

Greater Dublin Drainage

Alternative Sites Assessment - Phase Two Sites Assessment and Route Selection Report

Ecology

May 2012

5 Ecology

5.1 Introduction

This Alternative Sites Assessment – Phase Two Report examines the ecology in relation to the Greater Dublin Drainage project. This report examines the ecology surrounding: the nine land parcels for the proposed Regional WWTP in North County Dublin; the two proposed marine outfall locations for the treated effluent discharge to the Irish Sea, including the route of the outfall pipeline connection to the WWTP; and the routes of the Orbital Drainage System connecting existing drainage networks to the proposed Regional WWTP.

5.2 Methodology

5.2.1 Desktop Study

(a) Terrestrial Ecology

A comprehensive review of GIS digital datasets and existing data sources was undertaken as part of the terrestrial ecology desktop study. Datasets listed in Table 5.1 were inspected.

Table 5.1: GIS datasets used for desktop assessment

6 inch raster mapping
Aerial Photography
1:50,000 Discovery Mapping
Annex I Habitat
Tree Preservation Order
SPA
SAC
pNHA
NHA
Designated Shellfish Waters
Fingal Development Plan Ecological Corridors
Fingal Development Plan Ecological Buffer Zones
Fingal Development Plan Nature Development Areas
Fingal County Council habitat layers
Woodland
EPA Water Framework Directive Watercourse Register

The Fingal Development Plan 2011-2017 has identified areas of ecological value within the Plan area and set Plan Objectives to protect these features. They are categorised as Core Biodiversity Conservation Areas; Ecological Buffer Areas; Nature Development Areas; and Ecological Corridors. Table 5.2 lists Plan Objectives for each.

Table 5.2: Biodiversity Objectives of the Fingal Development Plan

Biodiversity Feature	Plan Objectives	
Core Biodiversity Conservation Areas	BD12	Strictly protect areas designated or proposed to be designated as Natura 2000 sites (also known as European sites) including any areas that may be proposed for designation or designated during the period of this Plan. These include Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive and Special Protection Areas (SPAs) designated pursuant to the Birds Directive, a number of which have also been designated under the Ramsar Convention.
	BD13	Ensure Appropriate Assessment Screening and, where required, full Appropriate Assessment Is carried out for any plan or project which, individually, or in combination with other plans and projects, is likely to have a significant direct or indirect impact on any Natura 2000 site or sites.
	BD14	Ensure planning applications for proposed developments likely to have significant direct or indirect impacts on any Natura 2000 site or sites are accompanied by a Natura Impact Statement prepared in accordance with the Guidance issued by the Department of the Environment, Heritage and Local Government
	BD15	Protect the ecological integrity of proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I habitats.
	BD16	Ensure that development does not have a significant adverse impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Annex I habitats, and on rare and threatened species including those protected by law and their habitats.
	BD17	Ensure ecological impact assessment is carried out for any proposed development likely to have a significant impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Annex I habitats, or rare and threatened species including those species protected by law and their habitats. Ensure appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment.
	BD18	Ensure that proposals for developments involving works to upstanding archaeological sites and features or works to the historic building stock include an assessment of the presence of bats in any such sites or structures and, where appropriate, ensure that suitable avoidance and/or mitigation measures are proposed to protect bats in consultation with the National Parks and Wildlife Service.
Ecological Buffer Zones	BD19	Protect the functions of the ecological buffer zones and ensure proposals for development have no significant adverse impact on the habitats and species of interest located therein.
Nature Development Areas	BD20	Maintain and/or enhance the biodiversity of the nature development areas indicated on the Green Infrastructure maps in the County Plan.

Biodiversity Feature	Plan Objectives	
Ecological Corridors and Stepping Stones including trees and hedgerows	BD21	Protect the ecological functions and integrity of the corridors indicated on the Development Plan Green Infrastructure maps.
	BD22	Protect rivers, streams and other watercourses and maintain them in an open state capable of providing suitable habitat for fauna and flora, including fish.
	BD23	Ensure that no development, including clearance and storage of materials, takes place within a minimum distance of 10m – 15m measured from each bank of any river, stream or watercourse in the County.
	BD24	Protect and enhance the ecological corridors along the following rivers in the County by ensuring that no development takes place, outside urban centres, within a minimum distance of 30m from each riverbank: Liffey, Tolka, Pinkeen, Mayne, Sluice, Ward, Broadmeadow, Ballyboghil, Corduff, Matt and Delvin (see Green Infrastructure maps).
	BD25	Require that development along rivers set aside land for pedestrian routes that could be linked to the broader area and any established settlements in their vicinity, subject to ecological impact assessment and Appropriate Assessment Screening as appropriate.
	BD26	Provide for public understanding of and public access to rivers, waterway corridors and wetlands, where feasible and appropriate, in partnership with the National Parks and Wildlife Service, Waterways Ireland and other relevant stakeholders, while maintaining them free from inappropriate development and subject to ecological impact assessment and Appropriate Assessment Screening as appropriate.
	BD27	Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character and ensure that proper provision is made for their protection and management.
	BD28	Consider the use of Tree Preservation Orders to protect important trees, groups of trees or woodlands.
	BD29	Identify and provide linkages along and between river and canal corridors within the Greater Dublin Area and adjoining regions to create interconnected routes and develop riverside parks and create linkages between them to form 'necklace' effect routes including development of walkways and cycleways.

A GIS environmental database was built up and inspected for each land parcel, marine outfall option and each route corridor. Pathways of effect along watercourses were also considered.

The Divisional Ecologist of National Parks and Wildlife Service and Vice-county recorders of Botanical Society of the British Isles were consulted by letter. At the time of preparing this draft report (Dec 2011), no response had been received.

(b) Freshwater Ecology

The freshwater ecological assessment included a comprehensive review of existing data sources on the watercourses within and adjacent to the land parcels and each route corridor. Datasets listed in Table 5.3 were inspected.

Table 5.3: Data sources used for freshwater ecology desktop assessment

EPA Biological Water Quality Monitoring Data
Water Framework Directive (WFD) Ecological Status of Catchments Data
Biodiversity Ireland Data on Protected Species
National Parks and Wildlife Service Data
Inland Fisheries Ireland

Consultation was undertaken with Inland Fisheries Ireland regarding the present fisheries status of the watercourses / catchments relevant to the land parcels and route corridors. This included the identification of those watercourses / catchments which support salmon or trout populations (salmonids), or both.

(c) Marine Ecology

The marine ecological assessment of the proposed marine outfall locations was carried out using existing literature for this section of the Irish Sea and the Fingal coastline.

Key literature sources were as follows:

- Coastal Habitats: Ecological Study of the Coastal Habitats in County Fingal Phase IV: Intertidal Habitats (Ecoserve, 2005).
- Fishing Ground and Fish Species: Fisheries Study of Fingal Coastal Zone (Ecoserve, 2006), Ecological Study of the Coastal Habitats in County Fingal Phase III – Estuarine Fish (Central Fisheries Board 2004) and Commercial Fishing Assessment (Brown and May Marine Ltd, 2008) along with information provided in submissions and by Irish East Coast Fisheries Board.
- Marine Ecology: Intertidal and Subtidal Benthic Studies in Broadmeadow Estuary (Aquafact, 2008), Environmental Baseline Survey of the Eirgrid Interconnector (Fugro Survey Limited 2008).
- Geomorphology: Infomar bathymetric and habitat datasets (GSI), Regional habitat classification maps for the Irish Sea (JNCC, UK) and Admiralty chart data for the Fingal Coastline.

(d) Avian Ecology

This ecological assessment included a comprehensive review of the birds of Fingal, which involved the examination of aerial photography and GIS mapping of known sites of importance to birds, including *inter alia* Special Protection Areas (SPAs), Irish Wetland Bird Survey (IWeBS) count areas, Natural Heritage Areas (NHAs) and Statutory Nature Reserves.

Key literature sources used in the desktop review included Gibbons *et. al.* (1993); Crowe (2005); and the National Parks and Wildlife Service website: www.npws.ie. Local ornithologists were also consulted as part of the data collection exercise.

5.2.2 Site Visits

A windshield survey of the nine land parcels and pipeline route corridors was undertaken between November 3rd to 12th, 2011. The survey was restricted to publicly

accessible lands and roadways, which limited the ground-truthing of the desktop datasets and aerial photography.

5.2.3 Five Categories of Impact

The land parcels and sites, pipeline route corridors and marine outfalls were assessed to identify ecological constraints. Five categories of impact were used to categorise any ecological impacts identified for the land parcels and sites, and the marine outfalls. These were:

- (i) Profoundly negative;
- (ii) Significantly negative;
- (iii) Moderately negative;
- (iv) Slightly negative; and
- (v) Imperceptible.

The defining characteristics of the five categories for each ecological constraint identified is attached in Appendix A.

5.3 Existing Environment

5.3.1 General Landscape

The study area is large (over 800km²), covering more than one Local Authority Area and comprises the urban fabric of northern and western suburbs of Greater Dublin, generally low-lying productive agricultural and arable farmland and approximately 88km of coastline. This corresponds to four of the Landscape Character Types listed in the Fingal Development Plan 2011-2017, being low lying agricultural; high lying agricultural; rolling hills with tree belts; and coastal, as shown in Figure 5.1 below.

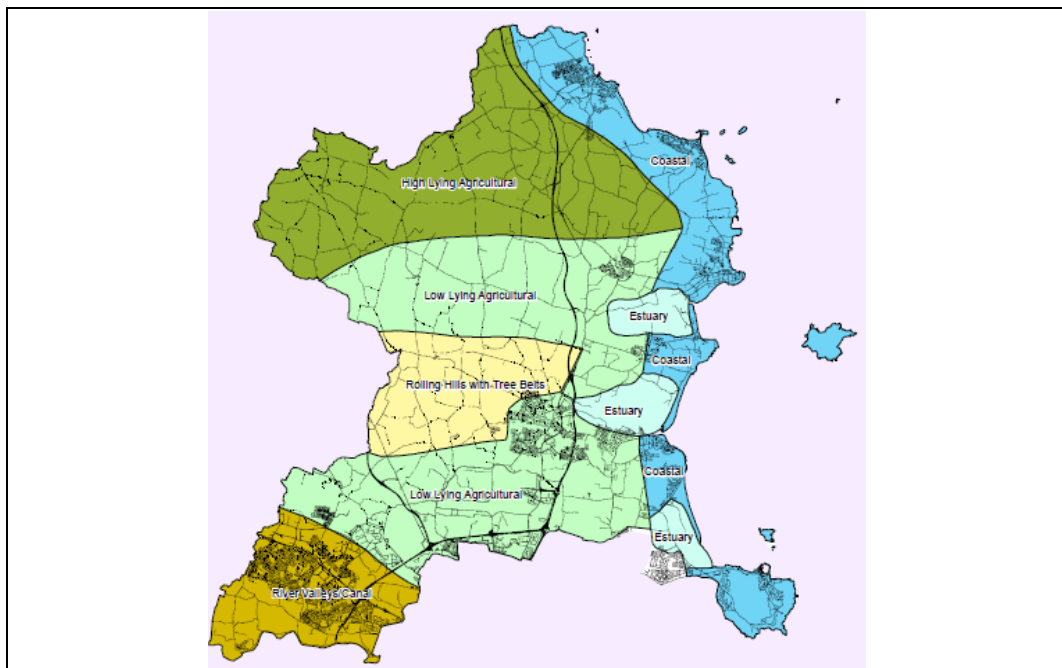


Figure 5.1 Landscape Character Types of the Fingal Development Plan 2011-2017

(a) **Designated Sites and Protected Areas**

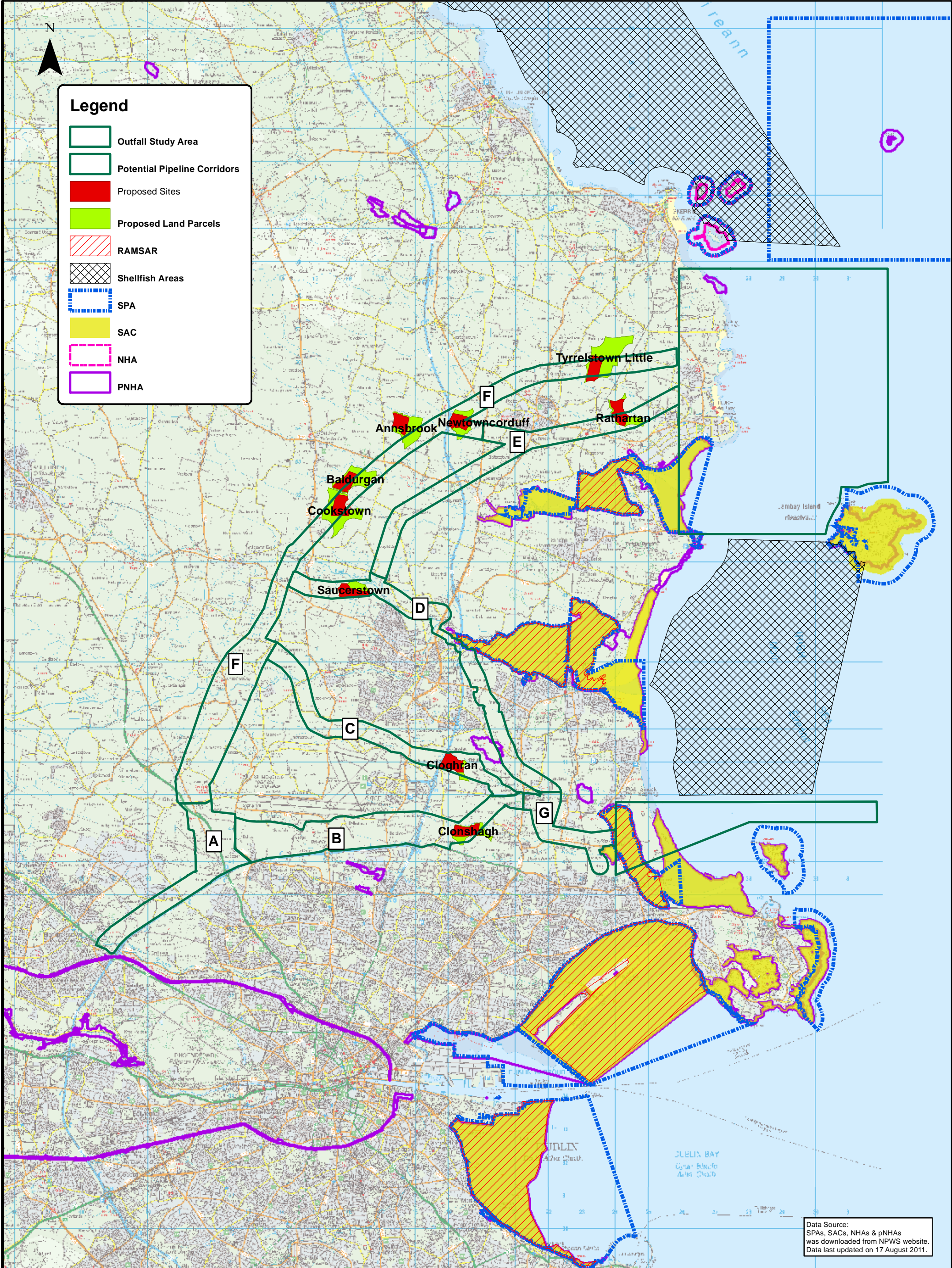
Ireland has designated sites and species of conservation value and/or concern in an effort to protect biodiversity. Designated conservation areas are areas containing habitats or species of national or international conservation importance.

The broad types of designation found within the study area to protect biodiversity are as follows:

SAC & SPA: Special Areas of Conservation (SAC) are designated under the EU Habitats Directive (92/43/EEC) and Special Protection Areas (SPA) under the EU Birds Directive (79/409/EEC). Natura 2000 is the European network comprising these two types of protected sites which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. As part of the designation, Member States are required to ensure that appropriate steps are taken to avoid the deterioration of habitats and species, as well as significant disturbance of the species.

Ramsar Site: Ramsar sites are wetlands of international importance designated under the Ramsar Convention on Wetlands (1971). Ramsar sites were originally intended to protect sites of importance for wildfowl habitat, but now this designation can be applied to a site which qualifies under any aspect of wetland conservation. The Convention recognises that wetlands are extremely important for biodiversity conservation in general and for the well-being of human communities.


NHA: Natural Heritage Areas (NHA) are designated under Wildlife Act 1976 (as amended) for the protection of flora, fauna, habitats and geological sites of national importance. NHAs are legally protected from damage from the date they are formally proposed (p) for designation. In many cases (p)NHAs have also been designated as Natura 2000 sites.

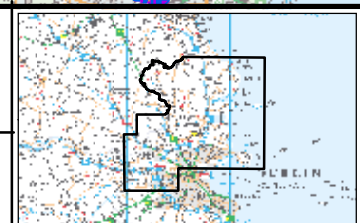


Data Source:
 SPAs, SACs, NHAs & pNHAs
 was downloaded from NPWS website.
 Data last updated on 17 August 2011.

Title
Figure 5.2 Designated Sites

Project
Specialist Ecology Services GDD

Client

 Comhairle Contae Fhine Gall
 Fingal County Council



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Issue Details	
Drawn By: BD	Project No. MDE1046
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5.3.2 Terrestrial Ecology

(a) Land Parcels and Sites

The short list of land parcels brought forward into Phase Two from the conclusions of the ASA Preliminary Screening Outcomes Report comprises nine land parcels. The process of short-listing a long list of sites is described in detail in that report and is not rehearsed here. Based on the methodology outline in Section 5.2, the terrestrial ecology characteristics and features of value for each site are now described. The habitat types ascribed have had limited ground-truthing, and are a prediction based on wind screen surveys along publicly accessible lands and roadways, and review and inspection of data available to the ecology team as described in Section 5.2. Figure 5.3 illustrates Ecological Buffer Areas; Nature Development Areas; and Ecological Corridors in the Fingal Authority Area, while Figures 5.4(a) and 5.4(b) illustrates habitats in the Fingal Authority Area. Within each land parcel a 20ha site, with access road, has been identified as illustrated in Figure 5.5

(i) Annsbrook

This land parcel is located primarily in the townland of Annsbrook approximately 2.5km north east of Ballyboghil. It has a total area of 62ha. The lands slope in a northwest / south-east direction with a central elevation of approximately 30.2mOD.

The parcel comprises portions of nineteen fields, most of which appear to be small arable or cultivated grasslands. Two fields on the north and western boundary of the site is the improved agricultural grassland habitat type. The parcel contains approximately 5.2km of hedgerow with trees. The parcel is bound to the north by the Rath Little Stream, which is also part of an ecological corridor identified in the Development Plan. The Grallagh Stream (a tributary of the Ballyboghil River) forms the parcel boundary along the south and west edge.

Arable grasslands, an abundance of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel. Mammal tracks were observed in this site by a member of the ecology team. The 2004 Dublin Landfill Siting Study reports a badger sett north on this parcel.

The parcel is located 4.1km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 20ha site has been selected as illustrated in Figure 5.5. This site has drawn back from both the Rath Little and Grallagh Stream corridors. The proposed access road does not cross, but flanks the Grallagh Stream for over 1km. The site and access route is estimated to result in the removal of 2.4km of hedgerow, or 46% of the total amount identified within the parcel.

(ii) Baldurgan

This land parcel is located primarily in the townland of Baldurgan approximately 1.6km south east of Ballyboghil with a total area of 57ha. The lands slope generally from west to east with a central elevation of 24.8mOD. It is immediately north of the Cookstown parcel, being separated only by the Donabate River. Again, Balheary Game Association signs were noted in proximity to this land parcel. The Ballyboghil River runs along its northern boundary and the Donabate River runs along its southern boundary.

The parcel comprises portions of seven fields, six of which appear to be large arable or cultivated grasslands. Only a small portion of the far eastern edge of the parcel is the improved agricultural grassland habitat type. These fields are largely unenclosed, and this large parcel contains only 300m of hedgerow with trees. A small amount of scrub occurs in a field margin of the southwest corner of the parcel. A larger portion of scrub occurs on the banks of the Ballyboghil River immediately north of the parcel. This watercourse forms part of an ecological corridor identified in the Development Plan.

Arable grasslands, scrub, a hedgerow network and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 5.3km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 21.6ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the river corridors bounding the parcel. The proposed access road crosses the Clonmethan stream (a tributary of the Ballyboghil River) and the Ballyboghil River, in quick succession. The site and access route is estimated to result in the removal of 0.1km of hedgerow, or one third of the total amount identified within the parcel.

(iii)

Cloghran

This land parcel is located primarily in the townland of Cloghran, approximately 2.2km east of Dublin Airport and 3.3km south of Swords with a total area of 32ha. The lands slope generally in a south-west / north-east direction with a central elevation of approximately 35.8mOD.

This land parcel is located in open agricultural land currently used for grazing cattle and horses. The parcel comprises portions of thirteen fields, all of which are improved agricultural grasslands. The parcel contains approximately 2.9km of well established hedgerows with trees and is bound to the north by the Sluice River, mapped as a depositing lowland river by FCC. This watercourse form part of an ecological corridor identified in the Development Plan.

Agricultural grasslands, a hedgerow network and an adjacent watercourse provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 4.3km upstream of Baldoyle Bay SPA and SAC with a potential pathway of effect available via the Sluice River (see Figure 5.2).

Within this parcel, a 25.9ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Sluice River corridor to the north. The site and access route is estimated to result in the removal of 2.3km of hedgerow, or almost 80% of the total amount identified within the parcel.

(iv)

Clonshagh

This land parcel is located primarily in the townland of Clonshagh, approximately 2.5km east of Dublin Airport and 1.3km north of Belcamp and Darndale and has a total area of

40ha. The lands slope in a west-east direction with a central elevation of approximately 42.3mOD.

This land parcel comprises portions of seven fields, three of which are improved agricultural grasslands. The remaining fields are arable or cultivated fields. The parcel contains approximately 2.1km of hedgerows with trees and is bound to the north by the Mayne River, mapped as a depositing lowland river by Fingal County Council (FCC). St Doolagh's Drain occurs in the eastern portion of the parcel also. These watercourses form part of an ecological corridor identified in the Development Plan.

Tilled earth, a hedgerow network and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 4.6km upstream of Baldoyle Bay Special Protection Area (SPA) and Special Area of Conservation (SAC) with a potential pathway of effect available via the Mayne River (see Figure 5.2).

Within this parcel, a 23.1ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Mayne River corridor to the north. The site and access route is estimated to result in the removal of 1.4km of hedgerow, or two thirds of the total amount identified within the parcel.

(v)

Cookstown

This land parcel is located primarily in the townland of Cookstown, approximately 2.5km south east of Ballyboghil with a total area of 80ha. The lands slope generally in a west / east direction with a central elevation of approximately 24.3mOD. Balheary game association signs were noted in proximity to this land parcel and a stud farm is situated on the western boundary.

The parcel comprises portions of eight fields, five of which appear to be large arable or cultivated fields. Three fields in the west are improved agricultural grasslands. The parcel contains approximately 2.3km of hedgerows with trees. The Donabate River forms the northern boundary of this parcel.

Agricultural and arable grasslands, a small portion of scrub, a hedgerow network and an adjacent watercourse provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 7.0km upstream of Malahide Estuary SPA and SAC with a potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 25.7ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Donabate River corridor to the north. The site and access route is estimated to result in the removal of 0.9km of hedgerow, or just under 40% of the total amount identified within the parcel.

(vi)

Newtowncorduff

This land parcel is located primarily in the townland of Newtowncorduff approximately 2.2km west of Lusk. This land parcel has a total area of 43ha. The lands slope generally in a north / south direction with a central elevation of 20.5mOD. It abuts the M1 motorway along part of its western flank.

The parcel comprises portions of eighteen fields, more than half of which are in arable or cultivated use. The remaining fields are agriculturally improved grasslands. It contains 4.3km of hedgerows. Watercourses run along its southwest (Rath Little Stream) and southeast (Ballough River) boundaries, at which point they converge and continue to the south. Both watercourses are part of an ecological corridor identified in the Development Plan.

The mixture of arable and tillage grasslands, an abundance of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 2.9km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 22.8ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Rath Little and Ballough River corridors to the southeast and southwest. The proposed access road crosses the Ballough River. The site and access route is estimated to result in the removal of 3.4km of hedgerow, or just under 80% of the total amount identified within the parcel.

(vii)

Rathartan

This land parcel is located primarily in the townland of Rathartan approximately 2.0km west of Rush and approximately 3.0km to the east of Lusk with a total area of 41ha. The lands slope in a north / south direction with a central elevation of approximately 18.7mOD.

The parcel comprises portions of nine fields, all of which are arable or cultivated with the exception of a portion of a long, thin field in the southwest of the parcel. 2.8km of hedgerow occurs within the parcel. The Lusk River follows the western parcel boundary for part of its length, and a portion of the eastern boundary is formed by the Palmerstown Stream.

The mixture of cultivated and tillage grasslands, hedgerows and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 1km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 25.1ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Lusk River corridor to the west. The proposed access road crosses the Lusk River. The site and access route is estimated to result in the removal of 2.5km of hedgerow, or just under 90% of the total amount identified within the parcel.

(viii)

Saucerstown

This land parcel is located primarily in the townland of Saucerstown, approximately 3.3km northwest of Swords with a total area of 36ha. The lands slope in a general south-west / north-east direction with a central elevation of approximately 16.9mOD.

This land parcel is located in open agricultural lands immediately south of the Broadmeadow River. This is a 5th Order river mapped as a depositing lowland river by

FCC. This watercourse forms part of an ecological corridor identified in the Development Plan. A school complex lies to south of the land parcel with Swords and Roganstown golf course situated to the northwest. Balheary game association signs were noted in proximity to this land parcel. The parcel comprises portions of four fields, all of which are tilled or cultivated grasslands. The parcel contains approximately 1.7km of hedgerows with trees. The Saucerstown Stream flows through this parcel. An area of scrub occurs in the north west of the parcel.

Agricultural and arable grasslands, a small portion of scrub, a hedgerow network and an adjacent watercourse provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 3.0km upstream of Malahide Estuary SPA and SAC with a potential pathway of effect available via the Broadmeadow River (see Figure 5.2).

Within this parcel, a 23.4ha site has been selected as illustrated in Figure 5.5. This site has drawn back from the Broadmeadow River corridor to the north, and indeed now does not cross the Saucerstown Stream which dissects the land parcel. The site abuts a tributary of the Saucerstown Stream, and the proposed access road crosses it. The site and access route is estimated to result in the removal of 1.4km of hedgerow, or just over 82% of the total amount identified within the parcel.

(ix)

Tyrrelstown Little

This land parcel is located in the townlands of Tyrrelstown Little, Tyrrelstown and Laytown, approximately 2.8km north east of Lusk and 3.6km north west of Rush with a total area of 104ha. The lands slope in a north / south direction with a central elevation of approximately 29.8mOD.

The parcel is the largest of the shortlisted parcels, comprising portions of twenty eight fields, and containing 8.5km of hedgerows with trees. All fields within this parcel are arable grassland or cultivated lands. This parcel is not bound by any watercourse, but the Rush Stream rises a short distance southeast of here, draining these lands. The Lusk River passes near to the southwest corner of the parcel.

The mixture of cultivated and tillage grasslands, abundance of hedgerows and adjacent watercourses provide good potential for occurrence of protected species, and notably badger, to occur within this parcel.

The parcel is located 2.2km upstream of Rogerstown Estuary SPA and SAC with a clear potential pathway of effect available through the local surface water network (see Figure 5.2).

Within this parcel, a 24.1ha site has been selected as illustrated in Figure 5.5. This site is located in the southwest of this large parcel. Neither the site or the proposed access road directly impacts upon a stream. The site and access route is estimated to result in the removal of 3.8km of hedgerow, or just over 44% of the total amount identified within the parcel.

(b)

Route Options

There are a range of options for the transfer pipelines (orbital sewers), as shown in Figure 4.14 of the ASA Preliminary Screening Outcomes Report. They have been split into seven (labelled A through to G) for comparative and description purposes.

(i) Route Section A

This corridor starts at the Tolka River where it meets the M50-N3 interchange (Junction 6) in Blanchardstown, and hugs the outer edge of the M50 for approximately 4km to the M50-N2 interchange (Junction 5). From here it moves north away from the motorway, and passes St. Margaret's to the west.

The corridor passes through open and enclosed farmland, waste ground and disturbed ground, scrubland and industrial lands. The corridor passes through Abbotstown Woodlands and adjacent woodland blocks as it hugs the M50 to the west. Tree Preservation Orders are in force through this section. It passes industrial lands at Cappogue, then further open farmland.

An inevitable loss of hedgerow habitat along 5km of transfer pipeline will occur. This corridor crosses the Tolka River, which is upstream of South Dublin Bay and River Tolka Estuary SPA/pNHA and North Dublin Bay SAC/SPA. It does not impinge upon any ecological buffer zones, but does impinge upon four Nature Development Areas (Abbotstown woodlands and three unnamed¹ NDAs, one of which is a quarry – the remaining two are woodland blocks).

(ii) Route Section B

This corridor joins up with A just to the north of the M50-N2 interchange and follows the M50, passing to the south of Dublin Airport, to the motorways eastern terminus interchange with the M1. From here it continues east following the N32 for a short stretch before moving northeast at Clonshagh towards Bohammer and Kinsealy. This corridor crosses the Santry River and Great Turnapin Stream (a tributary of the Mayne River). Where it turns in Clonshagh, it crosses the Mayne River, an ecological corridor identified in the County Plan.

The corridor crosses Ballymun Golf Course, a Nature Development Area designated in the County Plan. Much like Section A, this corridor passes through open and enclosed farmland, waste ground and disturbed ground, scrubland and industrial lands.

An inevitable loss of hedgerow habitat along 9km of transfer pipeline will occur. This corridor crosses the Santry River which is upstream of North Dublin Bay SAC and North Bull Island SPA. It also crosses the Mayne River which is upstream of Baldoyle Bay SAC/SPA. It does not impinge upon any ecological buffer zones and crosses one Nature Development Area.

(iii) Route Section C

This corridor diverges from Corridor B at Kinsealy, moving west through Cloghran, Fosterstown and Forrest Little between Dublin Airport and the urban edge of Swords. At Barberstown, it turns northwest, crossing the Ward River and meets Corridor F in Suralstown. This corridor broadly follows the path of the Sluice River for almost half its length, and a transfer pipeline in this corridor will potentially cross this river twice.

The corridor crosses Forrest Little Golf Course and Abbeyville Demesne, both Nature Development Areas designated in the Fingal Development Plan. The Sluice and Ward Rivers are ecological corridors identified in the Fingal Development Plan. This corridor predominantly crosses improved agricultural or cultivated field systems, all enclosed by hedgerows.

¹ Source: Fingal CoCo GIS dataset.

An inevitable loss of hedgerow habitat along 9km of transfer pipeline will occur. This corridor crosses the Ward River which is upstream of Malahide Estuary SPA/SAC. It also crosses the Sluice River which is upstream of Baldoyle Bay SPA/SAC. It does not impinge upon any ecological buffer zones but does impinge upon two Nature Development Areas.

(iv)

Route Section D

This corridor diverges from Corridor G at Kinsealy, moving northwest through Abbeyville and Feltrim, passing through the townlands of Auburn and Drinan in a broad agricultural green corridor separating the urban fabric of Swords as bound by the M1 and the western spread of Malahide. This corridor crosses the Sluice River, an ecological corridor identified in the Fingal Development Plan. Corridor D narrows considerably where it crosses the M1 motorway at an environmental pinchpoint with Malahide Estuary, the R132 and the confluence of the Broadmeadow and Ward Rivers in Seatown. Both rivers are ecological corridors identified in the Fingal Development Plan.

Moving northwest away from this pinchpoint, the corridor follows, then crosses the Broadmeadow River in Saucerstown before joining Corridor F to the north of Lispopple Crossroads. Here, the corridor crosses the Mountstuart and Roganstown Streams, and Roganstown Golf Course, a Nature Development Area designated in the Fingal Development Plan. This corridor predominantly crosses improved agricultural or cultivated field systems, all enclosed by hedgerows.

The western edge of this corridor impinges upon Feltrim Hill pNHA. It crosses the Broadmeadow River and also a number of its tributaries. This is upstream of Malahide Estuary SPA/SAC. This corridor also crosses the Sluice River which is upstream of Baldoyle Bay SPA/SAC. It impinges upon three ecological buffer zones (Feltrim Hill, Malahide, Malahide Estuary); and potentially impinges upon two Nature Development Areas (Broadmeadow River Park, Abbeyville). An inevitable loss of hedgerow habitat along 12km of transfer pipeline will occur.

(v)

Route Section E

Corridor E diverges from Corridor D at the Broadmeadow River to the northeast of Saucerstown. It moves in a broad northeast direction through Magillstown, turning at Deanestown, and through Thomondtown where it crosses the M1 motorway. From here it continues northeast towards Lusk, passing to the south of the ring road. It crosses the Belfast-Dublin train-line at the 14 mile post in Effelstown and continues northeast through Rathartan, meeting the northern outfall study area at Park Road, Rush.

This corridor potentially crosses nine rivers or streams, of which two are ecological corridors identified in the Fingal Development Plan (Ballyboghil and Ballough Streams). No Nature Development Areas are crossed by this corridor. Corridor E almost entirely crosses improved agricultural grassland or cultivated lands.

This corridor crosses the Donabate River which is upstream of Malahide Estuary SPA/SAC. It also crosses the Ballyboghil, Ballough, Regles, Rathmooney, Palmerstown and Horsetown Streams. All are upstream of Rogerstown Estuary SPA/SAC. This section is upstream of the Rush Stream which flows out at the coast into WFD coastal waters. An inevitable loss of hedgerow habitat along 13km of transfer pipeline will occur.

(vi) **Route Section F**

This corridor separates from Corridor A in Newtown, to the west of Dublin Airport. Corridor F is the longest of all options, providing links with corridors A, C, D and E. From the N2, this corridor moves away to the north through Dunsoghly, Kilmacree and Shallon, crosses the R122 at Chapelmidway and converges with corridor C in Surgalstown. The corridor crosses the Ward River in Chapelmidway. This is an ecological corridor identified in the Fingal Development Plan. The corridor also impinges upon two designated Nature Development Areas in Surgalstown and Skephubble Nature Development Area to the south of the Ward River.

North of Surgalstown, the corridor moves northeast through Balcultry, crossing a county road and the R125 at Lispopple Crossroads before converging with Corridor D. From here, this corridor continues northeast, crossing the Broadmeadow River, an ecological corridor identified in the Fingal Development Plan. After crossing the R108, the corridor continues northeast, passing through the Cookstown and Baldurgan parcels before crossing the Ballyboghil Stream, another ecological corridor identified in the Fingal Development Plan.

This corridor maintains its northeasterly course, passing through the Annsbrook parcel and crossing the Rath Little Stream before crossing the M1 motorway. Immediately abutting the M1 is the Newtowncorduff parcel, which is flanked to the southwest and southeast by the Rath Little Stream and Ballough River. Both are ecological corridors identified in the Fingal Development Plan and crossed by Corridor F. From here, the corridor crosses the R132 and passes Lusk to the north, through Causestown, Greatcommon and Tyrrelstown Little. It then crosses the Belfast-Dublin railway line at the 16 mile post, and meets the northern outfall study area to the west of the coast road in Rush Demesne and St. Catherine's Park.

Much like Corridor E, this option almost entirely crosses improved agricultural grassland or cultivated lands, being furthest from the population centres nearer the coast. Notably at Lispopple Crossroads and the Skerries Road in Greatcommons, this corridor must navigate through a dense network of private gardens and residential dwellings.

At Drumanagh Nature Development Area on the coast, a multitude of Annex I habitat types are recorded, including exposed and sheltered rocky shores and muddy sediment shores.

This corridor crosses the Ward River and a number of its tributaries, the Broadmeadow River and also a number of its tributaries, and the Donabate River. All are upstream of Malahide Estuary SPA/SAC. It also crosses Ballyboghil, Grallagh, Rath Little, Kinoud, Ballough, Rathmooney and Palmerstown Streams. All are upstream of Rogerstown Estuary SPA/SAC. This section is also upstream of the Balcunnin Stream which flows out at the coast into WFD coastal waters.

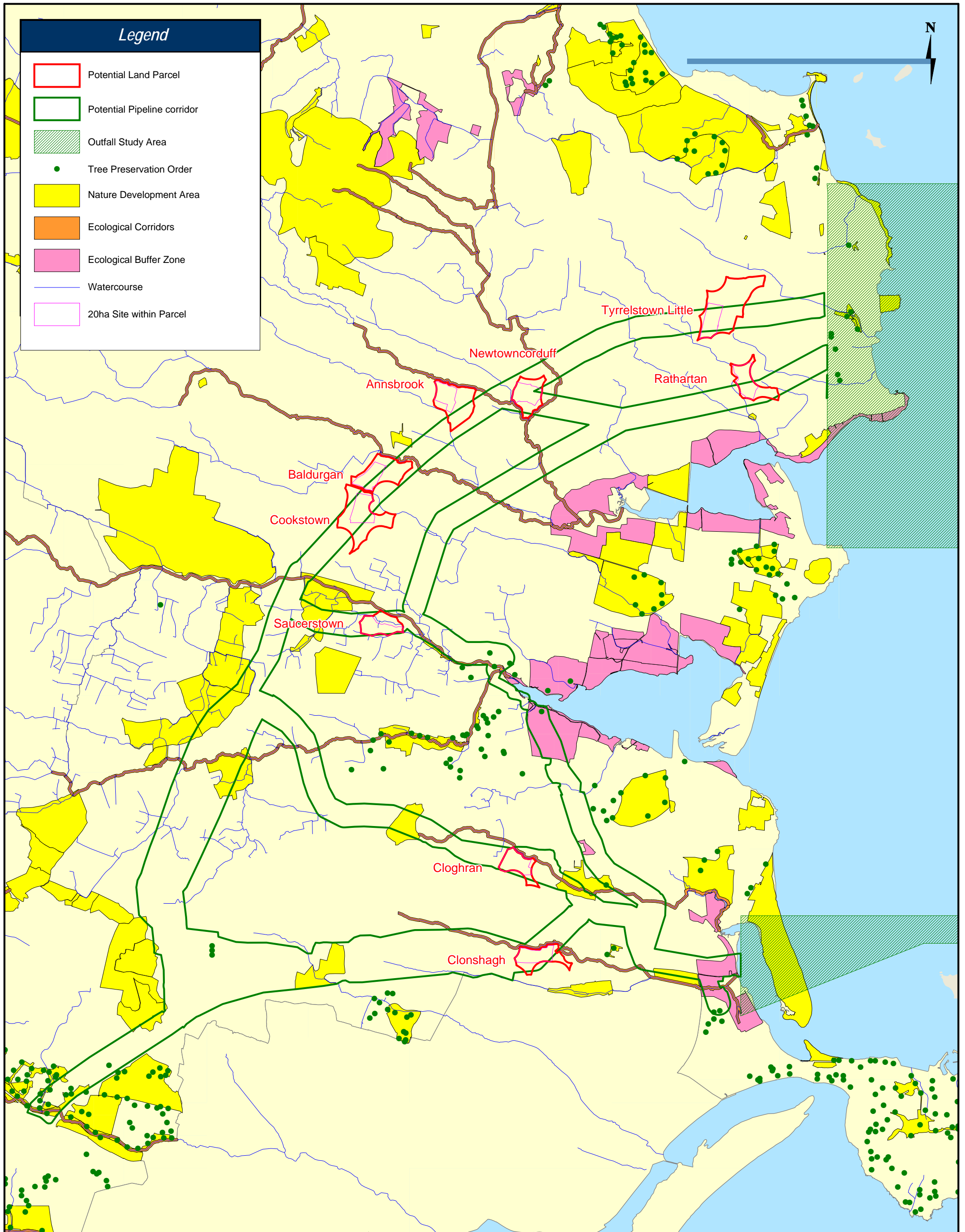
This corridor does not impinge upon any ecological buffer zones, but potentially impinges upon three Nature Development Areas. The corridor also impinges upon two unnamed farmland Nature Development Areas in Surgalstown, Skephubble Golf Course Nature Development Area to the south of the Ward River and Drumanagh Nature Development Area on the coast.

An inevitable loss of hedgerow habitat along 21km of transfer pipeline will occur.

(vii) Route Section G

This corridor commences at the point of convergence of corridors B, C and D in Kinsealy around the Malahide Road and Chapel Road junction. This corridor travels south through Drumnigh and towards Balgriffin before turning east at the Moyne Road towards the coast. The corridor impinges upon an unnamed farmland block which is designated as a Nature Development Area in the County Plan. It then passes across the Belfast-Dublin train line at the 6 mile post in Snugborough and finds the coastline at Maynetown. Once at the coastline, this corridor meets dry calcareous natural grassland, saltmarsh, mud shores and a tidal river. All are potentially Annex I habitat types, and some may be listed as conservation objectives for the SAC.

This corridor interfaces with the southern marine outfall area at Baldoyle Bay SAC/SPA and Ramsar site.



Title

Figure 5.3

Fingal Ecological Network (excluding Core Biodiversity Conservation Areas)

Project

Specialist Ecology Services GDD

Client

Comhairle Contae Fhine Gall
Fingal County Council

RPS

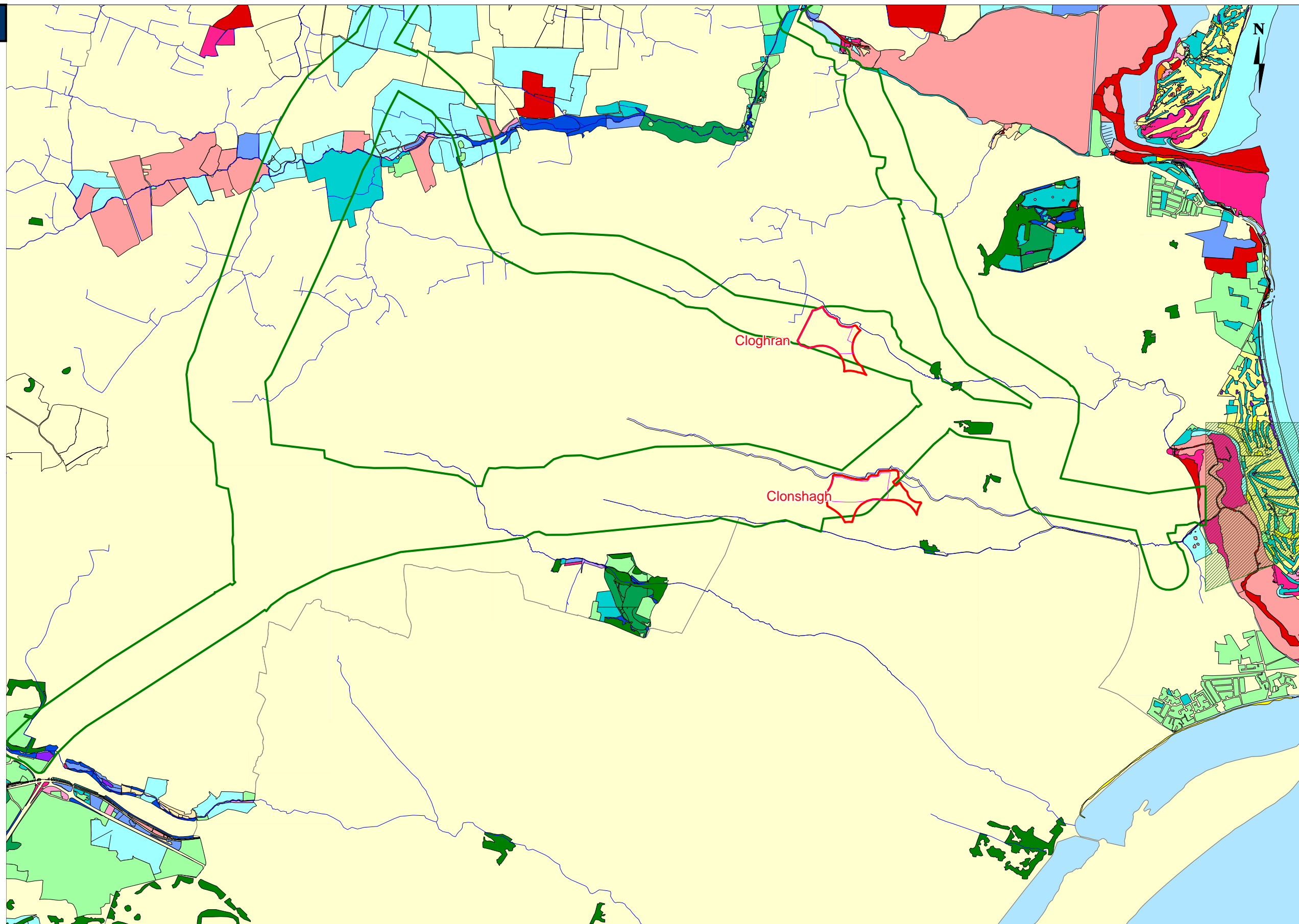
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Drawn by: JMC	Project No. NI 1350	
Checked by: BD	File Ref. NI1350GDD07 MI03D01	
Approved by: xxxx	Drawing No. Mi0003	Rev. D02
Scale: 1:100,000 @ A3	Date: 25/01/2012	
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Legend

- BC1 Arable crops (144)
- BC2 Horticultural land (92)
- BC3 Tilled land (86)
- BC4 Flower beds and borders (7)
- BL1 Stone walls (16)
- BL2 Earth banks (1)
- BL3 Buildings / Artificial surfaces (744)
- CB1 Shingle / Gravel banks (81)
- CD1 Embryonic dunes (71)
- CD2 Marram dunes (52)
- CD3 Fixed dunes (177)
- CD4 Dune Scrub (38)
- CD5 Dune slack (12)
- CM1 Lower saltmarsh (48)
- CM2 Upper saltmarsh (67)
- CS3 Sedimentary sea cliffs (1)
- CW1 Lagoons (7)
- CW2 Tidal rivers (22)
- ED1 Exposed sand or gravel (2)
- ED2 Spoil / Bare ground (25)
- ED3 Recolonising bare ground (27)
- ED4 Active quarry / mine (8)
- ED5 Refuse / other waste (3)
- ER1 Exposed siliceous rock (16)
- ER2 Exposed calcareous rock (1)
- FL8 Artificial lake / pond (47)
- FP1 Calcareous spring (2)
- FS1 Reeds swamp (3)
- FS2 Tall-herb swamp (6)
- FW4 Drainage ditch (1)
- GA1 Improved agricultural grassland (690)
- GA2 Amenity grassland (448)
- GM1 Marsh (14)
- GS1 Dry calcareous grassland (114)
- GS2 Dry meadows / Grassy verges (93)
- GS3 Dry-humid acid grassland (18)
- GS4 Wet grassland (57)
- HD1 Dense bracken (35)
- HH1 Dry siliceous heath (59)
- HH2 Dry calcareous heath (1)
- HH5 n/a (23)
- LR1 Exposed rocky shore (6)
- LR2 Moderately exposed rocky shore (156)
- LR3 sheltered rocky shore (210)
- LR4 Mixed substrata shore (42)
- LS1 Shingle shore (93)
- LS2 Sandy shore (118)
- LS3 Muddy sand shore (24)
- LS4 Mud shore (33)
- LS5 Mixed sediment shore (22)
- NI n/a (19)
- WD1 Broadleaf woodland (229)
- WD2 Mixed woodland (10)
- WD3 Conifer woodland (2)
- WD4 conifer plantation (10)
- WD5 Scattered trees & parkland (72)
- WN2 Oak-ash-hazel woodland (10)
- WN3 Yew woodland (1)
- WN5 Riparian woodland (6)
- WN6 Wet willow-alder-ash woodland (9)
- WS1 Scrub (96)
- WS2 Immature woodland (26)
- WS3 Ornamental / non-native shrub (22)



Title **Figure 5.4(a) Habitats of County Fingal**

- 20ha Site
- Potential Pipeline Corridor
- Potential Land Parcel
- Outfall Study Area
- Watercourse

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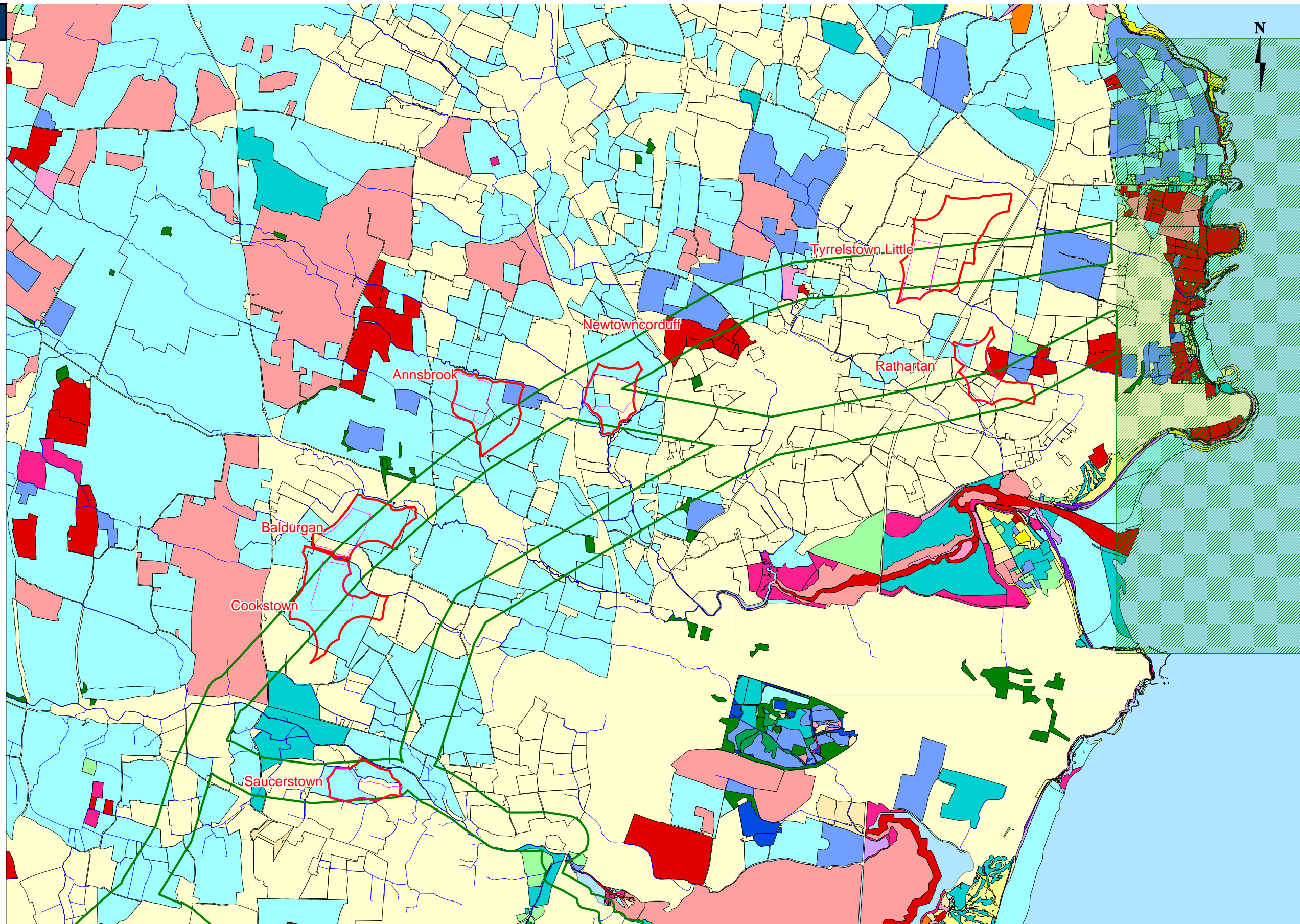
Issue Details		
Drawn by: JMC	Project No. NI 1350	
Checked by: BD	File Ref. NI1350GDD07 MI04D01	
Approved by: xxxx	Drawing No. MI0004	Rev. D02
Scale: 1:50,000 @ A3	Date: 25/01/2012	

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Legend

- BC1 Arable crops (144)
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- WN2 Oak-ash-hazel woodland (10)
- WN3 Yew woodland (1)
- WN5 Riparian woodland (6)
- WN6 Wet willow-alder-ash woodland (9)
- WS1 Scrub (96)
- WS2 Immature woodland (26)
- WS3 Ornamental / non-native shrub (22)



Title **Figure 5.4(b) Habitats of County Fingal**

- 20ha Site
- Potential Pipeline Corridor
- Potential Land Parcel
- Outfall Study Area
- Watercourse

Project
Specialist Ecology Services GDD

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Fingal County Council

Issue Details		
Drawn by: JMC	Project No. NI 1350	
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5.3.3 Freshwater Ecology

(a) Land Parcels and Sites

(i) Annsbrook

The northern boundary of the Annsbrook land parcel is bounded by a tributary of the Ballough River, while the southern boundary is bounded by a tributary of the Ballyboghil River (see Figure 5.5). Within this parcel, the selected site has drawn back from both watercourse corridors. The proposed access road does not cross, but flanks the Grallagh Stream (a tributary of the Ballyboghil River) for over 1km.

Fishery Importance

The Ballough River system supports local populations of both resident Brown trout and migratory Sea trout (both *Salmo trutta*) and importantly a small but biological significant population of Atlantic salmon (*Salmo salar*).

The Ballyboghil River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout and Sea trout, Eels (*Anguilla anguilla*) and importantly a small but biologically significant population of Atlantic salmon in its lower reaches, in addition to other fish species.

Water Quality

EPA biological water quality monitoring data indicates that the Ballough and Ballyboghil Rivers have suffered from pollution problems since monitoring commenced in 1991. After the 2010 round of biological monitoring, the Ballough River recorded a Q-values of 3-4, whereas the Ballyboghil River recorded Q-values of 3. The EPA has classified reaches of both the Ballough River and Ballyboghil River to be moderately polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Ballough River as Good and Poor, and the Ballyboghil River as Poor.

Ecological Importance

Both the Ballough and Ballyboghil Rivers support populations of salmonids, and discharge to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) approximately 4.1km downstream of Annsbrook.

(ii) Baldurgan

The northern boundary of the Baldurgan land parcel is bounded by the Ballyboghil River, while the southern boundary is bounded by the Donabate River (see Figure 5.5). Within this parcel, the selected site has drawn back from the river corridors bounding the parcel. The proposed access road crosses the Clonmethan stream (a tributary of the Ballyboghil River) and the Ballyboghil River, in quick succession.

Fishery Importance

The Ballyboghil River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout and Sea trout, Eels (*Anguilla anguilla*) and importantly a small but biologically significant population of Atlantic salmon in its lower reaches, in addition to other fish species.

The Donabate River constitutes a non-salmonid system because of the likely presence of impassable barriers to fish movement at the lower end of the system in addition to possible water quality problems.

Water Quality

EPA biological water quality monitoring data indicates that the Ballyboghil River has suffered from pollution problems since monitoring commenced in 1991. After the 2010 round of biological monitoring, the Ballyboghil River recorded Q-values of 3. The EPA has classified reaches of the Ballyboghil River to be moderately polluted.

The EPA does not monitor the biological water quality of the Donabate River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Ballyboghil River as Poor and the Donabate River as Moderate.

Ecological Importance

The Ballyboghil River supports populations of salmonids and discharge to Rogerstown Estuary SPA (004015) and SAC (000208) approximately 5.3km downstream of Baldurgan. The Donabate River does not support populations of salmonids but discharges to Malahide Estuary SPA (004025) and SAC (000205) approximately 7.0km downstream of Baldurgan.

(iii)

Cloghran

The northern boundary of the Cloghran land parcel is bounded by the Sluice River (see Figure 5.5). Within this parcel, the selected site has drawn back from the Sluice River corridor.

Fishery Importance

The Sluice River and its tributaries constitute a salmonid system. The system supports Brown trout throughout and Eels in its lower reaches, in addition to other fish species. Recent surveys of the Sluice River have recorded the presence of Brown trout at least as far upstream as the Abbeyville Estate.

Water Quality

The EPA does not monitor the biological water quality of the Sluice River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Sluice River as Good.

Ecological Importance

The Sluice River supports populations of salmonids and discharge to Baldoyle Bay SPA (004016) and SAC (000199) approximately 4.3km downstream of Cloghran.

(iv) **Clonshagh**

The northern boundary of the Clonshagh land parcel is bounded by the Cuckoo Stream, which is a tributary of the Mayne River, while the main channel of the Mayne River lies approximately 250m to the south of Clonshagh (see Figure 5.5). Within this parcel, the selected site has drawn back from the Mayne River corridor to the north.

Fishery Importance

The Mayne River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system. However, water quality has been noted as improving and Inland Fisheries Ireland is currently assessing the viability of a salmonid reintroduction programme. Several developments in the area have installed and configured instream features in compliance with salmonid waters requirements as per 'best practice'.

Water Quality

EPA biological water quality monitoring data indicates that the Mayne River has suffered from pollution problems since monitoring commenced in 1988. After the 2010 round of biological monitoring, the Mayne River recorded Q-values of 3. The EPA has classified reaches of the Mayne River to be moderately polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Cuckoo Stream as Poor and the Mayne River as Poor.

Ecological Importance

Neither the Cuckoo Stream or the Mayne River support populations of salmonids but they do discharge to Baldoyle Bay SPA (004016) and SAC (000199) approximately 4.6km downstream of Clonshagh.

(v) **Cookstown**

The northern boundary of the Cookstown land parcel is bounded by the Donabate River (see Figure 5.5). Within this parcel, the selected site has drawn back from the Donabate River corridor to the north.

Fishery Importance

The Donabate River constitutes a non-salmonid system because of the likely presence of impassable barriers to fish movement at the lower end of the system in addition to possible water quality problems.

Water Quality

The EPA does not monitor the biological water quality of the Donabate River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Donabate River as Moderate.

Ecological Importance

The Donabate River does not support populations of salmonids but discharges to Malahide Estuary SPA (004025) and SAC (000205) approximately 7.0km downstream of Baldurgan.

(vi)

Newtowncorduff

The south eastern boundary of the Newtowncorduff land parcel is bounded by the Ballough River, while the south western boundary is bounded by a tributary of the Ballough River (see Figure 5.5). Within this parcel, the selected site has drawn back from the Rath Little Stream and Ballough River corridors to the southeast and southwest. The proposed access road crosses the Ballough River.

Fishery Importance

The Ballough River system supports local populations of both resident Brown trout and migratory Sea trout (both *Salmo trutta*) and importantly a small but biological significant population of Atlantic salmon (*Salmo salar*).

Water Quality

EPA biological water quality monitoring data indicates that the Ballough River has suffered from pollution problems since monitoring commenced in 1991. After the 2010 round of biological monitoring, the Ballough River recorded a Q-value of 3-4. The EPA has classified reaches of the Ballough River to be moderately polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Ballough River as Good and Poor.

Ecological Importance

The Ballough River supports populations of salmonids and discharges to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) approximately 2.9km downstream of Newtowncorduff.

(vii)

Rathartan

The western boundary of the Rathartan land parcel is bounded by the Lusk River, while the eastern boundary is bounded by Palmerstown Stream (see Figure 5.5). Within this parcel, the selected site has drawn back from the Lusk River corridor to the west. The proposed access road crosses the Lusk River.

Fishery Importance

The Lusk River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system.

Water Quality

The EPA does not monitor the biological water quality of the Lusk River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Lusk River as Good and Palmerstown Stream as Poor.

Ecological Importance

The Lusk Rivers does not support populations of salmonids, and both the Lusk River and Palmerstown Stream discharge to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) approximately 1.0km downstream of Rathartan.

(viii)

Saucerstown

The northern boundary of the Saucerstown land parcel is bounded by the Broadmeadow River, while a number of its tributaries flow through the land parcel itself (see Figure 5.5). Within this parcel, the selected site has drawn back from the Broadmeadow River corridor to the north, and indeed now does not cross the Saucerstown Stream which dissects the land parcel. The site abuts a tributary of the Saucerstown Stream, and the proposed access road crosses it.

Fishery Importance

The Broadmeadow River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout, Sea trout and a small but biologically significant population of Atlantic salmon and Eels in its lower reaches, in addition to other fish species.

Water Quality

EPA biological water quality monitoring data indicates that the Broadmeadow River has suffered from pollution problems since monitoring commenced in 1971. After the 2010 round of biological monitoring, the Broadmeadow River recorded a Q-value of 3. The EPA has classified reaches of the Broadmeadow River to be moderately polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Broadmeadow River as Poor and the tributaries which run through the land parcel as Moderate.

Ecological Importance

The Broadmeadow River system supports populations of salmonids and discharges to Malahide Estuary SPA (004025) and SAC (000205) approximately 3.0km downstream of Saucerstown.

(ix)

Tyrrelstown Little

The Tyrrelstown Little land parcel has no watercourses running through it nor is not bounded by any watercourse. However, the Lusk River lies approximately 200m to the south west, Rush Stream lies approximately 100m to the south east and Balcunnin Stream lies approximately 100m to the north east (see Figure 5.5).

Fishery Importance

The Lusk River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system.

Water Quality

The EPA does not monitor the biological water quality of the Lusk River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Lusk River as Good. There is no status available in relation to Rush Stream or Balcunnin Stream.

Ecological Importance

The Lusk Rivers does not support populations of salmonids, and the river discharges to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) approximately 2.2km downstream of Tyrrelstown Little.

(b) Pipeline Route

(i) Route Section A

Pipeline Route Section A has the potential to impact on the Tolka River and one of its tributaries, the Abbotstown Stream (see Figure 5.5).

Fishery Importance

The Tolka River and its tributaries constitute a salmonid system. The system supports Brown trout throughout, and Sea trout and Eels in its lower reaches, in addition to other fish species. Salmon have recently been recorded from the lower reaches if this river system.

Water Quality

EPA biological water quality monitoring data indicates that the Tolka River has suffered from pollution problems since monitoring commenced in 1971. After the 2010 round of biological monitoring, the Tolka River recorded a Q-value of 3. The EPA has classified reaches of the Tolka River to be moderately polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Tolka River as Bad.

Ecological Importance

The Tolka River system supports populations of salmonids and discharges to Dublin Bay, which is adjacent to North Bull Island SPA (004006) and North Dublin Bay SAC (000206) and approximately 13km downstream of Section A.

(ii) Route Section B

Pipeline Route Section B has the potential to impact on the Santry River and the Mayne River (see Figure 5.5).

Fishery Importance

The Mayne River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system. However, water quality has been noted as improving and Inland Fisheries Ireland is currently assessing the viability of a salmonid reintroduction programme. Several developments in the area have installed and configured instream features in compliance with salmonid waters requirements as per 'best practice'.

The Santry River constitutes a non-salmonid system because of the presence of a number of impassable features to fish located towards the lower end of the system.

Water Quality

EPA biological water quality monitoring data indicates that the Mayne and Santry Rivers have suffered from pollution problems since monitoring commenced in 1988. After the 2010 round of biological monitoring, the Mayne River recorded a Q-values of 3, whereas the Santry River recorded a Q-value of 2-3. The EPA has classified reaches of both the Ballough River and Ballyboghil River to be moderately and seriously polluted.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Santry River as Bad and the Mayne River as Poor.

Ecological Importance

Neither the Mayne River or the Santry River support populations of salmonids but the Mayne discharges to Baldoyle Bay SPA (004016) and SAC (000199) approximately 4.5km downstream of Section B, and the Santry River discharges through North Bull Island SPA (004006) and North Dublin Bay SAC (000206) approximately 8.0km downstream of Section B.

(iii) Route Section C

Pipeline Route Section C has the potential to impact on the Ward River system and the Sluice River system (see Figure 5.5).

Fishery Importance

The Sluice River and its tributaries constitute a salmonid system. The system supports Brown trout throughout and Eels in its lower reaches, in addition to other fish species. Recent surveys of the Sluice River have recorded the presence of Brown trout at least as far upstream as the Abbeyville Estate.

The Ward River system constitutes a salmonid system. The system supports local populations of Brown trout throughout and migratory Sea trout, Eels and importantly a small but biologically significant population of Atlantic salmon in its lower reaches.

Water Quality

EPA biological water quality monitoring data indicates that the Ward River has suffered from serious pollution problems since monitoring commenced in 1973. After the 2010 round of biological monitoring, the Ward recorded Q-values of 3 at each of the four EPA sampling locations along the Ward system. The EPA has classified reaches of the Ward to be moderately polluted.

The EPA does not monitor the biological water quality of the Sluice River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Sluice River as Good and the Ward River as Poor or Bad.

Ecological Importance

The Sluice River supports populations of salmonids and discharge to Baldoyle Bay SPA (004016) and SAC (000199) approximately 4.0km downstream of Section C.

Likewise, the Ward River supports populations of salmonids and discharge to Malahide Estuary SPA (004025) and SAC (000205) approximately 5.5km downstream of Section C.

(iv)

Route Section D

Pipeline Route Section D has the potential to impact on the Broadmeadow River system, the Ward River system and the Sluice River system (see Figure 5.5).

Fishery Importance

The Broadmeadow River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout, Sea trout and a small but biologically significant population of Atlantic salmon and Eels in its lower reaches, in addition to other fish species.

The Sluice River and its tributaries constitute a salmonid system. The system supports Brown trout throughout and Eels in its lower reaches, in addition to other fish species. Recent surveys of the Sluice River have recorded the presence of Brown trout at least as far upstream as the Abbeyville Estate.

The Ward River system constitutes a salmonid system. The system supports local populations of Brown trout throughout and migratory Sea trout, Eels and importantly a small but biologically significant population of Atlantic salmon in its lower reaches.

Water Quality

EPA biological water quality monitoring data indicates that the Ward River has suffered from serious pollution problems since monitoring commenced in 1973. Likewise, the Broadmeadow River has suffered from pollution problems since monitoring commenced in it in 1971.

After the 2010 round of biological monitoring, both the Broadmeadow and Ward Rivers recorded Q-values of 3. The EPA has classified reaches of both the Broadmeadow and the Ward Rivers to be moderately polluted.

The EPA does not monitor the biological water quality of the Sluice River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Broadmeadow River as Poor and the tributaries which run through Section D as Moderate, the Sluice River as Good and the Ward River as Poor or Bad.

Ecological Importance

Both the Broadmeadow River system and the Ward River system support populations of salmonids and both discharge to Malahide Estuary SPA (004025) and SAC (000205) approximately 0.5 km downstream of Section D.

Likewise, the Sluice River supports populations of salmonids and discharge to Baldoyle Bay SPA (004016) and SAC (000199) approximately 2.0km downstream of Section D.

(v)

Route Section E

Pipeline Route Section E has the potential to impact on the Broadmeadow River system, the Donabate River, the Ballyboghil River, the Ballough River and the Lusk River (see Figure 5.5).

Fishery Importance

The Broadmeadow River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout, Sea trout and a small but biologically significant population of Atlantic salmon and Eels in its lower reaches, in addition to other fish species.

The Ballough River system supports local populations of both resident Brown trout and migratory Sea trout (both *Salmo trutta*) and importantly a small but biological significant population of Atlantic salmon (*Salmo salar*).

The Ballyboghil River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout and Sea trout, Eels (*Anguilla anguilla*) and importantly a small but biologically significant population of Atlantic salmon in its lower reaches, in addition to other fish species.

The Donabate River constitutes a non-salmonid system because of the likely presence of impassable barriers to fish movement at the lower end of the system in addition to possible water quality problems.

The Lusk River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system.

Water Quality

EPA biological water quality monitoring data indicates that the Broadmeadow, Ballough and Ballyboghil Rivers have suffered from serious pollution problems since monitoring commenced.

After the 2010 round of biological monitoring, the Broadmeadow and Ballyboghil Rivers recorded Q-values of 3, whereas, the Ballough River recorded a Q-value of 3-4. The EPA has classified reaches of each river to be moderately polluted.

The EPA does not monitor the biological water quality of either the Donabate River or the Lusk River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Broadmeadow River as Poor, the Ballough River as Good and Poor, the Ballyboghil River as Poor, Lusk River as Good and the the Donabate River as Moderate.

Ecological Importance

The Broadmeadow River system supports populations of salmonids and discharges to Malahide Estuary SPA (004025) and SAC (000205) downstream of Section E.

Likewise, both the Ballough and Ballyboghil Rivers support populations of salmonids, and discharge to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) downstream of Section E.

Neither the Lusk River or the Donabate River support populations of salmonids, however, the Donabate River discharges to Malahide Estuary SPA (004025) and SAC (000205) downstream of Section E.

(vi)

Route Section F

Pipeline Route Section F has the potential to impact on the Broadmeadow River system, the Ward River system, the Donabate River, the Ballyboghil River, the Ballough River and the Lusk River (see Figure 5.5).

Fishery Importance

The Broadmeadow River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout, Sea trout and a small but biologically significant population of Atlantic salmon and Eels in its lower reaches, in addition to other fish species.

The Ward River system constitutes a salmonid system. The system supports local populations of Brown trout throughout and migratory Sea trout, Eels and importantly a small but biologically significant population of Atlantic salmon in its lower reaches.

The Ballough River system supports local populations of both resident Brown trout and migratory Sea trout (both *Salmo trutta*) and importantly a small but biological significant population of Atlantic salmon (*Salmo salar*).

The Ballyboghil River constitutes a salmonid system. The system (main channel and tributaries) supports Brown trout throughout and Sea trout, Eels (*Anguilla anguilla*) and importantly a small but biologically significant population of Atlantic salmon in its lower reaches, in addition to other fish species.

The Donabate River constitutes a non-salmonid system because of the likely presence of impassable barriers to fish movement at the lower end of the system in addition to possible water quality problems.

The Lusk River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system.

Water Quality

EPA biological water quality monitoring data indicates that the Ward, Broadmeadow, Ballough and Ballyboghil Rivers have suffered from serious pollution problems since monitoring commenced.

After the 2010 round of biological monitoring, the Broadmeadow, Ward and Ballyboghil Rivers recorded Q-values of 3, whereas, the Ballough River recorded a Q-value of 3-4. The EPA has classified reaches of each river to be moderately polluted.

The EPA does not monitor the biological water quality of either the Donabate River or the Lusk River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Broadmeadow River as Poor, the Ballough River as Good and Poor, the Ballyboghil River as Poor, the Ward River as Poor or Bad, Lusk River as Good and the Donabate River as Moderate.

Ecological Importance

Both the Broadmeadow River system and the Ward River system support populations of salmonids and both discharge to Malahide Estuary SPA (004025) and SAC (000205) downstream of Section F.

Likewise, both the Ballough and Ballyboghil Rivers support populations of salmonids, and discharge to Rogerstown Estuary Special Protection Area (SPA) (004015) and Special Area of Conservation (SAC) (000208) downstream of Section F

Neither the Lusk River or the Donabate River support populations of salmonids, however, the Donabate River discharges to Malahide Estuary SPA (004025) and SAC (000205) downstream of Section F.

(vii)

Route Section G

Pipeline Route Section G has the potential to impact on the Mayne River system and the Sluice River system (see Figure 5.5).

Fishery Importance

The Sluice River and its tributaries constitute a salmonid system. The system supports Brown trout throughout and Eels in its lower reaches, in addition to other fish species. Recent surveys of the Sluice River have recorded the presence of Brown trout at least as far upstream as the Abbeyville Estate.

The Mayne River constitutes a non-salmonid system because of the presence of an impassable barrier to fish movement at the lower end of the system. However, water quality has been noted as improving and Inland Fisheries Ireland is currently assessing the viability of a salmonid reintroduction programme. Several developments in the area have installed and configured instream features in compliance with salmonid waters requirements as per 'best practice'.

Water Quality

EPA biological water quality monitoring data indicates that the Mayne River has suffered from pollution problems since monitoring commenced in 1988. After the 2010 round of biological monitoring, the Mayne River recorded Q-values of 3. The EPA has classified reaches of the Mayne River to be moderately polluted.

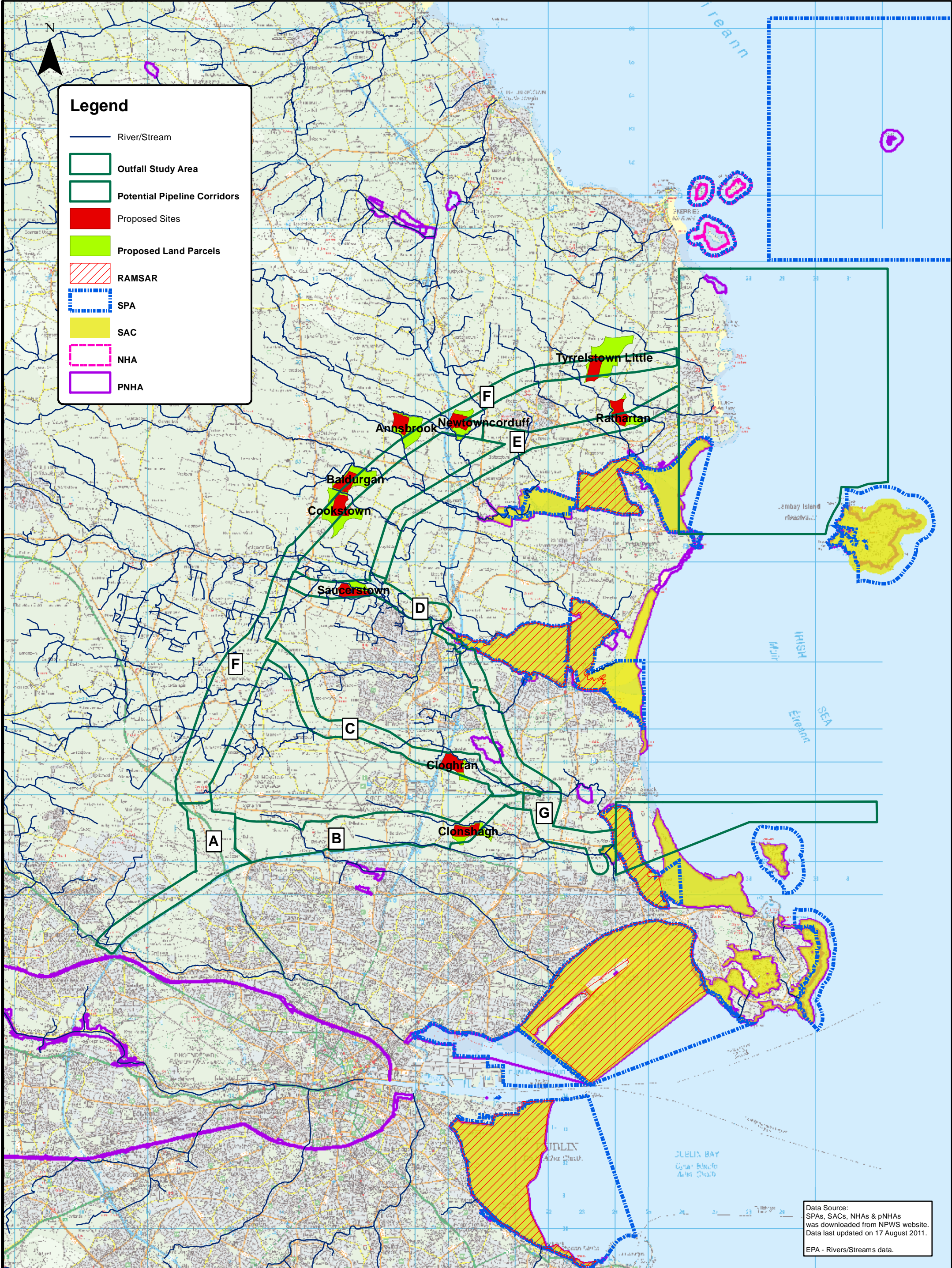
The EPA does not monitor the biological water quality of the Sluice River.

A review of the Water Maps tool (November 2011) in association with the Eastern River Basin District Management Plan has identified the current ecological status of the Sluice River as Good and the Mayne River as Poor.

Ecological Importance

The Sluice River supports populations of salmonids and discharge to Baldoyle Bay SPA (004016) and SAC (000199) downstream of Section G.

Whereas, the Mayne River does not support populations of salmonids but they do also discharge to Baldoyle Bay SPA (004016) and SAC (000199) downstream.



Data Source:
 SPAs, SACs, NHAs & pNHAs
 was downloaded from NPWS website.
 Data last updated on 17 August 2011.
 EPA - Rivers/Streams data.

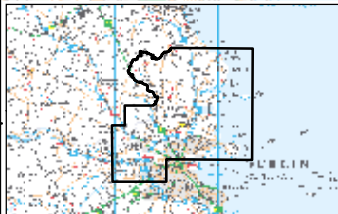
Title

Figure 5.5 Freshwater Constraints

Project
Specialist Ecology Services GDD

Client

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Issue Details	
Drawn By: BD	Project No. MDE1046
Checked By: EL	File Ref: MDE1046Arc004D02
Approved By: XXX	
Scale: 1:100,000 @ A3	Drawing No. Rev:
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5.3.4 Marine Ecology - Associated with the Marine Outfall Areas.

(a) Geomorphology

(i) Northern Marine Outfall Area

The northern marine outfall location spans the coastline from the southern Rogerstown inlet, at Portrairie, to Holmpatrick south of the Shenick's Island and extends offshore to a distance of approximately 5km from the beach at Rush. The coastline is dominated by a number of shallow sandy bays and open beaches, punctuated by rocky headlands and cliffs. The dominant beaches and open bays are those at Loughshinny, Rush (North Beach) and Rogerstown Inlet, the latter leading into the Rogertown Estuary located outside the proposed survey area. The southeastern corner of the survey area is truncated slightly in the east to remain outside the pNHA of Lambay Island.

The bathymetry (see Figure 5.6) and seabed habitats (see Figure 5.7) reflect the underlying geology of the region with outcropping carboniferous ledges recorded on the coastline (such as Carlyan Rocks at Rush) or on the seabed (such as Williams Rocks off Shenicks Point which protrude 5m clear of the seabed). The general bathymetry of the survey area is quite consistent but shallow and gently shoaling, reaching the 10 metres chart datum contour approximately 1km from the beach and the 20 metre contour at a distance of 4km (a slope of around 0.2 to 0.5°).

Lambay island, located southeast of this area, is adjoined by raised bank areas. Frazer Bank projects 3km north of the island and shoals to only 7m CD (chart datum), whilst a smaller bank (Burge Bar) runs due west approximately 2km and shoals to 7m CD. This creates a small basin due east of the Rogerstown inlet which is approximately 18m CD at its deepest point, and subsequently surrounded by shallow banks or the coastline on three sides excluding the north. The deepest water recorded in the area is approximately 23m CD and is recorded in the northeast of the proposed area.

No comprehensive assessment of the surface geology and surface habitats has been carried out in this area although data is available from a number of sources which provides the range of habitats expected for the possible outfall location. Detailed bathymetric and ground discrimination surveys in deeper waters have been carried out along the east coast (including Fingal) as part of the INFOMAR project (2011), whilst the inshore corridor for the Eircom East West Interconnector landing in Rush was also surveyed in 2008. The general habitat type is recorded by the admiralty charts and is presented in Figure 5.7. These show that the majority of the survey area is predominantly fine to medium sands, with patches of coarser sands, shells and gravels recorded in the channel separating Lambay Island from the mainland and to the north of Frazer Bank, which itself is predominantly sand based. Intermittent carboniferous rock outcrops are recorded along the coast as well as in deeper water although some of this material may be of glacial origin.

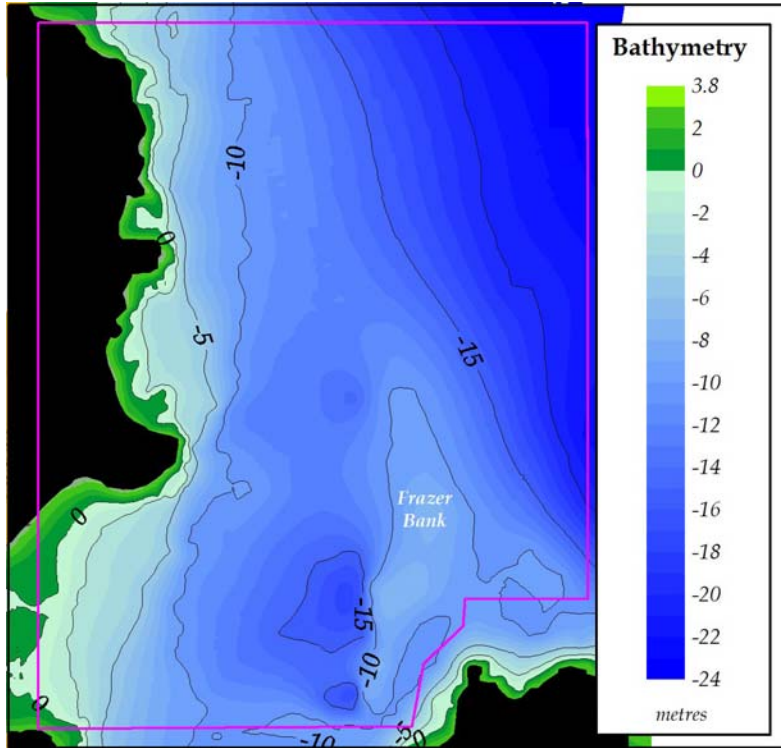


Figure 5.6 Bathymetry of Northern Outfall Area

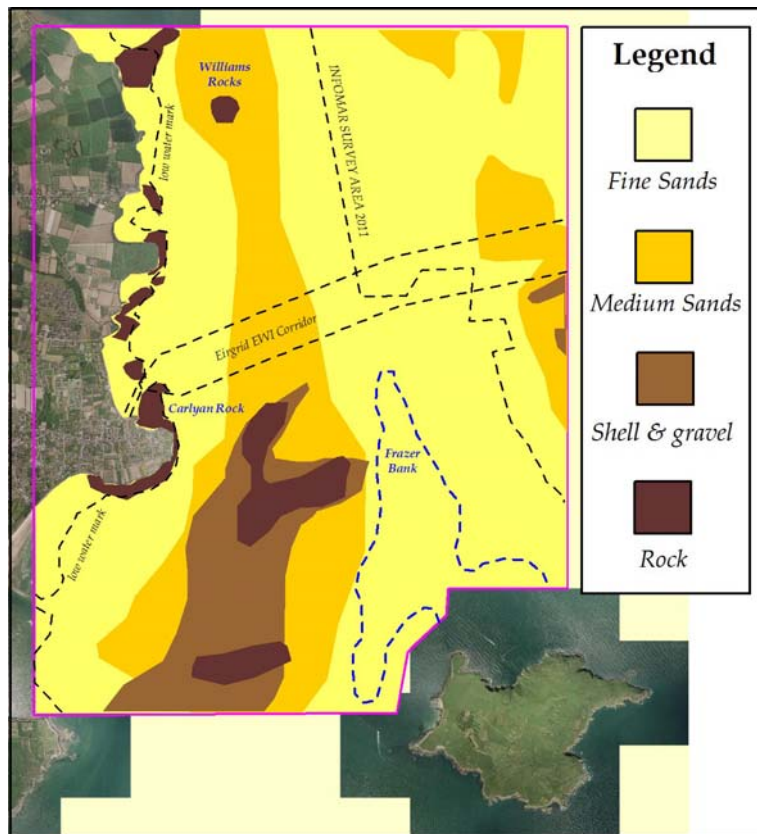


Figure 5.7 Broad Habitats of Northern Outfall Area

(ii) **Southern Marine Outfall Area**

The southern marine outfall location is located in a more restricted area which is approximately 2.2km at its widest point reducing down to 500m at 3km from the beach at Portmarnock. This area is located over the Baldoyle Estuary, across the Portmarnock Golf club on the peninsula and out to a point approximately 7km east of the coast (Velvet Strand) and approximately 3km north east of Ireland's Eye island. The corridor reduces to its thinnest point approximately 3km from the beach at Portmarnock. The coastline is dominated by an enclosed estuary and a large open sandy beach leading to an open sandy estuary. The dominant beach is that of the Velvet Strand east of Portmarnock. The shape of the proposed marine outfall area has been truncated in the southeast to avoid Ireland's Eye and Thulla islands.

The general bathymetry (see Figure 5.8) of the survey area is quite consistent but shallow, with a slight deflection of the contours as the route passes north of Ireland's Eye island from a northeast slope to a southeast slope. The beach slope is both shallow and relatively consistent, reaching the 10m chart datum contour approximately 3km from the beach and the 20 metre contour at a distance of 5km (a slope of around 0.2 to 0.5°). The deepest water recorded in the area is approximately 23m CD and is recorded at the eastern extreme of the route.

No comprehensive assessment of the surface geology and surface habitats has been carried out in this area although data is available from a number of sources which

provides the range of habitats expected for the possible outfall location. Detailed bathymetric and ground discrimination surveys in deeper waters have been carried out along the east coast including Fingal as part of the INFOMAR project (2011), whilst the inshore section of the route is recorded sporadically by the admiralty charts or from aerial photography due to the shallow nature of much of the intertidal zone. The general habitat type is presented in Figure 5.9. This shows that the majority of the survey area is predominantly fine to medium sands, with a small patch of mixed sediments south of the Ireland's Eye islets. Two areas of rock outcropping were noted, but neither are located within the proposed marine outfall area. A detailed habitat investigation will be carried out on the preferred outfall location once established following hydrodynamic modelling.

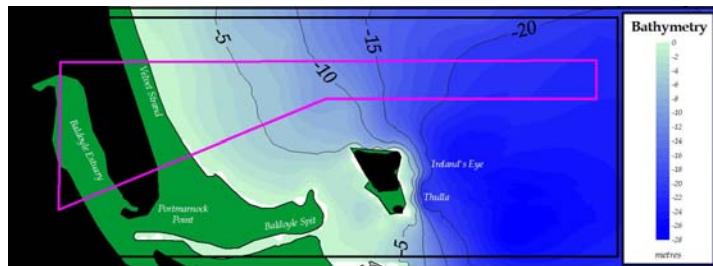


Figure 5.8 Bathymetry of Southern Outfall Area

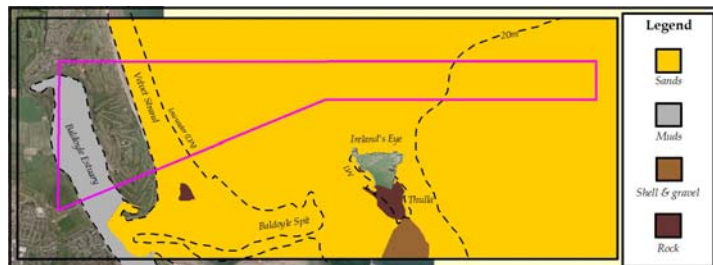


Figure 5.9 Broad Habitats of Southern Outfall Area

(b) **Coastal Ecology**

A large-scale ecological study was undertaken along the length of the Fingal coastline as part of the county council's Local Biodiversity Action Plan Program in 2005 (Ecoserve). The study provided detailed information on the status of the coastal habitats and species present. The objectives of these ecological studies were to establish which tidal habitats and associated species were present along the Fingal coastline along with their status, importance and sensitivity to threat. Sites and species of particular ecological interest were also highlighted for future monitoring.

The methodology of these surveys was based on the recording of the marine habitats according to two classification systems 'A Guide to Habitats in Ireland' (Fossitt 2000) and the Marine Nature Conservation Review: marine biotope classification for Britain and Ireland (Connor, et al. 1997).

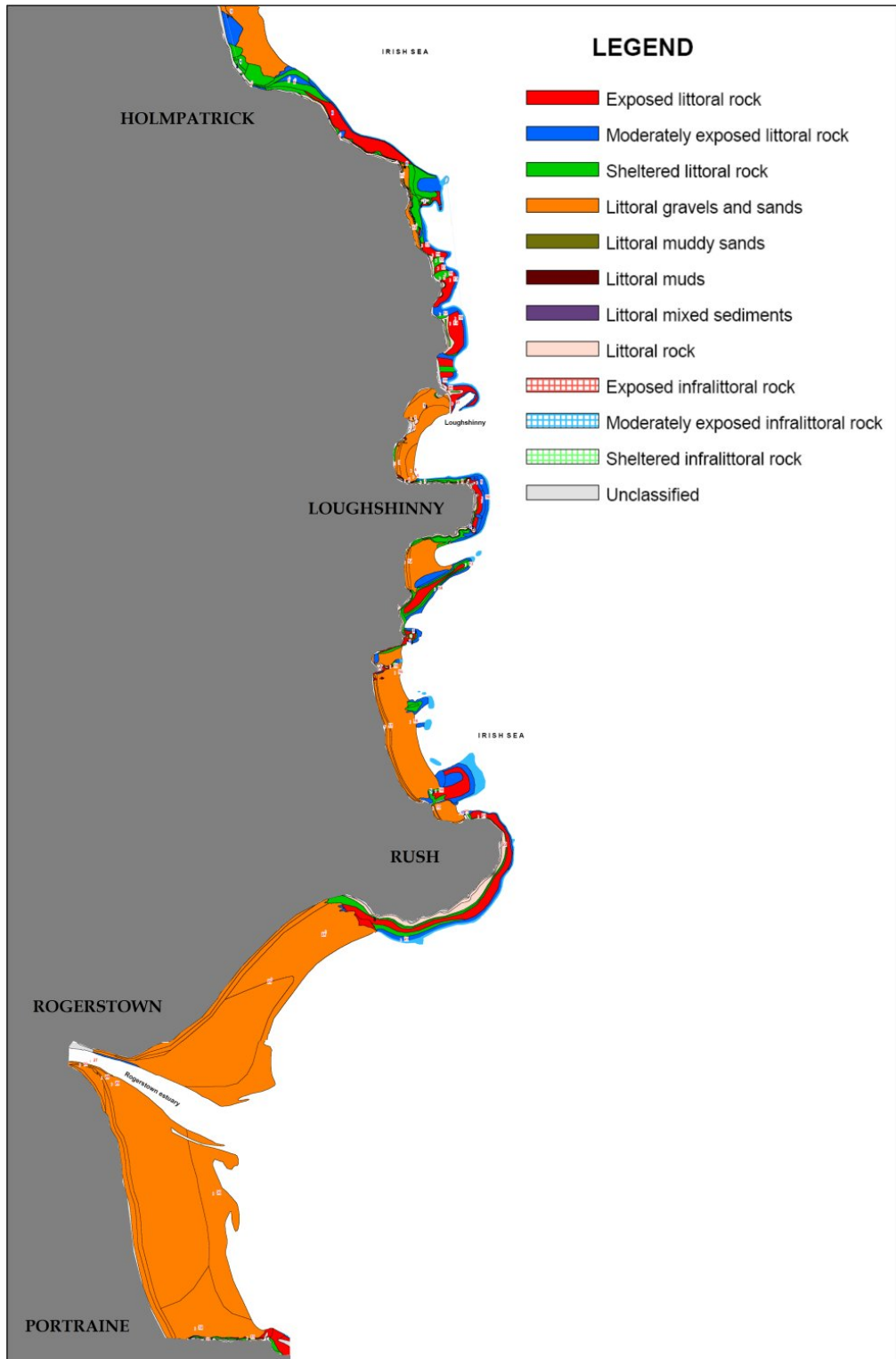
(i) **Northern Marine Outfall Area**

A summary of the main habitat types recorded within the northern marine outfall area are shown in figure 5.10. This shows a succession of both sheltered sandy bays and open exposed sandy beaches punctuated by rocky outcrops and areas of mixed gravel sediments. Macroalgal communities varied through out the area based on the level of rock exposure ranging from exposed to sheltered aspects. The fucoids *Fucus spiralis* and *F. vesiculosus*, along with *Ascophyllum nodosum* and *Laminaria digitatum* were all recorded on the rocks over different exposures, whilst the green algae *Enteromorpha* spp and *Cladophora* spp and coralline algae were recorded in rock pools high up on the shoreline, along with *Verrucaria maura* on the littoral fringe rocks. The upper foreshore was often marked by decomposing seaweeds along the strand-line, generally populated by Talitrid amphipods.

The granular sediments were generally fine sand based although several areas of mixed sands and fine gravels were recorded. Many of these relate to barren sand or gravel habitats devoid of conspicuous fauna, with burrowing amphipods and the lugworm *Arenicola marina* present lower down the shoreline near the low water mark. Other important macro-invertebrate species on the lower shore recorded were the masonry worm, *Lanice conchilega*, *Nephtys* sp and the cockle *Cerastoderma edule*.

In general, moderately exposed or sheltered rock and boulder biotopes are the most 'species rich' habitats (i.e. with the most species) recorded from Fingal. This is because a number of microhabitats are available, creating a range of niches that species can occupy. Coarse mobile sediment biotopes such as barren sand tend to be very 'species poor' (i.e. with the least species) and may be considered a poor habitat. However, muddy estuaries also tend to be species poor but are also among the most productive habitats of the intertidal zone. It is important to note that perceived 'richness' of habitats is based predominantly on natural phenomena and not necessarily an indicator of environmental health.

Habitat and biotopes recorded along this coastline are generally ubiquitous along this part of the Irish coast. The sedimentary bays and, immediately outside the survey areas, estuaries that are uncovered at low tide are protected habitats, and there were a number of specific biotopes of particular note and interest. The honeycomb worm *Sabelleraia alveolata* was recorded in patches in a couple of areas. This is a reef forming species that can create micro-habitats when recorded in high concentrations. Similarly, the presence of extensive beds of *Mytilus edulis*, the common mussel, were also found in the middle to lower shore in Rogerstown estuary, immediately outside the proposed survey area. Mussel beds such as these develop on mud or mixed substrata. The mussels bind the substratum together forming a habitat with a species composition more typical of littoral rock than mud. Both *Sabelleraia* and *Mytilus* can create biogenic reef communities that are protected under the European Habitats directive.



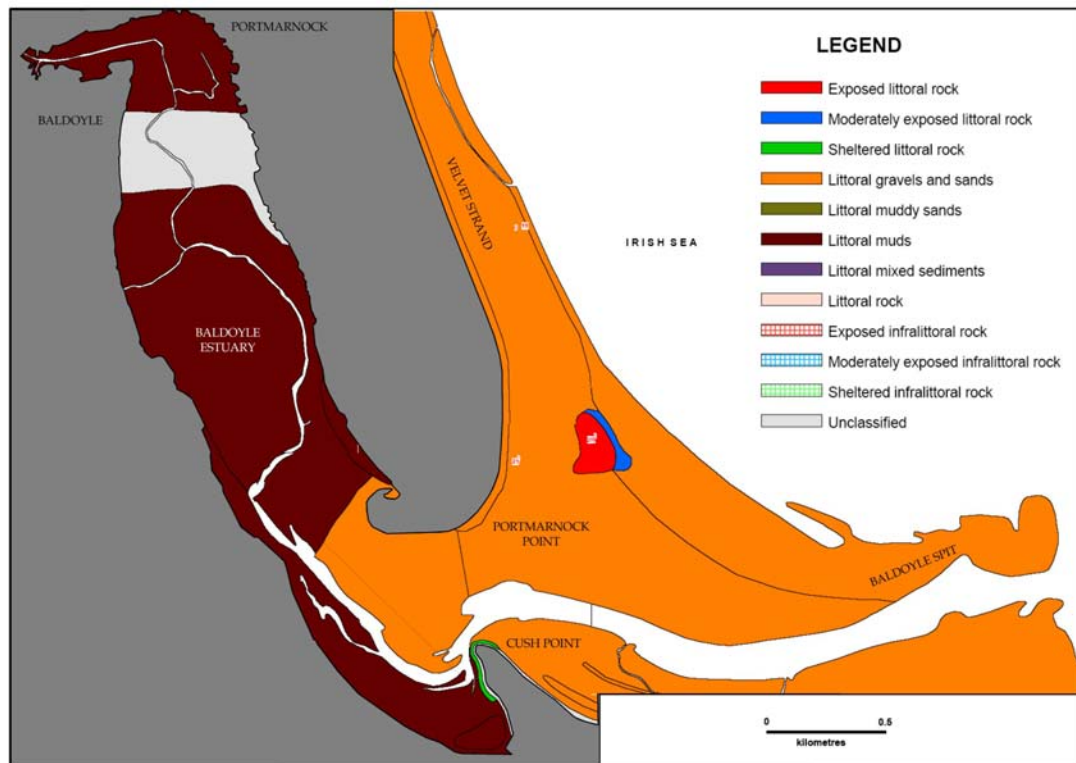
(Source Ecoserve 2005)

Figure 5.10 Intertidal Habitats of Northern Outfall Area

(ii) Southern Marine Outfall area

A summary of the main habitat types recorded within the southern marine outfall area are shown in figure 5.11. These include the Baldoyle Estuary, the Portmarnock

peninsula and open sand flats of the lower estuary. The intertidal habitats are dominated by sedimentary sediments. Heading from north to south, the habitat was dominated by the mason worm *Lanice conchilega* and the bivalve *Donax vittatus* on the lower shore, with a wide zone with burrowing of amphipods and polychaetes (often *Arenicola marina*). Above this the sands were dominated by *Nephtys* sp. and *Angulus tenuis* whilst *Corystes cassivelaunus* were also common. There was also a talitrid zone along the upper shore, which was backed by sand dunes. This extended as far as Portmarnock Point where the shore widened out. On the mid-shore here, there was a patch of rock supporting *Mytilus edulis* and the rhodophyte (red weed) *Osmundea pinnatifida* with coralline rockpools (*Corallina officinalis*).



(Source Ecoserve 2005)

Figure 5.11 Intertidal Habitats of Southern Marine Outfall Area

Inside the Portmarnock Point peninsula is the Baldoyle Estuary. The habitat here was typical for a low energy sedimentary basin with a muddy shore in the upper reaches grading to fine sands towards the mouth of the estuary. In the sheltered muddier sections of the estuary, the sediments are expected to support communities of polychaete worms (*Hediste diversicolor*, *Nephtys hombergii*, *Pygospio elegans*), bivalve molluscs (*Macoma balthica*, *Scrobicularia plana*, *Cerastoderma edule*, *Mya arenaria*), mud snails (*Hydrobia* spp.) and amphipod crustaceans (*Corophium* spp.). Patches of burrowing amphipods and polychaetes on clean sands were recorded on the upper shore and *Lance conchilega* occurred on the mid-shore in a long band adjacent to the channel. On the western shore within Baldoyle estuary, the sediment is somewhat muddier with cobbles and pebbles. Here there was a patch of *Salicornia* sp. and other salt marsh species in the far corner of the estuary along with *Corophium volutator*. This graded into *Fucus vesiculosus* and ephemeral green and red seaweeds at the tip of Cush point before the sediment grades into the fine sand biotopes.

There were significant beds of *Zostera noltii*, the dwarf eelgrass in the Baldoyle estuary near the saltmarsh community. While not a specifically protected species itself, *Zostera noltii* is one of the few intertidal flowering plants that are actually fully submerged at high tide. It is an important source of food for migrating birds and is considered sensitive to pollution including smothering by excessive siltation and reduced photosynthesis due to increased water turbidity.

(c) **Offshore Marine Ecology**

Benthic organisms are those that inhabit the seabed, comprising infauna (those living in or burrowing beneath the sediment) and epifauna (living on the sediment or rock surfaces). Diversity and abundance of benthos varies as a consequence of physical factors such as water depth, and sediment characteristics, of which particle size and organic content are key variables. Certain species of benthic invertebrates associate with each other, forming recognisable groupings or communities. General benthic communities in the Irish Sea have been mapped by Mackie (1990), based on sampling of the infauna. In addition, Ellis et al. (2000) sampled numerous stations across the Irish Sea using beam trawls to determine the demersal assemblages (fish and invertebrates associated with the seabed, including epifauna) present. Key communities recorded in the shallow waters expected for the proposed marine outfall are listed below:

- The Shallow Venus community, which occurs in shallow (5–40m) near-shore high energy sands, is often regarded as having two sub-communities: the *Tellina* subcommunity (in fine stable sands; typical species include the bivalve *Fabulina fabula* and polychaete *Magelona mirabilis*) and the *Spisula* sub-community (medium to coarse sands; including the bivalve *Spisula elliptica* and polychaete *Nephtys cirrosa*).
- The *Abra* community also occurs inshore in small pockets in shallow (5–30m) nearshore muddy sands/muds with rich organic contents. Typical species include the bivalve *Abra alba* and polychaete worm *Pectinaria koreni*.
- According to Ellis et al. (2000), the *Pleuronectes-Limanda* demersal fish assemblage was recorded in Irish inshore waters relatively close the area of the marine outfall This assemblage is dominated by flatfish (plaice, dab, Dover sole *Solea solea* and solenette *Buglossidium luteum*) and starfish *Asterias rubens* and *Astropecten irregularis*.

The Inshore section of the East West Interconnector was surveyed within the northern outfall area in the spring 2008 (Fugro Environmental 2008) using underwater video and still photography. A description of the communities found was largely limited to an assessment of visible epifauna from seabed imagery photography. In general, these communities were restricted to coarser sediments, and were dominated by colonial species such as *A. digitatum* (dead men's fingers), hornwrack (*Flustra foliacea*), Ross coral *Pentapora fascialis* and several species of sponge The starfish *Asterias rubens* was also prominent whilst other echinoderms species *Crossaster papposus* *Henricia oculata* and *Luidia ciliaris*, were also occasionally recorded. In certain coarse sediment areas, dense beds of the brittlestar *Ophiothrix fragilis* were also observed; these can be important areas for benthic productivity and as feeding grounds for fish, including commercial species.

A small number of epifaunal taxa associated with finer sediment areas were recorded, such as the sea pen *Virgularia mirabilis*, hermit crabs (order Paguroidea), brittlestars (*Ophiura* sp. and *Amphiura* sp.) and occasionally the heart urchin *Spatangus*

purpureus. Subtidal data acquired for the SensMap project indicated that the near-shore habitat were characterised by the heart urchin *Echinocardium cordatum*, and razor clam *Ensis* spp.

Macroinvertebrate communities recorded by grab sampling in 2008 (Fugro Environmental 2008), found that in coarser sediments, polychaetes appeared to dominate, with both *Nephtys* and *Glycera* being recorded along with tubicolous species such as *Chaetopterus variopedatus* and *Lanice conchilega*; many of which were already recorded within the inter-tidal zone. Alongside the polychaetes there was a reasonably diverse range of molluscs (such as the dog cockle *Glycymeris glycymeris*, the tellin *Abra prismatica* and nut shells *Nucula* sp.) and amphipod crustaceans.

The silt and clay habitats of the deeper waters outside the area of the proposed outfall were also polychaete dominated, with high densities of terrebellomorphs recorded from some areas and again the errant predators *Nephtys* sp. and *Glycera* sp. seen throughout these habitat types. Also prominent, if less evenly distributed, were spatangoid urchins (predominantly *Brissopsis lyrifera*), the Norwegian lobster *Nephrops norvegicus* and the crab *Goneplax rhomboides*.

(d) **Marine Mammals**

Marine mammals found in the vicinity of the two proposed marine outfall locations mainly comprise of the following:

- Cetaceans (whales, dolphins and porpoises); and
- Pinnipeds (seals).

Several species of cetacean have been recorded from the Irish Sea (Reid *et al.*, 2003), including the following:

- Harbour porpoise *Phocoena phocoena*,
- Bottlenose dolphin *Tursiops truncatus*,
- Risso's dolphin *Grampus griseus*,
- Minke whale *Balaenoptera acutorostrata*.

By far the most common of these cetacean species recorded in the proposed outfall area is the harbour porpoise. A survey of Harbour porpoises was undertaken in the summer of 2008 in North Dublin Bay (Berrow *et al.*, 2008). This overlaps significantly with the proposed survey of the North outfall options, but north of the Southern area. Results recorded a total of 111 individuals from 6 boat transects covering 293km of track starting from below Lambay Island to the north of the Skerries (see Figure 5.12).

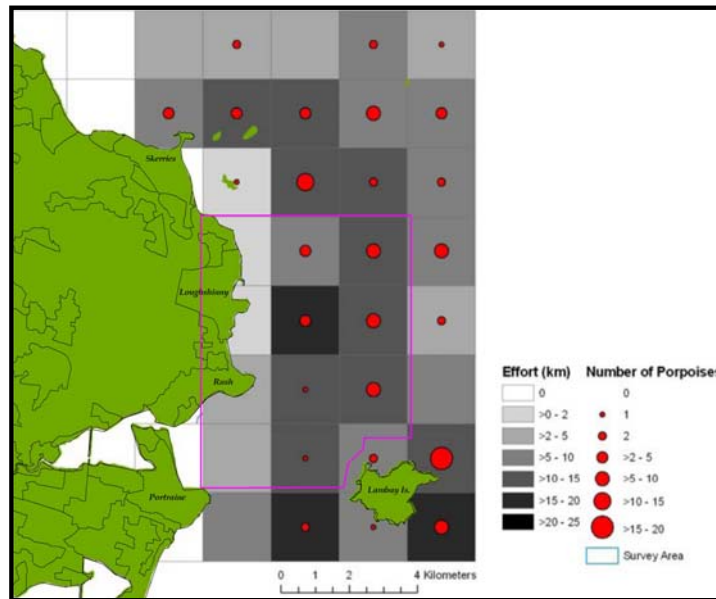


Figure 5.12 Map of North County Dublin with effort and harbour porpoise sightings shown within a 2km² grid (Berrow et al., 2008)

Further observations of harbour porpoises were recorded near Lambay Island, along with the addition of bottlenose dolphins near the Skerries Islands, during the geophysical surveys as part of the East West Interconnector in December 2007 through to February 2008 (Coppock, 2008).

Two species of seal occur commonly in the area: the common seal *Phoca vitulina* and the grey seal *Halichoerus grypus*. The only breeding colony of grey seals on the east coast of Ireland is found on Lambay and Ireland's Eye Islands close to both of the proposed Marine outfall locations in the North and South. A survey of this seal population undertaken in 2005 (Cadhla et al., 2005), recorded a total of 58 pups born between mid-September and late November of that year. The total grey seal population was estimated to be between 203 to 263 equivalent to around 3.7% of the entire population in the republic of Ireland. The majority of breeding was recorded on Lambay Island, responsible for 93% of the pup count for these islands. Lambay Island, south-east of the proposed outfall location has been designated an SAC as a result. The average grey seals breeding season here is from September to November (NPWS, 2007).

In addition to cetaceans and pinnipeds, the otter *Lutra lutra* may be found in shallow intertidal areas of the marine environment (such as estuaries), particularly during winter. To the north of the northern proposed outfall area, the River Boyne is designated as an SAC partly on the basis of the presence of otters there. As such, otters may reasonably be expected to occur occasionally in the area; however, they are unlikely to be found on exposed sandy beaches, preferring rocky coastlines.

(e) Commercial and Recreational Fisheries

Information on the commercial fisheries operating in the area of the proposed marine outfall locations has been collated from a variety of sources. This includes a regional assessment carried out by Brown and May Marine Limited for the East West Interconnector in 2008, regional fisheries datasets and information supplied by local fishermen during submissions after the SEA for this proposed development.

Fishing activity in the Irish inshore section is from vessels targeting razor clams (with the majority also able to target cockles) and those operating static gear, specifically potting for crab and lobster. Razor clam vessels active in the area are from Irish ports between Dundalk in the north, down to Howth in the south, and number more than 30. In addition to the razor clam fishery, there are a small number of local boats who target shellfish within the proposed northern outfall location that operate throughout the year for different gears (advice from Irish sea Fisheries Board). These are summarised in Table 5.4 and in Figure 5.13:

Table 5.4: Summary of Local Shellfish Fisheries in Northern Fingal

Species	No. of Boats	Season
Brown (Edible) Crab (<i>Cancer pagurus</i>)	4	June to December
Velvet Swimming Crab (<i>Necora puber</i>)	11* 4	All year : These boats fish brown crab later in the summer and velvets for only part of the season
European Lobster (<i>Homarus gammarus</i>)	4-5	All year round
Razor Clam (<i>Ensis sp.</i>)	Unknown	October to April
Shrimp (<i>Palaemon serratus</i>)	4	September to February

* All of the boats that target velvet crab would also have a bi-catch of lobster and brown crab.

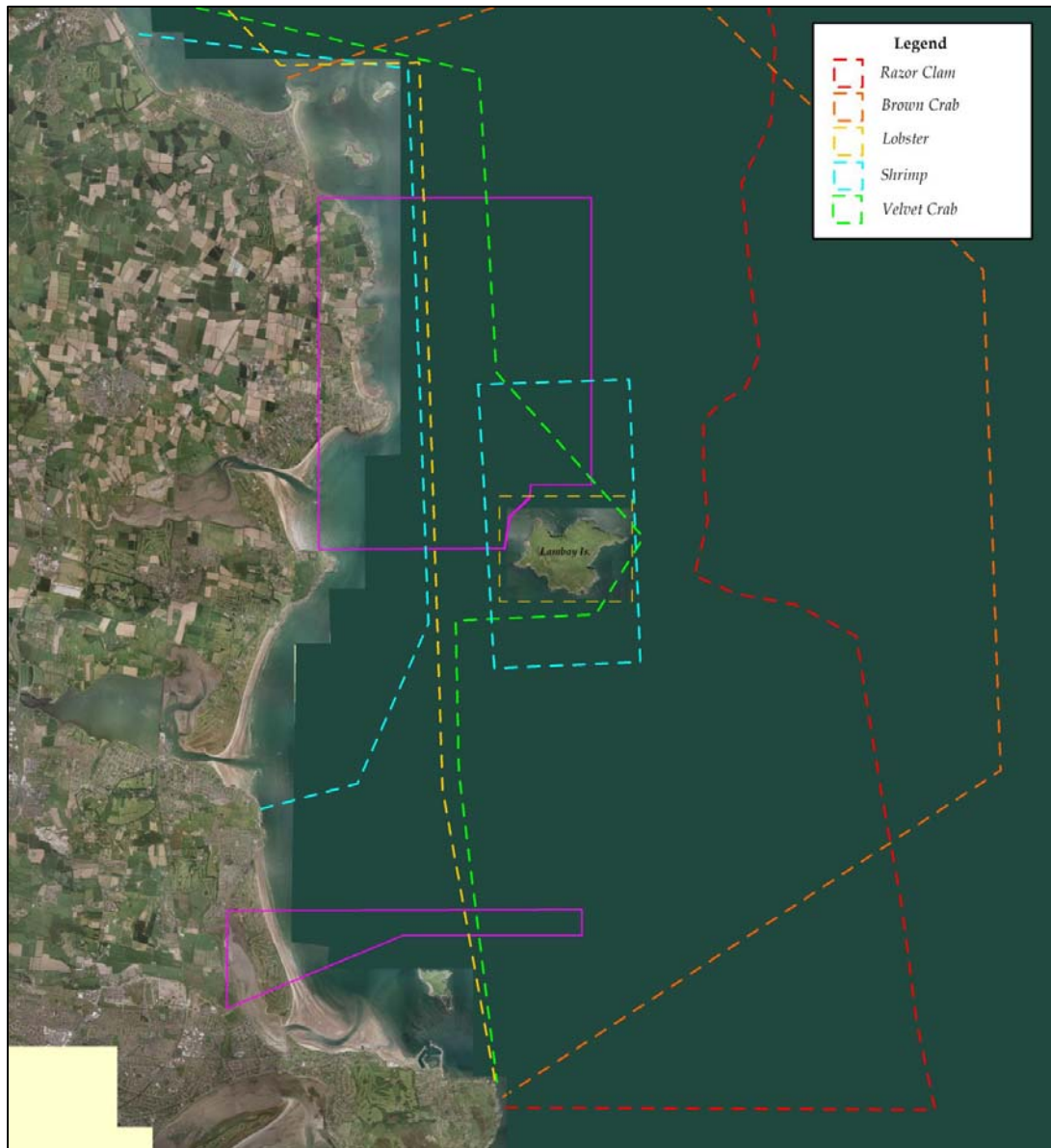


Figure 5.13 Inshore Shellfish Fishing Grounds along the Fingal Coast

Dredging is restricted inshore (as defined by the SFPA). However, fishermen have previously stated that the activity often occurs in grounds in between designated dredging sites. As the activity is mostly concentrated in small areas, the result is that the seabed can be excavated to depths of 30cms which could pose a significant interaction risk to the proposed outfall route.

(f) Recreational Fisheries

Another important fishery in the region is that of recreational fishing. Angling is very active along the Fingal coastline with fishing from beaches, harbours, piers, and from boats both close to shore and offshore over wrecks and reefs (Ecoserve 2006). Balbriggan, Skerries, Loughshinny and Rush are all boat angling venues, where small boats can be launched to fish around Lambay Island (3 miles to the south east) and over Rockabill grounds. Species caught include spurdog, ray, conger, dogfish, dab, codling, whiting, pollack, coalfish, wrasse and an occasional ling and tope. Balbriggan, Skerries and Loughshinny are also good shore angling locations and have recorded catches of mullet, mackerel (in season) and flatfish, whilst bass can be caught off the beach at Rush following an easterly blow. Small boats can be launched at Balbriggan to fish the Cardy Rock area and the grounds out to and around the Rockabill Lighthouse. Codling, dogfish, dab, spurdog, whiting, pollack and wrasse are the most common species.

Towards the southern area, in Howth Harbour at the East and West Pier, whiting, pollack, coalfish and codling can be caught during summer and autumn. Small boats can be launched for general ground fishing around Ireland's Eye and on the Kish Bank. Species to be expected are coalfish, pollack, whiting, dogfish, mackerel and flatfish. To the East of the harbour is Balscadden Rocks where rock fishing takes place for mackerel (in season), plaice, dabs, dogfish, pouting, whiting and codling. At the Baily, mackerel (in season), coalfish, plaice, dab, dogfish, wrasse and whiting have been recorded. At Red Rock in Sutton, bass and flatfish have all been recorded.

The Velvet Strand in Portmarnock is a shore angling venue. Around the Martello Tower occasional bass and flounder can be fished for from the rocks. Along the strand itself, distance casting will also produce dogfish and occasional codling and whiting in the autumn.

(g) Estuarine Fisheries

Many species avail of the highly productive nature of many estuaries and their use will vary with the seasons. Some fish species can be found in the estuaries the whole year round. Other fish are migratory, travelling through estuaries from the sea to reach spawning grounds in freshwater, such as salmon and lamprey, while others, such as eel, migrate down estuaries to the sea. The proposed outfall locations are close to the Rogerstown estuary in the North and the Baldoyle Estuary forming part of the southern proposed outfall area. Between the two is the Malahide, Broadmeadow estuary. A total of 24 species or taxa were recorded, from this and the Rogerstown estuary by King & Green in 2003. A summary of these is listed in Table 5.5 annotated with their status within this water body. These are broken down as:

- ER: estuarine residents - species considered to spend all, or the majority of, their life cycle in the estuary,
- MJ: marine juveniles - marine fish that have residency in an estuary as juveniles but may spend the rest of their life cycle at sea.
- MS: marine seasonal - species that move into estuaries on a seasonal basis and may not be present all year round (unlike the Marine Juveniles)
- MA: marine adventitious - functional group reflects an opportunistic or haphazard movement from the marine area into coastal or estuarine waters.

- CA: catadromous fish - those that spend part of their life cycle in fresh water and part at sea. Thus fish of this group use estuaries as a transit route between river and sea.

Table 5.5: Fish Recorded in Rogerstown and Broadmeadow Estuaries (King and Green 2003)

Species	Common Name	Functional
<i>Patichthys flesus</i>	Flounder	ER
<i>Gobio spp.</i>	Goby species	ER
<i>Spinachia spinachia</i>	15-spined stickleback	ER
<i>Myxocephalus scorpius</i>	Short-spined sea scorpion	ER
<i>Syngnathus sp.</i>	Pipefish	ER
<i>Pholis gunnellus</i>	Butterfish	ER
<i>Agonus cataphractus</i>	Hooknose or Pogge	ER
<i>Pleuronectes platessa</i>	Plaice	MJ
<i>Atherina presbyter</i>	Atherine	MJ
<i>Dicentrarchus labrax</i>	Bass	MJ
<i>Pollachius pollachius</i>	Pollack	MJ
<i>Gadus morhua</i>	Cod (codling)	MJ
<i>Spondylisoma cantharus</i>	Black Sea Bream	MJ
	Sprat / Herring	MS
<i>Crenimugil labrosus</i>	Thick-lipped grey mullet	MS
<i>Liza auratus</i>	Golden mullet	MS
<i>Ciliata mustela</i>	5-bearded rockling	MS
<i>Labrus bergylta</i>	Ballan wrasse	MA
<i>Blenius gattoruginae</i>	Tompot Blenny	MA
<i>Scyliorhinus caniculus</i>	Lesser-spotted dogfish	MA
<i>Ammodytes tobianus</i>	Sandeel	ER/MA
<i>Liza ramada</i>	Thin-lipped grey mullet	CA
<i>Gasterosteus aculeatus</i>	3-spined stickleback	CA
<i>Anguilla anguilla</i>	Eel	CA

(h) Migratory and Protected Fish

All three species of lampreys (Petromyzonidae) that occur in Ireland are listed under Annex II of the EU Habitats Directive, and Kelly and King (2001) summarised their distribution in Irish waters. While the brook lamprey *Lampetra planeri* is recorded from the Boyne and Liffey catchments (to the north and south of the proposed outfall locations, respectively), this species is exclusively found in freshwater. The river lamprey *Lampetra fluviatilis*, which is anadromous (i.e. uses coastal/marine habitat and then ascends rivers to spawn), are the least widely reported of the three species in Ireland, although it is recorded from the lower Boyne river to the north, contributing to its SAC status. The sea lamprey *Petromyzon marinus* is also anadromous and this species is more widely distributed in Ireland, although it is not recorded in the Boyne or the Liffey catchments (Kelly and King, 2001). Shad are related to herring, and are also anadromous; both the allis *Alosa alosa* and twaite shad *A. fallax* occur in Ireland and are designated as Annex II species. Four SACs in Ireland have been designated based on their importance to shad, although these are all in the south of the country (King and Roche, 2008); shad are apparently not known as being regularly recorded in the area of the proposed outfall locations. Smelt *Osmerus eperlanus*, an anadromous Irish Red Data book species, has not apparently been recorded from the east coast of the Republic of Ireland (Quigley et al., 2004).

Both salmon (*Salmo salar*, an EU Habitats Directive Annex II species) and sea trout (*Salmo trutta*) are anadromous and occur in rivers and coastal waters throughout Ireland. Both species are of great importance to recreational and commercial fisheries. The inshore areas of the proposed marine outfall are likely to be used by both species, given that important rivers exist relatively nearby: for example, the River Boyne, to the north of the proposed outfall locations, is designated an SAC partly based on the presence of salmon and is renowned as a salmon and sea trout fishing river.

(i) Designated Sites and Protected Areas

The Habitats (92/43/EEC) and Birds (79/409/EEC) directives are of fundamental importance for the management of coastal areas. Under these Directives responsibility is delegated to Member States to designate Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) to protect habitats and species.

The two proposed marine outfall areas have different exposure to designated sites or sites of scientific interest both directly, impacted by near-field effects or by neighbouring proximity where they may be impacted by far-field effects. A listing of these possible interactions along with a description of the principal and/or qualifying features (such as habitats and species) relevant to the proposed development in marine and intertidal waters is discussed in Table 5.6.

Table 5.6: Designated Coastal Sites in Fingal Relative to the Two Proposed Outfall locations

Designation	Code	Description	Qualifying habitats and/or species
Northern Marine Outfall Area			
SPA, Ramsar & pNHA	4015	Rogerstown Estuary	10 bird species
SPA & pNHA	4069	Lambay Island	7 bird species
SPA	4122	Skerries Islands	4 bird species
SPA & pNHA	4014	Rockabill	not specified
pNHA	1215	Portraine Shore	Rocky bedrock shore with a typical flora and fauna. Important geological site.
pNHA	205	Malahide Estuary	Not specified
pNHA	2000	Loughshinny Coast	Green-winged Orchid (<i>Orchis morio</i>), Black Bog-rush (<i>Schoenus nigricans</i>) and rushes (<i>Juncus</i> spp.).
pNHA	1218	Skerries Islands	Sea birds
SAC	204	Lambay Island	1230 and seals <i>Phoca vitulina</i> & <i>Halichoerus grypus</i>
SAC	208	Rogerstown Estuary	1130, 1140, 1310, 1330, 1410, 2120, 2130,
SAC	205	Malahide Estuary	1140, 1310, 1320, 1320, 1410, 2120
Southern Marine Outfall			
SPA & Ramsar	199	Baldoyle Bay	5 bird species + wetlands
SPA	2193	Ireland's Eye	3 bird species
SPA	4113	Howth Head Coast	1 bird species
SPA	4006	North Bull Island	14 bird species + wetlands
SPA & Ramsar	4025	Broadmeadow/Swords estuary	
SAC & pNHA	199	Baldoyle Bay	
NHA	203	Ireland's Eye	1220, 1230
SAC & pNHA	202	Howth Head	1230
SAC & pNHA	205	Malahide Estuary	1140, 1310, 1320, 1330, 1410, 2130
SAC & pNHA	206	North Dublin Bay	1140, 1310, 1330, 1410, 2110, 2120, 2130, 2190 and Plant: <i>Petalophyllum ralfsii</i>
Near-field	Far-field	none	Expected interaction with project or area

A summary of the SAC, SPA and pNHAs is outlined below for the two outfall locations along with the expected interaction with the proposed survey areas (e.g. a near-field interaction means that the two areas are coincident or the designated species may partially inhabit the proposed area; far field interactions means that protected species would pass through the proposed area but would not necessarily be affected. Figure 5.2 shows the designated sites relative to the two proposed outfall locations.

Details of some of these designated sites are as follows:

Rogerstown Estuary

Rogerstown Estuary is a relatively small, narrow estuary immediately south of Rush and is designated as a Ramsar, candidate SAC and SPA site. It is an important winter waterfowl site, supporting internationally important populations of Brent geese, with

another 14 species at nationally important levels, including greylag goose, shelduck, shoveler, oystercatcher, lapwing and redshank.

Rockabill

Rockabill SPA (north-east of the landfall) consists of two small, low-lying islets around 7km off the coast and is one of the most important tern colonies in Europe, with, for example, 75% of the entire north-western European population of roseate terns. The area also supports a nationally important population of black guillemot.

Skerries Islands

The Skerries Islands (north of the landfall) are a group of three small, uninhabited islands situated between 0.5km and 1.5km off the coast, and are designated as an SPA based on their importance both to breeding seabirds and wintering waterfowl. Breeding colonies of cormorant, shag, herring gull and great black-backed gull are of national importance; wintering waterfowl includes internationally important numbers of Brent geese and nationally important numbers of cormorants, purple sandpiper and turnstone.

Lambay and Ireland's Eye Islands

Lambay and Ireland's Eye Island SPA and SAC is approximately 4 and 1km off the coast, respectively. They are important for seals, in particular Lambay, and supports a high diversity of breeding seabirds including internationally important populations of cormorant, shag, razorbill and guillemot, and several other species of national importance. It also has the largest colony of puffin and the only colony of Manx shearwaters on the east coast of Ireland. It also supports a nationally important number of wintering greylag geese. Lambay Island supports the main breeding colony of grey seals on the east coast of Ireland.

Rush Bay North Beach (Carlyan Rock)

The intertidal rocky platform to the south of the cable landing area has been used extensively by students from University College Dublin, amongst other universities, as a site for numerous scientific experiments. These experiments tend to focus on the exclusion of certain species (such as algal grazers or predators) from small areas of the rock to investigate such effects on the other species present. Long term monitoring of the abundance of various species also takes place. It is understood that an application is being made to designate the site as a Scientific Exclusion Zone, with members of the public being encouraged not to collect animals from the site.

Baldoyle Estuary

Baldoyle Estuary is an enclosed narrow mud-prone estuary immediately east of the Portmarnock peninsula, within the landward area of the southern marine outfall. This estuary is designated as a Ramsar, candidate SAC and SPA site.

Designated Shellfish Waters

Article 5 of the Shellfish Directive (2006/113/EC) and section 6 of the Quality of shellfish Waters Regulations (S.I. No. 268 of 2006) requires the development of Pollution Reduction Programmes (PRPs) for designated shellfish areas in order to support shellfish life and growth and to contribute to the high quality of directly edible shellfish products. Shellfish PRPs relate to bivalve and gastropod molluscs, including oysters, mussels, cockles, scallops and clams. They do not cover shellfish crustaceans such as crabs, crayfish and lobsters.

The objectives of Shellfish PRPs are:

- To protect or improve water quality in designated shellfish areas;

- Achieve compliance with water quality parameter values outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedules 2 and 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006);
- Determine the factors responsible for any non-compliances with the water quality parameter values; and
- Ensure that implementation of the Shellfish PRPs does not lead, directly, or indirectly, to increased pollution of coastal and brackish waters.

These regulations also places an obligation on every public authority to perform its functions in a manner that promotes compliance with the Directive and the Regulations, and to take such actions as are necessary to ensure compliance with the Directive and the Regulations and with the Shellfish PRPs.

Neither of the two proposed marine outfall areas are located in designated shellfish waters, although hydrodynamic modelling of outfall plume dispersion would have to identify the presence of far-field effects once the final proposed outfall location has been established. The neighbouring shellfish designated areas are that of Malahide and Balbriggan/Skerries.

(i) Coastal Water Quality and Bathing Beaches

Since the mid-1990s, the majority of water quality investigations have focused on eutrophication in coastal waters around Ireland. The data have been captured by the regulatory bodies, the Marine Institute (formerly Department of the Marine), and the Irish Environmental Protection Agency. Most of the data were collected as part of rolling programmes and, weather and operational demands permitting, were planned to monitor inter and intra-annual changes and trends.

In general, water quality in the Irish Sea is good. Point source inputs have been addressed since the early 1990s and now regions of concern (such as Dublin Bay) are largely a consequence of diffuse inputs from urbanised/industrialised localities. The significant investment in “first-time” or enhanced waste water treatment has improved conditions vastly not least with respect to “bathing water” quality. Most designated sites in Ireland regularly pass the mandatory standards with many achieving compliance with the more stringent guideline values. The coastal waters in the vicinity of the proposed outfalls are reported by the Environmental Protection Agency to be unpolluted only in the north (www.epa.ie).

The 1976 EC Bathing Water Directive (76/160/EEC) requires member states to identify popular bathing areas and to monitor water quality at these bathing waters throughout the bathing season. In Ireland, results for 2007 showed that 127 of the 131 bathing areas (97%) complied with the minimum mandatory standards, whilst 105 of the 131 bathing areas (80%) complied with the much stricter EU guideline standards. Long-term trends in compliance with mandatory standards have been towards improved water quality while compliance with the stricter guide values has fluctuated between 79 and 92 per cent. With the exception of the Burrow Strand, located south of the southern outfall location, the remaining seven stations all indicated good annual water quality for the 2010 season. Monitoring covers the bathing season that normally extends from 1st June until the 15th September each year. Monitoring commences two weeks before the start of the season with a minimum of seven samples taken over the period.

In 2006, 81 beaches throughout Ireland were awarded Blue Flag status. This represents just 62 per cent of bathing areas designated under the bathing water regulations in Ireland. Currently (2011) only two beaches (Portraine and Portmarnoch

(Velvet Strand)) located within the proposed outfall areas currently have Blue Flag status (see Figure 5.14).

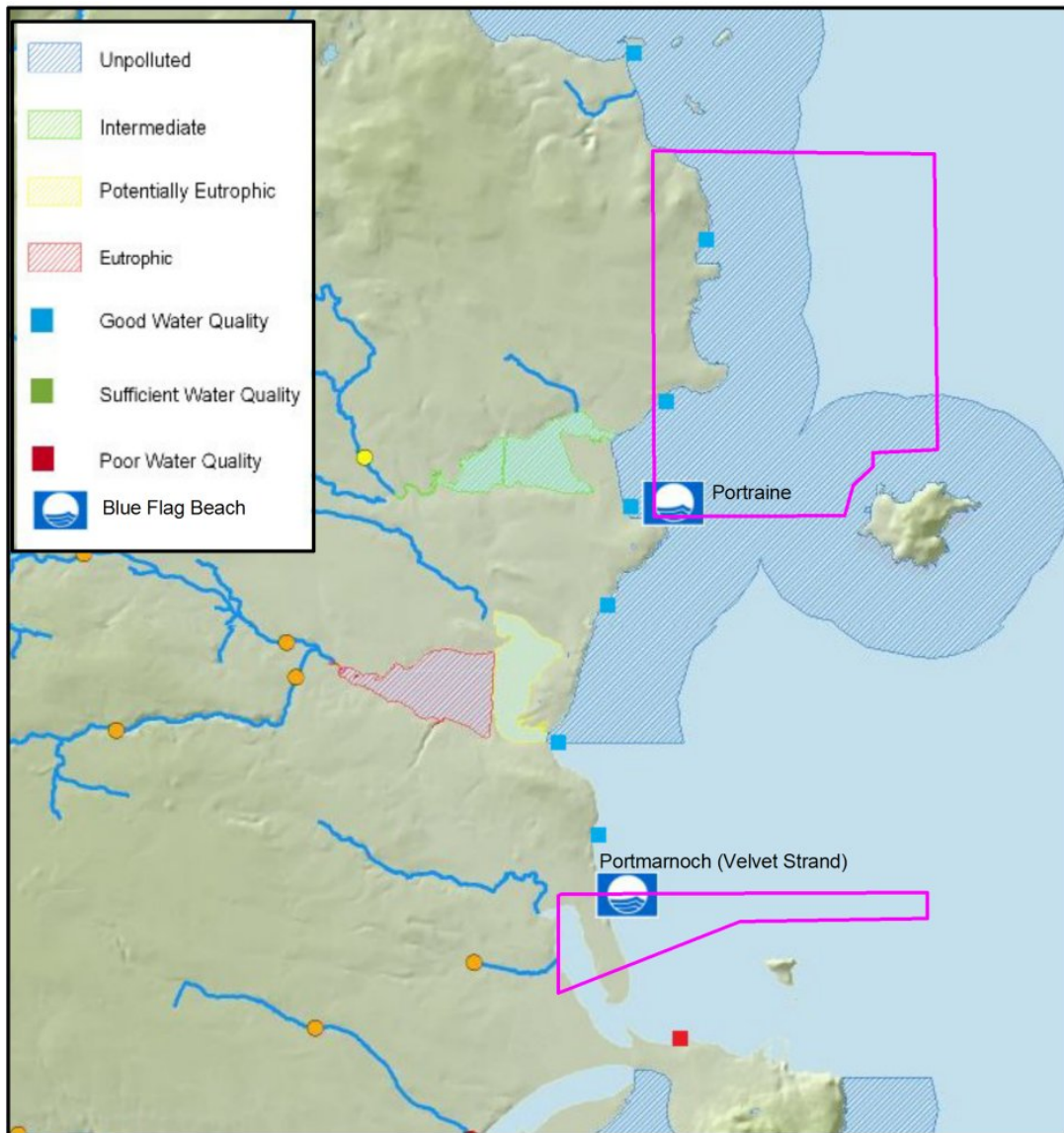


Figure 5.14 Summary Map of Coastal Water Quality and Blue Flag beaches with respect to Proposed Marine Outfall Locations (www.epa.ie)

5.3.5 Avian Ecology

(a) Designations for Birds of Fingal County

Special Protection Areas

SPAs are designated for the protection of internationally important populations of birds. Legal backing for SPAs is provided by EU Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna ('Habitats Directive'), which supersedes EU Directive 79/409/EEC on the Conservation of Wild Birds ('Birds Directive'; 79/409/EEC) under which they were initially designated, as implemented in Ireland by the Conservation of Wild Bird Regulations (S.I. 291 of 1985).

There are nine SPAs in north County Dublin; with the potential 'zone of influence' of the proposed project (see Figure 5.2). Details of these sites are presented in Table 5.7. Impacts on any SPAs outside this geographical area are considered highly unlikely however this will be determined through the Appropriate Assessment process under the requirements of Article 6 of the EU Habitats Directive.

The features of interest of the SPA's reflect the two most important ornithological features of the area: breeding seabirds on islands and headlands; and wintering waders and wildfowl on estuaries and coastal mudflats (see also Sections 5.3.5 (b) and 5.3.5 (c)).

Table 5.7: Special Protection Areas in north County Dublin and Their Main Features of Interest

SPA Name and Site Code	Main Features of Interest
Rogerstown Estuary (004015)	Wetlands and Waterbirds; wintering waders and wildfowl (Brent Goose, Greylag Goose, Shelduck, Shoveler, Oystercatcher, Ringed Plover, Grey Plover, Knot, Black-tailed Godwit, Redshank)
Malahide Estuary (004025)	Wetlands and Waterbirds; wintering waders and wildfowl (Great Crested Grebe, Brent Goose, Shelduck, Pintail, Goldeneye, Red-breasted Merganser, Oystercatcher, Ringed Plover, Grey Plover, Knot, Black-tailed Godwit, Bar-tailed Godwit, Redshank)
Baldoyle Bay (004016)	Wetlands and Waterbirds; wintering waders and wildfowl (Brent Goose, Shelduck, Ringed Plover, Grey Plover, Knot, Black-tailed Godwit)
North Bull Island (004006)	Wetlands and Waterbirds; wintering waders and wildfowl (Brent Goose, Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Grey Plover, Knot, Sanderling, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone)
Rockabill (004014)	Breeding Seabirds (Roseate Tern, Common Tern, Arctic Tern, Black Guillemot)
Skerries Island (004122)	Breeding Seabirds (Shag); wintering birds (Brent Goose, Sanderling, Turnstone)
Lambay Island (004069)	Breeding Seabirds (Fulmar, Shag, Kittiwake, Guillemot, Razorbill, Puffin); wintering waders and wildfowl (Greylag Goose)
Ireland's Eye (004117)	Breeding Seabirds (Kittiwake, Guillemot, Razorbill)
Howth Head Coast (004113)	Breeding Seabirds (Kittiwake)

(i) Natural Heritage Areas

Natural Heritage Areas (NHAs) are protected under Irish national legislation, the Wildlife (Amendment) Act of 2000.

Skerries Islands Natural Heritage Area (site code 001218) is the only fully transmitted NHA in Co. Dublin (See: <http://www.npws.ie/mapsanddata/>), however no further details of the designation are available on the NPWS website (www.npws.ie). The boundaries of the site are the same as those of Skerries Islands SPA and no Special Area of Conservation (SAC) designation exists at the site, implying that the site's birds are the main feature of interest. It is therefore assumed that the rationale behind the NHA designation corresponds to that of the SPA designation, namely, breeding Shag and other seabirds; and wintering Brent Goose, Purple Sandpiper, Turnstone and other bird species.

(ii) Proposed Natural Heritage Areas

Prior to the Wildlife (Amendment) Act of 2000, NHAs were designated under The Wildlife Act of 1976, however these designations were found to be illegal under challenge from landowners. While the stated aim of the Irish government is to 're-designate' all of the former NHAs under the 2000 Act, this process is not complete and a large number of the former NHAs remain undesignated under the 2000 Act. These sites are termed 'proposed Natural Heritage Areas' (pNHAs). In terms of ecological assessment, pNHAs are usually considered to be sites of National Importance.

Whilst these pNHA sites have no definitive legal backing at present², it is a stated objective of Fingal Development Plan 2011 – 2017 to protect pNHAs in the same manner as other sites on National Importance such as Natural Heritage Areas (see Section 5.3.2 (a) (ii)); Refuges for Fauna (see Section 5.3.5 (a) (v)) and Statutory Nature Reserves (see Section 5.3.5 (a) (iv)). The relevant Objectives of Fingal Development Plan 2011 – 2017 are as follows:

Objective BD15, to: "Protect the ecological integrity of proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I habitats";

Objective BD16, to: "Ensure that development does not have a significant adverse impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Annex I habitats, and on rare and threatened species including those protected by law and their habitats."; and

Objective BD17, to: "Ensure ecological impact assessment is carried out for any proposed development likely to have a significant impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Annex I habitats, or rare and threatened species including those species protected by law and their habitats. Ensure appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment."

There are thirteen pNHA sites in north County Dublin. Details of these sites and of their ornithological importance are presented in Table 5.8.

² Under Section 123A (1) (g) of the new Planning and Development (Amendment) (No. 3) Regulations (SI No 476 of 2011); in situations where a state authority proposes to carry out a sub-threshold (for EIA) development, but impacts on *inter alia* pNHAs are likely, then an EIA is required.

Table 5.8: Proposed Natural Heritage Areas (pNHAs) in North County Dublin and their Ornithological Importance

Name of pNHA and (former) site code	Ornithological Interest	Possible Impacts on ornithological interest of the pNHA
Rockabill Island (000207)	Corresponds with <i>Rockabill</i> SPA but does not include marine areas surrounding the island (see Section 5.3.5 (a) (i)).	See <i>Rockabill</i> SPA; Section 5.3.5 (a) (i)
Rogerstown Estuary (000208)	Corresponds closely with <i>Rogerstown Estuary</i> SPA (see 5.3.5 (a) (i)) but extends further inland from the high tide mark than the SPA in several locations.	See <i>Rogerstown Estuary</i> SPA; 5.3.5 (a) (i)
Portrane Shore (001215)	The site is primarily designated for its coastal flora, fauna and geology. The Site Synopsis states that “Turnstones, Oystercatchers and Curlew feed along the shore.”	None
Lambay Island (000204)	Corresponds to <i>Lambay Island</i> SPA (see 5.3.5 (a) (i)).	See <i>Lambay Island</i> SPA; 5.3.5 (a) (i)
Howth Head (000202)	Coastal sections overlap <i>Howth Head Coast</i> SPA, inland sections are not designated for birds (dry grassland and heath habitats and flora).	See <i>Howth Head Coast</i> SPA; Section 5.3.5 (a) (i)
North Dublin Bay (000206)	Overlaps <i>North Bull Island</i> SPA (see 5.3.5 (a) (i)).	See <i>North Bull Island</i> SPA; 5.3.5 (a) (i)
Santry Demesne (000178)	Not designated for any ornithological interest	None
Feltrim Hill (001208)	No Site Synopsis is available for this site but it is not considered that it is a site with ornithological features	None
Sluice River Marsh (001763)	The site is designated as an intact freshwater marsh, primarily for its botanical interest. The Site Synopsis also states that Mallard, Snipe, Grey Heron, Moorhen and Reed Bunting have been recorded on the marsh and that Grey Heron nests nearby.	None
Baldoyle Bay (000199)	Corresponds to <i>Baldoyle Bay</i> SPA (see 5.3.5 (a) (i))	See <i>Baldoyle Bay</i> SPA; 5.3.5 (a) (i)
Ireland’s Eye (000203)	Corresponds to <i>Ireland’s Eye</i> SPA (see 5.3.5 (a) (i))	See <i>Ireland’s Eye</i> SPA; 5.3.5 (a) (i)
Malahide Estuary (000205)	Corresponds to <i>Malahide Estuary</i> SPA (see 5.3.5 (a) (i)) but extends further inland from the high tide mark than the SPA in several locations.	See <i>Malahide Estuary</i> SPA; 5.3.5 (a) (i)
Loughshinny Coast (002000)	The site is designated primarily for its botanical interest (coastal grassland and rare flora) but the Site Synopsis also states that the grassy area is a roost for Curlew and Oystercatcher.	Located within the Northern Outfall Study Area but no impacts are anticipated.

(iii) Statutory Nature Reserves

Statutory Nature Reserves are designated under the 1976 Wildlife Act and (notwithstanding EU legislation) are regarded as the most rigorous Irish mechanism for protecting ecosystems and species of flora and fauna. Almost all damaging activity can be legally prevented within Statutory Nature Reserves (Hickie, 1997). Four Statutory Nature Reserves are present in north County Dublin, all of which include wildfowl as a Special Interest and all of which correspond to Special Protection Areas (see 5.3.5 (a) (i)). The four locations are: Rogerstown Estuary (downstream of the railway track); North Bull Island; North Bull Island Shore and Baldoyle Estuary.

(iv) Refuges for Birds

Rockabill Island is a designated Refuge for Fauna under the Wildlife Act. Seven such designations exist in Ireland. This designation is in effect a compulsory management arrangement for the protection of one or more species of animal (Hickie, 1997); in the case of Rockabill, breeding terns (see Section 5.3.5 (b)). The main power of the designation is to restrict public access and activity to the site and under the provisions of this designation, wardens at Rockabill are able to prevent the public from landing on the island during the summer breeding season.

(b) Breeding Birds of Fingal County

There are three key elements to Fingal's breeding bird fauna. Most important are the County's breeding seabird populations, the following of which are of International Importance³:

- The Roseate Tern and Common Tern populations of Rockabill Island;
- The Razorbill, Guillemot, Cormorant and Shag populations of Lambay Island;
- The (combined) Cormorant population of Island's Eye, St Patrick's Island (Skerries Islands) and Lambay Island.

Nationally Important breeding populations of various seabird species also occur in five of the SPA's in the county; Rockabill, Islands Eye, Lambay Island, Howth Head Coast and Skerries Islands (see Section 5.3.5 (a) (i)).

Secondly, Fingal supports breeding populations of the Birds Directive Annex I species: Peregrine, Kingfisher, Roseate Tern, Common Tern, Arctic Tern, Little Tern and Corncrake (the last two probably now extinct in Fingal); and populations of the 'red list' rare breeding species of high conservation concern (Lynas et. al., 2009), Barn Owl, Herring Gull and Yellowhammer and perhaps Lapwing, Curlew and Quail.

Thirdly, relative to other parts of Ireland, Fingal supports dense concentrations of some passerine species that are typical of rural or semi-rural lowland areas and are scarce, or becoming scarce, in Ireland as a whole; namely, Tree Sparrow, Yellowhammer (a red-list species) and Spotted Flycatcher.

(i) Breeding Birds within Designated Sites

As discussed in Section 5.3.5 (b), the most important breeding birds within Fingal are breeding seabirds. These are located almost exclusively within the five SPAs: Rockabill, Islands Eye, Lambay Island, Howth Head Coast and Skerries Islands. Section 5.3.5 (a) (i) details the breeding seabird species for which each of these sites is designated. Most important of all is probably the Roseate Tern population of Rockabill, which numbers more than 1,000 pairs (2011), representing more than 90% of the European population of this Birds Directive Annex I species.

(ii) Breeding Birds outside Designated Sites

Whilst Fingal's breeding seabirds are concentrated almost entirely within the county's SPAs (see Section 5.3.5 (b) (i)), other breeding species of ecological importance are generally not within designations, but are located in the wider countryside of the county. Breeding Birds in Britain and Ireland are mapped in the 'New Breeding Atlas'

³ Ref: NPWS Natura 2000 Standard Data Forms, www.npws.ie

(Gibbons *et. al.*, 1993) based upon field surveys from the period 1988 to 1991. This mapping is rather out-of-date however it gives an overall picture of bird breeding distribution and is the best available information. This information combined with the field windshield survey work conducted during November 2011 allows an assessment of the species likely to breed in the various habitats present in the land parcels and pipeline route sections. Details are presented in Sections 5.3.5 (c) and 5.3.5 (d).

(c) Non-Breeding Birds of Fingal County

The important non-breeding bird populations of Fingal comprise mainly wildfowl (predominantly ducks and geese) and waders which spend the winter months in Ireland. In the case of waders in particular, large numbers of migrants also pass through the area in autumn and to a lesser extent in spring. The numbers of these species present each month of each winter are monitored by ornithologists during Irish Wetland birds Survey (IWeBS) counts. Table 5.9 presents a summary of north County Dublin's IWeBS count areas.

Table 5.9: Irish Wetland Bird Survey (IWeBS) Count Areas in North County Dublin

Name of IWeBS Count Area	Details	Significance of Birds outside SPAs
Internationally Important Sites		
Dublin Bay	Corresponds approximately to <i>North Bull Island</i> SPA	Brent Geese from North Bull Island use local parks over a large part of Dublin city and areas beyond.
Rogerstown Estuary	Corresponds approximately to <i>Rogerstown Estuary</i> SPA	
Broadmeadow (Malahide) Estuary	Corresponds approximately to <i>Malahide Estuary</i> SPA	Brent Geese and Black-tailed Godwit regularly feed on coastal fields near Seatown East on the south shore and between Ballymadrough and Kilcreagh along the north shore.
Baldoyle Bay	Corresponds approximately to <i>Baldoyle Bay</i> SPA	Regular movements, particularly of Brent Geese between here, Dublin Bay and Seagrang Park
Skerries Islands	Corresponds to <i>Skerries Islands</i> SPA	
Hicks Tower, Robswall	Part of <i>Malahide Estuary</i> SPA	
Seagrang Park	Outside any SPA (see Figure 5.12)	Urban park close to Baldoyle Bay, used by Brent Geese and Bar-tailed Godwits
Nationally Important Sites		
Skerries Coast	Outside any SPA (see Figure 5.12)	Used by Common Scoter, Sanderling, Turnstone
Lambay Island	Corresponds to <i>Lambay Island</i> SPA	
Skerries Grasslands	Outside any SPA (see Figure 5.12)	Used by the Greylag Geese flock from the Lambay flock (and Rogerstown Estuary)
Rockabill	Comprises of Rockabill Island within <i>Rockabill</i> SPA	

As evidenced by the location of the IWeBS count areas, the majority of the important sites for non-breeding birds in Fingal are located within the SPAs discussed in Section 5.3.5 (a) (i), and impacts on these sites are not anticipated (this will be analysed in greater detail during the Environmental Impact Assessment and Appropriate Assessment stages of the project).

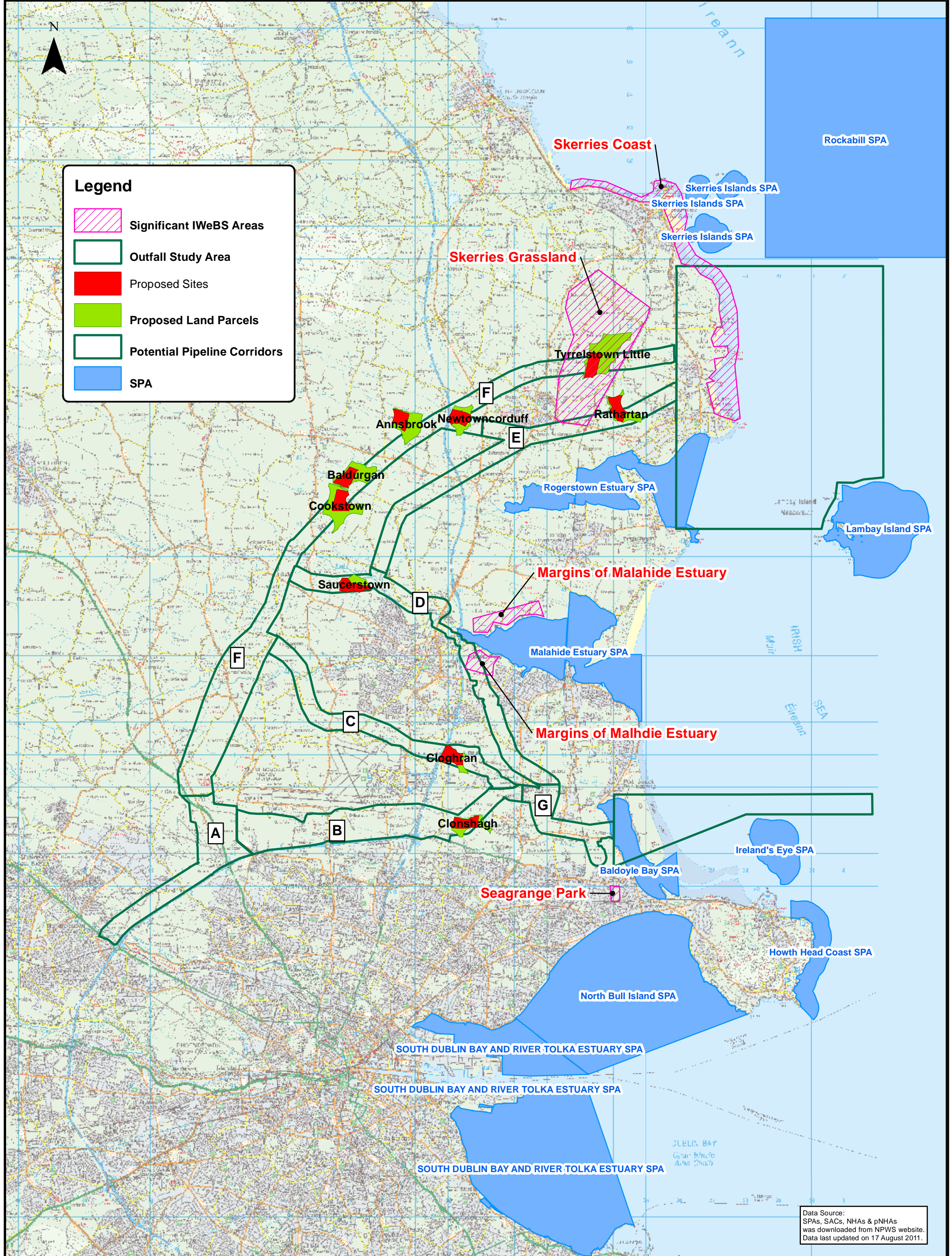
Outside the SPAs, other areas are used by certain species in an unpredictable way during the winter months. The presence or absence, and the numbers of such species as Lapwing, Golden Plover, Snipe and thrushes and to a lesser extent species such as

Wigeon, Teal, Black-tailed Godwit, curlew, swans, geese and others, will depend upon recent agricultural landuse (which crops were sown in the previous season; the extent to which grass was cut or grazed; the date of ploughing, etc) and recent weather patterns (the extent of water logging or flooding; cold weather in neighbouring parts of Europe, etc.).

In some cases the presence of such 'nomadic' bird populations is more predictable. This is the case with, for example, the Greylag Goose flock that frequents Lambay Island and Rogerstown Estuary during the winter, but which also uses the IWeBS area 'Skerries Grasslands' (see Figure 5.15). The Brent Geese of Dublin and Baldoyle Bays use areas of agricultural land and amenity grassland around the bays, and in particular at Seagrove Park in Baldoyle Bay, which is considered to be of international importance in its own right by virtue of counts made during IWeBS (Crowe, 2005). Four areas should be highlighted that having been identified by IWeBS as being of at least national importance to wildfowl and waders, but which are outside SPAs, as follows:

- The margins of Malahide Estuary;
- Skerries Grasslands;
- Skerries Coast; and
- Seagrange Park, Baldoyle.

These areas are shown approximately on Figure 5.15.



Data Source:
 SPAs, SACs, NHAs & pNHAs
 was downloaded from NPWS website.
 Data last updated on 17 August 2011.

Table 5.10: Ornithological Value of the Nine Land Parcels and Selected Sites

Site Name (south to north)	Description	Possible Ornithological Interest
Clonshagh	Large arable fields with hedgerows; some less intensively managed grassland; good areas of scrub, hedgerows and mature tree lines.	May support breeding passerines of some ecological value; may be used in autumn / winter / spring by Lapwing, Golden Plover, etc., but otherwise unlikely to be of significant value to birds.
Cloghran	Small pasture and horticultural fields with good hedgerows. Fields look fairly rough and are possibly damp.	May support breeding passerines of some ecological value but otherwise unlikely to be of significant value to birds.
Saucerstown	Large arable, horticultural and pasture fields with hedgerows. Some good areas of scrub, treelines and grass verges with mature willow and ash. Site is on the flood plain of the Broadmeadow River and is bordered to the north by the river.	This area may be used in autumn / winter / spring by Lapwing, Golden Plover, etc. The banks of the river appear suitable for breeding Kingfisher. The site is on the flood plain of the Broadmeadow River upstream of Malahide Estuary SPA and drains to that site.
Cookstown	Very large arable fields. Intensive pasture fields with hedgerows in western part.	This area may be used in autumn / winter / spring by Lapwing, Golden Plover, etc., but is otherwise unlikely to be of significant value to birds.
Baldurgan	Large arable fields.	This area may be used in autumn / winter / spring by Lapwing, Golden Plover, etc., but is otherwise unlikely to be of significant value to birds.
Annsbrook	Smallish arable, horticultural and pasture fields with good mature hedgerows and treelines. Two fields in northwest corner may possibly be wet.	Unlikely to be of significant value to birds.
Newtowncorduff	Smallish arable and pasture fields, some less intensively managed, with a wider range of grasses and broadleaved herbs and hedgerows, mature treelines, mixed scrub and immature woodland (birch, scots pine, willow). Good riparian habitat with small floodplain areas.	May support breeding passerines of some ecological value; may be used in autumn / winter / spring by Lapwing, Golden Plover, etc., but otherwise unlikely to be of significant value to birds.
Rathartan	Large arable fields and some smaller horticultural fields. Some good hedgerows.	This area may be used in winter on occasion by Greylag Geese and in autumn / winter / spring by Lapwing, Golden Plover, etc.
Tyrrelstown Little	Largish arable fields. Block of fields in southwest corner and field in centre of site include some (wet) grassland.	This area is located within the 'Skerries Grasslands' IWeBS area and is probably used in winter by Greylag Geese. The area may also be used in autumn / winter / spring by Lapwing, Golden Plover, etc.

(d) Land Parcels and Sites

Table 5.10 presents a summary of the habitats of value to birds at each of the nine land parcels. The information presented in the table is based upon field examination during the windshield surveys and on detailed examination of aerial photography.

(e) Pipeline Route Corridors

The majority of the pipeline route sections are in locations away from the coast, SPAs and other know sites of importance to birds. Exceptions to this are as follows:

Option F and to a lesser extent Option E pass through areas known to be frequented during the winter by the Greylag Goose flock which constitutes a Qualifying Feature of Lambay Island SPA and of Rogerstown Estuary SPA (see Section 5.3.5 (a) (i)). The flock feeds on occasion in the IWeBS area 'Skerries Grasslands' which is crossed by Option F (see Figure 5.15 and Section 5.3.5 (b)). The flock also frequents Rogerstown Estuary and Option E passes between the two locations, in an area where the geese may also feed on occasion.

Option D passes along the western boundary of Malahide Estuary SPA and crosses an area at Seatown East identified in IWeBS counts (Crowe, 2005) as being used by Brent Geese and Black-tailed Godwits in the winter, both species are qualifying Features of the SPA.

Option G terminates at the shore of Baldoyle Bay SPA and Option E passes within 1km and 2km of the northern shore of Rogerstown Estuary SPA for a length of more than 6km.

(f) Outfall Locations

Both outfall locations overlap important bird areas. The coastline of the northern outfall area includes part of the IWeBS area identified as being of national importance 'Skerries Coastline' (see Figure 5.15 and Section 5.3.5 (b)) and also includes the outer part of *Rogerstown Estuary* SPA (see Figure 5.15). The Southern outfall location includes a Section of *Baldoyle Bay* SPA (see Figure 5.15).

5.4 Predicted Impacts

Predicted impacts will be specific to the option that is selected, according to the findings of Environmental Impact Assessment and Appropriate Assessment under Article 6 of the EU Habitats Directive. The following Section presents a generalised summary of the potential impacts that may arise during the proposed development.

Impacts are a combination of the value attributed to an ecological receptor and the magnitude of impact felt by that receptor. Magnitude of potential impact may be difficult (or in certain cases impossible) to categorise, and the following parameters are considered when undertaking this task:

- Physical nature;
- Type (+ve/-ve, Direct/Indirect);
- Range of species & habitats affected;
- Population sizes of species & habitats affected;

- Geographic scale;
- Duration;
- Cumulative effects.

5.4.1

Construction Phase

(a)

Terrestrial Ecology

Ecological effects can occur by several different mechanisms. The most common effect is the direct loss of habitats of ecological value. This can be significant for example, if habitat loss includes portions of Core Biodiversity Conservation Areas (designated sites), Annex I habitat types or ecological corridors or stepping stones.

Other effects can contribute either in isolation or in combination, and may lead to a reduced richness of biodiversity within a wider landscape. These effects can be indirect, temporary to permanent, localised or extensive. Fragmentation can be a secondary effect of direct habitat loss, and may also increase barriers to dispersal of flora or fauna. Loss of refuges of protected fauna may also result from habitat loss.

Construction stage includes a great deal of movement and exposure of soils. This can result in sediment release to surface waters or groundwater. This can also result in pollution incidents such as release of oils, concrete or other substances to surface waters. Such occurrences may result in direct mortality of downstream aquatic life, or degradation of downstream habitats upon which certain species are dependant.

Construction noise can also result in mobile faunal species abandoning sites due to the increased disturbance associated with plant and machinery noise and increased human presence.

(b)

Freshwater Ecology

Pollution of watercourses with suspended solids due to runoff of soil from construction areas, or due to disturbance of fine subsurface substrates in the course of instream construction and excavation, can have severe negative impacts on invertebrate and plant life, and on all life stages of fish.

In addition, pollution of watercourses by substances associated with the construction process, such as fuels, lubricants, waste concrete, wastewater from site toilet and wash facilities, etc. will be a potential problem where the proposed development is constructed close to or over watercourses, particularly where this involves instream works.

Any instream construction work if carried out at the time of upstream spawning migrations can have significant disruption affects on salmon, trout and other fish species causing them to spawn in sub-optimal locations and exposing salmonids to increased angling pressure.

Loss of instream habitat could result in the loss of existing river substrates with their associated flora and fauna.

Degradation of Natura 2000 sites and their associated species and habitats, downstream of watercourses impacted during the construction phase of the development with suspended solids and other polluting substances associated with the construction process.

(c) Marine Ecology

(i) Loss/change of Sediment Habitat

The construction of the pipeline and the end diffuser will require significant engineering works along the route of the pipeline. Sediments/habitats within the immediate vicinity of the pipeline will be significantly disrupted by excavation and/or burial. For most marine environments this will be a temporary loss of habitat and will be quickly re-colonised by mobile faunal species, followed by the re-establishment by sessile marine species (both faunal and floral). Overall near-field impacts are predicted to be localised and temporary.

(ii) Change in Water Quality and Sediment Load

During construction, particularly during the trenching operations, suspended sediments from disturbed seabed will be carried away from the route location to impact marine sediments and water quality surrounding the site. The main impact of this will be the partial or total smothering of sessile communities on the seabed, or short-term introduction of a high turbidity water mass in the vicinity of the operation. Impacts to mobile species both pelagic (in the water column) or the demersal (on the seabed), are not expected to be significant. Overall far-field impacts are predicted to be relatively localised and temporary.

No chemicals are envisaged during construction, but the significant presence of the construction traffic will introduce the risk of pollution to the surrounding waters. Potential contamination of sediments and marine organisms from the accidental release of hydraulic, lubricant and fuel oils associated with the excavation equipment and machinery may occur. This can arise from accidental spillages to water, through poor operational management, the non-removal of spillages, poor storage, handling and transfer of oil or accidental release. Should contamination occur, then impacts are likely to impact water quality and pelagic environment rather than that of the sediment.

(iii) Noise Pollution

Engineering operations during the construction phase will introduce some element of noise to the surrounding waters. Sensitive receptors for this impact are generally limited to the higher animals (in particular the pinnipeds and the cetaceans), although impacts to fish, crustaceans and sea birds can also occur in extreme circumstances.

(iv) Access to site

Construction activities on the route will prohibit fishing related activities within the vicinity of the site due to safety considerations. Furthermore, due to the disturbance of the seabed areas of both near-field and to lesser degree, far field operations may also be impacted for a short period of time. Both situations will restrict inshore fishing activities during this time, however the significance of this cannot be assessed until the proposed route and season of construction are known.

(v) Concrete structures

It is assumed that a large end diffuser will remain at the end of the outfall on completion of the route, but little or none of the pipeline will remain above bed level. All hard surfaces concrete/steel, will be quickly colonised by epifauna and epiphytes as the structure(s) will create an artificial reef environment. Concrete is regularly used in the

construction of piers, sea walls, mooring and slipways around the Irish coast and is typically formulated to seal quickly from the ingress of sea water and to prevent leaching of possible harmful admixtures such as heavy metals, gypsum etc. Often seabed construction is typically supplied preformed and hardened before entering the marine environment.

(vi) Fish Including Salmonids

Until the exact route is known it is difficult to predict the full impact of the pipeline to mobile fish species in the region. However, assuming that this will be in an open water environment away from restricted access points (such as in a confined channel in the mouth of an estuary), impacts to resident and migratory fish species is not expected to be significant.

(vii) Impacts on Designated Sites and possible Annex species

The north and south options for the proposed marine outfalls both cover different areas along the coast and have exposure to different designated sites. These are discussed separately as follows:

North Area: There are no marine related designated sites that exist within the north outfall area, with the exception of the Rogerstown SAC, SPA, Ramsar and pNHA site, which just extends into the area in the far southwestern corner. All other sites are either outside the proposed area or are not along a likely route. Neighbouring sites outside the area (such as Lambay Island) that have qualifying interests away from their designated boundaries (i.e. seals on Lambay Island) could be impacted by construction operations.

In addition to the above, initial habitats assessments have revealed the possible presence of Annex 1 habitats in the form of biogenic reefs (*Mytilus* and *Sabellaria* reefs) in the general vicinity of the project. These would have to be properly investigated and if confirmed avoided or reinstated by any future construction route.

South Area: The more restricted corridor of the southern outfall area passes directly through the centre of the Baldoyle SAC, SPA, Ramsar and pNHA site. The nearest neighbouring site is the Ireland's Eye island SPA and pNHA 1km to the south. The qualifying interests of the Baldoyle site are that of an Estuary and SPA for resident and over-wintering birds. As such this will be exposed to physical disturbance by the construction activity as well as the localised impact on the macro-invertebrate population important to the wetland bird for a food source. Impacts to this area are expected to be temporary but significant. Far-field impacts on the seals on Ireland's Eye (not a qualifying species) are expected to be "slight".

In addition to the above, initial habitats assessments have revealed the possible presence of Annex 1 habitats in the form of salt marsh and *Zostera* bed areas in the estuary. Their position relative to a final route would have to be properly investigated and avoided or reinstated where required during construction. Overall impacts are therefore deemed to be "significant" if on the route.

(d) Avian Ecology

Permanent construction stage impacts on birds may include habitat loss or deterioration in habitat quality. This can only be practically mitigated (or compensated) by the provision of alternative habitat or by enhancing other areas of habitat.

5.4.2 Operational Phase

(a) Terrestrial Ecology

Treated sewage discharge to coastal waters could potentially result in hydrochemical changes to seawater as a result of the discharge plume. Dilution rates and the extent of the zone potentially affected is dependant on coastal processes including tidal cycles, currents and wave action. This operational discharge has potential to adversely affect sensitive wetland sites, such as coastal and offshore island Natura 2000 sites.

(b) Freshwater Ecology

Permanent loss of aquatic and/or riparian habitat will take place where the development is constructed through, or in close proximity to watercourses, or if streams are permanently diverted to facilitate the development and/or its associated access roads. Fishery Guidelines for Local Authority Works published by the Department of the Marine and Natural Resources (Anon 1998) state that "culverts are highly inimical to stream plant and fish life and become effectively sterile". Culverts can result in a significant reduction in invertebrate drift downstream which constitutes a significant food source for salmonid fish. By changing the hydrology of a section of stream or river, culverts may also result in changes in upstream and downstream habitat, due to changes in flow conditions and substrates.

The potential exists for accidental spillages with in the WWTP site and also through leaks in the pipeline itself, which may result in pollution of watercourses. The theoretical range of impact from such spillages is extremely wide and includes major impact on all downstream waters in a worst case scenario. It must be accepted that the potential exists for severe adverse impacts from accidental spillages on all watercourses to which the development will drain.

Major changes in hydrology reflected in significant changes in peak and minimum flows would have significant effects on instream flora and fauna, both directly and through the effects of increased erosion.

(c) Marine Ecology

(i) Loss/change of Sediment Habitat

There are not expected to be any significant loss of habitats along either of the marine outfall routes. The end diffuser will constitute a change of habitat from marine sediments to hard substrate.

(ii) Change in Water Quality and Sediment Load

Results will be heavily influenced by location through hydrodynamic modelling of dispersion. Microbiological and suspended sediment loads are not expected to create an impact as these are removed during tertiary treatment of the discharge. However an increased in nutrient load will produce a secondary biological impact of enrichment to the surrounding water mass. This is likely to have a low to medium impact on water quality. Further impacts to fishing related species close to the coast will vary with location but overall these are expected to be low.

(iii) Noise Pollution

There is no noise related impacts expected from the outfall during the operational period.

(iv) Access to site

Access to site will be limited only by the site of the diffuser. Physically all other parts of the route will be open although restricted operations over or near the pipe may be required dependant upon the final construction method.

(v) Concrete structures

The presence of the diffuser at the end of the marine outfall will create a change of habitat (see above). This will create a possible sheltered environment and a hard substrate for colonisation. A localised area of scour may also alter the seabed immediately surrounding the structure.

(vi) Fish Including Salmonids

The structure of the outfall is not expected to impact the route of migratory or residential fish if predominantly buried. The increased load of nutrients to the water column will enrich the waters surrounding the outfall and increase microbial and planktonic activity within the plume of discharge which will increase the food for most fish species within the vicinity of the outfall.

(vii) Impacts on Designated Sites and possible Annex species

As a dramatic reduction in water quality is not expected to occur for either of the sites base on the tertiary treatment, impacts to bird and pinniped species (qualifying species on several surrounding designated sites) feeding on fish and crustaceans in the area, are not expected.

(viii) Avian Ecology

Operational Impacts on birds are relatively unlikely in the case of the plant itself or the pipelines as these will be largely environmentally inert, static structures in the landscape. In the case of underground pipelines, operational impacts on birds will be almost non-existent. Hence, operational stage impacts are likely to be limited to the outfall from the plant.

The relationship between sewage outfalls and birds is a complex one. In some circumstances, nutrient enrichment of intertidal mud has been shown to increase food availability for some bird species such as Black-tailed Godwit (Alves et al., 2011); and there is anecdotal evidence that the same may apply to some seabird species in situations where their prey fish are advantaged by increased organic content in the water column. Conversely, algal growth resulting from nutrient enrichment can disrupt the food chain through mechanisms such as oxygen depletion, mortality of microfauna and resultant toxicity which is likely to reduce food availability and/or food quality for birds.

5.5 Evaluation

5.5.1 Evaluation of Land Parcel

Refer to Table 5.11 in Appendix A of this report for the evaluation of Land Parcels.

5.5.2 Evaluation of Selected Sites within Land Parcels

Refer to Table 5.12 in Appendix A of this report for the evaluation of Sites within the Land Parcels.

5.5.3 Evaluation of Pipeline Corridors

Refer to Table 5.13 in Appendix A of this report for the evaluation of the pipeline corridors.

5.5.4 Evaluation of Marine Areas

Refer to Table 5.14 in Appendix A of this report for the evaluation of the Marine Outfall Areas.

5.6 Mitigation Measures

Mitigation measures will be specific to the option that is selected, according to the findings of Environmental Impact Assessment and Appropriate Assessment under Article 6 of the EU Habitats Directive. The following Section presents a generalised summary of some of the measures that may be required to eliminate impacts or to reduce significant impacts to acceptable, non-significant, levels.

5.6.1 Terrestrial Ecology

Many of the indirect potential effects of construction such as siltation of and release of sediments to watercourses are routinely managed and minimised by Construction Stage Environmental Management Plans, Earthworks Management Plans, Construction and Demolition Waste Management Plans, and specific Construction Method Statements at sensitive locations.

Direct loss of high value ecological features such as habitats can sometimes be replaced, but in many cases the habitat type is difficult to replicate or requires many years of vegetation development before the compensation resource can be considered equal to the lost resource.

Direct loss of refuges for fauna can be mitigated by construction of well positioned artificial or replacement structures.

In both instances, the best mitigation measure to offset direct loss of high value ecological resources is by avoidance. It is the intention of this ASA (Phase 2) Study to direct the project away from the most sensitive and high value ecological resources in the study area.

5.6.2 Freshwater Ecology

(a) Reduction and prevention of suspended solids pollution

Release of suspended solids to all watercourses should be kept to a minimum and in the case of discharges to watercourses with salmonid fish should not exceed 25mg/l of total suspended solids. The key factors in erosion and sediment control are to intercept and manage off- and on-site runoff. This limits the potential for soils to be eroded and enter streams in runoff. Runoff and surface erosion control is more effective and less expensive than sediment control with sediment control ponds only.

(a) Reduction or elimination of pollution with other substances associated with the construction process

Where the construction site is close to a watercourse, particularly with a salmonid fish population present or downstream, the following guidelines based on Chilibeck *et al* (1992), NRA (2005) and “Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites” (<http://www.fishingireland.net/erfb/protect.htm>) should be followed:

(b) Mitigation of loss of protected fauna

Prior to any instream works, suitable salmonid nursery habitat in adjacent areas of the watercourse should be identified. If a section of watercourse is to be de-stocked to allow for those instream works, the work must be carried out by authorised personnel (licensed by NPWS and Department of Communications, Energy and Natural Resources).

(c) Mitigating permanent loss of habitat

The most effective method of mitigating habitat loss is to minimise it and where this is not possible to create new habitat.

Any watercourse to be culverted should be kept to the minimum necessary. Leave strip should be established upstream and downstream of the proposed watercourse crossing point, and their width should be agreed with Inland Fisheries Ireland. Leave strips are the areas of land and vegetation adjacent to watercourses that are to remain in an undisturbed state, throughout and after the development process. Leave strips are valuable not only because riparian vegetation is a vital component of a healthy riverine ecosystem, but because this vegetation acts as an effective screen/barrier between the watercourse and the development area, intercepting runoff and acting as an effective filter for sediment and pollutants from the development area. Where development is to take place close to rivers/streams, a riparian leave strip should be clearly marked and its significance explained to machinery operators.

Other than single span temporary bridges with no instream structures, strictly no temporary stream crossings or temporary culverting should take place without the prior agreement of Inland Fisheries Ireland.

(d) Mitigation of obstruction to upstream movement of fish and other aquatic fauna due to construction of culverts

Fishery Guidelines for Local Authority Works published by the Department of the Marine and Natural Resources recommends that *long stretches of river or stream*

should never be culverted and that rivers or streams should be culverted for essential reasons only (Anon 1998).

Fish passage conditions must be maintained at all times. Any potential watercourse crossings should be designed and constructed in such a way as to ensure that streams remain passable for fish and other aquatic fauna, and agreed with Inland Fisheries Ireland. This can only be reliably achieved by crossing methods which retain or provide 'natural' rough substrates which will slow currents near the bottom and create flow refuges, enabling invertebrates and juvenile fish to migrate upstream in otherwise impassable water velocities.

To avoid habitat fragmentation and obstruction to movement of aquatic and wetland fauna, if culverting of watercourses such as field drains or ephemeral streams (not shown on OS Discovery Map) is required, the culvert diameter should be at least 1.2 times the bankfull width of the stream and culverts should be embedded to a depth of at least 25% of the pipe diameter.

(e) Mitigation of impact of major accidental spillages

Measures such as bunding and SCADA early warning systems should be incorporated into the design of any proposed WWTP to ensure that any potential accidental spillages are detected and contained on-site.

5.6.3 Marine Ecology

(a) Site Selection

The final location of the marine outfall will be based on a hydrodynamic model to ensure the maximum dispersion and minimum impact to the surrounding water quality and receiving environment. The route selection will take into account all ecological factors to ensure minimal disturbance to existing designated sites (SAC, SPA, Ramsar and pHNA) as well as other sites and habitats that may be deemed to be of scientific, conservational or socio-economic interest, as well as possible Natura 2000 habitats protected under the European Habitats Directive.

(b) Subsea noise

Although noise generated from trenching of the pipeline will be within the magnitude of that from other existing anthropogenic sources (e.g. trawling, dredging), it will represent an increase in sound levels locally, albeit temporarily. The levels of noise, however, are not deemed to be of that likely to cause death or injury to any receptor, and measures will be in place (e.g. MMOs) to avoid deleterious interactions with cetaceans in close proximity to works.

(c) Vessel-derived pollution

Routine operation of all vessels according to procedures (e.g. waste management) will not ordinarily result in residual impacts, with, at worst, very short-term, temporary and negligible impacts to the water column from discharge of treated waste such as grey water and food waste (in line with applicable regulations).

The chances of a potentially significant impact from a construction vessel fuel spill (e.g. from collision or grounding) occurring are very low, due to the measures (e.g. safety, communication and engineering) in place to prevent it. In addition to those measures, an oil spill contingency plan will be in place, agreed with the coastguard.

(d) Sediment Disturbance

There will be mortality and displacement of benthic infauna along the pipeline construction route, although this will be within the range of that already occurring (e.g. through trawling or storm damage). Re-colonisation will occur within one or two years and will represent only a small proportion of the surrounding sediment habitat.

In coarser-grained environments, impacts from sediment suspension are likely to be very limited, localised and short-term, within the range of that expected through existing human or natural sources. In deeper and/or finer grained sediments, impacts are likely to be slightly more significant due to the receiving environment and the organisms inhabiting it being less adapted to such sources of disturbance. Some minor far-field impacts are likely to occur (due to plume dispersion). Route selection will take into account the sensitivity of receiving habitats by this impact.

5.6.4 Avian Ecology

Permanent construction stage impacts on birds may include habitat loss or deterioration in habitat quality. This can only be practically mitigated (or compensated) by the provision of alternative habitat or by enhancing other areas of habitat.

Temporary impacts in the form of disturbance during construction, or temporary damage to habitats, can usually be avoided or greatly reduced by the imposition of seasonal constraints on the impacting activity. Few locations of importance to birds are of importance throughout the year, so this option is often highly effective in avoiding significant impacts. Avoidance of either the winter or summer (breeding) seasons may be appropriate depending upon the bird population that is affected.

Other mitigation can be employed to reduce significant impacts, this may take the form of screening, noise reduction measures, limiting work wayleaves, avoidance of water contamination and other 'standard' construction mitigation measures.

Operational Impacts on birds are relatively unlikely in the case of the plant itself or the pipelines as these will be largely environmentally inert, static structures in the landscape. In the case of underground pipelines, operational impacts on birds will be almost non-existent. Hence, operational stage impacts are likely to be limited to the outfall from the plant.

The relationship between sewage outfalls and birds is a complex one. Hence, mitigation to avoid impacts, and in particular the sensitive location of outfalls, needs to be carefully examined through modelling and examination of precedents before conclusions can be drawn as to what is likely to be advantageous to birds.

If negative impacts are identified in this regard they can only be avoided entirely by modification of the design of the project. This may take the form, for example, of removing certain elements of the project which have been identified as the cause of impacts, or by spatially moving or altering the spatial design of elements of the project. Impacts can be reduced by, for example, moving an outfall, by changing the depth in the water column of an outfall, by altering dilution of effluent, or by altering the periodicity of effluent discharge.

Methodology for land parcel and site iteration matrix

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
<i>Potential to impact on Designated Sites</i>	No footprint within, abutting or in proximity to a designated site. No pathway of effect upon sensitive receptors of a designated site can be reasonably determined.	No footprint within or abutting a designated site. Pathway of effect along connecting watercourse is greater than 4km. No other pathway of effect upon sensitive receptors of a designated site can be reasonably determined.	No footprint within a designated site. Temporary ¹ or permanent footprint may abut or be in proximity to a designated site. Pathway of effect along connecting watercourse is between 2 – 4km. Other pathways of effect upon sensitive receptors of a designated site may be determined.	Temporary or permanent footprint within designated site. Results in a temporary or permanent adverse effect upon the ecological structure and functioning of the designated site. Pathway of effect along connecting watercourse is 2km or less. Other pathways of effect upon sensitive receptors of a designated site have been established.	Permanent footprint within designated site. Results in an adverse effect upon the ecological structure and functioning of the designated site. Potential to fail Appropriate Assessment at Stage 2.
<i>Potential to impact on Fingal Ecological Network (FEN) Sites</i>	Project is located more than 2km from a FEN site. No pathway of effect upon sensitive receptors of a designated site can be reasonably determined.	Project is located more than 500m from a FEN site. Pathway of effect along connecting watercourse is greater than 4km. No other pathway of effect upon sensitive receptors of a FEN site can be reasonably determined.	Project is located less than 500m from the nearest identified FEN site. Temporary downstream discharges may occur at construction stage. Other pathways of effect upon sensitive receptors of a FEN site may be established.	Temporary or permanent footprint occurs within or abuts a FEN site. Pathways of effect upon sensitive receptors of a FEN site have been established. Results in a temporary or permanent adverse effect upon the ecological structure and functioning of the designated site.	Permanent footprint within a FEN site. Results in an adverse effect upon the ecological structure and functioning of a FEN site.
<i>Potential to impact protected species based on length of field boundary defined by hedgerow within site</i>	Project results in no loss of hedgerow or field boundaries.	Project results in loss of <1km of hedgerow or field boundaries.	Project results in permanent loss of 1-2km of hedgerow or other field boundaries (without mitigation).	Project results in permanent loss of 2-5km of hedgerow or other field boundaries (without mitigation).	Project results in permanent loss of more than 5km of hedgerow or other field boundaries (without mitigation).
<i>Potential to result in loss of habitats of high ecological value</i>	Project footprint contains artificial and built surfaces only.	Project footprint contains highly modified habitats of limited importance for local wildlife.	Project footprint contains semi-natural habitats of local importance for wildlife including ecological stepping stones or linking corridors.	Project footprint contains County BAP habitats and ecological stepping stones or linking corridors.	Project footprint contains Annex I habitats (designated or not) and ecological stepping stones or linking corridors.

¹ Short-term Impacts are defined as lasting one to seven years; Medium-term impacts are defined as lasting seven to fifteen years (after EPA, 2002).

Methodology for land parcel and site iteration matrix (continued)

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
<i>Potential to disturb birds which are Qualifying Interests in the SPA (either within or outside the SPA boundary)</i>	No footprint within the boundary of an SPA and all works are located more than 1km from the boundary of any SPA and no pathway of effect upon birds which are Qualifying Interests of the SPA (either inside or outside its boundary) can be reasonably determined	No footprint within the boundary of an SPA and all works are located more than 1km from the boundary of any SPA. Pathway of effect upon birds which are Qualifying Interests of the SPA (either inside or outside its boundary) exists but possible effects on the birds are considered to be insignificant in terms of the Conservation Objectives of the SPA	No footprint within the boundary of an SPA and all works are located more than 1km from the boundary of any SPA. Pathway of effect upon birds which are Qualifying Interests of the SPA (either inside or outside its boundary) exists but possible effects on the birds are considered likely in terms of the Conservation Objectives of the SPA	Pathway of effect upon birds which are Qualifying Interests of the SPA (either inside or outside its boundary) exists and are considered likely to result in significant negative effects in terms of the Conservation Objectives of the SPA	Pathway of effect upon birds which are Qualifying Interests of the SPA (either inside or outside its boundary) exists and are considered highly likely to result in very significant negative effects in terms of the Conservation Objectives of the SPA
<i>Potential to result in the Loss of winter Greylag Goose Feeding Areas</i>	Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Within the normal geographical range of the north Co Dublin winter Greylag Goose flock but not overlapping or in close proximity to any areas known to be, or considered likely to be, used by the birds	Within the normal geographical range of the north Co Dublin winter Greylag Goose flock. Location is in an area considered likely to be used by the north Co Dublin winter Greylag Goose flock on occasion; or is in close proximity to such an area	Within the normal geographical range of the north Co Dublin winter Greylag Goose flock. Location is known to be, or is considered highly likely to be, used as a feeding site for the north Co Dublin winter Greylag Goose flock	Location is known to be a regular feeding site for the north Co Dublin winter Greylag Goose flock or where (in the absence of negative data) this is considered highly likely
<i>Potential to result in significant loss of breeding habitat for scarce or declining passerine species such as Yellowhammer, Tree Sparrow, Spotted Flycatcher</i>	Sites with no suitable habitat e.g. woodland, scrub, mature hedgerows, treelines, mature trees, rough grassland, dead trees) for Yellowhammer, Tree Sparrow, Spotted Flycatcher or other scarce bird species	Sites with very limited suitable habitat e.g. woodland, scrub, mature hedgerows, treelines, mature trees, rough grassland, dead trees) for Yellowhammer, Tree Sparrow, Spotted Flycatcher or other scarce bird species but where breeding of these species is considered unlikely	Sites which contain some suitable habitat (e.g. woodland, scrub, mature hedgerows, treelines, mature trees, rough grassland, dead trees) for breeding Yellowhammer, Tree Sparrow, Spotted Flycatcher or other scarce bird species	Sites which contain extensive or good quality habitat (e.g. woodland, scrub, mature hedgerows, treelines, mature trees, rough grassland, dead trees) for breeding Yellowhammer, Tree Sparrow, Spotted Flycatcher or other scarce bird species	Sites where breeding populations of Yellowhammer, Tree Sparrow, Spotted Flycatcher or other scarce bird species are known to occur or where (in the absence of negative data) this is considered highly likely

Methodology for land parcel and site iteration matrix (continued)

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
<i>Potential to result in the loss of breeding habitat for Annex I species Kingfisher</i>	Sites where no watercourses are present	Sites where watercourses are present but no suitable breeding habitat for Kingfisher (river cliffs or vertical banks) occurs and no high quality feeding habitat occurs	Sites where watercourses are present and whilst no suitable breeding habitat for Kingfisher (river cliffs or vertical banks) occurs, suitable feeding habitat is present and the watercourse may therefore form part of a breeding Kingfisher territory	Sites where suitable breeding habitat for Kingfisher (river cliffs or vertical banks) occurs	Sites where breeding populations of Kingfisher are known to occur or where highly suitable habitat (river cliffs or vertical banks and good quality feeding habitat) is present
<i>Potential to result in the significant loss of winter habitat for Lapwing and Golden Plover, and other wader species</i>	Sites with no suitable habitat for Lapwing, Golden Plover or other winter waders (i.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	Sites where suitable habitat for Lapwing, Golden Plover or other winter waders (i.e. ploughed arable land, open pasture) is very limited or of poor quality (e.g. small fields with tall trees and hedgerows or steep slopes or very dry soils)	Sites with suitable habitat for Lapwing, Golden Plover or other winter waders (i.e. relatively large, flat open fields of ploughed arable land or pasture or wet pastureland)	Sites with highly suitable habitat for Lapwing, Golden Plover or other winter waders (e.g. large areas of wet turf-pasture, large ploughed or fallow arable fields)	Sites where wintering populations of Lapwing and Golden Plover are known to occur on a regular basis

Methodology for marine outfall matrix

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
Potential to impact on Designated Sites within survey area footprint (near-field effects).	No footprint within, abutting or in proximity to a designated site. No pathway of effect upon sensitive receptors of a designated site can be reasonably determined	No footprint within or abutting a designated site. Pathway of effect along connecting watercourse is greater than 4km. No other pathway of effect upon sensitive receptors of a designated site can be reasonably determined.	No footprint within a designated site. Temporary ² or permanent footprint may abut or be in proximity to a designated site. Pathway of effect along connecting watercourse is between 2 – 4km. Protected area within immediate dispersion zone. Other pathways of effect upon sensitive receptors of a designated site may be determined.	Temporary or permanent footprint within designated site. Results in a temporary or permanent adverse effect upon the ecological structure and functioning of the designated site. Pathway of effect along connecting watercourse is 2km or less. Other pathways of effect upon sensitive receptors of a designated site have been established.	Permanent footprint within designated site. Results in an adverse effect upon the ecological structure and functioning of the designated site. Potential to fail Appropriate Assessment at Stage 2. Direct footprint within or abuts protected area and obliterates the sensitive aspects of the environment.
Potential to impact on Designated Sites outside survey area footprint (far-field effects)	Transient species within protected areas unlikely to pass through the outfall corridor area	Transient species within protected areas may pass through the outfall corridor area	Transient species within protected areas may spend significant time within outfall corridor area	Transient species within protected areas may spend the majority of their time within outfall corridor area.	The location of the outfall corridor may be critical to transient species.
Potential to impact on Fingal Ecological Network Sites	Project is located more than 2km from a FEN site. No pathway of effect upon sensitive receptors of a designated site can be reasonably determined.	Project is located more than 500m from a FEN site. Pathway of effect along connecting watercourse is greater than 5km. No other pathway of effect upon sensitive receptors of a FEN site can be reasonably determined.	Project is located 50m from the nearest identified FEN site. Temporary downstream discharges may occur at construction stage. Other pathways of effect upon sensitive receptors of a FEN site may be established.	Temporary or permanent footprint occurs within or abuts a FEN site. Pathways of effect upon sensitive receptors of a FEN site have been established. Results in a temporary or permanent adverse effect upon the ecological structure and functioning of the designated site.	Permanent footprint within a FEN site. Results in an adverse effect upon the ecological structure and functioning of a FEN site.
Potential to impact on other potential Annex 1 habitats within survey corridor on the coastline	There is very limited potential for Annex 1 habitats adjacent to the outfall corridor	There is a potential for localised Annex 1 habitats adjacent to the outfall corridor	Localised Annex 1 habitats are located within the outfall corridor	Significant Annex 1 habitats are located within the outfall corridor and may be alter these habitats.	Significant Annex 1 habitats are located within the outfall corridor and would obliterate these habitats.

² Short-term Impacts are defined as lasting one to seven years; Medium-term impacts are defined as lasting seven to fifteen years (after EPA, 2002).

Methodology for marine outfall matrix (continued)

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
Potential to impact subtidal habitats.	There is very limited potential for Annex 1 habitats or protected benthic species to exist adjacent to the outfall corridor	Potential for Annex 1 habitats or protected benthic species to exist adjacent to the outfall corridor	Potential for Annex 1 habitats or protected benthic species to exist within the outfall corridor	Annex 1 habitats or protected benthic species exist within the outfall corridor and may be altered.	Annex 1 habitats or protected benthic species exist within the outfall corridor and would be obliterated.
Potential to impact intertidal habitats.	There is very limited potential for Annex 1 or important habitats to exist adjacent to the outfall corridor	Potential for Annex 1 or important habitats to exist adjacent to the outfall corridor	Potential for Annex 1 or important habitats to exist within the outfall corridor	Annex 1 habitats or protected benthic species exist within the outfall corridor and may be altered.	Annex 1 habitats or protected benthic species exist within the outfall corridor and would be obliterated.
Potential to impact on water quality and bathing waters	No residual impacts from organic enrichment due to high natural hydrodynamic dispersion	Little or no residual impacts from organic enrichment due to high natural hydrodynamic dispersion	A small residual impact from organic enrichment due to moderate natural hydrodynamic dispersion	A significant residual impact from organic enrichment due to low natural hydrodynamic dispersion	A highly significant residual impact from organic enrichment due to very low natural hydrodynamic dispersion
Potential to impact on water quality and neighbouring shellfish waters	No residual impacts from organic enrichment due to high natural hydrodynamic dispersion	Little or no residual impacts from organic enrichment due to high natural hydrodynamic dispersion	A small residual impact from organic enrichment due to moderate natural hydrodynamic dispersion	A significant residual impact from organic enrichment due to low natural hydrodynamic dispersion	A highly significant residual impact from organic enrichment due to very low natural hydrodynamic dispersion
Potential to impact on water quality and inshore fishing grounds	No residual impacts from organic enrichment due to high natural hydrodynamic dispersion	Little or no residual impacts from organic enrichment due to high natural hydrodynamic dispersion	A small residual impact from organic enrichment due to moderate natural hydrodynamic dispersion	A significant residual impact from organic enrichment due to low natural hydrodynamic dispersion	A highly significant residual impact from organic enrichment due to very low natural hydrodynamic dispersion
Potential to impact on transient protected marine species (cetaceans and salmonids)	There is very limited potential that transient species may pass through the affected area and show any behavioural changes	Transient species may pass through the affected area showing minor behavioural changes	Transient species may show significant behavioural responses passing through the affected area	Potential to physiological impacts to transient species passing through the affected area	Significant potential to physiological damage to transient species passing through the affected area

Methodology for marine outfall matrix (continued)

Criterion	Impact level				
	<i>Imperceptible</i>	<i>Slight</i>	<i>Moderate</i>	<i>Significant</i>	<i>Profound</i>
Potential to impact on important coastal bird areas	No residual impacts from organic enrichment due to high natural hydrodynamic dispersion and outfall location is in an area known to be unused by significant numbers of seabirds and construction has no direct footprint within designated bird areas or in areas known to be used by significant numbers of seabirds.	Little or no residual impacts from organic enrichment due to high natural hydrodynamic dispersion and construction has no direct footprint within designated bird areas and construction operations do not directly affect areas known to be used by significant numbers of seabirds and the marine outfall is shown by modelling not to affect the food resources of marine birds.	A small residual impact from organic enrichment due to moderate natural hydrodynamic dispersion or construction may have temporary but localised impact within the designated bird areas or the marine outfall is shown by modelling to have a minor effect (either positively or negatively) on the food resources of marine birds.	A significant residual impact from organic enrichment due to low natural hydrodynamic dispersion or construction may have extensive temporary or localised residual impact within the designated bird areas or the marine outfall is shown by modelling to substantially affect (either positively or negatively) the food resources of marine birds.	A highly significant residual impact from organic enrichment due to very low natural hydrodynamic dispersion or construction may have permanent localised residual impact within the designated bird areas or the marine outfall is shown by modelling to substantially affect (either positively or negatively) the food resources of marine birds.

Phase 2 Alternative Sites Assessment - Environmental Criteria										
Table 5.11 - Stage 1 of Ecology (Land Parcels)										
1.0	Ecology	Annsbrook	Baldurgan	Clonshagh	Cookstown	Cloghran	Newtowncorduff	Rathartan	Saucerstown	Tyrrelstown Little
1.1	Potential to impact on Natura 2000 Sites and Natural Heritage Areas.	Slight: 4.1km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Slight: 5.3km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA and 7.0km upstream of Natura 2000 wetland sites Malahide Estuary SPA/SAC/Pnha	Slight: 4.6km upstream of Natura 2000 wetland sites (Baldoyle Bay SPA/SAC/pNHA)	Slight: 7.0km upstream of Natura 2000 wetland sites (Malahide Estuary SPA/SAC/pNHA)	Slight: 4.3km upstream of Natura 2000 wetland sites (Baldoyle Bay SPA/SAC/pNHA)	Moderate: 2.9km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Significant: 1.0km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Moderate: 3.0km upstream of Natura 2000 wetland sites (Malahide Estuary SPA/SACpNHA)	Moderate: 2.2km upstream of Natura 2000 wetland sites (Rogerstown Estuary SPA/SAC/pNHA)
1.2	Potential to impact on Fingal Ecological Network (FEN) Site	Significant: Site abuts Rath Little Stream ecological corridor	Significant: Site abuts Ballyboghil Stream ecological corridor	Significant: Site abuts Mayne River ecological corridor	Slight: Site located at distance from ecological corridor	Significant: Site abuts Sluice River ecological corridor	Significant: Site abuts Rath Little and Ballough Stream ecological corridors	Slight: Site located at distance from ecological corridor	Significant: Site abuts the Broadmeadow River ecological corridor	Slight: Site located at distance from ecological corridor
1.3	Potential to impact protected species based on length of field boundary defined by hedgerow, which incorporates mature trees, within site, e.g Badgers, Bats, Yellowhammer, Tree Sparrow, Stock dove.	Profound: 5.2km of hedges, with good mature hedgerows and treelines, within the site	Slight: 0.3km of hedges within the site	Significant: 2.1km of hedges, with good areas of scrub, hedgerows and mature treelines, within the site	Significant: 2.3km of hedges within the site	Significant: 2.9km of hedges within the site	Significant: 4.3km of hedges within the site	Significant: 2.8km of good mature hedgerows within the site	Moderate: 1.7km of good mature hedgerows within the site	Profound: 8.5km of hedges within the site
1.4	Potential to result in loss of habitats of high ecological value e.g. Annex I habitats (designated or not), ecological stepping stones or linking corridors.	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site.	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site.	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site.	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Moderate: Site comprised of agriculturally improved, cultivated or arable land but abuts FEN site.	Slight: Site comprised of agriculturally improved, cultivated or arable land.
1.5	Potential to impact on a salmonid system	Significant - Parcel is bounded by two watercourses . Ballyboghil River (main channel and tributaries) constitutes a salmonid system. Ballough River constitutes a salmonid system.	Moderate - Parcel is bounded by two watercourses. Ballyboghil River (main channel and tributaries) constitutes a salmonid system. Donabate River constitutes a non-salmonid system.	Slight - Parcel is bounded by one watercourse .Mayne River (main channel and tributaries) constitutes a non-salmonid system.	Slight - Parcel is bounded by one watercourse. Donabate River constitutes a non-salmonid system.	Moderate - Parcel is bounded by one watercourse. Sluice River and its tributaries constitute a salmonid system.	Significant - Parcel is bounded by by two watercourses. Ballough River and its tributaries constitute a salmonid system.	Slight - Parcel is bounded by two watercourses. Lusk River constitutes a non-salmonid system	Profound - Parcel is bounded b by two watercourses with a further two watercourses within the parcel. Broadmeadow River (main channel and tributaries) constitutes a salmonid system.	Imperceptible - Parcel is not bounded by any watercourses.

Phase 2 Alternative Sites Assessment - Environmental Criteria										
Table 5.11 - Stage 1 of Ecology (Land Parcels)										
1.0	Ecology	Annsbrook	Baldurgan	Clonshagh	Cookstown	Cloghran	Newtowncorduff	Rathartan	Saucerstown	Tyrrelstown Little
1.6	Potential to disturb birds which are Qualifying Interests in the SPA's (either within or up to 1km outside the SPA's boundaries)	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Interests of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA
1.7	Potential to result in loss of winter Greylag Goose Feeding Areas based on IWeBS Data	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Moderate - Within the normal geographical range of the north Co Dublin winter Greylag Goose flock. Location is in an area considered likely to be used by the north Co Dublin winter Greylag Goose flock on occasion	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Significant - Within 'Skerries Grasslands' IWeBS area, likely to be a feeding site for the north Co Dublin winter Greylag Goose flock
1.8	Potential to impact on the breeding habitat for Annex I species Kingfisher	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no breeding habitat for Kingfisher nor high quality feeding habitat for Kingfisher	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Significant - suitable breeding habitat and high quality feeding habitat for Kingfisher is present on the Broad Meadow River	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat
1.9	Potential to result in significant loss of winter habitat for Lapwing and Golden Plover and other wader species outside of designated areas (i.e. relatively large, flat open fields or ploughed or fallow arable land or pasture)	Moderate - site includes wet pasture suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large pasture fields suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders	Slight - smallish fields, unlikely to be used regularly by Lapwing and Golden Plover	Slight - smallish fields, unlikely to be used regularly by Lapwing and Golden Plover	Moderate - smallish fields, but proximity to Rogerstown Estuary increases likelihood of site being used by Lapwing and Golden Plover	Significant - site includes large wet fields close to the Broad Meadow River highly suitable for Lapwing, Golden Plover or other winter waders	Significant - site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Phase 2 Alternative Sites Assessment - Environmental Criteria Evaluation Matrix										
Table 5.12 Stage 1 of Ecology (Sites)										
1.0	Ecology	Annsbrook	Baldurgan	Clonshagh	Cookstown	Cloghran	Newtowncorduff	Rathartan	Saucerstown	Tyrrelstown Little
1.1	Potential to impact on Natura 2000 Sites and Natural Heritage Areas	Slight: 4.1km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Slight: 5.3km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC and 7.0km upstream of Natura 2000 wetland sites Malahide Estuary SPA/SAC/Pnha	Slight: 4.6km upstream of Natura 2000 wetland sites (Baldoyle Bay SPA/SAC/pNHA)	Slight: 7.0km upstream of Natura 2000 wetland sites (Malahide Estuary SPA/SAC/pNHA)	Slight: 4.3km upstream of Natura 2000 wetland sites (Baldoyle Bay SPA/SAC/pNHA)	Moderate: 2.9km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Significant: 1.0km upstream of Natura 2000 wetland sites Rogerstown Estuary SPA/SAC/pNHA)	Moderate: 3.0km upstream of Natura 2000 wetland sites (Malahide Estuary SPA/SAC/pNHA)	Moderate: 2.2km upstream of Natura 2000 wetland sites (Rogerstown Estuary SPA/SACpNHA)
1.2	Potential to impact on Fingal Ecological Network Sites	Moderate: Site located 125m from Rath Little Stream ecological corridor	Moderate: Site located 180m from Ballyboghil Stream ecological corridor, but access road crosses it.	Significant: Site abuts Mayne River ecological corridor	Slight: Site located 800m from Ballyboghil Stream ecological corridor.	Significant: Site abuts Sluice River ecological corridor	Significant: Site abuts Rath Little ecological corridor; Access road crosses Ballyboghil Stream ecological corridor.	Imperceptible: Site located more than 3km from Ballough Stream ecological corridor	Moderate: Site located 250m from the Broadmeadow River ecological corridor	Imperceptible: Site located more than 3km from Ballough Stream ecological corridor
1.3	Potential to impact protected species based on length of field boundary defined by hedgerow, which incorporates mature trees, within site, e.g. Badgers, Bats, Yellowhammer, Tree sparrow, Stock dove	Significant: 2.4km of good mature hedgerows and treelines within the site	Slight: 0.1km of hedgerows within the site	Moderate: 1.4km of hedges within the site. Good areas of scrub, hedgerow and mature treelines	Slight: 0.9km of hedges within the site	Significant: 2.3km of good mature hedgerows within the site	Significant: 3.4km of good mature hedgerows within the site	Significant: 2.5km of good mature hedgerows within the site	Moderate: 1.4km of good mature hedgerows within the site	Significant: 3.8km of hedges within the site
1.4	Potential to result in loss of habitats of high ecological value e.g. Annex I habitats (designated or not), ecological stepping stones or linking corridors	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Moderate: Site comprised of agriculturally improved, cultivated or arable land.	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Moderate: Site comprised of agriculturally improved, cultivated or arable land.	Moderate: Site comprised of agriculturally improved, cultivated or arable land.	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Slight: Site comprised of agriculturally improved, cultivated or arable land.	Slight: Site comprised of agriculturally improved, cultivated or arable land.
1.5	Potential to impact on a salmonid system	Moderate - The access road abuts the a tributary of the Ballyboghil River (main channel and tributaries) constitutes a salmonid system.	Moderate - The Ballyboghil River (main channel and tributaries) constitutes a salmonid system and the access road crosses it. However, the Donabate River constitutes a non-salmonid system.	Slight - The Mayne River constitutes a non-salmonid system	Slight - The Donabate River constitutes a non-salmonid system.	Moderate - The Sluice River (main channel and tributaries) constitutes a salmonid system.	Moderate - The Ballough River (main channel and tributaries) constitutes a salmonid system and the access road crosses it.	Slight - The Lusk River constitutes a non-salmonid system	Significant - The Broadmeadow River (main channel and tributaries) constitutes a salmonid system and the access road crosses a tributary and site abuts a tributary.	Imperceptible - The Lusk River constitutes a non-salmonid system
1.6	Potential to disturb birds which are Qualifying Interests in the SPA (either within or up to 1km outside the SPA's boundaries).	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA	Moderate - more than 1km from the boundary of any SPA. Any negative effect on birds which are Qualifying Features of an SPA are considered unlikely to be significant in terms of the Conservation Objectives of the SPA
1.7	Potential to result in the loss of winter Greylag Goose Feeding Areas based in IWeBS Data.	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Moderate - Within the normal geographical range of the north Co Dublin winter Greylag Goose flock. Location is in an area considered likely to be used by the north Co Dublin winter Greylag Goose flock on occasion	Imperceptible - Outside the normal geographical range of the north Co Dublin winter Greylag Goose flock	Significant - Within 'Skerries Grasslands' IWeBS area, likely to be a feeding site for the north Co Dublin winter Greylag Goose flock

Phase 2 Alternative Sites Assessment - Environmental Criteria Evaluation Matrix										
Table 5.12 Stage 1 of Ecology (Sites)										
1.0	Ecology	Annsbrook	Baldurgan	Clonshagh	Cookstown	Cloghran	Newtowncorduff	Rathartan	Saucerstown	Tyrrelstown Little
1.8	Potential to impact on the breeding habitat for Annex I species Kingfisher	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no breeding habitat for Kingfisher nor high quality feeding habitat for Kingfisher	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat	Significant - suitable breeding habitat and high quality feeding habitat for Kingfisher is present on the Broad Meadow River	Slight - watercourse present but no suitable breeding habitat for Kingfisher or high quality feeding habitat
1.9	Potential to result in significant loss of winter habitat for Lapwing and Golden Plover and other wader species outside of designated areas (i.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	Moderate - site includes wet pasture suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large pasture fields suitable for Lapwing, Golden Plover or other winter waders	Moderate - site includes large arable fields suitable for Lapwing, Golden Plover or other winter waders	Slight - smallish fields, unlikely to be used regularly by Lapwing and Golden Plover	Slight - smallish fields, unlikely to be used regularly by Lapwing and Golden Plover	Moderate - smallish fields, but proximity to Rogerstown Estuary increases likelihood of site being used by Lapwing and Golden Plover	Significant - site includes large wet fields close to the Broad Meadow River highly suitable for Lapwing, Golden Plover or other winter waders	Significant - site includes large arable fields and pastures suitable for Lapwing, Golden Plover or other winter waders

Phase 2 Alternative Sites Assessment - Environmental Criteria Evaluation Matrix								
Table 5.13 Stage 1 of Ecology (Pipeline Corridors)								
1.0	Ecology	Corridor A	Corridor B	Corridor C	Corridor D	Corridor E	Corridor F	Corridor G
1.1	Potential to impact on Natura 2000 Sites and Natural Heritage Areas	Crosses Tolka River, which is 13km upstream of South Dublin Bay and River Tolka Estuary SPA/pNHA and North Dublin Bay SAC/SPA	Crosses Santry River which is 8.0km upstream of North Dublin Bay SAC and North Bull Island SPA. Crosses Mayne River which is 4.5km upstream of Baldoyle Bay SAC/SPA/pNHA.	Crosses the Ward River which is 5.5km upstream of Malahide Estuary SPA/SAC. Crosses the Sluice River which is 4.0km upstream of Baldoyle Bay SPA/SAC/pNHA.	Crosses the Broadmeadow River and also a number of its tributaries. This is 0.5km upstream of Malahide Estuary SPA/SAC/pNHA. Also crosses the Sluice River which is 2.0km upstream of Baldoyle Bay SPA/SAC/pNHA.	Crosses the Donabate River which is 5.0km upstream of Malahide Estuary SPA/SAC/pNHA. Also crosses the Ballyboghil, Ballyboghil, Rathmooney, Palmerstown and Horsetown Streams. All are upstream of Rogerstown Estuary SPA/SAC/pNHA. This section is also upstream of the Rush Stream which flows out at the coast into WFD coastal waters.	Crosses the Ward River and a number of its tributaries, the Broadmeadow River and also a number of its tributaries, and the Donabate River. All are upstream of Malahide Estuary SPA/SAC/pNHA. Also crosses Ballyboghil, Grallagh, Rath Little, Kinoud, Ballyboghil, Rathmooney and Palmerstown Streams. All are upstream of Rogerstown Estuary SPA/SAC/pNHA. This section is also upstream of the Balcunnin Stream which flows out at the coast into WFD coastal waters.	Crosses Mayne River which is 0.5km upstream of Baldoyle Bay SAC/SPA/pNHA. Interfaces with the southern marine outfall area at Baldoyle Bay SAC/SPA/pNHA and Ramsar site.
1.2	Potential to impact upon ecological buffer zones or Nature Development Areas identified in the Fingal Development Plan 2011-2017	Does not impinge upon any ecological buffer zone. Impinges upon four Nature Development Areas (Abbotstown woodlands and three unnamed NDAs, one of which is a quarry – the remaining two are woodland blocks).	Does not impinge upon any ecological buffer zone. Crosses one Nature Development Area (Ballymun Golf Course).	Does not impinge upon any ecological buffer zone. Impinges upon two Nature Development Areas (Forrest Little Golf Course and Abbeyville Demesne).	Impinges upon three ecological buffer zones: Feltrim Hill, Malahide, Malahide Estuary. Potentially impinges upon two Nature Development Areas (Broadmeadow River Park, Abbeyville).	Does not impinge upon any ecological buffer zones. Does not impinge upon any Nature Development Areas.	Does not impinge upon any ecological buffer zone. Potentially impinges upon three Nature Development Areas (two unnamed farmland sites in Suralstown, Skephubble Golf Course and Drumanagh on the coast).	Impinges upon three ecological buffer zones: Baldoyle Estuary, Baldoyle the Coast and Millennium Park Baldoyle. Potentially impinges upon one Nature Development Area (unnamed farmland block).
1.3	Potential to impact upon ecological corridor, nature development area or high value habitats	Crosses Tolka River ecological corridor. Impinges upon TPO sites. Loss of hedgerow habitat along 5km of transfer pipeline will occur.	Crosses one TPO site and the Mayne River ecological corridor. Potentially crosses three rivers or streams and one area of deciduous woodland. Loss of hedgerow habitat along 9km of transfer pipeline will occur.	Crosses Ward River ecological corridor and Sluice River ecological corridor twice. Potentially crosses six rivers or streams and two areas of deciduous woodland. Loss of hedgerow habitat along 9km of transfer pipeline will occur.	Crosses Broadmeadow (twice), Ward and Sluice River ecological corridors. Potentially impinges upon TPO areas. Potentially crosses thirteen rivers or streams. Loss of hedgerow habitat along 12km of transfer pipeline will occur.	Crosses Ballyboghil and Ballyboghil Stream ecological corridors. Does not impinge upon any TPO areas. Potentially crosses nine rivers or streams. Loss of hedgerow habitat along 13km of transfer pipeline will occur.	Crosses Ward and Broadmeadow River, Ballyboghil, Rath Little and Ballyboghil Stream ecological corridors. Potentially crosses twenty two rivers or streams. Loss of hedgerow habitat along 21km of transfer pipeline will occur.	Potentially crosses the Mayne River ecological corridor. Potentially crosses one river. Loss of hedgerow habitat along 3km of transfer pipeline will occur.
1.4	Potential to impact on a salmonid system	The Tolka River (main channel and tributaries) constitutes a salmonid system.	Mayne River (main channel and tributaries) constitutes a non-salmonid system.	Both the Ward River system and the Sluice River system constitute salmonid systems.	The Ward River system, Broadmeadow River system and the Sluice River system all constitute salmonid systems.	The Ballyboghil River system, Broadmeadow River system and the Ballyboghil River system all constitute salmonid systems.	The Ballyboghil River system, Broadmeadow River system, the Ward River system and the Ballyboghil River system all constitute salmonid systems.	The Sluice River (main channel and tributaries) constitutes a salmonid system.

Phase 2 Alternative Sites Assessment - Environmental Criteria Evaluation Matrix								
Table 5.13 Stage 1 of Ecology (Pipeline Corridors)								
1.0	Ecology	Corridor A	Corridor B	Corridor C	Corridor D	Corridor E	Corridor F	Corridor G
1.5	Potential for significant loss of breeding habitat for scarce or declining passerine species & Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher	Portions of the route with good mature hedgerows trees, scrub and rough grassland likely to be suitable breeding habitat for Yellowhammer, Tree Sparrow, Spotted Flycatcher
1.6	Potential to impact on the breeding habitat for Annex I species Kingfisher	No suitable riparian habitat for breeding Kingfisher	No suitable riparian habitat for breeding Kingfisher	No suitable riparian habitat for breeding Kingfisher	A portion of the route located in along Broadmeadow River where possible suitable habitat for breeding Kingfisher occurs	No suitable riparian habitat for breeding Kingfisher	Ballough River small watercourse unlikely to have suitable riparian habitat for breeding Kingfisher	No suitable riparian habitat for breeding Kingfisher
1.7	Potential for the significant loss of winter habitat for Lapwing and Golden Plover, and other wader species outside of designated areas (i.e. relatively large, flat open fields of ploughed or fallow arable land or pasture)	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover	Temporary loss of areas of wet grassland, arable or pasture fields that are possibly suitable wintering habitat for Lapwing and Golden Plover
1.80	Potential to impact on IWeBS identified areas of importance to birds adjacent to Malahide Estuary	No IWEB areas located on pipeline route	No IWEB areas located on pipeline route	No IWEB areas located on pipeline route	Portion of route located within Malahide Estuary IWeBS area	Very small portion of route located within 'Skerries Grasslands' IWeBS area	Portion of route located within 'Skerries Grasslands' IWeBS area	No IWEB areas located on pipeline route

Phase 2 Alternative Sites Assessment - Environmental Criteria Evaluation Matrix
Table 5.14 Stage 1 of Ecology (Marine Outfall)

1.0	Ecology	Northern Outfall Study Area	Southern Outfall Study Area
1.1	Potential to impact on Natura 2000 Sites within survey area footprint.	Moderate (main area avoids marine designations)	Significant (passes through Baldoyle SAC)
1.2	Potential to impact on Fingal Ecological Network Sites.	Moderate Transfer pipeline can potentially pass through St. Catherine's Wood and/or Drumanagh Nature Development Areas, and must cross through Annex I habitats at the coastline (Rocky Sea Cliffs).	Significant Transfer pipeline must pass through Baldoyle Coast Ecological Buffer Zone and Portmarnock Golf Course Nature Development Area. These sites are protected in the County Plan and serve to further protect the Baldoyle Bay SPA/SAC/pNHA.
1.3	Potential to impact on other potential annex 1 habitats (under the Habitats Directive) within the survey area footprint.	Moderate (possible, dune habitats and biogenic reefs in north area)	Significant (saltmarsh and zoster beds in Baldoyle Estuary)
1.4	Potential to impact subtidal habitats.	Imperceptible (no sensitive habitats expected)	Imperceptible (no sensitive habitats expected)
1.5	Potential to impact intertidal habitats.	Slight (isolated sensitive sites in some areas of coast)	Moderate (sensitive habitats in Estuary and on Velvet Strand)
1.6	Potential to impact on water quality and bathing waters designated under the Bathing Water Directive.	Slight (to be determined following hydrodynamic modelling)	Moderate (to be determined following hydrodynamic modelling)
1.7	Potential to impact on water quality and neighbouring shellfish waters designated under the Shellfish Waters Directive.	Slight (to be determined following hydrodynamic modelling)	Slight (to be determined following hydrodynamic modelling)
1.8	Potential to impact on water quality and inshore fishing grounds based on regional fisheries datasets.	Slight (majority of shellfish fisheries in rocky shoreland areas away from expected final diffuser position)	Slight (sandy substrate has fewer shellfish fishing grounds)
1.9	Potential to impact on transient protected marine species (cetaceans and salmonids), which may pass through the affected area within the survey area footprint.	Imperceptible during construction None during operation	Imperceptible during construction None during operation
1.10	Potential to impact on important marine bird feeding areas.	Moderate - (to be determined following hydrodynamic modelling) . Impact magnitude will depend on organic enrichment predictions, the precise location, seasonal timing and nature of works, may potentially result in impacts on sites and on the birds they support in foraging locations away from the sites.	Moderate - (to be determined following hydrodynamic modelling) . Impact magnitude will depend on organic enrichment predictions, the precise location, seasonal timing and nature of works, may potentially result in impacts on sites and on the birds they support in foraging locations away from the sites.