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Introduction

Background

7.1 This chapter of the EIAR provides a description of the surface water (hydrology) and groundwater (hydrogeology) conditions in the application area within the context of the regional setting, and assesses the potential impacts the proposed development will have on surface water and groundwater. Mitigation measures, if required, are proposed.

7.2 Available information on the surface water and groundwater of the site and area around the Murrens Townland, Oldcastle, Co. Meath was collated and evaluated.

Proposed Development

7.3 The proposed development is described in detail in Chapter 2: Project Description of this EIAR and only those elements which relate to water and water management are presented here for the purpose of this chapter. The proposed site layout is shown on **Figure 2-3**.

7.4 The planning application area includes a newly proposed extension area, which comprises c. 4.2 hectares of an area of former woodland plantation within an overall planning application area of c. 5.8 hectares.

7.5 The proposed development will consist of:

- Extraction of sand and gravel (dry working) over a lateral extension extraction area of c. 4.2 hectares adjacent to the existing permitted sand and gravel pit development (P. Ref. KA14/1129 & ABP PL.17.245257) with access gained from the existing pit;
- The restoration of the lands, as part of the overall adjacent sand and gravel pit restoration. This will return the lands to a combination of agricultural grazing and beneficial ecological habitat; and
- All associated site ancillary works within an overall application area of c. 5.8 hectares.

Water Management

7.6 The sand and gravel material will be extracted above the groundwater table. Therefore, no surface water drainage infrastructure is required within the extension area. Rain falling across the site will percolate naturally to the ground as it does in the existing pit.

7.7 Extraction within the existing pit is carried out as a dry extraction operation above the groundwater table. It is proposed that extraction within the extension area will also be carried out above the groundwater table, with the proposed pit floor over the extension lands of between 123m AOD and 120mAOD. It is proposed to extract the sand and gravel on a gradual basis with the extraction face advancing southeast from the existing pit into the extension lands.

7.8 The sand and gravel material will continue to be processed at the existing BD Flood site, and which includes the washing and screening of material using existing fixed plant. All water used in the washing process is treated within the existing site washing plant system with c. 90% recycled back to the washing plant (i.e. it is a closed system with no discharges to surface water).

7.9 The existing water management system at the overall landholding site for processed water to be recycled / used for washing, is relatively simple and consists of:

- rainfall infiltrates to ground across the majority of the overall site. Rainfall from roadways, hard standing and roof areas is allowed to infiltrate to ground.

- groundwater is present in a clear water sump on the floor of the eastern pit void at the lowest point, and is kept separate from surface water runoff by berms on the floor of the pit;
- water used for processing aggregates, readymix and concrete block production plant and dust suppression is sourced from an onsite clean water pond. The wash water is recycled through the settlement lagoons / tanks and is reused in the batching process; this water is topped up as required from the onsite clear water pond on site;
- an existing proprietary treatment system, comprising treatment unit with percolation area, treats foul water from the site;
- there is bunded fuel storage at the site with hardstand refuelling area and a mobile tanker is used for refuelling the mobile crusher and plant on the pit floor. Runoff from the paved hard stand area in front of the workshop is managed and treated through a hydrocarbon separator before percolation to the ground;
- water for welfare use in the office / canteen / toilet facilities is sourced from a deep well (borehole) located beside the workshop;
- bottled water is used in the site canteen for personal use including the preparation of hot drinks etc.; and
- there is no discharge from the site and there are no surface water courses on the site.

Scope of Work

7.10 The scope of this chapter includes:

- an assessment of the existing surface water and groundwater within approximately 5 km of the application area;
- an assessment of the potential impact of the proposed sand and gravel extraction on surface water and groundwater; and
- where necessary, recommendation(s) for mitigation measures to reduce or eliminate any potential impacts.

Project Team

7.11 This chapter of the EIAR was prepared by SLR Consulting Ireland. The project team consists of:

- Clio Greenbank, Graduate Hydrogeologist, BSc. MSc. (Hydrogeology)
- Peter Glanville, Technical Director (Hydrology) BA (Geography), PhD (Geomorphology), PGeo, EurGeol and MCIWEM; and
- Dominica Baird, Technical Director (Hydrogeology) BSc (Earth Science), MSc (Hydrogeology), CGeol, EurGeol, MIAH.

Limitations / Difficulties Encountered

7.12 The evaluation of the hydrological and hydrogeological environment provided here relies on the detailed assessment, visual inspections conducted during site visits, a comprehensive dataset of monitoring records, publicly available information, and anecdotal evidence from local personnel.

7.13 No constraints or challenges were encountered during the compilation of this chapter in the Environmental Impact Assessment Report (EIAR).

Regulatory Background

Legislation

7.14 The key European Directives / European Union Legislation which apply to this Chapter of the EIAR and the hydrology and hydrogeology assessment presented herein are:

- Environmental Impact Assessment Directive (2011/92/EU); and
- Directive of the European Parliament and of the Council amending Directive 2011/92/EU on assessment of effects of certain public and private projects on the environment (2014/52/EU).

7.15 Other European Directives to which this EIAR makes reference, or has had regard, are listed in **Appendix 7-A**.

7.16 Irish Government Acts, National Legislation and Regulations which apply to this Chapter of the EIAR and the surface water and groundwater assessment presented herein are also listed in **Appendix 7-A.**

7.17 Most notably, under Regulation 4 of the Groundwater Regulations 2010, a duty is placed on public authorities to promote compliance with the requirements of the regulations and to take all reasonable steps including, where necessary, the implementation of programmes of measures, to:

> *"(**a**) prevent or limit, as appropriate, the input of pollutants into groundwater and prevent the deterioration of the status of all bodies of groundwater;*
>
> *(**b**) protect, enhance and restore all bodies of groundwater and ensure a balance between abstraction and recharge of groundwater with the aim of achieving good groundwater quantitative status and good groundwater chemical status by 2015 or, at the latest, by 2027;*
>
> *(**c**) reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater;*
>
> *(**d**) achieve compliance with any standards and objectives established for a groundwater dependent protected area included in the register of protected areas established under Regulation 8 of the 2003 Regulations [S.I. No. 722 of 2003] by not later than 2015, unless otherwise specified in the Community legislation under which the individual protected areas have been established."*

Planning Policy and Development Control

7.18 The Planning Policy and Development Control relating to water at the site in this EIAR is set out in the Meath County Development Plan 2021-2027.

Guidelines and Technical Standards

7.19 The following key guidelines apply to this hydrology and hydrogeology assessment:

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements, April 2013;
- National Roads Authority, 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports: Environmental Protection Agency; and

- Geological Survey of Ireland - Irish Concrete Federation, 2008. Geological Heritage Guidelines for the Extractive Industry.

7.20 Additional guidelines and technical standards which apply to this Chapter of the EIAR and the hydrology and hydrogeology assessment presented herein are listed in **Appendix 7-A**.

Receiving Environment

Study Area

7.21 For the purposes of this assessment, the study area comprises the application site and the surrounding area (up to 5 km radius) to reflect the sensitivity of the surface water and groundwater.

7.22 This is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013) which states that a minimum distance of 5 km should be reviewed in the context of the geological environment, and the scale of development. The IGI states that the study area should be increased as appropriate to reflect the sensitivity of the subsurface and recommends 5 km where karst environments occur.

Baseline Study Methodology

7.23 A detailed geological, hydrological and hydrogeological dataset has been collected as part of this EIAR study.

7.24 The investigation methodology adheres to the Environmental Protection Agency's (EPA) guidelines on environmental impact assessments and the IGI's recommendations on Geology in Environmental Impact Statements.

Desk Study

7.25 Existing information on the geology, hydrogeology and hydrological features of the Murrens area and its surrounds was collated and evaluated. The desk study involved the examination of several datasets to determine the geological and hydrogeological setting of the area, as detailed in **Table 7-1**.

Table 7-1: Regional data consultation

Data	Dataset Source
Soils	• Irish Soils Information System – Teagasc
Subsoil Geology	• Teagasc/GSI/EPA Subsoil Mapping
Bedrock Geology	• GSI Groundwater Data Viewer - Bedrock Geology
Surface Water	• OSi Discovery Series mapping; • Environmental Protection Agency online mapping; • Water Framework Directive; • OPW CFRAM; and • Current Meath County Council Development Plan.

Data	Dataset Source
Groundwater	• GSI Groundwater Data Viewer - bedrock and gravel aquifers, vulnerability, water supplies, groundwater recharge; • GSI Groundwater body description documents; • Environmental Protection Agency water maps; and • National Federation of Group Water Schemes (NFGWS) Data Viewer.
Climate	• Met Eireann
Protected Areas, Environmental Pressures	• Environmental Protection Agency; and • National Parks and Wildlife Service

Detailed Site Investigations

7.26 In addition to the above desk study of publicly available data, extensive data gathering has been undertaken at the site. The works carried out for assessing hydrology and hydrogeology in the application area is outlined as follows:

- Installation of two new (2025) groundwater monitoring boreholes across the proposed development area, to monitor both the sand and gravel superficial deposits and underlying sandstone aquifer; and
- Manual dipping of groundwater wells from four groundwater monitoring boreholes which includes two existing boreholes, and the two new boreholes drilled in 2025.

Site Setting

7.27 The proposed pit extension area is located to the southeast of the existing pit and represents c. 4.2 hectares set within an overall landholding of c. 254 hectares.

7.28 The extension lands subject of this planning application are located with the townland of the Murrens. Ground levels on the extension area gently slope from north to south, with the northern tip of the site being at c.140m AOD, and the southern boundary at c.132m AOD. The surrounding landscape is gently undulating at elevations of between 120 and 140m AOD.

7.29 The planning application are extends to c. 5.8 hectares and is an area of previous plantation woodland located immediately adjacent and southeast / east of the existing sand and gravel pit development permitted by planning permission KA/141129 (ABP PL17.245257).

7.30 The application site itself comprises rough ground and scrub terrain resulting from cleared forestry. Land situated to the north-west and west comprises the existing BD Flood sand and gravel pit, and associated facilities. The site is bounded to the south and east by a further block of plantation woodland and pastural farmland. The lands to the north of the application site are also subject to quarrying and are in the separate ownership of JJ Flood. The character of the wider area is predominantly agricultural, interspersed with other small blocks of plantation woodland, mineral extraction sites and small lakes. Small rural settlements and isolated farmsteads are scattered along the local road network. The regional R195 route is a dominant feature to the east of the application site.

7.31 There are no watercourses observable within the extension boundary nor in the immediate surrounds. The Lough Lene-Adeel Stream, a tributary of the River Deel, flows approximately 700m south of the site. A small unnamed stream, a tributary of the River Inny is observed c. 1.1km to the north of the application site.

7.32 Located 700m to the southwest of the site is the White Lough, Ben Loughs and Lough Doo SAC. The Lough Bane and Lough Glass SAC (Site Code 002120) is located c. 1.9km further to the southeast.

Rainfall and Climate

7.33 There is no Met Éireann rainfall gauging station near to the application site.

7.34 A Met Éireann meteorological station for which long-term average annual rainfall is available, is the Casement station located c. 71 km to the east of the site. The long-term annual average for this station is presented on **Table 7-2**.

Table 7-2: Long term average annual rainfall (1981-2010), Casement station

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept.	Oct	Nov	Dec	Avg.
63.8	48.5	50.7	51.9	59.1	62.5	54.2	72.3	60.3	81.6	73.7	75.7	754.2

Soils and Geology

7.35 The local and regional soils and geology are discussed in detail within Chapter 6 of this EIAR, with a summary provided below. The soils are shown in **Figure 6-2**, subsoils are presented in **Figure 6-3,** and Bedrock Geology is presented in **Figure 6-4**.

7.36 A summary if the regional geology stratigraphy is shown in **Table 7-3** below.

Table 7-3: Regional geological stratigraphy of the site

Strata	Description	Estimated Thickness
Rathowen Soil Association	Luvisols, Surface-water Gleys, Groundwater Gleys on drift.	c. 0.4 m
Limestone Sands and Gravels	Lower Carboniferous limestone sands and gravels	c. 9-11 m
Derravarragh Formation	Unfossiliferous dark grey thinly bedded calcsilicates and wackestones with thin shales	>20 m
Lucan Formation	Dark grey-black, fine-grained limestone with interbedded calcareous shale	Unknown

Soils and Subsoils

7.37 The Irish Soil Information System project has developed a national association soil map for Ireland; the project is co-funded by Teagasc and the Environmental Protection Agency (EPA). The soils are discussed in detail in Chapter 6 of this EIAR.

7.38 As presented on **Figure 6-2**, the principal soils across the region belong to the Elton Series and the Rathowen Series. Both comprise "*Luvisols, Surface-water Gleys, Groundwater Gleys on drift*" and are considered to be moderately and imperfectly drained.

7.39 The application site itself is entirely underlain by the Rathowen series.

7.40 Isolated areas of Peat are observed across the region, typically associated with valley features.

7.41 The EPA website publishes subsoil maps created by the Spatial Analysis Unit and Teagasc in collaboration with the Geological Survey Ireland (GSI). The subsoils are discussed in detail in Chapter 6 of this EIAR.

7.42 As presented on **Figure 6-3**, the regional subsoils are chiefly derived from either glacial origins or Limestone. The main subsoils are 'Basic Esker Sands and Gravels' which underlie the northern area of the application site, the northern area of the wider site and the historic quarry area; 'Limestone Sands and Gravels' which underlie the application site and the

southern area of the wider site, Limestone Till which is observed immediately to the north of the wider site, and Chert Till which is observable to the south-west.

Local Bedrock Geology

7.43 The GSI online map viewer (1:100,000 geology map) has been reproduced on **Figure 6-4**. The published mapping indicates the application site and the entirety of the wider study area, is underlain by the Derravaragh formation, which comprises "*unfossiliferous dark grey thinly bedded calcsilicates and wackestones with thin shales*". A site investigation from 2016 confirms the upper horizon of the bedrock is encountered at depth ranging from 7m BGL to 11.5m BGL.

7.44 The Lucan (Calp) formation does not outcrop beneath the application site but is observed immediately to the north of the wider site. The formation consists of "*dark grey-black, fine-grained limestone with interbedded calcareous shale*".

7.45 The bedrock dips in a south-east direction at around 15 degrees. The boundary between the Derravaragh formation and the Lucan formation is an extensional fault, which is encountered 800m east of the application site. The fault is observed to strike in a northwest-to-southeast direction.

Karst

7.46 The Derravaragh formation is a karstified bedrock. The GSI have registered 68 karst landforms within the 5km study area. All are within the Derravaragh formation, and comprise spring features, swallow holes, caves or enclosed depressions, turloughs and superficial solution features. The closest feature to the application site is an enclosed depression, located 180m to the southeast.

7.47 The Lough Owel and Lough Lene lack significant surface inflows and are predominantly groundwater-fed, implying a regional groundwater flow system sustained by karstified bedrock. This was confirmed through groundwater tracing which suggested rapid flow (up to 80m/hr) within karst conduits which outfall to the Lough Owel and Lough Lene.

Groundwater - Hydrogeology

Aquifer Characteristics

7.48 Published mapping provided by the GSI[1], reproduced as **Figure 7-1**, confirms that the application site is underlain by a *'Locally Important Aquifer – Karstified'* relating to the Derravaragh formation. This aquifer has an approximate area of 146,85 km^2 and is bounded to the north and east by extensional fault features. The Lucan formation is also recognised as a '*Locally Important Aquifer – Bedrock which is moderately productive only in local zones*'.

7.49 Most of groundwater flow occurs in the top 30 m of the rock, in the highly weathered layers through an active present-day karst system.

7.50 The groundwater in the sand and gravel subsoils at the proposed development site are not classified by the GSI as a discrete Sand & Gravel aquifer. To be classified as a Sand & Gravel aquifer the highly permeable subsoils need to be at least 10m thick, or has a saturated thickness of at least 5m and having a continuous area of at least 1km^2.

7.51 The fault systems are likely to act as conduits. Tracing experiments conducted[2] showed that flow into Lough Lene took place at a flow rate of 80m/h, suggesting that the faults are hydraulically connected.

Groundwater Vulnerability

7.52 The GSI has developed a groundwater vulnerability classification for Ireland, a summary of which is presented in **Table 7-4** below.

7.53 The groundwater vulnerability at a particular point is controlled by the natural geological and hydrogeological characteristics. This includes the nature of the subsoils (i.e., their permeability characteristics), the type of recharge (point or diffuse), and the thickness of the unsaturated zone (depth to groundwater).

7.54 Regional groundwater vulnerability mapping is presented as **Figure 7-3**; this indicates that the groundwater beneath the application site has a 'High' vulnerability rating, indicating resulting from a subsoil of high permeability, and a thickness which is greater than >3m.

Table 7-4: GSI Groundwater vulnerability rating

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			**Unsaturated Zone**	**Karst Features**
	High permeability (sand / gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/Gravel aquifers only)	(< 30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A
Notes:	(i) N/A= not applicable (ii) Precise permeability value cannot be given at present. (iii) Release point of contaminants is assumed to be 1-2m below ground surface.				

7.55 The GSI's online database identifies the hydrogeological setting of the application site as high permeability subsoil overlain by shallow well-drained soil. The effective rainfall (rainfall after evaporation) is 785 mm/yr. The groundwater recharge at the site is between 501 mm/yr. - 550 mm/yr. A recharge cap does not apply to the site.

Groundwater Bodies

7.56 The Extension site is underlain by the Tynagh Gravels groundwater body (GWB), the and the Derravarragh GWB is located to the south of the Tynagh Gravels GWB. The Tynagh Gravels GWB is bounded to the north and east by the Inny GWB, the Athboy GWB to the south-east and by the Ballymanus GWB to the west, as presented on **Figure 7-4**.

[2] McDonald (1988). Aspects of hydrology in and around Fore. Unpublished Moderatorship dissertation, Geography Department, Trinity College Dublin, 88 pp.

7.57 The Tynagh Gravels GWB covers an area of 16.27 km^2. The groundwater body mainly consist of sand and gravels, which are described as "clean, coarse esker & fan gravels" (Woods, 1988) with an estimated thickness of 5 to 15 metres.

7.58 The Tynagh Gravels GWB has a 'Good' WFD Status (2016-2021) but is classed as 'At Risk' under the WFD Third-Cycle from nutrient pollution and chemical pollution due to agriculture pressures on groundwater. The GWB is also at risk from forestry pressures on surface water quality, risks from forestry activities include forestry road construction, drainage, afforestation or replanting and clear felling. In addition, the Tynagh Gravels are classified as having a High groundwater vulnerability to potential pollution with '*10m depth of highly permeable sands and gravels in a locally important sand and gravel aquifer*.'

7.59 Underlying the Tynagh Gravels GWB is the Derravarragh GWB which covers an area of 118.94 km^2. The thickness can be variable but has been recorded at 64m.

7.60 The Derravarragh GWB has a 'Good' WFD Status (2016-2021) but is classed as 'At Risk' under the WFD Third-Cycle and faces the same pressures on groundwater as the Tynagh Gravels GWB outlined above. The vulnerability for the GWB ranges from 'Low' to 'Extreme' as bedrock outcrops to the south of the site.

7.61 Diffuse recharge will occur to both groundwater bodies through percolation through the soils. The Tynagh GWB is hydraulically connected to the Derravarragh GWB. The Derravaragh GWB can be recharged through point or diffuse recharge.

7.62 Groundwater will discharge locally to streams and lakes crossing the aquifer. Owing to the moderate to high productivity of the aquifers it is likely that moderate groundwater – surface water interactions are taking place. Baseflow to rivers and streams is likely to be high.

Groundwater Monitoring Network

7.63 Six groundwater monitoring boreholes have been installed across the wider site during two ground investigation (GI) campaigns. The first GI was undertaken in Summer 2016 and involved the installation of 3 boreholes (MH1, MH2 and MH3), these are located to the west of the application site, see **Figure 7-4**.

7.64 The second GI was undertaken in late Spring 2025 and involved the installation of 3 further boreholes (MH4, MH5 and MH6). MH4 and MH6 are located to the south of the application site, whilst MH5 is located to the north-north-east. A location plan is presented **as Figure 7-4** and borehole logs are included in **Appendix 7-B** and **Appendix 7-C**.

7.65 Drilling was carried out by Causeway Geotech and was supervised by SLR personnel.

7.66 All borehole installations included a gravel pack installed in the annular space between the slotted casing and the borehole; a bentonite seal was installed above the gravel pack to prevent the entry of surface water runoff from surrounding areas flowing directly into the boreholes.

7.67 The boreholes encountered sands and gravels at all locations at the site, underlain by low permeability clay just at MH1, west of the proposed extraction area.

7.68 Sand and Gravel was directly underlain by limestone at MH2 and MH3, towards the north to northwest of the site and outside the extension area. However, the Sand and Gravel strata overlying the limestone bedrock at all boreholes was dry during drilling. All the MH4-MH6 encountered sands and gravels at all locations at the site. The sands and gravels were directly underlain by Limestone at all of the boreholes. The sand and gravel strata overlying the bedrock at all boreholes were dry during drilling.

7.69 Details of groundwater monitoring boreholes and additional GW1 borehole installed on-site are presented in **Table 7-5**. Groundwater monitoring borehole locations are presented in **Figure 7-5**.

Table 7-5: Details of groundwater monitoring boreholes on-site

BH ID	Location	Depth (m BGL)	Water strikes (m BGL)	Screened Strata
MH1	E:651874 N:774016	21	No defined strikes	Sand and Gravel, Limestone
MH2	E:651708 N:774484	27	Water strike at 25m in Limestone-	Sand and Gravel
MH3	E:652077 N:774407	30	No defined strikes	Sand and Gravel
MH4	E: 652268 N: 774153	28	No defined strikes	Sand and Gravel and Limestone
MH5	E: 652144 N: 774650	28	No defined strikes	Sand and Gravel and Limestone
MH6	E: 652475 N: 773887	22	Water strike at 16m in Limestone-	Sand and Gravel and Limestone

Groundwater Levels

7.70 Groundwater levels have been manually measured in four of the wider site boreholes, MH1, MH2, MH5 and MH6. At present, only one collection round has been undertaken on the 24th April 2025.

7.71 Initial groundwater level data across the wider site indicates that groundwater levels are highest in the northeast (122.40m AOD in MH5) and are lowest in the southwest (110.61m AOD in MH1). Groundwater is therefore inferred to be flowing in a broad south-westerly direction, towards Loch Annagh. Groundwater levels are presented in **Table 7-6**.

Table 7-6: Groundwater Levels

Borehole ID	GWL (mAOD) 24/04/2025
MH1	110.61
MH2	118.56
MH5	122.4
MH6	114.33

Surface Water - Hydrology

Surface Water Bodies

7.72 Surface water bodies in the area are shown in **Figure 7-5**.

7.73 There are no surface water bodies within the Extension Boundary.

7.74 There is a river located along the northern Landholding boundary, the River Inny (INNY _020). The river flows to the north of the site into Lough Naneagh.

7.75 The are two lakes to the southwest of the site, the extension, Lough Doo, c. 970 m to the west, and Annagh Lough, c. 800m to the southwest. Annagh Lough is fed by the Lough Lene-Adeel Stream _010 (IE_EA_07L030040).

7.76 The Lough Lene-Adeel Stream flows into the River Deel (IE_EA_07D010080) which discharges into the River Boyne.

Catchment

7.77 The site is located in the northern part of the Boyne Catchment (ID 07), which has an area of 2,696 km^2. The catchment encompasses the region drained by the Lough Lene-Adeel Stream and the River Deel.

7.78 The site is situated in the Deel[Raharney]_SC_010 Sub-Catchment, see **Figure 7-5**, which lies within the Boyne catchment.

Flooding

7.79 The Office of Public Works (OPW) is the government agency with statutory responsibility for flooding in Ireland. The existing CFRAM and NIFM flood maps show that the site is at not at risk of fluvial flooding. The available GSI data does not indicate that the site is vulnerable to groundwater flooding. There are no records of historic flooding in the OPW database within 2 km of the site.

Surface Water Biological Quality

7.80 The surface water quality data of surface water bodies within the study area, was obtained from EPA web map. The EPA has a number of registered surface water monitoring stations throughout Ireland, which are continuously recording near real time river ecology monitoring results. The results are presented through “Q” values, that are reflecting average water quality at any location. These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site. Results scores are in range from 1 to 5, from the lowest (1) to the highest (5) water quality rating.

7.81 The closest monitoring station encountered is the Deel Br located southeast of the extension site.

7.82 The latest dataset reports a water quality Q value of 4, meaning that the river is good and in satisfactory condition. Since 1990, the Lough Lene-Adeel Stream has declined in water quality status from 4-5 to 4 since 1990.

7.83 A summary of the monitoring data collected from the two downstream monitoring stations is presented in **Table 7-7**, the Deel (Raharney) station was closed in 2003.

Table 7-7: EPA biological water quality ratings

Station ID	RS07L030040	RS07D010090
Station Name	Br u/s Lough Adeel	DEEL (RAHARNEY) – E Br u/s Lough Analla
EPA Watercourse Name	Lough Lene-Adeel Stream	Deel - Raharney
Approx. Dist. from site (km)	6 south	c. 9 south
1990	4 – 5	3
1994	4	3 – 4
1997	3 – 4	4
2000	4	3 – 4
2003	3 – 4	3 – 4
2006	3 – 4	-
2009	3 – 4	-
2012	3 – 4	-
2015	3	-
2018	3 – 4	-
2020	4	-
2024	4	-

Protected Areas

7.84 There are two Natura 2000 sites (SAC or SPA) within 5 km of the site.

- White Lough, Ben Loughs and Lough Doo SAC (**001810)**, located c. 700m southwest of the site, cited as SACs as they are hard water lakes with White-clawed crayfish present; and
- Lough Bane And Lough Glass SAC (**002120**), located 1.8 km south. It is cited as an SAC as they are hard water marl lakes with White-clawed crayfish present.

Water Environment Receptors

7.85 A review of the baseline conditions for the site and surrounding area has identified the following water environmentally sensitive receptors in the receiving environment:

- Regionally important karstified limestone bedrock aquifer;
- White Lough, Ben Loughs and Lough Doo SAC, located c. 700m southwest of the site; and
- The Lough Lene-Adeel Stream, located c. 1.5km southwest of the site, measured at its closest point.

7.86 For each identified receptor, the significance and sensitivity of the receptor is assessed in **Table 7-8** below and a rating (High / Medium / Low / Negligible) applied, based on the methodology outlined in existing guidance and reproduced in **Appendix G**.

Table 7-8: Existing environment - significance and sensitivity / importance

No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance / Sensitivity Rating (H/M/L/N)
1	Lough Lene-Adeel Stream	Surface watercourse c. 700m southwest of the site. Site is within Deel catchment.	A stream located southwest of the site that flows into the River Deel and the Lough Annagh. River is assumed to be in hydraulic continuity with the site through groundwater. Stream is classified as 'Good' status and has declined in status from 4-5 to 4 since 1990	**Medium** – Attribute has a medium quality or value on a local scale
2	White Lough, Ben Loughs and Lough Doo SAC	Surface waterbody.	The loughs in this SAC are hard water, so are groundwater-fed.	**High** – Attribute has a high quality or value due to international designation of watercourse
3	Locally important Limestone bedrock aquifer	Limestone bedrock aquifer is within the Tynagh GWB which has a good status (2016 - 2021).	Bedrock aquifer underlying sand and gravel superficial deposits. Sand and gravel deposits are not classified as an aquifer.	**High** – Attribute has a medium quality or value on a local scale (Locally Important Aquifer)

Receiving Environment - Baseline Summary

7.87 The site is underlain by limestone bedrock of the Derravaragh Formation and by sand and gravel subsoils which are Limestone sands and gravels.

7.88 The site is within the Boyne Catchment in the Lough Lene-Adeel Stream River Sub-basin.

7.89 The closest waterbody to the site extension area is the Lough Lene-Adeel Stream which flows through the Annagh Lough, approximately 700m southwest of the site.

7.90 Under the WFD classification the Lough Lene-Adeel Stream is classified as Good Status and is designated under the Third-Cycle as being 'At Risk' due to agricultural pressures.

7.91 There are no recorded flood events near the site, nor is there any risk of potential flooding.

7.92 The site is located within the Tynagh Gravels Groundwater Body (GWB), the groundwater in the gravels is not classified as a Sand & Gravel Aquifer by the GSI.

7.93 The bedrock aquifer in the area is classified as a locally important aquifers, with an area being classified as a Regionally Important Karstified Aquifer. The aquifer at the site is classified as a locally important karstified (Lk) aquifer. The GWB is classified as Good under WFD classification.

7.94 The groundwater vulnerability is classed as High due to the preamble nature of the sand and gravels material.

7.95 Three monitoring boreholes have been installed on the extension site area (MH04-MH06) with a maximum depth of 28m bgl. The maximum monitored groundwater level from the April 2025 monitoring round was recorded at 122.40m AOD.

7.96 The sand and gravel extension area pit floor levels will be maintained above the high groundwater level.

7.97 A well survey was carried out and no private water supplies were found in the surrounding area.

Impact Assessment

Evaluation Methodology

7.98 The potential direct and indirect impacts to surface water and groundwater associated with the proposed sand and gravel pit continued use and extension at Murrens are initially assessed in this chapter without any mitigation measures in place.

7.99 The methodology applied here is a qualitative risk assessment methodology in which the nature of the potential impacts are described in terms of the character, magnitude, duration, probability and consequence of the impact are considered. The terms used to describe the potential hydrological and hydrogeological impact or effects are explained in tables reproduced in **Appendix 7-E**. The cumulative impact of any potential impacts is also assessed.

7.100 The description of the potential impact is then screened against the significance and sensitivity of the receiving environment to establish the overall significance of the potential impact (without mitigation). The classification of the impact significance is determined using the matrix from the EPA Guidelines (2022) which is reproduced in **Appendix 7-F**.

7.101 This approach provides a mechanism for identifying the key areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the proposed development. Following consideration of mitigation measures (existing and proposed) an assessment of the residual impacts arising from the proposed development is provided.

7.102 The following sections identify the potential impacts of the proposed development on the hydrogeological and hydrological environments. It also assesses the likelihood of occurrence of each identified impact. As previously noted, the impacts are initially assessed with no mitigation or design measures incorporated to reduce the risk.

7.103 The potential direct and indirect impacts to surface waters and groundwater during the Construction Stage (site preparation), the Operation Stage (extraction and processing) and Post Operational Stage (site restoration) are discussed below.

Construction Stage (No Mitigation)

7.104 The potential direct and indirect construction stage impacts to surface waters and groundwater are discussed below. In the context of the proposed sand and gravel pit continued use and extension, the construction stage is taken to comprise the stripping stage where in-situ soils and subsoils are removed and stockpiled before extraction activities can commence, as well as some limited activity setting up required site infrastructure.

Direct Impacts

Surface Water

7.105 There is no discharge from the proposed sand and gravel pit site to any surface watercourse and therefore there are no direct negative impacts on surface water quality or quantity during this stage.

Groundwater

7.106 The accidental leaking or spillage of fuel and/or other petroleum-based products could also impact on groundwater in the bedrock aquifer.

7.107 Extraction will comprise dry working above the groundwater level in the sand and gravel deposits. There will be no dewatering associated with the proposed development and therefore there will be no impact on groundwater flows or quantities during this stage.

Indirect Impacts

Surface Water

7.108 Accidental leaking or spillage of fuel and/or other petroleum-based products at the site could also impact on the Lough Lene-Adeel Stream.

7.109 Any impact on the Lough Lene-Adeel Stream could impact the downstream surface water bodies, i.e. the Deel River, at distance from the site.

Groundwater

7.110 Accidental leaking or spillage of fuel and/or other petroleum-based products could also indirectly impact on local water supplies.

Protected Areas

7.111 The White Lough, Ben Loughs and Lough Doo SAC is located downstream of the Deel River, which is fed by the Lough Lene-Adeel Stream. Any indirect impact on the Lough Lene-Adeel Stream could impact the White Lough, Ben Loughs and Lough Doo SAC, located at distance downstream.

Operational Stage Impacts

7.112 There is the potential for direct impacts on groundwater and indirect impacts on surface water and groundwater arising from the proposed sand and gravel pit extension during the operational stage. Potential impacts on surface water and groundwater have been identified and are outlined below.

Direct Impacts

Surface Water

7.113 There will be no discharge from the proposed sand and gravel pit extension to the nearby streams and there will therefore be no direct impacts on surface water quality or quantity during the construction stage.

Groundwater

7.114 An accidental leaking or spillage of fuel and/or other petroleum-based products could also impact on groundwater in the bedrock aquifer.

7.115 The proposed sand and gravel pit will be worked at all times above the groundwater in the sand and gravel deposits, meaning there will be no requirement for dewatering of shallow groundwater to facilitate aggregate extraction. As there is no dewatering associated with the proposed development, there will be no impact on shallow groundwater flow or quantity.

7.116 The proposed development will remove the direct impact of agriculture pressures from the site on groundwater over the duration of the project.

Indirect Impacts

Surface Water

7.117 An accidental leaking or spillage of fuel and/or other petroleum-based products could impact on the Lough Lene-Adeel Stream.

7.118 The proposed development will remove the indirect impact of agriculture pressures from the site on surface water over the duration of the project.

Groundwater

7.119 An accidental leaking or spillage of fuel and/or other petroleum-based products could impact on groundwater in the bedrock aquifer.

Protected Areas

7.120 The White Lough, Ben Loughs and Lough Doo SAC is located downstream of the Deel River, which is fed by the Lough Lene-Adeel Stream. Any indirect impact on the Lough Lene-Adeel Stream could impact the White Lough, Ben Loughs and Lough Doo SAC, located at distance downstream.

Post - Operational Stage Impacts

Direct Impacts

7.121 A restoration scheme has been prepared for the proposed site and will be implemented following permanent cessation of extraction activities, refer to Chapter 2 of the EIAR for details.

7.122 There are no anticipated direct impacts from the post - operational stage.

Indirect Impacts

7.123 There are no anticipated indirect impacts from the post - operational stage.

'Do-nothing Scenario'

7.124 If the proposed development is not permitted, the existing sand & gravel pit will remain, and the proposed extension area will remain as is in mixed agricultural and forestry use. The aggregate resource will remain in the ground and alternative pit development will be required at other locations to provide aggregate material for manufacturing and construction activities.

7.125 The status of the Lough Lene-Adeel Stream is in decline, and in May 2024 was classified as 'At Risk' due to agricultural and forestry pressures. The proposed development will remove the direct and indirect impact of agriculture pressures from the site on groundwater and surface water over the duration of the project.

Rating of Identified Potential Impacts

7.126 The potential impacts outlined above during the construction and operational stages have been described in terms of the character, magnitude, duration, probability and consequence, and each impact is rated in terms of High (H), Medium (M), Low (L) and Negligible (N) based on the magnitude, extent, duration and consequence of the identified effects.

7.127 The description of the effects and rating for each identified impact is shown in **Table 7-9** below.

Significance of Impacts

7.128 The significance of impacts is based on the significance and sensitivity of the existing environment (**Table 7-8** above), and the description of identified potential impacts with likely significant effects outlined in Table 7-9 below. The significance of Impact is determined from the Classification of the Significance of Impacts in **Appendix 7-I**.

Table 7-9: Classification of significance of impacts (no mitigation)

No.	Potential Impacts	Impact Rating (No Mitigation)	Significance of Impact (No Mitigation)
Construction Stage - Indirect – Surface Water			
1	Improvement in surface water quality due to removal of land from agriculture.	**Low.** Potential to improve surface quality in stream by change of land use from agriculture. Contribute to maintenance of status of surface water as Good.	**Slight Positive**
Construction Stage - Direct - Groundwater			
2	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	**Low** to **Negligible.** Potential to affect groundwater quality in bedrock underlying shallow groundwater through vertical migration. Any impact to groundwater will be limited due to short term nature of works. Any leakage / spillage would be accidental only and of limited volume.	**Slight - Not Significant**
Construction Stage - Indirect - Surface Water			
3	Impact on surface water quality in the Lough Lene-Adeel Stream and SAC via groundwater baseflow to the watercourse	**Low** to **Negligible.** Potential to affect surface water quality (fuel) in the Lough Lene-Adeel Stream, through groundwater baseflow to the watercourse. Impact is unlikely on the stream and SAC due to short term nature of works. Any leakage / spillage would be accidental only and of limited volume. An impact on the stream and SAC is considered unlikely.	**Slight - Not Significant**
Operational Stage - Direct - Surface Water			
4	Improvement in surface water quality due to removal of land from agriculture.	**Low.** Potential to improve surface quality in stream by change of land use from agriculture. Contribute to maintenance of status of surface water as Good.	**Slight Positive**
Operational Stage - Direct - Groundwater			
5	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	**Low** to **Negligible.** Potential to affect groundwater quality in bedrock underlying shallow groundwater through vertical migration. Any impact to groundwater will be limited as any spillage would be accidental only and of limited volume; no fuel will be stored within the extension area.	**Slight - Not Significant**
Operational Stage - Indirect - Surface Water			

No.	Potential Impacts	Impact Rating (No Mitigation)	Significance of Impact (No Mitigation)
6	Impact on surface water quality in the Lough Lene-Adeel Stream and SAC via groundwater baseflow to the watercourse	**Low** to **Negligible.** Potential to affect surface water quality (fuel) in the Lough Lene-Adeel Stream, through groundwater baseflow to the watercourse. Impact is unlikely on the stream and SAC. An impact on the stream and SAC is considered unlikely as the impact to groundwater will be limited as any spillage would be accidental only and of limited volume; no fuel will be stored within the extension area.	**Slight - Not Significant**

Mitigation Measures

Construction & Operational Stages

7.129 BD Flood is part of the Flood Group who has implemented an environmental management system (EMS) at the existing site, refer to Chapter 2 of this EIAR. A copy of the Flood Group ISO14001 accreditation is also provided in Chapter 1. If planning permission is granted for the proposed extension, then the EMS will be extended to the proposed extension area.

7.130 Environmental water monitoring will be carried out on a regular basis to demonstrate that the sand and gravel pit is not having any significant adverse effects on the surrounding environment.

7.131 In order to mitigate against the risk of pollution to groundwater and surface water occurring at the site the following management measures will be implemented;

- Rain falling across the site will percolate downwards and recharge to the underlying sand and gravel. There will be no surface water run-off or overground flow across the site;
- There will be no off-site discharge from the proposed development to any surface watercourse;
- No re-fuelling (or servicing) of excavation plant will occur at the extraction area. Refuelling will take place adjacent to the bunded fuel storage area on a concrete pad with associated hydrocarbon interceptor attached in the existing operational site area at the BD Flood Site, with the exception of the jaw crusher and excavator which are refuelled at the working face using a bunded fuel bowser;
- No fuel and oils will be stored at the site;
- Fuel and oils will continue to be stored in the bunded fuel tanks at the existing BD Flood Site;
- Final floor levels at the proposed pit excavations will be maintained above the underlying (seasonal maximum) groundwater level and any rain falling across the pit will percolate naturally through unsaturated ground to the underlying groundwater;
- A number of spill kits will be available on-site to stop the migration of any minor accidental leakages or spillages should they arise;
- In order to control dust emissions, water will be sprayed from a tractor drawn bowser on dry exposed surfaces and stockpiles (paved roads, unsealed haul roads and hardstand areas) as required;
- Areas of bare or exposed soils will, insofar as practicable, be kept to a minimum during the extraction operations;
- All HGVs exiting the site will be routed through the existing wheelwash at the BD Flood Site. This will minimise the transport of fines by HGVs over the access / egress road and the public road network; and
- Periodic sweeping of the internal paved site access road and surrounding public roads will be carried out as required by a mechanical road sweeper.

7.132 The water requirement at the site is minimal and will be reduced further through monitoring water use and by promoting recycling and water efficient practices at the existing BD Flood Site.

7.133 Implementation of these measures at the application site will further reduce the potential impacts identified above to neutral.

Post - Operational Stage

7.134 As noted previously, the principal activity which will be undertaken at the application site is the extraction and processing of the in-situ sand and gravel with ultimate restoration of lands returned to an agricultural after-use and for the most part will merge back into the surrounding pastoral landscape.

7.135 The final phase of the restoration will start when all the accessible sand and gravel deposits have been exhausted. All plant associated solely with extraction will be removed from site. The remaining pit slopes and screening berms will also be regraded and the general area returned to a beneficial agricultural use over the pit floor.

7.136 A layer of soil and overburden material will be spread over the worked out pit floor as a sub-base in the progressive restoration area. On completion of the extraction works the sand and gravel pit will be restored to an agricultural use.

Residual Impact Assessment

7.137 Following the implementation of mitigation measures, a residual impact assessment has been undertaken. An assessment of the impacts with mitigation measures in place is presented in **Table 7-**10, and a summary of potential impacts and residual effects with mitigation measures in place is provided in **Table 7-**11, and the residual impact for all potential impacts is assessed as 'Not Significant'.

7.138 Examination of the identified potential impacts on the receiving environment show that with the mitigation measures in place, there are no significant residual impacts with respect to groundwater and surface water during the construction / operational / post operational stages of the proposed sand and gravel pit development.

7.139 Following mitigation, the significance of all potential negative impacts identified will be reduced to '**Not Significant**'.

Monitoring

7.140 Development of the sand and gravel pit presents an opportunity to protect and improve surface water quality in a sub catchment. The proposed monitoring program will allow for the following data collection in this sensitive sub catchment.

7.141 A network of groundwater monitoring boreholes has been installed across the site.

7.142 The following monitoring activities will be carried out to demonstrate that the development is not having an adverse impact on the surrounding environment and will document any improvements in water quality.

- groundwater levels in all boreholes will be monitored on a quarterly basis for the duration of the proposed development;
- groundwater quality monitoring to be undertaken on an annual basis for the duration of the proposed development; and
- surface water quality monitoring to be undertaken monthly (Mar-Sep) for the duration of the proposed development.

Table 7-10: Residual impact with mitigation measures

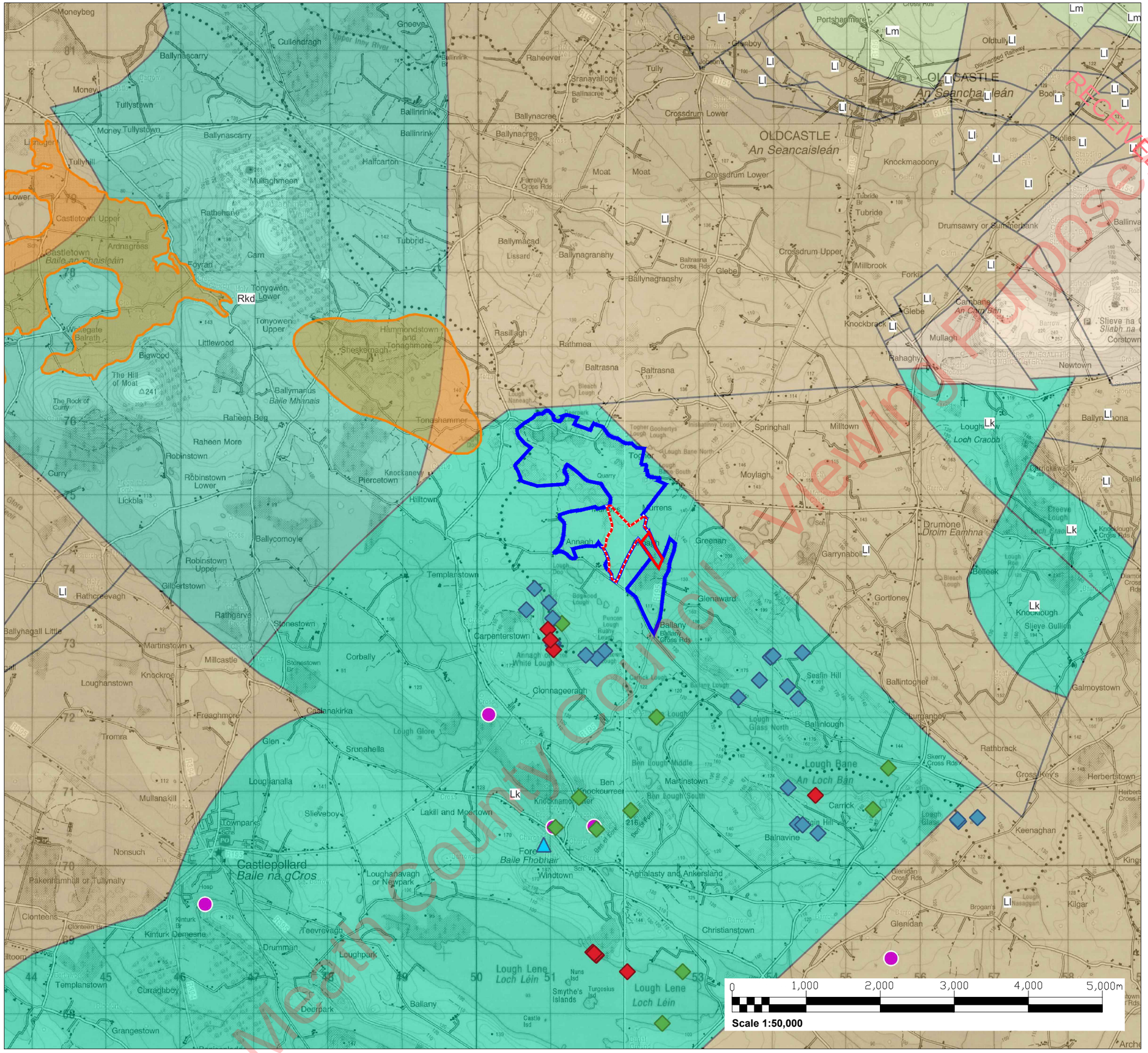
Activity	Existing Environment	Character of Impact	Mitigation Measures	Residual Impact
Construction Stage				
Accidental fuel leakage / spillage	• Groundwater quality in bedrock aquifer. • Lough Lene-Adeel Stream and downstream Deel River and SAC via groundwater baseflow to the watercourse	Accidental fuel leakage/ spillage during construction works could affect groundwater quality in bedrock underlying groundwater through vertical migration. Potential to affect surface water quality in the surface watercourses. Any impact will be limited due to short term nature of works. Any leakage / spillage would be accidental only and of limited volume.	Mitigation measures required. No re-fuelling (or servicing) of excavation plant will occur at extraction areas. Refuelling will take place adjacent to the bunded fuel storage area on a concrete pad with associated hydrocarbon interceptor attached, at the existing BD Flood Site, with the exception of the jaw crusher and excavator which are refuelled at the working face using a bunded fuel bowser. Mobile plant and machinery will not be serviced / maintained within the sand and gravel pit to minimise the risk of uncontrolled release of polluting liquids to groundwater. A number of spill kits will be available on-site to stop the migration of any minor accidental leakages or spillages should they arise. Fuel and oils will be stored in bunded fuel tanks.	**Not Significant**
Operational Stage				
Accidental fuel leakage / spillage	• Groundwater quality in bedrock aquifer. • Lough Lene-Adeel Stream and	Accidental fuel leakage/ spillage during construction works could affect groundwater quality in	Mitigation measures required. No re-fuelling (or servicing) of excavation plant will occur at extraction areas. Refuelling will take place	**Not Significant**

Activity	Existing Environment	Character of Impact	Mitigation Measures	Residual Impact
	downstream Deel River and SAC via groundwater baseflow to the watercourse	bedrock aquifer through vertical migration. Any leakage / spillage would be accidental only and of limited volume.	adjacent to the bunded fuel storage area on a concrete pad with associated hydrocarbon interceptor attached at the existing BD Flood Site , with the exception of the jaw crusher and excavator which are refuelled at the working face using a bunded fuel bowser;. Mobile plant and machinery will not be serviced / maintained within the sand and gravel pit to minimise the risk of uncontrolled release of polluting liquids to groundwater. A number of spill kits will be available on-site to stop the migration of any minor accidental leakages or spillages should they arise. Fuel and oils will be stored in bunded fuel tanks.	

Table 7-11: Summary of potential impacts and residual effects with mitigation measures in place

No.	Potential Impacts	Significance of Impact (No Mitigation)	Mitigation Required	Residual Effect
Construction Stage - Indirect - Surface Water				
1	Improvement in surface water quality due to removal of land from agriculture.	Low.	No	Not Significant
Construction Stage - Direct - Groundwater				
2	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	Low to Negligible.	Yes	Not Significant
Construction Stage - Indirect - Surface Water				
3	Impact on surface water quality in the Lough Lene-Adeel Stream and SAC via groundwater baseflow to the watercourse	Low to Negligible.	Yes	Not Significant
Operational Stage - Direct - Surface Water				
4	Improvement in surface water quality due to removal of land from agriculture.	Low.	No	Not Significant
Operational Stage - Direct - Groundwater				
5	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	Low to Negligible.	Yes	Not Significant
Operational Stage - Indirect - Surface Water				
6	Impact on surface water quality in the Lough Lene-Adeel Stream and SAC via groundwater baseflow to the watercourse	Low to Negligible.	Yes	Not Significant

Figures



Notes:

1. Based on 1:50,000 scale Tailte Eireann Discovery series maps 41 & 42

Legend:

- Landholding
- Planning Application Area (c. 5.8 hectares)
- Planning Permission Area P. Ref. KA/141129
- Locally Important Sand and Gravel Aquifer

GSI Karst Database:

- CAVE
- ENCLOSED DEPRESSION
- SPRING
- SUPERFICIAL SOLUTION FEATURES
- SWALLOW HOLE

GSI Bedrock Aquifers:

- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Rev	Amendments	Date	By	Chk	Auth

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Project: Sand & Gravel Pit Extension
The Murrens, Oldcastle, Co. Meath

Figure Title: Bedrock Aquifer Map

Scale	SLR Project No.
1:50,000 @ A3	501.065670.00001

Designed	Drawn	Checked	Authorised
smcd	smcd	lh	lh
Date: 01/25	Date: 01/25	Date: 03/25	Date: 03/25

Figure Number: **Figure 7-1** Rev.:

30/06/2025

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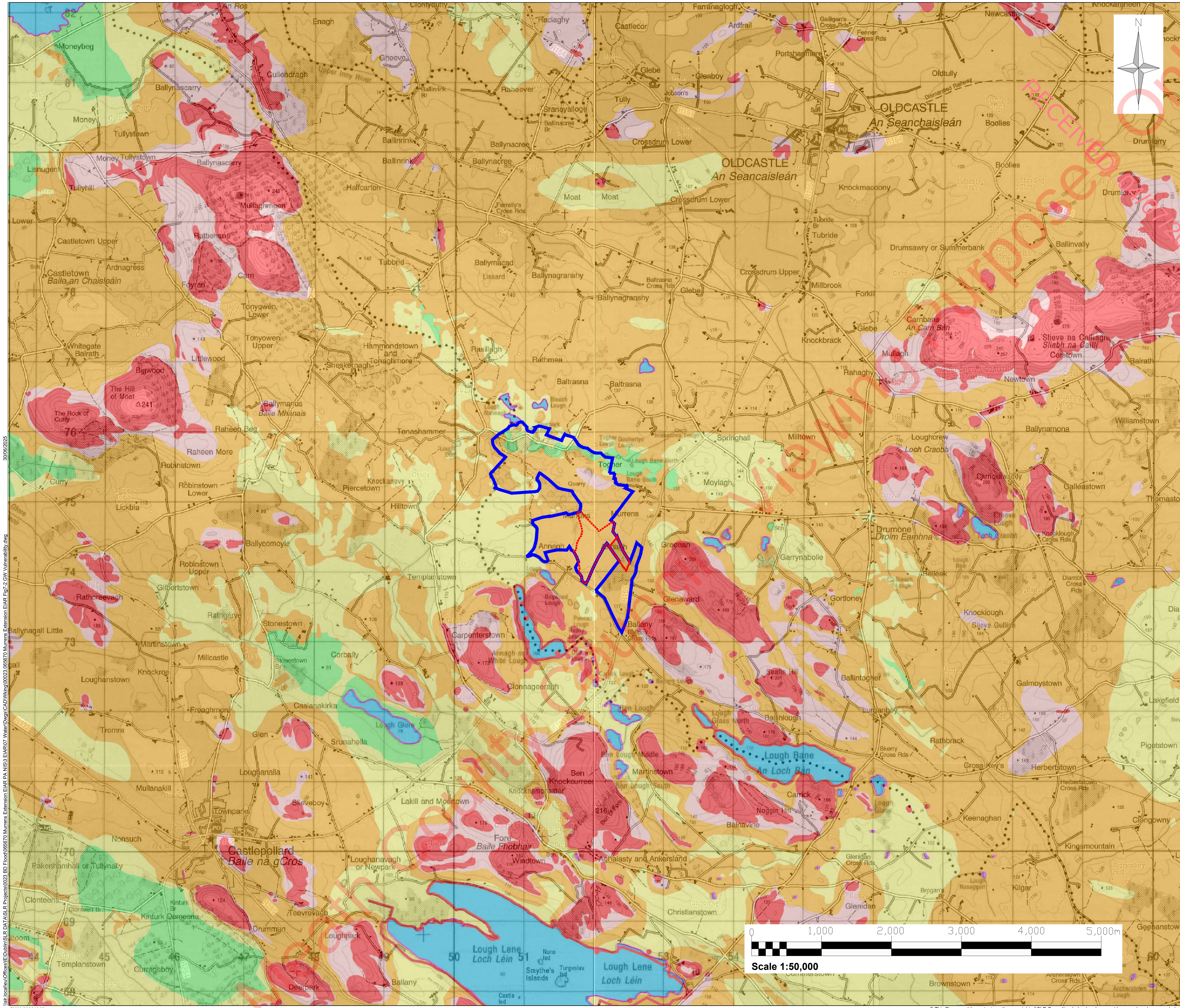

Notes:

1. *Based on 1:50,000 scale Tailte Eireann Discovery series maps 41 & 42*

Legend:

- Landholding
- Planning Application Area (c. 5.8 hectares)
- Planning Permission Area P. Ref. KA/141129

GSI Groundwater Vulnerability

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

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Figure Title
Groundwater Vulnerability Map

Scale		SLR Project No.	
1:50,000 @ A3		501.065670.00001	
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Date: 01/25	Date: 01/25	Date: 03/25	Date: 03/25

Figure Number: **Figure 7-2** Rev.

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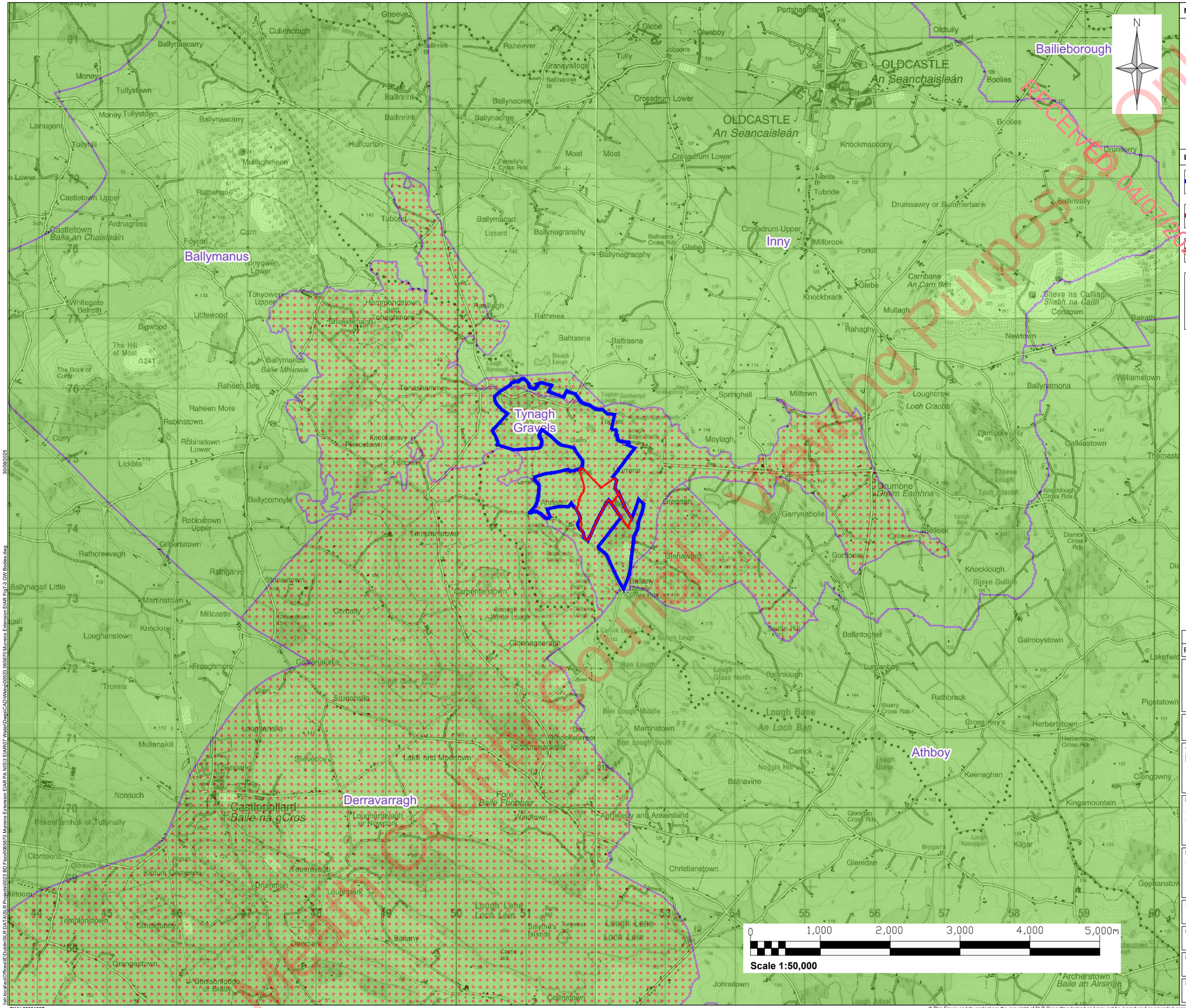

Notes:

1. Based on 1:50,000 scale Tailte Eireann Discovery series maps 41 & 42

Legend:

- Landholding
- Planning Application Area (c. 5.8 hectares)
- Planning Permission Area P. Ref. KA/141129

WFD Groundwater Body
- Good WFD Status - At Risk
- Good WFD Status - Not At Risk

Rev	Amendments	Date	By	Chk	Auth

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Figure Title: Groundwater body Map

Scale	SLR Project No.
1:50,000 @ A3	501.065670.00001

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Date: 01/25	Date: 01/25	Date: 03/25	Date: 03/25

Figure Number: **Figure 7-3** Rev.

30/06/2025

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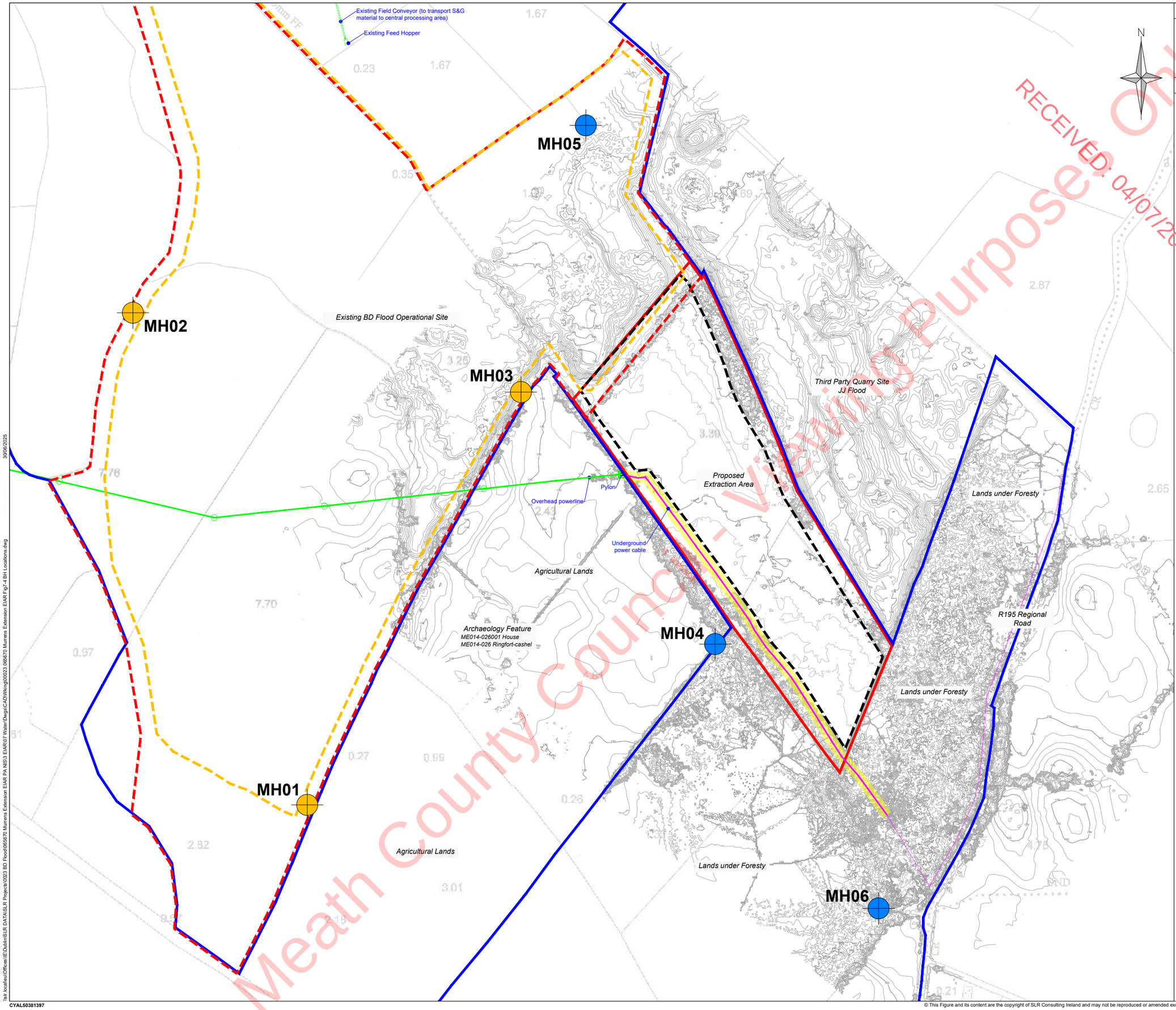

Notes:

1. Based on Tailte Eireann Digital maps 2304, 2305, 2367, 2368

Legend:

- Landholding
- Planning Application Area (c. 5.8 hectares)
- Proposed Extraction Area (c. 4.2 hectares)
- Planning Permission KA14/1129 (c. 28.5 hectares)
- Permitted Extraction Area KA14/1129 (c. 23.9 hectares)
- Overhead powerline
- Underground power cable route (with 5m exclusion zone either side)
- 2025 Boreholes
- 2016 Boreholes

Rev	Amendments	Date	By	Chk	Auth

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Project: Sand & Gravel Pit Extension
The Murrens, Oldcastle, Co. Meath

Figure Title: Site Borehole Locations

Scale	SLR Project No.
No Scale @ A3	501.065670.00001

Designed	Drawn	Checked	Authorised
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Date: 01/25	Date: 01/25	Date: 03/25	Date: 03/25

Figure Number: **Figure 7-4** Rev.

30/06/2025

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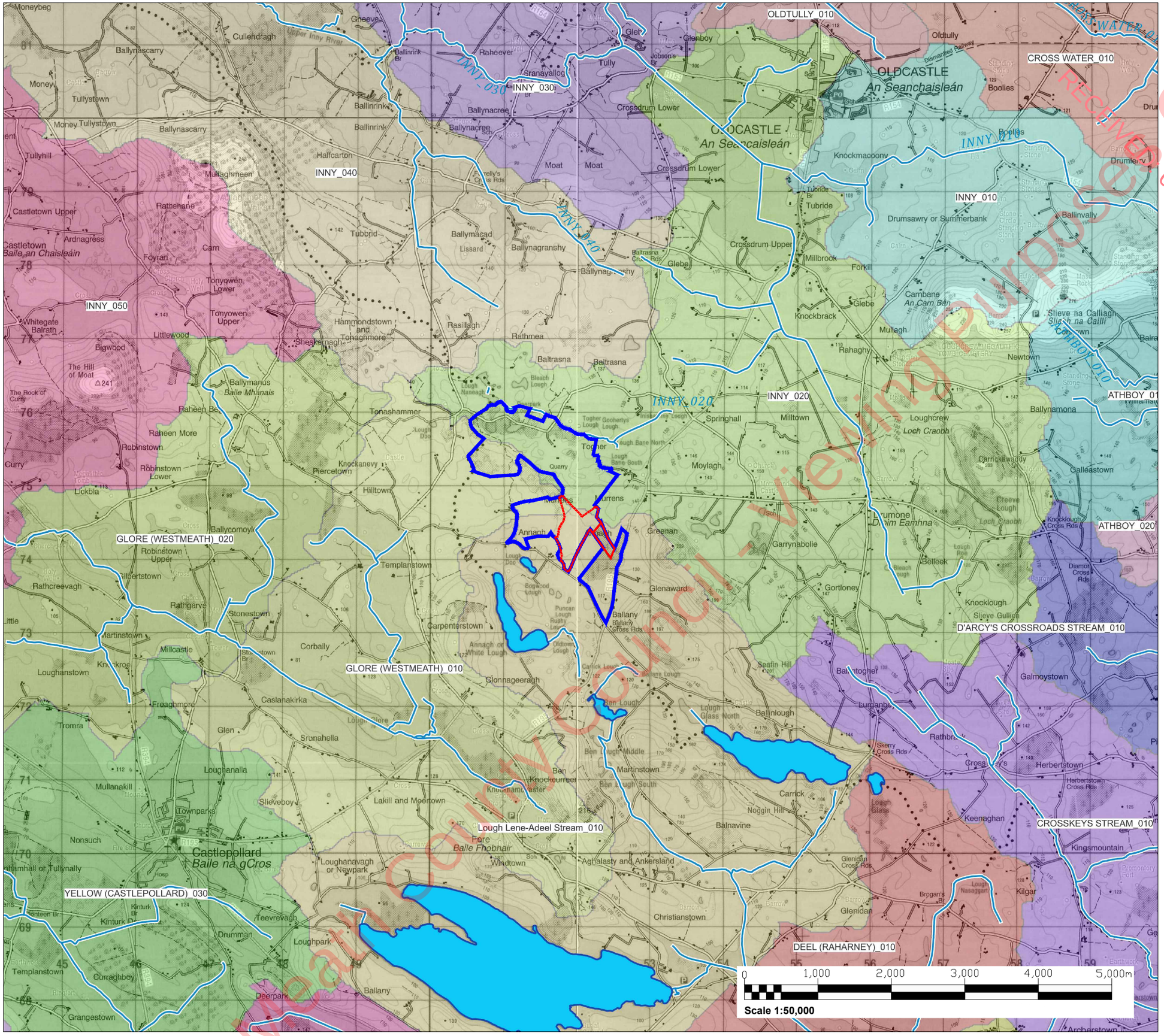

Notes:

1. Based on 1:50,000 scale Tailte Eireann Discovery series maps 41 & 42

Legend:

- Landholding
- Planning Application Area (c. 5.8 hectares)
- Planning Permission Area P. Ref. KA/141129
- WFD Lake Waterbodies
- Rivers

River Sub-Basins:

- Crosskeys Stream_010 (Boyne RBD)
- GLORE (Westmeath)_010 (Shannon RBD)
- INNY_020 (Shannon RBD)
- INNY_040 (Shannon RBD)
- Lough Lene-Adeel Stream_010 (Boyne RBD)

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Project
Sand & Gravel Pit Extension
The Murrens, Oldcastle, Co. Meath

Figure Title
Surface Water Features Map

Scale		SLR Project No.	
1:50,000	@ A3	501.065670.00001	
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Date	Date	Date	Date
01/25	01/25	03/25	03/25

Figure Number
Figure 7-5

Rev.

30/06/2025

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CYAL50381397

Appendices

Appendix 7-A
EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

Appendix 7-B
Borehole Logs (2016)

Appendix 7-C
Causeway Ground Investigation Report (2025)

Appendix 7-D
Rating of Existing Environment Significance / Sensitivity

Appendix 7-E
Descriptions of Effects (EPA, 2022)

Appendix 7-F
Classification of the Significance of Impacts

Appendix 7-A
EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

European Directives

- Environmental Impact Assessment. Directive (2011/92/EU) on the assessment of the effects of certain public and private projects on the environment;
- Environmental Impact Assessment Directive (2014/52/EU) on the assessment of the effects of certain public and private projects on the environment;
- Water Framework Directive (2000/60/EC);
- Groundwater Directive (2006/118/EC);
- Flooding Directive (2007/60/EC)
- Integrated Pollution and Prevention Control Directive (2008/1/EC); and
- The management of waste from extractive industries (2006/21/EC).

Irish Government Acts, National Legislation and Regulations

- S.I. No. 349 of 1989, European Communities (Environmental Impact Assessment) Regulations, and subsequent amendments (S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
- The Planning and Development Acts, 2000 to 2009, The Planning and Development (Amendment) Act 2010, S.I. 600 of 2001 Planning and Development Regulations and subsequent amendments including, S.I. No. 364 of 2005 and S.I. 685 of 2006.

National legislation on the protection of the water environment. Since 2000 water management in EU member states has primarily been directed by the Water Framework Directive (2000/60/EC) and the associate 'daughter' Groundwater Directive (2006/118/EC). Irish legislation implementing these, and other relevant directives currently includes:

- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 and amendments (S.I. No. 389 of 2011 and S.I. No. 149 of 2012);
- European Union (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- S.I. No. 278 of 2007 European Communities (Drinking Water) (No. 2) Regulations;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and amendment (S.I. No. 327 of 2012);
- S.I. No. 684 of 2007 Waste Water Discharge (Authorisation) Regulations, 2007, as amended (S.I. No. 231 of 2010);
- S.I. No. 122 of 2010 European Communities (Assessment and Management of Flood Risks) Regulations 2010;
- S.I. No. 457 of 2008 European Communities (Environmental Liability) Regulations which bring into force the European Liability Directive (2004/35/EC);
- European Union (Planning and Development) (Environmental Impact Assessment) (No. 2) Regulations 2018 (S.I. No. 404 of 2018);
- Local Government (Water Pollution) Acts 1977 to 1998;
- European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006) and amendments (S.I No. 55 and 464 of 2009), and;

- Bathing Water Quality Regulations, 2008 (S.I. No. 79 of 2008) and amendments (S.I No. 351 of 2011 and S.I. No. 163 of 2016);

Guidelines

- CIS (2007). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC) Guidance on preventing or limiting direct and indirect inputs in the context of the Groundwater Directive 2006/118/EC. Guidance Document No. 17.
- CIS (2010). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC). Guidance on risk assessment and the use of conceptual models for groundwater. Guidance document No. 26.
- DEHLG (2004). National Urban Waste Water Study. National Report.
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- DELG/EPA/GSI (1999). Groundwater Protection Schemes. Document prepared jointly by the Geological Survey of Ireland (GSI), the Environmental Protection Agency, and the Department of Environment, Heritage and Local Government.
- EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA (2010b). Methodology for Establishing Groundwater Threshold Values and the Assessment of Chemical and Quantitative Status of Groundwater, Including and Assessment of Pollution Trends and Trend Reversal.
- EPA (2011). Guidance on the Authorisation of Discharges to Groundwater. Version 1, December 2011.
- EPA (2003). Towards Setting Guideline Values for the Protection of groundwater in Ireland. Interim Report.
- EPA (2006). Ireland Water Framework Directive Monitoring Programme.
- Fitzsimons, V., Daly, D. and Deakin, J. (2003). Draft GSI guidelines for assessment and mapping of groundwater vulnerability to contamination. Groundwater Chapter, Geological Survey of Ireland.
- GSI (2006). Criteria used in aquifer classification. 1Available from http://www.gsi.ie/Programmes/Groundwater/Aquifer+Classification.htm
- IGI (2007). Guidelines on Water Well Construction. Available from http://www.igi.ie/assets/files/Water%20Well%20Guidelines/Guidelines.pdf
- Kilroy, G., Dunne, F., Ryan, J., O'Connor, A., Daly, D., Craig, M., Coxon, C., Johnston, P. and Moe, H. (2008). A Framework for the Assessment of Groundwater – Dependent Terrestrial Ecosystems under the Water Framework Directive. Environmental Research Centre Report Series No. 12.
- Institute of Geologists of Ireland, 2007. Recommended collection, presentation and interpretation of geological and hydrogeological information for quarry developments.

Technical Standards

- British Standards (2015). Code of Practice for Ground Investigations BS5930:2015;.
- CIRIA (2007). The SuDS Manual. (C697). CIRIA publication, February 2007.

Appendix 7-B
Borehole Logs (2016)

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B.D. Flood Ltd
The Murrens
Oldcastle
Co. Meath

Project:	**16-0673**
Site	**Groundwater monitoring wells, The Murrens, Oldcastle, Co. Meath**
Report Date	**29th August 2016**
Prepared by	**Stephen Franey**

Introduction

At the instruction of the SLR Consulting (the Client's Representative), on behalf of B.D. Flood Ltd (the Client), four wells were drilled at The Murrens site. Three of these wells were installed for groundwater monitoring purposes.

Exploratory works were undertaken on 22nd and 23rd June and 11th July using a HE101 drilling rig.

Boreholes were drilled to depths ranging between 15.0m and 30.0m and installed with 50mm HDPE standpipes to depths specified by the Client's Representative. Details of the geology encountered and monitoring well installations are presented in the enclosed borehole logs.

Encl.: Borehole logs

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Borehole Logs

Causeway Geotech Ltd
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

Registered in Northern Ireland. Company Number: NI610766
Approved: ISO 9001 • ISO 14001 • OHSAS 18001

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 1
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 1 of 3
Method: Rotary drilling	N	**Client's Representative:** SLR Consulting	**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 22/06/2016 - 22/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
						(1.40)		Clay and Stones (Driller's description)
						1.40		Gravel and Boulders (Driller's description)
						(2.60)		
						4.00		Sand and Cobbles (Driller's description)
						(1.50)		
						5.50		SAND (Driller's description)
						(2.00)		
						7.50		Gravel and Boulders (Driller's description)
						(3.50)		

Water / Backfill

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
14.50	200			

CAUSEWAY GEOTECH	**Project No.:** 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath	**Borehole No.:** 1
	Coordinates: E	**Client:** B.D. Flood Ltd.	Sheet 2 of 3
Method: Rotary drilling	N	**Client's Representative:** SLR Consulting	**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 22/06/2016 - 22/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Gravel and Boulders (Driller's description)		
						11.00		CLAY (Driller's description)		
						(3.50)				
						14.50		LIMESTONE (Driller's description)		
						(6.50)				

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
14.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 1
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 3 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 22/06/2016 - 22/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								LIMESTONE (Driller's description)		
		14.50	19.00	22-06-2016		21.00		End of Borehole at 21.00m		

20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
14.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 2
Coordinates: E N	**Client:** B.D. Flood Ltd.		Sheet 1 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(7.00)		Gravel with boulders (Driller's description)		
						7.00		LIMESTONE (Driller's description)		

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		25.00	7.00	0	0.00

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
7.00	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 2
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 2 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(20.00)		LIMESTONE (Driller's description)		

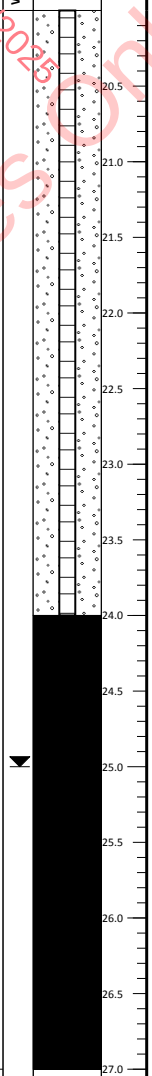
Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		25.00	7.00	0	0.00

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
7.00	200			

CAUSEWAY GEOTECH	**Project No.:** 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath	**Borehole No.:** 2
	Coordinates: E	**Client:** B.D. Flood Ltd.	Sheet 3 of 3
Method: Rotary drilling	N	**Client's Representative:** SLR Consulting	**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
								LIMESTONE (Driller's description)
				Water Strike at 25.00m				
		7.00	25.00	23-06-2016		27.00		End of Borehole at 27.00m



Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		25.00	7.00	0	0.00

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
7.00	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 3
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 1 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(11.50)		Gravel with boulders (Driller's description)		

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
11.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 3
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 2 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								Gravel with boulders (Driller's description)		
						11.50		LIMESTONE (Driller's description)		

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
11.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 3
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 3 of 3
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 23/06/2016 - 23/06/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(18.50)		LIMESTONE (Driller's description)		
						30.00		End of Borehole at 30.00m		

Remarks

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
11.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 4
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 1 of 2
Method: Rotary drilling	N	**Client's Representative:** SLR Consulting	**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 11/07/2016 - 11/07/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(2.20)		CLAY (Driller's description)		
						2.20		Cobbles and Boulders (Driller's description)		
						(2.50)				
						4.70		BOULDERS (Driller's description)		
						(5.30)				
						10.00				

Remarks
Additional borehole to prove bedrock

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
13.50	200			

CAUSEWAY GEOTECH

Project No.: 16-0673	**Project Name:** Groundwater Monitoring Wells, The Murrens, Oldcastle, Co. Meath		**Borehole No.:** 4
Coordinates: E	**Client:** B.D. Flood Ltd.		Sheet 2 of 2
Method: Rotary drilling	**Client's Representative:** SLR Consulting		**Scale:** 1:50
Plant: HE101	**Ground Level:** mOD	**Dates:** 11/07/2016 - 11/07/2016	**Driller:** DS
			Logger:

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(3.50)		GRAVEL (Driller's description)		
						13.50		LIMESTONE (Driller's description)		
						(1.50)				
						15.00		End of Borehole at 15.00m		

Remarks
Additional borehole to prove bedrock

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
13.50	200			

Appendix 7-C
Causeway Ground Investigation Report (2025)

CAUSEWAY GEOTECH

25-0077

MURRENS, OLDCASTLE, CO MEATH
GROUND INVESTIGATION REPORT

Client:
BD FLOOD

Client's Representative:
SLR CONSULTING IRELAND

Date:
APRIL 2025

Status:
FINAL

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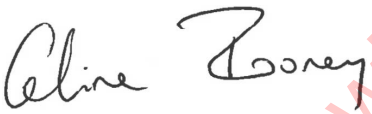
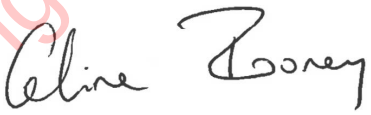
LIST OF TABLES

APPENDICES

DOCUMENT CONTROL SHEET

REPORT NO:		**25-0077**			
PROJECT TITLE:		**MURRENS, OLDCASTLE, CO MEATH**			
CLIENT:		**BD FLOOD**			
CLIENT'S REPRESENTATIVE:		**SLR CONSULTING IRELAND**			
REVISION:	**A00**	**STATUS**	**FINAL**	**ISSUE DATE**	**29/04/2025**
PREPARED BY:		**REVIEWED BY:**		**APPROVED BY:**	
 Buhlebenkosi Angie Ndebele BSc. Geology		 Celine Rooney BSc. MSc. PGEO (EUREGEOL)		 Celine Rooney BSc. MSc. PGEO (EUREGEOL)	

This report presents a factual account of the ground investigation in accordance with the Specification and Related Documents for Ground Investigation in Ireland 2nd Edition, published by Engineers Ireland (2016).

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Ground Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	Uncorrected in situ hand vane peak (HVP) and residual (HVR) result presented in kPa. Vane calibration factor has been applied, but no correction made for soil type.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.

1 AUTHORITY

On the instructions of SLR Consulting Ireland, (the "Client's Representative"), acting on the behalf of BD flood (the "Client"), a ground investigation was undertaken at the site to install groundwater monitoring wells.

This report details the work carried out on site; it contains a description of the site, the works undertaken and the exploratory hole logs.

All information given in this report is based upon the ground conditions encountered during the ground investigation works. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 PURPOSE, RATIONALE & SCOPE OF THE INVESTIGATION

The purpose of this investigation is to assess the ground conditions and groundwater levels and to allow an evaluation of the ground related issues with the current site and proposed development.

The rationale has been determined by the Client's Representative, with the extent of the investigation including boreholes and the preparation of a factual account of the ground investigation findings.

3 DESCRIPTION OF SITE

The site is located on agricultural land/forestry, located in Murrens, Oldcastle, Co. Meath just southeast of the existing BD Flood quarry. The site location is presented in Appendix A and a summary of the surrounding land uses is provided in Table 1.

Table 1: Summary of surrounding land uses

Location	Description
North	JJ Flood & Sons Manufacturing Ltd, BD Flood, agricultural land.
East	R195, agricultural land, residential properties.
South	R195, agricultural land, residential properties.
West	L68182 Annagh, agricultural land.

4 SITE OPERATIONS

4.1 SUMMARY OF SITE WORKS

Site operations, which were conducted between 27/03/2025 and 02/04/2025, comprised:

- Three rotary drilled boreholes
- a standpipe installation in two boreholes

The exploratory holes were located as instructed by the Client.

4.2 BOREHOLES

4.2.1 ROTARY DRILLED BOREHOLES

Three boreholes (GW04-GW06) were put to their completion by rotary drilling techniques only. The boreholes were completed using a Comacchio 405 tracked rotary drilling rig.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes to their completion depths.

Appendix B presents the borehole logs.

4.3 STANDPIPE INSTALLATIONS

A groundwater monitoring standpipe was installed in boreholes GW05-GW06.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

5 GROUND CONDITIONS

5.1 GENERAL GEOLOGY OF THE AREA

Published geological mapping from the online Geological Survey Ireland spatial resources database indicate the superficial deposits underlying the site comprise gravels derived from limestone. These deposits are shown to be underlain by Cherty limestone and minor shale of the Derravaragh Cherts Formation.

5.2 GROUND TYPES ENCOUNTERED DURING INVESTIGATION OF THE SITE

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Glacial Till:** sandy gravelly clay, typically firm encountered from surface to depths ranging from 0.30 -1.20m.
- **Fluvioglacial deposits:** light greyish brown sandy gravels encountered in all the boreholes from 0.30-1.20m.
- **Bedrock (Limestone):** Rockhead was encountered at depths ranging from 3.30m in GW05 to approximately 11.30m in borehole GW04.

Further details of these ground types, including their specific depths and descriptions, can be found on the individual exploratory hole logs accompanying this report.

5.3 GROUNDWATER

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Table 2: Groundwater strike details

Exploratory Hole	Depth of groundwater strike (m bgl)	Comments
GW05	-	Water strike unknown. Water in borehole on morning of the 02/05/25.
GW06	16.00m	-

Groundwater was not noted during drilling at exploratory hole GW04. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out additional groundwater strikes and the possibility of encountering groundwater during excavation works at these locations should not be ruled out.

Seasonal variation in groundwater levels should also be factored into design considerations.

6 REFERENCES

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APPENDIX A – SITE HOLE LOCATION PLANS

Legend Key

Project No.	25-0077
Client	BD flood
Client's Rep	SLR Consulting Ireland

Site Location Plan

Murrens, Oldcastle, Co Meath

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:20000

Legend Key

Locations By Type - RO

Project No.	25-0077
Client	BD flood
Client's Rep	SLR Consulting Ireland

Exploratory Hole Location Plan

Murrens, Oldcastle, Co Meath

CAUSEWAY GEOTECH

Last Revision	29/04/2025
Scale	1:5000

APPENDIX B – BOREHOLE LOGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW04
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652268.00 E 774153.00 N

Final Depth:	28.00 m	Start Date:	31/03/2025	Driller:	COS	Sheet 1 of 4 Scale: 1:40
Elevation:	137.70 mOD	End Date:	01/04/2025	Logger:	CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					137.40	0.30		Brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse. (Driller's description).		
								Light greyish brown very sandy subrounded fine to coarse GRAVEL. Sand is fine to course. (Driller's description).		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.
No groundwater strikes noted.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW04
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652268.00 E 774153.00 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 4
28.00 m	31/03/2025	COS	Scale: 1:40
Elevation: 137.70 mOD	**End Date:** 01/04/2025	**Logger:** CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					126.40	11.30		Light grey LIMESTONE (Driller's description).		

7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.
No groundwater strikes noted.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW04
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652268.00 E 774153.00 N

Final Depth:	Start Date:	Driller:	Sheet 3 of 4
28.00 m	31/03/2025	COS	Scale: 1:40
Elevation:	**End Date:**	**Logger:**	FINAL
137.70 mOD	01/04/2025	CR	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill

15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5 20.0 20.5 21.0 21.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.
No groundwater strikes noted.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW04
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652268.00 E 774153.00 N

Final Depth:	Start Date:	Driller:	Sheet 4 of 4
28.00 m	31/03/2025	COS	Scale: 1:40
Elevation:	**End Date:**	**Logger:**	FINAL
137.70 mOD	01/04/2025	CR	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					109.70	28.00		End of Borehole at 28.00m		

22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.
No groundwater strikes noted.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW05
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652146.00 E 774653.00 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 4
28.00 m	01/04/2025	COS	Scale: 1:40
Elevation: 126.25 mOD	**End Date:** 02/04/2025	**Logger:** CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
								Brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse. (Driller's description).		
					125.05	1.20		Light greyish brown very sandy subrounded fine to coarse GRAVEL. Sand is fine to coarse. (Driller's description).		
					122.75	3.50		Light grey Limestone. (Driller's description).		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m. Water strike unknown, water in borehole morning of 02/04/25.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW05
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652146.00 E 774653.00 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 4
28.00 m	01/04/2025	COS	Scale: 1:40
Elevation:	**End Date:**	**Logger:**	FINAL
126.25 mOD	02/04/2025	CR	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill

7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m. Water strike unknown, water in borehole morning of 02/04/25.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW05
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652146.00 E 774653.00 N

Final Depth:	28.00 m	Start Date:	01/04/2025	Driller:	COS
Elevation:	126.25 mOD	End Date:	02/04/2025	Logger:	CR

Sheet 3 of 4
Scale: 1:40
FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill

15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5 20.0 20.5 21.0 21.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m. Water strike unknown, water in borehole morning of 02/04/25.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW05
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	28.00	652146.00 E 774653.00 N

Final Depth:	Start Date:	Driller:	Sheet 4 of 4
28.00 m	01/04/2025	COS	Scale: 1:40
Elevation: 126.25 mOD	**End Date:** 02/04/2025	**Logger:** CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					98.25	28.00		End of Borehole at 28.00m		

22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
28.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m. Water strike unknown, water in borehole morning of 02/04/25.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW06
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	22.00	652425.00 E 773900.00 N

Final Depth:	22.00 m	Start Date:	27/03/2025	Driller:	COS	Sheet 1 of 4 Scale: 1:40
Elevation:	127.93 mOD	End Date:	31/03/2025	Logger:	CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					126.73	1.20		Firm brown slightly sandy gravelly slightly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse. (Driller's description).		
								Light greyish brown very sandy subrounded fine to coarse GRAVEL. Sand is fine to coarse. (Driller's description).		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
16.00			

Casing Details

To (m)	Diam (mm)
22.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW06
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	22.00	652425.00 E 773900.00 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 4
22.00 m	27/03/2025	COS	Scale: 1:40
Elevation: 127.93 mOD	**End Date:** 31/03/2025	**Logger:** CR	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					118.53	9.40		Light grey LIMESTONE (Driller's description).		

7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
16.00			

Casing Details

To (m)	Diam (mm)
22.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW06
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

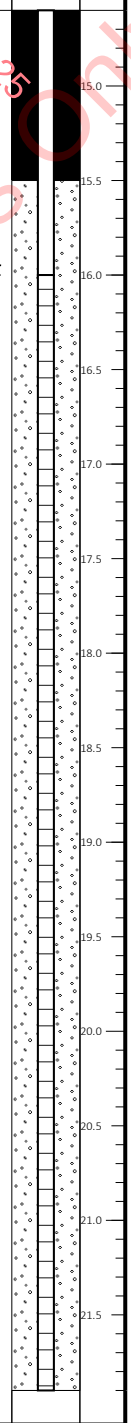
Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	22.00	652425.00 E 773900.00 N

Final Depth:	22.00 m	Start Date:	27/03/2025	Driller:	COS
Elevation:	127.93 mOD	End Date:	31/03/2025	Logger:	CR

Sheet 3 of 4
Scale: 1:40
FINAL

RECEIVED: 04/07/2025

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
16.00			

Casing Details

To (m)	Diam (mm)
22.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
25-0077	Murrens, Oldcastle, Co Meath	GW06
	Client: BD flood	
	Client's Rep: SLR Consulting Ireland	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Percussion	Comacchio 405	0.00	22.00	652425.00 E 773900.00 N

Final Depth:	Start Date:	Driller:	Sheet 4 of 4
22.00 m	27/03/2025	COS	Scale: 1:40
Elevation:	**End Date:**	**Logger:**	FINAL
127.93 mOD	31/03/2025	CR	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					105.93	22.00		End of Borehole at 22.00m		

22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
16.00			

Casing Details

To (m)	Diam (mm)
22.00	125

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.

Core Barrel	Flush Type	Termination Reason	Last Updated
	Air	Terminated on Engineer's instruction.	29/04/2025

AGS

CAUSEWAY GEOTECH

Causeway Geotech Limited has made its commitment to health and safety of people, the environment and the quality of its services an integral part of our strategy.

Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

CERTIFICATIONS /ACCREDITATIONS

Constructionline Gold Member

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001 — UKAS MANAGEMENT SYSTEMS 9235

MEMBERSHIPS

AGS

BRITISH DRILLING ASSOCIATION

BGA · THE BRITISH · GEOTECHNICAL ASSOCIATION

INTERNATIONAL JACK-UP BARGE OPERATORS ASSOCIATION

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Appendix 7-D
Rating of Existing Environment Significance / Sensitivity

Rating of Existing Environment Significance / Sensitivity (IGI, 2013 Guidelines)

Importance	Criteria	Typical Example
High	Attribute has a high quality or value on an international scale	Groundwater/ Surface Water supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status. Regionally important potable water source supplying >2,500 homes Inner source protection area for regionally important water source. Drinking water supply from river. Amenity use of waterbody
	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source. No specific recreational use of waterbody
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes. No water supply from surface water, no abstraction designation for watercourse No amenity value of waterbody
Negligible	Attribute has negligible quality or value on a local site scale	No groundwater supply from a bedrock aquifer inn vicinity of site. Surface water not used for any specific purpose.

Appendix 7-E
Descriptions of Effects (EPA, 2022)

Descriptions of Effects (EPA, 2022)

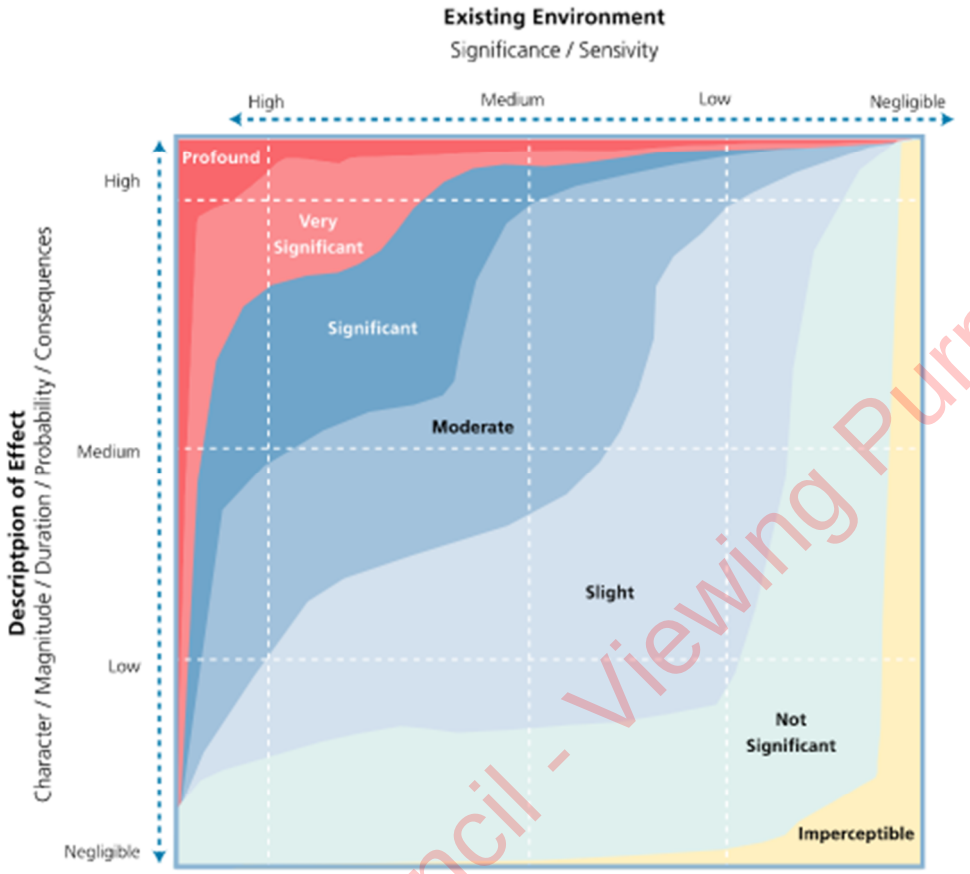
Impact Characteristic	Term	Description
Quality of Effects	Positive Effects	A change which improves the quality of the environment
	Neutral Effects	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative / Adverse Effects	A change which reduces the quality of the environment
Describing the Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequences
	Not significant	An effect which causes noticeable2 changes in the character of the environment but without significant consequences.
	Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects	An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects	Extent	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects	Likely Effects	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Unlikely Effects	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Duration and Frequency of Effects	Momentary Effects	Effects lasting from seconds to minutes
	Brief Effects	Effects lasting less than a day
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years

Impact Characteristic	Term	Description
	Reversible Effects	Effects that can be undone, for example through remediation or restoration
	Frequency of Effects	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually.
Describing the Types of Effects	Indirect / Secondary Effects	Likely, significant effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	Do-Nothing Effects	The environment as it would be in the future should the subject project not be carried out.
	Worst Case Effects	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
	Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

Appendix 7-F
Classification of the Significance of Impacts

Determining Significance

Figure 3.4 shows how comparing the character of the predicted effect to the sensitivity of the receiving environment can determine the significance of the effect.



There are seven generalised degrees of effect significance that are commonly used in EIA. Imperceptible, Not Significant, Slight, Moderate, Significant, Very Significant and Profound. Generalised definitions of each of these are provided in Table 3.4. When more specific definitions exist within a specialised factor or topic, e.g. biodiversity, these should be used in preference to these generalised definitions. (ref. Advice Notes[68].)

(Source: Figure 3.4 Environmental Protection Agency (May 2022), *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'*).