Chapter 13
Water

Contents

13. Water

13.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the Lucan 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) will be considered: hydrology, hydromorphology and water quality. Hydrogeology is dealt with specifically in Chapter 14 (Land, Soils, Geology & 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). This included 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 infrastructural projects.

An assessment of the Proposed Scheme's compliance with the Water Framework Directive (WFD) (Directive 2000/60/EC) requirements is provided in Appendix 13.1 WFD Compliance 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 Scheme 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 Section 13.4.6 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 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 Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (hereafter referred to as the Water Framework Directive (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 Urban 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 5km (kilometres) upstream 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 the 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 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. The Directive requires all water bodies (rivers, lakes, groundwater, transitional, coastal) to attain 'Good Water Status' (qualitative and quantitative) by 2027.

There are a number of objectives under which the quality of water is protected. The key objectives at EU level are the general protection of the 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 in 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 programme (i.e., length and / or nature of the works etc.) of a scheme / project 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 13.6.3.

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 waterbodies, 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 ensuring an integrated approach to the protection, improvement and sustainable management of the water environment, and are published every six years.

The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers Ireland as a whole (DHPLG 2018). For the second cycle, the original (2009) Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form one national River Basin District (RBD) which covers the whole of Ireland. For those water bodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures impacting them as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%).

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.

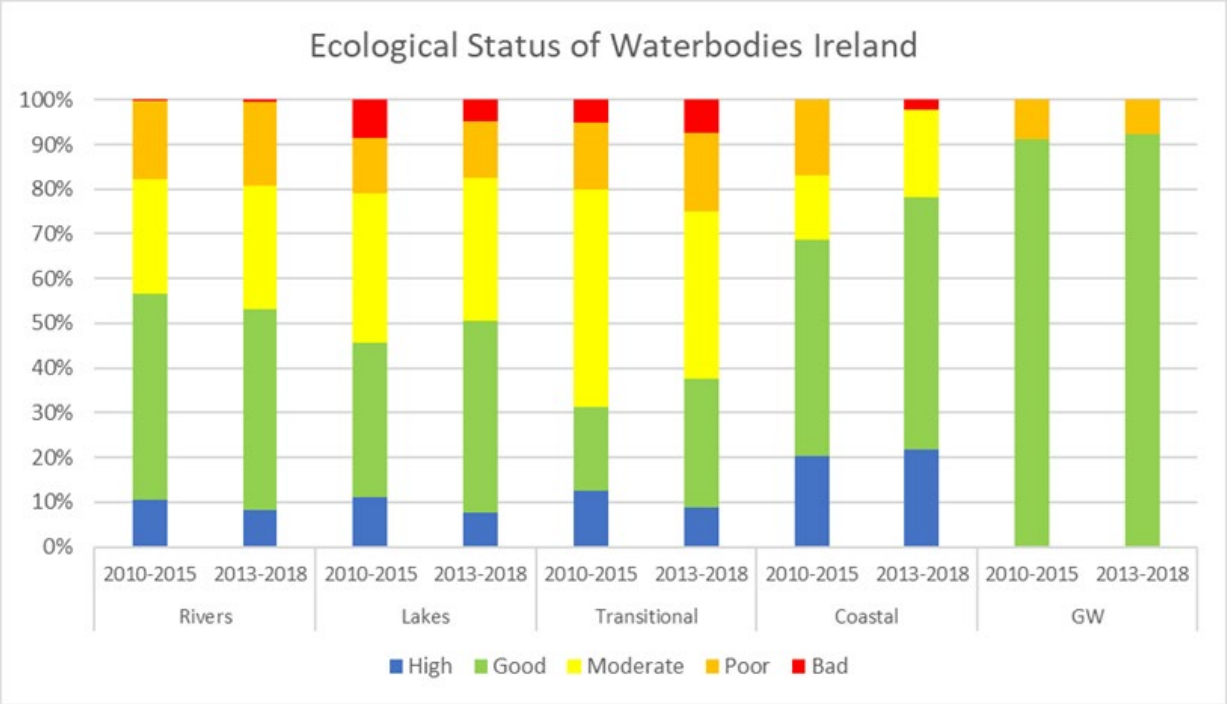

Image 13.1 Ecological Status of Water bodies in Ireland

The characterization 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% of 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) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022); and • European Commission (EU) Environmental Impact Assessment of Projects. Guidance on the Preparation of the Environmental Impact Assessment Report (EU, 2017)).
Water	• 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 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; • River Basin Management Plan 2018 - 2021; • The ERBD RBMP (ERBD 2009), which includes the River Liffey and its associated Water Management Unit Action Plans (various); 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 March 2020 and March 2022. . In March 2020, all watercourse crossings within the study area were visited to inform the determination of baseline conditions in order to identify the likely impacts of the Proposed Scheme. In March 2022, visual inspections were made at two locations which were identified as potentially high risk. 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 where applicable:

- 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 runoff 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).

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 following 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) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022). 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 10 (Population) and Chapter 19 (Material Assets)

The TII Assessment Guidelines outline how impact type, magnitude, significance 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.
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 impacts with other existing and / or approved projects impacts; and
- Possibility of effectively reducing the impacts.

The criteria for determining the magnitude of impacts is outlined in Table 13.4.

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.
Moderate 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)

Nature of Impact	Description	Scale and Nature of Impacts
Moderate 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	Moderate	Large
Extremely High	Imperceptible	Very 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 to be 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 Annual Average Daily Traffic (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 Catchment Maps were consulted (see Proposed Surface Water Drainage Works (BCIDA-ACM-DNG_RD-0006_XX_00DR-CD-0001) in Volume 3 of this EIAR).

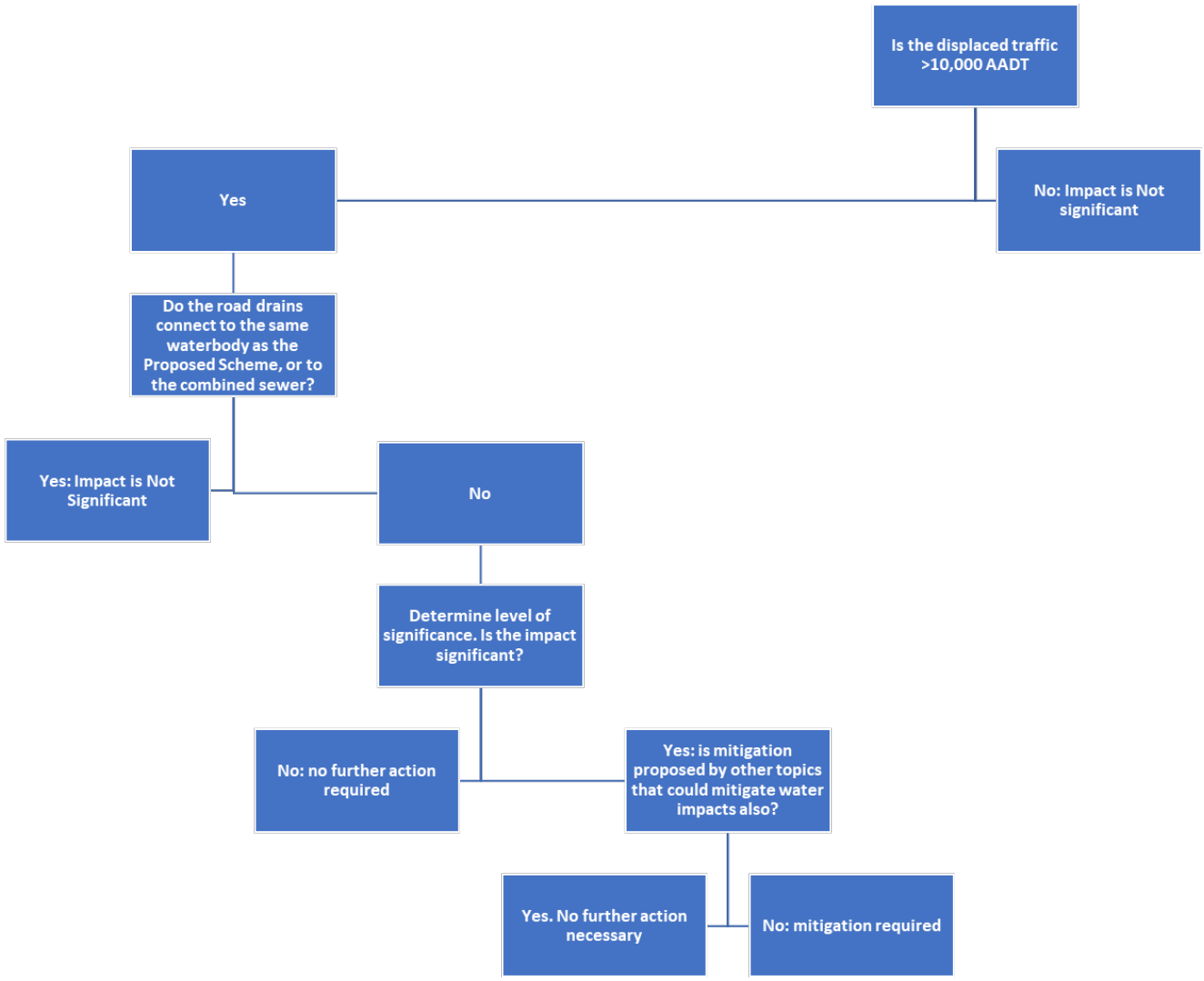

Diagram 13.1: Traffic Assessment Decision Tree

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 England Risk Assessment Tool (HEWRAT) 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 predicted to be greater than 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 HEWRAT 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 five main water bodies within the study area in this catchment: Liffey_170, the Liffey_180, Liffey_190, Liffey Estuary Upper and Camac_040, (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 Lucan, Palmerstown, Ballyfermot, Chapelizod, Kilmainham, Islandbridge and Inchicore. 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 from Q5 to Q1 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):

- Liffey_170;
- Liffey_180;
- Liffey_190;
- Liffey Estuary Upper; and
- Camac_040.

The WFD Status of the rivers and streams within the study area of the Proposed Scheme are provided in Table 13.7.

Table 13.7: Surface Water WFD Status

WFD Sub-Catchment	Water body ID	Heavily Modified?	Type	WFD Status (2013 to 2018)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Risk Categorisation
Liffey_SC_090 Liffey_SC_100	Liffey_170	No	River	Good	Extractive Industry, waste and industrial point sources, Urban waste Water and Runoff	At Risk
Liffey_SC_090	Liffey_180	No	River	Moderate	Storm Water Overflows (SWOs) and urban runoff	At Risk
Liffey_SC_100	Liffey_190	No	River	Moderate	Storm Water Overflows (SWOs) and urban runoff	At Risk
N/A	Liffey Estuary Upper	No	Transitional	Good	Urban Wastewater (SWOs)	At Risk
Liffey_SC_090	Camac_040	No	River	Poor	Urban runoff; Urban Wastewater (SWOs) and hydromorphology (culverts)	At Risk

13.3.4 Field Survey

The results of the March 2020 and March 2022 field surveys are detailed in Table 13.8.

Table 13.8: March 2020 and March 2022 Survey Information for the Site along the Proposed Scheme

Survey Attribute	March 2020			March 2022
Location	Camac_040 at Park West - location 1 Road	Camac_040 at Park West -location 2	River Liffey Estuary Upper at R148 Victoria Quay	Liffey_180 at Entrance to Hermitage Park Golf Club
Visual Flow	Fast flowing, medium water level	Medium flow, medium water level.	Appears to be low flow	Water body could not be observed due to excessive vegetation in the channel
Visual Water Quality	A lot of ragging and rubbish. Visibility poor	Poor. Rubbish. Possible fly-tipping area. Possible contamination on eastern side of river.	Watercourse is surrounded by roads so these could be potential pollution sources. Litter present on bed	Water body could not be observed due to excessive vegetation in the channel
Bed Observation	Not visible presumed artificial at culvert	Not visible	Some deposition noted in channel, mainly smaller grain sediment present	Water body could not be observed due to excessive vegetation in the channel
Bank Stability	High due to vegetation	45 degree sloping grass verge. Medium stability.	Banks are concrete.	Water body could not be observed due to excessive vegetation in the channel
Features	None	None	Number of bridges present but otherwise there are no notable features	None
Modifications	Partially culverted	Partial culvert	Channel is heavily modified, concrete banks and bridges	Water body could not be observed due to excessive vegetation in the channel
Runoff Pathway	Possible direct from road network	Flat. Likely from road drains.	Potential pathways from the surrounding roads	Surface water drains present on access road
Runoff Risk	High	Medium to high	Low	Low to Medium (due to surface water drain?)
Riparian Detail	Beech trees. Bramble. Ground ivy. Overhanging trees.	Grass verges. Standing trees.	No significant detail other than some vegetation growing in the walls	Dense vegetation in the channel
Natural Barriers	Scrub vegetation	Some vegetation	None, other than bridges	Dense vegetation in the channel

Survey Attribute	March 2020			March 2022
Discharges	Not possible to determine	At least one present	Outfalls present but all inactive during site visit	Water body could not be observed due to excessive vegetation in the channel
Culverted	Partial	Partial	No	Water body could not be observed due to excessive vegetation in the channel
Comment	None	Overflow observed	None	None

In March 2022, two locations were visited; access was only possible at one location; however the banks of the water body were so densely vegetated it was not possible to see the water. A surface water drain in the road was noted, however, as a possible pathway for runoff to the water body.

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 Areas of Conservation (SAC), Special Protection Areas (SPA), proposed Natural Heritage Areas (pNHA), Natural Heritage Areas (NHA), Nutrient Sensitive Areas, salmonid rivers, shellfish areas and marine bathing waters.

A review of the Natura 2000 network was conducted to determine those sites which were within the study area and / or hydrologically connected to the water bodies detailed in Section 13.3.3. A full assessment of designated European Sites, including hydrological links and water dependent species or habitats, is contained within Chapter 12 (Biodiversity) in Volume 2 of this EIAR 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:

- North Dublin Bay SAC (site code: 000206) (approximately 9km from the Proposed Scheme at its closest point);
- South Dublin Bay SAC (site code: 000210) approximately 10.5km from the Proposed Scheme at its closest point);
- North Bull Island SPA (site code: 004006) approximately 9km from the Proposed Scheme at its closest point); and
- South Dublin Bay and River Tolka Estuary SPA (site code: 004024) approximately 7km from the Proposed Scheme at its closest point).

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

- Liffey Valley pNHA (site code: 000128) (direct connection, 0m from the Proposed Scheme at its closest point);
- North Dublin Bay pNHA (site code: 000206) (as for North Dublin Bay SAC); and
- South Dublin Bay pNHA (site code: 000210) (as for South Dublin Bay SAC.

No designated salmonid rivers were identified within the study area during the desk study, however the IFI in their response to the consultation confirmed that the Camac_040 is a recognised Salmonid system and also supports populations of the Freshwater Crayfish (*Austropotamobius pallipes*) and Lamprey (*Lampetra* sp.) species listed under Annex II of the EU Habitats Directive.

There are three Nutrient Sensitive Areas in the study area within the Liffey and Dublin Bay catchment. They are the River Liffey, Liffey Estuary and Tolka Estuary, designated Nutrient Sensitive Areas as per the the Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (hereafter referred to as the UWWT Directive) (refer to Figure 13.2 in Volume 3 of this EIAR).

There are seven designated marine bathing waters downstream of the Proposed Scheme. The EPA published its Bathing Water Quality - A Report for the Year 2021 in May 2022 (EPA 2022b) and the website beaches.ie keeps

this information regularly updated. The beaches and the most up to date assessment (checked June 2022) of their quality is provided below:

- Dollymount Strand Excellent Quality (approximately 11km from Proposed Scheme at its nearest point);
- North Bull wall – North Bull (approximately 10km from Proposed Scheme at its nearest point);
- Half Moon Beach – Excellent quality (approximately12km from Proposed Scheme at its nearest point);
- Shelley Banks – Excellent Quality ((approximately 13km from Proposed Scheme at its nearest point)
- Sandymount Strand – Excellent Quality (approximately 14.5km from Proposed Scheme at its nearest point) ;
- Merrion Strand – Poor Quality ((approximately 15.5km from Proposed Scheme at its nearest point); and
- Seapoint – Excellent Quality (approximately 16km from Proposed Scheme at its nearest point).

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 2022a) was reviewed to determine the presence of point source discharges 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. The presence / absence of Wastewater Treatment Plants (WwTP), SWOs and Industrial Emissions Licence (IEL) / Integrated Pollution Control (IPC) licensed sites were examined. There are 37 surface water and SWO discharge locations within the study area.

13.3.8 Existing Drainage

Based on the information received from Irish Water the existing highway along the Proposed Scheme is served by both surface water and combined drainage networks. The surface water drainage system is managed by the local authority, whilst combined sewers system is managed by Irish Water. Flows are typically collected in standard gully grates, or via near surface collection systems such as slot drains and combined kerb and drainage units along the N4 and routed via a gravity network to outfall points. There are no SuDS/attenuation measures on the existing drainage networks to treat or attenuate runoff from the existing highway.

The sub-catchment assessment identifies that the inefficiency of the drainage system and issues with misconnections are priority issues within this catchment and study area (EPA 2018). All surface water drains to one of the Liffey water bodies (see Table 13.9).

For the purposes of describing the Proposed Scheme, it is broken into three sections:

- Section 1: N4 Junction 3 to M50 Junction 7 – N4 Lucan Road;
- Section 2: M50 Junction 7 to R148 Con Colbert Road – R148 Palmerstown Bypass and Chapelizod Bypass; and
- Section 3: Con Colbert Road to City Centre – St. John's Road West.

Table 13.9: Existing Drainage

Existing Catchment Reference	Type of Network, Foul/Combined (CW), Surface Water (SW)	Proposed Scheme Section ID	Outfalls to Water body
6.1	SW	Section 1	Liffey_170
6.2	SW	Section 1	Liffey_180

Existing Catchment Reference	Type of Network, Foul/Combined (CW), Surface Water (SW)	Proposed Scheme Section ID	Outfalls to Water body
6.3	SW	Section 2	Liffey_180
6.4	SW	Section 2	Liffey_180
6.5	SW	Section 2	Liffey_180
6.6	SW	Section 2	Liffey_190
6.7	SW	Section 2	Liffey_190
6.8	SW	Section 2	Liffey_190
6.9	SW	Section 3	Liffey Estuary Upper
6.10	SW	Section 3	Liffey Estuary Upper
6.11	SW	Section 3	Liffey Estuary Upper

13.3.9 Surface Water Features

The main water bodies within the study area, Liffey_170, Liffey_180, Liffey_190, Liffey Estuary Upper and Camac_040, are discussed in this section. The downstream extent of the Liffey river water bodies meets the Liffey Estuary Upper at the Irish National War Memorial Gardens; the Camac_040 discharges into the Liffey Estuary Upper via a culvert under Heuston Station environs. None of these water bodies are included within the RBMP 2018 - 2021 'Priority Areas for Action' (DHPLG 2018). The desk study assessment did not identify any surface water features within the study area which are not classified as WFD water bodies. The overarching hydromorphology of the study area was assessed during field surveys. The study area comprises highly modified straight planform water bodies with walled or artificial riparian zones. A summary of the distances and number of crossings of each water body within the study area is included in Table 13.10.

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

Water body	Nearest Proposed Scheme Section	Approx. Distance from Proposed Scheme (m)	Number of Crossings
Liffey_170	Section 1	1500 (surface water at start of the Proposed Scheme drains to this water body)	0
Liffey_180	Section 1 and Section 2	0 – 500	0
Liffey_190	Section 3	20 – 300	0
Liffey Estuary Upper	Section 3	0 – 300	0
Camac_040	Section 3	0 – 390	1

13.3.9.1 Liffey_170

The River Liffey rises from a number of small streams within the Liffey Head Bog between Kippure and Tonduff in the Wicklow Mountains in County Wicklow. It flows for approximately 125km through County Wicklow, County Kildare and County Dublin to Dublin Bay and the Irish Sea. There are three hydroelectric power station dams located along the River Liffey and a number of reservoirs including Poulaphouca and Leixlip. The watercourse was historically known for flash flooding events, which have been alleviated by these upstream dams and reservoirs (as outlined in the Dublin City Council (DCC) Dublin City Development Plan 2016 - 2022, Strategic Flood Risk Assessment (DCC 2016). Both significant bog and plantation forestry exist at the source of the River Liffey which are possibly contributing to eutrophication and the Moderate WFD status at source (2013 to 2018).

The EPA segments of the River Liffey which are contained within the study area are Liffey_170, Liffey_180 and Liffey_190.

Although the closest point to the Proposed Scheme is 1km, the Liffey_170 is included in the study area because the surface water system in the westernmost extent of the Proposed Scheme drains to it in Griffeen Valley Park.

The Liffey_170 has Good Ecological Status, however it is identified as being At Risk of not achieving (or maintaining) Good status by 2027. There are a number of pressures on the water body, from extractive industries, industrial point source discharges, urban runoff and SWOs. Much of the Liffey_170 is within the Liffey Valley Nutrient Sensitive Area, however the segment into which the Proposed Scheme drains is not designated as such. It joins the main channel approximately 1.5km downstream; at this point the Liffey_170 is a Nutrient Sensitive river and identified as a proposed Natural Heritage Area (pNHA).

In terms of assigning sensitivity, the water body has Good status, and has direct hydrological connection to a protected area of less than 2km; it is therefore Very High sensitivity.

13.3.9.2 Liffey_180

The Liffey_180 is 24.65km long and consists of the main channel of the River Liffey from Lucan and Chapelizod, the River Rusk tributary (from Dunboyne to Lucan) and a number of other minor tributaries (River Hermitage, River Annfield, River Quarryvale, River Astagob, an unnamed River at Carpenterstown, Longmeadow Stream and Glenaulin Stream).

The Liffey_180 runs almost parallel to the Proposed Scheme. There are no proposed route crossings of the Liffey_180.

The Liffey_180 was assigned Moderate WFD status in April 2022 and is At Risk of not achieving Good Status by 2027. Significant pressures have been identified including urban wastewater from SWOs and urban runoff from diffuse sources causing nutrient and organic pollution. It is within the Liffey Valley Nutrient Sensitive Area along its entire length and is a pNHA for much of its length with only the last 850m not designated as such. The Nutrient Sensitive Area makes it Very High sensitivity.

13.3.9.3 Liffey_190

Liffey_190 segment is 3.15km between Chapelizod and Islandbridge, consisting of the small section of the main channel of the River Liffey and tributaries, Magazine Stream and Creosote Stream. Both segments catchment contributions are considered to be primarily urban.

The Liffey_190 runs almost parallel to the Proposed Scheme. There are no proposed route crossings of the Liffey_190.

The Liffey_190 has a Moderate status and is also At Risk of not achieving Good Status by 2027. A range of significant pressures in relation to industry have been identified, in addition to waste, urban wastewater from SWOs and urban runoff from diffuse sources. It is within the Liffey Valley Nutrient Sensitive Area.

The most recent Biological Q Value assessment of the River Liffey was in 2019. Sixteen stations were monitored along the length of the watercourse, the lowest Q Value along the River Liffey was Q3. The assessment stated:

> '*Ecological conditions were found to be satisfactory at the majority (14) of the 16 stations surveyed on the River Liffey in 2019. The macroinvertebrate community indicated a decline at both station 2100 (Lucan) which dropped to Moderate and station 2360 (0.2 km d/s Chapelizod Br (Lynch's Lane)) which dropped to Poor ecological conditions. Sewage fungus and Chironomus sp. were found at this site*'. (EPA 2020d).

In terms of assigning sensitivity, the water body is of Moderate status, and it is within the Liffey Valley Nutrient Sensitive Area. The Nutrient Sensitive Area makes it Very High sensitivity.

13.3.9.4 Liffey Estuary Upper

The Liffey Estuary Upper is a transitional water body and is also within the Liffey Nutrient Sensitive Area. It is located at the northern extent of the Proposed Scheme. The water body is in a largely natural morphological state within the study area, although becomes considerably constrained by quay walls downstream of the Proposed Scheme as it passes through to Dublin City Centre. The Proposed Scheme will not cross Liffey Estuary Upper.

The Liffey Estuary Upper has a Good WFD Status and is 'At Risk' of not achieving Good Status by 2027, which means a deterioration in status is anticipated. The main pressure is from urban wastewater discharges from SWOs at Ringsend.

In terms of assigning sensitivity, the water body is of Good status, and it is within the Liffey Valley Nutrient Sensitive Area. The Nutrient Sensitive Area makes it Very High sensitivity.

13.3.9.5 Camac_040

The River Camac is a significant tributary of the River Liffey. The River Camac rises in the west of Dublin City and flows through Saggart, Clondalkin, Inchicore and Kilmainham before entering the Liffey Estuary Upper from a discharge point under Heuston Station. Much of its course is dominated by concrete channels and significant culverting, including the section of the Camac_040 which travels under Heuston Station. The River Camac is a heavily industrialised urban river with similarly associated land use within its catchment.

The EPA segment of the River Camac within the study area is Camac_040. This section is 13.57km and includes the primary segment of the River Camac from Clondalkin to where it joins the River Liffey at Heuston Station. The Camac_040 also includes a number of significant and minor tributaries including Ballymount Stream, Robinhood Stream, Walkinstown Stream and Drimnagh Castle or Walkinstown Stream.

Camac_040 will run parallel to the Proposed Scheme from R839 Memorial Road before being crossed by the Proposed Scheme at R148 St. John's Road West just before it converges with the Liffey Estuary Upper. The Camac_040 section has Poor WFD Status and is At Risk of not achieving Good Status by 2027. A range of significant pressures have been identified, including culverting causing alteration to habitats, urban wastewater from SWOs and urban runoff from diffuse sources.

The most recent Biological Q Value assessment of the River Camac was in 2019. Four stations were monitored along the length of the watercourse, Q3 being the lowest assigned Q Value. The assessment stated:

> '*The Camac was found to be at unsatisfactory conditions in August 2019. Poor ecological conditions recorded at 0100, 0310 and 0500, with 0100 (Saggart) declining from Good conditions in 2016. Moderate conditions were maintained at 0200 (Brownsbarn)*' (EPA 2020d).

Despite its Poor status and poor ecological conditions, the IFI, in their consultation response stated:

> *The Camac River is a recognised salmonid system, under significant ecological pressure as a result of its largely urban situation. Although considerable sections of main channel are culverted, lengths of this river that remain on the surface invariably support self-sustaining populations of brown trout (Salmo trutta). The river also supports populations of the Freshwater Crayfish (Austropotamobius pallipes) and Lamprey (Lampetra sp.) species listed under Annex II of the EU Habitats Directive.*

In terms of assigning sensitivity, its Poor status would normally render it Medium to Low sensitivity; however its direct hydrological connection to the Liffey Valley Nutrient Sensitive Area, the fact that it is a recognised salmonid system and supports populations of Annex II species, mean it is determined to be High sensitivity.

13.3.9.6 Summary of Baseline Receptor Sensitivity

The sensitivities identified are summarised in Table 13.11.

Table 13.11: Baseline Receptor Sensitivity

WFD Name	Attributes	Indicator / Feature	Sensitivity
Liffey_070	River	Good WFD status. Nutrient Sensitive Area	Very High
Liffey_180	River	Good WFD status. Nutrient Sensitive Area	Very High
Liffey_190	River	Nutrient Sensitive Area	Very High
Liffey Estuary Upper	Transitional water body	Good WFD status. Nutrient Sensitive Area	Very High

WFD Name	Attributes	Indicator / Feature	Sensitivity
Camac_040	River	Direct hydrological connection with Nutrient Sensitive Area (Liffey Estuary); Poor WFD Status	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 Flood Risk Assessment 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 is included 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 year 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 year 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 Zones A and B.

The Stage 1 assessment identified the main sources of flood risk to be:

- Residual fluvial flood risk,
- Moderate coastal/ tidal flood risk,
- Moderate pluvial flood risk.

13.3.10.1 Fluvial Flood Risk

The Office for Public Works (OPW) Flood Maps do not indicate any flood risk from fluvial sources along the Proposed Scheme corridor. However, the Dublin City Development Plan (2016-2022) Strategic Flood Risk Assessment (SFRA) suggests that there is a fluvial flood risk as the River Liffey is tidally influenced. This is considered to be a residual fluvial flood risk.

13.3.10.2 Coastal/ Tidal Flood Risk

The Stage 1 assessment has identified the Proposed Scheme corridor to be at a moderate risk from coastal/ tidal flooding. This flood risk has been identified as part of the SFRA only and is not identified within the OPW Coastal Flood Maps or the Irish Coastal Protection Strategic Study (ICPSS) Flood Maps. The identified coastal / tidal flood risk is 'localised' at the City Centre end of the corridor.

The SFRA suggests that the City Centre end of the Proposed Scheme is susceptible to flooding because of combined tidal and fluvial influences.

13.3.10.3 Pluvial Flood Risk

Rainfall has high potential to cause local flooding along the corridor unless associated drainage networks are designed/upgraded in accordance with relevant design standards/regulations/guidelines. There is a significant percentage of the Proposed Scheme corridor which is identified as being at risk of flooding following a 1 in 10-

year rainfall event. As indicated on the OPW Flood Maps, there are multiple locations on the R148 where there is a continuous section of corridor which is indicated as being flooded due to rainfall.

As noted above, the SFRA requires stormwater to be managed with different provisions along the Proposed Scheme corridor. Site 17 of the SFRA indicates fluvial flooding of the Proposed Scheme and states that this portion of the Camac Catchment is susceptible to pluvial flooding from intense rainfall events.

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

Thedrainage 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), which includes principles relating to Sustainable Urban Drainage Systems (SuDS). A SuDS drainage design has been developed as a first preference and in accordance with the SUDS hierarchy as 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 flows 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 (Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors) in Volume 4 of this EIAR)) which will ensure that there will be no net increase in the surface water flow discharged to these receptors.

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

Attenuation will be in the form of SuDS and those proposed are listed below. 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; a summary for each water body is provided in Table 13.13. No new outfalls are proposed.

- Oversized pipes (OSP); and
- Bioretention.

Table 13.12: Proposed SuDs and Impermeable Area changes

Existing Catchment Reference	Water body	Approx. Impermeable Surface Area m²			SuDS Measures Proposed
		Existing	Additional	Percentage change (%)	
6.1	Liffey_170	56,047	2,629	5	OSP, tree pits
6.2	Liffey_180	112,576	2,372	2	OSP. bioretention
6.3	Liffey_180	77,684	1,257	2	OSP, bioretention
6.4	Liffey_180	25,635	87	<1	None required
6.5	Liffey_190	10,840	988	9	OSP. bioretention
6.6	Liffey_190	6,427	0	0	None required
6.7	Liffey_190	10,189	0	0	None required
6.8	Liffey_190	32,172	44	<1	OSP
6.9	Liffey Estuary Upper	22,916	-258	-1	OSP, change from hard standing to permeable grassed median
6.10	Liffey Estuary Upper	35,232	-622	-2	OSP, change from hard standing to permeable grassed median
6.11	Liffey Estuary Upper	3,172	150	5	OSP

Table 13.13: Summary of Increased Impermeable areas per water body

Water body	Approx. Impermeable Surface Area		
	Existing impermeable area	Additional permeable area	Percentage change
Liffey_170	56,047	2629	4.85
Liffey_180	226,735	4,681	2.06
Liffey_190	48,788	44	0.09
Liffey Estuary Upper	61,320	-730	-1.196

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 (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 in order 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 pressures to water bodies 'At Risk' of achieving Good status within the 09_15 Liffey_SC_100, 9_16 Liffey_SC_090 and Liffey and Dublin Bay sub-catchments are Urban runoff from diffuse urban sources, and urban wastewater from CSOs.RBMP 2018-2021 includes a measure for further investigation under the Local Authority Water Programme (LAWPRO) (See www.lawaters.ie) to determine the nature and extent of the impacts. The Draft RBMP proposes six separate measures to address Urban Runoff pressures, including the development of strategies and guidance for nature-based solutions, including SuDS and the preparation of integrated urban drainage management plans.

Urban Runoff which relates to a mixture of misconnections, leakage from sewers and runoff from paved and unpaved areas, has been identified as a significant pressure to all water bodies, with the exception of Liffey Estuary Upper. Measures are underway within the Camac_040 by South Dublin County Council (SDCC), and Dublin City Council (DCC) to investigate Diffuse Urban sources and pressures in the area. Additional measures and actions are proposed including a Hydromorphological Risk Assessment. Further investigation is required to determine the nature and extent of the impacts. The investigation will include a review of existing data collected by DCC and SDCC.

Discharges from WwTPs and agglomeration networks have been identified (EPA 2021) as pressures to all water bodies within the study area. These include discharges from SWOs and Storm / Emergency Water Overflows.

The EPA Urban Wastewater Treatment in 2018 report (published in 2019) highlights two key actions to improve treatment at WwTPs:

- Upgrade deficient wastewater treatment systems in as timely a manner as possible. This requires increased investment and efficient delivery of infrastructure improvements.

- Get the best performance from the existing treatment systems by continuing to improve how they are operated, managed and maintained.

This report also underlines the fact that the reliable information through monitoring is essential to identify environmental risks and to plan and complete improvements to mitigate those risks. A number of actions are on Irish Water to complete assessments of their assets to target where future works are required. (EPA, 2019d)

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.

Hydromorphology has also been identified as a significant pressure on the Camac_040 as it is heavily culverted downstream towards the City Centre. Hydromorphology is the second most common pressure on water bodies in Ireland identified in the RMBP. The RBMP details "it anticipated that as our knowledge and understanding of hydromorphological pressures improves, so too will the extent of the impacts identified across the country". Therefore, improving knowledge and understanding of hydromorphological pressures has been identified as a key priority for the second cycle of the RBMP.

13.4.3 'Do Minimum' Scenario

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 operation 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 & 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 activities such as new or improved bridges, 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 construction compounds, 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 Compounds 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 include but are not limited to the following:

13.4.4.2.1 Hydrology

- Change in the natural hydrological regime due to an increase in discharge because of dewatering activities (if required) during construction. This may alter the groundwater regime and affect the baseflow to a surface water receptor;
- Disruption to local drainage systems due to diversions required to accommodate the construction works; and
- 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 near to water bodies or drains connected to the water bodies; and

- Re-exposure of historically settled contaminants within or near to water bodies because of working within or near to the water body.

13.4.4.2.3 Hydromorphology

- Increased sediment loading due to silty water runoff or dewatering activities, introducing a sediment plume, potentially leading to the smothering of bed substrate and changes to existing morphological features.

13.4.4.3 Assessment of Predicted 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 Liffey_170

During the Construction Phase, reconfiguration of junctions and resurfacing works are proposed. These works are not intrusive and are relatively small scale in nature. This could result in short-term, adverse impacts of negligible magnitude on this Very High sensitivity water body, resulting in an impact of Imperceptible significance.

In addition, it is proposed to remove the existing Ballydowd footbridge and replace with a new wider structure providing sufficient capacity for pedestrians and cyclists. The discharge of surface waters to Liffey_170 is approximately 1.5km from the Proposed Scheme, in Griffen Park, which would provide time for the settlement of any silty water which may arise during the proposed works, although in this location that is considered to be limited. This could result in short-term, adverse impacts of negligible magnitude, resulting in an impact of Imperceptible significance.

13.4.4.3.2 Liffey_180

The road widening works at Hermitage Golf Club takes place near to the head of a small stream which is also part of the Liffey_180 water body and connects to the main Liffey_180 approximately 1km to the north. It is likely this water body is largely made up of surface water drainage from the N4. There is an existing small road bridge across it at its head, and no alterations to this are proposed. There is potential for some increase in fine sediment in surface water runoff during reconstruction of the boundary wall of the golf club and resurfacing works and local surface water drains in the area to be resurfaced are likely to be connected to the water body. This could result in short-term, adverse impacts of small magnitude on this Very High sensitivity water body, resulting in an impact of Moderate significance.

A two-way cycle track to the north of the N4 is proposed for the entire length of Section 1 of the Proposed Scheme; at Hermitage Golf Club, this will require the dismantling of the existing boundary wall and removal of a line of trees; and at Hermitage Medical Clinic a line of trees will also be removed. The works proposed are intrusive and will expose subsoils for a period which could lead to an increase in silty water runoff. Surface water drains on the N4 drain to the Liffey_180 in this location so there is potential for impacts on it from any increased sediment load reaching the drains. This could result in short term, adverse impacts of small magnitude, resulting in an impact of Moderate significance.

Narrowing works, cycle track improvements, reconfigurations of junctions and surface markings on the N4 up to the M50 interchange, as well new cycleways at Old Lucan Road, are not intrusive works. This could result in short-term, adverse and of negligible magnitude resulting in an impact of Imperceptible significance.

The Construction Compounds at the R113 Fonthill Road /Old Lucan Road interchange (LU1a), the area between the N4 National Road and the Old Lucan Road (LU1b), the area north of Palmerstown Bypass between Kennelsfort Road Junction and the Oval Junction (LU2) and the area within Liffey Gaels GAA ground (LU3), all have the ability to be sources of pollution as local surface water drains drain to the water body. Overland flows to nearby surface water gullies are the most likely route as none of the sites has a surface water drain within it. The greatest potential for pollution is at Construction Compounds LU1a, LU1b and LU2 as the sites have the greatest

possibility of overland flows to local surface water gullies. The LU3 Construction Compound is bounded by a wall. LU1a, LU1b and LU2 have no such containment. There is also the presence of a surface water sewer with associated manholes at either end of the area proposed for compound LU1b. There is potential for the manholes to provide a pathway to the surface water system. This could result in short-term, adverse impacts of small magnitude (overland flows being easier to control than direct discharges to drains), resulting in an impact of Moderate significance.

Full depth construction will be required in a number of places in both Sections 1 and 2 of the Proposed Scheme (See Chapter 5, Construction for more details and exact locations). Both of these sections drain to the Liffey_180. This activity is more intrusive than reconfiguration and other similar works and there will be a greater level of stripped soil and a higher risk of sediment reaching the water body. This could result in short-term, adverse impacts of small to moderate magnitude, resulting in impacts of Moderate to Significant level of significance.

The construction of a new pedestrian bridge and associated ramps adjacent to the existing at Liffey Valley Shopping Centre Pedestrian Bridge will involve foundation for the bridge and ramps structure and walls to be constructed on site but the main bridge structure will be fabricated off-site and then assembled and craned into position on site. The works are over 400m from Liffey_180, therefore there is minimal potential for sediment to reach the water body. This could lead to short-term, adverse impacts of negligible magnitude, resulting in an impact of Imperceptible significance.

Road upgrades at the Chapelizod Bypass involve the installation of ramps and stairs from Chapelizod Hill Road to the bus stops and retaining walls on the Chapelizod side of the R148 Chapelizod bypass. Surface waters in this location drain to the water body, which is 140m from the proposed works, providing the potential for some settlement of solids in the surface water system. This could result in short term, adverse impacts of small magnitude, leading to a Moderate to Significant level of significance.

13.4.4.3.3 Liffey_190

The narrowing and reconfiguration works at Con Colbert Road involve narrowing of the road to facilitate cycleways and footways. Surface waters in this area drain to the water body; proposed works are approximately 250m from the water body providing the potential for settlement of solids in the surface water system. This could lead to adverse, short-term, impacts of negligible magnitude on this Very High sensitivity water body, resulting in impacts of Imperceptible significance.

13.4.4.3.4 Liffey Estuary Upper

The proposed works in Section 3 of the Proposed Scheme which drains to the Liffey Estuary Upper are reconfigurations of junctions, resurfacing and upgrades to existing facilities. Some road widening is proposed into green areas to provide bus stops or laybys. These works, whilst partially intrusive, are small in scale and limited in nature. This could result in short-term, adverse impacts of negligible magnitude on this Very High sensitivity water body, resulting in an impact of Imperceptible significance.

13.4.4.3.5 Camac_040

None of the surface water system drains to the Camac_040 where it is in open channel. As an open channel it is, for the most part at least 200m away from the proposed works, making overland pollution flows unlikely. There will be no impacts on this water body.

13.4.4.3.6 Summary of Construction Phase Impacts

Table 13.14presents a summary of the potential impacts on the water bodies as a result of the Construction Phase of the Proposed Scheme. Where no impacts are predicted, these activities or locations are not included.

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

Water body Name	Proposed Scheme Activity	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Liffey_170	Reconfiguration, resurfacing and new pedestrian/cycle bridge	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Very High	Negligible	Imperceptible Short term, Adverse
Liffey_180	Resurfacing and wall demolition/rebuild at entrance to Hermitage Golf Club	• Increased surface water runoff; • Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Very High	Small	Moderate Short term Adverse
Liffey_180	Widening at Hermitage Golf Club and Hermitage Medical Clinic for two-way cycle track to the north of N4	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Very High	Small	Moderate Short term Adverse
Liffey_180	Construction Compounds	• Increased sediment in runoff • Anthropogenic sources (fuel etc.)	Very High	Small	Moderate Short term Adverse
Liffey_180	Full depth construction in Sections 1 and 2	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Very High	Small	Moderate to Significant Short term Adverse
Liffey_180	Road reconstruction, narrowing, cycleways, new pedestrian bridge at Liffey Valley Shopping Centre	• Increased surface water runoff; • Increased sediment in runoff; • Anthropogenic sources (fuel etc.); • Water body 300-500m away.	Very High	Negligible	Imperceptible Short-term, Adverse
Liffey_190	Narrowing, upgrades	• Increased surface water runoff; • Increased sediment in runoff; • Anthropogenic sources (fuel etc.).	Very High	Negligible	Imperceptible Short-term, Adverse
Liffey Estuary Upper	Narrowing, widening, and reconfiguration,	• Increased surface water runoff; • Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Very High	Negligible	Imperceptible Short-term, Adverse
Camac_040	Narrowing, widening, reconfiguration	• No impacts	High	No impacts	N/A

13.4.5 Operational Phase

13.4.5.1 Overview of Predicted Impacts

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

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 routes of the Proposed Scheme; and
- Dispersal of traffic onto other side roads which may drain to a different catchment or have less stringent pollution control infrastructure.

Hydromorphology changes may arise 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 Predicted Impacts – Surface Water Runoff

Detailed assessments for each receptor are provided below, with a summary of impacts presented in Table 13.15. Pre-mitigation assessments are based upon the SuDs proposed as part of the Proposed Scheme being in place. See Section 13.4.1.1 for more details.

13.4.5.2.1 Liffey_170

There is a net increase in impermeable area of 2,629m^2, which equates to a 4.85% increase across the catchment area. SuDs are proposed in the form of oversized pipes. This will ensure no net increase in flow and provide a level of treatment. This would result in a permanent, beneficial impact of negligible magnitude, resulting an impact of Imperceptible significance.

13.4.5.2.2 Liffey_180

There is a net increase in impermeable area of 4,681, which equates to a 2.06% increase across the catchment area. SuDs are proposed in the form of oversized pipes, bioretention and filter drains. This will ensure no net increase in flow and provide a level of treatment. This would result in a permanent, beneficial impact of negligible magnitude, resulting an impact of Imperceptible significance.

13.4.5.2.3 Liffey_190

There is a net increase in impermeable area of 44m^2, which equates to a 0.09% increase across the catchment area. SuDs are proposed in the form of oversized pipes and bioretention. This will ensure no net increase in flow and provide a level of treatment. This would result in a permanent, beneficial impact of negligible magnitude, resulting an impact of Imperceptible significance.

13.4.5.2.4 Liffey Estuary Upper

There is a net decrease in impermeable area of 730m^2, which equates to a 1.19% decrease across the catchment area. An oversized pipe is proposed in one sub-catchment; none is required elsewhere as impermeable areas are either reduced (through new grassed median) or stay the same. This could result in permanent, beneficial impacts of negligible magnitude on this Very High sensitivity receptor, resulting in impacts of Imperceptible significance.

13.4.5.2.5 Camac_040

There is no hydrological connection from Proposed Scheme to the Camac_040 during operation, therefore there will be no impacts.

Table 13.15 : Summary of Potential Operational Phase Impacts on Water bodies within the Study Area

Water body Name	Project Operation	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Liffey_170	Surface water runoff	• No net increase in runoff; • Treatment for runoff across Proposed Scheme; • Reduced routine contaminants.	Very High	Negligible	Imperceptible Permanent Beneficial
Liffey_180	Surface water runoff	• No net increase in runoff; • Treatment for runoff across Proposed Scheme; • Reduced routine contaminants.	Very High	Negligible	Imperceptible Permanent Beneficial
Liffey_190	Surface water runoff	• No net increase in runoff; • Treatment for runoff across Proposed Scheme; • Reduced routine contaminants.	Very High	Negligible	Imperceptible Permanent Beneficial

Water body Name	Project Operation	Potential Impacts			
		Description of Potential Impacts	Sensitivity of Receptor	Magnitude of Impacts	Significance of Impacts
Liffey Estuary Upper	Surface water runoff	• No net increase in runoff; • Treatment for runoff across Proposed Scheme; • Reduced routine contaminants.	Very High	Negligible	Imperceptible Permanent Beneficial
Camac_040	Surface water runoff	• No impacts	High	No impacts	N/A

13.4.5.3 Assessment of Potential Impacts – Traffic Redistribution

Surface water drainage on the route of the Proposed Scheme will continue to discharge to existing catchments; a reduction in traffic numbers along this route is anticipated and it would lead to a reduction in the routine contaminants discharging to the Poddle_010. Potential impacts will be permanent, beneficial and of negligible magnitude, resulting in impacts of Imperceptible significance.

Traffic modelling (see Chapter 6 (Traffic & Transport)) has been carried out for two scenarios Do Minimum and Do Something for the years 2028 and 2043. The AADTs for these are presented in Table 13.16. This allows us to see if the Proposed Scheme will result in increased traffic via displacement onto side roads. A review of the data identified that, for most cases, any increases in traffic on side roads would not lead to AADTs being above 10,000. On seven sections of road, increases in AADT to above 10,000 were identified. See Table 13.16. All of these drain to existing catchments and so there is no significant impact.

Table 13.16 Section of Road with Increased AADT to > 10,000 under Do Something Scenarios

Road Name	A_B (GIS)	Length of Section (km)	2028 Do Min	2028 Do Sthg	% Incr	2043 Do Min	2043 Do Sthg	% Incr	Closest existing drainage route	Likely change in drainage catchment	Significant Impact?
Slip road from R112 to R148 Chapelizod Bypass	14160_14200	0.26	8603	10450	21	8808	10747	22	Lifffey_180	No	No
R112 Kylemore Road	14208_14160	0.14	8345	9413	13	9316	10409	12	Liffey_180	No	No
Winetavern Street	2458_6109	0.09	10974	16067	46	10337	14827	43	Ringsend WwTP	No	No
N1 Church Street	2200_2329	0.11	9890	10013	1	9768	10377	6	Ringsend WwTP	No	No
N1 Church Street	2329_2302	0.07	9890	10013	1	9768	10377	6	Ringsend WwTP	No	No
N1 Church Street	2302_2301	0.05	9890	10013	1	9768	10377	6	Ringsend WwTP	No	No
N1 Church Street	2301_2100	0.03	9890	10013	1	9768	10377	6	Ringsend WwTP	No	No

13.4.6 Summary of Flood Risk Assessment

As determined from the Stage 1 assessments in the Flood Risk Assessment (FRA) (Appendix 13.2 in Volume 4 of this EIAR), there is a risk of extensive pluvial flooding along a section of the Proposed Scheme corridor. There is also a residual fluvial flood risk near the City Centre end of Proposed Scheme. This is because the River Liffey is tidally influenced.

All new surface water sewers provided as part of the Proposed Scheme have been designed so that no flooding will occur for a return period up to 30 years. This is an improvement when compared to some of the existing historical drainage infrastructure to be replaced and will reduce the risk of pluvial flooding. Also, as part of the

Proposed Scheme new drainage infrastructure will be provided which will include new SuDS features. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

With the exception of the areas outlined above, the rest of the route does not fall within any flood extents, and therefore is Flood Zone C.

The Proposed Scheme is categorised by the Guidelines 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. As there are areas of the Proposed Scheme identified as being within Flood Zone B, a Justification Test is required.

The Development Management Justification has been assessed and passed. Therefore, further investigation of the flood risk in the form of a Stage 2 Flood Risk Assessment is not required.

The proposed general mitigation measures to reduce the residual flood risk associated with the Proposed Scheme comprise:

- The use of Sustainable Drainage Systems (SuDS) where practicable; and
- A 20% climate change allowance is included for in the design of any drainage attenuation measures.

13.5 Mitigation and Monitoring Measures

13.5.1 Introduction

This section sets out the measures envisaged to avoid, prevent, or reduce any significant adverse effects on the surface water environment identified in Section 13.3 and, where appropriate, identify any proposed monitoring arrangements of the efficiency of implementing those mitigation measures. This section covers both the Construction and Operational Phases. Construction Phase 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) 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:

- Requirement for a Pollution Incident Response Plan;
- Management of construction compounds 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 Specific Mitigation Measures

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

For works close to the Liffey_180 at the entrance to Hermitage Golf Club, surface water drains will be bunded during the removal of existing surfaces and the works being carried out on the boundary wall to prevent sediment entering the water body via this route. No refuelling of plant or machinery will take place in this location.

For the widening north of the N4 to accommodate the two-way cycleway and footway requiring the removal of trees at Hermitage Golf Club and Hermitage Medical Clinic, temporary infiltration (cutoff) ditches or silt-fences will be used to prevent silty water runoff entering the surface water system on the N4.

For the Construction Compounds (LU1a, LU1b and LU2), bunding or silt-fences will be incorporated into boundary fencing to prevent silty water runoff entering surface water drains nearby. At LU1b the silt fence will be reinforced with additional bunding to ensure no leakage of silty water under the silt curtain in hard standing areas. Also, in this location, the surface water manholes will be sealed to ensure no pathway to the sewer exists through that route. Fuel and other materials will be stored to the rear of the compound as far from the surface water drains (and any surface water sewer manholes) as is reasonably practicable. Concrete batching will also be carried out towards the rear of the compound and as far from the surface water drains as is reasonably practicable.

For the full depth construction works in Sections 1 and 2, surface water drains in the road network will be protected through the use of silt fences or infiltration ditches, as above. Refuelling of plant or machinery will only take place at least 10m from surface water drains and with the use of drip trays. For other measures relating to fuel, please see the SWMP.

13.5.3 Operational Phase

Mitigation for the Operational Phase has been built into the design of the Proposed Scheme and is described 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 authority 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 13.5 and the SWMP, no significant impacts on any of the receptors in this study area are anticipated. Residual impacts are presented in Table 13.17.

Table 13.17: Summary of Residual Construction Phase Impacts on Water bodies within the Study Area

Water body Name	Project Activity	Predicted Impacts		
		Description of Predicted Impacts	Potential Impact (Pre-Mitigation & Monitoring)	Predicted Impact (Post-Mitigation & Monitoring)
Liffey_170	Reconfiguration, resurfacing and new pedestrian/cycle bridge	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Imperceptible Short-term Adverse	Imperceptible Short-term Adverse
Liffey_180	Resurfacing and wall demolition/rebuild at entrance to Hermitage Golf Club	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Moderate Short term Adverse	Imperceptible Short-term Adverse
Liffey_180	Widening at Hermitage Golf Club and Medical Clinic for two-way cycle track to the north of N4	• Increased sediment in runoff • Anthropogenic sources (fuel etc.)	Moderate Short term Adverse	Imperceptible Short-term Adverse

Water body Name	Project Activity	Predicted Impacts		
		Description of Predicted Impacts	Potential Impact (Pre-Mitigation & Monitoring)	Predicted Impact (Post-Mitigation & Monitoring)
Liffey_180	Construction Compound	• Increased sediment in runoff • Anthropogenic sources (fuel etc.)	Moderate Short term Adverse	Imperceptible Short-term Adverse
Liffey_180	Construction of new bus lanes and cycleways at M50 Interchange; reconfiguration at R148 Con Colbert Road and Chapelizod Bypass	• Increased sediment in runoff • Anthropogenic sources (fuel etc.)	Moderate to Significant Short term Adverse	Imperceptible to Slight Short-term Adverse
Liffey_180	Road reconstruction, narrowing, cycleways, new pedestrian bridge at Liffey Valley Shopping Centre	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.); • Water body 300-500m away.	Imperceptible Short-term Adverse	Imperceptible Short-term Adverse
Liffey_190	Narrowing, upgrades	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.).	Imperceptible Short-term Adverse	Imperceptible Short-term Adverse
Upper Liffey Estuary	Narrowing, widening, and reconfiguration	• Increased sediment in runoff; • Anthropogenic sources (fuel etc.)	Imperceptible Short-term Adverse	Imperceptible Short-term Adverse
Camac_040	Narrowing, widening, reconfiguration	• No impacts	None	N/A

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. Residual impacts are presented in Table 13.18.

Table 13.18: Summary of Predicted Operational Phase Impacts on water bodies within the Study Area

Water Body Name	Project Operation	Predicted Impacts		
		Description of Predicted Impacts	Predicted Impact (Pre-Mitigation & Monitoring)	Predicted Impact (Post-Mitigation & Monitoring)
Liffey_170	Surface water runoff	▪ No net increase in runoff; ▪ Treatment for runoff across Proposed Scheme; ▪ Reduced routine contaminants.	Imperceptible Permanent Beneficial	Imperceptible Permanent Beneficial
Liffey_180	Surface water runoff	▪ No net increase in runoff; ▪ Treatment for runoff across Proposed Scheme; ▪ Reduced routine contaminants.	Imperceptible Permanent Beneficial	Imperceptible Permanent Beneficial
Liffey_190	Surface water runoff	▪ No net increase in runoff; ▪ Treatment for runoff across Proposed Scheme; ▪ Reduced routine contaminants.	Imperceptible Permanent Beneficial	Imperceptible Permanent Beneficial
Liffey Estuary Upper	Surface water runoff	▪ Reduced runoff; ▪ Treatment for runoff across Proposed Scheme; ▪ Reduced routine contaminants.	Imperceptible Permanent Beneficial	Imperceptible Permanent Beneficial

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) (in the case of an AWB) of any of the water bodies that are in scope (Table 13.19). 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 and indirect impacts. 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 1km 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 of the WFD.

> *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 Habitats Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance. No impact is anticipated as there are no European designated areas within 2km of the Proposed Scheme. There are European designated sites in the wider vicinity of the Proposed Scheme which have been assessed and are presented in the Appropriate Assessment Screening Report and Natura Impact Statement (NIS) submitted with this 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 Proposed Scheme will not influence or moderate agricultural land use or land management.

The revised Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (hereafter referred to rBWD) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Council Directive of 8 December 1975 concerning the Quality of Bathing Water (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 original directive. 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). The Proposed Scheme will not impact any designated bathing waters as there are none that are less than 2km from the Proposed Scheme. It is therefore compliant with the RBWD.

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 and will not prevent it from achieving GES or GEP. There will be no cumulative impacts with other developments, and it complies with other environmental legislation.

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

Taking into consideration the impacts of the Proposed Scheme on the biological, physico-chemical and hydromorphological quality elements, it is concluded that following the implementation of design and mitigation measures, it is concluded that it will not compromise progress towards achieving GES or GEP or cause a deterioration of the overall status of the water bodies that are in scope. It will not compromise the qualifying features of protected areas and is compliant with other relevant Directives. It can therefore be concluded that the Proposed Scheme is fully complaint with WFD and therefore does not require assessment under Article 4.7 of the WFD.

13.7 References

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