LOWER LEE (CORK CITY) FLOOD RELIEF SCHEME

(INCLUDING BLACKPOOL AND BALLYVOLANE)

CONSTRAINTS STUDY

JULY 2014

Client	**Office of Public Works**
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CONSTRAINTS STUDY REPORT

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EXECUTIVE SUMMARY

This report sets out the key environmental issues relating to the Lower Lee (Cork City) Flood Relief Scheme Study Area which may be impacted upon by possible flood alleviation measures and/ or which may impose constraints on the viability and/ or design of these measures. Information has been gathered on engineering, socio-economic, environmental, archaeological and geotechnical constraints.

Environmental constraints have been investigated under the following headings:

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

Under each heading the assessment methodology is outlined followed by a description of the current Study Area or 'receiving environment'. Finally a summary of the key constraints and implications for the proposed scheme is completed.

In addition to the assessments carried out, a public consultation was held to present the Study Area to the public and invite feedback regarding the proposed scheme. Information gathered during this public consultation has been included in this report.

This report is one stage in environmental assessment process, which will be ongoing throughout the planning and design of the project. Information gathered or alternatives suggested arising from public information days, meetings with stakeholders and written representations will be considered on the grounds of engineering feasibility, environmental viability, existing constraints and economics.

SUMMARY OF KEY CONSTRAINTS

The following is a summary of the key constraints identified as part of this study.

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 ensure that the public amenity value of the study area is not diminished. 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.
Properties and businesses currently accessed by culverted sections or bridges over the Bride and Glen Rivers in Blackpool and Ballyvolane will need to have access maintained/re-established, if works on these areas are proposed.
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, works 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 minimised 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 this designated site.
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, 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 existing and future abstractions from the River Lee at Inniscarra and Lee Road.
The design should also take into consideration the impact that any proposed flood relief scheme will have on the yields of existing groundwater abstractions from the study area Ground Water Bodies, taking into account the extreme vulnerability rating 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 EIS 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 in-channel 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 flood relief 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 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 flood relief 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 flood relief 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 flood relief 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 flood relief 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 flood relief 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 the discharges from Waste Water 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.

1 INTRODUCTION

1.1 OVERVIEW OF SCHEME

The purpose of the Lower Lee (Cork City) Flood Relief Scheme is to identify the most appropriate flood relief scheme to alleviate flooding in Cork City (including Blackpool and Ballyvolane).

1.2 STUDY AREA

The Study Area consists of the channel, floodplain and immediate surrounding areas of the River Lee from the Inniscarra Dam extending along the main channel of the river as shown on Figure 1.1, overleaf. The main population centres in the study area are Cork City (including Blackpool and Ballyvolane) and the village of Ballincollig.

The River Lee is joined by a number of large tributaries within the study area. These include:

- The River Sullane
- The Laney River.
- The Dripsey River
- The Bride (West and North) Rivers
- The Shournagh River

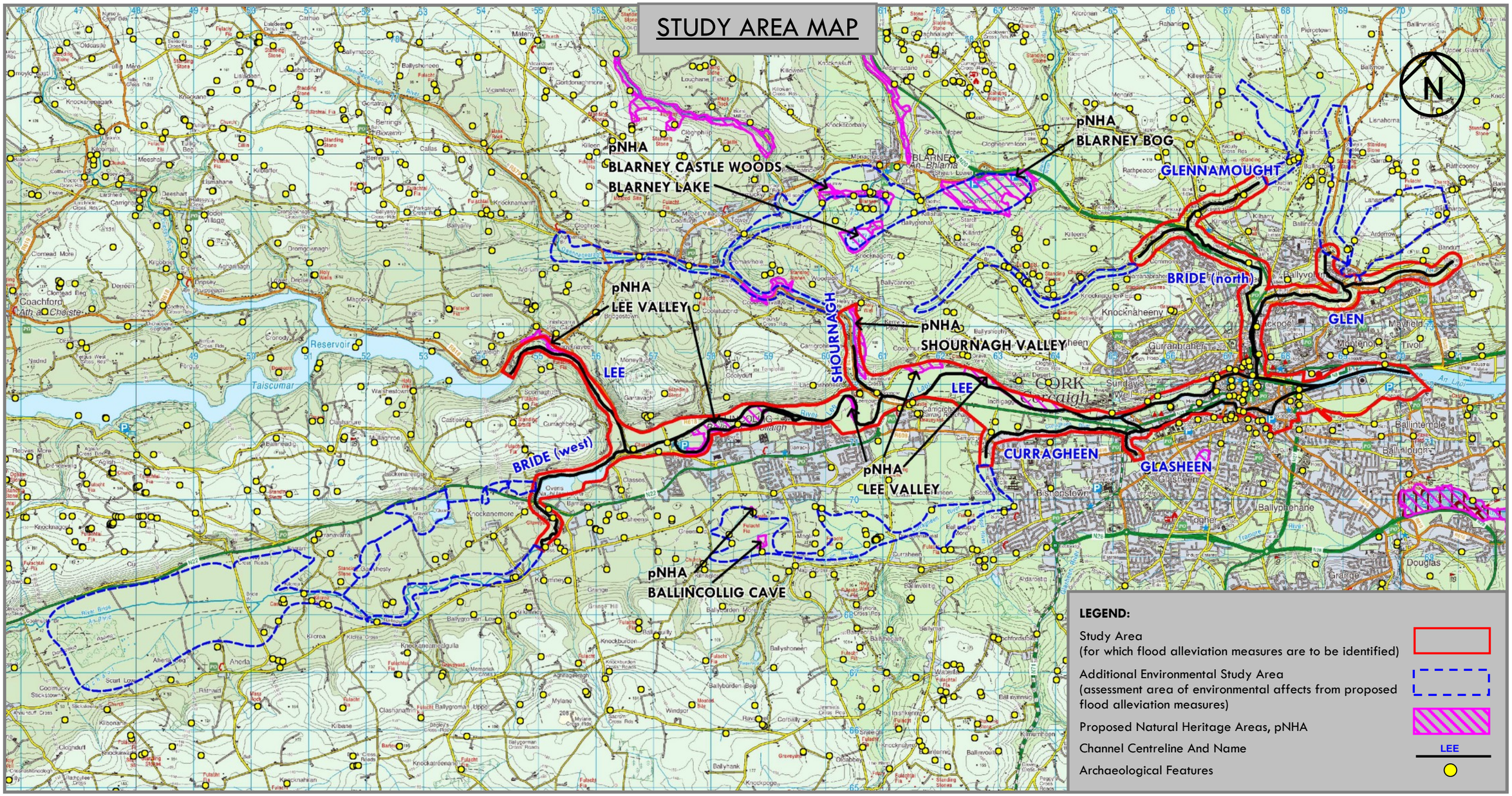
A number of smaller tributaries join the River Lee in Cork City including the Curragheen, Glasheen and Kiln Rivers. The catchment also includes a number of smaller rivers and their estuaries that drain directly into Cork Harbour. These include the Glashaboy, Owennacurra, Tramore and Owenboy Rivers.

1.3 STAGE OF PROCESS

The Constraints Study is the first stage in the Environmental Impact Assessment for Lower Lee (Cork City) Flood Relief Scheme and is being advanced in parallel with the Engineering Study for the Lower Lee (Cork City) Flood Relief Scheme. The project will be delivered in the following stages:

Environmental Impact Assessment			**Engineering Study**
Stage I	Part 1	**Constraints Study** (*this stage*)	Hydrology Study & Hydraulic Modelling
	Part 2	Screening for Appropriate Assessment	Site Investigations
Stage II	Part 1	Environmental Assessment of Viable Options	Flood Risk Assessments
	Part 2	Appropriate Assessment (if required)	Flood Risk Management Options
Stage III		Environmental Impact Statement	Cost Benefit Analysis
Stage IV		Public Exhibition	Selection of Preferred Option
			Flood Risk Management Plan
			Interference Notices
			Public Exhibition

Lower Lee (Cork City) Flood Relief Scheme (Including Blackpool and Ballyvolane)



Planning & Environmental Consultants

1.4 SCOPE OF ASSESSMENT

Information has been gathered under relevant headings prescribed in the Environmental Protection Agency (EPA) guidelines "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, 2003"

1.5 CONSULTATION

Consultation has taken place with statutory and non-statutory consultees as part of the initial scoping process. Comments and information were sought from consultees. The list of consultees is included in Appendix A, together with a copy of the letter and attachments issued to Consultees. Copies of any written correspondence received are also provided in Appendix A.

2 SCHEME CONTEXT AND BACKGROUND

2.1 HISTORY OF FLOODING

There is a long history of flooding of the River Lee within the Study Area. Flooding due to heavy rainfall in the catchment of the River Lee, and its tributaries, is occasionally exacerbated by high tides in the river estuary. Incidents of flooding on record include:

Flood Event	Mechanism	Rivers affected	Areas affected
August 1986	Fluvial	Lee, Sullane, Laney, Shournagh	Baile Mhic Íre; Macroom; Ballincollig Blarney; Cork City
November 2000	Fluvial	Lee; Owennacurra, Martin; Shournagh;	Midleton; Watergrasshill; Fivemilebridge; Ballinhassig; Ballygarvan; Cork City; Ballincollig; Blarney
November 2002	Fluvial	Lee; Glashaboy Owenboy; Ballybrack Butlerstown	Douglas; Carrigaline; Ballygarvan; Ballinhassig; Monkstown –Passage West; Riverstown
October 2004	Tidal	Lower Lee and Cork Harbour	Cork City; Cobh; Whitegate; Monkstown-Passage West; Crosshaven; Ringaskiddy; Glounthaune; Glanmire; Midleton, Carrigaline
December 2006	Fluvial	Sullane and Lower Lee	Baile Mhic Íre, Carrigrohane Road
November 2009	Fluvial	Lower Lee	Cork City, Ballincollig, Blackpool, Ballyvolane and surrounding areas
June 2012	Fluvial	Bride (North)	Blackpool, Ballyvolane
March 2013	Fluvial	Bride (North)	Blackpool, Ballyvolane

Table 2.1 Historical Flooding Incidents

2.2 FUTURE CHANGES

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 and higher tide levels
- 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 Lee River and its tributaries, 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
- Alterations to the operation and layout of the Inniscarra Dam

2.3 POTENTIAL FLOOD RISK MANAGEMENT MEASURES

An Engineering Study is being advanced in parallel with the Environmental Assessment of the Flood Relief Scheme. The Constraints identified in this report will inform the selection of a flood alleviation measures as part of the Engineering Study.

The range of engineering measures typically considered for flood alleviation schemes in an Engineering Study include, but are not limited to the following:

a) Do Nothing (i.e., implement no new flood alleviation measures)
b) Non-Structural Measures (e.g. flood warning system or individual property protection)
c) Relocation of Properties and/or infrastructure
d) Reconstruction of Properties and/or infrastructure to a higher level
e) Flow Diversion (e.g. river diversion or flood flow bypass channel)
f) Flow Reduction (e.g. upstream catchment management or flood storage)
g) Flood Containment through Construction of Flood Defences
h) Increase Conveyance of Channel (upstream and/or through and/or downstream of the town)
i) Sediment Deposition and Possible Sediment Traps
j) Pump storm waters from behind flood defences
k) Measures Specific to the Study Location

It is not possible, at this stage, to define the number of scheme options that will require study, although a typical Engineering Study of this nature will identify between three and five viable options.

2.4 TOPOGRAPHY AND MAPPING

The Study Area is concentrated mainly in the valleys of the River Lee (from the Inniscarra dam to the area North of Ballintemple in Cork City) and its tributaries and consists of the

channel, floodplain and immediate surrounding areas of the River Lee extending along the main channel of the river as shown on Figure 1.1. The land within the Study Area falls generally towards the river and its tributaries (listed in 1.2 above). The River Lee has a relatively flat gradient within the Study Area.

The following mapping was used in order to carry out this Constraints Report;

- Ordnance Survey Discovery Series Mapping at 1:50,000 scale
- Old Raster 6" Mapping
- Old Raster 25" Mapping

Ordnance Survey 1:50,000 scale Discovery Series mapping is the main background mapping used in the preparation of the drawings provided with this report.

3 ENVIRONMENTAL CONSTRAINTS

3.1 INTRODUCTION

The purpose of this section of the report is to describe the key environmental issues relating to the Lower Lee Flood Relief Scheme study area which may be impacted upon by possible flood alleviation measures and/ or which may impose constraints on the viability and/ or design of these measures.

3.2 METHODOLOGY AND GUIDELINES

This Constraints Study is the first stage in the Environmental Impact Assessment for the Lower Lee Flood Relief Scheme and is being carried out in accordance with the Environmental Protection Agency (EPA) guidelines "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, 2003".

Information has been gathered under relevant headings prescribed in the EPA Guidelines.

Ryan Hanley Consulting Engineers, in association with McCarthy Keville O'Sullivan Environmental & Planning Consultants, has employed archaeological specialists to carry out studies under the following heading:

Study	Specialist
Archaeology, Architectural & Cultural Heritage	John Cronin & Associates

Table 3.1 Environmental Specialists

The following sections outline the findings of the Constraints Study and identify environmental constraints associated with the scheme.

3.3 HUMAN BEINGS

This section sets out the socio-economic features of the Study Area that may impact on the selection of flood alleviation measures for the proposed scheme.

3.3.1 Settlements and Planning Policy

The following sources of information were utilised in the preparation of this section:

- Cork City Development Plan 2009-2015
- Cork County Development Plan 2009 (2nd Edition)
- Cork Area Strategic Plan 2001- 2020
- Cork Area Strategic Plan (Update) 2008
- Macroom Electoral Area Local Area Plan 2011
- Regional Planning Guidelines for the South West Region 2010-2022
- Census of Ireland 2011 & 2006
- Cork City Council Website
- Cork County Council Website
- Myplan.ie

The major settlements within the Study Area are Cork City, including the city centre and western suburbs, and Ballincollig. Cork City is designated as a "Gateway" city in the National Spatial Strategy 2002-2020, which is a 20 year national plan that seeks to promote a better balance of population, jobs and development between the regions. It has identified a number of Gateway cities as the focus for population and economic growth in their region. The specific gateway role for Cork City has also been enshrined in the Regional Planning Guidelines for the South-West Region 2010-2022 (RPGs), which seeks to strengthen the Cork Gateway. The Department for the Environment, Heritage and Local Government set population targets for each region and the RPGs translated these into population targets for Cork City, and Cork and Kerry Counties. These targets aim to shift some of the expected national growth in population to 2022 to regions outside the greater Dublin area, in line with NSS objectives. As a result Cork City is allocated a target population of 150,000 by 2022.

The overall vision of the Cork City Development Plan 2009-2025 is for Cork to be an attractive, accessible and unique city. The Plan sets three main goals, as follows:

1. *"To promote and provide for the sustainable development of Cork City enabling it to fulfil its role as a National Gateway City.*
2. *To promote social inclusion and to facilitate equality of access to employment, education, transport, suitable housing and social and cultural activities, whether by direct provision (e.g. social housing) or by facilitating others to provide the service (e.g. education).*
3. *To provide for a high quality natural and built environment and improved quality of life for those living and working in Cork City and also for those visiting the city."*

The City Development Plan sets out land use zoning and other specific objectives for lands within the City Council's administrative area, including lands within the study area. In this regard, there are many different land use zonings applying to the lands within the study area, generally based on existing land uses. However, for the purposes of this report, the Core Strategy (Ref. Figure 3.1), as included in the City Development Plan in 2011, provides an overview of the Council's strategy for the city. This is summarised in the following diagram:

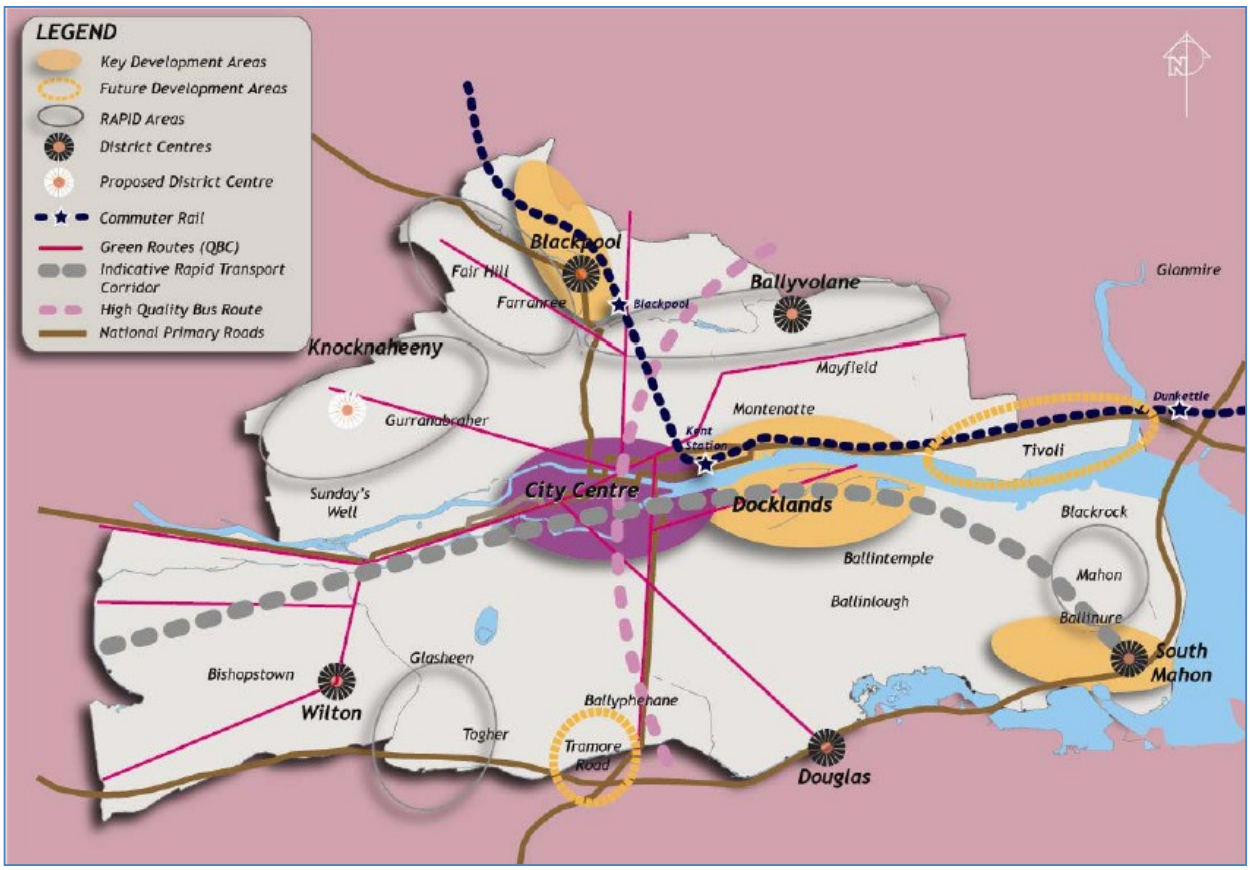


Figure 3.1 Cork City Council Core Strategy (City Development Plan)

Ballincollig is located approximately 10 kilometres to the west of Cork City Centre and is located within the administrative area of Cork County Council. Ballincollig is the largest main

town in County Cork and has experienced a high level of growth and development pressure since 2000. In this regard, the Cork Area Strategic Plan 2008 Update (CASP) identified Ballincollig as a major centre for additional population and employment growth. The County Development Plan designates Ballincollig as a "Metropolitan Town", where the objective is to promote critical growth to support the Cork Gateway. In addition, the town is within a designated "Developing Area", where strategically important and rapid development is anticipated over the next 5 – 10 years. Ballincollig has a target population of 21,430 by 2020.

The Macroom Electoral Area Local Area Plan 2011 sets out the vision for Ballincollig as follows:

> *"The vision for Ballincollig is that it will continue to grow as a major centre for population and employment within the Metropolitan Area. The Local Area Plan will identify suitable locations for both residential and employment growth in the town and co-ordinate this growth with the upgrading of infrastructure services and the delivery of the green route and the high quality rapid transit link to Ballincollig."*

The Local Area Plan sets out land use zoning and other specific objectives for lands within Ballincollig and the County Council's administrative area, including lands within the study area. In this regard, there are a number of different land use zonings applying to the lands within the study area, generally based on existing land uses. Figure 3.2 overleaf shows the zoning objectives for Ballincollig.

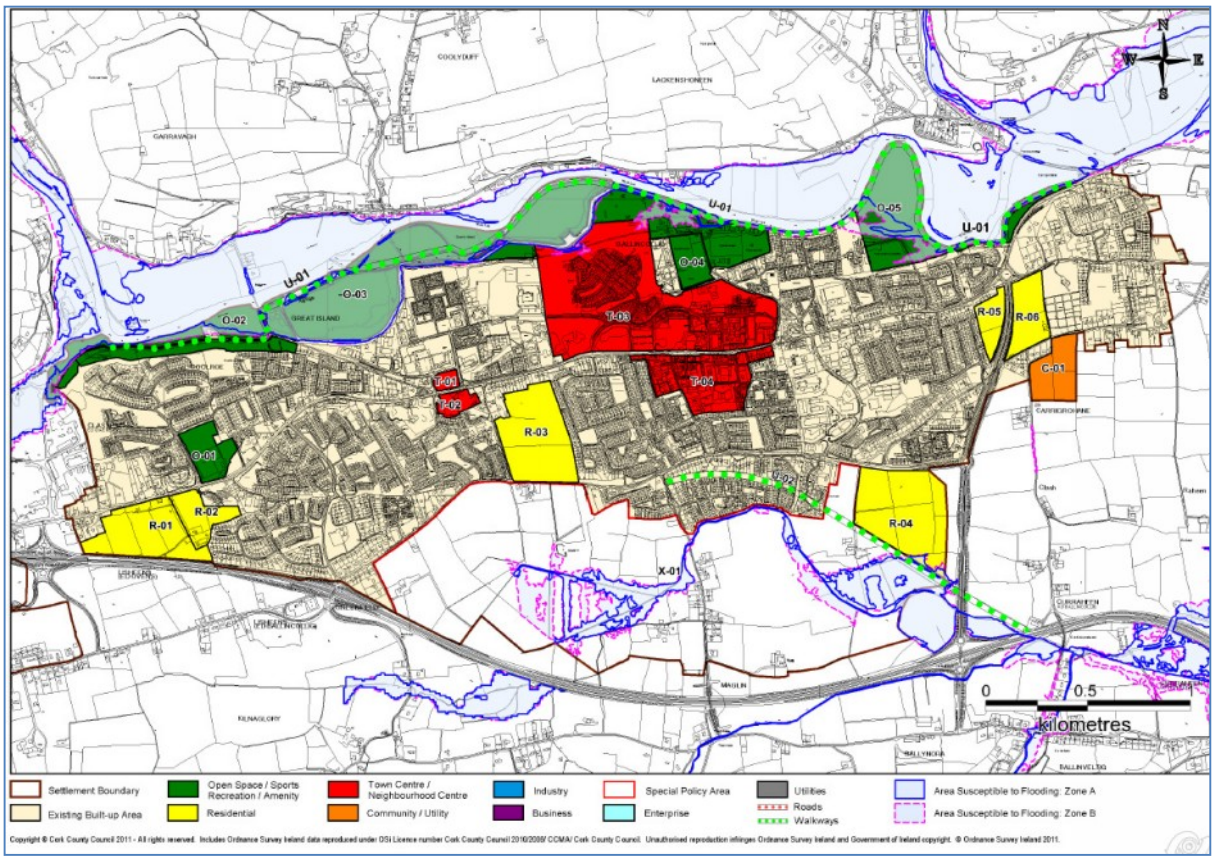


Figure 3.2 Ballincollig Zoning Map (Local Area Plan)

3.3.2 Population and Housing

During the inter-censal period 2006-2011, the population of Cork City fell slightly from 119,418 to 119,230, representing a marginal decline of 0.2%. It should be noted that these figures relate to the administrative area of Cork City Council and, as a result, parts of the suburbs are excluded. Much of the population growth in recent years has occurred in the wider Cork Metropolitan Area, outside the City Council boundary, in suburbs and satellite towns. However, as referred to above, the RPGs set a population target of 150,000 by 2022 and the City Development Plan sets an interim target of 134,710 by 2016.

The population targets set in the RPGs for Cork City have been converted to housing requirements, taking account of household size. The total number of households is 47,163 (Census 2011), which represented an increase of 7.3% from the Census 2006 figure of 43,939. The Development Plan household targets are 55,088 (2016) and 64,352 (2022). The Development Plan notes that, given the current economic climate, these targets may be ambitious. However, it confirms the objective of planning for a significant increase in the city's population and targeting regional growth at sustainable locations.

During the inter-censal period 2006-2011, the population of Cork County increased from 361,877 to 399,802, representing a significant increase of 10.5%. As referred to above, the County area includes parts of the suburbs of Cork City and, indeed, Ballincollig is a satellite town within the metropolitan area. Much of the population growth has occurred in the Cork Metropolitan Area, outside the City boundary.

Population targets set out in the County Development Plan suggest a target population of 21,430 in Ballincollig by 2020. The Census 2011 figures for the Ballincollig Electoral Division show a population of 17,965, which is a 10% increase from the 2006 Census figure of 16,308.

The population targets for Ballincollig have been converted to housing requirements, taking account of household size. The total number of households in the Ballincollig ED is 6,819 (Census 2011), which represented an increase of almost 28% from the Census 2006 figure of 5,335. The Local Area Plan target is 8,870 households by 2020. The Plan notes that the CASP and the County Development Plan 2009 recognise that land to the south of the town represents a major strategic development opportunity, where the majority of the town's growth will be accommodated.

3.3.3 Industry and Business

The City Development Plan states that the CASP Update envisages a total of 45,021 net new jobs will be required to sustain the projected population target for the entire CASP area, of which 15,443 will be within Cork City. It states that most of the anticipated growth will be in the services sector, with a continued decline in manufacturing employment likely.

The CASP Update identifies the City's Docklands as a key area of potential, although it also acknowledges that there is a need for significant public intervention, such as new infrastructure and incentives. The identified sectors of particular potential in Docklands include:

- National market traded services;
- Internationally traded services/mobile services;
- Health and education;
- Bio pharma/pharmaceuticals;
- ICT and digital media.

The City Council supports the implementation of the CASP update, including its economic and investment strategy, and has confirmed the Docklands area as a primary focus for economic development. The relevant Development Plan policy is as follows:

> *The City Council will encourage and facilitate the implementation of the CASP update economic and investment strategy, in co-operation with other institutions such as the IDA, Enterprise Ireland and Cork Marketing Partnership (through its Economic Marketing Plan) and the private sector, including organisations such as Cork Chamber, and in particular will seek to secure the economic development of Docklands.*

The CASP update and City Development Plan sets out objectives for the location of economic development and promotes the redevelopment of brownfield sites in or near the City Centre. In this regard, the City Centre is acknowledged as the focus for retail, cultural and commercial activity, with potential for expansion and intensification.

The 2009 County Development Plan designates Ballincollig as an "*integrated employment centre*". This is commensurate with its role as the main town in the County and its location within the metropolitan area. The County Plan states that employment activities in Ballincollig include industrial and enterprise development such as office based industry, manufacturing and distribution.

The Local Area Plan notes that Census 2006 data indicates that there were 7,096 jobs in Ballincollig. CASP has identified that Ballincollig would have the potential to become a strategic employment location, self-sustaining and distinct from Cork City. The CASP update forecasts an additional 5,704 jobs between 2006 and 2020 for Ballincollig and further identified the areas to the south of the town for a new business park.

Having regard to the growth targets for Ballincollig, the Local Area Plan has identified a large tract of land to the south of the town for mixed development. Zoning Objective X-01 is as follows (extracts):

> *It is the Planning Authorities objective to secure the development of a mixed use site through a phased programme of development that will deliver the future target housing growth figures for the town as required. The development of the site shall*

also secure the timely provision of the necessary physical, social and economic infrastructure. The masterplan should be prepared in coordination with the local authority, the public and relevant stakeholders. The masterplan shall include the following:

- *The development of up to 4,000 new dwellings.*
- *A 20ha enterprise area specifically designated for a high quality office park development which would provide up to 4,000 new jobs.*
- *Proposals for the provision of an educational campus which would provide up to two national primary schools and a secondary school.*
- *Provision shall be made for up to 20ha of open space in addition to the open space normally required.*

3.3.3.1 IPPC Licensed Facilities

The EPA licenses large-scale industrial and agricultural activities under the Integrated Pollution Prevention Control Directive. The following facilities in the vicinity of the Study Area are listed on the EPA website as licensed. There are currently 147 no. IPPC licensed activities in County Cork, many of which are in the Cork City area, particularly at Little Island and Ringaskiddy. However, these have not been included in the list. Nevertheless, consideration should be given to these clusters of IPPC facilities as constraints, as part of the flood risk assessment, given the large-scale nature of the activities and the associated pollution potential (See Table 3.3.1 below).

Facility	Address	Activity Category
Schering-Plough (Brinny) Company	Brinny, Inishannon, Co. Cork	Manufacture of pesticides, pharmaceutical or veterinary products and their intermediates
Eli-Lilly S.A. Irish Branch	Dunderrow, Kinsale, Co. Cork	Manufacture of pesticides, pharmaceutical or veterinary products and their intermediates
Dulux Paints Ireland Limited	Shandon Works, Commons Road, Cork	The manufacture of paints, varnishes, resins, inks, dyes, pigments or elastomers where the production capacity exceeds 1,000 litres per week.

Facility	Address	Activity Category
Rothbury Manufacturing Limited	Sunbeam Industrial Park, Millfield, Blackpool, Cork	The dyeing, treatment or finishing (including moth-proofing and fire-proofing) of fibres or textiles (including carpet) where the capacity exceeds 1 tonne per day of fibre, yarn, or textile material.
Heineken Ireland Limited	Lady's Well Brewery, Cork	Commercial brewing and distilling, and malting in installations where the production capacity exceeds 100,000 tonnes per year
Electricity Supply Board	Marina Generating Station, Centre Park Road, Cork	The operation of combustion installations with a rated thermal input equal to or greater than 50MW

Table 3.3.1 IPPC Licenced Facilities in vicinity of Study Area

3.3.4 Tourism

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. During 2011 (the latest annual period for which Fáilte Ireland figures are available), total tourism revenue generated in Ireland was €5.74 billion, a decrease of approximately 0.6% from the previous year. Between 2010 and 2011, the number of overseas tourist visits to Ireland increased by 6.4% to 6.32 million, the first increase in two years. The number of trips taken by domestic visitors in 2011 increased by 4.41% from the previous year to 8.99 million. (*'Tourism Facts 2001'*, Fáilte Ireland, December 2012)

Ireland is divided into seven tourism regions. The study area falls within the South-West Region, which comprises County Cork and County Kerry. Tourist revenue figures for 2011 show that a total of 1.68 million overseas tourists visited the South-West Region, generating a total revenue of almost €596 million (Source: Fáilte Ireland).

During 2011, the South West Region benefited from approximately 18% of the total number of overseas tourists to the country and approximately 20% of the total tourism income generated in Ireland for that year. Fáilte Ireland figures for 2012 show that County Cork is the second most visited county for overseas visitors, after Dublin. The 2012 figures show almost 1.23 million overseas visitors to County Cork, generating total revenue of almost €400 million.

The Cork City Development Plan recognises the importance of tourism in the economic life of the city and the potential that exists for the industry to expand further. It notes that Cork City

has its own tourism and visitor economy primarily based on local culture and distinctiveness, as well as the city's function as a base for the wider area.

The Tourism Strategy outlined within the County Development Plan 2009 identifies 6 areas of strategic tourism potential within County Cork. These are:

- The Blackwater Valley - a premier walking, cycling, fishing destination and other outdoor activities.
- The Galtee Mountains and the Ballyhoura Area - a centre for walking, cycling and adventure related activities.
- The Coastline – Marine related activities including some fine blue flag beaches.
- The West Cork Peninsulas (Beara, Mizen, Sheeps Head) – with their unique visual amenity and landscape character offer potential for walking and cycling and other outdoor activities.
- Cork Harbour – the potential for Spike Island to become an internationally recognized tourist attraction.
- Cork City – Heritage and cultural character

The Study Area includes parts of Cork City, which is one of the strategic tourism areas identified in the Development Plan.

The Macroom Electoral Area Local Area Plan, which covers a wider area than the study area, notes that the tourism industry relies on a quality environment. It notes that the area has many scenic and historic attractions and, in particular, that Ballincollig is an ideal base for exploring the local scenic landscapes. Ballincollig is also recognised in relation to the potential to develop water based tourism related activities at the nearby Inniscarra Lake.

3.3.5 Community Facilities

3.3.5.1 Education

A review of mapped information on existing schools indicates that, within the Cork City Council boundary, there are many schools within the vicinity of the study area (Myplan.ie).

The Macroom Electoral Area Local Area Plan notes that Ballincollig has four primary schools and two secondary schools. Arising from the population growth targets for the town, there will be an additional requirement for educational facilities, including primary and post primary

levels. Similarly, whilst the population of Cork City has been relatively stagnant, future growth of the Gateway city is likely to necessitate additional school facilities.

3.3.5.2 Recreation and Amenities

Being a Gateway city and a major centre of population, there are many sports and recreation facilities in Cork City, a number of which are located in the vicinity of the study area. These include University College Cork sports facilities adjacent to the River Lee and other riverside recreation and leisure amenities. Indeed, many of the riverside areas in the City provide for active and passive enjoyment of the amenities.

The Macroom Electoral Area Local Area Plan notes that Ballincollig is also well served by a range of high standard sports and recreational facilities, including the GAA Club, Rugby Club, playgrounds, pitch and putt course and the Regional Park. However, the Plan notes that Ballincollig lacks community facilities such as a community centre and playgrounds in the town centre and its eastern side.

3.3.6 Key Constraints

- 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 local transport links and access to homes and businesses in the study area are minimised.
- The design of the scheme should ensure that the public amenity value of the study area is not diminished. Impacts on public amenity areas adjacent to river such as the riverside walks, parks and playgrounds adjacent to the river, should be considered, with replacement mitigation proposed if necessary. Similarly, specialist amenity areas include angling and water sports areas should be given consideration.
- Impacts on especially sensitive receptors e.g. schools, crèches, nursing homes and hospitals should be considered in the flood relief scheme.
- The proposed scheme should take consideration of the zoning objectives and relevant specific objectives set out in the relevant Development Plan or Local Area Plan.

3.4 ECOLOGY

This ecological constraints assessment has been carried out to provide decision makers with clear and concise information on the international, national, regional and local issues that must be taken into account when planning and designing the Lower Lee (Cork City) Flood Relief Scheme.

This section will provide the main ecological issues and constraints that could significantly affect the design of the scheme, delay progress or influence the costs.

The findings of this section will feed into further sections of the proposed scheme such as the Environmental Impact Assessment.

3.4.1. Methodology

The methodology followed in completing this section of the report consisted of desktop research, field research and consultation with a number of governmental and non-governmental bodies. Consultation was held with the following bodies:

- National Parks and Wildlife Service (NPWS) local ranger
- Development Applications Unit of Department of Environment, Community and Local Government
- Environment Protection Agency
- Bat Conservation Ireland (Mr. Conor Kelleher)
- An Taisce
- Irish Peatland Conservation Council
- Cork County Council
- Birdwatch Ireland
- Irish Wildlife Trust
- Cork & District Angling Club
- Lee Reservoirs Angling Services
- Bord na Móna
- Coillte Teoranta
- Earthwatch (Friends of the Earth Ireland)
- Inland Fisheries Ireland
- Waterways Ireland
- University College Cork

The following sources were also used in the compilation of this section of the constraints report:

- 1:50,000 scale Discovery series mapping;
- 1:10,560 OS Maps of the study area
- Aerial photography of the Study Area
- Wildflowers of Cork City & County (O' Mahony, 2009)
- Cork City Urban Otter Survey 2011-2012 (Irish Wildlife Trust, Cork Branch, 2012)
- National Biodiversity Data Centre
- New Atlas of British and Irish Flora Preston et al 2002
- NPWS site synopses and database of information on designated sites and records of protected species.
- *The Atlas of Breeding Birds in Britain and Ireland'* (Sharrock, 1976), *'The New Atlas of Breeding Birds in Britain and Ireland*: 1988-1991' (Gibbons et al., 1993) and *'The Atlas of Wintering Birds in Britain and Ireland'* (Lack, 1986)
- *BirdLife Interternational's list of Important Bird Areas (Hunt et al., 2000),*
- *List of Birds of Conservation Concern (Lynas et all. 2007)*
- The EPA website http://www.epa.ie/rivermap/data
- The Water Framework Directive website www.WFD.ie
- Nature in the City a guide to Biodiversity in Cork City (Cork City Council, 2009)
- Lee Valley Greenway (Atkins, 2013)

The Study Area was also visited on the 18th June 2013 and a windshield survey was undertaken to verify details on the ground.

During this visit, the general habitat types within the Study Area were observed and photographed. The purpose of this was to observe the habitats in the area first hand and to a certain extent to ground truth the findings of the desk study that is detailed in Section 3.4.2 below. No detailed floral or faunal surveys were carried out during this visit.

3.4.2. Desk study

3.4.2.1 Designated areas

With the introduction of the EU Habitats Directive (92/43/EEC) which was transposed into Irish law as the Natural Habitats Regulations, 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna, and also, more importantly, their habitats. Member states were directed to provide lists of sites for designation.

Natural Heritage Areas

Natural Heritage Areas (NHAs) are heritage sites that were designated for the protection of flora, fauna, habitats and geological sites of **national** importance. Management of NHAs is guided by planning policy and the Wildlife (Amendment) Act 2000. It was from these NHAs that the most important sites were selected for international designation as SACs and SPAs.

Special Areas of Conservation and Special Protection Areas

There are two types of EU site designation, the Special Area of Conservation (SAC) and the Special Protection Area (SPA). SACs are designated for the conservation of flora, fauna and habitats of European importance and SPAs for the conservation of bird species and habitats of European importance. These sites form part of *"Natura 2000"* a network of protected areas throughout the European Union.

Annex I of the Habitats Directive lists certain habitats that must be given protection. Certain habitats are deemed 'priority' and have greater protection. Irish habitats include raised bogs, active blanket bogs, turloughs, heaths, lakes and rivers. Annex II of the Directive lists species whose habitats must be protected and includes Lesser Horseshoe Bat, Otter, Salmon and White-clawed Crayfish.

3.4.2.2 Designated Sites in the Vicinity of the Study Area

The National Parks and Wildlife Service publish synopses of the information regarding areas designated for conservation. The designated sites within the study area are shown in Figure 3.4.1. The full site synopses are provided in Appendix C.

Natura 2000 sites

The nearest Natura 2000 sites (SAC's or SPA's) are:

- Cork Harbour SPA (Site Code 004030)
- Great Island Channel SAC (Site Code:004219)

These marine designated areas are located within 5.0km of the Study Area within and downstream of the scheme.

Cork Harbour SPA is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poulnabibe inlets. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover,

Grey Plover, Lapwing, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country (NPWS, 2008).

The Great Island Channel SAC stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. The site is a Special Area of Conservation (SAC) selected for the following habitats:

- [1140] Tidal Mudflats and Sandflats
- [1330] Atlantic Salt Meadows

Outside of the 5km, there are two Natura 2000 sites located upstream of Inniscarra Dam which is the most westerly point of the scheme:

- The Gearagh SPA (Site Code: 004109)
- The Gearagh SAC (Site Code: 00108)

While these Natura 2000 sites are located upstream of the scheme, any proposal to increase capacity upstream of Inniscarra Dam to alleviate flooding could impact on water levels within The Gearagh.

The Gearagh SAC supports the Annex I priority habitat Alluvial Woodland Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) comprises woods dominated by Alder (*Alnus glutinosa*) and Willow (*Salix* spp) on flood plains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation.

According to the Site Synopsis for The Gearagh SAC “this unusual area has formed where the River Lee breaks into a complex network of channels (2 to 6 m wide) weaving through a series of wooded islands. The alluvial woodland which remains today at the Gearagh is of unique scientific interest, and qualifies as a priority habitat under Annex I of the EU Habitats Directive. The area has probably been wooded throughout the post-glacial era (i.e. since the end of the last Ice Age, around 10,000 years ago) and frequent flooding has served to enhance

its character. Originally, this area of alluvial woodland extended as far as the Lee Bridge. Unfortunately, in 1954/55, in the eastern part of the Gearagh, extensive tree-felling and flooding were carried out to facilitate the operation of a hydro-electric scheme. Around 60% of the former woodland was lost. Today, the reservoir covers the area from Lee Bridge to Annahala Bridge, and westwards of Illaunmore Island.

Despite the fact that about half the original area has been destroyed, the Gearagh still represents the only extensive alluvial woodland in Ireland or Britain, or indeed west of the Rhine in Europe. For this reason it is a unique site and has been designated also as a Statutory Nature Reserve. The international importance of the site is recognised by its designation both as a Ramsar site and as a Biogenetic Reserve. The reservoir is also a Wildfowl Sanctuary (NPWS, 2013).

Extensive swards of Mudwort (*Limosella aquatica*), also listed as 'Vulnerable' in the Irish Red Data Book and protected under the Flora (Protection) Order, 1999, occur on the mudflats along the Inniscarra reservoir (NPWS, 2013) within the SAC.

Please note that there is no Site Synopsis currently available for The Gearagh SPA on the NPWS website. The following species are Features of Interest (NPWS website, 2014) at the site:

- Teal (*Anas crecca*) [A052]
- Wigeon (*Anas penelope*) [A050]
- Mallard (*Anas platyrhynchos*)[A053]
- Coot (*Fulica atra*) [A125]
- Wetlands [A999].

The Gearagh SPA has also been designated as a Nature Reserve.

<u>Other Designated Sites</u>

There are 5 No. pNHAs which have surface water connectivity with the study area and are located in, or within 5km of the study area. These pNHAs are likely to be impacted by the proposed works.

- Great Island Channel pNHA (Site Code: 001058) – Located to the East of the River Lee.

- Dunkettle Shore pNHA (Site Code: 001082) – Located to the East and North of the River Lee.
- Lee Valley pNHA (Site Code: 000094) – includes terrestrial habitats along the banks of the River Lee.
- Douglas River Estuary pNHA (Site Code: 001046) – Located to the East of the River Lee.
- Monkstown Creek pNHA (Site Code: 001979) – Located to the South of the River Lee.

There are 10 No. pNHAs which are located either upstream or are not connected via surface water to the study area. They are therefore unlikely to be affected by the proposed works.

- Ardamadane Wood pNHA (Site Code: 001799) – Located to the North of the River Lee.
- Blarney Bog pNHA (Site Code: 001857) – Located to the North of the River Lee.
- Blarney Castle Woodland pNHA (Site Code: 001515) – Located to the North of the River Lee.
- Blarney Lake pNHA (Site Code: 001798) – Located to the North of the River Lee.
- Glanmire Wood pNHA (Site Code: 001054) – Located to the North of the River Lee.
- Shournagh Valley pNHA (Site Code: 000103) – Located to the North of the River Lee.
- Rockfarm Quarry pNHA (Site Code: 001074) – Located to the North of the River Lee.
- Cork Lough pNHA (Site Code: 001081) – Located to the South of the River Lee.
- Ballincollig Cave pNHA (Site Code: 001249) – Located to the South of the River Lee.
- Cushkinney Marsh pNHA (Site Code: 001987) – Located to the East of the River Lee.

3.4.2.3 Non Designated Features of Ecological Interest

River Lee

The River Lee with a catchment area of approximately 2000 km^2, rises in the Shehy Mountains on the western border of County Cork and flows eastwards through Cork city and flows into the sea at Cork Harbour.

Outside of The Gearagh to the west and the coastal transitional habitats of Great Island SAC and Cork Harbour SPA to the east, the aquatic habitats of the River Lee within the Study Area are not designated for nature conservation purposes. The River Lee is present on the NGO Shadow List of SAC's for the conservation of the Annex II species Atlantic Salmon (Dwyer, 2000; Crushell, 2002).

The River Lee is however designated as a salmonid fishery under the EC (Quality of Salmonid Waters) Regulations of 1988 (SI 84 of 1988), implementing the Freshwater Fish Directive (78/659/EEC).

In addition to Atlantic Salmon, the river and its larger 1st order tributaries, supports a number of other Annex II water dependant species, Annex I habitats and Annex I bird species and features of ecological interest.

Inland Fisheries Ireland during fish sampling for the Water Framework Directive (2010) recorded Brown Trout (*Salmo trutta*), Lamprey sp. and European Eel (*Anguilla anguilla*) in the River Lee at Inchinossig. At the Lee Fields in the City Lamprey sp., European Eel (*Anguilla anguilla*), Salmon (*Salmo salar*) and Brown trout (*Salmo trutta*) were recorded. Sea Lamprey have also been recorded downstream of Lee Waterworks Weir. It is not known if these species can move upstream above the weir. While the 1st order tributaries within the City have poor water quality e.g. Curaheen River and the River Bride they are likely to support a number of Annex II species and migratory species which move upstream on the tributaries to more suitable habitats in particular during winter floods (Ross Mackling pers. comm.). The ESB have operated a Smolt fishery at Inniscarra reservoir to assist with restocking Atlantic Salmon in the River Lee. Historically Atlantic Salmon and other fish species have not been able to migrate upstream and downstream of Inniscarra dam.

The entire length of the River Lee and its tributaries e.g. the River Bride and River Shournagh within the Study Area provide suitable foraging/commuting corridors for Otter. Otter holts are not known from within the environs of the City and its 1st order tributaries. A recent survey by IWT (2012) undertaken between 2011 and 2012 to evaluate the Otter population in the inner city and the adjacent suburban areas identified a minimum population of 11 No. Otters in the

city area. The survey area covered previous baseline surveys carried out between 2002 and 2004 by Sleeman (2005). Otters can be frequently seen within the city environs (pers. obs.).

A targeted Otter survey was also undertaken in 2013 for the Lee Valley Greenway by Atkins (2013) which also confirmed the presence of suitable habitat between Carrigrohane and the Weir at County Hall. An Otter holt was previously recorded at Classis Lake in Ballincollig. Otters also utilise the 1st order tributaries of the River Lee including the River Bride adjacent to Classis Lake and commute along the river down to the main channel of the River Lee. Parts of the River Lee are very accessible to recreational use include dog walkers meaning the habitats are less suitable for resting areas and holts but are good foraging areas (Atkins, 2013).

Ranunculus vegetation is also known to present within the River Lee (Ryan Hanley, 2012; 2014; Atkins, 2013) which corresponds to the Annex I habitat 'Watercourses of Plain to Montane Levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation [3260]'. The largest intact populations of *Ranunculus* vegetation are present on the River Lee main channel with smaller more localised populations having been recorded in the smaller 1st order tributaries e.g. the Bride River North, the Glen River, the Glenamought River and the Ballincolly Stream (Ryan Hanley, 2014).

The River Lee upstream of the Study Area supports the Annex II species Freshwater Pearl Mussel (*Margaritifera margaritifera*) at Inchigeelagh. The following tributaries of the River Lee are also known to support Freshwater Pearl Mussel (John Lucey; EPA river monitoring, post 2003 cited in OPW, 2007):

- Lough Lua;
- Foherish (River Code 19/F/02);
- Laney (River Code 19/L/01);
- Sullane (River Code 19/S/02);
- Toon (River Code 19/T/02); and
- Bealaphadeen.

In terms of terrestrial sites of ecological importance along the River Lee, O Mahony (2009) describes the most important habitat on the River Lee as "the contiguous series of inundation

meadows bordering the Lee Road in the flood plain of the River between Mount Dysert Road and Hollymount Road Junction within the Lee Fields. The habitat is located on the northern banks of the River Lee at this location and within the River Lee pNHA. O Mahony (2009) also describes an area of swampy scrub wood at the western boundary of the Lee Fields on the northern banks as being of ecological interest and refers to a series of small ponds in the eastern extremity of the Lee Fields containing Tubular Water Dropwort (*Oenanthe fistulosa*).

Smooth Newt (*Lissotriton vulgaris*) and Common Frog (*Rana temporaria*) are known from the wetlands on the northern bank of the River at Hollymount (Ross Macklin pers. comm.).

According to Cork City Council (2009) within the City's environs a number of semi-natural habitats or modified habitats supporting an array of wildlife are known: Distillery Fields, Fitzgerald Park, Lee Fields, UCC campus, The Marina, Atlantic Pond, Blackrock, The Lough, Atlantic Pond, Murphy's Farm and the Glen Recreation Area. Semi-natural habitats are also known from the 1st order tributaries e.g. the Curragheen, Bride, Twopot, Glasheen, Glen, Glenamought and Tramore. One scarce parasitic woodland plant Ivy Broomrape (*Orobanche hederae*) which grows parasitically on Ivy (*Hedera helix*) is known from the Distillery Fields area.

Lakes or ponds which support semi-natural or modified habitats and array of wildlife within the Study Area are known from Lee Fields at Hollymount, The Lough, Atlantic Pond and Classis Quarry Lakes (two) in Ballincollig and are also likely to be present outside the suburban areas on the River Lee Valley.

Many of the stone walls in Cork City support a diverse array of species including two listed under the Flora (Protection) Order, 1999, i.e. Roundleaved Cranesbill and Little Robin. These are listed as nationally 'Vulnerable' in the Irish Red Data Book. Little Robin is only known from walls and waste ground in Cork City and in Dungarvan Co Waterford. It has not been recorded recently at Dungarvan so it's only known remaining sites are probably all within Cork City. Roundleaved Cranesbill is found in very few sites in Ireland, one of which is waste ground areas around the city, where it has been recorded in greater numbers than at any of its other sites in Dublin and Wexford (Cork City Council, 2009).

According to (Cork City Council, 2009) the River Lee running west from the City to the Lee Fields is an excellent area for bats. Bats species recorded present include Common Pipistrelle, Soprano Pipistrelle, Daubenton's Bat, Leisler Bat and Brown-long eared Bat. Natteries and Whiskered Bat have also been recorded in the environs the City (e.g. around

Glanmire and may also occur in the more wooded areas along the Lee Road, Leemount and along the River Shournagh (Cork County Bat Group website, 2014).

The Annex I bird species Kingfisher (*Alcedo atthis*) is known to occur on the River Lee along the Irish Dipper (*Cinclus hibernicus*). The River Lee supports a number of bird species of Special Conservation Interest listed for the coastal marine habitats of Cork Harbour SPA e.g. Cormorant (*Phalacrocorax carbo*) and Grey Heron (*Ardea cinerea*)

Cork Harbour is also frequented by a number of Annex IV listed marine mammals including Harbour Porpoises (*Phocoena phocoena*), Bottlenose Dolphins (*Tursiops truncates*), Harbour Seals (*Phoca vitulina*) and Grey Seals (*Halichoerus grypus*). Orca whales (*Orcinus orca*) have also been known to move up the River Lee into the City environs.

Inniscarra Reservoir

Duck Mussel (*Anodonta anatine*) which is listed as Vulnerable on the Irish Red Data Book, also occurs in the Inniscarra reservoir (Ross Macklin pers. comm.).

According to Crowe (2005) Inniscarra reservoir is an extensive wetland site that is of high importance to waders and wildfowl and is monitored annually by IWeBS (Irish Winter Bird Survey). The section of the site which overlaps with The Gearagh is designated as a Special Protection Area. Outside of the SPA, however, much of the site remains undesignated despite its recognition by Birdlife International as an Important Bird Area (Hunt et al. 2000). The IBA covers The Gearagh and the upper part of the Inniscarra reservoirs, as far downstream as the Carrigadrohid dam (cited in AOS, 2010). The site is divided into three main sub-sites, each of which have been shown to regularly hold significant number of water birds:

- The Gearagh (designated as an SPA)

  Sullane Delta (Grid Reference: W 360 710). Significant numbers of Wigeon, Teal, Shoveler, Tufted Duck, Golden Plover, Lapwing and Curlew regularly occur at this subsite (IWeBS data). During winter 2010, the population of Whooper Swan that occurs at the Gearagh was shown to use this area for part of the winter season. The

swans were recorded roost on the lake and feeding on grassland habitat nearby (Crushell, 2010).

- Dunisky Culvert (Grid Reference: W 383 685). Significant numbers of Teal, Mallard, Tufted Duck and Curlew regularly occur at this small sub-site (IWeBs data).

3.4.2.4 New Flora Atlas

A search was made in the New Atlas of the British & Irish Flora (Preston et al., 2002) to find which rare or unusual plant species had been recorded in the 10km squares in which the Study Area is situated, (W36, W37, W46, W47, W56, W57, W66, W67, W76, W77, W86, W87). Eight species protected under the Flora (Protection) Order 1999 were recorded in these 10km squares. These species are listed below together with their record period data (as per Preston et al., 2002) and habitat requirements (as per Webb, 2012).

- Meadow Barley (Hordeum secalinum). Records from pre 1970 and 1987-1999. Upper parts of brackish marshes.
- Small Cudweed (Logfia minima). Records from pre 1970 and 1987-1999. Sandy and gravelly places.
- Mudwort (*Limosella aquatica*). Records from pre 1970. Small pools, especially on limestone, or on wet mud on the margins of lakes.
- Rough Poppy (*Papaver hybridum*). Records from pre 1970. Sandy fields.
- Pennyroyal (*Mentha pulegium*). Records from pre 1970 and 1987-1999. Damp, sandy places.
- Lesser Snapdragon (*Misopates orontium*). Records from pre 1970 and 1987-1999. Arable fields.
- Meadow Saxifrage (*Saxifraga granulata*). Records from pre 1970. Sandhills and pastures.
- Annual Knawel (*Scleranthus annuus*). Records from pre 1970. Waste places and roadsides on dry, sandy soils.

3.4.2.5 Bird Atlases

'The Atlas of Breeding Birds in Britain and Ireland' (Sharrock, 1976), 'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991' (Gibbons et al., 1993) and 'The Atlas of Wintering Birds in Britain and Ireland' (Lack, 1986) were consulted for information regarding the distribution of birds in Ireland. However, it should be remembered that, for some species at least, more recent work has been carried out.

These atlases show data for breeding and wintering birds respectively in individual 10 km by 10 km squares. Table 3.4.1 shows those species found in the relevant 10 km squares that are recorded in the Breeding Birds Atlases and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list. Birds listed under Annex I are offered special protection by the EU Birds Directive. Those listed on the BoCCI Red List meet one or more of the following criteria:

- Their breeding population or range has declined by more than 50% in the last 25 years
- Their breeding population has undergone significant decline since 1900
- They are of global conservation concern

Common Name	Scientific Name	Breeding Atlas 68-72	Breeding Atlas 88-91	Annex I	BoCCI red list
Hen Harrier	*Circus cyaneus*	✓	✓	Yes	No
Peregrine	*Falco preegrinus*	✓	✓	Yes	No
Corncrake	*Crex crex*	✓	**X**	Yes	Yes
Kingfisher	*Alcedo atthis*	✓	✓	Yes	No
Merlin	*Falco columbarius*	✓	✓	Yes	No
Dunlin	*Caladris alpina*	**X**	✓	Yes	No

Common Name	Scientific Name	Breeding Atlas 68-72	Breeding Atlas 88-91	Annex I	BoCCI red list
Lapwing	*Vanellus vanellus*	✓	✓	Yes	Yes
Common Tern	*Sterna hirundo*	✓	**X**	Yes	Yes

Table 3.4.2 Breeding Bird Atlas Data (W36, W37, W46, W47, W56, W57, W66, W67, W76, W77, W86, W87)

Eight species listed in Annex I of the EU Birds Directive have been recorded as breeding within the relevant 10km squares, in the Atlases of Breeding Birds.

The Hen Harrier is a medium sized bird of prey. The mature male has an off-white-grey plumage with dark wing tips. The female is larger than the male and has a mottled brown plumage. Hen harriers have a preference for undulating moorland, usually below 500m, with a lush covering of heather. Hen Harrier are also know to utilise young conifer plantation particularly in the first 5-10 year post planting. Hen Harrier predominantly feed on small birds and mammals.

The Peregrine is a bird of prey (raptor) with a short hooked bill. The species tends to nest on inland or coastal cliffs and in abandoned quarries. The peregrine is the fastest amimal on the planet and when diving during hunting can reach speeds of up to 240km/h.

The Corncrake (*Crex crex*) is a shy, secretive bird of hay meadows. Often the only indication of their presence is the distinctive kerrx-kerrx call of the male. Adult birds have a brown, streaked crown with blue-grey cheeks and chestnut eye-stripe. The breast is a buff grey, flanks show chestnut, white with thick black barring, fading on under-tail. The flight is weak and floppy. Large bright chestnut patches on the wings and dangling legs are distinctive in flight. Approximately 80% of the Corncrake's diet consists of animal matter and 20% vegetable matter Breeding is from mid May to early August and nests are generally constructed on the ground in tall vegetation. Females can have two broods, the first hatching in mid June and the second one in late July to early August. The Corncrake is Red-listed due to severe declines in the breeding population. The European population has been evaluated as Depleted due to a large historical decline.

Kingfisher require relatively shallow and slow moving freshwater, with thriving population of small fish (Stickleback, Minnow) and vertical banks with soft material where they can excavate

their nesting burrows. Kingfishers are very sedentary species and rarely move from their territories. However, some may move to lakes and coasts during extended spells of poor weather. The back, rump and tail are a bright, almost "electric" blue and usually draw attention to a flying bird. Despite these bright colours, can be easily overlooked perched motionless on a branch beside a stream or river on the look-out for fish. During the breeding season, females have a small red patch at the base of the bill, which is not shown by adult males.

The Merlin is a small falcon which breeds on moorland and tends to winter in lowland areas or along the coast. The Merlin is similar to a Peregrine in shape, with relatively narrow wings and a medium length tail. Merlin are nimble fliers and will pursue prey for extended periods. Merlin predominantly feed on Meadow pipits and Skylarks.

The Dunlin is one of the smaller waders and our most abundant one in winter and on passage. A limited number breed in some sandy / grassy locations along the Irish coastline.

Lapwings (*Vanellus vanellus*) are a distinct black-and-white, pigeon-sized wader, with wide rounded wings and floppy beats in flight. Wispy crest extending upwards from back of head and green/purple iridescence seen at close range. The Irish population is made up of residents, summer visitors from the Continent (France & Iberia) and winter visitors (from western & central Europe). Greatest numbers occur in Ireland between September & April. Lapwings feed on a variety of soil and surface-living invertebrates, particularly small arthropods and earthworms. They use traditional feeding areas, are opportunistic, and will readily exploit temporary food sources, such as ploughed fields and on the edge of floodwaters. Wintering distribution in Ireland is widespread. Large flocks are regularly recorded in a variety of habitats, including most of the major wetlands, pasture and rough land adjacent to bogs.

The Common Tern (*Sterna hirundo*) is a slender seabird with narrow, pointed wings, long forked tail and long, pointed bill. Common Tern nest colonially on the ground from April to October. The species form the nest colonies along the coastline and is also know to breed on islets in freshwater lakes, notably in Co. Galway and in Co. Mayo.

In terms of wintering birds, Table 3.4.3 shows those species found in the 10 km squares W4,5 & W5,5 that are recorded in the Atlas of Wintering Birds in Britain and Ireland 1988-91 and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list.

Common Name	Scientific Name	Annex I	BOCCI *red list*
Whooper Swan	*Cygnus cygnus*	Yes	No
Kingfisher	*Alcedo atthis*	Yes	No
Lapwing	*Vanellus vanellus*	No	Yes
Curlew	*Numenius arquata*	No	Yes
Herring Gull	*Larus argentatus*	No	Yes
Blackheaded Gull	*Larus ridibundus*	No	Yes
Yellowhammer	*Emberiza citrinella*	No	Yes
Dunlin	*Caladris alpina*	Yes	No
Shoveler	*Anas clypeata*	No	Yes
Pintail	*Anas acuta*	No	Yes
Knot	*Caladris canutus*	No	Yes

Table 3.4.3 Wintering Bird Atlas Data

Three birds recorded as wintering in the relevant 10 km square are protected under Annex I of the EU Habitats Directive: Whooper Swan, Dunlin and Kingfisher. Whooper Swan winter on large waterbodies and the surrounding grasslands and may be found within the Study Area. Kingfisher winter in similar habitats to their summer habitats and may be found in the area. Dunlin are common along all coastal areas - especially on tidal mudflats and estuaries.

A further eight birds that are listed on the BoCCI Red list were recorded in the atlas as being wintering in the area. These were Lapwing, Pintail, Curlew, Yellowhammer, Knot, Shoveler, Black Headed Gull and Herring Gull. Lapwing winter on farmland and flat coastal areas. Curlew Shoveler and Knot winter on mudflats and adjacent fields. In winter, Pintail form large flocks on brackish coastal lagoons, in estuaries and on large inland lakes. Yellowhammer winter on agricultural land, with adjacent scrub. Black Headed Gull winter on a variety of habitats and Herring Gull winters on lakes, estuaries and open fields. All the above species are potentially found at the site of the proposed works.

3.4.2.6 NPWS Records of Protected Species

The NPWS records of protected species in the area of the proposed development were obtained for the relevant 10 km squares: W36, W37, W46, W47, W56, W57, W66, W67, W76, W77, W86, and W87.

Species	No. of Records	Relevant 10km Grid Squares
Leatherback Turtle (*Dermocheles coriacea*)	8 No. records	W76, W86

Species	No. of Records	Relevant 10km Grid Squares
Atlantic salmon (*Salmo salar*)	1 No. record	W67
Brook Lamprey (*Lampetra planeri*)	4 No. records	W37, W67,W77, W86
Sea Lamprey (*Petromyzon marinus*)	5 No. records	W57, W67
Irish Hare *(Lepus timidus hibernicus*)	29 No. records	All 12 No. grid squares
Otter (*Lutra lutra*)	57 No. records	All 12 No. grid squares
Freshwater Pearl Mussel (*Margaritifera margaritifera*)	10 No. records	W36, W37
Pine Marten (*Martes martes*)	1 No. record	W87
Common Frog (*Rana temporaria*)	110 No. records	11 No. grid squares. No records from W47
Grey Seal (*Halichoerus grypus*)	1 No record	W86

Table 3.4.4 NPWS Rare and Protected Species Records (2013.

A search was also made of the NPWS Rare and Protected Species Records to identify which species recorded within the Study Area are protected under the Flora (Protection) Order 1999. This database identifies there are:

- 22 No. records for Little Robin (*Geranium purpureum*) from the 10km Grid Squares W67, W77 and W87
- 4 No. records of Wood Small-reed (*Calamarostis epigejos*) from the 10km Grid Square W77,
- 1 No. record for Red Hemp-nettle (*Galeopsis angustifolia*) from the 10km Grid Square W77,
- 2 No. records for Round-leaved Crane's-bill (*Geranium rotundifolium*) from the 10km Grid Squares W87 and W76,
- 4 No. records for Meadow Barley (*Hordeum secalinum*) from the 10km Grid Squares W76 and W77,
- 4 No. records of Henbane (*Hyoscyamus niger*) from the 10km Grid Squares W67 and W87,
- 4 No. records for Sharp-leaved Fluellen (*Kickxia elatine*) from the 10km Grid Squares W76, W86 and W87 (formerly protected under the 1987 Order),

- 4 No. records for Mudwort (*Limosella aquatica*) from the 10km Grid Squares W36 and W37,
- 1 No. record for Pennyroyal (*Mentha pulegium*) from the 10km Grid Square W76,
- 12 No. records for Weasel's Snout or Lesser Snapdragon (*Misopates orontium*) from the 10km Grid Squares W 47, W57, W67, W76, W86 and W87,
- 2 No. records for Round Prickly-headed Poppy or Rough Poppy (*Papaver hybridum*) from the 10km Grid Square W77,
- 2 No. records for Meadow Saxifrage (*Saxifraga granulata*) from the 10km Grid Squares W67 and W86 and
- 4 No. records for Annual Knawel (*Scleranthus annuus*) from the 10km Grid Squares W67, W76 and W86.
- There are 2 No. records for Small Cudweed (*Logfia minima*) from the 10km Grid Squares W57 and W86.
- 3 No. records for Lanceolate Fern or Spleenwort (*Asplenium obovatum* subsp. *Lanceolatum*) from the 10km Grid Squares W46 and W47. All records for Lanceolate Fern are from pre 1900.

According to the NPWS Rare and Protected Species Records there are also records for the following species which are considered rare, near threatened or are categorised as data deficient in the relevant Irish Red Data Book Lists:

- 2 No. records for Musk Thistle (*Carduus nutans*), which is listed as Data Deficient (dd) in the Irish Red Data Book 1: Vascular Plants (Curtis and McGough, 1988) from the 10km Grid Square W77.
- 3 No. records for Greater Broomrape (*Orobanche rapum-genistae*), which is listed as Rare (R) in the Irish Red Data Book of Vascular Plants from the 10km Grid Squares W67 and W86.
- 2 No. records for Hasselquist's Hyssop (*Entosthodon fascicularis*), listed as Near Threatened (NT) in the Ireland Red List No. 8: Bryophytes (Lockhart et al. 2012) from the 10km Grid Square W77.
- 2 No. records for *Schistidium elegantulum subsp. Elegantulum*, listed as Data Deficient (dd) in the Irish Red List of Bryophytes, from the 10km Grid Square W76.
- 3 No. records for Tufted Feather-moss (*Scleropodium cespitans*), listed as Near Threatened (NT) in the Irish Red List of Bryophytes, from the 10km Grid Square W67.
- 2 No. records for Rib-leaf Moss (*Tortula atrovirens*), listed as Near Threatened (NT) in the Irish Red List of Bryophytes

- 1 No. record for Dog Screw-moss (*Tortula canescens*), listed as Data Deficient (dd), both from the 10km Grid Square W86.
- 2 No. records for *Weissia brachycarpa var. oblique* from the 10km Grid Squares W76 and W86. Listed as data deficient (dd).
- 1 No. record for Green-tufted Stubble-moss (*Weissia controversa*) from the 10km Grid Square W56. Listed as data deficient (dd).

3.4.2.6 National Biodiversity Data Centre Records

The National Biodiversity Data Centre recorded were review in relation to flora and fauna species but in particular for records for bat species. According to the National Biodiversity Data Centre website (2014) there are:

- 197 No. records for Common Pipistrelle (*Pipistrellus pipistrellus*), and 151 No. records for Soprano Pipistrelle (*Pipistrellus pygmaeus*) across all twelve 10km Grid Squares overlapping with the Study Area.
- 2 No. records for Nathusius's Pipistrelle (*Pipistrellus nathusii*) from the 10km Grid Square W47.
- 118 No. records for Daubenton's Bat (*Myotis daubentoni*)
- 112 No. records for Leisler's Bat (*Nyctalus leisleri*) across all 12 10km Grid Squares overlapping with the footprint of the proposed works.
- 9 No. records for Natterer's Bat *(Myotis nattereri*) from the 10km Grid Squares W47, W67, W76, W77, W86 and W87.
- 71 No. records for Brown Long-eared Bat (*Plecotus auritus*) from the 10km Grid Squares W36, W37, W46, W47, W56, W57, W67, W76, W77, W86 and W87.
- 3 No. records for Lesser Horseshoe Bat (*Rhinolophus hipposideros*) from the 10km Grid Square W56. Lesser Horeshoe bat roost is known from the Dunisky Souterrain near Macroom.

3.4.3. Field Study

3.4.3.1 Terrestrial Ecology

The Study Area was visited on the 18th June 2013. During this visit, the general habitat types within the Study Area were observed and photographed. The purpose of this was to observe the habitats in the area first hand and to a certain extent to ground truth the findings of the

desk study that is detailed below. No detailed floral or faunal surveys were carried out during this visit – the site is merely described as it was seen.

Flora

In terms of flora, the field visit confirmed the findings of the desktop study in relation to the River Lee within the Study Area which offers a wide variety of habitats including bankside vegetation that potentially plays host to a broad range of floral species. Potential ecologically significant habitats and flora in the Study Area include the following:

- The Gearagh SAC which supports the groundwater dependant and surface water dependant Annex I priority habitat Alluvial Woodland Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) and the Flora (Protection) Order 1999 species Mudwort.

- The River Lee and its 1st order tributaries along its entire length outside the City environs supports a variety of woodland and wetland habitats.

- The River Lee within the City environs also supports a number of semi-natural or modified habitats which support a wide variety of species e.g. Lee Fields and the Distillery Fields and 1st order tributaries e.g. Curragheen, Glasheen. While these habitats are not of major ecological significance they are important within the contextual framework of a City's scape and therefore have biodiversity and amenity value.

- The River Lee and its tributaries support the Annex I habitat Watercourses of Plain to Montane Levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]'. Within the City extensive stands are present just upstream of the Lee Waterworks Weir and the Salmonid Weir/
- During the field visit the banks of the River Lee were found to support a wide variety of non-native invasive species including:

    - Japanese Knotweed *(Fallopia japonica)* and other members of the knotweed family

    - Giant Hogweed *(Heracleum mantegazzianum*).

    - Himalayan Balsam (*Impatiens glandulifera*)

- Travellers Joy (*Clematis vitalba*)
- Snowberry (*Symphoricarpos alba*)
- Himalayan Honeysuckle (*Leycesteria formosa*)
- Winter Heliotrope (*Petasites fragrans*)
- Ground Elder (*Aegopodium podagraria*)
- Montbretia (*Crocosmia x crocosmiiflora*)

- The following aquatic non-native invasive species is known from the River Lee and Carrigadrohid reservoir:
  - Nutall's Pondweed (*Elodea nuttallii*)

Fauna

In terms of faunal habitat, the river and its bankside vegetation within the study area offer a wide variety of habitats that potentially play host to a broad range of faunal species. Potential ecologically significant fauna in this area include the following:

- The entire length of the River Lee and its first order tributaries offers suitable habitat for Otter (*Lutra lutra*) with ample vegetation for cover along the river banks and likely good fishing within the river. The Rive Lee and its 1st order tributaries within the City environs are also known to support a population of foraging/commuting Otters.

- The Study Area offers good potential for waterbirds in general, particularly the lower stretches of the river e.g. Douglas Estuary that are likely to be used extensively by wildfowl. The River Lee provides suitable habitat for Kingfisher. Within the City environs this appears to be more fishing/foraging habitat while outside of the City suitable nesting habitat is likely on the main channel and on the 1st order tributaries.

- The River Lee supports a number of Annex II water dependent species i.e. Atlantic Salmon and Lamprey species and supports European Eel which is of European importance. While the 1st order tributaries within the City have poor water quality they

are likely to support a number of Annex II species and migratory species which move up the tributaries to more suitable habitats upstream in particular during winter floods.

- The habitats within the Study Area including the City environs offer good potential habitat for bat species with woodland, buildings, stonewalls and old trees offering roosts along with the river and its associated feeding habitat.

3.4.3.2 Water Quality

The EPA website http://www.epa.ie/rivermap/data, contains information regarding water quality in selected Irish rivers based on surveys carried out by the EPA. Information was gained from EPA monitoring stations on the River Lee within and upstream of the study area. Information is provided in the form of Q values. Q Values are used to express biological water quality and are based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. Q1 indicates a seriously polluted water body and Q5 indicates unpolluted water of high quality. A value of Q3 indicates moderately polluted water. Information was gained on the River Lee as a whole, including 2 monitoring points that were within or very close to the study area and three that were located upstream. The Q status of the River Lee at Leemount Bridge, within the study area, is Q4 – Good status. The water quality of the River Lee at Inishcarra Bridge, within the study area, is Q3 – Moderate status. The 3 monitoring points upstream of the proposed works area i.e. Dromcarra Bridge, Inchinossig Bridge, and Ford Bridge all have a Q rating of 4-5 – High status.

Information was gained on the River Bride, a tributary of the River Lee, including one monitoring location at Kilcrea Bridge which has been attributed a Q rating of 4 – Good status.

Information was also gained on the Shournagh River, a tributary of the River Lee, including 2 monitoring locations at Bannow Bridge and Healy's Bridge. The Q rating at both locations is 4-5 – High status.

3.4.4. Summary of Key Constraints and Implication for the Proposed Scheme

3.4.4.1 Main Findings

- The Gearagh SAC & SPA located upstream of the scheme support a number of habitats and species of European importance in particular the Annex I priority habitat Alluvial Woodland Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae). Despite the fact that about half the original

area has been destroyed, the Gearagh still represents the only extensive alluvial woodland in Ireland or Britain, or indeed west of the Rhine in Europe (NPWS, 2013). These habitats are sensitive to changes in water levels.

- The River Lee is of considerable ecological significance along the entire length of its course. It is an important salmonid fishery and also provides habitat for a range of other species that are listed on Annex II of the EU Habitats Directive and Annex I of the Birds Directive including Freshwater Pearl Mussel, Otter, Lamprey and Kingfisher species. The stretch of river within the Study Area is important for salmonid spawning, nursery and angling. In addition it has a function as a major migration route for fish travelling to the upper reaches of the River Lee. Otter, Lamprey and Kingfisher are also known from the River Lee and its tributaries Study Area.

- The River Lee and its tributaries support the Annex I habitat Watercourses of Plain to Montane Levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]'.

- The combination of all the riparian woodland and wetland habitats in the Study Area creates an area of relatively high biodiversity with cover and feeding grounds for a wide range of fauna including bat species.

- Certain riparian habitats of the River Lee and its tributaries are designated for conservation as pNHAs e.g. Lee Valley pNHA.

- The tidal sections of the River Lee below Cork City within Cork Harbour SPA and Great Island Channel SAC provide good quality habitat for wildfowl with large areas of mudflat exposed at low tide and extensive areas of wetland including Atlantic Salt Meadow fringing the estuary.

- The stonewalls within the study area support a number of Flora (Protection) Order 1999 species

- Non-native invasive species are present within the Study Area, in particular Japanese Knotweed (*Fallopia japonica*) was recorded extensively along the River Lee in sections.

3.4.4.2 Key Constraints

- It must be ensured that there are no significant impacts on Natura 2000 sites (SAC/SPA). In particular, any change in water levels at The Gearagh located upstream of the Study Area has the potential to impact on The Gearagh SAC and SPA.

- Given the sensitivity of aquatic habitats of the River Lee and its tributaries, works that materially affect the function of watercourses under normal flow conditions such as water depth, velocity and changes to the shape of the bed and physio-chemical properties of watercourses should be minimised 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.

- The woodlands, wetlands, riparian and instream vegetation along the river corridor within the Study Area add greatly to the biodiversity of the Lee Valley. Disturbance to these riparian and aquatic habitats e.g. Annex I habitat Watercourses of Plain to Montane Levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]' 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, 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.

- 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. Constraints may also be imposed in relation to the spawning season for lamprey.

- Where possible works should avoid impacts to Flora (Protection) Order 1999 species.

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

- In design of the proposed scheme, consultation with both the IFI and NPWS will be necessary, together with an appropriate amount of survey work to establish baseline conditions in the river. Constraints may be placed on the times of year that in-stream surveys 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.

- Pearl Mussel Surveys and Otter surveys can be undertaken at any time of year but are dependent 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)

- Four season bat surveys may be required to confirm presence/absence of roosting bats

3.5 WATER

This section of the constraints study describes the existing hydrological environment within the Study Area and the immediate surrounding area, in addition to the potential impacts of the Lower Lee (Cork City) Flood Relief Scheme.

3.5.1 Methodology

The establishment of possible hydrological constraints within the Study Area involved the review of desktop information, including:

- EPA water quality database and maps.
- Cork County Council Internal Geographical Information System (IGIS)
- Well card data compiled by the Geological Survey of Ireland (GSI)
- Cork Strategic Water Study Strategy Report (2006)
- OPW Database of Hydrometric Stations
- South West River Basin District Management Plan (2009-2015)

The desktop study was supplemented by a site visit, in order to further establish the overall hydrological regime within the Study Area.

3.5.2 Receiving Environment

3.5.2.1 Water Supply

3.5.2.1.1 Existing River Abstractions

According to information available from Cork County Council, there are two public water supply schemes are in operation in Cork City (Cork City WSS - Lee Road) and Inniscarra (Cork Harbour and City WSS). Both water supply schemes abstract water from the River Lee.

Water is abstracted for use for the Cork City Water Supply Scheme from the River Lee, 400m upstream of Wellington Bridge, 2.5 km to the West of Cork City Centre and within the Study Area. The public water supply supplies the majority (70%) of Cork City serving a population of approximately 87,000. The City scheme is augmented by the Cork Harbour & City Scheme, which sources water from the Inniscarra Impoundment, 10.5 km west of the Lee Road Plant. The Water Treatment Works at the Lee Road Plant has no residual capacity at present. In fact, the plant is operating well above its design capacity (52Ml/day on average compared to 36Ml/day design.

The Cork Harbour and City WSS is supplied with water from the ESB impounding reservoir at Inniscarra, 13km west of Cork City and within the study area. The Cork Harbour & City serves a large population of approximately 111,000 and includes the town of Ballincollig, Bishopstown, Douglas and Carrigaline. It also supplements the water supply of the Cork City

WSS, which are fed from the Harbour & City's Chetwynd Reservoir serving the southern areas of Sarsfield Road, Togher, and Mahon. The Cork Harbour and City WSS is currently operating at 60Ml/day against a current design capacity of 68Ml/day from the ESB impounding reservoir at Inniscarra.

3.5.2.1.2 Existing Groundwater Abstractions

The well card data by the Geological Survey of Ireland (GSI) indicates that a number of wells in the vicinity of the study area are used for public water supply and industrial use.

A select list of abstractions for industry and public water supply is provided in Table 3.5.1. A list of X No. groundwater abstractions in the vicinity of the Study Area are provided in Appendix D.

Townland	Depth (m)	Depth to Rock (m)	Source Use	Yield Class	Yield (m^3/day)
TBC					

Table 3.5.1 – GSI Well Card Data (Boreholes)

3.5.2.1.3 Hydrometric Stations

There are four active (six inactive) river gauges recorded for the River Lee and its tributaries relevant to the study area on the EPA database of Hydrometric Stations, maintained by ESB and the Cork Port Authority. The locations of the gauges are shown on in Table 3.5.2 below. Information on all of the stations is available on the OPW and EPA on line databases.

Station	Ref	Type	Easting	Northing	Waterbody	Responsible Authority	Active?
INNISCARRA POWER STN.	19093	Staff	154483	72149	Lee	ESB	No
INNISCARRA	19013	Staff	155926	71961	Lee	ESB	Yes
OVENS	19016	Recorder	154934	69976	Bride (Lee)	ESB	No
HEALY'S BR.	19015	Recorder	160310	73266	Shournagh	ESB	No
LEEMOUNT U/S	19011	Recorder	160932	71695	Lee	ESB	Yes
LEEMOUNT D/S	19012	Recorder	161140	71790	Lee	ESB	No
BISHOPSTOWN HOUSE	19049	Recorder	163196	69896	Curragheen	ESB	No
MARINA	19060	Staff	169273	72163	Lee Estuary	ESB	Yes
BLACKROCK CASTLE	19065	Recorder	172400	72000	Lee Estuary	Cork Port Company	No
TIVOLI	19067	Recorder	171800	72100	Lee Estuary	Cork Port Company	Yes

Table 3.5.2 – Hydrometric Stations

3.5.2.1.4 Future Abstractions

The Cork Strategic Water Study Strategy Report (2006) predicts increases in the abstractions from the two public water supply schemes in the Study Area. Increased abstraction may be necessary due to a combination of the following:

- Increased demand in the existing supply areas,
- Proposals to expand the supply areas:
    - *Cork City Water Works (Lee Road); there is an active proposal to develop the plant to 57.5Ml/day and an Abstraction Order has been confirmed for ultimate abstractions up to 80Ml/day.*
    - *Cork Harbour and City Works (Inniscarra); the abstraction agreement between Cork County Council and ESB provides for ultimate abstractions of up to 227Ml/day at this location. Planning is currently underway for an expansion of the treatment capacity at Inniscarra to 95 ml/day.*

3.5.2.2 Surface Water Features

From its source in the Shehy Mountains, the River Lee flows in a generally easterly direction to where it discharges to Cork Harbour at Cork City. In Cork City the river is used for navigation, its channel is dredged and the river banks include extensive quay walls.

The River Lee is joined by a number of large tributaries including the Sullane, Laney, Dripsey, Bride and Shournagh. A number of smaller tributaries join the River Lee in Cork City including the Curragheen, Glasheen and Kiln Rivers. The flows in the river are influenced and partly controlled by the Carrigadrohid and Inniscarra hydroelectric dams. The catchment also includes a number of smaller rivers and their estuaries that drain directly into Cork Harbour. These include the Glashaboy, Owennacurra, Tramore and Owenboy Rivers.

The main hydrological feature within the Study Area is the Lee River, which flows into the Study Area from the West. The river flows from the upper catchment into the Carrigodrohid and Inniscarra reservoirs before discharging into the narrow Lee valley at Inniscarra dam. The Lee veers east at its confluence with the Bride river, west of Ballincollig and from here passes through a series of bends and meanders before reaching transitional waters in Cork City. In Cork City, the Lee splits into a north and south channel before converging again at the east of city. It finally reaches the sea in Cork Harbour.

In addition, there are a number of tributaries that flow into the River Lee within the Study Area; the Bride (West of Ballincollig), the Shournagh, the Curragheen, the Glasheen, The Bride (Cork City North), the Glen and the Glennamought Rivers.

The EPA website http://www.epa.ie/rivermap/data contains information regarding water quality in selected Irish rivers based on surveys carried out by the EPA. Information was gained from EPA monitoring stations on the Lee River within and upstream of the study area.

Biological information is provided in the form of Q values. Q Values are used to express biological water quality and are based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. Q1 indicates a seriously polluted water body and Q5 indicates unpolluted water of high quality. A value of Q3 indicates moderately polluted water. These Q value ratings are shown in Table 3.5.3.

Table 3.5.3 Q value classification

Quality Ratings	**Quality Class**	**Pollution Status**	**Condition** (re beneficial uses)
Q5, Q4-5, Q4	Class A	Unpolluted	Satisfactory
Q3-4	Class B	Slightly Polluted	Unsatisfactory
Q3, Q2-3	Class C	Moderately Polluted	Unsatisfactory
Q2, Q1-2, Q1	Class D	Seriously Polluted	Unsatisfactory

In addition, various chemical parameters were also tested and are available for some of the monitoring points. Biological and chemical data for a number of the monitoring points within the study area are shown in Tables 3.5.4 and 3.5.5 below.

Information was gained on the River Lee as a whole, including nine monitoring points that were within or very close to the Study Area, as listed in Table 3.5.4. The EPA reporting concludes that water in the River Lee continues to be mostly satisfactory, with High and Good ecological quality, and with a slight improvement from Poor to Moderate quality at Inishcarra.

Biological Quality Ratings (Q Values)													
	Station Nos.	**1971**	**1976**	**1981**	**1986**	**1990**	**1994**	**1997**	**1999**	**2002**	**2005**	**2008**	**2011**
Ford u/s Gouganebarra Lake	0010	-	-	-	-	-	4-5	4-5	4	4	3/0	4-5	4-5
Br S of Gortafludig	0040	-	-	-	-	-	4-5	4-5	4	4-5	4-5	-	-
Inchinossig Br	0100	5	5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4	4	4
Foot-bridge d/s Inchigeelagh	0200	5	5	5	4-5	4-5	4	4-5	4	4	4	4	4
Dromcarra Br	0300	5	5	5	4-5	5	4-5	4-5	4	4	4	4	4-5
Inishcarra Br	0600	4-5	4-5	4	4	3-4	3	3	3	3	3	3	3-4
Leemount Br	0700	5	5	4	4	4	4	4	4	4	3-4	4	4

Table 3.5.4 Biological water quality in the River Lee Study Area based on EPA data.

Chemical Data					
Parameter	Unit	Criteria	Station No. 0700 Leemount Br		
			Minimum	Mean	Maximum
Alkalinity-total	(mg/l CaCO3)		25.0	45.9	67.0
Chloride	(mg/l Cl)		9.5	14.3	21.9
Conductivity @20°C	(µS/cm)		173.0	176.3	178.0
Conductivity @25°C	(µS/cm)		123.0	168.7	224.0
pH	-		7.3	7.5	7.8
Sulphate	mg/l		3.8	6.1	8.6
Temperature	°C		5.1	10.9	18.6
Total Hardness	(mg/l CaCO3)		39.2	56.2	82.9
Total Organic Carbon	mg/l		3.5800	6.2313	9.5900
True Colour	(Hazen)		11.0	27.3	54.0
Nitrate	(mg/l NO3)		4.450	9.136	16.800
Nitrite	(mg/l N)		0.010	0.013	0.057
Ortho-Phosphate	(µg/l P)		0.003	9.185	47.000
Total Nitrogen	(mg/l N)		0.500	2.601	5.000
Total Oxidised Nitrogen	(mg/l N)		1.020	2.193	3.820
Total Phosphorus	(mg/l P)		0.016	14.954	56.000
Ammonia-Total	(mg/l N)		0.005	0.039	0.209
BOD - 5 days (Total)	(mg/l O_2)		0.5	1.1	5.8
BOD(2d <5°C+5d incub. 20°C)	(mg/l O_2)		0.5	1.4	3.4
Dissolved Oxygen	(% Saturation)		71.0	94.6	130.0
Dissolved Oxygen	(mg/l)		7.70	10.38	13.30
Suspended Solids	(mg/l)		1.0	4.1	37.5

Table 3.5.5 Chemical water quality in the River Lee (Leemount Br Station) based on EPA data

Parameter	Unit	Criteria	Station No. 0700 Leemount Br		
			Minimum	Median	Maximum
Ortho-Phosphate	mg P 1-1	0.03*	0.01	0.01	0.03
Oxidised Nitrogen	mg N 1-1	50*	3.6	5.0	5.4
Temperature	ºC	25*	10.9	10.9	11.0
Total Ammonia	mg N 1-1	0.2*	0.02	0.02	0.02

* Limits from The European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations (S.I 293 of 1989) for A1 Waters

** Limits from the European Communities (Quality of Salmonid Waters Regulations) (S.I. 293 of 1988)

Table 3.5.6 EPA Physiochemical Water Quality Monitoring Results 2001 to 2003

Water Framework Directive

The Study Area is located within the Water Framework Directive (WFD) South Western River Basin District and the management plan for this area was consulted. The main objectives of this management plan were to Prevent deterioration, Restore good status, Reduce chemical pollution in surface waters and to Achieve protected areas objectives. The programme of measures designed to achieve these objectives are outlined in this document and include the following:

- Control of urban waste water discharges
- Control of unsewered waste water discharges
- Control of agricultural sources of pollution
- Water pricing policy
- Sub-basin management plans and programmes of measures for the
- purpose of achieving environmental water quality objectives for
- Natura 2000 sites designated for the protection of Freshwater Pearl
- Mussel populations
- Pollution reduction programmes for the purpose of achieving water
- quality standards for designated shellfish waters
- Control of environmental impacts from forestry

The South Western River Basin Management Plan (2009–2015) identifies five surface waters in the district as having been heavily modified for uses such as navigation (e.g. ports), water storage, public drink-water supply, flood defence or land drainage. These are: Carrigadrohid and Inniscarra Reservoirs, the Lower Lee Estuary, Lough Mahon and Cork Harbour. Other waters are man-made (artificial), of which there is only one in the district, Lismore Canal. These modified and artificial waters provide important uses and benefits tosociety, which

cannot be replaced by other means and need to be retained. Therefore, these waters are subject to a different set of objectives to other surface waters within the River Basin District.

With regard to Carrigadrohid and Inniscarra Reservoirs, the South Western River Basin Management Plan identifies these features as two separate heavily modified lake water bodies. As the reservoirs are located along the same river system, actions and measures towards achieving the required standard by 2015 are identified to apply to both lakes in unison.

The Lee (Cork) Estuary Lower is also identified by the South Western River Basin Management Plan as a heavily modified water body. The measures assigned towards achieving the required standard by 2015 are the investigation of any obsolete structures' impacts and their removal if required and feasible, the investigation of propeller bed scouring impacts and its elimination if feasible and ensuring steps are taken to minimise the impacts of dredging such as the suspension of silt.

Information on status, objectives and measures in the South Western RBD has been compiled for smaller, more manageable geographical areas than river basin districts, termed water management unit action plans. There are twenty-eight water management units (WMUs) in the South Western RBD. These units represent smaller river and lake basins where management of the pressures, investigations and measures will be focussed and refined during implementation of this plan. In addition, action plans focusing on groundwater and a transitional and coastal water management have been prepared for the South Western RBD. WMU action plans are a key background document to the plan.

The Study Area is within the Lower Lee Owenboy Water Management Unit (WMU). There are 43 river water bodies in this WMU - 9 High, 9 Good, 11 Moderate and 14 Poor Status. The status of the various waterbodies in this area is calculated using the EPA data described above. The identified pressures/risks in this area include waste water treatment works with the works at Ballincollig requiring capital works. Other pressures/risks include IPCC licensed activities, quarries and landfills. The WMU action plan states that nutrient sources within the area can be broken down as follows: 64% of TP comes from unsewered industry and 26% from Agriculture.

In relation to Future Pressures and Developments the WMU Action Plan states:

'Throughout the river basin management cycle future pressures and developments will need to be managed to ensure compliance with the objectives of the Water Framework Directive and the Programme of Measures will need to be developed to ensure issues associated with these new pressures are addressed.'

3.5.2.3 Hydrogeology

The Study Area consists of four groundwater bodies namely Ballinhassig_1, Ballincollig, Cork City_1 and Cork City_2. The Ballinhassig_1 and Cork City_1 groundwater aquifers within the Study Area are characterised by the Geological Survey of Ireland (GSI) as 'locally important',

which means that it is moderately productive only in local zones. The Ballincollig and Cork City_2 groundwater aquifers within the Study Area are characterised as 'regionally important'.

The groundwater body is generally covered by till derived from sandstone and shale. There are also frequent sand and gravel deposits, several of which are classified as locally important sand and gravel aquifers. Within the groundwater body, in the extreme North of the Study Area, is a productive gravel aquifer, which runs along the Ballymahane and Brinny rivers and a second gravel aquifer exists within the Study Area at Drumkeen.

The GSI database was also referenced regarding the vulnerability of the local aquifers. The interim vulnerability mapping indicates that the local aquifers are generally high to extremely vulnerable within the study area with the sandstone bedrock near the surface.

3.5.3 Summary of Key Constraints and Implication for the Proposed Scheme

- The design of the proposed scheme should take into account the water requirements (both Quality and Quantity) of existing and future abstractions from the River Lee at Inniscarra and Lee Road.
- The design should also take into consideration the impact that any proposed flood relief scheme will have on the yields of existing groundwater abstractions from the study area Ground Water Bodies, taking into account the extreme vulnerability rating 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

3.6 SOILS & GEOLOGY

This section describes the soils and geology within the Study Area of the Lower Lee (Cork City) Flood Relief Scheme (Including Blackpool and Ballyvolane).

3.6.1 Methodology

The section describes the bedrock geology, superficial deposits, economic geology and geological heritage of the constraints Study Area identified from desktop information sources only. References include the Geological Survey of Ireland's (GSI) online database and the GSI publication; 'Geology of South Cork' (1994). An inventory of those geological constraints identified by this desktop study is detailed below.

Soils and Geology have been assessed with reference to the following:

- The Geology of South Cork (Sleeman and Pracht, GSI, 1994)
- The GSI online database
- Cork County Council Planning Department (Application for Registration of Quarries under Section 261, Planning and Development Act 2000),
- Cork County Development Plan (2009)
- Cork City Development Plan (2009)
- Cork County Council Internal Geographical Information System (IGIS)
- Concrete Products Directory (Irish Concrete Federation), and
- Aerial Photographs (2005).
- ENVision Mines Site, the EPA's online Historic Mines Inventory

Appendix E contains maps of geological features within the Study Area.

3.6.2 Receiving Environment

3.6.2.1 Bedrock Geology

The Lee River flows through a valley cut into rocks of the Carboniferous period. The valley floor is covered with glacial drift and alluvium. The river rises in the Shehy Mountains near Gougane Barra on the Cork/Kerry border and flows eastwards to Cork City where it becomes an estuary and reaches the sea in Cork Harbour. Its total length is some 90km. The Study Area is located from the Iniscarra Dam, extending into the Lee estuary.

Underlying the catchment is a sedimentary geology of sandstone, mudstones and outcrops of limestone. Some areas of exposed geology such as quarries are of geological heritage importance and listed as Areas of Geological Interest in the County Development Plan (Cork County Council, 2009), including Rock Farm Quarry, Little Island.

Areas of karst limestone in the lower Lee and near Carrigtohill are also of geological heritage significance. To date, sites of geological interest have not been comprehensively covered by the existing nature conservation designations. This is currently being addressed by the DEHLG and the Geological Survey of Ireland (GSI) who are drawing up a list of sites of geological interest that will be proposed as Natural Heritage Areas (NHAs).

The Geological Survey of Ireland (GSI) indicates that a large part of the study area is made up made ground in the urban centres of Cork city and Ballincollig. Upstream of Cork City, in the vicinity of the River Lee and its tributaries, the subsoils consist generally of Alluvium surrounded by subsoils made up of tills derived chiefly from Sandstones.

The EPA web based ENVision database was referenced in relation to land cover within the study area. The Study Area includes Cork City and Ballincollig and therefore there is a high proportion of continuous urban fabric. In the vicinity of the study area, upstream of Cork City the land is put to agricultural use, with land cover consisting of pastures, interrupted by non irrigated arable land, complex cultivation pattern and natural grasslands. Further upstream at the Gearagh SAC, the lands are home to alluvial broad leaf forests and woodland scrub. In the vicinity of the study area, land is put to agricultural use, with land cover consisting of pasture, interrupted by non irrigated arable land and complex cultivation patterns. Many farmers in the area participate in the Rural Environmental Protection Scheme (REPS), run by the Department of Agriculture and Food, which promotes environmental awareness among the farming community.

3.6.2.2 Economic Geology

The term 'economic geology' refers to commercial activities involving soil and bedrock. The activities involved principally comprise aggregate extraction (sand and gravel pits and quarries) and mining. A number of sources were examined for information on such commercial activities within the constraints Study Area, these include the:

- Cork County Council Planning Department (Application for Registration of Quarries under Section 261, Planning and Development Act 2000),
- Cork County Development Plan (2009)
- Cork County Council Internal Geographical Information System (IGIS)
- Concrete Products Directory (Irish Concrete Federation), and
- Aerial Photographs (2005).
- ENVision Mines Site, the EPA's online Historic Mines Inventory
- ***Mine* Details - *Mine* Heritage Society of Ireland** *www.mhti.com/**mined**etails.htm*

The sources consulted above indicate that there are two quarries in the vicinity of the Study Area as follows:

Location	Status	Operators
Classis, Ovens, Inishannon, within Study Area	Active	John A Wood Ltd
Castlemore, Crookstown, Just outside Study Area	Active	Castlemore Minerals

Table 3.6.1 Quarries in the vicinity of the Study Area

A review of the ENVision Mines Site, the EPA's online Historic Mines database, indicates there are no records of mining activity in the vicinity of the Study Area.

3.6.2.3 Geological Heritage

To date, sites of geological interest have not been comprehensively covered by the existing nature conservation designations. This is currently being addressed by the Department of Environment, Heritage & Local Government and the Geological Survey of Ireland who is drawing up a list of sites of geological interest that will be proposed as Natural Heritage Areas in the future.

The Cork County Development Plan (2009) states that the Council *'recognises the importance of geological heritage and to this end has listed in this plan the important geological features within the County with the intention of maintaining their possible conservation value. The list has been produced in consultation with the Geological Survey of Ireland and the Geology Department of the National University of Ireland, Cork.'*

The Development Plan identifies 103 sites of geological and geomorphological interest in the county which could potentially become proposed Natural Heritage Areas (pNHAs). None of the 103 sites are located within the Constraints Study Area.

There are three pNHAs within the Study Area, however their value as habitats is considered separately in Section 3.4 of this Constraints Study Report.

3.6.3 Summary of Key Constraints and Implication for the Proposed Scheme

- 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.

3.7 ARCHAEOLOGY AND CULTURAL HERITAGE

This section describes the archaeological and cultural heritage constraints within the Study Area of the Lower Lee Flood Relief Scheme.

3.7.1 Methodology

An Archaeological Constraints Study was commissioned in order to identify all recorded archaeological monuments and protected structures within the study area including the legal status, if any, of these features.

This study is based on:

- detailed desk study of the archaeological, architectural & cultural heritage within the study area (published & non-published datasets)
- identification of all heritage constraints
- identification of heritage sites vulnerable to impact in order to inform the Engineering Study at the earliest stage.

The principal sources reviewed were the Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) for County Cork. The study also includes a review of recent archaeological excavations carried out in the Study Area. The following sources were also consulted:

- Archaeological Inventory for County Cork: Volume II East & South Cork;
- Excavations Database (www.excavations.ie);
- Cork County Council Development Plan 2009-2015;
- Cork City Council Development Plan 2009-2015;
- Cork City South Docks Local Area Plan 2008;
- Cork City North Docks Local Area Plan 2005;
- Cork City Draft Marina Masterplan 2013;
- National Inventory of Architectural Heritage;
- Various editions of Ordnance Survey maps;
- Aerial imagery; and
- Various published sources for local history.

A full copy of the full Archaeological Constraints Report is included in Appendix F.

3.7.2 Receiving Environment

The Archaeological Constraints Study identified a total of 153 cultural heritage sites within the Study Area. These include recorded archaeological monuments (National Monuments, Record of Monuments and Places [RMP] and Sites and Monuments Record [SMR] inter alia), protected architectural sites (Record of Protected Structures) and Cork City Council Protected Structures. Many of the identified cultural heritage sites are situated immediately adjacent to the Lee River.

Cultural heritage sites within the river channel itself, include historic bridges, of which there are several in the list of cultural heritage sites, and sites with archaeological potential such as weirs.

Cultural heritage sites on the river banks include various monuments and structures immediately adjacent to the river.

Archaeological deposits or artefacts may also survive below the ground surface and river bed in the vicinity of these monuments.

3.7.3 Summary of Key Constraints and Implication for the Proposed Scheme

- 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 EIS 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 in-channel works. These may consist of licensed underwater archaeological surveys and archaeological monitoring of all sediment extraction works during the construction phase.

3.8 LANDSCAPE

This section of the Constraints Study Report addresses the landscape and visual constraints that have been identified within the Study Area. The Study Area is described with reference to Landscape Character and Landscape Type, and the ratings that have been assigned to it in terms of Value, Sensitivity and Importance. The relevant recommendations that have been set out for this area by Cork County Council and Cork City Council in terms of landscape and visual characteristics are also addressed.

3.8.1 Methodology

This section of the Constraints Study is based on a desk study of the previous landscape character assessments and reviews that have been carried out within the Study Area. It incorporates a description of the policies and objectives of Cork County and City Councils with regards to Landscape Character Assessment, Scenic Amenity, Views and Prospects, and Scenic Routes and Landscapes, with specific reference to the Study Area location. The primary sources of information consulted during the course of the desk study include:

- Cork County Development Plan 2009
- Cork City Development Plan 2009
- Cork County Council Draft Landscape Strategy 2007
- Cork City Landscape Study 2008
- Environmental Protection Agency CORINE Land Cover Map

3.8.2 Receiving Environment

3.8.2.1 Landscape Character Assessment

Chapter 7 of the Cork County Development Plan 2009 sets out the policies and objectives of Cork County Council with regards to Heritage and Environment. Section 7.2 refers to the Landscape Character Assessment of County Cork, which was carried out during preparation of the 2003 County Development Plan. This Assessment identified 76 Landscape Character Areas (LCAs) within the county, which were then amalgamated into a set of 16 generic Landscape Types based on similar physical and visual characteristics.

Since 2003, the Landscape Character Assessment process for County Cork has continued. The assessment entails the use of a GIS-based multi-criteria evaluation and is presented in the form of a Draft Landscape Strategy for County Cork. The Draft Strategy is presented as a detailed supporting document to the 2009 County Development Plan. It is stated in the 2009 Plan that Cork County Council intends to finalise the Draft Strategy to include policy recommendations for the County Development Plan before proceeding with a Variation to the Plan to give effect to the Strategy.

3.8.2.2 Landscape Character and Type

The Study Area for this Constraints Study is located within the Landscape Character Areas: Blarney (LCA No. 8), River Bride West (No. 27) and Cork City and Harbour (No. 19), as shown in Map 1 of the Draft Landscape Strategy for County Cork 2007. The Blarney and River Bride West LCAs form part of the general Landscape Type: Broad Fertile Lowland Valley (Type 6a), as shown in Map 2 of the Draft Strategy. The Broad Fertile Lowland Valley Landscape Type extends west from Ballincollig and Blarney and is found also in the eastern parts of the county. The Draft Landscape Strategy describes Broad Fertile Lowland Valley, as follows:

"This landscape type stretches west and east from the environs of Cork City but also includes a smaller area east of Rathcormac. The valleys in these areas are created by the rivers flowing east to west and are surrounded by low well spaced ridges. These shallow and flat valleys wind as they follow the course of the river, rising to the north and south with gentle slopes where the valley is wide but with steeper faced slopes where the valley narrows. Further upstream to the west the broad flatness narrows and winds between low hills. Land cover comprises highly fertile, regularly shaped fields typically of medium size and with mature broadleaf hedgerows. Agricultural use primarily involves intensive dairying as well as tillage, with farmsteads relatively well screened by the hedgerows. Some of the larger settlements include Bandon, Ballincollig and Blarney to the west of Cork City, Castlemartyr to the east and Rathcormack to the north. Major roads such as the N22 between Macroom and Cork City and the N71 between Inishannon and Bandon tend to follow the rivers, often providing distant views across the landscape."

The Draft Landscape Strategy also lists the key characteristics of the Broad Fertile Lowland Valley Landscape Type, including the following:

- Land cover comprises a mosaic of regularly shaped fields typically of medium size. The fields throughout this landscape are bounded mostly by mature broadleaf hedgerows but also by post and wire fencing. Lower hedgerows prevail further to the west on higher ground.
- The agricultural use of this landscape primarily involves intensive dairying as well as tillage. The latter provides seasonal colour variation.
- There are large field sizes to the east of this Landscape Character Type.
- In the southwest, agriculture is interspersed with areas of marginal land and established broadleaf forestry.
- Farmsteads within this Landscape Type comprise houses as well as metal sheds (with older barrel vaulted or modern A-frame roofs) and traditional out buildings, most of which are relatively well screened by the hedgerows.
- Scrub and areas of gorse are relatively rare but groups of broadleaf trees and shelterbelts are common, providing punctuation across the landscape or hinting at the presence of farmsteads.

- Heathland on hilltops is more evident further west. Field sizes are also noticeably smaller in the western part of this Landscape Character Type.
- The valleys in these areas are created by the rivers flowing east to west, for example the Lee and Bandon Rivers, and are surrounded by low well-spaced ridges. They have also created imposing views across the landscape.
- In general, the towns in the area have a strong character/urban fabric reflecting the historic agricultural wealth of the area.
- Major roads such as the N22 between Macroom and Cork City tend to follow the rivers, often providing distant views across the landscape.
- There is some quarry activity close to the study area.

The eastern section of the Study Area extends into the Landscape Type: City Harbour and Estuary (Type 1), as shown in Map 2 of the Draft Landscape Strategy. While the Study Area does not extend to the wide mouth of the River Lee Estuary, there are certain aspects of this Landscape Type that are indeed found within the Study Area, specifically intensely urban areas. The relevant sections of the Draft Strategy description of this Landscape Type are as follows:

"Overall, the landscape of the city and harbour area comprises a mix of rural and intensely urban areas, combined with a large expansive harbour. To the south of the city, the western side of the harbour supports major industrial development, while on higher ground telecommunication masts or water storage towers punctuate the skyline."

The Draft Landscape Strategy lists the key characteristics of the City Harbour and Estuary Landscape Type, including the following:

- This landscape comprises a mix of rural and intensely urban areas, combined with a large expansive harbour.
- The harbour includes large islands, which, along with much of the harbour shore, comprises landscape of fertile farmland of mixed use and mature broadleaf hedgerows, which slope gently to the sea.
- The harbour area also has a wealth of natural heritage, including a number of important habitats and wetland areas, which are of international significance due to the number and diversity of bird species they support.
- Fota Island contains a unique recreational, ecological and tourism value.

A short section of the northwestern boundary of the Study Area extends, following the River Lee, in to the Landscape Type Hilly River and Reservoir Valleys (Type 8). The relevant sections of the Draft Strategy description of this Landscape Type are as follows:

"This landscape type comprises a relatively confined swath of land stretching between unique alluvial oak woodland known as "The Gearagh" in the west and the village of Inishcarra in the east. Topographically the landscape includes interweaving hills and valleys which conduct the River Lee. The valleys are contained by low flanking ridges set back from the water while

intermediate land comprises low hills which undulate or occasionally interlock and create a meandering course for the water. Geologically it comprises a river valley, or almost an elongated basin, of old red sandstone overlaid with brown podzols. The river as the dominant element in the landscape, expands and contracts along its course between hydroelectric dams. Landcover pattern comprises regular shaped fields of medium size, bounded by broadleaf hedgerows which are mostly low and thin. Complexity of landcover is provided not only by shelterbelts and small woodland copses, but also by patches of scrub, marginal land, bracken and gorse. Willow is found on lower wet areas while part of the reservoir includes the remains of the alluvial woodland. Coniferous plantations also articulate some flanking ridges where soils are thinner."

3.8.2.3 Cork City Development Plan 2009 – 2015

The western half of the Study Area for this Constraints Study is located within Cork City. The Cork City Development Plan 2009 – 2015 and specifically Section 10, under the heading Landscape and Natural Heritage, the Plan outlines the following objectives, emanating from the Cork City Landscape Study 2008:

- To preserve and enhance Cork's special Landscape Character and to implement the Landscape Structure Plan.
- To preserve and enhance Cork's Landscape assets and Key Landscape Sites.
- To preserve and enhance Cork's View's and Prospects of Special Amenity Value.
- To enable the creation of new landscapes of excellence that will have a positive impact on the overall landscape.

The City Council identifies the Rive Leer Corridor through the city as an Area of High Landscape Value and a primary landscape asset.

3.8.2.4 Study Area Land Cover

The CORINE land cover data for the Study Area was obtained from the Environmental Protection Agency (EPA). CORINE land cover is a map of the environmental landscape based on the interpretation of satellite images. It provides comparable digital maps of land cover for each country for much of Europe.

The CORINE data for the Study Area shows that pasture and urban fabric are the two primary land covers within the Study Area. Pastoral land within and in the vicinity of the Study Area is interspersed with smaller areas of non-irrigated arable land. Continuous urban fabric follows the discontinuous urban fabric as the Study Are enters the Cork City boundary. The outskirts of Cork City are characterised in most directions by discontinuous urban fabric an industrial and commercial units which gives way to pastoral and arable farmland. The beginning of the sea port land cover area is found in the eastern-most section of the Study Area adjacent to the River Lee.

3.8.2.5 Landscape Value and Sensitivity

The Draft Landscape Strategy for County Cork classifies the Landscape Value of each Landscape Type within the county, using a scale ranging from Very Low to Very High. The Landscape Value of each area was derived from an assessment of the natural, scenic and cultural value as determined within that area.

Landscape Sensitivity values were also defined through an assessment of the landscape character sensitivity and visual sensitivity of each area. The Landscape Character Types are ranked into five Landscape Sensitivity categories, ranging from Low to Very High.

The Landscape Type Broad Fertile Lowland Valley, in which the western half of the Study Area is located, has been assigned an overall Landscape Value of High and has been assigned an overall Landscape Sensitivity of High. This type of landscape is of high quality, vulnerable to change and can accommodate limited development pressure.

The Landscape Type City Harbour and Estuary occurs to the eastern half of the Study Area. The Landscape Value and Sensitivity of this Landscape Type have been classified as Very High. This type of landscape is of very high quality, extra vulnerable landscapes likely to be fragile and susceptible to change. However the Study Area, within this Landscape Type, comprises mostly of continuous urban fabric and discontinuous urban fabric and would be much less sensitive to change.

3.8.2.6 Scenic Amenity, Views and Prospects

Section 7.2 of the Cork County Development Plan 2009 refers to the features within the landscape that are recognised for their visual aspects and quality, and which play a significant role in maintaining the County's vitality as a visitor attraction and as an attractive place to live and work. It is a general objective of Cork County Council therefore to protect the visual and scenic amenities of the county's built and natural environment, as stated in Objective ENV 2-6 of the Plan. Objective ENV 2-9 relates to general views and prospects and states:

"It is a general objective to preserve the character of all important views and prospects, particularly sea views, river or lake views, views of unspoilt mountains, upland or coastal landscapes, views of historical or cultural significance (including buildings and townscapes) and views of natural beauty as recognised in the Landscape Strategy."

3.8.2.7 Scenic Routes and Landscapes

The Cork County Development Plan identifies specific Scenic Routes and Scenic Landscapes, which in general make up the areas of natural beauty and important views and prospects most valued by residents and visitors to Cork. Scenic Routes act as indicators of high value landscapes and identify more visually sensitive locations where higher standards of design, siting and landscaping are required. The objectives of the Planning Authority with regards to the Scenic Routes and Landscapes are as follows:

- *Objective ENV 2-7 Scenic Landscape: It is a particular objective to preserve the visual and scenic amenities of those areas of natural beauty identified as scenic landscape and shown in the scenic amenity maps in Volume 3 of this plan.*
- *Objective ENV 2-11 Scenic Routes: It is a particular objective to preserve the character of those views and prospects obtainable from scenic routes identified in this plan. These routes are shown on the scenic amenity maps in Volume 3 and listed in Volume 2 of this plan. A profile of each route and the views to be protected are listed in Volume 2 of this plan.*
- *Objective ENV 2-12 Details of Scenic Routes: It is an objective to protect the character and quality of those particular stretches of scenic routes that have very special views and prospects.*
- *ENV 2-13: Development on Scenic Routes:*
    - *(a) It is also an objective of the Planning Authority to require those seeking to carry out development in the environs of a scenic route and/or an area with important views and prospects, to demonstrate that there will be no adverse obstruction or degradation of the views towards and from vulnerable landscape features. In such areas, the appropriateness of the design, site layout, and landscaping of the proposed development must be demonstrated along with mitigation measures to prevent significant alterations to the appearance or character of the area.*
    - *(b) It is an objective to encourage appropriate landscaping and screen planting of developments along scenic routes. Where scenic routes run through settlements street trees and ornamental landscaping may also be required. Refer to Objective ENV 4-13, which provides guidance in relation to landscaping.*

A total of 118 Scenic Routes are identified within the county, as listed in Volume 2 – Chapter 4 of the County Development Plan. Only one of these Scenic Routes (S37) is partially located within the Study Area and very short sections of two other scenic routes (S38 and S39) are also located within the overall Study Area for this Constraints Study, including:

- Route S37: Local Road and R618 Regional Road between Leemount and Macroom via Coachford. Views of the Lee Valley and reservoir, rural landscape and the Sullane River.
- Route S38: R619 Regional Road and Local Road between Classis, Curraghbeg and Coachford. Views of the Lee Valley, the reservoir, surrounding hillsides and Farran wood.
- Route S39: R617 Regional Road and Local Road between Clogheen, Tower and Blarney and the road to Blarney Lake. Views of the settlements of Ballincollig, Tower, Blarney, Blarney Castle and the Lee Valley.

The locations of these routes are shown in the Landscape Constraints Map in Figure 3.8.1 of this report. (Appendix G).

A profile of each Scenic Route identified in the County Development Plan is set out in Appendix B of Volume 2 of the Plan. The profiles of Scenic Routes S37, S38 and S39, as listed in Appendix B, are shown overleaf in Table 3.8.1 of this report.

The Landscape Maps in Volume 3 of the County Development Plan show the designated Scenic Routes and Landscapes within each Landscape Type. The Study Area for this Constraints Study is shown in Map 9 of Volume 3. This map shows the areas to the west, north and east of Cork City that have been designated as Scenic Landscapes. The location of this area is also shown in the Landscape Constraints Map in Figure 3.8.1 of this report. It should be noted that the Scenic Landscapes identified in the 2009 Plan are currently being reviewed with regards to issues raised by rural communities, and it is considered by the County Council that further consultation with the public is necessary before finalising the County's Scenic Landscapes.

Table 3.8.1 Scenic Route Profiles

Scenic Route	Runs Through or Adjoins a Scenic Landscape	Adjoining NHA, pNHA, SAC, SPA or pSPA	Landscape Type(s) Route Runs Through	Overall Landscape Value	Main Features of Land cover	Key Characteristics of Land Use	Sense of Remoteness	Rural Character
S37	Yes	pNHA Lee Valley	Type 1 City Harbour & Estuary, Type 6a Broad Fertile Lowland Valleys, & Type 8 Hilly River & Reservoir Valleys	Very High – High – High	Settlement, hills, wooded area, valley & reservoir	Agriculture, forestry & residential	No	Prevalent in places
S38	Yes	No	Type 8 Hilly River and Reservoir Valleys & Type 6a Broad Fertile Lowland Valleys	High - High	Valley, lake, river, distant hill views & settlement	Agriculture, forestry, settlement, quarrying, amenity & recreation	Yes	Prevalent
S39	Yes	pNHA Blarney Castle and Woods	Type 6a Broad Fertile Lowland Valleys & Type 1 City Harbour & Estuary	High – Very High	Settlement, residential development, pastoral fields and trees	Urban area of Tower, village settlement of Kerry Pike, one-off housing & limited agriculture	No	Not Prevalent

3.8.3 Summary of Key Constraints and Implications for the Proposed Scheme

It is an objective of Cork County Council to ensure that landscape issues will be an important factor in all land-use proposals, thereby ensuring that a pro-active view of development is undertaken while maintaining respect for the environment and heritage generally in line with the principle of sustainability. (Cork County Development Plan 2009: Objective ENV 2-2 The Landscape). In this regard, the Draft Landscape Strategy for County Cork 2007 sets out specific recommendations for each Landscape Type within the county. The relevant recommendations for the Broad Fertile Lowland Valley Landscape Type, in which the western half of the Study Area is located and to which regard should be had in designing the proposed scheme, include:

- 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.

The Draft Landscape Strategy for Cork designates the Landscape Type Broad Fertile Lowland Valley, in which the western half of the Study Area is located as High Value, High Sensitivity and of County Importance. The Landscape Type City Harbour and Estuary, in which the eastern half of the Study Area is located, is designated as Very High Value, Very High Sensitivity and of National Importance. However it must be noted that the Study Area, within this Landscape Type, comprises of discontinuous and continuous urban fabric. Appropriate design, siting and mitigation measures are therefore 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.

3.9 AIR QUALITY

3.9.1 Methodology

This section of the Constraints Study describes the existing air quality and noise environment within the Study Area, and identifies possible issues which have the potential to constrain the design of any flood relief scheme.

The following items were the principal focus of the study:

- Identification of possible issues regarding air quality
- Identification of locations where there may be existing noise/ vibration-sensitive receptors
- Identification of any existing noise or vibration sources in the area
- A qualitative description of the existing noise climate

The following were referenced as part of the Constraints Study;

- Cork County Development Plan (2009)
- Cork City Development Plan (2009)
- EPA database of IPPC licences

3.9.2 Receiving Environment

3.9.2.1 Air

The Cork County Development Plan (2009) notes that; *'Air Quality is generally good in County Cork, as due to its location in an area with a relatively mild climate, it has an almost continuous movement of clean air. However it is evident that due to the significant increase of vehicles on the public roads, the biggest threat now facing air quality is emissions from road traffic.'* Although air quality monitoring stations are in place in Cork City, there are no immediate plans to monitor air quality in the vicinity of the Study Area.

It is not envisaged that a flood relief scheme recommended by the Engineering Study will increase the volume of traffic within the Study Area in the long term. Given the size of the Study Area, it is not envisaged that a flood relief scheme will have a long term detrimental affect on air quality.

Air quality may be temporarily impacted during the construction phase of the scheme, due in particular to the generation of dust.

3.9.2.2 Noise & Vibration

It is not envisaged that the preferred flood relief scheme emerging from the Engineering Study will have a long term detrimental affect on the noise environment within the Study Area, however noise during the construction phase of the project may have a temporary adverse impact on the environment.

3.9.2.2.1 Noise/ Vibration-Sensitive Receptors within the Area

The majority of the noise/ vibration-sensitive receptors in the Study Area are concentrated in Cork City and surrounding suburbs, with residential development also present throughout the remainder of the Study Area.

Vibration during construction has the potential to cause damage to structures, such as buildings, bridges and walls in the vicinity of the works.

Other noise/ vibration sensitive receptors in the Study Area include the pNHAs, which are dealt with more comprehensively in Section 3.4 of this report.

3.9.2.2.2 Prevailing Noise Climate

The dominant noise source in the Study Area is road traffic noise from the surrounding roads (Refer to Section 3.10.2.3; Roads and Transportation Infrastructure), other regional and local roads and background urban noise within Cork City.

3.9.3 Summary of Key Constraints and Implication for the Proposed Scheme

- Prior to the selection of a preferred flood relief scheme as part of the Engineering Study, it is recommended that the short listed flood alleviation measure 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 flood relief scheme.
- It is recommended that the affects of vibration during the construction phase be considered in the selection process for a potential flood alleviation measures.

3.10 MATERIAL ASSETS

Material Assets within the Study Area which are assessed within this section of the Constraints Study include:

- Waste water Infrastructure
- Waste Management Facilities
- Roads & Transportation Infrastructure
- Hydro Power Generation Infrastructure

3.10.1 Methodology

The following were consulted in the assessment of material assets within the Study Area:

- EPA Waste Water Discharge Licence Applications for Waste Water Agglomerations within the Study Area
- Cork County Council Internal Geographical Information System (IGIS)
- County Cork Waste Management Plan (2004)
- County Cork Development Plan (2009)

3.10.2 Receiving Environment

3.10.2.1 Waste Water Infrastructure

Waste Water infrastructure in the Study Area consists of Waste Water Treatment Plant, Sewerage Collection Networks and varied domestic treatment systems. Ballincollig is the only sewerage scheme, which incorporates a Waste Water Treatment Plant (WWTPs) within the Study Area; there are a further two sewerage schemes immediately upstream of the study area, at Killumney (A0435-01) and upstream of Iniscarra Reservoir at Coachford (D0427-01). Cork City sewerage scheme discharges to the Carrigrenan WWTP (D0033-01) at Little Island, outside of the study area. Carrigrenan WWTP discharges to Lough Mahon to the east of the study area.

Ballincollig Town is served by a combined sewerage network, which includes a total of eleven sewage pumping stations and a Waste Water Treatment Plant providing secondary treatment. The WWTP Ballincollig (D0049-01) is located in the Powdermill area to the north of Ballincollig Town on the South bank of the River Lee. The WWTP has a biological capacity of 30,000 and a hydraulic capacity of 26,000PE (following completion of upgrade works in 2008). The outfall consists of a single pipe discharging to the River Lee. The primary outfall pipe has a capacity of 1,600m^3/hour. Average daily flow to the plant is estimated at 2,800m^3/day, with a peak of 3,790m^3/day based on monthly flow results for 2011. There is one combined sewer overflow pipe within the collection network which discharges to the River Lee. The EPA Waste Water Discharge Licence Application for the Ballincollig Agglomeration was consulted regarding the locations of these pipes, which are shown to discharge into the centre of the river channel.

The site is subject to flooding from the River Lee during extreme flood events, as was evident in November 2009. The WWTP, when flooded, poses a substantial risk to the environment within the Study Area.

The sewerage collection network in Cork City serves the city on both the North and South banks of the River Lee, and both banks of the Bride (north), Glen, Curragheen, Glasheen and Glennamought Rivers. Cork City Sewerage Scheme, therefore includes pipe crossings of the River Lee and the tributaries listed. The EPA Waste Water Discharge Licence Application lists a total of 32 emergency overflows and 71 Combined Sewer Overflows (CSOs), all of which are designed to be activated during high flows in the combined collection network, as a result of high rainfall. The overflows discharge to the following receiving waters:

- Curraheen River
- Lee River
- Trabeg River
- Lough Mahon
- Douglas Estuary
- Glasheen River
- Kiln River.

The WWTP at Carrigrenan is located in the south eastern area of Little Island in Cork City. The plant provides secondary treatment to effluent from the collection network, and has a current load (2007; Ref. EPA Discharge Licence Application) of 254,000. The Design PE is 413,000. The plant discharges an average of 95,000m^3/day to Lough Mahon, with a peak of 162,000m^3/day.

3.10.2.2 Waste Management

EPA's ENVISION database along with Waste Management Plans for Cork County (2004) and Cork City (2004) were referenced in relation to Waste Management Facilities in the vicinity of the study area. There are three EPA licensed sites in the vicinity of the Study Area as follows:

Name	Townland (s)	EPA Licence
Ashgrove Recycling	Knocknaheeny	W0147-01
Kinsale Road Civic Amenity Site	Ballyphehane	W0012-03
Beaumount Quarry (disused)	Ballinlough Ballintemple	W0141-02

Table 3.10.1 EPA Licensed Waste Management Facilities

The Cork City Waste Management Plan (2004) lists thirteen known sites (Ref. table 3.10.2 below) within Cork City upon which waste disposal activities have been carried out in the past.

It is noted that all thirteen sites were used for landfill and have since been reclaimed for alternative uses.

Name	Current Use	Comment
Carrigrohane Rd	Playing pitches	In use 1940-1975
Garrane Lane	Housing	Closed 1966
Black Ash	Park n' Ride	Closed 1987
Curragh road	Housing	Closed pre 1950
Douglas road	Park / Amenity	Old quarry
Ballinlough road	housing	C&D material deposited here
Church Yard Lane	Open space	
Church road	housing	Waste removed and landfilled at Kinsale Road Landfill Site in 1994
Ballinure Road	Park / Amenity	Closed in 1967
Banduff Road	Grazing	1955 – 1970
Cahergal park	Park / Amenity	
Mallow Road	Open space	Closed in 1946
Ardmahon estate	Park / Amenity	

Table 3.10.2 Reclaimed Waste Facilities

The Cork County Development Plan (2009) notes the following in relation to Waste Management Assessments:

'The Council will seek a Waste Management Assessment for projects that will exceed the following thresholds:

- *demolition/renovation/refurbishment projects generating in excess of 100m^3 in volume of construction and demolition waste;*
- *civil engineering projects producing in excess of 500m^3 of waste, excluding waste materials used for development works on the site.*

3.10.2.3 Roads & Transportation Infrastructure

Road and transportation infrastructure in the Lower Lee (Cork City) Flood Relief Scheme study area comprises extensive road and rail infrastructure, as detailed below.

The primary access routes to the Study Area and the urban centres of Ballincollig and Cork City are:

- the N8/M8 National Primary Route from Dublin, ,

- the N20 National Primary Route from Limerick, which crosses the Bride (north) River just before it meets a tributary, the Glennamought River. The road runs parallel to the Bride (north) to Blackpool, where the river is culverted down to the Lee.
- the N22 National Primary Route from West Cork/Killarney, crosses the Bride (west) River to the west of Ballincollig, then runs south of Ballincollig (Ballincollig bypass). The N22 meets the N40 National Primary Route (Cork South Ring Road), runs north to the south banks of the Lee, then east into Cork City.
- the N25 National Primary Route from Waterford,
- the N27 National Primary Route from Cork Airport
- the N28 National Primary Route from Ringaskiddy, and
- The N71 National Secondary Route from Clonakilty/Bandon

Regional roads within the study area include the following:

- R579 Regional Road which follows the route of the Shournagh River north of the Lee from the Muskerry Golf Club to Carrigrohane, east of Ballincollig. From this point the R579 joins the R618 Regional Road which crosses over the Lee River, and subsequently joins the N22 National Primary Route, south of the Lee.
- R635 (Cork North Ring Road) which follows the route of and crosses over the Glen River, a tributary of the Bride (north) River, south of Ballyvolane. The R635 also crosses over the Ballincolly River south of Ballyvolane.

All roads in the Study Area are maintained by Cork City and County Council; however any modifications to National Primary and Secondary Roads would require consultation with the NRA.

Traffic Counts within the study area are available for the N22, N27, N28 National Primary Routes around Cork City.

The main Dublin-Cork rail line runs through the Lower Lee (Cork City) Flood Relief Scheme study area from where it crosses the River Bride (North) at a high level via a stone arch viaduct at Murphy's Rock on the Old Mallow Road. After approximately 800m the rail line enters a tunnel at the North Ring Road (Regional Road R635) and exits under the Lower Glanmire Road (National Primary Route N8), just before the main train station for Cork City (Kent Station).

The Cork-Cobh train line also runs through a portion of the study area. The line runs in an easterly direction from Kent Station, crossing over and running parallel to the Lower Glanmire Road (National Primary Route N8).

3.10.2.4 Hydro Power Generation Infrastructure

The ESB maintain two hydro power generation facilities on the Lee; an 8MW facility at Carrigadrohid (outside the study area) and a 19MW facility at Inniscarra (the western boundary of the study area). The Inniscarra facility consists of a dam and reservoir and power generating facilities comprising two generators (15MW and 4MW). The facility operates under an average head of 30m. The discharge limit from the dam is 150m^3/sec.

Fig. 3.10.1
Inniscarra Dam and ESB Hydro Power Station

The ESB maintain a number of river level gauges, both upstream and downstream of the dams.

During a storm event, rainfall data from the upper Lee catchment together with information on water levels in the reservoirs is transmitted to a central control room. Operations at both reservoirs are co-ordinated to optimise flood water management and are co-ordinated with forecast high tide levels in Cork City. Flood warnings are issued by the ESB to those known to be at risk of flooding downstream of Inniscarra dam.

Flooding downstream of Inniscarra Dam is affected by a number of factors including the additional flows to the River Lee from the Bride, Shournagh and Curragheen catchments which comprise over 30% of the overall River Lee catchment area. Additionally, high tide levels and storm surges affect water levels in the River Lee in the vicinity of Cork City.

3.10.2.5 Utilities

Utilities in the Study Area include water supply networks, telecommunications, electricity supply and gas pipelines. In addition to sewerage infrastructure, it is highly likely that these services also cross the Rivers in the study area at various locations.

3.10.2.6 Future Changes

The Water Services Investment Programme (2010 - 2012), is published by the Department of Environment Community & Local Government (DECLG), gives an indication of proposed water services investment for the various river basin districts in upcoming years. Relevant schemes in the Southern River Basin District of the WSIP include two phases of Ballincollig

Sewerage Scheme (Emergency WWTP Upgrade and Network Contracts), currently at construction stage, Ballincollig WWTP Upgrade (Advance Works) - at "Contracts to Start 2010-2012" stage, and Ballincollig Sewerage Scheme (at Planning Stage). The Investment Programme has allocated funding of €1.5m and €2.5m respectively for the two Ballincollig schemes at construction, and €5m for the Ballincollig WWTP Upgrade (Advance Works) Project.

Neither the County Cork Waste Management Plan nor the Cork County Development Plan (2009) contains plans to develop additional Waste Management Facilities within the study area. The Cork City Waste Management Plan includes details of plans to provide a new residual landfill with a capacity of over 5 million tonnes to serve the Cork region for approximately 20 years. It is noted that construction commenced on the facility in 2005 and opened in 2010.

The Cork Northern Ring Road Project is proposed to complete the ring of Cork City linking the N22 Ballincollig Bypass to the N8 Glanmire Bypass. A preferred route corridor has been established for the entire Cork Northern Ring Road between the N8 and the N22. The proposed route of the road is from the western side of the Ballincollig bypass on the South Bank of the Lee, crossing the Bride and Lee Rivers through the study area, with a potential tunnel and subsequent viaduct immediately after the river crossing. The route also crosses the Shournagh River within the study area. Such a road would involve a new bridge over the Bride and Lee rivers, which would have implications for the design of a proposed flood relief scheme.

Design and preparation of statutory orders have progressed for the Northern / Eastern Section of the route which deals with the proposed road from the N20 to the N8. The length of the scheme is approximately 20km. It is proposed that the scheme would be advanced as a dual carriageway / Motorway with a number of grade separated junctions at key locations. Progression of this scheme through the planning phases has been suspended.

3.10.3 Summary of Key Constraints and Implications for the Proposed Scheme

- 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 flood relief 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 flood relief 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 the discharges from Waste Water 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.

4 PUBLIC CONSULTATION

The details and analysis of the first Public Consultation (Public Information Day) are contained within this section of the report.

4.1 PUBLIC CONSULTATION ARRANGEMENTS

4.1.1 Public Information Day

A public information day (PID) was held on Wednesday 17th July 2013. The purpose of the PID was to present the Study Area to the general public and to outline the process involved in the preparation for the Lower Lee (Cork City) Flood Relief Scheme.

The public information day was held in Cork City Hall, between 3.00pm and 9.00pm. The PID was attended and staffed by members of staff from the Office of Public Works, Cork County Council, Cork City Council, Design Team (Arup and JBA Consulting) and the Environmental Team (Ryan Hanley and McCarthy Keville O'Sullivan), who were available to answer questions from the members of the public that attended. In the majority of cases, the members of the public who attended were individually greeted and offered the opportunity to have a member of the project team explain the Study Area and the flood relief scheme process, while accepting information from the general public and answer any questions at the preliminary stage.

4.1.2 Advertising of Public Information Day

Advertising of the Public Information Day was undertaken by the Environmental Team, in the local printed press and on local radio stations in the week preceding the event. The newspaper and print notices published are detailed in Table 4.1 below. The public notices broadcast on the local radio stations are detailed in Table 4.2 below.

Publication:	Issue Date:	Size:
Cork Independent	11/07/13	12cm x 2 column
Cork News	12/07/13	13cm x2 column
Evening Echo	12/07/13	10cm x 2 column
Examiner	12/07/13	10cm x 2 column
Southern Star	11/07/13	82 mms wide X 100 mms deep (b/w)
The Carrigdhoun	10/07/13	5" D/C ad
The Corkman	11/07/13	10cm x 2 column
The Muskerry News	15/07/13	4" x 2 column
Ballincollig Newsletter	13/07/13	¼ page

Table 4.1 Public notices published in local print media

Radio Station	Coverage:
Cork 96 FM	96fm and c103 whole county combined 40 SEC CAMPAIGN *TAP (6.30AM-24.00). 4 ads per day on Friday 12th, Monday 15th and Tuesday 16th July (plus 2 additional ads over the 3 days)
Cork 103 FM	
Cork Red FM	4 x 20/30 second primetime (7am-7pm) adverts per day on Friday 12th, Monday 15th and Tuesday 16th July + 4 additional slots per day in Community Diary section = 24 ads/slots over 3 days

Table 4.2 Public notices broadcast on local radio stations

The event was also well publicised through postings on the websites and social media channels on Cork City Council, Cork County Council and the Office of Public Works, and also via a text alert system operated by the private CorkFloodWatch website.

4.1.3 Literature Available for the Consultation

Brochures and Questionnaires were available at the PID on the 17th July. Stamped addressed envelopes were provided to those who wished to return questionnaire by post with a return date for the questionnaires of the 26th July. Information in addition to the questionnaires was also accepted on the day of the event or subsequently by post.

4.2 PUBLIC CONSULTATION MATERIALS

4.2.1 Public Consultation Brochure

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 I.

4.2.2 Public Consultation Questionnaire

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 I.

4.2.3 Public Consultation Exhibition Posters

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

- Constraints Study
- Public Involvement
- Scheme Objectives and Overview
- Study Area Map – including Archaeological & Ecological sites
- Formal Public Exhibition Process
- Flood Relief Scheme Process
- History of Flooding in Cork City

A copy of the posters are included in Appendix I.

4.2.4 Project Website

A dedicated website to make details of the Lower Lee (Cork City) Flood Relief Scheme went live in the days immediately following the PID. The website address (www.lowerleefrs.ie) was widely publicised at the PID, and attendees were informed that all information on display at the public exhibition, including brochures, posters, questionnaires, etc. would be available for download from the website.

It is intended to keep the website live for the duration of the scheme and for it to become a destination for interested members of the public to get project information and news and where project documentation can be made available for download.

4.3 PID Exhibition

4.3.1 Officials Visiting Exhibition

On the day of the Public Information Day at Cork City Hall, a number of local elected representatives visited the exhibition.

4.3.2 Numbers of Public Attendees

Members of the public visiting the exhibition were invited to sign a visitor's list to enable a record of the number of attendees to be maintained. A total of 44 attendees signed the attendance list at the event in Cork City Hall. The number of attendees was lower than expected given the extent of advertising for the event, but the low number could have had been influenced by the exceptionally good weather the Country experienced over that period during which the PID took place.

4.4 PUBLIC CONSULTATION RESPONSE

4.4.1 Verbal Comments at Exhibition

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 November 2009 event. Most of those that attended had a particular interest in certain properties or lands they had an interest in, and many were able to explain the extent to which their properties has been affected by previous flood events and what they considered to be the contributing factors that resulted in the flooding. In addition to provision of information about flooding, members of the public also provided information regarding previous maintenance of the River Lee and its tributaries and their suggestions relating to potential flood alleviation measures.

A number of the attendees had time-related questions, such as why it had taken so long to commence the FRS and what the likely timescale was for implementation of measures and physical works on the ground. The timeframe for the FRS was explained to attendees in the context of the larger CFRMS study and the statutory process for progressing a scheme of this nature. The timescale for implementation of measures on the ground was explained as being likely to commence sometime in 2015.

Engineers from Cork County Council and Cork City Council were available to discuss the Flood Early Warning System (FEWS) with members of the public who enquired in that regard. Contact details were taken from members of the public who requested additional copies of brochures of the information posters on display. All members of the public that attended the PID were encouraged to complete a questionnaire to ensure their comments, thoughts and suggestions were fully captured, and where necessary, the project team members in attendance assisted in completing questionnaires for people.

4.4.2 Returned Questionnaires

A total of 25 questionnaires were returned to the Environmental Team.

4.4.3 Other Submissions

In addition to the returned questionnaires, a small number (5) of other submissions were received by post of email following the PID. The information provided generally related to flood levels of historical flood events and suggestions on the likely cause of such flooding.

4.5 ANALYSIS OF PUBLIC CONSULTATION RESPONSE

4.5.1 Analysis of Questionnaires

In total, there were 25 respondents to the questionnaire, all of whom live or work within the Study Area and have been directly interest in or have previously been affected by the historical flood events on the River Lee in Cork City. Full details of the responses to the questionnaires

were provided to the Design Team. Outlined below is a summary of the information obtained from the questionnaires.

4.5.1.1 Flooding Information

When asked about previous flood events, many respondents listed other flood events, with dates including the most recent event in March 2013 (Blackpool), January 2013, June 2012 (Douglas), 2010, 2008, 2007, 2002, and 1985. The November 2009 flood event in particular was noted as the most commonly referenced flood event that respondents has personal experience of.

Of those who responded, most had residential property affected (53%), with the remaining respondents divided between those owning retail (20%), other (13%), workshop or open space properties.

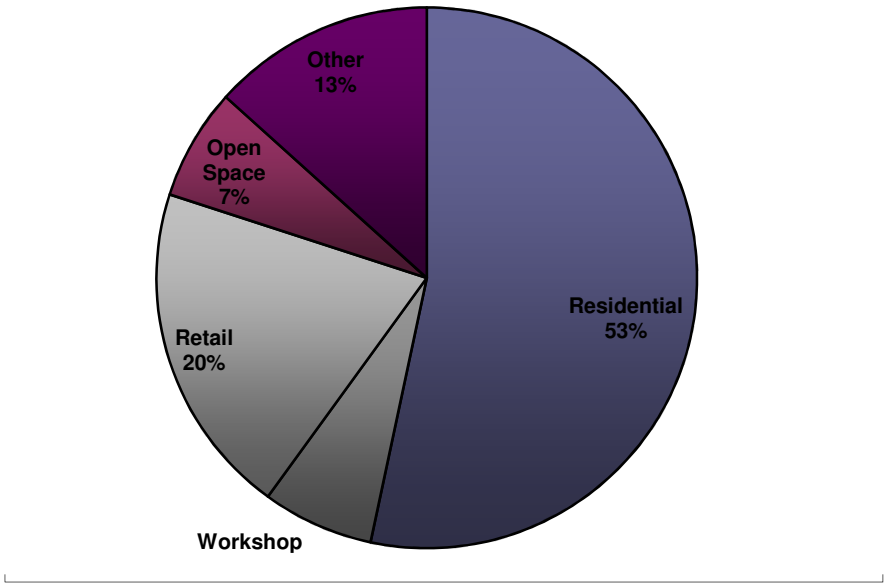


Figure 4.5.1 Property Type Affected by Flooding

The majority of those who responded (73%) expressed the opinion that flooding occurred directly from the River/Stream, while a smaller number (18%) expressed the opinion that flooding occurred as a result of a combination of direct flows from rivers/streams and drains, or as a result of a combination of direct flows from rivers/streams and overland flows (9%).

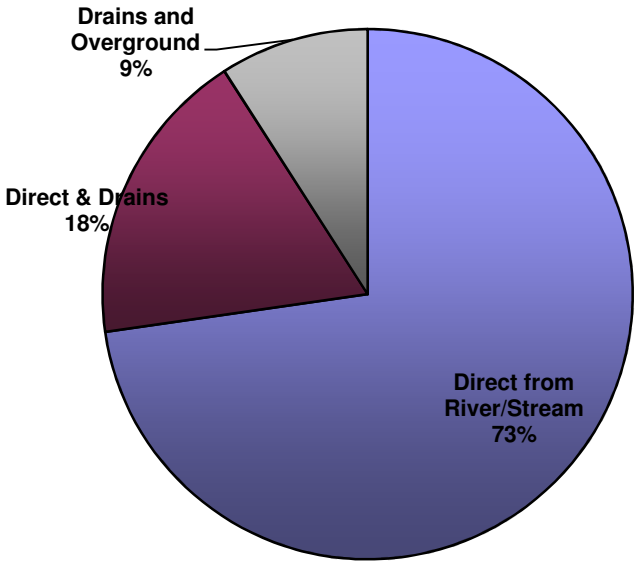


Figure 4.5.2 Source of Flooding

Question 12 asked if respondents had put any measures in place to reduce the impact of flooding. Of those who responded, 33% had put in place measures, but provided little or no detail on the types of measure employed.

4.5.1.2 Flood Alleviation Information

When asked in Question 13 if they had a preference for the type of flood alleviation method (from a selection of 11 measures), the greatest number of respondents (33%) expressed their first preference as a revised operating regime for Carrigadrohid and Inniscarra dams for the purposes of flood risk management. The second preference of the majority was flow reduction (66%) with non-structural measures as the third preference for most respondents (50%). Given the small number of questionnaires returned and the fact that not all respondents actually completed this question, it is difficult to establish a clear trend in preferences.

4.5.1.3 Environmental Constraints

In the final question on the questionnaire (Question 15) respondents were given seven environmental topics and asked to rank their opinion of the importance of each constraint, from very important to unimportant.

Water Quality was considered the most important of the environmental constraints, with 75% indicating it as 'very important'. Local fisheries, followed jointly by Landscape and Visual Amenity and Angling, Tourism & Recreation were considered 'important' by the majority of respondents. Flora and Fauna was generally considered 'very' to 'moderately important'. Overall answers to this question are summarised in Table 4.5.1 below:

	Very Important	Important	Moderately Important	Low Importance	Unimportance
Flora & Fauna	50%	17%	25%	0%	8%
Local Fisheries	27%	55%	9%	0%	9%
Habitats	61%	23%	8%	0%	8%
Water Quality	75%	17%	8%	0%	0%
Architectural/Cultural	12.5%	37.5%	12.5%	12.5%	25%
Landscape/Visual	25%	42%	8%	17%	8%
Angling/Tourism/Rec.	33%	42%	17%	0%	8%

Table 4.5.1 Answers to Question 15 – In your opinion, how important are the following environmental constraints to the proposed Flood Relief Scheme.

Given the small number of questionnaires returned and the fact that not all respondents actually completed this question, it may not be statistically reliable to draw conclusions from such a small number of responses.

In addition to ranking the importance of the various environmental constraints, respondents were also given the opportunity to provide comments specific to each of the environmental topics. A summary is provided below:

A number of comments were made about the need for ongoing maintenance and inspection of drains, thrash screens/grids and culverts, as it was considered that blockages in these were restricting channel flows and resulting in or exacerbating flooding elsewhere.

In line with the preferences on Question 15, many comments also referenced the need to maintain good water quality, and the resultant benefits of doing so for fisheries and associated tourism and leisure activities.

The majority of other comments received were one-off statements, and did not appear in more than one questionnaire/submission. Such comments included:

- Creating floodplains upstream and plant trees
- Constant building in the study area over the last number of decades increasing potential for flooding to occur
- Financial assistance should be made available to affected homeowners and business to allow them install flood protection measures.

4.5.2 Questionnaire, Written and Other Post PID Comments

A full list of the comments made by respondents is provided in in Table 4.5.2 below.

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
Respondent No.1	Keep drains clear. Put dykes at sides of roads. Make purpose of dam flood control. Create flood plains i.e. were no building is permitted.	**Flora and Fauna**: Flooding normally helps. **Local Fisheries**: Serious livelihood and recreation value and available for tourism. **Habitats**: Assist nature **Water Quality**: Put in a proper sewage system and the drought won't matter. **Architectural & Cultural Heritage**: Don't let the past kill the future. **Angling**, **Tourism** & **Recreation**: See fishing. **Other**: Create flood plains. Plant trees upstream (1,000,000 hectares). Prosecute Co. Co. if drains not clear (2 days after 2009 floods straingt road was cleared of 50% blockage). Council had not cleared the drains before this years floods.
Respondent No.2	If Bride River was deepened and cleaned, no need for grids they only collect material and stop the flow.	
Respondent No.3	Never again let the water levels reach its max capacity in both dams (Carrigadrohid & Inniscarra)	**Local Fisheries**: River Lee was the most famous river for salmon fishing and can return to its former glory if ye only had vision, so get ye're act together on this very important issue. **Angling**, **Tourism & Recreation**: River Lee could be goldmine for tourism if ye only had vision. Why not talk to the experts which are the anglers who would be willing to talk to ye.
Respondent No.4	In relation to Inniscarra & Carrigadrehid Dams, it pressure needs to be reduced it should be done when the tide is low in City.	
Respondent No.5	Regular maintenance of grids.	**Landscape & Visual Amenity:** Maintenance of grids

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
Respondent No.6	Better management of ESB Dam at Inniscarra.	
Respondent No.7	(1) Constant waterflow from Dam not off/on. A fish pass or provision for land locked smolts and salon return to the sea as per Habitats Directive and lessen chances of flooding; (2) removal of weir at Kingsley Hotel (Lee Baths); (3) build up a flood barrier at bend of Clarks Bridge and restore old wall but higher	**Flora and Fauna:** Surely under the Fisheries 50 year plan, a fish pass or provision (i.e. Locks) can be constructed to allow land (lake) fish to migrate. The flow from this construction would reduce the chances of flooding. **Local Fisheries:** Removal of Kingsleach Hotel weir (County Hall). All work must conform to Habitats Directive 92/43 EEC 21st May – See Highlighted **Habitats:** Section – Especially item Article 12 (1A to 1D) and no destruction of the breeding grounds or bed of the River for Salmon on the Lee West Bride & Shournagh Rivers **Water Quality:** Must conform to EU Water Framework Directive **Landscape & Visual Amenity:** Must blend in **Angling, Tourism & Recreation:** Improvement to the River by reducing flooding and other measures would aid this Section or tourist for fishing. Over 755 milling euro spend by this sector and creating over 10,000 jobs this could be improved on. **Other:** At Clarks Bridge/Grenville Place, the main flow of the Lee hits a wall and diverts sharply left into the main flow of the City Channel. Prior to the great flood of Nov 19 2009, this wall or part fell in & the stone barrier that diverted the Lee water was removed by machines. On the flood night and now there is no stone barrier to divert the flow. If this was restored and raised, the people of the marsh area of Cork would be less prone to flooding and give them time when it happens again!
Respondent No.8	Updated at present; outdate gully's and County Roads to be maintained and Co. water to run into Co. pipes not City pipes or catchment area within City.	**Flora and Fauna:** If your home was wiped out you would understand the fear! **Other:** Constant building within area over 50 years using original land piping and gully's in the cause of this flooding; this includes halting sites etc...

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
Respondent No.9	Maintenance of River, culverting of flooding section. Larger culverts downstream	**Local Fisheries:** We'd like to see a small (50m) section of River dealt with that continually floods Blackpool Village – We'd like Fisheries not to be an issue with this section of river.
Respondent No.10		**Other:** Area formerly flooded in area known as "The Glen". E/N5 of Blackpool hasn't flooded recently but was a storage area that originally would have held back some water from reaching the Lee.
Respondent No.11	Good Management of the Dam.	**Water Quality:** Very important to have good quality water after all we will be paying for it soon enough. **Other:** O'Connell St. Was flooded alot; it used to come down from the hill where the Neptune Stadium is.
Respondent No.12	Proper management of water in Dam when rick of flooding is known would help.	**Flora and Fauna:** If Flora & fauna are lost due to proposed scheme, they will never be replaced again. **Habitats:** When animals habitats are lost they are lost to the area perhaps will become extinct. **Water Quality:** Most important- Quality of water will have to be good as we will be paying for it. **Other:** Living on O'Connell Street Blackpool. Water was like a river outside door. Ran down from Neptune area to Water Course Road like a River sweeping bins and debris in its way. This does not happen very often but I would like to bring it to your attention as something must be causing it. It would be worth looking into now as work has not started yet on your Lower Lee Flood Relief Scheme.
Respondent No.13	Clear all waterways of junk.	
Respondent No.14	Reed Beds; Tidal barrage & energy production Dredging River bed Geomorphology study of River Lee	
Respondent No.15	March 2013 – Blackpool Thrash screen – Church illegal doesn't have Section 50; doesn't comply with	

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
	any regulations or design guidelines, should not be there – vertical filling capacity 5 mins monitored at time; thrash screen upstream. Red forge road temporary, never maintained or cleaned for H&S, broke off hinges, spoke to City Co. under Blackpoool SC, u/s of that > sunbeam > block a bit, pipe crossing, could put in trash screen. Historically quite alot of debris came down the River. Remove trash screen!! Ring this guy. Padraig Barrett (in-house Engineer; ex-council man Ph: 087 286 3066)	
Respondent No.16	Accountability by ESB for operation of 2 dams. Priority should be the city not power generation. Management shared by OPW/ESB/CCC/ Cork Co.Co. on operation of dam and also accountability	**Water Quality:** Min. to maintain quality that is there now. **Landscape & Visual Amenity:** Maintain visual amenity.
Respondent No.17	Increase capacity of culverts. Rivers kept clean using local knowledge for solutions. Flood alerts warning, divert River	**Other**: Short term measures; need screen overflow; ongoing consultation with residents and businesses; financial assistance for flood prevention measures for homes and businesses, public buildings issue insurance, dumping. Ongoing inside culvert inspections.
Respondent No.18	Mainly proper regulation and control of both dams, being vigilant and releasing water at low city tide levels. Noticing the forecast. ESB policy should be the safety of the city people and not just electricity generation.	Any of the environmental constraints are irrelevant when it comes to people's lives. River beds, river banks etc., should be cleaned and widened to take the additional flow, irrespective of any of these constraints.

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
Respondent No.19	A system to enable monitoring of atmospheric pressure, wind direction and speed and rainfall to make a judgement call on whether there will be a flood or not should be accessible, a system as outlined above should be made available ASAP.	In an ideal world the flow rate of water discharge at the ESB dams at Inniscarra and Carrigadrogid should be available both historical and actual online. This would assist in determining possible flooding of the river Lee at the city some hours after discharge
Respondent No.20	Urgently required – The present gullies must be replaced with wider and deeper types, which will also run from Mervue out to Whites Cross. The surrounding fields must have a proper run off to allow surface water to enter a separate system and not combine with the present gullies. There must be a proper collection area built in the playground area to collect and overflow which will then enter the system swiftly and immediately if and when a flood occurs. The new gully's must have screens erected further down from the gully entrances prevent and collection of waste including a screen at the gully face. All the channels leading to the gullies must be cemented to prevent and further growth of flora etc and will allow for the easy removal of debris. The present and newly erected channels and gullies must have a high mound area to prevent and water from	• The old and outdated Gully's are no longer adequate due to the increased amount of rain fall and to the heavy flow of surface water which runs from the Whites Cross diection into the Gully's in Mervue, this does not include the heavy rain fall which also runs off the surrounding fields. • The present grated manholes will provide some relief if the gully's over flow again, but will remove the problem in total. • The grills placed on the gullys are adequate but are just a stop gap to hopefully prevent any debris entering and blocking the gull's, the only problem is that they are to wide and allow a large amount of small debris to enter and will actually block the entrance when heavy rains occur. • Any interference with wild life, flora, etc which prevents the erection of proper safe guards is pointless, as this means a plant is more important than someone's home or their lives. • Video of flooding in Park Court on computer is someone wants to take from computer on memory stick

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
	escaping while it finds its way into the system. A register to be kept at city hall of regular signed inspections carried out. The present closed in river that runs between Meelick Park and Park court be reopened and covered the full length with a grated cover for safety reasons, the grating will allow any surface water to enter the system.	
Respondent No.21	Proposed pumped bypass in north channel, approx 8m wide x 5m deep, located circa Sunday's Well Bridge. The overall pumping power would be the order of 20,000 kW and the maximum capacity would be the order of 190m³/s. Building of the systems and costs associated are detailed.	Nov 2009 Flooding –background, observations, channels in Cork city, hydraulics of system
Respondent No.22	Stop all new developments on green fields on the future north and west of Cork City which are natures sponge for rain. Put all new development in the lower harbour which would bypass the city I have put forward a 10 year plan to the Government to the Government which would incorporate combination of a road over a tidal barrier and possible hydro generation at the enterance to Cork Harbour to link the Ringaskiddy By Pass in the future.	To pump flood waters back to Coolea, put the following in place: 1. Put a low profile dam in Cloghroe, Tower, Blarney, to trap part of the river Shournac. 2. Put dutch type pumps in place to pump river back to behind Iniscarra Dam. 3. Replicate this system onto Carrigadrohid Dam and back up to storage lake or lakes in Coolea. This system has also been put forward to solve the flooding in the Shannon and provide water for local towns and villages. 4. Should system be successful, it may allow for more development in areas that would potentially be the cause of the problem.

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
	Put water storage lakes within the mountains of Coolea, Ballyvourney. Put an outlet from these lakes into the Kilgarven River and into Kenmare bay. Outlet in times of emergency can produce its own power, by putting turbine in place at the exit. Water storage area can become a tourist attraction with amenity walks, possible fish farm, water sports, and possible water supply for Kerry where there is a water shortage.	5. Water storage areas maybe very valuable in the event of predicted water scarcity by scientists in the future due to increase in population.
Respondent No.23	Solution: Have a measure / watch tower at the Inniscarra Bridge to monitor the level of the floodwater....and send a warning upstream. Reason: that would give plenty time to the City to get ready for a potential flood risk/ flood Could you not rise the level of the wall all along the Quay from the Mercy to the Wellington Bridge once and for all and fix it properly. it seems like we are living in a 3rd country sometimes. Get a proper regime to man and monitor the Carrigadrohid and Inniscarra Dams... all the time... and forget about keeping the levels too dangerously high at their end	Also with regard to the Kingsley: why did the planners give permission for an underground car park there were they daft or what - the potential floods -being that near the river. If all of the services were on the upper floor of the kingsley... i would nearly guess that it could have reopened... why dont the County Hall help here also or is it the City hall ....

Initials of Contributor (Names purposely withheld)	Suggestions on how flooding can be resolved	Comments
	sometimes so that they end up letting off too much water like happened that night in 2009 no matter what anyone says.	
Respondent No.24	You need a mulcher system on the river across the road from Blackpool autos.This would grind up all the debris coming down the river.	
Respondent No.25	There is one flood area in Currahen that you should seriously be considering. It was identified on the OPW's flood maps website and is imidiatly adjacent to the Additional Study Area you have identified along the Curraheen river. Just south of the Additional Study Area the river flows north from Balinora and in Curraheen by the grotto it has 2 right angle bends and goes under the road. The OPW have flood records at this point with the flood going into a number of houses east and west of the bridge. This flood point is imidiatly adjacent to your study area and should be considered as part of your work.Locals are very concerned about flooding at this point and have been in contact with the OPW about doing work.	

Table 4.5.2 Questionnaire, Written and Other Post PID Comments

4.6 CONCLUSION

The Public Consultation was held to inform the general public of the Constraints Study and preliminary aspects of the Lower Lee (Cork City) Flood Relief Scheme and to obtain information about flooding or other relevant environmental information about the Study Area presented. Interested persons were able to scrutinise the consultation materials, have relevant questions answered and take away a brochure setting out the project for future reference.

The Public Information Day did not have as large an attendance as might have been expected in advance, despite an extensive publicity campaign. Nevertheless, a sizable amount of valuable information and comment was obtained both on the day of the PID and received subsequently.

Overall feedback from members of the public was that they were happy to have been involved in the Public Consultation; but wanted to process to proceed as quickly as possible to bring forward the date for when flood relief measures would be implemented on the ground.

5 SOURCES OF INFORMATION

General

Environmental Protection Agency (EPA) guidelines "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, 2003"
Lower Lee Flood Relief Scheme Scoping Report (WYG Ireland Ltd)
Lee CFRAMS Reports
Ordnance Survey Discovery Series Mapping at 1:50,000 scale
Old Raster 6" Mapping
Old Raster 25" Mapping
EPA ENVision Online Database

Human Beings

Cork County Development Plan, 2009 (2nd Edition)
Cork City Development Plan, 2009-2015
Cork Area Strategic Plan 2001- 2020
Macroom Electoral Area Local Area Plan 2011
Regional Planning Guidelines for the South West Region 2010-2022
Census of Ireland 2006 and 2011 (www.cso.ie)
Cork County Council Website
Cork City Council Website
Local Websites www.mytown.ie, www.myplan.ie
The economic impact of salmon angling in the SW of Ireland. Buck., P.J. *South* Western Regional Fisheries Board
Environmental Protection Agency Website – www.epa.ie

Ecology

1:50,000 scale Discovery series mapping
1:10,560 OS Maps of the study area
Aerial photography of the Study Area
NPWS site synopses and database of information on designated sites and records of protected species.
New Atlas of the British & Irish Flora (Preston et al., 2002)
The Atlas of Breeding Birds in Britain and Ireland' (Sharrock, 1976), 'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991' (Gibbons et al., 1993) and 'The Atlas of Wintering Birds in Britain and Ireland' (Lack, 1986)
The EPA website http://www.epa.ie/rivermap/data
The Water Framework Directive website www.WFD.ie

Water

The EPA website http://www.epa.ie/rivermap/data
The Water Framework Directive website www.WFD.ie
EPA water quality database and maps.

Cork County Council Internal Geographical Information System (IGIS)
Well card data compiled by the Geological Survey of Ireland (GSI)
Cork Strategic Water Study Strategy Report (2006)
OPW Database of Hydrometric Stations
South Western River Basin District Management Plan

Soils and Geology
The Geology of South Cork (GSI, 1994)
The GSI online database
Cork County Council Planning Department (Application for Registration of Quarries under Section 261, Planning and Development Act 2000),
Cork County Development Plan (2009)
Cork County Council Internal Geographical Information System (IGIS)
Concrete Products Directory (Irish Concrete Federation), and
Aerial Photographs (2005).
ENVision Mines Site, the EPA's online Historic Mines Inventory
http://maps.epa.ie/EnvisionMinesViewer/mapviewer.aspx

Archaeology
See references in report included in Appendix F for information sources

Landscape
Cork County Development Plan 2009
Cork City Development Plan, 2009-2015
Macroom Electoral Area Local Area Plan 2011
Draft Landscape Strategy for County Cork 2007
Environmental Protection Agency CORINE Land Cover Map

Air Quality
Cork County Development Plan (2009)
Cork Strategic Water Study Strategy Report (2006) (RPSMCOS)

Material Assets
EPA Waste Water Discharge Licence Applications for Waste Water Agglomerations within the Study Area http://www.epa.ie/terminalfour/wwda
Cork County Council Internal Geographical Information System (IGIS)
Cork City Council Internal Geographical Information System (IGIS)
The County Cork Waste Management Plan (2004)
County Cork Development Plan (2009)
Cork City Development Plan, 2009-2015