8. HYDROLOGY AND HYDROGEOLOGY

8.1 Introduction

8.1.1 Background & Objectives

In this chapter of the Environmental Impact Assessment Report (EIAR), MKO, on behalf of Roscommon County Council (RCC), has assessed the likely significant effects of the proposed redevelopment of an existing Waterfront and Marina at Hodson Bay, Lough Ree (Proposed Development) on the local hydrological and hydrogeological environment (surface water and groundwater).

This chapter provides a baseline assessment of the hydrological and hydrogeological environment of the Proposed Development site (the Site) and identifies and evaluates the potential impacts associated with the construction and operational phases of the Proposed Development. Appropriate mitigation measures are outlined and recommended to avoid or minimise significant effects where identified. Additionally, it includes an evaluation of residual effects following the implementation of mitigation measures and determines the significance of these effects. It has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction. The full description of the Proposed Development is provided in Chapter 4 of this EIAR

The objectives of the assessment are to:

- Produce a baseline study of the existing water environment of the Site (surface water and groundwater including connectivity with local designated sites);
- Identify likely negative impacts of the Proposed Development on surface water and groundwater during construction and operational phases of the development;
- Identify mitigation measures to avoid, remediate or reduce significant negative effects; and,
- Assess significant residual effects and cumulative impacts of the Proposed Development along with other local commercial and infrastructural developments.

8.1.2 Statement of Authority

This section of the Environmental Impact Assessment Report (EIAR) has been prepared by Dr Bébhinn Anders and reviewed by Monika Kabza, all of MKO.

Bébhinn Anders has a BSc. in Earth and Ocean Sciences and a PhD from the University of Galway in geochemistry and sedimentary provenance. Bébhinn has 4 years of practical field experience with projects that involve environmental monitoring, hydrogeological data analysis, and flood risk assessments. She has conducted geological mapping, supervised borehole drilling, and led water sampling campaigns. Her experience also includes preparing both Land, Soils and Geology and Hydrology and Hydrogeology chapters for EIARs.

Colin Fitzgerald is an environmental geologist with over fourteen years' experience in impact assessment, contaminated land, hydrogeology, catchment science, GIS, mining, and exploration. Colin has a BSc. in Geology from UCC and a postgraduate diploma in Environmental Engineering from Trinity College Dublin. He is a professional geologist (EurGeol, PGeo) and has worked on greenfield and brownfield impact assessment for over ten years, with experience in preparing and leading teams through Land, Soils and Geology, and Hydrology and Hydrogeology chapters for EIARs.

Monika Kabza has a MSc. in Groundwater Engineering from the AGH University of Science and Technology Krakow, Poland and is a professional geologist (PGeo) with over 16 years of experience gained from environmental and infrastructure projects. She has worked on projects for Uisce Éireann, Geological Survey Ireland, National Federation of Group Water Schemes, Dublin Airport, and private

industry. Her experience includes preparing the EIAR Hydrology and Hydrogeology chapters for infrastructure projects such as the N11/M11 Improvement Scheme and wind and solar farms.

8.1.3 Relevant Legislation

This EIAR has been prepared in accordance with the requirements of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU. These Directives have been transposed into Irish legislation through S.I. No. 296 of 2018 – European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

The EIAR is prepared in accordance with the requirements of European Union and Irish legislation identified in Chapter 1 Introduction. In addition, due regard has been given to the following relevant legislation as it relates to the protection of the water environment:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, as amended (including S.I. Nos. 84 of 1994, 101 of 1996, 351 of 1998, 93 of 1999, 450 of 2000, 538 of 2001, and 134 of 2013), together with the Minerals Development Act 2017, the Planning and Development Act 2000 (as amended), and S.I. No. 600 of 2001 Planning and Development Regulations (and amendments), which implement EU Directive 85/337/EEC and its successors on the environmental assessment of certain public and private projects;
- Planning and Development Act, 2000, as amended;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations, implementing EU Directive 78/659/EEC regarding the protection and improvement of waters supporting fish life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (S.I. Nos. 296/2009, 327/2012, 386/2015, and 77/2019), which give effect to Directive 2008/105/EC on environmental quality standards and to the EU Water Framework Directive (2000/60/EC);
- S.I. No. 722 of 2003: European Communities (Water Policy) Regulations, transposing the Water Framework Directive (2000/60/EC) and the associated Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. The Water Framework Directive, as amended by various directives (including 2008/32/EC, 2008/105/EC, 2009/31/EC, 2013/39/EU, and 2014/101/EU), has directed water management in the EU since 2000;
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations, transposing EU Directive 80/68/EEC on the protection of groundwater from pollution caused by certain dangerous substances;
- S.I. Nos. 106 of 2007, 122 of 2014 and 99 of 2023: European Communities (Drinking Water) Regulations, implementing EU Directive 98/83/EC (the Drinking Water Directive) and relevant provisions of Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended (S.I. Nos. 389/2011, 149/2012, and 366/2016, as well as the Radiological Protection (Miscellaneous Provisions) Act 2014).

Additional legislation relevant to the protection of the water environment includes:

- The Water Framework Directive (WFD) (2000/60/EC) and its transposition under S.I. No. 722 of 2003;
- The Groundwater Directive (2006/118/EC);
- The European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended;
- The European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended;
- The European Communities (Quality of Salmonid Waters) Regulations;
- The European Communities (Water Policy) Regulations 2003, as amended, provide for the implementation of 'daughter'; and
- The Freshwater Pearl Mussel Regulations (S.I. of 2009).

8.1.4 Relevant Guidance

The hydrology and hydrogeology section of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (EPA) (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- European Commission (2017): Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report;
- Institute of Geologists of Ireland (IGI) (2013). Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- Transport Infrastructure Ireland (TII) (formerly NRA) (2008). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Inland Fisheries Ireland (IFI) (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- Roscommon County Council (2022) Roscommon County Development Plan 2022 to 2028;
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

8.2 Methodology

8.2.1 Desk Study

A desk study of the Site was completed prior to completing a walkover assessment. As part of the desk study included in this chapter, the relevant geological, hydrological, hydrogeological and meteorological data were reviewed: The following data sources were reviewed:

- EPA Datasets and Map Viewer (www.catchments.ie and https://gis.epa.ie/EPAMaps);
- Geological Survey Ireland (GSI) Datasets Map Viewer (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services (NPWS) (www.npws.ie);
- Office of Public Works (OPW) Indicative Flood Maps (www.floodinfo.ie/map/floodmaps/);
- Tailte Eireann Historic Maps (www.tailte.ie);
- Topographical Survey (CIVIC, 2025);
- Utilities Survey (CIVIC, 2025);
- Site Specific Stage 2 Flood Risk Assessment (CIVIC, 2026), and
- Drainage Strategy (CIVIC, 2026).

8.2.2 Site Investigations

An initial walkover survey was completed by an MKO staff member on 10th and 11th of April 2025. A hydrological walkover survey, including drainage mapping to establish flow directions and drainage patterns (where present) was undertaken by MKO and RCC on 18th November 2025. Four water sampling events took place on

- 18th November 2025;
- 21st January 2026;
- 7th April 2026; and
- 11th May 2026.

In addition, a topographical survey (17th September 2025) and utilities survey (20th November 2025) were undertaken by CIVIC.

8.2.3 Scoping & Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.5 of this EIAR. The Department of Housing, Local Government and Heritage have suggested to conduct geophysical surveys and Underwater Archaeological Impact Assessment (UAIA), to include dive/wade, metal detection surveys of all areas where underwater/in-lake works are proposed, agreed with the National Monuments Service. National Parks and Wildlife Services (NPWS) and Uisce Éireann (UE) responded as outlined in Section 2.5.2, of which all comments have been considered in this chapter. Inland Fisheries Ireland (IFI), Local Authorities Waters Programme (LAWPRO) and Office of Public Works (OPW) had not responded at the time of report writing.

8.2.4 Impact Assessment Methodology

Please refer to Chapter 1 of the EIAR for a detailed description of the impact assessment methodology, which follows the guidance provided by the Environmental Protection Agency (EPA, 2022). In addition to the general EIA methodology, the water environment receptors' sensitivity was evaluated after the completion of the desk study and baseline field studies in accordance with the criteria outlined in Table 8-1 below and Table 4.1 of the National Roads Authority (NRA) (now Transport Infrastructure Ireland (TII)) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology, and Hydrogeology for National Road Schemes (NRA, 2008). Sensitivity levels have been applied to assess the potential effect and significance of the Proposed Development's impact on hydrological (Table 8-1) and hydrogeological (Table 8-2) receptors.

Table 8-1 Receptor Sensitivity Criteria

Sensitivity Level	Sensitivity of Receptor
Not Sensitive	Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted, fish sporadically present or restricted). Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" to "Moderate" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very Sensitive	Receptor is of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer.

Source: Adapted from www.sepa.org.uk

Table 8-2 Estimation of Importance of Hydrology Attributes

Importance	Criteria	Examples
Extremely High	Attribute has a high quality or value on an international scale.	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale.	› River, wetland or surface water body ecosystem protected by national legislation – NHA status. › Regionally important potable water source supplying >2,500 homes. › Quality Class A (Biotic Index Q4, Q5). › Flood plain protecting more than 50 residential or commercial properties from flooding. › Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale.	› Salmon fishery. › Locally important potable water source supplying >1000 homes. › Quality Class B (Biotic Index Q3-4). › Flood plain protecting between 5 and 50 residential or commercial properties from flooding. › Locally important amenity site for wide range of leisure activities.
Medium	Attribute has a medium quality or value on a local scale.	› Coarse fishery. › Local potable water source supplying >50 homes. › Quality Class C (Biotic Index Q3, Q2-3). › Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale.	› Locally important amenity site for small range of leisure › activities. › Local potable water source supplying <50 homes. › Quality Class D (Biotic Index Q2, Q1). › Flood plain protecting 1 residential or commercial property from flooding. › Amenity site used by small numbers of local people.

Source: (NRA, 2009)

Table 8-3 Estimation of Importance of Hydrogeological Attributes

Importance	Criteria	Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status.

Importance	Criteria	Examples
Very High	Attribute has a high quality or value on a regional or national scale.	› Regionally Important Aquifer with multiple wellfields. › Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status. › Regionally important potable water source supplying >2500 homes. › Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale.	› Regionally Important Aquifer. › Groundwater provides large proportion of baseflow to local rivers. › Locally important potable water source supplying >1000 homes. › Outer source protection area for regionally important water source. › Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale.	› Locally Important Aquifer. › Potable water source supplying >50 homes. › Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale.	› Poor Bedrock Aquifer. › Potable water source supplying <50 homes.

Source: (NRA, 2009)

8.3 Receiving Environment

8.3.1 Existing Land Use & Topography

The Proposed Development is in the townland of Barrymore, 4 kilometres (km) northwest of Athlone. The site covers an area of approximately 9 hectares (ha) and is centred around coordinates X 600814, Y 746366 Irish Transverse Mercator (ITM).

The Site is located on the southwestern shore of Lough Ree, a large freshwater lake forming part of the River Shannon system, immediately east of the Hodson Bay Hotel and north of where the River Shannon approaches Athlone to the southeast. The elevation of the Site ranges from approximately 34 to 44mAOD (metres above Ordnance Datum). The overall local topography is generally flat and gently slopes from west to east. The Site covers an area which comprises water-based recreational areas, free draining grassland, vehicular parking, and an access road. The Site location context is shown on Figure 1-1 of Chapter 1 of this EIAR.

8.3.2 Water Balance

The nearest synoptic station with long-term rainfall and evaporation data is at Mullingar, approximately 42 km east of the Site. The mean annual rainfall recorded at this station for the 30-year period 1991-2020 is 986 mm (Met Éireann). As shown in Table 8-4 below, the wettest month on average is December. The long-term average Potential Evapotranspiration (PET) for Mullingar station is 491.5 mm/year.

Table 8-4 Mean Monthly Rainfall (mm) – Mullingar Synoptic Weather Station (1991-2020)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Long term average	91.4	76.4	69.2	69.5	66.1	75.1	79.5	84.9	76.9	99.6	98.1	99.6

Note: these rainfall data are presented for baseline characterisation only and are not used in assessing runoff volumes or for drainage design purposes

According to the Qube model developed by EPA, which estimates river flows in ungauged catchments, the long-term annual average rainfall (AAR) within a 2 km radius of the Proposed Development site is approximately 923 mm/year, comparable to the 30-year average at Mullingar. The Qube model estimates the PET of the area at 476 mm/year, also comparable to Mullingar. Therefore, the effective rainfall (ER), the portion of precipitation available for surface runoff and groundwater recharge, is calculated as follows:

$$ER = AAR - PET = 923 \text{ mm/year} - 476 \text{ mm/year} = 447 \text{ mm/year}$$

Based on the groundwater recharge coefficient of 20%, as per GSI, the average annual groundwater recharge across the Site is estimated at 111 mm/year. This indicates that the area's hydrology is dominated by high surface water runoff and relatively low groundwater recharge.

8.3.3 Regional & Local Hydrology

On a regional scale, the Site is located within Hydrometric Area 26, Upper Shannon, and the WFD Upper Shannon Catchment. It lies within the Shannon[Upper]_SC_090 subcatchment, as defined under the WFD. A regional hydrology map is provided in Figure 8-1.

600,000

604,000

748,000

744,000

TEMP_26N24

Carrowmurragh

Williams Lough

MOYVANNAN

TEMP_26N58

Ree (Lough)

BALLYBAY_26

Barrymore

Curraghmore

Belcourt

Barrybeg

Cloongowna

Shannon[Upper]_SC_090

Shannon[Upper]_SC_100

BARR'S DRAIN

[Roscommon] Cross

Shannon[Upper]_SC_090

Shannon[Lower]_SC_010

[Upper] Shannon

TEMP_26K12

COOSAN

Williamstown

Coosan

Coosan Point Road

N61

R362

96 m

67 m

83 m

57 m

45 m

68 m

62 m

58 m

50 m

47 m

48 m

54 m

56 m

0 1 2 km

Upper Shannon

Athlone Golf Club

Curraghmore

Barrymore

Barrybeg

Upper Shannon

0 1 2 km

Map Legend

- EIAR Site Boundary
- River Network (EPA)
- Lake Waterbodies (EPA)
- WFD SubCatchments
- WFD Catchments (inset)

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title
Regional Hydrology

Project Title
Hodson Bay
EIAR

Project No.	Drawing No.	Scale
241220	8-1	1:25,000
Drawn By	Checked By	Date
BOC	CF	15/07/2026

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

599,000 600,000 601,000 602,000

747,000 746,000 745,000

Williams Lough

MOYVANNAN

TEMP_26N58

BALLYBAY_26

SW01 SW02 SW03 SW04

Ree (Lough)

Athlone Golf Club

Barrymore

Woodlands

Belcourt

The Rise

N61

46 m 41 m 55 m 45 m 47 m 43 m 42 m 62 m 49 m

0 0.5 1 km

Map Legend

- EIAR Site Boundary
- River Network (EPA)
- Lake Waterbodies (EPA)
- EPA Monitoring Station - Site 14
- Surface Water Monitoring Points

WFD River Sub Basins

- BALLYBAY_010
- SHANNON (Upper)_110

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
Local Hydrology and Surface Water Sampling Locations

Project Title
Hodson Bay EIAR

Project No.	Drawing No.	Scale
241220	8-2	1:12,500
Drawn By	Checked By	Date
BOC	BA	15/07/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

At the local scale, the majority of the Site is situated within the SHANNON (Upper)_110 sub basin and a section of the road to the south lies within the BALLYBAY_010 sub basin. There are currently no open surface watercourses or drains present within the Site. The closest river to the Site has been temporarily named 'TEMP_26N58' by EPA (WFD code: IE_SH_26S021660), which originates to the west of the Site and flows northward for approximately 0.8 km before discharging to Lough Ree; this river is upstream of the Site, via Lough Ree.

The Lough 'Ree' lake waterbody (WFD code: IE_SH_26_750a, Lough Ree, overlies and bounds the northern section of the Site. The lake covers approximately 100 km^2. The continuation of the River Shannon [Upper] is mapped by EPA approximately 3.6 km southeast of the Site, draining Lough Ree towards Athlone.

A local hydrology map is shown in Figure 8-2.

8.3.4 Site Drainage

There is no surface watercourse on the Site. Much of the rainfall that falls on permeable areas across the Site percolates to ground and likely travels via subsurface flow to Lough Ree which is located at the western site boundary. There is also likely some infiltration through the moderately permeable subsoils to the limestone bedrock. As the overall local topography gently slopes from west to east, any overland runoff will generally flow eastward.

The majority of the Site is urban fabric with artificial surfaces that are served with a stormwater network. The Site also contains areas of alluvial woodland and reedbeds. The surrounding area is primarily artificial vegetated grassland (golf course) to the north, and a mix of residential and agricultural land to the south of the Site. A substantial amount of rainfall is collected through gullies and the stormwater network, with likely outfall to Lough Ree. Some ponding of water has been observed at the gullies and car parking spaces in the northern area of the Site, which is likely due to blocked drainages or high lake water levels in winter. The existing roadway is served by gullies which are assumed to outfall to Lough Ree.

The existing stormwater network for the Hodson Bay Hotel is included in Appendix C of the Drainage Strategy Report included in Appendix 4-4 of the EIAR. There is one observed existing stormwater outflow which passes through an oil interceptor before discharging into Lough Ree along the marina wall to the north (local authority reference number: WP-16-11, ID 2023_983).

8.3.5 Flood Risk Identification

To assess potential flood risk for the Site, several sources were consulted, including the OPW Indicative River and Coastal Flood Map, the Preliminary Flood Risk Assessment (PFRA) maps from the CFRAM programme, the Department of Climate Energy and the Environment online planning portal, and historical 6" and 25" Ordnance Survey mapping.

Tidal flooding is not possible at the Site considering the elevation of the Site (approximately 35 metres above sea level) and distance from the coastline. The Roscommon County Development Plan (RCDP) 2022 to 2028 (RCC, 2022) indicates that the lands along the shoreline of Lough Ree are liable to flooding.

A Detailed Flood Risk Assessment (DFRA) has been prepared for the Proposed Development (CIVIC, 2026). This report determined that flood risk at the Site arises from elevated lake levels within Lough Ree during extreme, catchment-wide rainfall events. A conservative 0.1% AEP design flood level of 37.5mAOD was adopted for the assessment, based on CFRAM predictive modelling and long-term OPW hydrometric analysis. The report also concluded that the development does not encroach upon functional floodplain storage, does not obstruct flood conveyance and will not increase flood risk elsewhere. It is stated that some sections of the retained promenade access may be inundated during extreme events, however, the gradual nature of lake flooding and the non-residential use of the Proposed Development ensure that residual risk is low and manageable. For further reference, the DFRA for the Site is included in Appendix 8-1.

8.3.6 Surface Water Hydrochemistry

Lough Ree is the only surface waterbody located within the Site (Figures 8-1 & 8-2). Baseline water samples were collected from four locations, during four separate sampling events. They were collected from within the Site, along Lough Ree, one each from the upstream and downstream side of the proposed main works area around the proposed Water Sports Pavilion (the WSP), and two from the existing marina (Figure 8-2). The samples were taken from November 2025 to May 2026. Field hydrochemistry data are summarised presented in Table 8-5, with the full dataset included in Appendix 8-2.

Table 8-5: Summary of Field Hydrochemistry Data

		Temperature (°C)	Dissolved O_2 (mg/l)	Conductivity (µS/cm)	pH (pH Units)	ORP (SHE)
SW01	Min.	5.4	8.2	329	7.7	315
	Mean	9.7	9.4	361	7.9	330
	Max.	14.4	10.6	396	7.9	348
SW02	Min.	4.9	8.8	328	7.9	322
	Mean	9.2	10.0	348	8.0	346
	Max.	13.2	11.5	370	8.1	385
SW03	Min.	5.2	8.9	328	7.8	323
	Mean	9.6	11.3	481	8.0	356
	Max.	14.6	14.7	692	8.4	424
SW04	Min.	5.6	9.0	319	7.3	311
	Mean	9.9	10.7	349	7.9	333
	Max.	15.0	11.6	380	8.2	354

EPA has regularly sampled (almost always quarterly) at "Site 14" on Lough Ree from 2007 until present, 200m east of the Site. A summary of the surface water quality from this location is presented on Table 8-6.

Table 8-6: Summary of EPA Water Quality Data from Lough Ree

Parameter	Unit	DWS	MAC EQS	Min.	Mean	Max.	No. of Samples	No. of Detections	No. Exceedances (DWS)	No. Exceedances (MAC EQS)
pH	pH Units	6.5<pH<9.5	4.5<pH<9.0	7.4	8.4	8.6	70	70	0	0
Conductivity @25°C	µS/cm	2500	nc	313	352	390	45	45	0	nc
Transparency	m	nc	nc	1.5	2.8	4.3	70	70	nc	nc
Apparent colour	PCU	nc	nc	37	55	76	13	13	nc	nc
True Colour	PtCo Units	nc	nc	25	48	68	12	12	nc	nc
Temperature	°C	nc	nc	4.4	14	24.7	71	71	nc	nc
Dissolved Oxygen	mg O2/l	nc	nc	7.3	10.0	12.9	71	71	nc	nc
Alkalinity-total (as $CaCO_3$)	mg/l	nc	nc	25	144	169	68	67	nc	nc
Silica (as SiO_4)	mg/l	nc	nc	0.77	2.3	4.5	71	71	nc	nc
ortho-Phosphate (as P)	mg/l	nc	0.075	0.0025	0.008	0.022	60	22	nc	0
Total Phosphorus (as P)	mg/l	nc	nc	0.008	0.01	0.032	67	42	nc	nc
Nitrate (as N)	mg/l	50	nc	0.1	0.34	0.85	48	40	0	nc
Nitrite (as N)	mg/l	0.5	nc	0.0045	0.007	0.02	48	18	0	nc
Ammonia-Total (as N)	mg/l	0.5	0.14	0.005	0.02	0.18	70	39	0	1
Total Oxidised Nitrogen (as N)	mg/l	50.5	nc	0.1	0.36	0.87	71	60	0	nc
Fluoride	mg/l	1.5	0.5	0.05	0.08	0.12	25	22	0	0
nc = no criteria										

The following observations can be made from the physicochemical data summarised on Table 8-5 and Table 8-6:

- The field data show an expected seasonal temperature range for the months sampled (November to May). These temperatures are reflected in the lower temperature of EPA data.
- The field and EPA data reflect expected dissolved oxygen and oxidation-reduction potential (ORP) ranges for an oxygenated surface water body.
- The pH values are slightly alkaline in both datasets, reflecting the carbonate geological setting of the River Shannon basin, and the catchment area for Lough Ree.
- The mean electrical conductivity in both datasets reflect the expected values for a freshwater lake with a groundwater influence from a limestone aquifer(s).

The screening of site specific hydrochemistry data is introduced and described below. However, the full EPA hydrochemistry dataset summarised in Table 8-6 was also screened against environmental quality standards (EQS) for surface waters. One sample exceeded the maximum allowable concentration (MAC)-EQS threshold of 0.14 mg/l for total ammonia (as N). The sample was collected on 20th November 2024, had a concentration of 0.18 mg/l, and is the only exceedance of the total 70 sampling events in the EPA dataset, where total ammonia (as N) was analysed for each event. There were no other exceedances of the MAC-EQS or annual average (AA)-EQS in the 19 years of hydrochemistry testing at this location.

The screening of laboratory surface water quality results is presented in Appendix 8-3. The full set of original laboratory reports are included in Appendix 8-4. These results were screened against the relevant surface water quality regulations:

- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009, as amended); referred to as environmental quality standard (EQS).
- European Communities Directive (on the quality of fresh waters needing protection or improvement in order to support fish life) 2006 (2006/44/EC); referred to as the salmonid and cyprinid standards (SCWS).
- European Communities (Drinking Water) Regulations 2007 (S.I. No. 106 of 2007, as amended); referred to as drinking water regulations (DWS).

A summary of the screened exceedances is presented in Table 8-7, Table 8-8 and Table 8-9.

Table 8-7: Summary of DWS Exceedances from MKO Samples (Nov. 2025 to May 2026)

Test	Units	DWS	Min. (> LOD)	Mean	Max.	No. of Samples	No. of DWS Exceedances
Total Coliforms	cfu/100ml	0	1	29	>100	16	16
Faecal Coliforms	cfu/100ml	0	1	23	>100	16	15
Fluoride	mg/l	1.5	1.9	1.9	1.9	16	1

Table 8-8: Summary of MAC-EQS Exceedances from MKO Samples (Nov. 2025 to May 2026)

Test	Units	MAC-EQS	Min. (> LOD)	Mean	Max.	No. of Samples	No. of MAC-EQS Exceedances
Fluoride	mg/l	0.5	1.9	1.9	1.9	16	1

Table 8-9: Summary of SCWS Exceedances from MKO Samples (Nov. 2025 to May 2026)

Test	Units	SCWS	Min. (> LOD)	Mean	Max.	No. of Samples	No. of SCWS Exceedances
Ammoniacal Nitrogen as N	mg/l	0.065	0.03	0.04	0.05	16	10
Total Suspended Solids	mg/l	25	15	30	49	16	4
Nitrite as N	mg/l	0.01	0.007	0.009	0.011	16	1

Total coliforms were detected, and therefore exceeded the DWS, in all samples. Considering faecal coliforms were detected in all but one sample and the relative concentrations of each, faecal coliforms likely represent the majority of coliforms detected. This indicates a wastewater or agricultural runoff source of these coliforms, and in the context of the environmental setting of the Site, it is likely the latter. Flouride exceeded the DWS and the maximum allowable concentration (MAC)-EQS in 1 no. sample, however, as it was not detected in the remaining 15 no. samples, including 3 no. at the same location, it is not prevalent in the surface water environment close to the Site.

Although Lough Ree is not a known salmonid and cyprinid water body, the surface water quality results were also screened against the SCWS, primarily to compare samples against the total suspended solids (TSS) threshold value (25 mg/l). TSS exceeded this SCWS threshold in four samples, during two sampling events (January and May 2026) and at all but one location (SW02). Ammoniacal Nitrogen (as N) and nitrite exceeded the SCWS in 10 no. and 4 no. samples, respectively, which can be attributed to the agricultural runoff discussed above.

To calculate an appropriate annual average (AA) of samples, only parameters with a detection in three or more of the samples at each location were screened. Where a non-detection was reported in one of these samples, half the limit of detection (LOD) was used as a positive result. There were no exceedances of the AA-EQS at any location.

All samples were analysed for volatile organic compounds (VOCs), pesticides, and total petroleum hydrocarbons criteria working group (TPH-CWG) during the initial two sampling events. There were no detections of these parameters in samples and were subsequently not scheduled for analysis in the final two sampling events.

8.3.7 Hydrogeology

The Site is underlain by Visean Limestones (undifferentiated) (Figure 7-3 of Chapter 7), and the bedrock aquifer has been classified by GSI as a regionally important karstified aquifer which is conduit driven (Rkc). This aquifer type is capable of supplying regionally important supplies (e.g., large public water supplies). A bedrock aquifer map is presented in Figure 8-3. The Site lies within the Funshinagh groundwater body (GWB) (WFD code: IE_SH_G_091).

8.3.7.1 Groundwater Subsoil Permeability

The subsoils mapped across the Site comprise glacial till and gravel, both derived from limestones with a localised area of cutover peat in the southwest. Detailed characteristics of these subsoils are provided in Section 7.3.2.

GSI has classified the subsoils across most of the Site as having 'Moderate' permeability, with an area of 'High' permeability in a central portion of the Site along the L2020 Local Road (Figure 8-4). Under these conditions, there is some groundwater flux expected through the subsoils. The Site walkover confirms that the subsoils present have permeability to the extent where ponding is not present on-site in areas where natural ground is in-situ.

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67 m

Carrowmurragh

42 m

83 m

46 m

57 m

Athlone Golf Club

45 m

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54 m

68 m

Barrymore

Belcourt

48 m

Curraghmore

62 m

Coosan Point Road

50 m

Barrybeg

Williamstown

Coosan

Bog Road

56 m

58 m

Coosan Road

68 m

Cloongowna

60 m

R362

0 1 2 km

Map Legend

EIAR Site Boundary

Aquifer Category

LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones

Rkc - Regionally Important Aquifer - Karstified (conduit)

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title

Bedrock Aquifer

Project Title

Hodson Bay EIAR

Project No.	Drawing No.	Scale
241220	8-3	1:25,000
Drawn By	Checked By	Date
BOC	CF	15/07/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

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Carrowmurragh

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56 m

Athlone Golf Club

Barrymore

Belcourt

Curraghmore

Barrybeg

Williamstown

Coosan

Bog Road

Coosan Road

Coosan Point Road

Cloongowna

0 1 2 km

Map Legend

EIAR Site Boundary

Subsoil Permeability

- High
- Medium
- Low
- Water
- Not mapped

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title: Subsoil Permeability

Project Title: Hodson Bay EIAR

Project No.	Drawing No.	Scale
241220	8-4	1:25,000
Drawn By	Checked By	Date
BOC	CF	15/07/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

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Belfcourt

Coosan Point Road

50 m

Barrybeg

Williamstown

Coosan

Bog Road

56 m

Coosan Road

Cloongowna

60 m

0 1 2 km

Map Legend

- EIAR Site Boundary

Groundwater Vulnerability

- Extreme
- High
- Low
- Moderate
- Rock at or near Surface or Karst
- Water

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title

Groundwater Vulnerability

Project Title

Hodson Bay
EIAR

Project No.	Drawing No.	Scale
241220	8-5	1:25,000
Drawn By	Checked By	Date
BOC	CF	15/07/2026

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

8.3.7.2 Groundwater Vulnerability

Groundwater vulnerability across most of the Site is classified as 'Moderate', with an area of 'High' vulnerability identified in a central portion along the L2020 Local Road, where sands and gravels are present (Figure 8-5).

Due to the moderate to high permeability of the in-situ overlying subsoils across the Site, and the conduit driven nature of the karstified bedrock aquifer, there is a potential for groundwater contamination and subsequent rapid dispersion away from the Site, especially in the area of high permeability soils mentioned above.

8.3.7.3 Karst

There are no GSI mapped karst landforms within the Site, nor were there any such features observed during site walkovers or surveys.

There are a series of springs (west) and enclosed depressions (northwest) 4.2 km from the Site. At one of these springs, an underground connection has been traced 4.8 km north to a swallow hole at the southern extent of Lough Funshinagh with minimum groundwater flow rates of 70 m/hr (southwards).

8.3.7.4 Groundwater Flow and Levels

Within the Funshinagh GWB, groundwater flow is expected to concentrate in the upper epikarstic layer and in a zone of interconnected fissures extending to a depth of 30m. There may be some deeper inflows in areas associated with faults or dolomitization. Transmissivity values in karstified bedrock varies greatly from less than $1m^2/d$ up to a few thousand m^2/d (GSI, 2003).

Overall groundwater flow within the Funshinagh GWB will be towards Lough Ree (GSI, 2003). Local topography of the Site gently slopes from west to east towards Lough Ree and there no natural or artificial surface watercourses present within the Site. Accordingly, groundwater flow is likely eastward, providing minor baseflow to Lough Ree which is a local and regional hydraulic sink.

There are no groundwater wells available for groundwater measurement in the area. The status of any private or GSI mapped wells in the area is not known. However, groundwater levels across the Site are likely to reflect seasonal variations in lake water levels throughout the year.

8.3.8 Water Resources

Drinking water for the Site and the dwellings in the surrounding area is sourced from mains water supply.

A search of private well locations (accuracy of 1 – 50m only) was undertaken using the GSI well database (www.gsi.ie) (accessed on 29th July 2026). There are no GSI groundwater group water scheme (GWS) or public water supply (PWS) source protection areas within the Site; the closest is 7.5 km to the southeast. There is one public supply well (dug) located around the southeast section of the Site (GSI well unique ID: IE_GSI_GW_Well_35956), however, information on the yield or status of the well is not provided. It is unlikely any groundwater supply wells are hydrogeologically linked to the main works area around the WSP as groundwater beneath the Site likely discharges to Lough Ree.

The Site is not used for surface water drinking supply, however, an Article 7 (WFD) Abstraction for Drinking Water river waterbody, Shannon (Upper)_120, is located approximately 3 km downstream from the Site.

According to the EPA online mapping database, there is a licenced urban wastewater and sewage treatment plant (500 to 1,000 pe) within the Site named Hodson Bay and Environs (EPA licence no. D0377-01). The agglomeration boundary associated with this plant incorporates the Site. This plant has been decommissioned and is situated where an existing UE foul water pumping station is located. From here, the foul water is pumped off-site to the receiving wastewater treatment facility. For further details, please refer to the Drainage Strategy (CIVIC, 2026) (Appendix 4-4).

There is one licenced stormwater discharge (local authority reference number WP-16-11, ID 2023_983) into Lough Ree along the marina wall.

8.3.9 Groundwater Hydrochemistry

The WFD status for the underlying Funshinagh (GWB) has been assigned a 'Good' status for the latest status classification period (2019-2024).

The hydrochemical signature of the carbonate and limestone groundwater in the GWB has typical ranges of between 380 mg/l to 450 mg/l, while electrical conductivity values are of the order 500 to 700 µS/cm (GSI, 2003).

8.3.10 WFD Status & Risk Assessment

The WFD status classification for the 2019–2024 cycle and the WFD risk assessment for Ireland's third implementation cycle (2022–2027) was reviewed for the Funshinagh GWB and nearby surface water bodies, specifically the Lough 'Ree' lake waterbody. A detailed WFD report is included in Appendix 8-5.

The Lough 'Ree' lake waterbody is classified as being of 'Moderate' ecological status, with a 'high confidence' in this classification. The Lough 'Ree' lake waterbody is 'Not At Risk' of achieving its WFD 'Good Status' objective (by 2027).

8.3.11 Designated Sites & Protected Areas

The potential for the Proposed Development to have an impact on designated sites and protected areas considered the mapping and listing by NPWS of:

- Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs), which are designated under the EU Habitats Directive and EU Birds Directive, respectively. SACs and SPAs are collectively referred to as 'Natura 2000' or 'European Sites'.
- Natural Heritage Areas (NHAs), which are designated under Section 18 the Wildlife (Amendment) Act 2000.
- Proposed Natural Heritage Areas (pNHAs), which are designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated.
- Candidate SACs and SPAs listed (but not designated) under the terms of the EU Habitats Directive.

The source-pathway-receptor model of environmental risk assessment guided the determination of which sites might be affected. The designated sites must be potentially hydrologically or hydrogeologically connected to the Proposed Development via surface water or groundwater pathways. In addition, the designated sites and protected areas must have water-dependent qualifying interests (designation features). The latter was checked from 'site synopsis' reports and web-based resources made publicly available by the NPWS, as presented on their website (www.npws.ie).

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Lough Ree SPA

Lough Ree SAC

Lough Ree pNHA

Lough Ree SPA

Athlone Golf Club

Barrymore

Belcourt

Curraghmore

Barrybeg

Williamstown

Coosan

Bog Road

Coosan Road

Coosan Point Road

Cloongowna

R362

0 1 2 km

Map Legend

- EIAR Site Boundary
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Proposed National Heritage Area (pNHA)

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title
Designated Sites and Protected Areas

Project Title
Hodson Bay EIAR

Project No.	Drawing No.	Scale
241220	8-6	1:25,000
Drawn By	Checked By	Date
BOC	CF	15/07/2026

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

The Site is located adjacent to and partially within three designated sites, in association with Lough Ree:

- Lough Ree Special Area of Conservation (SAC) [000440];
- Lough Ree Special Protection Area (SPA) [004064]; and
- Lough Ree proposed Natural Heritage Area (pNHA) [000440].

Distances to receptors are calculated from the Proposed Development boundary. These designated sites, which are hydraulically linked to, and within the Zone of Influence (ZoI) of the Site, are presented in Figure 8-6.

Lough Ree is a nutrient sensitive lake, is not a designated salmonid river, and is not within a freshwater pearl mussel catchment. The screening of all other protected sites in the area and downstream of the Site are discussed and presented in Chapter 6, Section 6.5.

8.3.12 Receptor/Attribute Sensitivity & Importance

Based on the baseline characterisation, the principal environmental receptor associated with the Site is Lough Ree. Lough Ree is a nutrient sensitive lake, is not used for drinking water supply but is upstream of a designated drinking water protected area, is not a designated salmonid river, and not within a freshwater pearl mussel catchment. The Lough 'Ree' lake waterbody is of 'Moderate' ecological status and 'Not At Risk' of achieving its WFD 'Good Status' objective (by 2027). Lough Ree comprises the Lough Ree (SAC) and Lough Ree (SPA) which are of 'Extremely High' importance (Table 8-2). Accordingly, Lough Ree is a receptor of 'Extremely High' importance.

The Site is located adjacent to and partially within two 'European sites' designated under the Habitats Regulations Figure 8-6; therefore, Lough Ree is a 'Very Sensitive' receptor (Table 8-1).

Groundwater provides minor baseflow to Lough Ree. The Funshinagh GWB has been assigned a 'Good' status and 'Not at Risk' of achieving its WFD 'Good Status' objective (by 2027). The bedrock aquifer beneath the Site is classified as a regionally important karstified aquifer which is conduit driven (Rkc), which is of 'High' importance. Accordingly, the groundwater environment beneath the Site is a potential receptor of 'High' importance.

Due to the aquifer classification (regionally important) and the 'Moderate' to 'High' vulnerability groundwater vulnerability in areas of the Site (Figure 8-5), the groundwater beneath the Site is a 'Sensitive' receptor (Table 8-1).

8.4 Description of the Proposed Development

The Proposed Development includes rebuilding the Water Sports Pavilion (WSP), redeveloping and extending the marina to approximately 59 berths, adding new public realm features like a playground, promenade and event spaces, upgrading the L2020 Local Road for cycling and walking with traffic calming and relocated parking, and delivering associated site infrastructure such as landscaping, drainage, utilities and boundary safety upgrades. A full description of the Proposed Development is outlined in Section 4.3 of this EIAR. An overview of the Proposed Development site layout is provided in Planning Drawings HB-RKD-ZZ-ZZ-DR-A-1020 to HB-RKD-ZZ-ZZ-DR-A-1023.

8.4.1 Proposed Site Infrastructure and Drainage Management

The management of stormwater and foul water for the Proposed Development has been developed by CIVIC and was prepared in accordance with the following policies and guidelines:

- National Planning Framework, Project Ireland 2024 (April 2025);
- The RCDP 2022 to 2028 (RCC, 2022);
- Greater Dublin Strategic Drainage Study: Technical Document Volume Two (2005);
- Uisce Éireann Code of Practice for Wastewater Infrastructure (August 2025);

- Implementation of Urban Nature-based Solutions (LAWPRO, 2025), and
- SuDS Manual report C753 (CIRIA , 2015).

For further detail on the management of stormwater and foul water summarised below, please refer to the Drainage Strategy (CIVIC, 2026) (Appendix 4-4).

8.4.1.1 Drainage Strategy & Design

Runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies during the construction stage. Two distinct methods will be employed to manage drainage water within the Site. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas.

The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, and nutrients, to route them towards the existing site drainage system during the construction phase via a hydrocarbon and integrated silt separation interceptor. There will be no direct discharges to surface waters.

During the construction stage all runoff from works areas (i.e. dirty water) will be attenuated and treated to a high quality prior to being released. A detailed construction stage drainage plan will be developed prior to the construction of the Proposed Development.

With the close proximity of Lough Ree to the Site, the stormwater drainage strategy for the operation stage has been developed with water quality as a primary consideration alongside nature-based solutions (NBS) and SuDS hierarchy. The natural hydrological cycle will be emulated as far as reasonably practicable, involving grading of the Site, reducing stormwater runoff entering any conventional drainage systems, and attenuating runoff in proposed SuDs features prior to discharge to Lough Ree.

Where possible, Site catchments will be routed to a nature-based attenuation solution. Select areas of the Proposed Development which cannot be routed in this manner due to the tight levels and falls for gravity outfall to Lough Ree, below ground attenuation measures will not be introduced. All stormwaters will be routed through a hydrocarbon and integrated silt separation interceptor, in line with policy requirements. The Site stormwater drainage network will be routinely inspected and maintained.

The proposed drainage design elements during the operational stage are included in Appendix 4-4.

8.4.1.2 Wastewater Infrastructure

It is anticipated that no upgrade to the surrounding infrastructure is required. Foul water will be collected from the WSP buildings and Marina washroom facilities and will connect to the existing on-site foul water pumping station operated by UE. From there, the foul water will be pumped off-site to the receiving wastewater treatment facilities which currently treat foul water from the Site. A pre-connection enquiry has been submitted to UE to confirm network capacity at the receiving wastewater treatment plant.

8.4.1.3 Water Supply

Based on existing UE water infrastructure records reviewed, a UPVC water distribution main comprising sections of 150 mmØ, 100 mmØ, and 50 mmØ is recoded beneath the L2020 Local Road, serving adjacent properties and fire hydrants at Hodson Bay.

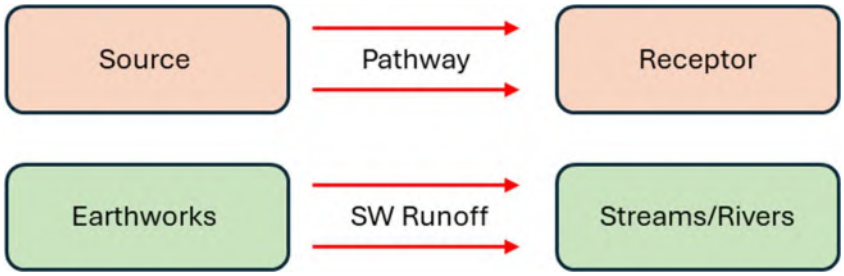
A preliminary potable water demand assessment has been undertaken for the Proposed Development. It is anticipated that the Water Sports Pavilion and Café will be served by a new on-site potable water storage tank supplied via a new 50mmØ MDPE connection. The proposed Marina WC and shower facilities will be served via a separate direct 25mmØ MDPE connection to the existing water distribution network.

The final point of connection to UÉ's existing distribution network will be confirmed through the ongoing pre-development application process. The preferred connection strategy will be dependent upon the location of suitable existing infrastructure, available network capacity, and any network reinforcement works that may be required to accommodate the proposed development.

8.5 Potential Impacts and Mitigation Measures

8.5.1 Overview of Impact Assessment Process

The conventional source-pathway-receptor model (see below, top) was applied to assess potential impacts on downgradient and downstream environmental receptors (see below, bottom as an example) as a result of the Proposed Development.



Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the EPA:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022), and
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below (Section 8.5.3 and 8.5.4), presented below on Table 8-10 is a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to the development construction and operational activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 8-10: Summary Guide of Impact Assessment Process

Step No.	Assessment	Process
Step 1	Identification and Description of Potential Impact Source:	Presenting and describing the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.
Step 2	Pathways / Mechanisms:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development surface water and groundwater flows are the primary

		pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	Receptors:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	Pre-Mitigation Potential Effects	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures / Impact Assessment	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post-Mitigation Residual Effects	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	Significance of Effects	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

8.5.2 Do Nothing Scenario

If the Proposed Development were not to proceed, the Site would remain in its current form as a waterfront, marina and recreational facility with associated buildings, access roads, parking areas and landscaped grounds. No changes to the existing hydrological and hydrogeological environment would be anticipated under the Do-Nothing scenario. The potential direct impacts to water are considered to be neutral, imperceptible, and long-term in the Do-Nothing scenario.

The Hodson Bay/ Barrymore Area Plan which is within the RCDP (RCC, 2022) encourages and supports the retention and appropriate expansion of existing facilities to accommodate appropriate forms of additional leisure, tourism and amenity related development, subject to satisfying all environmental considerations and normal siting and development criteria. The document further states that *'In particular, appropriate low intensity green tourism developments adjacent to the shore of Lough Ree will be supported'.*

8.5.3 Construction Stage

The construction stage has the greatest potential to affect the existing hydrological and hydrogeological environment due to excavation, earthworks and construction activities. The likely significant effects of the Proposed Development and associated mitigation measures are assessed in the following sections.

The likely significant effects of the Proposed Development and mitigation measures that were considered during the approximate 30-month construction stage (see Chapter 4) relate to:

- Earthworks;
- Pumping from open pits;
- Cofferdam installation;
- Bunding and dry works area;
- Piling foundations;
- Accidental spills, leaks or other releases;
- Release of cement-based products;

- Wastewater management;
- Public and private water supplies;
- WFD water body status, and
- Designated sites.

Mitigation measures consider specific actions which are designed to avoid, prevent or lessen potential effects – i.e., mitigation by avoidance and mitigation by design.

8.5.3.1 Earthworks

Construction stage activities including landscaping, site levelling, construction activities, service trench construction, and foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. The main risk will be from sediment laden surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to ground or enters the stormwater network through gullies and this will be allowed to continue during the construction stage. However, construction activities can result in the release of suspended solids to local drainage features and could result in an increase in the suspended sediment load, which may affect the water quality of Lough Ree.

Pathways: Drainage, runoff, surface water discharge routes.

Receptors: Downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, the potential effects will be indirect, negative, moderate, short-term, and likely.

Proposed Mitigation Measures / Impact Assessment: The Proposed Development is located adjacent to and partially within Lough Ree. The works areas for the Proposed Development will use a 50m setback distance from Lough Ree where possible and a cofferdam will be installed between the works area for the WSP and Lough Ree for the duration of works. However, surface runoff will ultimately discharge via the local storm drainage system and discharge into Lough Ree. Management of surface runoff and subsequent treatment prior to release will be undertaken during construction work as follows:

- Source controls include the covering work areas, staging areas, and stockpiles, as wells as the prioritisation of small working areas and cessation of works during heavy rainfall and inclement weather. Methods that will be employed are diversion drains, flume pipes, sandbags, oyster bags filled with gravel, and filter fabrics. A cofferdam will be installed to minimise sediment mobilisation into Lough Ree. Flexibility to adapt methods will be required based on location-specific conditions, as judged by supervising engineers from visual inspection.
- In-line controls involve settling of suspended sediments with the use of silt fences, straw bales, sand or oyster bags, weirs, baffles, and check dams. Flow limiters and sump pumping systems may be employed where needs arise in order to maintain the hydraulic functioning of the existing drain system.
- Treatment systems involve sediment traps and temporary sumps/attenuation ponds.

Adjacent drainage systems/groundwater need to be protected from sedimentation and direct surface water runoff generated onsite during the construction stage. Discharge from site will be managed and controlled within the Site boundary for the duration of the construction works. There will be no temporary uncontrolled discharges to surface water from the Site during the construction stage.

As construction advances there may be a requirement to collect and treat surface water within the Site. This will be completed using perimeter filter drains around the construction areas and discharged to the existing oil separator/petrol interceptor, which in turns discharges to Lough Ree. Sumps can be installed periodically along the perimeter filter drains to allow for collection of sediments.

All works shall be undertaken in accordance with the CIRIA document, 'Control of Water Pollution from Construction Sites, guidance for consultants and contractors'. All stockpiles will be damped down or covered, as required, which will prevent the creation of nuisance dust, and will also prevent sediment

runoff in times of heavy precipitation. Silt fencing will be installed around these stockpiles. Material stockpiles will be kept at least 10m from any manholes and >50m from lake shore where possible.

Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan (CEMP) (Appendix 4-2), which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

It should be noted for this site, that a network of stormwater drains already exists, and these will be integrated and enhanced as required and used within the Site drainage system. The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed Site drainage into the existing drainage network where possible. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion.
- Drains running parallel to the existing roads where footway widening is required will be upgraded. Velocity and silt control measures such as check dams, sand bags, oyster bags, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters;
- Silt fences will be emplaced within drains downgradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from the excavation of subsoils, and entrained in surface water runoff. Inspection and maintenance of these structures during construction stage is critical to their functioning to stated purpose. They will remain in place throughout the entire construction stage. Double silt fences will be emplaced within drains downgradient of all construction areas; and
- Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters.

Airborne dust will be generated from excavation and concrete cutting across the Site. The most efficient method of reducing dust particles is to remove at source. Accordingly, all excavation and cutting sites will require the suppression of dust through the use of water and sprinkler systems.

A double-lined, floating silt curtain will be installed around the main works area (the WSP) before any near-shore or in-water works commence. The silt curtain will only be removed following the completion of the construction stage. This will allow residual dust particles to be captured and settle out within the silt curtained area of Lough Ree, close to the Site.

Excavation spoil may be deposited on road surfaces via the wheels of construction vehicles. To minimise the amount of excavation material leaving the Site in this way, wheel washes will be installed at the exit of each work area and temporary construction compound. Residual material from wheels and airborne dust may still become deposited on the Site road network, potentially impacting the water quality of the stormwater drainage network or allowing for airborne dust to be mobilised from here in dry conditions. Therefore, dust suppression vehicles will be used throughout the year during the construction stage, routinely traversing the Site road network as required; this may be continuous during the summer months.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be indirect, negative, imperceptible, short-term, and likely. Proven and effective measures to mitigate the risk of releases of sediment have been proposed which will break the pathway between potential sources and receptors.

Furthermore, residual effects will be monitored for, and corrective action can be taken. Slight changes in current baseline conditions are expected during the construction stage, but these are not sufficient to change the character or sensitivity of the receiving waters, and not sufficient to affect the WFD status classification of the watercourses downgradient of the Site (Appendix 8-5).

Significance of Effects: For the reasons outlined above, likely significant effects on surface water courses will not occur.

8.5.3.2 Pumping from Open Pits

It is expected that open excavations for foundation works will have to be temporarily pumped to keep the excavations free of seepage water. Water will enter directly from rainfall and via subsurface seepage when the groundwater table is intersected. In bedrock, groundwater may ingress from fractures and a 'transition zone' that may be present at the contact between subsoils and bedrock.

The quantities to be pumped are not known at this time but may be small considering the low permeability of the bedrock, unless a high groundwater conduit intercepted which is not expected at shallow depths, and the moderate permeability of subsoils across most of the Site. The pumping from excavations will only be needed for short periods of time. For most components, the time frame is measured in days to weeks. The pumped water, which is expected to contain suspended solids, will be pumped to a discharge manhole before rejoining the network of filter drains. The filter drains will be discharged to the existing oil separator/petrol interceptor, which in turns discharges to Lough Ree. Sumps will be installed periodically along the perimeter filter drains to allow for collection of sediments.

The excavation-related water will be discharged periodically, on an as-needed basis. It is not a continuous process, and the volumes pumped will vary from location to location. Discharges from sump pumping can affect the water quality of watercourses, especially with regard to suspended sediments.

Pathways: Drainage, surface water discharge routes.

Receptors: Downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects will be indirect, negative, slight, short-term, and likely. Hydrogeologically, from a quantitative perspective, pumping effects are direct, neutral, imperceptible, temporary, and unlikely.

Proposed Mitigation Measures / Impact Assessment

Mitigation by Avoidance: An upslope interceptor drain will be established upslope of the excavation area to prevent greenfield runoff into the excavations. Berms will also be used, as necessary.

Mitigation by Design: Dewatering will be provided as relevant to specific requirements with dewatered discharge pumped using a pump equipped with a silt bag on the discharge outlet. As the water passes through the silt bags, the majority of sediment and organic matter is retained by geotextile fabric. The silt bags will be used with natural vegetation filters or sedimats. The sedimats will be secured to the ground surface using stakes/pegs. They will extend to the full width of the outfall to ensure that all water passes through this treatment measure.

The pumped water will be discharged to either the existing stormwater drainage system or to a suitably vegetated area within the Site boundary. Where discharge to a vegetated area is required, level spreaders will be installed for each outfall, and the area will be enclosed with silt fencing to prevent sediment-laden runoff and ensure compliance with best practice environmental controls. Prior to the outset of works a silt fence will be erected along the lakeshore perimeter of the proposed construction area to prevent run-off to potentially floodable areas and into Lough Ree at the boundaries of the development site.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be indirect, negative, not significant, short-term, and unlikely. The proposed mitigation measures are standard practice methods which serve to reduce suspended matter loads from pumped discharges, in this manner, the sediment load is managed. Hydrogeologically, from a quantitative perspective, residual pumping effects are direct, neutral, imperceptible, temporary, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.3.3 Cofferdam Installation

The Proposed Development is located adjacent to and partially within Lough Ree. Near-water construction works are required to develop the WSP. To protect Lough Ree from the uncontrolled release of suspended sediments during the construction stage, the installation of a cofferdam is recommended as a source control method between the works area and the lake shore (Section 8.5.3.1).

Although a mitigation measure for larger-scale works, cofferdams require in-water percussive and/or vibrative machinery for installation which is likely to cause disturbance to the lacustrine substrate. This will result in an increase in the suspended sediment load of the water and affect the water quality of Lough Ree.

Pathways: Proposed works are occurring in-water (Lough Ree).

Receptors: Lough Ree and downgradient surface water bodies.

Pre-Mitigation Potential Effects: Without mitigation, the potential effects will be direct, negative, moderate, temporary, and likely.

Proposed Mitigation Measures / Impact Assessment: Works will be completed between August and September (inclusive) aligning with IFI guidelines (2016) of sensitive periods for fish spawning, avoiding the main breeding and winter bird seasons, and coinciding with a time when water levels are at their lowest. A double-lined, floating silt curtain will be installed around the main works area (the WSP) before any near-shore or in-water works commence.

Non-intrusive or low-intrusive cofferdam systems are encouraged if possible. However, sheet piling is the likely method of cofferdam installation Differing sheet piling techniques cause differing levels of ground disturbance and pulverised drill spoil. Accordingly, percussive hammers will be minimised, and vibrative hammers will be utilised when installing sheet piles.

Disturbance of lake-substrate will be minimized through careful positioning of plant and adoption of low-impact construction methodologies. Equipment will not be dragged across the lakebed; this will avoid any additional sediment disturbance. Piles will not be advanced into bedrock to avoid any potential bridging to the karstified aquifer below the lakebed.

The top-level of the cofferdam will be installed to a minimum of 37.5mAOD to ensure that the cofferdam is not breached during flooding (Section 8.3.5).

The silt curtain will remain in place after cofferdam installation, and for the duration of the construction stage, and will only be removed once monitored suspended solids concentrations are observed at baseline levels. The silt curtain will be inspected regularly for defects and adjusted as necessary.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be direct, negative, slight, temporary, and likely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.3.4 Bunding and Dry Works Area

The cofferdam described above, will be installed around the majority of the works area encompassing the WSP. However, there is one area to the north of the works area where the installation of a cofferdam is not proposed, the area of alluvial forest north of the existing concrete hardstand.

Although, in the context of the Site, the cofferdam will be put in place to protect Lough Ree from the construction works, a cofferdam extending into this area will have a greater negative ecological impact. This area is adjacent to two sensitive ecological receptors, the alluvial forest and marine reed bed, see Section 6.8.2.1 for more details on this area.

The proposed engineering solutions for this area have been discussed and assessed in Section 3.7.1 of Chapter 3, and a low impact engineering solution has been chosen for this specific area, a combination of near-shore earth bunding and dry works.

Pathways: Drainage, runoff, surface water discharge routes.

Receptors: Downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, the potential effects will be indirect, negative, moderate, temporary, and likely.

Proposed Mitigation Measures / Impact Assessment: Mitigation measures to avoid water quality impacts during the construction stage will include the installation of sheet piled cofferdam around the lake edge following the boundary of the existing concrete hardstand at the location of the WSP.

However, to avoid any impacts on alluvial forest, alternative water quality protection solutions are required in this area. Sheet piling works are not proposed in areas of alluvial forest, and instead an earth bund structure will be installed in the vicinity of the alluvial forest. In order to avoid disturbance of root structures, the dam structure will be constructed above ground, with an earth bund installed on top of the existing concrete hardstand. The earth bund will be composed of soil, gravel or another suitable, natural material and will be completely sealed to avoid any potential interaction with lake water during elevated lake water levels. The earth bund will connect to the sheet piling at a point outside of the identified areas of alluvial forest. As with the cofferdam, the top-level of the bund will be installed to a minimum of 37.5mAOD to ensure that the bund is not breached during flooding (Section 8.3.5).

As with the cofferdam, the installation of the bund is recommended as a source control method between the lake shore and the works area to protect Lough Ree from the uncontrolled release of suspended sediments during the construction stage (Section 8.5.3.1).

Concrete removal under the earth bund will be undertaken in a sensitive manner using hand tools. Concrete removal in this area will be conducted in the dry. Around the areas of concrete removal and prior to the commencement of works, a sandbag dam will be instated with an impermeable geomembrane to minimise any potential lake water penetration. Should any water penetrate the sandbag dam, water will be pumped from the area to the Site drainage network (Section 8.5.3.2). Weather and flood forecasting will be continuously monitored, with concrete removal in this area taking place only during periods of dry weather and low lake levels. MKO can provide a weather and flood forecasting tool for these works. Silt curtains will be installed in front of areas of reed bed within this area.

Similarly, concrete pouring will be carried out during periods of dry weather and low lake levels, using water-tight shuttering and form works. Impermeable geomembrane sealing, sandbags and silt curtains will all be retained for the duration of concrete pouring and will be removed following the completion of works. Should rain be forecasted, or lake levels anticipated to rise, any concrete removal or concrete reinstatement works will cease until rain stops and lake levels return to a suitable level.

Sheet piling and concrete removal works will be undertaken in August and September (inclusive) aligning with IFI guidelines (2016) of sensitive periods for fish spawning, avoiding the main breeding and winter bird seasons, and coinciding with a time when water levels are at their lowest.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be indirect, negative, imperceptible, temporary, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.3.5 Piling Foundations

The Proposed Development includes the construction of a new marina extending into Lough Ree and in-water construction works are required. To provide a secure pile foundation for the marina, 42 no. individual piles installed into the lacustrine substrate are required. Piling activities are likely to last four to six weeks.

Pile foundations require in-water percussive and/or vibrative machinery for installation, which is likely to cause disturbance to the lacustrine substrate. This will result in an increase in the suspended sediment load of the water and affect the water quality of Lough Ree.

Pathways: Proposed works are occurring in-water (Lough Ree).

Receptors: Lough Ree and downgradient surface water bodies.

Pre-Mitigation Potential Effects: Without mitigation, the potential effects will be direct, negative, moderate, temporary, and likely.

Proposed Mitigation Measures / Impact Assessment: A double-lined, floating silt curtain will be installed around the works area before any works commence, i.e. the silt curtain will encompass as a whole, the 42 no. piling locations.

Differing drilling techniques cause differing levels of ground disturbance and pulverised drill spoil. Accordingly, percussive hammers will be minimised, and vibrative hammers will be utilised when drilling.

Disturbance of lake-substrate will be minimized through careful positioning of plant and adoption of low-impact construction methodologies. Equipment will not be dragged across the lakebed; this will avoid any additional sediment disturbance.

Following completion of piling works, disturbed sediments will be allowed to consolidate under natural hydrological conditions. The silt curtain will be inspected regularly for defects and adjusted as necessary, will remain in place for the duration of the works, and will only be removed once monitored suspended solids concentrations are observed at baseline levels.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be direct, negative, slight, temporary, and likely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.3.6 Accidental Spills, Leaks or Other Releases

Accidental spillage of chemical or fuels during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of chemical and fuels during routine plant use can also be a pollution risk. Hydrocarbons have a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

Pathways: Runoff, drains, groundwater.

Receptors: Groundwater and downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are both direct and indirect (surface water and groundwater, respectively), negative, imperceptible to profound, brief to long-term, and unlikely.

Small spills and leaks may cause effects that are imperceptible. Large or continuous spills and leaks can potentially damage the habitats and living organisms in the receiving water.

Hence, effects can be brief to long-term, depending on the nature and scale of the spills or leaks. Potential effects can be mitigated.

Proposed Mitigation Measures / Impact Assessment:

Mitigation by Design:

- The highest standards of site management will be maintained, with the utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the Site and surrounding environment during construction;
- An Emergency Response Plan for accidental spillages will be implemented as part of the CEMP. All construction staff will be familiar with the emergency procedures and the use of the relevant equipment;
- A named person will be given the task of overseeing the pollution prevention measures agreed for the Site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.
- Where possible, refuelling will occur at an off-site controlled fuelling station. On-site refuelling will be confined to the temporary construction compound(s) only, using appropriate containment measures and spill response equipment;
- On-site refuelling will be undertaken using a double skinned bowser with spill kits readily available for accidental leakages or spillages;
- Refuelling bowsers will be operated by suitably trained personnel only;
- Refuelling of construction machinery will take place using drip trays at all times;
- All plant and machinery will be serviced before being mobilised to site and will be regularly inspected and maintained to minimise the risk of leaks and spillages;
- Refuelling and maintenance of construction vehicles or plant will, where practicable, be undertaken off site;
- Fuels stored on-site will be minimised. Storage areas, where required, will be bunded appropriately for 110% of the fuel storage volume for the time period of construction and fitted with a storm drainage system and an appropriate oil interceptor;
- Concrete batching, washdown and washout activities will take place off-site. Concrete works will be managed to prevent accidental releases to soils or surface waters;
- All waste tar material arising from the potential chipping and resurfacing of roads will be removed off-site and taken to a licenced waste facility; and
- Appropriate erosion, sediment and pollution control measures will be implemented throughout the construction stage in accordance with the CEMP and relevant industry guidance.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, residual effects will be indirect, negative, imperceptible, short-term, and unlikely.

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven, routine, and effective measures to mitigate the risk of releases of fuels and chemicals are proposed which will break the link between potential sources and receptors.

Significance of Effects: For the reasons outlined above, likely significant effects on surface water or groundwater quality will not occur

8.5.3.7 Release of Cement-Based Products

Entry of cement-based products into drains or surface water within the Site represents a risk to the aquatic environment at and downstream of the release.

Concrete and other cement-based products are alkaline and can be corrosive. They generate fine, highly alkaline silt (pH 11.5) that can physically damage fish. A pH range of ≥ 6 ≤ 9 is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit.

Washing out of concrete transport and placement machinery are the activities most likely to generate a risk of cement-based pollution. Releases of cement-based products are obvious when they happen and can be stopped. They also involve small volumes (individually). Risks are increased with repeated poor practice.

Entry of cement-based products into the Site drainage system, and hence to surface watercourses or directly into watercourses, represents a risk to the aquatic environment.

Pathways: Site drainage network.

Receptors: Downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are both direct and indirect, negative, moderate, short term, and likely. The proximity of the effects (direct/indirect) is dependent on how and where releases occur.

Proposed Mitigation Measures / Impact Assessment:

Mitigation by Avoidance:

- Concrete will be delivered in sealed concrete delivery trucks. Batching of wet-cement products will not occur on-site.
- Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will take place.
- Pre-cast elements for cofferdams, pile foundations, culverts, and concrete works will be used.
- Concrete trucks will not be washed out on-site but will be directed back to their batching plant for washout.

Mitigation Measures by Design:

- Where concrete is delivered on-site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement-contaminated waters to the construction stage drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined washout ponds.
- Where temporary lined impermeable containment areas are used, such containment areas are built using straw bales and lined with an impermeable membrane. These are covered when not in use to prevent rainwater collecting.
- Pour sites of cement will be kept free of standing water, and plastic covers will be ready in case of sudden rainfall events.

Risks of pollution will be further reduced as follows:

- Concrete will not be transported around the Site in open trailers or dumpers so as to avoid spillage while in transport.
- All concrete used in the construction will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.
- Arrangements for concrete deliveries to the Site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the Site.
- Weather forecasting will be used to assist in planning large concrete pours and large pours will be avoided where prolonged periods of heavy rain is forecast.
- Concrete pumps and machine buckets from slewing over watercourses will be restricted while placing concrete.
- Excavations will be sufficiently dewatered before concreting begins and dewatering will continue while concrete sets.
- Covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Any potential, small surplus of concrete remaining after completion of a pour will be disposed at a suitable off-site facility.

Airborne dust will be generated from concrete excavation and cutting across the Site. The most efficient method of reducing dust particles is to remove at source. Accordingly, all excavation and cutting sites will require the suppression of dust through the use of water and sprinkler systems.

A double-lined, floating silt curtain will be installed around the main works area (the WSP) before any near-shore or in-water works commence. The silt curtain will only be removed following the completion of the construction stage. This will allow residual dust particles to be captured and settle out within the silt curtained area of Lough Ree, close to the Site.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, residual effects will be indirect, negative, imperceptible, short-term, and unlikely.

Proven, routine, and effective measures to mitigate the risk of releases of cement-based products are in place which will break the link between potential sources and receptors.

Significance of Effects: For the reasons outlined above, likely significant effects on surface water or groundwater quality will not occur.

8.5.3.8 Wastewater Management

Uncontrolled wastewater has the potential to impact on groundwater and surface water quality if not properly managed.

Pathways: Groundwater flow paths and site drainage network.

Receptors: Downgradient water supplies and surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are both indirect and direct (surface wate and groundwater, respectively), negative, not significant, short-term, and likely.

Proposed Mitigation Measures / Impact Assessment:

Mitigation by Avoidance:

- Self-contained portable toilets within portacabins with an integrated waste holding tank will be used at the Site compounds, maintained by the providing contractor, and removed from site on completion of the construction works.
- Portable toilets will be numerous and located conveniently for site workers.
- Wastewater will not be treated or disposed of onsite.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, residual effects will be indirect, neutral, imperceptible, short-term, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects on surface water or groundwater quality from wastewater will not occur.

8.5.3.9 Public and Private Water Supplies

The Site is hydrologically linked to an Article 7 (WFD) Abstraction for Drinking Water river waterbody, Shannon (Upper)_120, which is located approximately 3 km downstream of the Site. Hence, the risk of affecting public surface water supplies is present.

There are no GSI groundwater group water scheme (GWS) or public water supply (PWS) source protection areas within the Site; the closest is 7.5 km to the southeast. It is unlikely any groundwater supply wells are hydrogeologically linked to the main works area of the proposed WSP, as groundwater beneath the Site likely discharges to Lough Ree. Although mains water supply serves the Site and the surrounding area, there may be private wells, at single dwellings and farms, close to the southern area of the Site. Hence, there remains a risk of affecting groundwater well supplies.

Pathways: Groundwater flow paths, site drainage network and surface water.

Receptors: Downgradient water supplies and surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are both direct and indirect (surface water and groundwater, respectively), negative, not significant, short-term, and unlikely.

Proposed Mitigation Measures / Impact Assessment: The proposed works (road, cycle, pedestrian upgrades) along the L2020 Local Road, in the southern section of the Site will require only shallow excavations which is not likely to impact groundwater quality or flow.

By following the best practice measures outlined for other potential effects (e.g. accidental spills and leaks, wastewater management) risks to surface water and private groundwater drinking supplies are eliminated.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be direct, imperceptible, short-term, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.3.10 WFD Water Body Status

WFD water body status was presented in Section 8.3.10 and a further WFD compliance assessment is presented in Appendix 8-5. The Proposed Development has the potential to affect groundwater and surface water quality.

The duration of the construction stage is approximately 30 months, whereas WFD status is classified by EPA every 6 years. This means that risks of affecting (causing a deterioration of) WFD status in water bodies become more relevant for the longer-term operational stage (Section 8.5.4.3).

Pathways: Runoff, drains, other discharges (e.g. spills and leaks).

Receptors: Groundwater and downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects on surface water bodies within and downstream of the Site are direct, negative, not significant, short-term, and unlikely. Without mitigation, potential effects on groundwater bodies are direct, negative, not significant, short-term, and unlikely.

Effects are deemed unlikely due to the short duration of construction in relation to the WFD 6-year status classification and reporting cycle.

Proposed Mitigation Measures / Impact Assessment:

Mitigation by Design: Mitigation measures are necessary and proposed to break potential source-receptor linkages and allow for sediment settling and attenuation. The means and methods of achieving the necessary levels of protection are understood and proposed, largely based on existing guidance (Section 8.1.4) and practical experiences from other comparable sites.

Relevant mitigation measures are all of those described in preceding sections for the construction stage. The building contractor(s) will be legally required to adhere to the CEMP which encompasses the proposed mitigation measures. All works will be supervised, and monitoring will be undertaken as described in Section 8.5.3.12 in order to be able to identify potential effects and take corrective action, as necessary.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects on surface water bodies will be direct, negative, slight, short-term, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on groundwater bodies will be indirect, negative, slight, short-term, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects on WFD status of the named river subbasins and groundwater bodies will not occur during the construction stage.

8.5.3.11 Designated Sites

The Site is located adjacent to and partially within three designated sites, in association with Lough Ree:

- Lough Ree Special Area of Conservation (SAC) [000440];
- Lough Ree Special Protection Area (SPA) [004064]; and
- Lough Ree proposed Natural Heritage Area (pNHA) [000440].

Per Section 6.7 of this EIAR, these designated sites are interpreted to be hydraulically linked to, and within the Zone of Influence (ZoI), of the Proposed Development Site given that the Proposed Development Site is located adjacent to (and partially within) these three designated sites.

The following designated sites are not located within the Proposed Development site, however they are located downstream of the Proposed Development site and assessed as within the ecological ZoI:

- River Shannon Callows SAC [000216]
- Middle Shannon Callows SPA [004096]
- River Shannon Callows pNHA [000216]]

The construction works required for the Proposed Development have been assessed above. In the absence of appropriate mitigation measures, such works could result in significant and widespread disruption to the Lough Ree and associated habitats. Potential effects of the Site on each designated site and protected area, which are hydrologically or hydrogeologically linked to the Proposed Development, during construction are presented in Table 8-11.

The mitigation measures presented in Section 8.5.3 and the CEMP will serve to protect and mitigate against the identified, potential effects. For the reasons described in Table 8-11, likely significant effects on the named designated sites/protected areas will not occur during the construction stage.

Table 8-11: Assessment of Effects on Designated Sites/Protected Areas During Construction

Designated Site / Protected Area.	Direct /Indirect Connection to Proposed Development	Description	Assessment of Likely Significant Effects
Lough Ree SAC	**Direct** Proposed Development is located adjacent to and partially within the SAC.	There is a direct pathway between the Site and the habitats within the SAC. The habitats within the SAC are dependent on the hydrological conditions of the SAC. There is potential for water pollution of Lough Ree which is part of the SAC. Hence, there will be potential effects of the Proposed Development on the qualifying interests of the SAC during the construction stage. Any pollution that discharges into the lake will be significantly attenuated by dilution/mixing. Mitigation measures described in Sections 8.5.3.1 through 8.5.3.8 will serve to protect the SAC further from any potential quality or quantity effects.	Without mitigation, potential effects on the SAC are direct, negative, slight, short-term, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on the SAC will be direct, negative, imperceptible, short-term, and unlikely.
Lough Ree SPA	**Direct** Proposed Development is located adjacent to and partially within the SPA.	See SAC description above	Without mitigation, potential effects on the SPA are direct, negative, slight, short-term, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on the SPA will be direct, negative, imperceptible, short-term, and unlikely.
Lough Ree pNHA	**Direct** Proposed Development is located adjacent to and partially within the pNHA.	See SAC description above	

8.5.3.12 Proposed Monitoring

During the construction stage, a field monitoring campaign will be undertaken in Lough Ree. Monitoring will involve visual checks of drains, and streams, and measurements of field water quality parameters (temperature, pH, specific electrical conductivity, alkalinity and turbidity). The field measurements will be taken at locations upstream and downstream of the construction activity. Please refer to Figure 8-2 for the locations of the surface water sampling locations. Frequency of measurement will be judged in the field by the resident/supervising engineer but will be done at least on a weekly basis (potentially more frequently during storm events).

The field measurement campaign will begin two weeks prior to the proposed commencement of works and will cease up to four weeks after the proposed works are completed, unless observations dictate that measurements should continue. Regular inspections of all installed drainage components will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.

If visible impact occurs, works will be suspended at the discretion of the resident/supervising engineer, in which case the problem will be identified and corrective action taken before recommencing works.

Surface water samples will also be collected to monitor for effects and any shifts in baseline conditions. The sampling locations proposed are the ones presented in Figure 8-2 and included in Appendix 8-2; SW01, SW02, SW03, and SW04.

The samples will be collected on a monthly schedule during construction. Periodic review will determine the need for, or recommended amendments to, the monitoring programme in line with principles of adaptive monitoring (guided by the data review and findings).

The monthly samples will be analysed for general physico-chemical parameters, nutrients, dissolved organic carbon, true colour, and suspended solids. Adaptive monitoring will be practiced, whereby analytes and frequency of monitoring may change based on periodic review of results. All sampling events will be accompanied by field measurements of water temperature, pH, SEC, alkalinity and turbidity.

The broader purpose of the proposed monitoring is to track baseline conditions and how these might evolve under prevailing conditions. The baseline monitoring will begin three months prior to commencement of the construction stage. The data will be periodically reviewed to assess whether changes (trends) to water quality are occurring.

8.5.4 Operational Stage

8.5.4.1 Site Drainage

Water quality risks during the operational stage are much reduced compared to the construction stage. The operational stage of the Proposed Development will result in stormwater interacting with the Site. The stormwater drainage network of the Site will be indirectly discharged to Lough Ree. If not adequately treated, there is potential for indirect impacts on surface water quality.

Pathways: Site stormwater drainage network.

Receptors: Downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are indirect (via site drainage network) negative, slight, permanent, and likely.

Proposed Mitigation Measures / Impact Assessment: With the close proximity of Lough Ree to the Site, the operational stormwater drainage strategy has been developed with water quality as a primary consideration alongside NBS and SuDS hierarchy. The natural hydrological cycle will be emulated as far as reasonably practicable, involving grading of the Site, reducing stormwater runoff entering any conventional drainage systems, and attenuating runoff in proposed SuDs features prior to discharge to Lough Ree.

Where possible, Site catchments will be routed to a nature-based attenuation solution. Select areas of the Proposed Development which cannot be routed in this manner due to the tight levels and falls for gravity outfall to Lough Ree, below ground attenuation measures will not be introduced. All stormwaters will be routed through a hydrocarbon and integrated silt separation interceptor, in line with policy requirements.

The Site stormwater drainage network will be routinely inspected and maintained.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be indirect (via site drainage network), negative, imperceptible, permanent, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.4.2 Wastewater Management

The operational stage of the Proposed Development will result in the production of foul water. If not adequately managed, there is potential for impacts on groundwater and surface water quality.

It is anticipated that no upgrade to the surrounding infrastructure is required. Foul water will be collected from the WSP and marina facilities and will connect to the existing on-site pumping station operated by UE. A pre-connection enquiry has been submitted to UE by CIVIC Engineers to confirm network capacity and the receiving Wastewater Treatment Plant.

Pathway: Site foul water network.

Receptor: Groundwater and downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects are direct, negative, moderate, permanent, and likely.

Proposed Mitigation Measures / Impact Assessment: All foul water will be discharged to the existing foul water network and will be treated at the receiving Wastewater Treatment Plant. The foul water network will be routinely inspected and maintained.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects will be direct, negative, imperceptible, permanent, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects will not occur.

8.5.4.3 WFD Water Body Status

Water quality risks during the operational stage are much reduced compared to the construction stage.

During the operational stage, the stormwater drainage and foul water network, and all necessary mitigation measures are in place to limit the entry of potential pollutants to Lough Ree, especially sediment and suspended and dissolved organic matter. However the operational stage of the Proposed Development has the potential to affect groundwater and surface water quality.

The duration of the operational stage is indefinite, while WFD status is classified by EPA every 6 years. Accordingly, the risks of affecting (causing a deterioration of) WFD status in water bodies becomes more relevant than for the shorter-term construction stage (Section 8.5.3.10).

Pathways: Runoff, drains, other discharges (e.g. spills and leaks).

Receptors: Groundwater and downgradient surface water bodies (Lough Ree).

Pre-Mitigation Potential Effects: Without mitigation, potential effects on surface water bodies downstream of the Site are indirect (via site drainage network), negative, not significant, permanent, and unlikely. Without mitigation, potential effects on groundwater bodies are direct, negative, not significant, permanent, and unlikely.

Proposed Mitigation Measures / Impact Assessment: The Site surface water drainage and foul water network will be routinely inspected and maintained.

Post-Mitigation Residual Effects: Following implementation of the proposed mitigation measures, the residual effects on surface water bodies will be indirect (via site drainage network), negative, imperceptible, permanent, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on groundwater bodies will be indirect, negative, imperceptible, permanent, and unlikely.

Significance of Effects: For the reasons outlined above, likely significant effects on WFD status of the named river subbasins and groundwater bodies will not occur during the construction stage.

8.5.4.4 Designated Sites

Operational activities of the Proposed Development can affect the water quality of Lough Ree. Risks are mainly associated with stormwater network maintenance works, accidental spills of fuel, and foul water network failures.

Potential effects of the Site on each designated site and protected area, which are hydrologically or hydrogeologically linked to the Proposed Development, during the operational stage are presented in Table 8-12. The mitigation measures presented in Section 8.5.4 will serve to protect and mitigate against the identified potential effects.

For the reasons described in Table 8-12, likely significant effects on the named designated sites/protected areas will not occur during the operational stage.

Table 8-12: Assessment of Effects on Designated Sites/Protected Areas During Operation

Designated Site / Protected Area.	Direct /Indirect Connection to Proposed Development	Description	Assessment of Likely Significant Effects
Lough Ree SAC	**Indirect** Proposed Development will be hydraulically linked to the SAC via the Site stormwater network during the operational stage.	There is an indirect pathway between the Site and the habitats within the SAC. The habitats within the SAC are dependent on the hydrological conditions of the SAC. There is potential for water pollution of Lough Ree which is part of the SAC. Hence, there will be potential effects of the Proposed Development on the qualifying interests of the SAC during the construction stage. Any pollution that discharges into the lake will be significantly attenuated by dilution/mixing. Mitigation measures described in Sections 8.5.4.1 through 8.5.4.2 will serve to protect the SAC further from any potential quality or quantity effects.	Without mitigation, potential effects on the SAC are indirect, negative, not significant, permanent, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on the SAC will be indirect, negative, imperceptible, permanent, and unlikely.
Lough Ree SPA	**Indirect** Proposed Development will be hydraulically linked to the SPA via the Site stormwater network during the operational stage.	See SAC description above	Without mitigation, potential effects on the SPA are indirect, negative, not significant, permanent, and unlikely. Following implementation of the proposed mitigation measures, the residual effects on the SPA will be indirect, negative, imperceptible, permanent, and unlikely.
Lough Ree pNHA	**Direct** Proposed Development is located adjacent to and partially within the pNHA.	See SAC description above	

8.5.5 Assessment of Potential Health Effects

Potential health effects are associated with negative impacts on public and private water supplies and potential flooding.

An Article 7 (WFD) Abstraction for Drinking Water river waterbody is located approximately 3 km downstream of the Site. However, any pollution that discharges into the lake will be significantly attenuated by dilution/mixing.

There are no GSI groundwater GWS or PWS source protection areas hydrogeologically linked to the Site. Although mains water supply serves the Site and the surrounding area, there may be private wells, at single dwellings and farms, close to the southern area of the Site. However, the proposed works in the area will require only shallow excavations which is not likely to impact groundwater quality or flow.

The proposed site design and mitigation measures outlined in the previous sections ensures that likely significant effects to the water environment, which in turn could impact human health, will not occur.

The FRA (CIVIC, 2026).) for the Proposed Development concluded that the development does not encroach upon functional floodplain storage, does not obstruct flood conveyance and will not increase flood risk elsewhere.

8.5.6 Potential Cumulative Effects

8.5.6.1 Cumulative Effects - Interactions Between Various Elements of the Proposed Development

The interaction of the various elements of the Proposed Development was considered and assessed in this EIAR with regards to the water environment. The potential for each individual element of the Proposed Development on its own to result in significant effects on water receptors was considered in the impact assessment. The Proposed Development including the interactions between all its elements was also considered and assessed for its potential to result in significant effects on water receptors in the impact assessment presented. The complex interactions between the requirement for site drainage and the requirement to protect Lough Ree, groundwater and other downgradient receptors were considered for the Proposed Development and any impacts avoided through a series of mitigation measures that are fully described. The management and handling of potentially harmful materials across the Proposed Development was assessed with mitigation proposed and described fully.

All interactions between the various elements of the Proposed Development were considered and assessed both individually and cumulatively within this chapter. Where necessary, mitigation was employed to ensure that no cumulative effects will arise as a result of the interaction of the various elements of the Proposed Development with one another.

8.5.6.2 Cumulative Effects In-Combination with Other Projects

The potential cumulative effects of the Proposed Development in combination with the other projects listed in Section 2.6 of Chapter 2 of this EIAR have been considered in respect to hydrology and hydrogeology. These have not been repeated here to reduce the duplication of information within this EIAR. However, they have been fully considered in the assessment with further detail provided below.

A cumulative effect would be on the current discharges to Lough Ree. An existing stormwater network discharges to Lough Ree from the Site. It is not anticipated that additional stormwater infrastructure is required. Due to the incorporation of SuDS, NBS, and permeable surfaces to the drainage design, and the relatively minor change in natural percolation areas to impermeable percolation areas, there is no cumulative effects expected.

There will be no direct discharges of any substance from the Site during the construction stage of the Proposed Development directly to Lough Ree. The hydrological regime will not be altered significantly during the construction stage. Potential emissions from the Site are therefore related to potential uncontrolled releases and so a range of procedures, management plans, and infrastructural mitigation proposals have been identified and described earlier in this chapter and will be implemented to ensure that such uncontrolled releases do not occur. The potential for residual impacts on surface water and groundwater receptors is considered to be slight and not significant, respectively, and so the potential for cumulative effects associated with these receptors is limited.

During the operational stage, discharges from the Proposed Development will be as per pre-development rates and water quality will be controlled. Again, the water quality controls at the Proposed Development site will ensure no likely significant cumulative effects will occur during the operational stage. Mandated water quality controls at the other project sites will further reduce the potential for likely, significant cumulative effects.

Wastewater effluent arising from the operational stage of the Proposed Development will be pumped for treatment to a municipal wastewater treatment plant. In the circumstance where UE confirms wastewater arising from the Proposed Development will be treated at the designated wastewater treatment plant, the potential for cumulative effects associated with wastewater discharges does not arise. No significant cumulative effects on the water environment are anticipated during the construction or operational phases in circumstances where the proposed mitigation measures are implemented effectively.

8.5.7 Conclusion

Lough Ree is a lake waterbody within and adjacent to the Proposed Development. As a result, there is potential for impact on the water quality of the lake and downstream receptors.

During each stage of the Proposed Development (construction and operation) a number of activities will take place on the Proposed Development site which will have the potential to affect the hydrological regime or water quality at the Site and surrounding area. These potential impacts generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds, during the construction stage.

Stormwater drainage measures, foul water management, pollution control, and other preventative measures have been incorporated into the Proposed Development design to minimise significant adverse impacts on water quality and downstream receptors. Preventative measures during construction include hydrocarbon and cement-based materials spill management, which are incorporated in the CEMP for the Proposed Development (Appendix 4-2).

The stormwater drainage plan focuses on controlling runoff rates and suspended solids management. Direct discharge of untreated runoff into Lough Ree will not occur during either the construction or operational stage of the project, this is the key water quality control measure for the Proposed Development.

The operational stormwater drainage strategy has been developed with water quality as a primary consideration alongside NBS and SuDS hierarchy. The natural hydrological cycle will be emulated as far as reasonably practicable, involving grading of the Site, reducing stormwater runoff entering any conventional drainage systems, and attenuating runoff in proposed SuDs features prior to discharge to Lough Ree.

During the operational stage there will be no impact on water environment. This will be achieved by avoidance methods and design methods, including the routing of all stormwaters through a hydrocarbon and integrated silt separation interceptor, in line with policy requirements. The Site stormwater drainage network will be routinely inspected and maintained.

No significant impacts on the surface water and groundwater environment, or designated sites will occur due to the proposed redevelopment of the Waterfront and Marina at Hodson Bay, provided the proposed mitigation measures are implemented.