Chapter 10
Hydrology

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10. HYDROLOGY

10.1 Introduction

This chapter assesses the potential impacts of the proposed development on the surface water environment. The assessment considers the existing hydrological conditions, water quality status. It evaluates both construction and operational phases, identifying potential risks such as changes in flow regime, sedimentation, pollution, and flood risk.

This chapter should be read in conjunction with the following chapters, and their appendices, which present related impacts arising from the proposed development and proposed mitigation measures to ameliorate the predicted impacts:

- Chapter 1 Introduction
- Chapter 4 Description of the Proposed Development.
- Chapter 8 Biodiversity.
- Chapter 9 Land and Soils,
- Chapter 11 Hydrogeology.

A Site Specific Flood Risk Assessment (SSFRA) has been completed by ROD and is included in Appendix 10.1 in Volume 4 of this EIAR.

10.2 Legislation, Policy and Guidance

The following European legislation and transposing Irish regulations are of relevance to the surface water environment assessment and to the proposed development:

- European Union (EU) Water Framework Directive (WFD) (2000/60/EC), as amended in 2008 (by Directive 2008/105/EC) and in 2013 (by Directive 2013/39/EU).
- European Communities (EC) (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003), as amended in 2014 (by S.I. No. 350 of 2014), and in 2022 (by S.I. No. 166 of 2022) and in 2025 (by S.I. No. 52 of 2025).
- EU (Water Policy) (Abstractions Registration) Regulations, 2018 (S.I. No. 261 of 2018) and as amended in 2022 (by S.I. No. 166 of 2022).
- EC (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended in 2022 (by S.I. No. 286 of 2022), and in 2023 (by S.I. No. 99 of 2023).
- EC Environmental Objectives (Surface Water) Regulations, 2009 (S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019).
- European Communities Environmental Objectives (Surface Water) (Amendment) Regulations, 2025 (S.I. No. 50/2025)
- EC Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010 as amended), as amended in 2016 (S.I. No. 366 of 2016).
- EC Water Environment (Abstractions and Associated Impoundments) Regulations, 2024 (S.I. No. 419 of 2024).
- EU Environmental Impact Assessment (EIA) Directive 2011/92/EU as amended by 2014w/52/EU.
- EU (Planning and Development) (EIA) Regulations S.I. No. 419 of 2012, as amended by S.I. No. 543 of 2014, 2018 (S.I. No. 296 of 2018), as amended by S.I. No. 404 of 2018 and S.I. No. 646 of 2018.

- The EU Floods Directive 2007/60/EC.
- EC (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010).
- EU (EIA) (Flood Risk) Regulations 2012 (S.I. No. 470 of 2012).
- Habitats Directive (1992/43/EEC).

The assessment undertaken in this chapter has been carried out in line with European and National legislation, which has been set out in this subsection for context.

10.2.1 European Legislation

This study complies with Environmental Impact Assessment (EIA) as defined in Directive 2011/92/EU (as amended by Directive 2014/52/EU) for certain types of major development before development consent is granted. This study was undertaken in accordance with the Irish legislation SI No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018. Which transposes the WFD into Irish Law.

The Water Framework Directive (WFD), which was passed by the European Union (EU) in 2000, came into legal effect in Ireland in December 2015. The WFD establishes a framework for community action in the field of water policy. The WFD seeks to enhance the status of aquatic ecosystems, promotes sustainable water use and contributes to mitigating the effects of flood and drought.

The objective of the WFD is to achieve 'Good Status' for all water bodies which requires a water body to achieve good chemical and ecological status. An overarching principle of the WFD is the One-Out All Out (OOAO) principle whereby the overall status of a water body is determined by the worst performing Quality Element (QE). Article 8 of the Directive mandates Member States to establish Monitoring Programme, for QE's and Article 15 mandates Member States to prepare River Basin Management Plans (RBMP) on a 9-year cycle based on the data produced by the WFD monitoring programmes.

The Water Framework Directive (2000/60/EC) was transposed into Irish law by the European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003). The 2003 Regulations have been revised and extended by the subsequent statutory instruments listed below:

- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011); and
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).

10.2.2 Local Policy

The Clare County Council adopted the 'Clare County Development Plan 2023-2029' in 2023 (hereafter referred to as the 'CCDP'), which sets out a range of proposed policy objectives for development up to 2030. The plan is prepared in accordance with the provisions of the Planning and Development Act 2000 (as amended) and incorporates the mandatory objectives listed in the Act, including conservation and protection of the environment and promotion of compliance with environmental standard.

Table 10-1 presents the policies of relevance to the water environment and to this assessment.

Table 10-1 Relevant Policy Objectives

Policy ID	Policy Description: It is an objective of Clare County Council:
CDP2.6	**Flood Risk Assessment and Management:** a) To ensure development proposals have regard to the requirements of the SFRA and Flood Risk Management Guidelines; and where required are supported by an appropriately detailed hydrological assessment / flood risk assessment. b) To ensure that flood risk assessments include consideration of potential impacts of flooding arising from climate change including sea level rise and coastal erosion; c) To integrate sustainable water management solutions, prioritising nature based solutions (such as SUDS, nonporous surfacing and green roofs) into development proposals; d) To include Natural Water Retention Measures (NWRMS) where appropriate in consultation with the Office of Public Works (OPW) and other relevant stakeholders: e) To support investment in the sustainable development of capital works under the Flood Capital Investment Programme and Flood Risk Management Plans developed under the Catchment Flood Risk Assessment and Management (CFRAM) process; and f) To ensure that potential future flood information obtained/generated through the Development Management process is used to inform suitable adaptation requirements in line with the Guidelines for Planning Authorities on Flood Risk Management (DoECLG & OPW, 2009)
CDP2.8	**Floods Directive and CFRAMS:** a) To support the implementation of the EU Floods Directive 2007/60/EC to manage flood risks; and b) To implement the recommendations of the Catchment Flood Risk Assessment and Management Study (CFRAMS) programme as it relates to County Clare and to ensure that flood risk management policies and infrastructure are progressively implemented.
CDP2.11	**Storm Water Management:** a) To ensure that adequate storm water infrastructure is in place to accommodate the planned level of growth in the Plan area; b) To require all new developments to provide a separate foul and surface water drainage system; c) To ensure the implementation of Sustainable Drainage Systems (SuDS) and in particular, to ensure that all storm water generated in a new development is disposed of on-site or is attenuated and treated prior to discharge to an approved storm water system; and d) To request the submission of details regarding Surface Water Attenuation Systems that take account of the potential future impact of climate change for multi-unit development applications in the plan area. Development will only be permitted in areas where sufficient surface water capacity exists.
CDP2.12	**Flood Risk Management, Green Infrastructure & Biodiversity:** a) To facilitate and implement green infrastructure developments as a means of managing flood risk and enhancing the natural environment in the plan area in compliance with Objective CDP 3.1; and b) To avail of opportunities to enhance biodiversity and amenity and to ensure the protection of environmentally sensitive sites and habitats where flood risk management measures are planned subject to the requirements of the Habitats Directive.

Policy ID	Policy Description: It is an objective of Clare County Council:
CDP 11.26	**Water Framework Directive and River Basin Management:** a) To facilitate the implementation of the River Basin Management Plan 2022-2027 and any subsequent plan for ground, surface, estuarine, coastal and transitional waters in the Plan area as part of the implementation of the EU Water Framework Directive; b) To protect groundwater and surface water resources in accordance with the statutory requirements and specific measures as set out in the River Basin Management Plan 2022-2027, and any subsequent management plans; c) To achieve and maintain at least good water quality status for all water bodies except where more stringent obligations are required such as Blue Dot/High Status Objective Water Bodies; d) To consider development proposals where it can be clearly demonstrated that the development will meet the requirements of the River Basin Management Plan
CDP 11.27	**Water Resources:** a) To support the protection and improvement of the quality of drinking water sources in line with the requirements of the Water Framework Directive; b) To ensure that developments that would have an unacceptable impact on water resources, including surface water and groundwater quality and quantity, designated sources protection areas, estuarine, coastal transitional waters, river corridors and associated wetlands will not be permitted; c) To ensure the efficient and sustainable use and development of water resources and water services infrastructure in order to manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment; In areas of potable groundwater resources or over vulnerable aquifer areas, to consider development proposals only if the applicant can clearly demonstrate that the proposed development will not pose a risk to the quality of the underlying groundwater; To protect groundwater resources, in accordance with statutory requirements and specific measures as set out in the National River Basin Management Plan 2022-2027; d) To work with and support Uisce Éireann, the Group Water Scheme Sector and LAWPRO in identifying public drinking water sources vulnerable to climate change and develop source protection or alternative sources, in order to maintain water quantity and quality levels; e) To consider proposals for development which infringe on a river boundary, or an associated habitat, including their connection by groundwater, only where it can be clearly demonstrated that: • The character of the area will be conserved; • An acceptable physical riparian zone will be maintained; and, • There will be no deterioration of water body status; f) To work with Uisce Éireann to find a sustainable and long-term solution for the production, minimisation and beneficial reuse of water sludge as a by-product in order to minimise risk to human health and the environment.
CDP 11.29	**Water Services:** a) To work closely with Uisce Éireann to identify and facilitate the timely delivery of the water services required to realise the development objectives of this plan; b) To facilitate the provision of integrated and sustainable water services through effective consultation with Uisce Éireann on the layout and design of water services in relation to the selection and planning of development areas and the preparation of masterplans; **c)** To ensure that adequate water services will be available to service development prior to the granting of planning permission and to require developers to consult Uisce Éireann regarding available capacity prior to applying for planning permission; and,; To ensure that development proposals comply with Uisce

Policy ID	Policy Description: It is an objective of Clare County Council:
	Éireann's standards and requirements in relation to water and wastewater infrastructure to facilitate the proposed development.
CDP 11.30	**Water Supply:** a) To support the implementation of Uisce Éireann Investment Plans and to advocate the provision, by Uisce Éireann, of adequate water supply to accommodate the target population and employment potential of the county and in accordance with the statutory obligations set out in the EU and national policy and in line with the Core Strategy and Settlement Hierarchy set out in this plan; b) To support the role of Uisce Éireann Investment Plans in taking into account seasonal pressures on critical water supply service infrastructure, climate change implications and leakage reduction in the design of all relevant projects; To advocate for the ongoing conservation and upgrade of water supply infrastructure in the county; To maximise the use of existing capacity in water supply services in the planning of new development; c) To protect existing way leaves and protection areas around public water supply services infrastructure through appropriate zoning and to facilitate the provision of appropriate sites for required water services infrastructure;
CDP 11.32	**Wastewater Treatment and Disposal:** a) To support the implementation of Uisce Éireann Investment Plans and to advocate the provision, by Uisce Éireann, of adequate wastewater treatment facilities to accommodate the target population and employment potential of the county in accordance with the statutory obligations set out in the EU and national policy and in line with the Core Strategy and Settlement Hierarchy set out in this plan; b) To support the role of Uisce Éireann Investment Plans in taking into account seasonal pressures on critical wastewater treatment service infrastructure and climate change implications in the design of all relevant projects; To advocate for the on-going provision, maintenance and upgrade of wastewater treatment infrastructure in the county; c) To maximise the use of the existing capacity of wastewater treatment services in the planning of new development; d) To protect existing way leaves and protection areas around public wastewater treatment services infrastructure through appropriate zoning and to facilitate the provision of appropriate sites for required wastewater treatment services infrastructure; e) To support Uisce Éireann in the promotion of effective management of trade discharges to sewers in order to maximise the capacity of the existing sewer networks and minimise detrimental impacts on sewage treatment works; f) To permit the development of treatment systems for small businesses/community facilities in unserviced areas where they are in single ownership and where it is demonstrated to the satisfaction of the Planning Authority that the proposed wastewater treatment system is in accordance with Wastewater Treatment Manuals Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, EPA (1999) or any future versions
CDP 11.33	**Strategic Wastewater Treatment Projects:** a) To support investment in and the sustainable development of strategic wastewater treatment facilities by Uisce Éireann in County Clare arising from initiatives including Investment Plans and Strategic Drainage Area Plans subject to appropriate environmental assessment and the planning process; b) To liaise with Uisce Éireann to ensure adequate wastewater treatment facilities are available to accommodate population growth in the county; c) To ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does

Policy ID	Policy Description: It is an objective of Clare County Council:
	not contribute to degradation of water body status or give rise to adverse impacts on the integrity of the Natura 2000 network; d) To support Uisce Éireann to eliminate untreated discharges from settlements in the short-term, while planning strategically for the long-term in tandem with Project Ireland 2040 and the RSES and in increasing compliance with the requirements of the Urban Waste Water Treatment Directive; e) To support and facilitate the separation of foul and surface water networks in the county; and f) To liaise with Uisce Éireann to identify wastewater treatment plants which are subject to flooding from severe weather events, and to advocate for the prioritisation of these plants for suitable upgrades.
CDP 11.34	**Rural Wastewater Treatment Programmes:** To support investment in the sustainable development of rural waste water treatment programmes and the initiatives of Uisce Éireann, communities and developers in small rural settlements to identify sustainable solutions subject to available funding for such services including the Rural Regeneration and Development Fund of the NDP and the Multi-Annual Rural Water Programme 2022-2025 Measure 8 – Waste Water Collection and Treatment Needs for Villages and Settlements without access to Public Waste Water Services.
CDP 13.11	**Coastal Erosion and Flooding:** a) To engage with the OPW so it develops appropriate strategies for the management of identified coastal flood and erosion hazards and associated risks; b) To have regard to the Clare County Strategic Flood Risk Assessment, CFRAM Flood Risk Management Plans, the OPW Coast Protection Strategy Study, and any updated version/more detailed local studies, in the assessment of development applications in coastal areas; c) To permit developments only where the Council is satisfied that they will not be at risk from coastal erosion or inundation in the future; d) To permit developments only where the Council is satisfied that it will not result in an increase in coastal erosion or increase the risk of inundation, either at the subject site or at another location in the vicinity; e) To only permit development outside the boundaries of existing settlements where such development can be adequately defended over the lifetime of the development without the need to construct additional or new coastal defences; f) To support and facilitate the carrying out of coastal defence works based on the outcome of detailed Coastal Erosion and Flood Risk Management Studies undertaken in areas identified as being at risk from coastal flooding; g) To ensure full compliance with the requirements of the Habitats Directive, Water Framework Directive and overarching environmental Objective CDP3.1 of this plan with regard to development in the coastal area; h) To have regard to any future adopted Integrated Coastal Zone Management Plan for the coastal and estuarine areas of the County, undertaken in accordance with the Habitats and SEA Directive.
CDP 15.16	**Inland Waterways and River Corridors:** a) To work with all relevant stakeholders to protect from degradation and damage and manage inland waters, river corridors and their floodplains, turloughs, lakes, fens and other water bodies, and to recognise and promote them as natural assets and key elements in the green infrastructure network in the County; b) To protect riparian areas, where appropriate, in the Plan area; c) To ensure that, where development occurs within a riparian zone, it does not have a negative impact on associated habitats and species and to have regard for Inland

Policy ID	Policy Description: It is an objective of Clare County Council:
	Fisheries Ireland guidance 'Planning For Watercourses in the Urban Environment' and any updated versions; d) To work with all relevant stakeholders to protect and improve appropriate access to waterways and river corridors whilst ensuring their conservation and the protection of the resource and water quality;

The CCDP also includes the Local Area Plans, which set out strategies and objectives for the development of Kilrush, Kilkee and Moyasta. The following policies are of relevance to this hydrological environment assessment:

- To prioritise the development of the West Clare Railway Greenway and facilitate an initial Kilrush to Kilkee pilot project in line with Strategic Priority 15 'Prioritise the development of the West Clare Rail Greenway' of the County Clare Tourism Strategy 2030.
- To support the development of a Flood Protection Plan for Kilkee.

The CCDP Natura Impact Report was consulted for this hydrological assessment, as it includes mitigation measures to ensure that identified impacts do not result in adverse effects on the integrity of relevant European sites, in view of the Conservation Objectives of those sites. The following mitigation measures are of relevance to his assessment:

- Appropriate surface water management shall be installed during construction phase to ensure no direct discharges of unattenuated water enters any surface water body and European site. A Surface Water Management Plan shall be submitted as part of any planning application detailing how surface water run-off (including silt/hydrocarbons and other pollutants) shall be managed and controlled during construction.
- During operation appropriate SUDs shall be installed to treat surface water runoff prior to discharge to any surface water body (e.g., green roof, silt traps, petrol interceptors, permeable paving.).
- Appropriate wastewater treatment facilities shall be provided that can fully demonstrate that there will be no adverse effects upon water quality and European sites and compliance with mitigation for CDP11.32.

10.2.3 Guidance

The following guidance documents are of relevance to this hydrogeology environment assessment and the proposed development:

- Department of Environment, Housing and Local Government (DoEHLG)/ Office of Public Works (OPW) (2009), '*The Planning System and Flood Risk Management - Guidelines for Planning Authorities*'.
- Environmental Protection Agency (EPA) (2022), '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR)*'.
- Environmental Protection Agency (EPA) (2003), '*Advice notes on current practice (in the preparation of Environmental Impact Statements)*'.
- Institute of Geologists of Ireland (IGI) (2013), '*Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements*'.
- National Roads Authority (NRA) (2008), '*Environmental Impact Assessment of National Roads Schemes – A Practical Guide*'.
- Transport Infrastructure Ireland (TII) (formerly NRA) (2009), '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*'.

- Transport Infrastructure Ireland (TII) (2015), '*Road Drainage and the Water Environment'*, (DN-DNG-03022).
- Transport Infrastructure Ireland (TII) (2023), '*Environmental Planning of National Road and Greenway Projects (RE-ENV-07008)*'.
- Transport Infrastructure Ireland (TII) (2024), '*Environmental Impact Assessment of Rural Cycleways (Offline & Greenway) – A Practical Guide (PE-ENV-01109)*'.
- Transport Infrastructure Ireland (TII) (2025) '*Water Impact Assessment of Proposed National Roads – Standard (PE-ENV-01201)*'.
- Transport Infrastructure Ireland (TII) (2025) '*Water Impact Assessment for National Roads, Light Rail, Metro and Rural Cycleways – Overarching Technical Document (PE-ENV-01202)*'.
- Inland Fisheries Ireland (2022) 'Planning for water courses in Urban Environments, 2020'
- National Roads Authority (2008) 'Guidelines for the crossing of watercourses during the construction of national road schemes'
- Inland Fisheries Ireland (2016) Guidelines on the protection of fisheries during construction works in and adjacent to waters'
- CIRIA (2011) 'C532 Control of water pollution from constructions sites'
- CIRIA (2011) 'Control of water pollution from linear construction projects'

10.3 Methodology

10.3.1 Study Area

The West Clare Railway Greenway: Section 1 (Kilkee to Kilrush) project comprises a 15.2 km walking and cycling amenity along the general route of the abandoned West Clare Railway between Kilrush and Kilkee.

The greenway starts at the former railway station in Kilkee and travels east astwards through Moyasta towards Kilrush town. Between Kilkee and Kilrush, land use is predominantly agricultural. Beyond Moyasta, the greenway will follow the former railway and the coastline of the Mouth of the Shannon Coastal Waterbody (CWB).

A Study Area may be considered the 'effects area' over which changes to the receiving environment are likely to result from a project (Transport Infrastructure Ireland, 2023). The Study Area was selected by applying a 250m buffer either side of the proposed alignment and selecting all Water Framework Directive waterbodies intersecting or within this boundary.

Kilkee is a coastal town located on Moore Bay on the Shannon Plume Coastal Waterbody (CWB). The Kilkee Reefs (Natura 2000 site code IE002264) SAC lies within the CWB to the west of the study area.

The proposed development crosses two Termon East_010 River Waterbody (RWB) channels that discharge to the Mouth of the Shannon CWB. The Lower River Shannon Special Area of Conservation (SAC) (Natura 2000 site code 002165) is within the CWB. The impacts of the proposed development on the Qualifying Interests of the SAC are assessed in detail in Chapter 8 Biodiversity. The focus of this chapter is the assessment of the potential impacts of the proposed development on abiotic hydrology attributes of the receiving waterbodies. The proposed development route follows the coastline, passing within 10m of it in sections.

The River Shannon and River Fergus Estuaries (Natura 2000 site code IE0004077) Special Protection Area (SPA) is also located within the Shannon Estuary. The SPA supports an assemblage of over 20,000 waterbirds, making it a site of international importance.

A fluvial Flood Relief Scheme (FRS) for Kilkee is currently at the Detailed Design and Construction stage; a planning application was formally approved by An Coimisiún Pleanála in August 2025. The scheme aims to protect 134 properties including 118 residential properties from recurrent fluvial flooding of the Atlantic Stream and the Victoria Stream: local names for branches of the Kilkee_010 waterbody flowing through urban Kilkee. Both streams are tidally influenced. The online section of the proposed greenway passes over the Atlantic Stream.

Kilrush Creek is a small bay of the Mouth of the Shannon CWB. The bay is isolated from the coastal waterbody by a man-made sea wall and lock gate. A fluvial Flood Relief Scheme for Kilrush is proposed that incorporates structural and non-structural measures designed to reduce flood risk from the Wood_020 River Waterbody.

A map showing the location of the proposed development in the context of the study area and associated hydrological features identified above is shown in Figure 10.1 in Volume 3 of this EIAR.

10.3.2 Assessment Methodology

The evaluation of environmental effects has been undertaken in accordance with the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA,2022).

A desk study has been conducted to review all the relevant surface hydrology and Water Framework Directive (WFD) data for the proposed development route and surrounding areas to establish baseline conditions. The sources of information reviewed are summarised in Table 10-2.

The baseline hydrological conditions in the Study Area have been established by analysis of data from the published data sources outlined in Table 10-2.

Table 10-2 Data Sources

Assessment Attribute	Sources
General	• Water Action Plan 2024: A River Basin Management Plan for Ireland • Clare County Council o Clare County Development Plan 2023-2029 • National Parks and Wildlife Service (NPWS) Designations Viewer • Historic maps from the Ordnance Survey of Ireland (OSi) • Historic aerial photography from the OSi • Met Éireann historical weather data

Hydrology (Catchment studies, drainage, flood and flow estimation)	• Catchment summaries (Data - Catchments.ie)
	• Office of Public works (OPW)
	  o Arterial Drainage scheme land benefitting Mapping for Ireland
	  o OPW and Drainage District arterial Drainage Channels and maintained channels
	  o OPW hydrometric Data WEB Site
	  o Floodmaps Site

Assessment Attribute	Sources
	○ OPW FSU (Flood Studies Update) Web Portal Site for Flood flow Estimation • Catchment Flood Risk Assessment Management (CFRAM) Flood Maps, and National Indicative Fluvial Mapping (NIFM) and Geological Survey of Ireland (GSI) Groundwater Flooding Probability maps and Past flood Events (OPW Website)
Surface water quality, protected areas, hydromorphology, abstractions and pressure	• EPA map viewer ○ Water Framework Directive Classification ○ Hydrometric Data System ○ Protected Areas ○ Water Quality Monitoring Database and Reports ○ Pressures and Activities • National Parks and Wildlife Service (NPWS) ○ Designated Areas Mapping ○ Site Synopsis Reports ○ Contaminants in sediments in the marine environment (Marine Institute, 2024)
Flood Risk	• OPW National Flood Information Portal (OPW 2024) • Dublin City Development Plan 2022-2028 Strategic Flood Risk Assessment • The Flood Risk Management Sectoral Climate Change Adaption plan (National Adaption Planning Framework, 2019)

The Source-Pathway-Receptor (SPR) model has been adopted as the basis for the impact assessment. Within the SPR framework, a source is a contaminant or pollutant that has the potential to cause an environmental harm, a pathway is a route by which a receptor could be exposed to a source, and a receptor is an environmental attribute that could be adversely affected by a contact with a source.

10.3.3 Definition of Terminology Used in Determining Environmental Impacts

Effects refer to the changes that a proposed project may cause to the environment, whether positive or negative, direct or indirect. The quality of effects has been described according to Table *10-3*.

Table 10-3 Criteria for rating the quality of hydrological effects (adapted from EPA,2022

Effects	Criteria
Positive	A change which improves the quality of the environment.
Neutral	No effects, or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative/Adverse	A change which reduces the quality of the environment.

The assessment has applied the EPA's sensitivity–magnitude matrix approach (Plate 10-1) to determine the significance of each potential impact, integrating both the sensitivity of receptors and the magnitude of predicted effects.

The sensitivity of an attribute and the magnitude of an impact are combined to rate the significance of predicted environmental impacts. The sensitivity of an attribute is assessed based on the potential for a receptor to be significantly impacted or harmed by the proposed development.

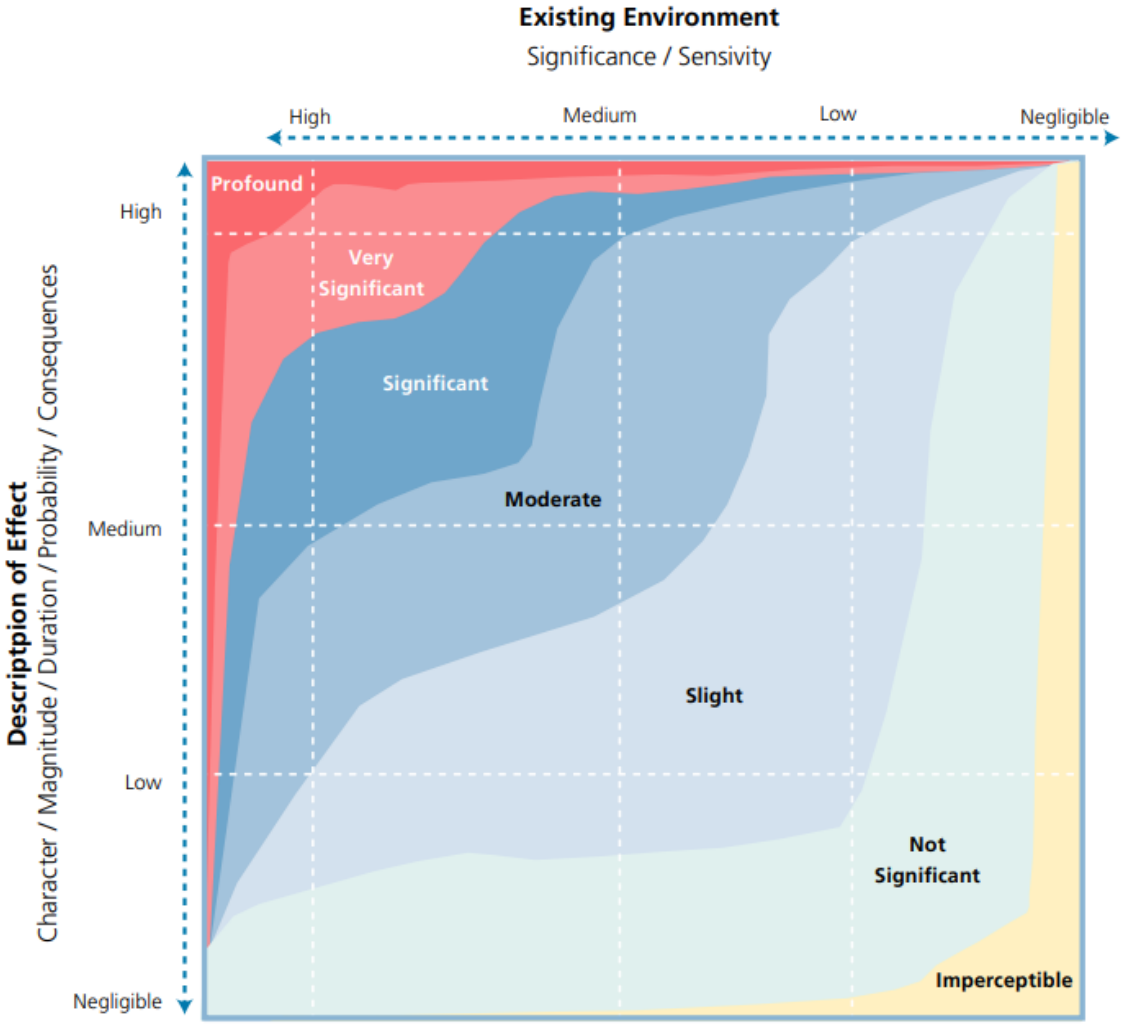

Plate 10-1 Determination of significance of an effect on the existing environment (EPA, 2022)

The terminology used to describe the type of effects are outlined in Table 10-4.

Table 10-4 Duration and frequency of effects definitions (Adapted from EPA, 2022)

Description	Duration
Momentary	Lasting from seconds to minutes.
Brief	Lasting less than a day.
Temporary	Lasting less than one year.
Short-term	Lasting 1 to 7 years
Medium-term	Lasting between 7 to 15 years
Long-term	Lasting between 15 to 60 years
Permanent	Lasting over 60 years

The significance of an impact on a hydrological attribute arising from the proposed development is described in accordance with the criteria outlined in Table 10-5.

Table 10-5 Impact assessment criteria (Adapted from EPA, 2022)

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

10.3.4 Description of the Proposed Development

In summary, for the purposes of this assessment, West Clare Railway Greenway: Section 1 is a proposed walkway and cycle path. It will generally follow the route of the former West Clare Railway between Kilrush and Kilkee, connecting towns and villages along the way. By utilising the former railway corridor, the development will repurpose the existing embankment, while also limiting construction waste. The proposed route is approximately 15.2km long, intersecting several local roads, streams and existing bridges along its length.

A full description of the proposed development is provided in Chapter 4 of this EIAR. The purpose of this section is to identify and describe activities and processes that have the potential to significantly impact the hydrological environment.

The pavement of the proposed greenway comprises 20mm bituminous macadam surface course over a 150mm sub-base. A geotextile layer and 300mm capping will also be implemented where necessary on soft ground, along sections where the greenway deviates from the former railway line. Drainage features will comprise over the edge drainage along the length of the greenway to allow surface water to naturally infiltrate into the ground or flow towards a stream outfall.

The proposed greenway will start in Kilkee at the Percy French Estate near the site of the former railway station and will run from there eastward to Moyasta. A trailhead will be constructed at Moyasta. The trailhead will be constructed on a greenfield site accessed from the L2036 Moyasta off the N67 national road. The trailhead will be accessed by vehicles further east along the L2036 from the N67 road adjacent to Poulnasherry Bay. The bay forms part of the Mouth of the Shannon WFD Coastal Waterbody (CWB). The area of the trailhead will be approximately 0.5ha. The car park circulation route will comprise an asphalt surface while the parking bays themselves will comprise a permeable paving material. Surface water will drain to an bioretention ditch along the eastern and northern boundaries of the trailhead. Suitable vegetation will be planted for bioretention purposes. These measures will filter pollutants from runoff and ensure sufficient water quality entering the Moyasta RWB and the Mouth of the Shannon CWB. Toilet facilities will be provided in the form of two water-free

compost toilets. Connection to foul sewers will not be required. Maintenance of the toilets will be managed by Clare County Council.

Construction works for the trailhead will include site clearance, excavation of topsoil, import and spread of 0.3m thick gravel foundation, provision of public lighting, installation of permeable paving system, installation of asphalt for internal circulation routes and planting of screen landscaping trees and shrubs. A zebra crossing will be provided at the N67 to provide pedestrian and cyclists access between the greenway and the trailhead.

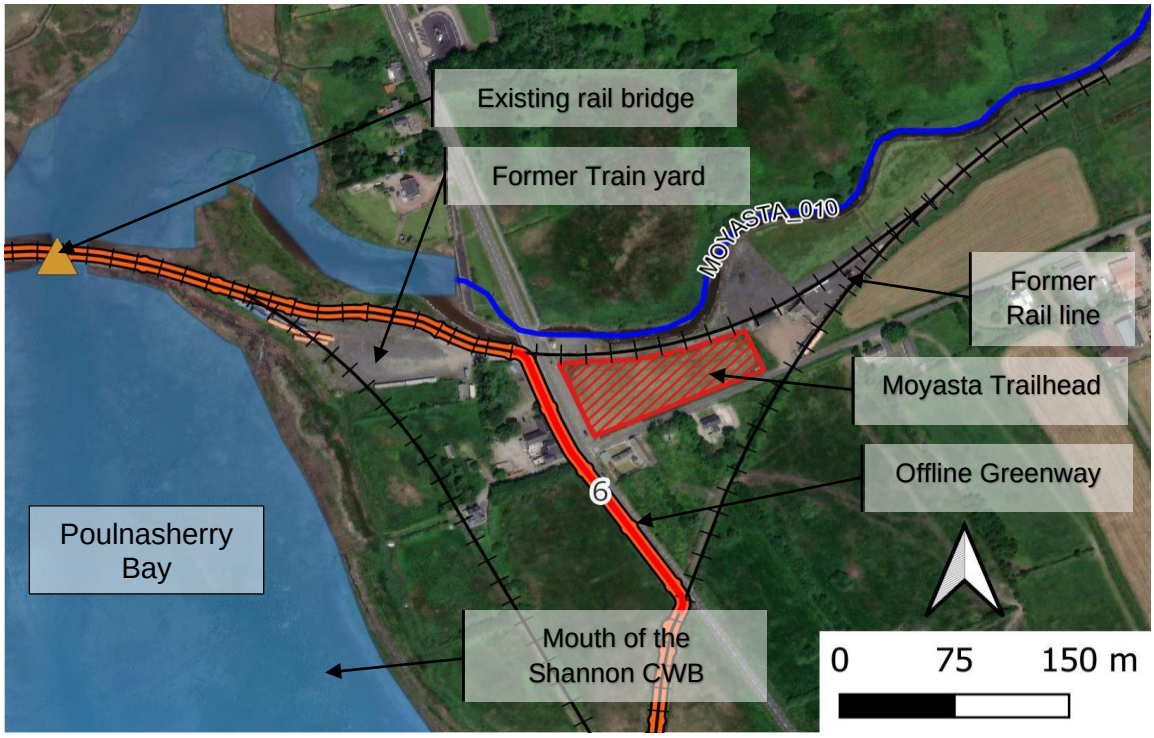

Plate 10-2 Moyasta Trailhead

A second trailhead will be constructed at Kilrush. The trailhead site is a brownfield site adjacent to the Kilrush Creek bay, as shown in Plate 10-3. Kilrush Creek is part of the Mouth of the Shannon Coastal Waterbody. The bay is isolated from the CWB by a seawall and tidal lock gate. The lock operates on an automated system that allows 24-hour access for leisure craft and small commercial vessels to the creek. The Wood_020 River Waterbody discharges at the eastern extent of the bay.

The trailhead will have an area of c. 3.65ha. The car park internal circulation routes will comprise an asphalt surface while the parking bays will comprise a permeable paving material. Surface water will drain to an bioretention ditch along the southern side of the trailhead. Suitable vegetation will be planted for bioretention purposes. These measures will filter pollutants from runoff and ensure sufficient water quality entering Kilrush Creek within the Mouth of the Shannon CWB. Toilet facilities will be provided in the form of four water-free compost toilets. Connection to foul sewers will not be required. Maintenance of the toilets will be managed by Clare County Council.

Indicative details of the proposed trailheads are summarised in Table 10-6.

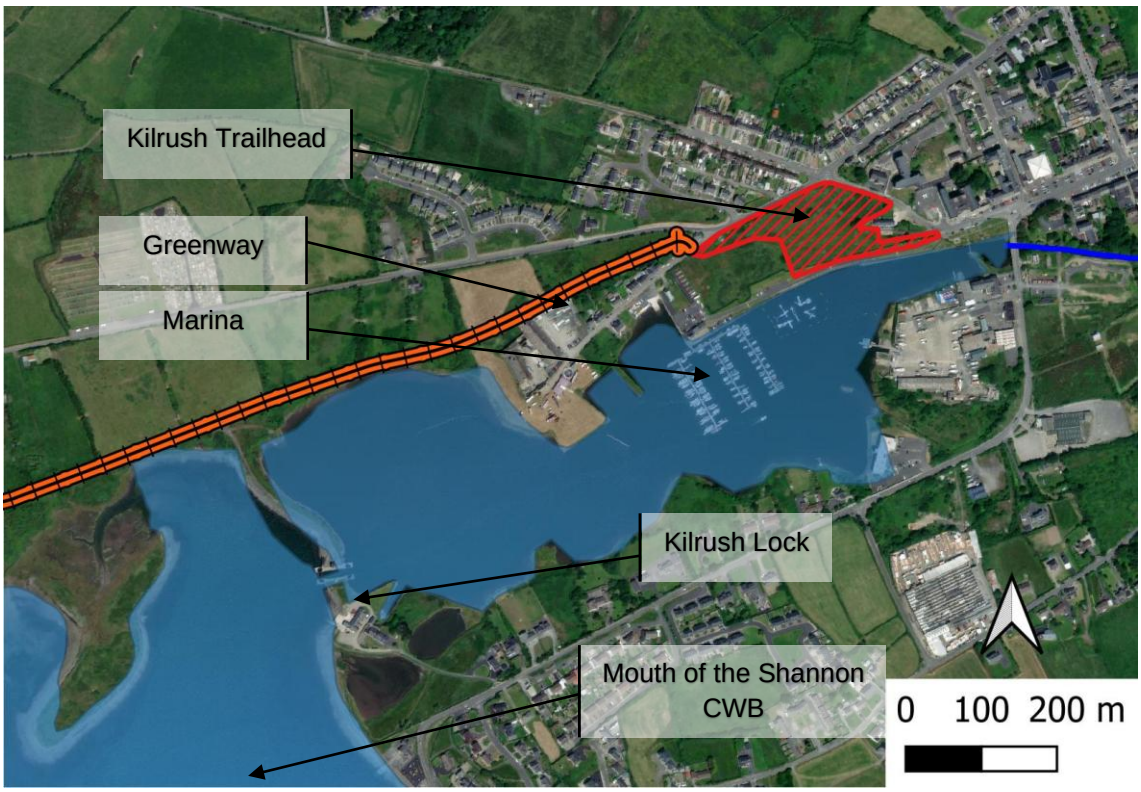

Plate 10-3 Kilrush Trailhead

Table 10-6 Indicative details of proposed trailheads

Location	Proposal	Site Description	Area (ha)	Ancillary Facilities
Kilrush	New trailhead	Greenfield	3.65	Bike stands, 4 toilets, playground
Moyasta	New trailhead	Greenfield	0.5	Bike stands, 2 toilets

The greenway will retain the bridges, culverts and pipe drains that it will pass over. There are 14 recorded existing box culverts traversing the railway. These culverts are predominantly concrete culverts. There are also 5 existing pipe drains. Existing culverts will be assessed to confirm their suitability for reuse, as set out in Section 4.4.2 of Chapter 4.

Moyasta Bridge (Ch 7900), which forms part of the proposed greenway, will be subject to simple maintenance works including re-painting, vegetation removal and graffiti removal. Carrowncalla Bridge (Ch 9775) is also proposed to be integrated as part of the greenway. It will undergo re-painting, vegetation removal and graffiti removal. Additional works such as construction of parapets and fencing are also proposed to bring the existing bridges up to a sufficient standard to accommodate the greenway.

The proposed greenway includes 35 new structures, as detailed in Chapter 4. The 4 proposed river bridges crossing the Termon East RWB will be clear span and will be constructed from prefabricated beams. Concrete pours are planned for the bridge deck and stitching. No instream works are envisaged during construction.

The proposed box culverts will be constructed from prefabricated units and will not require concrete pours. The proposed overpasses will not have an impact on hydrology, as they do not lie within the 20m riparian buffer zone of waterbodies.

The cross section of the greenway consists of a 3m wide asphalt surface, with 1m verges and boundary treatments either side of the path. The width will vary according to local constraints, narrowing slightly at railway bridges, through existing gaps in vegetations, and embankments. The grass verges proposed on either side will act as a natural drainage feature, collecting surface water run-off from the cycleway. Additional drainage ditches are proposed along sections of the greenway, where required, and the surface profile and cross section are designed to mitigate against surface water ponding. Drainage will outfall to existing watercourses. Water and wastewater mains within local roads will be protected at all points where they intersect with the proposed development.

The greenway will be constructed directly on the existing abandoned railway line and earthworks along 58.4% of the total greenway length while a further 4.5% of the total greenway length will be constructed directly adjacent to the former railway corridor and earthworks. The remaining 37.1% of the total greenway length will deviate away from the former railway corridor. Where the proposed greenway follows the railway corridor, the greenway will be constructed on top of the original embankment or cutting foundation and the formation and ballast will be retained as a foundation where it is still in place. Crushed rock sub-base material will be imported for a 150mm thick pavement base layer to be constructed using a paving machine. A 20mm surfacing course will seal the pavement using a bitumen surface dressing. Timber edging kerbs will form the greenway surface alignment and the 1m wide verges shall be graded to provide a 50mm level difference between the greenway surface level and the surrounding ground levels.

Plate 10-4 shows where the proposed greenway deviates from the route of the original railway. Where necessary due to soft-ground conditions, excavation will be limited to topsoil stripping typically to a depth of 150mm. Some cut and fill will be required where gradients are challenging, and on the approaches to structures. Estimated quantities of cut and fill are 9,500m^3 and 27,500m^3 respectively. The at grade offline sections of the greenway will be approximately 50mm proud of the surrounding ground with sloped edges down to prevent ponding on the greenway itself. The greenway level will be lifted in flood-prone areas.

ID	Layer	Length
1	Alignment deviations	100.102
2	Alignment deviations	1139.342
3	Alignment deviations	909.500
4	Alignment deviations	734.148
5	Alignment deviations	663.862
6	Alignment deviations	216.181
7	Alignment deviations	707.436
8	Alignment deviations	307.133
9	Alignment deviations	1438.903
10	Alignment deviations	157.003
11	Alignment deviations	159.263
12	Alignment deviations	145.018

Plate 10-4 Route alignment deviations from old railway alignment

The construction phase of the project is anticipated to take between 16 and 24 months. Construction compounds will be located at the proposed trailhead locations. The proposed Kilrush trailhead will be used as a construction compound for the Kilrush to Moyasta section, while the proposed Moyasta trailhead will be used as a construction compound for the Moyasta to Kilkee section.

Existing boundaries such as hedgerows located adjacent to the proposed greenway will be retained and maintained as appropriate. Vegetation will be removed from several structures using mechanical hand tools exclusively. Works shall also require removal of graffiti from structures.

Contaminated land may be identified along the route due to the historic land use associated with the former railway. There is also anecdotal evidence to suggest the proposed trailhead location at Kilrush was used as a former dump or landfill site, however based on a review of historical mapping and the results of preliminary ground investigations this does not support the finding with the material assessed as inert. The management of contamination will be dealt with in accordance with the Construction Environmental Management Plan (CEMP) and associated resource Waste Management Plan (refer to appendices in Volume 4 of this EIAR). Further discussion is provided in Chapter 9 of this EIAR, Land and Soils.

10.4 Receiving Environment

10.4.1 Overview of the Hydrological Environment

The proposed development lies in the western end of the Shannon Estuary North catchment. This catchment drains a total area of 1,658km^2, including the River Fergus basin and all streams entering tidal water between Thomond Bridge and George's Head, Co. Clare. The proposed route spans from Kilrush to Kilkee, two of the main urban centres in this catchment.

The Shannon Estuary North catchment is divided into 14 sub-catchments with 69 river waterbodies, 26 lake waterbodies, 5 transitional waterbodies, 5 coastal waterbodies and 23 groundwater bodies. The proposed route lies predominantly within the Wood_SC_010 sub-catchment, with approximately 1km of the greenway at the western end located within the Doonah_SC_010 sub-catchment. A map of these respective catchment areas is presented in Plate 10-5.

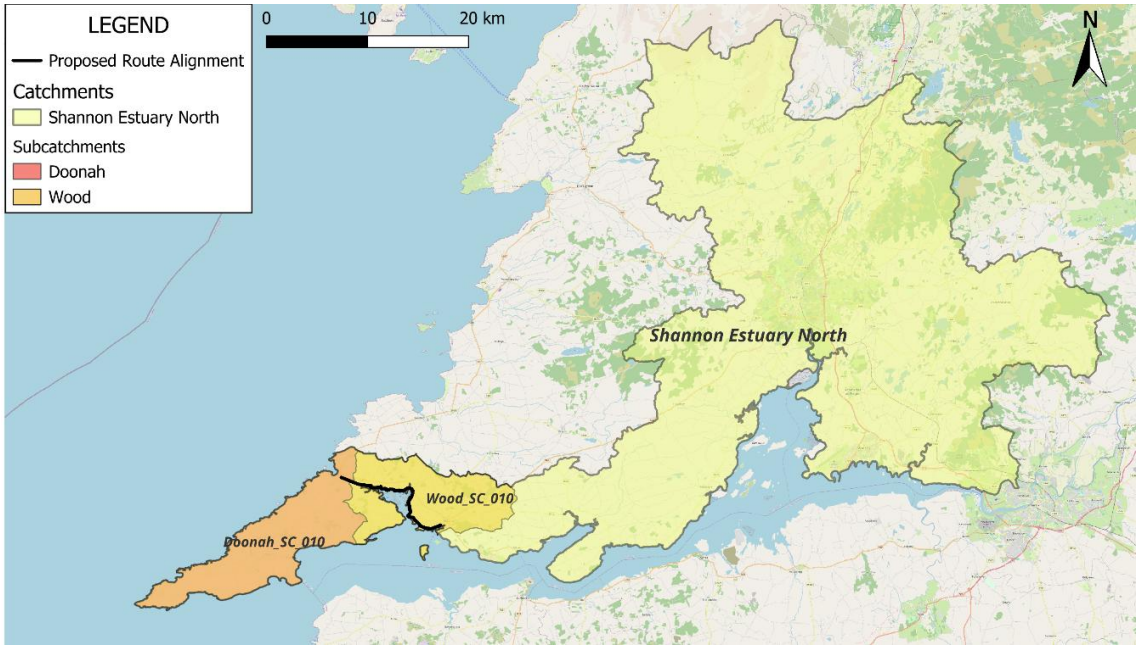

Plate 10-5 Catchment areas and sub-catchments within study area

Description of the Wood_SC_010 sub catchment

The area of the Wood_SC_010 sub-catchment is approximately 91km^2 and consists of predominantly rural agricultural land. The catchment is flat coastal land surrounding Poulnasherry Bay, with minimal elevation change. The subsoil consists of till derived from Namurian sandstones and shales. There are no karst landforms in the vicinity. The sub-catchment has areas of blanket peat and cut-peat, mainly to the northern side.

The Standard Average Annual Rainfall (SAAR) for the sub-catchment is estimated to be 1065mm. Most recharge will occur where overlying subsoils are thinner. (Geological Survey Ireland)

The Mouth of the Shannon CWB defines the western boundaries of the sub catchment. Lower River Shannon Special Area of Conservation (SAC) lies within the CWB. Plate 10-6 presents a map of the main hydrographic features.

There are three lakes to the north of the catchment. There are no hydraulic connections between the lakes and the proposed development. The lakes have not been designated as WFD waterbodies.

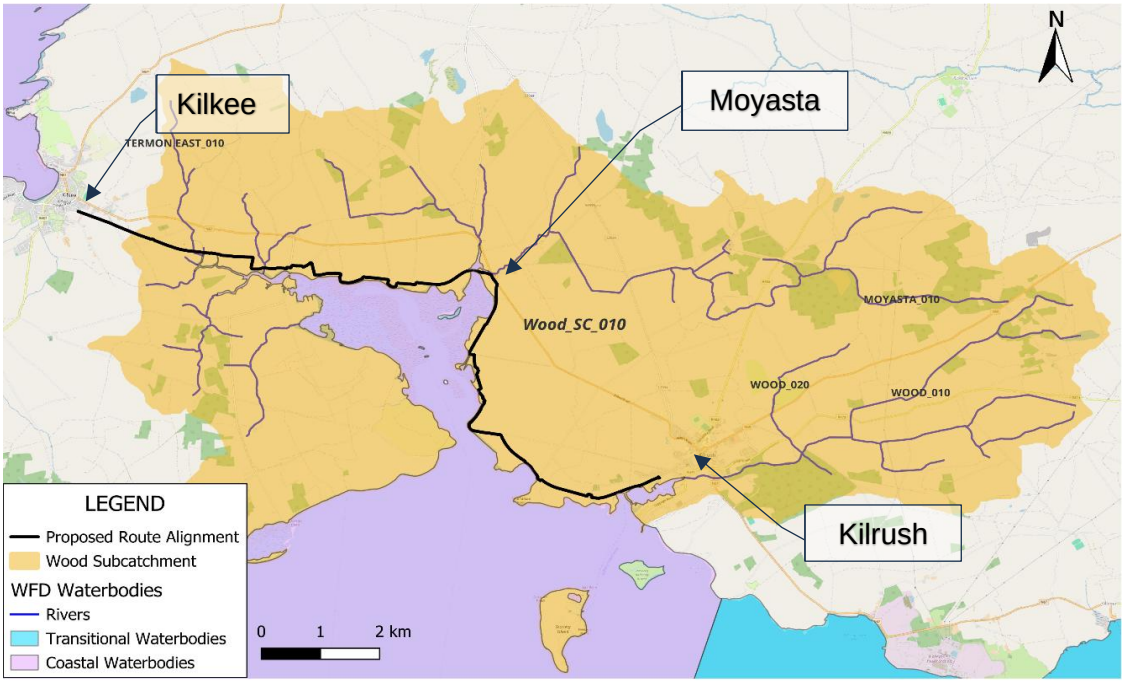

Plate 10-6 Wood_SC_010 WFD river, coastal and transitional waterbodies

Description of the Doonah_SC_010 sub catchment

The contributing area of the Doonah_SC_010 sub-catchment is 115km^2. The catchment lies within the South Clare/Shannon Estuary (HA 27) hydrometric area which incorporates the Kilrush Groundwater Body (GWB). No Group Schemes exist in this area for water supply. The subsoil consists of till derived from Namurian sandstones and shales. There are no karst landforms in the vicinity. The sub-catchment has dispersed areas of blanket peat, alluvium and bedrock outcrops. Groundwater vulnerability is predominantly moderate around the bay, with areas of higher vulnerability near the western coast. The Standard Average Annual Rainfall (SAAR) for the sub-catchment is approximately 1085mm.

The Doonah sub-catchment is bounded to the west by the Shannon Plume CWB and to the south by the Mouth of the Shannon CWB. The Kilkee Reefs SAC lies within the Mouth of the Shannon CWB. Plate 10-7 shows the main hydrographic features of the sub catchment.

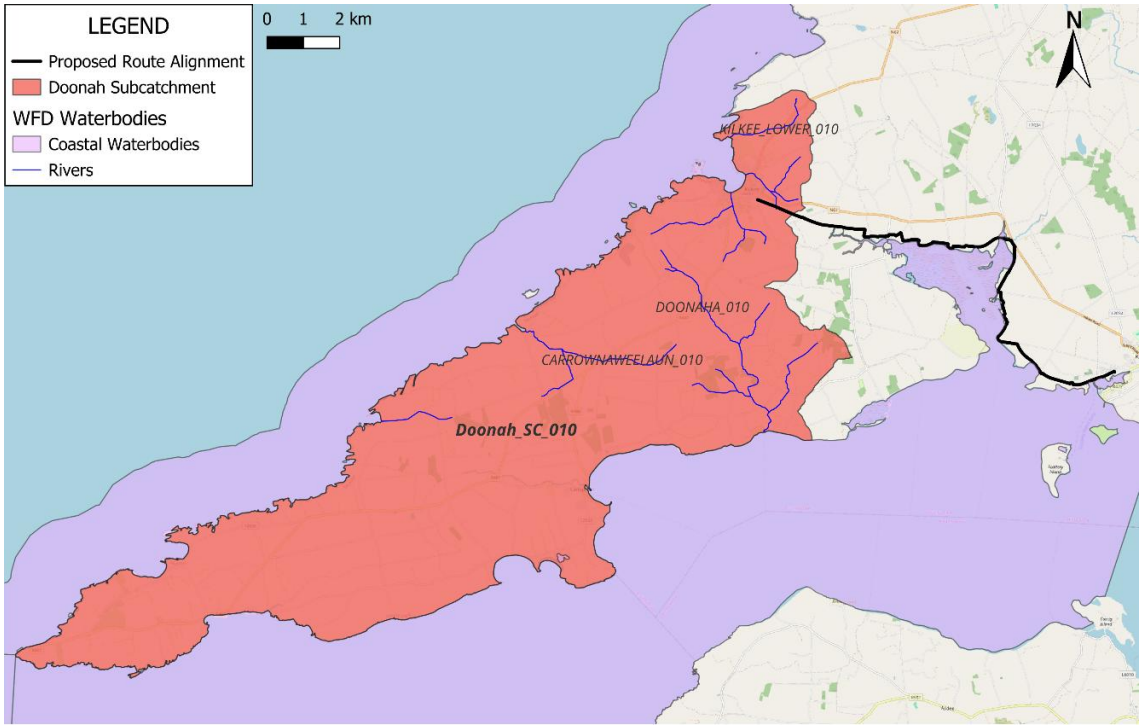

Plate 10-7 Doonah_SC_010 WFD river and coastal waterbodies

Urban Wastewater Treatment Plant (WWTP)

The Kilrush Wastewater Treatment Plant (Wastewater Discharge License No. D0075) has been in operation since 2024. The plant has a capacity of 6700 Person Equivalents (PE) and provides Primary, Secondary and Tertiary treatments. The plant is 1.2km west of the proposed Kilrush trailhead and adjacent to the proposed greenway route. The trailhead is connected to the WWTP by a gravity main. The plant discharges to the to the Mouth of the Shannon CWB. Storm water overflow discharges are located at Lower Moore Street, Frances Street pumping station, Philips Hill pumping station and Kilrush WWTP. Wastewater at Kilrush WWTP undergoes primary treatment and discharges to the Mouth of the Shannon CWB. As the proposed development is not a source of faecal pollution, it will not influence the WWTPs or estuary pollution (Environmental Protection Agency, 2024).

Wastewater from the Kilkee agglomeration (PE of 5,669) flows by gravity via a combined sewer system to 2 holding tanks in Victoria Park. There is currently no wastewater treatment provided in Kilkee; the wastewater is pumped from the holding tanks to a sea outfall at Intrinsic Bay (WWDL No. D0078), approximately 2km southwest. The outfall is through twin asbestos concrete rising mains, 250mm and 300mm, discharging into the Atlantic Ocean. Planning permission was granted by An Bórd Pleanála in June 2025 for the construction of a WWTP for Kilkee. Construction of the plant is expected to take 18-24 months and will eliminate untreated sewage discharges to Intrinsic Bay (Environmental Protection Agency, 2013).

Power Station

Moneypoint Power Station, formerly the largest electricity generation station in Ireland, is located approximately 5km southeast of Kilrush. After 40 years of coal-based generation, it ceased coal use in June 2025 and switched to oil-based generation. The plant regularly discharges cooling water and other effluents to the estuary. Major port activity is also associated with the power station, including shipments via Moneypoint berth, which pose risks of accidental spills, dust, and sediment disturbance. The power station is likely to be a dominant anthropogenic influence on Water Quality in the Mouth of the Shannon CWB.

Protected areas

Article 6.4 of the WFD requires the establishment and maintenance of a register of protected areas. The register includes all areas within a River Basin District that require special protection under specific legislation.

The impacts of the proposed development on areas protected under the Habitats and Birds Directive for the conservation of habitats and species are assessed in detail in Chapter 8. The discussion in this section is intended to identify non-conservation related protected areas that are potential receptors of effects arising from the proposed development on abiotic environmental attributes.

Non-conservation Protected areas identified in the Article 6 Register include:

- Drinking Water Protected areas,
- Nutrient Sensitive areas,
- Salmonoid rivers,
- Shellfish areas,
- Bathing water protected areas.

Plate 10-8 shows the proposed route alignment relative to the identified protected areas. The route passes in close proximity to the following protected areas:

- Cappagh Pier bathing water area, Kilrush
- Kilkee bathing water area
- West Shannon Poulnasherry Bay shellfish area

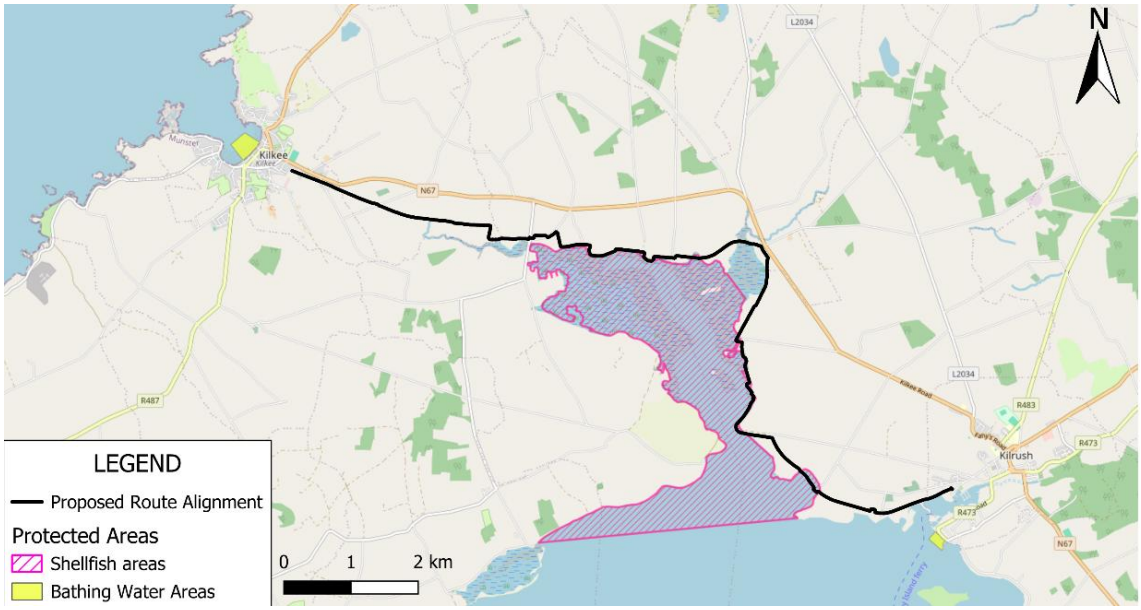

Plate 10-8 Protected areas

10.4.2 Water Framework Directive Status

The EU Water Framework Directive 200/0/EC provides the basis for water. The aim of the WFD legislation is to prevent deterioration of the status of all surface, ground, estuarine and coastal waters.

Under the WFD, the status of a waterbody is assessed against the following Quality Elements (QE):

1. Biological Status: Biological elements such as aquatic flora and fauna,
2. Hydromorphological Status: Hydrological regime, substrate conditions & connectivity,
3. Physio-chemical Status: Water quality conditions including temperature, pH, turbidity, dissolved oxygen and nutrient levels,
4. Chemical Status: Concentration of priority[1] substances and other pollutants.
5. Protected Areas: Specific areas designated for the protection of habitats, species, or human uses such as drinking water abstraction.

The Biological QE is the focus of Chapter 8 Biodiversity. This chapter will focus on effects of the proposed development on the QE's 2 to 5.

The environmental objectives under the WFD are for all water bodies to achieve at least 'Good' status, ensuring a healthy and sustainable water environment. A key aspect of the WFD is the One-Out-All-Out (OOAO) principle, whereby the overall Ecological Status of a water body is determined by the status of the worst performing quality element.

The National WFD Monitoring Programme provides a comprehensive overview of the ecological, chemical and hydromorphology status of the country's waterbodies assessing and reporting on every six years under the River Basin Management Plan (RBMP) cycle.

Status is assessed at the waterbody level. The programme monitors Physio-Chemical parameters such as pH, temperature, electrical conductivity and dissolved oxygen and nutrients at discrete points on waterbodies. In addition, specific pollutants such as heavy metals, organic compounds and industrial chemicals are routinely monitored. Surveillance monitoring undertaken by the program provides a long-term baseline for waterbodies nationally. The Biological QE is monitored by Environmental Protection Agency's (EPA) biological monitoring programme. Data from the monitoring programmes are combined to assign the overall status of a waterbody. The catchment assessments carried out over RBMP cycles allow a qualitative assessment of trends in the Ecological Status of a waterbody.

The Ecological Status of the hydrological attributes within the Study Area over River Basin Management Plan (RBMP) cycles are summarised in Table 10-7.

Table 10-7 Ecological status by RBMP Cycle (Adapted from EPA, 2024)

Waterbody	Type	Status 10-15	Status 13-18	Status 16-21	Status objective	Risk status
Wood_010	River	Poor	Poor	Poor	Good	At risk
Kilkee Lower_010	River	Un assigned	Poor	Moderate	Good	Review
Moyasta_010	River	Un assigned	Good	Moderate	Good	Review
Termon East_010	River	Un assigned	Good	Good	Good	Review
Mouth of the Shannon	Coastal	Moderate	Good	Good	Good	Not at risk
Lower Shannon Estuary	Transitional	Moderate	Moderate	Moderate	Good	Not at risk
Shannon Plume	Coastal	Unassigned	High	High	Good	Not at risk

1 Priority substances and associated Environmental Quality Standards (EQS) are defined within the Priority Substances Directive 2013/39/EU, transposed into Irish Law by the European Environmental Quality Objectives (Surface Waters) Amendment Regulations, 2015 (S.I. No. 386/2015)

'At risk' waterbodies require targeted measures to prevent further deterioration and to improve conditions to achieve its environmental objectives. The environmental objective for each of the natural waterbodies is 'Good' status, while for the artificial waterbodies, the Good Ecological Potential objective applies.

Under the WFD, a waterbody is considered 'at risk' if it is unlikely to meet the environmental objectives established under the directive without additional measures. Risk status is determined through risk assessments that evaluate pollution, physical alteration and other factors that can impact the waterbodies' ecological or chemical status.

The RBMP catchment assessments identify significant issues adversely affecting the overall quality and ecological status of a waterbody and indicate the dominant sources of these issues as 'significant pressures', as outlined in Table 10-8.

Table 10-8 Significant Pressures (Adapted from EPA, 2024)

Waterbody	Status	Significant Issues	Significant Pressure
Mouth of the Shannon	Review	Unknown	Anthropogenic Pressures
WOOD_010	At risk	Pasture	Agriculture
WOOD_020	At risk	Nutrients: elevated phosphate and ammonia concentrations	Agriculture, Forestry, Urban Run-off
KILKEE_LOWER_010	Review	Pasture, UWW Agglomeration	Agriculture, Urban Waste Water
MOYASTA_010	Review	Pasture	Agriculture
TERMON_EAST_010	Review	Pasture	Agriculture

The catchment assessments provide a metric for objectively establishing baseline environmental conditions of a waterbody. The sensitivity of a waterbody to the likely impacts of a project may be qualitatively assessed against existing Significant Pressures.

10.5 Description of Potential Impacts

10.5.1 Do Nothing Scenario

In the absence of the proposed development, no significant changes to hydrological attributes are likely to occur under the current regime.

10.5.2 Potential Construction Phase Impacts

This section describes the potential construction impacts associated with the Proposed Development before any mitigation measures are applied. Direct and indirect impacts will be addressed as well as the nature, extent and duration of the impacts. No instream works are anticipated during construction of the proposed bridges and the development does not propose culverts on main rivers. There are no significant abstractions from main rivers. Consequently, no significant effects on the hydromorphology QE of any of the waterbodies within the study are anticipated. The proposed development could result in potential impacts to the surface water environment during construction in terms of changes to water quality, water levels and flows.

The following potential impacts are considered as part of this assessment:

- Impacts on the Water Quality QE due to greenway earthworks,

- Impacts on the Water Quality QE due to bridge repairs,
- Impacts on the Water Quality QE due to uncontrolled discharge from construction sites,
- Impacts of the Water quality QE due to concrete works.

During the construction phase there is the potential for contamination of waterbodies due to uncontrolled discharge from construction sites to negatively impact on the Water quality QE of surface waterbodies.

Impacts on the Water QE quality due to uncontrolled discharge from construction sites

Construction site activities such as minor earthworks, the construction of temporary roads, site preparation, stockpiling of spoil, levelling and grading disturb and expose soils, leaving them more vulnerable to erosion during rainfall events. In places, these activities can also leave the ground more compacted, reducing infiltration to groundwater and increasing runoff to nearby watercourses and to any connected surface water dependent habitats. Erosion caused by earthworks and vehicle movements increases sediment loads. Increased sediments in runoff negatively impact the Water quality QE in a receiving waterbody.

Discharge generated from construction sites is highly polluting due to contamination from the following sources and waste streams:

- Contaminated water from concrete batching and washout areas,
- Contaminated water from wheel wash areas,
- Contaminated water from dust suppression systems,
- Water and wastewater from welfare facilities.
- Contaminated water from waste and rubbish heaps.
- Water contaminated with hydrocarbons, oils and construction chemicals arising from improper materials handling and storage.
- Accidental spillage of oils, fuels, or other construction chemicals and wastewater.
- Pumped water from dewatering operations contains dissolved nutrients and suspended solids.

Impacts on water quality due to greenway earthworks

The greenway earthworks including site preparation, construction of temporary access roads, stockpiling of soil material, levelling and grading activities will disturb and expose soils, leaving them more vulnerable to erosion during rainfall events. Runoff containing elevated levels of suspended sediments negatively impacts the Water Quality QE in a receiving waterbody.

Excavation exposes nutrients and metals bound as low bioavailability organic compounds in the soil structure to oxidation. Oxidation converts the inorganic species of nutrients and metals into bioavailable and leachable inorganic forms. Excavation and stockpiling effectively converts soils from an environmental sink for metals and nutrients into a source. Runoff from excavated areas creates a pathway to the aquatic environment that can increase suspended sediment loads and dissolved solids concentrations in a receiving waterbody. Runoff from excavated areas and stockpiles may also transport chemical pollutants from construction equipment, refuelling and maintenance operations, accidental spills and waste heaps. Earthworks along the railway line has the potential to mobilise legacy Persistent Organic Pollutants such as herbicides, pesticides, hydrocarbons pollutants and heavy metals associated with the operation of the railway.

Alteration to land cover within riparian corridors directly impacts water quality within a receiving waterbody. Riparian Buffer Zones (RBZ) have been shown to be effective at protecting

watercourses from pollution by removing suspended solids sediments and nutrients in surface runoff. In general, the level of protection provided by an RBZ increases with the width of the zone.

A buffer of 5m in width can remove between 50-60% of suspended sediments and between 30-40% of nitrates. Removal rates within the RBZ for sediments increase to 70-80% with nutrient removal increasing to 40-50% at 10m in width. A 20m wide buffer zone can reduce suspended sediment loads by 70-80% and nitrate concentrations by 70-80%. A 30m wide zone can remove greater than 95% and 85% of suspended sediments and nitrates respectively (Ó hUallacháin, et al., 2025).

Impacts on water quality from the repair of bridges

The repair of bridges involves the removal of vegetation, grout and masonry over and adjacent to the water surface. These activities generate dust, masonry, metal and organic debris that can enter the water body, either directly or by being blown in by wind. Wastewater streams are generated by cutting, power washing and dust suppression activities which create a pathway for water pollution.

The chemicals used in the repairs such as acids, alkalis, paints, bitumen and waterproofing compounds give rise to the risk of accidental spills, as does the use of plant equipment during repairs. Chemicals and plant debris entering the waterbody increase oxygen demand. There is a risk of acute toxicity associated with the use of chemicals and accidental spills. Applied chemicals in contact with water are prone to leaching that can cause localised toxicity and reduced dissolved oxygen.

Impacts on water quality due to concrete works

Uncured concrete is highly alkaline and contact with freshwater environments can raise the pH in the waterbody causing harm to aquatic organisms and disrupting ecosystems. Cement admixtures, fines and lime entering a waterbody increase turbidity and reduce light penetration.

Contamination of waterbodies with uncured concrete can negatively impact the Water quality QE and the biological QE. Contamination of watercourses with uncured concrete can cause acute toxicity to fish and benthic macroinvertebrates in addition to increasing pH, turbidity and reducing dissolved oxygen levels. Leaching of uncured concrete in contact with water also negatively impacts the Water quality QE.

Population and Housing

There are six electoral divisions (EDs) at least partially located within the ZoI. Uncontrolled discharge from the bridge construction sites at Lisdeen are likely to cause temporary, negative, moderate impacts on the Water Quality QE of the Termon East_010. In the absence of mitigation this could result in direct negative, likely, significant effects of a temporary duration on the water quality QE.

The construction of the bridge decks at Lisdeen require in-situ concrete pours that if unmitigated are likely to cause direct, negative, likely, significant effects of a temporary duration on the water quality QE.

There is a pathway for indirect effects on the water quality QE of the Mouth of the Shannon CWB and the bridge construction sites at Lisdeen. Uncontrolled discharge from the construction sites if unmitigated are likely to cause negative, imperceptible effects of a temporary duration on the Water quality QE.

The construction of the bridge decks at Lisdeen are likely to cause indirect, negative, imperceptible effects on the Water quality QE of the Mouth of the Shannon CWB if unmitigated.

Uncontrolled discharge from the greenway pavement construction sites from chainage 7800-8050m where the railway crosses Poolnasherry Bay are likely to cause direct, negative moderate effects on the Water quality QE of the Mouth of the Shannon CWB in the absence of mitigation. The buffer zone between surfacing works and the waterbody is less than 10m along the section in places and surfacing works will be required over the waterbody at Moyasta bridge.

The repair of the bridge at Moyasta is likely to cause direct imperceptible effects of temporary duration if unmitigated the Water quality QE of the Mouth of the Shannon CWB.

Uncontrolled discharge from the Moyasta trailhead construction site and temporary works compound are likely to cause direct, significant effects of a temporary duration on the Water Quality QE of the RWB.

A pathway exists for indirect impacts from uncontrolled discharges from the Moyasta trailhead construction site and temporary works compound on the water quality QE of the Mouth of the Shannon CWB via discharge from the Moyasta_010 to Poulnasherry Bay. Uncontrolled discharges from these sites in the absence of mitigation the absence could result in indirect negative, likely and slight effects of a temporary duration on the Water quality QE of the CWB.

Uncontrolled discharges from greenway pavement construction sites from Chainage 10500-11400m are likely to cause direct, negative, slight and temporary effects on the Water Quality QE of the Mouth of the Shannon CWB Water quality QE if unmitigated. The buffer zone between the water body and the greenway construction sites is less than 10m at some points.

Uncontrolled discharges from greenway earthworks from Chainage 10500-11400m are likely to cause Direct, negative, imperceptible and temporary effects on the Water Quality QE of the Mouth of the Shannon CWB Water quality QE if unmitigated. The buffer zone between the water body and the greenway construction sites is less than 10m at some points.

Uncontrolled discharges from greenway earthworks from Chainage 12620-12950m are likely to cause Direct, negative, imperceptible and temporary effects on the Water Quality QE of the Mouth of the Shannon CWB Water quality QE if unmitigated. The buffer zone between the water body and the greenway construction sites is less than 10m at some points.

Uncontrolled discharges from greenway earthworks from Chainage 12620-12950 m are likely to cause Direct, negative, imperceptible and temporary effects on the Water Quality QE of the Mouth of the Shannon CWB Water quality QE if unmitigated. The buffer zone between the water body and the greenway construction sites is less than 10m at some points.

The significance of the predicted impacts of the construction phase on the hydrological environment without mitigation measures have been assessed in accordance with the criteria outlined in Table 10-5. A summary of the significance assessment is presented in Table 10-9.

The construction phase will result in a range of temporary impacts on the water quality QE of the receiving water bodies environment, primarily associated with site preparation, earthworks, and construction of the bridge decks at Lisdeen and construction of the greenway paving which are likely to cause moderate to significant effects of receiving waterbodies without mitigation. The construction phase does not represent a significant source of effect on the hydromorphological QE of receiving waterbodies.

Table 10-9 Construction Phase impact Significance Assessment

Source	Hydrological Attribute	Sensitivity	Rationale	Effect	Significance of effect
Uncontrolled run off from bridge construction sites at Lisdeen	Termon East_010 RWB Water quality Q	Medium	Good status RWB	Direct, temporary, negative, moderate impacts	Moderate
Concrete works on bridge sites at Lisdeen	Termon East_010 RWB Water quality QE	Medium	Good status RWB	Direct, negative, likely, significant effects of a temporary duration	Significant
Uncontrolled run off from bridge construction sites at Lisdeen	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Indirect negative, imperceptible effects of a temporary duration	Not significant
Concrete works on bridge sites at Lisdeen	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Indirect, negative, imperceptible effects on the Water quality	Not significant
Paving construction from chainage 7800-8050 m (Moyasta Bridge).	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct, negative moderate effects	Moderate
Moyasta trail head construction and temporary works compound.	Moyasta _010	Medium	Good status RWB	Direct, significant effects of a temporary	Moderate
Moyasta trail head construction and temporary works compound.	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Indirect negative, likely and slight effects of a temporary	Slight
Uncontrolled discharge from greenway construction site from chainage 10500-11400	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct, negative, slight and temporary	Slight
Uncontrolled discharge from greenway earth works from chainage 10500-11400	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct, negative, imperceptible and temporary	Slight
Uncontrolled discharge from greenway construction site from chainage 12620-12950 m	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct, negative, slight and temporary	Slight

Source	Hydrological Attribute	Sensitivity	Rationale	Effect	Significance of effect
Uncontrolled discharge from greenway earthworks from chainage 12620-12950 m	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct, negative, imperceptible and temporary	Slight
Repair of Moyasta Bridge.	Mouth of the Shannon CWB Water quality QE	Medium	Good status CWB	Direct negative, imperceptible. temporary	Slight

10.5.3 Description of Operational Phase Impacts

The route of the proposed greenway has been selected, as far as is practicable, to utilise existing infrastructure and to minimise impacts on surface hydrological features.

As the greenway will be used for recreational purposes, the only significant sources of hydrocarbons during the operational phase will be from bicycles and low intensity vehicular traffic for maintenance. Wear rates of the paved surface will be low hence the greenway does not represent a significant source of water pollutants during its operational phase. Runoff generated from the paved surfaces will be attenuated adjacent to the greenway through over the edge drainage, allowing the runoff to naturally infiltrate at greenfield equivalent rates.

The proposed trailhead carpark at Kilrush represents a source of potential hydrocarbon pollution to the Mouth of the Shannon CWB. The CWB is assessed as being of High importance. Applying the simple index approach outlined in the SUDS manual (CIRIA, 2015) the trail head carpark at Moyasta and represents a 'Medium Pollution Hazard Level' for hydrocarbon pollution (Table 26.2, page 568). Effects on the Specific Pollutants QE of the Mouth of the Shannon CEB are likely. The significance of the effects are assessed as being moderate and of short-term duration.

The proposed trailhead carpark at Moyasta represents a source of potential hydrocarbon pollution to the Moyasta_010 RWB. The RWB is assessed as being of High importance. Applying the simple index approach outlined in the SUDS manual (CIRIA, 2015) the trail head carpark at Moyasta and represents a 'Medium Pollution Hazard Level' for hydrocarbon pollution (Table 26.2, page 568). Effects on the Specific Pollutants QE of the Moyasta_010 are likely. The significance of the effects are assessed as being moderate and of short-term duration.

There will likely be an increase in dog walking activities during the operational phase. Uncollected dog faeces represent a source of microbial contamination and nutrient loading to surface waterbodies. Microbial contaminants include Escherichia Coli, Salmonella and Campylobacter bacteria and Giardia and Cryptosporidium protozoan parasites.

Contamination of drinking water sources by runoff contaminated with Giardia and Cryptosporidium pose a particular risk to Public Health as both pathogens are resistant to disinfection by chlorination. Effects on public health due to contamination of drinking water supplies faecal pathogens during the operation of the greenway are not likely as there are no drinking water protected surface waterbodies within the study area.

Faecal Coliforms is a specified indicator parameter specified in the 3rd Schedule of European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009. Escherichia Coli can accumulate in shellfish tissues, hence dog fouling during the operational phase represents a source of negative effects on the water quality and the sanitary status of the Shellfish Protected area in Poolnasherry Bay. The protected area is assessed as being of high importance. Given the extents of the buffer zones between the greenway and the receiving waterbody and the reduction in bacterial loads due exposure to environmental factors such as temperature, UV light and desiccation dog fouling during the operational phase, effects during the operational phase on the shellfish protected area are unlikely. The significance of the effects are assessed as being imperceptible and of temporary duration.

Escherichia Coli is a specified indicator parameter under Schedule 4 of the Bathing Water Quality (Amendment) Regulations 2011, hence dog fouling during the operational phase represents a source of negative effects on the water quality and bathing water status of the

bathing water protected area at Kilrush. The importance of the protected area is assessed as being high.

Given the extents of the buffer zones between the greenway and the receiving waterbody and the reduction in bacterial loads due exposure to environmental factors such as temperature, UV light and desiccation dog fouling, effects during the operational phase on the bathing water protected area are unlikely. The significance of the effects are assessed as being imperceptible and of temporary duration.

Dog faeces contain high levels of nitrogen and phosphorous. Surface runoff from the greenway contaminated with dog faeces could increase nutrient levels and oxygen demand in receiving surface waterbodies, negatively impacting the Water quality QE. Given the dilution capacity of the coastal waterbodies and the extent of the buffer zones between the greenway and the receiving waterbodies the effects during the operational phase on the CWB are unlikely. The significance of the effects on the water quality QE of receiving waterbodies are assessed as being imperceptible and of temporary duration.

The proposed bridges are clear span structures. The geometry and bank substrates of the channels will not be modified. Effects on the hydromorphology of the rivers that they span are not likely.

Culvert construction is limited to minor streams and tributaries and effects on the longitudinal or lateral connectivity within the wider river networks are not likely.

10.5 Mitigation Measures

10.5.3 Construction Phase Mitigation Measures

During construction, the following guidance documents for construction work on, over or near water will be adhered to:

- C532 Control of water pollution from construction sites: guidance for consultants and contractors (CIRIA, 2001)
- Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.
- CIRIA C648 Control of water pollution from linear construction projects: technical guidance (CIRIA, 2006)
- Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945 (OPW, 2019)
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006b)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)
- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board)

The following mitigation measures relating to the protection of water quality will apply during the construction of the proposed development:

- Double silt fences will be installed along the watercourses in the vicinity of the works to contain any potential silt or sediment run-off, with particular attention to watercourses where instream works are required. Silt fences will be erected in accordance with the manufacturer's recommendations.

- Stockpiling of construction material or topsoil will be prohibited within 10m of the watercourse, in order to minimize sources of sediment runoff.
- Storage tanks will be bunded to capture any oil leakage. Bund specification will conform to the current best practice for oil storage (Enterprise Ireland, BPGCS005).
- Storage tanks, bunding, and machinery will be maintained and checked regularly for leakage.
- There are no instream works proposed to watercourses other than ditches, so the normal restriction of in-stream works to the months of June and September is not required for the proposed development.

The following measures prescribed regarding surface water run-off will also minimise the risk of any input of cementitious material into watercourses during the construction of the proposed development:

- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near the watercourses;
- Placing of concrete in or near the watercourses will be carried out only under the supervision of a suitably qualified Environmental Manager;
- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials. Such spills shall be contained immediately, and runoff prevented from entering watercourses;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of the watercourses;
- On-site concrete batching and mixing activities will only be allowed at the identified construction compound;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the supplier);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The concrete plant and all delivery drivers will be informed of their location with the order information and on arrival on site; and,
- Chute washout locations will be provided with appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.

The measures prescribed regarding surface water run-off will also remove the risk of any input of hydrocarbons and other chemicals into the watercourses. However, the following additional measures shall also apply:

- Fuel storage tanks shall have secondary containment provided by means of an above ground bund to capture any oil leakage.
- Storage tanks and associated provision, including bunds, will conform to the current best practice for oil storage and will be undertaken in accordance with Best Practice Guide BPGCS005 – Oil Storage Guidelines (Enterprise Ireland).

- Spill kits shall be available on-site. Spill kits shall be provided at all refuelling points and fuel/chemical storage areas. Staff shall be trained in the use of spill kits.

The following mitigation measures relating to sediment control and water quality during the installation of culverts:

- Culverts will be installed in ditches by placing a suitably sized pipe or section of box culvert in the existing channel.
- It is expected that the ditches will be dry, but if flow is present, the works area will be over pumped which the culvert is installed. The pump inlet and outlet will be fitted with a silt sock to prevent sediment being released into the ditch. A hay bale, silt fence or similar silt trap will be installed downstream of the works area.
- The pipe will be laid inside the existing channel and covered with crushed stone to the level required. The silt trap will be removed once the sediment has settled.
- No machinery is permitted in the watercourses.

Minor repairs will be required on some of the structures, limited to vegetation and repointing. The following mitigation measures relating to the repair of structures are as follows:

- Repointing and concrete repairs will be undertaken on foot, from a ladder, using scaffolding or using a bridge inspection unit.
- A catch net will be placed flush with the bridge to catch any spilled mortar or concrete. The catch net will be made of Visqueen heavy duty plastic sheeting or similar and will cover the entire area underneath the works.
- Repointing and concrete repairs will take place in dry weather and will not take place if rain is forecast in the following 12 hours. The commencement of the works will be approved by the Employer's Representative.
- Mortar and concrete will be mixed in a watertight container at least 20m from the watercourse.
- Vegetation will be removed mechanically. No herbicide will be used to remove vegetation from bridges.

The bridges have been designed to minimise the impacts on the watercourses. The following mitigation measures relating to sediment control and water quality during the construction of the bridges are:

- The new bridges will be clear span, with abutments set back from the riverbanks as far as possible, and the decks and parapets will be prefabricated.
- Where watercourses are present, silt fences will be installed along the riverbanks to intercept run-off during the construction phase and to protect the riparian vegetation.
- The silt fences will be located as far back from the bank as possible.
- No machinery is permitted in the watercourses.

The steel components of Moyasta Bridge will be sandblasted and repainted. In order to carry this work out, the bridge structure will be encapsulated, created a sealed environment in which the works will take place on the bridge while it is sandblasted and painted. The following mitigation measures relating to sediment control and water quality during the construction of bridges are:

- A scaffold structure will be hung on the bridge desk and used to create a frame around the bridge structure.
- Plastic sheeting will be fitting over the scaffolding and tightened by applying heat.
- Any gaps will be sealed using tape.

- The access point will be fitted with a zip to create a fully enclosed working area.
- The encapsulated area will ensure that no dust, frit or paint reaches the watercourse below. The internal temperature will be raised using heaters to create a dry environment and to ensure that the paint cures properly.
- Following the works, any dust, grit and the plastic sheeting will be removed and disposed of appropriately and the scaffolding will be dismantled.

Wastewater drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent water pollution and in accordance with the relevant statutory requirements.

Method statements that are prepared for the works that could affect biodiversity will be reviewed and approved by the Employer / Employer's Representative and the ECoW in advance of the works beginning. All method statements for works in, near or liable to impact on a waterway must have prior agreement with IFI.

This section describes the measures that are required to mitigate any likely harmful or negative effects associated with the proposed development on the identified hydrological attributes, as described in the preceding sections.

10.5.4 Operational Phase Mitigation measures

The operation of the greenway will not result in any changes to the hydrological regime or water quality of the area, as there will be no further disturbance of soils post-construction, and traffic will be limited to non-motorised traffic other than occasional maintenance vehicles and farm machinery. Surface water run-off will discharge over the edge or to existing drainage ditches where present.

At the trail heads, surface water will be directed to bioretention areas for treatment in line with SUDs principles. The use of permeable pavements will provide sufficient mitigation for hydrocarbon pollution that there are no residual impacts on the waterbodies.

10.5.5 Flood Risk Management

The mainline section of the greenway intersects the flow paths and drainage from the upper catchment. The proposed greenway will largely retain the existing structures on the mainline, hence existing flood regimes will not be impacted at the catchment level.

The greenway represents a modest increase in impermeable area in the catchments. The greenway pavement has been provided with over the edge drainage and will discharge to existing drainage networks. These measures are assessed as being sufficient to ensure that the greenway does not negatively impact local pluvial flood risk along its route.
A site-Specific Flood Risk Assessment (see Appendix 10.1 in Volume 4 of this EIAR) has been concluded for the greenway and has concluded that the proposed development is appropriate under the Planning System and Flood Risk Management Guidelines (OPW, 2019).

10.6 Residual Impacts

An assessment of the significance of the residual impacts post-mitigation has been completed according to the criteria outlined in Table 10-10 has been completed. The significance assessment is presented in Table 10-10.

Table 10-10 Residual Impacts

				Pre-mitigation	Post-mitigation
Source	**Hydrological Attribute**	**Sensitivity**	**Effect**	**Significance of impact**	**Significance of impact**
Uncontrolled run off from bridge construction sites at Lisdeen	Termon East_010 RWB Water quality Q	Medium	Direct, temporary, negative, moderate impacts	Moderate	Negligible
Concrete works on bridge sites at Lisdeen	Termon East_010 RWB Water quality QE	Medium	Direct, negative, likely, significant effects of a temporary duration	Significant	Negligible
Uncontrolled run off from bridge construction sites at Lisdeen	Mouth of the Shannon CWB Water quality QE	Medium	Indirect negative, imperceptible effects of a temporary duration	Not significant	Negligible
Concrete works on bridge sites at Lisdeen	Mouth of the Shannon CWB Water quality QE	Medium	Indirect, negative, imperceptible effects on the Water quality	Not significant	Negligible
Paving construction from chainage 7800-8050 m.	Mouth of the Shannon CWB Water quality QE	Medium	Direct, negative moderate effects	Moderate	Negligible
Moyasta trail head construction and temporary works compound.	Moyasta _010	Medium	Direct, significant effects of a temporary	Moderate	Negligible
Moyasta trail head construction and temporary works compound.	Mouth of the Shannon CWB Water quality QE	Medium	Indirect negative, likely and slight effects of a temporary	Slight	Negligible
Uncontrolled discharge from greenway construction site from chainage 10500-11400	Mouth of the Shannon CWB Water quality QE	Medium	Direct, negative, slight and temporary	Slight	Negligible

				Pre-mitigation	Post-mitigation
Source	**Hydrological Attribute**	**Sensitivity**	**Effect**	**Significance of impact**	**Significance of impact**
Uncontrolled discharge from greenway earth works from chainage 10500-11400	Mouth of the Shannon CWB Water quality QE	Medium	Direct, negative, imperceptible and temporary	Slight	Negligible
Uncontrolled discharge from greenway construction site from chainage 12620-12950 m	Mouth of the Shannon CWB Water quality QE	Medium	Direct, negative, slight and temporary	Slight	Negligible
Uncontrolled discharge from greenway earthworks from chainage 12620-12950 m	Mouth of the Shannon CWB Water quality QE	Medium	Direct, negative, imperceptible and temporary	Slight	Negligible
Repair of Moyasta Bridge.	Mouth of the Shannon CWB Water quality QE	Medium	Direct negative, imperceptible. temporary	Slight	Negligible

The significance of the effects of the development of the greenway on hydrological attributes is expected to be negligible taking account of mitigation measures as outlined. All mitigation measures shall be put in place in advance, as construction progresses across the route.

10.6.3 Water Framework Directive Impact Assessment

Under the Water Framework Directive (2000/60/EC), deterioration refers to any decline in the status of a water body that breaches the Directive's core objective to prevent deterioration and achieve good status.

Deterioration is defined as any drop in a quality element (biological, chemical, or hydromorphological) by at least one class, even if the overall waterbody status remains unchanged. If a quality element is already in the lowest class, any further decline within that element still counts as deterioration. This interpretation was confirmed by the Court of Justice of the European Union (CJEU) in the Weser (Bund) case.

This assessment has established the current WFD status of each waterbody within the study area. The potential impact of significant project elements on the Water quality and Hydromorphology Quality Elements has been assessed at the waterbody scale. The WFD status impact assessment has considered the Significant Pressures identified by River Basin Management Plans and Catchment Assessments at catchment and waterbody scales.

Following the full implementation of the mitigation measures described in Section 10.5.3, the residual impacts on the Hydromorphology and the Water quality Elements are assessed as being negligible. The specification of mitigation measures has considered the impact assessment in Chapter 8 Biodiversity to ensure the protection of the Biological Quality Element.

This assessment has been undertaken in accordance with the requirements of the Water Framework Directive (2000/60/EC). The proposed project has been evaluated to ensure that it will not cause deterioration in the status of any water body, nor prevent the achievement of the environmental objectives set under the Directive. Appropriate mitigation measures have been identified and incorporated where necessary to maintain compliance with WFD obligations.

10.6.4 Operation Phase Mitigation Measures

It is not predicted that the operation of the greenway will result in significant impacts on the hydrological regime or water quality of the area, as there will be no disturbance of soils post-construction, and only a minimum of traffic movement. The drainage has been designed to operate effectively during the operational period. Surface water run-off along the greenway will discharge over the edge or to existing drainage ditches where present during rain events. The ditches will be effective in filtering the run-off from the greenway should any accidental release of silt combine with the surface water run-off during operational activities.

10.6.5 Summary

It is predicted that impacts on the existing hydrological environment will be minimised as a result of the above mitigation measures.

The runoff impact of the proposed scheme on hydrology is expected to be imperceptible. Contaminant concentration in surface water runoff is based on traffic density, and projected traffic volumes will remain below the AADT threshold for pollution impacts on receiving waters.

10.7 Monitoring

Construction phase monitoring relates to the good maintenance of mitigation measures outlined in this Section 10.5.3, including the project specific Construction Environmental Management Plan (CEMP). It is recommended that any monitoring of any hazardous material stored on-site be carried out in accordance with the CEMP. It is recommended that a dust management/monitoring programme be implemented during the construction phase of the development in accordance with the CEMP.

10.7.1 Construction Phase

Proposed monitoring during the construction phase in relation to the water and hydrological environment are as follows:

- Contractors will be required to fully adhere to the CEMP at all times.
- Construction monitoring of the works (e.g. inspection of services and SuDS installation and backfill, stability of excavations etc.), including by a full time Ecological Clerk of Works.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and provision of vehicle wheel wash facilities.
- Monitoring of contractor's stockpile management (e.g. protection of excavated material to be reused as fill; protection of soils from contamination for removal from site)
- Monitoring sediment control measures (sediment retention tanks, surface water inlet protection etc.)

10.7.2 Operational Phase

Proposed monitoring during the operational phase to safeguard the water and hydrological environment are as follows:

- The performance of SuDS features, including permeable paving areas, will be monitored by the relevant authorities as part of routine management and maintenance arrangements for roads and public realm areas during the life of the development.
- The drainage system will be regularly inspected and maintained as part of same.
- Although no specific monitoring will be required for the proposed development, it is envisaged that EPA Monitoring of the water quality of the water bodies will continue in the area through the life of the development.
- Clare County Council will assign dedicated maintenance staff to the management of the greenway, and these will monitor the usage of bins, dog waste bags etc. along the route.

10.8 References

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