8. HYDROLOGY AND HYDROGEOLOGY

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes, and assesses the potential effects of the 'Proposed Development' on the local hydrological and hydrogeological environment (surface water and groundwater). It 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.

8.1.1 Background & Objectives

MKO, on behalf of Kingston Sables Ltd., has assessed the likely significant effects of a proposed mixed-use development (Proposed Development) at Knocknacarra, west of Galway City, on water aspects (hydrology and hydrogeology) of the receiving environment.

This chapter provides a baseline assessment of the hydrological and hydrogeological environment of the Proposed Development site and discusses potential impacts arising from both the construction and operational phases. Appropriate mitigation measures are recommended where significant effects are identified, and residual and cumulative impacts are assessed.

The objectives of the assessment are to:

- Produce a baseline study of the existing water environment (surface water and groundwater including connectivity with local designated sites) in the area of the Proposed Development site;
- 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 EIAR has been prepared by Monika Kabza & Dr Bébhinn Anders and reviewed by Michael Watson, employees of MKO. Monika is a Professional Hydrogeologist (PGeo & EurGeol) with over 16 years of experience in environmental and infrastructural projects, groundwater management and geological/hydrogeological assessments. Monika has been a lead hydrogeologist for Tobin and Arup, delivering projects for Uisce Éireann, GSI, NFGWS, Dublin Airport, and the private industry. Her experiences include preparing the EIAR Geology and Soils, and Hydrology and Hydrogeology chapters for infrastructure projects, including the N11/M11 Improvement Scheme (TII), solar farms and confidential developments.

Dr Bébhinn Anders has a BSc in Earth and Ocean Sciences and a PhD in Geology from the University of Galway titled ''Investigating sediment source, supply and evolution in the Northwest Carboniferous Basin: A multi-proxy provenance approach''. Bébhinn has four 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 coordinated and led water sampling campaigns. Her experience also includes preparing Hydrology and Hydrogeology chapter for EIARs.

Michael Watson has over twenty years' experience in the environmental sector and had worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a Professional Geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv).

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.

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 and 122 of 2014: 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).

The EIAR is prepared in accordance with the requirements of European Union and Irish legislation identified in Chapter 1. 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 water 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) (2009). 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;
- 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 Proposed Development study area was largely completed prior to the undertaking of a walkover assessment. As part of the desk study the area's relevant geological, hydrological, hydrogeological and meteorological data were reviewed. The desk study also included a review of the Civil Works Design Report and Drainage Design compiled by Tobin which set out the proposed surface water drainage, foul water drainage, watermain design and flood protection measures for the Proposed Development. The following data sources were reviewed:

- Environmental Protection Agency (EPA) Datasets and Map Viewer (https://gis.epa.ie/EPAMaps/ and www.catchments.ie/);
- 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/);
- Site Specific Flood Risk Assessment Report (Tobin 2025)
- Civil Design Report (Tobin, 2025)

8.2.2 Site Investigations

A hydrological walkover survey, including drainage mapping to establish flow directions and drainage patterns (where present) was undertaken by MKO staff on 6th June 2024. MKO supervised site investigations from 28th May to 6th June 2025. Water sampling took place on 23rd June 2025, 21st July 2025, 17th September 2025, and 29th September 2025.

Causeway Geotech completed site investigation work from 22nd May to 20th June 2025. The 2025 Site Investigation comprised twenty-one light cable percussion boreholes, five rotary drilled boreholes, standpipe installations in fifteen boreholes, thirty-three machine-dug trial pits, fifteen sampling locations, eighteen machine-dug soakaway pits, in-situ testing (including: Standard Penetration Tests, eighteen infiltration tests, and indirect CBR (Dynamic Cone Penetrometer (DCP)) tests at forty-two locations. A total of 78 soil samples were analysed for soil classification and soil chemistry (Appendix 7-1 and 7-2).

The trial pits were logged in accordance with BS5930:2015+A1:2020[1]. The Site Investigation Reports are included in Appendix 7-1 and Appendix 7-2.

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. Inland fisheries Ireland, (IFI) have recommend the incorporation of Sustainable Urban Drainage Systems (SUDS) into the Proposed Development. The Department of Housing, Local Government and Heritage have suggested to consider Green Infrastructure, 'Nature Based Surface Water Management', and SuDS. Uisce Éireann responded as outlined in Section 2.5.2 of which all comments have been considered in this chapter. Waterways Ireland have not commented.

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 7 1 Table 7.1 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.

[1] *BS5930:2015+A1:2020 Code of practice for ground investigations (British Standards Institute 2020)*

Table 8-1 Estimation of Importance of Hydrology Attributes (NRA, 2009)

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.

Table 8-2 Estimation of Importance of Hydrogeological Attributes (NRA, 2009)

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.
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.

8.3 Receiving Environment

8.3.1 Existing Land Use & Topography

The Proposed Development site covers approximately 5.37 hectares of land, located in the townlands of Knocknacarra, Co. Galway, approximately 3 km to the west of Galway City. The Proposed Development is outlined in Chapter 4 and will consist of 362 no. residential units in 4 no. development areas with a mix of apartment and house types. The Proposed Development is a component of a larger residential development project (Proposed Project).

The Proposed Project involves the construction of more than 500 residential units, and the development will require separate, individual planning applications for each part of the project. The EIAR Study Area encompasses an overall area of 8.74 ha and covers the entire Proposed Project area.

The site's elevation ranges between approximately 22 m and 34 m OD (metres above Ordnance Datum). The overall local topography generally slopes from northeast to south with an undulating topography.

There is no surface watercourse on the site, and much of the rainfall that falls on the site likely percolates through the soil. Once within the soil profile the water drains naturally south and westwards towards Galway Bay. There is likely little infiltration to the low permeability granite bedrock except for locally fractured zones. There are no obvious preferential drainage paths at the site and rainfall currently percolates freely to ground.

8.3.2 Water Balance

The nearest synoptic station with long-term rainfall and evaporation data is at Shannon Airport, approximately 65 km south of the EIAR Study Area. The mean annual rainfall recorded at this station for the 30-year period 1991-2020 is 1,019.6 mm (Met Éireann). As shown in Table 8-3 below, the wettest month on average is October.

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

Table 8-3 Mean Monthly Rainfall (mm) - Shannon Airport Synoptic Weather Station (1991-2020)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean monthly total	103.8	86.7	75.8	62.3	63.1	69.6	75.8	87.6	77.4	95.5	106.6	115.4
Greatest daily total	38.2	33.8	34.8	40.2	25.0	45.3	39.5	51.0	52.3	36.9	29.4	33.5

The long-term average Potential Evapotranspiration (PE) for Shannon Airport station is 562 mm/year.

According to the EPA's Qube model, 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 1,132 mm/year – comparable to the 30-year average at Shannon Airport. The area's potential evapotranspiration (PET) is estimated at 520 mm/year. Therefore, the effective rainfall (ER) — the portion of precipitation available for surface runoff and groundwater recharge — is calculated as follows:

$$ER = AAR - PET = 1{,}132 \text{ mm/yeas} - 520 \text{ mm/year} = 612 \text{ mm/year}$$

Based on the groundwater recharge coefficient of approximately 22.5%, as per the Geological Survey Ireland (GSI), the average annual groundwater recharge in the study area is estimated to be 100 mm/year. This indicates that the area's hydrology is dominated by high surface water runoff and relatively low groundwater recharge.

As a result, the site's annual groundwater recharge and surface water runoff rates are estimated to be 100 mm/year and 512 mm/year, respectively. The greenfield runoff rates for the site have been calculated in the Site-Specific Civil Works Design Report LRD Stage 2 (Tobin, 2025) for the project. Appendix 4-3 of this EIAR includes a copy of this report.

8.3.3 Regional & Local Hydrology

On a regional scale, the site is located within Hydrometric Area 31 - Galway Bay North. It lies within the Galway Bay North catchment and the Knock [Furbo]_SC_010 sub-catchment, as defined under the Water Framework Directive (WFD). A regional hydrology map is provided in Figure 8-1.

At the local scale, the site is situated within the Knocknacarragh_010 sub-basin. There are currently no open surface watercourses or drains present on the site. The nearest surface water feature is the

Knocknacarragh_010 Stream, which originates northwest of the site at Letteragh and flows southward for approximately 3 km before discharging to the sea.

A substantial portion of the lower reach of the Knocknacarragh Stream is culverted, extending nearly to its sea outfall at Rusheen Bay, near Blakes Hill in Salthill. A local hydrology map is provided in Figure 8-2.

8.3.4 Site Drainage

In general, the site of the EIAR Study Area is well drained with rainfall percolating to ground and likely travelling via subsurface flow to the culverted stream located at the western side of the site. There is a gently sloping hilly topography which is likely to reflect the direction of groundwater flow at the site which is likely from northwest to southeast. There was no surface water or ponding of water observed on the site. The existing roadway that bisects the site is served by gullies which discharge to the municipal storm water drainage system.

8.3.5 Flood Risk Identification

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

No indications of flood-prone lands were identified in the historical maps. Additionally, OPW flood mapping records show no history of recurring flood incidents within the study area.

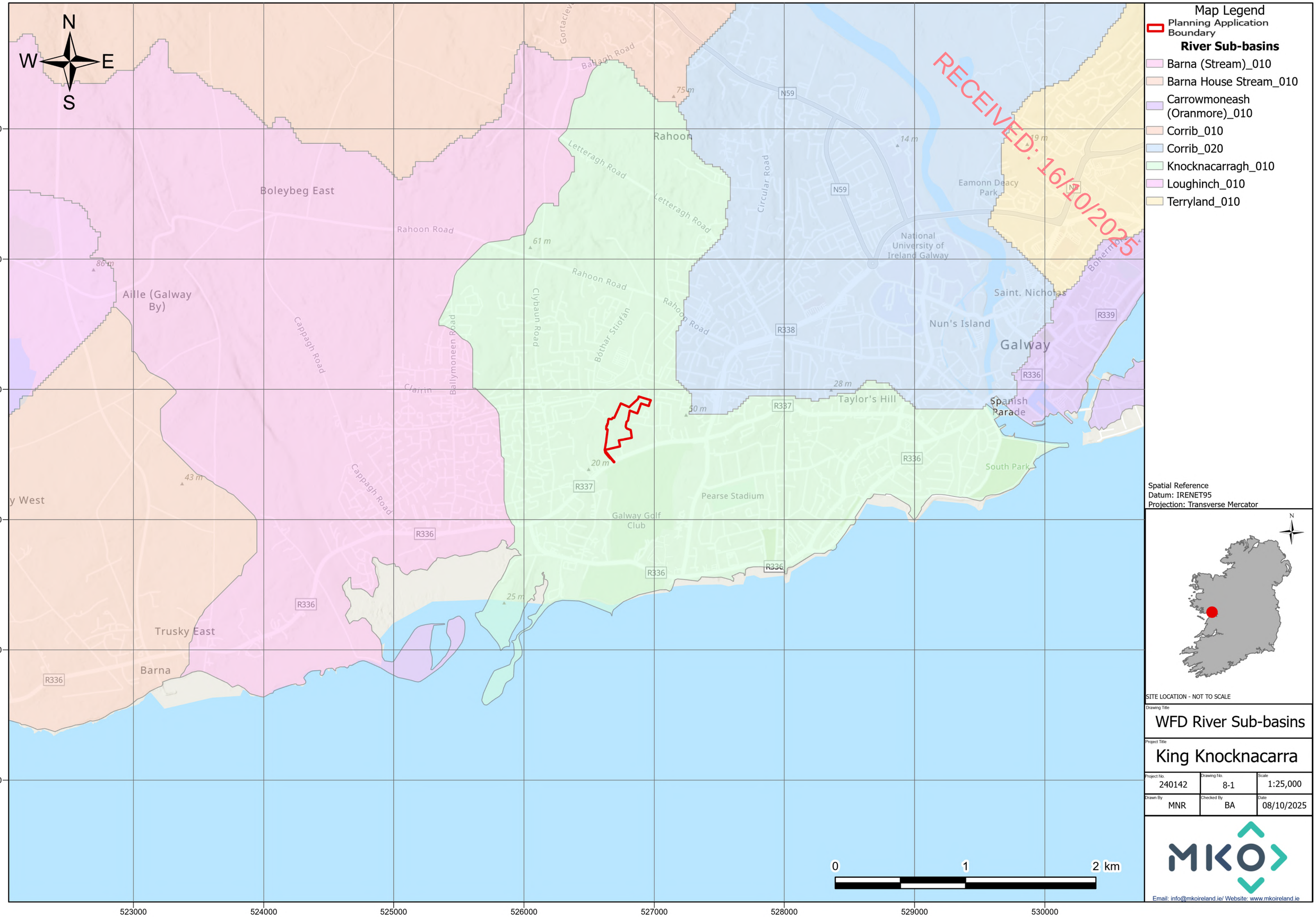
There are no recurring flood incidents within the study area boundary according to the OPW's flood mapping. The site is not located within any areas designated as "Benefiting Lands" – a dataset developed by the Office of Public Works highlighting lands that may benefit from Arterial Drainage Schemes and are typically subject to poor drainage or periodic flooding.

Tidal flooding is considered unlikely given the site's elevation (approximately 30 metres above sea level) and its distance from the coastline (approximately 1 km).

A Stage 2 - Flood Risk Assessment (FRA) has been prepared for the Proposed Development (Tobin, 2025; Appendix 8-1). This report determined that the Site is within Flood Zone C and concluded that the Site is not liable to fluvial, coastal, or groundwater flooding. The assessment also found that the risk to the site from pluvial flooding will be minimal with appropriate drainage design.

8.3.6 Surface Water Hydrochemistry

There are no surface water bodies located within the EIAR Study Area (Figures 8-1 & 8-2). However, baseline water samples were collected from the Knocknacarragh Stream at 3 no. locations; two upstream locations and one downstream location where the Knocknacarragh Stream enters Rusheen Bay (Figure 8-2). The stream runs along the northern and western boundaries of the site but is entirely culverted along these sections. The field water sampling results are presented in Table 8-4. Laboratory reports and screening of results for surface water are presented in Appendix 8-2.



Map Legend

Planning Application Boundary

River Sub-basins

- Barna (Stream)_010
- Barna House Stream_010
- Carrowmoneash (Oranmore)_010
- Corrib_010
- Corrib_020
- Knocknacarragh_010
- Loughinch_010
- Terryland_010

Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
WFD River Sub-basins

Project Title
King Knocknacarra

Project No.	Drawing No.	Scale
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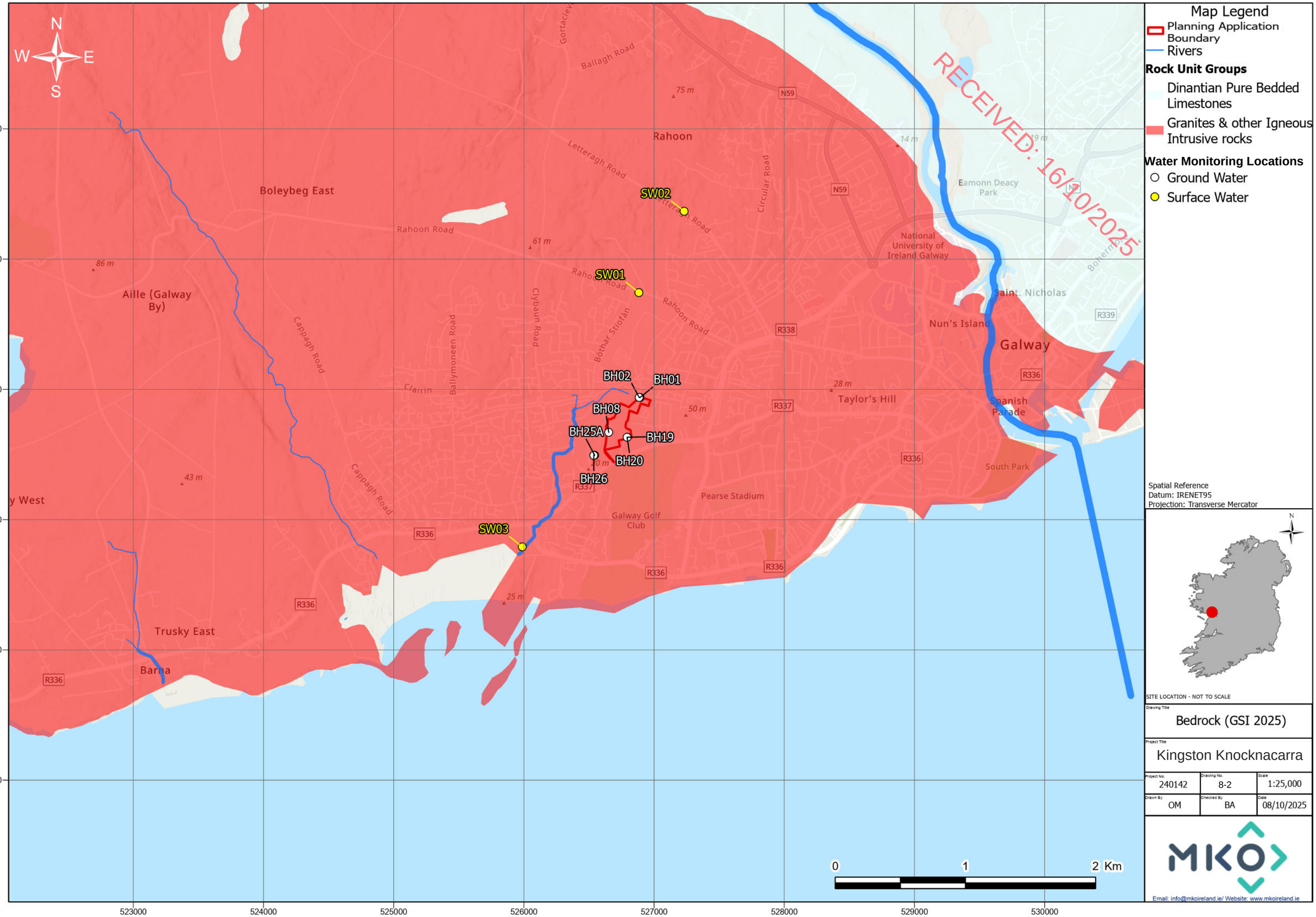
Drawn By	Checked By	Date
MNR	BA	08/10/2025

Email: info@mkoireland.ie/ Website: www.mkoireland.ie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BH08
BH25A
BH19
BH20
BH26
Boleybeg East
Aille (Galway By)
Trusky East
Barna
y West
Rahoon
Rahoon Road
Letteragh Road
Ballagh Road
Cappagh Road
Ballymoneen Road
Clybaun Road
Bóthar Stiofán
Circular Road
Clairin
Gortaclev
Bohermore
Eamonn Deacy Park
National University of Ireland Galway
Saint. Nicholas
Nun's Island
Galway
Taylor's Hill
Spanish Parade
South Park
Pearse Stadium
Galway Golf Club
N59
R338
R337
R336
R339
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61 m
86 m
43 m
50 m
28 m
25 m
14 m
19 m
0
1
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RECEIVED: 16/10/2025
Map Legend
Planning Application Boundary
Rivers
Rock Unit Groups
Dinantian Pure Bedded Limestones
Granites & other Igneous Intrusive rocks
Water Monitoring Locations
Ground Water
Surface Water
Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator
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SITE LOCATION - NOT TO SCALE
Drawing Title
Bedrock (GSI 2025)
Project Title
Kingston Knocknacarra
Project No. 240142
Drawing No. 8-2
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Drawn By OM
Checked By BA
Date 08/10/2025
MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

Table 8 4 Surface water field hydrochemistry

Round 1 (17/09/2025)			
Site Location	SW01	SW02	SW03
Temperature (C)	13.7	13.9	14.3
Dissolved Oxygen (%)	68.6	72.4	97.6
Dissolved Oxygen (mgl)	7.10	7.46	9.94
Conductivity (µscm)	316	278	503
pH	6.90	6.83	7.58
ORP (mV)	34.0	80.4	143
Round 2 (29/09/2025)			
Site Location	SW01	SW02	SW03
Temperature (C)	11.9	12.5	13.9
Dissolved Oxygen (%)	113.5	88.8	95.7
Dissolved Oxygen (mgl)	12.26	9.36	9.85
Conductivity (µscm)	261	301	312
pH	6.85	6.70	7.40
ORP (mV)	170	165	175

8.3.7 Hydrogeology

The Site lies within the Spiddal (IE_WE_G_0004) Groundwater Body (GWB).

8.3.7.1 Bedrock Aquifer Classification

Based on GSI's 1:100,000 scale Hydrostratigraphic Rock Unit Group mapping (Figure 8-2), the EIAR Study Area is underlain by granites and other igneous intrusive rocks. These are classified by the GSI as a Poor Aquifer – bedrock, which is generally unproductive except for local zones. A bedrock aquifer map is presented in Figure 8-3.

Groundwater flow is expected to be concentrated within fractured and weathered zones, particularly near fault lines. A fault zone has been mapped in the northeastern portion of the site. Flow paths are likely to be short, up to approximately 100 m, with groundwater expected to discharge rapidly to a nearby stream. Flow directions are expected to broadly follow the local topography. Transmissivity values for granite bedrock in the area are reported to be around 20 m²/day to 30 m²/day, potentially higher in the vicinity of fault zones (GSI, 2004).

Depth to rock head ranges from 0.70 m to 3.30m overlain by granitic silts and gravels. (Causeway Geotech SI report, 2025; Appendix 7-1 and Appendix 7-2). Groundwater was encountered in eleven of the twenty-six boreholes drilled and 20 of the 34 trial pits. Groundwater levels in boreholes range from 0.13 m below ground level (mbgl) to 3.3 mbgl and range from 0.60 mbgl to 4.00 mbgl in trial pits. Groundwater monitoring standpipes were installed in BH01, BH02, BH08, BH19, BH20, BH25A and BH26. The results of level readings are presented in Table 8-5.

N
W E
S

Boleybeg East
Rahoon
Aille (Galway By)
Taylor's Hill
Saint. Nicholas
Nun's Island
Galway
Spanish Parade
South Park
Pearse Stadium
Galway Golf Club
Trusky East
Barna
Eamonn Deacy Park
National University of Ireland Galway
Bohermore
Letteragh Road
Rahoon Road
Ballagh Road
Gortaclevan
Circular Road
Cappagh Road
Ballymoneen Road
Clybaun Road
Bóthar Stiofán
Clarin
N59
N6
R336
R337
R338
R339
75 m
61 m
86 m
43 m
50 m
28 m
20 m
25 m
14 m
19 m

0 1 2 Km

523000 524000 525000 526000 527000 528000 529000 530000

Map Legend

- Planning Application Boundary

Bedrock Aquifer

- Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Regionally Important Aquifer - Karstified (conduit)

Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
Bedrock Aquifers (GSI 2025)

Project Title
King Knocknacarra

Project No.	Drawing No.	Scale
240142	8-6	1:25,000
Drawn By	Checked By	Date
OM	BA	08/10/2025

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

8.3.7.2 Groundwater Subsoil Permeability

The subsoils mapped across the EIAR Study Area comprise glacial till derived from granites. Detailed characteristics of these subsoils are provided in Section 7.3.3.

From a hydrogeological perspective, the GSI has classified the subsoils (where thickness exceeds 3 m) across the site as having 'Low' to 'Moderate' permeability (Figure 8-4). Under these conditions, groundwater flux through the subsoils is expected to be limited. The site walkover confirms that the subsoils have permeability to the extent where ponding is not present on site.

8.3.7.3 Groundwater Vulnerability

Groundwater vulnerability across most of the site is classified as 'High', with an area of 'Extreme' vulnerability identified in the northwestern portion of the site, where bedrock is near or close to the surface (Figure 8-5).

Given the low permeability of the overlying subsoils and the low transmissivity of the underlying fractured bedrock aquifer, the potential for groundwater recharge, dispersion, and movement within the aquifer is relatively limited.

Groundwater monitoring as indicated in the Geo-environmental Interpretive Report (Appendix 7-3, Section 5.2.2;) indicates that water levels are relatively shallow in some areas of the Proposed Development. The shallowest water levels occur in permeable sediments and made ground, suggesting these zones respond quickly to precipitation and surface infiltration.

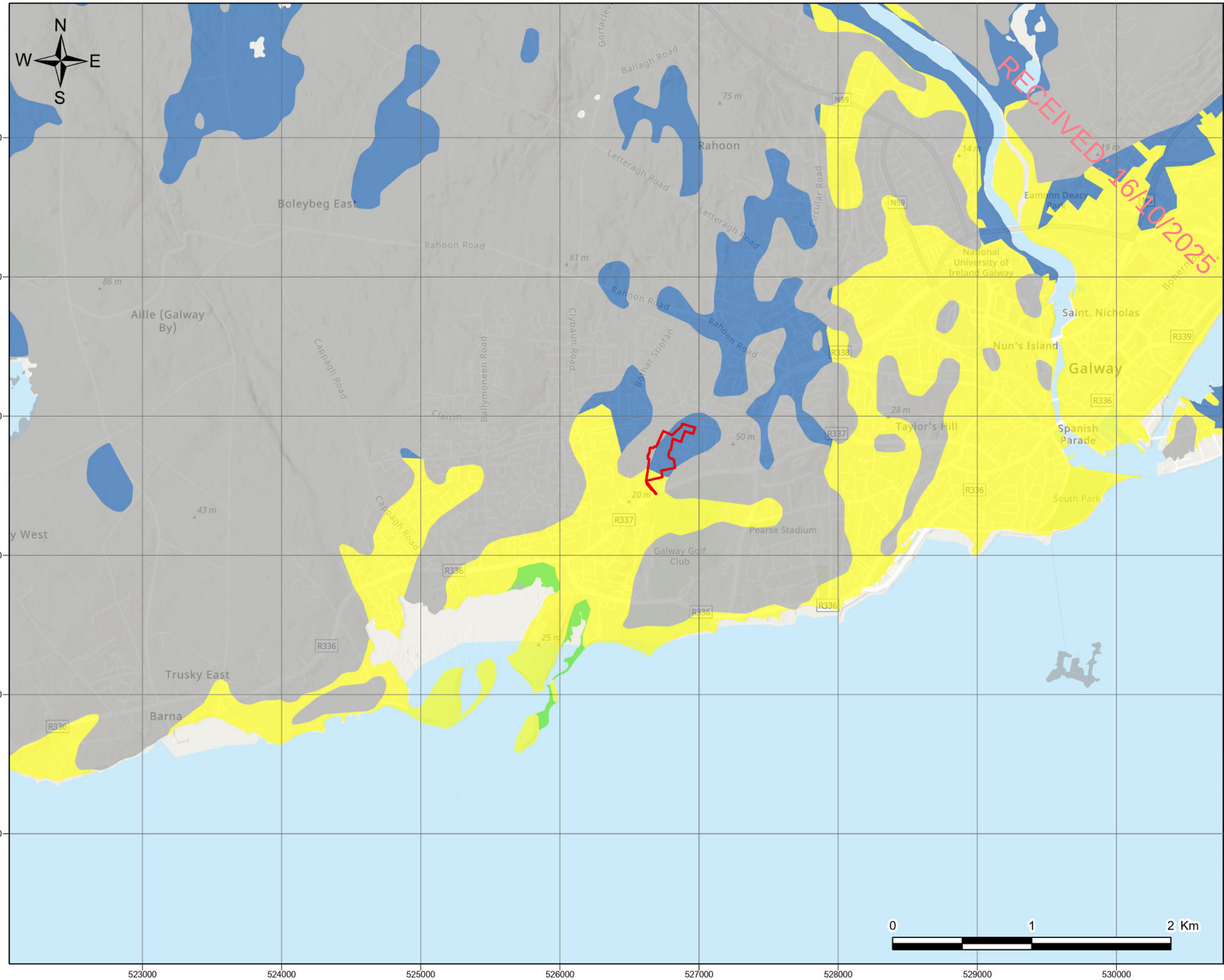
8.3.7.4 Groundwater Levels and Flow

Groundwater levels across the site are shallow and confined to permeable soil strata (Causeway Geotech Ground Investigation Report, 2025, Appendix 7-1). Transmissivity is low and flow is governed by site topography. Infiltration rates from soakaway infiltration tests in trial pits indicate low infiltration and transmissivity (imperceptible to 9.50E-5 m/s; Causeway Geotech Ground Investigation Report, 2025, Appendix 7-1).

An analysis of the groundwater monitoring data indicates a relatively shallow water table in parts of the site. The shallowest water levels occur in permeable sediments and Made Ground, suggesting these zones respond quickly to precipitation and surface infiltration (MKO, Appendix 7-4).

8.3.8 Water Resources

There are no Groundwater Protection Zones mapped within the EIAR Study Area. Additionally, no private wells are recorded within 1 km radius, based on the GSI well database (noting a location accuracy of <50m).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Bothar Stiofán
Clarin
Taylor's Hill
Saint. Nicholas
Nun's Island
Galway
Spanish Parade
South Park
National University of Ireland Galway
Eamonn Deacy Park
Pearse Stadium
Galway Golf Club
Trusky East
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Map Legend
Planning Application Boundary
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Drawing Title
Subsoils Permeability (GSI 2025)
Project Title
Kingston Knocknacarra
Project No. 240142
Drawing No. 8-4
Scale 1:25,000
Drawn By OM
Checked By BA
Date 09/10/2025
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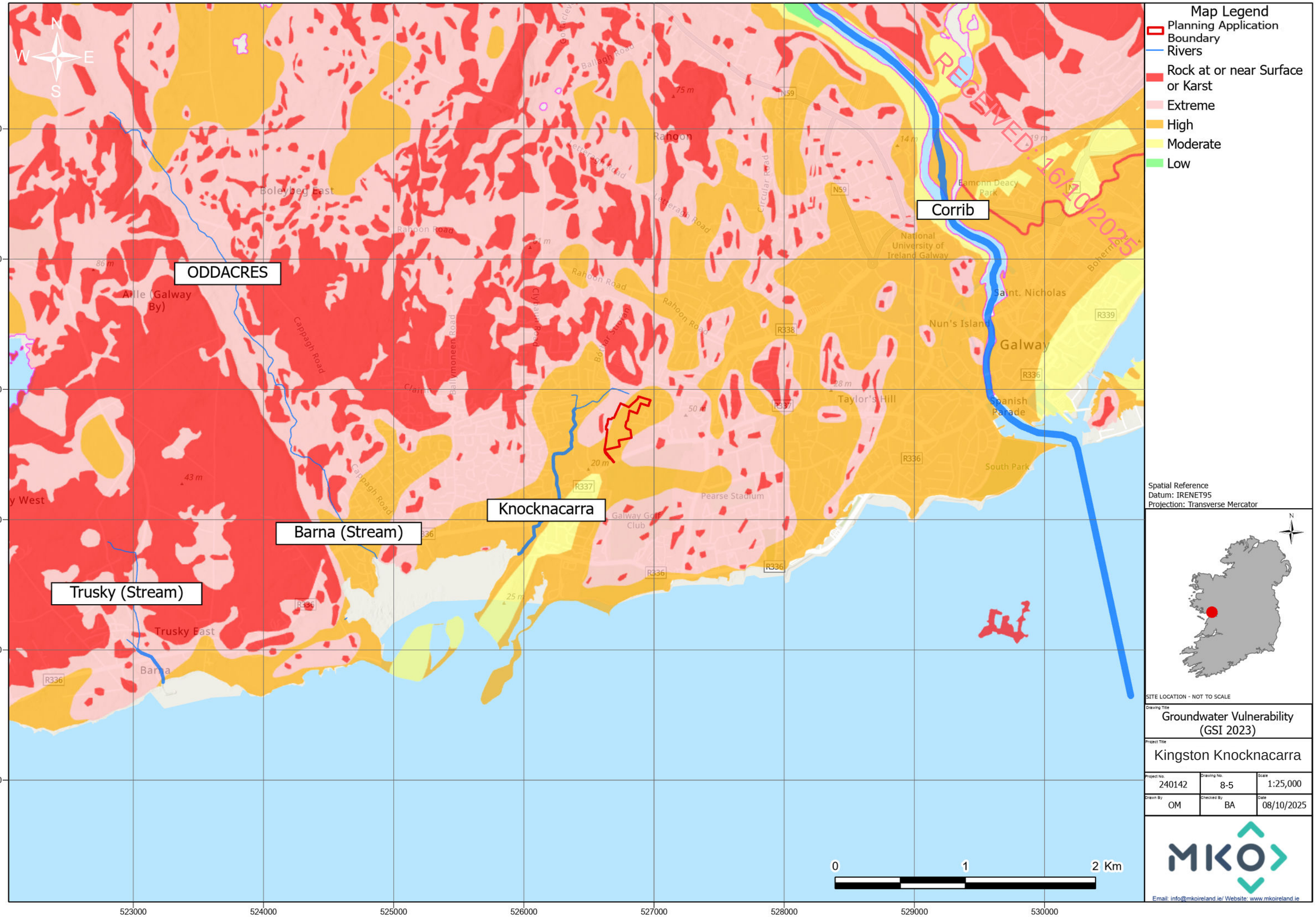
Email: info@mkoireland.ie/ Website: www.mkoireland.ie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Knocknacarra
Barna (Stream)
Trusky (Stream)
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Map Legend
Planning Application Boundary
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Moderate
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Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator
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Groundwater Vulnerability (GSI 2023)
Kingston Knocknacarra
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8.3.9 Groundwater Hydrochemistry

The WFD status for the local groundwater body in terms of water quality is Good.

Based on data from GSI publication Calcareous/Non calcareous classification of bedrock in the Republic of Ireland (WFD, 2004), water alkalinity for this bedrock type ranges from 43 mg/l – 199 mg/l while electrical conductivity and hardness reported values are442 µS/cm and 148 mg/l respectively.

Groundwater quality data and groundwater sampling for the Proposed Development site was completed to further investigate findings from Causeway's SI report 2019 indicated presence of hydrocarbons near the centre of the site (TP12) Appendix 7-1. Groundwater quality impacts would not be anticipated from the proposed development as there are also no proposed discharges to the ground – all discharges are via attenuation areas and to municipal stormwater sewer (Tobin, 2025, Appendix 4-3; Chapter 4).

The groundwater quality data collected on 17th June and 21st July is assumed to be the baseline condition for groundwater in the area of the Proposed Development. Tabulated field parameters are presented in Table 8-5 and groundwater hydrochemistry data summary is tabulated in Table 8-6. Laboratory reports for groundwater are presented in Appendix 8-3. There are no significant contaminant indicators from groundwater sampling laboratory analyses.

Table 8-4 Groundwater field parameters

Round 1 (Dry event) 17/06/2025							
Site Location	**BH01**	**BH02**	**BH08**	**BH19**	**BH20**	**BH25A**	**BH26**
Temperature (°C)	12.6	Dry	Dry	12.6	Dry	12.5	Dry
Dissolved Oxygen (%)	0.7	Dry	Dry	0.6	Dry	1.8	Dry
Dissolved Oxygen (mg/l)	0.08	Dry	Dry	0.06	Dry	0.19	Dry
Conductivity (µS/cm)	1940	Dry	Dry	793	Dry	1151	Dry
pH	6.99	Dry	Dry	6.68	Dry	6.98	Dry
ORP (mV)	52.5	Dry	Dry	49.8	Dry	72.5	Dry
Round 2 (after Rainfall event) 21/07/2025							
Site Location	**BH01**	**BH02**	**BH08**	**BH19**	**BH20**	**BH25A**	**BH26**
Temperature (C)	13.4	13.9	13.8	14.6	Dry	14.3	15.6
Dissolved Oxygen (%)	5.40	84.5	87.6	2.90	Dry	17.2	74.5
Dissolved Oxygen (mg/l)	0.56	8.71	9.04	0.30	Dry	1.76	7.40
Conductivity (µS/cm)	621	425	427	780	Dry	578	954
pH	6.90	6.30	6.22	6.42	Dry	6.80	6.81
ORP (mV)	-158	-93.7	-98.7	-127	Dry	-123	-73.1

Table 8-5 Groundwater Hydrochemistry

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	MAC-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances	No. of MAC-EQS Exceedances
Dissolved Arsenic	7.50	25	nc	9	0	0	0
Dissolved Barium	100.00	nc[2]	nc	9	0	0	0
Dissolved Boron	750.00	nc	nc	9	0	0	0
Dissolved Cadmium	3.75	0.008	0.45	9	1	1	1
Dissolved Calcium	200.00	nc	nc	9	0	0	0
Total Dissolved Chromium	37.50	3.4	32	9	0	0	0
Dissolved Copper	1500.00	5 or 30	nc	9	0	0	0
Total Dissolved Iron	200.00	nc	nc	9	3	0	0
Dissolved Lead	7.50	1.2	14	9	0	1	0
Dissolved Magnesium	50.00	nc	nc	9	0	0	0
Dissolved Manganese	50.00	nc	nc	9	6	0	0
Dissolved Mercury	0.75	0.05	0.07	9	0	0	0
Dissolved Nickel	15.00	4	34	9	0	3	0
Dissolved Potassium	5.00	nc	nc	9	5	0	0
Dissolved Selenium	nc	nc	nc	9	0	0	0
Dissolved Sodium	150.00	nc	nc	9	0	0	0
Dissolved Zinc	75.00	8 or 50 or 100	nc	9	0	0	0
PAH MS							

[2] *nc indicates that no criteria is available.*

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	MAC-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances	No. of MAC-EQS Exceedances
Naphthalene	1.00	2	130	9	0	0	0
Anthracene	10000.00	0.1	0.1	9	0	0	0
Fluoranthene	nc	0.0063	0.12	9	0	2	0
Benzo(bk)fluoranthene	0.50	nc	0.017	9	0	0	0
Benzo(a)pyrene	0.01	0.00017	0.27	9	0	0	0
Indeno(123cd)pyrene	0.05	nc	nc	9	0	0	0
Dibenzo(ah)anthracene	nc	nc	nc	9	0	0	0
Benzo(ghi)perylene	0.05	nc	0.0082	9	0	0	0
PAH 16 Total	0.08	nc	nc	9	0	0	0
Benzo(b)fluoranthene	0.50	nc	0.017	9	0	0	0
Benzo(k)fluoranthene	0.05	nc	0.017	9	0	0	0
VOC MS							
Dichlorodifluoromethane	nc	nc	nc	9	0	0	0
Methyl Tertiary Butyl Ether	10.00	nc	nc	9	0	0	0
Chloromethane	nc	nc	nc	9	0	0	0
Vinyl Chloride	0.38	nc	nc	9	0	0	0
Bromomethane	nc	nc	nc	9	0	0	0
Chloroethane	nc	nc	nc	9	0	0	0
Trichlorofluoromethane	nc	nc	nc	9	0	0	0
1,1-Dichloroethene (1,1 DCE)	30	nc	nc	9	0	0	0
Dichloromethane (DCM)	15.00	20	nc	9	0	0	0
Chloroform	12.00	2.5	nc	9	0	1	0

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	MAC-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances	No. of MAC-EQS Exceedances
1,1,1-Trichloroethane	500.00	nc	nc	9	0	0	0
Carbon tetrachloride	2	nc	nc	9	0	0	0
1,2-Dichloroethane	2.25	10	nc	9	0	0	0
Benzene	0.75	10	50	9	0	0	0
Trichloroethene (TCE)	7.50	nc	nc	9	0	0	0
Toluene	525.00	10	nc	9	0	0	0
Tetrachloroethene (PCE)	7.50	nc	nc	9	0	0	0
Chlorobenzene	1.00	1.5	nc	9	0	0	0
Ethylbenzene	10.00	nc	nc	9	0	0	0
m/p-Xylene	10.00	10	nc	9	0	0	0
o-Xylene	10.00	10	nc	9	0	0	0
1,2,4-Trichlorobenzene	0.40	0.4	nc	9	0	0	0
Hexachlorobutadiene	0.10	0.1	0.6	9	0	0	0
Naphthalene	1.00	2	130	9	0	0	0
1,2,3-Trichlorobenzene	nc	0.4	nc	9	0	0	0
Benzene	nc	10	50	9	0	0	0
Toluene	nc	10	nc	9	0	0	0
m/p-Xylene	nc	10	nc	9	0	0	0
o-Xylene	nc	10	nc	9	0	0	0
SVOC MS							
Pentachlorophenol	nc	0.4	1	9	0	0	0
Phenol	nc	8	46	9	0	0	0
Phthalates							

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	MAC-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances	No. of MAC-EQS Exceedances
Bis(2-ethylhexyl) phthalate	nc	1.3	nc	9	0	0	0
Other SVOCs							
1,2,4-Trichlorobenzene	nc	0.4	nc	9	0	0	0
Hexachlorobenzene	nc	0.01	0.05	9	0	0	0
Hexachlorobutadiene	nc	0.1	0.6	9	0	0	0
Aliphatics							
>C5-C6	10.00	nc	nc	9	0	0	0
>C6-C8	10.00	nc	nc	9	0	0	0
>C8-C10	10.00	nc	nc	9	0	0	0
>C10-C12	10.00	nc	nc	9	3	0	0
>C12-C16	10.00	nc	nc	9	4	0	0
>C16-C21	10.00	nc	nc	9	3	0	0
>C21-C35	10.00	nc	nc	9	0	0	0
Total aliphatics C5-35	10.00	nc	nc	9	4	0	0
Aromatics							
>C5-EC7	10.00	nc	nc	9	0	0	0
>EC7-EC8	10.00	nc	nc	9	0	0	0
>EC8-EC10	10.00	nc	nc	9	0	0	0
>EC10-EC12	10.00	nc	nc	9	0	0	0
>EC12-EC16	10.00	nc	nc	9	0	0	0
>EC16-EC21	10.00	nc	nc	9	0	0	0
>EC21-EC35	10.00	nc	nc	9	0	0	0
Total aromatics C5-35	10.00	nc	nc	9	0	0	0

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	MAC-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances	No. of MAC-EQS Exceedances
Total aliphatics and aromatics(C5-35)	7.50	nc	nc	9	4	0	0
Phenol	nc	8	46	6	0	0	0
Sulphate as SO4	187.50	nc	nc	9	0	0	0
Chloride	187.50	nc	nc	9	0	0	0
Ortho Phosphate as P	0.04	0.035	0.075	9	0	0	0
Total Oxidised Nitrogen as N	nc	nc	nc	9	0	0	0
Free Cyanide	0.04	10	nc	9	0	0	0
Total Cyanide	0.04	10	nc	9	0	0	0
Ammoniacal Nitrogen as N	0.07	0.065	0.14	9	6	6	6
Hexavalent Chromium	7.50	3.4	nc	9	0	0	0
Electrical Conductivity @25C	1875.00	nc	nc	9	0	0	0
pH	≥ 6.5 and ≤ 9.5	4.5< pH < 9.0	4.5 < pH < 9.0	9	0	0	0

8.3.10 Water Framework Directive Water Body Status & Risk Assessment

The Water Framework Directive (WFD) status classification for the 2016–2021 cycle and the WFD risk assessment for Ireland's third implementation cycle (2022–2027) was reviewed for the Spiddal GWB and nearby surface water bodies, specifically the Knocknacarragh_010 Stream and Inner Galway Bay North (Rusheen Bay), which receives flow from the stream. A detailed WFD report is provided in Appendix 8-4.

The Spiddal GWB is currently classified as having 'Good' status and is assessed as 'Not at Risk' under the WFD risk assessment. The Knocknacarragh_010 Stream is classified as having 'Poor' ecological status, with 'Low Confidence' in this classification. Its WFD risk status is currently under review. Inner Galway Bay North (Rusheen Bay) holds a 'Good' WFD status and is also classified as 'Not at Risk' (WFD Report, Appendix 8-4).

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 National Parks and Wildlife Service (NPWS), as presented on their website (www.npws.ie).

The Galway Bay Complex SAC (Code: 000268) is located approximately 1 km south of the site and the Inner Galway Bay SPA (Code: 004031) is located approximately 1 km to the south of the site (Figure 8-6). The culverted Knocknacarragh Stream which flows adjacent to the site, enters the Inner Galway Bay SPA (Code: 004031) approximately 1 km downstream of the proposed site.

The Lough Corrib SAC (Code: 000297), Connemara Bog Complex SAC (Code: 002034), Ross Lake and Woods SAC (Code: 001312), East Burren Complex SAC (Code: 001926), Moneen Mountain SAC (Code: 000054), Lough Corrib SPA (Code: 004042), Cregganna Marsh SPA (Code: 004142) and Connemara Bog Complex SPA (Code: 004181) are all located within 15 km of the site. Detailed discussion of designated sites is provided in the NIS for the project and in Section 5.3 of this EIAR.

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W
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S

Moycullen Bogs NHA

Lough Corrib SAC & NHA

Galway Bay Complex SAC & pNHA

Inner Galway Bay SPA

Boleybeg East
Rahoon
Aille (Galway By)
Trusky East
Barna
Taylor's Hill
Nun's Island
Galway
Saint. Nicholas
Pearse Stadium
Galway Golf Club
South Park
National University of Ireland Galway
Ballagh Road
Letteragh Road
Rahoon Road
Circular Road
Cappagh Road
Ballymoneen Road
Clybaun Road
Bóthar Stiofán
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Map Legend

- Planning Application Boundary
- Special Protection Area (SPA)
- Special Areas of Conservation
- Natural Heritage Areas
- Proposed Natural Heritgae Areas (pNHA)

Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title: Designated Sites and Protected Areas Map

Project Title: Kingston Knocknacarra

Project No.	Drawing No.	Scale
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Drawn By: OM	Checked By: BA	Date: 08/10/2025

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

8.3.12 Receptor/Attribute Sensitivity

The nature of the Proposed Development (near surface construction activities), combined with the nature of the hydrological regime and bedrock aquifer type means that potentiallynegative impacts on groundwater are negligible. Surface water is the main sensitive receptor assessed during impact assessments. The Knocknacarragh Stream is a potential receptor of 'Low' importance. However, the Knocknacarragh Stream is culverted immediately upstream of the EIAR study Area until it discharges to Rusheen Bay and the Galway Bay SAC which is of 'high' importance.

8.3.12.1.1 *Groundwater*

The primary risk to groundwater as a result of construction activities at the site is from cementitious materials, hydrocarbon spillage and leakages. The shallow nature of excavations within the development means that existing groundwater drainage pathways below the site will not be interrupted during construction activities and subsequent site operations.

The above identified potential contamination sources are common to all construction sites (such as road works and industrial sites). All potential contamination sources are to be carefully managed at the site during the construction and operational phases of the development and mitigation measures are proposed below to deal with the potential minor negative impact on the receiving environment.

The aquifer at the site is classified as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Table 8.1). Therefore, the site is classed as "Not Sensitive" to groundwater pollution because it is a Poor Aquifer. In addition, any contaminants which may be accidently released on-site will predominantly discharge via surface water runoff or shallow groundwater flow paths to nearby streams or to the municipal local storm water sewer.

8.3.12.1.2 *Surface Water*

Comprehensive surface water mitigation and controls are outlined below to ensure protection of all downstream receiving waters during construction and operational phases of the development. Mitigation measures will ensure that surface runoff from the developed areas of the site will be of a high quality and will therefore not have a negative impact on the quality of downstream surface water bodies. Any introduced drainage works at the development site will mimic the existing hydrological regime, and discharge will be to existing sewers and to ground via soakaways, thereby avoiding changes to surface water flow volumes leaving the site.

8.4 Characteristics of the Proposed Development

The Proposed Development is described in full Chapter 4 and will comprise the following*:*

Planning permission is sought by Kingston Stables Ltd for development of a Large-Scale Residential Development (LRD) for a 10-year planning permission, on a site which extends to 5.37 ha on lands located at Knocknacarra, Galway.

The Proposed Development will consist of the following:

1. *Provision of 362 no. residential units in 4 no. development areas with a mix of apartment and house types on a site area of 5.37 ha. The buildings range between 2 no. and 6 no. storeys in height. The development will comprise the following:*
    a. *4 no. 2-bed townhouses;*
    b. *40 no. 3-bed townhouses;*
    c. *21 no. 4-bed townhouses;*
    d. *15 no. 1-bedroom duplex apartments;*

e. *46 no. 2-bedroon duplex apartments;*
f. *15 no. 2-bedroom duplex houses;*
g. *46 no. 3-bedroom duplex houses;*
h. *114 no. 1-bedroom apartments;*
i. *56 no. 2-bedroon apartments;*
j. *5 no. 3-bedroom apartments.*

2. *Demolition of existing structures (333.8 sqm);*
3. *Vehicular access to the proposed development from a permitted road (Planning Reference 24/60370 refers);*
4. *The provision of new active travel cycle and pedestrian access from Millers Lane;*
5. *Upgrades to the existing access at Kingston Road*
6. *The provision of a childcare facility (440 sq.m.);*
7. *The provision of public open space;*
8. *The provision of 665 no. bicycle parking spaces;*
9. *The provision of 313 no. car parking spaces;*
10. *Public lighting, bin stores, signage, services, ESB substation, site landscaping and all ancillary site development and enabling works.*

The Proposed Development will typically require minor alteration of ground levels to ensure it is at an adequate level for the proposed surface water drainage and foul water drainage, and to mitigate flood risk.

Excavation of soil and subsoil will be required for the Proposed Development in preparation for the construction of building foundations and in the preparation of a suitable sub-formation for road construction, trenching for foul and drainage water infrastructure and other services. Significant excavations are not required as there are no subsurface basement type structures proposed.

8.4.1 Proposed Site Infrastructure and Drainage Management

8.4.1.1 Surface Water Drainage

Surface water management proposals are described in detail in Section 4.2 and 4.3 of the Civil Design Report (Tobin, 2025; Appendix 4-3). The management of surface water for the Proposed Development has been designed to comply with the philosophies of nature-based SuDS and CIRIA guidelines as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS) and with the requirements of Galway City Council.

The surface water strategy incorporates attenuation of storm water to limit discharge from the site, although storage facilities and SuDS elements will be designed to allow infiltration or reduction of run-off volumes and rates where possible. The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces in the Proposed Development including roadways, roofs, parking areas etc. All stormwater generated on site from roadways and roofs will discharge via an Oil/Petrol Interceptor to soakaways/attenuation units to remove possible hydrocarbons. The soakaway/attenuation units are strategically located within the site (Tobin 2025; Appendix 4-3). Where there is adequate infiltration stormwater will discharge to soakaways/attenuation. Otherwise, it will discharge at a controlled Greenfield runoff rate to existing 450 mm storm sewer network.

By-pass separators will be installed prior to discharging to the proposed soakaways/attenuation units and existing storm sewer. The separators will be sized to cater for impermeable areas i.e. roads, car parking and footpath areas.

The current conditions of the Proposed Development site are greenfield/brownfield. Therefore, there are no existing surface water drainage or SuDS measures in place. Interception storage can be achieved by implementing infiltration/attenuation storage tanks. Growth factors are applied to the allowable

discharge for the 100-year event. Therefore treatment and/or long-term storage are not required (Tobin 2025; Appendix 4-3). The following SuDS elements are applicable to the proposed scheme and layout (Tobin 2025, Appendix 4-3):

- Water butts Tree pits
- Rain gardens
- Permeable paving
- Detention Swales
- Drainage kerbs with infiltration trenches
- Thirteen attenuation storage systems.
- Hydrobrake manholes to control the flow of surface water to allow the soakway/attenuation units to fill to their capacity (designed to largest stormwater required over 48-hour storm period with rainfall depths taken for the 100year return period +20 % for climate change).
- Hydrocarbon separation prior to the outfall to the exiting surface water network and immediately downstream of any hydrobrake manholes.

Stormwater attenuation for the development has been sized in accordance with the requirements of the GDSDS. Run-off rates from the Proposed Development to the public system are in accordance with the GDSDS (Tobin 2025; Appendix 4-3).

8.4.1.2 Wastewater Infrastructure

All wastewater generated from the Proposed Development will outfall, via gravity, to an existing Uisce Éireann owned 225 mm foul sewer line located west of the development along the southern arm junction of the adjacent roundabout and Altan road (Tobin, 2025, Appendix 4-3). The 225 mm sewer line will require upgrade to 300 mm to where it meets an existing Uisce Éireann 375 mm foul network. The foul network for the Proposed Development has been designed using Causeway Flow Drainage modelling software. The pipework has been designed to provide six times the dry weather flow in accordance with Uisce Éireann Code of Practise and standard details (Tobin, 2025, Appendix 4-3). The pipes will be thermoplastic structured wall pipes minimum 150 mm diameter and maximum 300 mm. Gradients will range from 1/30 to 1/200 and velocities will range from 0.75 m/sec to 3 m/sec. A flow of 150 litres per head per day +10 % allowance to account for infiltration within a new development has been considered in the foul sewer design. The proposed foul sewer design and layout is in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and Uisce Éireann standards.

The Uisce Éireann foul sewer ultimately discharges to the EPA Licensed Mutton Island Waste Water Treatment Plant, located further west of Galway City.

8.4.1.3 Water Supply

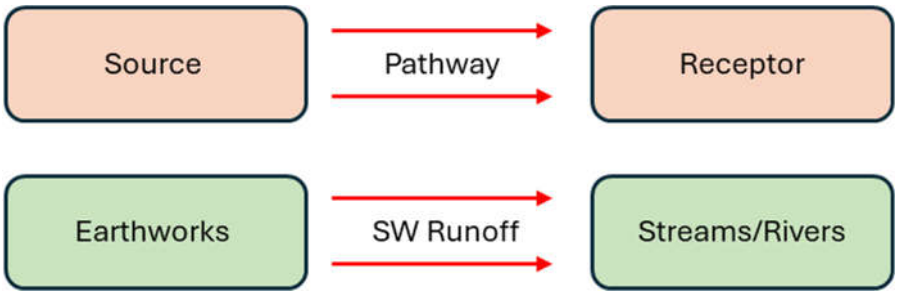
It is proposed to connect the watermain to supply the Proposed Development at the existing 315 mm watermain on the Kingston Road as per Uisce Éireann confirmation of feasibility letter.

In accordance with Local authority/Uisce Éireann standards, a water meter and Logging Device (Larson Type) are proposed at the entrance of the connection into the proposed site. A sluice valve, strainer and 150mm diameter by-pass arrangement are also proposed to allow for possible disconnection of water meters by the Local Authority/ Uisce Éireann. A Pre-Connection Enquiry for the water demand from the proposed residential development was submitted to Uisce Éireann, and a subsequent Confirmation of Feasibility (CoF) statement has been received. All watermains designs are presented in the Civil Design Report (Appendix 4-3). The proposed watermain layout will be designed in accordance with Uisce Éireann Code of Practice for Watermain Infrastructure IW-CDS-5020-03.

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 downstream environmental receptors (see below, bottom as an example) as a result of the proposed housing 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 Environmental Protection Agency (EPA):

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022);
- 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 8.4.2 and 8.4.3), we have firstly presented below 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 8-6 Summary Guide of Impact Assessment Process

Step 1	Identification and Description of Potential Impact Source This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.	
Step 2	**Pathway / Mechanism:**	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of housing developments, 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	**Receptor:**	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 Impact:**	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:**	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to housing developments, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	**Post Mitigation Residual Impact:**	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 carried out, the site would remain in its current form of low intensity farmland and brownfield with overgrown scrub. The potential direct impacts to water are considered to be long term, imperceptible, neutral in the Do-Nothing scenario.

The lands are zoned for development and so continuing the existing land uses would be contrary to local policy and would have a slight negative effect in the context of losing the benefits associated with the proposed land uses.

8.5.3 Receptor Sensitivity & Importance

The Knocknacarragh Stream is the only potential surface water receptor as it is mapped as flowing across the northern perimeter of the site and then flowing in a southerly direction parallel with the western perimeter of the EIAR Study Area and discharges into Rusheen Bay. The Knocknacarragh Stream is not in reality present at the northern boundary of the site as it has been culverted immediately north (and upstream) of the EIAR Study Area and is considered a 'Low' Importance receptor. The Knocknacarragh Stream is a direct connectivity to the Galway Bay SAC which is of high importance.

8.5.4 Construction Phase Potential Impacts

8.5.4.1 Earthworks

Construction phase activities including landscaping, site levelling, service trench construction, levelling/construction and building 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 and this will be allowed to continue during the construction phase. 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, resulting in increased turbidity which in turn could affect the water quality in downstream waters (Knocknacarragh Stream). There are no significant surface water discharges directly to the Knocknacarragh Stream from the site currently and none are proposed as part of the projects design.

Pathways: Drainage and surface water discharge routes. Pathways are limited as there are no open watercourses onsite.

Receptors: Down-gradient transitional and water dependent ecosystems.

Pre-Mitigation Impact: Indirect, negative, moderate, short-term, likely impact.

8.5.4.1.1 *Proposed Mitigation Measures*

The closest sensitive receptor is the culverted Knocknacarragh Stream. It is not proposed to alter the existing alignment or culvert associated with this stream. However, attenuated surface water runoff will ultimately discharge to the municipal storm drainage system of which this stream forms a part of.

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Adjacent drainage systems/groundwater need to be protected from sedimentation and erosion due to direct surface water runoff generated onsite during the construction phase. To prevent this from occurring surface water discharge from site will be managed and controlled within the site boundary for the duration of the construction works until the permanent surface water drainage system of the proposed site is complete. There will be no temporary construction phase uncontrolled discharges to surface water from the site.
- A temporary drainage system shall be installed, comprising sump areas which will allow existing runoff regimes to be maintained, prior to the commencement of the construction works to collect surface water runoff from the site during construction.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- 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 in a sheet of polythene, 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, if required.
- Material stockpiles will be kept at least 10m from any manholes.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan (CEMP), 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.

8.5.4.1.2 *Residual Impact*

The Proposed Development area is set back from surface water receptors (limiting the potential source of sediments) and runoff controls will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be indirect, imperceptible, short-term, medium probability, and of negative effect on downstream surface waters.

8.5.4.1.3 *Significance of Effects*

For the reasons outlined above, no significant effects on surface water quality are expected due to site excavation work. There is limited hydraulic connectivity between the site and watercourses, and mitigation measures will be employed on a precautionary basis.

8.5.4.2 Potential Surface Water Quality Impacts from Shallow Excavation Dewatering

Some groundwater seepages may potentially occur in foundation excavations. Dewatering will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. The Geo-environmental Interpretive report (MKO, 2025; Appendix 7-3) indicates that some Environmental Quality Standards (EQS) exceedances were recorded for a small number of parameters as outlined in Section 8.3.9. However, there is no evidence for significant groundwater contamination in the results. Should contaminated groundwater be encountered during construction it will be managed according to best practice which may include disposal to a licensed waste facility.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies.

Pre-Mitigation Impact: Indirect, negative, moderate, short-term, medium probability impact to surface water quality.

8.5.4.2.1 *Mitigation Measures*

Management of excavation seepages and subsequent treatment prior to discharge into the site drainage network will be undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place if required;
- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces using a pump equipped with a silt bag and not directly to surface waters;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via silt bags.

- There will be no direct discharge to the on-site main drains, and therefore no risk of hydraulic loading or contamination will occur.

8.5.4.2.2 *Residual Impact*

The potential source of sediment can be readily controlled, and the pathway broken using the water containment and silt fencing systems and therefore the residual impact will be indirect, imperceptible, short-term, low probability, and of negative effect on downstream surface waters. The pathway between the site works areas and receptors are broken by the nature of the site which does not have open water courses onsite combined with the proposed mitigation.

No impact on groundwater levels or groundwater quality will occur.

8.5.4.2.3 *Significance of Effects*

No significant impacts on surface water quality are expected due to excavation dewatering.

8.5.4.3 Potential Release of Hydrocarbons during Construction Stage

Accidental spillage 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 fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has 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.

Pathway: Groundwater flow paths and site drainage network.

Receptor: Groundwater and surface water.

Pre-Mitigation Impact: Indirect, negative, slight, short term, unlikely impact to local groundwater quality.

Indirect, negative, moderate, short term, unlikely impact to surface water quality.

8.5.4.3.1 *Proposed Mitigation Measures:*

Mitigation by Design:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Where possible, off-site refuelling will occur at a controlled fuelling station;
- On-site re-fuelling will be undertaken using a double skinned bowser or a refuelling truck with spill kits kept onboard. Only designated trained operators will be authorised to refuel plant on site.
- All plant and machinery will be serviced before being mobilised to site.
- All oils, fuels, paints and other chemicals will be stored in a secure bunded construction hardstand area.
- Refuelling of construction machinery will take place using drip trays at all times.
- A response procedure will be put in place to deal with any accidental pollution events and spillage kits will be available and construction staff will be familiar with the emergency procedures and use of the equipment.
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

- Fuels stored on site will be minimised. Any storage areas will be bunded appropriately for 110% of the fuel storage volume for the time period of the construction.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. 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.

8.5.4.3.2 *Residual Effects*

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. With the implementation of the mitigation measures set out above, the residual impacts on ground water and surface water will be indirect, imperceptible, short-term, unlikely, and of negative effect. The pathway between the hydrocarbons and the receptor is indirect by the nature of the site.

8.5.4.3.3 *Significance of Effects*

No significant effects on surface water or groundwater quality are anticipated.

8.5.4.4 Groundwater and Surface Water Contamination from Wastewater Disposal

Release of effluent from on-site wastewater systems has the potential to impact on groundwater and surface waters if not properly managed.

Pathway: Groundwater flow paths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, short-term, unlikely impact to surface water quality.

Indirect, negative, slight, short-term, unlikely impact to local groundwater.

8.5.4.4.1 *Proposed Mitigation Measures*

Mitigation by Avoidance:

- Self-contained port-a-loo 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; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

8.5.4.4.2 *Residual Impact*

No impact.

8.5.4.4.3 *Significance of Effects*

No significant effects on surface water or groundwater quality are anticipated.

8.5.4.5 Release of Cement-Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. 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. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water.

8.5.4.5.1 *Proposed Mitigation Measures*

Mitigation by Avoidance:

- Concrete batching will take place off site
- Wash down and wash out of concrete trucks will take place off site
- Excess concrete will not be disposed of on -site
- Pulped concrete will be monitored to ensure that there is no accidental discharge.
- Mixer washings will not be discharged into surface water drains or sewers

8.5.4.5.2 *Residual Impact*

The potential source of pollution can be readily controlled, and standard procedures will ensure no significant releases will occur. The pathway between the cement works and receptors are broken by the nature of the site which does not have open water courses combined with the proposed mitigation measures. Residual impacts are unlikely, indirect, imperceptible, short term, and of negative effect.

8.5.4.5.3 *Significance of Effects*

No significant effects on surface water quality are anticipated.

8.5.4.6 Potential Impacts on Hydrologically Connected Designated Sites

The Galway Bay Complex SAC (Code: 000268) and Inner Galway Bay SPA (Code: 004031) are located less than 1.5 kilometres to the south of the site. The culverted Knocknacarragh Stream has been incorporated into the storm sewer system and flows adjacent to the site. Discharges from the site could conceivably enter the culverted stream which discharges into the Galway Bay Complex SAC and Inner Galway Bay SPA at Rusheen Bay. The construction of the development will involve earth moving and levelling operations which create the potential for pollution in various forms to run off the site, i.e. the generation of suspended solids and the potential for spillage of fuels associated with the refuelling of excavation machinery. Taking a precautionary approach, the construction works have potential, in the absence of mitigation, to impact on groundwater and surface water quality. Pollutants may run off the site into the public stormwater system outside the site, which ultimately discharges to Rusheen Bay, thus having connectivity to Inner Galway Bay SPA and Galway Bay Complex SAC. There is also the possibility that pollutants may percolate through the ground ultimately discharge to the SAC/SPA via this diffuse pathway.

All liquids with the potential for pollution, such as hydrocarbons at individual properties will conform with best practice storage requirements. The risk associated with these is low.

Possible effects include water quality impacts which could be significant if mitigation is not put in place.

Pathway: Surface water and groundwater flow paths.

Receptor: Down-gradient water quality and designated sites.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water quality.

8.5.4.6.1 *Proposed Mitigation Measures*

Standard best practice environmental control measures will be implemented during the construction phase of the development. The pathway that would allow potential impacts to occur was considered in the design of the project. The accompanying CEMP (MKO, 2025) and Natura Impact Statement (NIS) (MKO, 2025) sets out the environmental management framework to be adhered to during the construction phase of the development, and it incorporates the mitigating principles to ensure no adverse impact on the integrity of European Sites. These documents include comprehensive detail regarding site set up, pollution prevention, hydrocarbon management, disturbance limitation, construction monitoring and biosecurity. Standard best practice environmental control measures have been incorporated in the design of the development and are outlined in the following subsections. In addition, the 'Civil Design Report '(Tobin, 2025) and the CEMP (MKO, 2025), (see Appendices 4-4 and 4-2), include measures for the avoidance of impact on groundwater and surface water during construction. As outlined above (Section 8.5.3.1 – 8.5.3.5) and reiterated here, controls will also be put in place to manage risks associated with hydrocarbons/chemicals and cement-based products used during construction phase. The following pollution control measures will be put in place:

- Sediment and Erosion – Adjacent drainage systems/groundwater will be protected from sedimentation and erosion which can be caused by direct surface water runoff generated onsite during the construction phase. Surface water discharge from site will be managed and controlled for the duration of the construction works until the permanent surface water drainage system of the proposed site is complete. A temporary drainage system shall be installed prior to the commencement of the construction works to collect surface water runoff within the site during construction.
- Accidental Spills and Leaks – All oils, fuels, paints and other chemicals will be stored in a secure bunded construction hardstand area. Refuelling and servicing of construction machinery will take place in a designated bunded area which is also remote from any drainage systems. A response procedure will be put in place to deal with any accidental pollution events and spillage kits will be available and construction staff will be familiar with the emergency procedures and use of the equipment.
- Concrete – Concrete batching will take place off site, wash down and wash out of concrete trucks will take place off site and any excess concrete will not be disposed of on site. Pumped concrete will be monitored to ensure there is no accidental discharge. Mixer washings will not be discharged into surface water drains.
- Disposal of Wastewater from Site – Discharge from any vehicle wheel wash areas will be directed to on-site settlement tanks/ponds, debris and sediment captured by vehicle wheel washes are to be disposed off-site at a licensed facility.
- Foul drainage discharge from the construction compound will be transported off site to a licensed facility until a connection to the public foul drainage network has been established.

The proposed mitigation measures for protection of surface water quality which will include on site drainage control measures will ensure that the quality of runoff from Proposed Development areas will be very high. Connections to the public foul and surface water sewers will not be completed until

approval has been received from the local authority and Irish Water. All drainage works will be constructed and tested in accordance with the local authority/ Irish Water requirements. As outlined above, controls will also be put in place to manage risks associated with hydrocarbons, chemicals and cement-based products used during construction phase.

8.5.4.6.2 *Residual Impact*

No significant impacts on water quality or hydrologically connected designated sites will occur. There will be no impacts on groundwater levels or existing hydrological regime or groundwater flow paths relating to designated sites, including the Galway Bay Complex SAC or Galway Bay SPA.

Therefore, no significant effects on groundwater or surface water quality and downstream designated sites are anticipated.

The potential pathway between the site works area and receptors is broken ensuring no significant impacts on designated sites.

8.5.4.6.3 *Significance of Effects*

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flow paths relating to designated sites, including the Galway Bay Complex SAC or Galway Bay SPA will occur.

8.5.5 Operational Phase Impacts

8.5.5.1 Potential Increased Downstream Flood Risk due to Increased Hardstanding Area.

Replacement of the greenfield surface with hardstand surfaces can potentially result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater.

Based on the results of the flood risk assessment (Tobin, 2025; Appendix 8-1), it is estimated that the risk of flooding to the proposed residential development will be minimal, and that the development will not increase the risk of flooding elsewhere.

Pathway: Site surface water drainage network.

Receptor: Surface watercourses, adjacent and downstream lands

Pre-Mitigation Impact

Direct, negative, slight, long term, low probability impact.

8.5.5.1.1 *Proposed Mitigation Measures*

The risk of flooding is minimised by using an attenuated surface water drainage network. Surface water run-off from the overall development will be attenuated to greenfield run-off rates.

8.5.5.1.2 *Residual Impact*

Direct, neutral, imperceptible, long term, low probability effect in relation to flood risk.

8.5.5.1.3 *Significance of Effects*

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.5.5.2 Potential Downstream Water Quality Impacts from Surface Water Drainage.

The operational phase of the proposed project will result in the production of surface water. If not adequately treated, there is potential for indirect impacts on ground water and surface water quality. To prevent pollutants or sediments discharging into water courses from surface drainage the GDSDS requires "interception storage" to be incorporated into the development.

All stormwater generated on site from roadways and roofs will discharge via an Oil/Petrol Interceptor to soakaways/attenuation units. The soakaway/attenuation units will be strategically situated within the site. Where there is adequate infiltration storm water will discharge to ground via soakaways, otherwise at a controlled Greenfield runoff rate to the existing storm sewer network.

Foul drainage will outfall, via gravity, to an existing Uisce Éireann foul sewer line located west of the development.

Pathway: Site surface water drainage network.

Receptor: Groundwater aquifer and/or surface watercourses and downstream designated sites.

Pre-Mitigation Impact: Direct, negative, slight, long term, low probability impact.

8.5.5.2.1 *Proposed Mitigation Measures*

Water quality risks are reduced by use of interception storage, silt traps, and oil/petrol interceptors.

8.5.5.2.2 *Residual Impact*

Direct, negative, imperceptible, long term, low probability effect in relation to water quality.

8.5.5.2.3 *Significance of Effects*

No significant impacts in terms of water quality from surface water drainage are expected due to the Proposed Development.

8.5.5.3 Potential Water Quality Impacts from Foul Drainage.

The operational phase of the proposed project will result in the production of foul sewage. If not adequately treated, there is potential for impacts on ground water and surface water quality.

Wastewater generated from the Proposed Development will outfall to an existing Uisce Éireann owned 225 mm foul sewer line located west of the development along the southern arm junction of the adjacent roundabout and Altan Road. The 225 mm foul sewer outfalls to an existing Uisce Éireann 375 mm foul network. It is envisaged that the 225 mm sewer line will require upgrading to a 300 mm sewer line to service the development as the number of units flowing through this network will exceed the maximum 330 units allowable for a 225 mm pipe.

The proposed foul sewer design and layout is in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water Infrastructure Standard Details and foul sewer design will be fully vetted by Uisce Éireann prior to receiving a connection offer.

All foul water will be discharged to the public sewer and will be treated at the Galway Mutton Island Wastewater Treatment Plant (WWTP) before discharges to Galway Bay. The Mutton Island WWTP has a current capacity of 170,000 population equivalent (p.e.)

Treatment process includes the following:

- Preliminary Treatment (Screening & Grit Removal)
- Primary Treatment (Upward Flow Settlement Tanks)
- Secondary Treatment (Activated Sludge)

A letter has been received from Irish Water confirming that a water connection can be facilitated for the Proposed Development. Given that waste will be appropriately treated to the required standards in the public sewer system; no potential for adverse impact on water quality exists

Pathway: Site foul water drainage network.

Receptor: Groundwater aquifer and/or surface watercourses as well as downstream designated sites.

Pre-Mitigation Impact: Direct, negative, significant, long term, likely impact.

8.5.5.3.1 *Proposed Mitigation Measures*

All foul water will be discharged to the public sewer and will be treated at the Galway Mutton Island Wastewater Treatment Plant.

8.5.5.3.2 *Residual Impact*

Given that waste will be appropriately treated to the required standards in the public sewer system; no potential for adverse impact on water quality exists.

8.5.5.3.3 *Significance of Effects*

No significant impacts in terms of water quality are expected due to the Proposed Development.

8.5.5.4 Potential Impacts on Hydrologically Connected Designated Sites

The Galway Bay Complex SAC (Code: 000268) and Inner Galway Bay SPA (Code: 004031) are located less than 1.5 kilometres to the south of the site. The culverted Knocknacarragh Stream has been incorporated into the storm sewer system and flows close to the site. Discharges from the site will connect to the municipal storm sewer which discharges into the Galway Bay Complex SAC and Inner Galway Bay SPA at Rusheen Bay. Foul water will discharge to the Uisce Éireann Mutton Island WWTP.

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no significant impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to ground or attenuation systems before discharge to the municipal storm sewer.
- All road gullies are designed to intercept and trap road grit and silt. All road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during

the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the storm sewer.
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.

Pathway: Surface water and groundwater flow paths.

Receptor: Down-gradient water quality and designated sites.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water quality.

8.5.5.4.1 *Proposed Mitigation Measures*

Standard best practice environmental control measures will be implemented during the operational phase of the development. All surface water arising on site will drain to attenuation systems, hydrocarbon interceptor and filter drain before discharge at controlled rates that are greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse. Foul water will be treated at the EPA Licensed WWTP.

8.5.5.4.2 *Residual Impact*

No significant impacts on water quality or hydrologically connected designated sites will occur. There will be no impacts on groundwater levels or existing hydrological regime or groundwater flow paths relating to designated sites, including the Galway Bay Complex SAC or Galway Bay SPA.

Therefore, no significant effects on groundwater or surface water quality and downstream designated sites are anticipated.

The potential pathway between the site works area and receptors is broken ensuring no significant impacts on designated sites.

8.5.5.4.3 *Significance of Effects*

No significant impacts on water quality, groundwater levels, existing hydrological regime, or groundwater flow paths relating to designated sites, including the Galway Bay Complex SAC or Galway Bay SPA will occur.

8.5.6 Assessment of Potential Health Effects

Potential health effects are associated with negative impacts on public and private water supplies and potential flooding. There are no mapped public supply group water scheme groundwater protection zones in the area of the Proposed Development.

The proposed site design and mitigation measures outlined in the previous subsections ensures that the potential for impacts on the water environment are not significant and so there is no pathway to public or private water supplies which in turn could impact human health.

The flood risk assessment for the development has also shown that the risk of the Proposed Development contributing to downstream flooding is minimal, and also that the development will not increase the risk of flood elsewhere.

The Geo-environmental Interpretive Report identifies a low to medium risk for groundwater as elevated concentrations of contaminants were encountered in isolated groundwater samples from the granite

bedrock. The isolated nature of the recorded exceedances of the EQS and GTV as discussed in the Geo-environmental Interpretive Report, in three of the six boreholes indicates that contamination beneath the site occurs in a series of discrete hotspots which may be impacting directly upon groundwater found in the granite bedrock and is not indicative of site-wide contamination. Should contaminated groundwater be encountered, it may need to be disposed off-site to a licensed waste disposal facility or it may be passed through a three-stage interceptor and discharged to foul sewer under a discharge license from the local authority.

8.5.7 Potential Cumulative Effects

8.5.7.1 Cumulative effects resulting from 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 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 entire project 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 the Knocknacarragh Stream, groundwater and other downgradient receptors were taken into account for the entire project and any impacts avoided through a series of mitigation measures that are fully described. The management and handling of potentially harmful materials across the entire project was assessed with mitigation proposed and described fully.

All interactions between the various elements of the project 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 development with one another.

8.5.7.2 Cumulative Effects In-Combination with Other Projects

The potential cumulative effects of the Proposed Development in combination with all the other projects listed in Section 2.2.1 of this EIAR have been considered in terms of impacts on 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 discharges to current Stormwater drainage. Uisce Éireann manage applications of discharges to stormwater infrastructure and outline when infrastructure upgrades are required. In order to discharge to the stormwater prior approval from Uisce Éireann is required. Given their granting permission there is no cumulative effects expected.

There are no proposed discharges of any substance from the site during the construction phase of the Proposed Development. The hydrological regime will not be altered significantly during the construction phase. 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 water and ground water receptors is considered to be imperceptible and so the potential for cumulative effects associated with these receptors is limited.

During the operational phase, 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 effects cumulatively will occur during the

operational phase. 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 phase of the Proposed Development will be piped to, and treated at, the municipal wastewater treatment plant. The Mutton Island treatment plant operates under licence from the EPA. The EPA cannot issue a licence in the event that emissions from that facility could lead to unacceptable environmental emissions. In circumstances where Irish Water has confirmed that the waste water arising from the Proposed Development will be treated at the Mutton Island wastewater treatment plant, the potential for cumulative effects associated with the wastewater discharges does not arise. No significant cumulative impacts on the water environment are anticipated during the construction or operational phases in circumstances where the proposed mitigation measures are implemented effectively.

8.5.8 Conclusion

There are no open surface watercourses within, adjacent or immediately downstream of the site. As a result, there is limited potential for impact on water quality or the downstream receptors.

Notwithstanding this, during each phase 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, which can have potential for impact during the construction phase.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant adverse impacts on water quality and downstream receptors.

The surface water drainage plan focuses on silt management and to control runoff rates. The key surface water control measure is that there will be no direct discharge of untreated development runoff into local watercourses during either the construction or operational phases of the project. Attenuated surface water drainage will discharge to the municipal storm drainage system during the operational phase of the development. SuDs principals will be employed meaning that clean surface waters will be directed to ground where possible.

During the operational stage there will be no impact on water environment. This will be achieved by avoidance methods and design methods including the use of attenuation tanks and pollutant interceptor devices as outlined in the accompanying Civil Design Report (Appendix 4-3).

Preventative measures during construction include fuel and concrete management and a waste management plan which will all be incorporated into the Construction and Environmental Management Plan (Refer to Appendix 4-1).

Overall, the proposal presents no significant impacts to surface water and groundwater quality provided the proposed mitigation measures are implemented.

No significant cumulative impacts on surface water, groundwater or designated sites will occur.