Chapter 13
Water

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13.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the BusConnects Galway: Dublin Road (hereafter referred to as the 'Proposed Development'), on the surface water environment during the Construction and Operational Phases. The following attributes of each surface waterbody (receptor) will be considered: hydrology, hydromorphology and water quality. Hydrogeology is dealt with specifically in Chapter 14 of this EIAR (Land, Soils, Geology & Hydrology).

The purpose of the Proposed Developments is to improve the walking cycling and bus infrastructure within Galway City. The Proposed Developments objectives are described in Chapter 1 (Introduction) of this EIAR.

During the Construction Phase, the potential surface water impacts associated with the development of the Proposed Development have been assessed, including impacts from construction runoff, drainage upgrades and footpath widening (see Section 13.4.3 of this report and Chapter 5 of this EIAR).

During the Operational Phase, the potential surface water impacts associated with changes in surface water runoff, increased impermeable surfaces and upgraded drainage infrastructure have been assessed (see Section 13.4.5).

An assessment of the Proposed Developments compliance with the Water Framework Directive (WFD) (Directive 2000/60/EC) requirements for the water bodies within the Study Area is provided in Volume 4 - Appendix A13.1 of this EIAR. WFD require all waterbodies in EU to retain ''Good quality status''. To meet the targets set by WFD and to improve the ecology of water bodies in Ireland a list of measures known as 'Program of Measure' need to be implemented. The Programme of Measures are mostly the responsibility of Governmental Organisations and relate to the setting up of Organisations, Monitoring Bodies, and protocols, who will act as the mechanism to ensure the objectives of the WFD are achieved. Relevant measures from the Programme of Measures will be implemented in the Proposed Development to ensure compliance with WFD requirements. Considering all requirements for compliance with the WFD, the Proposed Development will not cause a deterioration in status in any water body, not prevent it from achieving Good Environmental Status or Good Ecological Potential. The Proposed Development complies with all requirements of the WFD.

Flooding has been assessed within a dedicated Flood Risk Assessment (FRA) in Appendix A13.2 - Volume 4 of this EIAR. The results of the FRA have been summarised in Section 13.3.7 of this chapter.

The design of the Proposed Development 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 Development are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been considered and incorporated, where appropriate.

The assessment has been carried out in accordance with best practice and guidelines (see Section 13.2.3) for the assessment of surface water and has taken account of experience in assessment of similar large-scale infrastructural projects.

13.2 Methodology

13.2.1 Introduction

This section presents the study area and the appraisal method for the assessment of impacts on Water as a result of the Proposed Development.

13.2.2 Study Area

The Study Area for this assessment has been set to extend ~250m[1] beyond the landtake boundary of the Proposed Development as any significant impacts to local waterbodies are considered to occur within this offset distance.

It is considered that the 250m offset distance from the Study Area does not capture all waterbodies with connection to the proposed works. The existing drainage outfalls are located >250m from the landtake boundary, however, based on the direct hydrological connection provided by the drainage network, it is considered that the downstream waterbodies should be included within the assessment as these waterbodies may be susceptible to significant impacts as a result of the proposed works.

Waterbodies considered as receptors pertain to 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 WFD), which includes riverine, transitional waterbodies, lake (water) bodies and coastal waterbodies, and also non-WFD classified waterbodies. The European Union (Water Policy) Regulations 2014 also requires the assessment of permanent impacts of a scheme on groundwater waterbodies.

Existing and proposed artificial drainage features such as existing Sustainable Drainage Systems (SUDS) have not been considered as receptors within the assessment.

13.2.3 Relevant Guidelines, Policy, and Legislation

13.2.3.1 Guidance

This assessment has been undertaken in accordance with the Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022).

The following documents detailed in Table 13-1 below have been consulted during the preparation of this Chapter.

Table 13-1 Relevant Guidance

Reference Material	Title
Legislation	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the Assessment of the Impacts of Certain Public and Private Projects on the Environment (hereafter referred to as the Environmental Impact Assessment (EIA) Directive); Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 - Establishing a Framework for the Community Action in the Field of Water Policy (hereafter referred to as the WFD Directive); Directive 2007/60/EC Of the European Parliament and Of The Council of 23 October 2007 on the Assessment and Management of Flood Risks; Local Government (Water Pollution) Act 1977, as amended; Local Government (Water Pollution) (Amendment) Act 1990, as amended;

[1] Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, National Roads Authority, 2009.

Reference Material	Title
	S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003, as amended; S.I. No. 108/1978 - Local Government (Water Pollution) Regulations, 1978, as amended; S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988; S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations, 2006, as amended; S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations, 2009, as amended; S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended; S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations, 2011; S.I. No. 99/2023 - European Union (Drinking Water) Regulations 2023, as amended; S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014; S.I. No. 495/2015 - European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015; and S.I. No. 296/2018 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, as amended.
Guidance	Guidance note on carrying out a Water Framework Directive assessment on Environmental Impact Assessment developments (Northern Ireland Environmental Agency Water Management Unit, 2012); 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); National Road Authority (NRA) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA 2005); Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas - Best Practice Interim Guidance Document (Department of Housing, Local Government and Heritage, 2022); 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)[2]; Sustainable Drainage Design and Evaluation Guide 2021 (Dublin City Council, 2021);

[2] The National Roads Authority merged with the Railway Procurement Agency and is known as Transport Infrastructure Ireland (TII) since 1 August 2015. All references to guidance documents and standards within this EIAR will retain the NRA reference until such time as these documents are updated.

Reference Material	Title
	Greening and Nature-based SuDS for Active Travel Schemes (NTA 2023) The Department of the Environment, Heritage, and Local Government (DEHLG)[3] 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); and Transport Infrastructure Ireland (TII) Road Drainage and the Water Environment Guidance Document (TII 2015).

13.2.3.2 Water Framework Directive

The WFD established a framework for the protection of both surface and groundwaters, providing 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 (river, lakes, groundwater, transitional, coastal) to attain 'Good Status' (qualitative and quantitative) by 2027.

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

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

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

The Water Policy Regulations require the assessment of permanent impacts of a scheme on WFD water bodies, (rivers, lakes, estuaries, coastal waters and groundwater). Typically, the permanent impacts include all operational impacts but can also include impacts from construction depending on the length and / or nature of the works, etc. of the Proposed Development, as some potential construction impacts could be considered permanent in the absence of mitigation. An assessment of the compliance of the Proposed Development with WFD requirements is provided in Volume 4 - Appendix A13.1.

In the absence of WFD assessment guidance specific to Ireland, this assessment has been carried out using the UK Environment Agency's 'Water Framework Directive assessment: Estuarine and Coastal waters' 2016 (updated 2023) (Environment Agency). No specific guidance exists for freshwater water bodies; however, this guidance was used as the basis of the UK's Planning Inspectorate (PINS) Advisory

[3] Now the Department of Housing, Local Government and Heritage.

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 for the assessment of the Proposed Development.

In addition, the guidance document 'Carrying out a Water Framework Directive (WFD) Assessment of EIA Developments' as published by the Northern Ireland Environmental Agency Water Management Unit (2012), was also reviewed.

13.2.3.3 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for implementing an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years. The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and applies to the Republic of Ireland. 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).

For those water bodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures 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 2024 was published the Water Action Plan 2024 which is Ireland's third River Basin Management Plan. This Water Action Plan enhances and builds upon the work of the first and second-cycle plans. It outlines the measures the Government and other sectors are taking to improve water quality in Ireland's groundwater, rivers, lakes, estuarine and coastal waters, and provide sustainable management of our water resources. This RBMP has been used as a reference point for this assessment with respect to proposed measures. Where waterbodies 'At Risk' status has already been updated by the EPA online for the third cycle RBMP, this has been used in the assessment. The Environmental Protection Agency ('EPA') reports that water quality in Ireland has made some improvements but these are being offset by declines in water quality elsewhere. Just over half of surface waters (rivers, lakes, estuaries and coastal waters) are in satisfactory condition (that is they are achieving good or better ecological status).

Figure 13-1 and Figure 13-2 present the ecological status (in numbers and percentage) in each water bodies type in Ireland for the period 2016-2021.These figures illustrate the quality improvements of some surface water bodies like river lakes, transitional and coastal in achieving 'Good' or 'High' ecological status.

Overall, 54% of surface waters are in good or high ecological status while the remaining 46% are in unsatisfactory ecological status. For groundwater bodies, 91% are in good chemical and quantitative status.

Type	High	Good	Moderate	Poor	Bad	Unassigned	Total
River	257	1,345	1,028	554	5	3	3,192
Canal*	-	16	-	-	-		16
Lake	251	306	168	79	8		812
Transitional	28	27	79	18	4		156
Coastal	44	35	16	1	1		97
Groundwater	-	470	-	44	-		514
Total	580	2,199	1,291	696	18	3	4,787

*ecological potential for canals

Figure 13-1 Summary of status for each water body type (Source: RBMP)

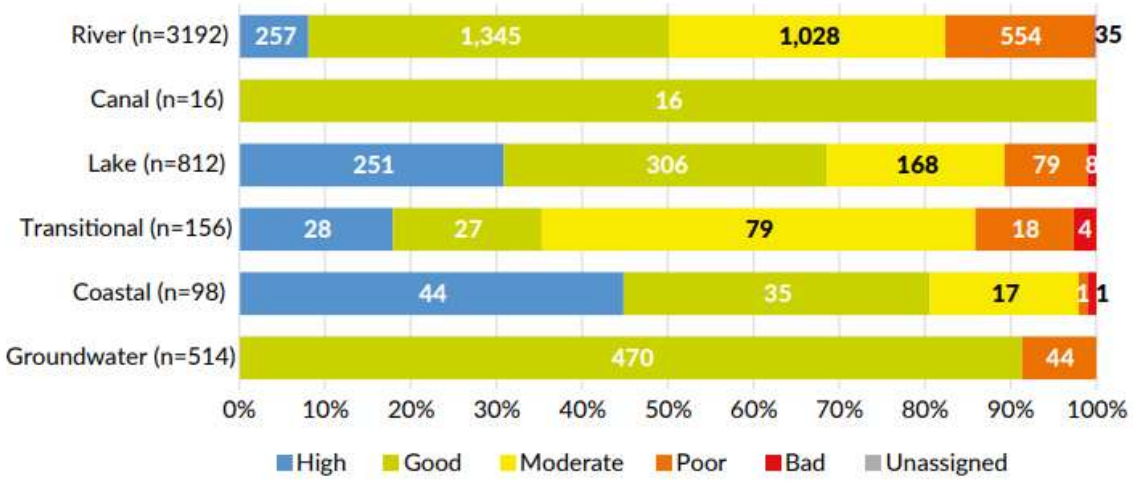

Figure 13-2 The percentage of water bodies (numbers also indicated) achieving each status class for each water body type for the period 2016-2021 (Source: RBMP)

The latest characterisation and risk assessments undertaken in 2023 by the EPA show that 41% of water bodies are within the 'Not at Risk' category; they are meeting their environmental objective of good or high-status; 34% of water bodies are 'At Risk' of not meeting their environmental objective of good or high-status. Of these, 46% are impacted by a single significant pressure while the remaining 54% are impacted by more than one significant pressure.

Agriculture remains the most common significant pressure, followed by hydromorphology, forestry and urban wastewater. There has been a slight reduction in the number of water bodies impacted by forestry, urban wastewater, domestic wastewater and industry, but little change in the other main pressure categories including agriculture, pressures on hydromorphology, peat, mines and quarries since the second cycle RBMP. The current RBMP sets out a Programme of Measures necessary to deliver the objectives of the WFD in full and to contribute to other environmental priorities.

13.2.4 Data Sources

Information on the baseline environment, including hydrology, hydromorphology and water quality of the receptors within the Study Area, has been collected and collated by the undertaking of both a desk study and a field survey.

13.2.4.1 Desk Study

Table 13-2 details the data sources consulted to undertake the desk study.

Table 13-2 Data Sources

Assessment Component	Description
General	Aerial photography (i.e., Google Earth); EPA Sources: Online mapping resource (Envision and www.catchments.ie): Teagasc subsoil classification mapping, WFD Mapping, Water Quality Monitoring Database and Reports including Hydrometric Data System / EPA Catchments, 'Water Quality in Ireland, 2013 to 2018' as published in 2019; Geological Survey of Ireland (GSI) - Online Mapping; Geohive - Environmental Sensitivity Mapping (UCD, EPA & AIRO) Inland Fisheries Ireland (IFI) - fishery resources; National Parks and Wildlife Service (NPWS): Designated Areas Mapping; and Ordnance Survey of Ireland (OSI): Discovery Mapping, Six Inch Raster Maps, Six Inch and 25 Inch OS Vector Mapping, Orthographic Aerial Mapping (Geohive).
Flood Risk	OPW: Online Mapping Resources: Hydrometric data (floodinfo.ie), OPW CFRAM Flood Risk and Flood mapping (www.epa.ie/hydronet).
River Basin Management Plans	River Basin Management Plan 2022-2027.
Development Plans	Galway County Development Plan 2022 – 2028; and Galway City Development Plan 2023 – 2029.

13.2.4.2 Field Surveys

Field walkover assessments were carried out on 23/06/2022 and 19/03/2023. All drainage outfalls associated with the Study Area were visited to inform the assessment of existing conditions and to identify potential pathways for environmental impacts associated with the development of the Proposed Development. It was noted that there are no watercourse crossings within the boundary of the Proposed Development.

13.2.5 Appraisal Method for the Assessment of Impacts

13.2.5.1 General Approach

The following method for the assessment of impacts has been adapted from the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (TII 2015), specifically Section 5.6. The assessment was also cognisant of the guidance set out in the EPA Guidelines.

The surface water environment is intrinsically linked to flood risk, ecological receptors, and groundwater, which have been considered in the FRA Report (Appendix A13.2 in Volume 4 of this EIAR), Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR respectively.

The commercial and recreational use of the water environment is not included in the scope of this Chapter as these interests are considered and assessed in Chapter 18 (Material Assets) and Chapter 10 (Population) of this EIAR.

The TII Guidelines (NRA 2009) outline how impact type, magnitude, and duration should be considered relative to the importance of the hydrological receptor and its sensitivity to change to determine significance of the impacts. The overall impact on surface water receptors (i.e., rivers, canals, transitional waterbodies, coastal waterbodies, and lakes) because of the Proposed Development will be determined based on two parameters:

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

13.2.5.2 Sensitivity of Receptors

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

Table 13-3 outlines the criteria for estimating the sensitivity of receptors and their attributes.

Table 13-3 Sensitivity of Receptor

Sensitivity	Criteria	Typical Example
Extremely High	Attribute has a very high quality or value on an international scale	Any water body which is protected by EU legislation (e.g. Designated European Sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) or 'Salmonid Waters'; and A waterbody that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.
Very High	Attribute has a high quality or value on an international scale or very high quality or value at a national scale	Any waterbody (specific EPA segment) which has a direct hydrological connection (<2km) to European Sites or protected ecosystems of international status (Special Areas of Conservation (SAC) / Special Protected Areas (SPA) or Salmonid Waters); A waterbody ecosystem protected by national legislation (Natural Heritage Area (NHA) status); A waterbody that appears to be largely in natural equilibrium and exhibits a diverse range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited modifications; and Nutrient Sensitive Areas.
High	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 (2016 - 2021) waterbody with some hydrological connection (<2km) to European Sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters) further downstream; A waterbody which has a direct hydrological connection to sites / ecosystems protected by national legislation (NHA status); A waterbody that appears to be in some natural equilibrium and exhibits some morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences; and Direct hydrological connectivity to Nutrient Sensitive Areas.
Medium	Attribute has some limited value at a national scale	A WFD waterbody with Moderate WFD Status (2016 - 2021); A WFD waterbody with limited (>2km - <5km) hydrological importance for sensitive or protected ecosystems (much further downstream); A waterbody showing signs of modification or culverting, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences; Evidence of historical channel change through artificial channel straightening and re-profiling; and Some hydrological connection downstream Nutrient Sensitive Areas.
Low	Attribute has a low quality or value on a local scale	A waterbody with Bad to Poor WFD Status (2016 – 2021); A waterbody with (>5km or no) hydrological connection to European Sites or national designated sites, or;

Sensitivity	Criteria	Typical Example
		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.

13.2.5.4 Magnitude of Impact

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

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

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

The criteria for assessing the magnitude of impact on hydrology attributes are presented in Table 13-4.

Table 13-4 Criteria for Assessing Magnitude of Impact[4]

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

13.2.5.3 Significance of Impact

The significance of an impact is determined by considering the sensitivity of the receptor alongside the potential magnitude of impact, as listed in Table 13-5.

[4] Box 5.2 – Guidelines and Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2009)

Table 13-5 Categories of Environmental Impacts (EPA 2022)

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

Description of the categories are explained in the EPA (2022) guidance and are given in Table 13-6.

Table 13-6 Description of Impacts (EPA 2022)

Impact Categories	Description
Profound Adverse	Where the Proposed Development will potentially result in degradation of the water environment because of profoundly adverse impacts on at least one water attribute. For example: ▪ Deterioration of overall status in a High or Good WFD status Class waterbody; ▪ Long-term deterioration of an EU Designated Salmonid fishery; ▪ Loss or extensive change to a site / habitat protected under EU or Irish legislation: SAC, SPA, Ramsar site, Water Protection Zone, Salmonid Water; and ▪ High risk of pollution from spillages when discharging into a Good or High-status Class under the WFD. Where the Proposed Development will potentially result in an increased flood risk. For example: ▪ Significant increase in impermeable areas; ▪ Development within Flood Zones and / or increased runoff without Sustainable Drainage Systems (SUDS); and ▪ Where the Proposed Development will potentially result in adverse impacts on receptor Hydromorphology including changes in drainage regime.
Significant Adverse	Where the Proposed Development will potentially result in the degradation of the water environment because of significant adverse impacts on at least one attribute. For example: ▪ Potential contribution towards the deterioration of a WFD quality element; ▪ Potential failure of any Environmental Quality Standard (EQS) in a Moderate or Poor WFD status waterbody; ▪ Loss or damage to channel morphology that may contribute to a reduction in waterbody WFD hydromorphology classification; ▪ Potential short-term failure of any EQS in a High or Good WFD status waterbody; ▪ Moderate / Low risk of pollution from spillages in a Good WFD status waterbody; ▪ Moderate / High risk in a Moderate or Poor WFD status waterbody; ▪ Partial loss or change to a fishery; and ▪ Impact on the integrity of the existing flora and fauna.
Moderate adverse	Where the Proposed Development will potentially result in a degradation of the water environment because of moderate adverse impacts on one or more attributes. For example: ▪ Potential short-term failure of any EQS in a Moderate or Poor WFD status waterbody; ▪ Potential short-term failure of any EQS in a Moderate or Poor WFD status waterbody; ▪ Loss or damage to channel morphology but insufficient to have any impact on waterbody WFD hydromorphology classification; ▪ Moderate / Low risk of pollution from spillages in a Moderate or Poor WFD status waterbody; and ▪ Temporary loss to, or loss in productivity of, a fishery.

Impact Categories	Description
Slight adverse	Where the impact of the Proposed Development is slight because it will result in no appreciable negative impact on the identified attribute. For example: ▪ No risk identified of failing any EQS; ▪ Minimal or no measurable change from baseline conditions in terms of sediment transport, channel morphology and natural fluvial processes; and ▪ Risk of pollution from spillages is Low.
Imperceptible	Where the impact of the Proposed Development has no noticeable change to baseline conditions.
No Impact	Where there is no impact of the Proposed Development.
Slight beneficial	Where the impact of the Proposed Development has a slight benefit and will result in minor improvement of the identified attributes.
Moderate beneficial	All other situations where the Proposed Development provides an opportunity to enhance the water environment or provide an improved level of protection to an attribute. For example: ▪ Assessment show that EQS will move up to Pass from previous Fail condition for existing discharges; and ▪ Reduction by 50% or more in existing pollution risk from spillages into High to Poor status waterbodies (when previous spillage risk was Moderate).
Significant beneficial	Where the Proposed Development provides an opportunity to enhance the water environment because it will result in a significant improvement for an attribute. For example: ▪ Contribution toward the improvement of a WFD quality element status; ▪ Assessment shows that EQS will pass from previous Refer or Fail condition for existing discharges; ▪ Reduction by 50% or more in likelihood of pollution to waterbodies from spillages from existing discharges through retrofitting of pollution control to outfalls into a High to Poor waterbody (where existing risk is Moderate); and ▪ Recharge of aquifer through provision of treated discharges to ground resulting in measurable improvements to a connected site / habitat of local nature conservation value i.e., Local Nature Reserve.
Profound beneficial	It is extremely unlikely that any new or improved development will fit into this category. However, proposals could have a large positive impact from a 'very' or 'highly' significant improvement to a water attribute(s), with insignificant adverse impacts on other water attributes. For example: ▪ Improvement of one or more WFD quality elements contributing to or resulting in the improvement of the overall status of a WFD waterbody's overall status; ▪ Removal of an existing polluting discharge through provision of pollution prevention measures, or any other measure, affecting a site / habitat protected under EU or Irish legislation (SAC, SPA, Ramsar site, NHA and Salmonid Water); and ▪ Reduction by 50% or more in the existing likelihood of pollution arising from a spillage affecting a site / habitat protected under EU or Irish legislation (SAC, SPA, Ramsar site, NHA and Salmonid Water) where existing risk is Moderate.

13.2.5.4 Passenger Car Unit

Traffic modelling (see Chapter 6 (Traffic & Transport)) has been carried out for two scenarios, the Do Minimum and Do Something (i.e. respectively without and with the Proposed Development) for 2028 and 2043.

Table 13-7 demonstrates that there is a reduction of between -166 and -328 general traffic flows along the direct Study Area during the AM Peak Hour, which is attributed to the Proposed Development and the associated modal shift as a result of its implementation. This difference in general traffic flow averages at -247 across all road links, which is determined as an overall Positive, Slight and Long-term effect on the direct Study Area. The most significant effect occurs on the Dublin Road, which is the main corridor of the Proposed Development.

As traffic flow numbers are proportional to the concentration of pollutants within surface water runoff, it is considered the Proposed Development will result in a slight decrease in the concentration of pollutants within the surface water runoff which is shed from the trafficked surfaces.

Table 13-7 Road Links that Experience a Reduction of ≥100 Combined Flows (AM Peak Hour, 2028)

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (Passenger Car Unit PCU)
BALLYBANE ROAD	1,294	1,052	-242
BALLYLOUGHANE ROAD	689	437	-252
DUBLIN ROAD	1,690	1,362	-328
RENMORE AVENUE	540	374	-166

13.3 Baseline Environment

13.3.1 Existing Drainage System and Outfall Locations

A desk study of the existing road drainage system within the Study Area, using online mapping tools (Google Street view and OpenStreetMap) and historical sewer network information, was conducted to determine the locations of existing road drainage and associated outfall locations.

It was noted that along a length of the existing road (between mainline chainage 2+170 and 3+883) surface water drainage occurs via an informal over the edge drainage system, whereby surface water from the road pavement is shed onto private lands adjacent to the road. This runoff is then infiltrated through the soil adjacent to the road. This form of system is common and is how most rural roads in Ireland are drained. As the proposed works incorporate kerbing, the existing over the edge drainage system cannot be utilised. Furthermore, the aquifer / groundwater in the region is considered highly vulnerable. The karstified limestone bedrock can act as a conduit between pollutants at ground level and the aquifer.

Due to the potential environmental risks associated with this aspect of the existing drainage regime, J.B. Barry Transportation undertook a drainage design assessment to identify potential design options to replace the existing and now unsuitable over the edge surface water drainage system. Section 13.5 outlines the mitigation measures proposed to ensure that the Proposed Development will result in the betterment of the existing drainage regime.

The remainder of the existing drainage system associated with the Proposed Development is serviced by surface water and combined drainage network. Flows are typically collected in standard gully grates and routed via a gravity network to outfall points. There are no SUDS / attenuation measures on the existing system.

A summary of the drainage details is listed in Table 13-8 and shown in Figure 13-3.

Table 13-8 Drainage Catchment Details

Existing Catchment Reference	Drainage Catchment Area (Ha)	Existing Network Type	Outfall Location
Catchment Area 1	325.0	Stormwater	Network outfalls to Lough Atalia

Existing Catchment Reference	Drainage Catchment Area (Ha)	Existing Network Type	Outfall Location
Catchment Area 2	16.0	Stormwater	Network outfalls to Lough Atalia
Catchment Area 3	18.0	Combined	Network outfalls to Mutton Island WWTP
Catchment Area 4	60.0	Stormwater	Network outfalls to Corrib Estuary
Catchment Area 5	282.0	Stormwater	Network outfalls to Ballyloughane Beach
Catchment Area 6	298.0	Stormwater	Network outfalls to North of Rabbit Island
Catchment Area 7	169.0	Stormwater	Network outfalls to Oranmore Bay

Figure 13-3 Outfall Locations

It can be summarised that the main surface water receptors for the drainage system within the study area are:

- Lough Atalia;
- Corrib Estuary; and
- Oranmore Bay.

and the immediate proximate / indirect coastal waterbodies include the Inner Galway Bay (North) and (South).

All of the above waterbodies form parts of Special Areas of Conservation (SACs). Where formal surface water drainage infrastructure is absent, it is noted that the receiving aquifer has a vulnerability of E (Extreme) or X (Rock at or Near Surface), which are the highest vulnerability ratings.

As outlined in Table 13-8 above, surface water drainage within the Site Boundary is distributed across seven catchment areas, the extents of which are presented in Figure 13-4 below.

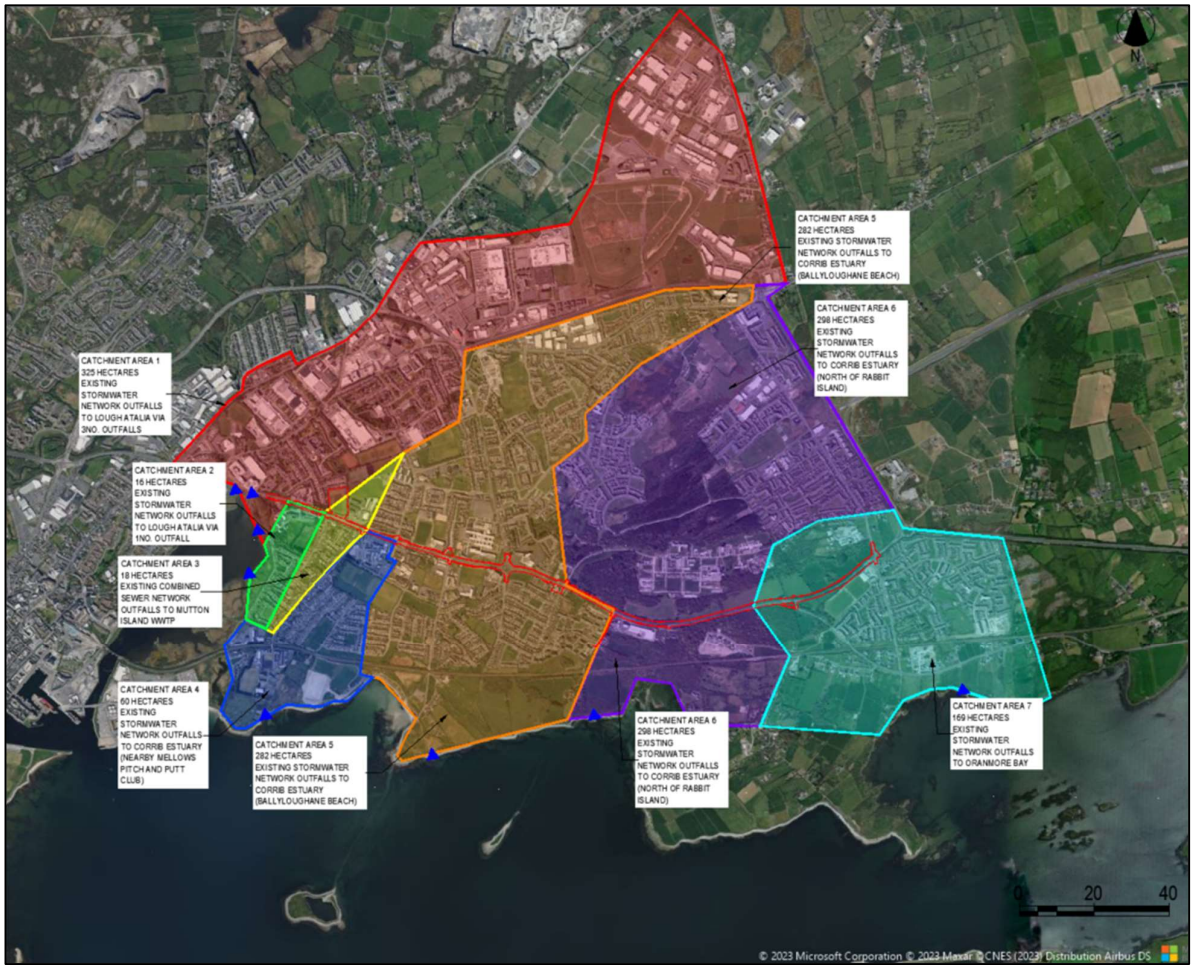

Figure 13-4 Drainage Catchment Areas

13.3.2 WFD Catchment Overview

Under the Water Framework Directive (WFD), water quality is monitored by the EPA and assigned an overall status based on the lowest status for the quality element monitored within that waterbody.

The Transitional Waterbody WFD status (2016 - 2021) of the Corrib estuary (including Lough Atalia) is 'Moderate'. Clarinbridge ground waterbody status was determined to be 'Good' for the same period. The status of Oranmore Bay is 'Unassigned' for the 2016 – 2021 period (i.e. has no current WFD status), however, it is worth noting that Oranmore Bay achieved a WFD status of 'High' for the 2013 – 2018 period. The Coastal Waterbody WFD status (2016 – 2021) of the Inner Galway Bay is 'Good'.

Under the WFD, an Approved Risk is assigned to each waterbody. Clarinbridge ground waterbody, Oranmore Bay and Inner Galway Bay were assigned 'Not at Risk' status while the Corrib Estuary is assigned 'Review' status. Waterbodies are categorised as 'Review' either because additional information is needed to determine their status before resources and more targeted measures are initiated or the measures have been undertaken, e.g. a wastewater treatment plant upgrade, but the outcome hasn't yet been measured /

monitored. Water bodies for 'Review' are not considered to be 'At Risk' but require further evidence that the objectives are being met, typically with ongoing monitoring and / or possibly modelling.

13.3.3.1 Hydrometric Areas

The Study Area lies within Hydrometric Area (HA) 29 Galway Bay Southeast. Figure 13-5 shows the WFD Catchment / Sub catchment near the Proposed Development.

Figure 13-5 Hydrometric Areas within and around the Study Area

The Galway Bay Southeast Catchment Summary (Galway Bay Southeast Catchment Assessment 2024 (HA 29)) (EPA 2024) reports that the catchment pertains to all streams entering tidal water in Galway Bay between Black Head and Renmore Point and drains a total area of 1,270m^2. The catchment has an approximate population density of 59 people per km^2.

This catchment is predominantly underlain by karstified limestone and the groundwater and surface water systems in the area are closely interlinked. The Proposed Development is entirely within the Carrowmoneash (Oranmore)_SC_010 sub-catchment.

13.3.4.2 Hydrometric and National Monitoring Stations

There are two active hydrometric stations present in proximity to the Study Area as shown in Table 13-9.

Table 13-9 Active Hydrometric Stations near the Study Area

Station Name	Station Number	Waterbody	Catchment Area	Owner	Available Data	Grid Reference
Galway Port	29062	Galway Bay	N/A	Marine Institute	Water Level	E130115 N224787
Wolfe Tone Bridge	30061	Corrib Estuary	3136	OPW	Water Level	E129616 N224896

There are also two national water monitoring stations located in proximity to the Study Area as provided in Table 13-10.

Table 13-10 National Water Monitoring Stations near the Study Area

Station Name	Station ID	Waterbody	Local Authority	Grid Reference
GY110 – Outside Galway Docks	TW12005248GY1001	Corrib Estuary	Galway County Council	E130256 N224636
GY170 – Oranmore Bay	CW12005240GY2003	Inner Galway Bay North	Galway County Council	E135305 N223508

13.3.3 Surface Water WFD Status

The EPA dataset records waterbody status in accordance with the European Communities (Water Policy) Regulations, as amended (S.I. No. 722/2003). The objective of the aforementioned regulation is to attain 'Good' status in waterbodies that currently have a lower status and retaining 'Good' status in waterbodies that have already achieved 'Good' status. The main surface waters within the study area are Corrib Estuary Transitional Waterbody, Oranmore Bay Transitional Waterbody, and Inner Galway Bay Coastal Waterbody. WFD designated waterbodies within the study area included in this assessment are shown in Figure 13-6 and the WFD waterbodies status is shown in Figure 13.1 in Volume 3 of this EIAR.

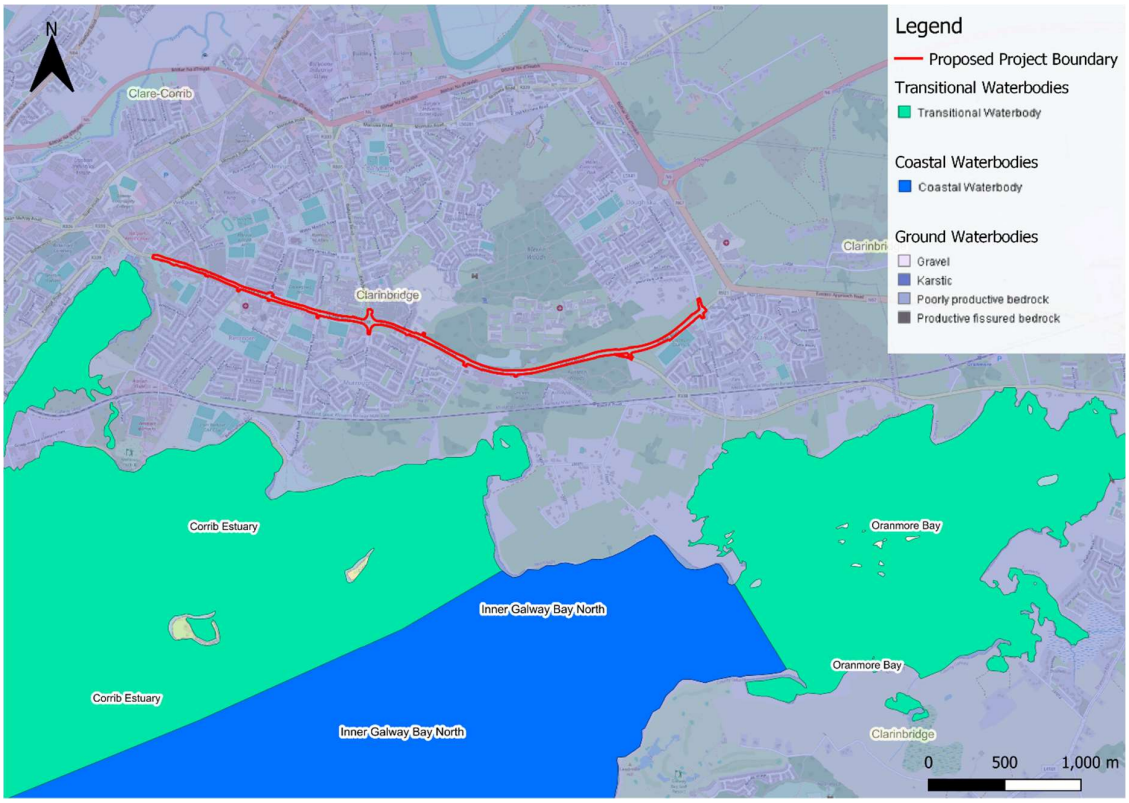

Figure 13-6 WFD Waterbodies within the Study Area. (*Yellow – Corrib Estuary; Green – Clarinbridge; Grey – Oranmore Bay; Blue – Inner Galway Bay North*)

The water quality ratings and the risk categorization for the WFD waterbodies within the Study Area are provided in Table 13-11.

Table 13-11 Water Quality and Risk Categorisation

Water Body EPA Name (WFD Name)	European Code	Type	Status 2016 - 2021	Risk Categorisation
Corrib Estuary	IE_WE_170_0700	Transitional	Moderate	Review
Oranmore Bay	IE_WE_170_0500	Transitional	Unassigned	Not at Risk

Water Body EPA Name (WFD Name)	European Code	Type	Status 2016 - 2021	Risk Categorisation
Clarinbridge	IE_WE_G_0008	Ground	Good	Not at Risk
Inner Galway Bay North	IE_WE_170_0000	Coastal	Good	Not at Risk

Furthermore, the Corrib Estuary, Oranmore Bay and Inner Galway Bay are classified as 'Unpolluted' based on water quality monitoring and assessments of Trophic Status carried out for the Reporting period 2018-2020. The WFD waterbodies risk status is shown in Figure 13.2 in Volume 3 of this EIAR.

As previously outlined, Oranmore Bay is unassigned with regard status for the most recent reporting period. Irrespective of the condition of the waterbody if it was categorised, the Proposed Development will not cause it to deteriorate and will include a number of mitigation measures to ensure that it will not prevent it meeting the biological and chemical characteristics for 'Good Status' in any way.

13.3.4 Summary of WFD Assessment

It is considered that, following the implementation of good practice design measures including the provision of sustainable drainage systems, pollution controls, flow controls and attenuation measures; the anticipated impacts of the Proposed Development on the biological, physico-chemical and hydromorphological quality elements will not compromise progress towards achieving 'Good' status or cause a deterioration of the overall Good Ecological Potential (GEP) of any of the waterbodies in proximity to the Proposed Development, refer to Appendix A13.1 WFD Assessment included in Volume 4 of this EIAR.

Table 13-12 WFD Assessment

Environmental Objective	Proposed Development	Compliance with the WFD Directive
No changes affecting high status sites.	No waterbodies identified as high status.	Yes
No changes that will cause failure to meet surface water Good Ecological Status (GES) or Good Ecological Potential (GEP) or result in a deterioration of surface water GES or GEP.	After consideration as part of the detailed compliance assessment, the Proposed Development will not cause deterioration in the status of the water bodies during construction; during operation, no significant impacts are predicted. Good practice measures employed during construction and operation will minimise any risk to the waterbodies.	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other waterbodies.	The Proposed Development will not cause a permanent exclusion or compromise achieving the WFD objectives in any other waterbodies within the RBD.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration of groundwater status.	The Proposed Development will not cause deterioration in the status of the groundwater bodies.	Yes

13.3.5 Designated Sites

A review of the Natura 2000 network was conducted to determine those European sites which are in proximity and or hydrologically connected to the Proposed Development. The following European sites were identified to be relevant to this assessment (with downstream hydrological connectivity):

- Galway Bay Complex SAC (Site Code:000268); and
- Inner Galway Bay SPA (Site Code: 004031).

The Galway Bay Complex is also identified as a proposed Natural Heritage Area (pNHA). There are no salmonid rivers, nutrient sensitive areas or shellfish areas within the Study Area, as per data on EPA geoportal.

There are four bathing waters under the remit of Galway City Council (Bathing Water Quality in Ireland report (EPA, 2022)). Only one of these bathing waters, Ballyloughane Beach, is within the Study Area of the Proposed Development. The water quality classification of this bathing water is presented in Table 13-13.

Table 13-13 Classification of Identified Bathing Waters 2019 – 2022 (EPA, 2022)

Identified Bathing Water	Bathing Water Classification			
	2019	2020	2021	2022
Ballyloughane Beach	Poor	Sufficient	Good	Good

As outlined in Table 13-13 above, the water quality at Ballyloughane Beach has improved from 'Poor' in 2019 to 'Good' in 2022.

13.3.6 Drinking Water Supply

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. There are no surface waters within the Study Area designated as a source for drinking water.

All WFD ground waterbodies have been identified as Drinking Water Protected Areas due to the potential for qualifying abstractions of water for human consumption as defined under Article 7 of the WFD.

13.3.7 Flood Risk

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

The FRA is summarised below;

- Flood risk was assessed for Fluvial, Pluvial, Tidal and Groundwater;
- On the website FloodInfo.ie, there are currently no recorded flood events along the Proposed Development route;
- While Catchment Flood Risk Assessment and Management (CFRAM) and National Indicative Fluvial Mapping (NIFM) Mapping do indicate flooding risks in the vicinity (River Corrib and Galway Bay amongst others), the inundation boundaries of these flood zones do not impact on the Proposed Development, see Figure 13-7 and Figure 13-8 below;
- The existing drainage systems which drain the public infrastructure and public spaces, together with the other development in the region, appears to be functioning adequately at present;
- The Proposed Development will result in a change to surface water management in the east of the Proposed Development between chainages 2+170 and 3+883. In this region, the existing over the edge drainage system, will be replaced with a sealed system whereby surface water is piped to low points from where it is pumped to a public sewer. Attenuation storage is to be provided adjacent to the pumps. The FRA identified that there would be an increase in Flood risk at the site of the pumps, as they are vulnerable to mechanical failure;
- There are three Flood Zones which are graphical areas within which the likelihood of flooding is in a particular range. Flood Zone A - High Probability flood events from rivers and sea (greater than 1% AEP or 1 in 100 year for river flooding or 0.5% or 1 in 200 for coastal flooding). Flood Zone B - Medium Probability flood events have approximately a 1-in-a-100 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 1%. Flood Zone C -

Low Probability flood events have approximately a 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of less than 0.1%. The Proposed Development is at low risk of fluvial and tidal floodings (Flood Zone C). Flood risk from pluvial, groundwater and mechanical/operational failure of the pumps have also been assessed for the construction and operation stages of the Proposed Development. The initial flood risk was found to be moderate for pluvial and moderate/high for the pump failure;

- Mitigation measures have been included for the proposed drainage works which has reduced the flood risk to acceptable levels. Surface water management measures including upgraded surface water drainage system, additional green area and SuDS features, oversized pipes and attenuation tanks with flow control are incorporated in the design; and
- In conclusion, there is still some residual risk, but these can be managed during the construction and operation phases of the Proposed Development. These measures are set out in the Appendix A5.1 CEMP in Volume 4 of this EIAR. This FRA has demonstrated that the Proposed Development is in compliance with the core principles of the FRM Guidelines.

Figure 13-7 CFRAM River Flood Extents (Current Scenario)

Figure 13-8 CFRAM Tidal Flood Extents (Current Scenario)

A summary of the baseline flood risk and the assessment of future risk from the FRA is provided below for completeness.

The various sources of flooding were assessed, and it was determined that the site is at low risk of fluvial and coastal flooding (Flood Zone C) but there is a moderate risk of pluvial and groundwater flooding. There is also a risk of flooding from failure of the pumping stations that is assessed as a moderate / high risk. Several mitigation measures have been proposed to reduce the following flood risks:

- **Increase in impermeable surface areas through widening of the carriageway.** Road drainage outfalls discharging to receiving surface water networks without flow attenuation could increase downstream flows and cause local flooding. This has been mitigated in the drainage design through suitably sized attenuation storage tanks incorporating flow control, oversized storage pipes and SuDS measures. Oversized storage pipes will provide additional capacity within the drainage system and reduce the likelihood of surface water surcharge onto the public road during an intense storm event. In addition, the proposal includes other drainage design measures such as additional gullies which will provide additional capacity within the system.
- **2 No. Surface water pump stations at low points in Networks 7 and 8.** There is a flood risk associated with this system as it is at risk from power outages, and mechanical failures. The attenuation tanks are designed with excess capacity above the storage requirements so that surface water will not immediately flood the public road, in the case of pump failure. (Refer to Appendix 13.3 in Volume 4 of this EIAR and BCGDR-BTL-DNG_RD-XX-DR-CD-00001_00011 in Volume 3)
- As with all drainage systems, the new drainage system had the **potential to become blocked**, which could cause flooding. A routine maintenance plan of the drainage system is proposed as a mitigation measure.

13.3.8 Known Pressures

A desktop study was undertaken to determine the presence of point source environmental pressures within 250m of the Proposed Development. The search included the presence of Industrial Emissions Licence (IEL) / Integrated Pollution Control (IPC) licensed sites and urban wastewater treatment plants (UWWTP) and associated stormwater overflows (SWOs). The search returned the following sites:

- IPC Licensed Facility Heiton Buckley Limited, Well Park, Galway, Reg No. P0339; and
- There are 2 No. SWOs within Lough Atalia (Emission IDs: TPEFF1100D0050SW022 and TPEFF1100D0050SW021).

13.3.9 Summary of Baseline Receptor Sensitivity

The sensitivity of surface water attributes to changes as a result of the Proposed Development are determined by a set of criteria including their relative importance or 'value'. The sensitivity of the baseline environment was established as per the sensitivity criteria outlined in Table 13-3 and is outlined in Table 13-14.

Table 13-14 Baseline Receptor Sensitivity

Waterbody	Attributes	Indicator / Feature	Sensitivity
Lough Atalia / Corrib Estuary	WFD 'Moderate' 2016 - 2021	Designated under Inner Galway Bay SPA and Galway Bay Complex SAC.	Extremely High
Oranmore Bay	WFD 'Unassigned' 2016 - 2021. (Formerly 'High' status under 2013 – 2018 reporting.)	Designated under Inner Galway Bay SPA and Galway Bay Complex SAC.	Extremely High
Clarinbridge GW	WFD 'Good'	As the area is underlain by karsified limestone, the groundwater and surface water systems in the area are closely interlinked. Clarinbridge ground waterbody is considered to have a direct hydrological connection (<2km) to Inner Galway Bay SPA and Galway Bay Complex SAC.	High
Inner Galway Bay (North)	WFD 'Good'	Designated under Inner Galway Bay SPA and Galway Bay Complex SAC.	Moderate

13.4 Potential Impacts

13.4.1 Introduction

This section presents the potential hydrological impact to the receiving waters associated with the development of the Proposed Development, with consideration for the proposed drainage design. This allows for the identification of any further mitigation or monitoring required to be proposed in Section 13.5.

The potential residual impacts of the Proposed Development consider the proposed mitigation measures and are presented in Section 13.6.

The main hydrological impacts relate to sediment runoff from works near waterbodies during the construction phase which may enter the receiving waterbodies via the road drainage system.

The current road drainage system has surface runoff outfalls at Lough Atalia, Oranmore Bay and the Corrib Estuary as shown in Figure 13-3. There is no new outfall locations proposed as part of the Proposed Development. The proposed upgrades to the existing regime to facilitate the requirements of the Proposed Development allows the existing impacts on receiving waterbodies to be mitigated against. This is achieved through the incorporation of SUDS measures, including petrol interceptors, online attenuation measures, penstock valves, etc.

13.4.2 Do Nothing Scenario

In the event of the Proposed Development not being constructed (the Do-Nothing Scenario) there would be no resulting impacts on the hydrology in proximity to the Proposed Development.

Changes to the hydrological baseline would occur due to climate change and due to the likely increase in hardstanding surfacing as greenfield areas are developed. Where greenfield areas are developed, developers will be required to reduce runoff rates to greenfield levels. As future development will therefore be mitigated by the requirement to provide attenuation, it is considered the largest potential impact will be increased rainfall intensity and occurrence of rainfall events due to climate change.

With respect to water quality, Table 13-11 has identified the current status and risk classification of the receiving waterbodies 2016-2021 records. The Draft RBMP includes an action for Uisce Éireann to continue investment in water infrastructure. Over time it is expected that the status of the surface waterbodies within the Study Area will improve and there should be a progression towards 'Good' status. This will occur as existing treatment plants within the catchment are improved and leaks from foul pipes are repaired, amongst other works.

Surface water from Drainage Networks 7 and 8 (between approx. Mainline Chainage 2+170 to 3+883) currently drain via an informal over the edge drainage system to the adjacent lands. These lands are considered a mosaic of Annex I grassland habitat underlain by karst limestone; however, they will not be impacted by the drainage works as shown in BCGDR-BTL-DNG_RD-XX-DR-CD-00001_00011 in Volume 3 of this EIAR.

The receiving ground waterbody within the Study Area is currently at risk from acute and chronic pollution. Acute pollution occurs where readily dissolvable pollutants are present in surface water runoff at sufficiently high concentrations to cause the death of organisms over a short period of time (e.g. as a result of a spillage from a tanker or a fuel tank rupture). With no apparent pollution controls provided along the existing Old Dublin Road, the risk from large fuel spillage could result in significant contamination of the vulnerable aquifer that may impact upon sensitive grassland habitats.

Chronic pollution occurs as a result of ongoing, low-level pollutant loading over a longer period of time from the continued over the edge drainage regime. Research conducted by TII, and related bodies have found that surface runoff from paved surfaces subject to vehicular traffic can contain traces of zinc, copper, and hydrocarbons amongst others. While only present in trace quantities, the concentrations are proportionate to the traffic levels (AADT's), and with time can accumulate in topsoil.

13.4.3 Construction Phase Impacts

14.4.3.1 Overall Development

Chapter 5 (Construction) of this EIAR outlines the principal Construction Phase activities required to complete the Proposed Development and includes details of activities such as carriageway widening, new and / or improved footpaths and cycle lanes, diversion and relocation of underground utilities, new or improved lighting, bus shelters, removal and subsequent reinstatement of boundary walls and any other upgrade works, where relevant.

There are a number of potential impacts related to the construction phase of the Proposed Development which, in the absence of mitigation, would impact the existing water regime in relation to hydrology, water quality and hydromorphology.

The potential for any of these types of impacts are considered for different construction activities for each water body within the Study Area. These potential construction phase impacts include:

Hydrological Impacts

- Disruption to local drainage systems due to diversions required to accommodate the construction works;
- Temporary increase in hardstanding areas and / or soil compaction during construction works which could result in temporary increased runoff rates to waterbodies; and
- Change in the natural hydrological regime due to an increase in discharge because of dewatering activities (where required) during construction, which may alter the groundwater regime and affect the baseflow to a surface water receptor.

Impact to Water Quality

- Silty water runoff containing high loads of suspended solids arising from construction activities, including the stripping of topsoil / road surface during site preparation; the construction of widened footpaths; the dewatering of excavations and the storage of excavated material; and
- Contamination of water bodies with anthropogenic substances such as oil, chemicals or concrete washings. This could arise due to a spillage or leakage of oils and fuels stored on site or directly from construction machinery, and the storage of materials or waste near waterbodies or drains connected to the waterbodies.

Hydromorphology

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

Specific aspects of the Proposed Development that are considered to pose a higher risk of surface water / groundwater impacts are presented below.

14.4.3.2 Increased Sediment Loading

During the Construction Phase, soil erosion occurs due to excavations, removal of vegetation, etc. This erosion loosens soil which is then easily transported in stormwater (via overland flow or via the drainage network) into downstream waterbodies. As the Proposed Development does not directly impact upon any natural waterbodies, this will be an indirect impact.

Carriageway widening works (requires the existing footpath to be broken out, full road build up to be constructed and joined to the existing carriageway and the replacement footpath / raised cycle lane to be constructed) and the diversion and relocation of underground utilities will cause considerable soil erosion.

In particular, there is potential for significant sediment generation associated with the widening of the existing footpath that bounds the Old Dublin Road to the south. As these works are in the vicinity of Lough Atalia, the potential impact of widening the existing footpath at this location relates to the accidental release of silt / sediment to a designated waterbody.

14.4.3.3 Accidental Spills and Leaks

During the Construction Phase, potential exists for accidental pollution incidences from the following sources:

- Spillage or leakage of oil / fuel storage containers;
- Spillage of fuel during refuelling activities;
- Spillage or leakage of oil / fuel directly from site vehicles or equipment; and
- The use of concrete.

The requirement for oil / fuel storage may result in an accidental spillage which could adversely impact surface water in the event it reaches the drainage network and / or a surface waterbody.

The reinstatement of footpaths will involve a mix of in-situ concrete, concrete paving, concrete setts and natural stone setts. The cement component of concrete is very alkaline and therefore, a potential spillage to a watercourse would be detrimental to water quality.

In the absence of further mitigation, the potential impacts are considered to be short term, slight – moderate adverse for the Clarinbridge ground waterbody. As the Corrib Estuary and Oranmore Bay are classified as 'Extremely High' sensitivity, the magnitude of potential impacts is increased to significant.

13.4.4 Impact from Drainage Upgrades

There are no new outfalls to be installed as part of the Proposed Development, however, the Drainage Design (BCGDR-BTL-DNG_RD-XX-DR-CD-00001_00011 in Volume 3 of this EIAR) proposes upgrades to the existing surface water networks as some surface water drains do not have petrol interceptors. New petrol interceptors will be provided on some of the existing surface water networks as detailed in Volume 3 of this EIAR BCGDR-BTL-DNG_RD-XX-DR-CD-00001_00011.

A number of sensitive receiving waterbodies were identified, with outfalls discharging to Lough Atalia, Corrib Estuary, Ballyloughane Beach and Oranmore Bay. These waterbodies form part of the Galway Bay Complex SAC (Site Code:000268) and the Inner Galway Bay SPA (Site Code:004031). The Galway Bay Complex is also classified as a pNHA. Based on the international importance of these receiving waterbodies, the sensitivity of the receptors is considered to be Extremely High.

14.4.4.1 Construction Compound

It is anticipated that one construction compound will be utilised during the construction of the Proposed Development. This Construction Compound will be located adjacent to the Connacht Hotel, Old Dublin Road and will be in place for the duration of the construction works, which is anticipated to take approximately 24 months. The compound will be used to facilitate material stockpiling, loading / unloading, fuel and machinery store, canteens, site office, welfare facilities, etc.

As the construction works duration exceeds a hydrologic year, potential exists for contaminated surface water runoff to discharge into the receiving waterbodies during a storm event. This is a short-term impact as the construction compound site will be fully reinstated to its original condition on completion of the Proposed Development. On this basis, the impact is considered to be negligible.

13.4.5 Operational Phase

The potential impacts for the Operational Phase are related to water quality and hydromorphology only. Changes to hydrology are not anticipated during the Operational Phase of the Proposed Development as SUDS measures have been incorporated into the drainage design. The drainage design principles ensure that there will be no net increase in the surface water flow discharged to identified receptors. Refer to the Drainage Design presented in Volume 3 - of this EIAR.

Potential impacts that could occur include:

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

The upgrades to the existing drainage system are considered to have long term, minor beneficial magnitude of impact, resulting in a slight / moderate beneficial impact on groundwater receptor quality and a significant beneficial impact on surface water quality. Overall, the post development condition will be improved from the existing condition. In particular the Proposed Development will address the long-term pollution of the Annex I grassland and Karstified Aquifer which has historically occurred between Chainage 2+170 and 3+883. The new sealed drainage system will replace the historical over the edge drainage system, which was previously polluting the aquifer via contaminants been washed from the road pavement and into the aquifer.

13.5 Mitigation and Monitoring Measures

The Surface Water Management Plan (SWMP), presented within the CEMP, outlines the best practice measures that will be implemented as part of the Proposed Development to minimise the potential for pollutant laden discharge to the surrounding waterbodies. The proposed mitigation measures for the construction phase of the development are detailed in Section 0. Subsequently, mitigation measures for the operational phase are detailed in Section 13.5.2. Section 13.5.3 will outline the monitoring requirements identified as part of the Construction and Operational Phases of the Proposed Development, if required.

The mitigation measures that are to be incorporated into the design of the Proposed Development to avoid, prevent or reduce the risks of potential impacts to the aquatic environment are outlined in the following section.

Chapter 6 (Traffic and Transport) of this EIAR determined that traffic impacts during the construction phases were negligible, not significant and temporary in nature. The Proposed Development will deliver a positive, significant and long-term impact in terms of People Movement by sustainable modes. The Proposed Development can be shown to deliver significant improvements in people movement by sustainable modes along the Proposed Development corridor, particularly by bus, with reductions in car mode share due to the enhanced sustainable mode provision.

13.5.1 Construction Phase

13.5.1.1 Overall Development Mitigation Measures

In terms of mitigation, a Surface Water Management Plan (SWMP) has been developed within the CEMP (Appendix A5.1 of Volume 4 of this EIAR), which details the measures to be put in place to avoid, prevent and reduce any significant adverse impacts on the surrounding water environment during the Construction Phase of the Proposed Development.

Mitigation measures for the management of surface water runoff were formulated with due regard for the following guidance documents:

- CIRIA C648 (2006) Control of Water Pollution from Linear Construction Projects;
- CIRIA C532 (2001) Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors; and
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI 2016).

At a minimum, all of the control and management measures detailed within the SWMP will be implemented, including measures related to:

- Control of sediment (use of silt fences and silt sacs);
- Use of concrete (precast concrete products to be used, where possible);
- The incorporation of SUDS measures (i.e. petrol interceptor) before the discharge of surface water generated during construction;
- The establishment of an Emergency Incident Response Plan (EIRP);
- Environmental monitoring;
- Construction Compound management (including the storage of materials); and

- Management of refuelling and wheel wash facilities (containment) to prevent release to the surrounding surface waters.

Subject to the implementation of the general mitigation measures outlined above, the majority of impacts will be not significant. However, certain activities will require additional measures, as outlined below.

13.5.1.2 Accidental Spills and Leaks Mitigations

In addition to mitigation measures outlined in the SWMP, Method Statements for responding to accidental spillages will be provided by the Appointed Contractor.

To reduce the potential risk of spillages, all oil, fuel, solvent and paints used during the Construction Phase of the Proposed Development will be stored in temporary bunded areas. Oil and fuel storage will include bunds capable of providing 110% of the capacity of the largest tank within the bunded area, including an allowance of 30mm for rainwater ingress. Any drummed fuel is to be stored in a dedicated chemical storage cabinet that features internal bunding. All drums are to be clearly labelled to allow for prompt, appropriate remedial action in the event of a spillage.

Hydraulic oil / lubricant will only be added to vehicles / plant at the designated refuelling area within the Construction Compound. Where it is not possible for refuelling to take place within the designated refuelling area, fuel will be transported in a mobile double skinned tank. A spill kit and drip tray must be present in this scenario.

Spill kits shall include 10-hour terrestrial oil booms (80mm ⌀ x 1000mm) and a plastic sheet, as a minimum. In the event of a spill, any contaminated soil is to be transferred on to the plastic sheet to prevent contaminants leaching to groundwater.

Concrete ready-mix will be delivered to site by truck on a 'just in time' basis to minimise the potential exposure time for leaks / spills. A concrete slump test will be completed to ensure the consistency of the concrete is not too watery / soupy in order to reduce the risk of alkaline wastewaters entering the storm water drain or contaminated storm water reaching the underlying subsoil. Concrete transporting vehicles will be directed back to their depot for washout.

13.5.1.3 Drainage Upgrades Mitigations

The proposed upgrades are to be constructed in-situ while the existing drainage network remains sealed. Given the existing network will not be opened at this point, there is no risk of contamination. Once the new infrastructure has been constructed, a specialist saw will be used to expose the internal portion of the drainage system. A dry cutting blade must be used, in combination with a dust extractor or vacuum to remove dust. Wet cutting methods should be avoided as the water combines with the dust to create a concrete slurry.

On completion of the above connection works the newly installed gullies / manholes must be covered / closed during backfilling. The above measures will reduce the exposure time for the receiving surface waters.

13.5.1.4 Construction Compound Mitigations

As the proposed Construction Compound currently consists of permeable surfacing (grassed playing fields), an area of hardstanding with its own drainage network will be installed to facilitate refuelling, washing and servicing of vehicles / plant. As it is proposed that this area will be drained to a soakaway, the soakaway is considered an adequate treatment for hydrocarbons as soil-borne microbes within the organic rich layers provide a degradation mechanism for hydrocarbons. As the organic rich layers are present close to the surface, the soakaway system for this area of hardstanding should consist of a broad and shallow system rather than a deep and narrow system. An example of a suitable system is an infiltration pond.

All other measures relating to the set up and management of construction compounds are presented in the CEMP (Appendix A5.1 of Volume 4 of this EIAR) and are to be updated by the appointed Contractor on their appointment.

13.5.1.5 Monitoring Requirements

As detailed within the SWMP, the appointed contractor shall carry out visual monitoring of surface water control measures (settlement tanks, silt fences, fuel storage areas, etc.) on a daily basis. In addition, weekly visual inspections of waterbodies in proximity to the Proposed Development will be carried out by the appointed contractor. If hydrocarbons are observed or other water quality parameters are suspected to have been exceeded, as a result of an incident but where a visual inspection may not provide sufficient information to conclude, an investigation will be carried out to determine whether any element of the construction of the Proposed Development could be causing the contamination. Mitigation measures will be taken to prevent further contamination. A record of incidents will be kept aiming to prevent reoccurrence.

13.5.2 Operational Phase Mitigations

The Proposed Development is hydrologically connected to a number of waterbodies designated as having international importance via the existing outfalls. The Proposed Development will maintain the existing outfalls, discharging to Lough Atalia, Corrib Estuary and Oranmore Bay. Petrol interceptors have been provided where possible, to remove hydrocarbons from the road runoff and the resultant reduction of hydrocarbons discharging to the sensitive watercourses in the region. The maintenance of the SUDS assets and the emptying and maintenance of petrol interceptors will be the responsibility of GCC.

There are no significant changes anticipated to the hydrological regime as the increase in impermeable surfacing is marginal and where additional hardstanding has been introduced, attenuation measures have been proposed to limit the surface water discharge rate from the Proposed Development. No additional mitigation measures have been identified for the Operational Phase of the Proposed Development.

13.5.3 Monitoring Requirements

It is not anticipated that routine monitoring will be required during the Operational Phase of the Proposed Development.

13.6 Residual Impacts

13.6.1 Construction Phase

No significant impacts are anticipated for any of the downstream waterbodies provided the mitigation measures outlined in Section 13.5 of this report are implemented alongside the mitigation controls within the SWMP and CEMP.

The predicted residual impacts and an outline of the corresponding aspects of the Proposed Development are presented in Table 13-15 below.

Table 13-15 Construction Stage Residual Impacts to Water

	Predicted Impacts		
Project Activity	**Description of Impacts**	**Predicted Impact (Pre-Mitigation)**	**Predicted Impact (Post-Mitigation)**
General works	The release of sediment is expected to be minimal.	Short-term, adverse Imperceptible	Short-term, adverse, Imperceptible
Carriageway / footpath widening	Increased surface water runoff attenuated by SUDS. The release of sediment is expected to be minimal.		

	Predicted Impacts		
Project Activity	**Description of Impacts**	**Predicted Impact (Pre-Mitigation)**	**Predicted Impact (Post-Mitigation)**
Construction Compound (Oil / fuel storage)	Potential exists for accidental spills / leaks.	Slight – moderate adverse (Clarinbridge groundwater) Significant (Surface waterbodies)	Short-term, adverse, Imperceptible
Construction Compound (Refuelling)	Potential exists for accidental spills / leaks.		
Construction Compound (Other)	The release of sediment is expected to be minimal.	Short-term, adverse, Imperceptible	Short-term, adverse, Imperceptible
General drainage works	The installation of relocated gullies and gully connector pipes. The installation of oversized storage pipes and associated drainage works.	Short-term, adverse, Imperceptible	Short-term, adverse, Imperceptible
Connection of new drainage infrastructure	Potential for sediment and other contaminants to enter the surface waterbody during connection works.	Short-term, adverse, Significant	Short-term, adverse, Imperceptible

Surface water management measures are presented within the CEMP (Volume 4 – Appendix 5 of this EIAR) to mitigate against the potential adverse hydrological, hydromorphological and water quality impacts to the receiving waterbodies during the construction phase of the Proposed Development. On this basis, subject to the proposed mitigation measures outlined in the CEMP being implemented, the Proposed Development is not considered to pose a significant impact to surface water or groundwater quality in the locality.

13.6.2 Operational Phase

Significant residual impacts are not anticipated for the receiving waterbodies, as shown in Table 13-16 below.

Table 13-16 Operational Phase Residual Impacts to Water

	Predicted Impacts		
Project Activity	**Description of Impacts**	**Predicted Impact (Pre-Mitigation)**	**Predicted Impact (Post-Mitigation)**
Runoff to surface water drainage	Increased impermeable surfacing resulting in increased surface water runoff to be attenuated by SuDS.	Long term, moderate, adverse	Long term, significant beneficial
Runoff to combined sewer	Increased impermeable surfacing resulting in increased surface water runoff to be attenuated by SuDS	Long term, moderate, adverse	Long term, significant beneficial
Over the edge drainage	Redirection of runoff to sealed drainage system reduces pollution to aquifer	Long term, significant adverse	Long term, slight - moderate beneficial.

Therefore, the Operational Phase of the Proposed Development is not considered to pose a significant impact to surface water or groundwater quality in the locality.

13.7 References

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