

Contents

Introduction.....	6-2
Background.....	6-2
Scope of Work / EIA Scoping.....	6-2
Consultations / Consultees	6-2
Authors.....	6-3
Regulatory Background	6-3
EU Directives.....	6-3
Guidelines	6-3
Planning Policy and Development Control.....	6-3
Receiving Environment.....	6-6
Study Area	6-6
Baseline Study Methodology	6-6
Sources of Information	6-7
Land Baseline.....	6-7
Land Cover.....	6-8
Soils Baseline	6-8
Subsoils Baseline.....	6-10
Bedrock Geology Baseline	6-11
Site Investigations.....	6-14
Geological Profile.....	6-16
Geological Heritage	6-16
GSI Consultation Response	6-18
Radon.....	6-18
Identified Sensitive Receptors	6-18
Impact Assessment.....	6-19
Evaluation Methodology.....	6-19
Evaluation of Impacts	6-19
Direct Impacts.....	6-20
Indirect Impacts.....	6-20
Cumulative Impacts	6-21
Unplanned Events.....	6-21

RECEIVED: 04/07/2025

Meath County Council - Viewing Purposes Only!

Human Health.....	6-21
Interaction with Other Impacts	6-21
‘Do-nothing Scenario’	6-21
Mitigation Measures	6-22
Construction Stage	6-22
Operational Stage	6-25
Post-Operational Stage (Final Restoration).....	6-26
Residual Impacts	6-26
Monitoring.....	6-26
References	6-27
Appendices	
Appendix 6-A: GSI Consultation Response.....	
Appendix 6-B: Trial Pits Logs 2013.....	
Appendix 6-C: Borehole Logs 2016.....	
Appendix 6-D: Borehole Logs 2025.....	
Appendix 6-E: BD Flood Trial Pit Details.....	
Appendix 6-F: County Geological Site Report - Murrens CGS.....	
Plates	
Plate 6-1: Geology map of County Meath with County Geological Sites	6-12
Diagrams	
Diagram 6-1: Schematic Geological profile at the site	6-16
Diagram 6-2: Soil stripping using modified layer by layer practice (The Institute of Quarrying, 2021) .	6-24
Diagram 6-3: Topsoil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)	6-25
Tables	
Table 6-1: Extractive industry objectives from Meath CDP 2021-2027 (Chapter 11).....	6-5
Table 6-2: Corine Land Cover	6-8
Table 6-3: Soils within the study area	6-9
Table 6-4: Summary of 2013 Trial Pits and Geology.....	6-15
Table 6-5: Summary of 2016 groundwater monitoring boreholes.....	6-15
Table 6-6: Summary of 2025 site groundwater monitoring boreholes	6-16
Table 6-7: Summary details of County Geological Sites encountered within the study zone	6-17
Table 6-8: Status & Importance: Land, Soil & Geology attributes	6-19
Table 6-9: Magnitude of potential impacts on Land, Soil and Geology (with no mitigation)	6-20
Table 6-10: Summary table of good practice handling soils in mineral workings.....	6-23

Figures

Figure 6-1: Land Cover Map (1:50,000).....

Figure 6-2: National Soils Map (1:50,000).....

Figure 6-3: National Subsoils Map (1:50,000).....

Figure 6-4: Bedrock Geology Map (1:50,000).....

Figure 6-5: County Geological Sites.....

Figure 6-6: Site Investigation Locations.....

RECEIVED: 04/07/2023

Meath County Council - Viewing Purposes Only!

Acronyms and Abbreviations

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
HDPE	High Density Polyethylene
HER POL	Heritage Policy
IFS	Irish Forestry Soils
IGH	Irish Geological Heritage
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
SHWW	Safety Health and Welfare at Work
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 Murrens Townland, Oldcastle, Co. Meath.
- 6.2. The planning application area includes a newly proposed extension area, which comprises c. 4.2 hectares of an area of former woodland plantation within an overall planning application area of c. 5.8 hectares.
- 6.3. The proposed development will consist of:
 - Extraction of sand and gravel (dry working) over a lateral extension extraction area of c. 4.2 hectares adjacent to the existing permitted sand and gravel pit development with access gained from the existing pit;
 - The restoration of the lands as part of the overall adjacent sand and gravel pit restoration which will return the lands to a combination of agricultural grazing and beneficial ecological habitat; and
 - All associated site ancillary works within an overall application area of c. 5.8 hectares.
- 6.4. There is a portion (c. 4 hectares) of the existing permitted development of P. Ref. KA/141129 / ABP PL17.245257, located in the southwest area of the permitted extension which will now not be extracted due to the poor quality of the materials that has been tested to date. The area is referred to Area 1 shown on EIAR **Figure 1-3**.
- 6.5. The application site (shown as Area 2 on EIAR **Figure 1-3**) is a new proposed extension extraction area of c. 4.2 hectares that will effectively be a replacement source of sand and gravel materials with extraction to be commensurate with the life of P. Ref. KA14/1129 / ABP PL17.245257 which is due to expire in December 2036.
- 6.6. Area 2, i.e., the application site, is situated within the townland of Murrens. The overall pit site traverses the three townlands of Baltrasna, Annagh and Murrens.

Scope of Work / EIA Scoping

- 6.7. This EIAR section 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

- 6.8. In preparing this Environmental Impact Assessment Report an initial pre-planning consultation meeting was sought between officials of Meath County Council and the Applicant. A request was made by email containing the Council's Pre Planning questionnaire and site location plans on 23rd September 2024. A telephone pre-planning consultation meeting was held between an official of Meath County Council and SLR on the 21st October 2024.
- 6.9. 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 is available in **Appendix 6-A**.

Authors

- 6.10. This EIAR Chapter relating to Land, Soils and Geology was prepared by:
- Peter Glanville - Professional Geologist (EurGeol. PGeo.) and Technical Director with SLR Consulting Ireland.

Regulatory Background

EU Directives

- 6.11. 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).
- 6.12. 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

- 6.13. This Land, Soils and Geology EIAR chapter has been prepared in compliance with 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

- 6.14. This section sets out the Planning Policy and Development Control relating to Land, Soils and Geology of relevance to the proposed development in the Meath County Development Plan 2021-2027.
- 6.15. The County Development Plan sets out development management standards, policies and objectives in relation to land use zoning in the county within the Chapter 11. According to Section 6 of Chapter 11, the Council recognises the contribution of the extractive Industry in

supporting jobs in construction and aggregates section of the county. Relevant policies and objectives are summarised in **Table 6-1** below.

RECEIVED: 04/07/2025
Meath County Council - Viewing Purposes Only!

Table 6-1: Extractive industry objectives from Meath CDP 2021-2027 (Chapter 11)

Objective	Detail
DM POL 22	To encourage the rehabilitation of disused pits and quarries to productive agricultural use where appropriate having regard to all appropriate environmental considerations.
DM OBJ 63	Where possible, sites shall be subject to rehabilitation and landscaping programmes in tandem with the various phases of extraction. Possible uses post closure could include agriculture and recreation/amenities.
DM OBJ 64	<p>All applications for extractive industry development shall comprehensively address the following criteria as part of a pre-application discussion and/or planning application proposal:</p> <p>Impact on Natura 2000 sites, NHAs, sites of ecological importance, geological or geomorphological heritage features; (Refer to Chapter 8 Cultural Heritage for further information);</p> <p>Impact on groundwater, surface water and important aquifers and compliance with the objectives of the Water Framework Directive (Refer to Chapter 6 for further information on Water Framework Directive).</p> <p>Effective control of emissions and dust;</p> <p>Phasing programme for extraction and rehabilitation;</p> <p>A scheme of rehabilitation and after care for the site upon abandonment / exhaustion of resource. Details to be submitted should include plan and section drawings, detailing the following:</p> <p>Anticipated finished landform and surface/landscape treatments (both of each phase and the whole excavation);</p> <p>Quality and condition of topsoil and overburden;</p> <p>Rehabilitation works proposed;</p> <p>Type and location of any vegetation proposed;</p> <p>Proposed method of funding and delivery of restoration/reinstatement works etc;</p> <p>Please note that provision for sinking funds under the control of the Council may be conditioned to ensure satisfactory reinstatement on completion of extraction, if considered appropriate</p> <p>A planning application shall include a Planning Report which details the planning status and planning history of the quarry;</p> <p>Visual impact of the development, a detailed landscape and visual assessment prepared by a suitably qualified professional (Refer to Volume 3 Book of Maps for Views and Prospects, Appendix 5 Landscape Character Assessment, Appendix 6 Record of Protected Structures, Appendix 10 Protected Views and Prospects for further information.).</p> <p>Impact on existing local communities with regard to but not limited to noise, vibration and subsidence;</p> <p>Contents of the 'Archaeological Code of Practice' (Department of Housing, Local Government and Heritage and Irish Concrete Federation, 2009);</p> <p>The extent of land ownership, nature of the deposits and details of any ancillary processes (such as crushing, concrete manufacture, etc).</p> <p>Proposals for surface water management and flood risk minimisation.</p> <p>Transportation impacts with particular reference to details of all haul routes, trip movements etc (A special contribution may be attached to a grant of permission in accordance with Section 48 of the Planning and Development Act, as amended).</p>

- 6.16. In 2007 the GSI identified 28 County Geological Sites (CGS) in County Meath, which are listed in the Meath County Development plan. These sites will be designated in due course, as Natural Heritage Areas (NHAs), because of their geological interest from a national perspective.
- 6.17. In the meantime, the Council, through the Plan, will safeguard and preserve the geological heritage value of these sites. Development proposals within or potentially impacting County Geological Sites may be referred to the GSI for consultation, as set by heritage protection **HER POL 46** and set out in the Plan.

Receiving Environment

Study Area

- 6.18. 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).
- 6.19. 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.
- 6.20. 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

- 6.21. 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.
- 6.22. The baseline study undertaken here for Land, Soils and Geology, involves a review of published literature and information, existing borehole information (2016) and trial pits (2013) undertaken on adjacent lands, site trial pits (2024) 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.
- 6.23. 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.

- 6.24. 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 Ireland¹ and also the EPA guidelines².
- 6.25. 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).

Sources of Information

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

Land Baseline

- 6.27. Within the EIA EU Directive (2014/52/EU) Land is recognised 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.
- 6.28. 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'.
- 6.29. 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 extension 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.
- 6.30. Agricultural and forestry land use activities may be considered to be tied activities; tied to the resource present at the site while the type/nature of agricultural/forestry activity is also related to the suitability of the soils present.

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).

- 6.31. 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.
- 6.32. 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 operation of the existing pit.
- 6.33. The proposed development will result in a temporary loss of c. 4.2 ha of land across the proposed extension 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 temporary loss of agricultural lands over the extension 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 agricultural after-use.

Land Cover

- 6.34. 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.
- 6.35. 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. There is a mix of land cover types in the vicinity of the site as shown in **Figure 6-1** and includes the land cover types summarised in **Table 6-2** below.

Table 6-2: Corine Land Cover

CORINE Land Cover Code	CORINE Land Cover (Type)	CORINE Land Cover (Detailed Description)
Extension area		
231	Agricultural Areas	Pastures
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
311	Forest and semi-natural areas	Broad leaved forest
313		Mixed Forest
411	Wetlands	Inland marshes
512	Water Bodies	Continental water bodies

- 6.36. The lands in the proposed extension area and in the vicinity of the site were primarily used for pasture in the past but the site and some surrounding lands has been under forestry in recent years.

Soils Baseline

- 6.37. 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.

- 6.38. 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.
- 6.39. 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

- 6.40. 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).
- 6.41. 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.
- 6.42. Summary of soils within the study zone is represented in **Table 6-3** below. The soils at the site are classified as the Rathowen Soil Association.

Table 6-3: Soils within the study area

Great Soil Group	Soil Association	Soil Parent Material	Soil Drainage Description
Site Soils			
Grey Brown Podzolic	Rathowen	Fine loamy drift with limestones	Imperfectly
Study Area Soils			
Brown Earths	Ballincurra	Fine loamy over limestone bedrock	Well
	Broomhill	Fine loamy over sandstone bedrock	Well
	Moord	Fine loamy drift with siliceous stones	Well
Rendzina	Burren	Loamy over limestone bedrock	Well
Grey Brown Podzolic	Elton	Fine loamy drift with limestones	Moderately
	Rathowen	Fine loamy drift with limestones	Imperfectly
Peat	Peat	Peat soils	Poor

- 6.43. Elton and Rathowen Series, from Grey Brown Podzolic Group are encountered as principal soil types across the study zone, see **Figure 6-2**. These soils are considered to be moderately and imperfectly draining.

Site Soils

- 6.44. Based on local trial pit information (2013) from adjacent lands, soil thickness varies up to 0.4m of topsoil overlying a variable thickness of subsoil. This is further confirmed by trial pits carried out over the proposed extension lands in October 2024.
- 6.45. Borehole drilling for groundwater monitoring (2016) confirmed the presence of sand and gravel material to depths of up to c. 11.5m below ground level on adjacent lands to the west of the site. Borehole drilling for groundwater monitoring (2025) has confirmed the presence

of sand and gravel material to depths of up to c. 9-11m below ground level on the application site.

- 6.46. The soils in the proposed extension area and in the vicinity of the site were primarily used for pasture in the past but the soils at the site have been under forestry in recent years.

Subsoils Baseline

National Subsoils

- 6.47. 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.
- 6.48. 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.
- 6.49. The Quaternary deposits in County Meath originated during the last glaciation that impacted Ireland. During the Quaternary mapping, eight primary genetic types of sediment were identified, including:
- **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.
 - **Alluvium:** Sediments deposited by rivers and streams.
 - **Peat:** Organic material accumulated in waterlogged areas.
 - **Head:** Loose, unconsolidated materials that have moved downslope.
 - **Marine deposits:** Sediments that were laid down in a marine environment.
- 6.50. As indicated on **Figure 6-3**, distribution of subsoils in the study area is represented by three main subsoil types:
- Limestone till;
 - Limestone sand and gravels; and
 - Chert Till.
- 6.51. Minor inputs are encountered in form of esker sands and gravels, peat, bedrock at or close to surface, alluvium, manmade ground and lake sediments within the study area.

Site Subsoils

- 6.52. Glacio-fluvial deposits are typically loosely compacted. These deposits are prevalent in Ireland due to the considerable volumes of water generated by the melting ice sheet that covered much of the country at the end of the last glacial period. On geological maps, these

deposits are labelled as "sands and gravels," and they are further classified based on their primary rock type, such as Lower Carboniferous limestone sands and gravels. They give rise to a variety of landforms, including kames, moraines, and occasionally drumlins.

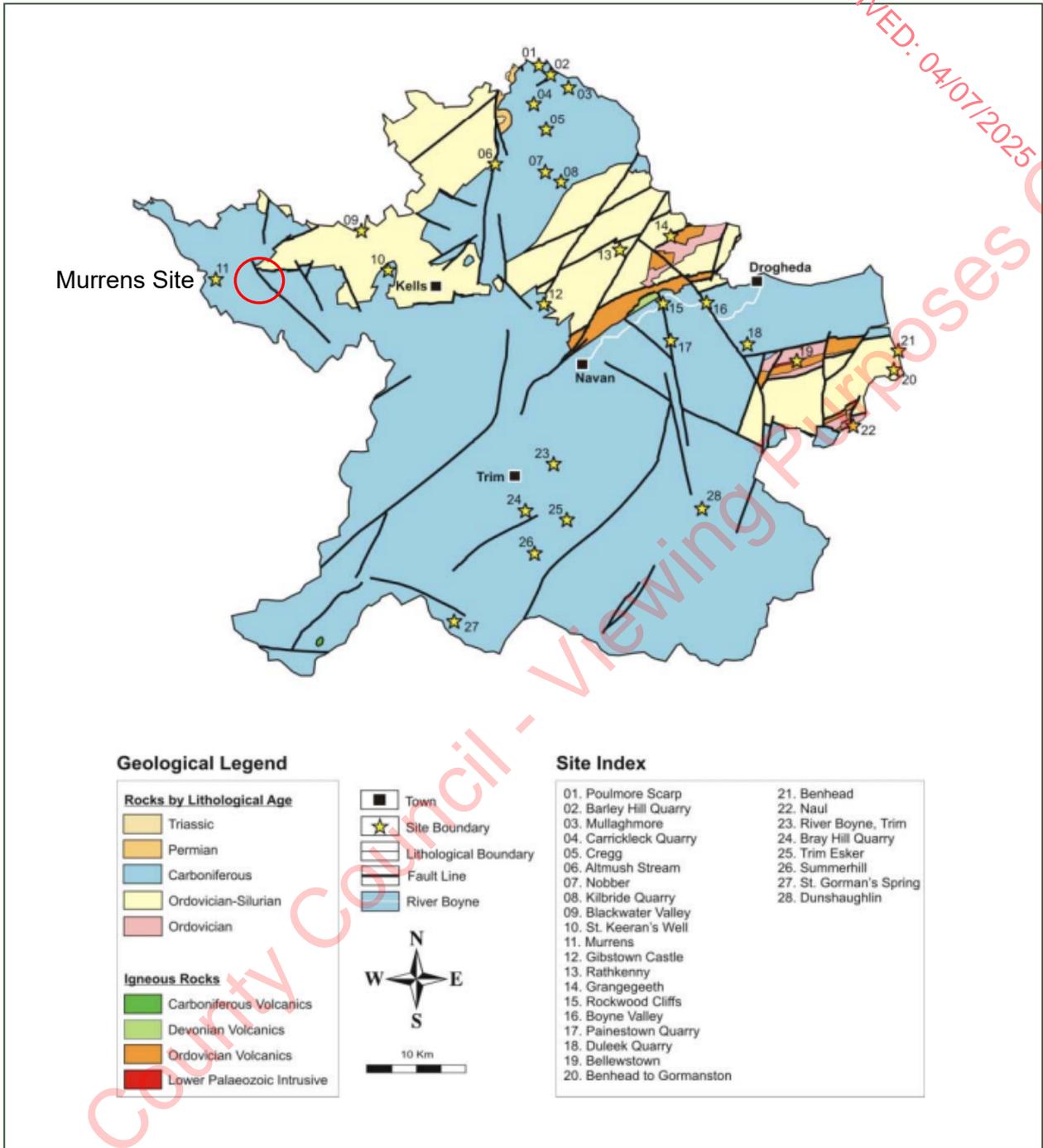
- 6.53. Subsoils in the proposed extension site have been mapped under the IFS project as GLs, limestone sand and gravels, see **Figure 6-3**.
- 6.54. Sands and gravels are widely distributed throughout the county and are particularly abundant in various hummocky regions situated below 120 m in elevation.
- 6.55. Based on previous site investigation data, sand and gravel deposits were encountered in all three 2016 groundwater monitoring boreholes, varying in thickness from 7 m (MH2) - 11.5 m (MH3). Trial pit details also revealed a presence of sand and gravel in all six 2013 trial pits, varying in thickness from 1.6 m (TP3) up to 6.4 m (TP2). In trial pits TP3, TP4 and TP5 between c. 1 m and 2 m of glacial till subsoils were overlying the sand and gravel material at these locations. Borehole drilling for groundwater monitoring (2025) has confirmed the presence of sand and gravel material to depths of up to c. 9-11m below ground level on the application site (MH4 and MH6).
- 6.56. Details of the site investigations undertaken at the site and on adjoining lands are included below in this EIAR Chapter.

Bedrock Geology Baseline

Regional Setting

- 6.57. The Geological Heritage of County Meath Report (GSI, 2007), states that the bedrock in County Meath primarily consists of Lower Carboniferous-aged limestone, see **Plate 6-1** below, which formed approximately 340 million years ago on the continental shelf of a tropical sea. The region experienced both deep marine basins and shallow water environments, leading to deposits of gypsum and mudstone in areas like Kingscourt due to periods of excessive evaporation.
- 6.58. As geological processes advanced, the eroded remnants of the Caledonian mountains were covered by "Old Red Sandstone" deposits, followed by various marine sediments indicating a transgression of shallow seas. Throughout the Carboniferous, deepening water limestone sediments accumulated in basins, characterized by features such as Waulsortian Limestones. Tectonic activity produced a "block and basin" topography, contributing to two key phenomena: the accumulation of economic mineral deposits through dolomitization; and the uplift of Carboniferous rocks during the Variscan Orogeny, which caused significant erosion before the deposition of overlying Permian beds.
- 6.59. Regionally, the proposed site lies in Dinantian Upper Impure Limestone Group of Ireland.
- 6.60. The lands at the application site are underlain by Derravaragh cherty limestones, which are a lithological variation of the Calp Limestone and are silicified thick bedded limestones, with chert nodules and shaly layers. South of Slieve na Calliagh the Calp Limestone is overlain by or passes into the Derravaragh Limestone, see **Figure 6-4**.
- 6.61. There are no bedrock exposures at the site, the closest bedrock outcrop of Derravaragh Formation in study area is encountered approximately 650m in a southeast direction from the southeast extension boundary. It is not proposed to extract or blast any bedrock at the site as part of this planning application.

Plate 6-1: Geology map of County Meath with County Geological Sites³



³ The Geological Heritage of Meath (2007)

Local Geology

- 6.62. An assessment of the local geology at the site has been undertaken here based on review of GSI mapping, existing exposures at the site, walkover surveys of the site, and previous site investigations also undertaken on adjacent lands and at the site.
- 6.63. Geological Survey of Ireland (GSI) 1:100,000 mapping shows the proposed extension site is primarily underlain by the Derravaragh Formation, comprising mostly unfossiliferous dark grey thinly-bedded calcsilicates and wackestones with thin shales, see **Figure 6-4**.
- 6.64. Bedrock lies beneath substantial layers of soil, sand and gravel, with minimal exposure in close proximity to the site. Although no outcrops are documented within the proposed extension site, there are sporadic occurrences of small outcrops, principally within the Derravaragh Formation, to the south, southwest and southeast of the extension area.
- 6.65. Site investigations from 2016 have identified the bedrock, within the south landholding area to the west of the site, at depths ranging from 7 m bgl (Borehole MH2) to 11.5m bgl (Borehole MH3), depending on location and topography. One of six trial pits (2014), Trial Pit TP7, encountered a bedrock at a depth of c. 6m below ground level.
- 6.66. Site investigations from 2025 have identified the bedrock, within the application area, at depths ranging from 11.3 m bgl (Borehole MH4) to 9.4m bgl (Borehole MH6). Borehole MH5 encountered bedrock at a depth of c. 3.5m below ground level, due to this location being within a previously extracted area within the existing pit.

Geological Structure

- 6.67. During the Lower Carboniferous period, a marine transgression took place, leading to the deposition of limestones. These limestones were laid down unconformably over the Lower Palaeozoic rocks. The deposition was highly intricate, featuring local variations that contributed to a lack of lateral continuity, resulting in numerous distinct stratigraphical units within the region.
- 6.68. Approximately 800m east of the extension area, the closest structural feature to the extension area (fault) is encountered as contact between Derravaragh Formation and Lucan Formation, stretching in northwest to southeast direction.
- 6.69. The Derravaragh Formation is bounded by the Lucan (Calp) formation in all directions, except to the northwest where the contact with Viséan Limestones is encountered, see **Figure 6-4**.
- 6.70. The dip of bedding in the wider extension area is indicated as 15 degrees in a southeast direction on GSI 100k bedrock mapping.

Karst

- 6.71. Karst landscapes are shaped by the dissolution of soluble rocks, primarily carbonate rocks like limestone, though they can also form on evaporites like gypsum or siliceous rocks like quartzite. These landscapes are characterized by unique hydrological features and landforms, including sinkholes, caves, enclosed depressions, disappearing streams, and springs.
- 6.72. The development of karst depends on limestone purity and geological structure. Pure bedded limestones are more susceptible to karstification and host the majority of karst features, while impure limestones with interbedded shale layers are less prone due to restricted water movement. Geological factors like bedding, folding, and fracturing create pathways for water to dissolve the rock, though intense deformation can reseal fractures with calcite, limiting karstification. In areas where thick subsoils cover the bedrock, karstified limestone may not exhibit visible surface landforms.

- 6.73. The application site is located within the Eastern Lowlands karst region. According to GSI karst data, this region exhibits notable karstification within the Derravaragh Chert, characterized by active and ancient karst features.
- 6.74. From GSI Derravaragh groundwater body description the key karst features are including springs, swallow holes, caves, enclosed depressions, turloughs, superficial solution features and epikarst (observed variably across the Derravaragh groundwater body). Groundwater tracing indicates rapid flow within karst conduits, with velocities up to 80 m/h (e.g., Lough Lene to Fore springs). These flow paths cross catchment boundaries, demonstrating that karst flow systems may differ significantly from surface water catchments.
- 6.75. Lough Owel and Lough Lene lack significant surface inflows and are predominantly groundwater-fed, implying a regional groundwater flow system sustained by karstified bedrock.
- 6.76. There are in total 68 GSI registered karst landforms and two underground traced connections encountered within the study zone and all of them within the Derravaragh Formation. The closest one to extension area is IE_GSI_Karst_40K_16099 feature, recorded as enclosed depression approximately 180 m in southeast direction. This feature is not field checked by GSI.
- 6.77. Enclosed depressions are the most common karst landforms, channelling rainfall and runoff downward to recharge groundwater. Their sizes vary widely, from a few meters to tens of kilometres in diameter and from a few centimetres to hundreds of meters in depth,

Site Investigations

- 6.78. Three separate site investigations have been undertaken in the immediate vicinity of the site and at the site. The site investigations include:
- Trial Pits on adjacent lands to the west undertaken in 2013/2014;
 - Boreholes on adjacent lands to the west undertaken in 2016; and
 - Trial pits at the site undertaken in 2024 and boreholes at the site undertaken in 2025.

Trial Pit Investigations - 2013

- 6.79. Six trial pits (TP1-TP6) were conducted in the area adjoining to extension area in July 2013 and January 2014. The locations of the trial pits are shown in and **Figure 6-6** and the trial pit logs are included in **Appendix 6-B**.
- 6.80. Summary details of trial pits are represented in **Table 6-4**. The trial pits extended up to a maximum depth of 8 m below ground level and were generally c. 6 m in depth. The trial pits indicated a range of materials including coarse gravelly cobbles and boulders (TP1) to sandy gravel with some cobbles (TP4).
- 6.81. Trial Pit (TP2) encountered glacial till material underlying the sand and gravel material at a depth of 7 m below ground level.
- 6.82. In trial pits TP3, TP4 and TP5 between c. 1 m and 2 m of glacial till subsoils were overlying the sand and gravel material at these locations.
- 6.83. Bedrock was not encountered in the trial pits.

Table 6-4: Summary of 2013 Trial Pits and Geology

ID	Location (ITM)	Ground Elevation (m AOD)	Trial Pit Depth (m bgl)	Topsoil Thickness (m)	Sand & Gravel Thickness (m)
TP1	E:652147 N:774430	137	6	0.3	5.7
TP2	E:651964 N:774431	129	8	0.6	6.4
TP3	E:651714 N:774717	134	3.5	0.4	1.6
TP4	E:651840 N:774496	129	6	0.3	4.9
TP5	E:652008 N:774389	131	5.5	0.3	4.7
TP6	E:652128 N:774672	140	6	0.3	5.7

Trial Pit Investigations - 2014

- 6.84. Trial Pits TP7 to TP12 were conducted by BD Flood in January 2014, see **Figure 6-6**. The trial pits ranged in depth from 3m up to 6.5m in depth. No trial pit logs are available for these trial pits.
- 6.85. The trial pits indicate some sand and gravel material and clayey material. Bedrock was encountered in trial pit TP7 at a depth of c. 6m below ground level.

Borehole Investigation - 2016

- 6.86. Four groundwater monitoring wells (MH1, MH2, MH3 and GW1) were drilled on lands immediately to the west of the application lands during June and July 2016. The locations of the monitoring wells are shown in **Figure 6-6** and the borehole logs are shown in **Appendix 6-C**.
- 6.87. The depth of boreholes ranges from 15 m bgl to 30m bgl and three monitoring wells (MH1, MH2 and MH3) were installed with 50 mm HDPE standpipes to the depths of 21 m bgl (MH1), 24 m bgl (MH2) and 30 m bgl (MH3).
- 6.88. Bedrock was encountered at all four boreholes. The depth to bedrock ranges from 7m bgl at MH2 to 13.5m bgl at GW1.
- 6.89. All boreholes have intersected sand and gravel material in various thickness ranging from 3.5 m to 11.5 m. Summary details of the boreholes are presented in **Table 6-5** below.

Table 6-5: Summary of 2016 groundwater monitoring boreholes

ID	Drillers BH ID	Location (ITM)	BH Depth (m bgl)	Depth to bedrock (m bgl)	Sand/Gravel Interval (m)
MH1	BH1	E651874 N774016	21	14.5	9.6
MH2	BH2	E651708 N774484	27	7	7
MH3	BH3	E652077 N774407	30	11.5	11.5
GW1	BH4	E651079 N 774285	15	13.5	3.5

Site Trial Pit Investigation - 2024

- 6.90. BD Flood undertook a trial pit investigation across the application site in October 2024 comprising a total of 23 trial pits, see **Appendix 6-E** for trial pit locations and summary details.

6.91. The maximum trial pit depth was c. 3.3 m and the majority of the pits identified 'Clean Gravel' to 'Very Clean Gravel' material. The trial pits were recorded and photographed by staff from BD Flood.

Site Borehole Investigation - 2025

6.92. Three boreholes were drilled at the application site in 2025, see **Figure 6-6** for borehole locations and a copy of the logs is included in **Appendix 6-D** and a summary of the logs is shown in **Table 6-6** below.

6.93. Borehole MW5 is located on the floor of the existing pit and therefore only shows c. 2.3m of Sand & Gravel material remaining at this location. Borehole MW4 is located beside the proposed extraction area, see **Figure 6-6** and indicates c. 11m of Sand & Gravel material at this location.

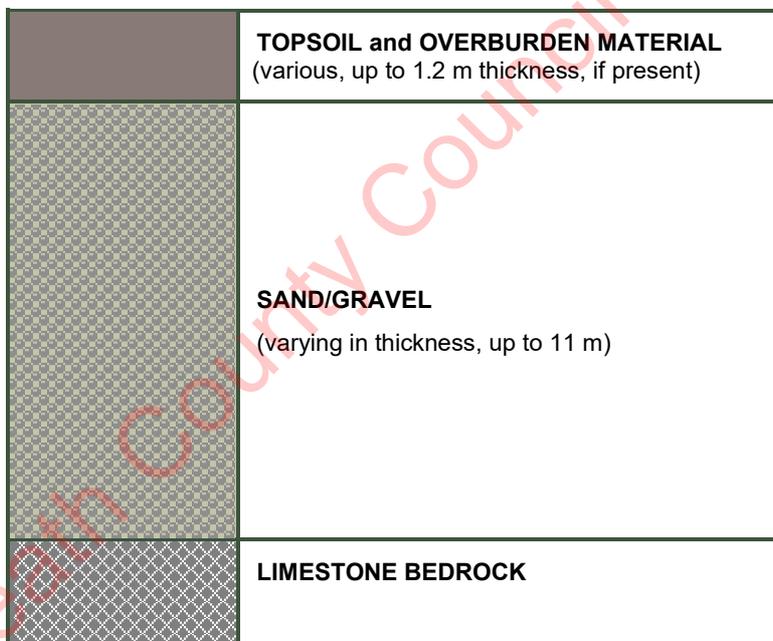
Table 6-6: Summary of 2025 site groundwater monitoring boreholes

ID	Location (ITM)	BH Depth (m bgl)	Depth to bedrock (m bgl)	Sand/Gravel Interval (m)
MW4	E652268 N774153	28	11.3	11
MW5	E652146 N774653	28	3.5	2.3
MW6	E652425 N773900	22	9	7.8

Geological Profile

6.94. Based on the information from the review of published geological information and site investigations the geological profile at the site is summarised below in **Diagram 6-1**.

Diagram 6-1: Schematic Geological profile at the site



Geological Heritage

6.95. The Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme has identified geological heritage sites in Ireland. The IGH programme has identified geological

heritage sites at and within the study area of the proposed extension at the Murrens (www.gsi.ie).

- 6.96. The GSI database indicates that the application site is located within the Murrens County Geological Site (CGS), see **Figure 6-5** and **Appendix 6-F**.
- 6.97. The Murrens CGS is selected under IGH theme IGH 7 - Quaternary. This site is considered to be of very good quality, showing spectacular topography which is unique in Ireland and is of international importance. The esker will be recommended for Natural heritage Area (NHA) designation.
- 6.98. Based on County Geological Site Report, the Annagh Esker system, extending 15 km into Westmeath and features a series of 11 segments forming a striking glacial landscape. The glacial landscape includes an esker created by subglacial river deposits, as well as an ice contact fan and delta system formed by glaciofluvial meltwater, resulting in distinctive hummocky terrain. The site, which also contains the large Murrens Quarry, is of exceptional quality and international importance, with its unique topography set to be designated as an NHA.
- 6.99. Within the study area there are three additional County Geological Sites (CGS) encountered, see **Table 6-7** and **Figure 6-5**.
- 6.100. The CGS site includes the Lough Naneagh proposed Natural Heritage Area (pNHA) which includes the esker ridge feature. The proposed extraction is c. 400 m from the pNHA at its closest point.

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

Site Name:	Finnea-Murrens Esker	Fore Hills	Lough Bane and Lough Glass
County Geological Site Code	WH007	WH008	WH014
Location relative to site	c. 2 km northwest of the north extension area boundary	c. 2 km south of the extension area boundary	c. 2.5 km southeast of extension area boundary
Description	A long, linear series of esker sand and gravel segments deposited under the ice sheet.	A landscape of hills, valleys and lakes, with surface and underground water flow systems.	Two lakes set within a deep glacial valley, impounded by high bedrock cliffs and glacial moraines.
Site Importance	This esker and the associated sands and gravels in the locality seem to be a good example of a deglacial, meltwater-deposited complex, with portions deposited under the ice (esker), and portions at the ice margin (fans).	Fore, is a geologically significant site showcasing pre-glacial karst, crag-and-tail limestone hills revealing past ice flow, and unique hydrogeology where water flows to both the Atlantic and Irish Sea, warranting its recognition as a geological NHA.	This fan feature comprises a fine landform sequence with a complex drainage history. The Lough Bane and Lough Glass SAC (site code 002120) covers the entirety of the site designated here.
Approx. area (ha.)	66	1,254	114

GSI Consultation Response

- 6.101. In response to a consultation request dated the 29th January 2025, regarding the proposed sand and gravel pit extension development, the GSI recommended utilising and referencing their publicly available datasets for the environmental assessment and planning process, see **Appendix 6-A** for copy of GSI consultation response.
- 6.102. This chapter addresses the relevant datasets recommended by the GSI pertaining to land, soils and geology. The GSI response acknowledges that the proposed development is located within the Murrens CGS.
- 6.103. The following possible mitigation measures are suggested in the consultation response from the GSI states that the proposed extraction does not extend to the entire CGS area and that the following mitigation measures are included:
- Allowing access to sand and gravel 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; and
 - Leave representative sections of the sand and gravel faces at the end of the pit 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.
- 6.104. These actions can be included in the restoration plan as planning conditions if deemed appropriate.

Radon

- 6.105. The EPA is responsible for monitoring radon in Ireland any they produced a Radon Risk Map for Ireland. The EPA undertakes continuous Radon monitoring at sites throughout Ireland.
- 6.106. 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, and can cause lung cancer when exposed to high levels over a long period of time.
- 6.107. The site is located in an area of medium risk where the EPA states that 1 in 10 homes are likely to have high Radon levels.
- 6.108. 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 at the site.

Identified Sensitive Receptors

- 6.109. 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; and
 - geological heritage.

Impact Assessment

Evaluation Methodology

6.110. 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

6.111. This assessment therefore will focus on the potential impact of the proposed sand and gravel extraction of the site.

6.112. 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. On cessation of the extraction activities the site will be restored to a mixture of agricultural use and areas left for the promotion of enhanced biodiversity, refer to EIAR Chapter 2 for details of the proposed restoration plan.

6.113. The status and importance of existing land, soil and geology attributes identified at the application site is 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 extension is currently rough scrub and roots following forestry felling at the site. The land is well drained.	The sand & gravel material is of high importance at a regional level for its aggregates. Agricultural land has a value in terms of its ability to support agriculture and it is considered to be of high importance at a local scale.
Soils	The soils at the site are imperfectly drained. The Rathowen Series Association has a relatively wide distribution across the county and therefore is not particularly unique or specific to this site.	The soils are considered to be of moderate importance at a local scale as they are generally imperfectly drained.
Subsoils	The subsoils are sand & gravels derived from limestones. The subsoils do not have any particular status.	The subsoils at the site are considered to be of moderate importance at a local scale as they facilitate the development of well-draining soils and can provide for sand & gravel extraction.
Geology	The bedrock at the site does not have any particular status.	The bedrock geology is of low economic importance. Bedrock material will not be extracted as part of the proposed development.
Geological Heritage	The Murrrens County Geological Site.	The site is of high importance in relation to the proposed development as it is included in the County Development Plan.

6.114. The magnitude of these impacts on the land, soils and geology attributes is assessed in **Table 6-9**, below.

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

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with No Mitigation)
Land	Development of land for the purposes of sand & gravel extraction.	Moderate and site-specific impact due to permanent loss of the sand & gravel resource within the extension area.
Soils	Stripping of soil, with storage and use in final restoration works.	Significant as the structure and quality of the soils could be degraded without mitigation.
Subsoils	Permanent loss of sand & gravel subsoil material from extraction.	Negative and permanent at the site as the material will be removed during the operation of the proposed development.
Geology	No impact. No bedrock will not be extracted at the site.	No impact.
Geological Heritage	Loss of the esker geomorphological features at the CGH designated site.	Any loss of this designated geomorphology would be permanent, and the significance of the impact would be Profound. The quality of impact will be Negative if there is a loss of the geomorphology attribute.

Direct Impacts

- 6.115. The nature of the development will entail the stripping and storage of soil material and the excavation of the underlying sand and gravel material within the proposed extraction area.
- 6.116. There will be a direct impact on the overlying soil which will occur during the stripping and placement of soils to expose the underlying sand and gravel material.
- 6.117. The direct impact on the soils will be medium term during the lifetime of the project as the soils will be reused in restoration. The effect on the soils, without mitigation, will be significant as the structure and nature of the soils could be degraded.
- 6.118. A direct impact will occur from the removal of the existing in situ sand and gravel material deposits within the extraction area. This impact will be negative and permanent at the site as the material will be removed during the operation of the sand & gravel pit. However, this localised site specific impact has to be balanced against the strategic national importance of the pit as a long-term secure supply of high quality sand and gravel material products are required in supporting construction and economic development.
- 6.119. Also, there will be a direct impact on geological heritage. The proposed development will not impact on bedrock geology.

Indirect Impacts

- 6.120. The development will not have an indirect impact on the geological aspects of the environment outside the footprint of the proposed sand and gravel pit extension.
- 6.121. Soils in adjoining lands will not be contaminated as a result of this proposal. The working (extraction and processing) of sand and gravel material at the site will not release any contaminants onto the lands and any dust resulting from the development can be controlled (refer to EIAR Chapter 8 - Air Quality).
- 6.122. The proposed development will not lead to any indirect impacts on bedrock geology.

Cumulative Impacts

- 6.123. The site of the proposed extension is set within an extensive area of existing pits where sand and gravel extraction, processing and aggregate production is an established land use. In this respect, the proposed extension to the existing pit will not result in any substantial increase of the overall permitted extraction footprint in the area as the application provides for an effective swap of the permitted Area 1 (c. 4 ha.) with the proposed Area 2 (c. 4.2 ha.). Furthermore, there will not an increase in aggregate production as the overall aggregate processing activities will remain the same, i.e. there is no increase in output from the overall ancillary activities.
- 6.124. There is an existing adjacent third-party quarry to the north of the proposed extension area which is owned and operated by JJ Flood and covers an area of c. 37.5 ha. The adjacent quarry includes aggregate processing including ancillary activities to facilitate the processing of aggregates.
- 6.125. There is the potential for an adverse cumulative impact on the County Geological Site at the Murrens, however it is considered that given the total area of the GCS, existing extractive land use in the area and the scale of the proposed extension, the cumulative impact is not considered significant.
- 6.126. Given that the extension is relatively small in area compared to the overall extractive operations in the area, it is considered that any cumulative impact will not be significant.

Unplanned Events

- 6.127. Unplanned events within the application site, such as accidents, have the potential to impact on the land, soils and geology adjoining the site.
- 6.128. 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 Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and this will eliminate the potential for unplanned events such as instability of pit faces or instability in adjacent lands.
- 6.129. With the implementation of the SHWW Quarry Regulations 2008, 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

- 6.130. 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

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

‘Do-nothing Scenario’

- 6.132. In a “do nothing scenario”, the proposed extraction and land restoration activities would not proceed at the application site. The existing permitted sand and gravel pit would remain in its current state and the proposed extension area would not progress leaving the mineral resource unused and remaining in-situ at the site. The local supply of quality aggregates

would not be augmented and would become increasingly restricted. The do nothing scenario would not result in any adverse impact on land, soil and geology.

- 6.133. 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.

Mitigation Measures

- 6.134. Mitigation measures are outlined below for the proposed development.

Construction Stage

Soils

- 6.135. Soils will be managed on site in line with best practice. A specific Soil Management Plan will be developed for the site for the stripping, storage and reuse of the soils in restoration at the site.
- 6.136. During the site preparation stage, the topsoil will be stripped off and will be stockpiled on site ready for use in the site restoration. The soils will be stripped and stored in accordance with best practice guidance as set out in The Institute of Quarrying guidelines⁴.
- 6.137. 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.
- 6.138. The scheme will involve progressive soil stripping across the proposed extension area. The soil stripping and storage operations will be undertaken in such a manner so as to minimise soil compaction.
- 6.139. 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.
- 6.140. Initial soils stripped will be stored in screening berms along the site boundary of the proposed extraction area in such a manner that they can be reused in restoration works for the pit. Thereafter soils will be appropriately stored on the pit floor, again for reuse in the restoration works when required.
- 6.141. 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.
- 6.142. 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.

⁴ The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings, 2021.

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 (topsoil, 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. Topsoil 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.
	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 topsoil 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.

Focus area	Steps	Description
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.

6.143. Soil stripping is to be undertaken by the excavator standing on the surface of the topsoil and digging the topsoil 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 (The Institute of Quarrying, 2021)

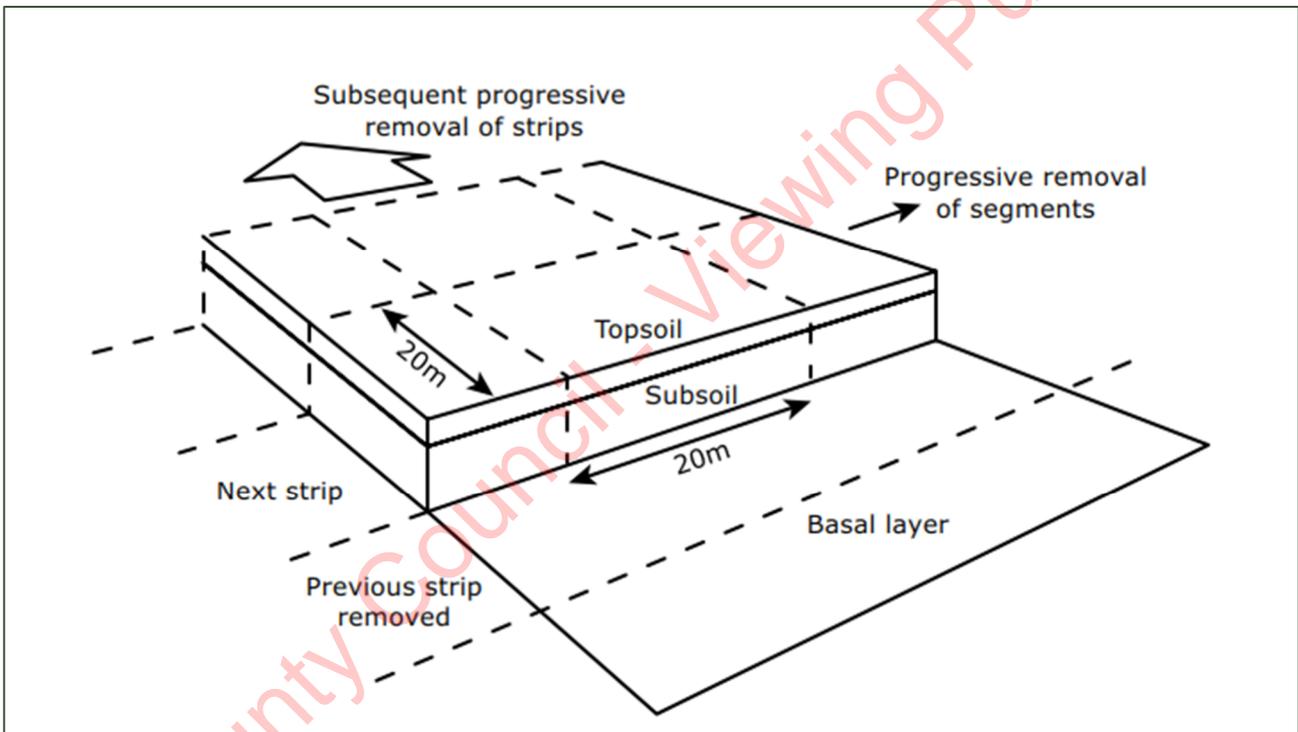
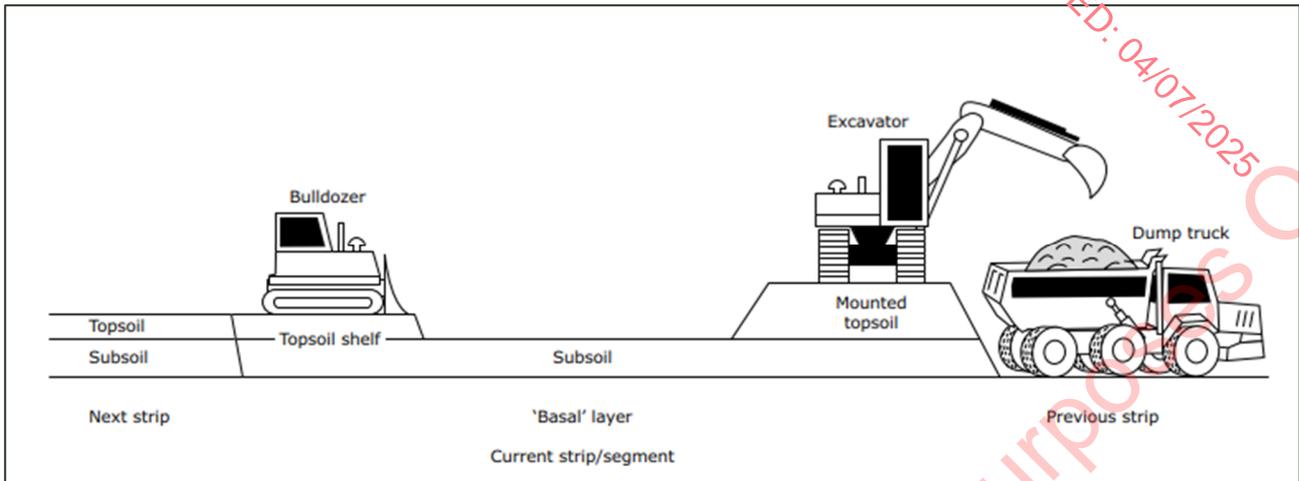


Diagram 6-3: Topsoil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)



- 6.144. Topsoil storage will not exceed 3m in height in order to protect the structure of the soils for use in restoration and any subsoils, if present, will be stored at a maximum height of 5 m.
- 6.145. 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 topsoil material. This is also an economically prudent practice.

Subsoils

- 6.146. Sand and gravel material will be extracted, processed and used for aggregates locally and regionally.

Geology

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

Geological Heritage

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

Operational Stage

- 6.149. The design of the extraction area has provided suitable set-back distances to adjoining land boundaries and the final pit slopes during the operational and post-operational stages are designed to ensure long term stability.
- 6.150. Operations at the proposed development site will comply with the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 to ensure stability of the adjoining lands.
- 6.151. In terms of geological heritage, subject to prior agreement and appropriate H&S requirements for working at the site, scientists or competent geologists will be provided access to pit faces during operations to study new stratigraphy's and morphology.

Post-Operational Stage (Final Restoration)

- 6.152. On cessation of extraction the land within the extraction area will be restored to agricultural use with areas left for enhanced biodiversity. The final restored pit slopes will be designed to ensure long-term stability.
- 6.153. A number of sections of the pit faces will be retained to allow the investigation of the stratigraphy.

Residual Impacts

- 6.154. The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.
- 6.155. With the proposed mitigation measures in place at the site it is considered that there will be no significant residual impacts associated with the proposed development.
- 6.156. The stripped soils at the proposed development will be retained on site and used in the restoration of the site to agricultural use. With this mitigation measure in place, it is considered that the residual impact on soils will be low to imperceptible and will not be significant.
- 6.157. The residual impact on the County Geological Site with the above mitigation measures in place as agreed with the GSI is considered to be low and will not be significant.
- 6.158. 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 Safety Health and Welfare at Work (Quarries) Regulations 2008 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 be negligible.

Monitoring

- 6.159. 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 restored final pit faces are stable, refer to EIAR Chapter 2 - Project Description.

References

- Geological Survey of Ireland (2007)**, 1:100,000 Bedrock Geology of Ireland (Digital-Map).
- Institute of Geologists of Ireland (2013)**, Geology in Environmental Impact Statements.
- Teagasc (2004)**, Ireland Subsoil Parent Materials Map (digital version).
- Creamer, R. & O'Sullivan, L., (2018)** The Soils of Ireland
- EPA Report No. 130 (2014)**, Irish Soil Information System Synthesis Report.
- Meath Groundwater Protection Scheme Report (2018)**, GSI
- The Geological Heritage of Meath (2007)**, Aaron Clarke, Matthew Parkes and Sarah Gatley
- EPA (2008)**, Irish Soil Information System Final Technical Report 10.
- EPA and Teagasc (2015)**, Irish Soil Information System Final Technical Report 10.
- Geological Survey of Ireland Bedrock Geology Sheet 12 (1:100,000)**.
- The Institute of Quarrying** Good Practice Guide for Handling Soils in Mineral Workings, (2021).
- Meath County Development Plan 2021 - 2027**.

Figures

Figure 6-1: Land Cover Map (1:50,000)

Figure 6-2: National Soils Map (1:50,000)

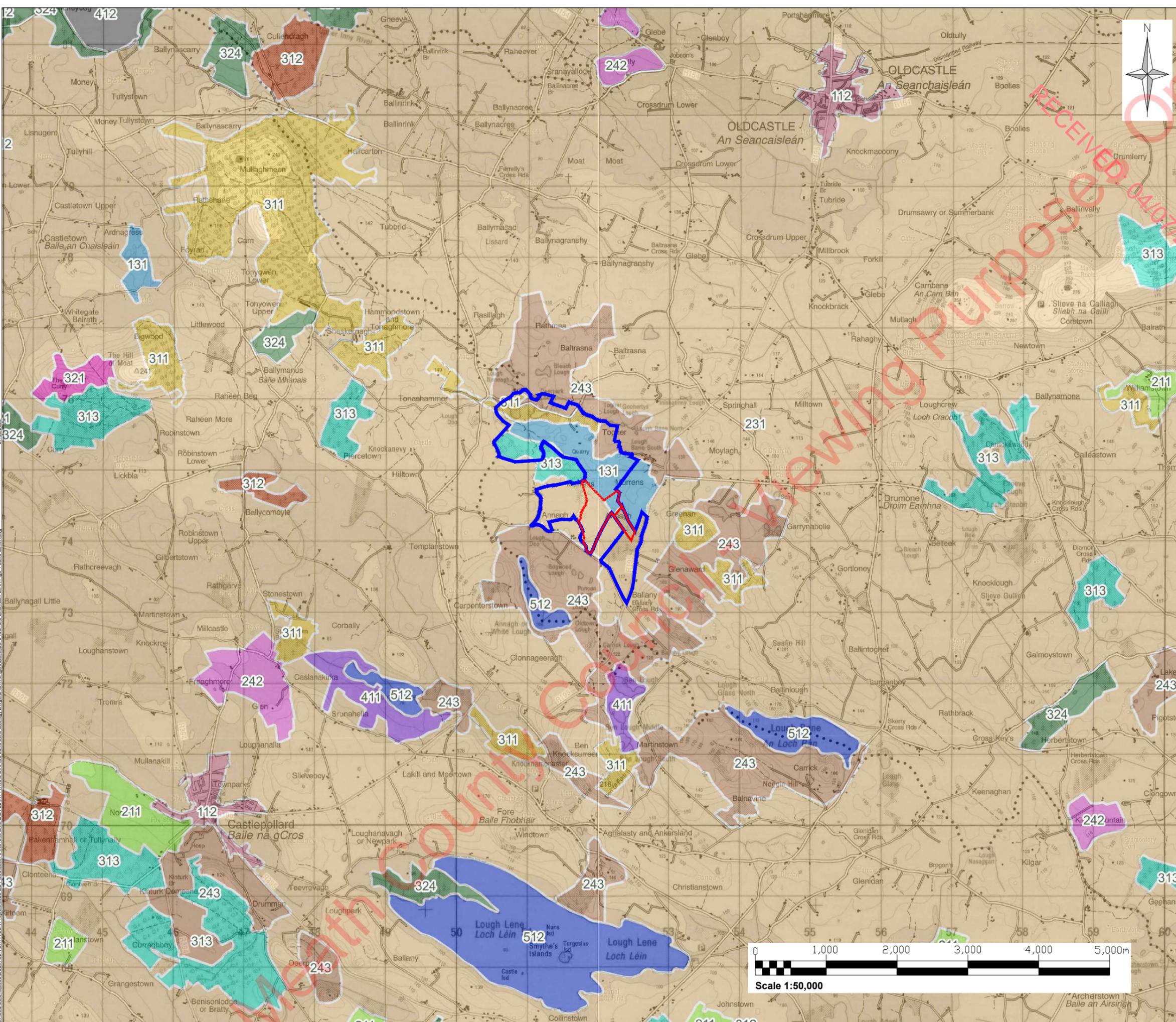
Figure 6-3: National Subsoils Map (1:50,000)

Figure 6-4: Bedrock Geology Map (1:50,000)

Figure 6-5: County Geological Sites

Figure 6-6: Site Investigation Locations

RECEIVED: 04/07/2025
Meath County Council - Viewing Purposes Only!



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

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

- Corine Land Cover:**
- 112 Discontinuous Urban Fabric
 - 131 Mineral Extraction Site
 - 211 Non-irrigated Arable Land
 - 231 Pastures
 - 242 Complex Cultivation Patterns
 - 243 Land Principally Occupied By Agriculture
 - 311 Broad-leaved Forest
 - 312 Coniferous Forest
 - 313 Mixed Forest
 - 321 Natural Grassland
 - 324 Transitional Woodland-shrub
 - 411 Inland Marsh
 - 412 Pete Bog
 - 512 Water Body

Rev	Amendments	Date	By	Chk	Auth



Client
 BD Flood Unlimited Company

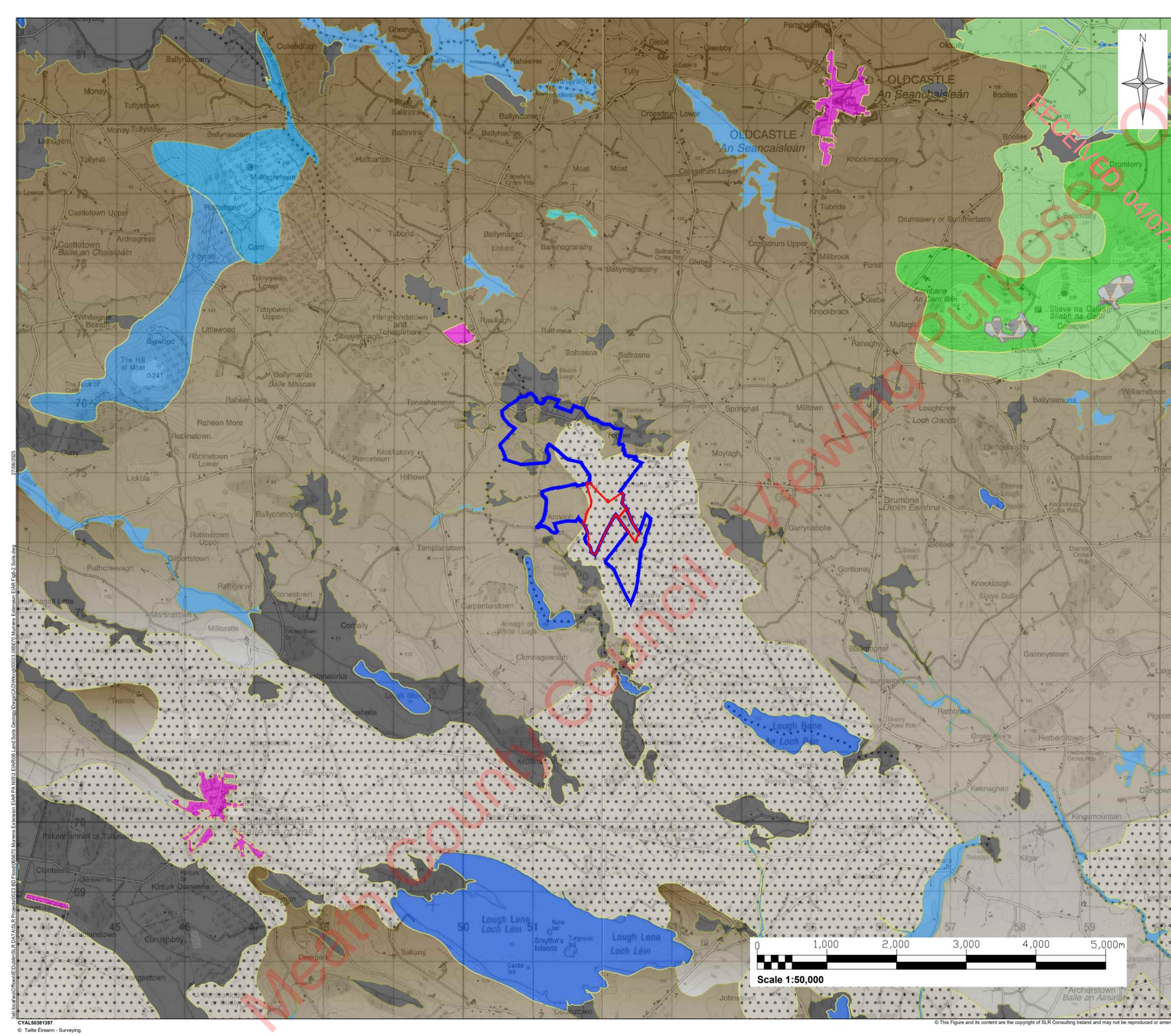
Project
 Sand & Gravel Pit Extension
 The Murrens, Oldcastle, Co. Meath

Figure Title
 Corine Land Cover Map

Scale 1:50,000 @ A3		SLR Project No. 501.065670.00001	
Designed smcd	Drawn smcd	Checked lh	Authorised lh
Date 01/25	Date 01/25	Date 03/25	Date 03/25

Figure Number
 Figure 6-1





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

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

- National Soils Associations:**
- Ballincurra
 - Broomhill
 - Burren
 - Elton
 - Lake
 - Moord
 - Peat
 - Rathowen
 - River
 - Rock
 - Urban
 - Water body

Rev	Amendments	Date	By	Chk	Auth



Client
 BD Flood Unlimited Company

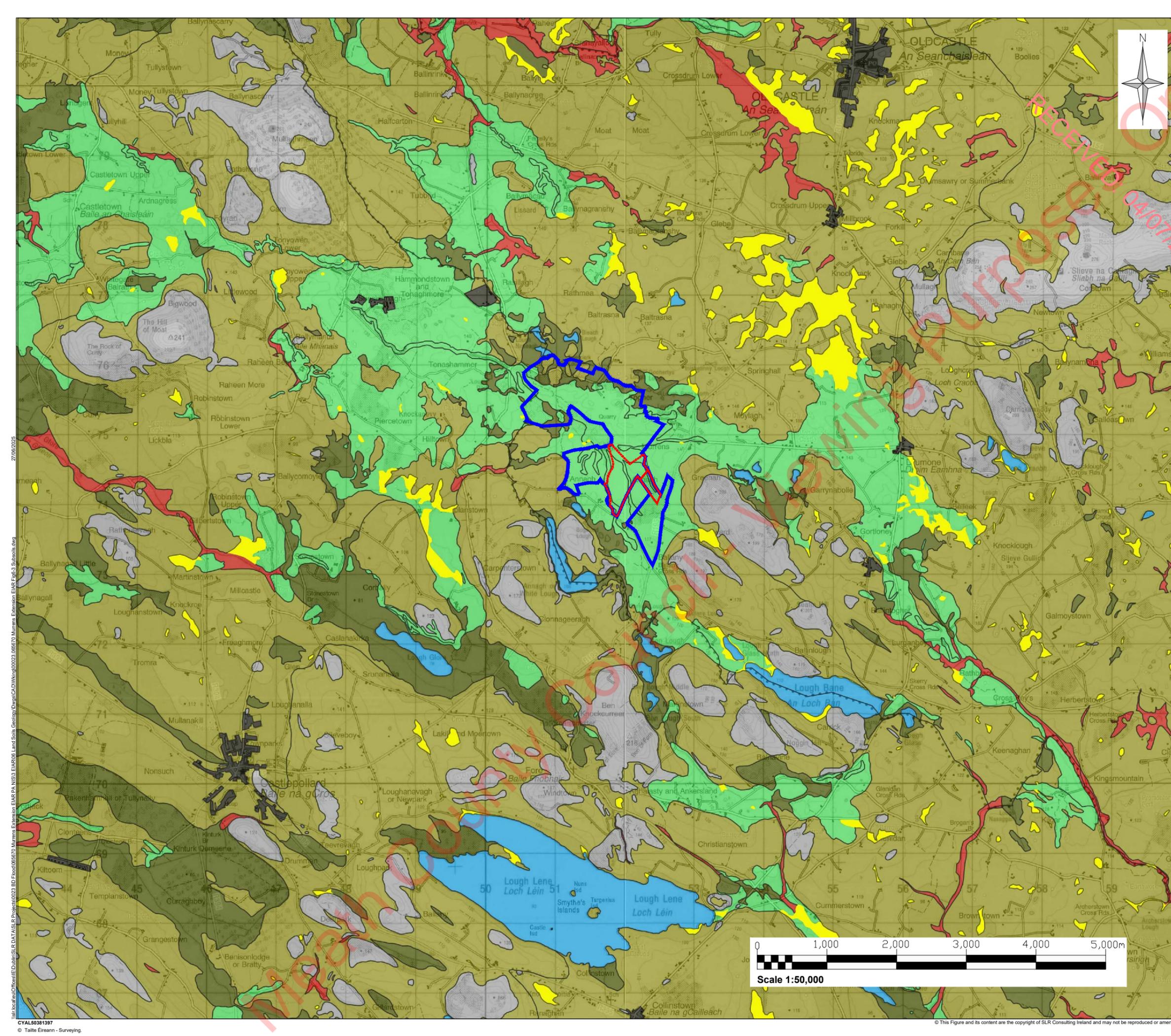
Project
 Sand & Gravel Pit Extension
 The Murrens, Oldcastle, Co. Meath

Figure Title
 National Soils Map

Scale 1:50,000	@ A3	SLR Project No. 501.065670.00001
Designed smcd	Drawn smcd	Checked lh
Date 01/25	Date 01/25	Date 03/25
		Date 03/25

Figure Number
Figure 6-2





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

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

- National Subsoils**
- Bedrock at surface
 - Concreted or artificial surface
 - Till sediment deposited by or from glacier ice
 - Alluvium: post glacial sand and gravel deposit
 - Peat
 - Sand and gravel deposited by glaciers
 - Sediments deposited into glacial lakes
 - Water

Rev	Amendments	Date	By	Chk	Auth



Client
BD Flood Unlimited Company

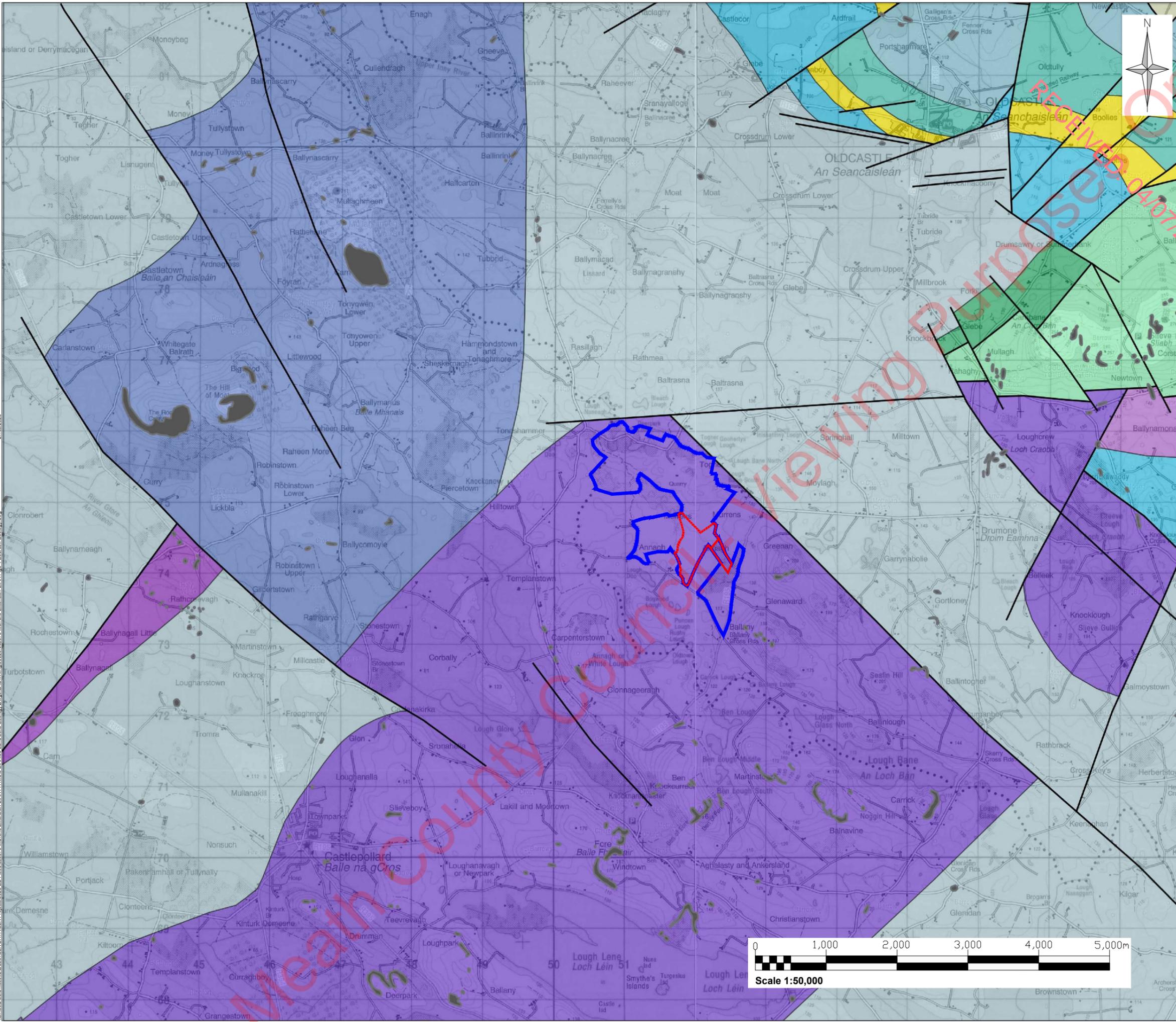
Project
Sand & Gravel Pit Extension
The Murrens, Oldcastle, Co. Meath

Figure Title
Subsoils Map

Scale 1:50,000	@ A3	SLR Project No. 501.065670.00001
Designed smcd	Drawn smcd	Checked lh
Date 01/25	Date 01/25	Date 03/25
		Date 03/25

Figure Number
Figure 6-3





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

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

- Bedrock Outcrop
- GSI Bedrock 100K:**
 - Ballysteen Formation
 - Castlerahan Formation
 - Clontail Formation
 - Derravaragh Cherts
 - Lucan Formation
 - Meath Formation
 - Moathill Formation
 - Mudbank limestone
 - Navan Beds
 - Stackallan Member
 - Visean Limestones (undifferentiated)
 - Waulsortian Limestones

Rev	Amendments	Date	By	Chk	Auth



www.slrconsulting.com

Client
 BD Flood Unlimited Company

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

Figure Title
 Bedrock Geology Sites

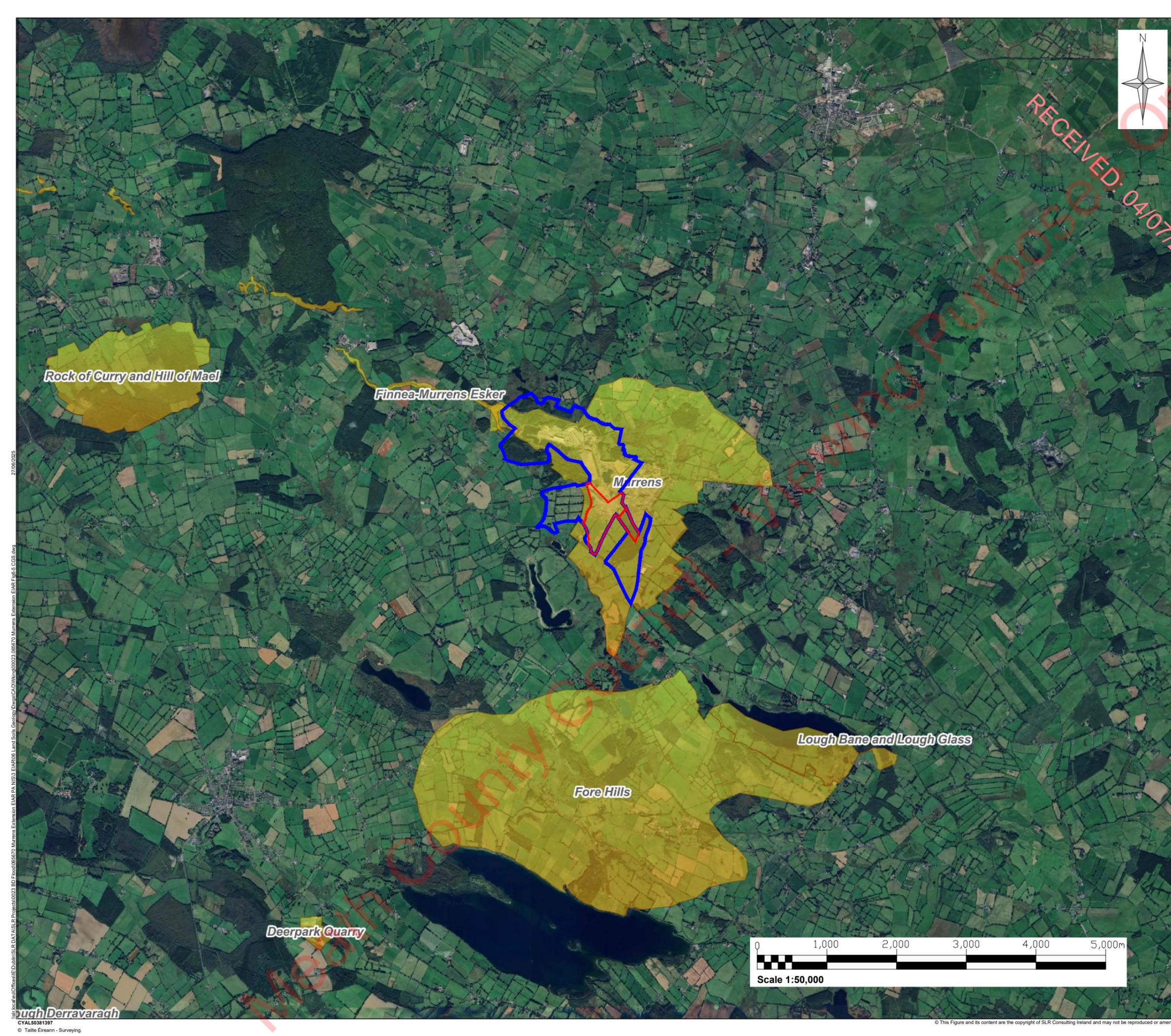
Scale: 1:50,000 @ A3 SLR Project No. 501.065670.00001

Designed smcd	Drawn smcd	Checked lh	Authorised lh
------------------	---------------	---------------	------------------

Date 01/25	Date 01/25	Date 03/25	Date 03/25
---------------	---------------	---------------	---------------

Figure Number **Figure 6-4** Rev.





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

- Legend:**
-  Landholding
 -  Planning Application Area (c. 5.8 hectares)
 -  Planning Permission Area P. Ref. KA/141129
 -  GSI Geological Heritage Sites

RECEIVED: 04/07/2025

27/06/2025
 \\slr-local\office\IE\Dublin\SLR\DATA\SLR\Projects\0223 BD Flood\065670 Murrens Extension\ELAR Figs\5 CGSS.dwg
 27/06/2025
 \\slr-local\office\IE\Dublin\SLR\DATA\SLR\Projects\0223 BD Flood\065670 Murrens Extension\ELAR Figs\5 CGSS.dwg

Rev	Amendments	Date	By	Chk	Auth



www.slrconsulting.com

Client
 BD Flood Unlimited Company

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

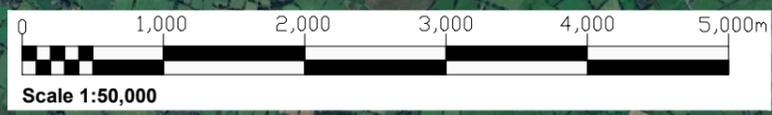
Figure Title
 County Geological Sites

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

Designed smcd	Drawn smcd	Checked lh	Authorised lh
------------------	---------------	---------------	------------------

Date 01/25	Date 01/25	Date 03/25	Date 03/25
---------------	---------------	---------------	---------------

Figure Number
 Figure 6-5



Lough Derravaragh