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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 proposed continued use and extension of the existing sand & gravel pit at Ballymacoonoge & Glentire Townlands, Ballaghkeen, Co. Wexford has been collated and evaluated here in this chapter.

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 2-2 of this EIAR.

7.4 Anthony D'Arcy Ltd. (ADL) has been extracting sand and gravel at the existing Ballaghkeen pit site since early 2020 and has also operated Sand & Gravel Pits in the Wexford area for over 30 years.

7.5 The key elements of the proposed development are as follows:

- Continued use of the existing sand & gravel pit for completion of extraction and restoration (c. 4 hectares) under planning permission ref. 20191259);
- Extension to the existing sand & gravel pit over an extraction area of c. 11 hectares;
- Extraction to final level two metres above the groundwater table;
- Screening berms and operational landscaping;
- Continued processing of sand & gravel using permitted mobile screening plant located on the pit floor;
- Continuance of use of the existing permitted access and internal access road to / from the R744 regional road;
- Continuance of use of existing permitted ancillary facilities: Office, portaloo, storage container, wheelwash and fuel storage;
- Phased and final restoration of the lands to agricultural use;
- Proposed duration c. 18 years plus 2 years for final restoration, total permission duration of 20 years;
- Within an overall planning application area of c. 23.2 hectares.

The extraction will be carried out dry working above the groundwater table at the site., using well established industry standard mechanical excavation techniques currently in use within the existing pit. There will be no dewatering at the site and there will be no discharge of water from the site.

Water Management

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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 is established practice within the existing pit permitted under planning permission ref. 20191259.

7.7 Extraction within the adjacent 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 and will be at least 2m above the groundwater table level at the site as per Planning Condition No. 17 of the existing planning permission (Ref. no. 20191259 dated 12/02/2020).

7.8 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.

7.9 A loading shovel will excavate sand & gravel from the working pit face and transport it to the existing mobile screening plant located within the pit floor.

7.10 The mobile screening plant will be moved onto the pit floor of the extension area as the operation of the extension area and restoration of the existing pit progress to minimise transport of material internally within the site, thereby reducing fuel costs, emissions and any potential from noise and dust.

7.11 The existing water management system at the overall landholding is straightforward and consists of the following elements:

- Rainfall infiltrates naturally to ground across the site;
- Rainfall from roadways, hard standing and roof areas also infiltrates naturally to ground;
- In accordance with Condition No. 16 of the existing planning permission:

  "*All over ground tanks containing liquids (other than water) shall be contained in a waterproof bunded area, which shall be of sufficient volume to hold 110 per cent of the volume of the tanks within the bund. All water contaminated with hydrocarbons, including storm water, shall be discharged via a grit trap and three-way oil interceptor with sump to a watercourse. The sump shall be provided with an inspection chamber and shall be installed and operated in accordance with the written requirements of the planning authority*."

- In accordance with Condition No. 18 of the existing planning permission:

  "*In the event of refuelling taking place on site the refuelling shall only take place a concrete hardstand area with a bund lip so as to contain any spillage*."

- There is an integrally bunded fuel storage at the site with hardstand refuelling area;
- Dust suppression will be by way of water sprayed from a tractor drawn bowser on dry exposed surfaces at the site;
- Toilet facilities have no requirement for water supply as it consists of a portaloo which is emptied on a regular basis by a licenced contractor, as per planning permission ref. 20191259; and
- Bottled water is brought to site and is used in the office for personal use including the preparation of hot drinks etc.

Scope of Work

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7.12 The scope of this chapter includes:

- an assessment of the existing surface water and groundwater within approximately 2 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

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

- Silas Rowe, Graduate Hydrogeologist, BSc. Earth Sciences; and
- Peter Glanville, Technical Director (Hydrology and Hydrogeology) PGeo, EurGeol and MCIWEM.

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."*

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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 Wexford County Development Plan 2022-2028.

Guidelines and Technical Standards

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

- Institute of Geologists of Ireland (April, 2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- 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 Ballagh 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**.

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Table 7-1: Regional data consulted

Data	Dataset Source
Soils	• Irish Soils Information System (Teagasc)
Subsoil Geology	• Subsoil Mapping (Teagasc/GSI/EPA)
Bedrock Geology	• Bedrock Geology (GSI)
Surface Water	• Discovery Series mapping (Tailte Éireann); • Water Framework Directive data (Environmental Protection Agency); • Flooding (Office of Public Works); and • Wexford County Development Plan.
Groundwater	• Bedrock and gravel aquifers, vulnerability, water supplies, groundwater recharge (GSI); • Groundwater bodies (GSI); • Water Framework Directive data (EPA); and • Drinking water source supply areas (EPA).
Climate	• Met Éireann
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, limited 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 three (2025) groundwater monitoring boreholes across the proposed development area, to monitor the sand and gravel superficial deposits; and
- Manual dipping of groundwater wells from the three groundwater monitoring boreholes in 2025.

7.27 One groundwater quality monitoring round of two groundwater monitoring boreholes in 2025.

Site Setting

7.28 The proposed pit extension area is located to the southeast of the existing pit and represents c. 11 hectares currently in agriculture.

7.29 The extension lands subject of this planning application are located adjacent to the existing Ballagh Pit.

7.30 Ground levels on the extension area are highest in the central to northwestern corner of the site and lowest on the southeastern and northern boundaries. The southwestern end of the site lies at c.82 mAOD, and the southern boundary at c.132 mAOD. The surrounding landscape is undulating at elevations of between 35 and 145 mAOD.

7.31 There are a number of residential properties located along the boundaries of the extension area.

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7.32 There is a watercourse located c. 400 metres south of the site, refer to Figure 7-1. This is the Ballynamona Beg, a tributary to the Blackwater. There is a River Sow located c. 1 km northeast of the site.

7.33 The site is located across the surface water catchment between the River Blackwater and the River Sow.

7.34 The Ballyroe Fen and Lake proposed Natural Heritage Area (pNHA) is located 3.8 km southeast of the southern site corner.

Rainfall and Climate

7.35 The Met Éireann Johnstown Castle meteorological station for which long-term average annual rainfall is available, is located c. 20km to the south of the site. The long-term annual average rainfall data for this station is presented on **Table 7-2**.

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept.	Oct	Nov	Dec	Avg.
101.0	78.6	73.1	72.0	66.5	74.3	78.8	83.9	84.4	122.3	115.0	112.8	1062.7

Soils and Geology

7.36 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.

7.37 A summary of the site and geological stratigraphy is shown in **Table 7-3** below.

Table 7-3: Regional geological stratigraphy of the site

Strata	Description	Estimated Thickness
Seafield Soil Association	Sandy, stoneless drift.	c. 0.4 m
Lower Palaeozoic sandstone and shale sands and gravels.	Often slightly gravelly, silty sand, frequently loose sand.	c. 20-26 m
Firm to Stiff Clay	Firm to stiff clay, rarely gravelly.	Thickness not confirmed
Ballyhoge Formation	Dark grey slates with siltstone laminae.	Bedrock.

Soils and Subsoils

7.38 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.

7.39 The principal soils across the region belong to the Seafield Soil Association. This comprises “Sandy stoneless drift” and is considered to be well draining.

7.40 Just outside the eastern site border there is a band of the Boyne Association Group. This is described by TEAGASC as silty river alluvium and is presumably the site of a current or palaeo stream.

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 The regional subsoils are chiefly of glaciofluvial origin. The main subsoil is 'Lower Palaeozoic sandstone and shale sands and gravels' which underlies the entire application site Within 2 km of the extension area, the subsoils are mostly the same as the site area itself. However, some variation exists. An area of Lower Palaeozoic shale till exists 1.2 km east of the site. Just outside the eastern site border there is a band of alluvium presumably the site of a current of the stream.

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Local Bedrock Geology

7.43 The published mapping indicates the application site and the majority of the wider study area is underlain by the Ballyhoge formation, which comprises a *"sequence of dark blue-grey, sometimes graphitic, slaty mudstones which are frequently pinstriped with pale siltstone laminae"*. The boreholes conducted in 2025 at the site did not reach the top of the bedrock confirming that it does not occur at depths greater than 20m to 26m at the site.

7.44 Several granite intrusions lie within the vicinity of the site to the northwest. The nearest of these lies approximately 1.3km to the north of the extension area. These are the Ballynamuddagh Granite, and are described by the GSI as '*Grey, fine to medium grained biotite granite'*.

Karst

7.45 Karst does not occur in these bedrock rock types; however, for completeness, the GSI karst database was consulted, and it was confirmed that there are no known karst features in the vicinity of the proposed development site.

Groundwater - Hydrogeology

Aquifer Characteristics

7.46 Published mapping provided by the GSI, reproduced as Figure 7-2 and Figure 7-3 confirms that the application site and the entirety of the wider surrounding area is underlain by the Screen Hills Regionally important gravel aquifer (Rg) relating to the thick, highly permeable sand and gravel subsoil underlying the site and surrounding wider area. The Screen Hills gravel aquifer covers a total area of c. 125 km^2.

7.47 The gravel aquifer is underlain by a bedrock aquifer which is classified as a Poor Aquifer which is generally unproductive except for regional zones. This underlying bedrock aquifer covers a much wider area of 801.8km^2, refer to Figure 7-2.

7.48 Consequently, groundwater flow paths are expected to be relatively short and will likely follow surface water catchments. In this likelihood, it is expected that moderate groundwater / surface water interactions will take place. Baseflow to rivers and streams is likely to be high.

Groundwater Vulnerability

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

7.50 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).

7.51 Regional groundwater vulnerability mapping is presented in Figure 7-4; this indicates that the groundwater beneath the application site has a 'High' vulnerability rating**,** indicating a subsoil of high permeability, and a thickness which is greater than 3m.

Table 7-4: GSI Groundwater vulnerability classification

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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.				

7.52 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 606 mm/yr. The groundwater recharge at the site is between 501 mm/yr and 550 mm/yr.

Groundwater Bodies

7.53 The proposed extension area is split by two different sand and gravel groundwater bodies. The northwestern half of the site is underlain by the Castlebridge Gravels groundwater body (GWB), and the Curracloe Gravels GWB which covers the southeastern half of the extension area, see Figure 7-5.

7.54 The Castlebridge Gravels GWB covers an area of 47 km^2. The GWB is classified as 'Not At Risk' by the WFD, it also has a 'Good' WFD status spanning 2007 up to the most recent 2021 assessment.

7.55 The Curracloe Gravels GWB covers an area of 69km^2. The Curracloe Gravels GWB is classified as being 'Not At Risk' by the WFD, it also has a 'Good' WFD status spanning 2007 up to the most recent 2021 assessment.

Groundwater Monitoring Network

7.56 Three boreholes were installed for groundwater monitoring purposes within the application area in 2025, see Figure 7-6 for borehole locations and the borehole logs are included in Appendix 7-B.

7.57 The drilling was carried out by Petersen Drilling and were supervised by SLR staff. The monitoring boreholes were all installed with 50 mm diameter standpipe and slotted from the base to 6-9m above the base of the borehole to screen the groundwater level.

7.58 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.

7.59 The boreholes encountered sand and gravel at all locations at the site, underlain by stiff to firm clay at >20m bgl. Bedrock was not encountered in any of the boreholes.

7.60 Details of groundwater monitoring boreholes installed on-site are presented in **Table 7-5**.

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

BH ID	Location	BH Depth (m BGL)	BH Elevation GL (mAOD)	Screen interval (mAOD)		Screened Strata
GW04	E:707744 N:636703	54.99	76.54	58.04	49.04	Sand and Gravel
GW05	E:707414 N:636515	50.95	77.98	61.981	55.981	Sand and Gravel
GW06	E:707555 N:636144	50.15	76.74	55.744	49.744	Sand and Gravel

Groundwater Levels

7.61 Groundwater levels have been manually measured in the three site boreholes, GW04, GW05, GW06. At present, only one monitoring round has been undertaken on the 3rd September, the 9th October and the 5th November 2025. Groundwater levels are presented in **Table 7-6**.

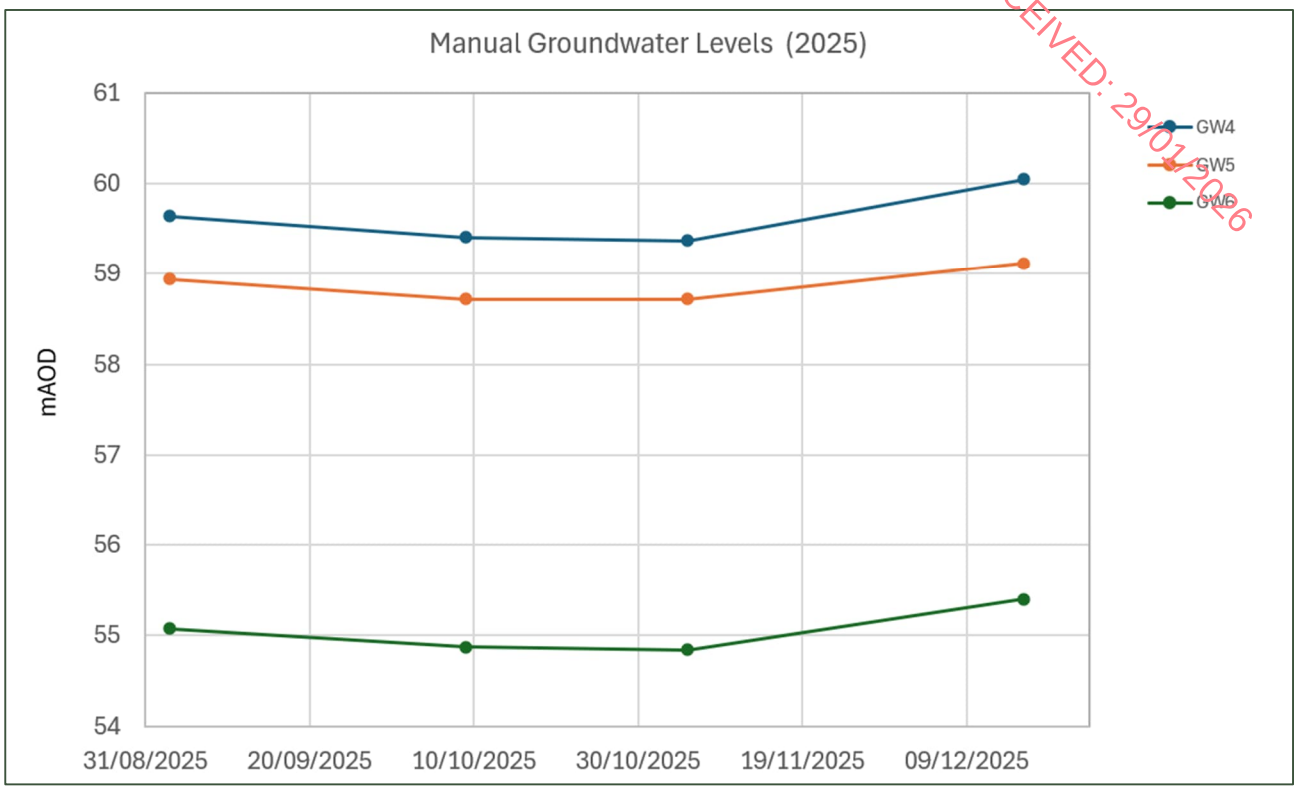
7.62 Initial groundwater level data across the wider site indicates that groundwater levels are highest in the north (60.05 mAOD in GW04) and are lowest in the south (54.84 mAOD in GW06). While the site straddles the surface water catchment between the Sow and the Blackwater the groundwater flow direction will be in a broadly southerly direction to the Ballynamona Beg tributary of the Blackwater and north westerly direction towards the Sow.

Table 7-6: Groundwater Levels

Borehole ID	GWL (mAOD) 03/09/2025	GWL (mAOD) 09/10/2025	GWL (mAOD) 05/11/2025	GWL (mAOD) 16/12/2025
GW04	59.64	59.41	59.37	60.05
GW05	58.94	58.72	58.72	59.12
GW06	55.07	54.87	54.84	55.40

Chart 7-1: Groundwater Levels

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Groundwater Quality

7.63 A groundwater quality monitoring round took place on the 3rd September 2025. Groundwater samples from monitoring locations GW04 and GW05 were taken. Subsequent laboratory data has provided concentrations of inorganics, metals, and organics. See Appendix 7-C for Field Record Sheets and Appendix 7-D for laboratory results.

7.64 Values have been compared to Groundwater Regulations including S.I. No. 366/2016, as well as EPA Interim Guideline Values. The following substances were found to exceed one or more of these regulations in at least one monitoring location: ammoniacal nitrogen (NH_3), chloride, nitrate (NO_3), and potassium.

7.65 Among the inorganic substances, concentrations are broadly similar or higher in GW04 compared to GW05, although sulphate goes against this trend.

7.66 Among the metals, concentration differences between the two boreholes are much more variable.

Groundwater Supply

7.67 The site is not located in a public water supply designated source protection zone for any GSI Public Water Supply (PWS) Source Protection Areas or any National Federation of Group Water Schemes (NFGWS) Source Protection Areas; there is no public water supply abstraction in the surrounding area.

7.68 Uisce Éireann (UÉ) were consulted as part of this EIA process and they indicate that there is a public mains supply network serving Ballaghkeen Village and the network extends along the L2041 and L20411 roads to the north west of the site and along the R744 and L6033 to the north and north east of the site, see Chapter 11 Material Assets for details of UÉ assets in the local area.

7.69 For those residences outside of the UÉ mains supply network, water supply is from private wells.

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Surface Water - Hydrology

Surface Water Bodies

7.70 Surface water bodies in the area are shown in Figure 7-1. There are no surface water bodies within the proposed extension area.

7.71 There is a watercourse located at its nearest point 400m south of the southern corner of the site. This is the Ballynamona Beg (WFD ID BLACKWATER (WEXFORD)_010), a tributary to the River Blackwater. This is classified as 'Good' WFD status, its risk status is under review. The Blackwater discharges into the sea at Blackwater Harbour.

7.72 The River Sow (WFD ID SOW_010) is located c. 1 km northeast of the site and flows in a south westerly direction. This is the River Sow. This is classified as 'Moderate' WFD status and is classified as being 'At Risk' of not achieving its objectives under the WFD. The River Sow discharges into the Lower Slaney Estuary just prior to its confluence with the sea.

Catchments

7.73 The hierarchy of surface water catchments subdivision in Ireland under the Water Framework Directive are:

i. WFD Catchments;
ii. WFD Sub Catchments; and
iii. WFD River Sub Basins.

7.74 At the River Sub Basin level the site straddles the River Sow and the River Blackwater catchments, see Table 7-7 below for WFD catchment hierarchy and also Figure 7-1.

Table 7-7: Catchment summary details

Surface water body	WFD Catchment	WFD Sub Catchment	WFD River Sub Basin
River Sow	Owenavorragh (ID 11)	Cahore_SC_010	SOW_010
Ballynamona Beg Stream (Tributary of the River Blackwater)	Slaney and Wexford Harbour (ID 12)	WHITEFORT_SC_010	BLACKWATER (WEXFORD)_010

Flood Risk

7.75 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 not at risk of fluvial flooding. The available GSI data indicates that the site area is not at risk from groundwater flooding.

7.76 Rainfall at the site will percolate naturally to the ground. There will be no discharge of any water from the site to surface waters, and the development will not increase the flood risk elsewhere in either catchment.

Surface Water Quality

7.77 Under the WFD the Ecological Status of waterbodies is classified and also the risk of the waterbody not reaching its required objectives under the Directive, see Table 7-8 below.

Table 7-8: WFD Ecological status and risk

Surface water body	Surface Waterbody Ecological Status	Waterbody Risk Rating
River Sow	Moderate	At Risk
Ballynamona Beg (tributary of the River Blackwater)	Good	Risk rating for waterbody currently under Review

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7.78 The surface water quality data of surface water bodies within the study area was obtained from the 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.

7.79 The closest monitoring station encountered is the Br. SW of Askasilla located 2.2 km southeast of the proposed extension area. The latest datasets reports a water quality Q value of 3, however, this was in 2001. This means the river is considered to be of Moderate status by the WFD and in unsatisfactory condition.

Protected Areas

7.80 There are no Natura 2000 designated sites (SAC or SPA) within 5 km of the site. There are no hydrological links (surface water pathways) to any Natura 2000 sites.

7.81 There is one proposed Natural Heritage Area located 3.8 km southeast of the site, the is the Ballyroe Fen and Lake pNHA (Site Code: 000747). The site is not hydrologically linked to the pNHA by way of any groundwater and / or surface water connectivity.

Water Environment Receptors

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

- The River Sow is located 1km northeast of the northern corner of the site;
- The Ballynamona Beg Stream (tributary of the Blackwater);
- Regionally important gravel aquifer; and
- Bedrock aquifer.

7.83 For each identified receptor, the significance and sensitivity of the receptor is assessed in **Table 7-9** below and a rating (High / Medium / Low / Negligible) applied, based on the methodology outlined in existing guidance and reproduced in Appendix 7-E.

Table 7-9: Existing environment - significance and sensitivity / importance

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No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance / Sensitivity Rating (H/M/L/N)
1	River Sow	Surface watercourse c. 1km northeast of the site at it nearest point. Site lies partly within the Slaney catchment.	Flows into the Lower Slaney Estuary. River is assumed to be in hydraulic continuity with the site through groundwater. Stream is classified as 'Moderate' status.	**Medium** - Attribute has a medium quality or value on a local scale
2	Ballynamona Beg Stream (tributary of the Blackwater)	Surface watercourse c. 400m south of the southern corner of the site at its nearest point.	Stream and blackwater River discharges into the sea at Blackwater Harbour. Stream and River are assumed to be in hydraulic continuity with the site through groundwater. Stream is classified as 'Good' status.	**Medium** - Attribute has a medium quality or value on a local scale
3	Regionally Important Gravel Aquifer (Castlebridge Gravels GWB and Curracloe Gravels GWB)	Regionally Important Aquifer (Rg). The GWBs are of 'Good' status. The site is not located in a drinking water supply source protection.	The risk of deterioration of the status of the GWB is under review. This GWB is sensitive to anthropogenic pressures. Activities at the site have the potential to result in a reduction in the groundwater quality.	**High -** Attribute has a high quality or value on a local scale The aquifer can supply regionally important abstraction. It is highly permeable.
4	Poor bedrock aquifer which is generally unproductive as a groundwater supply	Ordovician Metasediments bedrock aquifer is within the Castlebridge North GWB and Cahore Point GWB which both have good status (2016 - 2021).	Bedrock aquifer underlying sand and gravel superficial deposits.	**Low** - Attribute has a low quality and value on a local scale (Poor Aquifer).

Receiving Environment - Baseline Summary

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7.84 The site is underlain by mudstone bedrock of the Ballyhoge Formation and by sand and gravel subsoils which are shale and sandstone sands and gravels.

7.85 The site straddles two catchments, the Owenavorragh Catchment and the Slaney and Wexford Harbour catchment.

7.86 The closest waterbody to the site extension area is the Ballynamona Beg which is a tributary of the River Blackwater, and the River Sow.

7.87 The site is located partly within the Castlebridge Gravels and partly within the Curracloe Gravels Groundwater Bodies; The gravel aquifers are classified as regionally important aquifers. The groundwater bodies are classified as being of Good chemical and quantitative status under the WFD.

7.88 The bedrock aquifer underlying the gravels is classified as a Poor aquifer which is generally unproductive for water supply purposes.

7.89 The groundwater vulnerability is classed as 'High' due to the permeable nature of the sand and gravels material and their relatively substantial thickness.

7.90 Three monitoring boreholes have been installed on the extension site area. The groundwater levels at the site recorded in December 2025 range from 55.4 mAOD to 60.05 mAOD.

7.91 The sand and gravel extension area pit floor level will be maintained at least 2m above the winter groundwater level in compliance with planning permission ref. 20191259 for the existing sand & gravel pit.

7.92 The site is not located within a designated public water supply protection zone.

Impact Assessment

Evaluation Methodology

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

7.94 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. The terms used to describe the potential hydrological and hydrogeological impact or effects are explained in tables reproduced in Appendix 7-F. The cumulative impact of any potential impacts is also assessed.

7.95 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-G.

7.96 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.

7.97 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.

7.98 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.

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Construction Stage - No Mitigation

7.99 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 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. The existing site infrastructure including the office, portaloo and works container will remain in use during the proposed development.

Direct Impacts

Surface Water

7.100 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

7.101 The accidental leaking or spillage of fuel and/or other petroleum-based products could impact on groundwater in the underlying gravel aquifer.

Indirect Impacts

Surface Water

7.102 Accidental leaking or spillage of fuel and/or other petroleum-based products at the site could also impact on the Ballynamona Beg Stream / River Blackwater or River Sow at distance from the site, given the predicted hydrological continuity between groundwater in the gravels and the surface water.

Groundwater

7.103 Accidental leaking or spillage of fuel and/or other petroleum-based products could indirectly impact on local private domestic water supplies where they have a borehole supply and are not on a UÉ mains water supply.

Protected Areas

7.104 The sea at the mouth of the Blackwater River is a designated SPA, the Seas off Wexford, so there is an indirect link to the site via groundwater and the Blackwater River.

Operational Stage Impacts

7.105 There is the potential for direct impacts on groundwater and indirect impacts on surface water 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.

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Direct Impacts

Surface Water

7.106 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 this stage.

Groundwater

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

7.108 The proposed sand and gravel pit will be worked above the groundwater table. Therefore, there will be no requirement for dewatering of groundwater to facilitate sand & gravel extraction. As there is no dewatering associated with the proposed development, there will be no impact on groundwater levels, flow or quantity.

7.109 The proposed development will remove the direct impact of agriculture pressures from the site on groundwater quality over the duration of the project; this is a positive impact on groundwater quality.

Indirect Impacts

Surface Water

7.110 An accidental leaking or spillage of fuel and/or other petroleum-based products could impact on the Ballynamona Beg / River Blackwater or River Sow.

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

Groundwater

7.112 Accidental leaking or spillage of fuel and/or other petroleum-based products could indirectly impact on local private domestic water supplies where they have a borehole supply and are not on a UÉ mains water supply.

Protected Areas

7.113 The sea at the mouth of the Blackwater River is a designated SPA, the Seas off Wexford, so there is an indirect link to the site via groundwater and the Blackwater River.

Post - Operational Stage Impacts

Direct Impacts

7.114 A restoration scheme has been prepared for the proposed site and will be implemented following permanent cessation of extraction activities, refer to EIAR Chapter 2 and EIAR Figure 2-4 for details.

7.115 There are no anticipated direct impacts on surface water and / or groundwater during this stage as the site will have been fully decommissioned and restored to agricultural landuse.

Indirect Impacts

7.116 There are no anticipated direct impacts on surface water and / or groundwater during this stage.

'Do-nothing Scenario'

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7.117 If the proposed development is not permitted, then the proposed extension area will remain as is in agricultural use. The aggregate resource will remain in the ground and alternative pit development will be required at an alternate location(s) to provide the specialist aggregate material.

7.118 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

7.119 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.

7.120 The description of the effects and rating for each identified impact is shown in **Table 7-10** below.

Significance of Impacts

7.121 The significance of impacts is based on the significance and sensitivity of the existing environment, **Table 7-9** above, and the description of identified potential impacts with likely significant effects outlined in Table 7-10 below.

7.122 The significance of Impact is determined from the Classification of the Significance of Impacts in Appendix 7-G.

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Table 7-10: 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 gravel aquifer from accidental fuel leakage/ spillage.	**Low to Negligible**. Potential to affect groundwater quality in sand and gravel and possibly the bedrock underlying shallow groundwater through vertical migration. Any impact to groundwater will be limited due to small volumes of fuel stored on site (i.e. the source is very limited) and short term nature of construction works. Any leakage / spillage would be accidental only and of limited volume.	**Moderate to Slight**
Construction Stage - Indirect - Surface Water			
3	Impact on surface water quality in the Ballynamona Beg and River Sow.	**Low to Negligible**. Potential to affect surface water quality (fuel) in the Ballynamona Beg and downstream Blackwater, as well as the River Sow through groundwater baseflow to the watercourse. Any impact to groundwater will be limited due to small volumes of fuel stored on site (i.e. the source is very limited) and short term nature of construction works. Any leakage / spillage would be accidental only and of limited volume.	**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 the gravel aquifer from accidental fuel leakage/ spillage.	**Low to Negligible**. Potential to affect groundwater quality in sand and gravel and possibly the bedrock underlying shallow groundwater through vertical migration. Any impact to groundwater will be limited due to small volumes of fuel stored on site (i.e. the source is very limited) and short term nature of	**Moderate to Slight**

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No.	Potential Impacts	Impact Rating (No Mitigation)	Significance of Impact (No Mitigation)
		construction works. Any leakage / spillage would be accidental only and of limited volume.	
Operational Stage - Indirect - Surface Water			
6	Impact on surface water quality in the Ballynamona Beg and River Sow and pNHA via groundwater baseflow to the watercourse.	**Low to Negligible**. Potential to affect surface water quality (fuel) in the Ballynamona Beg and downstream Blackwater, as well as the River Sow through groundwater baseflow to the watercourse. impact to groundwater will be limited as any spillage would be accidental only and of limited volume (i.e. the source is very limited); no fuel will be stored within the extension area.	**Slight - Not Significant**

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Mitigation Measures

Construction & Operational Stages

7.123 Environmental groundwater monitoring will be carried out on a regular basis at the site to demonstrate that the sand and gravel pit is not having a significant adverse effect on the environment.

7.124 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 fuel or oils will be stored within the proposed extension area. Small volume of fuel is stored within the existing pit under planning permission ref. 20191259;
- Final floor levels at the proposed pit excavations will be maintained dry a minimum of 2 m above the groundwater table; and
- An emergency spill kits is and will be available on-site to stop the migration of any minor accidental leakages or spillages should they arise;

7.125 **The implementation of these mitigation measures at the application site will reduce the potential construction and operational stage impacts identified above to Neutral.**

Post - Operational Stage

7.126 As noted previously, the principal activity to 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.

7.127 As part of the restoration works all plan, machinery and ancillary facilities associated with the pit operations 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.

7.128 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

7.129 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 7-11, and a summary of potential impacts and residual effects with mitigation measures in place is provided in Table 7-12, and the residual impact for all potential impacts is assessed as 'Not Significant'.

7.130 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 surface water and groundwater during the construction, operational and post operational stages of the proposed development.

7.131 With implementation of the mitigation measures, the significance of all potential negative impacts identified during the construction, operational and post-operational stages will be reduced to **'Not Significant'.**

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Monitoring

Groundwater

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

7.133 The following monitoring activities will be carried out to demonstrate that the development is not having an adverse impact on the surrounding groundwater environment:

- groundwater levels in all boreholes will be monitored on a quarterly 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.

Surface Water

7.134 There is and will be no discharge of water off-site to any surface water course. The nearest watercourse is located c. 400 metres south of the site. Accordingly, there is no requirement for any surface water monitoring to be undertaken for the proposed development.

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Table 7-11: Residual impact with mitigation measures

Activity	Existing Environment	Character of Impact	Mitigation Measures	Residual Impact
Construction Stage				
Accidental fuel leakage / spillage	Groundwater quality in gravel aquifer. Ballynamona Beg and River Sow via groundwater baseflow to the watercourse	Accidental fuel leakage/ spillage during construction works could affect groundwater quality in sand and gravel 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.	No fuel will be stored at the site. Emergency spill kits will be kept at the site for any accidental leakages or spillages, should they arise.	**Not Significant**
Operational Stage				
Accidental fuel leakage / spillage	Groundwater quality in gravel aquifer. Ballynamona Beg and River Sow via groundwater baseflow to the watercourse	Accidental fuel leakage/ spillage during construction works could affect groundwater quality in gravel aquifer through vertical migration. Any leakage / spillage would be accidental only and of limited volume.	No fuel will be stored at the site. Emergency spill kits will be kept at the site for any accidental leakages or spillages, should they arise.	**Not Significant**
Groundwater	Groundwater quantity in gravel aquifer.	Reduction in groundwater levels in Gravel Aquifer	Pit will be worked with no dewatering	**Not Significant**

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Table 7-12: 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.	Slight Positive.	No	Not Significant
Construction Stage - Direct - Groundwater				
2	Reduction in groundwater quality in gravel aquifer from accidental fuel leakage/ spillage.	Moderate to Slight.	Yes	Not Significant
Construction Stage - Indirect - Surface Water				
3	Impact on surface water quality in Ballynamona Beg and River Sow via groundwater baseflow to the watercourse	Slight - Not Significant.	Yes	Not Significant
Operational Stage - Direct - Surface Water				
4	Improvement in surface water quality due to removal of land from agriculture.	Slight Positive.	No	Not Significant
Operational Stage - Direct - Groundwater				
5	Reduction in groundwater quality in gravel aquifer from accidental fuel leakage/ spillage, which could migrate into the underlying gravel aquifer	Moderate to Slight.	Yes	Not Significant
Operational Stage - Indirect - Surface Water				
6	Impact on surface water quality in Ballynamona Beg and River Sow via groundwater baseflow to the watercourse	Slight - Not Significant.	Yes	Not Significant

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Figures

Figure 7-1: Surface Water Features Map

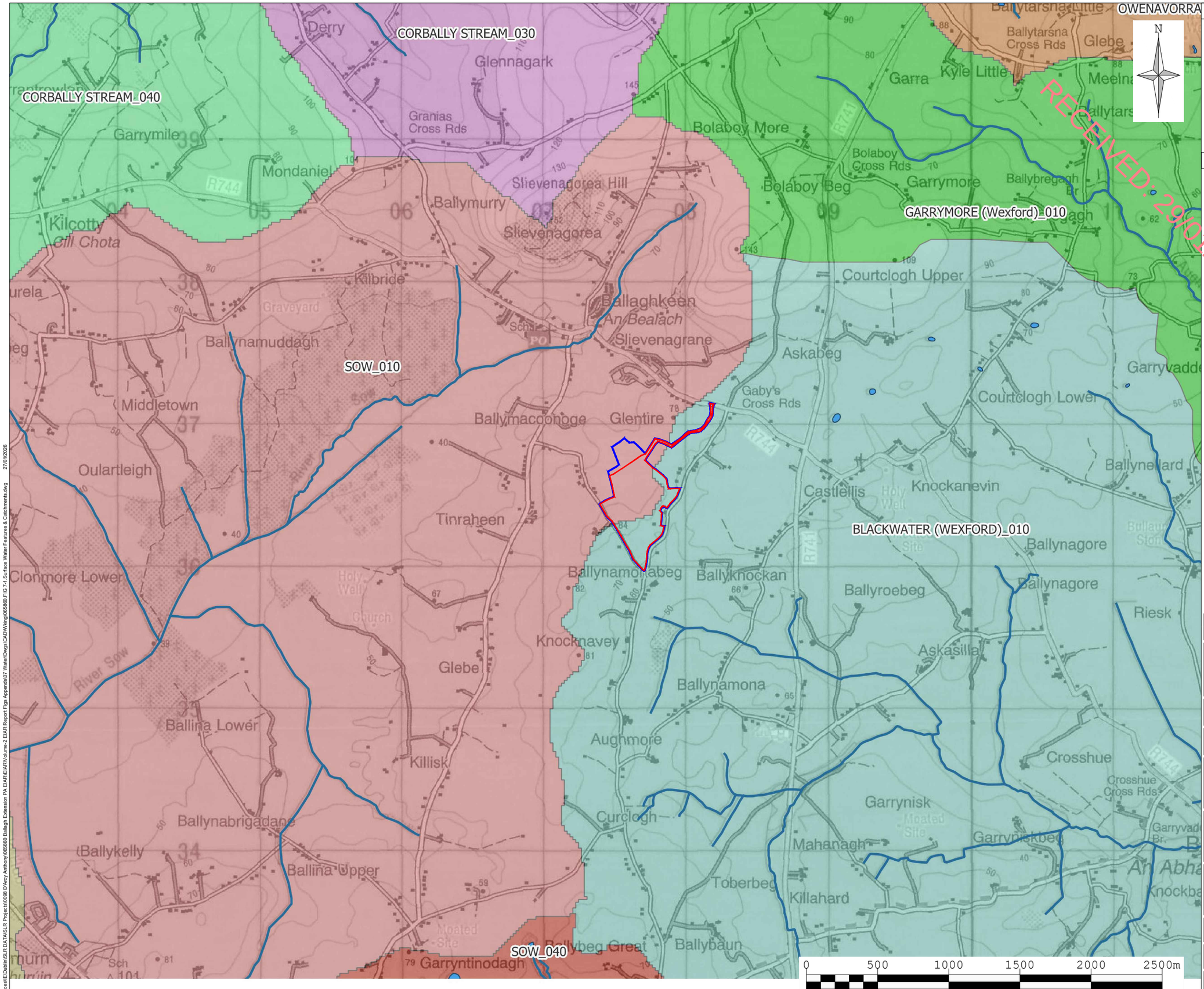
Figure 7-2: Bedrock Aquifer Map

Figure 7-3: Gravel Aquifer Map

Figure 7-4: Groundwater Vulnerability Map

Figure 7-5: Groundwater Bodies Map

Figure 7-6: Site Layout and Borehole Locations



Notes:

1. BASED ON 1:50,000 DISCOVERY SERIES OSI MAPPING - MAP **NO. 69 & 77**.

Legend:

ANTHONY D'ARCY LAND INTEREST AREA (c.27.2 Hectares)

PLANNING PERMISSION AREA (c.23.2 Hectares)

WFD Lake Waterbodies

WFD Rivers

River Sub-Basins

- BLACKWATER (WEXFORD)_010
- CORBALLY STREAM_030
- CORBALLY STREAM_040
- GARRYMORE (Wexford)_010
- KILLINCOOLY_BEG_010
- OWENAVORRAGH_010
- SOW_010
- SOW_020
- SOW_040

Rev	Amendments	Date	By	Chk	Auth

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Drawing Title: SURFACE WATER FEATURES & CATCHMENTS MAP

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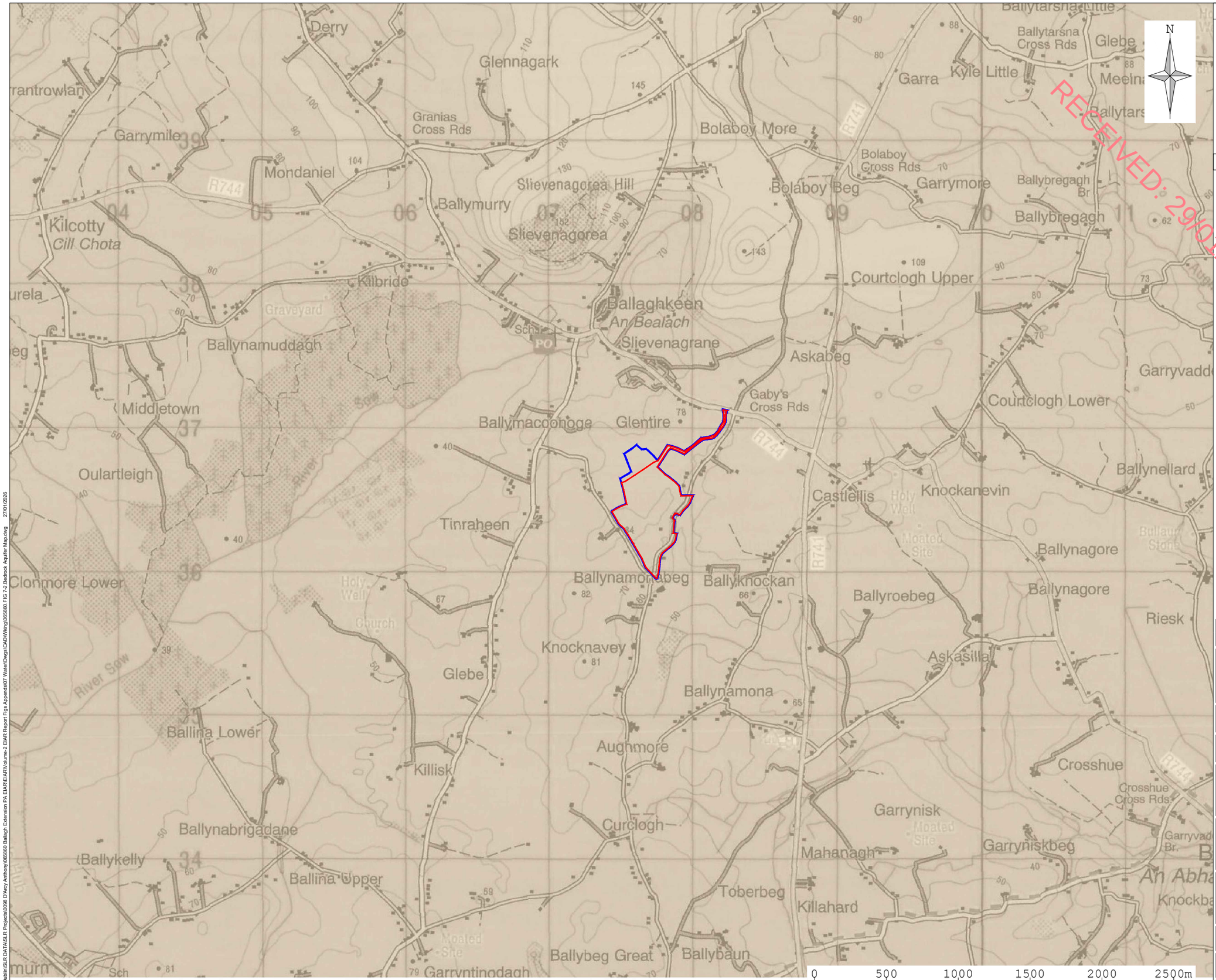
Drawing Number: **FIGURE 7-1**

Rev.: **0**

\\slr.local\ie\Offices\IE\Dublin\SLR DATA\SLR Project\065860 Ballagh Extension PA EIAR\EIARV olume~2 EIAR Report Figs Appends\07 WaterDwgs\CAD\Wking\065860. FIG 7-1 Surface Water Features & Catchments.dwg 27/01/2026

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ANTHONY D'ARCY LAND INTEREST AREA (c.27.2 Hectares)

PLANNING PERMISSION AREA (c.23.2 Hectares)

Bedrock Aquifer

Rf - Regionally Important Aquifer - Fissured bedrock

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

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Drawing Title: BEDROCK AQUIFER MAP

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Date 01/26	Date 01/26	Date 01/26	Date 01/26

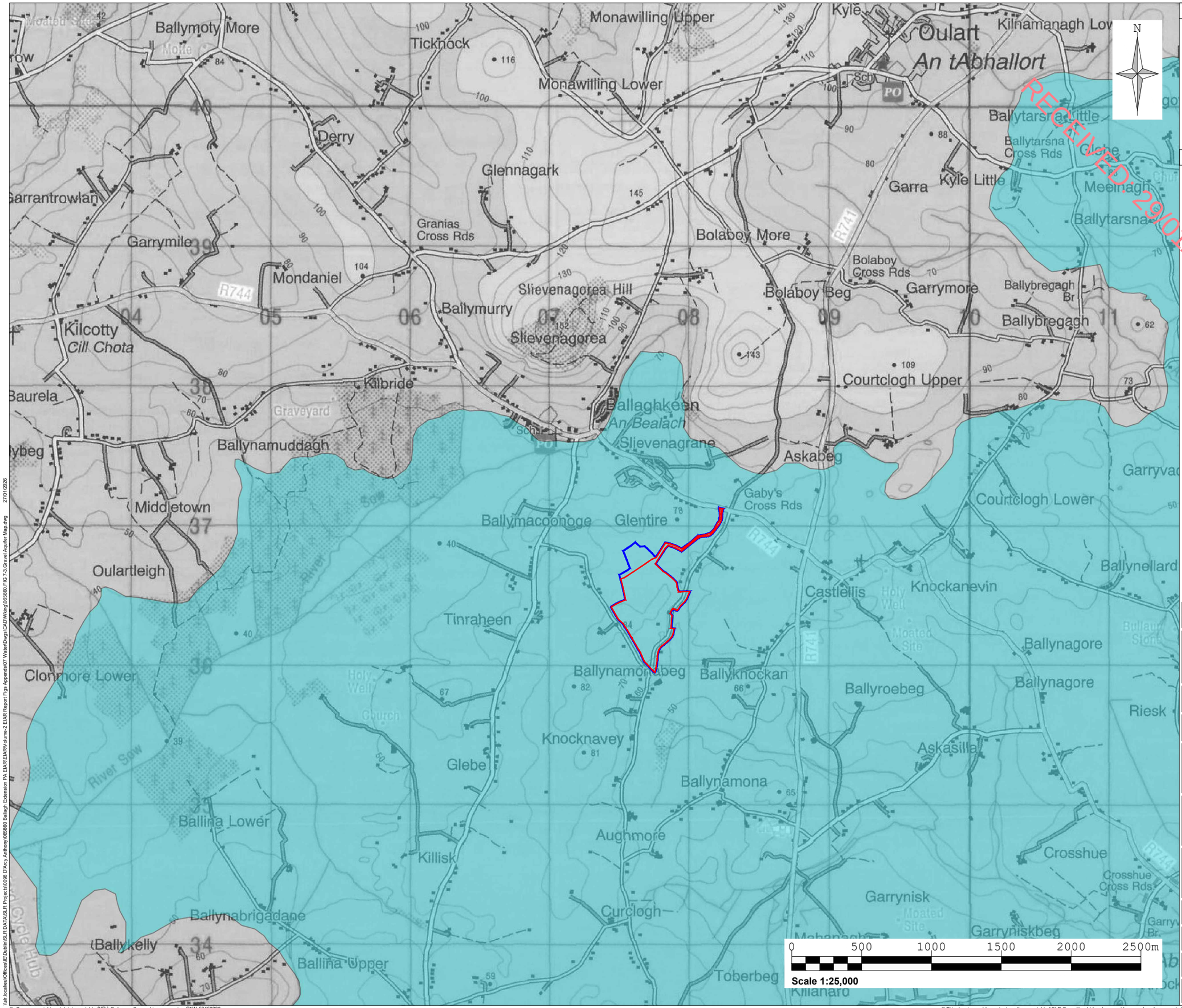
Drawing Number: **FIGURE 7-2**

Rev.: **0**

\\dir.local\eu\Offices\IE\Dublin\SLR DATA\SLR Projects\0098 D'Arcy Anthony\065860 Ballagh Extension PA EIAR\EIAR\Volume-2 EIAR Report Figs Appendi\07 Water\Dwgs\CAD\Wkng\065860 FIG 7-2 Bedrock Aquifer Map.dwg 27/01/2026

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Notes:

1. BASED ON 1:50,000 DISCOVERY SERIES OSI MAPPING - MAP **NO. 69 & 77**.

Legend:

ANTHONY D'ARCY LAND INTEREST AREA (c.27.2 Hectares)

PLANNING PERMISSION AREA (c.23.2 Hectares)

Gravel Aquifer

Rg - Regionally important gravel aquifer

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Drawing Title
GRAVEL AQUIFER MAP

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Date	Date	Date	Date
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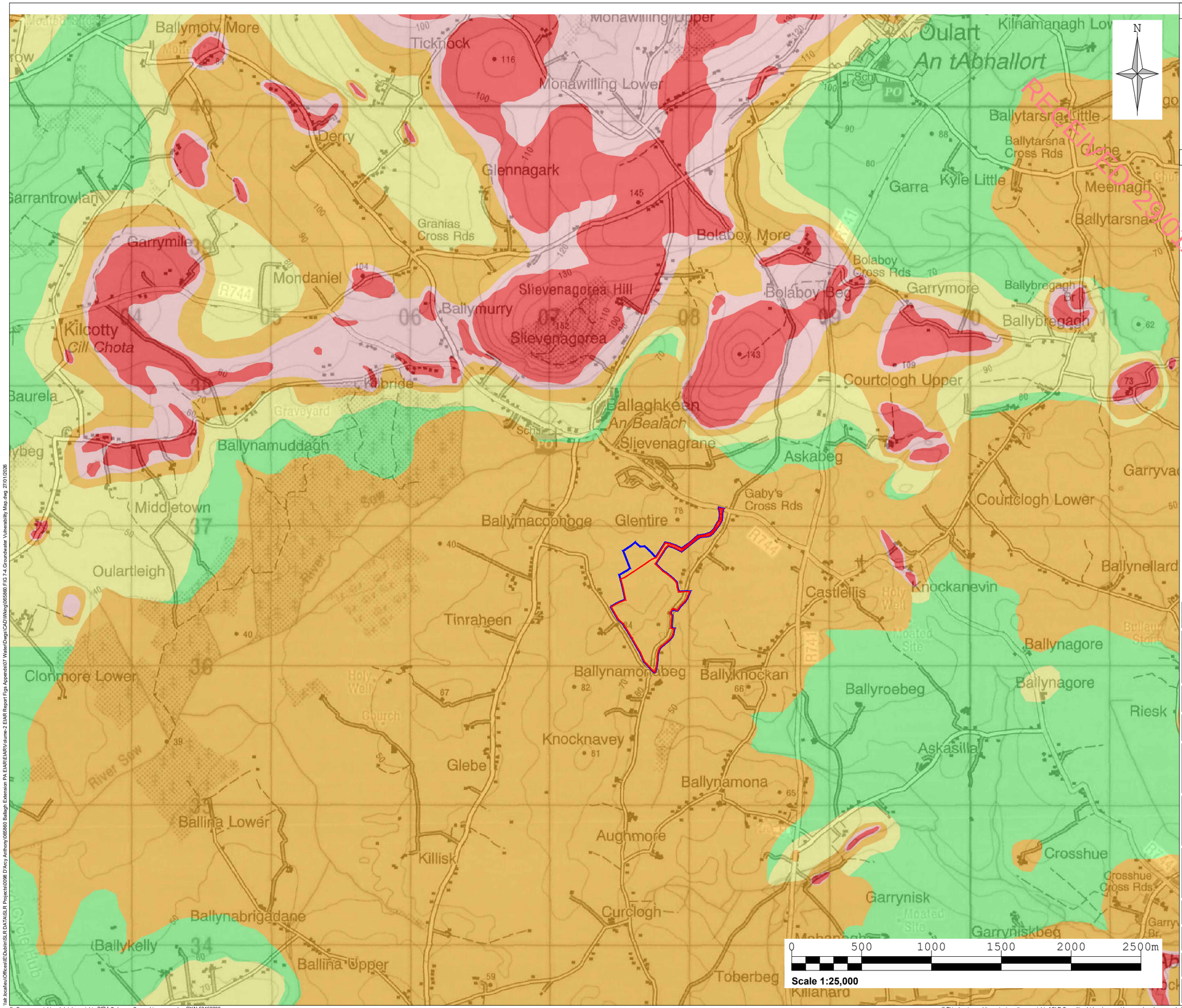
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FIGURE 7-3

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Notes:

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Legend:

ANTHONY D'ARCY LAND INTEREST AREA (c.27.2 Hectares)

PLANNING PERMISSION AREA (c.23.2 Hectares)

GSI Groundwater Vulnerability

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

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Drawing Title
GROUNDWATER VULNERABILITY MAP

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Date	Date	Date	Date
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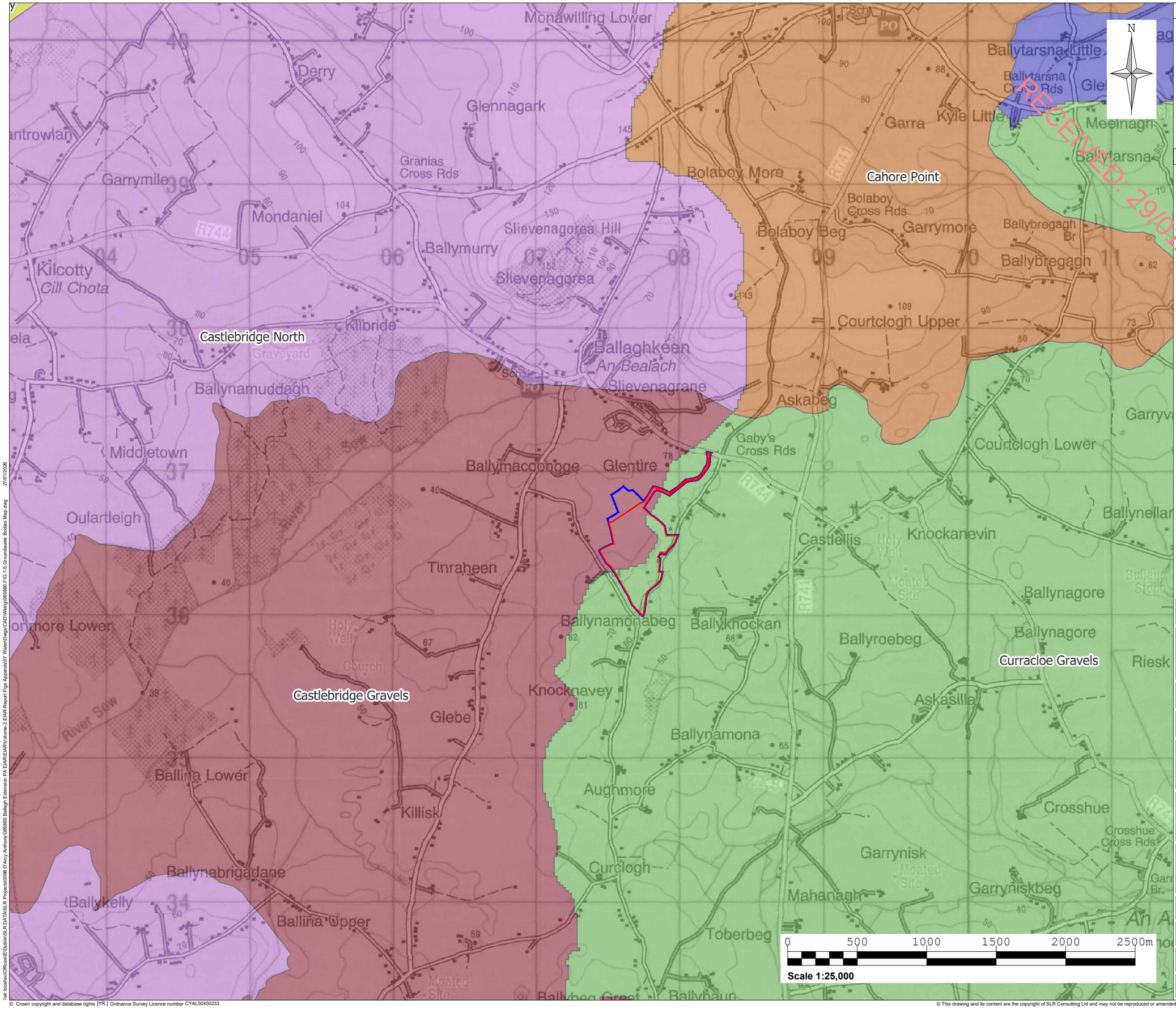
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FIGURE 7-4

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\\dir.local\eu\Offices\IE\Dublin\SLR DATA\SLR Projects\0098 D'Arcy Anthony\065860 Ballagh Extension PA EIAR\EIAR\Volume-2 EIAR Report Figs Appends\07 Water\Dwgs\CAD\Wking\065860 FIG 7-4 Groundwater Vulnerability Map.dwg 27/01/2026

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ANTHONY D'ARCY LAND INTEREST AREA (c.27.2 Hectares)

PLANNING PERMISSION AREA (c.23.2 Hectares)

WFD Groundwater Body

- Cahore Point
- Castlebridge Gravels
- Castlebridge North
- Curracloe Gravels
- Enniscorthy
- Oulart Gravels

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Drawing Title
GROUNDWATER BODIES MAP

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Date 01/26	Date 01/26	Date 01/26	Date 01/26

Drawing Number
FIGURE 7-5

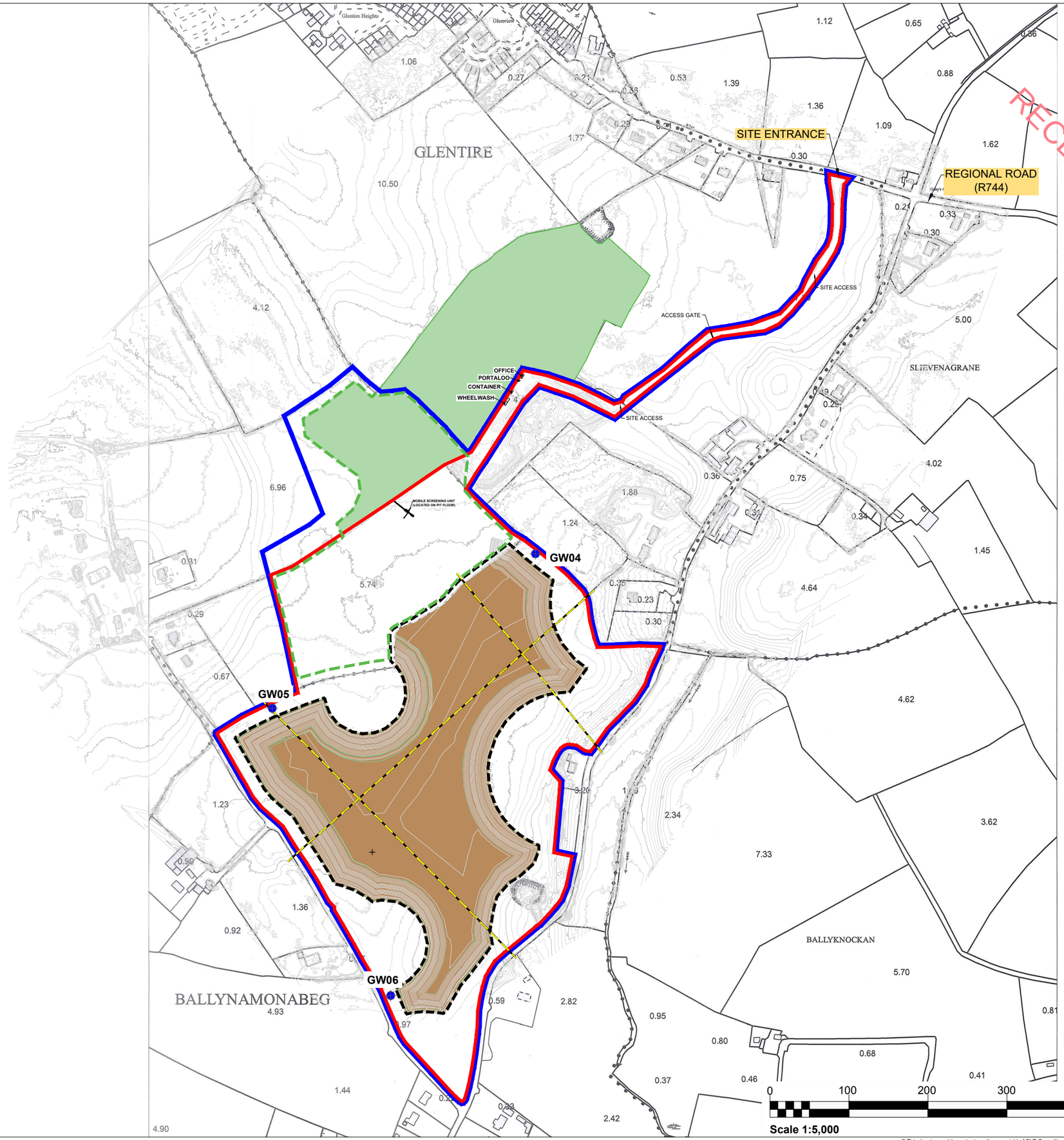
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Notes:

1. *Based on 1:2,500 OSI Place Mapping - Map No. 5145-D & 5146-C*

Legend:

- LAND INTEREST AREA (c.27.2 Hectares)
- PLANNING APPLICATION AREA (c.23.2 Hectares)
- PROPOSED EXTRACTION AREA (c. 11.0 Hectares)
- PERMITTED EXTRACTION AREA (c. 5.9 Hectares) (P.REF. 2019-1259)
- GROUNDWATER MONITORING LOCATION

Rev	Amendments	Date	By	Chk	Auth

SLR

www.slrconsulting.com

Drawing Status & Suitability Code

Client
ANTHONY D'ARCY LTD.

Project
SAND & GRAVEL PIT AT BALLYMACOONOGE, GLENTIRE & BALLYNAMONABEG TOWNLANDS BALLAGHKEEN, CO. WEXFORD

Drawing Title
SITE LAYOUT AND BOREHOLE LOCATIONS

Scale		SLR Project No.	
1:5,000	@ A3	065860.00001	
Designed	**Drawn**	**Checked**	**Authorised**
ND	ND	PG	PG
Date	**Date**	**Date**	**Date**
01/26	01/26	01/26	01/26

Drawing Number **FIGURE 7-6** Rev. **0**

\\slr.local\ie\Offices\IE\Dublin\SLR DATA\SLR Projects\00098 D'Arcy Anthony\065860 Ballagh Extension PA EIAR\EIAR\Volume-2 EIAR Report Figs Appends\07 Water\Dwgs\CAD\Wking\065860.FIG_7-6 Site Layout Map and Monitoring Locations.dwg

27/01/2026

CYAL50450233

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Appendices

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

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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);

RECEIVED: 29/01/2026

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.

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.

RECEIVED: 29/01/2026

Appendix 7-B: Borehole Logs

BOREHOLE LOG

BOREHOLE No **BH 4**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	76.54m	E707744 N636703

Project: **Ballagh Pit**

Sheet 1 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
						76.14		0.40	Firm brown TOPSOIL	
								(2.40)	Medium dense brown slightly gravelly SAND	
						73.74		2.80		
								(10.20)	Medium dense light brown gravelly SAND	

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	
18/08/2025	02:05			Start of shift							
18/08/2025	05:45	22.50	22.50	End of shift	Dry						
19/08/2025	08:10	22.50	22.50	Start of shift	0						
19/08/2025	10:25			End of shift							

All dimensions in metres	Contractor:	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:65	Plant: Knebel HY79	Hole Size: 154mm		

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No
BH 4

RECEIVED: 29/01/2026

Client:
Anthony D'Arcy Ltd.

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	76.54m	E707744 N636703

Project:
Ballagh Pit

Sheet
2 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Medium dense light brown gravelly SAND	
						63.54		13.00		
								(2.80)	Loose light brown SAND	
						60.74		15.80		
								(6.10)	Medium dense fine brown very silty SAND	

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No **BH 4**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	76.54m	E707744 N636703

Project: **Ballagh Pit**

Sheet 3 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Medium dense fine brown very silty SAND	
						54.64		21.90		
								(0.60)	Firm to stiff brownish grey CLAY	
						54.04		22.50		
									Borehole Complete at 22.50m	

21 22 23 24 25 26 27 28 29

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No **BH 5**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	77.98m	E707414 N636515

Project: **Ballagh Pit**

Sheet 1 of 3

SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
						77.58		0.40	Firm brown sandy TOPSOIL	
								(5.10)	Medium dense brown gravelly slightly silty SAND	
						72.48		5.50	Loose to Medium dense orangish brown SAND	

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	
18/08/2025	08:50			Start of shift							
18/08/2025	02:05			End of shift							

All dimensions in metres	Contractor:	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:65	Plant: Knebel HY79	Hole Size: 154mm		

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No
BH 5

RECEIVED: 29/01/2026

Client:
Anthony D'Arcy Ltd.

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	77.98m	E707414 N636515

Project:
Ballagh Pit

Sheet
2 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
									Loose to Medium dense orangish brown SAND	
11										
12										
13										
14										
15								(15.00)		
16										
17										
18										
19										

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No **BH 5**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	18/08/2025	77.98m	E707414 N636515

Project: **Ballagh Pit**

Sheet 3 of 3

SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
						57.48		20.50	Loose to Medium dense orangish brown SAND	
									Medium dense fine brown silty SAND	
								(6.00)		
						51.48		26.50		
								(0.60)	Stiff brown becoming grey CLAY	
						50.88		27.10		
									Borehole Complete at 27.10m	

21 22 23 24 25 26 27 28 29

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No **BH 6**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	19/08/2025	76.74m	E707555 N636144

Project: **Ballagh Pit**

Sheet 1 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
						76.49		0.25	Firm brown sandy TOPSOIL	
									Loose orangish brown SAND	
								(6.65)		
						69.84		6.90		
									Medium dense dark brown silty gravelly SAND	
								(1.60)		
						68.24		8.50		
									Loose to Medium dense light brown slightly gravelly SAND	

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	
19/08/2025	11:00			Start of shift							
19/08/2025	03:00			End of shift							

All dimensions in metres	Contractor:	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:65	Plant: Knebel HY79	Hole Size: 154mm		

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No
BH 6

RECEIVED: 29/01/2026

Client:
Anthony D'Arcy Ltd.

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	19/08/2025	76.74m	E707555 N636144

Project:
Ballagh Pit

Sheet
2 of 3

SAMPLES & TESTS					Water	STRATA				
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
								(15.20)	Loose to Medium dense light brown slightly gravelly SAND	

11
12
13
14
15
16
17
18
19

Borehole Continued on Next Page

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG

BOREHOLE No **BH 6**

RECEIVED: 29/01/2026

Client: **Anthony D'Arcy Ltd.**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065860.00001	19/08/2025	76.74m	E707555 N636144

Project: **Ballagh Pit**

Sheet 3 of 3

SAMPLES & TESTS					Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result	RQD		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
									Loose to Medium dense light brown slightly gravelly SAND	
						53.04		23.70		
								(3.30)	Medium dense fine brown silty gravelly SAND	
						49.74		27.00		
						49.24		(0.50) 27.50	Firm to stiff brown gravelly CLAY possible highly weathered rock	
									Borehole Complete at 27.50m	

21 22 23 24 25 26 27 28 29

Boring Progress and Water Observations						Chiselling			Water Added		General Remarks
Date	Time	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:65	Contractor: Plant: Knebel HY79	Method: Rotary open hole Hole Size: 154mm	Logged By:	Approved By:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

RECEIVED: 29/01/2026

Appendix 7-C:
Groundwater Sampling Field Record Sheets

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Ground Water Sampling Field Record Sheet

Date:	3 September 2025	**Time:**	10:30–1:30 on site	**Location:**	Ballynamoaheg, Co. Wexford
Staff:	Milo Cruise O'Brien			**SLR Project No.:**	501.065860.00001
Equipment	Aquatroll, Dipmeter, Bailers				

Table 1: Visual Field Parameters

Parameter	BH04	BH05
Odour	None	None
Sheen	None	None
Silt	High	High
Colour	Light Brown	Light Brown
Free product	None	None

Table 2: Field Parameters

Parameter	BH04	BH05
Specific conductivity (µS/cm)	672	552.92
Salinity (PSU)	0.33	0.27
Total Dissolved Solids (ppt)	0.44	0.36
Turbidity (NTU)	6113.11	6504.43
pH (pH Units)	Sensor Broken see Lab Results for pH value	Sensor Broken see Lab Results for pH value
RDO Concentration (mg/L)	10.18	10.55
Temperature (°C)	12.10	11.72

Other field observations:
Dry and calm on day of sampling. Previous few days had been very wet.

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Appendix 7-D:
Groundwater Quality Lab Results

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

RECEIVED: 29/01/2026

SLR Consulting Ireland
CSA House
Unit 7
Dundrum Business Park
Windy Harbour
Dublin
Dublin14

Attention: Milo Cruise O'Brien

CERTIFICATE OF ANALYSIS

Date of report Generation:	11 September 2025
Customer:	SLR Consulting Ireland
Sample Delivery Group (SDG):	250905-93
Your Reference:	501.065860.00001
Location:	Ballagh Pit Extension
Report No:	776901
Order Number:	1874

We received 2 samples on Friday September 05, 2025 and 2 of these samples were scheduled for analysis which was completed on Thursday September 11, 2025. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Justin Keeton
Business Unit Leader - Land

CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
32095642	GW04		0.00 - 0.00	03/09/2025
32095655	GW05		0.00 - 0.00	03/09/2025

Only received samples which have had analysis scheduled will be shown on the following pages.

RECEIVED: 29/01/2026

Validated

CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

RECEIVED: 09/01/2026

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)									32095642						32095655	
Customer Sample Reference									GW04						GW05	
AGS Reference																
Depth (m)									0.00 - 0.00						0.00 - 0.00	
Container									0.5l glass bottle (ALE227)	500ml Plastic (ALE208)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE246)	
Sample Type									GW	GW	GW	GW	GW	GW	GW	
Ammonium Low	All	NDPs: 0 Tests: 2									X					
Anions by Kone (w)	All	NDPs: 0 Tests: 2								X						
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2										X				
EPH and CWG by FID	All	NDPs: 0 Tests: 2							X							
Fluoride	All	NDPs: 0 Tests: 2								X						
GRO by GC-FID (W)	All	NDPs: 0 Tests: 2												X		
Mercury Dissolved	All	NDPs: 0 Tests: 2										X				
Nitrite by Kone (w)	All	NDPs: 0 Tests: 2											X			
pH Value	All	NDPs: 0 Tests: 2								X						
pH Value of Filtered Water	All	NDPs: 0 Tests: 2								X						
Phosphate by Kone (w)	All	NDPs: 0 Tests: 2								X						
Sulphide	All	NDPs: 0 Tests: 2													X	
TPH CWG (W)	All	NDPs: 0 Tests: 2							X							
VOC MS (W)	All	NDPs: 0 Tests: 2												X		

CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- *** 6:2 FTAB (see appendix)
- 1-4+§@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	GW04	GW05
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Ground Water (GW)	Ground Water (GW)
			Date Sampled	03/09/2025	03/09/2025
			Sample Time	.	.
			Date Received	05/09/2025	05/09/2025
			SDG Ref	250905-93	250905-93
			Lab Sample No.(s)	32095642	32095655
			AGS Reference		
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099		0.083 #	0.092 #
Ammoniacal Nitrogen Low as NH3	<0.01 mg/l	TM099		0.101 #	0.112 #
Ammoniacal Nitrogen Low as NH4	<0.01 mg/l	TM099		0.107 #	0.118 #
Sulphide	<0.01 mg/l	TM101		<0.01 #	<0.01 #
Fluoride	<0.5 mg/l	TM104		<0.5 #	<0.5 #
Aluminium (diss.filt)	<10 µg/l	TM152		<10 #	15.8 #
Arsenic (diss.filt)	<0.5 µg/l	TM152		<0.5 #	0.765 #
Barium (diss.filt)	<0.2 µg/l	TM152		25.2 #	19.7 #
Boron (diss.filt)	<10 µg/l	TM152		21.8 #	29.7 #
Cadmium (diss.filt)	<0.08 µg/l	TM152		<0.08 #	<0.08 #
Chromium (diss.filt)	<1 µg/l	TM152		<1 #	1.37 #
Copper (diss.filt)	<0.3 µg/l	TM152		1.75 #	0.746 #
Lead (diss.filt)	<0.2 µg/l	TM152		<0.2 #	<0.2 #
Manganese (diss.filt)	<3 µg/l	TM152		20 #	37.1 #
Nickel (diss.filt)	<0.4 µg/l	TM152		0.872 #	0.89 #
Phosphorus (diss.filt)	<10 µg/l	TM152		<10 #	18.2 #
Selenium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #
Vanadium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #
Zinc (diss.filt)	<1 µg/l	TM152		4.64 #	<1 #
Sodium (Dis.Filt)	<0.076 mg/l	TM152		19.6 #	8 #
Magnesium (Dis.Filt)	<0.036 mg/l	TM152		11.4 #	8.46 #
Potassium (Dis.Filt)	<0.2 mg/l	TM152		0.874 #	1.18 #
Calcium (Dis.Filt)	<0.2 mg/l	TM152		73.4 #	93.6 #
Iron (Dis.Filt)	<0.019 mg/l	TM152		<0.019 #	0.0307 #
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	<0.01 #
Nitrite as NO2	<0.05 mg/l	TM184		<0.05 #	<0.05 #
Sulphate	<2 mg/l	TM184		21 #	42.6 #
Chloride	<2 mg/l	TM184		57.8 #	22.4 #
Phosphate (Ortho as P)	<0.02 mg/l	TM184		<0.02 #	<0.02 #
Nitrate as NO3	<0.3 mg/l	TM184		66 #	48.7 #
Total Oxidised Nitrogen as N	<0.1 mg/l	TM184		14.9 #	11 #
pH	<1 pH Units	TM256		7.83 #	7.81 #
Conductivity @ 20 deg.C (diss.filt)	<0.02 mS/cm	TM256		0.524	0.512

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CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

TPH CWG (W)

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- *** 6:2 FTAB (see appendix)
- 1-4♦§@ Sample deviation (see appendix)

Customer Sample Ref.	GW04	GW05				
Depth (m)	0.00 - 0.00	0.00 - 0.00				
Sample Type	Ground Water (GW)	Ground Water (GW)				
Date Sampled	03/09/2025	03/09/2025				
Sample Time	.	.				
Date Received	05/09/2025	05/09/2025				
SDG Ref	250905-93	250905-93				
Lab Sample No.(s)	32095642	32095655				
AGS Reference						

Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM245	105	114				
GRO >C5-C12 (HS_1D_TOTAL)	<50 µg/l	TM245	<50 #	<50 #				
Aliphatics >C5-C6 (HS_1D_AL)	<10 µg/l	TM245	<10	<10				
Aliphatics >C6-C8 (HS_1D_AL)	<10 µg/l	TM245	<10	<10				
Aliphatics >C8-C10 (HS_1D_AL)	<10 µg/l	TM245	<10	<10				
Aliphatics >C10-C12 (HS_1D_AL)	<10 µg/l	TM245	<10	<10				
Aliphatics >C12-C16 (aq) (EH_2D_AL)	<10 µg/l	TM439	<50	<100				
Aliphatics >C16-C21 (aq) (EH_2D_AL)	<10 µg/l	TM439	<50	<100				
Aliphatics >C21-C35 (aq) (EH_2D_AL)	<10 µg/l	TM439	<50	<100				
Total Aliphatics >C12-C35 (aq) (EH_2D_AL)	<10 µg/l	TM439	<50	<100				
Aromatics >EC5-EC7 (HS_1D_AR)	<10 µg/l	TM245	<10	<10				
Aromatics >EC7-EC8 (HS_1D_AR)	<10 µg/l	TM245	<10	<10				
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10				
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10				
Aromatics >EC12-EC16 (aq) (EH_2D_AR_#1)	<10 µg/l	TM439	<50	<100				
Aromatics >EC16-EC21 (aq) (EH_2D_AR_#1)	<10 µg/l	TM439	<50	<100				
Aromatics >EC21-EC35 (aq) (EH_2D_AR_#1)	<10 µg/l	TM439	<50	<100				
Total Aromatics >EC12-EC35 (aq) (EH_2D_AR_#1)	<10 µg/l	TM439	<50	<100				
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM439	<10	<10				

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CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

VOC MS (W)

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- *** 6:2 FTAB (see appendix)
- 1-4♦§@ Sample deviation (see appendix)

Customer Sample Ref.	GW04	GW05
Depth (m)	0.00 - 0.00	0.00 - 0.00
Sample Type	Ground Water (GW)	Ground Water (GW)
Date Sampled	03/09/2025	03/09/2025
Sample Time	.	.
Date Received	05/09/2025	05/09/2025
SDG Ref	250905-93	250905-93
Lab Sample No.(s)	32095642	32095655
AGS Reference		

Component	LOD/Units	Method		
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208	<1 #	<1 #
Benzene	<1 µg/l	TM208	<1 #	<1 #
Toluene	<1 µg/l	TM208	<1 #	<1 #
Ethylbenzene	<1 µg/l	TM208	<1 #	<1 #
m,p-Xylene	<1 µg/l	TM208	<1 #	<1 #
o-Xylene	<1 µg/l	TM208	<1 #	<1 #
Sum of detected Xylenes	<2 µg/l	TM208	<2	<2
Sum of BTEX	<5 µg/l	TM208	<5	<5

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Table of Results - Appendix

Method No	Description
TM099	Determination of Ammonium in Water Samples using the Kone Analyser
TM101	Determination of Sulphide in soil and water samples using the Kone Analyser
TM439	Determination of Extractable Petroleum Hydrocarbons (EPH) CWG banding by GC-FID on liquids
TM104	Determination of Fluoride using the Kone Analyser
TM152	Analysis of Aqueous Samples by ICP-MS
TM183	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM208	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM245	Determination of GRO by Headspace in waters
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

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NA = not applicable.
Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 250905-93 **Report Number:** 776901 **Superseded Report:**
Client Ref.: 501.065860.00001 **Location:** Ballagh Pit Extension

Test Completion Dates

Lab Sample No(s)	32095642	32095655
Customer Sample Ref.	GW04	GW05
AGS Ref.		
Depth	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water
Ammonium Low	10-Sep-2025	10-Sep-2025
Anions by Kone (w)	09-Sep-2025	09-Sep-2025
Dissolved Metals by ICP-MS	09-Sep-2025	09-Sep-2025
EPH and CWG by FID	10-Sep-2025	10-Sep-2025
Fluoride	06-Sep-2025	06-Sep-2025
GRO by GC-FID (W)	11-Sep-2025	11-Sep-2025
Mercury Dissolved	10-Sep-2025	11-Sep-2025
Nitrite by Kone (w)	09-Sep-2025	09-Sep-2025
pH Value	10-Sep-2025	10-Sep-2025
pH Value of Filtered Water	10-Sep-2025	10-Sep-2025
Phosphate by Kone (w)	06-Sep-2025	06-Sep-2025
Sulphide	09-Sep-2025	10-Sep-2025
TPH CWG (W)	11-Sep-2025	11-Sep-2025
VOC MS (W)	11-Sep-2025	11-Sep-2025

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Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised.
This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur -
e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests.
We therefore cannot carry out any unfiltered analysis.
The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l.
Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only.
It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

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19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

If during the search of the two ‘pinch’ samples by PLM only 1 or 2 fibres or fibre bundles are seen and identified as asbestos, the term ‘trace asbestos identified’ is reported.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Potentially respirable fibres are identified by using a Phase Contrast Microscope.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.
The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

21. 6:2 FTAB

Recovery of 6:2 FTAB in the quality control samples has been observed to be <50% of the target value. Please note the 6:2 FTAB result is supplied as indicative only.

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Appendix 7-E:
Rating of Existing Environment Significance / Sensitivity

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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-F:
Descriptions of Effects (EPA, 2022)

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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

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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).

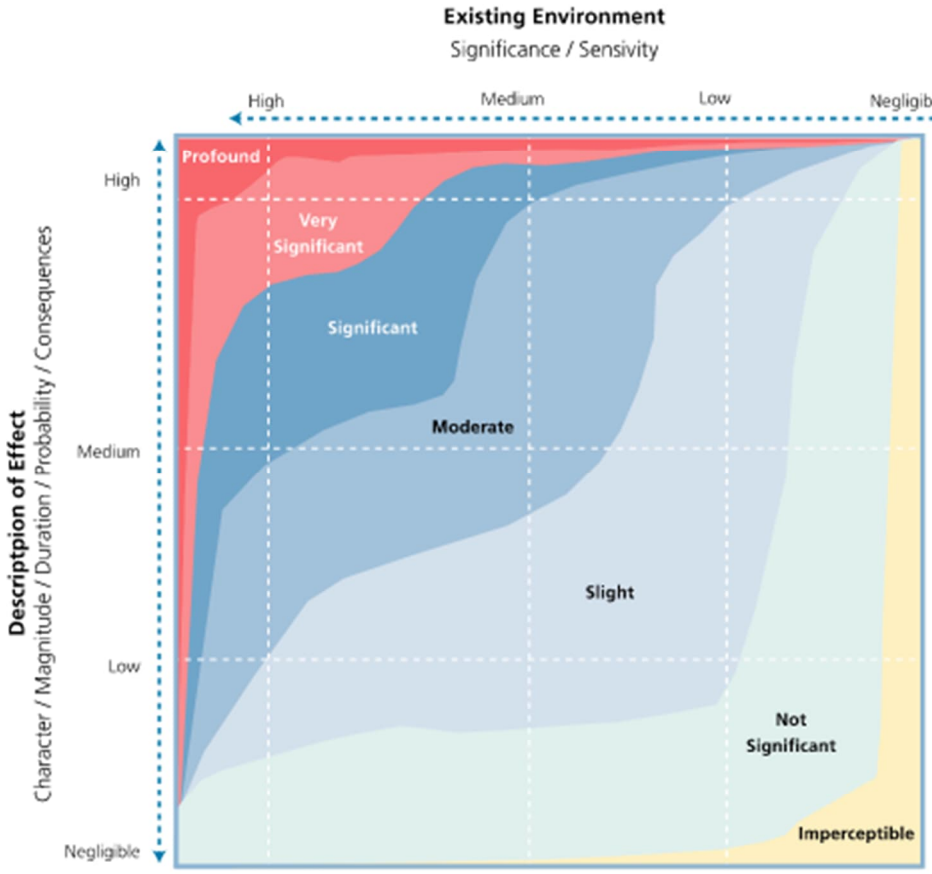
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Appendix 7-G:
Classification of the Significance of Impacts

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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[68].)

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