Decommissioning of 2 No. Boreholes (BH04 & BH05) and installation of 1 No. replacement borehole (BH04b)

Coolnabacky, Timahoe, Co. Laois

May 2023

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

Decommissioning of 2 No. Boreholes (BH04 & BH05) and installation of 1 No. replacement borehole (BH04b)

Client: ESB Networks

Location: Coolnabacky, Timahoe, Co. Laois

Date: 17th May 2023

Document Control

PROJECT NUMBER: IE2219		DOCUMENT REF: IE2219-5766-ISSUE			
2.0	Issue	J Mackey	J Keohane		17/05/2023
1.0	Draft	J Mackey	J Keohane		12/05/2023
Revision	Purpose Description	Originated	Checked	Reviewed	Date

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1. Introduction

IE Consulting were engaged by ESB Engineering and Major Projects (EMP), on behalf of ESB Networks to support the procurement and supervision of the decommissioning of 2 No. Boreholes (BH04 & BH05) and installation of 1 No. replacement borehole (BH04b), at Coolnabacky, Timahoe, Co. Laois.

These works are part of the proposed construction of a substation at Coolnabacky, which is an element of the network improvement scheme for the Laois-Kilkenny Project.

The objective of this document is to provide a specification for the decommissioning of 2 No. Boreholes (BH04 & BH05) and the installation of 1 No. replacement borehole (BH04b), together with a site specific environmental and health and safety risk assessment, plus method statement for the works.

2. Location and Topography

The site lies 2.5km north of Timahoe in Co. Laois with access off the R426. The site is bounded on all sides by agricultural land. The site is a low lying, mostly flat area which extends east and north of the site, although the surrounding land to the south and west becomes hummocky within 150m to 200m of the site. The geomorphology in the area of the site is glacio-fluvial in origin.

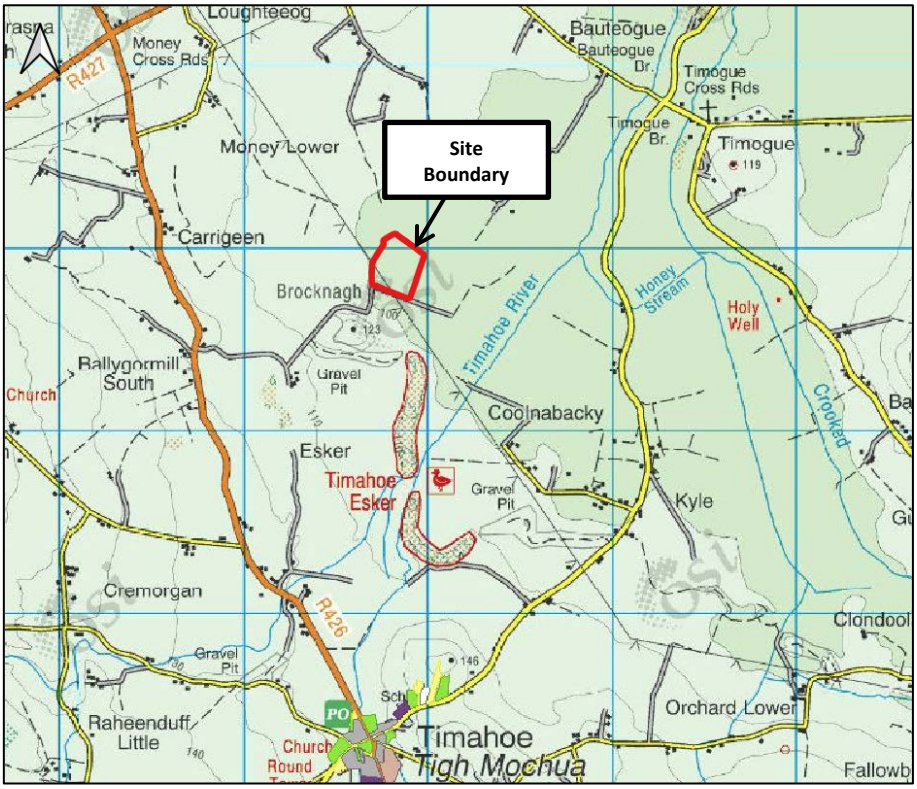


Figure 1: Location of Coolnabacky Site (modified from OSI, 2023)

3. Geological and Hydrogeological Environment

The main surface water drainage feature in the area is the Timahoe River which flows 500m east of the site, which later becomes the Bauteoge River. The un-named stream that borders the site to the north eventually joins the Timahoe River. The majority of the surface watercourses in the area are canalised or modified and there is extensive drainage in the low lying area. There are field drains on the western, eastern and southern borders of the Sub-station site.

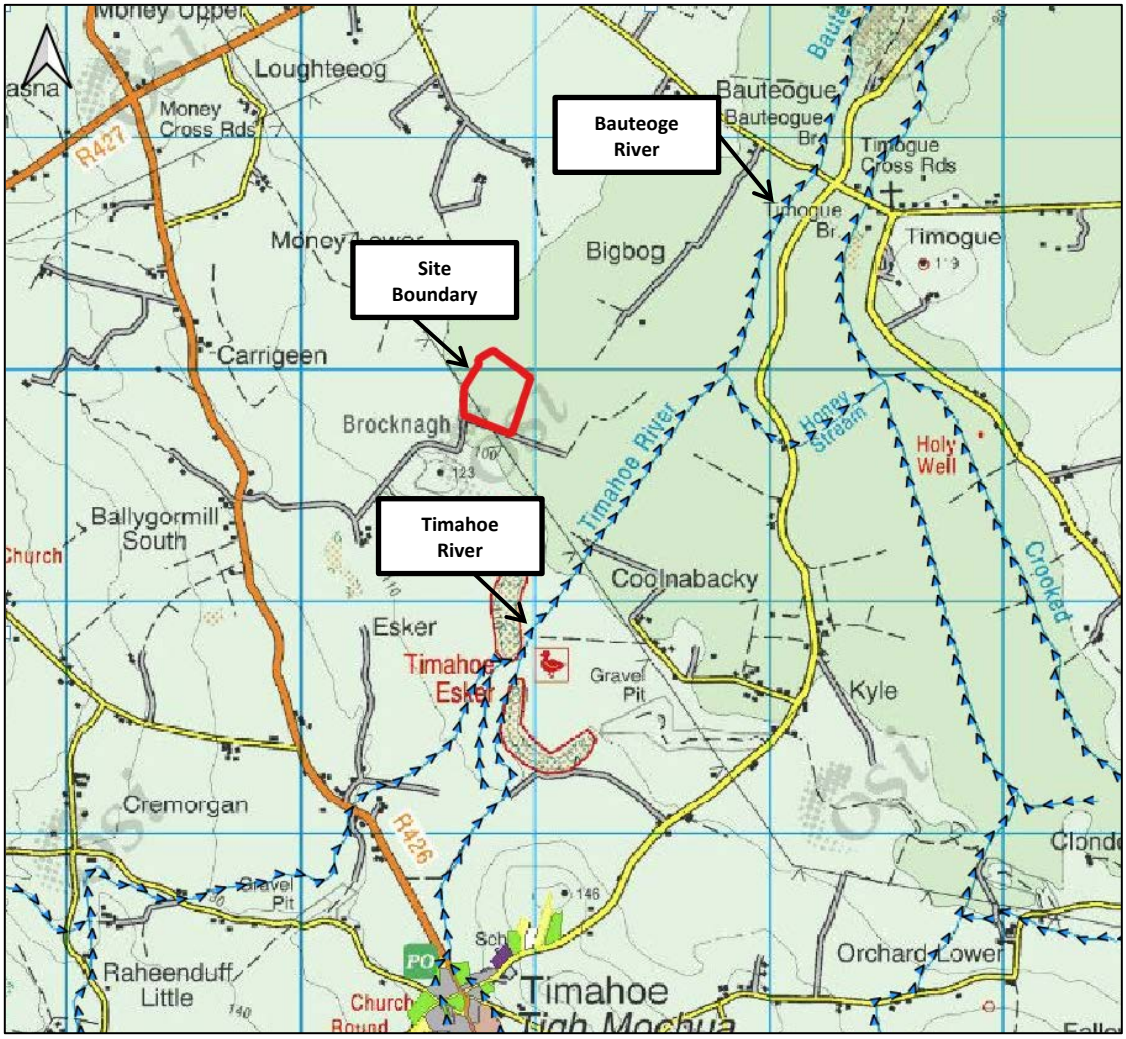


Figure 2: Surface drainage around Coolnabacky Site (modified from OSI, 2023)

Reference to the GSI database indicates subsoils consisting of Alluvium and Glacial sand and gravel to 3m approx. overlying stiff boulder clay from 3mbgl to approximately to 9mbgl (refer to Figure 3). The gravels are derived from Carboniferous limestones. The GSI maps mineral alluvium as the soils beneath the site and shallow poorly drained mineral (mainly basic) (BminSP) to the north, west, and south of the site (Teagasc, 2022). This was confirmed, as evidenced in the borehole logs completed by Causeway Geotech from borehole logs of from 2018. Bedrock was not encountered in the boreholes with depths of 6.5mbgl for BH01 and BH02; 8.5mbgl for BH03; 9.5mbgl for

exploratory hole BH04 located adjacent to monitoring borehole BH04; and 6.5mbgl for exploratory hole BH01 adjacent to BH05 (refer to Appendix I and III for Logs). Additionally, the following ground types were encountered more generally on site per Report No. 17-0439 prepared by Causeway Geotech, based on exploratory boreholes, trial pits, soil sampling etc., carried out on the site, and listed in approximate stratigraphic order:

- Topsoil: encountered at approximately 300-500mm thickness across the site.
- Alluvium/glacial gravels: typically, soft to firm sandy gravelly clay/silt or medium dense sandy gravel/gravelly sand. Encountered to a depth of 3.8m in BH09, located in the middle south west of the site (see Appendix II, Figure 2). Reworked topsoil was encountered to a depth of 700mm in TP10; located in the south of the site (see Appendix II, Figure 3).
- Glacial Till: sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth greater than 9.5m.

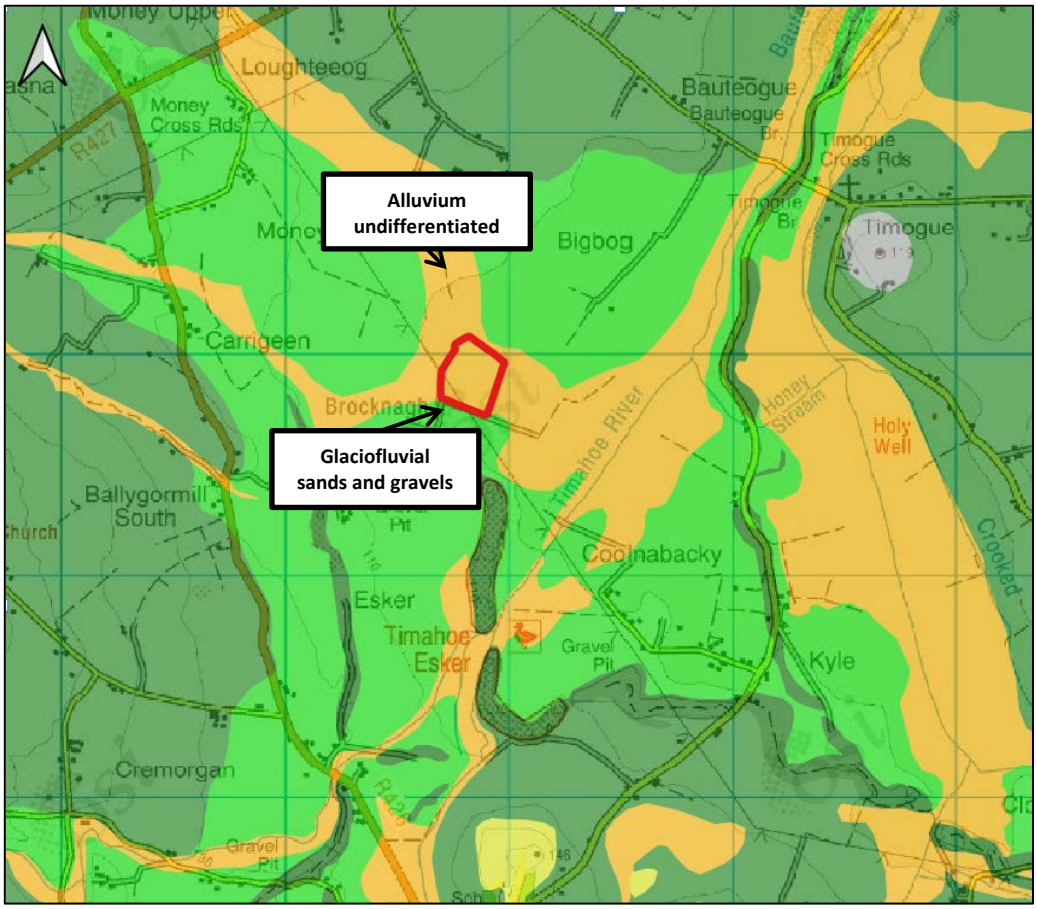


Figure 3: Subsoils in the vicinity of the Coolnabacky site (modified from GSI, 2023)

The underlying bedrock geology of the site comprises limestone of the Ballyadams Formation which is described as thick bedded to massive wackestones and packstones (GSI, 2023 (refer to Figure 4). Bedrock was not encountered in any of the historic boreholes on the site and it is not anticipated to be encountered in the upper 10m.

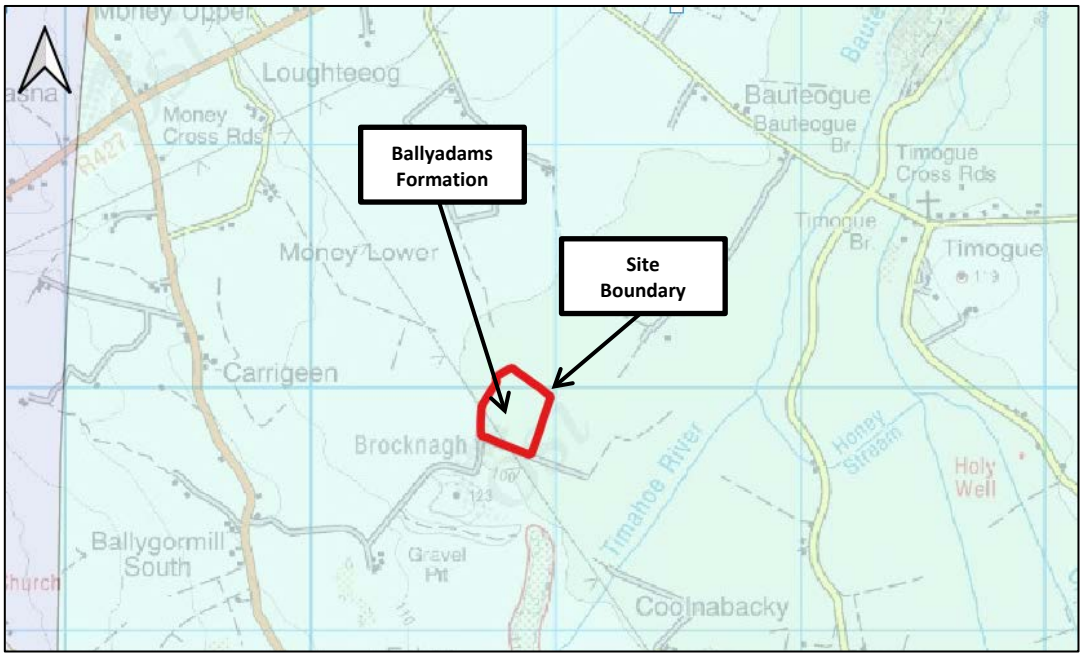


Figure 4: Underlying bedrock geology at Coolnabacky site (modified from GSI, 2023)

A survey carried out by IE Consulting in 2022, of all perimeter drains and the main stream encountered evidence of tufa deposits in the watercourses as shown in Figure 5, which suggests that many of the surface water features are groundwater fed.

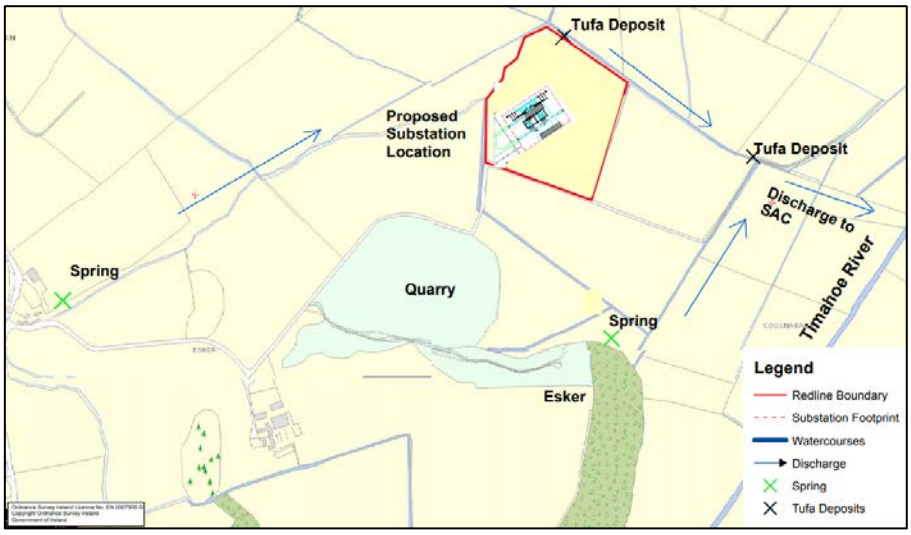


Figure 5: Tufa Deposits (modified from IE Consulting, 2022)

The bedrock aquifer below the site is mapped as an Rkd (Regionally Important Aquifer – Karstified-diffuse) (Refer to Figure 6). The GSI maps the area as being in a sand and gravel aquifer, but site specific studies have confirmed that the sand and gravel deposits on site do not comprise an aquifer (EIS chapters 9 and 10, 2013; Tobins Report, 2007; SLR, 2018; IE Consulting, 2021).

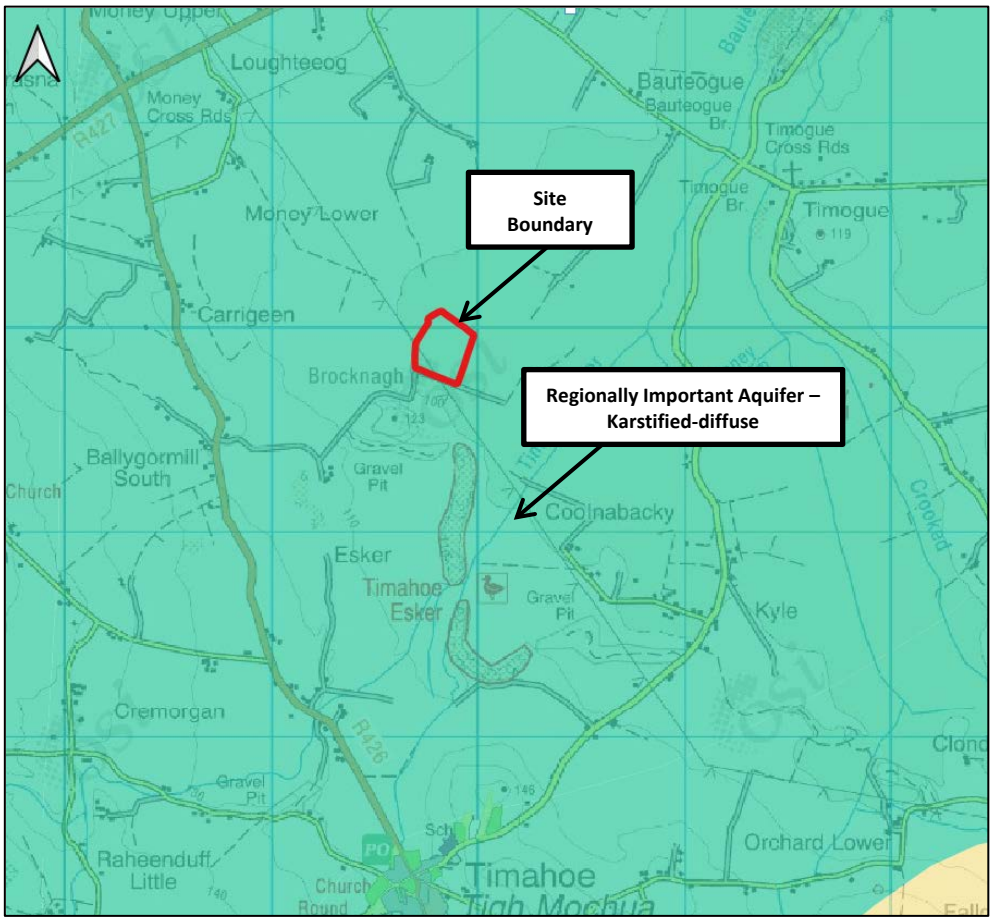


Figure 6: Aquifer Map (GSI, 2023)

4. Borehole Works

4.1. Introduction

It is proposed to re-locate monitoring borehole BH04 to avoid the construction footprint of the proposed substation 110kV building. The existing borehole BH04 will be decommissioned and a new borehole BH04b (replacement monitoring well) will be installed further south of the existing monitoring well. A former site investigation borehole BH05 is also in construction footprint of the substation 110kV building so will therefore also need to be decommissioned.

The borehole log is unavailable for BH05 so the borehole logs for BH01, BH02 and BH03 are provided for information purposes in Appendix I. There are a number of borehole logs from exploratory holes by Causeway Geotech in 2018, these locations and logs are available in Appendices II and III. Refer to Figure 7 for map of current boreholes in relation to footprint of construction. The subsequent sections outline the proposed approach to carry out these works.

Figure 7: Current location of Boreholes BH01 to BH05

4.2. Decommissioning of Wells

4.2.1. Overview

It has been decided to decommission 2 No. Boreholes (BH04 & BH05). At present, the Irish Environmental Protection Agency (EPA) and Geological Survey of Ireland (GSI) do not have guidance documents regarding the decommissioning of wells. BS5930:2015 is Code of practice for ground investigations, containing decommissioning information for water wells specific to site investigation activities.

BS5930 contains decommissioning information for boreholes specific to site investigation activities. In addition, the following guidance document was consulted, specific to water supply wells, when preparing this specification: *Good practice for decommissioning redundant boreholes and wells* – Scottish Environmental Protection Agency (SEPA) (SEPA, 2012).

It is to be noted that the above documents only provides an overview of the general procedure of good practice measures for decommissioning redundant boreholes and wells, issued by the Environmental Protection Agency of Scotland. The decommissioning procedure is to be carried out by a licenced drilling contractor. A detailed procedure, risk assessment and method statement must be site-specific and will be issued to ESB prior to commencement of works.

The guidance document - Good Practice for Decommissioning Redundant Boreholes and Wells, issued by the Environmental Agency of Scotland, strongly advices that a proficient contractor with sufficient experience must be present on site during the decommissioning works. It is suggested that good practice measures such as recording of backfilling and groundwater data must be followed for future reference.

4.2.2. Decommissioning BH04

4.2.2.1. Overview

A site visit was performed on 09th May 2023 to confirm the location of BH04 and to obtain construction details.

Exploration hole BH04 was drilled by Causeway in 2018 selected as the basis for the following procedure for decommissioning. Per the Causeway Geotech Report exploration hole log for BH04 (Appendix III) the monitoring well was documented at coordinates 653775.62 E, 692876.75 N. However on the site visit BH04 was verified as being located 653755.62 E, 692876.75 N. Therefore the location likely has an error in the easting coordinates recorded. Therefore the borehole log recorded in Appendix III is deemed to be an accurate representation of the monitoring well BH04 to be decommissioned.

On the site visit the following parameters were measured for all five monitoring boreholes:

Table 1: Measured Parameters recorded on 09th May 2023

	Total Depth (m) (From top of casing)	**Water Level (m)** (From top of casing)	**Stick up of casing above ground (m)**
BH01	1.71	1.06	0.54
BH02	2.23	1.37	0.36
BH03	2.79	1.67	0.55
BH04	6.55	1.18	0.63
BH05	3.40	1.30	0.61

Figure 8: Location of BH04 (pink) in relation to exploratory holes (orange) completed by Causeway Geotech in 2018

Figure 9: Picture of BH04 (facing south-south-west) on 09th May 2023

Refer to Figure 10 for schematic of the following phases of decommissioning:

4.2.2.2. Step 1

Remove all surface obstructions which may interfere with the sealing of the borehole. Pour wet, low viscosity with specific gravity of 1.1, cement grout into borehole up to the top of the slotted casing to seal both the borehole and the pore space within the permeable material surrounding the base of the gravel. The material should be checked prior to installation and introduced through the 200mm slotted casing. The cement will not migrate further than the borehole annulus.

4.2.2.3. Step 2

Excavate the upper 1mbgl of material in a 1m x 1m area around the borehole

4.2.2.4. Step 3

- The steel well head should be removed and the plastic casing should be cut flush with the ground.
- Place bentonite clay into the upper section and place in base of excavation to a depth of 100mm. This should be added slowly to avoid bridging of bentonite.

4.2.2.5. Step 4

- It is imperative that the fill material be of similar chemistry and rock type to the native bedrock geology, in particular due to the presence of the tufa deposits which require calcium rich conditions. However, in the case of these boreholes they do not penetrate bedrock or the aquifer, they only encounter the subsoil characterised as alluvium and sand and gravel deposits.

- This stockpile on site is an ideal filler for the upper portion of the borehole; i.e. a low permeability material. The fill material will therefore mimic the surrounding strata and be of the same chemistry so as groundwater quality and flow can be protected and restored.

4.2.2.6. Other Actions

- Photographs and records (water levels, diameter, depth of materials installed, type of material used etc.) of the decommissioning should be noted on a decommissioning log. The GPS coordinates and datum of the well should be noted on the log also.
- The abandoned borehole should be marked on all site maps and temporarily on the ground during construction, so that extra care is taken, if any excavations are undertaken.
- The location of the decommissioned borehole should be fenced off to prevent site traffic passing over it during the construction phase. No oils, chemicals or waste concrete should be stored in the immediate vicinity of the decommissioned well.
- The advice of a hydrogeologist should be sought if difficulties are encountered during the decommissioning phase.
- The borehole should be decommissioned prior to the commencement of any construction works in the vicinity of the borehole location to remove any potential preferential pathway for contaminations to enter the bedrock aquifer.

Decommissioning of BH04 & BH05

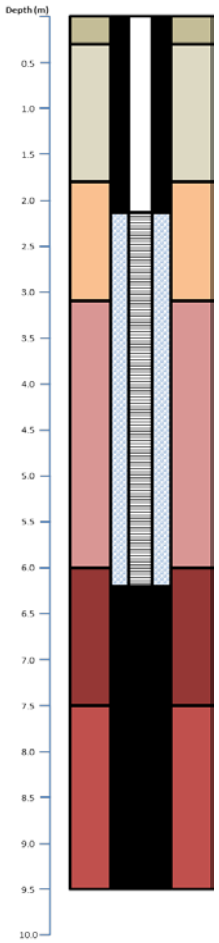
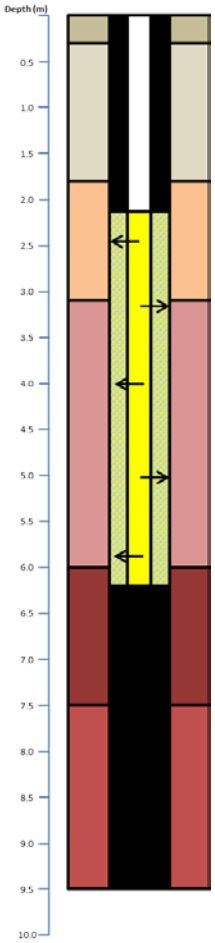
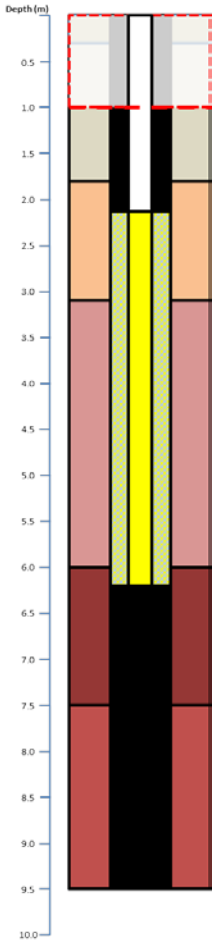
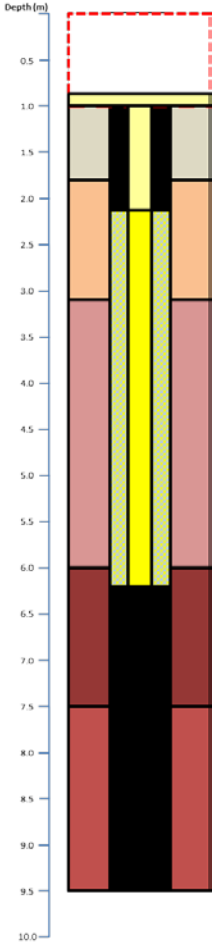
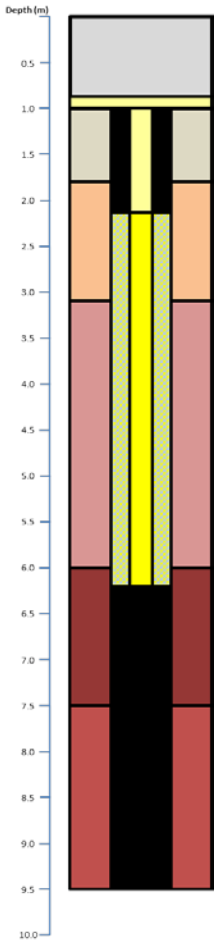
	Step 1	Step 2	Step 3	Step 4	Legend
					Very stiff grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to course. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded. Stiff grey slightly sandy gravelly CLAY low cobble content. Sand is fine to course. Gravel is subangular/subrounded fine to coarse. Cobbles are subangular/subrounded. Firm grey sandy slightly gravelly CLAY low cobble content. Sand fine to coarse. Gravel subangular/ subrounded fine to coarse. Cobbles subangular/subrounded. Soft grey sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subrounded fine to coarse. Medium dense grey sandy cleyey subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse. Topsoil: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Sand is fine to coarse. Backfill Permeable backfill. 200mm slotted casing. Permeable backfill, pore space occupied by concrete cement or bentonite clay. Cement grout: wet, low viscosity with specific gravity of 1.1. Area of extraction (to 1 mbgl) Cement grout, including cap allowed to spill over the upper extraction area. Stockpile from the site

Figure 10: Schematic for Decommissioning of BH04 & BH05

4.2.3. Decommissioning BH05

4.2.3.1. Overview

The location for BH05 was verified on a site visit on 09th May 2023, confirmed as coordinates 653738.95 E, 692851.67 N. The borehole log for BH05 is unavailable. Therefore a review of the available historic borehole log data for the site was performed. From the exploratory holes by Causeway Geotech in 2018 (see Figure 8), exploratory hole BH01 lies less than 7m south east of BH05 and BH04 is 30m north east of BH05. See appendix III for BH01 exploratory hole log. Generally the site is homogeneous so the same depths can be applied to BH05.

The below phased approach is recommended for decommissioning of BH05.

Figure 11: Location of BH05 (pink) in relation to exploratory holes (orange) completed by Causeway Geotech in 2018

Figure 12: Picture of BH05 (facing south-south-west) on 09th May 2023

Refer to Figure 10 above for schematic of the following phases of decommissioning (note figure 10 is applicable to BH04 decommissioning but the same approach will be employed here):

4.2.3.2. Step 1

Remove all obstructions which may interfere with the sealing of the borehole. If the slotted casing is present, pour wet, low viscosity concrete cement or bentonite clay with specific gravity of 1.1, into the borehole up to the top of the slotted casing to seal both the borehole and the pore space within the permeable material surrounding the base of the gravel. The material should be introduced through the 200mm slotted casing.

4.2.3.3. Step 2

4.2.3.4. Excavate the upper 1mbgl of material in a 1m x 1m area around the borehole. Step 3

- The steel well head should be removed and the plastic casing should be cut flush with the ground.
- Place bentonite clay into the upper section and place in base of excavation to a depth of 100mm. This should be added slowly to avoid bridging of bentonite.

4.2.3.5. Step 4

- It is imperative that the fill material be of similar chemistry and rock type to the native bedrock geology, in particular due to the presence of the tufa deposits which require calcium rich conditions. However, in the case of these boreholes they do not penetrate bedrock or the aquifer, they only encounter the subsoil characterised as alluvium and sand and gravel deposits.

- This stockpile on site is an ideal filler for the upper portion of the borehole; i.e. a low permeability material. The fill material will therefore mimic the surrounding strata and be of the same chemistry so as groundwater quality and flow can be protected and restored.

4.2.3.6. Other Actions

- Photographs and records (water levels, diameter, depth of materials installed, type of material used etc.) of the decommissioning should be noted on a decommissioning log. The GPS coordinates and datum of the well should be noted on the log also.
- The abandoned borehole should be marked on all site maps and temporarily on the ground during construction, so that extra care is taken, if any excavations are undertaken.
- The location of the decommissioned borehole should be fenced off to prevent site traffic passing over it during the construction phase. No oils, chemicals or waste concrete should be stored in the immediate vicinity of the decommissioned well.
- The advice of a hydrogeologist should be sought if difficulties are encountered during the decommissioning phase.
- The borehole should be decommissioned prior to the commencement of any construction works in the vicinity of the borehole location to remove any potential preferential pathway for contaminations to enter the bedrock aquifer.

4.3. Installation of Borehole Monitoring Well

4.3.1. Overview

It is proposed to re-locate BH04 due to the proposed substation 110 kV building as part of the Coolnabacky substation upgrade works. BH04b (replacement monitoring well) will be located further south (see Figure 13) of the existing monitoring well. It will be in a recessed area off the farm-track.

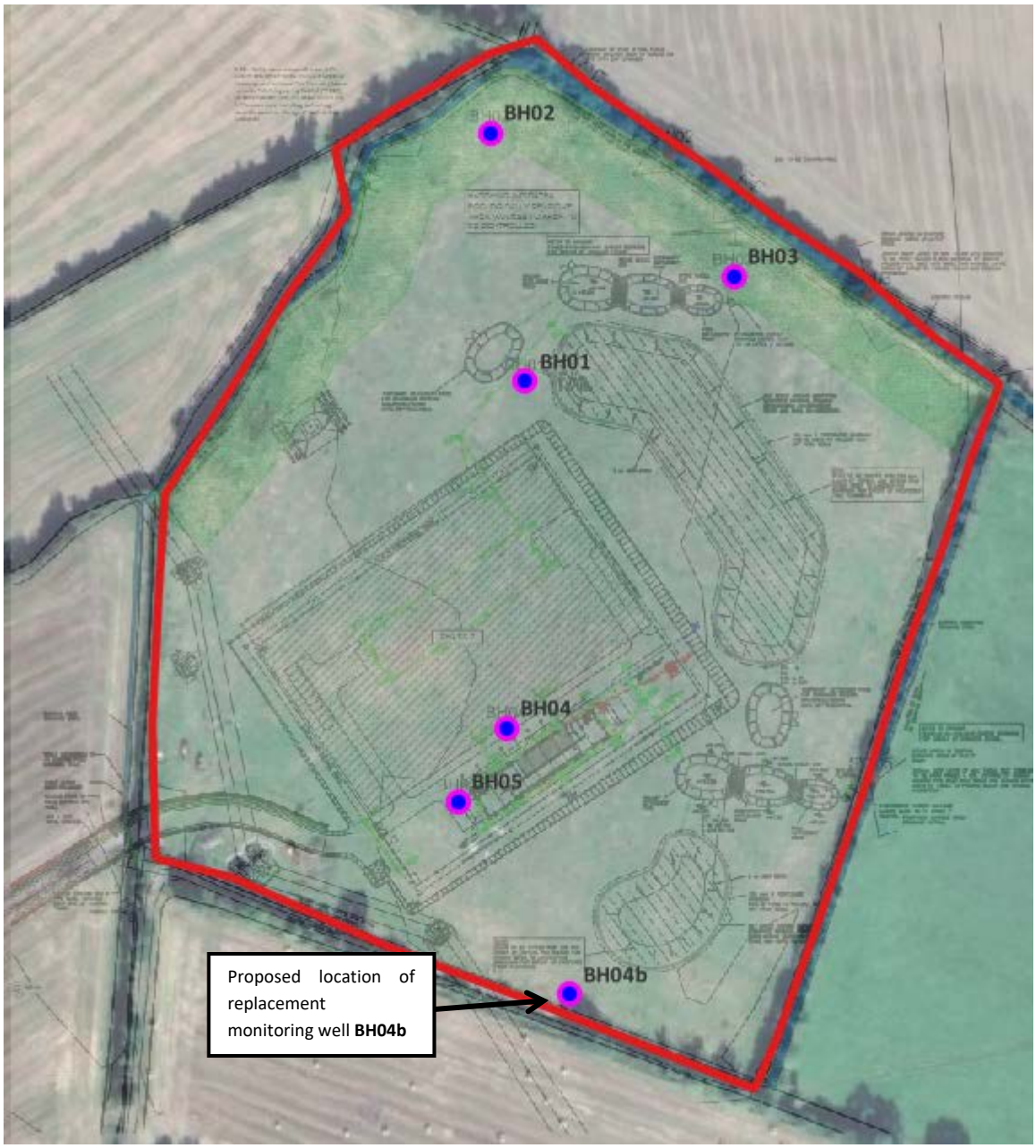


Figure 13: Drawing of BH04b in relation to proposed substation location

A review of the available historic borehole log data for the site was performed. From the exploratory holes by Causeway Geotech in 2018 (see Figure 12), exploratory hole BH01 and Trial Pit TP14 will lie north west of the replacement hole to be installed further 70m and 66m south respectively. See appendix III for Logs of BH01 exploratory hole and TP14 Trial Pit.

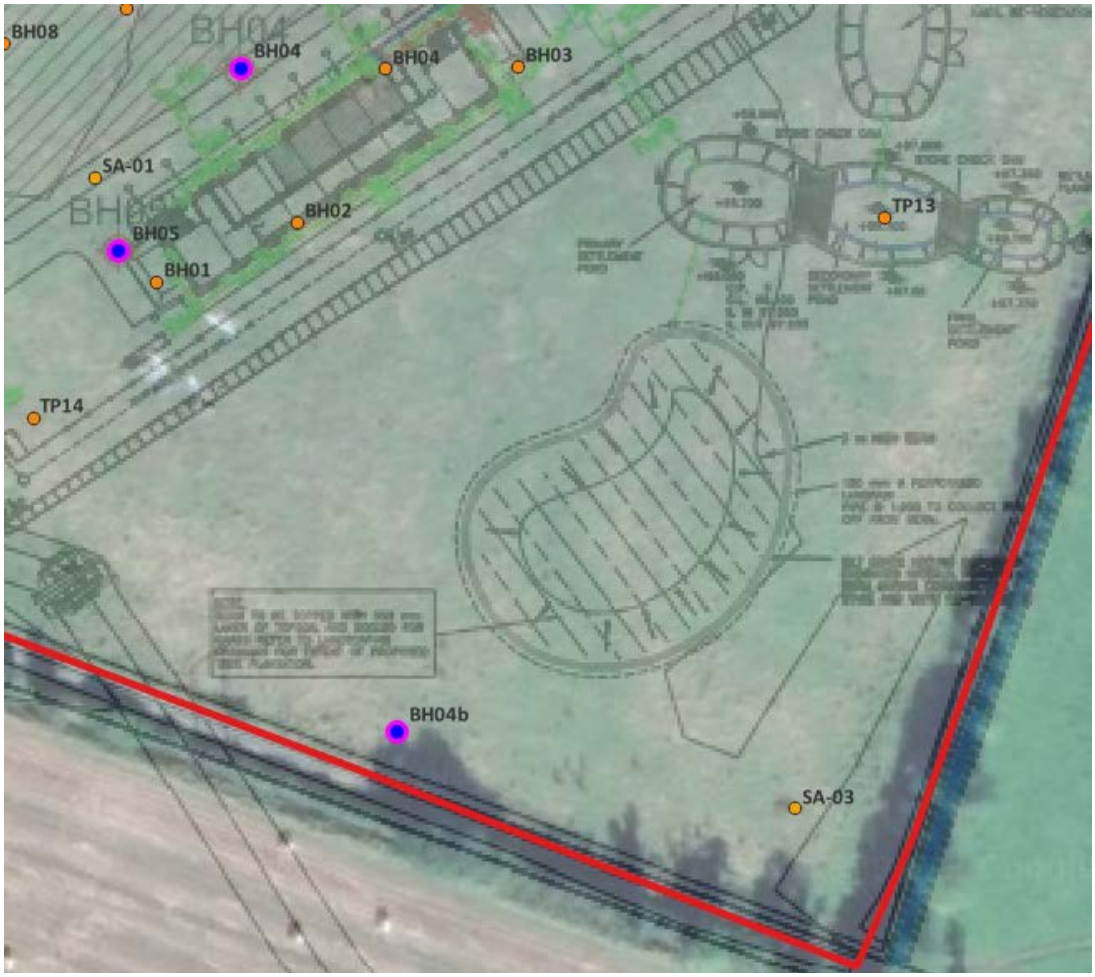


Figure 14: Adjacent exploratory holes to proposed replacement BH04b location

4.3.2. Installation Methodology for BH04b

BH04b will be installed as per available guidelines such as Environment Agency, Institute of Geologists of Ireland (IGI) and EPA. BH04b will be drilled to an approximate depth of 6m. The location is not adjacent to the tufa springs (located to the north of the site), or feeder streams and the target depth is well above the depth of expected bedrock.

The following steps should be included in the final methodology and scope of works submitted by the specialist drilling contractor but not limited to:

- Mobilisation

- Equipment & Supplies to be used
- Drilling methodology
- Monitoring well drilling diameter- minimum 200mm diameter with temporary casing
- Drill to 6.5m, place slotted 50mm diameter well screen with bottom cap, with plain from 1m to surface. The well casing should be wrapped with geotextile to prevent fines entering the borehole.
- Headworks design
- Backfill specification with clean round uniform limestone gravel pack.
- Bentonite seal from 1m to 0.5m
- Install headworks, with lockable cap
- Pour concrete plinth from 0.5m and create a sloping plinth around the borehole.
- Attach name plate BH 4-B
- Supervision by a geotechnical and/or environmental engineer
- Provide a Detailed borehole log with geological units and groundwater level
- Remove any excess concrete, bentonite or well materials off-site. Any uncontaminated drilling spoil can be incorporated with existing subsoil stockpiles enclosed by silt fencing

5. Environmental Method Statement for Works

5.1. Introduction

As part of environmental diligence, ESB EMP, on behalf of ESB Networks has requested that an environmental method statement be prepared for the decommissioning and installation works, as detailed in this document to minimise impacts, primarily on the Tufa deposits identified on the site, also the feeder streams along the perimeter of the site and to ensure there is no impact to the underlying Rkd aquifer.

5.2. Location

The activities involved in the decommissioning and installation, are confined to the south and south-eastern corner of the site, which is the most remote from the Tufa springs or the perimeter drains and feeder streams.

5.3. Interaction with underlying bedrock

The existing boreholes do not penetrate the bedrock so there will be no interaction with the bedrock during the decommissioning works.

Similarly the proposed replacement borehole is designed to mimic the existing ground conditions of BH04 as closely as possible, and is expected to be at least 3m above any potential bedrock, and to be collared in a stiff boulder clay, which will limit the ingress of any shallow groundwater or surface water during the drilling works.

There is no significant risk to the groundwater aquifer beneath the site, due to the proposed works. However, the proposed mitigation measures to protect surface water will by default provide adequate protection to groundwater as well.

5.3.1. Construction sequencing

5.3.1.1. Duration and timing of Works

The works will be undertaken in Summer of 2023 during which time groundwater levels are expected to be low, also no groundwater table was observed in the sand and gravels per the EIS, 2013; Chapters 9 and 10, and other available reports. The expected duration of works from establishment is not expected to exceed 5 working days. The works will be confined to daylight hours.

5.3.1.2. Site Establishment

Vehicular Access will be via the main entrance at the south-western corner of the site.

Safety tape with cones will be erected around the activity. There will be one access point and the area will be confined and small. A briefing on the sensitivity of the site will be undertaken by the geologist who will oversee the works. All staff will be required to present safe pass and manual handling certification where applicable.

This method statement and risk assessment will be discussed with all personnel to highlight the key environmental risk elements and mitigation measures.

All equipment will be cleaned prior to being transported to site to prevent the spread of invasive species and any contamination from other sites and will be inspected to ensure, there are no leaks, drips and that all pipes and connectors are properly fitted and secure.

The equipment proposed by the contractor will include the following;

- Transport Vehicle and Trailer
- Drill rig and associated tools
- Mini digger
- Fuel
- Spill-kits

Set down areas will be identified and cordoned off using cones and signage.

A spotter will assist with the loading and unloading of machinery/equipment to ensure that this is done safely, and to avoid plant to any accidental spillages.

5.3.1.3. General work practices

Re-fuelling of plant will be undertaken offsite. Particular attention will be paid to gradient and ground conditions at the re-fuelling location which could increase any risk of discharge to waters. A drip tray will be used at all times. Other mitigation will include:

- A hydrocarbon spill kit will be available at all times, this will contain as a minimum absorbent pads, oil containment booms and other items for clean-up and containment of spills.
- Daily checks will be made on the plant to ensure there are no signs of leakage
- Oils and fuels will not be stored overnight on site.
- A clean as you go policy will be implemented, and a through clean – up at the end of each day will be required.
- Weather conditions will be monitored and works will be stopped, if the weather conditions might lead to any increased environmental risk.

- The works area will be kept free of debris or waste materials.
- Because no in-stream works are scheduled, there will be no disturbance of in stream substrate, including tufa deposits and no loss of submerged or emergent tufa deposits from the stream.

5.3.1.4. Stage 1 – Decommission Borehole Well BH04

A specific detailed procedure for decommissioning of BH04 is outlined in Section 4.2.2.

5.3.1.5. Stage 2 - Decommission Borehole Well BH05

A specific detailed procedure for decommissioning of BH05 is outlined in Section 4.2.3.

5.3.1.6. Stage 3 – Installation of Borehole Well BH04b

A specific detailed procedure for installation of BH04b is outlined in Section 4.3.

5.3.1.7. Emergency Response Plan

The chain of command with regard to any environmental emergency will be led by a geologist from IE Consulting who will be on site for the duration of the works.

Staff will be informed of the consequences of any fuel spillages or poor control of sediment.

In the event of a fuel spillage, works will be stopped, the source of the spill will be stopped, and all sources of ignition will be removed. The spill will be contained by using a spill kit, and will not be spread and migrate towards the water course or flushed away. Contain and remove any oil contaminated material. Laois County Council will also be informed in the event of a spill.

In the remote chance that material enters a drain or a stream, place boom across the stream to trap the oil, and arrange for recovery of any free product.

A record of the event, including photographs will be prepared by the supervising geologist.

6. Health and Safety Method Statement

6.1. Purpose

The health & safety method statement will present the information compiled about the various hazards and the ways in which they are to be controlled for the decommissioning and installation works.

6.2. Scope

This Method Statement is prepared for the:

- Decommissioning of BH04
- Decommissioning of BH05
- Installation of BH04b

6.3. Risk Assessment

0	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Likelihood			Severity		
1	-	Almost impossible	1	-	No illness or injury
2	-	Not likely but possible	2	-	Minor/first aid injury
3	-	Likely to happen	3	-	Reportable accident/ incident
4	-	Probable	4	-	Major injury or illness
5	-	Certain	5	-	Death

Likelihood x Severity = Risk Rating

Score	Risk Rating	Action
0 to 5	Low	No immediate action required
6 to 12	Medium	Plan to reduce risk where practicable
15 or 16	High	Immediate action to reduce risk
20 or 25	DANGEROUS	ACTIVITY MUST CEASE IMMEDIATELY

*Note the likelihood, Severity and the risk rating are calculated both before and after control measures are put in place.

Table 2 – Health, Safety and Welfare Risk Assessment

Item	Activity / element	Potential hazard	People at risk of harm	Likelihood 1-5	Severity 1-5	Risk rating Likelihood x severity = risk rating	Risk Rating
1	Access and egress to site	Interaction with other vehicles. Collision with other traffic.	Everyone	3	2	6	Low
2	Set up on site and equipment	Creating an obstruction to other traffic	Employees, Contractors	2	1	2	Low
		Noise		2	4	8	Medium
3	Loading and unloading materials	Material falling from vehicle	Employees,	3	4	12	Medium
		Damage to equipment or property Collision between vehicles and pedestrians and vehicles.	Contractors	2	4	8	Medium
		Unauthorised persons entering work area.					
4	Manual handling	Lifting heavy items.	Employees,	3	3	9	Medium
		Lifting awkward or large items.	Contractors	3	3	9	Medium
		Carry loads over uneven ground.		1	3	3	Low
5	Housekeeping	Slips trips and falls	Contractors	3	3	9	Medium
		Untidy site	Employees	2	3	6	Medium
6	Noise	Generating noise levels at or above the exposure action values.	All Operators' and employees near by	2	4	8	Medium

Item	Activity / element	Potential hazard	People at risk of harm	Likelihood 1-5	Severity 1-5	Risk rating Likelihood x severity = risk rating	Risk Rating
7	Use of hand tools	Cuts and abrasions, impacts	All involved	2	1	2	Low
8	Weather Conditions	Slips / Trips Ice, frost, snow, Wind, Cold weather,	All involved	1	4	4	Low
9	Working close to other activities on site	Collision between varying vehicles/vehicles crashing into equipment/slips/trips/ falls	All persons and equipment involved	4	4	8	Medium
10	Working close to other activities Off site	Persons walking along the road outside of the fence, or on the adjoining site.	Passers by	2	3	6	Medium

6.4. Control Measures to Be Implemented

No.	*Name*	*Control Measure*
1	Access & Egress	• All operatives briefed by supervising geologist upon arrival at site. • Working area will be cordoned off with a single access point. Area will be small and confined. • Operatives will follow safe access routes around the site. • Operatives will follow the work Method Statement herein.
2	Use of Machinery	• Observe all safety instructions and warnings attached to the plant. • Loose or baggy clothing can get caught in running machinery. • Where possible when working close to the loud running machinery, wear ear protection.

No.	*Name*	*Control Measure*
		• For reasons of safety, long hair must be tied back or otherwise secured, garments must be close fitting and no jewellery such as rings may be worn. Injury may result from being caught up in the machinery or from rings catching on moving parts. • Always wear correctly fitting (CE approved) personal protective equipment. Recommended Personal Protective Equipment includes: hard Hat, Safety Glasses, Hearing Protection, Safety Boots (steel toe), Nitrile Gloves, High Visibility Vest or jacket. • Never lubricate, clean, service or adjust machinery while it is moving. Keep hands, feet and clothing clear of power-driven parts and in running nip-points. Disengage all power and operate controls to relieve pressure. Stop the engine. Allow the machinery to cool. • Keep all parts in good condition. Ensure that all parts are properly installed. Fix damage immediately. Replace worn and broken parts. Remove any build-up of grease, oil and debris. • Any work on the site must be executed by trained, reliable and authorised personnel only. Statutory minimum age limits must be observed. • ESB shall ensure that local barriers are erected and in place to stop unauthorized entry (if applicable). • Before starting any machinery ensure it is safe to do so.
3	Loading & Unloading material	• Operations should be planned to ensure maximum safety of personnel and property. • Sufficient numbers of trained persons to be available on site before lifting / loading takes place.
4	Manual Handling	• Never lift unless it is safe to do so. • Always use appropriate mechanical aids which are available. • All employees to be trained in safe manual handling techniques. • Remember the safe points of manual handling.
5	Housekeeping	• All operators to ensure site areas are kept clear of obstruction from materials and tools. • Regular checks to be carried out to ensure there are no tools or equipment which may pose a trip hazard. • A clean as you go policy in operation.
6	Noise	• When any operations are being carried out which may produce excessive noise levels, over 85 dBA, operators must wear ear defenders or disposable ear plugs. • Recommended to wear ear defends when working with the loud machinery.
7	Use of Hand Tools	• If using tools, there must be sufficient space to operate the tool. • Personal protective equipment must be used appropriate to the task. • Ensure tools are in good working order. • Do not use if broken or material fatigue is evident.
8	Weather Conditions	• Working in icy conditions may pose a slip risk when working with water. • Monitor weather conditions to ensure it is safe to work.

No.	*Name*	*Control Measure*
9	Working close to other activities on site	• All personnel to report to supervising geologist. • All personnel to review and to sign other site activities RAMS. • Traffic cones will be put around the work site. • High visibility clothing is essential on the site.
10	Working close to other activities on site Working close to other activities Off site	• All visitors to the work area are expected to wear suitable grade PPE.

6.5. Health and Safety Instructions for Persons Involved with Work

- Conduct work in compliance with this work method statement.

- Comply with site safety rules as indicated during induction.

- Obey all instructions from supervising geologist, Civil Contractor and ESB Staff.

6.6. Inspection and Maintenance

All safety critical equipment will be inspected immediately prior to use.

6.7. Training

- Briefing on the sensitivity of the site by supervising Geologist
- Manual Handling Training
- Safe Pass Training
- First Aid Training

6.8. Communication and Information

Before planned work takes place contact the supervising geologist for authorisation to attend site. Upon arrival at site report to supervising Geologist for briefing prior to commencing tasks.

6.9. Oversight

- IE Consulting to oversee works with Geologist onsite during works.

6.10. Specification

All work will be carried out per the current method statement and in accordance with ESB Health and Safety polices.

6.11. Emergency Response

Emergency Procedures:	1. Emergency contact numbers readily at hand with all operatives. 2. Fire extinguishers available locally (in vehicles) 3. First aid kit available in vehicle.
	Emergency Contact details

	Health and Safety Authority	0818 289 389
	Laois Fire & Rescue	112 / (057) 866 4000
	Midland Regional Hospital Portlaoise	112 / (057) 862 1364
	Garda Station Stradbally	112 / (057) 862 5222
First Aid Facilities:	First Aid Box Location:	In designated vehicle
	Location of Nearest Hospital:	Midland Regional Hospital Portlaoise Tel: 112 / (057) 862 1364

7. References

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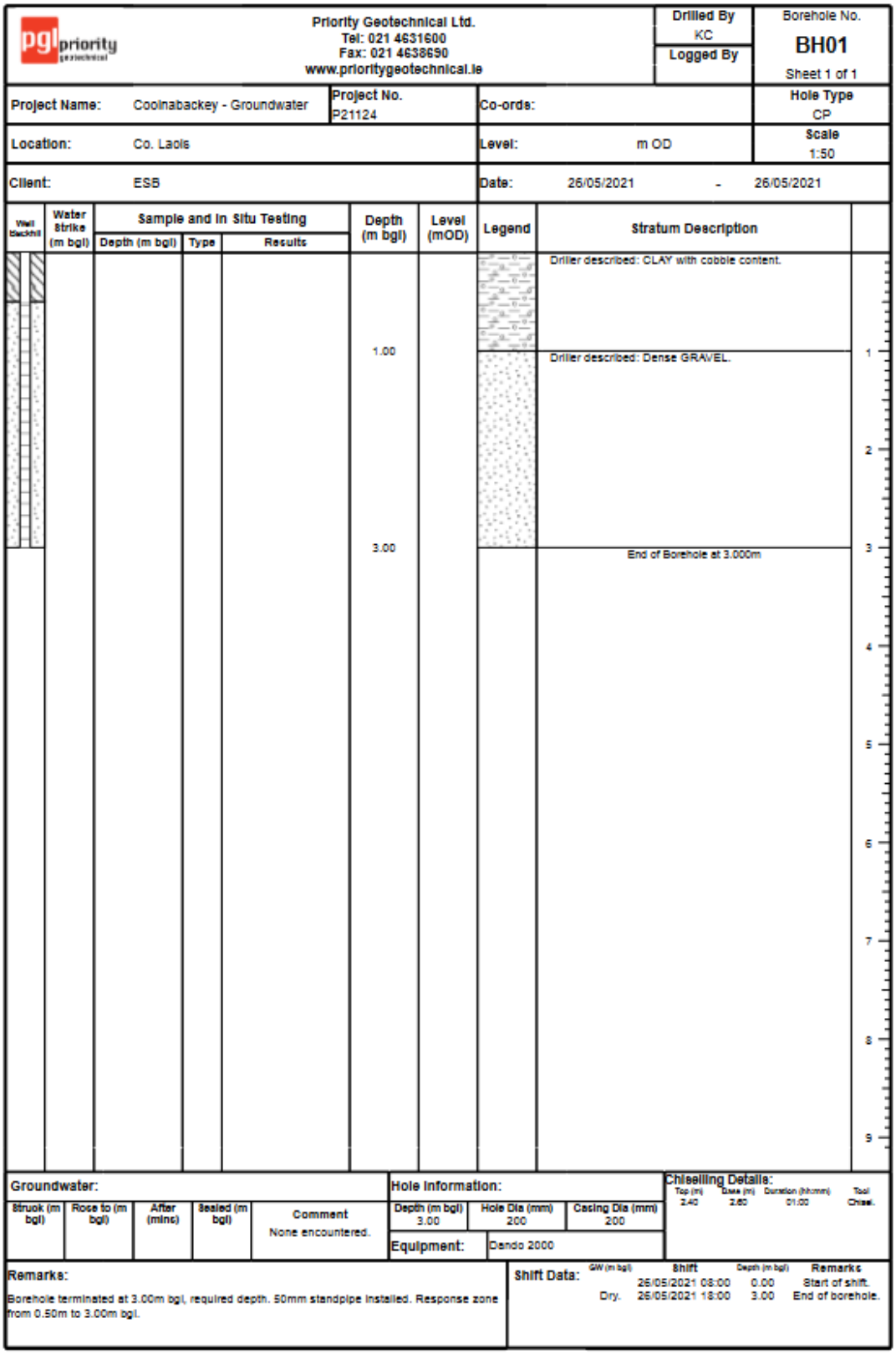
Appendix I – Borehole Logs



Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Drilled By: KC
Logged By:
Borehole No.: BH01
Sheet 1 of 1

Project Name: Coolnabackey - Groundwater
Project No.: P21124
Co-ords:
Hole Type: CP
Location: Co. Laois
Level: m OD
Scale: 1:50
Client: ESB
Date: 26/05/2021 - 26/05/2021

Well backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
								Driller described: CLAY with cobble content.
					1.00			Driller described: Dense GRAVEL.
					3.00			End of Borehole at 3.000m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
3.00	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
2.40	2.60	01:00	Chisel.

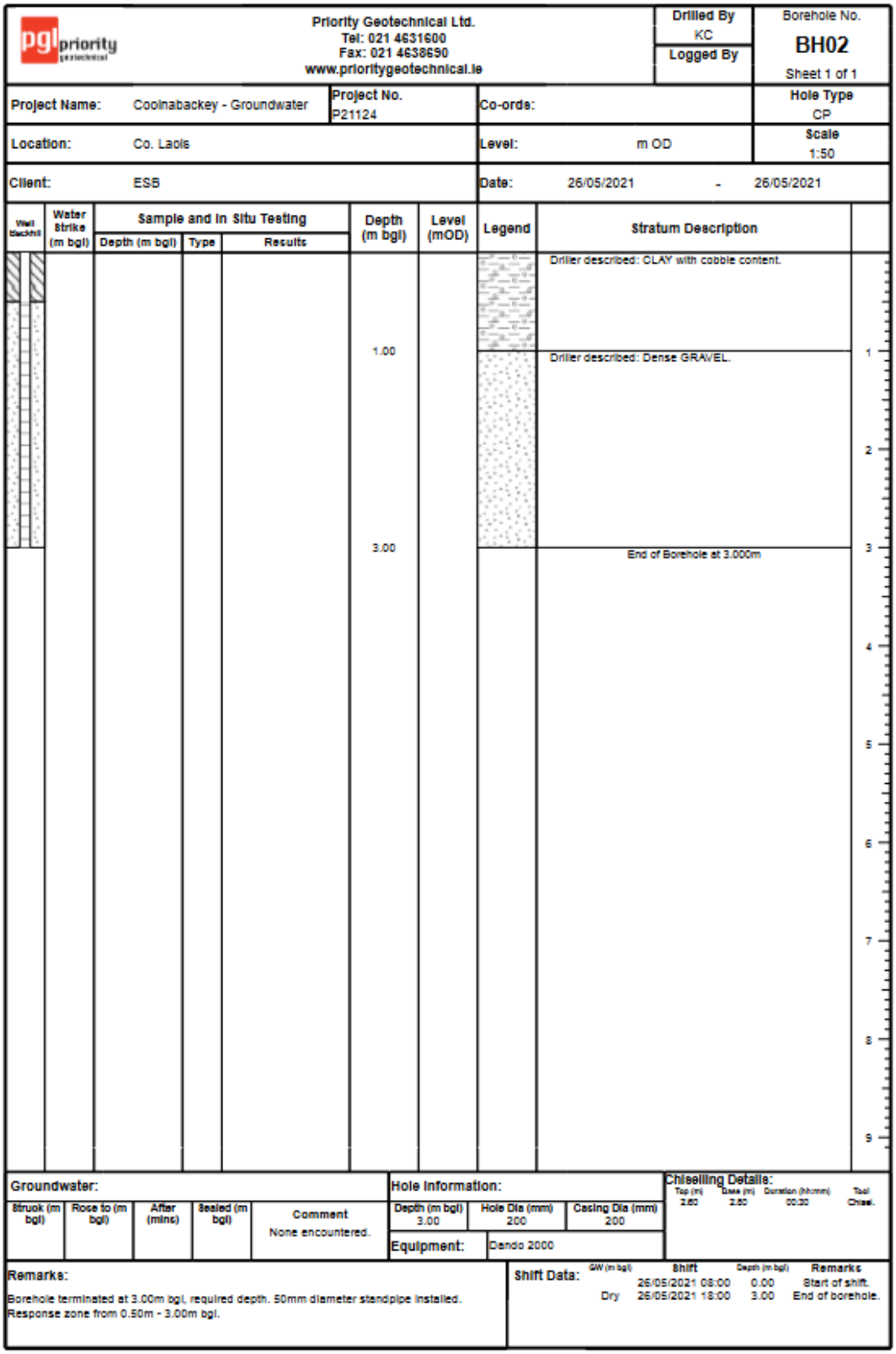
Remarks:
Borehole terminated at 3.00m bgl, required depth. 50mm standpipe installed. Response zone from 0.50m to 3.00m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	26/05/2021 08:00	0.00	Start of shift.
Dry.	26/05/2021 18:00	3.00	End of borehole.

Figure 1: Borehole Log of BH01 (Priority Drilling, 2018)

Appendix I – Borehole Logs



Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Drilled By: KC
Logged By:
Borehole No.: BH02
Sheet 1 of 1

Project Name:	Coolnabackey - Groundwater	Project No.: P21124	Co-ords:
Location:	Co. Laois	Level: m OD	Hole Type: CP
Client:	ESB	Date: 26/05/2021 - 26/05/2021	Scale: 1:50

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
								Driller described: CLAY with cobble content.
					1.00			Driller described: Dense GRAVEL.
					3.00			End of Borehole at 3.000m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
3.00	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
2.50	2.50	00:30	Chisel.

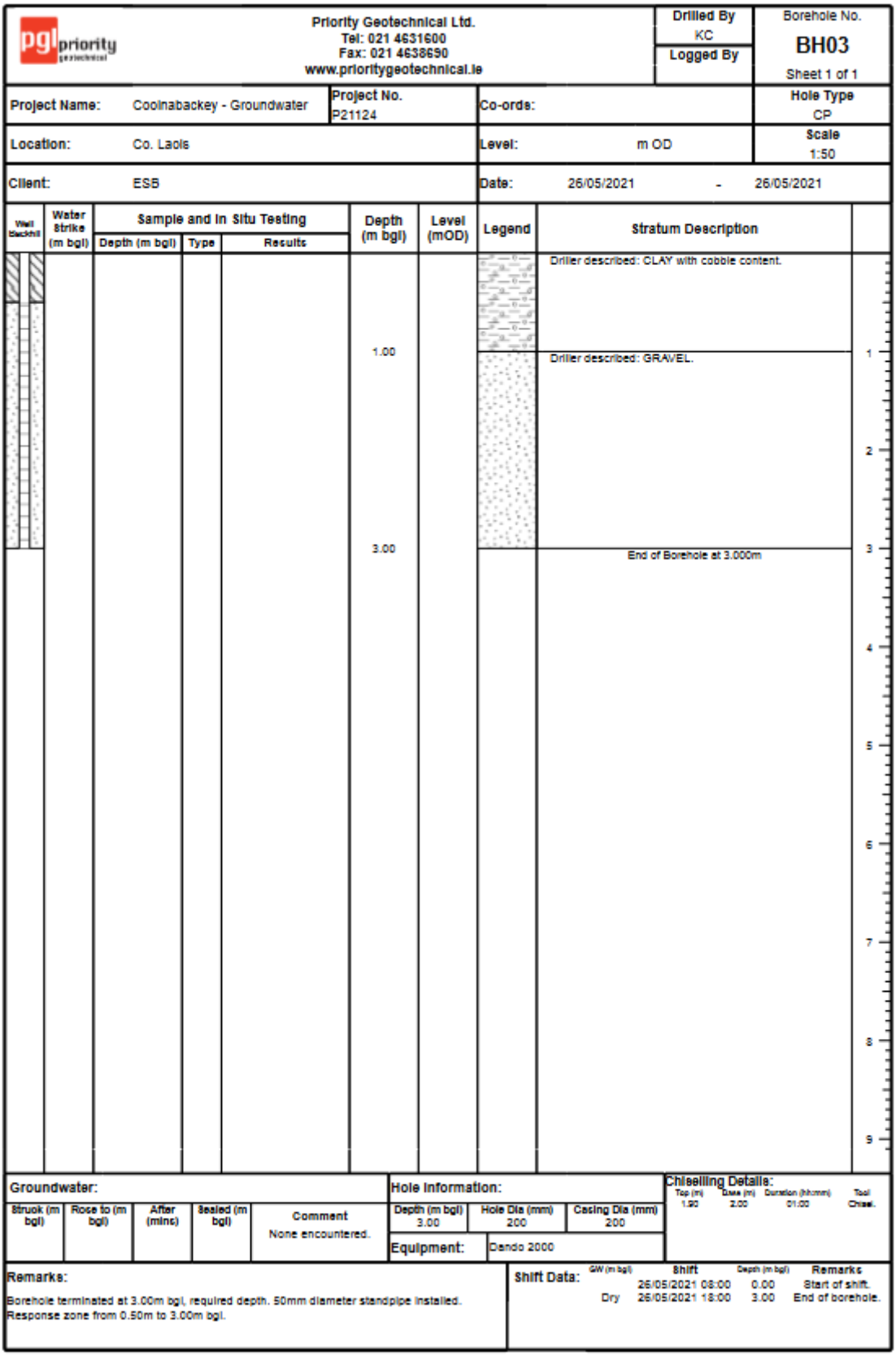
Remarks:
Borehole terminated at 3.00m bgl, required depth. 50mm diameter standpipe installed.
Response zone from 0.50m - 3.00m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	26/05/2021 08:00	0.00	Start of shift.
Dry	26/05/2021 18:00	3.00	End of borehole.

Figure 2 – Borehole Log of BH02 (Priority Drilling, 2018)

Appendix I – Borehole Logs



Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Drilled By: KC
Logged By:
Borehole No.: BH03
Sheet 1 of 1

Project Name: Coolnabackey - Groundwater
Project No.: P21124
Co-ords:
Hole Type: CP
Location: Co. Laois
Level: m OD
Scale: 1:50
Client: ESB
Date: 26/05/2021 - 26/05/2021

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
					1.00			Driller described: CLAY with cobble content.
					3.00			Driller described: GRAVEL.
								End of Borehole at 3.000m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
3.00	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
1.90	2.00	01:00	Chisel.

Remarks:
Borehole terminated at 3.00m bgl, required depth. 50mm diameter standpipe installed.
Response zone from 0.50m to 3.00m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	26/05/2021 08:00	0.00	Start of shift.
Dry	26/05/2021 18:00	3.00	End of borehole.

Figure 3 – Borehole Log of BH03 (Priority Drilling, 2018)

Appendix II – Exploratory Hole Locations

CAUSEWAY GEOTECH

Project No.:	17-0439	**Client:**	ESB Networks
Project Name:	Coolnabacky 400kV GIS Substation	**Client's Representative:**	Killeen Civil Engineering

Legend Key
Locations By Type - TP

Title:
Exploratory Hole Location Plan (1 of 3)

Last Revised:	Scale:
30/07/2018	1:2500

Figure 1 – Exploratory Hole Locations (1 of 3)

Appendix II – Exploratory Hole Locations

Figure 2 – Exploratory Hole Locations (2 of 3)

Appendix II – Exploratory Hole Locations

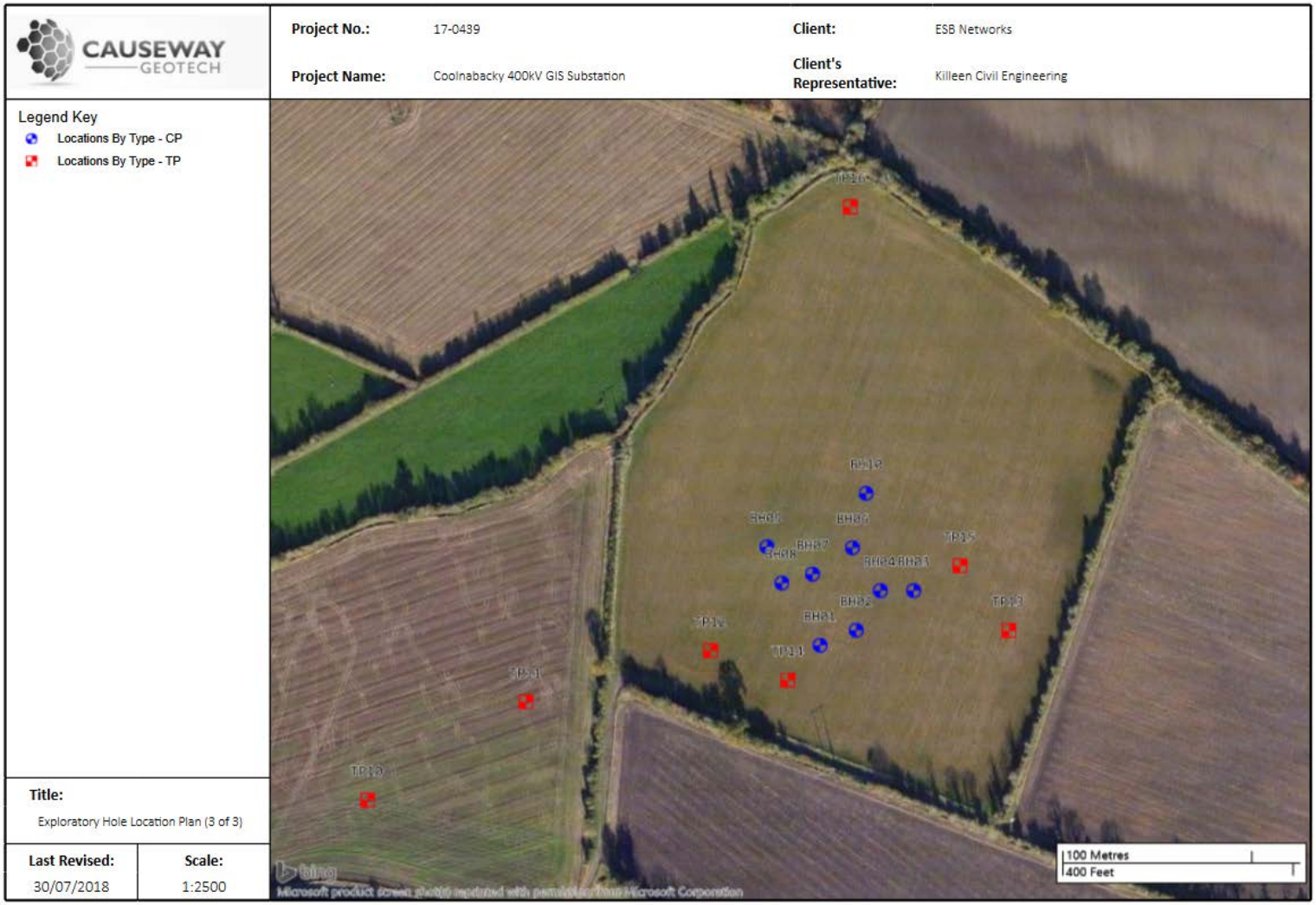


Figure 3 – Exploratory Hole Locations (3 of 3) (Causeway Geotech, 2018)

Appendix III – Exploratory Hole Logs

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	9.50

Project No.: 17-0439
Project Name: Coolnabacky 400kV GIS Substation
Borehole No.: BH04
Coordinates: 653775.62 E, 692876.75 N
Client: ESB Networks
Sheet 1 of 1
Client's Representative: Killeen Civil Engineering
Scale: 1:50
Ground Level: 100.93 mOD
Dates: 22/06/2018
Driller: BM
Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Backfill
			100.63	(0.30) 0.30	TOPSOIL: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse	
0.50	B1				Medium dense grey sandy clayey subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse	
1.00	B2			(1.50)		
1.20 1.20 - 1.65	D9 SPT (C) N=13	1.00 Dry N=13 (2,2/3,3,3,4)				
		Slight Seepage at 1.80m	99.13	1.80		
2.00	B3 D10				Soft grey sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subrounded fine to coarse.	
2.00 - 2.45	SPT (C) N=8	2.00 Dry N=8 (3,1/2,2,2,2)		(1.30)		
3.00	B4 D11		97.83	3.10		
3.00 - 3.45	SPT (S) N=12	3.00 Dry N=12 (2,2/3,2,3,4)			Firm grey sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded	
4.00	B5 D12					
4.00 - 4.45	SPT (S) N=22	4.00 Dry N=22 (4,9/6,6,6,4)		(2.90)		
5.00	B6					
5.00 - 5.45	U16	4.20 Dry U blow=50 100%				
6.00	D13		94.93	6.00		
6.00 - 6.45	SPT (S) N=27	4.20 Dry N=27 (4,5/6,6,7,8)			Stiff grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded	
7.00	B7			(1.50)		
7.50	D14		93.43	7.50		
7.50 - 7.95	SPT (S) N=36	4.20 Dry N=36 (7,7/8,8,9,11)			Very stiff grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded	
9.00	B8 D15			(2.00)		
9.00 - 9.45	SPT (S) N=45	4.20 Dry N=45 (7,8/8,11,12,14)	91.43	9.50	End of Borehole at 9.50m	

Remarks
Hand dug inspection pit excavated.

Terminated in stiff deposits

Water Strikes

Struck at (m)	Casing to (m)	Time (m:s)	Rose to (m)
1.80			

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
9.50	200

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Figure 1 - Borehole Log of exploratory hole BH04, located 20m east to BH04 (Causeway Geotech, 2018)

Appendix III – Exploratory Hole Logs

CAUSEWAY GEOTECH

Project No.:	Project Name:	Borehole No.:
17-0439	Coolnabacky 400kV GIS Substation	BH01
Coordinates:	**Client:**	Sheet 1 of 1
653744.29 E	ESB Networks	
692847.44 N	**Client's Representative:** Killeen Civil Engineering	**Scale:** 1:50
Ground Level:	**Dates:**	**Driller:** BM
101.53 mOD	22/06/2018	**Logger:** GH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	6.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Backfill
					101.23	(0.30) 0.30		TOPSOIL: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse	
0.50	B3							Firm grey sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.	
1.00	B4					(1.50)			
1.20	D9								
1.20 - 1.65	SPT (C) N=11	1.20	Dry	N=11 (2,2/3,3,3,2) Slight Trace at 1.30m					
					99.73	1.80		Soft to firm grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse	
2.00	B5 D10								
2.00 - 2.45	SPT (C) N=7	2.00	1.90	N=7 (2,2/2,1,2,2)		(1.20)			
3.00	B6				98.53	3.00		Firm to stiff grey sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded	
3.00 - 3.45	U1	3.00	Dry	Ublow=50 50%					
4.00	B7 D11								
4.00 - 4.45	SPT (S) N=17	4.00	Dry	N=17 (3,3/4,4,4,5)					
						(3.50)			
5.00	B8 D12								
5.00 - 5.45	SPT (S) N=28	4.20	Dry	N=28 (7,4/4,5,8,11)					
6.00 - 6.45	U2	4.20	Dry	Ublow=50 0%					
6.50 - 6.55	SPT (S)			N=50 (25 for 25mm/50 for 25mm)	95.03	6.50		End of Borehole at 6.50m	

Remarks
Hand dug inspection pit excavated.

Terminated in stiff deposits

Water Strikes			
Strike at (m)	Casing to (m)	Water (m/hr)	Rose to (m)
1.80			

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
		4.50	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Figure 2 - Borehole Log of exploratory hole BH01, located adjacent to BH05 to be decommissioned (Causeway Geotech, 2018)

Appendix III – Exploratory Hole Logs

CAUSEWAY GEOTECH

Project No.: 17-0439	**Project Name:** Coolnabacky 400kV GIS Substation		**Trial Pit No.:** TP14
Co-ordinates: 653727.14 E 692828.78 N	**Client:** ESB Networks		Sheet 1 of 1
Method: Trial Pitting	**Client's Representative:** Killeen Civil Engineering		**Scale:** 1:25
Plant: 3T Tracked Excavator	**Ground Level:** 101.57 mOD	**Date:** 12/06/2018	**Logger:** ST

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL	
			101.27	0.30		Grey very gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies, predominantly limestone	
0.50	B2						
0.50	D3						
0.50	ES1			(0.70)			
			100.57	1.00		Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies, predominantly limestone	
1.50	B4						
1.50	DS						
1.50	ES6			(1.20)			
			99.37	2.20		Grey very gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies, predominantly limestone	
		Seepage at 2.30m		(0.30)			
2.40	B7						
2.40	D8		99.07	2.50		End of trial pit at 2.50m	

Remarks
DCP carried out.

Terminated on scheduled depth at collapsing of pit sides.

Water Strikes:	
Struck at (m):	Remarks:
2.30	Seepage at 2.30m

Stability: Unstable

Width: 1.20
Length: 2.50

Figure 3 - Log of exploratory trial pit TP14, located north-west of BH04b (Causeway Geotech, 2018)

