Appendix XVI

Site Specific Soils and Geology Report (including ground investigation report) – prepared by Ciaran Reilly & Associates

Kilmannock 110kV substation

Site Specific Soils & Geology Report

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Note on status flags and revision codes:

Status	Description	Revision Code
Work in Progress (Non-Contractual)		
S0	Work In Progress	P01.01, etc
Shared (Non-Contractual)		
S1	Suitable for Coordination. The file is available to be 'shared' and used by other disciplines as a background for their information.	P01, P02, etc
S2	Suitable for Information	P01, P02, etc
S3	Suitable for Internal Review and Comment	P01, P02, etc
S4	Suitable for Construction Approval	P01, P02, etc
S6	Suitable for PIM Authorisation (Stages 2a, 2b and 3)	P01, P02, etc
S7	Suitable for PIM Authorisation (Stages 4 and 5)	P01, P02, etc
WIP to Published Unauthorized and (Non-contractual) use at risk.		
D1	Suitable for Costing	P01, P02, etc
D2	Suitable for Tender	P01, P02, etc
D3	Suitable for Contractor Design	P01, P02, etc
D4	Suitable for Manufacture / Procurement	P01, P02, etc
Published (Contractual)		
A1, A2, A3, etc	Approved and accepted as stage complete (C= Contractual/Complete)	C01, C02, etc
B1, B2, B3, etc.	Partially signed-off: with minor comments from the Client. All minor comments should be indicated by the insertion of a cloud and a statement of 'in abeyance' until the comment is resolved, then re-submitted for full authorization.	P01.01, etc
Published for AIM Acceptance		
CR	As Construction Record documentation, PDF, Models etc	C01, C02, etc

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1 Introduction

1.1 Background & Objectives

Ciaran Reilly & Associates has been instructed by Entrust Planning & Environmental, on behalf of Kilmannock Battery Energy Storage Ltd, to carry out an assessment of the likely effects on the land, soil and geological aspects of a proposed electricity substation and underground cabling works in the townland of Greatisland in Co. Wexford.

This report provides an assessment of the likely effects of the proposed development (110kV substation, underground cable connection to the existing power station and associated works) on the land, soil and geological environment. The assessment provides a description of the baseline environmental setting of the proposed development in terms of land, soils and geology and identifies the likely and significant effects that the construction, operation and decommissioning of the proposed development will have on them. Where required, appropriate mitigation measures to limit any identified effects to land, soils and geology are recommended. The residual effects of the proposed development post-mitigation are also assessed.

1.2 Development Description

The proposed development is for an electrical installation that can generally be described as consisting of a 110kV electrical substation and underground grid connection that would connect the proposed substation to an existing Eirgrid substation within the SSE Power Station at Great Island. For the purposes of planning validation, the proposed development will be described as:

> Construction of an electrical infrastructure installation and associated underground grid connection (UGC) on lands within the townland of Great Island measuring approximately 2.58Ha./25812 square metres in overall area. The installation would consist of a 110kV tailfed substation and underground grid connection measuring approximately 838m in overall length. The 110kV substation would consist of a 110kV transformer; house transformer; disconnect, individual current and voltage transformers, combined current/voltage transformer, surge arrestors; circuit breakers and cable sealing end; a blastwall measuring 8.00m in overall height; 4no. lightning masts measuring 18.00m in overall height; palisade fencing measuring 2.60m in overall height; pole-mounted security cameras and lamp posts. An Eirgrid substation building with an overall footprint of approximately 180.00sqm and overall height of 4.20m would be located at the western end of the substation area. An IPP substation with an overall footprint of 132sqm and height of overall 4.20m would be located at the eastern end. The typical UGC installation would consist of standard ESB ducting details of the following 1no. trench (0.82m wide; 1.31m deep) measuring approximately 838m in overall length to carry 3no. 160mm

power ducts and 2no. communication ducts and an ECC duct, connecting the proposed substation to an existing 110kV Eirgrid substation at Great Island. The typical trefoil trench will need to be adapted to a flat formation to accommodate for any service crossings encountered along the route. A typical width of trench for a flat formation trench would be approx. 1.60m with varying depths. A temporary construction compound would be constructed within the site boundary for construction phase of the development, after which it would be removed.

The application site "the Site", which measures 2.58Ha. in overall area and is greenfield, is situated approximately 12.60 kilometres (kms) south of New Ross Town and lies wholly within the townland of Great Island, being located directly east of the SSE Great Island Power Station and north of the Greenlink UK-Ireland Interconnector converter station currently undergoing construction. The village of Campile is approximately 3.1kms east of the Site, as the crow flies. The Site is located in a rural and sparsely populated area. There are no RPS or NIAH sites located within the proposed development site or immediately adjacent to it. The closest structure on the RPS is Kilmokea House, RPS ref. WCC0882 and it is located c. 1.5km to the north of the subject site. The Barrow Bridge (NIAH 12404401) located approximately 0.6km west of the existing energy plant is considered to be of national importance and has been identified as an important component of the built heritage of south County Wexford and Kilkenny.

The Site slopes from South to north, where the existing highest level of +22m ASL is in the south-west of the Site and lowest level of +5m ASL in the north-east of site. The Site is characterised as rough grassland with encroachment of brambles and scrub, bounded by hedgerows on the northern and eastern boundaries. Access to Site from L4033 (entrance road to Great Island Power Station) is shared with Greenlink Interconnector Station, past the Siemens temporary construction compound.

The purpose of the proposed development is to construction electrical plant in the form of a substation capable of to an existing Eirgrid substation on the electrical transmission system. A battery energy storage system "BESS" to be built would provide fast frequency capacity to the grid whilst reducing the need for conventional back up generation. In a pre-app consultation (ABP-318011-23) with An Bord Pleanála it was considered the BESS does not constitute Strategic Infrastructure Development and cannot form part of the proposal.

The 110kV substation, measuring 0.3Ha in overall area, would be sited at ground level of 16.00m ASL and would consist of the following infrastructure: 110kV transformer; House transformer; Disconnect; Individual current and voltage transformers; Combined current/voltage transformer; Surge arrestors; Circuit breakers; Cable sealing end; 4no. lightning masts measuring 18.00m in overall height. 2no. substations (Eirgrid and IPP) would be included in the substation, each building having an overall height of 4.20m. A blastwall measuring 8.00m in

overall height located on the eastern side of 110kV transformer, between transformer and IPP substation. Ancillary development to the main substation infrastructure would include palisade fencing measuring 2.60m in overall height, polemounted security cameras and lamp posts.

The underground grid connection would serve to connect an existing Eirgrid 110kV substation at the SSE Great Island Power Station to the proposed substation. Measuring approximately 838.00m in overall length. The connection would consist of 1 no. typical trefoil trench measuring approximately 0.82m wide and 1.31m m deep to house 3no. power ducts, 2no. communications ducts and 1 ecc duct. A precast communications chamber measuring approximately 1.30m in length, 1.03m in width and 1.20m in height would be installed outside both substations. The UGC would be wholly on private land.

The application will be supported by the following documents:

- Planning Statement
- Archaeology & Cultural Heritage Report;
- Ecology (Appropriate Assessment Screening and EcIA)
- Flood Risk Assessment;
- Environmental Noise Assessment;
- Landscape & Visual Impact Assessment;
- Landscaping Plan;
- Construction and Environmental Management Plan;
- Transport Management Plan;
- Air Quality Assessment
- Climate Report;
- Population and Human Health;
- COMAH Site Screening (Seveso 2022 designation) - SSE Generation Ltd. Great Island Power Station is notified to the HSA as a lower tier COMAH establishment.

In October 2023 an application was made to Wexford County Council for development generally described as a 38kV substation, 38kV BESS (consisting of 16no. battery units), 38kV underground grid connection and associated ancillary development. The application (LPA Ref. 23) was validated on October 27th, 2023.

1.3 Statement of Authority

Ciaran Reilly & Associates is a specialist geotechnical practice delivering a range of consultancy services to the private and public sectors across Ireland and the UK. Ciaran Reilly & Associates was established in 2016 and is based in Mullingar, Co. Westmeath.

This Site Specific Soils and Geology report was prepared by Ciaran Reilly & Joanna Church.

Ciaran Reilly (BE, PhD, PGDip, CEng, MIEI, Registered Ground Engineering Specialist (UK RoGEP)) is a Geotechnical Engineer with over 15 years' experience in civil and geotechnical engineering consultancy, contracting, and research. He worked for several years in industry before completing his PhD in Trinity College Dublin in 2014. Since then, he has undertaken a diverse range of environmental impact assessment and engineering design projects as senior engineer and more recently as director of Ciaran Reilly & Associates.

Joanna Church (BEng (Hons), CEng, MIEI) is a Civil Engineer with over 30 years' experience in the engineering industry. Her background has been extensive and varied, principally in geotechnical engineering consultancy work. Her experience includes preliminary design, detailed design and site supervision of both large and small civil engineering projects with responsibilities involving project management; design management; staff management; contract documentation production; project procurement; supervision of site-based activities; and quality assurance of construction materials and procedures.

1.4 Relevant Legislation

This Site Specific Soils and Geology report has been prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken of the requirements of the following legislation:

- S.I. No. 296 of 2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001-2018;
- S.I. No. 30 of 2000 the Planning and Development Act, 2000 as amended; and
- S.I. No. 4 of 1995: The Heritage Act 1995, as amended.

1.5 Relevant Guidance

This report has been prepared in accordance with guidance contained in the following documents:

- Environmental Protection Agency (2017): Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Institute of Geologists of Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment; and,

- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017).
- Wexford County Development Plan 2022 – 2028.

2 Methodology

2.1 Desk Study

A desk study of the proposed development, and its environs, was largely completed in advance of undertaking the walkover survey (see below). The desk study involved collecting all relevant land and geological information for the proposed development site. Data sources included:

- Environmental Protection Agency database (www.epa.ie).
- Geological Survey Ireland - Groundwater Database (www.gsi.ie).
- Bedrock Geology 1:100,000 Scale Map Series. Geological Survey Ireland (GSI, 1999).
- Geological Survey Ireland – 1:25,000 Field Mapping Sheets.
- General Soil Map of Ireland 2nd edition (www.epa.ie).
- Ground Check Ltd Ground Investigation Report, Kilmannock BESS, April 2023 (job ref: 23-3182), attached as Appendix A.

2.2 Baseline Monitoring & Site Investigations

A walkover survey was carried out on 13 September 2023. The site was found to be covered in grass, brambles and scrub. The site is bounded by the railway, hedgerows and a few trees to the north and hedgerows to the east. The Greenlink substation, founded on a reinforced wall / bund, is located to the south. Access to the proposed site and the Greenlink substation road is to the west. Cable infrastructure is proposed along the Greenlink substation road and across greenfield land to the ESB power station.

A ground investigation for the proposed development was carried out by Ground Check Ltd in March / April 2023 (ref 23-3182). The investigation comprised 4 nr rotary core boreholes to between 7.0m and 9.0m depth. The resulting report is attached as Appendix A for ease of reference.

2.3 Impact Assessment Methodology

Using information from the desk study, walkover, data from the ground investigations, and the proposed outline construction methodology, an estimation of the importance of the land, soil and geological environments within the study area has been assessed using the criteria set out in Table 1.

Table 2 – Estimation of Importance of Soil & Geology Attributes (NRA 2009)

Importance	Criteria	Typical Example
Very high	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource.
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes. Geological feature of high value on a local scale (County Geological Site). Well drained and/or high fertility soils. Moderately sized existing quarry or pit. Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed Wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

The statutory criteria for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this report are those set out in the EPA's (2017) description of effects. In addition, the two impact characteristics proximity and probability are described for each impact and these are defined in Table 2.

Table 2 – Description of Effects

Impact Characteristic	Degree / Nature	Description
Type of Effect	Direct	An impact which occurs within the area of the proposed development, as a direct result of the proposed works.
	Indirect	Impacts on the environment, which are not a direct result of the proposed development, often produced away from the proposed site or due to a complex pathway.
Probability	Likely	The effects that can reasonably be expected to occur because of the proposed development if all mitigation measures are properly implemented.
	Unlikely	The effects that can reasonably be expected not to occur because of the planned development if all mitigation measures are properly implemented.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in Table 3.

Table 3 – Impact Descriptors

Significance	Description
Profound	An effect which obliterates sensitive characteristics.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
Significant	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Imperceptible	An effect capable of measurement but without significant consequences.

3 Description of the Existing Environment

3.1 Site Location & Description

The proposed development site is located approximately 3km to the west of Campile in County Wexford. The site lies within the townland of Greatisland.

The proposed substation and cable infrastructure is to be located in an area of agricultural land adjacent to the existing power station. The topography of the site is sloping down from southwest to northeast with elevation levels ranging between 22mOD and 5mOD.

As noted previously, the proposed development includes the following:

- A substation compound, of approximately 2.58 hectares.
- Underground cable connection of approximately 840m between the substation and Great Island 110kV substation.

Ordnance Survey historic mapping shows that the area has undergone little in the way of change over the years. Alterations in the immediate vicinity of the proposed development is restricted to construction of the railway to the north of the site around 1906, construction of the ESB power station in 1963, and construction of the Greenlink substation to the immediate south of the proposed site beginning in September 2022 (ongoing).

The drainage and hydrology of the site area is described in detail in the site-specific flood risk assessment and Construction Environmental Management Plan (CEMP) by IE Consulting Ltd.

3.2 Subsoil Geology

The quaternary geology of the site has been mapped by Geological Survey Ireland (GSI). The GSI mapping shows the lithology over the site as bedrock outcrop or subcrop. A map of the local subsoils is shown in Figure 1.

Figure 1 - Quaternary geology (GSI, 2016 & Google background map)

Four rotary core boreholes to between 7.0m and 9.0m depth were drilled for the ground investigation of the site. Borehole locations are shown in Figure 2. The boreholes identified glacial deposits of stiff gravelly, sandy silt with cobbles and boulders overlying bedrock described as strong to very strong, moderately to slightly weathered rhyolite. Bedrock was encountered at between 1.8m and 3.5m depth. No groundwater was encountered during the investigation.

3.3 Bedrock Geology

Based on the GSI bedrock map of the area, the bedrock unit underlying the proposed substation site is the Campile Formation, which is described as rhyolitic volcanics, grey and brown slates and felsic volcanics. A structural linework feature is shown adjacent to the east of the proposed development area. The bedrock geology map is shown in Figure 3.

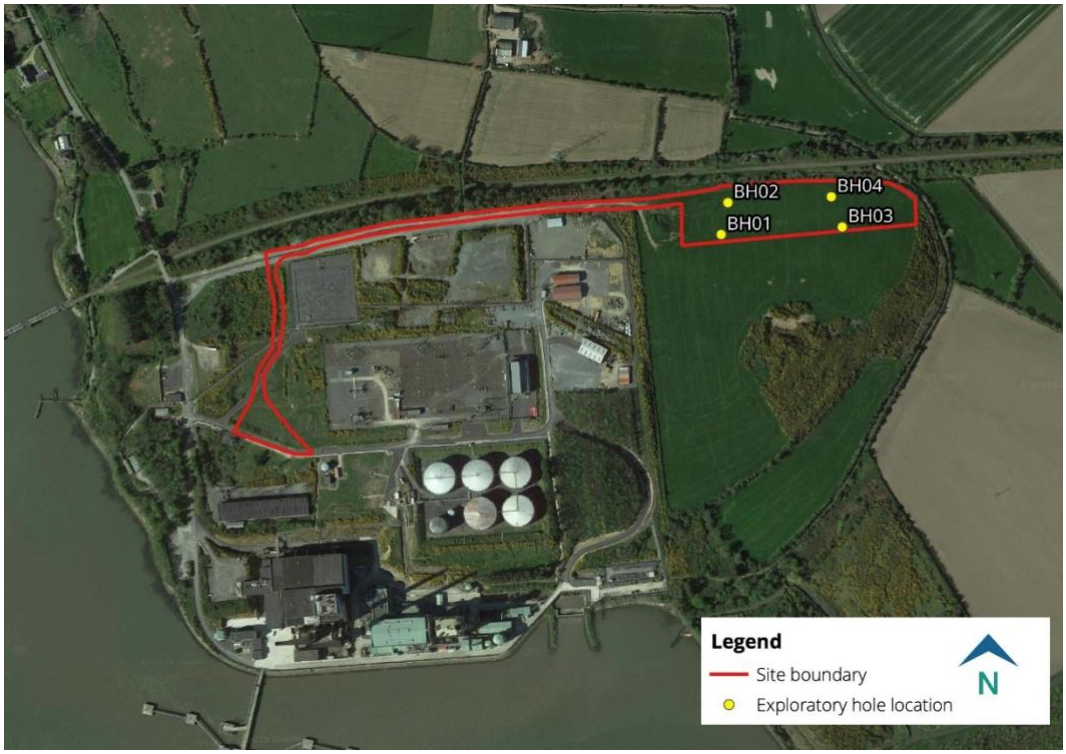


Figure 2 – Ground Investigation borehole locations (Google background map)

Figure 3 - Bedrock geology (GSI, 2018 & Google background map)

3.4 Geological Resource Importance

The GSI aquifer mapping indicates that the bedrock aquifer beneath the proposed development can be classified as a regionally important aquifer – fissured. The felsic volcanics of the Campile Foundation are expected to be the more important water bearing structures. Groundwater vulnerability is classed as category X – rock at or near surface or karst.

A number of historic wells, from the 1830s and 1890s, are noted outside the boundaries, but within 3km, of the proposed site.

The groundwater vulnerability map is shown in Figure 4 and the Great Island bedrock aquifer is shown in Figure 5.

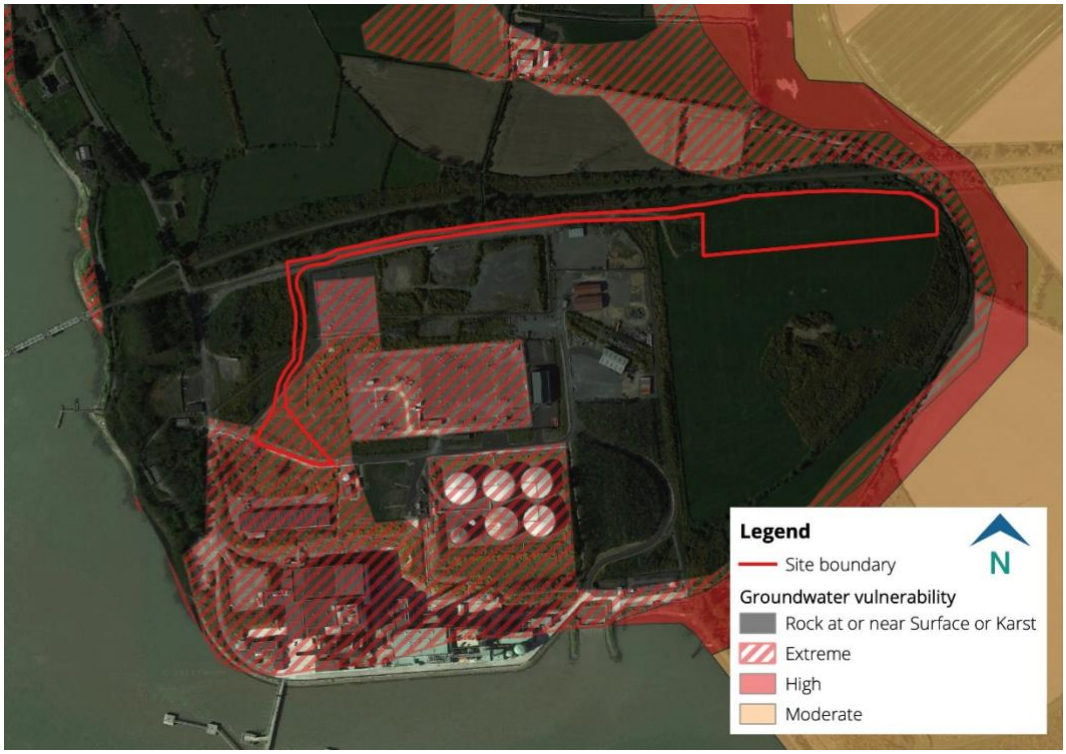


Figure 4 - Groundwater vulnerability (GSI, 2016 & Google background map)

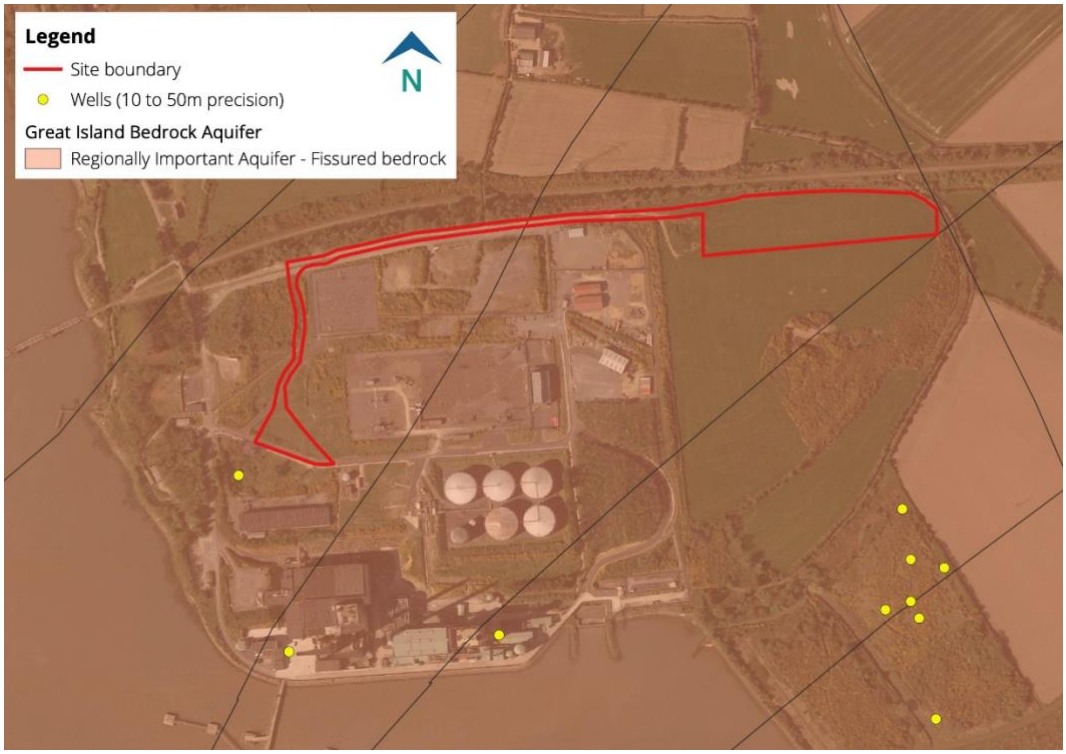


Figure 5 – Bedrock aquifer & wells (GSI, 2014 & Google background map)

3.5 Geological Heritage & Designated Sites

A number of mapped mineral localities are shown to be within 3km of the proposed development area, as follows: shale deposits approximately 2.6km to the west; igneous rock approximately 2.6km to the southeast; and iron, quartz, chlorite and slate approximately 2.7km to the south. There are no GSI recorded geological heritage sites noted within vicinity of the proposed development area.

3.6 Ground movements

The landslide susceptibility map, Figure 6, shows areas within the proposed site boundaries to be at moderately high risk for landslides. No landslide events are noted within the proposed development area. There are no GSI recorded karst features noted within vicinity of the proposed development area.

Figure 6 – Landslide susceptibility

4 Description of Likely Effects

4.1 Characteristics of the Proposed Development

The proposed development comprises construction of a new 110kV substation and its connection, via underground cables, to the Great Island substation.

The construction process will include the following:

- Vegetation clearance and levelling of the site.
- Construction of site entrances and new access tracks throughout the site.
- Establishment of temporary site facilities including site offices, car parking, storage areas, etc.
- Excavation of topsoil and subsoils from the substation compound area, including drainage control, and placement of suitable materials up to proposed levels.
- Construction of 110kV substation and surrounding infrastructure.
- Installation of underground cabling to the Great Island substation including approximately 500m of trenching existing access roads and approximately 340m along agricultural land.
- Installation of site security fencing.

Excavation for various components of the development is estimated to be as follows:

- Substation: approximately 12,400m^3 of topsoil / subsoils.
- Underground cables along access roads: approximately 550m^3 of Made Ground (road construction materials).
- Underground cables within agricultural land: approximately 380m^3 of subsoils / topsoil.

In total, it is estimated that all of subsoils will be excavated and reused for reinstatement where required. It is proposed and any surplus material will be transported off site to an appropriate authorised facility.

It is estimated that all Made Ground (road construction materials) will be excavated and reused for the reinstatement of the existing access roads. It is proposed and any surplus material will be transported off site to an appropriate authorised facility.

4.2 “Do Nothing” Impacts

If the proposed development is not constructed, the site will continue to be used as agricultural land and there will be no alteration to the land, soil or geological environment.

4.3 Construction Phase

4.3.1 Excavation of Topsoil / Subsoil / Made Ground

Excavation of topsoil and subsoil will be required during construction of the substation, particularly for site levelling and the installation of stable building foundations. This will result in the permanent removal of subsoils at excavation locations. The subsoil excavation effect is summarised below.

Attribute	Description
Receptor	Subsoil
Pathway / Mechanism	Excavation, extraction
Potential impact	Negative, slight/moderate, direct, likely, permanent effect on subsoil

Excavation of Made Ground (road construction material) will be required during construction of the underground cable grid connection to the Great Island substation. The Made Ground will be reinstated within the cable trenches. The Made Ground excavation effect is summarised below.

Attribute	Description
Receptor	Made Ground
Pathway / Mechanism	Excavation, extraction
Potential impact	Neutral, not significant, indirect, likely, temporary effect on road materials

4.3.2 Contamination of Soil by Leakages & Spillages & Alteration of Soil Geochemistry

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk. The accumulation of spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, flora and fauna and is persistent in the environment. Large spills have the potential to result in significant effects on the geological and water environment. The soil contamination effect is summarised below.

Attribute	Description
Receptor	Topsoil and subsoil
Pathway / Mechanism	Topsoil and subsoil pore space
Potential impact	Negative, significant, direct, unlikely, short-term

4.3.3 Erosion of Exposed Soil and Subsoil

Exposure of soil and subsoils at excavation locations may increase the likelihood for soil erosion resulting in a direct physical effect on the land and soil environment. The exposed soil erosion effect is summarised below.

Attribute	Description
Receptor	Topsoil and subsoil
Pathway / Mechanism	Vehicle movement, surface water erosion, wind action
Potential impact	Negative, slight, direct, likely temporary effect on topsoil and subsoil

4.4 Operational Phase

Very few likely direct effects are envisaged during the operational phase of the proposed development. These may include, as follows:

- The use of construction vehicles or plant may be necessary for maintenance which could result in minor accidental leaks or spills of fuel/oil.
- The transformer in the substation is oil cooled. There is a risk for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater.

Indirect effects during the operational phase may include importation of granular materials to maintain access tracks which place intermittent minor demand on local quarries.

4.5 Decommissioning Phase

The proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, decommissioning phase effects will not occur.

5 Mitigation & Monitoring

5.1 Construction Phase

5.1.1 Excavation of Topsoil / Subsoil / Made Ground

The excavation of soil, subsoil and bedrock will have a direct effect on the geological environment and no specific mitigation measures are proposed. The excavation of materials will be completed in accordance with best practice for the management and treatment of such materials. Topsoil shall be stockpiled carefully for reuse and not stored in stockpiles greater than 2m in height.

5.1.2 Contamination of Soil by Leakages & Spillages & Alteration of Soil Geochemistry

Mitigation measures, discussed in detail in the site-specific Construction Environmental Management Plan, will include but are not limited to the following:

- Minimum maintenance of construction vehicles and plant will take place on site during the works, with the majority occurring offsite.
- On site re-fuelling will be undertaken using a double skinned bowser with spill kits available for accidental leakages or spillages.
- Oils and fuels will not be stored on site and will be stored in an appropriately bunded area within the temporary storage compound.
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.
- An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.

5.1.3 Erosion of Exposed Soil and Subsoil

Mitigation measures will include the following:

- Excavated soil will be side cast and stored temporarily adjacent to excavation areas for use during reinstatement and landscaping.
- Silt fences will be installed around all temporary stockpiles and excavated areas to limit movement of entrained sediment in surface water runoff.
- In order to minimise runoff during the construction phase, works will not take place during periods of intense or prolonged rainfall (to prevent increased silt laden runoff). Drainage systems will be implemented to limit runoff effects during the construction phase.
- Bog mats will be used, as necessary, to support construction plant and machinery on soft ground, thus reducing the likelihood for soil and subsoil erosion and avoiding the formation of rutted areas. This will substantially reduce the likelihood for surface water ponding to occur.
- Reinstatement, landscaping, and drainage control will be implemented after excavation activities.

5.2 Operational Phase

Following the completion of construction activities and the reseeding of exposed soil as a result of excavations, it is assessed that due to the absence of likely soil erosion effects, no mitigation measures are required during the operational phase.

Oil used in transformers and other electrical apparatus and storage of hydrocarbons could result in leakages during the operational phase and result in effects of soil and subsoils. The buildings where oils are to be stored will be bunded appropriately to prevent leakage of chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and appropriate oil interceptor.

There will be no requirement for significant excavation subsoils during the operational phase so no significant effects on the land, soils and geology are anticipated.

5.3 Decommissioning Phase

The proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, no decommissioning phase mitigation measures are required.

6 Residual Effects

6.1 Construction Phase

6.1.1 Excavation of Topsoil / Peat / Subsoil

The residual impact on the land, soil and geological environment is the disturbance and relocation of approximately 12,740m^3 of subsoils and 550m^3 of Made Ground (road construction materials) during construction. The subsoil and Made Ground which will be removed during the construction phase will be localised to the infrastructure footprint. No likely significant effects on the geological environment are likely to arise from these excavations. The residual impact, therefore, is considered to be negative, slight, direct, likely, temporary effect on subsoils and Made Ground.

No significant residual effects on soils, subsoils or bedrock are anticipated.

6.1.2 Contamination of Soil by Leakages & Spillages & Alteration of Soil Geochemistry

The residual impact is considered to be negative, direct, imperceptible, short-term, unlikely.

No significant residual effects on soils, subsoils or bedrock are anticipated.

6.1.3 Erosion of Exposed Soil and Subsoil

The residual impact is considered to be negative, direct, slight, likely, medium probability effects.

No significant residual effects on soils, subsoils or bedrock are anticipated.

6.2 Operational Phase

No significant residual effects are assessed as likely to occur during the operational phase of the project.

6.3 Decommissioning Phase

The proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, residual decommissioning phase effects will not occur.

7 Assessment of Likely Health Effects

The likelihood of health effects arises mainly through the potential for soil and ground contamination. A substation and underground grid connection are not a recognised source of land or soil pollution and so the potential for effects to health due to soil or ground contamination are negligible.

Hydrocarbons will be used onsite during construction, however the volumes will be small and will be handled and stored in accordance with best practice mitigation measures. As a result, the likely residual impacts associated with soil or ground contamination and subsequent health effects are negligible.

8 "Worst Case" Effects

"Worst case" effects are considered to be localised contamination of soils and subsoils during the construction phase due to fuel / oils leaks and spillages. The "worst case" effects are not expected to be significant.

9 Cumulative Effects

Due to the localised nature of the proposed construction works which will be kept within the proposed project boundaries, there is no potential for significant cumulative effects on land, soils and geology in combination with other local developments.

The assessment shows that significant effects are unlikely to arise due to the localised and near surface nature of the construction works and the absence of likely significant effects during the operation and decommissioning phases of the proposed development.

It is therefore concluded that there is no likelihood for significant cumulative effects, arising from the entire proposed development, with any existing, permitted or proposed development on land, soils and geology. All effects relating to the proposed development are assessed to be direct and contained within the immediate vicinity of the proposed development and it is assessed that there is no pathway for the development to act in combination with other projects.

10 Summary

The baseline site geology for the proposed project has been characterised using ground investigation data. Near surface materials have been identified as tills of stiff gravelly, sandy silt with cobbles and boulders overlying bedrock. Bedrock, described as strong to very strong, moderately to slightly weathered rhyolite, was encountered at between 1.8m and 3.5m depth. No groundwater was encountered during the investigation.

The proposed development comprises a 110kV substation, underground cable grid connection to Great Island substation and associated works.

Excavations will be required for site levelling and for the installation of foundations for the substation, access tracks and underground cabling. This will result in a permanent removal of subsoils and Made Ground (road construction materials) at excavation locations. The estimated volume of materials to be excavated is 13,330m^3. Excavated subsoils and Made Ground will be used for reinstatement and landscaping works. Where excess material arises, this will be transported off site to an appropriate authorised facility.

This assessment has determined that the proposed development will not result in any likely significant effects on the land, soil and geology of the site.

Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Measures to prevent topsoil and subsoil erosion during excavation and reinstatement will be undertaken to ensure that any effects are negligible and imperceptible.

There will be no cumulative impacts on the land, soils and geology environment as a result of the proposed development.

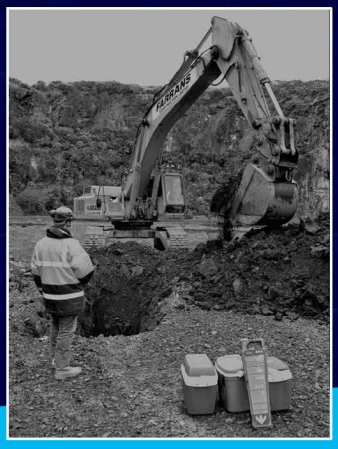
Appendix A – Ground investigation

GroundCheck
SITE INVESTIGATION SPECIALISTS

KILMANNOCK BESS,
KILMANNOCK,
COUNTY WEXFORD

GROUND INVESTIGATION REPORT

CLIENT: TLI
JOB REF: 23-3182
ISSUED: April 2023




CONTENTS

1.0 INTRODUCTION

1.1 Terms of Reference

Ground Check Ltd was commissioned by TLI, to undertake a ground investigation for Kilmannock battery energy storage system (BESS), Kilmannock, County Wexford. The location of the site is shown by Figure 1.

1.2 Method

The ground investigation was undertaken in accordance with the guidelines set-out in BS5930 Code of Practice for Site Investigations, 4th Edition (2015); UK Specification for Ground Investigation, 2nd edition (2011); BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006) and related standards. The scope of works comprised of the following elements:

- **Exploratory Holes**

  The locations of exploratory holes are shown by Figure 2 and logs and rock core photographs are included in Appendix A:

  - ***Rotary Drilling:*** Four boreholes were sunk using a Comacchio MC305 rig equipped with 150mm Symmetrix casing and tools.
  - ***Rotary Core Drilling:*** Follow-on rotary core drilling was undertaken in the base of boreholes BH01-04 after penetrating the bedrock surface, when intact specimens of rock were recovered using a T2 86 core barrel with double liner.

- **Sampling & In-situ Testing**

  - ***Disturbed samples:*** comprising ~1kg of soil sealed in a grip-seal polythene bag were recovered at intervals shown on the exploratory hole logs; generally being taken at 1m depth increments and from each stratum.
  - ***Bulk samples:*** comprising ~10kg of soil sealed in heavy gauge plastic sacks were recovered at intervals shown on the exploratory hole logs.
  - ***Standard Penetration Tests (SPT):*** were undertaken at intervals shown on the borehole logs; where the tests were conducted in accordance with BS1377:1990 Code of Practice: Methods of Test for Soils for Engineering Purposes - Part 9 In-Situ Tests.

- **Geotechnical Laboratory Testing**

  Selected soi and rock core samples were scheduled for the following laboratory tests, which were conducted in accordance with procedures outlined in BS1377. Test results are included in Appendix B:

  - Moisture Content
  - Particle Size Distribution
  - Point Load

2.0 SITE DESCRIPTION

The borehole investigation was undertaken to inform the design of Kilmannock battery energy storage system (BESS) located at Great Island, County Wexford. The site is centred over ITM Grid Co-ordinates E669220 N615105, where it is bounded by a railway cutting to the north, agricultural lands to the east, Great Island Power Station to the west and Greenlink Convertor Station to the south. Plate 1 provides an aerial overview of the site.

Plate 1: Overview of Site

3.0 GROUND CONDITIONS

3.1 Geology

The geological maps of the area indicate the Site is underlain at shallow depth by Igneous rocks assigned to the Campile Formation which comprises of rhyolitic / felsic volcanics.

3.2 Ground Investigation

The findings of the ground investigation are listed in Table 1 and summarised below:

- **Made Ground:** not encountered.
- **Glacial Deposits:** subsoils of possible glacial origin were encountered at shallow depth, and were composed of layers of; stiff, light greyish brown to reddish brown, gravelly, sandy, slightly clayey silt with cobbles and occasional boulders; and dense, greyish brown to reddish brown, silty, very gravelly, fine to coarse sand with cobbles and occasional boulders.
- **Bedrock:** Strata characteristic of the Campile Formation was encountered at depths ranging from 1.8 to 3.5m, and was described from intact core specimens as being composed of; strong / very strong, light grey, stained light orange-brown, fine to medium crystalline, moderately to slightly weathered rhyolite.

3.3 Groundwater

No groundwater strikes were encountered during drilling, where boreholes were recorded as dry on completion. It should be noted, however, that as groundwater levels and inflow rates may vary seasonally and relative to rainfall intensity, the reported short-term observations should be verified by the excavation of inspection pits prior to commencement of construction work.

Table 1: Ground Conditions Summary

Exploratory Hole Reference	Completion Depth (m)	Stratum Base Depth (m)			Bedrock Top (m)
		Made Ground	Recent Deposits	Glacial Deposits	
BH01	7.0	-	-	1.8	1.8
BH02	7.0	-	-	1.8	1.8
BH03	9.0	-	-	3.5	3.5
BH04	8.5	-	-	3.2	3.2

4.0 BEARING CAPACITY ASSESSMENT

4.1 Foundations

The foundation requirements would depend on the final ground levels and design loadings of the proposed structures. The following general advice relates to existing ground levels.

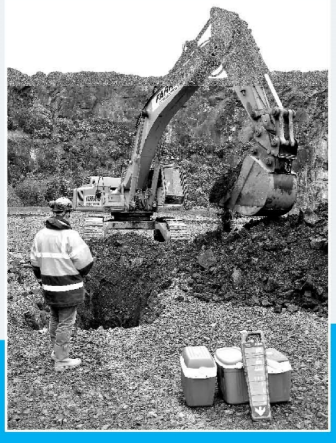
- **Base Foundations:** The investigation indicates that the use of shallow foundations based within the glacial deposits / upon bedrock would be suitable, where provisional foundation depths and estimated allowable bearing capacity values are indicated in Table 2. These values are based on a presumed maximum settlement of 25mm, which reflects the conventional serviceability limit that is adopted for most structures.

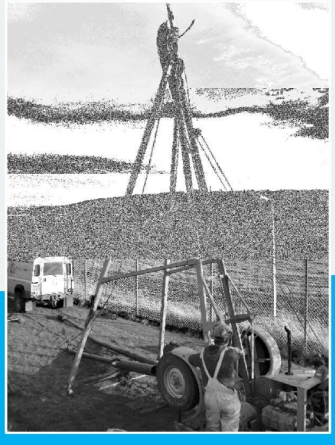
  In areas where it is necessary to extend the depth of footings below 1m depth consideration could be given to the use of trench fill method; where lean mix concrete would be used as backfill below the level of the structural footings. If necessary, foundation trenches should be excavated in short lengths or provided with temporary support under conditions of marginal stability, which should be evaluated by the excavation of additional inspection pits prior to commencement of construction work on site. Slight inflows of groundwater may be encountered locally in excavations which may necessitate pumping from sumps excavated in the base of the trench.

Table 2: Provisional Foundation Depths & Estimated Allowable Bearing Capacity

Exploratory Hole Location	Provisional Foundation Depth (m)	Estimated Allowable Bearing Capacity (kPa)	Temporary Works
BH01	1.0 2.0	150* 1000†	Trial pits should be opened prior to commencement of construction works on site. If necessary, trenches should either be opened in short, bayed sections, or installed with temporary shoring as trench support where sidewalls are unstable. Note: * Bearing Strata – Stiff gravelly SILT † Bearing Strata – Bedrock
BH02	1.0 2.0	150* 1000†	
BH03	1.0 2.0 3.5	150* 200* 1000†	
BH04	1.0 2.0 3.5	150* 200* 1000†	

Figures



GroundCheck
SITE INVESTIGATION SPECIALISTS

Drawing Title

Figure 1 - Site Location

Project ID

23-3182

Project Title

Kilmannock BESS Site

Project Location

Kilmannock, County Wexford

Scale: 1:10000

N

Legend Key

Locations By Type - RC

Project Bounds - Project Bounds

GroundCheck
SITE INVESTIGATION SPECIALISTS

Drawing Title

Figure 2 - Site Plan

Project ID

23-3182

Project Title

Kilmannock BESS Site

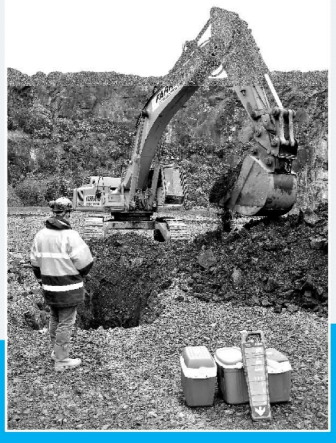
Project Location

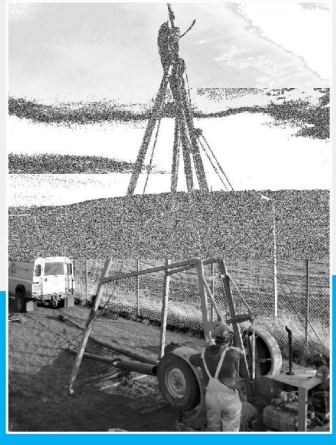
Kilmannock, County Wexford

Scale: 1:1500

Appendix A:

Borehole Logs and Rock Core Photographs



GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH01**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
22/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669145	615087

Date Finish:	Logged By:	Site Location:	Elevation:
22/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
									[TOPSOIL]		0.10	
									Stiff, light greyish brown to reddish brown, gravelly, sandy, slightly clayey SILT with cobbles and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-angular. [GLACIAL?]			
D: 0.5m												
D: 1.0m										1.0		
SPT: 1.2m	50 (25 for 125mm/50 for 50mm)								*Boulder*			
											1.80	
C: 2.0-3.0m D: 2.0m									Light grey, fine to medium crystalline RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]	2.0	2.00	
		2.0-3.0 100%	2.0-3.0 65%	2.0-3.0 56%	2.00-3.00 (6)				Very strong, light grey, stained light orange brown from 6-7m, fine to medium crystalline, fresh RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]			
									1) Joint - Close to medium spaced, dipping 60°, planer, rough, slightly open, fresh with strong iron staining.			
									2) Joint - Sub-vertical, dipping 80°, planar, slightly open, fresh with strong iron staining. From 3.5-4.3, 6.3-6.6 & 6.8-7.0.			
C: 3.0-4.0m										3.0		
		3.0-4.0 100%	3.0-4.0 60%	3.0-4.0 26%	3.00-4.00 (8)							
C: 4.0-5.0m										4.0		
		4.0-5.0 100%	4.0-5.0 25%	4.0-5.0 20%	4.00-5.00 (12)							
C: 5.0-6.0m										5.0		
		5.0-6.0 100%	5.0-6.0 70%	5.0-6.0 56%	5.00-6.00 (6)							
C: 6.0-7.0m										6.0		

Continued on Next Page

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00		DRY	22/03/2023 16:30	0.00	1.20	Obstruction time - Hand dug inspection pit.			

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH01**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
22/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669145	615087

Date Finish:	Logged By:	Site Location:	Elevation:
22/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
		6.0-7.0 100%	6.0-7.0 17%	6.0-7.0 0%	6.00-7.00 (9)				Very strong, light grey, stained light orange brown from 6-7m, fine to medium crystalline, fresh RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]			
									End of Borehole at 7.00m	7.0	7.00	
										8.0		
										9.0		
										10.0		
										11.0		
										12.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00		DRY	22/03/2023 16:30						

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

Borehole Number	Box Number	Depth (m)
BH-01	01	2.0 to 5.0m

Borehole Number	Box Number	Depth (m)
BH-01	02	5.0 to 7.0m

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH02**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
23/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669153	615125

Date Finish:	Logged By:	Site Location:	Elevation:
23/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
									[TOPSOIL]		0.10	
D: 0.5m									Stiff, light greyish brown to reddish brown, gravelly, sandy, slightly clayey SILT with cobbles and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-angular. [GLACIAL?]			
D: 1.0m										1.0		
SPT: 1.2m	N=28 (7,4/9,8,6,5)											
											1.80	
SPT: 2.0m C: 2.0-5.0m D: 2.0m	56 (7,9/56 for 154mm)								Light grey, fine to medium crystalline RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]	2.0	2.00	
		2.0-5.0 63%	2.0-5.0 0%	2.0-5.0 0%	2.00-5.00 (NI/NR)				Strong to very strong, light grey, stained light orange brown, fine to medium crystalline, moderately to slightly weathered RHYOLITE - Core non-intact2-5m & 6.2-7m. [CAMPILE FORMATION RHYOLITIC VOLCANICS] *1) Joint - Close to medium spaced, dipping 60°, planer, rough, slightly open, fresh with strong iron staining.* *2) Joint - Sub-vertical, dipping 80°, planar, rough, slightly open, fresh with strong iron staining.*	3.0		
										4.0		
C: 5.0-6.0m		5.0-6.0 100%	5.0-6.0 21%	5.0-6.0 10%	5.00-6.00 (9)					5.0		
C: 6.0-7.0m										6.0		
									Continued on Next Page			

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00		DRY	23/03/2023 16:30	0.00	1.20	Obstruction time - Hand dug inspection pit.			

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH02**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
23/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669153	615125

Date Finish:	Logged By:	Site Location:	Elevation:
23/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
		6.0-7.0 100%	6.0-7.0 0%	6.0-7.0 0%	6.00-7.00 (NI)				Strong to very strong, light grey, stained light orange brown, fine to medium crystalline, moderately to slightly weathered RHYOLITE - Core non-intact2-5m & 6.2-7m. [CAMPILE FORMATION RHYOLITIC VOLCANICS]			
									End of Borehole at 7.00m	7.0	7.00	
										8.0		
										9.0		
										10.0		
										11.0		
										12.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.00		DRY	23/03/2023 16:30						

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

Borehole Number	Box Number	Depth (m)
BH-02	01	2.0 to 7.0m

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH03**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
20/03/2000	Rotary cored	23-3182	Kilmannock BESS Site	669289	615096

Date Finish:	Logged By:	Site Location:	Elevation:
20/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
									[TOPSOIL]		0.20	
D: 0.5m									Dense, greyish brown to reddish brown, silty, very gravelly, fine to coarse SAND with cobbles and occasional boulders. Gravel is fine to coarse, sub-angular. [GLACIAL?]			
SPT: 1.0m D: 1.0m	50 (25 for 75mm/50 for 75mm)									1.0		
											1.80	
SPT: 2.0m D: 2.0m	N=28 (6,6/7,9,6,6)								Stiff, light greyish brown to reddish brown, gravelly, sandy, slightly clayey SILT with cobbles and occasional boulders. Sand is fine to medium. Gravel is fine to coarse, sub-angular. [GLACIAL?]	2.0		
SPT: 3.0m D: 3.0m	N=50 (5,6/50 for 275mm)									3.0		
									Light grey, fine to medium crystalline RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]		3.50	
C: 4.0-5.5m D: 4.0m		4.0-5.5 63%	4.0-5.5 0%	4.0-5.5 0%	4.00-5.50 (NI/NR)				Strong, light grey, stained light orange brown, fine to medium crystalline, moderately to slightly weathered RHYOLITE - Core non-intact. [CAMPILE FORMATION RHYOLITIC VOLCANICS]	4.0	4.00	
									1) Joint - Sub-vertical fracture, dipping 80°, planar, rough, slightly open, slightly weathered with strong iron staining.			
C: 5.5-7.5m										5.0		
										6.0		
									Continued on Next Page			

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.50		DRY	20/03/2023 16:30	0.00	1.20	Obstruction time - Hand dug inspection pit.			

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID:
BH03
Page2/2

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
20/03/2000	Rotary cored	23-3182	Kilmannock BESS Site	669289	615096

Date Finish:	Logged By:	Site Location:	Elevation:
20/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
		5.5-7.5 45%	5.5-7.5 0%	5.5-7.5 0%	5.50-7.50 (NI/NR)				Strong, light grey, stained light orange brown, fine to medium crystalline, moderately to slightly weathered RHYOLITE - Core non-intact. [CAMPILE FORMATION RHYOLITIC VOLCANICS]	7.0		
									End of Borehole at 7.50m	8.0	7.50	
										9.0		
										10.0		
										11.0		
										12.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					7.50		DRY	20/03/2023 16:30						

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale:
1:35

Borehole Number	Box Number	Depth (m)
BH-03	01	4.0 to 7.5m

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH04**

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
21/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669276	615132

Date Finish:	Logged By:	Site Location:	Elevation:
21/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
									[TOPSOIL]		0.10	
D: 0.5m									Stiff, light greyish brown to reddish brown, slightly gravelly to gravelly, sandy, slightly clayey SILT with cobbles and occasional boulders and occasional thin bands of slightly sandy, silty clay. Sand is fine to medium. Gravel is fine to coarse, sub-angular. [GLACIAL?]			
D: 1.0m										1.0		
SPT: 1.2m	N=22 (2,3/2,4,5,11)											
SPT: 2.0m D: 2.0m	N=23 (5,5/5,6,6,6)									2.0		
SPT: 3.0m D: 3.0m	50 (6,6/50 for 200mm)									3.0		
									Light grey, fine to medium crystalline RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]		3.20	
C: 3.5-4.5m		3.5-4.5 100%	3.5-4.5 0%	3.5-4.5 0%	3.50-4.50 (NI)				Strong, light grey, stained light orange brown, fine to medium crystalline, slightly weathered RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]		3.50	
									1) Joint - Sub-vertical, dipping 80°, planar, rough, slightly open, fresh to slightly weathered with strong iron staining. From 4.0-9.5m.	4.0		
C: 4.5-5.5m		4.5-5.5 100%	4.5-5.5 70%	4.5-5.5 24%	4.50-5.50 (10)					5.0		
C: 5.5-6.5m		5.5-6.5 80%	5.5-6.5 0%	5.5-6.5 0%	5.50-6.50 (NI/NR)					6.0		
									Continued on Next Page			

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					9.50		DRY	21/03/2023 16:30	0.00	1.20	Obstruction time - Hand dug inspection pit.			

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

Scale: 1:35

GroundCheck
SITE INVESTIGATION SPECIALISTS

Borehole Log

Location ID: **BH04**

Page2/2

Date Start:	Location Type:	Project ID:	Project Name:	Easting:	Northing:
21/03/2023	Rotary cored	23-3182	Kilmannock BESS Site	669276	615132

Date Finish:	Logged By:	Site Location:	Elevation:
21/03/2023	S. Thompson	Kilmannock, County Wexford	

Samples & In-situ Tests		Coring & Fracture Index				Wells & Instruments	Water	Legend	Stratum Description	Scale	Depth (m)	Reduced Level (m)
Type & Depth	Results & Info	TCR	SCR	RQD	FI							
C: 6.5-7.5m		6.5-7.5 100%	6.5-7.5 36%	6.5-7.5 0%	6.50-7.50 (9)				Strong, light grey, stained light orange brown, fine to medium crystalline, slightly weathered RHYOLITE. [CAMPILE FORMATION RHYOLITIC VOLCANICS]	7.0		
C: 7.5-8.5m		7.5-8.5 80%	7.5-8.5 0%	7.5-8.5 0%	7.50-8.50 (NI/NR)					8.0		
C: 8.5-9.5m		8.5-9.5 90%	8.5-9.5 0%	8.5-9.5 0%	8.50-9.50 (NI)					9.0		
									End of Borehole at 9.50m		9.50	
										10.0		
										11.0		
										12.0		

Water Monitoring		Water Strikes			Shift Information				Depth Related Remarks			Backfill		
Depth	Date	Struck	Date	Flow	Depth	Water	Remarks	Date Time	Top	Base	Remarks	Top	Base	Type
					9.50		DRY	21/03/2023 16:30						

Termination Reason:
Borehole terminated on instructions of engineer.

General Remarks:

AGS

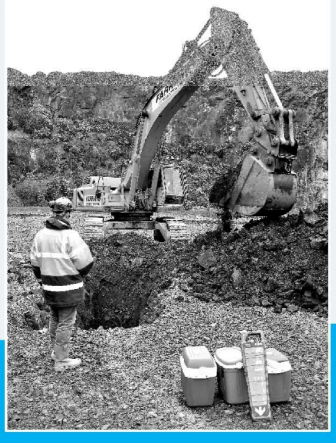
Scale:
1:35

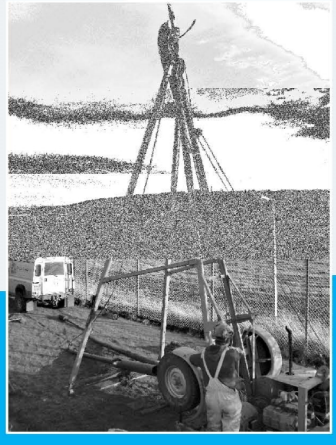
Borehole Number	Box Number	Depth (m)
BH-04	01	3.5 to 6.5m

Borehole Number	Box Number	Depth (m)
BH-04	02	6.5 to 9.5m

Appendix B:

Geotechnical Laboratory Test Results



GroundCheck
SITE INVESTIGATION SPECIALISTS

Project ID:
23-3182

Project Name:
Kilmannock BESS Site

Project Location:
Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF MOISTURE CONTENT

Location ID	Sample Type	Depth Top (m)	Sample Reference	Specimen Depth Top (m)	Specimen Reference	Moisture Content %	Assumed Natural?	Specimen Description
BH01	D	1.00	02	1.00	01	11.5	Yes	
BH02	D	1.00	02	1.00	01	14.9	Yes	
BH03	D	2.00	03	2.00	01	11.9	Yes	
BH04	D	1.00	02	1.00	01	21.8	Yes	

Method of Preparation: *BS 1377:PART 1:1990:7.4 Preparation of samples for classification tests & BS 1377:PART 21990:4.2 & 5.2 Sample preparations.*

Method of Test: *BS 1377:PART 2:1990:3 Determination of moisture content.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

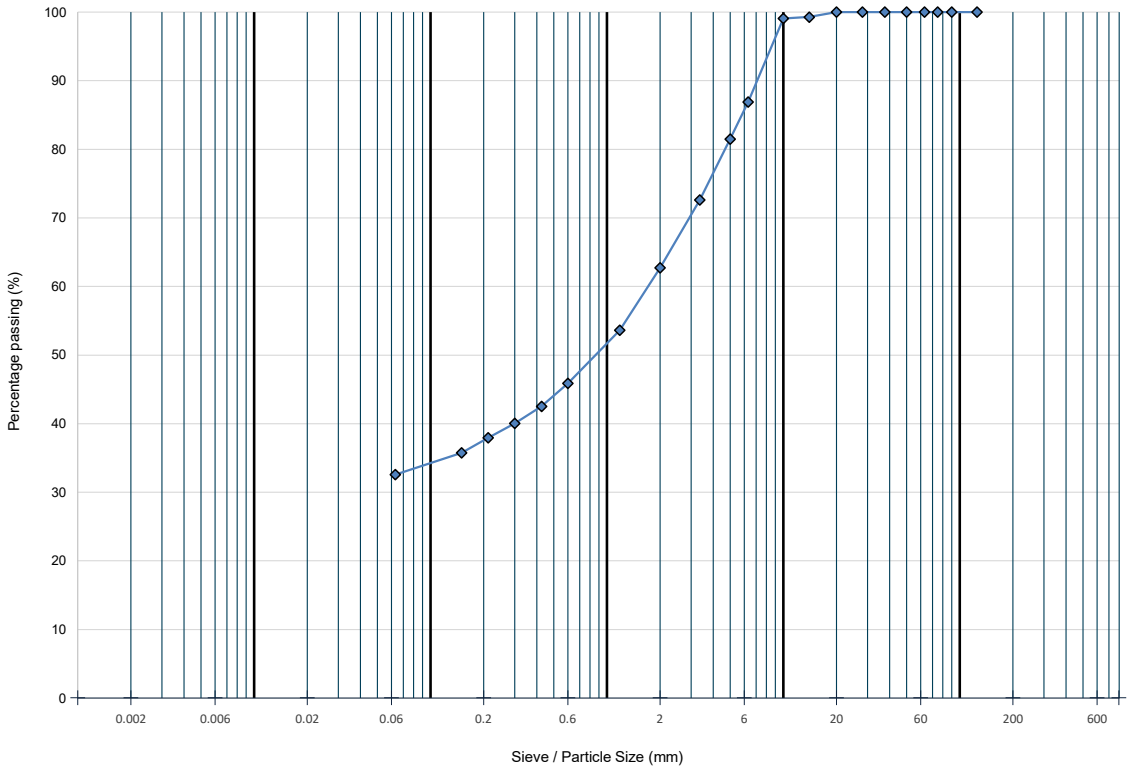
Project ID: 23-3182
Project Name: Kilmannock BESS Site
Project Location: Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
BH01	D	1.00	02	1.00	01	

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
32.6	30.2	37.3	-

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	100.0
28	100.0
20	100.0
14	99.3
10	99.1
6.3	86.9
5	81.5
3.35	72.6
2	62.7
1.18	53.6
0.6	45.9
0.425	42.5
0.3	40.1
0.212	37.9
0.15	35.8
0.063	32.6

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

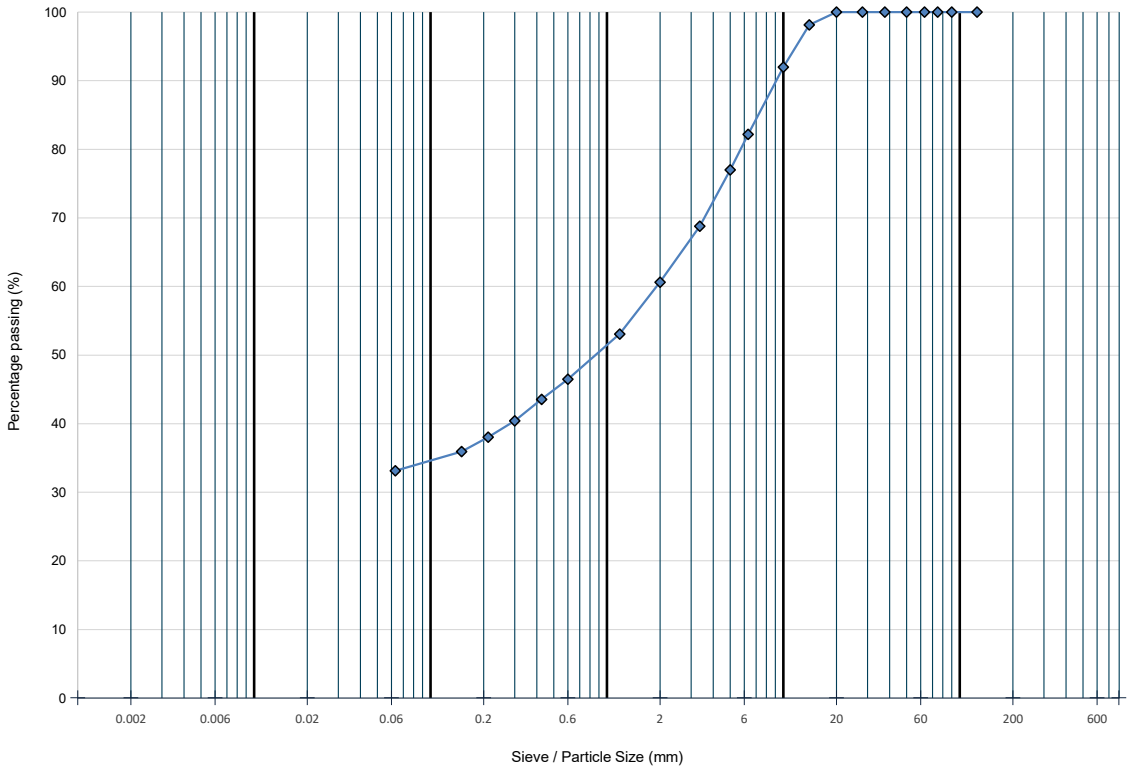
Project ID: 23-3182
Project Name: Kilmannock BESS Site
Project Location: Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
BH02	D	1.00	02	1.00	01	

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
33.1	27.5	39.4	-

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	100.0
28	100.0
20	100.0
14	98.1
10	92.0
6.3	82.2
5	77.0
3.35	68.8
2	60.6
1.18	53.1
0.6	46.5
0.425	43.5
0.3	40.4
0.212	38.0
0.15	36.0
0.063	33.1

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

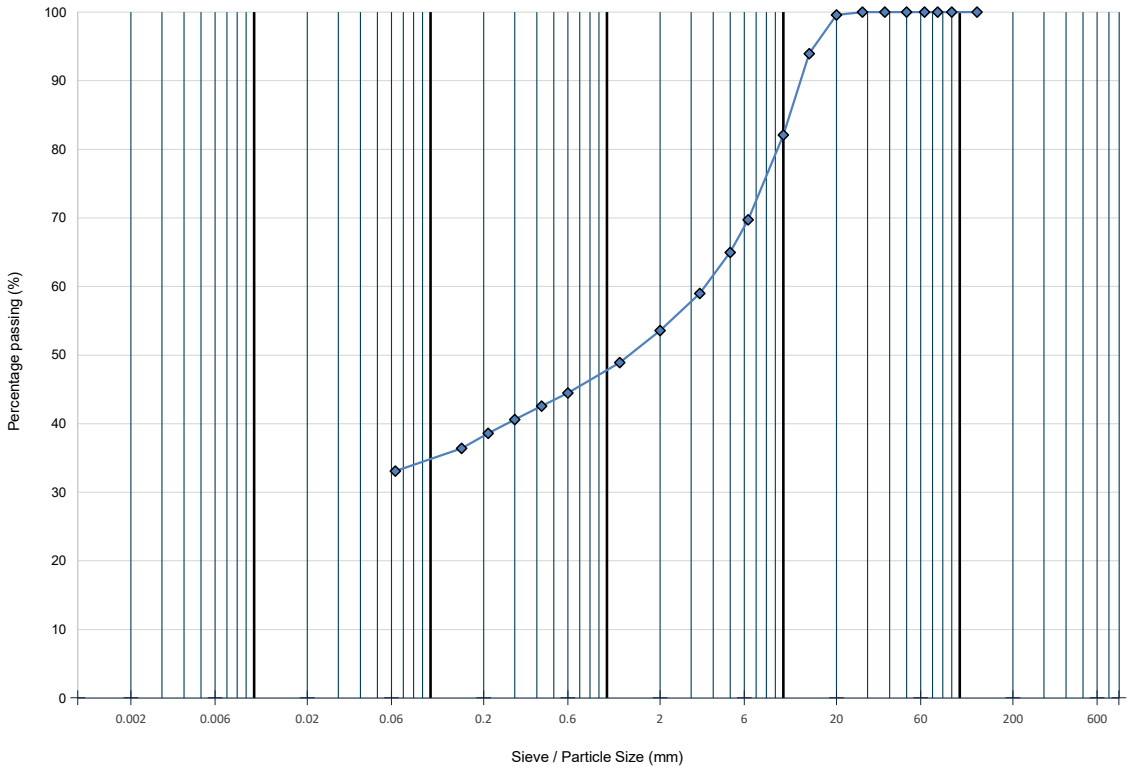
Project ID: 23-3182
Project Name: Kilmannock BESS Site
Project Location: Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
BH03	D	2.00	03	2.00	01	

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
33.1	20.5	46.4	-

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	100.0
28	100.0
20	99.6
14	94.0
10	82.1
6.3	69.7
5	65.0
3.35	59.0
2	53.6
1.18	48.9
0.6	44.5
0.425	42.5
0.3	40.6
0.212	38.6
0.15	36.4
0.063	33.1

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

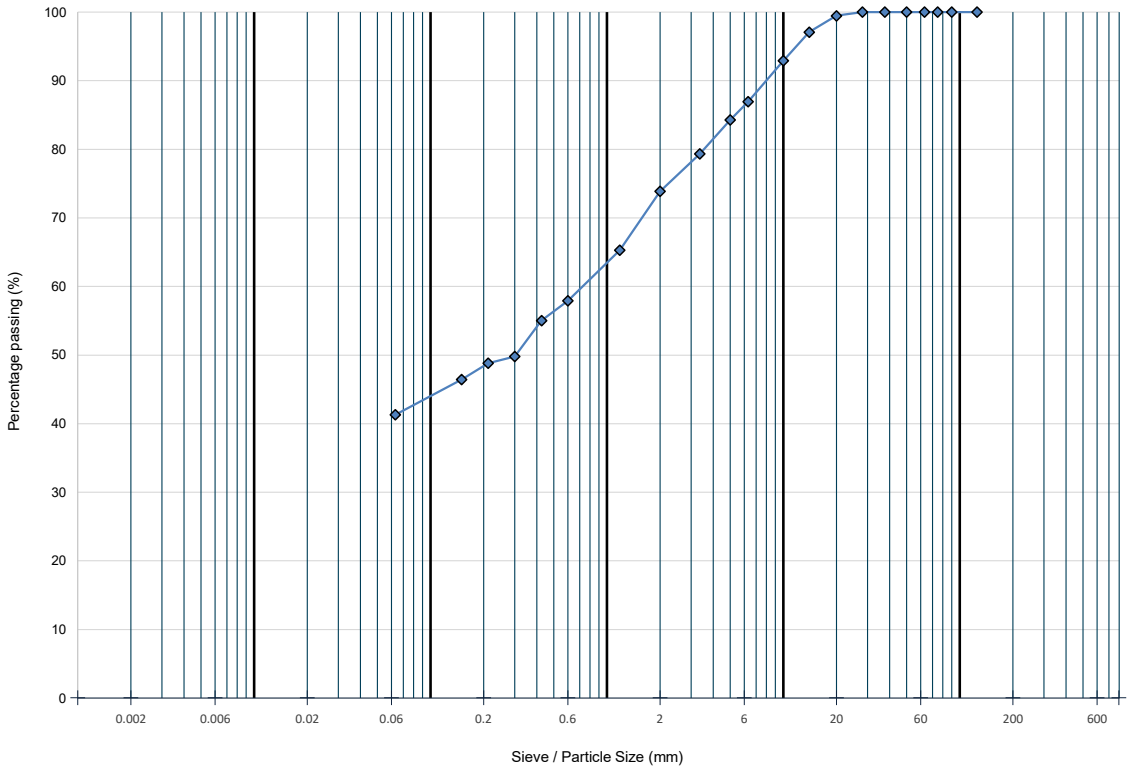
Project ID: 23-3182
Project Name: Kilmannock BESS Site
Project Location: Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Sample Information				Specimen Information		
Location ID:	Type:	Depth Top (m):	Reference:	Depth Top (m):	Reference:	Description:
BH04	D	1.00	02	1.00	01	

Particle Size Distribution Curve



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Particle Proportions			
Fines	Sand	Gravel	Cobbles
41.3	32.6	26.1	-

Uniformity Coefficient	

Sieve / Particle Size (mm)	Percentage Passing (%)
125	100.0
90	100.0
75	100.0
63	100.0
50	100.0
37.5	100.0
28	100.0
20	99.5
14	97.1
10	92.9
6.3	86.9
5	84.3
3.35	79.3
2	73.9
1.18	65.3
0.6	57.9
0.425	55.0
0.3	49.8
0.212	48.8
0.15	46.4
0.063	41.3

Method of Preparation: *BS 1377:PART 1 : 1990:7.3 Initial preparation. 1990:7.4.5 Particle size tests.*

Method of Test: *BS 1377:PART 1 : 1990:9 Determination of particle size distribution.*

Remarks:

GroundCheck
SITE INVESTIGATION SPECIALISTS

Project ID:
23-3182

Project Name:
Kilmannock BESS Site

Project Location:
Kilmannock, County Wexford

Laboratory Test Results

DETERMINATION OF POINT LOAD STRENGTH OF ROCK

Key to abbreviations:

Test Type
A - Axial
D - Diametrical
I - Irregular lump
B - Block

Test Direction
Pl - paralell to planes of weakness
Pd - perpendicular to planes of weakness
r - random or unknown orientation

Location ID	Sample Depth Top (m)	Sample Depth Base (m)	Sample Type	Sample Reference	Specimen Depth Top (m)	Specimen Reference	Test Type & Direction	Uncorrected Point Load Index - Is (Mpa)	Corrected Point Load Index - Is(50) (Mpa)	Estimated Uniaxial Compressive Strength - eUCS (Mpa)	Specimen Description
BH01	2.00	3.00	C	04	2.70	01	D - Pl	6.28	6.56	137.68	
BH01	3.00	4.00	C	05	3.70	01	D - Pl	6.11	6.63	139.31	
BH01	4.00	5.00	C	06	4.30	01	A - Pd	8.61	9.79	205.54	
BH01	4.00	5.00	C	06	4.40	02	D - Pl	6.94	7.54	158.30	
BH01	4.00	5.00	C	06	4.75	03	D - Pl	4.44	4.82	101.31	
BH01	4.00	5.00	C	06	4.80	04	D - Pl	3.75	3.39	71.23	
BH01	5.00	6.00	C	07	5.30	01	D - Pl	2.10	2.87	60.24	
BH02	5.00	6.00	C	05	5.00	01	D - Pl	4.17	4.52	94.98	
BH02	5.00	6.00	C	05	5.30	02	D - Pl	1.80	2.46	51.64	
BH02	6.00	7.00	C	06	6.00	01	D - Pl	3.13	3.86	81.08	
BH03	4.00	5.50	C	06	4.30	01	D - Pl	6.80	6.80	142.80	
BH03	4.00	5.50	C	06	4.90	02	D - Pl	1.73	2.25	47.29	
BH03	5.50	7.50	C	07	6.40	01	D - Pl	3.06	3.32	69.65	
BH04	3.50	4.50	C	05	3.50	01	A - Pd	3.40	3.86	81.13	
BH04	4.50	5.50	C	06	5.00	01	A - Pd	3.06	3.96	83.11	
BH04	4.50	5.50	C	06	5.10	02	D - Pl	2.20	3.01	63.11	
BH04	5.50	6.50	C	07	6.30	01	A - Pd	4.08	4.95	103.87	
BH04	7.50	8.50	C	09	8.40	01	D - Pd	3.67	4.27	89.75	

Method of Preparation: *BS EN ISO 1997-2:2007, Based on ISRM Commission on Testing Methods (1995)*

Method of Test: *BS EN ISO 1997-2:2007, Based on ISRM Commission on Testing Methods (1995)*

Remarks:

Construction Testing Services Ltd
2 Steeple Road Industrial Estate
Antrim BT41 1AB
Tel 028 9446 9191

COMPRESSIVE STRENGTH OF ROCK CORE SPECIMENS

Client: Ground Check Ltd. UCS1879

Project: 23-3182 Kilmannock BESS, Wexford 05-Apr-23

Reports sent to: Ground Check Ltd
Old Mill Industrial Estate
Muckamore
Antrim
Co Antrim BT41 4QE

rwells@ground-check.com

Lab Core ID	R2714	R2715				
Core Markings	BH01 4.8m	BH01 5.6m				
Date of coring	Unknown	Unknown				
Date received	27-Mar-23	27-Mar-23				
Diameter of core (Average mm)	79.5	79.4				
Length at test (mm)	60.8	100.4				
Length / Diameter Ratio	0.76	1.26				
Mass (g)	827	1372				
Density (Mg/m^3)	2.74	2.76				
Date of test	03-Apr-23	03-Apr-23				
Fail Load (KN)	277.5	335.1				
Measured compressive strength (MPa)	**55.9**	**67.6**				
Failure Type	Axial splitting	Axial splitting				

Comments	Low L/D ratio	Low L/D ratio				

Cores tested in received moisture condition using our UKAS calibrated Class 1 Compression Testing Machine.

Signed: *I Nichol*
I Nichol BSc(Hons) MSc

GroundCheck

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