

6 Biodiversity

6.1 Introduction

Dixon Brosnan Environmental Consultants have conducted an appraisal of the potential impacts of the Douglas Flood Relief Scheme (including Togher culvert) on terrestrial and aquatic flora and fauna. This chapter describes and evaluates the habitats, with their representative flora and fauna, and addresses the potential ecological impacts of the development. Mitigation measures are proposed where necessary and any residual impacts are described.

6.2 Methodology

6.2.1 Introduction

This appraisal is based on surveys of the proposed works area and a review of desktop data. This section of the EIS was prepared in accordance with the following guidance documents:

- Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003)
- Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002)
- Revised Guidelines on the Information to be contained in Environmental Impact Statements Draft September 2015 (EPA, 2015);
- Advice Notes for Preparing Environmental Impact Statements Draft September 2015 (EPA, 2015).
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU Commission, 2013).

This report was prepared by Carl Dixon MSc (Ecological Monitoring) and Ian McDermott MSc (Ecological Monitoring).

6.2.2 Desktop Review

The purpose of the desktop study was to identify features of ecological value occurring within the proposed development site and those occurring in close proximity to it. A desktop review also allows the key ecological issues to be identified early in the appraisal process and facilitates the planning of surveys. Sources of information utilised for this report include the following:

- National Parks & Wildlife Service (NPWS) - www.npws.ie;
- Environmental Protection Agency (EPA) – www.epa.ie;
- National Biodiversity Data Centre – www.biodiversityireland.ie;

- County Cork Biodiversity Action Plan 2009-2014 (Cork County Council, 2009);
- Bat Conservation Ireland - <http://www.batconservationireland.org>;
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011);
- Guidance on integrating climate changes and biodiversity into environmental impact assessment (EU Commission, 2013);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009);
- Aerial photography (Google Earth).

6.2.3 Consultation

Following an initial consultation with Inland Fisheries Ireland (IFI) in April 2014, a fish stock survey was requested. An electrofishing survey was carried out and a report on same is included as **Appendix 6.1** of this report. A second meeting was held with IFI in September 2014 to discuss constraints relating to fisheries. Subsequently an onsite meeting was held with Michael McPartland of Inland Fisheries Ireland on 15th August, 2016 to agree measures in relation to fisheries protection. A further meeting was held with Michael McPartland of Inland Fisheries Ireland on 4th May, 2017 to finalise details. During meetings and in subsequent correspondence it was requested that the EIS provides an assessment of the potential impacts on fish and fish habitat, maintain adequate low flow channels and ensure that the design of the proposed scheme minimises impacts on fish habitat and minimises impacts on fish movement within the affected watercourses.

6.2.4 Surveys Overview

The following surveys were carried out at the site:

- Habitat mapping and flora surveys were carried out over several visits in the period from May 2016 to April 2017. See **Figures 6.2 to 6.7** in **Appendix 6.2**.
- Surveys for birds were carried out in the period from May 2016 to October 2016 and in April 2017.
- A survey for mammals focusing on otters and badgers was carried out over several visits in the period from June 2016 to September 2016 and in April 2017.
- Bat surveys were carried out over several visits from June to September 2016.
- A survey for invasive species, including mapping with GPS coordinates, was carried out in 2015. Further observations in 2016 and 2017 were also recorded (See **Appendix 4.1**).
- A fish stock survey using electrofishing equipment was carried out in September 2014 (See **Appendix 6.1**).

6.3 Receiving Environment

6.3.1 General Landscape

The proposed flood relief scheme areas will be located in Togher along the Tramore River and in Douglas along the Grange Stream and Ballybrack Stream. The Grange and Ballybrack streams are tributaries to the Tramore River, which flows to Lough Mahon in Cork Harbour. Refer to **Figure 1.1**. The proposed works area in Togher is approximately 2.8km south of Cork city centre. The proposed works area in Douglas is to the south and within Douglas village and approximately 3.4km southeast of Cork city centre. All of these waterways flow through heavily urbanised areas with residential housing estates, industrial estates, shopping centres, sports facilities and public parks. An overview of the proposed works areas (1 to 4) is shown in **Chapter 3 Description of the Proposed Scheme**:

- **Figures 3.1 and 3.2** – Area 1: Ballybrack Stream through Douglas.
- **Figure 3.5** – Area 2: Tramore River through St Patrick’s Mills, Douglas
- **Figure 3.8** – Area 3: Grange Stream (tributary of Ballybrack Stream) through Donnybrook Commercial Centre
- **Figure 3.11** – Area 4: Tramore River through Togher

Construction activities are described in detail in **Chapter 4 Construction Activities**.

6.3.2 Designated Conservation Areas

The closest Natura 2000 site to the proposed works are the Cork Harbour SPA (Site code 004030) and Great Island Channel SAC (Site code 001058). There are also a number of pNHA sites within a 10km radius, the closest of which is Douglas River Estuary (Site code 001046). There is a direct hydrological connection between the proposed works and designated sites within Cork Harbour (Cork Harbour SPA, Great Island Channel SAC, Douglas River Estuary pNHA, Dunkettle Shore pNHA). A list of the Natura 2000 sites within 10km of the proposed development area is given below in **Table 6.1**.

Table 6.1: Designated areas and their location relative to the proposed works area

Site Name	Designation	Code	Distance from Togher works area	Distance from Douglas works area	Distance from closest works area
Special Protection Area (SPA)					
Cork Harbour	SPA	004030	3.8km E	0.4km E	0.4km E
Special Area of Conservation (SAC)					
Great Island Channel	SAC / pNHA	001058	10.5km E	6.9km E	6.9km E
Proposed Natural Heritage Area (pNHA)					
Lee Valley	pNHA	000094	2.9km NW	6.0km WNW	2.9km NW
Shournagh Valley	pNHA	000103	6.0km NW	9.4km NW	6.0km NW

Site Name	Designation	Code	Distance from Togher works area	Distance from Douglas works area	Distance from closest works area
Blarney Castle Woods	pNHA	001039	7.5km NW	10.3km NW	7.5km NW
Douglas River Estuary	pNHA	001046	3.9km E	0.5km E	0.5km E
Glanmire Wood	pNHA	001054	7.4km NE	4.5km NNE	4.5km NNE
Lough Beg (Cork)	pNHA	001066	12.5km SE	9.2km SE	9.2km SE
Rockfarm Quarry, Little Island	pNHA	001074	9.5km ENE	5.9km NE	5.9km NE
Cork Lough	pNHA	001081	1.2km N	3.3km NW	1.2km N
Dunkettle Shore	pNHA	001082	7.2km NE	4.0km N	4.0km N
Ballincollig Cave	pNHA	001249	7.0km W	10.7km W	7.0km W
Blarney Lake	pNHA	001798	7.3km NNW	10.3km NW	7.3km NNW
Ardamadane Wood	pNHA	001799	8.0km NNW	10.5km NW	8.0km NNW
Blarney Bog	pNHA	001857	6.3km N	8.5km NW	6.3km N

Important areas for birds within Cork Harbour are interrelated, with bird populations moving between different areas at different times. The closest Natura 2000 sites are the Cork Harbour SPA, which is located 0.4km downstream of the proposed works and the Great Island Channel SAC, which is located 6.9km away to the east. The closest pNHA is Douglas River Estuary, which is located 0.5km downstream of the proposed site works at its closest point. These designated sites are part of a network of sites which support important bird numbers and habitats within Cork Harbour and are considered relevant to this proposed development. These designated sites are shown below in **Figure 6.1**.

The remaining designated sites are located a considerable distance from the proposed development. Given the distances involved and/or the lack of direct hydrological connections, no potential impact on any of the remaining designated sites has been identified.

Likely significant impacts on Natura 2000 sites have been ruled out (refer to the separate ‘Screening Report for Appropriate Assessment’ in **Appendix 6.5** for further details). The authors of this report also concluded that, following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives, the proposed development will not have an adverse effect on the integrity of Natura 2000 sites.

6.3.3 Ramsar Sites

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. A key commitment of Ramsar Contracting Parties is to identify and place suitable wetlands onto the List of Wetlands of International Importance. Cork Harbour is listed as a Ramsar site, which is a non-statutory designation.

6.3.4 Habitats

Terrestrial habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011). All habitats within the study area were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and cross-referenced with habitats listed under Annex I of the Habitats Directive.

Habitat maps are included as **Figures 6.2- 6.7** in **Appendix 6.2** and the habitats recorded on site are described below in **Table 6.2**. The ecological value of habitats is defined by the classification scheme outlined in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009) which is included in **Appendix 6.3**.

Table 6.2: Terrestrial habitat value

Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
Treelines WL2	<p>A short but well developed treeline with a diverse mix of species occurs along part of the boundary of the Ballybrack River adjacent to the ICA Hall. It includes Beech, Ash, Western Red Cedar, Hawthorn, Elder and Holly.</p> <p>The western boundary of the Ballybrack Stream, as it flows through the Douglas Community Park, is vegetated and supports a mixture of trees including Sycamore and Ash, Elder and Alder. The trees do not form a continuous treeline.</p> <p>There is a short section of treeline adjoining an area of open channel adjoining the Togher Road. It includes one large mature Horse Chestnut as well as Ash, Elm, Lime, Hawthorn and Cherry Laurel. Ground layer species include Bramble and Hart's tongue fern.</p> <p>There is a patchy treeline along the pedestrian/cycle path which runs south from Douglas village into broadleaved woodland. Trees noted include Birch, Horse Chestnut, Sycamore and Ash. Some Cherry Laurel was also noted.</p> <p>Upstream of the Donnybrook Commercial Park there is a section of riparian treeline. Species include Alder, Ash and Lime.</p> <p>Further information on trees is provided in the Tree Survey report which is attached as Appendix 6.4.</p>	Local importance (Higher value)
Hedgerow WL1	A hedge of Western Red Cedar and <i>Griselinia sp.</i> runs along the northern boundary of the Lehenaghmore Industrial Estate boundary.	Local importance (Low value)
Dry meadow and grassy verge GS2	Although distributed sporadically within the survey area, the largest single block of this habitat type occurs along the Grange Stream within the Donnybrook Commercial Centre. The grassland at this location is moderately diverse with a mixture of typical species including Oxeye Daisy, Figwort, Meadow Vetchling, Field Sorrel, Yorkshire Fog, False Oat Grass and Sweet Vernal Grass.	Local importance (Low value)

Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
	Dry meadow and grassy verge GS2 corresponds to the Habitats Directive Annex I habitat: 'lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) (6510)'. However, the dry meadow and grassy verge habitat within the site is of poor quality, is highly modified, is very common locally and does not represent a valuable example of this Annex 1 habitat type.	
BL1 Stonewalls and other stonework	There are sections of stonewall at various locations either in close proximity to rivers or forming part of the bankside structure. Materials vary and include natural stone, concrete or gabions. Some typical species were noted such as Maidenhair Spleenwort, Ivy Leaved Toadflax and Hart's tongue fern. However, none of the stone walls recorded on site are of high value from an ecological perspective.	Local importance (Low value)
Wet willow-alder-ash woodland WN6	This habitat occurs adjacent to the river at the most upstream section of the Togher culvert north of the Lehenaghmore Industrial Estate. The trees are not mature with a dominance by closely spaced Willow and Alder. The ground flora is dominated by dense Bramble, Nettle with Winter Heliotrope and Hogweed and biodiversity is generally low.	Local importance (Higher value)
Mixed Broadleaved woodland WD1	<p>The Wet willow-alder-ash woodland WN6 north of the Lehenaghmore Industrial Estate blends into broadleaved woodland on a steep escarpment. The trees are generally semi-mature. Species noted include Sycamore, Alder, Willow, Ash, Elder, Hawthorn. Wild Clematis and ivy are common and the ground layer includes Male Fern, Bramble and Hart's tongue fern. Due in part to the dominance of Wild Clematis and Ivy and low light levels on this north facing slope, biodiversity is relatively low.</p> <p>A section of broadleaved woodland occurs at the upstream boundary of the works on the Ballybrack Stream. This woodland area has a relatively natural woodland structure but with a mixture of native and non-native species. Cherry laurel is dominant in places and blocks light and suppresses ground flora. Species noted include Beech, Sycamore, Alder, Holly, Ash, Sweet Chestnut, Oak, Lime and Plane. Ground flora is limited due to the heavy shade.</p> <p>Upstream of the Donnybrook Commercial Park there is an area of broadleaved woodland which extends for approximately 1km along the Grange stream. Along this length there are areas of beech woodland with some more natural areas with Oak, Ash, Hazel, Willow and Holly. Works on the stream will impact on the lower section of this woodland which has been more highly modified. The riparian zone consists of a mixture of mature Alder and Horse Chestnut with large areas also dominated by closely spaced immature alder and willow. Spoil heaps indicate relatively recent disturbance.</p>	Local importance (Higher value)

Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
	<p>Herbaceous species noted include Harts tongue fern, Woodrush, Nettle, Lesser Celandine, Male fern, Herb Robert and Ivy. The invasive species Japanese Knotweed, Winter Heliotrope and Buddleia were also recorded. Wetter areas support Golden Saxifrage, Rush species and Fools Watercress.</p> <p>Upstream of the Donnybrook Commercial Centre is an area of broad leaved woodland which extends upstream along the Grange Stream. This is a high-quality woodland in parts with a mixture of Beech, Hazel, Hawthorn Ash, Alder, Oak and Birch. Ground flora includes Wood Sorrel, Wood Avens, Ivy, Ransom, Lesser Celendine, and Pignut. Wetter, low lying areas support Golden Saxifrage and Water Parsnip. The woodland provides supports a range for bird species including Treecreeper, and Jay and for Red Squirrel (Carl Dixon pers. observation). This woodland is considered a high value resource in a local context. It is noted that the habitats within the works area are dominated by treelines and immature trees with only minor areas of woodland directly affected.</p>	
Amenity grassland GA2	Small areas of this habitat type occur within the study area. It is generally species poor and supports few herbaceous species. Examples include a small park adjacent to the Togher Road with a small number of semi-mature ash trees and along the Togher River north of Greenwood Estate.	Local importance (Low value)
Scattered trees and parkland WD5	Occurs most prominently in the Douglas Community Park where ornamental trees have been planted with a wide spacing in amenity grassland. Species noted include Field Maple, Norway Maple, Ash, Lime, Aspen, Birch, Rowan, Horse Chestnut, Oak and Sycamore. Most of the trees are semi-mature. A smaller area occurs at Westbrook Gardens, north of the Douglas Community Park. Trees noted here include Horse Chestnut, Alder, Ash, Poplar, Elder, Sycamore, Rowan, Lime, Red Oak, Birch, Norway Maple, Beech, Western Red Cedar and Atlantic Cedar.	Local importance (Low value)
Buildings and artificial surfaces BL3	Includes car parks, buildings, paths and roads. Of minimal ecological value.	Local importance (Low value)
Immature woodland WS2	Occurs upstream of Donnybrook Commercial Centre along a section of the riverbank. Consists of native trees including Willow and Alder.	Local importance (Higher value)

6.3.5 Flora

The National Parks and Wildlife Service (NPWS) does not record any rare or threatened plants as present in the 10km grid square W66. Some 238 flowering plants are listed by the National Biodiversity Data Centre (NBDC) as present in the grid square W66. Round-leaved cranes-bill (*Geranium rotundifolium*) is listed as endangered and is the only flowering plant with a threat assessment. No rare species were recorded during site surveys.

6.3.6 Invasive species

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality.

Detailed surveys for invasive species were carried out in May 2015 for the Douglas and Glashaboy Flood Relief Schemes. An additional area of Japanese Knotweed was recorded upstream of the Donnybrook Commercial Centre in March 2017; this area was not included within the original survey in 2015. The location of Japanese Knotweed within the scheme and Donnybrook Commercial Centre are included in **Appendix 4.1**. Additional individual plants were also recorded in the Douglas Community Park in April 2017. Alien species, which were recorded within the proposed works area but which are not considered highly problematic, include Sycamore, Three-Cornered Leek, Buddleia, Winter Heliotrope, Wild Clematis, Cotoneaster and Cherry Laurel.

Sycamore, Cherry Laurel and Cotoneaster are on the “Amber List: Recorded Species” (which under the right conditions could represent a significant impact on native species or habitats) on the invasive species list compiled by Invasive Species Ireland as part of a joint initiative by the Northern Ireland Environment Agency and NPWS. Buddleia, Wild Clematis, Three Cornered Leek and Winter Heliotrope are on the “Amber List: Uncertain Risk” (their ecological impact remains uncertain due to lack of data showing impact or lack of impact). These species can be managed relatively easily via standard herbicide based control programmes. It is noted that Sycamore is generally not included in treatment programmes as it is widely naturalised.

Japanese Knotweed, which was recorded within part of the works area is listed on both the “Most Unwanted: Established Threat” and on the “High Risk: Recorded Species” list compiled by Invasive Species Ireland in a joint initiative by the Northern Ireland Environment Agency and NPWS.

Japanese knotweed is a highly invasive, non-native species which was originally introduced as an ornamental plant but has since spread along transport routes and rivers to become a severe problem. From an ecological viewpoint, it out-competes native species by forming dense stands which suppress growth of other species. It grows extremely vigorously and can penetrate through small faults in tarmac and concrete and thus can damage footpaths, roads and flood defence structures. As it can survive in poor quality soils, including spoil, it often thrives in brownfield sites and in urban areas. The key features of the plant are summarised below:

- Produces fleshy red tinged asparagus like shoots when it first breaks through the ground in an established stand.
- Has large, heart or spade-shaped green leaves which are approximately the size of your hand.
- Has leaves arranged in a zig-zag pattern along the stem.
- Grows up to 3m in height.
- Yellow / cream flowers in late summer (Typically they start forming from late July onwards).
- Hollow bamboo like stems which have distinctive ring like nodules at regular intervals along it.
- Brown stems remain in winter once it has died back.
- Extensive rhizome system (roots) (7m radius x 3m depth approximately)
- Orange centred rhizome.
- Spreads entirely via the movement of plant and rhizome fragments.

The plant has woody underground rhizomes which can extend 7m laterally from a parent plant. The leaves and stems die back during winter, but growth is extremely rapid during spring. The plants spread mainly through fragments of rhizomes (as little as 0.7g of material or the size of a small fingernail is sufficient) and through cut stems. Stem material cannot regenerate once it has dried, but rhizome material may be viable for up to 20 years in the soil. Thus control of this species is very difficult.

Japanese knotweed is the most common knotweed. There are however, a total of four species present in Ireland, namely Japanese knotweed *Fallopia japonica*, Giant knotweed *Fallopia sachalinensis*, Bohemian knotweed *Fallopia japonicus x bohemica* and Himalayan Knotweed *Persicaria wallichii*.

All of these knotweed species are considered invasive aliens and are listed under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011. The same control measures apply to all of these species.

Herbicide treatment of Japanese Knotweed within the proposed works area has been carried out in proximity to the Ballybrack River within and upstream of the Douglas Community Park. This area was sprayed twice during 2015 as part of a specialised management programme in line with the relevant guidelines.

Observations by Dixon.Brosnan in October 2016 and April 2017 indicate that regrowth has occurred but is less vigorous. The treatment programme will be continued via two treatments in 2016/2017. Refer to **Appendix 4.1** for further details regarding outline non-native species management plan.

6.3.7 Aquatic habitats

The Tramore River is a small river, approximately 7.5km in length, which discharges to Cork Harbour via the Douglas River estuary. Most of its 21km² catchment area lies within urban/suburban areas on the outskirts of Cork City and the river has been extensively culverted in Togher. The main channel runs west to east with a low gradient and is joined by a number of tributaries flowing from higher agricultural grassland to the north. The Grange Stream flows into Douglas where it is known as the Ballybrack Stream. Due to its urban location, water quality issues have occurred in the past with respect to the Tramore River and are an ongoing concern. The Ballybrack Stream is extensively culverted within Douglas Village. An overview of the catchment is provided in **Chapter 12 Hydrology, Figure 12.2**.

All habitats within the study area were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and cross-referenced with habitats listed under Annex I of the Habitats Directive. The habitats recorded on site are described below in **Table 6.3**.

Table 6.3: Aquatic habitats

Aquatic Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
Tramore River Depositing Lowland River FW1/Tidal River CW2	<p>The Tramore river is a small river and due to a low gradient has a relatively sluggish flow along most of its length. It has been extensively culverted. Emergent vegetation is common along its banks including Yellow Flag, Common Reed and native Willow. The substrate is generally soft, with occasional weirs and riffle sections with rock substrate. Some areas of concrete riverbed also occur. The river has been extensively culverted.</p> <p>An electrofishing survey of sections of the Tramore River was carried out by Dixon.Brosnan in 2014 (See Appendix 6.1). It recorded Brown Trout, European Eel and Three-Spined Stickleback within the main channel. Moderate numbers of Brown Trout were recorded where there was sufficient bankside cover; however long sections which were open and shallow were largely devoid of fish.</p> <p>It is considered improbable that Atlantic Salmon (listed on Annex II of the Habitats Directive) occur in the Tramore River due to poor water quality, limited channel size, lack of holding pools, barriers to migration and limited spawning habitat.</p>	Local Importance (Higher value)

Aquatic Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
	<p>All three Lamprey species are listed on Annex II of the Habitats Directive. The presence of migratory lamprey species (Sea Lamprey and River Lamprey) is unlikely due to barriers to migration and limited spawning habitat. Brook lamprey could potentially occur within suitable areas of habitat. Although areas of silt suitable for juvenile lamprey were noted, no lamprey were recorded during the fish stock survey.</p> <p>Conditions are unsuitable for other Annex II species (i.e. freshwater pearl mussel or crayfish) or Annex I habitats (i.e. Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation).</p> <p>Works at St Patrick's Mills will occur adjacent to a tidal section of the river. Grey mullet and Flounder both occur in the lower tidal sections of the Tramore River which is characterised by softer substrate with some areas of gravel. Fluctuating silt levels are typical of the tidal sections of rivers.</p>	
Ballybrack River Depositing Lowland River FW1	<p>The Ballybrack Stream is formed by the confluence of the Grange and Moneygurney Streams. It has a relatively natural flow pattern with areas of gravel suitable for salmonid spawning and a well-developed riparian zone. It supports a population of brown trout. As one of Cork's few urban streams in good condition it is considered by Inland Fisheries Ireland to be an important community resource (M. McPartland IFI, pers. comm.)</p> <p>The section of the Ballybrack Stream to be affected lies within and upstream of the Douglas Community Park. Within the park the channel is narrow and relatively deep with a natural flow pattern. Adult Brown Trout are concentrated in small pools, particularly where there is cover from vegetation or undercut banks. There is a concrete apron at the northern boundary of the park followed by a large concrete culvert.</p> <p>Upstream of the Douglas Community Park the river is initially confined within stone walls and a large section of the riverbed is concreted. Habitat quality improves further upstream where a more natural riffle-glide sequence with gravel substrate is evident.</p> <p>Due to substantial culverting in the lower reaches, the Ballybrack Stream is unlikely to support migratory species such as Salmon, River Lamprey and Sea Lamprey which are listed on Annex II of the Habitats Directive. Although unlikely due to the limited size of the Ballybrack Stream, Brook Lamprey could theoretically occur, however no</p>	Local Importance (Higher value)

Aquatic Habitat	Description/ Habitats Directive Annex I Status	Ecological value (NRA guidelines)
	<p>significant areas of habitat for lamprey occur within the proposed works area. Due to the presence of culverts in the lower reaches Sea Trout are not expected to occur. Due to the limited size of the stream and underlying geology, crayfish and freshwater pearl mussel will not occur.</p> <p>The Annex 1 habitat Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation does not occur within the works area.</p>	
Grange Stream Depositing Lowland River FW1	<p>The Grange stream is a small watercourse which runs through a narrow and wooded valley before joining the Ballybrack Stream. Due to its limited size and depth and culverting along part of its length, it has limited fisheries potential. The area to be affected by works includes an open length of channel within a car park at the Donnybrook Commercial Centre. This section is isolated by culverting downstream and a vertical drop upstream (coarse screen) and has been heavily modified and straightened. Upstream of the Donnybrook Commercial Centre, the Grange Stream has a more natural riffle-glide structure as it flows through woodland. However silt levels are high with some excessive algal growth and sewage fungus noted. Upstream of the works area is a small tributary, flowing from the west, which is piped from a housing estate and joins the main channel. This stream has obvious signs of nutrient enrichment including sewage fungus and may be contributing to water quality deterioration in the main channel. There are a number of other piped discharges to this stream which may also be impacting on water quality.</p> <p>Whilst the presence of fish species such as Eel and Brown Trout from small deeper pockets of water further upstream cannot be entirely excluded, the areas to be affected are generally shallow and are likely to have very low flow levels during dry weather. Sewage fungus was also recorded within the proposed works area upstream of the Donnybrook Commercial Centre. Thus this small stream is of limited ecological value due to its limited size, water quality impairment and obstacles to free movement of fish.</p>	Local Importance (Lower value)

6.3.7.1 Water Quality Data

Biological Monitoring Data

There is no biological data available for the Tramore River, Grange and Ballybrack Streams (i.e. EPA Q values) as these streams are not included in the standard EPA water monitoring programme. However, the Tramore River is believed to have suffered a degree of water quality impairment in the past.

The Kinsale Road Landfill is located at the Tramore Valley Park, off the Kinsale Road and the Tramore River flows around the southern section of the site before flowing through Douglas. Information from three sampling events at three locations in 2015 is generally indicative of satisfactory water quality with only one slightly elevated BOD reading (4.3 mg/l). A high degree of variation was recorded in pH levels, however results do not indicate significant water quality issues. Further detail is provided in **Chapter 12 Hydrology**.

Table 6.4: Surface water quality results (summarised). Source: Kinsale Road Landfill AER (2015) under the EPA waste licence No. W0012-03.

Sampling Point	Sampling Date	pH	BOD (mg/l)
EM2	11/03/2015	7.67	1
	08/09/2015	8.06	1.7
	01/12/2015	7.71	1.2
EM10	11/03/2015	7.71	2.5
	08/09/2015	8.33	2.9
	01/12/2015	7.53	1.6
EM11	11/03/2015	7.22	4.3
	08/09/2015	8.41	1.1
	01/12/2015	8.11	1.2

In estuarine waterways the EPA rates water quality as Unpolluted, Intermediate, Potentially Eutrophic and Eutrophic. The former two are considered to be indicative of acceptable estuarine water quality, while the latter two water quality ratings are considered as unsatisfactory. **Table 6.5** displays the results for Lough Mahon into which the relevant watercourses ultimately discharge.

Table 6.5: EPA Water Quality Status

Area	Water quality status
Lough Mahon	Estuarine & coastal water quality – Intermediate

Source: EPA Envision map system

Water Framework Directive

The Water Framework Directive (WFD) is a key initiative aimed at improving water quality throughout the EU. It applies to rivers, lakes, groundwater, and coastal waters. The Directive requires an integrated approach to managing water quality on a river basin basis; with the aim of maintaining and improving water quality. The Directive requires that management plans be prepared on a river basin basis and specifies a structured approach to developing those plans. It requires that a programme of measures for improving water quality be brought into effect.

Specifically, the WFD aims to: protect/enhance all waters (surface, ground and coastal waters); achieve "good status" for all waters, manage water bodies based on river basins (or catchments); involve the public; and streamline legislation.

The WFD assesses the water quality of rivers and ranks their status as follows: High, Good, Moderate, Poor, Bad and Yet To Be Determined. The Water Framework Directive also determines the "Risk" level of a river as follows: 1a – At risk of not achieving Good Status, 1b – Probably at risk of not achieving Good Status, 2a – Expected to achieve Good Status and 2b – strongly expected to achieve Good Status. Relevant data for surface waters within the study area, where available, are given in **Table 6.6**.

Table 6.6: WFD data

Watercourse	Status	Risk
Lough Mahon	Good	1a – At risk of not achieving Good Status
SW_Coastalt2_Tramore_1Lower (Includes the lower sections of the Tramore River and the Ballybrack Stream)	Moderate	1a – At risk of not achieving Good Status

(Source: EPA Envision online map database)

6.3.8 Mammals

6.3.8.1 Otter

Otters, along with their breeding and resting places, are protected under the provisions of the Wildlife Act 1976, as amended. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Directive, as transposed into Irish law.

Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered Species (CITES). Given that the proposed works will occur along watercourses this species could be theoretically affected by the proposed works.

The NBDC notes that Otter have been recorded within grid square W66. A 2013 report (Atkins/Cork County Council, 2013) notes that signs of otter were recorded at nine locations along the Ballybrack Stream during a survey by the Irish Wildlife Trust. Using genetic evidence, it was concluded that six otters use the Ballybrack Stream. The report notes that it appears that otters can use the culverted structures through Douglas (north of Church Road) and that Douglas Village does not prevent Otters from the Ballybrack Stream entering the estuary.

A survey for otters was carried out within 150m of the proposed works area. Otters are commonly distributed along fish bearing watercourses and coastal habitats in Ireland. Signs of otters are readily identifiable, and include spraints, tracks, holts, resting areas, slides and feeding signs. Although periodic usage of the watercourses within the overall study area may occur, no signs of otter were recorded within the proposed works area. However as noted above otters do occur within the catchment and are likely to move through or feed within the proposed works areas.

6.3.8.2 Bats

All bat species in Ireland are protected under the Wildlife Act 1976, as amended. Bats are also protected under Annex IV of the EU Habitats Directive. Ireland is also a signatory to the Bonn convention (Convention on the conservation of migratory species of wild animals, Bonn 1979) and the Bern convention, 1982 (The Convention on the Conservation of European Wildlife and Natural Habitats), and it has a commitment to the “Eurobats” agreement (Agreement on the Conservation of Bats in Europe, 1991).

The Bat Conservation Ireland National Bat Database, available through the NBDC website, list the presence of four bat species for the 10km² grid square W66 (Daubenton’s Bat, Leisler’s, Common Pipistrelle and Soprano Pipistrelle). Bat Conservation Ireland also records Natterer’s Bat and Brown Long-Eared bat within 10km of the proposed works.

A bat survey of the Ballybrack Stream valley was carried out in 2013 (Bat Survey of Ballybrack River Valley, Douglas (Buckley, 2013). The survey recorded four species of bat namely Soprano Pipistrelle, Common Pipistrelle, Leisler’s Bat and an unidentified Myotis bat species which was probably Daubenton’s Bat. Activity was concentrated along the Ballybrack Stream particularly within woodland. The survey report does not include any records from within the proposed works area and most of the recorded activity occurred in woodland upstream of the proposed works area. Further survey work was undertaken in June, July and August 2013 by a UCC student. This survey also recorded Soprano Pipistrelle, Common Pipistrelle, Leisler’s Bat and Daubenton’s Bat along the Ballybrack River valley. (Atkins/Cork County Council, 2013).

Dixon.Brosnan carried out night-time bat activity surveys using standard heterodyne/frequency division bat monitors (Batbox Duet) in the period from May to September 2016. All surveys were carried out from 30 minutes prior to dusk and lasted for approximately three hours. Conditions were favourable with dry, warm conditions. The surveys consisted of a mixture of emergence surveys and general activity surveys. Emergence surveys were carried out where there were large trees present with the potential to support bat roosts. The survey recorded Common Pipistrelle, Soprano Pipistrelle and Leister's Bat feeding activity within the study area as indicated below in **Table 6.7**.

Table 6.7: Bat activity survey results

Location	Survey Results
<p>Douglas mills (Emergence/Activity Survey)</p>	<p>One Soprano Pipistrelle circling and feeding close to the upstream culvert. Although there was feeding activity in proximity to the culvert, no bat emergence was recorded. Sporadic overflying of downstream section of the site by Soprano Pipistrelle.</p>
<p>Donnybrook Commercial Centre (Activity survey)</p>	<p>Some Common Pipistrelle activity on the woodland edge along the site (1-2 bats). No activity was recorded along the stream channel which runs through the commercial centre. It is noted that subsequent to bat surveys being completed, an additional area of the Grange Stream upstream of the commercial centre was included in the flood relief scheme. Not all of this area was therefore surveyed. It is likely to provide some feeding habitat for common bat species and is part of a much larger woodland area which extends approximately 1km further upstream.</p>
<p>Douglas Community Park to upstream boundary of the proposed development (Emergence/Activity Survey)</p>	<p>Common and Soprano Pipistrelle feeding activity (3 bats) was observed. Concentrated close to the ICA Hall building and associated grassland with sporadic activity along the river channel. No evidence of emergence was noted for any of the mature trees adjoining the river.</p>
<p>Ballybrack Woods (Emergence/Activity Survey)</p>	<p>Soprano Pipistrelle (uncertain number) was recorded feeding upstream of the proposed works area. No evidence of emergence was noted for any of the trees within the woodland areas.</p>
<p>Upstream boundary of Togher Culvert (Emergence/Activity Survey)</p>	<p>Pipistrelle (unidentified species) recorded feeding along woodland edge. Approximately 2-3 individuals. One Leisler's bat was recorded overflying the site. No evidence of emergence was noted for any of the trees within the woodland areas.</p>

Location	Survey Results
Open sections of Tramore River (Togher) (Emergence/Activity Survey)	No bat activity recorded.

The surveys found that bat activity was low to moderate, with Common and Soprano Pipistrelle the predominant species. Only small numbers of individuals were recorded. The results indicate that the habitats within the proposed works area are of local value for feeding bats.

Although some mature trees are present within the study area no specific bat roosts or emergence points were recorded. A detailed tree survey was carried out within the works area and is included as **Appendix 6.4** of this EIS. The Tree survey report noted that there is a paucity of mature and veteran trees within the survey area which have the potential to be of high value as bat roosts. The trees identified as being of significant potential value as bat roosts were as follows: two older beech trees close to the ICA Hall in Douglas (Tree no. 812 and 813) and a sycamore (Tree no. 863), and a veteran Ash (Tree no. 873) adjoining the Lehenaghmore Industrial Estate. An Alder (Tree no. 838) in a woodland area at the upstream boundary of the works area on the Ballybrack Stream) had attached bat boxes. It will be not be possible to retain the trees in Douglas (812,813). It is intended that the trees adjoining the Lehenaghmore Industrial Estate (863,873) and the tree with bat boxes close to the Ballybrack Stream (838) will be retained.

No bats were specifically recorded emerging from these trees, however specific mitigation measures will be employed with respect to all trees.

6.3.8.3 Other mammals

Other protected mammal species listed in the NBDC databases for grid square W66 include Wood Mouse, Sika Deer, Hedgehog, Irish Hare, Badger and Irish stoat. Red Squirrel is known to occur within the Ballybrack woodland (Atkins/Cork County Council, 2013, Carl Dixon pers. Observation 2017). Several invasive mammals have also been recorded including Feral Ferret and American Mink. No protected mammals were recorded during site surveys although some common species including Brown Rat, Rabbit and Fox were recorded.

6.3.9 Reptiles and Amphibians

According to records held by the NBDC, Common Frog and Smooth Newt have been recorded in square W66. Common Lizard has not been recorded in W66. Common Frog is listed in Annex V of the EU Habitats Directive and is protected under the Wildlife Act 1976, as amended. No suitable habitat for these species will be affected by the proposed works.

6.3.10 Birds

A total of 99 birds have been recorded in grid square W66 according to the NBDC database. Annex I bird species which have been recorded include Kingfisher, European Nightjar, Little Egret, Peregrine Falcon, Ruff and Golden Plover. Red list species include Northern Shoveler, European Nightjar, Yellowhammer, Herring gull, Black-headed gull, Curlew, Golden plover, Redshank, Barn Owl, and Lapwing.

6.3.10.1 Bird Surveys

Bird surveys were carried out by Dixon.Brosnan during the period from June to October 2016 in conjunction with habitat surveys. Additional observations were made in April 2017. The bird species noted within the study area consist of a mix of common terrestrial bird species which typically occur in a suburban landscape and more specialised species associated with aquatic habitats. A nest box (probably for Dipper) was noted along the river close to the ICA hall. It is uncertain as to whether this has been used in the past and it was not in use in April 2017.

Common bird species recorded during site surveys included Bullfinch, Hooded Crow, Rook, Jackdaw, Magpie, Woodpigeon, Swallow, Dunnock, Great Tit, Long Tailed Tit, Song Thrush, Blue Tit, Greenfinch, Goldfinch, Wren, Robin, Pied Wagtail and Blackbird.

Bird species which were recorded and which are associated with aquatic habitats were as follows: Little Egret, Grey Heron, Grey Wagtail, Mallard and Dipper. Kingfisher was not recorded within the study area. Cormorant was recorded over flying the study area.

Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (Lynas et al., 2007). Red List bird species are of high conservation concern, and Amber List species are of medium conservation concern. One Red Listed species was recorded (Grey Wagtail) and three amber listed species were recorded (Swallow, Greenfinch and Robin). Little Egret is listed on Annex 1 of the Birds Directive.

Overall, the study area is of local value for a range of terrestrial bird species that are relatively common in the Irish countryside. The presence of watercourses provides additional habitat for more specialised species.

6.3.11 Invertebrates

Records from the All-Ireland Non-marine Molluscan Database and EPA river biologists' data available through the NBDC website, show that 54 species of non-marine mollusc have been recorded from grid square W66.

No non-marine molluscs which are classified as endangered have been recorded from grid square W66. Moss Bladder, Copse Snail and Tree snail are listed as 'vulnerable'. The recorded species Silky Snail, Gobular Pea Mussel and Common Whorl Snail are listed as 'near threatened'.

Out of a total of 21 species recorded in grid square W66 in the Water Beetles of Ireland database and the EPA River Biologists' Database, none are listed as 'critically endangered', 'endangered' or 'vulnerable' in the Irish Red Data list for water beetles.

Including records held by Moths Ireland, the Butterflies of Ireland Dataset at the National Biodiversity Data Centre, records held by the National Parks and Wildlife Service and records published in the Distribution Atlas of Butterflies in Ireland 1979, 22 species of butterfly and 300 species of moth have been recorded from grid square W66.

Five species of butterfly which have been recorded in grid square W66 have threat assessments and one has an EU Annex status. Wall is listed as 'endangered'; Marsh fritillary is listed as 'vulnerable' and is also an Annex II species; Dark green Fritillary is listed as 'vulnerable', and both Wood White and Gatekeeper are listed as 'near threatened'. None of the recorded moths have any formal threat assessment.

A total of nine species of odonates (dragonflies and damselflies) have been recorded from grid square W66 in the Dragonfly Ireland dataset available through the NBDC website. None are listed as 'critically endangered', or 'endangered' in the Irish Red Data list for dragonflies and damselflies. Scarce blue-tailed is listed as 'vulnerable' and is present in W66.

A search of National Biodiversity Data Centre records showed that, of the 33 species of Irish mayflies, only one species, *Serratella ignita*, has been recorded in square W66. This species is not listed as being 'endangered' in the Irish red data list for mayflies.

It is noted that the habitats to be affected are not of high ecological value and the presence of specialised or uncommon invertebrate species is considered unlikely. In this context, no specialised surveys for invertebrates was considered necessary.

6.4 Characteristics of the Proposed Scheme

The proposed works will impact on existing structures including river bank walls, culverts, bridges and roads and will impact on bankside vegetation. Excavation of soil and river bank material will be required for foundations, regrading, river widening and deepening, and trash screen construction. Channel realignment will require excavation and regrading of the existing channel. Excavated material will be reused on-site or in the wider flood relief works areas where possible, for example in embankments. A detailed description of the scheme is presented in **Chapter 3 Description of the Proposed Scheme** and the proposed scheme drawings are in **Appendix 3.1**. The main aspects of the proposed flood relief scheme comprise construction works entailing the following:

- Construction of new flood defence walls and/or replacement of existing walls with new flood defence walls
- Replacement of and/or extension of existing culverts
- Removal of and/or replacement of bridges

- Removal of existing trash screens and construction of new trash screens
- Local channel widening, deepening, realignment and regrading of river channel and bank stabilisation
- Construction of new earthen flood defence embankments
- Construction of 2 no. underground surface water pumping stations
- Relocation of 2 no ESB substations/kiosks close to their existing locations
- Provision of civil works such as road/footpath re-grading at a number of locations
- Removal of vegetation and trees to facilitate construction works
- Protecting drainage outlets along the line of flood defence works with non-return valves;
- Local diversion of services where necessary to facilitate construction
- Landscaping and tree planting
- Once construction is completed, ongoing maintenance of the river channel, trash screens etc.

6.5 Evaluation of Impacts

During construction, potential impacts could arise from impacts on water quality from excess siltation or inadvertent spills of hydrocarbons and impacts from the spread of invasive species. There will be a net loss of riparian habitat including a number of trees and there will be some loss of open channel habitat. There will be increased noise and disturbance during construction. These potential impacts are assessed in more detail below.

6.5.1 Impact Appraisal

When describing changes/activities and impacts on ecosystem structure and function, important elements to consider include magnitude, duration and probability of occurrence (IEEM, 2006).

Magnitude refers to the 'size' or 'amount' of an impact, determined on a quantitative basis if possible. Duration refers to the time for which the impact is expected to last prior to recovery or replacement of the resource or feature. This should be defined in relation to ecological characteristics (for example species' lifecycles) rather than human timeframes. Appropriate criteria for the assessment of magnitude and duration for this project are provided in **Tables 6.8 and 6.9** below.

Table 6.8: Criteria for Determining the Magnitude of Ecological Impacts

Magnitude	Examples
Very High	e.g. The proposal (either on its own or with other proposals) will result in – The total loss of or very major alteration to key elements/features of the baseline conditions such that post-development/character/composition/attributes will be fundamentally changed and may be lost from the site altogether.
High	e.g. The proposal (either on its own or with other proposals) will result in – Major alterations to key elements/features of the baseline (predevelopment) conditions such that post-development/character/composition/attributes will be fundamentally changed.
Medium	e.g. The proposal (either on its own or with other proposal) will result in – The loss of or alteration to one or more key elements/features of the baseline conditions such that post-development/character/composition/attributes of baseline would be partially changed.
Low	e.g. The proposal (either on its own or with other proposals) will result in – A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline conditions would be similar to predevelopment circumstances/patterns.
Negligible	e.g. The proposal (either on its own or with other proposals) will result in – A very slight change from baseline condition. Change barely distinguished approximating to the “no change” situation.

Table 6.9: Criteria for assessment of duration.

Duration	Criteria
Permanent	Effects continuing beyond one human generation (c.25 years) are expected. There is likely to be a substantial improvement after this period, whereby these would be described as "very long term effects."
Temporary	Long term-(15-25 years) Medium (5-15 years) Short term (0-5 years)

It is important to consider the likelihood that a change/activity will occur as predicted and also the degree of confidence in the assessment of the impact on ecological structure and function. The following scale (IEEM, 2006) is often utilised in ecological assessment:

- Certain/near-Certain: probability estimated at 95% chance or higher.
- Probable: probability estimated above 50% but below 95%.
- Unlikely: probability estimated above 5% but less than 50%.
- Extremely Unlikely: probability estimated at less than 5%

Based on the above and the value of habitats and species a matrix of significance can be used to determine specific impacts. This matrix is shown below in **Table 6.10**.

Table 6.10 Impact Matrix

Impact Significance		Ecological Value				
		Very High	High	Medium	Low	Negligible
Magnitude	Very High	Major	Major	Major	Moderate	Minor
	High	Major	Major	Moderate	Minor	Negligible
	Medium	Major	Moderate	Minor	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible

6.5.2 Do nothing scenario

In the absence of the proposed works, it is expected that habitats would remain generally similar with trees becoming more mature over time. Water quality is likely to remain broadly similar in the absence of significant changes in the catchment. However Japanese Knotweed is likely to spread if active control measures are not implemented.

6.6 Predicted Impacts on Terrestrial Habitats

6.6.1 Predicted Impacts on Terrestrial Habitats

Impacts on terrestrial habitats are generally restricted to direct removal of habitats and possible impacts from the spread of invasive species. Levels of dust during construction are predicted to be low and effectively managed by mitigation. The impact on vegetation in adjoining habitats from wind-blown dust is predicted to be negligible. No rare floral species were recorded within the study area. Based on the criteria outlined by the IEEM, as described above, the predicted impacts are detailed in **Table 6.11**.

Table 6.11: Impacts on Terrestrial Habitats

Habitat	Ecological value (NRA guidelines)	Predicted Impact
Treelines WL2	Local importance (Higher value)	Minor to moderate
Hedgerow WL1	Local importance (Low value)	Negligible
Dry meadow and grassy verge GS2	Local importance (Low value)	Negligible
BL1 Stonewalls and other stonework	Local importance (Low value)	Negligible
Wet willow-alder-ash woodland WN6	Local importance (Higher value)	Minor
Mixed Broadleaved woodland WD1	Local importance (Higher value)	Minor to moderate
Amenity grassland GA2	Local importance (Low value)	Negligible
Scattered trees and parkland WD5	Local importance (Low value)	Minor

Habitat	Ecological value (NRA guidelines)	Predicted Impact
Buildings and artificial surfaces BL3	Local importance (Low value)	Negligible
Immature woodland WS2	Local importance (Higher value)	Minor

6.6.2 Predicted Impacts on Aquatic Habitats

With respect to aquatic habitats there a number of potential impacts which can occur during the construction phase and following completion. These are summarised below. Predicted impacts for the different sections of the proposed works are specifically addressed in **Table 6.12**. Potential impacts could arise from loss of habitat due to culverting and in-stream works and from loss of riparian habitat which provides food, cover and shade and helps to stabilise river banks.

Significant impacts on fish populations of Brown Trout and European Eel and on macroinvertebrate populations could occur due to such loss of habitat. No Brook Lamprey were recorded during fish stock surveys, however this species could potentially be present.

Potential impacts associated with construction include the mobilisation of high levels of silt. High silt levels can impact on lamprey and salmonid spawning habitat. Excessive siltation can cause salmonid eggs and fry to be smothered. Spawning salmonids and lamprey are likely to avoid traditional spawning areas due to excessive silt deposits. Adult fish may also be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. High silt levels may also impact on macroinvertebrate populations and on aquatic flora.

Potential impacts may arise via inadvertent spills of hydrocarbons due to poorly maintained machinery or inadequate storage. Due to the limited size of watercourses within the project area, relatively small volumes of polluting material could have a significant impact.

Potential impacts on otter could occur via the following: increased noise and disturbance, potential impacts on prey availability, potential impacts on resting areas/holts and potential impacts on movement of otter along watercourses.

Notwithstanding that there has already been significant culverting of watercourses, additional culverting may further restrict the movement of fish and may lead to a net loss of habitat. Modifications of the river channel structure may result in the loss of habitat for particular age classes of fish i.e. riffle for juvenile fish or pools for adult fish. Such changes may impact on population dynamics. Impacts on fish populations can reduce prey availability for piscivorous birds such as Heron or macro-invertebrate prey items for Dipper and Grey Wagtail, with knock on effects on breeding success.

It is noted that the replacement of sections of concrete stream bed with natural gravels has the potential to improve habitat quality in certain sections of the works area. It is also noted that flooding in urban areas can introduce deleterious substances into watercourses including hydrocarbons. Prevention of flooding minimises the risk of such occurrences.

Table 6.12: Impacts on aquatic habitats

Aquatic Habitat	Ecological value (NRA guidelines)	Predicted Impact
Tramore River Depositing Lowland River FW1 (Proposed works at Togher)	Local Importance (Higher value)	<p>A number of measures are proposed for the upper reaches of the Tramore River in Togher. The proposed works include the following:</p> <ul style="list-style-type: none"> Existing trash screen structure to be removed and replaced with new screen and defence walls. It is proposed to construct a boundary wall along the open channel on the Lehenaghmore Road over a distance of approximately 30m to the Togher Road roundabout. New concrete culvert to replace existing culverts at two locations The existing channel will be widened by 1 metre. A new concrete retaining wall will be provided. <p>Extensive culverting within the upper sections of the Togher River has reduced habitat quality considerably. Electrofishing in proximity to the Lehenaghmore Industrial Estate found that Brown Trout were absent with only a small number of European Eel recorded. In this context, the replacement of existing culverts and a trash screen and the removal of an existing trash screen is not predicted to have any impact on fish movement within this section of the river and will not result in any net loss of aquatic habitat. The long-term impact from these works is predicted to be negligible.</p> <p>The construction of a wall at the section of channel upstream of the Togher Roundabout will result in the loss of riparian vegetation. This section of the Tramore River is completely isolated by upstream and downstream culverts and is heavily shaded. The long-term impact will be negligible.</p> <p>In-stream works associated with widening works have the potential to generate elevated levels of silt. The habitat to be affected is not of high value from an ecological viewpoint as the channel has been highly modified with a concrete riverbed. A natural substrate will be provided which will provide more natural conditions. The impact will be minor in the short term, and negligible in the long term.</p>
Tramore River Tidal River CW2 (Proposed works at St. Patricks Mills, Douglas)	Local Importance (Higher value)	<p>A new flood defence wall will be constructed along the right bank of the Tramore River. Construction of a new parapet wall over the R581 bridge is also proposed. Construction of underground surface water pumping station. The river is tidal at this location. There will be no direct impacts on the river itself and no significant changes in the ecological functioning of the river. No significant impacts on water quality are predicted to occur. The long-term impact is predicted to be negligible.</p>

Aquatic Habitat	Ecological value (NRA guidelines)	Predicted Impact
Ballybrack Stream Depositing Lowland River FW1	Local Importance (higher value)	<p>A number of measures are proposed for a section of the Ballybrack Stream. The proposed works include the following:</p> <ul style="list-style-type: none"> • Widening and deepening of the Ballybrack Stream channel in the southern half of the Douglas Community Park and local regrading in the northern half. • Upstream of the community park channel at various locations, widening will be carried out to increase the width of the channel. • New flood defence wall will be constructed at various locations. The total length of river affected will be approximately 200m. • Existing culvert to be replaced at Church Road. • Three small pedestrian/cycle bridges will be removed (ICA Bridge, Church Road cycle track bridge and Ballybrack Woods cycle track bridge) and the Lower Ravensdale Bridge will be replaced with a wider bridge. • A larger trash screen will be installed in Ballybrack Woods. The coarse screen in Ballybrack Woods will consist of galvanised steel posts and will be designed with a bar spacing of 0.3m. <p>During works, there will be mobilisation of silt, which can be limited but not prevented by mitigation, and there will be a net loss of habitat for invertebrates and fish during the in-stream works period. This is considered a moderate, short term impact.</p> <p>Downstream of the works area there is a culvert followed by a tidal section of the Tramore River.</p> <p>The habitats and species found within tidal rivers are adapted to fluctuating silt levels and impacts on such habitats are likely to be minor in the short term. The long-term impact will be negligible.</p> <p>In the longer-term modification of the existing channel, via deepening and widening will affect a mixture of modified and natural river channel which supports macroinvertebrate populations as well as a population of Brown Trout and European Eel. Widening of the channel can potentially result in a shallower river which lacks sufficient depth and holding pools for adult fish and which can heat up excessively during hot weather. The provision of a low flow channel and a natural channel structure will minimise such impacts. The removal of sections of concrete base and replacement with gravel will improve habitat quality for macroinvertebrate populations and fish and thus provides a net beneficial impact. The replacement of a culvert and provision of a bigger trash screen are not predicted to create any new impediments to fish movements. The loss of riparian vegetation and provision of new walls will have a detrimental impact on aquatic ecology. Riparian trees provide shade, insects from trees and leaf litter provides sources of nutrients and undercut roots provide refuges for fish. Overall it is</p>

Aquatic Habitat	Ecological value (NRA guidelines)	Predicted Impact
		<p>predicted that there may be changes in population dynamics and population size of fish populations within the affected areas, but these areas will continue to support fish populations and there will an ecological benefit in terms of more natural substrate in certain areas. The loss of riparian habitat will be a permanent negative impact. It is concluded therefore that the long-term impact will be minor.</p>
<p>Grange Stream Depositing Lowland River FW1</p>	<p>Local Importance (Lower value)</p>	<p>Permanent removal of one trash screen and replacement of a second trash screen is proposed. The existing channel to be regraded to remove sedimentation. Channel banks will be reinforced with rock armour as required. Culverting will be replaced.</p> <p>The loss of riparian vegetation will have a detrimental impact on aquatic ecology. Riparian trees provide shade, insects from trees and leaf litter provides sources of nutrients. In the longer term, modification of the existing channel, via regrading works will affect a mixture of modified and natural river channel which supports macroinvertebrate populations. In-stream works have the potential to generate high levels of silt.</p> <p>Overall the habitat to be affected is not of high value from an ecological viewpoint due to the limited size of the stream. The impact from works is predicted to be minor in the short term and negligible in the long-term.</p>

6.6.3 Predicted impact from invasive species

In the absence of development, the infestation of Japanese Knotweed will continue to spread due to lateral rhizome growth and from dispersal of plant fragments downstream. Works could potentially accelerate that process if fragments of the plant are fragmented and dispersed during site works. This could occur via transport of root fragments outside of the immediate growing area from the movement of vehicles or due to root fragments being dislodged and washed downstream during works.

The preferred treatment method for Japanese Knotweed is to treat an infestation in situ as this minimises the risk of spreading the plant. This process has already commenced with two treatments in 2015 and two treatments planned for 2017. Surveys in 2016 and 2017 indicate that the initial treatments did not kill off this species where it occurs, with some regrowth noted. However, further treatments would be expected to significantly reduce the vigour of this species and may be sufficient to eradicate it from the works area before works commence. However, there remains the potential for this species to spread in the absence of effective mitigation.

6.6.4 Otters

A survey by Dixon.Brosnan in 2016 did not record the presence of otter within a radius of 150m from the works area. Although periodic usage of the works area is likely to occur, it is unlikely that the works areas will provide critical resources for this species during the construction period. During construction works there will be increased noise and activity associated with the site works.

It is noted that otters are largely nocturnal, particularly in areas subject to high levels of disturbance. Otters can habituate to high background levels of noise and disturbance as evidenced by the presence of otters in the centre of Cork City.

As a worst-case scenario, the works could cause some temporary disturbance/displacement of otter from a given section of watercourse. Whilst this could potentially disrupt feeding patterns, given the short-term nature of the disturbance, the often-nocturnal habits of otter and the ability of otter to move away from disturbance the long-term impact on the feeding behaviour of this species is predicted to be negligible.

The use of the walkways and parks by people and dogs along with the lack of cover makes large sections of the works area unsuitable for otter breeding or resting areas and no such areas were detected within the study area. Overall therefore the impact of the proposed route on breeding otters is predicted to be negligible.

With respect to feeding, there may be short-term impacts on water quality which could impact on prey availability. High silt levels could cause temporary changes in otter movement through the catchment. In the short-term the sections of watercourses to be affected will form only part of the territory of otters within the catchment and other feeding resources will be available.

Whilst there will be some changes to channel structure the specified mitigation measures, including the provision of dry water channels and natural substrate, will minimise longer term impacts on fish stocks. Thus there is expected to be a short-term, minor impact on otter feeding within the study area during site works.

With regard to commuting patterns, a 2013 report (Atkins/Cork County Council, 2013) notes that signs of otter were recorded at nine locations along the Ballybrack Stream during a survey by the Irish Wildlife Trust. Using genetic evidence, it was concluded that six otters use the Ballybrack Stream. The report notes that it appears that otters can use the culverted structures through Douglas (north of Church Road) and that Douglas Village does not prevent Otters from the Ballybrack Stream entering the estuary. If otters cannot access the estuary during the works there could be a detrimental impact on otter populations. Therefore, it is important that the site works do not create obstacles to the free movement of otters between the Ballybrack Stream and the estuary.

Based on the above the impact on otter populations is predicted to be minor in the short term and negligible in the long-term.

6.6.5 Bats

Bat surveys did detect usage of the proposed development area by Common Pipistrelle, Soprano Pipistrelle and to a lesser extent by Leisler's Bat. Daubentons Bat have also been recorded within Ballybrack Wood. There will be a net loss of feeding habitat including treelines, grassland and woodland. There is no evidence that the treelines to be affected provide significant connective routes within the landscape and following completion of works the watercourse sections will remain as linear features. Due to the presence of significant culverting along the Tramore River there has already been considerable interruption of this linear feature as a potential commuting route for bats. Recreation of a natural river structure and substrate along the Ballybrack Stream is expected to allow aquatic macroinvertebrate populations, on which bats may feed, to recover to pre-existing levels. No evidence of breeding bats was recorded from trees to be removed by emergence surveys. Overall the impact will be localised and is unlikely to significantly impact on overall bat populations as there will be no loss of critical resources for bats. However, there will be a long-term permanent impact due to the loss of natural habitat which provides feeding areas for bats. Based on the above the short-term and long-term impact on bats is predicted to be minor.

6.6.6 Impacts on birds

The terrestrial bird species recorded during bird surveys are typical inhabitants of the types of habitat noted within the works area and are generally common. There will be a net loss of semi-natural habitats within the proposed development area (woodland, treeline and grassland) and this loss will have a localised impact on nesting and feeding resources for these species. Overall, the loss of habitat for breeding and feeding birds within the development site is considered a permanent minor impact. Some disturbance/displacement of terrestrial birds may occur during construction due to increased noise and disturbance. This is considered a minor, short-term impact.

High turbidity levels during construction or accidental hydrocarbon spills may impact on feeding success for aquatic birds such as Grey Heron, Dipper and Little Egret within and downstream of the works area. However relatively small sections of the overall catchment will be affected and there will be other feeding resources available for these species during the construction period. The impact during construction is therefore predicted to be short-term and minor. In the longer-term changes in the channel structure may lead to changes in population structures for fish and macroinvertebrates and it will take time before stable ecological conditions occur in areas where in-stream works have occurred. Thus there may be medium-term impacts on prey availability for predatory species. However this is unlikely to be of sufficient severity to significantly impact on populations of birds within the overall catchment. The impact is predicted to be minor in the short-term (0-2 years) and minor to negligible in the long-term.

6.6.7 Impacts on other fauna

Mammal species which are protected under the Irish Wildlife Act 1976, as amended, such as Pygmy Shrew, Red Squirrel, Hedgehog and Stoat could

potentially occur within the proposed works area, although no signs of these species were recorded. No habitats suitable for amphibians or reptiles will be affected by the proposed works. No uncommon invertebrate species are predicted to occur. Aquatic macroinvertebrates will re-colonise areas of stream substrate. Given that small areas of relatively common habitat will be affected, any impact on these species will be short-term and minor to negligible.

6.6.8 Impacts on designated sites

Two pNHAs are hydrologically connected to the works namely Douglas River Estuary (0.5km away) and Dunkettle Shore (4km away). Air emissions will be negligible and no significant impacts on water quality are predicted to occur. In this context and in the context of the robust nature of estuarine habitats and the dilution provided in the estuarine environment, the impacts on these sites is predicted to be minor in the short-term and negligible in the long term.

The Cork Harbour SPA and Great Island Channel SAC are located 0.4km and 6.9km respectively from the proposed works area. Impacts on Natura 2000 sites are specifically addressed in **Appendix 6.5** (Information report provided for AA Screening). The authors of this report have concluded that it is possible to rule out likely significant impacts on all Natura 2000 sites and in addition that the proposed development will not have a significant impact on qualifying interests and conservation objectives for Natura 2000 sites, and that the integrity of these sites will not be adversely affected. No significant direct, indirect or cumulative impacts on Natura 2000 sites have been identified. It is the opinion of the authors of this report that it is not necessary to undertake any further stage of the Appropriate Assessment process.

6.6.9 Climate change and biodiversity

The EU Commission guidance document on integrating climate change and biodiversity into environmental impact assessment (EU Commission, 2013) aims to improve the way in which climate change and biodiversity are integrated into Environmental Impact Assessment. Key principles specified by the document when considering impacts include the following:

- Consider climate change at the outset
- Analyse the evolving environmental baseline trends
- Take an integrated approach
- Seek to avoid biodiversity and climate change effects from the start
- For biodiversity, EIA should focus on ensuring 'no net-loss'
- Assess alternatives that make a difference in terms of climate change and biodiversity
- Use ecosystem-based approaches and green infrastructure as part of the project design and/or mitigation measures.

- Assess climate change and biodiversity synergies and cumulative effects which can be significant

No significant interactions between the impacts on biodiversity resulting from this development and climate change have been identified.

In relation to biodiversity, it is important to adopt an “ecosystem approach which considers all of the different ecological elements and how they interact with each other. Watercourses are important as linear connective elements within the wider landscape and the works will not significantly impact on this ecological function. Sympathetic landscaping using native species will minimise the loss of trees and terrestrial habitat.

6.6.10 Cumulative impacts

Cumulative impacts on fauna chiefly relate to increased noise and activity levels and the possibility of impacts on water quality. Impacts could also arise in relation to movement of fish through the catchment.

The watercourses are situated within urban/suburban areas and subject to existing pressures. These include water quality issues, barriers to migration and elevated levels of background noise. There are no known substantive developments which are likely to lead to cumulative impacts. If large scale construction projects were proposed they will incorporate appropriate mitigation to minimise cumulative impacts.

Increases in noise/disturbance is likely to be most pronounced during construction. This is a short-term impact which will be localised. The works will take place in the context of suburban areas with relatively high levels of background noise to which fauna to a degree will be habituated. In this context no significant cumulative noise and disturbance impacts are predicted.

A range of mitigation measures will be implemented as standard during construction. There will be temporary impacts on water quality however no long-term impacts related to construction are predicted and no significant cumulative impacts have been identified.

Post construction the works could theoretically impact on fish movement within the catchment particularly as there are large culverts in place. However, no additional barriers to migration are predicted with respect to fish movement. The removal of trash screens in the Grange Stream may have a net beneficial impact. Thus, culverting will not result in significant changes to the existing situation or have a cumulative impact.

6.7 Mitigation Measures

The likely success of the proposed mitigation measures is high, either in their current form or as they will be adapted on-site to achieve the desired result. The mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage. It is clear in what the mitigation measures are designed to achieve in lowering or reducing the risk of

impact to acceptable levels. Whilst the proposed methods of mitigation may be amended and supplemented the risk that the mitigation measures will not function effectively in preventing significant ecological impacts is low.

6.7.1 Construction Phase Mitigation Measures

Chapter 4 Construction Activities details the construction methodology for the proposed development and the associated environmental controls to minimise construction impacts. This will be developed further prior to construction into a detailed Construction and Environmental Management Plan (CEMP) by the appointed Contractor.

6.7.1.1 Mitigation – Protection of habitats

To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any trees earmarked for retention will be securely fenced early in the construction phase. A tree survey has been carried out for the site which specifies which trees should be retained where it is feasible to do so (See **Appendix 6.4**). All of the trees which can be retained will be clearly marked with hazard tape and the contractor should be made aware of the necessity of protecting the root structure from machinery damage.

Inadvertent damage to river banks on the margins of the works area or damage to vegetation can destabilise river banks and result in long term erosion and siltation. It is important therefore that the works area is adequately fenced and that works are confined to the works area. Access routes will also be clearly defined.

6.7.1.2 Mitigation - Invasive species

Stands of Japanese Knotweed were located within the proposed works area in proximity to the Ballybrack Stream within and upstream of the Douglas Community Park.

This area was sprayed twice during 2015 as part of a treatment programme. Observations in October 2016 indicate that regrowth has occurred but is less vigorous. The treatment programme will be continued via two treatments in 2017. This will be carried out by a suitably qualified contractor and in line with the provisions of the relevant guidelines.

It is noted that it is not possible to accurately predict the success of the spraying programme in advance. Whilst the spraying programme will result in considerable die off of the plant it may not be entirely eradicated. The root can stay dormant in the soil for long periods and when exposed to light, air and water can start to regrow.

Therefore, the entire works area will be resurveyed immediately prior to the commencement of works. The mitigation measures outlined below can then be incorporated into a specific invasive species management plan based on the most up to date information prior to the commencement of treatment. Further details on the management of non-native invasive species are also provided in **Appendix 4.1** of this EIS.

The management plan will make reference to and use of relevant guidelines including Best Practice Management Guidelines – Invasive Species Ireland

(Maguire et al. 2008), NRA (2010), Best Practice Management Guidelines Japanese knotweed *Fallopia japonica* (2008) prepared for NIEA and NPWS as part of Invasive Species Ireland. Appropriate methods are also outlined in Irish Water guidelines (Irish Water Report Information and Guidance Document on Japanese Knotweed Asset Strategy and Sustainability).

The management plan will take account of a range of factors including the timeframe in which the work needs to be completed, structural or environmental/ecological features (e.g. watercourses, treelines nesting birds), designated sites, availability of storage areas for contaminated spoil on or off site, access issues and agreement with landowners, seasonal restrictions to work and financial constraints.

To minimise risks in the longer term, a monitoring programme will be put in place for three years following the completion of site works. Where Japanese Knotweed re-emerges within the works area an in-situ herbicide treatment programme will be implemented.

Whilst the exact detail to be provided in the management plan can only be specified following repeat surveys prior to construction, the following information/measures will be provided in the management plan:

- Any areas of Japanese Knotweed identified by the survey prior to construction will be marked to within 7m of each individual stand or plant using hazard tape.
- It is imperative that Japanese Knotweed does not damage flood defences in the future and a root barrier should be put in place for all site works along the Ballybrack Stream.
- A supervising ecologist will be present on site, during any works within 7m of a Japanese Knotweed plant to identify pieces of Japanese Knotweed fragments and to determine the volume of spoil to be removed if this is required.
- Fine nets/silt curtains will be specifically employed downstream of works within areas contaminated with Japanese Knotweed. The purpose of the curtains to catch fragments of Japanese Knotweed dislodged by the site works.

The supervising ecologist will regularly inspect the nets, remove fragments where possible or determine when the nets should be replaced.

- Methods for treatment of Japanese Knotweed and treatment of contaminated spoil will be specified if required. It is noted that some treatment methods may require an offsite area where Japanese Knotweed can be buried and or banded. Site selection must take into account environmental/ecological sensitivities and site appropriate mitigation measures will be specified in the management plan. Possible treatment options, if required, include the following:
 - Herbicide treatment;
 - Combined treatment methods;
 - Excavation and Burial;
 - Excavation and Bund Method;
 - Excavation and Root Barrier Cell Method;
 - Removal of contaminated soil to landfill.

- It is noted that if Japanese Knotweed has been treated with a persistent herbicide, the excavated material may be classified as hazardous waste and may need a Waste Permit if it is removed off site. Furthermore, if Japanese knotweed contaminated material is removed off site it will require a licence from the National Parks and Wildlife Service in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477).
- Appropriate site hygiene protocols will be deployed throughout the process. This will include the following:
 - Only vehicles required for the works within the contaminated works area should be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area should be kept a minimum
 - A specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. They should also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery.
 - This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Japanese Knotweed.
 - Ideally works including site investigation works should be undertaken in dry weather to minimise the potential for dispersal of fragments of invasive species.
 - The areas where contaminated soil is to be stockpiled will be clearly marked out on site. Unauthorised access to these areas will be prevented.
 - Any trucks used to transport contaminated spoil offsite must be sealed so that no fragments of material can escape on route. Vehicles leaving the site will be inspected for any plant material and washed down into a contained wash down area.
- To prevent Japanese Knotweed from outside the site being inadvertently being brought in to the site, the contractor will inspect vehicles before usage on site. Particular attention is required for vehicles with caterpillar tracks. The supplier of fill will be required to provide a guarantee that imported material does not contain Japanese Knotweed. In addition, the fill will be inspected for signs of knotweed, prior to importation to site. The UK Environmental Agency's publication *Managing Japanese knotweed on development sites - The Knotweed Code of Practice* (EA 2013), states that inspection of topsoil brought into the site, should be carried out using the guidance in Appendix I-IV of the code BS 3882:2007 '*The British Standard Specification for topsoil and requirements for use*'. This Standard was replaced subsequently by BS3882:2015 *Specification for Topsoil*. The inspection of fill will be carried out according to this Standard.

6.7.1.3 Protection of water quality

The employment of good construction management practices will minimise the risk of pollution of soil, storm water run-off, seawater or groundwater. The Construction

Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors (Masters-Williams et al 2001)*. Additional guidance is provided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects (Murnane et al 2006)*.

Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:

- Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures,
- Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded.
- Vehicles will not be left unattended during refuelling.
- All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site.
- Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together.
- Adequately size spill kits will be provided.
- Collection systems will be used to prevent any contaminated drainage entering surface and groundwater.
- Silt curtains will be installed within the works area during in-stream works. These silt curtains must be effectively installed and must be monitored and maintained during works to ensure they are operating effectively.
- Ensure that all staff are trained and follow vehicle cleaning procedures. Wash down from machinery and in particular concrete trucks must be prevented from entering watercourses. Wash-down should take place well away from the river or in the site compound area provided a sedimentation area is provided.
- Construction works, especially works that involve the pouring of concrete must be conducted under dry conditions.
- Any stripping of areas of topsoil is to be avoided unless absolutely necessary and if unavoidable, the areas concerned are to be kept to a minimum.
- Where temporary stockpiling of topsoil or riverbed material is required, the material should be stockpiled in areas which are not liable to flood and where the risk to water quality is minimised. Geotextile should be used to cover stockpiles to prevent erosion.
- Weather forecasts will be checked daily to allow appropriate measures to be taken to mitigate against any negative impact resulting from heavy rainfall.
- Works will be carried out in line with the specifications of detailed method statements.

- The works will be supervised by a suitably qualified ecologist who will ensure that adequate mitigation is being implemented and who can advise on changes to same where required.

6.7.1.4 Protection of air

Construction activities have the potential to generate dust emissions, which can impact on vegetation. A dust minimisation plan will be prepared and implemented by the building contractor during the construction phase of the project.

6.7.1.5 Waste Management

A construction and demolition waste management plan will be developed and maintained by the main contractor prior to construction works commencing on site. The Plan will meet the requirements of the DoEHLG *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects*.

Any hazardous waste will be stored in leak-proof container(s) to prevent contamination.

6.7.1.6 Bird Mitigation Measures

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August.

Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation be removed outside of the breeding season.

NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

If works are required within the bird nesting season a survey for nesting birds including dipper, grey wagtail and in particular kingfisher should be carried out. Specific mitigation measures as specified by the supervising ecologist will be implemented where nests are discovered.

An existing dipper box will be removed by the proposed works. A replacement nest box will be provided in the finished development.

6.7.1.7 Otter Mitigation Measures

No otter signs or holts were noted within 150m of the proposed works. However, otters do occur along the watercourses impacted by the works. A detailed pre-construction survey will confirm the absence of otter holts within 150m of the proposed works area.

Any holts found to be present will be subject to monitoring and mitigation as set out in the NRA *Guidelines for the Treatment of Otter prior to the Construction of National Road Schemes (2006b)*. If found to be inactive, exclusion of holts may be

carried out during any season. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under licence. The prohibited working area associated with otter holts will be fenced and appropriate signage erected. Where breeding females and cubs are present no evacuation procedures of any kind will be undertaken until after the otters have left the holt, as determined by a specialist ecologist. Breeding may take place at any season, so activity at a holt must be adjudged on a case by case basis. The exclusion process, if required, involves the installation of one-way gates on the entrances to the holt and a monitoring period of 21 days to ensure the otters have left the holt prior to removal.

As there is evidence that otters move between the Ballybrack Stream and the estuary the works must allow free passage of otters through the works area on the Ballybrack Stream in Douglas. This should be implemented under ecological supervision.

Following completion there must be no impediments to the movement of otters through the affected area on the Ballybrack Stream.

6.7.1.8 Bat Mitigation Measures

Removal of mature trees will be kept to a minimum. Prior to felling mature trees will be checked for bats by the supervising bat expert to ensure impacts on same are minimised.

Trees will be removed where possible during the September/October period. Any ivy covered trees will be left to lie on the ground for 24 hours after cutting to allow any bats to escape.

Excess lighting can impact on bat feeding behaviour. Ideally lights shouldn't be used from dusk to dawn; if lighting is required it should be kept to the minimum necessary and will focus away from adjoining habitats such as treelines which may be used by feeding bats. Following completion of works any new lighting in proximity to watercourses should be cowled and faced away from the water.

It is noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

There will be replacement planting of trees along sections of the scheme where there is the capacity. Along the Ballybrack Stream, replanting will take place in Douglas Community Park and between the ICA Hall and the Church Road culvert. Replacement planting of trees along will help to maintain thus watercourse as a linear feature which can be used by commuting and feeding bats.

As a mitigation/enhancement measure, four bat boxes will be installed under the guidance of the supervising ecologist.

6.7.1.9 Fish Mitigation Measures

The works will incorporate the relevant elements of the guidelines outlined below:

- Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin.
- IFI (2016) *Guidelines on protection of fisheries during construction Works in and adjacent to waters* (IFI, 2016)
- Inland fisheries Ireland Biosecurity Protocol for Field Survey Work. (2011)

Mitigation will include the following:

- Detailed method statements will be prepared by the contractor in consultation with the supervising ecologist.
- Stone slabs (circa 600mm square x 100mm deep) will be tightly packed to form the base of concrete u-channels in the Ballybrack Stream. This will provide a mixed substrate and will diversify flow patterns in areas where gravel would be scoured out by flood events.
- A low flow channel will be established in the area to be widened and deepened within the Ballybrack Stream. This prevents the river from becoming too shallow during periods of low flow.
- A natural substrate will be provided within any sections of watercourses impacted by in-stream works where it is feasible to do so. Re-use of the original gravels from the affected watercourse, which can be stored for reuse, is preferred. In any event the gravel used should be similar in size and chemical composition. Large rocks will be incorporated into the river bed to create greater heterogeneity within the channel.
- To maintain the gradient and prevent excessive scouring of the river bed the invert of the proposed culvert at Church Road will be buried between 300mm and 500mm in depth. Large rocks will be incorporated into scour protection at the upstream face of the Church Road culvert and concrete u-channels.
- Rock armour will be placed in front of gabions in the lower section of the Douglas Community Park. Varying the line of rock armour will provide staggered deflectors within the channel. Rock armour will also be utilised upstream of the Donnybrook Commercial Centre.
- In-stream works will be carried out in the period from May to September (inclusive). This restriction does not apply to tidal waters on the Tramore River.
- The new trash screen in woodland upstream of Douglas will allow fish movement.
- An electrofishing salvage operation to remove fish from areas affected by direct works will be carried out under section 14 licence as issued by the Department of Communications, Energy and Natural Resources. Fish will be removed to suitable habitat within the same watercourse/catchment. After the

works are complete natural re-colonisation of recreated habitat is predicted to occur.

- In-stream works and fish salvage operation will follow the Inland fisheries Ireland Biosecurity Protocol for Field Survey Work (2011) to ensure no negative impacts are caused to other watercourses.
- Appropriately sized screens will be used where pumps are utilised.

6.7.2 Mitigation - during operation

As detailed in Chapter 7 *Landscape and Visual* a mixture of trees will be used in the final planting scheme. The planting scheme will incorporate a high proportion of native trees. The landscape scheme should replant a similar number of trees with respect to the number of trees removed.

These will be derived from local native-origin stocks where possible. This will ensure that local biodiversity is maintained and enhanced where possible thus minimising impacts on local ecology. In particular trees planted along watercourses provide shade, stabilise riverbanks, provide food for fish and increase their value as commuting routes for bats.

Along river banks where reseeded grassland is required, a species rich grassland mix which incorporates native species of grass and/or wild flowers should be utilised.

6.8 Residual Impacts

There will be removal of an area of habitat including treelines, grassland, woodland and parkland to accommodate the flood scheme works. The impact is considered to be a long term negligible to minor impact. The loss of habitat is predicted to have a long-term minor negative impact on bats. Impacts on other mammal species including otters and birds will be minor negative in the short-term and negligible to minor in the long-term. Impacts on aquatic habitats range from negligible to moderate in the short term depending on location and range from negligible to minor in the long-term. There will be some long-term minor positive ecological impacts on aquatic habitats due to the removal of concrete sections of riverbed and subsequent replacement with a gravel substrate. The impact on designated sites is predicted to be negligible. No significant cumulative impacts have been identified.

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