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Greater Dublin Drainage Project

Irish Water

Environmental Impact Assessment Report: Volume 3 Part A of 6

Chapter 11 Biodiversity (Terrestrial and Freshwater Aquatic)

June 2018

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11. Biodiversity (Terrestrial and Freshwater Aquatic)

This Chapter of the Environmental Impact Assessment identifies, describes and assesses the likely significant effects of the proposed Greater Dublin Drainage Project (hereafter referred to as the Proposed Project) on terrestrial and freshwater aquatic biodiversity resources. A section of the proposed outfall pipeline route (marine section) is to be:

- Located within Rockabill to Dalkey Island Special Area of Conservation (SAC);
- Located in proximity to Ireland's Eye Special Protection Area (SPA); and
- Tunnelled below Baldoyle Bay SAC, SPA, Ramsar site and proposed Natural Heritage Area (pNHA)

Approximately 60% of the Proposed Project, from the commencement of the proposed outfall pipeline route (marine section) from the R106 Coast Road to 1km north-east of Ireland's Eye, is located within transitional or buffer zones of Dublin Bay UNESCO Biosphere Reserve, and it is to be tunnelled under a core area of the Biosphere Reserve. Qualifying features of European Sites are located within the Zone Of Influence (ZOI) of the Proposed Project. There are a number of potential significant effects upon both terrestrial and freshwater aquatic biodiversity resources that could occur during the Construction Phase. In addition, potential significant effects upon some freshwater aquatic resources could occur during the Operational Phase. These potential significant effects upon biodiversity features located within the ZOI of the Proposed Project include:

- loss, deterioration and fragmentation of terrestrial and freshwater aquatic habitats; and
- disturbance to, displacement of or reduction in habitat availability for protected species.

Construction Phase effects are generally temporary, with the exception of the permanent loss of terrestrial habitats of site-level or local importance at the proposed Abbotstown pumping station and Wastewater Treatment Plant. Operational Phase effects are only likely to occur if wastewater infrastructure fails to function correctly and wastewater is released to the aquatic environment.

Mitigation measures have been incorporated into the Proposed Project to offset potential significant adverse effects on terrestrial and freshwater aquatic biodiversity resources. Trenchless techniques will be used for all watercourse crossings. An Ecological Clerk of Works will supervise or implement a number of mitigation measures, including:

- Provision of toolbox talks to appointed contractor(s);
- Establishing ecological buffer zones;
- Seasonal restrictions on vegetation clearance;
- Replanting of hedgerows to be removed;
- Obtaining wildlife disturbance licences from National Parks and Wildlife Service to fell trees, close badger setts and translocate smooth newts; and
- Erection of bat boxes.

There are no predicted significant residual effects upon terrestrial and freshwater aquatic biodiversity resources, following the implementation of mitigation measures.

11.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the direct and indirect likely significant impacts of the Greater Dublin Drainage Project (hereafter referred to as the Proposed Project) on biodiversity.

The Proposed Project will form a significant component of a wider strategy to meet future wastewater treatment requirements within the Greater Dublin Area as identified in a number of national, regional and local planning policy documents. The plant, equipment, buildings and systems associated with the Proposed Project will be designed, equipped, operated and maintained in such a manner to ensure a high level of energy performance and energy efficiency.

The table below includes a summary of the Proposed Project elements. A full description of the Proposed Project is detailed within Volume 2 Part A, Chapter 4 Description of the Proposed Project, of this EIAR.

Proposed Project Element	Outline Description of Proposed Project Element
Proposed Wastewater Treatment Plant (WwTP)	<ul style="list-style-type: none"> • WwTP to be located on a 29.8 hectare (ha) site in the townland of Clonshagh (Clonshaugh) in Fingal. • 500,000 population equivalent wastewater treatment capacity. • Maximum building height of 18m. • Sludge Hub Centre (SHC) to be co-located on the same site as the WwTP with a sludge handling and treatment capacity of 18,500 tonnes of dry solids per annum. • SHC will provide sustainable treatment of municipal wastewater sludge and domestic septic tank sludges generated in Fingal to produce a biosolid end-product. • Biogas produced during the sludge treatment process will be utilised as an energy source. • Access road from the R139 Road, approximately 400m to the southern boundary of the site. • Egress road, approximately 230m from the western boundary of the site, to Clonshaugh Road. • A proposed temporary construction compound to be located within the site boundary.
Proposed Abbotstown pumping station	<ul style="list-style-type: none"> • Abbotstown pumping station to be located on a 0.4ha site in the grounds of the National Sports Campus at Abbotstown. • Abbotstown pumping station will consist of a single 2-storey building with a ground level floor area of 305m² and maximum height of 10m and a below ground basement 17m in depth with floor area of 524m² incorporating the wet/dry wells. • The plan area of the above ground structure will be 305m² and this will have a maximum height of 10m. • A proposed temporary construction compound to be located adjacent to the Abbotstown pumping station site.
Proposed orbital sewer route	<ul style="list-style-type: none"> • The orbital sewer route will intercept an existing sewer at Blanchardstown and will divert it from this point to the WwTP at Clonshagh. • Constructed within the boundary of a temporary construction corridor. • 13.7km in length; 5.2km of a 1.4m diameter rising main and 8.5km of a 1.8m diameter gravity sewer. • Manholes/service shafts/vents along the route. • Odour Control Unit at the rising main/gravity sewer interface. • Proposed temporary construction compounds at Abbotstown, Cappoge, east of Silloge, Dardistown and west of Collinstown Cross to be located within the proposed construction corridor.
Proposed North Fringe Sewer (NFS) diversion sewer	<ul style="list-style-type: none"> • The NFS will be intercepted in the vicinity of the junction of the access road to the WwTP with the R139 Road in lands within the administrative area of Dublin City Council. • NFS diversion sewer will divert flows in the NFS upstream of the point of interception to the WwTP. • 600m in length and 1.5m in diameter. • Operate as a gravity sewer between the point of interception and the WwTP site.
Proposed outfall pipeline route (land based section)	<ul style="list-style-type: none"> • Outfall pipeline route (land based section) will commence from the northern boundary of the WwTP and will run to the R106 Coast Road. • 5.4km in length and 1.8m in diameter. • Pressurised gravity sewer. • Manholes/service shafts/vents along the route. • Proposed temporary construction compounds (east of R107 Malahide Road and east of Saintdoolaghs) located within the proposed construction corridor.
Proposed outfall pipeline route (marine section)	<ul style="list-style-type: none"> • Outfall pipeline route (marine section) will commence at the R106 Coast Road and will terminate at a discharge location approximately 1km north-east of Ireland's Eye. • 5.9km in length and 2m in diameter. • Pressurised gravity tunnel/subsea (dredged) pipeline. • Multiport marine diffuser to be located on the final section. • Proposed temporary construction compounds (west and east of Baldoyle Bay) to be located within the proposed construction corridor.
Proposed Regional Biosolids Storage Facility	<ul style="list-style-type: none"> • Located on an 11ha site at Newtown, Dublin 11. • Maximum building height of 15m. • Further details and full impact assessment are provided in Volume 4 Part A of this EIAR.

The total Construction Phase will be approximately 48 months, including a 12 month commissioning period to the final Operational Phase. The Proposed Project will serve the projected wastewater treatment requirements of existing and future drainage catchments in the north and north-west of the Dublin agglomeration, up to the Proposed Project's 2050 design horizon.

This Chapter contains a description of both the terrestrial and freshwater biodiversity features of the baseline environment within the planning application area and within a wider zone of influence (ZoI) near the Proposed Project.

Biodiversity encompasses a variety of life on earth; therefore, biodiversity assessments are typically divided into specialist subject areas. This Chapter of this EIAR comprises an assessment of the likely significant impacts of the Proposed Project on terrestrial biodiversity and freshwater biodiversity features. Particular attention to species and habitats protected under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) is given where applicable to terrestrial and freshwater biodiversity features. Further detailed analysis is given to marine species and habitats protected under the Habitats Directive in Chapter 9 Biodiversity (Marine) in Volume 3 Part A of this EIAR. More detailed analysis of species and habitats protected under Directive 2009/147/EC of 30 November 2009 of the European Parliament and of the Council on the conservation of wild birds (the Birds Directive) is given in Chapter 10 Biodiversity (Marine Ornithology).

The biodiversity assessments contained in Chapter 9 Biodiversity (Marine), Chapter 10 Biodiversity (Marine Ornithology) and this Chapter are based on Chapter 4 Description of the Proposed Project and the Outline Construction and Environmental Management Plan (CEMP). They are supported, as necessary, by other specialist assessments of the EIAR, including for example, Chapter 8 Marine Water Quality, Chapter 15 Noise and Vibration and Chapter 17 Hydrology and Hydrogeology.

This Chapter should be read with the following figures and appendices:

- Volume 5, Figure 11.1 Special Areas of Conservation to Figure 11.4 Dublin Bay UNESCO Biosphere Reserve;
- Volume 5, Figure 11.5 Habitat Survey Result (1 of 6) to 11.10 Habitat Survey Results (6 of 6);
- Volume 3 Part B, Appendix A11.1 Bat Survey and Assessment 2017;
- Volume 3 Part B, Appendix A11.2 Botanical Survey at Portmarnock;
- Volume 3 Part B, Appendix A11.3 Ecological Survey for Smooth Newt; and
- Natura Impact Statement (standalone report).

Note that figures illustrating mammal survey results indicate the location of badger setts, and these figures have been supplied to the An Bord Pleanála (ABP) as a confidential appendix.

Please also note that the terrestrial biodiversity impact assessment of the proposed RBSF aspect of the Proposed Project is addressed in Chapter 6 Biodiversity in Volume 4 Part A of this EIAR.

11.1.1 Chapter Structure

The structure of this Chapter has been divided into terrestrial biodiversity (Section 11.2 to Section 11.8) and freshwater aquatic biodiversity (Section 11.9 to Section 11.15). Section 11.2 details the methodology for both terrestrial and freshwater aquatic biodiversity assessments. Section 11.3 to Section 11.8 provide the terrestrial biodiversity assessment of the likely impacts for the Construction Phase and Operational Phase of the Proposed Project. Section 11.9 to Section 11.15 provide the freshwater aquatic biodiversity assessment of the likely impacts for the Construction Phase and Operational Phase of the Proposed Project. This Chapter identifies relevant terrestrial and freshwater aquatic biodiversity receptors within the planning application area and a Zol of the Proposed Project and provides baseline data against which future changes can be assessed. It also assesses the general status of the potentially affected watercourses from an ecological and fisheries perspective in the context of downstream catchments, coastal Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

11.1.2 Zone of Influence

From a terrestrial biodiversity perspective, the study area was defined as the footprint of the Proposed Project plus a 1km radius surrounding the Proposed Project boundary. The Proposed Project passes through coastal and farmland habitats on the northern fringe of the urban fabric of Dublin's suburbs which are categorised at the lower end of the scale of ecological values set out in Table 11.6. Terrestrial habitats occurring within and in close proximity to the Proposed Project boundary could clearly be adversely influenced by activities associated with the Proposed Project, but they are not highly groundwater dependant habitat types. There is no possibility of activities associated with the Proposed Project adversely influencing terrestrial habitats occurring more than 1km from the Proposed Project boundary. A change in terrestrial species behaviour is triggered by noise or visual stimuli. Species occurring within and in close proximity to the Proposed Project boundary can be adversely influenced by activities associated with the Proposed Project, but as the distance from the Proposed Project increases, the likelihood of terrestrial species being adversely affected decreases. Noise and visual stimuli that is more than 1km away from the Proposed Project boundary and that significantly affects species behaviour is unlikely to be associated with the Proposed Project. At this distance, noise or visual stimuli resulting from activities associated with the Proposed Project will not exist, being replaced by stimuli occurring much nearer to the species. On this basis, it is the view of the authors that beyond this distance, no terrestrial biodiversity receptor could be influenced by the Construction Phase or the Operational Phase of the Proposed Project.

From a freshwater aquatic biodiversity perspective, the ZoI includes the sub-catchments and catchment in which the Proposed Project lies, as defined by the Environmental Protection Agency (EPA) for the purposes of the implementation of Directive 2000/60/EC of 23 October 2000 of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the Water Framework Directive (WFD)), and includes downstream receptors in the marine environment and designated sites. The relevant sub-catchments and their EPA codes are the Tolka (Tolka_SC_020) and the Mayne (Mayne_SC_010). The relevant catchment is the Liffey and Dublin Bay Catchment. The Proposed Project boundary is wholly contained within these land based sub-catchments. The relevant marine receptors are the estuary transitional waterbodies and the Irish Sea.

11.2 Methodology – Terrestrial and Freshwater Aquatic

11.2.1 Desktop Data Sources and Consultation

A desktop review of relevant environmental data and anecdotal information was carried out to identify features of biodiversity value within the ZoI. Consultations were undertaken with the following organisations of particular relevance to terrestrial and freshwater biodiversity, flora and fauna:

- National Parks and Wildlife Service (NPWS);
- BirdWatch Ireland;
- Fingal County Council (FCC);
- Botanical Society of Britain & Ireland;
- National Biodiversity Data Centre (NBDC); and
- Inland Fisheries Ireland (IFI).

The following databases were consulted to retrieve biodiversity data:

- NPWS Maps & Data (NPWS 2017);
- National Biodiversity Data Centre Records & Mapping (NBDC 2017);

- Review of Ordnance Survey Ireland mapping and aerial photography of the Proposed Project area and its environs;
- EPA Water Quality Data (EPA 2017);
- WFD Ireland Water Maps (see www.wfdireland.ie);
- *Fishing in Ireland – An angler’s guide to fishing in Ireland* (IFI 2017);
- IFI WFD Fish Data (see www.wdfish.ie); and
- Invasive Species Ireland (Invasive Species Ireland 2017).

Other than establishing the occurrence or otherwise of biodiversity features within the ZoI of the Proposed Project, the results of desktop data gathered were used to inform and direct the detailed field surveys.

Non-Statutory Consultation

The issues raised as a result of non-statutory consultation on the Proposed Project are included in Table 11.1.

Table 11.1: Issues Raised During Non-Statutory Consultation on the Proposed Project

Stakeholder	Date Received	Submission Details	Environmental Impact Assessment Report Chapter Reference
BirdWatch Ireland	12 December 2013	<ul style="list-style-type: none"> • Location of the WwTP (site boundary proposed at 50m from Cuckoo stream, tributary of the Mayne River – struggling with ecological status). 	<ul style="list-style-type: none"> • Section 11.9 to Section 11.14 provide the assessment of the Proposed Project on aquatic biodiversity.
Inland Fisheries Ireland (IFI)	11 December 2013	<ul style="list-style-type: none"> • Environmental Impact Statement (EIS) should include an assessment establishing the current baseline ecological conditions, detail construction and operational activities and predict the impact of future changes to the baseline. • Water quality assessment should be carried out in accordance with all relevant existing national and European legislation. • The EIS should provide a full and detailed evaluation on the likely impacts of the complete project on groundwater, freshwater, estuarine and coastal ecology. • Mitigation strategies to be developed to avoid impacts on water quality and habitat ecology. All measures necessary should be taken to ensure protection of local aquatic ecological integrity, in the first place by complete impact avoidance and, as a secondary approach, through mitigation by reduction and remedy. • The EIS should assess the predicted impacts of noise and vibration during the construction and operation of the Proposed Project. 	<ul style="list-style-type: none"> • Sections 11.3 and 11.9 provide the baseline ecological conditions. • See Section 11.2.5 and Table 11.5, which demonstrate compliance with the WFD. • Chapters 9 to 11 provide a full and detailed evaluation on the likely impacts of the Proposed Project on freshwater, estuarine and coastal ecology. Chapter 17 Hydrology and Hydrogeology provides details on groundwater. • Sections 11.7 and 11.14 of this Chapter (along with Chapter 9) outline details of mitigation measures for water quality and habitat ecology. • Section 11.10 addresses potential impacts of noise and vibration during the construction of the Proposed Project on

Stakeholder	Date Received	Submission Details	Environmental Impact Assessment Report Chapter Reference
			fisheries. No noise impacts are predicted during the Operational Phase.
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs/ National Parks and Wildlife Service (NPWS) (Formerly Department of Arts, Heritage and the Gaeltacht)	10 January 2014	<ul style="list-style-type: none"> With regard to EIS, an ecological survey of the entire Proposed Project site and pipeline routes should be carried out; Where ex situ impacts are possible, survey work may be required outside of the project sites. The impact of the development on the flora, fauna and habitats present should be assessed. In particular, the impact of the proposed development should be assessed, where applicable, with regard to legislation relating to habitats and species. Project should be subject to Appropriate Assessment Screening and, where necessary, Appropriate Assessment as per Article 6.3 of the Habitats Directive. Consultation with the relevant Local Authorities is recommended to determine if there are any projects or plans which alone or in combination could impact on any Natura 2000 sites. 	<ul style="list-style-type: none"> Chapters 9 to 11 provide an ecological survey of the entire Proposed Project and an impact assessment of the development on flora, fauna and habitats. Natura Impact Statement (NIS) completed in accordance with Article 6.3 of the Habitats Directive. Chapter 23 Cumulative Impacts and Environmental Interactions assesses the potential for cumulative impacts arising from the Proposed Project in association with other developments, and also considers the potential interaction between environmental aspects arising from the Proposed Project.

11.2.2 Local Planning Policy

The *Fingal Development Plan 2017-2023* (FDP) (FCC 2017) was reviewed. Policies and objectives in relation to green infrastructure are prescribed in Chapter 8 of the FDP and natural heritage in Chapter 9 of the FDP.

The allied *Fingal Biodiversity Action Plan 2010-2015* (FCC 2010) is also a key reference document in guiding the conservation of the natural environment in Fingal by providing a template of action for the next 20 years. The *Fingal Biodiversity Action Plan 2010-2015* is based on the development of an Ecological Network across the administrative area of Fingal. The Ecological Network is comprised of four elements:

- Core Nature Conservation Sites;
- Buffer Zones around the core sites;
- Nature Development Areas (NDAs); and
- Ecological corridors and stepping stones.

The purpose of the Ecological Network is to provide a framework and focus for nature conservation efforts in Fingal. Core sites will be enlarged and protected with buffer zones to create more space for sustaining habitats and healthy populations of protected species. NDAs have been identified to provide opportunities for habitat improvement in the wider countryside and urban landscapes. Core sites and NDAs are connected by ecological corridors and stepping stones, with the objective of creating an interconnected landscape through which wildlife can move freely, and healthy populations of both rare and common species can be maintained.

Certain objectives of the FDP (FCC 2017) are relevant to this assessment, and have been extracted and listed in Table 11.2.

Table 11.2: Selected Objectives of the Fingal Development Plan 2017-2023 Relevant to Terrestrial and Freshwater Aquatic Biodiversity

Objective	Text	Where this is addressed in Environmental Impact Assessment Report
FDP – Chapter 8: Green Infrastructure (selected objectives)		
GI22	Require all proposals for large scale development, such as road or drainage schemes, wind farms, housing estates, industrial parks or shopping centres, to submit a Green Infrastructure Plan as an integral part of a planning application.	The Green Infrastructure Plan is contained in the Proposed Project Planning Report
GI24	Ensure biodiversity conservation and/or enhancement measures, as appropriate, are included in all proposals for large scale development such as road or drainage schemes, wind farms, housing estates, industrial parks or shopping centres.	Section 12.7 of Chapter 12 Landscape and Visual outlines the enhancement measures for the Proposed Project, including the planting of a series of flowing organic embankments with dense bands (approx. 15m to 20m wide) of hedgerow tree species and additional tree lines and grids at the proposed WwTP.
FDP – Chapter 9: Natural Heritage (selected objectives)		
NH15	Strictly protect areas designated or proposed to be designated as Natura 2000 sites (i.e. SACs and SPAs, also known as European Sites) including any areas that may be proposed for designation or designated during the period of this Plan.	EIAR Chapter 9 Biodiversity (Marine), Chapter 10 Biodiversity (Marine Ornithology), the NIS and this Chapter describe how the Proposed Project adheres with this Policy by avoiding footprints within designated sites, their buffer zones and locations where protected species occur, where this can be achieved; and describing the predicted impacts upon designated sites, their buffer zones and protected species, and mitigation measures proposed to reduce impacts on designated sites, their buffer zones and protected species.
NH16	Protect the ecological integrity of proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, and Habitat Directive Annex I sites.	
NH17	Ensure that development does not have a significant adverse impact on pNHAs, NHAs, Statutory Nature Reserves, Refuges for Fauna, Habitat Directive Annex I sites and Annex II species contained therein, and on rare and threatened species including those protected by law and their habitats.	
NH18	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.	
NH19	Develop Ecological Masterplans for the Rogerstown, Malahide and Baldoyle Estuaries focusing on their ecological protection and that of their surrounding buffer zones.	
NH20	Maintain and/or enhance the biodiversity of the NDAs indicated on the Green Infrastructure Maps.	Section 11.4 and Section 11.5 describe the predicted impacts upon NDAs, and Section 11.8 concludes that likely significant impacts are not predicted upon NDAs.
NH23	Protect the ecological functions and integrity of the corridors indicated on the Development Plan Green Infrastructure Maps.	Section 11.9 and Section 11.10 describe the predicted impacts upon these corridors and watercourses, and Section 11.15 concludes that likely significant impacts are not predicted upon these corridors and watercourses.
NH24	Protect rivers, streams and other watercourses and maintain them in an open state capable of providing suitable habitat for fauna and flora, including fish.	
NH25	Provide for public understanding of and public access to rivers, waterway corridors and wetlands, where feasible and appropriate, in partnership with the NPWS, Waterways Ireland and other relevant stakeholders, while maintaining them free from inappropriate development and subject to Ecological Impact Assessment and screening for Appropriate Assessment as appropriate.	
NH27	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.	EIAR Chapter 4 Description of the Proposed Project and Section 11.7 describe how vegetation to be retained will be protected, and how vegetation to be lost will be replaced.

Objective	Text	Where this is addressed in Environmental Impact Assessment Report
NH50	Protect and enhance the special landscape character and exceptional landscape value of the islands, including their biodiversity, archaeological and architectural heritage.	Not applicable
NH60	Strictly control the nature and pattern of development within coastal areas and ensure that it is designed and landscaped to the highest standards, and sited appropriately so as not to detract from the visual amenity of the area. Development shall be prohibited where the development poses a significant or potential threat to coastal habitats or features, and/or where the development is likely to result in altered patterns of erosion or deposition elsewhere along the coast.	EIAR Chapter 8 Marine Water Quality, Chapter 9 Biodiversity (Marine), Chapter 10 Biodiversity (Marine Ornithology), Chapter 12 Landscape and Visual and this Chapter describe how the Proposed Project adheres with this Policy as it does not give rise to significant environmental impacts, including visual impacts upon coastal habitats or features, and does not result in altered patterns of erosion or deposition elsewhere along the coast.

11.2.3 Field Survey

Terrestrial Habitats

An extended Phase 1 Habitat Survey was conducted along and extending 50m around each component of the Proposed Project over three years (July and August 2012; March and September 2013; April, May and August 2015), and re-surveyed again in August 2017. Such an approach facilitates the optimal survey season in which to survey the broad habitats and characteristic flora expected to be present within the footprint of the Proposed Project. The survey corridor broadly comprises grassland, woodland and scrub habitats and would not be impacted by construction or drilling techniques required for the Proposed Project beyond a 50m distance.

Surveys were coordinated and conducted by a team of competent and professional ecologists with considerable experience of habitat survey techniques in Ireland. The surveys were undertaken in accordance with the Heritage Council's (2011) *Best Practice Guidance for Habitat Survey and Mapping*. All terrestrial habitats (i.e. above the mean high-water mark) were mapped, and an intensive search was undertaken for protected and invasive flora species. Habitat assessment categories used were consistent with those outlined in *A Guide to Habitats in Ireland* (Fossitt 2000). A botanical quadrat survey was conducted at the site of proposed temporary construction compound no.10 due to the possibility of Annex I dune habitats occurring there (refer to Appendix A11.2).

Bats

Bat surveys for the Proposed Project were undertaken by experienced and licenced bat surveyors between 2012 and 2017. Preliminary walkover surveys extending 50m around each component of the Proposed Project were undertaken in June and August 2012, and September and October 2013, and habitats and structures of potential value to bats were noted and marked on a map. The value of each feature was noted according to its potential for use by bats for roosting, foraging or commuting. The value of habitat features for bats was defined in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins 2016) as shown in Table 11.3.

Both dusk activity surveys (from sunset, for a minimum of 120 minutes) and dawn activity surveys (from a minimum of 90 minutes prior to sunrise) were initially undertaken in 2012 and supplemented in 2013, 2015 and 2017. Dates of surveys are included in Appendix A11.1. These surveys enabled the identification of any obvious roost sites, determined the approximate numbers and species of bats present within the Proposed Project study area (as defined in Section 11.1.2), areas used for foraging, commuting routes to and from roosts and any changes in mid to late summer activity levels. The approximate flying height and direction

taken by bats were estimated and detailed where possible. Handheld detectors were used while walking along transects within the study area (as illustrated in Appendix A11.1, Figure 2.1 and Figure 2.2), and a driven transect was conducted in order to cover greater portions of the study area than on foot. Specific dusk emergence and dawn re-entry surveys were undertaken of trees that were identified during the activity surveys as obvious potential roosting sites (from approximately 15 minutes before sunset for a minimum of 120 minutes and from a minimum of 90 minutes prior to sunrise respectively). All surveys were conducted in optimum weather conditions (avoiding periods of very heavy rain, strong winds (i.e. greater than Beaufort Force 5), mists and dusk temperatures below 10°C).

In order to supplement the information gathered from the manual activity surveys, a Passive Monitoring System of bat detection was also deployed at point locations within the Proposed Project boundary (as illustrated in Appendix A11.1, Figure A.1 and Figure A.2) in 2017. A bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for later analysis. The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time, and also has the advantage that the detector can be positioned in locations that could not be walked in the hours of darkness for health and safety reasons. Passive monitoring was completed using an Anabat Express static detector. Bats were identified by their ultrasonic calls. This detector system recorded bat ultrasonic calls on a continuous basis and stored the information onto an internal Secure Digital (SD) card. Each time a bat was detected, an individual time-stamped (date and time to the second) file was recorded.

One Anabat Express monitor was deployed for the survey and was positioned in eight different locations, as illustrated in the Bat Survey Report in Appendix A11.1. The Anabat Express monitor was positioned in hedgerows, treelines and woodland that will be severed by, or are adjacent to, the Proposed Project, primarily in locations that could not be accessed at night-time. The detector was set to record from approximately 30 minutes before sunset until sunrise. Data were then downloaded and bat echolocation calls were later analysed by an AnalookW software analysis programme. Each time-stamped file was analysed and the species of bat recorded was noted as a bat pass.

Table 11.3: Value of Habitat Features for Bats (Collins 2016)

Suitability	Description	
	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on-site likely to be used by roosting bats.	Negligible habitat features on-site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain Potential Roost Features (PRFs), but with no features seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated, habitat that could be used by small numbers of foraging bats, such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status. (With respect to roost type only, the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.

Suitability	Description	
	Roosting Habitats	Commuting and Foraging Habitats
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	<p>Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>

Mammals (Other than Bats)

Upon review of the results of the extended Phase 1 Habitat Survey, a badger and otter survey was conducted along and extending 100m around each component of the Proposed Project between November 2012 and February 2013 (winter 2012/2013), and repeated again twice: once in winter 2015/2016 and again in August/September 2017. The freshwater aquatic ecology surveys undertaken in 2012, 2015 and 2017 (see Section 11.9.1) also examined watercourses and their bankside vegetation for signs of otter activity.

Badger and otter surveys were conducted in accordance with the National Road Authority (NRA) (now Transport Infrastructure Ireland) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA 2009a) as this provides best practice methodologies for major infrastructure projects. It is the view of the authors that ground mammals would not likely be significantly affected by the construction or operation of elements of the Proposed Project, including underground drilling, beyond 100m. Disturbance to protected ground mammals occurs when they change behaviour in response to noise or visual stimuli. The focus of the assessment on badgers and otters is to establish whether or not they use the land in a given area; and whether or not the resting place of any badger or otter occurs within a given area. Disturbance licences can be required up to 100m away from certain activities, and this is deemed to be the point beyond which likely significant impacts will not occur.

The objectives of the badger survey were to:

- Confirm whether or not badger setts occur within the Proposed Project study area surveyed;
- Confirm where possible the status of any setts identified in survey; and
- Describe field signs of badger activity.

Notes were made on signs of mammals in order to deduce the likelihood of faint tracks and/or feeding signs belonging to badgers.

The objective of the otter survey was to identify and describe:

- Sleeping and resting places, including holts, couches and natal dens;
- Breeding sites;
- Spraints;
- Pathways/trails;
- Slides;
- Hairs;
- Footprints; and
- Food remains.

Farmland Birds

The bird species and designations related to the estuarine and nearshore habitats of Baldoyle Bay are covered in Chapter 10 Biodiversity (Marine Ornithology) of this EIAR. This Chapter deals with land based species, largely comprising the species frequently referred to under the broad term 'farmland birds', but also including all raptors and inland riverine species such as kingfisher. The following ornithological elements of this Chapter therefore only consider these birds and their habitats.

The terrestrial footprint of the Proposed Project occupies open fields, with agriculture the main land use pattern. Habitats are heavily modified, with very few natural or semi-natural features. As a result, and taking account of the extended Phase 1 Habitat Survey, methods appropriate to lowland agricultural landscapes were adopted to survey both breeding and wintering birds, to determine the species present and their distribution. Given the nature of the landscape, particular consideration was given to the identification of any locations and habitats that supported higher relative concentrations of target species, so impacts on these species could be assessed, and any mitigation devised accordingly.

Detailed surveys were carried out to confirm the baseline, and in particular to check for any unexpected species of conservation importance or concentrations of other species that would need to be assessed.

Breeding Farmland Birds

In order to establish the breeding bird assemblage in the Proposed Project survey area, surveys were completed for the proposed WwTP in 2012, 2013, 2015 and 2017 and along the entire Proposed Project in 2015 and 2017.

Breeding bird surveys of the proposed WwTP were carried out in June 2012, April and June 2013, and repeated again between April and July in 2015 and 2017 using an abridged version of the British Trust for Ornithology's (BTO's) Common Bird Census Technique (Bibby et al. 2000; Gilbert et al. 1998), which aims to capture data on breeding bird activity within the survey area surrounding the proposed WwTP during the optimal survey window (April to July).

For the breeding bird survey of the Proposed Project, the survey extended 250m around each component of the Proposed Project. Unlike ground mammals, breeding farmland birds can be much more vulnerable to elevated noise levels which can mask their song. A survey area extending to 250m was selected to ensure that any breeding territories of sensitive songbirds which might be impacted by the Construction Phase or Operational Phase of the Proposed Project would be recorded if present.

All bird species encountered during the survey were mapped and coded using standard BTO species codes and categories of breeding evidence, e.g. singing male, carrying food, recently fledged downy young. No attempts were made to locate nests, as such behaviours are generally sufficient to determine probable or confirmed breeding. Survey visits commenced shortly after dawn and were generally completed before mid-day to coincide with the peak bird activity period. Visits were not made during adverse weather conditions. A transect route was chosen to ensure all elements of the Proposed Project survey area were passed within 50m.

Minor and localised restrictions in the survey study area did not affect the robust assessment conducted. In 2015, two sets of surveys were carried out (in late April and June), with repeat surveys also completed in 2017 (May and June). The surveys focused on areas of potential ornithological interest, such as waterbodies, drainage ditches, watercourses, scrub and woodland edges. The location and activities of all species seen or heard were recorded on field maps using standard BTO species codes and activity symbols, including behaviour and flight lines of the birds. Where possible, the sex of individuals was identified, and whether the bird was an individual or one of a pair. Account was also taken of whether birds were new or previously

recorded birds that had moved position. Surveys were carried out in suitable weather conditions to ensure good visibility.

Wintering Farmland Birds

For the winter bird survey of the Proposed Project, the survey extended 250m around each component of the Proposed Project using the same method as above, i.e. BTO Common Bird Census Technique, to capture a snapshot of wintering bird activity within a site. The proposed pipeline routes were divided into 10 sectors and bird numbers were recorded for each sector, mapping the location and activities of all bird species seen, with sightings recorded on field maps using standard BTO species codes and activity symbols, including behaviour and flight lines of the birds. Three sets of visits were carried out, in late winter 2014/2015, in early winter 2015/2016 and in late winter 2016/2017.

The same approach was used as for the breeding bird survey, i.e. surveyors walked the route, pausing at appropriate points to focus on areas of potential ornithological interest such as waterbodies, watercourses, scrub, hedges and woodland edges, stubble fields and game cover crops.

All surveys were conducted by competent and professional ornithologists with considerable experience of bird survey techniques in Ireland.

Other Species Groups

Newt Survey

Upon review of the results of extended Phase 1 Habitat Survey, it was considered that none of the ditches along the proposed pipeline routes or at the proposed WwTP site were suitable for smooth newts. Three locations along the proposed pipeline routes were identified as waterbodies holding potential for smooth newt breeding sites, as illustrated in Figure 1 of Appendix A11.3. A smooth newt survey was conducted under licence within 250m of the Proposed Project footprint at these three locations. The survey included 16 ponds and was conducted in May and June 2015. This survey was repeated at the same three locations in May and June 2017. The methodology used followed survey techniques for smooth newts, as outlined in *Ecological Survey Techniques for Protected Flora and Fauna* (NRA 2009a) and the guidance issued by the Northern Ireland Environment Agency (NIEA) *Newt Surveys – NIEA Specific Requirements* (NIEA 2014). Additional guidance was gathered from *Britain's Reptiles Amphibians* (Inns 2009), *The distribution and status of smooth newts in Northern Ireland* (O'Neill et al. 2004) and the *IWT National Smooth Newt Survey 2013 Report* (Meehan 2013)

Smooth newt survey results are presented in Appendix A11.3. During each survey visit, a two-pronged survey approach was employed and included (a) dip-netting and (b) torchlight surveys. Dip-netting was followed by torchlight survey during the hours of darkness. The two-pronged approach aims to identify and record newts within waterbodies, typically to observe individuals swimming to the surface to take gulps of air. Torchlight surveys were undertaken using rechargeable torches rated at 1 million candlepower. Dip-netting could not be undertaken at all pools, and drainage ditches were deemed too shallow or too densely vegetated.

Freshwater Habitat Assessment

The freshwater flora and fauna assessment addresses fishery value, invertebrate fauna, aquatic flora, water quality, habitat value and general ecological condition of freshwater catchments and their streams/rivers near or intersected by the Proposed Project and provides baseline data against which future changes can be assessed. It also assesses the general status of the potentially affected watercourses from an ecological and fisheries perspective in the context of downstream catchments, coastal SACs and SPAs from a freshwater ecology point of view.

Habitat assessments upstream and for 1km downstream (where possible) of each of the freshwater sampling locations (see Figure 11.17 Freshwater Sampling Locations) were carried out in July 2012 and June 2015. Repeat habitat surveys at each surveyed location were carried out in June 2017. Each river reach (uninterrupted length of river) was assessed using the following criteria:

- Watercourse width and depth;
- Substrate type, listing substrate fractions (e.g. bedrock, boulders, cobble, pebbles, gravel, sand and silt) in order of dominance (e.g. dominant, common);
- Flow type, listing percentage of riffle, glide and pool in the sampling area;
- In-stream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling location;
- Dominant bankside vegetation, listing the main species overhanging the stream and present in the riparian zone;
- Estimated degree of shade of the sampling site by bankside vegetation; and
- The degree of siltation was recorded on a scale of clean, slight, moderate and heavy, prior to kick sampling.

Surveys were carried out at each of the watercourses within the optimum period to conduct macroinvertebrate and in-stream flora assessments, i.e. between the months of May and September, as light and river conditions are generally more suitable and diversity is greatest.

Protected Freshwater Species

Criteria used for Assessment of Salmonid Habitat Quality

Each stream habitat section was rated as habitat for the different life stages of salmonid fish based on the habitat assessment features listed above.

Habitat quality for in-stream macroinvertebrates, plant communities, fish, and riparian birds and mammals is primarily a function of 'naturalness' and diversity. The more diverse the stream habitat, in terms of substrate, flow rate, depth, riparian vegetation and light conditions, the richer the biological community is likely to be, and the more suitable it is likely to be for salmonid fish (trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*)).

Assessment of the quality of salmonid spawning, nursery and adult habitats is based on professional expertise and judgement, and published information such as the following:

- Favourable locations for salmon spawning are likely to occur where the gradient of a river is 3% or less (Mills 1989);
- Preferred current velocity for spawning is within the range 25–90cm/s, with a water depth in the range 17–76cm (Hendry and Cragg-Hine 1997);
- Typical spawning sites are the transitional areas between pool and riffle where flow is accelerating and depth decreasing, where gravel of suitable coarseness is present and interstices are kept clean by up-welling flow (Bjornn and Reiser 1991);
- Salmon fry and parr occupy shallow, fast-flowing water with a moderately coarse substrate with cover (Symons and Heland 1978, Baglinière and Champigneulle 1986);
- Deep or slow-moving water, particularly when associated with a sand or silt substrate, does not support resident juvenile salmonids (Baglinière and Champigneulle 1986);
- Suitable cover for juveniles includes areas of deep water, surface turbulence, loose substrate, large rocks and other submerged obstructions, undercut banks, overhanging vegetation, woody debris lodged in the channel, and aquatic vegetation (Heggenes 1990, Bjornn and Reiser 1991, Haury et al. 1995);

- The juxtaposition of habitat types is also important. The proximity of juvenile habitat to spawning gravels may be significant to their utilisation. In addition, adults require holding pools immediately downstream of spawning gravels in which they can congregate prior to spawning. Cover for adult salmon waiting to migrate or spawn can be provided by overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water and surface turbulence (Bjorn and Reiser 1991); and
- Proximity of cover to spawning areas may be a factor in the selection of spawning sites by some salmonid species (Bjorn and Reiser 1991).

Criteria used for Assessment of Lamprey Habitat Quality

Lamprey habitat preferences change with the stages of their life cycle. They show a preference for gravel-dominated substratum for spawning. After hatching, the larvae swim or are washed downstream by the current to areas of sandy silt in still or slow-flowing water where they burrow and spend the next few years in tunnels. Lampreys therefore require mainly silt- and sand-dominated substratum for nursery habitat. Other important environmental characteristics for optimal ammocoete (juvenile) habitat are shallow waters with low water velocity, and the presence of organic detritus and/or plant material. Sub-optimal habitat supporting only a few individuals may consist of a few square centimetres of suitable silt in an open, comparatively high-velocity, boulder-strewn streambed. Spate rivers with high flow velocities tend to support fewer ammocoetes, as they contain smaller areas of stable sediment (Maitland 2003).

Criteria used for Assessment of White-Clawed Crayfish Habitat Quality

White-clawed crayfish (*Austropotamobius pallipes*) are typically found in watercourses of 0.75m to 1.25m depth, but the species may occur in very shallow streams (about 50mm of water) and in deeper, slow-flowing rivers (2.5m) (Holdich 2003). The white-clawed crayfish typically occupies cryptic habitats under rocks and submerged logs, among tree roots, algae and macrophytes, although it usually emerges to forage for food. Juveniles in particular may also be found among cobbles and detritus such as leaf litter. Adults may burrow into suitable substrates, particularly in the winter months. In habitats with flowing water, the white-clawed crayfish may be found in association with:

- Undermined, overhanging banks;
- Sections exhibiting heterogeneous flow patterns with refuges;
- Under cobbles (juveniles) and rocks in riffles, and under larger rocks in pools;
- Among roots of woody vegetation, accumulations of fallen leaves and boulder weirs; and
- Under water-saturated logs (Holdich 2003).

Peay (2003) lists the following habitat features as favoured by crayfish:

- Slow-flowing glides and pools (provided there are refuges), localised velocity of 0.1m/s or less;
- Loose boulders (>250mm) or other similarly sized material;
- Boulders or large cobbles in groups with crevices between them;
- Deep crevices in bedrock;
- Underlying substrate of fine gravel/sand with some pebbles;
- Submerged refuges in stable banks (e.g. natural crevices, stone block reinforcement or stable, slightly undercut banks with overhanging vegetation, large tree roots);
- Un-mortared stone revetting which protects banks from erosion; and
- Stands of submerged and emergent aquatic plants.

The rating of the sections as habitat for these protected species (salmonids, lamprey and crayfish) is on a scale of None/Poor/Fair/Good/Very Good/Excellent. This rating assesses the physical suitability of the habitat; the presence/absence/density of the species in question will also depend on present and historical water quality and accessibility of the section to these species. A rating of 'None' indicates that the ecologist carrying out the assessment regards it as impossible that the watercourse could support the species in question in the relevant life stage.

A rating of 'None – Poor' indicates that it is regarded as possible but extremely unlikely that the stream could support the species in the relevant life stage. 'Fair' indicates that it is possible that the stream section could support the species in question. 'Good' indicates that the ecologist considers it possible and likely that the stream could support the species in question. 'Very Good' indicates that the stream certainly could support the species. 'Excellent' indicates that the ecologist regards the stream as the ideal habitat for the species in question.

Other Freshwater Taxa

Macroinvertebrate Diversity and Biological Water Quality Assessment

Field surveys were carried out during July 2012, June 2015 and June 2017 following the EPA methodology for biological surveillance and water quality assessment of rivers (Toner et al. 2005). A two-minute kick and stone wash sample was taken at each of the freshwater sampling locations. Each of the samples was live sorted for a period of 30 minutes in situ. Relative abundance and sensitivity to organic pollution is used to indicate the water quality of the sampled watercourses. Relative abundance is determined by the percentage of the abundance each taxon represents (Table 11.4).

Table 11.4: Relative Abundance Categories

Relative Abundance Category	Approximate Percentage of Community
Present	1 or 2 individuals
Scarce/Few	<1%
Small numbers	<5%
Fair numbers	5–10%
Common	10–20%
Numerous	20–50%
Dominant	50–75%
Excessive	>75%

Q-values and water quality classes are assigned using a combination of habitat characteristics and structure of the macroinvertebrate community within the waterbody. EPA indices, EPA water quality status and WFD status are interpreted in Table 11.5.

Table 11.5: Environmental Protection Agency Q Rating and Equivalent Water Framework Directive Water Quality Status Classes (Colour Coding as Employed under Water Framework Directive as Specified in Schedule 3 of European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No 272 of 2009) (as amended))

Biotic Index	Environmental Quality Ratio	Environmental Protection Agency Quality Status	Water Quality	Water Framework Directive Status
Q5	1.0	Unpolluted	Good	High
Q4-5	0.9	Unpolluted	Fair to Good	High
Q4	0.8	Unpolluted	Fair	Good
Q3-4	0.7	Slightly Polluted	Doubtful to Fair	Moderate
Q3	0.6	Moderately Polluted	Doubtful	Poor
Q2-3	0.5	Moderately Polluted	Poor to Doubtful	Poor
Q2	0.4	Seriously Polluted	Poor	Bad
Q1-2	0.3	Seriously Polluted	Bad to Poor	Bad
Q1	0.2	Seriously Polluted	Bad	Bad

Note: High – Blue, Good – Green, Moderate – Yellow, Poor – Orange, and Bad – Red)

The Environmental Quality Ratio represents the relationship between the values of the biological parameters observed for a given body of surface water and the values for these parameters in the reference conditions applicable to that body. The ratio is expressed as a numerical value between zero and one, with high ecological status represented by values close to one and bad ecological status by values close to zero. In Ireland, it is calculated as Observed Q-value/Reference Q-value (e.g. Q5). The Environmental Quality Ratio allows comparison of water quality status across the European Union, as each member state has an Environmental Quality Ratio value for ‘High’, ‘Good’, ‘Moderate’, ‘Poor’ and ‘Bad’, based on an intercalibration of boundaries between water quality categories e.g., ‘High–Good’, ‘Good–Moderate’.

Freshwater Flora Assessment

In-stream vegetation was assessed during June 2015 and June 2017 at each of the biological sampling locations. Plant species occurring were listed, and their percentage coverage of the stream bottom at the sampling site was estimated.

11.2.4 Valuation and Impact Assessment

The information gathered from non-statutory informal consultations, scoping, stakeholder feedback, the desk study and the suite of targeted ecological field surveys has been used to inform the assessment of the Proposed Project. The impact assessment has been undertaken following the methodology set out in:

- *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal* (Chartered Institute of Ecology and Environmental Management (CIEEM) 2016);
- *Guidelines for Assessment of Ecological Impacts of National Road Schemes Revision 2* (NRA 2009b);
- *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2017); and
- *BS 42020:2013 Biodiversity: Code of practice for planning and development* (British Standards Institution 2013).

The impact assessment is based upon a source-pathway-receptor model, where the source is defined as the individual elements of the Proposed Project that have the potential to affect identified ecological features. The pathway is defined as the means or route by which a source can affect the ecological features. An ecological receptor is the feature of interest, being a species, habitat or ecologically functioning unit of natural heritage

importance. Each element can exist independently; however, an effect is created where there is a linkage between the source, pathway and feature. A significant effect is defined in the CIEEM (2016) guidelines as:

'an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' [...] or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local';

and

'an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring'.

BS 42020:2013 states that if an effect is sufficiently important to be given weight in the planning balance or to warrant the imposition of a planning condition, e.g. to provide or guarantee necessary mitigation measures, it is likely to be 'significant' in that context at the level under consideration. The converse is also true: insignificant impacts would not warrant a refusal of permission or the imposition of conditions.

Likely significant impacts are predicted on the basis of the Proposed Project as described in Chapter 4 Description of the Proposed Project.

Table 11.6 sets out a geographic frame of reference and criteria for valuing ecological features based on the *Guidelines for Assessment of Ecological Impacts of National Road Schemes Revision 2* (NRA 2009b) which informs the assessment of the magnitude of impacts. Table 11.7 sets out criteria for predicting magnitudes of effect. The ecological importance of natural resources such as surface waters (freshwaters) and terrestrial habitats has been evaluated against these criteria for the Proposed Project.

The methodology for the assessment of impacts which has been employed for this Chapter is derived from and uses the terminology of Section 5 of the CIEEM (2016) guidelines, while also incorporating the principles outlined in Section 3.7 of the EPA (2017) guidelines. The impact assessment identifies and characterises impacts and assesses these impacts in the absence of mitigation in the first instance. Following the identification of measures to avoid or mitigate these impacts, an assessment of the significance of any residual impacts after mitigation is presented. The CIEEM (2016) guidelines also state that the impact assessment process should also identify opportunities for ecological enhancement where they arise within developments.

The CIEEM (2016) guidelines are complementary to the EPA (2017) guidelines when describing the nature of effects on biodiversity features:

- **Positive or negative:** Positive and negative impacts are determined according to whether the change is in accordance with nature conservation objectives and policy, e.g. improves the quality of the environment or reduces the quality of the environment - Quality of Effects (EPA 2017);
- **Extent:** The spatial or geographical area over which the impact/effect may occur (Extent and Context of Effects) (EPA 2017);
- **Magnitude:** 'Magnitude' refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms - Duration and Frequency of Effects (EPA 2017);
- **Duration:** 'Duration' is defined in relation to ecological characteristics as well as human timeframes. Five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species. The duration of an activity may differ from the

duration of the resulting effect caused by the activity. Effects may be described as short, medium or long-term and permanent or temporary. Short, medium, long-term and temporary will need to be defined in months/years - *Duration and Frequency of Effects* (EPA 2017);

- **Frequency and timing:** The number of times an activity occurs will influence the resulting effect. The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons - *Duration and Frequency of Effects* (EPA 2017), and
- **Reversibility:** An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation. In some cases, the same activity can cause both reversible and irreversible impacts - *Duration and Frequency of Effects* (EPA 2017).

Table 11.6: Ecological Valuation Criteria for Ecological Biodiversity Features

Ecological Valuation: Examples
<p>International importance:</p> <ul style="list-style-type: none"> • 'European Site', including SACs and candidate SACs, Sites of Community Importance, SPAs or proposed SPAs (pSPAs). • Site that fulfils the criteria for designation as a 'European Site'. • Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man & The Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Sites hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988).
<p>National importance:</p> <ul style="list-style-type: none"> • Site designated or proposed as an NHA/pNHA. • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts 1976-2012. • National Park. • Undesignated site fulfilling the criteria for designation as an NHA; a Statutory Nature Reserve; a Refuge for Fauna and Flora protected under the Wildlife Acts 1976-2012; and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts; and/or species listed on the relevant Red Data list. • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
<p>County importance:</p> <ul style="list-style-type: none"> • Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan (CDP). • Resident or regularly occurring populations (assessed to be important at the county level) of the following: species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; species of animal and plants listed in Annex II and/or IV of the Habitats Directive; species protected under the Wildlife Acts; and/or species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or national importance. • County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan (BAP), if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
<p>Local importance (higher value):</p> <ul style="list-style-type: none"> • Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. • Resident or regularly occurring populations (assessed to be important at the local level) of the following: species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; species of animal and plants listed in Annex II and/or IV of the Habitats Directive; species protected under the Wildlife Acts; and/or species listed on the relevant Red Data list.

Ecological Valuation: Examples	
<ul style="list-style-type: none"> Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value. Locally important populations of priority species or habitats or features of natural heritage importance identified in a BAP, if this has been prepared. Key features of local value, being sites or features containing common or lower value habitats that maintain links and function as ecological corridors between key features of local value. 	
<p>Local importance (lower value):</p> <ul style="list-style-type: none"> Sites containing small areas of semi-natural habitats that are of limited local importance for wildlife. Sites containing areas of highly modified habitats. Sites containing local populations of species that are common and not of conservation value. Sites that are used by protected species or species of conservation value as part of their territories but which do not contain the breeding or resting places of these species. Sites that do not maintain links or do not function as ecological corridors between key features of local value. 	

Table 11.7: Magnitudes of Effect upon Biodiversity Features

Magnitude of Effect	Criteria
Major adverse	<ul style="list-style-type: none"> Adverse effect on the integrity of a European Site Loss of or permanent damage to any part of a site of international or national importance Loss of a key component or key feature of a site of county importance Decline in favourable conservation status or condition of a legally protected species of county value Causing of an offence under European Directives or domestic transposing legislation
Moderate adverse	<ul style="list-style-type: none"> Temporary or short-term impacts to key features of a site of international or national importance, but no permanent damage or loss of favourable conservation status or condition Medium to long-term or permanent impacts to any part of a site of county value Medium to long-term or permanent loss of a key feature of local importance (higher value) where a feature is important for and supports other features Causing of an offence under domestic legislation
Minor adverse	<ul style="list-style-type: none"> Temporary or short-term impacts to any part of a site of county value Temporary or short-term loss of a feature of local importance (higher value) Medium to long-term or permanent loss of a feature of local importance (lower value)
Negligible	<ul style="list-style-type: none"> No impacts above a <i>de minimis</i> threshold on identified biodiversity features Beneficial and adverse impacts balance such that the resulting impact has no overall affect upon feature
Minor beneficial	<ul style="list-style-type: none"> A small but clear and measurable gain in general wildlife interest, e.g. small-scale new habitats of wildlife value created where none existed before or where the new habitats exceed the area of habitats lost
Moderate beneficial	<ul style="list-style-type: none"> New larger scale habitats (e.g. net gains >1ha in area) created leading to significant measurable gains, helping to achieve relevant objectives of a BAP or CDP
Major beneficial	<ul style="list-style-type: none"> Major gains in new habitats (net gains >10ha) of high significance for biodiversity, helping to achieve relevant objectives of a BAP or CDP and underpinning government policy

11.2.5 Compliance with the Water Framework Directive

The potential for the Proposed Project to impact upon water quality is assessed in the context of the WFD. The WFD established a framework for the management of water resources throughout the European Union. The WFD's overarching goal is to achieve at least good ecological status and good chemical status for all surface waters by 2015, or by 2021/2027 via extended deadlines. The WFD aims are specified in Article 1:

- Prevent further deterioration and protect and enhance the status of aquatic ecosystems and associated wetlands;
- Promote the sustainable consumption of water;
- Reduce pollution of waters from priority substances and phasing out of priority hazardous substances;
- Prevent the deterioration in the status and to progressively reduce pollution of groundwater; and
- Contribute to mitigating the impacts of floods and droughts.

The WFD established four core environmental objectives to be achieved for surface waters which include rivers, lakes, transitional and coastal waters (out to one nautical mile):

- Prevent deterioration;
- Protect, enhance and restore Good status by 2015;
- Protect and enhance artificial and heavily modified water bodies (aim to achieve Good Ecological Potential and good surface water chemical status); and
- Progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances.

In addition, the WFD requires achievement of compliance with any standards and objectives for protected areas set by other legislation, e.g. designated under the Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (Bathing Water Directive), Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (Shellfish Water Directive), Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption (Drinking Water Directive), Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment (Urban Waste Water Treatment Directive) and the Habitats and Birds Directives.

The Department of Housing, Planning, Community and Local Government set the environmental objectives for each waterbody, based on the scientific evidence, extensive surface water quality monitoring, and risk characterisation undertaken by the EPA. The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) (as amended) place duties on public authorities to promote the requirements of the regulations and requires that sources of pollution be controlled to prevent or limit the input of pollutants. The impact assessment presented in this Chapter has reviewed the outcomes of the monitoring and characterisation processes undertaken by the EPA for the waters within the Zol of the Proposed Project, and has incorporated the findings into the impact assessment for the Proposed Project.

More stringent requirements may apply to specific water bodies, in particular those within areas designated as SACs or SPAs. Given that all the relevant watercourses (streams and rivers) within the Zol are not part of any SAC or SPA, but are directly hydrologically connected to the downstream SPAs of North Bull Island and Baldoyle Bay and the SACs of North Dublin Bay and Baldoyle Bay, the impact assessment and mitigation outlined are influenced by these designations. The environmental objective for these waters is good status, as per the *Draft River Basin Management Plan for Ireland 2018–2021* (Department of Housing, Planning, Community and Local Government (DoHPLG) 2018).

11.3 Baseline Environment – Terrestrial Flora and Fauna

11.3.1 Designated Sites

European Sites

Other than the proposed outfall pipeline route (marine section), the associated proposed temporary construction compounds for microtunnelling and the diffuser, there are no other Proposed Project elements near any European Site.

The proposed outfall pipeline route (marine section) will cross under the estuary habitats of Baldoyle Bay SAC and pNHA [Site Code: 000199] and Baldoyle Bay SPA [Site Code: 004016] and will terminate within the Rockabill to Dalkey Island SAC [Site Code: 003000] approximately 1km north-east of Ireland's Eye.

The proposed outfall pipeline route (marine section) will cross under Baldoyle Estuary between proposed temporary construction compound no. 9 and proposed temporary construction compound no. 10, and again will pass under Baldoyle Bay SAC 170m seaward of the top of the beach at Velvet Strand for a distance of approximately 100m. Proposed temporary construction compound no. 10 abuts Baldoyle Bay SAC/SPA/pNHA on its western edge where it meets the Golf Links Road. The Golf Links Road is the boundary of the estuarine SAC/SPA/pNHA.

After passing seaward of Baldoyle Bay SAC for the last time, the proposed outfall pipeline route (marine section) widens out to a 250m wide proposed construction corridor in the marine environment. Approximately 3.2km seaward from the beach at Velvet Strand, the proposed outfall pipeline route (marine section) enters the Rockabill to Dalkey Island SAC [Site Code: 003000], travelling for approximately 1.4km along the seabed in this European Site before ending at the proposed discharge location, approximately 1km north-east of Ireland's Eye. Where the proposed outfall pipeline route (marine section) enters the Rockabill to Dalkey Island SAC, it passes 140m north of Ireland's Eye SPA [Site Code: 004117] and 630m north of Ireland's Eye SAC [Site Code: 002193]. The proposed outfall pipeline route (marine section) will terminate at a discharge point 440m north-east of Ireland's Eye SPA. European Sites are shown in Figure 11.1 Special Areas of Conservation and Figure 11.2 Special Protection Areas and Ramsar Sites.

These European Sites are discussed in greater depth in Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology), as their Qualifying Interests and Special Conservation Interests (SCIs) correspond to marine biodiversity features.

Other Designated Areas

Baldoyle Bay is also designated as a pNHA, a Ramsar site and as a core area of the Dublin Bay United Nations Educational, Scientific and Culture Organisation (UNESCO) Biosphere Reserve. Similarly, Ireland's Eye is a pNHA and also a core area of the Dublin Bay UNESCO Biosphere Reserve. Ramsar sites, NHAs and the Dublin Bay UNESCO Biosphere Reserve are all shown in Figure 11.1 Special Areas of Conservation to Figure 11.4 Dublin Bay UNESCO Biosphere Reserve.

The Dublin Bay UNESCO Biosphere Reserve comprises three zones: a core area, a buffer zone and a transitional area. It is approximately 12.5km wide, stretching from Dublin Airport in the west to its seaward termination. The proposed outfall pipeline route (marine section) will terminate at a discharge point which will be located within the Dublin Bay UNESCO Biosphere Reserve. Approximately 14km of the Proposed Project (land based elements) will be located within all three (core, buffer or transitional) areas of the Dublin Bay UNESCO Biosphere Reserve, as illustrated in Figure 11.4 Dublin Bay UNESCO Biosphere Reserve.¹

The Proposed Project passes below Baldoyle Bay pNHA. The boundary of Baldoyle Bay pNHA is the same as that of Baldoyle Bay SAC, and it is considered within Chapter 9 Biodiversity (Marine). Santry Demesne pNHA is located 340m south of the proposed orbital sewer route where it flanks the eastbound M50 Motorway verge east of the R108 Road junction (M50 Motorway, Junction 4).

The Royal Canal pNHA is located 350m south of the Proposed Project at Abbotstown near the proposed Abbotstown pumping station site.

The Sluice River Marsh pNHA is 910m north of the proposed outfall pipeline route (land based section) where it crosses the Belfast–Dublin railway line.

Feltrim Hill pNHA is located approximately 1.2km north of the proposed outfall pipeline route (land based section) near where it passes through the Teagasc facility at Kinsealy.

¹i.e. from where the proposed orbital sewer route is proposed to cross the R132 Swords Road to the proposed outfall pipeline route (marine section) discharge point within the Rockabill to Dalkey Island SAC, and including the proposed WWTP

NDA and Ecological Buffer Zones (EBZs) have been identified in the FDP (FCC 2017) and the *Fingal Biodiversity Action Plan 2010-2015* (FCC 2010). The Proposed Project passes through or encroaches into NDAs at (i) the origin of the proposed orbital sewer route in woodland enveloping Connolly Hospital at Abbotstown; and (ii) where the proposed orbital sewer route passes through Silloge Park Golf Club. Proposed compound no.7 and a portion of the proposed outfall pipeline route (land based section) will be located within an EBZ at Mayne.

Proposed temporary construction compound no. 9, west of Baldoyle Bay SPA, is within the 'Portmarnock South Zoned Lands'. This is an area for which a Local Area Plan has been prepared and adopted. It includes a low intervention landscape approach to the EBZ lands in order to retain the supporting ecological functions this landscape provides to the estuary habitats, including a 'quiet zone' for migratory birds and arable crop areas for native bird species.

11.3.2 Terrestrial Habitats

This Section should be read with reference to Figure 11.5 Habitat Survey Result and Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds and Crossings. Only habitats above the mean high-water mark are detailed here. Intertidal, sub-tidal and marine habitats below the mean high-water mark are detailed in Chapter 9 Biodiversity (Marine). Freshwater aquatic habitats and species are detailed in Section 11.9 of this Chapter.

[Summary of Habitats](#)

Table 11.8 lists the habitats which were identified within the Proposed Project boundary. Habitats are those described by *A Guide to Habitats in Ireland* (Fossitt 2000). Ecological valuation is based upon criteria explained in Section 11.2.4 and set out in Table 11.6.

Table 11.8: Summary of Habitats

Heritage Council Habitat Code	Habitat	Value
FL8	Other artificial lakes and ponds	Local importance (higher value)
FW2	Depositing lowland rivers	Local importance (higher value)
FW4	Drainage ditches	Local importance (lower value)
GA1	Improved agricultural grassland	Local importance (lower value)
GA2	Amenity grassland	Local importance (lower value)
GS1	Dry calcareous or neutral grassland	Local importance (higher value)
GS2	Dry meadows and grassy verges	Local importance (higher value)
GS4	Wet grassland	Local importance (higher value)
WD1	(Mixed) broadleaved woodland	Local importance (higher value)
WS1	Scrub	Local importance (higher value)
WS2	Immature woodland	Local importance (higher value)
WL1	Hedgerows	Local importance (higher value)
WL2	Treelines	Local importance (higher value)
ED2	Spoil and bare ground	Local importance (lower value)
ED3	Recolonising bare ground	Local importance (lower value)
BC1	Arable crops	Local importance (lower value)
BC2	Horticultural land	Local importance (lower value)
BC3	Tilled land	Local importance (lower value)
BL3	Buildings and artificial surfaces	Local importance (lower value)

Heritage Council Habitat Code	Habitat	Value
CD3	Fixed dunes (managed golf course)	Local importance (higher value)

Proposed Wastewater Treatment Plant

The proposed WwTP footprint, ancillary Proposed Project elements and proposed temporary construction compound areas associated with the proposed WwTP are illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 2 of 3) to Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 3 of 3). This is an area comprising arable crops (habitat code BC1), horticultural land (BC2), hedgerows (WL1) and a drainage ditch (FW4). These large fields were separated by three managed thin and gappy hedgerows travelling north to south. Common hedgerow species, notably hawthorn (*Crataegus monogyna*) were dominant. A dense and intact mature hedgerow (with a drainage ditch) extended east to west along the southern boundary of the proposed WwTP site.

Proposed Abbotstown Pumping Station

The proposed Abbotstown pumping station, ancillary Proposed Project elements and proposed temporary construction compounds associated with the proposed Abbotstown pumping station are illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 1 of 3). This area comprises an arable field (BC1) and immature woodland (WS2). Mixed broadleaved woodland (WD1) with mature broadleaved species occurs immediately to the south but outside of the footprint of the proposed Abbotstown pumping station site, and also immediately north-east of the proposed Abbotstown pumping station site. To the north-east, the woodland is noted for its mature ornamental conifers and broadleaved trees including oak (*Quercus robur*) and beech (*Fagus sylvatica*). The immature woodland within the Proposed Project boundary occurs within an NDA which includes a southward extension of woodland beyond the Tolka Valley Regional Park.

Proposed Orbital Sewer Route – Blanchardstown to Clonshagh

The proposed orbital sewer route, ancillary Proposed Project elements and proposed temporary construction compounds associated with the proposed orbital sewer route are all contained within the Proposed Project boundary as illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 1 of 3). The first section of the proposed orbital sewer route (chainage 0,000m to 1,000m) will be a gravity sewer drilled under the trees and the habitat. No footprint will occur in the surface.

Extensive areas of mixed broadleaved woodland (WD1) were present around Connolly Hospital. Intermittent beech (*Fagus sylvatica*) grow amid younger sycamore (*Acer pseudoplatanus*), pine (*Pinus* sp.) and ash (*Fraxinus excelsior*). Ivy (*Hedera helix*), holly (*Ilex aquifolium*) and pine made much of this woodland particularly shaded, and woodland herbs were extremely patchy. A sizable area of neutral grassland (GS1) also occurs within the hospital grounds. Throughout, it had an unmanaged appearance. This woodland is part of an NDA referred to in the previous Section above. Parkland and scattered trees (WD5) were also found in the Connolly Hospital grounds, but not within the proposed construction corridor of the proposed orbital sewer route.

The habitats along the proposed orbital sewer route include depositing lowland rivers (FW2), drainage ditches (FW4), improved agricultural grassland (GA1), wet grassland (GS4), mixed broadleaved woodland (WD1), scrub (WS1), hedgerows (WL1), spoil and bare ground (ED2), arable crops (BC1), tilled land (BC3), other artificial lakes and ponds (FL8), recolonising bare ground (ED3), horticultural land (BC2) and buildings and artificial surfaces (BL3). Species contained in the arable, tilled and improved fields along the proposed orbital sewer route were consistent. The improved fields were species poor, as expected. Typical agricultural grassland species were present such as perennial ryegrasses (*Lolium* spp.), white clover (*Trifolium repens*)

and creeping buttercup (*Ranunculus repens*). Semi-natural habitats were very intermittent along the proposed orbital sewer route.

As the proposed orbital sewer route passes through the NSC towards Cappoge, it will pass through improved grassland fields. The proposed orbital sewer route will pass through 0.55ha of mixed broadleaved woodland (WD1) at chainage (1,300m to 1,400m) comprising ash, sycamore and beech. Disturbed soils which occurred on the periphery of these fields (recolonising bare ground (ED3)) are seemingly a consequence of recent infrastructure and development works. Only common grass and herb species were evident. Horses grazed most of this available grassland.

Some minor exceptions do occur such as the neutral grassland enclosures at Toberbunny. These are overgrown unmanaged enclosures. An area of recolonising bare ground (ED3) occurred here at the long-stay car park. A small pool and three drainage ditches occurred here and were surveyed for smooth newt in 2015. Smooth newt was not recorded in any of these waterbodies. These ditches had infilled with bulrush (*Typha latifolia*). Pointed spear-moss (*Calliergonella cuspidata*), willowherbs (*Epilobium* sp.) and sedges (*Carex* spp.) are colonising the gravels.

Drainage ditches (FW4) occurred throughout this section of the route. Many support species were found on upper field margins such as bramble (*Rubus fruticosus* agg.) and false oat grass (*Arrhenatherum elatius*). The occurrence of moisture-loving or purely aquatic herbs and forbs was highly variable. Identified species included brooklime (*Veronica beccabunga*), fool's watercress (*Apium nodiflorum*) and floating sweet-grass (*Glyceria fluitans*). These habitats are useful breeding sites for common frog (*Rana temporaria*) as well as supporting many aquatic invertebrates.

Hedgerows were comprised mainly of hawthorn, ash (*Fraxinus excelsior*), occasional beech (*Fagus sylvatica*), blackthorn (*Prunus spinosa*) and hazel (*Corylus avellana*).

[Proposed Temporary Construction Compound No. 2](#)

Proposed temporary construction compound no.2 at chainage 3,500m to 3,700m will be located along the proposed orbital sewer route, as illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 1 of 3). Habitats are comprised of two enclosures of improved grassland (GA1) and horticultural land (BC2), with a line of trees and scrub around the site of proposed temporary construction compound no. 2.

Improved grassland fields were the dominant habitat travelling towards the N2 National Road. There was an unmanaged wet grassland enclosure at chainage 5,300m just east of the N2 National Road. Common species were present such as glaucous sedge (*Carex flacca*), sweet vernal grass (*Anthoxanthum odoratum*), rushes (*Juncus* spp.) and pointed spear-moss (*Calliergonella cuspidata*). Creeping thistle (*Cirsium arvense*) and dandelion (*Taraxacum officinale* agg.) were frequent. Pioneer oak (*Quercus* spp.) and willow (*Salix* spp.) also occurred. This field bordered broadleaved woodland (WD1). Linear woodland occurred between the quarry access roads south of this enclosure.

A large area of recolonising bare ground was present immediately east of the N2 National Road at Coldwinters (chainage 5,600m to 6,100m). The site was entirely comprised of spoil (presumably from road infrastructure works) creating a very uneven hilly terrain. Ponds and pools formed in several hollows and in tracks made from heavy plant, some of which support aquatic plants. Sixteen pools and ponds were identified during the extended Phase 1 Habitat Survey. A macro algae (*Chara*) species was dominant. Smooth newt (*Lissotriton vulgaris*) was confirmed present in some of these ponds during smooth newt surveys. A smooth newt survey report is presented as Appendix A11.3. Horses have maintained a very short sward. Flowering

herbs and grasses include common species like white clover (*Trifolium repens*), plantains (*Plantago* spp.) and common ragwort (*Senecio jacobaea*).

Intensively farmed enclosures (tillage, horticulture and pasture) and amenity grassland were the dominant habitats approaching Ballymun.

[Proposed Temporary Construction Compound No. 3](#)

Proposed temporary construction compound no. 3 (chainage 8,900m to 9,100m) at Ballymun will be located along the proposed orbital sewer route, as illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 1 of 3), and the site contains recolonised bare ground (ED3) and neutral grassland (GS1). The grassland was unmanaged and rank in parts. A series of ponds are located in the recolonising bare habitat. They have developed communities of aquatic plants and freshwater invertebrates. The 2015 smooth newt survey did not find any newts at this location.

The recolonising bare ground had an array of flowering herbs, including frequent birdsfoot trefoil (*Lotus corniculatus*), silverweed (*Potentilla anserine*), selfheal (*Prunella vulgaris*), cowslip (*Primula veris*) and scattered lady's mantle (*Alchemilla* sp.). A golf course surrounds these habitats to the north and west. Spoil and bare ground (ED2) and scrub (WS1) dominated by butterfly bush (*Buddleja davidii*) were present nearby. The spoil and bare ground (ED2) and scrub (WS1) habitats occupy the area of proposed temporary construction compound no. 3 on either side of the approach road to a National Car Test Centre.

Travelling east from proposed temporary construction compound no. 3, habitats comprise car parking and other hard standing associated with Dublin Airport and local industry. Intensively farmed lands (GA1) and amenity grasslands (GA2) were the dominant habitats.

[Proposed Temporary Construction Compound No. 4](#)

Proposed temporary construction compound no. 4 (11,700m to 11,800m) will be located at the Old Airport Road/R132 Swords Road junction (the Collinstown Crossroads), along the proposed orbital sewer route, as illustrated in Figure 13.2 Proposed Construction Corridor, Access Routes, Compounds & Crossings (Sheet 1 of 3). As with proposed temporary construction compound no. 3, the main habitat here was spoil and bare ground (ED2).

[Proposed Outfall Pipeline Route \(Land Based Section\) \(Clonshagh to Baldoyle\)](#)

The proposed outfall pipeline route (land based section) runs from the proposed WwTP to the R106 Coast Road. Habitats along the proposed outfall pipeline route (land based section) included drainage ditches (FW4), improved agricultural grassland (GA1), dry meadows and grassy verges (GS2), broadleaved woodland (WD1), immature woodland (WS2), scrub (WS1), hedgerows (WL1), tree lines (WL2), arable crops (BC1), horticultural land (BC2), tilled land (BC3) and buildings and artificial surfaces (BL3).

Arable, tilled and improved fields dominate the proposed outfall pipeline route (land based section). At Kinsealy, the proposed outfall pipeline route (land based section) overlies what appeared to be willow (*Salix* spp.) that had been invaded by bramble scrub. This area was mapped as scrub (WS1).

Drainage ditches (FW4) or drainage ditches with hedgerows (WL1) were common to all field boundaries. Treelines (WL2) were occasional. Common species which were present here included hawthorn, blackthorn and ash.

At Mayne, the proposed outfall pipeline route (land based section) will be located within an EBZ of Baldoyle Estuary: a European Site described in Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology).

Proposed Outfall Pipeline Route (Marine Section)

It is proposed to tunnel the proposed outfall pipeline route (marine section) from the R106 Coast Road, beneath the European Sites at Baldoyle Bay, Portmarnock Golf Club and Velvet Strand, to emerge on the seabed approximately 600m offshore, where it will then be dredged to its termination point approximately 1km orth-east of Ireland's Eye.

Appendix A11.2 details findings of a more detailed botanical survey conducted in May 2016 to characterise the habitats within the footprint of proposed temporary construction compound no.10 at Portmarnock, as it is located across the Golf Links Road from Baldoyle Bay SAC and adjacent to sand dune habitats of the links course which may correspond to Annex I dune habitats. None of the species that were recorded in the three quadrats within the proposed temporary construction compound site, nor indeed around the perimeter of the study area, are considered rare, and the habitats present do not correspond to any Annex I habitat for which Baldoyle Bay SAC is designated. Rare plants, which have been previously recorded at Portmarnock, did not occur in the area surveyed.

The site of proposed temporary construction compound no. 10 is not designated for conservation nor is the managed vegetation analogous with any of the sand dune habitats for which the SAC is designated.

The area around the car park and the re-vegetating overflow car park are characterised as improved amenity grassland (GA2). Floristically, there is little merit to this habitat, which is managed regularly through mowing. The car park, with its hard surfaces, is classified as buildings and artificial surfaces (BL3) and is separated from the site of proposed temporary construction compound no. 10 by a linear feature comprising partially buried wooden poles.

The site of proposed temporary construction compound no. 10 is level. The managed vegetation largely corresponds with dry meadows and grassy verges (GS2). There was evidence of occasional mowing: decaying thatch among the grass sward but no signs of grazing. Floristically, and unlike the typical Fossitt (2000) description of the habitat, the area was not species-rich. Although ascribed to the meadow habitat, the species assemblage in no way reflects the typical diversity that might be expected from such a diminishing habitat. Instead, a small number of consistently occurring grasses dominated the habitat with herbaceous species scattered throughout. There were subtle variations within the sward, which related to drier areas where pedestrian activity had left distinct trails characterised by low-growing sward. Elsewhere, the wetland influence was apparent, and the graminoid component became rather lush and was accompanied by silverweed. This is indicative of the groundwater influence which occasionally affects the area. Quadrats 1 to 3 were typical of the study site, and their species assemblage accounted for the majority of the variation noted. Other species that were present, and which have been described in Appendix A11.2 in Volume 3 Part B of this EIAR, were less common or else locally abundant, often along raised banks alongside the hedges, which were left unmown. Species such as nettles (*Urtica dioica*) and hogweed (*Heracleum sphondylium*) were the key components in these areas, but others included perennial ryegrass (*Lolium perenne*) and patchily distributed brambles (*Rubus fruticosus* agg.).

The transition to sand dune vegetation, although gradual, was apparent towards the eastern tip of the site, where the pedestrian trails lead onto the boardwalk and focus the walkers through a narrow access section between the two golf courses. The vegetation was dominated by marram (*Ammophila arenaria*) and contained locally common patches of gorse (*Ulex europeaus*) dominated scrub. Other species typical of the habitat were recorded, including kidney vetch (*Anthyllus vulneraria*), bird foot trefoil (*Lotus corniculatus*) and red fescue (*Festuca rubra*), but were not as abundant as marram and gorse. Locally abundant patches of burnet rose (*Rosa pimpinellifolia*) were indicative of an aging system, where the habitat was starved of a suitable supply of fresh sand, resulting in the gradual lowering of the pH and facilitating the spread of the burnet rose. Although

gorse was the predominant shrub here, some sea buckthorn (*Hippophae rhamnoides*) was noted inside the fence of one golf club.

Portmarnock Golf Course and Portmarnock Hotel and Golf Links are well established and support a number of managed habitats. Originally, they would have supported fixed dune (CD3) habitats but have long since been altered. As such, they are excluded from the SAC. They are separated from the survey area on either side by a boundary fence along which hawthorn (*Crataegus monogyna*) was the main vegetative component. These planted linear features were classified as hedgerows (WL1).

Despite being near sand, and its presence in the soil matrix in places, the lands proposed for the proposed temporary construction compound no. 10 site shared no similarities with fixed dune vegetation. The composition of the vegetation within the immediate study area had long since lost any resemblance to fixed dune habitat owing to the management of the area. Annex I sand dune habitat does not occur within the Proposed Project.

A description of intertidal habitats is detailed in Chapter 9 Biodiversity (Marine).

Protected Plant Species

No protected habitats annexed to the Habitats Directive or species of flora protected by Section 21 of the Wildlife Act 1976 (as amended) or scheduled to the Flora (Protection) Order 2015 (S.I. No. 356 of 2015) were recorded during surveys within the Proposed Project footprint. At Mayne, two sites are listed under the Flora (Protection) Order (S.I. No. 356 of 2015) and also Fingal Rare Flora sites occur (refer to FDP (FCC 2017) Map Sheet No. 15 'Green Infrastructure 2' for locations of those sites). The Proposed Project will not be located in either of those sites. See also the above Section describing the absence of protected plant species at the site of proposed temporary construction compound no. 10 at Portmarnock Golf Club.

Non-Native Invasive Species

Non-native (or alien) invasive species are scheduled to the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) (as amended) and Regulation (EU) 1143/2014 on invasive alien species (Invasive Alien Species Regulation). Giant rhubarb (*Gunnera tinctoria* M.) was recorded along the Tolka River downstream of the proposed orbital sewer route and the proposed Abbotstown pumping station site during the aquatic surveys. The location of giant rhubarb is at a sufficient distance from the proposed construction corridor that it will not be impacted or disturbed by construction of the Proposed Project (refer to Section 11.9). No scheduled Invasive Alien Species Regulation were observed within the Proposed Project boundary during terrestrial flora and fauna surveys.

11.3.3 Bats

Bat species are not listed as Qualifying Interests of any European Site or Nationally Designated Site within 15km of the Proposed Project.

Desktop Data

The review of existing records of bat species in the Ordnance Survey 10km x 10km grid squares the Proposed Project is situated within, or adjacent to, indicated that eight of the 10 known Irish species of bat have been recorded in grid squares O03, O04, O13, O14, O23 and O24. These included common, soprano and Nathusius' pipistrelles, Leisler's Bat, brown long-eared bat, Daubenton's bat, whiskered bat and Natterer's bat as shown in Table 11.9. Known or potential bat roosts of some of these species were identified within 5km of the Proposed Project, but not within the Proposed Project boundary, and these are also shown in Table 11.9. Data on roosts were obtained from the National Bat Database (NBDC 2017), and results of previous on-site studies were obtained (Keeley 2013a; 2013b).

Table 11.9: Bat Records in Grid Squares O03, O04, O13, O14, O23 and O24

Common Name	Scientific Name	O03	O04	O13	O14	O23	O24	Known Roosts Within the Grid Squares	Known or Potential Roosts Within the Proposed Project Boundary	Sources
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	√	√	√	√	√	√	√	None	NBDC Previous on-site studies
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	√	√	√	√	√	√	√	None	NBDC Previous on-site studies
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	√		√					None	NBDC Previous on-site studies
Leisler's bat	<i>Nyctalus leisleri</i>	√	√	√	√	√	√	√	None	NBDC Previous on-site studies
Brown long-eared bat	<i>Plecotus auritus</i>	√	√	√	√	√	√	√	None	NBDC Previous on-site studies
Daubenton's bat	<i>Myotis daubentonii</i>	√	√	√	√			√	None	NBDC Previous on-site studies
Whiskered bat	<i>Myotis mystacinus</i>	√	√	√				√	None	NBDC Previous on-site studies
Natterer's bat	<i>Myotis nattereri</i>	√	√	√	√				None	NBDC Previous on-site studies
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>								None	NBDC Previous on-site studies
Brandt's bat	<i>Myotis brandtii</i>								None	NBDC Previous on-site studies

Summary of Previous Survey and Desktop Data for the Proposed Project Area and its Wider Environs

The bat survey and assessment conducted in 2013 (Keeley 2013a; Keeley 2013b) and 2015 found that the most widespread and abundant bat species recorded was the common pipistrelle. This species was present in suburban areas, the border between a city or suburb and its surrounding environment (urban edge) and in agricultural rural lands. Soprano pipistrelle was also widespread throughout Fingal, but less so than common pipistrelle. Leisler's bat was recorded in several locations within the Proposed Project study area. Keeley (2013a) also noted that, while no brown long-eared bats were recorded in the course of the surveys, the echolocation of this species is weak and consequently difficult to identify from detector survey. Brown long-eared bats are known from several locations in Fingal; therefore, it is probable that this is a widespread species throughout the region.

Nathusius' pipistrelle has been recorded in few locations in the Dublin area, including the Grand Canal (2009), Phoenix Park (2008-2013) and Islandbridge (2013). Nathusius pipistrelle is associated with broadleaved woodland, wetlands and waterbodies (Roche et al. 2014), and these habitats are not common within the Proposed Project study area.

Daubenton's bat has been recorded throughout the Proposed Project study area, with the exception of the Grid Squares located next to the coast. A Daubenton's roost has been recorded near Castleknock, south of Blanchardstown. Daubenton's bat typically forages over water, and is also associated with broadleaf woodland. There are several records of Daubenton's bat from the Tolka River at Blanchardstown.

Whiskered bat is uncommon in Fingal. There is one record from the industrial estates north of Blanchardstown, and the species is known from Phoenix Park, with a roost having been recorded to the east of Phoenix Park (1997). Records suggest that this species is associated with woodland cover, small areas of pasture, urban and scrub land cover (Roche et al. 2014).

Natterer's bat is widespread in Ireland but is much less common in the Dublin area. There are a very small number of Natterer's bat records from Fingal. This species is associated with broadleaf woodland, riparian habitats and areas with a larger scale provision of mixed forest (Roche et al. 2014).

Records for lesser horseshoe bats are mainly from Counties Cork, Kerry, Limerick, Clare, Galway and Mayo, with some records outside this core ranging from Counties Sligo and Roscommon. There are no records of lesser horseshoe bat from the Fingal area.

There is one confirmed record of Brandt's bat in Ireland, recorded in County Wicklow. There are no records of Brandt's bat from the Fingal area.

Field Survey

i. Preliminary Survey

Features of potential use by foraging and commuting bats identified in the study area during the preliminary surveys undertaken between June 2012 and October 2013 included areas of broadleaved mixed woodland (Blanchardstown and Abbotstown), immature woodland (Balgriffin), lowland depositing rivers (the Tolka River at Blanchardstown) and hedgerows and treelines (throughout the Proposed Project study area). There were a number of standing trees in hedgerows within the proposed orbital sewer route. None of these trees were identified as being of high potential for supporting roosting bats or confirmed as roost sites. However, a number were of low-moderate potential for roosting bats. There were a number of mature broadleaved trees of moderate potential for roosting bats within the mixed broadleaf woodland at Blanchardstown and Abbotstown.

The principal areas of ecological interest in relation to bats present within the Proposed Project study area include:

Hedgerows and treelines: The improved grassland and arable land covering the majority of the Proposed Project study area was of low conservation interest, and was of low interest to bats. However, many of the hedgerows which bound field systems offered connectivity in the landscape and shelter for commuting and foraging bats. Some of the older trees within hedgerows offered some potential roosting opportunities for individual/small numbers of bats. Therefore, the hedgerows and treelines in the Proposed Project study area are considered as being of local importance (higher value).

Woodlands and watercourses: The woodland along the Tolka River and the connected broadleaf woodland at Blanchardstown and Abbotstown provided an important foraging area and commuting corridor for bats, particularly as the woodland is associated with a watercourse, and there are potential roosting opportunities in mature trees. Therefore, this habitat is considered as being of local importance (higher value).

ii. Activity Survey

The manual and passive detector surveys undertaken within the active season in spring, summer and autumn of 2017 recorded the presence of at least six bat species within the Proposed Project study area. The results of the survey are presented in Table 11.10 along with the location and activity type. The calls on the passive detector are recorded as bat passes. For figures of survey results and raw survey data, please refer to Appendix A11.1.

Proposed Wastewater Treatment Plant

The most frequently recorded species within the proposed WwTP area during the bat activity surveys undertaken between 2012 and 2017 was common pipistrelle, followed by soprano pipistrelle. These species were recorded foraging or commuting along the hedgerows bounding the fields, with most activity concentrated along the treeline adjacent to Cuckoo Stream and a hedgerow with mature standard trees located towards the south-east of the site. Leisler's bat was occasionally recorded commuting overhead.

Roosts

No evidence of bat roosts in trees within or adjacent to the footprint of the site was found during the course of the bat surveys of the Proposed Project study area conducted in 2017, or in previous surveys conducted in 2012, 2013 and 2015. A number of mature trees were identified within the proposed WwTP site that are of low-moderate potential for use by bats as roosting or resting places. These trees may be used by individuals or small numbers of bat species, but it is considered to be unlikely that large numbers of bats roost in trees in the proposed site.

Proposed Abbotstown Pumping Station

The predominant habitat within the proposed Abbotstown pumping station area is arable land. No bats were recorded within the arable field during the activity surveys undertaken between 2012 and 2017. However, common and soprano pipistrelle and brown long-eared bat were recorded foraging along the immature woodland bordering the south of the proposed Abbotstown pumping station site. A low level of common and soprano pipistrelle and *Myotis* species activity was recorded in the mature woodland to the north-east, outside of the proposed Abbotstown pumping station site.

Roosts

No evidence of bat roosts in trees within or adjacent to the footprint of the proposed Abbotstown pumping station site was found during the course of the bat surveys of the Proposed Project study area conducted in 2017, or in previous surveys conducted in 2012, 2013 and 2015.

Proposed Orbital Sewer Route – Blanchardstown to Clonshagh

Common pipistrelle was recorded in the 2017 activity surveys foraging or commuting along the hedgerows and treelines throughout the proposed orbital sewer route. As in 2013 and 2015, there were no locations that were entirely devoid of bat activity, but some locations, such as near Dublin Airport, recorded much lower bat activity. This species was most commonly recorded foraging or commuting along hedgerows adjacent to agricultural and amenity land and at the edge of broadleaf woodland.

Soprano pipistrelle was also recorded in the 2017 activity surveys foraging or commuting along the hedgerows and treelines throughout the study area. This species was recorded alongside roads, local lanes and agricultural land.

Leisler's bat was recorded in 2017 commuting overhead at Blanchardstown, Baleskin and Silloge. Leisler's bat was also recorded foraging along the treelines/hedgerows at Coldwinters. The passive detector recorded Leisler's bat passes at Williamsville and Silloge.

Whiskered/Brandt's bat was recorded during the manual activity surveys foraging over the pond at Waterville Park at Blanchardstown (outside and to the north of the proposed orbital sewer route). Daubenton's bat was recorded foraging in the broadleaf woodland to the north-west of Connolly Hospital at Blanchardstown, near to the Tolka River. The passive detector also recorded a relatively high level of *Myotis* species (unidentifiable to species level) activity in the broadleaved woodland at Blanchardstown during the manual activity surveys. *Myotis* species were mainly recorded in the Blanchardstown area, indicating the importance of the woodland and aquatic habitats in this area for this genus of bats.

A single brown long-eared bat call was recorded during the manual activity surveys in the broadleaved woodland at Blanchardstown. Brown long-eared bat was not recorded on the passive detector, however. As mentioned previously, this species has a weak call that is difficult to pick up on detector surveys, and it is possible that this species is widespread in the Proposed Project study area.

Roosts

One soprano pipistrelle was recorded before sunset on 19 June 2017 in the woodland at Blanchardstown, and one large mature Sycamore tree in the woodland directly adjacent to the boundary of the proposed orbital sewer route at Blanchardstown was identified as a probable bat roost for an individual soprano pipistrelle. Small numbers of both soprano pipistrelle and common pipistrelle were recorded at dawn swarming around two mature oak trees located approximately 21m to 25m to the north-west of the proposed orbital sewer route in the woodland at Blanchardstown. (For the location of these trees, refer to Figure 3.5 of the Bat Survey Report in Appendix A11.1.)

No further evidence of bats roosts in trees was found during the course of the bat survey of the Proposed Project study area conducted in 2017, or in previous surveys conducted in 2012, 2013 and 2015. However, a number of mature trees were identified within the Proposed Project study area that are of low-moderate potential for use by bats as roosting or resting places. These trees may be used by individuals or small numbers of bat species, but it is considered to be unlikely that large numbers of bats roost in trees in the Proposed Project study area.

During the course of the bat surveys undertaken in 2015, soprano pipistrelle and common pipistrelle were recorded early in the evening at Silloge, indicating the potential presence of a roost in the vicinity. This area was re-surveyed in 2017, and no-evidence of a roost was observed within the Proposed Project study area or its immediate environs at this location.

Leisler's bat was recorded near the proposed orbital sewer route at Coldwinters early in the evening during surveys in 2013 and again in 2017. The nearest roosting site at Coldwinters was not shown to be a roost site in 2013 or 2017. As noted previously, the trees within the Proposed Project study area may have been used by individuals or small numbers of bat species but were not suitable to support larger numbers of bats (i.e. a maternity roost).

[Proposed Outfall Pipeline Route \(Land Based Section\) \(Clonshagh to Baldoyle\)](#)

Common and soprano pipistrelle were recorded foraging or commuting along the mature hedgerows present in the Kinsealy area.

Leisler's bat was recorded commuting overhead throughout the proposed outfall pipeline route (land based section). This species was also recorded foraging along the R123 Moyne Road to the south of the proposed outfall pipeline route (land based section).

A single brown long-eared bat call was recorded adjacent to a hedgerow at Kinsealy.

[Roosts](#)

Soprano pipistrelle was recorded on 22 June 2015 emerging from a farm building at Bohammer, near Kinsealy, adjacent to the proposed outfall pipeline route (land based section) (see Figure 3.5 of Appendix A11.1). During the course of the bat surveys undertaken in 2015, soprano pipistrelle was recorded early in the evening at Drumnigh. This area was re-surveyed in 2017, and no evidence of a roost was observed within the Proposed Project study area or its immediate environs at this location.

It is noted that no structures within the Proposed Project study area will require demolition as part of the Proposed Project.

Information on bat roosting preferences adapted from *Irish Bats in the 21st Century* (Roche et al. 2014) and *Bat Surveys for Professional Ecologists* (Collins 2016) is included in the bat report (Appendix A11.1), where the roosting preferences of bat species that have either been confirmed as present, or are likely to be present, in the study area are described.

Table 11.10: Bat Activity Recorded Within the Proposed Project Study Area in 2017

Species	Location	Project Element	Activity	Habitat
Common pipistrelle	Blanchardstown	Proposed orbital sewer route	Foraging	Broadleaf woodland edge and pond
	Abbotstown	Proposed Abbotstown pumping station	Foraging	Broadleaf woodland edge
	Coldwinters	Proposed orbital sewer route	Foraging	Pasture and treeline
	Balseskin	Proposed orbital sewer route	Foraging	Pasture and treeline
	Silloge	Proposed orbital sewer route	Foraging	Hedgerow/treeline
	Clonshagh	Proposed WwTP	Foraging	Hedgerows/treelines
	Kinsealy	Proposed outfall pipeline route (land based section)	Foraging/commuting	Hedgerow/treeline/amenity
Soprano pipistrelle	Blanchardstown	Proposed orbital sewer route	Foraging/commuting	Broadleaf woodland and park
	Abbotstown	Proposed Abbotstown pumping station	Foraging	Broadleaf woodland edge and improved grassland
	Balseskin	Proposed orbital sewer route	Foraging	Pasture and treeline
	Williamsville	Proposed orbital sewer route	Pass	Hedgerow/treeline
	Coldwinters	Proposed orbital sewer route	Foraging	Hedgerows/treelines lining local road
	Clonshagh	Proposed WwTP	Foraging	Hedgerows/treelines
	Kinsealy	Proposed outfall pipeline route (land based section)	Foraging	Conifer plantation edge
	Portmarnock	Proposed outfall pipeline route (marine section)	Foraging	Hedgerow/treeline
Leisler's bat	Blanchardstown	Proposed orbital sewer route	Foraging	Broadleaf woodland
	Abbotstown	Proposed Abbotstown pumping station	Foraging/commuting	Broadleaf woodland edge and improved grassland
	Coldwinters	Proposed orbital sewer route	Foraging	Pasture and hedgerows/treelines lining local road
	Balseskin	Proposed orbital sewer route	Foraging/commuting	Pasture and treeline
	Williamsville	Proposed orbital sewer route	Pass	Hedgerow/treeline
	Dubber's Cross	Proposed orbital sewer route	Pass	Hedgerow/treeline
	Silloge	Proposed orbital sewer route	Pass and foraging	Hedgerow/treeline
	Clonshagh	Proposed WwTP	Foraging/commuting	Hedgerows/treelines
	Kinsealy	Proposed outfall pipeline route (land based section)	Foraging/commuting	Hedgerow/treeline/amenity
	Portmarnock	Proposed outfall pipeline route (marine section)	Foraging	Hedgerows/treelines

Species	Location	Project Element	Activity	Habitat
Brown long-eared bat	Blanchardstown	Proposed orbital sewer route	Foraging	Broadleaf woodland
	Abbotstown	Proposed Abbotstown pumping station	Foraging	Broadleaf woodland edge
	Kinsealy	Proposed outfall pipeline route (land based section)	Foraging/commuting	Hedgerow/treeline/amenity
Whiskered/Brandt's bat	Blanchardstown	Proposed orbital sewer route	Foraging	Pond and parkland
Daubenton's bat	Blanchardstown	Proposed orbital sewer route	Foraging	Broadleaf woodland
<i>Myotis</i> spp.	Blanchardstown	Proposed orbital sewer route	Pass	Broadleaf woodland
	Abbotstown	Proposed Abbotstown pumping station	Pass	Broadleaf woodland ride
	Coldwinters	Proposed orbital sewer route	Pass	Hedgerow

The results of the activity survey are illustrated in Figure 3.3 and Figure 3.4 of the Bat Survey Report in Appendix A11.1.

11.3.4 Mammals (Other than Bats)

Badger

Badger was recorded during the surveys. Due to the high level of persecution of badger and legal protection afforded to this species (badger is listed in the Fifth Schedule of the Wildlife Act 1976 (as amended) and protected under Section 23), information pertaining to the location of setts is treated as confidential. For this reason, figures illustrating and identifying the location of badger setts are not provided with this Chapter. This information is contained within a separate confidential report which has been provided to ABP and the Development Applications Unit of the Department of Culture, Heritage and the Gaeltacht.

Eight badger setts were identified within the Proposed Project study area, and they are summarised in Table 11.11.

Table 11.11: Badger Setts Occurring Within the Proposed Project Study Area

Sett	Location	Distance to Proposed Project	Description
S1	Tolka River Valley	Within proposed construction corridor. 6m north of the proposed 20m wayleave.	Old and disused five-entrance sett, with old spoil heaps. No sign of recent activity. Completely overgrown with ivy and bramble.
S2	Connolly Hospital	110m east-north-east of S1. 7m north of the proposed construction corridor. 17m north of the proposed 20m wayleave. 30m west of proposed Abbotstown pumping station.	Two entrances recently used set within a large area of undisturbed dense scrub and felled trees. No bedding or active spoil heaps were visible, but surveyor views were extremely obscured. Over six well-trodden mammal paths leading in and out of area.
S3	NSC	340m north-east of S2. 3m north-west of the proposed construction corridor. 23m north-west of the proposed 20m wayleave.	Disused outlier, two-entrance sett, with small spoil heaps within mature deciduous woodland. Sett occupied by rabbit at time of survey. Adult badger skull found nearby.

S4	NSC	740m north-east of S3. 90m north-west of the proposed construction corridor.	Disused outlier, single-entrance sett within earth embankment and dense unmanaged hedgerow of dense bramble and ivy. No visible paths or tracks.
S5	NSC	100m north-east of S4. 70m north-west of the proposed construction corridor.	Disused outlier, single-entrance sett within earth embankment with field drain and dense unmanaged hedgerow of dense bramble and ivy. Occupied by rabbit.
S6	NSC	62m north-east of S5. 38m west-north-west of the proposed construction corridor.	Disused outlier, single-entrance sett within earth embankment with dense unmanaged hedgerow of dense bramble and ivy. Small spoil heap present, and some mammal paths in ivy. Occupied by rabbit.
S7	NSC	150m north-east of S6. 6m east of the proposed construction corridor. 5m east of the proposed 20m wayleave.	Disused outlier, single-entrance sett within earth embankment with wet ditch at base, Small spoil heap present overgrown by dense ivy. Occupied by rabbit.
S8	Private land at Kinsealy	On boundary of the proposed construction corridor. 8m north of the proposed 20m wayleave.	Abandoned outlier, two-entrance sett with small spoil heaps, currently being used by rabbit. Signs of human interference are evident with entrances blocked by large boulders and fence post. 33kV Electricity Supply Board overhead line directly adjacent. Another disused and overgrown single-entrance sett occurs 25m east along the hedgerow.

The badger setts identified in these surveys are of local importance (higher value), as they provide shelter for a local population of a protected species.

Badger prints were recorded within the footprint of the proposed WwTP. There were some mammal paths along the hedgerows at the proposed WwTP site, but there were no badger guard hairs or latrines observed at the proposed WwTP site, and no signs of excavations or underground structures providing shelter for protected species.

Other Mammal Structures

Four fox dens were noted within the Proposed Project boundary. Two were discovered in woodland of the Tolka River Valley Park between the Proposed Project boundary and the N3 National Road. One was recorded in woodland 25m from the Proposed Project boundary beside the R135 Finglas Road. One was recorded on the northern boundary of the Proposed Project boundary at Merryfalls.

Evidence of Other Mammals

There are records of otter along the Tolka River, Santry River and Mayne River as well as along Baldoyle Bay (Biodiversity Ireland 2017). As such, otters may reasonably be expected to occur in the area. No signs of otter were observed in terrestrial ground mammal field surveys. Section 11.9 of this Chapter describes the potential for otter at each of the main watercourses within the Proposed Project study area.

In the wider Proposed Project boundary, badger latrines, fox faeces, mammal prints and significant mammal tracks were noted infrequently during surveys, and their locations are presented in a confidential appendix to ABP. Many prints found within the Proposed Project study area were that of domestic cats and dogs. Rabbit (*Oryctolagus cuniculus*) was observed on many occasions and numerous small holes and burrows attributable to rabbits were observed throughout the Proposed Project study area.

Grey squirrel was observed at four locations along the proposed pipeline routes.

The locations of these sightings are illustrated in Figure 11.11 Mammal Survey Results (1 of 6) to Figure 11.16 Mammal Survey Results (6 of 6) contained in the separate confidential report.

11.3.5 Farmland Birds

The purpose of this Section is to highlight the existing nature of bird interests, specifically to report on those bird species that were present within the Proposed Project boundary and adjacent buffer, that are categorised as being of conservation importance and on which there is the potential for significant impacts to arise from the Proposed Project.

The bird species present within the 250m buffer of the Proposed Project boundary were all typical common birds associated with highly modified agricultural landscapes, with open fields, hedgerows, treelines, pockets of woodland, drainage ditches and watercourses. The species recorded are therefore entirely in keeping with what would be anticipated, given the land uses and habitats revealed by the extended Phase 1 Habitat Survey.

The breeding bird data demonstrate that the only Birds Directive Annex I species present within the study area was kingfisher, which was present at a single location on the Tolka River west of Abbotstown. No other Annex I species were present within the Proposed Project study area (or at a distance from the Proposed Project boundary). The only other species of note, in conservation terms, are those listed as Red or Amber Birds of Conservation Concern in Ireland (BOCCIs) (Colhoun and Cummins 2013). Seven Red-listed species were recorded within the survey area, of which grey wagtail, yellowhammer, lapwing and meadow pipit were confirmed, probable or possible breeders, albeit in very low numbers and black-headed gull, curlew and herring gull were recorded over-flying, loafing or foraging. Twenty-two Amber-listed species were recorded, but there was no indication that the Proposed Project study area was of special importance for any of these species, reflecting the highly modified and largely semi-urban or intensively farmed nature of the majority of habitats.

Given the habitats recorded throughout the terrestrial footprint of the Proposed Project, the breeding bird assemblage present is judged to be an ecological feature of site level importance.

There were no agglomerations of winter birds, such as geese or other wildfowl, or species reliant on farmland. The Proposed Project study area is therefore of no more than local importance for wintering birds.

The proposed WwTP site will have the largest permanent footprint of all elements of the Proposed Project, and it is considered helpful to provide a more detailed breakdown of the Red- and Amber-listed breeding birds recorded for this part of the Proposed Project. All bird species encountered within the footprint of the proposed WwTP were recorded, including those in flight, resulting in a total of 25 species being recorded over the combined breeding season surveys of 2012, 2013, 2015 and 2017. Of these, three were Red-listed BOCCIs and nine were Amber-listed BOCCIs. A full list of the bird species recorded is provided in Table 11.12.

The arable fields and defunct hedgerows, which dominated the proposed WwTP site, provide some limited nesting to species typical of the intensified agricultural environment. The presence of two to three pairs of yellowhammer was a noteworthy interest, given this is a Red-listed BOCCI, and breeding is considered probable. The overall breeding bird assemblage within the footprint of the proposed WwTP site was therefore considered to be an ecological feature of local importance (higher value).

Table 11.12: Breeding Bird Survey Results and Sensitivity of Species at the Proposed WwTP Site

Species	Approx. No. of Territories				Breeding Evidence	Conservation Status	Ecological Sensitivity
	2012	2013	2015	2017			
Black-headed gull	0	0	0	0	N – F	Red (Breeding)	Medium
Greenfinch	1	1	0	0	Pr – P	Amber	Low
Grey wagtail	0	0	0	0	N – U	Red (Breeding)	Medium
House martin	0	0	0	0	N – F	Amber	Low
House sparrow	0	0	0	0	Po – H	Amber	Low
Linnet	0	0-1	0	0	Po – H	Amber	Low
Sparrowhawk	0	0	0	0	N – F	Amber	Low
Starling	0	0	0	0	N – F	Amber	Low
Swallow	0	0	0	0	N – F	Amber	Low
Swift	0	0	0	0	N – F	Amber	Low
Teal	0	0	0	1	N – U	Amber	Low
Yellowhammer	3	2	2	2	Pr – N	Red (Breeding)	Medium

Key to Table
 Red- and Amber-listed BOCCIs (Colhoun and Cummins 2013)
 The breeding status of all species encountered during survey were classified into four categories: Confirmed (Br), Probable (Pr), Possible (Po) and Non-breeder (N), based on BTO categories of breeding evidence.
 Only the strongest level of breeding evidence recorded for each species is presented. Where a species was encountered within suitable nesting habitat but was known with a high degree of confidence not to have bred within the survey area, the species was categorised as a non-breeder.
 N = Non-breeding – F (flying over), U (summering non-breeder)
 Po = Possible breeding – H (observed in suitable nesting habitat)
 Pr = Probable breeding – P (pair in suitable nesting habitat), N (visiting probable nest site)
 Sensitivity rated according to Percival (2003)

11.3.6 Other Species Groups

Smooth Newt

Smooth newts are listed in the Fifth Schedule of the Wildlife Act 1976 (as amended) and protected under Section 23 of the Act. They were recorded at five ponds within Site 1 Coldwinters in 2017 and at eight ponds in 2015. No smooth newts were recorded at Sites 2 and 3. The Smooth Newt Survey Report (Appendix A11.3) provides full details of the survey results.

Site 1, Pond 1 was observed to contain adult male and females and also juvenile newts in all three surveys undertaken in 2017. This site was approximately 56m from the Proposed Project boundary. Pond 7 contained a single male and female newt on the third visit only. Pond 7 was approximately 50m from the Proposed Project boundary. Pond 11 contained small numbers of newts during the first two visits and was within the Proposed Project boundary. Pond 15 was dry during the first visit and two female newts were found during the third visit. Pond 15 is located on the Proposed Project boundary. A single juvenile newt was found in Pond 16 on the second visit only. Pond 16 approximately 130m from the Proposed Project boundary. Pond 11 and Pond 15 are approximately within or on the boundary of the Proposed Project boundary and also contained smooth newt during surveys carried out in May and June 2017.

The above results and pond locations are illustrated in Figures 1-4 of Appendix A11.3.

Site 2 had multiple waterbodies with submerged and emerging vegetation, but both fish (stickleback) and birds were present. Predators reduce the likelihood of a waterbody being of any significance for newts. A golf course lies immediately north and west, and a flowing stream occurs immediately south as well as major road network to the south and east.

Site 3 had suitable habitat, damp un-grazed grassland with scrub, but was deemed to be sub-optimal for newts due to the presence of a large car park immediately south and a major road immediately east. Waterbody no. 4 showed signs of oil on the water's surface. Such pollutants may deter smooth newt or their prey. Damp un-grazed fields were present to the north and west.

The ponds identified in these surveys are of local importance (higher value) as they provide shelter for a local population of a protected species.

11.3.7 Summary Valuation of Terrestrial Biodiversity Features

Table 11.13 outlines the terrestrial biodiversity features recorded along the Proposed Project and their value at a geographic scale.

Table 11.13: Terrestrial Biodiversity Features

Feature	Value
Baldoyle Bay SAC, SPA	International importance
Dublin Bay UNESCO Biosphere Reserve	International importance
Baldoyle Bay proposed NHA	National importance
Abbotstown NDA	County importance
Silloge Park Golf Club NDA	County importance
Baldoyle Bay EBZ	County importance
Habitats	Of varying local importance, from lower to higher value
Terrestrial non-native invasive species	Do not occur
Mammals (other than bats)	Local importance (higher value)
Bats	Local importance (higher value)
Farmland birds (proposed pipeline corridor)	Local importance (lower value)
Farmland birds (proposed WwTP)	Local importance (higher value)
Smooth newts	Local importance (higher value)

11.4 Impact of the Proposed Project on Terrestrial Biodiversity – Construction Phase

'Significant' impacts are moderate or major impacts which require avoidance, reduction or counterbalancing measures to mitigate or offset their adverse impacts. Beneficial impacts do not require mitigation measures as their effects are welcomed.

Impacts have been assessed in accordance with the geographic frame of reference and criteria for valuing ecological features described in Table 11.6 and criteria for predicting magnitudes of effect described in Table 11.7.

The total construction period for the overall Proposed Project will be approximately 48 months, including 12 months of commissioning. Potential impacts of the Proposed Project on terrestrial biodiversity have been predicted in the absence of mitigation.

The Proposed Project has been designed, as far as possible, to avoid high value biodiversity receptors, and much of the Proposed Project (i.e. the proposed orbital sewer route and the proposed outfall pipeline route) will be placed underground with surface habitats reinstated. The proposed Abbotstown pumping station, WwTP, permanent access/egress roads, access chambers, manholes, air valves and scour valves will have an above ground footprint through the Operational Phase. Therefore, loss of habitats of local importance (both lower and higher value) is inevitable for elements of the Proposed Project with an above ground footprint into

the Operational Phase. Locations are shown on Planning Drawing Nos. 32102902-2101 to 32102902-2109 and details as shown on Planning Drawing Nos. 32102902-2200 to 32102902-2204.

The construction methodology for the proposed pipeline routes will involve both open cut and trenchless methods. The construction methodology that will be employed for the majority of the proposed orbital sewer route will be conventional open cut, whereby the land is stripped of topsoil, a trench of suitable dimension is excavated and the pipe is installed, on suitable bedding material, to the lines and levels determined by the design, depending on whether the pipeline is a gravity sewer or a rising main. Following testing of the pipeline, it is then surrounded with specified material and the trench is backfilled.

For the proposed WwTP, the land will be stripped of topsoil. Construction of the proposed WwTP will involve excavation for building foundations and tanks; reinforced concrete works; erection of structural steel/concrete building frames; erection/building walls (concrete/blockwork); erection of prefabricated cladding panels to walls and roofs of buildings; erection of prefabricated steel tanks; mechanical and electrical fit out of buildings and tanks; installation of below and above ground pipework; construction of screening berms; construction of access/egress roads to site and internal circulation roads, car parks and footpaths; landscaping and final planting.

At those boundaries adjoining the rural context to the east, north and west, a series of embankments planted with dense bands (approx. 15-20m wide) of hedgerow tree species will provide visual screening of the proposed WwTP. The embankments will rise to a maximum height of about 4m with gentle outward facing slopes in order to blend with the flat to mildly undulating terrain context that surrounds the site. This will be achieved using a buffer zone width of approximately 60m. Between the mounds, specimen trees will rise from a more open wildflower meadows context. The dense but linear bands of hedgerows vegetation topping the mounds will reference the hedgerows and tree-lined field boundaries of the agricultural fields nearby. The meadow and specimen trees between the dense sections of hedgerow planting reference the parkland aesthetic of the nearby demesne landscapes to the east.

For the proposed Abbotstown pumping station site, the land will be stripped of topsoil followed by wet/dry well construction, i.e. the pumps will be mounted in a dry well with the suction pipework being constructed in the pumping station wet well. The superstructure will be located directly above the wet/dry well, with the cover slab acting as a foundation for the superstructure. This will also facilitate access to the pumps. The superstructure will be a maximum of 10m above ground level. Due to the invert level of the incoming sewer from the Blanchardstown Regional Drainage Scheme, the wet well will be 17m below ground level. This will involve deep excavation, with most of this taking place in rock.

For all elements of the Proposed Project, including the proposed temporary construction compounds, site clearance works will generally require the removal of hedgerows and surface habitats within the working width of the Proposed Project boundary. Therefore, there will be direct, although not necessarily permanent, impacts on all habitats along the Proposed Project boundary.

Where protected species have been found to occur along the Proposed Project boundary, construction of the Proposed Project may result in disturbance to or displacement of protected species to adjacent habitats. Removal of habitats may impede the ability of species to move throughout the landscape within their territories.

Potentially significant Construction Phase impacts are summarised in Table 11.14 and described thereafter.

Table 11.14: Potentially Significant Construction Stage Impacts of the Proposed Project on Terrestrial Biodiversity

Feature	Value	Potential Impacts During Construction Phase	
		Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability
European Sites, their buffer zones and the UNESCO Biosphere Reserve	International importance	No impact. There will be no direct or indirect loss, deterioration or fragmentation of terrestrial habitats for which these sites have been designated.	No impact. There will be no direct or indirect disturbance to or displacement of terrestrial protected species, or reduction in terrestrial habitat availability to protected species for which these sites have been designated.
Inland NHAs	National importance	No impact. There will be no direct or indirect loss, deterioration or fragmentation of terrestrial habitats for which terrestrial pNHAs have been designated.	No impact. There will be no direct or indirect disturbance to or displacement of terrestrial protected species, or reduction in terrestrial habitat availability to protected species for which any terrestrial pNHA sites have been designated.
NDA	County importance	No likely significant impact. The Proposed Project will pass 10m below the NDA at Abbotstown and will partially tunnel through the golf course at Silloge. NDAs have been identified to provide opportunities for habitat improvement. A temporary construction site corridor running through the NDA does not prevent those opportunities arising.	No impact. Not applicable as NDAs are not designated in the FDP (FCC 2017) for the occurrence of protected species
GS2 grassland	Local importance (higher value)	No likely significant impact. Direct impact will occur, as areas of dry meadows and grassy verges will be removed during construction.	Not applicable
GS4 grassland	Local importance (higher value)	No likely significant impact. Direct impact will occur, as areas of wet grassland will be removed during construction.	Not applicable
(Mixed) broadleaved woodland, scrub, hedgerows and treelines	Local importance (higher value)	No likely significant impact. Direct impact will occur, as areas of (mixed) broadleaved woodland, scrub, hedgerows and treelines will be removed during construction.	Potentially significant impact. Indirect impact on species will occur, as these habitats are used by protected species to move throughout the wider area and their removal may impede the ability of species to do that throughout construction.
Fixed dune habitat at Portmarnock	Local importance (higher value)	No impact. Construction of the project will avoid this habitat.	Not applicable
GA1 and GA2 grasslands, spoil and recolonising bare ground, arable crops, horticultural land and tilled land	Local importance (lower value)	No likely significant impact. Direct impact will occur, as areas of grasslands, spoil and recolonising bare ground, arable crops, horticultural land and tilled land will be removed during construction.	Not applicable
Bats	Local importance (higher value)	Not applicable	Potentially significant impact. No direct impacts on roosts. Indirect impact on bats may occur as their foraging and commuting routes may be severed by loss of broadleaved woodland, scrub, hedgerows and treelines.

Feature	Value	Potential Impacts During Construction Phase	
		Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability
Farmland birds	Local importance (higher value)	Not applicable	Potentially significant impact. No direct impacts on nests in use, but nesting habitat will be removed during construction. Breeding species will be displaced to adjacent woodland, scrub, hedgerows and treeline habitat.
Smooth newt	Local importance (higher value)	Not applicable	Potentially significant impact. Direct impacts on ponds used by newts may occur during construction. Species will be displaced to adjacent ponds. Newts may be accidentally harmed in the absence of any special measures. Wildlife offence may occur.
Otters	Local importance (higher value)	Not applicable	No impact. No direct or indirect impacts on any features identified as being used by otters shall be affected during the Construction Phase.
Badgers	Local importance (higher value)	Not applicable	Potentially significant impact. Direct impacts on badger setts within the proposed construction corridor will occur during construction. Species will be displaced to adjacent habitat. Badgers may be accidentally harmed in the absence of any special measures. Wildlife offence may occur.

11.4.1 Designated Sites

European Sites

No component or aspect of the Proposed Project is proposed to be located within any habitat above the mean high-water mark which is part of a European Site. The Golf Links Road separates the location of proposed temporary construction compound no. 10 and the saltmarsh habitats of Baldoyle Bay. No Annex I habitat for which the Baldoyle Bay SAC has been designated occurs at proposed temporary construction compound no. 10 on the Golf Links Peninsula. Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology) set out an impact assessment of the Construction Phase of the Proposed Project on European Sites, as their Qualifying Interests and SCIs correspond to ecological features described under each of these respective chapters.

Other Designated Areas

No component or aspect of the Proposed Project is proposed to be located within any terrestrial NHA or pNHA. The nearest pNHA is located 350m from the Proposed Project and is an enclosed canal. No indirect impacts upon the pNHA are predicted. The Sluice River Marsh is over 900m from the Proposed Project and Feltrim Hill is over 1km from the Proposed Project. No indirect impacts are predicted upon these features at such distances.

The Proposed Project will pass under an NDA at its western terminal end in woodland enveloping Connolly Hospital at Abbotstown. The NDA includes a southward extension of woodland beyond the Tolka Valley Regional Park, and will turn north-east, skirting the M50 Motorway for approximately 1km. The proposed

orbital sewer route will be directionally drilled at a depth of approximately 10m for the first 1km (Planning Drawing No. 32102902-2100) and will pass underneath the roots of trees (Dobson 1995) comprising woodland in the Tolka Valley Regional Park part of the NDA, avoiding any direct or indirect habitat impact. The proposed orbital sewer route will be constructed by shallow trench through the remainder of the NDA as it skirts along the M50 Motorway. A temporary and direct habitat impact will occur whilst the proposed orbital sewer route is being constructed in the proposed construction corridor. The temporary direct habitat loss will not undermine the NDA in terms of its potential to achieve longer-term opportunities for habitat improvement, as in the longer-term the proposed orbital sewer route will be installed underground, and will pass through only a small part of the NDA. The overall impact is minor adverse and short-term. This is not significant.

The Proposed Project will pass through and encroach into an NDA at Silloge Park Golf Club. The proposed orbital sewer route shall be constructed through this area by combination of surface trench and directional drill. The temporary direct habitat loss will not undermine the NDA at Silloge Park Golf Club in terms of its potential to achieve longer-term opportunities for habitat improvement as the proposed orbital sewer route will be installed underground, and will pass through only a small part of the NDA. The overall impact is minor adverse and short-term. This is not significant.

The Proposed Project will be located within an EBZ at Mayne. Proposed temporary construction compound no. 9, accommodating the tunnel drive reception shaft, west of Baldoyle Bay SPA and north of Baldoyle Bay SAC will be within the 'Portmarnock South Zoned Lands'. This is an area for which a Local Area Plan has been prepared and adopted. It includes a 'quiet zone' as a supporting function for migratory birds using the estuary and arable crop areas for native bird species. Proposed temporary construction compound no. 9 comprises approximately 20% of the quiet zone. Construction Phase impacts of the Proposed Project at this location, including predicted noise levels and how the bird species which use the estuary are likely to react, are discussed in Chapter 10 Biodiversity (Marine Ornithology), and in the NIS.

11.4.2 Terrestrial Habitats

[Proposed Wastewater Treatment Plant](#)

With reference to Figure 11.8 Habitat Survey Results (Sheet 4 of 6), the arable fields (BC1) and horticultural lands (BC2) which the proposed WwTP overlies are of ecological value at a site level. Approximately 1.6km of hedgerows will be removed to facilitate the Proposed Project, 800m of which about a drainage ditch (FW4) travelling east to west along the southern boundary of the proposed WwTP site, including small sections of hedgerow removed for the proposed access road. Hedgerows are a feature of local importance (higher value) and their loss will be permanent. Drainage ditches and hedgerows provide valuable habitat, giving refuge for flora and fauna absent in intensively managed crop fields and they provide an ecological corridor function. The overall impact will be the direct loss of hedgerows. In accordance with Table 11.6, a feature of local importance (higher value) is evaluated as a key feature of local importance where that feature is important for and supports other features (such as an ecological corridor function for species). The overall impact is moderate adverse and permanent. This is significant.

[Proposed Abbotstown Pumping Station](#)

With reference to Figure 11.5 Habitat Survey Results (Sheet 1 of 6), the proposed Abbotstown pumping station will result in the loss of 0.4ha of an arable field (BC1). The ecological value of the arable field is of local importance (lower value). The immature (WS2) and mixed broadleaved woodlands (WD1) between the proposed Abbotstown pumping station and the M50 Motorway are of local importance (higher value) and part of a key linear feature of local importance. The arable grassland will be lost but the woodland will not be affected by construction. The overall impact is negligible and permanent. This is not significant.

Proposed Orbital Sewer Route (Blanchardstown to Clonshagh) Including Proposed Temporary Construction Compounds

With reference to Figure 11.5 Habitat Survey Results (Sheet 1 of 6) to Figure 11.8 Habitat Survey Results (Sheet 4 of 6), the construction method employed will be trenches of varying depths that will be backfilled with granular material and excavated topsoil once the laying of the proposed orbital sewer route is complete. For certain natural or man-made obstructions, such as rivers, roads or major infrastructure, trenchless techniques will be used. Much of the proposed construction corridor habitats are intensively farmed lands (such as GA1, BC1) or heavily modified habitats (ED2, ED3) of local importance (lower value). Some hedgerows (WL1), immature woodland (WS2) and (mixed) broadleaved woodland (WD1) were found along the proposed orbital sewer route and will be disturbed when they are subject to open trenching. These habitats are of local importance (higher value) and evaluated as a key feature of local importance where they support other features (such as an ecological corridor function for species) in an otherwise agricultural grassland dominated landscape. In the absence of mitigation, the hedgerow and woodland will be permanently lost. The overall impact is moderate adverse and permanent. This is significant.

Up to 0.6ha of neutral grassland (GS1) in Connolly Hospital grounds will be directly impacted. These are overgrown, species-poor swards and are of local importance (lower value). This habitat is not considered to be a key feature of local importance. The impact is slight adverse and short-term. This is not significant.

The wet grassland (GS4) field at Kildonan is of ecological value in a local context (higher value) given the reasonable diversity of flora occurring in it. Topsoil stripping will result in removal of the seedbank of this wet grassland community unless it is retained and reused. In the absence of mitigation, this habitat will be permanently lost. This habitat does not occur elsewhere in the locality, and it is a key feature of local importance. The overall impact is moderate adverse and permanent. This is significant.

Proposed Outfall Pipeline Route (Land Based Section) (Clonshagh to Baldoyle) Including Proposed Temporary Construction Compounds

With reference to Figure 11.9 Habitat Survey Results (Sheet 5 of 6) and Figure 11.10 Habitat Survey Results (Sheet 6 of 6), the proposed outfall pipeline route (land based section) will mostly be constructed using open trench excavation. The habitats are mainly intensive agricultural lands of local importance (lower value). Hedgerows (WL1), a treeline (WL2), wet grassland (GS4) occurring at Drumnigh and willow-bramble scrub (WS1) will be directly impacted by construction. Up to 0.9ha of willow-bramble scrub (WS1) will be directly impacted resulting in habitat loss. These habitats are of local importance (higher value). Much of the remainder of the proposed outfall pipeline route (land based section) comprises intensively farmed lands (such as GA1, BC1) or heavily modified habitats (ED2, ED3) of local importance (lower value). In the absence of mitigation, the scrub and hedgerow habitat will be permanently lost. The scrub habitat occurring along this section of the proposed outfall pipeline route (land based section) which will be lost occurs widely in the locality. The wet grassland strip is narrow and small in size. It is not a key feature of local importance, and the overall impact is slight adverse and permanent. The hedgerow and scrub habitat is considered to be a key feature of local importance where it supports other features (such as an ecological corridor function for species) in an otherwise agricultural grassland dominated landscape. In the absence of mitigation, the hedgerow and scrub will be permanently lost. The overall impact is moderate adverse and permanent. This is significant.

Sections of hedgerow (WL1) and their variable components (earth banks (occasional), ground flora, trees and shrubs) will be removed. The hedgerow network will be severed. The proposed construction corridor for the proposed outfall pipeline route (land based section) is 40m wide to allow for the movement of heavy plant and temporary storage of construction materials. The proposed construction corridor will be reduced to a proposed

20m wayleave to facilitate maintenance of the pipeline for its operational life. The main Construction Phase impact will be the loss of up to 40m sections of existing hedgerows that are crossed by the proposed outfall pipeline route (land based section). However, normal practice is not to strip hedgerow sections from the full proposed construction corridor width, but instead to remove only what is required to facilitate the pipeline trench, haul route and any topsoil strip storage area beside the trench (approximately 20m). This type of hedgerow loss will occur at 35 separate sections of hedgerow, replaced by a strip of bare ground the width of the proposed construction corridor which will remain until a grass sward is reinstated.

In the absence of mitigation, approximately 1.4km of hedgerows will be permanently lost, and the local network of hedgerows functioning as wildlife corridors will be severed. This habitat is of local importance (higher value) and a key feature of local importance. The overall impact is moderate adverse and permanent. This is significant.

[Proposed Outfall Pipeline Route \(Marine Section\) - Proposed Temporary Construction Compounds for Microtunnelling](#)

With reference to Figure 11.10 Habitat Survey Results (Sheet 1 of 6), proposed temporary construction compound no. 9 west of Baldoyle Bay will be located in horticultural land (BC2). East of Baldoyle Bay, proposed temporary construction compound no. 10 will overlie an area of improved amenity grassland (GS2). These habitats are of local importance (lower value). Managed fixed dune (CD3) habitat (of local value) occurs to the east of proposed temporary construction compound no. 9, but the proposed outfall pipeline route (marine section) will be tunnelled under here, so no habitat loss is likely to occur.

Habitats will be lost in the footprint of proposed temporary construction compounds no. 9 and no. 10. These habitats will be permanently lost. The value of the features is of local importance (lower value). The overall impact is negligible and permanent. This is not significant.

11.4.3 Bats

Results of the most recent 2017 survey supplemented by previous surveys between 2012 and 2015 indicate that the Proposed Project study area supports at least six species of bat. Furthermore, there are existing records of eight bat species from the 10k grid squares that the Proposed Project study area is located within. Due to their use of wide areas of landscape and their low birth rate, bats are vulnerable to potential impacts from linear projects such as the installation of the proposed pipeline routes.

[Proposed Wastewater Treatment Plant](#)

The removal of sections of linear features such as hedgerows and treelines may act as a barrier to species that are reluctant to cross open ground. Woodland adapted species (such as *Myotis* species, brown long-eared bat, lesser horseshoe bat) and small generalists (*Pipistrellus* species) make more use of, and are more dependent on, these features than larger open-air species (Leisler's bat). The construction of the proposed WwTP will involve the removal of approximately 1.6km of hedgerows of local value that currently function as flight lines for common and soprano pipistrelle. The removal of hedgerows that function as foraging and commuting habitat would have a direct and moderate adverse impact on bats at the local level. This impact would be permanent and significant.

The loss or fragmentation of foraging habitats (such as hedgerows) may reduce the available insect prey species and also reduce feeding area for bats. The reduction of foraging habitat would have a direct significant adverse impact on bats at the local level. This impact would be permanent and irreversible.

Loss of mature trees within hedgerows may reduce potential roosting sites for individual bats. No bat roosts were identified within the footprint of the proposed WwTP. However, occupation of roosts in trees by bats may

be very transient, and there is potential that the mature broadleaf trees in the footprint of the proposed WwTP may be used occasionally as roosting or resting places by individual/small numbers of bats. Therefore, there is potential for significant direct adverse impacts to individual bats as a result of the clearance of mature broadleaf trees during the Construction Phase. This would be significant at the local level.

When bats emerge from roosts they tend not to echolocate but rely on eyesight to fly from the roost to adjoining treelines or hedgerows. Various studies have shown that bats' eyesight works best in dim light conditions; where there is too much luminance bats' vision can be reduced, resulting in disorientation. Too much luminance at bat roosts may cause bats to desert a roost. Light falling on a roost exit point can delay bats from emerging and miss peak levels of insect activity at dusk, and any delays of emergence can reduce feeding periods. Studies have also found that lighting can cause avoidance of an area for commuting bats and can prevent or reduce foraging for *Myotis* species and brown-long-eared bats. As noted above, no bat roosts were identified within the footprint of the proposed WwTP. There is potential that the disturbance of bats due to lighting during the Construction Phase would have an indirect, significant adverse impact at the local level. The impact would be temporary and would persist for the duration of the Construction Phase.

[Proposed Abbotstown Pumping Station](#)

Common and soprano pipistrelle and brown long-eared bat were recorded foraging along the immature woodland bordering the south of the proposed Abbotstown pumping station lands. A low level of common and soprano pipistrelle and *Myotis* species activity was recorded in the mature woodland to the north-east, outside of the proposed Abbotstown pumping station site.

The removal of immature woodland and mixed woodland of local value would result in the removal of bat foraging habitat and may reduce the available insect prey species and the feeding area for bats. The reduction of foraging habitat would have a direct significant adverse impact on bats at the local level. In the absence of mitigation, this impact would be permanent and irreversible.

Lighting can cause avoidance of an area for commuting bats and can prevent or reduce foraging for *Myotis* species and brown long-eared bats. There is potential that the disturbance of bats due to lighting during the Construction Phase would have an indirect, significant adverse impact at the local level. The impact would be temporary, and would persist for the duration of the Construction Phase.

[Proposed Orbital Sewer Route \(Blanchardstown to Clonshagh\) and Proposed Outfall Pipeline Route \(Land Based Section\) \(Clonshagh to Baldoyle\)](#)

Common and soprano pipistrelle were recorded foraging and commuting throughout the proposed orbital sewer route and along the mature hedgerows present in the Kinsealy area. Leisler's bat was recorded commuting overhead throughout the proposed orbital sewer route and outfall pipeline route (land based section). Brown long-eared bat, whiskered/Brandt's bat, Daubenton's bat and *Myotis* species of bat were all recorded in the Blanchardstown area, and a single brown long-eared bat call was recorded adjacent to a hedgerow at Kinsealy (see Section 11.3.3 for further details).

The Proposed Project Construction Phase works will require the removal of sections of hedgerows, immature woodland and (mixed) broadleaved woodland of local value. Loss of treelines and hedgerows or other linear features during construction will impact on commuting and foraging bats. The removal of foraging and commuting habitat would have a direct and significant adverse impact on bats at the local level. In the absence of mitigation, this impact would be permanent and irreversible.

Loss or fragmentation of foraging habitats (such as hedgerows, treelines and woodlands) may reduce the available insect prey species and the feeding area for bats in some locations. The reduction of foraging

habitat would have a direct, significant adverse impact on bats at the local level. In the absence of mitigation, this impact would be permanent and irreversible.

Loss of mature trees within hedgerows and mixed woodland may reduce potential roosting sites for individual bats. No bat roosts were identified within the Proposed Project boundary. However, occupation of roosts in trees by bats may be very transient, and there is potential that the mature broadleaf trees in the footprint of the proposed orbital sewer route may be used occasionally as roosting or resting places by individual/small numbers of bats. Therefore, there is potential for significant direct adverse impacts to individual bats as a result of the removal of mature broadleaf trees during the Construction Phase. This would be significant at the local level.

One mature sycamore and two mature oak trees have been identified as probable roosts for individual/small numbers of bats at Blanchardstown. The sycamore tree is directly adjacent to the proposed orbital sewer route construction corridor, and the two oak trees are approximately 21m to 25m to the north-west of the proposed orbital sewer construction corridor. There is potential that the disturbance of bats due to lighting during the Construction Phase would have an indirect, significant adverse impact at the local level. The impact would be temporary, and would persist for the duration of the Construction Phase.

11.4.4 Mammals (Other than Bats)

No likely or significant impacts are predicted upon any ground mammals other than badgers.

Section 23(5)(d) of the Wildlife Act 1976 (as amended) makes it an offence to wilfully interfere with or destroy the breeding place of any protected wild animal, including badger.

Three setts out of a total of eight setts identified in the survey area (S4, S5 and S6) are located sufficiently far from the Proposed Project boundary (90m, 70m and 40m respectively) that Construction Phase disturbance to those setts is not expected to occur.

Two badger setts (S2 and S3) are in very close proximity to the Proposed Project boundary, and Construction Phase activities are likely to cause disturbance to badger occupying these setts. S2 is active, located within the proposed construction corridor. S3 is disused and located within the proposed construction corridor. Setts S2 and S3 are both located on the northern side of the Proposed Project, and their foraging grounds extend both to the north and the south of the Proposed Project boundary and proposed 20m wayleave. A Wildlife Act disturbance licence will be obtained to temporarily close these badger setts during construction. Neither sett is a main breeding sett or an annex sett to a main breeding sett.

Three setts (S1, S7 and S8) are within or in such close proximity to the Proposed Project boundary that they will be directly impacted upon during construction and must be closed under licence. These setts will be permanently closed prior to the commencement of construction. A Wildlife Act disturbance licence will be obtained to permanently close these badger setts during construction. These setts are either disused or long abandoned. Further, none of the setts have been characterised as a main breeding sett or an annex sett to a main breeding sett.

The main breeding setts in each territory were not located during surveys. As such, it is considered that the main breeding setts are located at the least 100m from the Proposed Project boundary and therefore will not be impacted by the construction of the Proposed Project.

The affected badger groups whose territories include land in the Proposed Project boundary will have a temporary boundary fence erected at the proposed construction corridor within their territories and through part of their foraging areas. The animals are principally nocturnal and construction activities will be principally undertaken during the daytime. The proposed construction corridor will be fenced off as noted above. In the

case of Sett S1 to Sett S7, the affected badger territories are enclosed on the south-east by the M50 Motorway. As the Proposed Project skirts the M50 Motorway, only a fraction of their territory will be affected by construction of the Proposed Project.

Lands within the Proposed Project boundary are normally available to animals to pass through and forage within, but they may be displaced from the proposed construction corridor for the duration of construction, either because a fence prevents them accessing the land (without the animals digging under), or badger may choose to avoid foraging in these areas. Open pipes, excavations and/or trenches within the proposed construction corridor present a risk to foraging animals which could become trapped within them.

In the absence of mitigation, foraging habitats will be temporarily lost or present additional risks of entrapment to animals which venture into them. The overall impact is moderate adverse. This is significant.

The three setts to be permanently closed under licence (S1, S7 and S8) are disused. Setts S2 and S3 require temporary closure under licence. Setts S4, S5 and S6 shall not be impacted upon by construction. No main breeding setts within any territory will be affected. In the absence of mitigation, badger setts would be disturbed or destroyed and an offence under wildlife law would occur. This is a moderate adverse impact and significant.

11.4.5 Farmland Birds

The key construction impacts of the Proposed Project relevant to farmland birds are the potential for disturbance to nesting birds and damage to their nests. The works are short-term and disturbance impacts will be localised. In respect of the proposed orbital sewer route, outfall pipeline route (land based section) and terrestrial components of the proposed outfall pipeline route (marine section), together with the associated proposed temporary access tracks and proposed temporary construction compounds, the great majority of habitat comprises highly modified and intensively farmed agricultural landscapes (refer to Section 11.3.2 describing results of the habitat survey). These open fields support bird interests of local significance throughout the year. Farmland bird habitat will be lost in the short-term. Land will subsequently be reinstated. The overall impact is minor adverse. This is not significant.

In the case of the proposed WwTP site and the proposed Abbotstown pumping station site, there will be the permanent loss of habitat, although the great majority of this is again, characteristically, intensively farmed fields chiefly of local importance (lower value) (see Section 11.4.2 above).

Removal of habitats that do support breeding birds will occur, leading to some loss of nesting habitat and feeding opportunities. Birds will be displaced to alternative nesting habitat in the wider area beyond the Proposed Project boundary in the short-term. The overall impact is minor adverse. This is not significant.

Accidental destruction of nests or disturbance of nests could occur during the Construction Phase in the breeding season. This would be a moderate adverse impact and is significant. Mitigation is required.

11.4.6 Other Species Groups

Smooth Newt

A series of ponds occur in the recolonising bare ground habitat at Coldwinters. Smooth newt was confirmed to be present in waterbodies here in both 2015 and 2017. In 2015, five ponds were located within the Proposed Project boundary. In response to 2015 survey findings, the Proposed Project boundary was modified to avoid three of the ponds. Now, only two ponds (11 and 15) occur within or on the Proposed Project boundary and in which newts were recorded in 2017.

The core breeding pools/ponds (including the largest pond seen to retain water year-round) will be avoided. No significant impact is predicted upon the local population of this protected species as a result of the Proposed Project. However, in the absence of any special measures taken to avoid mortality of any individuals of a protected species, these ponds used by smooth newt (ascribed a local value) would be disturbed or destroyed. This is a moderate adverse impact and is significant.

11.5 Impact of the Proposed Project on Terrestrial Biodiversity – Operational Phase

The normal operation of the Proposed Project and its constituent elements will be fully automated, which will be monitored, controlled and managed from a control centre located at the proposed WwTP.

The automated control systems will report through supervisory control and data acquisition and telemetry systems to the control centre. The proposed WwTP will be manned 24 hours a day, seven days a week. Between 30 and 40 operations staff will be employed, working in normal shift patterns, to ensure the continued and efficient operation of all elements of the Proposed Project.

Normal operational activities would typically include general maintenance, periodic inspections and monitoring of influent and treated wastewater discharges, sludge/septage imports and biosolids produced, depth of flow in the proposed orbital sewer route and outfall pipeline route (land based section and marine section) and pressure in the pumped rising mains amongst other things.

Potentially significant Operational Phase impacts are summarised in Table 11.15 and described thereafter.

Table 11.15: Potentially Significant Operational Stage Impacts of the Proposed Project on Terrestrial Biodiversity

Feature	Value	Potential Impacts During Operational Phase	
		Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability
European Sites, their buffer zones and the UNESCO Biosphere Reserve	International importance	No impact. There will be no direct or indirect loss, deterioration or fragmentation of terrestrial habitats for which these sites have been designated. Marine habitats are assessed in EIAR Chapter 9 Biodiversity (Marine) and the NIS.	No impact. There will be no direct or indirect disturbance to or displacement of terrestrial protected species, or reduction in terrestrial habitat availability to protected species for which these sites have been designated. Impacts on marine species are assessed in EIAR Chapter 10 and the NIS.
Inland NHAs	National importance	No impact. There will be no direct or indirect loss, deterioration or fragmentation of terrestrial habitats for which terrestrial pNHAs have been designated. pNHAs with marine habitats are assessed in EIAR Chapter 9.	No impact. There will be no direct or indirect disturbance to or displacement of terrestrial protected species, or reduction in terrestrial habitat availability to protected species for which any terrestrial pNHA sites have been designated. Impacts on marine species are assessed in EIAR Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology) and the NIS.
NDA	County importance	No likely significant impact. NDAs have been identified to provide opportunities for habitat improvement. A proposed 20m wayleave through the NDA does not prevent those opportunities arising.	No impact. Not applicable as NDAs are not designated in the FDP (FCC 2017) for the occurrence of protected species
GS2 grassland	Local importance (higher value)	No impact. The operation of the project will not result in any ongoing impacts to areas of dry meadows and grassy verges.	Not applicable
GS4 grassland	Local importance (higher value)	No impact. The operation of the project will not result in any ongoing impacts to areas of wet grassland.	Not applicable
(Mixed) broadleaved woodland, scrub, hedgerows and treelines	Local importance (higher value)	No impact. The operation of the project will not result in any ongoing impacts to areas of (mixed) broadleaved woodland, scrub, hedgerows and treelines.	Not applicable
Fixed dune habitat at Portmarnock	Local importance (higher value)	No impact. The operation of the project will not result in any ongoing impacts to areas of fixed dune habitat.	Not applicable
GA1 and GA2 grasslands, spoil and recolonising bare ground, arable crops, horticultural land and tilled land	Local importance (lower value)	No impact. The operation of the project will not result in any ongoing impacts to areas of grasslands, spoil and recolonising bare ground, arable crops, horticultural land and tilled land.	Not applicable
Bats	Local importance	Not applicable	No likely significant impact. No direct impacts on roosting, commuting or

Feature	Value	Potential Impacts During Operational Phase	
		Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability
	(higher value)		foraging bats. No further nesting habitat will be removed during operation and no further displacement will occur.
Farmland birds	Local importance (higher value)	Not applicable	No likely significant impact. No direct impacts on farmland birds. No further roosting, commuting or foraging habitat will be removed during operation and no further displacement will occur.
Smooth newt	Local importance (higher value)	Not applicable	No likely significant impact. No direct impacts on newts are likely to occur at operational stage. No further pond habitat will be removed during operation and no further displacement will occur.
Otters	Local importance (higher value)	Not applicable	No impact. No direct or indirect impacts on any features identified as being used by otters shall be affected at operational stage.
Badgers	Local importance (higher value)	Not applicable	No likely significant impact. No direct impacts on badgers are likely to occur at operational stage. No further sett disturbance will occur during operation and no further displacement will occur.

11.5.1 Designated Sites

European Sites

No component or aspect of the Proposed Project is to be located within any habitat above the mean high-water mark (i.e. a terrestrial habitat) which is part of a European Site. No Annex I habitat for which the Baldoyle Bay SAC has been designated occurs at proposed temporary construction compound no. 10 on the Portmarnock Peninsula. Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology) set out an impact assessment of the Operational Phase of the Proposed Project on European Sites, as their Qualifying Interests and SCIs correspond to ecological features falling under Chapter 9 Biodiversity (Marine) and Chapter 10 Biodiversity (Marine Ornithology) respectively.

Other Designated Areas

No component or aspect of the Proposed Project is proposed to be located within any terrestrial NHA or pNHA.

There will be no impacts on designated areas during the Operational Phase.

11.5.2 Terrestrial Habitats

All Elements of the Proposed Project

As there is no requirement for any additional land-take during the Operational Phase, there will be no further loss of habitat after the Construction Phase. As such, there are no direct or indirect impacts on terrestrial habitats anticipated during the Operational Phase.

11.5.3 Bats

Proposed Wastewater Treatment Plant and Proposed Abbotstown Pumping Station

There is potential for disturbance to bats due to lighting of the proposed WwTP during the hours of darkness. As detailed in Appendix A11.1, bats' eyesight works best in dim light conditions; where there is too much luminance, bats' vision can be reduced resulting in disorientation. Disturbance of bats due to lighting would have an indirect, significant adverse impact at the local level. Former semi-natural habitats at the proposed Abbotstown pumping station and the proposed WwTP will remain unavailable.

Proposed Orbital Sewer Route (Blanchardstown to Clonshagh) and Proposed Outfall Pipeline Route (Land Based Section) (Clonshagh to Baldoyle)

After land reinstatement, habitats along the proposed orbital sewer route and outfall pipeline route (land based section) within the Proposed Project boundary will be available for bats foraging and commuting within their territories. Hedgerow replanting will re-establish ecological corridors which will be maintained throughout the Operational Phase. There is no requirement for any additional land-take during the Operational Phase, and there will be no further loss of habitat after the Construction Phase. There are no anticipated operational activities giving rise to visual stimuli likely to disturb bats. As such, there are no direct or indirect impact on bats anticipated during the Operational Phase.

11.5.4 Mammals (Other than Bats)

After land reinstatement, habitats along the proposed pipeline routes within the Proposed Project boundary will be available for ground mammal foraging within their territories. Former semi-natural habitats at the proposed Abbotstown pumping station and the proposed WwTP will remain unavailable. Hedgerow replanting will re-establish ecological corridors which will be maintained throughout the Operational Phase. There is no requirement for any additional land-take during the Operational Phase, and there will be no further loss of habitat after the Construction Phase. There are no anticipated operational activities giving rise to noise or visual stimuli likely to disturb ground mammals. As such, there are no direct or indirect impacts on other mammals anticipated during the Operational Phase.

11.5.5 Farmland Birds

After land reinstatement, habitats along the proposed pipeline routes within the Proposed Project boundary will be available for farmland birds to forage and build nests their territories. Former semi-natural habitats at the proposed Abbotstown pumping station and the proposed WwTP will remain unavailable. Hedgerow replanting will re-establish ecological corridors which will be maintained throughout the Operational Phase. There is no requirement for any additional land-take during the Operational Phase, and there will be no further loss of habitat after the Construction Phase. There are no anticipated operational activities giving rise to noise or visual stimuli likely to disturb farmland birds. As such, there are no direct or indirect impacts on farmland birds anticipated during the Operational Phase.

11.5.6 Other Species Groups

After land reinstatement, habitats where smooth newts were recorded along the proposed pipeline routes within the Proposed Project boundary will be available for smooth newts to hold territories. Ponds where newts are to be relocated will not be affected. There is no requirement for any additional land-take during the Operational Phase, and there will be no further loss of suitable newt habitat after the Construction Phase. There are no anticipated operational activities likely to disturb smooth newts. As such, there are no direct or indirect impacts on smooth newts anticipated during the Operational Phase.

11.6 'Do Nothing' Impact on Terrestrial Biodiversity

Not constructing and operating the Proposed Project would result in terrestrial flora and fauna along the Proposed Project persisting under its current land use and management regimes. The impact of such a course of action is neutral upon terrestrial biodiversity features near the Proposed Project.

11.7 Mitigation Measures – Terrestrial Biodiversity

Where the assessment of impacts has concluded that there are no significant effects, it is considered that no mitigation is required. and therefore no mitigation is proposed, in accordance with Section 11.2.4.

11.7.1 Overarching Measures

All Proposed Project Elements

An Ecological Clerk of Works (ECoW) will be appointed by Irish Water to advise on effective implementation of biodiversity mitigation specified in the EIAR, NIS and the Outline CEMP, and to act as a liaison between Irish Water and ABP in the discharge of planning conditions relating to biodiversity.

The ECoW shall be supported by other specialist ecologists as necessary to ensure effective implementation of biodiversity mitigation.

Tool-box talks will be provided for the appointed contractor(s), subcontractors and operatives on their legal obligations in relation to wildlife legislation, and good practice in relation to construction and protected species.

Tool-box talks will be provided by the ECoW in consultation with the appointed Environmental Manager of the main appointed contractor(s), prior to the commencement of the Construction Phase.

11.7.2 Designated Sites (All Proposed Projects Elements)

Construction Phase

No mitigation is proposed.

Operational Phase

No mitigation is proposed.

11.7.3 Terrestrial Habitats

Construction Phase

Proposed Wastewater Treatment Plant

All hedgerows removed during the Construction Phase shall be replaced.

Planting of native hedgerow and perimeter screening with native species of trees will be implemented as part of the landscape strategy presented in Chapter 12 Landscape and Visual.

Proposed Abbotstown Pumping Station

No mitigation is proposed.

Proposed Pipeline Routes Including All Proposed Temporary Construction Compounds

Grassland sward along the proposed construction corridor will be reinstated.

Sections of hedgerows and treelines which are removed to facilitate construction will be replanted.

Topsoil shall be retained from wet grassland and neutral grassland habitats subject to topsoil stripping and will be reused for reinstatement in its original location.

Operational Phase

No mitigation is proposed.

11.7.4 Bats

Construction Phase

Proposed Wastewater Treatment Plant

Loss or Fragmentation of Habitat

Hedgerow removal will create a barrier and reduce the foraging area for foraging and commuting bats during the construction of the proposed WwTP. This will be mitigated by the landscape proposed, which include the planting of hedgerow, specimen trees and wildflower meadow to the north, east and west of the proposed WwTP site (refer to Chapter 12 Landscape and Visual, Section 12.7 for further details).

Loss of Potential Roost Sites

In order to protect potential roost sites, any existing mature trees adjacent to the Proposed Project or construction areas which will not be removed shall be protected from root damage in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction* (British Standards Institution 2012) as part of the construction contract.

Mature standard trees within the hedgerows to be cleared at the proposed WwTP site shall be felled in the period from late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per the Guidelines for the Treatment of Bats Prior to the Construction of National Road Schemes (NRA 2005a). During this period bats, are still capable of flight having not entered hibernation, and undertaking works in this period may reduce the risks of tree-felling if proper measures are undertaken.

Once felled, trees that have potential bat roost features shall be left intact on-site for 24 hours prior to disposal to allow any bats to escape overnight.

Tree roosts may be established for short periods and may not be detectable when bats are not occupying the roost from an examination of a suitable tree. Furthermore, trees may become suitable for roosting bats through damage from storm, machinery, rot or human interference. Therefore, trees that are at present unsuitable may become roosts between the pre-planning assessment contained within this EIAR and the Construction Phase of the Proposed Project. All trees within the boundary of the Proposed Project shall be checked for Potential Roost Features (PRFs) by an experienced bat ecologist as part of a pre-construction survey.

Resulting from the pre-construction PRF survey, all trees with medium to high roost potential shall be examined by an experienced bat ecologist reporting to the ECoW prior to work commencing by any appointed contractor(s) or subcontractors on any part of the Construction Phase (including enabling works) of the Proposed Project, including fencing, vegetation clearance or topsoil stripping. Following this examination, should any tree be identified as a bat roost then a derogation licence application will be made to exclude the bats and fell the tree. The roost must not be altered or affected in any way prior to works being undertaken as stipulated within the derogation licence and using the measures stipulated in the licence for the exclusion of bats and felling must be carried out under the supervision of a bat specialist named on the licence.

The loss of PRFs in trees as a result of vegetation clearance will necessitate the installation of bat boxes to compensate for potential roost loss. Bat boxes will be installed at least three months in advance of removal of existing potential roosting sites. One box per tree with moderate to high bat suitability scheduled to be felled will be installed by the appointed contractor(s); the appropriate number of bat boxes to compensate for loss of potential roosting features will be finalised following pre-construction PRF inspection presence/absence surveys. The boxes will be attached to suitable trees in hedgerows, treelines and woodland along the route but outside the area of clearance. The final box locations will be confirmed on-site with the bat specialist. The principal recommended type along the proposed pipeline routes is the Schwegler 1FF bat box. Boxes shall be erected in pairs and all boxes placed in sites that will be protected from disturbance. These boxes must be away from any felling or trimming to ensure that they are not accidentally damaged or removed. Bat boxes must be clear of scrub and away from ivy encroachment as well as lighting and traffic.

Monitoring

It is essential to monitor boxes for their acceptance of use by bats, and those boxes that remain unused two years after the date of erection should be relocated. Seasonal inspection of bat boxes shall be undertaken (excluding mid-June to mid-August, the lactation period of females, where any disturbance at this time can be detrimental to the survival of young) to monitor bat usage and in wintertime for general wear and tear and to remove droppings following use the previous summer. This should be undertaken by a licensed bat-handler (NRA 2005a).

Light Pollution

Where construction lighting is required, lighting will be directed away from all woodland, hedgerow and linear habitats. Directional lighting (i.e. lighting which only shines on the Proposed Project and not on the nearby countryside) will be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.

Proposed Abbotstown Pumping Station

Loss or Fragmentation of Habitat

The loss of foraging and commuting habitat as a result of the removal of immature and mixed broadleaved woodland for construction of the proposed Abbotstown pumping station will be mitigated by planting schemes utilising advanced nursery stock.

Light Pollution

Where construction lighting is required, lighting will be directed away from all woodland, hedgerow and linear habitats to be retained. This can be achieved by the use of directional lighting to prevent overspill.

Proposed Orbital Sewer Route (Blanchardstown to Clonshagh)

Loss or Fragmentation of Habitat

The loss of foraging and commuting habitat as a result of hedgerow and treeline removal for construction will be mitigated by replacement and replanting. Where feasible, trees and hedgerows disturbed by the construction works will be re-instated. Depending on the season in which construction work takes place, it may be possible to store and replace sections of dormant hedgerows once work in a particular section is complete. Where this is not practicable, new planting will take place utilising advanced nursery stock.

Loss of Potential Roost Sites

Mitigation as per measures provided for loss of potential roost sites at the proposed WwTP.

Light Pollution

Where construction lighting is required, lighting will be directed away from all woodland, hedgerow and linear habitats to be retained. This can be achieved by the use of directional lighting.

There will be no direct illumination of known bat roosts. Lights will be positioned to avoid sensitive areas and restricted so that there are dark areas. When works are conducted adjacent to known or potential bat roosts (as identified in Figure 3.5 of the Bat Survey Report at Appendix A11.1, the timing of lights shall be restricted to avoid bat activity (i.e. from dusk until dawn).

Proposed Outfall Pipeline Route (Land Based Section) (Clonshagh to Baldoyle)

Loss or Fragmentation of Habitat

Mitigation as per measures provided for loss or fragmentation of habitat for the proposed orbital sewer route.

Loss of Potential Roost Sites

Mitigation as per measures provided for loss of potential roost sites at the proposed WwTP.

Light Pollution

Mitigation as per measures provided for light pollution for the proposed orbital sewer route.

Operational Phase

Proposed Wastewater Treatment Plant

Landscaping treatment for the proposed WwTP includes planting of hedgerow, specimen trees and wildflower meadow to the north, east and west of the proposed WwTP site. Lighting will be minimised in these areas, and the times during which the lighting is on will be limited to provide some dark periods. Should security lighting be necessary, directional lighting will be used to prevent overspill.

Proposed Abbotstown Pumping Station

No significant impacts have been identified; therefore, no mitigation is proposed.

Proposed Orbital Sewer Route (Blanchardstown to Clonshagh)

No significant impacts have been identified; therefore, no mitigation is proposed.

Proposed Outfall Pipeline Route (Land Based Section) (Clonshagh to Baldoyle)

No significant impacts have been identified; therefore, no mitigation is proposed.

11.7.5 Mammals (Other than Bats)

Construction Phase

Proposed Orbital Sewer Route Including Proposed Abbotstown Pumping Station

In order to ensure there are no significant changes to the badger territory's identified in the EIAR and the mitigation measures specified, a pre-construction badger survey should be undertaken prior to the commencement of any works.

A wildlife disturbance licence will be obtained from NPWS for the exclusion and closure (two temporarily and three permanently) of five badger setts identified within the Proposed Project boundary.

The licence application will be made by the appointed ECoW, who will conduct or otherwise supervise all licensed activities.

All works under licence will be monitored as necessary by the appointed ECoW throughout the Construction Phase.

Setts closed for the duration of the Construction Phase shall be re-opened at the earliest opportunity in consultation with the licencing authority.

An Ecological Exclusion Zone will be set up around setts S2 and S3 at a radius of 25m to protect them from construction activities, facilitating their re-opening after the Construction Phase is complete. The Ecological Exclusion Zone fence will keep appointed contractor(s) out of the Ecological Exclusion Zone, and warning signs will be erected at intervals on the fence. No vehicles, storage or stockpiling of materials will be allowed within the Ecological Exclusion Zone. An ECoW will supervise the erection of each Ecological Exclusion Zone and inspect it regularly to ensure that it is in working condition and functioning as required.

The specification of the temporary fence for the proposed construction corridor will allow unimpeded movement of badger at the bottom of the fence so they can continue to move within their territorial boundaries.

Open excavations and/or trenches will either be covered to avoid access by wildlife or a means of escape installed to facilitate egress at the end of each working day. All pipes will be capped overnight to prevent access by mammals.

Operational Phase

No mitigation is proposed.

11.7.6 Farmland Birds

Construction Phase

All Proposed Project Elements

Grassland sward along the proposed construction corridor will be reinstated.

Sections of hedgerows and treelines which are removed to facilitate construction will be replanted.

Vegetation clearance and topsoil stripping will be programmed to be undertaken outside of the breeding bird season between 1 March and 31 August.

If any small pockets of vegetation must be cleared within the breeding season, due to circumstances beyond the control of the applicant, then an experienced ornithologist, appointed by Irish Water or its agents, will report to the ECoW and inspect the vegetation to check for breeding birds.

These checks will be done no more than three days ahead of the required clearance, and if a nest is found, suitable buffers will be cordoned off and clearly marked. The ECoW shall ensure that no works including fencing, vegetation clearance or topsoil stripping shall occur within a cordoned area.

Nest boxes and nest cavities shall be incorporated into the building design of the proposed Abbotstown pumping station and proposed regional WwTP.

Operational Phase (All Proposed Project Elements)

No mitigation is proposed.

11.7.7 Other Species Groups

Construction Phase

Proposed Orbital Sewer Route

A disturbance licence shall be obtained from NPWS.

Smooth newts shall be captured at Coldwinters under licence during the spring migration period.

Smooth newts shall be relocated from affected ponds to an alternative pond at Coldwinters prior to the commencement of construction.

All works under licence will be monitored as necessary by the appointed ECoW throughout the Construction Phase. The pond within the Proposed Project boundary from which newts are removed must be drained down and remain unavailable to smooth newts throughout the Construction Phase until the land is reinstated.

Operational Phase

No mitigation is proposed.

11.8 Residual Impacts – Terrestrial Biodiversity

An assessment of residual impacts identifies the impacts associated with the Proposed Project and the likely significance of impacts on the environment and its ecological features after the implementation of mitigation measures. With the successful implementation of mitigation measures outlined within Section 11.7, no significant residual impacts on terrestrial biodiversity features are predicted, as summarised in Table 11.16.

Table 11.16: Residual Impacts of the Proposed Project on Terrestrial Biodiversity

Feature	Value	Residual Impacts During Construction Phase		Residual Impacts During Operational Phase	
		Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability	Habitat Loss, Deterioration and Fragmentation	Disturbance to or Displacement of Protected Species or Reduction in Habitat Availability
European Sites, their buffer zones and the UNESCO Biosphere Reserve	International importance	Not significant	Not significant	Not significant	No impact
Inland NHAs	National importance	No impact	No impact	No impact	No impact
NDA's	County importance	Not significant	No impact	Not significant	No impact
GS2 grassland	Local importance (higher value)	Not significant	Not applicable	No impact	Not applicable
GS4 grassland	Local importance (higher value)	Not significant	Not applicable	No impact	Not applicable
(Mixed) broadleaved woodland, scrub, hedgerows and treelines	Local importance (higher value)	Not significant	Not significant	No impact	Not significant
Fixed dune habitat at Portmarnock	Local importance (higher value)	No impact	Not applicable	No impact	Not applicable
GA1 and GA2 grasslands, spoil and recolonising bare ground, arable crops, horticultural land and tilled land	Local importance (lower value)	Not significant	Not applicable	No impact	Not applicable
Bats	Local importance (higher value)	Not applicable	Not significant	Not applicable	Not significant
Farmland birds	Local importance (higher value)	Not applicable	Not significant	Not applicable	Not significant
Smooth newt	Local importance (higher value)	Not applicable	Not significant	Not applicable	Not significant
Otters	Local importance (higher value)	Not applicable	No impact	Not applicable	No impact
Badgers	Local importance (higher value)	Not applicable	Not significant	Not applicable	Not significant

11.8.1 Difficulties Encountered in Compiling Required Information

For the terrestrial flora and fauna surveys, there were a small number of locations along the Proposed Project where access permission could not be secured for the suite of ecological surveys undertaken. These areas were small, discrete, visible from distance and/or from adjoining lands where access was permitted and were generally comparable in nature to other habitats.

11.9 Baseline Environment – Freshwater Aquatic Biodiversity

The proposed orbital sewer route will commence in the townland of Abbotstown, where the proposed Abbotstown pumping station will be located, approximately 130m from the Tolka River (survey location 1, see Figure 11.17 Freshwater Sampling Locations). This site has a footprint of approximately 4,000m³. Travelling in an easterly direction, the proposed orbital sewer route will cross the Santry River (survey location 2) in the townland of Silloge, followed by the Mayne River (survey location 3) in the townland of Ballystruan before entering the proposed WwTP at Clonshagh.

The northern boundary of the proposed WwTP at Clonshagh, located on a 29.8ha site, is set back 50m from the Cuckoo Stream, a tributary of the Mayne River. A SHC will also be co-located at this site, while the proposed NFS diversion sewer will also be connected to the proposed WwTP. On exiting the proposed WwTP, the proposed outfall pipeline route (land based section) will cross the Cuckoo Stream (survey location 4). A proposed access road will be constructed from the R139 Road to the proposed WwTP, and this will require the installation of a culvert and widening of the bridge over the Mayne River, currently leading to Craobh Chiaráin Gaelic Athletic Association (GAA) pitches (survey location 5). All watercourse crossings are identified on Figure 11.17 Freshwater Sampling Locations.

Catchment Description

The Tolka River rises near Dunshaughlin in Co. Meath and flows in a south-easterly direction where it crosses through the north of Dublin City before entering the sea at Clontarf through South Dublin Bay and the River Tolka Estuary SPA (004024) and North Dublin Bay pNHA (000206). The Tolka River has a length of approximately 20km from source to the sea, nearly half of which is located within the urban sprawl of Dublin City. The Tolka River will not be crossed by the proposed orbital sewer route; however, the proposed Abbotstown pumping station will be located approximately 130m from the Tolka River. The course of the Tolka River has been altered in this location and flows in a straight line under the M50 Motorway within an artificial channel with concrete banks.

The Santry River rises near Harristown, in Co. Dublin, and flows east via Santry, Kilmore, Edenmore and Raheny, through several designated nature conservation areas, before entering the sea at Dublin Bay. The Santry River flows through the Santry Demesne pNHA (00178) and discharges through North Bull Island SPA (004006) and North Dublin Bay SAC and pNHA (000206). The Santry River will be crossed once by the proposed orbital sewer route at Silloge. Proposed temporary construction compound no. 3 will be located at the M50 Motorway Junction 4, and will be located approximately 100m from this river.

The Mayne River rises near Harristown, in Co. Dublin, and flows east, entering the sea via Portmarnock Estuary at Mayne Bridge. The Cuckoo Stream, a tributary of the Mayne River, rises near Huntstown, in Co. Dublin, and flows east, merging with the Mayne River at Balgriffin. The Mayne River discharges through Baldoyle Bay SAC and pNHA (000199) and Baldoyle Bay SPA (004016). The Mayne River will be crossed once by the proposed orbital sewer route just north of the M50 Motorway and south of Ballystruan. Proposed temporary construction compound no. 4 will be located at the Old Airport Road/R132 Swords Road junction (the Collinstown Cross) and will be located approximately 650m from the Mayne River and approximately 235m from the Cuckoo Stream. The Mayne River will also be crossed by a new culvert system which will be

constructed to provide access to the Craobh Chiaráin GAA pitches and the proposed WwTP at Clonshagh. The Cuckoo Stream will be crossed once by the proposed orbital sewer route directly downstream of the proposed WwTP which will be constructed at Clonshagh. The Cuckoo Stream also lies immediately north of the proposed WwTP site, while the Mayne River lies approximately 400m to the south. The site of the proposed WwTP will also house temporary construction compound no. 5 for the duration of the Construction Phase.

Other designations of relevance have been presented in Section 11.3.1 of this Chapter.

Water Quality

The EPA Catchments website (EPA 2017) identifies the current ecological status of the Tolka River, Santry River, Mayne River and Cuckoo Stream near the Proposed Project being Poor (refer to Table 11.17 below). The EPA biological water quality monitoring data indicate that all three rivers have suffered from pollution problems since monitoring commenced in 1973 for the Tolka River and 1988 for the Santry River and the Mayne River. All three rivers and the Cuckoo Stream are classified as ‘at risk’ of failing to achieve the environmental objectives of the *Draft River Basin Management Plan for Ireland 2018–2021* (DoHPLG 2017) and therefore will require significant measures to improve their condition.

Table 11.17: Condition of Rivers Crossed by the Proposed Project

River	Overall Status ²	Overall Risk	Q-Value ³	Fisheries Status ⁴	Heavily Modified*
Tolka	Poor	At risk	Q3	Poor (2011)	No
Santry	Poor	At risk	Q3	Not surveyed by IFI	Yes
Mayne	Poor	At risk	Q3	Poor (2016)	No
Cuckoo Stream	Poor	At risk	Not surveyed by EPA	Bad (2016)	No

*Heavily modified waterbodies have been substantially altered from their natural condition by human activity and cannot therefore attain Good ecological status. Heavily modified waterbodies have targets relating to their ecological potential.

Designated Areas and Protected Species (Existing Records)

The land based elements of the Proposed Project are not within the footprint of any site designated for nature conservation, as outlined in Section 11.3.1. The proposed outfall pipeline route (marine section) of the Proposed Project will pass under Baldoyle SAC and Baldoyle SPA and is discussed further in Chapter 9 Biodiversity (Marine).

The land based elements of the Proposed Project intersect three watercourses (Mayne River, Santry River and Cuckoo Stream) and are near to a fourth (Tolka River). These are the aquatic Ecological Receptors (AERs) potentially impacted by the Proposed Project. Via the ERs, the Proposed Project is hydrologically connected to several downstream Natura 2000 sites (see Chapter 9 Biodiversity (Marine)). These include eight SACs and eight SPAs. Interactions between the Proposed Project and Natura 2000 sites are considered in greater detail in the NIS for the Proposed Project.

The Proposed Project is not within the footprint of any NHAs or pNHA sites. Table 11.18 below lists the NHAs and details on their supporting connectivity to the Proposed Project. The pNHAs numbered 3, 4, 5, 6 and 7 in Table 11.18 are marine locations and are considered in Chapter 9 Biodiversity (Marine).

² Data sourced from www.catchments.ie, based on data from 2010 to 2015 (latest available and published survey data by the EPA).

³ Q-value for the river segment at the location of the crossing for the Santry, Mayne and at the proposed Abbotstown pumping station for the Tolka. There is no EPA monitoring station on the Cuckoo Stream.

⁴ Data sourced from www.wdfish.ie, based on surveys undertaken in 2011 and 2016 by Inland Fisheries Ireland.

Table 11.18: Proposed Natural Heritage Areas Supporting Connectivity to the Proposed Project

No.	Site Code	Site Name	Distance (km)	Qualifying Features
1	000128	Liffey Valley	2.2	<p>This site is part of the Liffey Valley Special Amenity Areas Order 1990 (SDCC 2016). The site is important due to the diversity of the habitats within the site, both aquatic and terrestrial. A number of rare and threatened plant species have been recorded from the site.</p> <p>The Proposed Project is not connected to the Liffey Valley pNHA. Therefore, there will be no impact to this site.</p>
2	000178	Santry Demesne	0.3	<p>The primary importance of this site is that it contains a legally protected plant species. The woodland, however, is of general ecological interest as it occurs in an area where little has survived of the original vegetation.</p> <p>There is a hydrological connection to the Santry Demesne pNHA. However, this pNHA is designated for terrestrial woodlands which are not at risk of impact from the Proposed Project.</p>
3	000199	Baldoyle Bay	0.0	<p>Mudflats and sandflats not covered by seawater at low tide (1140) <i>Salicornia</i> and other annuals colonising mud and sand (1310) Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) (1330) Mediterranean salt meadows (<i>Juncetalia maritimi</i>) (1410)</p>
4	000202	Howth Head	4.3	<p>Vegetated sea cliffs of the Atlantic and Baltic coasts (1230) European dry heaths (4030)</p>
5	000203	Ireland's Eye	3.4	<p>Perennial vegetation of stony banks (1220) Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)</p>
6	000206	North Dublin Bay	2.3	<p>Mudflats and sandflats not covered by seawater at low tide (1140) Annual vegetation of drift lines (1210) <i>Salicornia</i> and other annuals colonising mud and sand (1310) Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) (1330) Mediterranean salt meadows (<i>Juncetalia maritimi</i>) (1410) Embryonic shifting dunes (2110) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (2120) Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) Humid dune slacks (2190) <i>Petalophyllum ralfsii</i> (Petalwort) (1395)</p>
7	000210	South Dublin Bay	7.3	<p>Mudflats and sandflats not covered by seawater at low tide (1140) Annual vegetation of drift lines (1210) <i>Salicornia</i> and other annuals colonising mud and sand (1310) Embryonic shifting dunes (2110)</p>
8	001208	Feltrim Hill	1.2	<p>Feltrim Hill is regarded as a good example of a knoll-reef and is a valuable geological education site.</p> <p>There is no connection between the Proposed Project and Feltrim Hill.</p>
9	001763	Sluice River Marsh	1.0	<p>This site is of importance as a relatively intact freshwater marsh, a habitat that is now rare in County Dublin.</p> <p>There is no connection between the Proposed Project and the Sluice River Marsh.</p>

No.	Site Code	Site Name	Distance (km)	Qualifying Features
10	002103	Royal Canal	0.3	The value of the canal lies in the diversity of species it supports along its linear habitats. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods. There is no connection between the Proposed Project and the Royal Canal pNHA.
11	002104	Grand Canal	6.1	The ecological value of the canal lies in the diversity of species it supports along its linear habitats and the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods. There is no connection between the Proposed Project and the Grand Canal pNHA.

Protected Freshwater Species

A review of the NBDC website (Biodiversity Ireland 2017) revealed no records for white-clawed crayfish, salmon or lamprey in any of the watercourses potentially impacted by the Proposed Project. IFI has confirmed that the Tolka River is an important salmonid river, and supports eel (*Anguilla anguilla*) and river lamprey. A review of the NPWS website (NPWS 2015) revealed no records of rare and protected freshwater species in the area of the Proposed Project. During macroinvertebrate surveys of the watercourses, no salmonids, lamprey or white-clawed crayfish were identified at any of the sampling locations. Low quality spawning habitat for salmonids and lamprey were recorded on the Tolka River and in the lower reaches of the Mayne River.

Fishery Value

The Tolka River (which is not crossed by the proposed orbital sewer route (refer to Figure 11.17 Freshwater Sampling Locations) is an important salmonid system under significant ecological pressure from urbanisation. One site was surveyed by IFI on the Tolka River in 2011 (IFI 2012) as part of the Irish WFD fish monitoring programme. The site was located downstream of the N2 National Road bridge, between the Violet Hill estate and Glasnevin Cemetery. A total of six species were recorded during the survey. Minnow (*Phoxinus phoxinus*) was the most abundant species, followed by three-spined stickleback (*Gasterosteus aculeatus*), lamprey (*Lampetra* sp.), eels (*Anguilla anguilla*), stone loach (*Barbatula barbatula*) and salmon (*Salmo salar*). This site was classified at Poor ecological status. However, the surveys confirmed the presence of salmon in this river for the first time in over 100 years, which indicates the potential for this river as a salmon fishery. Significant improvement in water quality would be required before a sustainable population can be established in the future⁵. IFI has also confirmed that this system supports a resident population of brown trout, a migratory population of sea trout, eels and river lamprey (Gretta Hannigan, IFI, *pers. comm.* 2015).

The Santry River is a non-salmonid system due to impassable features located at the lower end of the system (Gretta Hannigan, IFI⁶, *pers. comm.* 2015). There is no WFD fish monitoring undertaken on this river; however, a survey undertaken by IFI in 2013 found only five three-spined stickleback. Water quality is also under significant pressure due to urbanisation in the catchment, and the river has been significantly modified through culverting and channelization which has caused straightening and widening of the river channel.

The Mayne River and tributaries including the Cuckoo Stream are currently a non-salmonid system due to a combination of factors, namely impassable barriers and historically poor water and habitat quality. The Mayne River is included as part of the Irish WFD fish monitoring programme. The survey in 2011 at Wellfield Bridge surveyed 42m of channel consisting of pool, glide and riffles, and recorded only two fish species: three-spined

⁶ http://laetitiabeschus.weebly.com/uploads/2/8/4/3/28435135/santry_river_and_santry_woods.pdf

stickleback (*Gasterosteus aculeatus*) and eels (*Anguilla anguilla*). The Mayne River was also surveyed at two sites in 2016⁷, and three fish species were recorded: eel and three-spined stickleback were present at two sites surveyed, and flounder (*Platichthys flesus*) was found at one site due to the close proximity of the site to the sea. There was a reduced density of three-spined stickleback when compared with the 2011 survey at the Wellfield Bridge site. This represented deterioration in ecological status for the Mayne River at the Wellfield Bridge site, from Moderate ecological status in 2011 to Poor ecological status in 2016. The Snugborough site was also classified as Poor ecological status. The Cuckoo Stream (a tributary of the Mayne River) was surveyed by IFI in 2016. European eel was the only species recorded at the site surveyed at Limekiln Lane. The ecological status at this site was deemed to be Bad. It is the view of IFI that salmonid status (i.e. waters capable of supporting salmon and trout) could be regained on the river, and therefore IFI have sought and secured fish-friendly culverts when consulted with respect to developments (Gretta Hannigan, IFI, *pers. comm.* 2015).

Invasive Species

The introduction and spread of invasive species can have significant impacts on the ecological functioning of watercourses. The following invasive species have been identified in the lower reaches of the Tolka River (Biodiversity Ireland 2017): Japanese knotweed (*Fallopia japonica*), giant hogweed (*Heracleum mantegazzianum*) and Himalayan balsam (*Impatiens glandulifera*). Japanese knotweed and giant hogweed are also present in the lower reaches of the Santry River (Biodiversity Ireland 2017). Giant rhubarb (*Gunnera tinctoria* M.) was recorded along the Tolka River downstream of the proposed orbital sewer route and the proposed Abbotstown pumping station during the freshwater surveys in 2015.

Drainage Ditches near the Proposed Project

Several drainage ditches, in addition to the above watercourses, will be crossed by the proposed orbital sewer route and the proposed outfall pipeline route (land based section) and within the proposed WwTP site. During surveys in the spring (February to April 2014), the drainage ditches were recorded as containing low water levels, and were either recently cleared as part of agricultural drainage maintenance or contained filamentous algal growth. These ditches had no fisheries habitat or potential to support fisheries habitat. These drainage ditches were not subject to macroinvertebrate sampling, as they were considered inappropriate for Q-value assessments. Further surveys of the drainage ditches were not deemed to be required on the basis of these findings.

11.9.1 Field Survey Results

Habitats

Along the potentially affected watercourses (i.e. those near or crossed by the proposed orbital sewer route (land based section) or new culvert system), the habitat sections surveyed and the sites at which biological sampling was undertaken are shown in Figure 11.17 Freshwater Sampling Locations. One site, a tributary of the Tolka River between the back of Connolly Hospital and the N3 National Road which will be crossed by the proposed orbital sewer route, was not suitable for survey due to significant morphological alternations to its channel, which have impacted its aquatic characteristics. There were no suitable areas of this tributary within which a survey could be conducted. The Tolka River itself will not be crossed by the proposed orbital sewer route (lies south-west); however, it has salmonid potential. All other watercourses surveyed had limited salmonid potential. Salmonid spawning and nursery habitat of poor quality was recorded in some of the downstream sections surveyed, e.g. the Mayne River and Cuckoo Stream, and are known to be non-salmonid rivers/streams due to an impassable barrier to fish movement at the lower end of the system (Gretta

Hannigan, IFI, *pers. comm.* 2015). Poor lamprey nursery habitats were present in the surveyed reaches, and lamprey spawning habitat was classified as poor quality.

Macroinvertebrate Biodiversity

Across the five sampled locations, macroinvertebrate diversity was generally low with six or fewer taxa identified at each location in 2015, and again in 2017 (refer to Table 11.19). The Mayne River (Location 5) had the highest number of taxa (six) and was the only location that had a sensitive taxon present in the 2015 survey (*Ecdyonurus* spp.). During the 2017 survey, no taxa considered sensitive were identified at any location. Each of the watercourses exhibited a community impacted by urbanisation, eutrophication and other pressures.

Table 11.19: Macroinvertebrate Community Composition from Sampled Watercourses

Habitat Site	Macroinvertebrate Taxa List	Relative Abundance 2015	Relative Abundance 2017	Sensitivity to Organic Pollution
Location 1 – Tolka River	Chironomidae spp.	Numerous	None recorded	Relatively tolerant
	Gammaridae sp.	Numerous	None recorded	Relatively tolerant but acid sensitive
	Hydrophsyce spp.	Few	None recorded	Relatively tolerant
	Caenidae spp.	Few	None recorded	Less sensitive
	Baetidae spp.	Few	None recorded	Relatively tolerant but acid sensitive
Location 2 – Santry River	Gammaridae sp.	Numerous	Excessive	Relatively tolerant but acid sensitive
	Ceratopogonidae spp.	Few	None recorded	Relatively tolerant
	Simuliidae spp.	Few	None recorded	Relatively tolerant
	Chironomidae spp.	Few	Few	Relatively tolerant
	Hirudinea	None recorded	Few	Tolerant
Location 3 – Mayne River	Chironomus	None recorded	Few	Tolerant
	Asellus sp.	Numerous	Common	Very tolerant
	Gammaridae sp.	Numerous	Excessive	Relatively tolerant but acid sensitive
	Erpobdella	Few	None recorded	Tolerant
Location 4 – Cuckoo Stream	Chironomidae spp.	Few	Common	Relatively tolerant
	Baetidae spp.	Numerous	Excessive	Relatively tolerant but acid sensitive
	Gammaridae sp.	Numerous	None recorded	Relatively tolerant but acid sensitive
	Ephemera spp.	Few	None recorded	Less sensitive
	Simuliidae	None recorded	Common	Relatively tolerant
	Chironomidae spp.	None recorded	Few	Relatively tolerant
	Chironomus sp.	None recorded	Few	Tolerant
	Hirudinea sp.	None recorded	Few	Tolerant
Location 5 – Mayne River	Diptera Larvae	None recorded	Few	Relatively tolerant
	Gammaridae sp.	Numerous	Excessive	Relatively tolerant but acid sensitive
	Chironomidae	None recorded	Scarce/Few	Relatively tolerant
	Hirudinea sp.	None recorded	Scarce/Few	Tolerant
	Asellus sp.	None recorded	Scarce/Few	Very tolerant

Biological Water Quality Assessment

The water quality survey of the invertebrate community (Q-values) in the potentially impacted watercourses ranged from Q2 (Bad ecological status) at the Santry River (Location 2) and Mayne River (Location 3) to Q3 (Poor ecological status) at the Cuckoo Stream (Location 4), with the Tolka River falling between Q2 and Q3 (Poor ecological status) (refer to Table 11.20 and Plate 11.1). All sites are indicative of low diversity communities of unsatisfactory condition and less than Good status.

Freshwater Flora

In-stream plant diversity was low across all sites surveyed, with only bulrush (*Typha latifolia* L.) and yellow iris (*Iris pseudacorus* L.) being recorded in the Tolka River. Bulrush was also recorded in the Santry River, and lesser water-parsnip (*Berula erecta* (Hudson) Coville) and fool's watercress (*Apium nodiflorum* (L.) Lagasca) were recorded in the Mayne River. These species are common throughout Ireland (Preston and Croft 1997) and are often found in shallow water in nutrient rich sites.

Fish

All the watercourses surveyed had limited salmonid potential, except for the Tolka River, due to the presence of impassable barriers to fish movement in the lower reaches of these systems.

Salmonid spawning and nursery habitat of poor quality were recorded in some of the downstream sections surveyed. Fair lamprey nursery habitat was recorded in some of the surveyed reaches, and the lamprey spawning habitat was classified as poor quality. The Tolka River contains suitable salmonid habitat and supports brown trout, sea trout and eels both upstream and downstream of the proposed Abbotstown pumping station, in addition to other fish species. Salmon have also recently been recorded from the lower reaches of the Tolka River system (IFI 2011).

Table 11.20 presents a description of the habitats and macroinvertebrate communities found at the sampling locations, together with information on fisheries value and the presence of Annex II Habitats Directive species. The ecological valuation for each identified AER is also presented.

Ecological Importance

A total of four aquatic AERs were recorded within the Zol of the Proposed Project. Table 11.20 provides a description of each of these AERs. The ecological valuation system follows the NRA Geographic Context for determining value set out in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA 2009b). In the context of national projects, ecological resources of below local importance (higher value) should not be selected as Key Ecological Receptors, for which detailed assessment is required.

The Tolka River has been determined to be of county importance, as there are records of Atlantic salmon in the river from 2011, although it is not designated as a salmonid river. The presence of a protected species in the watercourse indicates it is of a high ecological importance, albeit not at a national or international level.

The Santry River, Mayne River and Cuckoo Stream are evaluated to be of local importance (lower value), based on desktop and field survey findings. The rivers/stream contained limited areas of natural habitat and have limited biodiversity, with Q-values ranging from Q2 to Q3 (Bad to Poor ecological status). Following the criteria set out by the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA 2009b), these ERs should not be selected as Key Ecological Receptors for which detailed assessment is required. However, given that these ERs act as pathways to downstream protected areas in the marine environment, and therefore the potential for indirect impacts exists, they are retained in the assessment to ensure full consideration of these potential impacts, and to allow for appropriate mitigation measures to be incorporated into the Proposed Project.

The downstream SACs and SPAs that are hydrologically connected to the Proposed Project works areas are considered to be of international importance.

Table 11.20: Description of Habitats and Macroinvertebrate Communities at the Sampled Locations

Aquatic Ecological Receptor	Habitat Site	River	Connectivity, Downstream Receptors	Habitat Characteristics	Potential Annex II Species/Supporting Habitat	Fishery Value	Q-Rating 2015	Q-Rating 2017	Ecological Valuation
ER1	Location 1	Tolka River Not crossed by the Proposed Project. (upstream and downstream of the M50 Motorway at Abbotstown Bridge, south of the proposed Abbotstown pumping station).	Direct connectivity to North Dublin Bay SAC, South Dublin Bay and River Tolka Estuary SPA and North Bull Island SPA	<ul style="list-style-type: none"> Shaded upstream of the M50 Motorway bridge, limited shading downstream. 8m to 10m wide. The substrate consisted of bedrock and boulder/cobble mix upstream with sand/silt deposition downstream. Water depth was 0.8m to 3m. In-stream vegetation consisted of bulrush and yellow iris downstream of the M50 Motorway and algae on the hard surfaces. Filamentous algal cover age: approx. 30%. Oil slick visible on downstream section. Excessive rubbish on riverbed on upstream section. Riverbanks are well-vegetated, forming a near-continuous riparian corridor comprising a dense mix of mainly grasses, nettle, giant rhubarb, willow, alder and thistle (see Plate 11.1 – Photos 1 and 2 below). 	<p>None observed.</p> <p>Good habitat for white-clawed crayfish. Abundant refugia and foraging potential.</p>	<p>Fair spawning habitat for salmonids and lamprey.</p> <p>Good nursery habitat for salmonids.</p> <p>Good habitat for lamprey ammocoetes utilising marginal soft sediments.</p>	<p>Q2-3. Moderately polluted.</p> <p>Poor ecological status.</p>	<p>Not sampled in 2017 due to access difficulties at the time of survey.</p> <p>River will not be crossed by the Proposed Project.</p>	County Importance

Aquatic Ecological Receptor	Habitat Site	River	Connectivity, Downstream Receptors	Habitat Characteristics	Potential Annex II Species/Supporting Habitat	Fishery Value	Q-Rating 2015	Q-Rating 2017	Ecological Valuation
ER2	Location 2	Santry River (Accessed via pasture land west of Silloge Park Golf Club).	Direct connectivity to North Dublin Bay SAC, South Dublin Bay and River Tolka Estuary SPA and North Bull Island SPA	<ul style="list-style-type: none"> Shaded section of stream channel with a glide/riffle type habitat and a substratum of bedrock, sand and silt deposition. Water depth 0.2m to 0.6m. In-stream vegetation consisted of rooted bulrush along central channel. Filamentous algae attached to hard substrates. Riverbanks are well-vegetated, forming a near-continuous riparian corridor comprising a dense mix of bramble, beech, willow, ivy, nettle, thistles, rumex, hazel, hogweed, cow parsley and grasses (see Plate 11.1 – Photos 3 and 4 below). 	<p>None observed.</p> <p>Poor habitat for white-clawed crayfish due to low quality aquatic habitat and reduced foraging potential.</p>	<p>Poor spawning habitat for salmon and lamprey.</p> <p>Poor nursery habitat for salmonids and lamprey due to low flow channel and poor water quality.</p>	<p>Q2. Seriously polluted.</p> <p>Bad ecological status.</p>	<p>Q2-3. Moderately polluted.</p> <p>Poor ecological status.</p>	Local importance (lower value)

Aquatic Ecological Receptor	Habitat Site	River	Connectivity, Downstream Receptors	Habitat Characteristics	Potential Annex II Species/Supporting Habitat	Fishery Value	Q-Rating 2015	Q-Rating 2017	Ecological Valuation
ER3	Location 3	Mayne River (Section accessed at Collinstown Business Park east of Turnapin Bridge).	Direct connectivity to Baldoyle Bay SAC and Baldoyle SPA	<ul style="list-style-type: none"> • Slow-flow habitat over a compacted substratum comprised of predominantly cobble and some coarse gravel with overlying silt. • Depth varies from 0.1m to 0.4m. • No in-stream vegetation or macrophyte beds present. • Filamentous algal coverage was patchy with silty plumes observed after bed disturbance. • Very steep banks either side of channel. (see Plate 11.1 – Photos 5 and 6 below). 	<p>None observed.</p> <p>Poor habitat for white-clawed crayfish due to lack of overhanging banks, poor invertebrate assemblages and degraded water quality.</p>	<p>Poor spawning for salmon and lamprey.</p> <p>Poor nursery habitat for salmon and lamprey due to low flow, channel and poor water quality.</p>	<p>Q2. Seriously polluted.</p> <p>Bad ecological status.</p>	<p>Q2. Seriously polluted.</p> <p>Bad ecological status.</p>	Local importance (lower value)

Aquatic Ecological Receptor	Habitat Site	River	Connectivity, Downstream Receptors	Habitat Characteristics	Potential Annex II Species/Supporting Habitat	Fishery Value	Q-Rating 2015	Q-Rating 2017	Ecological Valuation
	Location 5	Mayne River (at proposed access road to proposed WwTP and Craobh Chiaráin GAA grounds)		<ul style="list-style-type: none"> • Low flow pool dominated section with only a small area of riffle habitat. • Bed comprised predominantly of cobble with covering layer of silt. • Depth varies from 0.15m to 1m in parts. • Bramble and willow common and riparian grasses present • No filamentous algal cover and large plumes of silt suspended on disturbance. • Horses accessing channel downstream. • Highly shaded along the length of the habitat due to grassy verges and excessive bramble and fern growth. • Butterfly bush present in the riparian zone. • Some dumping. • (see Plate 11.1 – Photos 9 and 10 below) 	<p>No otters observed.</p> <p>No prints or spraints recorded along bank. However, there is potential for otter activity with some cleaner sections of the river downstream providing more suitable for foraging sites.</p> <p>Poor habitat for white clawed crayfish due to siltation of potential refugia.</p>	<p>Poor spawning for salmon and lamprey</p> <p>Poor nursery habitat for salmonids.</p> <p>Poor habitat for Lamprey Ammocoetes utilising marginal soft sediments.</p>	Not sampled. New site Established in 2017.	<p>Q2. Seriously polluted.</p> <p>Bad Ecological status.</p>	Local importance (lower value)

Aquatic Ecological Receptor	Habitat Site	River	Connectivity, Downstream Receptors	Habitat Characteristics	Potential Annex II Species/Supporting Habitat	Fishery Value	Q-Rating 2015	Q-Rating 2017	Ecological Valuation
ER4	Location 4	Cuckoo Stream (Mayne River Tributary) Intersecting arable field.	Direct connectivity to Baldoyle Bay SAC and SPA	<ul style="list-style-type: none"> Moderate to fast flow with compacted substratum comprised of predominantly cobble and boulder. Silt deposits line undercut bankside edges. Depth varies from 0.1m to 0.8m. No in-stream vegetation or macrophyte beds present. Filamentous algal coverage was extensive on downstream channel and proliferated along extraneous material recorded on river bed. Upstream channel dominated either side by overhanging hazel and hawthorn trees lining bankside intertwined with excessive bramble (Rubus) growth (see Plate 11.1 – Photos 7 and 8 below). 	<p>None observed.</p> <p>Good habitat for white clawed crayfish was observed as silty marginal sections and undercut banks provide good habitat.</p>	<p>Poor spawning for salmon and lamprey</p> <p>Poor nursery habitat for salmonids</p> <p>Poor habitat for Lamprey</p> <p>Ammocoetes utilising marginal soft sediments.</p>	<p>Q3. Moderately polluted.</p> <p>Poor ecological status.</p>	<p>Q2-3. Moderately polluted.</p> <p>Poor ecological status.</p>	Local importance (lower value)



Photo 1: Tolka River at Abbotstown – Upstream (Location 1)



Photo 2: Tolka River at Abbotstown – Downstream (Location 1)



Photo 3: Upstream of Santry River Tributary West of Silloge Park Golf Club (Location 2)

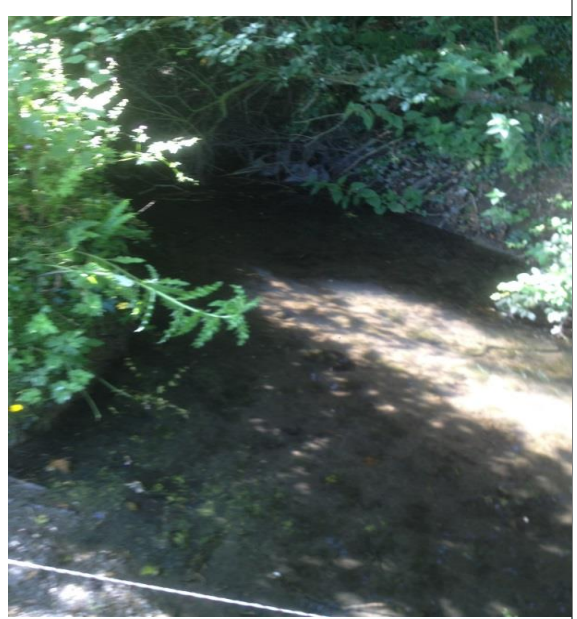


Photo 4: Downstream of Santry River Tributary West of Silloge Park Golf Club (Location 2)

	
<p>Photo 5: Cobble/Gravel/Silt Mix Substratum at Mayne River Tributary East of Turnapin Bridge (Location 3)</p>	<p>Photo 6: Steep Bank with Narrow Channel at Mayne River Tributary East of Turnapin Bridge (Location 3)</p>
	
<p>Photo 7: Downstream View of Narrow, Shaded Channel at Cuckoo Stream (Mayne River Tributary) (Location 4)</p>	<p>Photo 8: Upstream View of Cuckoo Stream (Location 4)</p>
	
<p>Photo 9: Downstream of Mayne River Proposed Access Road to Proposed WwTP (Location 5) Facing Upstream.</p>	<p>Photo 10: Downstream of Mayne River Proposed Access Road to Proposed WwTP (Location 5) Facing Downstream.</p>

Plate 11.1: Images of Sampled Watercourse Locations

11.10 Impact of the Proposed Project on Freshwater Aquatic Biodiversity – Construction Phase

In the absence of adequate mitigation, the Proposed Project has the potential for impacts on the watercourses within the ZoI of the Proposed Project, which includes the downstream marine sites which are hydrologically connected to the Proposed Project via river pathways. The potential impacts include contamination with deleterious substances generated during the Construction Phase, including the possible introduction of invasive species, and during the Operational Phase, runoff from hard surfaces at the proposed WwTP at Clonshagh and proposed Abbotstown pumping station. The primary discharge from the proposed WwTP will be to the marine environment, and therefore there will be no untreated wastewater discharged to freshwater ERs. The potential impact from the primary discharge has been assessed in Chapter 9 Biodiversity (Marine).

All watercourse crossings by the proposed orbital sewer route (total of three crossings) as shown in Figure 11.17 Freshwater Sampling Locations will be by trenchless techniques. The proposed construction corridor for the proposed outfall pipeline route (land based section) is 40m wide to allow for the movement of heavy plant and temporary storage of construction materials. The proposed construction corridor will be reduced to a proposed 20m wayleave to facilitate maintenance of the pipeline for its operational life. The use of trenchless techniques for the watercourse crossings will protect the watercourses from the potential significant impacts associated with traditional in-stream trench type methods or wet open cut methods. Trenchless techniques are commonly used to avoid impacts to environmentally sensitive areas such as SACs or SPAs, or to streams/ rivers which are within the upstream catchment of an SAC or SPA as is the case for this Proposed Project. The specific method to be employed will be either pipe jacking or microtunnelling, to be confirmed at the detailed design stage when the ground conditions have been determined in greater detail (see Chapter 4 Description of the Proposed Project for further details). The potential impacts associated with trenchless crossing techniques are the same regardless of the specific method used.

The drilling methods will involve microtunnelling through the soil and passing the pipe through the tunnel behind a bore. The installation starts with a pilot hole being drilled along the predetermined drill path. Bentonite clay suspension or a polymer mix is used to reduce friction between the soil and the pipe. The pipe, once in place and prior to backfilling around the pipe, will be pressure tested using a hydrostatic/water test on the full length of pipeline to ensure there are no leaks. Each of the trenchless techniques follow similar steps and carry similar potential risks, e.g. bentonite blow out, risk of sedimentation generated at launch and reception pits and during pressure testing, which are described below. Trenchless watercourse crossings must consider a number of factors, including the width of the channel and topography of the river valley, suitable locations for entry and exit pits, disturbance associated with the pits, pipe bending radius, stresses associated with pulling the pipe through the drill bore, geotechnical conditions and restoration of conditions at the works areas post construction.

No in-stream works are proposed for any watercourse crossed by the proposed orbital sewer route or the proposed outfall pipeline route (land based section). In-stream works will be required where a proposed access road will be constructed from the R139 Road to the proposed WwTP, and this will require the installation of a culvert and widening of the bridge over the Mayne River, currently leading to Craobh Chiaráin GAA pitches (survey location 5, Figure 11.17 Freshwater Sampling Locations).

The Proposed Project onshore elements are spread from Blanchardstown to Portmarnock, and as a result, proposed construction access routes are widespread. Proposed construction access routes will be required for the delivery and removal of material, plant and personnel to the works locations. Works on public roads are limited to a number of crossing points, and the majority of these will be crossed by trenchless techniques. Other than at the new entrance to the proposed WwTP/Craobh Chiaráin GAA grounds, there will be no new roads constructed over watercourses to facilitate the Proposed Project. The potential for impacts associated with proposed access roads arise from the generation of dust, dirty machinery, spillage or leakage of fuels, oils or onboard materials.

The potential significant impacts during the Construction Phase associated with these works are described below. General impacts associated with all elements of the works include sedimentation, pollution with other substances, introduction of invasive species, and the risk of incidences or accidents. Site specific impacts are associated with trenchless river/stream crossing works, installation and use of proposed temporary construction compounds during the Construction Phase, culvert system installation at survey location number 5, use of access roads and potential changes in hydrology as a result of the construction of hardstanding areas.

Suspended Solids Pollution

The potential for pollution with suspended solids will be an issue within the Proposed Project at all locations where:

- Demolition works are undertaken;
- The proposed temporary construction compounds will be temporarily established;
- Construction site drainage takes place;
- Permanent drainage features are constructed;
- Permanent hard surfaces are constructed;
- There are 19 proposed outfalls to ditches, road drainage and local watercourses (post-attenuation);
- Earthworks (cut/fill) occurs. The Proposed Project has the potential to generate significant quantities of waste material, the primary sources being surplus excavated material associated with the proposed orbital sewer route construction, excess material from deep excavations required for the construction of the proposed Abbotstown pumping station, excess material from the construction of the proposed WwTP, and excess material from the construction of the proposed outfall pipeline route (marine section) and tunnel spoil. Surplus material in the order of 215,000m³ has been quantified, and
- At river/stream crossing locations during trenchless works and culvert system construction (three river crossings and one access road crossing).

Sediment-laden runoff from construction areas and introduction of fine sediments can pose adverse impacts to aquatic life in watercourses resulting in the following range of impacts:

- Reduction of visibility in the stream, impairing foraging ability for fish;
- Settled sediments can smother and displace aquatic organisms, such as macroinvertebrates, reducing the amount of food items available to fish;
- Suspended solids particles can clog or damage the gills of salmonid fish;
- The settlement of suspended solids particles on spawning areas can smother the eggs in the gravel;
- Higher concentrations of suspended solids may also serve as a sink or carrier for toxins/chemicals; and
- Water with higher concentration of solids retards photosynthesis.

In the absence of mitigation, suspended solids impacts would be expected to be moderately negative on a local scale, with short-term impacts during the Construction Phase for all AERs with the potential for sedimentation to be transported downstream to the marine environment. This is based on the reduced capacity of these streams to sustain further sedimentation, which would further reduce their water quality status. Each of the three rivers and the Cuckoo Stream are currently failing to meet their Good status objectives.

Pollution with Other Substances

There is potential for a range of pollutants to enter watercourses during the construction of the Proposed Project at river crossings, activities at proposed temporary construction compounds and satellite offices/welfare facilities, and during the construction of the new culvert system at location 5. The following will have harmful impacts on fish, plants and invertebrates if allowed to enter the freshwater:

- Raw or uncured concrete and grouts;
- Excessive dust emissions from excavation and transportation of materials can potentially dissipate to nearby watercourses;
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks; and
- Fuels, lubricants and hydraulic fluids for equipment used for construction purposes.

In the absence of mitigation, contaminated substances released to the environment during the Construction Phase would be expected to impact moderately negatively, on a local scale with medium-term impacts for all AERs and with the potential for these substances to indirectly affect the downstream marine environment. The assessment takes into account the toxic nature of the inputs, e.g. concrete, and the already reduced status within these watercourses which require significant protection in order to restore them to Good status.

Trenchless Crossings

Trenchless crossing methods will be employed at three crossing points: one on the Santry River, one on the Mayne River and one on the Cuckoo Stream (tributary of the Mayne River). The use of trenchless techniques for watercourse crossings is a mitigation measure in itself, and has been built into the design of the Proposed Project in order to avoid significant impacts to the freshwater and downstream marine environment. However, there remains the risk of some impacts associated with trenchless crossing works, which include:

- Large volumes of spoils will be removed from the tunnel under the watercourse. Spoil material, if improperly stored, can act as a source of sedimentation. Increased suspended solids can lead to increased deposition of fine sediment (silt/clay) onto the river bed. By altering the bed structure, excessive deposited sediment removes habitats for macroinvertebrates, reduces suitable substrate for fish spawning and impacts on the river's morphological condition;
- Interception of the hyporheic zone (zone of interaction between river and groundwater) or groundwater during trenchless crossing of streams may lead to large volumes of sediment-contaminated waters being produced, which would require treatment prior to discharge;
- During trenchless crossing techniques, bentonite clay or other suitable material is pumped at pressure into the space between the pipe's surface and the soil. There is potential for 'blowout', where bentonite escapes to the surface, potentially entering the watercourse. Release of bentonite to the watercourse would alter the substrate structure by coating habitats for macroinvertebrates, reducing suitable substrate for fish spawning and impairing in-stream water clarity; and
- Noise and vibration impacts to the stream bed which may disturb fish in-stream is a potential risk. Anthropogenic noise and vibration impacts to freshwater fish is not a well understood area of science, although there is growing evidence that anthropogenic noise has an adverse effect on fish behaviour and physiology.

In the absence of mitigation, impacts resulting from trenchless crossing techniques would be expected to be moderately negative on a local scale, with short-term impacts during the Construction Phase for AERs 2, 3 and 4 (Santry River, Mayne River and Cuckoo Stream).

Construction of Culvert System at Location 5

Installation of a new culvert system and proposed access road at location 5 is proposed. The primary impacts associated with these activities on aquatic receptors are:

- The potential for the obstruction of the passage of fish and aquatic fauna. The effect of a particular culvert on salmonids will depend on, e.g., water depth, speed and volume, length of culvert, type of culvert, species of fish, size and condition of fish. Physical alteration of stream channels can result in altered hydraulic characteristics and changes in stream profile, particularly in width, depth, gradient and current speed. Above a critical flow velocity, fish can only sustain progress for a limited period of time without resting. The faster the current velocity above this critical speed, the shorter the distance the fish can travel against the current. The impact of a culvert on fish movement is therefore primarily due to changes in

hydrological conditions. Other factors such as the length of the structure and light are commonly used as significant criteria in determining the fish passage capability of an installation. The preference of IFI (2016) is the use of clear span bridge structures, followed by bottomless box culverts instead of box culverts or pipe culverts; and

- Aquatic invertebrates may travel long distances within a stream by their own power in the case of snails, amphipods, crayfish and other crustaceans. As many of these species are confined to the water, any barrier to their dispersal impacts their populations. By eliminating the natural aquatic vegetation and its associated invertebrate fauna, culverts can result in a significant reduction in invertebrate drift downstream which constitutes a significant food source for salmonid fish.

In the absence of mitigation, culvert impacts would be expected to be moderately negative on a local scale and permanent for AER 3 (Mayne River), given the existing physical alterations on the Mayne River, which are already leading to a barrier to fish migration, and the existing stream flow conditions. That said, IFI's comments which seek fish passable structures on the Mayne River are recognised.

Construction of the Proposed Access Roads

Construction access will be required for delivery and removal of material, plant and personnel. Access routes for use as part of the Proposed Project primarily involve national primary and secondary existing routes, e.g. N2 National Road and N3 National Road, M50 Motorway and the R132 Swords Road, and short sections of regional roads. Three temporary proposed access roads are also required within the proposed construction corridor. The importation and disposal of construction related material will entail the transportation of materials from quarries and to licensed waste disposal facilities. There is potential for site traffic to carry soil or other material on the wheels of vehicles out onto public roads, and also for debris lost on the road network to enter watercourses which are crossed by these public roads. Dust emissions from loads of materials leaving site could also be a source of impact.

In the absence of mitigation, impacts would be expected to be slight negative, on a local scale and of short duration during the Construction Phase for all AERs. It is unlikely that there will be an impact to downstream marine receptors via freshwater pathways given the potential volumes of debris or dust that could be emitted.

Potential Changes to Hydrology as a Result of Hardstanding Areas

The pattern of runoff from hardstanding areas and the location of outfalls from these areas as a consequence of the installation of temporary drainage systems (to facilitate the Proposed Project works) to the freshwater environment can lead to localised scouring and increased flow rates during rainfall events, in particular during peak events. Contaminated runoff to the aquatic environment at outfall locations may lead to localised point source loading of relevant pollutants and suspended solids.

Increases in hard standing and new proposed access roads can alter surface water infiltration rates and flow paths. The creation of impermeable and permanent surfaces will alter drainage patterns in the immediate vicinity of the proposed WwTP and at the proposed Abbotstown pumping station and may lead to localised surface water flow path preferences.

In the absence of mitigation, hydraulic impacts would be expected to be moderate negative on a local scale and permanent for AER 1 (Tolka River) as a consequence of the proposed Abbotstown pumping station and AER 4 (Cuckoo Stream) as a consequence of the proposed WwTP. Impacts are predicted to be slightly negative on a local scale for AER 3 (Mayne River) as a consequence of the new proposed access road to be built to the proposed WwTP. These impacts would be slightly negative on downstream marine receptors, and short-term in duration.

Proposed Temporary Construction Compound Areas Including Office and Welfare Facilities

There is potential for site disturbance during the setup and utilisation of the proposed temporary construction compound areas to facilitate the works. Proposed temporary construction compound areas located close to

watercourses have the potential to impact stream/river riparian corridors and alter surface water attenuation and flow paths. Activities such as vehicle movements and refuelling can all create the potential for spillages and leakages which may enter nearby watercourses.

The construction of proposed temporary construction compounds will require the removal of wastewater from toilets and domestic water from washing facilities which will require treatment and safe disposal to a suitable location. Inadequate treatment of on-site toilets and washing facilities has the potential to cause faecal contamination.

In the absence of mitigation, impacts associated with the proposed temporary construction compound areas would be expected to be slightly negative on a local scale and short-term for all AERs and downstream marine receptors.

Introduction or Transport of Invasive Species

The introduction and spread of invasive species, such as Japanese knotweed (*Fallopia japonica*), Himalayan balsam (*Impatiens glandulifera*), Giant hogweed (*Heracleum mantegazzianum*), on vehicles during the Construction Phase can have significant impacts on the ecological functioning of watercourses.

In the absence of mitigation, impacts from the introduction of invasive species would be expected to be significant negative on a local scale and long-term for all AERs and downstream marine protected areas.

Environmental Incidents and Accidents

An environmental incident or accident during the Construction Phase, e.g. a large-scale spillage of a contaminant such as diesel or cement which could enter local streams or the marine environment, would have a negative impact on the aquatic environment.

In the absence of mitigation, impacts would be expected to be significant negative on a local scale and long-term for all ecological receptors and downstream protected areas. Spillages of contaminants, depending on their concentration and volume, could lead to a toxic reaction within the streams, with further impacts on an already degraded fisheries habitat, with consequences for the chemical status of the watercourse as per WFD environmental quality standards.

11.11 Impact of the Proposed Project on Freshwater Aquatic Biodiversity – Operational Phase

The potential significant impacts due to the existence and operation of the Proposed Project include:

- Pollution of the Tolka River, Santry River or Mayne River systems from the leakage or spillage of untreated wastewater during the Operational Phase of the proposed WwTP and the proposed Abbotstown pumping station or from the proposed orbital sewer route would have significant negative short-term impacts at a local scale for all AERs and downstream marine protected areas, until the pollution is contained and the breach rectified;
- Any changes in hydrology due to runoff from impermeable surfaces within the proposed WwTP and the proposed Abbotstown pumping station sites reflected in changes in maximum and minimum flows would have a slightly negative impact at a local scale on in-stream flora and fauna, and will be temporary (i.e. associated with high rainfall events) given the sizes of the areas involved relative to the sizes of the catchments within which they sit; and
- Accidental spillage of fuels, oils, chemicals or other polluting substances would be expected to be slightly negative on a local scale and temporary, given that this risk is largely associated with the Construction Phase when vehicle activity will be greatest, rather than the Operational Phase of the Proposed Project, which will see lower activity associated with maintenance requirements.

11.12 Summary of Potential Impacts in the Absence of Mitigation Measures

Table 11.21 outlines the potential impacts from the Proposed Project in the absence of mitigation.

Table 11.21: Impacts of the Proposed Project in the Absence of Mitigation

Aquatic Ecological Receptor	Location and Rating	Potential Impacts During the Construction Phase									Potential Impacts during the Operational Phase		
		Suspended Solids Pollution	Pollution with Other Substances	Introduction of Invasive Species	Trenchless Crossing	Culvert and Bridge Construction	Construction of Access Roads	Compound Areas	Hydrological Changes	Environmental Incidents and Accidents	Pollution from Pipe Leakage/Spillage of Untreated Wastewater	Pollution from Runoff from Hardstanding Areas	Accidental Spillage of Fuels/Oil/ Chemicals
ER1	Tolka River (Location 1) of county importance	Moderately negative on a local scale, short-term	Moderately negative on a local scale, medium-term	Significantly negative on a local scale, long-term	No impact	No impact	Slightly negative on a local scale, short-term	Slightly negative on a local scale, short-term	Moderately negative on a local scale, permanent	Significantly negative on a local scale, long-term	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary
ER2	Santry River (Location 2) of local importance (lower value)	Moderately negative on a local scale, short-term	Moderately negative on a local scale, medium-term	Significantly negative on a local scale, long-term	Moderately negative on a local scale, short-term	No impact	Slightly negative on a local scale, short-term	Slightly negative on a local scale, short-term	No impact	Significantly negative on a local scale, long-term	Slightly negative on a local scale, temporary	No impact	Slightly negative on a local scale, temporary
ER3	Mayne River (Location 3) of local importance (lower value)	Moderately negative on a local scale, short-term	Moderately negative on a local scale, medium-term	Significantly negative on a local scale, long-term	Moderately negative on a local scale, short-term	No impact	Slightly negative on a local scale, short-term	Slightly negative on a local scale, short-term	No impact	Significantly negative on a local scale, long-term	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary
	Mayne River (Location 5) of local importance (lower value)	Moderately negative on a local scale, short-term	Moderately negative on a local scale, medium-term	Significantly negative on a local scale, long-term	No impact.	Moderately negative on a local scale, permanent	Slightly negative on a local scale, short-term	No impact	Slightly negative on a local scale, permanent	Significantly negative on a local scale, long-term	No impact	Slightly negative on a local scale, temporary	No impact
ER4	Cuckoo Stream (Location 4) of local importance (lower value)	Moderately negative on a local scale, short-term	Moderately negative on a local scale, medium-term	Significantly negative impact on a local scale, long-term	Moderately negative on a local scale, short-term	No impact	Slightly negative on a local scale, short-term	Slightly negative on a local scale, short-term	Moderately negative on a local scale, permanent	Significantly negative on a local scale, long-term	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary	Slightly negative on a local scale, temporary

11.13 'Do Nothing' Impact on Freshwater Aquatic Biodiversity

If the Proposed Project does not proceed, ongoing activities would continue within the Proposed Project boundary which may include further urbanisation, airport activities and intensive agriculture. These activities would be likely to result in localised and moderate scale impacts to the AERs within the ZoI, with resulting indirect impacts to the downstream marine environment. This would result in the freshwater biodiversity along the Proposed Project route potentially remaining as it is at present or potentially being impacted further in terms of its ecological status classification. Environmental objectives under the *Draft River Basin Management Plan for Ireland 2018–2021* (DoHGLG 2017) have not yet been established for these waterbodies; however, Good status is the minimum environmental objective set under WFD, with varying timelines for the achievement of that objective.

11.14 Mitigation Measures – Freshwater Aquatic Biodiversity

This Section prescribes best practice measures to be employed throughout the works area, and where required, site specific mitigation measures that will be implemented to avoid, reduce or remedy potential impacts identified above in Section 11.10 and Section 11.11.

11.14.1 Construction Phase

An ECoW will be appointed by Irish Water or its agents to monitor and regularly inspect the implementation of all ecological mitigation contained in this EIAR, associated NIS and the Outline CEMP, and to act as a liaison between Irish Water and ABP in the discharge of planning conditions relating to biodiversity.

A detailed CEMP will be developed by the appointed contractor(s). An Outline CEMP and Outline Surface Water Management Plan have been developed and are included as part of the Planning Documentation for the Proposed project. This includes the best practice measures outlined in this Chapter, and site specific mitigation measures, where identified. All site operatives shall be fully informed in advance of any works of the ecological sensitivities in the surrounding environment, and the required mitigation measures will be in place in advance of works.

Suspended Solid Pollution

The reduction and prevention of suspended solid pollution will be required during all elements of the Proposed Project works, including:

- During site preparation and clearance works (cut/fill operations);
- Where trenchless operations are undertaken;
- Where the culvert system at location 5 is constructed along with the new proposed access road to the proposed WwTP;
- Where site proposed access roads are constructed;
- Where the proposed WwTP and Abbotstown pumping station construction works are undertaken, and
- Where proposed temporary construction compounds are temporarily installed.

As such, this Section outlines best practice mitigation measures for the control of suspended solid pollution to the freshwater environment, and site-specific measures, where required. The key factors in erosion and sediment control are to intercept and manage runoff. This limits the potential for soils to be eroded and enter streams in runoff and traveling downstream to marine protected areas.

Best practice measures to be implemented are:

- The appointed contractor(s) will develop the Outline Surface Water Management Plan and Sediment Control Plan, which will form part of the CEMP, in advance of any construction activities commencing for

the Proposed Project (the principles of which are detailed in the Outline CEMP). The Surface Water Management Plan will adopt mitigation proposed in Chapter 17 Hydrology and Hydrogeology of this EIAR;

- All discharges to surface waters will be suitably treated prior to discharge. There will be no direct discharge of surface water from any element of the works without proper attenuation and treatment. The level of suspended solids in any discharges to fisheries waters, e.g. the Tolka River (or waters with fisheries potential e.g. the Santry River, Mayne River and Cuckoo Stream), as a consequence of construction works shall not exceed 25mg/l⁸ nor result in the deposition of silts on gravels or any element of aquatic flora and fauna as per IFI guidelines (IFI 2016). If baseline suspended solid levels in pre-construction monitoring show that these rivers exceed this threshold, the baseline suspended solid levels will not exceed baseline levels during the Construction Phase of the Proposed Project;
- Pathways of preferential flow are identified within the works area in the Outline Surface Water Management Plan, and the appropriate mitigation measures will be undertaken by the appointed contractor(s), as presented, to ensure contaminated water from the site is treated before being discharged to the watercourse. Pathways of preferential flow on a small scale are determined by the topography of the site and are subject to change as works are undertaken, and therefore will need to be determined on-site by the appointed contractor(s), and agreed with the ECoW. All vulnerable infrastructure, e.g. the proposed WwTP and Abbotstown pumping station, are to be located in Flood Zone C – low risk. Similarly, all proposed temporary construction compounds, storage areas and launch pits (for trenchless technologies) will be located, where possible, within Flood Zone C – low risk. The following best practice guidelines for erosion and sediment control will be adhered to during the Construction Phase, and will inform appropriate mitigation. These guidelines are largely based on publications by CIRIA (Murnane et al. 2006), Goldman et al. (1986), Murphy (2004) and IFI (2016):
 - Sediment traps or settlement ponds shall be provided for all works near watercourses during construction in order to attenuate and treat all water prior to discharge, and will adhere to the IFI guidelines (IFI 2016);
 - Works within and adjacent to watercourses will only be conducted during forecast low flow periods;
 - The design of the outfalls and settlement ponds and the construction method statements for their installation shall be agreed with IFI prior to construction;
 - Topsoil stripping near to any watercourses will be undertaken in dry weather conditions, and all stockpiles will be located further than 100m from a watercourse or removed off site. Stockpiles within 200m of a watercourse will be covered;
 - Stripped areas will be revegetated, particularly cut and fill slopes and disturbed slopes, as soon as possible (for example by use of hydroseeding (larger areas) and replacement of turves (smaller areas)). Mulches or other organic stabilisers will be used to minimise erosion until vegetation is established on sensitive soils. Hydroseeding shall not be carried out in close proximity to water, and these areas will be seeded by hand or placement turves used;
 - Runoff velocities and erosive energy will be minimised by maximising the lengths of flow paths for precipitation runoff, constructing interceptor ditches and transport, and lining unavoidably steep interceptors or conveyance channels with low gradients to minimise secondary erosion and ditches with filter fabric, rock or polyethylene lining to prevent channel erosion;
 - The crossing of watercourses at natural fords will not be permitted due to the uncontrolled sedimentation that can be generated;
 - The creation of fords on streams and rivers through the introduction of stone shall be prohibited;
 - There will be designation of appropriate locations set back from watercourses and methods for stockpiling, for example, soil, aggregates and chemicals;
 - Heavy vehicle movements will be restricted adjacent to watercourses and tidal areas in order to avoid inputs;

⁸ The standard is expressed as an average concentration over a period of 12 months and does not apply to suspended solids with harmful chemical properties. European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988).

- Runoff from stockpiles will be collected via a shallow toe-drain which will discharge to a settlement pond. Settlement ponds will be designed and sized to adequately attenuate suspended solid runoff from stockpile areas. Sediment build-up will be removed at regular intervals by manual means only and will be treated at an appropriately authorised waste management facility;
- Existing and proposed surface water drainage and discharge points shall be mapped on a site plan including the location of existing and proposed measures such as monitoring points, sediment traps, settlement lagoons and hydrocarbon separators;
- Site access roads shall be constructed of a non-friable, clean, well-graded material, typically of NRA Clause 804, to ensure the material does not break down under loading;
- No water that has gathered on-site from any source (groundwater, surface water or precipitation) will be pumped directly to the surface water drainage network. All water intercepted on-site must be attenuated in sediment control structures for sufficient time to ensure that sediment concentrations are appropriate before discharge;
- No in-stream structures, strictly no temporary stream crossings or temporary culverting shall take place without the prior agreement of IFI; and
- Excavations for foundations will be carried out so as to minimise sediment runoff.

Chapter 17 Hydrology and Hydrogeology provides further specification for suspended solid control.

Site specific measures to be implemented are as follows:

- The northern boundary of the proposed WwTP site is set back from the Cuckoo Stream. Earth mounds and planting will occur within 50m of the stream. However, these works will not take place within 20m of the stream, as riparian vegetation plays a crucial role in removing sediment in over-land flows. Riparian vegetation is a vital component of a healthy stream ecosystem and will be preserved. The site will be stripped and earth mounds will be formed as work progresses along the site boundary. These mounds/planting will provide a buffer to further protect the Cuckoo Stream in conjunction with the maintained 20m riparian buffer. Earth mounds will be revegetated as soon as possible, e.g. by use of hydroseeding (for larger areas). Broadleaves will be planted in this area adjacent to the Cuckoo Stream to encourage a mixture of dapple and shade conditions benefiting in-stream flora and fauna;
- Where trenchless crossing works take place, i.e. within 200m of the Tolka River and crossing under the Santry River, Mayne River and Cuckoo Stream, a riparian buffer strip at least 20m in width (from the edge of the watercourse on either bank) shall be clearly marked and maintained, to protect the watercourse from any potential impact. Reception and launch pits from trenchless operations will not be located within this 20m buffer. Silt fencing will be installed along the 20m buffer line to isolate the works area from the relevant watercourses. A detailed Pollution Control Plan, Emergency Response Plan and Method Statements will be drafted in agreement with IFI and other relevant authorities;
- Suspended solid pollution associated with culvert system installation will be avoided by use of a clear span structure if possible or, where a bottomless box culvert is installed, will follow IFI guidelines (IFI 2016) for works in or adjacent to watercourses. Mitigation will include protection of the riparian bank structure, minimisation of sedimentation to the watercourse by use of silt fencing, sand bags or other sediment reducing measures, and minimisation of in-stream activity; and
- The appointed contractor(s) will inspect and monitor the water quality of surface waters near any works, paying particular attention to suspended solids and turbidity levels. This monitoring will form part of the CEMP for the works.

Trenchless Crossing of Watercourses

The primary mitigation measure for the protection of the freshwater environment during the Construction Phase of the Proposed Project is the use of trenchless techniques to cross the watercourses. This approach will protect the streams and downstream marine protected areas from the significant impacts of traditional trench based methods. Nevertheless, there are some risks associated with the various trenchless methods, and mitigation for these is outlined below:

- Reception and launch pits for the directional drilling process shall not be located within 20m of any watercourse;
- Direct disposal of arisings from excavations and from groundwater dewatering activities to the nearby watercourses will not be allowed. Any discharge of such water, after proper treating/de-silting, will be discussed and agreed with the landowner, and if necessary, discharge consent will be acquired from the concerned authority (EPA, IFI) prior to the commencement of work;
- If drilling fluids are being returned for cleaning and reuse or recirculation through a temporary fluid return line, pneumatic leak testing shall be carried out to confirm the integrity of the return line;
- Spent drilling fluids including separated drill materials shall be contained in secure bunded areas within selected proposed temporary construction compounds for off-site disposal at a licensed disposal facility;
- To avoid reception and launch pits being open for longer than is necessary, all ducting required shall be available on-site prior to commencement of pit excavation;
- Marker posts will be placed at each side of the streams/rivers identifying the location of the crossing;
- Stream crossing works, including preparatory works, shall be carried out under the supervision of a suitably qualified ECoW;
- Upon completion of works at each stream crossing, the site shall be cleaned and any waste disposed of to a suitably licensed facility;
- Pipes, once in place, will be hydrostatic/water tested to design capacity to validate pipe integrity; and
- The appointed contractor(s) will inspect and monitor the water quality of surface waters near trenchless works, paying particular attention to signs of blowout and silt plumes. In the event of a bentonite break-out, then the site will be monitored for chemicals and macroinvertebrates to ensure no residual impacts following clean-up operations. This monitoring will form part of the CEMP for the works.

Construction of Culvert System

There is one culvert system proposed as part of the Proposed Project. This culvert system will be located on the proposed access road to the proposed WwTP at Clonshagh, and will cross the Mayne River at survey location number 5. The following mitigation has been included within the design of the Proposed Project, which is in line with the IFI's *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI 2016), in particular Section 6 (River and Stream Permanent Crossing Structures). During the Construction Phase, the appointed contractor(s) shall ensure that:

- In-stream works shall be undertaken during the period 1 July to 30 September, as required by IFI guidelines (IFI 2016), to avoid accidental damage or siltation of spawning beds, unless otherwise specified by IFI during consultations in advance of works. This shall include preparatory work near all watercourses and all river bank works;
- Bank protection works will be required (e.g. upstream and downstream of the new structure) to ensure no undercutting or destabilisation of either the structure or riparian bank areas occurs. Rock armour will be installed and will include large enough boulders, strategically positioned to ensure they cannot be undercut; and
- Bridge and culvert design has avoided impacting on flow regimes and river bed profiles upstream and downstream of the structure and has allowed for unimpeded movement of fish by ensuring a minimum depth of water within the structure. The river substrate will be maintained. The design will ensure that the flow regime for this crossing, which has the potential to support salmonids in the future, shall allow for the unimpeded passage of fish upstream and downstream by having the invert buried 500m below bed level. Due to the width of the river, and to prevent the foundations of these structures encroaching on the river, a precast box culvert will be installed at this location.

Pollution with Other Substances

Where the construction works are close to a watercourse, and at all watercourse crossings, the following best practice guidelines, adapted from Chilibeck et al. (1992), NRA (2005b) and Murphy (2004), shall be followed:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site should be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to *Best Practice Guidelines BPGCS005 – Oil Storage Guidelines* (Enterprise Ireland);
- Best Practice Guidelines BPGCS005 – Oil Storage Guidelines (Enterprise Ireland);
- Fuelling and lubrication of equipment shall not be carried out on-site within 20m of any watercourse or drainage ditch;
- Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained and a pollution control kit used. The contaminated soil shall be removed from the site and properly disposed of;
- In the event of any spillage of fuels, lubricants or hydraulic oils, the ECoW will be notified immediately;
- Oil booms and oil soakage pads shall be kept on-site to deal with any accidental spillage, and replenished immediately once used;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or recycling;
- All pumps using fuel or containing oil shall be locally and securely bunded and shall not be located within 20m of a watercourse or drainage ditch; and
- Prior to any in-stream works, the appointed contractor(s) will ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.

Use of Concrete

Concrete will be required as part of works undertaken to construct the proposed WwTP at Clonshagh, to construct the proposed Abbotstown pumping station and at manholes (at bends, changes in gradient and at specific locations along the proposed pipeline routes) and chambers. Mitigation in the form of avoidance of the use of concrete has been built into the design of the Proposed Project for the culvert discussed above, with a precast box culvert utilised. It is possible that the chosen pipe material may be concrete; however, the suitability of the particular materials will be considered further at the detailed design stage. Therefore, mitigation proposed here, includes for the scenario in which the pipe material is concrete.

The use and management of concrete, which has a deleterious effect on water chemistry and aquatic habitats and species, in or close to watercourses shall be carefully controlled to avoid spillage. Where the use of concrete near water cannot be avoided, the following control measures will be employed:

- When working in or near the surface water and the application of in situ materials cannot be avoided, alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration of the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe. Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters;
- Placing of concrete near watercourses will be carried out only under the supervision of the ECoW;
- There will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately and runoff prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed at Clonshagh and Abbotstown, where concrete works are proposed, and sediment allowed to settle out and reach pH neutral, before clarified water is discharged back to a watercourse or removed off-site;

- On-site concrete batching and mixing activities will not be allowed and will be specifically prohibited in the contract documents;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on-site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The concrete plant and all delivery drivers will be informed of their location with the order information and on arrival on-site;
- Chute washout locations will be provided with appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks, and
- The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the Construction Phase settlement facilities) or alternatively disposed of as waste to a licensed facility.

Surface Water Management along the Route

Surface water management measures will be installed along the proposed pipeline routes in order to manage runoff through the wayleave in which construction is occurring. There will be shallow toe-drains located along the edges of the wayleave in order to catch runoff from the stockpiles of topsoils and subsoils resulting from the digging of the trenches for the pipeline. These toe-drains will drain into temporary settlement ponds which will be located along the proposed pipeline routes at regular intervals as required as construction progresses, and shall be sized based on calculations of hourly runoff volumes based on a 1 in 10 year rainfall event. These settlement ponds will collect surface waters flowing over the wayleave and into the toe-drains. The routes will be split into 19 separate sections for the purposes of surface water management. The Surface Water Management Plan provides details of the volumes of attenuation to be provided at each section along the proposed route, as well as outfall information.

Sediment will be removed from the surface water prior to discharge through measures as per the guidance on control of water pollution from construction projects (CIRIA 2001) (for example silt screens or hay bales). The treated surface water will be discharged to local watercourses, ditches or road drainage as deemed suitable at locations along the pipeline route. There will be no direct discharge of surface waters from the site without prior attenuation and treatment.

During pipeline construction, trenches shall not be left open overnight or for extended periods of time. Trenches shall only be dug to lengths which can be constructed each day. All trenches will be backfilled once the section of pipe is installed. This will prevent pooling of surface waters within open trenches.

Proposed Temporary Construction Compound Areas Including Office and Welfare Facilities

There will be a number of proposed temporary construction compounds (including those at the proposed WwTP and Abbotstown pumping station sites) as part of the Proposed Project. The following mitigation will apply together with suspended solids pollution measures outlined above:

- Sites for storage areas, machinery depots, site offices, construction of temporary access roads or the disposal of spoil will be located at least 50m from any watercourse;
- All materials will be stored in compounds and shall be stored in a manner that is safe and in line with best industry practice. Fuels and chemicals will be stored in an appropriately bunded area/with double skinned tanks. All potential harmful substances will be stored in accordance with the manufacturer's guidelines;
- All aspects of the works will be watertight, which will include the pipelines, tanks, storage containers and pump sumps;
- Wheel washing facilities will be installed at the entrance to the proposed WwTP site and other locations deemed appropriate;
- Invasive species biosecurity measures will be installed at the entrance to the proposed WwTP site, proposed Abbotstown pumping station site and all proposed temporary construction compounds. This will adhere to the *Biosecurity Protocol for Field Survey Work* (IFI 2010); and

- Foul drainage from compounds will be disposed of through the provision of a direct connection to a local sewer or be serviced by means of a waste water storage tank, which will be emptied by means of a suction tanker and the wastewater shall be disposed of to a licenced facility.

Invasive Species

No invasive species were found during freshwater surveys within the proposed pipeline routes. However, invasive species records are known from the wider catchments of the Tolka River and Santry River. There may be a risk associated with the spread of, or introduction of, invasive species via soil or other materials which will be imported to the site during construction work, or via machinery or equipment. The following mitigation shall be adhered to:

- All plant and equipment employed on the proposed construction corridor (e.g. excavator, footwear) will be thoroughly cleaned using a power washer unit prior to arrival on-site, and prior to leaving site, to prevent the spread of invasive aquatic/riparian species such as Japanese knotweed in accordance with the Office of Public Works' (2011) *Environmental Standard Operating Procedures* and the IFI's (2010) *Biosecurity Protocols for Field Survey Work*. A sign-off sheet must be maintained to confirm cleaning;
- Staff involved in the works shall be informed as to the presence of invasive species in the area downstream along the Tolka River and Santry River. All staff working on the Proposed Project shall be familiar with the sections within the document *Guidelines on the Management of Noxious Weeds and Non-Native Plant Species on National Roads* (NRA 2008) which detail the treatment necessary for each of the aforementioned species, together with the required reporting procedure if encountered. All site staff will also be familiar with *Information and Guidance Document on Japanese Knotweed Asset Strategy and Sustainability* (Irish Water 2012); and
- If invasive species are found within the works area during the course of construction works, a buffer zone will be marked around the invasive species, and plant and equipment that could transport the species within the site will be excluded. This will be reported to the ECoW, who will develop a plan of action in association with the appointed contractor(s). The significance of the buffer will be explained to machinery operators.

Environmental Incidents and Accidents

- An emergency operating plan shall be established to deal with incidents or accidents during construction that may give rise to pollution within any watercourse. This shall include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (including, for example, oil booms and soakage pads);
- Throughout all stages of the Construction Phase of the Proposed Project, the appointed contractor(s) shall ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types;
- All hazardous materials on-site will be stored within secondary containment designed to retain at least 110% of the storage contents;
- Temporary bunds for oil/diesel storage tanks will be used on the site during the Construction Phase of the Proposed Project, as appropriate;
- Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during the Construction Phase of the Proposed Project, and an Emergency Response Plan shall be in place in case of accidental spillage;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of; and
- There shall be no discharge of un-attenuated water to the adjacent marine environment.

11.14.2 Operational Phase

- The primary discharge from the proposed WwTP at Clonshagh will be to the marine environment, and mitigation for associated impacts are presented in Chapter 9 Biodiversity (Marine);
- To mitigate against the potential for pipe failure or leakage during the Operational Phase, the proposed orbital sewer route design and construction will be to best practice requirements, as outlined in Chapter 4 Description of the Proposed Project. This includes the reduction in the number of pipe joints, which mitigates the potential for operational leakage. All pipelines will be subject to watertightness testing prior to sewage being passed through them. Flow monitors will be installed on the rising main leaving the proposed Abbotstown pumping station and on the inlet to the proposed WwTP. These will identify possible pipe bursts or significant leaks on rising mains, as this leads to a pressure drop off in the main which is monitored;
- A Sustainable Drainage System shall be installed at the proposed WwTP site and the proposed Abbotstown pumping station site to manage water from hard surfaces from entering surface waters un-attenuated and untreated. Attenuation systems will be in place to limit discharges from the site to the greenfield site flow rate. The purpose of the Sustainable Drainage System will be to prevent sediment, grit and hydrocarbons from entering watercourses. Hydrocarbon and grit interceptors shall be located at outfalls to watercourses from hard standing areas of the proposed WwTP. Design of those interceptors shall conform to the recommendations of *Control of pollution from highway drainage discharges (R142)* (Luker and Montague 1994);
- Surface water from the WwTP will be discharged to the Cuckoo Stream after attenuation and treatment. Treatment will include interceptors and attenuation tanks before discharge to the Cuckoo Stream. Surface water from the proposed WwTP's roof will be collected in grey-water tanks. It will then either be recycled on the site, or discharged into the surface water drainage downstream of the fuel interceptors;
- Interceptors will require proper maintenance in order to function properly. Irish Water shall adopt a program of regular cleaning, maintenance and inspection of the Sustainable Drainage System and associated interceptors to ensure they are functioning correctly; and
- The proposed WwTP and the proposed Abbotstown pumping station will be designed with secondary containment to ensure that, in the unlikely event of leakage, the untreated wastewater is fully contained on-site.

11.15 Residual Impacts – Freshwater Aquatic Biodiversity

An assessment of residual impacts identifies the impacts associated with the Proposed Project and the likely significance of impacts on the environment and its ecological features after the implementation of mitigation measures. With the successful implementation of mitigation measures outlined within Section 11.14, no significant residual impacts on freshwater biodiversity or downstream marine protected areas are predicted (see Table 11.22).

Table 11.22: Summary of Residual Impacts During the Construction and Operational Phases

Aquatic Ecological Receptor	Location and Rating	Residual Impacts from the Construction Phase									Residual Impacts from the Operational Phase		
		Suspended Solids Pollution	Pollution with Other Substances	Introduction of Invasive Species	Trenchless Crossing	Culvert and Bridge Construction	Access Roads	Compound Areas	Hydrological Changes	Environmental Incidents and Accidents	Pollution from Pipe Leakage/Spillage of Untreated Wastewater	Pollution from Runoff from Hardstanding Areas	Accidental Spillage of Fuels/Oil/Chemicals
ER1	Tolka River (Location 1) of county importance	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
ER2	Santry River (Location 2) of local importance (lower value)	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
ER3	Mayne River (Location 3) of local importance (lower value)	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
	Mayne River (Location 5) of local importance (lower value)	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
ER4	Cuckoo Stream (Location 4) of local importance (lower value)	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant

11.16 References

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