6.0 HYDROLOGY

6.1 INTRODUCTION

This chapter assesses and evaluates the potential impacts of the proposed development on the hydrological aspects of the site and surrounding area. In assessing likely potential and predicted effects, account is taken of both the importance of the attributes and the predicted scale and duration of the likely effects.

6.2 METHODOLOGY

6.2.1 Criteria for rating of effects

This chapter evaluates the effects, if any, which the proposed development will have on Hydrology as defined in the Environmental Protection Agency (EPA) 'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2017). The Draft EPA document entitled '*Advice Notes for Preparing Environmental Impact Statements*' (EPA, 2015) is also followed in this hydrological assessment and classification of environmental effects. In addition, the document entitled '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*' by the National Roads Authority' (NRA, 2009) is referenced where the methodology for assessment of impact is appropriate.

The rating of potential environmental effects on the hydrological environment is based on the standard EIAR impact predictions table included in Chapter 1 which takes account of the quality, significance, duration and type of effect characteristic identified (in accordance with impact assessment criteria provided in the Draft EPA Guidelines (2017) publication).

The duration of each effect is considered to be either momentary, brief, temporary, short-term, medium term, long-term, or permanent. Momentary effects are considered to be those that last from seconds to minutes. Brief effects are those that last less than a day. Temporary effects are considered to be those which are construction related and last less than one year. Short term effects are seen as effects lasting one to seven years; medium-term effects lasting seven to fifteen years; long-term effects lasting fifteen to sixty years; and permanent effects lasting over sixty years.

The TII criteria for rating the magnitude and significance of impacts and the importance of hydrological attributes at the site during the EIA stage are also relevant in assessing the impact and are presented in Tables 1-3 in Appendix 6.1.

The principal attributes (and effects) to be assessed include the following:

- River and stream water quality in the vicinity of the site (where available);
- Surface watercourses near the site and potential impact on surface water quality arising from proposed development related works including any discharge of surface water run-off;
- Localised flooding (potential increase or reduction) and floodplains including benefitting lands and drainage districts (if any); and
- Surface water features within the area of the site.

6.2.2 Sources of Information

Desk-based hydrological information in the vicinity of the site was obtained through accessing databases and other archives where available. Data was sourced from the following:

- Environmental Protection Agency (EPA) – website mapping and database information. Envision water quality monitoring data for watercourses in the area;
- River Basin Management Plan for Ireland 2018-2021.
- *The Planning System and Flood Risk Management, Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie);
- South Dublin City Council (2005), Greater Dublin Strategic Drainage Study: Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council; and
- 'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA 532, 2001);
- National Parks and Wildlife Services (NPWS) – Protected Site Register.

Site specific data was derived from the following sources:

- Engineering Planning Report – Drainage and Water Services. Art Data Centre. Clifton Scannell Emerson Associates (CSEA) (January 2022);
- Flood Risk Assessment. Art Datacentre Ennis. Clifton Scannell Emerson (January 2022);
- Report on the Geophysical Investigation for the Project Art Data Centre, Ennis, Co. Clare. Apex Geophysics (Apex). Report Reference – AGP21033_Phase III_01. (January 2022).
- Construction Environmental Management Plan. Art Data Centre Ennis. AWN Consulting (January 2021) which includes a Surface Water Management Plan for the Construction Phase prepared by (CSEA) (January 2021)
- Art Data Centre – Ennis Campus Clarification document, CSEA May 2022 file no 20_110MEMO-20_110-001
- Various design site plans and drawings; and
- Consultation with design engineers.

6.3 RECEIVING ENVIRONMENT

The following section describes the receiving environment in terms of current land use, local and regional hydrological features and surface water quality, flood risk and areas of ecological importance. A summary of the hydrological attributes and importance rating of same (following TII, 2009 criteria) is presented at the end of the section -this will be used as part of the impact assessment covered in Section 6.5 below.

6.3.1 Site Setting & Land Use

The receiving environment is discussed in terms of surface water hydrology including potential for existing and historical contamination. The proposed development site is c. 55 hectares (ha) in area and is located to the east of Ennis in the townland of Tooreen and Cahernalough, Co. Clare. The lands are bordered to the south by the R352 (Tulla Road) and to the west by the M18 national route. The lands are traversed by a [transmission] gas pipeline running south to north towards the eastern site

boundary as well as overhead powerlines running east to west and which connect to the existing Ennis 110kv substation that adjoins the south-western boundary.

The site is used for agricultural purposes currently and comprises a series of irregularly shaped fields divided by hedgerows and ditches typical of a rural setting. A number of existing dwellings and farm outbuildings are present within the development boundary. A number of these structures will be retained, and some will be demolished as part of the proposed development of the site.

6.3.2 Topography

The topographical gradient across the development boundary is quite variable mostly due to the drumlin type features present. Overall, the ground level generally falls from east to west/ southwest with an elevation of approx. +15mOD (metres above Ordnance Datum) in the west and +46mOD in the east.

The topographical low points are generally to the southwest where the Ballymacahill River crosses the M18 road. Here, elevations within the range of +7.0mOD to +8.0mOD are recorded. Farther to the east, the general [lake edge] elevation of the Tooreen Lough lies at approx. 14.2mOD. Beyond the eastern site boundary, the Ardnamurry Lough to the immediate north of the R352 lies at approx. +27.5mOD to +28.0mOD with the discharge via the swallow hole to the south of the R352 lying at an elevation of approx. +26.5mOD to +26.0mOD.

6.3.3 Regional & Local Hydrology

Regional Hydrology

The subject site is located within the former Shannon Estuary North River Basin District (now the Irish River Basin District), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD).

According to the EPA (2021) on-line mapping, the proposed development site lies within the Shannon Estuary North Catchment (Hydrometric Area No. 27) and the River Fergus sub-catchment (refer to Figure 6-1 below).

Regional surface water drainage near the proposed development boundary includes the Ballymacahill (EPA ref: Spancelhill) River to the north/ west of the site boundary. The Ballymacahill River generally aligns with the full western site boundary with only a section of the river (to the immediate east of the M18 road) shown to lie within the south-western boundary of the site. The river flows in a NE to SW direction crossing beneath the M18 road. The river converges with the River Fergus c. 3.0Km farther to the SW and the River Fergus ultimately discharges into the Shannon Estuary at the Lower River Shannon Special Area of Conservation (SAC) located >7.0Km downstream of the site.

Note: The perimeter of the Lower River Shannon SAC extends upstream along the River Fergus towards Ennis and approx. 2.1 km southwest of the site. Therefore, the proposed development has direct connectivity to the Lower River Shannon SAC via the Ballymacahill River feature to the west.

In terms of regional drainage, generally all identified water courses tend to drain in a northeast to southwest orientation (refer Figure 6-1 below). This would also indicate a

general interpreted NE-SW groundwater flow orientation (refer Chapter 6 Land, Soil, Geology & Hydrogeology).

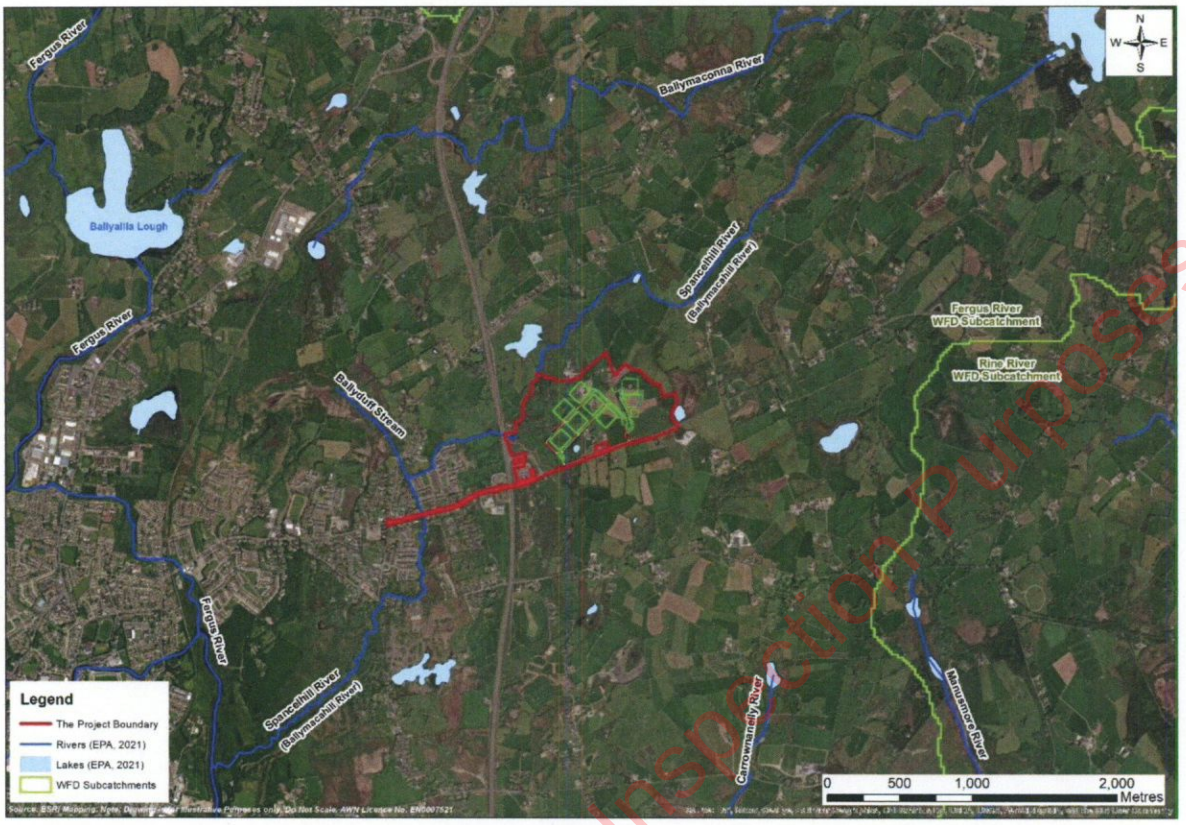


Figure 6-1 *Hydrological Setting and Site Boundary (Source: EPA, 2021)*

Local Hydrology

Drainage within the site boundary comprises a feature lake, a number of ponds, swallow holes and spring discharges, which ultimately discharges to the Ballymacahill River. Local drainage at the proposed development site is typical of a karst environment.

Spring discharges have been identified mainly to the west of the site and include a spring to the immediate east of Tooreen Lough discharging to this feature, and a spring to the NW of the lough which receives groundwater from a swallow hole located farther east and south of the R352 road (this water is discharged from the Ardnamurry Lough wetlands located adjacent to the eastern site boundary line -refer to Figure 6-2 below). It is likely, under increased local water levels [head] at the lake, that Tooreen Lough ultimately discharges into the Ballymacahill River under gradient flow observed in the field as both at surface and possibly through gravelly subsoils located between the lough and the river. Local drainage would also typically follow the topographical decline in gradient recorded from east to west/ southwest (refer also to Figure 6-2 below). Refer to Section 5.3.16 in Chapter 5 for groundwater and surface water interactions discussion.

Site walkovers conducted by AWN in March, April, and May 2021 included a visual inspection of the local drainage network and features across site. These features are encapsulated in Figure 6.2 below and include some seepages/ springs with intermittent or ephemeral characteristics which discharge into what are surface streams that

ultimately discharge towards the Ballymacahill River running along the western/ southwestern boundary of the site.

Local drainage within the development boundary is further defined in Section 6.3.4 (Lakes) and Section 6.3.5 (Ponds) below.

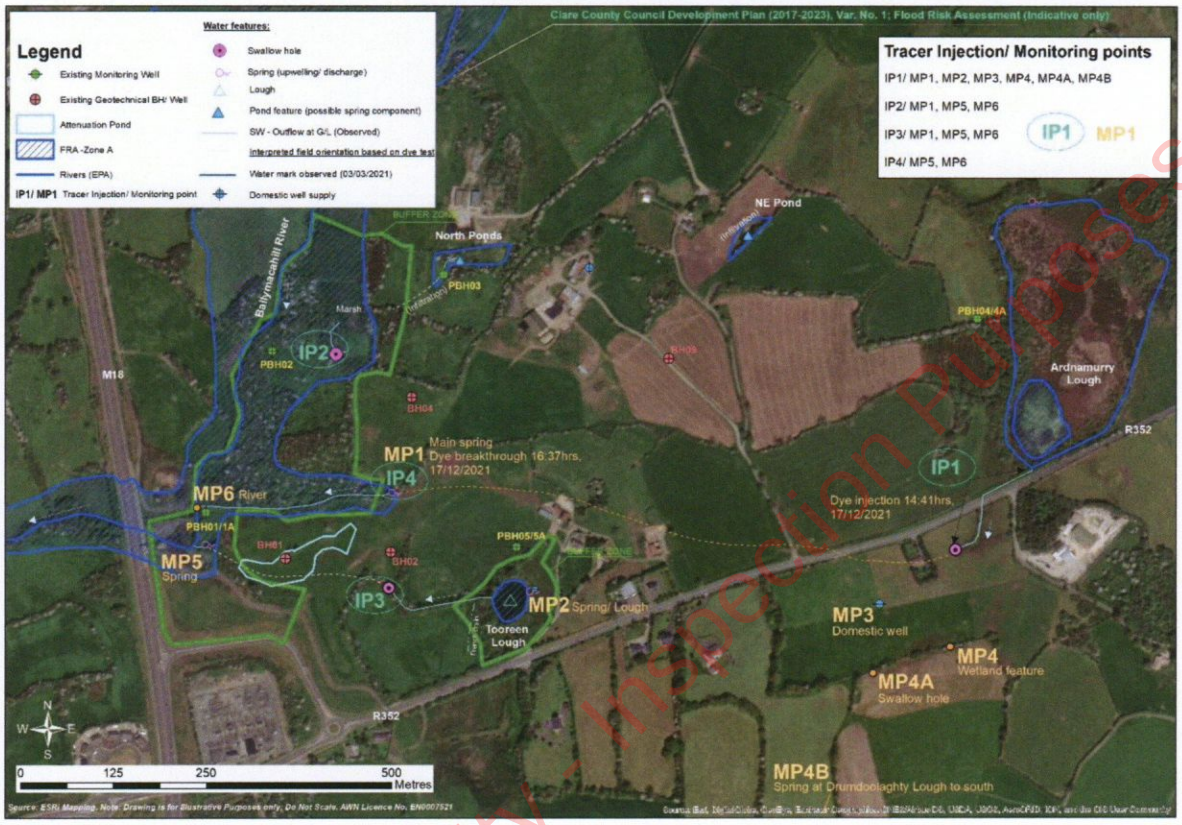


Figure 6-2 *Site Location and Local Drainage*

6.3.4 Lake Features

There are two lake features, refer to Figure 6-2 above. These lakes are called Tooreen Lough and Ardnamurry Lough and are located along the southern boundary with the R352 road and outside the eastern boundary of the site, respectively.

These lakes are primarily collected surface water within low lying depressions but are also fed by groundwater. A spring is located to the immediate east of Tooreen Lough and is likely discharging into this feature. The spring is also a local groundwater supply point for nearby residents and its presence indicates some continuity of upwelling effects in terms of supplying this well point. Farther to the east at Ardnamurry Lough, groundwater seepages (described in [GeoHive] historical 6" mapping for the area (OSi, 2021) as 'Rises') were recorded by AWN (March and May 2021) and are located to the north of the lough feature. It is therefore interpreted that the feature receives a component of groundwater inflow in addition to meteoric recharge in the wider area which drains towards this locally low wetland feature.

Tooreen Lough overflow water is recorded as discharging as stream flow to the immediate northwest/ west with the stream mainly flowing westwards towards an identified swallow hole located two fields across. Surface water discharges to ground at this point with an obvious [acoustically observed] 'drop' in water level below ground.

This discharge is interpreted to ultimately drain towards a spring observed with 'overburden outflow' located farther west near the Ballymacahill River into which this outflow water finally discharges.

Tooreen Lough is not connected to the swallow hole located south of Tulla Road. No emergence of dye was noted here including on 17/12/2021. Tooreen Lough is likely fed by a smaller 'spring' which is located adjacent to the water feature. Tooreen Lough is directly connected to a nearby swallow hole which regulates the water levels in the lough (see also **Appendix 5.3 Chapter 5** hydrograph for SP2). Tooreen Lough discharges at ground level to the west before the water flow enters the nearby swallow hole (IP3) which effectively regulates the water levels in the lough. This is confirmed by the information gathered from the data logger installed at SP2.

Continuous datalogging of water levels in Tooreen Lough indicates a range from +14.24 mAOD (May 2021) to +14.51 mAOD (December 2021), i.e. very little variation in water levels due to the nearby swallow hole from which Tooreen Lough water discharges to the west towards the Ballymacahill River. No connection is recorded between this swallow hole (IP3) and the main spring (IP4).

Refer to Appendix 5.3 in Chapter 5 for hydrograph data for Tooreen Lough (SP2).

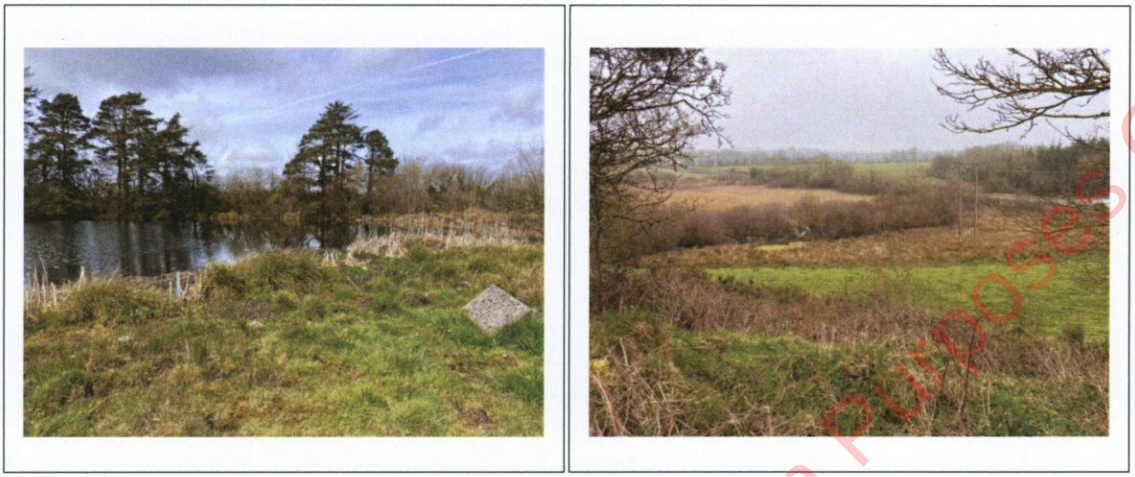
The swallow hole located farther east and south of the R352 road (this water is sourced from the wetlands at Ardnamurry Lough) is interpreted as discharging westwards crossing the R352 at a point where 'possible karstified Limestone' is reported by APEX (2022) as Feature 8.1 through which the transmission gas main also runs. This feature is interpreted as 5-6m in depth and discussion with the landowner indicated significant groundwater in the area during the excavation for the gas main installation. Where (b) represents a potential [groundwater] flow path then this water is interpreted to flow westwards beneath the proposed development and ultimately discharging to the main spring located to the northwest of Tooreen Lough. Discharge to the main spring to the northwest of the lough, then this water will feed into the stream flow that ultimately discharges to the Ballymacahill River (refer also Figure 6-2 above). This was confirmed during the most recent dye tracer event in December 2021. following excavation works at the swallow hole to the south of the R352, which created a significant discharge to ground (i.e. approx. 20-30 l/sec inflow rate), the injection of 250g of Fluorescein dye (and de-ionised water) was observed on site at IP4 within <2 hours as presented in **Appendix 5.4 Chapter 5**.

It is noted that the silt laden water resulting from the swallow hole excavation works was also observed at the main spring and sooner than the dye -this is due in effect to the rapid 'slug of water' effect associated with the sudden release of water to ground at the time of excavation.

As mentioned above, dye was not observed within Tooreen Lough during any of the tests completed, indicating a more northern flow path to the north of the lough.

The geophysical survey (APEX, 2022) did not identify these conduits but identified a significant karstic and dolmitised zone which coincides with the swallow holes on the west of the proposed development site. The ecological assessment (Chapter 7) has not identified any specifical groundwater dependent species present at Tooreen Lough.

Insert 6.1 presents [current] imagery of both lake features.



Insert 6. 1 *Tooreen Lough (LHS, April 2021) and Ardnamurry Lough (RHS, March 2021)*

6.3.5 Pond Features

Surface water features within the site boundary comprise a series of ponds to the north/ northeast with interpreted [seasonal/ recharge dependent] infiltration to ground.

There are two (2) no. pond water features of note either within the site boundary or along the site boundary where flooding historically occurs (see Figure 6-2 above). These features are located to the north (northwest of the proposed Data Centre DC4) and northeast (north of the proposed Energy Centre). These features discharge to ground and water fluctuates due to seasonality i.e. with swelling of levels during winter/ wetter months and recession of levels during summer/ drier months as presented in Figure 6-2 above and Insert 6.2 below. These areas are likely to be a combination of groundwater contribution and ponding after rainfall events. All pond features are located in [locally] low lying depressions within the landscape. The ecological assessment (Chapter 7) has not identified any specific groundwater dependent species present.

Based on recent geophysical data (January 2022), the northeast pond is an ephemeral surface water feature with no groundwater influence. Based on the geophysical survey (Line R17/ R18) undertaken here, there is approx. 5 to 7m of overburden comprising Peat/Clay/Silt hence the feature is a capture point for arterial run-off from elevated areas with levels controlled by rainfall, very slow infiltration to ground and evaporation effects.

The north ponds, in contrast, are surface water features with likely groundwater influence. Based on the geophysical survey (Line R26), there is approx. 1.0-1.5 metres of overburden (sandy gravelly Clay – clayey sandy Gravel) below the top pond which discharges into the second pond to the immediate SW. This second pond discharges to ground with ultimate flow towards the nearby marshy area and the Ballymacahill River.

The Ballymacahill River is the principal drainage feature in the area and flowing in a N-S/SW to W direction. Based on additional extensive geophysical surveys in the area,

and assessment of monitored groundwater levels, then it is likely that the river receives baseflow from the underlying rock together with composite discharge from key water features listed above.

The Ballyamachill (Spancelhill) River flows along the north-western boundary of the proposed development site. It flows between two attenuation ponds located within and adjacent to the western section of the proposed development site, before exiting the site through a culvert under the M18 Motorway to Ennis, refer to Insert 6.2 below. Ballyamachill River then flows *c.* 2.1km downstream into the River Fergus, which in turn discharges into the Fergus Estuary *c.* 4.9km downstream. The River Fergus overlaps with the Lower River Shannon SAC where the Ballyamachill River joins the River Fergus, and the Fergus Estuary overlaps with the River Shannon and River Fergus Estuaries SPA *c.* 4.9km downstream.

Insert 6.2 *Culvert under M81 motorway.*

The Dromore Woods and Loughs SAC is located *c.* 4.5km northwest of the proposed development site. A portion of the River Fergus flows through this European site. The River Fergus then flows *c.* 9.3km downstream, via Ballyallia Lough SAC, and combines with the outfall of the River Fergus that connects with the Ballyamachill River, upstream of this.

There is therefore a hydrological link between the proposed development site and European sites therein.

6.3.6 Surface Water Quality

The proposed development is located within the former Shannon Estuary North River Basin District (now the Irish River Basin District), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD). lies within the Shannon Estuary North Catchment (Hydrometric Area 27) and the River Fergus sub-catchment (refer to Figure 6.1 above).

The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring by 2015 or, at the least, by 2027. 'Good status' means both 'Good Ecological (Status' and 'Good Chemical Status'. In 2009, the Eastern River Basin District (ERBD) River Basin

Management Plan (RBMP) 2009-2015 was published. In the ERBD RBMP, the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015 and include a programme of measures to address and alleviate these pressures by 2015. This was the first River Basin Management planning cycle (2010-2015). The second cycle river basin management plan for Ireland is currently in place and will run between 2018-2021 with the previous management districts now merged into one Ireland River Basin District (Ireland RBD).

This second-cycle RBMP aims to build on the progress made during the first cycle. Key measures during the first cycle included the licensing of urban waste-water discharges (with an associated investment in urban waste-water treatment) and the implementation of the Nitrates Action Programme (Good Agricultural Practice Regulations). In more general terms, three key lessons have emerged from the first cycle and the public consultation processes. These lessons have been firmly integrated into the development of the second cycle RBMP. Firstly, the structure of multiple RBDs did not prove effective, either in terms of developing the plans efficiently or in terms of implementing those plans. Secondly, the governance and delivery structures in place for the first cycle were not as effective as expected. Thirdly, the targets set were too ambitious and were not grounded on a sufficiently developed evidence base. The second cycle RBMP has been developed to address these points.

The proposed development is situated within the administrative area of Clare County Council. The Planning and Development policy framework with which the proposed development complies is defined by the Clare County Development Plan 2017 – 2023 (CCDP) and specifically Variation No.1 (adopted March 2019). Variation No.1 was undertaken to give effect 'to the *Government Policy Statement on the Development of Data Centres* in Ireland by identifying, in a plan led manner, the preferred location of a Data Centre in County Clare.' In terms of water quality, Variation No. 1 states that a development must "*maintain and improve water quality, as well as avoid and minimise effects on natural processes in particular natural flood management and catchment processes*".

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014);
- European Communities Environmental Objectives (Surface Waters); Regulations, 2009 (S.I. No. 272 of 2009 as amended SI No. 77 of 2019);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010 S.I. No. 366 of 2016);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011);
- Statutory Instrument (SI) No. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988;
- Local Government (Water Pollution) Acts 1977-1990; and
- SI No. 258 of 1988 Water Quality Standards for Phosphorus Regulations 1998

Surface water quality is monitored periodically by the EPA at various regional locations along with principal and other smaller watercourses. The EPA assesses the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse. The biological indicators range from Q5 - Q1. Level Q5 denotes a watercourse with good water quality and high community diversity, whereas Level Q1 denotes very low community diversity and bad water quality.

In relation to the subject site, the nearest active EPA monitoring stations located along the Ballymacahill (Spancelhill) River are:

- Up-gradient monitoring station: 'Bridge NW, near Spancelhill' (EPA Code: RS27S030200): located along the Ballymacahill River c. 1.30Km upstream of the proposed development site. The most recent status recorded by the EPA (2019) is classified as *Q3/ Poor*.
- Down-gradient monitoring station: 'Gaurus Br (Br d/s Aughavaddy Br)' (EPA Code: RS27S030400): located along the Ballymacahill River c. 1.35Km downstream of the proposed development site. The most recent status recorded by the EPA (2019) is classified as *Q3/ Poor*.

Figure 6-3 below presents the location of these EPA quality monitoring points in the context of the proposed development site.

Figure 6-3 *EPA Surface Water Quality Stations (Source: EPA, 2021)*

The Water Framework Directive (WFD) Directive 2000/60/EC was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters. In addition to protecting said waters, its objectives include the attainment of 'Good Status' in water bodies that are of lesser status at present and retaining 'Good Status' or better where such status exists at present. The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'.

The Ballymacahill (Spancelhill) River is currently classified by the EPA as having 'Poor' water status and is '*At risk of not achieving good status*'. This poor status is related to Anthropogenic Pressures along this waterbody.

Site-Specific Water Quality

The following table presents a summary of baseline field parameters collected at points across the proposed development site. Parameters include for pH, EC -electrical conductivity (uS/cm) and temperature (Deg. C) as well as some manual flow measurements on the date shown.

These sampling points are also shown in Figure 6-2 above.

Table 6. 1 *Summary of Field Parameters*

Feature ID	General location	pH	EC (uS/cm)	Temp (Deg. C)	Comments
Tooreen Lough	North of R352	08/04/2021 8.50 05/05/2021 8.10	08/04/2021 654 05/05/2021 661	08/04/2021 11.8 05/05/2021 14.6	08/04/2021 Some recession of water mark observed at lake boundary; clear water. 05/05/2021 No further significant recession in water levels observed; clear water
Swallow hole at Tooreen Lough	West of stream discharge from Tooreen Lough	03/03/2021 - 08/04/2021 8.09 05/05/2021 7.80	03/03/2021 642 08/04/2021 632 05/05/2021 715	03/03/2021 7.1 08/04/2021 9.6 05/05/2021 10.5	08/04/2021 Flow estimated at ~2.0 l/sec; very clear
Spring near Ballymachill River	West of swallow hole from Tooreen Lough	05/05/2021 7.30	05/05/2021 703	05/05/2021 13.5	Very slow seepage, clear
Main spring	North-west of Tooreen Lough	03/03/2021 - 08/04/2021 7.67 05/05/2021 7.20	03/03/2021 592 08/04/2021 633 05/05/2021 729	03/03/2021 7.4 08/04/2021 8.4 05/05/2021 10.4	08/04/2021 Flow estimated at ~5.8 l/sec; very clear

GW seepage	North-west (in wooded area)	05/05/2021 7.70	05/05/2021 685	05/05/2021 10.5	05/05/2021 Minimal upwelling and discharge observed
Ponds to North	Main pond to East	05/05/2021 N/A	05/05/2021 N/A	05/05/2021 N/A	05/05/2021 Observed as generally drying out
Spring at Ardnamurry Lough	North of Ardnamurry Lough	08/04/2021 7.47 05/05/2021 7.80	08/04/2021 874 05/05/2021 648	08/04/2021 11.8 05/05/2021 10.8	08/04/2021 Wet conditions observed. 05/05/2021 Observed as generally damp only
Swallow hole from Ardnamurry Lough	South of R352	03/03/2021 7.80 05/05/2021 7.20	03/03/2021 540 05/05/2021 651	03/03/2021 6.0 05/05/2021 10.4	05/05/2021 Flow estimated at ~0.5 l/sec; very clear

Table 6.1 above indicates EC values that would be typical of groundwater (mineralised waters) rather than surface water, and this ties in with the monitored feature types (springs, seepages etc) as presented. Note: While a similar EC profile (~632uS/cm) is presented for the stream water at the point of discharge via the swallow hole to the west of Tooreen Lough and that of the main spring farther to the north, the estimated flow rates for each, in addition to the pH values recorded on 08/04/2021 would infer no connectivity, especially as the flow to the swallow hole is less than that recorded at the main spring discharge.

6.3.7 Flood Risk

According to the Flood Risk Assessment (FRA) carried out by Clifton Scannell Emerson Associates (CSEA, 2022), and the information provided in Art Data Centre – Ennis Campus Clarification document, CSEA May 2022 file no 20_110MEMO-20_110-001there is no risk of flooding affecting the site from fluvial or coastal sources, since the site lies within Flood Zone C (i.e., where the probability of flooding from rivers is less than 0.1% or 1 in 1000). This Flood Risk Assessment report is included with the planning and the flood map extent of the Ballymacahill River (and main spring discharge to the east of this watercourse) is presented in Figure 6-2 above.

A regularly maintained drainage system would ensure that the network remains effective and in good working order should a large pluvial storm event occur. The FRA (CSEA, 2022) also concluded that the proposed development will not increase flood risk potential in any downstream third-party land.

6.3.7.1 Groundwater Flooding with pluvial influence

Groundwater flooding occurs when full storage in the underground aquifer is reached and rainfall (meteoric recharge) cannot discharge quick enough, causing the local water table to rise above the ground surface. According to the Geological Survey of Ireland (GSI), groundwater flooding in Ireland occurs mainly on the limestone lowlands to the west of the Shannon. The prevalence of groundwater flooding in the western counties is fundamentally linked to bedrock geology. The limestone bedrock in these areas has been dissolved over time in a process known as karstification, creating a subterranean network of water-bearing fractures and conduits with limited storage capacity. Surface drainage systems are frequently absent within well-developed karst

landscapes. Instead, the groundwater conduit flow system acts as the main drainage mechanism for the region.

The following site-specific data was used to determine the potential of groundwater flooding across the site:

1. CFRAM flood maps.
2. Topography.
3. Walk over survey to assess water level marks and review of historical photographs of surface water features, including lakes.
4. Review of contemporary borehole logs drilled through both the overburden and the underlying bedrock.

These data have been used to assess the potential for groundwater flooding.

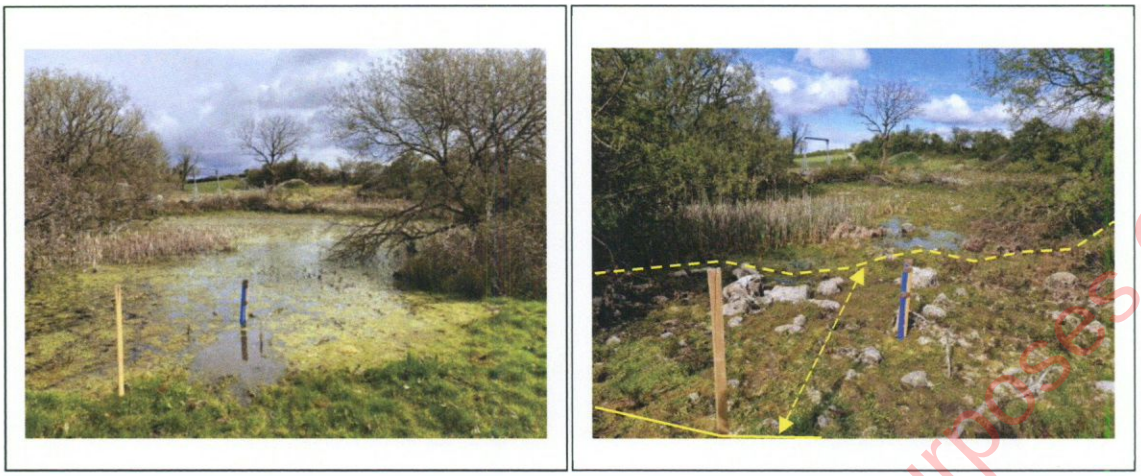
The topographical gradient is quite variable across the proposed development. Overall, the elevation falls from east to west/ southwest with detailed elevation of approx. +15mOD (meters above Ordnance datum) in the west and +46mOD in the east. The topography (presence of low-lying depressions) and presence of springs and discharge to ground points (swallow holes) is crucial in determining where groundwater flooding could occur at/ within the proposed development site boundary.

There are four water features of significance either within the site boundary or along the site boundary where historically flooding has occurred (see Figure 6-2). These are: Tooreen Lough to the south (within the proposed development boundary), Ardnamurry Lough farther to the east (outside but adjacent to the eastern site boundary line), and two separate pond features located to the north (2 no. ponds) and northeast (1 no. pond) – both lie within the proposed development boundary.

The two lake features discharge to ground at nearby swallow holes as presented in Figure 6-2 above. Ardnamurray Lough, Tooreen Lough and north ponds are likely to be a combination of groundwater contribution and ponding rainfall. While the northeast pond is an ephemeral surface water feature with no groundwater influence. There is approx. 5 to 7m of overburden comprising Peat/Clay/Silt hence the feature is a capture point for arterial run-off from elevated areas with levels controlled by rainfall, very slow infiltration to ground and evaporation effects. The latter two (i.e., Tooreen Lough and Ardnamurry Lough) are recorded as continuing to discharge during dry spells (observed on site in April/ May 2021). All four features are located within [locally] low-lying depressions within the landscape.

All these water features have been observed to expand in terms of lateral extent seasonally with autumn/ winter flooding and this footprint is generally followed by recession during drier conditions in summertime for example. Figure 6-2 above presents the local drainage map and historical water mark for each of these features. The historical water mark has been defined based on desk review of historical aerial imagery, field mapping of wetland vegetation as well as on the ground marking using fence posts to observe fluctuations in water levels (refer to below for the ponds to the north for example). These water levels are also based on available aerial imagery during high rainfall periods, see Insert 6.4 below. This filling and emptying/ lowering of water levels is likely based on exceedance/ enhancement of storage capacity of the karst conduit system in wetter months in addition to pluvial components.

Insert 6.3 presents [recent] imagery of the recession in water levels at the (2 no.) ponds to the north.

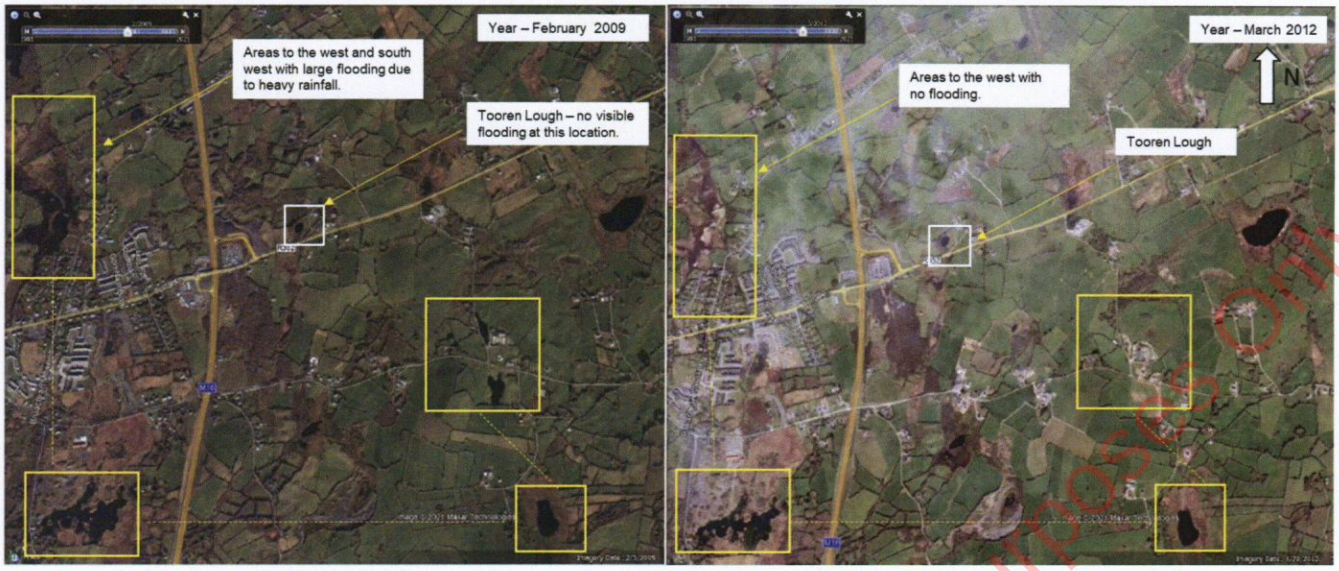


Insert 6.3 *Ponds to the north -Observed recession in water levels April to May 2021*

Water level loggers have also been installed since April 2021 to allow continuous water level monitoring for pre-construction seasonal variation monitoring at Tooreen Lough and the ponds to the north (eastern pond).

Based on available historical aerial imagery, the water level in Tooreen Lough appears to not dramatically fluctuate. The aerial image from February 2009 (significant flood in Ennis Town), flooding is noted in the west and south-west of the site due to the antecedental weather conditions. This is confirmed in the March 2012 aerial photograph where the features to the west and south-west almost recede completely and again, Tooreen Lough does not change, see Insert 6.4 below.

Tooreen Lough is likely fed by a smaller 'spring' which is located adjacent to the water feature. Tooreen Lough is directly connected to a nearby swallow hole which regulates the water levels in the lough (see also Appendix 5.3 in Chapter 5 hydrograph for SP2). Continuous datalogging of water levels in Tooreen Lough indicates a range from +14.24 mAOD (May 2021) to +14.51 mAOD (December 2021), i.e. very little variation in water levels due to the nearby swallow hole from which Tooreen Lough water discharges to the west towards the Ballymacahill River. No connection is recorded between this swallow hole (IP3) and the main spring (IP4).



Insert 6.4 *The fluctuation of Tooreen Lough based on high flood and rainfall events.*

In terms of bedrock geology, groundwater flooding is more susceptible in areas where karstification is more prominent than where competent limestone bedrock prevails. Defining the geological setting in which the full site boundary lies is based on a combination of data provided by studies carried out by the GSI as well as based on the site-specific exploratory hole drilling and geophysical studies. These investigations follow best practice and were undertaken in May-June 2021 to provide a comprehensive assessment of the water and soils environment and are described within Chapter 5 Land Soils and Water. Karst limestone with the presence of dolomite as the dominant bedrock geology has been identified in the western and south-western section of the site while more competent limestone rock is interpreted to prevail from the boundary with the karst in the west towards the centre of the site and extending eastwards towards Ardnamurry Lough, refer to Chapter 5 of this EIA Report.

Refer to Chapter 5 (Land, Soils, Geology & Hydrogeology) for further details on the underground connection potential of these features.

6.3.8 Ecology Receptors

As outlined in Chapter 7 (Biodiversity), there are a number of water habitats which are water fed/ maintained. These are described in Section 7.3.2.1. International and national habitats which are dependent on '*no measurable change in the natural water environment*' are summarised as follows:

Table 6. 2 *Ecological attributes within the site boundary*

Alluvial woodland [*91E0] (WN5 Riparian Woodland and WN6 Wet Willow-Alder-Ash Woodland) GW fed	International
Cladium Fen [*7210] (FS1) GW fed	International
Alkaline fen [7230] (PF1 – Rich Fen and Flush)	National
Molinia Meadows [6410] (GS4 Wet Grassland) GW fed	National

The above habitats are presented in Figure 6-4 below and Figure 7.8 of Chapter 7 (Biodiversity) of this EIA Report which shows the level of ecological importance of habitats at the development site. It is noted that an area of International Importance (alluvial woodland) is present at the edge of Fen habitat at Tooreen Lough and along

the eastern boundary. Furthermore, the Reed and Large Sedge swamp (Cladium Fen) area is located along the eastern boundary of the proposed development site. Further information on the habitats is discussed in Chapter 7 (Biodiversity) of this EIA Report. There are no specific groundwater dependent species identified with the habitats present. As such the habitats are dependent on influx of flood water (rainwater and or groundwater) only.

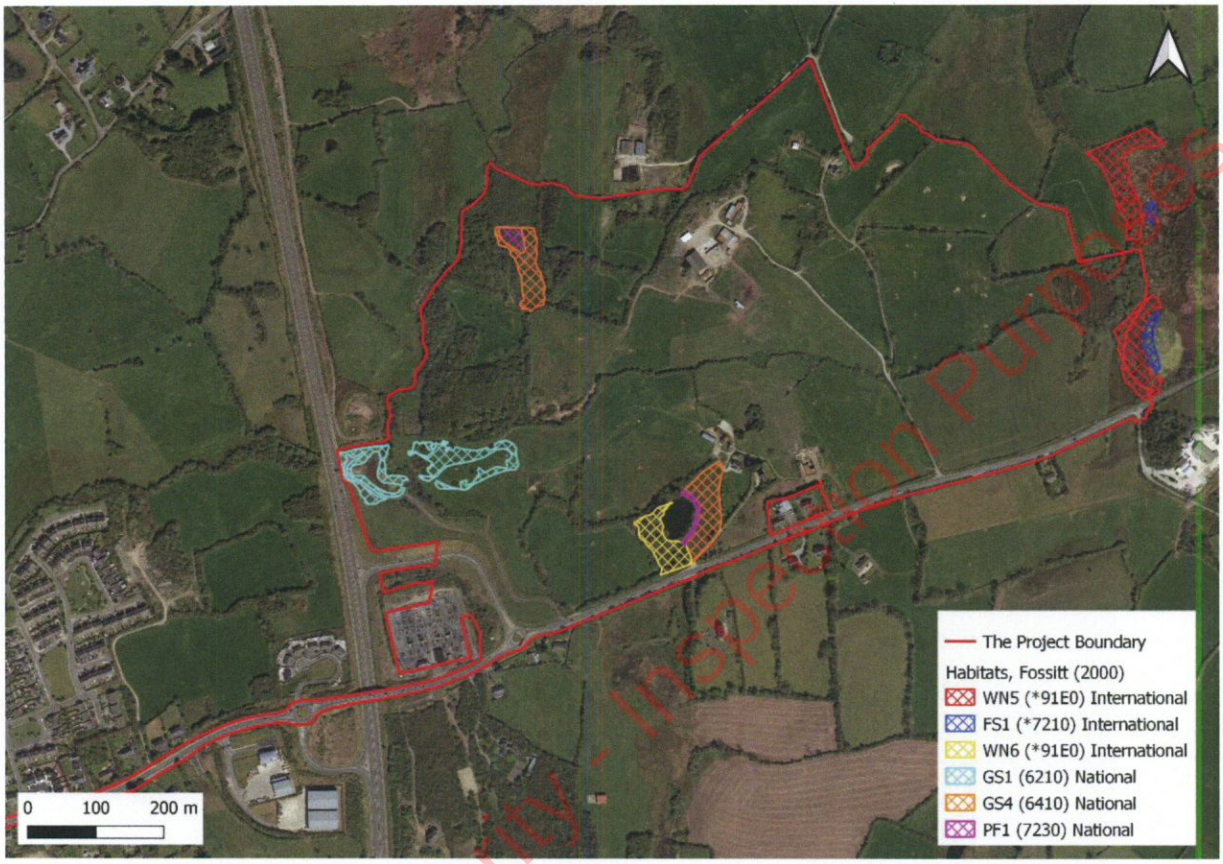


Figure 6-4 *Ecological Features of International and National Importance located within the site boundary.*

Fen type habitat was located in two different areas. These are considered of National Importance according to their species composition and structure.

The small area of rich fen and flush, located in the far northwest of the proposed development site, described as a wetland/pond feature, corresponded to a depression between wooded areas, and are naturally relatively species-rich vegetation communities. It is likely to have formed as a consequence of a lake infilling and can be described as a topogenous fen (i.e. forming in a valley or depression). A more-species-poor fen community occurs bordering on the landward side of reed and tall sedge swamp vegetation at Tooreen Lough.

Fen habitats located within these two particular areas corresponded to the description of the Annex I habitat Alkaline fen [7230], which are described as '*Wetlands mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous base-rich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum…*' within the Interpretation Manual of European Union Habitats (European Commission, 2013). The examples of rich fen and flush habitats within these two areas are considered to be of National Importance.

The areas of oak-ash-hazel woodland and immature woodland in the northwest, Tooreen Lough, the alluvial woodland (*91E0), Molinea meadows (6410) and alkaline fen (7230) surrounding Tooreen Lough and in the north west, and calcareous grassland (6210) adjacent to the attenuation pond by the M18 Motorway, will be protected as 'Ecological Buffer Space' designated by Clare County Development Plan Variation No. 1. These areas will be retained, protected from development and will not be directly impacted from the development.

The wetland in the north of the site will also not be impacted by the proposed hardstand footprint of the development.

6.3.9 Fisheries

Fish species are protected under the Fisheries Acts and by fishing by-laws. Atlantic salmon, river lamprey and the brook lamprey are listed on Annex II of the EU Habitats Directive. Electrofishing surveys were not carried out as part of the field surveys.

The proposed development site lies within the Fergus_SC_040 catchment. The EPA segment of the Spancelhill Stream which is contained within the study area is Spancelhill_010. Spancelhill_010 segment is c. 7.5km and consists of the channel of the Spancelhill Stream from its starting point in O'Briens Big Lough, to where it joins the River Fergus downstream of the proposed development site. The Spancelhill Stream and the River Fergus have not been surveyed by Inland Fisheries Ireland (IFI) for their Ecological Fish Status. There are five Annex II fish species found within the Lower River Shannon SAC, i.e., sea lamprey Petromyzon marinus, brook lamprey Lampetra planeri, river lamprey Lampetra fluviatilis, Atlantic salmon Salmo salar and twaite shad Alosa fallax, the four former species of which are Qualifying Interests of the SAC. The three lamprey species and Atlantic salmon have all been observed to be spawning in the Lower Shannon and its tributaries (NPWS, 2013d). There was one fish species record, sea lamprey, identified within c. 2km returned from the desk study.

Note: While fish surveys were not carried out in the waterbodies within the proposed development site boundary, both Tooreen Lough and the M18 Attenuation Pond have potential to hold populations of small fish species.

6.3.10 Areas of Conservation

According to the NPWS (2021) on-line database there are no special protected areas on or in the vicinity of the subject site. The closest European listed sites are as follows;

- Lower River Shannon Special Area of Conservation (SAC) (site code 002165) - circa. 2.1 km to the southwest of the site.
- Ballyallia Lake SAC and proposed National Hertiage Area (pNHA) (site code: 000014) - circa. 2.3 km to the west of the subject site.
- Ballyallia Lake Special Protection Area (SPA) (site code: 004041) - circa. 2.8 km to the northwest of the subject site.
- Newpark House (Ennis) pNHA (site code: 000061) - circa. 1.6 km to the southwest of the site.

A potential source-pathway-receptor (SPR) link exists between the proposed development site and the following European sites: Lower River Shannon SAC and River Fergus and River Shannon Estuaries SPA. This link is via the Ballymacahill (Spancelhill) River which flows along the north-western boundary of the proposed development site, flowing downstream before joining the River Fergus and finally discharging into the Fergus Estuary. The Dromore Woods and Loughs SAC is located

c. 4.5km northwest of the proposed development site and is upstream of the proposed development. A portion of the River Fergus flows through this European site. The River Fergus then flows c. 9.3km downstream, via Ballyallia Lough SAC, and combines with the outfall of the River Fergus that connects with the Ballymacahill River, upstream of this. There is therefore a hydrological link between the proposed development site and European sites therein.

Figure 6-5 below presents the location of these protected areas in the context of the subject development site.

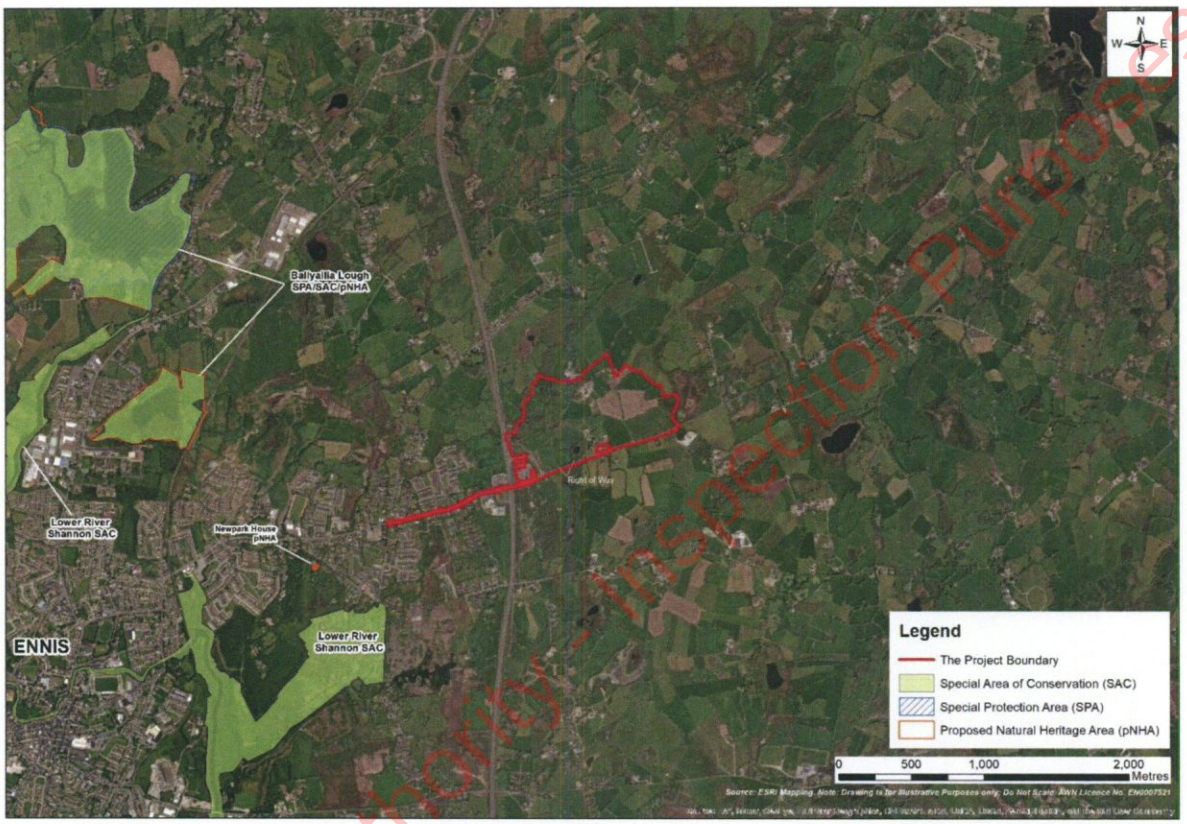


Figure 6-5 *Natura Sites in the Context of the Subject Site (Source: NPWS, 2021)*

6.3.11 Rating of Importance of Hydrological Attributes

Based on the TII methodology (2009) (See Appendix 6.1) the importance rating of the hydrological features within the development boundary site is presented in Table 6. 3 below.

Table 6. 3 *Summary of Hydrological Evaluation of Identified Attributes*

Hydrological Feature	Importance of Attribute	Comment
Ardnamurry Lough	Medium to High	Based on habitat / ecological evaluation
Tooreen Lough and associated spring and swallow hole.	Medium to High	Based on habitat / ecological evaluation.
Pond to the North-East	Low	Based on habitat / ecological evaluation.
Ponds to the North	Low	Based on habitat / ecological evaluation.
Spring / seepage in wooded area to the east of Ballymacahill River	Medium to High	This feature is considered low to Medium to High with potential

Hydrological Feature	Importance of Attribute	Comment
		connection to the Ballymacahill River and therefore the Lower Shannon River SAC downgradient.
Ballymacahaill River	High	This feature is considered High as there is a direct connection to the Lower Shannon River SAC, 2.1 km downgradient from the proposed development site.

As there is a direct hydrological connection between the site and Lower Shannon River protected sites (SAC), the overall attribute significance is considered to be High to Very High.

6.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development is c. 58 hectares in area and comprises:

- Six (6) no. data centres buildings (DC1 to DC6).
- A gas-powered Energy Centre and Above Ground Installation (AGI).
- A new 110kV substation, two drop down masts and underground grid connection.
- Fibre connection.
- Connection and upgrade of foul sewer and mains supply extending along the existing R352.
- Undergrounding of two of the existing overhead 110kv circuits.
- Associated Infrastructure: including roads and a attenuation pond.

The proposed development represents an overall increase in hardstanding surfaces of approx. 17.3 hectares. The rest of the site comprises landscaping and undeveloped areas. Ecological buffer zones cover c. 10 ha of lands as seen in Figure 2.1 in Chapter 2 Description of the Proposed Development. These were delineated following assessment undertaken as part of the area assessment within the Clare County Development Plan 2017 – 2023 (Variation No. 1). Further assessment has been undertaken by the project ecologist to protect ecology during construction and operation of the proposed development.

The proposed development site boundary includes approx. 2.1 km of the existing Tulla Road for connection to sewer.

Two of the 110kV overhead circuits which currently traverse the site will be brought underground to the [existing] Ennis substation as they come on to the site on the eastern side.

Further details of the proposed development are described in Chapter 2 (Description of the Proposed Development). The details of the construction and operation of the development in terms of Hydrology are detailed in the subsections below.

6.4.1 Construction Phase

The key civil engineering works which will have a potential impact on the water and hydrological environment during construction of the proposed development are summarised below.

- Excavation of the proposed attenuation pond to the southwest of the site (proposed lowest surface water capture point within the main development site).
- Excavations are required for foundations of buildings and installation of associated services included within the development. This may include installation of load-bearing piles to target depth at select data centre footprints.
- Possible discharge of collected rainwater/ minimal dewatering during excavation works and groundworks (the extent of which is dependent on the time of year development works are carried out).
- Construction activities will necessitate storage of cement and concrete materials, temporary oils, and fuels on site. Small localised accidental releases of contaminating substances including hydrocarbons have the potential to occur from construction traffic and vehicles operating on site.
- Construction of culvert pipes to receive overflow water from Tooreen Lough as well as installation of a concrete ring and chamber at the existing swallow hole receiving stream water from the lough. There is also a proposed overflow pipe from this swallow hole (dimensions to include correction for climate change effects).
- Potential localised earthworks south of the existing pond to the north of the proposed Energy Centre.
- Localised excavations (cuts) and infill (build-up) as part of the designed elevation changes across the proposed development site.

6.4.2 Operational Phase

The key activities which will have a potential impact on the hydrological environment during operation of the proposed development are summarised below:

6.4.2.1 Increase in Hard Standing Area

The proposed surface water network(s) for the development will collect runoff from roofs, roads and other hard standing areas in a sealed system of pipes and gullies. The proposed development represents an overall increase in hardstanding surfaces of approx. 17.3 hectares. Refer also to Section 6.4.2.3 for additional detail on surface water management and maintaining existing surface water/ groundwater interaction.

6.4.2.2 Storage of Hazardous Materials:

In the event of a loss of power supply, the emergency generators are designed to automatically activate and provide power to the data storage facility. The generators will be supplied by low sulphur diesel. Fuel oil for the emergency generators is the only required bulk chemical required on site. Located within the services yard of three of the six datacentres, it is proposed to have up to 7 bunded above ground bulk storage tanks for fuel oil (440m^3 for three (3 no.) data storage facilities), distribution pumps, overground delivery pipeline to the belly tanks for diesel fired standby generators within each data storage facility.

The proposed Energy Centre will have back-up fuel storage with up to 20 fully bunded above ground bulk storage tanks for fuel oil (total of 1,440 m^3 of fuel oil). The total fuel store will be 2,900 m^3 (or 2,494 tonnes). All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25% of the total volume of the substance stored and will designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004).

The site is traversed by a high-pressure Gas Networks Ireland gas pipeline running in a S-N direction to the east of the development site. An Above Ground Installation (AGI) will be constructed to facilitate supply for the Energy Centre.

6.4.2.3 Surface Water Management:

The proposed surface water drainage system for the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage Systems (SuDS) elements. The proposed surface water drainage was designed in accordance with the SuDS Manuel 2015 and includes correction for climate change effects. The intention of the proposed surface water management plan is to maintain existing surface water (and groundwater) flow patterns. Drainage for non-paved areas will continue to discharge to ground. Drainage in areas of fuel storage will be fully sealed.

The developed area of the site is 17.3 ha and attenuation has been designed on site for the 1:100-year flood event including consideration of a 20% allowance for climate change effects. An overflow subsurface pipeline will discharge at current discharge rates (greenfield) to the Ballymacahill River. Drainage will be from a single lined fully designed attenuation pond feature to be located to the southwest of the site.

Rainwater run-off from the roofs of the six Data Centres will be collected and will feed water harvesting tanks with any excess overflow into the common road drainage network. This water will be available as cooling water. Other SuDS measures will include permeable paving and swales. These drains and swales will discharge to the surface water attenuation pond where the discharge will be controlled using a 'Hydrobrake Optimum' vortex flow control device to limit the maximum discharge to 95 l/s during the 1:100-year storm (the calculated Q-bar value attributed to the site is 98.61 l/s).

The attenuation pond will be constructed to retain a constant volume of water to promote settling and reduce conveyance of suspended solids and other particles to the receiving watercourse. An attenuation volume of 15,900 m³ is designed as part of the proposed development. A Class (I) by-pass separator with a suitable capacity will be installed downstream of the proposed hydrobrake unit. The function of the separator is to intercept pollutants (any petroleum/ oil) and prevent their entry to the Ballymacahill River. As such, there is no potential for increase either flooding or impact on water quality as a result of the proposed development. Further details are provided within the CSEA (2021) engineering report prepared for planning.

The attenuation pond has two (2) no. design levels. The two levels are summarised as follows:

(i) 1:100 + 20% climate change, and
(ii) 1:1000 year. Please see table below.

Additional details on the attenuation pond are provided in Table 6.5 below.

Table 6.4 *Design details for the attenuation pond*

Description	Data	Level mOD/remarks
Top Area	5184.3 m^2	+15.23
Bed Area	2591.0 m^2	+12.23, 3m total depth
Storage for 1/100 year + 20% CC	6864 m^3	+14.24 , FB = 990mm
Storage for 1/1000 year	9293 m^3	+14.79, FB= 440mm
Side-slope grading	1:3	-
Hydrobrake Max. outflow rate for 1/100 year +20% CC	108.7 l/s	-
Hydrobrake Max. outflow rate for 1/1000 year	122.4 l/s	-

6.4.2.4 Wastewater

Existing System

The site is currently not serviced by foul sewage.

According to Clare County Council and Irish Water drawings, there is an existing 225mm diameter foul drain that forms part of an existing foul drainage network that services the existing Knockanean area southwest of the proposed development along the existing Tulla Road/R352. This existing 225mm diameter foul drain discharges to the existing Pumping Station of Gort Na mBlath located approximately 550 metres farther west from the proposed development.

Proposed System Connection

The proposed Art Data Centre Development, subject to this planning application, comprises a gravity foul sewer networks consisting of 150mm diameter pipes size. As such, the overall wastewater discharges associated with the proposed development are in accordance the demand/ discharge rates outlined in the Pre-Consultation Enquiry (PCE) provided to Irish Water (IW).

The design Dry Weather Flow (DWF) of the development is 20.9 m^3/d for the entire site catchment. A peak of 0.6 l/s domestic/ staff wastewater flow was included as part of the submitted PCE to IW. The proposed foul drainage service attributed to the site will incorporate a foul pumping station and associated rising main which will also include a 24-hour emergency storage tank in the unlikely event that the proposed foul pump malfunctions. The proposed 24-hour emergency storage tank shall be situated in an open space located southwest of the proposed data storage buildings. Maintenance access to both the pump chamber and 24-hour emergency storage tank will be incorporated into the design. This proposed pumping system will transfer the generated wastewater via a rising main which runs along the Tulla Road (southwest of the site) to the existing Gort Na mBlath Pumping Station.

All wastewater works to be in accordance with the relevant Irish Water Code of Practice. It is proposed to use the 24-hour emergency storage tank as to avoid foul discharge from the development during peak domestic wastewater hours in the town. This might be achieved by allowing for the proposed pumping system to operate only during night times (typically between 00:00 hrs and 06:00 hrs). However, the operation of the proposed pumping station is subject to agreement with the Department of Water and Drainage in Clare County Council.

The final discharge point from the Ennis North WWTP is the River Fergus. This WWTP is required to operate under an EPA licence (D0048-01) and to meet environmental legislative requirements. A review of the available Annual Environmental Reports (AERs) provided as part of the EPA licence requirements, confirms the WWTP is generally operating in compliance. There were some minor exceedances which relates to chemical problems, equipment failure and maintenance issues. These were temporary and rectified within the normal response time by Irish Water.

The domestic/ staff wastewater peak design flow is 0.6 l/s (51.84 m^3/day) (Source: CSEA, 2021). The peak foul discharge calculated for the proposed development is well within the capacity of the WWTP. Even without treatment at the Ennis North WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.79% of the licensed discharge at Ennis North WWTP. This would not impact on the overall water quality within River Fergus and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). (Note: the peak effluent discharge equates to approx. 0.003% of the licensed maximum discharge (peak hydraulic capacity) at Ennis North WWTP). Therefore, the wastewater discharge volume from the proposed development site will not have a negative impact on the Ennis North WWTP and, as a consequence, will not have a negative impact on the receiving environment, e.g., River Fergus.

Further detail in relation to wastewater emissions is presented in the CSEA (2021) Engineering Planning Report – Drainage and Water Services (RPT-20_110-001).

6.4.2.5 Water Supply

A 450mm diameter mains runs along the Tulla Road. Following a proposed upgrade for connection (within the existing road), it will have capacity to supply adequate water for the proposed development.

Water is required for cooling equipment, cleaning, general potable supply for drinking and sanitary facilities. This will be sourced from mains water supply and on-site rainwater harvesting. The 450mm diameter mains runs along the Tulla Road and following a proposed upgrade for connection (within the existing road), has capacity to provide an adequate supply of water to the proposed development. Residual cooling water, associated with the evaporative cooling process, is to be discharged from the air handling units to the surface water drainage network. When evaporative cooling is required the average rate of demand for the proposed development is estimated to be less than 1,000 m^3/day for the whole site. It is proposed to store at least 48 hours' worth of rainwater at each data storage facility for the purpose of supplying the evaporative coolers prior to using the public water supply. Of the water supplied, only 40% will be discharged to the surface water system as the remainder will be lost to evaporation in the cooling process. This results in an average daily discharge of 400 m^3/day. The peak rate of discharge for the proposed development will be 205 l/s. As the cooling water will only be required during periods of hot dry weather (i.e., temperature exceeds, 27°C), the discharge to the surface water network will not coincide with any rainfall events.

Consultation with IW has confirmed that sufficient water and wastewater capacity is available. A PCE was submitted to IW which addressed water demand (and wastewater) for the proposed development (Appendix 13.1 of this EIA Report). The overall water demand associated with the proposed development is in accordance with the water demand outlined in the PCE.

Further detail in relation to water supply emissions is presented in the CSEA (2021) Engineering Planning Report – Drainage and Water Services (RPT-20_110-001).

6.4.3 Do Nothing Scenario

The proposed development land is currently agricultural land; the land is zoned 'enterprise' which provides for the use and development of land for high end research and development, business science and technology-based industry, financial services, call centres/telemarketing, software development, data centres, enterprise and incubator units, small/medium manufacturing or corporate office in high quality campus/park type development.' It is likely that the land use will change over time even if this development does not go ahead. The associated impact of any such development in accordance with the zoning objective will be similar to the proposed development for the surrounding hydrological environment.

6.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

An analysis of the potential impacts of the proposed development on the hydrological environment during the construction and operation is outlined below. Receptors include the Ballymacahill River, internal [shallow] drainage ditches running along some field boundaries, as well as ponds, Tooreen Lough and swallow holes which lead to underground conduits, all of which ultimately discharge to west/ southwest and to the Ballymacahill River.

The site is drained by an internal field drainage network and karst flow. This network ultimately flows in a west to south westerly direction towards the Ballymacahill River which in turn joins the Fergus River approx. 3.0 Km downstream. The River Fergus discharges to the sea at Shannon Estuary over 7.0 Km downstream of the site. The Ballymacahill River flows towards the Lower River Shannon SAC) located c. 2.1 Km to the southwest of the site.

6.5.1 Construction Phase

6.5.1.1 Increased Sediments Loading in Surface Water Run-off

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction related activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses (for example Tooreen Lough). Silt-laden water can arise from dewatering of excavations, exposed ground, stockpiling of subsoils/ rock material and from access/ haulage tracks and roads.

6.5.1.2 Accidental Spills and Leaks

As with all construction projects there is potential for water (rainfall and/ or groundwater) to become contaminated with pollutants associated with construction related activity.

During construction of the development, there is a risk of accidental pollution incidences from the following sources:

- Cement/ concrete (increase turbidity and pH) – arising from construction phase materials.

- Hydrocarbons (ecotoxic) – accidental spillages from construction plant or on-site storage.
- Wastewater (nutrient and microbial rich) – arising from accidental discharge from on-site toilets and washrooms.

Due to the distance to the Lower River Shannon SAC, the proposed development does not have the potential to affect the water quality, and therefore the integrity, of this Natura 2000 site due to:

- An accidental pollution event during construction or discharge of silt laden water (without mitigation) has the ability to locally affecting water quality in the Ballymacahill River. However, based on the low chemical loading (c. < 5000 litres of oil and alkaline run-off from cementing works), together with the available attenuation and dilution within the Ballmacahil river and the Fergus there is no potential for exceedance of SI thresholds (i.e. S.I. European Communities Environmental Objectives Regulations, 2009 [S.I. No. 272 of 2009 as amended by SI No. 77 of 2019]) at the SAC.
- Due to its close proximity to the proposed development site via connectivity with the Ballymacahill River there is potential for local disturbance and/ or change in morphology of the river if not appropriately attenuated and outfall designed appropriately.

6.5.1.3 Potential Blockage of Swallow Holes & Springs

Due to the proposed construction compound located immediately southwest of Data Centre DC6 and beside the existing swallow hole that receives water from Tooreen Lough stream flow, there is a potential that this feature could be blocked temporarily. Blockages could arise as a result of sediment runoff, or storage of subsoil/ rock material for example.

Similar to the swallow hole at DC6, the main spring located to the immediate north of DC6 may also potentially be impacted from adjacent earthworks (sediment run-off for example).

6.5.1.4 Summary of Construction Phase Impacts

A summary of construction phase impacts for the proposed development (with and without mitigation) following EPA (2017) EIA guidelines is provided in Table 6. 5 below.

Table 6. 5 *Impact Assessment of Proposed Construction Activities*

Water Feature	Summary of Works Proposed	Magnitude of Impact - without mitigation measures	Magnitude of Impact - with mitigation measures
Ardnamurry Lough	Outside of the Construction Works	No Impact predicted	No Impact predicted
Tooreen Lough	Excavations, infill and construction activities in the vicinity of this feature.	*Temporary, Significant impact*	*Temporary, Imperceptible impact*
Pond to the North-East (North of the Energy Centre)	Excavations, infill and construction works in the vicinity of this feature	*Temporary, Significant impact*	*Temporary, Imperceptible impact*

Water Feature	Summary of Works Proposed	Magnitude of Impact - without mitigation measures	Magnitude of Impact - with mitigation measures
Ponds to the North	Excavations, infill and construction works in the vicinity of this feature	*Temporary, Significant impact*	*Temporary, Imperceptible impact*
Swallow hole south of Tulla Road	Outside of the Construction Works	No Impact predicted	No Impact predicted
Main Spring north west of Tooreen Lough	Excavations, infill and construction works in the vicinity of this feature	*Temporary, Significant impact*	*Temporary, Imperceptible impact*
Stream and Swallow hole west of Tooreen Lough and south of DC6	Stream will be culverted, and swallow hole will be covered with a concrete manhole with cover.	*Temporary, Moderate impact*	*Temporary, Imperceptible impact*
Ballymacahaill River	Construction activities in the vicinity of features with direct connectivity to this waterbody.	*Temporary, Significant impact*	*Temporary, Imperceptible impact*
Lower River Shannon SAC	Downgradient (over 2.0 km) of the Ballymacahaill River.	*Temporary, Significant impact*	*Temporary, Imperceptible impact*

6.5.2 Operational Phase

6.5.2.1 Increase in hardstanding

The increase in hardstanding (17.3 ha), if not adequately attenuated on site, would result in an increase in run-off rate and potential downgradient flooding. As described in Section 6.4.2.3 above, the design has incorporated adequate attenuation for a 1: 100-year flood event including correction for climate change effects.

The increase in hardstanding can cause increases in surface water run-off which has the potential to impact on the water quality and quantity of the hydrological environment and especially the Ballyamachill River (with downstream links to the SAC). Furthermore, this increase in surface water runoff has the potential to increase off-site flooding to neighbouring lands if not appropriately attenuated.

Refer also to Section 6.4.2.3 for additional detail on surface water management and maintaining existing surface water/ groundwater interaction which is applicable also to the long-term operation of the proposed development.

6.5.2.2 Accidental Spill and Leaks

The development includes the storage and use of diesel fuel which has the potential to have water quality impacts if a leak/ spill occurs and is not adequately mitigated. The design incorporates containment measures and measures for treatment of any spills/ leaks (described in Section 6.6 below).

6.5.2.3 Summary of the Operational Phase Impacts

A summary of operational phase impacts for the proposed development (with and without mitigation) following EPA (2017) EIA guidelines is provided in the Table 6. 6 below.

Table 6. 6 *Impact Assessment of Proposed Operational Phase*

Water Feature	Magnitude of Impact -without design measures [1]	Magnitude of Impact – with design and mitigation measures
Ardnamurry Lough	No Impact predicted	No Impact predicted
Tooreen Lough	*Temporary, Significant impact*	*Long-term Imperceptible impact*
Pond to the North-East (North of the Energy Centre)	*Temporary, Significant impact*	*Long-term Imperceptible impact*
Ponds to the North	*Temporary, Significant impact*	*Long-term Imperceptible impact*
Swallow hole south of Tulla Road	No Impact predicted	No Impact predicted
Main Spring north west of Tooreen Lough	*Temporary, Significant impact*	*Long term, Imperceptible impact*
Stream and Swallow hole west of Tooreen Lough and south of DC6	*Temporary, Moderate impact*	*Long-term Imperceptible impact*
Ballymacahaill River	*Temporary, Significant impact*	*Long-term Imperceptible impact*
Lower River Shannon SAC	*Temporary, Significant impact*	*Long-term Imperceptible impact*

[1] The Impact Assessment without design mitigation measures assumes that the attenuation pond, interceptor and other measures in place fail during the operational phase. However, these mitigation measures are a part of the design of the proposed development. The majority of the failures would result in increased flows to the receiving waterbody.

6.6 REMEDIAL AND MITIGATION MEASURES

The design has taken account of the potential impacts of the development on the hydrology environment local to the area where construction is taking place and containment of contaminant sources during the operational phase of the site. These design measures and mitigation measures are described below.

Due to the inter-relationship between land, soils, geology, hydrogeology, ecology and hydrology, the following mitigation measures discussed will be considered applicable to each of the respective chapters. Waste Management is also considered an interaction in some sections.

6.6.1 Construction Phase

In order to reduce the potential for any adverse impacts on the existing hydrological environment, a number of mitigation measures will be adopted as part of the construction works on site.

A Construction Environmental Management Plan (CEMP) and Construction Surface Water Management Plan (SWMP) for the site are included with the planning documentation. The contractor will be obliged to implement the measures outlined in the CEMP and SWMP (refer to Chapter 13 of this EIA Report). The CEMP sets out the overarching vision of how the construction of the proposed development will be managed in a safe and organised manner by the Contractor.

The CEMP will be a live document and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent planning conditions relevant to the proposed development.

The SWMP follows best international practice, including, but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532) Construction Industry Research and Information Association;
- CIRIA (2002) Control of water pollution from construction sites: guidance for consultants and contractors (SPI56) Construction Industry Research and Information Association
- CIRIA (2005), Environmental Good Practice on Site (C650); Construction Industry Research and Information Association
- BPGCS005, Oil Storage Guidelines;
- Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- CIRIA 697, The SUDS Manual, 2007; and
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004.

6.6.1.1 Surface Water Run-Off

As there is potential for run-off to directly or indirectly discharge to a watercourse, the SWMP includes specific mitigation measures to manage run-off and water quality during the construction phase. These include:

- No direct run-off will be allowed to ecological buffer zones, any open water, or karst swallow holes as identified. Construction run-off will be collected and discharged through sediment traps/ siltbuster type settlement tanks prior to discharge to ground or to the on-site attenuation tank.
- Silt [trap] fencing will be emplaced around buffer zones and along open water courses and swallow holes to prevent any direct run-off to these areas.
- Provision of exclusion zones and barriers (e.g. silt trap/ fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems and hence the downstream receiving water environment.
- Provision of temporary construction surface drainage and sediment control measures to be in place before earthworks commence.
- A hydrocarbon interceptor will be installed upgradient of the attenuation pond to provide treatment in the event of an accidental release of oil from construction vehicles.
- Any minor ingress of groundwater and collected rainfall in the excavation will be pumped out during construction. It is estimated that the inflow rate of groundwater will be low and limited across the site.
- Daily monitoring (visual inspection) will be adopted to ensure that the water is of sufficient quality to discharge from the attenuation pond. The outlet of the pond includes a shut off valve should the water quality be deemed to be poor and require further treatment prior to discharge.
- The temporary storage of excavated subsoil/ rock material will be carefully managed. Stockpiles will be tightly compacted to reduce runoff and graded to aid in runoff collection. This will prevent any potential negative impact on the stormwater drainage and the material will be stored away from any surface water drains. Movement of material will be minimised to reduce the degradation of soil structure and generation of dust.
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise the potential for water ingress into excavations.
- Excavated soil/ rock material from site works will be stored away from existing drainage features to remove any potential impact.
- Weather conditions will be considered when planning construction activities to minimise the risk of run-off from the site and the suitable distance of topsoil piles from surface water drains will be maintained.
- A specific method statement will be prepared for the discharge outlet from the attenuation pond to the Ballymachaill River. The outfall structure will be designed with headwall, wingwalls and a bed apron to prevent local scouring of the banks and the channel bed. This, together with management of flow to mimic current run-off rates, will ensure no measurable impact on river morphology, existing surface water flow hydraulics or the potential for an increase in the risk of flooding.
- A method statement for installation of the discharge pipe and outlet structure from Tooreen Lough will be provided by the contractor for approval by CCC and IFI stakeholders.

6.6.1.2 Fuel and Chemical Handling

Any fuels or chemicals (including hydrocarbons or any polluting chemicals) will be stored in a designated, secure bunded area(s) within the designated contractor's compound to prevent any seepage of potential pollutants into the local surface water network. These designated areas will be clearly sign-posted and all personnel on site will be made aware of their locations and associated risks.

All mobile fuel bowsers shall carry a spill kit and operatives must have spill response training. All fuel containing equipment such as portable generators shall be placed on drip trays. All fuels and chemicals required to be stored on- site will be clearly marked. Care and attention will be taken during refuelling and maintenance operations. Particular attention will be paid to gradient and ground conditions, which could increase risk of discharge to waters.

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas within the contractor's compound. Oil and fuel storage tanks shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in a designated area within the contractor's compound which will be away from surface water gullies or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as '*Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors*' (CIRIA 532, 2001) will be complied with.

Where feasible, all ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite and no washing of concrete from vehicles will be done on site.

In the case of drummed fuel or other chemical which may be used during construction, containers should be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

Emergency response procedures will be outlined in the detailed CEMP. All personnel working on the site will be suitably trained in the implementation of the procedures, and upskilled where necessary.

6.6.1.3 Accidental Spills

A robust and appropriate Spill Response Plan and Environmental Emergency Plan will be prepared prior to works commencing and they will be communicated, resourced and implemented for the duration of the works. Emergency procedures/ precautions and spillage kits will be available and construction staff will be trained and experienced in emergency procedures in the event of accidental fuel spillages.

Machinery activities on site during the construction phase may result in contamination of runoff/ surface water. Potential impacts could arise from accidental spillage of fuels, oils, paints etc. which could impact surface water if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses. However, implementation of the mitigation measures outlined in the CEMP and detailed above will ensure that this does not occur.

Concreting operations carried out near surface water drainage points during construction activities could lead to discharges to a watercourse. Concrete

(specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora. However, control of run-off from concrete work areas as outlined in the CEMP will ensure that any impact will be mitigated.

6.6.1.4 Foul Water

Welfare facilities (canteens, toilets etc.) will be available within the construction compound and these will remain in place for the construction phase of the proposed development. The offices and site requirements will initially need to have their own power supply (generator), water deliveries and foul water collection until connections are made to the mains networks (refer to Section 6.6.2 Operational Phase below). All welfare systems will be fully sealed and temporary in terms of usage.

6.6.1.5 Water Supply

The works Contractor will be obliged to put Best Practice measures in place to ensure that there are no interruptions to the public/ private water supply for the area unless this has been agreed in advance.

Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

6.6.1.6 Earthworks - Subsoil/ Rock Removal and Compaction

Temporary storage of excavated subsoil and rock will be carefully managed in such a way as to prevent any potential negative impact on the receiving hydrological [and hydrogeological] environment. The material will be stored away from any surface water drains (see Section 6.4.2.3 above). Movement of material will be minimised to reduce degradation of soil/ rock structure and the generation of dust.

All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of potential contaminants to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the subsoil/ rock matrix excavated is contaminated, this will be segregated and appropriately disposed of by a suitably permitted/ licensed waste disposal contractor with appropriate record keeping from source to permitted disposal.

Ground investigations carried out by Ground Investigations Ireland (GII) at the site in 2021 (Refer to Chapter 5 where soil quality data and borehole data is assessed) found no signs of ground contamination at any of the exploratory holes (trial pits and boreholes) completed across the site. Nonetheless, all excavated materials will be visually assessed for signs of possible contamination such as staining and/ or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of potential contaminants to ensure that historical pollution of the subsoil has not occurred. Should it be determined that any of the soil/ rock matrix excavated is contaminated, this will be effectively segregated (and away from water features) and appropriately disposed of by a suitably permitted/ licensed waste disposal contractor (again with correct paper trail records maintained).

6.6.1.7 Protection of Hydrological / Hydrogeological Water Features

This section describes the specific mitigation measures implemented during construction for the protection of the existing identified surface water features and

maintaining the existing surface water drainage system. Given the interconnectivity between the identified surface water features and groundwater type features in what is a karst environment then all mitigation measure which apply to hydrology will also apply to hydrogeology (Refer to Chapter 5, Section 5.6).

These measures will be implemented in association with the measures described above to ensure the protection of all hydrological [and hydrogeological] attributes. Mitigation measures are further discussed in the CEMP and SWMP for the development.

Tooreen Lough

There will be no construction works carried out within Tooreen Lough. There will be no oil or subsoil storage in the vicinity of this feature. An ecological buffer of at least 10 metres applies to this feature.

It is proposed that that overland stream discharging from Tooreen Lough will be culverted. The culvert will be designed in accordance with *Section 50 of the Arterial Drainage Act, 1945*, as amended and the overground pipe will be adequately for winter flows. This will ensure continued conveyance of existing flows without any upgradient or downgradient impacts on flow or water quality. The culvert will be adequately sized for current and future flow conditions.

Ardnamurry Lough

There are no construction activities planned for this area and this feature is located upgradient and outside of the red line boundary, along the eastern boundary of the proposed development. Therefore, no mitigation measures are needed for this feature.

Swallow Hole (Receiving water from Tooreen Lough) located south of DC6

Prior to commencement of construction works, the discharge stream from Tooreen Lough and swallow hole will be clearly delineated and marked. The swallow hole will be surrounded by a concrete ring with chamber and accessed by a manhole cover to avoid blockage during works on the site. This swallow hole will be monitored daily to ensure it is free flowing. i.e. ensuring no change to the existing flow regime there.

Main Spring located north of DC6

Prior to commencement of construction works, the spring and areas around this feature will be clearly delineated and marked. There are no proposed construction works within this spring area and a buffer zone of at least 10 metres will be implemented to ensure that the integrity of the spring is protected. Therefore, maintaining the flow and water quality of this spring. Daily to weekly monitoring of the spring in terms of flow and water quality will be recorded during construction phase works.

Furthermore, provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems like this feature and hence protecting the integrity of this feature.

Pond located North of the Energy Centre

There are no construction activities proposed within this feature. It is proposed that the Energy Centre will be built up by infill material and a retaining wall will be built to protect the pond feature. An existing [field dividing] wall is in place and will be protected throughout the construction phase works.

As previously discussed, there will be no stockpiling of subsoil/ rock matrix by this feature as well as no fuel storage - fuel will be adequately stored in effective bunds located within the contractor compound. Provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems such as this feature and hence protecting the integrity of this attribute.

Ponds located North of the DC4

There are no construction phase activities proposed within these two (2) no. features, however the proposed Data Centre building DC4 is located in close proximity. It is proposed that the DC4 structure will be 'built up' using engineered infill material.

As previously discussed, there will be no stockpiling of subsoil/ rock matrix or fuel storage within 10 m of this feature and no fuel storage within this area. Fuel will be adequately stored in fully contained bunds located within the contractor compound. Provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces will be undertaken to prevent sediment washing into these ponds.

Karst Features - potential conduits/ flow paths

The protection and integrity of potential karst conduits (groundwater flow paths) and the associated mitigation measures during construction are discussed in Chapter 5 of this EIA Report.

6.6.2 Operational Phase

The development includes the storage of up to 7 no. bunded above ground bulk storage tanks for fuel oil distribution pumps, overground delivery pipeline to the belly tanks for diesel fired standby generators within each data storage facility. Both the Data Centres and Energy Centre building will have bulk oil storage. However oil storage is fully bunded, within areas of hardstand where rainage is designed to discharge through a petrol interceptor. These interceptors will ensure containment of any accidental leak/spill during refueling etc.

An additional oil interceptor will be installed upgradient of the attenuation pond to capture and treat any minor leaks from vehicles within car park areas.

The proposed surface water drainage service to the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage Systems (SuDS) elements. The proposed surface water drainage was designed in accordance with the SuDS Manual 2015.

6.6.2.1 *Emergency Response Procedures*

As normal for a development site of this type, all staff will be suitably trained in emergency response procedures and standard operating procedures (SOPs) to

respond to an on-site fuel spillage incident. All employees will be provided with such equipment, information, training and supervision as is necessary to implement the emergency response procedures and SOPs.

6.6.2.2 *Environmental Procedures*

Containment measures are included within the design to reduce potential for environmental impact. There will be comprehensive emergency response procedures and SOPs to respond to chemical/ oil spillage of all types. All employees will be provided with such equipment, information, training and supervision as is necessary to implement the emergency response procedures and SOPs.

6.6.2.3 Fuel Storage

The provision of suitable spill kit facilities and training of operatives in use of same; should be undertaken at the operational stage in order to manage any leaks from fuel storage and vehicles resulting in water quality impacts.

All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25% of the total volume of the substance stored and will designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004). As oil is only required for emergency operation only and testing, refuelling requirement is very low therefore the risk from tanker movement is low. A dedicated tanker unloading area will be provided at each of these service yards which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

The storage of fuel oil for the emergency generators should be restricted to the generator yard, the bulk fuel tanks and belly tanks should be bunded, and the over ground delivery pipeline double-lined. The final design for the diesel storage will be contained within a bunded area in line with the requirements of the *Guidance to Storage and Transfer of Materials for Scheduled Activities* (EPA, 2005).

In terms of the risk to the underlying aquifer (with connectivity to surface water features) this is considered low due to the mitigation in place for containment, delivery and distribution and use of oil interceptors on the stormwater system downgradient of the off-loading area and prior to discharge from the site.

6.6.2.4 Foul Water

During the operational phase, the site will operate in compliance with the requirements of an Irish Water (IW) licence for discharge to sewer.

The proposed Art Data Centre Development, subject to this planning application, will comprise a gravity foul sewer network as discussed under Section 6.4.2.4 above.

All wastewater works to be in accordance with Irish Water Code of Practice and the final discharge point from the Ennis North WWTP will be the River Fergus, as discussed under Section 6.4 above – Characteristics of the Proposed Development. Consultation with CCC personnel has confirmed there is adequate capacity for the wastewater at the receiving WWTP and a review of the licence shows that the plant is generally in compliance with its licence requirements.

6.6.2.5 Storm Water & Surface water run-off

The proposed development will provide full attenuation for increase in hardstand area in compliance with the requirements of the Greater Dublin Strategic Drainage Study. The proposed surface water drainage service to the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage Systems (SuDS) elements. The proposed surface water drainage was designed in accordance with the SuDS Manual 2015. This is further detailed under Section 6.4.2.3 Characteristics of the Proposed Development - Operational Phase.

A number of measures will be put in place to minimise the likelihood of any spills entering the water environment to include the design of the car park, fitting of refuelling areas with hydrocarbon interceptors and on-site speed restrictions. Refer to the Infrastructure Report for further details (CSEA, 2021).

It is proposed to ultimately discharge surface water from the proposed development, post attenuation and outflow restrictions into the existing main drainage feature in the wider area namely the Ballymacahill River.

To minimise any impact to receiving water flows, the design incorporates effective attenuation to greenfield run-off rates for new hardstanding areas following the Institute of Hydrology Report Number 124 (IH 124) Methodology. The proposed attenuation storage volumes are sized to accommodate any potential increase in surface water run-off rates up to the 1000-year return period storm event with an allowance for climate change effects. Run-off rates are controlled by a hydrobrake system which discharges attenuated water at greenfield run-off rates. These rates will mimic existing run-off rates and will not change the morphology of the nearby river.

All outfall structures will be designed with an outlet structure that includes headwall, wingwalls and a bed apron to prevent local scouring of the banks and the channel bed. This, together with management of flow to mimic current run-off rates, will ensure no measurable impact on river morphology, existing surface water flow hydraulics or the potential for an increase in the risk of flooding.

To facilitate high flood conditions at Tooreen Lough an overflow will be provided at the swallow hole to direct water to a localised area within the proposed development site to alleviate flood levels. Refer to Flood Risk Assessment Report (CSEA, 2021).

6.6.2.6 Protection of Surface Water Features

Intermittent and ongoing inspection and maintenance of the swallow hole south of DC6 discharge from Tooreen lough will be undertaken to ensure free flowing discharge to Ballymacahill River along the western boundary of the proposed development.

6.7 CUMULATIVE IMPACTS

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (as described in Chapter 3 and Appendix 3.1)) are discussed below.

6.7.1 Construction Phase

Impacts to water during construction are associated with spillage and leakage of oils and fuels and potential silt deposition in watercourses due to disturbance of land. With the proposed mitigation in place (as outlined in Section 6.6 above) including the management of run-off using sediment ponds, stockpiling of soil away from open water, and management of accidental discharges, there is low potential for construction at the proposed development to impact on receiving waters. Contractors for the proposed development will be contractually required to operate in compliance with the CEMP which includes the mitigation measures outlined in this EIA Report. With these measures in place, there will be no change in water body status, water quality or flow as a result of construction for the proposed project and the impact as described above are concluded as being of *imperceptible* significance with a *neutral* impact on water. The other developments will be required, during construction, to protect water quality in compliance with legislative standards for receiving water quality and having regard to the nature and extent of that development, the cumulative or in-combination impacts are considered to be of *imperceptible* significance with a *neutral* impact on water.

6.7.2 Operational Phase

The operation of the proposed development will have a long-term *imperceptible* significance with a *neutral* impact on quality due to the measures in place to protect water quality and manage stormwater discharge within the design for the proposed development. The proposed development has incorporated suitable containment measures for proposed oil storage, incorporated interceptors in areas of potential accidental spills/leaks and provided sufficient attenuation to manage run-off rates to greenfield run-off rates. The impact is considered to be of *imperceptible* significance with a *neutral* impact on water having regard to the designed mitigation measures. The other developments considered, which ae identified in Chapter 3 and Appendix 3.1, will be required during operation to meet legislative requirements in relation to water quality and mitigate for hardstand in terms of run-off rates. As such the cumulative or in-combination impacts are considered to be of *imperceptible* significance with a *neutral* impact on water.

6.8 RESIDUAL IMPACTS OF THE PROPOSED DEVELOPMENT

6.8.1 Construction Phase

The implementation of mitigation measures outlined above (Section 6.6) will ensure that the predicted impacts on the hydrological [and therefore the hydrogeological] environment do not occur during the construction phase and that the residual impact will be **short-term-imperceptible-neutral**. Following the TII (2009) criteria (refer to Appendix 6.1) for rating the magnitude and significance of impacts on the hydrological related attributes, the magnitude of impact is considered **negligible**.

6.8.2 Operational Phase

The implementation of the design and mitigation measures highlighted above (Section 6.6) will ensure that the predicted impacts on the hydrological [and therefore the hydrogeological] environment do not occur during the operational phase and that the residual impact will be **long-term-imperceptible-neutral**. Following the TII (2009) criteria (refer to Appendix 6.1) for rating the magnitude and significance of impacts on the hydrological related attributes, the magnitude of impact is considered **negligible**.

6.9 MONITORING OR REINSTATEMENT

6.9.1 Construction Phase

During construction phase the following monitoring measures are proposed subject to planning conditions:

- Weekly checks will be carried out to ensure surface water drains are not blocked by silt, or any other items, and that all soil storage is located at least 10 metres from the nearest surface water receptors. A regular log of inspections will be maintained, and any significant blockage or spill incidents will be recorded for root cause investigation purposes and updating procedures to ensure incidents do not re-occur.
- Daily inspection of surface water run-off from the attenuation pond and sediment controls e.g. silt traps will be carried during the construction phase. Continuous monitoring system for pH, temperature, electrical conductivity and total organic carbon to be installed to ensure water quality discharging from site is of good quality and meets the respective S.I. threshold values.
- Regular inspection of construction mitigation measures will be undertaken e.g. concrete pouring, refuelling etc.
- Regular monitoring of the surface water drainage features and swallow holes to ensure all are free flowing.
- Regular monitoring of the silt traps/ trenches/ fences around established buffer zones to ensure on-going protection of all surface water attributes.

6.9.2 Operational Phase

Maintenance of the surface water drainage system and foul sewers as per normal urban developments is recommended to minimise any accidental discharges to ground.

Long term environmental monitoring will follow the approved Environmental Management Plan for the completed development and will include key details as per any permitted discharges.

Inspection and maintenance of the swallow hole south of DC6 discharge from Tooreen Lough to ensure free-flowing discharge to Ballymacahill River along the western boundary of the proposed development.

Three yearly inspection of bund integrity as per EPA guidance.