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Acronyms and Abbreviations

bgl	below ground level
BH	Borehole
CDP	County Development Plan
CGS	County Geological Sites
DM OBJ	Development Management Objective
DM POL	Development Management Policy
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
GW	Groundwater
HDPE	High Density Polyethylene
IFS	Irish Forestry Soils
IGHP	Irish Geological Heritage Programme
IGI	Institute of Geologists of Ireland
ISIS	The Irish Soil Information System
ITM	Irish Transverse Mercator
m AOD	meters Above Ordnance Datum
m bgl	meters below ground level
MH	2016 Monitoring Borehole
NHA	Natural Heritage Area
pNHA	proposed Natural Heritage Area
PSD	Particle Size Distribution
REDP	Regional Economic Development Policy
SHWW	Safety Health and Welfare at Work
SI	Site Investigation
TP	Trial Pit

Introduction

Background

6.1. This chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the existing land, soils and geological setting at the regional and local scale, and an assessment of the impact of the proposed development on the land, soils and geological features of the area around the site at Derryarkin Townland, Rhode, Co. Offaly.

6.2. The proposed development will consist of:

- An overall application area of c. 19.5 hectares;
- Phased extraction of sand and gravel (wet working) over an area of c. 11.7 hectares with processing that includes crushing and screening and all ancillary works and structures;
- Provision of new site facilities to include wheelwash (c. 35m²), weighbridge (c. 69m²); mobile welfare pod facility (c. 16m²) consisting of office, canteen, toilet and drying room; dedicated parking area, perimeter vegetation planting and fencing.
- Access to the site will be via an existing entrance onto the local access road to the north of the site;
- Progressive restoration of the site to naturally regenerated wildlife habitat and a permanent water body;
- The proposed development life is for 15 years to complete extraction and restoration operations.

6.3. The proposed extraction of the sand and gravel will be **wet working**, (i.e., extraction below the natural groundwater level of the site). Processing of the extracted materials will be carried out on-site to produce a range of aggregates for use by the applicant in the manufacture of concrete at their existing concrete batching facility located c. 600 m to the northwest.

Scope of Work / EIA Scoping

6.4. This EIAR chapter is based on a desk study of the proposed development site / surrounding lands using published geological data, past site investigations, site photographs and site visits previously carried out by SLR.

Consultations / Consultees

6.5. In preparing this Environmental Impact Assessment Report a MS Teams pre-planning consultation meeting was held between officials of Offaly County Council (Planning Department and Edenderry Municipal District Office), BD Flood and SLR on the 12th September 2024 (pre-planning ref. no. ED2423).

6.6. In addition, a pre-planning consultation document was issued to statutory consultees. Details of those consulted and feedback obtained is contained in Chapter 1 of this EIAR. The Geological Survey of Ireland (GSI) was consulted during the preparation of this EIAR Chapter and publicly available information from the GSI was reviewed also. The GSI consultation response dated the 29th January 2025 is available in **Appendix 6-A**.

Authors

6.7. This EIAR Chapter relating to Land, Soils and Geology was prepared by:

- Clio Greenbank – Graduate Hydrogeologist (MSc, BSc) with SLR Consulting Limited; and
- Peter Glanville - Professional Geologist (EurGeol. PGeo.) and Technical Director with SLR Consulting Ireland.

Regulatory Background

EU Directives

6.8. The following European Union (EU) Directives relate to Land, Soils and Geology at the proposed development site in this EIAR:

- Environmental Impact Assessment Directive (2014/52/EU); and
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018).

6.9. This chapter of the EIAR has been undertaken in accordance with the EU EIA Directive which regulates the environmental impact assessment process and information to be contained in EIARs.

Guidelines

6.10. This Land, Soils and Geology EIAR chapter has been prepared with regard to the following guidelines:

- Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Environmental Protection Agency.
- DoEHLG (2010) Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities;
- Geological Survey of Ireland, Irish Concrete Federation (2008) Geological Heritage Guidelines for the Extractive Industry;
- Institute of Geologists of Ireland (2013) Guidelines for the preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008) Environmental Impact Assessment of National Road Schemes - A Practical Guide;
- National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes; and
- Good Practice Guide for Handling Soils in Mineral Workings. The Institute of Quarrying (2021).

Planning Policy and Development Control

6.11. This section sets out the Planning Policy and Development Control relating to Land, Soils and Geology of relevance to the proposed development in the Offaly County Development Plan (CDP) 2021 - 2027.

6.12. The CDP sets out development management standards, policies and objectives in relation to land use zoning and rural economic activity in the county. Chapter 5 of the plan sets out Economic Development Strategy and in relation to the extractive industry it states that quarrying is a significant area of employment in the rural areas of County Offaly.

6.13. Rural Economic Development Policy No. 3 (**REDP-03**) states that:

'...it is Council policy to continue to protect existing resource-based industry from encroachment by residential development, for example mining, quarrying, gravel pits, and intensive agriculture.'

6.14. Policies for biodiversity and landscape, and designated and non-designated sites in the CDP set out policies for geology, eskers and quarries in the County, see **Table 6-1** below.

Table 6-1: Development policy for geology, eskers and quarries (Offaly CDP 2021 - 2027)

Policy	Detail
BLP-09	It is Council policy to protect from inappropriate development and maintain the character, integrity and conservation value of features or areas of geological interest as contained in the scheduled list of geological heritage sites identified in Table 4.11 Offaly Geological Sites.
BLP-10	It is Council policy to encourage, where practical and when not in conflict with ownership rights, access to geological features in the county.
BLP-11	It is Council policy to protect and conserve the landscape, natural heritage and biodiversity value of esker systems in the county as identified in the Offaly Esker Study, 2006.
BLP-12	It is Council policy to assess the impact of proposals for quarry development on nearby eskers, with reference to their status or relative importance, for example, amenity, landscape and scientific value in the context of the overall esker system.
BLP-13	It is Council policy to recognise the natural heritage value of disused quarries as rich habitats and to encourage landowners to preserve quarries post extraction as habitats rather than levelling or infilling the quarry area where possible subject to health and safety considerations and the protection of the relevant conservation objectives, qualifying interests and integrity of Natura 2000 sites.
BLO-07	It is an objective of the Council to protect county geological sites and mushroom stones identified in Table 4.11 Schedule of County Geological Sites identified by the Irish Geological Heritage Programme for Protection in County Offaly.
BLO-08	It is an objective of the Council to increase pedestrian and cycling access to esker and geological sites in turn increasing appreciation of esker and geological heritage, where possible, subject to Article 6 of the Habitats Directive.
BLO-09	It is an objective of the Council to consider, in consultation with the National Parks and Wildlife Service, Westmeath County Council, the Geological Survey of Ireland and others, the potential designation of the north Offaly esker landscape as a UNESCO Geopark, to promote the unique geological heritage of the area.

6.15. In 2016 the GSI identified 28 County Geological Sites (CGS) in County Offaly under the Irish Geological Heritage Programme (IGHP), which are listed in the Offaly County Development plan. The CGS are proposed Natural Heritage Areas (pNHA) and they may be designated in due course as Natural Heritage Areas (NHAs) based on their geological interest from a national perspective.

6.16. The site at Derryarkin is not located within or adjacent to a CGS and the site does not form part of an esker ridge system.

Receiving Environment

Study Area

6.17. For the purposes of this assessment, the study area comprises the application site and predominantly focuses on the surrounding area up to 5 km; this is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013).

6.18. The IGI guidelines state that the minimum distance of 2 km should be reviewed in the context of the geological environment as well as the scale of development and increased to reflect the sensitivity of the subsurface. The IGI guidelines also state that maps should be sourced to allow for the review of any sensitive geological and hydrogeological conditions that exist beyond 2 km of the site boundary (from the outer limit of the planning and/or licence area) and presented at a scale of 1:25,000.

6.19. The baseline maps produced in this EIAR are at a scale of 1:50,000 and include an area up to c. 8.5 km from the lands under the control of the applicant, although the main focus of the study area extends up to 5 km as stated above.

Baseline Study Methodology

6.20. This section of the EIAR provides a description of the existing geological setting on both a local and regional scale, an assessment of the impact of the development on the geological features of the area and other geological aspects of the development.

6.21. The baseline study undertaken here for Land, Soils and Geology, involves a review of published literature and information, site trial pits (2025) and site investigations (boreholes) undertaken in March 2025, GSI consultation and the findings from a walkover survey of the proposed development site. This baseline information was considered in the context of the existing site, proposals for it and the geological conditions of the surrounding study area.

6.22. This chapter describes the receiving environment at and in the immediate vicinity of the site using the available baseline information gathered, specifically the:

- **Context** of the receiving environment - location/ magnitude/ spatial extent and trends of the environmental factors;
- **Character** of the receiving environment - distinguishing aspects of the environment being considered here;
- **Significance** of the receiving environment - the quality, value or designation is assigned to the existing environment; and
- **Sensitivity** of the receiving environment - how sensitive is the aspect of the environment to change.

6.23. This chapter was prepared by SLR Consulting Ireland with regard to the Guidelines on Geology in Environmental Impact Assessments issued by the Institute of Geologists of Ireland[1] and also the EPA guidelines[2].

6.24. The baseline study is a qualitative assessment of the available information based on professional experience and interpretation of the available quantitative data obtained through comprehensive fieldwork (see below).

[1] Guidelines for the Preparation of Soils, geology and Hydrogeology Chapters of Environmental Impact Statements
[2] Guidelines on the Information to be Contained in Environmental Impact Statements (2022).

Sources of Information

6.25. The following sources of information were consulted in the preparation of the receiving environment baseline study for Land, Soils and Geology.

- Geological Survey of Ireland (GSI) (www.gsi.ie);
- Teagasc subsoil mapping for Irish Forestry Soils Project (www.epa.ie);
- Irish Soils Information System (www.teagasc.ie/soils);
- Environmental Protection Agency (EPA) (https://gis.epa.ie/EPAMaps/)
- Irish Geological Heritage Programme (www.gsi.ie); and
- Tailte Éireann - Surveying (www.osi.ie).

Land Baseline

6.26. Land is recognised within the EIA EU Directive (2014/52/EU) as a 'natural resource', and the Directive also refers to the importance of the sustainable use of soil and the need to address the unsustainable increase in settlement areas over time ('land take'). Therefore, the issues of land as both a natural resource and land take must be considered in an assessment.

6.27. The introduction section to the EU Directive (2014/52/EU) notes that the:

'final document of the United Nations Conference on Sustainable Development held in Rio de Janeiro on 20-22 June 2012, which recognises the economic and social significance of good land management, including soil, and the need for urgent action to reverse land degradation. Public and private projects should therefore consider and limit their impact on land, particularly as regards land take, and on soil, including as regards organic matter, erosion, compaction and sealing; appropriate land use plans and policies at national, regional and local level are also relevant in this regard'.

6.28. Land can be considered to be a resource with a beneficial use to society, for example agricultural land use, extractive industry land use or urban residential land use. Unnecessary land take may result in the loss of this resource which has the potential to have adverse social and economic consequences for society. The current land use across the application area is noted as 'pastures' on the Corine Land Cover map (**Figure 6-1**) which has a beneficial aspect for society through grassland animal grazing, however the application site has been under forestry until recently.

6.29. Agricultural land use activities may be considered to be tied activities; tied to the resource present at the site while the type/nature of agricultural activity is also related to the suitability of the soils present.

6.30. The extraction of sand and gravel material at the proposed development site is a resource-tied land use activity, as it is dependent on the location and suitability of the sand and gravel material for its intended use, which are considered to be a natural resource.

6.31. The sand & gravel material is a mineral resource (non-scheduled mineral). The sand and gravel material resource at the site has been proven through the detailed site investigations carried out at the site.

6.32. The proposed development will result in a loss of c. 11.7 ha of land across the proposed extractive area and an additional 7.8 ha across the wider application area. In terms of land take, the proposed development will result in a temporary use of the land for sand and gravel material extraction and a permanent loss of agricultural lands over the application area. The soils at the site will be stripped and stored on site during the extraction of the sand and gravel

material and will be used for the restoration of the site to return it to a beneficial biodiversity habitat and permanent waterbody after-use.

Land Cover

6.33. The Corine land cover mapping is a standardised inventory of land cover across Europe which is split into 44 different land cover classes. The latest 2018 Corine land cover mapping for Ireland is based on the interpretation of satellite imagery and national in-situ vector data. Land cover is mapped to the standard CORINE classification system and data specifications.

6.34. The Corine land cover mapping (www.epa.ie) reflects land use at the time of survey, in this case the latest available land cover data for Ireland is 2018. As shown in **Figure 6-1,** and summarised in **Table 6-2** below, there is a mix of land cover types present in the vicinity of the site.

Table 6-2: Corine Land Cover

CORINE Land Cover Code	CORINE Land Cover (Type)	CORINE Land Cover (Detailed Description)
Application area		
243	Agricultural Areas	Land principally occupied by agriculture with significant areas of natural vegetation
Study Zone (2 km around site)		
131	Artificial Surfaces	Mineral Extraction Sites
231	Agricultural Areas	Pastures
243		Land principally occupied by agriculture with significant areas of natural vegetation
324	Forest and semi-natural areas	Transitional Woodland Shrub
412	Wetlands	Peat Bogs

6.35. The lands in the proposed application area and in the vicinity of the site are primarily used for agriculture with significant areas of natural vegetation.

Soils Baseline

6.36. Soil is defined as the top layer of the earth's crust and is formed by mineral particles, organic matter, water, air and living organisms. Soil is an extremely complex, variable and living medium and its characteristics are a function of parent subsoil or bedrock materials, climate, relief and the actions of living organisms over time.

6.37. Soil formation is an extremely slow process and can take thousands of years to evolve; soil can be considered essentially as a non-renewable resource.

6.38. As the interface between the earth, the air and the water, soil performs many vital functions; it supports food and other biomass production (forestry, biofuels etc.) by providing anchorage for vegetation and storing water and nutrients long enough for plants to absorb them. Soil also stores, filters and transforms other substances, including carbon and nitrogen, and has a role supporting habitats serving as a platform for human activity.

National Soils

6.39. The Irish Soil Information System (ISIS) project was undertaken by the EPA and Teagasc, and has gathered together existing information and data from soil survey work in Ireland, which has been augmented with new field data, leading to the production of a new national soil map at a scale of 1:250,000 (www.teagasc.ie/soils).

6.40. The ISIS project has identified a number of Soil Associations across Ireland, which are each comprised of a range of soil types (or 'Series'), each of them different in properties, with different environmental and agronomic responses. For each soil type, the properties have been recorded in a database maintained by Teagasc.

6.41. Summary of soils within the study zone is represented in **Table 6-3** below.

Table 6-3: Soils within the study area

Great Soil Group	Soil Association	Soil Parent Material	Soil Drainage Description
Site Soils			
Peat	Peat	Peat soils	Poor
Study Area Soils			
Grey, brown Podzolic	Elton	Fine loamy drift with limestones	Moderately
Urban	Urban	Urban	Other

6.42. As presented on **Figure 6-2,** the principal soil types across the study zone are Peat and the Elton Series. The drainage of these soils is considered to be moderate to poor and imperfectly draining.

Site Soils

6.43. The thickness of the organic rich clayey soil was confirmed by the excavation of eight trial pits during a site investigation in May 2025. The presence of organic rich clayey soils across the site was also confirmed during this investigation during borehole drilling.

6.44. The trial pits and boreholes confirm that the thickness of the organic rich clayey soil ranges between 0.2 m – 0.9 m.

Subsoils Baseline

National Subsoils

6.45. The subsoils (Quaternary deposits) were deposited during the last 2 million years. The two principal types of quaternary subsoils in Ireland are glacial till, deposited at the base of ice sheets, and sand and gravel deposits associated with the melting of the ice sheets, and are generally termed glaciofluvial outwash sands and gravels. Other extensive quaternary subsoils in Ireland include peat and river alluvium. Most Quaternary deposits in Ireland were deposited since the maximum of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.

6.46. The subsoils across Ireland have been mapped on a national basis by Teagasc as part of the EPA Soil and Subsoil Mapping Project for the Irish Forestry Soils (IFS) project. The subsoil mapping was undertaken at a national basis using existing Quaternary Geology maps, publications, remote sensing and field mapping and sampling.

6.47. The Quaternary deposits in County Offaly originated during the last glaciation that impacted Ireland. The primary subsoil types in County Offaly are:

- Tills - these are unsorted sediment deposited directly by glacial ice;
- Glacio-fluvial sands and gravels - formed from meltwater streams that flowed from the glacier;
- Esker sands and gravels - resulting from sediment deposited in subglacial tunnels;
- Glacio-lacustrine deposits - accumulations formed in glacial lakes; and
- Alluvium: Sediments deposited by rivers and streams.

6.48. As indicated on **Figure 6-3**, the subsoils in the study area are represented by four main subsoil types:

- Cut over raised peat;
- Sand and Gravels derived from Limestones;
- Limestone Till; and
- Lake Sediments.

Site Subsoils

6.49. Subsoils in the proposed application site and study area have been mapped under the IFS project as Peat Cut, see **Figure 6-3**.

6.50. Based on the site investigation data, the entirety of the site is underlain by a thin layer of organic rich clayey soil of c. 0.3 m thickness. Borehole and trial pit logs, see **Appendix 6-E**, **Appendix 6-C** and **Appendix 6-D**, indicate that there are thick layers of sands and gravels beneath the organic rich clayey soil. Based on the IFS mapping these are likely to be Sands and Gravels derived from Limestones.

6.51. Based on Site Investigation (SI) data, discussed below, sand and gravel deposits were encountered at all boreholes and trial pits across the site. Details of the SI undertaken at the site are included below in this EIAR Chapter.

Bedrock Geology Baseline

Regional Setting

6.52. The Geological Heritage of County Offaly Report (GSI, 2016), states that the bedrock in County Offaly primarily consists of Lower Carboniferous-aged limestone which formed approximately 360 million years ago in a marine paleoenvironment. At this time, volcanoes erupted at Croghan Hill, leaving the only ridge of igneous volcanic rock in the county, see **Figure 6-4**.

6.53. Regionally, the site lies in the Dinantian Upper Impure Limestones Group of Ireland.

6.54. GSI mapping indicates that the application site is directly underlain by two bedrock types:

- Basalt, lithologically described as '*generally massive black olivine basalts, weathered to various degrees*'; and
- Agglomerate, lithologically described as '*Vitric lithic lapilli tuffs and tuff breccias with intercalated thin basalts*'.

6.55. These are underlain at depth by the Lucan Formation, classified as '*dark grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey'*, see **Figure 6-4**.

6.56. There are no bedrock exposures within the application area. The nearest bedrock exposure within the study area is located c. 1.2 km to the south of the site.

Site Investigations

6.57. A number of site investigations were undertaken at the site between January and May 2025 to determine the geological conditions at the site. The surveys included:

- Geophysical survey;
- Trial pit survey;
- Grading testing of subsoils; and
- Borehole survey

Geophysical Survey (January 2025)

6.58. A geophysical survey was carried out between 21st - 25th January 2025 to investigate the underlying geological conditions at the site and to identify the potential resource available at the site, see **Appendix 6-B** and **Figure 6-5**.

6.59. The survey included an electromagnetic (EM) ground conductivity, electrical resistivity tomography and seismic refraction profiles across the site. The survey indicated between that between 1.0 m and 4.7 m of sand and gravel material and areas of sandy gravelly clay.

6.60. The geophysical survey identified four zones at the site, identified as A to D, based on the in-situ geology. Zones A, B & C, located in the south, north-east and north-west, consisted of clayey sand and gravel and cobbles. The sand and gravel is present to an average thickness of 3.0m, overlain by peat which has a thickness of c. 1.0 m. These zones are expected to have economic potential.

6.61. Zone D, which covers the majority of the site, is identified by saturated fine, possible silty, sand and gravel deposits which are present to an average thickness of 5.4m.

6.62. The geophysical investigation indicates that the upper horizon of the bedrock is present from c. 6.3 m BGL in the northwest of the site, to c. 18.8m BGL in the west of the site, indicating that the sand and gravel subsoil ranges from being approximately 6 to 18 m thick.

Site Boreholes (April - May 2025)

6.63. Three groundwater monitoring wells (identified as GW1, GW2 and GW3) were installed in April 2025, and a further six boreholes (identified as BH1 to BH6) were drilled at the application site in May 2025. Summary borehole details are shown in **Table 6-4**, the borehole locations are shown in **Figure 6-5** and the borehole logs are included in **Appendix 6-C** and **Appendix 6-D**.

6.64. The site boreholes extend to between 10 m and 11 m BGL at the site. The groundwater monitoring wells were installed with 50 mm HDPE standpipes to their full depths.

6.65. Bedrock was not encountered within any of the boreholes or groundwater monitoring wells.

6.66. All boreholes have intersected sand and gravel material in thicknesses ranging from 2.7 m (BH5) to 4.9 m (BH3 and BH4), see **Figure 6-5**.

Table 6-4: Summary of Borehole Investigation (April-May 2025)

ID	Location (ITM)	BH Depth (m bgl)	Sand/Gravel Interval (m)
GW1	E648804 N736188	11.00	4.30
GW2	E649326 N736317	10.00	3.90
GW3	E648986 N735980	11.00	4.80
BH1	E648900 N736424	10.00	2.80
BH2	E649154 N736302	10.00	3.30
BH3	E649054 N736255	10.00	4.90
BH4	E648854 N736221	10.00	4.90
BH5	E649021 N736129	10.00	2.70
BH6	E648821 N736084	10.00	4.60

Trial Pits and Soil Gradings (April 2025)

6.67. Eight trial pits (TP1 to TP8) were excavated in the application area in May 2025. The locations of the trial pits are shown in **Figure 6-5** and the trial pit logs are included in **Appendix 6-E**.

6.68. Summary details of trial pits are represented in **Table 6-5**. The trial pits extended up to a maximum depth of 2.1 m below ground level (bgl). The trial pits encountered a range of materials including "*coarse grained sand with cobbles and boulders*" to "*gravelly clay and silts*".

6.69. All trial pits recorded between 0.3m and 0.5m of organic rich clayey soil, overlying the sand and gravel material, see **Appendix 6-E**. The trial pits were constrained by the groundwater level at the site as it was not feasible to excavate below this level with the excavator. No bedrock was not encountered in any of the trial pits.

Table 6-5: Tria Pit Summary of and geology encountered

ID	Location (ITM)	Ground Elevation (m AOD)	Trial Pit Depth (m bgl)	Organic Rich Clayey Soil Thickness (m)	Sand &Gravel thickness to the groundwater level (m)
TP1	E648760 N736011	79.20	1.90	0.30	1.80
TP2	E648849 N736008	79.62	2.20	0.30	1.20
TP3	E948854 N736208	79.04	2.00	0.25	1.40
TP4	E648997 N736132	79.23	2.10	0.30	1.50
TP5	E648904 N736305	79.26	2.10	0.40	1.30
TP6	E649185 N736301	78.21	2.10	0.35	1.50
TP7	E649057 N736224	79.08	1.90	0.40	1.10
TP8	E648992 N736292	79.00	2.00	0.20	1.15

6.70. Particle Size Distribution (PSD) grading tests were undertaken on eight bulk disturbed samples from the trial pits. The PSD lab test results are shown in **Appendix 6-F** and the graphed results are shown in **Appendix 6-G**. Summary details of the PSD grading tests are shown in **Table 6-6**.

Table 6-6: Soil grading summary results

ID	Sample depth (m)	Fines (% passing)	Sand (% passing)	Gravel (% passing)	Very Coarse (% passing)	Sample Description
TP1 (44082)	1.65	12	35	49	4	SAND & GRAVEL
TP2 (44083)	1.95	2	27	71	0	Sandy GRAVEL
TP3 (44084)	1.75	9	45	41	5	SAND & GRAVEL
TP4 (44085)	1.85	2	33	65	0	SAND & GRAVEL
TP5 (44086)	1.85	2	43	55	0	SAND & GRAVEL
TP6 (44087)	1.85	1	47	52	0	SAND & GRAVEL
TP7 (44088)	1.65	1	41	58	0	SAND & GRAVEL
TP8 (44089)	1.75	15	33	48	4	SAND & GRAVEL

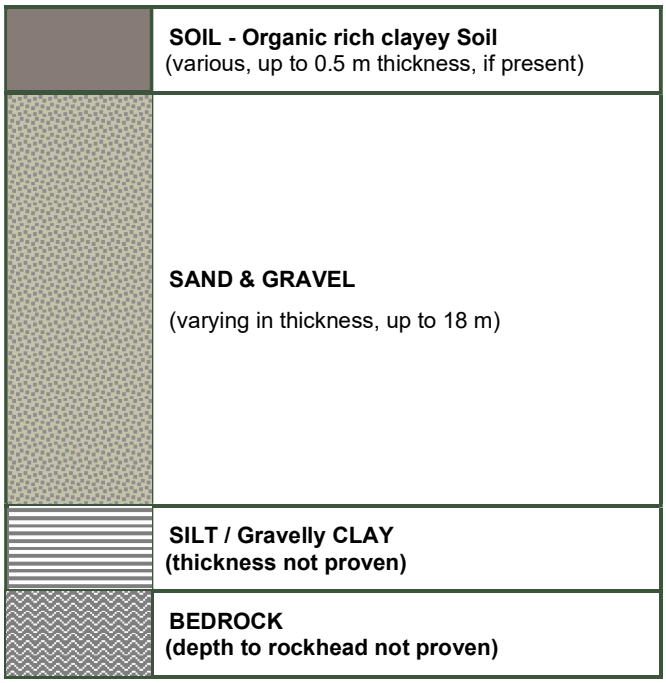
6.71. The gradings results indicate that the samples tested are predominantly comprised of SAND & GRAVEL material with some fines and with very little coarse material present, see **Table 6-6** above.

6.72. Two samples (TP1 and TP8) have fines (Silt/Clay) >10%, sample TP3 has fines of 9%, while the remaining five samples have very low percentages of fines at <2% of the sample, see **Table 6-6** above.

Geological Profile

6.73. The site's geological profile is summarised below in **Diagram 6-1**.

Diagram 6-1: Schematic Geological profile at the site



Geological Heritage

6.74. The Geological Survey of Ireland's (GSI) Irish Geological Heritage (IGH) Programme has identified geological heritage sites in Ireland. The site at Derryarkin is not located within a designated County Geological Site (CGS). See planning consultation response from the GSI, **Appendix 6-A**.

6.75. The closest County Geological Site (CGS) is Croghan Hill, located c. 2.5 km south of the application area. Summary details of Croghan Hill CGS are included in **Table 6-7** below.

Table 6-7: Summary details of County Geological Sites within the study zone

Site Name:	Croghan Hill CGS
Location relative to application site	c. 2.5 km south of the application area boundary
Description	A prominent hill rising from an otherwise flat landscape of midland raised bogs and low-lying pasture.
Site Importance	This site is important in terms of volcanic igneous geology, particularly in the low-lying midlands, which is predominantly underlain by Carboniferous limestones covered by bog. It is one of only a few such Carboniferous-age volcanic sites in Ireland

6.76. The Croghan Hill CGS is selected under theme IGH 11 - Igneous Intrusions and IGH 8 - Lower Carboniferous. This site is considered to be of very good quality, showing spectacular topography which is unique in Ireland and is of international importance.

6.77. Croghan Hill was elevated above the sea that covered this area during the Carboniferous period. The volcanic rocks, including extrusive alkali basalts, limburgites, and pyroclastic agglomerates and tuffs, are interbedded with the limestones which were formed in the warm seas.

Radon

6.78. Monitoring of radon gases is controlled by the EPA, who produce a Radon Risk Map for Ireland.

6.79. Radon is a natural radioactive gas that is formed in the ground by the radioactive decay of uranium which is present in all rocks and soils. The gases can cause lung cancer when exposed to high levels over a long period of time.

6.80. The site is located in an area identified as being of medium risk, defined by the EPA as where 1-in-10 homes are likely to have high Radon levels.

6.81. It is not proposed to have any offices or enclosed buildings at the proposed extraction site and therefore Radon is not considered to be a risk in terms of the development proposed here.

Identified Sensitive Receptors

6.82. In terms of the land, soils and geology baseline considered here, the sensitive receptors identified from this baseline are:

- land and soils for agricultural use;
- subsoils including Sand and Gravel deposits.

6.83. Both land and soils, and the subsoils have been identified as sensitive receptors under the baseline undertaken here and therefore are considered below in the impact assessment.

6.84. Bedrock geology and geological heritage have not been identified here as sensitive receptors from the baseline study undertaken; therefore, both have been screened out here and are not considered as part of the impact assessment:

- Bedrock has been screened out as it will not be excavated as part of the proposed development and will remain in situ at the site; and
- The site is not located within or adjacent to a designated CGS.

Impact Assessment

Evaluation Methodology

6.85. The evaluation of impacts of the proposed development is based on a methodology similar to that outlined in the Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements published by the IGI (2013).

Evaluation of Impacts

6.86. The proposed development comprising sand and gravel material extraction will result in the direct loss of agricultural land, soils and the sand & gravel subsoils through extraction. This assessment therefore will focus on the potential impact of the proposed sand and gravel extraction of the site.

6.87. The proposed restoration scheme envisages that the worked-out area will ultimately be reinstated to a landscaped lake, interspersed with constructed peninsulas, capable of supporting new habitat.

6.88. There will be no requirement to import any materials to site for restoration purposes.

6.89. The status and importance of existing land, soil and geology attributes identified at the application site identified from the baseline outlined in **Table 6-8** below.

Table 6-8: Status & Importance: Land, Soil & Geology attributes

Attribute	Status / Occurrence	Importance
Land	The land at the proposed application is currently grassland used for grazing and for an annual silage crop.	The land at the site is considered to have a low value at the local scale in terms of its ability to support agriculture, with limited potential other than for grazing or forestry.
Soils	Elton series are identified as imperfectly draining. The Peat Series Association has a relatively wide distribution across the county and therefore is not particularly unique or specific to this site.	The organic rich clayey soils are relatively thin at the site and support grassland landuse. The soils are considered to be of low quality or value on the local scale only with a limited range of uses. Where soil drainage is less good then their use is limited without any significant soil drainage improvement works.
Subsoils	The subsoils are sand & gravels derived from limestones. The subsoils do not have any particular designation or status.	The Sand & Gravel subsoils are considered to be of local and regional importance and is considered to be of high economic value where used in readymix products or in the construction industry .
Geology	The bedrock at the site does not have any particular designation status.	The bedrock geology is of low economic importance as no bedrock material will not be extracted as part of the proposed development.

6.90. The magnitude of potential impacts on the land, soils and subsoil attributes at the site are assessed below in **Table 6-9**.

Table 6-9: Magnitude of potential impacts on Land, Soil and Geology (with no mitigation)

Attribute	Potential impact on land, soil and subsoil receptors	Magnitude of Potential Impact (with No Mitigation)
Land	Permanent loss of low-quality agricultural land for the purposes of sand & gravel extraction.	Negative and slight impact. The magnitude of the impact is considered to be negative and slight with the permanent loss of low-quality agricultural lands.
Soils	Permanent loss of soils from extraction area.	Negative and slight impact. The magnitude of the impact is considered to be negative and slight with the permanent loss of low quality soils.
Subsoils	Permanent loss of sand & gravel economic resource from extraction area.	Negative and high impact.

		Permanent loss of sand & gravel resource which is of local and regional importance for the construction industry.
Bedrock Geology	No impact	None

Direct Impacts

6.91. The nature of the development will entail the stripping and storage of organic rich clayey soil material and the excavation of the underlying sand and gravel subsoil material within the proposed extraction area.

6.92. There will be a direct impact on the agricultural land at the site as the soils will be removed to facilitate extraction.

6.93. There will be a direct impact on the overlying organic rich clayey soil which will occur during the stripping and placement of soils to expose the underlying sand and gravel material for extraction.

6.94. There will be a direct impact on the sand and gravel subsoil material within the extraction area as it will be removed as part of the proposed development. This impact will be negative and permanent; however, this site-specific impact must be balanced against the strategic regional importance of the pit, as a medium-term secure supply of high-quality sand and gravel material products are required in support of construction and economic development.

Indirect Impacts

6.95. The development will not have an indirect impact on the geological aspects of the environment outside the footprint of the proposed sand and gravel extraction area.

6.96. Soils in adjoining lands will not be impacted as a result of the proposed development. The working (extraction and processing) of sand and gravel material at the site will not release any contaminants onto the lands and any fugitive dust resulting from the development will be controlled (refer to EIAR Chapter 8 - Air Quality).

6.97. The proposed development will not lead to any indirect impacts on bedrock geology.

Cumulative Impacts

6.98. The site of the proposed application is set within an area with a number of existing pits where sand and gravel extraction, processing and aggregate production is an established land use. In this respect, it is considered that the proposed pit will not result in a substantial or significant increase in extraction area given the number and extent of existing sites in the vicinity.

6.99. The majority of material extracted will be going to the existing concrete batching facility located c. 600 m to the northwest with the balance supplied to other BD concrete plants in the region. The supply of aggregate from the site will not result in any additional output from the BD Flood concrete batching plant as it is a replacement aggregate supply to the plant.

Unplanned Events

6.100. Unplanned events within the application site, such as accidents, have the potential to impact on the land, soils and geology adjoining the site.

6.101. Ground instability, particularly the long-term stability of the pit faces, has the potential to impact on adjoining lands. The proposed development will adhere to the Health and Safety

Authority Safe Quarry Regulations and Guidance[3] in relation to the Safety, Health and Welfare at Work (SHWW) Regulations[4] and this will eliminate the potential for unplanned events such as instability of pit faces or instability in adjacent lands.

6.102. With the implementation of the SHWW Regulations, it is considered extremely unlikely that instability of pit faces would result in an impact on the land, soils and geology at the proposed development site or on adjacent lands outside the application area.

Human Health

6.103. From a land, soils and geology perspective, any potential impacts on human health from the proposed development would not be via the land use, soils and geology pathways but via other pathways such as air and water, which are addressed in the relevant chapters of this EIAR.

Interaction with Other Impacts

6.104. The interaction between soils / geology and water is addressed in EIAR Chapter 7 Water (Hydrology & Hydrogeology).

'Do-nothing Scenario'

6.105. In a "do nothing scenario", the proposed extraction and restoration activities would not proceed at the application site; the site will remain in agricultural landuse. However, under this scenario the local supply of quality aggregates would not be augmented and would become increasingly restricted.

6.106. The site would not be used to maximum advantage, and the opportunity would be missed to obtain high quality and desirable sand and gravel material from a proven resource and which would utilise existing processing facilities and infrastructure located nearby.

6.107. The do-nothing scenario would not result in any adverse impact on land, soil and geology.

Mitigation Measures

6.108. Mitigation measures are outlined below for the proposed development.

Construction Stage

Soils

6.109. Soils will be managed on site in line with best practice in terms of handling, storage and reuse for restoration.

6.110. During the site preparation stage, the soil will be stripped off and will be stored in screening berms around the excavation area. The soils will be stripped and stored in accordance with best practice guidance a set out in The Institute of Quarrying guidelines[5].

6.111. The soil handling method can affect the quality of the restoration through severe soil deformation (compression and smearing); this is primarily caused through trafficking, the effects of which increase with soil moisture content.

[3] www.has.ie
[4] Safety, Health and Welfare at Work (Quarries) Regulations 2008.
[5] The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings, 2021.

6.112. The scheme will involve the final restoration of those parts of the site outside of the extraction area but within the application area. The soil stripping and storage operations will be undertaken in such a manner so as to minimise soil compaction.

6.113. In order to limit the effects of erosion and deterioration on the soil, material will not be removed during either periods of prolonged dry weather or excessively wet weather, this is to avoid the higher potential for dust generation during extended periods of dry weather, and conversely the greater potential for soil erosion during extended periods of wet weather.

6.114. Initial soils stripped will be stored in screening berms along the site boundary of the proposed extraction and thereafter, excess soils will be placed back into the worked out area along the edges of the waterbody.

6.115. Good practice measures will be implemented at the site in order to preserve the structure and integrity of the soils and limit the effects of erosion on the stored soil during excavation and storage.

6.116. To ensure effective soil management during mineral extraction activities '*Good Practice Guide for Handling Soils in Mineral Workings*' (Institute of Quarrying, 2021) indicates seven areas of focus, and these are set out in **Table 6-10** below.

Table 6-10: Summary table of good practice handling soils in mineral workings

Focus area	Steps	Description
1. Soil resource conservation	Soil Stripping and Storage	Follow best practices for stripping soil layers (soil, subsoil) separately to avoid mixing. Ensure the soil is stored in appropriately sized, shaped, and located stockpiles to prevent compaction, erosion, and loss of fertility.
	Minimizing Soil Compaction	Avoid the use of heavy machinery on wet soils. Implement low-ground-pressure equipment and minimize trafficking on sensitive areas.
	Avoiding Soil Contamination	Prevent the mixing of soil types, as well as contamination by fuel spills, waste, or other pollutants.
2. Soil and subsoil management	Sequential Soil Removal and Storage	Strip soils progressively, only in areas to be worked immediately, to reduce exposure and risk of erosion.
	Stockpile Design	Stockpiles should not exceed recommended heights (e.g., 3-5 meters for topsoil) to prevent compaction. Maintain vegetative cover on long-term stockpiles to reduce erosion.
	Stockpile Maintenance	Ensure proper drainage systems around stockpiles and implement regular inspections to monitor stability and prevent weed growth.
3. Soil handling during adverse weather conditions	Weather-Responsive Planning	Implement a weather management plan that includes halting soil handling operations during wet conditions to prevent structural damage and erosion. Resume activities only when conditions improve, based on soil moisture limits.
4. Minimizing erosion and runoff	Erosion Control	Use appropriate temporary silt fencing, sediment traps, or diversion drains to manage surface water runoff and prevent soil erosion during and after soil stripping.
	Vegetation Management	Maintain vegetation in areas not immediately required for mineral extraction to protect soil from wind and water erosion.

Focus area	Steps	Description
	Restoration Phasing	Incorporate phased restoration into the quarrying plan to minimize the exposure of bare soils over large areas at one time.
5. Soil replacement and site restoration	Restoration Strategy	Develop a soil reinstatement strategy for returning soil and subsoil in the correct sequence to support ecosystem recovery and future land use. Ensure soil depths are sufficient to support the intended land use.
	Soil Aeration and Conditioning	Before replacing soils, ensure that they are aerated and conditioned to restore structure, reduce compaction, and enhance fertility.
	Monitoring Post-Restoration	Regular soil quality monitoring post-restoration to assess fertility, compaction, drainage, and biological health, making adjustments where necessary.
6. Biodiversity and ecological protection	Integration with Habitat Creation	Align soil management practices with habitat restoration efforts, ensuring that soils support biodiversity initiatives such as woodland, grassland, or wetland creation.
	Wildlife Protection	Implement measures to protect soil-dwelling organisms and surrounding habitats, ensuring minimal disturbance during soil handling and storage.
7. Monitoring and adaptive management	Soil Monitoring Program	Develop a program to monitor soil health, structure, and fertility over time. Include metrics for compaction, erosion rates, moisture content, and organic matter.
	Adaptive Management Practices	Adjust mitigation measures based on monitoring outcomes to address any issues such as erosion, compaction, or poor fertility. This may include re-grading stockpiles, improving drainage, or re-vegetating bare areas.

6.117. Soil stripping is to be undertaken by the excavator standing on the surface of the soil and digging the soil to its maximum depth and loading it into dump trucks. The dump trucks draw alongside the exposed soil profile, standing and travelling only on the basal layer, see **Diagram 6-2** and **Diagram 6-3** below.

Diagram 6-2: Soil stripping using modified layer by layer practice[5]

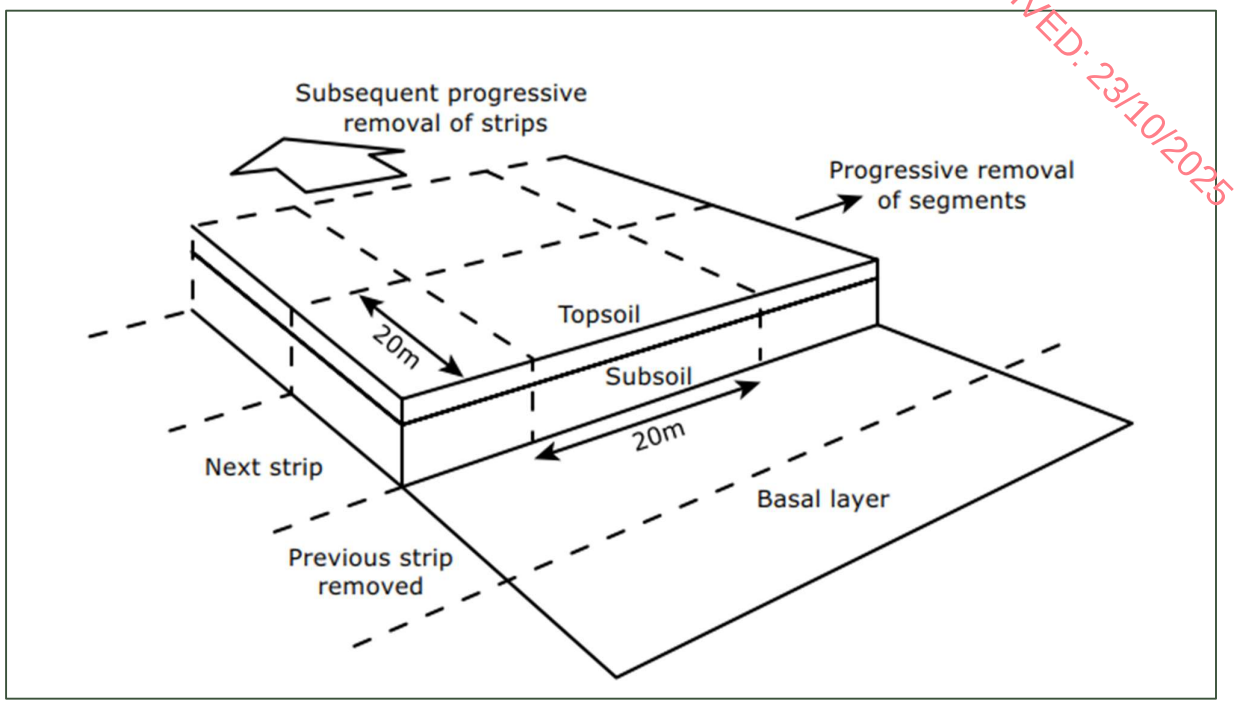
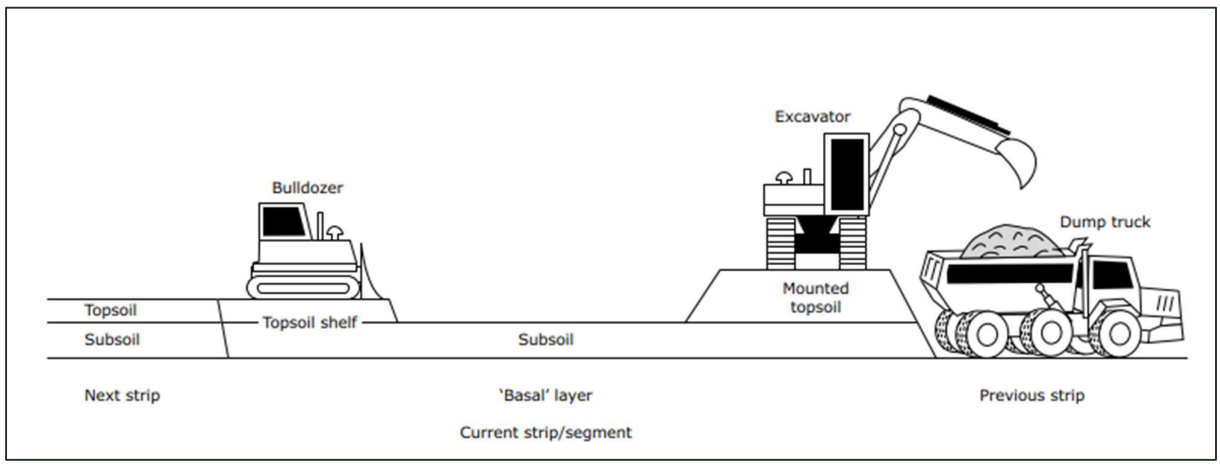


Diagram 6-3: Soil stripping using modified layer by layer practice[5]



6.118. In order to protect the structure of the soils for use in restoration, soil storage will not exceed 3 m in height in any landscaping berms. Any subsoils which require stockpiling will be stored at a maximum height of 5 m.

6.119. Stripped soil will be re-vegetated where they are in place for a sufficient length of time to justify such a measure. The re-handling of soil material will be minimised as much as possible in order to preserve the integrity of the soil material. This is also an economically prudent practice.

Subsoils

6.120. Sand and gravel material will be extracted, processed and used for aggregate supply to the concrete batching plant to serve the local and regional market.

Geology

6.121. It is not proposed to extract bedrock as part of this development at Derryarkin and, therefore, no mitigation measures are required. There will be no effect on the geology during construction.

Geological Heritage

6.122. There will be an impact on geological heritage arising from the proposed development.

Operational Stage

6.123. The design of the extraction area has provided suitable set-back distances to adjoining land boundaries and the final pit sides during the operational and post-operational stages will be designed to ensure long term stability.

6.124. Operations at the proposed development site will comply with the Health and Safety Authority Safe Quarry Guidelines in relation to the SHWW Regulations to ensure stability of the adjoining lands.

Post-Operational Stage (Final Restoration)

6.125. On cessation of extraction the land within the extraction area will be restored to a landscaped permanent lake feature, interspersed with constructed peninsulas, capable of supporting new habitat. The final restored pit slopes will be designed to ensure long-term stability of the pit sides.

Residual Impacts

6.126. The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.

6.127. There will be a residual impact on the land, soil and subsoils at the site with the permanent loss of land and soils for agriculture and the subsoils. However, it is considered that the context of the site and quality of the land and soils, the residual impact on both will not be significant.

6.128. The stripped soils at the proposed development will be retained on site and used in the restoration of the site. With this mitigation measure in place, it is considered that the residual impact on land and soils in these areas will be not significant.

6.129. The design of the extraction scheme (boundary set-back distance and final pit slopes) together with the operation of the pit will be in line with the Health and Safety Authority Safe Quarry Guidelines in relation to the SHWW Regulations and will eliminate the potential for unplanned events such as instability of pit face or instability in adjacent lands. Therefore, it is considered that the residual impact of the proposed development on land stability will not be significant.

Monitoring

6.130. The restoration works will be managed and monitored during the proposed final restoration period to ensure that the restored soils and land use is successful and to confirm that the final pit faces are stable, refer to EIAR Chapter 2 - Project Description.

References

Creamer, R. & O'Sullivan, L., (2018) The Soils of Ireland

EPA (2008), Irish Soil Information System Final Technical Report 10.

EPA and Teagasc (2015), Irish Soil Information System Final Technical Report 10.

EPA Report No. 130 (2014), Irish Soil Information System Synthesis Report.

Geological Survey of Ireland (2007), 1:100,000 Bedrock Geology of Ireland (Digital-Map).

Geological Survey of Ireland Bedrock Geology Sheet 12 (1:100,000).

Institute of Geologists of Ireland (2013), Geology in Environmental Impact Statements.

Offaly County Development Plan 2021 - 2027.

Teagasc (2004), Ireland Subsoil Parent Materials Map (digital version).

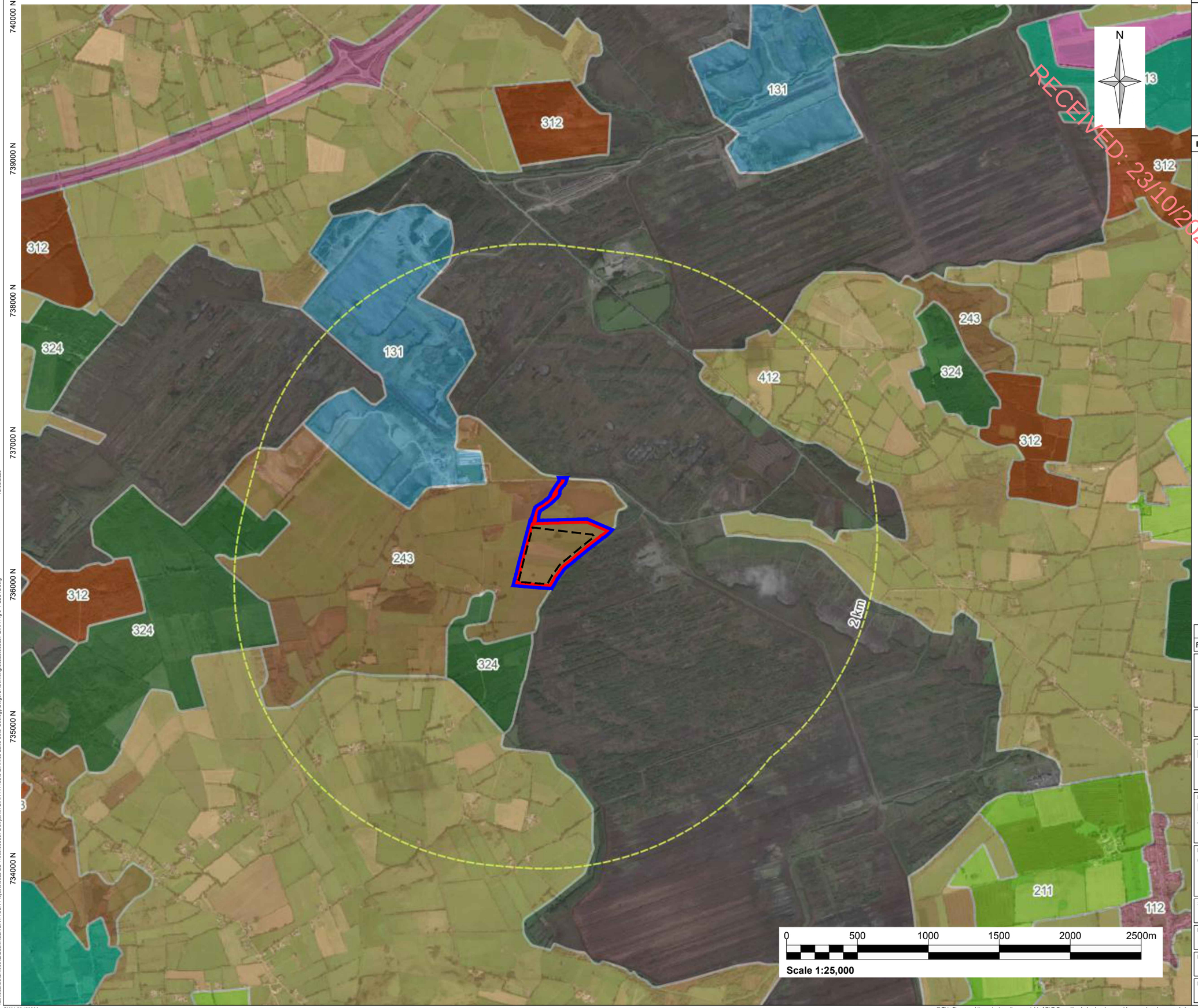
The Geological Heritage of County Offaly (2016), An audit of County Geological Sites in County Offaly Geological Survey of Ireland.

The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings, (2021).

Figures

645300 E | 646300 E | 647300 E | 648300 E | 649300 E | 650300 E | 651300 E | 652300 E | 653300 E

740000 N | 739000 N | 738000 N | 737000 N | 736000 N | 735000 N | 734000 N



Notes:

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from EPA Corine Land Cover © EPA

Legend:

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicant Land Interest Area
- 112 Urban Fabric (Code: 112)
- 131 Mineral Extraction Sites (Code: 131)
- 211 Non-irrigated Arrable Land (Code: 211)
- 231 Pastures (Code: 231)
- 243 Land Principally Occupied by Agriculture (Code: 243)
- 312 Coniferous Forests (Code: 312)
- 313 Mixed Forest (Code: 313)
- 324 Transitional Woodland Shrub (Code: 324)
- 412 Peat Bogs (Code: 412)

Rev	Amendments	Date	By	Chk	Auth

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BD Flood Unlimited Company

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

Figure Title
Corine Land Cover Map

Scale		SLR Project No.
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Figure Number
Figure 6-1

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19/09/2025

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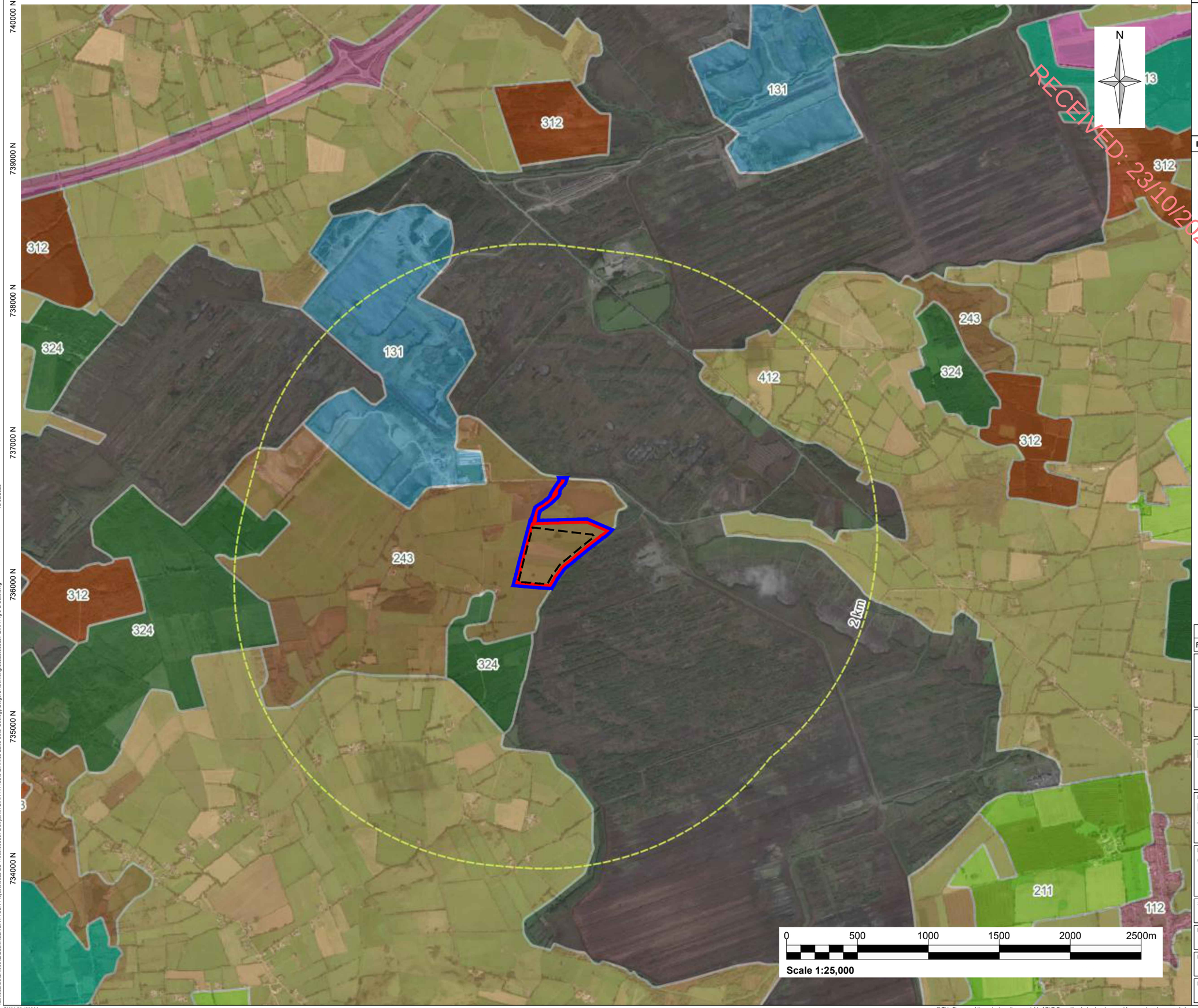

Notes:

1. Extract from Ordnance Survey Discovery Series Map No. 48
2. Extract from EPA Corine Land Cover © EPA

Legend:

- Proposed Sand and Gravel Extraction Area (11.7 Hectares)
- Planning Application Area (c.19.5 Hectares)
- Applicants Land Interest Area
- 112 Urban Fabric (Code: 112)
- 131 Mineral Extraction Sites (Code: 131)
- 211 Non-irrigated Arrable Land (Code: 211)
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- 412 Peat Bogs (Code: 412)

Rev	Amendments	Date	By	Chk	Auth

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

Figure Title: Corine Land Cover Map

Scale	SLR Project No.
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Figure Number: **Figure 6-2** | Rev: **R0**

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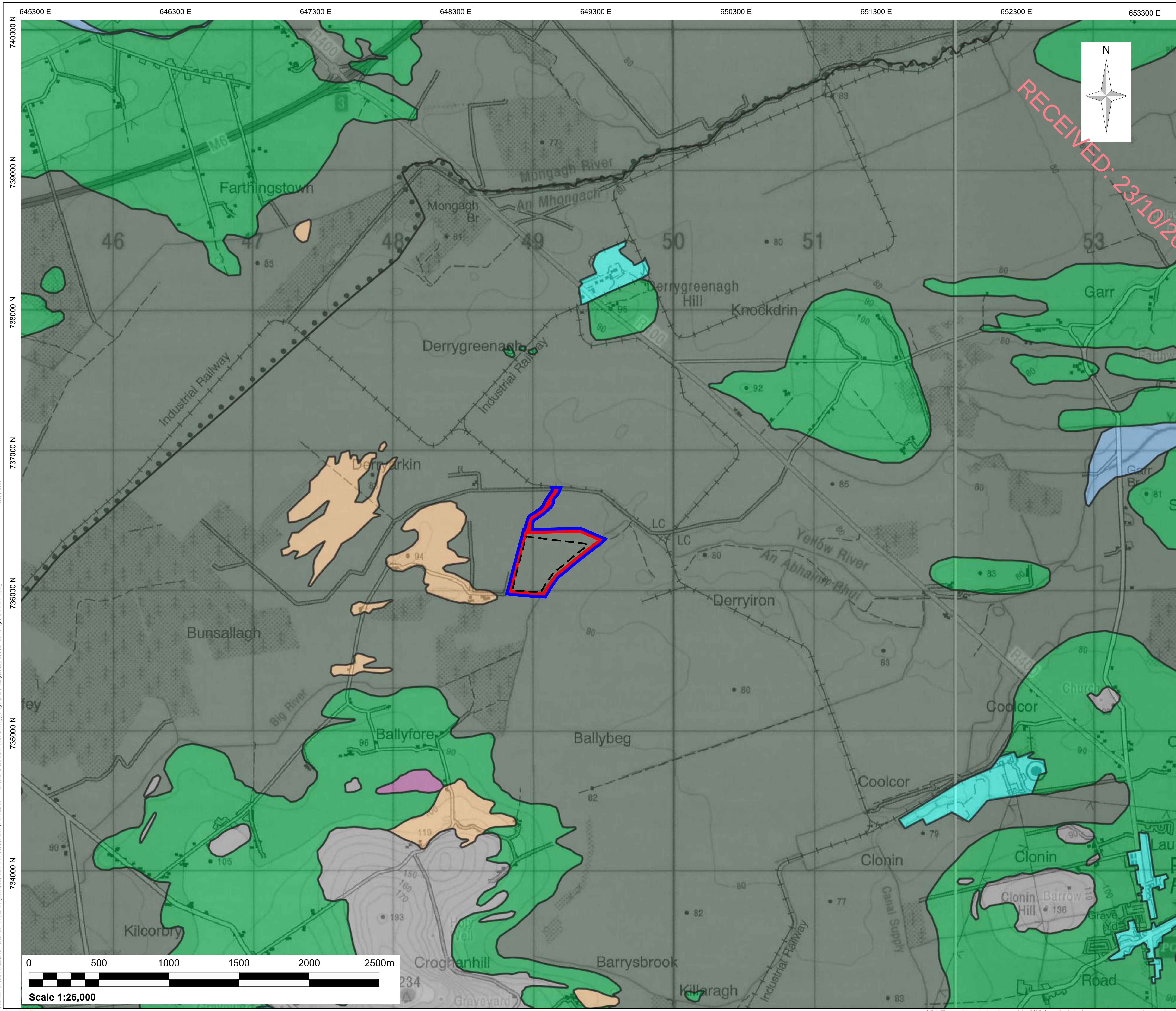

Notes:

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

Legend:

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

EPA & TEAGASC SUBSOILS:

- Urban
- Peat Cut
- TLs - Limestone Till
- River Alluvium
- GLs - Limestone Sand and Gravels
- L - Lake Sediments
- Rock

Rev	Amendments	Date	By	Chk	Auth

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Proposed Sand and Gravel Development at Derryarkin, Co. Offaly

Figure Title
Subsoils Map

Scale		SLR Project No.	
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Figure Number: **Figure 6-3** Rev.: **R0**

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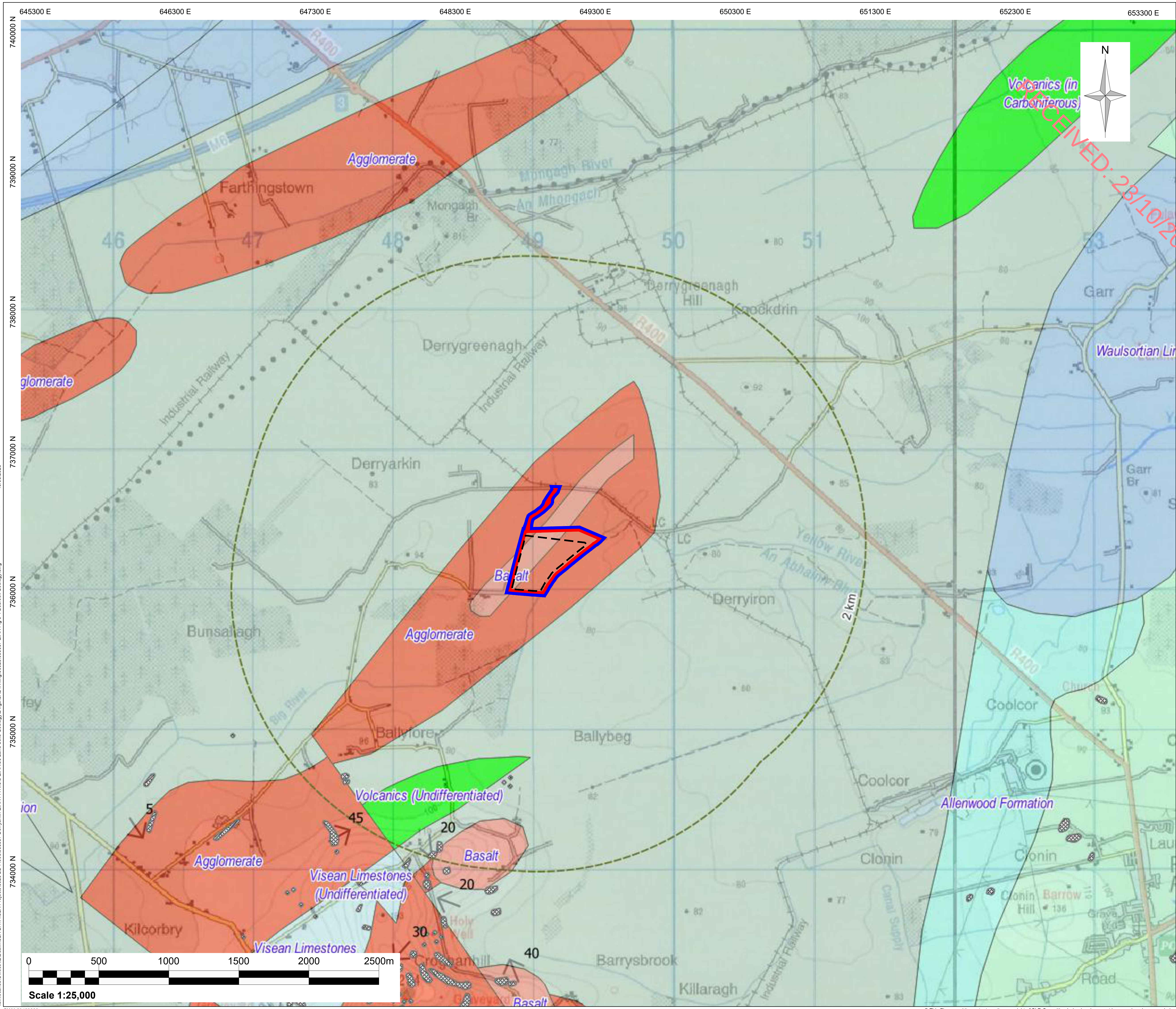
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737000 N
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735000 N
734000 N
N
Agglomerate
Farthingstown
Mongagh River
An Mhongach
Mongagh Br
Volcanics (in Carboniferous)
Derrygreenagh Hill
Knockdrin
Derrygreenagh
Industrial Railway
Waulsortian Lir
Garr
Derryarkin
Basalt
Derryiron
Yellow River
An Abhainn Bhuí
2 km
Bunsalagh
Ballyfore
Ballybeg
Coolcor
Volcanics (Undifferentiated)
Allenwood Formation
Visean Limestones (Undifferentiated)
Clonin
Kilcorbry
Visean Limestones
Barrysbrook
Killaragh
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Notes:

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

Legend:

Proposed Sand and Gravel Extraction Area (11.7 Hectares)

Planning Application Area (c.19.5 Hectares)

Applicants Land Interest Area

GSI BEDROCK 100K:

Lucan Formation

Edenderry Oolite Member

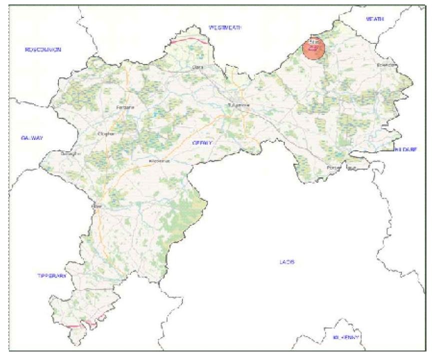
Allenwood Formation

Waulsortian Limestones

Mafic & felsic volcanic tuff

Basalt

Agglomerate



Rev	Amendments	Date	By	Chk	Auth

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

Figure Title
Bedrock Geology Map

Scale		SLR Project No.	
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Date	Date	Date	Date
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Figure Number
Figure 6-4

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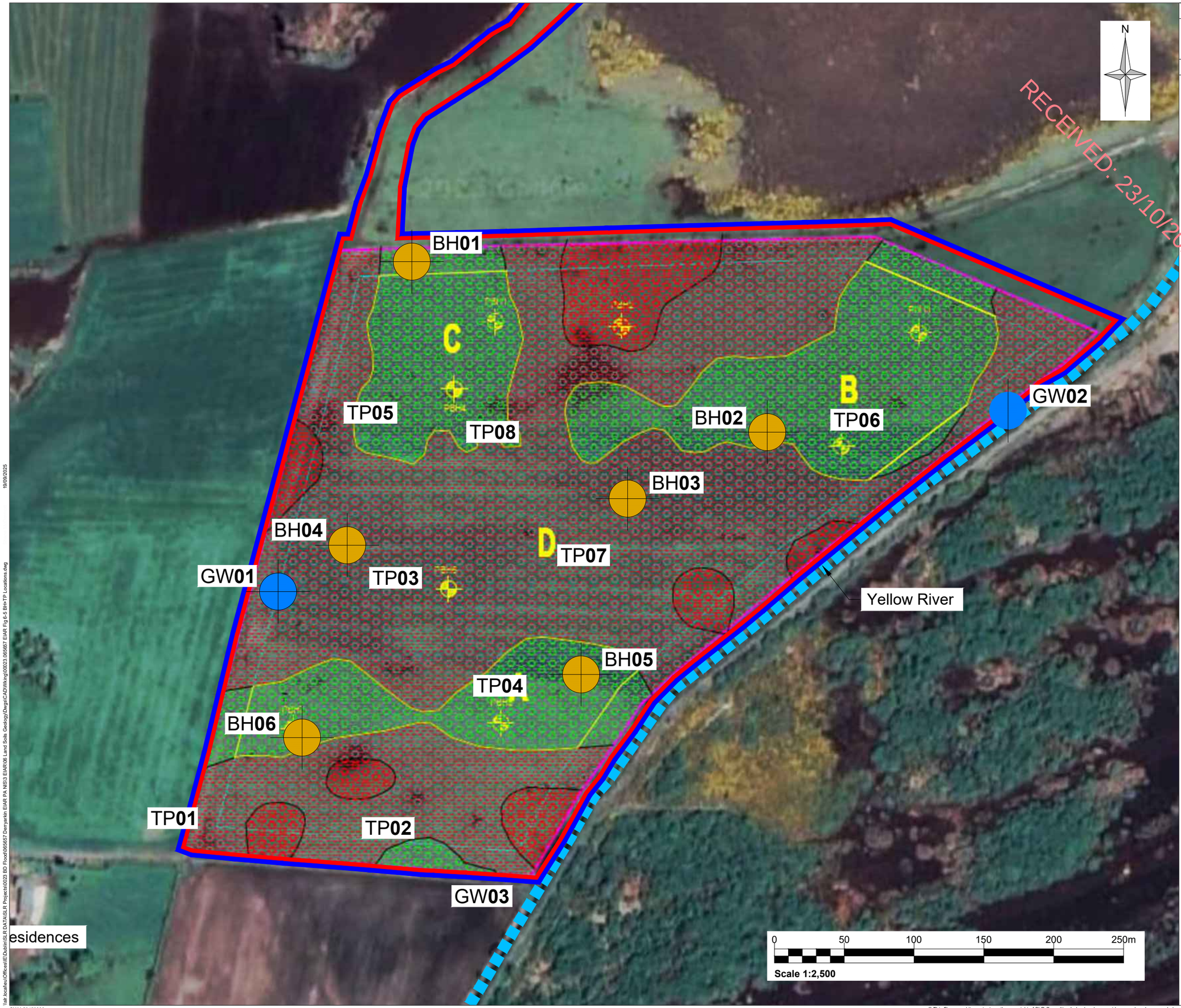

Notes:

Legend:

- Applicant Land Interest Boundary
- Proposed Planning Application Area 19.5 hectares
- Proposed Sand and Gravel Extraction Area 11.7 hectares
- Groundwater Monitoring Wells (GW01 - GW03)
- Ground Investigations - Trial Pit Locations (TP01 - TP08)
- Ground Investigations - Borehole Locations (BH01 - BH06)

Apex Geophysics Report Basemap

LEGEND:

- Site
- TOPSOIL/PEAT over clayey SAND/GRAVEL & cobbles over saturated fine possible silty SAND/GRAVEL
- TOPSOIL/PEAT over sandy gravelly CLAY over saturated fine possible silty SAND/GRAVEL
- Increased CLAY/SILT content
- A — Potential Resource Zones A-C
- D — 20m Standoff from site boundary, Potential Resource Zone D

Rev	Amendments	Date	By	Chk	Auth

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Client: BD Flood Unlimited Company

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

Figure Title: Ground Investigation Locations (Boreholes & Trialpits)

Scale	SLR Project No.
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Date 04/25	Date 04/25	Date 09/25	Date 09/25

Figure Number: **Figure 6-5** Rev.: **0**

19/09/2025

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Appendices

Appendix 6-A: GSI Consultation Response

Appendix 6-B: Geophysical Survey (January 2025)

Appendix 6-C: Groundwater Monitoring Borehole Logs (April 2025)

Appendix 6-D: Borehole Logs (May 2025)

Appendix 6-E: Trial Pits Logs and (May 2015)

Appendix 6-F: Particle Size Distribution Test Lab Certificates

Appendix 6-G: Particle Size Distribution Results

Appendix 6-A: GSI Consultation Response

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Shane McDermott
SLR Consulting Ireland
7 Dundrum Business Park
Windy Arbour, D14 N2Y7

29 January 2025

Re: Proposed Derryarkin sand and gravel pit development, Rhodes, Co Offaly
Your Ref: 501.065657.00001
Our Ref: 25/14

Dear Shane,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and interpretation and gather various data for that purpose. Please see our website for data availability.

With reference to your email received on the 22 January 2025, concerning the proposed Derryarkin sand and gravel pit development, Rhodes, Co Offaly, we recommend using our various data sets when conducting the EIAR, SEA, planning and scoping processes for developments, plans and policies. For more detailed information on how to access this data please access 'Data and Maps' Data & Maps (gsi.ie) on our 'Geoscience for planning' webpage. Use of our data or maps should be attributed correctly (please refer to each individual dataset's metadata for correct attribution).

For specific data available for Environmental Assessment and Planning topics please follow this link [Data by Environmental Assessment and Planning Topic (gsi.ie)], where you will find our data arranged by environmental assessment topic as illustrated below:

Land and soils
Soil • Subsoils (Quaternary Geology) • Tellus Geochemistry • Geotechnical *Geology* • Bedrock • Geophysics • Bedrock & Quaternary 3D

Water
Groundwater • Aquifers GW vulnerability, GWPSs (GWPPs) *Surface water* • Tellus Geochemistry *Estuarine & marine waters* • Marine and coastal *Flooding* • GWClimate • Karst

Climate Change
Carbon accounting / Carbon balance • Geothermal • Carbon capture and storage *Climate change trends* • National coastal change assessment

Cultural Heritage
Archaeology • Cherish *Underwater Archaeology* • Shipwrecks

Material Assets
Built Services • Natural resources (Minerals & Aggregates) • Active quarries

The Landscape
Landscape Appearance & Character • Physiographic units *Historical landscapes* • Historic mines

Other Relevant Data		
Natural (Geo) hazards • Landslide Susceptibility Mapping • Groundwater flooding • Coastal vulnerability • Subsidence • Radon	*Natural heritage* • Geoheritage (County Geological Sites) • Dimension Stone/Stone Built Ireland	

Other Comments

Geological Survey Ireland would request that the operator might assist our geological heritage goals with the following (and ideally this would be written into the restoration / closure plan) and be included as a condition of planning as deemed appropriate by the planning authority:

1. Allowing access to quarry faces by appropriate scientists (upon request and with due regards to Health and Safety requirements) during quarrying to check for interesting new stratigraphies / relationships as they might become exposed and to establish if the quarry site is worthy of recognition post extraction and through aftercare/restoration planning.

2. If deemed appropriate in (1) above, leaving a representative section of the quarry face at the end of the quarry life or inclusion of information panels to promote the geology to the public or develop tourism or educational resources if appropriate depending on the future use of the site. Natural exposures are few, or deeply weathered, this measure would permit on-going improvement of geological knowledge of the subsurface.

The Geoheritage Programme tries to promote a partnership between geological heritage and active quarrying, with such measures as those outlined in the 'Geological Heritage Guidelines for the Extractive Industry', which can be downloaded here. This document, written in association with Irish Concrete Federation, acts as a comprehensive guide in the sustainable extraction of natural resources while preserving the geological heritage of Ireland.

If we can be of any further help, please do not hesitate to contact me Clare Glanville, or my colleague Trish Smullen at GSIPlanning@gsi.ie.

Yours sincerely,

Dr. Clare Glanville
Senior Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

Trish Smullen
Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

The publicly available data referenced/presented here, should in no way be construed as Geological Survey Ireland support for or objection to the proposed development or plan. The data are made freely available to all and can be used as independent scientific data in assessments, plans or policies. It should be noted that in many cases these data are a baseline or starting point for further site specific assessments.

Appendix 6-B: Geophysical Survey (January 2025)

AGP25010_01

Report

on the

Geophysical Investigation

At

Derrygreenagh, County Offaly

For

BD Flood

02nd April 2025

APEX Geophysics Limited
Unit 6, Knockmullen Business Park
Gorey
Co. Wexford

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PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP25010 _01		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
TONY LOMBARD M.SC. (GEOPHYSICS)	EURGEOL PETER O'CONNOR P.GEO., M.SC (GEOPHYSICS), DIP. EIA MGT.	V.01	02ND APRIL 2025

CONTENTS

1. EXECUTIVE SUMMARY

Apex Geophysics Limited was requested by BD Flood to carry out a geophysical investigation at Derrygreenagh, County Offaly. The objective of the investigation was to provide information on potential sand and gravel thickness, volume of available resource and depth to and type of bedrock.

The site is located at Derrygreenagh, approximately 5 km northwest of Rhode village, County Offaly and c. 3.6 km south of the M6 Dublin-Galway Motorway. The site, which is c. 17.9 ha in extent, comprises of open grassed fields and is bounded to the east by the Yellow River. The topography is generally flat and varies from 77.7 m OD to 79.9 m OD across the site.

The Geological Survey of Ireland (GSI) Quaternary Sediments map indicates cut over raised peat across the survey area with gravels derived from limestones mapped approximately 500 m west of the site. The bedrock Geology map indicates that the site is underlain by generally massive, black olivine basalt weathered to various degrees and vent volcanoclastic agglomerate described as vitric lithic lapilli tuffs and tuff breccias with intercalated thin basalts. A SW-NE fault is mapped c. 200 m southeast of the site.

The survey was carried out on the 21st and 22nd January 2025 with the collection of EM ground conductivity readings, four Electrical Resistivity Tomography (ERT) profiles and three seismic refraction profiles.

The interpreted geophysical data indicates:

- an overburden layer consisting of **TOPSOIL/PEAT** with an assumed thickness of 1.0m across the site which increases to approximately 4.7 m thickness in areas where sandy gravelly **CLAY**.
- Three zones (A, B & C) of interpreted **clayey SAND/GRAVEL & cobbles** in the south, northeast and northwest of the site with average thickness of 3.0 m, overlain by TOPSOIL/PEAT with an assumed thickness of 1m.
- An inferred water table level of 75 m OD below which there is a layer of **saturated fine possible silty SAND/GRAVEL** (Zone D). This material has an average thickness of 5.4 m across the entire site.

The geophysical results have outlined a potential resource of c. 178,362 tonnes of **clayey SAND/GRAVEL & cobbles** in Zones A to C. A potential resource of 1,111,644 tonnes of underlying **saturated fine possible silty SAND/GRAVEL** is also outlined in Zone D. This classification is dependent on confirmatory boreholes and satisfactory laboratory testing results.

The interpreted base of **saturated fine possible silty SAND/GRAVEL**/depth to bedrock varies from 6.3 m below ground level (bgl) in the northwest of the site to 18.8 m bgl in the west. Bedrock type is interpreted as slightly weathered to fresh mudstone over basalt and tuffs.

Boreholes to confirm the findings of the geophysical survey are recommended across the site. Samples should be taken for Particle Size Distribution (PSD) analysis and for chemical, physical, mechanical and laboratory tests to assess suitability for use.

The volume and tonnage estimates are based on interpreted geophysical data and average heights from the topographic data acquired as part of the geophysical investigation. This should be refined after any further direct investigation or detailed design.

The geophysical report should be reviewed after any further direct investigation.

2. INTRODUCTION

APEX Geophysics Limited was requested by BD Flood to carry out a geophysical investigation at Derrygreenagh in County Offaly. The geophysical investigation was to provide information on the thickness and extent of potential sand and gravel deposits across the site and depth to and type of bedrock.

2.1 Survey Objectives

The objectives of the geophysical investigation were to provide information on:

- Sand and gravel thickness,
- Volume estimation of available resource,
- Depth to and type of bedrock.

2.2 Site Background

The area under investigation is located at Derrygreenagh, approximately 5 km northwest of Rhode village, County Offaly and c. 3.6 km south of the M6 Dublin-Galway Motorway. The site, which is c. 17.9 ha in extent, comprises of open grassed fields and it is bounded to the east by the Yellow River (Fig. 2.1). The topography is generally flat and varies from 77.7 m OD to 79.9 m OD across the site. A water level reading of 76.0 m OD was recorded in the Yellow River in the northeast of the site during the geophysical survey.

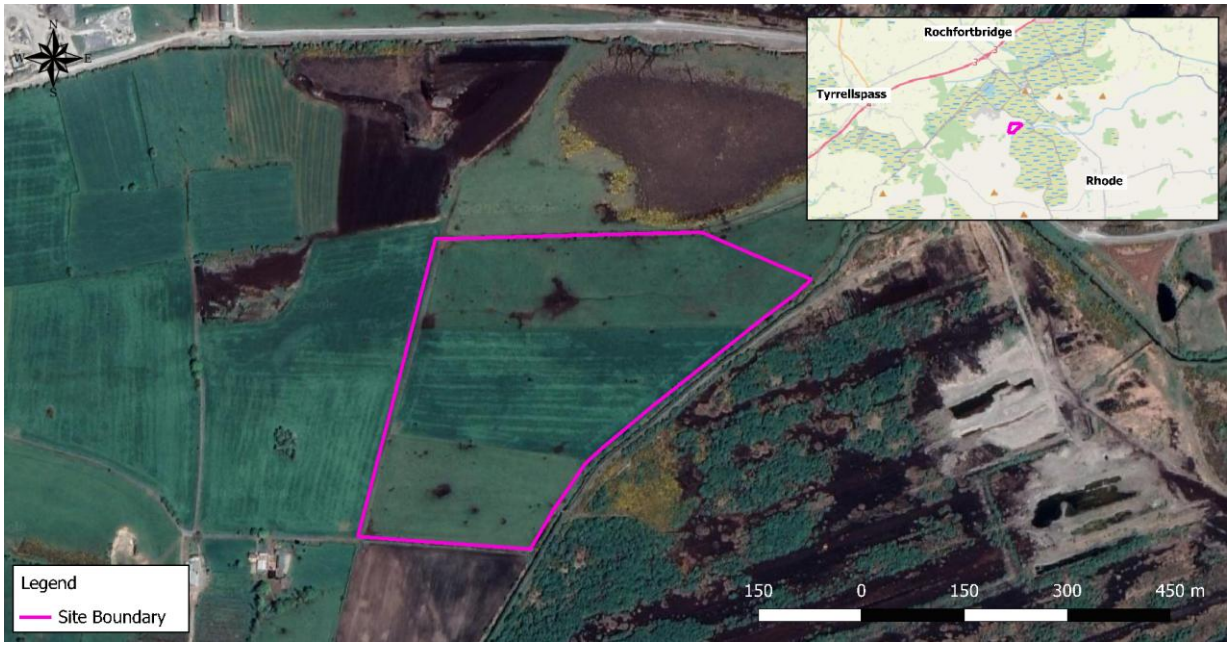


Fig. 2.1: Geophysical survey area shown in magenta.

2.2.1 Soils

The Geological Survey of Ireland (GSI) Quaternary Sediments map for the area (GSIc, 2019) indicates cut over raised peat across the survey area (Fig. 2.2). Gravels derived from limestones are mapped approximately 500 m west of the site.

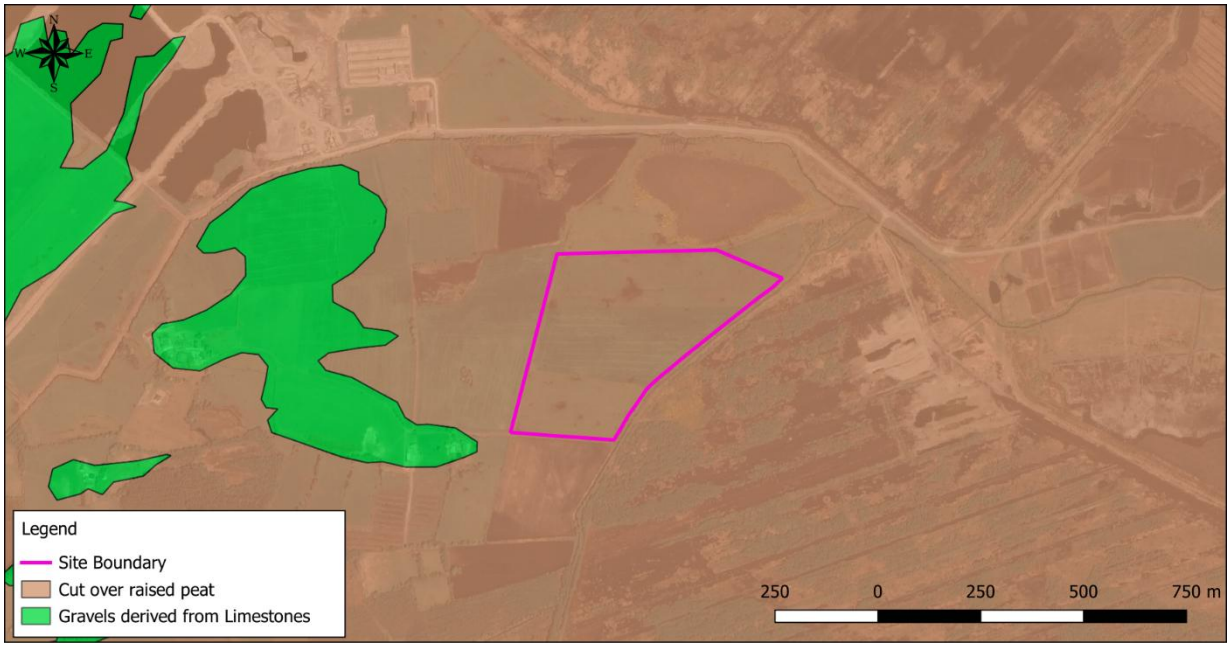


Fig. 2.2: The GSI Quaternary sediments map (geophysical survey area shown in magenta).

2.2.2 Geology

The GSI 1:100k Bedrock Geology map for the area (GSI, 2018) indicates that the site is underlain by generally massive, black olivine basalt weathered to various degrees and vent volcanoclastic agglomerate described as vitric lithic lapilli tuffs and tuff breccias with intercalated thin basalts (Fig. 2.3). A SW-NE fault is mapped c. 200 m southeast of the site.

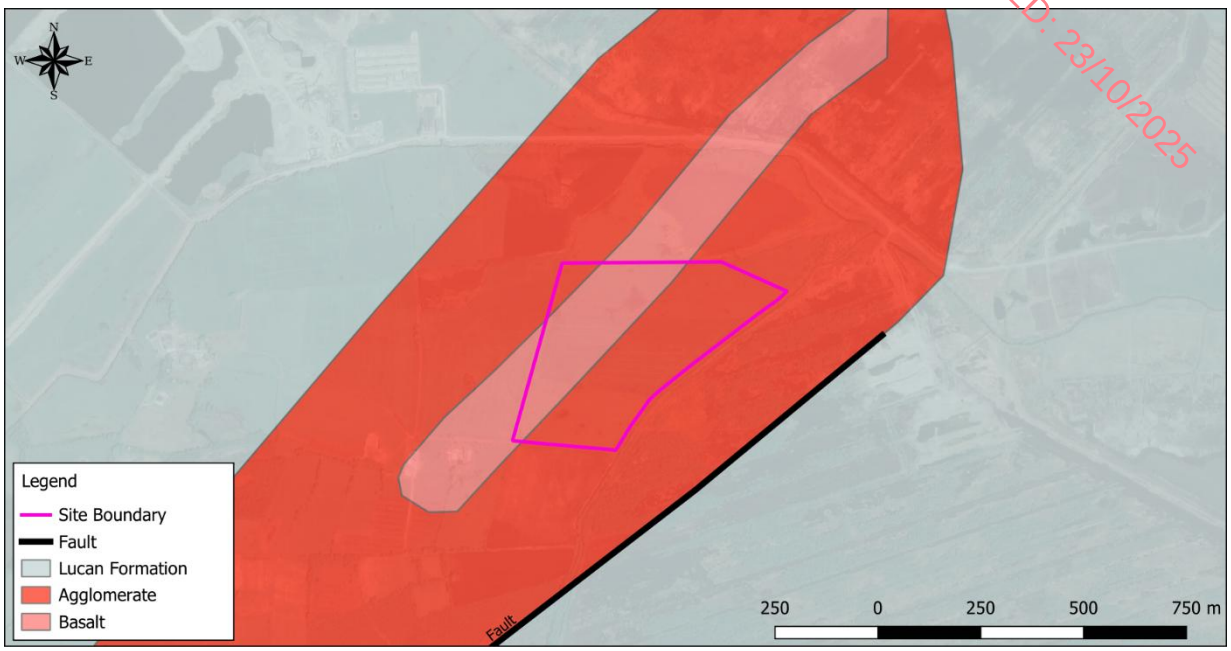


Fig. 2.3: The GSI bedrock geology map (geophysical survey area shown in magenta).

2.2.3 Vulnerability

The groundwater vulnerability rating for the site (GSIb, 2019) is predominantly classified as 'Moderate' with a 'Low' classification in the east boundary of the site (Fig. 2.4).

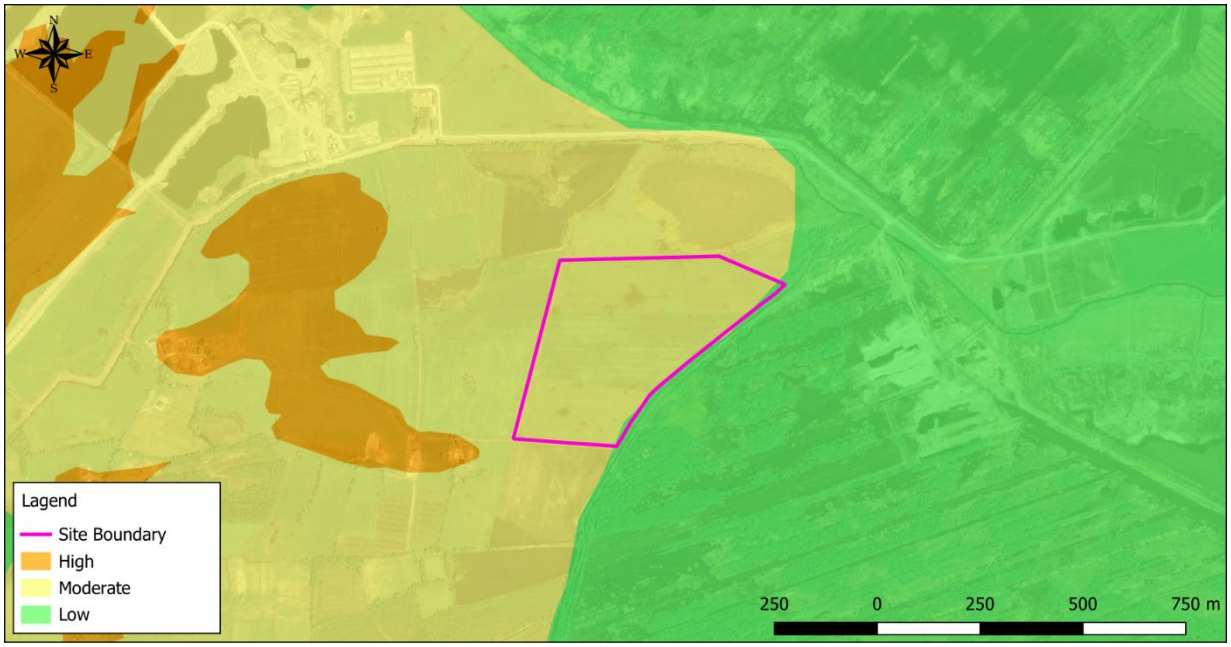


Fig 2.4: The GSI vulnerability map (geophysical survey area shown in magenta).

2.2.4 Aquifer Classification

The bedrock formation underlying the site is classified (GSIa, 2019) as a 'Locally Important aquifer - bedrock which is moderately productive only in local zones' (Fig. 2.5).

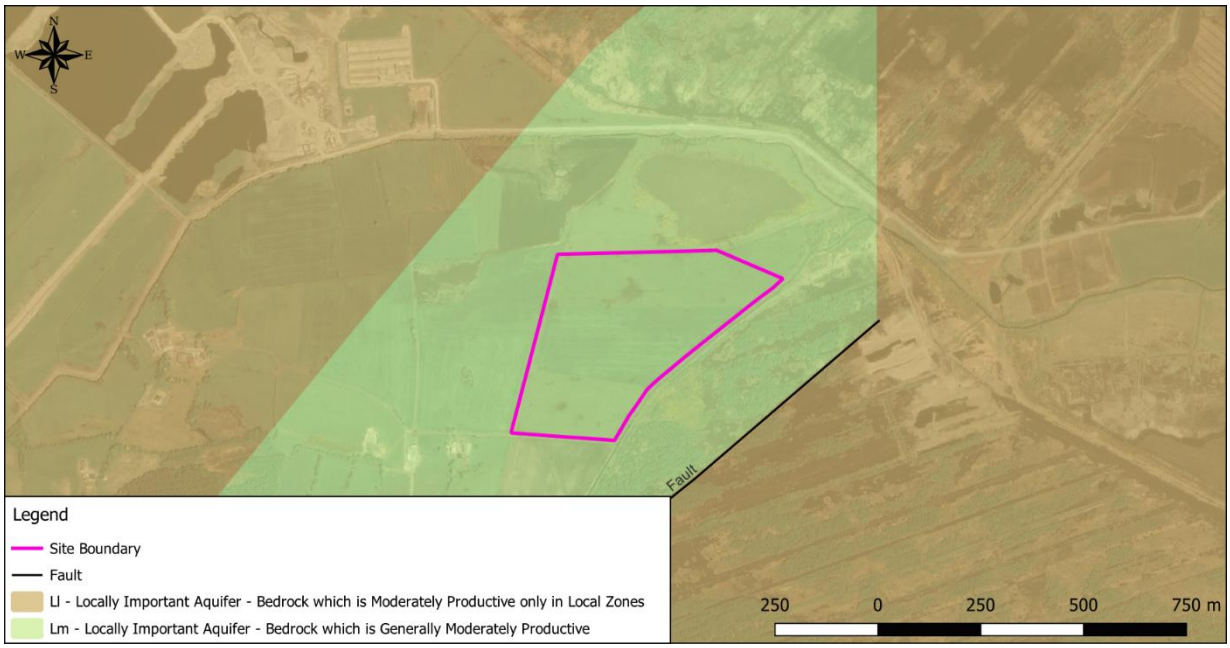


Fig. 2.5: The GSI aquifer classification map (geophysical survey area shown in magenta).

2.2.5 Historical data

The historical 6-inch sheet for the area (Fig. 2.6) shows bog across the site and limestone gravel and drift approximately 500 m southwest of the site.

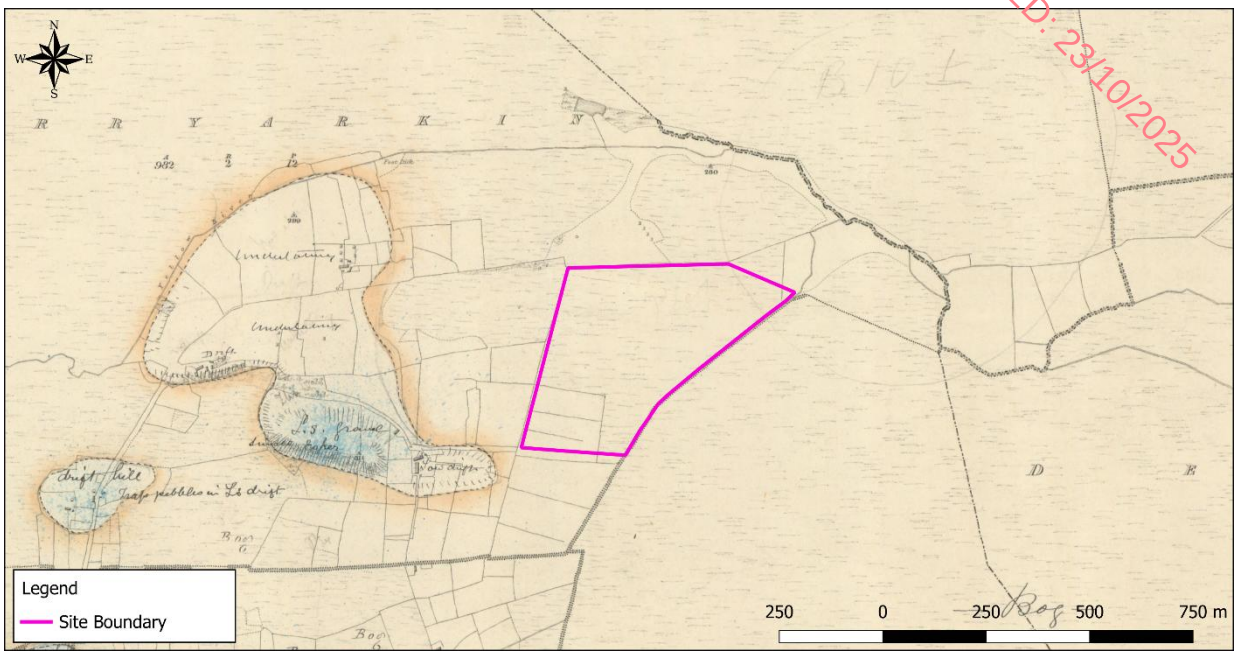


Fig. 2.6: The historical 6-inch field sheet (Geophysical survey area shown in magenta).

2.2.6 Direct Investigation Data

No direct investigation data was available at the time of witing.

2.3 Survey Rationale

The geophysical investigation consisted of electro-magnetic (EM) ground conductivity mapping, 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling:

EM ground conductivity mapping operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary EM field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). This technique provides information on the shallow (0-6m below ground level) variation of the superficial deposits.

ERT soundings image the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity to depths which depend on the length of the profile. Each cross-section is interpreted to determine the material type along the profile based on the typical resistivities returned for Irish ground materials.

Seismic Refraction Profiling measures the P-wave velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. This method profiles the depth to the top of the stiff soils and bedrock and provides information on the quality/strength of the bedrock.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques, it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED METHODOLOGY**.

3. RESULTS

The survey was carried out on the 21st and 22nd January 2025. The geophysical survey locations are shown on Drawing AGP25010_01 (Appendix C).

3.1 EM Ground Conductivity Mapping

The contoured EM ground conductivity results (Drawings AGP25010_02) are indicative of the bulk conductivity of the ground materials from 0 - 6.0 m bgl. Values are in the range from 5 to 13.0 mS/m and these have been generally interpreted in conjunction with the ERT and seismic refraction data as follows:

Conductivity (mS/m)	Interpretation
5.0-7.5	Thin topsoil/peat/ over clayey SAND/GRAVEL & cobbles over saturated fine possible silty SAND/GRAVEL, possible shallow rock @ < 6m bgl in northwest
7.5-10.0	Thin topsoil/peat over sandy gravelly CLAY over saturated fine possible silty SAND/GRAVEL
10.0-13.0	Increased clay/silt content in overburden

3.2 ERT

Four ERT profiles (R1 to R4) were recorded across the site. The resistivity values have been interpreted, as follows:

Resistivity (Ohm-m)	Interpretation
50-250	Sandy gravelly CLAY and saturated fine possible silty SAND/GRAVEL
250-500	Clayey SAND/GRAVEL & cobbles
500-1000	SAND/GRAVEL
50-125	BASALT and TUFFS
125-350	MUDSTONE

3.3 Seismic Refraction Profiling

Three seismic refraction profiles (S1 to S3) were recorded across the site along the ERT profiles. The seismic data indicated 4 subsurface velocity layers which have been interpreted as follows:

Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Interpretation	Stiffness/ Rock Quality	Estimated Excavatability
208-256	238	Soil	Soft/Loose	Diggable
655-908	800	Soil	Firm/Med. Dense	Diggable
1,620-1,702	1,669	Soil/saturated SAND/GRAVEL	Stiff/Dense	Diggable
2,587-2,748	2,963	Slightly Weathered to Fresh Bedrock	Good	Break/Blast

3.4 Integrated Interpretation

From previous experience electrical resistivity values for Irish sand and gravel deposits generally increase as the fines content decreases. Fines refer to the clay and silt content of the sand/gravel material. The higher the fines content the poorer the material and use is restricted and/or washing required.

Unsaturated sand/gravel deposits have clear resistivity contrasts between clean sand/gravel, silty sand/gravel, clayey sand/gravel and sandy gravelly silt/clay, as per the table below. When these materials become water saturated, as likely the case here, these resistivity contrasts are significantly reduced and the distinction between different material types based on resistivity values becomes more subtle.

Electrical resistivity values for unsaturated Irish sand and gravel deposits are generally within the following ranges:

Material	*Fines Content %	Resistivity (Ohm-m)	Economic Potential
'Clean' SAND/GRAVEL	< 5	> 1000	Yes
Silty SAND/GRAVEL	5 - 15	500-1000	may have, subject to screening/washing.
Clayey SAND/GRAVEL	> 15%	250-500	unlikely, due to fines content

The interpretations made in this report are based on experience from similar sites in conjunction with a water table level of approximately 75.0 m OD inferred from the ERT data.

The geophysical results are presented on Drawings AGP25010_R1 to AGP25010_R4 and summarised on Drawing AGP25010_03, Appendix C.

The data indicate an overburden layer consisting of topsoil/peat with an assumed thickness of 1.0m across the site with an increase to approximately 4.7 m where sandy gravelly clay is interpreted.

Three areas of low EM ground conductivity readings (**Zones A, B & C**) in the south, northeast and northwest of the site correspond with **clayey SAND/GRAVEL and cobbles** interpreted on ERT profiles R1, R3 and R4. These zones may have economic potential.

Below the inferred water table low resistivity values indicate saturated **fine possible silty SAND/GRAVEL (Zone D).** This material has an average thickness of 5.4 m and is interpreted on all ERT profiles across the site and extents over an area of approximately 17.9 ha. Based on the results of recommended direct investigations this zone may have economic potential

The seismic data generally indicate overburden/soils are soft/loose in the upper 1m becoming firm to stiff/medium dense to dense with depth. Seismic velocities of 1,620 to 1,702 m/s indicate probable saturated material at approximate depth of around 4.0 m bgl (c. 75 m OD)

Interpreted depth to underlying bedrock varies from 6.3 m bgl in the northwest of the site, on profile R1, to 18.8 m bgl in the west, on profile R2. While the seismic velocities of 2,587 – 2,748 m/s indicate the rock is slightly weathered to fresh there is a low contrast in resistivity values between the soils and sand/gravel deposits and underlying bedrock and therefore interpreted top of rock is approximate. The data predominantly indicates higher resistivity mudstone (125 to 350 Ohm-m) over low resistivity basalt and tuffs (50-125 Ohm-m).

3.5 Resource

The interpreted data have outlined a potential resource of **clayey SAND/GRAVEL & cobbles** in **Zones A to C** and **saturated fine possible silty SAND/GRAVEL** in across the area **(Zone D)**. A standoff of 20 m has been allowed for around the site boundary and 10% fines has been accounted for. The estimated volumes are shown in Table 4.1 below:

Material	Extent	Average Thickness (0.7 correction applied) *	Overburden Volume	Sand/Gravel Volume	Estimated Sand/Gravel Resource Tonnes Gross**
	(ha)	(m)	(cu.m)	(cu.m)	(@1.8 t/cu.m.)
Zone A Overburden	1.37	1.0	13,700		
Zone A Clayey SAND/GRAVEL & cobbles	1.37	3.0		41,100	66,582
Zone B Overburden	2.30	1.0	23,000		
Zone B Clayey SAND/GRAVEL & cobbles	2.30	3.0		69,000	111,780
Zone C Overburden	1.30	1.0	13,000		
Zone C Clayey SAND/GRAVEL & cobbles	1.30	3.0		39,000	63,180
TOTAL ZONES A, B & C			**49,700**		**178,362**
Zone D Overburden	14.60	3.7	540,200		
Zone D Saturated fine possible silty SAND/GRAVEL	14.60	4.7		686,200	1,111,644
TOTAL ZONE D			**540,200**		**1,111,644**

** The estimated thicknesses shown on the ERT profiles have been multiplied by a calibration factor of 0.7, (this is due to the overestimation of the thickness of high resistivity materials, which is an artifact of resistivity data processing software).*

*** A conversion density of 1.8 tonnes/cu.m. for SAND/GRAVEL has been used. An allowance of -10% has been made for fines.*

The geophysical results have outlined a potential resource of c. 178,362 tonnes of **clayey SAND/GRAVEL & cobbles** in Zones A to C. A potential resource of 1,111,644 tonnes of underlying **saturated fine possible silty SAND/GRAVEL** is outlined in Zone D. This classification is dependent on confirmatory boreholes and satisfactory laboratory testing results.

4. RECOMMENDATIONS

Boreholes to confirm the findings of the geophysical survey are recommended at the following locations to confirm clayey SAND/GRAVEL, SAND/GRAVEL, possible saturated fine silty SAND, saturated silty GRAVEL & cobbles and rock.

No.	Easting (ITM)	Northing (ITM)	Depth (m)
PBH1	648965	736387	15
PBH2	649056	736384	15
PBH3	649271	736380	20
PBH4	648935	736339	15
PBH5	649215	736298	15
PBH6	648750	736151	15
PBH7	648819	736094	15
PBH8	648970	736099	15

Samples should be taken for Particle Size Distribution (PSD) analysis and for chemical, physical, mechanical and laboratory tests to assess suitability for use.

The volume and tonnage estimates are based on interpreted geophysical data and average heights from the topographic data acquired as part of the geophysical investigation. This should be refined after any further direct investigation or detailed design.

The geophysical report should be reviewed after any further direct investigation.

REFERENCES

Bell F.G., 1993;
'Engineering Geology', Blackwell Scientific Press.

Geotomo Software, 2011;
'RES2DINV Users Manual', Malaysia.

GSIa, 2019;
Bedrock Aquifer Shapefile. http://www.gsi.ie/Mapping.htm

GSI, 2018;
Bedrock Geology 1:100,000 Shapefile. http://www.gsi.ie/Mapping.htm

GSIb, 2019;
Groundwater Vulnerability Shapefile. http://www.gsi.ie/Mapping.htm

GSIc, 2019;
Quaternary Subsoils Shapefile. http://www.gsi.ie/Mapping.htm

Hagedoorn, J.G., 1959;
'The plus - minus method of interpreting seismic refraction sections', Geophysical Prospecting, 7, 158 - 182.

Palmer, D., 1980;
'The Generalized Reciprocal Method of seismic refraction interpretation', SEG.

Redpath, B.B., 1973;
'Seismic refraction exploration for engineering site investigations', NTIS, U.S. Dept. of Commerce.

SeisImager, 2009;
'SeisImager/2D Manual'

Soske, J.L., 1959;
'The blind zone problem in engineering geophysics', Geophysics, 24, pp 359-365.

APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY

A combination of geophysical techniques was used to provide a high-quality interpretation and reduce any ambiguities, which may otherwise exist.

EM Ground Conductivity Mapping

Principles

This is an electromagnetic technique used to investigate lateral variations in overburden material and to assist with the indication of the depth to bedrock. This method operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). Readings over material such as organic waste and peat give high conductivity values while readings over dry materials with low clay mineral content such as gravels, limestone or quartzite give low readings.

Data collection

The EM equipment used was a GF CMD-4 conductivity meter equipped with data logger which determines the apparent conductivity of the different overburden layers from 0-6m bgl depending on the dipole mode used. This instrument features a real time graphic display of the previous 20 measurement points to monitor data quality and results. Conductivity and in-phase values were recorded across the site. Local conditions and variations were recorded.

Data processing

The conductivity and in-phase field readings were downloaded, contoured and plotted using the SURFER 12 program (Golden Software, 2015). Data which was affected by metallic objects was removed. Assignation of material types and possible anomaly sources was carried out, with cross-reference to other data.

Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying soils and bedrock.

Principles

This surveying technique makes use of the Gradient resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter to control the process of data collection and storage.

Data Collection

Profiles were recorded using a ABEM Terrameter LS resistivity meter, four 21 takeout multicore cable and up to 81 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing
The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

Seismic Refraction Profiling

Principles
This method measures the velocity of refracted seismic waves through the soils and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection
A Geode high resolution 24 channel digital seismograph, 24 10 Hz vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable. Equipment was carried and operated by a two-person crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.(eg. 69m profile ~23m depth, 46m profile ~ 15m depth).

Data Processing
First break picking in digital format was carried out using the SeisImager/2D PICKWIN software program from Geometrics to construct p-wave (Vp) traveltime plots for each spread. The processing and interpretation use the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D PLOTREFA program.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The program includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method and was then converted to a layer model for display and interpretation. Material types were assigned and estimation made of material properties, cross-referenced to borehole data.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Spatial Relocation

All the geophysical investigation locations were acquired using a Trimble TSC5 with a Trimble R580 receiver high-accuracy GNSS handheld system using the settings listed below. This system allows collection of GPS data with c.20mm accuracy.

Projection:	Irish Transverse Mercator (ITM)
Datum:	IRENET95
Coordinate units:	Metres
Altitude units:	Metres
Survey altitude reference:	MSL
Geoid model:	OSGM15_Malin

APPENDIX B: SEISMIC REFRACTION DATA

The tomographic inversions of the seismic refraction datasets are shown below.

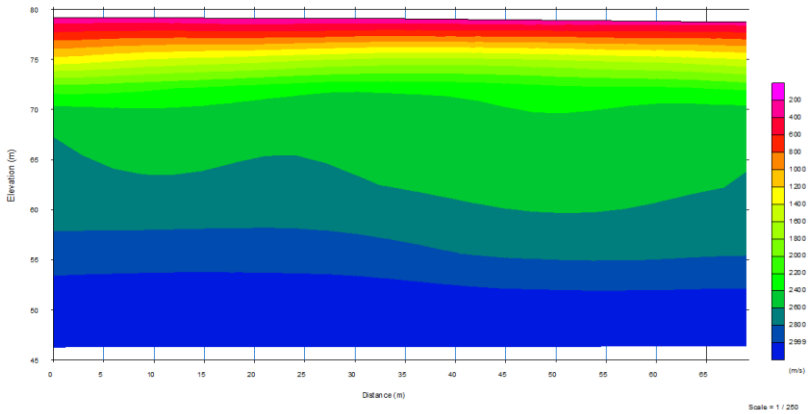


Fig B.1: Seismic Refraction S1 Tomographic Inversion plotted W to E.

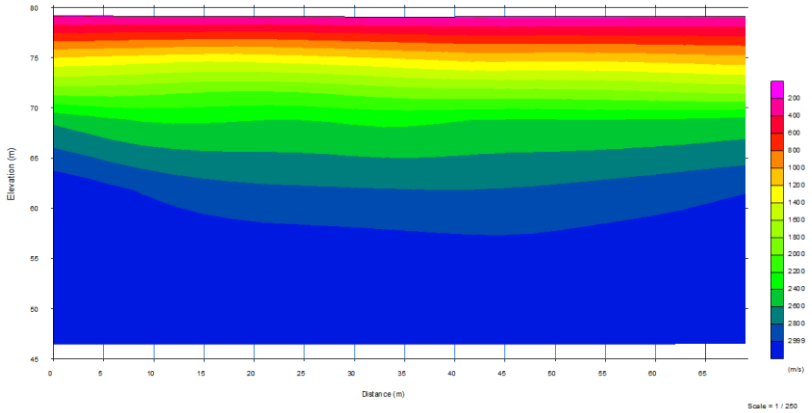


Fig B.2: Seismic Refraction S2 Tomographic Inversion plotted W to E.

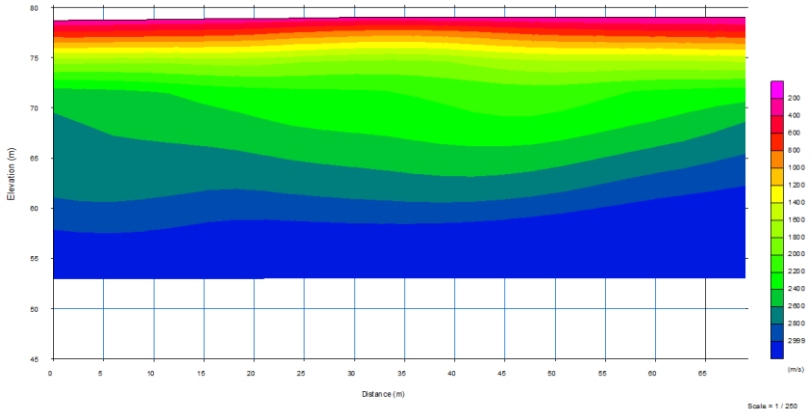


Fig B.3: Seismic Refraction S3 Tomographic Inversion, plotted W to E.

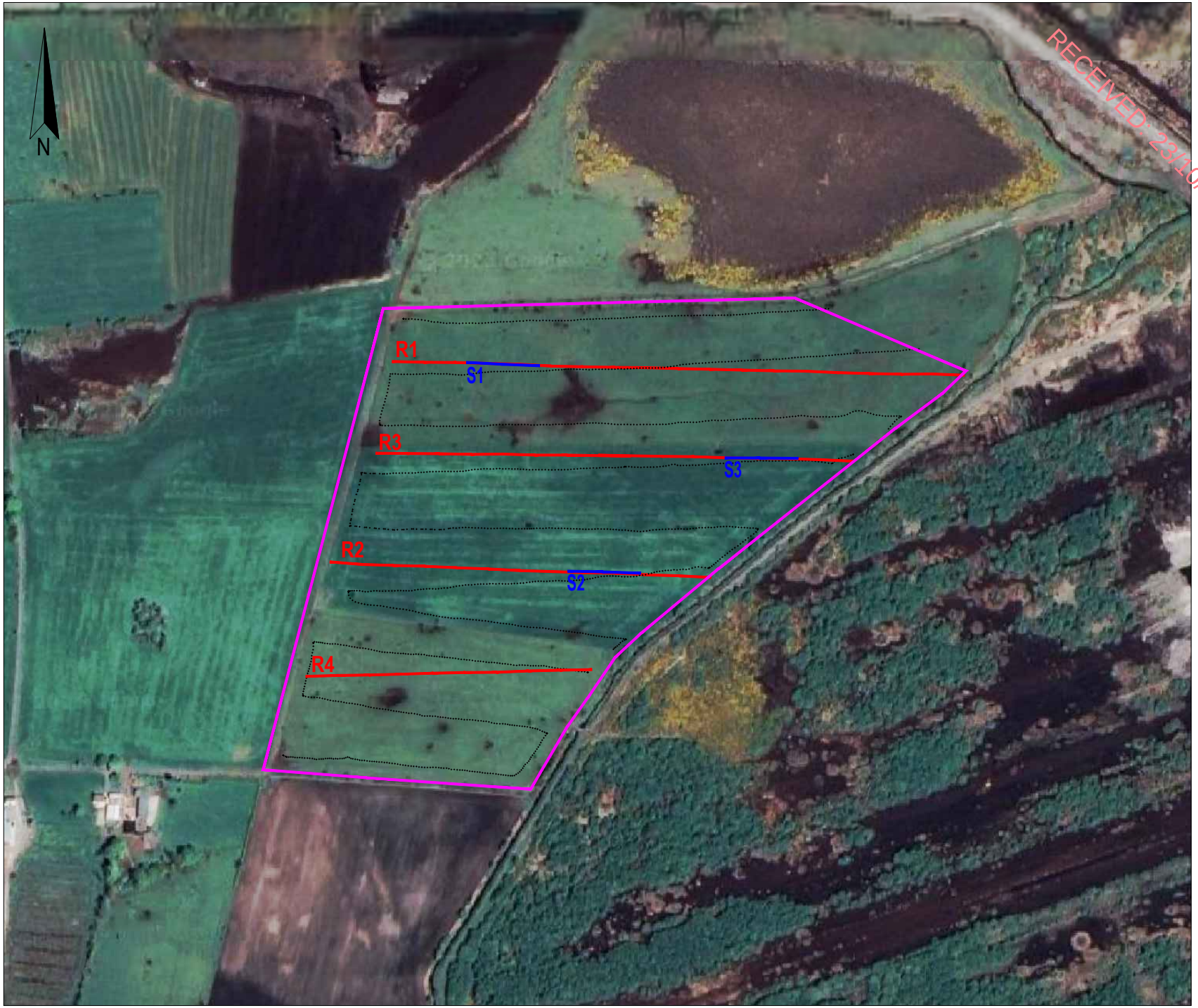
APPENDIX C: DRAWINGS

The information derived from the geophysical investigation is presented in the following drawings:

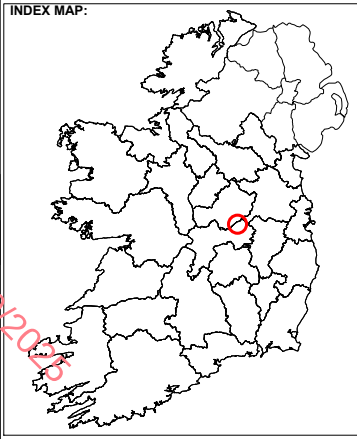
AGP25010_01	Geophysical Investigation Locations	1:5000@A4
AGP25010_02	EM Ground Conductivity Results (mS/m)	1:5000@A4
AGP25010_03	Summary Interpretation Map	1:5000@A4
AGP25010_R1A	Results and Interpretation ERT Profile R1 and Seismic Refraction Profile S1	1:1250@A4
AGP25010_R1B	Results and Interpretation ERT Profile R1	1:1250@A4
AGP25010_R2	Results and Interpretation ERT Profile R2 and Seismic Refraction Profile S2	1:1750@A4
AGP25010_R3A	Results and Interpretation ERT Profile R3	1:1250@A4
AGP25010_R3B	Results and Interpretation ERT Profile R3 and Seismic Refraction Profile S3	1:1250@A4
AGP25010_R1A	Results and Interpretation ERT Profile R4	1:1250@A4

GEOPHYSICAL INVESTIGATION LOCATIONS

SCALE 1:5000



INDEX MAP:



LEGEND:

- Site
- EM conductivity reading
- R1 — 2D resistivity profile
- S1 — Seismic refraction profile

The information displayed here is to be used in conjunction with AGP25010_01 Report on the Geophysical Investigation at Derrygreenagh, Co. Offaly for BD Flood, APEX Geophysics Ltd. 2nd April 2025.

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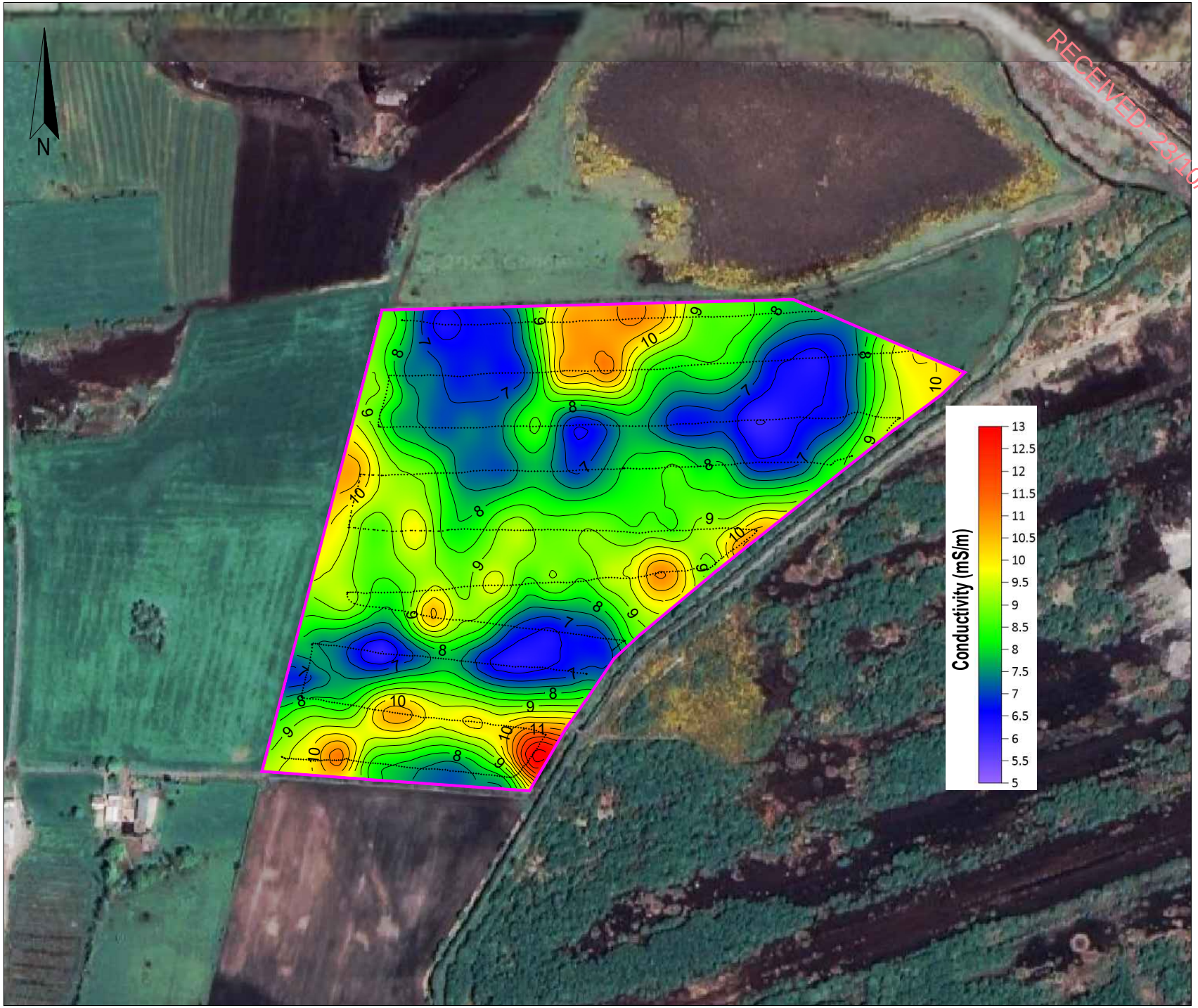
CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_01
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

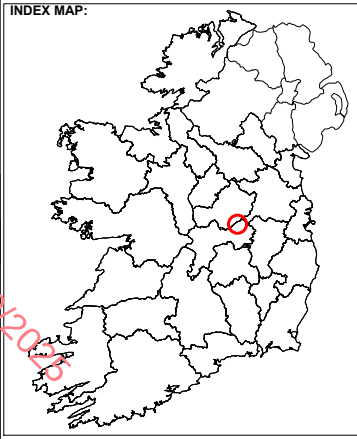
Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

EM GROUND CONDUCTIVITY RESULTS (mS/m)

SCALE 1:5000



INDEX MAP:



LEGEND:

Site

EM conductivity reading

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CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_02
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
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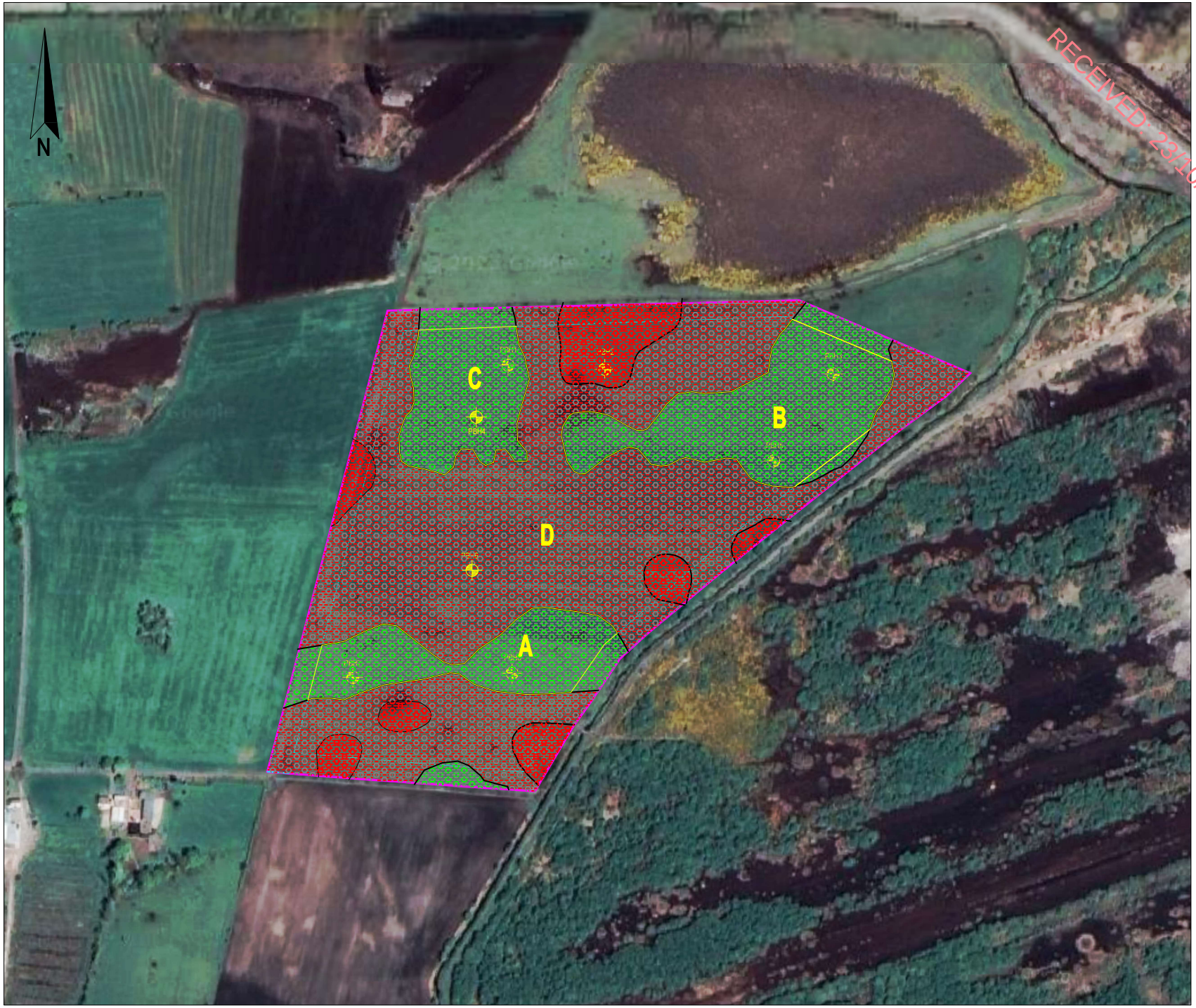
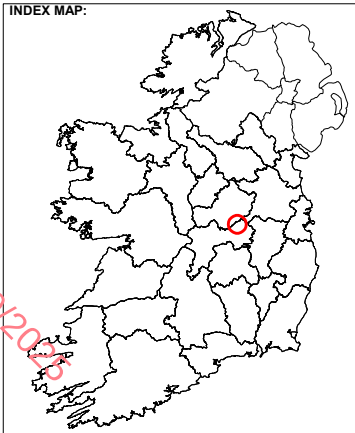
SUMMARY INTERPRETATION MAP

SCALE 1:5000



INDEX MAP:



LEGEND:

- Site
- TOPSOIL/PEAT over clayey SAND/GRAVEL & cobbles over saturated fine possible silty SAND/GRAVEL
- TOPSOIL/PEAT over sandy gravelly CLAY over saturated fine possible silty SAND/GRAVEL
- Increased CLAY/SILT content
- A — Potential Resource Zones A-C
- D — 20m Standoff from site boundary, Potential Resource Zone D
- PBH1 — Proposed Borehole

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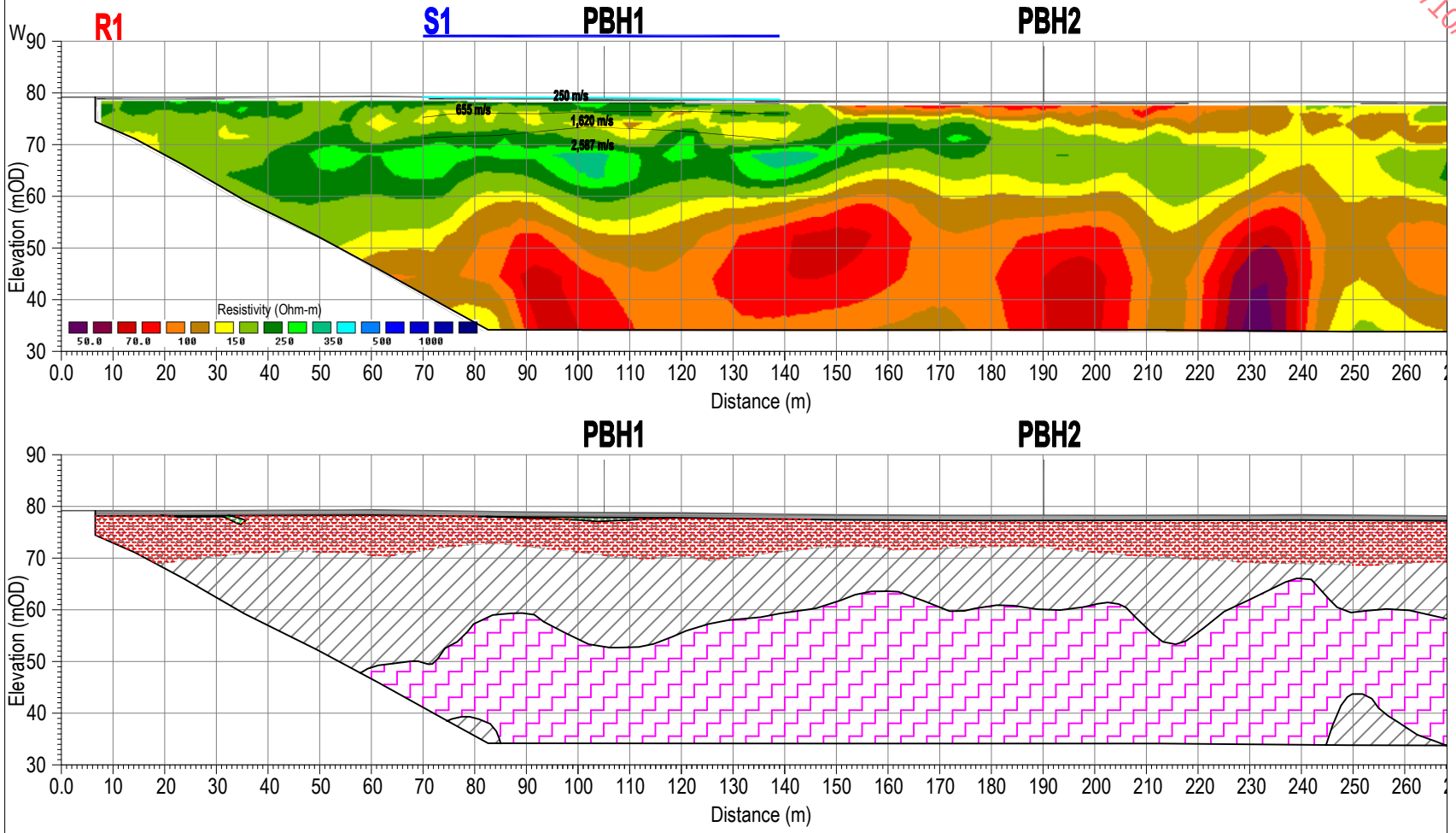
PROJECT:	DERRYGREENAGH, COUNTY OFFALY GEOPHYSICAL INVESTIGATION
CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_03
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

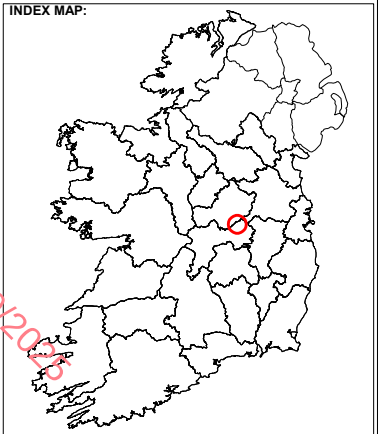
Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

RESULTS AND INTERPRETATION ERT PROFILE R1 AND SEISMIC PROFILE S1

SCALE 1:1250



INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

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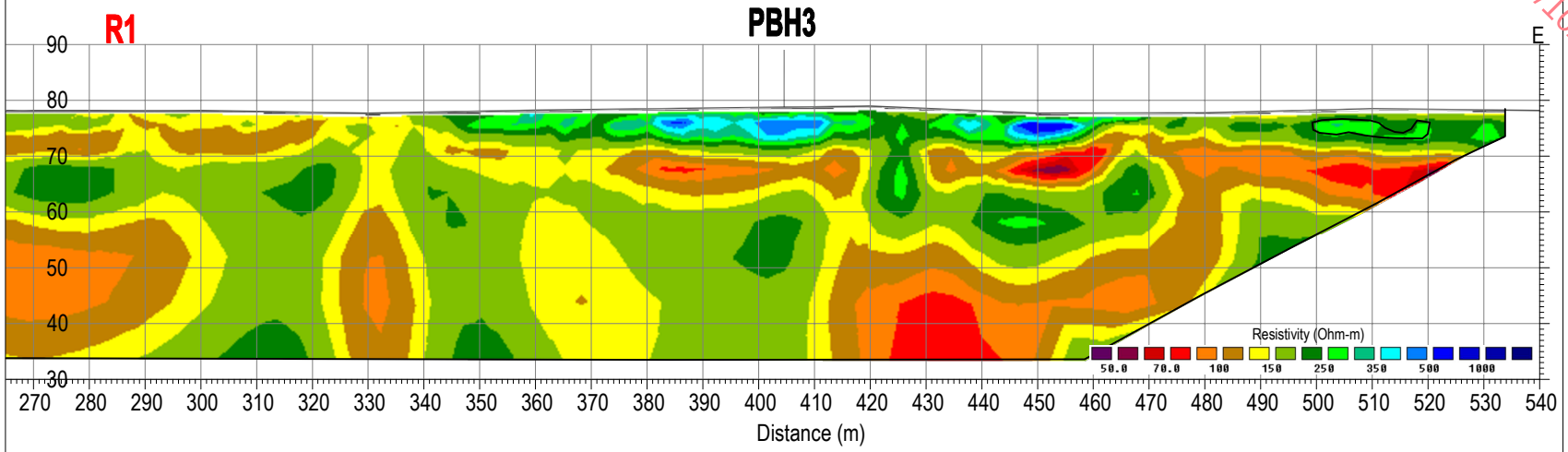
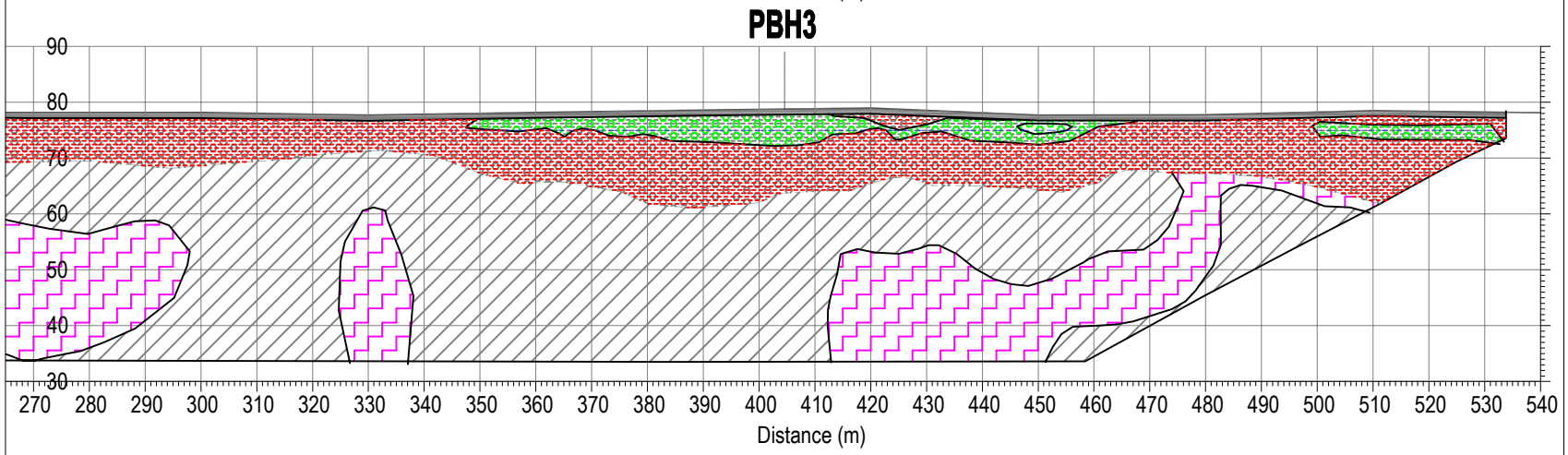
DRAWING NO:	AGP25010_R1A
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

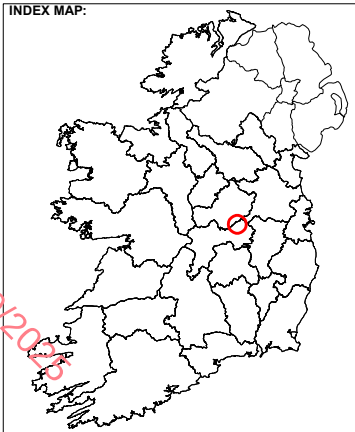
RESULTS AND INTERPRETATION ERT PROFILE R1

SCALE 1:1250





INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

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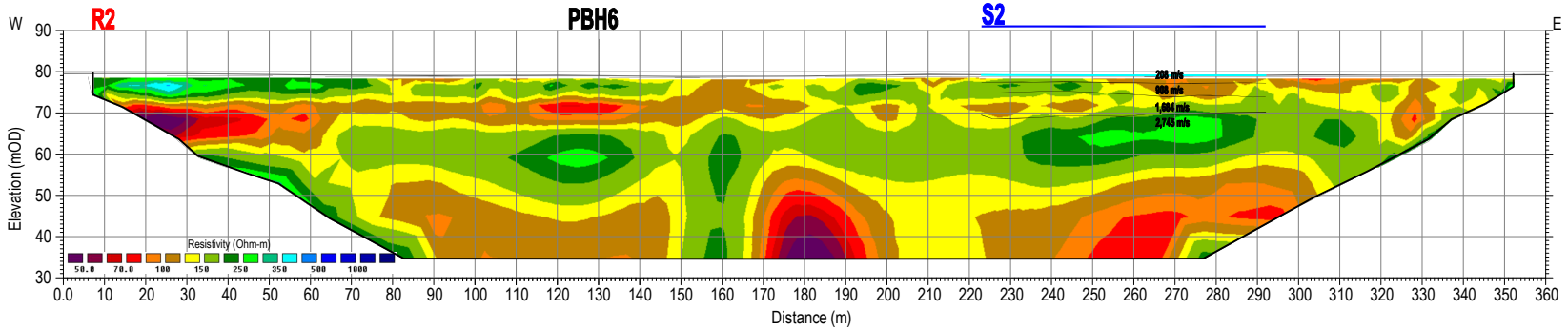
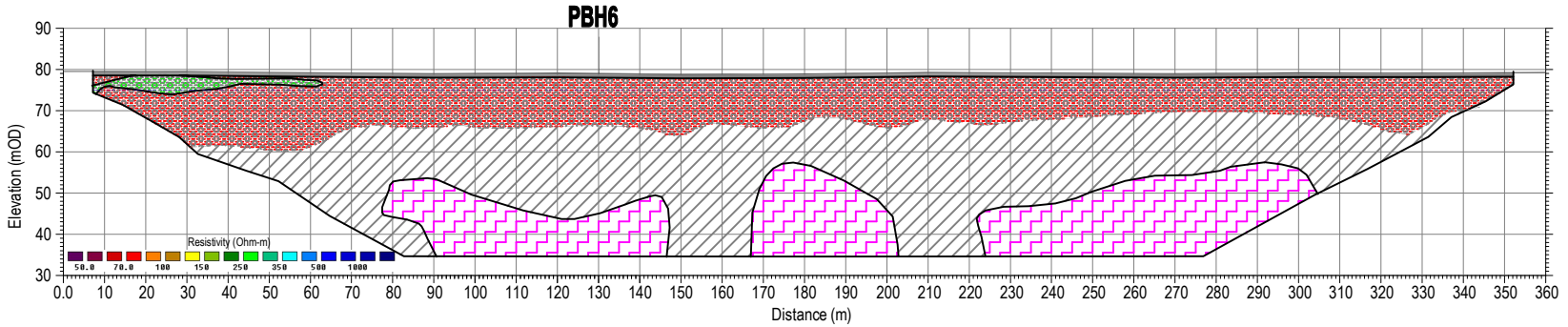
CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_R1B
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

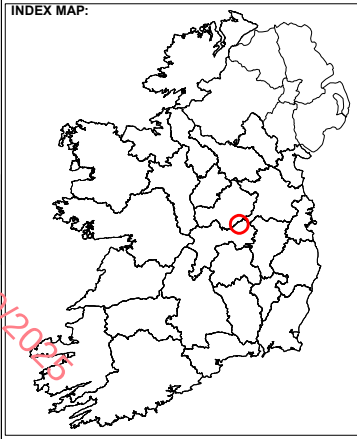
RESULTS AND INTERPRETATION ERT PROFILE R2 AND SEISMIC PROFILE S2

SCALE 1:1750





INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

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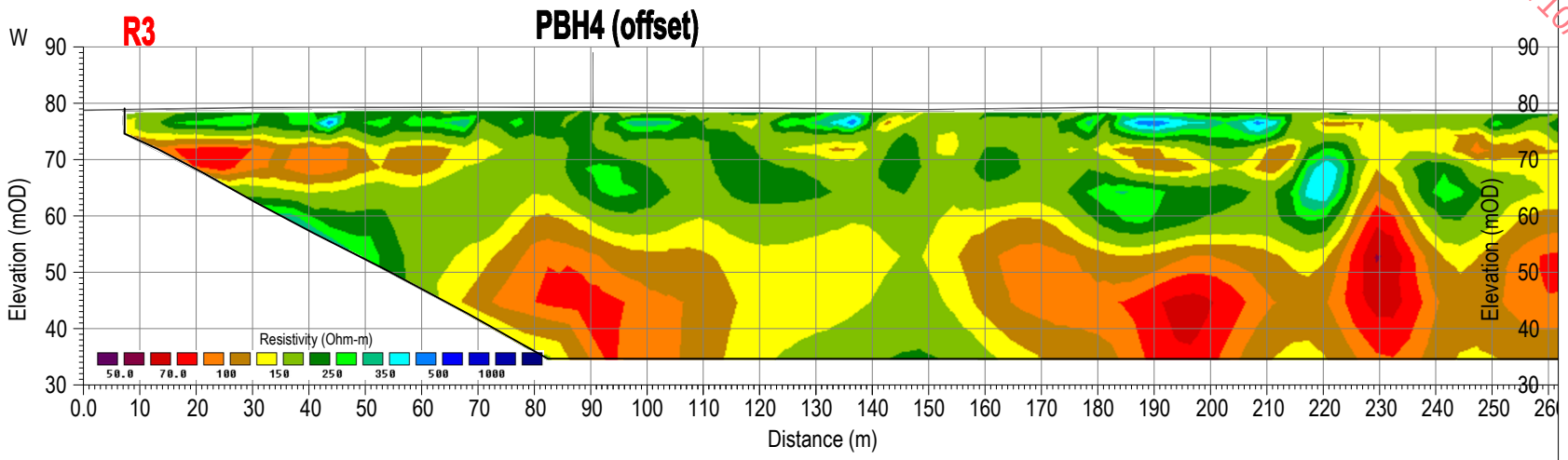
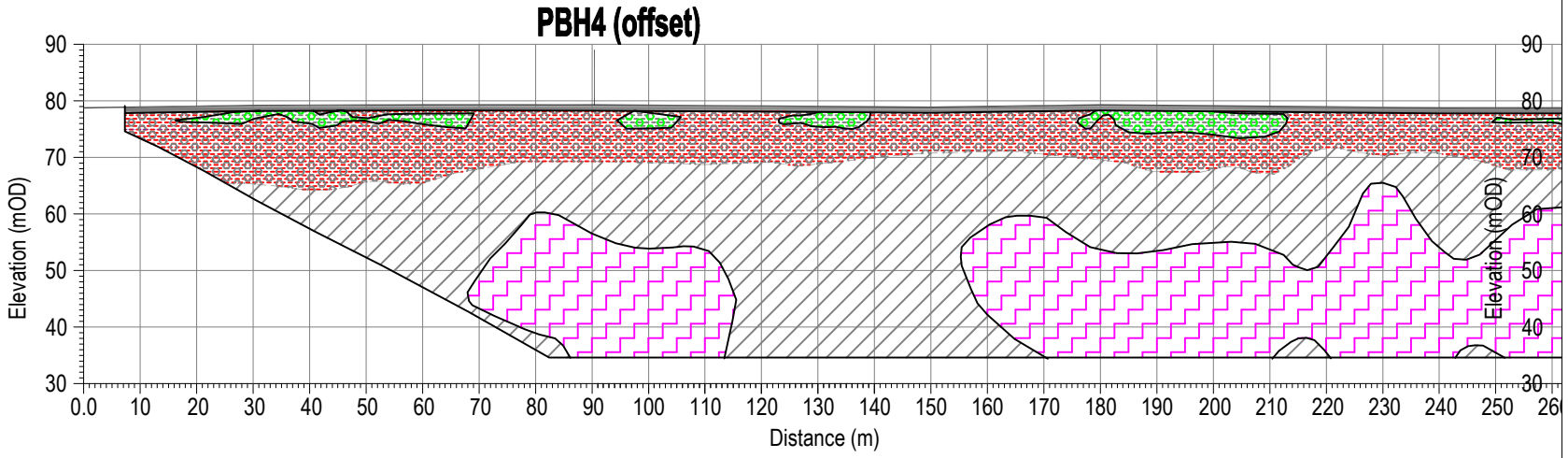
DRAWING NO:	AGP25010_R2
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

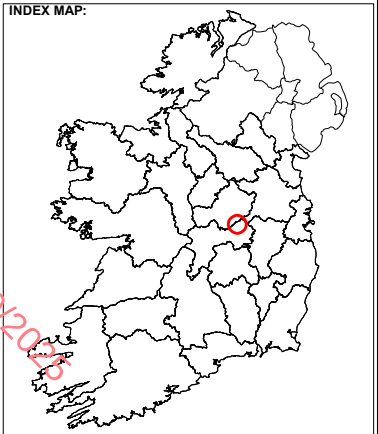
RESULTS AND INTERPRETATION ERT PROFILE R3

SCALE 1:1250





INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

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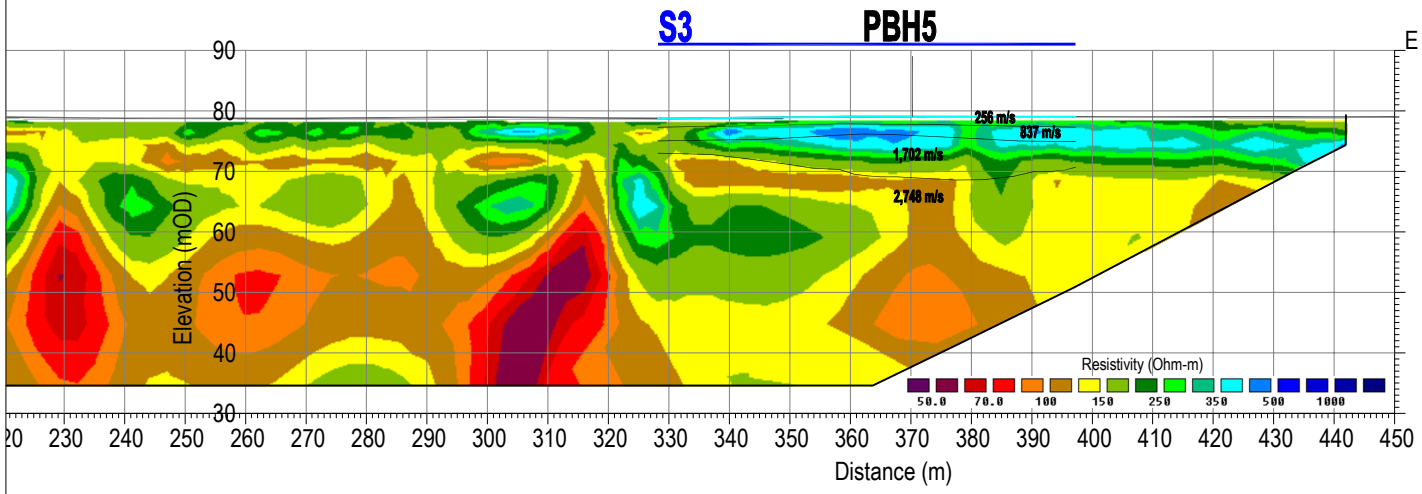
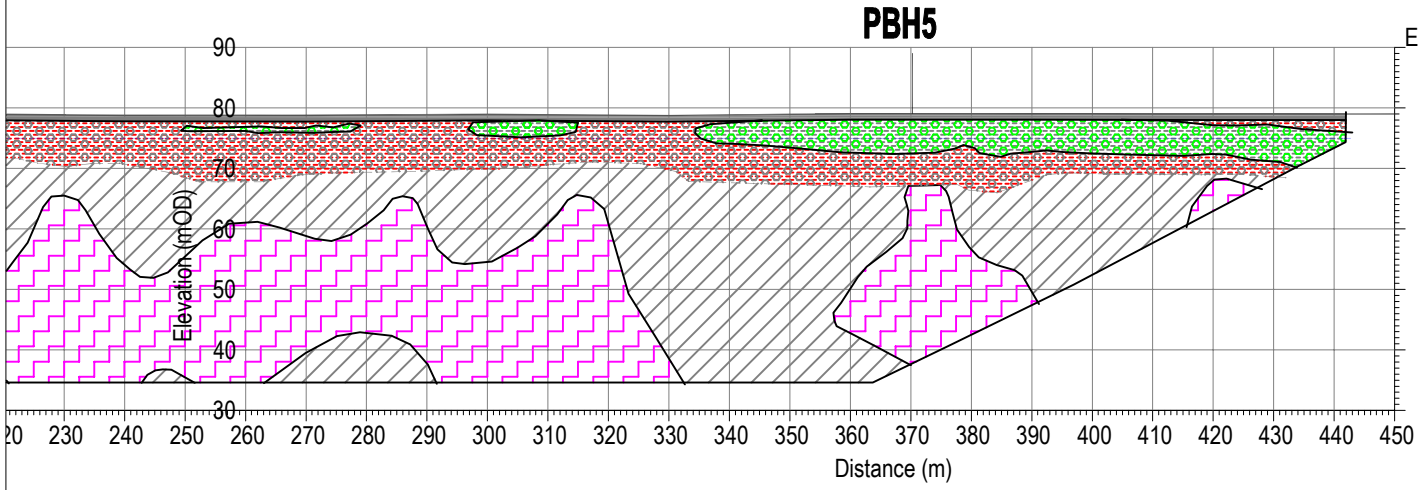
CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_R3A
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

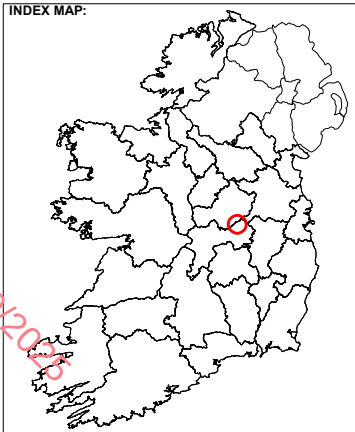
RESULTS AND INTERPRETATION ERT PROFILE R3 AND SEISMIC REFRACTION PROFILE S3

SCALE 1:1250





INDEX MAP:



LEGEND:

- Seismic refraction layer with 1254-1288 m/s interpreted P-wave velocity
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

The information displayed here is to be used in conjunction with AGP25010_01 Report on the Geophysical Investigation at Derrygreenagh, Co. Offaly for BD Flood, APEX Geophysics Ltd. 2nd April 2025.

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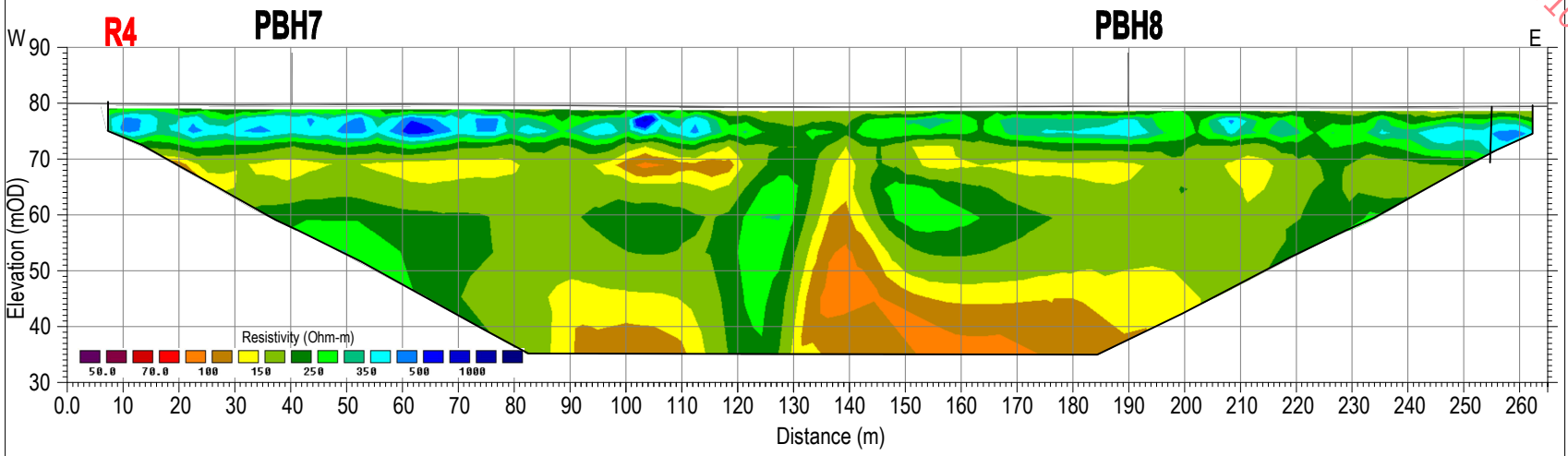
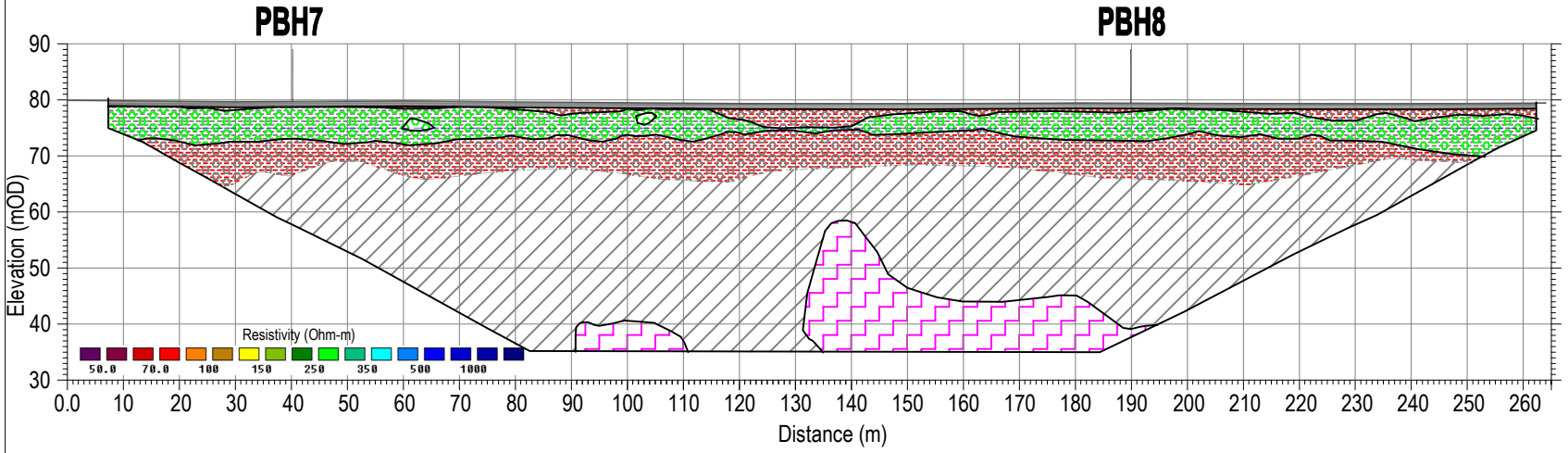
CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_R3B
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

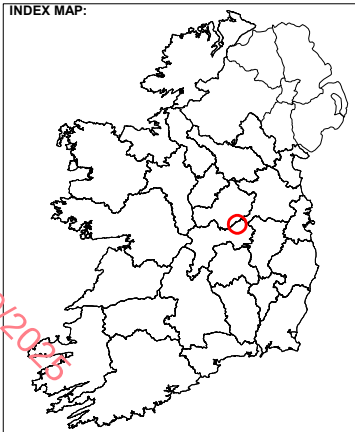
RESULTS AND INTERPRETATION ERT PROFILE R4

SCALE 1:1250





INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)
- TOPSOIL/PEAT/OVERBURDEN
- Sandy gravelly CLAY/saturated possible fine silty SAND/GRAVEL
- Clayey SAND/GRAVEL and Cobbles
- SAND/GRAVEL
- BASALT & TUFFS
- MUDSTONE
- Inferred water level @ 75 m OD
- Possible top of bedrock
- PBH01 Proposed borehole

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CLIENT.:	BD FLOOD LIMITED
DRAWING NO:	AGP25010_R3B
SCALE:	AS INDICATED @ A4
DATE:	02-04-2025

Version:	Date:	Drawn By:	Checked:
01	02-04-2025	FP	TL

Appendix 6-C: Groundwater Monitoring Borehole Logs (April 2025)

BOREHOLE LOG

BOREHOLE No **GW 1**

Client: **B.D.FLOOD LIMITED**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	02/04/2025	79.52m	E648804 N736188

Project: **Derryarkin S&G Pit Development EIAR & PA**

Sheet 1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.62		(0.90) 0.90	Soft dark PEAT	
							(4.30)	Loose fine grey SAND AND GRAVEL	
					74.32		5.20		
					73.02		(1.30) 6.50	Soft grey sandy SILT	
							(3.30)	Dense coarse grey sub-angular silty GRAVEL very frequent cobbles	
					69.72		9.80		
					68.52		(1.20) 11.00	Stiff very gravelly sandy CLAY high cobble content	
								Borehole Complete at 11.00m	

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

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

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

BOREHOLE LOG

BOREHOLE No
GW 2

Client:
B.D.FLOOD LIMITED

SLR

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	02/04/2025	78.43m	E649326 N736317

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					77.63		(0.80) 0.80	Soft dark brown PEAT	
					73.73		(3.90) 4.70	Loose fine grey well rounded SAND AND GRAVEL	
					68.83		(4.90) 9.60	Soft to firm grey clayey SILT	
					68.43		10.00	Firm to stiff grey silty gravelly CLAY	
								Borehole Complete at 10.00m	

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

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No
GW 3

Client:
B.D.FLOOD LIMITED

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	02/04/2025	79.86m	E648986 N735980

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument / Backfill
					79.56		0.30	Soft to firm brown peaty TOPSOIL	
							(4.80)	Medium dense coarse grey well rounded SAND AND GRAVEL frequent cobbles and boulders	
					74.76		5.10		
					74.36		5.50	Loose fine brown SAND	
							(4.10)	Loose to Medium dense fine grey silty SAND	
					70.26		9.60		
					68.86		(1.40) 11.00	Soft to firm grey sandy SILT	
								Borehole Complete at 11.00m	

Boring Progress and Water Observations				
Date	Depth	Casing Dpt	Casing Dia	Water Dpt
02/04/2025	11.00	3.50	140.00	

Chiselling			Water Added	
From	To	Hours	From	To

General Remarks
Drillers Descriptions

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

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

Appendix 6-D: Borehole Logs (May 2025)

BOREHOLE LOG

BOREHOLE No
BH 1

Client:
B.D.FLOOD LIMITED

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	20/05/2025	78.77m	E648900 N736424

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.47		0.30	Firm brown peaty TOPSOIL	
							(2.80)	Loose to Medium dense coarse greyish brown sub-rounded SAND AND GRAVEL	
					75.67		3.10		
							(2.40)	Soft to firm grey gravelly SILT becoming Stiff	
					73.27		5.50		
							(4.50)	Stiff grey silty sandy gravelly CLAY medium cobble content	
					68.77		10.00		
								Borehole Complete at 10.00m	

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
20/05/2025	0.00									
20/05/2025	10.00									

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No **BH 2**

Client: **B.D.FLOOD LIMITED**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	20/05/2025	78.77m	E649154 N736302

Project: **Derryarkin S&G Pit Development EIAR & PA**

Sheet 1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.47		0.30	Firm brown peaty TOPSOIL	
							(3.30)	Medium dense brownish grey medium coarse sub-rounded SAND AND GRAVEL	
					75.17		3.60		
					74.67		(0.50) 4.10	Soft to firm grey gravelly SILT	
							(5.90)	Stiff grey silty sandy gravelly CLAY medium cobble content becoming Very stiff	
					68.77		10.00		
								Borehole Complete at 10.00m	

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
20/05/2025	0.00									
20/05/2025	10.00									

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No
BH 3

Client:
B.D.FLOOD LIMITED

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	20/05/2025	79.14m	E649054 N736255

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.74		0.40	Firm brown peaty TOPSOIL	
							(4.90)	Medium dense brownish grey medium coarse sub-rounded SAND AND GRAVEL	
					73.84		5.30		
					72.54		(1.30) 6.60	Soft to firm grey gravelly SILT	
							(3.40)	Firm to stiff grey silty sandy gravelly CLAY medium cobble content	
					69.14		10.00		
								Borehole Complete at 10.00m	

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
20/05/2025	0.00									
20/05/2025	10.00									

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No
BH 4

Client:
B.D.FLOOD LIMITED

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	21/05/2025	79.01m	E648854 N736221

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.71		0.30	Firm brown peaty TOPSOIL	
							(4.90)	Medium dense coarse brownish grey sub-rounded SAND AND GRAVEL frequent cobbles and boulders	
					73.81		5.20		
							(4.80)	Soft to firm grey sandy gravelly SILT	
					69.01		10.00		
								Borehole Complete at 10.00m	

Boring Progress and Water Observations				
Date	Depth	Casing Dpt	Casing Dia	Water Dpt
21/05/2025	0.00			
21/05/2025	10.00			

Chiselling			Water Added	
From	To	Hours	From	To

General Remarks
Drillers Descriptions

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No
BH 5

Client:
B.D.FLOOD LIMITED

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	20/05/2025	79.16m	E649021 N736129

Project:
Derryarkin S&G Pit Development EIAR & PA

Sheet
1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					78.86		0.30	Firm brown peaty TOPSOIL	
							(2.70)	Medium dense coarse brownish grey sub-rounded SAND AND GRAVEL	
					76.16		3.00		
							(1.50)	Soft to firm sandy gravelly SILT	
					74.66		4.50		
							(2.70)	Firm to stiff grey very sandy gravelly CLAY high cobble content	
					71.96		7.20		
							(2.80)	Stiff grey silty sandy gravelly CLAY	
					69.16		10.00		
								Borehole Complete at 10.00m	

1 2 3 4 5 6 7 8 9

Boring Progress and Water Observations					Chiselling			Water Added		General Remarks
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To	Drillers Descriptions
20/05/2025	0.00									
20/05/2025	10.00									

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

BOREHOLE LOG

BOREHOLE No **BH 6**

Client: **B.D.FLOOD LIMITED**

Project No:	Date:	Ground Level:	Co-ordinates:
501.065657.00001	21/05/2025	79.65m	E648821 N736084

Project: **Derryarkin S&G Pit Development EIAR & PA**

Sheet 1 of 1

SAMPLES & TESTS				Water	STRATA				
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Instrument Backfill
					79.35		0.30	Firm brown PEAT	
							(4.60)	Medium dense to Dense brownish grey coarse sub-rounded SAND AND GRAVEL with frequent cobbles and boulders	
					74.75		4.90		
					73.05		(1.70)	Soft to firm grey gravelly SILT	
							6.60		
							(3.40)	Stiff grey silty sandy gravelly CLAY medium cobble content	
					69.65		10.00		
								Borehole Complete at 10.00m	

1 2 3 4 5 6 7 8 9

Boring Progress and Water Observations

Date	Depth	Casing Dpt	Casing Dia	Water Dpt
21/05/2025	0.00			
21/05/2025	10.00			

Chiselling

From	To	Hours

Water Added

From	To

General Remarks

Drillers Descriptions

All dimensions in metres	Contractor: Petersen Drilling Ltd.	Method: Rotary open hole	Logged By:	Approved By:
Scale 1:66	Plant: Knebel HY79	Hole Size: 154mm	SP & MH	SP

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

Appendix 6-E: Trial Pits Logs and (May 2015)

TRIAL PIT LOG

TRIAL PIT No
TP01

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

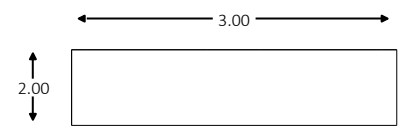
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.20m	E648760 N736011	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.90		(0.30) 0.30	TOPSOIL, Dark brown CLAY.	
					78.20		(0.70) 1.00	Soft, dark brown, slightly sandy, very gravelly CLAY with occasional cobbles and rare boulders. Clasts are rounded.	
1.40 - 1.90	B			▼	77.30		(0.90) 1.90	Loose, dark brown, slightly silty/clayey, very gravelly SAND / SAND & GRAVEL with occasional cobbles and rare boulders. Sand is coarse grained. Clasts are rounded.	
								Trial Pit Complete at 1.90m	

GENERAL REMARKS:
Water level at 1.9m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

TRIAL PIT LOG

TRIAL PIT No
TP02

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

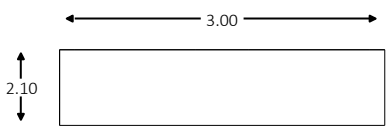
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.62m	E648849 N736008	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					79.32		(0.30) 0.30	TOPSOIL, Dark brown CLAY.	
					78.62		(0.70) 1.00	Soft, greyish brown, slightly sandy, very gravelly CLAY with common cobbles and rare boulders. Clasts are rounded.	
1.70 - 2.20	B				77.82		(0.80) 1.80	Loose, greyish brown, very sandy GRAVEL with common cobbles and boulders. Sand is mid to coarse grained. Clasts are rounded.	
				▼	77.42		(0.40) 2.20	Loose, orangish brown, very sandy GRAVEL with common cobbles and boulders. Sand is mid to coarse grained. Clasts are rounded.	
								Trial Pit Complete at 2.20m	

GENERAL REMARKS:
Water level at 2.2m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres	Contractor: N/A	Method: Trial pit/trench	Logged By:	Approved By:
Scale 1:20	Plant: TBC		SS	PG

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

TRIAL PIT LOG

TRIAL PIT No
TP03

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

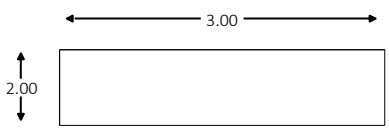
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.04m	E648854 N736208	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.79		(0.25) 0.25	TOPSOIL, Dark brown CLAY.	
					78.44		(0.35) 0.60	Soft, greyish brown, sandy, very gravelly CLAY. Sand is fine to coarse grained. Clasts are rounded.	
1.50 - 2.00	B			▼	77.04		(1.40) 2.00	Loose, greyish brown, SAND & GRAVEL with common cobbles and rare boulders towards base. Sand is coarse grained. Clasts are rounded.	
								Trial Pit Complete at 2.00m	

GENERAL REMARKS:
Water level at 2m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

TRIAL PIT LOG

TRIAL PIT No
TP04

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

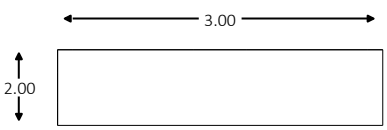
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.23m	E648997 N736132	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.93		(0.30) 0.30	TOPSOIL, Dark brown CLAY.	
					78.63		(0.30) 0.60	Soft, greyish brown, slightly sandy, gravelly CLAY. Clasts are rounded.	
1					78.03		(0.60) 1.20	Loose, greyish brown, very gravelly SAND with common cobbles and rare boulders. Sand is mid to coarse grained. Clasts are rounded.	
					77.93		(0.10) 1.30	Loose, orangish brown, very sandy GRAVEL with common cobbles and rare boulders. Sand is mid to coarse grained. Clasts are rounded.	
1.60 - 2.10	B						(0.80)	Loose, greyish brown, very gravelly SAND with occasional cobbles and rare boulders. Sand is mid to coarse grained. Clasts are rounded.	
2				▼	77.13		2.10	Trial Pit Complete at 2.10m	

GENERAL REMARKS:
Water level at 2.1m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

TRIAL PIT LOG

TRIAL PIT No
TP05

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

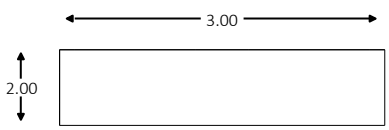
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.26m	E648904 N736305	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.86		(0.40) 0.40	TOPSOIL, Dark brown CLAY.	
					78.46		(0.40) 0.80	Soft, brown and orangish brown towards base, slightly sandy, very gravelly CLAY. Clasts are rounded.	
1								Loose, greyish brown, SAND & GRAVEL with occasional cobbles at top. Sand is mid to coarse grained. Clasts are rounded.	
1.60 - 2.10	B						(1.30)		
2				▼	77.16		2.10		
								Trial Pit Complete at 2.10m	

GENERAL REMARKS:
Water level at 2.1m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

TRIAL PIT LOG

TRIAL PIT No
TP06

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

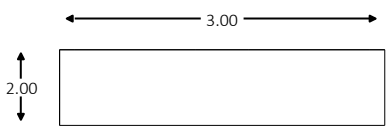
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	78.21m	E649185 N736301	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					77.86		(0.35) 0.35	TOPSOIL, Dark brown CLAY.	
					77.61		(0.25) 0.60	Soft, greyish brown, gravelly CLAY. Clasts are rounded.	
					77.31		(0.30) 0.90	Loose, greyish brown, very sandy GRAVEL / SAND & GRAVEL with common cobbles and occasional boulders. Sand is coarse grained. Clasts are rounded.	
1					77.01		(0.30) 1.20	Loose, orangish brown, sandy GRAVEL with occasional cobbles and boulders. Sand is coarse grained. Clasts are rounded.	
1.60 - 2.10	B						(0.90)	Loose, greyish brown, very sandy GRAVEL / SAND & GRAVEL with common cobbles and occasional boulders. Sand is coarse grained. Clasts are rounded.	
2				▼	76.11		2.10	Trial Pit Complete at 2.10m	

GENERAL REMARKS:
Water level at 2.1m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

TRIAL PIT LOG

TRIAL PIT No
TP07

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

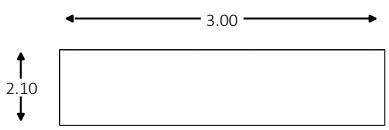
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.08m	E649057 N736224	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.68		(0.40) 0.40	TOPSOIL, Dark brown CLAY.	
					78.28		(0.40) 0.80	Soft, greyish brown, slightly sandy, gravelly CLAY. Clasts are rounded.	
1.40 - 1.90	B			▼	77.18		(1.10) 1.90	Loose, greyish brown and slightly orangish brown to top, very sandy GRAVEL with common cobbles and rare boulders. Sand is mid to coarse grained. Clasts are rounded.	
								Trial Pit Complete at 1.90m	

GENERAL REMARKS:
Water level at 1.9m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres	Contractor: N/A	Method: Trial pit/trench	Logged By:	Approved By:
Scale 1:20	Plant: TBC		SS	PG

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

TRIAL PIT LOG

TRIAL PIT No
TP08

Client:
B.D.FLOOD LIMITED

Project:
Derryarkin S&G Pit Development EIAR & PA

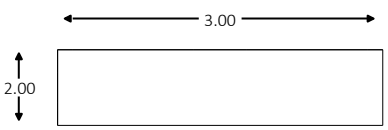
Project No:	Date:	Ground Level:	Co-ordinates:	Sheet
501.065657.00001	20/05/2025	79.00m	E648992 N736292	1 of 1

SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
					78.80		(0.20) 0.20	TOPSOIL, Dark brown CLAY.	
					78.15		(0.65) 0.85	Soft, greyish brown, gravelly CLAY. Clasts are rounded.	
					78.00		(0.15) 1.00	Loose, orangish brown, SAND & GRAVEL with occasional cobbles and boulders. Sand is coarse grained. Clasts are rounded.	
1.50 - 2.00	B						(1.00)	Loose, dark brown, very sandy GRAVEL / SAND & GRAVEL with occasional cobbles. Sand is mid to coarse grained. Clasts are rounded.	
				▼	77.00		2.00	Trial Pit Complete at 2.00m	

GENERAL REMARKS:
Water level at 2m

KEY
V = Hand Vane Shear Strength
PP = Pocket Penetrometer Shear Strength
J = Jar Sample
D = Disturbed Sample
B = Large Bulk Sample
HS = Head Space Measurement

Trial Pit Dimensions:



Shoring/Support: N/A
Stability: Stable Pit

All dimensions in metres Scale 1:20	Contractor: N/A Plant: TBC	Method: Trial pit/trench	Logged By: SS	Approved By: PG

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

Appendix 6-F: Particle Size Distribution Test Lab Certificates

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601

e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No:	**DNC25-16075-1**
Report Date:	09/06/2025
	Version 1

Customer Details

Customer Name:	SLR Consulting Ireland
Address:	Dundrum Business Park, Dundrum Rd
	Co. Dublin
Contract:	n/a
Site Address:	n/a

Sample & Test Details

Location:	n/a
Proposed Class:	Soil
Sample Description:	Soil
Detailed Description:	Soil
Source:	Site Won
Supplier:	Site Won
Site Ref:	PO 1728 - 44082
Sample Cert:	Yes
Sampled By:	Customer
Mattest Lab.:	Mattest Dublin
Date Sampled:	Unknown
Date Received:	26/05/2025
Date Tested:	03/06/2025
Sample Type:	Bulk
Method Used:	Wet Sieving
Specification:	BS 1377-2:2022, Clause 10.
	ISO 17892-4:2016, Clause 5.2.
	TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16075-1

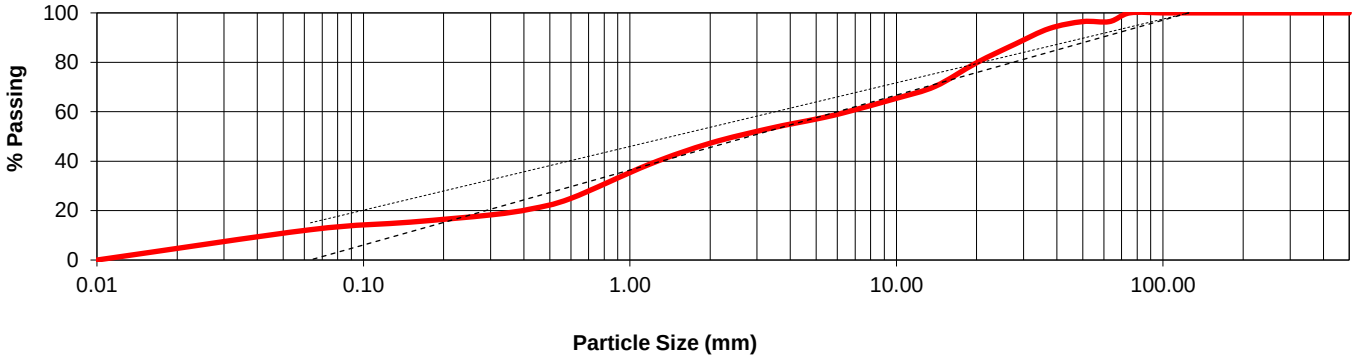
Test Results

Uniformity Coefficient: 100

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	96		
50.00	96		
37.50	94		
28.00	87		
20.00	80		
14.00	70		
10.00	65		
6.30	60		
5.00	57		
3.35	53		
2.00	47		
1.18	39		
0.600	25		
0.425	21		
0.300	18		
0.150	15		
0.063	**12**	**0**	**15**

Particle Size Distribution



Remarks:

1. The result(s) apply only to the sample tested.
2. This report shall not be reproduced, except in full, without the approval of the laboratory.
3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Limited

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16076-1**
Report Date: 12/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Unknown
Sample Description: See Detailed Description
Detailed Description: Soil
Source: n/a
Supplier: n/a
Site Ref: PO 1728 - 44083

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: n/a
Date Received: 26/05/2025
Date Tested: 04/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Group
Dublin Laboratory
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Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16076-1

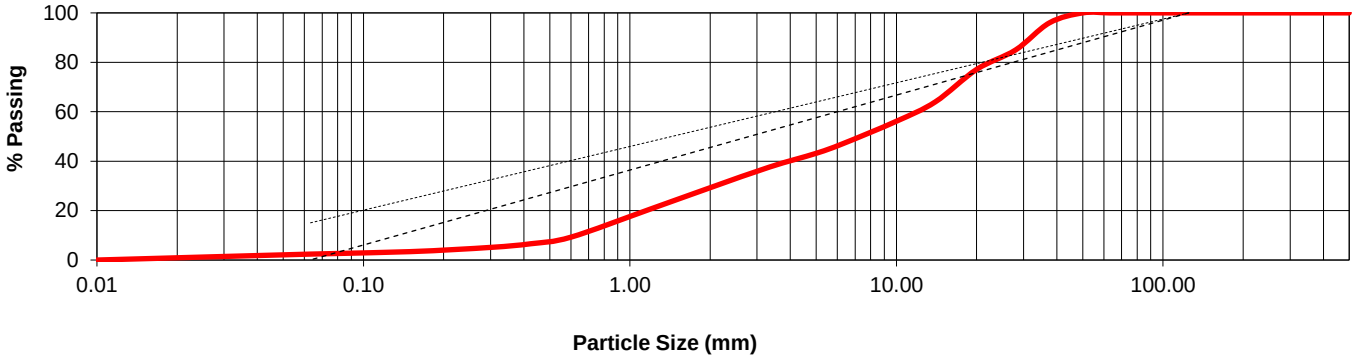
Test Results

Uniformity Coefficient: 17

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	100		
50.00	100		
37.50	96		
28.00	85		
20.00	77		
14.00	64		
10.00	56		
6.30	47		
5.00	43		
3.35	38		
2.00	29		
1.18	20		
0.600	9		
0.425	7		
0.300	5		
0.150	3		
0.063	**2**	**0**	**15**

Particle Size Distribution



Remarks:

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3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Group

MATTEST

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601

e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16077-1**
Report Date: 09/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Soil
Sample Description: Soil
Detailed Description: Soil
Source: Site Won
Supplier: Site Won
Site Ref: PO 1728 - 44084

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: Unknown
Date Received: 26/05/2025
Date Tested: 03/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16077-1

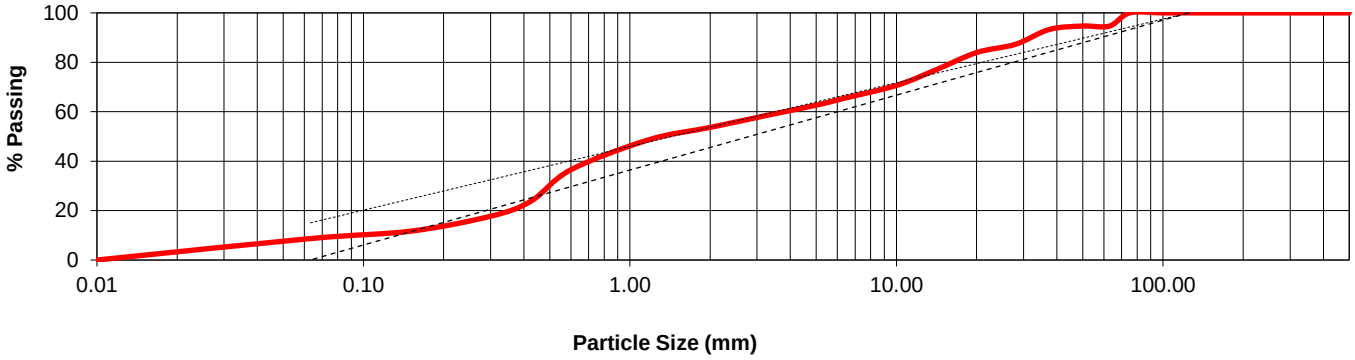
Test Results

Uniformity Coefficient: 53

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	95		
50.00	95		
37.50	93		
28.00	87		
20.00	84		
14.00	77		
10.00	71		
6.30	65		
5.00	63		
3.35	59		
2.00	54		
1.18	49		
0.600	37		
0.425	24		
0.300	18		
0.150	12		
0.063	**9**	**0**	**15**

Particle Size Distribution



Remarks:

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3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Limited

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601

e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16078-1**
Report Date: 12/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Unknown
Sample Description: See Detailed Description
Detailed Description: Soil
Source: n/a
Supplier: n/a
Site Ref: PO 1728 - 44085

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: n/a
Date Received: 26/05/2025
Date Tested: 04/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

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Ballycoolin
Dublin 15

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Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16078-1

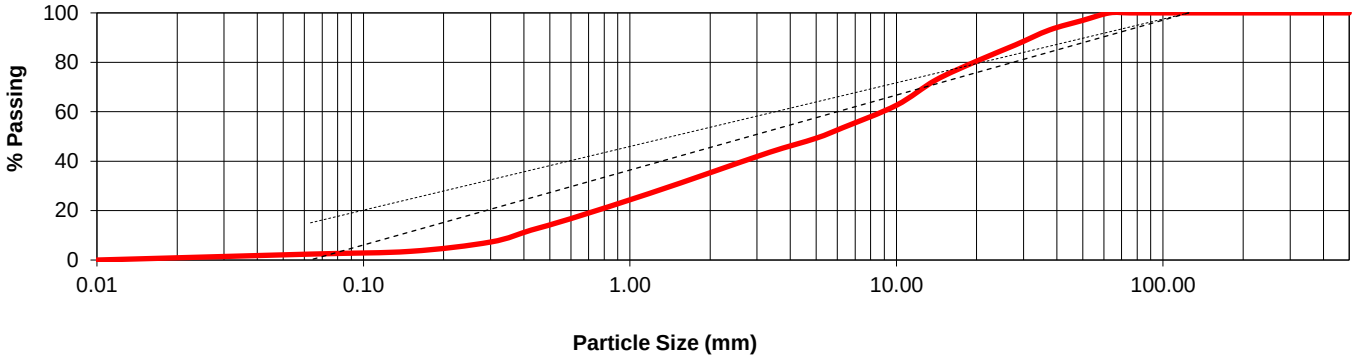
Test Results

Uniformity Coefficient: 24

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	100		
50.00	97		
37.50	93		
28.00	87		
20.00	80		
14.00	73		
10.00	63		
6.30	54		
5.00	49		
3.35	44		
2.00	35		
1.18	27		
0.600	17		
0.425	12		
0.300	7		
0.150	4		
0.063	**2**	**0**	**15**

Particle Size Distribution



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Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Group

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
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e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16079-1**
Report Date: 12/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Unknown
Sample Description: See Detailed Description
Detailed Description: Soil
Source: n/a
Supplier: n/a
Site Ref: PO 1728 - 44086

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: n/a
Date Received: 26/05/2025
Date Tested: 04/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16079-1

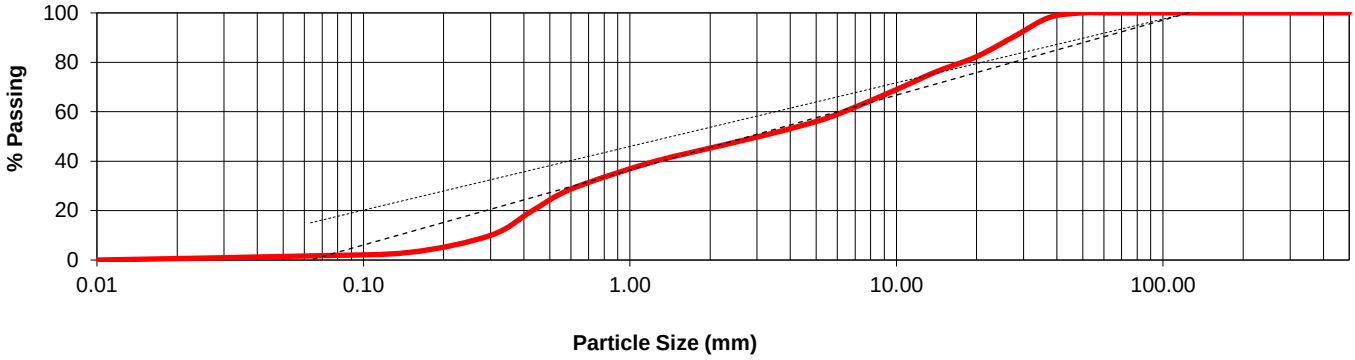
Test Results

Uniformity Coefficient: 21

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	100		
50.00	100		
37.50	98		
28.00	91		
20.00	82		
14.00	76		
10.00	69		
6.30	60		
5.00	56		
3.35	51		
2.00	45		
1.18	39		
0.600	29		
0.425	20		
0.300	10		
0.150	3		
0.063	**2**	**0**	**15**

Particle Size Distribution



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Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Group

MATTEST

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601

e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16080-1**
Report Date: 09/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Soil
Sample Description: Soil
Detailed Description: Soil
Source: Site Won
Supplier: Site Won
Site Ref: PO 1728 - 44087

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: Unknown
Date Received: 26/05/2025
Date Tested: 03/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Limited
Dublin Laboratory
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Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16080-1

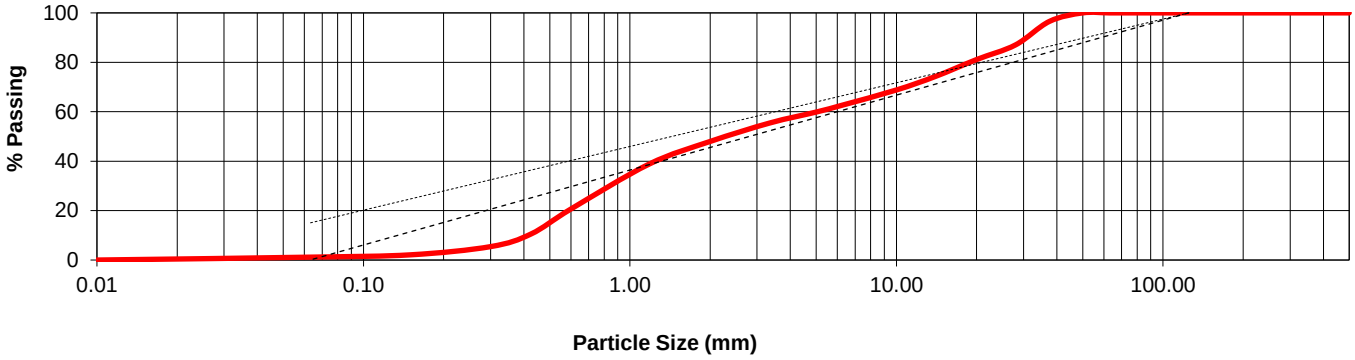
Test Results

Uniformity Coefficient: n/a

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	100		
50.00	100		
37.50	97		
28.00	87		
20.00	81		
14.00	74		
10.00	69		
6.30	63		
5.00	60		
3.35	55		
2.00	48		
1.18	39		
0.600	21		
0.425	11		
0.300	5		
0.150	2		
0.063	**1**	**0**	**15**

Particle Size Distribution



Remarks:

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3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Limited

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16081-1**
Report Date: 12/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Unknown
Sample Description: See Detailed Description
Detailed Description: Soil
Source: n/a
Supplier: n/a
Site Ref: PO 1728 - 44088

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: n/a
Date Received: 26/05/2025
Date Tested: 04/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Group
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16081-1

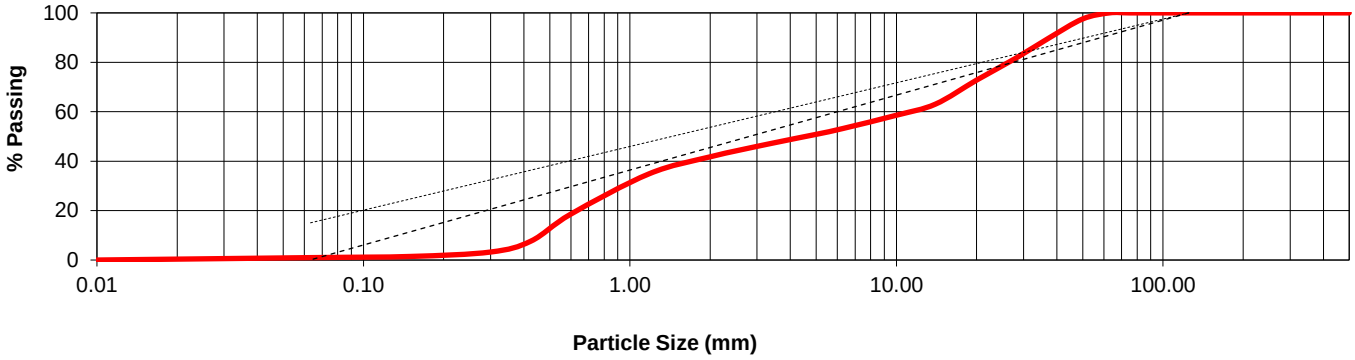
Test Results

Uniformity Coefficient: 24

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	100		
50.00	98		
37.50	90		
28.00	82		
20.00	73		
14.00	63		
10.00	59		
6.30	53		
5.00	51		
3.35	47		
2.00	42		
1.18	35		
0.600	19		
0.425	8		
0.300	3		
0.150	1		
0.063	**1**	**0**	**15**

Particle Size Distribution



Remarks:

1. The result(s) apply only to the sample tested.
2. This report shall not be reproduced, except in full, without the approval of the laboratory.
3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Group

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: **DNC25-16082-1**
Report Date: 09/06/2025
Version 1

Customer Details

Customer Name: SLR Consulting Ireland
Address: Dundrum Business Park, Dundrum Rd
Co. Dublin

Contract: n/a
Site Address: n/a

Sample & Test Details

Location: n/a
Proposed Class: Soil
Sample Description: Soil
Detailed Description: Soil
Source: Site Won
Supplier: Site Won
Site Ref: PO 1728 - 44089

Sample Cert: Yes
Sampled By: Customer
Mattest Lab.: Mattest Dublin
Date Sampled: Unknown
Date Received: 26/05/2025
Date Tested: 03/06/2025

Sample Type: Bulk
Method Used: Wet Sieving
Specification: BS 1377-2:2022, Clause 10.
ISO 17892-4:2016, Clause 5.2.
TII : SHW : Series 600 : March 2013 : Class 1A/B

MATTEST

Mattest Limited
Dublin Laboratory
Unit 2
Northwest Business Park
Ballycoolin
Dublin 15

Tel: 01 8278600
Fax: 01 8278601
e-mail: info@mattest.ie
Web: www.mattest.ie

Determination of Particle Size Distribution
in accordance with BS 1377-2:2022 Cl. 10 & ISO 17892-4:2016 Cl. 5.2

Report No: DNC25-16082-1

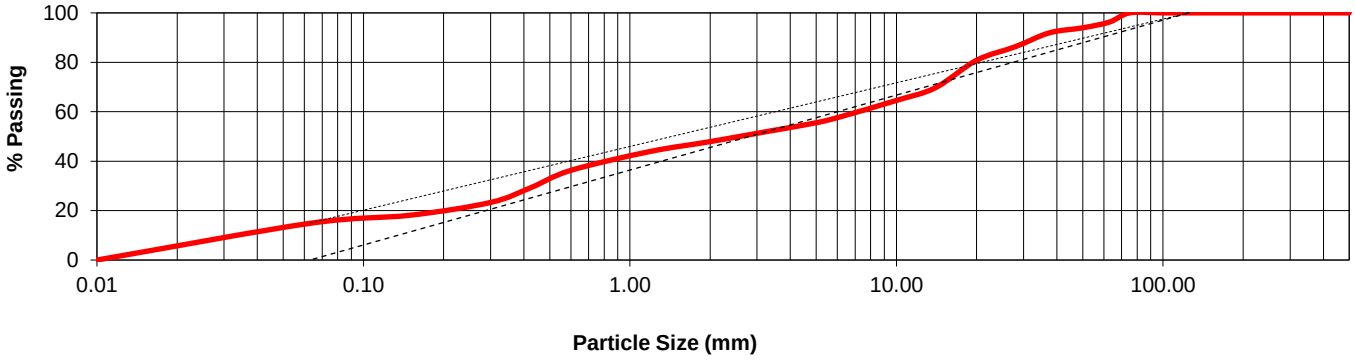
Test Results

Uniformity Coefficient: 100

Specification: TII : SHW : Series 600 : March 2013 : Class 1A/B

Sieve Size (mm)	% Passing	Specified Limits	
500.00	100		
125.00	**100**	**100**	**100**
100.00	100		
75.00	100		
63.00	96		
50.00	94		
37.50	92		
28.00	86		
20.00	81		
14.00	70		
10.00	65		
6.30	58		
5.00	56		
3.35	52		
2.00	48		
1.18	44		
0.600	36		
0.425	29		
0.300	23		
0.150	18		
0.063	**15**	**0**	**15**

Particle Size Distribution



Remarks:

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2. This report shall not be reproduced, except in full, without the approval of the laboratory.
3. The sample and sample information have been provided by the customer and the test result(s) apply to the sample as received.

Comments:

Authorised Signatory

R. Barreto - Laboratory Supervisor

Signed:

For Mattest Limited

Appendix 6-G: Particle Size Distribution Results