AQUIND Limited

AQUIND INTERCONNECTOR

Design and Access Statement - Appendix 3 - SWDACMS - Appendix 8 Aquind Drainage Design Additional GI - Factual Report

The Planning Act 2008

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Aquind Drainage Design Additional GI

Factual Report

for
Aquind Limited

Engineer : WSP UK Limited

Project Number PE201667

January 2021

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Ground Investigation
at

Factual Report

Aquind Drainage Design Additional GI

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APPENDICES

1.0 INTRODUCTION

A geotechnical investigation was undertaken by Geotechnics Limited to provide additional information for the Drainage Design at the proposed location of the UK Converter Station and ORS Building (landfall) for the Aquind Interconnector (part of the Aquind UK – France high voltage direct current (HVDC) cable interconnector project).

The investigation was carried out to the instructions of the Engineer, WSP UK Limited, on behalf of the Client, Aquind Limited. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain further information on the ground and groundwater conditions relating to the drainage and geotechnical design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The Brief for the project is included in Appendix 1. The investigation comprised rotary and dynamic sample boreholes, machine-excavated trial pits with in-situ soakaway testing, in situ and laboratory testing and reporting.

In addition, two hand excavated trial pits were undertaken in the south of the site, within Fort Cumberland Car Park to locate a suspected water main pipe.

A Factual Report was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 11 of this Report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 12 to aid an understanding of the procedures followed and the context in which the report should be read.

4.0 THE SITE

4.1 Location

The site is divided into two areas, Denmead Farm, Broadway Lane to the north of Portsmouth, and Fort Cumberland Car Park, Southsea.

4.1.1 Denmead Farm

The Denmead Farm section of the site is located outside the West and South perimeter of the Lovedean substation, Horndean, Waterlooville. The approximate Ordnance Survey National Grid Reference for the site is SU 671 135 and an extract from the relevant 1:50,000 Scale O.S. Map (Sheet No 196) is included as Appendix 2.

The site is approximately L shaped 'strip' measuring approximately 600m from the northern end to the south eastern end, and 150m at its widest point. The site's topography is generally 'u' shaped, with the south of the site, dipping gently northwards, and the north of the site dipping gently south.

The site is situated within agricultural farmland bounded by hedgerows with the Lovedean substation to the northeast. All fields are grass covered whilst the south eastern field has been ploughed with a crop recently planted. There are no known water courses in the site.

A gravel and dirt topped farmers' lane transects the site and is generally orientated East to West.

4.1.2 Fort Cumberland Car Park

Fort Cumberland Car Park is located approximately 5m the East of Fort Cumberland Road, Portsmouth, Southsea, and 200m to the Northwest of Fraser Range. The approximate Ordnance Survey National Grid Reference for the site is SZ 678 991 and an extract from the relevant 1:50,000 Scale O.S. Map (Sheet No 196) is included in Appendix 2.

The site is triangular shaped and measures approximately 80m x 60m. The site is gravel topped and undulating with numerous 'potholes' across the site. The site is located within a residential and recreational area, with housing bounding the North, South and West are to the site. The east of the site is bounded by open grass land. At the time of the investigation the site was being used as a carpark. There are no known water courses in the site.

4.3 Site Geology

The British Geological Survey website, http://mapapps.bgs.ac.uk/geologyofbritain/home.html, accessed on the 26/11/2020, shows the Denmead Farm site to be underlain by the Cretaceous Tarrant Chalk Member (Bedrock), which is described as soft white chalk with relatively widely spaced large flint seams. Although not mapped, widespread Quaternary Head deposits are to be found throughout the area. These are described as poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep.

The Fort Cumberland Car Park is shown to be underlain by the Paleogene Wittering Formation (Bedrock), which is described as greyish brown laminated clay with interbedded sand and rare glauconitic sand. Quaternary Storm beach deposits (Superficial) described as rounded gravel cobbles and boulders.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with their requirements (see Appendix I).

5.2 General

The procedures followed in this site investigation are based on *BS 5930: 2015 and A1:2020 – Code of Practice for Site Investigations*. The soils and rocks encountered have been described in accordance with BS5930:2015 and BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The Rotary Borehole, Dynamic Sample Borehole and Trial Pit Records are included in Appendices 4 to 7 and their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 3.

The Exploratory Hole locations were specified by WSP UK Limited, however Trial Pit 21, 22 and 27 were moved to an alternative location which was agreed with the WSP Engineer. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica GS08 GPS survey device.

At each exploratory hole location, with the exception of the trial pits, an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT) and magnetometer to check for the presence of UXO.

5.3 Combined Dynamic Sample and Rotary Boreholes

Four (4 No.), 150mm diameter boreholes (numbered BH40 to BH43) were sunk utilising a combination of dynamic sampling and rotary coring techniques to depths varying between 3.00 and 10.00m below ground level. The work was carried out between the 16th and 20th November 2020. The Dynamic Sample and Rotary Borehole Records are presented in Appendix 4 together with photographs of the locations before and after reinstatement (where available).

The dynamic sample sections of the boreholes were carried out using a compressed air percussive apparatus fitted to the rotary drilling rig which drives lined steel tubes into the ground in 1.00m or 1.50m lengths. Samples are retrieved in the plastic liners. The liners are extruded from the sampler and placed into suitable core boxes.

Rotary coring (96mm diameter), commenced at a depth of between 6.00m and 6.10m below ground level in BH41 and BH42. The drilling equipment used in the rotary sections of the boreholes on this particular contract utilised air-mist as the flushing medium.

The strata descriptions in the open-hole sections of the Borehole Records are the Drilling Foreman's estimate based on sediment and also on chipping returns in the flushing medium placed into disturbed (D) samples. The rate of penetration is also used as an indicator of the type of material being drilled, particularly where there is loss of flush returns. Definitive classification in terms of geology or degree of disturbance is not usually possible from these sources.

Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes.

Photographs of the individual core boxes are included in Appendix 5.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Borehole Records.

On completion, all the boreholes were backfilled with bentonite.

5.4 Trial Pits

Eight (8 No.) Machine Excavated Trial Pits (numbered TP21 to TP28) were excavated to depths varying between 0.5m and 2.5m below ground level using a 5-Tonne excavator between the 16th and 20th November 2020. This work was supervised on site by a geotechnical engineer.

Two (2 No) Hand Excavated Trial Pits (numbered HP01 to HP02) were excavated to depths between 1.00m and 1.10m below ground using a 2 Tonne mini-excavator and insulated hand tools on the 19th of November 2020.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. Representative samples were taken, where appropriate, for laboratory examination and analysis and in addition, Environmental samples (ES) were recovered at the depths indicated on the Trial Pit Records. Samples were taken directly from excavated materials deposited at the surface. Groundwater observations and trench stability notes are included on the Trial Pit Records. Photographs of the pits are presented in Appendix 7 together with photographs of the locations before and after reinstatement (where available).

5.5 In Situ Permeability Tests

In Situ Falling Head Permeability tests were undertaken in all Boreholes at depths specified by the WSP engineer during a pause in the drilling operations in accordance with *BS EN ISO 22282-2:2012* at the following depth ranges:

Exploratory Hole	Test Section (m below ground level)
BH40	1.20m to 3.20m
BH41	4.50m to 5.50m
BH41	6.00m to 7.00m
BH42	3.20m to 4.20m
BH42	4.50m to 6.00m
BH43	2.60 to 2.65m

The test locations were specified by the Engineer.

An estimate only of the permeability has been provided as the boreholes were dry throughout the investigation. The test section is therefore above the groundwater level such that the test section is not fully saturated.

The test data is presented in Appendix 8 with two estimates given based firstly on an assumed groundwater depth of 15m bgl, and secondly assuming groundwater at the base of the borehole test. These examples are provided to allow a comparison of possible situations.

5.6 Soakaway Tests

Eight (8 No.) soakaway tests were carried out in all Trial Pits, TP21 and TP28 at the locations marked on the Exploratory Hole Location Plan (see Appendix 3) to depths of between 0.30 and 2.00m below ground level in accordance with the method given in *BRE Digest 365 "Soakaway Design", 2016*. Following the test procedures in the Digest the tests were repeated three times at each location. At TP28, due to ground collapse and unsafe conditions, only two repeated tests were undertaken. The results of the tests are presented in Appendix 9.

5.7 Explosive Ordnance Clearance

Historical information provided by the Client highlighted the potential risk of the presence of unexploded bombs/ordnance beneath the site. In order to reduce the risk of them being found during drilling or excavation, each exploratory hole location was cleared by a Specialist Company, EOD Contracts Limited before commencement of the ground investigation operations.

The clearance works for the borehole was carried out by an Explosive Ordnance Detection (EOD) Engineer working with magnetometer.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer in order to relate to the proposed development. The tests were carried out in MATTest Limited's UKAS accredited Laboratory (Testing No. 2643) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Test Certificate in Appendix 10. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:

BS 1377:1990

Test No.		**Test Description**
Part 2		
3.2	10 No.	Moisture Content Determination
4.3 & 5.3	7 No.	Liquid and Plastic Limit Determination
8.3	13 No.	Particle Density Determination.
9.4	10 No.	Mechanical Analysis - Sedimentation
Part 4		
3.4	5 No.	Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)
5.5	2 No.	Moisture Condition Value Calibration Tests.
Part 6		
3.5	2 No.	Consolidation Properties in a Hydraulic Cell – one way vertical drainage with rigid load
Part 7		
4.4.3	2 No.	Shear Strength by Direct Shear - Small Sheabox Test
9	1 No.	Shear Strength Measurement - 100mm diameter (Multi-Stage) Quick Undrained Triaxial Compression Test.

The following testing was carried out at the laboratories of DETS (UKAS Accredited Laboratory, Number 2139):

BRE Special Digest 1 Suite

2 No. Suites comprising:-
Soluble Sulphate
pH

The results of the tests are presented in Appendix 10.

6.2 Contamination

Selected samples of soil were tested at the laboratories of Eurofins Chemtest for a number of determinands in order to check on potential site contamination. The determinands specified by the Engineer and are detailed on the results sheets in Appendix 11 together with the test result as well as the test method, accreditation and detection limit.

Prepared by:

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Bsc (Hons), FGS
Regional Operations Manager

APPENDIX I

The Brief

MEMO

TO	Aquind Ltd	**FROM**	Joshua Kaufmann
DATE	**28 July 2020**	**CONFIDENTIALITY**	**Confidential**
SUBJECT	**Aquind Additional Ground Investigation Specification for Drainage Design at the Converter Station and ORS Building (Phase 3)**		

INTRODUCTION

At the time of the original 2018 ground investigation the location of detention/retention ponds and drainage design for the project were unknown and so could not be investigated. Further to receipt of comments from key stakeholders and a preliminary drainage design it is considered that additional ground investigation is required to confirm/prove the drainage design assumptions.

This specification is to provide a preliminary scope of works for additional ground investigation, including in-situ testing and sampling to inform the drainage design for the UK Converter Station and ORS Building (landfall) for the Aquind Interconnector. This scope of works aims to outline a ground investigation that will prove ground conditions at key locations (ponds, swales, soakaways etc) and provide information on ground permeability and porosity to allow drainage design in addition to other geotechnical testing.

SCHEDULE 2: DRAINAGE DESIGN

The following assumptions have been made during the preparation of the Schedule 2 for the drainage design, these should be reviewed, and revisions made as necessary.

Ground Investigation to be undertaken in accordance with UK Specification for Ground Investigation (SISG).

All in-situ and laboratory testing are to be confirmed by the Investigation Supervisor.

The ground investigation has been scoped with prior site knowledge from Phase 1 and 2 ground investigations. Positions shown on preliminary plans in Appendix A are approximate only and may require adjustment during the site works.

Abbreviations

- BH = Borehole
- TP = Trial pit
- CP = Cable Percussion
- Rot = Rotary Core
- WS = Window Sample

Note 1 - Please note that the scheduled exploratory hole depths and installation details are provisional and are to be confirmed by the Investigation Supervisor.

Note 2 - See drawing(s) in Appendix A for coordinates

Note 3 - Where UXO risks have been identified, surface clearance and/or a UXO engineer will be on site.

For provisional exploratory hole locations see location plan, Appendix A, locations to be confirmed on site. Scheduled exploratory hole depths are also provisional and are to be confirmed by the investigating supervisor. Boreholes – combined cable percussive and rotary, or equivalent, boring to log ground conditions, obtain samples and undertake in-suit testing.

Trial pits – mechanically excavated trial pits for logging ground conditions, carrying out in situ tests and obtaining samples for laboratory testing.

CONVERTER STATION AND ACCESS TRACK

Table 1 Schedule 2 Converter Station and Access Track

HOLE NUMBER	UXO SEARCH	SCHEDULED DEPTH (M)	PURPOSE	TESTING	COMMENT
BH40	Surface Scan	5m	Prove ground conditions to allow design of the infiltration pond and the converter station gravel infiltration zones. To provide data on permeability, porosity as well as soil strength parameters. Waste acceptance criteria testing required (Suite H).	Every metre alternate SPT and Bulk sample (granular) or OS-T/W U100 (cohesive), sampling to occur before the metre interval if change in strata. Testing and sampling is to be to CIRIA C574 and BS 5930:2015. Environmental testing to be specified in the detailed specification. Two packer permeability tests per a hole, testing to be to CIRIA C574, BS EN ISO 22282 and BS 5930:2015.	As directed by Investigation Supervisor. A minimum of three suitable samples will need to be collected from BH41 and BH42 for laboratory permeability and porosity testing. Locations within SPZ1.
BH41 – BH42	Surface Scan	10m			
TP21-TP27	Surface Scan	Assume 1.75m (1.0-2.5m) depth (machine dug).	Prove ground conditions to allow design of the Soakaways, infiltration pond and swale infiltration Infiltration testing providing permeability results. In-situ and laboratory testing providing further porosity and soil strength parameters. Waste acceptance criteria testing required (Suite H).	One soakaway per trial pit, testing to be to BRE 365. Testing and sampling is to be to CIRIA C574 and BS 5930:2015. Environmental testing to be specified in the detailed specification. One large bulk and one small tub every metre or change of strata.	As directed by Investigation Supervisor. Locations within SPZ1. Depths may vary dependent on location, to be confirmed by supervising engineer.

ORS BUILDING

Table 2 Schedule 2 ORS Building

HOLE NUMBER	UXO SEARCH	SCHEDULED DEPTH (M)	PURPOSE	TESTING	COMMENT
BH44	Surface Scan + UXO Engineer	5m	Prove ground conditions to allow design of the ORS Building infiltration drainage. To provide data on permeability, porosity as well as soil strength parameters. Ground/groundwater aggressivity testing for potential concrete structure (Suite C (Brownfield site – pyrite absent)). Waste acceptance criteria testing required (Suite H).	Every metre alternate SPT and Bulk sample (granular) or OS-T/W U100 (cohesive), sampling to occur before the metre interval if change in strata. Testing and sampling is to be to BS 5930:2015. Environmental testing to be specified in the detailed specification. Two falling head permeability tests per a hole (3 runs per a test), testing to be to BS EN ISO 22282 and BS 5930:2015.	As directed by Investigation Supervisor.
TP28	Surface Scan + UXO Engineer	Assume 2.0m depth (machine dug).	Prove ground conditions to allow design of the ORS Building infiltration drainage Infiltration testing providing permeability results. In-situ and laboratory testing providing further porosity and soil strength parameters. Ground/groundwater aggressivity testing for potential concrete structure (Suite C (Brownfield site – pyrite absent)). Waste acceptance criteria testing required (Suite H).	One soakaway per trial pit, testing to be to BRE 365. Testing and sampling is to be to BS 5930:2015. Environmental testing to be specified in the detailed specification. One large bulk and one small tub every metre or change of strata.	As directed by Investigation Supervisor.

OTHER REQUIREMENTS

PERSONNEL

WSP Engineer (Joshua Kaufmann or similar experience) to represent client and undertake role of Investigation Supervisor. Requirements for drilling crew, engineers and support staff to be confirmed by the Contractor.

HEALTH AND SAFETY

The Contractor is to produce suitable and approved health and safety documents including risk registers, safety controls and RAMS, these are to be reviewed by WSP. Detail of health and safety requirements will be included within the detailed specification

METHODOLOGIES

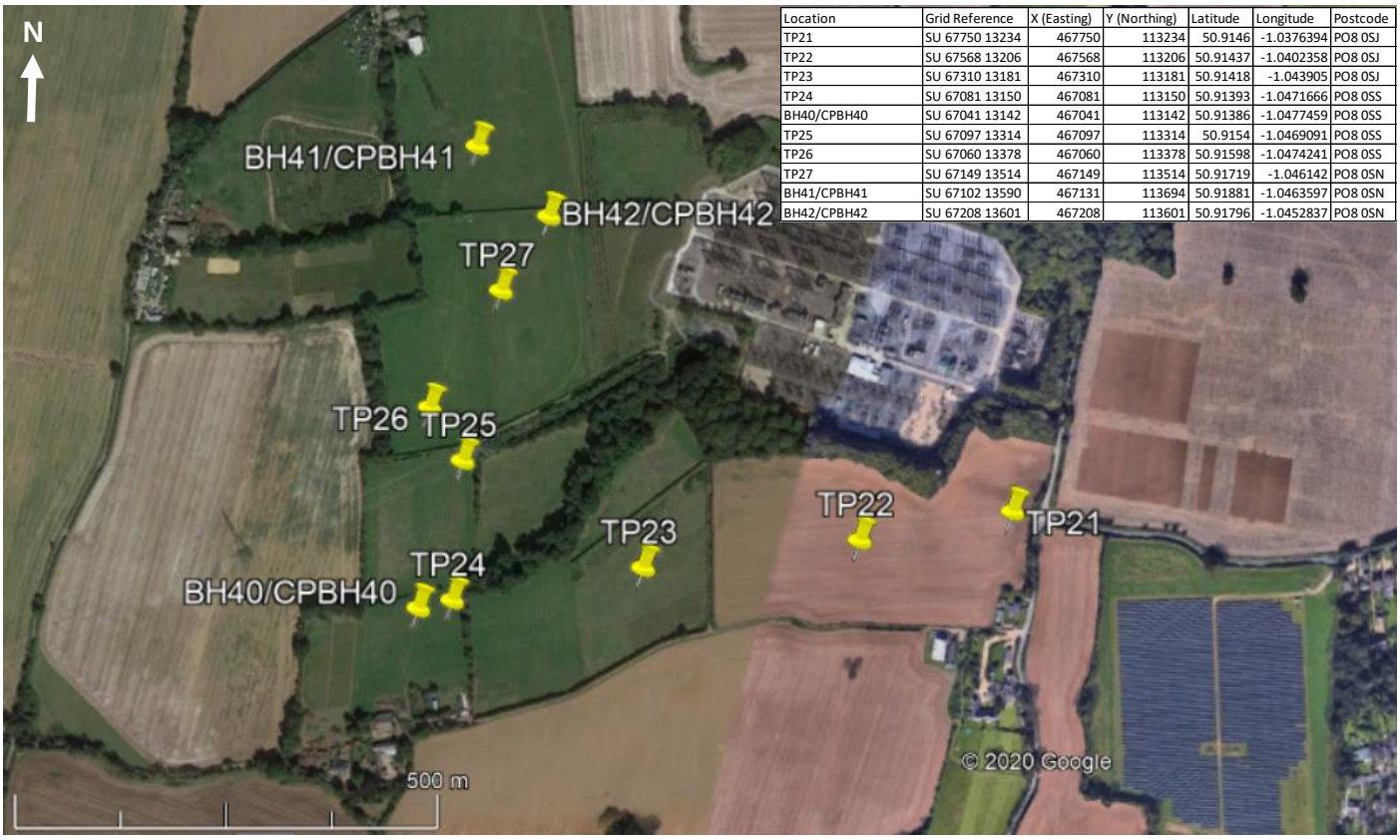
Suitable methodologies will need to be agreed with the local landowners and relevant statutory bodies. Drilling methodologies are to be the same as the previous ground investigation phase methodologies which were agreed with Portsmouth Water and available in Appendix B. The water used for variable head testing, packer testing and infiltration testing is to be potable water sourced from a nearby Portsmouth Water standpipe. Confirmation and review of the proposed methodologies will need to be completed by Portsmouth Water.

STATUTORY BODIES CONSULTATION AND PERMITS

All works will need to be permitted by local landowners.
Works within the SPZ1 will require consultation and agreement with Portsmouth Water.
Portsmouth City Council will require consultations for any works within the city of Portsmouth.

APPENDIX A

Figure 1 Converter Station Infiltration Testing Plan



Location	Grid Reference	X (Easting)	Y (Northing)	Latitude	Longitude	Postcode
TP21	SU 67750 13234	467750	113234	50.9146	-1.0376394	PO8 0SJ
TP22	SU 67568 13206	467568	113206	50.91437	-1.0402358	PO8 0SJ
TP23	SU 67310 13181	467310	113181	50.91418	-1.043905	PO8 0SJ
TP24	SU 67081 13150	467081	113150	50.91393	-1.0471666	PO8 0SS
BH40/CPBH40	SU 67041 13142	467041	113142	50.91386	-1.0477459	PO8 0SS
TP25	SU 67097 13314	467097	113314	50.9154	-1.0469091	PO8 0SS
TP26	SU 67060 13378	467060	113378	50.91598	-1.0474241	PO8 0SS
TP27	SU 67149 13514	467149	113514	50.91719	-1.046142	PO8 0SN
BH41/CPBH41	SU 67102 13590	467131	113694	50.91881	-1.0463597	PO8 0SN
BH42/CPBH42	SU 67208 13601	467208	113601	50.91796	-1.0452837	PO8 0SN

Figure 2 ORS Building Infiltration Testing Plan

Location	Grid Reference	X (Easting)	Y (Northing)	Latitude	Longitude	Postcode
TP28	SZ 67821 99126	467821	99126	50.78775	-1.0392353	PO4 9LP
BH43/CPBH43	SZ 67851 99131	467851	99131	50.78779	-1.0388169	PO4 9LP

APPENDIX B

UK – France Interconnector Ground Investigation

Drilling Methodologies Proposed. (Revision 1 – *additions in italics*)

Geotechnics Ltd have been employed by WSP on behalf of Aquind Ltd to carry out a ground investigation to determine the ground condition *at two potential converter station locations as well as* along the proposed cable route from Lovedean Sub- station south to the coast at Eastney. The project has been split into 4 packages of work –

Package 1, Package 1A, Package 2, Package 3

Areas of the site are known to be underlain by a principle aquifer – Chalk and has also been designated as a Source Protection Zones (SPZ1s).

As part of the investigation Geotechnics have been asked to drill rotary boreholes to depths up to 30m below ground level.

All drilling carried out by Geotechnics Ltd will be undertaken in accordance with the Environment Agency guidance as outlined in

- "Technical Report P5-065/TR" in "Technical aspects of site investigation" Volume 2, Environment Agency 2002
- Guidance on the design and installation of groundwater quality monitoring points
- British Drilling Association Guidelines

Aquifer protection measures*, including telescopic drilling techniques (clean drilling techniques) will be employed at* ***all*** *boreholes along the whole scheme including the proposed converter station locations close the existing electrical substation.*

Telescopic drilling is a technique used to minimise cross-contamination in layered aquifer systems. In brief, a borehole and temporary casing is advanced until a low permeability layer is encountered. The temporary casing is sealed into this layer and a second, narrower string of temporary casing is then advanced within it to permit drilling to continue. The technique will require the borehole to be started at a larger diameter than conventional drilling and may also require the use of additional lengths of casing.

Our proposed methodology based on the requirements of the investigation (information required, depths stipulated etc) the expected geology, indications from previous reports, work that we have carried out in the area previously and British Geological Survey borehole records, was to bore using 150mm diameter drilling tools and 150mm diameter casing to start each borehole.

Casing would be advanced as boring progresses, until a non permeable layer is encountered and the 150mm casing then effectively sealed into this layer meaning potential contaminated ground *and/or perched groundwater and any lenses of potentially contaminated water* above is sealed off from those stratas below. There would therefore be no route available for contaminations to seep downwards.

A second smaller diameter string of casing (nominal 140mm) will then be installed to case off any additional permeable layers *and/or perched groundwater and any lenses of potentially*

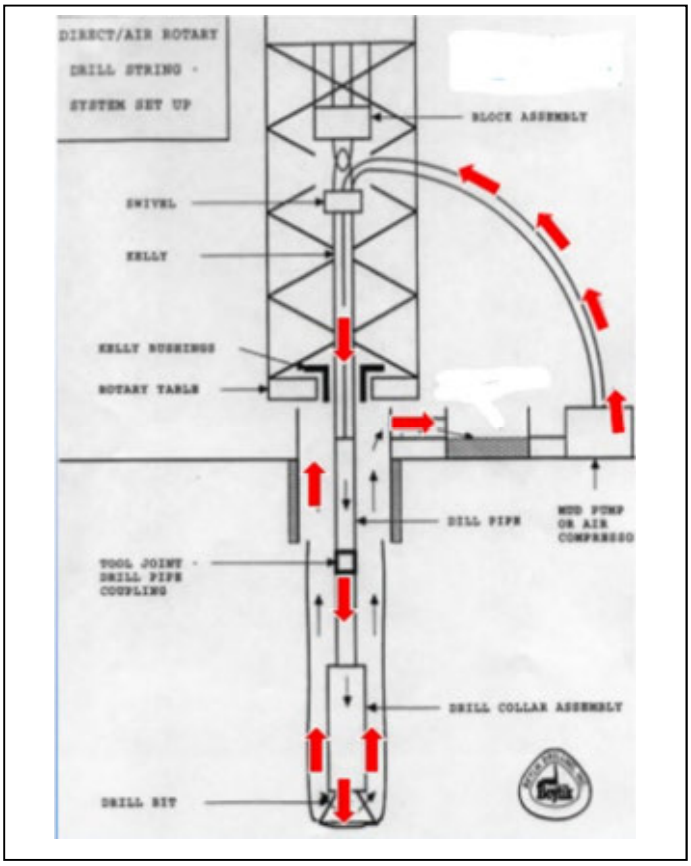
contaminated water prior to the rotary coring beginning (once competent material is encountered – this could be before the Chalk is reached as stiff clays are anticipated).

The addition of bentonite seals can be installed at the base of each string of casing – this entails pulling back the casing by 1.0m then adding bentonite pellets to form a minimum 1.0m seal. The bentonite pellets will be left to cure for a minimum of 2 hours before drilling recommences. *If the borehole is dry at the point of adding the bentonite seals then potable water will be added to the borehole to enable the bentonite pellets to cure. The data sheet for the bentonite pellets that will be used (Mikolit 300) is at the end of this document; the delayed swelling time for these pellets is ~15mins therefore waiting 2 hours for the bentonite to swell and cure and create a low permeability seal is deemed more than sufficient.*

We anticipate encountering stiff impermeable clays for the majority of the borehole so the addition of bentonite seals may not be of any additional merit – however the geology will be closely monitored by our rig supervisors and drillers and the necessity of the bentonite seals assessed at a borehole by borehole / strata by strata basis.

The main risk is following completion of boring when casing is removed. However, we would be backfilling boreholes with bentonite pellets which will fully seal the boreholes. This is added as casing is removed so again, there is no time at which contaminated ground *or perched groundwater lenses* could “fall” down the borehole.

All the boreholes will be cased *(telescopically*) as detailed above as the borehole is progressed; sampling and drilling will be carried out using a combination of dynamic sampling (window sampling) through the softer overburden then switching to rotary coring utilising air mist as flush – direct circulation.
The dynamic sampling section of the borehole is achieved by percussive sampling – dropping weight onto sample barrel repeatedly to advance it through the ground and return continuous meter long samples – no flush is required whilst this technique is carried out.
Once rotary coring is being used flush will be added to the drill string by direct circulation to the base of the hole and pushed back up to the surface inside the temporary casing. The flush is used to lubricate and cool the bit as drilling progresses as well as to lift the drill cuttings to the surface where they will be contained within a bunded area at ground level. The water added to the borehole will be potable water.



Should poor core recovery be encountered then shorter run lengths shall first be attempted if this does not improve the core recover then the option to switch to water flush will be considered.
Water flush can be less destructive to the core in some geologies and help improve recovery, it can however wash away very weak rock. Consultation will be had between the lead driller, rig supervisor and investigation supervisor prior to switching the flush.

The drilling techniques described above result in continuous samples of the soils / rock being recovered with minimal excess spoil. All samples recovered will be logged and sub sampled by the onsite engineers/geologists and samples utilised for laboratory testing off site.

Proposed Plant and Equipment

Rig1 – Commaccio 405 – tracked
Rig2 – Klemm UniMog – Truck Mounted

Drilling Equipment – Rotary

- Rotary drilling rigs - Fitted with compliant guarding – weight 14 Tonnes
- 1 No. compressor
- Water bowser
- 100 mm diameter bauer pipework in 3 m and 6 m lengths
- 50 mm fire hoses
- 150 mm nominal diameter temporary casing in 2 m lengths
- 140mm nominal diameter temporary casing in 2m lengths
- Tricone bits, tungsten bits, diamond bits

- Drill rods
- Hand tools (stilsons, chains, hammers, shovels etc.)

Unexpected Ground Conditions

The nature of ground investigations is to gain more information on the ground conditions – geology, strength and groundwater, to that effect unexpected ground conditions may well be encountered.

Examples of these could be karstic features which are sometimes found within chalk.

To mitigate risks associated with these features any desk study or mapping information of local karstic features will be shared with Geotechnics and boreholes set out in areas to avoid any known features.

The rigs will be set up in such a way so that their load is spread over a larger footprint by way of using wooden sleepers under their outriggers thereby reducing their ground pressure at surface.

Lead drillers will be briefed on the fact that these features may be present in the area.
Lead drillers will take special note of the drilling speed and in particular the amount of flush being used and any flush loss both of which can be indicators that a void could be present or close.
Additional indicators that could be evidence of a karstic feature are encountering granular fill material within the Chalk strata and silts and sands in situ within the Chalk.

Should any one of these features be encountered in any of the boreholes – works will stop and the EA and Portsmouth *Water* informed immediately. Instructions will then be sought from the Investigation Supervisor WSP.
If instructed and ground conditions permitting drilling will continue to try to identify the depth of the feature/void – this will likely involve adding rods to the drill string and lowering these down the borehole until the base of the void is identified.
Additional casing will be required to advance the borehole past the void.

On terminating the borehole we would propose installing a mechanical packer at the top of the feature / void to effectively plug the borehole. From here the borehole will then be backfilled with bentonite pellets as the casing strings are removed until the borehole is completely backfilled up to surface.

For all boreholes located within the SPZ1 Portsmouth Water will be contacted to inform them of the following:-

- Prior to starting Boreholes
- Immediately of any loss of drilling flush
- *Encountering any unexpected fill/geology*
- Encountering any voids/karstic features
- Backfilling of the boreholes.
- Agreement of any installation details.

Ground Water Installations

We understand that the client may require some standpipes in some *boreholes (one at each converter station location)*, which again creates a possible pathway/route for contamination to move between shallow and deep zones. We would seal off the deeper zones from shallower response zones using a minimum of 2m bentonite. Also ensuring that response zones are not too long and thereby linking layered aquifers and or aquifers and made ground/contaminated stratas.

On the instruction of Portsmouth Water, a minimum of 2.0m from ground level of plain installation pipe will be grouted into the borehole with the plain pipe extending a reasonable depth to reduce the risks associated with preferential pathways.

Dual installations can be installed safely within boreholes, however to add an additional layer of safety only single installations will be scheduled in any of the boreholes along this scheme. All installations will be cemented in at ground level and fitted with lockable covers either flush or upstanding – depending on location and investigation supervisors / landowners instructions.

Bentonite Pellets

Mikolit 300

Mikolit® is a sealing pellet which requires no mixing or pumping. It is a patented clay based pellet with a very low dust content.

Mikolit 300 is a medium grade bentonite pellet suitable for most applications. It has a **swelling capacity of 50-70%.**

All Mikolit pellets have excellent sinking qualities and are dust free and easy to use.

Pellet Size:	**± 8mm (D); 7-12mm(L)**
Processing Time:	**None**
Sinking Speed In Water:	**21m/min**
Saturated Density:	**~1.80 t/m³**
Bulk Density:	**~1.10 t/m³**
Delayed Swelling Time:	**~ 15 minutes**
Swelling Capacity:	**50 - 70%**
Swelling Pressure:	**9 kN/m²**
Permeability:	**<10^{-11}m/s**

SHELF LIFE: Unlimited if unopened & kept in a dry location

PACKAGING: 25kg waterproof bags, 40 or 56 bags per pallet.

QUANTITY NEEDED (KG/M) Borehole Diamater (mm)

00	100	125	150	200	250	300	400	500	600
0	9	13	19	34	54	77	137	215	309
50	6	11	17	32	51	75	135	212	307
100		5	11	26	45	69	129	206	300
125			6	21	40	64	124	201	295
160				12	32	55	115	193	287
200					19	43	103	180	175
250						24	84	161	255
315							52	129	224
400								77	172
500									94

Applications

- Borehole sealing
- Isolating instrumentation and sampling zones

Features

- 50-70% swelling capacity
- Pre-formed pellet
- Delayed swelling
- No grout loss
- No grouting/mixing machines required
- Simple & easy to use
- Environmentally friendly
- Low permeability
- Dust free

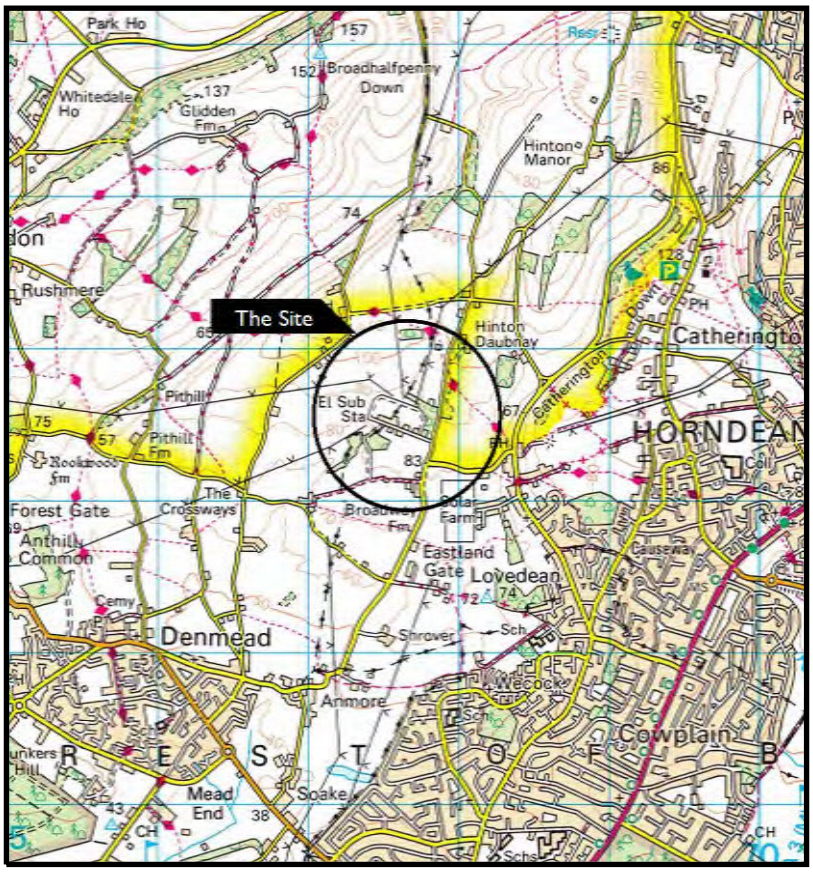
Specifications may change without prior notice

Marton Geotechnical Services Ltd www.mgs.co.uk e info@mgs.co.uk t +44(0)1359 271167 f +44(0)1359 271168
Geotechnical Centre, Rougham Industrial Estate, Rougham, Bury St Edmunds, Suffolk IP30 9ND, England

APPENDIX 2

Site Location Plan

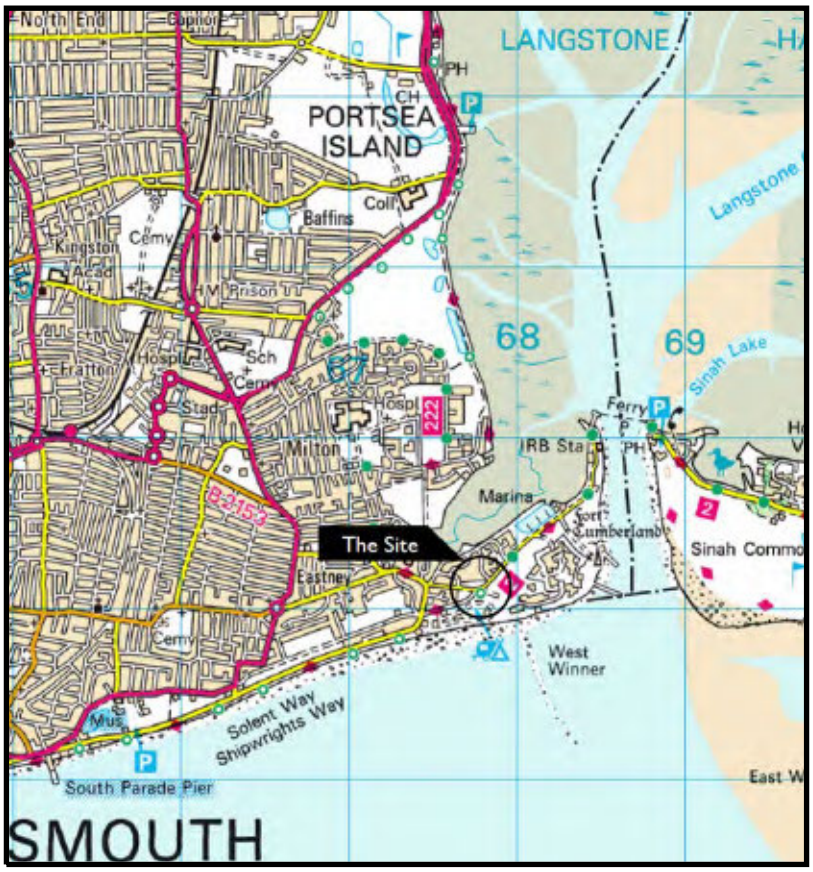
SITE LOCATION PLAN



Ground Investigation
at
Aquind Drainage Design Additional GI
for
Aquind Limited

GEOTECHNICS
geotechnical and geoenvironmental specialists

SITE LOCATION PLAN



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APPENDIX 3

Exploratory Hole Location Plan

BH41

BH42

TP27

TP26

TP25

0 20 40 Meters

Key

- Borehole
- Trial Pit
- Hand-Dug Pit

Hole ID	Easting (mE)	Northing (mN)	Level (mOD)
BH40	447954.5	113140.9	97.18
BH41	447529.9	113495.1	99.27
BH42	447288.5	113802.9	98.13
BH43	447699.3	995180.5	3.48
HP01	447850.6	995238.2	3.69
HP02	447942.8	995277.9	3.44
TP22	447764.3	113418.0	97.80
TP23	447758.1	113549.9	99.00
TP24	447728.2	113720.4	97.46
TP25	447579.3	113747.1	98.60
TP26	447597.2	113931.1	73.22
TP27	447728.4	113940.9	86.75
TP28	447728.4	113943.9	86.75
TP29	447818.4	995237.3	3.48

TP22 and TP23 co-ordinates and height approximate.

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Engineer:
WSP UK Limited

Client:
Aquind Limited

Project:
UK-France HVDC Interconnector - Additional Ground Investigation for Drainage Design

Drawing Title:
EXPLORATORY HOLE LOCATION PLAN
Drawing 1 of 4

Scale: 1:1000@A1

Date:
November 2020

Project No:
PE201667

File Name:
Geo-PE201667-001(1)

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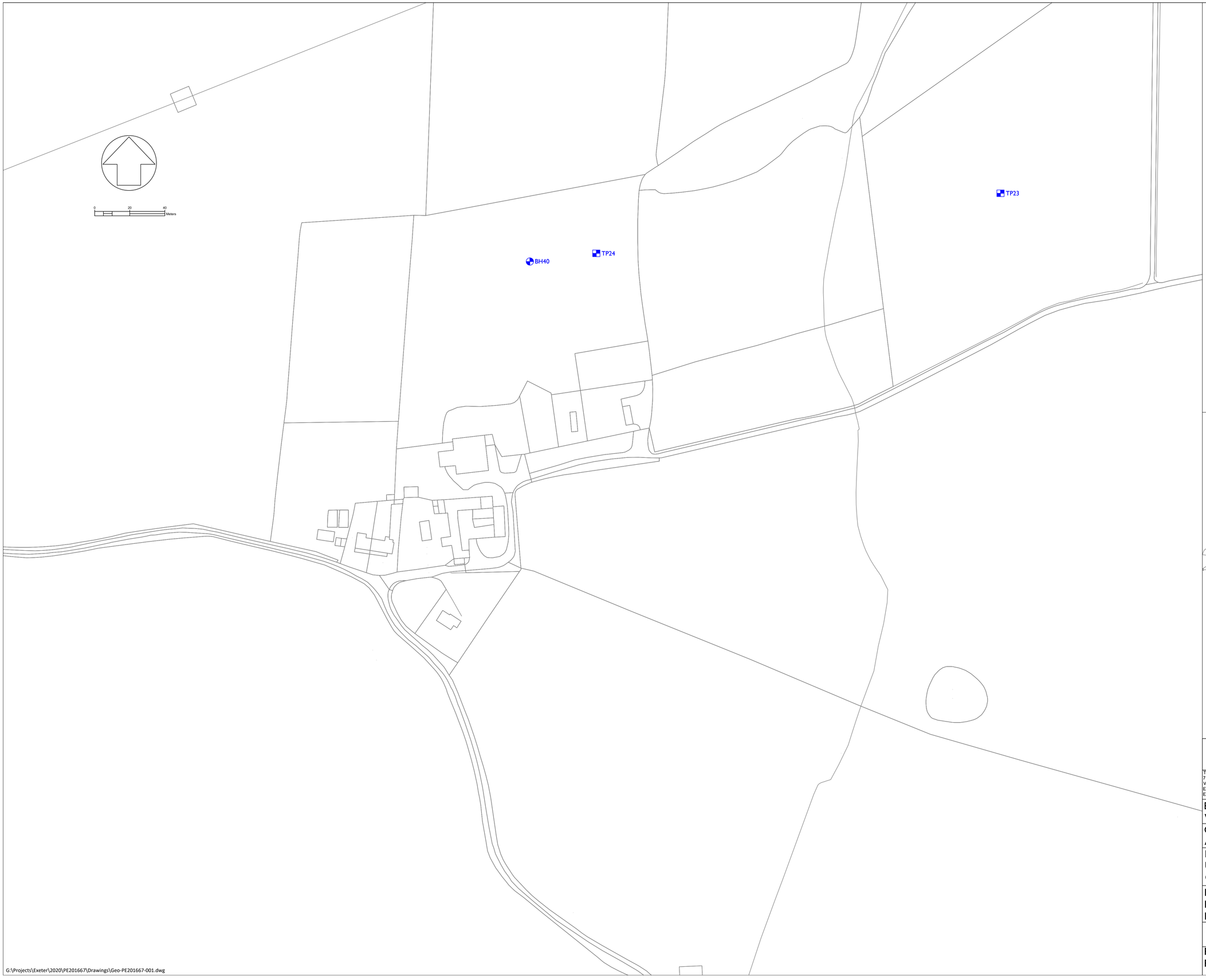

Key

- Borehole
- Trial Pit
- Hand-Dug Pit

Hole ID	Easting (mE)	Northing (mN)	Level (mOD)
BH39	447954.7	113140.9	97.18
BH40	447529.9	113495.2	96.27
BH42	447288.7	113857.9	94.13
BH43	447699.3	995580.5	3.46
HP01	447850.6	995628.2	3.49
HP02	447942.8	995677.9	3.44
TP21	447722.3	113 0 0 0.1	97.90
TP22	447756.0	113 0 0 0.9	99.00
TP23	447328.2	113 0 0 1.4	77.40
TP24	447579.5	113 0 0 7.1	68.40
TP25	447997.2	113 0 0 1.1	73.10
TP26	447 9 0 0.0	113 0 0 5.0	86.00
TP27	447 0 0 8.4	113 0 0 6.9	99.75
TP28	447 9 0 0.6	995 0 7.3	3.40

TP22 and TP23 co-ordinates and height approximate.

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Drawing Title:
EXPLORATORY HOLE LOCATION PLAN
Drawing 2 of 4

Scale: 1:1000@A1

Date:
November 2020

Project No:
PE201667

File Name:
Geo-PE201667-001(2)

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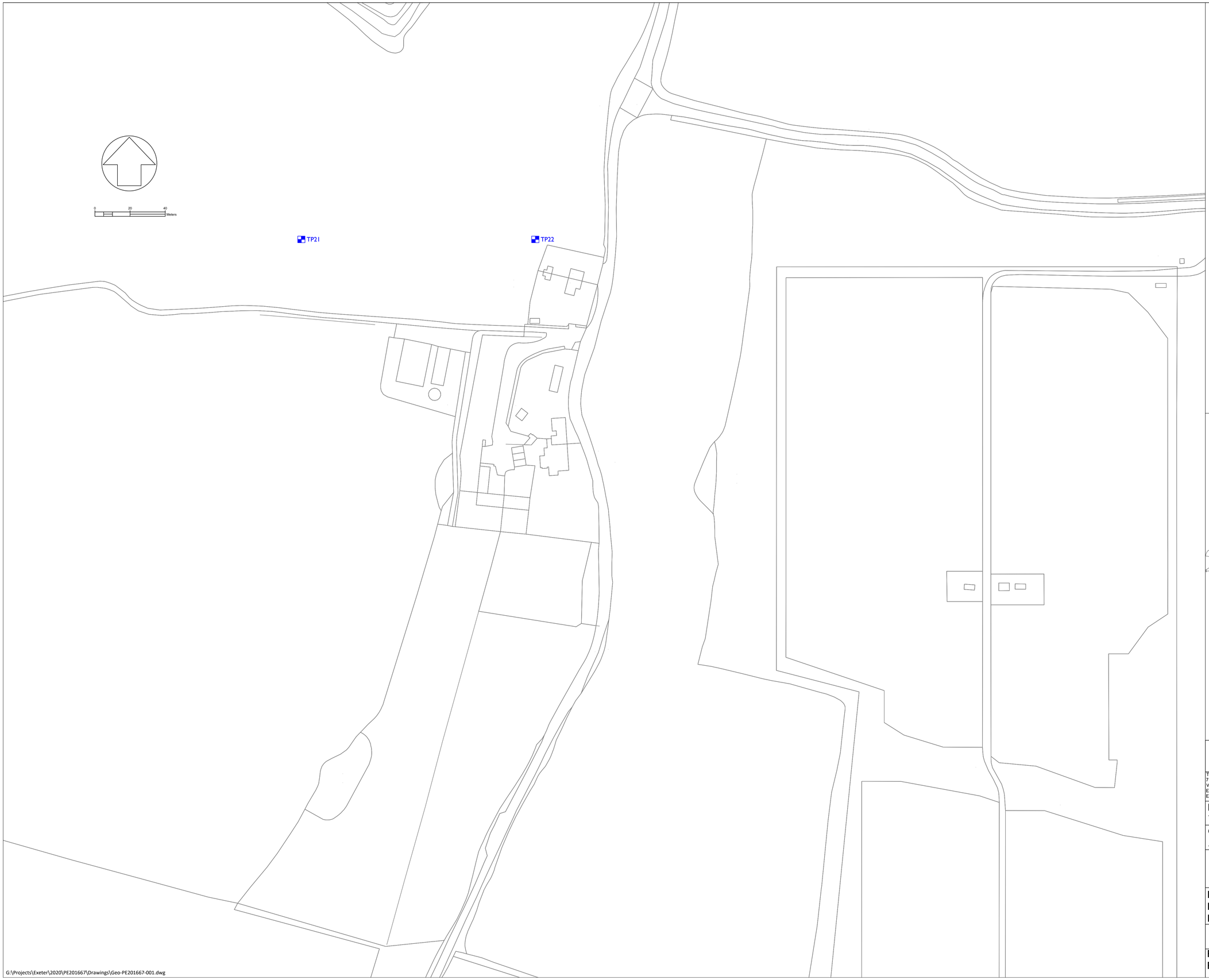

Key

- Borehole
- Trial Pit
- Hand-Dug Pit

Hole ID	Easting (mE)	Northing (mN)	Level (mOD)
BH(B)	647954.5	113140.9	87.18
BH(E)	647529.9	113495.1	90.27
BH(I)	647288.5	113857.9	94.13
HP(E)	647849.3	99530.9	2.46
HP(I)	647850.6	99439.3	3.49
HP(J)	647842.8	99327.9	3.44
TP20	647753.3	112999.9	77.82
TP21	647756.0	113149.9	84.90
TP22	647728.2	113181.4	77.40
TP24	647579.5	113147.1	68.40
TP25	647597.2	113021.1	73.22
TP26	647599.4	112900.5	79.10
TP27	647728.4	113160.9	80.75
TP28	647818.6	99527.3	3.46

TP22 and TP22 co-ordinates are for grid to approximate.

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Project:
UK-France HVDC Interconnector - Additional Ground Investigation for Drainage Design

Drawing Title:
EXPLORATORY HOLE LOCATION PLAN
Drawing 3 of 4

Scale: 1:1000@A1

Date:
November 2020

Project No:
PE201667

File Name:
Geo-PE201667-001(3)

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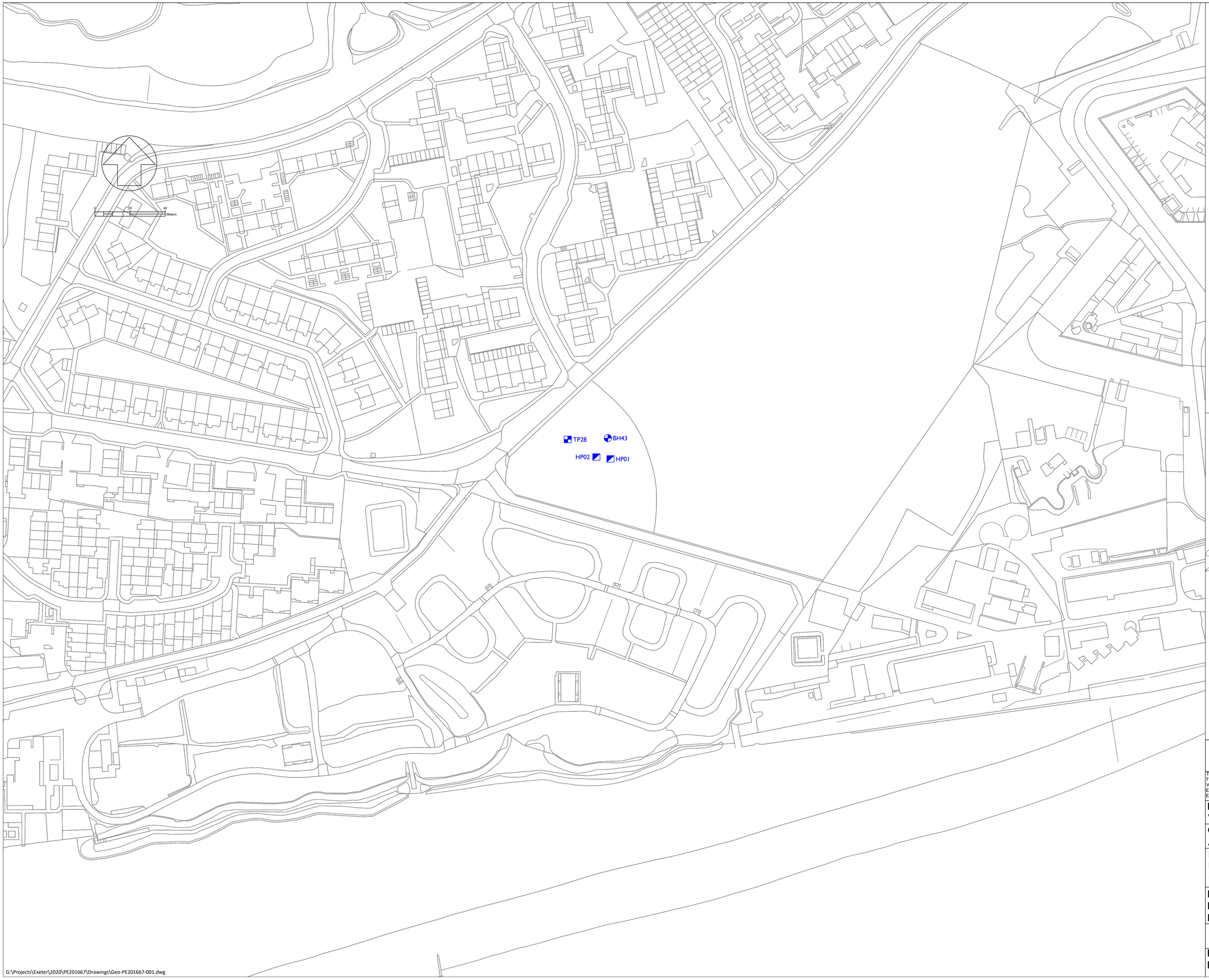
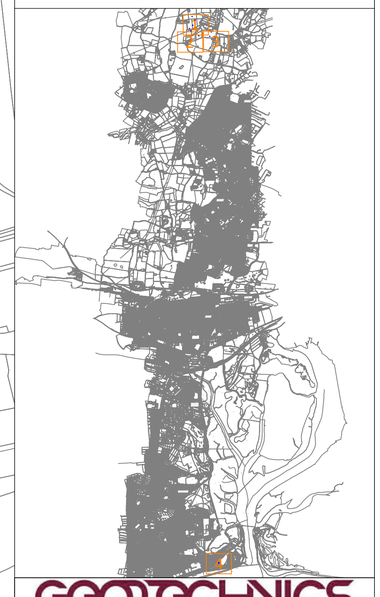


Key

- Borehole
- Trial Pit
- Hand-Dug Pit

Hole ID	Easting (mE)	Northing (mN)	Level (mOD)
BH38	647954.5	113140.9	97.18
BH41	647529.9	113495.1	96.27
BH42	647288.5	113601.9	94.13
BH43	647699.3	995580.9	3.46
HP01	647860.6	995629.2	3.69
HP02	647842.8	995597.9	3.44
TP27	647766.3	113468.9	97.90
TP28	647758.0	113458.9	99.00
TP29	647708.2	113181.4	97.40
TP30	647579.5	113147.1	98.90
TP31	647597.2	113011.1	73.10
TP32	647588.4	112966.0	86.60
TP33	647538.4	113063.9	99.75
TP34	647810.6	995537.3	3.46

TP32 and TP33 co-ordinates are for grid to approximate.



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Drawing Title:
EXPLORATORY HOLE LOCATION PLAN
Drawing 4 of 4

Scale: 1:1000@A1

Date:
November 2020

Project No:
PE201667

File Name:
Geo-PE201667-001(4)

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APPENDIX 4

Dynamic Sample and Rotary Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PID	Photo Ionisation Detection (ppm)
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

Instrumentation

Seal

Filter

Seal

Strata

Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

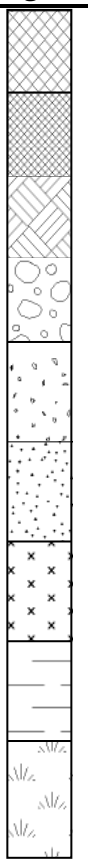
Gravel

Sand

Silt

Clay

Peat



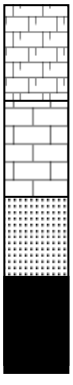
Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

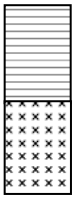
Coal



Strata, Continued

Mudstone

Siltstone

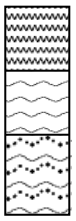


Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

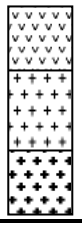


Igneous Rock

Fine Grained

Medium Grained

Coarse Grained



Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD – Dynamic Sampler

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Borehole **BH40**
Project No **PE201667**

Client **AQUIND LIMITED**

Ground Level **67.18** m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		67.18
0.00- 0.20	B					Soft dark brown slightly sandy CLAY.			
0.20- 0.60	B						0.25		66.93
0.20	ES					Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint.			
0.50	D						0.60		66.58
0.50	ES					Firm brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel (and cobbles) are angular to subrounded fine to coarse flint.			
0.60- 1.00	B								
1.00	D								
1.00	ES								
1.20- 1.65	D	Nil (Dry)			S12				
1.20 2.20			TR=	100%			1.50		65.68
1.50- 3.00	B					Structureless CHALK. Recovered as cream slightly sandy gravelly SILT. Gravel is weak, low density white chalk and flint (Grade Dm).			
1.80	D								
2.20- 2.65	D	Nil (Dry)			S16				
2.20 3.20			TR=	100%					
2.50	D								
						End of Borehole	3.20		63.98

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	CJ	G.L.			19/11/20	08:00						Groundwater was not encountered during drilling.
3.20	0.12	Dynamic Sampler	CJ	3.20	Nil	Dry	19/11/20	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
A Falling Head Permeability Test was carried out during boring at a depth of 3.20m. Borehole collapsed during the second test and the borehole was backfilled.
Backfill details from base of hole: bentonite seal up to 1.00m, arisings up to ground level.

Logged by HL
Checked by EAS
Figure 1 of 1
09/02/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

geotechnics

BOREHOLE RECORD – Dynamic Sampler and Rotary

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** Borehole **BH41** Project No **PE201667**

Client **AQUIND LIMITED** Ground Level **90.27** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		90.27
0.20- 0.30	B					TOPSOIL: Brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse chert.	0.30		89.97
0.20- 0.30	ES								
0.50- 0.60	D								
0.50- 0.60	ES					Firm reddish brown gravelly CLAY. Gravel is angular to subrounded fine to coarse chert.			
1.00- 1.20	B						1.00		89.27
1.00- 1.20	ES								
1.20- 1.65	D	Nil			S13	Structureless CHALK. Recovered as cream and brown slightly gravelly SILT and slightly gravelly CLAY. Gravel is very weak, low density occasionally stained orange, black speckled angular to subrounded chalk and angular to subangular fine to coarse chert (Grade Dm).	1.20		89.07
1.20- 1.40	ES	(Dry)							
1.40- 2.00	B								
2.00- 2.20	D					Structureless CHALK. Recovered as cream slightly gravelly SILT. Gravel is very weak, low density occasionally stained orange, rare black speckles angular to subrounded chalk and angular to subangular fine to coarse chert (Grade Dm).			
2.20- 4.50	B								
2.20- 2.65	D	Nil			S45				
		(Dry)							
2.80- 3.00	D								
3.20- 3.80	D								
3.20- 3.65	D	3.20			S14				
3.20- 3.80	UT42	(Dry)							
4.50- 5.50	B						4.50		85.77
						Structureless CHALK. Recovered as cream slightly gravelly SILT. Gravel is very weak, low density occasionally stained orange, rare black speckles angular to subrounded chalk and angular to subangular fine to coarse chert (Grade Dm).			
5.50- 5.95	D	4.50			S19				
		(Dry)							
6.00-10.00	B						6.00		84.27

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %		Continued by Rotary techniques General	Detail
6.00- 7.00	6.00 (Dry)	100 0		0		Structureless CHALK. Recovered as slightly sandy gravelly SILT. Gravel is weak, low density, white with occasional black speckling (Grade Dm).	
6.50		D					
7.00- 8.50	6.00 (Dry)	66 0		0			
7.00- 7.45	6.00 (Dry)	D			S16		
7.50		D					
8.50-10.00	6.00 (Dry)	60 0		0			
8.50- 8.50		D					
9.00		D					
10.00-10.45		D			S31	End of Borehole	10.00 80.27

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.30	Inspection Pit	CJ
10.00	0.14	Dynamic Sampler and Rotary	CJ

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			18/11/20	08:00
7.00	6.00	Dry	18/11/20	18:00
7.00	6.00	6.80	19/11/20	08:00
10.00	6.00	Dry	19/11/20	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					Groundwater was not encountered during drilling.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
Falling Head Permeability Tests were carried out during drilling at depths of 5.50m and 7.00m.
Dynamic sample recovery: 1.20-2.20m,100%; 2.20-3.20m,100%; 3.80-4.50m,100%; 4.50-5.50m,100%.
Backfill details from base of hole: bentonite seal up to 1.00m, arisings up to ground level.

Logged by JW
Checked by EAS
Figure 1 of 2
09/02/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

geotechnics

BOREHOLE RECORD – Dynamic Sampler and Rotary

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Borehole **BH41**
Project No **PE201667**

Client **AQUIND LIMITED**

Ground Level **90.27** m OD

Scale 1:50

Drilling		Properties/Sampling				Strata				
Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N	Description General	Description Detail	Depth	Legend	Level m OD
	6.00 (Dry)							**10.00**		**80.27**

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **JW**
Checked by **EAS**
Figure **2 of 2**
09/02/2021

geotechnics

BOREHOLE RECORD - Dynamic Sampler and Rotary

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** Borehole **BH42** Project No **PE201667**

Client **AQUIND LIMITED** Ground Level **86.13** m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		86.13
0.20- 0.30	B					TOPSOIL: Brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse chert.	0.30		85.83
0.20- 0.30	ES								
0.50- 0.60	B								
0.50- 0.60	ES					Firm orangish brown gravelly CLAY. Gravel is angular to subrounded fine to coarse chert. From 0.70m, Very gravelly.			
1.00- 1.20	B								
1.00- 4.20	D								
1.00- 1.20	ES								
1.20- 1.65	D	Nil			S10				
1.48- 2.20	B	(Dry)					1.48		84.65
1.48- 1.60	D					Structureless CHALK. Recovered as cream frequently stained orangish brown slightly gravelly CLAY. Gravel is very weak, low density, cream, subangular to subrounded chalk and angular to subrounded fine to coarse chert (Grade Dm).			
2.20- 2.65	D	Nil (Dry)			S17	Between 1.48 and 1.95m, Surface stained with orange clay.			
2.50- 2.70	D					From 2.30m, Frequent black speckling.			
2.70- 4.00	B								
3.20- 3.65	D	3.20 (Dry)			S12				
4.20- 5.90	B								
4.30- 5.10	UT								
4.50- 5.10	B								
4.50- 5.10	D								
4.50- 5.10	UT37	0.60							
5.10- 5.55	D	4.50 (Dry)			S29				
5.90- 6.10	D					Between 6.10 and 6.60m, No Recovery.			
6.10- 7.00	B								
6.10- 6.55	D	6.10 (Dry)			S15				

Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %		Continued by Rotary techniques General	Detail		
6.10- 7.50 (96mm)	6.10 (Dry)	71 11		11				7.00	79.13
7.30- 7.95		C				Structureless CHALK. Recovered as cream very rarely stained orange frequently speckled black very clayey GRAVEL. Gravel is very weak, low density, cream, subangular to subrounded chalk and angular fine to coarse chert (Grade Dc).			
7.50- 9.00 (96mm)	6.10 (Dry)	47 0		0					
7.50- 8.60		B							
8.60- 8.80		B							
9.00- 9.45	6.10 (Dry)	D			S19	End of Borehole		9.00	77.13

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.30	Inspection Pit	CJ
9.00	0.12	Dynamic Sampler and Rotary	CJ

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/11/20	08:00
4.20	3.20	Dry	16/11/20	18:00
4.20	3.20	Dry	17/11/20	08:00
9.00	6.10	Dry	17/11/20	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					Groundwater was not encountered during drilling.

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.
A Falling Head Permeability Test was carried out during drilling at a depth of 6.00m.
Dynamic sample recovery: 1.20-2.20m,100%; 2.20-3.20m,100%; 3.20-4.20m,100%; 4.20-4.50m,100%; 5.10-6.10m,100%.
Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.

Logged by JW
Checked by EAS
Figure 1 of 1
09/02/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

geotechnics

BOREHOLE RECORD – Dynamic Sampler

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Borehole **BH43**
Project No **PE201667**

Client **AQUIND LIMITED**

Ground Level **3.46** m OD

Scale 1:50

Sampling			Properties			Strata			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		3.46
0.00- 0.20	B					MADE GROUND: Greyish brown sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse sandstone, chert, glass and brick.	0.25		3.21
0.00- 0.20	ES						0.30		3.16
0.30- 0.40	B					MADE GROUND: Orange sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse bricks and brick fragments.	0.40		3.06
0.30- 0.40	ES								
0.40- 1.00	B								
0.40- 1.00	ES								
1.20- 3.00	B					MADE GROUND: Grey occasionally orange and black slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and clinker. Hydrocarbon odour present.			
1.20 2.20			TR=	100%					
1.20- 1.65		2.20 (Dry)			S24				
						Medium dense light brown gravelly fine to coarse SAND. Gravel is angular to subrounded flint. Between 1.00 and 1.20m, Sand Blown out by installation of casing.			
2.20 3.00			TR=	80%					
2.20- 2.65		1.20 (Dry)			S13				
							3.00		0.46
						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	CJ	G.L.			20/11/20	08:00						Groundwater was not encountered during drilling.
3.00	0.12	Dynamic Sampler	CJ	3.00	2.50	Dry	20/11/20	18:00						

Remarks

Inspection pit hand excavated to 1.00m depth and no services were found.
A Falling Head Permeability Test was carried out during drilling at a depth of 2.65m.
Backfill details from base of hole: bentonite seal up to 1.20m, arisings up to ground level.

Logged by **JW**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

geotechnics

Fieldwork Results - SPT Results Summary

Project AQUIND DRAINAGE DESIGN ADDITIONAL GI **Project No** PE201667

Client Aquind Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH40	1.20	65.98	S	-	2	3	3	3	3	3	12	*
BH40	2.20	64.98	S	-	3	3	3	4	4	5	16	*

Driller	Clyne Jones
Hammer No.	TEC130133
Energy Ratio, Er (%)	71.00
Calibration Date	17/12/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project AQUIND DRAINAGE DESIGN ADDITIONAL GI **Project No** PE201667

Client Aquind Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10 20 30 40 50
BH41	1.20	89.07	S	-	2	2	2	3	3	5	13	
BH41	2.20	88.07	S	-	5	4	6	17	10	12	45	
BH41	3.20	87.07	S	-	2	3	2	3	5	4	14	
BH41	5.50	84.77	S	-	2	2	2	5	5	7	19	
BH41	7.00	83.27	S	-	3	2	2	4	6	4	16	
BH41	10.00	80.27	S	-	2	7	6	7	8	10	31	

Driller	Clyne Jones
Hammer No.	TEC130133
Energy Ratio, Er (%)	71.00
Calibration Date	17/12/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project AQUIND DRAINAGE DESIGN ADDITIONAL GI **Project No** PE201667

Client Aquind Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH42	1.20	84.93	S	-	1	1	2	2	3	3	10	*
BH42	2.20	83.93	S	-	3	3	4	5	4	4	17	*
BH42	3.20	82.93	S	-	1	3	4	3	3	2	12	*
BH42	5.10	81.03	S	-	4	5	6	6	10	7	29	*
BH42	6.10	80.03	S	-	5	5	4	4	5	2	15	*
BH42	9.00	77.13	S	-	4	4	5	5	4	5	19	*

Driller	Clyne Jones
Hammer No.	AB.01
Energy Ratio, Er (%)	62.00
Calibration Date	06/03/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project AQUIND DRAINAGE DESIGN ADDITIONAL GI **Project No** PE201667

Client Aquind Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' 10 20 30 40 50
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		
BH43	1.20	2.26	S	-	4	5	7	7	5	5	24	*
BH43	2.20	1.26	S	-	1	1	2	4	3	4	13	*

Driller	Clyne Jones
Hammer No.	TEC130133
Energy Ratio, Er (%)	71.00
Calibration Date	17/12/2020

Remarks

-/- Blows/penetration (mm) after seating
-*/- Total blows/penetration (mm)
SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)
C - SPT with cone
L - Split Spoon with liner used

GEOTECHNICS

EQUIPE GROUP

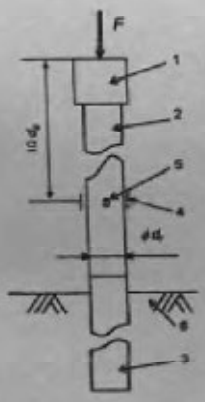
SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Test No	EQU2550
Client	AB-OVO
Test Depth (m)	12.70
Mass of hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of instrumented rod	0.558 m
Area	A = 11.61 cm²
Modulus	E_a = 206843 MPa



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

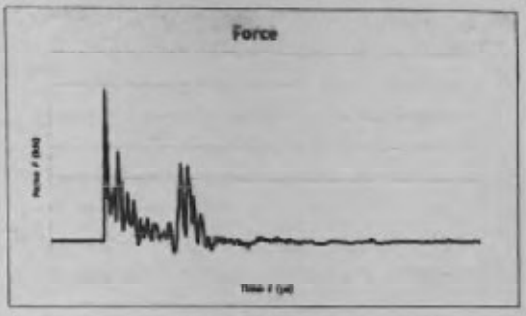
Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

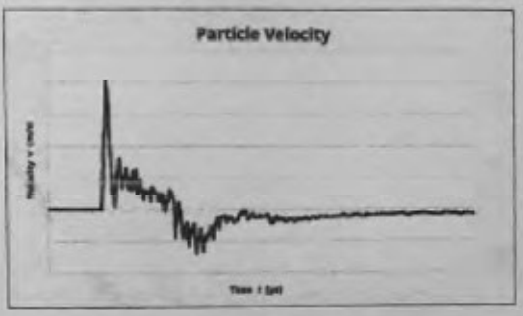
DATE OF TEST	VALID UNTIL	HAMMER ID
05/03/2020	[redacted]	AB01

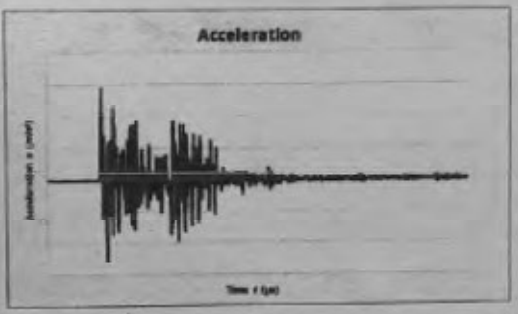
E_{meas} = **0.293** kN-m

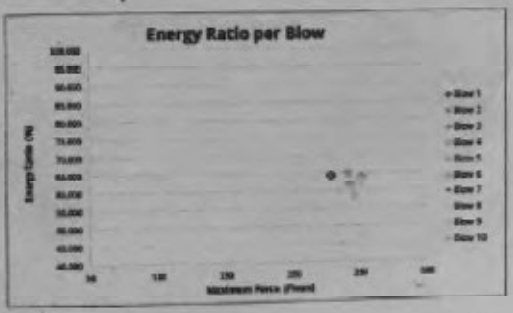
E_{theor} = **0.473** kN-m

Comments









Energy Ratio (EF) = $\frac{E_{meas}}{E_{theor}}$ **62.00%**

Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
[redacted]	[redacted]	[redacted]	06/03/2020

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire. OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232. Email: info@equipegroup.com

Allied Exploration & Geotechnics Ltd.

Unit 25 Stella Gill Industrial Esatate
Pelton Fell
Chester-le-Street
DH2 2RG

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

SPT Hammer Ref:	TEC 130133
Test Date:	17/12/2020
Report Date:	17/12/2020
File Name:	1904052.spt
Test Operator:	BP

Instrumented Rod Data

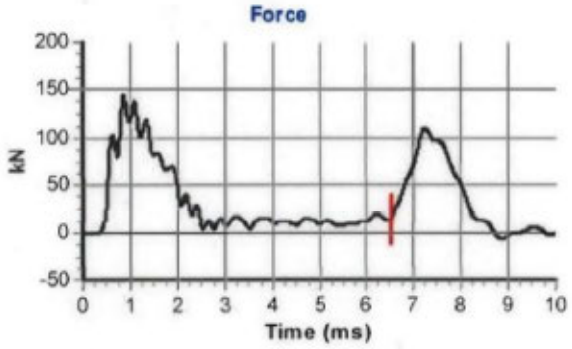
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	5991
Accelerometer No.2:	5990

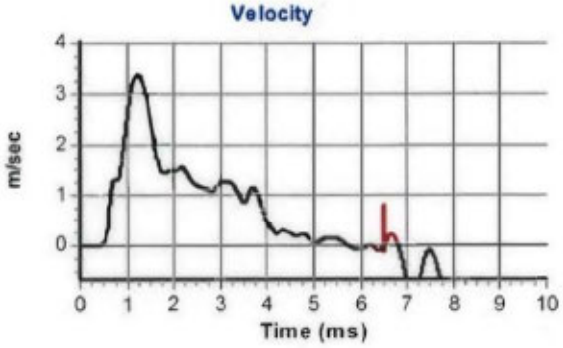
SPT Hammer Information

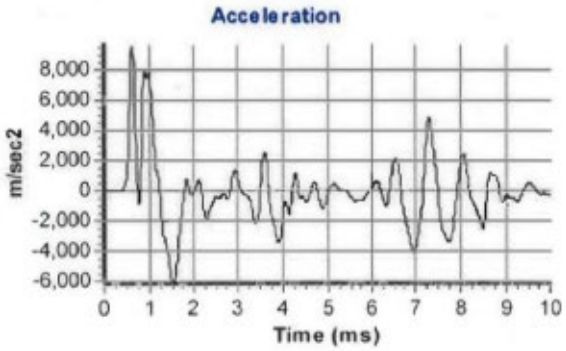
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.1

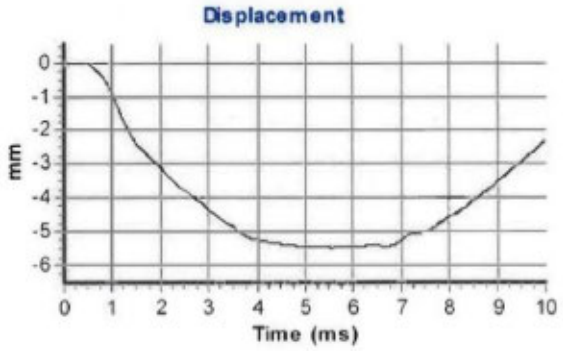
Comments / Location

Mass and drop supplied by client









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	334

Energy Ratio E_r (%): **71**

[redacted]

Signed: Brian Proctor

Title: Technician

The recommended calibration interval is 12 months

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH40 - Reinstated

BH41 - Before

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH41 - Reinstated

BH42 - Before

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH42 - Reinstated

BH43 - Before

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH43 - Reinstated

APPENDIX 5

Dynamic Sample and Rotary Photographs

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH41 1.20 - 4.50m

BH41 6.00-10.00m

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH42 1.20 - 4.20m

BH42 4.20 - 6.10m

Project Number : PE201667

Project : Aquind Additional Ground Investigation

BH42 6.10 - 9.00m

APPENDIX 6

Trial Pit Records

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** **Trial Pit** **HP01** Project No **PE201667**

Client **AQUIND LIMITED** National Grid Coordinates **467850.842** E **99126.187** N Ground Level **3.49** m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		3.49
				MADE GROUND: Greyish brown occasionally pinkish grey sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse sandstone, chert, rare brick and glass fragments, clinker and bitmac.	0.30	1	
					0.40	2	3.19
				Brown very sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse chert.	1.00	3	3.09
				Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse chert.	1.10	4	2.49
				Brown very sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse chert.			2.39
				End of Excavation			

Excavation

Plant **2 Tonne Mini-Excavator**
Date **19/11/2020**
Shoring **None.**
Stability **Stable during excavation.**
Width (B) **0.60**
Length (C) **1.50**
Date Backfilled **19/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **JW**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

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TRIAL PIT RECORD *Trial Pit*

Project	AQUIND DRAINAGE DESIGN ADDITIONAL GI	Engineer	WSP UK LIMITED	Trial Pit	HP02
				Project No	PE201667
Client	AQUIND LIMITED	National Grid Coordinates	467842.829 E 99127.273 N	Ground Level	3.44 m OD

Samples and Tests

Depth	Type	Stratum No	Results

Strata

Scale 1:50

Description	Depth	Legend	Level m OD
	G.L.		3.44
MADE GROUND: Greyish brown occasionally pinkish grey sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded sandstone, chert, rare brick fragments, glass and clinker.	0.30		3.14
	0.35		3.09
MADE GROUND: Black sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to medium clinker.	0.70		2.74
Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse chert.	1.10		2.34
Brown very sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse chert.			
End of Excavation			

Excavation

Plant	2 Tonne Mini-Excavator	Width (B)	0.60
Date	19/11/2020	Length (C)	1.20
Shoring	None.	Date Backfilled	19/11/2020
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by	JW
Checked by	EAS
Figure	1 of 1
	09/02/2021

geotechnics

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** **Trial Pit** **TP21** Project No **PE201667**

Client **AQUIND LIMITED** National Grid Coordinates **467601.0** E **113169.0** N Ground Level **79.00** m OD

Samples and Tests | Strata — Scale 1:50

Depth	Type	Stratum No	Results
0.30	ES		
0.50	D		
0.50	ES		
0.50- 1.00	LB		

Description	Depth	Legend	Level m OD
	G.L.		79.00
TOPSOIL: Dark brown slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse chalk.	0.25	1	78.75
Firm dark brown slightly sandy slightly gravelly CLAY with a low cobble content of angular to subangular flint. Gravel is subangular to subrounded fine to coarse flint.		2	
	1.00		78.00
End of Excavation			

Excavation

Plant **5 Tonne Excavator**
Date **16/11/2020**
Shoring **None.**
Stability **Stable during excavation.**
Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **16/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks **A Soakaway Test was carried out on completion of the trial pit and the results are presented separately.**
Approximate co-ordinates: 467734, 113169 at 80m AOD.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Trial Pit **TP22**
Project No **PE201667**

Client **AQUIND LIMITED**

National Grid Coordinates **467734.0** E **113169.0** N

Ground Level **80.00** m OD

Samples and Tests

Depth	Type	Stratum No	Results
0.20	ES		
0.30- 0.50	LB		
0.50	D		
0.50	ES		
1.50	D		

Strata

Scale 1:50

Description	Depth	Legend	Level m OD
	G.L.		80.00
TOPSOIL: Brown slightly sandy clay with occasional rootlets.		1	
	0.30		79.70
Firm dark yellowish brown slightly sandy slightly gravelly CLAY with low cobble content of angular to subangular flint. Gravel is subangular to subrounded fine to coarse flint.		2	
	1.20		78.80
Structureless CHALK. Recovered as cream slightly gravelly sandy SILT. Gravel is weak, low density and white (Grade Dm).		3	
	1.70		78.30
End of Excavation			

Excavation

Plant **5 Tonne Excavator**
Date **16/11/2020**
Shoring **None.**
Stability **Stable during excavation.**

Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **16/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks **A Soakaway Test was carried out on completion of the trial pit and the results are presented separately.**
Approximate co-ordinates: 467601, 113173 at 79m AOD.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Trial Pit **TP23**
Project No **PE201667**

Client **AQUIND LIMITED**

National Grid Coordinates **467309.219**E **113181.444**N

Ground Level **77.92** m OD

Scale 1:50

Samples and Tests				Strata			
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
				TOPSOIL: Grass over dark brown slightly sandy clay.	**G.L.**	1	**77.92**
0.20- 0.80	**B**			**Firm orangish brown slightly sandy slightly gravelly CLAY with a moderate cobble content of angular to subangular flint. Gravel is subangular to subrounded fine to coarse flint.**	**0.20**	2	**77.72**
0.30	**ES**						
0.50	**D**				**0.50**	3	**77.42**
0.50	**ES**						
0.90	**D**			**Structureless CHALK. Recovered as cream slightly sandy gravelly SILT. Gravel is weak, low density and white (Grade Dm).**	**1.00**		**76.92**
				End of Excavation			

Excavation

Plant **5 Tonne Excavator**
Date **18/11/2020**
Shoring **None.**
Stability **Stable during excavation.**

Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **18/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Trial Pit **TP24**
Project No **PE201667**

Client **AQUIND LIMITED**

National Grid Coordinates **467078.882**E **113147.248**N

Ground Level **68.92** m OD

Scale 1:50

Samples and Tests				Strata			
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		68.92
				TOPSOIL: Grass over soft dark brown slightly sandy clay.	0.20	1	68.72
0.30	D			**Soft brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint.**	0.45	2	68.47
0.30	ES						
0.45- 1.60	LB			**Structureless CHALK. Recovered as brownish cream slightly sandy gravelly SILT. Gravel is weak, low density, white with occasional flint (Grade Dm).**		3	
0.50	D						
0.50	ES						
1.50	D						
				End of Excavation	1.60		67.32

Excavation

Plant **5 Tonne Excavator**
Date **18/11/2020**
Shoring **None.**
Stability **Stable during excavation.**

Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **18/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

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TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** **Trial Pit** **TP25** Project No **PE201667**

Client **AQUIND LIMITED** National Grid Coordinates **467097.161**E **113311.099**N Ground Level **73.10** m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		73.10
0.20- 1.00	LB			TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse flint.	0.20	1	72.90
0.30	ES						
0.50	D						
0.50	ES			Firm reddish brown slightly sandy slightly gravelly CLAY with an occasional cobble content of angular to subangular flint. Gravel is subangular to subrounded fine to coarse flint.		2	
					1.00		72.10
				End of Excavation			

Excavation

Plant **5 Tonne Excavator**
Date **18/11/2020**
Shoring **None.**
Stability **Stable during excavation.**
Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **18/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD — Trial Pit

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED** Trial Pit **TP26** Project No **PE201667**

Client **AQUIND LIMITED** National Grid Coordinates **467060.847**E **113378.632**N Ground Level **77.31** m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		77.31
0.20- 0.80	LB			**TOPSOIL: Grass over brown slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse flint with frequent rootlets.**	0.20	1	77.11
0.30	ES						
0.50	D			**Firm orangish brown slightly sandy slightly gravelly CLAY with a medium cobble content of angular to subangular flint. Gravel is subangular to subrounded fine to coarse flint and chalk.**		2	
0.50	ES				0.80		76.51
1.00- 1.50	B			**Structureless CHALK. Recovered as slightly sandy silty subangular to subrounded GRAVEL and COBBLES. Clasts are weak, low density, white with rare black speckling. Matrix is cream (Grade Dm).**		3	
1.50	D						
2.00- 2.50	D						
2.30	D						
				End of Excavation	2.50		74.81

Excavation

Plant **5 Tonne Excavator**
Date **17/11/2020**
Shoring **None.**
Stability **Stable during excavation.**
Width (B) **2.00**
Length (C) **0.60**
Date Backfilled **17/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks **A Soakaway Test was carried out on completion of the trial pit and the results are presented separately.**

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD *Trial Pit*

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Trial Pit **TP27**
Project No **PE201667**

Client **AQUIND LIMITED**

National Grid Coordinates **467149.383**E **113463.773**N

Ground Level **80.75** m OD

Scale 1:50

Samples and Tests				Strata			
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		80.75
0.30	ES			**TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse flint with frequent roots.**	0.20	1	80.55
0.30- 0.60	LB			**Soft to firm orangish brown slightly sandy slightly gravelly CLAY with a medium cobble content of flint. Gravel is subangular to subrounded fine to coarse flint.**		2	
0.50	D			**From 0.80m, Gravelly.**	1.00	3	79.75
0.50	ES						
1.00- 1.50	B			**Structureless CHALK. Recovered as slightly sandy silty subangular to subrounded GRAVEL and COBBLES. Clasts are weak, low density and white. Matrix is brownish cream (Grade Dm).**	1.50		79.25
1.30	D			**End of Excavation**			

Excavation

Plant **5 Tonne Excavator**
Date **16/11/2020**
Shoring **None.**
Stability **Stable during excavation.**

Width (B) **0.60**
Length (C) **2.00**
Date Backfilled **16/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details
		Groundwater not encountered during pitting.

Remarks **A Soakaway Test was carried out on completion of the trial pit and the results are presented separately.**

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **PS**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

geotechnics

TRIAL PIT RECORD — Trial Pit

Project **AQUIND DRAINAGE DESIGN ADDITIONAL GI** Engineer **WSP UK LIMITED**

Trial Pit **TP28**
Project No **PE201667**

Client **AQUIND LIMITED**

National Grid Coordinates **467826.580** E **99137.284** N

Ground Level **3.46** m OD

Scale 1:50

Samples and Tests				Strata			
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		3.46
0.20- 0.30	B			MADE GROUND: Brown sandy gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse sandstone, limestone and chert.		1	
0.20- 0.30	ES				0.30		3.16
0.30- 1.00	B			At 0.29m, Geotextile membrane separating made ground from central soils.		2	
0.30- 1.00	ES						
1.00- 1.70	B			Brown very sandy GRAVEL. Sand is fine to coarse. Gravel is angular fine to coarse chert and sandstone.	1.00		2.46
1.00- 1.70	ES					3	
				Light brown gravelly SAND. Gravel is angular to subrounded fine to coarse chert and sandstone.			
					1.70		1.76
				End of Excavation			

Excavation

Plant **5 Tonne Excavator**
Date **19/11/2020**
Shoring **None.**
Stability **Stable during excavation.**

Width (B) **0.60**
Length (C) **2.20**
Date Backfilled **19/11/2020**

Groundwater

Depth Observed	Depth of Pit	Details

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by **JW**
Checked by **EAS**
Figure **1 of 1**
09/02/2021

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APPENDIX 7

Trial Pit Photographs

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP21 Before

TP21 GL-1.00m

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP21 Spoil

TP21 After

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP22 Before

TP22 GL-1.70m

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP22 Spoil

TP22 After

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP23 Before

TP23 GL-1.00m

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP23 Spoil

TP23 After

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP24 Before

TP24 GL-1.60m

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP24 Spoil

TP24 After

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP25 GL-1.00m

TP25 Spoil

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP25 After

TP26 Before

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP26 GL-2.50m

TP26 Spoil

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP26 After

TP27 Before

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP27 GL-1.50m

TP27 Spoil

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP27 After

TP28 - Before

PHOTOGRAPHS

Project Number : PE201667

Project : Aquind Additional Ground Investigation

TP28 GL-1.70m

TP28 - Backfilled

APPENDIX 8

Borehole Permeability Test Results

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	19/11/2020

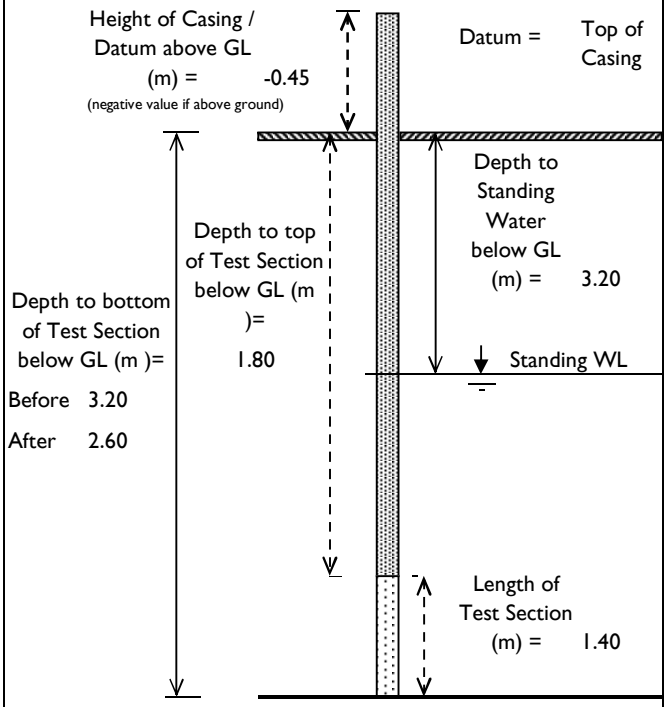
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467041.0
	N 113142.6
Level (m OD)	67.18

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	1.20		
0.5	1.80		
1.0	2.16		
1.5	2.32		
2.0	2.36		
2.5	2.42		
3.0	2.47		
3.5	2.47		
4.0	2.49		
4.5	2.52		
5.0	2.60		
6.0	2.60		
7.0	2.60		
8.0	2.60		
9.0	2.60		
10.0	2.60		
15.0	2.63		
20.0	2.66		
30.0	2.70		



Depth to Standing Water Level below Datum	3.65 m
Depth to Induced Water Level below Datum	1.20 m
Differential head at start of Test (H_o)	2.45 m
Differential Head at end of Test (H_f)	0.75 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

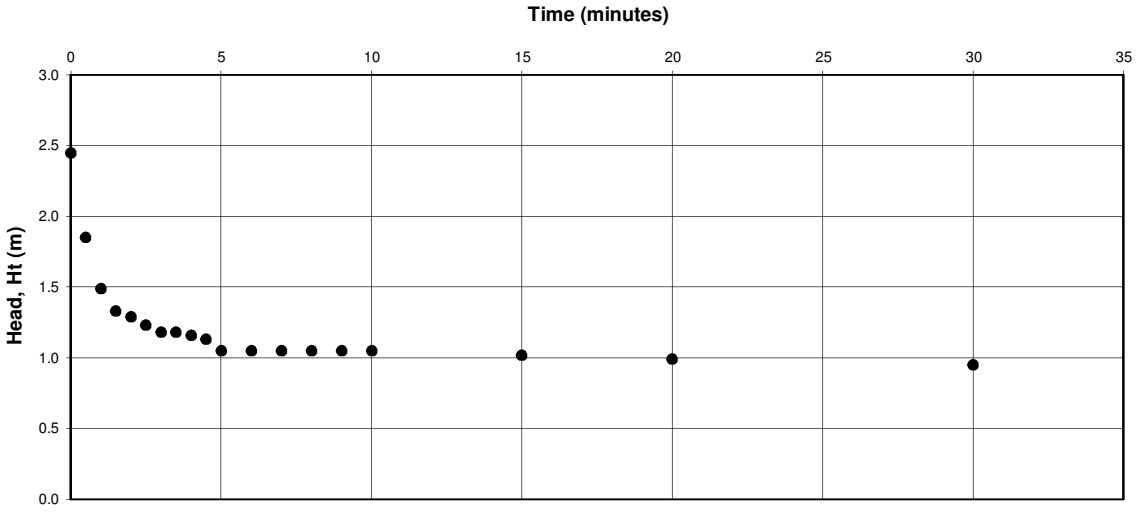
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	19/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	1.20	0.75	2.45	0.00
0.5	1.80	1.35	1.85	0.76
1.0	2.16	1.71	1.49	0.61
1.5	2.32	1.87	1.33	0.54
2.0	2.36	1.91	1.29	0.53
2.5	2.42	1.97	1.23	0.50
3.0	2.47	2.02	1.18	0.48
3.5	2.47	2.02	1.18	0.48
4.0	2.49	2.04	1.16	0.47
4.5	2.52	2.07	1.13	0.46
5.0	2.60	2.15	1.05	0.43
6.0	2.60	2.15	1.05	0.43
7.0	2.60	2.15	1.05	0.43
8.0	2.60	2.15	1.05	0.43
9.0	2.60	2.15	1.05	0.43
10.0	2.60	2.15	1.05	0.43
15.0	2.63	2.18	1.02	0.42
20.0	2.66	2.21	0.99	0.40
30.0	2.70	2.25	0.95	0.39

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

Water assumed at base of hole.

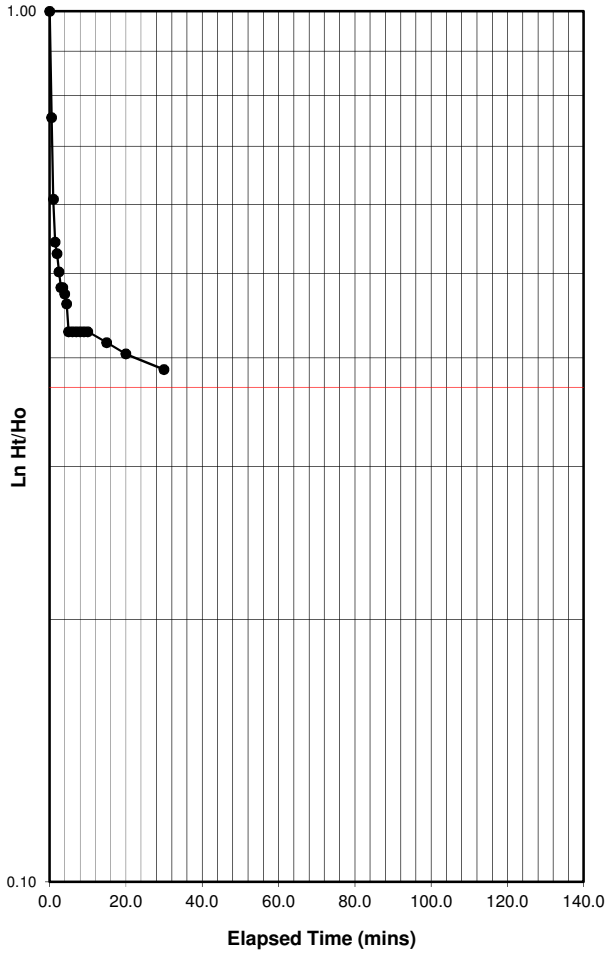
NB. Borehole collapsed from 3.20m back to 2.60m during the test.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	19/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.45	1.00	9.0	1.05	0.43			
0.5	1.85	0.76	10.0	1.05	0.43			
1.0	1.49	0.61	15.0	1.02	0.42			
1.5	1.33	0.54	20.0	0.99	0.40			
2.0	1.29	0.53	30.0	0.95	0.39			
2.5	1.23	0.50						
3.0	1.18	0.48						
3.5	1.18	0.48						
4.0	1.16	0.47						
4.5	1.13	0.46						
5.0	1.05	0.43						
6.0	1.05	0.43						
7.0	1.05	0.43						
8.0	1.05	0.43						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	3.65	m
Depth to Induced Water Level	1.20	m
Differential head at start (H_{o})	2.45	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.40	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.791	
Time (t1)	1.50	mins
Time (t2)	5.00	mins
Head at Time t1 (H1)	13.130	m
Head at Time t2 (H2)	1.050	m
Permeability (k) = A/(F[t2-	**4.87E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	19/11/2020

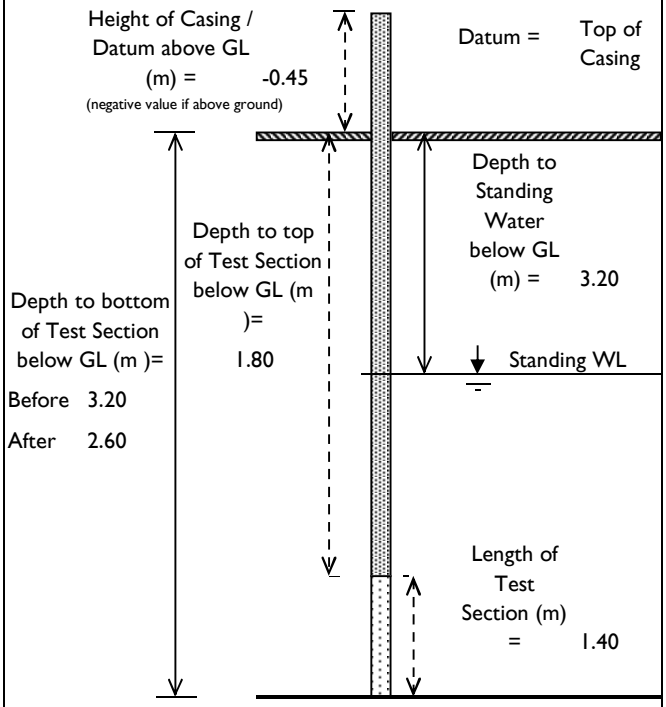
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467041.0
	N 113142.6
Level (m OD)	67.18

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)		Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	1.20			
0.5	1.78			
1.0	2.14			
1.5	2.32			
2.0	2.40			
2.5	2.43			
3.0	2.48			
3.5	2.49			
4.0	2.50			
4.5	2.55			
5.0	2.60			
6.0	2.60			
7.0	2.60			



Depth to Standing Water Level below Datum	3.65 m
Depth to Induced Water Level below Datum	1.20 m
Differential head at start of Test (H_o)	2.45 m
Differential Head at end of Test (H_f)	0.43 m
Time Elapsed at end of test (t_f)	7.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

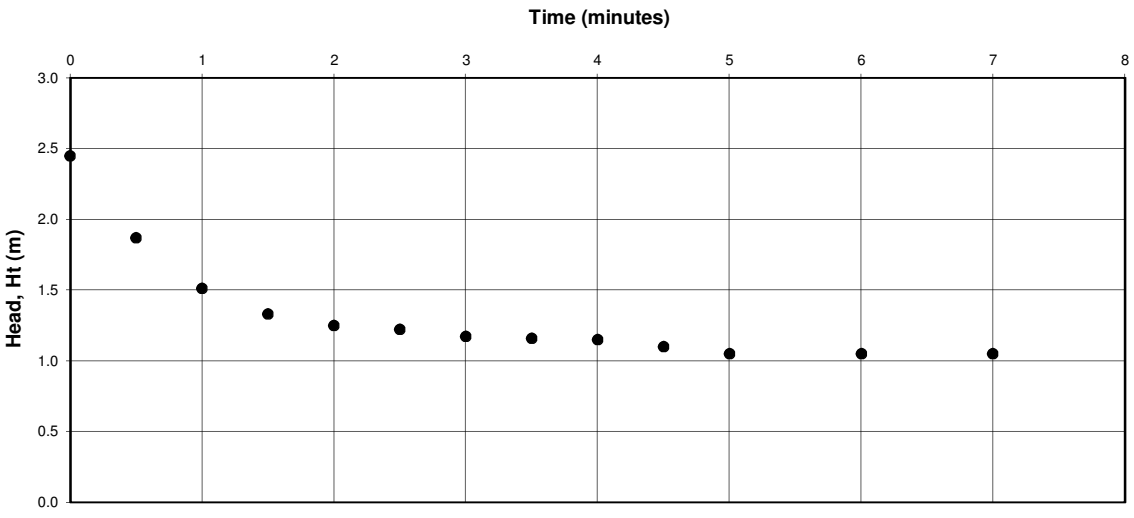
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	19/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	1.20	0.75	2.45	0.00
0.5	1.78	1.33	1.87	0.76
1.0	2.14	1.69	1.51	0.62
1.5	2.32	1.87	1.33	0.54
2.0	2.40	1.95	1.25	0.51
2.5	2.43	1.98	1.22	0.50
3.0	2.48	2.03	1.17	0.48
3.5	2.49	2.04	1.16	0.47
4.0	2.50	2.05	1.15	0.47
4.5	2.55	2.10	1.10	0.45
5.0	2.60	2.15	1.05	0.43
6.0	2.60	2.15	1.05	0.43
7.0	2.60	2.15	1.05	0.43

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

Water assumed at base of hole.

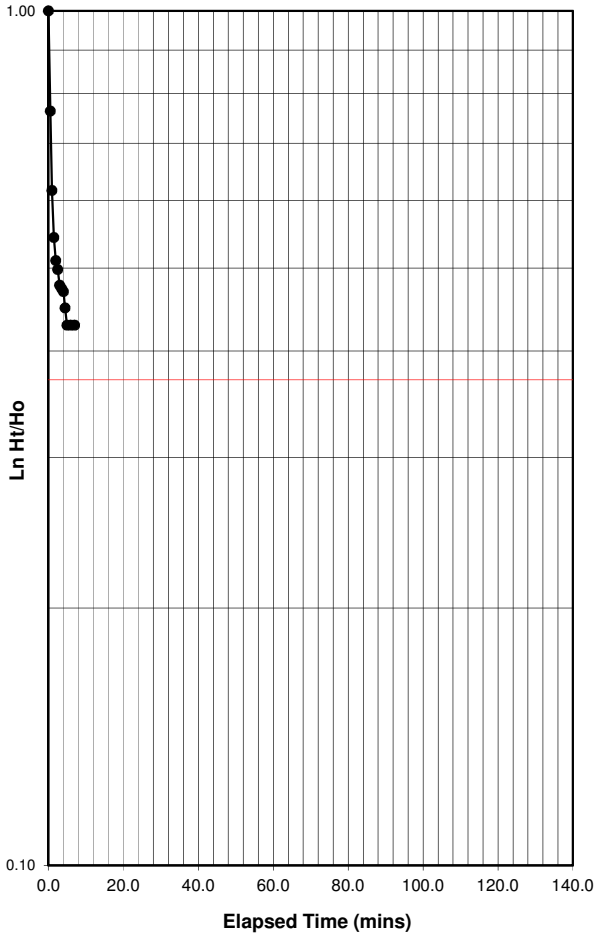
NB. Borehole collapsed from 3.20m back to 2.60m during the test.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	19/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.45	1.00						
0.5	1.87	0.76						
1.0	1.51	0.62						
1.5	1.33	0.54						
2.0	1.25	0.51						
2.5	1.22	0.50						
3.0	1.17	0.48						
3.5	1.16	0.47						
4.0	1.15	0.47						
4.5	1.10	0.45						
5.0	1.05	0.43						
6.0	1.05	0.43						
7.0	1.05	0.43						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	3.65	m
Depth to Induced Water Level	1.20	m
Differential head at start (H_{o})	2.45	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.40	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.791	
Time (t1)	1.50	mins
Time (t2)	5.00	mins
Head at Time t1 (H1)	1.330	m
Head at Time t2 (H2)	1.050	m
Permeability (k) = A/(F[t2-	**4.56E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	19/11/2020

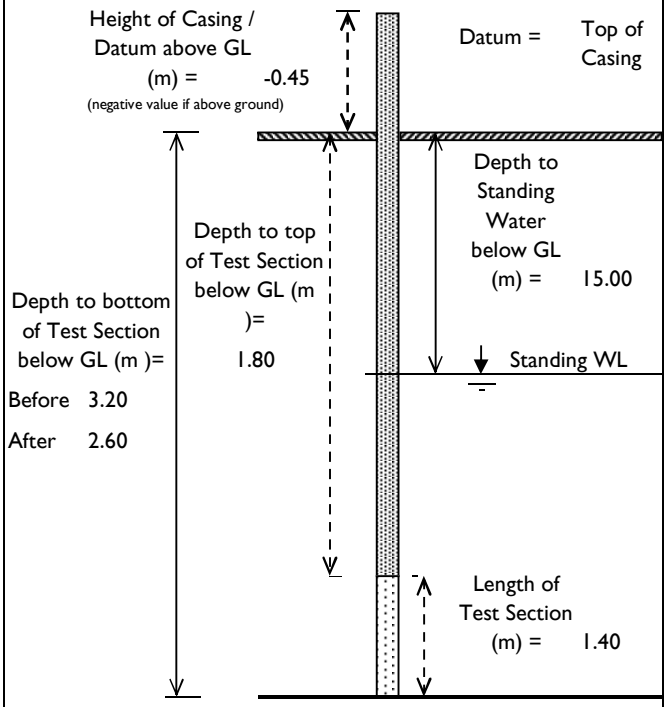
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467041.0
	N 113142.6
Level (m OD)	67.18

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	1.20		
0.5	1.80		
1.0	2.16		
1.5	2.32		
2.0	2.36		
2.5	2.42		
3.0	2.47		
3.5	2.47		
4.0	2.49		
4.5	2.52		
5.0	2.60		
6.0	2.60		
7.0	2.60		
8.0	2.60		
9.0	2.60		
10.0	2.60		
15.0	2.63		
20.0	2.66		
30.0	2.70		



Depth to Standing Water Level below Datum	15.45 m
Depth to Induced Water Level below Datum	1.20 m
Differential head at start of Test (H_o)	14.25 m
Differential Head at end of Test (H_f)	0.75 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

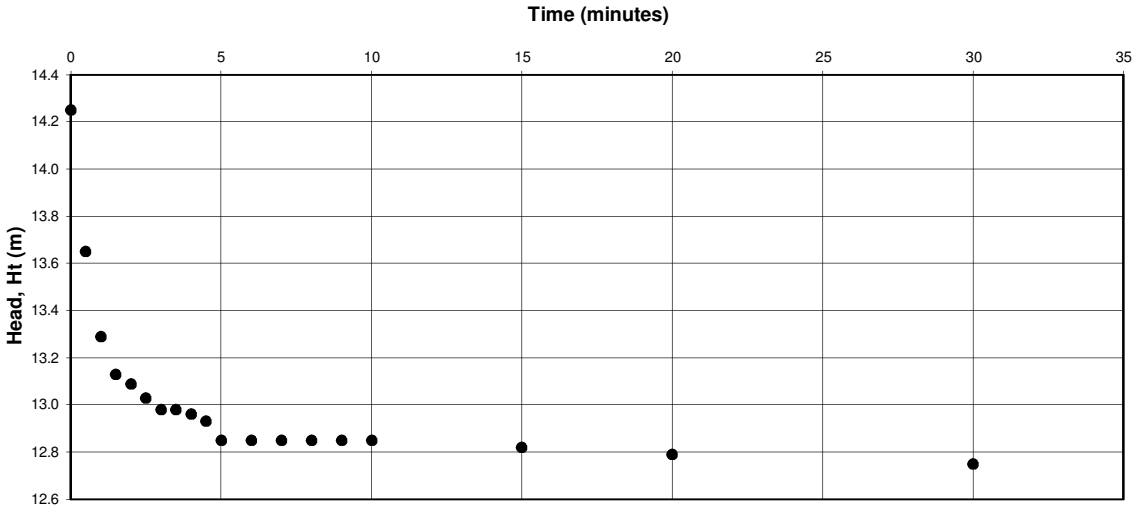
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	19/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	1.20	0.75	14.25	0.00
0.5	1.80	1.35	13.65	0.96
1.0	2.16	1.71	13.29	0.93
1.5	2.32	1.87	13.13	0.92
2.0	2.36	1.91	13.09	0.92
2.5	2.42	1.97	13.03	0.91
3.0	2.47	2.02	12.98	0.91
3.5	2.47	2.02	12.98	0.91
4.0	2.49	2.04	12.96	0.91
4.5	2.52	2.07	12.93	0.91
5.0	2.60	2.15	12.85	0.90
6.0	2.60	2.15	12.85	0.90
7.0	2.60	2.15	12.85	0.90
8.0	2.60	2.15	12.85	0.90
9.0	2.60	2.15	12.85	0.90
10.0	2.60	2.15	12.85	0.90
15.0	2.63	2.18	12.82	0.90
20.0	2.66	2.21	12.79	0.90
30.0	2.70	2.25	12.75	0.89

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

Water assumed at 15m bgl.

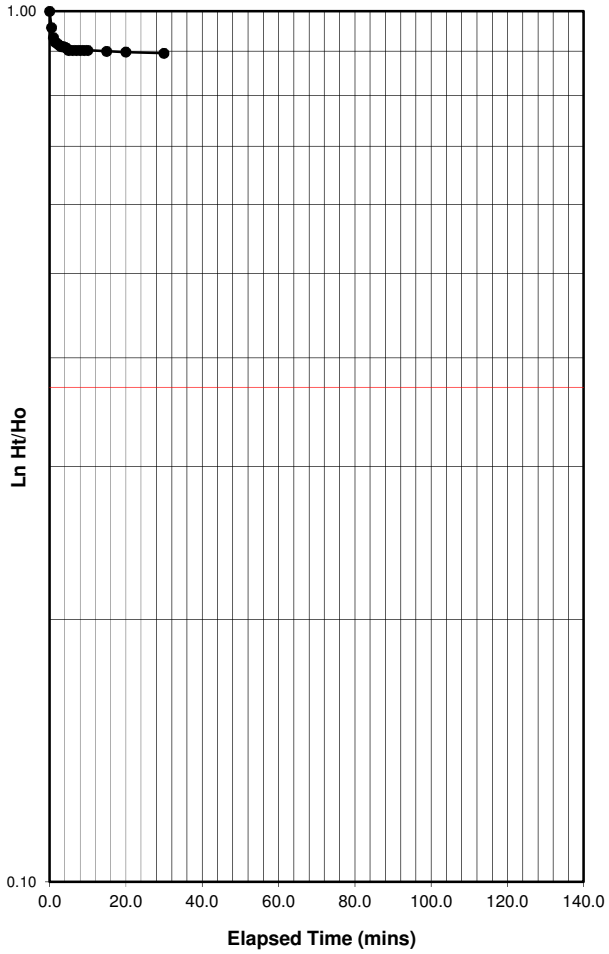
NB. Borehole collapsed from 3.20m back to 2.60m during the test.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	19/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	14.25	1.00	9.0	12.85	0.90			
0.5	13.65	0.96	10.0	12.85	0.90			
1.0	13.29	0.93	15.0	12.82	0.90			
1.5	13.13	0.92	20.0	12.79	0.90			
2.0	13.09	0.92	30.0	12.75	0.89			
2.5	13.03	0.91						
3.0	12.98	0.91						
3.5	12.98	0.91						
4.0	12.96	0.91						
4.5	12.93	0.91						
5.0	12.85	0.90						
6.0	12.85	0.90						
7.0	12.85	0.90						
8.0	12.85	0.90						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.45	m
Depth to Induced Water Level	1.20	m
Differential head at start (H_{o})	14.25	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.40	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.791	
Time (t1)	1.50	mins
Time (t2)	5.00	mins
Head at Time t1 (H1)	13.130	m
Head at Time t2 (H2)	12.850	m
Permeability (k) = A/(F[t2-	**4.16E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	19/11/2020

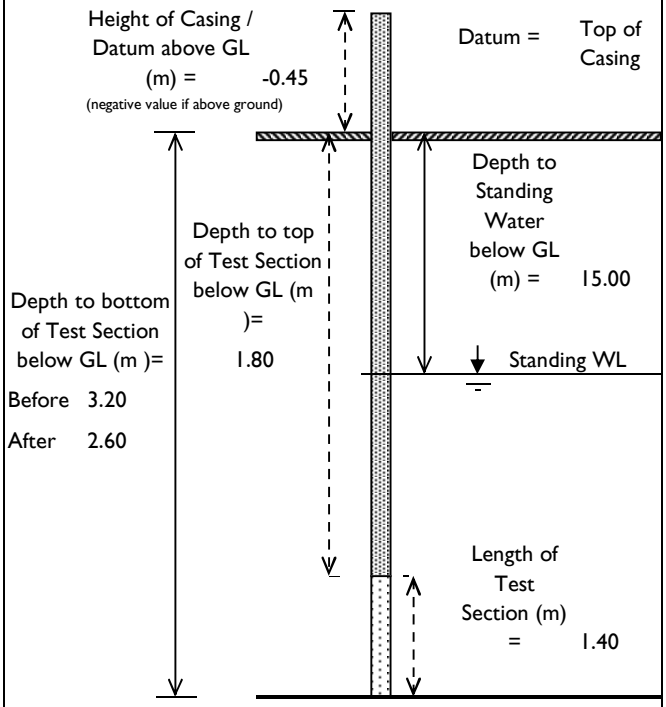
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467041.0
	N 113142.6
Level (m OD)	67.18

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)		Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	1.20			
0.5	1.78			
1.0	2.14			
1.5	2.32			
2.0	2.40			
2.5	2.43			
3.0	2.48			
3.5	2.49			
4.0	2.50			
4.5	2.55			
5.0	2.60			
6.0	2.60			
7.0	2.60			



Depth to Standing Water Level below Datum	15.45 m
Depth to Induced Water Level below Datum	1.20 m
Differential head at start of Test (H_o)	14.25 m
Differential Head at end of Test (H_f)	0.90 m
Time Elapsed at end of test (t_f)	7.0 mins

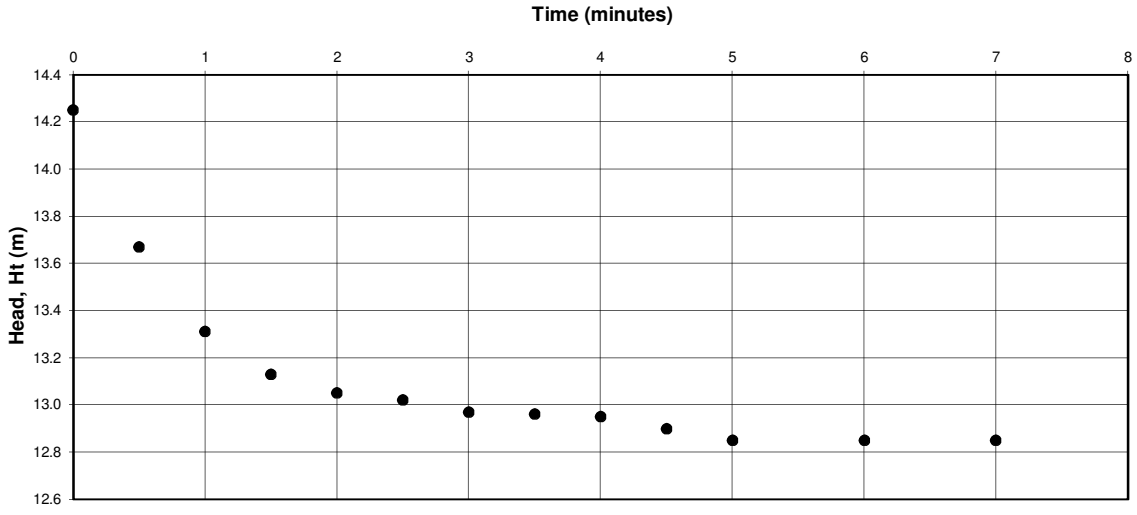
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	19/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	1.20	0.75	14.25	0.00					
0.5	1.78	1.33	13.67	0.96					
1.0	2.14	1.69	13.31	0.93					
1.5	2.32	1.87	13.13	0.92					
2.0	2.40	1.95	13.05	0.92					
2.5	2.43	1.98	13.02	0.91					
3.0	2.48	2.03	12.97	0.91					
3.5	2.49	2.04	12.96	0.91					
4.0	2.50	2.05	12.95	0.91					
4.5	2.55	2.10	12.90	0.91					
5.0	2.60	2.15	12.85	0.90					
6.0	2.60	2.15	12.85	0.90					
7.0	2.60	2.15	12.85	0.90					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

Water assumed at base of hole.

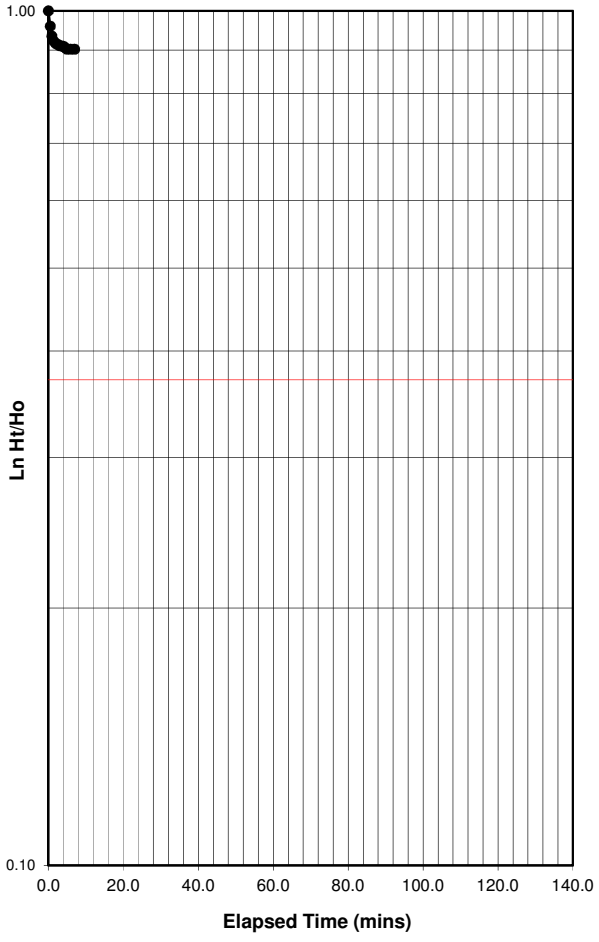
NB. Borehole collapsed from 3.20m back to 2.60m during the test.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH40
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	19/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	14.25	1.00						
0.5	13.67	0.96						
1.0	13.31	0.93						
1.5	13.13	0.92						
2.0	13.05	0.92						
2.5	13.02	0.91						
3.0	12.97	0.91						
3.5	12.96	0.91						
4.0	12.95	0.91						
4.5	12.90	0.91						
5.0	12.85	0.90						
6.0	12.85	0.90						
7.0	12.85	0.90						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.45	m
Depth to Induced Water Level	1.20	m
Differential head at start (H_{o})	14.25	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.40	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.791	
Time (t1)	1.50	mins
Time (t2)	5.00	mins
Head at Time t1 (H1)	13.130	m
Head at Time t2 (H2)	12.850	m
Permeability (k) = A/(F[t2-	**4.16E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	18/11/2020

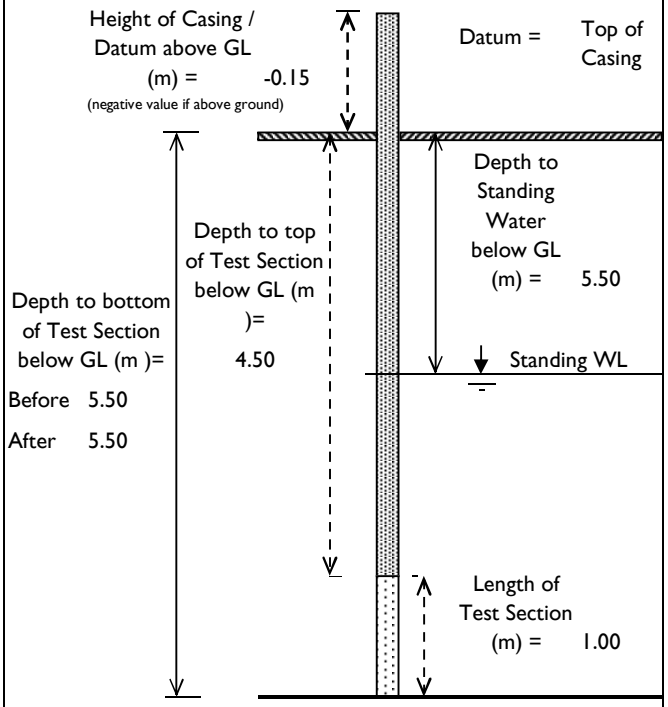
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.56		
0.5	3.85		
1.0	3.99		
1.5	4.04		
2.0	4.14		
2.5	4.17		
3.0	4.17		
3.5	4.20		
4.0	4.24		
5.0	4.28		
6.0	4.34		
7.0	4.37		
8.0	4.40		
9.0	4.46		
10.0	4.48		
15.0	4.59		
20.0	4.68		
30.0	4.85		



Depth to Standing Water Level below Datum	5.65 m
Depth to Induced Water Level below Datum	3.56 m
Differential head at start of Test (H_o)	2.09 m
Differential Head at end of Test (H_f)	0.80 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK.

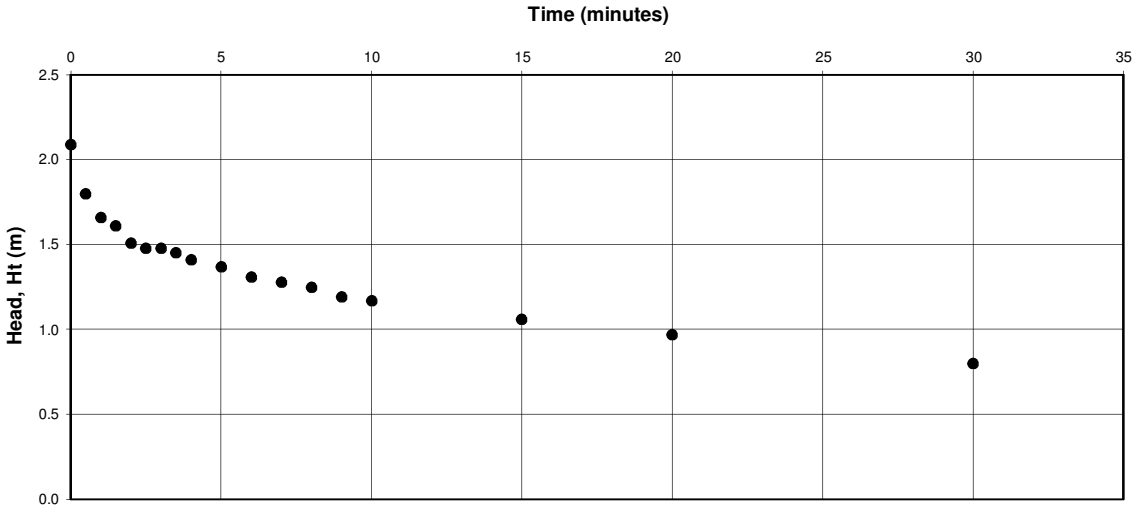
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.56	3.41	2.09	0.00
0.5	3.85	3.70	1.80	0.86
1.0	3.99	3.84	1.66	0.79
1.5	4.04	3.89	1.61	0.77
2.0	4.14	3.99	1.51	0.72
2.5	4.17	4.02	1.48	0.71
3.0	4.17	4.02	1.48	0.71
3.5	4.20	4.05	1.45	0.69
4.0	4.24	4.09	1.41	0.67
5.0	4.28	4.13	1.37	0.66
6.0	4.34	4.19	1.31	0.63
7.0	4.37	4.22	1.28	0.61
8.0	4.40	4.25	1.25	0.60
9.0	4.46	4.31	1.19	0.57
10.0	4.48	4.33	1.17	0.56
15.0	4.59	4.44	1.06	0.51
20.0	4.68	4.53	0.97	0.46
30.0	4.85	4.70	0.80	0.38

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

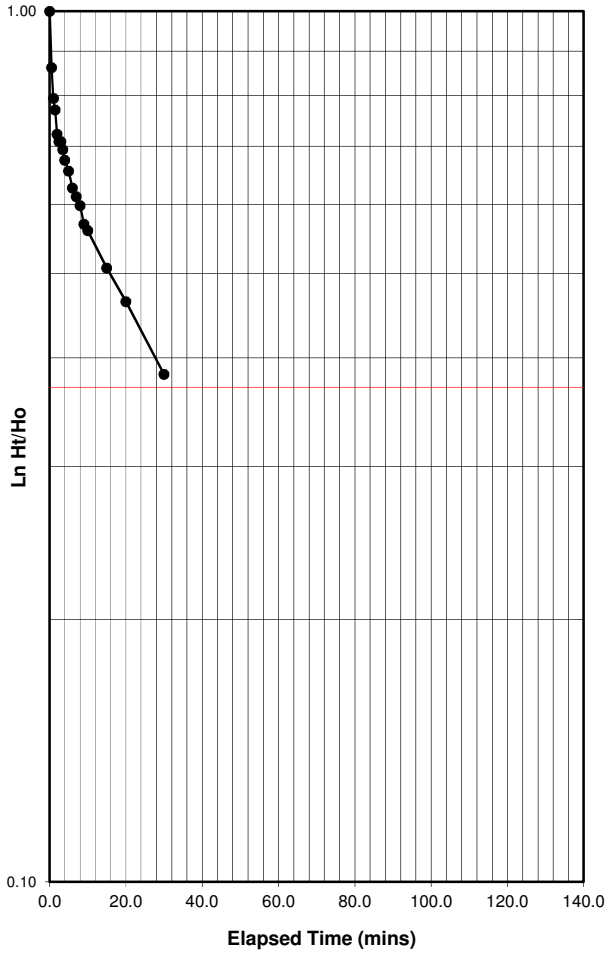
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.09	1.00	10.0	1.17	0.56			
0.5	1.80	0.86	15.0	1.06	0.51			
1.0	1.66	0.79	20.0	0.97	0.46			
1.5	1.61	0.77	30.0	0.80	0.38			
2.0	1.51	0.72						
2.5	1.48	0.71						
3.0	1.48	0.71						
3.5	1.45	0.69						
4.0	1.41	0.67						
5.0	1.37	0.66						
6.0	1.31	0.63						
7.0	1.28	0.61						
8.0	1.25	0.60						
9.0	1.19	0.57						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	5.65	m
Depth to Induced Water Level	3.56	m
Differential head at start (H_{o})	2.09	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	3.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	1.480	m
Head at Time t2 (H2)	0.800	m
Permeability (k) = A/(F[t2-	**1.93E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	18/11/2020

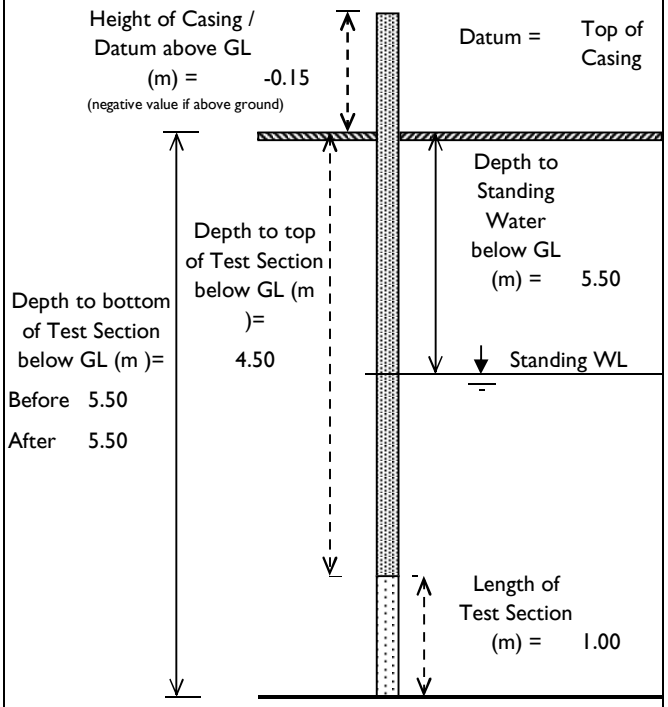
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.30		
0.5	3.80		
1.0	3.94		
1.5	3.96		
2.0	4.08		
2.5	4.14		
3.0	4.18		
3.5	4.23		
4.0	4.26		
5.0	4.32		
6.0	4.40		
7.0	4.46		
8.0	4.51		
9.0	4.54		
10.0	4.55		
15.0	4.63		
20.0	4.73		
30.0	4.97		
40.0	5.14		
50.0	5.27		



Depth to Standing Water Level below Datum	5.65 m
Depth to Induced Water Level below Datum	3.30 m
Differential head at start of Test (H_o)	2.35 m
Differential Head at end of Test (H_f)	0.38 m
Time Elapsed at end of test (t_f)	50.0 mins

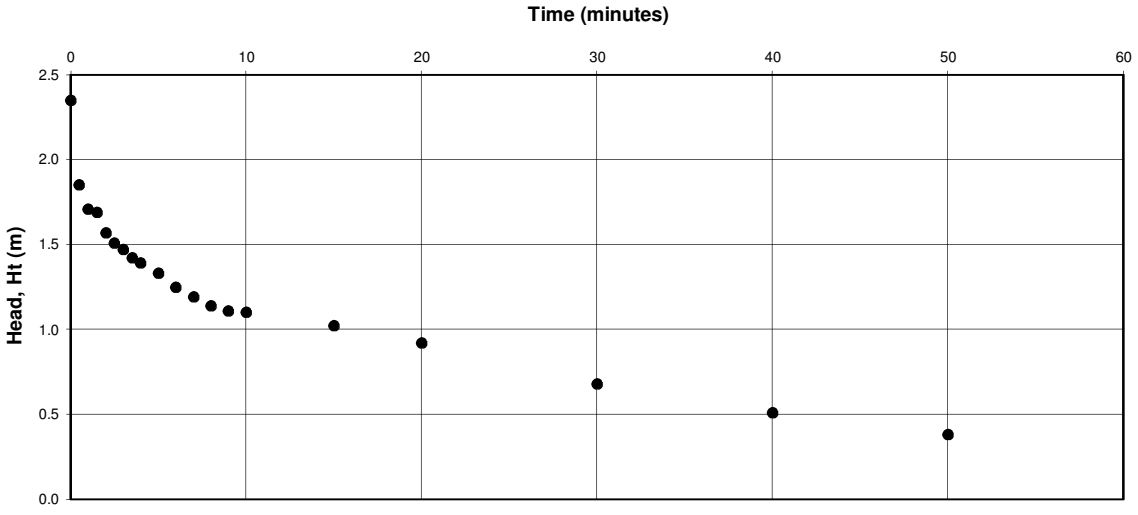
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.30	3.15	2.35	0.00					
0.5	3.80	3.65	1.85	0.79					
1.0	3.94	3.79	1.71	0.73					
1.5	3.96	3.81	1.69	0.72					
2.0	4.08	3.93	1.57	0.67					
2.5	4.14	3.99	1.51	0.64					
3.0	4.18	4.03	1.47	0.63					
3.5	4.23	4.08	1.42	0.60					
4.0	4.26	4.11	1.39	0.59					
5.0	4.32	4.17	1.33	0.57					
6.0	4.40	4.25	1.25	0.53					
7.0	4.46	4.31	1.19	0.51					
8.0	4.51	4.36	1.14	0.49					
9.0	4.54	4.39	1.11	0.47					
10.0	4.55	4.40	1.10	0.47					
15.0	4.63	4.48	1.02	0.43					
20.0	4.73	4.58	0.92	0.39					
30.0	4.97	4.82	0.68	0.29					
40.0	5.14	4.99	0.51	0.22					
50.0	5.27	5.12	0.38	0.16					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

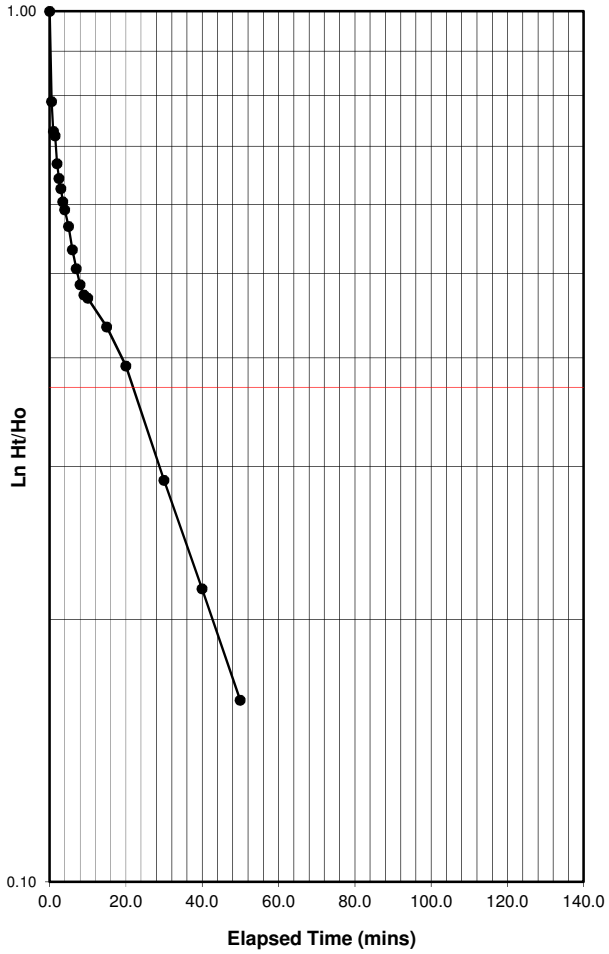
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.35	1.00	10.0	1.10	0.47			
0.5	1.85	0.79	15.0	1.02	0.43			
1.0	1.71	0.73	20.0	0.92	0.39			
1.5	1.69	0.72	30.0	0.68	0.29			
2.0	1.57	0.67	40.0	0.51	0.22			
2.5	1.51	0.64	50.0	0.38	0.16			
3.0	1.47	0.63						
3.5	1.42	0.60						
4.0	1.39	0.59						
5.0	1.33	0.57						
6.0	1.25	0.53						
7.0	1.19	0.51						
8.0	1.14	0.49						
9.0	1.11	0.47						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	5.65	m
Depth to Induced Water Level	3.30	m
Differential head at start (H_{o})	2.35	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	7.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	1.190	m
Head at Time t2 (H2)	0.680	m
Permeability (k) = A/(F[t2-	**2.06E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	18/11/2020

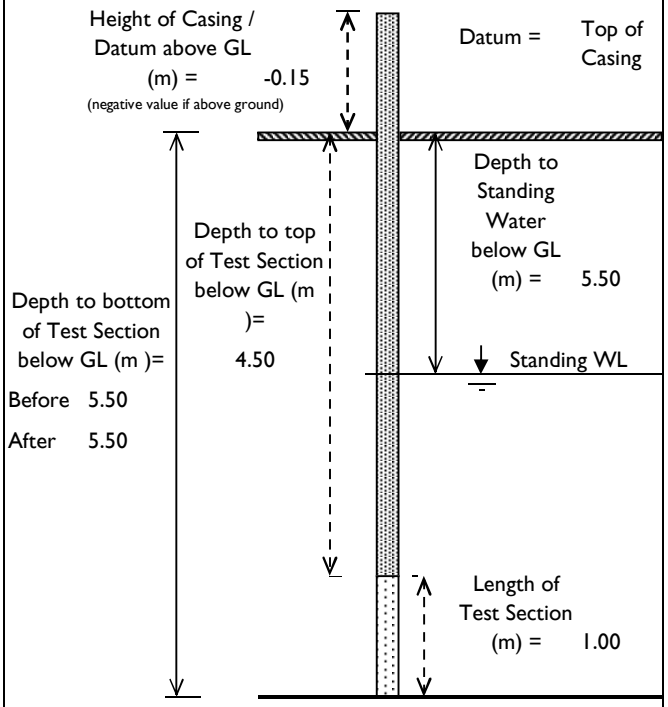
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.40		
0.5	3.77		
1.0	3.87		
1.5	3.98		
2.0	4.09		
2.5	4.10		
3.0	4.17		
3.5	4.23		
4.0	4.26		
5.0	4.30		
6.0	4.36		
7.0	4.40		
8.0	4.44		
9.0	4.49		
10.0	4.50		
15.0	4.59		
20.0	4.69		
30.0	4.88		



Depth to Standing Water Level below Datum	5.65 m
Depth to Induced Water Level below Datum	3.40 m
Differential head at start of Test (H_o)	2.25 m
Differential Head at end of Test (H_f)	0.77 m
Time Elapsed at end of test (t_f)	30.0 mins

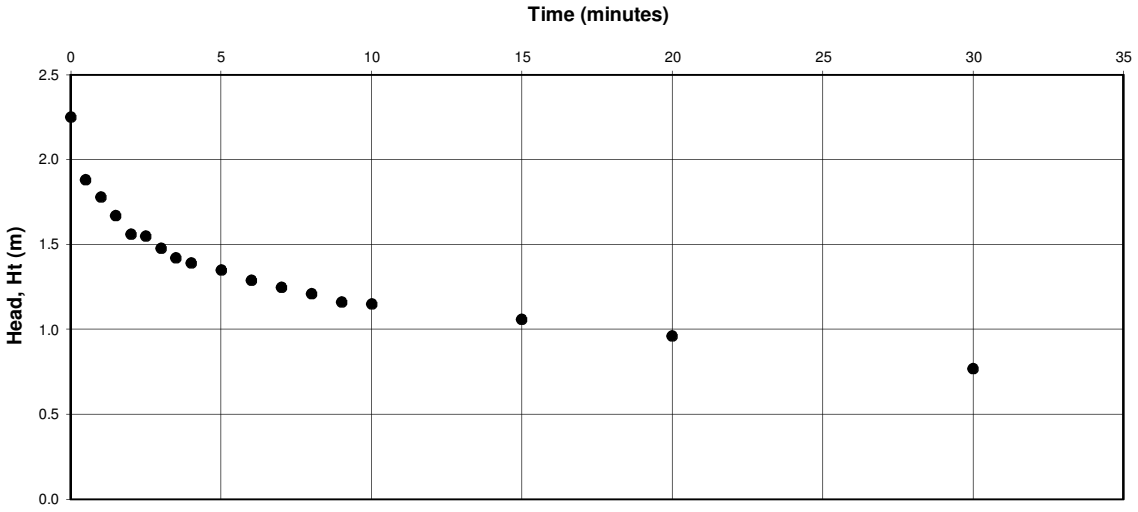
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless Chalk

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.40	3.25	2.25	0.00					
0.5	3.77	3.62	1.88	0.84					
1.0	3.87	3.72	1.78	0.79					
1.5	3.98	3.83	1.67	0.74					
2.0	4.09	3.94	1.56	0.69					
2.5	4.10	3.95	1.55	0.69					
3.0	4.17	4.02	1.48	0.66					
3.5	4.23	4.08	1.42	0.63					
4.0	4.26	4.11	1.39	0.62					
5.0	4.30	4.15	1.35	0.60					
6.0	4.36	4.21	1.29	0.57					
7.0	4.40	4.25	1.25	0.56					
8.0	4.44	4.29	1.21	0.54					
9.0	4.49	4.34	1.16	0.52					
10.0	4.50	4.35	1.15	0.51					
15.0	4.59	4.44	1.06	0.47					
20.0	4.69	4.54	0.96	0.43					
30.0	4.88	4.73	0.77	0.34					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

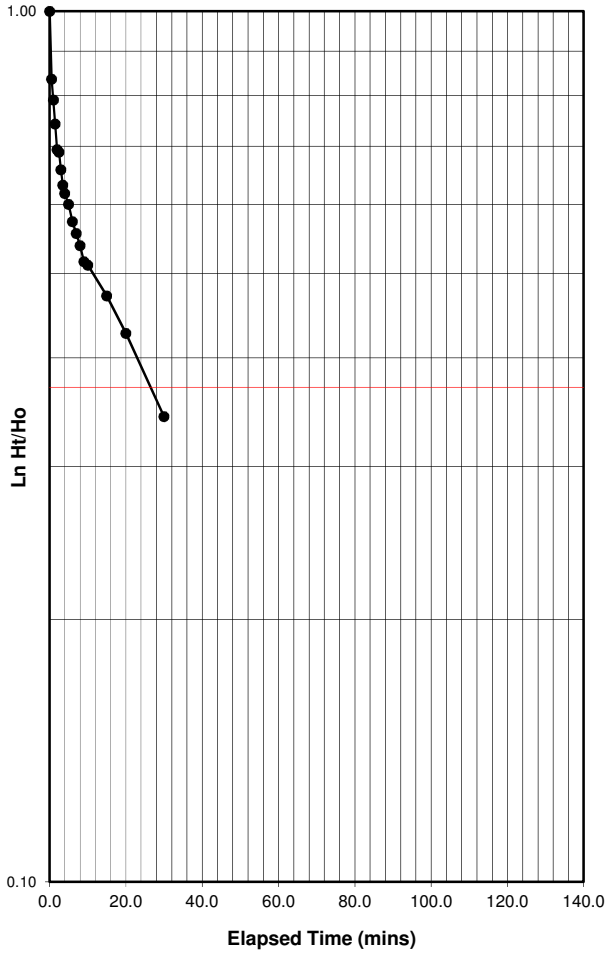
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.25	1.00	10.0	1.15	0.51			
0.5	1.88	0.84	15.0	1.06	0.47			
1.0	1.78	0.79	20.0	0.96	0.43			
1.5	1.67	0.74	30.0	0.77	0.34			
2.0	1.56	0.69						
2.5	1.55	0.69						
3.0	1.48	0.66						
3.5	1.42	0.63						
4.0	1.39	0.62						
5.0	1.35	0.60						
6.0	1.29	0.57						
7.0	1.25	0.56						
8.0	1.21	0.54						
9.0	1.16	0.52						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	5.65	m
Depth to Induced Water Level	3.40	m
Differential head at start (H_{o})	2.25	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	4.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	1.390	m
Head at Time t2 (H2)	0.770	m
Permeability (k) = A/(F[t2-	**1.92E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

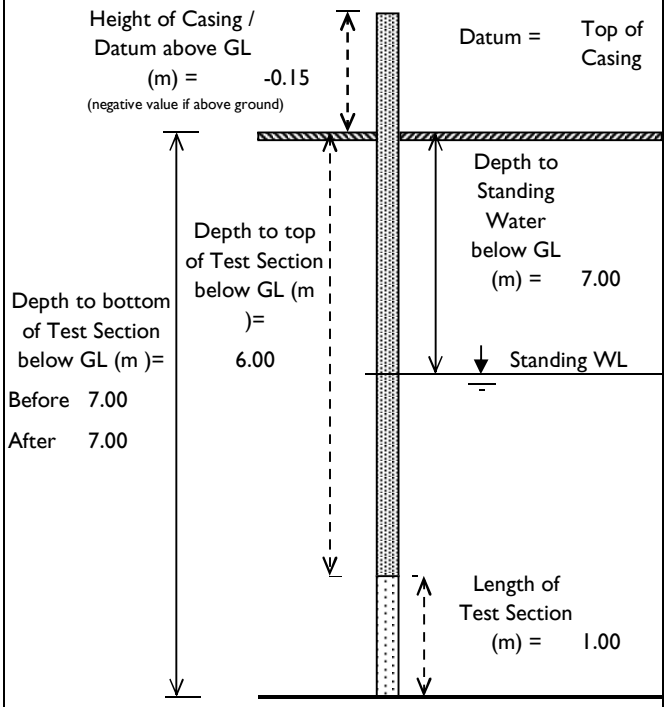
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	2.30		
1.0	3.33		
1.5	3.68		
2.0	3.85		
2.5	3.99		
3.0	4.18		
3.5	4.28		
4.0	4.45		
4.5	4.55		
5.0	4.59		
6.0	4.78		
7.0	4.82		
8.0	4.94		
9.0	5.07		
10.0	5.16		
15.0	5.29		
20.0	5.37		
30.0	5.46		



Depth to Standing Water Level below Datum	7.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	5.15 m
Differential Head at end of Test (H_f)	9.69 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structural CHALK

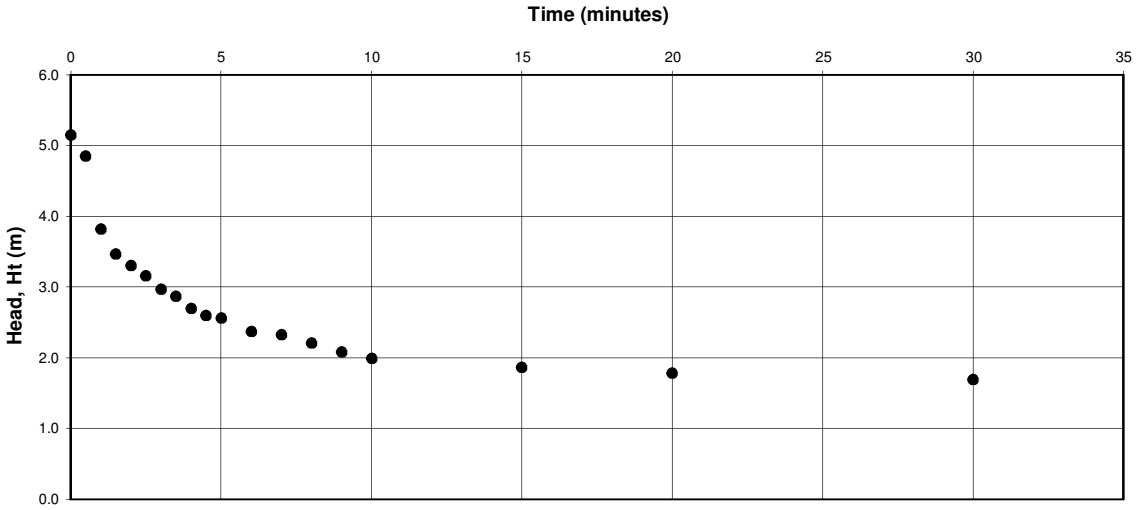
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	5.15	0.00
0.5	2.30	2.15	4.85	0.94
1.0	3.33	3.18	3.82	0.74
1.5	3.68	3.53	3.47	0.67
2.0	3.85	3.70	3.30	0.64
2.5	3.99	3.84	3.16	0.61
3.0	4.18	4.03	2.97	0.58
3.5	4.28	4.13	2.87	0.56
4.0	4.45	4.30	2.70	0.52
4.5	4.55	4.40	2.60	0.50
5.0	4.59	4.44	2.56	0.50
6.0	4.78	4.63	2.37	0.46
7.0	4.82	4.67	2.33	0.45
8.0	4.94	4.79	2.21	0.43
9.0	5.07	4.92	2.08	0.40
10.0	5.16	5.01	1.99	0.39
15.0	5.29	5.14	1.86	0.36
20.0	5.37	5.22	1.78	0.35
30.0	5.46	5.31	1.69	0.33

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

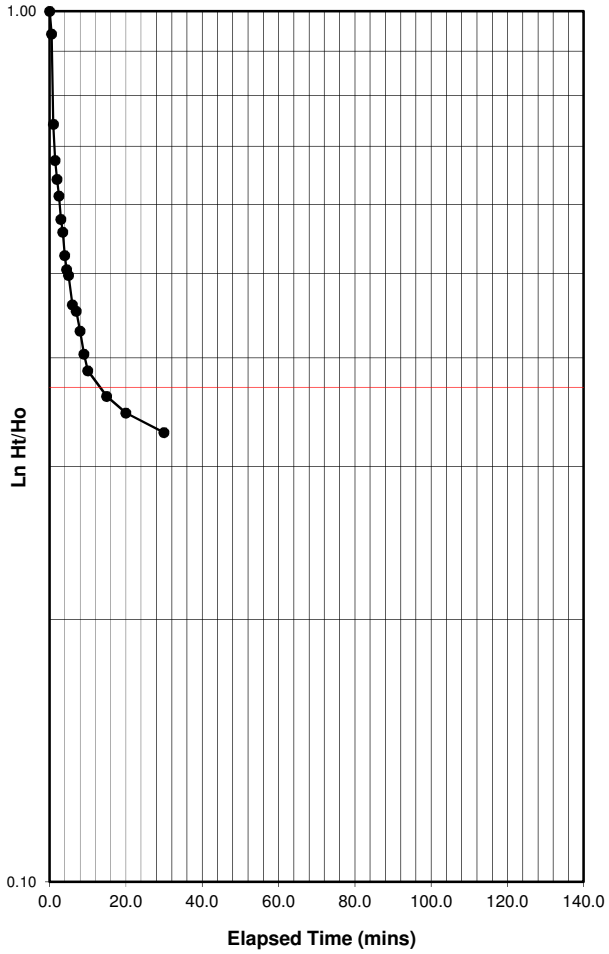
Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	5.15	1.00	9.0	2.08	0.40			
0.5	4.85	0.94	10.0	1.99	0.39			
1.0	3.82	0.74	15.0	1.86	0.36			
1.5	3.47	0.67	20.0	1.78	0.35			
2.0	3.30	0.64	30.0	1.69	0.33			
2.5	3.16	0.61						
3.0	2.97	0.58						
3.5	2.87	0.56						
4.0	2.70	0.52						
4.5	2.60	0.50						
5.0	2.56	0.50						
6.0	2.37	0.46						
7.0	2.33	0.45						
8.0	2.21	0.43						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	7.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	5.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	1.50	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	3.470	m
Head at Time t2 (H2)	1.990	m
Permeability (k) = A/(F[t2-	**5.53E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

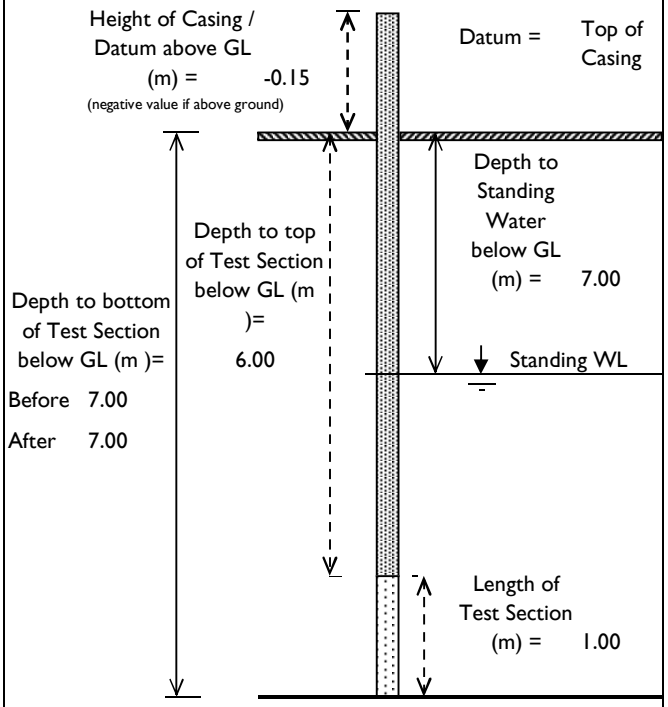
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	2.57		
1.0	3.39		
1.5	3.72		
2.0	3.80		
2.5	4.02		
3.0	4.07		
3.5	4.17		
4.0	4.32		
4.5	4.42		
5.0	4.49		
6.0	4.63		
7.0	4.74		
8.0	4.87		
9.0	4.99		
10.0	5.05		
15.0	5.37		
20.0	5.40		
30.0	5.58		



Depth to Standing Water Level below Datum	7.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	5.15 m
Differential Head at end of Test (H_f)	9.57 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project Aquind Drainage Design Additional GI

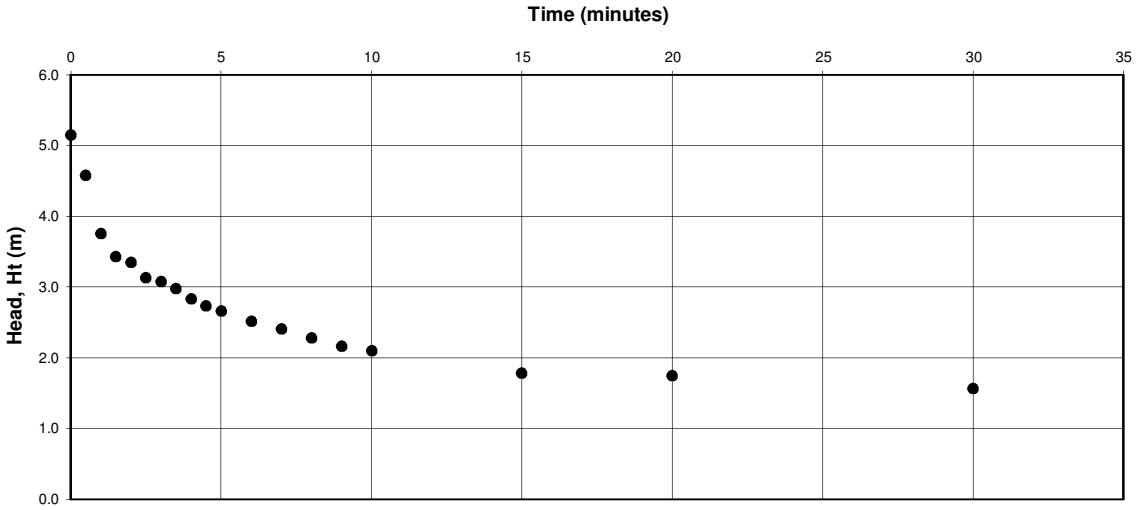
Client WSP UK Limited

Borehole BH41
Project No PE201677
Test No 2
Date 17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	5.15	0.00
0.5	2.57	2.42	4.58	0.89
1.0	3.39	3.24	3.76	0.73
1.5	3.72	3.57	3.43	0.67
2.0	3.80	3.65	3.35	0.65
2.5	4.02	3.87	3.13	0.61
3.0	4.07	3.92	3.08	0.60
3.5	4.17	4.02	2.98	0.58
4.0	4.32	4.17	2.83	0.55
4.5	4.42	4.27	2.73	0.53
5.0	4.49	4.34	2.66	0.52
6.0	4.63	4.48	2.52	0.49
7.0	4.74	4.59	2.41	0.47
8.0	4.87	4.72	2.28	0.44
9.0	4.99	4.84	2.16	0.42
10.0	5.05	4.90	2.10	0.41
15.0	5.37	5.22	1.78	0.35
20.0	5.40	5.25	1.75	0.34
30.0	5.58	5.43	1.57	0.30

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

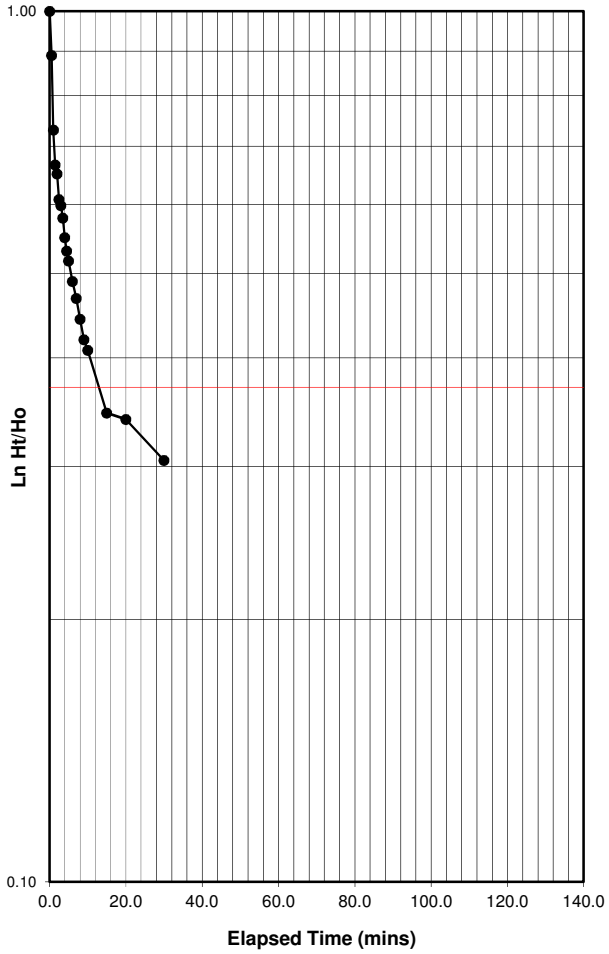
Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	5.15	1.00	9.0	2.16	0.42			
0.5	4.58	0.89	10.0	2.10	0.41			
1.0	3.76	0.73	15.0	1.78	0.35			
1.5	3.43	0.67	20.0	1.75	0.34			
2.0	3.35	0.65	30.0	1.57	0.30			
2.5	3.13	0.61						
3.0	3.08	0.60						
3.5	2.98	0.58						
4.0	2.83	0.55						
4.5	2.73	0.53						
5.0	2.66	0.52						
6.0	2.52	0.49						
7.0	2.41	0.47						
8.0	2.28	0.44						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	7.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	5.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	1.50	mins
Time (t2)	15.00	mins
Head at Time t1 (H1)	3.430	m
Head at Time t2 (H2)	1.780	m
Permeability (k) = A/(F[t2-	**4.11E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

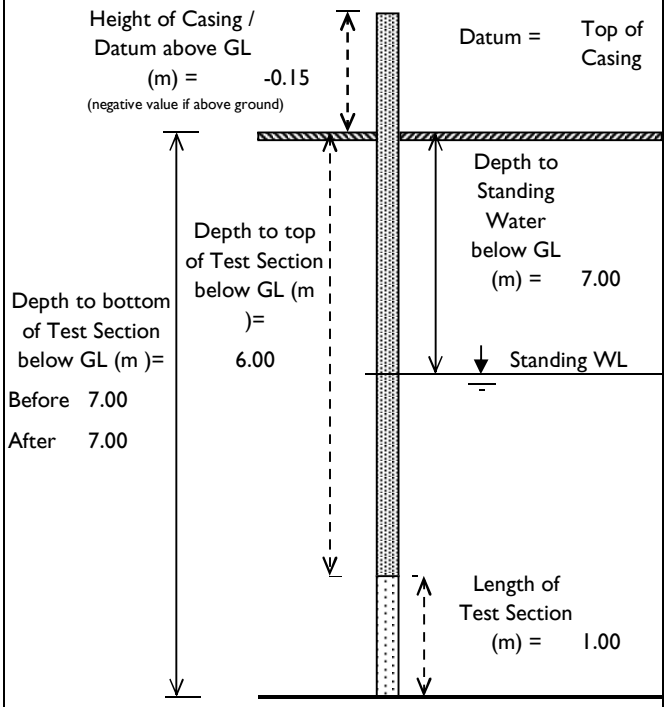
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	3.10		
1.0	3.56		
1.5	3.86		
2.0	4.04		
2.5	4.28		
3.0	4.43		
3.5	4.55		
4.0	4.71		
4.5	4.82		
5.0	4.91		
6.0	5.10		
7.0	5.16		
8.0	5.27		
9.0	5.37		
10.0	5.42		
15.0	5.57		
20.0	5.73		
30.0	5.96		
40.0	6.19		
50.0	6.26		



Depth to Standing Water Level below Datum	7.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	5.15 m
Differential Head at end of Test (H_f)	8.96 m
Time Elapsed at end of test (t_f)	50.0 mins

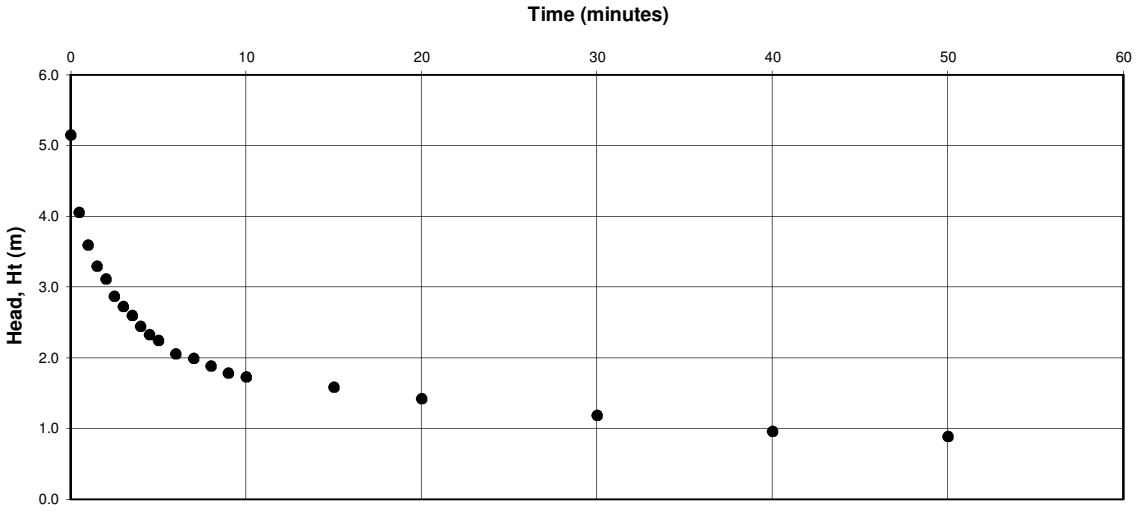
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	5.15	0.00	50.0	6.26	6.11	0.89	0.17
0.5	3.10	2.95	4.05	0.79					
1.0	3.56	3.41	3.59	0.70					
1.5	3.86	3.71	3.29	0.64					
2.0	4.04	3.89	3.11	0.60					
2.5	4.28	4.13	2.87	0.56					
3.0	4.43	4.28	2.72	0.53					
3.5	4.55	4.40	2.60	0.50					
4.0	4.71	4.56	2.44	0.47					
4.5	4.82	4.67	2.33	0.45					
5.0	4.91	4.76	2.24	0.43					
6.0	5.10	4.95	2.05	0.40					
7.0	5.16	5.01	1.99	0.39					
8.0	5.27	5.12	1.88	0.37					
9.0	5.37	5.22	1.78	0.35					
10.0	5.42	5.27	1.73	0.34					
15.0	5.57	5.42	1.58	0.31					
20.0	5.73	5.58	1.42	0.28					
30.0	5.96	5.81	1.19	0.23					
40.0	6.19	6.04	0.96	0.19					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

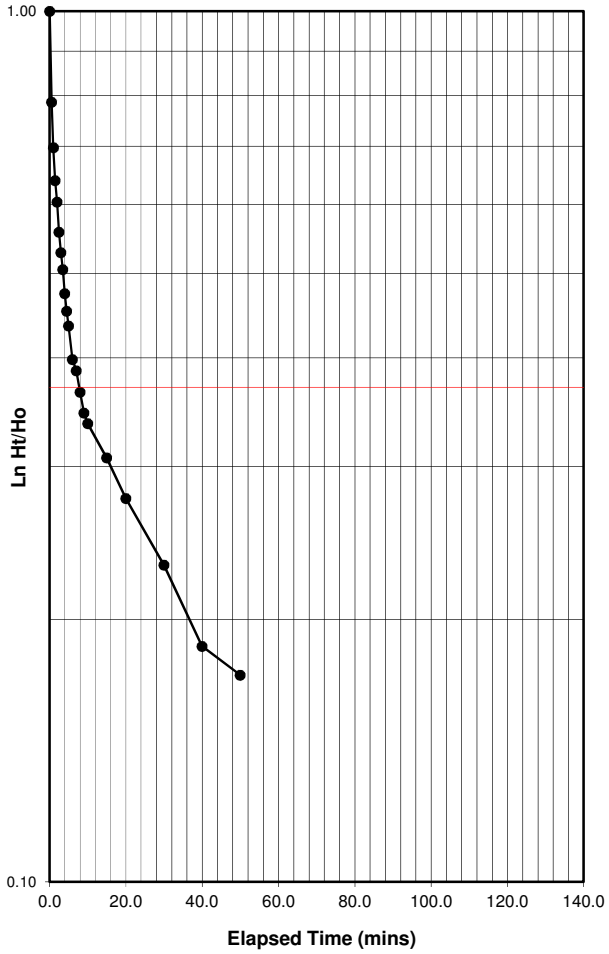
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	5.15	1.00	9.0	1.78	0.35			
0.5	4.05	0.79	10.0	1.73	0.34			
1.0	3.59	0.70	15.0	1.58	0.31			
1.5	3.29	0.64	20.0	1.42	0.28			
2.0	3.11	0.60	30.0	1.19	0.23			
2.5	2.87	0.56	40.0	0.96	0.19			
3.0	2.72	0.53	50.0	0.89	0.17			
3.5	2.60	0.50						
4.0	2.44	0.47						
4.5	2.33	0.45						
5.0	2.24	0.43						
6.0	2.05	0.40						
7.0	1.99	0.39						
8.0	1.88	0.37						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	7.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	5.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.233	
Time (t1)	5.00	mins
Time (t2)	50.00	mins
Head at Time t1 (H1)	2.240	m
Head at Time t2 (H2)	0.890	m
Permeability (k) = A/(F[t2-	**1.73E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	18/11/2020

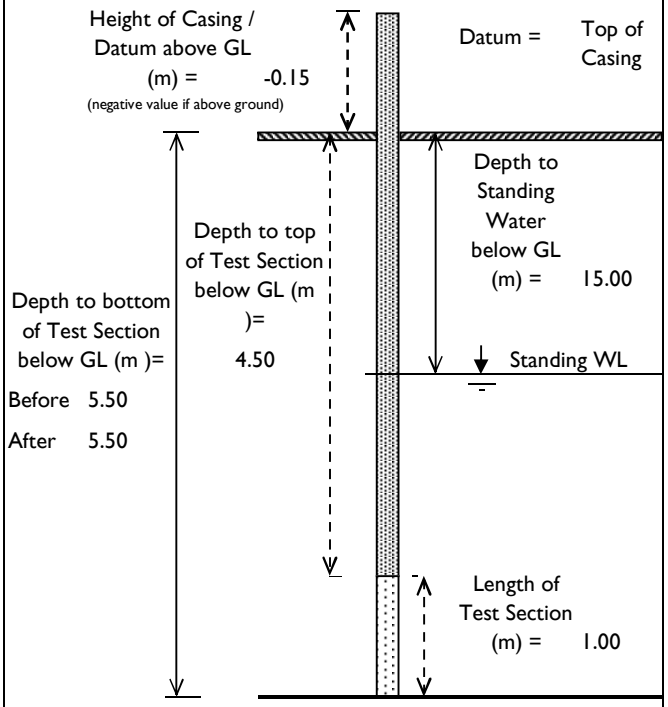
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.56		
0.5	3.85		
1.0	3.99		
1.5	4.04		
2.0	4.14		
2.5	4.17		
3.0	4.17		
3.5	4.20		
4.0	4.24		
5.0	4.28		
6.0	4.34		
7.0	4.37		
8.0	4.40		
9.0	4.46		
10.0	4.48		
15.0	4.59		
20.0	4.68		
30.0	4.85		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	3.56 m
Differential head at start of Test (H_o)	11.59 m
Differential Head at end of Test (H_f)	10.30 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK.

INSITU TESTING - *Permeability (Borehole)*

Project Aquind Drainage Design Additional GI

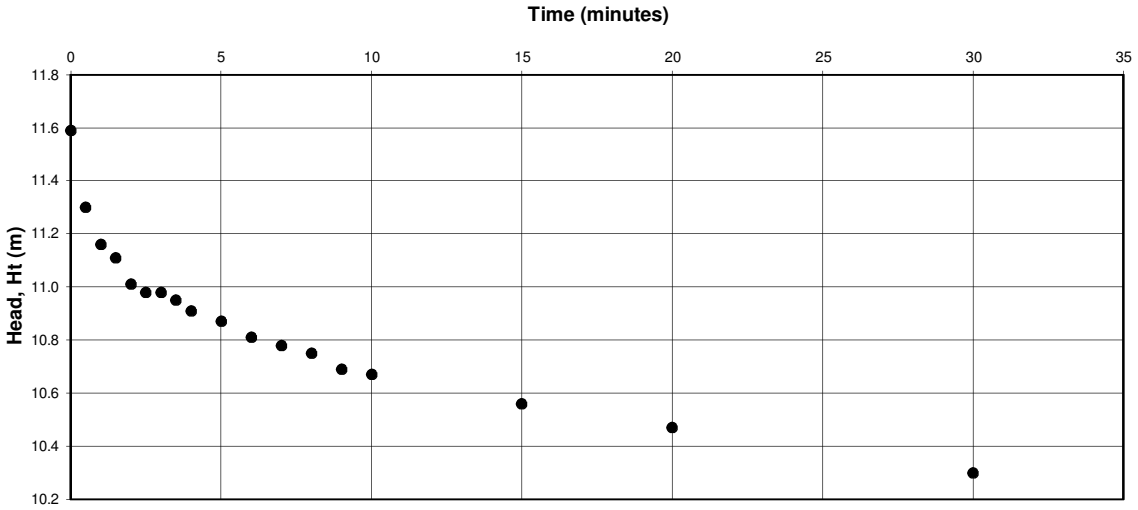
Client WSP UK Limited

Borehole BH41
Project No PE201677
Test No 1
Date 18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.56	3.41	11.59	0.00
0.5	3.85	3.70	11.30	0.97
1.0	3.99	3.84	11.16	0.96
1.5	4.04	3.89	11.11	0.96
2.0	4.14	3.99	11.01	0.95
2.5	4.17	4.02	10.98	0.95
3.0	4.17	4.02	10.98	0.95
3.5	4.20	4.05	10.95	0.94
4.0	4.24	4.09	10.91	0.94
5.0	4.28	4.13	10.87	0.94
6.0	4.34	4.19	10.81	0.93
7.0	4.37	4.22	10.78	0.93
8.0	4.40	4.25	10.75	0.93
9.0	4.46	4.31	10.69	0.92
10.0	4.48	4.33	10.67	0.92
15.0	4.59	4.44	10.56	0.91
20.0	4.68	4.53	10.47	0.90
30.0	4.85	4.70	10.30	0.89

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

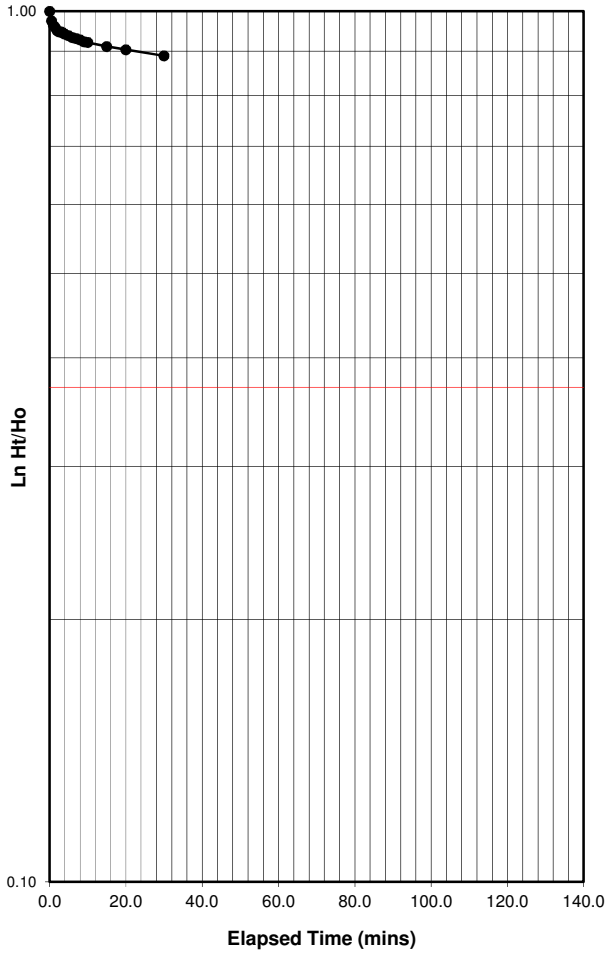
Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	11.59	1.00	10.0	10.67	0.92			
0.5	11.30	0.97	15.0	10.56	0.91			
1.0	11.16	0.96	20.0	10.47	0.90			
1.5	11.11	0.96	30.0	10.30	0.89			
2.0	11.01	0.95						
2.5	10.98	0.95						
3.0	10.98	0.95						
3.5	10.95	0.94						
4.0	10.91	0.94						
5.0	10.87	0.94						
6.0	10.81	0.93						
7.0	10.78	0.93						
8.0	10.75	0.93						
9.0	10.69	0.92						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	3.56	m
Differential head at start (H_{o})	11.59	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	3.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	10.980	m
Head at Time t2 (H2)	10.300	m
Permeability (k) = A/(F[t2-	**2.00E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	18/11/2020

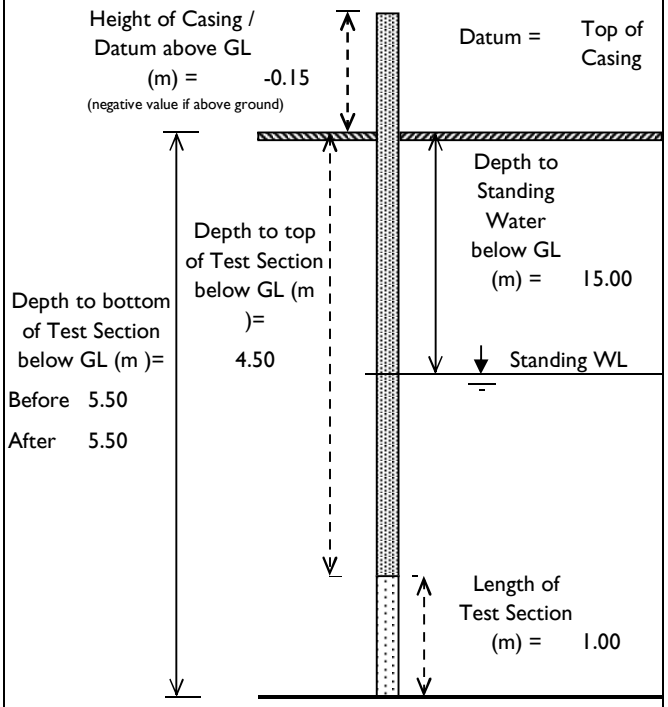
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.30		
0.5	3.80		
1.0	3.94		
1.5	3.96		
2.0	4.08		
2.5	4.14		
3.0	4.18		
3.5	4.23		
4.0	4.26		
5.0	4.32		
6.0	4.40		
7.0	4.46		
8.0	4.51		
9.0	4.54		
10.0	4.55		
15.0	4.63		
20.0	4.73		
30.0	4.97		
40.0	5.14		
50.0	5.27		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	3.30 m
Differential head at start of Test (H_o)	11.85 m
Differential Head at end of Test (H_f)	m
Time Elapsed at end of test (t_f)	50.0 mins

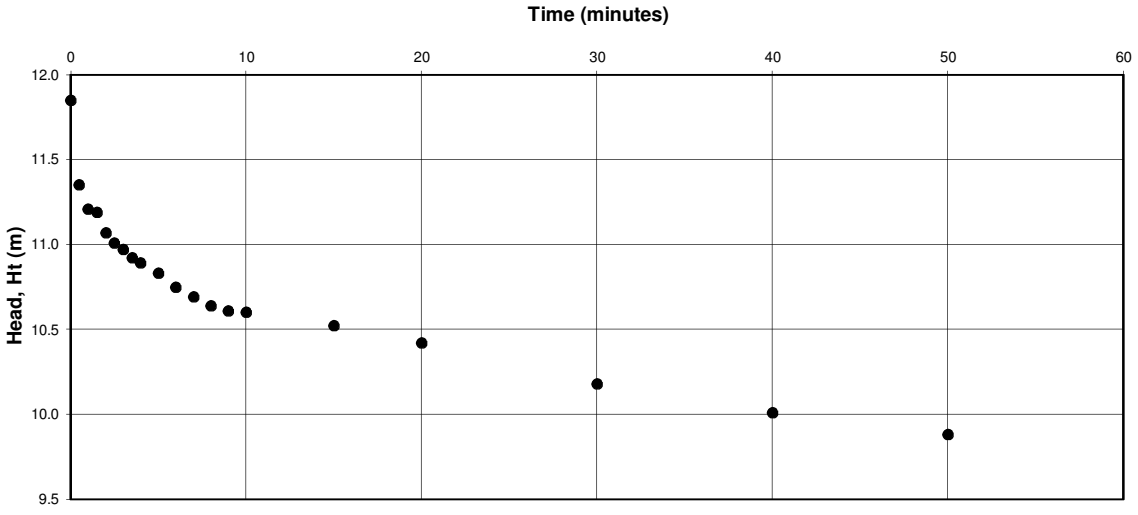
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.30	3.15	11.85	0.00					
0.5	3.80	3.65	11.35	0.96					
1.0	3.94	3.79	11.21	0.95					
1.5	3.96	3.81	11.19	0.94					
2.0	4.08	3.93	11.07	0.93					
2.5	4.14	3.99	11.01	0.93					
3.0	4.18	4.03	10.97	0.93					
3.5	4.23	4.08	10.92	0.92					
4.0	4.26	4.11	10.89	0.92					
5.0	4.32	4.17	10.83	0.91					
6.0	4.40	4.25	10.75	0.91					
7.0	4.46	4.31	10.69	0.90					
8.0	4.51	4.36	10.64	0.90					
9.0	4.54	4.39	10.61	0.90					
10.0	4.55	4.40	10.60	0.89					
15.0	4.63	4.48	10.52	0.89					
20.0	4.73	4.58	10.42	0.88					
30.0	4.97	4.82	10.18	0.86					
40.0	5.14	4.99	10.01	0.84					
50.0	5.27	5.12	9.88	0.83					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

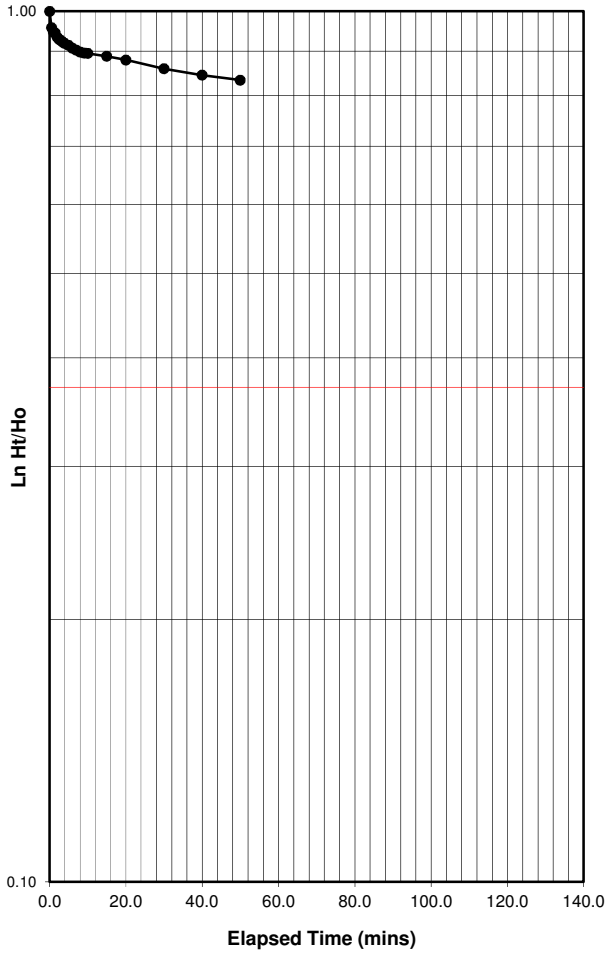
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	11.85	1.00	10.0	10.60	0.89			
0.5	11.35	0.96	15.0	10.52	0.89			
1.0	11.21	0.95	20.0	10.42	0.88			
1.5	11.19	0.94	30.0	10.18	0.86			
2.0	11.07	0.93	40.0	10.01	0.84			
2.5	11.01	0.93	50.0	9.88	0.83			
3.0	10.97	0.93						
3.5	10.92	0.92						
4.0	10.89	0.92						
5.0	10.83	0.91						
6.0	10.75	0.91						
7.0	10.69	0.90						
8.0	10.64	0.90						
9.0	10.61	0.90						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	3.30	m
Differential head at start (H_{o})	11.85	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	7.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	10.690	m
Head at Time t2 (H2)	10.180	m
Permeability (k) = A/(F[t2-	**1.80E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	18/11/2020

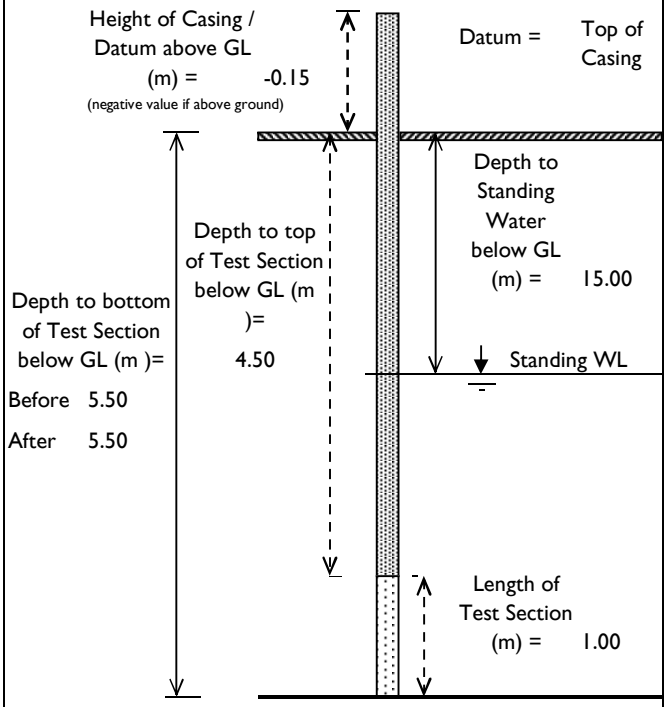
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	3.40		
0.5	3.77		
1.0	3.87		
1.5	3.98		
2.0	4.09		
2.5	4.10		
3.0	4.17		
3.5	4.23		
4.0	4.26		
5.0	4.30		
6.0	4.36		
7.0	4.40		
8.0	4.44		
9.0	4.49		
10.0	4.50		
15.0	4.59		
20.0	4.69		
30.0	4.88		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	3.40 m
Differential head at start of Test (H_o)	11.75 m
Differential Head at end of Test (H_f)	m
Time Elapsed at end of test (t_f)	30.0 mins

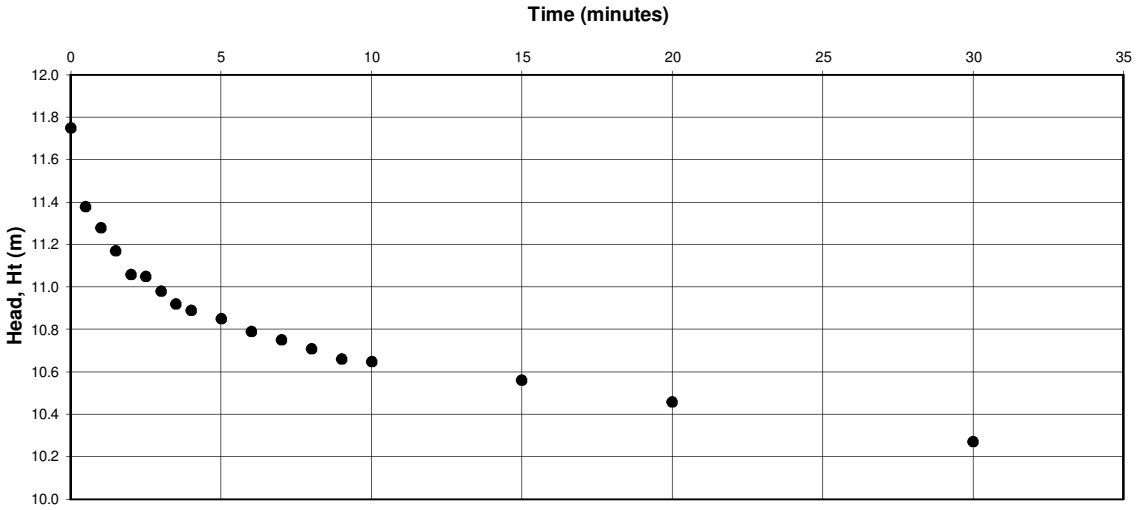
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless Chalk

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	18/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	3.40	3.25	11.75	0.00					
0.5	3.77	3.62	11.38	0.97					
1.0	3.87	3.72	11.28	0.96					
1.5	3.98	3.83	11.17	0.95					
2.0	4.09	3.94	11.06	0.94					
2.5	4.10	3.95	11.05	0.94					
3.0	4.17	4.02	10.98	0.93					
3.5	4.23	4.08	10.92	0.93					
4.0	4.26	4.11	10.89	0.93					
5.0	4.30	4.15	10.85	0.92					
6.0	4.36	4.21	10.79	0.92					
7.0	4.40	4.25	10.75	0.91					
8.0	4.44	4.29	10.71	0.91					
9.0	4.49	4.34	10.66	0.91					
10.0	4.50	4.35	10.65	0.91					
15.0	4.59	4.44	10.56	0.90					
20.0	4.69	4.54	10.46	0.89					
30.0	4.88	4.73	10.27	0.87					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

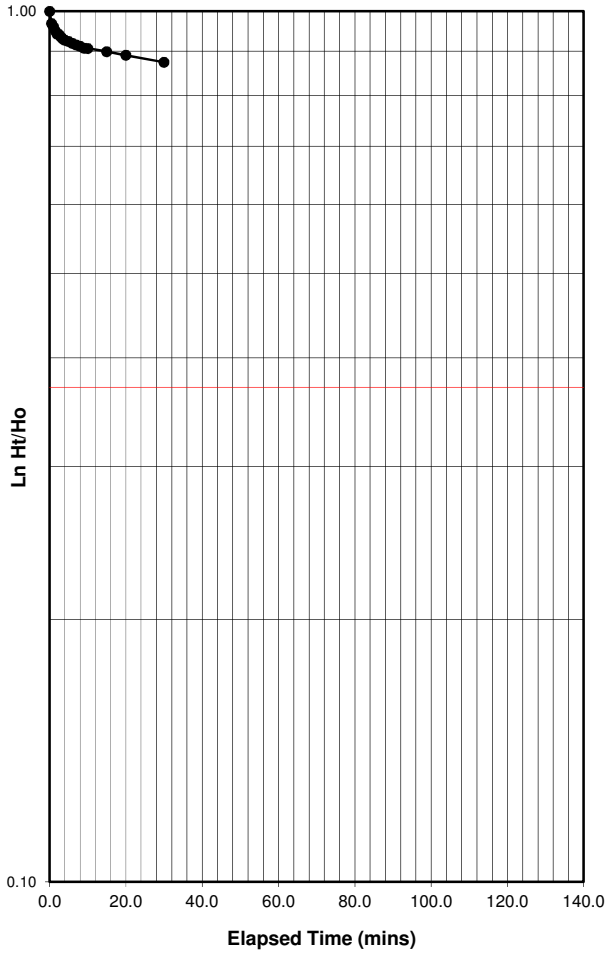
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	18/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	11.75	1.00	10.0	10.65	0.91			
0.5	11.38	0.97	15.0	10.56	0.90			
1.0	11.28	0.96	20.0	10.46	0.89			
1.5	11.17	0.95	30.0	10.27	0.87			
2.0	11.06	0.94						
2.5	11.05	0.94						
3.0	10.98	0.93						
3.5	10.92	0.93						
4.0	10.89	0.93						
5.0	10.85	0.92						
6.0	10.79	0.92						
7.0	10.75	0.91						
8.0	10.71	0.91						
9.0	10.66	0.91						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	3.40	m
Differential head at start (H_{o})	11.75	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	4.00	mins
Time (t2)	30.00	mins
Head at Time t1 (H1)	10.890	m
Head at Time t2 (H2)	10.270	m
Permeability (k) = A/(F[t2-	**1.91E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

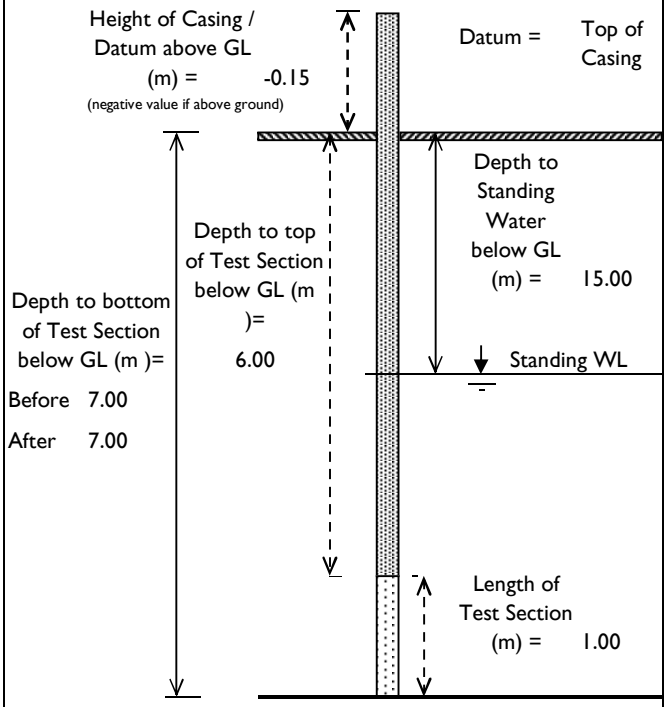
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	2.30		
1.0	3.33		
1.5	3.68		
2.0	3.85		
2.5	3.99		
3.0	4.18		
3.5	4.28		
4.0	4.45		
4.5	4.55		
5.0	4.59		
6.0	4.78		
7.0	4.82		
8.0	4.94		
9.0	5.07		
10.0	5.16		
15.0	5.29		
20.0	5.37		
30.0	5.46		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	13.15 m
Differential Head at end of Test (H_f)	9.69 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structural CHALK

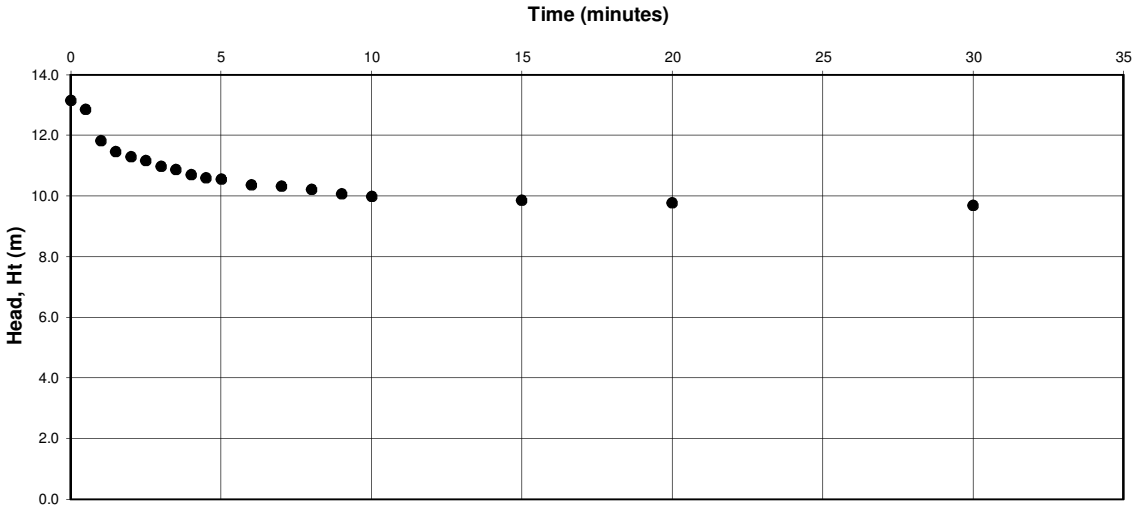
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	13.15	0.00
0.5	2.30	2.15	12.85	0.98
1.0	3.33	3.18	11.82	0.90
1.5	3.68	3.53	11.47	0.87
2.0	3.85	3.70	11.30	0.86
2.5	3.99	3.84	11.16	0.85
3.0	4.18	4.03	10.97	0.83
3.5	4.28	4.13	10.87	0.83
4.0	4.45	4.30	10.70	0.81
4.5	4.55	4.40	10.60	0.81
5.0	4.59	4.44	10.56	0.80
6.0	4.78	4.63	10.37	0.79
7.0	4.82	4.67	10.33	0.79
8.0	4.94	4.79	10.21	0.78
9.0	5.07	4.92	10.08	0.77
10.0	5.16	5.01	9.99	0.76
15.0	5.29	5.14	9.86	0.75
20.0	5.37	5.22	9.78	0.74
30.0	5.46	5.31	9.69	0.74

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

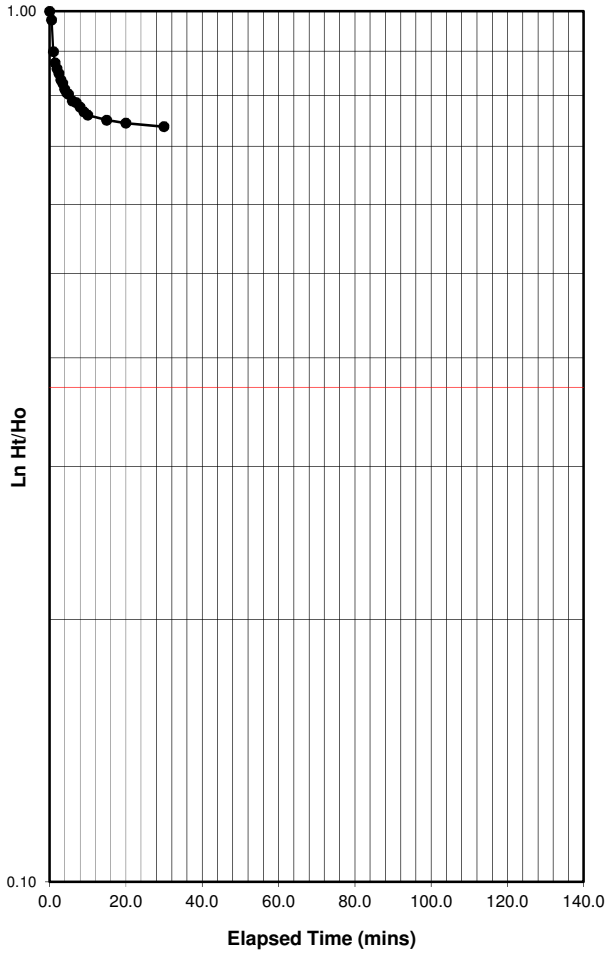
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	13.15	1.00	9.0	10.08	0.77			
0.5	12.85	0.98	10.0	9.99	0.76			
1.0	11.82	0.90	15.0	9.86	0.75			
1.5	11.47	0.87	20.0	9.78	0.74			
2.0	11.30	0.86	30.0	9.69	0.74			
2.5	11.16	0.85						
3.0	10.97	0.83						
3.5	10.87	0.83						
4.0	10.70	0.81						
4.5	10.60	0.81						
5.0	10.56	0.80						
6.0	10.37	0.79						
7.0	10.33	0.79						
8.0	10.21	0.78						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	13.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	1.50	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	11.470	m
Head at Time t2 (H2)	9.990	m
Permeability (k) = A/(F[t2-	**1.37E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

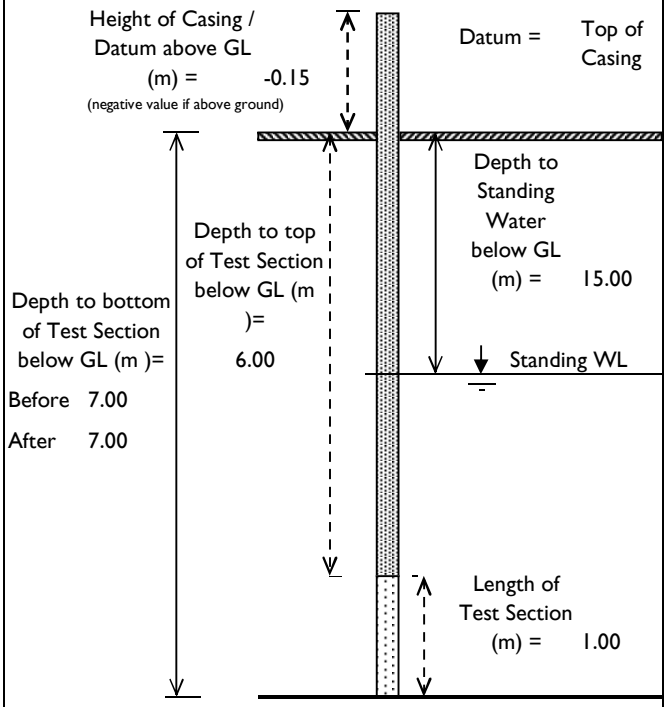
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	2.57		
1.0	3.39		
1.5	3.72		
2.0	3.80		
2.5	4.02		
3.0	4.07		
3.5	4.17		
4.0	4.32		
4.5	4.42		
5.0	4.49		
6.0	4.63		
7.0	4.74		
8.0	4.87		
9.0	4.99		
10.0	5.05		
15.0	5.37		
20.0	5.40		
30.0	5.58		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	13.15 m
Differential Head at end of Test (H_f)	9.57 m
Time Elapsed at end of test (t_f)	30.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

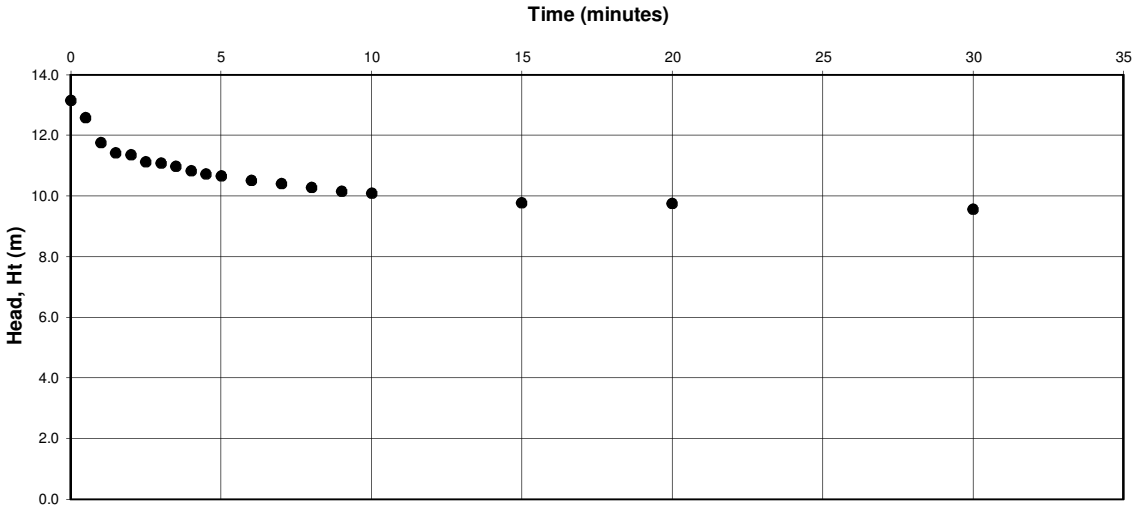
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	13.15	0.00
0.5	2.57	2.42	12.58	0.96
1.0	3.39	3.24	11.76	0.89
1.5	3.72	3.57	11.43	0.87
2.0	3.80	3.65	11.35	0.86
2.5	4.02	3.87	11.13	0.85
3.0	4.07	3.92	11.08	0.84
3.5	4.17	4.02	10.98	0.83
4.0	4.32	4.17	10.83	0.82
4.5	4.42	4.27	10.73	0.82
5.0	4.49	4.34	10.66	0.81
6.0	4.63	4.48	10.52	0.80
7.0	4.74	4.59	10.41	0.79
8.0	4.87	4.72	10.28	0.78
9.0	4.99	4.84	10.16	0.77
10.0	5.05	4.90	10.10	0.77
15.0	5.37	5.22	9.78	0.74
20.0	5.40	5.25	9.75	0.74
30.0	5.58	5.43	9.57	0.73

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

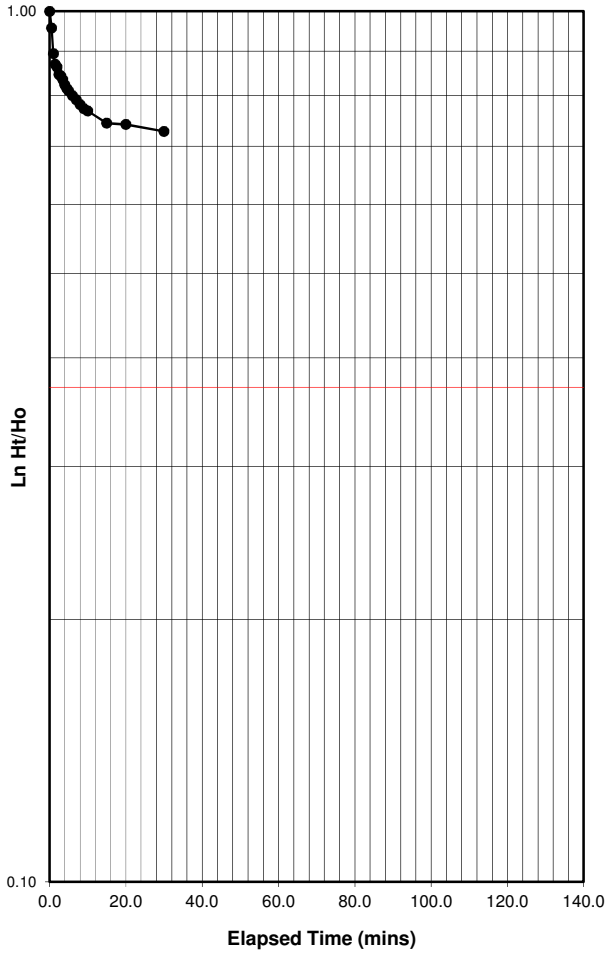
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	13.15	1.00	9.0	10.16	0.77			
0.5	12.58	0.96	10.0	10.10	0.77			
1.0	11.76	0.89	15.0	9.78	0.74			
1.5	11.43	0.87	20.0	9.75	0.74			
2.0	11.35	0.86	30.0	9.57	0.73			
2.5	11.13	0.85						
3.0	11.08	0.84						
3.5	10.98	0.83						
4.0	10.83	0.82						
4.5	10.73	0.82						
5.0	10.66	0.81						
6.0	10.52	0.80						
7.0	10.41	0.79						
8.0	10.28	0.78						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	13.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.230	
Time (t1)	1.50	mins
Time (t2)	15.00	mins
Head at Time t1 (H1)	11.430	m
Head at Time t2 (H2)	9.780	m
Permeability (k) = A/(F[t2-	**9.76E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

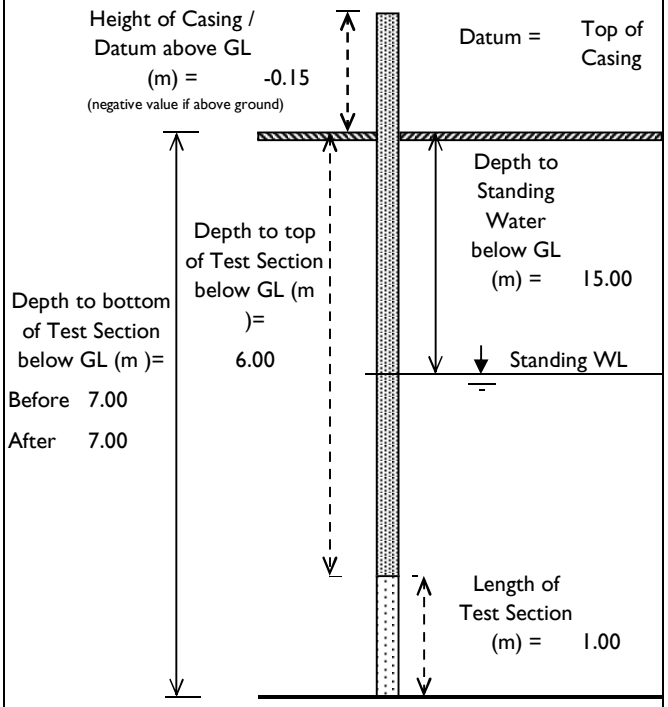
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Rotary Coring
Co-ordinates (m)	E 467129.6
	N 113695.4
Level (m OD)	90.27

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.00		
0.5	3.10		
1.0	3.56		
1.5	3.86		
2.0	4.04		
2.5	4.28		
3.0	4.43		
3.5	4.55		
4.0	4.71		
4.5	4.82		
5.0	4.91		
6.0	5.10		
7.0	5.16		
8.0	5.27		
9.0	5.37		
10.0	5.42		
15.0	5.57		
20.0	5.73		
30.0	5.96		
40.0	6.19		
50.0	6.26		



Depth to Standing Water Level below Datum	15.15 m
Depth to Induced Water Level below Datum	2.00 m
Differential head at start of Test (H_o)	13.15 m
Differential Head at end of Test (H_f)	8.96 m
Time Elapsed at end of test (t_f)	50.0 mins

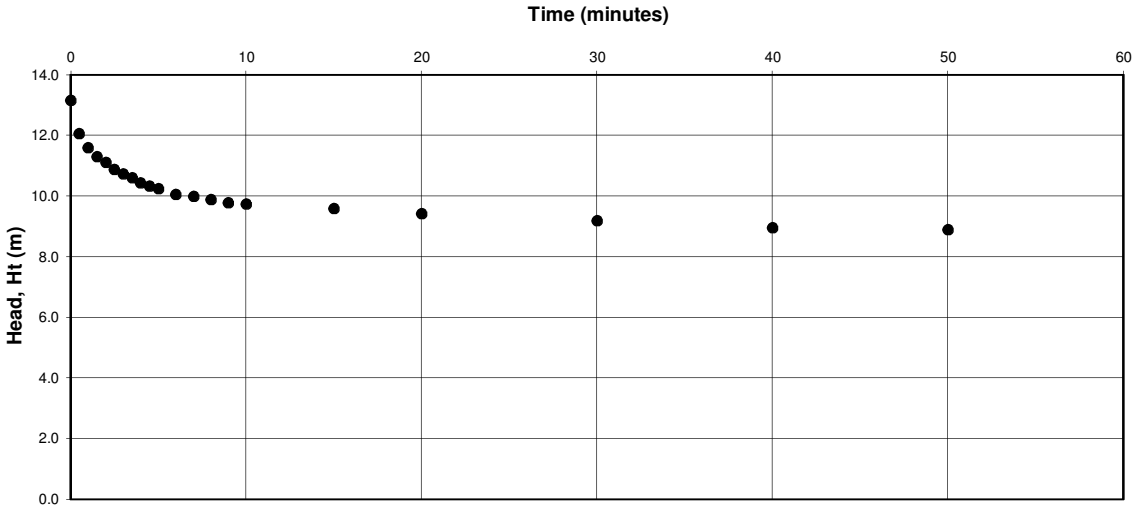
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.00	1.85	13.15	0.00	50.0	6.26	6.11	8.89	0.68
0.5	3.10	2.95	12.05	0.92					
1.0	3.56	3.41	11.59	0.88					
1.5	3.86	3.71	11.29	0.86					
2.0	4.04	3.89	11.11	0.84					
2.5	4.28	4.13	10.87	0.83					
3.0	4.43	4.28	10.72	0.82					
3.5	4.55	4.40	10.60	0.81					
4.0	4.71	4.56	10.44	0.79					
4.5	4.82	4.67	10.33	0.79					
5.0	4.91	4.76	10.24	0.78					
6.0	5.10	4.95	10.05	0.76					
7.0	5.16	5.01	9.99	0.76					
8.0	5.27	5.12	9.88	0.75					
9.0	5.37	5.22	9.78	0.74					
10.0	5.42	5.27	9.73	0.74					
15.0	5.57	5.42	9.58	0.73					
20.0	5.73	5.58	9.42	0.72					
30.0	5.96	5.81	9.19	0.70					
40.0	6.19	6.04	8.96	0.68					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

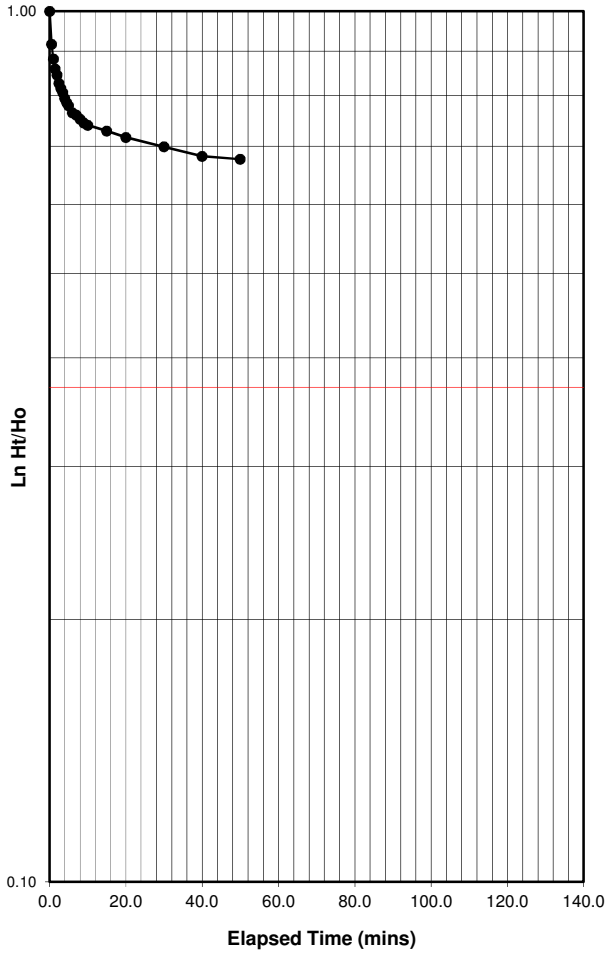
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH41
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	13.15	1.00	9.0	9.78	0.74			
0.5	12.05	0.92	10.0	9.73	0.74			
1.0	11.59	0.88	15.0	9.58	0.73			
1.5	11.29	0.86	20.0	9.42	0.72			
2.0	11.11	0.84	30.0	9.19	0.70			
2.5	10.87	0.83	40.0	8.96	0.68			
3.0	10.72	0.82	50.0	8.89	0.68			
3.5	10.60	0.81						
4.0	10.44	0.79						
4.5	10.33	0.79						
5.0	10.24	0.78						
6.0	10.05	0.76						
7.0	9.99	0.76						
8.0	9.88	0.75						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.15	m
Depth to Induced Water Level	2.00	m
Differential head at start (H_{o})	13.15	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.00	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.233	
Time (t1)	5.00	mins
Time (t2)	50.00	mins
Head at Time t1 (H1)	10.240	m
Head at Time t2 (H2)	8.890	m
Permeability (k) = A/(F[t2-	**2.65E-07**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

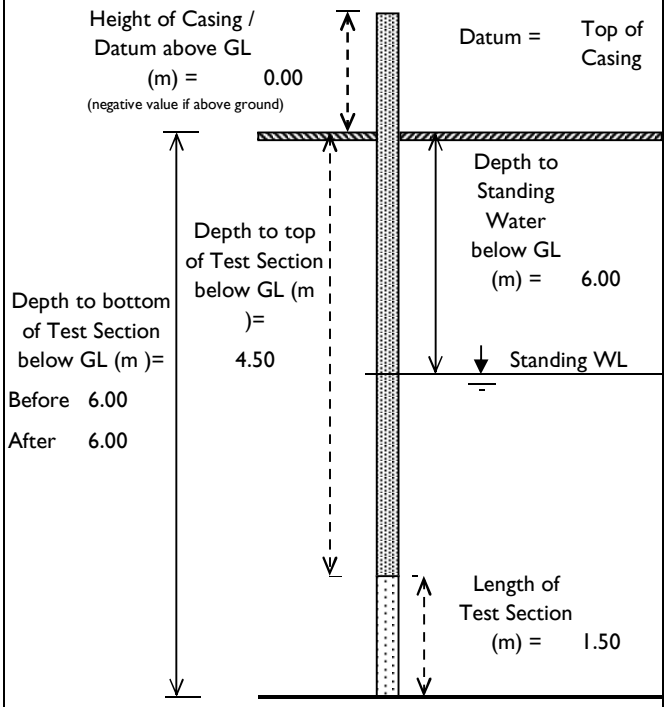
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.37		
0.3	2.64		
0.5	2.80		
0.8	2.93		
1.0	3.10		
1.3	3.25		
1.5	3.40		
1.8	3.52		
2.0	3.62		
2.3	3.70		
2.5	3.79		
2.8	3.87		
3.0	3.93		



Depth to Standing Water Level below Datum	6.00 m
Depth to Induced Water Level below Datum	2.37 m
Differential head at start of Test (H_o)	3.63 m
Differential Head at end of Test (H_f)	1.92 m
Time Elapsed at end of test (t_f)	3.0 mins

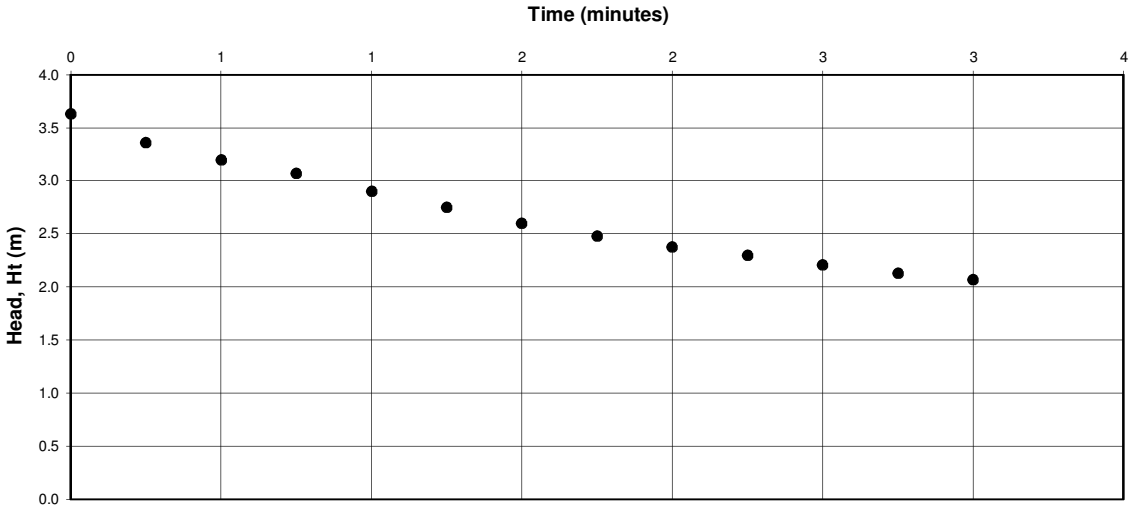
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.37	2.37	3.63	0.00					
0.3	2.64	2.64	3.36	0.93					
0.5	2.80	2.80	3.20	0.88					
0.8	2.93	2.93	3.07	0.85					
1.0	3.10	3.10	2.90	0.80					
1.3	3.25	3.25	2.75	0.76					
1.5	3.40	3.40	2.60	0.72					
1.8	3.52	3.52	2.48	0.68					
2.0	3.62	3.62	2.38	0.66					
2.3	3.70	3.70	2.30	0.63					
2.5	3.79	3.79	2.21	0.61					
2.8	3.87	3.87	2.13	0.59					
3.0	3.93	3.93	2.07	0.57					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

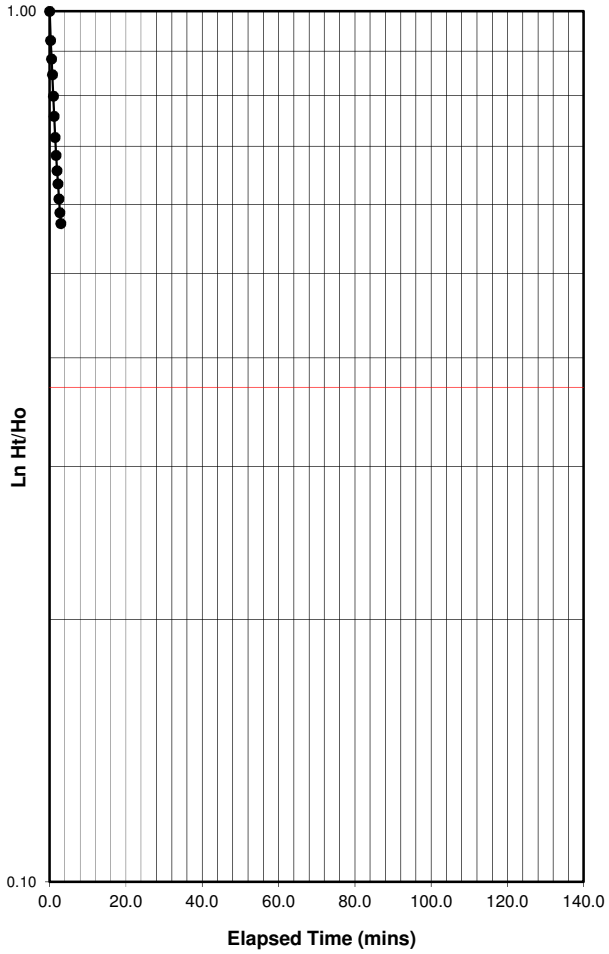
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	3.63	1.00						
0.3	3.36	0.93						
0.5	3.20	0.88						
0.8	3.07	0.85						
1.0	2.90	0.80						
1.3	2.75	0.76						
1.5	2.60	0.72						
1.8	2.48	0.68						
2.0	2.38	0.66						
2.3	2.30	0.63						
2.5	2.21	0.61						
2.8	2.13	0.59						
3.0	2.07	0.57						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	6.00	m
Depth to Induced Water Level	2.37	m
Differential head at start (H_{o})	3.63	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	0.00	mins
Time (t2)	3.00	mins
Head at Time t1 (H1)	3.630	m
Head at Time t2 (H2)	2.070	m
Permeability (k) = A/(F[t2-	**1.21E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

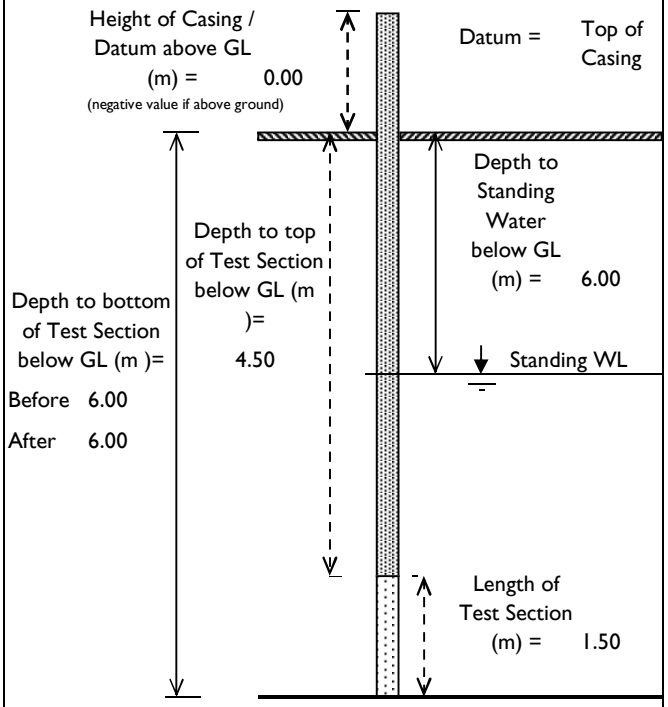
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.25		
0.3	2.72		
0.5	2.95		
0.8	3.10		
1.0	3.25		
1.3	3.38		
1.5	3.47		
1.8	3.65		
2.0	3.77		
2.3	3.80		



Depth to Standing Water Level below Datum	6.00 m
Depth to Induced Water Level below Datum	2.25 m
Differential head at start of Test (H_o)	3.75 m
Differential Head at end of Test (H_f)	11.20 m
Time Elapsed at end of test (t_f)	2.3 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

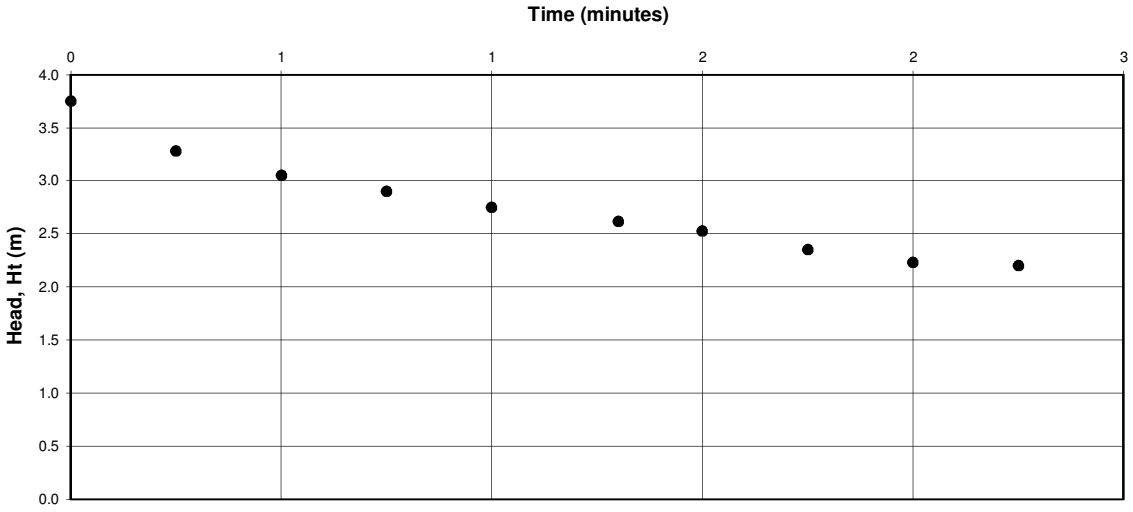
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.25	2.25	3.75	0.00
0.3	2.72	2.72	3.28	0.87
0.5	2.95	2.95	3.05	0.81
0.8	3.10	3.10	2.90	0.77
1.0	3.25	3.25	2.75	0.73
1.3	3.38	3.38	2.62	0.70
1.5	3.47	3.47	2.53	0.67
1.8	3.65	3.65	2.35	0.63
2.0	3.77	3.77	2.23	0.59
2.3	3.80	3.80	2.20	0.59

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

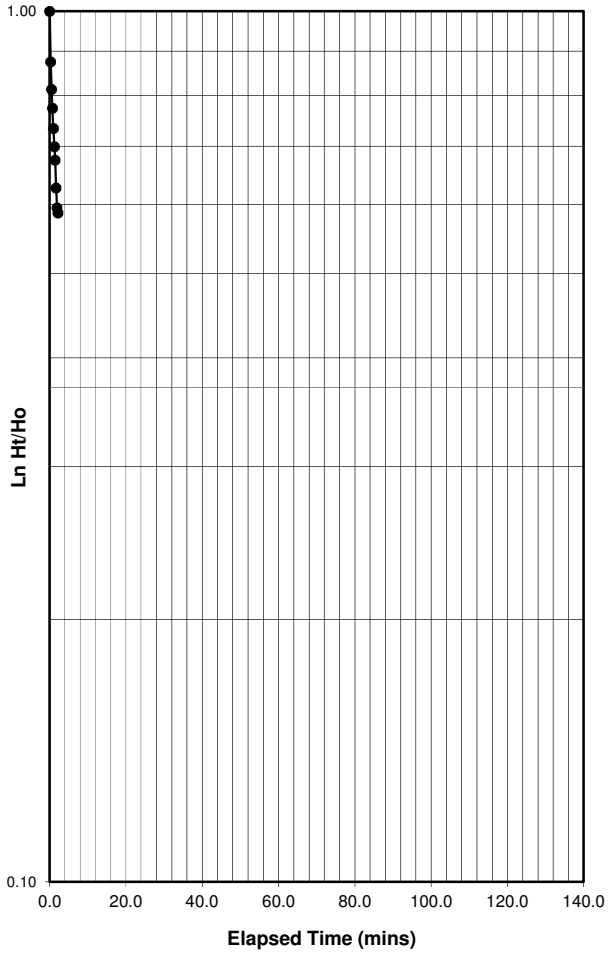
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	3.75	1.00						
0.3	3.28	0.87						
0.5	3.05	0.81						
0.8	2.90	0.77						
1.0	2.75	0.73						
1.3	2.62	0.70						
1.5	2.53	0.67						
1.8	2.35	0.63						
2.0	2.23	0.59						
2.3	2.20	0.59						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	6.00	m
Depth to Induced Water Level	2.25	m
Differential head at start (H_{o})	3.75	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	0.50	mins
Time (t2)	2.00	mins
Head at Time t1 (H1)	3.050	m
Head at Time t2 (H2)	2.230	m
Permeability (k) = A/(F[t2-	**1.34E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

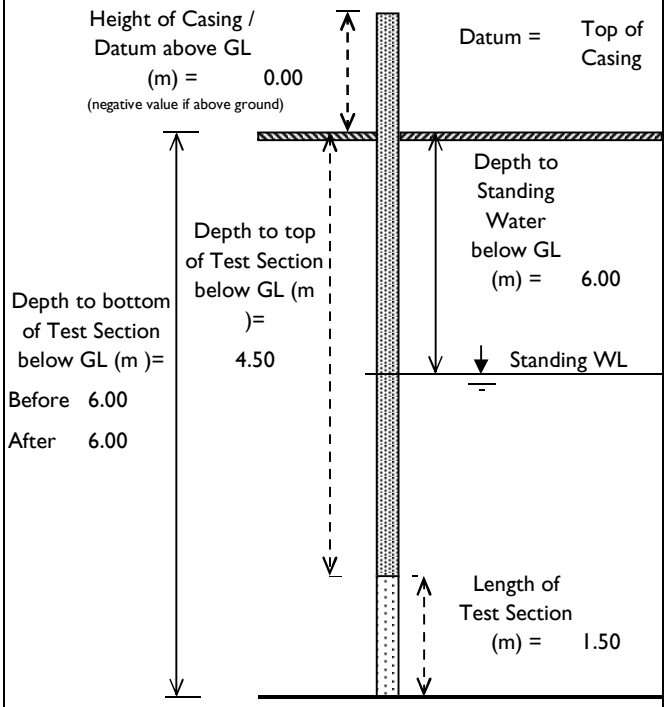
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.35		
0.3	2.77		
0.5	2.92		
0.8	3.12		
1.0	3.25		
1.3	3.38		
1.5	3.51		
1.8	3.61		
2.0	3.67		
2.5	3.88		
3.0	3.99		
3.5	4.13		
4.0	4.26		
4.5	4.38		
5.0	4.52		
6.0	4.68		
7.0	4.97		
8.0	5.14		
9.0	5.23		
10.0	5.42		
15.0	5.73		
20.0	5.73		
25.0	5.73		
30.0	5.73		



Depth to Standing Water Level below Datum	6.00 m
Depth to Induced Water Level below Datum	2.35 m
Differential head at start of Test (H_o)	3.65 m
Differential Head at end of Test (H_f)	9.27 m
Time Elapsed at end of test (t_f)	30.0 mins

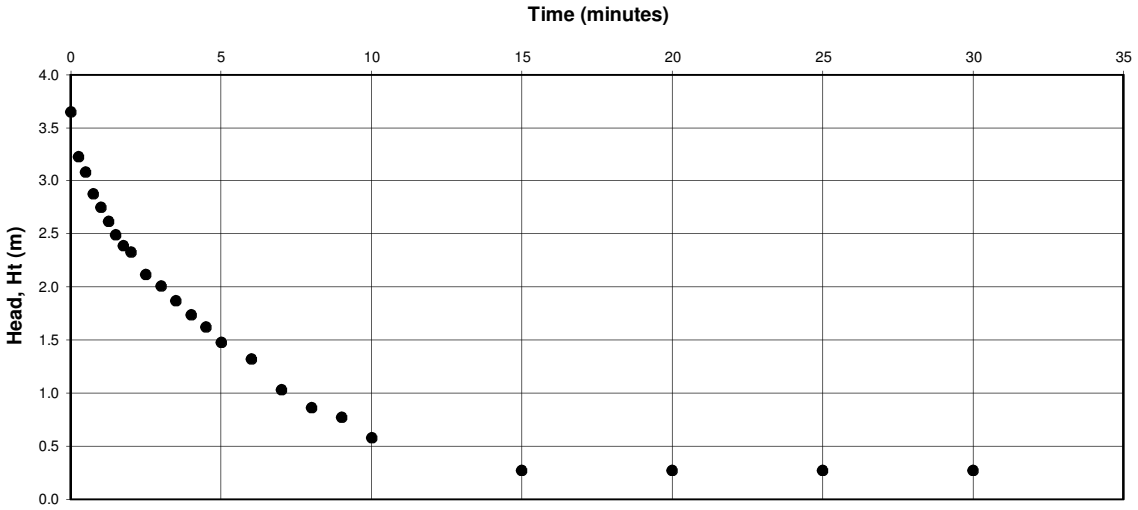
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.35	2.35	3.65	0.00	15.0	5.73	5.73	0.27	0.07
0.3	2.77	2.77	3.23	0.88	20.0	5.73	5.73	0.27	0.07
0.5	2.92	2.92	3.08	0.84	25.0	5.73	5.73	0.27	0.07
0.8	3.12	3.12	2.88	0.79	30.0	5.73	5.73	0.27	0.07
1.0	3.25	3.25	2.75	0.75					
1.3	3.38	3.38	2.62	0.72					
1.5	3.51	3.51	2.49	0.68					
1.8	3.61	3.61	2.39	0.65					
2.0	3.67	3.67	2.33	0.64					
2.5	3.88	3.88	2.12	0.58					
3.0	3.99	3.99	2.01	0.55					
3.5	4.13	4.13	1.87	0.51					
4.0	4.26	4.26	1.74	0.48					
4.5	4.38	4.38	1.62	0.44					
5.0	4.52	4.52	1.48	0.41					
6.0	4.68	4.68	1.32	0.36					
7.0	4.97	4.97	1.03	0.28					
8.0	5.14	5.14	0.86	0.24					
9.0	5.23	5.23	0.77	0.21					
10.0	5.42	5.42	0.58	0.16					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

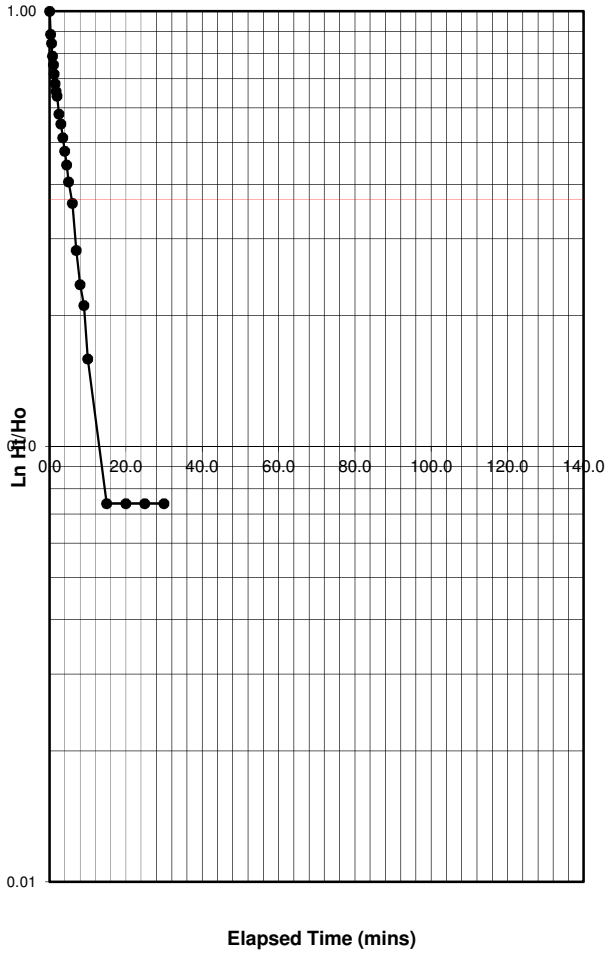
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	3.65	1.00	5.0	1.48	0.41			
0.3	3.23	0.88	6.0	1.32	0.36			
0.5	3.08	0.84	7.0	1.03	0.28			
0.8	2.88	0.79	8.0	0.86	0.24			
1.0	2.75	0.75	9.0	0.77	0.21			
1.3	2.62	0.72	10.0	0.58	0.16			
1.5	2.49	0.68	15.0	0.27	0.07			
1.8	2.39	0.65	20.0	0.27	0.07			
2.0	2.33	0.64	25.0	0.27	0.07			
2.5	2.12	0.58	30.0	0.27	0.07			
3.0	2.01	0.55						
3.5	1.87	0.51						
4.0	1.74	0.48						
4.5	1.62	0.44						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	6.00	m
Depth to Induced Water Level	2.35	m
Differential head at start ($H_{o)}$	3.65	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	2.50	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	2.120	m
Head at Time t2 (H2)	0.580	m
Permeability (k) = A/(F[t2-	**1.11E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

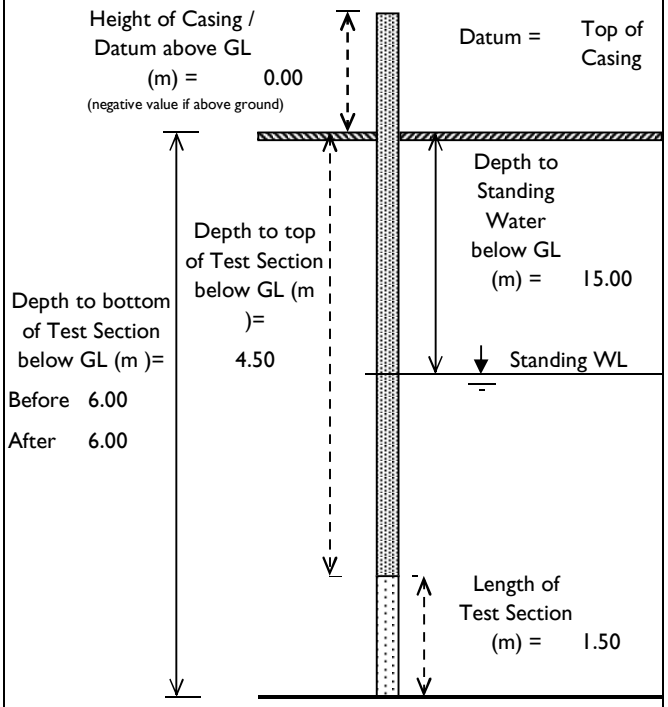
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.37		
0.3	2.64		
0.5	2.80		
0.8	2.93		
1.0	3.10		
1.3	3.25		
1.5	3.40		
1.8	3.52		
2.0	3.62		
2.3	3.70		
2.5	3.79		
2.8	3.87		
3.0	3.93		



Depth to Standing Water Level below Datum	15.00 m
Depth to Induced Water Level below Datum	2.37 m
Differential head at start of Test (H_o)	12.63 m
Differential Head at end of Test (H_f)	1.92 m
Time Elapsed at end of test (t_f)	3.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

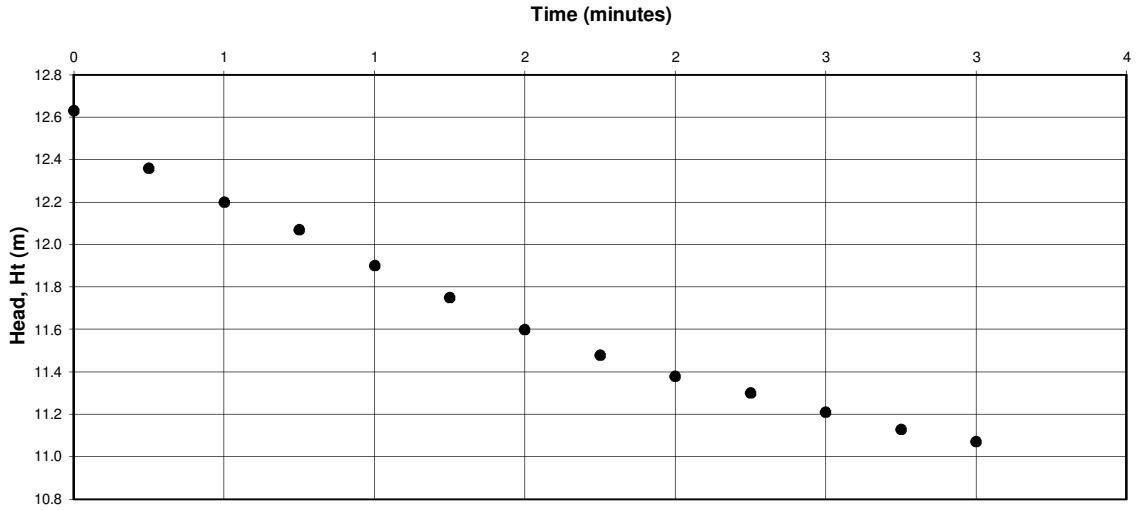
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.37	2.37	12.63	0.00
0.3	2.64	2.64	12.36	0.98
0.5	2.80	2.80	12.20	0.97
0.8	2.93	2.93	12.07	0.96
1.0	3.10	3.10	11.90	0.94
1.3	3.25	3.25	11.75	0.93
1.5	3.40	3.40	11.60	0.92
1.8	3.52	3.52	11.48	0.91
2.0	3.62	3.62	11.38	0.90
2.3	3.70	3.70	11.30	0.89
2.5	3.79	3.79	11.21	0.89
2.8	3.87	3.87	11.13	0.88
3.0	3.93	3.93	11.07	0.88

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

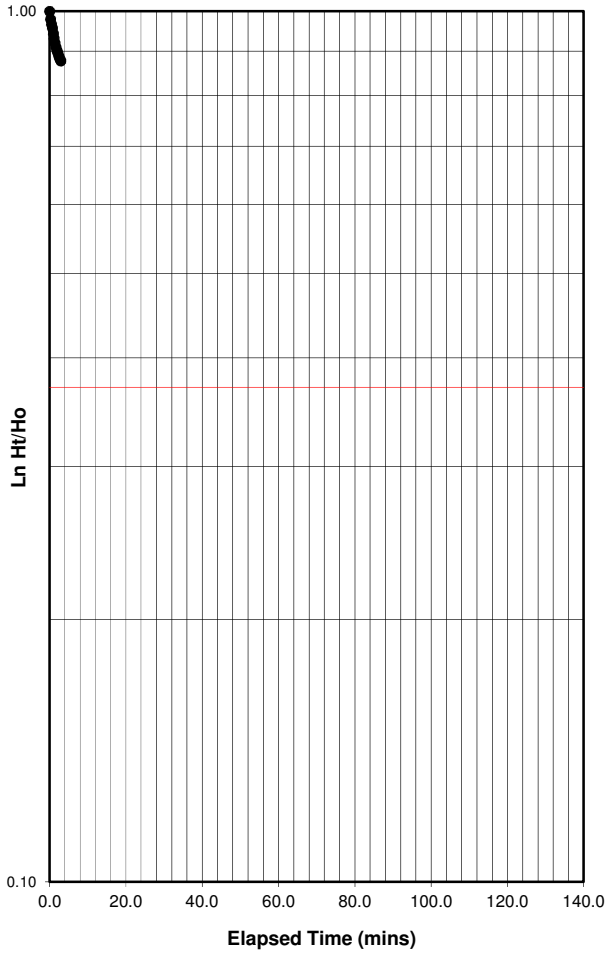
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	12.63	1.00						
0.3	12.36	0.98						
0.5	12.20	0.97						
0.8	12.07	0.96						
1.0	11.90	0.94						
1.3	11.75	0.93						
1.5	11.60	0.92						
1.8	11.48	0.91						
2.0	11.38	0.90						
2.3	11.30	0.89						
2.5	11.21	0.89						
2.8	11.13	0.88						
3.0	11.07	0.88						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.00	m
Depth to Induced Water Level	2.37	m
Differential head at start (H_{o})	12.63	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	1.50	mins
Time (t2)	3.00	mins
Head at Time t1 (H1)	11.600	m
Head at Time t2 (H2)	11.070	m
Permeability (k) = A/(F[t2-	**2.01E-06**	**m/sec**

Remarks and Additional Information

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

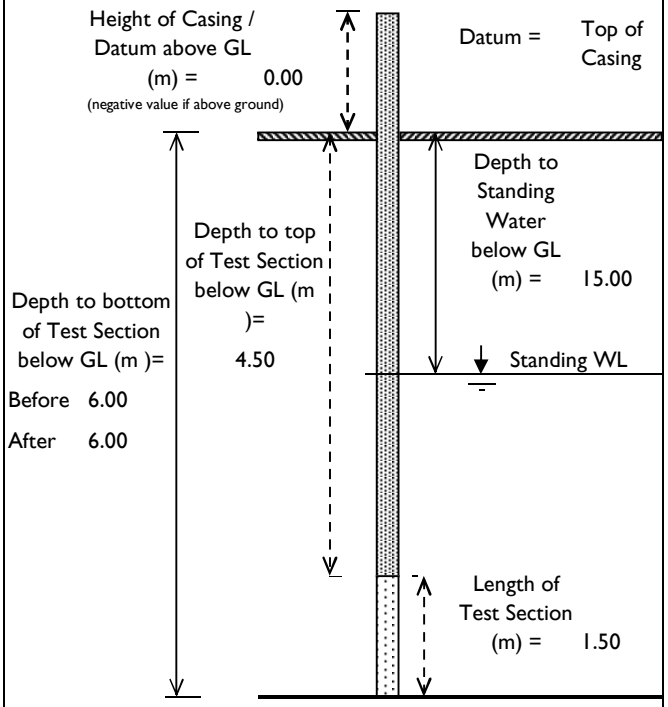
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.25		
0.3	2.72		
0.5	2.95		
0.8	3.10		
1.0	3.25		
1.3	3.38		
1.5	3.47		
1.8	3.65		
2.0	3.77		
2.3	3.80		



Depth to Standing Water Level below Datum	15.00 m
Depth to Induced Water Level below Datum	2.25 m
Differential head at start of Test (H_o)	12.75 m
Differential Head at end of Test (H_f)	11.20 m
Time Elapsed at end of test (t_f)	2.3 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

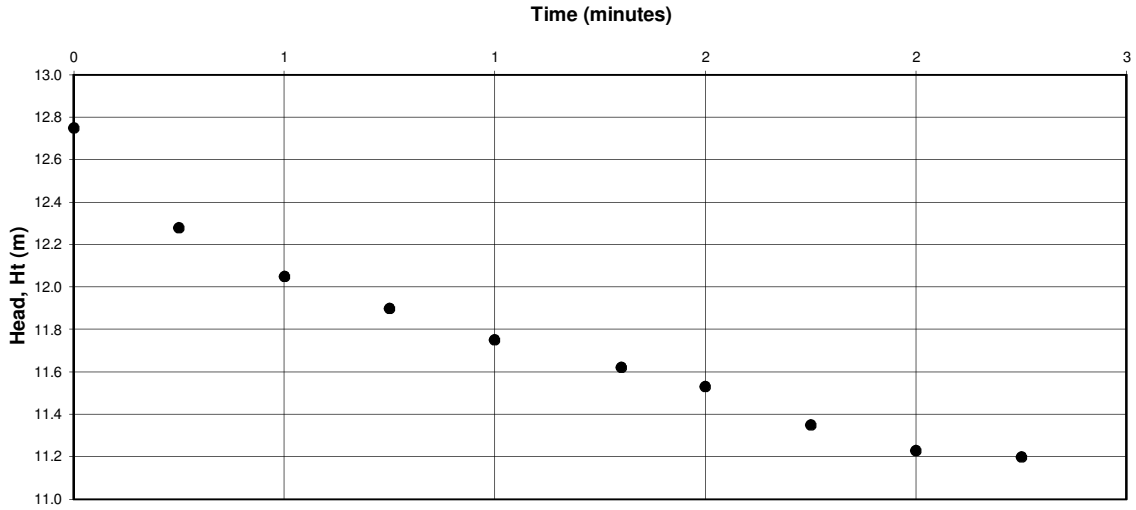
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.25	2.25	12.75	0.00
0.3	2.72	2.72	12.28	0.96
0.5	2.95	2.95	12.05	0.95
0.8	3.10	3.10	11.90	0.93
1.0	3.25	3.25	11.75	0.92
1.3	3.38	3.38	11.62	0.91
1.5	3.47	3.47	11.53	0.90
1.8	3.65	3.65	11.35	0.89
2.0	3.77	3.77	11.23	0.88
2.3	3.80	3.80	11.20	0.88

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

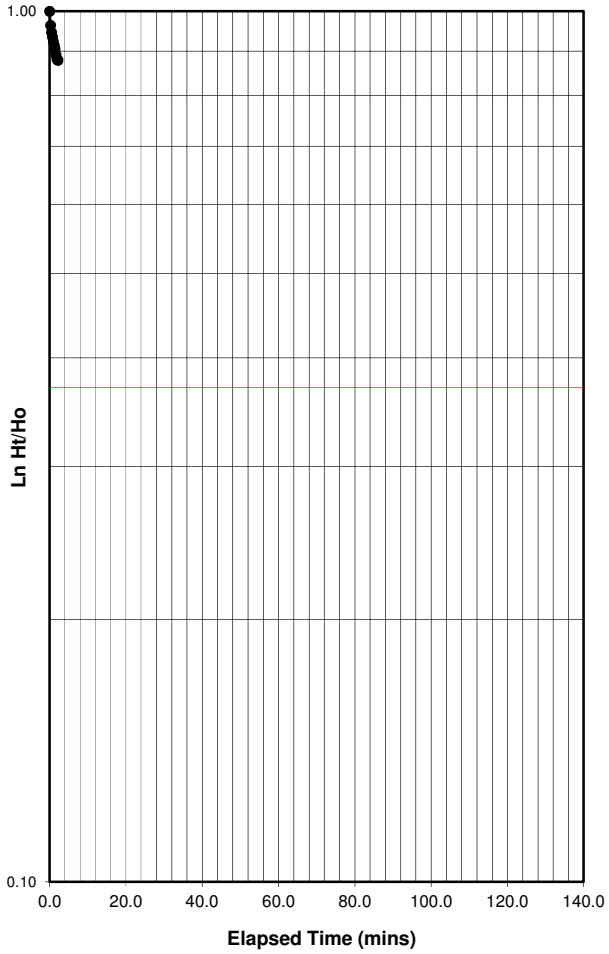
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	12.75	1.00						
0.3	12.28	0.96						
0.5	12.05	0.95						
0.8	11.90	0.93						
1.0	11.75	0.92						
1.3	11.62	0.91						
1.5	11.53	0.90						
1.8	11.35	0.89						
2.0	11.23	0.88						
2.3	11.20	0.88						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.00	m
Depth to Induced Water Level	2.25	m
Differential head at start (H_{o})	12.75	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	0.50	mins
Time (t2)	2.00	mins
Head at Time t1 (H1)	12.050	m
Head at Time t2 (H2)	11.230	m
Permeability (k) = A/(F[t2-	**3.03E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

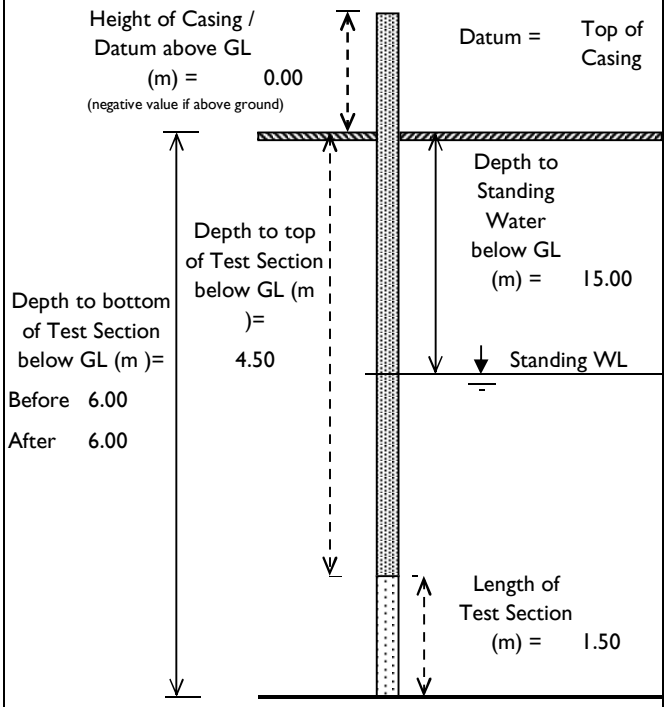
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467208.7
	N 113601.0
Level (m OD)	86.13

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	2.35		
0.3	2.77		
0.5	2.92		
0.8	3.12		
1.0	3.25		
1.3	3.38		
1.5	3.51		
1.8	3.61		
2.0	3.67		
2.5	3.88		
3.0	3.99		
3.5	4.13		
4.0	4.26		
4.5	4.38		
5.0	4.52		
6.0	4.68		
7.0	4.97		
8.0	5.14		
9.0	5.23		
10.0	5.42		
15.0	5.73		
20.0	5.73		
25.0	5.73		
30.0	5.73		



Depth to Standing Water Level below Datum	15.00 m
Depth to Induced Water Level below Datum	2.35 m
Differential head at start of Test (H_o)	12.65 m
Differential Head at end of Test (H_f)	9.27 m
Time Elapsed at end of test (t_f)	30.0 mins

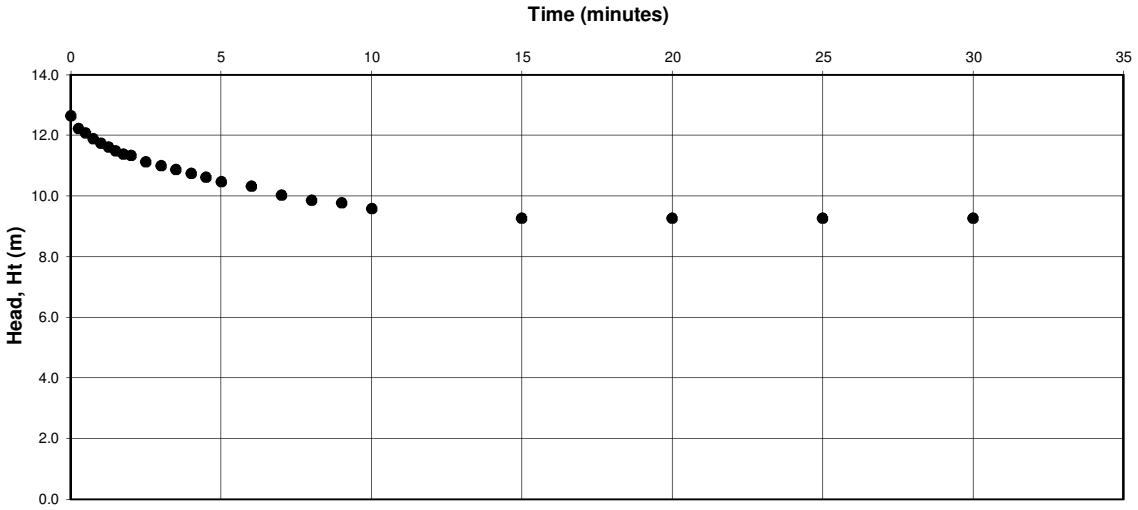
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Structureless CHALK

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	2.35	2.35	12.65	0.00	15.0	5.73	5.73	9.27	0.73
0.3	2.77	2.77	12.23	0.97	20.0	5.73	5.73	9.27	0.73
0.5	2.92	2.92	12.08	0.95	25.0	5.73	5.73	9.27	0.73
0.8	3.12	3.12	11.88	0.94	30.0	5.73	5.73	9.27	0.73
1.0	3.25	3.25	11.75	0.93					
1.3	3.38	3.38	11.62	0.92					
1.5	3.51	3.51	11.49	0.91					
1.8	3.61	3.61	11.39	0.90					
2.0	3.67	3.67	11.33	0.90					
2.5	3.88	3.88	11.12	0.88					
3.0	3.99	3.99	11.01	0.87					
3.5	4.13	4.13	10.87	0.86					
4.0	4.26	4.26	10.74	0.85					
4.5	4.38	4.38	10.62	0.84					
5.0	4.52	4.52	10.48	0.83					
6.0	4.68	4.68	10.32	0.82					
7.0	4.97	4.97	10.03	0.79					
8.0	5.14	5.14	9.86	0.78					
9.0	5.23	5.23	9.77	0.77					
10.0	5.42	5.42	9.58	0.76					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

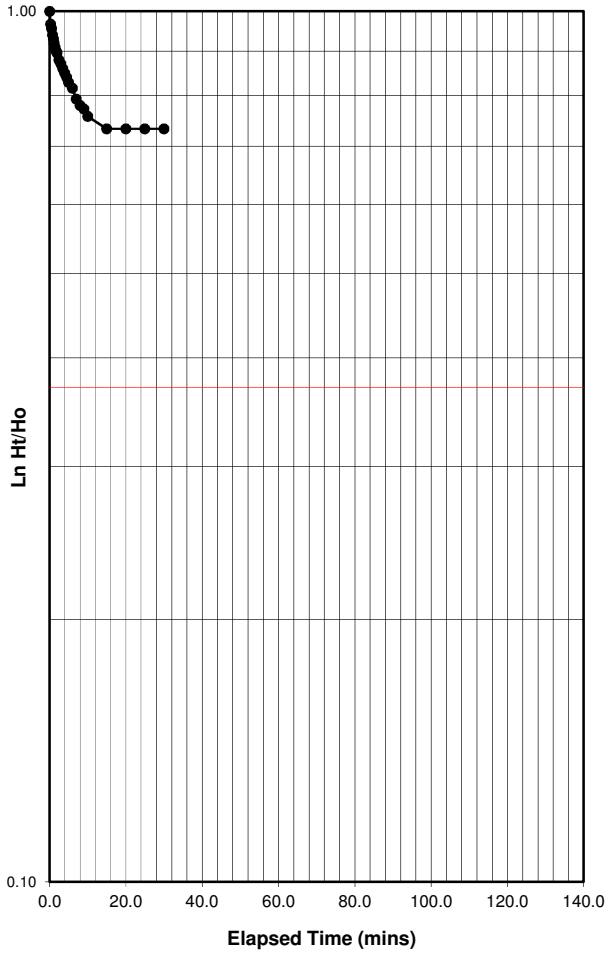
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH42
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	12.65	1.00	5.0	10.48	0.83			
0.3	12.23	0.97	6.0	10.32	0.82			
0.5	12.08	0.95	7.0	10.03	0.79			
0.8	11.88	0.94	8.0	9.86	0.78			
1.0	11.75	0.93	9.0	9.77	0.77			
1.3	11.62	0.92	10.0	9.58	0.76			
1.5	11.49	0.91	15.0	9.27	0.73			
1.8	11.39	0.90	20.0	9.27	0.73			
2.0	11.33	0.90	25.0	9.27	0.73			
2.5	11.12	0.88	30.0	9.27	0.73			
3.0	11.01	0.87						
3.5	10.87	0.86						
4.0	10.74	0.85						
4.5	10.62	0.84						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.00	m
Depth to Induced Water Level	2.35	m
Differential head at start (H_{o})	12.65	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	1.50	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	2.927	
Time (t1)	2.50	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	11.120	m
Head at Time t2 (H2)	9.580	m
Permeability (k) = A/(F[t2-	**1.28E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

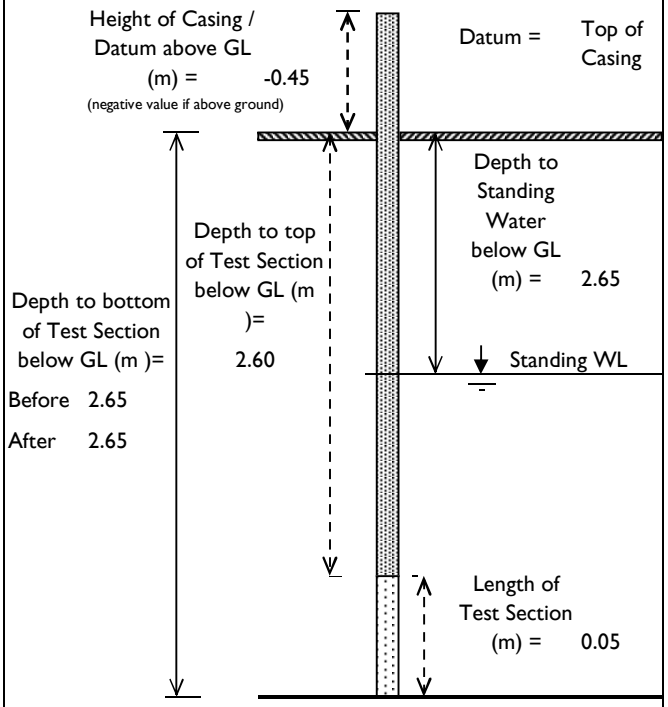
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.77		
0.5	1.23		
1.0	1.52		
1.5	1.62		
2.0	1.78		
2.5	1.90		
3.0	2.00		
3.5	2.10		
4.0	2.16		
4.5	2.23		
5.0	2.37		
6.0	2.43		
7.0	2.51		
8.0	2.57		
9.0	2.62		
14.0	2.73		



Depth to Standing Water Level below Datum	3.10 m
Depth to Induced Water Level below Datum	0.77 m
Differential head at start of Test (H_o)	2.33 m
Differential Head at end of Test (H_f)	12.72 m
Time Elapsed at end of test (t_f)	14.0 mins

Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

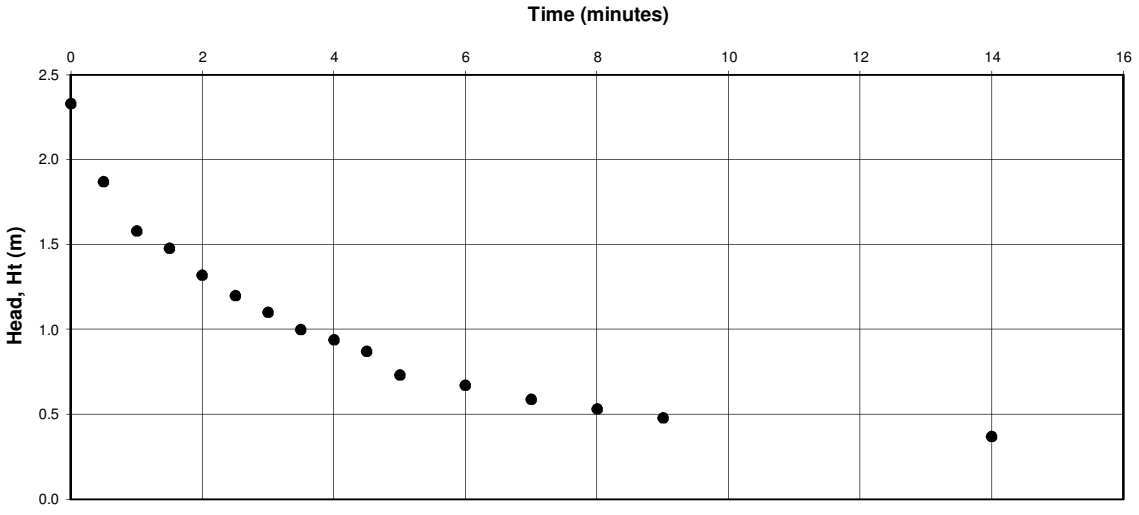
INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.77	0.32	2.33	0.00
0.5	1.23	0.78	1.87	0.80
1.0	1.52	1.07	1.58	0.68
1.5	1.62	1.17	1.48	0.64
2.0	1.78	1.33	1.32	0.57
2.5	1.90	1.45	1.20	0.52
3.0	2.00	1.55	1.10	0.47
3.5	2.10	1.65	1.00	0.43
4.0	2.16	1.71	0.94	0.40
4.5	2.23	1.78	0.87	0.37
5.0	2.37	1.92	0.73	0.31
6.0	2.43	1.98	0.67	0.29
7.0	2.51	2.06	0.59	0.25
8.0	2.57	2.12	0.53	0.23
9.0	2.62	2.17	0.48	0.21
14.0	2.73	2.28	0.37	0.16

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)



Remarks and Additional Information

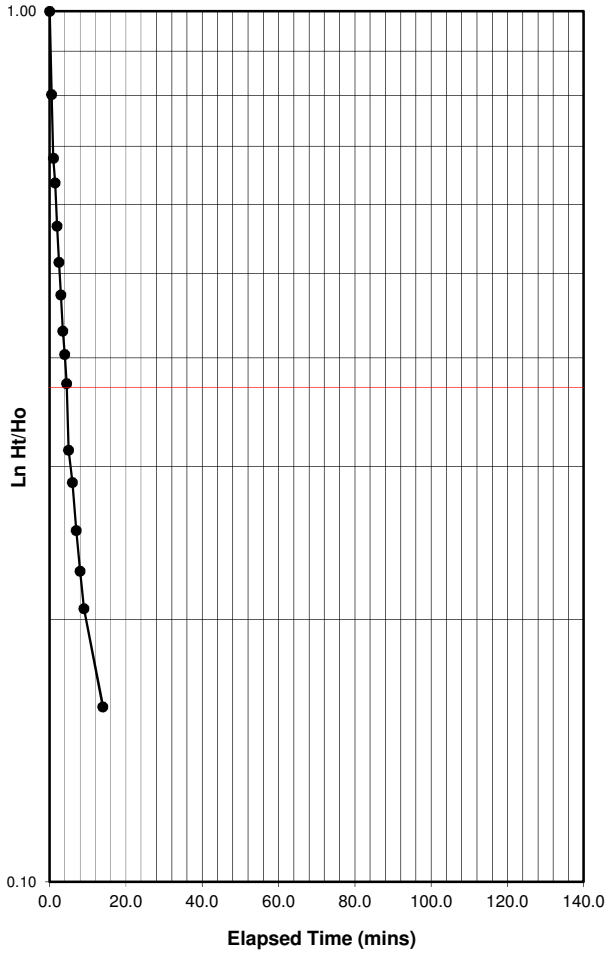
Results is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.33	1.00	9.0	0.48	0.21			
0.5	1.87	0.80	14.0	0.37	0.16			
1.0	1.58	0.68						
1.5	1.48	0.64						
2.0	1.32	0.57						
2.5	1.20	0.52						
3.0	1.10	0.47						
3.5	1.00	0.43						
4.0	0.94	0.40						
4.5	0.87	0.37						
5.0	0.73	0.31						
6.0	0.67	0.29						
7.0	0.59	0.25						
8.0	0.53	0.23						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	3.10	m
Depth to Induced Water Level	0.77	m
Differential head at start (H_{o})	2.33	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	1.00	mins
Time (t2)	8.00	mins
Head at Time t1 (H1)	1.580	m
Head at Time t2 (H2)	0.530	m
Permeability (k) = A/(F[t2-	**8.91E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

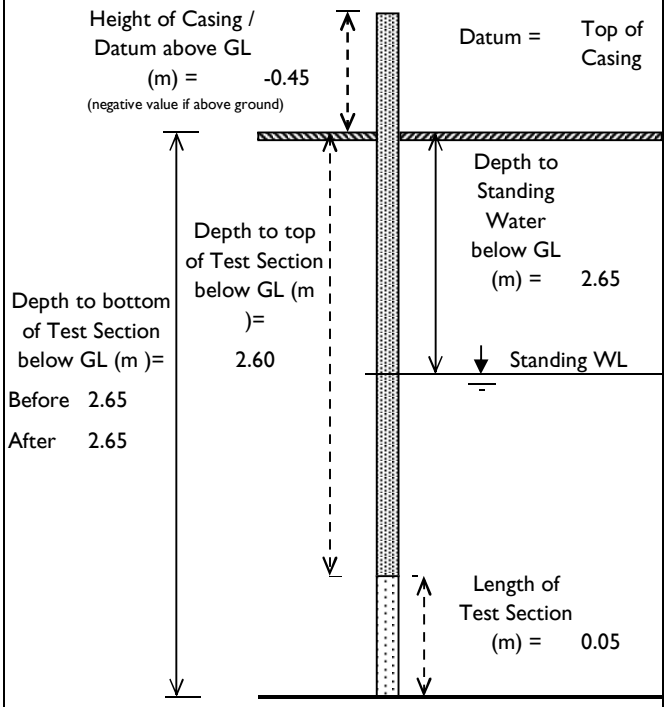
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.51		
0.5	0.67		
1.0	0.86		
1.5	1.00		
2.0	1.14		
2.5	1.26		
3.0	1.39		
3.5	1.50		
4.0	1.67		
4.5	1.72		
5.0	1.78		
6.0	1.92		
7.0	2.07		
8.0	2.19		
9.0	2.24		
10.0	2.34		
11.0	2.45		
12.0	2.50		
13.0	2.58		
14.0	2.59		
15.0	2.65		
16.0	2.70		



Depth to Standing Water Level below Datum	3.10 m
Depth to Induced Water Level below Datum	0.51 m
Differential head at start of Test (H_o)	2.59 m
Differential Head at end of Test (H_f)	12.75 m
Time Elapsed at end of test (t_f)	16.0 mins

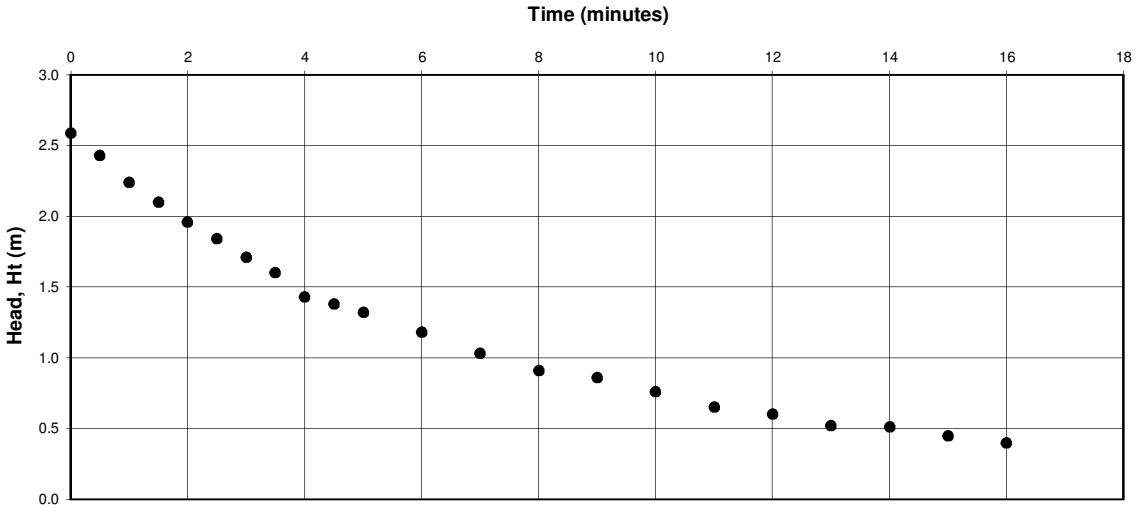
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.51	0.06	2.59	0.00	15.0	2.65	2.20	0.45	0.17
0.5	0.67	0.22	2.43	0.94	16.0	2.70	2.25	0.40	0.15
1.0	0.86	0.41	2.24	0.86					
1.5	1.00	0.55	2.10	0.81					
2.0	1.14	0.69	1.96	0.76					
2.5	1.26	0.81	1.84	0.71					
3.0	1.39	0.94	1.71	0.66					
3.5	1.50	1.05	1.60	0.62					
4.0	1.67	1.22	1.43	0.55					
4.5	1.72	1.27	1.38	0.53					
5.0	1.78	1.33	1.32	0.51					
6.0	1.92	1.47	1.18	0.46					
7.0	2.07	1.62	1.03	0.40					
8.0	2.19	1.74	0.91	0.35					
9.0	2.24	1.79	0.86	0.33					
10.0	2.34	1.89	0.76	0.29					
11.0	2.45	2.00	0.65	0.25					
12.0	2.50	2.05	0.60	0.23					
13.0	2.58	2.13	0.52	0.20					
14.0	2.59	2.14	0.51	0.20					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

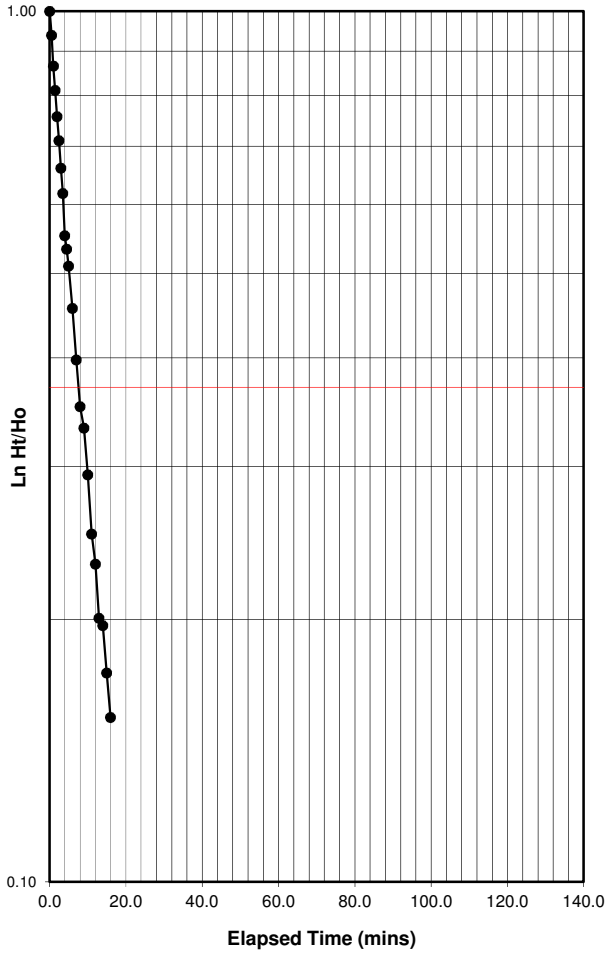
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.59	1.00	9.0	0.86	0.33			
0.5	2.43	0.94	10.0	0.76	0.29			
1.0	2.24	0.86	11.0	0.65	0.25			
1.5	2.10	0.81	12.0	0.60	0.23			
2.0	1.96	0.76	13.0	0.52	0.20			
2.5	1.84	0.71	14.0	0.51	0.20			
3.0	1.71	0.66	15.0	0.45	0.17			
3.5	1.60	0.62	16.0	0.40	0.15			
4.0	1.43	0.55						
4.5	1.38	0.53						
5.0	1.32	0.51						
6.0	1.18	0.46						
7.0	1.03	0.40						
8.0	0.91	0.35						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	3.10	m
Depth to Induced Water Level	0.51	m
Differential head at start (H_{o})	2.59	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	0.00	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	2.590	m
Head at Time t2 (H2)	0.760	m
Permeability (k) = A/(F[t2-	**7.00E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

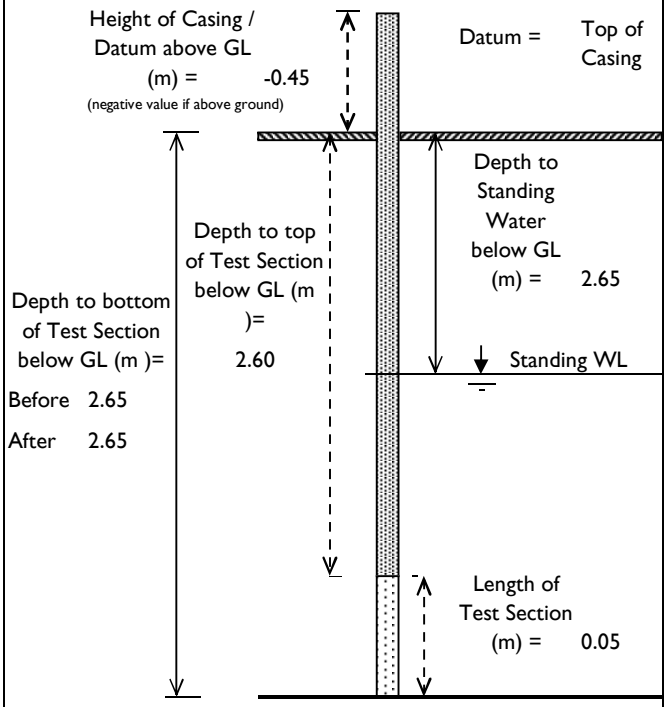
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.60		
0.5	0.77		
1.0	0.83		
1.5	0.97		
2.0	1.09		
2.5	1.21		
3.0	1.34		
3.5	1.44		
4.0	1.61		
4.5	1.70		
5.0	1.80		
6.0	1.90		
7.0	2.03		
8.0	2.21		
9.0	2.26		
10.0	2.35		
11.0	2.47		
12.0	2.54		
13.0	2.59		
14.0	2.63		
15.0	2.68		
16.0	2.70		



Depth to Standing Water Level below Datum	3.10 m
Depth to Induced Water Level below Datum	0.60 m
Differential head at start of Test (H_o)	2.50 m
Differential Head at end of Test (H_f)	12.75 m
Time Elapsed at end of test (t_f)	16.0 mins

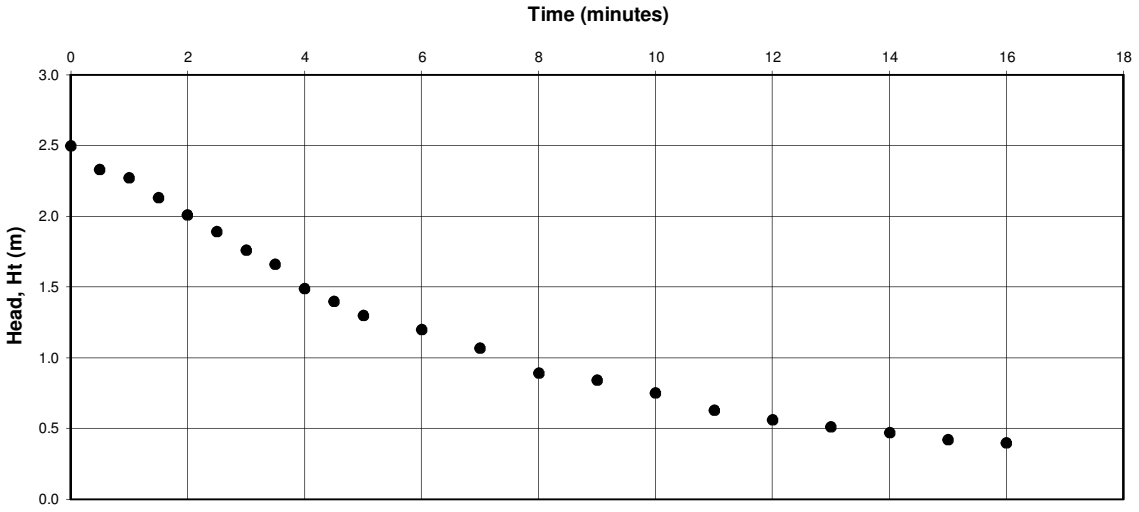
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.60	0.15	2.50	0.00	15.0	2.68	2.23	0.42	0.17
0.5	0.77	0.32	2.33	0.93	16.0	2.70	2.25	0.40	0.16
1.0	0.83	0.38	2.27	0.91					
1.5	0.97	0.52	2.13	0.85					
2.0	1.09	0.64	2.01	0.80					
2.5	1.21	0.76	1.89	0.76					
3.0	1.34	0.89	1.76	0.70					
3.5	1.44	0.99	1.66	0.66					
4.0	1.61	1.16	1.49	0.60					
4.5	1.70	1.25	1.40	0.56					
5.0	1.80	1.35	1.30	0.52					
6.0	1.90	1.45	1.20	0.48					
7.0	2.03	1.58	1.07	0.43					
8.0	2.21	1.76	0.89	0.36					
9.0	2.26	1.81	0.84	0.34					
10.0	2.35	1.90	0.75	0.30					
11.0	2.47	2.02	0.63	0.25					
12.0	2.54	2.09	0.56	0.22					
13.0	2.59	2.14	0.51	0.20					
14.0	2.63	2.18	0.47	0.19					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

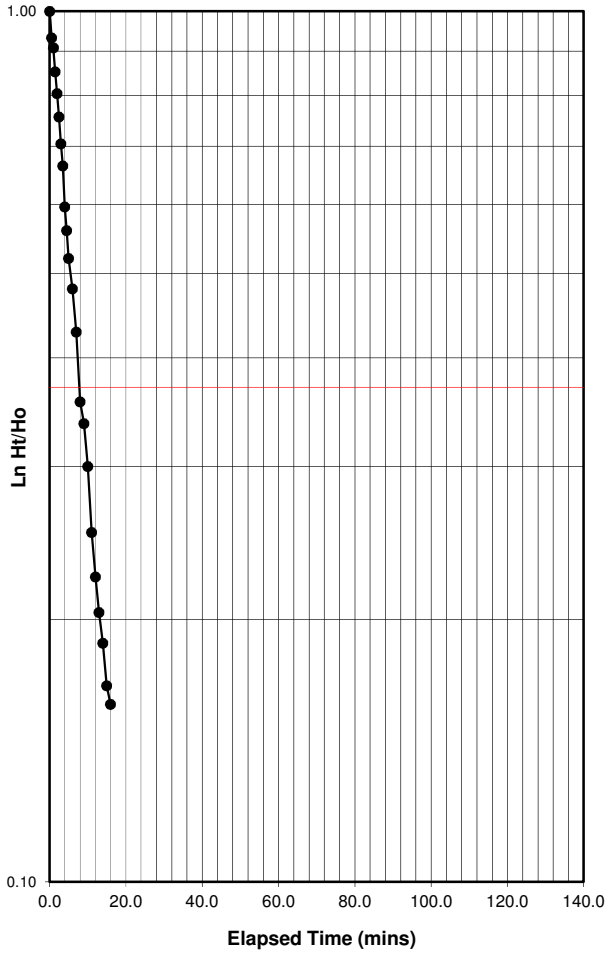
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	2.50	1.00	9.0	0.84	0.34			
0.5	2.33	0.93	10.0	0.75	0.30			
1.0	2.27	0.91	11.0	0.63	0.25			
1.5	2.13	0.85	12.0	0.56	0.22			
2.0	2.01	0.80	13.0	0.51	0.20			
2.5	1.89	0.76	14.0	0.47	0.19			
3.0	1.76	0.70	15.0	0.42	0.17			
3.5	1.66	0.66	16.0	0.40	0.16			
4.0	1.49	0.60						
4.5	1.40	0.56						
5.0	1.30	0.52						
6.0	1.20	0.48						
7.0	1.07	0.43						
8.0	0.89	0.36						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	3.10	m
Depth to Induced Water Level	0.60	m
Differential head at start (H_{o})	2.50	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	0.00	mins
Time (t2)	8.00	mins
Head at Time t1 (H1)	2.500	m
Head at Time t2 (H2)	0.890	m
Permeability (k) = A/(F[t2-	**7.37E-05**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at base of hole.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

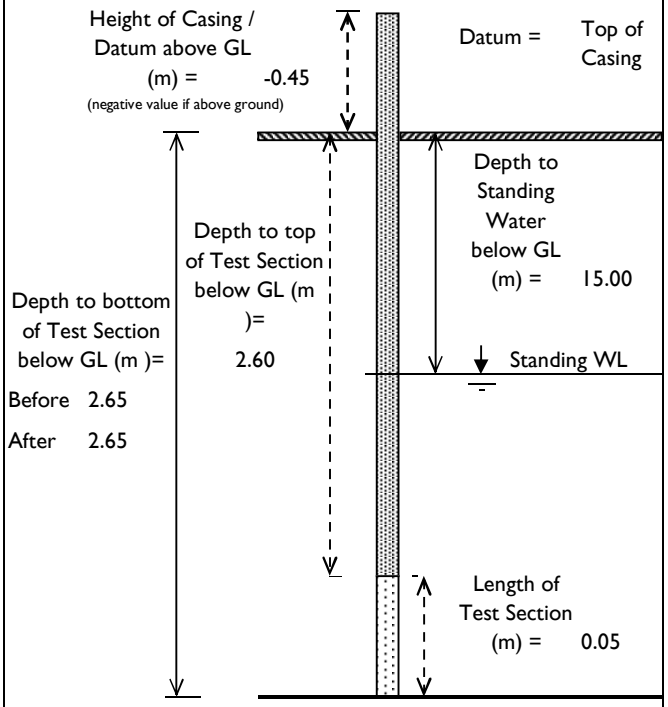
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.77		
0.5	1.23		
1.0	1.52		
1.5	1.62		
2.0	1.78		
2.5	1.90		
3.0	2.00		
3.5	2.10		
4.0	2.16		
4.5	2.23		
5.0	2.37		
6.0	2.43		
7.0	2.51		
8.0	2.57		
9.0	2.62		
14.0	2.73		



Depth to Standing Water Level below Datum	15.45 m
Depth to Induced Water Level below Datum	0.77 m
Differential head at start of Test (H_o)	14.68 m
Differential Head at end of Test (H_f)	12.72 m
Time Elapsed at end of test (t_f)	14.0 mins

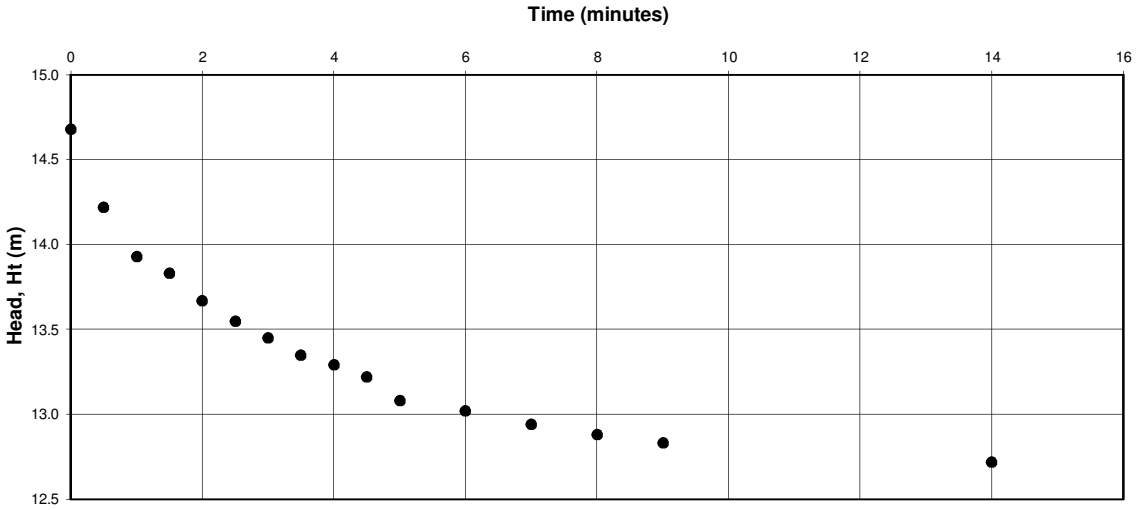
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.77	0.32	14.68	0.00					
0.5	1.23	0.78	14.22	0.97					
1.0	1.52	1.07	13.93	0.95					
1.5	1.62	1.17	13.83	0.94					
2.0	1.78	1.33	13.67	0.93					
2.5	1.90	1.45	13.55	0.92					
3.0	2.00	1.55	13.45	0.92					
3.5	2.10	1.65	13.35	0.91					
4.0	2.16	1.71	13.29	0.91					
4.5	2.23	1.78	13.22	0.90					
5.0	2.37	1.92	13.08	0.89					
6.0	2.43	1.98	13.02	0.89					
7.0	2.51	2.06	12.94	0.88					
8.0	2.57	2.12	12.88	0.88					
9.0	2.62	2.17	12.83	0.87					
14.0	2.73	2.28	12.72	0.87					



Remarks and Additional Information

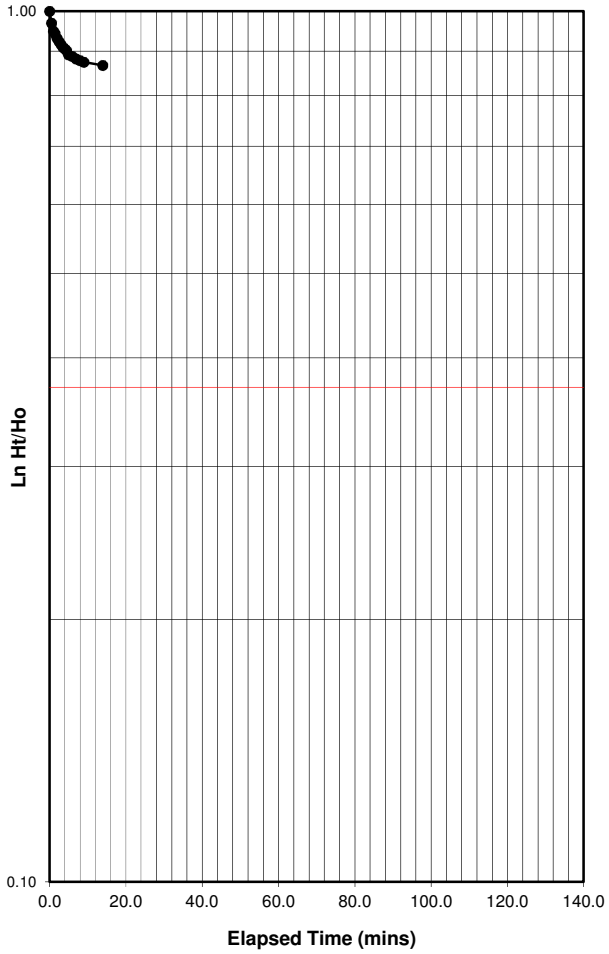
Results is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	1.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	14.68	1.00	9.0	12.83	0.87			
0.5	14.22	0.97	14.0	12.72	0.87			
1.0	13.93	0.95						
1.5	13.83	0.94						
2.0	13.67	0.93						
2.5	13.55	0.92						
3.0	13.45	0.92						
3.5	13.35	0.91						
4.0	13.29	0.91						
4.5	13.22	0.90						
5.0	13.08	0.89						
6.0	13.02	0.89						
7.0	12.94	0.88						
8.0	12.88	0.88						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.45	m
Depth to Induced Water Level	0.77	m
Differential head at start (H_{o})	14.68	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	1.00	mins
Time (t2)	8.00	mins
Head at Time t1 (H1)	13.930	m
Head at Time t2 (H2)	12.880	m
Permeability (k) = A/(F[t2-	**6.39E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

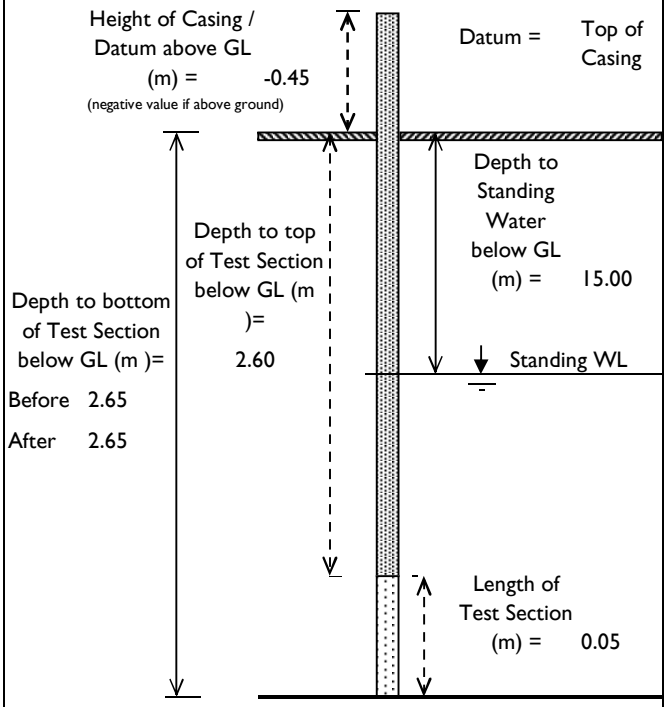
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.51		
0.5	0.67		
1.0	0.86		
1.5	1.00		
2.0	1.14		
2.5	1.26		
3.0	1.39		
3.5	1.50		
4.0	1.67		
4.5	1.72		
5.0	1.78		
6.0	1.92		
7.0	2.07		
8.0	2.19		
9.0	2.24		
10.0	2.34		
11.0	2.45		
12.0	2.50		
13.0	2.58		
14.0	2.59		
15.0	2.65		
16.0	2.70		



Depth to Standing Water Level below Datum	15.45 m
Depth to Induced Water Level below Datum	0.51 m
Differential head at start of Test (H_o)	14.94 m
Differential Head at end of Test (H_f)	12.75 m
Time Elapsed at end of test (t_f)	16.0 mins

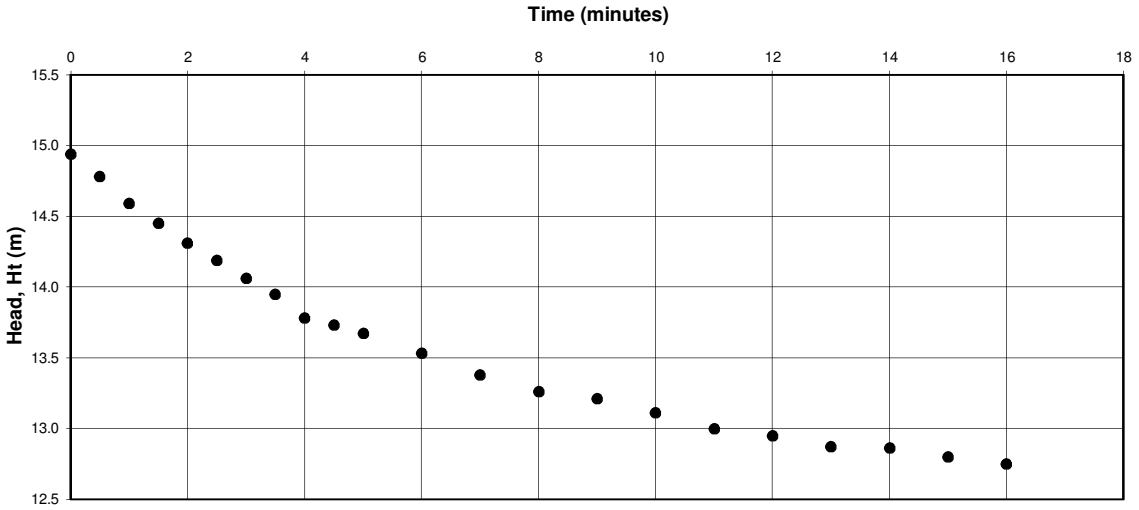
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.51	0.06	14.94	0.00	15.0	2.65	2.20	12.80	0.86
0.5	0.67	0.22	14.78	0.99	16.0	2.70	2.25	12.75	0.85
1.0	0.86	0.41	14.59	0.98					
1.5	1.00	0.55	14.45	0.97					
2.0	1.14	0.69	14.31	0.96					
2.5	1.26	0.81	14.19	0.95					
3.0	1.39	0.94	14.06	0.94					
3.5	1.50	1.05	13.95	0.93					
4.0	1.67	1.22	13.78	0.92					
4.5	1.72	1.27	13.73	0.92					
5.0	1.78	1.33	13.67	0.91					
6.0	1.92	1.47	13.53	0.91					
7.0	2.07	1.62	13.38	0.90					
8.0	2.19	1.74	13.26	0.89					
9.0	2.24	1.79	13.21	0.88					
10.0	2.34	1.89	13.11	0.88					
11.0	2.45	2.00	13.00	0.87					
12.0	2.50	2.05	12.95	0.87					
13.0	2.58	2.13	12.87	0.86					
14.0	2.59	2.14	12.86	0.86					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

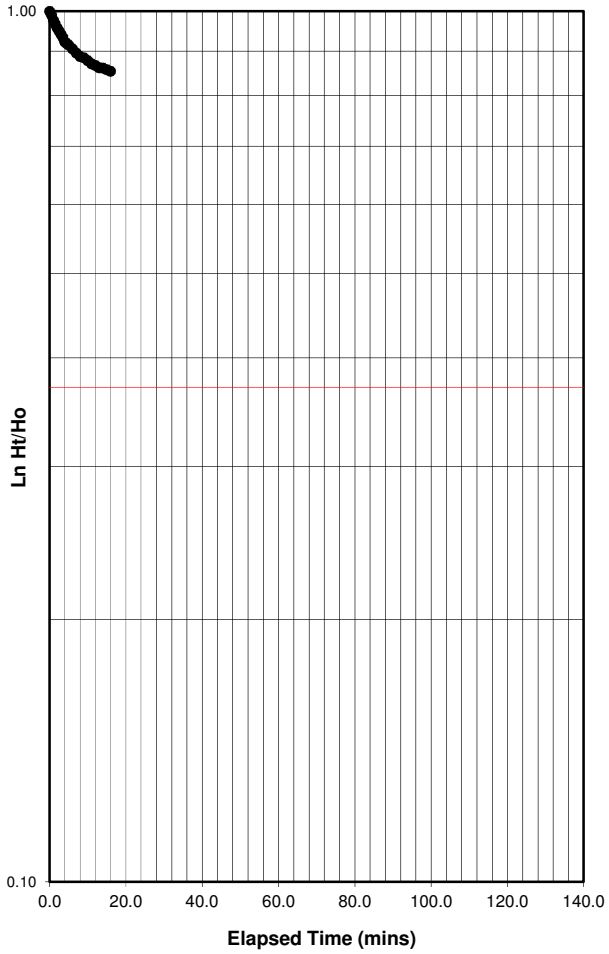
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	2.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	14.94	1.00	9.0	13.21	0.88			
0.5	14.78	0.99	10.0	13.11	0.88			
1.0	14.59	0.98	11.0	13.00	0.87			
1.5	14.45	0.97	12.0	12.95	0.87			
2.0	14.31	0.96	13.0	12.87	0.86			
2.5	14.19	0.95	14.0	12.86	0.86			
3.0	14.06	0.94	15.0	12.80	0.86			
3.5	13.95	0.93	16.0	12.75	0.85			
4.0	13.78	0.92						
4.5	13.73	0.92						
5.0	13.67	0.91						
6.0	13.53	0.91						
7.0	13.38	0.90						
8.0	13.26	0.89						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.45	m
Depth to Induced Water Level	0.51	m
Differential head at start (H_{o})	14.94	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :	mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	0.00	mins
Time (t2)	10.00	mins
Head at Time t1 (H1)	14.940	m
Head at Time t2 (H2)	13.110	m
Permeability (k) = A/(F[t2-	**7.46E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

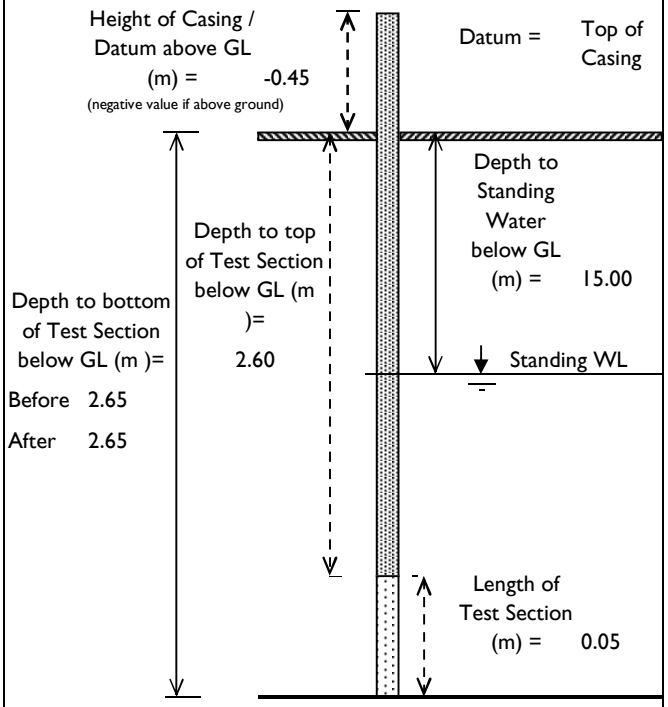
Water Permeability Test in a Borehole using Open Systems in accordance with BS EN ISO 22282-2:201

Borehole Details	
Inclination	Vertical
Method of Drilling	Dynamic Sampling
Co-ordinates (m)	E 467849.3
	N 99138.0
Level (m OD)	3.46

Test Details	
Test Type	Variable Head - Falling
Hydrogeological Conditions	Test Section Patially Saturated
Type of Filter	None
Isolation Device	None
Test Section Dia. (m)	0.12
Measuring Tube Dia. (m)	0.12

Test Measurements

Elapsed Time (minutes)	Depth of Water below Top of Casing (m)	Elapsed Time (Continued) (minutes)	Depth of Water below Top of Casing (continued) (m)
0.0	0.60		
0.5	0.77		
1.0	0.83		
1.5	0.97		
2.0	1.09		
2.5	1.21		
3.0	1.34		
3.5	1.44		
4.0	1.61		
4.5	1.70		
5.0	1.80		
6.0	1.90		
7.0	2.03		
8.0	2.21		
9.0	2.26		
10.0	2.35		
11.0	2.47		
12.0	2.54		
13.0	2.59		
14.0	2.63		
15.0	2.68		
16.0	2.70		



Depth to Standing Water Level below Datum	15.45 m
Depth to Induced Water Level below Datum	0.60 m
Differential head at start of Test (H_o)	14.85 m
Differential Head at end of Test (H_f)	12.75 m
Time Elapsed at end of test (t_f)	16.0 mins

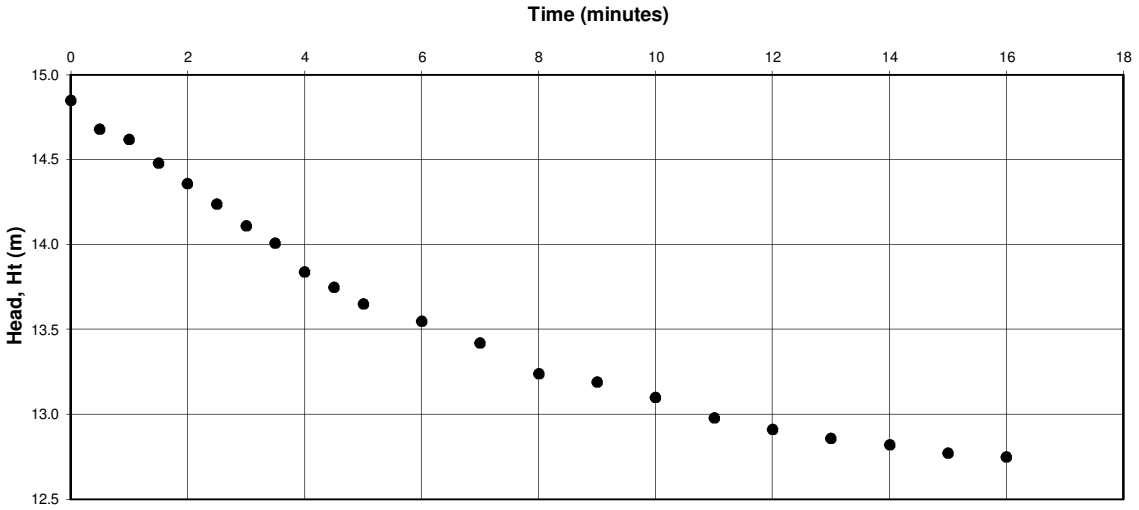
Weather during Test	
Test Carried Out By	CJ
Test Checked By	AS
Description of Test Section	Light brown gravelly fine to coarse SAND.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3
Client	WSP UK Limited	Date	17/11/2020

Test Results

Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)	Time (mins)	Measured Depth (m)	Relative Depth (m bgl)	Ht (m)	ΔH (m)
0.0	0.60	0.15	14.85	0.00	15.0	2.68	2.23	12.77	0.86
0.5	0.77	0.32	14.68	0.99	16.0	2.70	2.25	12.75	0.86
1.0	0.83	0.38	14.62	0.98					
1.5	0.97	0.52	14.48	0.98					
2.0	1.09	0.64	14.36	0.97					
2.5	1.21	0.76	14.24	0.96					
3.0	1.34	0.89	14.11	0.95					
3.5	1.44	0.99	14.01	0.94					
4.0	1.61	1.16	13.84	0.93					
4.5	1.70	1.25	13.75	0.93					
5.0	1.80	1.35	13.65	0.92					
6.0	1.90	1.45	13.55	0.91					
7.0	2.03	1.58	13.42	0.90					
8.0	2.21	1.76	13.24	0.89					
9.0	2.26	1.81	13.19	0.89					
10.0	2.35	1.90	13.10	0.88					
11.0	2.47	2.02	12.98	0.87					
12.0	2.54	2.09	12.91	0.87					
13.0	2.59	2.14	12.86	0.87					
14.0	2.63	2.18	12.82	0.86					



Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.

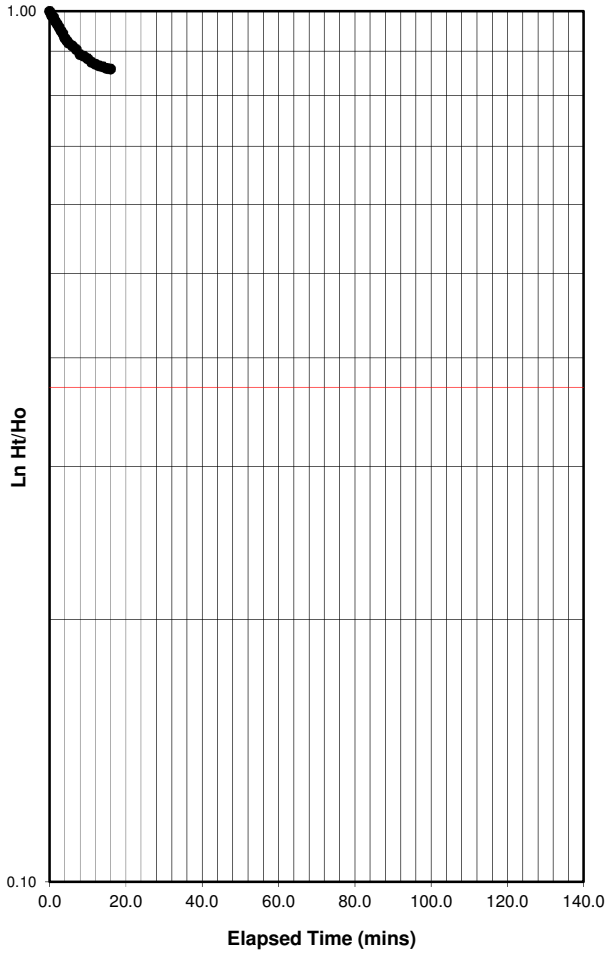
Water assumed at 15m bgl.

INSITU TESTING - *Permeability (Borehole)*

Project	Aquind Drainage Design Additional GI	Borehole	BH43
		Project No	PE201677
		Test No	3.000
Client	WSP UK Limited	Date	17/11/2020

Calculation of Permeability using Hvorslev Method (Ref BS5930:1999 + A2:2010)

Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho	Time (mins)	Ht (m)	Ht/Ho
0.0	14.85	1.00	9.0	13.19	0.89			
0.5	14.68	0.99	10.0	13.10	0.88			
1.0	14.62	0.98	11.0	12.98	0.87			
1.5	14.48	0.98	12.0	12.91	0.87			
2.0	14.36	0.97	13.0	12.86	0.87			
2.5	14.24	0.96	14.0	12.82	0.86			
3.0	14.11	0.95	15.0	12.77	0.86			
3.5	14.01	0.94	16.0	12.75	0.86			
4.0	13.84	0.93						
4.5	13.75	0.93						
5.0	13.65	0.92						
6.0	13.55	0.91						
7.0	13.42	0.90						
8.0	13.24	0.89						



Type of Test	Variable Head - Falling	
Depth to Standing Water Level	15.45	m
Depth to Induced Water Level	0.60	m
Differential head at start (H_{o})	14.85	m
Diameter of Test Section	0.12	m
Diameter of Measuring Tube	0.12	m
Test Length (L)	0.05	m
Area of Test Section (As)	1.13E-02	m^2
Area of Measuring Tube (Af)	1.13E-02	m^2

Time at ratio H/Ho=.37 :		mins

VARIABLE HEAD TEST	**(GENERAL APPROACH**	
Shape factor (F)	0.330	
Time (t1)	0.00	mins
Time (t2)	8.00	mins
Head at Time t1 (H1)	14.850	m
Head at Time t2 (H2)	13.240	m
Permeability (k) = A/(F[t2-	**8.19E-06**	**m/sec**

Remarks and Additional Information

Result is an approximation only and is not a true permeability as no water was encountered during drilling.
Water assumed at 15m bgl.

APPENDIX 9

Trial Pit Soakaway Test Results

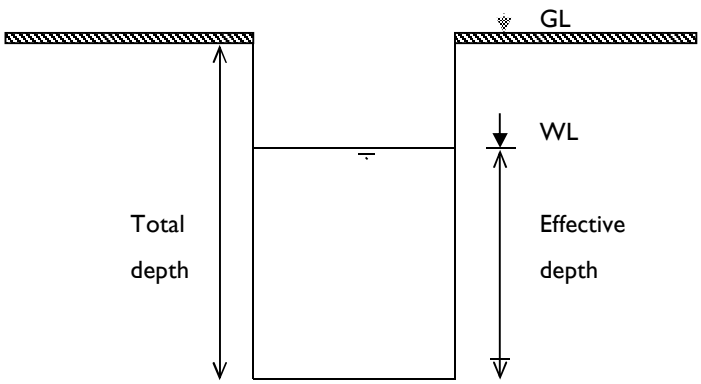
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP21
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	16/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.40	0.60	100.00
1.00	0.41	0.59	98.33
2.00	0.41	0.59	98.33
3.00	0.41	0.59	98.33
4.00	0.42	0.58	96.67
5.00	0.43	0.57	95.00
10.00	0.43	0.57	95.00
15.00	0.43	0.57	95.00
20.00	0.43	0.57	95.00
30.00	0.43	0.57	95.00
45.00	0.43	0.57	95.00
60.00	0.44	0.56	93.33
1320.00	0.64	0.36	60.00
1680.00	0.70	0.30	50.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.000	m
Effective depth (Head of Water)	=	0.600	m

Initial depth from GL	=	0.400m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.450	0.550	750.00
25%	0.150	0.850	2600.00
Vp75-25	=	0.360	m3
ap50	=	2.760	m2
tp75-25	=	1,850.000	min
Soil Infiltration, f	=	**1.18E-06**	m/sec

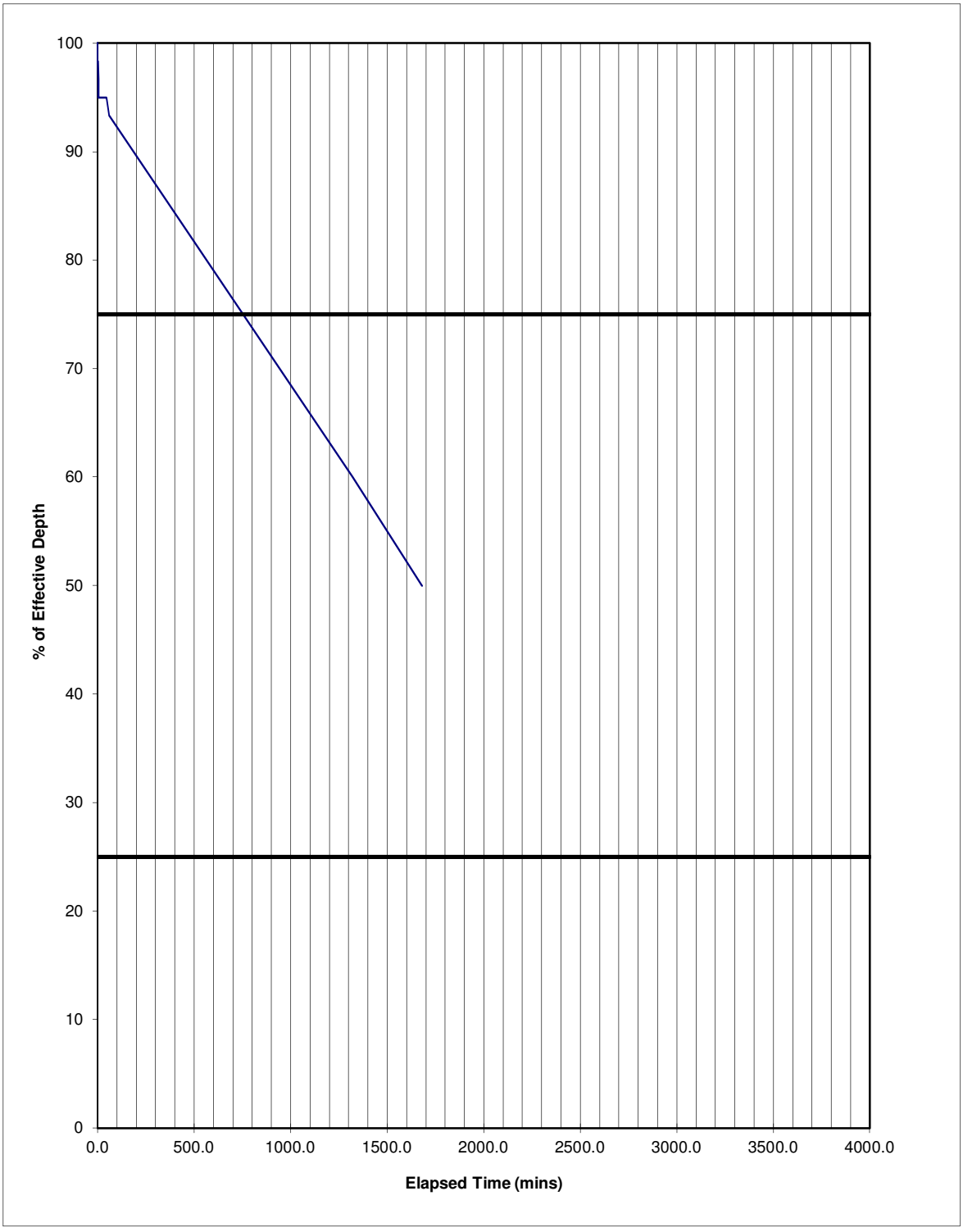
x
x

Remarks Infiltration Rate estimated only by extrapolation.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP21
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	16/11/2020



tp75	=	750.00
tp25	=	2600.00

Remarks Infiltration Rate estimated only by extrapolation.

GEOTECHNICS

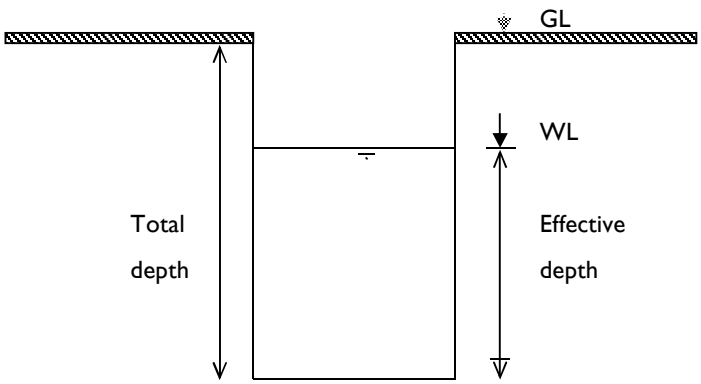
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	16/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.32	1.38	100.00
1.00	0.40	1.30	94.20
2.00	0.45	1.25	90.58
3.00	0.50	1.20	86.96
4.00	0.56	1.14	82.61
5.00	0.59	1.11	80.43
10.00	0.88	0.82	59.42
15.00	0.93	0.77	55.80
20.00	1.09	0.61	44.20
30.00	1.20	0.50	36.23
45.00	1.59	0.11	7.97

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.700	m
Effective depth (Head of Water)	=	1.380	m

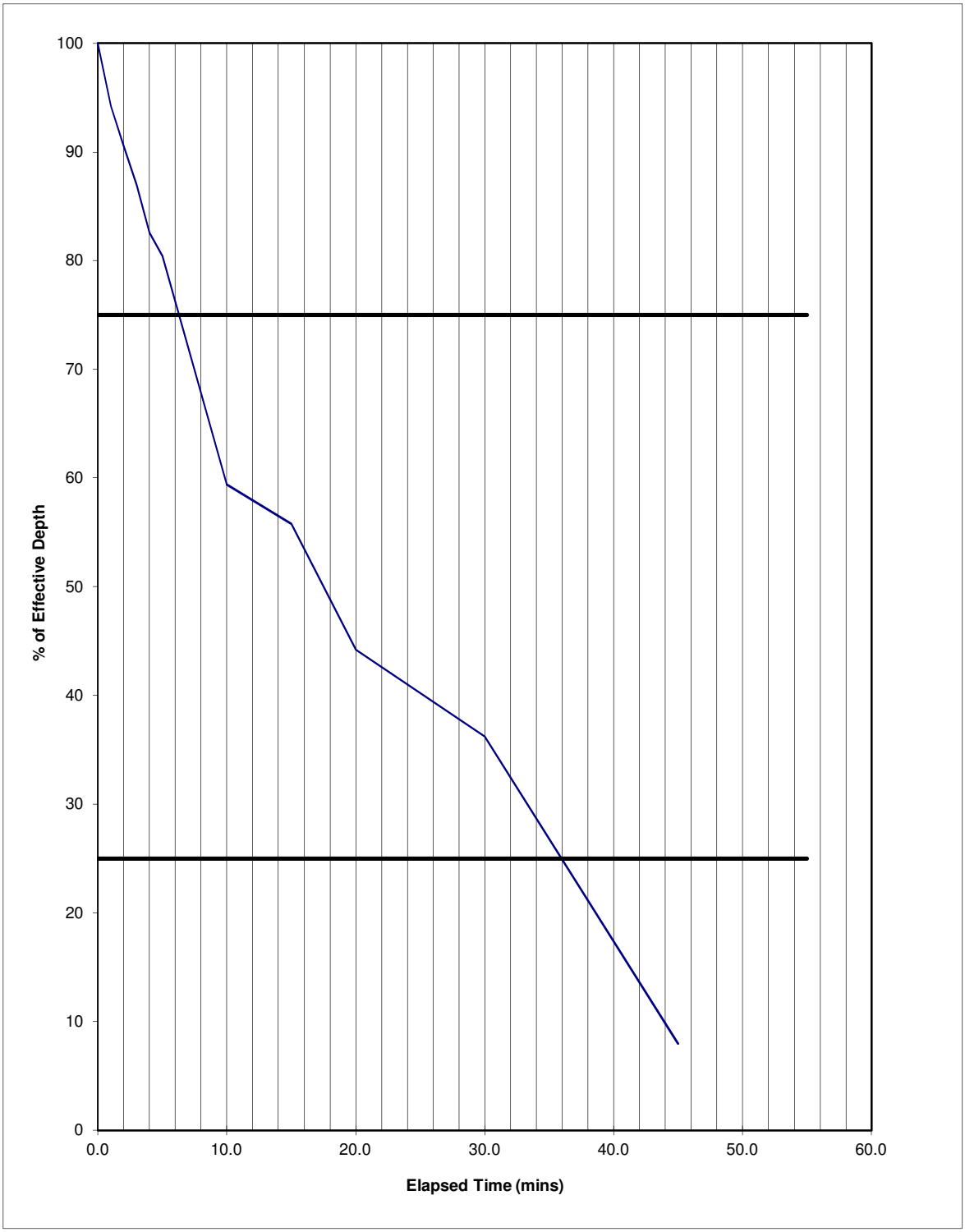
Initial depth from GL	=	0.320m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.035	0.665	6.40
25%	0.345	1.355	36.00
Vp75-25	=	0.828	m3
ap50	=	4.788	m2
tp75-25	=	29.600	min
Soil Infiltration, f	=	**9.74E-05**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	16/11/2020



tp75	=	6.40
tp25	=	36.00

Remarks

GEOTECHNICS

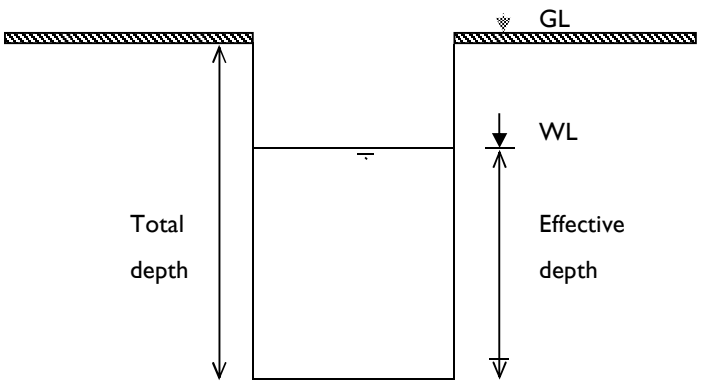
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.51	1.19	100.00
1.00	0.57	1.13	94.96
2.00	0.61	1.09	91.60
3.00	0.63	1.07	89.92
4.00	0.65	1.05	88.24
5.00	0.68	1.02	85.71
10.00	0.79	0.91	76.47
15.00	0.88	0.82	68.91
20.00	0.96	0.74	62.18
30.00	1.14	0.56	47.06
60.00	1.51	0.19	15.97
90.00	1.70	0.00	0.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.700	m
Effective depth (Head of Water)	=	1.190	m

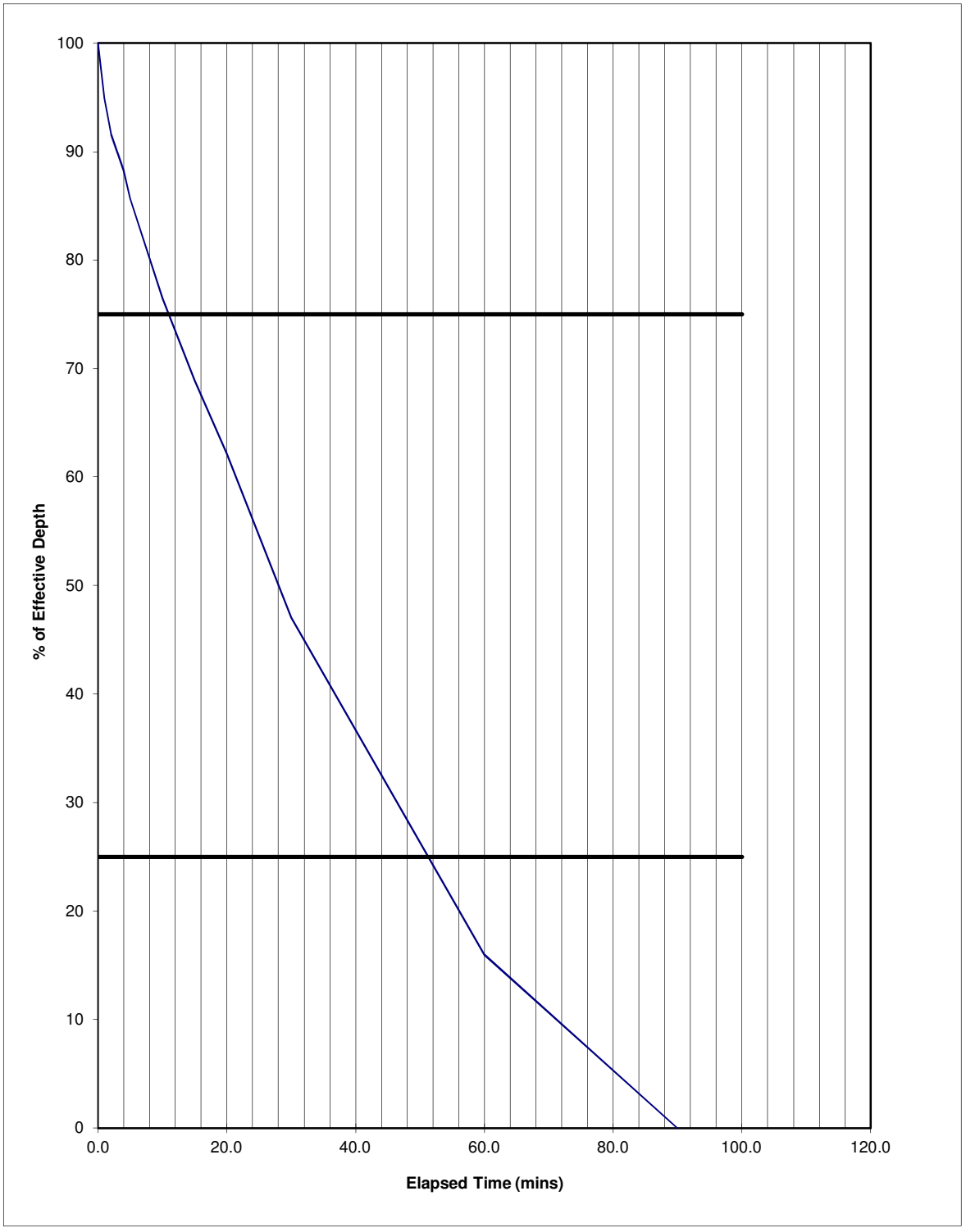
Initial depth from GL	=	0.510m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.893	0.808	11.00
25%	0.298	1.403	51.50
Vp75-25	=	0.714	m3
ap50	=	4.294	m2
tp75-25	=	40.500	min
Soil Infiltration, f	=	**6.84E-05**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	11.00
tp25	=	51.50

Remarks

GEOTECHNICS

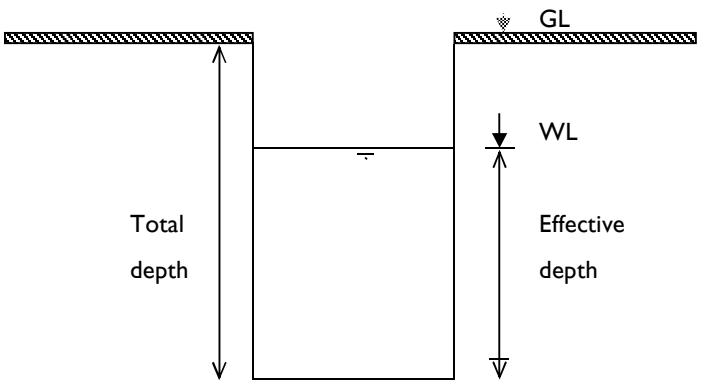
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.34	1.36	100.00
2.00	0.38	1.32	97.06
3.00	0.39	1.31	96.32
4.00	0.42	1.28	94.12
52.00	1.01	0.69	50.74
120.00	1.55	0.15	11.03

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.700	m
Effective depth (Head of Water)	=	1.360	m

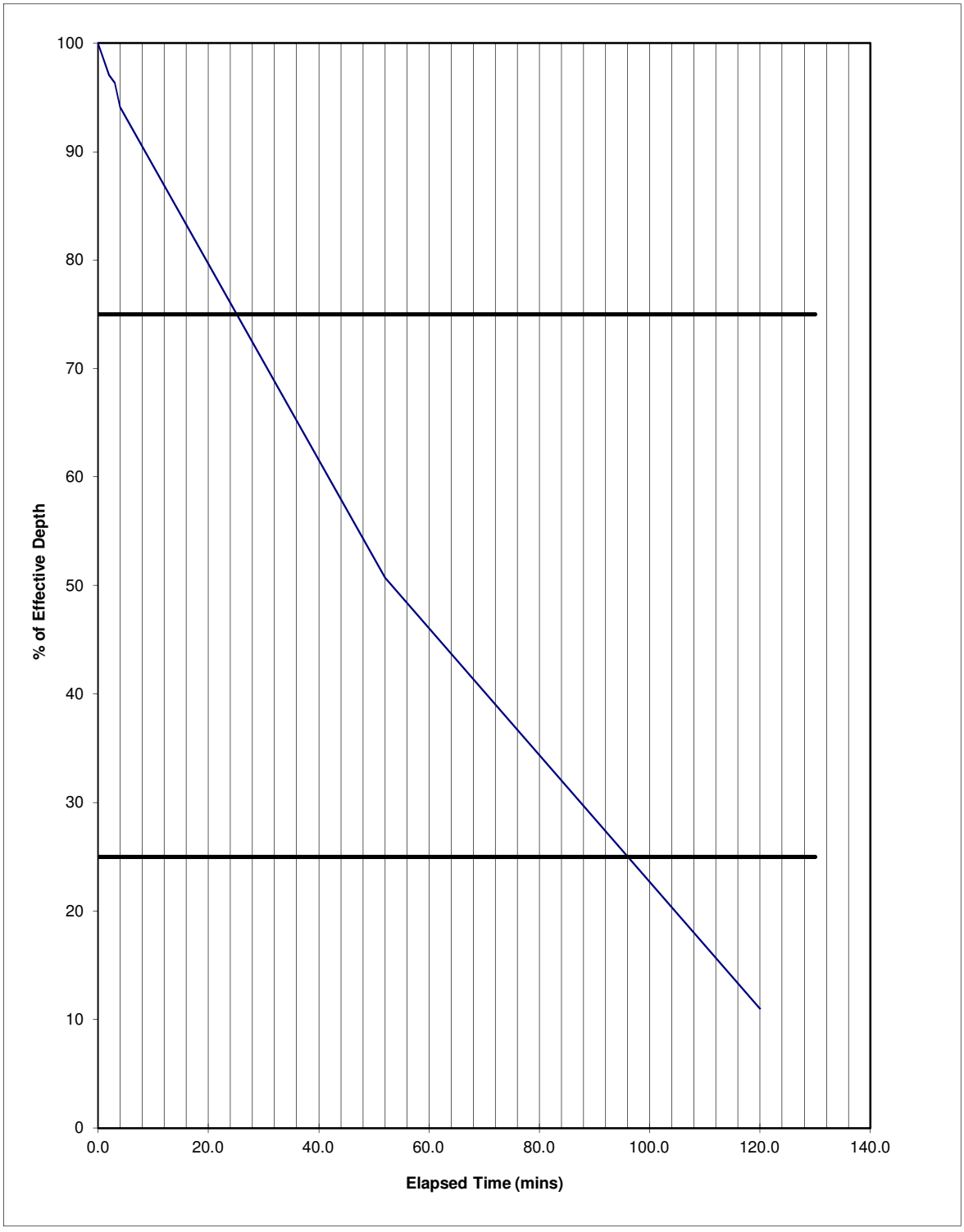
Initial depth from GL	=	0.340m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.020	0.680	25.00
25%	0.340	1.360	96.00
Vp75-25	=	0.816	m3
ap50	=	4.736	m2
tp75-25	=	71.000	min
Soil Infiltration, f	=	**4.04E-05**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP22
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	25.00
tp25	=	96.00

Remarks

GEOTECHNICS

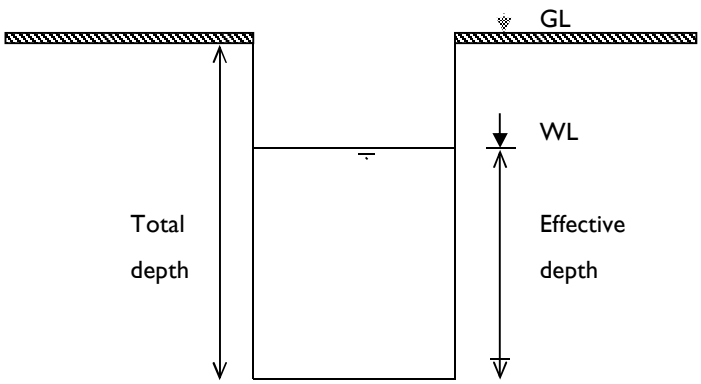
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.45	0.55	100.00
1.00	0.54	0.46	83.64
2.00	0.62	0.38	69.09
3.00	0.68	0.32	58.18
4.00	0.74	0.26	47.27
5.00	0.78	0.22	40.00
15.00	1.00	0.00	0.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.000	m
Effective depth (Head of Water)	=	0.550	m

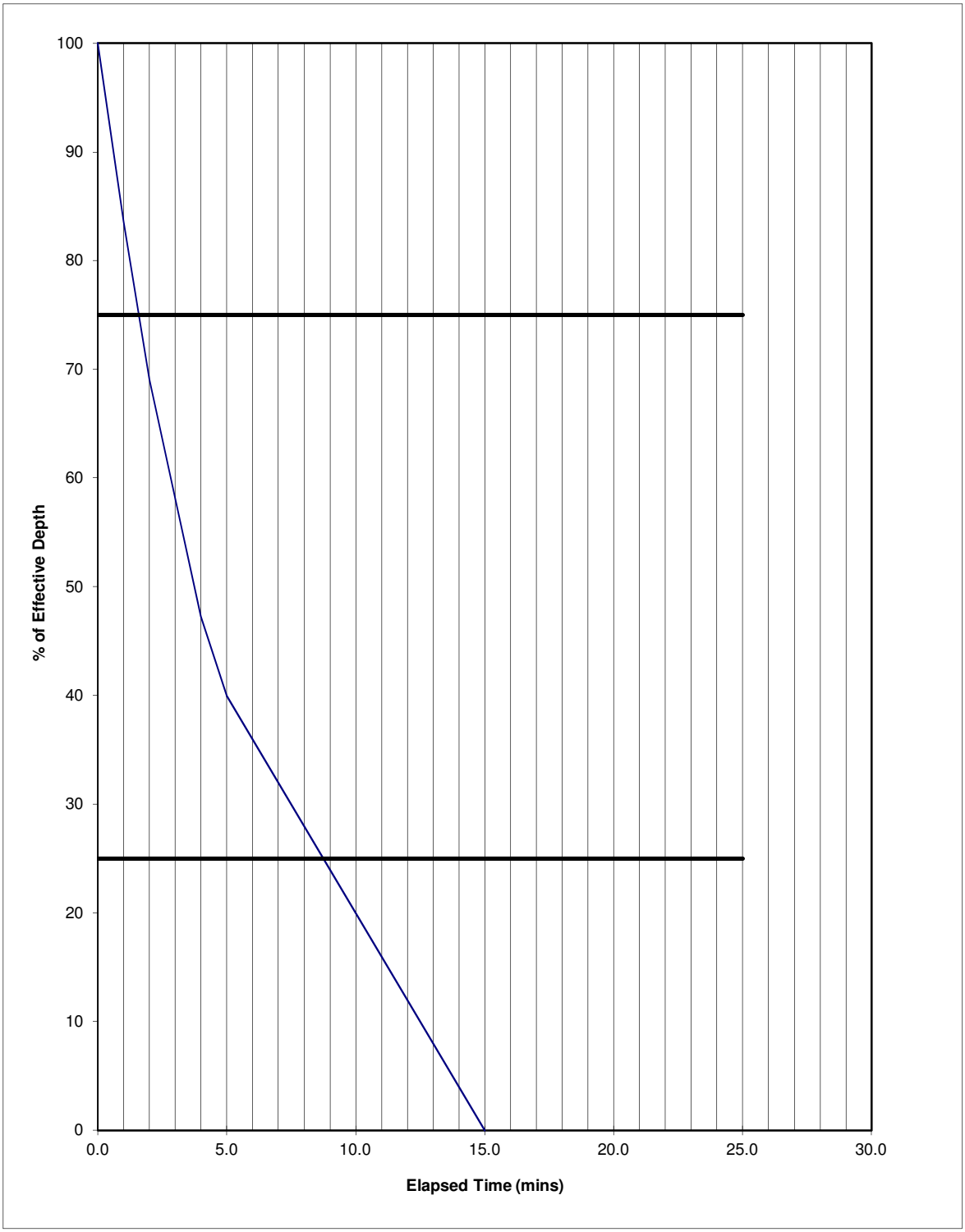
Initial depth from GL	=	0.450m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.413	0.588	1.60
25%	0.138	0.863	8.70
Vp75-25	=	0.330	m3
ap50	=	2.630	m2
tp75-25	=	7.100	min
Soil Infiltration, f	=	**2.95E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	1.60
tp25	=	8.70

Remarks

GEOTECHNICS

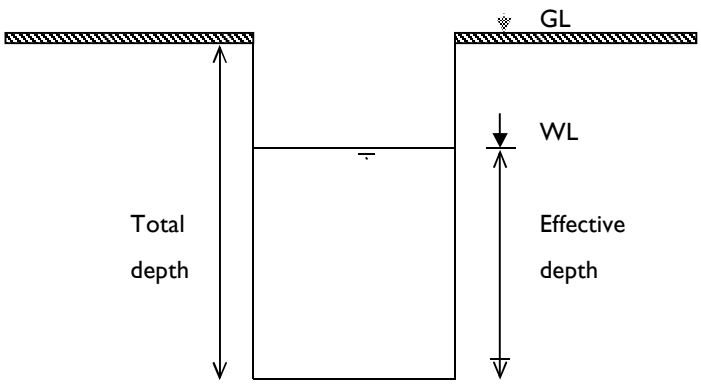
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.40	0.60	100.00
1.00	0.45	0.55	91.67
2.00	0.48	0.52	86.67
3.00	0.54	0.46	76.67
4.00	0.57	0.43	71.67
5.00	0.60	0.40	66.67
10.00	0.72	0.28	46.67
15.00	0.82	0.18	30.00
18.00	0.91	0.09	15.00
20.00	0.95	0.05	8.33

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.000	m
Effective depth (Head of Water)	=	0.600	m

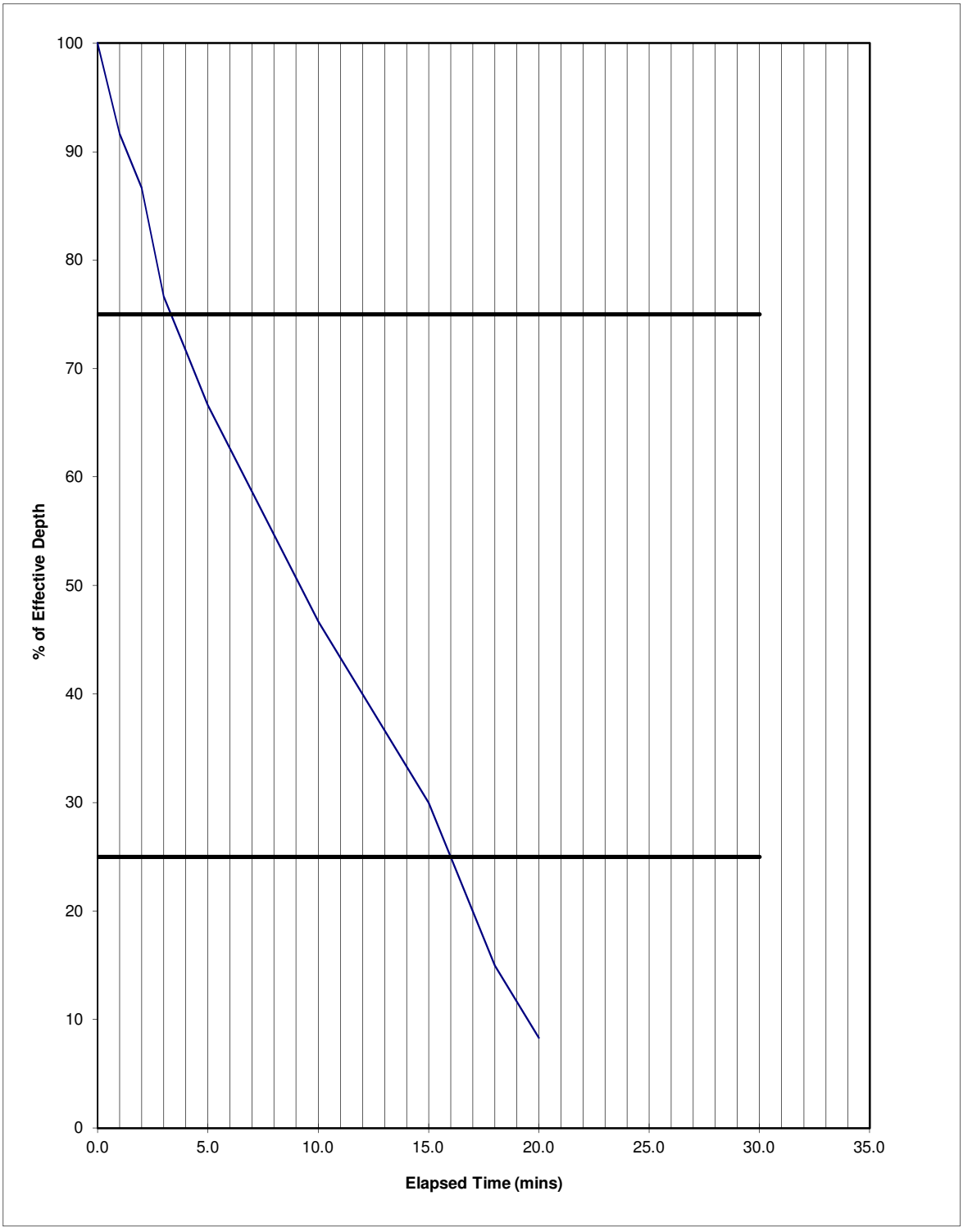
Initial depth from GL	=	0.400m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.450	0.550	3.40
25%	0.150	0.850	16.00
Vp75-25	=	0.360	m3
ap50	=	2.760	m2
tp75-25	=	12.600	min
Soil Infiltration, f	=	**1.73E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	3.40
tp25	=	16.00

Remarks

GEOTECHNICS

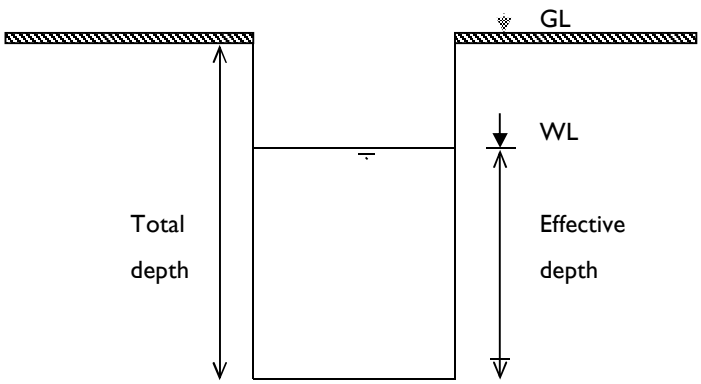
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.35	0.65	100.00
1.00	0.40	0.60	92.31
3.00	0.45	0.55	84.62
5.00	0.50	0.50	76.92
7.00	0.56	0.44	67.69
10.00	0.62	0.38	58.46
15.00	0.74	0.26	40.00
20.00	0.84	0.16	24.62
25.00	0.89	0.11	16.92
30.00	0.97	0.03	4.62

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.000	m
Effective depth (Head of Water)	=	0.650	m

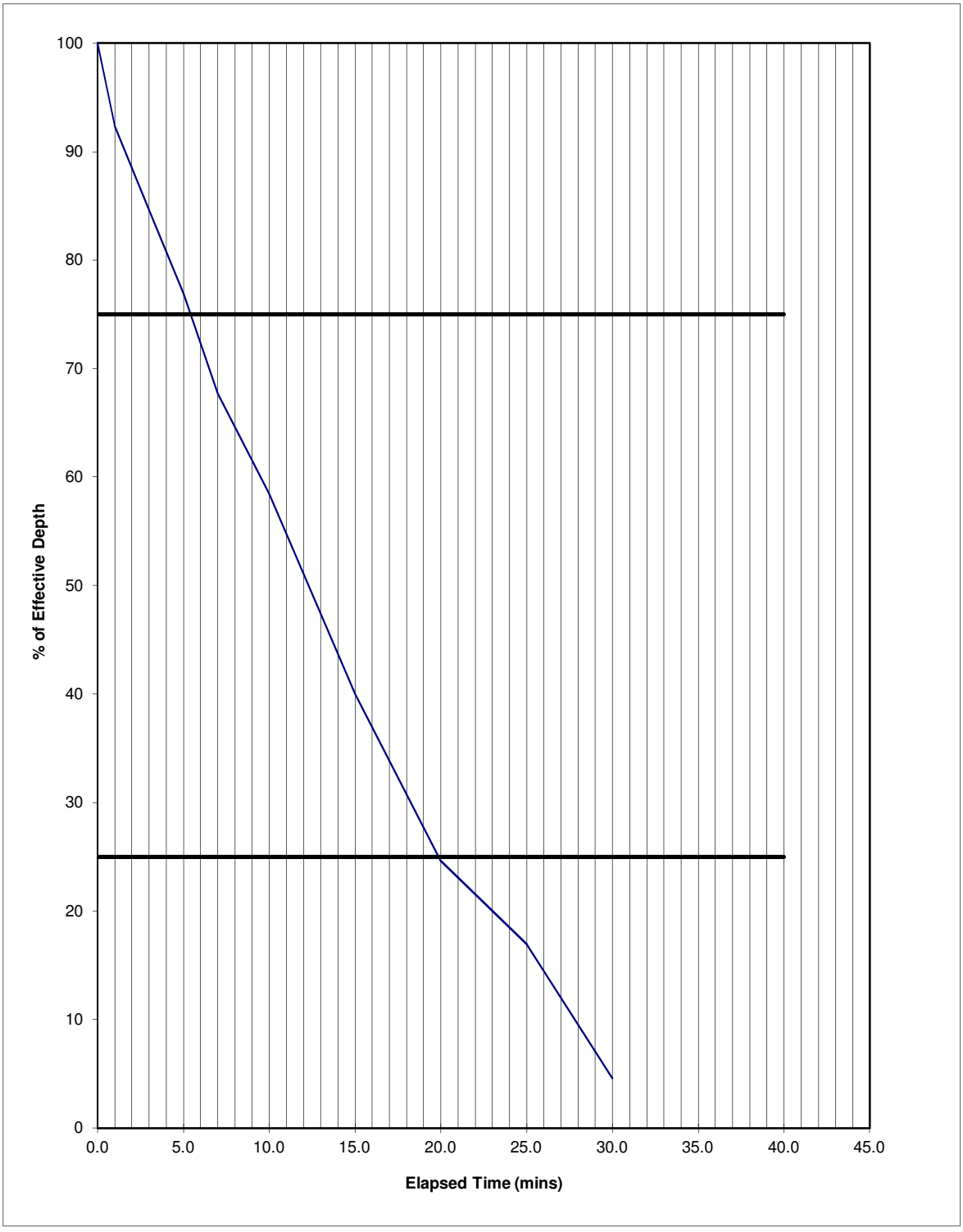
Initial depth from GL	=	0.350m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.488	0.513	6.50
25%	0.163	0.838	19.80
Vp75-25	=	0.390	m3
ap50	=	2.890	m2
tp75-25	=	13.300	min
Soil Infiltration, f	=	**1.69E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP23
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	6.50
tp25	=	19.80

Remarks

GEOTECHNICS

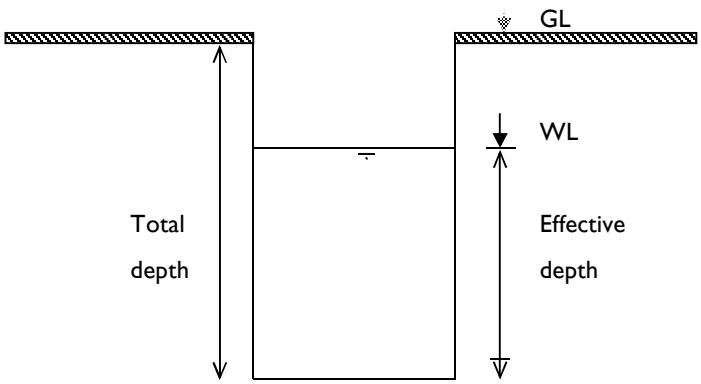
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.65	0.95	100.00
1.00	0.75	0.85	89.47
2.00	0.90	0.70	73.68
3.00	1.14	0.46	48.42
4.00	1.24	0.36	37.89
6.00	1.32	0.28	29.47
9.00	1.42	0.18	18.95
10.00	1.44	0.16	16.84

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.600	m
Effective depth (Head of Water)	=	0.950	m

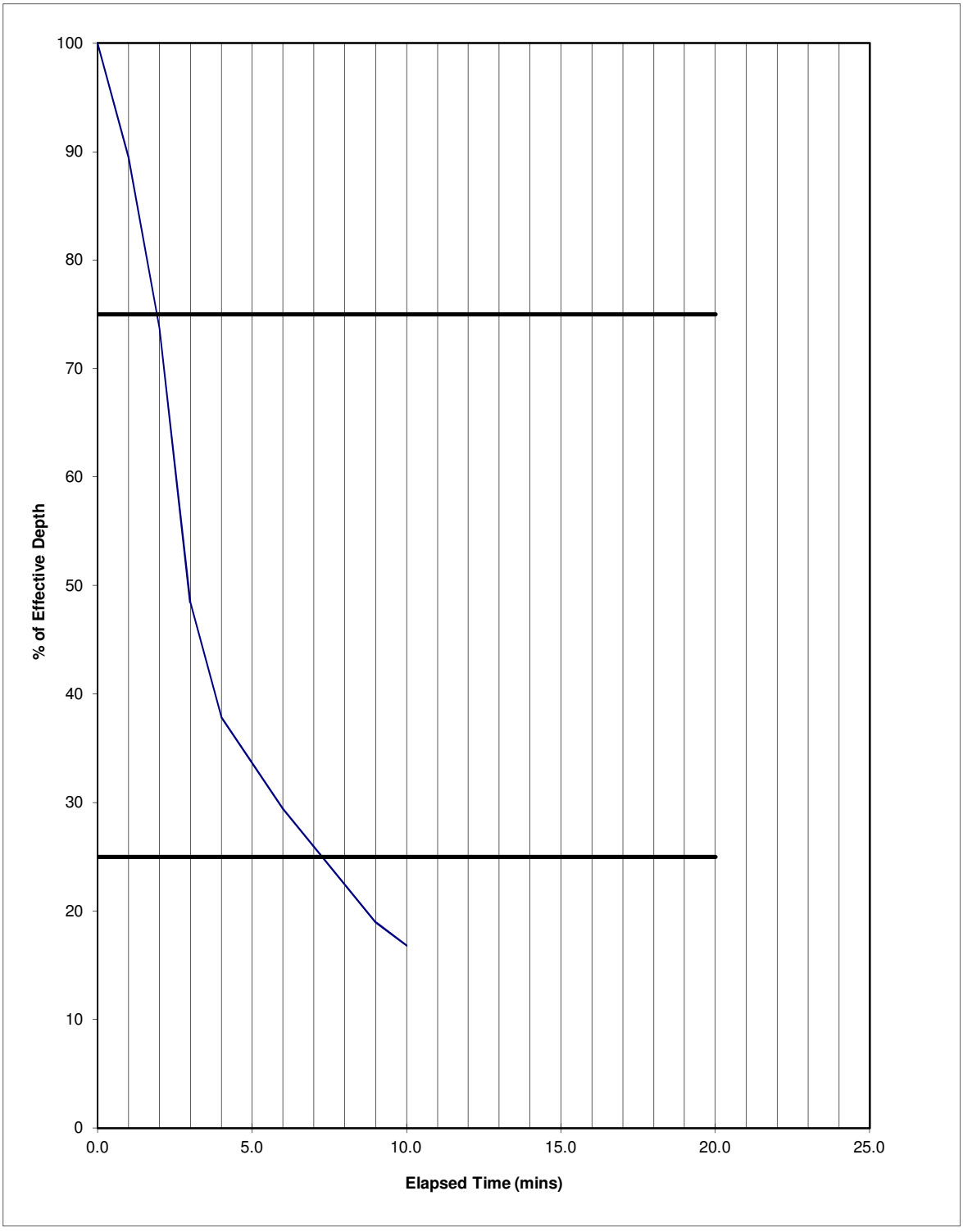
Initial depth from GL	=	0.650m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.713	0.888	2.00
25%	0.238	1.363	7.30
Vp75-25	=	0.570	m3
ap50	=	3.670	m2
tp75-25	=	5.300	min
Soil Infiltration, f	=	**4.88E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	2.00
tp25	=	7.30

Remarks

GEOTECHNICS

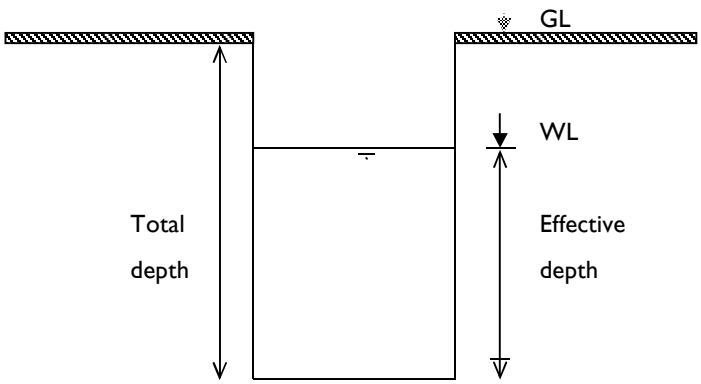
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.40	1.20	100.00
1.00	0.52	1.08	90.00
2.00	0.60	1.00	83.33
3.00	0.68	0.92	76.67
4.00	0.76	0.84	70.00
5.00	0.82	0.78	65.00
10.00	1.15	0.45	37.50
15.00	1.26	0.34	28.33
17.00	1.32	0.28	23.33
20.00	1.42	0.18	15.00
25.00	1.50	0.10	8.33

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.600	m
Effective depth (Head of Water)	=	1.200	m

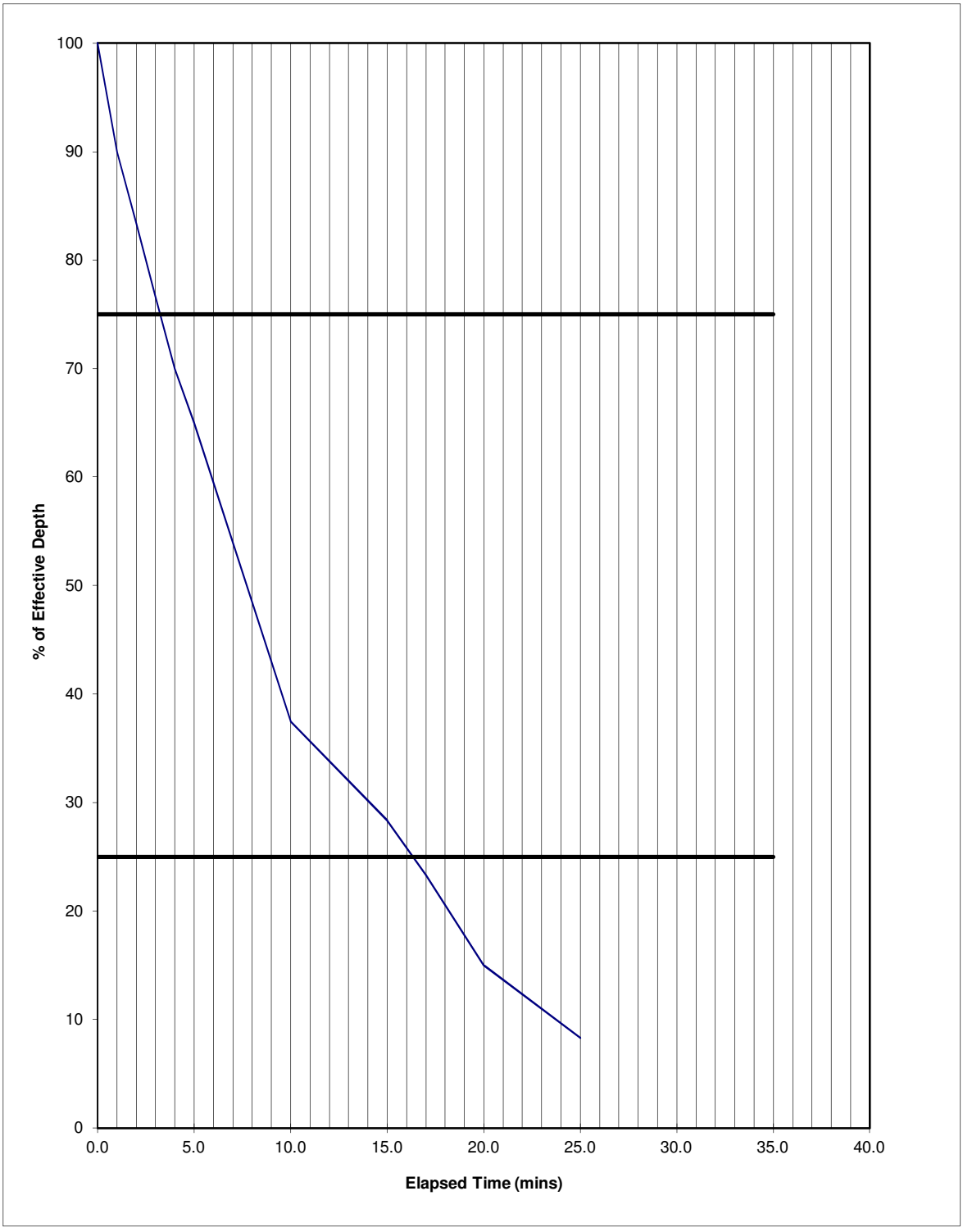
Initial depth from GL	=	0.400m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.900	0.700	3.25
25%	0.300	1.300	16.40
Vp75-25	=	0.720	m3
ap50	=	4.320	m2
tp75-25	=	13.150	min
Soil Infiltration, f	=	**2.11E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	3.25
tp25	=	16.40

Remarks

GEOTECHNICS

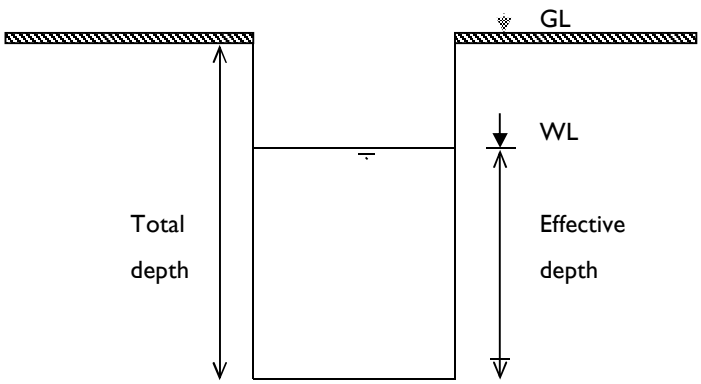
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.49	1.11	100.00
1.00	0.54	1.06	95.50
2.00	0.59	1.01	90.99
3.00	0.67	0.93	83.78
4.00	0.74	0.86	77.48
5.00	0.82	0.78	70.27
6.00	0.90	0.70	63.06
10.00	1.02	0.58	52.25
18.00	1.28	0.32	28.83
20.00	1.32	0.28	25.23
22.00	1.37	0.23	20.72

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.600	m
Effective depth (Head of Water)	=	1.110	m

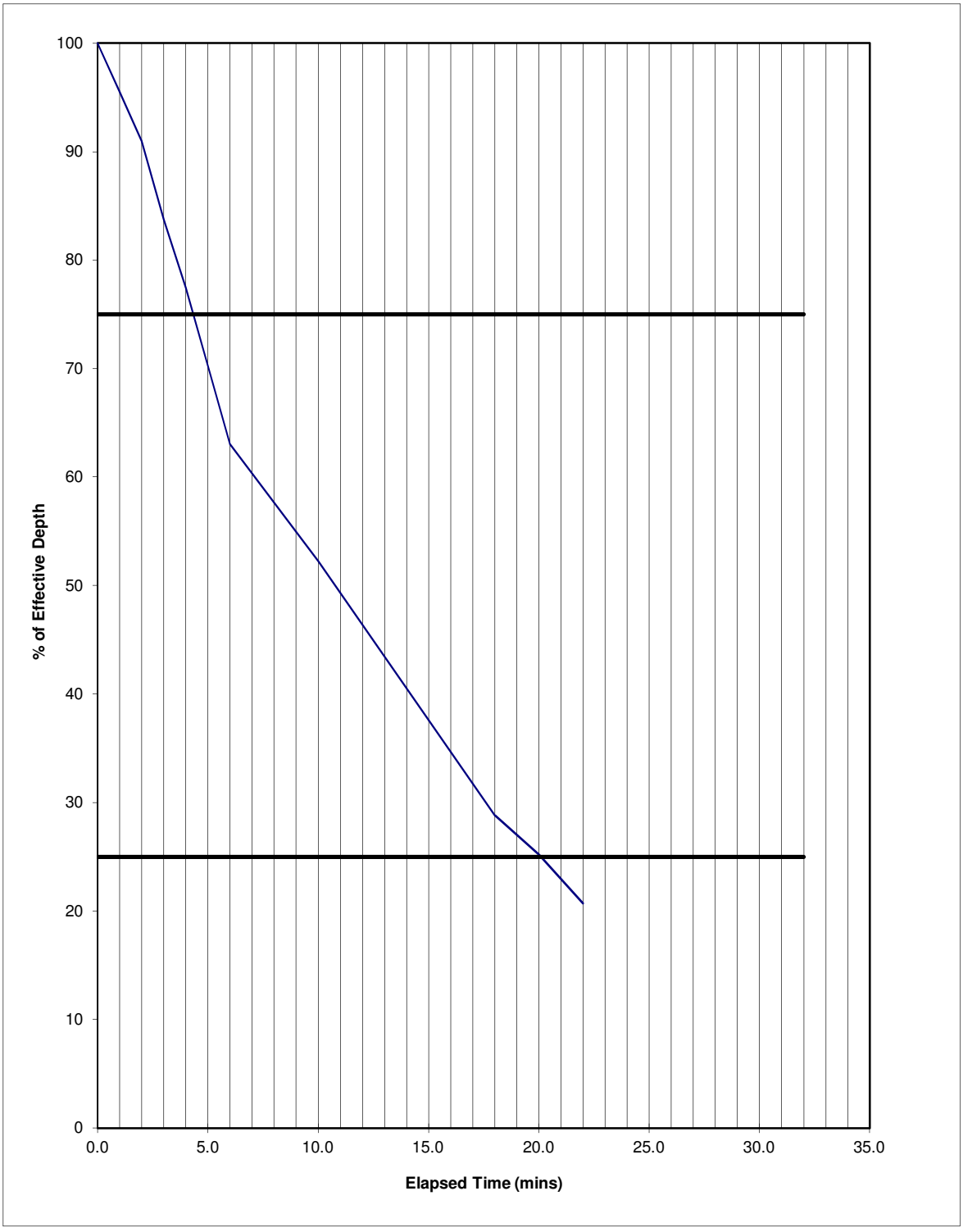
Initial depth from GL	=	0.490m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.833	0.768	5.40
25%	0.278	1.323	20.00
Vp75-25	=	0.666	m3
ap50	=	4.086	m2
tp75-25	=	14.600	min
Soil Infiltration, f	=	**1.86E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP24
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	5.40
tp25	=	20.00

Remarks

GEOTECHNICS

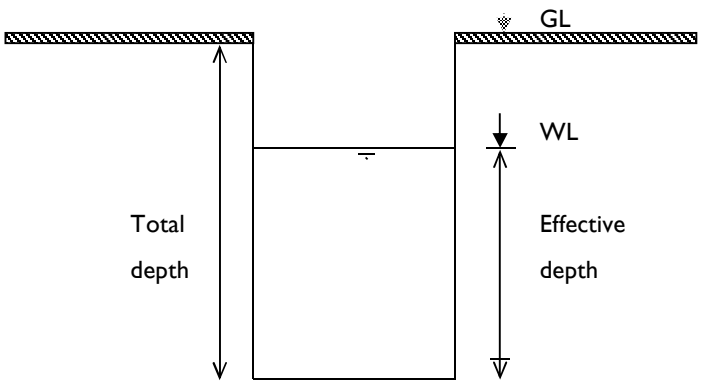
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.31	2.19	100.00
1.00	0.33	2.17	99.09
2.00	0.35	2.15	98.17
3.00	0.38	2.12	96.80
4.00	0.40	2.10	95.89
5.00	0.48	2.02	92.24
6.00	0.46	2.04	93.15
10.00	0.69	1.81	82.65
15.00	0.78	1.72	78.54
45.00	1.00	1.50	68.49

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	2.190	m

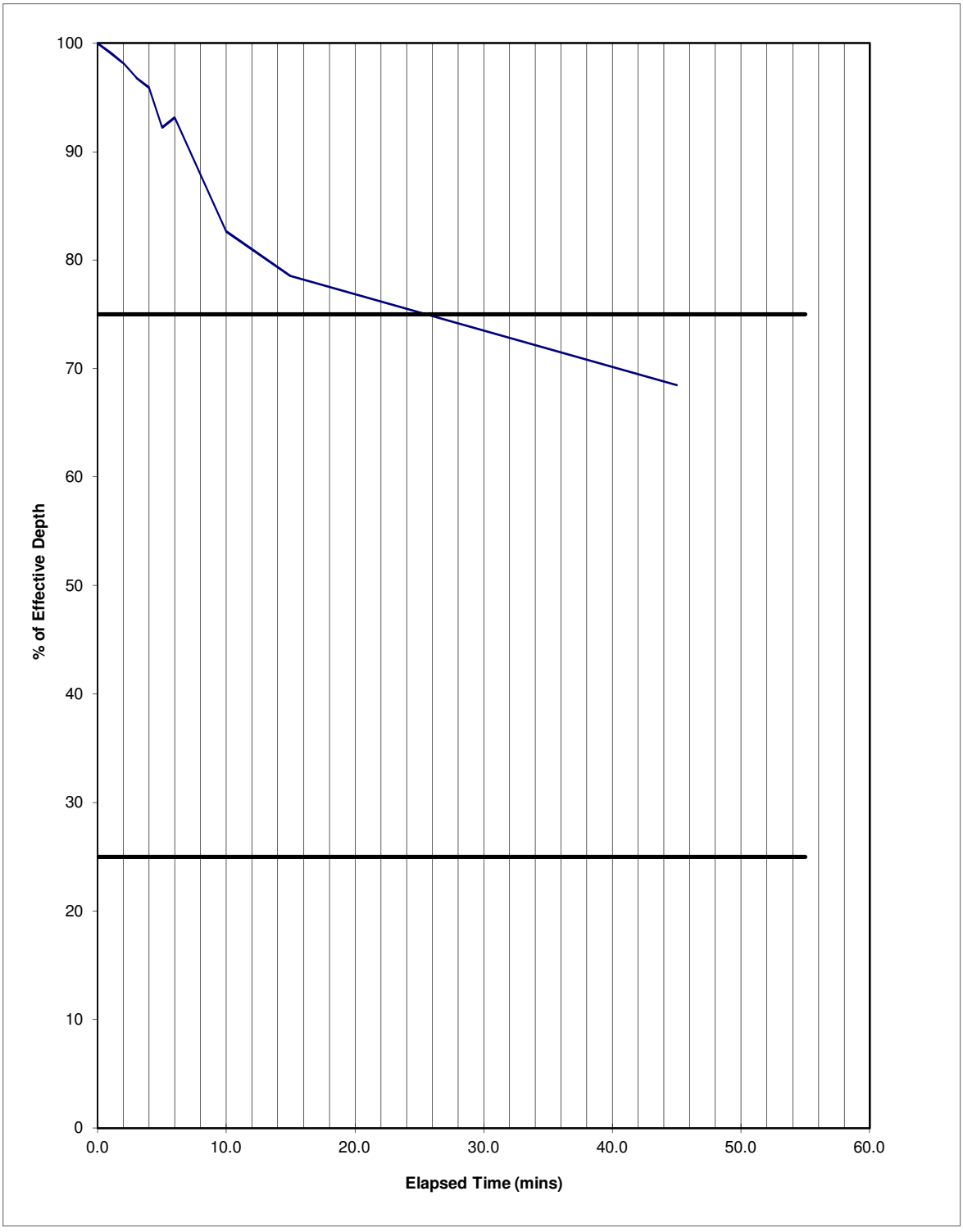
Initial depth from GL	=	0.310m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.643	0.858	
25%	0.548	1.953	
Vp75-25	=		m3
ap50	=		m2
tp75-25	=		min
Soil Infiltration, f	=	*	m/sec

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=
tp25	=

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

GEOTECHNICS

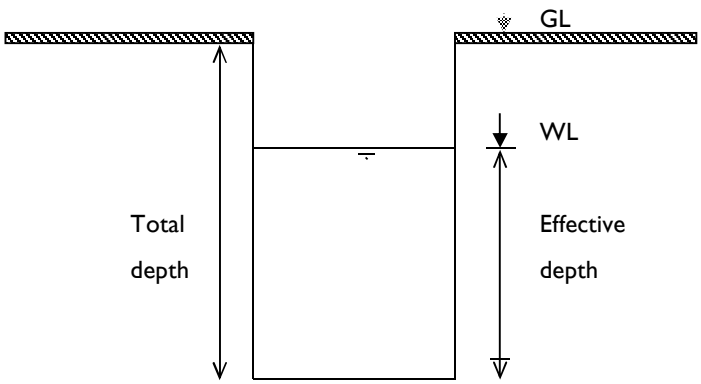
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.32	2.18	100.00
15.00	0.42	2.08	95.41
20.00	0.49	2.01	92.20
25.00	0.58	1.92	88.07
60.00	0.69	1.81	83.03
90.00	0.85	1.65	75.69

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	2.180	m

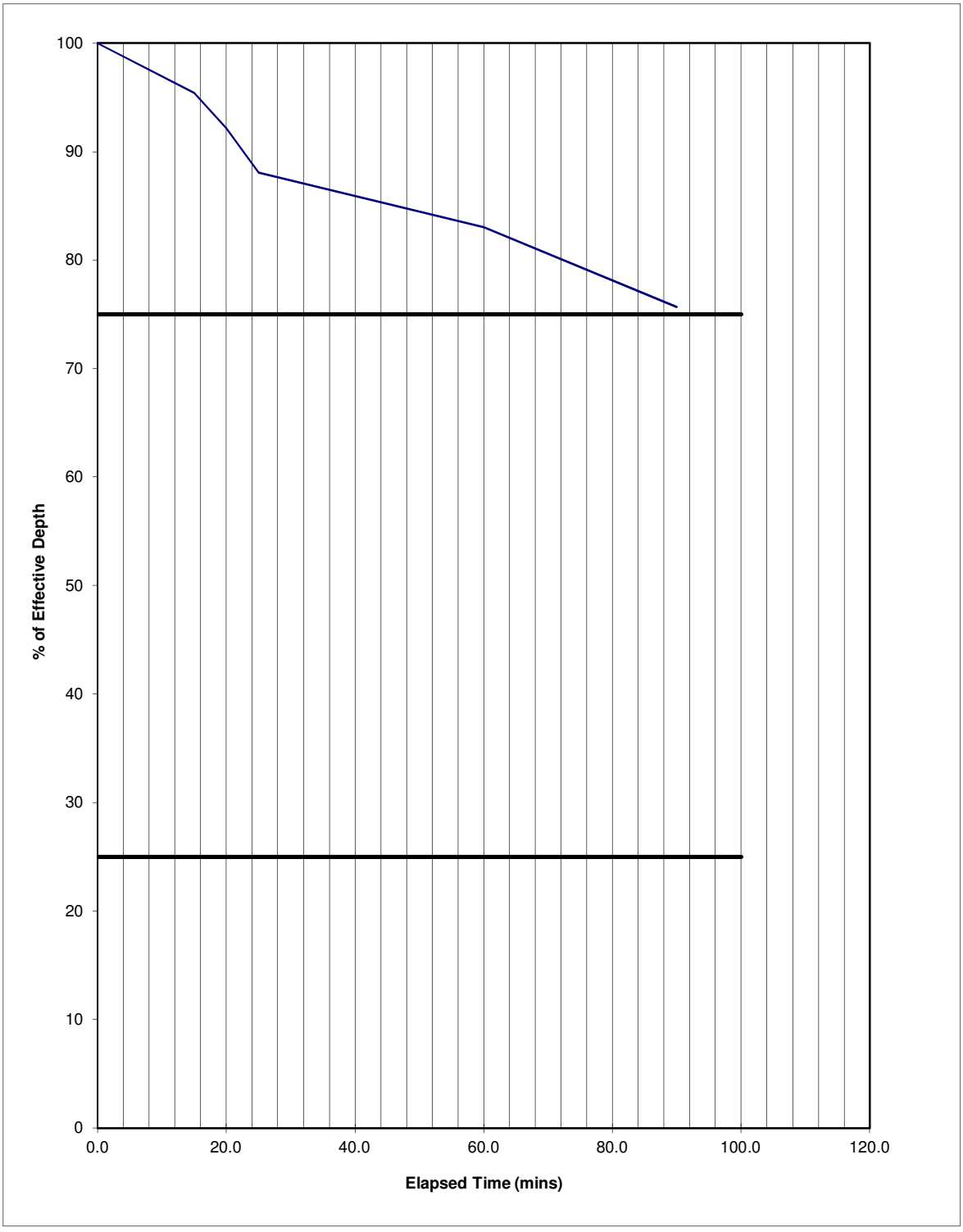
Initial depth from GL	=	0.320m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.635	0.865	
25%	0.545	1.955	
Vp75-25	=		m3
ap50	=		m2
tp75-25	=		min
Soil Infiltration, f	=	*	m/sec

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=
tp25	=

Sheet 2

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

GEOTECHNICS

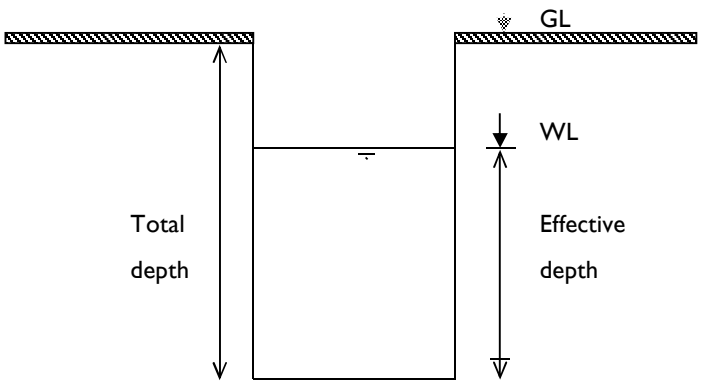
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.30	2.20	100.00
12.00	0.35	2.15	97.73
20.00	0.43	2.07	94.09
25.00	0.46	2.04	92.73
60.00	0.66	1.84	83.64
90.00	0.87	1.63	74.09

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	2.200	m

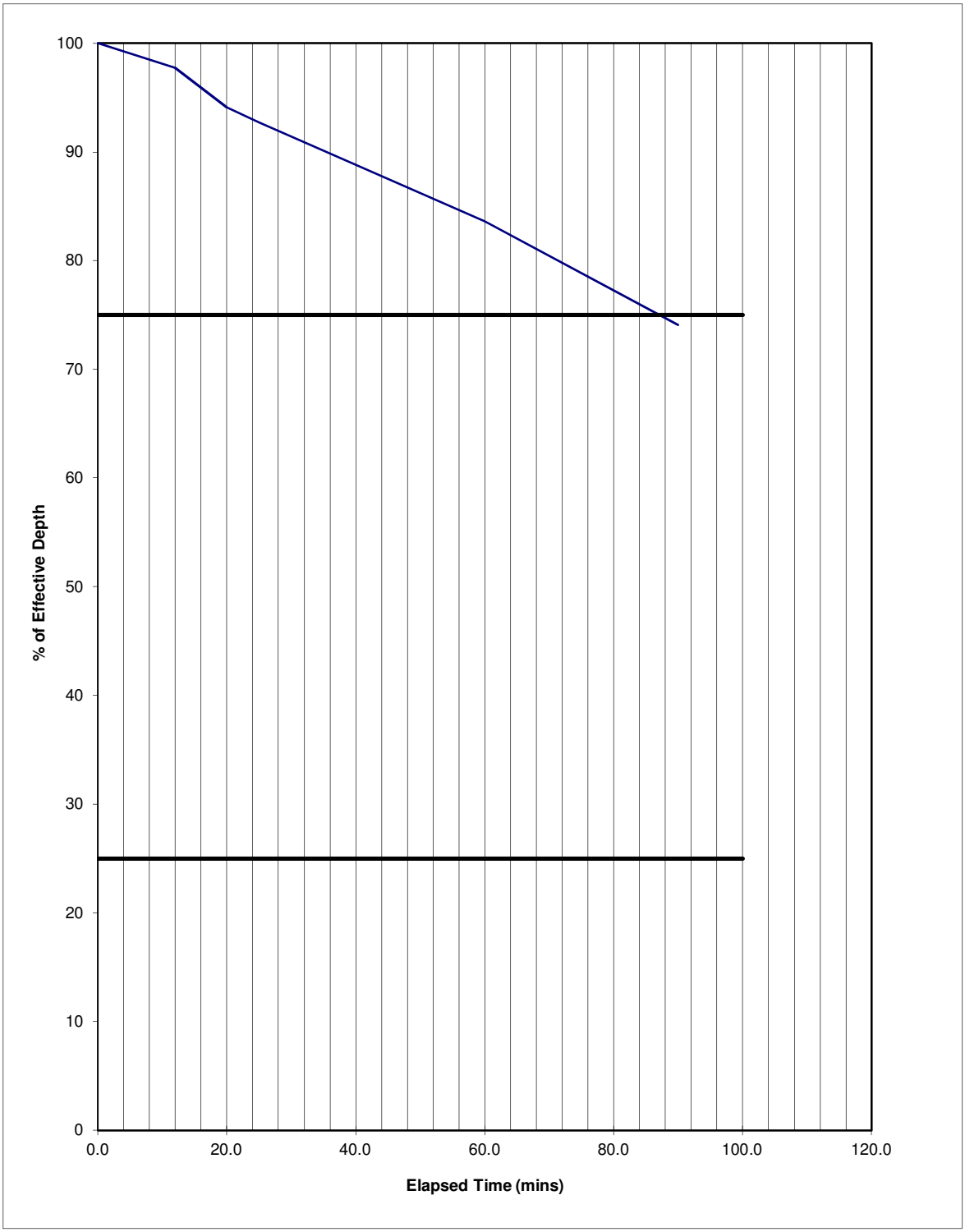
Initial depth from GL	=	0.300m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	1.650	0.850	
25%	0.550	1.950	
Vp75-25	=		m3
ap50	=		m2
tp75-25	=		min
Soil Infiltration, f	=	*	m/sec

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP25
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=
tp25	=

Sheet 2

Remarks Unable to claculate infiltration rate due to slow rate of soakage.

GEOTECHNICS

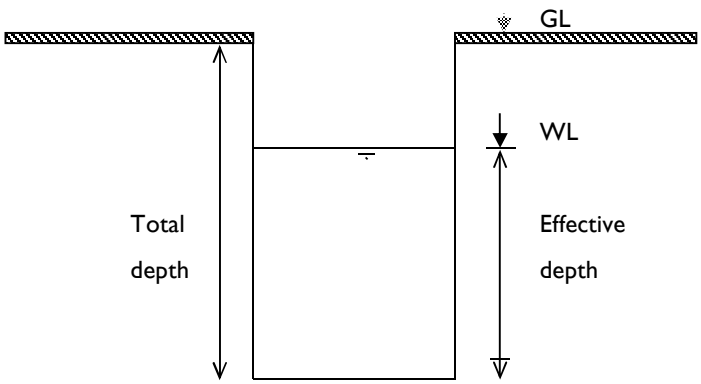
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	17/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	2.00	0.50	100.00
1.00	2.04	0.46	92.00
2.00	2.08	0.42	84.00
3.00	2.10	0.40	80.00
4.00	2.16	0.34	68.00
5.00	2.18	0.32	64.00
10.00	2.27	0.23	46.00
15.00	2.37	0.13	26.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	0.500	m

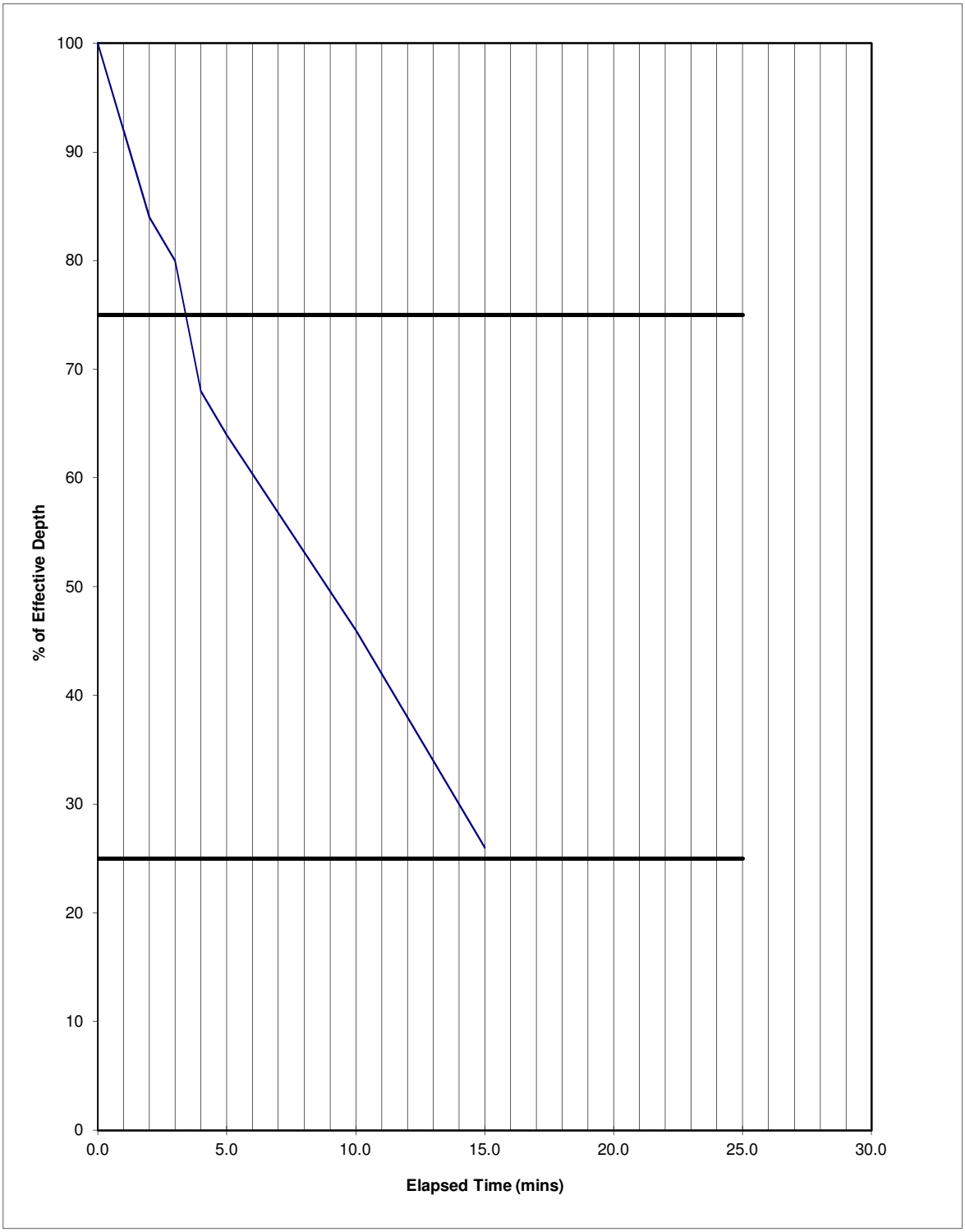
Initial depth from GL	=	2.000m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.375	2.125	3.50
25%	0.125	2.375	15.50
Vp75-25	=	0.300	m3
ap50	=	2.500	m2
tp75-25	=	12.000	min
Soil Infiltration, f	=	**1.67E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	17/11/2020



tp75	=	3.50
tp25	=	15.50

Remarks

GEOTECHNICS

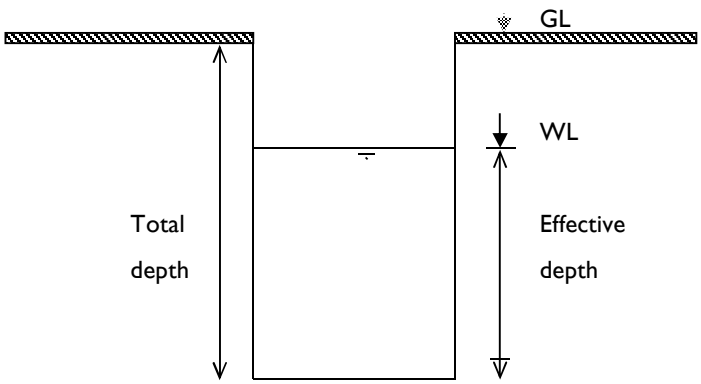
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.51	0.99	100.00
1.00	1.61	0.89	89.90
3.00	1.70	0.80	80.81
10.00	2.10	0.40	40.40
34.00	2.50	0.00	0.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	0.990	m

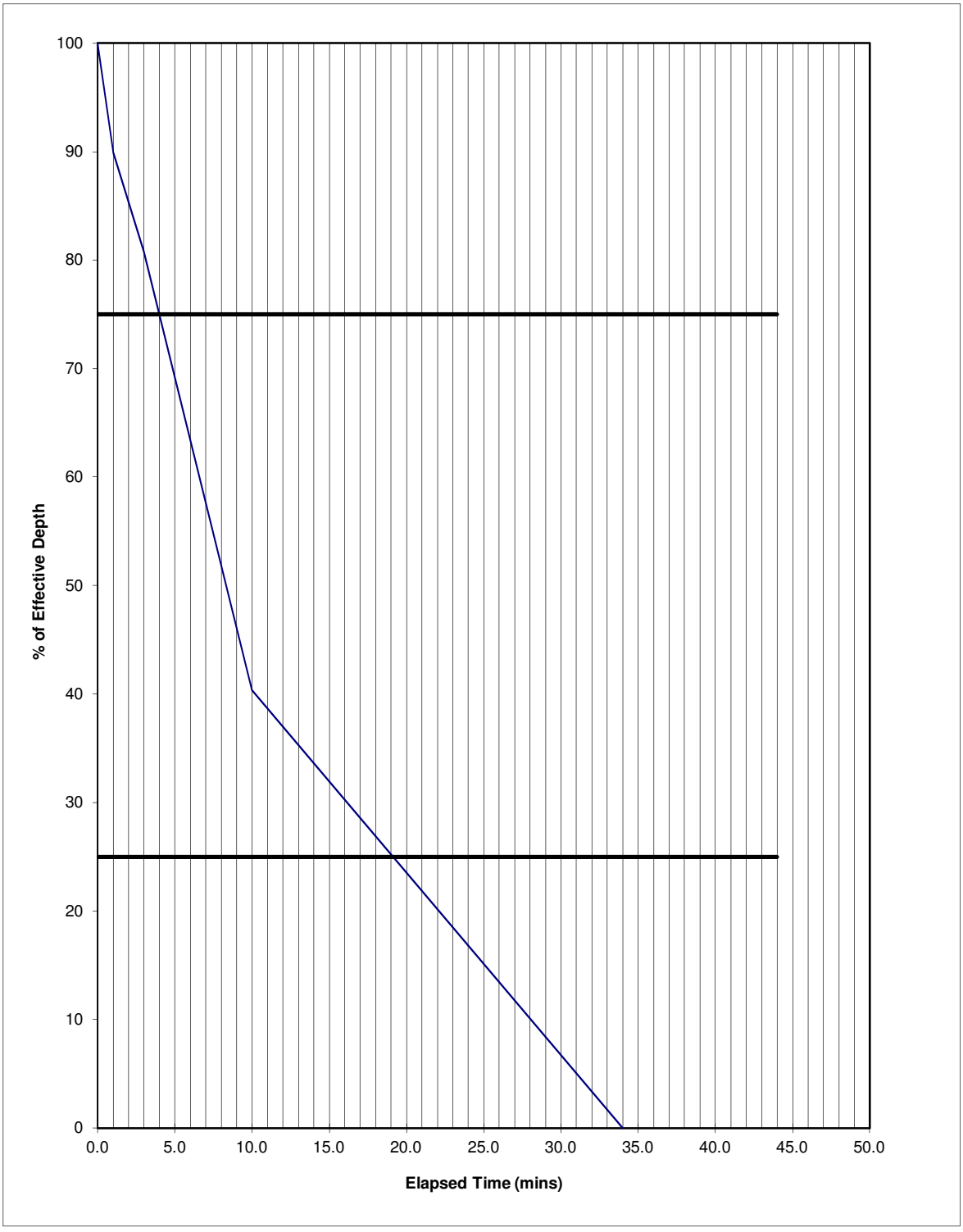
Initial depth from GL	=	1.510m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.743	1.758	4.00
25%	0.248	2.253	19.20
Vp75-25	=	0.594	m3
ap50	=	3.774	m2
tp75-25	=	15.200	min
Soil Infiltration, f	=	**1.73E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	4.00
tp25	=	19.20

Remarks

GEOTECHNICS

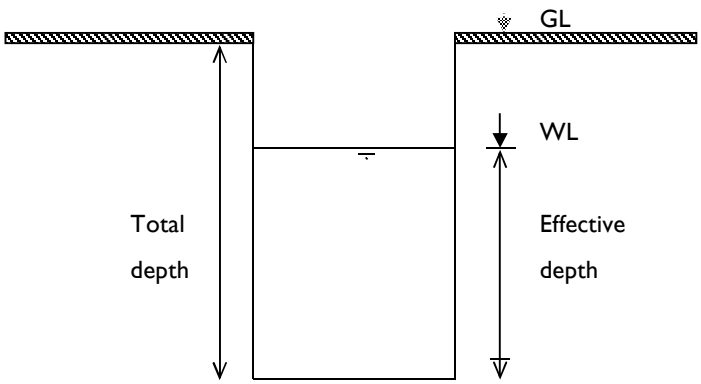
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.48	1.02	100.00
2.00	1.56	0.94	92.16
4.00	1.77	0.73	71.57
6.00	1.86	0.64	62.75
35.00	2.50	0.00	0.00

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	2.500	m
Effective depth (Head of Water)	=	1.020	m

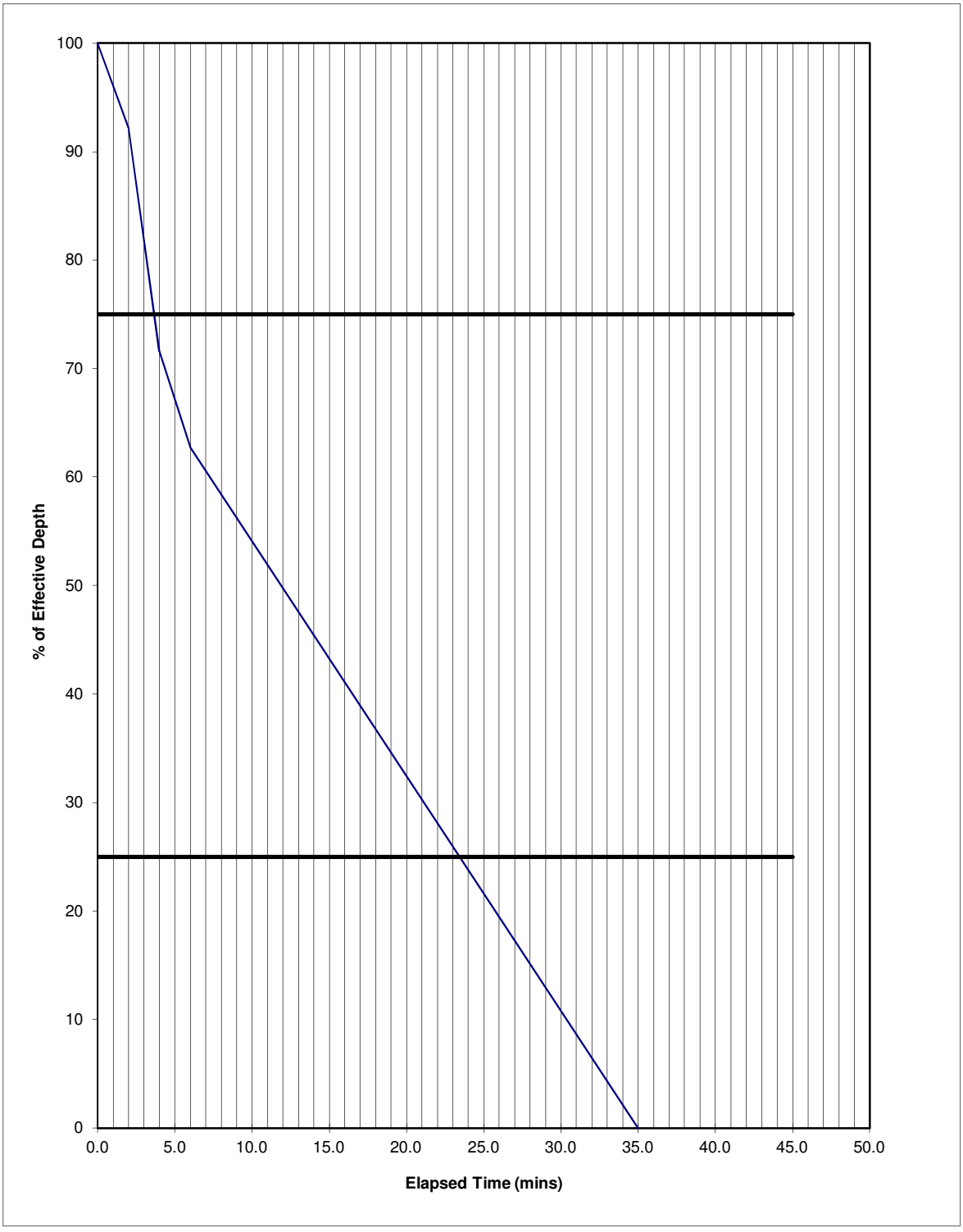
Initial depth from GL	=	1.480m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.765	1.735	3.80
25%	0.255	2.245	23.50
Vp75-25	=	0.612	m3
ap50	=	3.852	m2
tp75-25	=	19.700	min
Soil Infiltration, f	=	**1.34E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP26
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	3.80
tp25	=	23.50

Remarks

GEOTECHNICS

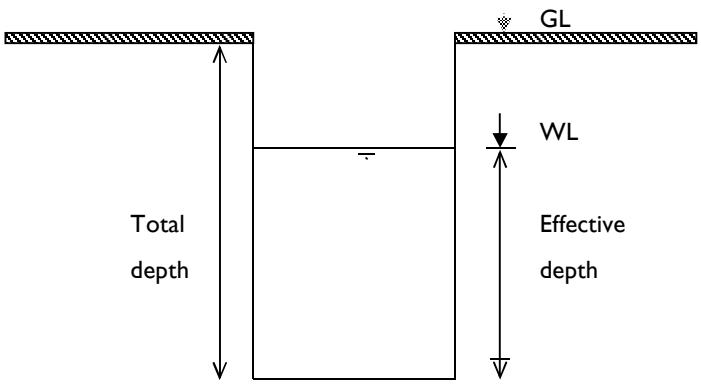
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	17/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	1.30	0.26	100.00
1.00	1.34	0.22	84.62
2.00	1.37	0.19	73.08
3.00	1.40	0.16	61.54
4.00	1.44	0.12	46.15
5.00	1.44	0.12	46.15
10.00	1.52	0.04	15.38

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.560	m
Effective depth (Head of Water)	=	0.260	m

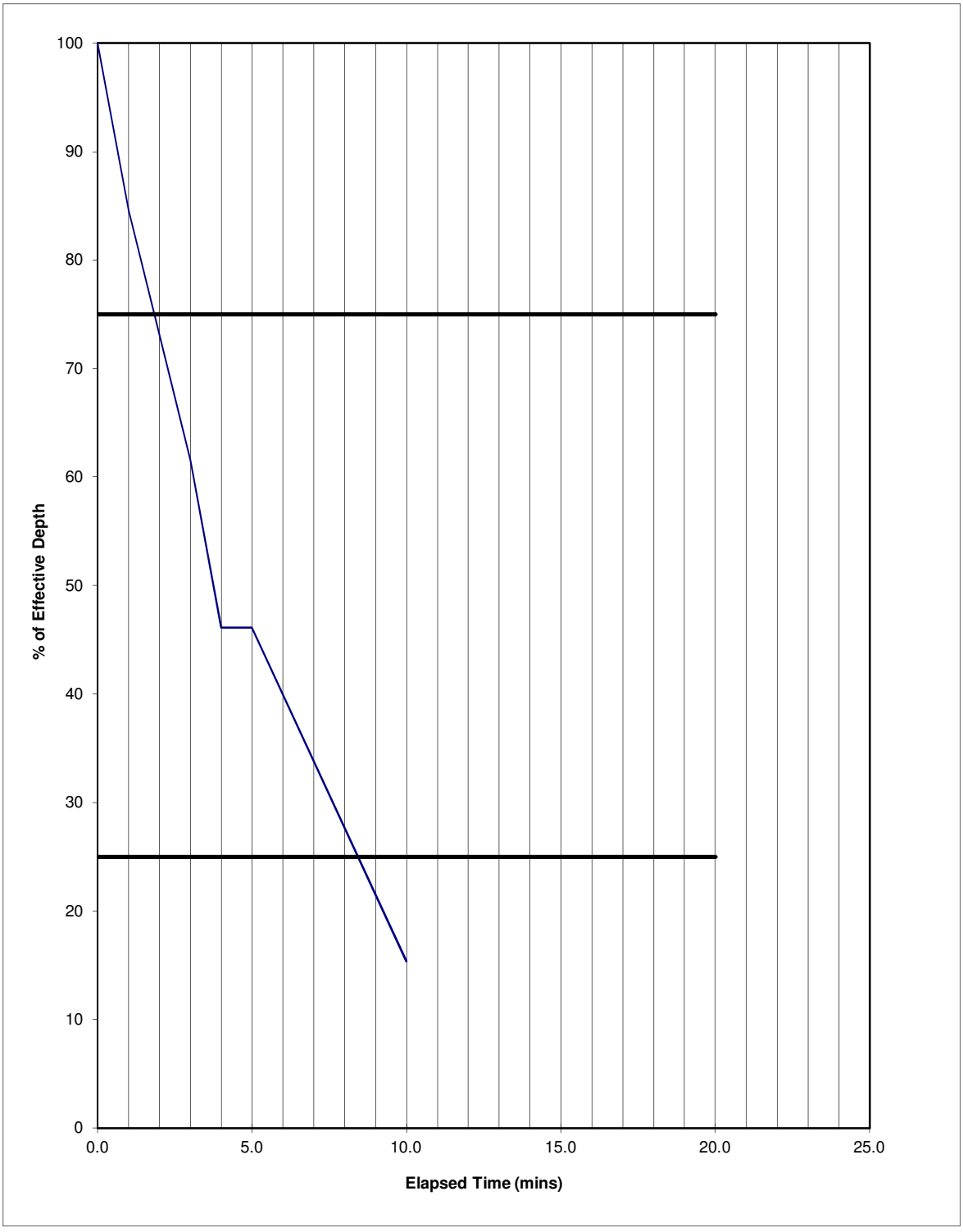
Initial depth from GL	=	1.300m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.195	1.365	1.80
25%	0.065	1.495	8.45
Vp75-25	=	0.156	m3
ap50	=	1.876	m2
tp75-25	=	6.650	min
Soil Infiltration, f	=	**2.08E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	17/11/2020



tp75	=	1.80
tp25	=	8.45

Remarks

GEOTECHNICS

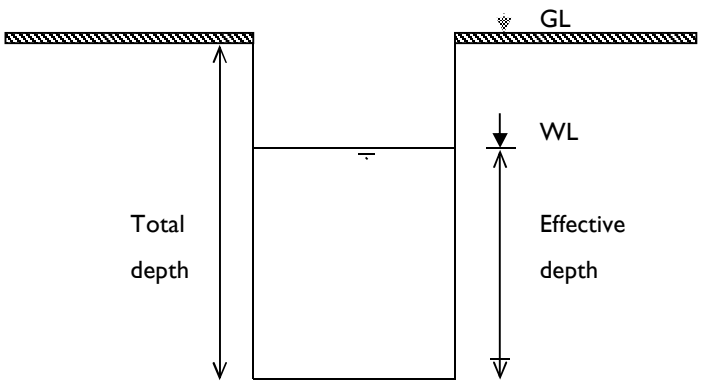
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.73	0.83	100.00
1.00	0.90	0.66	79.52
3.00	1.09	0.47	56.63
6.00	1.20	0.36	43.37
9.00	1.30	0.26	31.33
11.00	1.34	0.22	26.51
17.00	1.48	0.08	9.64

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.560	m
Effective depth (Head of Water)	=	0.830	m

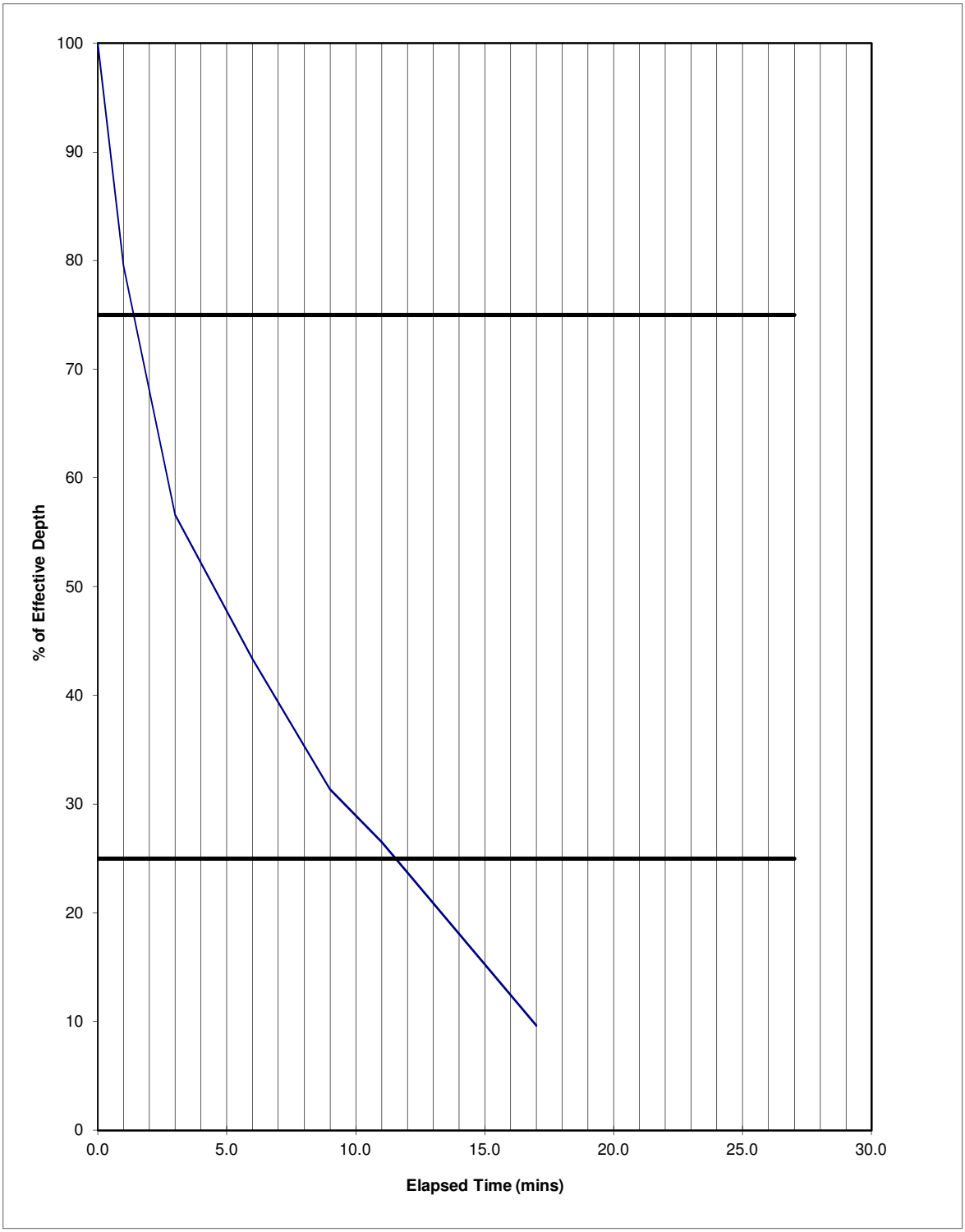
Initial depth from GL	=	0.730m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.623	0.938	1.45
25%	0.208	1.353	11.50
Vp75-25	=	0.498	m3
ap50	=	3.358	m2
tp75-25	=	10.050	min
Soil Infiltration, f	=	**2.46E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	1.45
tp25	=	11.50

Remarks

GEOTECHNICS

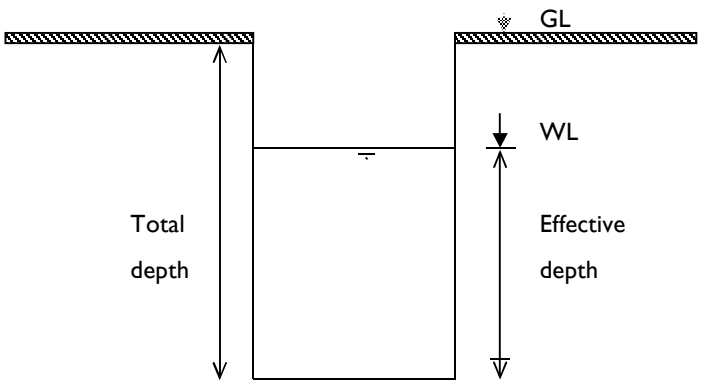
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.54	1.02	100.00
1.00	0.67	0.89	87.25
2.00	0.76	0.80	78.43
3.00	0.86	0.70	68.63
4.00	0.92	0.64	62.75
5.00	0.97	0.59	57.84
10.00	1.02	0.54	52.94
16.00	1.45	0.11	10.78

TRIAL PIT SOAKAWAY



Trial pit length	=	2.000	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.560	m
Effective depth (Head of Water)	=	1.020	m

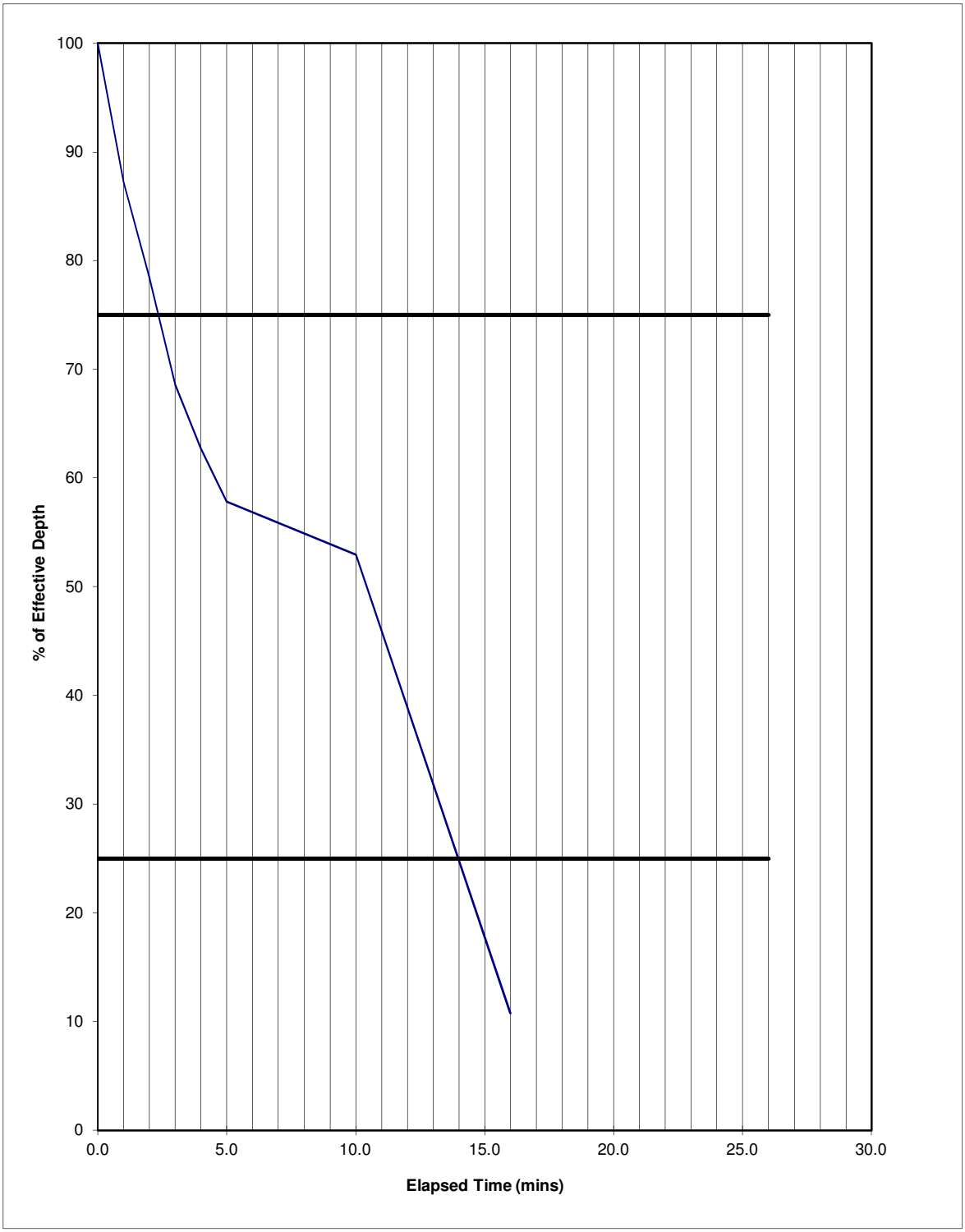
Initial depth from GL	=	0.540m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.765	0.795	2.30
25%	0.255	1.305	14.00
Vp75-25	=	0.612	m3
ap50	=	3.852	m2
tp75-25	=	11.700	min
Soil Infiltration, f	=	**2.26E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP27
		Test No	3
		Project No	PE201667
Client	WSP UK Limited	Date	18/11/2020



tp75	=	2.30
tp25	=	14.00

Remarks

GEOTECHNICS

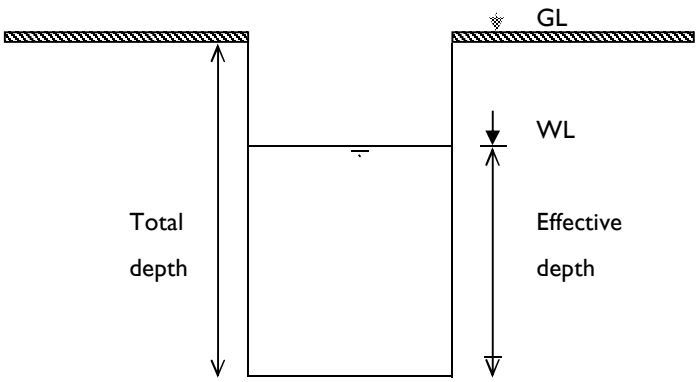
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP28
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	19/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.89	0.81	100.00
1.00	0.79	0.91	112.35
2.00	1.01	0.69	85.19
3.00	1.08	0.62	76.54
5.00	1.19	0.51	62.96
10.00	1.31	0.39	48.15
17.00	1.50	0.20	24.69

TRIAL PIT SOAKAWAY



Trial pit length	=	2.200	m
Trial pit width	=	0.600	m
Trial pit depth	=	1.700	m
Effective depth (Head of Water)	=	0.810	m

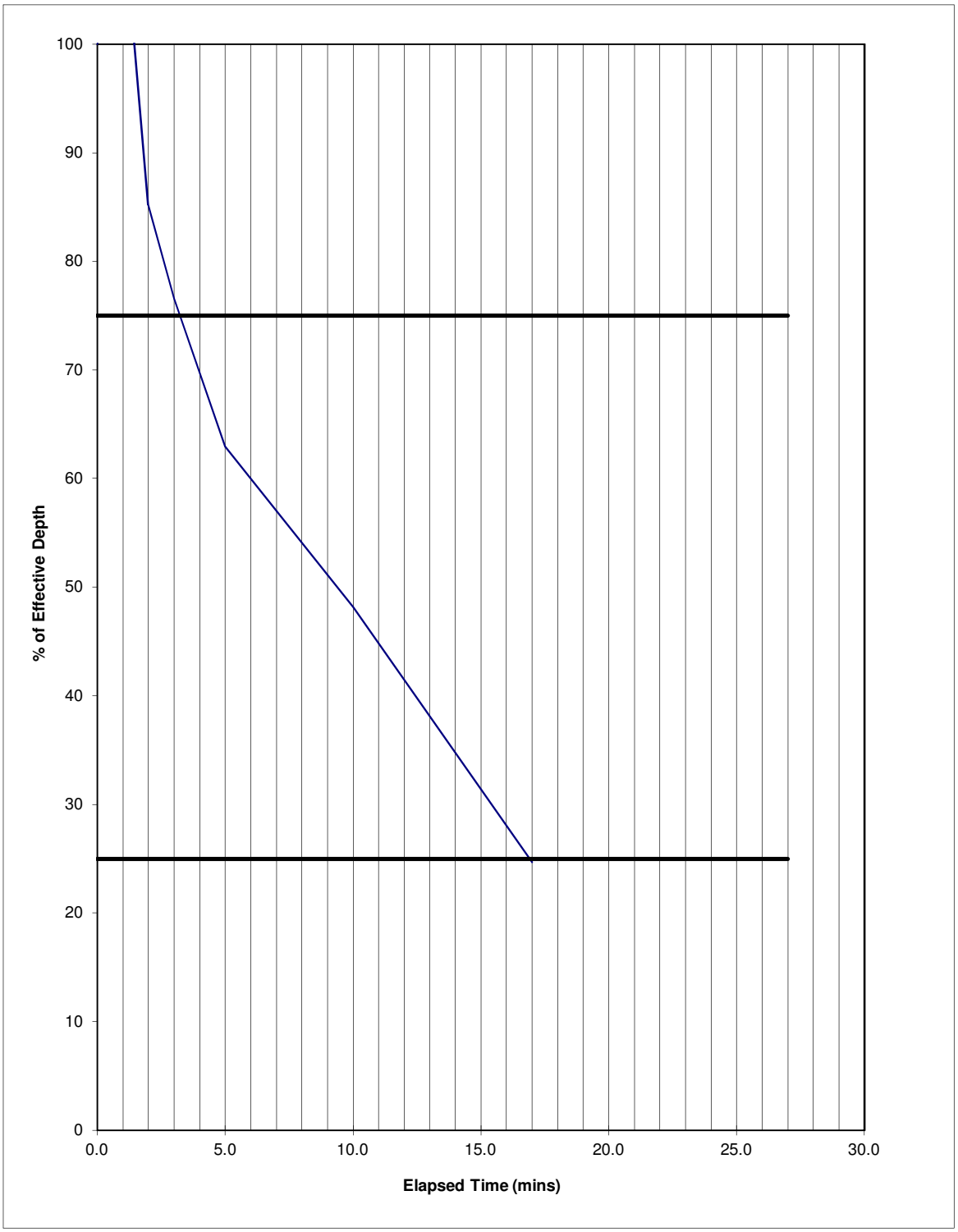
Initial depth from GL	=	0.890m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.608	1.093	3.30
25%	0.203	1.498	16.90
Vp75-25	=	0.535	m3
ap50	=	3.588	m2
tp75-25	=	13.600	min
Soil Infiltration, f	=	**1.83E-04**	m/sec

Remarks

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP28
		Test No	1
		Project No	PE201667
Client	WSP UK Limited	Date	19/11/2020



tp75	=	3.30
tp25	=	16.90

Remarks

GEOTECHNICS

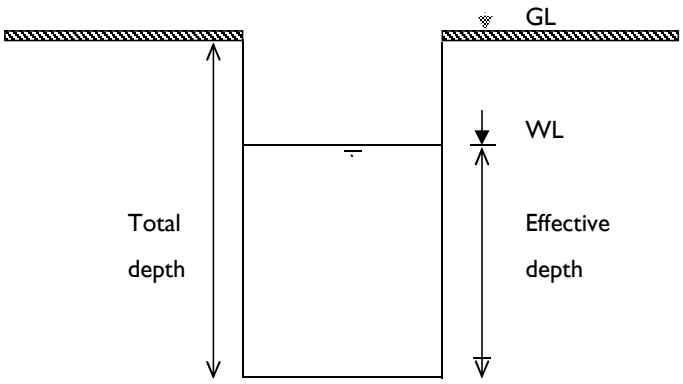
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP28
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	13/11/2020

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.75	0.85	100.00
1.00	0.85	0.75	88.24
2.00	0.91	0.69	81.18
3.00	0.99	0.61	71.76
6.00	1.09	0.51	60.00
11.00	1.21	0.39	45.88
13.00	1.23	0.37	43.53

TRIAL PIT SOAKAWAY



Trial pit length	=	2.200	m
Trial pit width	=	1.000	m
Trial pit depth	=	1.600	m
Effective depth (Head of Water)	=	0.850	m

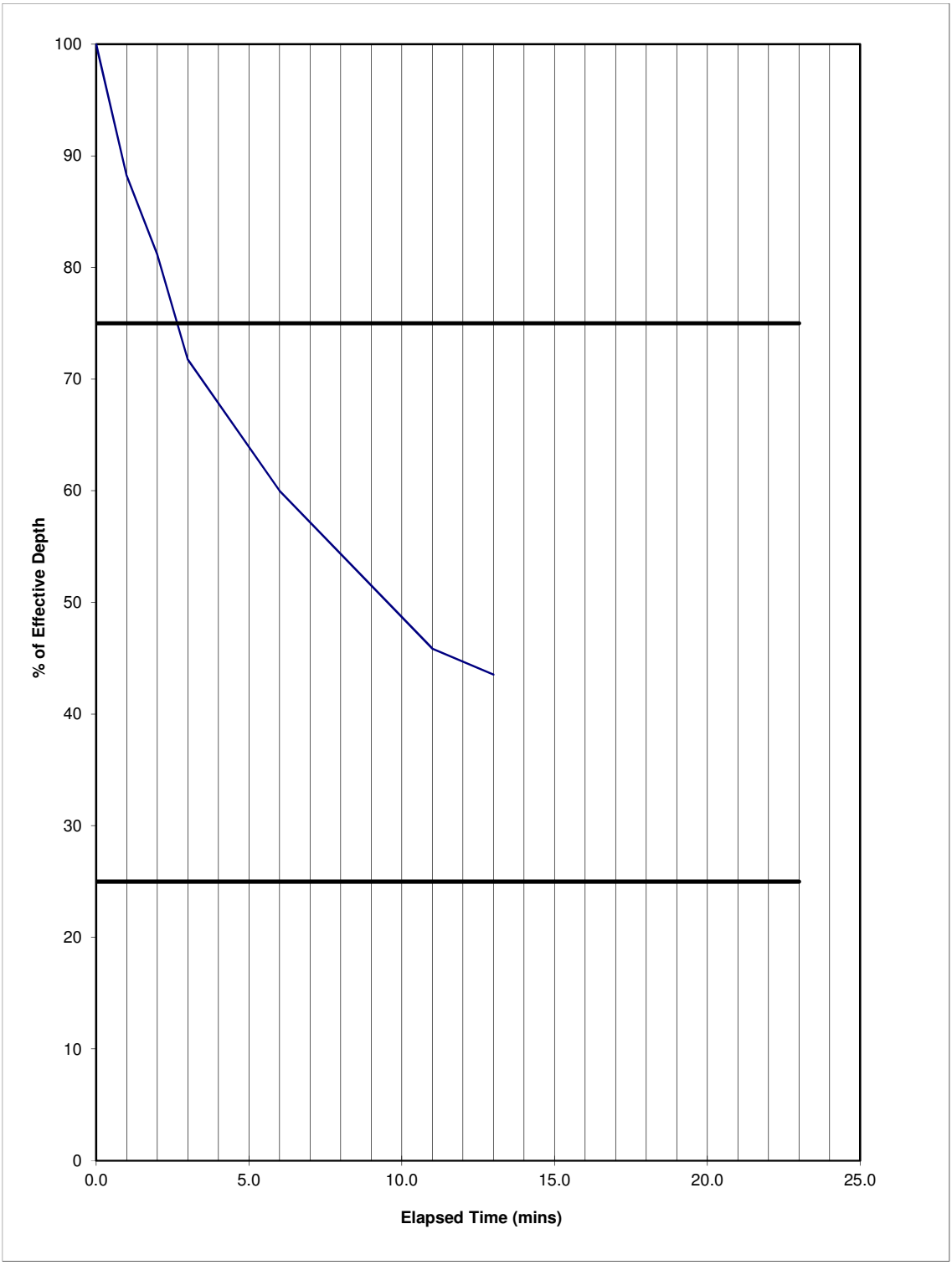
Initial depth from GL	=	0.750m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.638	0.963	2.75
25%	0.213	1.388	25.00
Vp75-25	=	0.935	m3
ap50	=	4.920	m2
tp75-25	=	22.250	min
Soil Infiltration, f	=	**1.42E-04**	m/sec

Remarks Trial Pit collapsed prior to end of soakaway test. Infiltration Rate is approximate only based on extrapolated value.

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Aquind Drainage Design Additional GI	Trial Pit	TP28
		Test No	2
		Project No	PE201667
Client	WSP UK Limited	Date	13/11/2020



tp75	=	2.75
tp25	=	25.00

Remarks Trial Pit collapsed prior to end of soakaway test. Infiltration Rate is approximate only based on extrapolated value.

GEOTECHNICS

APPENDIX 10

Geotechnical Laboratory Testing Results

Certificate of Analysis

Certificate Number	20-25331	*Issued:*	16-Dec-20

Client MATTest Ltd.
10 Queenslie Point
120 Stepps Road
Glasgow
G33 3NQ

Our Reference	20-25331
Client Reference	20/1161
Order No	MATSC3205
Contract Title	Aquind Drainage Design
Description	2 Soil samples.
Date Received	10-Dec-20
Date Started	10-Dec-20
Date Completed	16-Dec-20
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 20-25331
Client Ref 20/1161
Contract Title Aquind Drainage Design

Lab No	1775018	1775019
.Sample ID	TP26	TP26
Depth	0.50	1.50
Other ID		
Sample Type	SOIL	SOIL
Sampling Date	n/s	n/s
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Inorganics					
pH	DETSC 2008#		pH	7.1	7.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	14	14

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 20-25331
Client Ref 20/1161
Contract Aquind Drainage Design

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1775018	TP26 0.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
1775019	TP26 1.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

LABORATORY TEST CERTIFICATE

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **20/1161 - 01**

To : **Anne Simpson**

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 5 Orchard Road, Heron Road
Sowton Industrial Estate
Exeter, Devon
EX2 7NR

Dear Sirs,

LABORATORY TESTING OF SOIL

Introduction

We refer to samples taken from Aquind Drainage Design, Additional Investigation and delivered to our laboratory on 07th December 2020.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	See Page 2 to Page 3 inclusive
Date Sampled	:	Not Supplied
Date Tested	:	07th December 2020 Onwards
Source	:	PE201667 - Aquind Drainage Design, Additional Investigation

Test Results;

As Detailed On Page 2 to Page 34 inclusive

Comments;

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks;

Approved for Issue

Date 22/12/2020

T McLelland (Director)

2643

TRIAL PIT	SAMPLE	DEPTH (m)	SAMPLE DESCRIPTION
TP21	D	0.50	Brown gravelly slightly sandy silty CLAY. Gravel is fine to coarse.
TP21	LB	0.50-1.00	Brown gravelly very sandy very silty CLAY. Gravel is fine to coarse.
TP22	D	1.50	Off-white clayey fine to coarse highly weathered CHALK.
TP24	LB	0.45-1.60	Off-white clayey fine to coarse highly weathered CHALK.
TP25	LB	0.20-1.00	Brown very gravelly slightly sandy very silty CLAY with root fibres. Gravel is fine to coarse.
TP25	D	0.50	Brown gravelly slightly sandy silty CLAY. Gravel is fine to medium.
TP26	B	1.00-1.50	Off-white clayey fine to coarse highly weathered CHALK.
TP26	D	1.50	Off-white clayey fine to coarse highly weathered CHALK.
TP26	D	2.00-2.50	Off-white clayey fine to coarse highly weathered CHALK.
TP27	LB	0.30-0.60	Brown gravelly slightly sandy silty CLAY. Gravel is fine to coarse.
TP27	B	1.00-1.50	Off-white clayey fine to coarse highly weathered CHALK.
TP27	D	1.30	Off-white clayey fine to coarse highly weathered CHALK.
TP28	B	0.30-1.00	Brown fine to coarse SAND and GRAVEL.
TP28	B	1.00-1.70	Brown fine to coarse SAND and GRAVEL with chalk fragments.

SUMMARY OF SAMPLE DESCRIPTIONS

BOREHOLE	SAMPLE	DEPTH (m)	SAMPLE DESCRIPTION
BH40	D	0.50	Brown gravelly slightly sandy silty CLAY. Gravel is fine to medium.
BH40	B	0.60-1.00	Brown slightly gravelly slightly sandy very silty CLAY with chalk fragments. Gravel is fine to coarse.
BH40	B	1.50-3.00	Off-white clayey fine to coarse highly weathered CHALK.
BH41	B	1.40-2.00	Off-white clayey fine to coarse highly weathered CHALK.
BH41	B	2.20-4.50	Off-white very clayey fine to coarse highly weathered CHALK.
BH41	UT	3.20-3.80	Off-white very clayey fine to coarse highly weathered CHALK.
BH41	B	4.50-5.50	Off-white very clayey fine to coarse highly weathered CHALK.
BH42	B	1.48-2.20	Off-white very clayey fine to coarse highly weathered CHALK.
BH42	D	1.48-1.60	Off-white very clayey fine to coarse highly weathered CHALK.
BH42	B	2.70-4.00	Off-white very clayey fine to coarse highly weathered CHALK.
BH42	UT	4.50-5.10	Off-white clayey fine to coarse highly weathered CHALK.
BH42	D	5.90-6.10	Off-white clayey fine to coarse highly weathered CHALK.
BH42	DSPT	6.10-6.55	Off-white clayey fine to coarse highly weathered CHALK.
BH43	B	0.30-0.40	Reddish brown very silty fine to coarse CRUSHED ROCK / BLAES.
BH43	B	1.20-3.00	Brown fine to coarse SAND and GRAVEL with chalk fragments.

SUMMARY OF SAMPLE DESCRIPTIONS

TRIAL PIT	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)
TP21	D	0.50	22
TP25	D	0.50	21
TP26	D	1.50	27
TP28	B	0.30-1.00	2.2

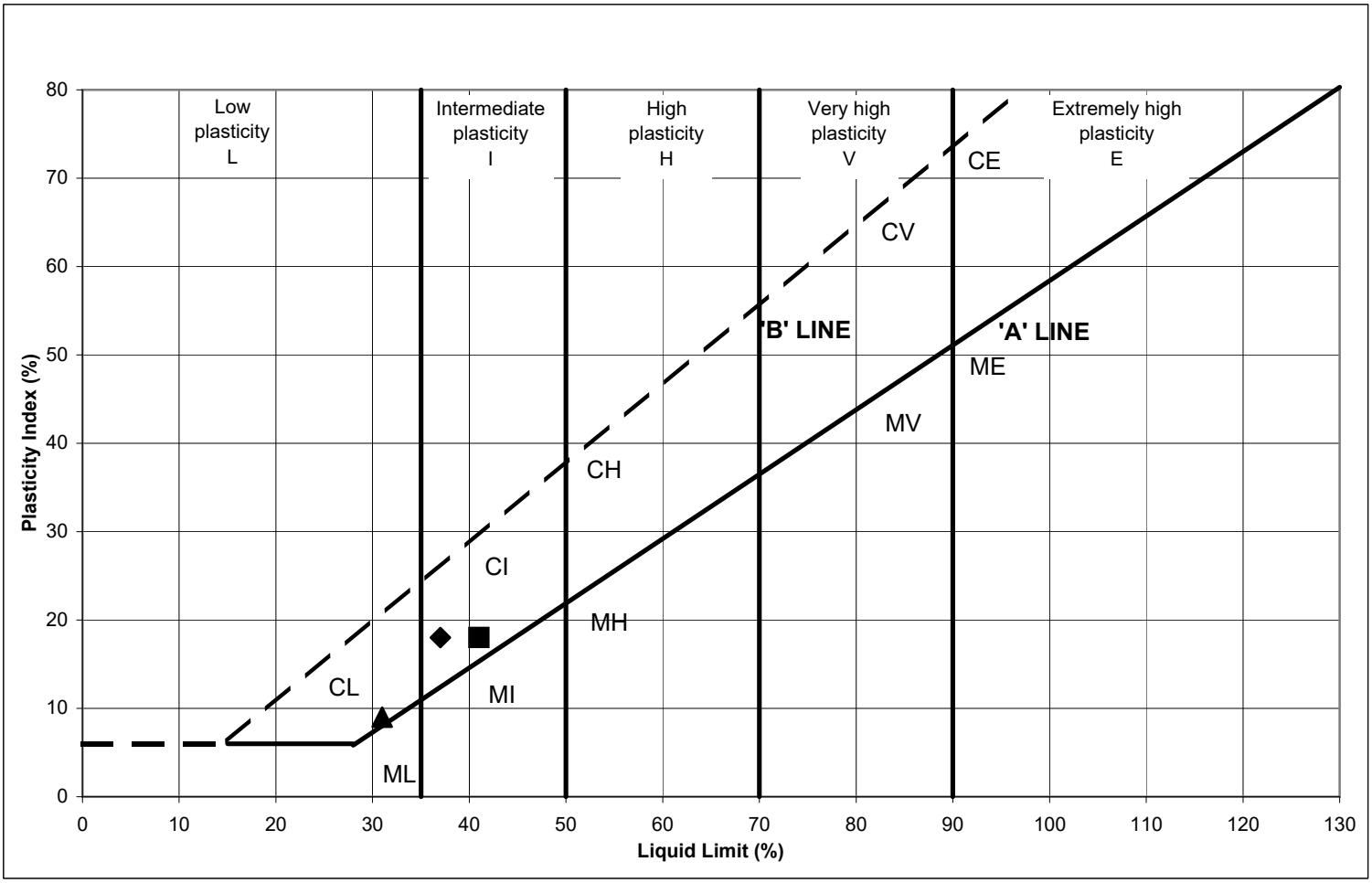
Tested in accordance with BS 1377: Part 2: 1990: Clause 3

SUMMARY OF MOISTURE CONTENT TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)
BH40	D	0.50	22
BH41	UT	3.20-3.80	18
BH42	D	1.48-1.60	26
BH42	D	5.90-6.10	28
BH43	B	0.30-0.40	6.9
BH43	B	1.20-3.00	7.6

Tested in accordance with BS 1377: Part 2: 1990: Clause 3

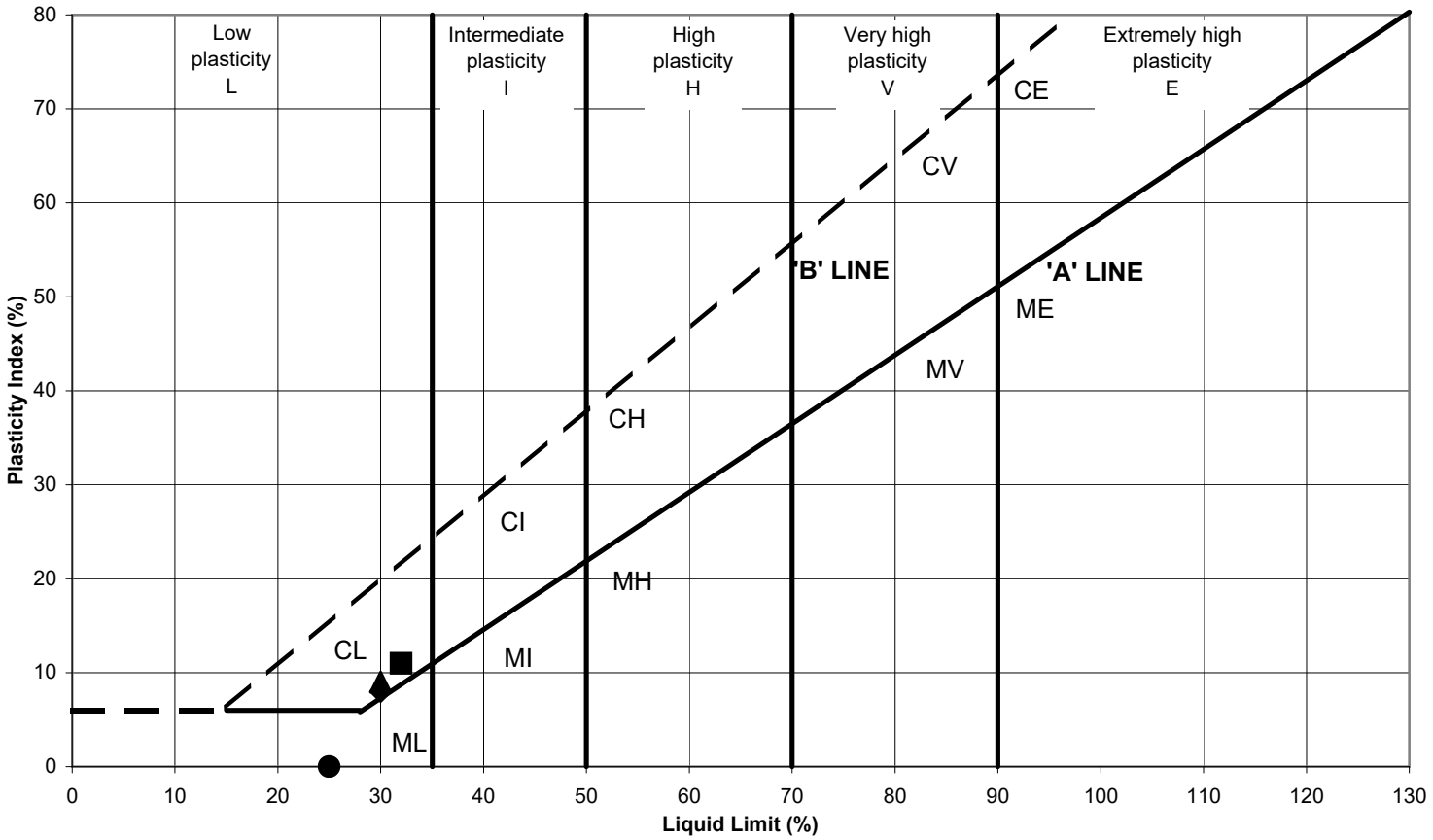
SUMMARY OF MOISTURE CONTENT TEST RESULTS



Symbol	Trial Pit	Sample	Depth	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing 0.425mm Sieve	Remarks
■	TP21	D	0.50	22	41	23	18	62	Clay with intermediate plasticity
◆	TP25	D	0.50	21	37	19	18	71	Clay with intermediate plasticity
▲	TP26	D	1.50	27	31	22	9	83	Clay with low plasticity
●									
□									
◇									
△									
○									
×									
✳									

All samples were tested in accordance with BS 1377 : Part 2 : 1990 Clause 4.3, 5.3 and 5.4.
All samples were washed on a 0.425mm test sieve prior to test.

SUMMARY OF ATTERBERG LIMITS TEST RESULTS

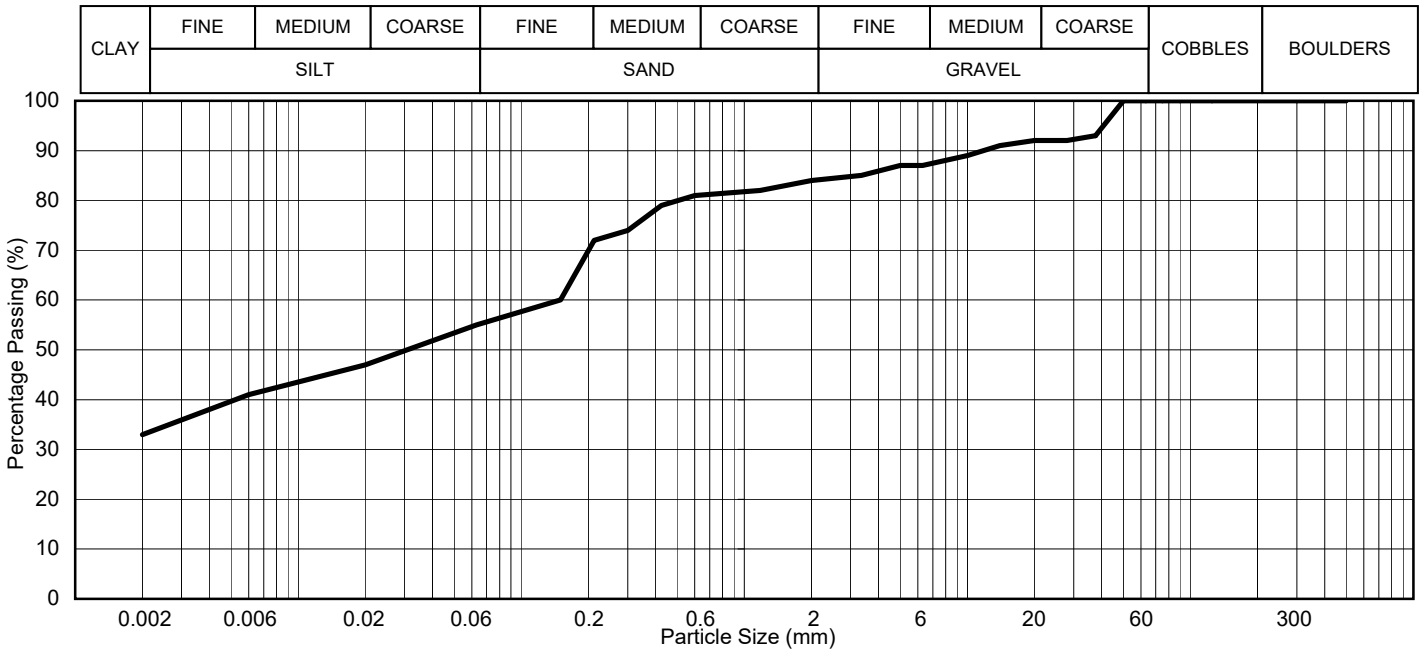


Symbol	Borehole	Sample	Depth	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing 0.425mm Sieve	Remarks
■	BH40	D	0.50	22	32	21	11	63	Clay with low plasticity
◆	BH42	D	1.48-1.60	26	30	22	8	56	Clay with low plasticity
▲	BH42	D	5.90-6.10	28	30	21	9	94	Clay with low plasticity
●	BH43	B	1.20-3.00	7.6	25	Non Plastic	Non Plastic	27	
□									
◇									
△									
○									
×									
✳									

All samples were tested in accordance with BS 1377 : Part 2 : 1990 Clause 4.3, 5.3 and 5.4.
All samples were washed on a 0.425mm test sieve prior to test.

SUMMARY OF ATTERBERG LIMITS TEST RESULTS

Borehole	TP21
Sample	LB
Depth (m)	0.50-1.00



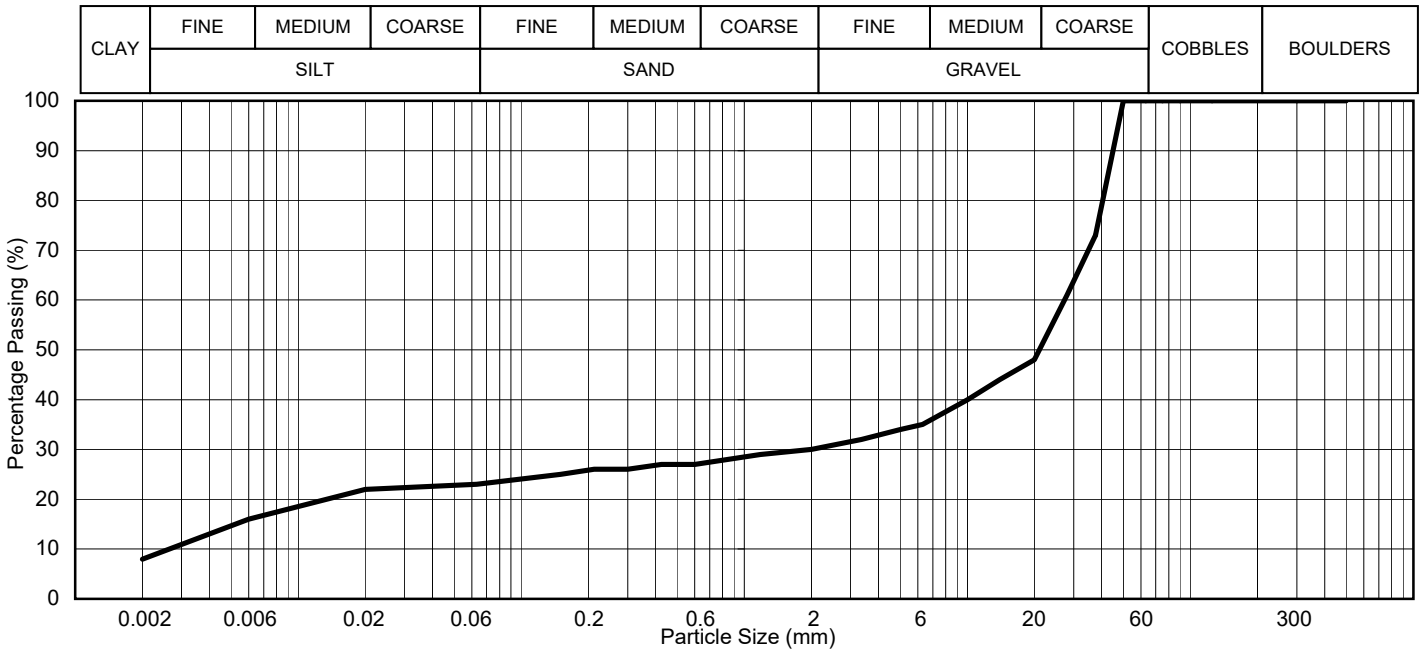
SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	47
300.0	100	-	-	0.006	41
125.0	100	-	-	0.002	33
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	93	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	92	-	-		
20.0	92	-	-		
14.0	91	-	-		
10.0	89	-	-	**PERCENTAGE SOIL TYPES**	
6.30	87	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	87	-	-		
3.35	85	-	-	33 / 22 / 29 / 16 / 0	
2.00	84	-	-		
1.18	82	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	81	-	-	**D10** / **D60** / **Specification**	
0.425	79	-	-		
0.300	74	-	-	- / -	
0.212	72	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	60	-	-		
0.063	55	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

SIEVE ANALYSIS AND SEDIMENTATION - BS 1377 : PART 2 : 1990 : CLAUSE 9.2 & 9.4

Borehole	TP22
Sample	D
Depth (m)	1.50



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	22
300.0	100	-	-	0.006	16
125.0	100	-	-	0.002	8
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	73	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	61	-	-		
20.0	48	-	-		
14.0	44	-	-		
10.0	40	-	-	**PERCENTAGE SOIL TYPES**	
6.30	35	-	-		
5.00	34	-	-		
3.35	32	-	-		
2.00	30	-	-		
1.18	29	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	27	-	-		
0.425	27	-	-		
0.300	26	-	-		
0.212	26	-	-		
0.150	25	-	-		
0.063	23	-	-		

CLAY	SILT ₸	SAND	GRAVEL	COBBLES
8	15	7	70	0

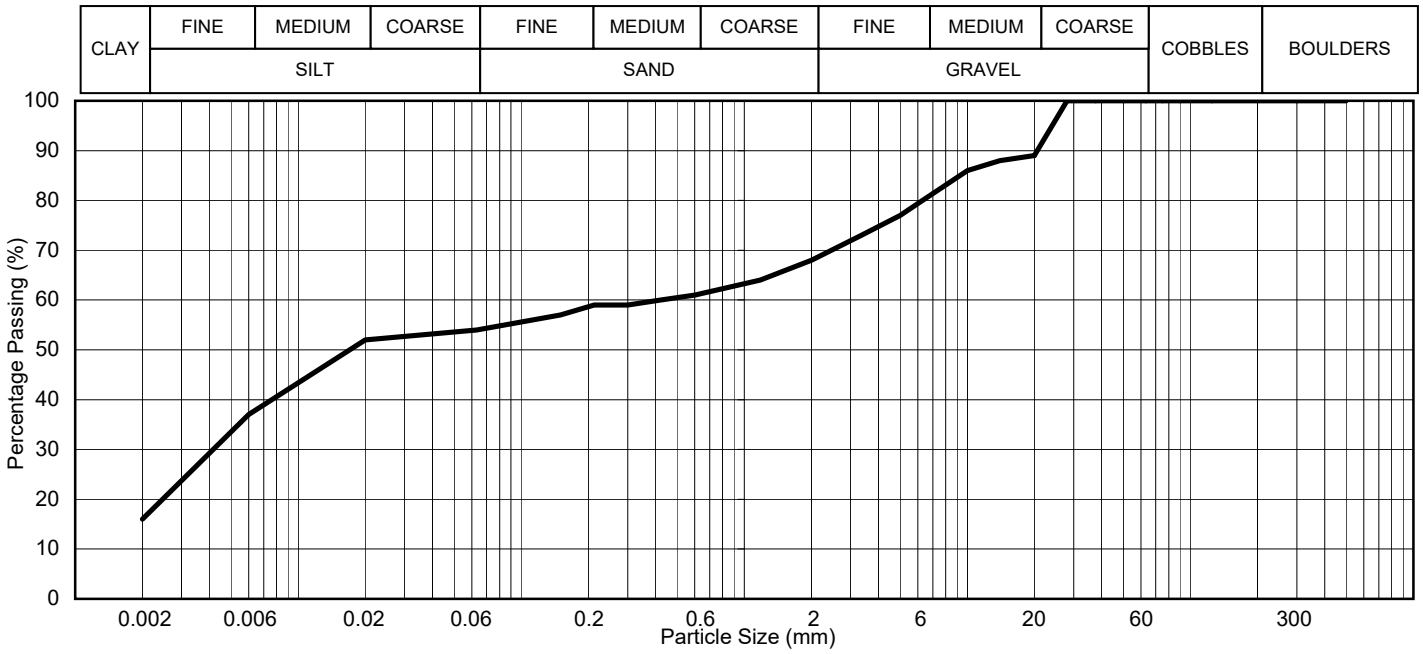
D10	D60	Specification
-	-	
UNIFORMITY COEFFICIENT	-	-

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Sample does not meet minimum mass requirement for material type

Borehole	TP24
Sample	LB
Depth (m)	0.45-1.60



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	52
300.0	100	-	-	0.006	37
125.0	100	-	-	0.002	16
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	100	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	100	-	-		
20.0	89	-	-		
14.0	88	-	-		
10.0	86	-	-	**PERCENTAGE SOIL TYPES**	
6.30	80	-	-		
5.00	77	-	-		
3.35	73	-	-		
2.00	68	-	-		
1.18	64	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	61	-	-		
0.425	60	-	-		
0.300	59	-	-		
0.212	59	-	-		
0.150	57	-	-		
0.063	54	-	-		

CLAY	SILT ₸	SAND	GRAVEL	COBBLES
16	38	14	32	0

D10	D60	Specification
-	-	
UNIFORMITY COEFFICIENT	-	-

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

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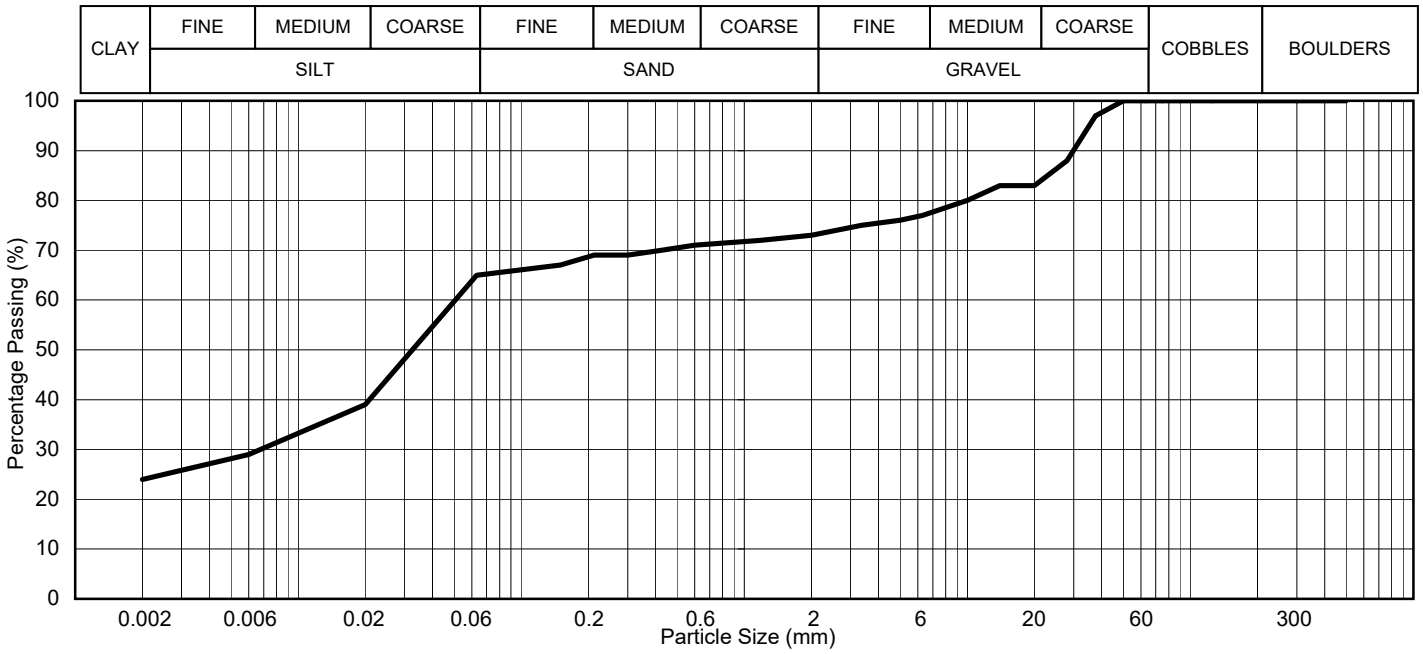
Borehole	TP25
Sample	LB
Depth (m)	0.20-1.00



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	39
300.0	100	-	-	0.006	29
125.0	100	-	-	0.002	24
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	97	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	88	-	-		
20.0	83	-	-		
14.0	83	-	-		
10.0	80	-	-	**PERCENTAGE SOIL TYPES**	
6.30	77	-	-		
5.00	76	-	-		
3.35	75	-	-		
2.00	73	-	-		
1.18	72	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	71	-	-		
0.425	70	-	-		
0.300	69	-	-		
0.212	69	-	-		
0.150	67	-	-		
0.063	65	-	-		

CLAY	SILT ₸	SAND	GRAVEL	COBBLES
24	41	8	27	0

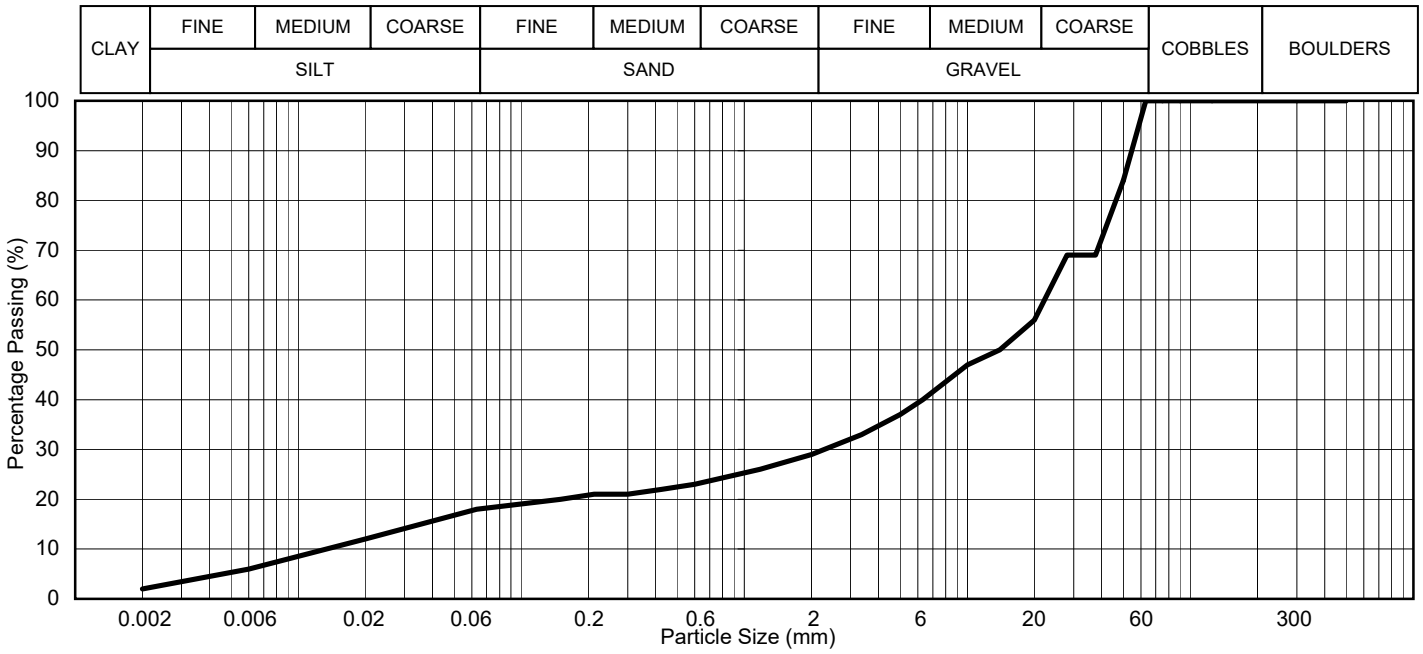
D10	D60	Specification
-	-	
UNIFORMITY COEFFICIENT	-	-

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Sample does not meet minimum mass requirement for material type

Borehole	TP26
Sample	D
Depth (m)	2.00-2.50



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	12
300.0	100	-	-	0.006	6
125.0	100	-	-	0.002	2
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	84	-	-		
37.5	69	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	69	-	-		
20.0	56	-	-		
14.0	50	-	-		
10.0	47	-	-	**PERCENTAGE SOIL TYPES**	
6.30	40	-	-		
5.00	37	-	-		
3.35	33	-	-		
2.00	29	-	-		
1.18	26	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	23	-	-		
0.425	22	-	-		
0.300	21	-	-		
0.212	21	-	-		
0.150	20	-	-		
0.063	18	-	-		

CLAY	SILT ₸	SAND	GRAVEL	COBBLES
2	16	11	71	0

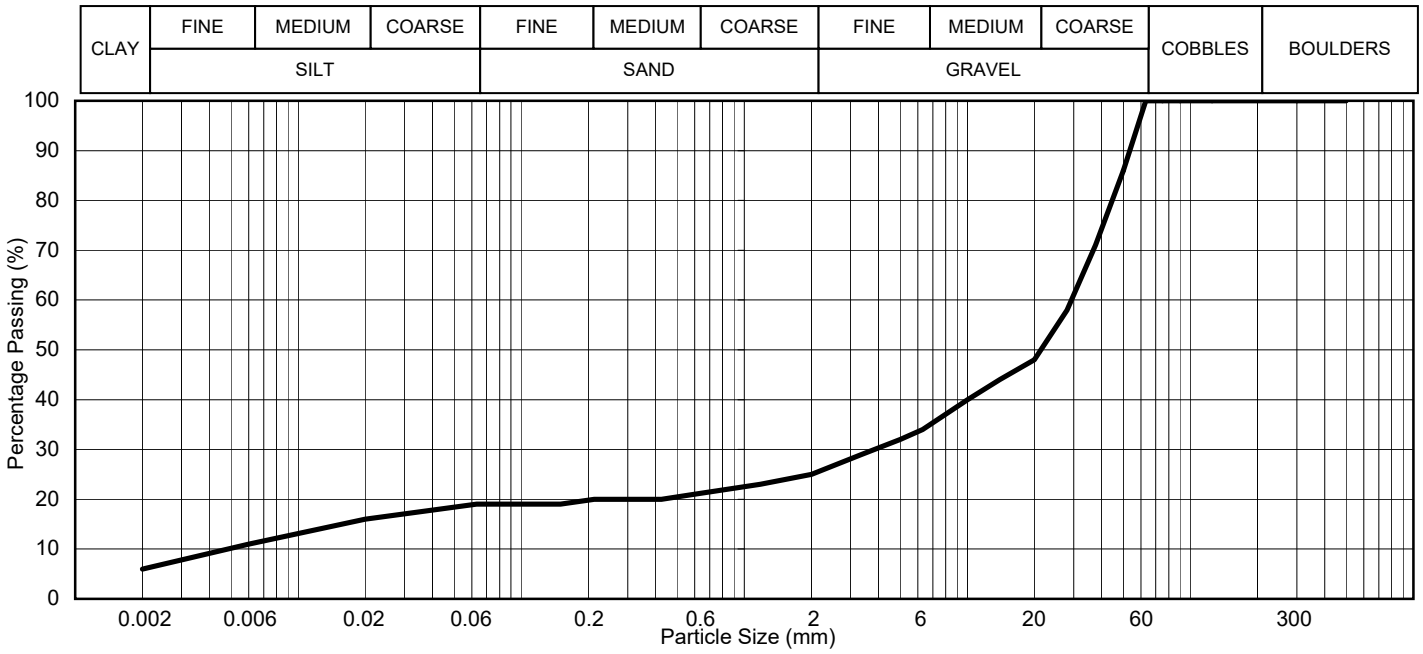
D10	D60	Specification
-	-	
UNIFORMITY COEFFICIENT	-	-

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Sample does not meet minimum mass requirement for material type

Borehole	TP27
Sample	B
Depth (m)	1.00-1.50



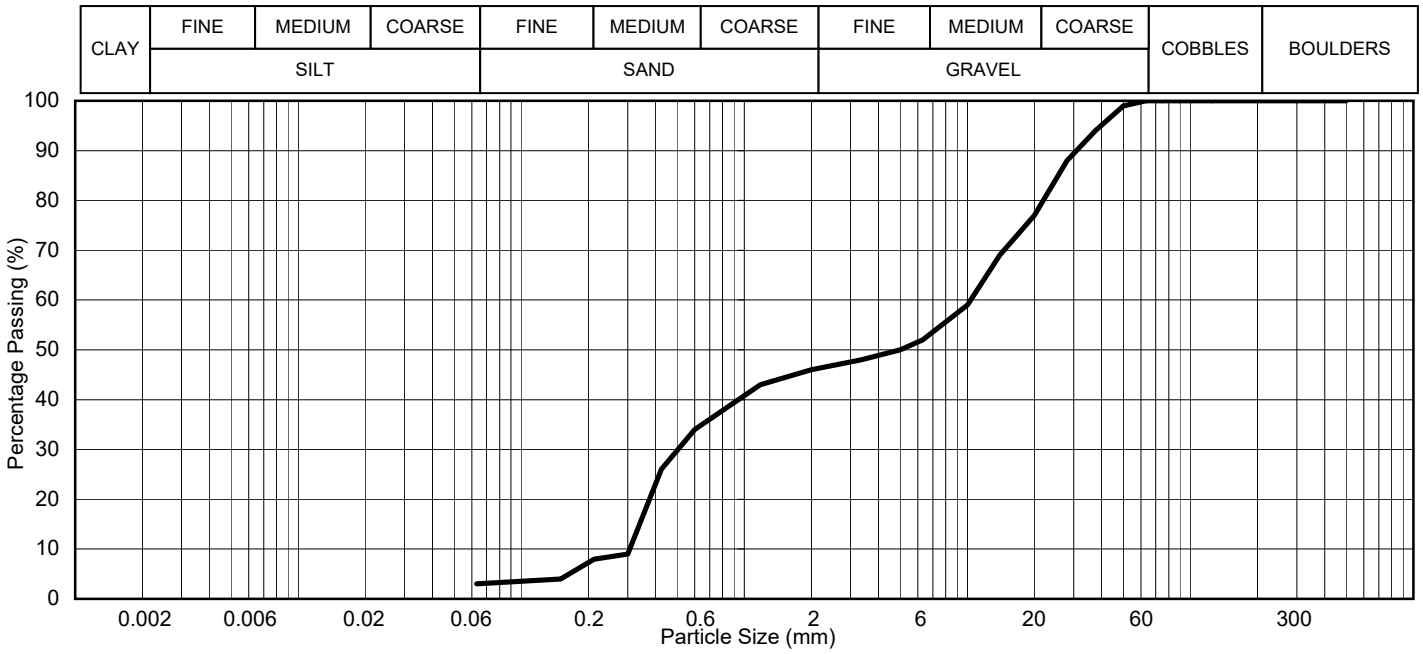
SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	16
300.0	100	-	-	0.006	11
125.0	100	-	-	0.002	6
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	86	-	-		
37.5	71	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	58	-	-		
20.0	48	-	-		
14.0	44	-	-		
10.0	40	-	-	**PERCENTAGE SOIL TYPES**	
6.30	34	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	32	-	-		
3.35	29	-	-	6 / 13 / 6 / 75 / 0	
2.00	25	-	-		
1.18	23	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	21	-	-	**D10** / **D60** / **Specification**	
0.425	20	-	-		
0.300	20	-	-	- / -	
0.212	20	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	19	-	-		
0.063	19	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Sample does not meet minimum mass requirement for material type

Borehole	TP28
Sample	B
Depth (m)	1.00-1.70



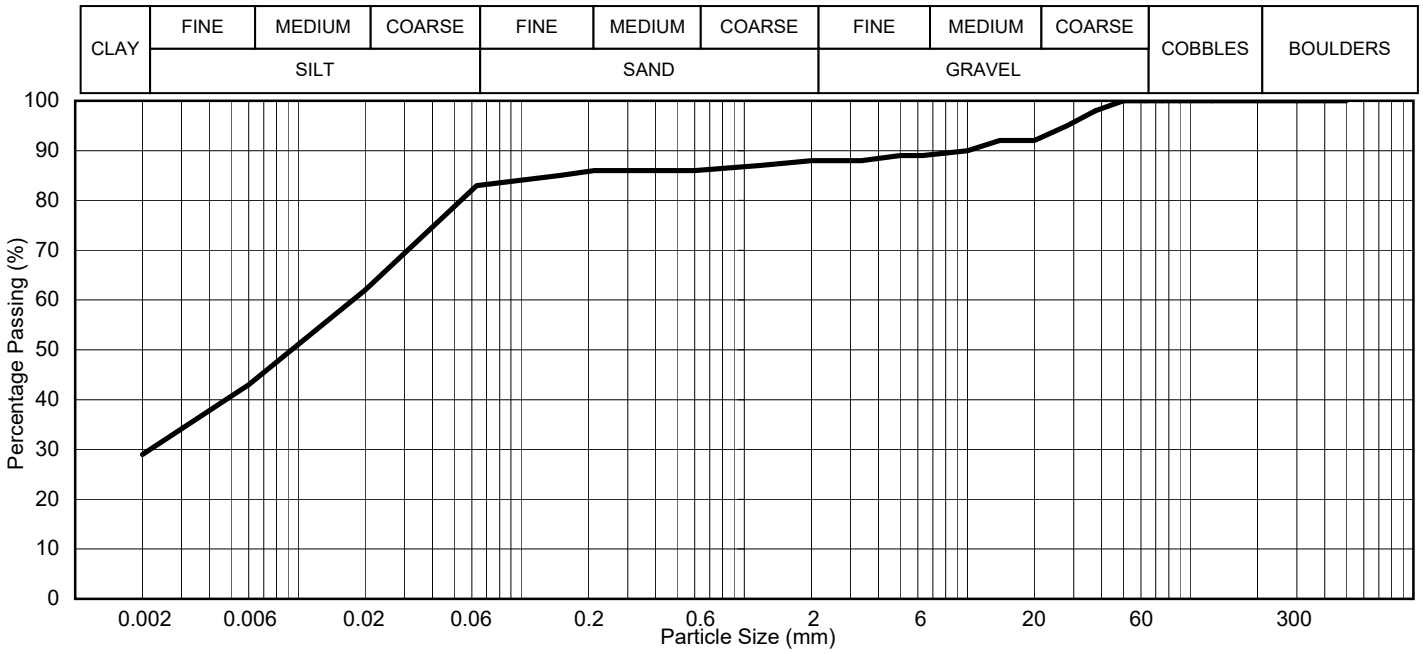
SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	
300.0	100	-	-	0.006	
125.0	100	-	-	0.002	
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	99	-	-		
37.5	94	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	88	-	-		
20.0	77	-	-		
14.0	69	-	-		
10.0	59	-	-	**PERCENTAGE SOIL TYPES**	
6.30	52	-	-	**CLAY** / **SILT Ŧ** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	50	-	-		
3.35	48	-	-	/ 3 43 54 0	
2.00	46	-	-		
1.18	43	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	34	-	-	**D10** / **D60** / **Specification**	
0.425	26	-	-		
0.300	9	-	-	- -	
0.212	8	-	-	**UNIFORMITY COEFFICIENT** - -	
0.150	4	-	-		
0.063	3	-	-		

Remarks

Ŧ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

SIEVE ANALYSIS - BS 1377 : Part 2 : 1990 : CLAUSE 9.2

Borehole	BH40
Sample	B
Depth (m)	0.60-1.00

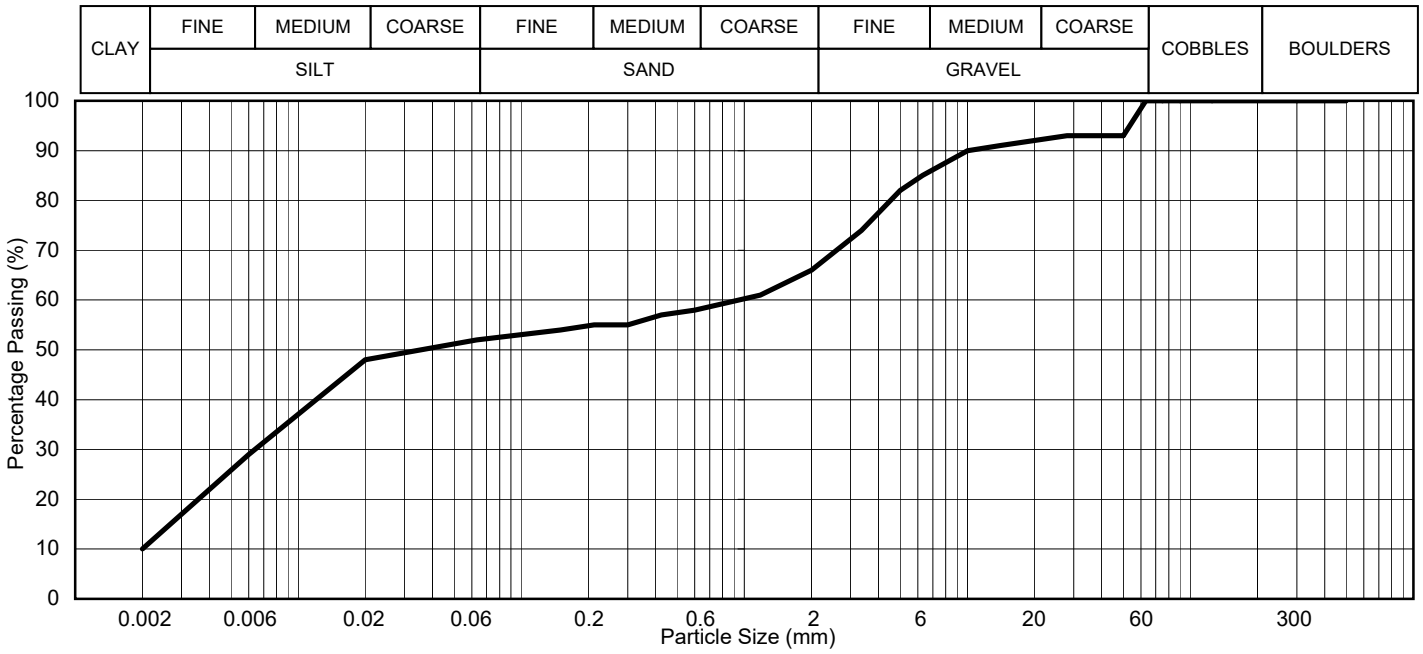


SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	62
300.0	100	-	-	0.006	43
125.0	100	-	-	0.002	29
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	98	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	95	-	-		
20.0	92	-	-		
14.0	92	-	-		
10.0	90	-	-	**PERCENTAGE SOIL TYPES**	
6.30	89	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	89	-	-		
3.35	88	-	-	29 / 54 / 5 / 12 / 0	
2.00	88	-	-		
1.18	87	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	86	-	-	**D10** / **D60** / **Specification**	
0.425	86	-	-		
0.300	86	-	-	- / -	
0.212	86	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	85	-	-		
0.063	83	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Borehole	BH41
Sample	B
Depth (m)	4.50-5.50



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	48
300.0	100	-	-	0.006	29
125.0	100	-	-	0.002	10
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	93	-	-		
37.5	93	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	93	-	-		
20.0	92	-	-		
14.0	91	-	-		
10.0	90	-	-	**PERCENTAGE SOIL TYPES**	
6.30	85	-	-		
5.00	82	-	-		
3.35	74	-	-		
2.00	66	-	-		
1.18	61	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	58	-	-		
0.425	57	-	-		
0.300	55	-	-		
0.212	55	-	-		
0.150	54	-	-		
0.063	52	-	-		

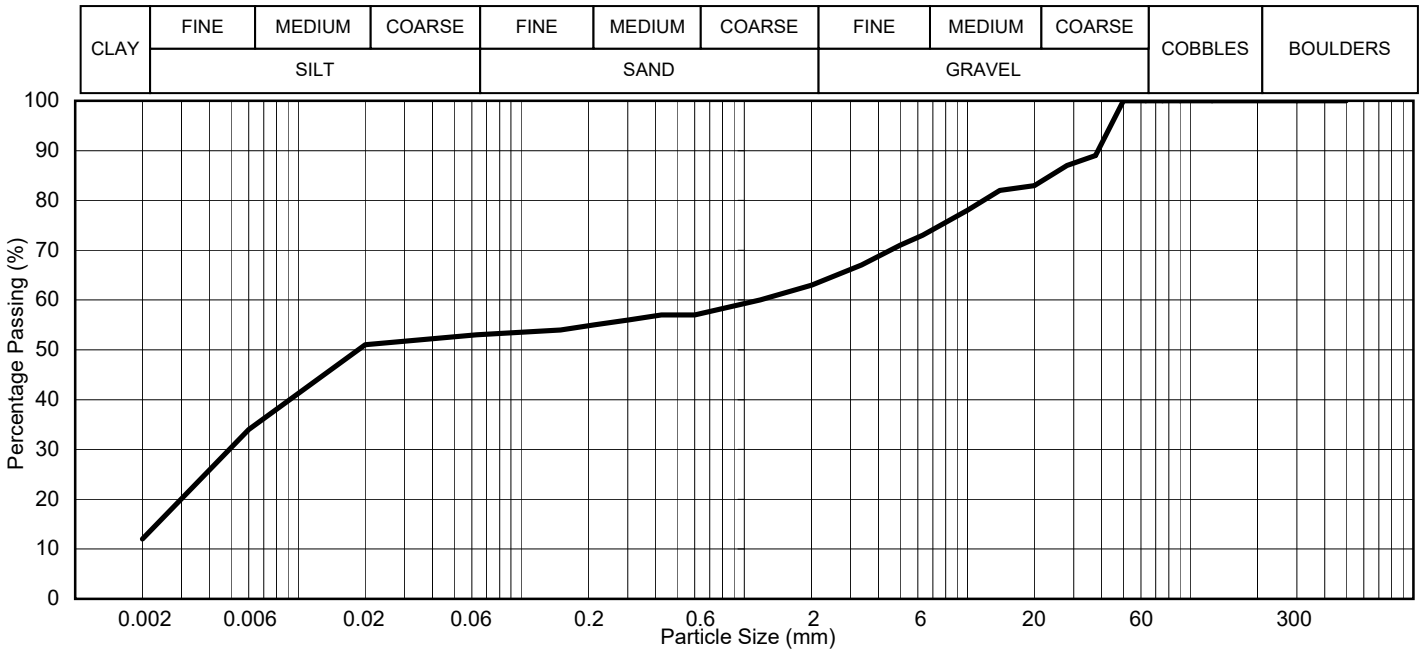
CLAY	SILT ₸	SAND	GRAVEL	COBBLES
10	42	14	34	0

D10	D60	Specification
-	-	
UNIFORMITY COEFFICIENT	-	-

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Borehole	BH42
Sample	B
Depth (m)	1.48-2.00



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	51
300.0	100	-	-	0.006	34
125.0	100	-	-	0.002	12
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	89	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	87	-	-		
20.0	83	-	-		
14.0	82	-	-		
10.0	78	-	-	**PERCENTAGE SOIL TYPES**	
6.30	73	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	71	-	-		
3.35	67	-	-	12 / 41 / 10 / 37 / 0	
2.00	63	-	-		
1.18	60	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	57	-	-	**D10** / **D60** / **Specification**	
0.425	57	-	-		
0.300	56	-	-	- / -	
0.212	55	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	54	-	-		
0.063	53	-	-		

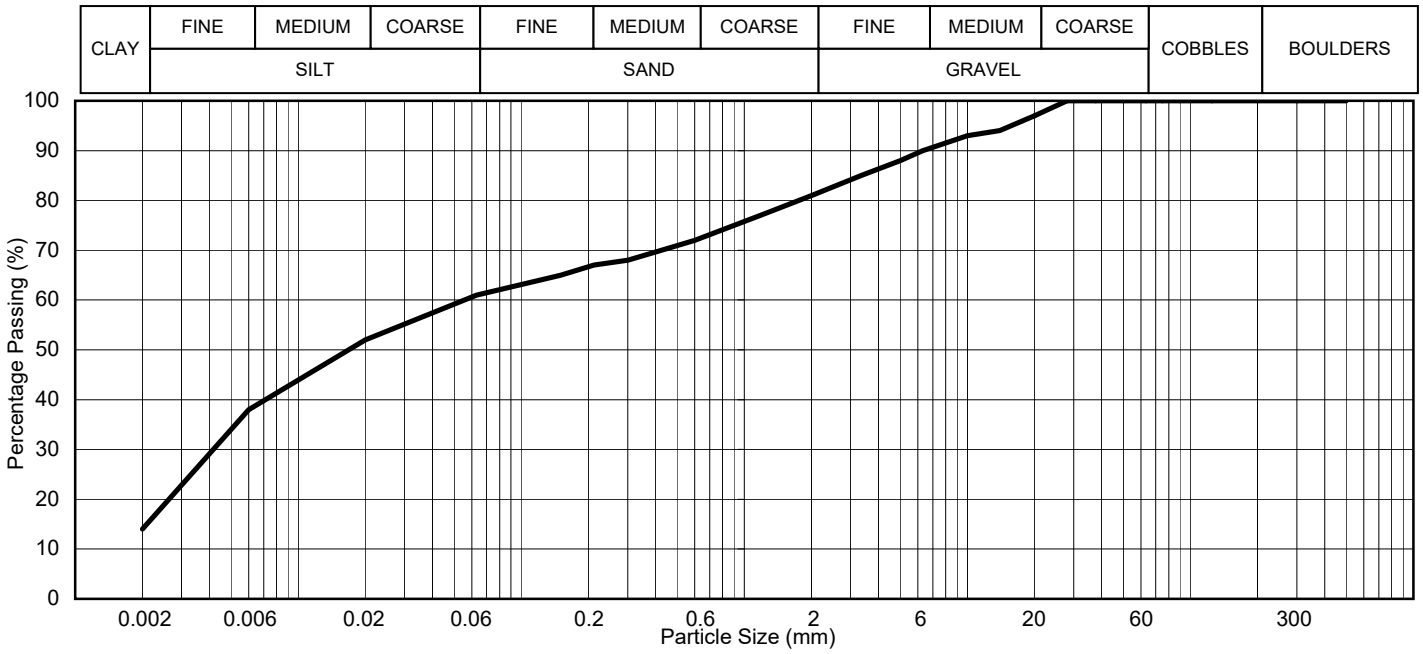
Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Sample does not meet minimum mass requirement for material type

SIEVE ANALYSIS AND SEDIMENTATION - BS 1377 : PART 2 : 1990 : CLAUSE 9.2 & 9.4

Borehole	BH42
Sample	DSPT
Depth (m)	6.10-6.55

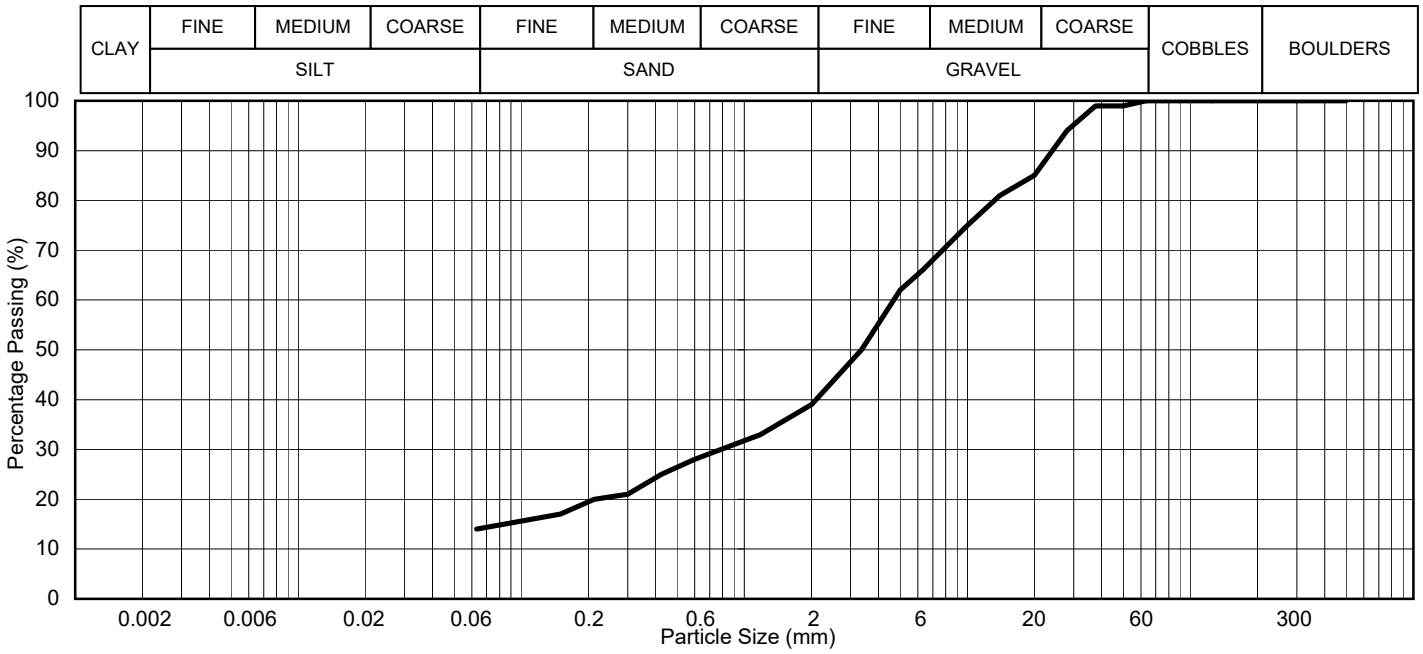


SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	52
300.0	100	-	-	0.006	38
125.0	100	-	-	0.002	14
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	100	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	100	-	-		
20.0	97	-	-		
14.0	94	-	-		
10.0	93	-	-	**PERCENTAGE SOIL TYPES**	
6.30	90	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	88	-	-		
3.35	85	-	-	14 / 47 / 20 / 19 / 0	
2.00	81	-	-		
1.18	77	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	72	-	-	**D10** / **D60** / **Specification**	
0.425	70	-	-		
0.300	68	-	-	- / -	
0.212	67	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	65	-	-		
0.063	61	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

Borehole	BH43
Sample	B
Depth (m)	0.30-0.40



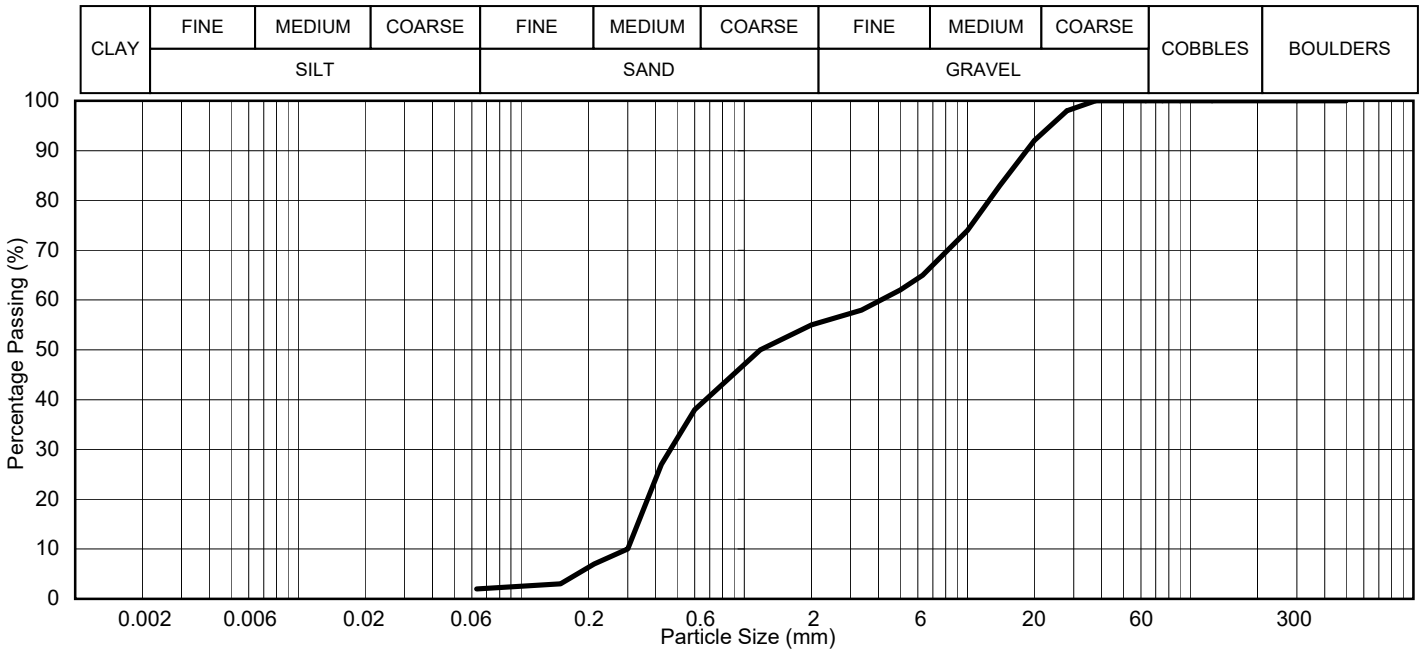
SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	
300.0	100	-	-	0.006	
125.0	100	-	-	0.002	
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	99	-	-		
37.5	99	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	94	-	-		
20.0	85	-	-		
14.0	81	-	-		
10.0	75	-	-	**PERCENTAGE SOIL TYPES**	
6.30	66	-	-	**CLAY** / **SILT ₸** / **SAND** / **GRAVEL** / **COBBLES**	
5.00	62	-	-		
3.35	50	-	-	/ 14 25 61 0	
2.00	39	-	-		
1.18	33	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	28	-	-	**D10** / **D60** / **Specification**	
0.425	25	-	-		
0.300	21	-	-	- -	
0.212	20	-	-	**UNIFORMITY COEFFICIENT** - -	
0.150	17	-	-		
0.063	14	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

SIEVE ANALYSIS - BS 1377 : Part 2 : 1990 : CLAUSE 9.2

Borehole	BH43
Sample	B
Depth (m)	1.20-3.00



SIEVING				SEDIMENTATION	
Sieve Size (mm)	Percentage Passing (%)	Specification Not Applicable		Particle Size (mm)	Percentage Passing (%)
		Lower %	Upper %		
500.0	100	-	-	0.020	
300.0	100	-	-	0.006	
125.0	100	-	-	0.002	
90.0	100	-	-		
75.0	100	-	-	**GRADING CLASSIFICATION (SHW TABLE 6/2)**	
63.0	100	-	-	-	
50.0	100	-	-		
37.5	100	-	-	Grading classification proves the material has met the relevant grading requirements only. Further testing may be required to assess compliance with SHW.	
28.0	98	-	-		
20.0	92	-	-		
14.0	83	-	-		
10.0	74	-	-	**PERCENTAGE SOIL TYPES**	
6.30	65	-	-	**CLAY** / **SILT ₸** 2 / **SAND** 53 / **GRAVEL** 45 / **COBBLES** 0	
5.00	62	-	-		
3.35	58	-	-		
2.00	55	-	-		
1.18	50	-	-	**UNIFORMITY COEFFICIENT (SHW TABLE 6/1 NOTE 5)**	
0.600	38	-	-	**D10** - / **D60** - / **Specification**	
0.425	27	-	-		
0.300	10	-	-		
0.212	7	-	-	**UNIFORMITY COEFFICIENT** - / -	
0.150	3	-	-		
0.063	2	-	-		

Remarks

₸ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

SIEVE ANALYSIS - BS 1377 : Part 2 : 1990 : CLAUSE 9.2

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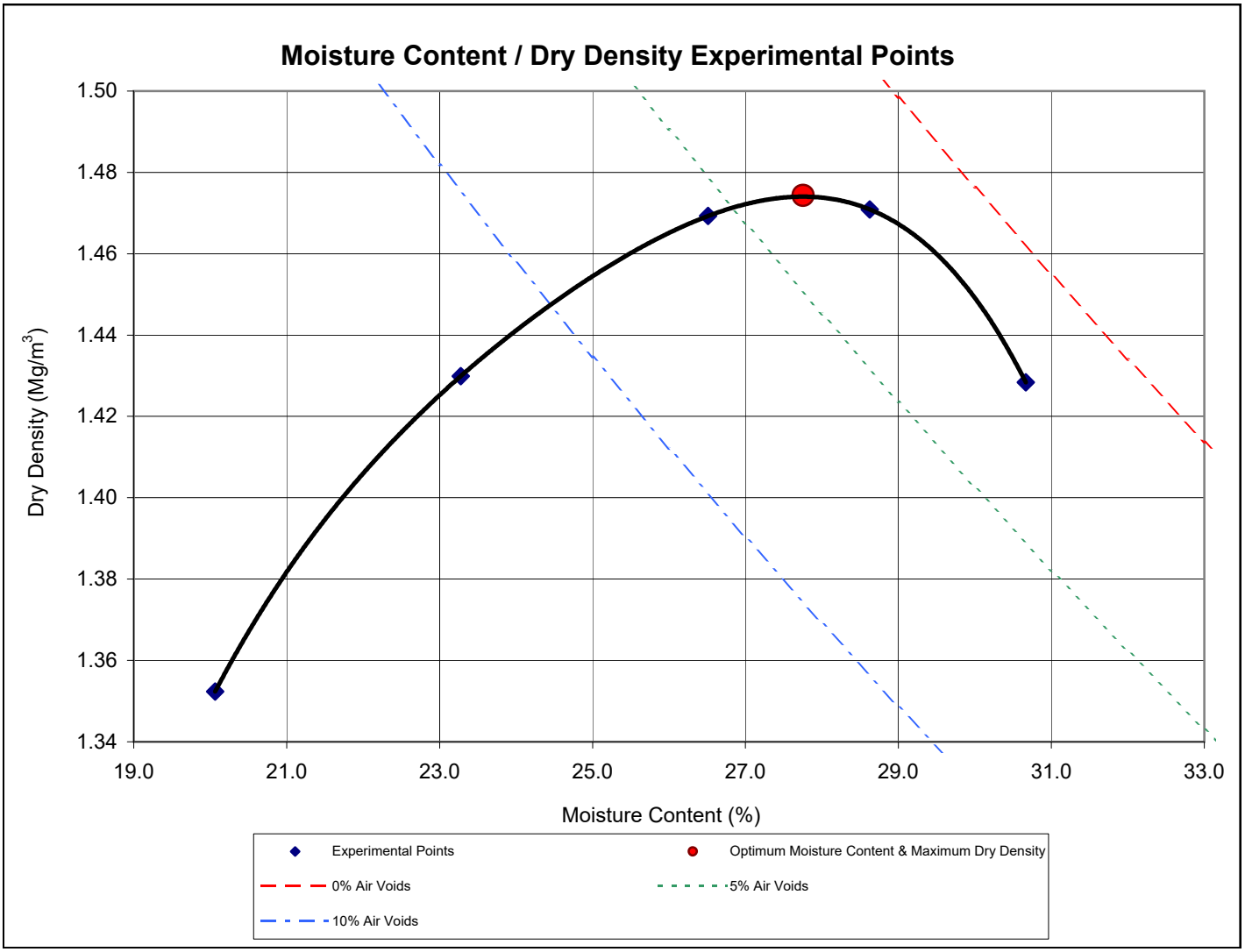


Test Method	:	Clause 3.4: 2.5kg rammer, 3 layers, 62 blows/layer
Preparation Method	:	Separate samples
% Passing 37.5mm	:	100
% Passing 20mm	:	89
Grading Zone	:	3
Particle Density	:	2.65 Mg/m^3 (Assumed)

Experimental Points	
Moisture Content (%)	Dry Density (Mg/m^3)
20.1	1.35
23.3	1.43
26.5	1.47
28.6	1.47
30.7	1.43

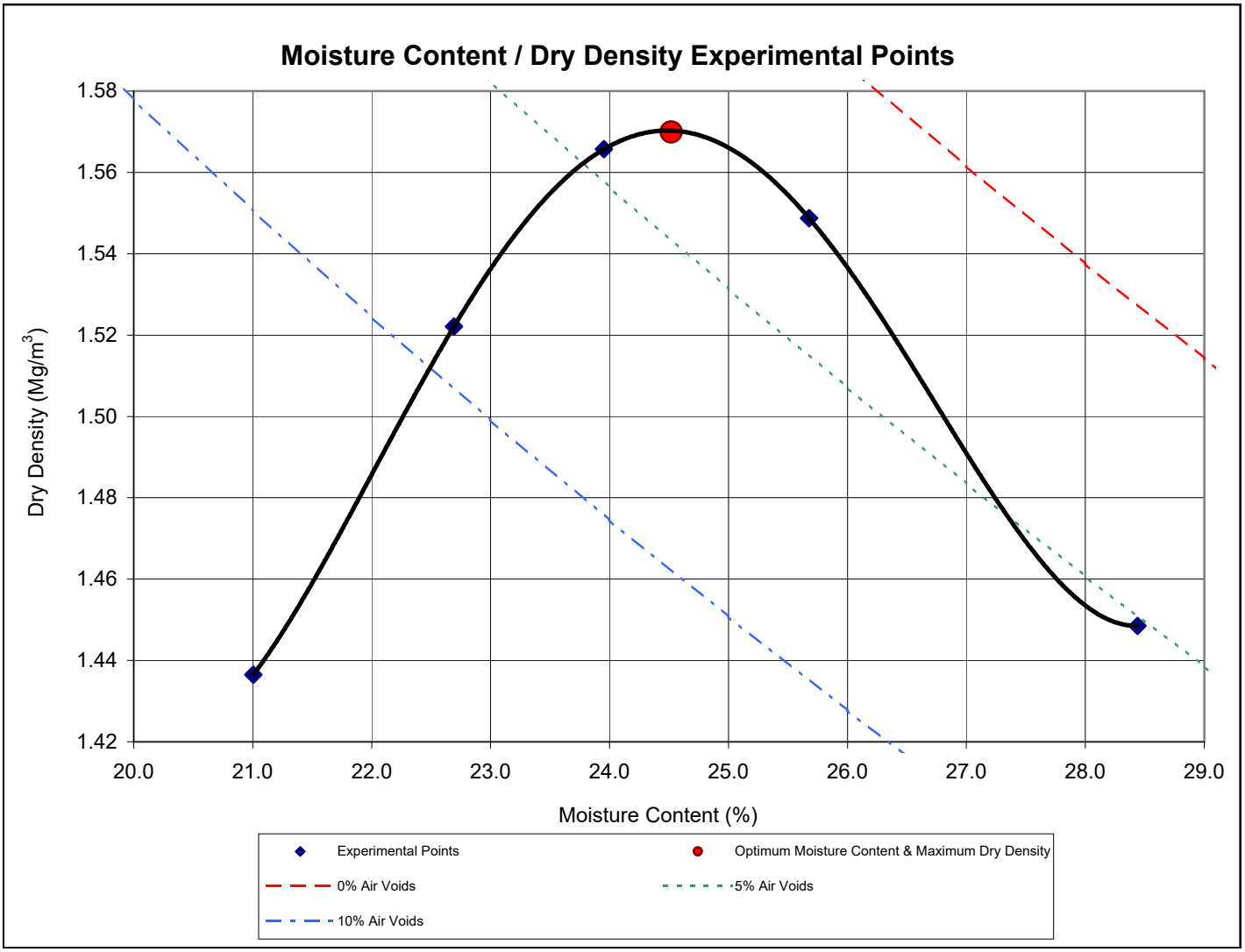
Optimum Moisture Content (%)	**Maximum Dry Density (Mg/m^3)**
27.8	**1.47**

Remarks

Borehole :	TP24
Sample :	LB
Depth (m) :	0.45-1.60

Tested in accordance with BS 1377 : Part 4 : 1990

DETERMINATION OF MOISTURE CONTENT / DRY DENSITY RELATIONSHIP BY COMPACTION



Test Method	:	Clause 3.4: 2.5kg rammer, 3 layers, 62 blows/layer
Preparation Method	:	Separate samples
% Passing 37.5mm	:	68
% Passing 20mm	:	60
Grading Zone	:	x
Particle Density	:	2.70 Mg/m^3 (Assumed)

Experimental Points	
Moisture Content (%)	Dry Density (Mg/m^3)
21.0	1.44
22.7	1.52
24.0	1.57
25.7	1.55
28.4	1.45

Optimum Moisture Content (%)	**Maximum Dry Density (Mg/m^3)**
24.5	**1.57**

Remarks

Materials which contain more than 10% retained on a 37.5mm test sieve and 30% retained on a 20mm test sieve are not suitable for this test (Zone X - BS 1377 : Part 4 : 1990, figure 2). In this instance only material passing the 37.5mm sieve was tested.

Borehole :	TP26
Sample :	B
Depth (m) :	1.00-1.50

Tested in accordance with BS 1377 : Part 4 : 1990

DETERMINATION OF MOISTURE CONTENT / DRY DENSITY RELATIONSHIP BY COMPACTION

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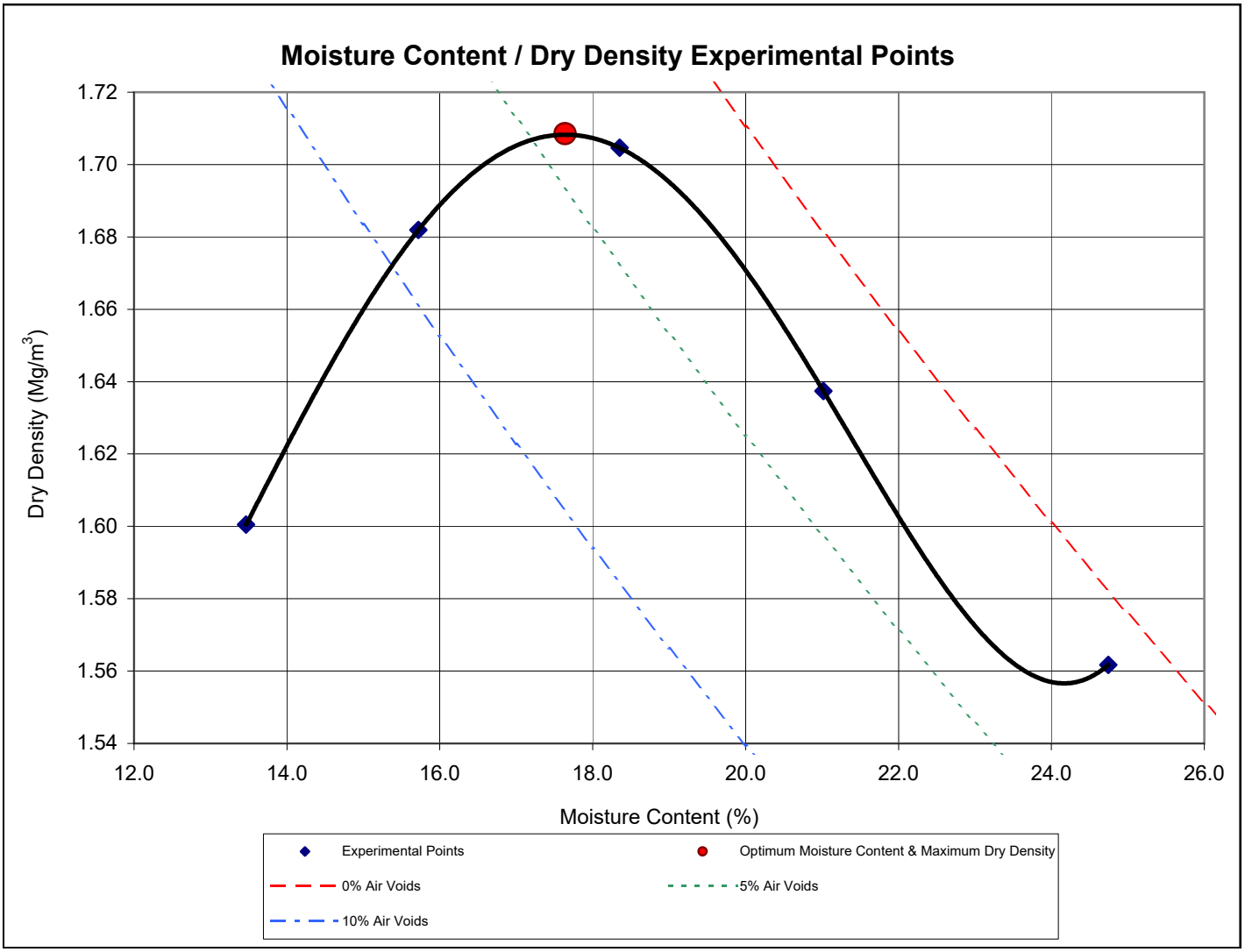


Test Method	:	Clause 3.4: 2.5kg rammer, 3 layers, 62 blows/layer
Preparation Method	:	Separate samples
% Passing 37.5mm	:	92
% Passing 20mm	:	84
Grading Zone	:	5
Particle Density	:	2.60 Mg/m^3 (Assumed)

Experimental Points	
Moisture Content (%)	Dry Density (Mg/m^3)
13.5	1.60
15.7	1.68
18.4	1.70
21.0	1.64
24.7	1.56

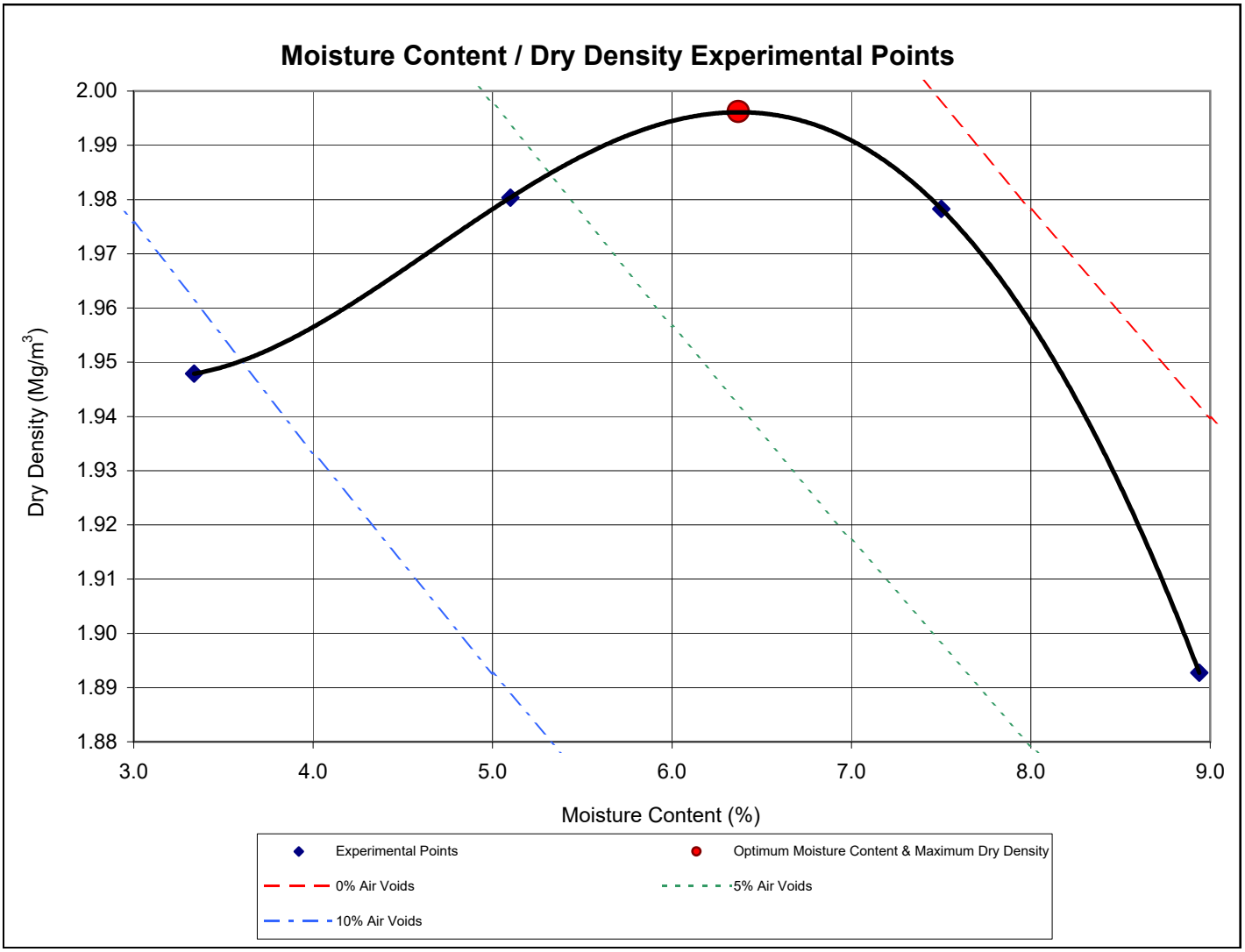
Optimum Moisture Content (%)	**Maximum Dry Density (Mg/m^3)**
17.6	**1.71**

Remarks

Borehole :	TP27
Sample :	LB
Depth (m) :	0.30-0.60

Tested in accordance with BS 1377 : Part 4 : 1990

DETERMINATION OF MOISTURE CONTENT / DRY DENSITY RELATIONSHIP BY COMPACTION



Test Method	:	Clause 3.4: 2.5kg rammer, 3 layers, 62 blows/layer
Preparation Method	:	Separate samples
% Passing 37.5mm	:	94
% Passing 20mm	:	77
Grading Zone	:	5
Particle Density	:	2.35 Mg/m^3 (Assumed)

Experimental Points	
Moisture Content (%)	Dry Density (Mg/m^3)
3.3	1.95
5.1	1.98
6.3	2.00
7.5	1.98
8.9	1.89

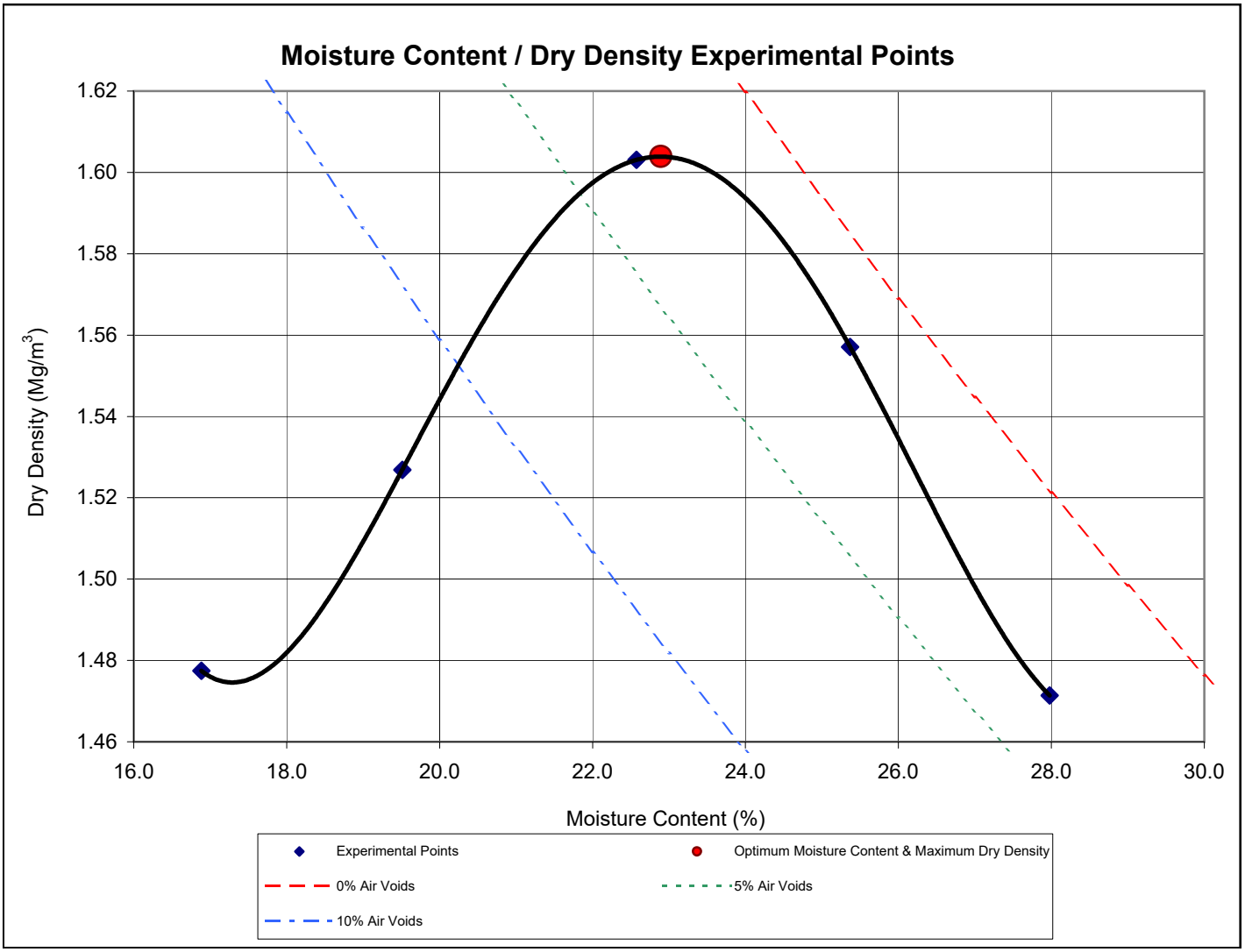
Optimum Moisture Content (%)	**Maximum Dry Density (Mg/m^3)**
6.4	**2.00**

Remarks

Borehole :	TP28
Sample :	B
Depth (m) :	1.00-1.70

Tested in accordance with BS 1377 : Part 4 : 1990

DETERMINATION OF MOISTURE CONTENT / DRY DENSITY RELATIONSHIP BY COMPACTION



Test Method	:	Clause 3.4: 2.5kg rammer, 3 layers, 62 blows/layer
Preparation Method	:	Single sample
% Passing 37.5mm	:	90
% Passing 20mm	:	80
Grading Zone	:	5
Particle Density	:	2.65 Mg/m^3 (Assumed)

Experimental Points	
Moisture Content (%)	Dry Density (Mg/m^3)
16.9	1.48
19.5	1.53
22.6	1.60
25.4	1.56
28.0	1.47

Optimum Moisture Content (%)	**Maximum Dry Density (Mg/m^3)**
22.9	**1.60**

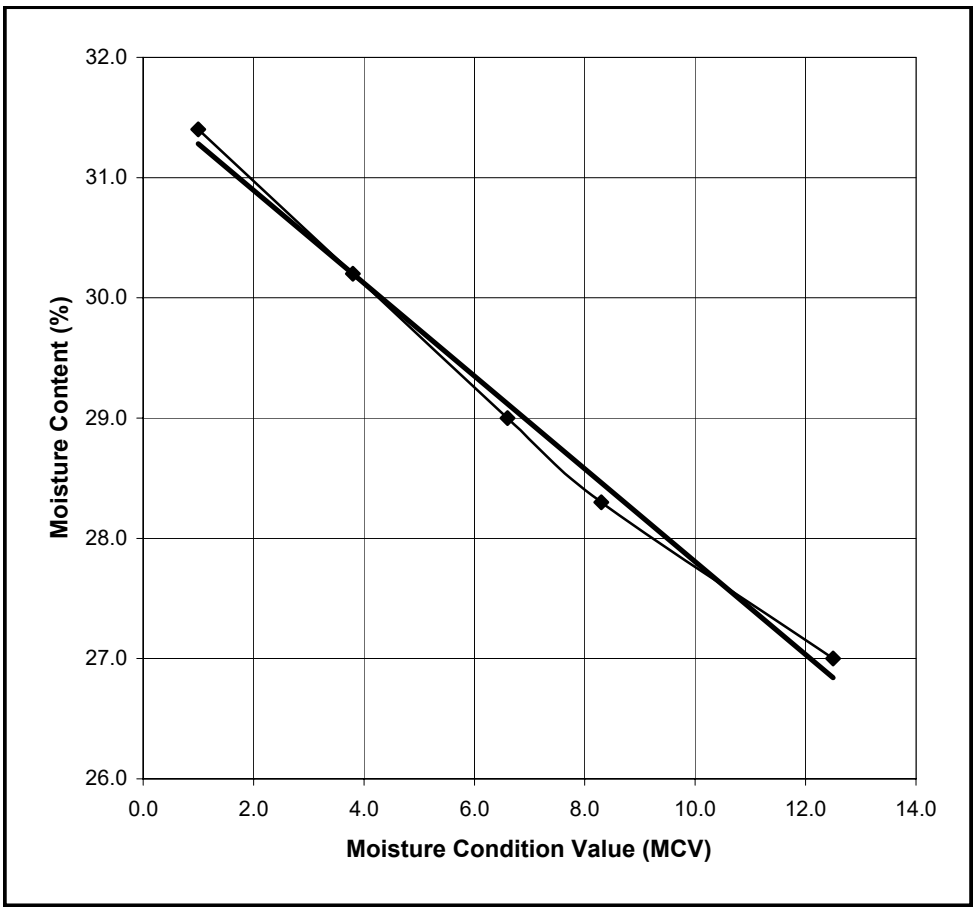
Remarks

Borehole :	BH40
Sample :	B
Depth (m) :	1.50-3.00

Tested in accordance with BS 1377 : Part 4 : 1990

DETERMINATION OF MOISTURE CONTENT / DRY DENSITY RELATIONSHIP BY COMPACTION

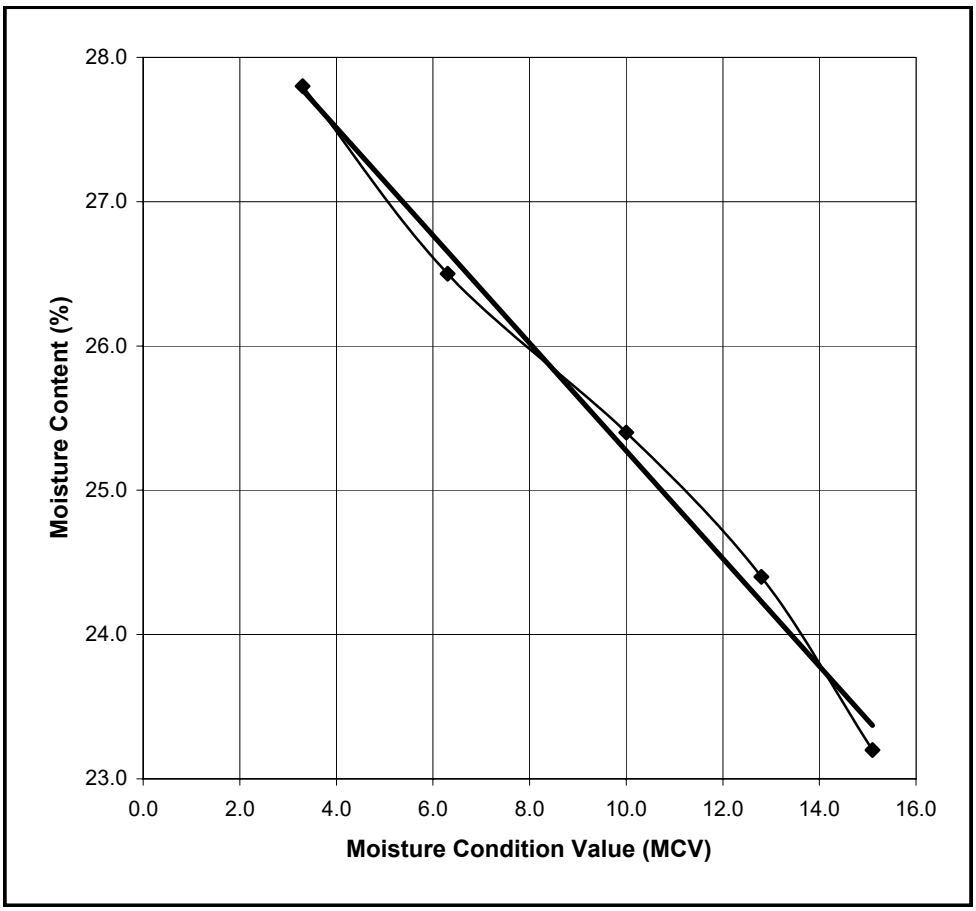
TRIAL PIT	SAMPLE	DEPTH (m)	% MATERIAL GREATER THAN 20mm	MOISTURE CONTENT (%)	M.C.V.
TP24	LB	0.45-1.60	11	27.0 28.3 29.0 30.2 31.4	12.5 8.3 6.6 3.8 1.0



*Material Passing 20mm sieve, separate samples used for each point
Tested in accordance with BS 1377: Part 4 : 1990: Clause 5.5

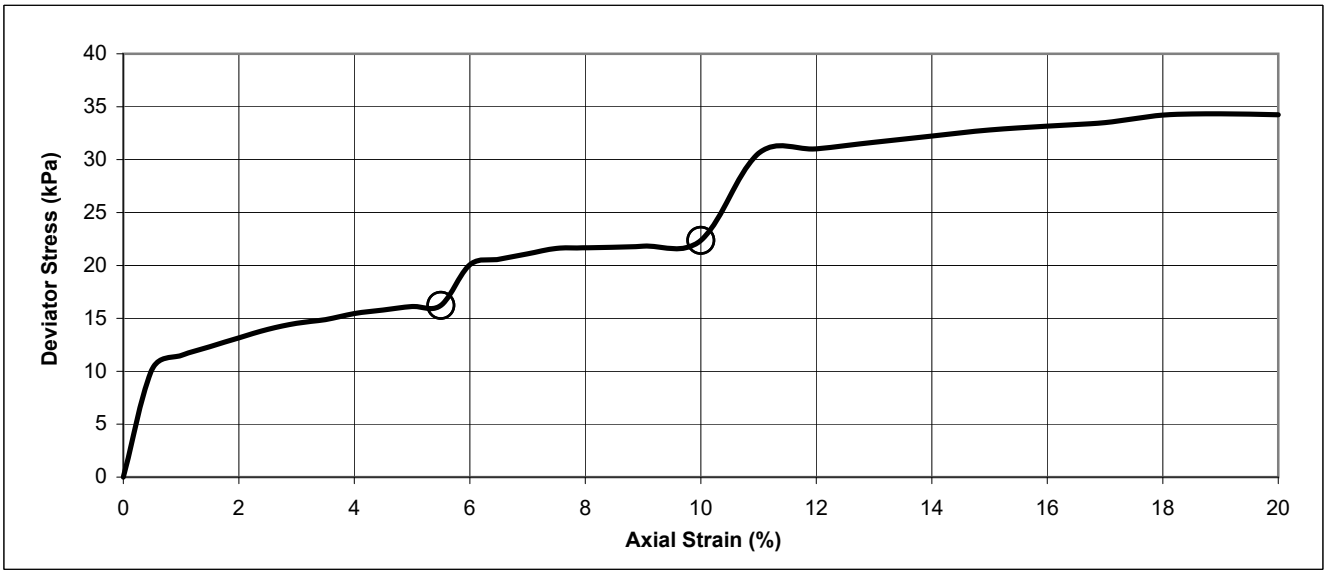
SUMMARY OF MOISTURE CONDITION TEST RESULTS

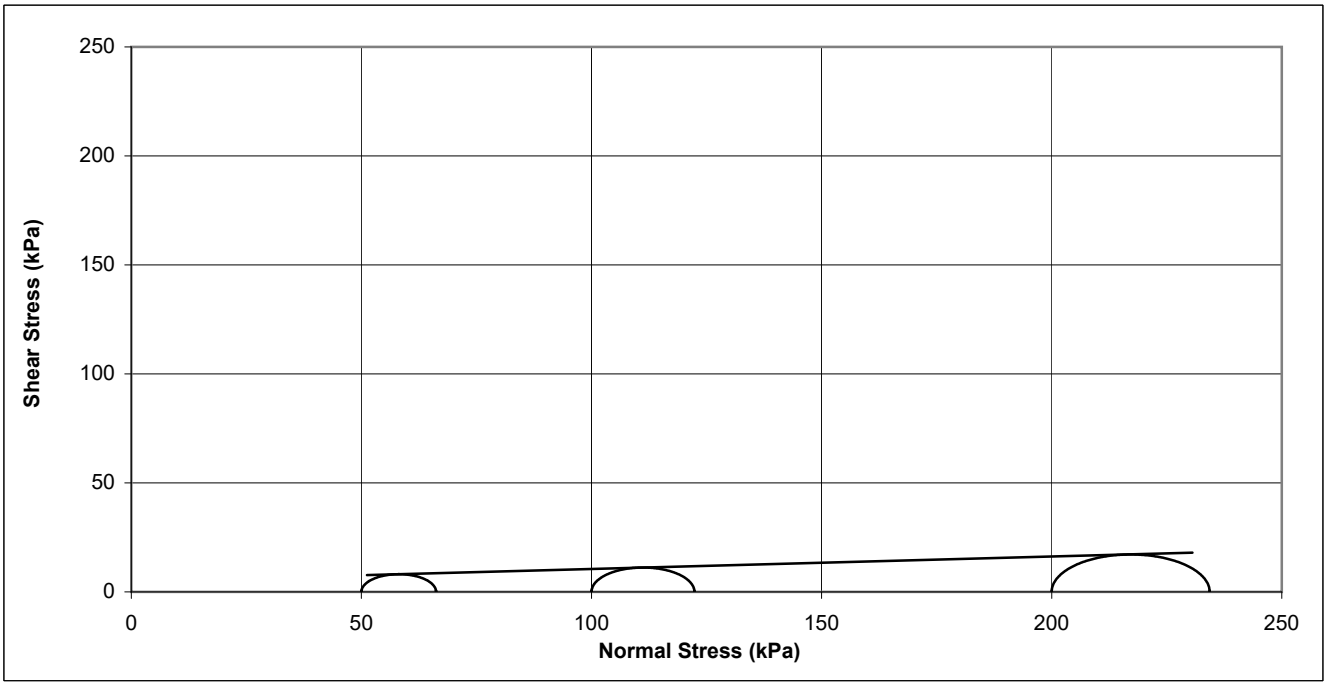
TRIAL PIT	SAMPLE	DEPTH (m)	% MATERIAL GREATER THAN 20mm	MOISTURE CONTENT (%)	M.C.V.
TP26	B	1.00-1.50	40	23.2 24.4 25.4 26.5 27.8	15.1 12.8 10.0 6.3 3.3



*Material Passing 20mm sieve, separate samples used for each point
Tested in accordance with BS 1377: Part 4 : 1990: Clause 5.5

SUMMARY OF MOISTURE CONDITION TEST RESULTS





Failure Conditions				
Cell pressure	kPa	50	100	200
Membrane correction	kPa	0.3	0.5	0.9
Strain at failure	%	5.5	10.0	19.0
Failure Type		Intermediate	Intermediate	Intermediate
Corrected deviator stress	kPa	16	22	34
Undrained shear stress	kPa	8	11	17

Cohesion	kPa	4.8	Friction Angle	°	3.3

Initial Conditions						
Sample length	mm	168.23	Rate of strain	%/min	2.0	Borehole BH42
Sample diameter	mm	84.23	Bulk Density	Mg/m^3	1.88	Sample UT
Membrane type		Latex	Dry Density	Mg/m^3	1.41	Depth (m) 4.50-5.10
Membrane thickness	mm	0.20	Moisture Content	%	33	

Undisturbed sample, taken directly from the sample tube and retaining axial orientation

DETERMINATION OF MULTI STAGE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

Tested in accordance with BS 1377 : Part 7 : 9.0 : 1990

Borehole	BH41
Sample	B
Depth (m)	2.20-4.50

Specimen Details

Particle Density (Assumed)	(Mg/m3)	2.65		
Specimen Number		**1**	**2**	**3**
Length	mm	60.09	60.09	60.09
Width	mm	60.02	60.02	60.02
Height	mm	24.77	24.71	24.62
Initial Moisture Content	%	24	24	24
Initial Bulk Density	Mg/m3	1.90	1.91	1.91
Initial Dry Density	Mg/m3	1.53	1.53	1.54
Optimum Moisture Content	%	-		
Maximum Dry Density	Mg/m3	-		

Shearing Stage

Normal Pressure	kPa	40	80	160

Peak Conditions

Rate of horizontal displacement	mm/min	0.125	0.125	0.125
Peak shear stress	kPa	31.331	57.949	106.471
Horizontal displacement at peak	mm	2.78	2.89	3.14

Residual Conditions

Rate of horizontal displacement	mm/min	-	-	-
Residual shear stress	kPa	-	-	-
Final cumulative displacement	mm	-	-	-
Total traverses		-	-	-
Method of reversal		-	-	-
Final Moisture Content	%	22	22	22

Shear Strength Parameters

Peak Condition

Apparent Cohesion	kPa	7.1
Angle of Shearing Resistance	°	32.0

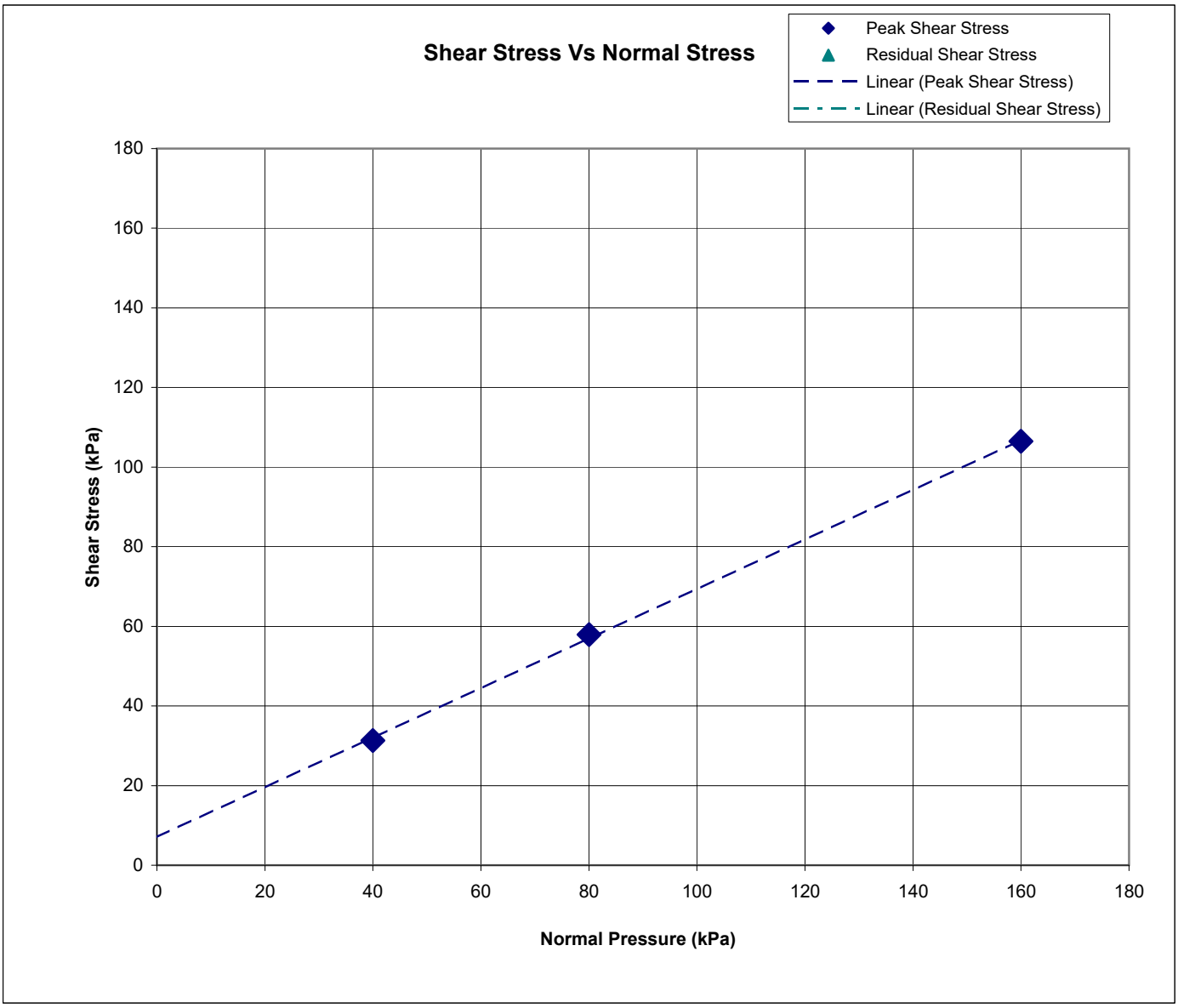
Residual Condition

Apparent Cohesion	kPa	-
Angle of Shearing Resistance	°	-

Test Notes
Preparation - <2mm material prepared in accordance with BS 1377 : Part 7 : 1990 : Clause 4.4.3
Test condition - Submerged
Test specimen remoulded at natural moisture content using a 2.5kg rammer.

DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

Borehole	BH41
Sample	B
Depth (m)	2.20-4.50



Peak Conditions

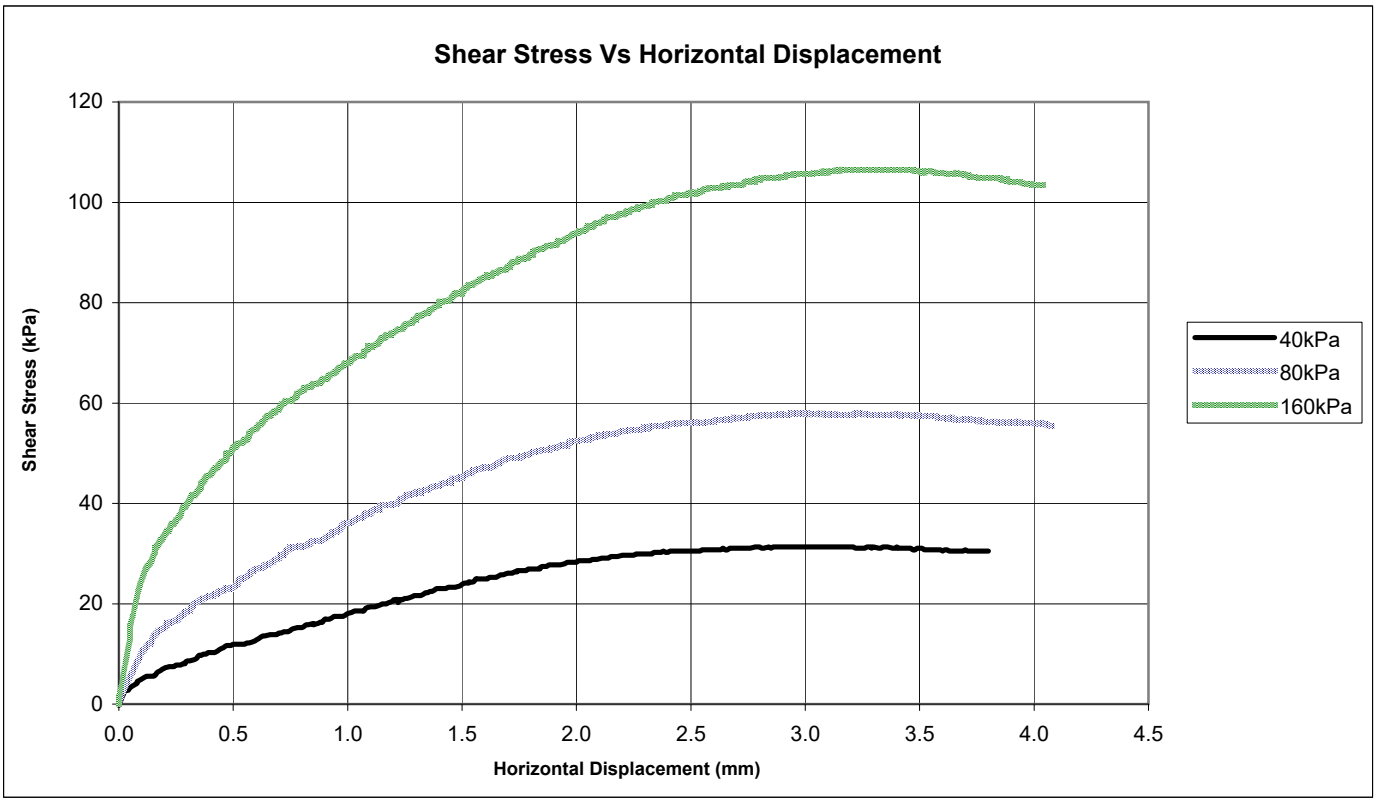
Apparent Cohesion	kPa	7.1		
Angle of Shearing Resistance	°	32.0		
Normal Pressure	kPa	40	80	160
Peak shear stress	kPa	31.331	57.949	106.471

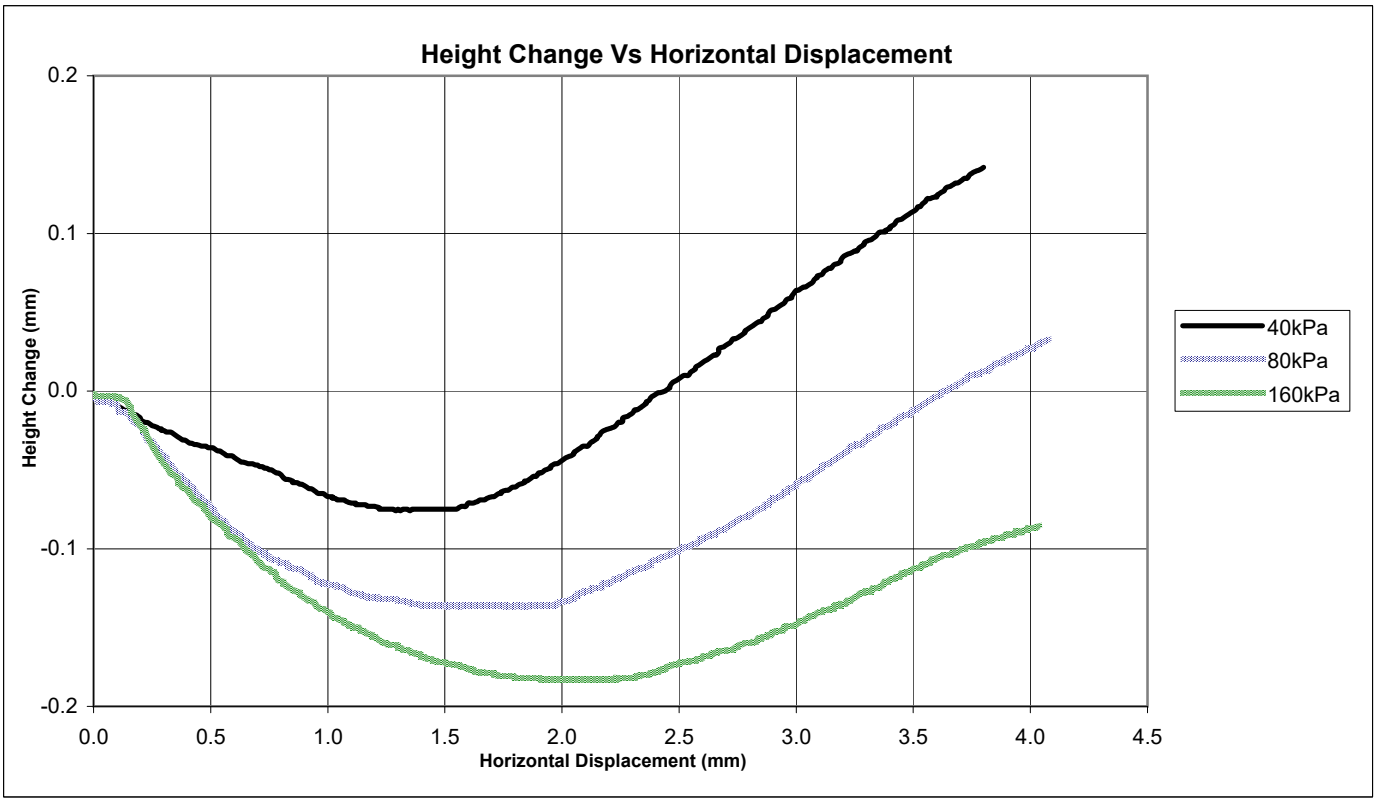
Residual Conditions

Apparent Cohesion	kPa	-		
Angle of Shearing Resistance	°	-		
Normal Pressure	kPa	-	-	-
Residual shear stress	kPa	-	-	-

DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

Borehole	BH41
Sample	B
Depth (m)	2.20-4.50





DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

Borehole	BH42
Sample	B
Depth (m)	2.70-4.00

Specimen Details

Particle Density (Assumed)	(Mg/m3)	2.65

Specimen Number		1	2	3
Length	mm	59.75	59.75	59.75
Width	mm	60.07	60.07	60.07
Height	mm	25.00	25.00	25.00
Initial Moisture Content	%	27	27	27
Initial Bulk Density	Mg/m3	1.89	1.89	1.89
Initial Dry Density	Mg/m3	1.48	1.48	1.48
Optimum Moisture Content	%	-		
Maximum Dry Density	Mg/m3	-		

Shearing Stage

Normal Pressure	kPa	30	60	120

Peak Conditions

Rate of horizontal displacement	mm/min	0.125	0.125	0.125
Peak shear stress	kPa	25.075	43.464	76.619
Horizontal displacement at peak	mm	0.94	2.00	2.15

Residual Conditions

Rate of horizontal displacement	mm/min	-	-	-
Residual shear stress	kPa	-	-	-
Final cumulative displacement	mm	-	-	-
Total traverses		-	-	-
Method of reversal		-	-	-

Final Moisture Content	%	25	23	21

Shear Strength Parameters

Peak Condition

Apparent Cohesion	kPa	8.5
Angle of Shearing Resistance	°	29.5

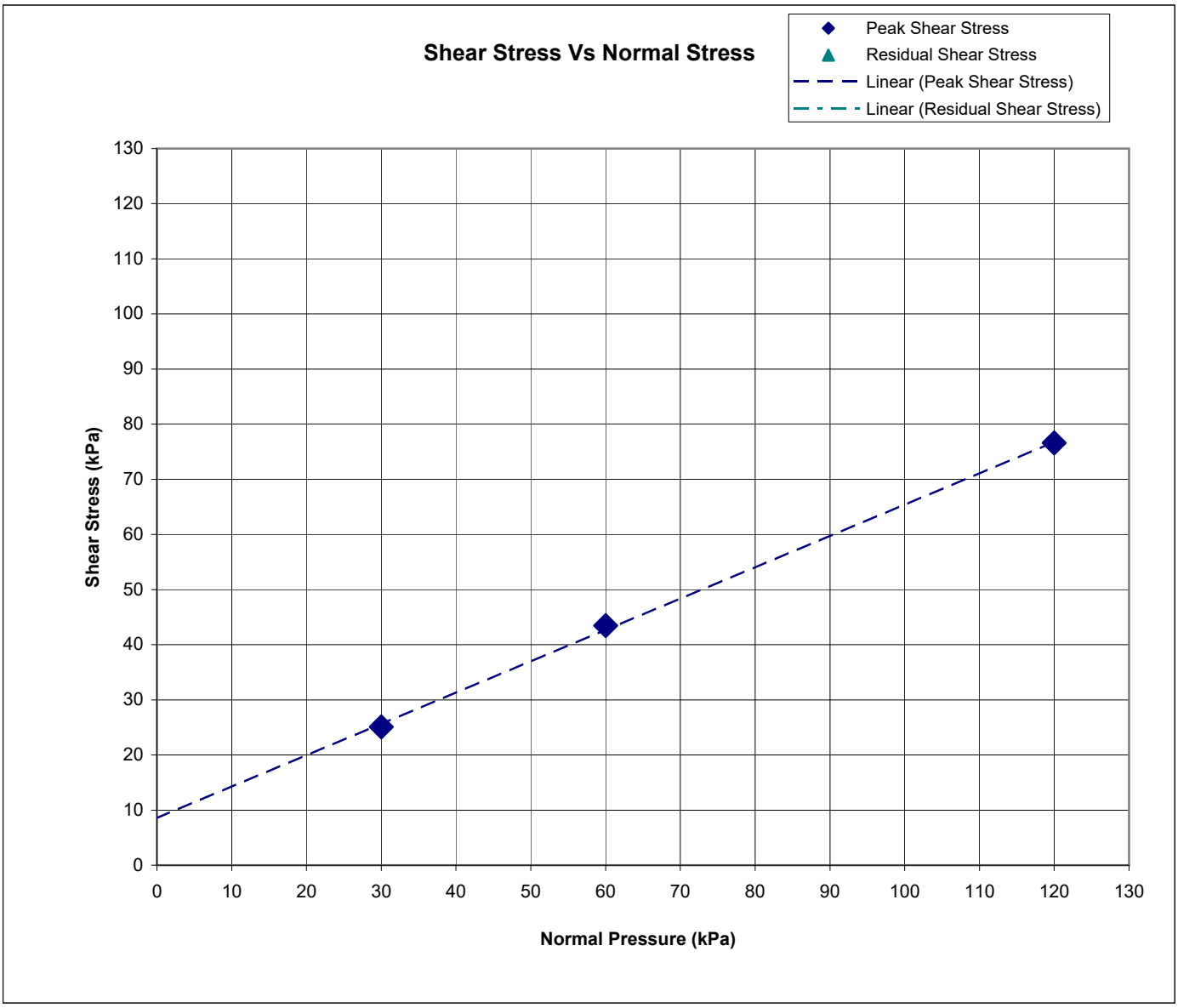
Residual Condition

Apparent Cohesion	kPa	-
Angle of Shearing Resistance	°	-

Test Notes
Preparation - <2mm material prepared in accordance with BS 1377 : Part 7 : 1990 : Clause 4.4.3
Test condition - Submerged
Test specimen remoulded at natural moisture content using a 2.5kg rammer.

DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

Borehole	BH42
Sample	B
Depth (m)	2.70-4.00



Peak Conditions

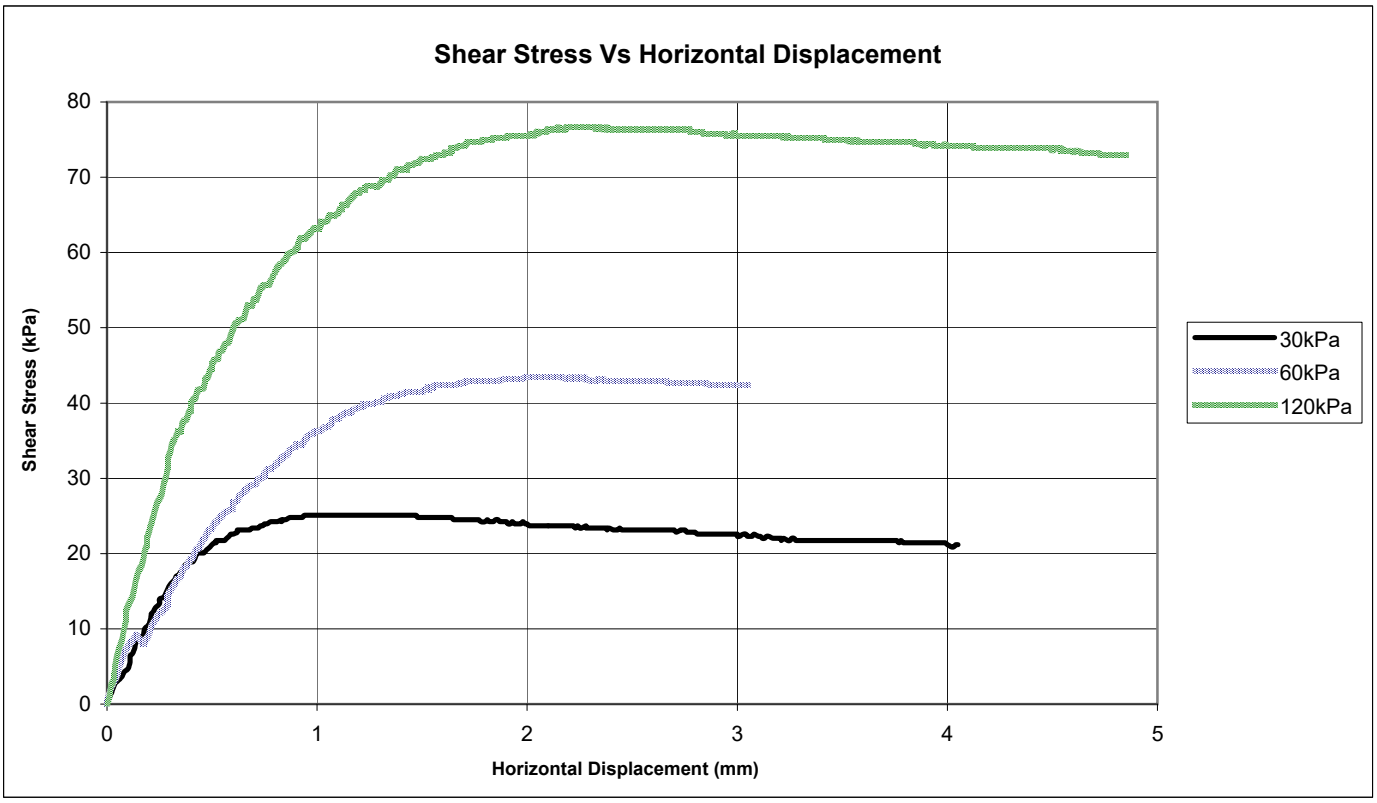
Apparent Cohesion	kPa	8.5		
Angle of Shearing Resistance	°	29.5		
Normal Pressure	kPa	30	60	120
Peak shear stress	kPa	25.075	43.464	76.619

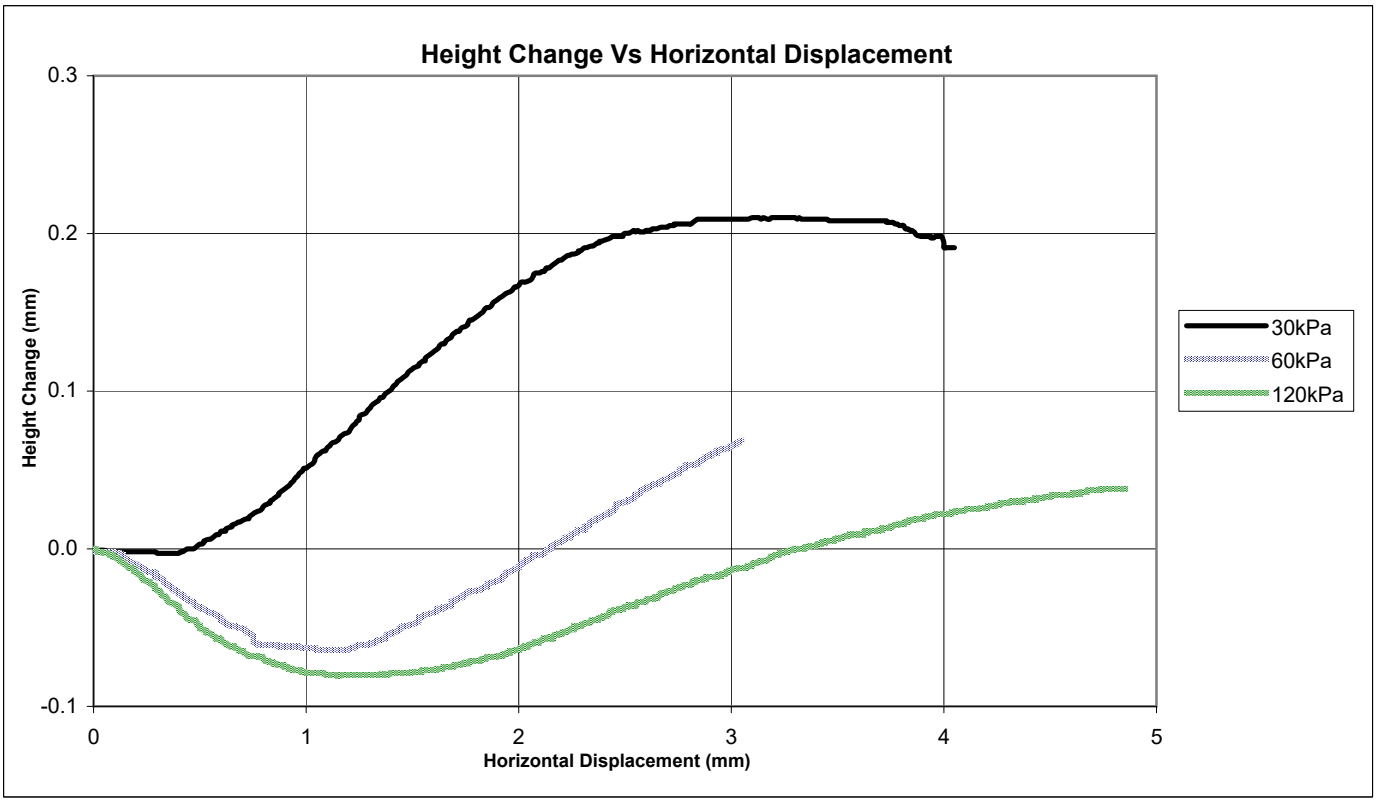
Residual Conditions

Apparent Cohesion	kPa	-		
Angle of Shearing Resistance	°	-		
Normal Pressure	kPa	-	-	-
Residual shear stress	kPa	-	-	-

DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

Borehole	BH42
Sample	B
Depth (m)	2.70-4.00





DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR - SMALL SHEARBOX APPARATUS
Tested in accordance with BS 1377 : Part 7 : 1990 : Clause 4.5.4

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

LABORATORY TEST CERTIFICATE

Certificate No : **20/1161 - 01-1**

To : **Anne Simpson**

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 5 Orchard Road, Heron Road
Sowton Industrial Estate
Exeter, Devon
EX2 7NR

Dear Sirs,

CHALK CRUSHING VALUE (CCV) - BS 1377 : PART 4 : 1990

Introduction

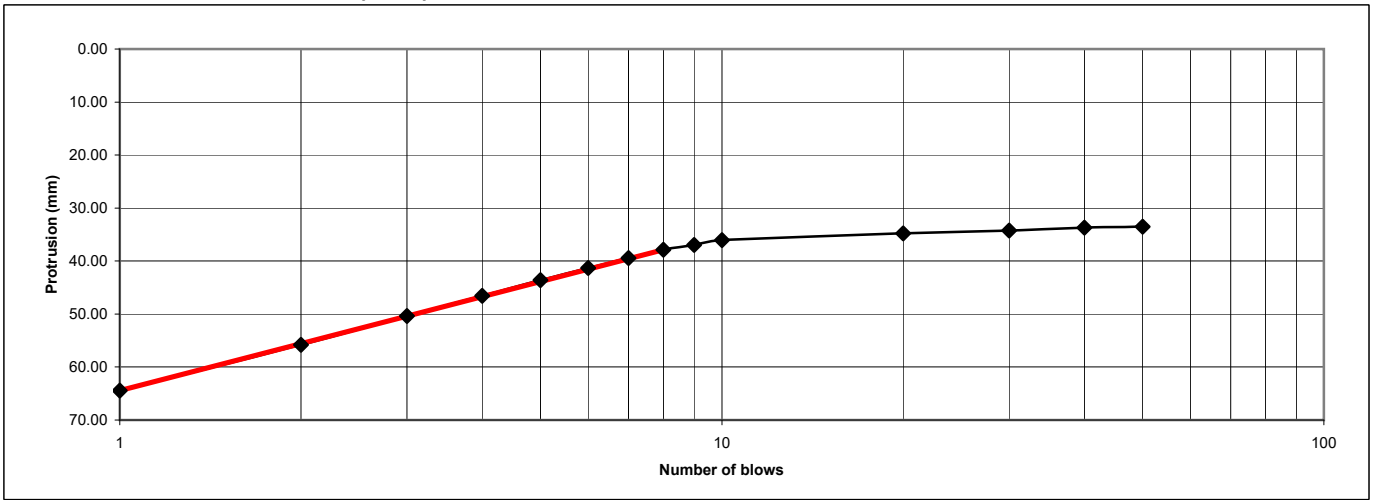
We refer to a bulk sample taken from Aquind Drainage Design, Additional Investigation and delivered to our laboratory on 07th December 2020.

Material & Source

Sample Reference	:	TP24, LB, 0.45-1.60m
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	TP24, LB, 0.45-1.60m
Designation (d/D)	:	Not Supplied
Description	:	Off-white clayey fine to coarse highly weathered CHALK
Date Sampled	:	Not Supplied
Date Tested	:	07th December 2020 Onwards
Source	:	PE201667 - Aquind Drainage Design, Additional Investigation
% Greater than 10mm	:	14

Test Results;

CHALK CRUSHING VALUE (CCV) **2.9**



Remarks
Test was deemed to be complete as maximum of 50 blows was reached

Approved for Issue

[redacted]

Date 22/12/2020

T McLelland (Director)

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
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G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **20/1161 - 01-2**

To : **Anne Simpson**

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 5 Orchard Road, Heron Road
Sowton Industrial Estate
Exeter, Devon
EX2 7NR

Dear Sirs,

CHALK CRUSHING VALUE (CCV) - BS 1377 : PART 4 : 1990

Introduction

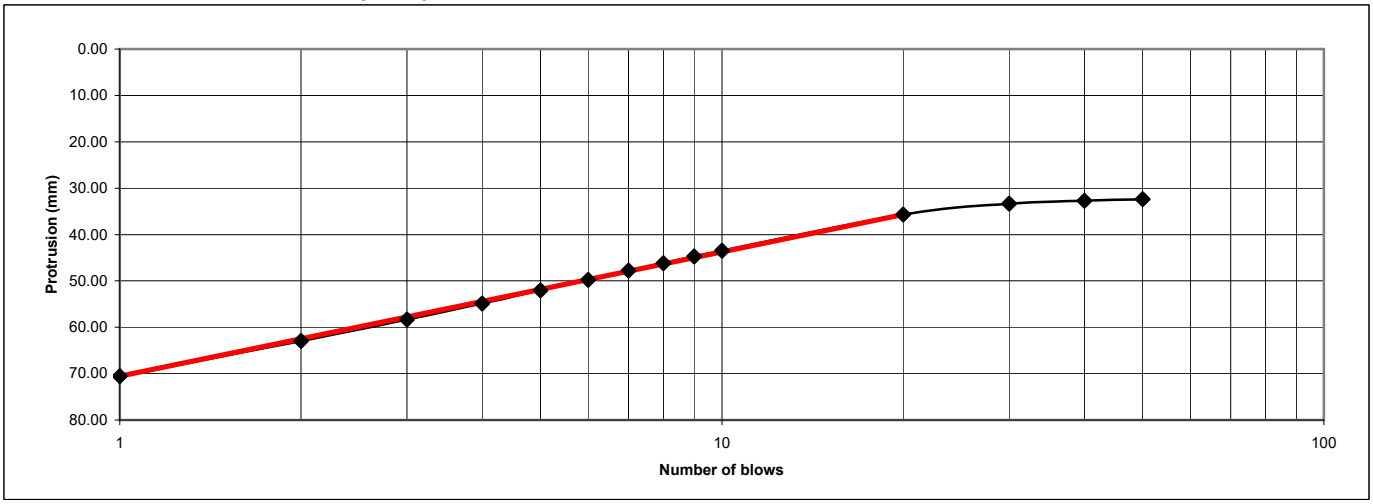
We refer to a bulk sample taken from Aquind Drainage Design, Additional Investigation and delivered to our laboratory on 07th December 2020.

Material & Source

Sample Reference	:	TP27, D, 1.30m
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	TP27, D, 1.30m
Designation (d/D)	:	Not Supplied
Description	:	Off-white clayey fine to coarse highly weathered CHALK
Date Sampled	:	Not Supplied
Date Tested	:	07th December 2020 Onwards
Source	:	PE201667 - Aquind Drainage Design, Additional Investigation
% Greater than 10mm	:	0

Test Results;

CHALK CRUSHING VALUE (CCV) **2.7**



Remarks

Test was deemed to be complete as maximum of 50 blows was reached

[redacted]

Date 22/12/2020

T McLelland (Director)

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
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G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **20/1161 - 01-3**

To : **Anne Simpson**

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 5 Orchard Road, Heron Road
Sowton Industrial Estate
Exeter, Devon
EX2 7NR

Dear Sirs,

CHALK CRUSHING VALUE (CCV) - BS 1377 : PART 4 : 1990

Introduction

We refer to a bulk sample taken from Aquind Drainage Design, Additional Investigation and delivered to our laboratory on 07th December 2020.

Material & Source

Sample Reference	:	BH40, B, 1.50-3.00m
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	BH40, B, 1.50-3.00m
Designation (d/D)	:	Not Supplied
Description	:	Off-white clayey fine to coarse highly weathered CHALK
Date Sampled	:	Not Supplied
Date Tested	:	07th December 2020 Onwards
Source	:	PE201667 - Aquind Drainage Design, Additional Investigation
% Greater than 10mm	:	26

Test Results;

CHALK CRUSHING VALUE (CCV) **0.3**

Remarks

Test was deemed to be complete as no further penetration occurred

[redacted]

Date 22/12/2020

T McLelland (Director)

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
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120 Stepps Road
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G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **20/1161 - 01-4**

To : **Anne Simpson**

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 5 Orchard Road, Heron Road
Sowton Industrial Estate
Exeter, Devon
EX2 7NR

Dear Sirs,

CHALK CRUSHING VALUE (CCV) - BS 1377 : PART 4 : 1990

Introduction

We refer to a bulk sample taken from Aquind Drainage Design, Additional Investigation and delivered to our laboratory on 07th December 2020.

Material & Source

Sample Reference	:	BH41, B, 1.40-2.00m
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	BH41, B, 1.40-2.00m
Designation (d/D)	:	Not Supplied
Description	:	Off-white clayey fine to coarse highly weathered CHALK
Date Sampled	:	Not Supplied
Date Tested	:	07th December 2020 Onwards
Source	:	PE201667 - Aquind Drainage Design, Additional Investigation
% Greater than 10mm	:	19

Test Results;

CHALK CRUSHING VALUE (CCV) **0.5**

Remarks

Test was deemed to be complete as no further penetration occurred

Approved for Issue

[redacted]

Date 22/12/2020

T McLelland (Director)

BS1377 : Part 6 : Clause 3.5 : 1990

CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

One-way vertical drainage with rigid loading

Location	BH41
Depth (m)	3.20-3.80
Sample Type	UT
Distance from top	20 mm
Orientation	Vertical

Description:

Very weak off white structured CHALK.

SAMPLE DETAILS

Sample preparation		Undisturbed
Condition and quality of sample		Good
Remarks on specimen preparation		No difficulties

TEST DETAILS

Apparatus used		Hydraulic consolidation cell of 79 mm nominal diameter
Cell preparation		Check performed in accordance with Clause 3.2.6
Type of loading		Equal strain
Drainage conditions		One-way vertical
Pore pressure measurement location		Centre of base
Diameter of central drain	*mm*	n/a
Method of forming the well		n/a
Material used for centre drain well		n/a

INITIAL CONDITIONS

Diameter	*mm*	79.02	Bulk density	*Mg/m³*	1.89
Height	*mm*	25.11	Dry density	*Mg/m³*	1.48
Moisture content	*%*	28.1	Voids ratio		0.829
Particle density	*Mg/m³*	2.70 (Assumed)	Initial degree of saturation	*%*	91.6

SATURATION

Method		Saturation by increments of cell pressure only
Pressure used		50 kPa increments
Volume of water taken in	*mL*	0
Final diaphragm pressure	*kPa*	200
Final pore pressure	*kPa*	186
Final B value		0.97
Duration	*days*	1

UNDRAINED LOADING / UNLOADING

Stage number		**1**
Stage type		Load
Diaphragm pressure	*kPa*	370
Height change	*mm*	0.00
Pore pressure increase	*kPa*	168

CONSOLIDATION (drained loading/unloading)

Back pressure	*kPa*	300
Effective stress at end of stage	*kPa*	70
Voids ratio at end of stage		0.581
Pore pressure dissipation at end of stage	*%*	100
Coeff. of Volume Compressibility (mv)	*m²/MN*	8.2
Coefficient of Consolidation (cv)	*m²/year*	130
Method for deriving cv (including method))		t50 (b)

PERMEABILITY

Vertical Cell pressure	*kPa*	370
Inlet pressure	*kPa*	295
Outlet pressure	*kPa*	305
Mean effective stress	*kPa*	70
Coefficient corrected to 20°C	*kPa*	1.4E-09
Duration	*days*	6

FINAL CONDITIONS

Wet density	*Mg/m³*	1.89
Moisture content	*%*	29.6

Checked and Approved by

[redacted]

J A Reynolds - Laboratory Manager
27/01/2021

Project Number:

GEO / 32413

Project Name:

AQUIND DRAINAGE DESIGN
20/1161

GEOLABS

BS1377 : Part 6 : Clause 3.5 : 1990

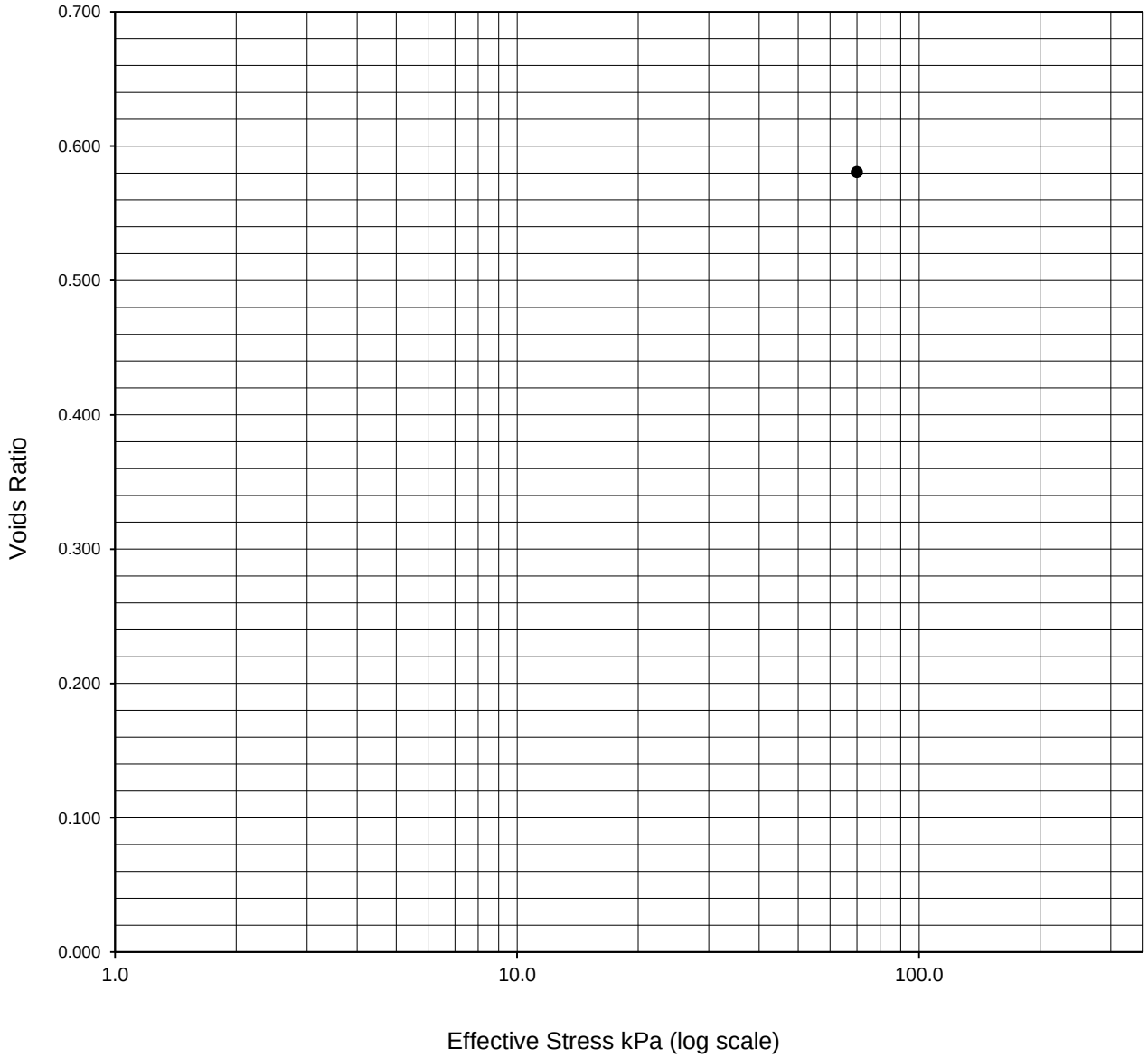
CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

One-way vertical drainage with rigid loading

Location	BH41
Depth (m)	3.20-3.80
Sample Type	UT
Distance from top	20 mm
Orientation	Vertical

Description:

Very weak off white structured CHALK.



Checked and Approved by

[redacted]

J A Reynolds - Laboratory Manager
27/01/2021

Project Number:

GEO / 32413

Project Name:

AQUIND DRAINAGE DESIGN
20/1161

GEOLABS

BS1377 : Part 6 : Clause 3.5 : 1990

CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

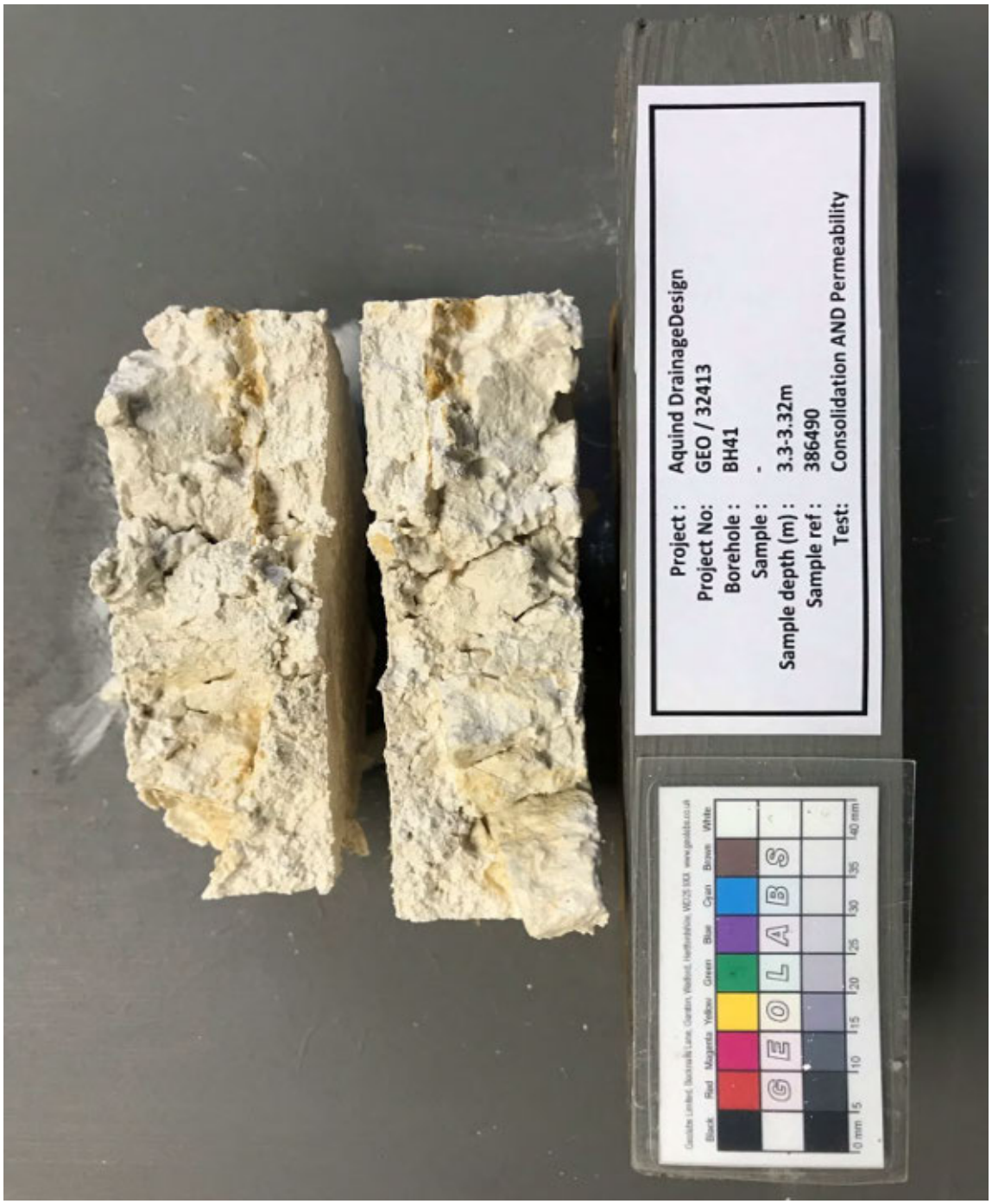
One-way vertical drainage with rigid loading

Location	BH41
Depth (m)	3.20-3.80
Sample Type	UT
Distance from top	20 mm
Orientation	Vertical

Description:

Very weak off white structured CHALK.

After test photographs



Checked and Approved by

J A Reynolds - Laboratory Manager
27/01/2021

Project Number:

GEO / 32413

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AQUIND DRAINAGE DESIGN
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CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

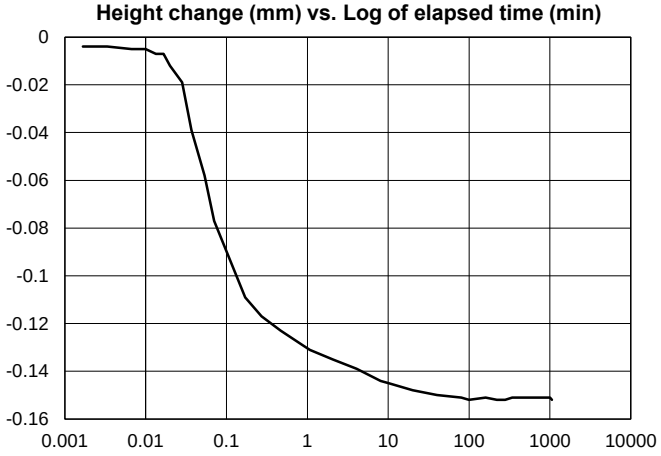
One-way vertical drainage with rigid loading

Location	BH41
Depth (m)	3.20-3.80
Sample Type	UT
Distance from top	20 mm
Orientation	Vertical

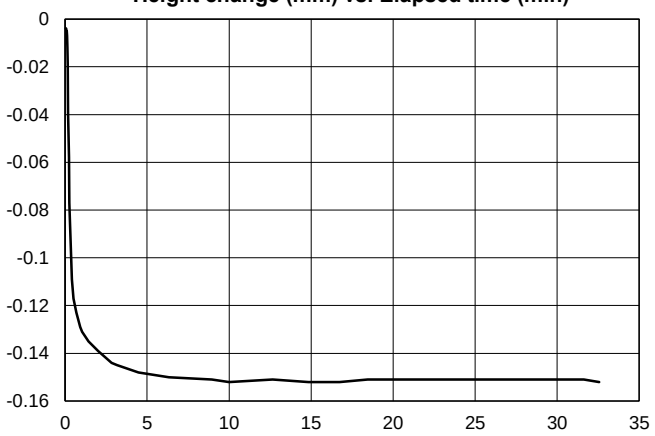
Stage 1

Effective Consolidation Pressure 70 kPa

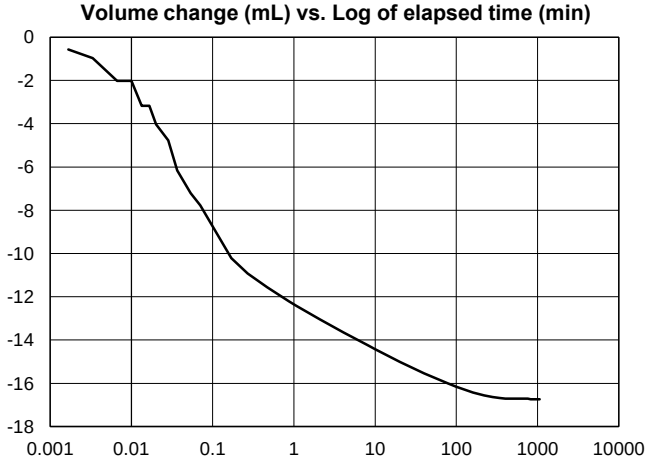
Height change (mm) vs. Log of elapsed time (min)



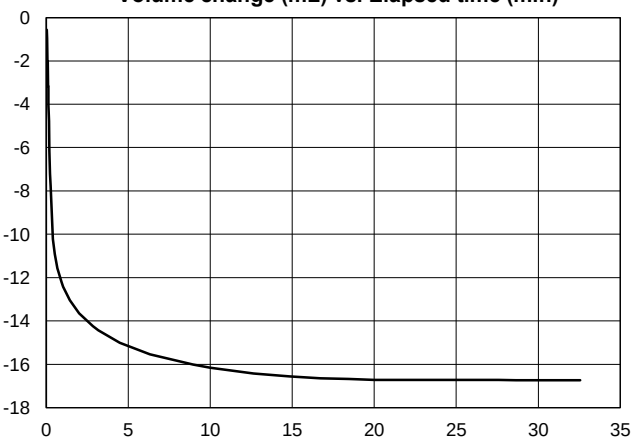
Height change (mm) vs. Elapsed time (min) $^{0.50}$



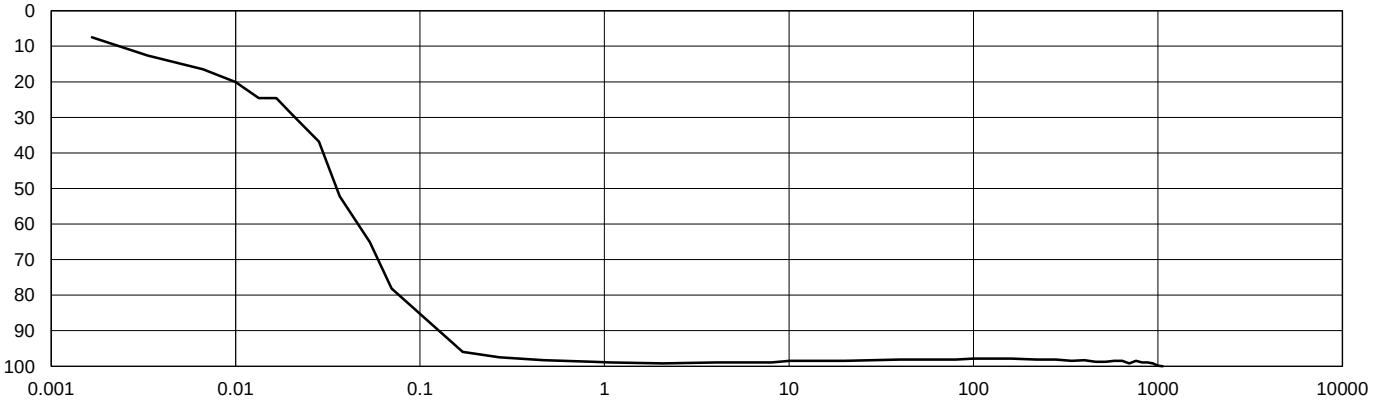
Volume change (mL) vs. Log of elapsed time (min)



Volume change (mL) vs. Elapsed time (min) $^{0.50}$



Pore pressure dissipation (%) vs. Elapsed time (min)



Checked and Approved by

[redacted]

J A Reynolds - Laboratory Manager
27/01/2021

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AQUIND DRAINAGE DESIGN
20/1161

GEOLABS

BS1377 : Part 6 : Clause 3.5 : 1990

CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

One-way vertical drainage with rigid loading

Location	BH42
Depth (m)	4.30-5.10
Sample Type	UT
Distance from top	
Orientation	Vertical

Description:

Very WEAK white fissured CHALK

SAMPLE DETAILS

Sample preparation		Undisturbed
Condition and quality of sample		Good
Remarks on specimen preparation		No difficulties

TEST DETAILS

Apparatus used		Hydraulic consolidation cell of 79 mm nominal diameter
Cell preparation		Check performed in accordance with Clause 3.2.6
Type of loading		Equal strain
Drainage conditions		One-way vertical
Pore pressure measurement location		Centre of base
Diameter of central drain	*mm*	n/a
Method of forming the well		n/a
Material used for centre drain well		n/a

INITIAL CONDITIONS

Diameter	*mm*	79.01	Bulk density	*Mg/m³*	1.91
Height	*mm*	25.11	Dry density	*Mg/m³*	1.50
Moisture content	*%*	27.5	Voids ratio		0.806
Particle density	*Mg/m³*	2.70 (Assumed)	Initial degree of saturation	*%*	92.1

SATURATION

Method		Saturation by increments of cell pressure only
Pressure used		50 kPa increments
Volume of water taken in	*mL*	0
Final diaphragm pressure	*kPa*	300
Final pore pressure	*kPa*	280
Final B value		0.95
Duration	*days*	1

UNDRAINED LOADING / UNLOADING

Stage number		**1**
Stage type		Load
Diaphragm pressure	*kPa*	400
Height change	*mm*	0.09
Pore pressure increase	*kPa*	98

CONSOLIDATION (drained loading/unloading)

Back pressure	*kPa*	300
Effective stress at end of stage	*kPa*	100
Voids ratio at end of stage		0.430
Pore pressure dissipation at end of stage	*%*	100
Coeff. of Volume Compressibility (mv)	*m²/MN*	9.5
Coefficient of Consolidation (cv)	*m²/year*	1600
Method for deriving cv (including method))		t50 (b)

PERMEABILITY

Vertical Cell pressure	*kPa*	400
Inlet pressure	*kPa*	295
Outlet pressure	*kPa*	305
Mean effective stress	*kPa*	100
Coefficient corrected to 20°C	*kPa*	5.9E-09
Duration	*days*	6

FINAL CONDITIONS

Wet density	*Mg/m³*	2.31
Moisture content	*%*	30.0

Checked and Approved by

[redacted]

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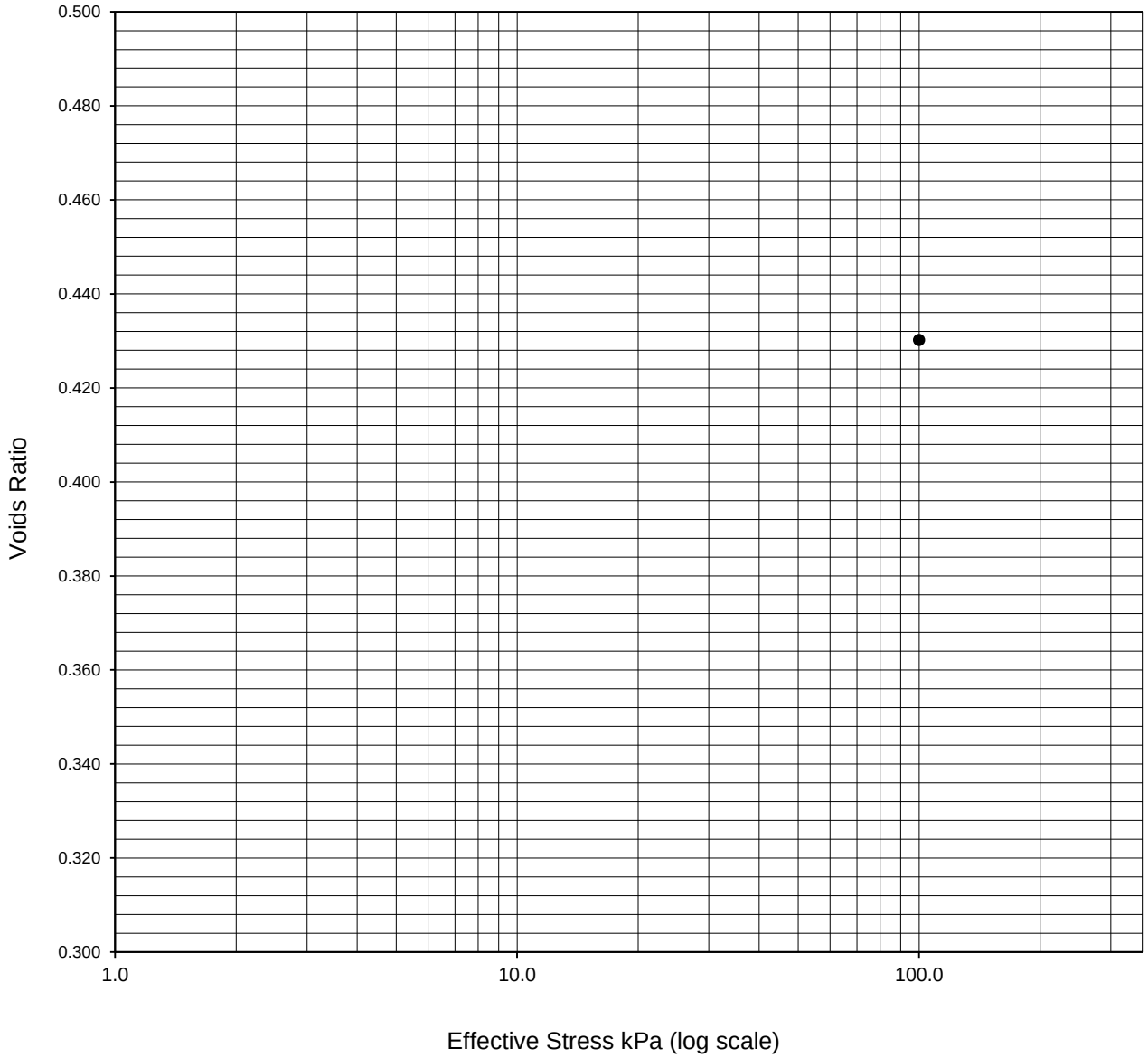
CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

One-way vertical drainage with rigid loading

Location	BH42
Depth (m)	4.30-5.10
Sample Type	UT
Distance from top	
Orientation	Vertical

Description:

Very WEAK white fissured CHALK



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CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

One-way vertical drainage with rigid loading

Location	BH42
Depth (m)	4.30-5.10
Sample Type	UT
Distance from top	
Orientation	Vertical

Description:

Very WEAK white fissured CHALK

After test photos.

Checked and Approved by

J A Reynolds - Laboratory Manager
27/01/2021

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GEOLABS

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CONSOLIDATION PROPERTIES IN A HYDRAULIC CELL

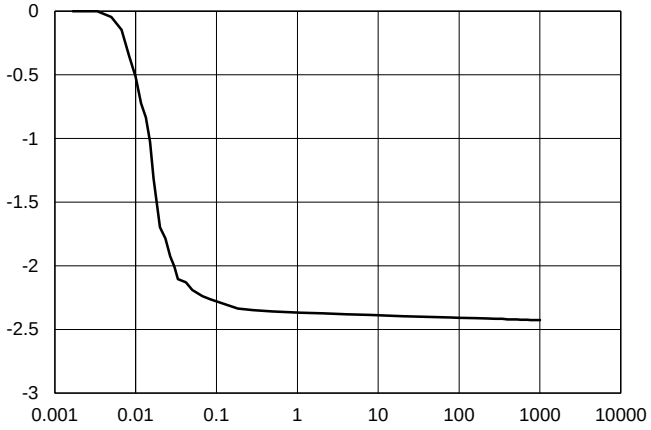
One-way vertical drainage with rigid loading

Location	BH42
Depth (m)	4.30-5.10
Sample Type	UT
Distance from top	
Orientation	Vertical

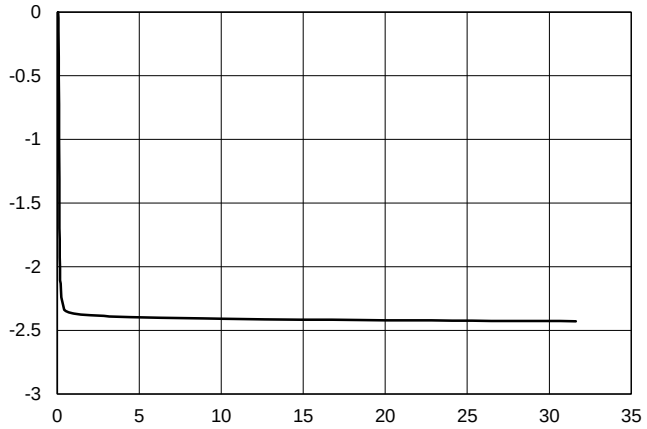
Stage 1

Effective Consolidation Pressure 100 kPa

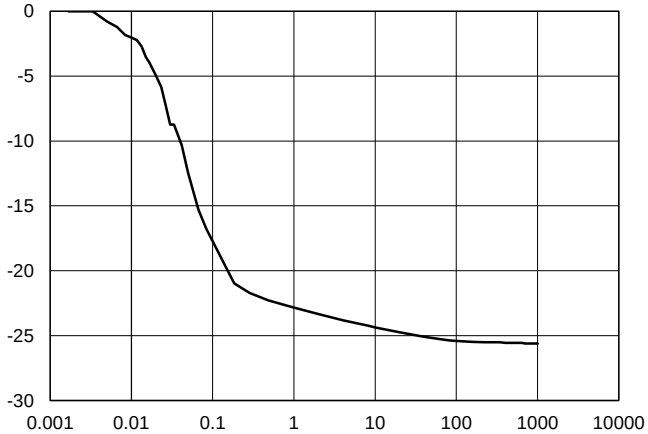
Height change (mm) vs. Log of elapsed time (min)



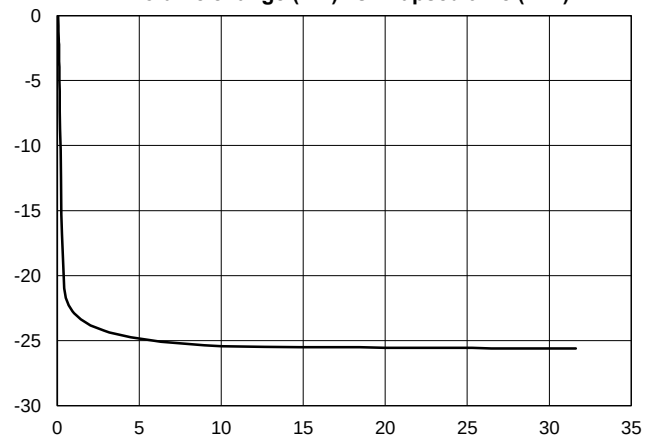
Height change (mm) vs. Elapsed time (min) $^{0.50}$



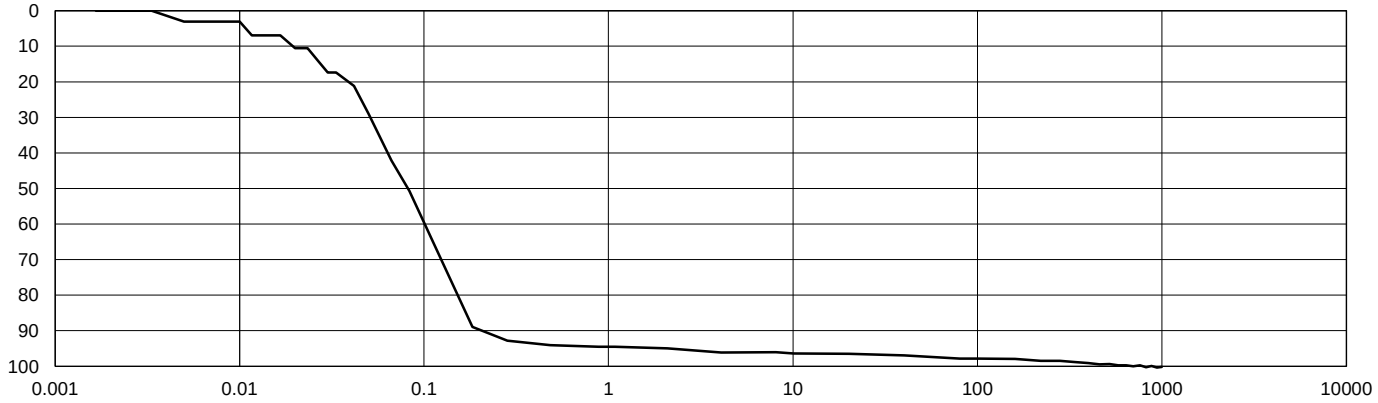
Volume change (mL) vs. Log of elapsed time (min)



Volume change (mL) vs. Elapsed time (min) $^{0.50}$



Pore pressure dissipation (%) vs. Elapsed time (min)



Checked and Approved by

[redacted]

J A Reynolds - Laboratory Manager
27/01/2021

Project Number:

GEO / 32413

Project Name:

AQUIND DRAINAGE DESIGN
20/1161

GEOLABS

APPENDIX 11

Contamination Laboratory Testing Results

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-32163-1
Initial Date of Issue:	10-Dec-2020
Client	Geotechnics Ltd
Client Address:	Unit 5 Orchard Court Heron Road Sowton Industrial Estate Exeter Devon EX2 7LL
Contact(s):	Hannah Dwane Anne Simpson Matthew Yates
Project	PE201667 Aquind Additional Ground Investigation
Quotation No.:	Q20-22266
Order No.:	OE27857
No. of Samples:	3
Turnaround (Wkdays):	5
Date Approved:	10-Dec-2020
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Date Received:	25-Nov-2020
Date Instructed:	04-Dec-2020
Results Due:	10-Dec-2020

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd		**Chemtest Job No.:**			20-32163	20-32163	20-32163
Quotation No.: Q20-22266		**Chemtest Sample ID.:**			1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A		-	
Asbestos Identification	U	2192		N/A		No Asbestos Detected	
ACM Detection Stage	U	2192		N/A		-	
Moisture	N	2030	%	0.020	18	3.0	2.4
pH	M	2010		4.0	8.4	8.8	9.0
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010	0.013	0.052	0.010
Chloride (Water Soluble)	M	2220	g/l	0.010	< 0.010	< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	0.012	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50		[B] < 0.50	
Ammonium (Water Soluble)	M	2120	g/l	0.01	< 0.01	< 0.01	< 0.01
Sulphate (Acid Soluble)	M	2430	%	0.010	0.020	0.092	0.030
Arsenic	M	2450	mg/kg	1.0		24	
Cadmium	M	2450	mg/kg	0.10		0.60	
Chromium	M	2450	mg/kg	1.0		13	
Copper	M	2450	mg/kg	0.50		12	
Mercury	M	2450	mg/kg	0.10		< 0.10	
Nickel	M	2450	mg/kg	0.50		11	
Lead	M	2450	mg/kg	0.50		78	
Zinc	M	2450	mg/kg	0.50		87	
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	
Organic Matter	M	2625	%	0.40		8.6	
Total TPH >C6-C40	M	2670	mg/kg	10		[B] 320	
Naphthalene	M	2700	mg/kg	0.10		< 0.10	
Acenaphthylene	M	2700	mg/kg	0.10		< 0.10	
Acenaphthene	M	2700	mg/kg	0.10		< 0.10	
Fluorene	M	2700	mg/kg	0.10		< 0.10	
Phenanthrene	M	2700	mg/kg	0.10		1.4	
Anthracene	M	2700	mg/kg	0.10		0.48	
Fluoranthene	M	2700	mg/kg	0.10		4.5	
Pyrene	M	2700	mg/kg	0.10		4.9	
Benzo[a]anthracene	M	2700	mg/kg	0.10		2.6	
Chrysene	M	2700	mg/kg	0.10		2.6	
Benzo[b]fluoranthene	M	2700	mg/kg	0.10		4.2	
Benzo[k]fluoranthene	M	2700	mg/kg	0.10		1.8	

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd		**Chemtest Job No.:**			20-32163	20-32163	20-32163
Quotation No.: Q20-22266		**Chemtest Sample ID.:**			1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Benzo[a]pyrene	M	2700	mg/kg	0.10		3.5	
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10		2.4	
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10		0.70	
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10		2.5	
Total Of 16 PAH's	M	2700	mg/kg	2.0		32	
Dichlorodifluoromethane	U	2760	µg/kg	1.0		[B] < 1.0	
Chloromethane	M	2760	µg/kg	1.0		[B] < 1.0	
Vinyl Chloride	M	2760	µg/kg	1.0		[B] < 1.0	
Bromomethane	M	2760	µg/kg	20		[B] < 20	
Chloroethane	U	2760	µg/kg	2.0		[B] < 2.0	
Trichlorofluoromethane	M	2760	µg/kg	1.0		[B] < 1.0	
1,1-Dichloroethene	M	2760	mg/kg	1.0		[B] < 1.0	
Trans 1,2-Dichloroethene	M	2760	mg/kg	1.0		[B] < 1.0	
1,1-Dichloroethane	M	2760	µg/kg	1.0		[B] < 1.0	
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0		[B] < 1.0	
Bromochloromethane	U	2760	µg/kg	5.0		[B] < 5.0	
Trichloromethane	M	2760	µg/kg	1.0		[B] < 1.0	
1,1,1-Trichloroethane	M	2760	µg/kg	1.0		[B] < 1.0	
Tetrachloromethane	M	2760	µg/kg	1.0		[B] < 1.0	
1,1-Dichloropropene	U	2760	µg/kg	1.0		[B] < 1.0	
Benzene	M	2760	µg/kg	1.0		[B] < 1.0	
1,2-Dichloroethane	M	2760	µg/kg	2.0		[B] < 2.0	
Trichloroethene	N	2760	µg/kg	1.0		[B] < 1.0	
1,2-Dichloropropane	M	2760	µg/kg	1.0		[B] < 1.0	
Dibromomethane	M	2760	µg/kg	1.0		[B] < 1.0	
Bromodichloromethane	M	2760	µg/kg	5.0		[B] < 5.0	
cis-1,3-Dichloropropene	N	2760	µg/kg	10		[B] < 10	
Toluene	M	2760	µg/kg	1.0		[B] < 1.0	
Trans-1,3-Dichloropropene	N	2760	µg/kg	10		[B] < 10	
1,1,2-Trichloroethane	M	2760	µg/kg	10		[B] < 10	
Tetrachloroethene	M	2760	µg/kg	1.0		[B] < 1.0	
1,3-Dichloropropane	U	2760	µg/kg	2.0		[B] < 2.0	
Dibromochloromethane	U	2760	µg/kg	10		[B] < 10	
1,2-Dibromoethane	M	2760	µg/kg	5.0		[B] < 5.0	
Chlorobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0		[B] < 2.0	
Ethylbenzene	M	2760	µg/kg	1.0		[B] < 1.0	

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd		**Chemtest Job No.:**			20-32163	20-32163	20-32163
Quotation No.: Q20-22266		**Chemtest Sample ID.:**			1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
m & p-Xylene	M	2760	µg/kg	1.0		[B] < 1.0	
o-Xylene	M	2760	µg/kg	1.0		[B] < 1.0	
Styrene	M	2760	µg/kg	1.0		[B] < 1.0	
Tribromomethane	U	2760	µg/kg	1.0		[B] < 1.0	
Isopropylbenzene	M	2760	µg/kg	1.0		[B] < 1.0	
Bromobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
1,2,3-Trichloropropane	N	2760	µg/kg	50		[B] < 50	
N-Propylbenzene	U	2760	µg/kg	1.0		[B] < 1.0	
2-Chlorotoluene	M	2760	µg/kg	1.0		[B] < 1.0	
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0		[B] < 1.0	
4-Chlorotoluene	U	2760	µg/kg	1.0		[B] < 1.0	
Tert-Butylbenzene	U	2760	µg/kg	1.0		[B] < 1.0	
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0		[B] < 1.0	
Sec-Butylbenzene	U	2760	µg/kg	1.0		[B] < 1.0	
1,3-Dichlorobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
4-Isopropyltoluene	U	2760	µg/kg	1.0		[B] < 1.0	
1,4-Dichlorobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
N-Butylbenzene	U	2760	µg/kg	1.0		[B] < 1.0	
1,2-Dichlorobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50		[B] < 50	
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0		[B] < 1.0	
Hexachlorobutadiene	U	2760	µg/kg	1.0		[B] < 1.0	
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0		[B] < 2.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		[B] < 1.0	
N-Nitrosodimethylamine	M	2790	mg/kg	0.50		[B] < 0.50	
Phenol	M	2790	mg/kg	0.50		[B] < 0.50	
2-Chlorophenol	M	2790	mg/kg	0.50		[B] < 0.50	
Bis-(2-Chloroethyl)Ether	M	2790	mg/kg	0.50		[B] < 0.50	
1,3-Dichlorobenzene	M	2790	mg/kg	0.50		[B] < 0.50	
1,4-Dichlorobenzene	N	2790	mg/kg	0.50		[B] < 0.50	
1,2-Dichlorobenzene	M	2790	mg/kg	0.50		[B] < 0.50	
2-Methylphenol	M	2790	mg/kg	0.50		[B] < 0.50	
Bis(2-Chloroisopropyl)Ether	M	2790	mg/kg	0.50		[B] < 0.50	
Hexachloroethane	N	2790	mg/kg	0.50		[B] < 0.50	
N-Nitrosodi-n-propylamine	M	2790	mg/kg	0.50		[B] < 0.50	
4-Methylphenol	M	2790	mg/kg	0.50		[B] < 0.50	
Nitrobenzene	M	2790	mg/kg	0.50		[B] < 0.50	

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd			**Chemtest Job No.:**		20-32163	20-32163	20-32163
Quotation No.: Q20-22266			**Chemtest Sample ID.:**		1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Isophorone	M	2790	mg/kg	0.50		[B] < 0.50	
2-Nitrophenol	N	2790	mg/kg	0.50		[B] < 0.50	
2,4-Dimethylphenol	N	2790	mg/kg	0.50		[B] < 0.50	
Bis(2-Chloroethoxy)Methane	M	2790	mg/kg	0.50		[B] < 0.50	
2,4-Dichlorophenol	M	2790	mg/kg	0.50		[B] < 0.50	
1,2,4-Trichlorobenzene	M	2790	mg/kg	0.50		[B] < 0.50	
Naphthalene	M	2790	mg/kg	0.50		[B] < 0.50	
4-Chloroaniline	N	2790	mg/kg	0.50		[B] < 0.50	
Hexachlorobutadiene	M	2790	mg/kg	0.50		[B] < 0.50	
4-Chloro-3-Methylphenol	M	2790	mg/kg	0.50		[B] < 0.50	
2-Methylnaphthalene	M	2790	mg/kg	0.50		[B] < 0.50	
4-Nitrophenol	N	2790	mg/kg	0.50		[B] < 0.50	
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50		[B] < 0.50	
2,4,6-Trichlorophenol	M	2790	mg/kg	0.50		[B] < 0.50	
2,4,5-Trichlorophenol	M	2790	mg/kg	0.50		[B] < 0.50	
2-Chloronaphthalene	M	2790	mg/kg	0.50		[B] < 0.50	
2-Nitroaniline	M	2790	mg/kg	0.50		[B] < 0.50	
Acenaphthylene	M	2790	mg/kg	0.50		[B] < 0.50	
Dimethylphthalate	M	2790	mg/kg	0.50		[B] < 0.50	
2,6-Dinitrotoluene	M	2790	mg/kg	0.50		[B] < 0.50	
Acenaphthene	M	2790	mg/kg	0.50		[B] < 0.50	
3-Nitroaniline	N	2790	mg/kg	0.50		[B] < 0.50	
Dibenzofuran	M	2790	mg/kg	0.50		[B] < 0.50	
4-Chlorophenylphenylether	M	2790	mg/kg	0.50		[B] < 0.50	
2,4-Dinitrotoluene	M	2790	mg/kg	0.50		[B] < 0.50	
Fluorene	M	2790	mg/kg	0.50		[B] < 0.50	
Diethyl Phthalate	M	2790	mg/kg	0.50		[B] < 0.50	
4-Nitroaniline	M	2790	mg/kg	0.50		[B] < 0.50	
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50		[B] < 0.50	
Azobenzene	M	2790	mg/kg	0.50		[B] < 0.50	
4-Bromophenylphenyl Ether	M	2790	mg/kg	0.50		[B] < 0.50	
Hexachlorobenzene	M	2790	mg/kg	0.50		[B] < 0.50	
Pentachlorophenol	N	2790	mg/kg	0.50		[B] < 0.50	
Phenanthrene	M	2790	mg/kg	0.50		[B] 0.61	
Anthracene	M	2790	mg/kg	0.50		[B] 1.8	
Carbazole	M	2790	mg/kg	0.50		[B] 0.75	
Di-N-Butyl Phthalate	M	2790	mg/kg	0.50		[B] < 0.50	

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd		**Chemtest Job No.:**			20-32163	20-32163	20-32163
Quotation No.: Q20-22266		**Chemtest Sample ID.:**			1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Fluoranthene	M	2790	mg/kg	0.50		[B] 17	
Pyrene	M	2790	mg/kg	0.50		[B] 15	
Butylbenzyl Phthalate	M	2790	mg/kg	0.50		[B] < 0.50	
Benzo[a]anthracene	M	2790	mg/kg	0.50		[B] 8.4	
Chrysene	M	2790	mg/kg	0.50		[B] 8.0	
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50		[B] < 0.50	
Di-N-Octyl Phthalate	M	2790	mg/kg	0.50		[B] < 0.50	
Benzo[b]fluoranthene	M	2790	mg/kg	0.50		[B] 15	
Benzo[k]fluoranthene	M	2790	mg/kg	0.50		[B] 4.9	
Benzo[a]pyrene	M	2790	mg/kg	0.50		[B] 13	
Indeno(1,2,3-c,d)Pyrene	M	2790	mg/kg	0.50		[B] 6.4	
Dibenz(a,h)Anthracene	M	2790	mg/kg	0.50		[B] 2.2	
Benzo[g,h,i]perylene	M	2790	mg/kg	0.50		[B] < 0.50	
PCB 28	U	2815	mg/kg	0.010		< 0.010	
PCB 52	U	2815	mg/kg	0.010		< 0.010	
PCB 90+101	U	2815	mg/kg	0.010		< 0.010	
PCB 118	U	2815	mg/kg	0.010		< 0.010	
PCB 153	U	2815	mg/kg	0.010		< 0.010	
PCB 138	U	2815	mg/kg	0.010		< 0.010	
PCB 180	U	2815	mg/kg	0.010		< 0.010	
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10		< 0.10	
Alpha-HCH	N	2840	mg/kg	0.20		< 0.20	
Gamma-HCH (Lindane)	N	2840	mg/kg	0.20		< 0.20	
Beta-HCH	N	2840	mg/kg	0.20		< 0.20	
Delta-HCH	N	2840	mg/kg	0.20		< 0.20	
Heptachlor	N	2840	mg/kg	0.20		< 0.20	
Aldrin	N	2840	mg/kg	0.20		< 0.20	
Heptachlor Epoxide	N	2840	mg/kg	0.20		< 0.20	
Gamma-Chlordane	N	2840	mg/kg	0.20		< 0.20	
Alpha-Chlordane	N	2840	mg/kg	0.20		< 0.20	
Endosulfan I	N	2840	mg/kg	0.20		< 0.20	
4,4-DDE	N	2840	mg/kg	0.20		< 0.20	
Dieldrin	N	2840	mg/kg	0.20		< 0.20	
Endrin	N	2840	mg/kg	0.20		< 0.20	
4,4-DDD	N	2840	mg/kg	0.20		< 0.20	
Endosulfan II	N	2840	mg/kg	0.20		< 0.20	
Endrin Aldehyde	N	2840	mg/kg	0.20		< 0.20	

Results - Soil

Project: PE201667 Aquind Additional Ground Investigation

Client: Geotechnics Ltd			**Chemtest Job No.:**		20-32163	20-32163	20-32163
Quotation No.: Q20-22266			**Chemtest Sample ID.:**		1102916	1102918	1102919
			Sample Location:		TP27	TP28	TP28
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.20	0.30
			Bottom Depth (m):			0.30	1.00
			Date Sampled:		16-Nov-2020	19-Nov-2020	19-Nov-2020
			Asbestos Lab:			DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
4,4-DDT	N	2840	mg/kg	0.20		< 0.20	
Endosulfan Sulphate	N	2840	mg/kg	0.20		< 0.20	
Methoxychlor	N	2840	mg/kg	0.20		< 0.20	
Endrin Ketone	N	2840	mg/kg	0.20		< 0.20	
Total Phenols	M	2920	mg/kg	0.30		< 0.30	

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1102918			TP28	19-Nov-2020	B	Amber Glass 250ml
1102918			TP28	19-Nov-2020	B	Amber Glass 60ml
1102918			TP28	19-Nov-2020	B	Plastic Tub 1000g

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurememrnt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2840	Organochlorine (O-Cl) Pesticides in Soils by GC-MS	Organochlorine pesticide representative suite including DDT and its metabolites, 'drins' and HCH etc, plus client specific determinands	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX 12

Investigation Techniques and General Notes

INVESTIGATION TECHNIQUES

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPT's) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

GENERAL NOTES

1. The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.

2. Further copies may be obtained with the Client's written permission, from Geotechnics Limited with whom the master copy of the document will be retained.

3. The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.

4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.

5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.

6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.

7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.

8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.

9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.

10. Any unavoidable variations from specified procedures are identified in the report.

11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated

12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.

13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.

15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.

16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.

17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.

18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.

19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.

20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.

21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.