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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 Derryarkin Townland, Rhode, Co. Offaly was collated and evaluated.
- 7.3 This site at Derryarkin was a former Bord na Móna working bog with peat being cut at the site up to the 1980's. Bord na Móna had previously excavated and deepened the Yellow River in the vicinity of the site in order to lower the water table and drain the adjacent bogs to facilitate the harvesting of peat. Following peat extraction the land at the site was converted to a grassland and used for farming. It is understood that agriculture has been an established landuse at the site for c. 40 years.

### Proposed Development

- 7.4 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** of this EIAR.
- 7.5 The proposed development will consist of:
- An overall application area of c. 19.5 hectares;
  - Phased extraction of sand and gravel (wet working) over an area of c. 11.7 hectares with processing that includes crushing and screening and all ancillary works and structures;
  - Provision of new site facilities to include wheel wash (c. 35 m<sup>2</sup>), weighbridge (c. 69 m<sup>2</sup>); mobile welfare pod facility (c. 16 m<sup>2</sup>) consisting of office, canteen, toilet and drying room; dedicated parking area, perimeter vegetation planting and fencing.
  - Access to the site will be via an existing entrance onto the local access road to the north of the site;
  - Progressive restoration of the site to naturally regenerated wildlife habitat and a permanent water body; and
  - The proposed development life is for 15 years to complete extraction and restoration operations.
- 7.6 The proposed extraction of the sand and gravel will be **wet working**, (i.e., extraction below the natural groundwater level of the site). Processing of the extracted materials will be carried out on-site to produce a range of aggregates for use by the applicant in the manufacture of concrete at their existing concrete batching facility located c. 600 m to the northwest.

### Water Management

- 7.7 The sand and gravel material will be worked wet, i.e. extracted below the groundwater table using a long-reach excavator. Therefore, no surface water drainage infrastructure is

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- required within the site; rain falling across the site will either go directly to the open wet working excavation or will percolate naturally to the ground as it does at the present day.
- 7.8 It is proposed that extraction will also be carried out below the groundwater table, with the proposed pit floor of c. 6-10 m below current ground level at the site. It is proposed to extract the sand and gravel across four phases.
- 7.9 The sand and gravel material will be processed onsite at a mobile processing plant before being taken to the nearby BD Flood site for use as aggregates in the production of concrete for the construction industry.
- 7.10 The existing agricultural lands are currently drained by a combination of percolation down through the soil and sub-strata to the groundwater table. There is a shallow cut drainage channel along the northern application boundary running in a west to east direction towards the Yellow River.
- 7.11 The surface water management system at the proposed site will be relatively simple. Rain falling across the application site will infiltrate naturally into the ground across in-situ residual soil / sand & gravel areas, internal haul roads or stripped processing areas. In worked out areas it will fall into the permanent waterbody (restoration lake).
- 7.12 Due to the high permeability of the underlying materials, little rainwater run-off is expected to arise within the application site. There will be no discharge of water from the extraction area to any surface watercourse. Therefore, no specific surface water management plan is required in respect of the proposed development.
- 7.13 The Yellow River flows in a north easterly direction along the eastern edge of the site. To the north of the site an Unnamed Stream flows in an easterly direction and discharges into the Yellow River. The Unnamed Stream is a small watercourse and has been straightened and deepened for local drainage measures.
- 7.14 There will be no discharge of surface water off-site to either the Yellow River, or the Unnamed Stream or any other watercourse.

### Wheel Wash

- 7.15 A wheel wash facility will be constructed within the facilities compound area on the outbound side of the access track (see Chapter 2 **Figure 2-2** of the EIAR) and will be set back c. 350 m from the edge of the public road at the site entrance and will help to eliminate the risk of mud and dust being carried from the development onto the local access road. All aggregate haulage vehicles will be required to pass through the wheel wash prior to leaving the site.
- 7.16 The new unit will be utilised throughout the life of the development, with due maintenance as required. It will consist of a wheel bath system whereby the trucks drive through the water bath to dislodge any debris before exiting the site. The water level is maintained by top-up from an adjacent reservoir tank with the reservoir tank being topped up from a water bowser that will source water from the adjacent working pit as required. Details of the proposed wheel wash are provided in Planning **Drawing 10**.
- 7.17 In the event of material being spilled on the public road the operator will ensure that spilled material is removed from the public road surface in a safe and timely manner as soon as they notice or are notified that a spillage has arisen. BD Flood has its own road sweeper to maintain entrances and any emergency spillages on public roads.

## Scope of Work

- 7.18 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

- 7.19 This chapter of the EIAR was prepared by SLR Consulting Ireland. The project team consists of:
- Clio Greenbank, Graduate Hydrogeologist, BSc. MSc. (Hydrogeology);
  - Jack Crawley, Associate Hydrogeologist, BSc. MSc. (Hydrogeology); and
  - Peter Glanville, Technical Director (Hydrology & Hydrogeology) BA (Geography), PhD (Geomorphology), PGeo, EurGeol and MCIWEM.

## Limitations / Difficulties Encountered

- 7.20 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.
- 7.21 No constraints or challenges were encountered during the compilation of this chapter in the Environmental Impact Assessment Report (EIAR).

## Regulatory Background

### Legislation

- 7.22 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).
- 7.23 Other European Directives to which this EIAR makes reference, or has had regard, are listed in **Appendix 7-A**.
- 7.24 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**.
- 7.25 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:

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*“(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

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

### Guidelines and Technical Standards

7.27 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.

7.28 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

7.29 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.

7.30 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

- 7.31 A detailed geological, hydrological and hydrogeological dataset has been collected as part of this EIAR study.
- 7.32 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

- 7.33 Existing information on the geology, hydrogeology and hydrological features of the site 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
<ul style="list-style-type: none"> <li>• Soils</li> </ul>	<ul style="list-style-type: none"> <li>• Irish Soils Information System – Teagasc</li> </ul>
<ul style="list-style-type: none"> <li>• Subsoil Geology</li> </ul>	<ul style="list-style-type: none"> <li>• Teagasc/GSI/EPA Subsoil Mapping</li> </ul>
<ul style="list-style-type: none"> <li>• Bedrock Geology</li> </ul>	<ul style="list-style-type: none"> <li>• GSI Groundwater Data Viewer - Bedrock Geology</li> </ul>
<ul style="list-style-type: none"> <li>• Surface Water</li> </ul>	<ul style="list-style-type: none"> <li>• Tailte Éireann Discovery Series mapping;</li> <li>• Environmental Protection Agency online mapping;</li> <li>• Water Framework Directive;</li> <li>• OPW CFRAM; and</li> <li>• Current Offaly County Council Development Plan.</li> </ul>
<ul style="list-style-type: none"> <li>• Groundwater</li> </ul>	<ul style="list-style-type: none"> <li>• GSI Groundwater Data Viewer - bedrock and gravel aquifers, vulnerability, water supplies, groundwater recharge;</li> <li>• GSI Groundwater body description documents;</li> <li>• Environmental Protection Agency water maps; and</li> <li>• National Federation of Group Water Schemes (NFGWS) Data Viewer.</li> </ul>
<ul style="list-style-type: none"> <li>• Climate</li> </ul>	<ul style="list-style-type: none"> <li>• Met Éireann</li> </ul>
<ul style="list-style-type: none"> <li>• Protected Areas, Environmental Pressures</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Protection Agency; and</li> <li>• National Parks and Wildlife Service</li> </ul>

## Detailed Site Investigation

- 7.34 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 area is outlined as follows:
- Installation of three new (2025) groundwater monitoring boreholes across the proposed development area, as well as the installation of multiple ground investigation boreholes and trial pits (see also Chapter 6 of this EIAR for details), to monitor both the sand and gravel superficial deposits and underlying aquifer; and
  - Manual dipping of groundwater wells from three groundwater monitoring boreholes installed in the 2025 ground investigation.

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## Site Setting

- 7.35 The proposed application area is located within the existing land interest area and is c. 19.5 hectares, existing of poorly drained and open agricultural lands.
- 7.36 The application area is located within the townland of Derryarkin, Croghan, Rhode, Co. Offaly, approximately 2 km from the Offaly / Westmeath County border. Ground levels across the area remains relatively flat between 78 - 80 m AOD.
- 7.37 The application site comprises of agricultural land. Beyond the boundaries of the site to the north and west, the landscape is dominated by agricultural land, with most of the mixed sized fields under pasture. To the south and east of the site, the landscape is dominated by cutover bogs, formerly worked at an industrial level.
- 7.38 There is a watercourse flowing along the eastern boundary, the Yellow River, which flows in a north easterly direction.

## Rainfall and Climate

- 7.39 There is no Met Éireann rainfall gauging station near to the application site.
- 7.40 The nearest Met Éireann meteorological station for which long-term average annual rainfall is available, is the Casement station located c. 40 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 (1991-2020), Casement station**

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ann. Avg.
65	55.2	51.8	55.3	59.1	65.7	59.4	71.2	61.6	81.6	81.9	75.7	783.5

## Soils and Geology

- 7.41 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**.
- 7.42 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	Thickness (m)
Soil	<ul style="list-style-type: none"> <li>Organic rich clayey soil</li> </ul>	c. 0.4
Limestone Sands and Gravels	<ul style="list-style-type: none"> <li>Lower Carboniferous limestone sands and gravels</li> </ul>	c. 5 - 6
Silt Gravelly Clay	<ul style="list-style-type: none"> <li>Silt and gravelly clay material underlying the Sands and Gravels</li> </ul>	Unknown
Bedrock: Agglomerate and Basalt underlain by Lucan Formation	<ul style="list-style-type: none"> <li>Agglomerate: Vitric lithic lapilli tuffs and tuff breccias with intercalated thin basalts;</li> <li>Lucan Formation: Dark grey-black, fine-grained limestone with interbedded calcareous shale</li> </ul>	Unknown

## Soils and Subsoils

- 7.43 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.
- 7.44 Organic rich peaty soil and the Elton Series are the principal soil types across the study zone, see **Figure 6-2**. These soils are considered to be moderately to poor and imperfectly draining.
- 7.45 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.
- 7.46 As presented on **Figure 6-3**, the subsoils in the study area are represented by two main subsoil types; Cut over peat and Gravels derived from Limestones. The only remaining peat at the site comprises an organic rich clayey soil.

## Local Bedrock Geology

- 7.47 The GSI online map viewer (1:100,000 geology map) has been reproduced on **Figure 6-4**. The published mapping indicates the application site is underlain by the Basalt and Agglomerate formations, which comprises of:  
*'generally massive, black, olivine basalts, weathered to various degrees'* and *'Vitric lithic lapilli tuffs and tuff breccias, with intercalated thin basalts'*.
- 7.48 Underlying this is the Lucan formation which is lithologically described as:  
*'dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey'*.
- 7.49 There are no bedrock exposures within the application area, however there are bedrock exposures within the study area, closest to the site at c. 1.2 km south.

## Groundwater - Hydrogeology

### Aquifer Characteristics

- 7.50 Published mapping provided by the GSI, reproduced as **Figure 7-2**, confirms that the application area is underlain by a:  
*"Locally Important Aquifer - Bedrock which is generally moderately productive (Lm)"*.
- 7.51 The rest of the study area is underlain by a:  
*"Locally Important Aquifer – Bedrock which is moderately productive only in local zones (LI)"*.
- 7.52 The groundwater flow gradient in this area will be low as the area is flat with numerous watercourses and drainage channels. Local groundwater flow at the site will be in a southeasterly direction to the Yellow River.
- 7.53 This site at Derryarkin was a former Bord na Móna working bog with peat being cut at the site up to the 1980's. Bord na Móna had previously excavated and deepened the Yellow River in the vicinity of the site in order to lower the water table and drain the adjacent bogs to facilitate the harvesting of peat. The Yellow River was deepened in order to artificially lower the groundwater table in the local area, including at the application site.

## Groundwater Vulnerability

- 7.54 The GSI has developed a groundwater vulnerability classification for Ireland, a summary of which is presented in **Table 7-4** below.
- 7.55 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/or the thickness of the unsaturated zone (depth to groundwater).
- 7.56 Regional groundwater vulnerability mapping is presented as **Figure 7-4**; this indicates that the groundwater beneath the application area has a 'Moderate' vulnerability rating.

**Table 7-4: GSI Groundwater vulnerability rating**

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness (m)			Unsaturated Zone thickness (m)	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)
<b>Extreme (E)</b>	0 - 3.0	0 - 3.0	0 - 3.0	0 - 3.0m	-
<b>High (H)</b>	>3.0	3.0 - 10.0	3.0 - 5.0	>3.0m	N/A
<b>Moderate (M)</b>	N/A	>10.0	5.0 - 10.0	N/A	N/A
<b>Low (L)</b>	N/A	N/A	>10.0	N/A	N/A
<b>Notes:</b>	(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.				

- 7.57 The GSI's online database identifies the hydrogeological setting of the application site as moderate permeability subsoil. The effective rainfall (rainfall after evaporation) is 493 mm/yr. The average groundwater recharge at the site is <50 mm/yr. However; the GSI hydrogeological setting appears to assume that there is Peat present at the site and local area; site investigations indicate only a thin layer of organic rich clay soil remains as the peat has been extracted in the past from across the site.

## Groundwater Bodies

- 7.58 The application area is underlain by the Athboy groundwater body (GWB). The Athboy GWB is bounded to the south-east by the Trim GWB and Rhodes GWB, as presented on **Figure 7-3**.
- 7.59 The Athboy GWB covers an area of 964 km<sup>2</sup> and mainly consists of the Dinantian Limestones. The thickness varies but has been recorded at c. 60 m.
- 7.60 The Athboy GWB has a "Good" WFD Status (2016 – 2021) but is classed as "Not at Risk" under the WFD Third-Cycle. In addition, the Athboy GWB is classified as having a: "Low-to-High" groundwater vulnerability to potential pollution with "3 to 4 metres depth of moderate permeability till (boulder clay) above bedrock".

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- 7.61 The main recharge mechanism is diffuse recharge. The groundwater body mainly consists of low permeability aquifers therefore recharge will mainly be occurring in the weathered upper layers, particularly in the volcanic strata.
- 7.62 Groundwater will discharge locally to streams and rivers. The rivers and streams have moderate to low dry weather flows, and therefore baseflow cannot support the river levels during summer months. There may also be instances of discharge to the adjacent Trim GWB to the east.

## Groundwater Monitoring Network

- 7.63 A ground investigation (GI) was undertaken in 2025, in which three groundwater monitoring boreholes were installed across the application area. This involved the installation of three boreholes, GW1, GW2, and GW3 which are located on the perimeter of the site, see **Appendix 7-B** and **Figure 7-4**.
- 7.64 The boreholes encountered sands and gravels at all locations at the site, underlain by lower permeability clays and silts, with high cobble contents.
- 7.65 Summary details of groundwater monitoring boreholes installed on-site are presented in **Table 7-5**.

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

BH ID	Location	Borehole Depth (m BGL)	Water strikes (m AOD)	Screened Strata
GW1	E648804 N736188	11.00	75.52	Sand and Gravel
GW2	E649326 N736317	10.00	74.43	Sand and Gravel
GW3	E648986 N735980	11.00	76.36	Sand and Gravel

## Groundwater Levels

- 7.66 Groundwater levels have been manually measured in the above boreholes, GW1, GW2 and GW3, see **Table 7-6** below.
- 7.67 Groundwater level data indicates that levels are highest in the southwest (GW3) and are lowest in the northeast (GW2). Groundwater is therefore inferred to be flowing a broad north-easterly direction towards the Yellow River which forms the local hydraulic boundary for groundwater flows.

**Table 7-6: Groundwater levels**

Borehole ID	GWL (m AOD) 24/04/2025	GWL (m AOD) 03/09/2025
GW1	76.59	76.35
GW2	76.41	76.30
GW3	77.59	77.12

## Surface Water - Hydrology

### Surface Water Bodies

- 7.68 Local surface water bodies are shown in **Figure 7-1**. The Yellow River, WFD Waterbody ID 'Yellow (CASTLEJORDAN)\_010', runs along the eastern boundary of the application area flowing in a north easterly direction. The Yellow River flows into the River Boyne which flows into the Irish Sea at Drogheda Town.
- 7.69 The Yellow River at the site is classified as being 'At Risk' of not meeting its environmental objectives under the Water Framework Directive (WFD) and agricultural pressures in the catchment have been identified as the significant pressure on the waterbody not meeting its environmental objectives.

### Catchment

- 7.70 The site is located within the Boyne Catchment (WFD ID07), which has an area of 2,696 km<sup>2</sup>.
- 7.71 The site is situated within the yellow River sub-catchment of the River Boyne, WFD subcatchment ID 'Yellow (CASTLEJORDAN)\_SC\_010', see **Figure 7-1**.

### Flooding

- 7.72 The Office of Public Works (OPW) is the government agency with statutory responsibility for flooding in Ireland.
- 7.73 The available OPW National Indicative Flood Maps (NIFM) flood maps show that the site is not at risk of fluvial flooding from the Yellow River.
- 7.74 The available GSI data indicates that the site is not vulnerable to groundwater flooding. There are also no records of historic flooding in the OPW database within 2 km of the site.

### Surface Water Biological Quality

- 7.75 The surface water quality data of surface water bodies within the study area, was obtained from EPA web map. The EPA controls a significant 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 macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site which are either pollution-sensitive or pollution-tolerant. Results score from 1 to 5, with the lowest water quality rating being 1, and the highest being 5.
- 7.76 The closest active EPA monitoring station is WFD ID *Br d/s Big R confluence* which is approximately 380 m to the northeast of the application area. There was an EPA monitoring station on the eastern boundary of the application area (WFD ID *Yellow (CASTLEJORDAN) - Nr Derryarkin*), however monitoring at this location ceased in 2003.
- 7.77 The latest water quality (Q-Value) dataset for the Yellow River at the site reported a water quality Q value of 3 in 2003.
- 7.78 The latest water quality (Q-Value) dataset for the Yellow River downstream of the site reported a water quality Q value of 3 in 2024.
- 7.79 Since 2000, the Q-Values for the Yellow River near the site have remained relatively level, with Q-Values fluctuating between 3, 3 - 4 and 4, see **Table 7-7** below.

**Table 7-7: EPA biological water Q-Value quality ratings**

	Station ID RS07Y020060	Station ID RS07Y020070
<b>Station Name:</b>	YELLOW (CASTLEJORDAN) - Nr Derryarkin	Br d/s Big R confluence
<b>EPA Watercourse ID:</b>	YELLOW (CASTLEJORDAN)_010	YELLOW (CASTLEJORDAN)_010
<b>Approx. Dist. (m):</b>	On eastern boundary	c. 380 north east
2000	4	-
2003	3	3
2006	-	4
2009	-	4
2012	-	4
2014	-	-
2015	-	3-4
2018	-	3-4
2020	-	3
2024	-	3

## Protected Areas

7.80 Published EPA mapping indicates that there are no protected areas within 5 km of the site.

## Water Environment Receptors

7.81 A review of the baseline conditions for the site and surrounding area has identified the following sensitive receptors relating to the water environment down-gradient of the site:

- Locally Important Volcanic Bedrock Aquifer; and
- Yellow River located on the eastern boundary of the application area.

7.82 As presented in **Table 7-8**, the significance and sensitivity of the receptor has been assessed and a rating (High / Medium / Low / Negligible) applied. This is based on the methodology outlined in existing guidance and reproduced in **Appendix 7-G**.

**Table 7-8: Existing Environment - significance and sensitivity / importance**

No.	1	2
<b>Existing Environment:</b>	Yellow River	Locally Important Aquifer
<b>Significance:</b>	Surface watercourse on the eastern boundary. Site is within Boyne catchment.	Bedrock aquifer is within the Athboy GWB which has a good status (2016 - 2021).
<b>Sensitivity:</b>	A stream located east of the site that flows into the Boyne River. River is assumed to be in hydraulic continuity with the site through groundwater.	Bedrock aquifer underlying sand and gravel superficial deposits. Sand and gravel deposits are not classified as an aquifer.

# Water (Hydrology & Hydrogeology) 7

	Stream is classified as 'Good' status and has retained status from 3 to 4 since 1994.	
<b>Existing Environment Significance / Sensitivity Rating (H/M/L/N):</b>	<b>Medium</b> - Attribute has a medium quality or value on a local scale	<b>Medium</b> - Attribute has a medium quality or value on a local scale (Locally Important Aquifer)

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## Receiving Environment - Baseline Summary

- 7.83 The following provides a summary of the baseline water environment conditions at the site:
- The site is underlain by volcanic bedrock of the Basalt and Agglomerate formations and by sand and gravel subsoils;
  - The site is in the Yellow River catchment, which is a sub-catchment of the River Boyne;
  - The closest waterbody to the application area is the Yellow River which flows along the eastern boundary;
  - Under the WFD classification, the Yellow River is classified as “Good Status” and is designated under the Third-Cycle as being ‘At Risk’ from agricultural pressures in the catchment;
  - There are no recorded flood events near the site, nor is there any risk of potential flooding;
  - The site is located within the Athboy GWB. The bedrock aquifer in the area is classified as a locally important aquifer. The aquifer at the site is classified as a locally important (Lm) aquifer. The GWB is classified as being of Good status under WFD classification.
  - The groundwater vulnerability is classed as being of ‘Moderate’ vulnerability from potential pollution sources; and
  - Groundwater level monitoring at the site indicates a groundwater flow to the Yellow River which forms the local hydraulic boundary for the site.

## Impact Assessment

### Evaluation Methodology

- 7.84 The potential direct and indirect impacts to surface water and groundwater associated with the proposed sand and gravel pit are initially assessed in this chapter without any mitigation measures in place.
- 7.85 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-D**. The cumulative impact of any potential impacts is also assessed.
- 7.86 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-E**.

- 7.87 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 proposed; an assessment of the residual impacts arising from the proposed development is provided.
- 7.88 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.
- 7.89 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)

- 7.90 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 the construction stage is taken to comprise the stripping stage where in-situ soils are removed and stockpiled before extraction activities can commence, as well as some limited activity setting up required site infrastructure including the wheel wash, weighbridge, mobile welfare pod facility consisting of office, canteen, toilet and drying room, dedicated parking area and perimeter vegetation planting and fencing.

### Direct Impacts

#### Surface Water

- 7.91 There will be no discharge from the proposed sand and gravel pit site to any surface watercourse. Therefore, there are no direct adverse impacts on surface water quality or quantity during this stage.

#### Groundwater

- 7.92 The accidental leaking or spillage of fuel and/or other petroleum-based products has the potential to impact on groundwater in the underlying sand and gravel material and potentially also the underlying bedrock aquifer.
- 7.93 Extraction will comprise wet working below 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

- 7.94 Accidental leaking or spillage of fuel and/or other petroleum-based products at the site has the potential to impact on the Yellow River.
- 7.95 Any impact on the Yellow River has the potential to also impact the downstream surface water bodies, i.e. the River Boyne, at a distance from the site.

#### Groundwater

- 7.96 There are no anticipated indirect impacts on groundwater at this stage.

## Operational Stage Impacts

- 7.97 There is the potential for direct impacts on groundwater, and indirect impacts on surface water and groundwater, arising from the proposed extraction of sand and gravel during the operational stage. Potential impacts on surface water and groundwater have been identified and are outlined below.

### Direct Impacts

#### Surface Water

- 7.98 There will be no discharge from the proposed sand and gravel pit to the nearby watercourses. Therefore, there will therefore be no direct impacts on surface water quality or quantity during the operational stage.

#### Groundwater

- 7.99 An accidental leaking or spillage of fuel and/or other petroleum-based products could impact on groundwater quality in the underlying sand and gravel and bedrock aquifer.
- 7.100 The proposed sand and gravel pit will be worked below the groundwater in the sand and gravel deposits; however, no dewatering of shallow groundwater will take place. As there is no dewatering associated with the proposed development, there will be no change to the shallow groundwater flow or quantity.
- 7.101 The proposed development will remove the direct impact of agriculture pressures from the site on groundwater as the land will not be used for agriculture any longer.

### Indirect Impacts

#### Surface Water

- 7.102 An accidental leaking or spillage of fuel and/or other petroleum-based products at the site has the potential to impact on the surface water quality Yellow River.
- 7.103 The proposed development will remove the indirect impact of agriculture pressures from the site on surface water as the land will not be used for agriculture any longer.

#### Groundwater

- 7.104 There are no anticipated indirect impacts on groundwater at this stage.

## Post - Operational Stage Impacts

### Direct Impacts

- 7.105 A restoration scheme has been prepared for the proposed site and will be implemented following permanent cessation of extraction activities. Restoration will be on a phased basis with surplus excavated organic rich clayey soil to the extracted areas, the establishment of a permanent water body and allowing the lake edges and external perimeter berms to naturally regenerate / revegetate over time. There is no requirement to import any materials to site for restoration purposes.
- 7.106 There are no anticipated direct impacts during the post operational stage as all plant, machinery and ancillary equipment will be removed from the site following extraction.

### Indirect Impacts

- 7.107 There are no anticipated indirect impacts from the post operational stage as all plant, machinery and ancillary equipment will be removed from the site following extraction.

## 'Do-nothing Scenario'

- 7.108 If the proposed development is not permitted, the site will remain under agricultural landuse. The aggregate resource will remain in the ground and alternative pit development will be required at other locations to provide aggregate material for the BD Flood manufacturing and construction activities.
- 7.109 The ecological status of the Yellow River is in decline, and in is classified as being at 'At Risk' due to agricultural 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

- 7.110 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.
- 7.111 The description of the effects and rating for each identified impact is shown in **Table 7-9** below.

## Significance of Impacts

- 7.112 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**.

# Water (Hydrology & Hydrogeology) 7

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

No.	Potential Impacts	Impact Rating (No Mitigation)	Sig. of Impact (No Mitigation)
<b>Construction Stage - Indirect - Surface Water</b>			
1	Improvement in surface water quality due to removal of land from agriculture.	<b>Medium.</b> Potential to improve surface quality in stream by change of land use from agriculture. Contribute to maintenance of status of surface water as Good.	<b>Moderate</b>
<b>Construction Stage - Direct - Groundwater</b>			
2	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	<b>Low.</b> Potential to affect groundwater quality in bedrock due to exposed groundwater from wet working on the site. 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.	<b>Slight - Not Significant</b>
<b>Construction Stage - Indirect - Surface Water</b>			
3	Impact on surface water quality in the Yellow River via groundwater baseflow to the watercourse	<b>Medium.</b> Potential to affect surface water quality (fuel) in the Yellow River, through groundwater baseflow to the watercourse, or runoff due to the proximity of the watercourse to the site. Any leakage / spillage would be accidental only and of limited volume. An impact on the stream is considered unlikely.	<b>Moderate</b>
<b>Operational Stage - Direct - Surface Water</b>			
4	Improvement in surface water quality due to removal of land from agriculture.	<b>Medium.</b> Potential to improve surface quality in stream by change of land use from agriculture. Contribute to maintenance of status of surface water as Good.	<b>Moderate</b>
<b>Operational Stage - Direct - Groundwater</b>			
5	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying bedrock aquifer	<b>Low.</b> Potential to affect groundwater quality in bedrock due to exposed groundwater from wet working on the site. 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; no fuel will be stored at the site.	<b>Slight - Not Significant</b>
<b>Operational Stage - Indirect - Surface Water</b>			
6	Impact on surface water quality in the Yellow River via groundwater baseflow to the watercourse	<b>Medium.</b> Potential to affect surface water quality (fuel) in the Yellow River, through groundwater baseflow to the watercourse. Any impact on the stream 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 at the site.	<b>Moderate</b>

## Mitigation Measures

### Construction & Operational Stages

- 7.113 BD Flood is part of the Flood Group who has implemented an environmental management system (EMS) at their existing sites (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 development, the group EMS will be extended to include the application site.
- 7.114 Environmental water monitoring will be carried out on a regular basis to demonstrate that the development is not having any significant adverse effects on the surrounding environment.
- 7.115 In order to mitigate against the risk of pollution to groundwater and surface water occurring at the site the following standard management mitigation measures will be implemented:
- 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;
  - During any fuelling or servicing of plant and equipment at the site a spill kit and drip trays will be available in the event of any accidental spills or leakages;
  - No fuel and oils will be stored at the site. HGV's will be refuelled off-site at other BD Flood sites. The long reach excavator, loading shove and crusher / screener will be refuelled on-site using a mobile 'bundled' double-skinned fuel dispenser that will be brought to site by a third-party fuel supplier (with road certified trucks, competent drivers, and spill kits). Refuelling will typically be carried out every 2 days;
  - A number of spill kits will be available on-site in the event of any 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 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 a bath type wheel wash;
  - a road sweeper will be used to maintain entrances and any emergency spillages on public roads;
  - The BD Flood environmental team undertake quarterly environmental audits at the site to ensure that compliance with all planning consents, licences and site environmental management system, which is accredited to ISO14001 standard, is both maintained and enhanced.
- 7.116 With the implementation of these standard mitigation measures at the site any potential adverse impacts on the water environment identified above will be further reduced and the will be neutral and not significant.

### Post - Operational Stage

- 7.117 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 a beneficial ecological habitat use.

- 7.118 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.
- 7.119 Following extraction all plant, machinery and ancillary infrastructure will be removed from the site, so there will be no potential adverse impacts on the water environment during this stage.

### Residual Impact Assessment

- 7.120 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** below, and the residual impact for all potential impacts is assessed as being Not Significant.
- 7.121 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.
- 7.122 Following mitigation, the significance of all potential negative impacts identified will be reduced to Not Significant.

### Monitoring

- 7.123 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.
- 7.124 A network of groundwater monitoring boreholes has been installed across the site.
- 7.125 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:
- surface water quality monitoring to be undertaken on a bi-annual basis for the duration of the proposed development, with grab sample from the Yellow River upstream and downstream of the site;
  - groundwater levels in all boreholes will be monitored on a bi-annual basis for the duration of the proposed development; and
  - groundwater quality monitoring to be undertaken on an annual basis for the duration of the proposed development.

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**Table 7-10: Summary of potential impacts and residual effects with mitigation measures in place**

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

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## Figures

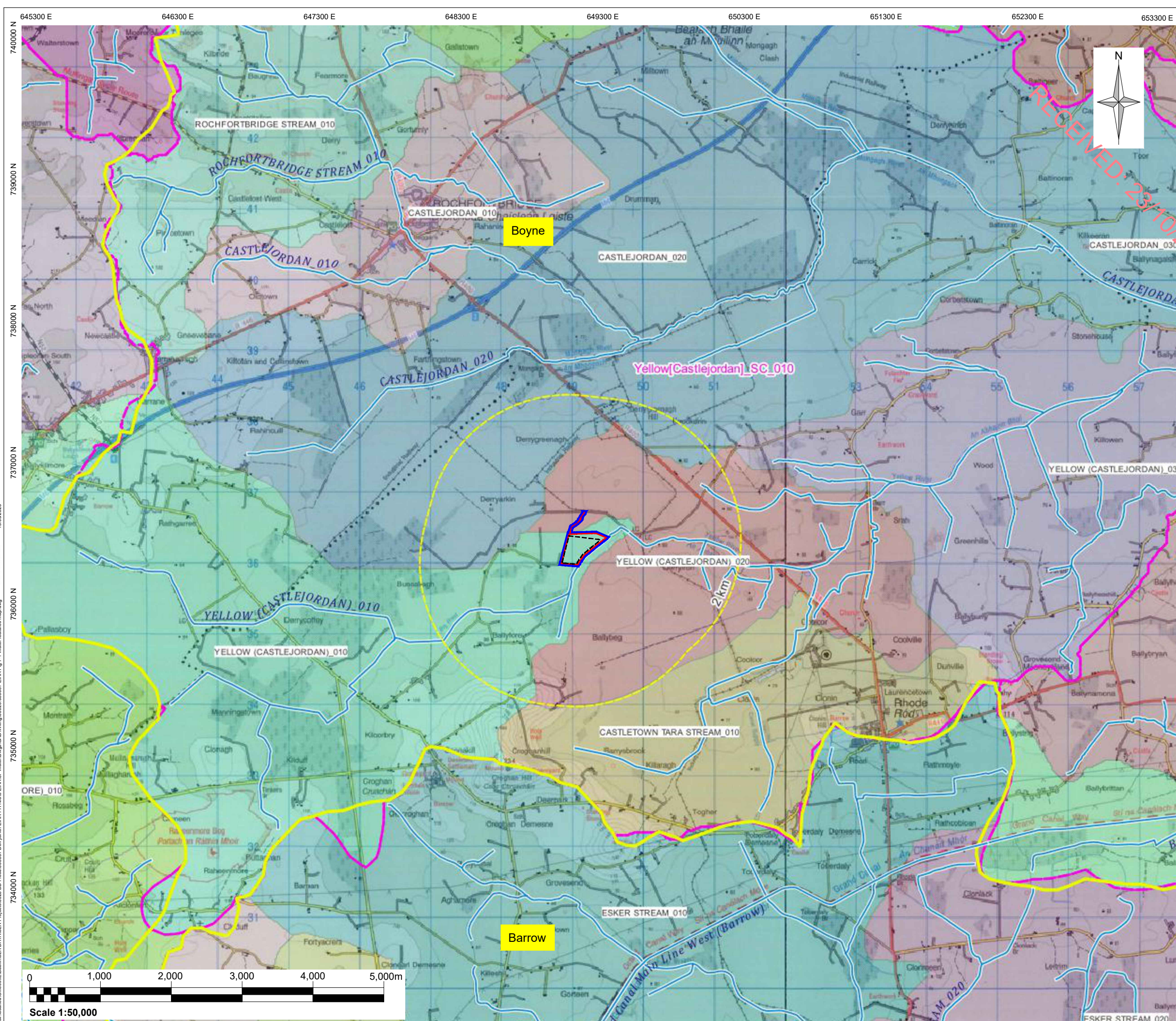
**Figure 7-1: Surface Water Features Map**

**Figure 7-2: Bedrock Aquifer Map**

**Figure 7-3: Groundwater Body Map**

**Figure 7-4: Groundwater Vulnerability Map**

**Figure 7-5: Groundwater Well / Surface Water Monitoring Locations**



**Notes:**

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from EPA WFD © EPA

**Legend:**

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicants Land Interest Area
- Catchment Boundary
- Sub-Catchment Boundary
- Rivers

EPA WFD River Sub-basins in Yellow (Castle Jordan) Sub-Catchment\_010:

- YELLOW (CASTLEJORDAN)\_010
- CASTLEJORDAN\_020
- YELLOW (CASTLEJORDAN)\_020
- CASTLEJORDAN TARA STREAM\_010
- YELLOW (CASTLEJORDAN)\_030
- CASTLEJORDAN\_010
- ROCHFORTBRIDGE STREAM\_010

Rev	Amendments	Date	By	Chk	Auth

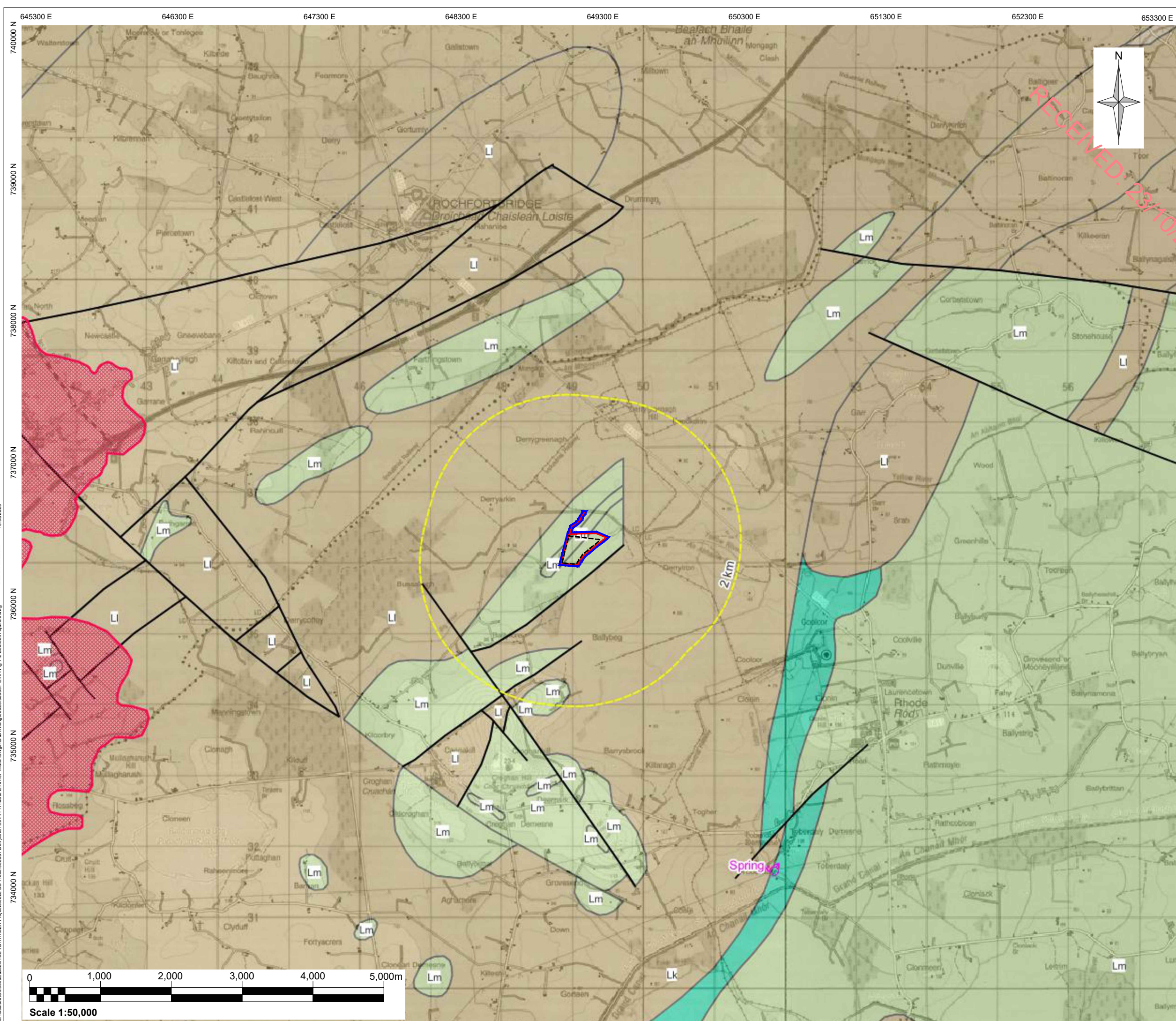
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BD Flood Unlimited Company

Project  
Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

Figure Title  
Surface Water Features Map

Scale 1:50,000 @ A3	SLR Project No. 501.00023.065657		
Designed NB	Drawn NB	Checked PG	Authorised PG
Date 12/24	Date 12/24	Date 09/25	Date 09/25
Figure Number <b>Figure 7-1</b>			Rev. <b>R0</b>



**Notes:**

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from GSI Bedrock Aquifer © GSI

**Legend:**

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicants Land Interest Area

**GSI Bedrock Aquifers:**

- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lk - Locally Important Aquifer - Karstified
- Lg - Locally important gravel aquifer

**GSI Karst Landforms:**

- Spring

Rev	Amendments	Date	By	Chk	Auth

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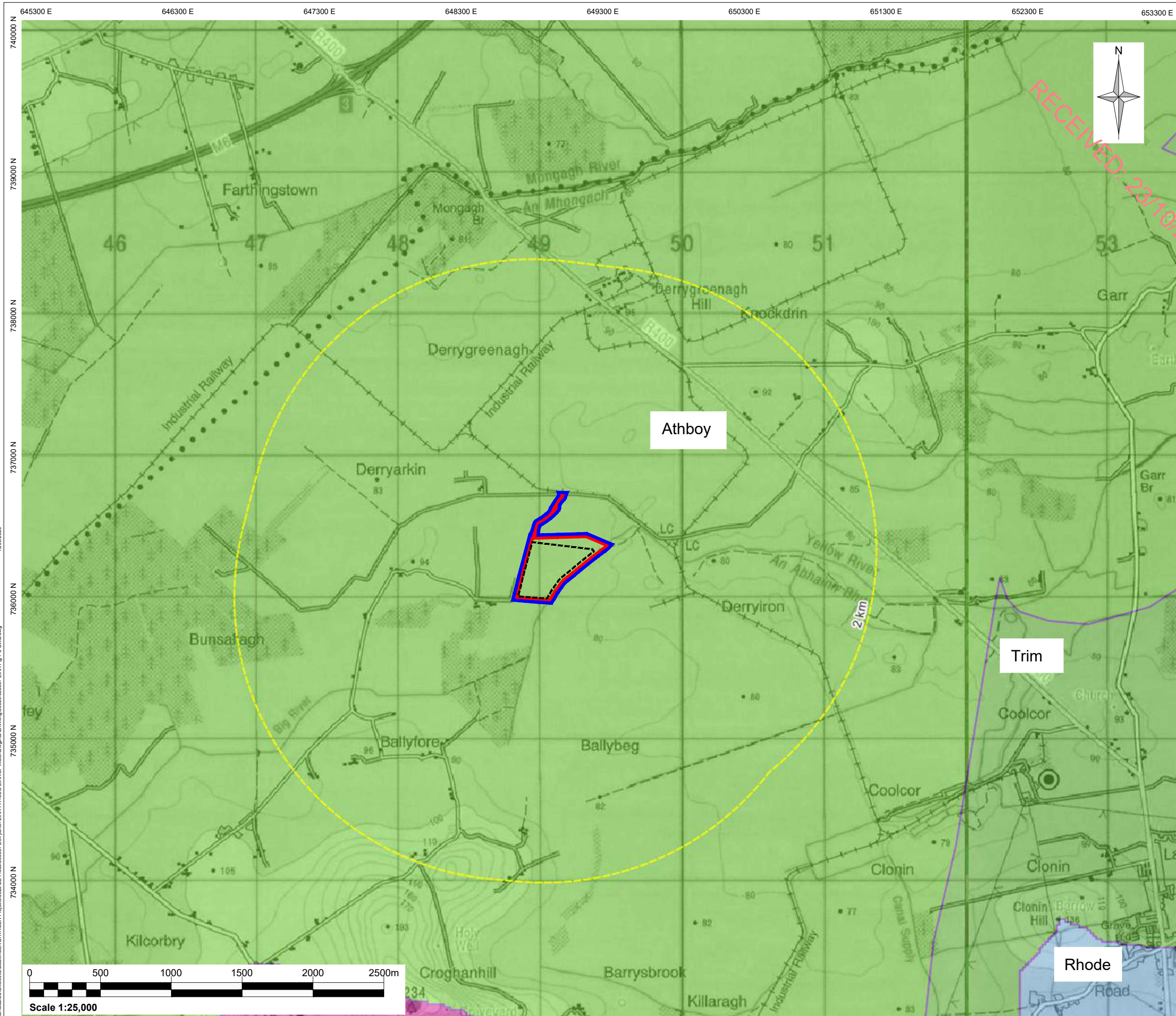
Project  
Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

Figure Title  
Bedrock Aquifer Map

Scale 1:50,000	@ A3	SLR Project No. 501.00023.065657
Designed NB	Drawn NB	Checked PG
Date 12/24	Date 12/24	Date 09/25
Authorised PG	Date 09/25	

Figure Number  
**Figure 7-2**

Rev.  
**R0**



**Notes:**

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from GSI GWB Data © GSI

**Legend:**

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicants Land Interest Area

**GSI Groundwater Bodies:**

- Athboy
- Trim
- Rhode

Rev	Amendments	Date	By	Chk	Auth



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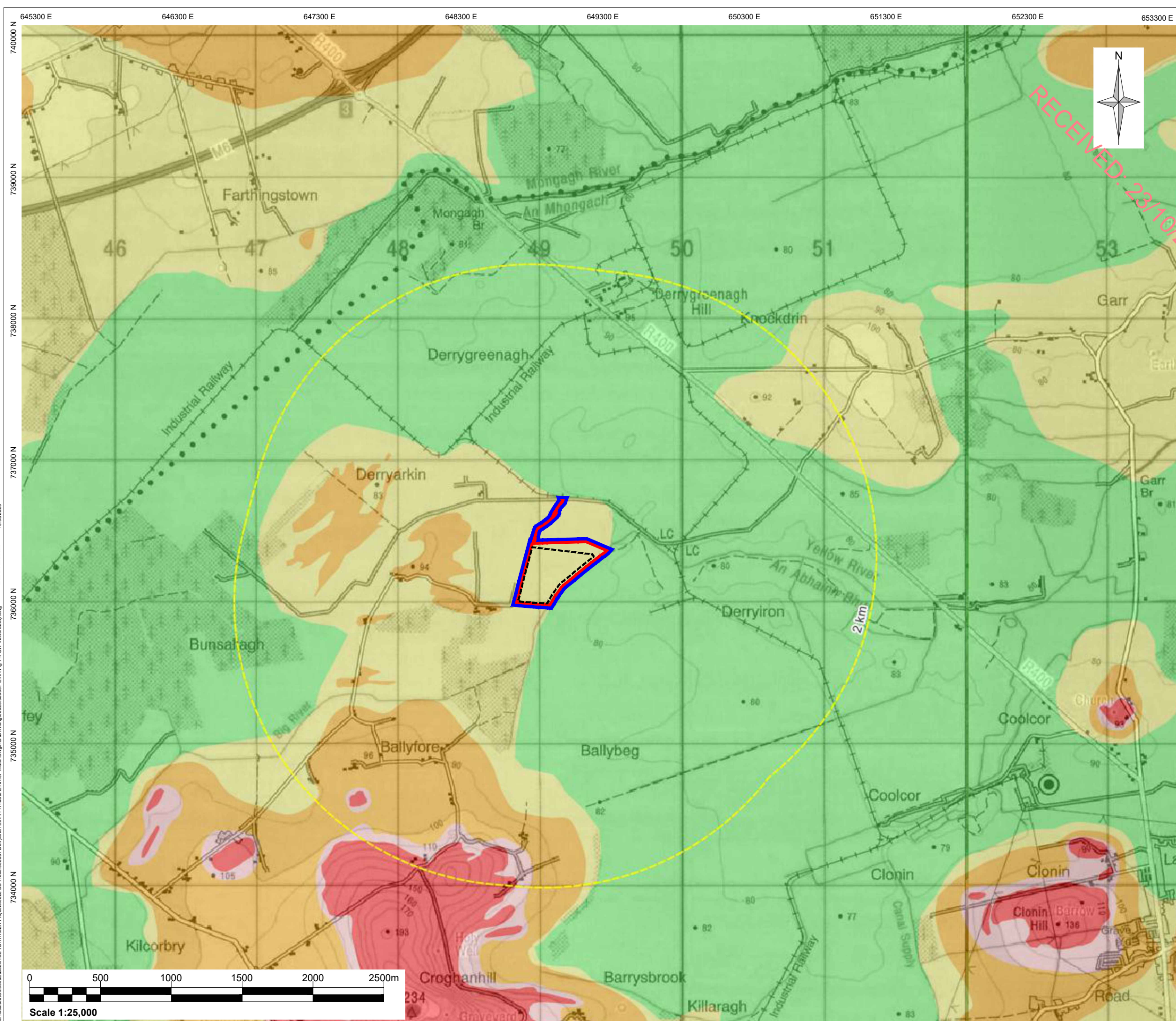
**Project**  
Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

**Figure Title**  
Groundwater Body Map

Scale: 1:25,000 @ A3 SLR Project No. 501.00023.065657

Designed NB	Drawn NB	Checked PG	Authorised PG
Date 12/24	Date 12/24	Date 09/25	Date 09/25

Figure Number: **Figure 7-3** Rev: **R0**



**Notes:**

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from GSI GW Vulnerability © GSI

**Legend:**

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicants Land Interest Area

**GSI Groundwater Vulnerability:**

- Rock at surface
- Extreme
- High
- Moderate
- Low

Rev	Amendments	Date	By	Chk	Auth



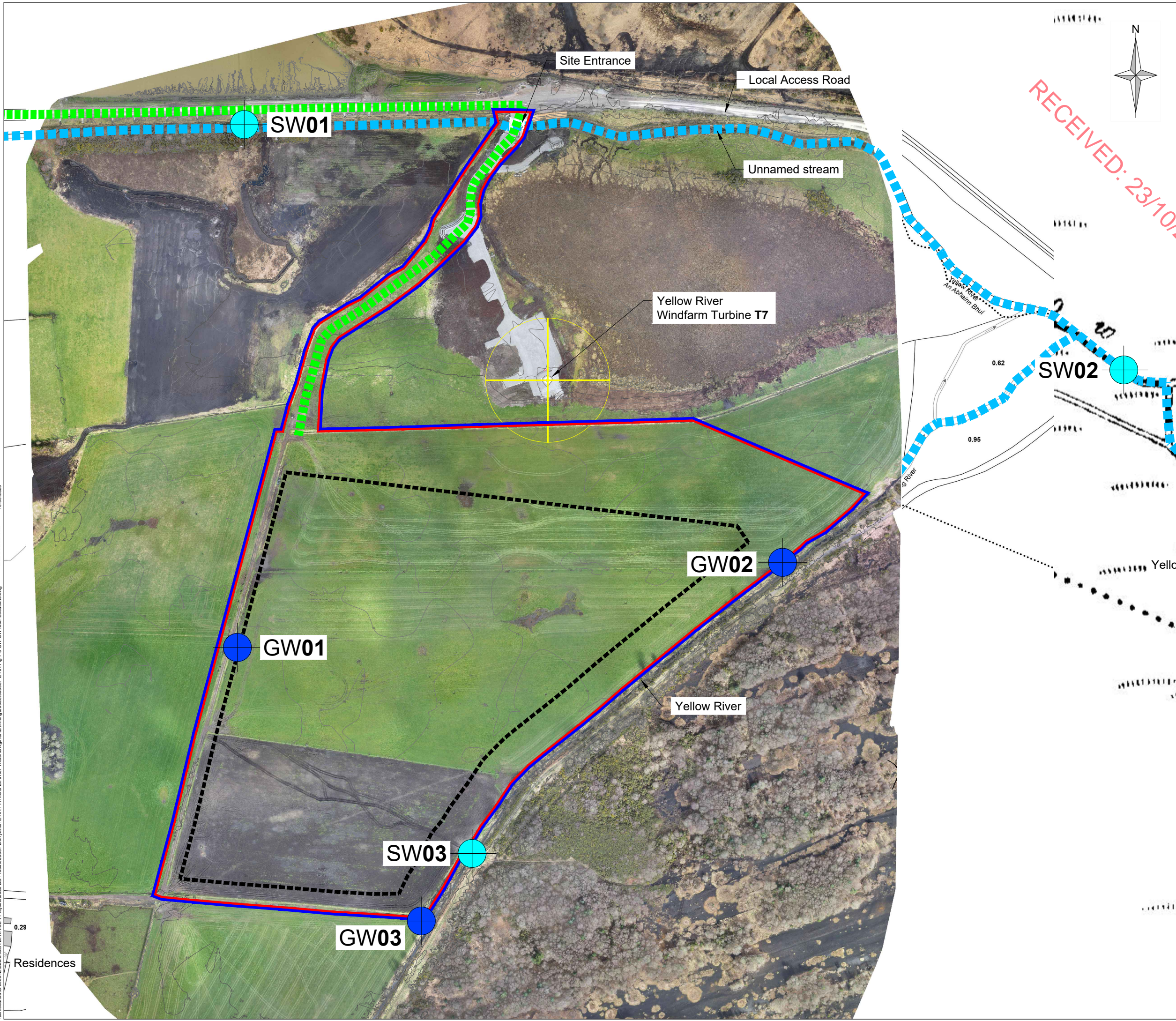
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**Project**  
Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

**Figure Title**  
Groundwater Vulnerability Map

Scale 1:25,000 @ A3		SLR Project No. 501.00023.065657	
Designed NB	Drawn NB	Checked PG	Authorised PG
Date 12/24	Date 12/24	Date 09/25	Date 09/25
Figure Number <b>Figure 7-4</b>			Rev. <b>R0</b>



**Notes:**  
 Tailte Éireann OSI Mapping 5,000 scale - sheet no.'s 3180 & 3181

- Legend:**
- Applicant Land Interest Boundary
  - Proposed Planning Application Area  
19.5 hectares
  - Proposed Sand and Gravel Extraction Area  
11.7 hectares
  - BD Flood Ltd. Land Interest Boundary  
2.5 hectares
  - Baseline **Groundwater** Monitoring Well Locations
  - Baseline **Surface Water** Monitoring Locations

Rev	Amendments	Date	By	Chk	Auth



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 Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

Figure Title  
 Groundwater Well / Surface Water Stream Monitoring Locations

Scale N.T.S	@ A3	SLR Project No. 501.00023.065461
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Date 04/25	Date 04/25	Date 09/25
Date 04/25	Date 09/25	Date 09/25

Figure Number  
**Figure 7-5**

Rev.  
**0**

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 CYAL50450233  
 © Tailte Éireann - Surveying.

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## **Appendices**

### **Appendix 7-A**

EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

### **Appendix 7-B**

Groundwater Borehole Logs

### **Appendix 7-C**

Rating of Existing Environment Significance / Sensitivity

### **Appendix 7-D**

Descriptions of Effects (EPA, 2022)

### **Appendix 7-E**

Classification of the Significance of Impacts

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## 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;

# Water (Hydrology & Hydrogeology) 7

- 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.
- DEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities.
- 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.
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**Appendix 7-B**  
**Groundwater Borehole Logs**

<b>BOREHOLE LOG</b>				BOREHOLE No <b>GW 1</b>	
Client: <b>B.D.FLOOD LIMITED</b>					
Project No: 501.065657.00001		Date: 02/04/2025	Ground Level: 79.52m	Co-ordinates: E648804 N736188	
Project: <b>Derryarkin S&amp;G Pit Development EIAR &amp; PA</b>					Sheet 1 of 1

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SAMPLES & TESTS				STRATA					Instrument Backfill
Depth	Type No	Test Type	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
1 2 3 4 5 6 7 8 9 10				▼	78.62	siltz siltz s	(0.90)	Soft dark PEAT	
				▽	74.32	siltz siltz s	(4.30)	Loose fine grey SAND AND GRAVEL	
					73.02	x x x x x	(1.30)	Soft grey sandy SILT	
					69.72	x x x x x	(3.30)	Dense coarse grey sub-angular silty GRAVEL very frequent cobbles	
					68.52	x x x x x	(1.20)	Stiff very gravelly sandy CLAY high cobble content	
Borehole Complete at 11.00m									

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
02/04/2025	11.00	4.00	140.00							

All dimensions in metres Scale 1:73	Contractor: Petersen Drilling Ltd. Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By: SP & MH Approved By: SP
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<b>BOREHOLE LOG</b>				BOREHOLE No <b>GW 2</b>	
Client: <b>B.D.FLOOD LIMITED</b>					
Project No: 501.065657.00001		Date: 02/04/2025	Ground Level: 78.43m	Co-ordinates: E649326 N736317	
Project: <b>Derryarkin S&amp;G Pit Development EIAR &amp; PA</b>					Sheet 1 of 1

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SAMPLES & TESTS				STRATA					Instrument Backfill
Depth	Type No	Test Type	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
1 2 3 4 5 6 7 8 9				▼	77.63	siltz siltz s siltz siltz s siltz siltz s	0.80	Soft dark brown PEAT	
				▼	73.73	siltz siltz s siltz siltz s siltz siltz s	4.70	Loose fine grey well rounded SAND AND GRAVEL	
				▼	68.83	x x x x x x x x x x x x x x x	4.90	Soft to firm grey clayey SILT	
				▼	68.43	x x x x x x x x x x x x x x x	10.00	Firm to stiff grey silty gravelly CLAY	
Borehole Complete at 10.00m									

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
02/04/2025	10.00	4.00	140.00							

All dimensions in metres Scale 1:66	Contractor: Petersen Drilling Ltd. Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By: SP & MH Approved By: SP
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<b>BOREHOLE LOG</b>				BOREHOLE No <b>GW 3</b>	
Client: <b>B.D.FLOOD LIMITED</b>					
Project No: 501.065657.00001	Date: 02/04/2025	Ground Level: 79.86m	Co-ordinates: E648986 N735980		
Project: <b>Derryarkin S&amp;G Pit Development EIAR &amp; PA</b>				Sheet 1 of 1	

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SAMPLES & TESTS				STRATA						
Depth	Type No	Test Type	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Instrument Backfill	
1 2 3 4 5 6 7 8 9 10				▼	79.56		0.30	Soft to firm brown peaty TOPSOIL		
							(4.80)	Medium dense coarse grey well rounded SAND AND GRAVEL frequent cobbles and boulders	█	
					↙	74.76		5.10	Loose fine brown SAND	
						74.36		5.50	Loose to Medium dense fine grey silty SAND	
						70.26		(4.10)	Loose to Medium dense fine grey silty SAND	
					68.86		(1.40)	Soft to firm grey sandy SILT	█	
					68.86		11.00		█	

Borehole Complete at 11.00m

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
02/04/2025	11.00	3.50	140.00							

All dimensions in metres Scale 1:73	Contractor: Petersen Drilling Ltd. Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By: SP & MH Approved By: SP
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**Appendix 7-C**  
**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.

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**Appendix 7-D**  
**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 noticeable 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

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## Water (Hydrology & Hydrogeology) 7

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 SO <sub>x</sub> and NO <sub>x</sub> to produce smog).

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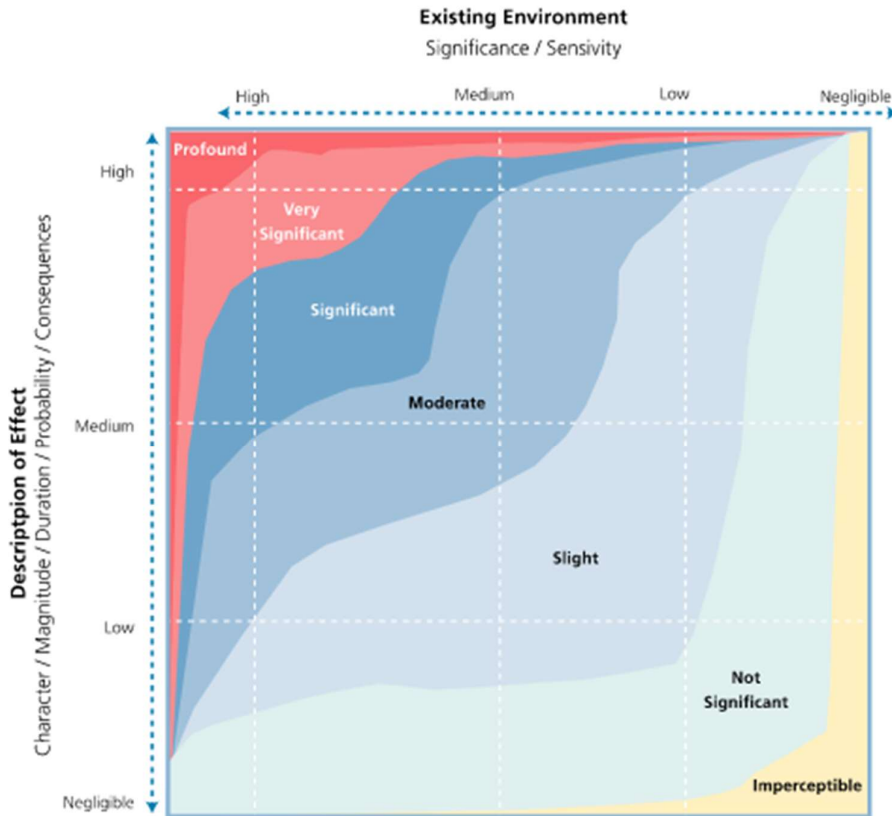
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**Appendix 7-E**  
**Classification of the Significance of Impacts**

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## 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<sup>68</sup>.)

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