Chapter 10
Water (including Hydrology & Flood Risk)

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10. WATER (INCLUDING HYDROLOGY & FLOOD RISK)

10.1 Introduction

This chapter has assessed the potential effects on water arising from the DART+ Coastal North project ("the Proposed Development") during the Construction and Operational Phases based on the draft Railway Order, Chapter 4 (Description of Proposed Development) and Chapter 5 (Construction Strategy). Where appropriate, the findings of the Flood Risk Assessment (see Appendix A10.1 of Volume 4 of this EIAR) are also incorporated within the assessment.

The assessment examines the potential impacts during the Construction, Operational and Decommissioning Phases of the Proposed Development. This chapter should be read in conjunction with the following chapters, which present related impacts arising from the Proposed Development:

- Chapter 8: Biodiversity;
- Chapter 9: Land and Soils; and
- Chapter 11: Hydrogeology.

Whilst the greatest emphasis was given to the permanent structures (i.e., track works, Overhead Line Equipment (OHLE) foundations and substations), due consideration was also given to temporary structures such as access and haul routes and Construction Compounds.

This chapter contains:

- the existing baseline environmental condition evaluated from desk studies and surveys conducted for this purpose;
- a review of the potential effects of the Proposed Development on flood risk and local hydrology;
- an assessment of the surface water quality effects on watercourses crossed by the Proposed Development;
- recommended mitigation measures for the potential effect as appropriate and the identification of any residual effects, and
- limitations of this assessment and assumptions made while compiling this chapter,

The potential effects assessed are for the entire life cycle of the project, i.e., Construction, Operational and Decommissioning Phases.

During the Construction Phase, the potential surface water effects associated with the Proposed Development have been assessed. This includes impacts from construction runoff and watercourse disturbance due to utility diversions.

The potential impacts of the Operational Phase may include those associated with increased flood risk due to structural impacts on formal and informal flood defences, blockage and damage to drainage infrastructure and impacts on surface water quality and quantity.

The assessment has been carried out according to best practice and guidelines relating to hydrological and flood risk assessment. Flooding has been assessed separately in a site-specific Flood Risk Assessment (FRA) Report and included in Appendix A10.1 in Volume 4 of this EIAR.

10.2 National Planning Framework

Objective 57 of the National Planning Framework (NPF) (Project Ireland 2040) outlines ways to enhance water quality and resource management by:

- Ensuring flood risk management informs place-making by avoiding inappropriate development in areas at risk of flooding in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG/OPW, 2009);
- Ensuring that River Basin Management Plan objectives are fully considered throughout the physical planning process; and
- Integrating sustainable water management solutions, such as Sustainable Urban Drainage (SUDS), non-porous surfacing and green roofs, to create safe places.

10.3 Water Framework Directive (WFD)

The WFD established a framework for the protection of both surface and groundwaters. The WFD provides a vehicle for establishing a system to improve and / or maintain the quality of waterbodies across the European Communities (EC). It requires all waterbodies (river, lakes, groundwater, transitional, coastal) to attain 'Good Water Status' (qualitative and quantitative) by 2027.

There are several WFD objectives in respect of which the quality of water is protected. The key objectives at European level are the general protection of aquatic ecology, specific protection of unique and valuable habitats, the protection of drinking water resources, and the protection of bathing water. The objective is to achieve "Good" Status through a system of river basin management planning and extensive monitoring. 'Good Status' means both 'Good Ecological Status' and 'Good Chemical Status'.

The WFD was transposed into Irish law in December 2003 by S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003 (hereafter referred to as the WFD Regulations). The WFD Regulations outline the water protection and water management measures required to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least Good status for all waters.

The WFD Regulations, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 (hereafter referred to as the Surface Waters Regulations) and S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 (hereafter referred to as the Groundwater Regulations) govern the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments.

10.4 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for ensuring an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years.

The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers Ireland as a whole (DHPLG, 2018). For the second cycle, the original (2009) Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form one national River Basin District (RBD) which covers the

whole island of Ireland. For those waterbodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures impacting them as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%).

The RBMP 2018-2021 (2nd cycle), in line with its objective of meeting the objectives of the EU Water Framework Directive (WFD), requires that Proposed Developments must integrate into their design measures that:

- Ensure full compliance with relevant EU legislation;
- Prevent further deterioration as a minimum or enhance existing high-quality status; and
- Maintain or enhance surface water bodies to achieve good status by 2021 leading up to the 3rd RBMP.

The third cycle RBMP Plan 2022-2027 is still in draft format (DHLGH 2021). The Public Consultation Report was issued in July 2022 and publication of the final Plan was planned for Q3/Q4 of 2022. The above bullet point measures are carried forward in the Draft Plan 2022-2027 but with more ambition to reverse the declining water quality and put in place a specific plan for all 46 river catchments in the country, among others. Therefore, regardless of whether the second or third cycle RBMP plan is in place, the proposed project must not result in a deterioration of the status of the water body.

10.5 Legislation, Policy and Guidance

The key legislation and guidance referenced in the preparation of the EIAR is outlined in Chapter 1 (Introduction). Specific to Water (including Hydrology and Flood Risk), the following legislation, guidance and planning framework relevant to the consideration of hydrology has informed the assessment as outlined below.

10.5.1 Legislation

The assessment was undertaken with consideration of the principal legislation as outlined below:

10.5.1.1 European Union (EU) Legislation

- Directive 2011/92/EU as amended by Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment ("the EIA Directive");
- Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013, amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy;
- Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks;
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (daughter to 2000/60/EC) (Groundwater Daughter Directive); and
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive).

10.5.1.2 National Legislation

- The Transport (Railway Infrastructure) Act 2001 (as amended and substituted);

- The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021) which gives further effect to the transposition of the EIA Directive by amending the Transport (Railway Infrastructure) Act 2001;
- European Communities (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011) as amended;
- European Communities Environmental Objectives (Groundwater) Regulations 2009 (S.I. No. 9 of 2010);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities (Drinking Water) (No. 2) Regulations 2007 (S.I. No. 278 of 2007); and
- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).

10.5.2 Policy

The assessment has had due regard to relevant policy that includes the following:

- Department of Housing, Planning and Local Government (April 2018), The River Basin Management Plan for Ireland (2018-2021) and 3rd cycle in preparation (DHLGH 2018);
- Strategic Flood Risk Assessment (SFRA) for Dublin City Development Plan 2022-2028 (DHLGH 2021),
- SFRA of the Fingal County Development Plan 2023-2029 (FCC 2023),
- SFRA of the Louth County Development Plan 2021-2027 (LCC 2023), and
- SFRA of the Meath County Development Plan 2021-2027 (MCC 2023).

10.5.3 Guidance

The assessment had had due regard to relevant guidelines that include the following:

- Transport Infrastructure Ireland (TII) (December 2017), Strategy for Adapting to Climate Change on Ireland's Light Rail and National Road Network;
- Transport Infrastructure Ireland (TII 2008), Guidelines for the crossing of watercourses during the construction of National Road Schemes;
- TII (March 2015a), Road Drainage and the Water Environment, DN-DNG-03065;
- TII (March 2015b), Drainage Systems for National Roads, DN-DNG-03022;
- Inland Fisheries Ireland (IFI) (2016), Guidelines on protection of fisheries during construction works in and adjacent to waters;
- Department of Environment, Heritage and Local Government (DEHLG) / Office of Public Works (OPW) (2009), The Planning System and Flood Risk Management – Guidelines for Planning Authorities;
- TII (2009), Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Construction Industry Research and Information Association (CIRIA) (2015), The SuDs Manual C753;
- CIRIA C689 Culvert Design and Operation Guide (CIRIA, 2010);
- CIRIA (2001), Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (CIRIA C532); and
- Environmental Protection Agency (EPA) (2003), Advice Notes on Current Practice in the Preparation of Environmental Impact Statement; and

- Environmental Protection Agency (EPA) (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR).

10.6 Methodology

10.6.1 Study Area

The DART+ Coastal North project, as part of the DART+ Programme, will deliver an improved and extended electrified rail network and will enable increased passenger capacity and an enhanced train service between Dublin City Centre and Drogheda, including the Howth Branch.

The development will modify the current rail network between Dublin City Centre (north of Connolly Station) and Drogheda MacBride Station as described in Chapter 4 (Description of the Proposed Development) and includes modifications to the existing line across the entirety of the Proposed Development (referred to as general linear works) as well as specific interventions at key locations, including, for example, the provision of 8 no. new substations along the route. The Proposed Development extends across four administrative/local authority areas, including Louth, Meath and Fingal County Councils as well as Dublin City Council. The total length of the Proposed Development is approximately 50 kilometres.

Image 10-1 presents the study area for the Proposed Development. Table 10-1 presents the waterbodies which fall within the study area. Figure 10.1 in Volume 3A of this EIAR presents an overview of the water features in the vicinity of the study area.

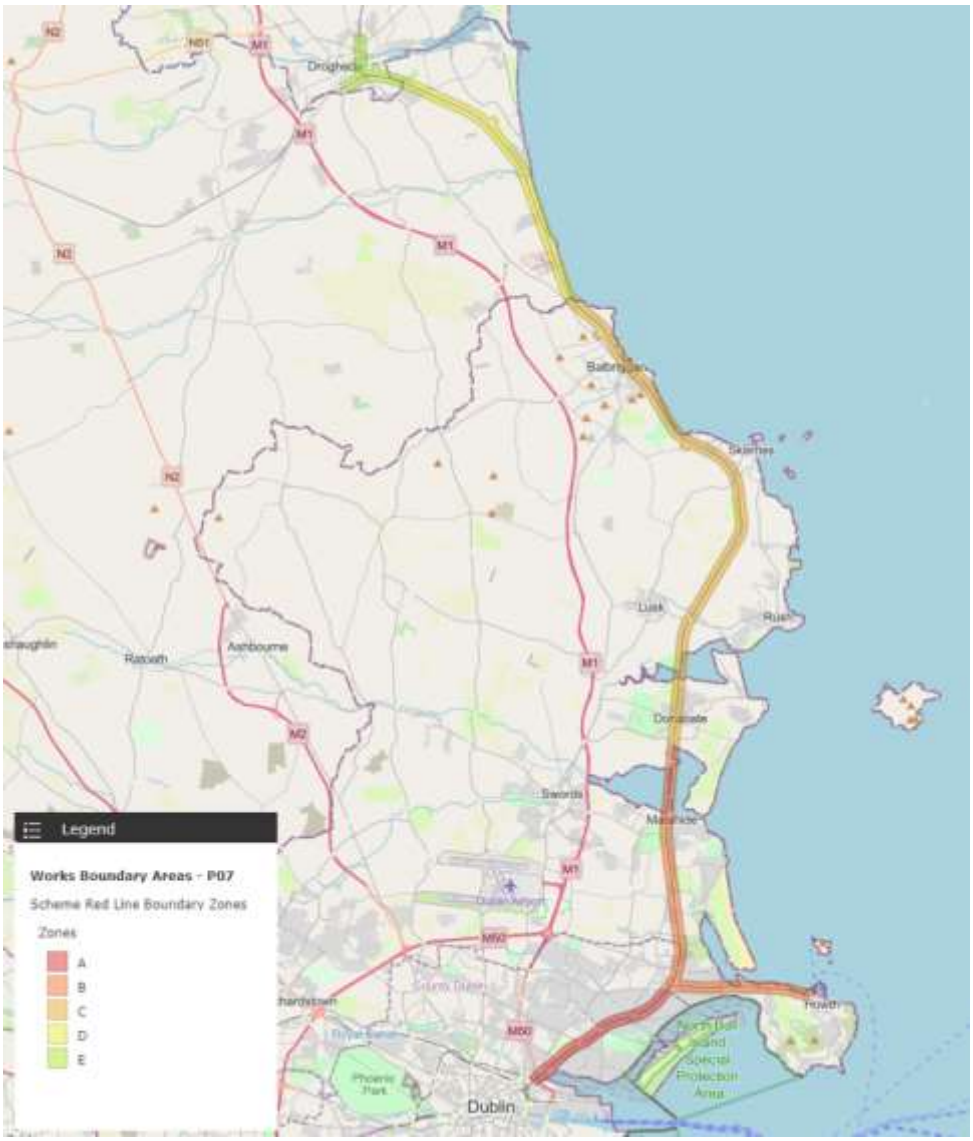

Image 10-1 DART+ Coastal Study Area (Colour coded for the 5no. Geographical Zones)

Table 10-1 DART+ Coastal North Waterbodies within Study Area

Crossing No.	EPA Waterbody Name	WFD Waterbody Name	Crossing ITM X Coordinate	Crossing ITM Y Coordinate
1	Boyne	Boyne Estuary	709736	775406
2	Tullyeskar	Tullyeskar_010	696889	746029
3	Stagrennan	Stagrennan_010	711366	774641
4	Betaghstown	Betaghstown_010	713251	773851
5	Pilltown	Betaghstown_010	714837	772941
6	Mornington	Betaghstown_010	715102	772640
7	Corballis	Nanny (Meath)_050	716184	771187
8	Nanny	Nanny (Meath)_050	716206	771154
9	Mosney	Mosney_010	716780	769696
10	Flemingtown	Delvin_040	718162	766332
11	Delvin	Delvin_040	718162	766332
12	Bremore	Matt_010	719978	764440
13	Matt	Matt_010	720391	763861
14	Barnageeragh	Mill Stream (Skerries)_010	723732	760524
15	Mill Stream (Skerries)	Mill Stream (Skerries)_010	724765	759567
16	Balcunnin	Balcunnin_010	724705	756750
17	Rush	Balcunnin_010	723927	755369
18	Palmerstown	Palmerstown_010	723660	754893
19	Rathmooney	Palmerstown_010	723250	754151
20	Turvey	Turvey_010	722588	748513

Crossing No.	EPA Waterbody Name	WFD Waterbody Name	Crossing ITM X Coordinate	Crossing ITM Y Coordinate
21	Rahillion	Ballyboghil_010	722740	750795
22	Hazelbrook Stream	Sluice_010	722733	743540
23	Sluice Stream	Sluice_010	722769	743226
24	Mayne	Mayne_010	723089	741219
25	Howth	Howth_010	727696	739467
26	Santry	Santry_020	721166	738308
27	Tolka	Tolka_060	717472	735731
28	Broadmeadow Estuary	Broadmeadow Estuary	722500	746944
29	Rogerstown Estuary	Rogerstown Estuary	722821	751795

10.6.2 Legislation and Guidance

This assessment has been undertaken in accordance with the Guidelines on the information to be contained in Environmental Impact Assessment Reports (referred to as the EPA Guidelines) (EPA, 2022). The following additional guidance was also consulted during the preparation of this Chapter:

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and hydrogeology for National Road Schemes (NRA, 2009);
- The Planning System and Flood Risk Management Guidelines for Planning Authorities (referred to as the FRM Guidelines) (DEHLG and OPW, 2009);
- The WFD Regulations, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 (hereafter referred to as the Surface Waters Regulations);
- S.I. No. 108/1978 - Local Government (Water Pollution) Regulations, 1978;
- Local Government (Water Pollution) Act; and
- Local Government (Water Pollution) (Amendment) Act, 1990.

10.6.3 Data Collection and Collation

Information on the baseline environment including hydrology, hydromorphology and water quality of the receptors within the study area has been collected and collated by means of a desk study.

Water quality sampling data for the receiving waterbodies has also been collected across 11no. locations over a three-month period in the summer of 2023 and has been used to inform the baseline assessment.

A SSFRA was prepared for the Proposed Development in line with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' (DEHLG/OPW, 2009). The FRA was carried out to assess the risk of flooding and to inform the design of the Proposed Development. This is included in Appendix A10.1 of Volume 4 of this EIAR. The FRA details the existing flood risk within the vicinity of the Proposed Development.

Table 10-2 Data Sources

Assessment Attribute	Title
General	Ordnance Survey Ireland (OSI) Aerial photography (i.e., Google Earth, Google Maps)
Surface Water Quality and Hydromorphology	EPA GIS Maps
Hydrology	Catchment Summaries EPA Hydrometric Data System
Flood Risk	OPW National Flood Information Portal (OPW, 2022)

10.6.4 Assessment Methodology

10.6.4.1 Key Parameters for Assessment

The surface water environment is linked to flood risk, ecological receptors and groundwater as considered in Appendix A10.1 (SSFRA) within Volume 4 of this EIAR, Chapter 8 (Biodiversity), Chapter 9 (Land & Soils) and Chapter 11 (Hydrogeology), respectively within Volume 2 of this EIAR.

The overall impact on surface water receptors (i.e., rivers, canals, transitional waterbodies, coastal waterbodies, and lakes) due to the Proposed Development will be determined based on two parameters:

1. The sensitivity of the receptor attributes (hydrology, water quality and geomorphology) to change, and
2. The magnitude of the impacts on waterbody attributes.

10.6.4.2 Sensitivity of Receptors

The sensitivity of surface water attributes to changes because of the Proposed Development is determined by a set of criteria including their relative importance or "value" (e.g., whether features are of national, regional or local value).

Table 10-3 outlines the criteria for estimating the sensitivity of receptors and their attributes using Surface Water Receptors (NRA, 2009) adapted to include WFD Assessment Guidelines from the EU Water Directors (Environment Agency, 2016).

Table 10-3 Criteria Used to evaluate the sensitivity of Surface Water Receptors

Sensitivity	Criteria	Typical Example
Extremely High	Receptor (or receptor attribute) has a very high quality or value on an international scale	Any WFD waterbody which is protected by European Union (EU) legislation (e.g., Designated European Sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) or 'Salmonid Waters', and A waterbody that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.
Very High	Receptor (or receptor attribute) has a high quality or value on an international scale. or very high quality or value at a national scale	Any WFD waterbody (specific EPA segment) which has a direct hydrological connection of <2km to European Sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters), WFD waterbody ecosystem protected by national legislation (Natural Heritage Area (NHA) status), A waterbody that appears to be largely in natural equilibrium and exhibits a diverse range of morphological features (such as pools and riffles), There is a diverse range of fluvial processes present, with very limited modifications; and Nutrient Sensitive Areas.
High	Receptor (or receptor attribute) has a moderate value at an international scale or high quality or value on a national scale	A WFD waterbody with High or Good WFD Status, A Moderate WFD Status (2013 - 2018) waterbody with some hydrological connection (<2km) to European Sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters) further downstream, WFD waterbody which has a direct hydrological connection to sites/ecosystems protected by national legislation (NHA status), A waterbody that appears to be in some natural equilibrium and exhibits some morphological features (such as pools and riffles). There is a diverse

Sensitivity	Criteria	Typical Example
		range of fluvial processes present, with very limited signs of modification or other anthropogenic influences, and Direct hydrological connectivity to Nutrient Sensitive Areas.
Medium	Receptor (or receptor attribute) has some limited value at a national scale	WFD waterbody with Moderate WFD Status (2013 - 2018), WFD waterbody with limited (>2km <5km) hydrological importance for sensitive or protected ecosystems (much further downstream), A waterbody showing signs of modification or culverting, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences, Evidence of historical channel change through artificial channel straightening and re-profiling; and Some hydrological connection downstream Nutrient Sensitive Areas.
Low	Receptor (or receptor attribute) has a low quality or value on a local scale	Waterbody with Bad to Poor WFD Status (2013 - 2018), A WFD waterbody with >5km (or no) hydrological connection to European Sites or national designated sites, Or A non-WFD water feature with minimal hydrological importance to sensitive or protected ecosystems; and / or economic and social uses, A highly modified watercourse that has been changed by channel modification, culverting, or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification. Highly likely to be affected by anthropogenic factors. Heavily engineered or artificially modified and could dry up during summer months; and Many existing pressures which are adversely affecting biodiversity.

10.6.4.3 Magnitude of Impact

The scale or magnitude of potential impacts (both beneficial and adverse) depends on both the degree and extent to which the Proposed Development may impact the Surface water receptors during the Construction and Operational Phases.

Factors that have been considered to determine the magnitude of potential impacts include the following (EPA, 2022):

- Nature of the impacts;
- Intensity and complexity of the impacts;
- Expected onset, duration, frequency, and reversibility of the impacts;
- Cumulation of the impacts with other existing and / or approved projects impacts; and
- Possibility of effectively reducing the impacts.

The criteria used to determine the magnitude of impact are presented in Table 10-4.

Table 10-4 Criteria determining the Magnitude of Impact on Surface Water Receptors (NRA, 2009)

Magnitude of Impact	Criteria
Large Adverse	Results in loss of receptor and / or quality and integrity of receptor.
Moderate Adverse	Results in impact on integrity of receptor or loss of part of receptor.
Small Adverse	Results in minor impact on integrity of receptor or loss of small part of receptor.
Negligible	Results in an impact on receptor but of insufficient magnitude to affect either use or integrity.
Small Beneficial	Results in minor improvement of receptor quality.
Moderate Beneficial	Results in moderate improvement of receptor quality.
Large Beneficial	Results in major improvement of receptor quality.

10.6.4.4 Significance of Impacts

The significance of an impact is determined by combining the sensitivity of the receptor with the predicted magnitude of impact as shown in Image 10-2. Descriptions of the categories in the context of the water environment are given in Table 10-5.

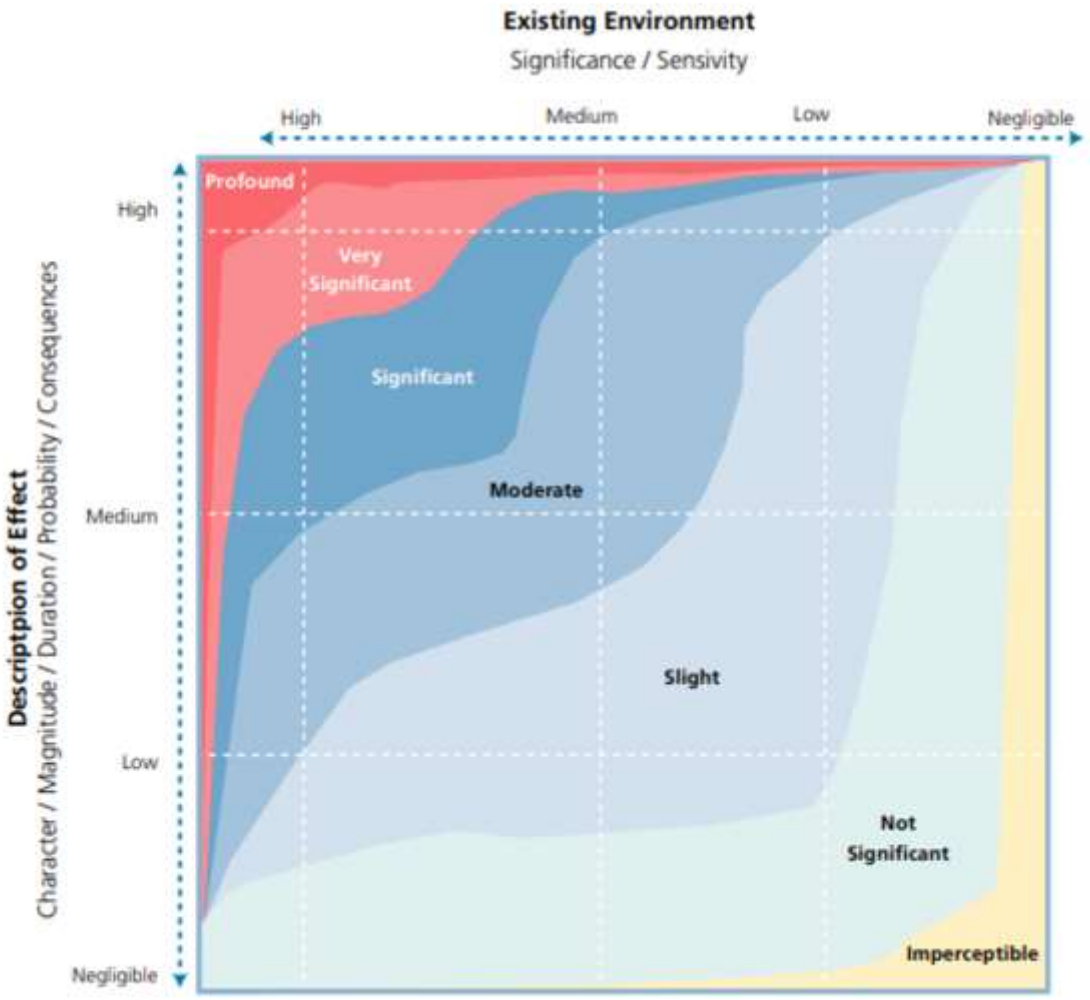

Image 10-2 Categories of Environmental Impacts (EPA 2022)

Table 10-5 Descriptions of Environmental Impacts

Impact Categories	Description
Profound	An effect which obliterates sensitive characteristics.
Very Significant	An effect which, by its character, magnitude, duration, or intensity, significantly alters most of a sensitive aspect of the environment.
Significant Effects	An effect which, by its character, magnitude, duration, or intensity, alters a sensitive aspect of the environment.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences

Impact Categories	Description
Imperceptible	An effect capable of measurement but without significant consequences.

10.6.5 Difficulties Encountered / Limitations

This assessment is based on publicly available data and information gathered from the EPA, OPW reconnaissance surveys. Surface water quality monitoring was also conducted at specific locations where there was no publicly available EPA data. The water quality monitoring was undertaken at a time where dilution was expected to be at its minimum. The water quality analysis was completed by approved methods and accredited laboratories. Overall, the level of our confidence in the assessment was moderate to high that none of the stated limitations would affect the conclusion.

10.7 Baseline Environment

10.7.1 General Description

The Proposed Development has been divided into five distinct geographic zones (see Image 10-1) along the length of the corridor (Zones A to E) as outlined in Chapter 4 (Description of the Proposed Development) and summarised below. The Proposed Development is described from south to north along the railway corridor.

- Zone A - North of Connolly Station to south of Howth Junction & Donaghmede Station (refer to Chapter 4, Section 4.6);
- Zone B - South of Howth Junction & Donaghmede Station to north of Malahide Viaduct. (Including Howth Branch) (refer to Chapter 4, Section 4.7);
- Zone C – North of Malahide viaduct to south of Gormanston Station (Fingal boundary) (refer to Chapter 4, Section 4.8);
- Zone D - South of Gormanston Station (Fingal border) to Louth/Meath border (refer to Chapter 4, Section 4.9); and
- Zone E - Drogheda MacBride Station and surrounds (refer to Chapter 4, Section 4.10).

In terms of the hydrological assessment for the Proposed Development, a breakdown of the receiving environment by project zone has not been carried out as waterbodies may overlap between zones. The baseline environment described in this section includes hydrological features in the region surrounding the study area, with reference to the project zones where relevant.

10.7.2 WFD Catchment Overview

The study area lies within the Boyne (HA 07), Nanny-Delvin (HA 08) and Liffey and Dublin Bay (HA 09) Catchments. These catchment areas are presented on Figure 10.1 in Volume 3A of this EIAR.

The Boyne Catchment Summary (Boyne Catchment Report HA 07, EPA 2021) describes this catchment as including the area drained by the River Boyne and by all streams entering tidal water between The Haven and Mornington Point, Co. Meath, draining a total area of 2,694km². The largest urban centre in the catchment is Drogheda. The other main urban centres are Navan, Trim, Kells, Virginia, Bailieborough, Athboy, Kinnegad, Edenderry and Enfield. The total population of the catchment is approximately 196,400 with a population density of 73 people per km².

The Nanny-Delvin Catchment Summary (Nanny Delvin Catchment Report HA 08, EPA 2021) describes this catchment as including the area drained by the Rivers Nanny and Delvin and by all streams entering tidal water between Mornington Point and Sea Mount, Co. Dublin, draining a total area of 711km^2. The largest urban centre in the catchment is Swords, and the other main urban centres relevant to the study area are Lusk and Balbriggan. The total population of the catchment is approximately 159,230 with a population density of 224 people per km^2.

The Liffey and Dublin Bay Catchment Summary (Liffey and Dublin Bay Catchment Report HA 09) (EPA 2021) describes this catchment as including the area drained by the river Liffey and by all streams entering tidal water between Sea Mount and Sorrento Point in County Dublin, draining a total area of 1,616km^2. The largest urban centre in the catchment is Dublin City. The Liffey and Dublin Bay catchment contains the largest population (approximately 1,255,000) of any catchment in Ireland and is characterised by a sparsely populated, upland south-eastern area underlain by granites and a densely populated flat, low lying limestone area over the remainder of the catchment basin. The catchment area is heavily urbanised and industrialised.

The EPA River dataset is designed as a geometric river network for monitoring, management and reporting purposes. The EPA has sub-divided rivers and streams into smaller sections to allow areas to be easily distinguished. These smaller segments are assigned segment codes (estuaries and canals are not assigned segment codes). The EPA's segmented coding and naming system has been applied throughout this chapter.

The 2016-2021 WFD Status of the rivers and streams within the study area of the Proposed Development are detailed in Table 10-6 below.

In summary, the WFD risk of the water bodies shows that the watercourses in the vicinity of the Proposed Development have "poor" status. However, all waterbodies have set 2027 as the year to meet their environmental objectives.

Table 10-6 Surface Water WFD Status

WFD Sub Catchment	Waterbody ID	Type	Status (2016-2021)	Key Pressures	Risk Categorisation
Tolka_SC_060	Royal Canal Main Line (Liffey and Dublin Bay)	River	Poor	Urban Runoff, Urban Wastewater	At Risk
Mayne_SC_010	SANTRY_020	River	Poor	Urban Wastewater	At Risk
Mayne_SC_010	MAYNE_010	River	Poor	Urban Runoff,	At Risk
Mayne_SC_010	SLUICE_010	River	Poor	Anthropogenic Pressures	At Risk
Ballough[Stream]_SC_010	TURVEY_010	River	Poor	Urban Runoff, Urban Wastewater	At Risk
Ballough[Stream]_SC_010	BALLYBOGHIL_010	River	Poor	Agriculture	At Risk
PALMERSTOWN_SC_010	PALMERSTOWN_010	River	Poor	Agriculture	At Risk
PALMERSTOWN_SC_010	BALCUNNIN_010	River	Poor	Anthropogenic Pressures	At Risk
PALMERSTOWN_SC_010	MILLSTREAM (SKERRIES)_010	River	Poor	Urban Run-off	At Risk
PALMERSTOWN_SC_010	MATT_010	River	Poor	Hydromorphology, Urban Runoff	At Risk
Delvin_SC_010	DELVIN_040	River	Poor	Urban Wastewater, Agriculture	At Risk
Nanny[Meath]_SC_020	MOSNEY_010	River	Poor	Domestic Wastewater, Urban Run-off, Agriculture	At Risk
Nanny[Meath]_SC_020	NANNY (MEATH)_050	River	Poor	Hydromorphology, Agriculture	At Risk
Nanny[Meath]_SC_020	BETAGHSTOWN_010	River	Poor	Urban Run-off, Hydromorphology, Domestic	Review

WFD Sub Catchment	Waterbody ID	Type	Status (2016-2021)	Key Pressures	Risk Categorisation
				Wastewater, Agriculture	
Boyne_SC_130	STAGRENNAN_010	River	Poor	Anthropogenic Pressures	At Risk
Boyne_SC_130	TULLYESKAR_010	River	Poor	Agriculture, Urban Run-off	At Risk
Broadmeadow Estuary (inner	Broadmeadow_040	River	Poor	Agriculture, Hydromorphology	At Risk

10.7.3 Designated Sites

The Designated Sites that have been summarised in this Section are located within the Boyne, the Nanny-Delvin and the Liffey and Dublin Bay catchments. The sites described comprise Nutrient Sensitive Areas, Special Areas of Conservation (SAC), Special Protection Areas (SPA), proposed Natural Heritage Area (pNHA), Nutrient Sensitive Areas, salmonid rivers, shellfish areas and coastal bathing waters.

There are three Nutrient Sensitive Areas in the study area. These are the Boyne Estuary, the Broadmeadow Estuary (Inner) and the Tolka Estuary as designated under the UWWT Directive.

There are two designated shellfish areas, in Malahide and Balbriggan/Skerries. The shellfish areas are compliant with the relevant standards and there are no water quality issues of concern (as per the Sea Fisheries Protection Authority (SFPA) and Marine Institute Monitoring Programme).

There are two designated marine bathing waters along the proposed route, being Balbriggan, Front Strand Beach and Claremont Beach.

The website for beaches in Ireland (beaches.ie) was consulted to determine the most recent (2022) Annual Water Quality Rating (AWQR) for these designated areas. The Front Strand Beach at Balbriggan has a" Poor Quality" Status while Claremont Beach has 'Sufficient Quality' Status.

A review of the Natura 2000 network was conducted to determine those sites which were within the study area and/ or hydrologically connected to the waterbodies listed in Table 10-1.

The following Natura 2000 sites were identified as being relevant to this assessment:

- Baldoyle Bay SAC (site code: 000199);
- Baldoyle Bay SPA (site code: 004016);
- Boyne Coast and Estuary SAC (site code: 001957);
- Boyne Estuary SPA (site code: 004080);
- Broadmeadow/Swords Estuary SPA (site code: 004025);
- Malahide Estuary SAC (site code: 000205);

- North-west Irish Sea SPA (site code 004236);
- River Boyne And River Blackwater SAC (site code: 002299);
- River Nanny Estuary and Shore SPA (site code: 004158);
- Rogerstown Estuary SAC (site code: 000208);
- Rogerstown Estuary SPA (site code: 004015); and
- South Dublin Bay and River Tolka Estuary SPA (site code: 004024).

The pNHAs within the study area / hydrologically connected are:

- Baldoyle Bay pNHA (site code: 000199);
- Boyne Coast And Estuary (site code: 001957);
- Ireland's Eye pNHA (site code: 000203);
- Lambay Island pNHA (site code: 000204);
- Laytown Dunes/Nanny Estuary (site code: 000554);
- Malahide Estuary pNHA (site code: 000205);
- Rogerstown Estuary pNHA (site code: 000208);
- Royal Canal pNHA (site code: 002103);
- Skerries Islands pNHA (site code: 001218), and
- Sluice River Marsh (site code: 001763).

There are two Nature Reserves hydrologically connected to the WFD waterbodies within the study area:

- Rogerstown Estuary Nature Reserve; and
- Baldoyle Estuary Nature Reserve.

There are two designated shellfish areas hydrologically connected to the WFD waterbodies within the study area:

- Balbriggan/Skerries (IEPA2_0063); and
- Malahide (IEPA2_0057).

No designated salmonid rivers were identified within the study area.

As noted in Section 10.6, Image 10-1 presents the study area for the Proposed Development. Table 10-1 presents the waterbodies which fall within the study area. Figure 10.1 in Volume 3A of this EIAR presents an overview of the water features in the vicinity of the study area.

10.7.4 Surface Water Quality

10.7.4.1 EPA Surface Water Monitoring

The EPA assesses the water quality of rivers and streams across Ireland using a biological assessment method (EPA 2018). The EPA assigns biological river quality (biotic index) ratings from Q5 to Q1 to watercourse sections (refer to Table 10-7). Q5 denotes a watercourse with high water quality and high community diversity, whereas Q1 denotes very low community diversity and bad water quality. This data is used to inform baseline receptor importance.

Table 10-7 EPA Scheme of Biotic Indices or Quality (Q) Values (EPA 2018)

Biotic Index Q Value	WFD Status	Pollution Status	Condition	Quality Class
Q5, Q4-Q5	High	Unpolluted	Satisfactory	Class A
Q4	Good	Unpolluted	Satisfactory	Class A
Q3-Q4	Moderate	Slightly Polluted	Unsatisfactory	Class B
Q3, Q2-Q3	Poor	Moderately Polluted	Unsatisfactory	Class C
Q2, Q1-Q2, Q1	Bad	Seriously Polluted	Unsatisfactory	Class D

Only a few water quality monitoring locations where ratings are established, are found on the streams adjacent to the Proposed Development, i.e., Boyne (Q3-Q4), Nanny (Meath) (Q3), Mosney (Q3), Delvin (Q3-Q4), Ballyboghil (Q3), Turvey (Q3-Q4), Sluice (Q3-Q4), Mayne (Q3), Santry (Q3) and Tolka (Q3). The majority of these are moderately polluted to slightly polluted which indicates that the overall water quality is unsatisfactory.

10.7.4.2 Site Specific Water Quality Survey

Site specific water quality monitoring has been undertaken at 11no. proposed crossing locations where EPA data was not available at all or where there was inadequate/obsolete detail. These results are shown in Table 10-8. The full list of these watercourses is shown in Table 10-9 and shown in Image 10-3. These results aim to establish a baseline water quality prior to construction commencing and will be used for monitoring water quality through the duration of the Proposed Development.

Table 10-8 Water Quality Monitoring Results

		08/05/2023	28/06/2023	20/07/2023
Test Parameters	**Units**	**Ardmore Ave., Betaghstown, Co. Meath**		
Ammonia	mg/L as N	0.1	0.1	0.1
Conductivity	µscm -1@20C	725.0	708.0	600.0
Dissolved oxygen	mg/L as N	8.9	6.4	7.4
pH	pH Units	7.8	8.6	8.5
Phosphate (Ortho)	mg/L as P	0.1	0.1	0.1
Solids (Total Suspended)	mg/L	5.0	665.0	403.0
Temperature	degree C	14.6	22.7	17.3
Turbidity	NTU	3.3	8.9	6.4
		Nanny River, Corballis, Laytown		
Ammonia	mg/L as N	0.3	0.1	0.3
Conductivity	µscm -1@20C	4360.0	9890.0	41800.0
Dissolved oxygen	mg/L as N	8.9	7.1	7.8
pH	pH Units	7.8	8.6	8.5
Phosphate (Ortho)	mg/L as P	<0.01	0.0	0.0
Solids (Total Suspended)	mg/L	323.0	34.0	33.0
Temperature	degree C	14.6	21.0	17.4
Turbidity	NTU	69.6	1.9	95.4
		Tolka River, East Wall		
Ammonia	mg/L as N	0.1	0.1	0.2
Conductivity	µscm -1@20C	783.0	4780.0	3060.0
Dissolved oxygen	mg/L as N	9.3	7.5	7.8
pH	pH Units	8.1	8.4	8.5
Phosphate (Ortho)	mg/L as P	0.1	0.1	0.1
Solids (Total Suspended)	mg/L	10.0	18.0	<2
Temperature	degree C	17.2	23.0	17.4
Turbidity	NTU	3.0	1.4	1.1
		River Pill/Turvey		
Ammonia	mg/L as N	0.4	0.3	0.3
Conductivity	µscm -1@20C	31200.0	470.0	3890.0
Dissolved oxygen	mg/L as N	9.6	7.3	7.6
pH	pH Units	8.4	7.9	8.9
Phosphate (Ortho)	mg/L as P	0.0	0.1	0.0
Solids (Total Suspended)	mg/L	36.0	186.0	251.0
Temperature	degree C	16.7	20.9	17.6
Turbidity	NTU	2.4	5.1	2.5
		Balcunnin Featherbed Lane, Co. Dublin		
Ammonia	mg/L as N	0.1	0.1	0.0
Conductivity	µscm -1@20C	861.0	740.0	742.0
Dissolved oxygen	mg/L as N	8.9	7.6	6.6
pH	pH Units	7.3	8.3	7.5
Phosphate (Ortho)	mg/L as P	0.0	0.1	0.1
Solids (Total Suspended)	mg/L	241.0	10.0	<2
Temperature	degree C	13.6	22.0	14.9
Turbidity	NTU	53.1	3.8	1.2
		Palmerstown House, Horsetown		
Ammonia	mg/L as N	0.0	0.0	0.0
Conductivity	µscm -1@20C	599.0	657.0	634.0
Dissolved oxygen	mg/L as N	9.5	6.5	7.6
pH	pH Units	8.0	8.6	8.7
Phosphate (Ortho)	mg/L as P	0.2	0.2	0.2
Solids (Total Suspended)	mg/L	9.0	24.0	<2
Temperature	degree C	12.9	22.1	16.4
Turbidity	NTU	3.2	17.2	0.9

		08/05/2023	28/06/2023	20/07/2023
Test Parameters	**Units**	**Mayne River, Co. Dublin**		
Ammonia	mg/L as N	0.0	0.1	0.3
Conductivity	µscm -1@20C	514.0	668.0	447.0
Dissolved oxygen	mg/L as N	9.2	7.3	7.4
pH	pH Units	8.0	8.3	8.7
Phosphate (Ortho)	mg/L as P	0.0	0.1	0.1
Solids (Total Suspended)	mg/L	3.0	5.0	9.0
Temperature	degree C	16.0	22.1	17.1
Turbidity	NTU	6.1	1.2	5.3
		Palmerstown Effelstown Farm, Lusk		
Ammonia	mg/L as N	0.0	0.0	0.1
Conductivity	µscm -1@20C	769.0	1060.0	1098.0
Dissolved oxygen	mg/L as N	8.9	6.6	7.4
pH	pH Units	8.1	8.8	8.7
Phosphate (Ortho)	mg/L as P	0.1	0.2	0.3
Solids (Total Suspended)	mg/L	13.0	11.0	<2
Temperature	degree C	14.9	21.2	18.0
Turbidity	NTU	4.1	2.2	2.5
		River Boyne, Drogheda		
Ammonia	mg/L as N	0.0	0.5	0.2
Conductivity	µscm -1@20C	8550.0	13100.0	15800.0
Dissolved oxygen	mg/L as N	9.3	7.4	9.5
pH	pH Units	8.1	8.5	8.6
Phosphate (Ortho)	mg/L as P	0.0	0.0	0.0
Solids (Total Suspended)	mg/L	54.0	80.0	74.0
Temperature	degree C	15.4	20.3	17.9
Turbidity	NTU	24.1	1.9	<0.1
		Betaghstown, Ministown, Co. Meath		
Ammonia	mg/L as N	0.1	0.1	0.4
Conductivity	µscm -1@20C	1244.0	705.0	622.0
Dissolved oxygen	mg/L as N	8.6	6.9	7.1
pH	pH Units	7.7	8.5	8.4
Phosphate (Ortho)	mg/L as P	0.1	0.1	0.4
Solids (Total Suspended)	mg/L	8.0	120.0	1312.0
Temperature	degree C	17.2	22.3	16.7
Turbidity	NTU	4.1	4.5	77.9
		Matt/Bracken, Balbriggan		
Ammonia	mg/L as N	0.0	0.1	0.3
Conductivity	µscm -1@20C	1028.0	692.0	13080.0
Dissolved oxygen	mg/L as N	9.2	7.5	7.7
pH	pH Units	8.4	8.4	8.8
Phosphate (Ortho)	mg/L as P	0.0	0.1	0.1
Solids (Total Suspended)	mg/L	11.0	<2	11.0
Temperature	degree C	14.7	20.5	17.4
Turbidity	NTU	2.5	4.0	0.9

Table 10-9 Watercourses where water quality sampling was undertaken.

No.	Water Body Name	Monitoring Location
1	Balcunnin	Balcunnin Featherbed Lane, Co. Dublin
2	Betaghstown	Ardmore Ave, Betaghstown, Co. Meath
3	Betaghstown	Betaghstown, Ministown. Co. Meath
4	Boyne River	River Boyne, Drogheda
5	Matt/Bracken River	Matt/Bracken River Balbriggan Harbour, Balbriggan
6	Mayne River	Mayne River Grange, Co. Dublin
7	Nanny River	Nanny River Nanny Car Park, Corballis, Laytown
8	Palmerstown	Palmerstown House. Horsetown
9	Palmerstown	Palmerstown Effelstown Farm, Lusk, Co. Dublin
10	Pill/Turvey River	River Pill/Turvey
11	Tolka River	Tolka River, E Wall

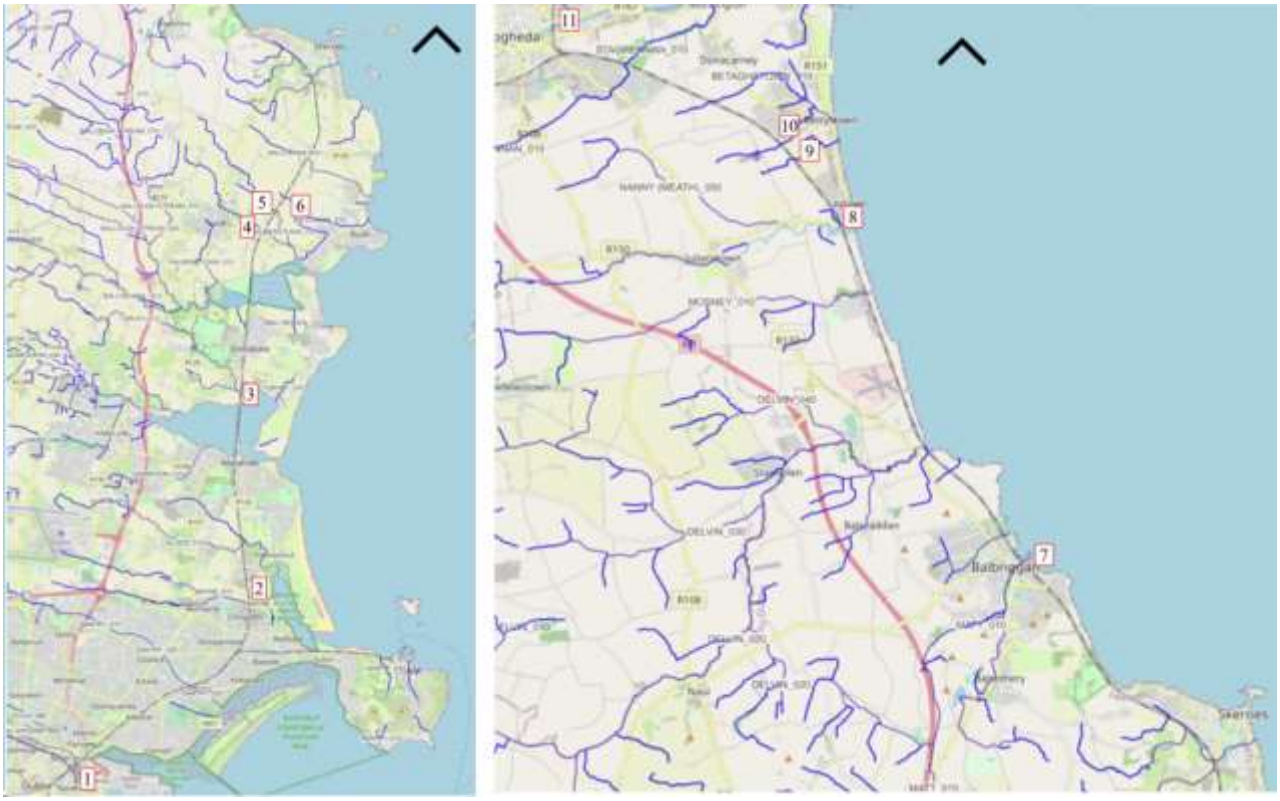

Image 10-3 Approximate Sampling Locations

10.7.5 Baseline Flood Risk

A standalone site-specific FRA has been completed for the Proposed Development. A summary of the baseline flood risk and the assessment is provided in this section for ease of reference. The study area covers the proposed railway corridor and associated track works, temporary Construction Compounds, the proposed substations, and other temporary works areas including access.

The risk of flooding to the existing study area from fluvial, tidal, pluvial, and groundwater sources was assessed and is summarised as follows:

- Locations with liability to flood notes indicate a historic tendency for flooding at 17no. crossings which are therefore likely to be susceptible to flooding.
- The CFRAM flood maps indicate that 12no. crossings lie within the 100-year or 1000-year fluvial flood extent and the rest of the study area is located outside of the fluvial flood extents.
- The CFRAM flood map indicates that 11no. crossings lie within the 200-year tidal flood extent. The rest of the study area extents are inland and are not at risk of tidal flooding.
- The PFRA maps indicate that the study area and many of the roads in the vicinity of the study area are not typically within areas at high risk of pluvial flooding. Given that the PFRA maps are only indicative, pluvial flooding risk to the study area may still exist.
- The temporary Construction Compound, CC-16100, at Bissett's Strand south of Malahide Yacht club is at risk from the 20% AEP tidal event. It is recommended that the compound is used only from May to September (matching the ecological constraints), and that no/minimal hard standing surfaces will be created. Further, that all material stored on site is immediately removed in the event of a national high tide warning to avoid flood damage.

- The GSI groundwater flooding map suggests that the study area and surrounding vicinity are not identified as being at risk of groundwater flooding. At locations close to rivers and waterways, there is a moderate risk of groundwater flooding which is limited to the construction stage when trenching and horizontal-directional drilling (if required) are underway.

Current track levels at each of the crossing locations have been assessed and it was found that the proposed levels are >2m above the flood levels at each site. Therefore, the above list of flood risk areas which may affect the works is only during the Construction Phase.

10.7.6 Drinking Water Supply (Surface Water)

There are no Geological Survey Ireland (GSI) Public Supply Source Protection Areas within 500m radius of the study area which are used for drinking water supply.

There are no National Federation of Group Water Schemes (NFGWS) Source Protection Areas within the study area. None of the river segments within the study area are designated as a Drinking Water Source.

10.7.7 Known Pressures

The EPA online database was reviewed to determine the presence of point source environmental pressures within the study area. The presence / absence of urban wastewater treatment plants (UWWTP) and associated storm water overflows (SWOs) and Industrial Emissions Licence (IEL) / Integrated Pollution Control (IPC) licensed sites were examined. The following IE / IPC licensed sites were identified in the study area:

- IPC Licensed Facility Superwarm Homes (Limerick) Limited, Marsh Road, Drogheda, Louth, Reg. No. P 0368-01;
- IPC Licensed Facility Irish Building Chemicals, Unit 143 Baldoyle Industrial Estate, Baldoyle, Dublin, 13, Reg. No. P0231-01;
- IE Licensed Facility Glanbia Foods Society Limited (Drogheda) Reg. No. P 0799-01;
- IE Licensed Balleally Landfill, Balleally, Lusk, Dublin, Reg. No. W0009-03;
- IE Licensed Facility Fingal Landfill, Nevitt, Lusk, Dublin, Reg No.: W0231-01;
- IE Licensed Facility Newport Synthesis Ltd., Baldoyle Industrial Estate, Grange Road, Baldoyle, Dublin 13, Dublin, Reg No.: P0097-01;
- IE Licensed Facility (Surrendered) Reheis Inc, Kilbarrack Road, Dublin 5, Dublin, Reg No.: P0071-02;
- IE Licensed Facility Everlac Paints Ltd, Windsor Works, Windsor Avenue, Fairview, Dublin 3, Dublin, Reg. No.: P0220-01;
- IE Licensed Facility Cahill Printers Limited Reg. No.: P0060-01;
- UWWTP Drogheda, Reg. No.: D0041;
- UWWTP Stamullen, Reg No.: D0262-01;
- UWWTP Balbriggan Reg No.: D0023-01; and
- UWWTP Malahide, Reg. No.: D0021-01.

10.8 Description of Potential Impacts

The potential impacts on each of the previously mentioned hydrological attributes to all phases of the Proposed Development are provided in the following sections. The development is described in detail in Chapter 4 (Description of the Proposed Development) and key construction works are described in Chapter 5 (Construction Strategy).

10.8.1 Do Nothing Scenario

In this EIAR, the 'evolution of the baseline environment without the development' is described as the "Do-Nothing" scenario, i.e., the Proposed Development does not proceed. The baseline environment describes the existing waterbodies within the study area as identified and categorised under the RBMP 2018-2021 and reported by the EPA.

The RBMP categorises significant pressures impacting waterbodies in Ireland into 14 categories, and identifies measures and actions aimed at addressing each pressure. This supports the analysis of future trends expected in the water environment to determine the 'evolution of the baseline without the development'. Future trends will be more noticeable, predictable, and measurable in the short to medium-term in relation to water quality, whereas hydrological and hydro-morphological changes are subject to more long-term trends.

The most significant pressures to the waterbodies "at risk" of achieving good status within the study area are urban runoff from diffuse urban sources, hydromorphology from channelisation and urban wastewater from combined sewer overflows. Agriculture and domestic wastewater from wastewater discharges are also identified at the Boyne, Barnageeragh, and Malahide, respectively. Anthropogenic pressures are also present at the Sluice and Tolka waterbodies.

The current trend in relation to pressures will continue for the foreseeable future unless a planned intervention in RBMP is implemented. Therefore, in the absence of the Proposed Development, the baseline surface water environment will not be impacted or will continue to improve albeit at a slow pace if the Proposed Development is not progressed. Therefore, the magnitude of impact under the Do-Nothing scenario is Imperceptible.

10.8.2 Do Something Scenario

The Do-Something scenario is the scenario where the Proposed Development goes ahead. The Proposed Development is described in Chapter 4 (Description of the Proposed Development), with the key construction methodologies described in Chapter 5 (Construction Strategy).

The below section describes the potential impacts of the proposed scheme on the water environment in the absence of mitigation.

10.8.2.1 Construction Phase

There are several potential hydrological impacts related to the Construction Phase of the Proposed Development. The nature of the impacts varies for the various construction stages and activities for each waterbody within the study area. These include the following:

- Hydrology and Flood Risk
  - Potential for disrupting local drainage systems due to diversions required to accommodate the construction works;
  - Effect on the hydraulic characteristics of water features through modifications to the channel dimensions during construction of outfalls and culverts, where required; and

    - Change in the natural hydrological regime due to an increase in discharge because of dewatering activities during construction; potential for temporary increase in hard standing areas and / or soil compaction during construction works which could result in increased runoff rates to waterbodies.
- Water Quality
    - Silty water runoff containing high loads of suspended solids from construction activities;
    - Contamination of waterbodies with anthropogenic substances (e.g., oil spills, grease); and
    - Re-exposure of historically settled contaminants within or near to waterbodies because of working within or near to the waterbody.
- Hydromorphology
    - Increased sediment loading because of silty water runoff or dewatering activities, introducing a sediment plume, potentially leading to the smothering of bed substrate and changes to existing morphological features.

The Construction Phase is estimated to take place over a period of approximately 36 months, subject to obtaining the relevant statutory approvals, permits and licences. The assessment considers the potential impacts of the Proposed Development construction activities prior to mitigation or control measures being implemented.

The following construction activities are anticipated as having the potential to have hydrological effects:

- Installation of Overhead Line Equipment (OHLE), and associated works required for electrification;
- Piling works;
- Temporary Construction Compounds;
- Traction substations and associated infrastructure;
- Utility diversions;
- Access and haul roads; and
- Transportation of concrete, fuel, and other chemicals with a potential to impact on water quality, etc.

The Construction Phase will also require the removal of topsoil or vegetation, track lowering and building of new retaining walls that may increase the risk of flooding and water quality degradation.

A detailed assessment of the potential impacts on receptors during the Construction Phase is summarised in Table 10-10.

Table 10-10 Construction Impact Risk Assessment for Surface Waters

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
1	Boyne River	The existing rail line crosses the Boyne. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No additional works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant**	Risk minimised as no significant works are required to the existing culvert crossing or the bridges in the area. Risk of surface runoff from tracks, access roads and stations can be managed through best practice measures outlined in Section 10.9.	Imperceptible
2	Tullyeskar	The existing rail line crosses the Tulleskar River. Although the river is within the RLB, the works area has no hydrological connection the river at the crossing location. No works are proposed at the crossing location or nearby.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Within the RLB but no works proposed at the crossing location. Therefore, the construction impact is **Negligible**	No mitigation measure proposed.	Imperceptible
3	Stagrennan	The existing rail line crosses the Stagrennan Stream. Works in this	High Sensitivity	Activities in close proximity to tracks, stations and link bridges	Risk minimised as no works are required at the existing culvert.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	watercourse. Poor WFD Status, At Risk.	could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Low risk of surface runoff interactions from tracks and access roads can be managed through measures outlined in Section 10.9.	
4	Betaghstown	The existing rail line crosses Betaghstown. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff interactions from track and access roads can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
5	Pilltown	The existing rail line crosses Pilltown. Works in this area include the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area. A temporary Construction Compound and a small portion of the Bettystown Substation boundary runs adjacent to this watercourse. This may temporarily pose potential surface runoff risk to watercourses.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Potential to impact on water quality. Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Low risk of surface runoff interactions from tracks, access roads, and the temporary Construction Compound can be managed through measures outlined in Section 10.9.	Imperceptible
6	Mornington	The existing rail line crosses Mornington. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design.	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff interactions from tracks and access roads can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
				The potential pre-mitigation construction impact will be short term and **not significant.**		
7	Corballis	The existing rail line crosses Corballis. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area. Temporary Construction Compound border runs adjacent to this watercourse. This may temporarily pose potential surface runoff risk to watercourses.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
8	Nanny	The existing rail line crosses Nanny. Works in this area involve the provision of OHLE and associated works required for electrification. Installation of two OHLE posts on the edge piers of the Laytown Viaduct are planned. These works may involve instream Works will be minimally	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The	Suspend construction on account heavy rainfall and /or high tide forecast. Avoid direct discharge of flood water to river/sea. As works are primarily bankside, it is required to consult the IFI standards and works should be restricted to May-September. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		invasive involving new connection plates. Scaffolding is planned for the watercourse edge. Temporary Construction Compounds border runs adjacent to this watercourse. This may temporarily pose potential surface runoff risk to watercourses.		potential pre-mitigation construction impact will be short term and **slight.**		
9	Mosney	The existing rail line crosses Mosney. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
10	Flemingtown	The existing rail line crosses Flemingtown. Works in this area will be limited to the provision of OHLE and associated works required for	High Sensitivity watercourse. Poor WFD	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		electrification. No works are required to the existing culvert crossing or the bridges in the area.	Status, At Risk.	quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**		
11	Delvin	The existing rail line crosses Delvin. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area.	Imperceptible
12	Bremore	The existing rail line crosses Bremore. Works in this area include provision of	High Sensitivity	Activities in proximity to tracks, stations and link bridges could	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		OHLE and associated works required for electrification.	watercourse. Poor WFD Status, At Risk.	potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Low risk of surface runoff can be managed through measures outlined in Section 10.9.	
13	Bracken (Matt)	The existing rail line crosses Bracken. Works in this area will be limited to the provision of OHLE and associated works required for electrification. Additionally works will be carried out on the Balbriggan Viaduct. Works will be carried out on piers adjacent to the watercourse.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk minimised as no significant works are required to the existing culvert crossing or the bridges in the area. Risk of surface runoff from tracks and access roads, stations and can be managed through best practice measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
14	Barnageeragh	The existing rail line crosses Barnageeragh. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area. Temporary Construction Compound area will be set up in proximity to this watercourse with direct access to Skerries Station.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff via the adjacent Construction Compound can be managed through measures outlined in Section 10.9.	Imperceptible
15	Mill Stream (Skerries)	The existing rail line crosses Mill Stream (Skerries). Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
				construction impact will be short term and **not significant.**		
16	Balcunnin	The existing rail line crosses Balcunnin. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
17	Rush	The existing rail line crosses Rush. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area. A temporary Construction Compound will run adjacent to the watercourse to	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		assist in track lowering 210m south of the watercourse.		included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**		
18	Palmerstown	The existing rail line crosses Palmerstown. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
19	Rathmooney	The existing rail line crosses Rathmooney. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		to the existing culvert crossing or the bridges in the area. Significant works will be carried out at Rush & Lusk station 200m south of the watercourse. Associated temporary works boundary and Construction Compound areas run adjacent to the watercourse.		construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**		
20	Turvey	The existing rail line crosses Turvey. Works at the watercourse will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area. The construction of a substation compound will be carried out 120m north of the watercourse.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
21	Rahillion	The existing rail line crosses Rahillion. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No	High Sensitivity watercourse. Poor WFD	Activities in proximity to tracks, stations and link bridges could potentially increase surface	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		works are required to the existing culvert crossing or the bridges in the area.	Status, At Risk.	runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Low risk of surface runoff can be managed through measures outlined in Section 10.9.	
22	Hazelbrook Stream	The existing rail line crosses Hazelbrook Stream. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in close proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
23	Sluice Stream	The existing rail line crosses Sluice Stream. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
24	Mayne	The existing rail line crosses Mayne. Works in this area will be a provision of OHLE and associated works required for electrification. A secondary arch bridge is proposed parallel to the existing bridge UBB19 as well as an extension of the retaining wall and earthwork embankments to facilitate the widening of the track. No permanent	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and new bridge could potentially increase surface runoff and impact on water quality. Machinery operation near to the watercourse increases the risk of pollution. Surface water control measures and best practice construction methods must be included in the design. The	Bank stabilisation and erosion protection to be in place during construction of the bridge. No machinery to be operated from within the stream. Any stream banks affected outside of the works area must be reinstated to predevelopment conditions. Maintain low risk of surface runoff interactions from the temporary Construction Compound through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		works proposed within the watercourse. Temporary Construction Compounds border runs adjacent to this watercourse. This may temporarily pose potential surface runoff risk to watercourses.		potential pre-mitigation construction impact will be short term and **Moderate.**		
25	Howth	The existing rail line crosses Howth. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
26	Santry	The existing rail line crosses Santry. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing	High Sensitivity watercourse. Poor WFD	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		culvert crossing or the bridges in the area.	Status, At Risk.	measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**		
27	Tolka	The existing rail line crosses Tolka. Works in this area will be limited to the provision of OHLE and associated works required for electrification. No works are required to the existing culvert crossing or the bridges in the area.	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **not significant.**	Risk eliminated as no works are required to the existing culvert crossing or the bridges in the area. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible
28	Broadmeadow Estuary	The existing rail line crosses Broadmeadow Estuary. The works include the provision of overhead line	High Sensitivity watercourse.	Activities in proximity to tracks, stations and link bridges could potentially increase surface	Suspend construction in the event of a heavy rainfall and /or high tide forecast. Avoid direct discharge of flood water to river/sea.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		equipment (OHLE) required for electrification. Upgrades to the existing Malahide Viaduct involve OHLE mast installation on existing piers without in-stream works. A new turnback will be constructed on a widened embankment between the Strand Road underbridge (UBB29) and the Malahide Viaduct (UBB30). This requires a modular reinforced earth (~400m) wall with varying heights (1-3m) and earthworks slope on the west side of the existing embankment.	Poor WFD Status, At Risk. The ICWWS predicted 0.5% AEP tidal level is approx. 4m.	runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The predicted high tide will impact on the construction of the embankment if it occurs during construction. The potential pre-mitigation construction impact will be short term and **slight.**	As works are primarily bankside, it is required to consult the IFI standards and works should be restricted to May-September. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	
29	Rogerstown Estuary	The existing rail line crosses Rogerstown Estuary. Works in this area will be limited to the provision of OHLE and associated works required for electrification. Demolition and reconstruction of the Rogerstown Viaduct wingwalls is planned to support the OHLE support frames. Construction to include	High Sensitivity watercourse. Poor WFD Status, At Risk.	Activities in proximity to tracks, stations and link bridges could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation	Suspend construction in the event of a heavy rainfall and /or high tide forecast. Avoid direct discharge of flood water to river/sea. As works are primarily bankside, it is required to consult the IFI standards and works should be restricted to May-September period, if reasonably practicable. Low risk of surface runoff can be managed through measures outlined in Section 10.9.	Imperceptible

No.	Waterbody Name	Crossing and Construction Technique	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		demolition, vertical drilling, and onsite concrete pours.		construction impact will be short term and **slight.**		

The magnitude of impacts on water quality and runoff from temporary structures such as Construction Compounds, haul roads and access are local, short term and reversible once construction is completed. The overall impact of the Proposed Development prior to mitigation is therefore slight.

Table 10-11 Coastal and Estuarine Waters

No.	Waterbody Name	Construction Activities	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
1	Malahide Estuary	The proposed turnback near Malahide Station involves constructing a modular reinforced earth wall on the west side of the existing embankment. The wall will be approximately 400 meters long, with varying heights based on earth retention levels. It will run along the eastern boundary of the proposed Broadmeadow Greenway and be completed before installing additional railway tracks and equipment. The main worksite, where the proposed modular reinforced earth wall will be constructed, will be supported from a compound adjacent to Bissetts Strand on the west of the railway. Additionally, another compound located south of the Malahide Yacht Club on Sea	High Sensitivity water body - the works at Malahide turnback are hydrologically connected to Malahide Estuary SAC, Malahide Estuary SPA, and Malahide Estuary pNHA. The Construction Compound at Bissett's Strand and the other compound South of Malahide Yacht Club are at risk from the 20% AEP Coastal flooding.	Activities in close proximity to the protected areas could potentially increase surface runoff and impact on water quality. Surface water control measures and best practice construction methods are included in the design. The potential pre-mitigation construction impact will be short term and **slight**	Risk minimised as works are completed during summer months and best practice construction methods will put in place. Risk of tidal flooding at the temporary Construction Compound (CC-16100) is significant. However, mitigation measures involving working during low tide seasons (May to September), minimising or avoiding impervious surfaces, and removal of material stored on receipt of high tide forecast.	Imperceptible

No.	Waterbody Name	Construction Activities	Predicted Impact			
			Sensitivity of Receptor	Potential Effect (Pre-Mitigation)	Mitigation Measure	Predicted Effect (Post-Mitigation)
		Road (L2130) will provide further support due to limited space for material storage west of the embankment.				

10.8.2.2 WFD Assessment

It is concluded that the WFD status and objectives will not be impacted or otherwise compromised by the works. The works would not adversely affect the morphology, water quality and flood risk and would not prevent the implementation of the RBMP (2018-2021).

10.8.2.3 Operational Phase

The potential impacts predicted for the Operational Phase are related to water quality and surface runoff which may occur due to increased impermeable areas which may lead to increased surface runoff and an increase in pollution and sediment load entering surface water receptors from maintenance works required.

The potential for increased runoff is expected to be minimal as the flows will be limited to greenfield runoff rates and SuDs designed as required. The Construction Compounds will be reinstated and landscaped once the construction works are complete. As such there will be no increase in surface water discharge during the Operational Phase. The primary activity during the Operational Phase is the occasional access for maintenance activities which may result in accidental spills, oil leaks, etc. These occasional visits may result in surface water pollution in the absence of mitigation measures which is considered **imperceptible**.

10.8.2.4 Decommissioning Phase

The Proposed Development is providing rail infrastructure which will enable an increase in frequency and capacity on the Northern Line and the Howth Branch in the coming years. It is not intended that this infrastructure will be decommissioned, but rather, as the infrastructure reaches the end of its design life, it will likely be refurbished or renewed to enable continued operation of the railway. Any such future renewal or refurbishment may require additional construction works, which would be similar to, but of a much lesser impact (in terms of extent and duration) than, the Construction Phase associated with the DART+ Coastal North project. The associated impacts are considered local and short term on the receiving water bodies. Therefore, in the absence of mitigation measures, the potential impact of the decommissioning activity is considered **Imperceptible**.

10.8.3 Flood Risk Summary

There are 18 no. watercourse crossings across the full area of the Proposed Development that may be at moderate risk of flooding in the absence of mitigation measures. As these sections fall within Flood Zones A and B and the Proposed Development is classified as highly vulnerable as it includes essential transport infrastructure, a justification test may be required where there is a proposal to lower the track level, build a substation or access road that interact with the floodplain. However, whilst the crossings appear to fall within Flood Zone A or B, the rail and substation levels within the Proposed Development boundary are >2m above the max flood level at each location and hence do not require a justification test.

More detailed review of the flood risk can be found in Appendix A10.1 (Flood Risk Assessment) in Volume 4 of this EIAR.

10.9 Mitigation Measures and Monitoring Requirements

As part of the Proposed Development, best practice construction methods will be implemented that will ensure the construction related impacts are avoided or reduced to a minimum where reasonably practicable. This section outlines this best practice and/or mitigation measures that will be implemented to mitigate the potential impacts identified in Section 10.8 of this chapter.

10.9.1 Construction Phase

10.9.1.1 Generic Mitigation & Monitoring Measures

A construction Surface Water Management Plan (SWMP) is included as sub-appendix H within Appendix A5.1 (Construction Environmental Management Plan) (CEMP). The SWMP which outlines appropriate mitigation measures for the Construction Stage (See Appendix A5.1 in Volume 4 of this EIAR). This includes measures relating to:

- A requirement for a Pollution Incident Response Plan;
- Construction Compound management including the storage of any fuels and materials;
- Maintaining the current level of the ground and limiting works to the period May - September at the proposed temporary construction compound at Malahide;
- Control of Sediments;
- Use of concrete; and
- Management of vehicles and plant including refuelling and wheel wash facilities, etc.

10.9.1.2 Specific Mitigation & Monitoring Measures

As well as these generic mitigation measures, other specific mitigation and/or monitoring measures may be required, which will include, but will not be limited to:

- Works in Flood Zones A and B are avoided where possible. In these areas, the Contractor will be required to provide appropriate mitigation measures within a method statement for the removal of materials to minimise sediment discharge into the nearest watercourse;
- Construction works in areas prone to flooding are to take place during dry seasons. The Contractor must follow the weather forecast prior to commencing instream works and concrete pouring. It is noted that track levels for the entirety of the development are well above flood levels.
- Works areas will be kept dry as far as reasonably practicable;
- Bunds of non-erodible material will be used adjacent to watercourses to avoid contaminated water entering the watercourse as far as reasonably practicable;
- Settlement tanks, silt traps/bags and bunds will be used where required to remove silt from surface water runoff. Sizing of the tanks will be based on best available guidelines, CIRIA (2006). Any construction work within a 10m buffer zone must be provided with these measures to minimise sediment discharge to a watercourse;
- Weather conditions to be checked by the Contractor and coordinated with any planning construction activities in order to minimise surface water runoff from the site.
- Refuelling of all plant, machinery, and vehicles will be undertaken only in designated areas where leaks and spills are can be contained relatively easily. Spill kits will be made available on all temporary and permanent construction sites. Refuelling areas must be kept at least 50m away from any watercourse;
- Construction materials to be managed in such a way as to effectively minimise the risk posed to the aquatic environment;

- Construction Compounds and haul roads will avoid high flood risk zones as much as possible and maintain a minimum buffer of 50m from surface watercourses, and
- Excavated material to be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses.

10.9.2 Operational Phase

Measures to control the risk of flooding and contamination to local waterbodies and the hydrological environment have been included within the design of the Proposed Development. Maintenance of the railway and substations will be on-going to ensure the risks are minimised during the Operational Phase. Maintenance activities will be in accordance with Iarnród Éireann best practice procedures to ensure that no additional risks to waterbodies are encountered.

Iarnród Éireann will also follow and implement its flood risk management operational procedures which assist in managing flood risk for rolling stock during inclement weather and flooding events, these include:

- CCE-TMS-311 - Irish Rail Weather Management Procedures (2017);
- CCE-TEB-2014-05 - Guidance On Alerts And Service Restrictions During Adverse Weather Events; and;
- CME-TMS-001-008 - Operation Of IE RU Rolling Stock On Flooded Track (2016).

These procedures specify how Iarnród Éireann:

- Monitors and disseminates applicable weather warnings from Met Éireann;
- Prepares and implements local weather management plans for predicted adverse weather events;
- Sets out recommended flood level limits for their rolling stock passing over flooded tracks; and
- Sets out actions to be undertaken by duty managers, drivers, signallers etc when high water alerts are issued.

Operational limits on flooded tracks have been specified for the different rolling stock (i.e., types of trains) within their fleet, as shown in Image 10-4. The limits have been set to avoid damage to critical onboard equipment and to mitigate against the risk of a train becoming disabled in a flooded area. The limits are also subject to change depending on the track and weather conditions. It is important to note that no trains may operate over flooded track until permitted to do so by Iarnród Éireann's Infrastructure Department. The maximum limit identified within the procedure for the EMU is the top of the railway track. A typical railway track is approximately 170mm deep from ground level.

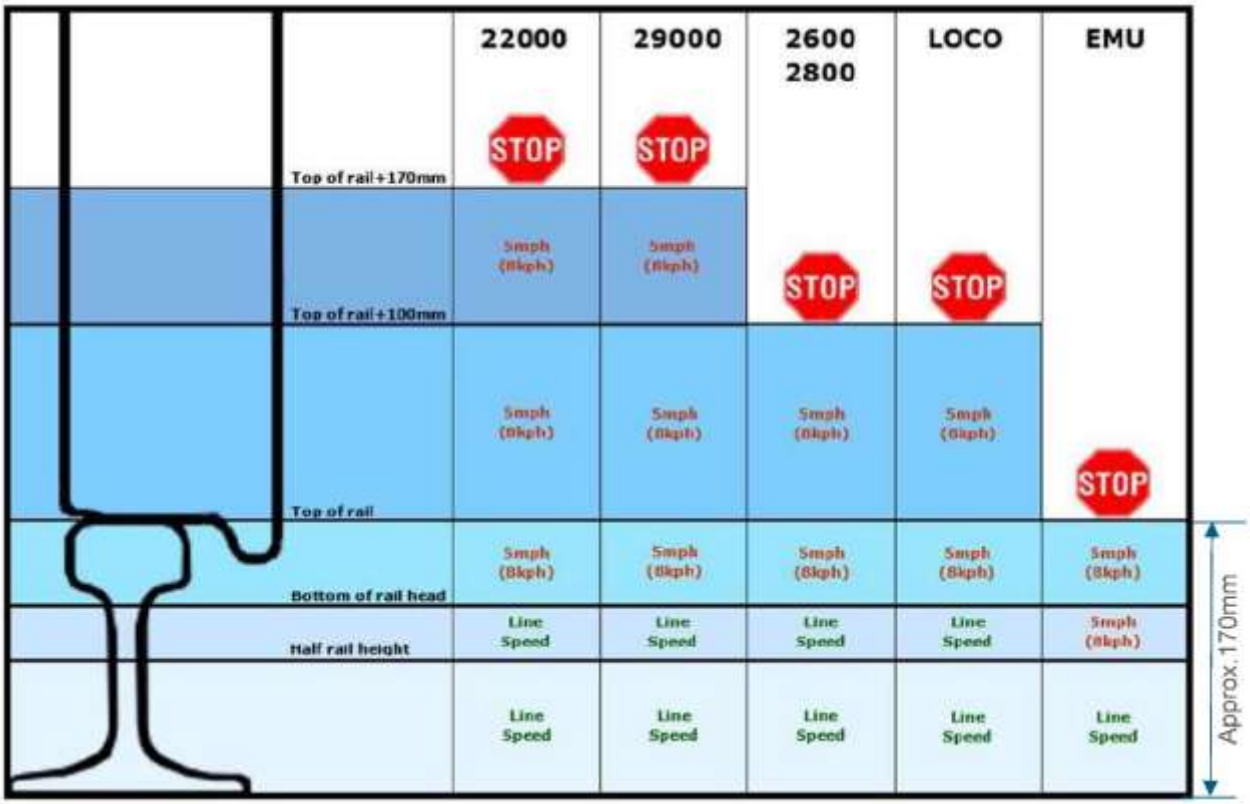

Image 10-4 Iarnród Éireann RU Rolling Stock Operating Procedure on Flooded Track Condition

10.9.3 Monitoring

Water quality monitoring should be undertaken in the surface water bodies located in the proximity of construction works and sensitive watercourses. Monthly samples have been taken as a baseline prior to commencement of the Construction Phase. Sampling should continue from the start of the Construction Phase until at least 12 months post-completion. Additional sampling points can be added if required, determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during the Construction Phase. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where this is deemed to be associated with the Proposed Development.

It is expected that the OPW and EPA will continue to monitor water levels in the 11 no. waterbodies listed previously in Table 10-9. The Marine Institute also has a tidal gauge at Dublin Port which can be monitored. Sea level rise and freeboard have been assessed and accounted for in the design, however, any unforeseen changes identified in continued monitoring can be used to inform and update the scheme design and considered on a case-by-case basis.

The drainage systems including new underground attenuation tanks serving the Proposed Development must continue to function as designed. Maintenance of the new underground attenuation tanks and other drainage features will be in accordance with manufacturer recommendations.

10.10 Residual Effects

Having examined the proposed the reasonable worst-case scenario construction method, implementation of best practice and proposed mitigation measures, it is concluded that the impacts on hydrology and flood risk are **Imperceptible** during the Construction, Operational and Decommissioning Phases of the Proposed Development and therefore the proposed scheme is not anticipated to impact the WFD Objectives.

10.10.1 Water Quality

During the Construction and Operational Phases the project drainage design, mitigation measures and infrastructure will limit the risk to watercourses and the hydrological environment from flooding and runoff contamination. Water quality samples were collected from 11no. locations across the study area and documented in this study. These results will, together with the EPA monitored data, be used as a baseline to ensure any negative residual impact on sensitive receptors is mitigated.

10.10.2 Flood Risk

There are 18no. areas along the proposed scheme where a risk of fluvial flooding, tidal flooding or a combination is identified. Each of these could be considered part of Flood Zone A, as they directly interact with watercourses.

Whilst the sections appear to fall within Flood Zone A, the railway line and substation levels within the Proposed Development boundary are >2m above the max flood level at each location. As such and as demonstrated in the site-specific FRA Report (Appendix A10.1 in Volume 4 of this EIAR), the Proposed Development does not propose significant level changes. Five locations throughout the development will be subject to track lowering of a maximum of 0.3m. All tracks are a minimum of 1.35m above flood defence level so the lowering of tracks will not increase flood risk. It is beyond the scope of the project to mitigate flooding for the existing road network in its entirety. Therefore, there is no significant flood risk to either the railway line, stations or substations within the site boundary.

10.10.3 Construction Phase

Following implementation of the mitigation measures outlined in the sections above, no significant impacts are anticipated on any of the receptors of this study area and no residual risks are envisaged during the Construction Phase.

10.10.4 Operational Phase

Following implementation of the mitigation measures outlined in the sections above, no significant impacts are anticipated on any of the receptors of this study area and no residual risks are envisaged during the Operational Phase.

10.11 Cumulative Effects

The cumulative assessment of relevant plans and projects is undertaken separately in Chapter 26 (Cumulative Effects) in Volume 2 of this EIAR.

10.12 References

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