Chapter 13
Water

Contents

13. Water

13.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the Belfield / Blackrock to City Centre Core Bus Corridor Scheme (hereafter referred to as the Proposed Scheme), on the surface water environment during the Construction and Operational Phases. The following attributes of each surface water body (receptor) are considered: hydrology, hydromorphology and water quality. Hydrogeology is dealt with specifically in Chapter 14 Land, Soils, Geology and Hydrogeology.

During the Construction Phase, the potential surface water impacts associated with the development of the Proposed Scheme have been assessed (see Section 13.4.4), including potential impacts from construction runoff and watercourse disturbance due to utility diversions, road resurfacing and road realignments.

During the Operational Phase, the potential surface water impacts associated with changes in surface water runoff, increased hard standing and watercourse disturbance have been assessed (see Section 13.4.5).

The assessment has been carried out according to best practice and guidelines relating to surface water assessment, and in the context of similar large-scale infrastructure projects.

An assessment of the Proposed Scheme's compliance with Water Framework Directive (WFD) (Directive 2000/60/EC) requirements is provided in Appendix A13.1 WFD Assessment in Volume 4 of this EIAR; the status of WFD water bodies and protected areas within the Study Area are provided in Section 13.3.3 and a summary of the conclusions of the WFD assessment is provided in Section 13.6.3.

Flooding has been assessed within a Site Specific Flood Risk Assessment (FRA) report in Appendix A13.2 in Volume 4 of this EIAR. The results of this assessment have been summarised in Sections 13.3.10 and 13.4.5.4 of this Chapter.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through the comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

13.2 Methodology

13.2.1 Study Area

The baseline study area for this assessment is 500m from the boundary of the Proposed Scheme. It is anticipated that any likely significant impacts from the Proposed Scheme would occur at local water bodies, and given the nature and extent of the Proposed Scheme, the 500m study area is considered appropriate to encompass all those water bodies that may be susceptible to significant impacts. Therefore, any identified surface water bodies within that area have been considered as receptors including those classified under the WFD, including riverine, transitional water bodies, lake (water) bodies and coastal water bodies, and also non-WFD classified water bodies. Artificial drainage features, such as existing Sustainable Drainage Systems (SuDS) have not been considered as receptors within the baseline assessment.

The nearest surface water abstraction point is Leixlip Reservoir, which is approximately 16km (kilometres) west of the Proposed Scheme. This is a major public water supply abstraction point (approximately 195,000 m^3/day

(cubic metres per day)) which supplies approximately 600,000 people, serving Fingal, Kildare and North Dublin. However, due to separation from the Proposed Scheme and the fact that it is upstream of the study area, there is considered to be no potential for the Proposed Scheme to interact with this abstraction point and, accordingly, this abstraction point has not been considered further in the assessment.

13.2.2 Relevant Guidelines, Policy and Legislation

13.2.2.1 Water Framework Directive (WFD)

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

There are a number of WFD objectives under which the quality of water is protected. The key objectives at EU 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 this 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 initially transposed into Irish law by S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003, as amended (hereafter referred to as the Water Policy Regulations). The Water Policy 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.

Subsequently, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 as amended (hereafter referred to as the Surface Waters Regulations) and S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended (hereafter referred to as the Groundwater Regulations) were promulgated to regulate 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.

The Water Policy Regulations require the assessment of permanent impacts of a scheme / project on WFD water bodies, (rivers, lakes, estuaries, coastal waters and groundwater). Typically, the permanent impacts include all operational impacts, but can also include impacts from construction depending on the length and / or nature of the works, etc. of the Proposed Scheme as some potential construction impacts could be considered permanent in the absence of mitigation. An assessment of the compliance of the Proposed Scheme with WFD requirements is provided in Appendix A13.1 WFD Assessment; a statement of the status of WFD water bodies and protected areas within the Study Area are provided in Section 13.3 and a summary of the conclusions of the WFD assessment is provided in Section 13.6.1.

In the absence of WFD assessment guidance specific to Ireland, the assessment has been carried out using the UK Environment Agency's 'Water Framework Directive assessment: Estuarine and Coastal waters' 2016 (updated 2017) (Environment Agency 2016). No specific guidance exists for freshwater water bodies; however this guidance was used as the basis of the UK's Planning Inspectorate (PINS) Advisory Note 18 'Water Framework Directive' June 2017 (PINS 2017) in which it sets out the stages of an assessment. On this basis it is considered appropriate to use for the assessment of the Proposed Scheme.

13.2.2.2 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for implementing 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 have been merged to form one national River Basin District (RBD). For 'At Risk' water bodies, the RBMP 2018 - 2021 identified the frequency of significant pressures impacting these receptors 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%).

In September 2021, the Minister for Housing, Local Government and Heritage, published the draft River Basin Management Plan for Ireland 2022-2027 for public consultation (DHLGH 2021). The consultation period closed March 2022. The draft RBMP sets out at the outset that it is published in the context of a rapidly changing policy landscape at European and International levels and against a backdrop of 'widespread, rapid and intensifying climate change'. In addition, Ireland is now experiencing a sustained decline in water quality following many years of improvements, therefore stronger measures are now required to achieve sustainable water management in order to address and adapt to the impacts of climate change and achieve the desired outcomes for biodiversity.

Image 13.1 presents the ecological status of water bodies in Ireland over the past two cycles of the RBMP and illustrates the reduction in water quality, particularly in relation to the reduced percentage of water bodies achieving high status and increased percentage achieving bad status. The reductions in water quality are especially notable for rivers; for other water bodies the changes are more mixed; some reductions, some improvements. The draft RBMP cites a 4.4% net decline in the status of water bodies, and notes that this is mostly driven by a decline in the status of river water bodies.

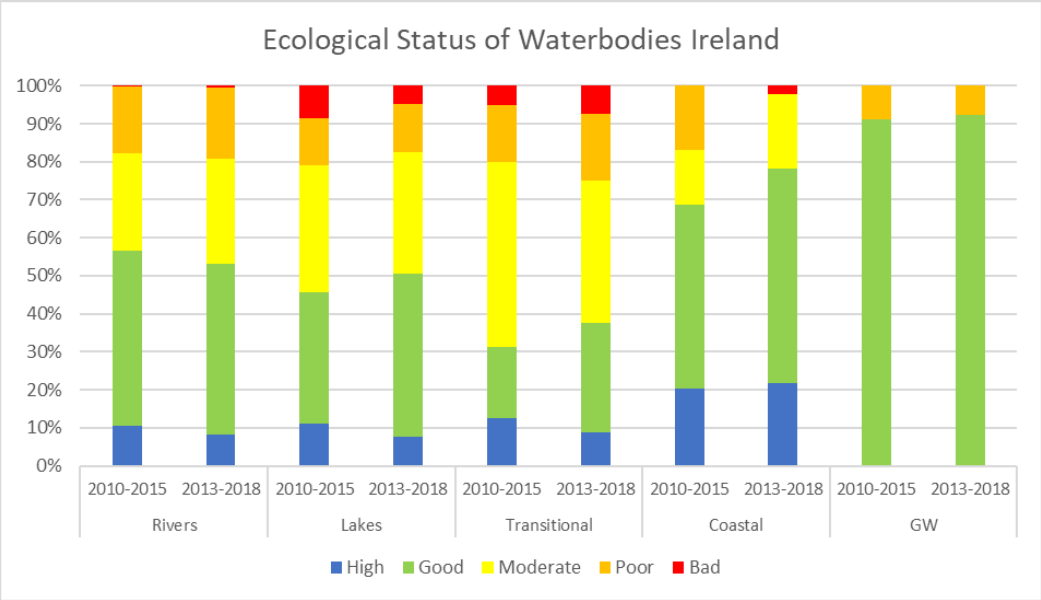

Image 13.1: Ecological Status of Water bodies in Ireland

The characterisation and risk assessments carried out for the third cycle show that 33% of water bodies are 'At Risk' of not meeting their environmental objective of good or high status. Of these, 46% are impacted by a single significant pressure. Agriculture remains the most common pressure, followed by hydromorphology, forestry and urban wastewater. There has been an increase in water bodies impacted by agriculture since the second cycle RBMP.

The draft RBMP sets out a Programme of Measures (PoMs) necessary to deliver the objectives of the WFD in full and to contribute to other environmental priorities.

13.2.2.3 Guidelines

The guidance detailed in Table 13.1 has also been consulted during the preparation of this Chapter, where relevant.

Table 13.1: Guidelines

EIA Topic	Guidance
EIA / General	• Environmental Protection Agency (EPA) Draft Guidelines on the information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the Draft EPA Guidelines) (EPA 2017); and • European Commission (EU) Environmental Impact Assessment of Projects. Guidance on the Preparation of the Environmental Impact Assessment Report, 2017. (EU, 2017)
Water	• Transport Infrastructure Ireland (TII) Road Drainage and the Water Environment guidance document (TII 2015). • National Road Authority (NRA) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA 2005)*; • NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the TII Assessment Guidelines) (NRA 2009)*; and • The Department of the Environment, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) Planning System and Flood Risk Management – Guidelines for Planning Authorities (hereafter referred to as the FRM Guidelines) (DEHLG and OPW 2009).

*. The NRA and Rail Procurement Agency merged to establish a new agency – Transport Infrastructure Ireland (TII). As a result, all previous NRA documents are now referred to as TII documents.

13.2.3 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 undertaking both a desk study and field surveys.

13.2.3.1 Data Sources used to Undertake Desk Study

Table 13.2 details the data sources consulted during the assessment.

Table 13.2: Data Sources used to Undertake the Desk Study

Assessment Attribute	Title
General	• Ordnance Survey of Ireland (OSI) - current and historic mapping; and • Aerial photographs (i.e., Google Maps).
Surface Water Quality and Hydromorphology	• WFD Ireland Database; • EPA - water quality monitoring database and reports. EPA Water Environment Maps (EPA 2020a); • EPA Environmental Data Maps; • National Parks and Wildlife Service (NPWS) - designated sites; and • Inland Fisheries Ireland (IFI) - fishery resources.
Hydrology	• Catchment Summaries; • RBMP 2018 - 2021; and • EPA - flow and water level measurements.
Water / Flood Risk	• OPW National Flood Information Portal (OPW 2020).

13.2.3.2 Field Surveys

Field walkover assessments were carried out in March 2020 and March 2022. In March 2022, seven survey points were identified at points where either potential impacts had been identified during the assessment or where confirmation of the culverted status of a water body was required. Each of the sites was visited and inspected to inform further the assessment of the likely impacts of the Proposed scheme. Further details of the locations and the results of the survey are provided in Section 13.3.4.

Observations were made from bridges and from the top of riverbanks. The following observations were recorded at each survey location:

- Flow conditions (recording observations such as homogenous flow, low flow or high flow);
- Riverbed (recording observations such as the sediment type and whether there was any deposition);
- Water quality (recording any potential sources of pollution as well as visual indicators of poor quality (e.g., presence of sewage fungus, litter or foam lines);
- Bank stability (recording any instances of erosion and aggradation);

- Natural and manmade features of the river (including modifications, examples of structures could include culverts, weirs or bridges);
- Runoff pathway and risk (recording the pathway for any surface runoff to the watercourse and the likelihood of surface runoff reaching the river);
- Riparian vegetation (recording the surrounding vegetation); and
- Outfalls and discharges (recording any outfalls and discharges and whether these were active at the time of the survey).

No water quality sampling was carried out; information relating to the quality of the water bodies was drawn from the EPA's online mapping and information portals, as detailed in Section 13.2.3.1.

13.2.4 Appraisal Method for the Assessment of Impacts

13.2.4.1 General Approach

The method for the assessment of impacts has been adapted from the Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the TII Guidelines) (NRA 2009), specifically Section 5.6. The assessment also took account of the guidance set out in the Environmental Protection Agency (EPA) Draft Guidelines on Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2017). In addition, the relevant provisions of the EU's Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (EU, 2017) have been considered in preparing this chapter of the EIAR.

The surface water environment is intrinsically linked to flood risk, ecological receptors and groundwater, considered in the FRA Report (Appendix A13.2 in Volume 4 of this EIAR), Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology) respectively. Commercial and recreational use of the water environment is not included in the scope of this Chapter, as commercial and recreational interests are considered and assessed in Chapter 19 (Material Assets) and Chapter 10 (Population).

The TII Assessment Guidelines outline how impact type, magnitude, and duration should be considered relative to the importance of the hydrological receptor and its sensitivity to change in order to determine significance of the impacts.

The overall impact on surface water receptors (i.e., rivers, canals, transitional water bodies, coastal water bodies and lakes) as a result of the Proposed Scheme will be determined based on two parameters:

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

13.2.4.2 Sensitivity of Receptors

The sensitivity of surface water attributes to changes as a result of the Proposed Scheme are determined by a set of criteria including their relative importance or 'value' (e.g., whether features are of national, regional or local value). Table 13.3 outlines the criteria for estimating the sensitivity of receptors and their attributes.

Table 13.3: Criteria Used to Evaluate the Sensitivity of Surface Water Receptors (TII Guidelines 2009 adapted to include WFD Assessment Guidelines (Environment Agency 2016))

Sensitivity	Criteria	Typical Example
Extremely High	Receptor (or receptor attribute) has a very high quality or value on an international scale	• Any WFD water body 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 water body 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.

Sensitivity	Criteria	Typical Example
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 water body (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 water body ecosystem protected by national legislation (Natural Heritage Area (NHA) status); • A water body 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 water body with High or Good WFD Status; • A Moderate WFD Status (2013 - 2018) water body with some hydrological connection (<2km) to European Sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters) further downstream; • WFD water body which has a direct hydrological connection to sites/ecosystems protected by national legislation (NHA status); • A water body that appears to be in some natural equilibrium and exhibits some morphological features (such as pools and riffles). There is a diverse 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 water body with Moderate WFD Status (2013 - 2018); • WFD water body with limited (>2km <5km) hydrological importance for sensitive or protected ecosystems (much further downstream); • A water body 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	• Water body with Bad to Poor WFD Status (2013 - 2018) • A WFD water body 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.

13.2.4.3 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 Scheme 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, 2017):

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

Table 13.4: Criteria for Determining the Magnitude of Impact on Surface Water Receptors (TII Guidelines, NRA 2009)

Nature of Impact	Description	Scale and Nature of Impacts
Large Adverse	Results in loss of attribute and/or quality and integrity of the attribute	• Loss or extensive change to a fishery. • Loss of regionally important public water supply. • Loss or extensive change to a designated nature conservation site. • Reduction in water body WFD classification or quality elements. • Results in loss of receptor and/or quality and integrity of receptor. • An impact, which has a high likelihood of occurrence and that has the potential to alter the character of a small part or element of the receptor in the medium-long term. This could be frequent or consistent in occurrence, and result impact which may alter the existing or emerging trends.
Medium Adverse	Results in effect on attribute and/or quality and integrity of the attribute	• Partial loss in productivity of a fishery. • Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. • Contribution to reduction in water body WFD classification. • Results in impact on integrity of receptor or loss of part of receptor. • An impact, which has reasonable likelihood of occurrence and that has the potential to alter the character of a small part or element of the receptor in the medium term. This could be intermittently or occasionally, and result impact which may be consistent with existing or emerging trends.
Small Adverse	Results in some measurable change in attributes, quality or vulnerability	• Measurable impact but with no change in overall WFD classification or the status of supporting quality elements. • Minor impacts on water supplies. • Results in minor impact on integrity of receptor or loss of small part of receptor. • An impact, which has low likelihood of occurrence and that has some potential to alter the character of a small part or element of the receptor in the short term. This could be on a once-off occasion or rare occurrence, and result impact which may be consistent with existing or emerging trends.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	• No measurable impact on integrity of the attribute. • Results in an impact on receptor but of insufficient magnitude to affect either use or integrity.
Small Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	• Has some potential to results in minor improvement WFD quality element(s).
Medium Beneficial	Results in moderate improvement of attribute quality	• Contribution to improvement in water body WFD classification.
Large Beneficial	Results in major improvement of attribute quality	• Improvement in water body WFD classification.

13.2.4.4 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 Table 13.5.

Table 13.5: Categories of Environmental Impacts

Importance of Attribute	Magnitude of Impact			
	Negligible	Small	Medium	Large
Extremely High	Imperceptible	Significant	Profound/Very Significant	Profound
Very High	Imperceptible	Significant / Moderate	Very Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Very Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

13.2.4.5 Methodology for Operational Phase Traffic Impact Assessment

Traffic modelling (see Chapter 6 (Traffic & Transport)) has been carried out for two scenarios Do minimum and Do Something (i.e. respectively without and with the Proposed Scheme) for 2028 and 2043. In addition to predicting how traffic on the main route of the Proposed Scheme could change, it also includes modelling for predicted traffic on side roads. This allows an understanding of whether the Proposed Scheme could result in increased traffic on those side roads via displacement.

This is important from a surface water perspective because, whilst the main route will continue to discharge to the same catchment as existing, there is the potential for displaced traffic on side roads which discharge to a different water body. This could lead to a change in pollutant loadings and consequent impacts on that water body.

To help determine this, the TII Road Drainage and the Environment (2015) guidance was consulted. It states that roads carrying less than 10,000 AADT are lightly trafficked and therefore pollutants occur in lower concentrations. As such no significant impact on receptors are considered likely. Therefore, this was used as a threshold point to determine whether there was the potential for impacts on water bodies.

The threshold was built into a 'decision tree' approach (see Diagram 13.1) for the assessment of impacts from displaced traffic.

In order to determine which water body drainage from side roads carrying displace traffic would discharge to, the Proposed Scheme Catchment Plans were consulted (see Proposed Surface Water Drainage Works (BCIDA-ARP-DNG_RD-1415_XX_00-DR-CD-9001) in Volume 3 of this EIAR).

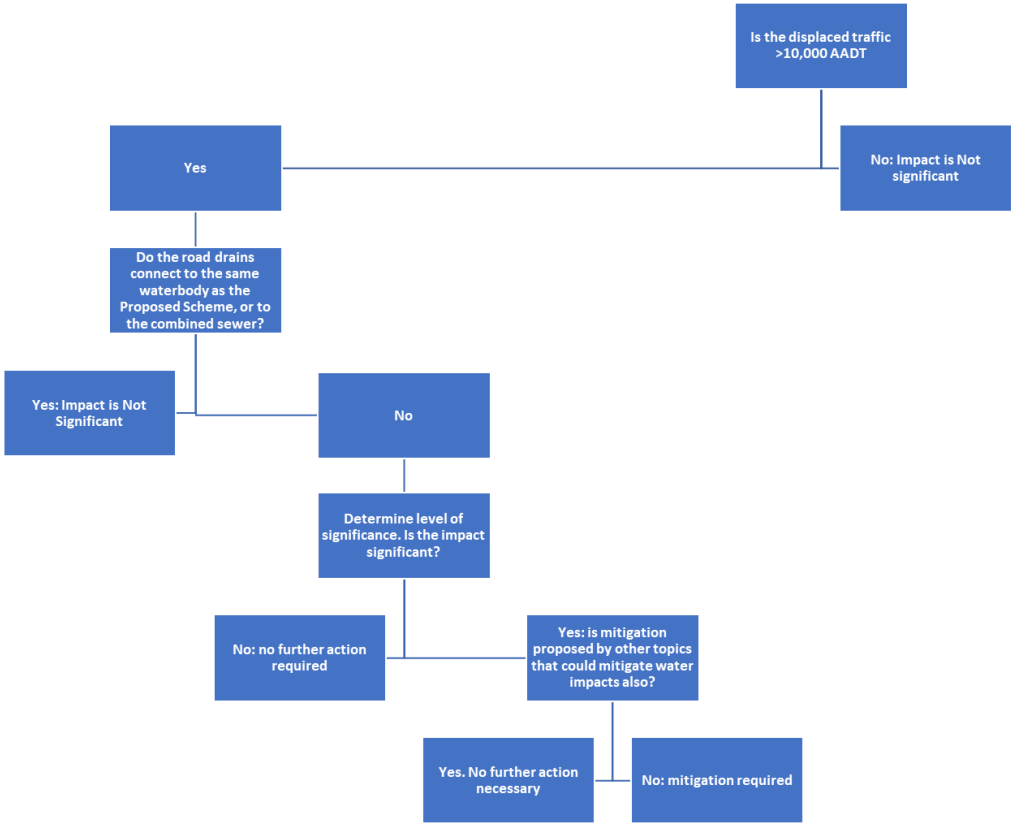

Diagram 13.1: Traffic Assessment Decision Tree

If, through the decision tree, it is determined that a new water body is potentially impacted upon, a qualitative assessment of the potential impact will be carried out. For the sections of road being considered in this assessment, the use of the Highways Agency Risk Assessment Tool (HAWRAT) is generally not considered appropriate; and it is considered that it would be a disproportionate level of assessment for the scale of the Proposed Scheme unless new levels of AADT are above 11,000 (see below). Taking into account the existing

urban nature of the roads under consideration, the following criteria are applied to determine the magnitude of impact on the new receptor:

- If road section length <100m, magnitude is negligible;
- If AADT < 10,500 magnitude is small;
- If AADT >10,500 and <11,000 magnitude is medium; and
- For AADT >11,000, the HAWRAT spreadsheet will be used to check for potential impacts from heavy metals and sediment.

13.3 Baseline Environment

13.3.1 WFD Catchment Overview

The study area lies within Hydrometric Area (HA) 09 (Liffey and Dublin Bay) and is within the River Liffey catchment. The Liffey and Dublin Bay Catchment Summary (Liffey Catchment Assessment 2010 – 2015 HA 09) (EPA 2018) 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. There are four main water bodies within the study area in this catchment. These are the Dodder_050, Brewery Stream_010, the Grand Canal and Dublin Bay (refer to Figure 13.1 in Volume 3 of this EIAR). The largest urban centre in the catchment is Dublin City. The other main urban centres, relevant to the study area, are Booterstown, Blackrock, Ballsbridge, Merrion and Sandymount. 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.

13.3.2 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 Q1 to Q5 to watercourse sections (refer to Table 13.6). 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 will be used to inform baseline receptor importance.

The WFD also considers heavily modified water bodies (HMWB) and artificial surface water bodies (AWB). The WFD requires HMWB and AWB to achieve good ecological potential rather than Good Status.

Table 13.6: EPA Scheme of Biotic Indices or Quality (Q) Values

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

13.3.3 Surface Water WFD Status

The EPA river dataset is designed as a geometric river network for monitoring, management and reporting purposes. The EPA has split up rivers and streams into smaller sections, to allow areas to be easily distinguished. These 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.

Water bodies within the study area included in this assessment are (refer to Figure 13.1 in Volume 3 of this EIAR):

- Dublin Bay

- Brewery Stream_010;
- Dodder_050; and
- Grand Canal Main Line (Liffey and Dublin Bay).

The WFD Status of the water bodies within the study area of the Proposed Scheme are provided in Table 13.7.

Table 13.7: Surface Water WFD Status

WFD Sub-catchment	WFD Water body Name	Heavily Modified?	Type	Status (2013 to 2018)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Risk Categorisation
Dodder_SC_010	Brewery Stream_010	Not designated as HMWB but heavily culverted	River	Moderate	Anthropogenic pressures	Under Review
N/A	Dublin Bay	N/A	Coastal	Good	N/A	Not at Risk
Dodder_SC_010	Dodder_050	No	River	Moderate	Anthropogenic pressures, urban wastewater, urban runoff	At Risk
N/A	Grand Canal Main Line (Liffey and Dublin Bay)	Yes - AWB	Canal	Good ecological potential	Elevated levels of faecal coliforms and ammonia	Not at Risk

13.3.4 Field Survey

The Proposed Scheme was surveyed on 2 March 2020. The water bodies surveyed were the Dodder_050, the Grand Canal and Booterstown Marsh (which is part of Brewery Stream_010). Weather conditions were recorded as dry for all sites on the day of the survey, with the exception of the Grand Canal site where there was some light rainfall.

The results of the field surveys at these locations are detailed in Table 13.8.

Table 13.8: Survey Information for Sites along the Proposed Scheme

Survey Attribute	Survey Location BB1	Survey Location BB2	Survey Location BB3	Survey Location BB4	Survey Location BB5	Survey Location BB6	Survey Location BB7
Location	Brewery Stream Crossing #1	Brewery Stream Crossing #2	Construction Compound	Water Body North West of Booterstown March	Brewery Stream Crossing #3	Merrion Strand - Dublin Bay. Strand Rd	Dodder _050 at Ballsbridge
Date	1/3/2022	1/3/2022	1/3/2022	1/3/2022	1/3/2022	1/3/2022	1/3/2022
Climate Observations	Sunny clear skies, slight wind	Sunny clear skies, slight wind	Sunny, clear skies slight wind	Sunny, clear skies slight wind	Sunny, clear skies slight wind	Sunny, clear skies slight wind	Sunny, clear skies slight wind
Waterbody Crossed	No	Yes	No	No	No	Yes	Yes

Survey Attribute	Survey Location BB1	Survey Location BB2	Survey Location BB3	Survey Location BB4	Survey Location BB5	Survey Location BB6	Survey Location BB7
Construction Compound	No	No	Yes	No	N0	No	No
Closest Waterbody	Brewery Stream _010	Brewery Stream _010	Dublin Bay	Brewery_010	Brewery_010	Dublin Bay	Dodder_050
Distance to Waterbody	Culverted under road	10m from survey point	15m	Waterbody culverted under road	Waterbody culverted under road	Directly adjacent to survey point	Waterbody directly under bridge
River Flow	-	Low water level, fast flow with ripples	Moderate flow	-	-	Moderate flow	Low water level, moderate flow
Water Quality	-	Clear water, no sign of pollution, no rubbish	Visually clear	-	-	No rubbish visible, low tide unable to see quality of water	Water is slightly discoloured
Run-off pathway	-	Possibly pathway via road gullies	Unclear only slit drain present in construction compound	-	Storm water drain present	Potential pathway from road	Potential pathway from surface water runoff
Run-off risk	-	Medium	Medium	-	-	Low	Medium
Riverbed observations	-	Pebbles and small boulders present along the river bed	-	-	-	-	Pebbles and small rounded boulders along the river bed
Riverbank observations	-	Stone walls with grass verge downstream	Erosion visible on banks	-	-	Concrete walls separating beach from path	Concrete walls alongside the river, grass verge present on one side
Features	-	Bridge crossing river downstream, partially culverted	Weir present adjacent to river	-	-	-	Bridge crossing river
Barriers	-	Culverted under road, stone walls along the bank.	-	-	-	Concrete walls separating beach from path	Concrete walls along river's edge
Riparian Detail	-	-	-	-	-	-	-

Survey Attribute	Survey Location BB1	Survey Location BB2	Survey Location BB3	Survey Location BB4	Survey Location BB5	Survey Location BB6	Survey Location BB7
Comments	Water body culverted under road, surrounding area consists of impermeable surface, manhole cover present 10m south of survey point.	Survey location appears to be last point of culvert. Active discharge outfall at location.	Construction compound located beside river. Slit drain present in the middle of the construction compound, unclear where this drains to.	Construction area located beside site. Japanese Knotweed present in the site.	Waterbody culverted under road. Petrol station/car wash located over waterbody. Storm water drains present at petrol station.	No rubbish visible on beach.	Water is shallow and slightly discoloured.

13.3.5 Designated Sites

The designated sites that are considered in Section 13.3.9 as part of the determination of sensitivity for each water body are located within the Liffey and Dublin Bay catchment. The sites described comprise Special Area of Conservation (SAC), Special Protection Areas (SPA), proposed Natural Heritage Areas (pNHA and NHAs), Nutrient Sensitive Areas, salmonid rivers, shellfish areas and marine bathing waters.

A review of the Natura 2000 network was conducted to determine those European sites which are within the study area and / or hydrologically connected to the water bodies listed in Section 13.3.3. A full assessment of potential impacts on designated European Sites, including hydrological links and water dependant species or habitats, is contained within Chapter 12 (Biodiversity) and Figure 12.2 in Volume 3 of this EIAR shows the hydrological connectivity to the Proposed Scheme. The following European sites were identified to be relevant to this assessment:

- South Dublin Bay SAC (site code: 000210) (approximately 10m from the closest point of the Proposed Scheme);
- South Dublin Bay and River Tolka Estuary SPA (site code: 004024) (approximately 0m from the closest point of the Proposed Scheme);
- North Bull Island SPA (site code: 004006) (approximately 5km from the closest point of the Proposed Scheme);
- North Dublin Bay SAC (site code: 000206) (approximately 5km from the closest point of the Proposed Scheme);
- Rockabill to Dalkey Island SAC (site code: 00300) (approximately 5.5km from the closest point of the Proposed Scheme);
- Howth Head SAC (site code: 000202) (approximately 9km from the closest point of the Proposed Scheme);
- Baldoyle Bay SPA (site code: 004016) (approximately 19km from the closest point of the Proposed Scheme) ;
- Baldoyle Bay SAC (site code:000199 (approximately 16km from the closest point of the Proposed Scheme));
- Ireland's Eye SPA (site code: 004117) (approximately 16km from the closest point of the Proposed Scheme);
- Ireland's Eye SAC (site code: 002193) (approximately 16km from the closest point of the Proposed Scheme); and
- Dalkey Islands SPA (site code: 004172) (approximately 6km from the closest point of the Proposed Scheme).

In addition, the following Natural Heritage Areas proposed for designation under Irish national legislation (pNHAs) located within the study area / hydrologically connected are:

- South Dublin Bay pNHA (site code: 000210);
- Booterstown Marsh pNHA (site code: 001205); and
- Grand Canal pNHA (site code: 002104).

There is one Nutrient Sensitive Area within the study area, the Liffey Estuary. It is designated under the UWWT Directive (refer to Figure 13.2 in Volume 3 of this EIAR).

There are no designated shellfish areas within 2km of the Proposed Scheme.

There are four designated marine bathing waters in proximity to the Proposed Scheme. The EPA published its Bathing Water Quality - A Report for the Year 2020 in May 2020 (EPA 2020b) and the website beaches.ie keeps this information regularly updated. The beaches and the most up to date assessment (checked April 2022 and based on May to September 2021 sampling results) of their quality is provided below:

- Merrion Strand (approximately 0.1km from Brewery Stream_010 outfall to Dublin Bay– the closest point of the Proposed Scheme) - Excellent Quality;
- Sandymount Strand (approximately 0.25km from the closest point of the Proposed Scheme) Poor Quality (and was closed for the Summer 2021 bathing season);
- Seapoint (approximately 1km from the closest point of the Proposed Scheme – Excellent Quality;
- Shelley Banks (approximately 2.5km from the closest point of the Proposed Scheme) – Excellent Quality;
- Half Moon (approximately 4kmfrom the closest point of the Proposed Scheme) – Excellent Quality;
- North Bull wall (approximately 6km from the closest point of the Proposed Scheme) – Poor Quality; and
- Dollymount Strand (approximately 7km from the closest point of the Proposed Scheme) – Poor Quality.

No designated salmonid rivers were identified within the study area during the desk study.

13.3.6 Drinking Water Supply (Surface Water Abstractions)

There are no Geological Survey Ireland (GSI) Public Supply Source Protection Areas or 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 Drinking Water Rivers.

13.3.7 Known Pressures

The EPA online interactive map and database for water (EPA 2020a) was reviewed to determine pressures on water bodies and the presence of point source discharged from EPA licensed activities within the study area. Pressures common to all water bodies in the study area are discharges from urban wastewater systems (via storm water overflows (SWOs)) and urban surface runoff. Further details on these for each water body are provided in Section 13.3.9.

There are no Wastewater Treatment Plants (WwTP) or IE / IPPC licensed sites in the study area. There are 28 discharge locations within the study area. Some discharge directly to water bodies, however most go to Ringsend WwTP.

13.3.8 Existing Drainage

A desk study of the existing road drainage system within the study area, using online mapping tools (Google street view and OpenStreetMap) and historical sewer network information, was conducted to determine the existing road drainage and the level of treatment and attenuation provided currently.

The pressures identified for the water bodies in the study area include diffuse pollution and discharges from SWOs. These pressures result from failures in the drainage system, either as a result of insufficient capacity, poor

maintenance or incorrectly connected wastewater from domestic or commercial properties. It is likely that some or all of these issues are present within the study area.

Surface water runoff from the Proposed Scheme will discharge directly to each of the segments of Brewery Stream_010 which are crossed and then indirectly to Dublin Bay. Surface water runoff for a large proportion of the Proposed Scheme will discharge to a combined sewer system and from there on to Ringsend WwTP.

The Proposed Scheme is described as per the five subsections below

- Section 1 - Stradbrook Road to Booterstown Avenue;
- Section 2 - Booterstown Avenue to Nutley Lane;
- Section 3 - Merrion Road (Nutley Lane to Ballsbridge);
- Section 4 - Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street); and
- Section 5 - Nutley Lane.

Details of the existing drainage are provided in Table 13.9.

Table 13.9: Existing Drainage

Catchment	Existing Network Type	Proposed Scheme Section ID	Section Description	Existing Outfall Water body
Catchment 1	Surface Water (Storm)	1	Stradbrook Road to Booterstown Avenue	Brewery Stream_010 (Brewery Stream)
Catchment 2	Combined			Ringsend WwTP
Catchment 3	Surface Water (Storm)			Brewery Stream_010 (Priory Stream)
Catchment 4	Surface Water (Storm)			Brewery Stream_010 (Priory Stream (Via S/W drains in Blackrock Park))
Catchment 6	Surface Water (Storm)	1 & 2	Stradbrook Road to Booterstown Avenue & Booterstown Avenue to Nutley Lane	Ringsend WwTP
Catchment 5	Surface Water (Storm)	2	Booterstown Avenue to Nutley Lane	Brewery Stream_010 (Booterstown Stream)
Catchment 7	Surface Water (Storm)			Brewery Stream_010 (Elm Park Stream)
Catchment 8	Surface Water (Storm)			Ringsend WwTP
Catchment 9	Combined	3	Merrion Road (Nutley Lane to Ballsbridge)	Ringsend WwTP
Catchment 10	Surface Water (Storm)			Ringsend WwTP
Catchment 11	Combined			Ringsend WwTP
Catchment 12	Combined			Ringsend WwTP
Catchment 13	Combined	4	Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street Lower)	Ringsend WwTP
Catchment 14	Combined			Ringsend WwTP
Catchment 15	Combined			Ringsend WwTP
Catchment 16	Combined			Ringsend WwTP
Catchment 17	Combined			Ringsend WwTP

13.3.9 Surface Water Features

The four WFD water bodies within the study area, Brewery Stream_010, Dublin Bay, the Dodder_050 and the Grand Canal are discussed in this section. The Dodder_050 and the Grand Canal flow into the Liffey Valley Estuary Lower and subsequently Dublin Bay. Brewery Stream_010 is an unusual water body because it comprises a number of segments which are hydrologically not connected to each other but flow directly into Dublin Bay. For this reason the EPA river name is also provided for context and to distinguish between the segments. The Dodder_050 is contained within the RBMP 2018 - 2021 ‘Priority Areas for Action’ (DHPLG 2018).

In addition, the desk study identified two surface water features within the study area which is not classified as WFD water bodies: Booterstown Marsh and Nutley Stream. The marsh is part of the South Dublin Bay and River Tolka Estuary SPA and connects directly to Dublin Bay via an outfall / inlet to the north of Booterstown Park car park. Nutley Stream is a small watercourse which runs from Merrion House car park east to Booterstown Marsh.

Table 13.10 details the distances and number of crossings of each water body within the study area.

Table 13.10: Distance of the Water bodies Within the Study Area to the Proposed Scheme and the Individual Sections of the Proposed Scheme

WFD Water body (EPA Name)	Nearest Proposed Scheme Section	Approx. Distance from Proposed Scheme (m)	Number of Crossings
Brewery Stream_010 (Brewery Stream)	Stradbrook Road to Booterstown Avenue	0	1
Brewery Stream_010 (Priory Stream)	Stradbrook Road to Booterstown Avenue	0	1
Brewery Stream_010 (Booterstown Stream)	Booterstown Avenue to Nutley Lane	0	1
Brewery Stream_010 (Elm Park Stream)	Booterstown Avenue to Nutley Lane	0	1
Booterstown Marsh and Nutley Stream	Booterstown Avenue to Nutley Lane	15	0
Dublin Bay	Booterstown Avenue to Nutley Lane	10	0
Dodder_050	Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)	0	1
Grand Canal Main Line (Liffey and Dublin Bay)	Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)	0	1

13.3.9.1 Brewery Stream_010

Brewery Stream_010 is made up of a number of segments:

- Brewery Stream;
- Priory Stream;
- Booterstown Stream; and
- Elm Park Stream.

Each segment outfalls to Dublin Bay without any hydrological connection to the other segments:

- Brewery Stream (EPA segment) rises on the N31 Brewery Road adjacent to the Leopardstown Tennis Club and has a segment length of 3.2km.
- Priory Stream (EPA segment) rises in Stillorgan Park, has a segment length of approximately 2.4km and travels through a culvert, from the Frascati Centre, under Blackrock Park.
- Booterstown Stream, also known as Trimlestown Stream (EPA segment), has a segment length of 191m and flows along the northern boundary of Booterstown Marsh, before joining Nutley Stream (non WFD surface water feature) and then into Booterstown Marsh (see Section 13.3.9.2).
- Elm Park Stream (EPA segment) rises north of the Health Sciences Centre and flows north-east for approximately 1.3km before flowing into Dublin Bay. The land use along the majority of the watercourse is recreational (golf course) before flowing north-east through Elm Park Business Campus. The land use along Brewery Stream_010 is mainly urban residential.

The Proposed Scheme crosses the water bodies at the following locations:

- Temple Road, to the east of Barclay Court (Brewery Stream);
- N31 Frascati Road at Frascati Centre (Priory Stream);
- R118 Merrion Road towards the north end of Booterstown Marsh (Booterstown Stream); and
- R118 Merrion Road at Elm Park Business Campus (Elm Park Stream);

The EPA River Quality survey results are not available for Brewery Stream_010.

In terms of assigning sensitivity, Brewery Stream_010 has Moderate WFD status. For the most part, the segments of Brewery_010 are culverted for their full length and so may be considered to be heavily modified with little ecological potential possible. This means the sensitivity would be medium. However, all (except one) of the water body segments have a direct and very short (<1km) connection to Dublin Bay SAC. This would suggest a Very High sensitivity. Taking into account the modifications to the water body and the Moderate status, a High sensitivity is assigned.

13.3.9.2 Booterstown Marsh and Nutley Stream

Booterstown Marsh is the only remaining saltmarsh in South Dublin Bay. It is located between the R118 Rock Road, Dart Railway Line and the culverted Booterstown Stream. It is a potential National Heritage Area (pNHA). Booterstown Marsh is approximately 4.3 hectares (ha) in size. It is a brackish water marsh with both salt and freshwater intakes and is connected to the sea at Williamstown Lagoon by a sluice which floods the marsh at each high tide.

The freshwater Nutley Stream runs along the sea boundary of the marsh and ultimately flows , to Dublin Bay. This water body is not contained within Brewery Stream_010 and is not a WFD water body. Nutley Stream has been highly modified and is culverted under Dublin City for the majority of its length (approximately 3.3km) from Airfield to Booterstown Marsh (Sweeney 1991). The combination of this freshwater source and the saltwater marine input leads to varying degrees of salinity within the Marsh and supports a variety of internationally important bird species. Furthermore, the *Puccinellia maritima* (common saltmarsh-grass), which is a protected plant species under Section 21 of the Wildlife Act, 1976, and as listed under S.I. No. 356/2015 - Flora (Protection) Order, 2015, also occurs within the marsh.

Nutley Stream and Booterstown Marsh are considered as one surface water feature. As the marsh has a direct connection to South Dublin Bay SAC and is a potential Natural Heritage Area (pNHA), these waterbodies are assigned a Very High sensitivity.

13.3.9.3 Dublin Bay

Dublin Bay is a United Nations Educational, Scientific and Cultural Organisation (UNESCO) Biosphere Reserve which protects the areas in Dublin Bay of high ecological value and the surrounding areas which support the associated protected species and habitats. The UNESCO Biosphere covers most of Dublin Bay (300km^2) and aims to ensure the protection of its water quality and biodiversity. The coastal water body has Good WFD Status and is 'Not at Risk' of not meeting the WFD objectives.

There are several designations in the Dublin Bay area; of particular note to the Proposed Scheme is the South Dublin Bay SAC.

As this is a UNESCO and European designated site and is of good status, it is assigned as Extremely High sensitivity.

13.3.9.4 Dodder_050

The River Dodder has a total catchment area of 167.7km^2 and rises on the northern flanks of the Dublin Mountains, flowing 26km north through the Upper and Lower Glenasmole reservoirs and onward through South Dublin, becoming tidal near Lansdowne Road before entering the River Liffey at Ringsend. The land in the Dodder catchment consists of agricultural land in the upstream reaches and urban land within the mid to lower stream extents. The Dodder_010 and Dodder_020 (the upper part of the catchment) are in a protected Drinking Water Area. Although the River Dodder is not a designated salmonid river there is an important trout and salmon fishery in the lower sections, with ongoing work to remove weirs and open up more of the river for fish passage. The Inland Fisheries Ireland (IFI) identified the importance of this water body for salmonid species in its response to the scoping report consultation.

The EPA segment of the Dodder within the study area is the Dodder_050. The Dodder_050 segment is 29.63km long from Templeogue to where it joins the Liffey Estuary Lower at Ringsend.

The Dodder_050 will be crossed by the Proposed Scheme at Ballsbridge. The Dodder_050 has Moderate WFD Status and is 'At Risk' of not achieving the WFD objective of Good Status by 2027. The main risks are anthropogenic pressures, diffuse urban runoff and urban wastewater.

The River Dodder was last surveyed in 2019. The EPA River Quality Surveys (EPA 2020b) stated:

> '*Satisfactory ecological conditions continue in the upper reaches (0010,0100) with the diversity of pollution sensitive macroinvertebrates indicating a return to high ecological conditions upstream of the Reservoir (0010). A welcome improvement to good ecological conditions was noted at Old bawn (0300) in August 2019, after a decline in 2016. Station 0620 (Springfield Ave) also improved slightly to Moderate conditions, while the lowest station at Beavor Row (0900) remained Moderate'*.

An EPA National Monitoring Station (ID. 1000) is located on the Proposed Scheme, at Ballsbridge. However, the last time a Q value was recorded from this station was 1984 when it was assigned a Q Value of Q2 to Q3. The next closest station is 0900, which is 1km upstream at Donnybrook. This station was assigned a Q Value of Q3 to Q4 in 2019. However, the assessment indicates the biological quality trends of the River Dodder catchment.

In terms of assigning sensitivity, the water body has Moderate WFD status. It has a direct connection to the Liffey Estuary Lower, which is a Nutrient Sensitive Area. It is 4.5km from South Dublin Bay and Tolka Estuary SPA and it is 5.5km from North Dublin Bay SAC (at the point at which the Proposed Scheme crosses it). In addition, salmonid species are also present, although it is not a designated salmonid water body. Therefore, it is assigned a High sensitivity.

13.3.9.5 Grand Canal Main Line (Liffey and Dublin Bay)

The Grand Canal Main Line (Liffey and Dublin Bay) (hereafter referred to as the Grand Canal) is an artificial water body, primarily used for recreation. Constructed in the 18th Century, the Grand Canal traverses the country from Dublin to Shannon for approximately 131km. Waterways Ireland are responsible for the monitoring of this water body.

The Grand Canal will be crossed by the Proposed Scheme at the Baggot Street Bridge, where Baggot Street Lower and Baggot Street Upper meet.

As stated in the EPA report Water Quality in Ireland 2013 - 2018 (EPA 2019), assessments of the canals using macroinvertebrates indicates generally good biological conditions. Similarly, positive results were identified in terms of macrophyte assessment. The Grand Canal achieved Good ecological potential in the period from 2013 to 2015.

The water body has Good WFD status. It has a direct connection to the Liffey Estuary Lower, which is a Nutrient Sensitive Area; it is 4.5km from South Dublin Bay and Tolka Estuary SPA and it is 5.5km from North Dublin Bay SAC (at the point at which the Proposed Scheme crosses it). In addition, coarse fish species are also present (IFI Consultation response). Therefore it is assigned a High sensitivity.

13.3.9.6 Summary of Baseline Receptor Sensitivity

Table 13.11: Summary of Baseline Receptor Sensitivity

Water body	Attributes	Indicator / Feature	Sensitivity
Brewery Stream_010	Heavily culverted river	Moderate WFD Status Anthropogenic Pressures Significant modification <2km Direct connection to designated site (South Dublin Bay SAC)	High
Booterstown Marsh and Nutley Stream	Wetland	<2km Direct connection to designated site (South Dublin Bay SAC) pNHA	Very High
Dublin Bay	Coastal water body	Water body protected by EU legislation (SAC)	Extremely High

Water body	Attributes	Indicator / Feature	Sensitivity
Dodder_050	Stone-walled river	Direct hydrological connection with Designated Nutrient Sensitive Area (Liffey Estuary Lower) Moderate WFD Status	High
Grand Canal Main Line (Liffey and Dublin Bay)	Artificial water body	Good Ecological Potential Direct hydrological connection with Designated Nutrient Sensitive Area (Liffey Estuary Lower) pNHA Site	High

13.3.10 Flood Risk

Flood Risk is not considered as part of the impact assessment in this Chapter; a separate Site Specific FRA has been completed for the Proposed Scheme. However, given the connectivity between this assessment and the FRA, a summary of the baseline flood risk and the assessment of future risk from the FRA is provided here for ease of reference.

The FRA has been prepared in accordance with the Department of the Environment, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) Planning System and Flood Risk Management Guidelines for Planning Authorities (hereafter referred to as the FRM Guidelines) (DEHLG and OPW 2009). A copy of the FRA Report is in Appendix A13.2 in Volume 4 of this EIAR.

The FRM Guidelines define three Flood Zones:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% Annual Exceedance Probability (AEP) or 1 in 100 years for river flooding or 0.5% AEP or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1,000 year and 1% AEP or 1 in 100 years for river flooding and between 0.1% AEP or 1 in 1,000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1,000 for both river and coastal flooding).

Flood Zone C covers all areas which are not in Flood Zone A and Zone B.

13.3.10.1 Historic Flooding

There are a number of historic flood events at different locations along the Proposed Scheme, including at Temple Road, Booterstown, Merrion and Nutley and Elm Park Streams.

In Section 3 (Merrion Road), Section 4 (Ballsbridge to Merrion Square) and Section 5 (Nutley Lane), the Dodder has been the most common source of flooding. However parts of the River Dodder Flood Alleviation Scheme and upgrades to the local drainage network have since been carried out thereby reducing the risk of flooding in this area.

13.3.10.2 Coastal Flood Risk

Merion Strand is the only area identified along the Proposed Scheme where there is a risk of fluvial flooding, which falls within Flood Zone A.

13.3.10.3 Groundwater Flood Risk

Groundwater vulnerability varies along the Proposed Scheme from Low to Moderate.

13.3.10.4 Pluvial flood Risk

The pluvial flood risk along the majority of the Proposed Scheme in Sections 1 (Stradbrook Road to Booterstown Avenue) and Section 2 (Booterstown Avenue to Nutley Lane) is Medium. In the remaining sections of the Proposed Scheme, the pluvial flood risk is Medium to High.

13.3.10.5 Fluvial Flood Risk

Frascati Road, Merrion Road and Ballsbridge are at risk of fluvial flooding, which all lie within Flood Zone B.

13.4 Potential Impacts

This Section presents potential impacts that may occur due to the Proposed Scheme, taking into account the proposed drainage design as set out in Section 13.4.1, but in the absence of any further mitigation. This informs the need for mitigation or monitoring to be proposed (refer to Section 13.5). Predicted 'residual' impacts taking into account any proposed mitigation is then presented in Section 13.6.

13.4.1 Characteristics of the Proposed Scheme

Full details of the Proposed Scheme are provided in Chapter 4 (Proposed Scheme Description) but elements of relevance to the surface water impact assessment are provided below.

13.4.1.1 Impermeable Areas and Drainage Design

The drainage design is based on a number of general principles, which are set out in the document 'BusConnects Core Bus Corridor Drainage Design Basis' (NTA 2020). A SuDS drainage design has been developed as a first preference and in accordance with the SuDS Management Train described in the CIRIA SuDS manual (CIRIA 2015). The CIRIA SuDS Manual recommends that when considering SuDS solutions, the preferred approach is a hierarchy whereby runoff using source control solutions (e.g. pervious surfacing) are considered first. Where source control is not possible or cannot fully address an increase in runoff from a development, residual flows are then managed using site controls (e.g. bioretention / infiltration basins). If this is not practical or residual flows remain above existing runoff rates, regional controls (e.g., oversized pipes) are used. SuDS provide the dual benefits of controlling flow and treating water quality.

In areas where the catchment is proposed to remain unchanged as no additional impermeable areas are proposed, the design consists of relocating existing gullies (where possible) to new locations.

The drainage design principles have informed the drainage design (see Chapter 4 (Proposed Scheme Description) and Appendix A4.1 in Volume 4 of this EIAR) which will ensure no net increase in the surface water flow discharged to these receptors.

The proposed drainage design includes the relocation and addition of drainage gullies.

In a number of areas along the Proposed Scheme, there will be either no increase or a reduction in impermeable areas. Where an increase in impermeable area is proposed, the following SuDS types are proposed:

- Bio retention / rain garden areas;
- Filter Drains (FD);
- Tree Pits (TP);
- Sealed Drains (SD); and
- Oversized pipes (OSP).

These SuDS measures allow a level of treatment and / or attenuation to be provided before discharge to the network, reducing the impact on water quality as well as preventing an increase in runoff rates. The details of drainage measures proposed for each catchment and subsequently each water body are provided in Table 13.12. No new outfalls are proposed.

Table 13.12: Proposed SuDS and Impermeable Area changes

Existing Catchment Reference	Water body	Impermeable Area			SuDS Measures Proposed
		Impermeable Surface Area (m^2)	Change (m^2)	% Change	
Catchment 1	Brewery Stream_010 (Brewery Stream)	N/A	No change	-	None
Catchment 2	Ringsend WwTP	N/A	No change	-	None
Catchment 3	Brewery Stream_010 (Priory Stream)	N/A	No change	-	None
Catchment 4	Brewery Stream_010 (Priory Stream (Via S/W drains in Blackrock Park))	4,306	423	10	FD, TP & OSP
Catchment 6	Ringsend WwTP	N/A	No change	-	None
Catchment 5	Brewery Stream_010 (Booterstown Stream)	6,770	1,232	18	FD, TP & SD
Catchment 7	Brewery Stream_010 (Elm Park Stream)	13,459	1,811	13	FD, TP, OSP & SD
Catchment 8	Ringsend WwTP	1,231	79	6	FD, TP & OSP
Catchment 9	Ringsend WwTP	3,727	200	5	FD, TP & OSP
Catchment 10	Ringsend WwTP	N/A	No change	-	None
Catchment 11	Ringsend WwTP	N/A	No change	-	None
Catchment 12	Ringsend WwTP	187	52	28	Bio-retention/rain gardens & SD
Catchment 13	Ringsend WwTP	N/A	No change	-	None
Catchment 14	Ringsend WwTP	N/A	No change	-	None
Catchment 15	Ringsend WwTP	N/A	No change	-	None
Catchment 16	Ringsend WwTP	N/A	No change	-	None
Catchment 17	Ringsend WwTP	N/A	No change	-	None

Table 13.13: Summary of Increased Impermeable Areas by water body

Water body/Outfalls to	Approx. Impermeable Surface Area		
	Existing (m^2)	Additional (m^2)	% change
Brewery Stream_010	24,535	3,466	14
Booterstown Marsh and Nutley Stream	N/A	No change	-
Dublin Bay	N/A	No change	-
Dodder_050	N/A	No change	-
Grand Canal Main Line	N/a	No change	-
Ringsend WwTP	5,145	331	6

13.4.1.2 Key Infrastructure Proposed

Key infrastructure elements for the Proposed Scheme are described in detail within Chapter 4 (Proposed Scheme Description) of this EIAR. Chapter 5 (Construction) describes the Construction Phase for the works related to these key infrastructure elements.

13.4.2 'Do Nothing' Scenario

In the Do Nothing Scenario, the Proposed Scheme would not be implemented and there would be no changes to existing highway infrastructure, so infrastructure provision for buses, pedestrians and cyclists would remain the same.

The Baseline (see Section 13.3) includes a description of the current status of the environment in and around the area in which the Proposed Scheme will be located and identifies the existing pressures on the water bodies within the study area. These are identified and categorised under the RBMP 2018-2021 process under baseline conditions (i.e. what is there at present) and reported by the EPA. The RBMP categorises significant pressures impacting water bodies 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 hydromorphological changes are subject to more long-term trends.

Future trends are determined based on the significant pressures identified under the RBMP, and the measures and actions in relation to policy and monitoring identified for the water bodies to meet the requirements of the WFD Directive and any information available detailing progress on those measures or actions.

The most significant pressure on water bodies within the study area are diffuse urban runoff and urban wastewater. Dodder_050 has pressures from urban runoff in relation to misconnections causing exceedances in Environmental Quality Standard (EQS) values since 2011. Further investigation is needed under the Local Authority Waters Programme (LAWPRO) to determine the nature and extent of impacts.

Dodder_050 is also under pressure from urban wastewater and EQS exceedances have also been an issue, particularly in relation to phosphate, ammonia and dissolved oxygen. Storm water overflows have been identified as the significant pressure impacting the Dodder_050 and a load reduction analysis has been identified as an action to be undertaken by the LAWPRO to determine the impact of the misconnections and also how / if the Dodder Flood Project misconnection repairs had a significant impact.

Brewery Stream_010 is under pressure from anthropogenic pressures, however more assessment is needed to assess the pressure in partnership with Dun Laoghaire-Rathdown County Council and the EPA.

The Draft RBMP includes an action for Irish Water to continue investment in wastewater infrastructure with Irish Water investing in 83 wastewater treatment plants and 10 collection networks at an estimated cost of €1.022bn, over the period 2020-2024. In addition. As part of Ireland's National Recovery and Resilience Plan (2021), Irish Water will be delivering its enhanced Ambition Programme, which aims to deliver 10 priority wastewater treatment plant projects whose discharges have been identified as being significant pressures on receiving water bodies.

With these investigations, programmes and actions in place to locate and improve deficient infrastructure, it is anticipated that pressures from urban wastewater and urban runoff will be reduced over the coming years. Therefore, in the absence of the Proposed Scheme the surface water environment in the area should improve, particularly in relation to water quality.

13.4.3 'Do Minimum'

The potential for changes in traffic loading on side roads, as set out in Section 13.2.4.5 of this chapter, means that the assessment of potential operational impacts from the Proposed Scheme is required to consider an additional future baseline scenario, as well as Do Nothing; Do Minimum, in line with the assessment of impacts on traffic as set out in Chapter 6 (Traffic and Transport).

The 'Do Minimum' scenario (Opening Year 2028, Design Year 2043) represents the likely traffic and transport conditions of the direct and indirect study areas including for any transportation schemes which have taken place, been approved or are planned for implementation, without the Proposed Scheme in place. This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something') for the quantitative assessments.

Further detail on the Proposed Scheme and demand assumptions within this scenario is included in Chapter 6 (Traffic & Transport).

The outputs of the transport modelling for these future scenarios are used in the operational impact assessment in Section 13.5.3 of this chapter. In terms of the potential future baseline of the surface water environment under these two scenarios, there is a great deal of uncertainty, however it is reasonable to assume that the measures set out in the current and draft RBMPs (once agreed) will be implemented and improvements to water bodies in terms of their biological, water quality and hydromorphology will continue to enable as many water bodies as possible to achieve 'Good' status by 2027.

13.4.4 Construction Phase

13.4.4.1 Introduction

Chapter 5 (Construction) outlines the principal Construction Phase activities required to complete the Proposed Scheme and includes details of these activities such as road widening and narrowing, new and / or improved footpaths, cycle tracks, pavement repairs, road resurfacing, junction upgrades, new or improved lighting, bus stops, retaining walls and any other upgrade works, where relevant.

In addition to a detailed description of the works involved, Chapter 5 (Construction) also details the location of the construction compound, the location and duration of any necessary traffic diversions, hours of working, and numbers of personnel involved.

The duration of the Construction Phase is estimated to be 24 months. The Construction Compound will be in place for the full duration of the extent of the works they support and will be removed following completion of the works they support.

The assessment considers the potential impacts of the Proposed Scheme construction activities prior to mitigation or control measures being implemented.

13.4.4.2 Potential Construction Phase Impacts

There are a number of potential impacts which, in the absence of mitigation could occur during the construction of the Proposed Scheme in relation to hydrology, water quality and hydromorphology. The potential for any of these types of impacts are considered for different construction activities for each water body within the study area. These potential construction phase impacts include:

13.4.4.2.1 Hydrology

- Disruption to local drainage systems due to diversions required to accommodate the construction works.
- Temporary increase in hard standing areas and / or soil compaction during construction works which could result in temporary increased runoff rates to water bodies.

13.4.4.2.2 Water Quality

- Silty water runoff containing high loads of suspended solids from construction activities. This includes the stripping of topsoil / road surface during site preparation; the construction of widened roads; the dewatering of excavations and the storage of excavated material.
- Contamination of water bodies with anthropogenic substances such oil, chemicals or concrete washings. This could occur because of a spillage or leakage of oils and fuels stored on site or direct from construction machinery, or from the storage of materials or waste in proximity to water bodies or drains connected to the water bodies.
- Re-exposure of historically settled contaminants within or near to water bodies as a result of working within or near to the water body.

13.4.4.2.3 Hydromorphology

- Increased sediment loading as a result 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.
- Modifications to the morphological characteristics of the water body, such as alterations to banks for construction or other works.

13.4.4.3 Assessment of Potential Impacts on Receptors

Detailed assessment of the potential impacts on receptors is provided here and a summary table for all receptors provided in Table 13.14.

13.4.4.3.1 Brewery Stream_010

Brewery Stream and Priority Stream segments of this water body are crossed by Section 1 (Stradbrook Road to Booterstown Avenue) of the Proposed Scheme, in which it is proposed to provide a single bus lane, a single general traffic lane and a segregated cycle track in each direction. Land take will be required, however existing green space will be retained. The widening will be in existing hard standing areas only. The nature of the works proposed are intrusive but of a minor extent and impacts therefore have the potential to be short term, adverse and of small magnitude resulting in an impact of Moderate to Slight significance.

Booterstown Stream and Elm Park Stream are crossed by Section 2 (Booterstown Avenue to Nutley Lane) of the Proposed Scheme in which it is proposed to provide a single bus lane, a single general traffic lane and segregated cycle tracks in each direction. The existing boundary wall for land to the immediate north of Booterstown Marsh is proposed to be set back in phased way to approximately 2m; 2m working area behind it will also be required. The wall will require shallow footings in its new location. Brewery Stream_010 is in culvert under the road and to its confluence with Dublin Bay immediately adjacent to the start of the proposed works in this location. There will be no direct impacts over land to the water body but there is a direct hydrological link via surface water drains in the road close to the proposed works. This could result in impacts on the water quality of the water body. These include silty water runoff and hydrocarbons from either leaking plant and machinery or accidental spillage during refuelling. This has the potential to result in short term, adverse, water quality impacts of small magnitude, resulting in an impact of Moderate to Slight significance. There will be no impacts on ecological systems or hydromorphology because the water body is fully in culvert; there is however potential for this water body to act as a conduit of contaminated water to Dublin Bay where such impacts could occur (See Section 13.4.4.3.3).

Surface water on Nutley Lane drains to the Elm Park Stream segment of this water body. In Section 5 (Nutley Lane) of the Proposed Scheme, it is proposed that four lanes - two bus lanes and two general traffic lanes - will be provided, in addition to a cycle track and pedestrian crossings. Some land take is required, however these works are not deep or extensive earthworks. This has the potential to lead to short term, adverse impacts of negligible magnitude, resulting in an impact of Imperceptible significance.

A Construction Compound is proposed at Booterstown car park within Blackrock Park on the R118 Rock Road, opposite Willow Terrace near to Booterstown Marsh and Nutley Stream (15m from this water body). Booterstown Marsh is connected to Dublin Bay, via Nutley Stream which is culverted under the railway. There is a slit drain within the car park itself which is not present on drainage records; it is therefore not clear whether there is a connected surface water drain in this location and, if it is connected, where it connects to. In the absence of this information, a precautionary approach is taken, and a reasonable worst-case scenario assumed. Given the proximity to Nutley Stream and its short and direct connection to Dublin Bay SAC, it assumed this slit drain connects to Nutley Stream. There would be no direct connection to Brewery Stream_010 via surface water drains.

There is, however, a potential pathway to Brewery Stream_010 (Booterstown Stream) via overland flows to surface water drains in the road, although this is considered unlikely to occur. There is a low wall along the length of the car park which would act as a bund, containing any potential spillages or silty water. No impacts are anticipated via this pathway.

13.4.4.3.2 Booterstown Marsh and Nutley Stream

In the event of an accidental spillage of fuels or chemicals at the Construction Compound there is potential for significant impacts on Nutley Stream. Even though Nutley Stream is not a WFD water body and is not assigned a WFD status; it is closely connected to Dublin Bay SAC and is therefore assigned a Very High sensitivity. A spillage in this location has the potential to lead to short to medium term potential impacts of large magnitude resulting in an impact of Profound significance.

In terms of impacts via overland flows there is a low likelihood of any spillages reaching Nutley Stream in this manner since the car park is surrounded by a grass verge, which is bounded to the north by a cycle path, and there is additional vegetation along the banks of the water body, effectively acting as bunding and minimising impacts. Any spillages which were able to reach the water body would be relatively minor in nature, leading to short to medium term potential impacts of small magnitude, resulting in Significant impacts.

13.4.4.3.3 Dublin Bay

There are indirect discharges of surface water to Dublin Bay in Section 1, Section 2 and Section 3 of the Proposed Scheme. There are no direct discharges to Dublin Bay from the Proposed Scheme.

Section 1 proposals, as set out above, include land take, however the works to be undertaken are not deep or extensive earthworks. Given there is no direct connection to Dublin Bay, indirect impacts would be via Brewery Stream_010, which have the potential to be Slight. Potential impacts on Dublin Bay are therefore expected to be adverse, short term of negligible magnitude, resulting in Imperceptible impacts.

In Section 2, the proposed works to set back the boundary wall in land to the north of Booterstown Marsh have the potential to impact this water body via Brewery Stream_010 (Booterstown Stream). Surface water drains in the road drain to this water body and the distance from these to Dublin Bay is approximately 160m. Impacts identified for water quality in the Brewery Stream_010 culvert are silty water and hydrocarbons. For Dublin Bay, this has the potential to lead to short term, adverse impacts from silty water of small magnitude (owing to the size of the receiving water body), resulting in Significant impacts, and medium to long term adverse impacts from hydrocarbons, of small to large magnitude (depending on whether leaking machinery or a spill), resulting in impacts of Very Significant to Profound significance.

Impacts on Nutley Stream from any accidental spillages at the Construction Compound may have indirect impacts on Dublin Bay. Impact on Nutley Stream if there is a direct connection from the site are potentially of Profound significance. Given the short connection to Dublin Bay (20m) any spillage into Nutley Stream would be similar to a direct spillage into Dublin Bay itself. Dublin Bay is a much larger water body and so the magnitude of the impact would be relatively smaller. However, the nature of the receiving environment means impacts could be longer lasting. Any such spillage therefore has the potential to lead to medium to long term adverse impacts, of medium magnitude, resulting in Very Significant to Profound significance.

In Section 3 (Merrion Road (Nutley Lane to Ballsbridge)) there are substantial infrastructure changes proposed, including the provision of a four-lane carriageway, new footpath and cycle track. However all of the drainage in this area outfalls to Ringsend WwTP and so no impacts on Dublin Bay are anticipated.

13.4.4.3.4 Dodder_050

The Dodder_050 is at the boundary of Section 3 and Section 4 of the Proposed Scheme. Proposals for these sections are largely confined to resurfacing works, realignment of and upgrades of junctions, installation of Bus Gates to reduce traffic flows and the introduction of wider footpaths and additional cycle tracks. Surface water systems in this section of the Proposed Scheme drain to combined sewer and so no impacts are anticipated on the Dodder_050.

13.4.4.3.5 Grand Canal (Main Line Dublin and Liffey Bay)

Widening and narrowing works for realignment of footways / cycleways in the northernmost part of Section 4 of the Proposed Scheme are between 40m and 300m from the water body. As surface water drainage goes to Ringsend WwTP, there will be no impacts on the water body.

It is proposed to upgrade the existing footpath and cycle ramp along the canal tow path at Wilton Terrace. This will include a new section of retaining wall which will be approximately 0.9m high and set on foundations of approximately 0.9m deep. The wall will be set back from the top of the canal bank by 2m. No in-stream working is proposed. The foundations will be poured concrete. Potential impacts from construction of the wall are silty water runoff, hydrocarbons from leaking machinery or accidental spillage during refuelling and concrete washings/leachate from the pouring of the foundations. In addition, this section of the footpath is set above an ESB underground electricity cable which is oil-insulated. This cable has been identified previously (2020) as leaking at points along its length by the EPA (EPA 2020). There is potential for hydrocarbon impacts through the creation of new pathways for potentially contaminated land into the canal and a breach in the cable during construction. Potential impacts are as follows:

- Silty water runoff: short term, adverse and of small magnitude, resulting in an impact of moderate significance;
- Hydrocarbons (machinery or spillage): medium to long term, adverse and of small to large magnitude, resulting in an impact of Moderate to Profound;
- Concrete washings: short term, adverse of moderate magnitude, resulting in a Significant impacts;
- Hydrocarbons (from contaminated land): medium term, adverse of moderate magnitude, resulting in Significant impacts; and
- Hydrocarbons (from a break in the cable): medium to long term, adverse and of large magnitude, resulting in Profound impacts.

The works from Haddington Road Junction to Fitzwilliam Street Lower cross the Grand Canal and therefore there is a much greater potential for the impacts set out in Section 13.4.4.2 associated with increased surface water runoff, silty water and anthropogenic contaminants. However, the proposed works are not deep or extensive earthworks and are largely changes to layouts on the bridge and the junctions approaching it to accommodate cycle routes. This has the potential to lead to short term, adverse impacts of negligible magnitude, resulting in an impact of Imperceptible significance.

Table 13.14: Summary of Potential Construction Phase Impacts on Water bodies within the Study Area

Water body Name	Project Activity	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Brewery Stream_010 (Brewery Stream and Priory Stream segments)	Section 1 – widening of carriageways, provision of cycle tracks and footpath	Increased surface water runoff Increased sediment in runoff Anthropogenic sources (fuel etc.)	Medium	Small	Slight Adverse, Short-term
Brewery Stream_010 (Booterstown Stream segment)	Section 2- movement of boundary wall by 2m.	Increased sediment in runoff	Medium	Small	Slight Adverse, Short-term,
		Anthropogenic sources (fuel etc.)	Medium	Small to large	Slight to Significant Adverse Short to medium term
Brewery Stream_010 (Elm Park Stream segment)	Section 5 - resurfacing/realignment of existing carriageway	Increased surface water runoff Increased sediment in runoff Anthropogenic sources (fuel etc.)	Medium	Negligible	Imperceptible, Adverse, Short term

Water body Name	Project Activity	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Booterstown Marsh and Nutley Stream	Construction Compound at Booterstown Park	Anthropogenic sources (fuel etc.) (direct connection)	Very High	Large	Profound Adverse, Medium to Long term,
Booterstown Marsh and Nutley Stream	Construction Compound at Booterstown Park	Anthropogenic sources (fuel etc.) (overland flow connection)	Very High	Small	Significant Adverse, Short to Medium term
Dublin Bay	Construction compound at Booterstown Playground	Anthropogenic sources (fuel etc.)	Extremely High	Medium	Very Significant to Profound Adverse, Medium to Long term
Dublin Bay	Section 1– widening of carriageways, provision of cycle tracks and footpath	Increased surface water runoff Increased sediment in runoff Anthropogenic sources (fuel etc.)	Extremely High	Negligible	Imperceptible Adverse, Short-term,
Dublin Bay	Section 2- movement of boundary wall by 2m.	Increased sediment in runoff	Extremely High	Small	Significant Adverse, Short term
		Anthropogenic sources (fuel etc.)	Extremely High	Small to large	Significant to Profound Adverse Medium to Long term
Dublin Bay	Section 3- Nutley Lane to Ailesbury Road proposals only - widening of carriageways, provision of cycle tracks and footpath	Increased sediment in runoff Anthropogenic sources (fuel etc.)	Extremely High	None	No impacts from this source
Dodder_050	Sections 3 and 4 - Realignment of footways / cycleways, junction layout changes, upgrades	Increased sediment in runoff Anthropogenic sources (fuel etc.)	High	None	No impacts on this water body
Grand Canal Main Line (Liffey to Dublin Bay)	Section 4 - Realignment of footways / cycleways, junction layout changes, upgrades	Increased sediment in runoff Anthropogenic sources (fuel etc.)	High	Negligible	Adverse, Short term, Imperceptible
	Upgrade to ramp alongside canal at Wilton Terrace	Increased sediment in runoff Hydrocarbons (machinery or spillage) Concrete washings Hydrocarbons (from contaminated land) Hydrocarbons (from a break in the cable)	High	Small	Moderate Adverse Short term
				Small to large	Moderate to Profound Adverse Medium to Long term
				Moderate	Significant Adverse Short term

Water body Name	Project Activity	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
				Moderate	Significant Adverse Medium term
				Large	Profound Adverse Medium to Long term

13.4.5 Operational Phase

13.4.5.1 Overview of Potential Impacts

The potential impacts for the Operational Phase are related to water quality and hydromorphology only. No potential changes to hydrology are anticipated as the drainage design ensures no net increase in runoff rates.

Potential impacts that could occur include:

- Deterioration in water quality from increased levels of 'routine' road contaminates, such as hydrocarbons, metals, sediment and chloride (seasonal) due to:
  - potential increase in pollution and sediment load entering surface water receptors from new or widened roads;
  - Increased impermeable area, and changes to the nature, frequency and numbers of vehicles using the new routes of the Proposed Scheme; and
  - Dispersal of traffic onto the local road network, which may drain to a different catchment or have less stringent pollution control infrastructure.
- Hydromorphology changes due to:
  - Changes in the flow regime due to increased surface water runoff or discharges in new locations, resulting in changes to sedimentation processes and the structure of riverbanks.

13.4.5.2 Assessment of Potential Impacts – Surface Water Runoff

Assessments for each receptor are provided below, with a summary of impacts at Table 13.15.

13.4.5.2.1 Brewery Stream_010

There is an increase in impermeable area of 3,466m^2 for the area of the Proposed Scheme draining to the various Brewery Stream_010 segments in the study area. This equates to an 14% increase impermeable area draining to Brewery Stream_010. A combination of grassed areas and SuDS, in the form of tree pits, filter drains and oversized pipes will ensure no net increase in runoff and provide a level of treatment for routine contaminants from the road networks. Therefore, potential impacts will be permanent and beneficial of negligible magnitude resulting in an impact of Imperceptible significance.

13.4.5.2.2 Dublin Bay

There is limited potential for significant impact on Dublin Bay from the Proposed Scheme, as there is no direct hydrological connection to this water body and therefore no direct pathway for pollutants or increased surface water runoff. There is potential for indirect impacts via Brewery Stream_010 which has a short and close connection to Dublin Bay from the route of the Proposed Scheme. Impacts on Brewery Stream are, however, anticipated to be Imperceptible. Potential impacts on Dublin Bay therefore would be permanent, beneficial and of negligible magnitude, resulting in an impact of Imperceptible significance.

The potential for increased frequency or duration of the operation of storm water overflows (SWOs) discharging to Dublin Bay could result in an indirect impact. The net increase in impermeable area to combined sewers along the Proposed Scheme, including in the area which would discharge to Dublin Bay, is calculated as being an increase of 3,797m^2. SuDS in the form of bio retention areas, tree pits and filter drains will ensure no net increase in runoff and provide a level of treatment for routine contaminants from the road networks. Therefore, potential impacts will be permanent and beneficial of negligible magnitude resulting in an impact of Imperceptible significance.

13.4.5.2.3 Dodder_050

There is no potential for significant impact on the Dodder_050 from the Proposed Scheme, as there is no direct hydrological connection to this water body and therefore no pathway for pollutants or increased surface water runoff.

The potential for increased frequency or duration of the operation of storm water overflows (SWOs) discharging to the Dodder_050 has could result in an indirect impact. The net increase in impermeable area to combined sewers along the Proposed Scheme, including in the area which would discharge to Dodder_050 is calculated as being an increase of 331m^2 which equates to a 6% increase in impermeable area draining to the combined sewer. SuDS in the form of tree pits and filter drains will ensure no net increase in runoff and provide a level of treatment for routine contaminants from the road networks. Therefore, potential impacts will be a permanent and beneficial of negligible magnitude resulting in an impact of Imperceptible significance.

13.4.5.2.4 Grand Canal (Main Line Dublin and Liffey Bay)

There is no potential for significant impact on the Grand Canal from the Proposed Scheme, as there is no direct hydrological connection to this water body and therefore no pathway for pollutants or increased surface water runoff.

Table 13.15: Summary of Potential Operational Phase Impacts from Changes in Impermeable Areas on Water bodies. within the Study Area

WFD Water body Name	Project Activity				
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Brewery Stream_010	Runoff to water body	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse	Medium	Negligible	Imperceptible Permanent Beneficial
Dublin Bay	Indirect Runoff to water body Discharge of SWOs	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse.	Extremely High	Negligible	Imperceptible Permanent Beneficial
Dodder_050 (via SWOs)	Discharge of SWOs	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse	High	Negligible	Imperceptible Permanent Beneficial

13.4.5.3 Assessment of Potential Impacts – Traffic Redistribution

Traffic modelling (Chapter 6 (Traffic & Transport)) has been undertaken for two scenarios: Do Minimum and Do Something for 2028 and 2043. The review of changes in AADT provides a mechanism to understand if the Proposed Scheme could result in traffic redistribution onto the surrounding local road network. A review of the data identified that, for most cases, any increases in traffic on the local road network would not lead to AADTs of greater than 10,000. However, in eight sections of side roads, AADT are predicted to be greater than 10,000 in either or both the 2028 and 2043 Do Something scenarios. Details of these locations are presented in Table 13.16).

Table 13.16 AADT where traffic flows have increased from <10,000 to >10,000 in DS 2028 and / or 2043

Road Name	A_B (GIS)	Length of Section (km)	2028 Do Min	2028 Do Something	%	2043 Do Min	2043 Do Something	%	Closest existing drainage route	Likely change in drainage catchment?	Significant Impact?
Benamore Rd	19475_ 20276	0.35	6832	11061	62	6958	11092	59	Brewery Stream_010	No	No
St. Lorgan Grove	19427_ 19616	0.73	8038	11745	46	7953	11797	48	Brewery Stream_010	No	No
St. Lorgan Grove	19616_ 19427	0.73	9534	14093	48	9556	14116	48	Brewery Stream_010	No	No
Sandform Rd	11318_ 11317	0.1	9702	10925	13	9503	10844	14	Ringsend WwTP	No	No
Pembroke St Lw	6279_ 6443	0.09	9874	13976	42	9719	12541	29	Ringsend WwTP	No	No
Pembroke St Lw	6443_ 6416	0.08	9221	12426	35	9074	11898	31	Ringsend WwTP	No	No
Fitzwilliam Square west	6416_ 6408	0.1	8858	12134	37	8765	11646	33	Ringsend WwTP	No	No
Merrion Street Upper	6187_ 6285	0.1	8723	10282	18	8694	9832	13	Ringsend WwTP	No	No

These locations either drain to the same water body as the Proposed Scheme and existing surface water drains, or to the combined sewer and on to Ringsend WwTP. Therefore, there will be no impacts on water bodies as a result of these changes.

13.4.5.4 Summary of Flood Risk Assessment

Summary text from the FRA (Appendix 13.2 in Volume 4 of this EIAR) is provided in this section.

13.4.5.4.1 Historic Flooding

The Proposed Scheme is largely on existing roads and will result in minimal additional paved areas and will therefore not increase the risk of these events reoccurring compared to the current scenario.

13.4.5.4.2 Coastal Flood Risk

There is one area identified along the Proposed Scheme where there is a risk of coastal flooding. at Merrion Strand which falls within Flood Zone A. Due to the extreme nature of coastal flood events, mitigation measures involving coastal flood defenses are not proposed as part of the Proposed Scheme.

13.4.5.4.3 Groundwater Flood Risk

The proposed works do not involve any excavations, significant changes in levels or basement construction. As the Proposed Scheme is on existing roads with no known flooding specifically due to groundwater it is not expected that this risk will increase to the site or surrounding areas due to the construction of the Proposed Scheme.

13.4.5.4.4 Pluvial Flood Risk

Where new surface water sewers are being proposed along the development Proposed Scheme, these networks shall be designed to provide attenuation for return period of up to 30 years where possible. This would be an improvement on the existing historical drainage network infrastructure and will reduce the overall risk of pluvial flooding. However, the drainage design is not proposing to replace existing drainage infrastructure. Only the new infrastructure will be size to restrict the flooding to 1 in 30 years. If the existing is flooding, it will likely remain flooding. However as part of the Proposed Scheme new drainage infrastructure will be provided including SuDS such as rain gardens, swales, and tree pits where possible. These SuDS features will provide source control measures and reduce the risk of pluvial flooding.

13.4.5.4.5 Fluvial Flood Risk

Where new surface water sewers are being proposed along the development Proposed Scheme, these networks shall be designed to provide attenuation for return period of up to 30 years where possible. This localised improvement to the existing drainage infrastructure network will contribute to reducing the overall risk of fluvial flooding. Similarly, as part of the Proposed Scheme sections of new drainage infrastructure will be provided which include new SuDS such as rain gardens, swales and tree pits. These SuDS features will contribute to the management of fluvial flooding risk through the provision of surface water storage capacity in the network.

13.4.5.4.6 Justification Test

The Proposed Scheme is categorised by the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG and OPW, 2009) as a ‘highly vulnerable development’ and is required to pass the justification test if any part of the development is located within Flood Zone A or Flood Zone B. The Plan Making Justification Test and Development Management Justification have been assessed and passed in the Site Specific FRA and further investigation of the flood risk in the form of a Stage 2 FRA is not required. For more information on this see Appendix A13.2 in Volume 4 of this EIAR.

13.5 Mitigation and Monitoring Measures

13.5.1 Introduction

This Section sets out the measures envisaged to avoid, prevent or reduce any potential significant adverse effects on the environment identified in Section 13.4 and, where appropriate, identify any proposed monitoring of the efficacy of implementing those mitigation measures. This section covers both the Construction and Operational Phases. Construction works will take place in accordance with Appendix A5.1 Construction Environmental Management Plan (CEMP), which is included as Appendix A5.1 in Volume 4 of this EIAR.

13.5.2 Construction Phase

13.5.2.1 Mitigation Measures

In terms of mitigation, a Surface Water Management Plan (SWMP) and Environmental Incident Response Plan (EIRP) has been prepared (provided in the CEMP, Appendix A5.1 in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme. It will be a condition within the Employer's Requirements that the successful contractor(s), immediately following appointment, must detail in the SWMP how it is intended to effectively implement all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

At a minimum, all the control and management measures set out in the SWMP will be implemented. This includes measures relating to:

-
- Construction Compounds management including the storage of fuels and materials;
- Control of Sediment
- Use of Concrete;
- Management of vehicles and plant including refuelling and wheel wash facilities; and
- Monitoring.

13.5.2.2 Site Specific Mitigation Measures

Following implementation of the mitigation measures outlined in the SWMP, the majority of impacts will be not significant. There are a few activities however that require additional measures to ensure that impacts are not significant.

For Booterstown Marsh, Nutley Stream and Dublin Bay, potential impacts of Profound significance have been identified associated with the proposed Construction Compound which will be located at Booterstown car park, within Blackrock Park. Activities within the Construction Compound will be largely controlled as set out in general measures in the SWMP. The proximity of Booterstown Marsh which connects directly to Dublin Bay, means additional measures are required, as follows:

- The slit drain in the centre of the car park will be sealed for the duration of the construction programme (it is assumed the construction compound will be retained for the full length of the construction programme);
- The appointed contractor will ensure that appropriate spill control equipment is available (e.g., a suitably sized floating boom), to control any spillages to the watercourse should a spillage occur;
- The existing gravel-like surface will be retained to reduce the likelihood of silty water runoff. Geotextile membranes will be installed in high-risk areas;
- Existing grassed areas which provide a buffer to the pond outlet (and Dublin Bay) will be retained;
- Silt fencing will be installed along the boundary to the pond outlet (as a last defence against any overland runoff of silty water or spillages of chemicals or hydrocarbons);
- Fuel storage will be located on the western boundary of the construction compound – nearest the road and as far as possible from the slit drain or pond outlet. There is an existing wall here which will prevent any spillages reaching surface water drains in the road. All fuel will be stored in accordance with the SWMP;
- Storage of other materials will be located on the western boundary of the construction compound – nearest the road and as far as possible from the pond outlet;
- All potentially contaminating materials will be stored in covered areas;
- Wheel wash areas will be closed-cycle. There will be no discharge of wheel wash water to surface water drains. Off-site disposal of contaminated and silty water and sludge will be required;
- Wastewater from cabins will be contained. Where discharge to the local sewer is required consent from the local authority will be obtained (a temporary permit); and

- The appointed contractor will undertake a risk assessment due to the proximity of the existing surface water drainage system to the Construction Compound.

The potential for significant impacts associated with the movement of an existing boundary wall in land to the north of Booterstown Marsh have been identified. These will be avoided and minimised through the following measures:

- If dewatering of the footings of the wall is required, water will be settled in a siltbuster tank (or similar) before being discharged as clean, uncontaminated surface water to local surface water systems;
- Surface water drains will be clearly identified and marked as such;
- Surface water drains in the road will be protected through the use of a silt curtain (or similar) to prevent silty water runoff from entering during construction. This will be placed as close to the works as is practicable and at the very least no further than alongside the footpath edge;
- No refuelling will take place at this location – the construction compound is close by and so all refuelling of plant and machinery will take place there; and
- The generic mitigation measures outlined in the SWMP for the management of vehicles and plant will be implemented by the appointed contractor.

There is potential for significant impacts associated with the upgrading of the ramp on the Grand Canal tow path. These will be avoided and minimised through the following measures:

- Retaining wall:
  - The concrete for the foundations will be poured in dry weather only;
  - Silt fences will be used along the top of the bank to reduce the likelihood of silty water runoff and cement washings reaching the canal; and
  - Any water collected behind the silt fences will be settled using a siltbuster tank (or similar) and then discharged to the foul sewer (with the permission for Dublin City Council).
- Oil filled cable:
  - Ground Investigations will be carried out in this location to determine whether there is contamination present. If any is detected, excavated materials will be removed to a licensed waste facility by a licensed contractor and will not be used in any landscaping or backfilling activities; and
  - A construction method statement detailing the measures taken to avoid the cable will be prepared by the appointed contractor in advance of construction works at the location.

13.5.3 Operational Phase

Mitigation for the operational phase has been built into the design of the Proposed Scheme which is outlined in Section 13.4.1.1 No additional mitigation is required.

In the Operational Phase the infrastructure (including the maintenance regime for SuDS) will be carried out by the Local Authorities and will be subject to their management procedures.

13.6 Residual Impacts

13.6.1 Construction Phase

Following implementation of the mitigation measures outlined in Section 13.4.3 and the SWMP within the CEMP (Appendix A5.1 in Volume 4 of this EIAR), there are no significant impacts predicted on any of the receptors in this study area. Residual impacts are presented in Table 13.17.

Table 13.17: Residual Impacts during Construction Phase

WFD / EPA Water body Name	Project Activity	Predicted Impacts		
		Description of Predicted Impacts	Significance of Impacts pre-mitigation	Significance of impacts post mitigation.
Brewery Stream_010 (Brewery Stream and Priory Stream segments)	Section 1 – widening of carriageways, provision of cycle tracks and footpath	Increased sediment in runoff Anthropogenic sources (fuel etc.)	Slight Adverse, Short-term	Imperceptible, Adverse, Short term
Brewery Stream_010 (Booterstown Stream segment)	Section 2- movement of boundary wall by 2m.	Increased sediment in runoff	Slight Adverse, Short-term,	Imperceptible, Adverse, Short term
		Anthropogenic sources (fuel etc.)	Slight to Significant Adverse Short to medium term	Imperceptible, Adverse, Short term
Brewery Stream_010 (Elm Park Stream segment)	Section 5 - resurfacing/realignment of existing carriageway	Increased sediment in runoff Anthropogenic sources (fuel etc.)	Imperceptible, Adverse, Short term	Imperceptible, Adverse, Short term
Booterstown Marsh and Nutley Stream	Construction compound at Booterstown Park	Anthropogenic sources (fuel etc.)	Profound Adverse, Short to Medium term	Imperceptible, Adverse, Short term
Dublin Bay	Construction compound at Booterstown Playground	Anthropogenic sources (fuel etc.)	Very Significant to Profound Adverse, Medium to long term	Imperceptible, Adverse, Short term
Dublin Bay	Section 1– widening of carriageways, provision of cycle tracks and footpath	Increased sediment in runoff Anthropogenic sources (fuel etc.)	Imperceptible Adverse, Short-term	Imperceptible, Adverse, Short term
Dublin Bay	Section 2- movement of boundary wall by 2m.	Increased sediment in runoff	Significant Adverse, Short term	Imperceptible, Adverse, Short term
		Anthropogenic sources (fuel etc.)	Very Significant to Profound Adverse Medium to long term	Imperceptible, Adverse, Short term
Grand Canal Main Line (Liffey to Dublin Bay)	Section 4 - Realignment of footways / cycleways, junction layout changes, upgrades	Increased sediment in runoff Anthropogenic sources (fuel etc.)	Imperceptible Adverse, Short term	Imperceptible, Adverse, Short term
	Upgrade to ramp alongside canal at Wilton Terrace	Increased sediment in runoff Hydrocarbons (machinery or spillage) Concrete washings Hydrocarbons (from contaminated land)	Moderate Adverse Short term	Imperceptible, Adverse, Short term
			Moderate to Profound Adverse Medium to Long term	Imperceptible, Adverse, Short term

WFD / EPA Water body Name	Project Activity	Predicted Impacts		
		Description of Predicted Impacts	Significance of Impacts pre-mitigation	Significance of impacts post mitigation.
		Hydrocarbons (from a break in the cable)	Significant Adverse Short term	Imperceptible, Adverse, Short term
			Significant Adverse Medium term	Imperceptible, Adverse, Short term
			Profound Adverse Medium to Long term	Imperceptible, Adverse, Short term

13.6.2 Operational Phase

Mitigation for the Operational Phase has been built into the design of the Proposed Scheme. As a result, no residual significant impacts are anticipated for any water body in the study area. This is summarised in Table 13.19.

Table 13.18: Residual Impacts during Operational Phase

WFD Water body Name	Project Activity	Predicted Impacts		
		Description of Predicted Impacts	Predicted Impact (Pre-Mitigation & Monitoring)	Predicted Impact (Post-Mitigation & Monitoring)
Brewery Stream_010	Increased impermeable area	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse	Imperceptible	Imperceptible
Dublin Bay	Indirect Runoff to water body Discharge of SWOs	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse.	Imperceptible	Imperceptible
Dodder_050	Discharge of SWOs	Minimal increased sediment in runoff Minimal anthropogenic sources (fuel etc.) No scouring of watercourse	Imperceptible	Imperceptible

13.6.3 Summary of WFD Assessment

The full WFD Assessment is provided in Appendix A13.1 in Volume 4 of the EIAR. A summary is provided here for ease of reference.

13.6.3.1 Overview

Taking into consideration the anticipated impacts of the Proposed Scheme on the biological, physico-chemical and hydromorphological quality elements, following the implementation of design and mitigation measures, it is concluded that it will not compromise progress towards achieving Good Ecological Status (GES) or cause a deterioration of the overall Good Ecological Potential (GEP) of any of the water bodies that are in scope. Therefore, the Proposed Scheme does not require assessment under Article 4.7 (Table 13.19).

Table 13.19: Compliance of the Proposed Scheme with the Environmental Objectives of the WFD

Environmental Objective	Proposed Scheme	Compliance with the WFD Directive
No changes affecting high status sites	No water bodies identified as high status	Yes
No changes that will cause failure to meet surface water GES or GEP or result in a deterioration of surface water GES or GEP	After consideration as part of the detailed compliance assessment, the Proposed Scheme will not cause deterioration in the status of the water bodies during construction following the implementation of mitigation measures; during operation, no significant impacts are predicted.	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies	The Proposed Scheme will not cause a permanent exclusion or compromise achieving the WFD objectives in any other bodies of water within the River Basin District.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.	The Proposed Scheme will not cause deterioration in the status of the of the groundwater bodies.	Yes

The WFD also requires consideration of how a new scheme might impact on other water bodies and other EU legislation. This is covered in Articles 4.8 and 4.9 of the WFD.

Article 4.8 states: '*a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation*'.

All water bodies within the Study Area have been assessed for direct impacts, and indirect impacts on Dublin Bay have also been assessed. The assessment concludes that the Proposed Scheme will not compromise the achievement of the objectives of the WFD for any water body. In addition, the Proposed Scheme has been assessed for the potential for cumulative impacts with other Proposed Developments within 500m of the Study Area. This concludes that in combination with other Proposed Developments the Proposed Scheme will not compromise the achievement of the objectives of the WFD for any water body. Therefore, the Proposed Scheme complies with Article 4.8.

Article 4.9 of the WFD requires that *"Member States shall ensure that the application of the new provisions guarantees at least the same level of protection as the existing Community legislation".*

The Habitats Directive (1992) promotes the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance. There are European designated sites in the vicinity of the Proposed Scheme which have been assessed and are presented in an Appropriate Assessment Screening report and Natura Impact Statement (NIS) submitted with the application.

The Nitrates Directive (1991) aims to protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. The Scheme will not influence or moderate agricultural land use or land management.

The revised Bathing Water Directive (rBWD) (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Bathing Water Directive (BWD) (76/160/EEC) and the process used to measure/monitor water quality at identified bathing waters. The rBWD focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the BWD. Bathing waters under the rBWD are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (*intestinal enterococci* and *Escherichia coli*) in samples obtained during the bathing season (May to September). Following implementation of measures set out in the CEMP, the Proposed Scheme will not have a significant adverse impact on any designated Bathing Waters. It is therefore compliance with the Bathing Water Directive.

13.6.3.2 Conclusion

Considering all requirements for compliance with the WFD, the Proposed Scheme will not cause a deterioration in status in any water body, nor prevent it from achieving GES or GEP. There are no cumulative impacts with other Schemes, and it complies with other environmental legislation.

It can be concluded that the Proposed Scheme complies with all requirements of the WFD.

13.7 References

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