8 Hydrology & Hydrogeology

8.1 Introduction

This chapter comprises an assessment of the hydrological and hydrogeological environment (collectively known as the water environment) within the site and the surrounding environs. The potential effects posed by the construction and operational phases of the Proposed Development are investigated, and suitable mitigation measures are recommended to minimise effects on the local water receptors.

In terms of Environmental Impact Assessment (EIA):

- "Hydrology" is the study of surface water features.
- "Hydrogeology" is the study of groundwater features.

The objectives of this chapter are.

- To provide a baseline assessment of the receiving water environment in terms of surface water (hydrological) and groundwater (hydrogeological) receptors.
- To identify any potential negative effects posed by the construction and operational phases of the Proposed Development.
- To propose suitable mitigation measures to prevent or reduce the significance of the negative effects identified.
- To consider any significant residual effects of cumulative effects posed by the Proposed Development.

8.2 Consultation

ORS have been commissioned to assess the potential impacts of the Proposed Development in terms of hydrology and hydrogeology during the construction and operational phases.

The principal members of the ORS EIA team involved in this assessment include the following persons:

- **Project Scientist & Author:**
  Bianca Severgnini – B.Eng. (Hons) (Environmental).
  Current Role: Environmental Consultant. Experience *ca.* 4 years.

- **Project Coordinator & Reviewer:**
  Oisín Doherty – B.Sc. (Geography with Environmental Science), MSc. (Environmental Management), CEnv, MIEnvSc. Current Role: Chartered Environmental Consultant. Experience *ca.* 16 years.

Consultation between ORS and other members of the planning/design team was made in order to obtain information required to assess the potential construction and operational phase impacts on local hydrology and hydrogeology.

8.3 Assessment Methodology & Significance Criteria

This chapter was carried out in accordance with the following guidance documents:

- EPA, (2022). *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*.
- EPA, (2013). *Land spreading of Organic Waste – Guidance on Groundwater Vulnerability Assessment of Land*.
- 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*.
- NRA, (2008). *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*.
- CIRIA, (2001). C532 - *Control of Water Pollution from Construction Sites – Guidance for consultants and contractors*.

8.3.1 Desktop Study

A desk-based assessment method was used to assess baseline water quality for the receiving environment of the proposed site. The baseline information that is detailed in this section of the assessment was obtained from publicly available information.

The following documents and sources were referenced:

- Aquifer classification and vulnerability identification from the Geological Survey of Ireland (GSI web page)
- Search of GSI and Galway County Council files to determine the location of groundwater wells within a 2km radius
- 1:50,000 Discovery Series Maps and 6” maps (Geohive)
- Water Quality in Ireland 2010-2015 (EPA)
- Water Quality in Ireland 2013-2018 (EPA)
- Water Quality in Ireland 2016-2021 (EPA)
- Water Action Plan 2024: A River Basin Management Plan for Ireland.
- Meteorological data from Met Eireann and hydrometric data from the Office of Public Works (OPW)
- Strategic Flood Risk Assessment of the Galway County Development Plan 2022-2028
- Galway County Development Plan 2022 - 2028
- Reports, maps and data published by the Geological Survey of Ireland (GSI) and the National Soil Survey of Ireland
- General Soil Map of Ireland 2nd Edition, (1980), The National Soil Survey, An Fóras Taluntais
- An Foras Talúntais (1966). Soils of County Galway
- Reports, maps and data published by the Environmental Protection Agency (EPA).
- UK CIRIA report C552 (2001). (Contaminated Land Risk Assessment: A Guide to Good Practice.
- IFI (2016), Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses.
- OPW and DoEHLG (2009), The Planning System and Flood Risk Management - Guidelines for Planning Authorities.
- EPA (2022), River Quality Surveys: Biological - Hydrometric Area 26D
- Möller, K., & Müller, T. (2012). Effects of anaerobic digestion on digestate nutrient availability and crop growth: a review. Engineering in Life Sciences, 12(3), 242-257.

The following technical reports completed in support of the planning application for the Proposed Development were also consulted to further assess baseline water quality.

- Civil Engineering Design Report
- Site Specific Flood Risk Assessment
- Site Suitability Assessment for onsite domestic wastewater treatment system

8.3.2 Field Survey

Fieldwork commissioned in July 2025 consisted of the following elements:

- Trial Pit Excavations
- BRE Digest 365 Percolation/Soakaway Testing

A site walk-over was conducted by ORS geotechnical consultants on the 14th of July 2025 to identify hydrological features on site including:

- Drainage patterns and distribution
- Exposures
- Drainage Infrastructure
- Wet ground

8.3.3 Impact Assessment Methodology

Chapter 1: Introduction of the EIAR outlines the impact assessment rationale applied to each chapter of the study. This section describes some further criteria applied to the assessment of hydrological and hydrogeological receptors.

8.3.3.1 Risk Appraisal Methodology

The Conceptual Site Model (CSM) identifies potential contaminants, receptors and exposure pathways that may be present based on the construction and operational phase of the Proposed Development. The identification of potential “contaminant linkages” is a key aspect of the evaluation of potentially contaminated land. An approach based on this methodology has been adopted within this report. For each of the contaminant linkages, an estimate is made of:

- The potential severity of the risk.
- The likelihood of the risk occurring.

8.3.3.2 Hydrological and Hydrogeological Receptor Criteria

The level of sensitivity of hydrological and hydrogeological receptors is based on a number of factors which are summarised in **Table 8.1**.

Table 8.1: Criteria for rating importance of hydrological and hydrogeological attributes (NRA, 2008)

Importance	Criteria	Receptors	
		Hydrological	Hydrogeological
Extreme	Attribute has a high quality or value on an international scale	River, wetland, or surface water body ecosystem protected by EU legislation	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for wide range of leisure activities.	Regionally Important Aquifer with multiple wellfields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding	Poor Bedrock Aquifer Potable water source supplying <50 homes

8.3.3.3 River Water Quality Assessment Criteria

Under the Water Framework Directive and SI 722 of 2003 European Communities (Water Policy) Regulations, the EPA carries out water quality assessments of rivers, transitional and coastal water bodies as part of a nationwide monitoring programme. Data is collected from physico-chemical and biological surveys, sampling both river water and the benthic substrate (sediment). **Table 8.2** summarises the quality classes used to assess the condition of rivers

throughout the country.

Table 8.2: Biotic Indices Classification for River Water Quality

Biotic Indices	Community Diversity	Quality	Condition	Quality Status	Quality Class
Q5	High	Good	Satisfactory	Unpolluted	Class A
Q4	Reduced	Fair	Satisfactory	Slightly Polluted - Unpolluted	Class B-A
Q3	Low	Doubtful	Unsatisfactory	Moderately – Slightly Polluted	Class C-B
Q2	Very Low	Poor	Unsatisfactory	Seriously – Moderately Polluted	Class C-D
Q1	Little/None	Bad	Unsatisfactory	Seriously Polluted	Class D

'Biotic Indices' or Quality (Q) Values are indicative of specified groups of macro-invertebrates' sensitivity to pollution. Q-Values are assigned to a waterbody based on the presence or absence of particular species with the Q5 biotic index indicating the least polluted waters and the Q1 biotic index indicating the most polluted waters.

Quality Class relates to the potential beneficial use of a water body as summarised in **Table 8.3**.

Table 8.3: Quality Class Descriptions

Quality Class	Description	BOD (mg/l)	Orthophosphate (mg/l)	Dissolved Oxygen (% Sat)
A	Highest water quality with very high amenity value Suitable for abstraction Suitable for game fisheries	<3	~0.015	~100%
B	Variable water quality with considerable amenity value Potential abstraction issues Game fish 'At Risk'	Occasionally exceeds 3mg/l	~0.045	<80% or >120%
C	Doubtful Water Quality with reduced amenity value Advanced Treatment of abstracted water required Coarse fisheries – Fish kills likely	Regularly Exceeds 3mg/l	~0.070	v. unstable
D	Poor to bad water quality with no amenity value Low grade & limited abstraction Fish absent	Levels regularly far in exceedance of 3mg/l	>0.1	Low, approaching 0%

8.3.3.4 Groundwater Vulnerability Assessment Criteria

Groundwater Vulnerability is a term used to represent the intrinsic geological and hydro geological characteristics that determine the ease with which groundwater may be contaminated by human activities. It is usually dependent on the nature (sandy, gravely, clay, etc.,) and depth of soil/subsoil overlying an aquifer (i.e., its shallowness). The travel time, attenuation capacity of the subsoils (i.e., ability to filter contaminants) and the nature of the contaminants are also important elements in determining the vulnerability of groundwater.

In the context of groundwater protection, Groundwater Vulnerability is the most important factor in determining control measures in areas where potentially hazardous discharge to

groundwater might take place. This is because the type, permeability and thickness of the soil and subsoil play a critical role in preventing groundwater contamination by acting as a protecting filtering layer over the groundwater.

The extent of site investigation works required to accurately assess the groundwater vulnerability at a site is determined by the sensitivity of hydrogeological receptors within the site vicinity. The extent of sampling requirements as defined by the hydrogeological sensitivity of the site is defined in **Table 8.4**.

Table 8.4: Summary of Sampling Requirements

Ground Water Protection Scheme (GWPS) exists	**Vulnerability**	**Sampling Requirements**
	LOW	Simple walkover survey to confirm what has been established in the GWPS, i.e., no evidence of outcrop, depth to bedrock information from wells, etc.[1] If walkover survey indicates that the lands do not have sufficient thickness of subsoil (i.e. rock outcrops) then site specific information may be required.
	MEDIUM	
	HIGH	
	EXTREME[2]	Regionally Important Aquifers - Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required.
		Locally Important and Poor Aquifers – Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required.
Ground Water Protection Scheme (GWPS) does not exist	**Aquifer Type**	**Sampling Requirements**
	Locally Important / Poor Aquifers	Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
	Regionally Important Aquifers	Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
Source Protection Areas[3]	**Source Protection Zone**	**Sampling Requirements**
	Outer	A minimum thickness of 3m of subsoil should be demonstrated at a minimum depth to rock data point frequency of one point per hectare.
	Inner	It is not generally acceptable to land-spread unless there is no alternative area available, and that the area has been defined as having moderate vulnerability (i.e. > 10m of moderate permeability subsoil or > 5m of low permeability subsoil) overlying the aquifer. The depth to rock should be demonstrated at a

[1] The classification to Low / Medium / High class as part of GWPS indicates that minimum of 3m soil/subsoil depth can be anticipated
[2] To give a rough picture of "extreme vulnerability" areas we can use: GSI Outcrop data & Teagasc Shallow Rock data
[3] In general land-spreading of organic wastes should not be carried out within the source protection area (SPA) of a water supply. However, there are cases where if the subsoil is sufficiently thick it may be deemed acceptable subject to conditions

		minimum frequency of one point per hectare.

8.4 Description of the Receiving Environment

8.4.1 Background

This section of the chapter provides the baseline information in relation to geology, hydrogeology and hydrology that exists in the vicinity of the Proposed Development. The Proposed Development occupies a total area of *ca.* 3.8ha and is situated in the townland of Glenloughaun, Co. Galway. The Proposed Development is situated just south of the R355 Regional Road and Glenloughan Road junction with agricultural lands dominating the surrounding area. The Proposed Development lies approximately 3.8km south of Ballinasloe town centre.

The underlying geology has a major influence on topographical, hydrogeological and hydrological features within the site vicinity; hence this chapter is closely linked to the previous chapter (**Chapter 7 – Soils & Geology**).

The receiving environment is described below under the following headings:

- Topography
- Drift (Quaternary) Geology
- Bedrock Geology
- Hydrology
- Hydrogeology

8.4.2 Topography

The County of Galway can be broadly divided into three landscape regions and a distinct coastal zone, each shaped by underlying geology and glacial processes that have influenced the topography, soils, vegetation, and human settlement patterns from prehistoric times to the present day. The West Galway Region is characterised by bold, hard geology, creating a rugged and complex landscape of mountains, lakes, bogs, islands, and coastal inlets. In contrast, the Eastern Plains Region is defined by younger, softer rocks and a glacial soil cover that forms extensive flat grasslands interspersed with bogs, particularly in the north. The South Galway Region marks the transition between the older rocks of the Slieve Aughty Mountains and the softer geology of the Burren and Shannon basin, resulting in a mosaic of varied smaller landscapes from west to east. The Coast constitutes a separate region encompassing Galway's islands and coastal waters, with its character shaped by dynamic interactions between land and sea, forming unique seascapes.

Each part of the County has been classified according to the type of landscape that it is part of, as follows:

- Coastal Landscape - the Coasts of Galway are highly distinctive, but very complex and varied, types of landscape that vary considerably between low and high tide.
- Island Landscape - large, inhabited islands, unconnected to the shore, more than 3km from

the coast.

- Uplands and Bog Landscape - an extensive area of very open landscapes with low levels of settlement, roads or agriculture. Upland and Bogs make up much of the centre of those western parts of the county that are nearest to the Atlantic.
- Lake Environs Landscape - this type covers Lough Corrib and Lough Derg, Ireland's second and third largest lakes respectively, both highly prized as recreational and scenic resources.
- North Galway Complex Landscape - an extensive grassland plain stretching from the Suck River in the east to the watershed of the River Clare in the west. It includes elevated areas such as Slieve Dart in the north, as well as lakes, turloughs, raised bogs, wetlands and winding rivers.
- Central Galway Complex Landscape - an extensive plain of grasslands comprising medium-to-large fields with low enclosures and many areas of low stone walls. This area contains the majority of the county's population, along with associated high levels of rural housing, roads, and settlements.
- Urban Environs Landscape - around all major settlements, can establish extensive landscapes of urbanised appearance and character for a considerable distance around each centre.
- Shannon Environs Landscape - establishes an extensive area of distinctive character along much of the southeastern boundary of the county.
- Karst Landscape - a distinctive localised landscape created where the northern-most extent of Burren exposed limestone forms a southern boundary of County Galway. The characters that define the Karst Landscape extend beyond the south boundary of County Galway.
- Slieve Aughty Landscape - distinctive uplands of the Slieve Aughty Mountains define much of Galway's southern boundary with County Clare.

The Landscape Character Types as described in the GCDP 2022-2028 – LCA is shown in the

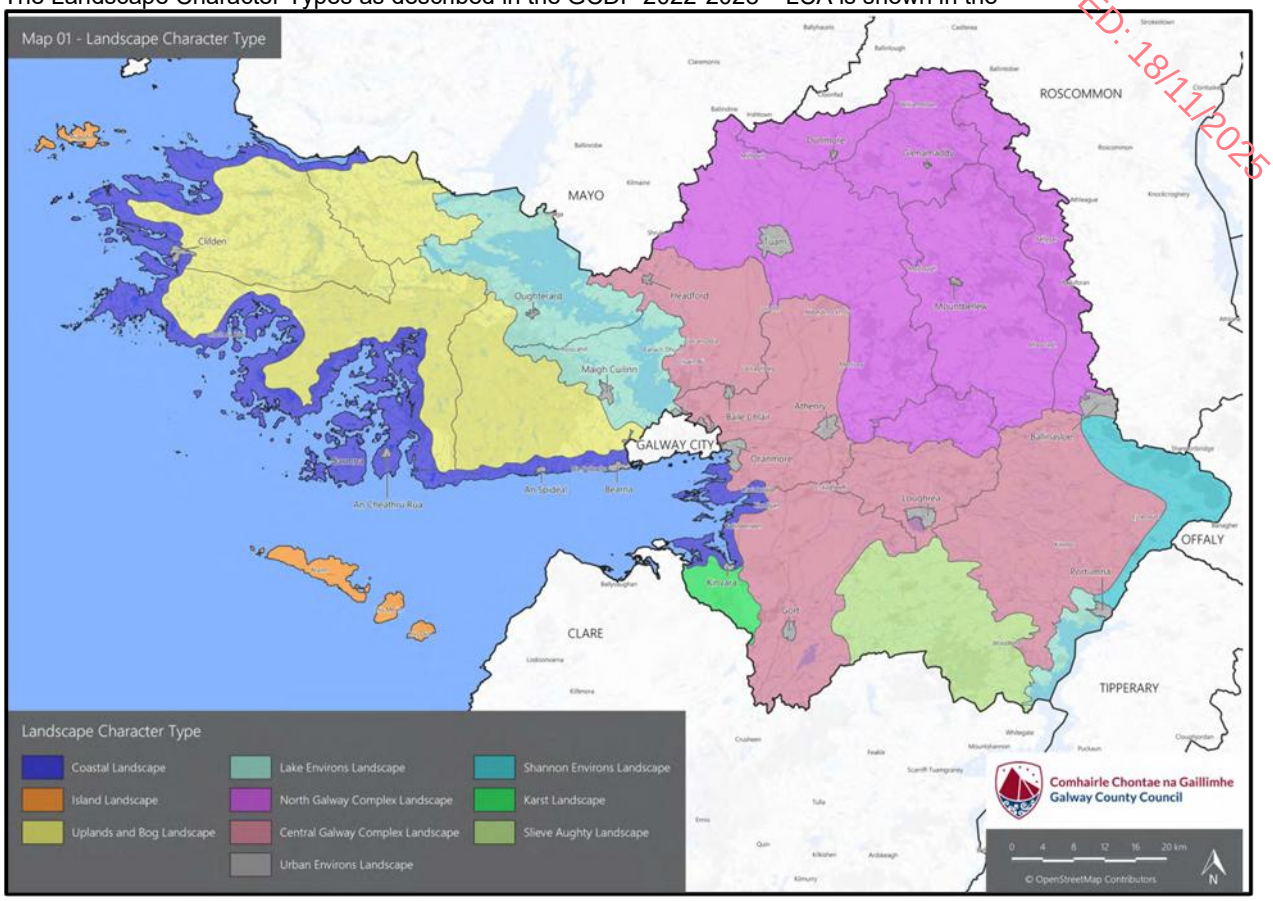

Figure 8.1.

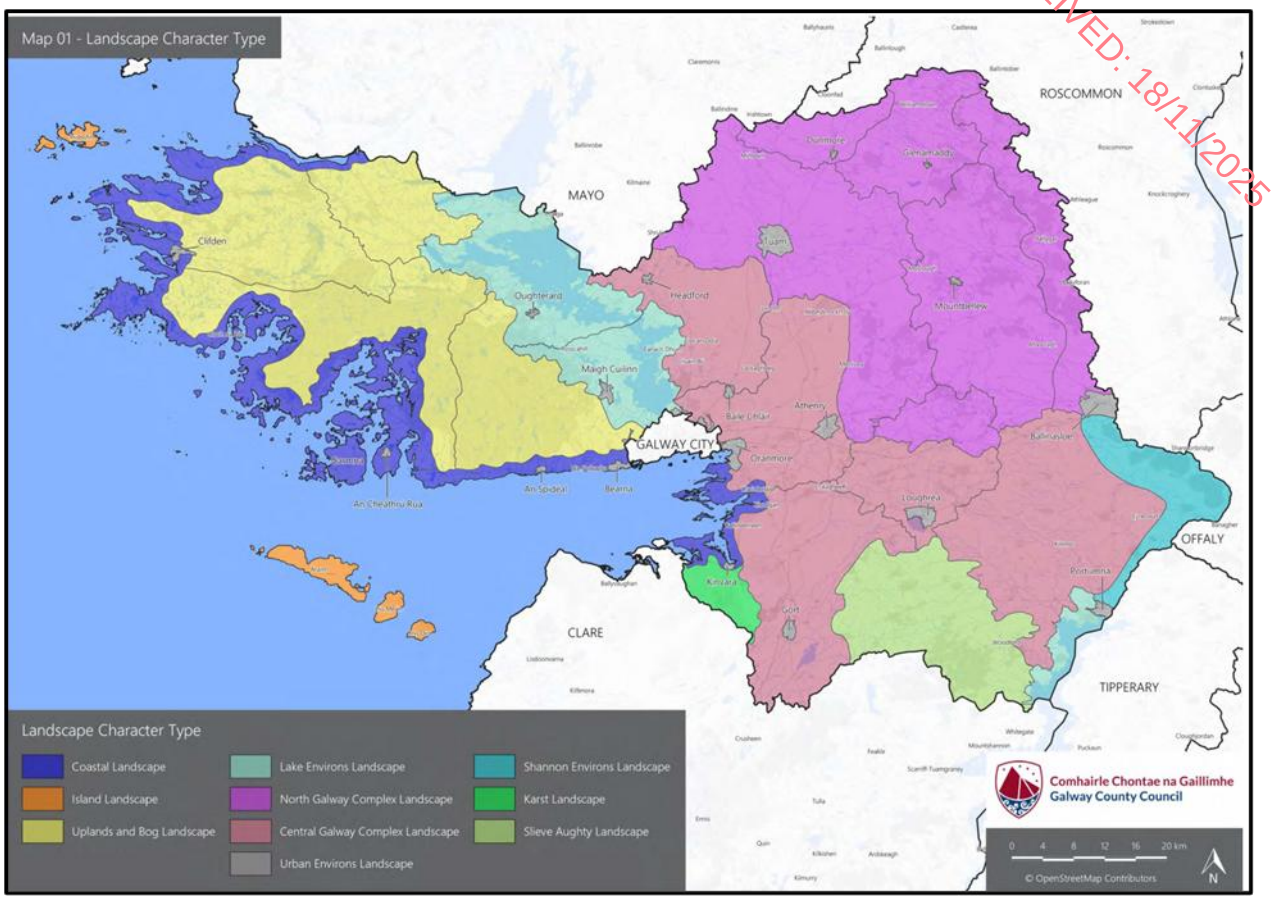

Figure 8.1: Map 01 Landscape Character Type (Landscape Character Assessment - Galway County Development Plan 2022-2028)

The proposed development site lies entirely within the "*Shannon Environs Landscape*," a distinctive area along County Galway's south-eastern boundary characterised by open water, naturalised vegetation, elongated islands, and the ecologically important Shannon Callows—seasonally flooded grasslands that support significant wintering bird populations. Within a 2 km radius, the site is also near the "*Central Galway Complex Landscape*", *ca.* 235m to the west, and a small area of the "*Urban Environs Landscape*", *ca.* 1.9 km to the north. The surrounding landscape includes extensive boglands and large farm holdings with parkland characteristics, shaped by centuries of agriculture and settlement.

The proposed development site comprises a mix of brownfield and greenfield land, featuring areas of hardstanding and small buildings. It is surrounded predominantly by farmland, giving the area a distinctly rural character. The Glenloughaun Local Road (L8417) borders the northern boundary of the site, with its junction to the Kellysgrove Regional Road (R355) located *ca.* 20 m to the east. A peatland area is situated *ca.* 1.6 km to the east.

A slope model of the study area, derived from the NASA Shuttle Radar Terrain Mission (SRTM) dataset (tile N53W009_N53W009), reveals a gentle slope from northwest to east, broadly following the course of the Ballinure River. Elevations in the wider area range from 85m to 33m AOD. Physiographic information from the GSI Viewer indicates that the site lies within a terrain characterised as "hummocky glaciofluvial sediments topography."

A topographic survey conducted by ORS identified the highest elevation within the site as

54.06m AOD, located near the centre of the northern boundary, and the lowest as 39.09m AOD, found near the central southern boundary. This indicates a vertical difference of nearly 15m over a horizontal distance of 197.819m, equating to a slope of approximately 7.57%. According to the FAO Slope Gradient Classes (2006), this places the site within the "sloping" category (Class 06), with the gradient generally descending southwards towards the Ballinure River.

Figure 8.2 illustrates the surface of the site, including contour lines and elevation points.

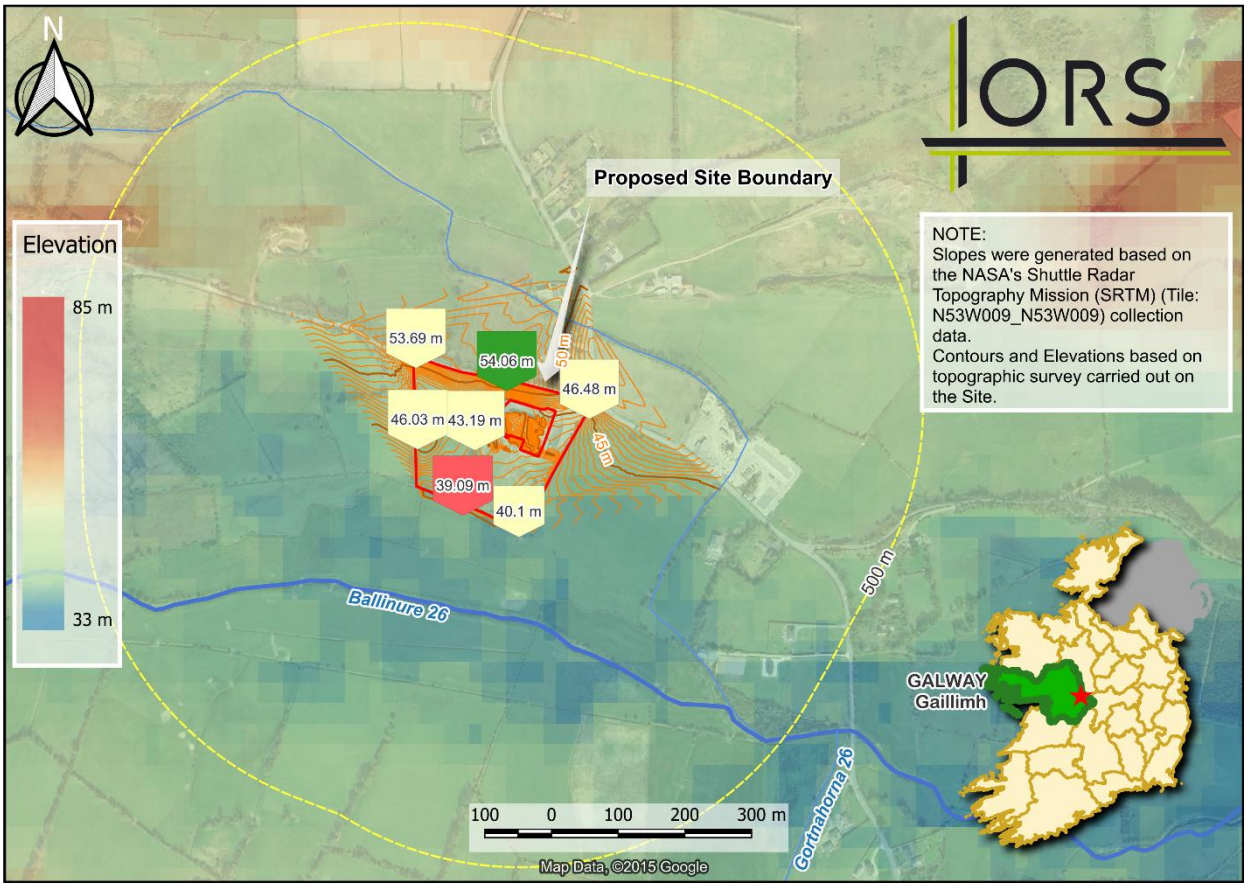

Figure 8.2: Site slope and elevation details.

8.4.3 Drift (Quaternary) Geology

Drift is a general term applied to all mineral material (clay, silt, sand, gravel and boulders) transported by a glacier and deposited directly by or from the ice or as fluvioglacial deposits. It generally applies to deposits laid down during the Pleistocene (Quaternary) glaciations. Drift can also be included under Holocene (Quaternary) deposits.

The drift geology of the study area primarily reflects the processes of the last glaciation, during which various sediments, such as clay, silt, sand, gravel, and boulders, were deposited by glaciers either directly from the ice or through meltwater activity (fluvio-glacial processes). Initially, as glaciers advanced, boulder clays were deposited beneath the ice as lodgement till, while granular moraine materials accumulated along glacier margins. With the subsequent retreat of the ice sheet, meltwater streams deposited fluvio-glacial sediments across the landscape. These deposits mostly date from the Pleistocene glaciations, although some can

also be associated with the Holocene.

The proposed development site lies entirely within a zone classified as having a hummocky glaciofluvial sediment topography, shaped predominantly by meltwater deposition, as per **Figure 8.3**. According to the GSI physiographic dataset, this area falls under three classification levels:

- Level 1 - Hummocky Sediments: indicating uneven terrain of unconsolidated deposits.
- Level 2 - Hummocky Glaciofluvial Sediments Topography: highlighting meltwater influence.
- Level 3 – Hummocky Eskers and Associated Gravel: specifying the presence of key geomorphological features.

The landscape is characterised by eskers (sinuous ridges of sand and gravel), kames (steep mounds), and kettles (depressions), forming a distinct rolling surface. The gravels in these formations are typically well-sorted and stratified, reflecting their fluvial origin within the glacial environment—features commonly found in areas shaped by retreating ice sheets.

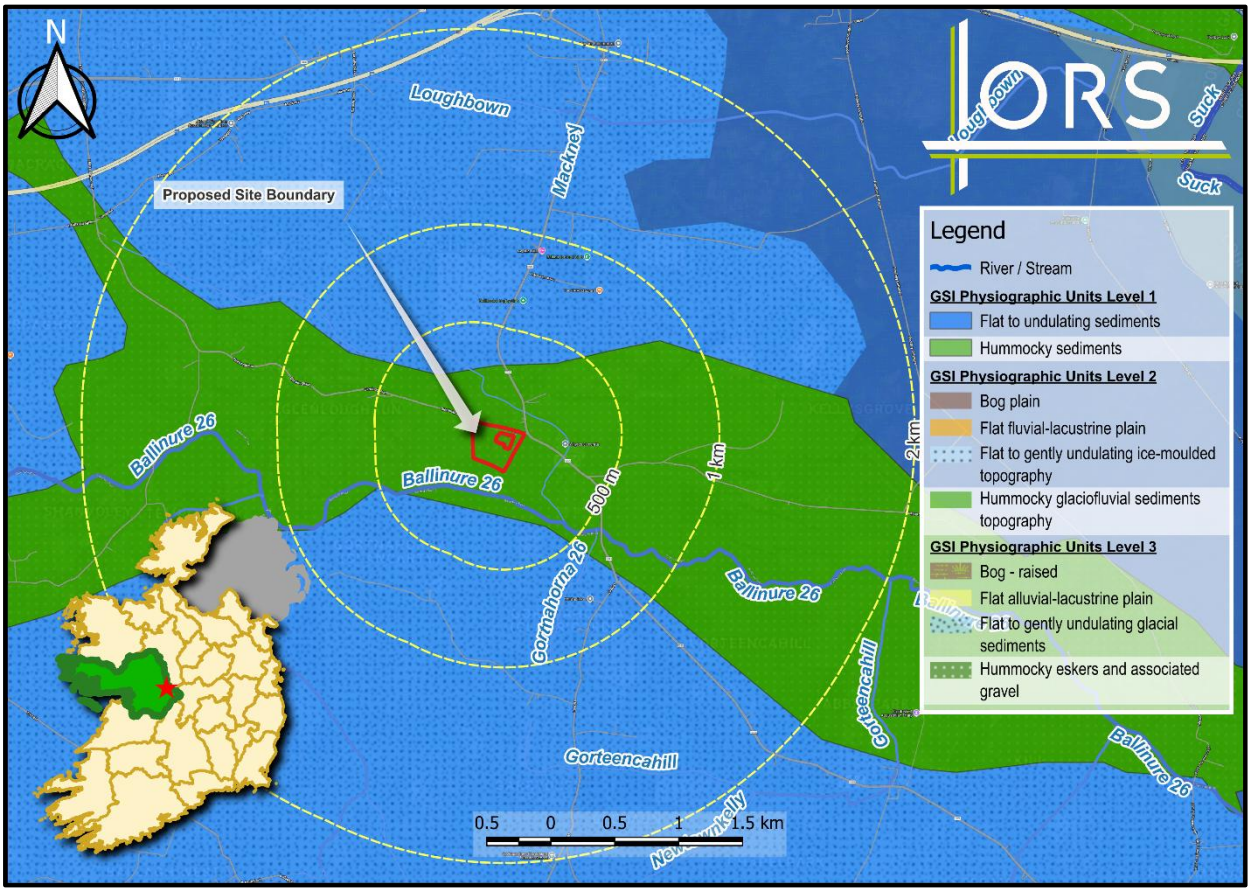

Figure 8.3: Physiographic character of the site and surrounding landscape (Source: GSI adapted by ORS 2025)

The site is classified within a Flat to Undulating Lowland landscape, which identifies the area as comprising Mainly Dry Mineral Soils and Mainly Wet Mineral and Organic Soils. The local soil composition consists principally of Grey Brown Podzolics (70%), with associated Brown Earth (20%), Gley (5%) and Basin Peat (5%). These soils have developed on limestone morainic gravels and sands - coarse-textured fluvioglacial deposits of predominantly Carboniferous limestone origin that were widely deposited during the last glacial period as kames, eskers and

outwash materials.

Four principal soil types occur in this setting: moderately deep, shallow, imperfectly drained and poorly drained components. The moderately deep soils, representing about 70% of the association, occur across the flatter to undulating terrain and lower slopes of hummocky features. These well-drained Grey Brown Podzolics consist of friable, gravelly sandy loams with high base status. Their profiles typically exhibit a dark greyish-brown to dark brown surface horizon (25-40 cm depth) overlying a brown to yellowish-brown leached layer, which in turn rests upon an undulating, dark greyish-brown B horizon showing distinct clay accumulation. The parent material, encountered at 0.5-0.8 metres depth, consists of very coarse-textured gravelly sands.

The Geological Survey of Ireland's (GSI) 1:50,000 Quaternary Sediments vector dataset indicates that nearly the entire area is underlain by "*tills derived from limestones*". A minor stretch adjacent to the Glenloughaun Local Road (L8417) is classified as "*eskers comprised of gravels of basic reaction*", as illustrated in **Figure 8.4**. Additionally, alluvial deposits are present along the southern boundary of the site.

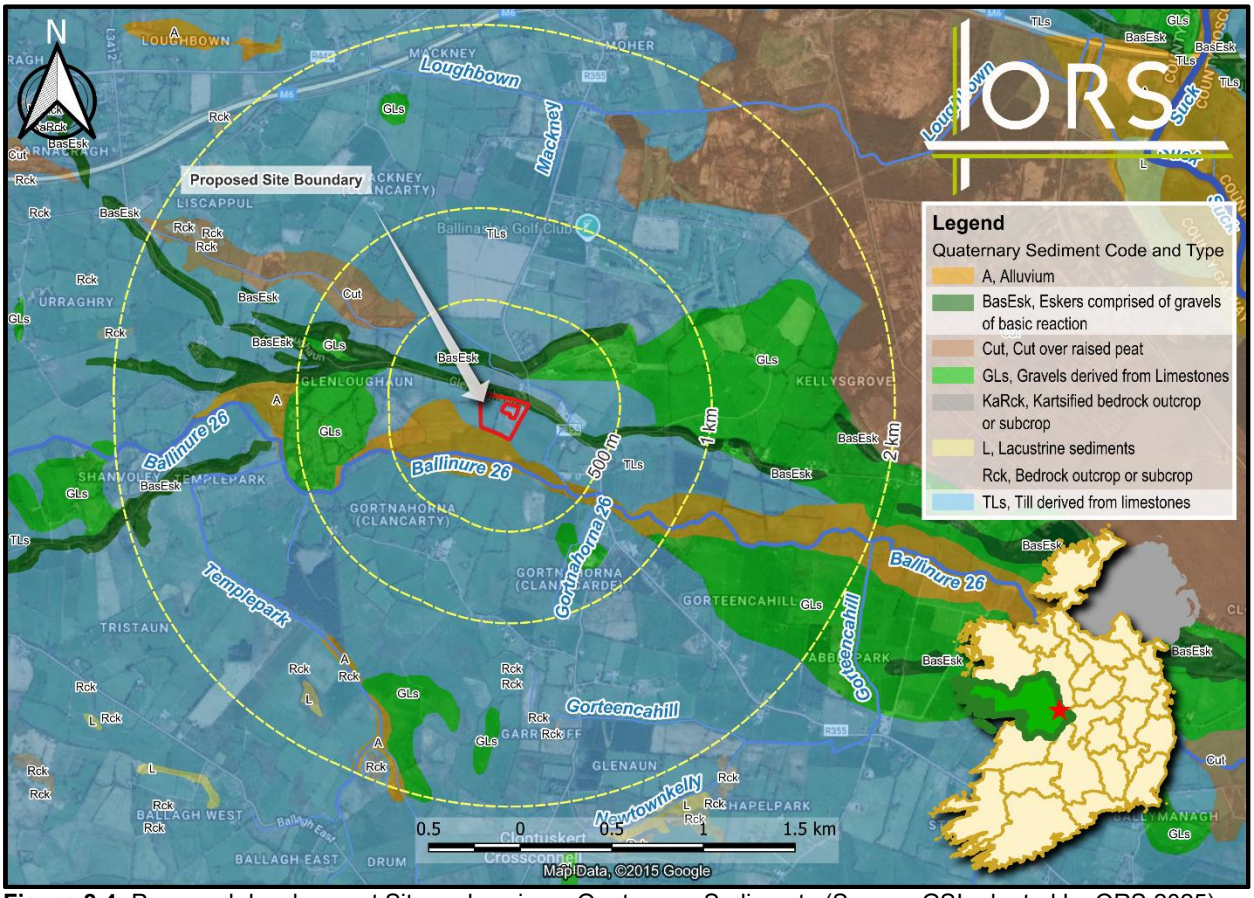

Figure 8.4: Proposed development Site and environs Quaternary Sediments (Source: GSI adapted by ORS 2025)

8.4.4 Bedrock Geology

This sub-section deals with bedrock underlying the area. Bedrock is defined as a consolidated aggregate of minerals underlying the ground surface and any soils present. Above the bedrock is usually an area of broken and weathered unconsolidated rock in the basal subsoil.

Sedimentary rock lies in beds which may comprise different rock types and which may be horizontal or inclined, so that the rock encountered at the ground surface may change over a short distance.

County Galway exhibits a geologically diverse and complex structure, marked by a distinct east-west divide. The western region, particularly Connemara, features ancient metamorphic rocks such as schist and gneiss, part of the Dalradian Supergroup also found in North Mayo, Donegal, and western Scotland. This area includes fault-uplifted Precambrian exposures and distinct terranes formed through tectonic activity. Prominent features include the quartzite peaks of the Twelve Bens, erosion-resistant and underlain by the ornamental Connemara marble. South Connemara is dominated by the 400-million-year-old Galway Granite batholith, while Slieve Aughty showcases Devonian sandstones and Silurian slates. East of Galway City, Carboniferous limestone prevails, forming a gently undulating, fertile landscape, though karst features are more subdued compared to the Burren. The Aran Islands, however, display classic limestone pavements and granite erratics.

Geological mapping, including hydrostratigraphic and bedrock datasets, highlights a stark lithological contrast across Lough Corrib. The west is dominated by Granites and other igneous intrusions, with extensive zones of Precambrian quartzites, gneisses, schists, and Silurian metasediments. In contrast, the east is underlain primarily by Dinantian Pure Bedded Limestones, transitioning upwards to impure limestones and Devonian sandstones. This division results in distinct hydrogeological regimes, with the western region featuring more varied and less permeable rock types, and the eastern region offering more homogeneous and aquifer-friendly carbonate formations. Overall, the geological profile of County Galway reflects its position across major tectonic zones, with the west characterised by complex, older bedrock and the east by more uniform, fossil-rich Palaeozoic sedimentary sequences.

The development site and its study area predominantly overlay Dinantian Upper Impure Limestones, dating from the Palaeozoic Era, Carboniferous Period, Mississippian Subperiod. These bedrock units are primarily composed of Marine basinal facies (Tobercolleen & Lucan Fms - "Calp"): dark-grey argillaceous and cherty limestone and shale (65). A small exception, *ca.* 1.9km northwest of the Site, around Loughbrown and Liscappul, features Dinantian Pure Unbedded Limestones.

According to the Geological Survey of Ireland, the bedrock within the 2km study area surrounding the proposed development is predominantly composed of Carboniferous strata, specifically the Lucan Formation. Identified on the 1:100,000 Bedrock Solid Geology Map as 'calp' (dark limestone and shale) this formation consists of deep marine mudstones and siltstones interpreted as distal turbidites. It is also described as well-bedded, fine-grained, weakly laminated, and bioturbated, with alternating layers of argillaceous limestone and dark calcareous mudstone. Its primary lithologies include dark argillaceous limestone, shale, and calcareous mudstone, with frequent chert and pyrite and minor skeletal units. The formation can reach a thickness of over 1100m and was deposited in moderate to deep marine environments, below the storm wave base.

Within the 2km study area, there is occurrence of a single geological structure, a fault, located *ca.* 1.6 km northwest of the site, trending southeast to northwest. Waulsortian Limestones (massive, unbedded lime-mudstones) occur *ca.* 1.8 km northwest, adjacent to this fault, and intersect the Visean Limestones (undifferentiated) formation to the west. These features are illustrated in **Figure 8.5**.

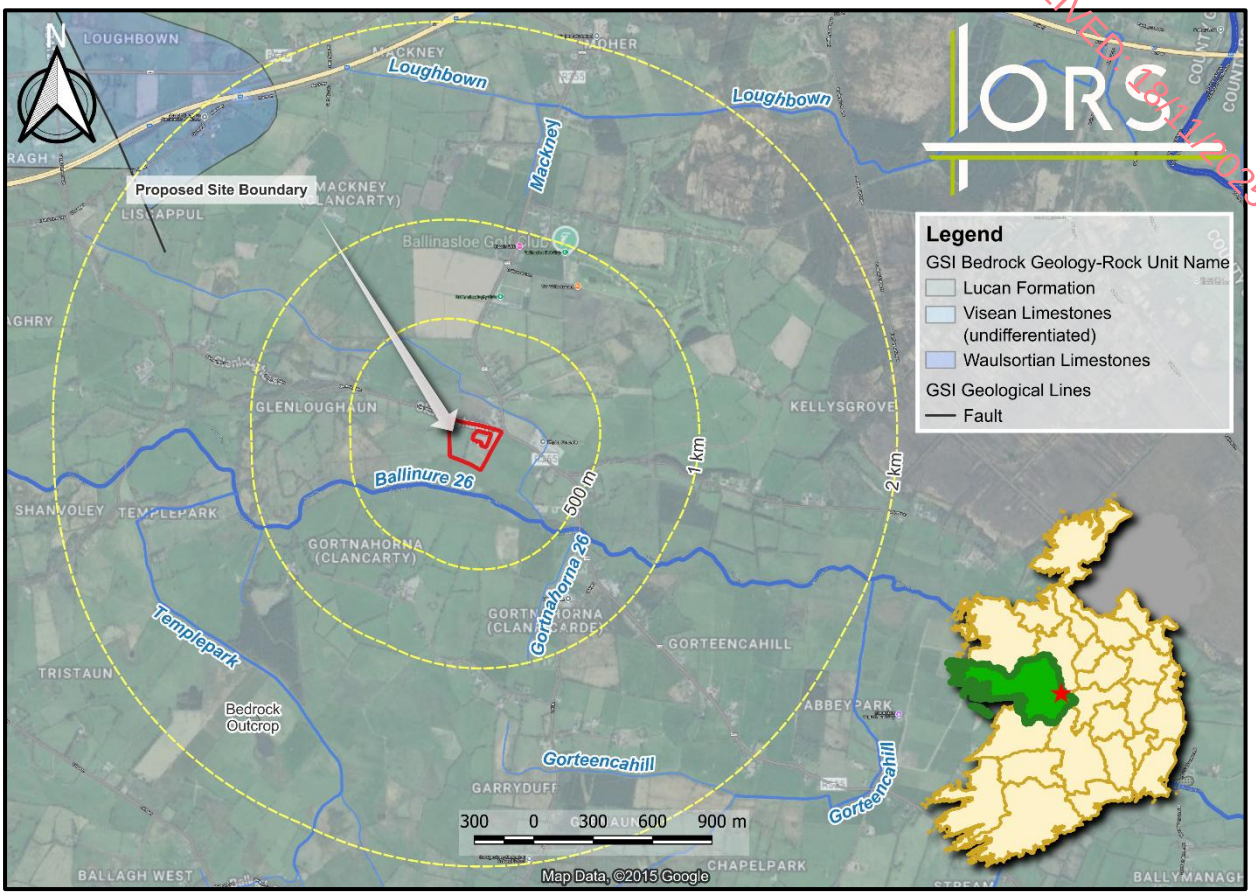

Figure 8.5: Local Bedrock Formations (GSI)

8.4.5 Hydrology

8.4.5.1 Regional Hydrology

A river basin is the area of land drained by a river, its tributaries, and their associated groundwaters and coastal waters. The Water Action Plan 2024, part of Ireland's third River Basin Management Plan, builds on lessons from previous initiatives and incorporates both immediate and long-term goals to meet EU and international environmental obligations. The plan outlines a comprehensive approach to restoring and protecting the country's water bodies, such as rivers, lakes, estuaries, coastal waters, and groundwater. This initiative aligns with the EU Water Framework Directive, aiming to achieve "good" ecological status for water bodies by 2027. The newly adapted Plan covers a single national River Basin District (RBD), which also includes two international RBDs shared with Northern Ireland.

The Irish RBD spans 70,273 km² and is divided into 46 catchment management units, further broken down into subcatchments. Agriculture dominates land use within the RBD, with 55% dedicated to pastures, 7% to agricultural land, 5% to arable land, and 1% to complex cultivation. Forestry makes up 6% of the land use, while Urban fabric represents only 2% of the area.

A catchment is a land area where all surface water converges toward a single point, such as a river. The proposed site is located within the Upper Shannon (Suck) Catchment (Hydrometric Area 26D), which spans an area of 1,598 km². This catchment is underlain almost entirely by karstified bedrock, except for some isolated pockets and the most southerly part downstream of

Ballinasloe. The catchment is characterised by flat, undulating topography, with groundwater and surface water drainage systems highly interlinked throughout the area.

The Upper Shannon (Suck) Catchment is divided into 11 sub-catchments, containing 58 river water bodies, one lake water body, and 17 groundwater bodies. The main urban centres within the catchment are Castlerea, Athleague, Mountbellew, and Ballinasloe. The key water bodies of interest in the Upper Shannon catchment include sub-catchments Suck_SC_20 (Islands River), Suck_SC_50 (Shiven River), and the Lower Shannon catchment Cappagh (Galway)_SC_010 (Duniry River).

The main river in this catchment is the River Suck, an important tributary of the River Shannon, stretching approximately 133 kilometres through Counties Galway and Roscommon. It originates in the Slieve Aughty Mountains and flows through predominantly rural areas consisting of farmland, peatlands, and wetlands before joining the Shannon at Shannonbridge. Along its course, the river passes through seasonally flooded meadows known as the Suck Callows, which provide valuable habitats for fish species such as brown trout and pike, as well as birds and otters. The river supports local farming and fishing activities but faces challenges from agricultural runoff and changes to its natural environment. Efforts are ongoing to improve water quality and protect the wildlife dependent on this river within the broader Shannon catchment.

Land use in the catchment is primarily agricultural (pasture), and the predominant geology consists of limestone and calcareous shale.

According to the Cycle 3 - HA 26D Upper Shannon (Suck) Catchment Report (May 2024), 58% of surface water bodies achieved Good Ecological Status during the 2016–2021 monitoring period. All groundwater bodies (100%) were reported to be at Good status. A total of 46 (61%) water bodies currently meet their environmental objective of Good or High Ecological Status. Meanwhile, 28 (37%) water bodies are classified as At Risk of not meeting their environmental objectives, 11 (14%) are under Review, and 37 (49%) are Not At Risk.

Agriculture is the most significant pressure, impacting 54% of the 28 At Risk water bodies within the Upper Shannon (Suck) Catchment, followed by hydromorphological pressures affecting 46%, and peat extraction and urban wastewater each impacting 11%. These pressures primarily cause altered morphological conditions (habitat changes), nutrient pollution, and organic pollution in surface waters, alongside chemical quality decline and nutrient pollution in groundwater.

The proposed development site, located in the townland of Glenloughaun, Co. Galway, falls within sub-catchment 26D_3 of the Upper Shannon (Suck) Catchment, also known as the Suck_SC_100 sub-catchment, as shown in **Figure 8.6**.

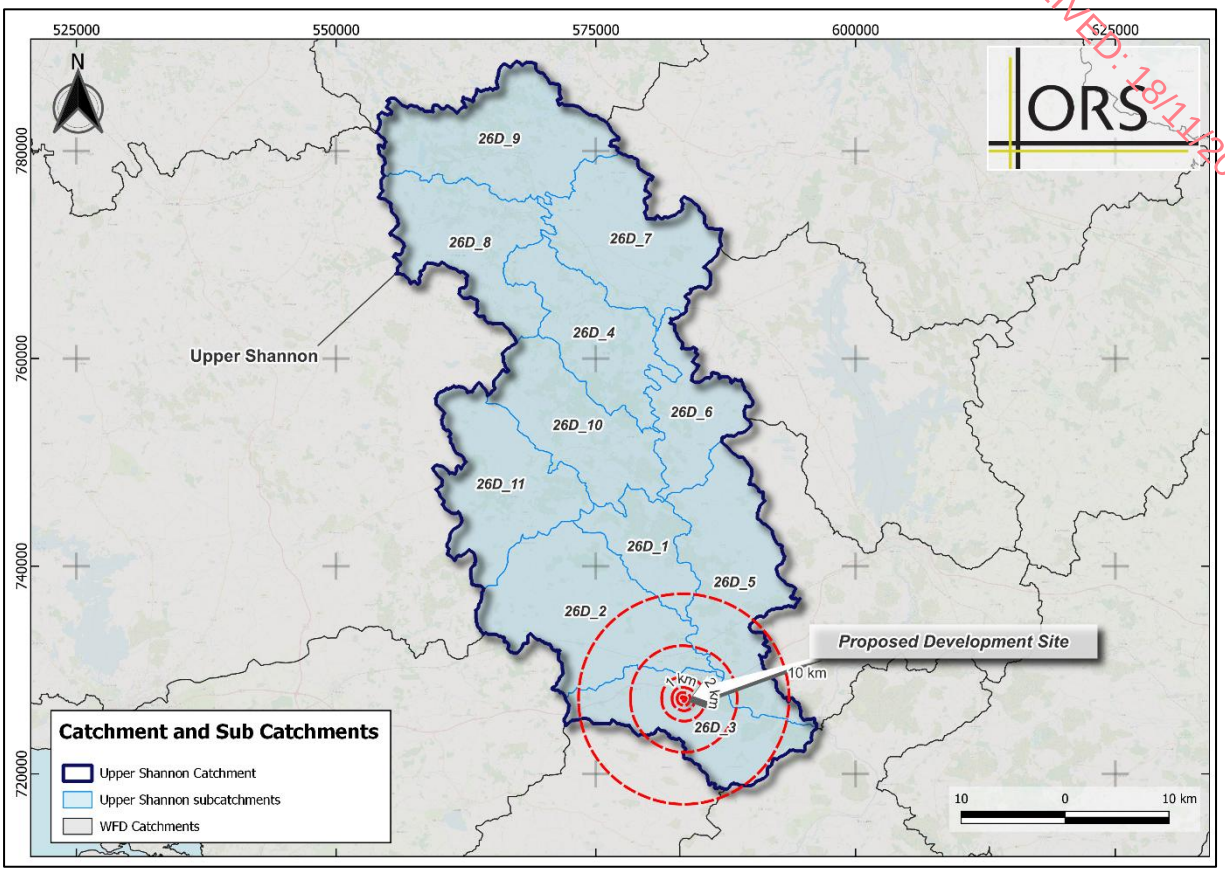

Figure 8.6: Upper Shannon (Suck) Catchment and Sub-Catchments (EPA maps).

8.4.5.2 Local Hydrology

The Ballinure River (EPA waterbody name: BALLINURE_010) is the primary hydrological feature in the vicinity of the site, located *ca*. 130m to the south of the Site boundary. Surface water on the site follows the natural topography and drains towards this river. The Ballinure River flows in an easterly direction for *ca.* 7.4 km before merging with the River Suck, which continues eastward and eventually joins the River Shannon *ca.* 15 km downstream of the site.

In addition, an unnamed stream, classified as a tributary of the Ballinure River, is located *ca.* 100m north of the site. This stream runs parallel to the site's northern boundary in a west-to-east direction for *ca.* 500m, before turning south *ca.* 200m east of the site. It then flows eastward again, ultimately joining the Ballinure River *ca.* 350m downstream of the subject site.

The site is also bordered by a drainage ditch along its southern boundary. This ditch, which is part of the Kellysgrove DD Scheme, primarily serves to manage surface runoff from the site and surrounding areas, exhibiting irregular water flow patterns with intermittent dry periods due to limited or absent hydrological input. It functions solely as drainage feature, with no evidence of springs or significant water sources upstream.

Without proper mitigation measures, this ditch could potentially act as conduit for pollution from the Proposed Development, particularly during wetter conditions. Additionally, as the ditch forms part of a drainage scheme, in the absence of mitigation, stormwater discharge to it could exacerbate risk of floods on-site and on downstream receptors (see **Section 8.4.5.8 – Flood Risk** for further information).

The area surrounding the site is primarily characterised by agricultural land, predominantly

used as pastures. Scattered patches of artificial surfaces areas are also present in the vicinity, while areas of Peat bogs are located *ca.* 1.7 km to the east.

The subject site local hydrology is illustrated in **Figure 8.7** below.

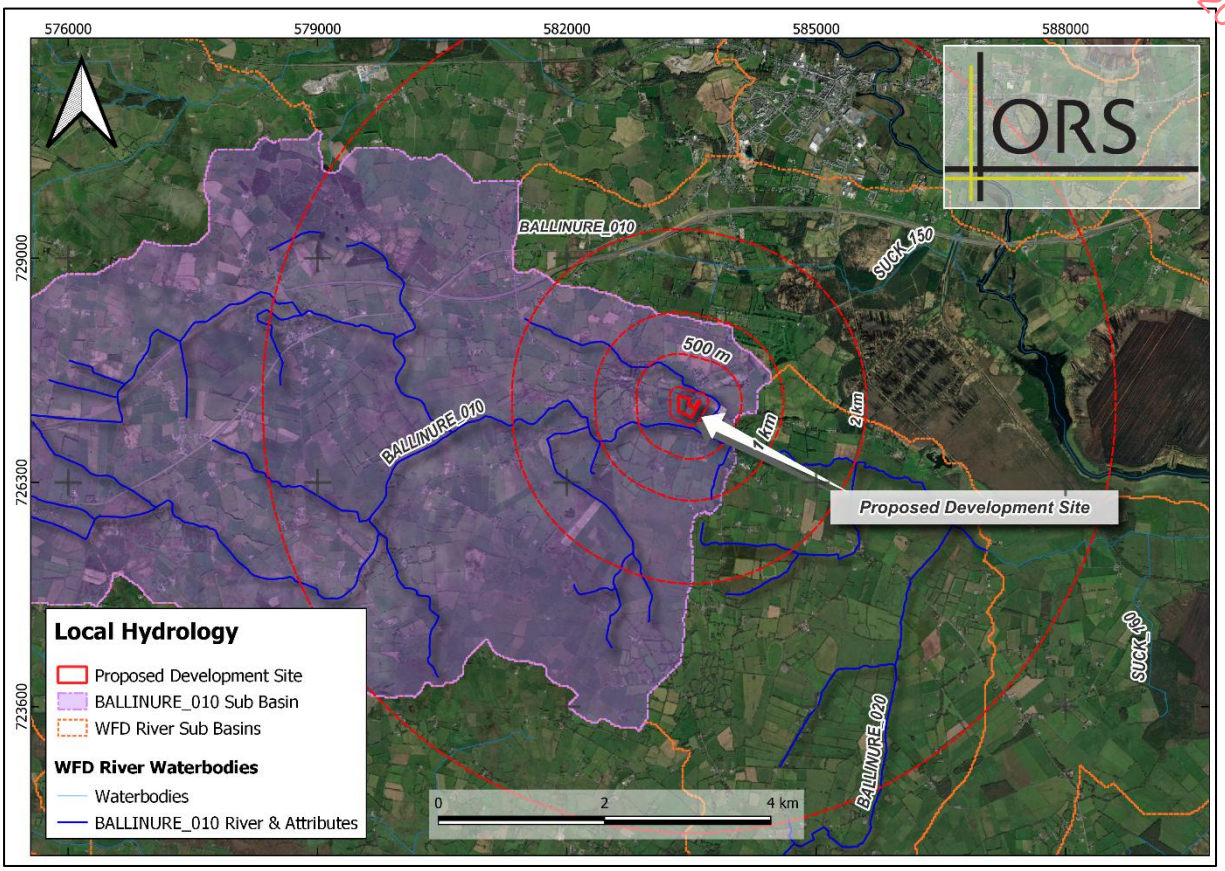

Figure 8.7: Local Hydrology (EPA).

8.4.5.3 Protected Areas

The proposed site is not within or immediately adjacent to any site that has been designated as a Special Area of Conservation (SAC) or a Special Protection Area (SPA) under the EU Habitats or EU Birds Directive. Similarly, there are no nationally designated site, such as a Natural Heritage Area or a proposed Natural Heritage Area in the immediate vicinity.

There are seven Natura 2000 sites and 14 no. proposed NHA within the Zone of Influence of this Proposed Development site. These sites are summarised in **Table 5.5.2** of **Chapter 5 - Biodiversity**. The location of the site in relation to these designated areas are shown in **Figure 8.8** and a full synopsis of these sites can be read online on the website of the National Parks and Wildlife Service (www.npws.ie).

The closest of these is the Glenloughaun Esker SAC, which is located *ca.* 740m west of the site. The drainage ditches on the site flow into the Ballinure River *ca.* 135m southeast of the site. The Ballinure River flows for approximately 6.6km east, where it joins the River Suck. Before the Ballinure River joins the River Suck, it flows into the River Suck Callows SPA, *ca.* 5.4km from the proposed development site. The River Suck then flows for a further 6.3km east before discharging into the River Shannon. The Middle Shannon Callows SPA and River

Shannon Callows SAC are also located at this point. Two no. NHAs are also hydrologically connected via this route; Suck River Callows NHA and River Shannon Callow NHA.

An appraisal of the potential effects of the Proposed Development on the constitutive characteristics of European sites identified within 15km of the Proposed Development is set out in the Natura Impact Statement which accompanies the planning application for this project.

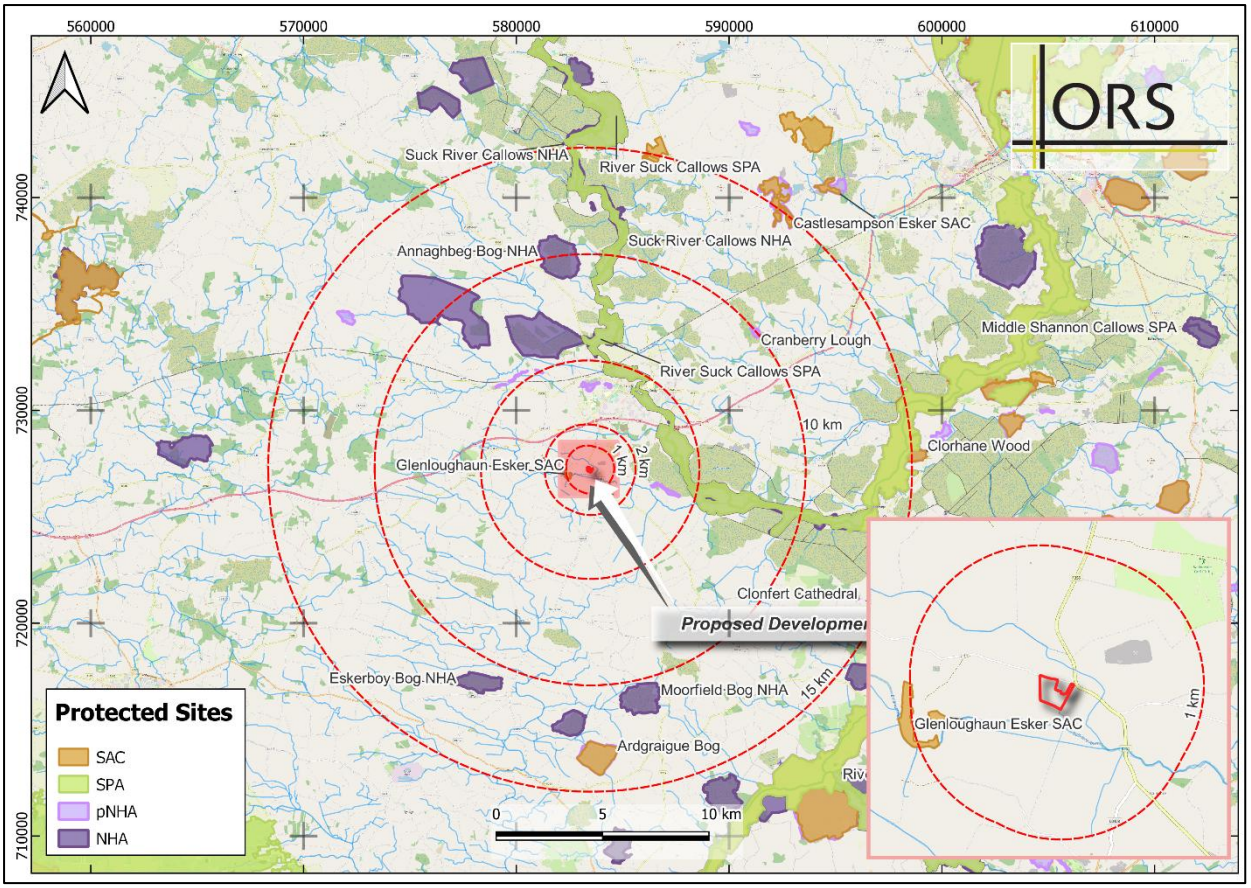

Figure 8.8: SPA, SAC and NHA sites within 15km of site.

8.4.5.4 Site Drainage

Arterial Drainage Schemes are those that the Office of Public Works (OPW) is legally obligated to maintain. These schemes were established under the Arterial Drainage Act of 1945, primarily to enhance agricultural land and mitigate flooding. The works involved modifications to rivers, lakes, weirs, and bridges to improve water conveyance, the construction of embankments to control floodwater movement, and various other activities outlined in Part II of the Act. The main objectives of the schemes were to improve agricultural land, ensure that flood levels up to a 3-year return period were contained within banks, and reduce waterlogging in adjacent lands (known as callows) by lowering water levels during the growing season. As a result, flood protection in the affected areas was significantly enhanced.

In addition, local authorities are responsible for maintaining Drainage Districts, with provisions for their management outlined in Part III and Part VIII of the Arterial Drainage Act, 1945.

According to OPW Arterial Drainage Scheme mapping, the proposed site is not located within

or adjacent to any OPW Arterial Drainage Scheme channels or benefitted lands.

However, the south-eastern portion of the site lies within the benefited lands of the Kellysgrove Drainage District (DD) Scheme, with Drainage District Channel 1717 running along the southern boundary, as illustrated in **Figure 8.9**.

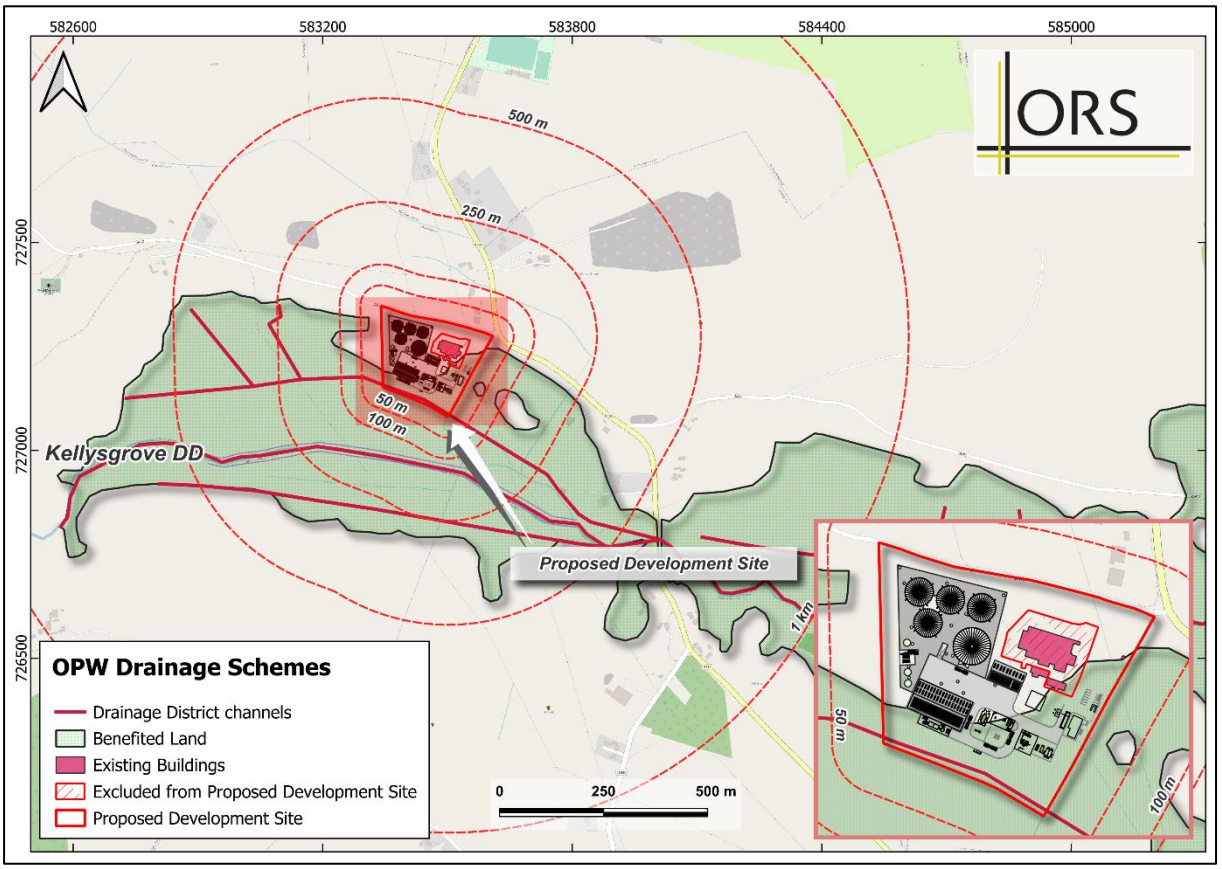

Figure 8.9: Site drainage catchments (OPW)

The site's drainage system follows its natural topographical gradient, with surface water primarily flowing from northwest.

8.4.5.5 Surface Water Rate of Discharge

The permissible rate of discharge of surface water from the site is determined in accordance with criteria set out in the IH 124 report method (Institute of Hydrology). The IH 124 report found that Qbar can be estimated for small rural catchments (less than 25km^2) with the following equation:

$$Qbar_{rural} = 0.00108(AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$$

$Qbar_{rural}$ is the mean annual flood flow from a rural catchment (approximately 2.33-year return period).

AREA is the area of the catchment in hectares.

SAAR is the standard average annual rainfall.

SOIL is the soil index value based on the Winter Rainfall Acceptance Parameter (WRAP) as noted in the flood studies report. It broadly describes infiltration potential and was derived by consideration of soil permeability, topographic slope and the likelihood of impermeable layers.

The site SOIL index value was determined as 0.3 based on onsite observations from the trial pits undertaken which categorised substrata as "Soil Type 2" – Intermediate Sandy Soils.

Based on calculations for Qbar using the equation outlined above, the outflow from the sub catchments will be restricted to greenfield runoff rates as follows:

- Service yard: 3.9 l/s
- Sump/Lower Level: 2.5 l/s

The cumulative site discharge is, therefore, 6.4 l/s.

8.4.5.6 Galway County Development Plan (2022 – 2028) – Flood Risk Management

The Galway County Development Plan 2022–2028 sets out the strategy for the proper planning and sustainable development of Galway County over a six-year period. Of particular relevance to the proposed development at Kellysgrove are the following chapters and policies relating to flood risk management:

- ***Chapter 7:*** *Infrastructure, Utilities and Environmental Protection*
- ***Chapter 10:*** *Natural Heritage, Biodiversity and Green/Blue Infrastructure*
- ***Chapter 14:*** *Climate Change, Energy and Renewable Resource*
- ***Chapter 15:*** *Development Management Standards*

A key objective of the Plan is to integrate sustainable development with the protection and enhancement of the natural environment and ecosystem services. Chapter 14 recognises that *"The control of flooding, in the face of climate change, is a key land-use management issue and a collective responsibility." And that "flooding cannot be completely eliminated but can be minimised through proactive management of catchments and flood risk areas. Avoidance of development in floodplains, except in limited circumstances, is prioritised."*

Chapter 7 – Infrastructure, Utilities and Environmental Protection

- ***Section 7.5.9 –*** *Surface and Storm Water / Sustainable Drainage Systems*
  Policy Objective: All new development throughout the County will be required to minimise surface water discharge through on-site systems such as Sustainable Drainage Systems (SuDS). Development proposals must demonstrate SuDS use, limit unnecessary hardstanding, and be accompanied by a comprehensive SuDS assessment addressing runoff quantity, quality, and potential impacts on habitats and water quality.

Chapter 10 – Natural Heritage, Biodiversity and Green/Blue Infrastructure

- ***Policy Objective WR1 –*** *Water Resources:* Protect water resources including rivers, streams, wetlands, surface water and groundwater quality, and aquatic habitats, in accordance with the EU Water Framework Directive, River Basin District Management Plans, and other relevant EU and national legislation.

Chapter 14 – Climate Change, Energy and Renewable Resource

- ***Section 14.5 –*** *Flooding: Core Objectives of the Flood Risk Management Guidelines:*
  - Avoid inappropriate development in flood-prone areas.
  - Prevent new development from increasing flood risk elsewhere, including from surface water runoff.
  - Ensure effective management of residual flood risk for permitted development.
  - Avoid unnecessary restrictions on economic and social growth.
  - Improve understanding of flood risk among stakeholders.
  - Ensure compliance with EU and national environmental and conservation law.

  Key Principles:

  - Avoid flood risk where possible.
  - Substitute less vulnerable uses when avoidance is not possible.
  - Mitigate and manage risk where avoidance and substitution are not possible.
  - Development should not be permitted in flood risk areas unless no suitable alternatives exist. Vulnerable development in floodplains or on "benefitting lands" should be restricted.

Flood Policy Objectives (FL 1 – FL 18)

- ***FL 1 – Flood Risk Management Guidelines:*** *It is the policy objective of Galway County Council to support, in co-operation with the OPW, the implementation of the EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No. 122 of 2010) and the DEHLG/OPW publication The Planning System and Flood Risk Management Guidelines (2009) (and any updated/superseding legislation or policy guidance) and Department Circular PL2/2014 or any updated / superseding version.*
- ***FL 2 – Flood Risk Management and Assessment:*** *Comply with the requirements of the DoEHLG/OPW The Planning System and Flood Risk Management Guidelines for Planning Authorities and its accompanying Technical Appendices Document 2009 (including any updated/superseding documents). This will include the following:*
  - *Avoid, reduce and/or mitigate, as appropriate in accordance with the Guidelines:*
  - *Development proposals in areas where there is an identified or potential risk of flooding or that could give rise to a risk of flooding elsewhere will be required to carry out a Site-Specific Flood Risk Assessment, and justification test where appropriate, in accordance with the provisions of The Planning System and Flood Risk Management Guidelines 2009 (or any superseding document); Any flood risk assessment should include an assessment of the potential impacts of climate change, such as an increase in the extent or probability of flooding, and any associated measures necessary to address these impacts;*
  - *Development that would be subject to an inappropriate risk of flooding or that would cause or exacerbate such a risk at other locations shall not normally be permitted:*
  - *Galway County Council shall work with other bodies and organisations, as appropriate, to help protect critical infrastructure, including water and wastewater, within the County, from risk of flooding.*
- ***FL 3 – Principles of the Flood Risk Management Guidelines:*** *The Planning Authority shall implement the key principles of flood risk management set out in the Flood Risk Management Guidelines as follows:*
  - *Avoid development that will be at risk of flooding or that will increase the flooding risk elsewhere, where possible:*
  - *Substitute less vulnerable uses, where avoidance is not possible; and*
  - *Mitigate and manage the risk, where avoidance and substitution are not possible.*

- *Development should only be permitted in areas at risk of flooding where there is no alternative, reasonable sites available in areas at lower risk that also meet the objectives of proper planning and sustainable development. Vulnerable development in areas which have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas which have lower flood risk.*

- ***FL 4 – Flood Relief Schemes:*** *The Planning Authority shall support and co-operate with the Office of Public Works (OPW) in the delivery of Flood Relief Schemes.*
- ***FL 5 – Catchment Planning:*** The Planning Authority will support the OPW'S CFRAM Programme and catchment-based Flood Planning Groups, especially where catchments go beyond the Council's administrative boundary, in the development and implementation of catchment-based strategies for the management of flood risk - including those relating to storage and conveyance.
- ***FL 6-Surface Water Drainage and Sustainable Drainage Systems (SuDs):*** *Maintain and enhance, as appropriate, the existing surface water drainage system in the County. Ensure that new developments are adequately serviced with surface water drainage infrastructure and promote the use of Sustainable Drainage Systems in all new developments. Surface water run-off from development sites will be limited to pre-development levels and planning applications for new developments will be required to provide details of surface water drainage and sustainable drainage systems proposals.*
- ***FL 7-Protection of Waterbodies and Watercourses:*** *Protect waterbodies and watercourses within the County from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include protection buffers in riverine, wetland and coastal areas as appropriate.*
- ***FL 8-Flood Risk Assessment for Planning Applications and CFRAMS****: Protect Flood Zone A and Flood Zone B from inappropriate development and direct developments/land uses into the appropriate Flood Zone in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 (or any superseding document) and the guidance contained in Development Management Standard 68.*
  Site-specific Flood Risk Assessment (FRA) is required for all planning applications in areas at elevated risk of flooding, even for developments appropriate to the particular flood zone. The detail of these site-specific FRAs will depend on the level of risk and scale of development. A detailed site-specific FRA should quantify the risks, the effects of selected mitigation and the management of any residual risks. The Planning Authority shall have regard to the results of any CFRAM Studies in the assessment of planning applications. Development proposals will need to be accompanied by a Development Management Justification Test in addition to the site-specific Flood Risk Assessment. Where only a small proportion of a site is at risk of flooding, the sequential approach shall be applied in site planning, in order to seek to ensure that no encroachment onto or loss of the flood plain occurs and/or that only water compatible development such as Open Space would be permitted for the lands which are identified as being at risk of flooding within that site.
  In Flood Zone C, where the probability of flooding is low (less than 0.1%, Flood Zone C), site-specific Flood Risk Assessment may be required, and the developer should satisfy themselves that the probability of flooding is appropriate to the development being proposed.
  In addition to the County Plan SFRA datasets (including the Flood Zones, CFRAMS mapping, historical and predictive groundwater mapping, predictive pluvial mapping and historical flood risk indicator mapping, such as the Benefitting Lands mapping), new and

emerging datasets (such as the OPW's National Fluvial Mapping that will supersede existing PFRA fluvial mapping for catchments greater than 5km2) must be consulted by prospective applicants for developments and will be made available to lower-tier Development Management processed in the Council. Applications for developments in coastal areas and associated assessments shall also consider wave overtopping and coastal erosion.

- ***FL 9-SFRA of Lower Tier Plans:*** *Lower tier plans shall undertake SFRA (Strategic Flood Risk Assessment) in compliance with the Flood Risk Management Guidelines.*
- ***FL 10-SFRA/FRA and Climate Change:*** *SFRAs and site-specific FRAs shall provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (or any superseding document) shall be consulted with to this effect.*
- ***FL 11-FRA and Environmental Impact Assessment (EIA):*** *Flood risk may constitute a significant environmental effect of a development proposal that in certain circumstances may trigger a sub-threshold EIA. FRA should therefore be an integral part of any EIA undertaken for projects within the County.*
- ***FL 12-Inland Fisheries****: It is a policy objective of the Planning Authority to consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the construction of flood alleviation measures in County Galway.*
- ***FL 13-CFRAM****: It is a policy objective of the Planning Authority to take account of and incorporate into local planning policy and decision making, including possible future variations to this plan, CFRAM measures that may be published in the future, including planned investment measures for managing and reducing flood risk.*
- ***FL 14-Flood Vulnerable Zones:*** *It is Council policy objective to ensure that applications pertaining to existing developments in flood vulnerable zones provide details of structural and non-structural risk management measures to include but not be limited to specifications of the following - floor levels, internal layout, flood resilient construction, flood resistant construction, emergency response planning, access and egress during flood events.*
- ***FL 15-Flood Risk Management****: Ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan for Flood Risk Management applicable at the time.*
- ***FL 16-Benefitting Land:*** *Applications for development on land identified as benefitting land may be prone to flooding, and as such site-specific flood risk assessments may be required in these areas.*
- ***FL17-Consultation with OPW:*** *Consult with the OPW in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible and retain a strip on either side of such channels where required, to facilitate maintenance access thereto. In addition, promote the sustainable management and uses of water bodies and avoid culverting or realignment of these features.*
- ***FL 18-Inappropriate Development on Flood Zones:*** *Where a development/land use is proposed within any area subject to this objective the development proposal will need to be accompanied by a detailed hydrological assessment and robust SUDS design which demonstrates the capacity to withstand potential flood events to maintain water quality and avoid potential effects to ecological features.*

- *Any development proposals should be considered with caution and will be required to comply with The Planning System and Flood Risk Management Guidelines for Planning Authorities/Circular PL2/2014 & the associated Development Management Justification Test.*
- *Climate Change should be duly considered in any development proposal.*
- *Protect the riparian zones of watercourse systems throughout the plan area through a general 10 metre protection buffer from rivers within the plan area as measured from the near riverbank, (this distance may be increased and decreased on a site-by-site basis, as appropriate).*
- *Any development proposals submitted for this site will require a detailed ecological report (s), carried out by suitably qualified personnel for the purposes of informing Appropriate Assessment Screening by Galway County Council, the competent authority.*
- *The relevant lands will be outlined and flagged with a symbol on the land use zoning map and on the GIS system of Galway County Council so that staff and the public are aware of the special conditions/constraints attached.*

Chapter 15 – Development Management Standards

- **DM Standard 67 – Sustainable Drainage Systems (SuDS)**
  - All developments must incorporate SuDS to reduce flood risk, improve water quality, and enhance biodiversity.
  - SuDS may include swales, permeable pavements, ponds, wetlands, soakaways, and green roofs.
  - Alternative attenuation systems (e.g., underground tanks) will only be accepted where SuDS are not feasible and must include maintenance plans.
  - Comprehensive SuDS assessments must address runoff rate, quality, and impacts on habitats and water quality.

- **DM Standard 68 – Flooding**

  - Development in inappropriate flood zones requires a Justification Test and site-specific FRA.
  - Specify structural and non-structural risk management measures including:

- **Floor levels:** Raised above design flood levels.
- **Internal layouts:** Living and critical spaces above predicted flood levels.
- **Resilient/resistant construction:** Use of materials and methods to resist or recover from flood damage.
- **Emergency response planning:** Flood warnings, evacuation plans, and coordination with emergency services.

8.4.5.7 Galway County Development Plan (2022-2028) – Strategic Flood Risk Assessment

The Strategic Flood Risk Assessment (SFRA), included in the Galway County Development Plan (2022-2028), is an important resource for managing flood risks. The SFRA provides guidance and suggested approaches to managing flood risk to development; the contents are of particular use in informing the policies and objectives within the Development Plan. The application of the Sequential Approach (e.g. avoid, substitute, justify, mitigate, proceed) and Justification Test is described with particular reference to specific sites across the city and

County.

The purpose of this SFRA is to provide a high-level assessment of all types of flood risk in Galway to inform strategic land use planning decisions. A review of available flood risk information was undertaken to identify any flooding or surface water management issues that warrant further investigation.

The SFRA has mapped boundaries for Flood Risk Zones, taking into account factors including: predictive and historical indicators of flood risk, documented Council knowledge of lands, local knowledge, the potential source and direction of flood paths from rivers and streams, vegetation indicative of flood risk, and the locations of topographic/built features that coincide with the flood indicator related to boundaries/topographical survey.

All SFRA recommendations have been integrated into the Plan and the Plan complies with the Guidelines and associated Circular.

An appropriately detailed flood risk assessment will be required in support of any planning application e.g. Flood Zones A & B require a site-specific Flood Risk Assessment (SSFRA). The level of detail will vary depending on the risks identified and the proposed land use. For projects in Flood Zone C, whether close to a watercourse or not, a flood risk assessment should be carried out to identify flood risks. Factors such as future scenarios (climate change), blocking of a bridge or culvert or other residual risk should be considered. Other sources or flood risk (not fluvial or coastal derived) should be addressed, including groundwater flooding and/or flooding associated with stormwater deficiencies. All Flood Zone C developments must consider the impact of water flood risks on drainage design.

If such risks exist, the assessment should propose mitigation measures. Common solutions include setting finished floor levels above the 1 in 100-year fluvial or 1 in 200-year tidal flood levels, with allowances for climate change and freeboard, or ensuring a step up from road level to prevent surface water ingress. Additional design measures, such as maintaining channels or installing trash screens, might also be necessary. The assessment should detail evacuation routes in case of surrounding land flooding.

Considering the effects of climate change is crucial for all proposed developments, especially those near areas prone to tidal flooding. A development currently classified as being in Flood Zone C might be at risk in the future if sea levels rise by 0.5m (This relates to the OPW guidance, which considers a Mid-Range Future Scenario (MFRS), i.e. end of the century, circa 2100.

The SFRA also includes a checklist for development proposals, which involves:

- The SSFRA is carried out by a qualified engineer with relevant flood risk assessment experience, in accordance with the Galway City and County Council SFRA and planning guidelines.
- Demonstrating that the specific flood risk management objectives outlined in section 5 of the SFRA have been met, including evaluating any residual risks.
- Preparing access, egress, and emergency plans which are appropriate to the source of the flooding and lead time to issue a warning, vulnerability of the development and its occupiers, intensity of use, and flood risk level.
- Assessing the potential impacts of climate change and the development's ability to adapt.

Ensuring compliance with the C753 CIRIA SuDS guide and GDSDS and incorporating SuDS into the design.

8.4.5.8 Flood Risk

According to OPW, the main sources of flooding are rainfall (Inland flooding) or higher sea levels (Coastal Flooding). The principal pathways include rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors may include people, their property, and the environment. To accurately determine the potential consequences of flooding, it is essential to assess these three elements – sources, pathways, and receptors - alongside the vulnerability and exposure of receptors.

The Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) published 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' in 2009 (The Guidelines). The Guidelines define the likelihood of flooding is the probability or frequency of a flood of a specific magnitude or severity occurring or being exceeded in any given year. It is generally expressed as the chance of a particular flood level being exceeded in one year. This return period is described as the Annual Exceedance Probability (AEP). For example, a 1 in 100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types or levels of flood zones defined for the purposes of the Guidelines:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

In 2018, the Office of Public Works (OPW) launched a new online flood map viewer to provide information on the likelihood of flood risk and the extent of flooding across Ireland. This viewer includes flood risk data derived from several sources including:

1. ***Catchment Flood Risk Assessment and Management (CFRAM) Programme:*** 300 communities at potentially significant flood risk, referred to as Areas for Further Assessment (AFA's).
2. ***National Indicative Fluvial Mapping (NIFM):*** Predictive flood maps showing indicative areas predicted to be inundated during a theoretical fluvial flood event with an estimated probability of occurrence. Indicative flood maps have been produced for all watercourses that are on the EPA am
3. layers, have a catchment area greater than 5km^2 and for which flood maps were not produced under the National CFRAM Programme.
4. ***Geological Survey Ireland Groundwater Flooding:*** Probabilistic flood extent of groundwater flooding in limestone regions. These maps are focused primarily (but not entirely) on flooding at seasonally flooded wetlands known as turloughs.

5. ***Past Flood Events:*** A Past Flood Event is defined as the occurrence of recorded flooding at a given location on a given date or on a recurring basis. The event is derived from available flood information documentation including flood event reports, news articles, archive information and photos.

The Preliminary Flood Risk Assessment (PFRA) carried out a national-level screening using available and readily derivable datasets to identify locations at significant risk of flooding, referred to as Areas for Further Assessment (AFAs). According to the PFRA, there are no identified areas of significant groundwater or pluvial flood risk in proximity to the proposed site.

In terms of fluvial flooding, the town of Ballinasloe, located *ca.* 4 km northeast of the site, has been assigned a Flood Index of 315, indicating a moderate to high risk of fluvial flooding. Consequently, Ballinasloe has been designated as an Area or Potential Area for Further Assessment (AFA). However, this designation does not extend to Glenloughaun or the proposed development site. As such, no detailed CFRAM flood modelling data is available for the site itself. The nearest CFRAM-modelled flood extents are located along the River Suck, *ca.* 2 km to the northeast, as shown in **Figure 8.10**.

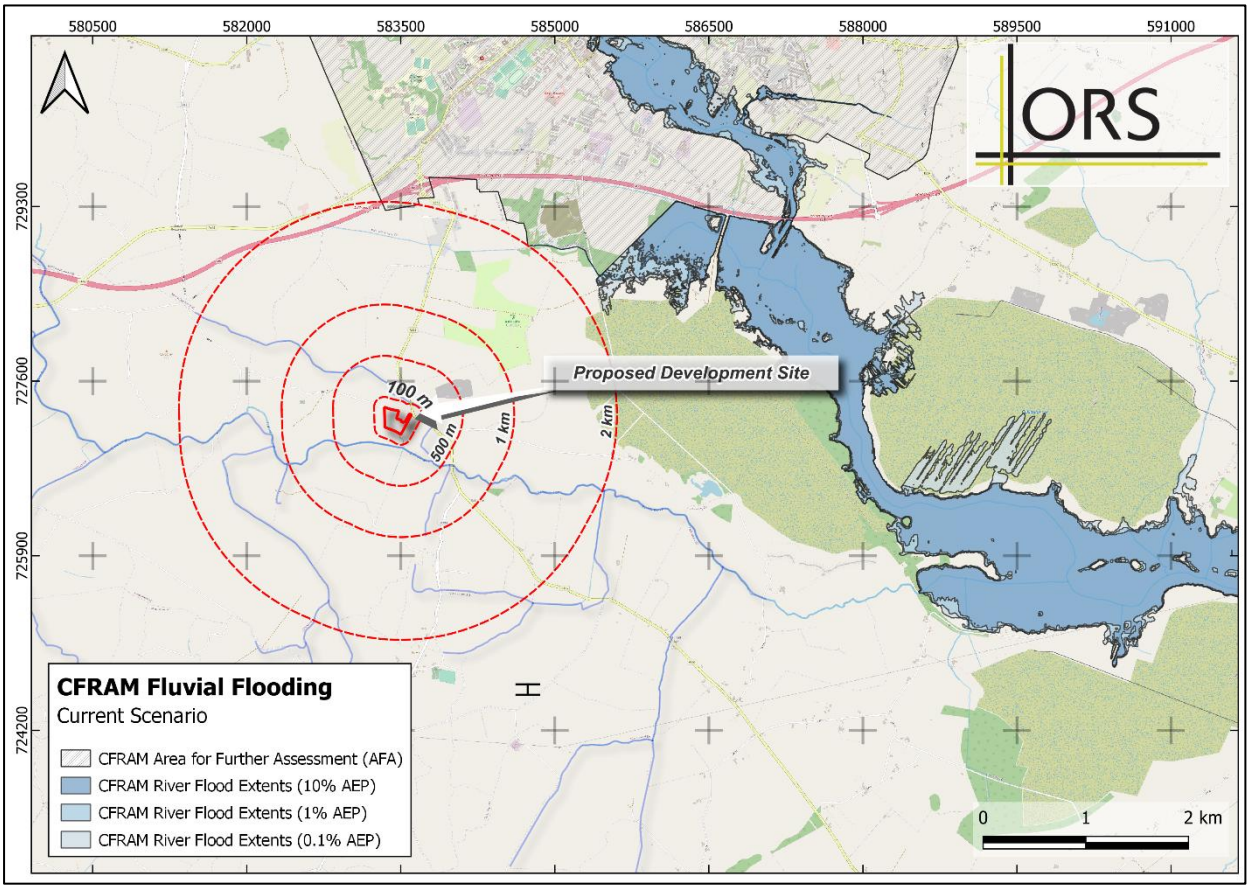

Figure 8.10: CFRAM Flood Extents & Ballinasloe AFA in relation to the Proposed Development

The National Indicative Fluvial Maps (NIFM) have been developed to provide a broad-scale overview of potential fluvial flood risk. These maps are predictive in nature and highlight areas likely to be inundated during theoretical fluvial flood events of varying probabilities, intended to guide the need for further assessment where development is proposed.

According to the NIFM, for the Present-Day scenario with annual exceedance probabilities of 0.1%, 1%, and 10%, flood-prone areas are identified along the southern boundary of the site. In these scenarios, floodwaters are estimated to extend *ca.* 50m into the site boundary. The mid-range and high-end future climate scenarios do not predict any significant expansion of flood extents within the site area.

In summary, the majority of the proposed site lies within an area with a less than 0.1% annual probability of flooding, corresponding to Flood Zone C, which represents a low risk of flooding. Nonetheless, a small portion of the site along the southern boundary falls within Flood Zones A and B, where the risk of flooding is higher.

A summary of the above-noted surface flood risk data as derived from the OPW map viewer within the vicinity of the site is presented in **Figure 8.11**.

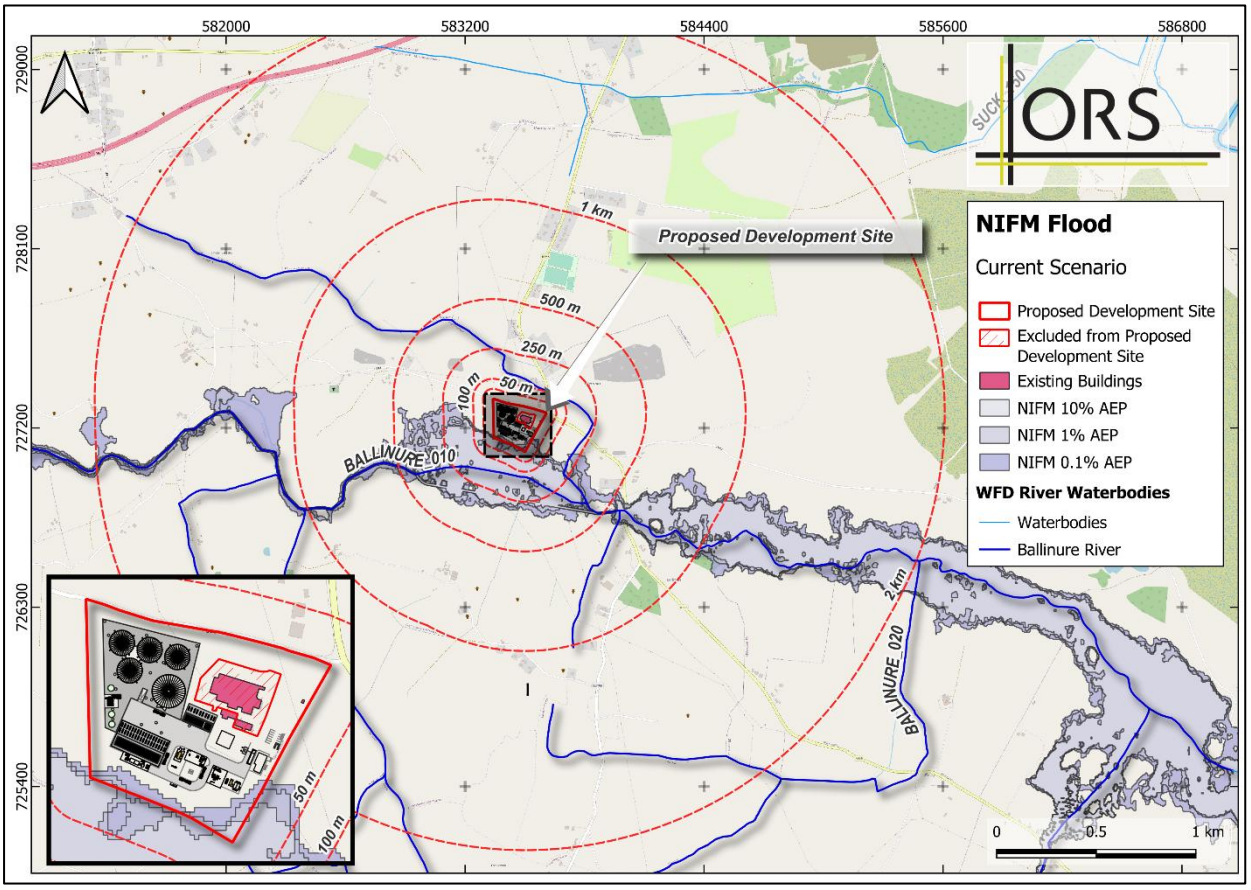

Figure 8.11: NIFM Flood extends in relation to the Proposed Development (Source: OPW).

The Synthetic Aperture Radar (SAR) Seasonal Flood Maps also indicate historic low confidence flooding adjacent to the southern boundary of the site (Flood ID 25371). These maps show observed flood extents between Autumn 2015 and Summer 2021, created using SAR images from the Copernicus Programme Sentinel-1 satellites. The flood extents were generated using Python 2.7 algorithms developed by the Geological Survey Ireland and refined through post-processing filters. While the maps depict actual observed flood events, the absence of flooding in certain areas only means that flooding was not observed, not that it is impossible in the future.

Additionally, the GSI developed a Winter 2015/2016 Surface Water Flooding map, which attempted to measure the surface water flood extents, shows several instances of historic flooding within a 2 km radius from the Proposed Site. The closest surface water flood extents that occurred during the Winter of 2015/2016 is located *ca.* 250m E of the Proposed Site.

The Winter 2015/2016 Surface Water Flooding along with the Synthetic Aperture Radar (SAR) Seasonal Flood Maps are presented in **Figure 8.12**.

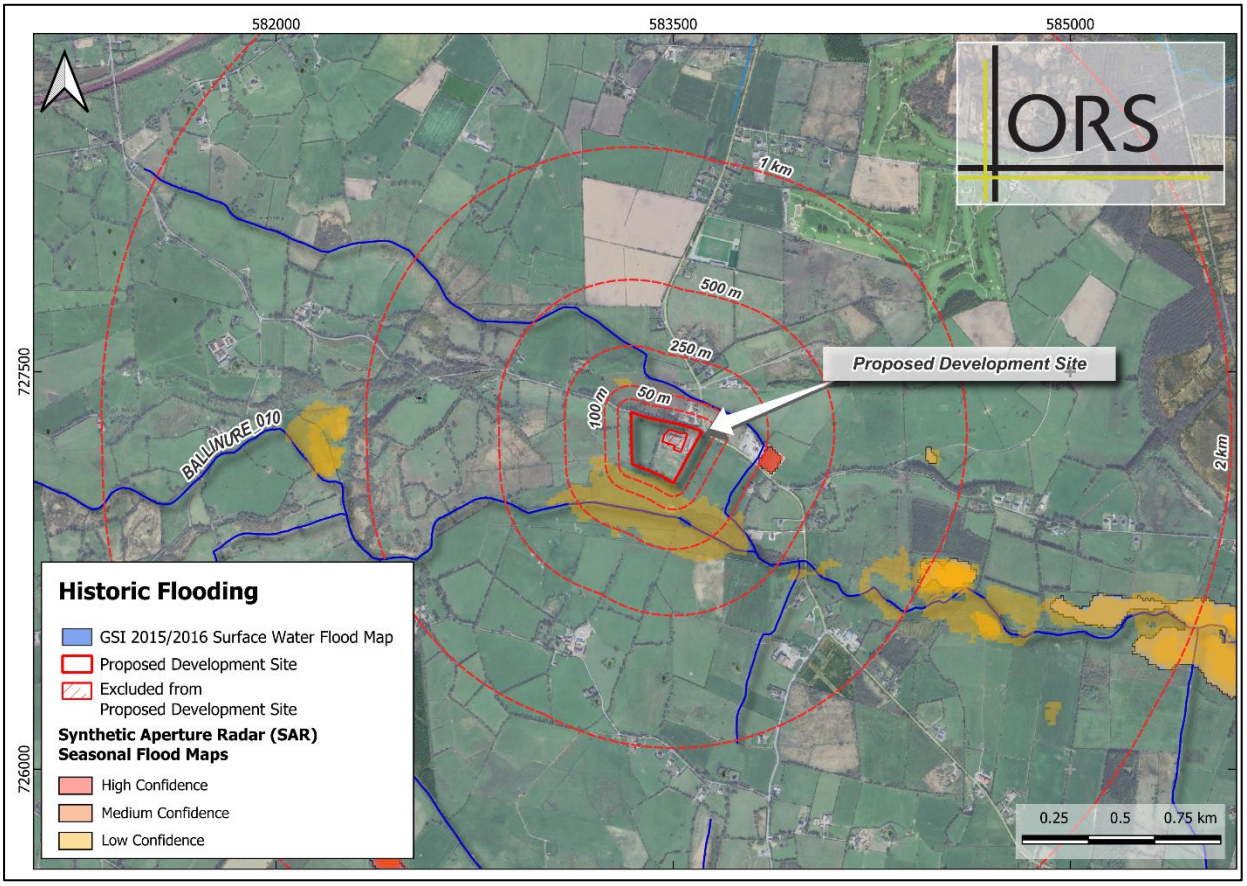

Figure 8.12: Historic Flooding within 2km from Proposed Site.

There are 2 no. flood events noted within 2.5 km of the proposed site. The closest flood event noted within the OPW records was the recurring flooding at Kellysgrove/R355 (ID-1734), where Low lying land floods after heavy rain every year due to inadequate drainage.

Further details on flood risk for the site, see Site-Specific Flood Risk Assessment (SSFRA) which is accompanying this application (***Ref. No. 231960-ORS-XX-XX-RP-EN-13d-011***).

8.4.5.9 Galway County Development Plan (2022 – 2028) – Water Quality

A review of the Galway County Development Plan was conducted to identify policies and objectives related to the preservation and protection of water quality across the region. The policies relevant to the proposed development are outlined below.

Chapter 4 – Rural Living and Development:

- ***RC 5 – Rural Clustering on un-serviced lands in Villages:*** *Support the development of clusters of five houses or less within the footprint of existing villages with individual wastewater treatment plants in accordance with the most up to date EPA Code of Practice for Wastewater Treatment and Disposal Systems serving single houses. All proposals shall ensure that there is the provision of safe water supply. Proposals for development in these villages shall include an assessment undertaken by a qualified hydrologist, that demonstrates that the outfall from the septic tank will not, in combination with other septic tanks within the village and wider area, contribute towards any surface or ground water body not meeting the objective of the water group under the Waste Framework Directive, or negatively impact upon drinking water resources.*
- ***RH 11 – Waste Water Treatment provision:*** *Where a connection to the public wastewater network is not available, provide for sustainable rural housing in the county in accordance with the EPA Code of Practice: Wastewater Treatment Systems for Single Houses (2009).*
- ***AD 4 – Agricultural Waste:*** *To ensure agricultural waste is managed and disposed of in a safe, efficient and sustainable manner having regard to the environment and in full compliance with the European Communities Good Agricultural Practice for the Protection of Waters Regulations (2014) and relevant best practice guidelines.*

Chapter 7 – Infrastructure, Utilities and Environmental Protection:

- ***WS 2 – Protection of Water Supplies:*** *Collaborate with Irish Water and the Group Water Federation Scheme to protect, conserve and enhance all existing and potential water resources in the County to ensure compliance with the European Union (Drinking Water) Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations.*

- ***WS 4 – Requirement to Liaise with Irish Water – Water Supply:*** *Ensure that new developments are adequately serviced with a suitable quantity and quality of drinking water supply and require that all new developments intending to connect to a public water supply liaise with Irish Water with regard to the water (and wastewater) infrastructure required.*

- ***WS 5 – Private Water Supply:*** *Support the provision of a private water supply in instances where there is no public water supply or where the existing supply does not have sufficient capacity to serve the proposed development. This will only be considered where it can be demonstrated that the proposed water supply meets the standards set out in the EU and national legislation and guidance including adherence to Article 6 of the EU Habitats Directive, and would not be prejudicial to public health or would not significantly impact negatively on the source or yield of an existing supply*

- ***WS 7 – Water Quality:*** *Require that new development proposals would ensure that there would not be an unacceptable impact on water quality and quantity including surface water, ground water, designated source protection areas, river corridors and associated wetlands.*

- ***CWS 1 – Water Conservation with all Developments:*** *To ensure all developments incorporate water conservation measures such as rainwater harvesting to minimise wastage of water supply.*

- ***WW 4 – Requirement to Liaise with Irish Water - Wastewater:*** *Ensure that new developments will only be permitted which are adequately serviced with sufficient capacity*

for appropriate collection, treatment and disposal (in compliance with the Water Framework Directive and River Basin Management Plan) to the public sewer unless provided for otherwise by the plan. Developers shall liaise with Irish Water with regard to the wastewater (and water) infrastructure to ensure sufficient capacity is available prior to the submission of a planning application.

- ***WW 6 – Private Wastewater Treatment Plants:*** *Ensure that private wastewater treatment plants, where permitted, are operated in compliance with Environmental Protection Agency (EPA) Code of Practice for Domestic Waste Water Treatment System 2021 (Population Equivalent ≤10).*

- ***WW 7 – Sustainable Drainage Systems:*** *To require the use of Sustainable Drainage Systems to minimise and limit the extent of hard surfacing and paving and require the use of SuDS measures be incorporated in all new development (including extensions to existing developments). All development proposals shall be accompanied by a comprehensive SuDS assessment including run-off quantity, run off quality and impacts on habitat and water quality.*

- ***WW 10 – Surface Water Drainage:*** *To require all new developments to provide a separate foul and surface water drainage system and to incorporate sustainable urban drainage systems where appropriate in new development and the public realm.*

- ***WW 11 – Protection of Irish Water Collection Systems:*** *To prohibit the discharge of additional surface water to combined (foul and surface water) sewers in order to maximise the capacity of existing collection systems for foul water.*

Chapter 10 – Natural Heritage, Biodiversity and Green/Blue Infrastructure:

- ***WR 1 – Water Resources:*** *Protect the water resources in the plan area, including rivers, streams, lakes, wetlands, springs, turloughs, surface water and groundwater quality, as well as surface waters, aquatic and wetland habitats and freshwater and water dependant species in accordance with the requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the River Basin District Management Plan 2018 – 2021 and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same) and also have regard to the Freshwater Pearl Mussel Sub-Basin Management Plans.*
- ***WR 2 – River Basin Management Plans:*** *It is a policy objective of the Planning Authority to implement the programme of measures developed by the River Basin District Projects under the Water Framework Directive in relation to: Surface and groundwater interaction, Dangerous substances, Hydromorphology, Forestry, On site wastewater treatment systems, Municipal and industrial discharges, Urban pressures, Abstractions.*

Chapter 14 – Climate Change, Energy and Renewable Resource:

- ***FL 6 – Surface Water Drainage and Sustainable Drainage Systems (SuDS):*** *Maintain and enhance, as appropriate, the existing surface water drainage system in the County. Ensure that new developments are adequately serviced with surface water drainage infrastructure and promote the use of Sustainable Drainage Systems in all new developments. Surface water run-off from development sites will be limited to predevelopment levels and planning applications for new developments will be required to*

provide details of surface water drainage and sustainable drainage systems proposals.

- ***FL 7 – Protection of Waterbodies and Watercourses:*** *Protect waterbodies and watercourses within the County from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include protection buffers in riverine, wetland and coastal areas as appropriate.*

8.4.5.10 Biological Water Quality

National surveys of Irish rivers have taken place on a continuous basis since 1971. The National Rivers Monitoring Programme was replaced by the Water Framework Monitoring Programme from 22 December 2006. As part of the Water Framework Directive (WFD) Monitoring Programme approximately one third of our major rivers and their more important tributaries are surveyed and assessed each year by EPA ecologists. A complete survey cycle is completed every three years. The sites are scored on a five-point system developed by the EPA called the Biological Q-Rating system. Macroinvertebrate data is utilised to ascertain the biological quality of a given river or stream as detailed in **Table 8.2** at the beginning of this chapter.

Biological Q-values and physico-chemical data are not available for the River Ballinure in close proximity to the Proposed Site. Nevertheless, there are some relevant data from EPA monitoring stations both upstream and downstream of hydrological point of connection with the site. This data provides a good basis for characterising the local hydrology. **Table 8.5** outlines the monitoring stations relevant to the proposed development, including their associated Q-Ratings, while **Figure 8.13** illustrates their locations relative to the site.

Table 8.5: Upstream and downstream Biological Q-Ratings for River Ballinure (EPA)

Station ID (EPA)	Station Name	Year									
		1992	1999	2002	2006	2009	2011	2014	2017	2020	2023
RS26B060150	Attibrassil Br	-	-	-	-	4	4	-	-	4	4
RS26B010200	Attibrassil Bridge (1" map)	-	4	4	3-4	-	-	-	-	-	-
RS26B010300	Ballinure bridge	4	-	-	-	-	-	-	-	-	-
RS26B010400	Br N. of Ballymanagh Lodge	3-4	3	3	3-4	4	4	3-4	3-4	3	3

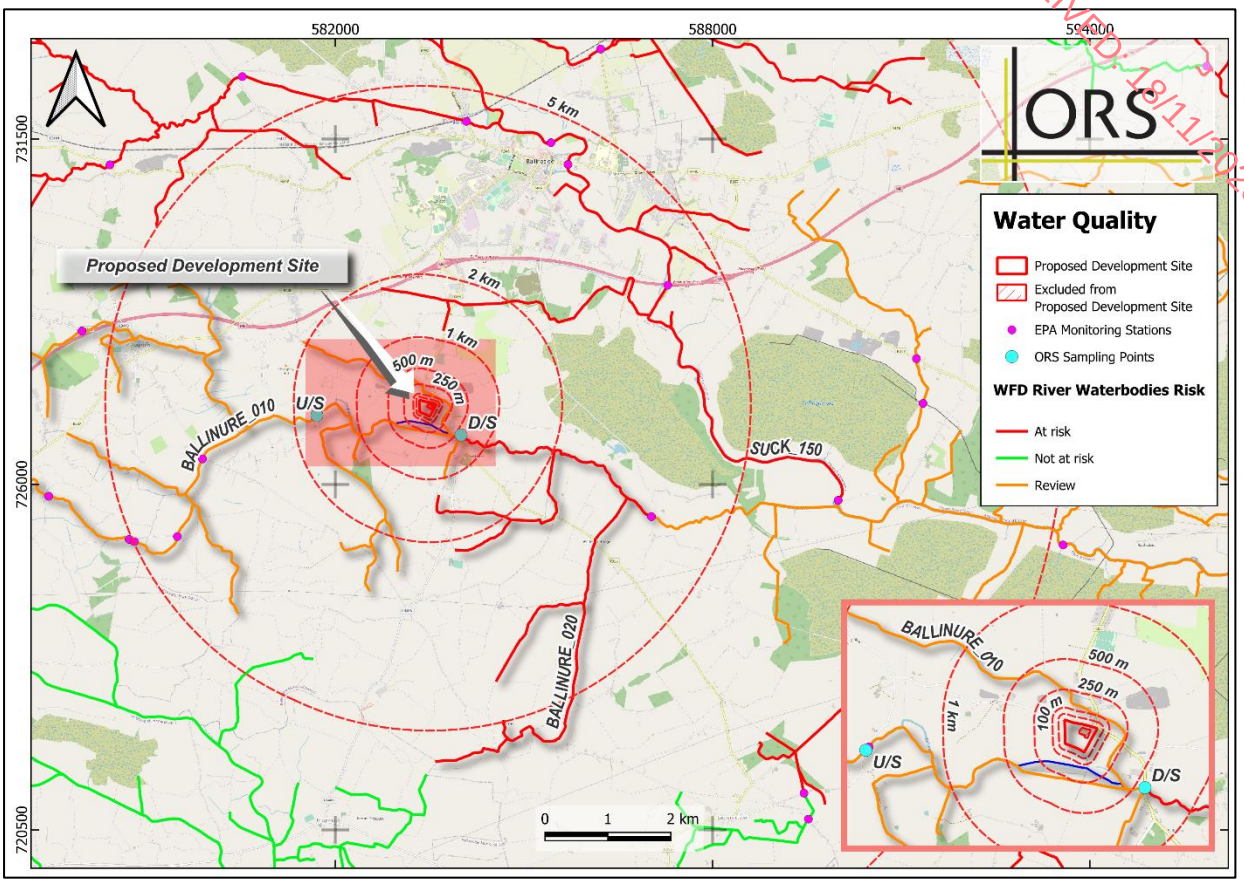

Figure 8.13: Water Framework Directive Risk and locations of water quality monitoring stations (EPA maps)

EPA water quality monitoring stations **RS26B060150** and **RS26B010200** are located on the River Ballinure, *ca.* 4.5 km and 2.2 km upstream of the Proposed Site, respectively. Q-value assessments at these locations have been infrequent, with four and three recorded monitoring events over the past three decades.

Despite the limited monitoring frequency, station **RS26B060150** has consistently reported a Q-value of 4, including the most recent assessment in 2023. This indicates a stable and satisfactory biological quality at this upstream reach, likely representative of the current condition of the watercourse.

In contrast, station **RS26B010200** has exhibited signs of water quality decline. While two previous assessments recorded a Q-value of 4, the most recent result in 2006 indicated a deterioration to Q-value 3–4. No subsequent data are available for this station.

Downstream of the Proposed Site, station **RS26B010300** is located *ca.* 500 m away. This station has not been active in recent years, with the last recorded Q-value of 4 dating back to 1992.

Further downstream, *ca.* 4.3 km from the Proposed Site, station **RS26B010400** has a more comprehensive dataset, with Q-values recorded consistently over the past three decades. Results indicate generally moderate biological quality, with values typically ranging between 3 and 3–4, and only two instances of Q-value 4. The most recent result, a Q-value of 3, reflects unsatisfactory biological conditions in this section of the River Ballinure.

This data suggests a gradual decline in water quality along the course of the River Ballinure. Upstream monitoring stations show Q-values indicative of good ecological status and low pollution levels, whereas downstream results reflect increasing pressures, likely linked to agricultural activity and nutrient enrichment, resulting in moderate pollution and reduced biological integrity.

The nearest section of the River Ballinure to the Proposed Site (EPA waterbody code: BALLINURE_010), including its tributaries, is currently classified as having ‘Good’ ecological status under the Water Framework Directive (WFD). However, its risk status is currently under review, as outlined in the Cycle 3 HA 26D Upper Shannon (Suck) Catchment Report (May 2024). At the time of publication, no specific pressures were identified for this waterbody.

Approximately 500 m downstream of the Proposed Site, the waterbody designation changes to BALLINURE_020, which was classified as having ‘Poor’ WFD status in the most recent monitoring cycle (2022–2027) and is now considered At Risk. The Catchment Report identifies agriculture as a significant pressure on this waterbody, with nutrient load being the primary concern.

The report also notes that BALLINURE_010 is hydrologically connected to the Glenloughaun Esker SAC and has therefore been designated as an Area for Action – Restoration (AFA) under the Local Authorities Waters Programme (LAWPRO). The Ballinure Priority Area for Action – Desk Study Summary, which includes both BALLINURE_010 and BALLINURE_020, highlights domestic wastewater and agriculture as significant contributors to water quality issues in the area.

This AFA designation prioritises targeted restoration measures that supplement existing actions, with multiple agencies collaborating to improve water quality. Key stakeholders involved include LAWPRO, local authorities, and the National Federation of Group Water Schemes. The AFA covers a total of four waterbodies and commenced in 2021, with the initial public engagement phase having recently been completed.

ORS has undertaken a Site-Specific Q-value Assessment for the subject location. Ecological status was evaluated at two monitoring points along the River Ballinure, situated upstream and downstream of the hydrological connectivity with the site. Both monitoring points returned Q-values of 3–4, corresponding to Moderate Ecological Status under the Water Framework Directive (WFD). This classification indicates slight organic pollution and places the waterbody within an Unsatisfactory status category. The specific monitoring locations in relation to the site are presented in **Figure 8.13**.

The results are consistent with the most recent monitoring data published by the Environmental Protection Agency (EPA) for the local hydrological network.

8.4.5.11 Hydrochemistry Data

The section of the River Ballinure (BALLINURE_010) nearest the Proposed Site, including its tributaries, currently holds a 'Good' ecological status under the Water Framework Directive, though its risk status is under review (HA 26D Upper Shannon Catchment Report, May 2024). Around 500 metres downstream, the river becomes BALLINURE_020, which was classified as having 'Poor' status in the 2022–2027 monitoring cycle and is considered At Risk.

Available information from both watercourses is summarised in **Table 8.6** below.

Table 8.6: Description of Receiving Waters – Ballinure_010 & Ballinure_020 (Catchments.ie)

Characteristic	Classification	Status	Interpretation
Receiving Waterbody Name	Ballinure_010	Under Review	Receiving Waterbodies are the Ballinure_010 and the Ballinure_020, which have a Good and Poor WFD Status, respectively. There are no inputting surface waterbodies for BALLINURE_010, and this is the only inputting waterbody for BALLINURE_020.
	Ballinure_020	At Risk	
Waterbody Type	River	-	-
WFD Status	SW 2016-2021	Good	The waterbody has shown consistent water quality since the 2007–2009 SW monitoring cycle, maintaining a classification of Good Ecological Status in all subsequent assessments.
		Poor	The waterbody has shown a decline in its Ecological Status over the years. It was originally classified as having Good Status during the 2007–2009 and 2010–2012 SW monitoring cycles, but its water quality deteriorated in the following two monitoring periods, falling to Moderate Status and eventually being classified as Poor Status in the 2016–2021 cycle. According to Catchment Reports, the stream is primarily impacted by agricultural activities in the surrounding area.
Resource	Not Classified		No drinking water abstractions and no abstractions pressures registered for either Ballinure_010 or Ballinure_020.
Hydromorphological Conditions	Not classified	N/A	Hydromorphological Conditions is not included in the Planned Monitoring for these waterbodies.
Chemical SW Status	Not classified	N/A	Chemical Surface Water Status is not included in the Planned Monitoring for these waterbodies.
Biological Status	Macrophyte Status or Potential	N/A	The monitoring programme for Ballinure_010 & Ballinure_020 focuses solely on Invertebrate Status or Potential (Q-value). For the Ballinure_010, historical data since 2007 indicate a consistently good water quality, with Q-values equal to 4. In the other hand, the Ballinure_020 has shown a decline in its Ecological Status over the years, degrading from Good Status in the SW 2007-2009 to Poor in the SW 2016-2021. Macrophyte, Phytobenthos, and Fish Status are not included in the Planned Monitoring for these waterbodies.
	Invertebrate Status or Potential	Good/Poor	
	Phytobenthos Status or Potential	N/A	
	Fish Status or Potential	N/A	
Supporting Chemistry Conditions	Oxygenation Conditions	Pass	**BALLINURE_010:** Chemical conditions were not included in the most recent monitoring cycle; therefore, data from the
	Nitrogen	High	

Characteristic	Classification	Status	Interpretation
	Phosphorus	High	2013–2018 SW cycle have been considered instead. The waterbody has shown fairly stable hydrochemical conditions over the years, with the only recorded failure being for Dissolved Oxygen (% Sat) during the 2010–2015 cycle. **BALLINURE_020:** Chemical conditions were only included in the most recent monitoring cycle; therefore, no trend is currently available for analysis.
	Other Nutrients	High	
	Specific Pollutant Conditions	N/A	

EPA hydrochemistry data for BALLINURE_010 is limited, with the most recent records dating back to 2018. For BALLINURE_020, updated data from 2025 is available, although it includes only a limited set of parameters. Nevertheless, this data was used to inform the present analysis. The BALLINURE_010 section is monitored by station **RS26B010300**, located *ca.* 690m downstream of the site. The BALLINURE_020 section is monitored by station **RS26B010400**, situated *ca.* 4.5 km downstream of the site. **Table 8.7** overleaf presents the average background concentrations considering the available data for these monitoring stations. The location of these stations in relation to the subject site can be seen in **Figure 8.13**.

Table 8.7: EPA Hydrochemistry data for both upstream and downstream points on River Ballinure (Source: Cacthment.ie)

Monitoring Station	Parameter	Unit	Average	River Waterbodies Risk	River Waterbody WFD Status 2016-2021
RS26B010300 (BALLINURE_010)	Ammonia-Total	mg/l as N	0.044	Under Review	Good
	BOD - 5 days (Total)	mg/l	1.43		
	Dissolved Oxygen	mg/l	11.1		
	Nitrate	mg/l as N	1.16		
	Nitrite	mg/l as N	0.01		
	Orthophosphate	mg/l as P	0.02		
	pH	pH units	8.03		
	Total Oxidised Nitrogen	mg/l as N	1.17		
RS26B010400 (BALLINURE_020)	Ammonia-Total	mg/l as N	0.025	At risk	Poor
	BOD - 5 days (Total)	mg/l	1.59		
	Dissolved Oxygen	mg/l	9.81		
	Nitrate	mg/l as N	0.95		
	Nitrite	mg/l as N	0.005		
	ortho-Phosphate	mg/l as P	0.02		

Monitoring Station	Parameter	Unit	Average	River Waterbodies Risk	River Waterbody WFD Status 2016-2021
	pH	pH units	8		
	Total Oxidised Nitrogen	mg/l as N	1.25		

On 17th July 2025, ORS collected baseline water samples from the River Ballinure at locations upstream (U/S) and downstream (D/S) of the proposed development. The positions of the sampling points relative to the site are shown in **Figure 8.13** and are indicated by light blue markers. The samples were analysed at an accredited laboratory (Eurofins), with the results presented in Table 8.9. The full laboratory reports are provided in **Appendix 8.1**.

Table 8.8: Hydrochemistry results (U/S and D/S of Proposed Development – River Ballinure)

Sampling Location	Parameter	Unit	Result
Upstream sample	Ammonia	mg/l as N	0.019
	BOD	mg/l	1.30
	COD	mg/l	20
	Nitrogen (Total Oxidised)	mg/l as N	<1
	Nitrate (surface water)	mg/l as N	<1
	Nitrite (surface water)	mg/l as N	0.011
	pH	pH units	7.9
	Orthophosphate	mg/l as P	0.07
	Total Suspended Solids	mg/l	<5
Downstream Sample	Ammonia	mg/l as N	0.012
	BOD	mg/l	1.00
	COD	mg/l	14.0
	Nitrogen (Total Oxidised)	mg/l as N	1.02
	Nitrate (surface water)	mg/l as N	<1
	Nitrite (surface water)	mg/l as N	0.013
	pH	pH units	8.0
	Orthophosphate	mg/l as P	0.038
	Total Suspended Solids	mg/l	<5

The results indicate that the waterbody does not achieve the criteria required for ‘Good’ status under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. This is primarily attributable to elevated concentrations of orthophosphate recorded in both samples. These findings are consistent with the EPA monitoring data referenced above.

It is noted that the majority of hydrochemistry parameters for the upstream sample exhibited elevated values compared to the downstream sample. This may be attributable to the location of Aughrim Town upstream of the sampled point, along with other small clusters of residential and agricultural industries, potentially contributing via surface runoff or localised discharges.

The concentrations may have been diluted between the upstream and downstream points, an area predominantly agricultural and unlikely to have significant discharges. However, it is important to recognise that this analysis is based on a single measurement and may not fully represent the overall or current condition of this surface waterbody.

Furthermore, as the Proposed Development will not involve any process discharges, no adverse impact on the quality of the local hydrology or downstream receptors is anticipated.

8.4.6 Hydrogeology

8.4.6.1 Regional & Local Hydrogeology

Hydrogeology is the study of groundwater, including its origin, occurrence, movement and quality. Rocks which store and transmit groundwater are known as bedrock aquifers. Different bedrock types have differing abilities to store and transmit water, depending on their permeability and fracture intensity. The Geological Survey of Ireland has classified all aquifers in Ireland in three main categories based on potential yield and extent:

- Regionally Important
- Locally Important
- Poor

County Galway's hydrogeology is shaped by a varied geological landscape, with a marked division between the karstic limestone lowlands of the east and the less productive upland bedrock in the west. The eastern area is underlain mainly by Waulsortian and Burren limestones, which have undergone significant karstification. This results in features such as swallow holes, turloughs, and conduit-driven spring systems. The high secondary permeability in these karst aquifers allows for rapid groundwater flow and minimal natural attenuation, making them highly susceptible to contamination. Drainage is often subterranean and complex, with strong interactions between groundwater and surface water systems.

In contrast, the western part of the county consists largely of low-permeability Silurian and Devonian metasedimentary rocks and granite, where groundwater occurs only in fractured zones and is typically of limited yield. These aquifers are classified as poorly productive and support only small-scale water supplies. Overlying Quaternary deposits, mainly glacial till and sand/gravel outwash, vary in thickness and permeability, further influencing recharge dynamics and localised aquifer potential. Hydrological connectivity between surface water and groundwater, particularly in the karst areas, presents both management challenges and ecological sensitivities, especially in relation to seasonal flooding and water quality protection.

The subject site is located above the Aughrim Groundwater Body, which covers an area of 250 km², between Galway & Roscommon Counties. The main aquifer category in this GWB is Locally important aquifer which is moderately productive only in local zones (Ll). However, there is a small area north of Aughrim which is classified as Regionally important karstified aquifer dominated by conduit flow (Rk^c).

This GWB comprises flat, low-lying areas adjacent to the River Suck, with progressively higher ground extending towards the groundwater body boundaries. The bedrock is generally of low permeability, although localised zones of enhanced permeability occur along structural features. Groundwater movement is primarily through fractures, joints, and major faults. Recharge occurs diffusely through the subsoil but is restricted in areas where the aquifer is

overlain by clayey till and lacustrine clay deposits associated with the bogs.

In general, groundwater within this GWB is unconfined; however, confinement may occur locally beneath the extensive clayey till and lacustrine clay deposits underlying the large bogs along the River Shannon. The majority of groundwater flow is concentrated within the upper 15 m of the bedrock, comprising a shallow weathered zone and an underlying interconnected fractured zone. Isolated deeper groundwater strikes may occur within more significant faults or fracture systems. Groundwater flow within this body is predominantly localised, with generally short flow paths.

Groundwater discharges primarily to streams traversing the body and to the River Suck, with the overall flow direction oriented towards the River Suck.

The subject site lies above a Locally Important bedrock aquifer, classified as generally Moderately Productive only in Local Zones (Ll). A Locally Important Gravel Aquifer, the Clontuskert, is distant *ca.* 900 m to the east, as illustrated in

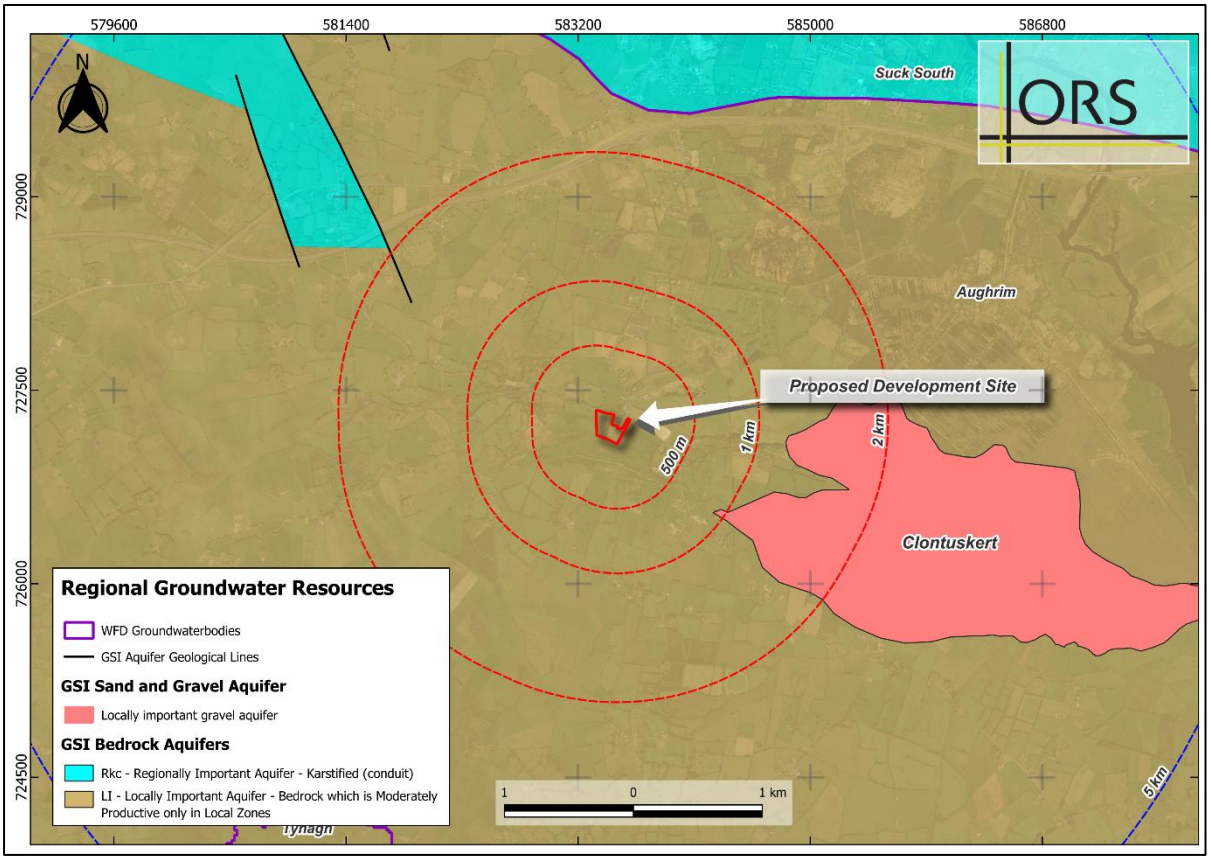

Figure 8.14.

The Clontuskert Sand and Gravel Aquifer is located approximately 4 km south of Ballinasloe and comprises glaciofluvial sands and gravels, together with an east–west oriented band of eskers within a relatively low-lying, gently undulating area that parallels the course of the Ballinure and Cloonescragh Rivers. The aquifer body is overlain by extensive areas of cutover raised peat and alluvium, which cover approximately 41% of the delineated aquifer area.

Groundwater levels across approximately 95% of the aquifer are mapped as being less than 3

m below ground level (BGL). At Kellysgrove, the depth to bedrock is recorded at 37 m BGL. On the basis of these data, together with the local topography, it is inferred that the majority of the sand and gravel deposits exceed 10 m in thickness.

Groundwater flow path lengths are dependent on the extent of the sand and gravel deposits. In general, locally important sand and gravel aquifers are characterised by relatively short flow paths (typically up to several hundred metres), and this is also expected to apply at Clontuskert given the geometry and hydrogeological setting of the deposit.

Groundwater discharges via seeps and springs to the Ballinure and Cloonescragh Rivers, to several unnamed streams, and to springs located within the aquifer body. Hydraulic connectivity between groundwater in the aquifer and the adjacent surface watercourses is considered to be high.

Recharge is diffuse, occurring primarily via rainfall infiltration through the unsaturated sands and gravels. Owing to their high permeability, a significant proportion of available recharge percolates rapidly to the water table where sand and gravel deposits are exposed at the surface.

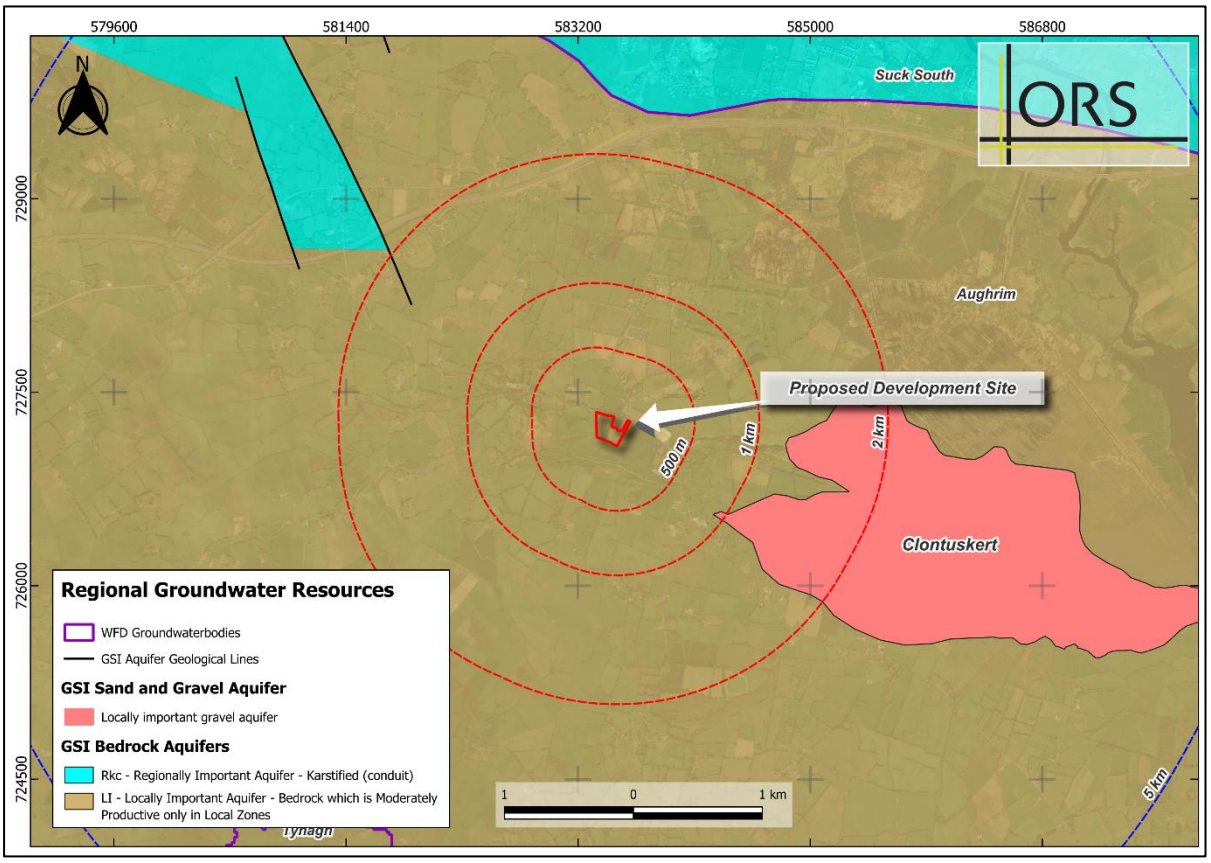

Figure 8.14: Groundwater Bodies in site locality. (GSI Maps)

The majority of the proposed site is underlain by moderate-permeability subsoil (Till derived chiefly from limestone) overlain by well-drained soil, classified as Hydrogeological Setting 3.i. A small area along the northern boundary is underlain by a highly permeable subsoil (Esker Sand and Gravel) overlain by well drained soils (Hydrogeological Setting 2.ii). The average annual groundwater recharge in the area is estimated to range from 151 mm to 200 mm.

Groundwater vulnerability is influenced by factors such as subsoil, recharge type (point or diffuse) and thickness of the unsaturated zone, through which potential contaminants can move. The Geological Survey of Ireland (GSI) uses a matrix comprising four categories - extreme, high, moderate and low - for mapping purposes and in the assessment of risk to groundwater. These categories are determined by the thickness of the overburden, as shown in **Table 8.9**, which acts as a barrier to contaminants moving toward the groundwater table. For instance, when the overburden is less than 3 m thick, the vulnerability is classified as extreme, indicating a very high risk of contamination reaching the aquifer. Conversely, with an overburden greater than 10 m thick and low permeability, vulnerability is considered low.

Table 8.9: Vulnerability Mapping Criteria

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge (Subsoil Permeability & Type)			Point Recharge	Unsaturated Zone
	High (Sand & Gravel)	***Moderate (Sandy Subsoil)***	***Low (Clay & Peat)***	***Swallow Holes***	***Sand & Gravel Aquifers***
0-3m	Extreme	Extreme	Extreme	Extreme (30m radius)	Extreme
3-5m	High	High	High	N/A	High
5-10m	High	High	Moderate	N/A	High
>10m	High	Moderate	Low	N/A	High

Groundwater vulnerability in County Galway ranges from low in the western uplands, where thick subsoils and poorly productive bedrock offer natural protection, to high or extreme in the karstic limestone lowlands of the east. In these eastern areas, thin or absent subsoil and rapid infiltration through karst features make the groundwater particularly susceptible to contamination. The majority of the proposed site is classified as having moderate groundwater vulnerability, with only a limited area along the northern boundary identified as high vulnerability. Refer to **Figure 8.15**.

There are no wells located within the boundaries of the proposed development site. Only one groundwater well is potentially located within 2 km of the site (approximately 1.9 km to the southeast), though its recorded location has an accuracy margin of 1 km. This well is classified as having a "Good" yield. Further details are provided in **Error! Reference source not found.** overleaf and its location relative to the proposed site is shown in **Figure 8.15**.

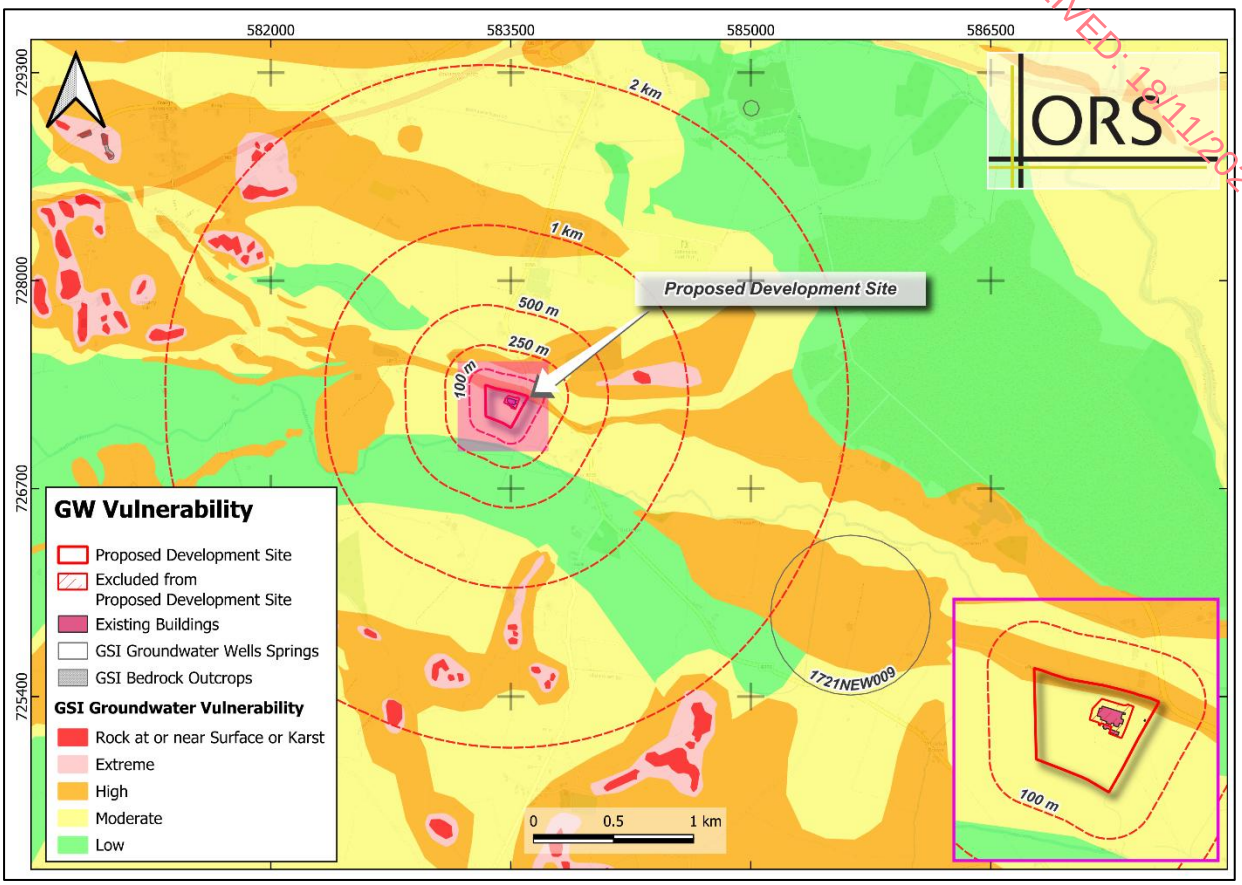

Figure 8.15: Groundwater Vulnerability and location of Groundwater Wells

Table 8.10: Groundwater Wells with 2km of the site (GSI Well Database)

GSI Reference	1721NEW009
Easting	185670
Northing	225880
Well Type	Borehole
Depth (m)	25.9
Depth to Bedrock (m)	N/A
Well Use	Agricultural & domestic use
Location Accuracy	1km
Proximity to site	1.9 km SE

Karst areas, characterised by unique dissolution landforms, often contain aquifers that are highly susceptible to pollution and can contribute to flooding risks. There are no karstic features located within the proposed boundaries of the Proposed Development or within 2 km from the Proposed Development, as shown in **Figure 8.16**.

The closest identified karst landform, a turlough, is located *ca.* 7.7 km east of the Proposed Development Site. Geological Survey Ireland (GSI) groundwater tracing investigations have indicated interconnectivity between karst features *ca.* 12 km northeast of the Study Area, revealing an easterly to westerly groundwater flow direction that diverges from the Proposed

Development Site. To date, no hydrogeological connectivity has been established with any features within the 2 km Study Area or within a 10 km radius of the Site.

Groundwater sources are vital for public water supply, industry, agriculture, and domestic use, especially in rural areas. To safeguard these resources, Source Protection Areas (SPAs) have been established, enforcing stricter controls within the Zone of Contribution (ZOC). There are two main types: Group Water Scheme (GWS) Preliminary Source Protection Areas (PSPAs) ZOCs and Public Water Supply (PWS) SPAs.

GWS PSPAs are designated around groundwater sources supplying community-run schemes, primarily in rural areas. These zones help landowners and stakeholders understand groundwater risks and are mapped using preliminary hydrogeological data, often without detailed field studies. Protection in these areas is largely voluntary and focused on risk assessment, rather than strict regulatory enforcement.

In contrast, PWS SPAs are formally designated for public water supplies managed by Irish Water or local authorities. These areas undergo scientific hydrogeological assessments, including groundwater flow modelling and contamination risk analysis, ensuring strict regulatory controls to prevent pollution from agriculture, wastewater discharge, and industrial activities. Their ZOCs are further divided into two zones: the Inner Protection Area (SI), which defends against immediate human and microbial contamination, and the Outer Protection Area (SO), covering the remaining ZOC to mitigate long-term risks.

The GSI Source Protection Area (SPA) map confirms that no SPAs are located in the immediate vicinity of the proposed development site. The nearest public supply SPA is the Killeglan PWS (Tobermore Spring), situated *ca.* 10 km to the northeast. Within a 10 km radius of the site, there are three Group Water Scheme Zones of Contribution (GWS ZOCs): Cloonigney (*ca.* 8.2 km northwest), Newcastle GWS (*ca.* 8.8 km west), and Cappataggle District ZOC (*ca.* 9.2 km west). While the Newcastle and Cappataggle GWS ZOCs are hydrologically connected to the proposed site via surface water, both lie upstream and are therefore not at risk from the development. No registered groundwater sources are located downstream of the site.

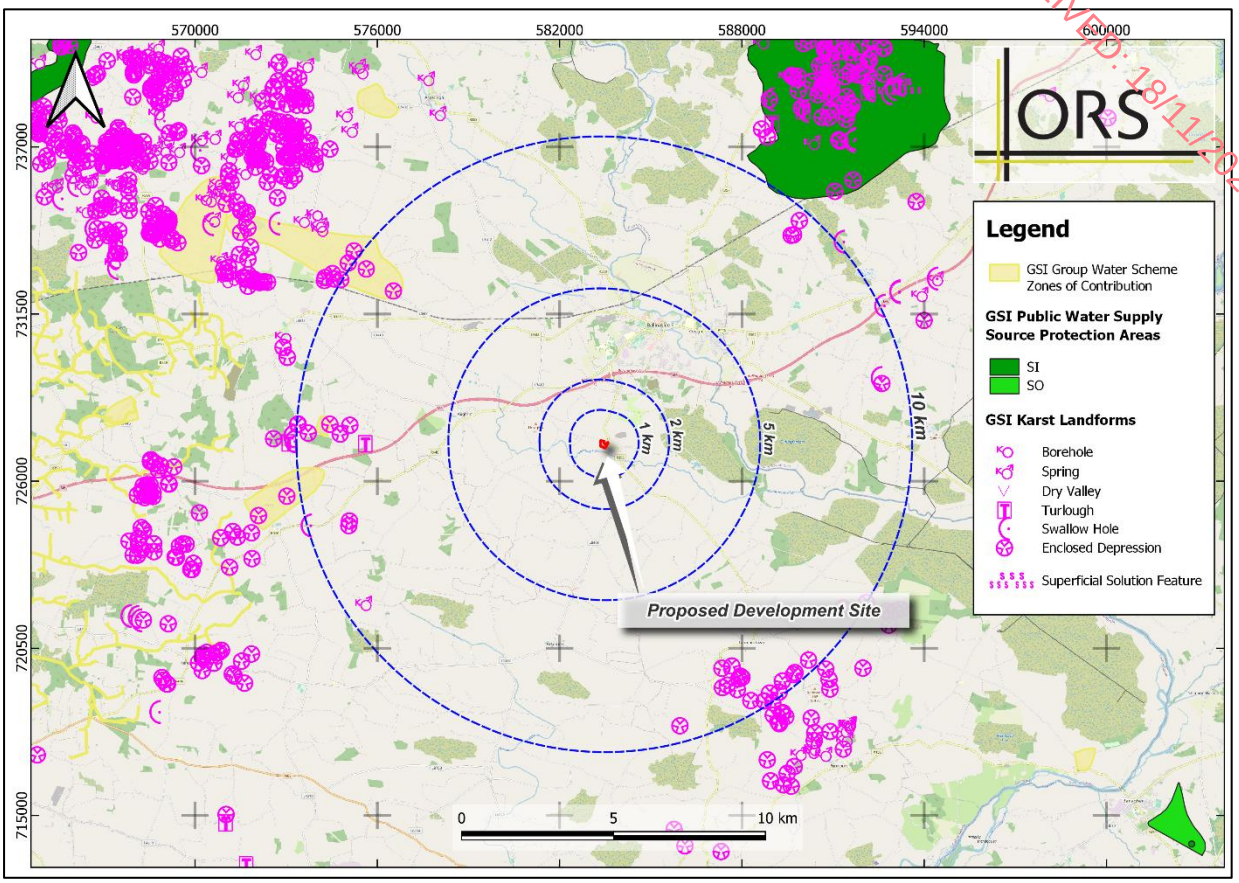

Figure 8.16: Karstic Features and Source Protection Areas (SPAs) location (GSI Maps)

8.4.6.2 Ground Investigations

Ground investigation works were undertaken by an ORS environmental scientist for the proposed development at Glenloughaun on 14 July 2025. The investigations revealed that the geology and subsoil conditions on site were somewhat inconsistent with those indicated in the existing geological mapping.

The depths of the trial pits ranged from 2.1 m to 3.5 m below ground level (bgl), with no bedrock encountered in any of the excavations. The site's topography peaks at 54.06 m AOD near the centre of the northern boundary, in the vicinity of TP-01 and TP-02 and falls southwards to a low of 39.09 m AOD near TP-04 and TP-06. The overall site gradient runs from northwest to southeast, with a slightly more pronounced incline along the northern boundary.

Some variation was observed in the soil profiles across the six trial pits. Generally, the site's soil composition comprised loose, non-cohesive materials such as fine sand or silty sand with a moderate to high gravel content and the presence of rounded cobbles. Unstable, collapsible soils prone to sloughing and caving were encountered.

The topsoil in TP-01 to TP-03 consisted of a loose to firm brown gravelly or slightly gravelly silt with low to moderate organic content, extending to depths between 0.4 m and 0.7 m bgl. TP-04 and TP-06 exhibited higher organic content: TP-04 presented an organic silt layer, while TP-06 comprised a loose, darker brown, slightly gravelly silt with frequent rootlets. TP-05 was underlain by Made Ground containing plastic fragments and sheeting.

In the lower horizons, silty to sandy soils with gravel were encountered in TP-01 to TP-05. TP-01 to TP-03 shared a similar stratigraphy, with laminated silts transitioning into silty, sandy gravel that became increasingly coarse with depth. TP-04 exhibited a slightly different profile, consisting of silty to sandy soils with a high gravel content and a greater presence of cobbles and boulders. TP-05 was characterised by Made Ground and anthropogenic materials throughout, comprising gravelly silt with an organic silt lens, underlain by sandy, gravelly silt. These pits generally remained dry throughout their depth, indicating good natural drainage characteristics across much of the site.

TP-06 was notably different from the other trial pits. The underlying subsoil consisted of soft, dark grey, pure clay, which was distinct from all other profiles encountered on site. According to the GSI Quaternary Sediments Map, alluvium is mapped adjacent to the southern boundary; however, the findings at TP-06 suggest this mapping may be inaccurate, with alluvial deposits more likely extending into the south-eastern portion of the site. This area likely functions as a floodplain of the River Ballinure. The dark grey colour and soft consistency of the clay subsoil suggest prolonged saturation, consistent with a persistently high groundwater table or from floodwaters originating from the river.

No bedrock was encountered in any of the six trial pits. Groundwater was observed at 2.1 m bgl in TP-04 and at 3.5 m bgl in TP-05.

A site characterisation assessment (percolation assessment) was conducted by Coyle Environmental on the same date as the Trial Pits excavation. The assessment was conducted in TP-05 and concluded that the Proposed Site has an R1 groundwater protection response, which is acceptable to normal good practice. The complete report is available in **Appendix 8.2**.

The location and depth of the trial pits is shown on **Figure 8.17** overleaf, and details of each investigation location is presented in **Table 8.11**.

Table 8.11: Ground profile for each Trial Pit

Location	Depth (m)	Ground Profile	Comments
TP-01	0 – 0.4	Loose brown gravely SILT with frequent rootlets. Gravel is fine to coarse, rounded to sub-rounded.	No Bedrock or GW encountered. Trial Pit walls have collapsed.
	0.4 – 1.2	Firm pale brown laminated SILT. Becomes gravellier with cobbles towards base.	
	1.2 – 1.4	Firm grey sandy gravely SILT with moderate cobbles present. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.	
	1.4 – 2.4	Loose brown-grey silty very sandy GRAVEL with frequent cobbles and rare boulders present. Sand is fine to coarse. Gravel is fine to coarse, rounded to sub-rounded. Cobbles and boulders are rounded to sub-rounded.	
	2.4	End of TP @ 2.4mbgl.	
TP-02	0 - 0.70	Firm brown gravelly SILT with frequent rootlets present. Gravel is fine to coarse, rounded to sub-rounded.	No Bedrock or GW encountered. Trial Pit walls have collapsed.
	0.70 – 2.0	Firm pale brown laminated SILT. Becomes gravellier with cobbles towards base.	
	2.0 – 2.8	Loose brown grey silty very sandy GRAVEL with frequent cobbles and rare boulders	

Location	Depth (m)	Ground Profile	Comments
		present. Sand is fine to coarse. Gravel is fine to coarse, rounded to sub-rounded. Cobbles and boulders are rounded to sub-rounded.	
	2.8	End of the Trial Pit	
TP-03	0 – 0.4	Loose brown slightly gravely SILT with frequent rootlets.	No Bedrock encountered. No GW encountered.
	0.4 – 1.1	Firm pale brown laminated SILT.	
	1.1 – 2	Firm brown gravely SILT. Gravel is fine to coarse, angular to sub-angular.	
	2m – 2.5	Loose brown grey silty very sandy GRAVEL with frequent cobbles and rare boulders present. Sand is fine to coarse. Gravel is fine to coarse, rounded to sub-rounded. Cobbles and boulders are rounded to sub-rounded.	
	2.5	End of Trial Pit	
TP-04	0 - 0.5	Organic silt topsoil	No Bedrock encountered. Rapid GW Inflow @2.1mbgl. Collapsing walls.
	0.5 – 1.8	Gravely SILT with cobbles	
	1.8 – 2.1	Silty very sandy GRAVEL with cobble and boulders. GW encountered at 2.1mbgl.	
	2.1	End of Trial Pit	
TP-05	0 - 0.4	MADE GROUND comprising of loose brown very gravely silt with frequent cobbles present. Gravel is fine to coarse, rounded to sub-rounded. Contains frequent plastic fragments and plastic sheeting	No Bedrock encountered. Rapid GW Inflow @ 3.5mbgl
	0.4 – 2	Firm dark brown very gravely SILT with rare cobbles. Gravel is fine to coarse, rounded to sub-rounded. Cobbles are rounded to sub-rounded	
	2- 2.4	Dark brown organic SILT lens.	
	2.4 – 3.5	Loose grey sandy very gravely SILT with frequent cobbles present. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to angular. Cobbles are sub-rounder to angular	
	3.5	End of Trial Pit	
TP-06	0 - 0.8	Loose brown slightly gravely SILT with frequent rootlets.	No Bedrock Encountered. Area is likely within the flood plain of the River Ballinure.
	0.8 – 3	Soft dark grey CLAY.	
	3.0	End of Trial Pit	

Figure 8.17: Location of Trial Pits (TP) and Site Characterisation Assessment

8.4.6.3 Galway County Development Plan 2022 – 2028 – Groundwater Protection

A review of the Galway County Development Plan was carried out to determine the policies and objectives relevant to the preservation and protection of groundwater quality throughout the region. The following objectives, taken from the CDP, were deemed to be relevant in the area of Groundwater Protection.

- ***REC 5 – Rural Clustering on un-serviced lands in Villages:*** *Support the development of clusters of five houses or less within the footprint of existing villages with individual wastewater treatment plants in accordance with the most up to date EPA Code of Practice for Wastewater Treatment and Disposal Systems serving single houses. All proposals shall ensure that there is the provision of safe water supply. Proposals for development in these villages shall include an assessment undertaken by a qualified hydrologist, that demonstrates that the outfall from the septic tank will not, in combination with other septic tanks within the village and wider area, contribute towards any surface or ground water body not meeting the objective of the water group under the Waste Framework Directive, or negatively impact upon drinking water resources.*
- ***AD 4 – Agriculture Waste:*** *To ensure agricultural waste is managed and disposed of in a safe, efficient and sustainable manner having regard to the environment and in full compliance with the European Communities Good Agricultural Practice for the Protection of Waters Regulations (2014) and relevant best practice guidelines.*
- ***WS 2 – Protection of Water Supplies:*** *Collaborate with Irish Water and the Group Water Federation Scheme to protect, conserve and enhance all existing and potential water*

resources in the County to ensure compliance with the European Union (Drinking Water) Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations.

- ***WS 7 – Water Quality:*** *Require that new development proposals would ensure that there would not be an unacceptable impact on water quality and quantity including surface water, ground water, designated source protection areas, river corridors and associated wetlands.*
- ***WS 8 – Proliferation of Septic Tanks:*** *Encourage the use of high standard treatment plants to minimise the risk of groundwater pollution.*
- ***SQ 3 – Soil Protection, Contamination and Remediation:*** *Adequate and appropriate investigations shall be carried out into the nature and extent of any soil and groundwater contamination and the risks associated with site development work, where brownfield development is proposed. All undeveloped, contaminated sites shall be remediated to internationally accepted standards prior to redevelopment. All applications shall be accompanied by a report from a qualified, expert consultant remediation incorporating international best practice and expertise on innovative ecological restoration techniques including specialist planting and green initiatives that create aesthetically improved sites, healthy environments and contribute to the provision of new green open spaces as integral parts of newly created areas. Treatment/management of any contaminated material shall comply as appropriate with the Waste Management Act 1996 (waste licence, waste facility permit), as amended, and under the EPA Act 1992 (Industrial Emissions licensing, in particular the First Schedule, Class 11 Waste), as amended. These measures will ensure that contaminated material will be managed in a manner that removes any risk to human health and ensures that the end use will be compatible with any risk.*
- ***WW 4 – Requirement to Liaise with Irish Water – Wastewater:*** *Ensure that new developments will only be permitted which are adequately serviced with sufficient capacity for appropriate collection, treatment and disposal (in compliance with the Water Framework Directive and River Basin Management Plan) to the public sewer unless provided for otherwise by the plan. Developers shall liaise with Irish Water with regard to the wastewater (and water) infrastructure to ensure sufficient capacity is available prior to the submission of a planning application.*
- ***WW 6 – Private Wastewater Treatment Plants:*** *Ensure that private wastewater treatment plants, where permitted, are operated in compliance with Environmental Protection Agency (EPA) Code of Practice for Domestic Waste Water Treatment System 2021 (Population Equivalent ≤10).*
- ***WR 1 – Water Resources:*** *Protect the water resources in the plan area, including rivers, streams, lakes, wetlands, springs, turloughs, surface water and groundwater quality, as well as surface waters, aquatic and wetland habitats and freshwater and water dependant species in accordance with the requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the River Basin District Management Plan 2018 – 2021 and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same) and also have regard to the Freshwater Pearl Mussel Sub-Basin Management Plans.*

8.4.6.4 Groundwater Vulnerability Assessment

The site is not located within a Source Protection Area, and no Groundwater Protection Scheme has been established for County Galway. Accordingly, the vulnerability assessment will be undertaken in accordance with the methodology outlined in **Table 8.4** of **Section 8.3**, as excerpted below:

Excerpt of **Table 8.4:** Summary of Sampling requirements for groundwater vulnerability assessments

	Aquifer Type	Sampling Requirements
Ground Water Protection Scheme (GWPS) does not exist	Locally Important / Poor Aquifers	Prove that 1m depth of soil/subsoil cover exists. Minimum of 1 data point per 5 hectares is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.
	Regionally Important Aquifers	Prove that 2m depth of soil/subsoil cover exists. Minimum of 1 data point per hectare is required. Site investigation points can be based on existing information. New information only required where existing information is insufficient.

Groundwater resources protection zones are determined by combining the aquifer and vulnerability maps. The aquifer map boundaries, in turn, are based on the bedrock map boundaries and the aquifer categories are obtained from an assessment of the available hydrogeological data. The vulnerability map is based on the subsoils map, together with an assessment of relevant hydrogeological data, in particular indications of permeability and karstification.

The location and management of potentially polluting activities in each groundwater protection zone is calculated by means of a groundwater protection response matrix. The level of response depends on the different elements of risk: the vulnerability, the value of the groundwater (with sources being more valuable than resources and regionally important aquifers more valuable than locally important and so on) and the contaminant loading. By consulting the Response Matrix, it can be determined:

- Development's suitability of purpose
- what kind of further investigations may be necessary to reach a final decision; and
- what planning or licensing conditions may be necessary for that development.

The groundwater protection responses are a means of ensuring that good environmental practices are followed.

The matrix in **Table 8.12** gives the result of integrating the two regional elements of land surface zoning (vulnerability categories and resource protection areas) – a possible total of 24 resource protection zones. In practice this is achieved by superimposing the vulnerability map on the aquifer map. Each zone is represented by a code e.g. Rf/M, which represents areas of regionally important fissured aquifers where the groundwater is moderately vulnerable to contamination. In land surface zoning for groundwater protection purposes, regionally important sand/gravel (Rg) and fissured aquifers (Rf) are zoned together, as are locally important sand/gravel (Lg) and bedrock which is moderately productive (Lm).

Table 8.12: Matrix of Resource Protection Zones from EPA Guidance Notes on Groundwater Protection

Vulnerability Rating	Resource Protection Zones					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	Rk/E	Rf/E	Lm/E	Ll/E	Pl/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	Ll/H	Pl/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	Ll/M	Pl/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	Ll/L	Pl/L	Pu/L

Combining the proposed site vulnerability rating of Moderate and High, and the underlying aquifer classification of 'Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (Ll)', the site is classified as **Ll/M** & **Ll/H**.

8.4.6.5 Site Vulnerability Assessment

The Groundwater Protection Responses for the land spreading of organic wastes (DoE/GSI/EPA publication, 1999) are relevant to this study given the proposed nature and operational phase of the development. According to the DoE/GSI/EPA guidelines, a Locally Important Bedrock Aquifer with a moderate vulnerability rating is deemed acceptable for land spreading, provided standard best practices are followed.

Table 8.13: Vulnerability Rating Summary

Vulnerability Rating	SOURCE PROTECTION AREA		Resource Protection (Aquifer Category)					
			Regionally Important Aquifers (R)		Locally Important (L)		Poor Aquifers(P)	
	Inner	Outer	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	R4	R4	R3[2]	R3[2]	R3[1]	R3[1]	R3[1]	R3[1]
High (H)	R4	R2[1]	R1	R1	R1	R1	R1	R1
Moderate (M)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1
Low (L)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1

R1 Acceptable, subject to normal good practice.
R2[1] Acceptable subject to a maximum organic nitrogen load (including that deposited by grazing animals) not exceeding 170 kg/hectare/yr.
R3[1] Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated.
R3[2] Not generally acceptable, unless a consistent minimum thickness of 2 m of soil and subsoil can be demonstrated.
R3[3] Not generally acceptable, unless no alternative areas are available and detailed evidence is provided to show that contamination will not take place.
R4 Not acceptable

Desktop and field investigations indicate that the site overlies a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (Ll). The Groundwater Vulnerability across majority of the site is classified as 'Moderate', with exception of a small portion along the northern boundary where vulnerability is 'High'. In relation to resource protection zones the site is classified as Ll/M & Ll/H. Based on the groundwater protection response matrix, the site is assigned a vulnerability rating of "**R1**," indicating that the development is acceptable from a groundwater protection perspective.

An intrusive site investigation was conducted by ORS in July 2025. This involved excavating six

trial pits across the site of a minimum depth of 2.4 mbgl. Bedrock was not encountered in any of them. Groundwater was observed in two of the trial pits, TP-04 and TP-05, while TP-06 exhibited a soft, dark grey clay subsoil indicative of prolonged saturation, consistent with a persistently high groundwater table.

The GSI well data has not indicated wells within the immediate area and no Source Protection Areas downstream from the site. Therefore, as no land spreading will occur on the Proposed Development Site, it is very unlikely that it will have any detrimental impact on the underlying aquifer or more importantly any wells in the area. The farms of the customer farmers have been identified. All farmers will use the biobased fertiliser on lands that have an agronomic requirement for fertiliser.

The proposed facility's operation is not expected to have any adverse effects on the underlying aquifer. However, additional trial pits are recommended before work begins, particularly in the southwestern portion of the site to confirm the water table level and at the north of the proposed bunded area, where a small portion of the site has been assigned a high groundwater vulnerability.

8.5 Likely Significant Effects

Using data from the desk study and intrusive site investigation, a risk assessment was conducted to evaluate the predicted impacts on hydrology and hydrogeology during both the construction and operational phases of the development. This assessment identifies relevant sources, pathways, and receptors (pollutant linkages) and assigns a qualitative risk classification—'low,' 'moderate,' or 'high'—to each identified Potential Pollutant Linkage (PPL).

For a risk of surface water and groundwater contamination to exist, a contaminant source, pathway for migration and viable receptor must exist. The presence of all three of these elements is known as a 'pollutant linkage'. The likely potential pollutant linkages identified as a result of this assessment and specific for the site have been provided in the initial CSM. The model has been based upon the site setting at the time of the assessment, the land use (current and reasonably foreseen future use) of the surrounding area and the state what the proposal is (i.e. development, ongoing use, etc.).

As well as identifying the potential pollutant linkages the model includes a preliminary assessment of risk based upon the probability of impact and the likely severity of impact in the context of the site setting and proposed future site use.

The criteria used for the risk assessment classifications as detailed in the CSM table are based on those presented in *CIRIA Report 552*.

The likely significant effects identified in this section do not take proposed mitigation measures into account, as these will be addressed in **Section 8.6**. The actual effects anticipated following the implementation of these measures are presented as Residual Effects and can be found in **Section 8.9.**

8.5.1 Do-Nothing Scenario

The proposed site includes both brownfield and greenfield areas, with the majority of the land being greenfield. The northeast portion of the site is currently occupied by a food processing facility, with some disused structures that will be demolished as part of the proposed plans.

The brownfield portion of the site contains Construction and Demolition waste that has been inappropriately disposed of in the soil. In addition, there is an underground tank, formerly used to collect washings and runoff from lorries delivering livestock to the former abattoir. This tank is scheduled for removal and demolition and is currently empty, aside from accumulated rainwater.

In the brownfield portion of the site, a 'Do Nothing' scenario would be expected to sustain or further degrade the already poor environmental quality. Construction and Demolition Waste would remain inappropriately deposited within the soil, creating ongoing risks of soil and groundwater contamination. The underground tank also presents a residual risk. Although it currently contains only rainwater, residual contaminants from its former use could leach into the subsurface, particularly if the structure deteriorates. During periods of heavy rainfall, the potential for overflow could result in contaminated discharges to local drainage systems or watercourses. While short-term impacts may be minimal, leaving these features unaddressed would increase the likelihood of gradual pollution and create long-term environmental liability.

8.5.2 Receptor Sensitivity

The sensitivity of the receptors identified during the study of hydrological & hydrogeological features within the vicinity of the site are summarised in **Table 8.14**.

Table 8.14: Receptor Sensitivity

Receptor	Receptor Importance	Receptor Sensitivity	Rationale
Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Locally Important	Medium	The subject site is located above the Aughrim Groundwater Body, classified as a Locally Important Aquifer - Generally Moderately Productive only in Local Zones (LI). A Locally Important Gravel Aquifer, the Clontuskert, is distant *ca.* 900 m to the east. This classification reflects local hydrogeological importance. According to the GSI map viewer, groundwater vulnerability across the site is rated as "Moderate", except for a limited area along the northern boundary identified as high vulnerability. Trial pits excavated to a depth of 3.5 mbgl did not encounter bedrock. Groundwater was observed at 2.1 m bgl in TP-04 and at 3.5 m bgl in TP-05. The soil profile was generally dry throughout the trial pits, indicating good natural drainage characteristics across much of the site. The exception being in the southeastern portion of the site where subsoil consisted of soft, dark grey, pure clay was observed. This suggests alluvial deposits are likely to extend into the south-eastern portion of the site. This area likely functions as a floodplain of the River Ballinure. The dark grey colour and soft consistency of the clay subsoil suggest prolonged saturation, consistent with a persistently high groundwater table. Based on the response matrix (**Table 8.1315**), the site is classified as "R1 Acceptable, subject to normal good practice," confirming that the proposed development is considered suitable in terms of groundwater protection.

Surface Water Rivers Ballinure_010 and Ballinure_020	Local Level	High	The Rivers Ballinure_010 and Ballinure_020 currently hold a "Good" and "Poor" status under the Water Framework Directive (WFD) 2016–2021 assessment, respectively. The Ballinure_020 are considered to be at risk, while the Ballinure_010 is currently under review. These waterbodies have exhibited a gradual decline in water quality along its course. Upstream monitoring stations show Q-values indicative of good ecological status and low pollution levels, whereas downstream results reflect increasing pressures, likely linked to agricultural activity and nutrient enrichment, resulting in moderate pollution and reduced biological integrity. Hydrological pathway exists to the River Suck Callows SPA, River Shannon Callows SAC and Middle Shannon Callows SPA, areas protected under EU legislation. Significant effects from the Proposed Development are anticipated, in the absence of mitigation measures.

8.5.3 Sources - Construction Phase

The construction phase is likely to yield the most potentially significant effects on the surrounding water environment. A summary of these potential effects is provided in **Table 8.15**, with a detailed analysis below.

Table 8.15: Construction Phase Effects (Unmitigated)

Receptor	Potential Environmental Effects	Quality	Significance	Duration
Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Increased Run-off and Sediment Loading	**Negative**	**Moderate**	**Temporary**
	Accidental Spillages of Harmful Substances	**Negative**	**Significant**	**Short-Term**
	Increased Groundwater Vulnerability	**Negative**	**Significant**	**Long-Term**
	Excavation of Bedrock Aquifer	**Negative**	**Significant**	**Long-Term**
	Excavation of Contaminated Soils	**Negative**	**Moderate**	**Temporary**
Surface Water Rivers Ballinure_010 and Ballinure_020	Increased Run-off and Sediment Loading	**Negative**	**Moderate**	**Temporary**
	Accidental Spillages of Harmful Substances	**Negative**	**Significant**	**Temporary**
	Excavation of Contaminated Soils	**Negative**	**Moderate**	**Temporary**
	Increase in Flood Risk to Receiving Catchment	**Negative**	**Significant**	**Long-Term**

8.5.3.1 Increased Run-off and Sediment Loading

During the initial stages of the construction phase, enabling works will involve stripping and removing a layer of topsoil in certain areas across the site. This will be followed by earthworks

to level the ground and prepare for the construction of foundations and the installation of services and drainage infrastructure. These activities will also result in the removal of some vegetation cover.

The displaced soils and sediments will be stockpiled, and without appropriate mitigation measures, these stockpiles will be vulnerable to erosion. This creates a potential pathway for silt and sediment to migrate off-site into surrounding watercourses, either through wind-blown dust or surface run-off during periods of heavy rainfall.

Of particular concern is the drainage ditch along the southern boundary of the site, which forms part of the Kellysgrove Drainage District (DD) Scheme and discharges into the Ballinure River *ca.* 400 m downstream of the site. In such circumstances, surface water receptors may be exposed to elevated levels of silt, suspended solids, and nutrients, which can lead to water quality deterioration, reductions in fisheries resources, and significant ecological impacts on aquatic biota.

Furthermore, the deposition of silt and sediment within the ditch and riverbed can reduce channel capacity, thereby increasing flood risk both on-site and for downstream receptors.

The site investigation has confirmed that the majority of the site is underlain by well-drained subsoil, generally composed of loose, non-cohesive materials such as fine sand or silty sand with a moderate to high gravel content and occasional rounded cobbles. In contrast, the southeast portion of the site is characterised by soft, dark grey, pure clay. The presence of soils with differing permeability could contribute to surface water pooling and impede water movement across the site. Depending on weather conditions and construction practices, these factors may influence runoff patterns and localised water flow.

Groundwater was encountered at two locations on site (TP-04 at 2.1 m bgl and TP-05 at 3.5 m bgl). Based on the preliminary Cut & Fill data, excavations in these areas are not expected to exceed 1.0 m in depth. However, groundwater strikes during groundworks remain possible due to potential fluctuations in the water table.

Available data for the Aughrim GWB indicates that groundwater is expected to flow in a southeasterly direction, following the local topographic gradient. There are no recorded groundwater wells or springs in this direction; therefore, the likelihood of adverse impacts on Source Protection Areas or abstraction wells from site-related groundwater influences is considered low.

Groundwater flow is anticipated to be localised, with generally short flow paths, which act to limit the spread of potential contaminants and thereby reduce the risk of widespread dispersion.

Considering the natural topography of the proposed site and the surrounding areas along with the hydrological connection with the River Ballinure***, in the absence of mitigation***, uncontrolled releases of sediment run-off would result in a ***negative, moderate, temporary effect*** on the water quality of the local hydrological system.

In the absence of mitigation, uncontrolled releases of sediment run-off would result in a ***negative, moderate, temporary effect*** on the water quality of the Aughrim Groundwater Body. Effects on the Clontuskert Sand and Gravel Aquifer are unlikely to occur.

8.5.3.2 Accidental Spillages of Harmful Substances

During the construction phase, there is a possibility of a spillage of contaminants such as fuels, oils, chemicals and cement material, posing a potential risk to surface and groundwater quality. Fuels, oils and chemicals have a number of hazardous properties, and the constituents of concrete are alkaline and corrosive. Each one of these substances can have a significant deleterious effect on water quality and aquatic life should any become entrained in the receiving water environment.

The drainage characteristics of the site area outlined in **Section 8.4.5** concluded that the cumulative Qbar value for the site is 6.4 l/s.

The groundwater vulnerability assessment in **Section 8.4.8** classified the site as having moderate vulnerability, primarily due to the presence of moderately permeable subsoils. During the site investigation, groundwater was encountered in two trial pits (TP-04 & TP-05), while clayey soils were observed in the southeastern portion of the site. This area likely functions as a floodplain of the River Ballinure, and the soil profile suggests prolonged saturation, likely influenced by floodwaters or a persistently high-water table.

Available data for the Aughrim GWB indicates that groundwater is expected to flow in a southeasterly direction, following the local topographic gradient. There are no recorded groundwater wells or springs in this direction; therefore, the likelihood of adverse impacts on Source Protection Areas or abstraction wells from site-related groundwater influences is considered low.

Groundwater flow is anticipated to be localised, with generally short flow paths, which limit the spread of potential contaminants and reduce the risk of widespread dispersion.

In the event of any spillages in areas of well-drained soils, contamination could potentially reach the underlying bedrock aquifer if not mitigated promptly. The risk of any contamination reaching the nearby gravel aquifer is very low. In areas of poorly drained soils (TP-06 area), contamination of groundwater is unlikely; however, contaminants are more likely to be transported via surface run-off into the adjacent drainage ditch and downstream receptors.

In the absence of mitigation, uncontrolled releases of hydrocarbons, chemicals or cement would result in a ***negative, significant, temporary effect*** on the River Ballinure. This would lead to impacts on the water quality, and the contamination could extend to downstream receptors, including the River Suck and its respective SAP and NHA.

In the absence of mitigation, uncontrolled releases of hydrocarbons, chemicals or cement would result in a ***negative, significant, temporary effect*** on the water quality of the Aughrim Ground Water Body. Effects on the Clontuskert Sand and Gravel Aquifer are unlikely to occur.

8.5.3.3 Increased Groundwater Vulnerability

The removal and disturbance of a significant amount of soil required in order to level the site is anticipated during the construction phase which carries the potential to increase the vulnerability of a groundwater body to incidences of contamination at surface level.

The preliminary Cut and Fill analysis for the Proposed Development indicates that a total of 51,017.29 m³ of subsoil will be excavated, of which 2,074.36 m^3 will be reused on-site as

capping layers and fill. To minimise the quantities of the excavated material being removed from site, excavated material will be reused on site where possible to provide visual and auditory screening. Further reuse of excavated material may be possible for landscaping and backfill or proposed drainage lines if classified as acceptable backfill material.

Any surplus soil that cannot be reused will be transported to licensed disposal facilities. These volume estimates are subject to change pending further ground investigations before construction begins.

The deepest excavations on site will be along the northern boundary of the proposed bunded area, reaching depths of up to 9.0 m bgl. The rainwater harvesting tank will require excavation to a depth of 4.68 m bgl at the centre-east of the site, while the proposed attenuation structures, underground tank in the sump area and open surface pond at the southeastern boundary, will extend to 4.33 m bgl and 1.34 m bgl, respectively.

When excavation to FFL has been achieved, further earthworks will then follow to facilitate the construction of foundations and the installation of services/drainage infrastructure, which will extend to depths between 3.0 and 5.0 mbgl into subsoils. Foundations of up to 0.5m below the FFL will be required along the structural outline of buildings.

GSI maps indicate the groundwater vulnerability throughout the majority of the site was classed as ‘moderate’, with a small area along the northern boundary being classified as High. The groundwater protection response matrix (**LI/M** & **LI/H**) assigns the site a vulnerability rating of "**R1**," indicating that the development location is acceptable with respect to groundwater protection.

The desktop study indicates a subsoil depth of over 10 m across most of the area, based on the subsoil type and indicative groundwater vulnerability mapping. Along the northern boundary, subsoil depth is likely to range between 3–5 m. No bedrock was encountered during the site investigation, which comprised the excavation of six trial pits to a maximum depth of 3.5 m bgl. Excavation to depths of up to 9.0 m bgl along the northern boundary, where subsoil is highly permeable, could increase groundwater vulnerability from ‘high’ to ‘extreme’. In other areas, excavation to depths of up to 5.0 m bgl could increase groundwater vulnerability from ‘moderate’ to ‘high’. Further trial pits are recommended prior to construction to confirm soil depth, particularly along the northern boundary and within the proposed bunded area.

In the absence of mitigation, the removal of soil/subsoil cover during the construction phase would have a ***negative, significant, long-term effect*** on groundwater vulnerability at the Proposed Development site.

8.5.3.4 Excavation of Bedrock Aquifer

A desktop study indicates that subsoil depths across the majority of the area are likely to exceed 10 m, consistent with the moderate groundwater vulnerability of the area and the subsoil permeability type. Along the northern boundary, subsoil depths could possibly range between 3 and 5 m. This assessment is supported by the site investigation carried out by ORS, which involved the excavation of six trial pits ranging from 2.1 m to 3.5 m bgl, none of which encountered bedrock.

Given that maximum excavation depths in areas with deeper subsoils (over 10 m) are up to 5.0 m bgl, interaction with bedrock is unlikely. Nevertheless, the installation of impermeable

liners beneath the rainwater harvesting tanks, attenuation tank and pond is still recommended.

Along the northern boundary, bedrock may occur at depths between approximately 3 m and 5 m bgl, although this has not been confirmed and deeper subsoils cannot be ruled out. It is therefore recommended that additional trial pits be undertaken prior to construction in areas of high groundwater vulnerability and where excavation depths are anticipated to exceed 5 m bgl, particularly along the northern edge of the proposed bunded area.

In the event of excavation into bedrock and ***control and mitigation measures are not implemented***, predicted effects will have ***negative, significant and long-term effect*** on hydrogeology.

8.5.3.5 Excavation of Contaminated Soils

The excavation and construction activities will cause quantities of excavated materials to be reused on site or removed from site for disposal or recovery. Majority of the site is a greenfield site, and historical mapping does not suggest any incidences of land use which might result in the contamination of soils.

Furthermore, a geotechnical site investigation conducted at the site in January 2025 did not detect any evidence of contaminated soils in this part of the site. It is not anticipated contaminated soils will be encountered during construction activities there hence no adverse effects on the groundwater or surface water quality are expected as a result of contaminated soils.

A small section of the site, located adjacent to the existing meat processing facility, is classified as brownfield, having previously been occupied by installations associated with that facility. Within this area, Made Ground and Construction and Demolition (C&D) waste have been identified, with Made Ground containing frequent plastic fragments and sheeting recorded to approximately 0.4 m mbgl at exploratory location ***TP-05***. Additionally, a decommissioned soakaway (filter bed) from a former septic tank associated with the facility is known to be present within the vicinity of ***TP-05***.

An underground tank, formerly used to collect washings and runoff from lorries delivering livestock to the previous abattoir, is also present within this brownfield portion of the site. The tank is currently decommissioned and contains only accumulated rainwater.

Although no visual or olfactory evidence of hydrocarbon or chemical contamination was observed during the site investigation, the presence of Made Ground, C&D waste, and the redundant underground tank introduces a potential for localised contamination of soils within this area.

Disturbance of these materials during excavation may result in the mobilisation of contaminants, should any be present, with the potential to affect underlying groundwater or nearby surface water receptors. There is also a possibility of temporary deterioration in soil quality within the brownfield area as a result of excavation and handling of mixed or potentially contaminated materials. In addition, there is potential for exposure of construction workers and for the localised release of odours or dust should contaminated soils or waste materials be encountered during the works.

Encountering contaminated soils would have ***negative, moderate and temporary*** effect in the

local hydrology and hydrogeology, in the absence of mitigation measures.

Overall, given the limited extent of brownfield land relative to the overall site area, any potential negative effects are expected to be localised. No significant effects are anticipated in the greenfield areas of the site.

The Outline Construction Environmental Management Plan (**Document Ref: 231960-ORS-XX-XX-RP-EN-13d-010**) will include a set of procedures to be implemented in the incidence of contaminated soils encountered.

Appropriate identification, handling, and remediation of any contaminated soils, if encountered, would contribute to the enhancement of baseline hydrological and hydrogeological conditions through the removal of potential pollutant linkages and the prevention of contaminant migration to surface water or groundwater receptors.

8.5.3.6 Increase in Flood Risk to Receiving Catchment

The construction phase will involve converting the current site, which includes greenfield and partially disturbed areas, into areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to a large increase in volume and intensity of surface water run-off within a given catchment.

The increase in impervious area means that a greater proportion of the incident rainfall will appear in the drainage system as surface run-off. The provision of sealed pipes to convey run-off from the site to existing watercourse will result in larger (concentrated) volumes being discharged at point locations within a shorter duration, thereby increasing flood risks.

The southeastern portion of the site is prone to flooding, and increased surface water discharge to the adjacent drainage ditch could worsen on-site flood risk. Most of this area lies within the benefited area of the Kellysgrove Drainage District, which includes surrounding ditches and the River Ballinure. Careful design of the drainage strategy for the site will be required to mitigate on-site flooding without increasing risk to downstream receptors.

In the absence of mitigation, the predicted effects of the Proposed Development resulting in an increase of flood risk to the receiving catchment are ***negative, significant and long-term.***

8.5.4 Sources - Operational Phase

A summary of the potential operational phase effects is provided in **Table 8.16**, with a detailed analysis below.

Table 8.16: Operation Phase Effects Summary (Unmitigated)

Receptor	Potential Environmental Effects	Quality	Significance	Duration
Groundwater Aughrim Groundwater Body & Clontuskert	Contaminated Run-off	**Negative**	**Moderate**	**Temporary**
	Foul Water	**Negative**	**Moderate to Significant**	**Temporary**

Receptor	Potential Environmental Effects	Quality	Significance	Duration
Sand and Gravel Aquifer	Increased Groundwater Vulnerability	**Negative**	**Significant**	**Long-term**
	Uncontrolled Releases & Spillage of Digestate and Feedstocks	**Negative**	**Slight to Moderate**	**Temporary**
	Fire and Resultant Firewater	**Negative**	**Moderate**	**Temporary**
	Landspreading of Biobased Fertiliser	**Negative**	**Slight**	**Temporary**
	Attenuation Tank & Pond	**Negative**	**Moderate**	**Long-Term**
Surface Water Rivers Ballinure_010 and Ballinure_020	Contaminated Run-off	**Negative**	**Moderate to Significant**	**Temporary**
	Foul Water	**Negative**	**Moderate to Significant**	**Temporary**
	On-Site Flooding	**Negative**	**Moderate**	**Temporary**
	Increase in Flood Risk to Receiving Catchment	**Negative**	**Significant**	**Long-Term**
	Uncontrolled Releases & Spillage of Digestate and Feedstocks	**Negative**	**Slight to Moderate**	**Temporary**
	Fire and Resultant Firewater	**Negative**	**Slight to Moderate**	**Temporary**
	Landspreading of Biobased Fertiliser	**Negative**	**Slight**	**Temporary**
	Attenuation Tank & Pond	**Neutral**	**Moderate**	**Long-Term**

8.5.4.1 Contaminated Run-off

During operation, surface water runoff from the Proposed Development has the potential to become contaminated from a variety of on-site sources. Runoff from the odour abatement building, service yard, and silage clamp may contain organic material, nutrients, suspended solids, and other pollutants associated with feedstock handling and storage. In addition, runoff from impermeable areas such as access roads and car parking areas is likely to contain hydrocarbons, heavy metals, and sodium chloride arising from winter de-icing activities.

If uncontrolled, such contaminated runoff could infiltrate surrounding soils, surface watercourses, or groundwater. This may lead to deterioration in surface water quality, including nutrient enrichment, oxygen depletion, and chemical contamination, with associated impacts on aquatic habitats and species. It could also result in pollution of groundwater resources, particularly where infiltration pathways are present, posing risks to hydrogeological integrity and local water supplies.

There is also potential for nuisance effects, including odour, discolouration of receiving waters, and breaches of environmental quality standards. Furthermore, contaminated runoff could contribute to cumulative pollution pressures if discharges coincide with other agricultural or industrial activities in the surrounding area.

In the absence of suitable design & mitigation measures, there would be a ***negative, moderate, temporary effects*** on the water quality of the Aughrim Groundwater Body. Effects on the Clontuskert Sand and Gravel Aquifer are unlikely to occur.

In the absence of suitable design & mitigation measures, there would be a ***negative, moderate to significant, temporary effects*** on the water quality of the River Ballinure. This would lead to impacts on the water quality, and the contamination could extend to downstream receptors, including the River Suck and its respective SAP and NHA.

8.5.4.2 Foul Water

A domestic scale wastewater treatment plan is proposed to cater for the foul water arising from staff facilities on-site only (Population Equivalent 'PE' of 7). The accompanying site suitability assessment has concluded that the site is suitable to provide treatment for domestic sewage via discharge to groundwater.

The inherent risk associated with wastewater treatment systems is leakage of untreated foul water. This situation can arise from poor construction methods, inadequate maintenance and failure to scale the system to an appropriate projected population equivalent.

During incidences of leakage foul water would likely follow preferential pathways created by permeated backfill and infiltrate into the site drainage system ultimately impacting both surface water and groundwater receptors. Adverse effects associated with foul water leakages consist of contamination relating to the of the following:

- Pathogens, (E. Coli etc.)
- Elevated levels of ammonia and nitrate
- Elevated levels of phosphorus

In the absence of suitable design and mitigation measures, such leakages could lead to degradation of water quality with negative consequences for aquatic life within the River Ballinure and to the Aughrim Groundwater Body. Effects on the Clontuskert Sand and Gravel Aquifer are unlikely to occur. Overall, the predicted effects of foul water leakage on hydrological and hydrogeological receptors are ***negative, moderate to significant and temporary.***

8.5.4.3 Increased Groundwater Vulnerability

The proposed Finished Floor Level (FFL) will be up to 9.00 m below the existing ground level in the northern section of the bunded area. Excavations for specific infrastructure will include the rainwater harvesting tank to a depth of 4.68 m bgl at the centre-east of the site, and the proposed attenuation structures, underground tank in the sump area and open surface pond at the southeastern boundary, will extend to 4.33 m bgl and 1.34 m bgl, respectively. Following excavation to the proposed FFL, additional earthworks will be required to accommodate foundations and underground services/drainage infrastructure, extending to depths of 3.0–5.0 m bgl within the subsoils.

Placement of underground services at these depths will reduce the protective subsoil layer between the bedrock aquifer and potential contamination sources. Achieving the proposed FFLs, particularly at 9.0 m bgl, will also reduce subsoil cover above bedrock, increasing groundwater vulnerability. In effect, vulnerability could rise from 'high' to 'extreme' along the northern boundary, and from 'moderate' to 'high' across the remainder of the site.

In the absence of mitigation measures, the reduction of subsoil cover to achieve the proposed FFLs, combined with the installation of underground services, is likely to result in a ***negative, significant, long-term effect*** on groundwater vulnerability at the Proposed Development site.

8.5.4.4 On-Site Flooding

A flood event occurring on the Proposed Development would cause the Sustainable Urban Drainage Infrastructure (SuDS) to become overwhelmed, creating additional pathways for potential contaminants to migrate off-site into downstream receptors along with elevated flow rates.

According to the NIFM, under current conditions, flood-prone areas affect a small portion of the site along its southern boundary, with floodwaters extending roughly 50 m into the site for events with 0.1%, 1%, and 10% annual exceedance probabilities, while future climate scenarios do not significantly increase these extents. Overall, most of the site lies in Flood Zone C, indicating a low flood risk, though a minor area along the southern edge falls within higher-risk Flood Zones A and B. Please refer to Site Specific Flood Risk Assessment (Document Ref: **231960-ORS-XX-XX-RP-EN-13d-011**) which accompanies the application.

Overall, ***in the absence of suitable design and mitigation measures*** the predicted effects of the occurrence a flood event on hydrological receptors is ***negative, moderate,*** and ***temporary*** to hydrogeology and hydrology***.***

8.5.4.5 Increase in Flood Risk to Receiving Catchment

The operational phase will see a significant portion of the existing greenfield site converted to areas of hardstanding. Under this scenario, the risk of flooding within the receiving catchment will increase due to an increase in impervious land area and associated drainage systems, which leads to an increase in volume and intensity of surface water run-off within a given catchment.

The increase in impervious area means that a greater proportion of the incident rainfall will appear in the drainage system as surface run-off. The provision of sealed pipes to convey run-off from the Proposed Development to existing watercourse will result in larger (concentrated) volumes being discharged at point locations within a shorter duration, thereby increasing flood risks.

The southeastern portion of the site is prone to flooding, and increased surface water discharge to the adjacent drainage ditch could worsen on-site flood risk. Most of this area lies within the benefited area of the Kellysgrove Drainage District, which includes surrounding ditches and the River Ballinure. Careful design of the drainage strategy of the site will be required to mitigate on-site flooding without increasing risk to downstream receptors.

In the absence of mitigation, the predicted effects of the Proposed Development resulting in an increase of flood risk to the receiving catchment are ***negative, significant, and long-term.***

8.5.4.6 Uncontrolled Releases and Spillages

During the operational phase, there is a possibility of leakage or spillage of biobased fertiliser or feedstocks via vehicle movements or from a failure of a tank or feed line. While such

substances are significantly less hazardous than fuels, oils, chemicals, and cement material, the still pose a potential risk to surface and groundwater quality. Biobased fertiliser or animal slurries in high quantities can have a deleterious effect on water quality and aquatic life should any become entrained in the receiving water environment.

Uncontrolled releases of biobased fertiliser, feedstock, hydrocarbons, chemicals or cement, ***in the absence of mitigation measures***, would result in ***negative, slight to moderate, temporary effects*** on the water quality of the River Ballinure. The contamination could extend to downstream receptors, including the River Suck and its respective SAP and NHA.

8.5.4.7 Fire and Resultant Firewater

Appropriate storage facilities will be provided for combustible and flammable materials (i.e. fuel) required for the operation of the Proposed Development. In the event of a fire, significant quantities of water resources will be utilised to quench the fire. Water used to quench a fire is known as “firewater”. Firewater is known to contain the following harmful substances:

- Products of combustion
- Extinguishing foam / fluid
- Hazardous substances (fuels, oils & chemicals)

Due to the presence of these hazardous substances, firewater poses a significant risk to surface and groundwater quality.

Uncontrolled releases of firewater ***in the absence of mitigation measures***, would result in ***negative, slight to moderate, temporary effects*** on the water quality of the River Ballinure. The contamination could extend to downstream receptors, including the River Suck and its respective SAP and NHA.

Uncontrolled releases of firewater, ***in the absence of mitigation measures***, would result in ***negative, moderate, temporary effects*** on the water quality the Aughrim Groundwater Body. Effects on the Clontuskert Sand and Gravel Aquifer are unlikely to occur.

8.5.4.8 Landspreading of Biobased Fertiliser

The biobased fertiliser produced will be a rich source of nutrients that will be used by customer farmers for the fertilisation of their land. In the worst-case scenario and in absence of mitigation, any inappropriate land-spreading of the biobased fertiliser could lead to impacts upon the receiving waters in local catchments and it can result in eutrophication, algal blooms, fish kills and loss of biodiversity. Designated habitats and species can be impacted upon. There is a greater risk when groundwater vulnerability at the lands for spreading is high, or when land-spreading is undertaken close to drains or streams. In these situations, the Pollution Impact Potential for both phosphates and / or nitrates is high.

The farms of the customer farmers have been identified; however, these will be subject to local change on an annual basis. All farmers will use the biobased fertiliser on lands that have an agronomic requirement for fertiliser. Spreading will be done in accordance with the specific Nutrient Management Plan for the farm and in accordance with S.I. 113 of 2022. Records for the movement of all biobased fertiliser will be kept.

Inappropriate land spreading ***in the absence of mitigation measures*** would result in

negative, slight, temporary effects on the water quality of the River Ballinure. The contamination could extend to downstream receptors, including the River Suck and its respective SAP and NHA.

The potential for contamination of the local groundwater body will depend on the specific characteristics of the land where the biobased fertiliser is applied. However, with proper management practices, contamination is unlikely to occur. If contamination is to reach the groundwater body, ***in the absence of mitigation measures***, the effects would be ***negative, slight, and temporary.***

The positive benefits of using the biobased fertiliser produced must also be considered, as this provides an alternative to the land-spreading of liquid slurry. Using biobased fertiliser presents several scientific advantages over the continued use of untreated manures, slurries, or chemical fertilisers, particularly concerning plant nutrient availability and the mitigation of nutrient leaching into watercourses. The benefits are outlined below.

- **Balanced Nutrient Availability:** Biobased fertiliser typically contains a balanced mix of essential nutrients, including nitrogen (N), phosphorus (P), potassium (K), and micronutrients crucial for plant growth. This balanced nutrient profile contrasts with chemical fertilisers, which often supply only specific nutrients. Studies have shown that the diverse nutrient composition of biobased fertiliser supports comprehensive plant nutrition, contributing to improved crop yields and overall plant health (Möller and Müller, 2012)[4].

- **Slow-Release Nutrients:** Biobased fertiliser releases nutrients gradually over time as it decomposes in the soil. This gradual release mechanism ensures a sustained supply of nutrients to plants, contrasting with untreated manures, slurries and chemical fertilisers, which can be prone to leaching or volatilisation. The slow-release nature of biobased fertiliser reduces the risk of nutrient loss and enhances nutrient uptake efficiency by plants (Yao et al., 2011)[5]. Analysis has shown that approximately 80% of the total nitrogen in biobased fertiliser is present as readily available nitrogen. Digestion of livestock slurry has also been shown to increase the plant availability of nitrogen in slurry by *ca.* 10%.

  Compared to untreated manures and slurries, biobased fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality (Möller and Müller, 2012).

- **Enhanced Soil Health: R**ich in organic matter, biobased fertiliser improves soil structure, promotes water retention, and stimulates microbial activity. These soil health benefits contribute to improved nutrient cycling, root development, and overall soil fertility (De Vries et al., 2015).[6]

- **Biobased Fertiliser Usage:** At full capacity the total tonnages for transportation off-site as

[4] Möller, K., & Müller, T. (2012). Effects of anaerobic digestion on biobased fertiliser nutrient availability and crop growth: a review. Engineering in Life Sciences, 12(3), 242-257.
[5] Yao, R., Li, G., Xie, H., Zhao, B., & Liu, H. (2011). *Release characteristics of nutrients from aerobic composted swine manure in soil. Journal of Soils and Sediments*, 11(1), 103-111.
[6] De Vries, J. W., Groenestein, C. M., & Kool, P. L. (2015). *Effects of anaerobic digestion and composting on reducing the environmental impact of pig manure*. Journal of Environmental Management, 162, 230-237.

biobased fertiliser to local agricultural operators are summarised below:

- Digestate Fibre - 24,500 tonnes
- Digestate Liquid - 53,500 tonnes

Post-pasteurisation the biobased fertiliser will meet the standard of an EU fertilising product under Regulation (EC) No 2019/1009 under the criteria outlined for Product Function Category (PFC) 3 B: Inorganic Soil Improver. The operator will apply for End of Waste status upon grant of permission.

All biobased fertilisers will be used in accordance with S.I. 113 of 2022 European Communities (Good Agricultural Practice for Protection of Waters Regulations, 2022). The spreading of the biobased fertiliser on the customer farms will be done on accordance with the specific Nutrient Management Plan for that farm.

8.5.4.9 Attenuation Tanks & Pond

The Proposed Development includes one attenuation pond at the south of the site which will act as the primary attenuation structure, providing attenuation volumes for the entire site. The outflow from the pond will be controlled by means of an overflow headwall discharging to a hydrobrake manhole.

Given the requirement to isolate any potential contaminated water should there be a failure in the digestate/digester tanks, the sump area will count with a separated attenuation system. This will be below ground, through a Pluvial Cube or similar approved structure, and it will provide attenuation capacity to the 1:100 year + 20% climate change volume. An automated penstock will be provided within the final manhole prior to discharge from the sump level which will be activated in the unlikely event that there is a failure of the digester or digestate tanks.

The underground attenuation tank will require excavation to a depth of 4.33 m bgl at the centre-south of the bunded area, while the proposed attenuation pond at the southeastern boundary of the site will extend to 1.34 m bgl.

If inappropriately constructed, the attenuation tank & pond may pose a risk to the underlying aquifer. As such, all underground structures will be fully impermeable in order to limit the risk of contaminants leaching into the underlying locally important gravel aquifer. There is also a potential risk of contaminants to reach surface water receptors via run-off.

The attenuation tanks, ***if not properly constructed and in the absence of mitigation measures*** is foreseen to have potentially ***negative, moderate, and long-term effects*** on surface water bodies and on the groundwater body.

8.6 Mitigation Measures

Mitigation measures proposed in this section relate primarily to the preservation of the existing subterranean drainage regime, the protection of groundwater receptors and the protection of surface water receptors.

Mitigation Measures proposed in this section are in response to the risks identified in **Section 8.5.**

8.6.1 Construction Phase

8.6.1.1 General Mitigation Measures

A Construction Environmental Management Plan (CEMP) will be prepared and implemented by the main contractor during the construction phase. This is a practical document which will include detailed procedures to address the main potential effects on surface water and groundwater.

8.6.1.2 Increased Run-off and Sediment Loading

Moderate negative impacts on both surface water and groundwater may occur during site setup, clearance, and earthworks in the pre-construction phase. The main potential pollutants in site runoff include silt, fuel/oil, concrete, and chemicals. In line with the Eastern Regional Fisheries Board's recommendations for protecting watercourses during construction, a series of mitigation measures are proposed. These are intended to prevent contamination of surface and groundwater from site runoff and to minimise potential hydromorphological impacts on the Kellysgrove DD Scheme channels in the surrounding area.

1. Soil and Stockpile Management

- Keep sand and gravel stockpiles to a minimum size and well away from the southern drainage ditch and site drains.
- Cover soil and debris stockpiles during high winds or wet weather to prevent erosion and dust.
- Avoid earthworks and heavy plant movement during periods of extensive rainfall.
- Landscaping and reinstatement should be carried out as soon as possible to reduce exposed soils.

2. Excavation and Groundwater Protection

- Excavations should be backfilled as soon as possible to reduce infiltration and risk of groundwater contamination.
- Excavations must be covered during rainfall to prevent accumulation of sediment-laden water that would require dewatering.

3. Pollution Prevention

- Store fuels, oils, paints, greases, and hydraulic fluids in bunded, impermeable compounds located away from drains, gullies, and the southern drainage ditch. Bunds must hold 110% of the primary vessel capacity.
- Fuel bowsers must also be bunded.
- Refuelling:
  - Not permitted within 50 m of the Kellysgrove DD Scheme channel and 10 m of any other surface drains.
  - Must not occur in flood-prone (southeastern boundary) or high groundwater vulnerability (along northern boundary) areas.
  - To be carried out only by trained operatives using drip trays.
  - Plant and machinery must use drip trays when parked.
- Spill response:
  - Spill kits available at all refuelling/storage points and in each plant vehicle.

  - Staff trained in spill response.
  - Emergency spill procedures (containment, reporting, removal of contaminated soil to a licensed facility) must be in place.
- Concrete use:
  - On-site batching is prohibited.
  - Use pre-cast concrete where possible.
  - Any in-situ pours must be carried out in dry days and isolated from drains/watercourses until fully cured.
  - No direct discharges containing cement, residues, or chemicals to surface waters.

4. Surface Water and Sediment Control

- Cover manholes and gullies with silt fencing material and/or sandbags to prevent silt entry.
- Use temporary measures during rainfall events (sandbags, silt fencing) to control run-off before the permanent drainage system is in place.
- A temporary drainage system with settlement ponds and oil interceptors will be installed.
- Ponds must be sized and maintained in line with CIRIA SuDS Manual (C753).
- Silt chambers may be blocked off after heavy rain to reduce silt discharge.
- Install silt fencing along the southern and south-eastern perimeters (and elsewhere if needed), consisting of geotextile fabric buried 150 mm into the ground, supported by stakes at 2 m intervals, and extending 400–500 mm above ground level.
- Use supplementary erosion controls (geotextiles, vegetated buffers) where appropriate.

5. Inspection, Monitoring, and Emergency Planning

- Appoint site staff responsible for environmental compliance.
- Carry out regular inspections of sediment controls, plant/machinery condition, and storage areas.
- Keep records of inspections, maintenance, and corrective actions.
- Main contractor must prepare and implement an emergency response plan for accidental sediment release or pollution incidents.

8.6.1.3 Accidental Spillages of Harmful Substances

Potentially significant impacts on local hydrology and hydrogeology may arise from accidental spillages of harmful substances during the construction phase of the proposed development. To minimise the risk of releases involving fuels, oils, chemicals, or cement-based products, the following measures have been developed. As spillages are also likely to affect site runoff, some of the mitigation measures outlined below are intentionally repeated from **Section 8.6.1.2**.

- Store fuels, oils, paints, greases, and hydraulic fluids in bunded, impermeable compounds located away from drains, gullies, and the southern drainage ditch. Bunds must hold 110% of the primary vessel capacity.
- Fuel bowsers must also be bunded.
- Refuelling:
  - Not permitted within 50 m of the Kellysgrove DD Scheme channel and 10 m of any other surface drains.
  - Must not occur in flood-prone (southeastern boundary) or high groundwater vulnerability (along northern boundary) areas.
  - To be carried out only by trained operatives using drip trays.

  - Plant and machinery must use drip trays when parked.
- Spill response:
  - Spill kits available at all refuelling/storage points and in each plant vehicle.
  - Staff trained in spill response.
  - Emergency spill procedures (containment, reporting, removal of contaminated soil to a licensed facility) must be in place.
- Concrete use:
  - On-site batching is prohibited.
  - Use pre-cast concrete where possible.
  - Any in-situ pours must be carried out in dry days and isolated from drains/watercourses until fully cured.
- Install impermeable liners beneath soil and material storage areas to contain potential contaminants, particularly if contaminated soil is identified on site.
- Appoint site staff responsible for environmental compliance.
- Carry out regular inspections of plant/machinery condition, and storage areas.
- Keep records of inspections, maintenance, and corrective actions.
- Main contractor must prepare and implement an emergency response plan for accidental sediment release or pollution incidents.

8.6.1.4 Increased Groundwater Vulnerability / Excavation of Bedrock

A desk-based study has classified the site as having moderate groundwater vulnerability. Geotechnical investigations conducted on-site support this, as no bedrock was encountered during the excavation of trial pits. Water was observed at 2.1 and 3.5mbgl at TP-04 and TP-05, respectively.

During construction, the following measures will be implemented to protect groundwater:

- Excavations will be backfilled as soon as practicable to minimise the risk of contaminant infiltration into the subsurface and underlying aquifer.
- Landscaping works will be carried out promptly to reduce surface erosion and weathering.
- Baseline groundwater quality monitoring will be conducted prior to the commencement of works.
- Foundation and service designs will account for groundwater pressures and will include attenuation systems where appropriate, ensuring alignment with greenfield runoff rates (Qbar).
- Surface water will be managed using temporary SuDS during construction to reduce runoff and attenuate flows prior to controlled discharge. No dedicated infiltration systems are proposed.
- Pollution prevention measures will be enforced throughout all construction phases to prevent untreated runoff, spills, or other pollutants from entering groundwater or surface waters. See **Section 8.6.1.2** and **Section 8.6.1.3**.
- Additional trial pits are recommended prior to construction along the northern boundary of the bunded area in order to verify the subsoil depth.

8.6.1.5 Excavation of Contaminated Soils

Although no visual or olfactory evidence of hydrocarbon or chemical contamination was observed during the investigation, the presence of Made Ground and a redundant underground tank indicates a low to moderate potential for localised contamination of soils or shallow

groundwater within the brownfield portion of the site.

To appropriately manage potential risks, a comprehensive site investigation should be undertaken prior to the commencement of construction to fully characterise soil conditions. Soil sampling should specifically target the Made Ground area, as well as the vicinity of the former underground tank and the soakaway (filter bed). Should any contamination be identified, a further phase of investigation, including groundwater monitoring, should be undertaken to delineate the extent and nature of contamination.

Additionally, the following mitigation measures will be implemented during construction across the whole site:

- Any soils exhibiting evidence of contamination (e.g., staining, odour, or debris) will be segregated, sampled, and tested for classification prior to reuse or disposal.
- Excavated soils from brownfield and greenfield areas shall be kept separately to prevent potential cross-contamination.
- Following removal of the underground tank and soakaway, further sampling of surrounding soils will be conducted to confirm the absence of residual contamination, if deemed necessary.
- Any contaminated material identified will be removed to a licensed waste facility or treated in accordance with regulatory requirements.

8.6.1.6 Increase in Flood Risk to Receiving Catchment

The construction phase will convert the existing greenfield site into areas of hardstanding. This increase in impermeable surfaces is expected to raise surface water discharge to the local drainage network, potentially resulting in a significant downstream flood risk. Careful implementation of mitigation measures during construction will therefore be essential to minimise any increase in flood risk to the receiving catchment. The majority of the mitigation measures proposed in **Section 8.6.1.2** will also help to reduce flood risk to downstream receptors during the construction phase. In addition, the following measures are proposed:

- All discharges will pass through settlement or treatment measures such as ponds, silt fences, or tanks, with release rates restricted so as not to exceed greenfield run-off conditions.
- Outfalls will be fitted with energy-dissipating features to prevent erosion within receiving ditch.
- Diversion channels and bunds will be installed to route water away from sensitive areas, including open excavations, drainage ditches, and the flood-prone southeast portion of the site.
- A discharge strategy will be developed based on predicted flow rates, identifying appropriate discharge points and incorporating settlement or treatment facilities as necessary.
- If dewatering systems are necessary, these will be designed and operated in accordance with recognised best practice guidance, such as CIRIA C750.
- Compounds, material storage areas, and fuel bowsers will not be located in the southeastern portion of the site, which is adjacent to the Kellysgrove DD Scheme channel.
- All temporary drainage features will be subject to regular inspection and maintenance to ensure effective operation, with checks carried out especially after rainfall.
- Silt build-up in settlement ponds and tanks will be removed as required to preserve storage capacity.

- The drainage strategy will be reviewed and adapted throughout the construction period to reflect evolving site conditions.
- Emergency pumps, sandbags, and spill kits will be kept on-site to allow rapid response to storm events or accidental discharges.
- Weather forecasts will be reviewed regularly, and pre-emptive measures will be taken in advance of heavy rainfall.

8.6.2 Operational Phase

8.6.2.1 General Mitigation Measures

An Environmental Management System (EMS) will be prepared and implemented by the operator during the operational phase. This is a practical document which will include detailed procedures to address the main potential effects on surface water and groundwater.

The Proposed Development will operate under an Industrial Emissions Licence (IEL) issued by the Environmental Protection Agency (EPA). The licence will contain several conditions which the operator must remain in compliance with for the entire duration of the facility's lifespan. Typical conditions relating to the protection of water receptors include:

- Site specific trigger levels will be established and agreed with the EPA.
- Monitoring requirements for surface waters
- Resource use and energy efficiency
- Waste management control and documentation
- Storage and transfer of substances
- Facility management
- Accident prevention and emergency response including fire water retention
- Operational Controls

8.6.2.2 Contaminated Run-off

Compared to untreated manures and slurries, biobased fertiliser poses a lower risk of nutrient leaching into watercourses. The balanced nutrient composition and slow-release nature of biobased fertiliser minimise the likelihood of excess nutrients washing away into streams or groundwater. This reduction in nutrient leaching coupled with land spreading best practice helps mitigate water pollution and eutrophication, safeguarding aquatic ecosystems and maintaining water quality.

The proposed surface water management strategy incorporates a multi-tiered containment and treatment system to prevent the release of contaminated runoff to sensitive receptors, including the adjacent watercourse and underlying high- to moderate-sensitivity groundwater body. In the sump area, where there is potential for contamination from digester or digestate tank failure, a fully sealed below-ground attenuation system (e.g., Pluvial Cube or equivalent) has been specified to accommodate the full 1:100-year +20% climate change storage volume. An automated penstock installed within the final manhole upstream of discharge enables immediate isolation of flows in the event of contamination. SuDS-based attenuation features are not employed in this area to eliminate the risk of pollutant ingress.

Site-wide controls include flow control devices at outlet manholes from attenuation tanks and the surface pond, regulating discharge to maintain greenfield runoff rates (Qbar of 6.4 l/s). All flow control chambers are equipped with manual penstocks to facilitate maintenance and

incorporate silt traps to prevent sediment mobilisation. Runoff from trafficked areas is routed through Class 1 Bypass Separators upstream of the attenuation pond, providing hydrocarbon and fine sediment removal for flows up to 6.5 mm/hr, covering over 99% of rainfall events, thereby minimising downstream contamination risk.

Catchpit manholes are provided at attenuation inlets to intercept silt and debris and prevent blockages, while linear drainage across the service yard incorporates emptiable sumps to facilitate sediment removal. An operational maintenance regime is specified to ensure ongoing system performance. The industrial footprint is fully constructed with impermeable reinforced concrete, directing runoff to below-ground rainwater harvesting tanks or attenuation facilities. These structures incorporate impermeable barriers, including geotextile liners where appropriate, and are preceded by petrol interceptors to provide treatment prior to reuse or controlled discharge. Silage effluent is collected separately via an internal drainage network for reuse as process starter material, ensuring segregation from stormwater systems.

Collectively, these measures provide a robust, multi-stage system for containment, treatment, and controlled discharge of contaminated runoff, ensuring compliance with design criteria and effective protection of both surface water and groundwater receptors.

The $Qbar_{rural}$ calculations and more details are outlined in the Civil Engineering report which accompanies this application (***Ref. No.: 231960-ORS-XX-XX-RP-C-13a-001***). For further detail please refer to drawing ***231960-ORS-ZZ-00-DR-CE-400***.

Additional mitigation measures are:

- Site bunding will be designed in accordance with the EPA IPC Guidance Note on the Storage and Transfer of Materials for Scheduled Activities (EPA, 2004), ensuring high standards of containment and impermeability.
- The entire tank farm will be bunded to contain potential leaks. All bunds will be:
  - Impermeable, constructed of concrete or suitable material with chemical resistance.
  - Sized to hold a minimum of 110% of the volume of the largest single tank within the bunded area or 25% of the total volume stored within the bund.
  - Fitted with sealed sumps to allow for safe inspection and removal of stormwater or spill residues.
- Dedicated hardstanding areas will be provided for vehicle off-loading and chemical handling, with appropriate drainage controls and a minimum setback distance from any nearby surface watercourses, including the Kellysgrove DD channel along the southern boundary.
- Spill prevention and containment measures will include the use of:
  - Bunded pallets and secondary containment units for smaller storage vessels.
  - Mobile spill kits strategically located throughout the site.
  - Clearly marked and regularly inspected emergency shut-off systems.
- Runoff from substantial areas of impermeable surfaces, including roofs and service yards, will be directed to a rainwater harvesting system. These tanks will:
  - Store rainwater for reuse (e.g., for washdown or non-potable applications).
  - Include overflow mechanisms to regulate discharge during heavy rainfall and avoid overloading the system.
  - Connect to a properly designed outfall system incorporating flow control structures and filtration, where necessary.
- A detailed Environmental Operating Plan will be developed and implemented, containing:
  - Site-specific standard operating procedures (SOPs) for material handling, storage, and

waste management.
- A documented emergency response plan for accidental spills, including notification protocols, isolation procedures, and clean-up instructions.
- Staff training and awareness programmes to ensure proper implementation.

8.6.2.3 Foul Water

A domestic scale wastewater treatment plant (EUROTANK TER 3 PACKAGED TERTIARY UNIT and a distribution attenuation layer of 100sqm) is proposed to cater for the foul water arising from staff facilities on-site only (Population Equivalent 'PE' of 7). A Site Suitability Assessment conducted by *Coyle Environmental* in line with the EPA Code of Practice for onsite domestic wastewater treatment systems (2022) has concluded that the soils at the Proposed Development have sufficient absorption capacity for the installation of a percolation area suited for this PE.

Based on the design population for the 11 relevant number of users, the population equivalent (PE) for the Proposed Development is calculated at PE7. The volume of foul water generated from the Proposed Development was calculated at 550 litres/day for hydraulic loading and 400 g BOD/day for organic loading. The proposed treatment system will produce an effluent with a standard compliant with SR66 the percolation area be designed on the hydraulic loading of 7 PE.

The wastewater treatment plant will comprise a tertiary treatment system (7PE EuroTank BAF2 Wastewater Treatment System), followed by a 7PE EuroTank TER3 Percolation Unit. The system is proposed with discharge to a Ter3 packaged tertiary unit with a minimum 100m^2 attenuation layer.

The treatment plant will be specified and installed by an appropriately qualified technician and will be subject to regular desludging and maintenance, subject to manufacturers recommendations.

8.6.2.4 Increased Groundwater Vulnerability

Excavations for the proposed development will reach a maximum depth of 9.0 m below existing ground level in the northern bunded area. Additional significant excavations will occur for the rainwater harvesting tank (4.68 bgl), the underground attenuation tank within the sump area (4.33m bgl) and attenuation pond (1.34 m bgl). Earthworks for foundations and underground services will extend to 3.0–5.0 m bgl. These works will reduce the protective subsoil layer above bedrock, increasing groundwater vulnerability from high to extreme along the northern boundary and from moderate to high in other areas of the site.

Mitigation measures to ensure maximum protection of groundwater include:

Engineering and Structural Controls

- Site bunding will be designed in accordance with the EPA IPC Guidance Note on the Storage and Transfer of Materials for Scheduled Activities (EPA, 2004), ensuring high standards of containment and impermeability.
- The entire tank farm will be bunded to contain potential leaks. All bunds will be:
  - Impermeable, constructed of concrete or suitable material with chemical resistance.
  - Sized to hold a minimum of 110% of the volume of the largest single tank within the

bunded area or 25% of the total volume stored within the bund.
    - Fitted with sealed sumps to allow for safe inspection and removal of stormwater or spill residues.
- Dedicated hardstanding areas will be provided for vehicle off-loading and chemical handling, with appropriate drainage controls and a minimum setback distance from any nearby surface watercourses, including the Kellysgrove DD channel along the southern boundary.
- Spill prevention and containment measures will include the use of:
    - Bunded pallets and secondary containment units for smaller storage vessels.
    - Mobile spill kits strategically located throughout the site.
    - Clearly marked and regularly inspected emergency shut-off systems.
- Runoff from substantial areas of impermeable surfaces, including roofs and service yards, will be directed to a rainwater harvesting system. These tanks will:
    - Store rainwater for reuse (e.g., for washdown or non-potable applications).
    - Include overflow mechanisms to regulate discharge during heavy rainfall and avoid overloading the system.
    - Connect to a properly designed outfall system incorporating flow control structures and filtration, where necessary.
- All proposed below-ground structures will be constructed to be fully impermeable. The rainwater harvesting tanks will comprise reinforced concrete construction.
- The attenuation pond will be designed to be fully impermeable through the use of an appropriate geomembrane or geotextile liner. Protective measures and suitable surrounding materials will be incorporated to ensure structural stability and maintain the integrity of the lining system.

Operational Environmental Management

- A detailed Environmental Operating Plan will be developed and implemented, containing:
    - Site-specific standard operating procedures (SOPs) for material handling, storage, and waste management.
    - A documented emergency response plan for accidental spills, including notification protocols, isolation procedures, and clean-up instructions.
    - Staff training and awareness programmes to ensure proper implementation.

8.6.2.5 On-Site Flooding

The effects of on-site flooding resulting from the proposed development have been classified as negative and moderate. Most of the site lies within Flood Zone C, indicating a low flood risk, although a minor area along the southeastern edge falls within the higher-risk Flood Zones A and B.

No construction will take place within Flood Zones A or B, which will be retained as functional floodplain, with only landscaping works proposed. The layout has been designed so that no part of the industrial process lies within flood extents. Ground levels and the existing channels along the southern and eastern boundaries will be retained to ensure that upstream discharges to these channels are uninterrupted and that downstream flood extents remain unchanged. Essential equipment will have finished floor levels raised above the 1-in-100-year flood level plus a climate change allowance, and flood-resilient materials will be used for ground-level construction.

Surface water runoff from the site will be managed using a combination of SuDS and an

appropriate drainage network designed to replicate existing greenfield runoff rates. Flow paths for post-development runoff are maintained, with discharge directed to the drainage ditch on the southern boundary. Swales are proposed throughout the site to convey high-intensity runoff and intercept lower-intensity flows, while vegetated buffer strips along the southern boundary will slow and filter runoff. Non-return valves on drains, oil interceptors, silt traps, and sealed drainage will prevent pollutants from entering the Kellysgrove DD channel or the Ballinure River.

The attenuation pond located at the south of the site will provide storage for the entire site, including controlled discharge from sump levels. The pond and attenuation tanks will include overflow headwalls discharging to hydrobrake manholes, flow control devices at outlet manholes to regulate discharge and maintain greenfield runoff rates, penstocks on inlets to facilitate future maintenance, and slit traps below inlets to capture sediment. These measures ensure that post-development flows do not increase flood risk downstream.

The office car parking bays are proposed as permeable pavement. Runoff from the bays will infiltrate through the paving layers and be connected to the office rainwater harvesting tank. Overflow from the tank during high-intensity events will discharge to the surface water network, preventing uncontrolled runoff.

Additional mitigation measures include:

- Bunded containment for all hazardous material storage, preferably outside flood-prone areas.
- Raised floor levels for essential equipment above design flood levels.
- A Flood Risk Management and Emergency Response Plan covering extreme rainfall events, safe evacuation routes, and emergency shutdown procedures.
- Regular inspection and maintenance of SuDS, bunds, and drainage infrastructure to ensure continued performance.
- Availability of emergency pumps, spill kits, and mobile barriers to protect critical areas during flood events.

8.6.2.6 Increase in Flood Risk to Receiving Catchment

Significant impacts on flood risk within the receiving catchment are anticipated as a result of converting the existing greenfield site into areas of hardstanding during the operational phase of the proposed development. The southeastern portion of the site is particularly susceptible to flooding, and increased surface water discharge to the adjacent drainage ditch could exacerbate this risk.

To address this, a comprehensive drainage strategy has been developed to mitigate on-site flooding and ensure there is no increased risk to downstream receptors. The key elements of this strategy are summarised below.

Attenuation Facilities

- An underground Pluvial Cube (or similar approved system) will provide storage capacity for a 1 in 100-year storm event, including an allowance for 20% climate change, collecting runoff from the sump area.

- A surface attenuation pond with capacity for a 1 in 100-year pluvial storm event will be constructed in the southeastern portion of the site. This pond will attenuate runoff from the service yard and office catchment. The banks will have a 1:4 gradient to facilitate maintenance and blend with surrounding ground levels.
- An additional 0.25 m freeboard above the top water level in the pond will be included to accommodate the 1% AEP flood extent modelled for the area.
- The attenuation pond will provide the required attenuation volumes for the entire site, including controlled discharge from the sump level.
- Attenuation and rainwater harvesting volumes have been calculated assuming a 95% runoff rate from all impermeable surfaces.

Controlled discharge

- All attenuation facilities will be tanked and discharge through a Hydrobrake at the calculated greenfield runoff rate.
- The existing topographical discharge route to the drainage ditch along the southern boundary will be maintained.
- Infiltration to ground is not proposed as part of this development.
- Flow control devices will be installed at the outlet manholes of both the attenuation tanks and the attenuation pond.
- All flow control manholes will include penstocks on the inlet side to facilitate future maintenance.
- Silt traps will be installed within all flow control chambers below the inlets.
- An outflow flow control device will be fitted in the manhole downstream from the sump level below ground attenuation feature to limit flow to 2.5L/s.
- The site outflow will be restricted to a maximum cumulative discharge rate of 6.4 L/s, calculated in accordance with the IH124 Method (Institute of Hydrology). This ensures the proposed development will not adversely affect flow or flood regimes in the receiving catchment.

Sustainable Drainage Systems (SuDS)

- SuDS features will be integrated across the site in line with best practice guidance from the UK SuDS Manual (CIRIA C753).
- Swales will be incorporated throughout the site to convey runoff during high-intensity rainfall events and to intercept flows during lower-intensity events.
- Permeable paving will be provided within the office car park area. Runoff will infiltrate through the permeable pavement sub-base, which will be linked to a rainwater harvesting tank supplying the office block. Overflow from this tank during high-intensity events will discharge to the surface water network.

Additional Mitigation Measures

- A rainwater harvesting tank will collect water from the office roof and permeable paving areas for non-potable use within the office building (e.g., sanitary facilities).
- Collected rainwater will be treated to provide a supplementary potable water supply for the office.
- A monitoring system will be installed to maintain optimal water levels within the rainwater harvesting tank and ensure continued operational performance.

- Regular inspection and maintenance of all SuDS components, bunds, and drainage infrastructure will be undertaken to preserve design capacity and functionality.
- No alterations will be undertaken to the existing drainage ditches along the Site boundaries, and the existing outflow direction will be preserved and maintained to ensure continuity of the current drainage regime.

8.6.2.7 Uncontrolled Releases and Spillage

Uncontrolled releases or spillages of biobased fertiliser or feedstocks from the proposed development could have slight to moderate effects on the receiving environment. To minimise these impacts, an Environmental Management System (EMS), accredited to ISO 14001:2015, will be implemented. In addition, the proposed development will operate under an Industrial Emissions Licence (IEL) issued by the Environmental Protection Agency (EPA). The licence will include conditions that the operator must comply with throughout the operational lifespan of the facility, with specific requirements aimed at preventing and controlling uncontrolled releases. These should include:

- Use of spill kits, bunded pallets and secondary containment units, as appropriate.
- All bunds sized to contain 110% of the volume of the primary storage vessel or 25% of the total volume of the substance which could be stored withing the bunded area (in compliance with Guidance to storage and Transfer of Materials for Scheduled Activities, EPA 2004)
- EMS to include site specific standard operating procedures pertaining to waste management and emergency response.
- All attenuation facilities will be tanked in order to avoid percolation of contents into the underlying locally important gravel aquifer.
- The entire tank farm area of the Proposed Development will be bunded.
- The Reception Hall, Digestate Treatment building a will each be self-bunded.
- All bunds and underground pipelines (foul and process) will be subject to integrity assessments every 3 years by a suitably qualified engineer.
- Ongoing monitoring of stormwater discharge to the drainage ditch along the southern boundary.

8.6.2.8 Fire and Resultant Firewater

There is limited watermain infrastructure within the vicinity of the site that would allow for fire-fighting capacity to be provided. The central rainwater harvesting tank detailed in the accompanying Civil Engineering Planning Report (**Ref. No.: 231960-ORS-XX-XX-RP-C-13a-001**) will provide the source of water for use within the proposed firefighting ring main. A dual pump system will be installed within a standoff manhole chamber connected to the rainwater harvesting tank to provide firefighting capacity to a number of hydrants located throughout the site. Hydrants have been located to ensure coverage of the site and accessibility by fire tenders.

All proposed below-ground structures will be constructed to Eurocode standard (BS EN 1992-3:2006) and will be fully impermeable. The rainwater harvesting tanks will comprise reinforced concrete construction. The smaller circular tanks are pre-cast concrete units supplied by Molloy Precast and are designed to be watertight. The larger rainwater harvesting tank will also be constructed from reinforced concrete, likely cast in-situ, and will achieve full impermeability. Both tank types are to be installed on a compacted bed of single-sized granular material, in accordance with standard detailing for below-ground concrete structures.

The Proposed Development will operate under an Industrial Emissions Licence (IEL) issued by the Environmental Protection Agency (EPA). The licence will contain several conditions which the operator must remain in compliance with for the entire duration of the facility's lifespan.

It is recommended that a Firewater Risk Assessment be commissioned within the first six months of operations. The findings and recommendations of the assessment will ensure that fire response measures and firewater retention are appropriately scaled to the size of the facility. The facility operator will be required to ensure:

- Adequate firewater retention capacity is maintained on-site in the event of a worst-case scenario fire event.
- All retention infrastructure systems will be automatically activated in the event of a fire alarm being triggered.
- All retention tanks shall be maintained empty, or at least to a point where the required retention capacity is available.

8.6.2.9 Land Spreading of biobased fertiliser

The operation phase will involve the production of a biobased fertiliser which will be used by customer farmers for the fertilisation of their land. Mitigation measures to ensure maximum protection of receiving environment include:

- Nutrient management plans to avoid excess fertiliser application
- Farmers to comply with the Nitrates Action Plan
- "Lay-off" period of 21 days for grazing or harvesting following application
- Biobased fertiliser will be pasteurised in accordance with Regulation (EU) 142/2011 on use of animal by products as organic fertiliser.

8.6.2.10 Attenuation Tanks & Pond

The Proposed Development includes one underground attenuation tank and one open surface pond designed to manage surface water runoff from roads, yards, roofs, and the impermeable bunded area. The underground tank will be located centrally within the sump area, while the open surface pond is positioned in the southeastern portion of the site.

The following mitigation measures are proposed in order to ensure maximum protection of the surface and groundwater systems:

- The attenuation tanks have been sized using Causeway Flow drainage software and considers that the rainwater harvesting tank may be full at the time of a 1:100 year + 20% climate change rainfall event.
- The lower-level sub catchment will discharge to an isolated drainage system in order to contain any potential contaminated water should there be a failure in the digestate tanks. This limits the potential for SuDS based attenuation features and as such the full 1:100 year + 30% climate change volume will be contained below ground in the proposed pluvial cube system. An automated penstock will be provided within the final manhole prior to discharge from the sump level that will be activated in the unlikely event that there is a failure of the digester or digestate tanks.
- Post-attenuation, surface water runoff will be discharged at the greenfield runoff rate calculated for each catchment via means of a Hydrobrake or similar approved flow control device.

- Attenuation and rainwater harvesting volumes have been sized based on a 95% runoff rate from all impermeable surfaces throughout the site.
- All proposed below-ground structures will be constructed to be fully impermeable. The rainwater harvesting tanks will comprise reinforced concrete construction.
- The attenuation pond will be designed to be fully impermeable through the use of an appropriate geomembrane or geotextile liner. Protective measures and suitable surrounding materials will be incorporated to ensure structural stability and maintain the integrity of the lining system.

8.6.3 Decommissioning Phase

The decommissioning phase will entail similar activities to the construction phase. The construction stage mitigation measures outlined in **Section 8.6.1** above will be undertaken to limit and avoid effects to the underlying soil from compaction and contamination. The goal of the decommissioning phases is to render the site safe both physically and environmentally so that it no longer poses a risk to the surrounding population and environment. A Closure, Restoration and Aftercare Management Plan (CRAMP) will be developed as a condition of the industrial emission licences and in compliance with the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites set by the EPA (2012).

8.7 Interactions

Hydrology and Hydrogeology is linked with Land, Soils and Geology as discussed in **Chapter 7** of this EIAR. In terms of hydrogeology specifically, the recharge capacity at the Proposed Development will be diminished as a function of surface sealing, which has the potential to adversely enhance flood events downstream of the Proposed Development. This is addressed in the above sections in regard to flood risk assessment and mitigation i.e. attenuation and SUDs.

Hydrology is linked with Biodiversity as discussed in **Chapter 5**. The site is hydrologically connected to several protected areas, meaning that impacts on the local surface water network or groundwater could adversely affect these sites. With the successful implementation of adequate mitigation measures potential hazards will be managed and the likelihood of environmental incidents occurring is very low. Any potential impacts are therefore resolved or minimised.

Hydrology and Hydrogeology is linked with the Population and Human Health in **Chapter 6**. The risk of surface or groundwater contamination affecting human health is minimal. However, the effective implementation of mitigation measures will further manage any potential hazards, substantially reducing the likelihood of environmental incidents and ensuring that potential impacts are resolved or minimised.

8.8 Cumulative Effects

Within the European Commission's *Guidelines for the Assessment of Indirect and Cumulative Effects as well as Impact Interactions* (May 1999), cumulative effects are described as "effects that result from incremental changes caused by other developments, plans, or projects in combination with the Proposed Development."

While a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or insignificant), result in a cumulative impact that is collectively significant. For

example, effects on traffic due to an individual industrial project may be acceptable, however, it may be necessary to assess the cumulative effects taking account of traffic generated by other permitted or planned projects. It can also be prudent to have regard to the likely future environmental loadings arising from the development of zoned lands in the immediate environs of the proposed project.

8.8.1 Construction Phase

The phasing or commencement of other future permitted developments in the locality could give rise to a scenario in which multiple construction sites operate simultaneously with the Proposed Development. A review of County Galway planning applications identified several developments located upstream of the site that could potentially give rise to cumulative effects if construction periods overlap. However, as none of these are located within the immediate vicinity of the site (i.e. within 500 m), significant effects are not anticipated.

Furthermore, taking into account the mitigation measures outlined in this report, along with the expected residual effects following their successful implementation, the Proposed Development is not considered likely to significantly contribute to cumulative adverse impacts on the associated hydrological network.

8.8.2 Operational Phase

For the operational phase, the cumulative impacts of the proposed development in combination with surrounding activities are primarily as follows:

- Nutrient-enriched run-off: Elevated nutrient levels and suspended solids in surface water run-off, with potential additive effects when combined with slurry spreading, fertiliser application, and manure storage associated with nearby agricultural activities.
- Altered run-off and flood risk: Maintenance or modification of agricultural ditches and drains could increase run-off volumes and sediment transport into the local hydrological network, compounding flood risk along the southern boundary of the site.
- Indirect nutrient and silt loading risk to the downstream River Suck Callows: A licensed discharge, located approximately 1 km northeast of the site and originating from Ballinasloe Golf Club, occurs upstream in a tributary of the River Ballinure that is not hydrologically connected to the site. However, nutrient loading from this discharge could act cumulatively with discharges from the proposed development within the downstream SPA.

Considering the mitigation measures outlined in the previous sections, and the expected residual effects following their successful implementation, the proposed development is not considered likely to significantly contribute to cumulative adverse impacts on the associated hydrological network. In particular, as the development will not involve any process discharges, no adverse impacts on local water quality or downstream receptors are anticipated, and cumulative impacts on water quality are therefore not relevant.

With respect to flood risk, the drainage strategy (SuDS) for the proposed development has been carefully designed to address on-site flooding and to avoid exacerbating downstream flood risk. Accordingly, no cumulative impacts on flooding are expected.

8.9 Residual Effects

According to Environmental Protection Agency guidelines, Residual Impact is described as ‘the

degree of environmental change that will occur after the proposed mitigation measures have taken place.' The mitigation strategy above recommends actions which can be taken to reduce or offset the scale, significance and duration of the effects on the surrounding hydrological and hydrogeological features.

The purpose of this assessment is to specify mitigation measures where appropriate to minimise the 'risk factor' to all aspects of the water environment such as to minimise the potential for hydrocarbons to contaminate the streams or groundwater, reduce the risk of erosion and run-off, etc. This 'risk factor' is reduced or offset by recommending the implementation of a mitigation strategy in each area of the study. On the implementation of this mitigation strategy, the potential for impact will be lessened.

A site-specific Construction Environmental Management Plan (CEMP) will be devised and implemented throughout the duration of the construction phase. This document will contain all the necessary procedures required to prevent and minimise any environmental risks posed by the project on the surrounding environment.

8.9.1 Construction Phase

A summary of the predicted effects associated with the construction phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 8.17**.

The overall impact anticipated during the construction phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral*** to ***negative***, ***imperceptible*** to ***slight***, and ***temporary.***

8.9.2 Operational Phase

A summary of the predicted effects associated with the operational phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 8.18.**

The overall impact anticipated during the operational phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral***, ***slight***, and ***short-term*** to ***long-term***. There are no uncontrolled emissions anticipated as a result of the Proposed Development.

Table 8.17: Summary of predicted construction phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Increased Run-off and Sediment Loading	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Degradation of water quality, reduced suitability of aquatic habitats, and increased localised flood risk on-site and in downstream receptors as a result of topsoil stripping, earthworks, and vegetation removal.	***Negative***	***Moderate***	***Temporary***	• Keep stockpiles to a minimum size and away from the water drains. • Cover stockpiles during high winds or wet weather to prevent erosion and dust. • Avoid earthworks and heavy plant movement during periods of extensive rainfall. • Landscaping and reinstatement to be carried out as soon as possible. • Excavations to be backfilled as soon as possible. • Excavations to be covered during rainfall. • Store hazardous fluids in bunded, impermeable compounds located away from drains, gullies, and the southern drainage ditch. Bunds must hold 110% of the primary vessel capacity. • Fuel bowsers must also be bunded. • Refuelling is not permitted within 50 m of the Kellysgrove DD Scheme channel and 10 m of any other surface drains. • Refuelling to be carried out only by trained operatives using drip trays. • Plant and machinery must use drip trays when parked. • Spill kits available at all refuelling/storage points and in each plant vehicle. • Staff trained in spill response. • Emergency spill procedures must be in place. • On-site batching is prohibited. • Use pre-cast concrete where possible. • Any in-situ pours must be carried out in dry days and isolated from drains/watercourses until fully cured. • No direct discharges containing cement, residues, or chemicals to surface waters. • Cover manholes and gullies with silt fencing material and/or sandbags to prevent silt entry.	***Neutral, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Loose sediments becoming entrained in open excavations.	***Negative***	***Moderate***	***Temporary***	• Use temporary measures during rainfall events to control run-off before the permanent drainage system is in place. • A temporary drainage system with settlement ponds and oil interceptors will be installed. • Ponds must be sized and maintained in line with CIRIA SuDS Manual (C753). • Silt chambers may be blocked off after heavy rain to reduce silt discharge. • Install silt fencing along the southern and south-eastern perimeters (and elsewhere if needed). • Use supplementary erosion controls (geotextiles, vegetated buffers) where appropriate. • Appoint site staff responsible for environmental compliance. • Carry out regular inspections of sediment controls, plant/machinery condition, and storage areas. • Keep records of inspections, maintenance, and corrective actions. • Main contractor must prepare and implement an emergency response plan for accidental sediment release or pollution incidents.	***Neutral, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Accidental Spillages of Harmful Substances	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Spillage of contaminants such as fuels, oils, chemicals and cement material and subsequent migration into surface water receptors	**Negative**	**Significant**	**Temporary**	• Store hazardous fluids in bunded, impermeable compounds located away from drains, gullies, and the southern drainage ditch. Bunds must hold 110% of the primary vessel capacity. • Fuel bowsers must also be bunded. • Refuelling not permitted within 50 m of the Kellysgrove DD Scheme channel and 10 m of any other surface drains. • Refuelling must not occur in flood-prone (southeastern boundary) or high groundwater vulnerability (along northern boundary) areas. • Refuelling to be carried out only by trained operatives using drip trays. • Plant and machinery must use drip trays when parked. • Spill kits available at all refuelling/storage points and in each plant vehicle. • Staff trained in spill response. • Emergency spill procedures must be in place. • On-site batching is prohibited. • Use pre-cast concrete where possible. • Any in-situ pours must be carried out in dry days and isolated from drains/watercourses until fully cured. • Install impermeable liners beneath soil and material storage areas to contain potential contaminants, particularly if contaminated soil is identified on site. • Appoint site staff responsible for environmental compliance. • Carry out regular inspections of plant/machinery condition, and storage areas. • Keep records of inspections, maintenance, and corrective actions. • Main contractor must prepare and implement an emergency response plan for accidental sediment release or pollution incidents.	***Negative, Slight, Temporary***
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Spillage of contaminants in soils and subsoils, particularly in open excavations, and subsequent migration to the underlying aquifer.	***Negative***	***Significant***	***Short-term***		***Neutral, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Increased Groundwater Vulnerability	**Groundwater** Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Excavation depths of up to 9.0 mbgl could significantly increase groundwater vulnerability in certain areas from 'High' to 'Extreme' and from 'Moderate' to 'High'.	**Negative**	**Significant**	**Long-Term**	• Excavations will be backfilled as soon as practicable to minimise the risk of contaminant infiltration into the subsurface and underlying aquifer. • Landscaping works will be carried out promptly to reduce surface erosion and weathering. • Baseline groundwater quality monitoring will be conducted prior to the commencement of works. • Foundation and service designs will account for groundwater pressures and will include attenuation systems where appropriate, ensuring alignment with greenfield runoff rates (Qbar). • Surface water will be managed using temporary Sustainable Drainage Systems (SuDS) during construction to reduce runoff and support on-site infiltration. • Pollution prevention measures will be enforced throughout all construction phases to prevent untreated runoff, spills, or other pollutants from entering groundwater or surface waters. • Additional trial pits are recommended prior to construction along the northern boundary of the bunded area in order to verify the subsoil depth.	***Negative, Slight, Temporary***
Excavation of Bedrock		Potential removal of bedrock in certain parts of the site to create a uniform base.	**Negative**	**Significant**	**Long-Term**		***Negative, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Excavation of Contaminated Soils	**Surface Water** Rivers Ballinure_010 and Ballinure_020 **Groundwater** Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	The presence of Made Ground, C&D Waste and underground tank and soakaway in a small area of the site indicates potential presence of contaminated soils. The disturbance of these materials may result in the mobilisation of contaminants to surface and groundwater.	***Negative***	***Moderate***	***Temporary***	• A comprehensive site investigation should be undertaken prior to the commencement of construction to fully characterise soil conditions. Should any contamination be identified, a further phase of investigation, including groundwater monitoring, should be undertaken to delineate the extent and nature of contamination. • Any soils exhibiting evidence of contamination (e.g., staining, odour, or debris) will be segregated, sampled, and tested for classification prior to reuse or disposal. • Excavated soils from brownfield and greenfield areas shall be kept separately to prevent potential cross-contamination. • Following removal of the underground tank and soakaway, further sampling of surrounding soils will be conducted to confirm the absence of residual contamination, if deemed necessary. • Any contaminated material identified will be removed to a licensed waste facility or treated in accordance with regulatory requirements.	***Neutral to Positive, Slight, Long-term***
Increase in Flood Risk to Receiving Catchment	**Surface Water** Rivers Ballinure_010, Ballinure_020 and Kellysgrove Drainage District	The gradual conversion of the site to hardstanding areas may increase the volume and intensity of surface water runoff within the receiving catchment, potentially elevating the risk of flooding both upstream and downstream of the proposed site.	***Negative***	***Significant***	***Long-Term***	• All discharges will pass through settlement or treatment measures such as ponds, silt fences, or tanks, with release rates restricted so as not to exceed greenfield run-off conditions. • Outfalls will be fitted with energy-dissipating features to prevent erosion within receiving ditch. • Diversion channels and bunds will be installed to route water away from sensitive areas, including open excavations, drainage ditches, and the flood-prone southeast portion of the site. • A discharge strategy will be developed based on predicted flow rates, identifying appropriate discharge points and incorporating settlement or treatment facilities as necessary. • Where discharge to surface water is proposed, the relevant licensing requirements will be met, including obtaining a Discharge Licence from Galway County Council if required.	***Negative, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						• If dewatering systems are necessary, these will be designed and operated in accordance with recognised best practice guidance, such as CIRIA C750. • Compounds, material storage areas, and fuel bowsers will not be located in the southeastern portion of the site, which is flood-prone and adjacent to the Kellysgrove DD Scheme channel. • All temporary drainage features will be subject to regular inspection and maintenance to ensure effective operation, with checks carried out especially after rainfall. • Silt build-up in settlement ponds and tanks will be removed as required to preserve storage capacity. • The drainage strategy will be reviewed and adapted throughout the construction period to reflect evolving site conditions. • A flood risk response plan will be prepared, setting out actions and procedures for extreme weather events, including safe evacuation routes for staff and protection of plant and materials. • Emergency pumps, sandbags, and spill kits will be kept on-site to allow rapid response to storm events or accidental discharges. • Weather forecasts will be reviewed regularly, and pre-emptive measures will be taken in advance of heavy rainfall.	

Table 8.18: Summary of predicted operational phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Contaminated Run-off	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Contaminated runoff from operational areas may cause deterioration in surface water quality, nutrient enrichment, and ecological degradation in downstream receptors.	***Negative***	***Moderate to Significant***	***Temporary***	• Use of biobased fertiliser, which reduces nutrient leaching and eutrophication risk through balanced, slow-release nutrient composition and best-practice land spreading. • Sealed attenuation structure (1:100-year + 20% CC) and automated penstocks prevent runoff discharge from sump area; SuDS excluded in this area. • Outlet devices maintain greenfield runoff rate (6.4 l/s); flow chambers fitted with penstocks and silt traps; Class 1 Bypass Separators remove hydrocarbons and fine sediments. • Catchpit manholes are provided at attenuation inlets to intercept silt and debris and prevent blockages, while linear drainage across the service yard incorporates emptiable sumps to facilitate sediment removal. • Operational maintenance regime to ensure ongoing system performance.	***Neutral, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Infiltration of contaminated runoff may lead to localised deterioration in groundwater quality and risks to nearby water supplies, depending on soil permeability and connectivity.	***Negative***	***Moderate***	***Short-term***	• Impermeable surface redirect runoff to rainwater harvesting or attenuation underground tanks. • Structures incorporate impermeable barriers, including geotextile liners where appropriate, and are preceded by petrol interceptors to provide treatment prior to reuse or controlled discharge. • Separate collection and reuse system prevents cross-contamination with stormwater. • Tank farm fully bunded per EPA guidance; bunds impermeable, chemically resistant, and sized for 110% tank volume. • Designated hardstanding for off-loading; bunded pallets, mobile spill kits, and emergency shut-off systems installed. • Tanks store roof and yard runoff for reuse with overflow and flow control systems to manage discharge. • Environmental Operating Plan to include SOPs, emergency response procedures, and staff training to ensure effective implementation and maintenance.	***Neutral, Imperceptible, Short-term***
Foul Water	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Leakage of untreated foul water and infiltration via preferential pathways to site drainage system and subsequent discharge to surface water receptors	***Negative***	***Moderate to Significant***	***Temporary***	• A domestic scale packaged tertiary treatment system (EuroTank TER3) installed to serve staff facilities only (PE7). • Assessment confirms adequate soil absorption capacity for a percolation area designed in accordance with the EPA Code of Practice (2022). • Treatment system sized for 550 L/day hydraulic and 400 g BOD/day organic loading, compliant with SR66 discharge standards. • Includes EuroTank BAF2 secondary treatment and TER3 tertiary percolation unit with 100 m² attenuation layer to ensure high effluent quality. • System to be installed by qualified personnel and maintained through regular desludging and inspection in line with manufacturer's recommendations.	***Negative, Slight, Temporary***
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Leakage of untreated foul water and infiltration downwards through sediments into aquifer					

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact

Increased Groundwater Vulnerability	**Groundwater** Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	The proposed FFL will be up to 9.0 m below the existing elevation of the site in certain places, which may increase the vulnerability of the underlying locally important aquifer from 'High' to 'Extreme' in localised areas or from 'Moderate' to 'High' across the site.	***Negative***	***Significant***	***Long-Term***	<u>*Engineering and Structural Controls*</u>
						• Site bunding will be designed in accordance with the EPA IPC Guidance Note on the Storage and Transfer of Materials for Scheduled Activities (EPA, 2004), ensuring high standards of containment and impermeability.
						• The entire tank farm will be bunded to contain potential leaks. All bunds will be:
						• Impermeable, constructed of concrete or suitable material with chemical resistance.
						• Sized to hold a minimum of 110% of the volume of the largest single tank within the bunded area or 25% of the total volume stored within the bund.
						• Fitted with sealed sumps to allow for safe inspection and removal of stormwater or spill residues.
						• Dedicated hardstanding areas will be provided for vehicle off-loading and chemical handling, with appropriate drainage controls and a minimum setback distance from any nearby surface watercourses, including the Kellysgrove DD channel along the southern boundary.
						• Spill prevention and containment measures will include the use of:
						  ○ Bunded pallets and secondary containment units for smaller storage vessels.
						  ○ Mobile spill kits strategically located throughout the site.
						  ○ Clearly marked and regularly inspected emergency shut-off systems.
						• Runoff from substantial areas of impermeable surfaces, including roofs and service yards, will be directed to a rainwater harvesting system. These tanks will:
						  ○ Store rainwater for reuse (e.g., for washdown or non-potable applications).
						  ○ Include overflow mechanisms to regulate discharge during heavy rainfall and avoid overloading the system.
							Negative, Slight, Long-term

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						○ Connect to a properly designed outfall system incorporating flow control structures and filtration, where necessary. • All proposed below-ground structures will be constructed to be fully impermeable. The rainwater harvesting tanks will comprise reinforced concrete construction. • The attenuation pond will be designed to be fully impermeable through the use of an appropriate geomembrane or geotextile liner. Protective measures and suitable surrounding materials will be incorporated to ensure structural stability and maintain the integrity of the lining system. <u>*Operational Environmental Management*</u> • A detailed Environmental Operating Plan will be developed and implemented, containing: ○ Site-specific standard operating procedures (SOPs) for material handling, storage, and waste management. ○ A documented emergency response plan for accidental spills, including notification protocols, isolation procedures, and clean-up instructions. ○ Staff training and awareness programmes to ensure proper implementation	
On-Site Flooding	**Surface Water** Rivers Ballinure_010, Ballinure_020 and Kellysgrove DD	Most of the site lies in Flood Zone C, indicating a low flood risk, though a minor area along the southern edge falls within higher-risk Flood Zones A and B	***Negative***	***Moderate***	***Temporary***	• No construction within Flood Zones A or B; these areas retained as functional floodplain with landscaping only. • Ground levels and existing drainage channels along the southern and eastern boundaries retained to maintain natural flow paths. • Essential equipment and infrastructure set above the 1-in-100-year flood level plus climate change allowance. • Use of flood-resilient materials for ground-level construction. • Drainage network designed to replicate existing greenfield runoff rates.	***Negative, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact

						• Flow paths for post-development runoff maintained, with controlled discharge to the southern drainage ditch.
						• SuDS features incorporated, including:
						  ○ Swales for high-intensity flow conveyance and interception of low-intensity flows.
						  ○ Vegetated buffer strips along the southern boundary to slow and filter runoff.
						  ○ Permeable paving in office car parking areas to promote infiltration and reduce surface runoff.
						• Non-return valves, oil interceptors, silt traps, and sealed drainage to prevent pollutant entry to the Kellysgrove DD channel and Ballinure River.
						• Attenuation pond and below-ground tanks sized to store runoff for the entire site, including controlled discharge from sump areas.
						• Overflow headwalls designed to discharge to hydrobrake manholes.
						• Flow control devices installed at outlet manholes to regulate discharge and maintain greenfield runoff rates.
						• Penstocks on inlets to facilitate maintenance and slit traps below inlets to capture sediment and prevent blockages.
						• Rainwater harvesting tank includes overflow connection to the surface water network to manage excess during high-intensity rainfall and prevent uncontrolled runoff.
						• Bunded containment for all hazardous material storage, preferably outside flood-prone areas.
						• Raised floor levels for essential equipment above design flood levels.
						• A Flood Risk Management and Emergency Response Plan covering extreme rainfall events, safe evacuation routes, and emergency shutdown procedures.
						• Regular inspection and maintenance of SuDS, bunds, and drainage infrastructure to ensure continued performance.	

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						• Availability of emergency pumps, spill kits, and mobile barriers to protect critical areas during flood events.	
Uncontrolled Releases & Spillage of Digestate and Feedstocks	**Surface Water** Rivers Ballinure_010 and Ballinure_020	During the operational phase, there is a possibility of leakage or spillage of biobased fertiliser or feedstocks via vehicle movements or from a catastrophic failure of a tank or feed line. While such substances are significantly less hazardous than fuels, oils, chemicals and cement material, the still pose a potential risk to surface and groundwater quality.	***Negative***	***Slight to Moderate***	***Temporary***	• Use of spill kits, bunded pallets and secondary containment units, as appropriate. • All bunds sized to contain 110% of the volume of the primary storage vessel or 25% of the total volume of the substance which could be stored withing the bunded area (in compliance with Guidance to storage and Transfer of Materials for Scheduled Activities, EPA 2004) • EMS to include site specific standard operating procedures pertaining to waste management and emergency response. • All attenuation facilities will be tanked in order to avoid percolation of contents into the underlying locally important gravel aquifer. • The entire tank farm area of the Proposed Development will be bunded. • The Reception Hall, Digestate Treatment building a will each be self-bunded. • All bunds and underground pipelines (foul and process) will be subject to integrity assessments every 3 years by a suitably qualified engineer. • Ongoing monitoring of stormwater discharge to the drainage ditch along the southern boundary.	***Neutral to Negative, Slight, Temporary***
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer		***Negative***	***Slight to Moderate***	***Temporary***		***Neutral to Negative, Slight, Temporary***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Fire and Resultant Firewater	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Given the presence of flammable substances on the site, there is a risk of fire prevalent at the facility, during the operational phase. In the event of a fire, significant quantities of water resources will be utilised to quench the fire. Water used to quench a fire is known as "firewater". Firewater is known to contain several harmful substances.	***Negative***	***Slight to Moderate***	***Temporary***	• Central rainwater harvesting tank to supply the on-site firefighting ring main. • Dual pump system installed within a standoff manhole chamber to provide reliable firewater pressure and capacity. • Hydrants strategically located across the site to ensure full coverage and accessibility for fire tenders. • All below-ground structures (including rainwater harvesting and storage tanks) to be constructed to Eurocode standard (BS EN 1992-3:2006) for water-retaining structures. • Tanks constructed from reinforced concrete, ensuring full impermeability to prevent leakage or groundwater infiltration. • Smaller circular tanks supplied as precast watertight units (e.g., Molloy Precast), with larger tanks cast in-situ for enhanced structural integrity. • All tanks installed on compacted granular bedding in accordance with standard engineering specifications for below-ground concrete structures. • Facility to operate under an EPA Industrial Emissions Licence (IEL), ensuring compliance with all conditions related to emissions, containment, and environmental protection. • Firewater Risk Assessment to be undertaken within the first six months of operation to verify firewater containment capacity and ensure appropriate scaling of fire response measures.	***Negative, Slight, Temporary***
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer		***Negative***	***Moderate***	***Temporary***		***Negative, Slight, Temporary***
Increase in Flood Risk to Receiving Catchment	**Surface Water** Rivers Ballinure_010, Ballinure_020 and Kellysgrove DD	The conversion of a significant area of the site to hardstanding areas may increase the volume and intensity of surface water runoff within the receiving catchment, potentially elevating the risk of flooding both upstream and downstream of the	***Negative***	***Significant***	***Long-Term***	<u>*Attenuation Facilities*</u> • An underground Pluvial Cube (or similar approved system) will provide storage capacity for a 1 in 100-year storm event, including an allowance for 20% climate change, collecting runoff from the sump area. • A surface attenuation pond with capacity for a 1 in 100-year pluvial storm event will be constructed in the southeastern portion of the site. This pond will attenuate runoff from the service yard and office	***Negative to Neutral, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
		proposed site.				catchment. The banks will have a 1:4 gradient to facilitate maintenance and blend with surrounding ground levels. • An additional 0.25 m freeboard above the top water level in the pond will be included to accommodate the 1% AEP flood extent modelled for the area. • The attenuation pond will provide the required attenuation volumes for the entire site, including controlled discharge from the sump level. • Attenuation and rainwater harvesting volumes have been calculated assuming a 95% runoff rate from all impermeable surfaces. *Controlled discharge* • All attenuation facilities will be tanked and discharge through a Hydrobrake at the calculated greenfield runoff rate. • The existing topographical discharge route to the drainage ditch along the southern boundary will be maintained. • Infiltration to ground is not proposed as part of this development. • Flow control devices will be installed at the outlet manholes of both the attenuation tanks and the attenuation pond. • All flow control manholes will include penstocks on the inlet side to facilitate future maintenance. • Silt traps will be installed within all flow control chambers below the inlets. • An outflow flow control device will be fitted in the manhole downstream from the sump level below ground attenuation feature to limit flow to 2.5L/s. • The site outflow will be restricted to a maximum cumulative discharge rate of 6.4 L/s, calculated in accordance with the IH124 Method (Institute of Hydrology). This ensures the proposed development will not adversely affect flow or flood regimes in the receiving catchment.	

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
						Sustainable Drainage Systems (SuDS) • SuDS features will be integrated across the site in line with best practice guidance from the UK SuDS Manual (CIRIA C753). • Swales will be incorporated throughout the site to convey runoff during high-intensity rainfall events and to intercept flows during lower-intensity events. • Permeable paving will be provided within the office car park area. Runoff will infiltrate through the permeable pavement sub-base, which will be linked to a rainwater harvesting tank supplying the office block. Overflow from this tank during high-intensity events will discharge to the surface water network. *Additional Mitigation Measures* • A rainwater harvesting tank will collect water from the office roof and permeable paving areas for non-potable use within the office building (e.g., sanitary facilities). • Collected rainwater will be treated to provide a supplementary potable water supply for the office. • A monitoring system will be installed to maintain optimal water levels within the rainwater harvesting tank and ensure continued operational performance. • Regular inspection and maintenance of all SuDS components, bunds, and drainage infrastructure will be undertaken to preserve design capacity and functionality. • No alterations will be undertaken to the existing drainage ditches along the Site boundaries, and the existing outflow direction will be preserved and maintained to ensure continuity of the current drainage regime.	

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Land Spreading of biobased fertiliser	**Surface Water** Rivers Ballinure_010 and Ballinure_020 **Groundwater** Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer	Application of processed biobased fertiliser to agricultural land. Reduction in chemical fertiliser use, pathogen and diseases which may be contained and spread in untreated manures Discharge of contaminated materials into the attenuation tanks may have the potential to percolate into the underlying aquifer and to reach surface water receptor via run-off.	***Negative***	***Slight***	***Temporary***	• Nutrient management plans to avoid excess fertiliser application • Farmers to comply with the Nitrates Action Plan • "Lay-off" period of 21 days for grazing or harvesting following application • Biobased fertiliser will be pasteurised in accordance with Regulation (EU) 142/2011 on use of animal by products as organic fertiliser.	***Positive, Imperceptible, Temporary***
Attenuation Tank & Pond	**Surface Water** Rivers Ballinure_010 and Ballinure_020	Discharge of contaminated materials into the attenuation tank or pond may have the potential to percolate into the underlying aquifer and to reach surface water receptor via run-off.	***Negative***	***Moderate***	***Long-Term***	• The attenuation tanks have been sized using Causeway Flow drainage software and considers that the rainwater harvesting tank may be full at the time of a 1:100 year + 20% climate change rainfall event. • The lower-level sub catchment will discharge to an isolated drainage system in order to contain any potential contaminated water should there be a failure in the digestate tanks. This limits the potential for SuDS based attenuation features and as such the full 1:100 year + 30% climate change volume will be contained below ground in the proposed pluvial cube system. An automated	***Neutral, Slight, Long-term***

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
	Groundwater Aughrim Groundwater Body & Clontuskert Sand and Gravel Aquifer					penstock will be provided within the final manhole prior to discharge from the sump level that will be activated in the unlikely event that there is a failure of the digester or digestate tanks. • Post-attenuation, surface water runoff will be discharged at the greenfield runoff rate calculated for each catchment via means of a Hydrobrake or similar approved flow control device. • Attenuation and rainwater harvesting volumes have been sized based on a 95% runoff rate from all impermeable surfaces throughout the site. • All proposed below-ground structures will be constructed to be fully impermeable. The rainwater harvesting tanks will comprise reinforced concrete construction. • The attenuation pond will be designed to be fully impermeable through the use of an appropriate geomembrane or geotextile liner. Protective measures and suitable surrounding materials will be incorporated to ensure structural stability and maintain the integrity of the lining system.	

8.10 Monitoring

The Construction Environmental Management Plan (CEMP) and Environmental Operating Plan (EOP) and the Industrial Emissions Licence (IEL) will include provision for the monitoring of construction related activities including the following:

- Water Quality Monitoring of the surface water receptor – River Ballinure U/S and D/S
- Daily inspections for housekeeping and site cleanliness
- Dust Suppression on dry days or during concrete cutting
- Risk assessment for the prevention of fuel spillages
- Monitoring of stockpiles to determine if further measures are required to prevent erosion
- Daily site inspections to ensure procedures outlined within the CEMP are adhered through throughout the Proposed Development.

The site will be subject to inspection by the Environmental Protection Agency (EPA) that will critically assess compliance with Surface Water Regulations (S.I. No. 77/2019)

Monitoring for the Proposed Development will be conducted in line with BAT Waste treatment CID and conditions set out in the proposed EPA licence. Monitoring results will be reported to the EPA annually. The site will be subject to inspection by the Environmental Protection Agency who will critically assess the site's compliance with the conditions of the Industrial Emissions licence (IEL).

8.11 Summary of Significant Effects

The receptors for this assessment are considered to be local surface water receptor named the River Ballinure and the Locally important aquifer which is moderately productive only in local zones (Aughrim GWB) beneath the Proposed Development. Whilst the development proposals have the potential to cause detrimental effects to sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential effects is reduced to negligible.

8.12 Statement of Significance

The significance of impact upon local & regional hydrology and hydrogeology systems have been assessed for both during the construction and operational phases. The results of the assessment are presented on **Table 8.17** and **Table 8.18**.

The overall impact anticipated during the construction phase of the project following the implementation of suitable mitigation measures is considered to be ***positive*** to ***negative***, ***imperceptible*** to ***slight***, and ***temporary***.

The overall impact anticipated during the operational phase of the project following the implementation of suitable mitigation measures is considered to be ***neutral*** to ***negative***, ***slight***, and ***short-term*** to ***long-term***.

APPENDIX 8.1 – HYDROCHEMISTRY LABORATORY REPORTS

eurofins | Environment Testing

Eurofins Environment Testing Ireland
Hoffman Park, Inchera
Cork
T45 PC80
Ireland
T: 0818 252526
Web: www.eurofins.ie
Email: ASTsupport@etuki.eurofins.com

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 138T

Client: ORS Building Consultants
Marlinstown Office Park
Co. Westmeath
Mullingar
N91 W5NN
IRELAND

Certificate Code: AR-25-M3-023841-01
Page Number: Page 1 of 1
PO reference: Kellysgrove 2

Certificate of Analysis

Sample number	966-2025-00027445	Received on	17/07/2025
Your sample code	Upstream	Analysis started on	17/07/2025
Your sample reference	Upstream		
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Additional Information	Surface Water
Sample Date	2025-07-17	Time Sampled	10:00:00

Test Code / Analyte	SUB [5]	Analysis Started	Method	LOQ [3]	SPEC [2]	Result	Units	ACCRED [4]
Ammonia as N - Gallery [M300Z]								
Ammonia as N - Gallery		18/07/25 11:22	EW175	0.01		0.0190	mg/l	C6
Biochemical Oxygen Demand (BOD) Robotic Method [M304E]								
Biochemical oxygen demand (BOD) 5d by Robotic Method		18/07/25 15:25	Ew001R	1		1.30	mg/l	C6
Chemical Oxygen Demand (COD) [M3004]								
Chemical oxygen demand (COD)		18/07/25 12:01	EW094	8		20.0	mg/l	C6
Conductivity at 20°C (Robotic Method) [M3052]								
Conductivity at 20°C		17/07/25 20:10	EW152R	5		623	µS/cm	C6
Nitrate (as N) - Gallery [M301A]								
Nitrate (as N) - Gallery		18/07/25 11:22	EW175	1		<1	mg/l	C6
Nitrite (as N) - Gallery [M3016]								
Nitrite (as N) - Gallery		18/07/25 11:22	EW175	0.01		0.0110	mg/l	C6
pH (Robotic Method) [M3051]								
pH		17/07/25 20:10	EW152R	4		7.9		C6
Phosphate (Ortho/MRP) as PO4 (Calc) - Gallery [M300M]								
Phosphate (Ortho/MRP) as PO4 (Calc) - Gallery		18/07/25 11:22	EW175	0.03		0.0700	mg/l	C6
Suspended Solids [M3002]								
Suspended Solids		18/07/25 09:31	EW013	5		<5	mg/l	C6
Total Nitrogen [M3007]								
Total Nitrogen		22/07/25 09:38	EW140	1		<1	mg/l	C6

[4] Accreditiation Information

C6: ISO/IEC 17025:2017 INAB 138-T

NOTES

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2. SPEC = Allowable limit or parametric value.
3. LOQ = Limit of Quantification or lowest value that can be reported.
4. ACCRED = Indicates accreditation for the test, a blank field indicates not accredited.
5. * indicates the test was sub-contracted, "D" indicates the analysis was performed in Dublin and "C" indicates the analysis performed in Cork.
6. The sampling date was not communicated; this may impact the validity of the results unless provided.
7A. This test was conducted outside of recommended best practice holding time; this may impact the validity of the result while the accreditation status of the test result will stay unaffected .
7B. No time of sampling was supplied, a default time of 00:00:00 will be assumed for holding time calculations unless provided. This may impact the validity of the results.
7C. Your sample arrived at the laboratory already outside of the recommended best practice holding time ; this may impact the validity of the result while the accreditation status of the test result will stay unaffected .
7D. The sample was received close to the recommended best practice holding time; this may impact the validity of the result while the accreditation status of the test result will stay unaffected .
8. This notification is based on the numerical result for the test without consideration of the uncertainty of measurement of the result, unless otherwise agreed in writing. Uncertainty of measurement has been calculated for all INAB accredited tests and is available upon request.
9. Report is issued as per our standard T&C of sale.

Signed: 23/07/2025

Niamh Ward - Senior Laboratory Analyst

eurofins | Environment Testing

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 138T

Client: ORS Building Consultants
Marlinstown Office Park
Co. Westmeath
Mullingar
N91 W5NN
IRELAND

Certificate Code: AR-25-M3-023842-01
Page Number: Page 1 of 1
PO reference: Kellysgrove 2

Certificate of Analysis

Sample number	966-2025-00027446	Received on	17/07/2025
Your sample code	Downstream	Analysis started on	17/07/2025
Your sample reference	Downstream		
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Additional Information	Surface Water
Sample Date	2025-07-17	Time Sampled	10:30:00

Test Code / Analyte	SUB [5]	Analysis Started	Method	LOQ [3]	SPEC [2]	Result	Units	ACCRED [4]
Ammonia as N - Gallery [M300Z]								
Ammonia as N - Gallery		18/07/25 11:22	EW175	0.01		0.0120	mg/l	C6
Biochemical Oxygen Demand (BOD) Robotic Method [M304E]								
Biochemical oxygen demand (BOD) 5d by Robotic Method		18/07/25 15:25	Ew001R	1		1.00	mg/l	C6
Chemical Oxygen Demand (COD) [M3004]								
Chemical oxygen demand (COD)		18/07/25 12:01	EW094	8		14.0	mg/l	C6
Conductivity at 20°C (Robotic Method) [M3052]								
Conductivity at 20°C		17/07/25 20:10	EW152R	5		608	µS/cm	C6
Nitrate (as N) - Gallery [M301A]								
Nitrate (as N) - Gallery		18/07/25 11:22	EW175	1		<1	mg/l	C6
Nitrite (as N) - Gallery [M3016]								
Nitrite (as N) - Gallery		18/07/25 11:22	EW175	0.01		0.0130	mg/l	C6
pH (Robotic Method) [M3051]								
pH		17/07/25 20:10	EW152R	4		8.0		C6
Phosphate (Ortho/MRP) as PO4 (Calc) - Gallery [M300M]								
Phosphate (Ortho/MRP) as PO4 (Calc) - Gallery		18/07/25 11:22	EW175	0.03		0.0380	mg/l	C6
Suspended Solids [M3002]								
Suspended Solids		18/07/25 09:31	EW013	5		<5	mg/l	C6
Total Nitrogen [M3007]								
Total Nitrogen		22/07/25 09:38	EW140	1		1.02	mg/l	C6

[4] Accreditiation Information

C6: ISO/IEC 17025:2017 INAB 138-T

NOTES

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8. This notification is based on the numerical result for the test without consideration of the uncertainty of measurement of the result, unless otherwise agreed in writing. Uncertainty of measurement has been calculated for all INAB accredited tests and is available upon request.
9. Report is issued as per our standard T&C of sale.

Signed: 23/07/2025

Niamh Ward - Senior Laboratory Analyst

APPENDIX 8.2 - SITE CHARACTERISATION ASSESSMENT (PERCOLATION ASSESSMENT)

Site Characterisation Assessment Report

Cycle O

1st & 2nd Floor Kilmurry House, Main Street,
Castlerea, Co. Roscommon, F45 DK58

Tel: 094 962 1258 **Website**: www.coyleenv.ie

Coyle ENVIRONMENTAL

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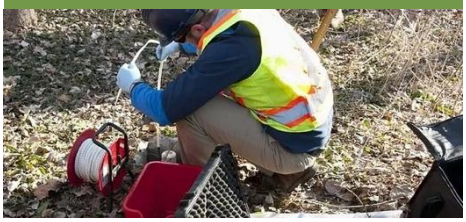

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Document Control

Project Title:	Site Characterisation Assessment Report for Cycle O
Project Reference No:	25-173
Project Description:	Site Characterisation Assessment Report for Cycle O at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway
Status:	Final Report
Client Details:	Kellysgrove, Clontuskert, Ballinasloe, Co. Galway
Issued By:	Coyle Environmental Ltd., 1st & 2nd Floor Kilmurry House, Castlerea, Co. Roscommon

Document Production & Approval

Appendix Number	Description		
Prepared by:	Patrick Mannion	19/09/2025	Sewage & Wastewater Department Manager

Revision History

Rev	Status	Date
01	Final	19/09/2025

Table of Contents

Appendices

Appendix Number	Description
1	Photographic Representation of Site & Site Characterisation Assessment
2	General Mapping, Aquifer, Vulnerability & Groundwater Protection Information
3	Site Layout & Cross Section of Proposed Site, Illustration of Water Table, Existing & Proposed Ground Levels
4	Manufacturer Site Specific Report
5	Specific Purpose Certificate
6	Coyle Environmental Professional Indemnity Insurance

1.0 Non-Technical Summary

A Site Characterisation Assessment was undertaken in accordance with the EPA Code of Practice: Domestic Wastewater Treatment Systems (p.e.≤10) 2021. to establish the soil percolation rate at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway. This was needed in order to progress the development at the site location and to provide adequate wastewater treatment to be discharged to groundwater.

The proposed development will have a maximum design population of 4. no persons for Hydraulic and 7 for organic loading as per EPA Wastewater Treatment Manuals for Small Communities, Business, Leisure Centres and Hotels.

LOADING DATA CALCULATOR					
BASED ON EPA GUIDELINES					
	Per person per day			Totals	
Sources of Effluent	Hydraulic Loading (litres)	Organic Loading (grams)	Relevant number of users	Hydraulic Loading litres/day	Organic Loading grams BOD/day
Industrial					
Office/factory without canteen	30	20	15	450	300
Toilet blocks - per use	10	10	10	100	100
			Sub total	550	400
Population equivalent (higher reading aplies)			Totals	4	7

Results from the percolation test yields a Subsurface Value of 58.67 min/25mm.

With a total daily demand of 4 Hydraulic loading and 7 for organic loading we recommend a PE 7 proprietary treatment system is proposed with discharge to a Ter3 packaged tertiary unit with a minimum 100m2 attenuation layer. (Explanatory note: The Percolation Area is designed in accordance with the EPA Code of Practice Wastewater Treatment and Disposal Systems serving Single Houses 2021).

2.0 Introduction:

Coyle Environmental was commissioned by Cycle O to undertake a Site Characterisation Assessment in order to design a wastewater treatment system for the proposed development.

The site is situated in an area of Moderate groundwater vulnerability as per mapping produced from the Geological Survey of Ireland. The site has an R1 Protection Response which is acceptable subject to normal good practice (i.e. system selection, construction, operation and maintenance in accordance with EPA Code of Practice Wastewater Treatment and Disposal Systems serving Single Houses 2021).

The proposed development is located in at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway. The townland consists mainly of agricultural grassland, residential and agricultural buildings. There is 1 house located within 250m of the development. Groundwater is the primary target at risk and suitable distances will have to be adhered to.

APPENDIX A: SITE CHARACTERISATION FORM

File Reference: 24-173

1.0 GENERAL DETAILS (From planning application)

Prefix: | First Name: Cycle O | Surname:

Address: Kellysgrove, Clontuskert, Ballinasloe, Co. Galway

Site Location and Townland: 53.2947590, -8.2474293

Number of Bedrooms: | Maximum Number of Residents:

Comments on population equivalent

The proposed development will have a maximum design population of 4. no persons for Hydraulic and 7 for organic loading as per EPA Wastewater Treatment Manuals for Small Communities, Business, Leisure Centres and Hotels.

Proposed Water Supply:

Mains ✓ | Private Well/Borehole | Group Well/Borehole

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): BminDW- Deep well drained mineral (Mainly basic)

Subsoil, (Specify Type): TLs, Till derived from limestones

Bedrock Type: Dark limestone and shale ('calp)

Aquifer Category: Regionally Important | Locally Important | LI | Poor

Vulnerability: Extreme | High | Moderate ✓ | Low

Groundwater Body: | Status

Name of Public/Group Scheme Water Supply within 1 km: Turlough PWS

Source Protection Area: ZOC | SI | SO | Groundwater Protection Response: R1

Presence of Significant Sites (Archaeological, Natural & Historical): None within 250m of the site

Past experience in the area: Past experience in area. Site test required to determine suitability.

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

THIS SITE HAS AN R1 GROUNDWATER PROTECTION RESPONSE: ACCEPTABLE TO NORMAL GOOD PRACTICE SEPARATION DISTANCES CAN BE FOUND IN TABLE 6.2 AND 6.3 IN EPA CODE OF PRACTICE: DOMESTIC WASTE WATER TREATMENT SYSTEMS (PE<10), 2021.

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: BACKGROUND WHEN ROAD USED AS BENCHMARK

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☑ Relatively Flat (<1:20) ☐

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres):

Houses:

1 Within 250m
13 Within 500m

Existing Land Use:

Unused area

Vegetation Indicators:

Grass

Groundwater Flow Direction: Potentially South

Ground Condition:

Firm underfoot

Site Boundaries:

Fencing all around

Roads:

R355 and Glenloughaun North of site

Outcrops (Bedrock And/Or Subsoil):

None

Surface Water Ponding:

None within 250m

Lakes:

None within 250m

3.1 Visual Assessment (contd.)

Beaches/Shellfish Areas:

None within 250m

Wetlands:

None within 250m

Karst Features:

None within 250m

Watercourses/Streams: *

Ballinure River 250m south of the site

Drainage Ditches: *

None on site

Springs: *

None Within 250m as per GSI Mapping

Wells: *

None Within 250m as per GSI Mapping

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

GROUNDWATER IS POTENTIALLY AT RISK, SUITABLE SEPARATION DISTANCES WILL HAVE TO BE ADHERED TO. SEPARATION DISTANCES CAN BE FOUND IN TABLE 6.1,6.2 AND B.3 IIN EPA CODE OF PRACTICE: DOMESTIC WASTE WATER TREATMENT SYSTEMS (PE<10), 2021.

Note and record water level

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g.NHAs, SACs, SPAs, and / or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.7

Depth from ground surface to bedrock (m)(if present):

Depth from ground surface to water table (m)(if present): 1.5

Depth of water ingress:

Rock type (if present):

Date and time of excavation: 14-07-2025 09:00

Date and time of examination: 15-07-2025 09:00

Depth of Surface and Subsurface Percolation Tests	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/Compactness	Colour****	Preferential flowpaths
0.1 m	FILL	DIFFICULTY TO DILATANT	STRUCTURELESS	COMPACT	GREY	
0.2 m						
0.3 m						
0.4 m						
0.5 m	"clayey" SILT/CLAY	DILATANT	STRUCTURELESS	COMPACT	LIGHT BROWN	
0.6 m						
0.7 m						
0.8 m						
0.9 m						
1.0 m						
1.1 m						
1.2 m						
1.3 m						
1.4 m						
1.5 m	WATER TABLE	WATER TABLE	WATER TABLE	WATER TABLE	WATER TABLE	WATER TABLE
1.6 m	CLAY	NOT DILATANT	BLOCKY	COMPACT	BLACK	
1.7 m						
1.8 m	CLAY	NOT DILATANT	BLOCKY	COMPACT	BLACK	
1.9 m						
2.0 m						
2.1 m						
2.2 m						
2.3 m						
2.4 m						
2.5 m						
2.6 m						
2.7 m						
2.8 m						
2.9 m						
3.0 m						
3.1 m						
3.2 m						
3.3 m						
3.4 m						
3.5 m						

Likely Subsurface Percolation Value:

Likely Surface Percolation Value:

Note:
*Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate)
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon
**** All signs of mottling should be recorded

Evaluation:

O-HORIZON CONSISITED OF GRASSROOTS A-HORIZON CONSISTED OF TOP SOIL AND WENT DOWN 0.4M B-HORIZON CONSISTED OF "clayey" SILT/CLAY AND DOWN 1.6M C-HORIZON CONSISTED OF CLAY AND WENT DOWN 1.8M D-HORIZON CONSISTED OF CLAY AND WENT DOWN TO 3.7M T-TEST STARTED AT 0.4M WATER TABLE ENCOUNTERED IN THE TIRAL HOLE AT 1.5M BELOW GROUNDLEVEL

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)	400	400	400
Depth from ground surface to base of hole (mm) (B)	800	800	800
Depth of hole (mm) [B - A]	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

Pre-soak start	Date	14-07-2025	14-07-2025	14-07-2025
	Time	09:00	09:00	09:00
2nd Pre-soak start	Date	15-07-2025	15-07-2025	15-07-2025
	Time	17:00	17:00	17:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring $T_1$00

Percolation Test Hole No.	1	2	3
Date of test	15-07-2025	15-07-2025	15-07-2025
Time filled to 400 mm	08:00	08:00	08:00
Time filled to 300 mm	10:05	09:53	10:18
Time (min.) to drop 100 mm (T_1oo)	125	113	138
Average $T_1$00			125.33

If $T_1$00 > 480 minutes then Subsurface Percolation value >120 - site unsuitable for discharge to ground
If $T_1$00 ≤ 210 minutes then go to Step 4;
If $T_1$00 > 210 minutes then go to Step 5;

Step 4: Standard Method (where T100 ≤ 210 minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	10:05	13:30	205	09:53	12:45	172	10:18	13:40	202
2	13:30	17:30	240	12:45	16:20	215	13:40	17:26	226
3	17:30	21:55	265	16:20	21:27	307	17:26	22:28	302
Average Δt Value			236.67			231.33			243.33
	Average Δt/4 = [Hole No.1]		59.17	Average Δt/4 = [Hole No.2]		57.83	Average Δt/4 = [Hole No.3]		60.83

Result of Test: Subsurface Percolation Value = 58.67 (min/25 mm)

Comments:

SUBSOIL HAS SUITABLE PERCOLATION PROPERTIES TO BE USED AS A PERCOLATION OPTION AS PER STEP 4 STANDARD METHOD

Step 5: Modified Method (where T100 > 210 minutes)

Percolation Test Hole 1

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 2 = (T2) =			

Percolation Test Hole 2

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 2 = (T2) =			

Percolation Test Hole 3

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 3 = (T3) =			

Result of Test: Subsurface Percolation Value = min/25 mm

Comments:

3.3(b) Surface Percolation Test for Soil :

Step 1: Test Hole Preparation

Percolation Test Hole	**1**	**2**	**3**
Depth from ground surface to top of hole (mm)			
Depth from ground surface to base of hole (mm)			
Depth of hole (mm)			
Dimensions of hole [length x breadth (mm)]			

Step 2: Pre-Soaking Test Holes

Pre-soak start	Date			
	Time			
2nd Pre-soak start	Date		-	
	Time			

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring $T_1$00

Percolation Test Hole No.	**1**	**2**	**3**
Time filled to 400 mm			
Time filled to 300 mm			
Time (min.) to drop 100 mm (T_1oo)			
Average $T_1$00			

If T100 > 480 minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground
If T100 ≤ 210 minutes then go to Step 4;
If T100 > 210 minutes then go to Step 5;

Step 4: Standard Method (where T100 ≤ 210 minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1									
2									
3									
Average Δt Value									

Average Δt/4 [Hole No.1] =

Average Δt/4 [Hole No.2] =

Average Δt/4 [Hole No.3] =

Result of Test: Surface Percolation Value = min/25 mm

Comments:

Step 5: Modified Method (where T100 > 210 minutes)

Percolation Test Hole 1

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T-Value		T- Value Hole 1 = (T1) =			

Percolation Test Hole 2

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T-Value		T- Value Hole 2 = (T2) =			

Percolation Test Hole 3

Fall of water in hole (mm)	Time Factor = Tf	Start Time hh:mm	Finish Time hh:mm	Time of fall(mins)= Tm	Kfs= Tf / Tm	T - Value= 4.45 / Kfs
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T-Value		T- Value Hole 3 = (T3) =			

Result of Test: Surface Percolation Value = min/25 mm

Comments:

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area:	0
Are all minimum separation distances met?	✓
Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)	

Percolation test result: Surface: Sub-surface: 58.67

Not Suitable for Development **Suitable for Development** ✓

Identify all suitable options

1. Septic tank system (septic tank and percolation area) (Chapter 7)	No
2. Secondary Treatment System (Chapters 8 and 9) and soil polishing filter (Section 10.1)	No
3. Tertiary Treatment System and Infiltration /treatment area (Section 10.2)	Yes

Discharge Route

GROUNDWATER

5.0 SELECTED DWWTS

Propose to install: Tertiary Treatment System and Infiltration /treatment area

and discharge to: Ground Water

Invert level of the trench/bed gravel or drip tubing (m)

Site Specific Conditions (e.g. special works, site improvement works testing etc.

From our Site Characterisation Assessment, we can confirm that this site is suitable to provide treatment for domestic sewage via discharge to groundwater.
The proposed development will have a maximum design population of 4. no persons for Hydraulic and 7 for organic loading as per EPA Wastewater Treatment Manuals for Small Communities, Business, Leisure Centres and Hotels.
With a total daily demand of 4 Hydraulic loading and 7 for organic loading we recommend a PE 7 proprietary treatment system is proposed with discharge to a Ter3 packaged tertiary unit with a minimum 100m2 attenuation layer.
PIPE RUNS MUST BE VENTED.
The location of filter can be seen on the attached site layout plan and cross section detail (Appendix 3) We would recommend that the installation be supervised and certified by the Environmental Engineer who carried out the site characterisation assessment and proposed design.1 A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m3)		Percolation Area		Mounded Percolation Area	
		No. of Trenches		No. of Trenches	
		Length of Trenches (m)		Length of Trenches (m)	
		Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type	
PE7 TREATMENT	
Capacity PE	PE7
Sizing of Primary	Compartment
	m3

Polishing Filter*: (Section 10.1)

Surface Area (m2)*		Option 3 - Gravity Discharge Trench length (m)	
Option 1 - Direct Discharge Surface area (m2)		Option 4 - Low Pressure Pipe Distribution Trench length (m)	
Option 2 - Pumped Discharge Surface area (m2)		Option 5 - Drip Dispersal Surface area (m2)	

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
EUROTANK TER3 UNIT IS A TERTIARY TREATMENT SYSTEM IS REOUIRE TO MEAT SEPERATION DISTANCE AS PER EPA CODE 2021 TABLE 6.1	EFFLUENT QUALITY AS PER PIA TEST BOD 2MG/L NH4N 0.3MG/L SUSPENDED SOLIDS 4MG/L PHOPHATES<6MG/L ECOLI AND TOTAL COLIFORM REMOVAL >99%	TER 3 PACKAGED TERTIARY UNIT and a distribution ATTENUATION LAYER OF 100sqm

DISCHARGE ROUTE:

Groundwater	✓	Hydraulic Loading Rate * (l/m2.d)		Surface area (m2)	
Surface Water **		Discharge Rate (m3/hr)			

*Hydraulic loading rate is determined by the percolation rate of subsoil

**Water Pollution Act discharge licence required

6.0 TREATMENT SYSTEM DETAILS

QUALITY ASSURANCE:

Installation & Commissioning

Manufactures certification of installation & supervising engineers certification of compliance with planing and building regulations this certificate will be forwarded to the local authority.

On-going Maintenance

Maintenance contract with manufacturer & de sludging as per epa cop by the owner. Certificate must be kept.

7.0 SITE ASSESSOR DETAILS

Company:	COYLE ENVIRONMENTAL
Prefix:	
First Name:	PATRICK
Surname:	MANNION
Address:	1ST AND 2ND FLOOR KILMURRY HOUSE, MAIN STREET, CASTLEREA, CO. ROSCOMMON
Qualifications/Experience:	BSc ENV (HONS) IAH IEMI FETAC SITE ASSESSOR 2000
Date of Report:	19/09/2025
Phone:	0949621258
E-mail:	Info@coyleenv.ie
Indemnity Insurance Number:	RL UNDERWRITING LTD PL/C/12420/1
Signature:	Patrick Mannion

Appendix 1

Photographic Representation of Site & Site Characterisation Assessment

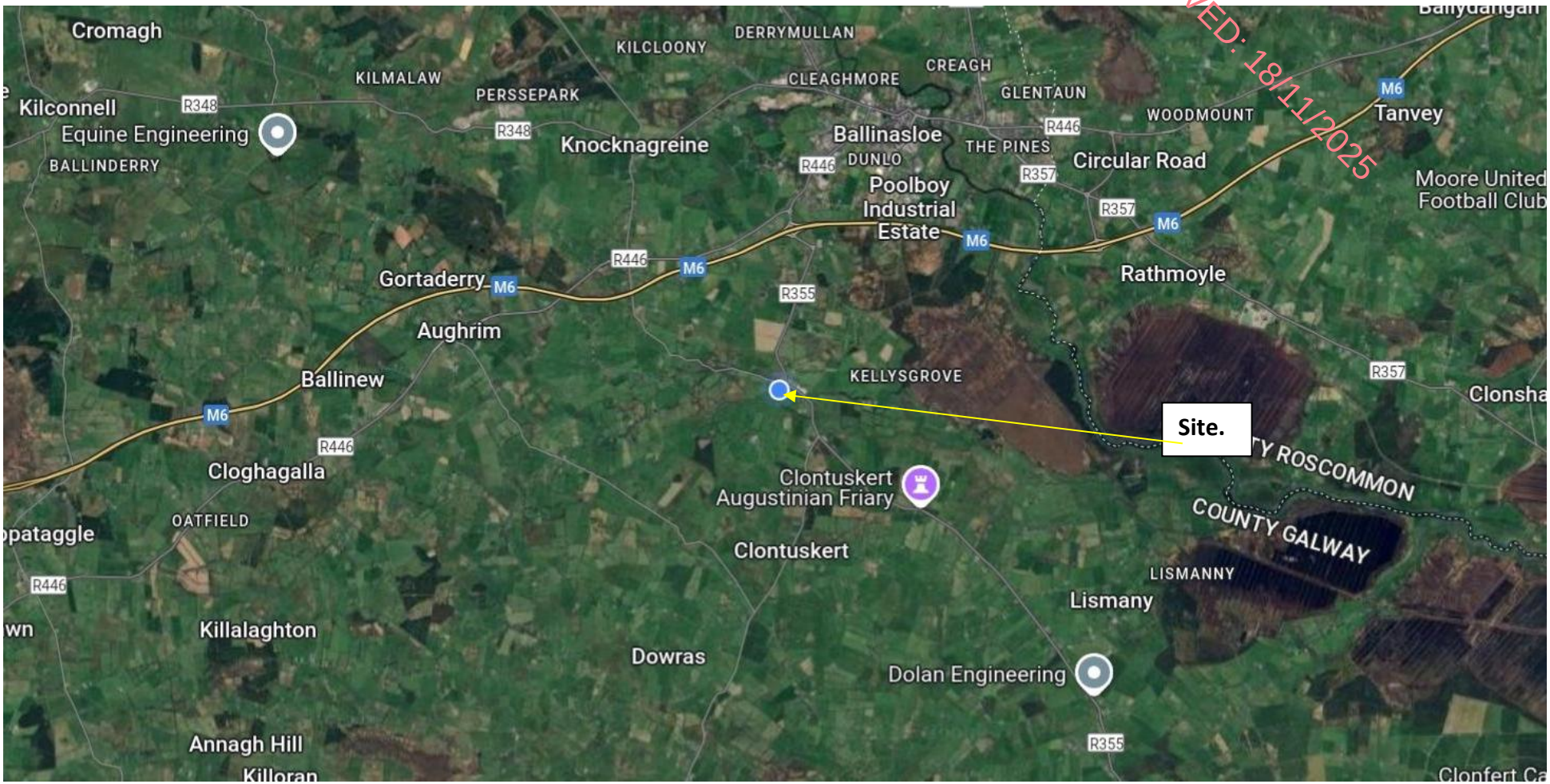

Figure 1: Shows a Google image of the site location.

Figure 2: Shows a Google image of the site location and trial hole location.

Figure 3: This photograph provides an overview of the site and illustrates the location of trial pit and subsurface & surface test holes.

Figure 4: Illustrates the trial hole depth at 3.7m below ground level.

Figure 5: Shows the different layers within the trial hole.

Figure 6: Shows the different layers within the trial hole.

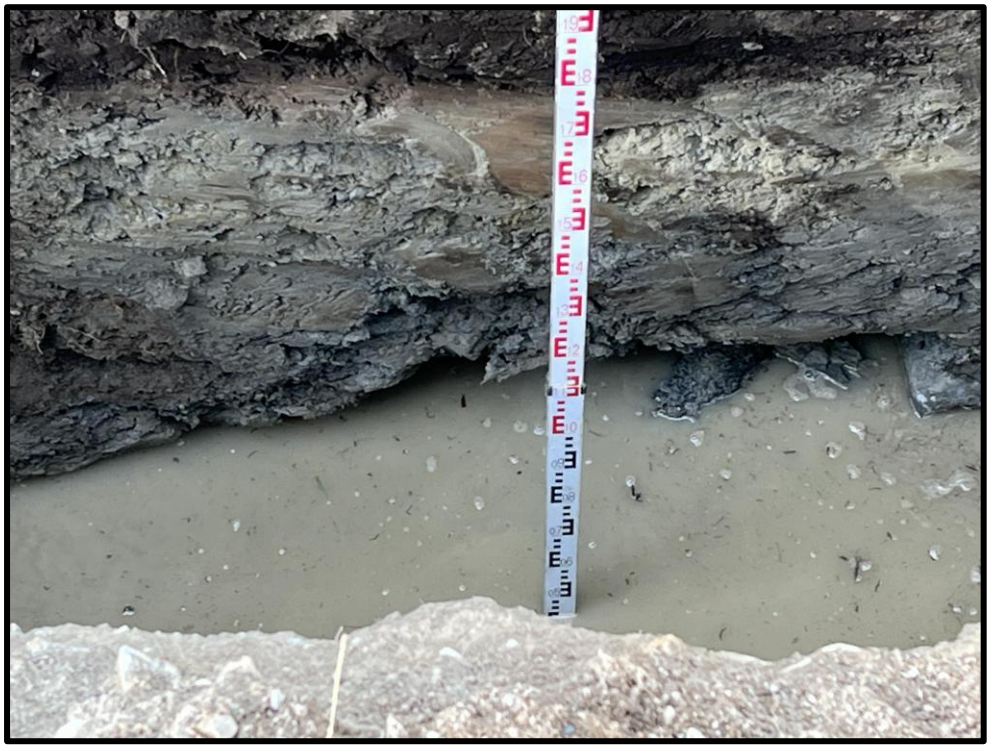

Figure 7: Shows the different layers within the trial hole.

Figure 8: Shows subsurface and surface percolation test carried out.

Figure 9: Shows subsurface and surface percolation test carried out.

Figure 10: Shows subsurface and surface percolation test carried out.

Figure 11: Shows location of subsurface and surface percolation test and trial hole

Figure 12: Shows digger used to dig trial hole.

Figure 13: Shows Trial hole been dug on site.

Figure 14: Shows overview of site.

Figure 15: Shows overview of site.

Appendix 2

General Mapping, Aquifer, Vulnerability & Groundwater Protection Information

Geological Survey
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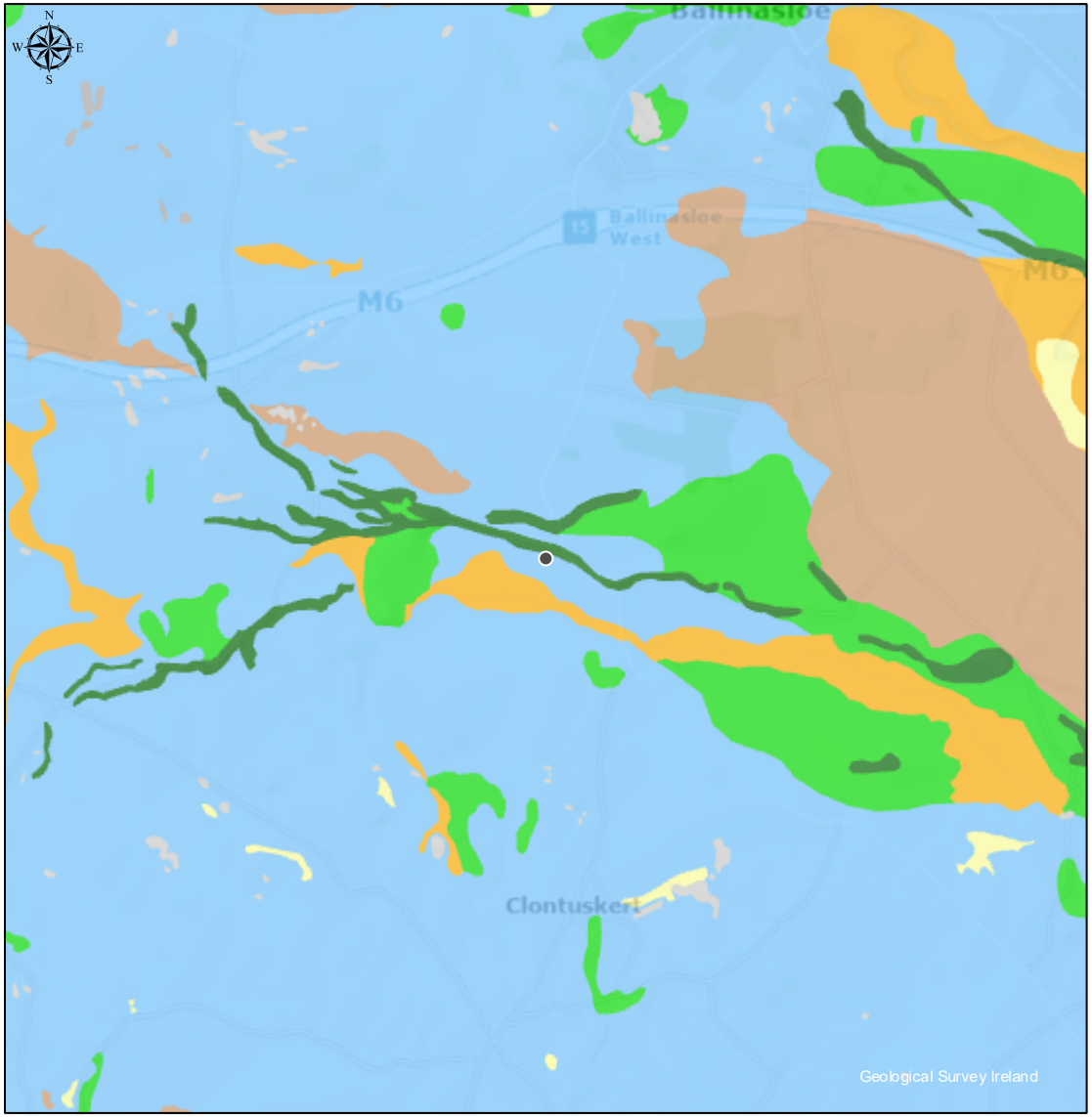
SUBSOIL



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Legend

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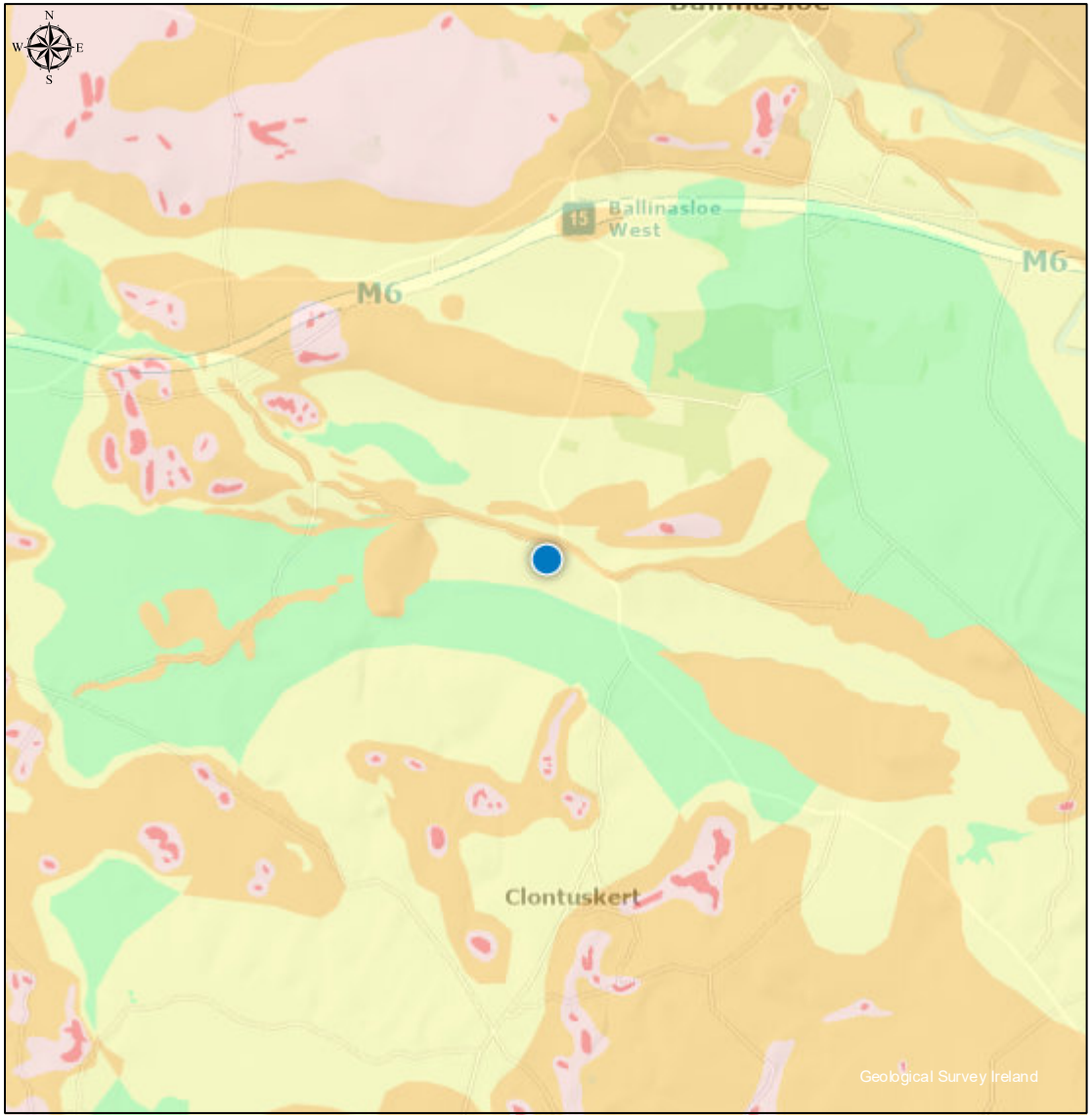
GROUNDWATER VULNERABILITY



Legend

IE_GSI_Groundwater_V...

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

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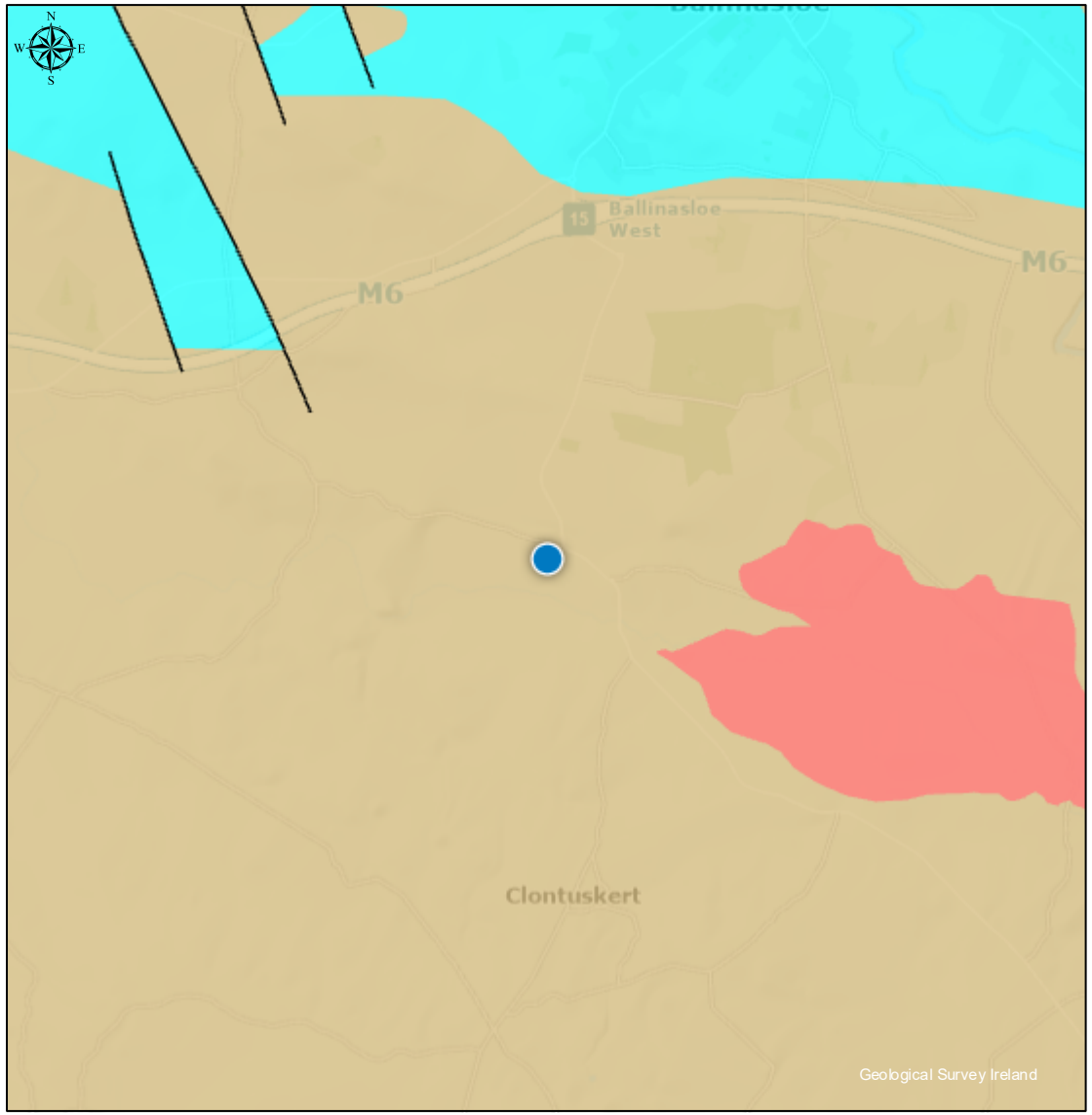
GROUNDWATER AQUIFERS



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Legend

IE_GSI_Sand_and_Gra...

- Regionally important gravel aquifer
- Locally important gravel aquifer
- IE_GSI_Aquifer_G...

IE_GSI_Bedrock_Aquif...

- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Rk - Regionally Important Aquifer - Karstified
- Rf - Regionally Important Aquifer - Fissured bedrock
- Rf/Rk - Regionally Important Aquifer - Fissured bedrock/Regionally Important Aquifer - Karstified
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Lake
- Unclassified

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Geological Survey
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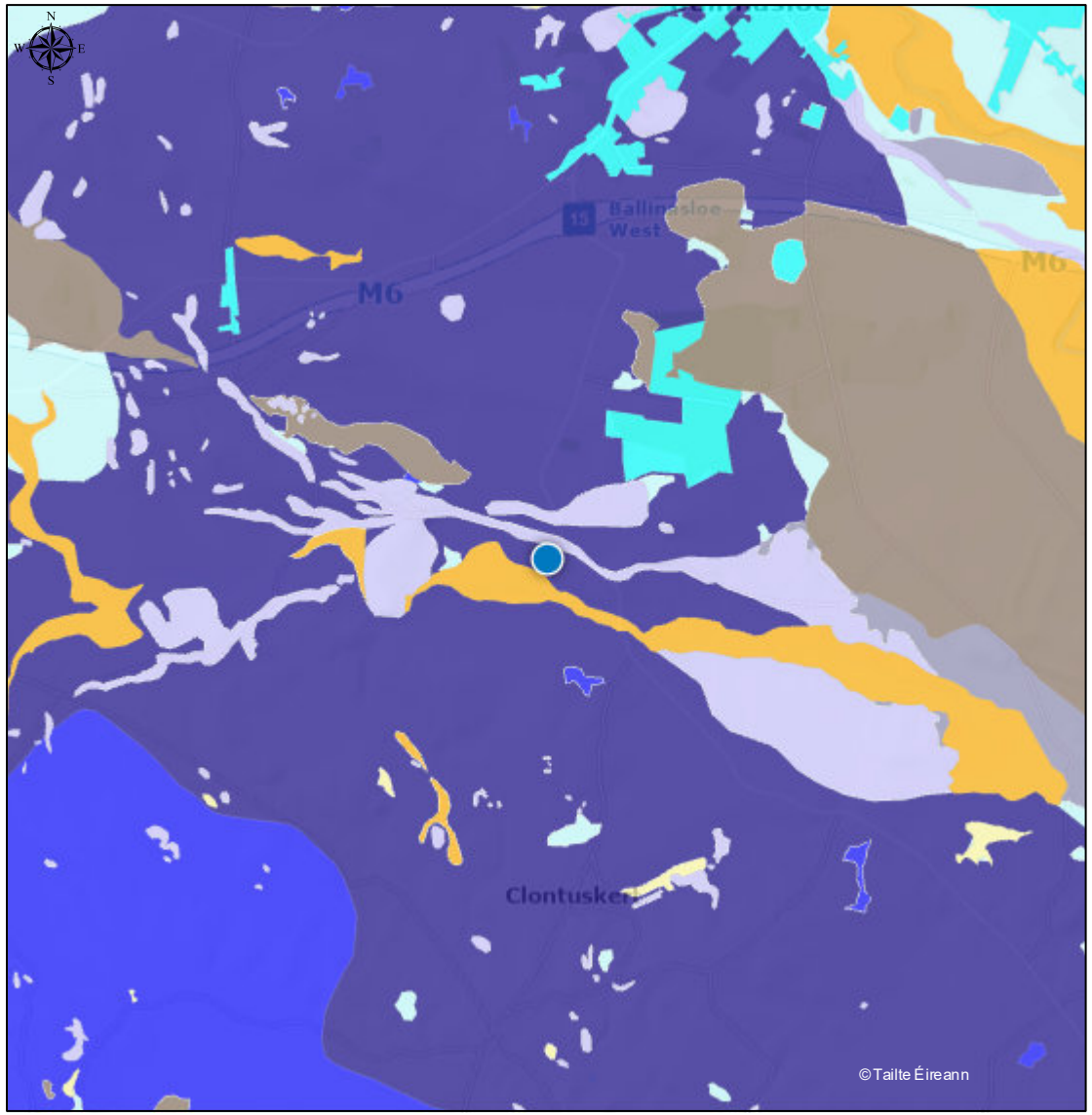
TEAGASC SOILS



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Legend

IE_GSI_TEAGASC_EPA...

- AminDW - Deep well drained mineral (Mainly acidic)
- AminPD - Mineral poorly drained (Mainly acidic)
- AminPDPT - Peaty poorly drained mineral (Mainly acidic)
- AminSW - Shallow well drained mineral (Mainly acidic)
- AminSP - Shallow poorly drained mineral (Mainly acidic)
- AminSPPT - Shallow peaty poorly drained mineral (Mainly acidic)
- AminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly acidic)
- BminDW - Deep well drained mineral (Mainly basic)
- BminPD - Mineral poorly drained (Mainly basic)
- BminPDPT - Peaty poorly drained mineral (Mainly basic)
- BminSW - Shallow well drained mineral (Mainly basic)
- BminSP - Shallow poorly drained mineral (Mainly basic)
- BminSPPT - Shallow peaty poorly drained mineral (Mainly basic)
- BminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly basic)
- BktPt - Blanket peat
- FenPt - Fen peat
- RsPt - Raised Peat
- Cut - Cutover/cutaway peat
- AlluvMIN - Alluvial (mineral)
- AlluvMRL - Alluvial (marl)
- Lac - Lacustrine type soils
- Scree - Scree
- AeoUND - Aeolian undifferentiated
- MarSands - Marine sand and gravel
- MarSed - Marine/estuarine sediments
- Made - Made ground
- Water - Water
- Unclass

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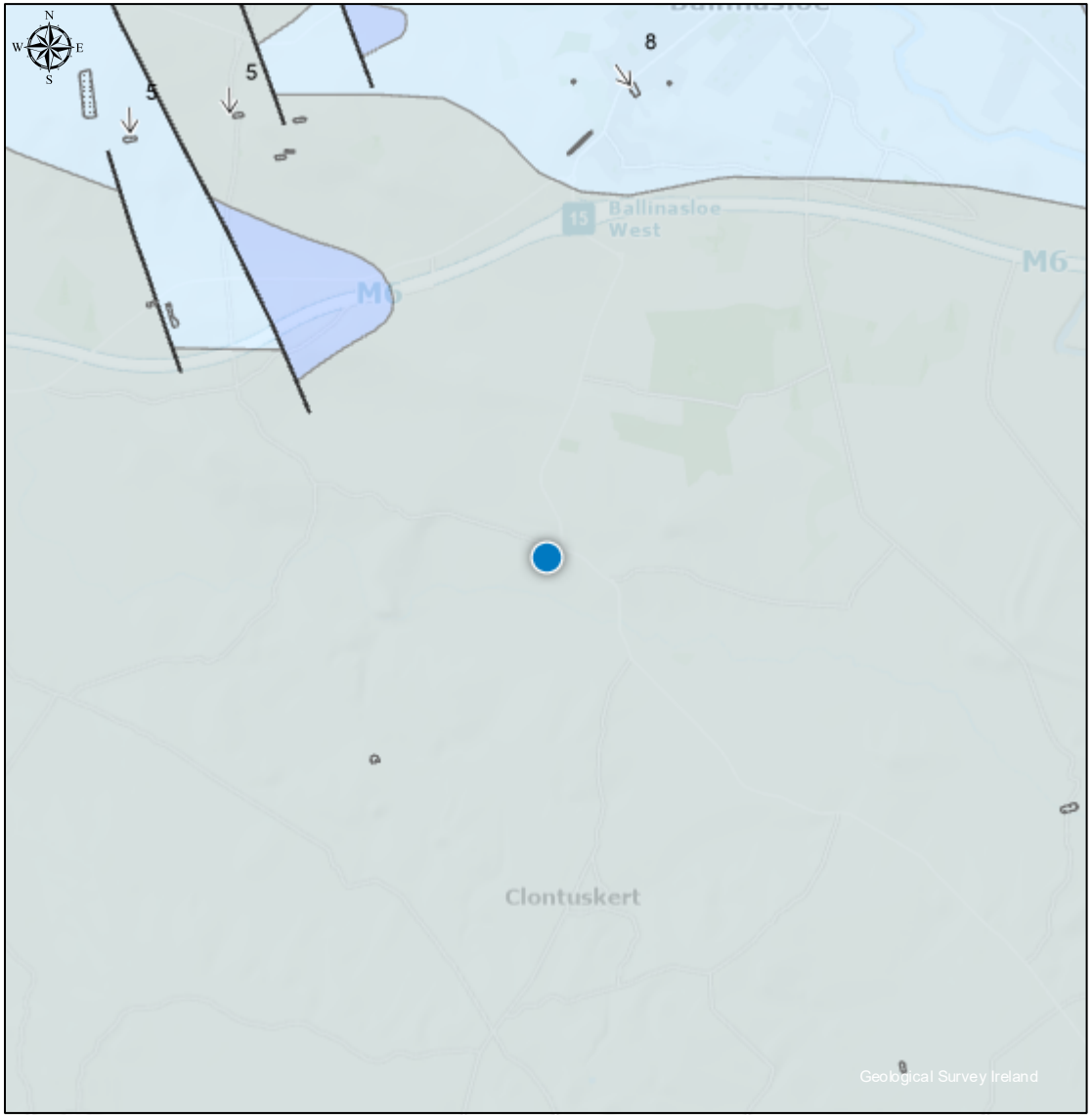
GEOLOGY BEDROCK



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Legend

IE_GSI_Structural_Sym...

- Dip of bedding or main foliation, old GSI data
- First foliation parallel to bedding
- Foliation trend, Thorr and Rosses Granites
- Horizontal Bedding
- Strike and dip of bedding, right way up
- Strike and dip of bedding, way up unknown
- Strike and dip of first foliation
- Strike and dip of overturned bedding
- Strike and dip of second foliation
- Strike and dip of third foliation
- Strike and plunge of first generation fold axis
- Strike and plunge of second generation fold axis
- Strike and plunge of third generation fold axis
- Strike of vertical bedding/foliation
- Strike of vertical first foliation
- Bedrock Outcrops

IE_GSI_Geological_Lin...

- Anticlinal Axis
- Antiformal axis
- Aquifer Boundary
- Area
- Coal seam
- Dyke
- Fault
- Ghost Line
- Goniatite marine band (R1-R4)
- Lithological boundary offshore
- Metadolerite sheet, mainly sills
- Paleogene/ Tertiary Dyke
- Synclinal Axis
- Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

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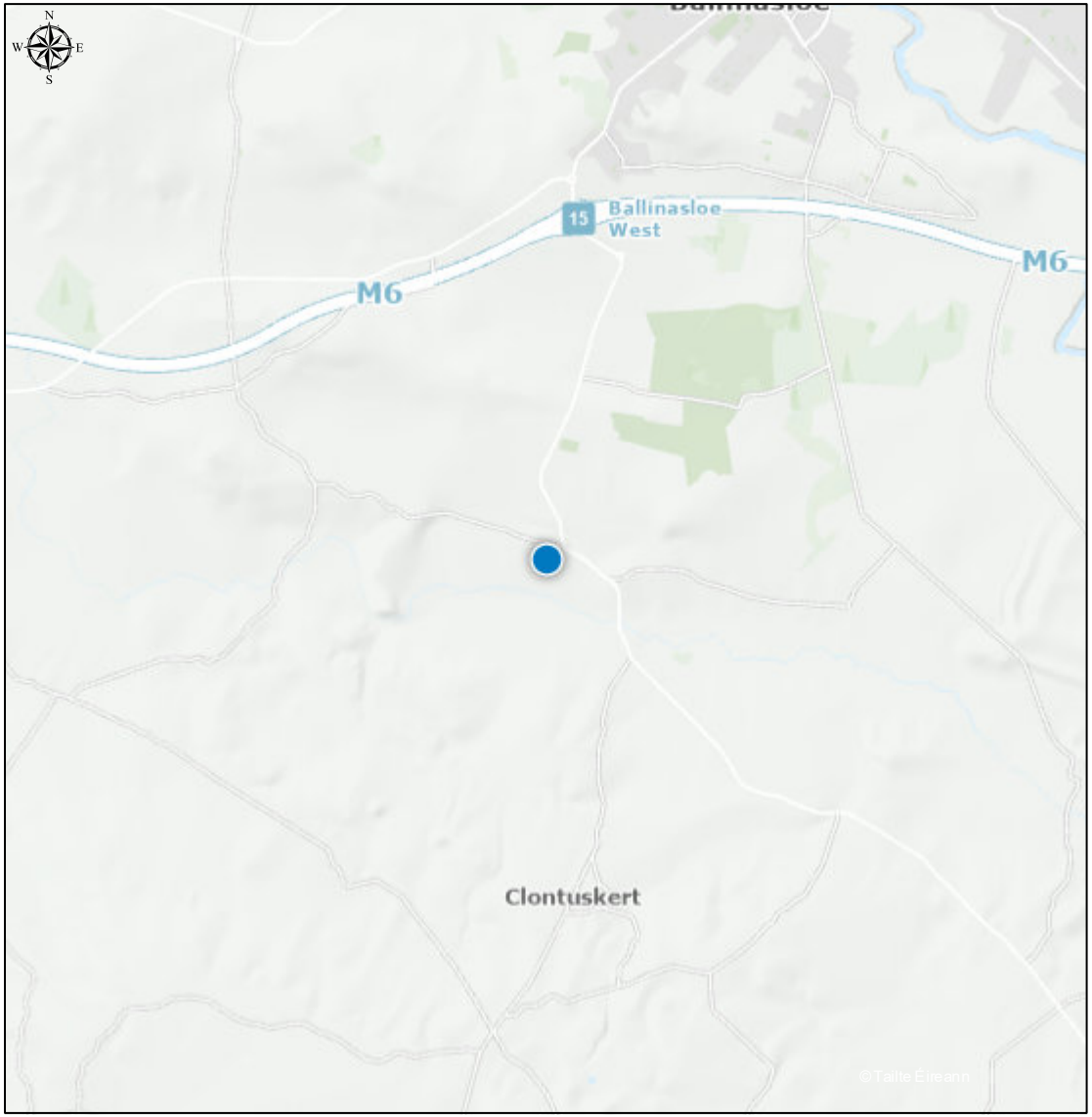
GROUNDWATER KARST FEATURES



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Legend

RECEIVED: 18/11/2025

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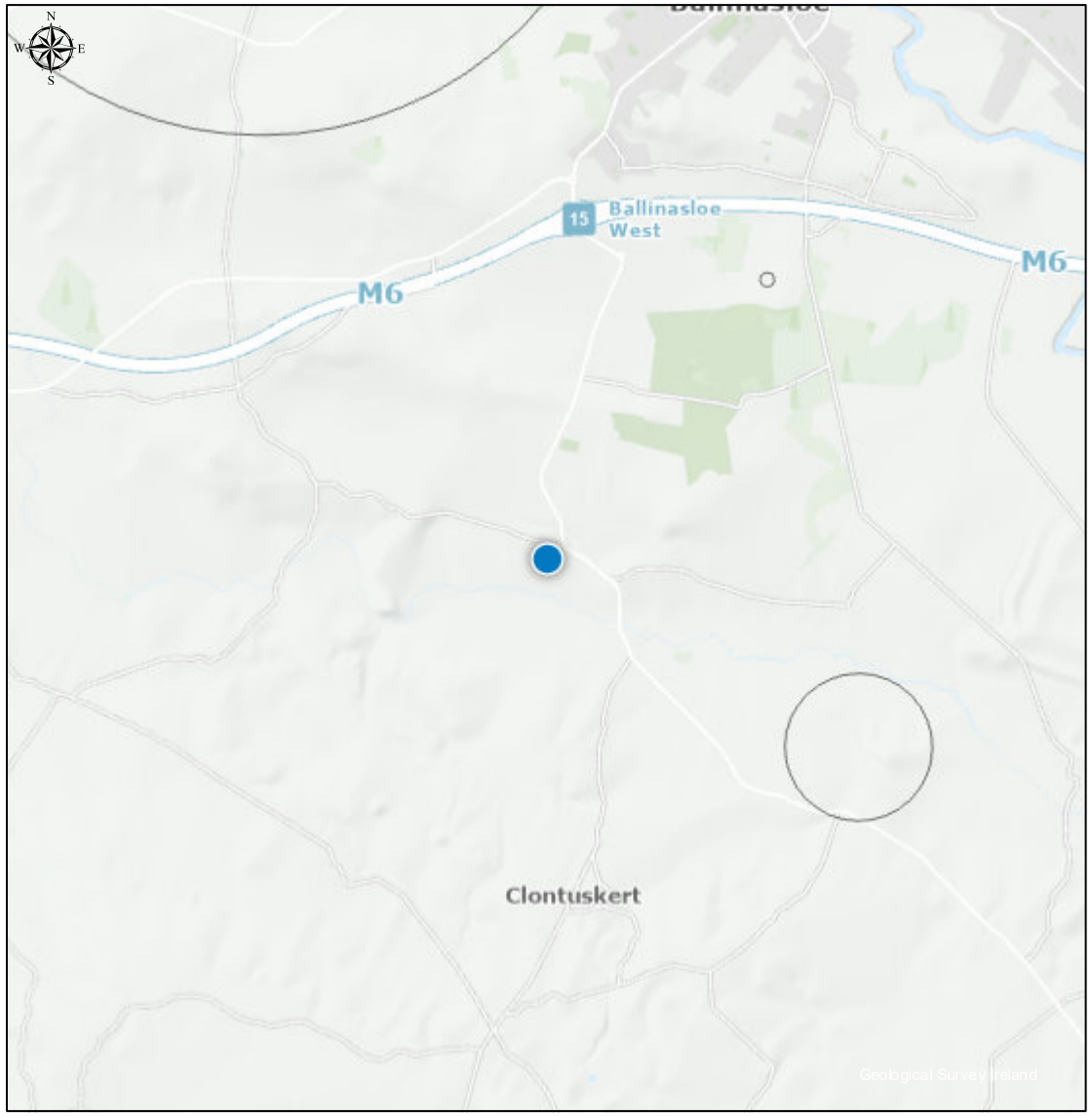
GROUNDWATER WELLS AND SPRINGS



Legend

Groundwater Wells and Springs - circle size is location accuracy

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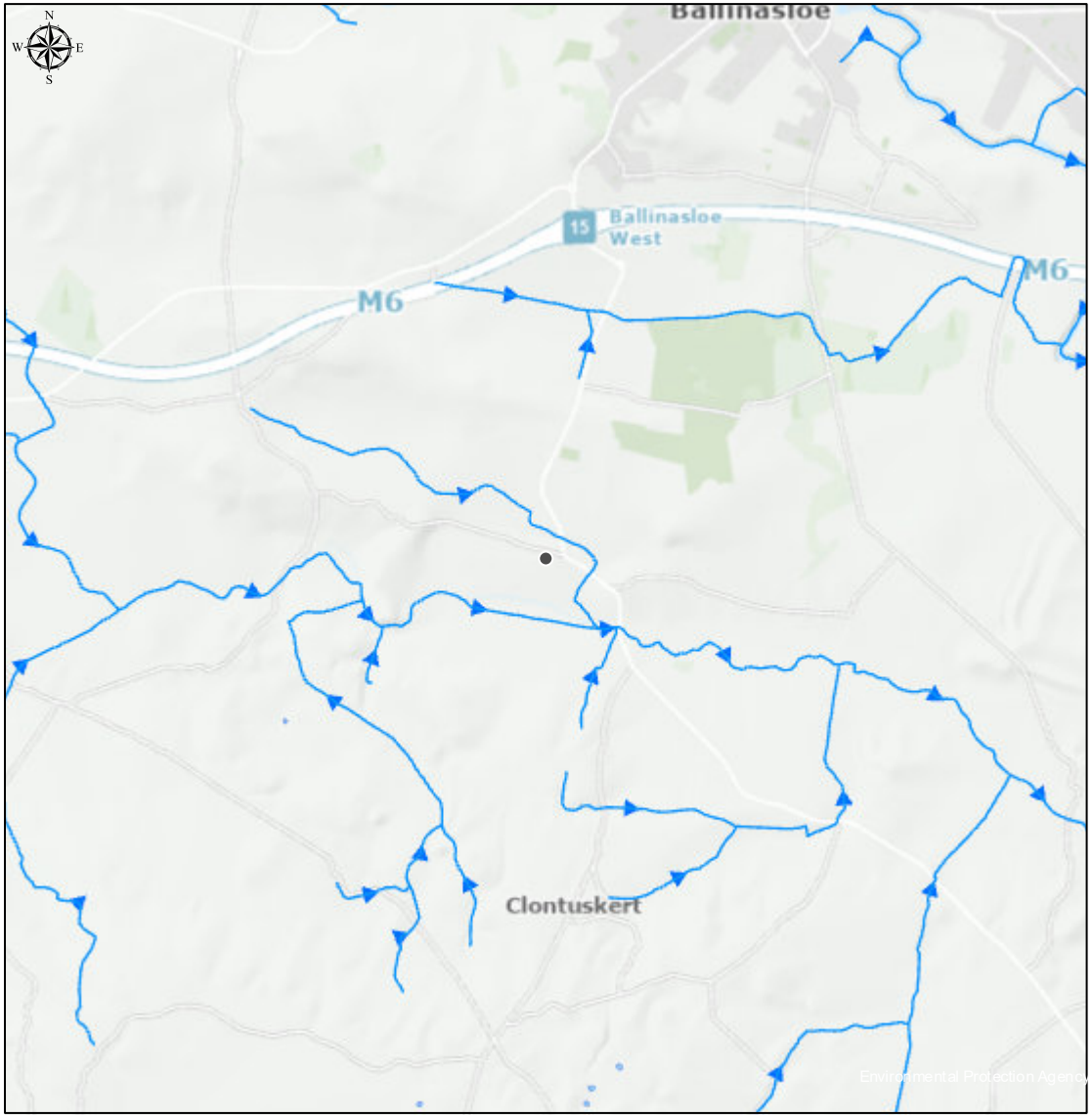
SURFACE WATER FEATURES



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Legend

- River and River Flow Direction Arrow
- Lake

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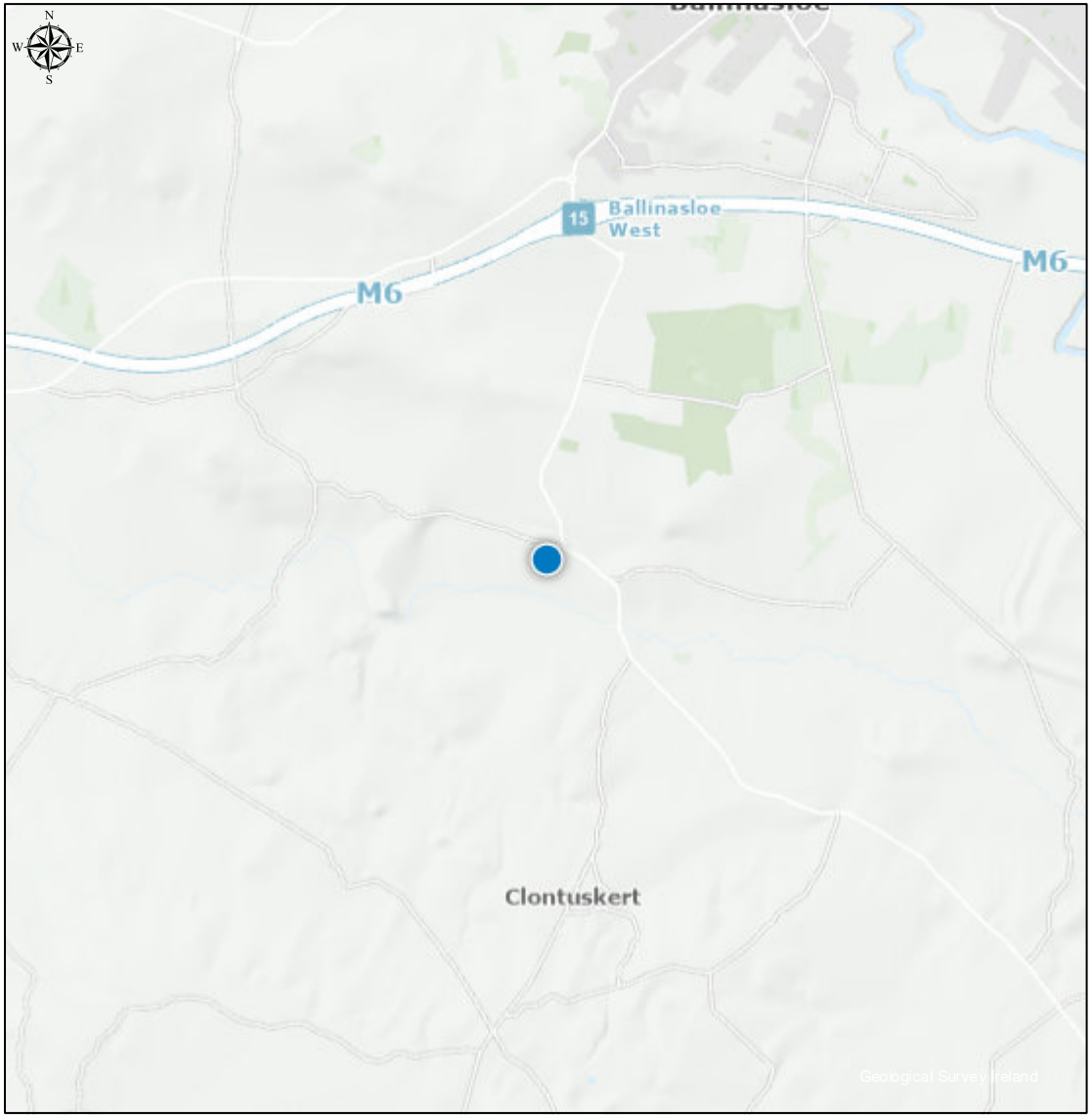
GROUNDWATER DRINKING WATER PROTECTION AREAS



Legend

IE_GSI_Public_Water_S...

- SI-Inner Protection Area
- SO-Outer Protection Area
- Group Water Scheme Preliminary Source Protection Areas Zones of Contribution

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Snapshot Date: July 14, 2025

Appendix 3

Site Layout & Cross Section of Proposed Site, Illustration of Water Table, Existing & Proposed Ground Levels

Sheet Title:-

Site Layout

Client:- Cycle O	Project No:25-173	Drg No:-01
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:1000 @ A4	Rev:-
	Drawn by:- P.M.	Date:-19/09/2025

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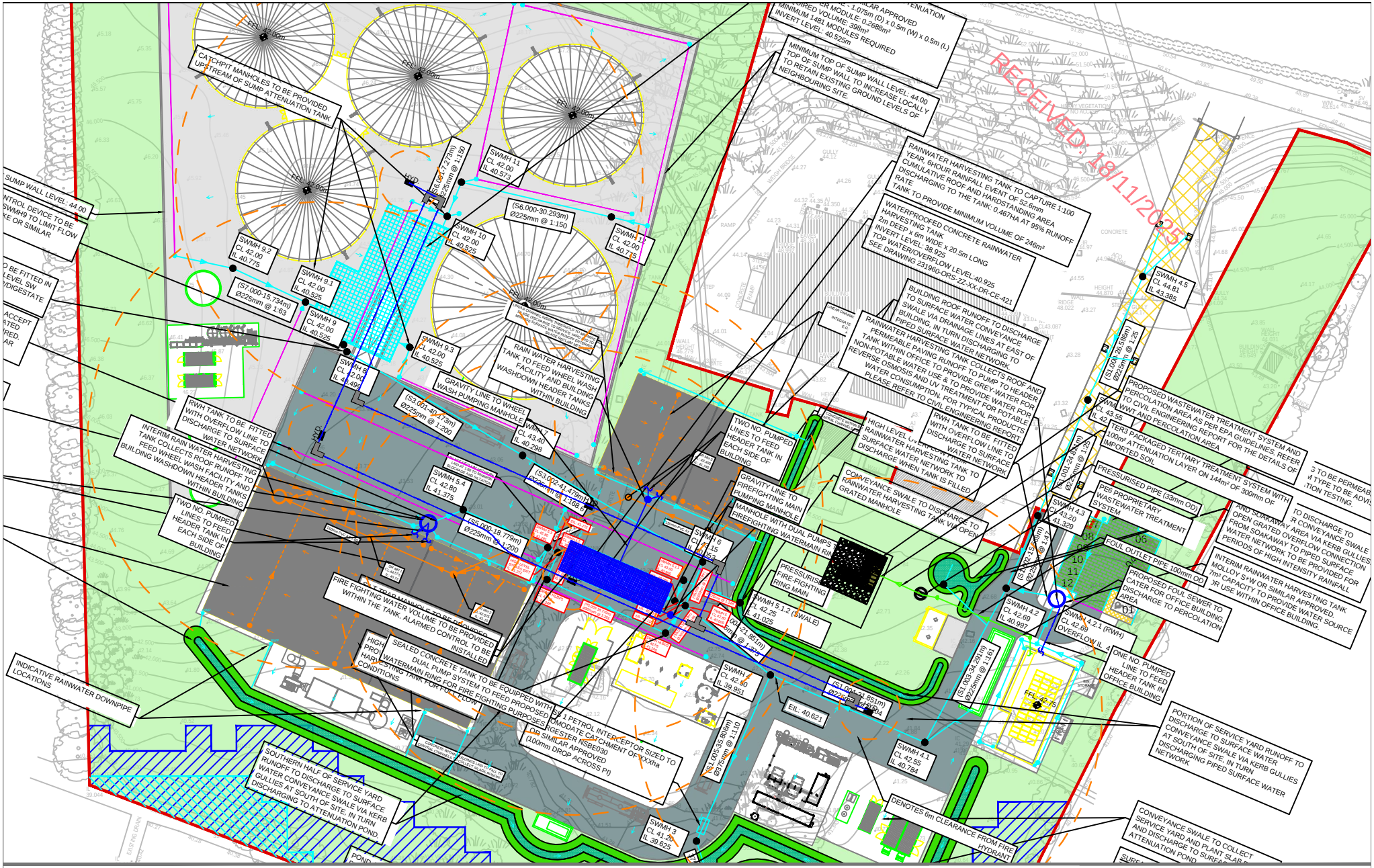

Sheet Title:-

Site Layout

Client:- Cycle O	Project No:25-173	Drg No:-02
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:1000 @ A4	Rev:-
	Drawn by:- P.M.	Date:-19/09/2025

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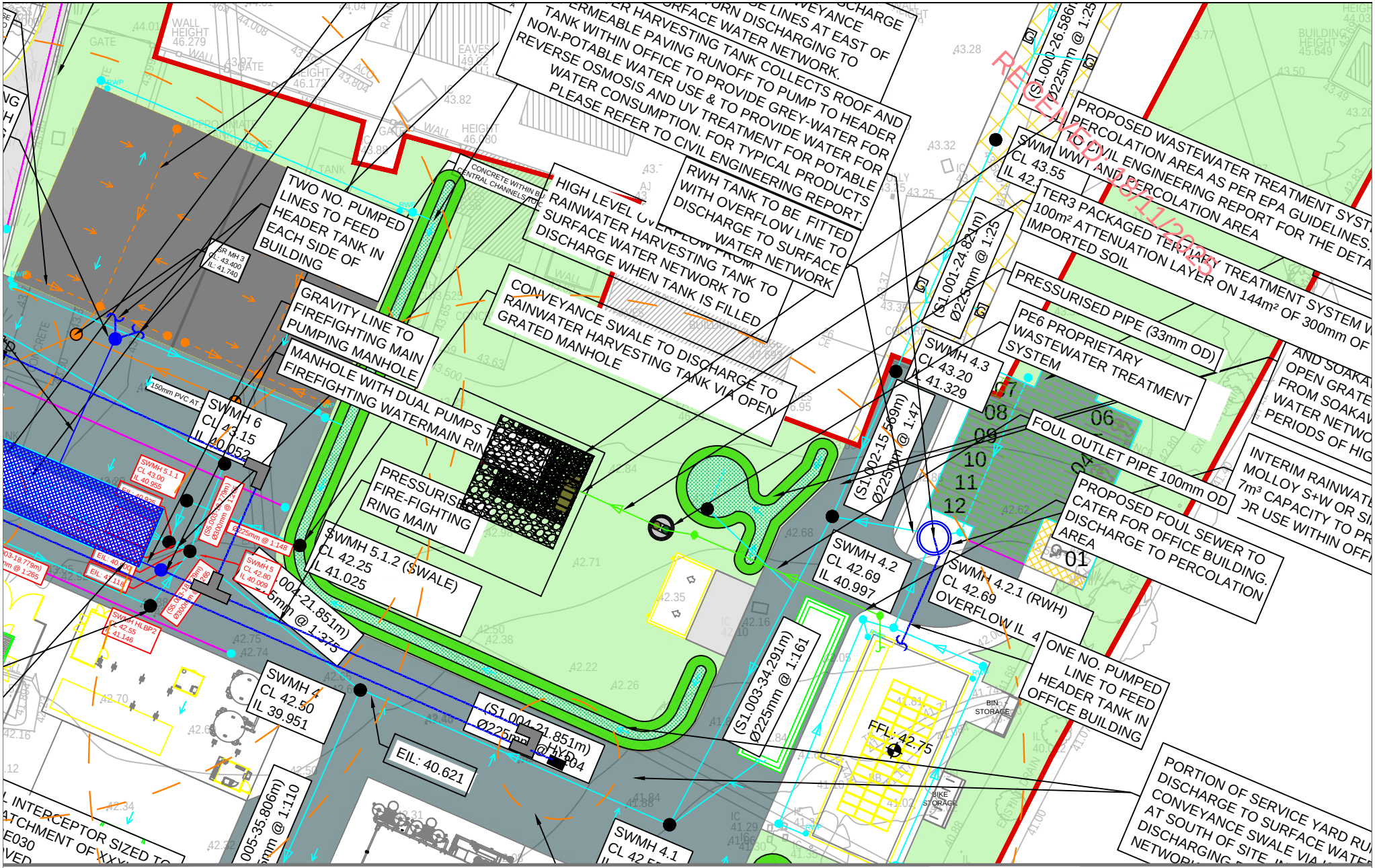

Sheet Title:-

Site Layout

Client:- Cycle O	Project No:25-173	Drg No:-03
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:500 @ A4	Rev:-
	Drawn by:- P.M.	Date:-19/09/2025

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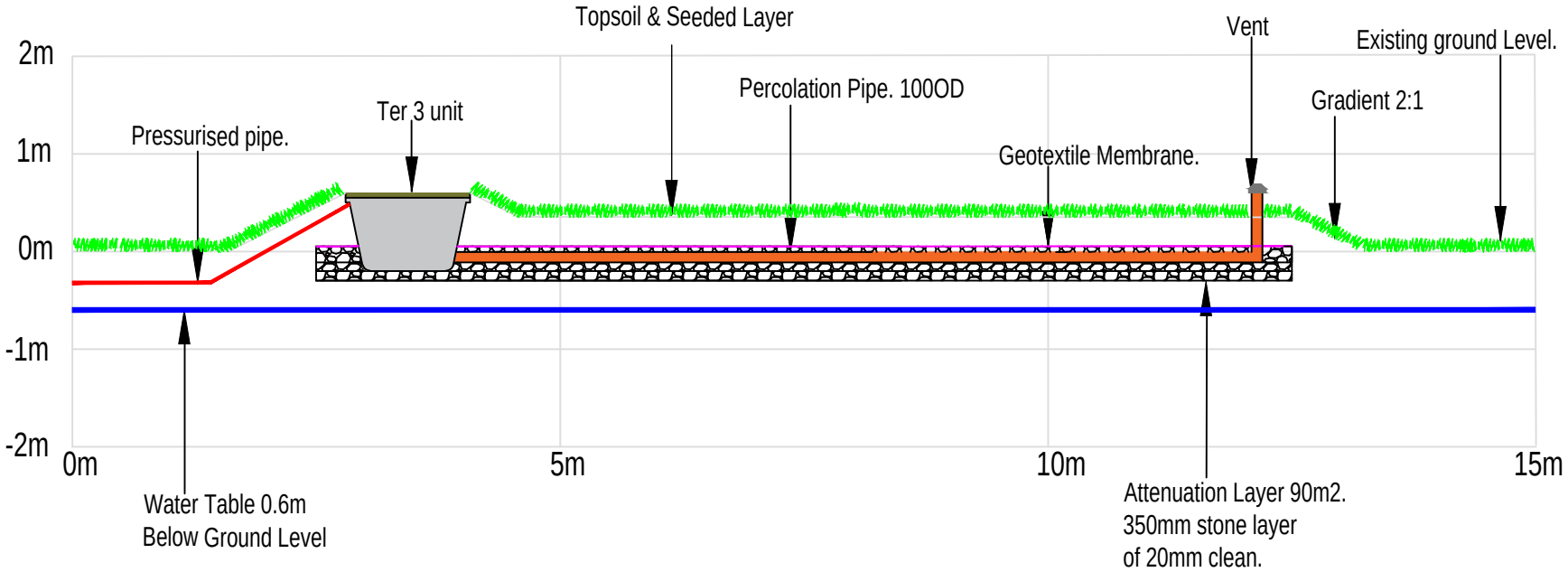

Sheet Title:-

Cross Section

Client:- Cycle O	Project No:25-173	Drg No:-04
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:70 @ A4	Rev:-
	Drawn by:- P.M.	Date:-19/09/2025

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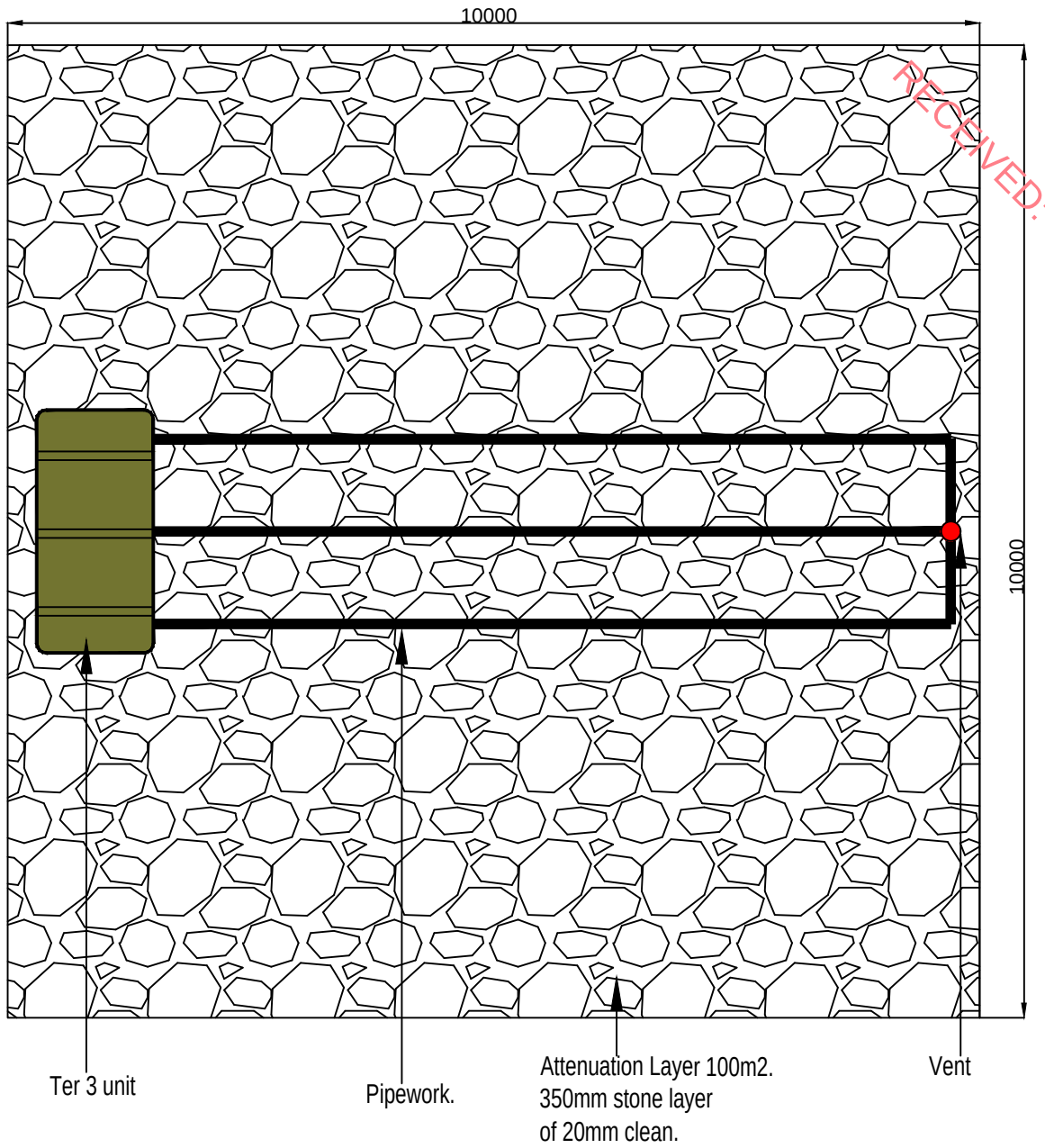

Sheet Title:-

TER3 Layout

Client:- Cycle O	Project No:25-173	Drg No:-05
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:70 @ A4	Rev:-
	Drawn by:- P.M.	Date:-19/09/2025

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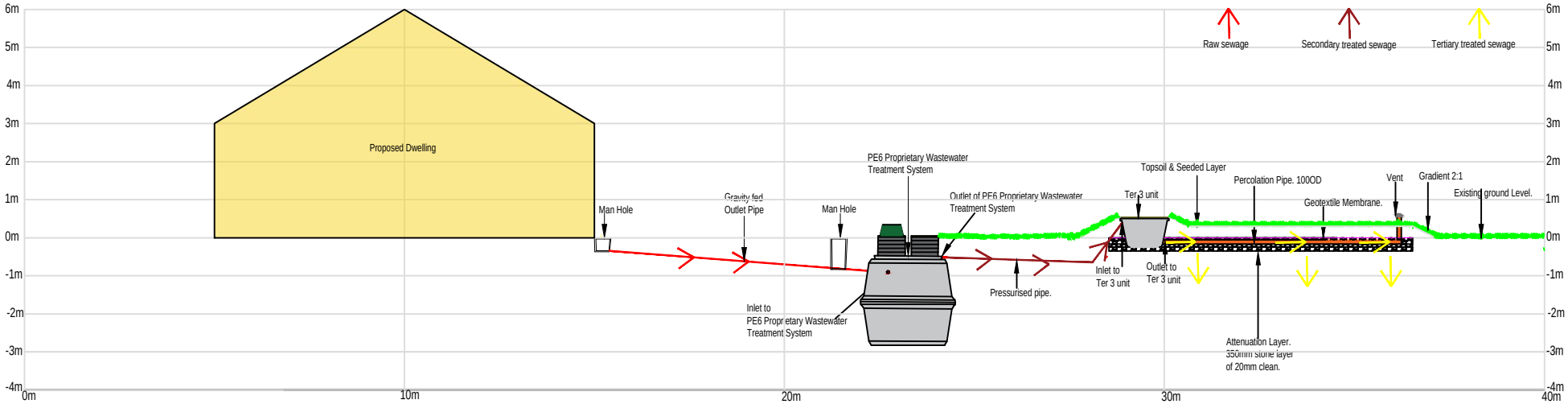

Sheet Title:-

Long Cross Section Example

Not Site Specific

Client:- Cycle O	Project No:25-173	Drg No:-06	
Project Description:- Proposed new wastewater treatment system and Ter 3 Packaged Tertiary Unit at Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.	Scale: 1:160 @ A4	Rev:-	
	Drawn by:- P.M.	Date:-19/09/2025	

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Appendix 4

Manufacturer Site Report

SEWAGE SYSTEMS

SITE SPECIFIC REPORT

Cycle 0.

Kellysgrove, Clontuskert,
Ballinasloe, Co. Galway.

Email: info@sewagesystems.ie
Web: www.sewagesystems.ie

Annie: 087 2807724
Peter: 087 9859681

Date: 30/07/2025

Client Name: Cycle 0

Site Location: Kellysgrove, Clontuskert, Ballinasloe, Co. Galway.

DESIGN CAPACITY

The proposed development will have a maximum design population of 4. no persons for Hydraulic and 7 for organic loading as per EPA Wastewater Treatment Manuals for Small Communities, Business, Leisure Centres and Hotels.

LOADING DATA CALCULATOR BASED ON EPA GUIDELINES					
	Per person per day			Totals	
Sources of Effluent	Hydraulic Loading (litres)	Organic Loading (grams)	Relevant number of users	Hydraulic Loading litres/day	Organic Loading grams BOD/day
Industrial					
Office/factory without canteen	30	20	15	450	300
Toilet blocks - per use	10	10	10	100	100
			Sub total	550	400
Population equivalent (higher reading aplies)			Totals	4	7

SITE RELEVANT PARAMETERS

A review of the Site Characterisation Assessment carried out on this site provided the following data.

T-Value (Subsurface)	55.67
P-Value (Surface)	N/A
Depth from ground to Water Table	1.5
Depth from ground to Bedrock	N/A
Groundwater Protection Response	R1
Minimum Infiltration Area (m2)	See SCA Report

PROPOSED SYSTEM DETAILS

Based on the information provided to us in the Site Characterisation Assessment for your site and the requirements of the 2021 EPA Code of Practice, the most suitable system for sewage treatment and percolation on your site is the 6PE EuroTank BAF2 Wastewater Treatment System followed by the 6PE EuroTank TER3 Percolation Unit.

SEWAGE SYSTEMS

EUROTANK BAF2 WASTEWATER TREATMENT SYSTEM

The EuroTank BAF2 is a concrete wastewater treatment system and is certified by EN12566/3 & NSAI SR66 as listed on www.pia-gmph.com (Irish Certificates). The system uses Moving Bed Technology in a 3 stage Biological Aeration Filtration process.

Chamber 1: Primary settlement chamber, receives raw sewage and wastewater & settles solids.

Chamber 2: Reactor, biological treatment with the use of aeration and high spec fluidised media.

Chamber 3: Clarifier, any remaining solids are allowed to settle and are returned to the primary chamber to aid the activated sludge process.

The final Effluent leaves Chamber 3 via gravity or a float switch pump.

Appendix 1 : EuroTank BAF2 Specification Brochure, PIA Certification and Drawings

EUROTANK TER3 PERCOLATION UNIT

The EuroTank TER3 is a concrete packaged tertiary treatment system which further treats effluent from a secondary treatment system. It is certified by EN12566/3 & NSAI SR66 as listed on www.pia-gmph.com (Irish Certificates).

Effluent from the EuroTank BAF2 is pumped via a network of pipes over the surface of the TER3 percolation unit. It then trickles down through the various layers in the TER3 where it receives biological treatment before final discharge to the ground via a network of percolation pipes which sit on a layer of distribution stone. The TER3 will be either a slightly raised small bed or finished at ground level, depending on the results of the percolation test.

Appendix 2: EuroTank TER3 Specification Brochure, PIA Certification and Drawings

CLIENT RESPONSIBILITIES

- Any necessary excavation or backfilling on site.
- Provision of a solid, unimpeded access for a crane lorry to drop the BAF2 Wastewater.
- Treatment System into the excavated hole.
- Provision of power supply and connection to the BAF2 Wastewater Treatment System.
- Provision of a 12T machine or similar to lift TER onto the stone bed if required.
- Provision of 30m2, 60m2 or 90m2 stone bed, as per Percolation Test Report.

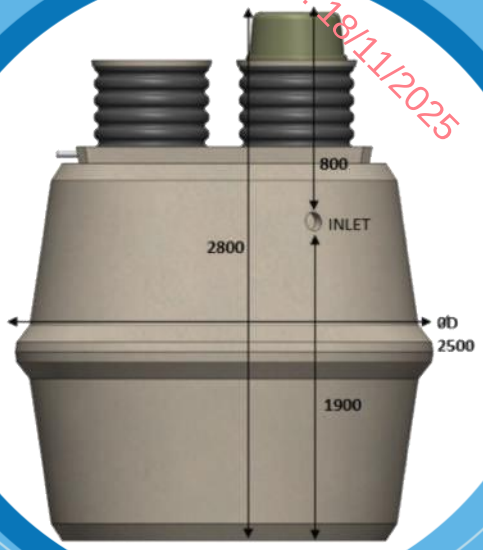
SEWAGE SYSTEMS

Appendix 1

SEWAGE SYSTEMS

EuroTank

BAF2 Secondary Wastewater Treatment System



Description:

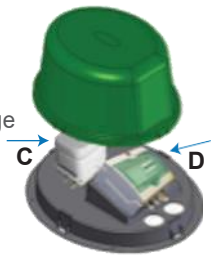
Eurotank BAF2 is a very strong Concrete, Economical, Efficient, Wastewater / Sewage Treatment System for use in domestic housing and commercial applications.

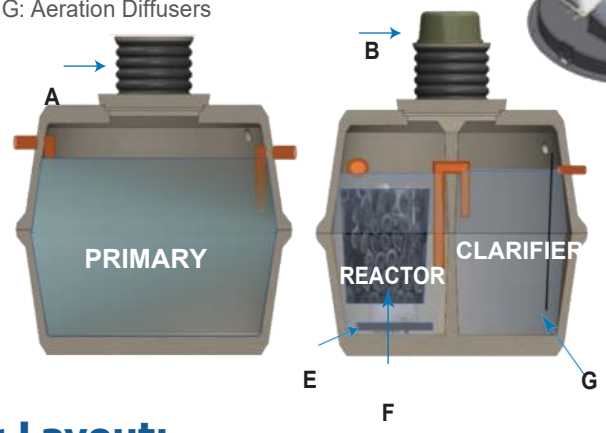
The system is EN12566/3 & NSAI SR66 Certified as listed on www.pia-gmph.com (Irish Certificates). Eurotank BAF uses Moving Bed Technology in a 3 stage Biological Aeration Filtration process as a very simple method of treatment with great effluent quality. The range comprises various tank sizes, comes fully built and delivered with a lot of installation advantages.

Full after-sales nationwide service.

Population Equivalent PE	6 TO 50 Tank configurations for 6, 12, 25, 50 and up to 300
Certification	By Pia Gmbh To En12566/3 SR66 as listed for Irish use. (ATTACHED)
Effluent Quality	BOD5 - 11 mg/lt <20mg/l required SS - 12mg/lt <30mg/l required NH4-N – 6.2 mg/lt <20mg/l required Exceeding Irish Requirement
Electrical Consumption -Cable -Protection	1kwH/D 2.5mm2 x 3 core SWA (up to 100m run) RCD 16 amp,230v ,30ma ,Bs 4293 standard
Alarm	Audible for Pump Failure
Outlet	Gravity or Pumped

A: Pvc Risers, sealed no leaks, ground adjustable
B: Enclosure, Aesthetic control unit housing
C: ECO Blower unit
D: Control unit with built in Mcb`s & alarm
E: Sludge return, solids removal & activated sludge
F: Media Bed
G: Aeration Diffusers





Internal Treatment Process & Chamber Layout:

The Process has 3 Functions Housed in 3 Chambers

Chamber 1 – Primary settlement chamber, receives raw Sewage and Wastewater & settle solids.
Chamber 2 – Reactor, Biological treatment with use of aeration and high spec Fluidised Media
Chamber 3 – Clarifier, any remaining soilds are allowed settle and are returned to primary chamber to aid activated sludge process.
Final Effluent leaves chamber 3 Via gravity or float switched pump.

Email: info@sewagesystems.ie
Web: www.sewagesystems.ie

Annie: 087 2807724
Peter: 087 9859681

SEWAGE SYSTEMS

Appendix 1

Certification En12566/3 SR66

TREATMENT PERFORMANCE RESULTS

TPW Systems Ltd
Ballyheige, Screen, Co. Wexford, Ireland

EN 12566-3
Results corresponding to EN 12566-3 and S.R. 66

PIA2020-SR66-2007-1023.02

EUROTANK BAF2 (range with 5 models)
Biological aerated filter

Nominal organic daily load	0.29 kg/d		
Nominal hydraulic daily load	0.9 m³/d		
Material	Concrete		
Watertightness	Pass		
Structural behaviour (Crushing resistance)	Pass (also wet conditions)		
Durability	Pass		
Treatment efficiency (nominal sequences)		Efficiency	Effluent
	COD	92.9 %	59 mg/l
	BOD_5	96.4 %	11 mg/l
	NH_4-N	84.3 %	6.2 mg/l
	SS	96.9 %	12 mg/l
Number of desludging	Not more than once		
Electrical consumption	1.10 kWh/d		

Performance tested by:

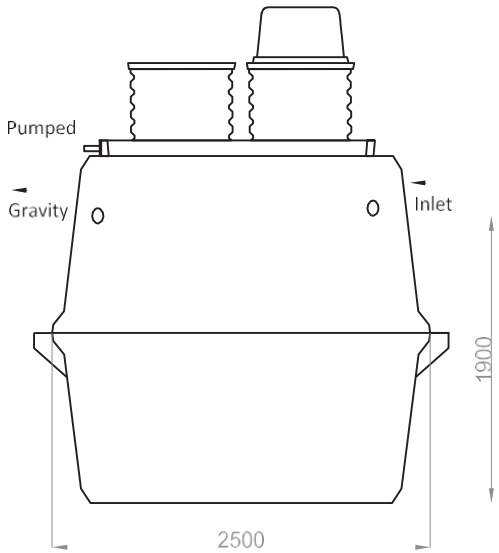
PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

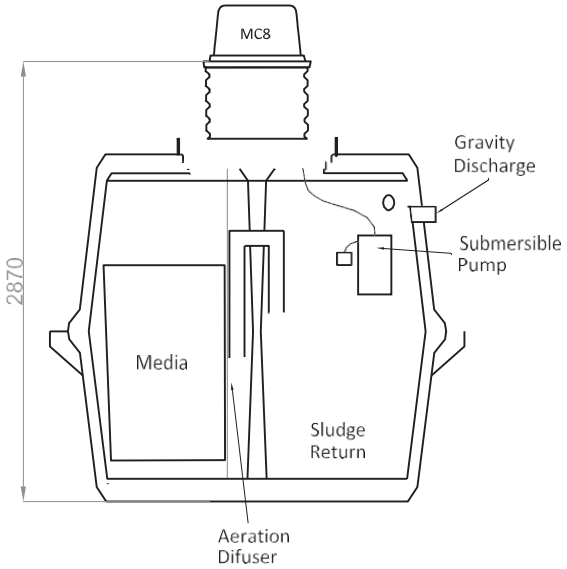
This document replaces neither the declaration of performance nor the CE marking.

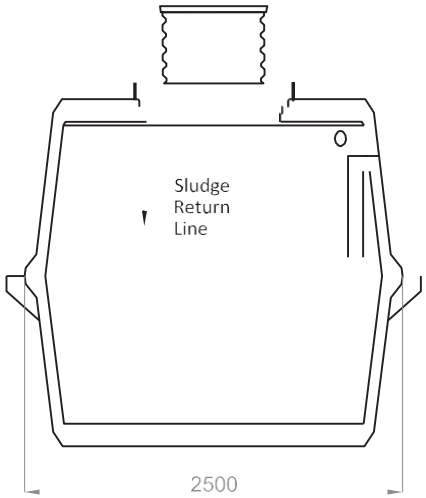
PIA - Sustainable Certification
geprüft - tested - testé

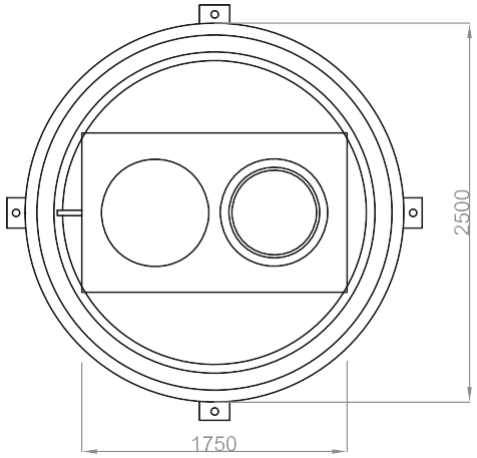
Notified Body No.: 1739
Certified according to ISO 9001:2015

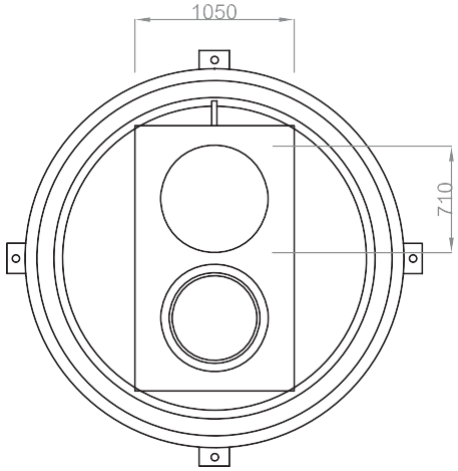
Verschitz / Wermter February 2021

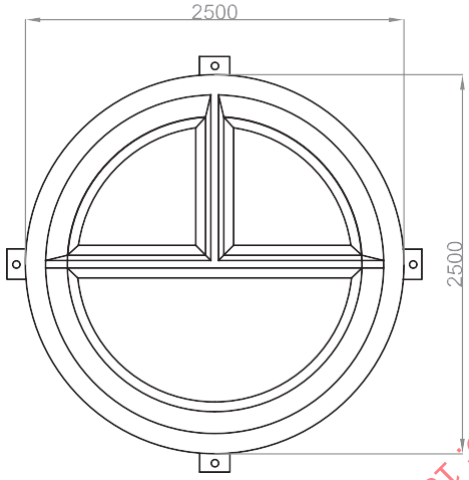












6M3 BAF2

Notes: Do not Scale off this Drawing

Notes: All Dimensions are given in good faith and believed to be correct
No responsibility can be taken for any errors found by measuring of this drawing

RECEIVED: 18/11/2025

SEWAGE SYSTEMS	Scale: 1:50@ A4	Date: 18/11/2021	www.Sewagesystems.ie
			Phone : 087 9859681
	Eurotank BAF2		
	1st & 2nd Floor, Kilmurry House, Main Street, Castlerea, Co Roscommon, F45 DK58		EuroTank

Appendix 2

SEWAGE SYSTEMS

EuroTank

TER3

Packaged Tertiary Percolation Unit

Description:

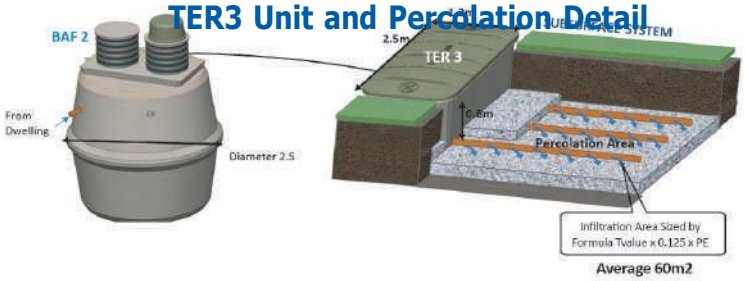
EuroTank TER3, is a CONCRETE Packaged Tertiary Treatment System which further treats effluent from a secondary treatment system. It is fully PIA Certified and compliant with the EPA Code of Practice 2021. It is ideal for most sites including difficult sites with poor soakage and a high water table, sites in Environmentally Sensitive Areas and is especially suited to small sites due to its small footprint and low profile.

Raw sewage from the dwelling enters a wastewater treatment system where it is partially treated. Effluent then leaves this system and is pumped via a network of pipes over the surface of the TER3. It then trickles down through the various layers in the TER3 where it receives biological treatment before finaldischarge to the ground via a network of percolation pipes whichsit on a layer of distribution stone.

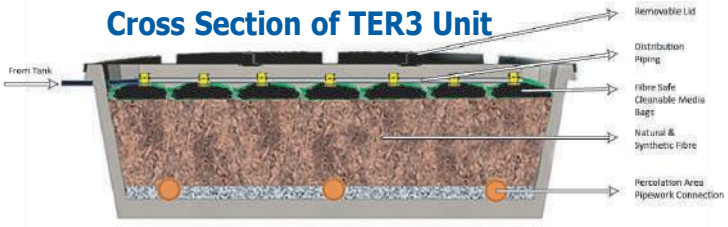
The TER3 will be either a slightly raised small bed or finished at ground level, depending on the results of the percolation test. **EuroTank TER3 is a Cost effective, Easily Installed, Low Profile and Efficient method of complete on-site wastewater treatment and disposal.**

Population Equivalent PE	6 to 50 with configurations for 6, 9, 12,18, 24, 36, 43, 50.
Effluent Quality *(Far Exceeding Irish Minimum Standards)*	Bod 2mg/l Suspended Solids 4mg/l NH4N 0.3mg/l Phosphates < 6mg/l Ecoli and Total Coliform Removal >99%
Concrete	45n reinforced
Certification	By PIA GMBH Under EN12566/3 To Irish NSAI SR66 Standard

TER3 Unit and Percolation Detail



Cross Section of TER3 Unit



Key Features:

- High Effluent Quality, with superior reduction in BOD,COD, Suspended solids, Nutrients, and Pathogens. (Best on the Irish Market!)
- Suitable for many sites including small restricted existing sites.
- Concrete unit.
- Fibre safe pre-clean system, in cleanable bags that can be shaken or washed.
- Very easy to maintain.
- Includes percolation pipe connections.

Operation Principles:

Secondary treated water from the tank is pumped and distributed via a pipe network with orifice shielding.

Water is distributed evenly over the Fibre safe Bags which remove any residual solids and in particular greases which ensure long life use of the natural and synthetic mixfibre Media.

The waters then trickle through the fibre to receive final treatment and polishing before entering the percolation pipework over a bed of stone for distribution and final discharge to underlying soils.

Email: info@sewagesystems.ie
Web: www.sewagesystems.ie

SEWAGE SYSTEMS

Annie: 087 2807724
Peter: 087 9859681

TREATMENT PERFORMANCE RESULTS

TPW Systems Ltd
Ballyheige, Screen, Co. Wexford, Ireland

EN 12566-3
Results corresponding to EN 12566-3 and S.R. 66

PIA2020-SR66-2007-1024

EUROTANK BAF2 + TER3 (range with 7 models)
Biological aerated filter + packaged tertiary treatment mod

Nominal organic daily load	0.29 kg/d
Nominal hydraulic daily load	0.9 m³/d
Material	Concrete
Watertightness	Pass
Structural behaviour (Crushing resistance)	Pass (also wet conditions)
Durability	Pass

Treatment efficiency (nominal sequences)

	Efficiency	Effluent
COD	96.6 %	28 mg/l
BOD_5	99.3 %	2 mg/l
NH_4-N	99.3 %	0.3 mg/l
SS	98.8 %	4 mg/l

Number of desludging	Not more than once
Electrical consumption	1.16 kWh/d

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

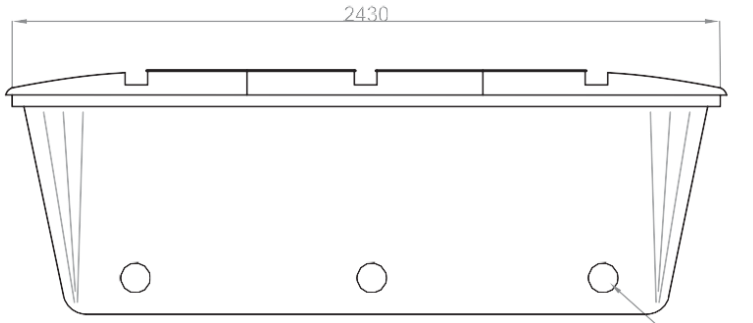
This document replaces neither the declaration of performance nor the CE marking.

PIA - Sustainable Certification
J. Verschitz
M. Wermter
geprüft - tested - testé

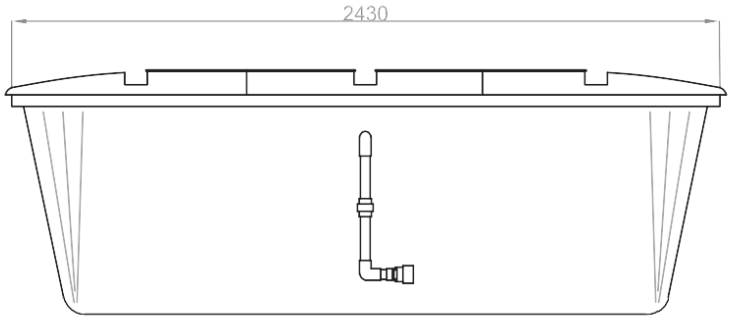
Verschitz / Wermter July 2020

Notified Body No.: 1739

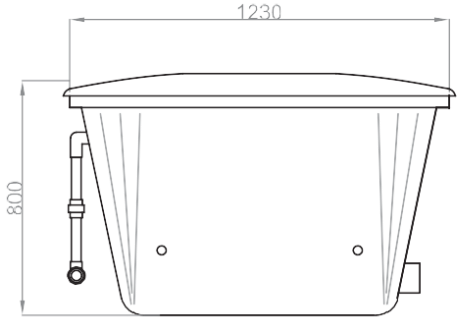
Certified according to ISO 9001:2015



Front Elevation

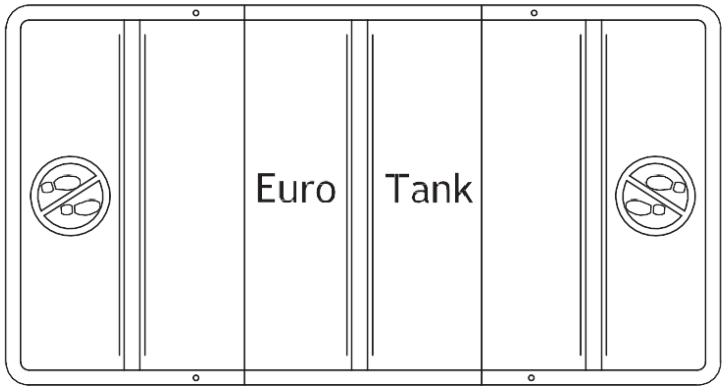


Back Elevation

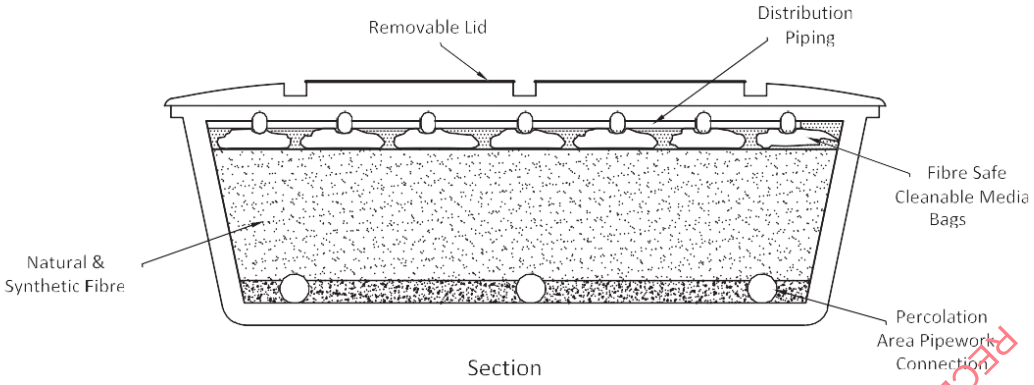


Side Elevation

TER3



Plan



Section

Notes: Do not Scale off this Drawing

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Scale: 1:25@ A4	Date: 18/11/2021	www.Sewagesystems.ie
		Phone : 087 9859681

TER 3 Percolation Unit 6PE

1st & 2nd Floor, Kilmurry House, Main Street, Castlerea, Co Roscommon, F45 DK58

EuroTank

Appendix 5

Specific Purpose Certificate

QQI AWARD

Dámhachtain Breisoideachais agus Oiliúna
Further Education and Training Award

TEASTAS CUSPÓRA SHAINIÚIL LEIBHÉAL 6
LEVEL 6 SPECIFIC PURPOSE CERTIFICATE

i
in

Oiriúnacht Suíomh Láithreáin i gcomhair Cóireáil Fuoílluisce
Site Suitability for Wastewater Treatment

le Tuillteanas
with Merit

Bronnta ar
Awarded to

PATRICK MANNION

ar
on

14 Feabhra 2021
14 February 2021

Príomhfheidhmeannach
Chief Executive QQI

6S2241
F1714793
38906N

Bronnta ag Dearbhú Cáilíochta agus Cáiliochtaí Éireann faoi Chuid 4 den Acht um Cháilíochtaí agus Dearbhú Cáilíochta (Oideachas agus Oiliúint) 2012
Awarded by Quality and Qualifications Ireland under Part 4 of the Qualifications and Quality Assurance (Education and Training) Act 2012

FET Creidiúntí/Credits 10
NFQ Leibhéal/Level 6
EQF Leibhéal/Level 5

www.QQI.ie

Appendix 6

Coyle Environmental Professional Indemnity Insurance

To Whom It May Concern

Re: Our Client: **Coyle Environmental Limited, 1st & 2nd Floor, Kilmurray House, Main Street, Castlerea, Co Roscommon**

We act as insurance broker on behalf of our above-named client and we have pleasure in confirming their Combined Liability and Professional Indemnity, details as follows: -

INSURED:	**Coyle Environmental Limited**
BUSINESS DESCRIPTION:	**Environmental Monitoring & Consulting**
COMBINED LIABILITY INSURANCE	
INSURERS:	**Hiscox SA**
POLICY NO.:	**HU PI6 8524721**
EFFECTIVE DATES:	**07/07/2024 - 06/07/2025**
EMPLOYERS LIABILITY	
Limit of Indemnity:	**€13 million each and every accident, unlimited any one period.**
PUBLIC LIABILITY	
Limit of Indemnity:	**€6.5 million each and every accident, unlimited any one period and in all in respect of Products Liability.**
PROFESSIONAL INDEMNITY	
INSURERS:	**Aspen 5383 Lloyds Brussels via DUAL Insurance**
POLICY NO.:	**PI/C/12420/21/1**
EFFECTIVE DATES:	**09/12/2024 – 08/12/2025**
LIMIT IF INDEMNITY:	**€1,500,000 any one claim**

This document is for information purposes only. Please refer to the policy document and schedule issued by your Insurer for the policy terms conditions endorsements exceptions and exclusions.

Yours sincerely,

Nigel Quigley

Nigel Quigley | Commercial Account Executive
Campion Insurance