

8. HYDROLOGY AND HYDROGEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

McCarthy Keville O’Sullivan (MKO), on behalf of Burkeway Homes Limited, has carried out an assessment of the potential impacts of the proposed strategic housing development at Bearna, Co. Galway on hydrology and hydrogeology.

This chapter provides a description of the baseline environment in terms of hydrology and hydrogeology and identifies the potential impacts that the construction and operation of the proposed development may have on hydrology and hydrogeology. Where required, appropriate mitigation measures have been identified to avoid or reduce any potential impacts to water and an assessment of residual impacts and significance of any such residual effects is also provided.

The objectives of the assessment are:

- 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 potential effects of the Proposed Development on surface water and groundwater during construction and operational phases of the development;
- Identify mitigation measures to avoid, prevent, reduce or, if possible, offset any identified significant effects on the environment; and
- Assess significant residual impacts and cumulative or in-combination impacts of the proposed development along with other developments including residential, commercial and infrastructural developments.

8.1.2 Statement of Authority

This chapter of the EIAR was prepared by Michael Watson with assistance from Eoin Gilson.

Michael Watson completed an MA in Environmental Management at NUI, Maynooth in 1999. He is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv). Michael joined McCarthy Keville O’Sullivan Ltd. in 2014 having gained over 15 years’ experience in a Cork-based environmental & hydrogeological consultancy firm.

Eoin is an Environmental Scientist with MKO who took up his position in October 2018. Eoin holds a BSc (Hons) in Microbiology and a MSc (Hons) in Applied Environmental Science. On joining MKO Eoin has been involved on a range of renewable energy infrastructure projects, working as part of a large multi-disciplinary team to produce EIA Reports.

8.1.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with consultees, bodies with environmental responsibility and other interested parties. This consultation process and the List of Consultees is outlined in Section 2-7 of this EIAR. Matters raised by Consultees in their responses with respect to the water environment are summarised in Table 8-1 below.

Table 8.1 Scoping Consultees

No.	Consultee	Response
6	Geological Survey of Ireland	<p>Response received 13/08/2020</p> <p>GSI make a number of recommendations which can be viewed in full under Appendix 2-1 of this report.</p> <p>These relate mainly to information sources available for review and reiterating the need to protect groundwater. These information sources have been reviewed and all comments incorporated into the project design and assessment.</p>
8	Irish Water	<p>Response received 06/08/2020</p> <p>Irish Water make a number of recommendations which can be viewed in full under Appendix 2-1 of this report.</p> <p>These relate mainly to having consideration of potential impacts on IW assets and guidance regarding discharges to sewer and IW storm systems.</p> <p>The Irish Water comments have been incorporated into the project design and assessment.</p>

8.1.4 Legislative Context

The EIAR is prepared in accordance with the requirements of European Union and Irish legislation identified in Chapter 1. In addition, consideration has been given to the following provisions relevant to the assessment of potential effects of the proposed SHD on hydrology and hydrogeology:

- EU Water Framework Directive (2000/60/EC)
- EU Groundwater Directive (2006/118/EC)
- European Communities (Quality of Salmonid Waters) Regulations;
- European Communities (Environmental Objectives)(Surface Waters) Regulations 2009, as amended
- European Communities (Water Policy) Regulations 2003, as amended provide for implementation of ‘daughter’.
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended; and
- S.I. No. 296 of 2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009, as amended.

8.1.5 Relevant Guidance

The water section of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (2017): Draft 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 Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- 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 & Preliminary Hydrological Assessment

A desk study of the Proposed Development study area was largely completed prior to the undertaking of field mapping, surface water sampling and walkover assessments. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 14 (Geology of Galway Bay).
- Geological Survey of Ireland (GSI, 2004);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodinfo.ie);
- Environmental Protection Agency – “Hydrotool” Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

8.2.2 Site Data

The following data were used in preparation of this chapter:

- A walkover survey, including detailed drainage mapping, was undertaken by Eoin Gilson of MKO on the 27th August 2020. The walkover survey and hydrological mapping of the proposed site the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A walkover survey was completed by Michael Watson from MKO on the 15th September 2020.
- A flood risk assessment for the proposed development footprint area completed by OCSC (January 2020).
- Engineering Services Report completed by OCSC (January 2020).

8.2.3 Impact Assessment Methodology

Please refer to Chapter 1 of the EIAR for details on the impact assessment methodology. In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 8-2 are then used to assess the potential effect that the Proposed Development may have on them.

Table 8.2 Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

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

8.3 Receiving Environment

8.3.1 General Site Description

The site area comprises approximately 5.38ha of land located within the townlands of Trusky East, Trusky West, Freeport and Ahaglugger, approximately 6km to the west of Galway City. The elevation of the site ranges between approximately 24m and 14.5m OD (metres above Ordnance Datum). The site is currently predominantly being used as agricultural land for grazing.

In general, the site undulates with a general fall from the north (+24.0m AOD) to the southeast (+14.5m AOD), with levels along the western boundary typically +22.5m AOD to +15.1m AOD. The Trusky Stream is immediately east of the site’s boundary, which is similarly graded, from north to south. The site is bounded by improved agricultural grassland to the north and east and residential housing to the west and south.

Bedrock is close to surface over much of the site, particularly in the centre of the site where rock outcrops are visible and thin soils evident. There are numerous field boundaries, acid grasslands, scrub, dense bracken and soil and stone likely associated with some shallow excavations that occurred in the

past. The Galway Granite underlying bedrock is evident at numerous rock outcrops as well as the disturbed ground areas and stockpiles.

The Trusky Stream forms the eastern boundary of the proposed development and the riparian zone along the stream comprises wet grasses, rushes and bracken. All surface water runoff, on the existing site, currently infiltrates to the natural ground or discharges to the Trusky Stream, which in turn discharges to sea at Galway Bay, approximately 690m south from the proposed development. The majority of rainfall discharges via shallow subsurface flow to the Trusky Stream. The thin soils and the low permeability bedrock at the sites mean that there is limited potential for significant infiltration to ground.

The key sensitive receptor from a water and hydrogeology perspective is the Trusky Stream. The potential for impacts on the bedrock aquifer are limited however mitigation measures have been developed to protect the aquifer as well as the surface water receptor.

8.3.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year annual average rainfall (1981 - 2010) recorded at Athenry station, located southeast of the Proposed Development site, are presented in Table 8-3 below. This is the closest station to the proposed development site.

(Please note that these rainfall data are used for baseline characterisation purposes only and are not used for assessing runoff volumes pre/post development or for drainage design).

Table 8.3 Local Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Athenry		08° 47'08"W		53° 17'21" N		40		1945		N/A		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
117	88	95	72	75	80	87	108	100	129	120	123	1,193

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is at Claremorris station, approximately 50 kilometres northeast of the site. The long-term average PE for this station is 408 mm/yr. This value is used as a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 388mm/yr (which is $0.95 \times PE$).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

$$\text{Effective rainfall (ER)} = \text{AAR} - \text{AE}$$

$$= 1,193\text{mm/yr} - 388\text{mm/yr}$$

$$\text{ER} = 805\text{mm/yr}$$

The annual recharge and runoff rates for the site are estimated to be 563mm/yr and 242mm/yr respectively. The mixture of coverage of well-draining mineral soils and peaty poorly drained mineral means recharge rates are likely to be towards the middle of the GSI range. The greenfield runoff rates for the site have been calculated using the ICPSuDS Input, (Flood Studies Report (FSR) Method, the

rainfall runoff discharging from the greenfield site area that is to be developed in its existing condition has been estimated at $Q_{BARrural} = 19.2 \text{ l/s}$ (5.5 l/s/ha) and are described in the Engineering Services Report for the project. A copy of the Engineering Services Report is included as Appendix 4-3 of this EIAR.

8.3.3 Regional Hydrology

On a regional scale, the site is located within Hydrometric Area 31 of the Western River Basin District. The site is located in the Galway Bay North catchment and Knock[Furbo]_SC_010 sub-catchment under the Water Framework Directive (WFD). A local hydrology map is shown as Figure 8-1.

The Trusky Stream forms the eastern boundary of the proposed development and flows in a north-south direction towards Galway Bay. It is highly likely that rainfall falling at the site makes it to this stream, given the distance and topography of the site.

8.3.4 Local Hydrology

The site of the proposed development is bounded by the Trusky Stream on its eastern boundary. The Trusky Stream is approximately 3.1 kilometres long and flows into Galway Bay at Bearna Pier. The majority of the site appears to be well drained from observations during the site visit. No evidence of water logging, such as the growth of reeds was observed, through much of the site and, in particular, within the areas proposed for development. The riparian zone along the stream comprises wet grasses, rushes and bracken.

In the areas surrounding the proposed development site to the west and southeast, the ground has been mainly built upon/made. This hard surfacing combined with extensive storm water sewer systems means that the drainage of the area has been heavily modified and generally directed to the municipal sewer or likely discharges via soakways. In the areas to the north, south and east of the site, where agricultural lands are found, the drainage is similar to the subject site.

8.3.5 Flood Risk Identification

A Flood Risk Assessment was completed by O'Connor Sutton Cronin Consulting Engineers in September 2020 and is included in the planning application submission. The results of this assessment are summarized here.

Variation No.2(a) Galway County Development Plan 2015-2021 (“the Bearna Plan”) includes a Flood Risk Management map, which establishes “Indicative Flood Zones” at the subject site. The map indicates that the lands zoned ‘OS’ are within Indicative Flood Zones A&B. The map indicates that two areas of lands zoned ‘R’ are within Indicative Flood Zones A&B and are subject to Objective CCF6. The remainder of the lands zoned ‘R’ are within Indicative Flood Zone C.

To inform the site-specific flood risk assessment, a detailed hydrological assessment and hydraulic modelling was undertaken to quantify the fluvial flood risk at the subject site. The analysis shows that, at four locations within the subject site, the predicted flood extent extend into areas shown to be within Indicative Flood Zone C in the Flood Risk Management map (Variation No.2(a) Galway County Development Plan 2015-2021 Bearna Plan).

All proposed buildings will be located exclusively within (a) lands zoned ‘R’ (and not subject to Objective CCF6) and (b) Indicative Flood Zone C (as identified in Variation No.2(a) Galway County Development Plan 2015-2021 Bearna Plan); and outside (c) the predicted flood extent for the 0.1% AEP flood event. The building floor levels have been selected to provide at least 500mm freeboard over the adjacent 1.0%AEP flood water levels, in accordance with GDSDS recommendations.

Where the proposed drainage system is constructed as designed (in accordance with the relevant standards and regulations), the flood risks arising from the proposed drainage infrastructure will be negligible

8.3.6 Surface Water Hydrochemistry

Q-rating status data is not available for the Trusky Stream that runs along the eastern boundary of the site. An EPA monitoring point exists on this watercourse downstream of the development site, however, no river status data is available. The Trusky Stream was used to determine surface water hydrochemistry of the proposed development site. Samples were taken immediately upstream and downstream of the site. These samples were collected on 2nd September 2020 and data for a number of parameters were determined, as seen in Table 8-4 below. The results show that the existing baseline water quality is good and that the chemical signature of the water is similar between the up and downstream locations. The laboratory results are included in Appendix 8-1.

Table 8.4 Surface water laboratory results from 19th February 2019

Parameter	Unit	LOD	SW1	SW2	EQS	AA-EQS	MAC-EQS
Dissolved Arsenic	µg/l	<2.5	<2.5	<2.5	25	20	-
Dissolved Boron	µg/l	<12	<12	<12	2000	-	-
Dissolved Cadmium	µg/l	<0.5	<0.5	<0.5	5	-	-
Total Dissolved Chromium	µg/l	<1.5	<1.5	<1.5	30	0.6	3.2
Dissolved Copper	µg/l	<7	<7	<7	30	5	-
Dissolved Lead	µg/l	<5	<5	<5	10	-	-
Dissolved Mercury	µg/l	<1	<1	<1	1	-	-
Dissolved Nickel	µg/l	<2	<2	<2	50	20	-
Dissolved Selenium	mg/l	<3	<3	<3	-	-	-
Dissolved Zinc	µg/l	<3	5	6	100	40	-
Total Phosphorus	µg/l	<5	136	154			
Sulphate as SO4	mg/l	<0.5	14.5	11.0	200	-	-
Chloride	mg/l	<0.3	22.7	21.7	250	-	-
Nitrate as NO3	mg/l	<0.2	1.3	1.2			
Nitrite as NO2	mg/l	<0.02	<0.02	<0.02			
Ortho Phosphate as PO4	mg/l	<0.03	0.07	0.08			
Ammoniacal Nitrogen as N	mg/l	<0.03	0.07	0.05	0.2	0.065	-
BOD (Settled)	mg/l	<1	2	2	-	-	-
COD (Settled)	mg/l	<7	63	64			
Electrical Conductivity at 25C	µS/cm	<2	255	225	1000	-	-
pH	pH units	<0.01	7.77	7.72	-	4.5<pH<9.0	4.5<pH<9.0
Total Suspended Solids	mg/l	<10	14	17			

8.3.7 Hydrogeology

The Proposed Development site is underlain by the Megacrystic-Porphyrific Granite (Galway Granite) which is described as Monzogranite, mafic, megacrystic. The Megacrystic-Porphyrific Granite

Formation is classified by the GSI as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones. A bedrock aquifer map is shown as Figure 8-2.

This aquifer has expected transmissivity in the range of 20-30m²/d (this may be higher in the vicinity of faults) and low storativity (<0.5%). Groundwater here should be unconfined (GSI, 2004).

Groundwater flow paths are expected to be concentrated in fractures and weathered zones in the vicinity of faults. The flow paths are typically short (up to 100 metres). The flow direction is generally to the south, driven by topography (GSI, 2004).

Shallow groundwater from this aquifer generally discharges to streams and lakes. Small springs and seeps are likely to occur at the stream heads and along their course (GSI, 2004).

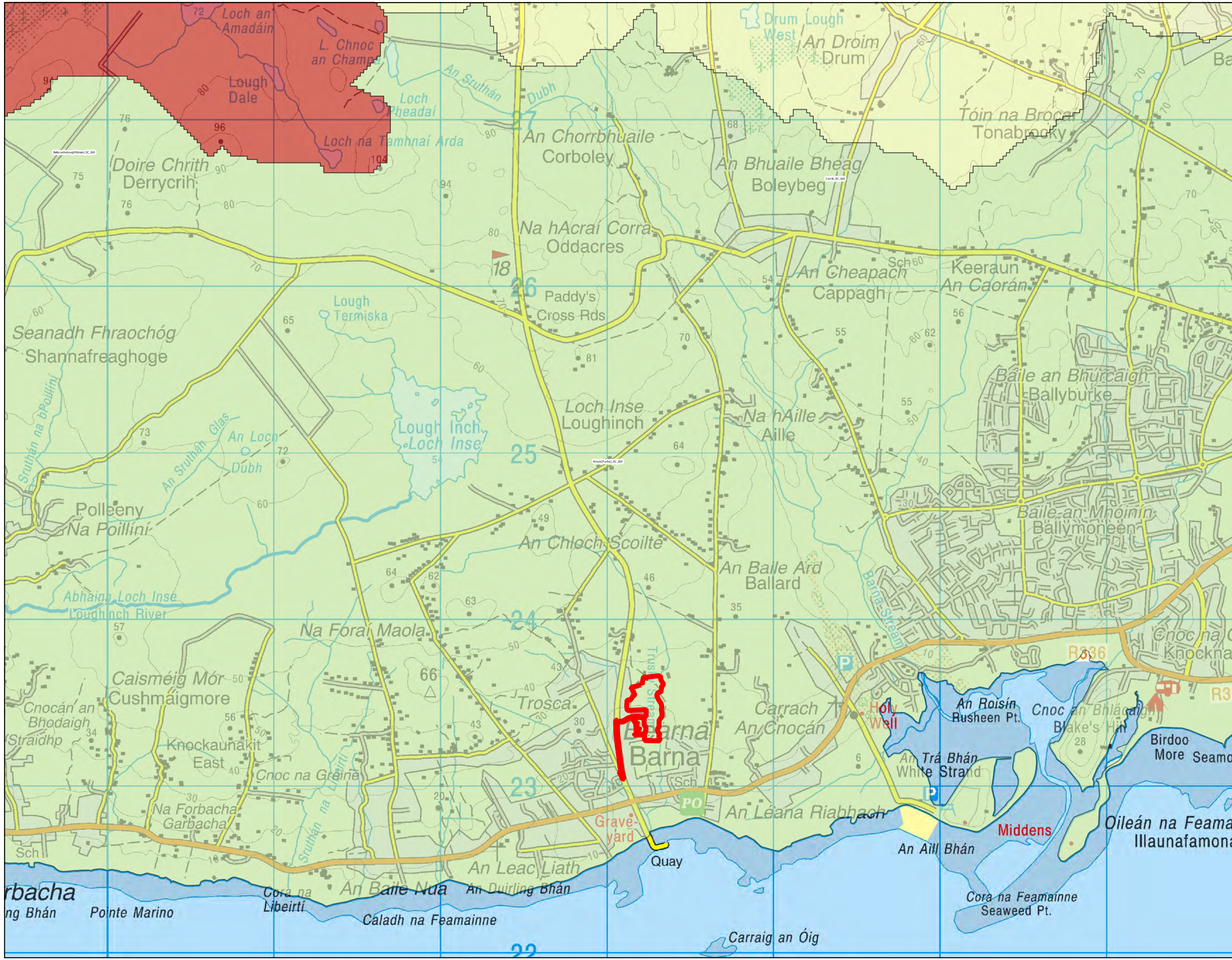
8.3.8 Groundwater Vulnerability

The vulnerability rating of the aquifer within the overall site is classified as “Rock at or near surface or Karst” with a small area classified as “extreme”. The site walkover surveys confirmed this classification and reflects the thin layer of soils and subsoils present on site.

8.3.9 Groundwater Hydrochemistry

There are no groundwater quality data for the proposed development site and groundwater sampling would generally not be undertaken for this type of development in terms of EIAR reporting as groundwater quality impacts would not be anticipated due to the nature of the proposed works and the poor aquifer beneath the site. There are also no proposed direct discharges to ground. The WFD status for the local groundwater body in terms of water quality is **Good** and therefore this is therefore considered to be the baseline condition for groundwater in the area of the proposed development.

Based on data from GSI publication Calcareous/Non calcareous classification of bedrock in the Republic of Ireland (WFD,2004), alkalinity for this bedrock type generally ranges from 43 – 199mg/L while electrical conductivity and hardness were reported to have mean values of 148µS/cm and 442mg/L respectively.



Map Legend

- Site Boundary
- WFD Subcatchments
 - BallycurkeLough Stream_SC_010
 - Corrib_SC_010
 - Knock Furbo_SC_010

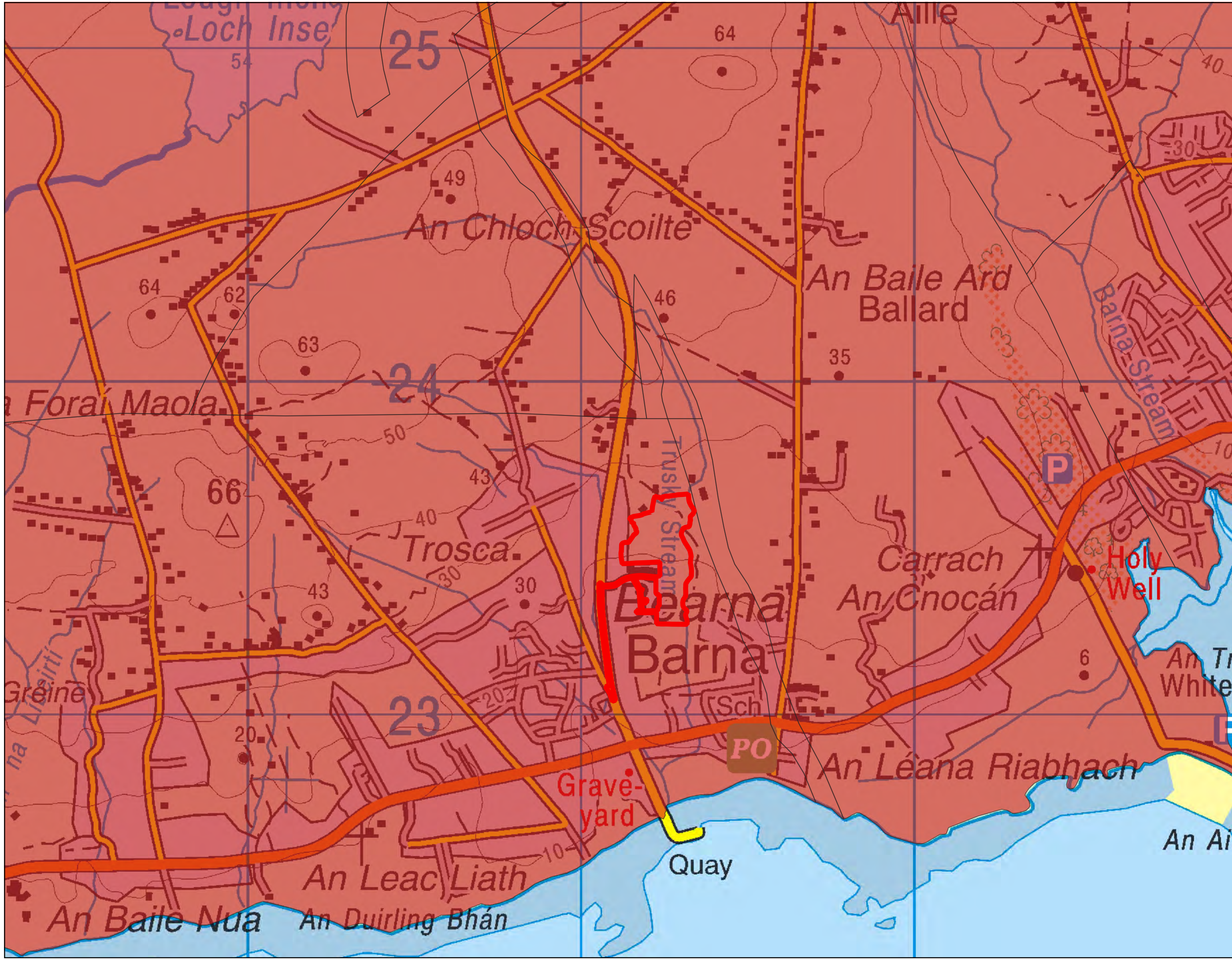
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Local Hydrology



Project Title: **Burkeway Bearná SHD**

Drawn By: SC	Checked By: MW
Project No: 190450-a	Drawing No: Fig 8.1
Scale: 1:20000	Date: 30.09.2020


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Map Legend

-  Site Boundary
-  Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

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Drawing Title	
Local Bedrock Aquifers	
Project Title	
Burkeway Bearná SHD	
Drawn By	Checked By
SC	MW
Project No.	Drawing No.
190450-a	Fig 8.2
Scale	Date
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8.3.10 Water Framework Directive Water Body Status & Objectives

The River Basin Management Plan was adopted in 2018 and has amalgamated all previous river basin districts into one national river basin management district. The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the proposed development, include the following:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a ‘high’ status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2021;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

In considering these objectives, surface waters, regardless of whether they have ‘Poor’ or ‘High’ status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all.

Local Groundwater Body and Surface Water Body status and risk result are available from (www.catchments.ie).

The proposed development site predominately drains to the underlying subsoil and aquifer and surface watercourses. The Trusky Stream drains the land along the eastern boundary of the site.

The River Water Quality Status (2013 – 2018) for this stream (IE_WE_31B020500) is rated as “Unassigned”.

8.3.11 Groundwater Body Status

Local Groundwater Body (GWB) status information are available (www.catchments.ie). Refer to Figure 8-3 for the location and extent of local groundwater body.

The Spiddal GWB (IE_WE_G_0004) which underlies the western portion of Proposed Development site is assigned ‘Good’ status under the WFD 2013-2018.

8.3.12 Designated Sites & Habitats

Designated European sites include Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). Whilst other designated sites include National Heritage Areas (NHAs), and Proposed National Heritage Areas (pNHAs),

The proposed development site is located approximately 0.9 kilometres north of the Galway Bay Complex candidate Special Area of Conservation (cSAC), 1.2 kilometres north of Inner Galway Bay Special Protection Area (SPA) and approximately 6.3 kilometres to the southwest of the Lough Corrib Special Area of Conservation (SAC) by land. The Galway Bay Complex is also listed as a proposed NHA. A designated sites map is attached as Figure 8-4. A list of European Sites is provided in Table 8.5, and a list of other designated sites is provided in Table 8.6.

The assimilative capacity assessment is included as Appendix 6-2 of this EIAR.

Table 8.5 European Sites

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
Special Areas of Conservation (SAC)/candidate Special Areas of Conservation (cSAC)			
Galway Bay Complex cSAC [000268] Distance: 0.9km (Hydrological distance between the mouth of the Trusky Stream and the cSAC 1.5 km)	<ul style="list-style-type: none"> > [1140] Mudflats and sandflats not covered by seawater at low tide > [1150] Coastal lagoons* > [1160] Large shallow inlets and bays > [1170] Reefs > [1220] Perennial vegetation of stony banks > [1310] <i>Salicornia</i> and other annuals colonising mud and sand > [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) > [1355] Otter (<i>Lutra lutra</i>) > [1365] Harbour seal (<i>Phoca vitulina</i>) > [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) > [3180] Turloughs* > [5130] <i>Juniperus communis</i> formations on heaths or calcareous grasslands > [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>)(*important orchid sites) > [7210] Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>* > [7230] Alkaline fens > 	Detailed conservation objectives for this site, (Version 1, April 2013), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects as the project site is located entirely outside and approximately 0.9km distant from the European site. There is no potential for indirect effects on the following Qualifying Interests (QIs) as there is no potential link or connectivity between the proposed development and these terrestrially or groundwater dependant habitats: <ul style="list-style-type: none"> > Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] > Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210] > Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] > Alkaline fens [7230] > Limestone pavements [8240] > Perennial vegetation of stony banks [1220] > Turloughs [3180] > <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>The Trusky Stream is located within the proposed development site boundary. The stream is separated from the main construction footprint by over 10m at its nearest point. However, the development also involves the discharge of surface water from the proposed development, to the Trusky Stream. This involves, the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls. There will also be some minor landscaping works including the planting of native species and the construction of a boundary fence along the stream banks. The stream discharges to Galway Bay approximately 1.5km to the west of the cSAC.</p> <p>The Assimilative Capacity Modelling Study that is included as Appendix 6-2 demonstrates that even in a highly unlikely pollution event, very low levels of pollutant have the potential to enter this designated site via Galway Bay.</p> <p>However, adopting an extremely precautionary approach, a potential pathway for indirect effects on the following aquatic QIs has been identified via the Trusky Stream in the form of deterioration of surface water quality resulting from potential pollution associated with the</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>construction and operational phases of the development:</p> <ul style="list-style-type: none"> ➤ [1140] Mudflats and sandflats not covered by seawater at low tide ➤ [1150] Coastal lagoons* ➤ [1160] Large shallow inlets and bays ➤ [1170] Reefs ➤ [1310] <i>Salicornia</i> and other annuals colonising mud and sand ➤ [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) ➤ [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) ➤ [1355] Otter (<i>Lutra lutra</i>) ➤ [1365] Harbour seal (<i>Phoca vitulina</i>) <p>As there is potential for indirect effects on certain QIs of this European site via the Trusky Stream in the form of deterioration of surface water quality resulting from potential pollution associated with the construction and operational phases of the development, it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.</p>
<p>Lough Corrib cSAC [000297]</p>	<ul style="list-style-type: none"> ➤ [1029] Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>) ➤ [1092] White-clawed Crayfish (<i>Austropotamobius pallipes</i>) 	<p>Detailed conservation objectives for this site, (Version 1, April 2017), were</p>	<p>There will be no direct effects as the project site is located entirely outside and</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
<p>Distance: 5.9km</p>	<ul style="list-style-type: none"> > [1095] Sea Lamprey (<i>Petromyzon marinus</i>) > [1096] Brook Lamprey (<i>Lampetra planeri</i>) > [1106] Salmon (<i>Salmo salar</i>) > [1303] Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>) > [1355] Otter (<i>Lutra lutra</i>) > [1393] Slender Green Feather-moss (<i>Drepanocladus vernicosus</i>) > [1833] Slender Naiad (<i>Najas flexilis</i>) > [3110] Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) > [3130] Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea > [3140] Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. > [3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation > [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) > [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) > [7110] Active raised bogs* > [7120] Degraded raised bogs still capable of natural regeneration > [7150] Depressions on peat substrates of the <i>Rhynchosporion</i> > [7210] Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>* > [7230] Petrifying springs with tufa formation (Cratoneurion)* > [7220] Alkaline fens > [8240] Limestone pavements* > [91A0] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles > [91D0] Bog woodland* 	<p>reviewed as part of the assessment and are available at www.npws.ie</p>	<p>approximately 6km distant from the European site.</p> <p>No pathway for indirect effects on the terrestrial QIs for which the cSAC has been designated exists.</p> <p>There is no surface or ground water connectivity between the proposed development and the cSAC, which is located in a separate hydrological catchment. Therefore no potential for indirect effects on the aquatic QIs for which the cSAC has been designated exists.</p> <p>The development site is located outside the 2.5km core foraging range for lesser horseshoe bat as outlined in Map 11 of the Site-Specific Conservation Objectives document. No potential for indirect effects on this species, through disturbance or displacement, exists.</p> <p>No pathway for effect exists and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects,</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.
<p>Connemara Bog Complex cSAC [002034]</p> <p>Distance: 7.4km</p> <p>(Hydrological distance between the mouth of the Trusky Stream and the cSAC over 50km)</p>	<ul style="list-style-type: none"> > [1065] Marsh Fritillary (<i>Euphydryas aurinia</i>) > [1106] Salmon (<i>Salmo salar</i>) > [1150] Coastal lagoons* > [1170] Reefs > [1355] Otter (<i>Lutra lutra</i>) > [1833] Slender Naiad (<i>Najas flexiles</i>) > [3110] Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) > [3130] Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> > [3160] Natural dystrophic lakes and ponds > [3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation > [4010] Northern Atlantic wet heaths with <i>Erica tetralix</i> > [4030] European dry heaths > [6410] <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) > [7130] Blanket bogs (* if active bog) > [7140] Transition mires and quaking bogs > [7150] Depressions on peat substrates of the <i>Rhynchosporion</i> > [7230] Alkaline fens > [91A0] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles 	<p>Detailed conservation objectives for this site, (Version 1, October 2015), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>There will be no direct effects as the project site is located entirely outside and approximately 7.5km distant from the European site.</p> <p>There is no surface or ground water connectivity between the proposed development and the terrestrial elements of the cSAC.</p> <p>The marine elements of the cSAC are located over 30km in a straight line distance from the site of the proposed development (and over 50km via surface water) and the potential for significant effects on these QIs has been excluded on the basis of the objective information contained in the Assimilative Capacity Modelling Study and as set out in Section 3.2 above. No pathways for significant indirect effects on this European Site exists.</p> <p>No pathway for effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			European site. Accordingly, a Stage Two Appropriate Assessment is not required.
<p>Black Head-Poulsallagh Complex cSAC [000020]</p> <p>Distance: 11.7km</p>	<ul style="list-style-type: none"> > [1170] Reefs > [1220] Perennial vegetation of stony banks > [1395] Petalwort (<i>Petalophyllum ralfsii</i>) > [3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation > [4060] Alpine and Boreal heaths > [5130] <i>Juniperus communis</i> formations on heaths or calcareous grasslands > [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>)(*important orchid sites) > [6510] Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) > [7220] Petrifying springs with tufa formation (<i>Cratoneurion</i>) > [8240] Limestone pavements* > [8330] Submerged or partially submerged sea caves 	<p>Detailed conservation objectives for this site, (Version 1, May 2014), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>There will be no direct effects as the project site is located entirely outside and approximately 11½km distant from the European site.</p> <p>There is no surface or ground water connectivity between the proposed development and the terrestrial elements of the cSAC. The marine elements of the cSAC are located over 11km from the site of the proposed development and the potential for significant effects on these has been excluded on the basis of the objective information contained in the Assimilative Capacity Modelling Study (Appendix 6-2), and as set out in Section 3.2 above.. As such, it can be objectively concluded that there is no potential for significant effect on this European Site.</p> <p>> No pathway for significant effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020))	Conservation Objectives	Likely Zone of Impact Determination
<p>Ross Lake and Woods cSAC [001312]</p> <p>Distance: 12.1km</p>	<ul style="list-style-type: none"> ➤ [1303] Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>) ➤ [3140] Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. 	<p>Detailed conservation objectives for this site, (Version 1, October 2018), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>There will be no direct effects as the project site is located entirely outside and approximately 12km distant from the European site.</p> <p>The proposed development and the cSAC are located within different hydrological catchments and there is no connectivity between the proposed development and the cSAC. No pathways for indirect effects on the terrestrial or aquatic QIs exist.</p> <p>The development site is located outside of the 2.5km core foraging range for lesser horseshoe bat as detailed in Map 3 of the Site Specific Conservation Objectives. No potential for indirect effects on this species, through disturbance or displacement, exists.</p> <p>No pathway for effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>
<p>East Burren Complex cSAC [001926]</p> <p>Distance: 13.1km</p>	<ul style="list-style-type: none"> ➤ [3140] Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. ➤ [3180] Turloughs 	<p>Generic conservation objectives exist for this site (Generic Version 7.0, NPWS 2020):</p>	<p>There will be no direct effects as the project site is located entirely outside and approximately 13km distant from the European site.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
	<ul style="list-style-type: none"> ➤ [3260] Water courses of plain to montane levels with the <i>Ranunculon fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation ➤ [4060] Alpine and Boreal heaths ➤ [5130] <i>Juniperus communis</i> formations on heaths or calcareous grasslands ➤ [6130] Calaminarian grasslands of the <i>Violetalia calaminariae</i> ➤ [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) ➤ [6510] Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) ➤ [7210] Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> ➤ [7220] Petrifying springs with tufa formation (<i>Cratoneurion</i>) ➤ [7230] Alkaline fens ➤ [8240] Limestone pavements ➤ [8310] Caves not open to the public ➤ [91E0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) ➤ [1065] <i>Euphydryas aurinia</i> (Marsh Fritillary) ➤ [1303] <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) ➤ [1355] <i>Lutra lutra</i> (Otter) 	<p>‘To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected’</p>	<p>The cSAC and the proposed development are located within different hydrological catchments and there is no connectivity between the development and the cSAC. Therefore no potential for indirect effects on the cSAC exists.</p> <p>The development site is located outside of the core 2.5km foraging range for lesser horseshoe bat. No potential for indirect effects on this species, through disturbance or displacement, exists.</p> <p>No pathway for effect exist. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>
<p>Moneen Mountain cSAC [000054]</p> <p>Distance: 13.3km</p>	<ul style="list-style-type: none"> ➤ [3180] Turloughs* ➤ [4060] Alpine and Boreal heaths ➤ [5130] <i>Juniperus communis</i> formations on heaths or calcareous grasslands ➤ [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) ➤ [7220] Petrifying springs with tufa formation (<i>Cratoneurion</i>)* 	<p>Generic conservation objectives exist for this site (Generic Version 7.0, NPWS 2020):</p> <p>‘To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected’</p>	<p>There will be no direct effects as the project site is located entirely outside and approximately 13km distant from the European site.</p> <p>No pathway for indirect effects on the terrestrial QIs for which the cSAC has been designated exists.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
	<ul style="list-style-type: none"> > [8240] Limestone pavements > [1065] Marsh Fritillary (<i>Euphydryas aurinia</i>) > [1303] Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>) 		<p>The cSAC and the proposed development are located within different hydrological catchments and there is no connectivity between the development and the cSAC. Therefore no potential for indirect effects exists on the cSAC.</p> <p>The development site is located outside of the 2.5km core foraging range for lesser horseshoe bat. No potential for indirect effects on this species, through disturbance or displacement, exists.</p> <p>No pathway for effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>
Special Protection Area (SPA)			
Inner Galway Bay SPA [004031]	<ul style="list-style-type: none"> > [A003] Great Northern Diver (<i>Gavia immer</i>) > [A017] Cormorant (<i>Phalacrocorax carbo</i>) > [A028] Grey Heron (<i>Ardea cinerea</i>) > [A046] Brent Goose (<i>Branta bernicla hrota</i>) 	Detailed conservation objectives for this site, (Version 1, May 2013), were reviewed as part of the assessment and are available at www.npws.ie	The proposed development is located entirely outside the SPA and is separated from it by 1.3 km. There is no potential for direct effects on this European Site.

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
<p>Distance: 1.3km</p> <p>(Hydrological distance between the mouth of the Trusky Stream and the SPA 1.5 km)</p>	<ul style="list-style-type: none"> > [A050] Wigeon (<i>Anas penelope</i>) > [A052] Teal (<i>Anas crecca</i>) > [A056] Shoveler (<i>Anas clypeata</i>) > [A069] Red-breasted Merganser (<i>Mergus serrator</i>) > [A137] Ringed Plover (<i>Charadrius hiaticula</i>) > [A140] Golden Plover (<i>Pluvialis apricaria</i>) > [A142] Lapwing (<i>Vanellus vanellus</i>) > [A149] Dunlin (<i>Calidris alpina alpina</i>) > [A157] Bar-tailed Godwit (<i>Limosa lapponica</i>) > [A160] Curlew (<i>Numenius arquata</i>) > [A162] Redshank (<i>Tringa tetanus</i>) > [A169] Turnstone (<i>Arenaria interpres</i>) > [A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) > [A182] Common Gull (<i>Larus canus</i>) > [A191] Sandwich Tern (<i>Sterna sandvicensis</i>) > [A193] Common Tern (<i>Sterna hirundo</i>) > [A999] Wetlands and Waterbirds > 		<p>The proposed development site does not provide suitable habitat for the species for which the SPA has been designated. Therefore no pathway for indirect effects as a result of disturbance or displacement have been identified.</p> <p>The Trusky Stream is located within the proposed development site boundary. The stream is separated from the main construction footprint by over 10m at its nearest point. However, the development also involves the discharge of surface water from the proposed development, to the Trusky Stream. This involves, the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls. There will also be some minor landscaping works including the planting of native species and the construction of a boundary fence along the stream banks. The stream discharges to Galway Bay approximately 1.5km to the west of the SPA.</p> <p>The Assimilative Capacity Modelling Study that is included as Appendix 6-2, demonstrates that even in a highly unlikely pollution event, very low levels of pollutant have the potential to enter this designated site via Galway Bay.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>However, adopting an extremely precautionary, a potential pathway for indirect effects on the supporting wetland habitat for SCI bird species was identified in the form of deterioration of water quality resulting from potential pollution associated with the construction and operational phases of the development. The SCI [A999] Wetlands and Waterbirds is assessed in relation to the wetland habitat for all SCI species.</p> <p>The European site is located within the project Zone of Influence and, as there is potential for indirect effects on certain QIs of this European site via the Trusky Stream in the form of deterioration of surface water quality resulting from potential pollution associated with the construction and operational phases of the development, it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.</p>
<p>Lough Corrib SPA [004042]</p> <p>Distance: 6.3km</p>	<ul style="list-style-type: none"> > [A051] Gadwall (<i>Anas strepera</i>) > [A056] Shoveler (<i>Anas clypeata</i>) > [A059] Pochard (<i>Aythya ferina</i>) > [A061] Tufted Duck (<i>Aythya fuligula</i>) 	<p>Generic conservation objectives exist for this site (Generic Version 7.0, NPWS 2020):</p>	<p>The proposed development is located entirely outside the SPA and is separated from it by over 6km. There is no potential for direct effects on this European Site.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
	<ul style="list-style-type: none"> > [A065] Common Scoter (<i>Melanitta nigra</i>) > [A082] Hen Harrier (<i>Circus cyaneus</i>) > [A125] Coot (<i>Fulica atra</i>) > [A140] Golden Plover (<i>Pluvialis apricaria</i>) > [A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) > [A182] Common Gull (<i>Larus canus</i>) > [A193] Common Tern (<i>Sterna hirundo</i>) > [A194] Arctic Tern (<i>Sterna paradisaea</i>) > [A395] Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) > [A999] Wetland and Waterbirds 	<p>‘To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA’</p> <p>And</p> <p>‘To maintain or restore the favourable conservation condition of the wetland habitat at Lough Corrib SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.’</p>	<p>No surface or ground water connection between the SPA, which is in a different hydrological catchment, and the proposed development site has been identified. Therefore no potential for indirect effects on the supporting wetland habitat [A999] for SCI bird species as a result of deterioration in water quality exists.</p> <p>The proposed development site does not provide suitable habitat for the species for which the SPA has been designated. Therefore no pathway for indirect effects as a result of disturbance or displacement exists.</p> <p>No pathway for effect was identified. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>
<p>Connemara Bog Complex SPA [004181]</p> <p>Distance: 11.0km</p>	<ul style="list-style-type: none"> > [A017] Cormorant (<i>Phalacrocorax carbo</i>) > [A098] Merlin (<i>Falco columbarius</i>) > [A140] Golden Plover (<i>Pluvialis apricaria</i>) > [A182] Common Gull (<i>Larus canus</i>) 	<p>Generic conservation objectives exist for this site (Generic Version 7.0, NPWS 2020):</p> <p>‘To maintain or restore the favourable conservation condition of the bird</p>	<p>The proposed development is located entirely outside the SPA and is separated from it by 11km. There is no potential for direct effects on this European Site.</p> <p>There is no surface or ground water connectivity between the proposed</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
		species listed as Special Conservation Interests for this SPA'	<p>development and the SPA. The proposed development site does not support suitable habitat for the species for which the SPA has been designated. Therefore no pathway for indirect effects as a result of disturbance or displacement has been identified.</p> <p>No pathway for effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.</p>
<p>Cregganna Marsh SPA</p> <p>Distance: 14.1km</p>	<p>➤ [A395] Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>)</p>	<p>Generic conservation objectives exist for this site (Generic Version 7.0, NPWS 2020):</p> <p>'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'</p>	<p>The proposed development is located entirely outside the SPA and is separated from it by over 14km. There is no potential for direct effects on this European Site.</p> <p>The proposed development site does not support suitable habitat for the species for which the SPA has been designated. Therefore no pathway for indirect effects as a result of disturbance or displacement.</p> <p>No pathway for effect exists. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this</p>



European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			European site. Accordingly, a Stage Two Appropriate Assessment is not required.

Table 8.6 Other Designated Sites

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
Natural Heritage Area (NHA)		
Moycullen Bogs NHA [002364] Distance: 1.6km	> Peatlands [4]	There will be no direct effects as the proposed development is located entirely outside, and 1.6 km from the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 1.5km away with no identifiable habitat, surface or groundwater connection. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Cregganna Marsh NHA [000253] Distance: 14.1km	> Birds [12]	There will be no direct effects as the proposed development is located entirely outside, and over 14km from, the designated site. No connectivity exists between the proposed development and the designated site, which is separated from the proposed development by Galway Bay with no identifiable habitat, surface or groundwater connection. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Proposed Natural Heritage Area (pNHA)		
Galway Bay Complex Distance: 0.9km (Hydrological distance between the mouth of the Trusky Stream and the SPA 1.5 km)	> N/A	There will be no direct effects as the project footprint is located entirely outside, and 0.9km from, the designated site. The Trusky Stream is located within the site boundary and the development involves the discharge of surface water to the stream. This also involves the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls from the proposed development. The stream discharges to Galway Bay approximately 1.5km to the west of the pNHA. Therefore, taking a precautionary approach, a potential pathway for indirect effects the pNHA has been identified in the form of deterioration of surface water

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
		<p>quality resulting from pollution associated with the construction and operational phases of the development.</p> <p>A potential for effect has been identified through surface water pollution, this site is within the Likely Zone of Impact.</p>
<p>Furbogh Wood</p> <p>Distance: 4.2km</p>	<p>> N/A</p>	<p>There will be no direct effects as the development footprint is located entirely outside, and 4.2km from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 4km away with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Lough Corrib</p> <p>Distance: 6.2km</p>	<p>> N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 6.2km from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 6.2km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Ballycuirke Lough</p> <p>Distance: 7.1km</p>	<p>> N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 7.1 km from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 7km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Connemara Bog Complex</p>	<p>> N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 7.4km from, the designated site. No connectivity was identified between the proposed development</p>

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
<p>Distance: 7.4km</p>		<p>and the designated site, which is located over 7km away and with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Killarainy Lodge, Moycullen</p> <p>Distance: 9.1km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 9.1km from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 9km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Drimcong Wood</p> <p>Distance: 10.0km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 10km from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 10km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Black Head-Poulsallagh Complex</p> <p>Distance: 11.7km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 11km from, the designated site.</p> <p>The Trusky Stream is located within the proposed development site boundary. The stream is separated from the main construction footprint by over 10m at its nearest point. However, the construction works also involve the discharge of surface water from the proposed development, to the Trusky Stream. This involves, the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls. There will also be some minor landscaping works including the planting of native species and the construction of a boundary fence along the stream banks. The stream discharges to Galway Bay approximately 11km to the north east of the and the potential for significant effects on</p>

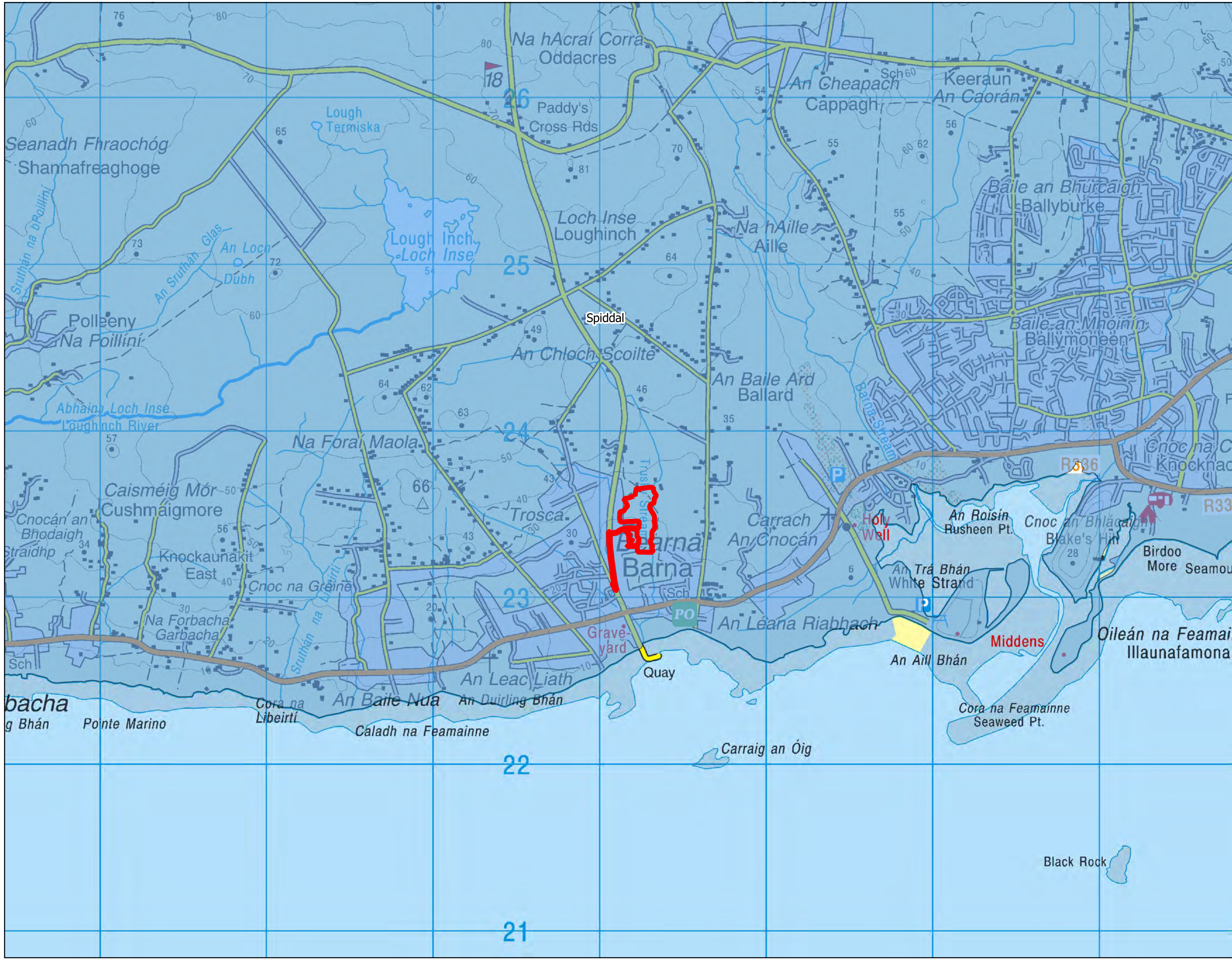
Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
		<p>these has been excluded following a review of the Assimilative Capacity Modelling Study that is provided as Appendix 6-2. This report shows that no pollutants were recorded in the vicinity of this pNHA. There is no potential for significant effects on this site and any such effects can be excluded.</p> <p>No pathway for significant effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Ross Lake and Woods</p> <p>Distance: 12.1km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 12.1km away from, the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 12km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>East Burren Complex</p> <p>Distance: 13.1km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 13.1km from the designated site. No surface or groundwater connectivity was identified between the proposed development and this terrestrial designated site, which is located over 13km away on the opposite side of Galway Bay.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Moneen Mountain</p> <p>Distance: 13.3km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 13.3km from the designated site. No surface or groundwater connectivity was identified between the proposed development and this terrestrial designated site, which is located over 13km away on the opposite side of Galway Bay.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
<p>Kiltullagh Turlough</p> <p>Distance: 14.2km</p>	<p>➤ N/A</p>	<p>There will be no direct effects as the project footprint is located entirely outside, and 14.2km from the designated site. No connectivity was identified between the proposed development and the designated site, which is located over 14km away, in a separate hydrological catchment with no identifiable habitat, surface or groundwater connection.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
<p>Ramsar Site</p>		
<p>Inner Galway Bay</p> <p>Site number: 838</p>	<p>The shallow sheltered part of a large sea bay with numerous intertidal inlets and small low islands composed of glacial deposits. The area provides important habitat for marine life along Ireland's west coast. The site supports the richest seaweed flora on the Irish Coast (500+ species) and 65% of the Irish marine algal flora occur in the area. The site supports internationally and nationally important numbers of numerous species of waterbirds. There is a large cormorant colony on Teer Island. Human activities include aquaculture.</p>	<p>The Trusky Stream is located within the site boundary and the development involves the discharge of surface water to the stream. This also involves the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls from the proposed development. The stream discharges to Galway Bay approximately 1.5km to the west of Inner Galway Bay. Therefore, taking a precautionary approach, a potential pathway for indirect effects the Ramsar Site has been identified in the form of deterioration of surface water quality resulting from pollution associated with the construction and operational phases of the development.</p> <p>A potential for effect has been identified through surface water pollution, this site is within the Likely Zone of Impact. Further assessment is required.</p>



8.3.13 Water Resources

There are no groundwater protection zones mapped within the proposed development site or study area. There is 1 no. mapped private wells (GSI database to accuracy of <50m) located approximately 5km north east of the proposed site, which was obtained from the GSI well database (www.gsi.ie).

No groundwater wells would be expected to be in use in the area, given the municipal supply and the proximity to the sea. Notwithstanding this, an assessment of groundwater resources relative to the proposed development is completed below.



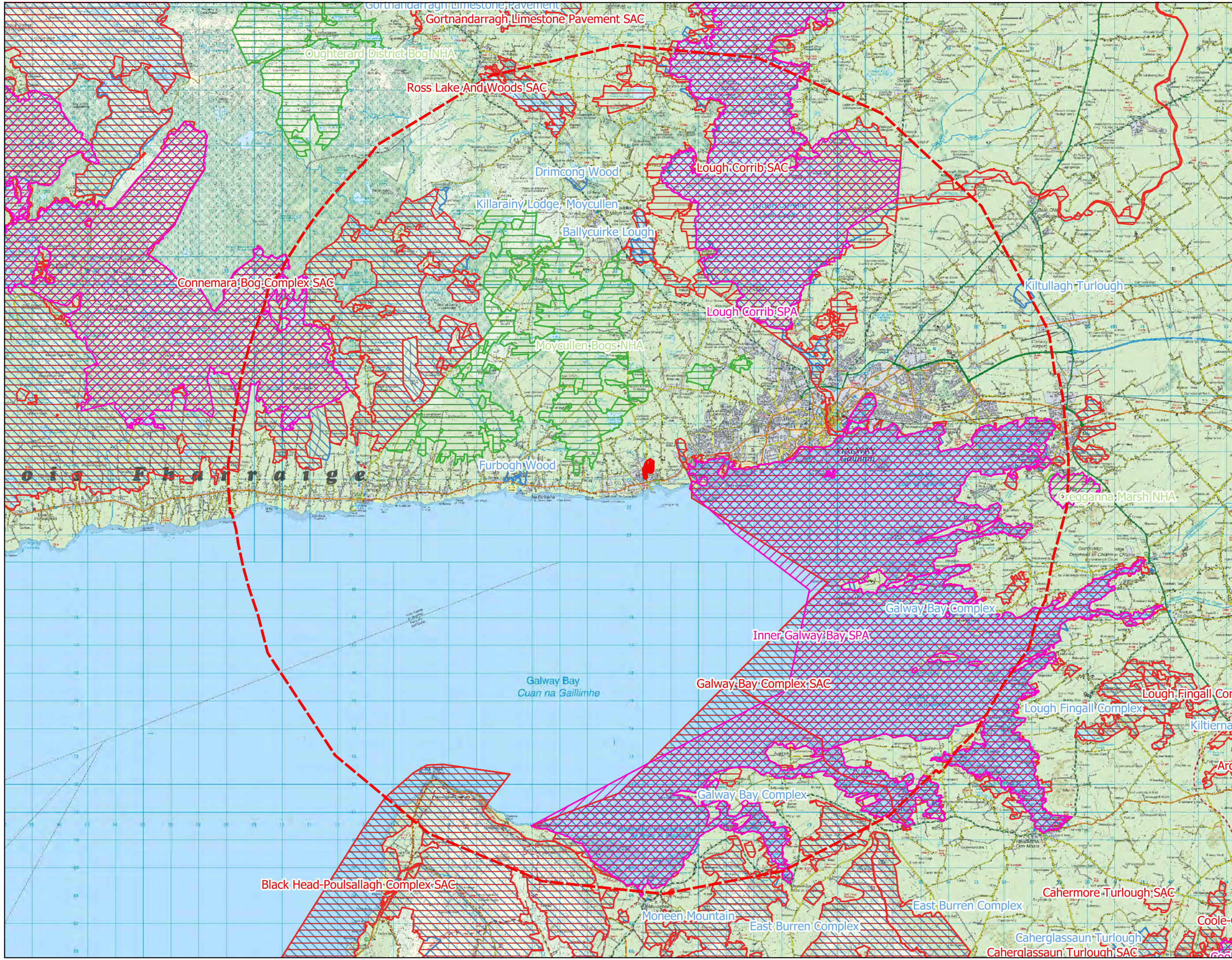
Map Legend

-  Site Boundary
-  Groundwater Body Spiddal

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Drawing Title	
Groundwater Bodies	
Project Title	
Burkeway Bearná SHD	
Drawn By	Checked By
SC	MW
Project No.	Drawing No.
190450-a	Fig 8.3
Scale	Date
1:20000	30.09.2020


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Map Legend

- Site Boundary
- 15KM Buffer
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)

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Designate Sites

Project Title	
Burkeway Bearna SHD	
Drawn By	Checked By
SC	MW
Project No.	Drawing No.
190450-a	Fig 8.4
Scale	Date
1:120000	30.09.2020

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8.3.14 Receptor Sensitivity

Due to the nature of this residential development, being near surface construction activities, combined with the nature of the hydrological regime and bedrock aquifer type, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during the impact assessment.

Groundwater

The primary risk to groundwater at the site would be from cementitious materials, hydrocarbon spillage and leakages. No interruption of existing groundwater drainage pathways below the site will occur due to the shallow nature of excavations within the development.

The above are common potential impacts on 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 these potential minor impacts.

Based on criteria set out in Table 8-1 above, the site is classified as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones. Therefore, the site can be classed as Not Sensitive to pollution on account of being a Poor Aquifer. Any contaminants which may be accidentally released on-site may discharge via groundwater flow paths to nearby streams withing surface runoff, and then potentially on into Galway Bay.

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 impact on the quality of downstream surface water bodies. Drainage works at the development site will discharge to storm water sewers via attenuation tanks and via oil interceptors which will discharge at controlled flow rates to the Trusky Stream.

8.3.15 Do Nothing Scenario

Current land use (grassing/agriculture/scrub) will continue. Surface water drainage and infiltration to ground will continue as is occurring currently with no impact on either surface or groundwater.

8.4 Characteristics of the Proposed Development

The proposed development is described in Chapter 4 and will generally comprise the following:

- 1) Demolition of existing outbuildings
- 2) Construction of 121 no. residential units comprising:
 - 52 no. houses (37 no. three-beds, 15 no. four-beds)
 - 4 no. duplex units in Duplex Block D1 (2 no. two-beds (ground floor units) and 2 no. three beds (2 storey units))
 - 8 no. duplex units in Duplex Block D2 (4 no. two-beds (ground floor units) and 4 no. three beds (2 storey units))
 - 6 no. duplex units in Duplex Block D3 (3 no. two-beds (ground floor units) and 3 no. three beds (2 storey units))
 - 14 no. duplex units in Duplex Block D4 (7 no. two-beds (ground floor units) and 7 no. three beds (2 storey units))

- 4 no. duplex units in Terrace Block T5 (2 no. two-beds (ground floor units) and 2 no. three beds (2 storey units))
 - 14 no. Apartments in Apartment Block A1 (5 no. one-beds, 9 no. two-beds)
 - 13 no. Apartments in Apartment Block A2 (4 no. one-beds, 9 no. two-beds and a Multipurpose Room)
 - 2 no. Apartments in Apartment Block A3 (2 no. two-beds)
 - 4 no. Apartments in Apartment Block A4 (4 no. two-beds)
- 3) Development of a crèche facility (224.80 sqm) associated outdoor play areas and parking
 - 4) Provision of a footpath connectivity link along the L-1321
 - 5) Provision of shared communal and private open space, car and bicycle parking, site landscaping and public lighting, decommissioning of the existing wastewater treatment plant and provision of all services, access from the L-1321 via the Cnoc Fraoigh development and all associated site development works.
 - 6) Provision of a public linear park along the Trusky Stream

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.

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.

Surface Water Drainage

The surface water drainage system will consist of a gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge at controlled flow rates to the Trusky Stream. Discharge will be limited to the greenfield equivalent, QBARRURAL, runoff rate. This will be achieved using a Hydro-Brake flow restrictor prior to discharging to the Trusky Stream. Temporary underground attenuation will also be provided at two separate locations in the form of underground cellular storage units. Silt traps will be provided for upstream of the attenuation tanks. Surface water will pass through petrol interceptors prior to discharging from the site.

Water Supply

Water supply to the site will be via connection to the adjacent public (Irish Water) watermain.

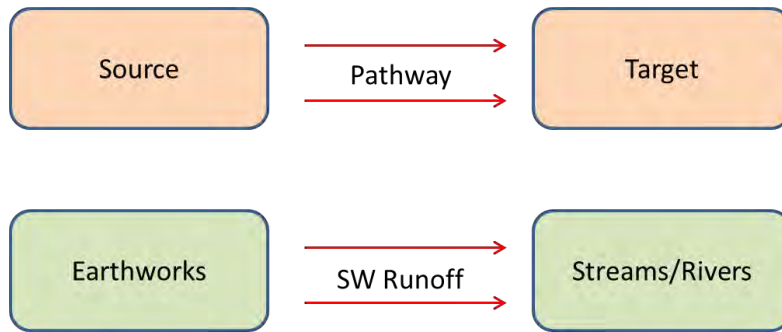
Wastewater Infrastructure

Wastewater from the proposed development will be collected by the wastewater network for the development and directed to the local municipal wastewater treatment plant for treatment via the sewage collection network. The existing Cnoc Fraoigh residential development will also be connected to the wastewater network for the proposed development via a new wastewater pumping system.

8.5 **Potential Impacts and Mitigation Measures**

8.5.1 **Overview of Impact Assessment Process**

The conventional source-pathway-target 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 strategic 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):

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017);
- Advice Notes For Preparing Environmental Impact Statements Draft (EPA, 2015)

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

In order to provide an understanding of the stepwise impact assessment process applied below (Section 8.5.2 and 8.5.3), we have firstly presented below a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process (refer to Table 8-4). 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 impact on the geological and hydrological/hydrogeological (including water quality) environments.

Table 8.7 Impact Assessment Methodology

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 this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	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 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 this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post Mitigation Residual 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 Construction Phase Potential Impacts

8.5.2.1 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Potential Suspended Solids Entrainment in Surface Waters

Construction phase activities including 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. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Trusky Stream and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Trusky Stream and downstream water bodies, such as Galway Bay. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient transitional and water dependent ecosystems.

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

Proposed Mitigation Measures:

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

- A solid boundary fence will be constructed around the construction footprint in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint and the Trusky Stream and its associated riparian habitat. No works will be undertaken outside the confines of this fence with the exception of the installation of the two surface water outfalls and minor landscaping works including plantings and the installation of a fence, which will be undertaken as a separate element of the development that is described below.
- A silt fence will also be attached to this boundary fence. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will be buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- 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;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses; and,
- Good construction practices such as wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, 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.

Residual Impact Assessment: The proposed development area will be set back from the Trusky Stream (limiting the potential source of sediments) and a silt fence will be in place to break the pathway between the works area and the stream (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality will occur due to site excavation work when mitigation measures are employed.

8.5.2.2 Potential Surface Water Quality Impacts from Shallow Excavation Dewatering

Some groundwater seepages may potentially occur in foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer. Dewatering, if undertaken, 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. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies.

Pre-Mitigation Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Mitigation Measures

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

- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from the Trusky Stream.
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur.

The temporary nature of such works (if they are required), and also the limited shallow depth of any such requirement will not affect the local hydrological regime, the level of the water table, nor the throughflow of shallow or deeper groundwater flow below the development site. The discharge from the silt bag will be located at a significant distance from the Trusky Stream and an discharge will dissipate and lose its sediment load as it moves via subsurface flow.

Residual Impact Assessment : The potential source of sediment can be readily controlled, and the pathway broken using the silt bag and silt fencing systems and therefore the residual impact will be Indirect, negative, imperceptible, temporary, low probability impact on downstream surface waters.

No impact on groundwater levels or groundwater quality will occur.

8.5.2.3 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.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water.

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

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

Proposed Mitigation Measures -

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- 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.

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.

Residual Impact Assessment: 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. The residual effect is assessed as - Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.5.2.4 Potential 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.

Pathway: Groundwater flowpaths and site drainage network.

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

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

Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures -

- A self-contained port-a-loo 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.

Residual Impact: No impact.

8.5.2.5 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 $6 \leq 9$ is set in S.I. No. 293 of 1988 European Communities (Quality of Salmonid Water) Regulations 1988, as amended, 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.

Proposed Mitigation Measures -

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute need be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water is to be tanked and removed from the site to a suitable, non-polluting, discharge location;
- Use weather forecasting to plan dry days for pouring concrete; and,
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact: The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Should a release occur the mitigation measures, in particular the silt fencing will break the pathway from the proposed works areas to the stream. The residual impacts are Negative, Indirect, imperceptible, short term, unlikely impact.

8.5.2.6 Construction of Stormwater Outfalls to Trusky Stream

The proposed development will require stormwater discharge to the Trusky Stream at two locations. These works will be located outside the general construction area for the project and are the only works that will directly impact on the Trusky Stream. To prevent any potential for significant effects on the Trusky Stream during construction, a silt fence will be erected to form a solid barrier between the proposed pipe laying works and the stream. To construct the surface water outfalls, the installation of two small precast concrete headwalls will be required along the Trusky Stream. Non-return valves will

be positioned at the outfalls. The following best practice construction measures will be followed to ensure that there are no significant effects on the Trusky Stream as a result of the proposed works.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient transitional and water dependent ecosystems.

Pre-mitigation Impact

Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- Prior to the outset of these works, small defined works areas will be fenced off at the location of each of the storm water outfalls (between the main construction site and the Trusky Stream). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Trusky Stream.
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Trusky Stream will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Short sections of the Trusky Stream will be temporarily dammed with sandbags at times of low water. One dam will be constructed immediately downstream of the outfall point and the other, immediately upstream.
- A submersible pump will be used to overpump any flow within the stream from upstream to downstream of the dammed area.
- Any remaining surface water within the dammed area will be pumped to a discharge point over 30m from the Trusky Stream and within the main construction site. It will pass through a silt bag before discharge to ground.
- Machinery will not enter the water, the construction of the outfall will only occur after the dry working area is created.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt.
- Following this the dams will be removed.
- Each surface water discharge point is likely to take less than one day to install.
- Biosecurity measures will be strictly adhered to throughout the proposed works. Measures will be in accordance with IFI (2010) Biosecurity Protocol for Field Survey Work. Where staff are working instream, staff footwear and PPE will be inspected on daily completion of the works and vegetation or debris removed. Footwear will be dipped in or scrubbed with a disinfectant solution (e.g. 1% solution of Virkron Aquatic or another proprietary disinfection product) and thoroughly dried afterwards. Sand bags placed instream will not be re-used in other watercourses.

Residual Impact: Neutral, direct, imperceptible, short term, high probability impact.

8.5.2.7 Potential Impacts on Hydrologically Connected Designated Sites

The Trusky Stream drains the land along the eastern boundary of the site and flows in a southern direction and, as set out in Tables 8.8 and 8.9 below is potentially hydrologically connected to the following designated sites:

Table 8.8 Hydrologically Connected European Sites

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
Special Areas of Conservation (SAC)/candidate Special Areas of Conservation (cSAC)			
Galway Bay Complex cSAC [000268] Distance: 0.9km (Hydrological distance between the mouth of the Trusky Stream and the cSAC 1.5 km)	<ul style="list-style-type: none"> > [1140] Mudflats and sandflats not covered by seawater at low tide > [1150] Coastal lagoons* > [1160] Large shallow inlets and bays > [1170] Reefs > [1220] Perennial vegetation of stony banks > [1310] <i>Salicornia</i> and other annuals colonising mud and sand > [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) > [1355] Otter (<i>Lutra lutra</i>) > [1365] Harbour seal (<i>Phoca vitulina</i>) > [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) > [3180] Turloughs* > [5130] <i>Juniperus communis</i> formations on heaths or calcareous grasslands > [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>)(*important orchid sites) > [7210] Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae* > [7230] Alkaline fens > > 	Detailed conservation objectives for this site, (Version 1, April 2013), were reviewed as part of the assessment and are available at www.npws.ie	<p>There will be no direct effects as the project site is located entirely outside and approximately 0.9km distant from the European site.</p> <p>There is no potential for indirect effects on the following Qualifying Interests (QIs) as there is no potential link or connectivity between the proposed development and these terrestrially or groundwater dependant habitats:</p> <ul style="list-style-type: none"> > Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] > Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210] > Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] > Alkaline fens [7230] > Limestone pavements [8240] > Perennial vegetation of stony banks [1220] > Turloughs [3180] > <i>Juniperus communis</i> formations on heaths

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>or calcareous grasslands [5130]</p> <p>The Trusky Stream is located within the proposed development site boundary. The stream is separated from the main construction footprint by over 10m at its nearest point. However, the development also involves the discharge of surface water from the proposed development, to the Trusky Stream. This involves, the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls. There will also be some minor landscaping works including the planting of native species and the construction of a boundary fence along the stream banks. The stream discharges to Galway Bay approximately 1.5km to the west of the cSAC.</p> <p>The Assimilative Capacity Modelling Study that is included as Appendix 6-2, demonstrates that even in a highly unlikely pollution event, very low levels of pollutant have the potential to enter this designated site via Galway Bay.</p> <p>However, adopting an extremely precautionary approach, a potential pathway for indirect effects on the following aquatic QIs has been identified via the Trusky Stream in the form of deterioration of surface</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>water quality resulting from potential pollution associated with the construction and operational phases of the development:</p> <ul style="list-style-type: none"> ➤ [1140] Mudflats and sandflats not covered by seawater at low tide ➤ [1150] Coastal lagoons* ➤ [1160] Large shallow inlets and bays ➤ [1170] Reefs ➤ [1310] <i>Salicornia</i> and other annuals colonising mud and sand ➤ [1330] Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) ➤ [1410] Mediterranean salt meadows (<i>Juncetalia maritim</i>) ➤ [1355] Otter (<i>Lutra lutra</i>) ➤ [1365] Harbour seal (<i>Phoca vitulina</i>) <p>As there is potential for indirect effects on certain QIs of this European site via the Trusky Stream in the form of deterioration of surface water quality resulting from potential pollution associated with the construction and operational phases of the development, it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.</p>
Special Protection Area (SPA)			
<p>Inner Galway Bay SPA [004031]</p> <p>Distance: 1.3km</p> <p>(Hydrological distance between the mouth of the Trusky Stream and the SPA 1.5 km)</p>	<ul style="list-style-type: none"> > [A003] Great Northern Diver (<i>Gavia immer</i>) > [A017] Cormorant (<i>Phalacrocorax carbo</i>) > [A028] Grey Heron (<i>Ardea cinerea</i>) > [A046] Brent Goose (<i>Branta bernicla hrota</i>) > [A050] Wigeon (<i>Anas penelope</i>) > [A052] Teal (<i>Anas crecca</i>) > [A056] Shoveler (<i>Anas clypeata</i>) > [A069] Red-breasted Merganser (<i>Mergus serrator</i>) > [A137] Ringed Plover (<i>Charadrius hiaticula</i>) > [A140] Golden Plover (<i>Pluvialis apricaria</i>) > [A142] Lapwing (<i>Vanellus vanellus</i>) > [A149] Dunlin (<i>Calidris alpina alpina</i>) > [A157] Bar-tailed Godwit (<i>Limosa lapponica</i>) > [A160] Curlew (<i>Numenius arquata</i>) > [A162] Redshank (<i>Tringa tetanus</i>) > [A169] Turnstone (<i>Arenaria interpres</i>) > [A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) > [A182] Common Gull (<i>Larus canus</i>) > [A191] Sandwich Tern (<i>Sterna sandvicensis</i>) > [A193] Common Tern (<i>Sterna hirundo</i>) > [A999] Wetlands and Waterbirds > 	<p>Detailed conservation objectives for this site, (Version 1, May 2013), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>The proposed development is located entirely outside the SPA and is separated from it by 1.3 km. There is no potential for direct effects on this European Site.</p> <p>The proposed development site does not provide suitable habitat for the species for which the SPA has been designated. Therefore no pathway for indirect effects as a result of disturbance or displacement have been identified.</p> <p>The Trusky Stream is located within the proposed development site boundary. The stream is separated from the main construction footprint by over 10m at its nearest point. However, the development also involves the discharge of surface water from the proposed development, to the Trusky Stream. This involves, the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls. There will also be some minor landscaping works including the planting of native species and the construction of a boundary fence along</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>the stream banks. The stream discharges to Galway Bay approximately 1.5km to the west of the SPA.</p> <p>The Assimilative Capacity Modelling Study that is included as Appendix 6-2, demonstrates that even in a highly unlikely pollution event, very low levels of pollutant have the potential to enter this designated site via Galway Bay.</p> <p>However, adopting an extremely precautionary, a potential pathway for indirect effects on the supporting wetland habitat for SCI bird species was identified in the form of deterioration of water quality resulting from potential pollution associated with the construction and operational phases of the development. The SCI [A999] Wetlands and Waterbirds is assessed in relation to the wetland habitat for all SCI species.</p> <p>The European site is located within the project Zone of Influence and, as there is potential for indirect effects on certain QIs of this European site via the Trusky Stream in the form of deterioration of surface water quality resulting from potential pollution associated with the construction and operational phases of the development, it cannot be excluded, on the basis of objective information, that the</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, (May 2020)	Conservation Objectives	Likely Zone of Impact Determination
			<p>proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.</p>

Table 8.9 OtherHydrologically Connected Designated Sites

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
Proposed Natural Heritage Area (pNHA)		
Galway Bay Complex Distance: 0.9km (Hydrological distance between the mouth of the Trusky Stream and the SPA 1.5 km)	> N/A	<p>There will be no direct effects as the project footprint is located entirely outside, and 0.9km from, the designated site.</p> <p>The Trusky Stream is located within the site boundary and the development involves the discharge of surface water to the stream. This also involves the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls from the proposed development. The stream discharges to Galway Bay approximately 1.5km to the west of the pNHA. Therefore, taking a precautionary approach, a potential pathway for indirect effects the pNHA has been identified in the form of deterioration of surface water quality resulting from pollution associated with the construction and operational phases of the development.</p> <p>A potential for effect has been identified through surface water pollution, this site is within the Likely Zone of Impact.</p>
Ramsar Site		
Inner Galway Bay Site number: 838	The shallow sheltered part of a large sea bay with numerous intertidal inlets and small low islands composed of glacial deposits. The area provides important habitat for marine life along	The Trusky Stream is located within the site boundary and the development involves the discharge of surface water to the stream. This also involves the installation of two precast headwalls within the banks of the stream at the location of the two surface water outfalls from the proposed development. The stream discharges to Galway Bay approximately 1.5km to the west of Inner Galway Bay. Therefore, taking a

Designated Sites and distance from proposed development	Features of Interest	Likely Zone of Impact Determination
	<p>Ireland's west coast. The site supports the richest seaweed flora on the Irish Coast (500+ species) and 65% of the Irish marine algal flora occur in the area. The site supports internationally and nationally important numbers of numerous species of waterbirds. There is a large cormorant colony on Teer Island. Human activities include aquaculture.</p>	<p>precautionary approach, a potential pathway for indirect effects the Ramsar Site has been identified in the form of deterioration of surface water quality resulting from pollution associated with the construction and operational phases of the development.</p> <p>A potential for effect has been identified through surface water pollution, this site is within the Likely Zone of Impact. Further assessment is required.</p>

The Galway Bay Complex candidate Special Area of Conservation(cSAC) and Galway Bay Special Protection Area (SPA) are the closest designated sites to the development. These sites are separated from the mouth of the Trusky Stream by a distance of approximately 0.9km within the open waters of Galway Bay.

Possible effects during the construction phase include surface and ground water quality impacts which could occur if mitigation is not put in place. Such impacts, should they occur, have the potential to indirectly effect hydrologically connected designated sites, such as Galway Bay Complex candidate Special Area of Conservation(cSAC) and Galway Bay Special Protection Area (SPA).

Pathway: Surface water and to a lesser extent groundwater flowpaths.

Receptor: Down-gradient water quality and qualifying interests of designated sites.

Pre-Mitigation Impact: Indirect, negative, imperceptable, long term, unlikely impact to designated sites and qualifying interests of designated sites.

No impacts on groundwater levels or existing hydrological regime or flowpaths.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water quality which will include on site drainage control measures (i.e. silt fences, silt bags etc) will ensure that the quality of runoff from proposed development areas will be good. As outlined above (Section 8.5.2.1 – 8.5.2.6) 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.

- A solid boundary fence will be constructed around the construction footprint in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint and the Trusky Stream and its associated riparian habitat. No works will be undertaken outside the confines of this fence with the exception of the installation of the two surface water outfalls and minor

landscaping works including plantings and the installation of a fence, which will be undertaken as a separate element of the development that is described below.

- A silt fence will also be attached to this boundary fence. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will be buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- 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;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses; and,
- Good construction practices such as wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, 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.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from the Trusky Stream.
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur.
- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;

- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- 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.
- A self-contained port-a-loo 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.
- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute need be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water is to be tanked and removed from the site to a suitable, non-polluting, discharge location;
- Use weather forecasting to plan dry days for pouring concrete; and,
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of each of the storm water outfalls (between the main construction site and the Trusky Stream). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Trusky Stream.
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Trusky Stream will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Short sections of the Trusky Stream will be temporarily dammed with sandbags at times of low water. One dam will be constructed immediately downstream of the outfall point and the other, immediately upstream.
- A submersible pump will be used to overpump any flow within the stream from upstream to downstream of the dammed area.
- Any remaining surface water within the dammed area will be pumped to a discharge point over 30m from the Trusky Stream and within the main construction site. It will pass through a silt bag before discharge to ground.
- Machinery will not enter the water, the construction of the outfall will only occur after the dry working area is created.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt.
- Following this the dams will be removed.
- Each surface water discharge point is likely to take less than one day to install.

All surface water arising on site will be dealt with by the proposed surface water drainage system. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the Trusky Stream.

Residual Impact: No 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 flowpaths relating to designated sites, including the Galway Bay cSAC or Galway Bay SPA.

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

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to designated sites, including the Galway Bay cSAC or Galway Bay SPA will occur.

8.5.3 Operational Phase Impacts

8.5.3.1 Potential Increased Downstream Flood Risk due to Increased Hardstanding Area

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Trusky Stream could result in an increased risk of fluvial flooding due to increased peak discharges in the stream.

The proposed development has been designed and will be constructed such that all surface water arising on site will drain via the proposed gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge via gravel infiltration beds at controlled flow rates to the Trusky Stream. The engineering design for this is included in Appendix 4.3.

Pathway: Site surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure

Pre-Mitigation Impact: If the proposed development design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage and gravity sewer network, and by using underground attenuation tanks for drainage management which will control discharge to the Trusky Stream at pre-development greenfield rates.

Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4 and shown on the Drainage drawings which are included in Appendix 4-1.

Residual Impact: Direct, neutral-, imperceptible, long term, low probability impact in relation to flood risk.

Therefore, no significant effects in terms of flooding will occur due to the proposed development.

8.5.3.1 Potential Operational Phase Water Quality Impacts

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off and waste water. In relation to storm water run-off, and as described in detail in Chapter 4, the surface water drainage system will consist of a gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge at controlled flow rates to the Trusky Stream. Discharge will be limited to the greenfield equivalent, QBARRURAL, runoff rate. This will be achieved using a Hydro-Brake flow restrictor prior to discharging to the Trusky Stream. Temporary underground attenuation will also be provided at two separate locations in the form of underground cellular storage units. Silt traps will be provided for upstream of the attenuation tanks. Surface water will pass through petrol interceptors prior to discharging from the site.

Wastewater from the development will discharge to the existing gravity wastewater network at the existing adjacent Cnoc Fraoigh residential estate prior to it exiting the estate and discharging to Mutton Island Wastewater Treatment Plant. The wastewater treatment plant is regulated and operates under an EPA licence which controls emissions to acceptable levels.

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Trusky Stream will be the landscaped and linear park and so there is no significant source of pollution related to these areas.

Pathway: Site surface water and foul water drainage network.

Receptor: On-Site, adjacent and downstream water courses and foul water infrastructure

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water to the Trusky Stream via silt traps, attenuation tanks and petrol/oil interceptors as described above. It is also proposed to retain and enhance the existing riparian zone which will act as a buffer between the development and that stream.

Waste water will be directed to an EPA regulated waste water treatment plant.

Residual Impact: The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation tank, silt traps and petrol/oil interceptor will break the pathway from the proposed works areas to the stream. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Foul water discharges will be directed to the municipal sewer and regulated waste water treatment plant as so the residual impacts are neutral, indirect, imperceptible, long term, unlikely impact.

Therefore significant effects on surface water or ground water quality will not occur.

8.5.3.2 Potential Operational Impacts on Hydrologically Connected Designated Sites

The Trusky Stream drains the land along the eastern boundary of the site and flows in a southern direction and is hydrologically connected to a number of designated Sites including the Galway Bay Complex Special Area of Conservation (cSAC) and Galway Bay Special Protection Area (SPA), which are the closest designated Sites to the development.

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

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

- There will be no net change in recharge at the Development Site. Attenuation tanks, and a Hydro-Brake flow restrictor will be installed.
- Petrol/Oil Interceptors will be installed.
- Gravel infiltration beds will be installed
- No dewatering will occur during the operational phase of the development.
- No new drainage channels are proposed.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.
- No deep foundations will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phase.

Groundwater flowpaths will be maintained during the operational phase as any excavation proposed will be shallow. Groundwater flowpaths during the operational phase from east to west below the site will be unaltered by the proposed development.

Pathway: Surface water and groundwater flowpaths.

Receptor: Down-gradient water quality and hydrological regime of designated sites.

Pre-Mitigation Impact: Indirect, negative, imperceptible, long term, unlikely impact to surface water and groundwater quality of hydrologically connected Designated Sites.

No impacts on groundwater levels or existing hydrological regime or flowpaths.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation tanks and a Hydro-Brake flow restrictor and petrol/oil interceptor prior to discharging to the Trusky Stream. Groundwater quality risks are reduced during the operational phase by use of paved areas as well as the hydrocarbon interceptors, attenuation tanks and silt traps prior to discharge.

Residual Impact: The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation tank, silt traps and petrol/oil interceptor will break the pathway from the proposed works areas to the stream and by extension the designated sites downstream. The residual impacts on designated sites are neutral, indirect, and imperceptible.

Foul water discharges will be directed to the municipal sewer and regulated waste water treatment plant as so the residual impacts on Designated Sites are neutral, indirect and imperceptible.

No impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Galway Bay SAC or Galway Bay SPA will occur.

There will be no perceptible direct or indirect hydrological impacts on designated sites, including the Galway Bay cSAC or Galway Bay SPA.

8.5.4 Assessment of Potential Impacts on Water Supplies

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 by extension can not impact significantly on human health.

The flood risk assessment for the development has also shown that the proposed housing development will not increase the risk of flooding elsewhere, and also that there is no significant risk of flooding within the proposed development area of the site and it is considered appropriate for the proposed use.

8.5.5 Monitoring Proposals

An inspection and maintenance plan for the on-site drainage systems and mitigation measures will be prepared in advance of commencement of any works and for the duration of construction. Regular inspections of all installed drainage systems and controls will be undertaken daily, to check that the integrity of silt fencing, for example, is intact. Daily visual checks of the stream will also be carried out.

During the construction phase, field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for the adjacent Truskey stream (as per the CEMP).

Field chemistry measurements of unstable parameters, (pH, conductivity, dissolved oxygen, temperature) will be taken at the two surface water monitoring locations on the Truskey stream, subject to agreement with Galway County Council. In-situ field monitoring will be completed on a monthly basis.

Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken prior to construction at two locations on the Truskey stream.

The analytical determinants of the monitoring programme will be as set out below and carried out quarterly.

- > pH (field measured)
- > Electrical Conductivity (field measured)
- > Temperature (field measured)
- > Dissolved Oxygen (field measured)
- > Total Suspended Solids
- > Total Phosphorus
- > Chloride
- > Nitrate
- > Nitrite
- > Total Nitrogen
- > Ortho-Phosphate
- > Ammonia N
- > Biochemical Oxygen Demand

8.5.6 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 hydrology. 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 Trusky Stream and other receptors were taken into account for the entire project and any impacts avoided through a series of mitigation measures that were 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 Cumulative In-combination

The potential cumulative effects of the proposed development in combination with the other projects described in Chapter 15 of this report have been considered in terms of impacts on hydrology and hydrogeology.

Of the projects listed in Chapter 15 of this EIAR it was determined that, due to proximity and scale, the seven projects listed below have the potential for cumulative effects in combination with the proposed development. There are 5 no. proposed housing developments with permission granted in the locality, 1 housing development at pre-planning, and the proposed Galway City Ring road in the locality. A description of the development types is included below within Table 8-10 and where appropriate the application documentation, EIAR and NIS have been reviewed to inform the assessment.

There are no proposed discharges of any substance from the site during the construction phase of the proposed development. The hydrological regime, which includes shallow subsurface flows to the Trusky Stream and some percolation of rainfall to ground, 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. It is highly unlikely that all projects would be constructed at the same time and so the potential for multiple uncontrolled releases to water are also not likely. Should some or all projects be constructed at the same time, the water quality controls at the Proposed Development site will ensure no likely significant cumulative effects will occur. Furthermore, it should be noted that planning and construction standards require that similar water quality controls will be implemented at the other sites, thus further reducing the potential for likely, significant cumulative effects.

During the operational phase, discharges are proposed to the Trusky Stream and this has been assessed as leading to a potential imperceptible effect as the discharge rate 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. The 6 no. developments in the locality of the proposed development have been designed with appropriate water and wastewater services as has the Proposed Development.

Table 8.10 Local/Nearby Developments

	Description	Decision
Pre-planning	Bearna Village SHD – Prospective SHD development of approximately 105 units	
ABP-302848-18	approval in relation to a proposed road development consisting of :- A dual carriageway, consisting of 2 lanes and a hard shoulder in each direction divided by a segregating barrier, A single carriageway, consisting of 1 lane and a hard shoulder in each direction, New link roads, The realignment / improvement of regional, county and local roads crossed by the proposed road development.	
19/1749	for minor amendments to previously granted planning permissions ref. 17/1314 and 18/1527 for 48 units at An Maolán.	Grant
19/314	for the construction of 20 no. residential units (4 no. 3 bed semi-detached dwellings & 16 no. 5 bed detached dwellings) including the construction of a new road accessed via the existing Dreasla housing development, infrastructure, ESB Substation and all associated external works.	Grant
16/147	for development on site accessed from the main street (R336). The proposed development will consist of the following: (1) modifications and improvements to 2 no. existing 2 storey street front houses, new public footpath and access to the houses, on-street car-parking spaces and boundary treatments. Construction of 1 no. new infill 1 bed roomed terraced house between the existing street front houses (2) demolition of existing partially-built garage structure on the site (3) construction of 15 no. new houses	Grant
18/148	for the construction of 9 no. residential units with 1165.6 sqm Gross floor space.	Grant
17/1305	for the construction of three no. two storey houses (comprising 2 no. 3 bedroom & 1 no. 5 bedroom) including infrastructural sewer connection, vehicular access on waterfront & parking and associated site works.	Grant

8.5.8 Conclusion

During each phase of the proposed development (construction and operation) a number of activities will take place on the development site which will have the potential to affect the hydrological regime, hydrogeological regime or water quality at the site or its vicinity. These potential impacts generally

arise during the construction stage from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds, with the former having the most potential for impact.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant negative or adverse impacts on water quality including the adjacent Trusky Stream and avoid impact on downstream designated sites. Preventative measures during construction include fuel and concrete management and a waste management plan which have been incorporated into the Construction and Environmental Management Plan (Refer to Appendix 4-2). A range of surface water control measures will also be used including silt fencing along the Trusky Stream and the maintenance of a set back from that stream during construction.

During the operational phase, the key surface water control measure is that there will be a gravity fed sewer network water drainage system with a Hydro-Brake flow restrictor, silt trap and attenuation tank along with a petrol / oil interceptor prior to outflow to the Trusky Stream. The proposed system will control discharge volume and discharge quality to acceptable levels. It is also proposed to retain and enhance the existing riparian zone which will act as a buffer between the development and that stream.

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

There will be no net impact on the local hydrological regime, groundwater levels, or groundwater flowpaths during the construction and operational phase of the proposed development. There will be no perceptible direct or indirect hydrological impacts on designated sites, including the Galway Bay cSAC or Galway Bay SPA.

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