A57 Link Roads
TR010034
7.6 Ground Investigation Report

APFP Regulation 5(2)(q)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2021

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A57 Link Roads Scheme

Development Consent Order 202[x]

7.6 GROUND INVESTIGATION REPORT

Regulation Number:	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010034
Application Document Reference	TR010034/APP/7.6
Author:	A57 Link Roads Scheme Project Team, Highways England

Version	Date	Status of Version
Rev 1.0	June 2021	DCO Application

Table of contents

1. Foreword

1.1.1 This Ground Investigation Report (GIR) relates to an application made by Highways England (the "Applicant") to the Planning Inspectorate under the Planning Act 2008 (the "2008 Act") for a Development Consent Order ("DCO"). If made, the DCO would grant consent for the Applicant to undertake the A57 Links Roads Scheme (the "Scheme").

1.1.2 A detailed description of the Scheme can be found in the 'Introduction to the Application [TR010034/APP/1.3] and in Chapter 2 of the Environmental Statement [TR010034/APP/6.3].

1.1.3 The Scheme lies mainly within the administrative boundaries of Tameside Metropolitan Borough Council (TMBC), up until to the proposed River Etherow Bridge. To the east of this, the Scheme crosses over the boundary with High Peak Borough Council (HPBC) and Derbyshire County Council (DCC).

1.1.4 The Scheme includes the following components:

- A new offline bypass of 1.12 miles (1.8km) of dual carriageway road connecting the M67 Junction 4 to A57(T) Mottram Moor Junction.
- A new offline bypass of 0.81 miles (1.3km) of single carriageway connecting the A57(T) Mottram Moor to the A57 Woolley Bridge.
- Creation of two new junctions, Mottram Moor Junction and Woolley Bridge Junction and improvement works to the existing M67 Junction 4.
- Creation of five new structures (Old Hall Farm Underpass, Roe Cross Road Overbridge , Mottram Underpass, Carrhouse Lane Underpass, River Etherow Bridge and Roe Cross Road overbridge).
- One main temporary construction compound area, located on agricultural land to the east of the M67 Junction 4.
- Detrunking, including safety measures from the M67 Junction 4 to Mottram Back Moor Junction, to be agreed with Tameside MBC.
- Safety measures and improvements to the A57 from Mottram Moor Junction to Gun Inn Junction and from Gun Inn Junction to Woolley Bridge Junction, to be agreed with Tameside MBC.

2. Background

2.1.1 This GIR has been prepared and submitted in compliance with Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the "2009 Regulations"), as amended and to comply with Highways England (HE) technical standard HD22/08 'Managing Geotechnical Risk' (Highways Agency, 2008) and BS EN 1997-1:2004+A1:2013 'Eurocode 7: Geotechnical design - Part 1: General rules' (British Standards Institution, 2004a).

2.1.2 Four previous phases of ground investigation have been undertaken across the Scheme.

2.1.3 In 2018 Arcadis was commissioned to prepare a GIR as defined in Appendix D of DMRB HD22/02 (Highways Agency, 2008). The GIR prepared in 2019 provided an interpretation of previous desk study and ground investigation information and gave recommendations for the geotechnical aspects associated with the proposed A57/A628 Trans-Pennine Upgrade development.

2.1.4 The three previous phases of ground investigation undertaken within the area of the proposed route were also accompanied by Geotechnical Reports produced by Mott MacDonald in 2005 and Hyder Consulting UK Limited in 2006. The three previous phases of ground investigation were completed by:

- Soil Mechanics Ltd, circa 1995
- Norwest Holst Soil Engineering, 2004
- Furgo Engineering Services Ltd, 2005

2.1.5 Arcadis Consulting reviewed these documents and undertook a gap analysis of the ground investigation data in relation to the proposed development. As a result, a fourth detailed ground investigation was undertaken by Socotec UK Limited in 2018.

2.1.6 The Arcadis Consulting GIR (2019) considered the three previous ground investigations and the fourth gap analysis undertaken by Socotec in 2018. The information in the GIR prepared by Arcadis in 2018/9 is therefore considered current and relevant to the Scheme and is submitted as part of this DCO submission.

2.1.7 The Scheme Design for DCO submission is based on data gathered from previous phases of ground investigation as detailed above. It is not believed that the geology and/or ground conditions have significantly altered since assessments were undertaken in 2018/9.

2.1.8 The land to be developed has been used primarily as agricultural land or existing highway over this time period. The use or conditions of mines within the Scheme red line boundary has also not thought to have altered during the two year period. Additional data will be gathered as part of the 2021 ground investigation described in below. As these ground investigations will not be completed prior to submission the information gathered will be provided in a Ground Investigation Report addendum and utilised to support the later stages of design.

2.2 Ground Investigation summary

2.2.1 In total approximately 109 exploratory boreholes and 50 trial pits have been undertaken located within the current red line boundary between 1994 and 2018. From these locations over 80 soil samples have been subjected to environmental laboratory analysis, with only two exceedances of the generic assessment criteria recorded.

2.2.2 Six groundwater samples were also collected from along the route of the scheme, with exceedances of polycyclic aromatic hydrocarbons, total petroleum hydrocarbons and, zinc and chromium recorded. It was concluded previously by Arcadis that the concentrations within the overlying made ground and natural deposits do not indicate a significant source of contamination and do not pose an unacceptable risk to either the Scheme or controlled waters within influencing distance of the Site.

2.2.3 Ground gas monitoring was undertaken in four locations across the Scheme on three occasions. The Site was given a CS1 classification (very low risk). This information has been utilised to characterise ground conditions underlying the Scheme.

3. Further Ground Investigation

3.1.1 A series of new ground investigation surveys commenced in Winter 2021 and are due to be completed in Summer 2021, which will provide information specific to the current scheme and aid the design process and dewatering assessments. A further ground investigation has been undertaken to fill gaps in the existing information and as further preliminary design has been undertaken.

3.1.2 The additional ground investigation information will be used to supplement the information obtained during past ground investigations. This is required to:

- Confirm composition and ground conditions across the scheme extents to inform the permanent and temporary works design where gaps are considered to be present within the existing data
- Improve understanding of potential risks associated with areas of reported instability (Mottram Moor) and geological fault zones (proposed Mottram Underpass)
- Evaluate potential for migration of contaminants or leachate from possible off-site sources of contamination (landfill)
- Provide supplementary ground information for evaluating the re-use of potential arisings
- Assist a detailed hydrogeological assessment
- Confirm details pertaining to the United Utilities Longdendale Aqueduct asset

3.1.3 The current scope of investigation does not include for detailed testing of ground conditions at the proposed road formation where stabilisation using lime / cement additives might be considered. Testing to determine resistance to fragmentation required when assessing suitability of arisings for selected backfill to structures is also not presently proposed. This is due to the difficulty in obtaining and processing sufficient quantities of representative material from the horizons, likely to generate potentially appropriate properties.

3.1.4 The current phase of ground investigation will aim to confirm the ground conditions previously encountered during previous investigations. This includes the areas outlined in the Table 3.1, please refer to Appendix A for locations of the boreholes.

Table 3.1: Location of current phases of land contamination review

Location	Requirements	Exploratory hole
Within the vicinity of Carrhouse Lane landfill (potential source of contamination). To gather data within the area between the Scheme and suspected landfill location, which was not previously investigated.	Soil samples, groundwater and ground gas.	BH541
Exploratory holes located within an area of a number of contemporary trade directories. Previous ground investigations recorded a marginal dibenz(ah) anthracene exceedance within a soil sample and minor TPH exceedances within groundwater samples collected within this area. Due to the creation of an enclosed space within the proposed underpass, further gas	Soil samples and groundwater samples.	BH510 BH511 BH512

Location	Requirements	Exploratory hole
monitoring may be required. Further sampling/monitoring is required to confirm that no unacceptable risk is present.	Ground gas (BH510 & BH513).	BH513 BH514 BH515
Previous ground investigation recorded a lead exceedance within this area of the Scheme. Further samples required to confirm that this does not pose an unacceptable risk.	Soil sample and groundwater sample.	BH546
Exploratory holes located within proposed deep cuttings. Require deeper samples of soil due to the potential reuse of material across the Scheme. Previous ground investigations recorded heavy metal exceedances within groundwater but did not show a significant risk. More recent samples will be obtained from this area to provide confirmation of low risk.	Soil samples and groundwater samples	BH517 BH520 BH527 BH528
Previous ground investigations recorded exceedances of PAHs and TPH within the vicinity of this area within the groundwater. Exceedances were not found to pose an unacceptable risk, however, further samples are required to confirm this.	Soil and groundwater	BH504 BH503
To aid in the analysis of risk posed to controlled waters receptors and the calculation of bioavailable concentrations.	Surface Water Samples	River Etherow (upstream, centre and downstream)

3.1.5 Environmental soil samples will also be collected from all exploratory holes planned to be undertaken for chemical analysis to assess suitability for reuse.

3.1.6 Pump tests are also proposed to inform the understanding of groundwater conditions, particularly flows from the underpass/proposed cutting sides. Tests are proposed at the following locations:

- BH514
- BH519
- BH521

3.1.7 Following completion of the ground investigation, post site work ground gas and groundwater monitoring will be undertaken at selected exploratory holes.

4. Communication with Statutory Consultees

4.1.1 The methodology for using the ground investigation information already gathered (as reported by Arcadis in the GIR 2019) and supplemented with further ground investigation, as outlined above, was proposed to statutory consultees. A summary of the consultees and feedback received is included in Table 4.1.

4.1.2 A series of new ground investigation surveys was proposed to commence in Winter 2021 to provide information specific to the current Scheme and support the detailed design process. The locations of the proposed exploratory holes, to be undertaken in 2021, were highlighted. The 2021 ground investigation surveys will aim to confirm the ground conditions encountered during previous investigations. This includes the areas outlined in Table 4.1:

Table 4.1: Consultees consulted on ground investigation methodology

Communication	Date	Recipient	Response received	Feedback
Email seeking review and agreement on the methodology proposed for ground investigation works across the Trans-Pennine Upgrade – A57 Link Roads.	18 Dec 2020	TMBC	04 Jan 2021	Consultee stated that proposed scope for the investigation appears to be thorough and it has no further comments but requested a copy of the Environmental Statement.
Email seeking review and agreement on the methodology proposed for ground investigation works across the Trans-Pennine Upgrade – A57 Link Roads.	18 Dec 2020	HPBC	31 March 2021	Awaiting feedback
A chasing email seeking a response to proposed methodology issued on 18 Dec 2020.	03 March 2021			
Email seeking review and agreement on the methodology proposed for ground investigation works across the Trans-Pennine Upgrade – A57 Link Roads.	18 Dec 2020	Environment Agency (EA)	21 Jan 2021	The Consultee stated that it have no comments to make directly upon specific locations for ground investigation points as it is not party to the whole spectrum of information that suggested those locations. It did welcome the decision to complete additional ground investigation. That additional ground investigation must be based on the current site conceptual model and any information gaps considered present. Its stated that from the

Communication	Date	Recipient	Response received	Feedback
				narrative provided in the covering email this seems to be the adopted approach. It drew attention to the two ground investigation points associated with the identified Carrhouse Lane Landfill site. It stated that given this is likely to be the highest risk source for the wider scheme it may be prudent to increase the number of investigation points at this location to correctly identify any adverse impact arising from this feature and, to fully delineate the extent of the feature, wherever possible. Overall it encouraged the full characterisation of the development corridor to ensure that the ground conditions are fully understood (which should enable the fullest scope of material reuse for the future ground works), that any possible contamination sources are known and that any subsequent source-pathway-receptor linkages are realised.
The Applicant fed back to the Environment Agency its response to its comments on the GI methodology and initial GI results. It stated that due to the recorded location of the landfill in relation to the Scheme, a single borehole was identified to be sufficient to identify any potential impact of the landfill upon the Scheme. The singular exploratory hole is also due to access limitations in this area of the Scheme.	31st March 2021	Environment Agency	None	

Communication	Date	Recipient	Response received	Feedback
The investigation within this area of borehole BH541 has now been completed. The borehole assessment indicates that the layer of top soil is underlain by clay. No visual and/or olfactory evidence of contamination, including landfill material, was identified. No groundwater was encountered during drilling. The exploratory hole has been installed at a depth to allow for ground gas monitoring to be undertaken upon completion of the site works, to monitor for any potential migration of gas/contamination towards the Scheme. It should be noted that historic exploratory holes undertaken in the area of Carrhouse Lane Landfill Site did not record any evidence of landfill material (historic investigations BH428, BH429 and TP423). It is therefore not anticipated that the Scheme will encroach onto the area occupied by Carrhouse Lane Landfill. During construction the reuse of soils across the Scheme will be supervised under a Materials Management Plan (MMP) with associated validation sampling. On this basis it is not anticipated that Carrhouse Lane Landfill will impact upon the Scheme and the risk is looking to be scoped out this risk. The Applicant request the EAs views on this stance.				

4.1.3 The proposed GI methodology was agreed by TMBC and the Environment Agency, to date no response has been received from HPBC.

4.1.4 The Environment Agency suggested it would be prudent to increase the number of boreholes in the vicinity of Carrhouse Lane Landfill site. However, as set out in the response above the recent ground investigations found no visual and/or olfactory evidence of contamination, including landfill material, was identified. No groundwater was encountered during drilling. Furthermore, historic exploratory holes undertaken in the area also did not record any evidence of landfill material, it is therefore concluded that Carrhouse Lane Landfill Site will not impact upon the Scheme.

5. Arcadis 2019 Ground Investigation Report

5.1.1 The report prepared by Arcadis in 2019 is attached as Appendix B. As set out in Section 2 the primary land use has not changed in the two years since the report was prepared and the information is considered accurate and current.

Appendix A. A57 Link Road 2021 Exploratory Hole Plan

DO NOT SCALE

DESIGN LEVELS	198.335	198.213	197.986	197.760	197.533	197.306	197.079	196.853	196.641	196.458	196.303	196.177
EXISTING LEVELS	198.335	196.559	194.494	194.096	194.038	194.090	194.135	194.331	194.694	194.885	194.873	194.740
CHAINAGE	00	10	20	30	40	50	60	70	80	90	100	110

DESIGN LEVELS	196.080	196.011	195.971	195.959	195.976	196.022	196.096	196.198	196.330	196.489	196.678	196.895
EXISTING LEVELS	195.140	195.281	195.290	195.262	194.892	194.640	195.047	195.723	196.054	195.738	196.442	196.493
CHAINAGE	120	130	140	150	160	170	180	190	200	210	220	230

DESIGN LEVELS	197.140	197.414	197.717	198.048	198.401	198.756	199.112	199.467	199.822	200.177	200.532	200.887
EXISTING LEVELS	196.489	196.581	197.193	197.656	197.963	198.180	198.365	198.923	199.188	199.435	199.628	199.816
CHAINAGE	240	250	260	270	280	290	300	310	320	330	340	350

DESIGN LEVELS	201.242	201.597	201.952	202.308	202.663	203.018	203.373	203.728	204.083	204.438	204.793	205.148
EXISTING LEVELS	200.009	200.220	200.312	200.225	199.577	200.193	200.657	200.962	201.354	201.853	202.336	203.283
CHAINAGE	360	370	380	390	400	410	420	430	440	450	460	470

DESIGN LEVELS	205.501	205.838	206.158	206.462	206.749	207.020	207.273	207.511	207.731	207.935	208.122	208.292
EXISTING LEVELS	203.912	204.319	204.581	204.531	204.125	203.637	203.342	203.505	203.464	203.611	203.724	203.843
CHAINAGE	480	490	500	510	520	530	540	550	560	570	580	590

DESIGN LEVELS	208.446	208.583	208.704	208.807	208.894	208.965	209.019	209.056	209.076	209.080	209.067	209.038
EXISTING LEVELS	204.221	204.116	203.388	201.731	202.853	203.252	204.673	205.390	204.299	204.661	206.503	206.944
CHAINAGE	600	610	620	630	640	650	660	670	680	690	700	710

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

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V - 1:200

Scale 1:1000
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Scale 1:200
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NOTES

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5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

PROPOSED ROAD
EXISTING GROUND
2450
ROAD ALIGNMENT CHAINAGE
PROPOSED BOREHOLE LOCATION
PROPOSED TRIAL PIT LOCATION
CONE PENETROMETER TEST
TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

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S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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Client: highways england

Project Title: A57 TPU

Drawing Title: A57 LINK ROADS PROPOSED EXPLORATORY HOLE PLAN SHEET 1 OF 8

Drawing Number
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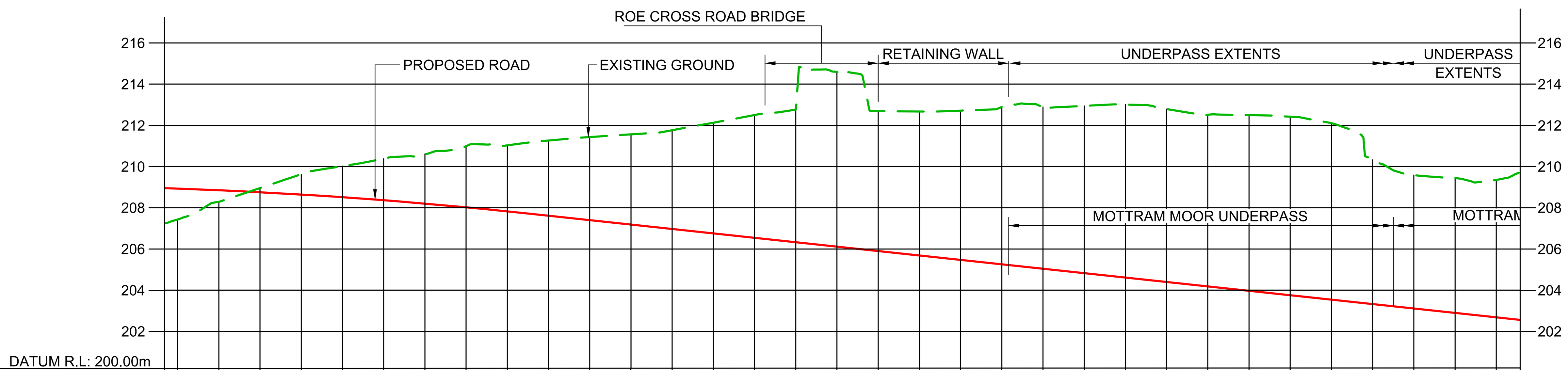

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EXISTING LEVELS	207.431	208.291	208.957	209.626	210.020	210.381	210.613	210.990	211.031	211.265	211.434	211.562	211.767	212.124	212.502	212.759	214.589	212.685	212.671	212.713	212.889	212.890	212.944	213.009	212.791	212.513	212.493	212.420	212.102	210.330	209.586	209.446	209.353
CHAINAGE	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000	1010	1020

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

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Client
highways england

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Drawing Title: A57 LINK ROADS PROPOSED EXPLORATORY HOLE PLAN SHEET 2 OF 8

Drawing Number
Project: HE551473 - Originator: BBA - Volume: HGT - Location: A57_AL_SCHEME - Type: DR - Role: CE - Number: 000012

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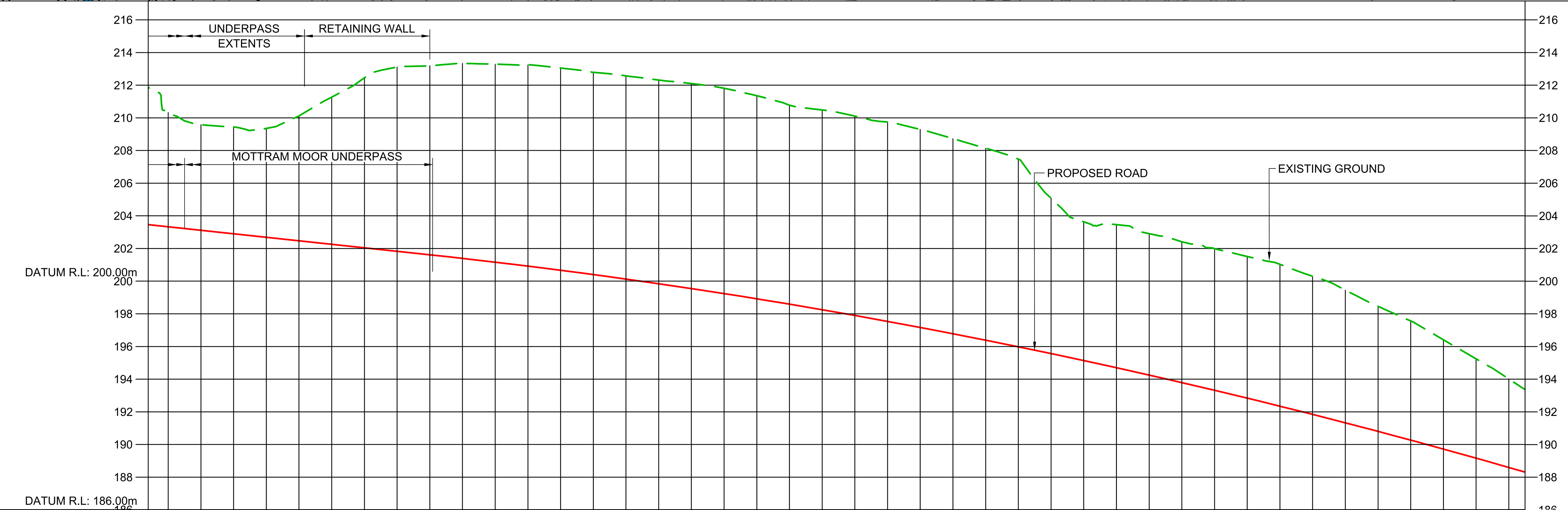

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CHAINAGE	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150

DESIGN LEVELS	200.129	199.843	199.546	199.239	198.920	198.591	198.250	197.899	197.537	197.164	196.781	196.386	195.981	195.564
EXISTING LEVELS	212.572	212.318	212.102	211.808	211.357	210.776	210.483	210.104	209.756	209.292	208.727	208.140	207.471	205.080
CHAINAGE	1160	1170	1180	1190	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290

DESIGN LEVELS	195.137	194.699	194.250	193.790	193.319	192.838	192.345	191.842	191.328	190.803	190.267	189.720	189.163	188.594
EXISTING LEVELS	203.633	203.459	202.908	202.410	201.993	201.511	201.029	200.301	199.451	198.458	197.565	196.410	195.245	194.015
CHAINAGE	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390	1400	1410	1420	1430

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S3	P01	DH	JH	MSR	MSR	10/12/20
FOR INFORMATION	S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Designer: ATKINS
Member of the SNC-Lavalin Group
Chadwick House, Birchwood Park, Warrington, WA3 6AE
Tel: +44 (0)1925 238000
Fax: +44 (0)1925 238500
www.atkinsglobal.com
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Delivery Partner: Balfour Beatty
Spencer House, Dewhurst Road, Birchwood, Warrington, WA3 7PG
www.balfourbeatty.com

Client: highways england

Project Title: A57 TPU

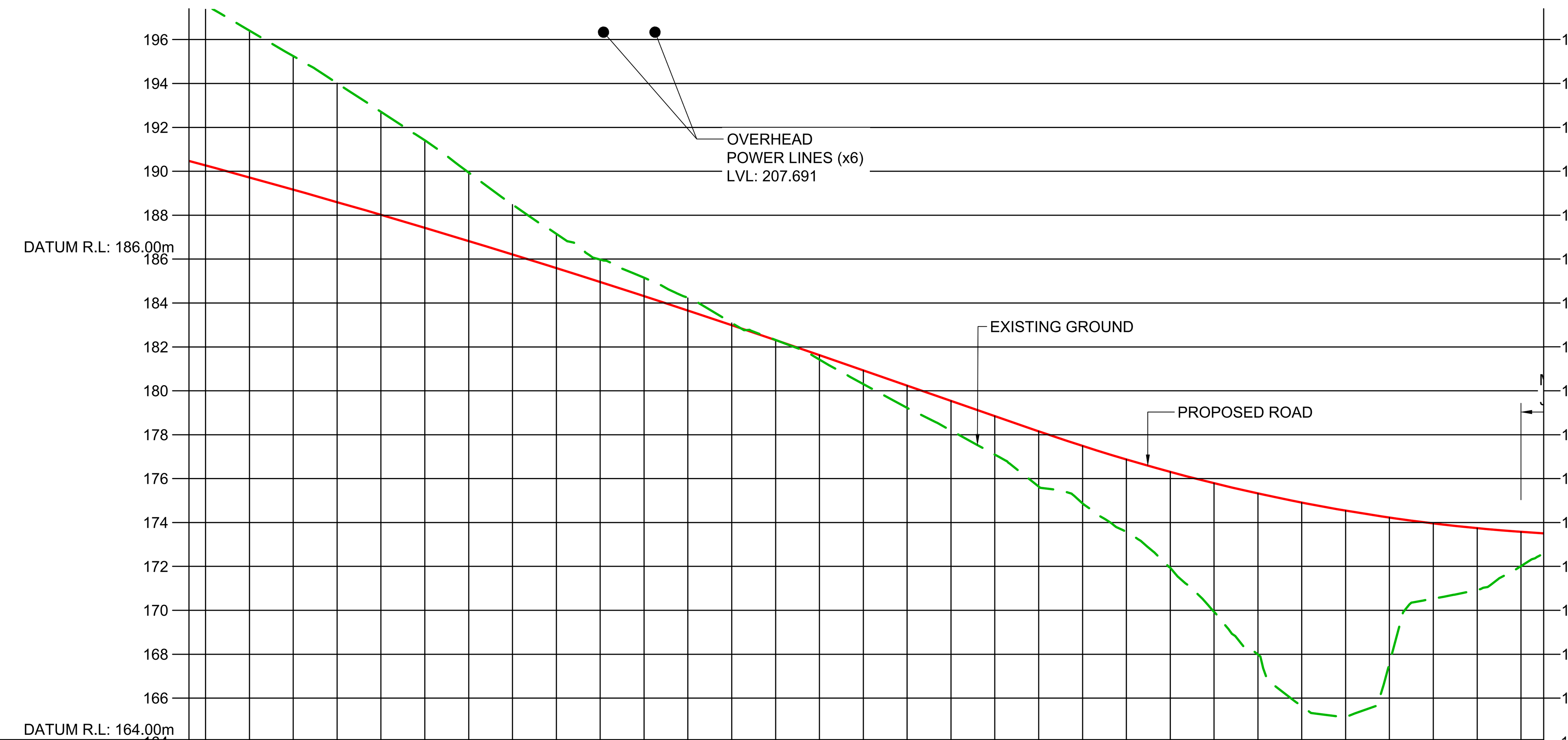
Drawing Title: A57 LINK ROADS
PROPOSED EXPLORATORY HOLE PLAN
SHEET 3 OF 8

Drawing Number
Project | Originator | Volume
HE551473 - BBA - HGT - A57_AL_SCHEME - DR - CE - 000013
Location | Type | Role | Number

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5186301 | Sheet: 3 of 8 | Rev: P02

This Drawing is saved on ProjectWise. Plotted: 16/12/2020 17:03:12 By: HAIR5096

DO NOT SCALE



CHAINAGE	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550
DESIGN LEVELS	190.267	189.720	189.163	188.594	188.015	187.424	186.823	186.211	185.588	184.955	184.310	183.654	182.988	182.311	181.623	180.929
EXISTING LEVELS	197.565	196.410	195.245	194.015	192.709	191.408	189.944	188.481	187.151	185.979	185.154	184.232	183.092	182.314	181.423	180.310

CHAINAGE	1560	1570	1580	1590	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700
DESIGN LEVELS	180.236	179.543	178.849	178.156	177.490	176.874	176.307	175.791	175.325	174.909	174.543	174.227	173.961	173.744	173.578
EXISTING LEVELS	179.222	178.193	177.093	175.642	174.872	173.568	171.935	169.931	167.988	165.629	165.131	167.587	170.532	170.935	172.013

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

SCALE = H - 1:1000
V - 1:200

Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m

Scale 1:200
5m 0m 5m 10m

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE A57 LINK ROADS GROUND INVESTIGATION SPECIFICATION HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS HE551473-BBA-HGT-A57_AL_SCHEME--DR-CE-000011 TO 000018.
4. FOR DETAILS ON UTILITIES, PLEASE REFER TO SECTION S1.8.5 OF THE GROUND INVESTIGATION SPECIFICATION: HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

- PROPOSED ROAD
- EXISTING GROUND
- ROAD ALIGNMENT CHAINAGE (2450)
- PROPOSED BOREHOLE LOCATION
- PROPOSED TRIAL PIT LOCATION
- CONE PENETROMETER TEST
- TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Designer: ATKINS
Member of the SNC-Lavalin Group
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www.atkinsglobal.com
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Delivery Partner: Balfour Beatty
Spencer House, Dewhurst Road, Birchwood, Warrington, WA3 7PG
www.balfourbeatty.com

Client: highways england

Project Title: A57 TPU

Drawing Title: A57 LINK ROADS
PROPOSED EXPLORATORY HOLE PLAN
SHEET 4 OF 8

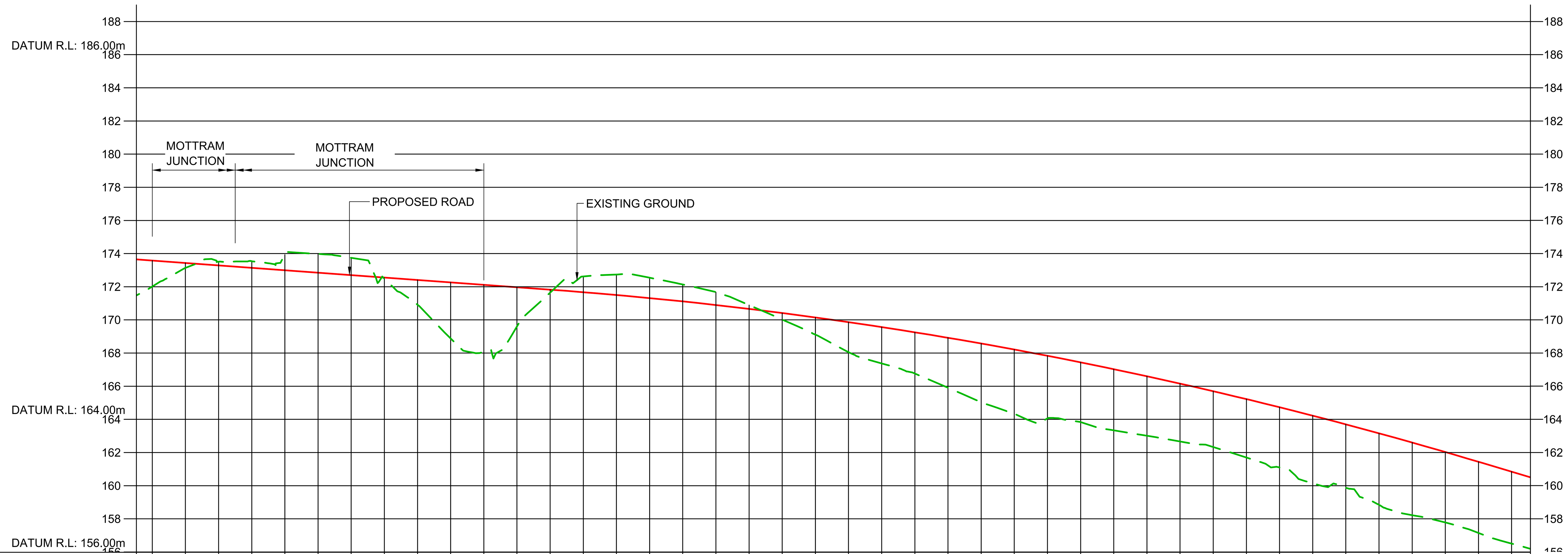
Drawing Number
Project: HE551473 - Originator: BBA - Volume: HGT - Location: A57_AL_SCHEME - Type: DR - Role: CE - Number: 000014

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5186301 | Sheet: 4 of 8 | Rev: P02

This Drawing is saved on ProjectWise. Plotted: 16/12/2020 16:55:59 By: HAIR5096

Millimetres 100 10 0

DO NOT SCALE



DESIGN LEVELS	173.578	173.432	173.286	173.140	172.993	172.847	172.701	172.555	172.409	172.262	172.116	171.970	171.824	171.671
EXISTING LEVELS	172.013	173.140	173.509	173.539	173.933	173.978	173.747	172.488	170.916	168.878	168.076	169.606	171.648	172.623
CHAINAGE	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790	1800	1810	1820	1830

DESIGN LEVELS	171.501	171.316	171.114	170.897	170.663	170.413	170.147	169.865	169.567	169.252	168.922	168.575	168.212	167.833
EXISTING LEVELS	172.733	172.545	172.136	171.678	170.895	170.022	169.110	168.047	167.375	166.764	165.906	165.035	164.332	164.063
CHAINAGE	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970

DESIGN LEVELS	167.438	167.027	166.600	166.156	165.697	165.221	164.729	164.221	163.697	163.157	162.601	162.028	161.440	160.841
EXISTING LEVELS	163.836	163.338	163.010	162.666	162.330	161.698	161.099	160.143	159.878	158.844	158.216	157.784	157.151	156.505
CHAINAGE	1980	1990	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

SCALE = H - 1:1000
V - 1:200

Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m

Scale 1:200
5m 0m 5m 10m

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE A57 LINK ROADS GROUND INVESTIGATION SPECIFICATION HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS HE551473-BBA-HGT-A57_AL_SCHEME--DR-CE-000011 TO 000018.
4. FOR DETAILS ON UTILITIES, PLEASE REFER TO SECTION S1.8.5 OF THE GROUND INVESTIGATION SPECIFICATION: HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

PROPOSED ROAD
EXISTING GROUND
2450
ROAD ALIGNMENT CHAINAGE
PROPOSED BOREHOLE LOCATION
PROPOSED TRIAL PIT LOCATION
CONE PENETROMETER TEST
TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Designer
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www.atkinsglobal.com
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Delivery Partner
Balfour Beatty
Spencer House,
Dewhurst Road,
Birchwood,
Warrington,
WA3 7PG
www.balfourbeatty.com

Client
highways england

Project Title: A57 TPU

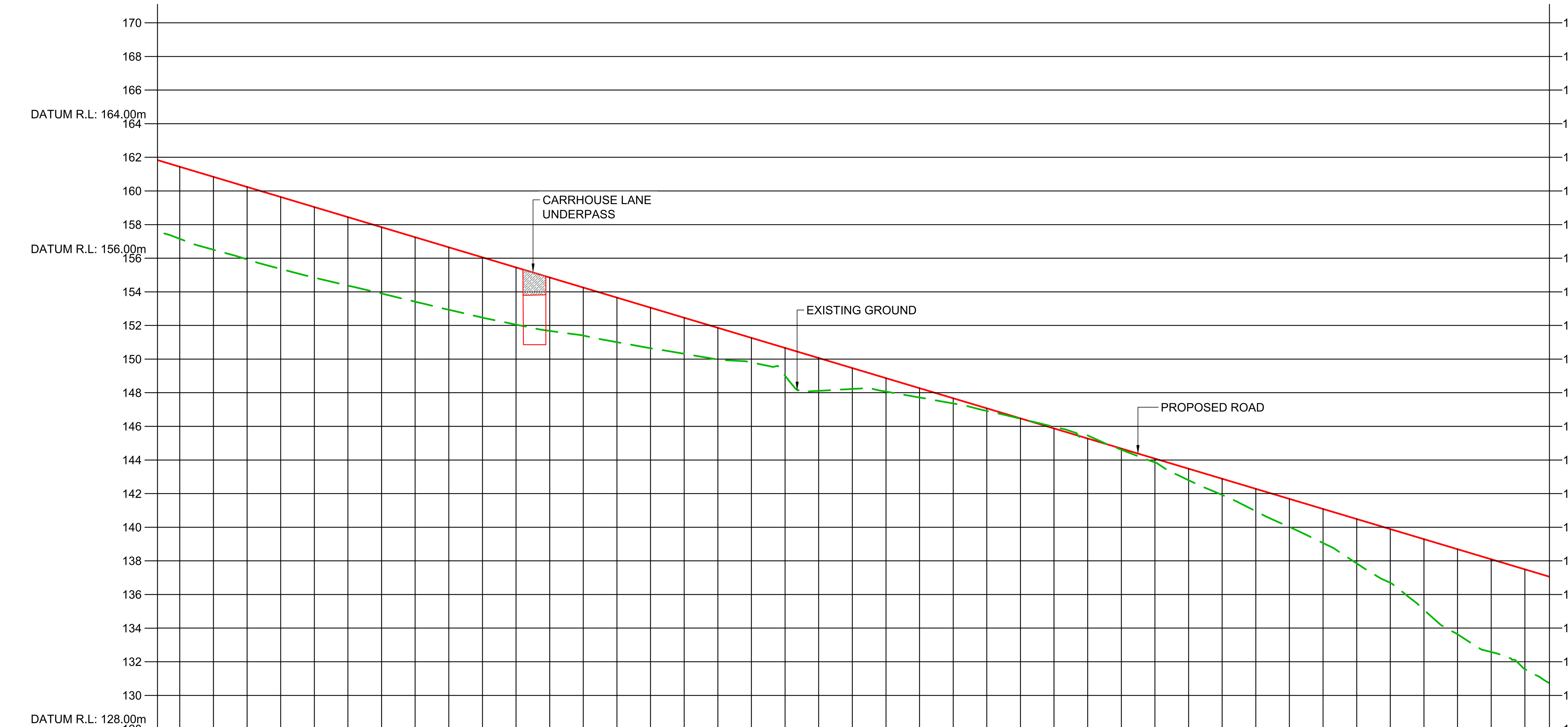
Drawing Title: A57 LINK ROADS PROPOSED EXPLORATORY HOLE PLAN SHEET 5 OF 8

Drawing Number
Project: HE551473 - Originator: BBA - Volume: HGT -
Location: A57_AL_SCHEME - Type: DR - Role: CE - Number: 000015

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5186301 | Sheet: 5 of 8 | Rev: P02

DO NOT SCALE

Millimetres 0 10 100



CHAINAGE	2100	2110	2120	2130	2140	2150	2160	2170	2180	2190	2200	2210	2220	2230
DESIGN LEVELS	161.440	160.841	160.243	159.644	159.045	158.447	157.848	157.250	156.651	156.053	155.454	154.855	154.257	153.658
EXISTING LEVELS	157.151	156.505	155.929	155.363	154.848	154.372	153.902	153.415	152.933	152.469	152.050	151.680	151.395	151.007

CHAINAGE	2240	2250	2260	2270	2280	2290	2300	2310	2320	2330	2340	2350	2360	2370
DESIGN LEVELS	153.060	152.461	151.863	151.264	150.665	150.067	149.468	148.870	148.271	147.673	147.074	146.475	145.877	145.278
EXISTING LEVELS	150.646	150.317	149.974	149.799	149.019	148.114	148.225	148.068	147.719	147.362	146.914	146.456	145.969	145.463

CHAINAGE	2380	2390	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
DESIGN LEVELS	144.680	144.081	143.483	142.884	142.285	141.687	141.088	140.490	139.891	139.293	138.694	138.095	137.497
EXISTING LEVELS	144.609	143.856	142.798	141.919	140.949	140.014	139.061	137.851	136.692	135.088	133.627	132.581	131.566

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

SCALE = H - 1:1000
V - 1:200

Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m

Scale 1:200
5m 0m 5m 10m

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE A57 LINK ROADS GROUND INVESTIGATION SPECIFICATION HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS HE551473-BBA-HGT-A57_AL_SCHEME--DR-CE-000011 TO 000018.
4. FOR DETAILS ON UTILITIES, PLEASE REFER TO SECTION S1.8.5 OF THE GROUND INVESTIGATION SPECIFICATION: HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

- PROPOSED ROAD
- EXISTING GROUND
- 2450 ROAD ALIGNMENT CHAINAGE
- PROPOSED BOREHOLE LOCATION
- PROPOSED TRIAL PIT LOCATION
- CONE PENETROMETER TEST
- TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Designer: ATKINS
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Tel: +44 (0)1925 238000
Fax: +44 (0)1925 238500
www.atkinsglobal.com
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Delivery Partner: Balfour Beatty
Spencer House, Dewhurst Road, Birchwood, Warrington, WA3 7PG
www.balfourbeatty.com

Client: highways england

Project Title: A57 TPU

Drawing Title: A57 LINK ROADS PROPOSED EXPLORATORY HOLE PLAN SHEET 6 OF 8

Drawing Number
Project | Originator | Volume
HE551473 - BBA - HGT - A57_AL_SCHEME - DR - CE - 000016
Location | Type | Role | Number

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5186301 | Sheet: 6 of 8 | Rev: P02

This Drawing is saved on ProjectWise. Plotted: 16/12/2020 16:36:28 By: HAIR5096

DO NOT SCALE

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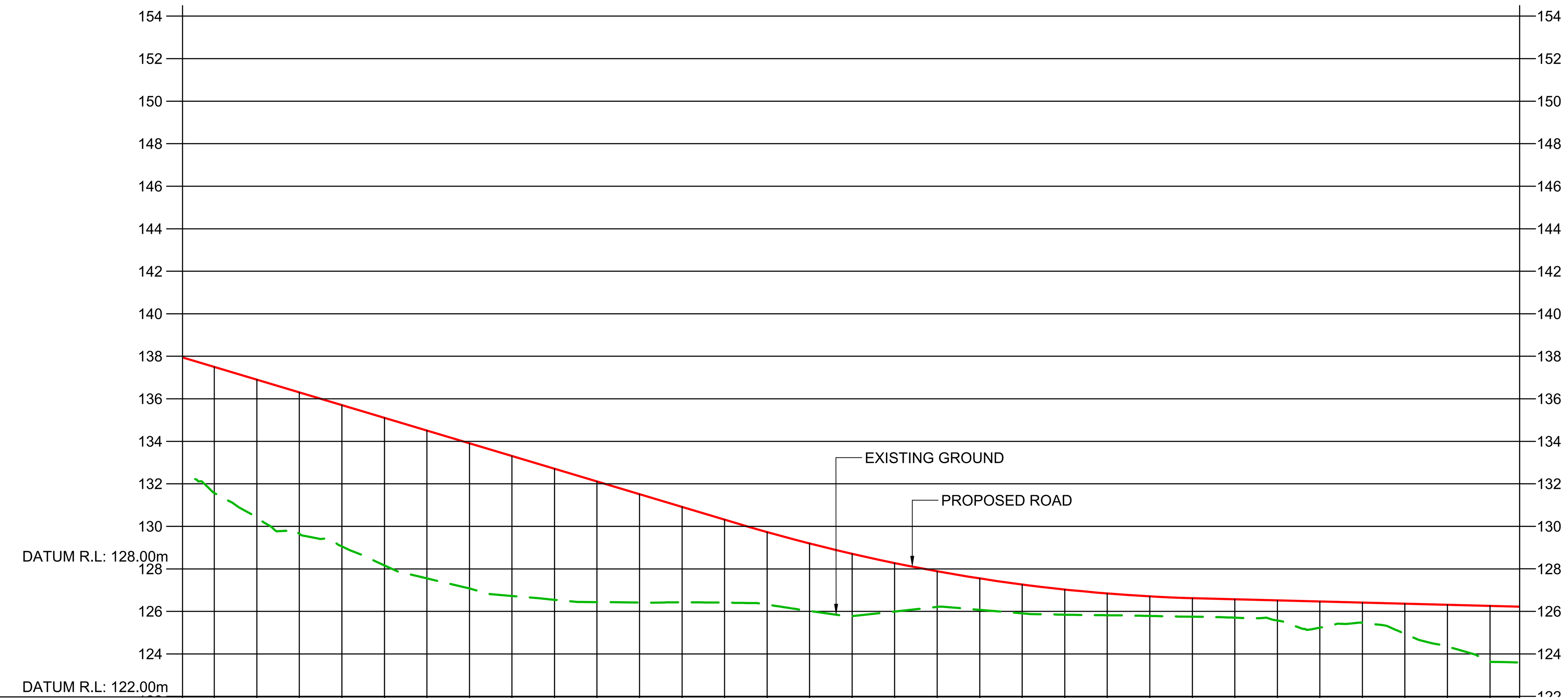
Scale 1:1000



DESIGN LEVELS	137.497	136.898	136.300	135.701	135.103	134.504	133.905	133.307	132.708	132.110	131.511	130.913	130.314	129.730	129.194	128.708	128.273	127.887	127.551	127.265	127.030	126.844	126.708	126.622	126.570	126.518	126.467	126.415	126.364	126.312	126.261
EXISTING LEVELS	131.566	130.402	129.653	129.057	128.158	127.551	127.078	126.725	126.546	126.436	126.418	126.426	126.410	126.317	126.019	125.779	125.996	126.214	126.074	125.907	125.845	125.819	125.786	125.751	125.704	125.570	125.235	125.466	124.953	124.331	123.629
CHAINAGE	2500	2510	2520	2530	2540	2550	2560	2570	2580	2590	2600	2610	2620	2630	2640	2650	2660	2670	2680	2690	2700	2710	2720	2730	2740	2750	2760	2770	2780	2790	2800

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

SCALE = H - 1:1000
V - 1:200

Scale 1:1000

Scale 1:200

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE A57 LINK ROADS GROUND INVESTIGATION SPECIFICATION HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS HE551473-BBA-HGT-A57_AL_SCHEME--DR-CE-000011 TO 000018.
4. FOR DETAILS ON UTILITIES, PLEASE REFER TO SECTION S1.8.5 OF THE GROUND INVESTIGATION SPECIFICATION: HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

- PROPOSED ROAD
- EXISTING GROUND
- 2450 ROAD ALIGNMENT CHAINAGE
- PROPOSED BOREHOLE LOCATION
- PROPOSED TRIAL PIT LOCATION
- CONE PENETROMETER TEST
- TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P02	DH	HG	JJ	MSR	16/12/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Designer: ATKINS
Member of the SNC-Lavalin Group
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www.atkinsglobal.com
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Delivery Partner: Balfour Beatty
Spencer House, Dewhurst Road, Birchwood, Warrington, WA3 7PG
www.balfourbeatty.com

Client: highways england

Project Title: A57 TPU

Drawing Title: A57 LINK ROADS
PROPOSED EXPLORATORY HOLE PLAN
SHEET 7 OF 8

Drawing Number
Project: HE551473 - Originator: BBA - Volume: HGT - A57_AL_SCHEME - Location: DR - Type: CE - Role/Number: 000017

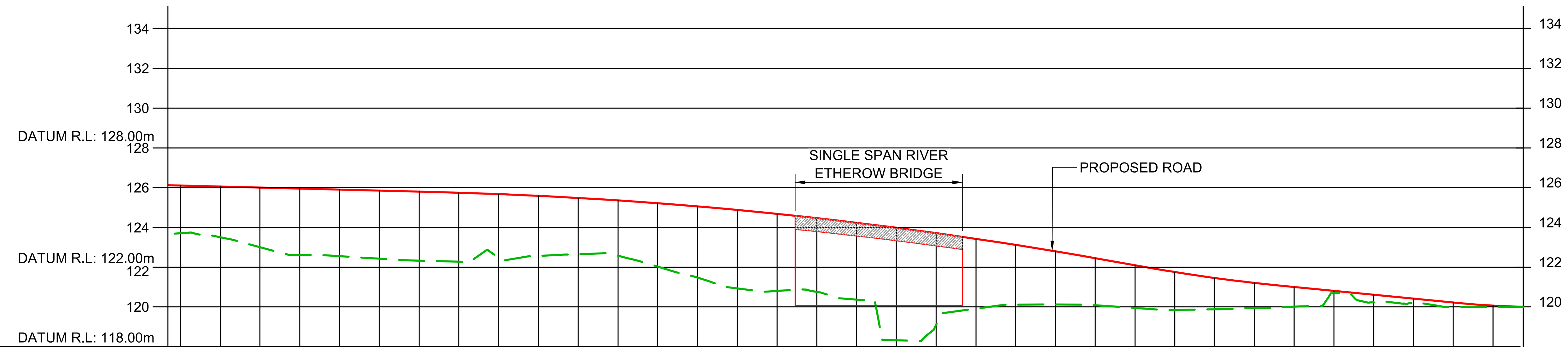
Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5186301 | Sheet: 7 of 8 | Rev: P02

This Drawing is saved on ProjectWise. Plotted: 16/12/2020 16:30:50 By: HAIR5096

DO NOT SCALE

Millimetres 0 10 100

Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m



DESIGN LEVELS	126.106	126.055	126.003	125.952	125.901	125.849	125.798	125.744	125.675	125.587	125.481	125.357
EXISTING LEVELS	123.706	123.507	123.006	122.613	122.550	122.424	122.324	122.276	122.465	122.568	122.653	122.572
CHAINAGE	2830	2840	2850	2860	2870	2880	2890	2900	2910	2920	2930	2940

DESIGN LEVELS	125.215	125.055	124.876	124.680	124.465	124.232	123.981	123.711	123.424	123.118	122.794	122.452
EXISTING LEVELS	122.025	121.474	120.928	120.805	120.756	120.366	118.317	119.100	119.913	120.113	120.119	120.082
CHAINAGE	2950	2960	2970	2980	2990	3000	3010	3020	3030	3040	3050	3060

DESIGN LEVELS	122.098	121.753	121.455	121.207	121.004	120.809	120.613	120.418	120.223	120.062	120.005
EXISTING LEVELS	119.946	119.845	119.877	119.950	120.014	120.683	120.229	120.215	120.005	120.005	120.005
CHAINAGE	3070	3080	3090	3100	3110	3120	3130	3140	3150	3160	3167.604

LONGITUDINAL SECTION - A57 MAINLINE ALIGNMENT

SCALE = H - 1:1000
V - 1:200

Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m

Scale 1:200
5m 0m 5m 10m

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE A57 LINK ROADS GROUND INVESTIGATION SPECIFICATION HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS HE551473-BBA-HGT-A57_AL_SCHEME--DR-CE-000011 TO 000018.
4. FOR DETAILS ON UTILITIES, PLEASE REFER TO SECTION S1.8.5 OF THE GROUND INVESTIGATION SPECIFICATION: HE551473-BBA-HGT-A57_AL_SCHEME-SP-CE-000001.
5. THE FINAL POSITION OF ALL PROPOSED EXPLORATORY HOLE POSITIONS SHALL BE AGREED ON SITE BETWEEN BBA AND THE GI CONTRACTOR.

KEY

- PROPOSED ROAD
- EXISTING GROUND
- 2450 ROAD ALIGNMENT CHAINAGE
- PROPOSED BOREHOLE LOCATION
- PROPOSED TRIAL PIT LOCATION
- CONE PENETROMETER TEST
- TRACER TEST (TR501)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Maintenance / Cleaning
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Use
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Decommissioning / Demolition
REFER TO HEALTH AND SAFETY RISK REGISTER DOCUMENT No:

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S3	P01	DH	JH	MSR	MSR	10/12/20
Description: FOR INFORMATION						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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SHEET 8 OF 8

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Appendix B. Ground Investigation Report 2019

Trans-Pennine Upgrade

TR010034

7.6 Ground Investigation Report

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 7

February 2019

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Trans-Pennine Upgrade
Development Consent Order 2018

7.6 GROUND INVESTIGATION REPORT

Regulation Number:	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010034
Application Document Reference	TR010034/APP/7.6
Author:	Trans-Pennine Upgrade Project Team, Arcadis.

Version	Date	Status of Version
V0.1.0	15/11/2018	Draft
V0.2.0	21/02/2019	Final

CONTENTS

APPENDICES

LIST OF TABLES

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1 EXECUTIVE SUMMARY

1.1.1 This report is referred to as “Ground Investigation Report” (GIR) as defined in Appendix D of DMRB HD22/02 (Highways Agency, 2008). This GIR provides an interpretation of previous desk study and ground investigation information and gives recommendations for the geotechnical aspects associated with the proposed A57/A628 Trans-Pennine Upgrade development.

1.1.2 The A57/A628 Trans-Pennine Programme scheme is classified by DMRB HD22/08 as a category 3 project due to the complex nature of the geological and geotechnical activities involved with the design and construction of an underpass beneath part of Mottram Village.

1.1.3 Three previous ground investigation have been carried out within the area of the proposed route by Soil Mechanics in 1994, NorWest Holst in 2004 and Fugro Engineering in 2005 (See Section 3.7 for further details).The ground investigation reports mentioned above are accompanied by Geotechnical Reports produced by Mott MacDonald in 2005 and Hyder Consulting UK Limited in 2006.

1.1.4 Arcadis Consulting reviewed these documents and undertook a gap analysis of the ground investigation data in relation to the proposed development. As a result, a detailed ground investigation was undertaken by Socotec UK Limited in 2018.

1.1.5 This GIR has been prepared considering the historical information listed in Table 3 and the latest ground investigation in 2018 by Socotec UK Limited.

1.1.6 The proposed route chosen following optioneering in PCF Stage 2 was Option 0, later known as Option A. The proposed development can be found in Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3067. Notable features of the development are the Mottram cut and cover underpass with associated approach cuttings, two smaller farm accommodation underpasses, 9m embankments, structural protection for the Longdendale Aqueduct and a bridge spanning the River Etherow.

1.1.7 The majority of the proposed route is underlain by cohesive Glacial Till. Laminated cohesive Glacial Till soils in addition to granular lenses within the cohesive Glacial Till are sporadically present across the site. Localised Alluvium soils were recorded within the vicinity of the existing M67 roundabout and River Etherow Bridge Crossing. Head Deposits and River Terrace Deposits are present in the vicinity of the River Etherow Bridge Crossing. Made Ground soils were mainly encountered in Mottram Village.

1.1.8 An area of recorded landslips was mapped and intrusively investigated during the 2018 ground investigation works. The upper section of a shallow slip surface was identified during the assessment.

1.1.9 Bedrock Encountered across the site comprises the Millstone Grit Group which comprises Mudstone, Siltstone and Sandstone Units of varying thickness. Weathering thicknesses of each unit are shown to vary across the site.

1.1.10 A shear zone in the bedrock has been identified within the footprint of the proposed Mottram Underpass. Evidence of significant faulting has been interpreted from between CH940 to approximately CH1060. Localised areas of faulting are noted beyond these chainages. The shear zone is understood, from the literature (BGS geological survey), to comprise a major northwest – southeast trending fault in addition to two mapped northeast – southwest trending faults.

1.1.11 An additional mapped northeast – southwest trending fault is shown to pass through the proposed Eastern Cutting.

1.1.12 The Millstone Grit Group is the main aquifer. It has significant heterogeneity due to its layered structure and the weathering, folding and faulting it has been subjected to. Transmissivity is considered to be derived from fracture flow domains. It is overlain by the Glacial Till, which generally comprises massive cohesive clays. The Glacial Till has a very limited ability to store and release groundwater and is an aquiclude. In the Mottram Village and proposed Eastern Cutting areas artesian conditions exist and the Millstone Grit Group aquifer is confined beneath the Glacial Till. At the River Etherow, the sand dominated Glacio-fluvial deposits aquifer is confined beneath the Glacial Till.

1.1.13 A combination of historical and current in-situ testing data and geotechnical laboratory testing information has been utilised to assist in geotechnical parameter derivation for rock and soil samples. The test data obtained, as well as established empirical relationships, have been utilised to determine appropriate characteristic material parameters for use in geotechnical design, as discussed in Section 6 of this report.

1.1.14 It should be noted that parameters provided are for guidance only and at detailed design a review of parameters should be undertaken using any further GI information obtained since writing this report.

2 INTRODUCTION

2.1 Scheme

2.1.1 The Scheme is titled 'Trans-Pennine Upgrade'. This document forms a Ground Investigation Report (GIR) and has been produced by Arcadis Consulting (UK) Limited (Arcadis) to comply with Highways England (HE) technical standard HD22/08 'Managing Geotechnical Risk' (Highways Agency, 2008) and BS EN 1997-1:2004+A1:2013 'Eurocode 7: Geotechnical design - Part 1: General rules' (British Standards Institution, 2004a).

2.1.2 This report follows on from the Preliminary Sources Study Report (PSSR) titled "A57/A628 Trans Pennine Upgrade Programme - Preliminary Sources Study Report Doc No. HE551473-ARC-HGT-ZZZ-RP-GE-2001" issued by Arcadis in 2016. The reader should note that the scheme alignment has altered slightly following the issue of the PSSR document in 2016.

2.2 Scope and Objective of the Report

2.2.1 This GIR relates to the Mottram Moor Link Road section upgrade of the A57/A628. The scope of this report is as follows:

- Review of Existing Information;
- Scheduling of field and Geotechnical / Geo-environmental Laboratory testing;
- Undertaking of Geological and Geo-morphological mapping along relevant sections of the proposed scheme alignment;
- Develop an understanding of ground conditions underlying the scheme;
- Development of the hydrogeological groundwater regime of the site;
- Derivation of soil and rock geotechnical characteristic values;
- Undertaking of a Geo-Environmental Contaminated Land Assessment;
- Update of the scheme specific Geotechnical Risk Register.

2.2.2 The objective of this document is to provide a Geotechnical, Geo-environmental and Hydrogeological assessment of the proposed scheme alignment in accordance with requirements of HD22/08.

2.3 Description of The Project

Site Location

2.3.1 See Drawing HE551473-ARC-HGN-SZ_ZZ000-DR-D-3100 - LOCATION PLAN 1-10000 for site location plan.

2.3.2 The A57/A628 Trunk Road forms part of the route between Manchester and Sheffield, connecting the M67 with the A616 and M1. The A57(T) currently passes through the village of Mottram in Longdendale in the Tameside District of Greater Manchester. The site consists of both agricultural and urban land around the village of Mottram in Longdendale.

2.3.3 A site description of the scheme is presented in Table 1 below.

2.3.4 It should be noted that chainages stated in Table 1 vary slightly from those stated in the PSSR. This is due to modifications of the scheme alignment following the issue of the

PSSR document. Current site chainages can be found in Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044 to 3051.

Table 1: Site description summary.

Section Reference	Chainage (CH) (m)	Site Description
M67 Terminal Roundabout to Mottram in Longdendale Village	0 - 880	The M67 roundabout forms the far southwest extent of the scheme. The proposed scheme alignment within this section extends from the M67 roundabout and links to Roe Cross Road to the west of Mottram Village. Land between the M67 and Roe Cross Road comprises agricultural land which undulates and gently slopes down from the north-northwest (approximately 1 in 40) to the south-southeast. The M67 roundabout and Roe Cross Road are located at 198m Above Ordinance Datum (AoD) and 212m AoD respectively. The area of agricultural land comprises grassed farm pastures. An unnamed watercourse passes through the grassed farmland area and crosses the proposed Roe Cross Link Road at CH270. Boggy ground was observed over this section of the site during site walkover visits. At CH530 the proposed route crosses over a farm track. Hurstclough Brook passes under the proposed “Cricket Ground Roundabout” (CH650). Electricity pylons cross the route at CH100. The electricity pylon route is orientated from north to south.
Roe Cross Road to Old Hall Lane (Mottram in Longdendale Village)	880 - 1010	The proposed alignment is proposed to form the Mottram Underpass, which will run beneath the village from CH880 to CH1000. The proposed eastern and western underpass approach portals will be located within deep cuttings ranging in depth from 4m to 13m on agricultural land on the approach to Mottram in Longdendale Village. Land directly above and immediately adjacent to the proposed Mottram Underpass comprises both derelict and occupied residential properties some of which are owned by Highways England. The surface topography of Mottram in Longdendale Village is relatively flat at approximately 212m AoD.
Old Hall Lane to Mottram Moor	1010 - 1800	Ground level at the eastern portal is estimated to be 212m AoD. Land to the east of the eastern

Section Reference	Chainage (CH) (m)	Site Description
Roundabout		portal includes a spring adjacent to the proposed alignment at CH1050 and an area of grassed land east of the eastern portal forms land referred to as 'The Show Ground'. The alignment over this part of the site is proposed to be formed in a cutting measuring up to 13m in depth. Electricity Pylons are observed to cross the proposed route alignment between CH1490 to CH1530. The proposed alignment extends to the southeast from Mottram Village. The surface topography steepens to a 1 in 9 gradient. A topographical low of 165m AoD is encountered at CH1640 with a west to east watercourse, which is observed to sink in the area of the proposed alignment, at Ch1640. The assumed location of the Longdendale Aqueduct is understood to be located at depth below this chainage. Further information regarding this feature is discussed in Section 2.4.5 of this report. The topography rises steeply to an elevation of 175m AoD at the A57 road and the location of the proposed "Mottram Moor Roundabout".
Mottram Moor Roundabout to A57 Junction	1800 – 3116	The proposed route alignment extends towards the east from the Mottram Moor Roundabout. Land underlying the proposed Mottram Moor Roundabout comprises a small un-named southwest to northeast orientation and flowing watercourse within a small gully feature with undulating slope faces. The alignment extends eastwards across grassed agricultural land at an approximate 1 in 19 gradient which steepens slightly to 1 in 9 from CH2310 to CH2485. Carrhouse lane is located at CH2240. It is proposed to reroute this lane through an underpass at CH2180. The proposed alignment crosses the River Etherow at CH2950. The proposed alignment is shown to cross a number of small, un-named watercourses from the Mottram Moor Roundabout to the east-

Section Reference	Chainage (CH) (m)	Site Description
		west crossing of the north – south flowing River Etherow. The proposed alignment joins the existing A57 at CH3080.

Project Description

2.3.5 The proposed development commences with the construction of an embankment heading north east over the agricultural land from the M67/A560 roundabout towards Mottram in Longdendale village. A roundabout located towards the eastern end of this section "Cricket Ground Roundabout" will allow traffic to flow north to join the A6018 at a new junction. An underpass before the "Cricket Ground Roundabout" allows a farmer's track to pass beneath the route.

2.3.6 The route continues from this roundabout into the western cutting approach into the Mottram Underpass which runs beneath the A6018 and Mottram in Longdendale Village. On emerging from the underpass, the road enters the eastern rock cutting, approximately 13m deep and turns to the south east. Most of this section is in a cutting. However, as the road approaches the A57, it transitions onto an embankment to join with a new roundabout (Mottram Moor Roundabout) for the A57. After this new roundabout the route continues south east, crossing the River Etherow and re-joining the A57 at a junction to the south of Wooley Bridge.

2.4 Geotechnical Category of Project

2.4.1 The Geotechnical Classification of the Mottram Moor Link Road section of the scheme is Geotechnical Category 3 project due to the complex nature of the ground conditions along the 130m long underpass beneath parts of Mottram in Longdendale village. Additional scheme complexities include the presence of a deep cutting which is likely to be impacted by artesian groundwater pressures.

2.5 Other relevant information

List of Structures

2.5.1 A list of proposed structures associated with the scheme is presented in Table 2. Ground models and geotechnical parameters derived per structure are presented in Section 5 and 6 of this report.

Table 2: Scheme section breakdown.

Scheme Sections and chainage extents	Structure	Structural chainage extents
Section 1 CH0 - 880	Western Embankments	CH0-CH540, CH540-CH760
	Roe Cross Link Road	CH0-CH320
	Old Mill Farm Underpass	CH540
	Mottram Underpass Western approach Cutting	CH760 to CH800
Section 2 CH880 - 1090	Mottram Underpass West Wing Walls	CH800 to CH880

Scheme Sections and chainage extents	Structure	Structural chainage extents
	Mottram Underpass	CH880 to CH1010
	Mottram Underpass East Wing Walls	CH1010 to CH1090
Section 3 CH1090 - 1510	Mottram Underpass Eastern Cutting	CH1010 to CH1510
Section 4 CH1510 – 3116	Eastern Embankments	CH1510-CH1640, CH1640-CH2175, CH2175-CH2950
	Embankment or structurespanning across the assumed location of the Longdendale Aqueduct	CH1600-CH1680
	Mottram Moor Roundabout	CH1720-CH1820
	Carrhouse Lane Underpass	CH2175
	River Etherow Bridge	CH2920-CH2980

**Note: Table comprises assumed layout of scheme at time of writing this report.*

2.5.2 In addition to these structures, a number of slip roads and link roads link the proposed route to existing roads as described below and shown on Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044 to 3051.

2.5.3 A link road connects the proposed scheme to the A6018 at CH610. This link road extends for 320m in a north easterly direction.

2.5.4 Two link roads are proposed to extend from the Mottram Moor Roundabout and join the A57 at CH1750. Both link roads are proposed to be orientated in a west – east direction and are approximately 430m and 230m in length.

2.5.5 Longdendale Aqueduct is understood to be located beneath land to the north of the existing A57 between the M67 roundabout and Mottram in Longdendale (between approximate chainages CH1600 and CH1680.

2.5.6 Air shafts associated with the Longdendale Aqueduct are shown on the interactive Coal Authority map. The shafts are linearly aligned in a west – east orientation. This observation is supported by information presented in the Coal Authority Report (Report No: 51001235020001) issued as part of the Arcadis PSSR document.

2.5.7 Additional information on the Aqueduct was obtained from “Manchester’s Water – The Reservoirs in the Hills” (Quayle, 2006) The Aqueduct forms a tunnel from Hollingworth in the east to Godley reservoir in the West in order to allow it to pass through a topographical ridge between the Etherow and Tame valleys.

2.5.8 The length of tunnel is approximately 2800m in length and it is 1.8m in diameter. A number of borings were sunk along the tunnel alignment prior to the construction of the tunnel. Findings from the borings identified the presence of a glacial paleo-valley to the west of Mottram in Longdendale village. This infilled paleo-valley feature is understood to underlie the section of the proposed scheme between the M67 roundabout and the eastern underpass portal entrance. Findings from Quayle 2006 stated some of the paleo-valley infill materials comprised “quick-sand and silt, upwards of 24m in depth”

3 EXISTING INFORMATION

3.1 Topographical Maps

3.1.1 1:25,000 scale Sheet OL1 The Peak District Dark Peak Area Ordnance Survey (OS) Explorer Map.

3.1.2 A scheme specific topographical survey was undertaken in early 2017 in the form of a full LIDAR topographical survey which was supplemented by a conventional ground-based survey (total stations) where the proposed route would be interfacing with existing highway boundaries.

3.2 Geological Maps and Memoirs

3.2.1 A geological review of the scheme has been discussed in detail within the 2016 PSSR document issued by Arcadis. Geological information discussed in the document was sourced from 1:50,000 scale British Geological Survey (BGS) survey sheet for Glossop, Survey Sheet No 86. (British Geological Survey: Geological Survey of England and Wales 1:63,360/1:50,000 geological map series, New Series, 2018). A review of the online BGS Geology Interactive Map (British Geological Survey, 2018) was also used to assess the geology of the area.

3.2.2 The Carboniferous Millstone Grit Group forms the majority of the solid geology of the upland Pennines to the east of the site. The solid geology for the area of the scheme is generally overlain by Quaternary deposits.

3.2.3 The site area is underlain by two sub-group formations from the Millstone Grit Group, namely the Fletcher Bank Grit and Marsden Formation. The Lower Coal Measures are shown to be present to the south of Mottram in Longdendale Village. The interbedded shales and sandstones of the Middle Grits are freshwater or estuarine in origin, as shown by the presence of plant fragments and freshwater lamelli branches.

3.2.4 The reported composition of the Fletcher Bank Grit is Sandstone formed in an environment previously dominated by rivers. The Marsden Formation comprises Mudstone and Siltstone which was deposited in an environment dominated by swamps, estuaries and deltas.

3.2.5 A review of the Geological Memoir of the area shows the site to be located on the western flank of the Goyt Trough which forms a syncline bounded by the Mossley Anticline to the west, and the Alport Dome Anticline to the east. The principal bedding dip direction in this area is to the east and southeast towards the centre of the Goyt Trough (Bromehead, Wilfrid Edwards, Wray, & Stephens, 1933). The presence of several faults and smaller scale folds is shown to cause local bedding orientation variations.

3.2.6 Folding, principally associated with the Mossley Anticline, has resulted in intense faulting in the area. Folding is considered to be the result of Post-Carboniferous earth movements. Faulting within Carboniferous deposits is reported to have occurred during the same geological time period.

3.2.7 The Mottram Fault runs approximately northwest – southeast with the downthrow to the south and it forms the northern boundary of the Coal Measures Basin. Tectonic ground movements at this location have brought the Coal Measures into contact with Middle Grits of the Millstone Grit Group to the south of Mottram in Longdendale Village. Text within the geological memoir indicates that the downthrow displacement may be in the order of 90m.

3.2.8 The eastern Mottram Underpass portal is shown to be intersected by three faults. The main fault forms a northwest-southeast trending normal fault which is intersected by two southwest to northeast trending faults which run northeast from the main fault.

Quaternary History

3.2.9 The Quaternary Geology of the area is predominantly glacial or peri-glacial in origin. The Late Devensian Glaciation ice sheet terminated against the western flank of the Pennines. This resulted in the deposition of the relatively thick Devensian Till deposits. As the ice sheets began to retreat, the meltwaters accumulated in a series of lakes between the ice front and the flank of the Pennines. One such lake (Lake Etherow) covered the area around Glossop and part of Longdendale (Bromehead, Wilfrid Edwards, Wray, & Stephens, 1933). At one point this lake may have overflowed and drained to the south as inferred on the 1:50,000 scale BGS Survey Sheet for Glossop (Sheet No 86). This process may explain the presence of the glacial overflow flow channel underlying the western extent of the scheme as shown on the 1:50,000 scale BGS Survey Sheet for Glossop (Sheet No 86).

3.2.10 The infilled glacial overflow flow channel was shown to be present to the west of Mottram in Longdendale Village. Information obtained from Quayle 2006 identified this feature and recorded this feature to be infilled with quick-sand and silt, which was in the order of 24m in depth. A review of historical ground investigation information supports the presence of the buried glacial overflow flow channel. However, a review of historical borehole logs indicates that this feature is predominantly infilled with cohesive Glacial Till soils.

3.2.11 Quaternary Head Deposits are mapped towards the base of the 1 in 10 gradient slope within Section 4 between approximate CH2470 to CH2900. Head deposits are likely to be post-glacial in origin, formed from the effects of freeze-thaw weathering on the upper slopes causing the material to slump downslope and collect.

3.2.12 Alluvium and River Terrace Deposits are shown over the far eastern area of the proposed alignment between CH2900 to CH3080. These deposits are associated with the River Etherow.

3.2.13 A review of Survey Sheet No 86 shows a landslip area over the location of the Mottram Moor Roundabout. Additional information relating to this feature is discussed in the geomorphological review of the scheme in Section 4.2 and Section 5.5.

3.3 Aerial Photographs

3.3.1 Aerial photographs were reviewed and interpreted in the 2006 Hyder Consulting GIR. Relevant information from the report has been summarised below.

3.3.2 A series of small (10m-20m across) round or oval depressions to the north of the current A57 between the M67 roundabout and Mottram in Longdendale village were identified. It was postulated that these depressions may be Kettle Holes[1] or other ice-marginal features. However, they may also represent sites of historical sand or gravel extraction. The recorded presence of peat or peaty clay soils does support the assumption that these features are ice-marginal features. It cannot be ruled out that these may form depressions related to the Longdendale Aqueduct (including but not limited to shafts or test pits).

[1] Kettle, also called Kettle Hole, in geology, depression in a glacial outwash drift made by the melting of a detached mass of glacial ice that became wholly or partly buried.

3.3.3 An abandoned stream course was identified in this area, directly east of Hurstclough Brook. This feature is manifested as a low bank defining the eastern margin of the channel in addition to an abandoned meander loop. A review of the BGS survey sheet for the area confirms the presence of Alluvium soils in this area.

3.3.4 Two depressions were observed to the east of the Mottram showground. The northernmost depression shows evidence of mass movement features in the form of leaning trees and terracettes. The southern depression is an area of boggy ground with a pond at the centre. Both depressions are shown to be associated with surface groundwater flows flowing into them and may require drainage measures to be implemented where construction and these features overlap.

3.4 Records of Mines and Mineral Deposits

3.4.1 Information from the Coal Authority, BGS “mining plans portal” and Mineral Resource mapping along with a Coal Authority Report was reviewed in the 2016 PSSR and the findings are summarised below.

3.4.2 From this review, two mine entries were identified as being within, or within 20 metres of, the boundary of the previous alignment (6 figure grid reference: 398395). More detailed information regarding this review and the Coal Authority Report can be found in Section 2.6. and Section 4.8. and Appendix C of the 2016 PSSR.

3.4.3 Due to changes in the route alignment after issue of the PSSR, the two mine entries are no longer within 20m of the boundary of the scheme.

3.5 Land Use and Soil Survey Information

3.5.1 No Land Use or Soil Surveys have been carried out to date.

3.6 Archaeological and Historical Investigations

3.6.1 A detailed archaeological assessment has been undertaken by a third-party consultant. Doc TR010034/APP/6.7.3 should be referred to for more archaeological information.

3.7 Existing Ground Investigations

3.7.1 Hyder Consulting prepared a Ground Investigation Report during 2006. This report utilised information from three historic phases of Ground Investigations. The Ground Investigations predominantly focused on the route alignment from the M67 roundabout through Mottram-in-Longdendale village and to the north east past Arnfield Reservoir to Townhead Farm on the A628 (PSSR). Minimal Ground Investigation information coverage is available on land to the south of The Mottram Showground to the end of the proposed scheme.

3.7.2 The historic ground investigations are summarised in Table 3 below:

Table 3: Summary of existing ground investigations.

Ground Investigation	Reasoning	Investigations
Soil Mechanics Ltd (1994)	For the A57/A68 Mottram to Tintwistle Bypass.	157no. boreholes (rotary and cable percussive) and 70no. mechanically excavated trial pits.
Norwest Holst Soil Engineering Ltd (2003)	Supplementary GI in area of Mottram in Longdendale village to further characterise geology and	25no. rotary and cable percussive boreholes and 2no. mechanically

Ground Investigation	Reasoning	Investigations
	groundwater regime of the cut and cover underpass.	excavated trial pits.
Mott Macdonald Geotechnical Interpretive Report (2005)	Summary and interpretation of existing Ground Investigations	Relevant intrusive investigations to date of issue.
Fugro Engineering Services Ltd (2005)	For the A57/A68 Mottram to Tintwistle Bypass.	57no. boreholes (rotary and cable percussive) and 75no. mechanically excavated trial pits.
Hyder Geotechnical Interpretive Report (2006)	Summary of existing Ground Investigations	Relevant intrusive investigations to date of issue
Geo-physical Survey (2007)	Investigate shallow geological structure beneath Mottram in Longdendale village	10 survey lines with both Seismic refraction and resistivity tomography

3.7.3 Relevant information from the Soil Mechanics Ltd, Norwest Holst Soil Engineering Ltd and Fugro Engineering Services Ltd schemes will be used as additional information in Sections 5.3 and 6 of this document.

3.7.4 Information from a Ground Investigation carried out by Allied Exploration and Geotechnics Ltd. for Mouchel Consulting Ltd in 2002 cannot be relied upon and utilised in this GIR. This is due to the information from the report only being available as draft. H.E. have not been able to source a finalised version of the report.

3.8 Consultation with Statutory Bodies and Agencies

3.8.1 Prior to implementation of the intrusive ground investigation, consultation was undertaken with HE and its agent. These consultations established that the HE were satisfied with the proposed scope of Arcadis's Ground Investigation.

3.8.2 Consultation was undertaken with HE with regards to providing Arcadis with any available geotechnical information available for the scheme. A summary on geotechnical information provided is included in Table 3.

3.8.3 Consultation with The Coal Authority (CA) was undertaken during the Hyder 2006 Ground Investigation for the scheme. Further consultation with the CA was not undertaken for the Arcadis phase of investigation. Consultation with the Environment Agency and Natural England was undertaken by Arcadis as part of the Environmental Scope.

3.9 Flood Records

3.9.1 The Flood Records for the scheme have been reviewed in the Arcadis 2016 PSSR. A summary of key information from the PSSR is presented below.

3.9.2 The only section of the scheme which is considered to be at risk from flooding is the far eastern section where the proposed alignment crosses the River Etherow. This area is highlighted as Flood Zone 2 and Flood Zone 3.

3.9.3 Flood Zone 2 is defined as land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%), or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year. Flood zone 3 is defined as land having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of sea flooding (>0.5%) in any year.

3.9.4 The Hyder Environmental Statement states that “due to the relatively steep topography and impermeable nature of the geology, water courses generally react quickly to rainfall, causing some minor problems in controlling flooding in some villages and towns located near to the large watercourses in the area.”

3.10 Contaminated Land

3.10.1 The proposed route is mainly through an agricultural setting. Potential areas of contaminated land have been identified including landfill sites, historical industrial sites and the current urban setting of Mottram in Longdendale. Further details of the contaminated land assessment are included in Section 4.10.3 and Appendix A.

3.10.2 Reference should be made to Environmental Statement Document No. TR010034/APP/6.1-6.20 for any information regarding ecology.

4 FIELD AND LABORATORY STUDIES

4.1 Introduction

4.1.1 The following sections presents the field and laboratory information from the 2018 ground investigation.

4.2 Walkover Survey

4.2.1 A site walkover was carried out by Arcadis with the ground investigation Contractor on 12 January 2018. The site walkover comprised a walkover survey of the site for the proposed scheme and was carried out mainly on farmland and through Mottram in Longdendale Village.

4.2.2 The objectives of the site walkover were to provide a preliminary visual examination of the site and to confirm the final locations of exploratory holes before the intrusive works began.

4.2.3 The area between the M67 roundabout and Mottram in Longdendale Village was generally observed as agricultural land for animal grazing. Due to the time of year the ground surface was extremely wet, and in places not passable by foot. Where land was not used for agricultural purposes the vegetation was allowed to grow naturally forming wet marsh lands. Possible Kettle Holes (depressions in the ground) have been observed randomly across the fields.

4.2.4 The area of Mottram in Longdendale Village is a tightly packed residential area. Due to the nature of the ground in this area, it was essential to have exploratory holes located within a certain area to help identify the underlying fault. Unfortunately, this meant exploratory holes were required on residential land. During the walkover proposed positions were moved within a 5m radius to allow for better access for the Contractor and to cause less disruption to residents.

4.2.5 The area between Mottram in Longdendale Village and Mottram Moor consists of the Mottram Showgrounds and agricultural land for farming or animal grazing. Two large Kettle Holes were observed to the east of Mottram Showground. These features were partially filled of water at the time. However, due to the time of year it was not possible to determine if this water collected from natural springs or rain water. Further south towards Mottram Moor, a High Voltage power line was observed. Contractor requested two exploratory holes to be moved a further distance away from the power line for an extra safety measure. A natural gully was observed to run from north to south in this area. Again, it was not possible, due to dense vegetation, to determine if the gully was formed by a natural spring or rain water. However the ground was damp underfoot.

4.2.6 The final area of the walkover was the land between Mottram Moor and the A57. The north east part of this area has had a geomorphology survey carried out by Arcadis in 2018. Please see Section 4.2 for details. Most of the land in this area is used for agricultural land for farming or animal grazing. A small plot of land to the east of Carrhouse lane is currently being used to grow conifer trees. The land in the west and middle part of this area has gradual undulations with more possible Kettle Holes. The surface of the ground was extremely wet underfoot and some slopes could not be climbed by foot. Due to this, 2 exploratory holes were moved to flatter more stable ground to allow for safer drilling conditions for the Contractor. To the east of this area, the ground becomes flatter and possibly serves as a flood plain for the River Etherow. The River Etherow is located in the far eastern part of this area, adjacent to the A57. Due to recent rainfall, the river was not passable via the ford and therefore the small plot of land between the river and the A57 was not observed. However, as observed from a distance, the land was generally flat, with a man-made flood bund around the perimeter of the field.

4.3 Geomorphological/Geological Mapping

Geomorphological Field Works

4.3.1 Geomorphological field works were undertaken by an Arcadis Engineering Geologist from Arcadis between the 8th and the 9th of March 2018 in the vicinity of the proposed Mottram Moor Roundabout. A geomorphological plan of the area of investigation is shown on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3056.

4.3.2 A subsequent Trial Trenching exercise in the geomorphologically mapped area was undertaken between the 5th and the 8th May 2018. Findings from both assessments are discussed in Section 5.6.

4.3.3 Geomorphological field mapping works were undertaken in the location of mapped landslips, shown in the published geological maps in the vicinity of the proposed Mottram Moor Roundabout. Weather conditions were dry and cold, with partial snow cover across the site. A later site walkover was undertaken when the ground was clear to confirm the observations.

4.3.4 Geomorphological features were mapped using a digital tablet and software data program synchronised with the Geographical Information System (GIS) database for the scheme.

4.3.5 A general arrangement plan and cross sections for the investigation works are shown in Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061 and HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3064. Photos of Trial Trenches are available in Appendix C.

Geological Mapping

4.3.6 A survey of exposed bedrock adjacent to Roe Cross Road (A6018) was proposed to be undertaken. However unsafe access conditions were observed during a drive over of the site. An alternative geological scan line survey exercise was proposed at the dis-used Hobson Moor Quarry.

4.3.7 A scan line survey of Hobson Moor Quarry (dis-used) was undertaken by an Arcadis Engineering Geologist on the 9th March 2018.

4.3.8 The survey was undertaken in order to provide additional discontinuity information for the underlying bedrock. The reader should note that exposures at the Quarry were from the Lower Kinderscout Grit formation as opposed to the Fletcher Bank Grit or Marsden formations. Additionally, faults are shown to be located between the Quarry and the area of investigation.

4.3.9 Information obtained during the scan line survey will be cross checked with geo-physical tele-viewer information and field logging measurements and descriptions to determine the validity of the scan line information to the scheme. Findings from this exercise will be discussed in Section 5 and Section 6 of this report.

4.4 Ground Investigation

Description of Fieldwork

4.4.1 Ground Investigation works were undertaken by Socotec from January 2018 to July 2018. The Ground Investigation works scoped by Arcadis were aimed at targeting sections of the updated route alignment which were not fully investigated during the earlier ground investigation phases.

4.4.2 The intrusive ground investigation was designed to provide geotechnical design parameters for the following:

- The western embankments;
- The western and eastern soil cuttings;
- The Mottram Underpass;
- Mottram Underpass wing walls;
- Eastern Rock cutting;
- Eastern Embankments;
- Carrhouse Underpass;
- Retaining structures;
- Pavement design;
- Groundwater dewatering;
- Drainage;

4.4.3 A summary of the 2018 Socotec Ground Investigation is shown in Table 4 below.

Table 4: Summary of current ground investigation.

Exploratory Hole Type	Scheduled Depth (m BGL)	Number	Borehole Reference
Cable Percussive Borehole	10-15	8	BH401, BH402, BH403, BH404, BH415, BH427, BH430, BH431
Cable Percussive Borehole with rotary core follow on	15-35	17	BH405, BH406, BH407, BH408, BH409, BH412, BH413, BH414, BH420, BH422, BH423, BH428, BH429, BH432, BH433, BH434, BH435
Dynamic Sampling with rotary core follow on (inclined)	55m borehole length (inclined at 40°)	3	BH410, BH411, BH416
Dynamic Sampling with rotary core follow on	20-25	3	BH417, BH418, BH421
Machine Excavated Trial Pit	4	22	TP401-TP415, TP422, TP423, TP424, TP427, TP430, TP431, TP432
In situ plate load test	0.3	9	PL401-PL406, PL408, PL411, PL413
TRL DCP test	N/A	4	DCP401-DCP404

4.4.4 Permeability testing was also carried out in the form of variable head and falling head tests in BH405, BH417, BH418, BH428 and BH429. The tests were all carried out in accordance with BS5930 (2015).

4.4.5 Pumping tests were carried out on BH414 with monitoring taking place in boreholes BH407, BH418, BH409, BH412, BH413 and BH415. Monitoring of water levels was undertaken for at least 3 days before the start of the test. This was followed by a stepped rate pumping test and a constant rate pumping test. BH413 was initially intended to be used. However, due to the borehole being unable to maintain adequate flow rates, it was decided to use BH414.

4.4.6 For full details on the pumping tests, please refer to Pumping Test at Mottram in Longdendale Report Doc.HE551473-ARC-VGN-TPU-RP-Z-3118, found in Appendix B.

4.4.7 Groundwater level monitoring was undertaken in the boreholes stated in Table 5 on 6 occasions between 17th April 2018 and 5th July 2018. Gas monitoring of appropriate wells was undertaken on 26th June 2018 and 5th July 2018.

Table 5: Groundwater installation summary.

Hole I.D.	Instrument Type	Instrument level (m BGL)	Top of response Zone (m BGL)	Bottom of response zone (m BGL)
BH401	Standpipe	10.00	7.50	10.00
BH402	Vibrating Wire Piezometer	9.25	7.50	10.00
BH403	Standpipe	6.50	4.50	6.50
BH404	Standpipe	11.00	7.00	11.00
BH405	Vibrating Wire Piezometer	15.00	13.00	17.00
BH406	Standpipe	17.20	15.00	17.20
BH407	Vibrating Wire Piezometer	15.00	13.50	16.50
BH408 (D)	Vibrating Wire Piezometer	16.00	14.50	17.50
BH408 (S)	Vibrating Wire Piezometer	7.25	6.50	8.00
BH409	Vibrating Wire Piezometer	17.00	15.00	19.00
BH412A	Vibrating Wire Piezometer	15.00	12.00	18.00
BH413	Standpipe	33.00	9.50	33.00
BH414 (1)	Standpipe Piezometer	31.50	10.00	31.50
BH414 (2)	Standpipe Piezometer	31.50	10.00	31.50
BH414 (3)	Standpipe	31.00	10.00	31.00
BH415	Vibrating Wire Piezometer	17.00	14.00	18.00
BH417	Vibrating Wire Piezometer	11.00	8.50	12.00

Hole I.D.	Instrument Type	Instrument level (m BGL)	Top of response Zone (m BGL)	Bottom of response zone (m BGL)
BH418 (D)	Standpipe	18.00	16.00	18.00
BH418 (S)	Standpipe Piezometer	13.00	11.00	13.00
BH421	Standpipe	17.00	13.00	17.00
BH422 (D)	Standpipe	26.00	22.00	26.00
BH422 (S)	Standpipe Piezometer	11.00	7.00	11.00
BH423	Vibrating Wire Piezometer	27.50	25.00	28.00
BH427	Vibrating Wire Piezometer	12.00	10.00	13.70
BH428	Standpipe Piezometer	11.00	8.00	12.00
BH430A	Vibrating Wire Piezometer	10.50	8.00	11.30
BH432	Vibrating Wire Piezometer	12.00	9.00	13.00
BH435	Vibrating Wire Piezometer	19.00	16.50	20.00

4.5 Results of In Situ Tests

4.5.1 The results of in situ testing for the three historic Ground Investigations and the current Arcadis ground investigation can be found in Section 10.

4.6 Drainage Studies

4.6.1 No drainage studies have been carried out or are proposed at this time.

4.7 Geophysical Surveys

4.7.1 Geophysical Surveys were undertaken in the form of GPR scanning and Visual Tele viewer surveys.

4.7.2 GPR scanning was undertaken to help to identify services within a 5m² area around each exploratory hole location.

4.7.3 A summary of Geophysical Surveys can be found in Table 6 below.

Table 6: Summary of Geophysical Surveys from Socotec 2018 Ground Investigation.

Borehole ID	Geophysical Method	Depth From (m)	Depth To (m)
BH409	Acoustic Imager	9.0	34.9
	Optical Imager	20.0	35.1
BH410	Acoustic Imager	3.9	54.5
BH411	Acoustic Imager	9.7	53.4
BH412A	Acoustic Imager	12.2	34.3
BH416	Acoustic Imager	4.6	40.0
	Optical Imager	2.9	4.6

Borehole ID	Geophysical Method	Depth From (m)	Depth To (m)
BH417	Acoustic Imager	9.6	24.8
	Optical Imager	9.6	25.0

4.7.4 Visual Tele viewer surveys were carried out at the following boreholes; BH409, BH410, BH411, BH412, BH416, BH417.

4.8 Pile Tests

4.8.1 No pile tests have been carried out or are proposed at this time.

4.9 Other Field Work

4.9.1 Fieldwork other than that described in this report has not been undertaken during the ground investigation works.

4.10 Laboratory Investigation

Description of Tests

4.10.1 Geotechnical laboratory testing was scheduled for disturbed and undisturbed soil samples obtained during the 2018 Socotec Ground Investigation. A summary of scheduled geotechnical tests is presented in Table 7.

Table 7: Summary of laboratory testing.

Test		Method	No. of Determinations
Moisture Content Determination		BS1377 (1990)	159
Atterberg Limit Tests (4 point)		BS1377 (1990)	146
Particle Density		BS1377 (1990)	2
Particle Size Distribution Analysis (wet sieve)	Wet Sieve	BS1377 (1990)	78
	Hydrometer Testing		
Quick Undrained Triaxial Compression Test		BS1377 (1990)	4
Consolidated Undrained Triaxial testing with Pore Water pressure measurements		BS1377 (1990)	13
Consolidated Drained Triaxial with controlled Pore Water Pressures		BS1377 (1990)	1
One Dimensional Oedometer Consolidation Test		BS1377 (1990)	37
Determination of Residual Shear Strength using Ring Shear Apparatus		BS1377 (1990)	9

Test	Method	No. of Determinations
Compaction (Dry Density / Moisture Content Relationship)	BS1377 (1990)	15
California Bearing Ratio (Recompacted)		13
Uniaxial Compressive Strength of Rock	ISRM (2007)	29
Point Load Index	ISRM (2007)	99
BRE SD1 Suite for aggressive ground conditions (pH value, Water Soluble Sulphate, Acid Soluble Sulphate and Total Sulphur Contents of Soils)	BS1377 (1990) (BRE Special Digest 1)	112

4.10.2 A number of samples for Unconfined Compressive Strength (UCS) and Direct Shear tests are reported to have failed during handling and prior to testing. This is reported to be due to the highly fractured nature of the rock specimens being tested. Several attempts have been made by Arcadis and Socotec to find suitable replacements where possible.

Geo Environmental Testing

4.10.3 Samples were recovered in the field following best practice and thereafter shipped to SOCOTEC Laboratories who have been accredited by UKAS to undertake the tests. Both the geotechnical and chemical laboratory tests were conducted by SOCOTEC Laboratories.

4.10.4 Soil and groundwater samples from across the proposed route were analysed for a suite of contaminants including metals, non- metals, hydrocarbons (TPH, PAH, phenol) and pH. Soil samples were analysed for asbestos fibres. Where appropriate due to ground conditions encountered soil and groundwater samples were analysed for Volatile Organic Compounds (VOCs) and Polychlorinated Biphenyl (PCB).

Copies of Test Results

4.10.5 A summary of the laboratory results are included in the listed figures and are discussed in Section 6 of this report.

4.10.6 A number of scheduled particle size distribution tests from the current investigation are unavailable due to issues with transport and disturbance of samples.

5 GROUND SUMMARY

5.1 Introduction

5.1.1 The following section details the interpretation of the topography, geology, hydrogeology and geomorphology of the site using information from the three historic ground investigations and the latest 2018 ground investigation.

5.2 Topography

5.2.1 A brief general overview of the schemes topography is presented below. A further detailed topographic review of the scheme is presented in Section 6.

5.2.2 The proposed route alignment gradually increases in elevation towards the northeast from the M67 roundabout to Mottram in Longdendale village. The Mottram underpass passes west to east beneath the village and heads down gradient to the south east to cross the existing A57. A brief, very sharp increase in elevation is present in the area of the Longdendale Aqueduct, prior to the scheme reaching the A57 carriageway and the proposed new roundabout. The route turns to east south east and levels off crossing relatively flat ground around the River Etherow which it crosses before re-joining the A67.

5.2.3 The Roe Cross Road link road extends northwards from the Cricket Ground roundabout. The surface topography slopes gently down towards the southeast, placing the alignment along a gentle side-long ground profile. A surface depression, possibly relating to a Kettle Hole or a man-made excavation, is located immediately west of the proposed scheme alignment between CH80 to CH100. This feature currently forms a pond. An additional depression is shown immediately east of the scheme between CH80.0 to CH100. The link road crosses an un-named northwest – southeast orientated watercourse / brook at CH270.

5.2.4 Roe Cross Road at this area of the alignment is supported by an approximately 11m high retaining wall. The elevation of the existing Roe Cross Road in the vicinity of the route alignment link is approximately 220.0m AoD. The elevation of the grassed land to the west of Roe Cross Road, at the base of a retaining wall for Roe Cross Road, is approximately 209.0m AoD.

5.2.5 Potential topographical hazards identified along the proposed alignment have been summarised in Table 8 below.

Table 8: Summary of topographical hazards.

Chainage (m)	Topography
CH0 – CH890	• Surface depression (possible Kettle Hole or man made feature) and apparent gully below the footprint of the alignment between CH160 to CH260. • Surface depression as above between CH400 to CH540 to the Northwest of the proposed alignment. • Brook along the majority of the southern alignment of the Old Mill Farm underpass route. • Brook underlying the roundabout footprint from CH500 to CH750. • Surface depression a/a to the west of the proposed roundabout and land between the proposed Roe Cross Road Link Road and the proposed main scheme alignment between CH680 to CH720.

	• Minor surface depression along the western embankment approach between CH790 to CH810. • Brook crossing the Roe Cross Road Link Road between Line Road Chainage CH260 to CH270. • Steep change in elevation of approximately 11m between agricultural grassed land the existing Roe Cross Road, which is supported at this location by a retaining wall.
CH890 – CH1140	• Ditch located to the east of Old Hall Lane between CH1050 and CH1090.
CH1140 – CH1645	• Surface depression (possible Kettle Hole or manmade feature) and pond within the proposed cutting footprint of the alignment between CH1280 to CH1340. Additional surface depression feature located approximately 45m north of the central alignment. • Steepening of topographical gradient towards the southeast from CH1400 to CH1630. • Elongated large ditch / gully running parallel to the proposed scheme alignment from CH1400 to CH1630. Feature predominately falls within the footprint of the proposed alignment. • Elongated ditch / gully running parallel to and in line with the proposed scheme central alignment from CH1570 to CH1630. • Low lying stream / base of gully feature trending west – east between CH1630 to cH1660. • 1 in 1.3 gradient north facing slope between CH1630 to CH1660.
CH1645 – CH1830	• Approximately 60m wide gully feature, beneath the footprint of the proposed Mottram Moor Roundabout between CH1750 to CH1830. • Area of likely landslips located between CH1750 and CH1830.
CH1830 – CH2550	• Surface depression (possible Kettle Hole or manmade feature) and pond within the proposed cutting footprint of the alignment between CH1880 to CH1920. • Gully located between CH1990 to CH2010. • Side-long surface ground profile sloping towards the east from between approximate CH2180 and CH2500 within an area of potential head deposits. • Surface depression (possible Kettle Hole or manmade feature) and pond beneath the proposed cutting footprint of the alignment between CH2420 to CH2480. • Northwest to southeast trending gully feature located to the north of the proposed scheme alignment between CH2400 to CH2440.
	• 1 in 2.5 gradient south facing slope located approximately 18m away from the edge of the

	proposed embankment and the Carrhouse lane underbridge between CH2025 to CH2225.
CH2550 – CH3116	• River Etherow between CH2950 to CH2970.

5.3 Geology

5.3.1 Stratigraphic information has been interpreted from the 2018 Socotec ground investigation with relevant supplementary information from the three previous ground investigations. This information has been interpreted using a long section of the route with all relevant borehole information included (Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044 to 3051).

5.3.2 In Table 2 the route has been split into Sections 1 to 4. Each section is further split by structure. The following presents a summary of the geology per structure. It should be noted that thickness' of the geology along the alignment are inferred from information at the exploratory borehole positions.

Section 1

Western Embankments: CH0 – CH580, CH580 – CH760

5.3.3 Most of this section crosses agricultural land and so a layer of Topsoil is present in the majority of boreholes with a thickness up to 0.5m. Topsoil is described predominantly as slightly sandy CLAY with numerous rootlets. This is underlain by Glacial Till, predominantly cohesive with some laminated horizons and infrequent granular lenses. The Till thins gradually from west to east from approximately 26m thick at the western end of this section to approximately 22m near the approach to the Mottram Underpass. A review of the BGS sheet for the area indicates that this stratum lies in a buried paleochannel (superficial deposit-filled) which is orientated in the same direction as this section of the proposed route alignment. The Glacial Till is described as soft to firm, occasionally stiff to very stiff slightly sandy, occasionally gravelly CLAY.

5.3.4 Glacial Till was encountered within each exploratory hole position along this section of the scheme. The majority of Glacial Till soils are considered to form Lodgement Till[2]. It is understood from the regions Pleistocene history that several ice sheet advances, regressions and subsequent advances have taken place over Mottram in Longdendale and the surrounding area. These variations of glacial and interglacial climates are likely to have caused the deposits of Ablation Till[3] across the site. Both variations of Glacial Till soils are likely to be present across the entire site area.

5.3.5 The presence of sand and gravel lenses and laminations within the Glacial Till deposit are considered to be a product of this process of ice sheet advance and regression. Glacial Till across the scheme should be considered to be heterogeneous.

5.3.6 Occasional pockets of Alluvium are recorded to overlie the Glacial Till soils over the Western end of this section (BH 15, BH17, BH18, BH20, BH23, TP10 and TP6). These locations are typically localised to within 220m of the northeast of the existing M67 roundabout and are recorded to underlie part of the proposed scheme alignment to CH280. Additional unrecorded Alluvium soils may be present over additional lengths of the proposed alignment in this section of the site.

5.3.7 The thickest recorded Alluvium deposit was 1.80m (BH15) and comprises soft sandy CLAY, SAND and PEAT and occasional organic soils. The base of this deposit was

[2] Lodgement Till - Glacial till deposited from slowly melting ice at the base of a glacier.
[3] Ablation Till – Comprises sediments transported at the base of an ice sheet which are deposited during melting of the glacier

recorded at 3.00m bgl (195.27m AoD). Granular Alluvium comprising SAND was recorded in BH15 from 3.00m to 4.80m bgl and comprised a clayey fine to medium SAND with occasional fine to medium gravel clasts. The base of the granular Alluvium deposit was recorded at 4.80m bgl (193.47m AoD). Alluvium deposits are generally thought to be associated with Hurstclough Brook and are not thought to be laterally extensive. This watercourse is considered to have been subject to higher flow rates in the past given the thickness of Alluvium soils recorded in BH15. Higher flow rates were probably associated with a wetter climate during the Pleistocene period.

5.3.8 Bedrock was proven in two boreholes at the western end of the section of the main scheme proposed alignment between CH100 and CH130 in BH20 and BH21 at depths of 26.40m bgl (169.38m AoD) and 26.50m bgl (169.62m AoD) respectively. Bedrock comprised highly to slightly weathered, moderately strong to strong SILTSTONE.

5.3.9 Exploratory borehole BH406 was undertaken approximately 80m west of the central point of the Cricket Ground Roundabout at approximately CH600. This borehole position recorded bedrock at 16.80m bgl (192.93 m AoD).

Old Mill Farm Underpass: CH580

5.3.10 Topsoil overlies the area around the Old Mill Farm Underpass to depths of between 0.10m and 0.40m bgl and comprises soft to firm slightly sandy CLAY.

5.3.11 Glacial Till underlies the Topsoil and comprises soft to firm occasionally stiff slightly sandy occasionally gravelly CLAY. Boreholes advanced to a maximum depth of 10.45m bgl in the area of the proposed Old Mill Farm Underpass did not prove bedrock.

5.3.12 BH406, described in Section 5.3.8, is the closest borehole to the proposed Old Mill Farm Underpass to prove bedrock.

A6018 Link Road: CH250 – CH321 on A6018 (Roe Cross Road) Link

5.3.13 This section includes the link road from the Cricket Ground Roundabout to the intersection with the A6018 (Roe Cross Road) and the retaining structures for that existing road.

5.3.14 Topsoil is present in all boreholes up to a thickness of 0.7m. Topsoil is described as soft dark brown slightly sandy occasionally silty CLAY with frequent rootlets.

5.3.15 BH404, located approximately 35m from the central alignment of the proposed scheme at CH260, recorded Made Ground at a thickness of 0.60m. Made Ground is described as slightly sandy clayey fine to coarse GRAVEL of sandstone and mudstone. Made Ground was underlain by soft slightly sandy, gravelly CLAY (considered to form a cohesive Glacial Till soil).

5.3.16 Roe Cross Road is supported by an approximately 8m high retaining wall at the intersection with the proposed link road. The retaining wall height initially increases to the northeast before decreasing as the natural ground level rises to meet the carriageway level. The retaining wall decreases in height to the southeast as the road elevation decreases to meet the rising natural ground level. Made Ground was recorded in BH212 and BH205 from ground level to 4.00m bgl (211.67m AoD) and from ground level to 8.80m bgl (211.56m AoD), respectively. Both boreholes are located on Roe Cross Road which is elevated above the grassed land to the west by approximately 11m. The uppermost 0.3m of Made Ground comprised bituminous road materials. Made Ground behind the retaining wall and underlying Roe Cross Road, as recorded in BH212, comprised a black brown, sandy, gravelly CLAY. Made Ground encountered in BH205 comprises a grey, clayey, sandy fine to coarse GRAVEL of angular, mudstone, siltstone and sandstone Clasts. Made Ground in both boreholes was recorded to be underlain by cohesive Glacial Till soils described below.

5.3.17 Glacial Till has been encountered across the site. However, the lower boundary of the Glacial Till has only been proven for this part of the route in BH403 (immediately west of Roe Cross Road) at a depth of 10.30m bgl (207.58m AoD and BH406 (adjacent to the Cricket Ground Roundabout) at 16.80m bgl (192.93m AoD).

5.3.18 The Cohesive Glacial Till typically comprises a soft, recorded to a maximum depth of 2.00m bgl in BH402 and BH406, becoming firm and stiff with depth, brown grading to grey with depth, variably sandy, variably gravelly CLAY with gravels of variable size and roundness.

5.3.19 Soft to very soft thick Glacial Till units are recorded on Glacial Till soils encountered in BH404 which was located in front of the retaining wall in the vicinity of Hutchinson Brook. The presence of fissures within the Glacial Till soil are likely to have caused saturation and softening of Glacial Till soils in this part of the site.

5.3.20 Granular Glacial Till horizons were encountered in BH205 and BH404 at depth intervals of 16.00 to 17.30m bgl (204.36m to 203.06m AoD), and 7.20m to 8.20m bgl (204.28m to 203.28m AoD) respectively. This feature is likely to be continuous between both boreholes given the similarity in elevation. The granular horizon comprised a brown, silty or clayey, gravelly fine to coarse SAND. This feature is likely to be an Ablation Till deposition feature.

5.3.21 The base of the Glacial Till profile shallows slightly from BH406 in the southwest to BH403 in the northeast at this area of the scheme approaching the edge of the paleochannel. The depth to the base of the Glacial Till is shown to increase from the northwest (bedrock encountered in BH403 at 10.30m bgl (207.58m AoD) towards the southeast where it was not encountered BH205 or BH404 which were advanced to a maximum depth of 23.30m bgl (197.06m AoD).

5.3.22 Bedrock in the form of Mudstone from the Millstone Grit Group at the Roe Cross Road end and Siltstone of the same formation at Cricket Ground Roundabout end were found in BH403 and BH406 respectively. Thicknesses at these locations have not been proven but both materials are described as extremely weak with the mudstone recovered as slightly sandy gravelly CLAY with gravel of mudstone lithorelicts whilst the siltstone was recovered as fine to medium GRAVEL.

Western Cutting: CH760 – CH880

5.3.23 Topsoil is present in the majority of boreholes up to a thickness of 0.4m. Topsoil in this are of the site generally comprises a black or dark brown sandy silty CLAY.

5.3.24 Cohesive Alluvium was found only in TP10 from 0.5m to 0.7m BGL and comprises firm light grey sandy CLAY with rare fine to coarse gravel.

5.3.25 Topsoil in this Section is predominately underlain by cohesive Glacial Till to a depth of 22m (187.00m AoD) to 14.30m bgl at CH760 (BH210) in BH410 and BH 405 respectively. BH410 and BH405 are located at chainage CH760 and CH880 respectively. This shallowing of the depth to bedrock to the east is anticipated to be associated with the paleochannel channel shallowing towards the east. The extent of the entire proposed western cutting is anticipated to lie within the Glacial Till deposit.

5.3.26 The Cohesive Glacial Till is generally described as soft to stiff slightly sandy CLAY. However, the upper layers at the western end have a gravelly component of mixed lithologies. There are also occasional pockets of granular or laminated till recorded (for example, in BH205, BH211 and BH404).

5.3.27 The presence of horizontal laminations and potential perched water bearing Granular Glacial Till horizons will need to be considered during the design of cuttings within the Glacial Till unit.

5.3.28 The presence of granular deposits and laminations within the Glacial Till unit indicates that an Ablation Glacial Till sequence may be present in this area of the site.

5.3.29 The Millstone Grit Group was recorded in BH211 (CH810) an recovered an approximately 1.60m thick highly to moderately weathered, very weak to moderately weak MUDSTONE which was overlain by a 0.70m thick band of strong SANDSTONE from 18.60m bgl (192.22m AoD).

5.3.30 At the eastern end of the cutting, the Millstone Grit Group becomes dominated by sandstones and siltstones, the latter of which are generally extremely weak to weak with extremely closely to closely spaced fractures. The sandstones are generally stronger (medium strong to strong, occasionally weak), with fractures very closely spaced to closely spaced.

5.3.31 A Rock Quality assessment in this section of the site shows the underlying bedrock to have a Rock Quality Designation (RQD) of less than 25%.

5.3.32 In addition to the presence of weathering processes acting on the Millstone Grit Group bedrock, the presence of known faulting in the area may also be responsible for causing the degradation and weakening of the bedrock material in this area of the site.

Section 2

Mottram Underpass and associated wing walls CH880 – CH1100

5.3.33 A solid Geological Plan and eight cross sections through and across the proposed Mottram Underpass are presented in Drawings HE551473-ARC-HGT-S2_ML001-DR-CE-3052 to HE551473-ARC-HGT-S2_ML001-DR-CE-3062.

5.3.34 A map of inferred Glacial Till thicknesses beneath the footprint of the proposed Underpass Portal is presented on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3055.

5.3.35 The uppermost soil strata encountered in this section comprise Topsoil and Made Ground. Made Ground soils encountered are likely to be associated with the development of Mottram Village.

5.3.36 Made Ground thicknesses range from 0.1m to 2.8m and comprise asphalt and hardcore underlain by predominantly fine to coarse SAND and GRAVEL with gravel of mixed lithologies including fragments of concrete and brick. Clay is also present and is described as soft to firm, slightly sandy, slightly gravelly, occasionally very silty clay with gravel of mixed lithologies. Topsoil is found up to 0.5m deep and is composed of very soft to soft slightly sandy CLAY or slightly sandy, clayey SILT with abundant rootlets.

5.3.37 Topsoil and Made Ground soils are underlain by cohesive Glacial Till.

5.3.38 A predominately cohesive Glacial Till profile was encountered from the western underpass portal to eastern extent of the infilled paleochannel located at approximately chainage CH1020, See drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062.

5.3.39 The Glacial Till boundary with bedrock in a north to south section, underlying the western underpass portal, was recorded at 22.50m bgl (192.67m AoD) (BH212) 30m northwest of the proposed western portal central alignment and is shown to shallow to

11.40m (202.27m AoD) in BH38 located approximately 20m to the southeast of the central alignment.

5.3.40 The Glacial Till thickness to bedrock generally thins from west to east and north to south. The base of the cohesive Glacial Till stratum beneath the central alignment of the western underpass portal was recorded at depth of 14.30m bgl (198.22m AoD) (BH405).

5.3.41 Glacial Till is shown to shallow to the depth of the base of the proposed Mottram Underpass at a depth of 9.00m bgl (203.77m AoD) at CH975 (BH43A). The west to east Glacial Till boundary with bedrock is shown to remain relatively level until CH1020 where the Glacial Till is shown to shallow rapidly and pinch out. This location is interpreted to represent the eastern extent of the infilled paleochannel.

5.3.42 Cohesive Glacial Till soils are encountered again and gradually thicken towards the east from Circa CH1080.

5.3.43 The Glacial Till boundary with the bedrock beneath the eastern underpass portal is shown to shallow slightly from the northwest to the southeast. BH201 indicates a depth to bedrock of 10.0m bgl (202.82m AoD), located 35m northwest of the Underpass central alignment and BH42 indicates a depth of 3.60m bgl (208.06m AoD) approximately 25m southeast of the central alignment. Below the central alignment of the eastern underpass portal, the depth to bedrock is approximately 8.50m bgl (203.77m AoD) in BH409..

5.3.44 Glacial Till soils are predominantly cohesive with occasional areas of granular material (BH201) and laminated clays (BH43). The cohesive material is described as soft to stiff, slightly sandy occasionally gravelly CLAY with gravel of mixed lithologies. Granular glacial till is described as medium dense, fine to medium, slightly gravelly clayey SAND or GRAVEL. The laminated CLAY is described as firm thinly laminated clay with some fine orange sand along sub horizontal partings.

5.3.45 Bedrock from the Millstone Grit Group comprised interbedded Sandstone and Siltstone from the Fletcher Bank Grit formation from the western Underpass Portal to approximate chainage CH990. The lithological boundary for the Marsden Formation was encountered at CH990 and is interpreted to have a northeast to southwest orientation across the Underpass Portal, See Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062. A second northeast to southwest lithological boundary between the Marsden formation going back into the Fletcher Bank Grit formation is interpreted to be present at CH1050. With the exception of the southern Wing Wall, the remainder of the underpass and northern Wing Wall are interpreted to be underlain by bedrock from the Marsden Formation.

5.3.46 Both Lithological Boundaries discussed are interpreted to form two northeast – southwest trending significant faults. A significant northwest – southeast trending fault is interpreted to be present at CH950 (See drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062). Evidence of additional shearing and fault displacements are recorded in multiple borehole records from between CH940 to CH1100 See Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3053 and HE551473-ARC-HGT-S2_ML001-DR-CE-3054.

5.3.47 The presence of a general Shear Zone, inclusive of the influence of tectonic deformation from the three significant faults discussed above is considered to extend from CH940 to CH1100 as shown on drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062.

5.3.48 A zone of high tectonic deformation is interpreted to extend from between CH980 to CH1040. This zone primarily comprises the interval of Mudstone from the Marsden formation. Horizons of high tectonic deformation have been interpreted as follows:

- Zones of no core recovery;
- Mudstone broken down to a cohesive material or sand / gravel (possible rock flour) as shown on the borehole core photographs); and
- Horizons logged as Breccia (likely to form a faulted Breccia given the geological sequence in the area).

5.3.49 A zone of lesser tectonic deformation is interpreted from between CH940 to CH980 and from CH1040 to CH1100. Zones of lesser tectonic deformation have been identified by the following characteristics:

- Evidence of juxtaposition of strata evident along Section E – E (See Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3054) which has been drawn along the direction of the recorded bedding orientation (Determined from the tele-viewer survey undertaken in BH409);
- Mudstone, Sandstone and Siltstone ground down to a gravel material; and
- SlickenSlide polished surfaces / shear surfaces recorded within borehole cores.

5.3.50 A zone of minimum evidence of tectonic deformation was recorded from between CH940 to CH980. A brief summary of each characterised area of tectonic deformation is discussed below.

Zone of high tectonic deformation (CH980 to CH1040)

5.3.51 Horizons of highly disturbed Mudstone, occasionally recovered as a dark grey, sandy, gravelly CLAY / SILT were recorded in BH407, BH408, BH409, BH410, and BH413. Bands of highly disturbed Mudstone were frequently observed to be interbedded / bounded by extremely weak, locally weak, mostly non-intact MUDSTONE and, to a lesser extent, SILSTONE. Zones of Mudstone, broken down to a CLAY / SILT are shown to be present at depth of up to 35.30m bgl (177.39m AoD) as recorded in BH407. Zones of CLAY / SILT horizons and zones of no recovery are considered to potentially form horizons of Rock Flour formed by tectonic shearing.

5.3.52 The Rock Quality Designation (RQD) values for this section of the site generally fell below 25% to a depth of 19.40m (193.07m AoD) (BH43). An exception to this is BH45A A where an RQD range of 68% to 92% was recorded between 14.30m (198.56m AoD) to 20.10m bgl (192.76m AoD).

5.3.53 RQD values were typically not observed to improve with depth, indicating that the poor quality of the bedrock is more likely related to faulting as opposed to a weathering profile.

Zone of lesser tectonic deformation (CH940 to CH980 and CH1040 to CH1100)

5.3.54 A discontinuation of bedrock strata was observed between BH407 (Mudstone) and BH43 (Sandstone). These posistions are in close proximity and the discontinuation indicates that displacement may be caused by fault displacement.

5.3.55 Highly weathered strata were recorded in BH43A from 9.00m bgl to 11.45 (203.77m to 201.31m AoD) and BH41 from 8.30m to 9.40m bgl (204.17 to 203.07m AoD). Highly weathered strata are recorded to comprise a firm to stiff CLAY with lithorelicts (BH43A) or weak SILTSTONE recovered as a very clayey SILT with lithorelicts (BH41).

5.3.56 Horizons of interbedded Siltstone, Sandstone and Mudstone are recorded to be moderately weathered to depths of 9.40m bgl (203.07m AoD) (BH41) to 18.60m bgl (193.87m AoD) (BH43). The thickness of the Moderately weathered horizon is shown to reduce with distance towards the west (with increasing distance from the zone of high tectonic deformation. Moderately weathered strata typically comprise moderately weak to moderately strong MUSTONE, SILTSTONE or SANDSTONE. Horizons of SANDSTONE or SILSTONE were typically recorded as being strong.

5.3.57 Bedding recorded within tele-viewer survey data correspond well to field logging observations showing the underlying bedding to generally dip by 10 to 20 degrees towards the southeast (110 to 140 degrees). Strata encountered are typically thinly laminated to thinly bedded.

5.3.58 A steep joint set, recorded at 80 degrees, was frequently reported.

5.3.59 An RQD of less than 25% was recorded to depths of between 14.0m (199.07m AoD) (BH40) to 19.20m (193.27m AoD) (BH 43). RQD values were typically observed to improve with depth in this section, indicating that there is less of an influence of tectonic deformation within this section when compared to the strata encountered between CH980 to CH1040.

5.3.60 A juxposition of bedding sequence between BH40 and BH43 indicates that faulted displacements are present in this area.

5.3.61 Bedrock encountered from CH1035 to CH1050 along the proposed central alignment comprises MUDSTONE from the MARSDEN FORMATION. The northern Wingwalls are shown to be underlain by MUDSTONE whereas the majority of the southern Wingwalls are shown to be underlain by interbedded SANDSTONE and SILSTONE from the Fletcher Bank Grit Formation.

5.3.62 Frequent slickenslide surface and polished surfaces are recorded in the vicinity on the northern Wingwalls in BH48, BH203 and BH49 at elevations of between 200m to 173m AoD. Areas of Mudstone broken down into a predominately CLAY / SILT material was recorded in exploratory boreholes undertaken adjacent to the southern Wingwall in BH413 and BH410. Records of highly degraded arising (possibly comprising rock flour) were recorded between elevations of 194.50m AoD to 182.0m AoD). The location of these signs of tectonic deformation are considered to form the position of one of the southwest – northeast trending faults (See Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062).

5.3.63 The Millstone Grit Group is generally made up of interbedded Siltstone and Sandstone at the western end of the underpass. The strata predominantly comprise Mudstone with rare interbedded Siltstone towards the east. This variation in solid geology is likely to be due to faulting. Generally, the rock mass decreases in quality with distance to the east as the route approaches the faulted area. From CH900 to CH925 the RQD is above 50% (good quality rock) at a depth of approximately 15m. The quality rapidly decreases eastwards from CH925 with the majority of the rock mass showing less than 25% RQD to a depth of 35 – 40m bgl (Base of boreholes).
Section 3

Eastern Cutting CH1100 - 1440

5.3.64 Made Ground is present from ground level to a depth of between 0.20m (BH209) to 2.60m bgl (BH 48). Both borehole locations are positioned adjacent to Old Hall Lane. The Made Ground encountered is anticipated to be associated with the construction of Old Hall Lane and the historical development of this part of Mottram Village. The majority of recovered Made Ground comprises SAND and GRAVEL. There are occasional deposits of firm CLAY.

5.3.65 Topsoil is present under the grassed area of land known as the Show Ground to the east of Old Hall Lane and Mottram Village. Topsoil was typically encountered to depths of between 0.20m and 0.50m bgl. BH307A and TP12A recorded Topsoil to depths of 1.20m and 2.00m bgl. These horizons are considered more likely to form superficial weathered Glacial Till soils. Topsoil generally comprises a slightly sandy silty and occasionally gravelly CLAY with rootlets.

5.3.66 Glacial Till is recorded to underlie the Topsoil and Made Ground as described above. Glacial Till at the western end of the proposed cutting (CH1100) was recorded to depths of between 1.60m bgl (211.52m AoD) (BH 49) and 4.30m bgl (207.62m AoD) (BH204). The Glacial Till upper surface appears to undulate from north to south (i.e. perpendicular to the cutting profile) (Refer to Underpass Cross Sections Drawing HE551473-ARC-HGT-S2_ML002-DR-CE-3058 to HE551473-ARC-HGT-S2_ML002-DR-CE-3059).

5.3.67 Exploratory boreholes in the vicinity of CH1150 and CH1200 generally show the Glacial Till profile to thicken towards the southern end of the cutting. Exploratory positions towards the northern end of the cutting encounter the base of the Glacial Till at depths as shallow as 1.20m bgl (213.44m AoD) (BH 51 at CH1140). Exploratory positions over the southern face of the proposed cutting at CH1200 (BH307A) recorded the base of the Glacial Till to be at 6.90m bgl (202.60m AoD). A similar Glacial Till profile is inferred to be present at CH1250.

5.3.68 Cross sections at CH1300 and CH1400 indicate that the base of the Glacial Till profile may be relatively level in a perpendicular orientation across the cutting profile. The Glacial Till thickness is inferred to be approximately 6.00m to 7.00m bgl (192m to 193m AoD). Borehole spacing over this area of the cutting is less dense, therefore thicknesses have been inferred from borehole positions BH 150A, BH418 and BH417.

5.3.69 The Glacial Till thickness along the alignment of the cutting is generally shown to thicken from the west (1.60m bgl (211.52m AoD) to 4.30m bgl (207.62m AoD)) to the east (6.00m to 7.00m bgl (192m to 193m AoD)). A general side long Glacial Till to Bedrock boundary is shown between CH1150 and CH1250. With regards to variations in AoD values reported, it should be noted that the topography of the current ground profile reduces in elevation towards the southeast from CH1275.

5.3.70 Additional, unrecorded variations in the rockhead profile are likely to be present along the length of the cutting.

5.3.71 Variations in the Glacial Till to Bedrock boundary along this section of the scheme may be due to the presence of an infilled paleochannel.

5.3.72 Glacial Till described above generally comprises a firm to stiff, variably sandy, variably gravelly CLAY. Shallow soft Glacial Till soils were recorded in BH417 between 0.15m (206.72m AoD) and 1.20m bgl (205.67m AoD). Soft bands of cohesive Glacial Till were occasionally recorded at depth in BH418 from 3.20m (194.09m AoD) to 3.55m bgl (193.74m AoD), and BH417 from 3.40m bgl (203.47) to 5.00m bgl (201.87m AoD). A granular Glacial Till lens was encountered in BH417 from between 2.45m to 3.40m bgl (204.42m to 203.47m AoD). Additionally, both BH417 and BH418 are located adjacent two surface depressions (possibly Kettle Holes) and a spring in addition to a small un-named watercourse. Saturation and softening of the Glacial Till soil profile may have occurred due to groundwater and surface water infiltrating and percolating from the sand horizon into the Glacial Till soil mass via fissures within the soil mass.

5.3.73 Laminated Glacial Till soils were recorded in BH52 between 0.70m (211.04m AoD) and 2.40m bgl (209.34m AoD) and TP412 between 0.20m bgl (206.51m AoD) and 0.90m bgl (205.81m AoD). Both units are typically thinly laminated.

5.3.74 Granular Glacial Till soils were recorded in BH52 (0.70m to 2.40m bgl), BH307A (1.20m tp 3.65m bgl), BH417 (2.45m to 2.90m bgl and 2.90m to 3.40m bgl) and TP412 (2.50m to 2.80m bgl). Granular Glacial Till deposits typically comprise a gravelly fine to coarse SAND. However, records of slightly clayey, sandy fine to coarse GRAVEL were recorded in BH417. All of these positions are located along the central alignment of the proposed scheme and are positioned at relatively similar levels. It is likely that they are interconnected and may act as an active pathway for perched groundwater within the Glacial Till horizon. Perched groundwater may potentially flow into the ponded surface depression positioned between CH1280 to CH1400. The presence of ponded water within this feature indicates that groundwater migration into this feature from within the Glacial Till soil mass is likely. Rainwater and surface water migration into this feature is also likely to contribute to the presence of ponded water at this location.

5.3.75 Bedrock comprises various lithologies. MUDSTONE is generally prominent towards the western end of the cutting. The geological sequence grades towards interbedded SANDSTONE and SILTSTONE interbedded units from CH1125 (BH 51). This sequence of bedrock is likely to form horizons from the FLETCHER BANK GRIT.

5.3.76 The majority of the rock quality along this section of the site is of poor quality (<25% RQD) and is likely to be associated with the tectonic deformation and weathering processes. The RQD is generally shown to improve with depth.

5.3.77 The uppermost 5m of bedrock typically exhibits an RQD of less than 25% (poor quality) with a generally thinner discontinuous band of medium quality rock (25-50%) ranging from 5m BGL to 13m BGL with increasing chainage. Good quality rock (RQD>50%) can be found beneath the medium quality band from 6m BGL to 14m BGL. At CH1225, good quality rock can be found up to the lithological Glacial Till boundary in BH 53 at 6.90m bgl (203.98m AoD).

5.3.78 A southwest to northeast trending fault is shown to intersect the cutting. It is possible that the area of thickened Glacial Till, thought to potentially form a Paleochannel feature, may form the surface sub-crop of the fault. No clear evidence of faulting was recorded on the ground investigation exploratory hole logs.

Section 4

Eastern Embankments CH1530 – CH1640, CH1640 – CH2175, CH2175 – CH2950, CH2950 – CH3116

5.3.79 Topsoil is generally present across this area of the site from surface level to a depth of up to 0.40m (BH347). An exception to this is the area around the Longdendale Aqueduct where Made Ground was encountered from ground level (See Section 5.3.86).

5.3.80 The Glacial Till profile increases in thickness from 6.30m in BH152 at CH1550 to a maximum thickness of 22.90m (142.46m AoD) in BH423 at CH1795. From CH 1795 the Glacial Till gradually thins with distance to the east to a depth of 13.70m bgl (108.50m AoD). Localised thickening of the Glacial Till is evident from CH2915 to CH3020. This thickening is likely to the due to the presence of previous channels of the

River Etherow Channel. Glacio-fluvial soils are shown on the BGS survey sheet for this area of the site.

5.3.81 A review of the 1:50,000 scale BGS Survey Sheet (No 86) indicates that Head Deposits should be present from ~CH2700 to the River Etherow crossing at ~CH2940. Head Deposits were not recorded in the borehole logs during any of the ground investigation phases. However, interpretation of the laboratory testing referred to in 5.3.105 indicates that Head Deposits are present.

5.3.82 A total of 13 no boreholes (BH152, BH153, BH347A, BH422, BH423, BH427, BH428, BH429, BH431, BH432, BH434, BH434A and BH435) proved Bedrock over this area of the site. Bedrock at the western end of this section generally comprises interbedded SANDSTONE and SILTSTONE. MUDSTONE was recorded in the central and eastern area of this section.

5.3.83 Limited boreholes in the central area of the site proved bedrock due to the depth to bedrock being large in this area of the site. It is therefore uncertain as to whether this area of the site is predominately underlain by Mudstone from the MARSDEN formation or units of interbedded Sandstone and Siltstone horizons from the FLETCHER BANK GRIT formation. A review of the BGS survey sheet for the area indicates that this area of the site is underlain by deposits from the MARSDEN formation.

5.3.84 Bedrock proven in the vicinity of the River Etherow predominately comprised MUDSTONE units from the MARSDEN formation. A further breakdown of the detailed ground conditions within the vicinity of proposed structures within this section is discussed below.

Longdendale Aqueduct Structure – CH1640

5.3.85 Topsoil is present up to a thickness of 0.40m and comprises a slightly sandy gravelly CLAY.

5.3.86 Made Ground is recorded to a maximum depth of up to 1.60m bgl (1.60m AoD) in TP371. Made Ground was also recorded in TP64 to a depth of 0.50m bgl (161.27m AoD). Made Ground was recorded to comprise either a gravelly SAND, a gravelly CLAY / SILT. Gravel clasts are generally described as angular to subangular fragments of brick, pottery and tiles with abundant plant roots and a slight organic odour.

5.3.87 An un-named surface watercourse was observed to 'sink' below the ground surface in this part of the site. It is considered possible that surface water over this part of the site may have infiltrated into a granular Made Ground deposit. However with further investigation, it has been shown that a 2 foot stone culvert is present beneath the surface, draining to the east. It is possible that the source of Made Ground could be associated with the Longdendale Aqueduct which is known to be present beneath that part of the site. This aqueduct is thought to have been tunnelled but the presence of surface workings, for example for cut and cover construction cannot be ruled out.

5.3.88 The Glacial Till profile at this location is inferred to thicken to the east. The base of the Glacial Till was proven in BH153 at CH1620 at a depth of 9.80m bgl (160.30m AoD). The base of the Till was also proven in BH422 at CH1685 at a depth of 20.20m bgl (152.17m AoD).

5.3.89 The Glacial Till is described as soft to stiff but generally firm, fissured, slightly sandy, occasionally gravelly CLAY with gravel described as angular to sub-rounded, fine to coarse clasts of mixed lithologies. Soft Glacial Till soils in TP63, TP371 and TP372 are recorded to depths of between 0.90m and 2.00m bgl. Irregular sand deposits up to 30mm thick are sporadically present.

5.3.90 Bedrock underlying the Glacial Till comprises approximately 3.00m of weathered SANDSTONE overlying SILTSTONE from the FLETCHER BANK GRIT formation, recovered in BH422 (CH1685) from 20.60m bgl (151.77m AoD). The SANDSTONE was recovered as a sandy, slightly clayey, angular to subangular, fine to coarse sandstone gravel. A thin 0.40m thick horizon of weathered MUDSTONE was recorded above the weathered SANDSTONE horizon described above. The quality of the rock mass improved from 23.36m bgl (149.01m AoD), where the unit was recorded as a Medium Strong SILTSTONE.

5.3.91 1.20m of bedrock was proven in BH153. A 0.70m weathered horizon of SANDSTONE was recorded between 8.80m to 9.50m bgl (160.30m to 159.10m AoD). Sandstone recovered from 9.50m bgl (159.60 m AoD) was recorded as moderately weak to medium strong. The borehole was terminated at 10.0m bgl (159.10m AoD). It is not possible to comment on whether the weathered profile at this location increases further beyond 159.10m AoD.

Mottram Moor Roundabout – CH1660 – CH1830

5.3.92 Made Ground is present on the existing A57 embankment in recorded thicknesses up to 2.6m. Made Ground here was recorded in BH154, TP374, BH422 and TP65. The majority of the recorded Made Ground comprises fine to coarse GRAVEL and fine to coarse SAND deposits. Gravel is of mixed lithologies including siltstone, sandstone, granite, brick and clinker. Cohesive Made Ground is also present and comprises slightly sandy, gravelly CLAY with occasional pockets of fine to coarse sand.

5.3.93 Topsoil was recorded to the south of the existing A57 from CH1770 onwards. Topsoil was recorded to depths of up to 0.8m. Topsoil is generally described as a firm CLAY with fine to coarse gravels and cobbles of sandstone, quartzite and granite.

5.3.94 Cohesive Glacial Till is recorded to underlie Topsoil and Made Ground deposits. The Cohesive Glacial Till is recorded to a maximum depth of 22.90m bgl (134.96m AoD) in BH423 at CH1795. The Glacial Till is described as fissured and laminated in places, soft to firm, occasionally stiff slightly sandy, occasionally slightly gravelly CLAY. Pockets of sand were also recorded within the cohesive Glacial Till mass.

5.3.95 A 1.60m thick horizon of fine to coarse GRAVEL was recorded in BH423 from 13.80m to 15.40m (153.06m – 151.46m AoD). The drillers note that this was a granite obstruction, possibly relating to a boulder. Limited recovery of Glacial Till soils were achieved from 15.40m to the top of the proven SILTSTONE at 24.40m bgl (151.46m to 142.46m AoD). It is possible that a more extensive granular Glacial Till deposits are present within this soil horizon.

5.3.96 Bedrock recovered at CH1680 in BH422 is discussed in 5.3.90.

5.3.97 A MUDSTONE unit from the MARSDEN formation was encountered in the central area of the proposed Mottram Moor Roundabout in BH423 at CH1795 at a depth of 22.90m bgl (134.96m AoD).

5.3.98 The Mudstone recovered comprised a weathered horizon from 22.90m bgl (143.96m AoD), followed by partial recovery of 1.50m of very weak, locally extremely weak, SILTSTONE. The remainder of the borehole recovered a very weak to weak MUDSTONE which is predominantly non-intact and recovered as fine to coarse gravel with low cobble content.

Carrhouse Lane Underpass – CH2175

5.3.99 TP423, BH429 and BH428 were undertaken in the vicinity of the proposed Carrhouse Lane Underpass. All exploratory hole positions encountered Topsoil to 0.3m. Topsoil comprised very soft to soft, slightly gravelly (of various lithologies) sandy silty CLAY with frequent rootlets.

5.3.100 Topsoil is recorded to be underlain by cohesive Glacial Till in all exploratory hole positions. The base of the cohesive Glacial Till was proven at depths between 18.70m bgl (131.35m AoD (BH429)) and 21.50m bgl (130.18m AoD (BH428)).

5.3.101 Glacial Till comprised a soft (to 1.00m bgl) becoming firm, brown and mottled bluish grey, variably sandy, variably gravelly CLAY. Gravel clasts are typically sub-angular to sub-rounded, fine to coarse of siltstone, sandstone, mudstone, quartz and quartzite.

5.3.102 No laminated or granular Glacial Till horizons are recorded.

5.3.103 Bedrock encountered in BH428 and BH429 comprised up to 0.70m of stiff slightly sandy gravelly silt which is likely to be weathered siltstone underlain by an extremely weak SILTSTONE recovered as fine to coarse gravel. The base of this unit was not proven.

River Etherow Bridge – CH2950

5.3.104 Topsoil was recorded up to a depth 0.4m and is predominantly sandy, silty, occasionally gravelly CLAY and sporadically gravelly, silty, very clayey SAND.

5.3.105 Topsoil is underlain by suspected cohesive Head Deposits encountered in BH427, BH432 and BH433 to depths of between 1.30m bgl (119.35m AoD) and 2.50m bgl (119.70m AoD). This stratum is typically described as very soft to firm, frequently mottled orangish brown and bluish grey, variably sandy, variably gravelly CLAY with an occasional cobble content. Particle Size Distribution tests (PSD) undertaken on this material show the material to have a very similar grading profile to the cohesive Glacial Till soils. Glacial Till located up gradient and towards the west of the River Etherow crossing is suspected to form the source of this deposit. No solifluction shear surfaces have been recorded within this stratum. It cannot however be ruled out that these surfaces are present within the deposit.

5.3.106 Predominantly cohesive Alluvium deposits were encountered below the Head Deposits to depths of between 8.70m bgl (111.00m AoD) (BH435) and 10.70m bgl (111.50m AoD) (BH427). Alluvium soils typically comprised very soft to firm, occasionally thinly laminated, dark brown and dark greyish brown, variably sandy and variably gravelly CLAY. Occasional interbedded horizons of gravelly, slightly clayey SAND were encountered in BH432 between 1.30m and 2.20m bgl (119.25m and 118.35m AoD). 0.45m and 1.10m thick SAND layers were encountered in BH434 between 1.20m and 1.65m bgl (118.83m and 118.38m AoD) and 2.70m and 3.80m bgl (117.33 and 116.23m AoD).

5.3.107 Limestone gravel clasts are recorded within the Alluvium. No records of limestone clasts have been observed within the Glacial Till soils in other parts of the project site. This suggests that this deposit may have been deposited by fluvial processes as opposed to glacial ice sheet deposits.

5.3.108 Possible granular Glacio-fluvial deposits (or River Terrace Deposits) were recorded below Alluvium deposit to depths of between 14.30m bgl (105.40m AoD) (BH435) and 15.80m bgl (104.55m AoD) (BH433). Recorded deposits typically comprise loose becoming medium dense (and dense towards the base of the stratum), fine to coarse SAND and angular to sub-rounded fine to coarse GRAVEL with occasional cobbles.

Glacio-fluvial deposits are mapped on the BGS Survey Sheet No 86 to the south of the site. The stratum encountered in the vicinity of the River Etherow over this part of the site is considered likely to form part of the mapped deposit to the south.

5.3.109 Bedrock was encountered at depths of between 15.80m bgl (104.55m AoD) (BH433) and 14.30m bgl (105.40m AoD) (BH435). Bedrock mainly comprised of MUDSTONE which was described as very weak occasionally extremely weak MUDSTONE with sub-horizontal, closely spaced discontinuities. BH434 and BH434A recorded SILTSTONE from the top of rockhead as the uppermost bedrock and is described as extremely weak, occasionally very weak SILTSTONE with sub-horizontal, very closely to closely spaced discontinuities. A SANDSTONE horizon of approximately 1.0m in thickness is recorded to be very weak to medium strong, fine to medium grained SANDSTONE with sub-horizontal, closely spaced undulating and rough discontinuities. The rockhead profile here is considered to form deposits from the MARSDEN FORMATION.

5.4 Groundwater

5.4.1 The data presented in the historical ground investigations and the 2018 Socotec ground investigation have been reviewed and are interpreted in this section to describe the groundwater conditions likely to be found across the footprint of the Scheme. The references for these documents are provided in Table 3.

5.4.2 The interpretation of groundwater conditions has been completed broadly, for the whole route, and in more detail for each of the four route sections and individual infrastructure elements (see paragraph 5.3.2). Plans showing the locations of boreholes from both historical and the 2018 Socotec ground investigations are provided in drawings HE551473-ARC-HGT-S2_ML001-DR-CE-3052 to HE551473-ARC-HGT-S2_ML001-DR-CE-3062.

5.4.3 A detailed geological interpretation of the route is given in chapter 5.3.

5.4.4 The bedrock aquifer is the Millstone Grit Group, which is comprised of interbedded siltstone, sandstone, and mudstone. The Millstone Grit Group is classified by the EA as a *Secondary Type A aquifer* that has *minor primary permeability as well as secondary permeability in fractures*. It is therefore considered by the EA to have permeable layers that can support water supplies at a local rather than regional scale.

5.4.5 The Millstone Grit Group is overlain by Glacial Till, which is designated by the EA as a *Secondary (undifferentiated) aquifer*. The Glacial Till is comprised primarily of cohesive CLAY over most of the area covered by the ground investigation.

5.4.6 Glacio-fluvial deposits are present at the eastern end of the route within the vicinity of the River Etherow and form a confined water bearing unit that is sandwiched beneath Glacial Till and above the Millstone Grit Group.

Groundwater monitoring – manual observations

5.4.7 Groundwater levels were monitored by manually dipping boreholes at 10 sites, between 14th March 2018 and 25th July 2018. A summary of the groundwater monitoring data from manual observations is presented in Table 9.

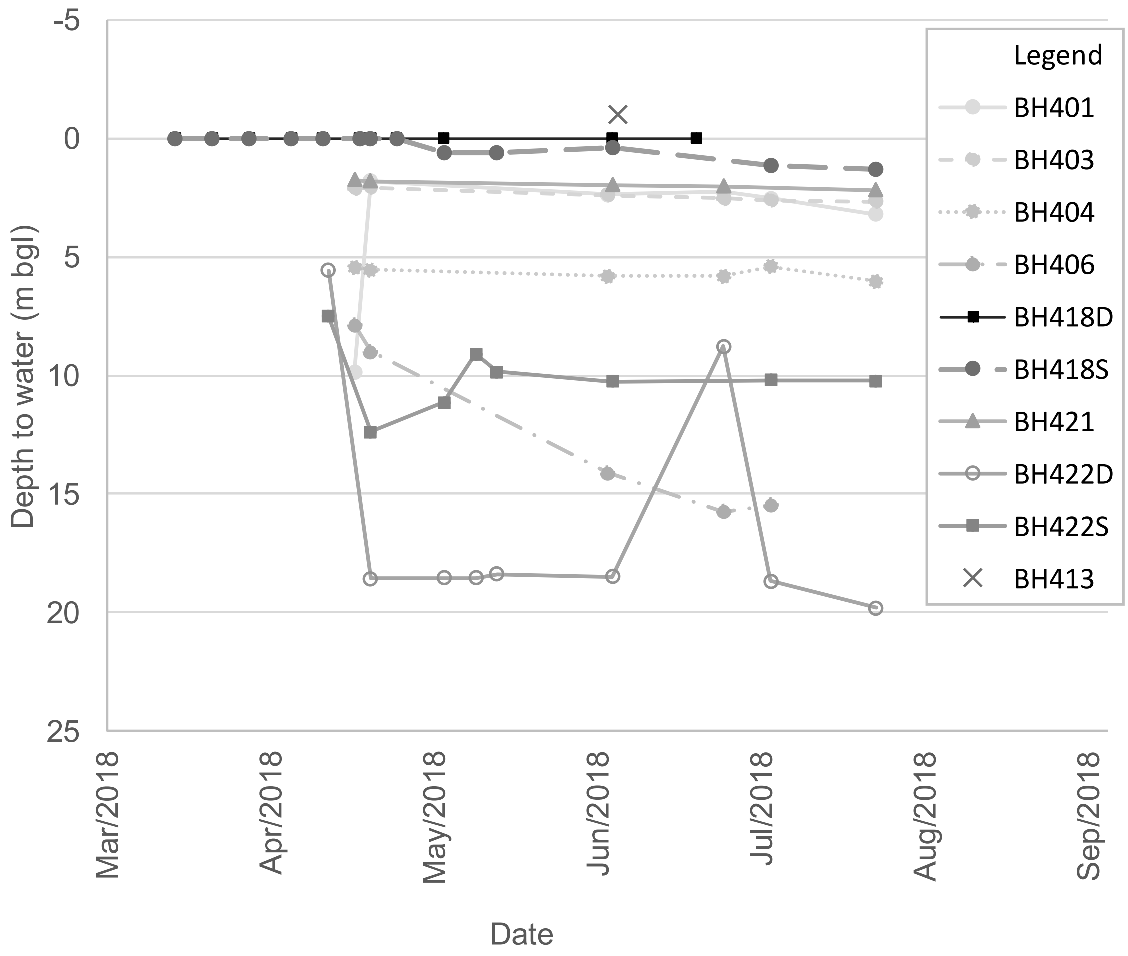
Table 9 Summary of depth to groundwater from manual observations.

Borehole	Aquifer	Depth to groundwater (m bgl)	Groundwater level (m AOD)	Average (mean) depth to water (m bgl)	Monitoring period
BH401	Glacial Till	9.9 to 1.8	196.1 - 204.1	2.5	17/04/2018 to 25/07/2018
BH403	Glacial Till	2.7 to 2.1	215.2 – 215.8	2.4	17/04/2018 to 25/07/2018
BH404	Glacial Till	6.0 to 5.4	205.5 – 206	5.7	17/04/2018 to 25/04/2018
BH406[1]	Millstone Grit Group	15.8 to 7.9	193.9 – 201.8	12.4	17/04/2017 to 05/07/2018
BH413	Millstone Grit Group	< 1.0 m artesian head	211.1	Artesian	06/6/2018
BH418D	Millstone Grit Group	< 1.0 m artesian head	>197.3	Artesian	14/03/2018 to 21/06/2018
BH418S	Millstone Grit Group	1.3 to artesian (<1 m artesian head)	196.0 - >197.3	0.3	14/03/2018 to 25/07/2018
BH421	Millstone Grit Group	2.2 to 1.7	184.7 – 185.2	1.9	17/04/2018 to 25/07/2018
BH422D	Millstone Grit Group	19.8 to 5.6	152.6 – 166.8	16.2	12/04/2018 to 25/07/2018
BH422S	Glacial Till	12.4 to 7.5	160.0 – 164.9	10.1	12/04/2018 to 25/07/2018
[1]An artesian level of 0.14 m AGL was recorded during packer testing, however the groundwater level was not able to be recorded whilst it was above the ground surface					

5.4.8 Figure 5.4.1 shows the depth to water record from manual observations as reported in the 2018 ground investigation. Manual readings of artesian results are representative of the height of the upstand, if one, at the time. During the period of groundwater monitoring the wheather conditions typically varied from a high pressure cold conditions in March, through prevailing westerly cyclonic (low pressure) airflows in April, transitioning back to high pressure through late spring and summer. Precipitation was approximately average in spring and and below average through summer. The groundwater monitoring results show that:

- The water levels generally show a slight downward trend in groundwater levels across the period of monitoring. This is interpreted to be natural recession during the summer months of 2018.
- The initial groundwater readings for BH401, BH422S and BH422D are likely outliers and are thought to be caused by an unnatural raising or lowering of the initial water level after the addition or removal of water during drilling.
- BH422D shows a 10 m increase in the observed water level on the 26th June 2018. This is considered likely to be a measurement error as a similar increase is not seen in the records at other sites.
- BH413 has a single reported manual dip showing an artesian water level with a piezometric head of 1 m AGL.

Figure 5.4.1 Groundwater levels (manual observations).



Groundwater monitoring – automated observations

5.4.1 Groundwater levels were recorded using vibrating wire piezometers (VWPs) and automated groundwater loggers in selected boreholes between 14th March 2018 and 25th July 2018 . This monitoring (which continues at the time of writing) has been reported in Appendix E of the 2018 Ground Investigation Factual Report. Table 10 shows a summary details of the VWP and standpipe installations.

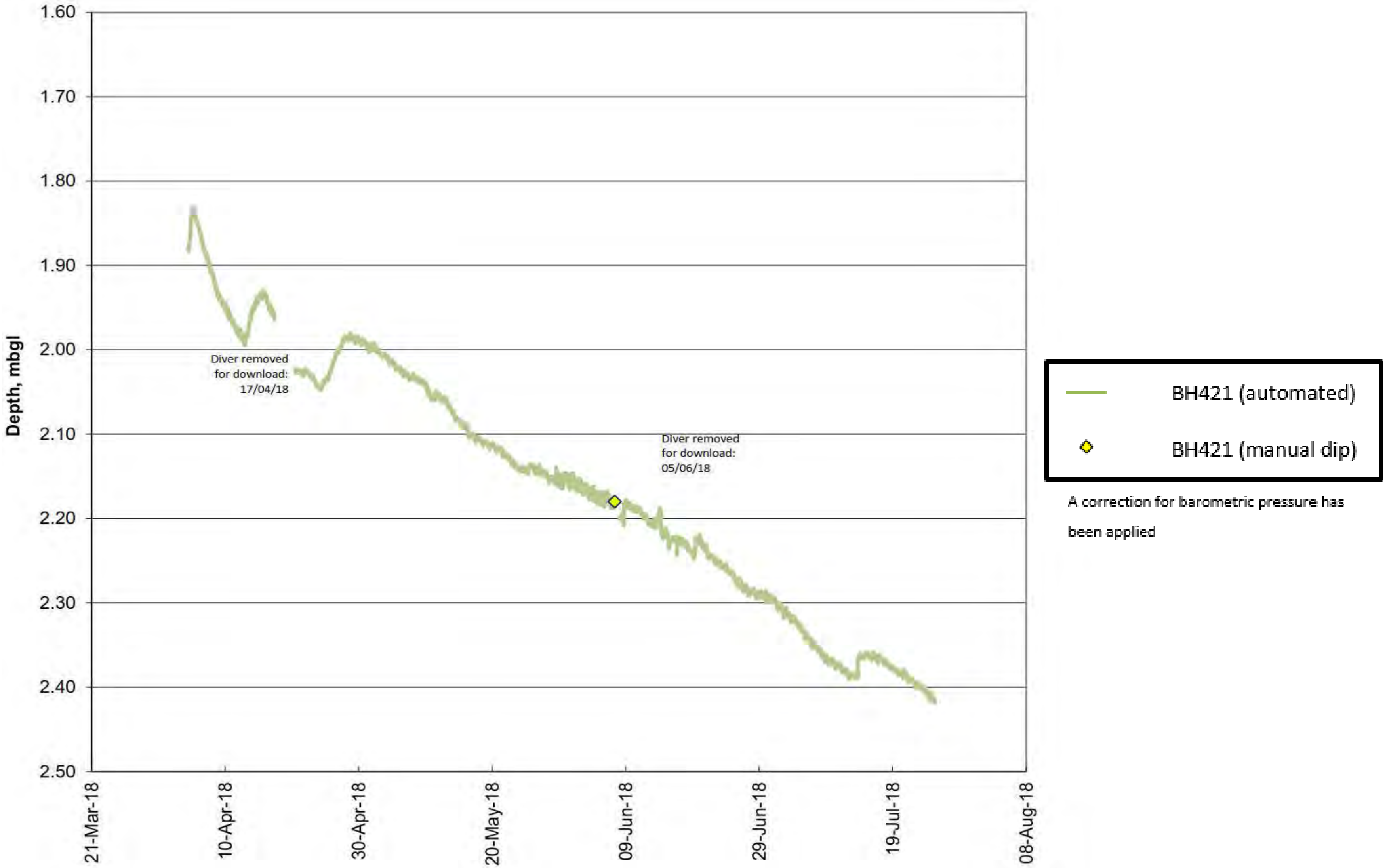
5.4.2 The results include the downward trend in groundwater level throughout the summer of 2018, as seen in manual measurements. A typical groundwater hydrograph example is shown in Figure 5.4.2

Table 10 Summary details of automated groundwater monitoring installation.

Borehole	Instrument type	Installation date	Pipe diameter (m)	Response zone (m bgl)	Screened aquifer
BH401	SP	05/02/2018	50	7.5 – 10.0	Glacial Till
BH402	VWP	26/02/2018	19	7.5 – 10.0	Glacial Till
BH403	SP	19/02/2018	50	4.5 – 6.0	Glacial Till
BH404	SP	15/02/2018	50	7.0 – 11.0	Glacial Till
BH406	SP	08/02/2018	50	15.0 – 17.2	Millstone Grit Group
BH408D	VWP	09/02/2018	19	14.5 – 17.5	Millstone Grit Group
BH408S	VWP	09/02/2018	19	6.5 – 8.0	Glacial Till
BH409	VWP	20/02/2018	19	15.0 – 19.0	Millstone Grit Group
BH412A	VWP	05/02/2018	19	12.0 – 18.0	Millstone Grit Group
BH414	PW	25/05/2018	19	10.0 – 31.5	Millstone Grit Group
BH415	VWP	07/03/2018	19	14.0 – 18.0	Millstone Grit Group
BH417	VWP	20/03/2018	19	8.5 – 12.0	Millstone Grit Group
BH421	SP	06/03/2018	50	13.0 – 17.0	Millstone Grit Group
BH423	VWP	14/05/2018	19	25.8 – 28.0	Millstone Grit Group
BH427	VWP	15/05/2018	19	10.0 – 13.7	Glacio-fluvial deposit
BH428	VWP	14/05/2018	19	25.0 – 28.0	Glacial Till
BH430A	VWP	10/5/2018	19	8.0 – 11.3	Glacial Till and Millstone Grit Group
BH432	VWP	22/5/2018	19	9.0 – 13.0	Millstone Grit Group
BH435[1]	VWP	09/04/2018	19	16.5 – 20.0	Millstone Grit Group
SP = Standpipe VWP = Vibrating wire piezometer					

SPIE = Standpipe piezometer with automated groundwater logger PW = Pumping well installed with an automated groundwater logger [1]Data logger damaged by cattle and no data retrieved

Figure 5.4.2 An example of automated data collection record (BH421) taken during the 2018 Ground Investigation.



Groundwater levels – artesian boreholes and upward vertical gradients

5.4.3 Artesian conditions were recorded during the 2018 Socotec ground investigation when drilling at borehole locations BH408, BH409, BH413, BH417 and BH418 and during subsequent monitoring at BH413, BH417 and BH418. These boreholes are all screened in and monitor water levels associated with the Millstone Grit Group.

5.4.4 BH408, BH409 and BH413 are located in Mottram village and within the area of the proposed underpass. BH417 and BH418 are situated in the proposed eastern cutting. It was found that:

- Pockets of pressurised artesian conditions were reported to have been encountered during drilling at BH408 between a depth of 16.7 to 24.9 m bgl. A VWP installed between 14.5 m bgl and 17.5 m bgl, within this same zone, recorded a depth to groundwater of between 4.0 to 5.0 m bgl which demonstrates the heterogeneity of the Millstone Grit Group aquifer.
- Artesian conditions were encountered when drilling BH409 at depths below 18 m bgl. Artesian conditions were not reported during ongoing monitoring, during which time the groundwater level was between 0.8 m bgl and 1.5 m bgl. It is considered possible that artesian conditions may arise at this site during periods prolonged of high recharge; and
- At BH413 groundwater was first encountered during drilling at approximately 8.0 m bgl and as drilling continued the groundwater level rose to 0.5 m bgl. During monitoring the groundwater level was reported artesian at times as evidenced by the borehole overtopping. The groundwater level was recorded at 1.0 m above ground level (AGL) on the 6th June 2018, although the artesian flow rate from the open borehole was negligible.

5.4.5 An upwards hydraulic gradient was evidenced from water conditions encountered during drilling in boreholes BH408 and BH409.

- The water table at BH408 was 1.3 m bgl when drilling at 13.7 m bgl and artesian when drilling between 16.7 m bgl to 24.9 m bgl;
- The water table at BH409 was 0.25 m bgl at a depth of 14.8 m bgl and became artesian at a depth of 18 m bgl; and
- BH418 has a shallow and deep monitoring installation, both in the Millstone Grit Group. The shallow observation piezometer (installed at 13 m bgl in siltstone) has a groundwater level that is up to 1.3 m below that of the deep observation borehole (installed at 16 m bgl in sandstone).

In-situ testing of hydraulic conductivity

5.4.6 In-situ-testing from historical ground investigations and the 2018 Socotec ground investigation are assessed below.

5.4.7 Packer and rising head tests were performed during the previous ground investigations and are summarised in Table 11.

Table 11 Historical ranges of hydraulic parameters from in-situ tests.

Hydrogeological Unit	Description	Thickness (m)	Hydraulic Conductivity (m/s)[1]
Glacial Till	Clay with small and localised minor silt and sand lenses	0 m to 40	Minimum 2.5×10^{-10} m/s Maximum 2.2×10^{-7} m/s Geomean 2.6×10^{-8} m/s
Millstone Grit Group – sandstones, mudstones and siltstones	Interbedded sandstones, mudstones and siltstones with quartz matrix	>100 m (base not found) Individual units between 5 m and 20 m thick	Minimum 4.6×10^{-10} m/s Maximum 7.3×10^{-7} m/s Geomean 3.3×10^{-8} m/s

5.4.8 A series of packer tests (single and double) targeting the Millstone Grit Group were completed in eight boreholes during the 2018 ground investigation (Table 12). In general, the majority of the packer tests were incomplete, due to the following issues reported during testing:

- Problems with maintaining the packer seal in fractured aquifer test zones (poor formation quality), causing overflowing of the borehole during the test (borehole seal lost);
- Insufficient water was taken into the formation, leading to a static water level, likely due to low hydraulic conductivity;
- Insufficient water supply to borehole sites to achieve the required pressure (logistical problems); and
- Unable to supply adequate flow of water into the test zone due to high hydraulic conductivity.

Table 12 Packer testing results.

Borehole	Test	Test interval (m bgl)	Hydraulic conductivity (m/s)	Comment
BH405 (Single packer)	1 2 3 4 5 6	17.3-18.0 18.0-21.0 21.0-24.0 24.0-27.0 33.0-35.0 30.0-33.0	5.3×10^{-7} 6.3×10^{-7} 1.3×10^{-6} 3.9×10^{-6} 7.0×10^{-8} 2.4×10^{-8}	Steps 3 and 4 failed[1] Steps 3 and 4 failed[1] Steps 2, 3, 4 and 5 failed[1] Steps 2, 3, 4 and 5 failed[1] Step 5 failed Steps 1, 2, 4 and 5 failed[4]
BH413 (double packer)	1 2 3 4 5	31.2-34.2 28.0-31.0 25.0-28.0 22.0-25.0 19.0-22.0	- - - 3.1×10^{-6} 7.5×10^{-8}	All steps failed[2] All steps failed[2] All steps failed[2] Steps 2, 3, 4 and 5 failed

Borehole	Test	Test interval (m bgl)	Hydraulic conductivity (m/s)	Comment
	6	16.0-19.0	$7.8x10^{-8}$	
	7	13.0-16.0	$8.1x10^{-8}$	
	8	10.0-13.0	$7.0x10^{-8}$	
	9	7.0-10.0	$6.6x10^{-8}$	
BH414 (double packer)	1	27.0-30.0	$2.2x10^{-7}$	
	2	24.0-27.0	$6.6x10^{-6}$	Step 4 failed[3]
	3	21.0-24.0	$1.0x10^{-5}$	Steps 2, 3, 4 and 5 failed[3]
	4	19.0-21.0	$8.5x10^{-6}$	
	5	16.0-19.0	$1.1x10^{-5}$	Steps 3, 4 and 5 failed[3]
	6	13.0-16.0	$5.5x10^{-5}$	Steps 3, 4 and 5 failed[1,3]
	7	10.0-13.0	$1.3x10^{-5}$	Steps 2, 3, 4 and 5 failed[1,3]
	8	7.0-10.0	$1.5x10^{-5}$	Steps 2, 3, 4 and 5 failed[3]
BH417 (double packer)	1	20.5-23.5	$6.1x10^{-6}$	Steps 4 and 5 failed[1]
	2	17.5-20.5	$6.7x10^{-6}$	Steps 4 and 5 failed[1,3]
	3	14.5-17.5	$9.7x10^{-6}$	Steps 3, 4 and 5 failed[1,3]
	4	15.5-16.5	$1.7x10^{-5}$	
	5	13.5-14.5	$1.3x10^{-5}$	
	6	11.5-12.5	$6.2x10^{-6}$	Steps 4 and 5 failed[1]
	7	9.5-10.5	$1.0x10^{-7}$	
	8	7.5-8.5	$4.0x10^{-5}$	

[1]Poor packer seal/seal failure
[2]Insufficient water take by formation (no flow) permeability likely to be less than $8.0x10^{-9}$ m/s
[3]Insufficient water supply (high storage, high permeability or packer seal leakage)
[4]No flow occurred until a sufficient pressure was attained

5.4.9 A calculation of hydraulic conductivity has been completed using Particle Size Distribution (PSD) curve data on 38 samples collected during the 2018 ground investigation and is presented in . The analysis was completed using Hydrogeosieve™

5.4.10 Table 13. The analysis was completed using Hydrogeosieve™

Table 13 Particle size distribution analysis.

Stratigraphy	Number of samples	Minimum (m/s)	Maximum (m/s)	Geometric average (m/s)
Top Soil	7	$4.9x10^{-7}$	$5.2x10^{-4}$	$1.2x10^{-5}$
Glacial Till - Clay	26	$9.8x10^{-11}$	$5.9x10^{-6}$	$3.2x10^{-8}$
[1]Glacio-fluvial deposits – Sand	4	$1.3x10^{-6}$	$6.9x10^{-4}$	$7.0x10^{-5}$

[1]These samples are restricted to a confined sand and gravel aquifer present in the area of TP431, TP432, BH434 and BH435

5.4.11 A series of variable head tests were performed at varying depths during the 2018 ground investigation, with test results given in Table 14 below.

Table 14 Summary of variable head tests performed during the 2018 ground investigation.

Material	Number of successful / unsuccessful tests[1]	Hydraulic conductivity (m/s)		
		Minimum	Maximum	Geometric average
Glacial Till	10/1	$1.0x10^{-11}$	$5.7x10^{-8}$	$1.5x10^{-9}$
Millstone Grit Group	1/4	$2.7x10^{-6}$		
[1] Unsuccessful tests had 'insufficient water level change' for analysis to be performed, indicating very low hydraulic conductivity at these test intervals.				

5.4.12 A pumping test was completed as part of the 2018 ground investigation in Mottram village at BH414 and is reported in detail in Appendix B. The pumping test found that:

- The fault zone was most transmissive along its NW-SE strike and has a hydraulic conductivity between $2.4x10^{-7}$ m/s and $2.5x10^{-6}$ m/s, with a storage coefficient of 0.0002 to 0.0003 (typical of confined aquifers);
- No hydraulic connectivity was observed between the pumping borehole and monitoring sites perpendicular to the NW-SE strike of the main fault-line during the test;
- There was no drawdown within the Glacial Till due to pumping in the Millstone Grit Group; and
- The analysis of the aquifer response to pumping confirmed that groundwater flow (along the fault) is dominated by fractured rock aquifer flow conditions.

Summary of hydrogeological conditions encountered

5.4.13 The data produced from the historical and 2018 ground investigation has shown that the aquifers comprise:

- An extensive cover of Glacial Till of variable thickness (except where absent in a small area around the eastern portal underpass entrance). In the Mottram area the Glacial Till was found to behave as an aquitard inhibiting the upward flow of groundwater originating from the Millstone Grit Group.
- Glacio-fluvial deposits are present at the eastern end of the route within the vicinity of the River Etherow (e.g. at BH434 and BH435). These deposits form a confined water bearing unit that is sandwiched beneath Glacial Till and above the Millstone Grit Group. Analysis of samples of collected from boreholes show that a relatively high hydraulic conductivity of $7.0x10^{-5}$ m/s (geometric average of samples) is possible (based on an approximation from particle size distribution analysis).
- The Millstone Grit Group comprises alternating bands of sandstone, siltstone and mudstone with a secondary permeability and porosity developed through tectonic deformation. The hydraulic conductivity for the Millstone Grit Group is quite variable

in the field and ranges between $4.6x10^{-10}$ m/s and $5.5x10^{-5}$ m/s, with a geometric average of $1.6x10^{-6}$ m/s.

- In the area of the Scheme, particularly at Mottram village, the Millstone Grit Group has been affected by tectonic deformation, is strongly weathered and faulted and contains a sub-vertical joint set. A pump test in this area indicated hydraulic connectivity parallel to the fault zone in a NW-SE direction, but with little or no hydraulic connectivity perpendicular to it, i.e. in a NE-SW direction.

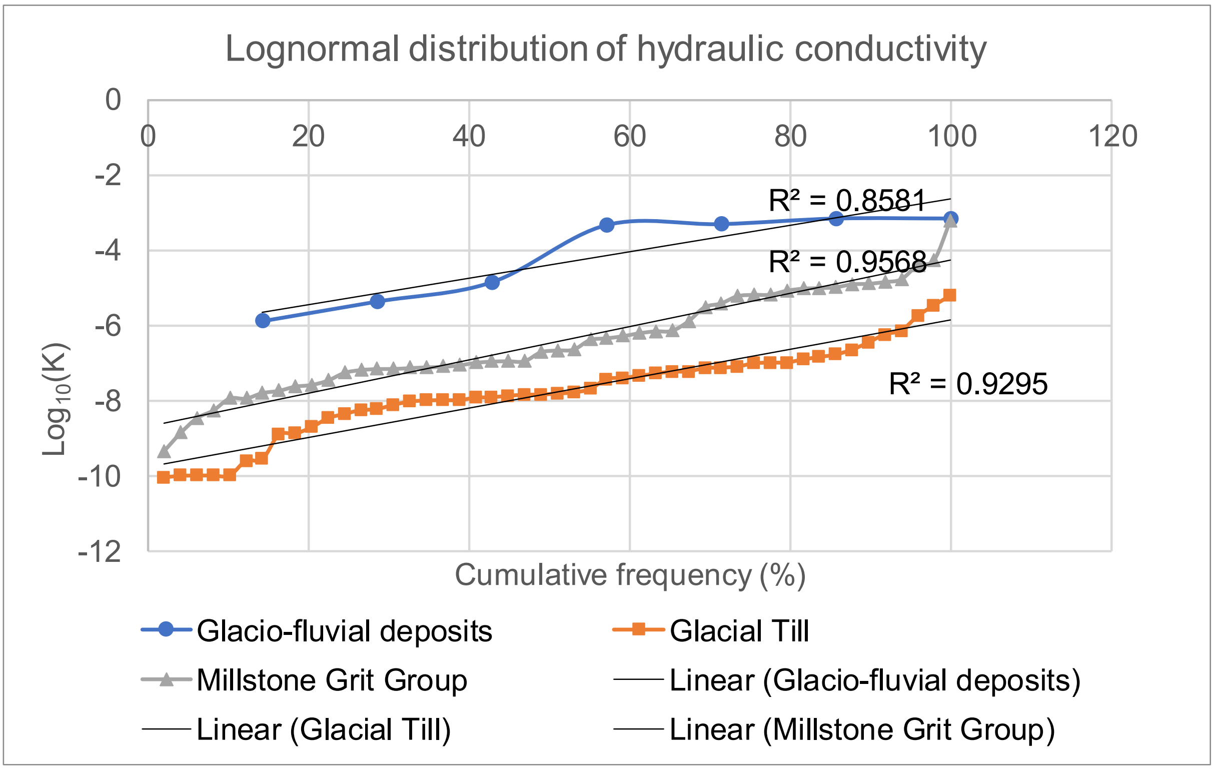
5.4.14 A summary of all hydraulic conductivity and permeability coefficient test results (as presented in Table 11 to Table 14) for each geological unit is presented in Table 15.

Table 15 Summary of all hydraulic conductivity/permeability coefficient test results (as presented in Table 11 to Table 14) for each geological unit.

	Topsoil[1]	**Glacial Till[2]**	**Glacio-fluvial[1]**	**Millstone Grit Group[2]**
Number of samples	3	48	7	24
Minimum calculated (m/s)	$4.9X10^{-7}$	$1.0x10^{-11}$	$1.3x10^{-6}$	$4.6x10^{-10}$
Maximum calculated (m/s)	$5.2X10^{-4}$	$5.9X10^{-6}$	$6.9X10^{-4}$	$5.5x10^{-5}$
Geometric average of samples (m/s)	$1.2X10^{-5}$	$1.8X10^{-8}$	$7.0X10^{-5}$	$1.6x10^{-6}$
[1]All samples from analysis of PSD curves [2]Combination of PSD curve analysis, and historical and 2018 in-situ tests				

5.4.15 Figure 5.4.3 shows the cumulative log-normal frequency distribution of the hydraulic conductivity for each geological unit. A straight line through the majority of the data would indicate a perfect log-normal distribution and in this case the geometric average would be the most appropriate average. The relatively high residuals (R^2) after matching the linear trend suggest that all formations have a log-normal frequency distribution and that the geometric average is the most appropriate average to use here.

Figure 5.4.3 Cumulative Log-normal frequency distribution of hydraulic conductivity by geological formation.



Water levels and flow direction

5.4.16 Figure 5.4.5 shows a representation of piezometric levels (head) recorded in the Millstone Grit Group (confined aquifer).

5.4.17 The following is interpreted from the data:

- The water table is positively correlated to the topographic elevation;
- The average hydraulic gradient is approximately 0.1 m/m, however, a hydraulic gradient of up to 0.2 m/m can be present, for example in the area of the eastern cutting;
- Groundwater flow in the Millstone Grit Group is generally in a south easterly direction towards the River Etherow;
- Groundwater west of Mottram LongdendaleVillage is considered likely to discharge towards the south-west towards Hurstclough Brook, due to high ground to the south associated with an outcrop of Rossendale Formation (a formation of the Millstone Grit Group); and
- A shallower hydraulic gradient is present around the River Etherow at the eastern end of the route. This is likely to be associated with the higher permeability Glacio-fluvial deposit aquifer present beneath the Glacial Till in this area.

5.4.18 Large changes in groundwater elevation occur around the zone of tectonic deformation (see paragraph 5.3.49) in Mottram VillageLongdendale. Here, the groundwater level is over 10 m lower to the west of it than it is to the east, where it is artesian. From this, it is interpreted that:

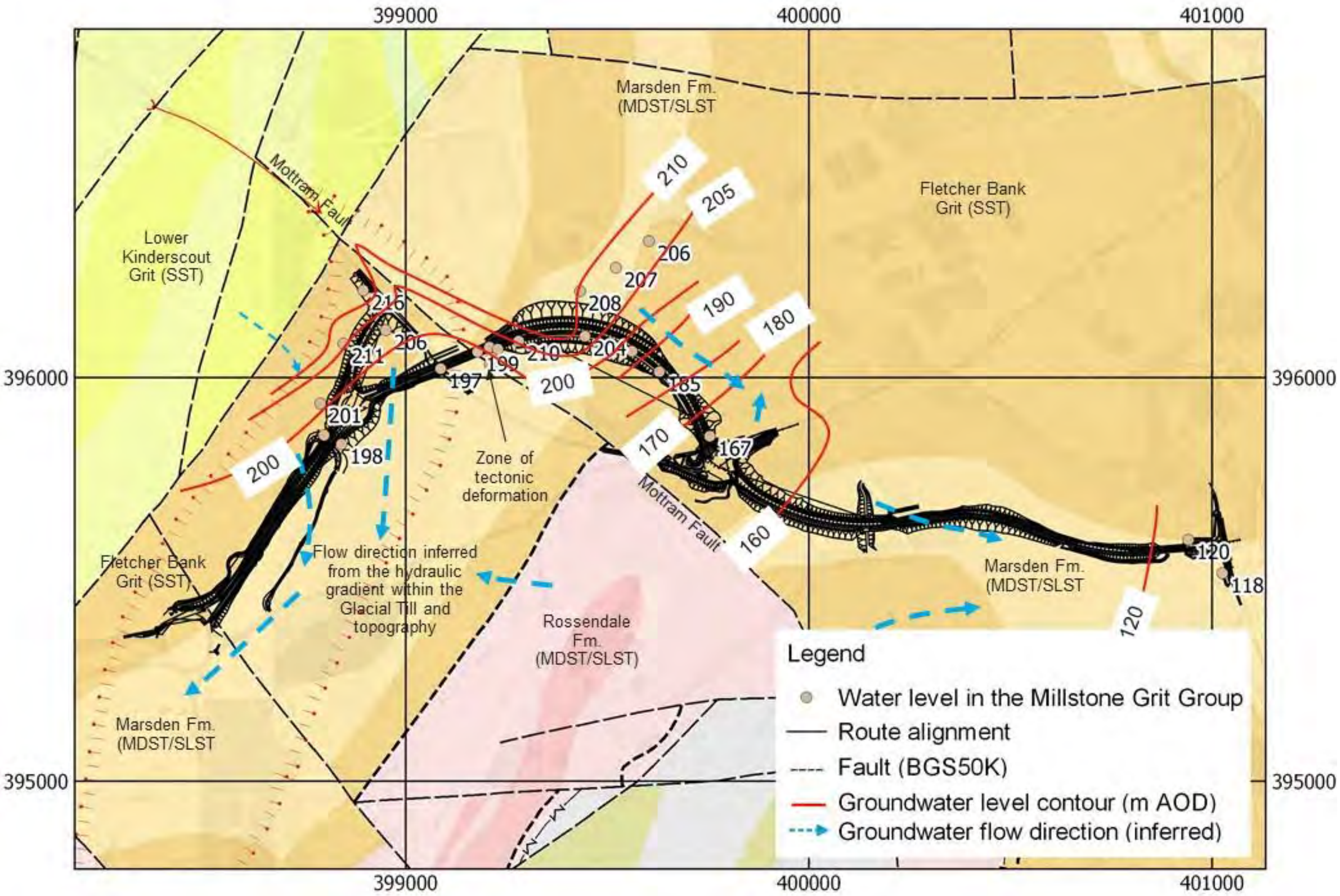
- There is a significant barrier to groundwater flow across the zone of tectonic deformation (i.e. from east to west)Longdendale;
- Discontinuities and faults provide conduits for groundwater flow and storage and likely transmit artesian pressure from deeper horizons; and
- Bedrock within the zone of tectonic deformation has low transmissivity due to weathering and disorganisation of strata as a result of deformation. The pumping test showed that drawdown propagates preferentially in a direction parallel to the fault zone in a NW-SE direction and did not propagate in a SW-NE direction across the fault zone.

5.4.19 Groundwater at the eastern end of the Scheme flows towards the River Etherow, which is likely to provide a focal point for groundwater discharge. The main aquifer in this area is the Glacio-fluvial deposits (confined).

5.4.20 Artesian conditions may be encountered:

- In the area of the proposed underpass, extending to the eastern cutting wingwalls. This area has suffered extensive tectonic deformation. Artesian conditions are most likely to be encountered at a depth of between 10 and 15 m bgl within the Millstone Grit Group and to have an aartesian head of 1 m AGL; and.
- In the proposed eastern cutting due to the steep decrease in topography.

Figure 5.4.4 Piezometric head in the Millstone Grit Group (m AOD).



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5.4.21 Groundwater conditions, details and parameters have been reviewed for sections 1 to 4 and selected infrastructure locations in paragraphs 0 to 5.4.36.

Section 1

Western Embankments: CH0 – CH580, CH580 – CH760

5.4.22 A summary table showing the details of the key hydrogeological features expected in this section of the route is given in Table 16.

Table 16 Hydraulic conductivity and water levels at Western Embankments (CH0 – CH760).

Geology	Groundwater level	Hydraulic conductivity	Thickness
Glacial Till (cohesive CLAY)	[1]Between 1.0 m bgl and 8 m bgl with an average of 4 m bgl (187 m AOD to 204 m AOD)	[2]Min:2.4×10^{-10} m/s Max:1.6×10^{-7} m/s Geomean 1.0×10^{-8} m/s	[3] Greater than 25 m
Millstone Grit Group Not encountered, see paragraph 5.4.3.	Not measured	No testing available. Refer to Table 15 for route wide summary parameter ranges	Thickness unconfirmed
[1]From historical sites BH3, BH7, BH8, BH10, BH16, BH17, BH18 and BH24 [2]BH16, BH18 and BH24 have each been tested twice within the Glacial Till [3]BH18 was 25 m deep, recorded only cohesive clay and was dry			

Old Mill Farm Underpass: CH580

5.4.23 A summary table showing the details of the key hydrogeological features is given in Table 17.

Table 17 Hydraulic conductivity and water levels at Old Mill Farm Underpass (CH580).

Geology	Groundwater level	Hydraulic conductivity	Thickness
Glacial Till (cohesive CLAY)	The groundwater level is approximately at the ground surface[1]	[2]1.0×10^{-7} m/s	Greater than 15 m[1]
Millstone Grit Group Not encountered, see paragraph 5.4.3.	Not measured	No testing available. Refer to Table 15 for route wide summary parameter ranges	Thickness unconfirmed. Encountered from at least 15 m bgl

[1]Water level from BH29, which is located 90 m north-west and was drilled to 15 m bgl, ending in the Glacial Till. [2]BH24, 270 m south west.

A6018 Link Road: CH250 – CH321 on A6018 Link (Roe Cross Road)

5.4.24 A summary table showing the details of the key hydrogeological features is given in Table 18.

Table 18 Hydraulic conductivity and water levels at A6018 Link Road: CH250 – CH321 on A6018 Link (Roe Cross Road).

Geology	Groundwater level	Hydraulic conductivity	Thickness
Glacial Till (cohesive CLAY and occasional sandy gravelly CLAY)	[1]Glacial Till 2 to 6 m bgl (215 m AOD to 202 m AOD) falling from the north to the south and south-west	[4]2.0×10^{-8} m/s Refer to Table 15 for route wide summary parameter ranges	[2]Greater than 11 m
Millstone Grit Group (Weak light grey SILSTONE)	[3]Millstone Grit Group 7 m bgl (203 m AOD)	[4]2.0×10^{-8} m/s Refer to Table 15 for route wide summary parameter ranges	Thickness unconfirmed. Encountered from at least 11 m bgl
[1]BH401, BH403 and BH404 provide records of the water table, which is in the Glacial Till. [2]BH403 struck bedrock Millstone Grit Group at 11 m bgl, however BH401 and BH404 finished in the Glacial Till at 11 m bgl. [3]BH406 struck water in the Millstone Grit Group at 16.8 m bgl, which rose to 7.0 m bgl. The Glacial Till (16.8 m thick) was dry during drilling at this location. [4]A test at BH48 was completed for a 25 m interval including both the Millstone Grit Group and Glacial Till			

Western Cutting: CH760 – CH880

5.4.25 A summary table showing the details of the key hydrogeological features is given in Table 19.

Table 19 Hydraulic conductivity and water levels between CH760 and CH880.

Geology	Groundwater level	Hydraulic conductivity	Thickness	
Glacial Till (Stiff CLAY[1])	Glacial Till – not measured	[3]Negligible	14.3 m bgl[1]	
Millstone Grit Group (Alternating sandstone and siltstones	[1]Millstone Grit Group– 14.8 m bgl to 15.3 m bgl (197.3 m AOD to 197.7 m AOD)	[2]Min 2.4×10^{-8} m/s Max 3.9×10^{-6} m/s Geomean	Thickness not confirmed. Encountered from at least 14.3 m bgl	

dominant)		3.8×10^{-7} m/s		
	[1]Recorded at BH405, screened within the Millstone Grit Group at 15 m bgl [2]Five packer tests were completed in the Millstone Grit Group at BH405 [3]Four rising head tests were completed in the Glacial Till at BH405, all failed to record sufficient water level change to calculate permeability			

Section 2

Mottram Underpass and associated wing walls CH880 – CH1010

5.4.26 Selected long and cross sections for the proposed Mottram Underpass and associated wingwalls are presented in Figure 5.4.6 and Figure 5.4.7. The figures show the geological and hydrogeological features. A heatmap of the inferred Glacial Till thicknesses beneath the footprint of the proposed Underpass Portal is presented on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3055.

5.4.27 A detailed summary of the geological conditions is provided in paragraphs 5.3.33 to 5.3.63. A zone of high tectonic deformation has previously been identified (paragraph 5.3.48) and is shown on drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062. Within this zone, the Millstone Grit Group was very weak, highly weathered and had a steep joint set at about 80 degrees. Juxtapositions of bedding sequences were common and considered to indicate numerous faulted displacements.

5.4.28 Table 19 provides a summary of hydrogeological data that represents the western side of the fault zone mapped by the BGS and shown on Figure 5.4.4.

- A thin veneer of made ground is present near the ground surface. (BH33) and has a perched water table within the made ground;
- The Glacial Till was found to be unsaturated during drilling; and
- Groundwater is observed in the Millstone Grit Group at an elevation of between 198 m AOD (BH414) to 197 m AOD (BH405) and displays a shallow hydraulic gradient trending to the west.

Figure 5.4.5 Long section through Section 2 showing the piezometric head in the Millstone Grit Group.

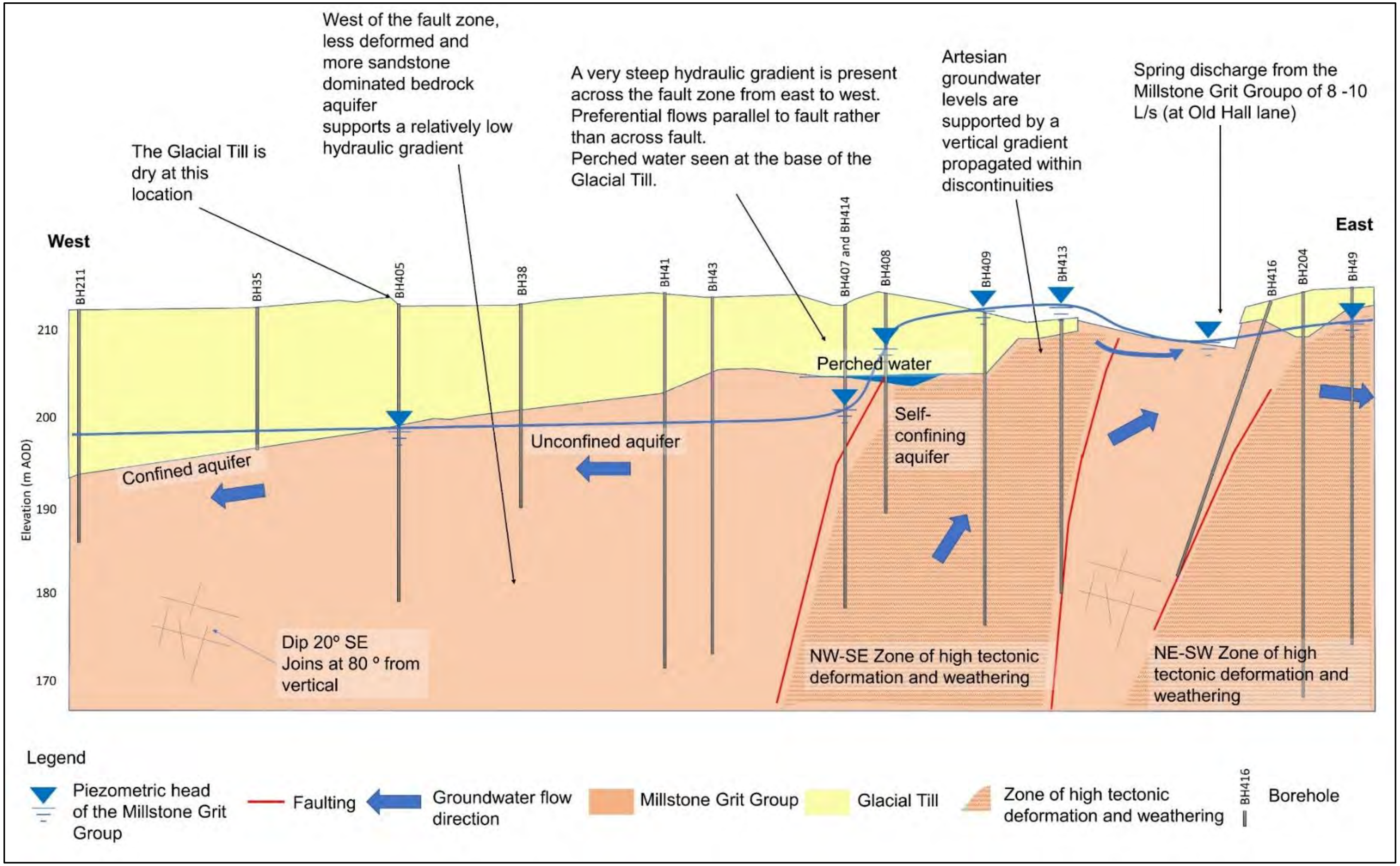


Table 20 Hydraulic conductivity and water levels west of the zone of high tectonic deformation.

Geology	Groundwater level	Hydraulic conductivity	Thickness
Made Ground (cohesive grey sandy CLAY)	[1]Less than 2 m bgl	No test completed	Less than 2.3 m
Glacial Till (stiff dark brown slightly sandy CLAY)	[2]Dry	[3]Negligible	7.2 m to 14.3 m
Millstone Grit Group (alternating sandstone and siltstone units dominate the sequence)	197 m AOD to 198 m AOD[4]	[5]Min: 2.4×10^{-8} m/s Max: 5.5×10^{-5} m/s Geomean: 1.8×10^{-6} m/s	Not determined. Encountered at a depth of between 7.2 m bgl and 14.3 m bgl
[1]BH33 records made ground to 2.3 m bgl and is screened between 0.3 m to 2.6 m bgl. Cohesive clay underlies the Made Ground, so it is expected that this water level is perched. [2]BH405 is screened from 13 m to 17 m bgl and intercepts the base of the Glacial Till, no other sites in this subsection are screened in the Glacial Till. Variable head test records show the Glacial Till was unsaturated to 12 m depth. [3]Variable head tests (5 no. falling head tests) were performed between 2 m and 15 m bgl and there was not enough not enough water take to calculate a value, indicating very low hydraulic conductivity [4]BH405 and BH414 respectively. These levels indicate a hydraulic gradient towards the west. [5]Recorded in 14 packer tests over 3 m intervals at BH405 and BH414 and a single test at BH213.			

5.4.29 Table 21 provides a summary of hydrogeological data on eastern side of the fault zone mapped by the BGS:

- Groundwater conditions recorded in the Millstone Grit Group here are confined. The piezometric head increases from 198 m AOD (BH414) to 213 m AOD through the zone of tectonic deformation (from west to east). The hydraulic gradient is extremely steep for a natural condition (0.28 m/m);
- Artesian conditions are present in this area, as discussed in paragraphs 5.4.3 and 5.4.4;
- In-situ testing has shown that the hydraulic conductivity of the Millstone Grit Group in the zone of tectonic deformation is 9.8×10^{-8} m/s (geometric average), however pump testing determined that the Faultline itself has higher hydraulic conductivity (see next paragraph); and
- The Glacial Till was generally thin in this area. A perched water table was present within the Glacial Till at BH408, where the water table in the Glacial Till was between 5.8 m bgl to 6.5 m bgl, 2 m lower than that of the Millstone Grit Group.

5.4.30 A pump test completed at BH414 (Appendix B) showed that:

- There was no observed/apparent hydraulic connection across the zone of tectonic deformation (west-east) at Mottram village, likely due to the low hydraulic conductivity proved by in-situ testing (see paragraph 5.4.29);
- Drawdown propagated preferentially along the strike of the zone of tectonic deformation. It is considered that there are higher permeability discrete flow pathways along discontinuities parallel to the NW-SE faulting;
- There is significant anisotropy in the Millstone Grit Aquifer system; and
- There was no response in the water table elevation in boreholes screened in the Glacial Till during pumping testing, even where in proximity to boreholes displaying drawdown in the Millstone Grit Group.

Table 21 Hydraulic conductivity and water levels within and east of the zone of high tectonic deformation.

Geology	Groundwater level	Hydraulic conductivity	Thickness
Glacial Till (Firm dark brown slightly sandy slightly gravelly CLAY)	[1]Glacial Till 6 m bgl (206 m AOD)	[8]No testing results available, Refer to Table 15 for route wide summary parameter ranges	[2]1.2 m to 9.5 m
Millstone Grit Group (Highly disturbed and weathered mudstones, siltstone and sandstones with mudstone dominant. Slickensides and steep dipping (80 degree) fracture set. Zone of high tectonic deformation)	Millstone Grit Group – 13 m bgl to -1 m bgl artesian head[4] (199 to 213 m AOD)	[3]Small scale borehole tests: Min 5.6×10^{-9} m/s Max: 3.1×10^{-6} m/s Geomean: 9.8×10^{-8} m/s	Thickness not proven. Encountered at 1.4 m bgl to 9.6 m bgl.
		Pumping test: 7.3×10^{-5} m/s for BH414 connection to BH407, with no connection along strike (east) or to the Glacial Till (Appendix B)	
[1]BH408S [2]Minimum thickness at BH412 and maximum at BH407. Highly variable. [3]Based on 6 packer tests at BH413 and two rising head tests (BH213 and BH42 over 25 m long screens). [4]1 m artesian head recorded at BH413.			

Section 3

5.4.31 This section includes the Eastern Cutting (CH1100 – CH1440) and is situated east of the Mottram Underpass. Paragraphs 5.3.64 to 5.3.78 describe the geology in this area.

5.4.32 Table 22 provides a summary of the key hydrogeological data relevant to this section, and as discussed below:

- Granular Glacial Till deposits are located along the central alignment of the proposed scheme. It is possible that the thin lens' of Granular Glacial Till are interconnected with each-other and potentially are a pathway for perched groundwater within the Glacial Till horizon, however the horizon was dry during drilling;
- Groundwater was generally first struck at greater than 4 m bgl within the Glacial Till; and
- The groundwater level within the Millstone Grit Group aquifer falls from 210 m AOD at the underpass (west end of section) to 185 m AOD at the eastern end of the cutting.

Table 22 Hydraulic conductivity and water levels between CH1100 and CH1440.

Material type	Groundwater level	Hydraulic conductivity (m/s)	Thickness
Granular Glacial Till (Brown sandy slightly clayey SAND and GRAVEL)	[1]Granular Glacial Till - Dry	No tests completed	0.5 m to 2.4 m (average 1.0 m thick), present within the upper 3.4 m of Glacial Till deposits
Glacial Till (Firm brown slightly sands slightly gravelly CLAY)	Glacial Till [5]No specific monitoring, but expected to be dry or to be found at greater than 4.2 m bgl	Min: $8.9x10^{-11}$ m/s Max: $5.7x10^{-8}$ m/s Geomean: $1.1x10^{-9}$ m/s	[2]1.5 m to 7.6 m
Millstone Grit Group (SILTSTONE and SANDSTONE)	[3]Millstone Grit Group 0.0 m bgl to 6.2 m bgl (210 to 185 m AOD)	[4]Min: $5.6x10^{-8}$ m/s Max $6.2x10^{-4}$ m/s Geomean of $5.6x10^{-6}$ m/s	Thickness not proven. Depth to bedrock of 3.5 m to 7.6 m bgl
[1]Present at BH52, BH307A, BH417 and TP412 [2]Thins at CH1140 (BH51), generally increasing in thickness from west to east [3]Falling from the west to the east between TP411 and BH421 [4]BH49, BH417 and BH418 [5]Whilst drilling in the Glacial Till, BH417 and BH421 had a water strike at 4.4 m bgl and 4.2 m bgl, respectively			

5.4.33 Water strikes were recorded in BH418 when drilling through the Millstone Grit Group at 12.3 m bgl and 16.8 m bgl, rising to 5.1 m bgl and 6.2 m bgl respectively. This indicates that the Millstone Grit Group aquifer is self-confining due to its layered structure. This was also observed at BH421.

Section 4

5.4.34 This section includes the Eastern Embankments (CH1440 – CH1640, including the Carrhouse Lane Underpass (CH2175) and the River Etherow bridge (CH2950). The geology includes Millstone Grit Group overlain by Glacial Till, which is described in detail in paragraphs 5.3.79 to 5.3.109. The superficial sequence is thickest in the area of the River Etherow where a Glacio-fluvial deposit is present beneath the Glacial Till. Table 29 provides summary information on the hydrogeology data obtained for this area; and as discussed below:

- Depth to water generally decreases from the west (12.4 m bgl to 16.8 m bgl) towards the River Etherow in the east (1.0 m bgl 1.2 m bgl);
- The groundwater flow is also from the west to the east, towards the River Etherow; and
- In the west the Millstone Grit Group aquifer is confined beneath the Glacial Till. East of Carrhouse Lane Underpass, confined Glacio-fluvial deposits are the main aquifer and have significantly higher transmissivity than the Millstone Grit Group found beneath it (see paragraph 5.4.36).

Table 23 Hydraulic conductivity and water levels between CH1440 and CH3116.

Geology	Groundwater level	Hydraulic conductivity	Thickness
Glacial Till (Soft to firm thinly laminated brown slightly sandy CLAY)	Glacial Till (1.0 m to 16.8 m bgl)	Min: $1x10^{-11}$ m/s Max: $5x10^{-8}$ m/s Geomean: $8.4x10^{-10}$ m/s	[4]8.5 m to 22.9 m
Glacio-fluvial deposits (Medium dense brown and yellow slightly clayey SAND)	[1]Glacio-fluvial deposits (1.0 m to 1.2 m bgl)	Min: $4.3x10^{-6}$ m/s Max: $6.9x10^{-4}$ m/s Geomean: $2.0x10^{-4}$ m/s	3.0 m to 8.3 m thick[2] (encountered from a depth of between 8.5 m bgl and 10.7 m bgl)
Millstone Grit Group (SILSTONES, MUDSTONE and SANDSTONE)	Millstone Grit Group (No data collected)[5]	No tests performed, Refer to Table 15 for route wide summary parameter ranges.	[3]Depth not proven. Depth to bedrock of between 10.6 to 22.9 m bgl
[1]Found at BH427, BH433, BH434 and BH435. Hydraulic conductivity data is produced from PSD analysis. The groundwater level for the Glacio-fluvial deposits is within the Glacial Till and therefore the GFD are confined. [2]Minimum thickness is at BH427, increasing in thickness and depth towards the east and the River Etherow. [3]Deepest in the west of this section at BH422, BH423 and BH428, shallower near the R. Etherow (east) [4]Increasing in thickness from the east to the west [5]A VWP installed at BH435 was damaged by cattle and no data was able to be collected			

Carrhouse Lane Underpass – CH2175

5.4.35 The key hydrogeological features at the location of the Carrhouse Lane Underpass are provided in Table 24. The superficial cover of Glacial Till was dry in this area during drilling, suggesting that the hydraulic conductivity of the Glacial Till is very low or that the area is subject to high run-off with little bypass flow.

Table 24 Hydraulic conductivity and water levels at Carrhouse Lane.

Groundwater level	Hydraulic conductivity	Thickness	Material type
Glacial Till – Dry[1]	[1]Min: 1.0×10^{-11} m/s Max: 1.6×10^{-8} m/s Geomean 5.1×10^{-8} m/s	22.2 m	Firm greyish brown slightly sandy slightly silty CLAY
Millstone Grit Group - 2.0 m to 3.4 m bgl [1](159.7 m AOD to 148.3 m AOD)	No testing was completed. Refer to Table 15 for route wide summary parameter ranges	Thickness not proven. Encountered at 22.2 m bgl	Extremely weak siltstone
[1]Four variable head (falling) tests were completed at BH428. A VWP was installation in the Millstone Grit Group. Water was not encountered in the Glacial Till.			

River Etherow Bridge – CH2950

5.4.36 Table 25 provides a summary of the hydrogeological features at the River Etherow Bridge. A confined superficial aquifer comprised of Glacio-fluvial deposits is present in this area that has, based on the product of its hydraulic conductivity and the thickness, an average transmissivity of 28.3 m^2/d. This is large compared to that of the overlying Glacial Till, which has a transmissivity of 0.01 m^2/d.

Table 25 Hydraulic conductivity and water levels at the River Etherow Bridge.

Groundwater level	Hydraulic conductivity	Thickness	Material type
Glacial Till	No data from nearby boreholes, see Table 15 and Table 24 for relevant ranges	8.5 m to 10.7 m, average of 8.6 m	Firm brown-greyish brown slightly sandy slightly silty CLAY
[1]Glacio-fluvial deposits (1.0 m to 1.2 m bgl)	Min: 4.9×10^{-7} m/s Max: 6.9×10^{-4} m/s Geomean: 5.2×10^{-5} m/s	3.0 m to 8.3 m, average of 6.3 m. (encountered from a depth of between 8.5 m bgl and 10.7 m bgl)	Medium dense brown and yellow slightly clayey SAND
Millstone Grit Group	No tests performed, Refer to Table 15 for route wide summary parameter ranges	Thickness was not proved. The depth to bedrock is between 10.6 m bgl to 15.8 m bgl	Grey sandstone
[1]Found at BH427, BH433, BH434 and BH435. Hydraulic conductivity data is from PSD analysis at BH433 and BH434. The sole groundwater level is from BH427 and shows that the Glacio-fluvial deposits are confined.			

5.5 Hydrology

5.5.1 The route of the proposed bypass is located entirely within the catchment of the River Etherow. The River Etherow is an Environment Agency (EA) designated Main River that flows in a south-westerly direction from its source in the Peak District, 13.5km east of the site, to the River Goyt, 5.5km south of the site. The catchment of the River Etherow predominantly drains moorland in the west of the Peak District. The river channel in the 10km upstream of the site is dominated by a series of six reservoirs, the closest of which is located less than 1.5km northeast of the site.

5.5.2 The proposed route crosses the River Etherow as well as five minor tributaries. The crossings are described below:

- The proposed crossing of the River Etherow is located at the eastern extent of the Scheme and consists of a new bridge located less than 200m south of Woolley Lane.
- Tara Brook rises to the south of Mottram in Longdendale and flows eastwards to the south of the A57 Mottram Moor Road. The Tara Brook’s confluence with the River Etherow is located less than 100m north of the proposed new bridge. Tara Brook is crossed by the proposed scheme approximately 80m south of the A57.
- Two small unnamed streams and tributaries of the Tara Brook, which are sourced to the east of Mottram in Longdendale and flow southwards towards the A57. The watercourses are crossed by the proposed scheme approximately 80m and 450m north of the A57.
- Hurstclough Brook is sourced to the north of the proposed road and west of Mottram in Longdendale. The Hurstclough Brook flows south-eastwards towards the A57/M67, is crossed by the A57(T) Hyde Road immediately east of the roundabout and then continues southwards and flows into the River Etherow 2.3km to the south. The Hurstclough Brook is crossed by the proposed route approximately 700m northeast of the A57/M67 roundabout.
- A small ditch and tributary of the Hurstclough Brook, that is sourced in the Mainsgrass area, approximately 150m northeast of the A57/M67 roundabout and flows into the Hurstclough Brook immediately south of the A57(T) Hyde Road. The ditch is crossed by the proposed route less than 100m northeast of the A57/M67 roundabout.

5.5.3 The Glossop Brook, an EA designated Main River, is also located within the study area. The Glossop Brook’s confluence with the River Etherow is located less than 300m south of the proposed new bridge.

5.6 Geomorphology

5.6.1 Geomorphological fieldworks were undertaken in the vicinity of the proposed Mottram Moor Roundabout structure between CH1740 and CH1820. Field works were undertaken following the identification of land slipped materials shown in the BSG Survey Sheet for the area (Sheet No 86) and site observations of possible slope mass movement features.

5.6.2 The area of observed slope mass movement features is located within a west to east flowing un-named water course and small gully. The gully feature at the location of investigation is approximately 50m wide (from northwest to southeast) and 5.0m in height (from the stream base to the crest of the northern gully slope. The gully feature runs in parallel to the unnamed watercourse from west to east.

5.6.3 Proposed construction works over this location includes the Mottram Moor Roundabout which comprises two west – east carriageways linking the roundabout to the current A57 carriageway. Two north – south orientated carriageways are proposed as part of the main development alignment. The proposed level of the roundabout and associated carriageways will be formed on embankments of up to 5.0m above the existing ground level.

Initial site inspection findings

5.6.4 The geomorphological mapping exercise of the area of concern identified likely mass movement features on the northern and southern gully slopes. Differing mass movement features were observed on the northern and southern slope faces.

Northern slope findings

5.6.5 The horizontal aspect of the northern slope is observed to be significantly longer in comparison to the southern slope (typical horizontal distance of approximately 35m from the gully base to the northern slope crest compared to approximately 10m horizontal distance from the stream base to the southern slope crest).

5.6.6 The northern slope over the central and eastern proposed Mottram Roundabout feature was observed to be benched with an Upper and Mid bench, (See Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3064 and HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061. Section A-A on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061 is located approximately 35m northwest of TT402, shows only an Upper Bench with the lower bench grading into an approximately 24 degree slope. The slope profile grades into a uniform approximately a 24 degree slope further west of Mottram Moor Roundabout.

5.6.7 The northern most possible backscarp forms a small (generally less than 1m in height), overly steep sharp break in slope. This feature has been mapped as a possible back scarp features. Ponded water and hydrophilic vegetation (bull rush reeds) was observed at the toe of the upper backscarp.

5.6.8 Section B-B on Section A-A on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061 shows a second mid-slope bench and possible backscarp over the central area of the slope.

5.6.9 A third very sharp break in slope (mapped as a possible backscarp feature) has been mapped at the far southern end of the south facing slope. A leaning, mature tree (See Appendix C) is present on this bench. Hydrophilic vegetation (bull rush reeds) were observed on the Lower Tier and in vicinity of the unnamed watercourse.

5.6.10 A steep gully feature with flowing water (approximately <5 l/s) was observed beyond the crest of the Upper Bench and backscarp. Ponded water at the base of the upper backscarp is likely to originate from this feature. The source of water into the gully feature is not clear. The source of flowing water in the gully is likely to be from perched groundwater within the Glacial Till.

5.6.11 Several Badger Setts were observed to the far eastern end of the mapped northern slope.

5.6.12 A cross section of the northern slope, including annotations of bench tiering aspects is included as shown on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061.

Southern slope findings

5.6.13 The southern slope typically has a minimum horizontal distance of 4.0m from the base of the slope to the crest of the slope. The height difference between the base of the gully and crest of the slope is typically 3.0m at the central location of the Mottram Roundabout.

5.6.14 The southern slope typically forms a short, steep profile with a slope angle of up to 35 degrees in the central area of the Mottram Roundabout. Possible slumped debris and a leaning tree were noted on the far western extent of the mapped southern slope.

5.6.15 Hydrophilic vegetation (bull rush reeds) were noted at the toe of the slope, adjacent to the watercourse.

5.6.16 No benched slope profiles were observed over this part of the site.

Ground Conditions review

5.6.17 A list of exploratory hole positions in the vicinity of Mottram Roundabout are shown in Table 26 below.

Table 26: Summary Exploratory borehole positions in the vicinity of the geomorphological area of interest.

Exploratory Hole Type	Reported Depth (m BGL)	Borehole Reference
Cable Percussive Borehole	6.00 – 15.30	BH152, BH155, BH156 and BH420
Cable Percussive Borehole with rotary core follow on	29.90 – 35.00	BH422 and BH423
Machine Excavated Trial Pit	4	TP65, TP67, TP68, TP69, TP374 and TP375
Machine Excavated Trial Trenches	2	TT401 and TT402

5.6.18 A review of the above exploratory boreholes shows the area of geomorphological interest to be underlain by Topsoil (0.10 – 0.40m) underlain by cohesive Glacial Till soils. Bedrock was only proven in BH422 and BH423 at depths of 20.60m bgl (151.77m AoD) and 22.90m bgl (143.96m AoD) respectively.

5.6.19 Glacial Till soils encountered typically comprise a soft to firm, typically brown, variably sandy, variably gravelly, silty CLAY with traces of cobbles from ground level to approximately 1.00 to 1.50m bgl. Glacial Till soils were generally observed to become grey in colour and generally firm from 1.00 to 1.50m bgl. Gravel and cobble clasts were typically angular to sub-rounded siltstone, sandstone, quartz, quartzite and coal. Records of very soft to soft fissured and laminated, silty, sandy to very sandy, slightly gravelly CLAY was recorded in split UT100 samples from BH423 below a depth of 3.60m bgl.

5.6.20 Horizontal laminations within the Glacial Till stratum were recorded in BH420 between 10.20m to 13.00m. Laminations were recorded in split UT100 samples obtained from BH423 between depths of 3.60m and 4.65m bgl. Laminations and fissures are typically recorded to be infilled with silt or fine sand partings.

5.6.21 Additional very close to closely spaced fissures with silt and fine sand partings were recorded in the split UT100 samples from BH423.

Trial Trench Findings

5.6.22 Two Trial Trenches (TT) were added to the ground investigation scope by Arcadis. One Trial Trench (TT401) was undertaken into the backscarp and upper bench of the northern slope. A second TT (TT402) was undertaken at the toe of the second bench of the northern slope at the base of the gully.

5.6.23 TTs were 4.0m in length and 2.0m deep. Both TT were shored in order to allow each trench to be logged by an Arcadis Engineering Geologist. TT logs are shown in Appendix C of this report.

TT401

5.6.24 Ground conditions in the area of the slip surface recorded at the rear, upper most backscarp comprised firm grading to stiff at approximately 0.60m, brown with grey mottling, closely fissured, slightly fine to medium sandy, variably gravelly silty CLAY (Glacial Till) with traces of cobbles of sub-angular to rounded sandstone, mudstone, quartz and quartzite. Fissures were typically observed to be dipping at about 20 degrees downwards at a bearing of about 155 degrees (South-southeast) with rare vertical fissures.

5.6.25 The presence of a possible slip surface was identified in TT401 during excavation (See Photo 01 amd 02 in Appendix C). The possible slip surface was observed within Face A from beneath the Topsoil from 0.30m to 0.60m bgl. The possible slip surface was located approximately 0.40m beyond the toe of the mapped backscarp for the upper bench. It was not possible to trace this feature beyond 0.60m depth within the TT location.

5.6.26 The possible slip surface feature was observed to be 80 degrees at its steepest (at ~0.30m bgl) and shallowed to ~60 degrees at 0.60m bgl. The slip surface was measured to dip towards 145 to 158 degrees. Pockets of sandy materials were observed to bound the observed potential slip surface. A possible slip surface feature observed in face B was observed to be bounded with grey silt and fine sand. It was not possible to trace this feature beyond 0.60m bgl.

5.6.27 Cohesive Made Ground soils and a field drain were encountered on the southern half of TT401. Groundwater seepage from soils bounding the field drain were observed to flow into the TT. This feature was re-instated, and the field drain replaced by the contractor.

5.6.28 A deeper buried service was mapped and detected beyond the southern extent of TT401. A GPR survey indicates that this feature was in the order of 4.0m deep. The Made Ground encountered in the southern end of TT401 is considered to potentially form infilled soils used to re-instate the service trench.

5.6.29 The age of the service placement is uncertain, but consultation with the landowner indicates that the service is likely to be relatively old. Given the presence of recorded Made Ground and the likely age of the service, it is considered likely that this service was laid down in an excavation as opposed to directionally drilled.

TT402

5.6.30 TT402 was positioned at the backscarp of the Lower Tier. The un-named watercourse was located approximately 12m south of the southern point of the TT402.

5.6.31 TT402 encountered approximately 0.50m of soft colluvium, underlain by cohesive Alluvium which in turn was underlain by granular River Terrace Deposits to 1.50m bgl. Cohesive Glacial Till was encountered from 1.50m bgl.

5.6.32 The Colluvium comprised soft, orange brown with occasional black staining, slightly fine to medium sandy, slightly gravelly clayey SILT. Gravel clasts were rounded to sub-rounded, fine to coarse of mixed lithologies.

5.6.33 The Alluvium comprised a soft, grey, slightly fine to coarse sandy, slightly gravelly silty CLAY with traces of branches and an organic odour and rare sand lenses. Gravel clasts were fine, sub-rounded of mixed lithologies.

5.6.34 Granular River Terrace Deposits comprised a grey, fine to medium, slightly fine to coarse gravelly SAND grading into a SAND and GRAVEL with rare cobbles.

5.6.35 Cohesive Glacial Till encountered comprised a soft grading to firm, brown with grey mottling, slightly fine to medium sandy, slightly gravelly CLAY with traces of cobbles. The upper horizon of the Glacial Till stratum bounding against the River Terrace Soils was observed to be damp with a decrease in water content with increasing depth.

5.6.36 No slip surfaces were evident with TT402. However, evidence of lateral stream channel migration and erosion / scouring of the historical stream bank channel were evident and may have obscured historical slip features.

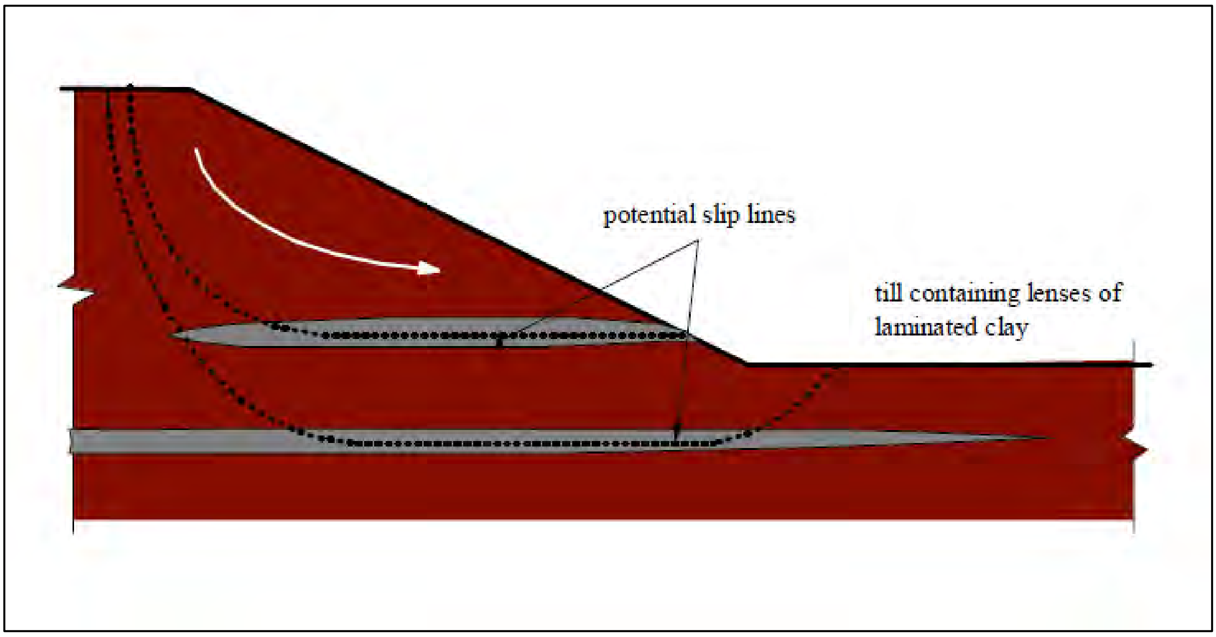
Landslip Failure Mechanisms

5.6.37 Three potential failure mechanisms have been concluded from the investigation findings.

5.6.38 It is considered that slope movements associated with the Upper Bench could have been caused by slip surfaces developing along near horizontal laminations in the Glacial Till sequence. This would result in a planar basal slip surface within the Glacial Till unit, see Figure 5.6.1.

5.6.39 The possible presence of a nearby spring, hydrophilic vegetation and ponding water indicates that shallow groundwater (possibly perched within the Glacial Till) is likely to present. Localised elevated pore water pressures here are likely to have had an adverse influence on the stability of the slope over this part of the site.

Figure 5.6.1: Potential Slip Surface Mechanism for laminated, cohesive Glacial Till soils, Sourced from the Geological Society online publications of landslips within Glacial Till soils.



5.6.40 A planar slip surface would appear more likely than a circular slip surface given that the bench feature appears to show no back tilted features which would be indicative of a rotational / circular slip. It cannot be ruled out that any man-made changes to the topography of the site could have removed any typical landslip failure features.

5.6.41 Secondly, Landslip features encountered at the base of the gully are considered to be caused by the paleo-migration of the un-named water feature at the base of the slope. Findings from TT402 indicate that the watercourse once bounded the northern slope. Erosion of the toe of the gully slope could have caused the on-set of localised landslips of the stream bank.

5.6.42 Evidence of stream erosion at the toe of steep north facing slope were also observed.

5.6.43 It is possible that landslips at the toe of the gully could have triggered landslips towards the crest of the slope.

5.6.44 Thirdly, the excavation and placement of the approximately 4.0m deep buried water main could have triggered the onset of slope movements over this part of the site during the temporary works. This mechanism is likely to have only caused slope movements affecting the Upper Bench. The cause of slope movements on the Mid Bench is likely to be caused by migration and erosion of the palaeo-stream bank.

5.6.45 Topographical features associated with the landslip appeared to be smooth, indicating that the slip has not been recently active.

5.7 Hobson Moor Quarry Inspection

5.7.1 A scan line survey was undertaken at the disused, publicly accessible Hobson Moor Quarry, located approximately 0.80 miles north of central Mottram.

5.7.2 A scan line of an exposed bedrock section was undertaken in order to assist with an understanding of the structure and composition of bedrock geology in relation to the design of the eastern cutting.

5.7.3 The Quarry was located within the Lower Kinderscout Grit formation as opposed to the Fletcher Bank Grit or Marsden Formation. A number of faults are shown to separate these formations.

5.7.4 Face logging of the quarry face (approximately 30m in height) showed the quarry to comprise a strong (index testing undertaken using a geological hammer), thickly bedded, medium to coarse grained SANDSTONE from the Lower Kinderscout formation. Bedding was measured to dip by between 10 to 15 degrees towards 115 to 120 degrees. The freshly weathered rock mass at the base of the quarry had a blocky structure, with a near vertical joint set evident throughout the entire rock mass. A visual inspection of the upper 30 to 40m of the quarry face (observed from the base of the quarry) showed the bedding and joint spacing to distance to decrease significantly.

5.7.5 A summary of the scan line survey findings is shown below.

5.7.6 A scan line survey of a smaller quarry cliff section (in the order of 4m high) was undertaken to develop an understanding of the weathered rock mass properties in comparison to a freshly weathered cliff face section.

Bedding Observations

5.7.7 Bedding was observed to dip by 10 to 15 degrees towards 115 to 120 degrees. Bedding aperture was measured to be tight to partly open with surface staining evident. The bedding surface was observed to be rough and undulating with a 400mm wavelength and 20mm waviness amplitude. The discontinuity surface appeared to be dry with no evidence of waterflow. Bedding spacing was observed to be moderately to widely spaced.

Joint Observations

5.7.8 A total of 12 bedrock discontinuity joint readings were collected during the scan line survey. Two separate near vertical joint sets were observed within the stratum.

5.7.9 Joint set 1 typically dipped between 75 to 90 degrees between 360 / 0 to 180 degrees (i.e. joints were typically observed to vary between dipping steeply towards the north and towards the south). Joints either had a low or very high persistence with a termination which extended beyond the visible extent of the rock face. Joint aperture ranged from between very tight to open with an occasional non – cohesive infill. Joints were rough, undulating and planar with a waviness of between 50mm to 400mm, and an amplitude of between 5mm to 300mm. Most joint surfaces showed signs of groundwater flow. Discontinuities were typically close to widely spaced.

5.7.10 The second Joint set typically dipped between 80 to 90 degrees at 090 or 270 degrees (i.e. joints were typically observed to vary between dipping steeply towards the west and towards the east). The remainder of the joint characteristics are similar to those recorded for Joint Set 1.

5.8 Man-Made Features

5.8.1 Given the mixed nature of the existing land use, man-made features are present in a number of areas. However, generally the agricultural land shows no man-made features. The main areas of interest include Mottram in Longdendale village itself, the associated existing roads (A6018 and A57) and Longdendale Aqueduct.

5.8.2 In the area of the Longdendale Aqueduct at approximately CH1640, made ground was found in TP371 to a depth of 1.6m. The exact depth and location of the Aqueduct has not been proven in the intrusive investigations to date. Air shafts related to the Aqueduct have been identified at the western end of the scheme around Hurstclough Brook with the Aqueduct thought to be close to the surface in this area.

5.8.3 The area of raised ground between CH1660 and CH1765 is associated with the existing A57. Made ground is present here to depths up to 2.6m BGL. This material is likely related to the road construction and is of a granular nature.

5.8.4 The majority of made ground is found where the route passes through the village in varying thicknesses up to approximately 3m and is associated with the local roads and properties in the area and therefore is of a mixed nature.

5.9 Historical Development

5.9.1 The most significant development in the area is the growth of Mottram in Longdendale village and the made ground associated with it. A cobbled road was identified in BH36 from a depth of 0.25m to 0.45m. This is located below the current Roe Cross Road (A6018)

5.9.2 The 2016 PSSR contains more detailed information on developments such as nearby quarries and mills, along with bleach works and sewage works which are outside the scheme footprint.

6 GROUND CONDITIONS AND MATERIAL PROPERTIES

6.1 General

6.1.1 Geotechnical properties are presented in the following sections by section and structure as defined in Table 2 based on all the historical and recent in situ data, relevant to the latest route. The historical ground investigation exploratory holes which are relevant to the latest route are summarised in Table 27 below.

6.1.2 Each sub-location has two tables, one summarising the range of values and number of tests for that location and the other providing characteristic derived parameter values.

6.2 Derivation of soil and rock parameter values

Soil Parameter Value Derivation

6.2.1 The derivation of geotechnical parameter values will generally follow the guidance set out in Eurocode 7 (EC7). EC7 defines the Characteristic Value as a cautious estimate of the value affecting the occurrence of the limit state and also describes it as a cautious estimate of the mean. This can also be defined as a moderately conservative value in accordance with CIRIA 104 and CIRIA 185. Where feasible, the characterization process will follow this statistical approach, whereby Design Values are derived by an assessment of the standard deviation of the dataset. In general, this applies to index properties where there are large data sets. Where data sets are small, or the data shows a trend with depth the selection of the characteristic values has relied on engineering judgement using a plot of the data.

6.2.2 In the absence of sufficient data, published data and empirical correlation shall be used.

Unit Weight

6.2.3 The unit weight of the materials has been derived from correlations between soil descriptions and SPT-N_{60} values outlined in Look (2007) and BS8004:2015.

Particle Size Distribution

6.2.4 Particle Size Distribution grading is described in geological terms rather than in engineering terms.

Standard Penetration Tests

6.2.5 For the current ground investigation, SPT N values have been corrected based on an average of the provided SPT energy ratio certificates. For the historic investigations where energy ratio certificates are not available, a conservative energy ratio of 60% has been adopted.

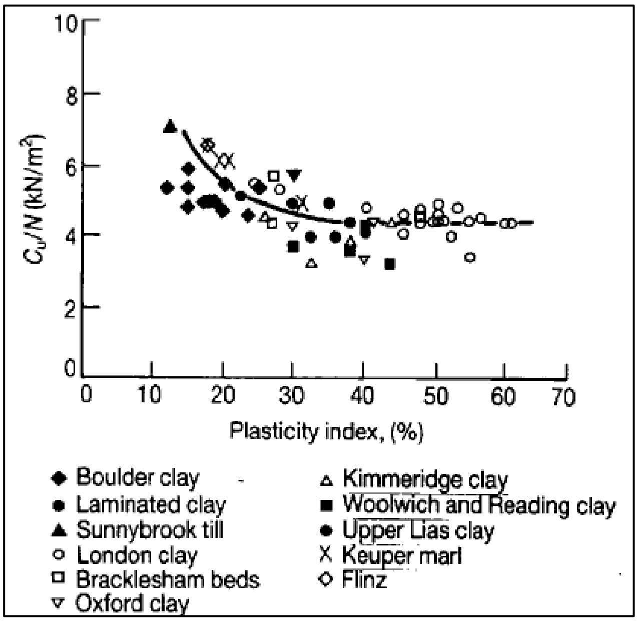
6.2.6 A large proportion of the cohesive materials encountered on the scheme contain varying amounts of gravel and cobbles with a distinct probability of boulders being present as well. A number of SPT results record refusal at 50 blows which may have been influenced by the presence of the gravel and cobbles and so may not represent the consistency of the cohesive component.

Undrained Shear Strength

6.2.7 The derivation of undrained shear strength (C_u) for cohesive materials takes into consideration laboratory data and correlation from SPT N_{60} values. Outlier SPT results which may relate to the presence of boulders and cobbles have been discounted from the calculation of a characteristic value.

6.2.8 Correlation of undrained shear strength form SPT N_{60} values considers the correlations between SPT N_{60}, plasticity index and undrained shear strength (Clayton, 1995). The equation used for this calculation can be seen below with values of f_1 dependent on the Plasticity Index of the clay (Figure 6.2.1:):

Figure 6.2.1: Correlation between SPT N value and undrained shear strength (Stroud, 1974).



$$Cu = f_1 N_{60}$$

6.2.9 As can be seen in Figure 6.2.1, at lower Plasticity Index, the Cu /N ratio increases rapidly. It has therefore been decided to limit the Cu /N ratio to no more than 5 for the derivation of undrained shear strength.

Drained Shear Strength

6.2.10 The drained Angle of Internal Friction (Phi') can be estimated from SPT-N_{60} values using the Peck (1974) correlation for granular soils, and the correlation with plasticity index outlined in BS8004 for cohesive soils. The correlation for cohesive soils can be compared against Phi' values from undrained consolidated triaxial tests. Although values of drained cohesion (c') can be taken from undrained consolidated triaxial tests, for the purposes of design, c' values are assumed to be 0kPa.

Compressibility (m_v)

6.2.11 The compressibility of the cohesive materials encountered on the scheme has been calculated from laboratory oedometer tests and from correlation from SPT N_{60} results in using the guidance in CIRIA Report 143. The following correlation from SPT N_{60} has been used (Clayton, 1995):

$$Coefficient\ of\ volume\ compressibility\ (m_v) = 1/(N_{60} \times f_2)$$

Stiffness

6.2.12 The undrained Youngs Modulus (E_u - MPa) of cohesive soils has been estimated from SPT N_{60} results using the guidance in CIRIA Report 143 and is equal to 1xN_{60}. Assuming a drained and undrained Poissons Ratio of 0.15 and 0.5 respectively means that the drained Youngs Modulus (E') is approximately 0.76xE_u.

6.2.13 For granular soils, the drained Youngs Modulus can also be estimated from SPT N_{60} values through the equation $E' = 2xN_{60}$.

Table 27: Summary of historic boreholes used in current GIR.

Ground Investigation	Relevant Boreholes
Soil Mechanics Ltd. (1994)	BH14-BH65, BH149-BH156, TP4-TP15, TP62-TP65, TP67-TP69
Norwest Holst Soil Engineering Ltd. (2003)	BH201-BH219
Fugro Engineering Services Ltd (2005)	BH300-BH303, BH307-BH310/A, BH347/A, TP300-TP311, TP369-TP375

Rock Parameter Derivation

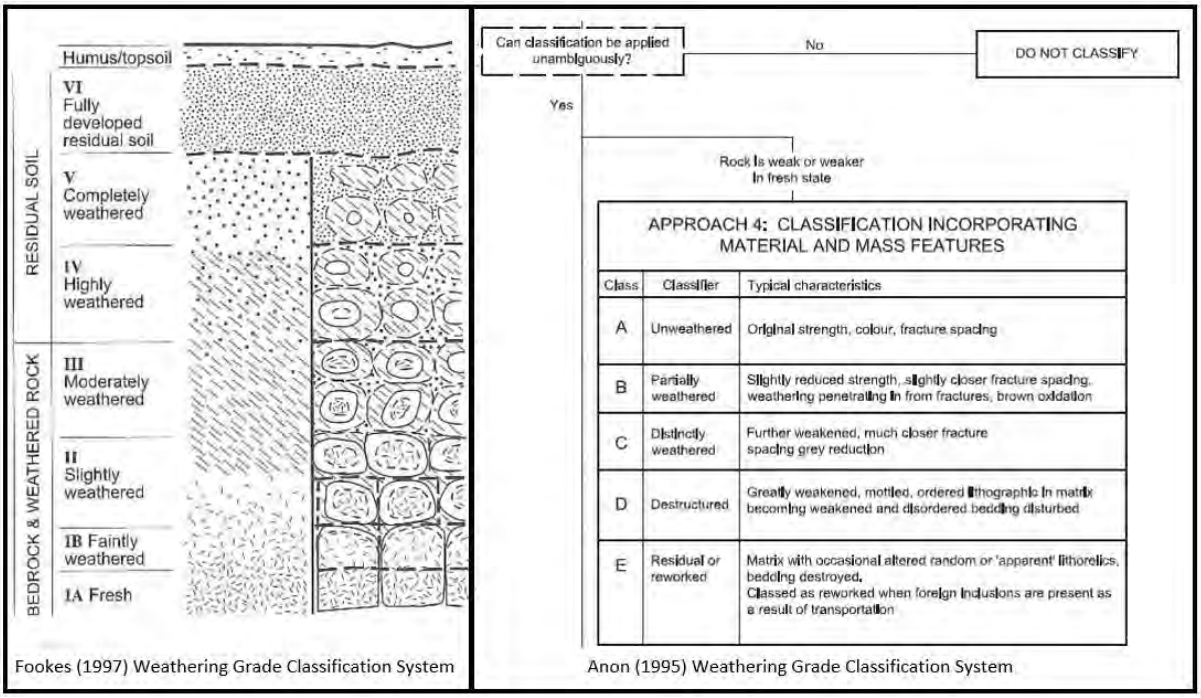
6.2.14 The statistical derivation of geotechnical rock parameters will generally follow the guidance set out in Eurocode 7 (EC7) as discussed in Section 6.2.1 and 6.2.2 of this report.

Weathering Grades

6.2.15 A characterisation of weathering grades stated on exploratory field logs over four phases of ground investigations have been undertaken using Fookes (1997) and Anon (1995), See

6.2.16 Figure 6.2.2. Fookes (1997) weathering grade terminology has been adopted for the remainder of this report.

Figure 6.2.2 Weathering Grade Classifications.



6.2.17 A cross check of weathering grades stated on exploratory field logs provided to Arcadis has been undertaken to ensure they comply with the descriptive classifications stated on the Fookes 1997 weathering classification scheme. No weathering classifications were provided on field logs issued from the Socotec 2018 Ground Investigation.

Weathering grades were therefore applied to these strata by Arcadis in accordance with Guidance from Fookes 1997.

6.2.18 In summary tables of rock parameters, weathering grades of Highly, Moderately and Slightly Weathered have been abbreviated to H, M and S respectively.

6.2.19 A characterisation of zones of tectonic deformation have been discussed in Section 5.3.48 to Section 5.3.50.

Unit Weight

6.2.20 The unit weight of the materials has been derived from correlations between Rock Weathering Grade descriptions and published values stated in BS 8004:2015.

Conversion of SPT-N_{60} to UCS

6.2.21 A conversion of SPT-N_{60} values to UCS has been undertaken using guidance from CIRIA 143. The below correlation has been used for SPT's undertaken in the highly weathered bedrock rock mass.

$$UCS = 5.N_{60}\ (kPa)$$

6.2.22 The above conversion is considered to be conservative for materials with an unconfined compressive strength of greater than approximately 4MPa. Therefore, the below equation has been adopted for Moderately and slightly weathered strata.

$$UCS = 10.N_{60}\ (kPa)$$

Conversion of SPT N_{60} to E' for Highly Weathered Rock Materials

6.2.23 A conversion of SPT-N_{60} to Stiffness has been undertaken using guidance from CIRIA 143, Stroud (1989) and Leach and Thompson (1979). The following equation has been utilised for the Millstone Grit Group.

$$\frac{E'}{N_{60}} = 0.5\ to\ 2.0\ (MPa)$$

6.2.24 A conservation factor of 1 was applied to the strata in accordance of lower bound values suggested for weak rocks by Stroud (1974).

Determination of E' for intact Rock Mass

6.2.25 A derivation of an E' value for the Rock Mass was attempted using guidance from Bieniawski (1978) and a Rock Mass Rating (RMR) assessment for the rock mass. Bieniawski's equation was however only suitable for rock with an RMR which is greater than 50.

6.2.26 A further assessment was undertaken using guidance from Serafim and Pereira (1983), which can be undertaken for Rock with an RMR which is less than 50. Values derived using Serafim and Pereira's approach were considered to be unrealistically high for the rock mass.

6.2.27 A comparison assessment was undertaken using guidance from BS 8004:1986, findings of which produced a reasonably credible E' value. The following equation was adopted for rock masses

$$E_m = j.M_r.q_c$$

Where:

E_m = Youngs Modulus for the rock mass
M_r = Modulus Ratio
q_c = UCS
j = Rock Mass Factor

6.2.28 A Group 3 characterisation of the rock mass has been assumed for the Millstone Grit Group.

6.2.29 A Rock Mass Factor of 0.2 has been assumed for the Millstone Grit in accordance with guidance from Tomlinson (2007) and consideration of the RQD data.

Figure 6.2.3 Modulus Ratio determination for the Millstone Grit Group.

Table G.1 — Grouping of weak and broken rocks

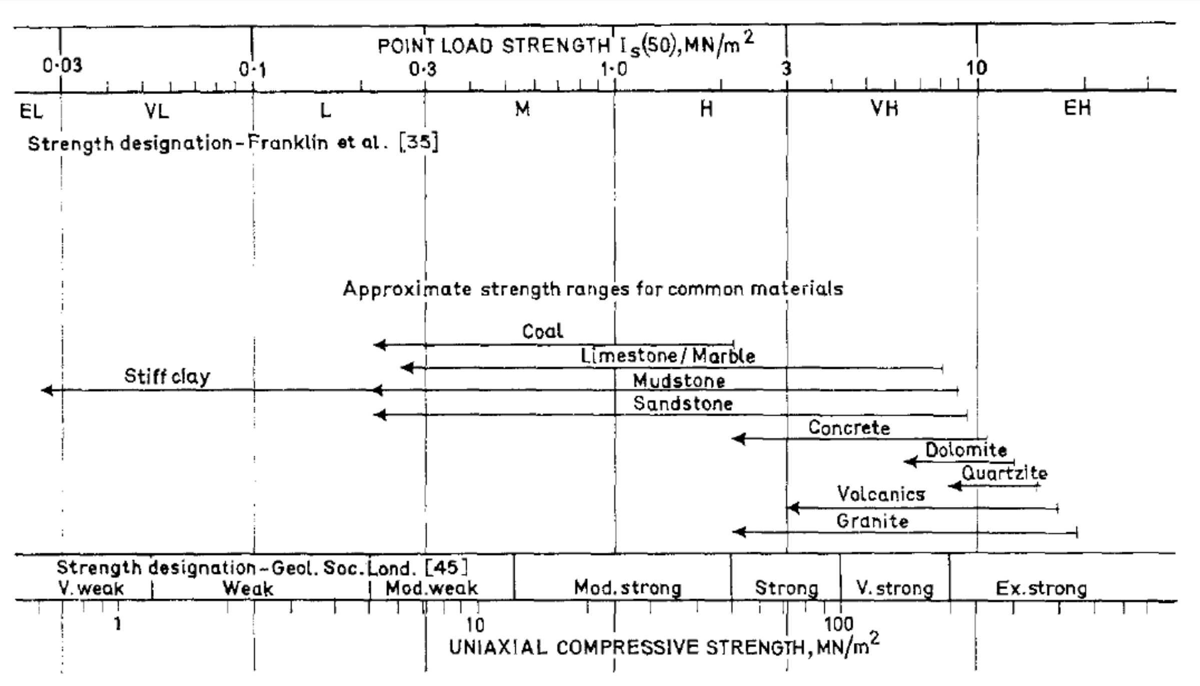
Group	Type of rock
1	Pure limestones and dolomites Carbonate sandstones of low porosity
2	Igneous Oolitic and marly limestones Well cemented sandstones Indurated carbonate mudstones Metamorphic rocks, including slates and schist (flat cleavage/foliation)
3	Very marly limestones Poorly cemented sandstones Slates and schists (steep cleavage/foliation)
4	Uncemented mudstones and shales

The four rock groups have been given the following modulus ratios.
Group 1: 600
Group 2: 300
Group 3: 150
Group 4: 75
These ratios are considered to be conservative.

Conversion of $I_{s(50)}$ to UCS

6.2.30 $I_{s(50)}$) values, size corrected, have been converted to UCS values in accordance with guidance from Broch and Franklin (1972) and Rusnak and Mark (Rusnak, 2000). Conversion factors published by Broch and Franklin (1972) for separate lithologies are discussed below. Typical ranges of Point Load Strength to Uniaxial Compressive Strengths for differing materials is presented in Figure 6.2.4.

Figure 6.2.4 Strength classification showing nomenclature and a correlation of $I_s(50)$ and UCS typical ranges for common rocks.



6.2.31 A number of PLT samples were scheduled to be tested adjacent to UCS scheduled specimens for each stratum in order to assist on the derivation of a suitable conversion factor. A number of UCS samples, scheduled for testing, were reported to have crumbled during sample preparation. This was particularly the case for Mudstone samples. It has been noted that samples successfully tested for direct UCS are likely to represent good quality bedrock and are less representative of poorer quality, deformed bedrock. This is noted in Plots of $I_s(50)$ values and direct UCS test plots, whereby the higher end values are normally represented by direct UCS test results. Lower bound direct UCS testing data points do frequently overlap with converted $I_s(50)$ to UCS data values, indicating that a reasonable correlation factor has been adopted for the Rock Material.

Figure 6.2.5 Published comparisons between PLI and UCS tests for sedimentary rocks.

Reference	Rock Type	Location	Number of tests	Conversion Factor	Comments
Das, 1995	Siltstone	Western Canada, bituminous coalfields	NG[1]	14.7	lumps, fresh core, old core
	Sandstone/siltstone		NG	18	
	Shale/mudstone		NG	12.6	
Vallejo et al, 1989	Sandstone	Eastern KY, VA, WV	420 PLT, 21 UCS	17.4	Freshly blasted rock, irregular lump samples
	Shale	surface coal mines	1,100 PLT, 55 UCS	12.6	
Smith, 1997	Dredge material	various harbors	NG	8	UCS<1000 psi
	Dredge material	various harbors	NG	15	UCS<3500 psi
	sandstone/limestone	unk	NG	24	UCS>6000 psi
Broch and Franklin, 1972	Various	UK (?)	NG	23.7	11 rock types
Carter and Sneddon, 1977	Coal measure	UK	1,000 PLT, 68 UCS	21-22	3 units tested
O'Rourke, 1988	Sedimentary	Paradox Basin, US	66	30	samples from one borehole
Hassani et al., 1980	Sedimentary	UK	1,000	29	
Singh and Singh, 1993	Quartzite	India, copper pit	65	23.4	
Read et al, 1980	Sedimentary rocks	Melbourne, Australia	NG	20	Reference in Choi and Hong, 1998
Bieniawski, 1975	Sandstone	South Africa	160	23.9	
Rusnak, 1998	Coal measure	Southern WV	386	20	Subset of current data
Jermy and Bell, 1991	Coal measure	South Africa	NG	14.1	Mainly sandstones

[1]NG=Not given in reference

6.2.32 A lower range conversion factor of 17.5 has been adopted for Mudstone encountered across the site. This value is considered to be conservative when compared to typical values reported by Broch and Franklin (1972). This value is however higher in comparison with a number of published values for Mudstone strata reported by Rusnak and Mark for Coal Measures Mudstone strata. A conservative value of 17.5 is considered to be appropriate for the Mudstone strata given the degree of faulting at the eastern portal of the Mottram Underpass.

6.2.33 A lower range conversion factor of 20 has been adopted for Siltstone and Sandstone encountered. This value is also considered to be conservative when compared to typical values reported by Broch and Franklin (1972). However, the distribution of $I_s(_{50})$ data points amongst direct UCS data points indicates that a correlation factor of 20 is reasonable for the Siltstone and Sandstone Rock Material.

6.2.34 The use of SPT-N_{60} information to derive an estimated UCS for highly weathered materials is considered to be more appropriate as this approach will take into account the behaviour of the materials Rock Mass as oppose to the Rock Material.

Rock Mass Rating (RMR)

6.2.35 A Rock Mass Rating (RMR) for the Millstone Grit Group has been undertaken using guidance from Bieniawski (1989).

6.2.36 A lower bound bedding / discontinuity value has been adopted for the RMR in situations where a range of values have been provided for a given stratum.

6.2.37 RMR characteristics are anticipated to vary locally within the Millstone Grit Group.

Excavatability

6.2.38 An excavatability assessment of the Millstone Grit Group has been undertaken using guidance from Franklin, Broch and Walton (1971), which has subsequently been updated and amended by Fookes. The assessment was undertaken by plotting $I_s(_{50})$ data points, direct UCS data and fracture spacing on an excavatability assessment chart.

6.2.39 Bedding / discontinuity spacing values have been used from the field log descriptions for the given bedrock stratum tested. A higher bound bedding / discontinuity value has been adopted for the excavatability assessment in situations where a range of values have been quoted on the exploratory hole logs.

6.3 Section 1 – Western Embankments

6.3.1 A summary of ground conditions encountered along the proposed Western Embankments can be seen in Section 5.3.3 to Section 5.3.9.

6.3.2 Table 28 summarises the materials present for this location and the measured geotechnical parameter values for each material.

Table 28: Summary of testing for Western Embankments location.

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Peat[1]	Cohesive Alluvium	Granular Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till[2]
Moisture Content W (%)		23-25 {2}	-	22-62 {2}	20-25 {2}	16 {1}	6-29 {103}	14-17 {3}	14-19 {11}
Liquid Limit (%)		31-38 {4}	-	27-119 {2}	22-33 {4}		20-55 {114}		19-31 {11}
Plastic Limit (%)		12-23 {4}	-	87 {1}	12-16 {3}		9-29 {112}		11-17 {10}
Plasticity Index (%)		14-19 {4}	-	32 {1}	18 {1}		5-28 {112}		10-20 {10}
Bulk Density γ (Mg/m)		1.73-2.17 {2}	-	1.67-2.07 {2}	1.96-1.99 {2}	2.02-2.12 {2}	1.69-2.38 {71}	2.26-2.36 {2}	2.11-2.27 {6}
Dry Density γ (Mg/m)		-	-	1.07 {1}	1.53 {1}	1.68 {1}	1.55-2.24 {72}	-	1.78 {1}
Particle Density (Mg/m³)		-	-	2.65 {1}	2.65 {1}	2.65 {1}	2.65-2.75 {32}	-	2.65 {1}
SPT – N_{60} values (Blows)		5-9 {2}	5 {1}	-	-	-	5-73 {39}	8-45 {5}	13-50 {15}
Particle size Distribution	Cobbles	-	-	-	-	-	-	-	-
	Gravel	-	75 {1}	-	-	-	0-14 {10}	-	42 {1}
	Sand	-	23 {1}	-	-	-	20-59 {10}	-	30 {1}

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Peat[1]	Cohesive Alluvium	Granular Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till[2]
	Silt	-	12 {1}	-	-	-	41-80 {10}	-	28 {1}
	Clay	-		-	-	-	16-32 {10}	-	14 {1}
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer)		-	-	0.011-5.1 {1}	0.001-0.5 {1}		0.001-1.1 {223}	-	0.068-0.42 {1}
Coefficient ofConsolidation(Root Time method) (m^2/yr) (Oedometer)		-	-	-	-	-	0.83-20.53 {77}	-	-
CBR (%)	**Plate Load Test**	-	-	-	-	-	0.9-2.8 {7}	-	-
	TRL DCP	-	-	-	-	-	6.2-42 {10}	-	-
	Laboratory CBR	-	-	-	-	-	2.2-4.4 {6}	-	-

[1]- *Low end Moisture Content and high end Density may be due to presence of silt and clay in peat samples.*
[2]-*Lower bound Moisture Content and Plasticity Index considered unrepresentative of material.*
**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.3.3 Geotechnical considerations for Topsoil have not been taken into account along the Western Embankments. It is assumed that it will be removed prior to construction.

Cohesive Made Ground

6.3.4 A plot of Natural Moisture Content (NMC), Plastic Limit (PL) and Liquid Limit (LL) against depth below ground level is presented in Figure 10.1.1. From the PL and LL a Plasticity Index of between 14 and 19% are plotted on Figure 10.1.2. A characteristic Plasticity Index of 19% has been considered appropriate for design purposes.

6.3.5 The unit weight of the Cohesive Made Ground was derived using soil descriptions and correlations in Look (2007). The majority of descriptions state that the material is soft to firm and so a characteristic bulk unit weight of 17kN/m^3 is recommended.

6.3.6 In this area, only 2 SPT-N_{60} results were obtained in the cohesive made ground due to its limited extent with values of 8 and 9. These results can be seen in Figure 10.1.3.

6.3.7 As outlined in Section 6.2.8, SPT N_{60} values can be used to estimate the undrained shear strength of the cohesive made ground. At the low plasticity indices stated in 6.3.4, a limited Cu/N ratio of 5 was used, resulting in undrained shear strength of between 40 and 45kPa (Figure 10.1.4). A characteristic lower bound value of 40kPa is recommended for design.

6.3.8 The coefficient of volume compressibility of the Cohesive Made Ground can also be estimated from SPT results. Using an f_2 coefficient of 500 results in m_v values of 0.22 and 0.25m^2/MN (Figure 10.1.5). This puts the Cohesive Made Ground at the mid to upper range for medium compressibility clays (Tomlinson, 2001). A Characteristic value of 0.25m^2/MN is recommended for design.

6.3.9 The drained and undrained Young's Modulus have been estimated using SPT N values as outlined in 0. This resulted in an undrained Youngs Modulus between 8 and 9MPa and a drained Youngs Modulus of between 6 and 7MPa (Figure 10.1.6). A Characteristic value of 6MPa is recommended for design.

Granular Made Ground

6.3.10 One SPT N_{60} value of 5 (Figure 10.1.3.) has been recorded for Granular Made Ground in the Western Embankments section relating to a soil description of loose clayey sandy gravel.

6.3.11 Two particle size distribution tests were carried out in BH212 during the Norwest Holst Soil Engineering Ground Investigation. One test has been carried out on a slightly sandy mudstone which when checked against the borehole log comprises only the gravel portion of cohesive made ground. The other test was carried out on a sandy gravel; however the sample size was found to be insufficient for a representative particle size distribution.

Peat

6.3.12 Due to the extremely low occurrence of peat, a very limited amount of geotechnical testing is available. Two index tests have been carried out on the peat with moisture contents ranging from 22 to 62%. Liquid limits range from 27 to 119% whilst only one plastic limit result is available at 87%, corresponding to the higher Liquid Limit value (Figure 10.1.7.).

6.3.13 Soil descriptions of the Peat describe it as very soft to soft and so a conservative unit weight of 15kN/m^3 is recommended for design from guidance in Look (2007).

Granular Alluvium

6.3.14 The moisture content of one sample in BH15 for Granular Alluvium provides a value of 16% (Figure 10.1.8.).

6.3.15 Due to the limited extent of Granular Alluvium in this section, no other testing is available for the material.

6.3.16 Soil descriptions of Granular Alluvium in this section do not indicate its compaction state. However, generally, granular alluvial deposits are loosely compacted and so a unit weight of 18kN/m^3 has been chosen.

Cohesive Alluvium

6.3.17 Natural Moisture Content (NMC), Plastic Limit (PL) and Liquid Limit (LL) values for Cohesive Alluvium are presented in Figure 10.1.9. A plasticity index value of 18% was derived from the index test data and shall be used as a characteristic value. A single data point shown in Figure 10.1.10 shows the Alluvium to lie above the A-line on the low to intermediate plasticity boundary.

6.3.18 Using a characteristic plasticity index of 18% results in a drained angle of internal friction of 26° for the Cohesive Alluvium.

6.3.19 Cohesive Alluvium is described as very soft to firm relating to a unit weight range of 16 to 18kN/m^3. A characteristic value of 17kN/m^3 is recommended for design.

Cohesive Glacial Till

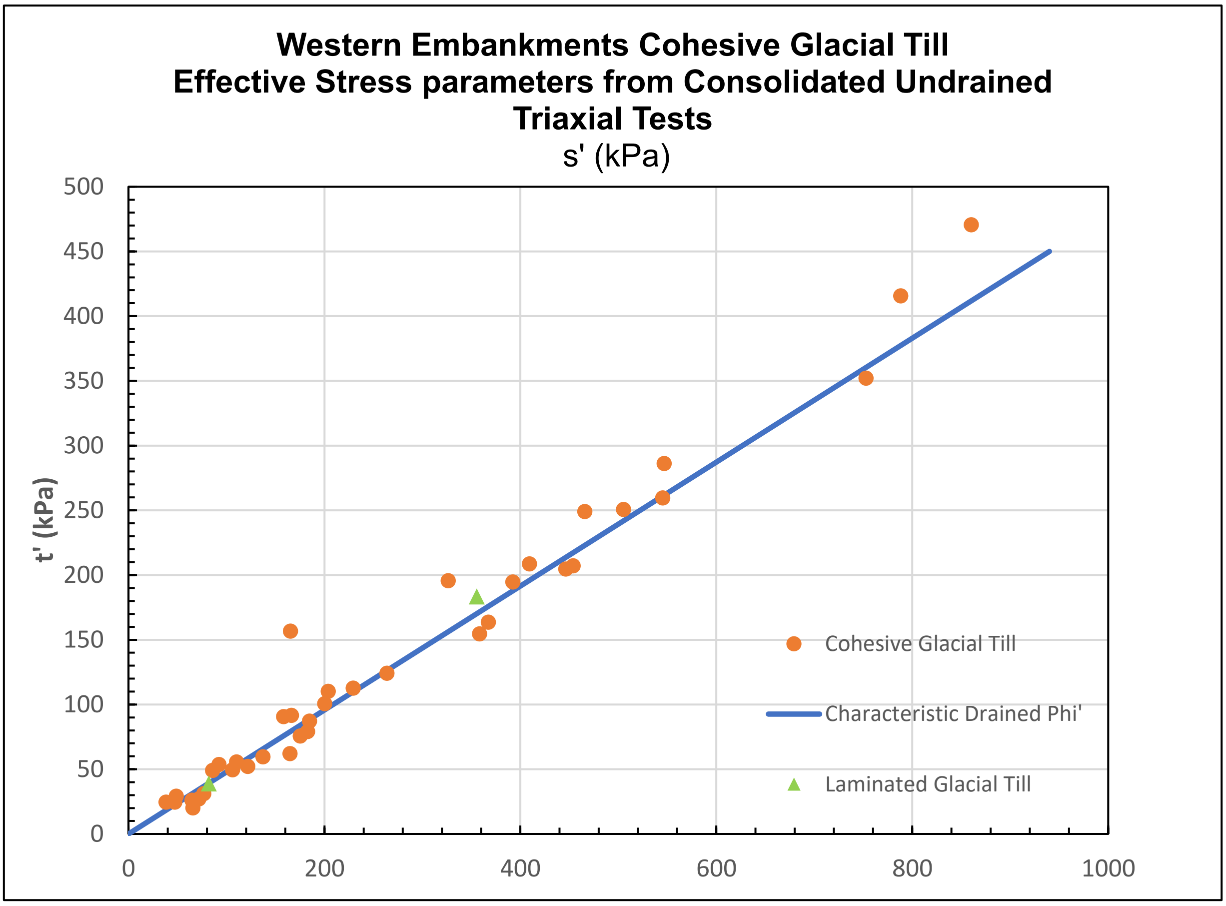
6.3.20 Natural moisture content (NMC), Plastic Limit (PL) and Liquid Limit (LL) for the Cohesive Glacial Till are displayed in Figure 10.1.11. Plasticity Index values for the material are plotted on Figure 10.1.12 with a characteristic Plasticity Index value of 18% considered appropriate for the material at this location.

6.3.21 Based on soil descriptions indicating the Cohesive Glacial Till is generally firm to stiff with some softer areas, a unit weight of 18kN/m^3 has been considered appropriate as a characteristic value.

6.3.22 The correlation between the plasticity index and drained angle of internal friction (British Standards Institution, 2015) suggest values for ϕ' to be in the range of 24° to 29° (Figure 10.1.13.). Based on the statistical method in 6.2.1, a characteristic value for ϕ' of 26° with a c' of 0 kPa is recommended for design.

6.3.23 Drained parameters for the Cohesive Glacial Till have been estimated from consolidated undrained triaxial tests, the results of which can be seen in Figure 10.1.32. A characteristic Phi' value of 26° has been derived from the data which correlates well with the Phi' from Atterberg Limit data.

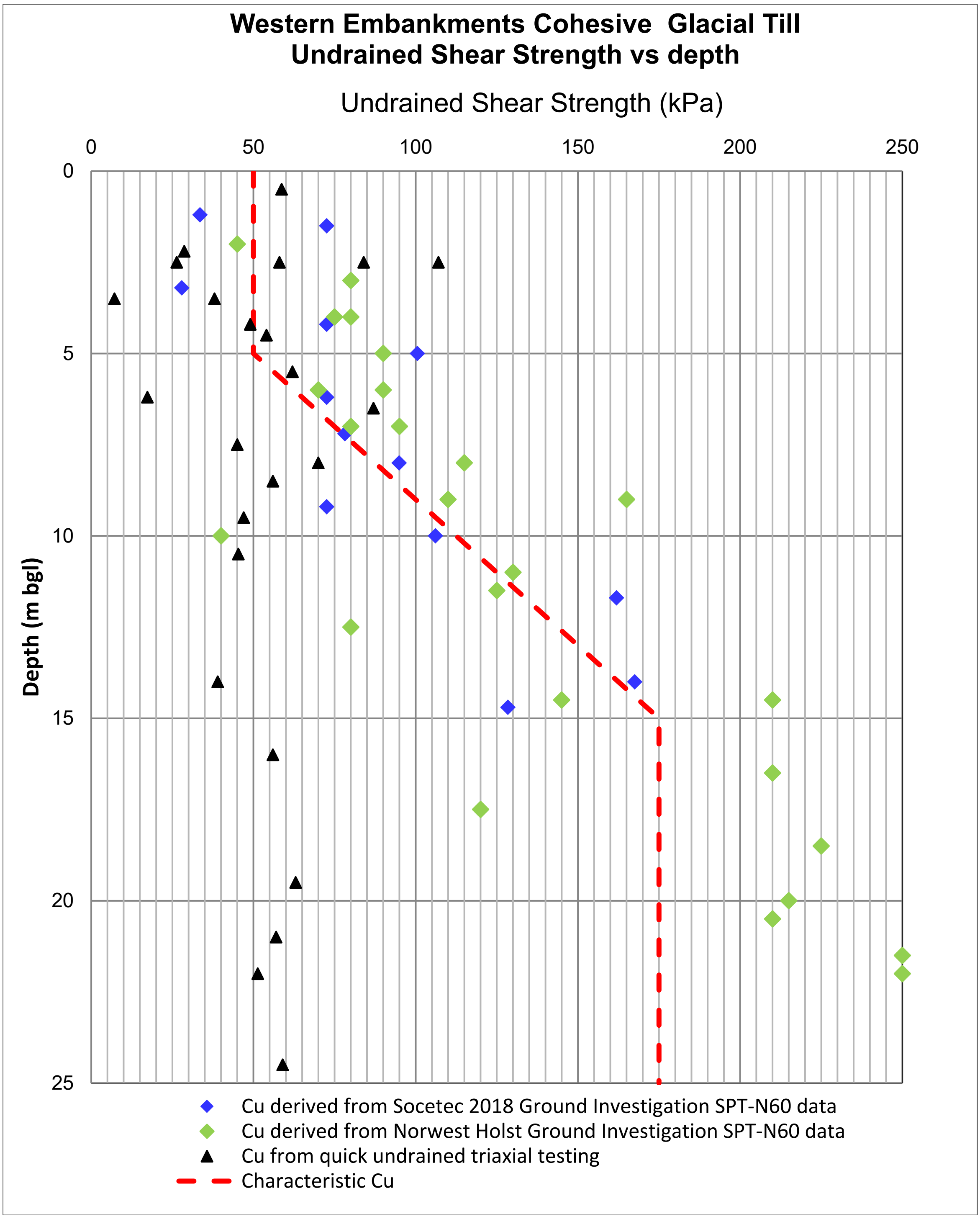
Figure 10.1.32. Western Embankments Cohesive Glacial Till effective stress Shear Strength.



6.3.24 A total of 10 particle size distribution analyses have been undertaken for the Cohesive Glacial Till in the area of the western embankments and are displayed in Figure 10.1.14. These confirm that the soil is a sandy silty CLAY with a fair range in the proportion of the soil finer than 0.425mm, the portion of the sample used in Atterberg Limit testing.

6.3.25 39 SPTs were carried out on Cohesive Glacial Till for the Western Embankments (Figure 10.1.15). Using the correlation in CIRIA 143 (Stroud, 1974) undrained shear strengths (Cu) have been calculated and range from 28 to 250kPa. The results of this correlation and a characteristic Cu line can be seen in Figure 10.1.16.

Figure 10.1.32. Western Embankments Cohesive Glacial Till Undrained Shear Strength.



6.3.26 Multistage quick undrained triaxial tests also recorded undrained shear strengths for the Cohesive Glacial Till with the results plotted on Figure 10.1.6. The results from these multistage tests show relatively large increases in undrained shear strength with increasing cell pressure, indicating that there may have been issues with sample quality.Due to the large disparity between the SPT derived Cu values and the deeper undrained triaxial results, it has been decided to base the characteristic line on the more recent SPT data which was supervised by a representative from Arcadis.

6.3.27 Following guidance in CIRIA 143 (Clayton, 1995), the drained Young's Modulus (E') and undrained Young's Modulus (E_u) are presented in Figure 10.1.17 and Figure 10.1.18, respectively. Young's Modulus has been calculated using the method outlined in Section 6.2.12. Characteristic lines are shown on the respective figures with the equations of the lines displayed in Table 29.

6.3.28 As outlined in Section 6.2.11, SPT N60 values have been converted to Coefficient of Volume Compressibility values following guidance in CIRIA 143 (Figure 10.1 19) Using a plasticity index of 18% gives an f2 value of 500. This equates to an mv value of between 0.04 and 0.30m2/MN classifying the Cohesive Glacial Till as of Very Low to Medium Compressibility.

6.3.29 Oedometer tests were also carried out on samples of Cohesive Glacial Till to determine one dimensional consolidation parameter values. The results of both SPT and Oedometer testing are plotted on Figure 10.1.19 along with a characteristic line. The Oedometer data is plotted at a depth corresponding to the vertical effective stress at the end of the loading stage.

6.3.30 Coefficients of Consolidation (C_v) measured at varying applied stresses during oedometer testing ranged from 0.83 to 20.53m^2/yr. Generally, the values show quite a high scatter. However, the majority of values are below 5m^2/yr.

6.3.31 Compaction tests were carried out on samples of the Cohesive Glacial Till. The results of maximum dry density vs optimum moisture content (OMC) can be seen on Figure 10.1.20. The moisture contents shown in Figure 10.1.11. indicate some of the material may fall outside of this OMC range and so may require wetting or drying in some areas to achieve maximum compaction.

Granular Glacial Till

6.3.32 Granular Glacial Till soils encountered represent Sand lenses sporadically found within the Glacial Till and therefore only a limited amount of geotechnical testing data is available.

6.3.33 Soil descriptions of the Granular Glacial Till along with SPT N_{60} values of more than 10 indicate the material is medium dense corresponding to a unit weight of 20kN/m^3.

6.3.34 Five SPT N_{60} values were obtained for the Granular Glacial Till and show a trend of increasing N_{60} with depth. Due to the sporadic nature of the granular deposits in the till, a characteristic value of 15 is considered appropriate for design.

6.3.35 Using the Peck (1974) correlation, the drained angle of internal friction (φ') can be estimated from SPT-N_{60} values. This gives values of φ' in the range of 29° to 40° (Figure 10.1.22.). A characteristic value of 32° is recommended for design.

6.3.36 The drained Youngs Modulus for the Granular Glacial Till has been estimated from SPT N_{60} results with a characteristic design line shown in Figure 10.1.23.

Laminated Glacial Till

6.3.37 11 natural moisture content (NMC) tests were carried out in the Laminated Glacial Till and show a range of 14 to 19%. Figure 10.1.24. shows the moisture contents along with liquid and plastic limits plotted against depth. The figure shows that there is no apparent trend of index properties with depth.

6.3.38 A characteristic plasticity index of 16% is considered to be appropriate. These tests have also been plotted on a Casagrande chart and indicate that the Laminated Glacial Till is classified as a low plasticity clay (Figure 10.1.25).

6.3.39 The Unit weight of the Laminated Glacial Till has been based on typical soil descriptions of firm to stiff clay resulting in a characteristic value of 18kN/m^3.

6.3.40 Based on a plasticity index of 16% using the correlation with drained angle of internal friction results in a value of 27° for the Laminated Glacial Till (Figure 10.1.26.). Drained angle of internal friction values from consolidated undrained triaxial tests (Figure 10.1.32) are limited but fall within the range for Glacial Till and thus a value of 26° is considered an appropriate characteristic friction angle for the Laminated Glacial Till.

6.3.41 15 SPT N values were recorded in the Laminated Glacial Till and are plotted against depth in Figure 10.1.27.

6.3.42 Using a plasticity index of 16% and the correlation in 6.2.8 results in undrained shear strength values of 65 to 140kPa (with a non-credible outlier of 250kPa) which are shown in Figure 10.1.28 with a characteristic line also plotted.

6.3.43 The conversion from SPT N_{60} to Coefficient of Volume Compressibility resulted in m_v values between 0.08 and 0.15m^2/MN (with the outlier disregarded) (Figure 10.1.29), classifying the Laminated Glacial Till as of Very Low to Medium Compressibility.

6.3.44 The undrained Youngs Modulus (E_u) from SPT results are displayed on Figure 10.1.30 along with a characteristic line to show the increase in E_u with depth. Drained Youngs Modulus for the Laminated Glacial Till (Figure 10.1.31.) again shows an increase with depth, the rate of which is plotted as a characteristic line on the figure.

Table 29: Summary of characteristic derived parameters for Western Embankments.

Derived Geotechnical Parameter	Made Ground (cohesive)	Peat	Cohesive Alluvium	Granular Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till
Unit weight ɣ (kN/m3) (Look)	17	15	17	18	18	20	18
Undrained Shear Strength (Cu) kPa	40	-	-	-	0m-5m = 50kPa 5m – 15m = 50+11.5(d-5) 15m+=175kPa	-	>2m = 65+4.62(d-2)
Effective angle of internal friction ϕ' (°)	26	23	26	-	26	29	26
Drained Cohesion – C' (kPa)	0	0	0	-	0	-	0
Coefficient of Volume Compressibility m_v (m^2/mN)	Refer to Figure 10.1.5	-	-		Refer to Figure 10.1.19		Refer to Figure 10.1.29
Drained Youngs Modulus (E') (MPa) (CIRIA 143)	6	-	-	-	0m-5m = 7 5m – 15m = 7+1.88(d-5) 15m+ = 26	4m = 16+3.14(d-4)	>2m = 10+0.75(d-2)

<table>
<tr><th colspan="2">Derived Geotechnical Parameter</th><th>Made Ground (cohesive)</th><th>Peat</th><th>Cohesive Alluvium</th><th>Granular Alluvium</th><th>Cohesive Glacial Till</th><th>Granular Glacial Till</th><th>Laminated Glacial Till</th></tr>
<tr><td colspan="2">Undrained Youngs Modulus (E_u) (MPa) (CIRIA 143)</td><td>8</td><td>-</td><td>-</td><td>-</td><td>0m-5m = 10
5m – 15m = 10+2.47(d-5)
15m+ = 35</td><td>-</td><td>2m= 13+1(d-2)</td></tr>
<tr><td rowspan="2">Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)</td><td>Maximum DD (Mg/m3)</td><td></td><td></td><td></td><td></td><td>1.89</td><td></td><td></td></tr>
<tr><td>Optimum Moisture Content (%)</td><td></td><td></td><td></td><td></td><td>15</td><td></td><td></td></tr>
</table>

6.4 Section 1 – Old Mill Farm Underpass
Description of Old Mill Farm Underpass Results

6.4.1 Due to the limited extents of this structure, the only material relevant is the Cohesive Glacial Till. A summary of testing results and derived parameter values is shown in Table 30 and Table 31.

Table 30: Summary of geotechnical testing results - Old Mill Farm Underpass.

Measured Geotechnical Parameter		Cohesive Glacial Till
Moisture Content W (%)		13 – 20 {8}
Liquid Limit (%)		21-36 {10}
Plastic Limit (%)		13-20 {9}
Plasticity Index (%)		10-21 {17}
Bulk Density γ (Mg/m)		1.69 – 2.20 {5} Classification testing, Oedometer and Triaxial
Dry Density γ (Mg/m)		1.73 – 1.93 {10} Oedometer, CBR and Triaxial
Particle Density (Mg/m^3)		2.65 {1} Oedometer
SPT – N_{60} values (Blows)		6-32 {9}
Particle size Distribution (%)	**Cobbles**	0
	Gravel	3-5
	Sand	15-44
	Silt	17-58
	Clay	22-36
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer)		0.015 – 0.8 {1}
Coefficient of Consolidation (Root Time method) (m^2/yr) (Oedometer)		2.3 – 46 {1}
California Bearing Ratio (CBR) %	**Top**	2.6 – 3.9 {2}
	Bottom	2.6 – 4.4 {2}

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.4.2 Geotechnical considerations for Topsoil have not been taken into account at Old Mill Farm Underpass. It is assumed that the topsoil will be removed prior to construction.

Cohesive Glacial Till

6.4.3 A plot of Natural Moisture Content (NMC, Plastic Limit (PL) and Liquid Limit (LL) against depth below ground level is presented in Figure 10.2.1. From the PL and LL, a characteristic Plasticity Index of 18% is considered appropriate for design purposes. Plasticity Index values range from 10% to 21% and can be seen plotted in Figure 10.2.2. The portion of the Glacial Till tested is a low plasticity clay.

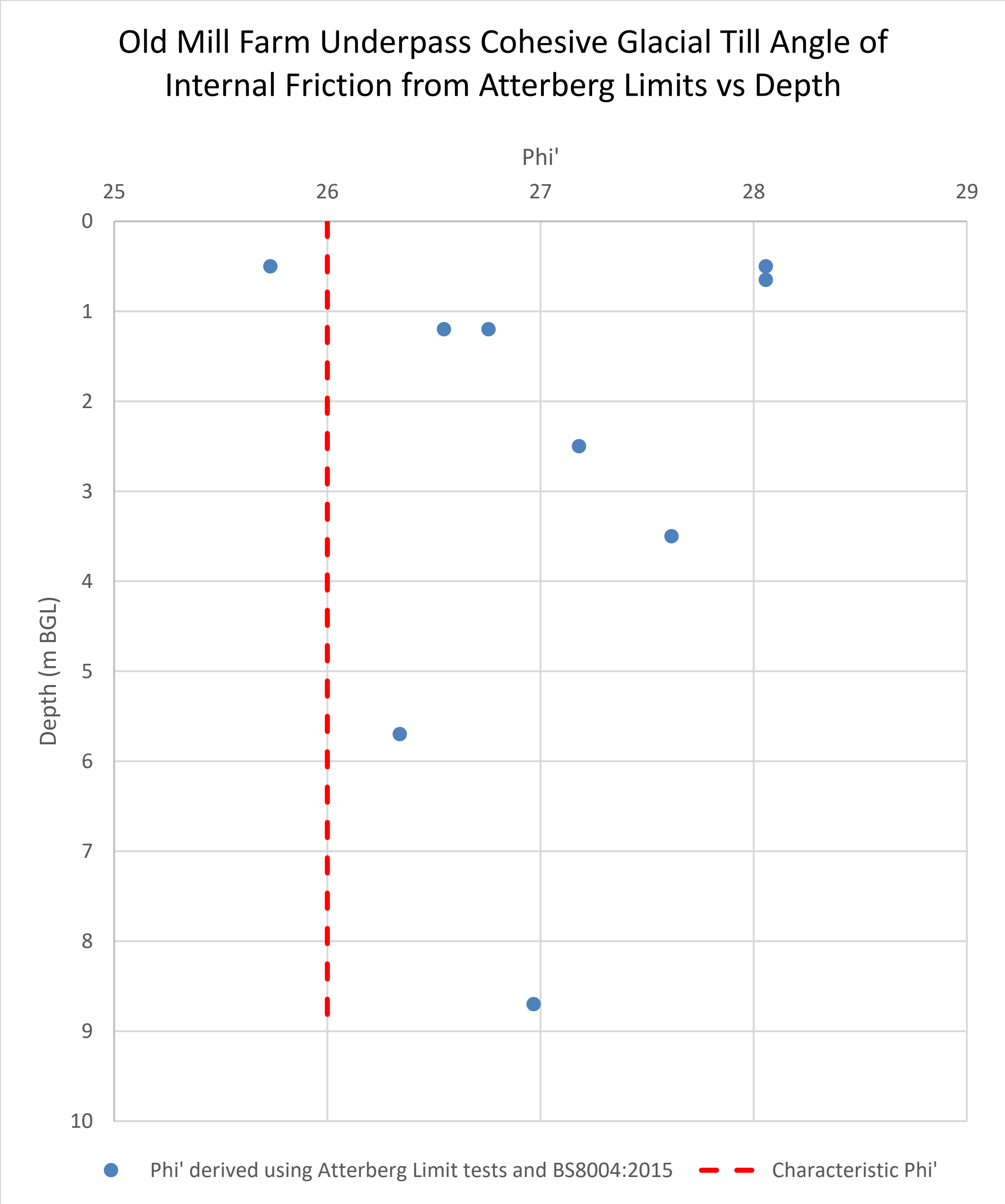
6.4.4 Measured Bulk Density results from Oedometer, Triaxial and Classification tests show a range of densities of 1.69 Mg/m^3 to 2.2Mg/m^3.

6.4.5 From borehole log descriptions describing the Cohesive Glacial Till as Firm to Stiff with occasional soft spots, a characteristic Bulk Unit Weight of 18kN/m^3 is considered appropriate.

6.4.6 Four Particle Size Distribution Tests were undertaken in this area, the results of which can be seen in Figure 10.2.3. The cohesive Glacial Till is a sandy silty clay.

6.4.7 The correlation between the Plasticity Index and drained angle of internal friction suggest values for Phi’ to range from 26° to 28° (Figure 10.2.10).

Figure 10.2.10: Old Mill Farm Underpass Cohesive Glacial Till Angle of Internal Friction.



6.4.8

6.4.9

Figure 10.2.10: Old Mill Farm Underpass Cohesive Glacial Till Angle of Internal Friction.

6.4.11 Results of consolidated undrained triaxial tests are shown in Figure 10.2.11 and indicate an angle of internal friction of 30°. A conservative characteristic value of 26° is considered appropriate for the material. A drained cohesion (c') of 0kPa should be adopted for design purposes.

6.4.12 SPT N_{60} values range from 6 to 32 and can be seen plotted against depth in Figure 10.2.4 with a characteristic line increasing with depth.

6.4.13 Undrained shear strength (Cu) values were derived from the SPT-N_{60} results and are shown plotted against depth in Figure 10.2.5 with the characteristic line also shown. The calculated undrained shear strength ranges from 28kPa to 162 kPa and increases with depth.

6.4.14 The Coefficient of Volume Compressibility for the Cohesive Glacial Till has been estimated from SPT-N_{60} data and can be seen plotted against depth in Figure 10.2.6:.Using a Plasticity Index of 18% equates to a range of m_v values of 0.06m^2/MN to 0.36m^2/MN.

6.4.15 Results from one oedometer test were also used to determine the materials one dimensional consolidation characteristics with the coefficient of volume compressibility for increasing applied stress plotted on Figure 10.2.9.

6.4.16 A comparison of derived in situ m_v values and those obtained from laboratory tests indicate a good correlation between the two data sets (Figure 10.2.12:) with a characteristic line also plotted on the figure, the equation of which can be seen in Table 31.

6.4.17 Coefficient of Consolidation values from the Oedometer test show values ranging from 3.1 to 2.3m^2/yr with one outlier of 46m^2/yr which is not considered to be representative of the material.

6.4.18 Derived undrained Youngs Modulus (E_u) from SPT-N_{60} data can be seen in Figure 10.2.7:. along with a characteristic line. Drained Youngs Modulus (E') from SPT-N_{60} can be seen in Figure 10.2.8: with a characteristic design line.

6.4.19 Three samples underwent compaction testing with a 2.5kg rammer (Figure 10.2.14). Results from the testing determined an optimum moisture content and mean maximum dry density of 16% and 1.77Mg/m^3 respectively.

Table 31: Summary of derived geotechnical parameters for Old Mill Farm Underpass.

Derived Geotechnical Parameter	Cohesive Glacial Till
Unit weight ɣ (kN/m3)	18
Undrained Shear Strength (Cu) kPa	1m-15m = 20+8.57(d-1)

Effective angle of internal friction ϕ' (°)		26
Drained Cohesion – C' (kPa)		0
Coefficient of Volume Compressibility mv (m^2/mN)		1m-15m = 0.4-0.025(d-1)
Drained Youngs Modulus (E')		1m-15m = 3+1.28(d-1)
Undrained Youngs Modulus (E_u)		1m-15m = 4+1.71(d-1)
Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)	**Maximum DD (Mg/m3)**	1.82
	Optimum MC (%)	18

6.5 Section 1 – Roe Cross Link Road

6.5.1 Summarised results from in situ and laboratory based testing for the Granular Made Ground and Cohesive Glacial Till present at this location are summarised in Table 32. A summary of derived geotechnical parameters for the materials can be found in Table 33.

Table 32: Roe Cross Link Road Measured Geotechnical Parameters Summary Table.

Measured Geotechnical Parameter		Made Ground (Granular)	Cohesive Glacial Till
Moisture Content w (%)		-	7-29 {22}
Liquid Limit (%)		-	21-41 {25}
Plastic Limit (%)		-	12-21 {24}
Plasticity Index (%)		-	10-22 {27}
Bulk Density γ (Mg/m)		-	1.98-2.31 {11} Oedometer
Dry Density γ (Mg/m)		-	1.59 – 2.10 {11} Oedometer
Particle Density (Mg/m^3)		-	2.65 – 2.66 {11} Oedometer
SPT – N_{60} values (Blows)		24-50 {8}	5-50 {28}
Particle size Distribution (%)	Cobbles	-	-
	Gravel	-	13 – 19
	Sand	-	30 - 50
	Silt	-	14 – 27
	Clay	-	13 - 23
Coefficient of Volume Compressibility m_v (m^2/mN)		-	0.0017 – 1.8 {6}
Coefficient of Consolidation Root Time (m^2/yr)		-	0.62 – 30 {6}

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.5.2 Geotechnical considerations for Topsoil have not been taken into account at Roe Cross Link Road. It is assumed that the topsoil will be removed prior to construction.

Granular Made Ground

6.5.3 Granular Made Ground was found in BH205 located on the embankment carrying Roe Cross Road into Mottram Village. Very limited amounts of the material can also be found in BH403 and BH404. Therefore, the amount of testing carried out on the material is limited to PSD in BH205.

6.5.4 Four Particle Size Distribution Tests were carried out on samples of Granular Made Ground in BH205 and can be seen in Figure 10.3.1.

6.5.5 SPT-N_{60} values for the Granular Made Ground range from 24 to 50 with no distinct increase with depth (Figure 10.3.2:). Based on the data set, a characteristic N_{60} of 32 is considered for design.

6.5.6 The drained angle of internal friction (Phi') for granular soils can be estimated from SPT-N_{60} values and for this material give a range of 34° to 42° with a characteristic Phi' of 37° considered appropriate for the Granular Made Ground (Figure 10.3.3:.)

6.5.7 The drained Youngs Modulus (E') has also been estimated from SPT-N_{60} data based on the correlations in CIRIA 143. Figure 10.3.4: shows the estimated E' values plotted against depth with a characteristic value of 64MPa considered appropriate.

Cohesive Glacial Till

6.5.8 Natural Moisture Content (NMC), Plastic Limit (PL) and Liquid Limit (LL) values for Cohesive Glacial Till at Roe Cross Link Road are plotted on Figure 10.3.5. A characteristic Plasticity Index of 18% is considered appropriate for this section. Plasticity Index values can be seen plotted against LL in Figure 10.3.6: and show the portion tested to be a low plasticity clay.

6.5.9 Measured Bulk Density values from Oedometer testing range from 1.98 to 2.31Mg/m.

6.5.10 The unit weight of the Cohesive Glacial Till, estimated from soil descriptions, has been derived as 18kN/m^3. The majority of descriptions indicate a firm to stiff clay, apart from the upper 3m of the Till which is described as soft, likely due to the presence of watercourses in the area.

6.5.11 5 Particle Size Distribution tests were undertaken on samples of Cohesive Glacial Till with results shown in Figure 10.3.7 and show the Glacial Till to be a very sandy, gravelly, silty clay.

6.5.12 SPT-N_{60} values for the material are presented in Figure 10.3.8 which have then been converted to undrained shear strengths as outlined in Section 6.2.8. The results of this conversion can be seen in Figure 10.3.9 along with a characteristic line.

6.5.13 Coefficient of Volume Compressibility (m_v) values derived from SPT-N_{60} data can be seen on Figure 10.3.10. The values range from 0.04 to 0.45m^2/MN.

6.5.14 Coefficient of Volume Compressibility values have also been derived from Oedometer testing and are shown in Figure 10.3.11. A comparison of SPT derived m_v values and those from Oedometer testing can be seen along with a characteristic m_v line in Figure 10.3.14.

6.5.15 Undrained Youngs Modulus (E_u) values, derived from SPT N_{60} results are shown in Figure 10.3.12. A characteristic line can be seen on the figure, the equation for which can be seen in Table 33.

6.5.16 Drained Youngs Modulus (E') values range from 3 to 27MPa and generally show an increase with depth (Figure 10.3.13) with a characteristic line also shown on the figure.

Table 33: Summary of derived geotechnical parameters - Roe Cross Link Road.

Derived geotechnical parameter		Made Ground (Granular)	Cohesive Glacial Till
Unit weight ɣ (kN/m^3)		21	18
Undrained Shear Strength (Cu) kPa		-	0m-5m=50 5m-10m=90 >10m = 90+11.25(d-10)
Effective Cohesion (c') kPa		-	0
Effective angle of internal friction ϕ' (°)		35	26
Coefficient of Volume Compressibility m_v (m^2/mN)		-	Refer to Figure 10.3.14
Drained Youngs Modulus (E') MPa		56 MPa	0m-5m=7 5m-10m=14 >10m = 14+1.75(d-10)
Undrained Youngs Modulus (E_u) MPa		-	0m-5m=10 5m-10m=18 >10m = 18+2.25(d-10)
Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)	**Maximum DD** (Mg/m^3)	-	-
	Optimum MC (%)	-	-

6.6 Section 1 – Western Cutting

6.6.1 Ground conditions encountered at the location of the proposed Western Cutting are summarised in Section 5.3.23 to Section 5.3.32.

Table 34: Western Cutting Measured Geotechnical Parameter Summary Table.

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till
Moisture Content W (%)		-	-	25 {1}	6-22 {55}	-	14-19 {11}
Liquid Limit (%)		-	-	35 {1}	20-55 {54}	-	19-31 {11}
Plastic Limit (%)		-	-	17 {1}	9-29 {52}	-	11-17 {10}
Plasticity Index (%)		-	-	18 {1}	5-26 {52}	-	10-20 {10}
Bulk Density γ (Mg/m)		-	1.73-2.17 {2}	-	1.7-2.38 {48}	-	2.11-2.27 {8}
Dry Density γ (Mg/m)		-	-	-	1.79-2.24 {10}	-	1.98 {1}
Particle Density (Mg/m^3)		-	-	-	2.65 {10}	-	2.65 {2}
SPT – N_{60} values (Blows)		20-49 {3}	5-8 {3}	-	8-50 {30}	15-32 {3}	13-50 {11}
Particle size Distribution	Cobbles	-	0-5 {2}	-	-	-	-
	Gravel	-	62-65 {2}	-	6-9 {2}	-	42 {1}
	Sand	-	20-23 {2}	-	46-50 {2}	-	30 {1}
	Silt	-	12-13 {2}	-	23-26 {2}	-	15 {1}
	Clay	-	-	-	18-22 {2}	-	12 {1}
Coefficient of Volume Compressibility Mv (m^2/mN)		-	-	-	0.001-0.61 {10}	-	0.033-0.423 {2}

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till
(Oedometer)							
Coefficient of Consolidation (Root Time method) (m^2/yr) (Oedometer)		-	-	-	1.2-20.5 {10}	-	2.54-5.7 {2}
CBR (%)	**Plate Load Test**	-	-	-	-	-	-
	TRL DCP	-	-	-	-	-	-
	Laboratory CBR	-	-	-	2.2-2.3 {2}	-	-

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.6.2 Geotechnical considerations of topsoil have not been taken into account at the location of the proposed Western Cutting. It is assumed that the topsoil will be removed prior to construction.

Cohesive Made Ground

6.6.3 SPT-N_{60} values for the Cohesive Made Ground range from 20 to 49 and can be seen in Figure 10.4.1.

Granular Made Ground

6.6.4 Particle Size Distribution Tests undertaken on two samples of Granular Made Ground in BH212 can be seen in Figure 10.4.2 and show the soil to be slightly silty sandy Gravel.

6.6.5 SPT-N_{60} results for the material are in the range of 5 to 8 with a description of loose GRAVEL (Figure 10.4.1.).

6.6.6 Drained angles of internal friction derived from the SPT-N_{60} results give a range of values between 28° and 29° with a characteristic angle of 28° considered appropriate.

Cohesive Alluvium

6.6.7 Cohesive Alluvium was present in TP10 at a thickness of 0.2m and hence geotechnical testing of this material in this section is limited.

6.6.8 One moisture content test of the material was undertaken with a value of 25%. The material's LL and PL were measured to be 35% and 17% respectively.

6.6.9 A Plasticity Index of 18% resulted in an angle of internal friction for the cohesive alluvium of 26° which is considered appropriate as a characteristic value.

Cohesive Glacial Till

6.6.10 Figure 10.4.3 shows Natural Moisture Contents (NMC), Plastic Limits (PL) and Liquid Limits (LL) for the Cohesive Glacial Till stratum. Plasticity Index values can be seen in Figure 10.4.4 with a characteristic value of 20% decided upon for design purposes. The portion tested is shown to be a low plasticity Clay.

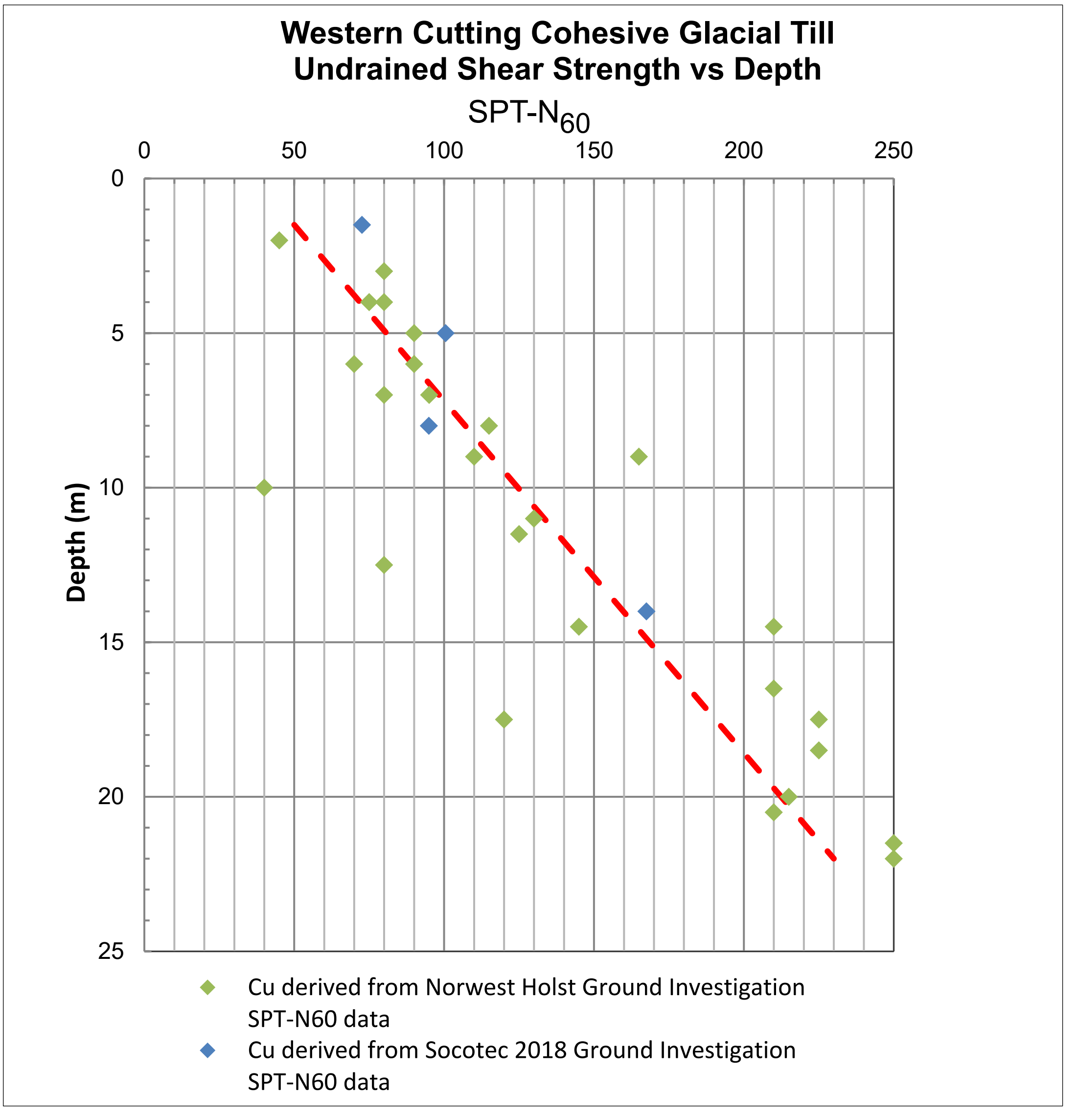
6.6.11 Measured Bulk Density values, measured from oedometer, triaxial and classification testing range from 1.7 to 2.38 Mg/m^3.

6.6.12 SPT-N_{60} data points are shown in Figure 10.4.5 and generally show an increase with depth.

6.6.13 Two PSD grading tests have been carried out on Glacial Till soils within the vicinity of the proposed Western Cutting (Figure 10.4.6.). Both Glacial Till samples were shown to be well graded sandy silty Clay.

6.6.14 Undrained Shear Strength (Cu) parameters for the Glacial Till stratum were derived using SPT-N_{60} data and a Plasticity Index of 20%. The results of this derivation can be seen in Figure 10.4.7.

Figure 10.4.7 Western Cutting Cohesive Glacial Till Undrained Shear Strength.



6.6.15 A drained cohesion (c') of 0 kPa is recommended for the stratum.

6.6.16 A characteristic drained friction angle (Phi') of 26˚ is recommended for the stratum (Figure 10.4.20). This value has been derived using Atterberg Limits data and guidance from BS 8004:2015.

6.6.17 A total of ten oedometer tests were scheduled in order to determine the stratums one – dimensional consolidation (mv) parameters at the proposed Western Cutting, the results of which can be seen in Figure 10.4.8.

6.6.18 Glacial Till mv values derived from SPT-N_{60} data show a linear reduction with depth (Figure 10.4.9). A characteristic line taking into consideration both oedometer test data and SPT derived m_v can be seen in the figure.

6.6.19 Coefficients of Consolidation (m2/yr) values measured at varying applied stresses during the oedometer testing can be seen in Figure 10.4.21.

6.6.20 An undrained Youngs Modulus (Eu) profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.4.18. and is considered appropriate for design purposes.

6.6.21 A drained Youngs Modulus (E') profile for Glacial Till soils, derived from SPT-N_{60} data is presented in Figure 10.4.19.

Laminated Glacial Till

6.6.22 Figure 10.4.12 shows Natural Moisture Contents (NMC), Plastic Limits (PL) and Liquid Limits (LL) for the Laminated Glacial Till. Plasticity Index results can be seen plotted on the Casagrande chart in Figure 10.4.13 and show the portion tested to be a low plasticity Clay. A characteristic Plasticity Index of 18% is considered appropriate for design purposes.

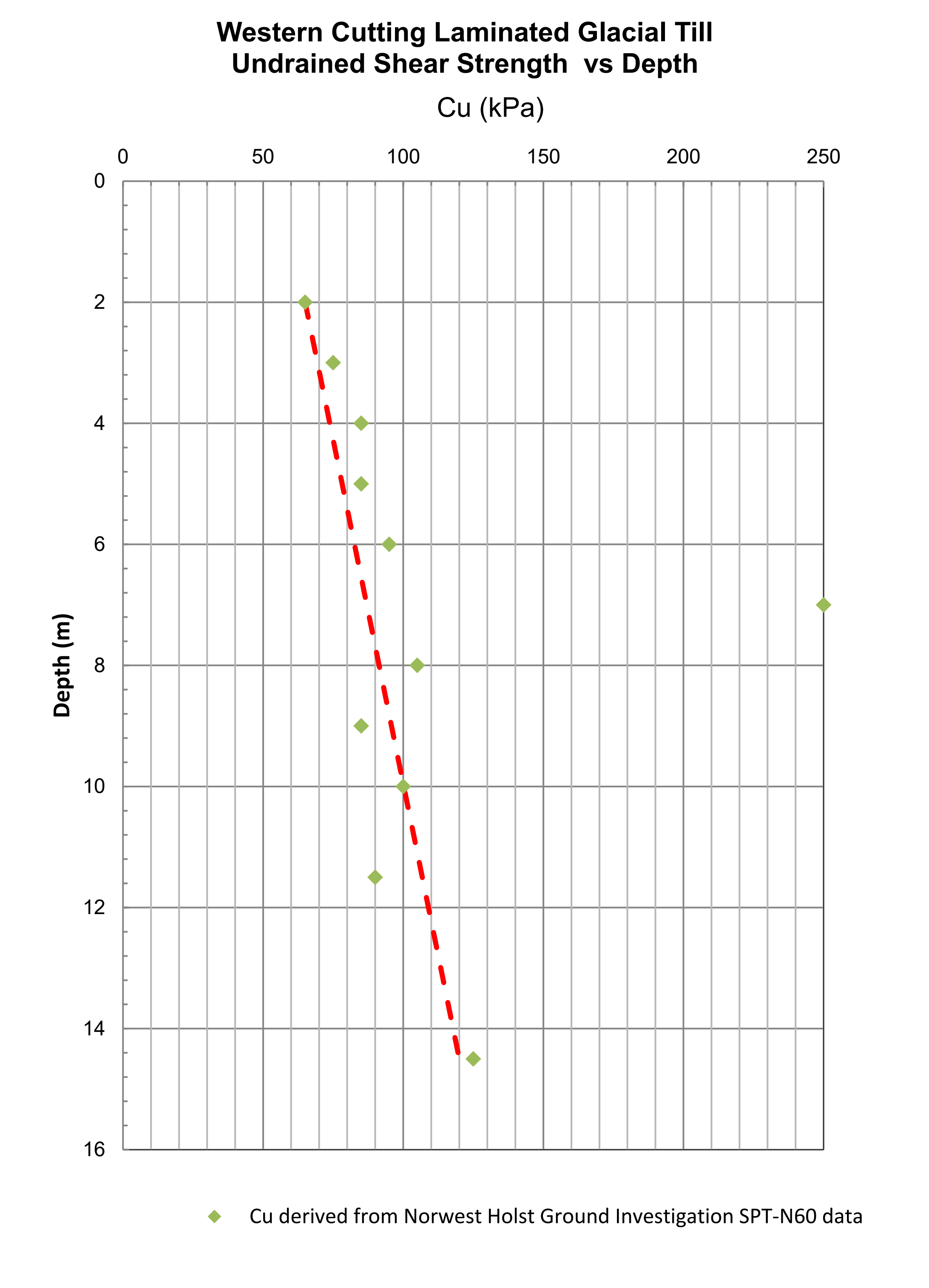
6.6.23 Measured Bulk Density values, measured from oedometer, triaxial and classification testing range from 2.11 to 2.27 Mg/m^3.

6.6.24 SPT-N_{60} data points show a generally linear increase with depth with a characteristic SPT line shown in Figure 10.4.14.

6.6.25 One PSD grading test has been carried out on Laminated Glacial Till soils within the vicinity of the proposed Western Cutting. The sample was shown to be a well graded cohesive soil with a clay content of 13% and silt content of 15%. Sand and gravel contents are 30% and 42% respectively.

6.6.26 Undrained Shear Strength (Cu) parameter values for the Laminated Glacial Till stratum were derived using SPT-N_{60} data and a Plasticity Index of 20%. A characteristic line for the undrained shear strength is shown along with the data in Figure 10.4.15.

Figure 10.4.15. Western Cutting Laminated Glacial Till Undrained Shear Strength.



6.6.27 A drained cohesion (c') of 0 kPa is recommended for the stratum.

6.6.28 A characteristic drained friction angle (Phi') of 26° is recommended for the stratum. This value has been derived using Atterberg Limits data and guidance from BS 8004:2015. The results of this derivation can be seen in Figure 10.4.22.

6.6.29 A total of two oedometer tests were scheduled in order to determine the stratums one – dimensional consolidation (m_v) parameters at the proposed Western Cutting. A plot of the Coefficient of Volume Compressibility (m2/MN) against Applied Stress (kPa) is presented in Figure 10.4.16.

6.6.30 Glacial Till m_v values derived from SPT-N_{60} data show a linear reduction with depth (Figure 10.4.17).

6.6.31 A comparison of laboratory m_v values and derived in-situ m_v data shows both sets of data to correlate well.

6.6.32 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing indicate a range of 2.5 to 5.7m^2/yr (Figure 10.4.23).

6.6.33 An undrained Youngs Modulus (Eu) profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.4.18. A characteristic line for Eu can also be seen in the figure.

6.6.34 A drained Youngs Modulus (E') profile for Glacial Till soils along with a characteristic line, derived from SPT-N_{60} data is presented in Figure 10.4.19.

Granular Glacial Till

6.6.35 Due to the limited amount of Granular Glacial Till in this section, only a limited amount of geotechnical testing is available.

6.6.36 Three SPT-N_{60} results are available for the Granular Glacial Till ranging from 15 to 32 (Figure 10.4.24). The results do show an increase with depth but due to the limited amount of data, this trend cannot be relied upon.

6.6.37 Drained angles of internal friction derived from SPT-N_{60} values give a range from 32° to 37° (Figure 10.4.25). Due to the limited amount of data, a conservative characteristic value of 32° is considered appropriate for the Granular Glacial Till at this location.

6.6.38 Drained Youngs Modulus, derived from SPT-N_{60} values are shown in Figure 10.4.26. Again, due to the limited amount of data available, a lower bound characteristic value of 30MPa is considered appropriate.

Table 35: Western Cutting Derived Geotechnical Parameter Summary Table.

Derived Geotechnical Parameter	Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till
Unit weight ɣ (kN/m3) (Look)	17	17	17	18	20	18
Undrained Shear Strength (Cu) kPa	-	-	-	50+8.78(d-1.5)	-	65+4.23(d-2)
Effective angle of internal friction ϕ' (°)		28	26	26	32	26
Drained Cohesion (C') kPa	0	-	0	0	-	0
Coefficient of Volume Compressibility Mv (m^2/MN)				Figure 10.4.8		Figure 10.4.16
Drained Youngs Modulus (E') MPa	-		-	8+1.27(d-1.5)	30	10+0.61(d-2)
Undrained Youngs Modulus (Eu) MPa	-	-	-	10+1.7(d-1.5)	-	13+0.85(d-2)
Optimum dry density (DD) / **Maximum Dry Density (Mg/m^3)**	-	-	-	1.92	-	-

Derived Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till
Optimum moisture content (MC) (2.5kg Rammer)	Optimum Moisture Content (%)	-	-	-	14	-	-

6.7 Section 2 – Mottram Underpass and associated Wing Walls

6.7.1 A summary of ground conditions encountered at the Mottram Underpass and Wing Walls are summarised in Section 5.2.100 to Section 5.2.103.

6.7.2 A Glacial Till thickness map for the Mottram Underpass area is shown on Drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3055. Several Mottram Underpass Cross Sections are shown on Drawings HE551473-ARC-HGT-S2_ML001-DR-CE-3052 to HE551473-ARC-HGT-S2_ML001-DR-CE-3054.

Table 36: Mottram Underpass and Wing Walls Measured Geotechnical Parameter Summary Table.

		Made Ground (Granular)	Made Ground (Cohesive)	Cohesive Glacial Till	Granular Glacial Till
Moisture Content w (%)		-	-	13-30 {16}	-
Liquid Limit (%)			-	23-52 {44}	
Plastic Limit (%)			-	10-23 {44}	
Plasticity Index (%)			-	4-31 {44}	
Bulk Density γ (Mg/m)		-	-	1.97-2.38 {35}	-
Dry Density γ (Mg/m)		-	-	1.65-2.24 {47} Oedometer, Triaxial	-
Particle Density (Mg/m³)		-	-	2.65-2.8 {19}	-
SPT – N_{60} values (Blows)		5-8 {2}	20-49 {3}	7-50 {32}	15-50 {2}
Particle size Distribution (%)	**Cobbles**	-	-	-	-
	Gravel	-	-	6-25 {5}	46 {1}
	Sand	-	-	34-46 {5}	33 {1}
	Silt	-	-	26-30 {5}	15 {1}
	Clay	-	-	13-21 {5}	6 {1}
Coefficient of Volume Compressibility Mv (m²/mN)		-	-	0.001-0.75 {91}	-
Coefficient of Consolidation Root Time (m²/yr)		-	-	-4.1-21 {43}	-
California Bearing	**Top**	-	-	0.61-3.4 {5}	-

		Made Ground (Granular)	Made Ground (Cohesive)	Cohesive Glacial Till	Granular Glacial Till
Ratio (CBR) %	Bottom	-	-	0.79-5.5 {5}	-

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.7.3 Geotechnical considerations for Topsoil have not been taken into account at Carrhouse Lane. It is assumed that the topsoil will be removed prior to construction.

Made Ground

6.7.4 Made Ground encountered in the vicinity of the Mottram Underpass and Wingwalls are localised to roads, areas of developed properties and retaining walls encountered along Mottram Village. Limited geotechnical tests were undertaken on Made Ground samples due to their sporadic occurrence within the area of the proposed Mottram Underpass.

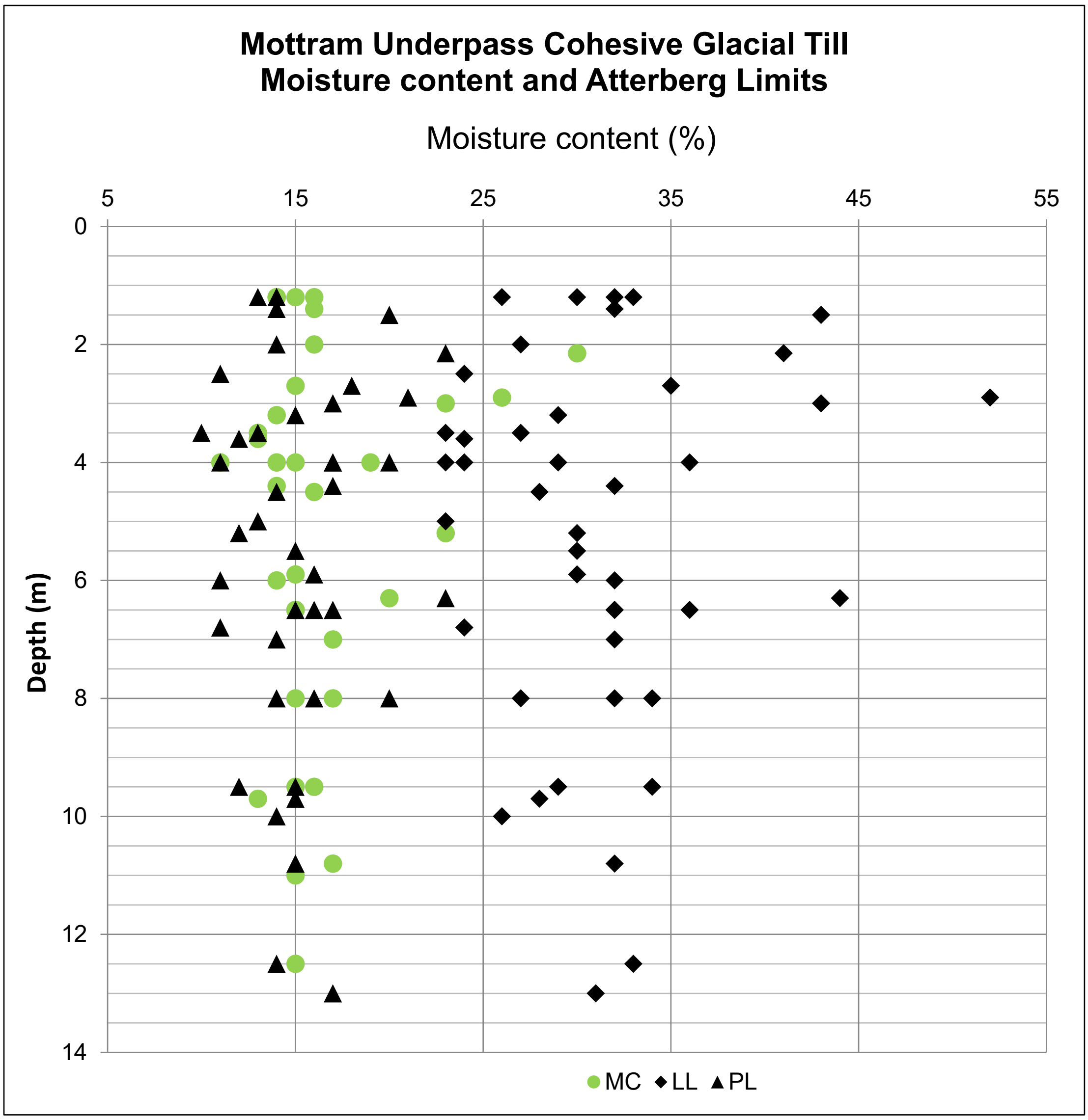
6.7.5 Two SPT's were recorded in Granular Made Ground soils within BH38. SPT-N_{60} values were recorded to range from 5 to 8 and are shown in Figure 10.5.1.

6.7.6 Three SPT's were recorded in Cohesive Made Ground soils in BH212. N_{60} Values ranged from between 20 to 49 and are also shown in Figure 10.5.1. Values presented for the cohesive Made Ground Stratum are not considered to represent its in-situ strength, which is considered to be highly variable given the nature of the material.

Cohesive Glacial Till

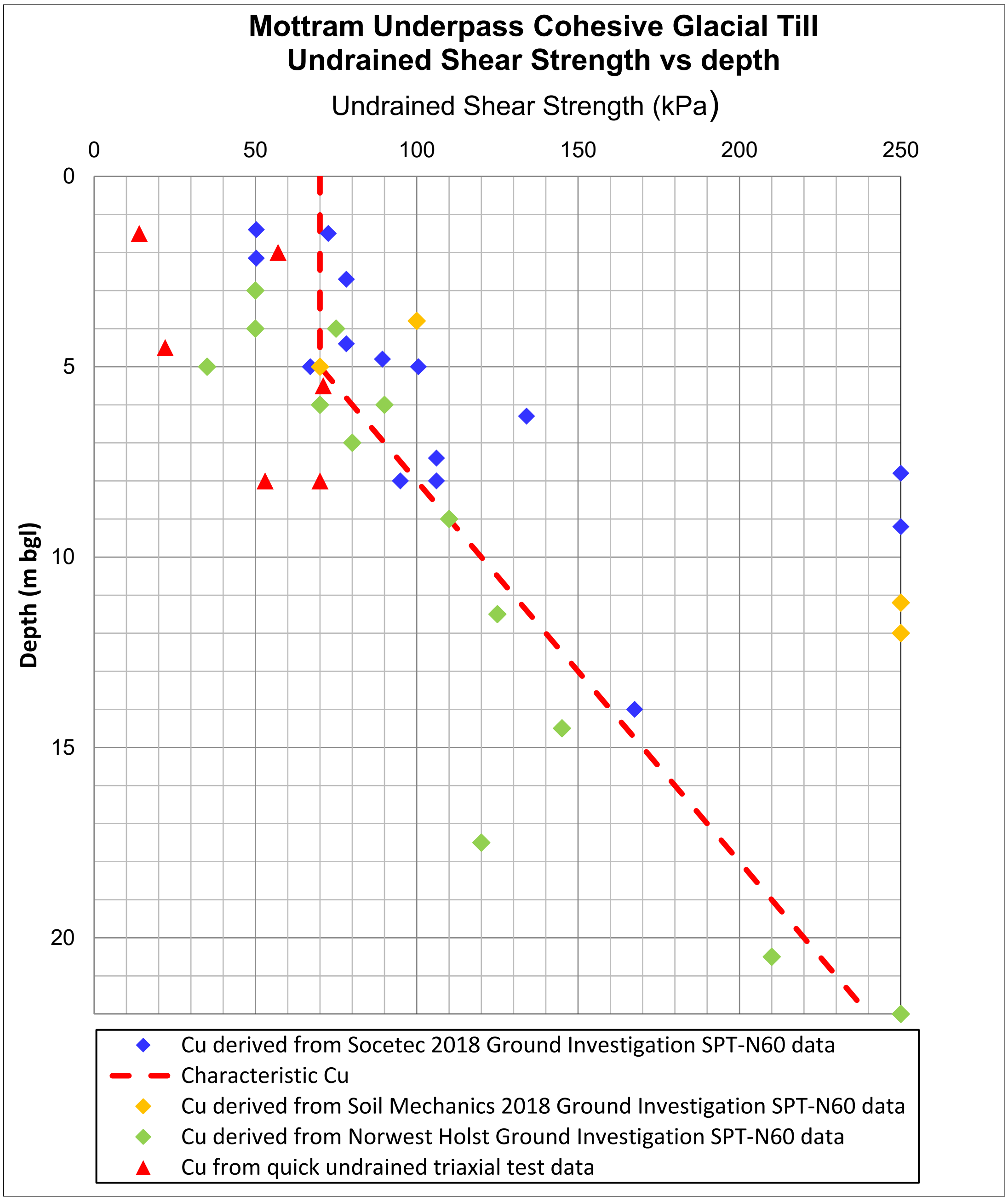
6.7.7 Natural Moisture Content (NMC), Plastic Limit (PL) and Liquid Limit (LL) results for the Cohesive Glacial Till are shown in Figure 6.7.1 and Figure 10.5.2. Plasticity Index (PI) values are presented on an Atterberg Limit plot in Figure 10.5.3 and the portion tested is shown to be a clay of low to intermediate plasticity. A characteristic PI of 16% is considered appropriate for design.

Figure 6.7.1: Mottram Underpass Cohesive Glacial Till Moisture Content.



6.7.8 A total of 32 no SPT's have been undertaken within cohesive Glacial Till soils in the vicinity of the Mottram Underpass and Wingwalls and are presented in Figure 6.7.3with a characteristic line also displayed on the chart.

Figure 6.7.2. Mottram Underpass Cohesive Glacial Till Undrained Shear Strength.

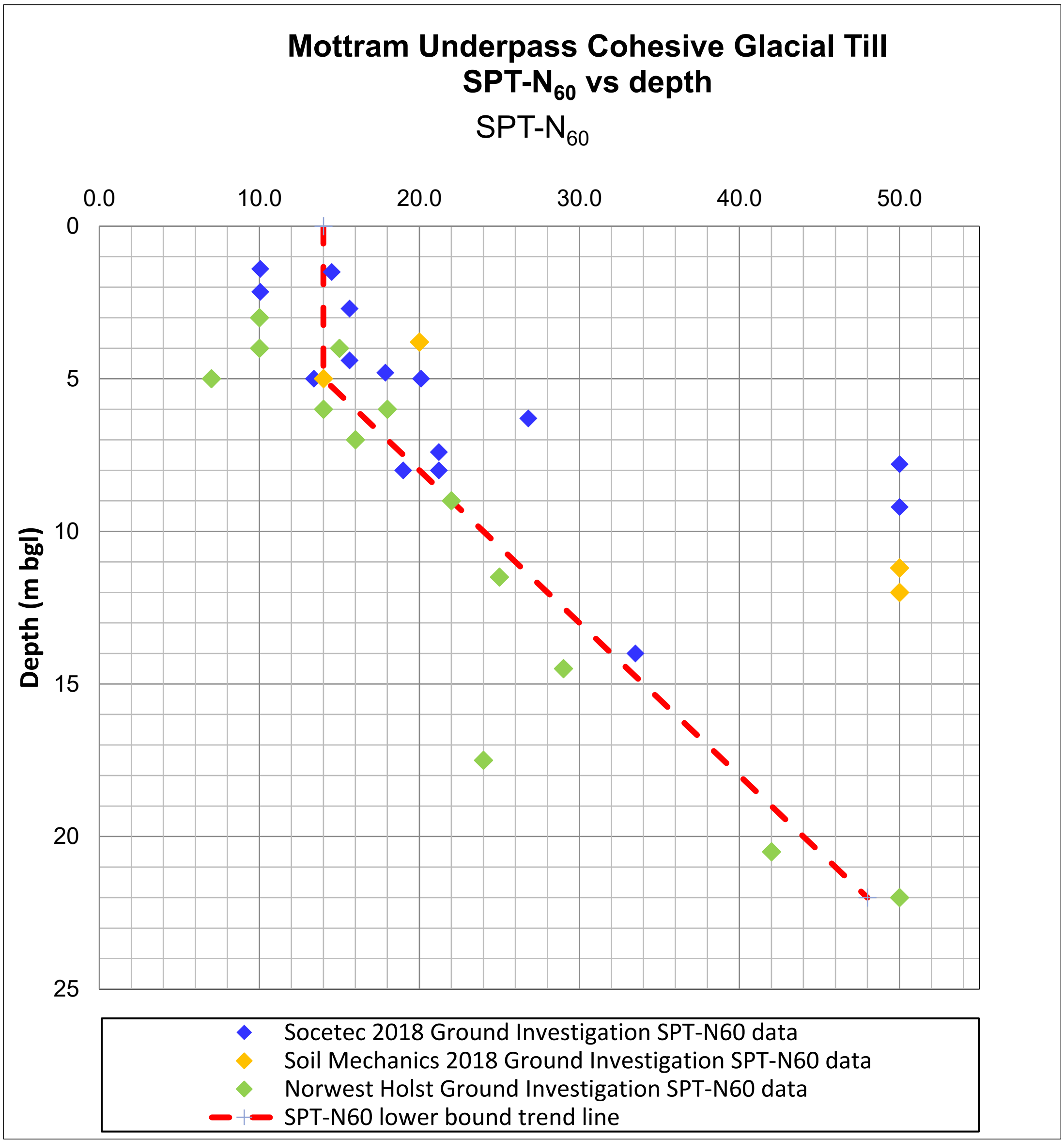


6.7.9 A total of five PSD tests were undertaken within cohesive Glacial Till soils during the Socotec 2018 Ground Investigation. All tested specimens were well graded cohesive soils and the data is presented in Figure 10.5.5.

6.7.10 A Cu vs depth plot, inclusive of Cu parameters derived using SPT-N_{60} data and quick undrained triaxial tests data from the Mottram Underpass and Wingwalls is presented as Figure 6.7.2 with a characteristic line derived from the data.

6.7.11 A review of the historical multistage quick undrained triaxial data shows the samples to be tested at increasing applied cell pressures. A range of Cu values, increasing with cell pressure, is presented for each individual test, indicating that the samples may have not been collected or prepared properly. Values from the historical quick undrained triaxial tests are therefore considered to be unrepresentative of in-situ conditions for the stratum.

Figure 6.7.3. Mottram Underpass Cohesive Glacial Till SPT N_{60}.



6.7.12 A total of eight consolidated undrained triaxial tests with pore water pressure measurements were undertaken on undisturbed samples obtained from the stratum. Effective cohesion, c', values recorded during testing ranged from 0 to 5.0kPa. A characteristic c' of 0kPa is considered to be appropriate for the stratum.

6.7.13 Phi' values obtained from a derivation based on PI data and guidance from BS 8004:2015 ranged from 24˚ to 30˚ (Figure 10.5.16). Effective stress plots from the CU triaxial tests (Figure 10.5.7) show the angle of internal friction from the gradient of the trend line. A characteristic phi' of 26˚ is considered to be appropriate for Glacial Till soils encountered in the area of the Mottram Underpass.

6.7.14 A total of twelve oedometer tests were scheduled for the stratum in the area of the Mottram Underpass and Wingwalls. A plot of m_v (m^2/MN) against Applied Stress (kPa) is presented in Figure 10.5.8. Findings generally show a linear reduction in m_v values with increasing stress.

6.7.15 M_v values derived via SPT-N_{60} data recorded m_v values to range from between 0.30 to 0.040 m2/MN and are presented in Figure 10.5.9.

6.7.16 A comparison of m_v values derived from oedometer testing and a derivation of SPT-N_{60} data shows a similar trend with a characteristic line taking into consideration both data sets shown on Figure 10.5.8.

6.7.17 Coefficients of Consolidation measured at varying applied stresses during the oedometer testing ranged from 0.80 to 22 m2/yr and are shown in Figure 10.5.10.

6.7.18 An Eu profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.5.11 with a characteristic line derived from the data.

6.7.19 A E' characteristic profile derived from SPT-N_{60} data Is shown in Figure 10.5.12 with the equation of the characteristic profile given in Table 37.

6.7.20 Pressuremeter tests were undertaken in the vicinity of the Mottram Underpass during historical ground investigation phases. Testing results reported in the Hyder Consulting 2006 GIR state a general increase in Shear Modulus (G) with depth. Data plots show a relatively large range of scatter. However a trend line where G = 2MPa at 5.0m bgl to approximately 13MPa at 25m can be derived from the plot.

6.7.21 Findings from the pressuremeter testing can be used to derive an E' value of the Glacial Till stratum by using the following equation.

$$G = \frac{E}{2(1+v)}$$

6.7.22 Where

G = Shear Modulus

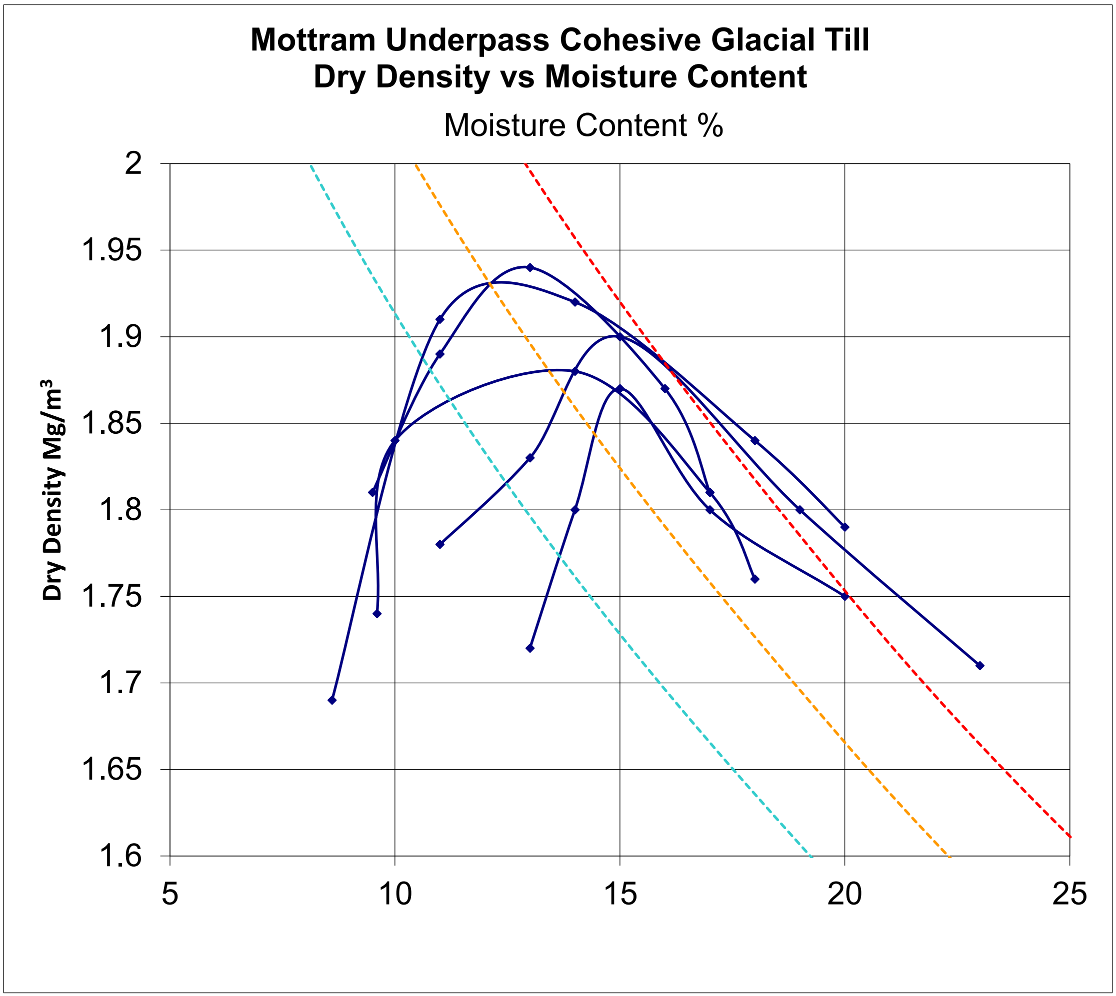
E = Youngs Modulus

v = Poisson's ratio

6.7.23 A Poissons ratio of 0.1 to 0.2 is considered to be appropriate for an over-consolidated clay in a drained analysis. An E' range of 4.4 to 4.8MPa at 5m and 28.8 to 31.2MPa at 25m can be derived from the equation above. A comparison of E' values derived from SPT-N_{60} data discussed in Section 6.7.19. Data shows a good correlation between the two data set derivations.

6.7.24 Five samples underwent compaction testing using a 2.5kg rammer with a mean maximum dry density of 1.90Mg/m^3 and mean optimum moisture content of 15% considered appropriate for design. A plot of Moisture Content vs Dry Density (Mg/m^3) is presented as Figure 6.7.4.

Figure 6.7.4. Mottram Underpass Cohesive Glacial Till Maximum Dry Density and Optimum Moisture Content.



Granular Glacial Till

6.7.25 Granular Glacial Till soils encountered represent Sand lenses sporadically encountered within the Glacial Till stratum.

6.7.26 Two SPT's were undertake within granular Glacial Till soils. N_{60} values were recorded to ranged from 15 to 50 and are shown plotted against depth in Figure 10.5.14.

6.7.27 One grading test was undertaken on a granular Glacial Till deposit with the particle size distribution shown in Figure 10.5.15.

6.7.28 A Phi' of 28˚ is recommended for the granular Glacial Till soils encountered within the Mottram Underpass area given their sporadic distribution and relatively low thickness.

6.7.29 One compaction test was undertaken on a granular Glacial Till sample. Findings from the test measured an optimum moisture content of 10% and a maximum dry density of 1.95 Mg/m^3.

Table 37: Mottram Underpass Derived Geotechnical Parameters Summary Table.

<table>
<tr><th colspan="2">Derived Geotechnical Parameter</th><th>Made Ground (Cohesive)</th><th>Made Ground (Granular)</th><th>Cohesive Glacial Till</th><th>Granular Glacial Till</th></tr>
<tr><td colspan="2">Unit Weight ɣ (kN/m³)</td><td>18</td><td>18</td><td>18</td><td>20</td></tr>
<tr><td colspan="2">Undrained Shear Strength (Cu)
kPa</td><td>-</td><td>-</td><td>70kPa to 5m bgl and 70 + (d – 5) 10 From 5m to 22m bgl</td><td>-</td></tr>
<tr><td colspan="2">Effective Angle of Internal Friction ϕ’ (°)</td><td>-</td><td>28</td><td>26</td><td>28</td></tr>
<tr><td colspan="2">Effective Cohesion (c’)</td><td>0</td><td>-</td><td>0</td><td>-</td></tr>
<tr><td colspan="2">Coefficient of Volume Compressibility m_v (m^2/mN)</td><td>-</td><td>-</td><td>Refer to Figure 10.5.8</td><td>-</td></tr>
<tr><td colspan="2">Drained Youngs Modulus (E’)</td><td>15 MPa</td><td>10 MPa</td><td>0-5m = 10
5m-22m = 10 +1.52 (d-5)</td><td>30MPa</td></tr>
<tr><td colspan="2">Undrained Youngs Modulus (E_u)</td><td>20MPa</td><td>-</td><td>0-5m = 14
5m-22m = 14 + 2(d-5)</td><td>-</td></tr>
<tr><td rowspan="2">Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)</td><td>Maximum DD (Mg/m3)</td><td>-</td><td>-</td><td>1.90</td><td>1.95</td></tr>
<tr><td>Optimum MC (%)</td><td></td><td></td><td>14</td><td>10</td></tr>
</table>

Millstone Grit

6.7.30 A description of the location and composition of the Millstone Grit beneath the Mottram Underpass is presented in Section 5.3.33 to Section 5.3.63.

Table 38: Summary of measured Rock geotechnical parameter values – Mottram Underpass.

Measured Geotechnical Parameter	Mudstone	Siltstone	Sandstone
Bulk Density (Mg/m^3)	(2.57 – 2.65) {5}	(2.53 – 2.63) {2}	(2.47 – 2.63) {5}
SPT-N_{60}	(34 - 750) {14}	(47 – 1000) {9}	(29 – 750) {5}
$Is_{(50)}$ corrected (MPa)	(0.02 – 3.83) {91}	(0.05 – 6.03) {73}	(0.06 – 5.09) {48}
Uniaxial Compressive Strength tests (UCS) (MPa)	(30.3 – 74.3) {4}	(9.1 – 57.4) {2}	(14.4 – 129.8) (8)
UCS derived via SPT-N_{60} conversion (MPa)	(340 – 7500) {14}	(470 – 10,000) {9}	(270 – 7500) {5}

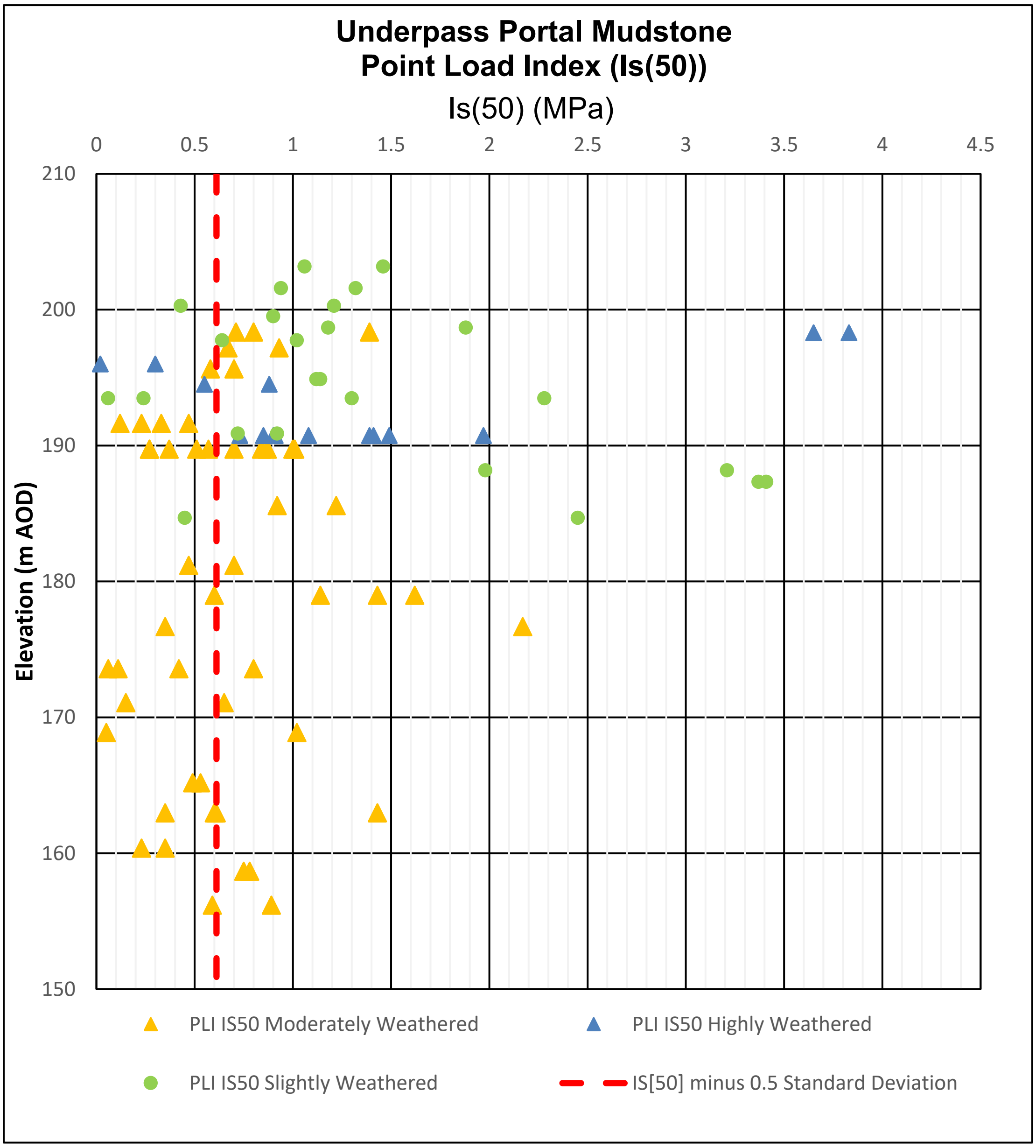
Mudstone

6.7.31 A total of 28 SPT's were undertaken within the Mudstone stratum. A plot of N_{60} values are shown in Section 10.5.

6.7.32 Derived UCS values for the Highly weathered SPT-N_{60} data points provided a range of 0.17 to 7.5MPa. Derived UCS values for strata described as Moderately and Slightly weathered bedrock ranged from 0.25 to 0.50MPa from depths of 16m to 22m bgl. These lower bound values are possibly considered to form faulted and disturbed units of bedrock encountered at depth.

6.7.33 Point Load Index testing provided a $I_s(_{50})$range of 0.02 to 3.83 MPa for samples which have been corrected for size. A Plot of $I_s(_{50})$data points for Highly, Moderately and Slightly weathered strata is provided in Figure 6.7.5. Highly weathered samples generally provided a lower bound range of $I_s(_{50})$data points which ranged between 0.02 to 1.97MPa from 16.0m to 21.0m bgl. Data points for the Highly, Moderately and Slightly weathered rock material are shown to provide a large range of data points, with no clear trends with depth.

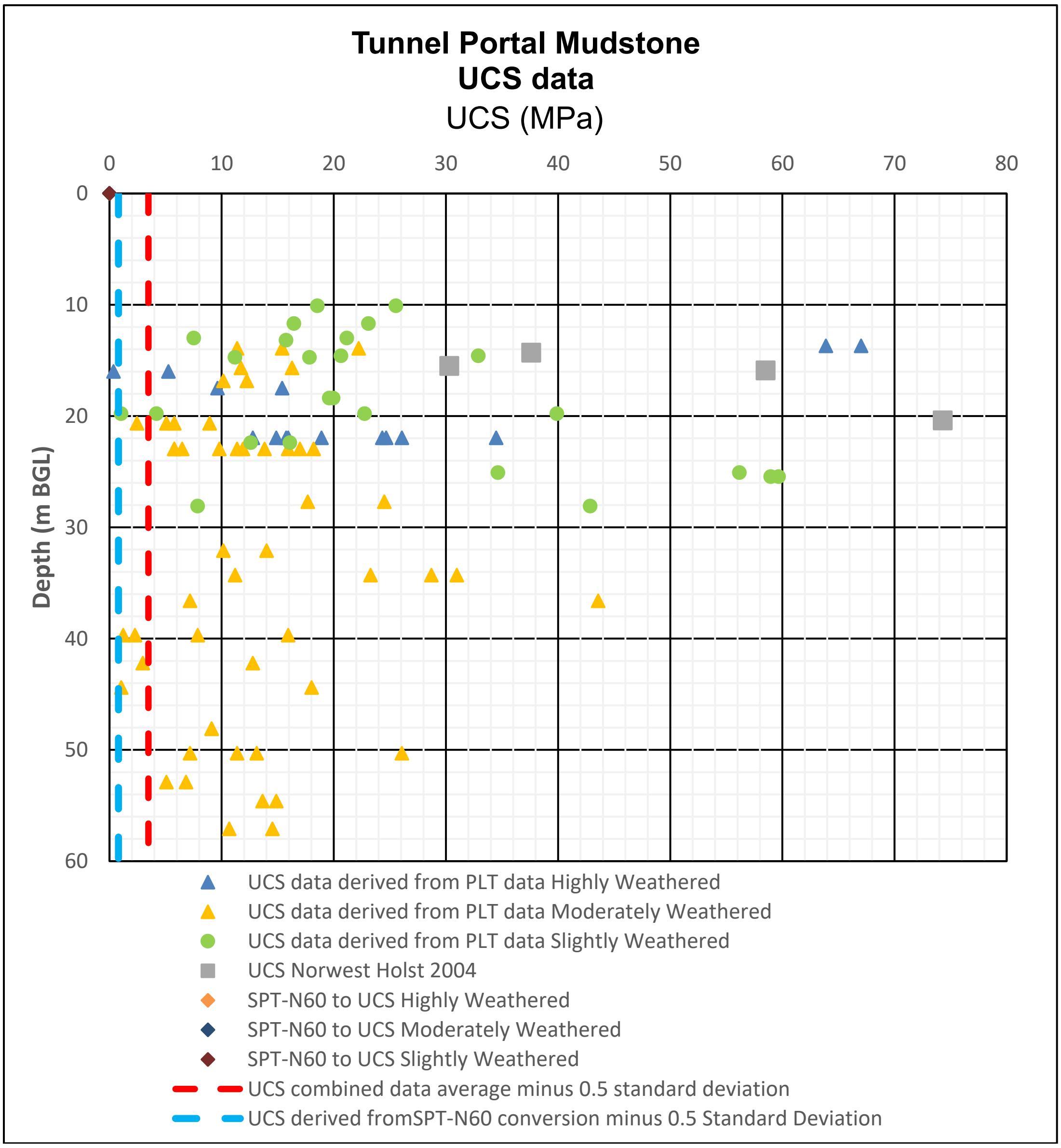
Figure 6.7.5. Mottram Underpass Mudstone Point Load Index vs depth.



6.7.34 Four UCS tests were undertaken on cored Mudstone samples. Additional samples were scheduled during the Socotec 2018 ground investigation. However feedback from the laboratory stated that the samples broke apart during preparation for testing. Successfully tested samples provided a UCS range of between 30 to 74MPa. Weaker rock should be assumed to exist around the samples that were successfully tests.

6.7.35 $I_{s(50)}$data points converted to UCS data points as discussed in 6.2.30, provided a UCS range of 30.3 to 129.8MPa for samples. A Plot of UCS data points derived from SPT-N_{60}, $I_{s(50)}$ data and direct UCS tests are shown in Figure 6.7.5.

Figure 6.7.5: Mottram Underpass Mudstone UCS datapoints vs depth.



6.7.36 A chart of combined derived UCS data is shown on Figure 6.7.5. Lower range UCS values have been derived from the SPT-N_{60} data conversions. These lower bound values are considered to represent the Rock Mass material, as opposed to the Rock Material which has been measured via Point Load Data and Direct UCS testing.

6.7.37 A characteristic UCS value of highly weathered / tectonically disturbed Mudstone stratum of 0.50MPa is considered to be appropriate for the stratum where safety of the design depends on strength. This value has been obtained from a statistical analysis of the SPT-N_{60} derived data for the Highly weathered Mudstone Stratum. Higher values may be appropriate for example when assessing excavatability. A characteristic UCS value of 3.5MPa is considered to be appropriate for the Moderately to slightly weathered Mudstone unit where design depends on strength. Higher values may be appropriate for example when assessing excavatability. Higher values may also be justifiable at depths greater than 20m bgl.

6.7.38 Discontinuity data derived from the televiewer geophysical survey undertaken in Boreholes BH409 showed bedding to dip by 39 to 45 degrees towards the South East.

These data points are considered to be within the zone of high tectonic deformation. Adjacent discontinuity data readings from surveyed boreholes within the Cutting show the bedding to generally dip between 10 to 20 degrees. This alteration in bedding dip indicates a degree of faulting and / or folding may have altered the geological structure of the bedrock in this part of the site. Bedding within BH409 was recorded to dip towards 120 to 130 degrees / the south-east.

6.7.39 Bedding spacing within the Mudstone Unit is measured to range from between 0.01m to 0.90m. This equates to a bedrock material of thinly laminated to thickly bedded stratum. A review of the exploratory borehole logs for the Mudstone unit generally indicate that the material is thinly laminated.

6.7.40 A near vertical joint set, dipping at up to 80 degrees was recorded within the Mudstone Unit. Discontinuities within the Mudstone Unit are typically planar, smooth with rare clay infilling within the faulted area. Steep discontinuity's measured in BH409 were generally spaced at 0.20m to 3.80m, which equates to a discontinuity spacing of close to very wide. A review of borehole comments within the Mudstone stratum indicate that the bedrock is frequently observed to be non-intact, indicating that a worse case discontinuity spacing of extremely close is likely to represent the stratum.

6.7.41 RQD values of between 9 to 100% were recorded within the Mudstone stratum encountered within BH41 and BH42. These two borehole positions lie towards the edge of the inferred Fault Zone marked on HE551473-ARC-HGT-S2_ML001-DR-CE-3062. Boreholes within the central area of the Highly Sheared zone recorded RQD's of between 0% to 41% (BH407, BH408 and BH409). No clear improvement of RQD was observed with increasing depth within these locations.

Siltstone

6.7.42 31 SPT's were undertaken within the Siltstone stratum. N_{60} values for the Highly weathered stratum show the largest range with N_{60} values generally ranging from between 50 to 134 from SPT's undertaken between 1.20m to 4.20m bgl. SPT's undertaken within the Moderately or Slightly weathered material generally fell within the range stated for the Highly weathered material as shown in Section 10.5.

6.7.43 UCS data points derived from SPT-N_{60} data for the Highly weathered stratum provided a range of 0.35 to 0.67MPa. Moderately and Slightly weathered Units are shown to provide a UCS range of between 0.50 to 1.2MPa. Lower range derived UCS values within the Siltstone Unit may be indicative of signs of tectonic deformation at depths of up to 27.5m bgl.

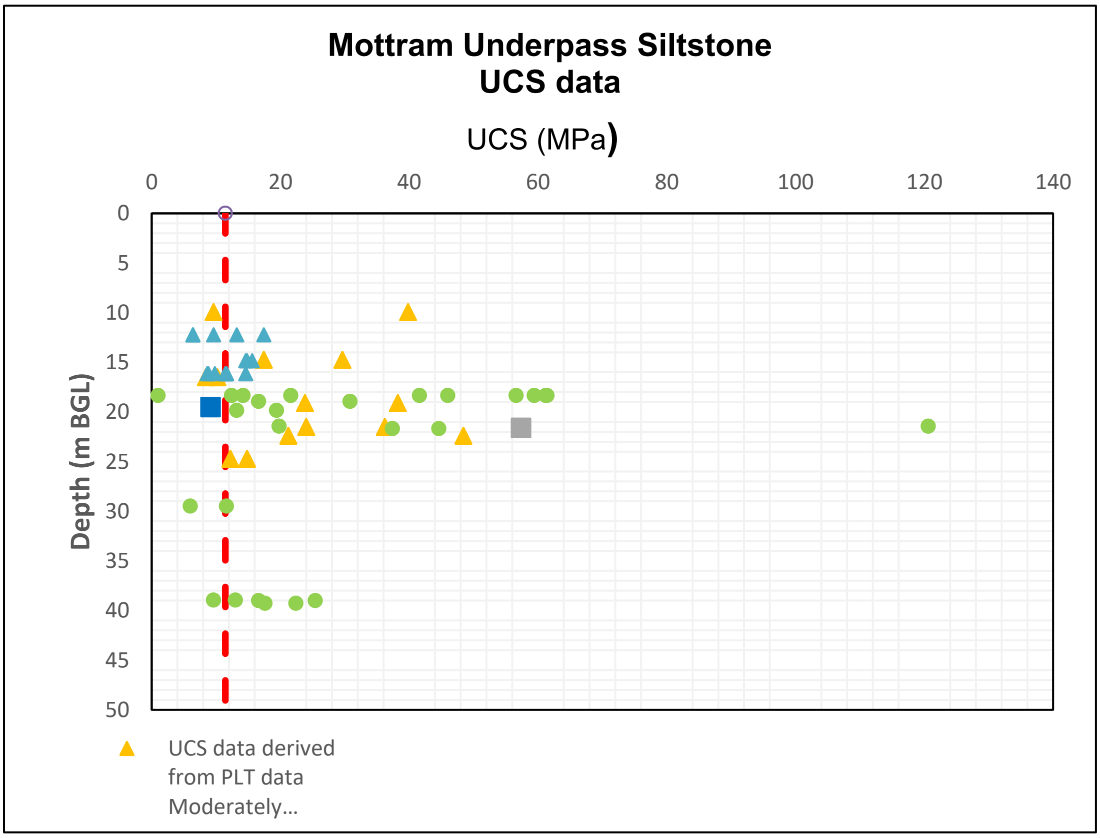
6.7.44 Point Load Index testing provided an $I_s(50)$ range of 0.05 to 3.07 MPa for samples which have been corrected for size. Data points for Highly, Moderately and Slightly weathered Siltstone units are not shown to vary greatly with increasing depth.

6.7.45 Two UCS tests were undertaken on the Siltstone stratum. Successfully tested samples provided a UCS range of between 9 and 57MPa.

6.7.46 $I_s(50)$ data points converted to UCS data points as discussed in Section 6.2.30, provided a UCS range of 1.0 to 120MPa. A Plot of UCS data points derive from SPT-N_{60}, $I_s(50)$ data and direct UCS tests are shown inFigure 6.7.6.

6.7.47 A derivation of the UCS material was undertaken by subtracting 0.50 x Standard Deviation from the mean as opposed to 1.0 x Standard deviation from the mean as per the approach undertaken for the Mudstone stratum. A value of 1.0 x standard deviation was undertaken for the Mudstone given its position within the Highly sheared part of the site. A characteristic UCS of 0.40MPa is considered to be appropriate for the highly weathered Siltstone stratum based on an assessment of the SPT-N data. A UCS of 13MPa is considered to be appropriate for the moderately to slightly weathered strata based on PLT and UCS testing data.

Figure 6.7.6: Mottram Underpass Siltstone UCS datapoints vs depth (m bgl).



6.7.48 The Siltstone Unit is typically described as thinly laminated, with lamination planes dipping at between 5 – 10 degrees. Additional joints are reported to dip at up to 45 degrees within the unit. A review of the Televiewer information obtained from BH410 indicates that shallow bedding or lamination planes are present, dipping between approximately 10 to 20 degrees. Frequent joint sets dipping at20 to 50 degrees are frequently recorded within the Siltstone unit in BH410 between 23.04m to 26.10m bgl (186.65 to 183.59m AoD). Discontinuities within the Siltstone Unit are typically recorded to be planar smooth with rare clay or silt infill. A minimum joint spacing of 0.07m is measured using the televiewer data. A review of the field log descriptions for BH41 support this observation where discontinuities are described to be extremely closely spaced.

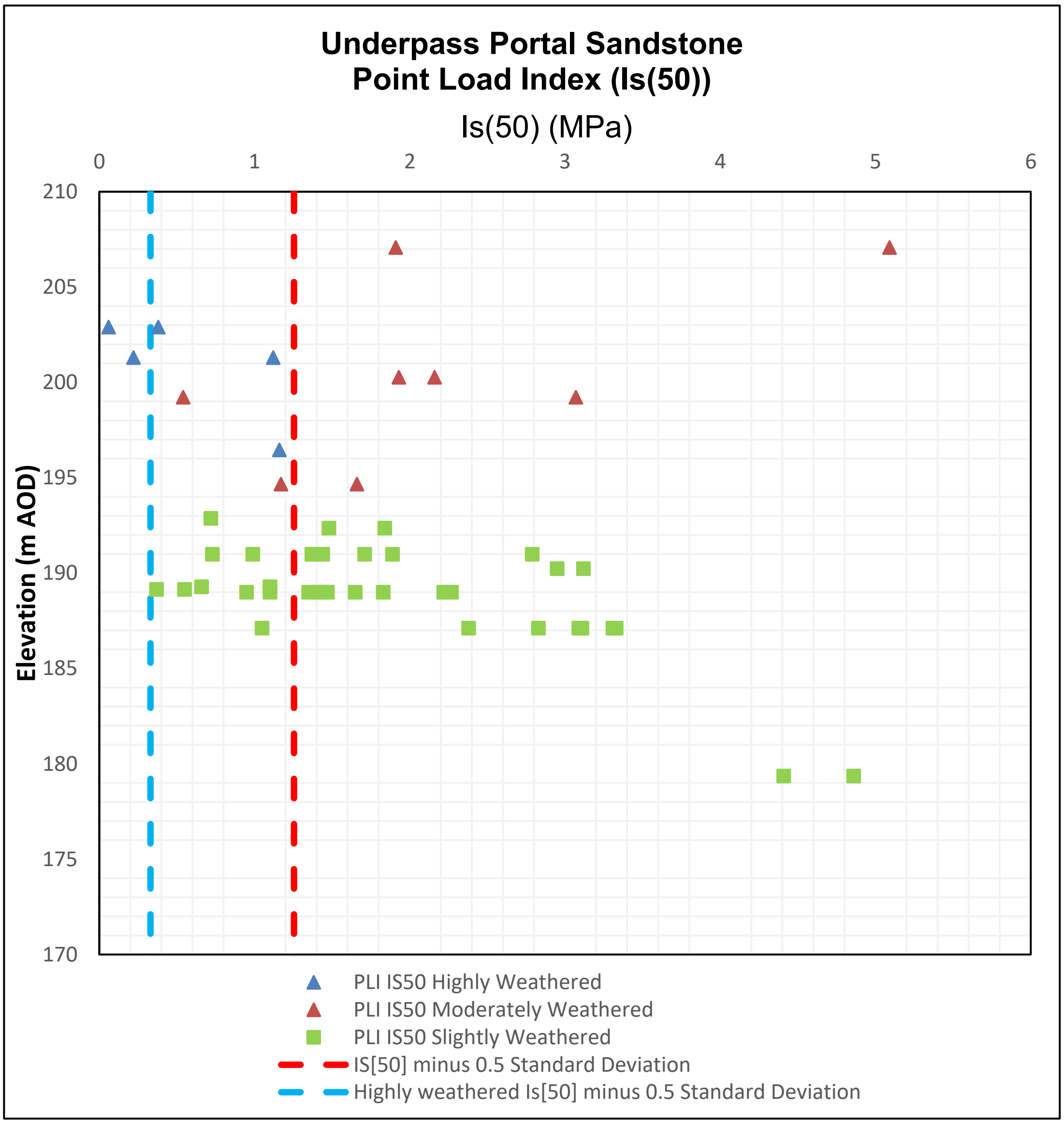
6.7.49 Fracture spacing within the Siltstone stratum in BH405 between depths of 15.60m to 21.50m bgl (196.92 - 191.47m AoD) recorded a maximum fracture spacing range of 40mm to 130mm. The fracture spacing was recorded to generally improve within the underlying Sandstone unit from 22.50m to 35.9m bgl (190.02m to 176.62m AoD). RQD values are shown to range from 0 to 7% within the Siltstone horizon and are generally shown to improve to between 30 and 83% once within the Sandstone unit from 22.50m to 35.9m bgl (190.02m to 176.62m AoD).

Sandstone

6.7.50 Four SPT's were undertaken within the Sandstone within the footprint of the Mottram Underpass. N_{60} values are shown to range from between 50 and 250. Insufficient data points are available to make a meaningful comment on how SPT-N_{60} values vary with increasing depth within the Sandstone unit.

6.7.51 A review of $I_s(50)$ data points (size corrected) plotted against depth shows a significant variation in $I_s(50)$ data points and weathering grades but without clear trends with depth or weathering except for the highly weathered Sandstone. Highly weathered Sandstone $I_s(50)$ data points are shown to vary between 0.06 to 1.16MPa. $I_s(50)$ values for moderately and slightly weathered Sandstone specimens are generally shown to have no trend with depth as shown on Figure 6.7.7.

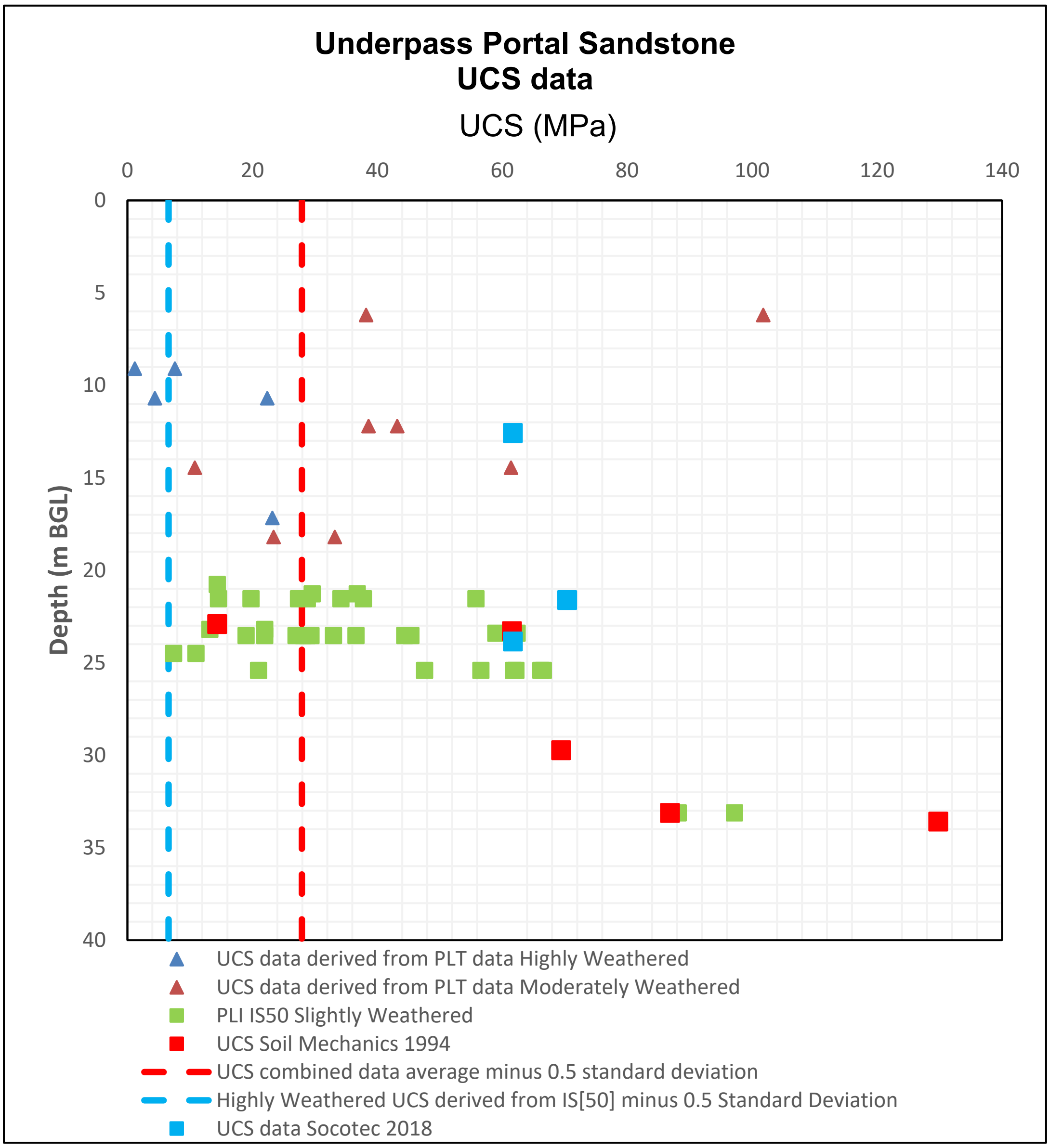
Figure 6.7.7: Mottram Underpass Sandstone UCS datapoints vs depth (m bgl).



6.7.52 Eight UCS tests were undertaken on the Sandstone core specimens. A UCS range of between 61.7 to 129MPa was measured. A slight increase in UCS with depth is evident with core samples recovered from between 12.8m to 33.5m bgl (200.11m to 179.18m AoD). Overall, the UCS data cover the same range as the PLT derived UCS data.

6.7.53 A similar approach to that used for the Siltstone stratum (See Section 6.7.47) was adopted for the Sandstone Unit. A characteristic UCS value of 6.6MPa is considered to be appropriate for the Highly weathered Sandstone Unit. A characteristic UCS of 13.4MPa is considered to be appropriate for the Moderately to Slightly weathered Sandstone unit.

Figure 6.7.8: Mottram Underpass Siltstone UCS datapoints vs depth (m bgl).



6.7.54 Sandstone units are is typically described as thinly laminated and thinly interbedded within this part of the site. Bedding and laminations are recorded to typically dip at between 5 – 15 degrees. Steeper joint sets were measured to dip at up to 60 to 70 degrees (BH405 at 24.23 to 24.98m bgl). Steep joint sets are recorded to be up to very closely to closely spaced. Bedding and joints within the Sandstone unit are recorded to be predominantly planar rough with staining along discontinuity plans.

6.7.55 Fracture spacing within the Sandstone unit to the west of the area of high tectonic deformation are recorded to typically range between 20mm to 250mm in BH405 towards the western tunnel portal. RQD values of 0% were recorded in Sandstone units encountered in BH38 and BH40 from depths of 14.6m and 12.7m to 17.85 and 17.1m bgl respectively. RQD values within both boreholes improve with depth within both boreholes to a maximum value of 85% up to depths of 23.75m bgl.

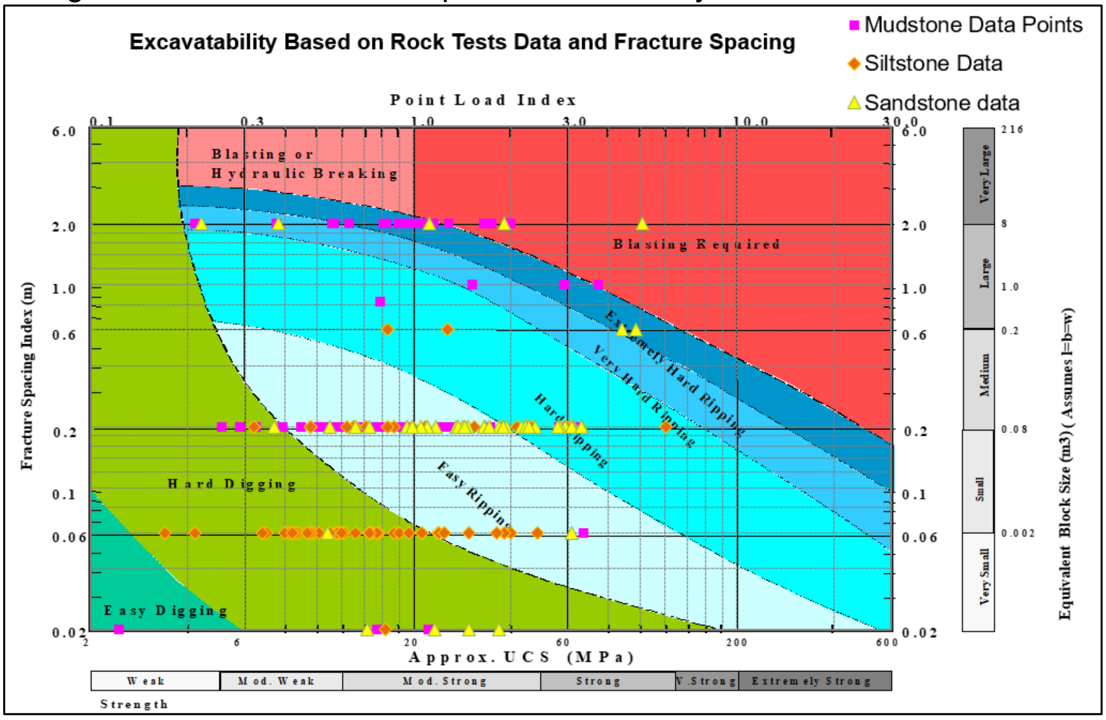
6.7.56 RDQ values within BH202 to the east of the area of high tectonic deformation showed poor RDQ values of between 0 and 9% from 4.30m to 10.1m bgl. RQD values were shown to improve to a value of 72% at 14.6m bgl. RQD values were shown to reduce to 0% again within BH202 at depths of 19.5m, 27.2m to 34m and 46.8m bgl. Areas of poor RQD values are considered to be indicative of tectonic disturbance east of the area of high tectonic deformation.

Table 39: Derived Rock geotechnical parameter values – Mottram Underpass.

Measured Geotechnical Parameter	Mudstone (Highly Faulted Zone)			Siltstone			Sandstone		
	H	M	S	H	M	S	H	M	S
Unit Weight (kN/m^3)	22	23	24	21	22	24	21	22	24
Is(50) (MPa)	0.20	0.20	0.20	0.0	0.60	0.60	0.10	0.70	0.70
Uniaxial Compressive Strength (UCS) (MPa)	0.50	3.5	3.5	0.40	13	13	1.50	14.0	14.0
Youngs Modulus (E') (MPa)	94	105	105	88	390	390	150	420	420

6.7.57 An excavatability assessment has been undertaken for the Millstone Grit Group encountered at the Mottram Underpass. Findings from the assessment indicate that excavation conditions vary from easy digging to blasting required as shown on Figure 6.7.9. The majority of the data points fall below a bedrock material that requires hard ripping. Some data points indiocate that blasting may be required. The main controlling factor of excavatability in this part of the site relates to fracture spacing. The area of faulting is anticipated to have a reduced fracture spacing in comparison to areas of lesser observed tectonic deformation.

Figure 6.7.9: Mottram Underpass excavatability assessment.



6.7.58 A Rock Mass Rating (RMR) of the Millstone Grit Group has been undertaken in the area of the proposed Mottram Underpass.

6.7.59 Findings from the RMR assessment indicates that Mudstone from the Millstone Grit Group is of very poor quality over this part of the site. A breakdown of the assessment rating is presented below.

Figure 6.7.10: Mottram Underpass Mudstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group - Siltstone and Sandstone

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	<1MPa		0
2	RQD (%) [2]	<25%		3
3	Spacing of joints	<60mm		5
4	Condition of joints	Slicken-sided surfaces		10
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Fair	-25

Output:

RMR (-)	-7
Class number (-)	V
Description	Very poor rock

6.7.60 A slight improvement of the RMR is shown for the Siltstone and Sandstone units, which are still regarded as a material of very poor rock quality.

Figure 6.7.11: Mottram Underpass Siltstone and Sandstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group - Siltstone and Sandstone

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	5-25MPa		2
2	RQD (%) [2]	<25%		3
3	Spacing of joints	<60mm		5
4	Condition of joints	Slicken-sided surfaces		10
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Fair	-25

Output:

RMR (-)	-5
Class number (-)	V
Description	Very poor rock

6.8 Section 3 – Eastern Cutting

6.8.1 A summary of ground conditions encountered at the location of the proposed Eastern Cutting are presented in Section 5.3.64 to 5.3.77.

6.8.2 Summaries of measured geotechnical parameters and derived geotechnical parameters are presented in Table 40 and Table 41 respectively.

Table 40: Eastern Cutting Measured Geotechnical Parameter Summary Table.

Measured Geotechnical Parameter		Made Ground	Cohesive Glacial Till	Granular Glacial Till
Moisture Content w(%)		-	12-23 {12}	-
Liquid Limit (%)		-	24-56 {46}	
Plastic Limit (%)		-	2.7-25 {45}	
Plasticity Index (%)		-	5-53.3 {45}	
Bulk Density γ (Mg/m)		-	1.86-2.29 {17}	-
Dry Density γ (Mg/m)		-	1.74-2.01 {7}	-
Particle Density (Mg/m^3)		-	2.65 {6}	-
SPT – N_{60} values (Blows)		(24-50) {3}	10-50 {15}	30 {1}
Particle size Distribution (%)	**Cobbles**	-	-	-
	Gravel	-	1-59 {5}	36 {1}
	Sand	-	21-65 {5}	48 {1}
	Silt	-	15-31 {5}	8 {1}
	Clay	-	5-24	8

		{5}	{1}
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer)	-	0.045-0.219 {6}	-
Coefficient of Consolidation Root Time (m^2/yr) (Oedometer)	-	1.88-5.8 {6}	-

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.8.3 Geotechnical considerations of topsoil have not been taken into account at the location of the Eastern Cutting. It is assumed that the topsoil will be removed prior to construction.

Made Ground

6.8.4 Made Ground (Cohesive and Granular) is only found in BH48 for 2.3m and BH59 for 3.3m and therefore a limited amount of geotechnical information is available.

6.8.5 Three SPT-N_{60} results are available for Cohesive and Granular Made Ground. For Granular Made Ground, two values of 24 and 50 are available from BH48, whilst BH59 provides one SPT-N_{60} value of 50 for Cohesive Made Ground.

6.8.6 Two drained angles of internal friction have been derived for the Granular Made Ground and are 34° and 41°. The lower value of 34° has been chosen as a characteristic value for the Granular Made Ground.

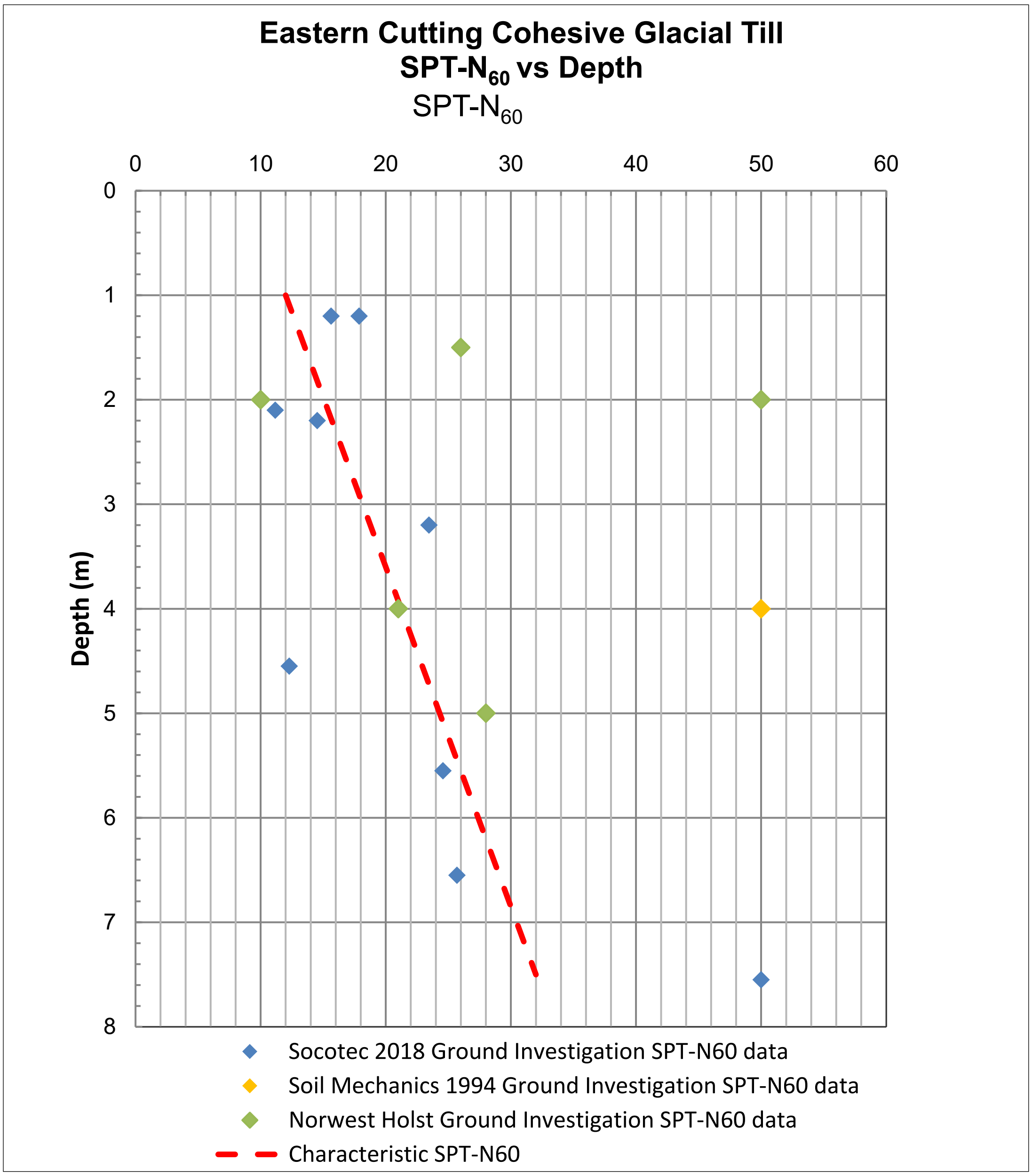
Cohesive Glacial Till

6.8.7 Figure 10.6.1 shows Natural Moisture Contents (NMC), Plastic Limits (PL) and Liquid Limits (LL) for the Cohesive Glacial Till with a slight reduction with depth. Plasticity Index values can be seen in Figure 10.6.2 with a characteristic value of 20% considered appropriate for design purposes.

6.8.8 Measured Bulk Density values from Oedometer and Classification tests give a range of values from 1.86 to 2.29 Mg/m^3.

6.8.9 SPT-N_{60} values range from 10 to 28 and generally increase with depth (Figure 6.8.3.). A characteristic SPT-N_{60} line is also shown on the figure.

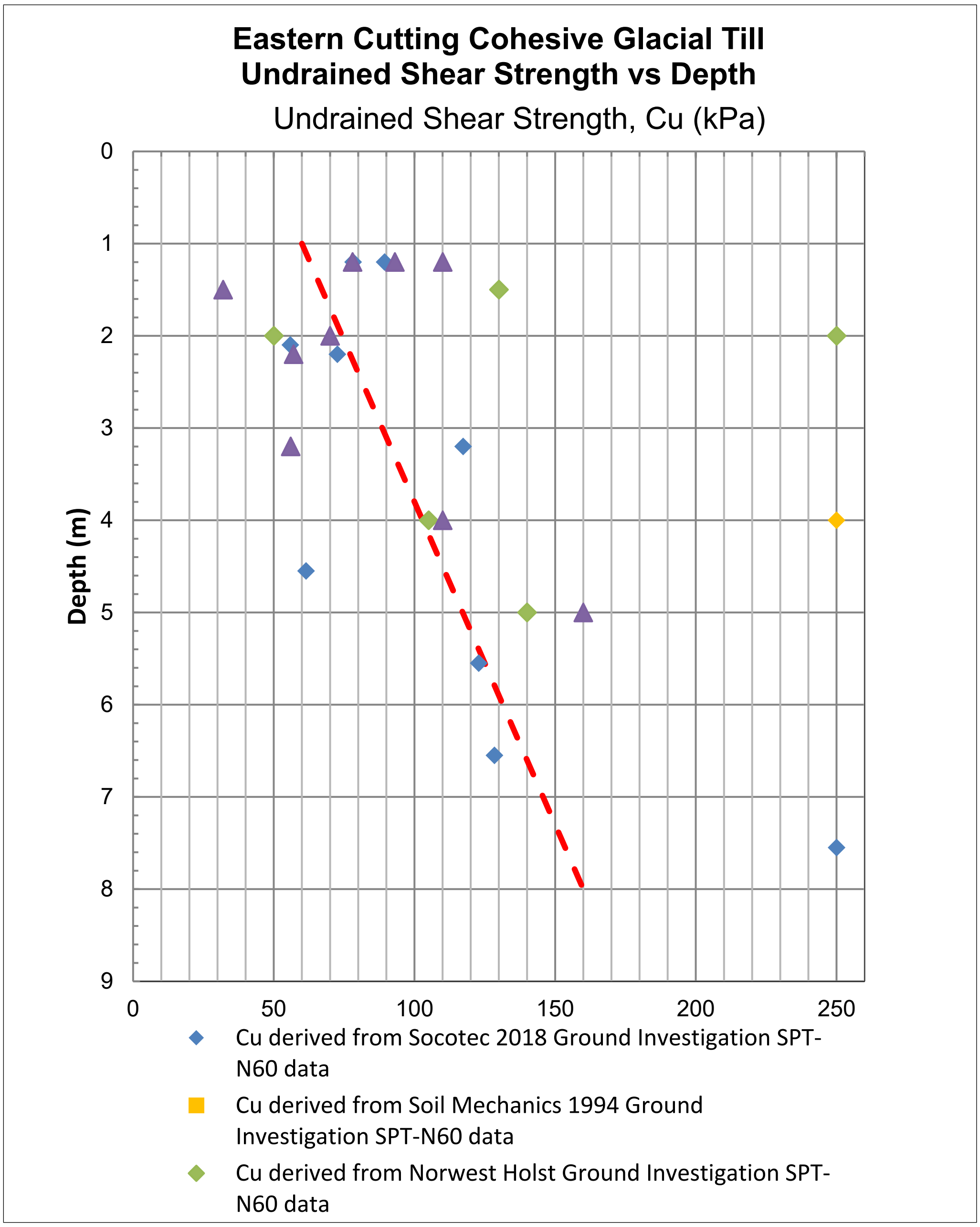
Figure 6.8.1. Eastern Cutting cohesive Glacial Till SPT N_{60}.



6.8.10 Five PSD tests were carried out in the Cohesive Glacial Till which are presented in Figure 10.6.4 and show the Till to be a variably graded, from gap to well graded, cohesive material.

6.8.11 Undrained Shear Strength (Cu) parameter values for the Glacial Till stratum were derived using SPT-N_{60} data and triaxial lest data. A plot of Cu derived from both SPT tests and Triaxial tests against Depth for the Eastern Cutting is shown in Figure 10.6.5.

Figure 6.8.2: Eastern Cutting Cohesive Glacial Till Undrained Shear Strength.



6.8.12 The undrained shear strengths from quick undrained triaxial testing and those derived from SPT-N_{60} data show a good correlation with a characteristic line plotted on Figure 10.6.5.

6.8.13 A drained cohesion (c') of 0 kPa is recommended for the stratum.

6.8.14 A characteristic drained friction angle (Phi') of 26˚ is recommended for the stratum. This value has been derived using Atterberg Limits data and guidance from BS 8004:2015 with results shown in Figure 10.6.6.

6.8.15 One oedometer test was scheduled in order to determine the stratum's one – dimensional consolidation (m_v) parameters at the location of the proposed Eastern

Cutting. A plot of the Coefficient of Volume Compressibility (m^2/MN) against Applied Stress (kPa) is presented in Figure 10.6.7. Findings show a general linear reduction in m_v values with increasing stress.

6.8.16 Glacial Till m_v values derived from SPT-N_{60} data show a slight reduction with depth (Figure 10.6.8).

6.8.17 A comparison of laboratory m_v values and derived in-situ m_v data shows both sets of data to correlate well and is shown in Figure 10.6.7.

6.8.18 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer test ranged from 1.88 to 5.81 m^2/yr (Figure 10.6.12).

6.8.19 An undrained Youngs Modulus (Eu) profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.6.9. showing a characteristic line with Eu increasing with depth.

6.8.20 A characteristic design line for the Drained Youngs Modulus along with the individual data points derived from SPT-N_{60} results is shown in Figure 10.6.10.

Granular Glacial Till

6.8.21 Granular Glacial Till is of very limited prevalence in this section with only one SPT-N_{60} of 30 recorded at 2.8m bgl in BH218.

6.8.22 Two Particle Size Distribution tests were undertaken on samples of Granular Glacial Till, the results of which can be seen in Figure 10.6.11, showing it to be a slightly clayey gravelly sand.

Table 41: Eastern Cutting Derived Geotechnical Parameters Summary Table.

Derived Geotechnical Parameter	Made Ground (Granular)	Cohesive Glacial Till	Granular Glacial Till
Unit weight ɣ (kN/m3)	20	18	20
Undrained Shear Strength (Cu) kPa	-	25+17.85(d-1)	-
Effective Cohesion (C') kPa	-	0	-
Effective angle of internal friction ϕ' (°)	34	26	36
Coefficient of Volume Compressibility m_v (m^2/mN)	-	(0.04-0.22)	-
Drained Youngs Modulus (E')	48	6+2.28(d-1)	60
Undrained Youngs Modulus (E_u)	-	8+2.85(d-1)	-

Derived Geotechnical Parameter		Made Ground (Granular)	Cohesive Glacial Till	Granular Glacial Till
Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)	**DD (Mg/m3)**	-	1.81	1.91
	MC (%)	-	16	11

Millstone Grit

Table 42: Summary of measured Rock geotechnical parameters – Eastern Cutting.

Measured Geotechnical Parameter	Mudstone	Siltstone	Sandstone
SPT-N_{60}	41 – 130 {6}	40 – 130 {17}	50 {1}
$I_{s(50)}$ corrected (MPa)	0.02 – 10.34 {165}	0.07 – 6.06 {48}	0.03 – 7.74 {86}
Uniaxial Compressive Strength tests (UCS) (MPa)	14.2 – 79.8 {15}	58.2 {1}	13.6 – 85.6 {7}
UCS derived via SPT-N_{60} conversion (MPa)	0.41 – 1.30 {6}		
Peak Drained Cohesion (c') MPa	*	0.01 – 0.03 {2}	0.02 – 0.04 {4}
Peak Angle of Internal l Friction (°)	*	34.5 – 42 {2}	18.2 – 34.5 {4}
Residual Drained Cohesion (c') MPa	*	0.01 – 0.03 {2}	11.9 – 35.7 {4}
Residual Angle of Internal l Friction (°)	*	27.9 – 42 {2}	11.9 – 35.7 {2}

SAMPLES SCHEDULED FOR DIRECT SHEAR BOX TESTING ON MUDSTONE ARE REPORTED TO HAVE DISINTEGRATED DURING SAMPLE PREPARATION.

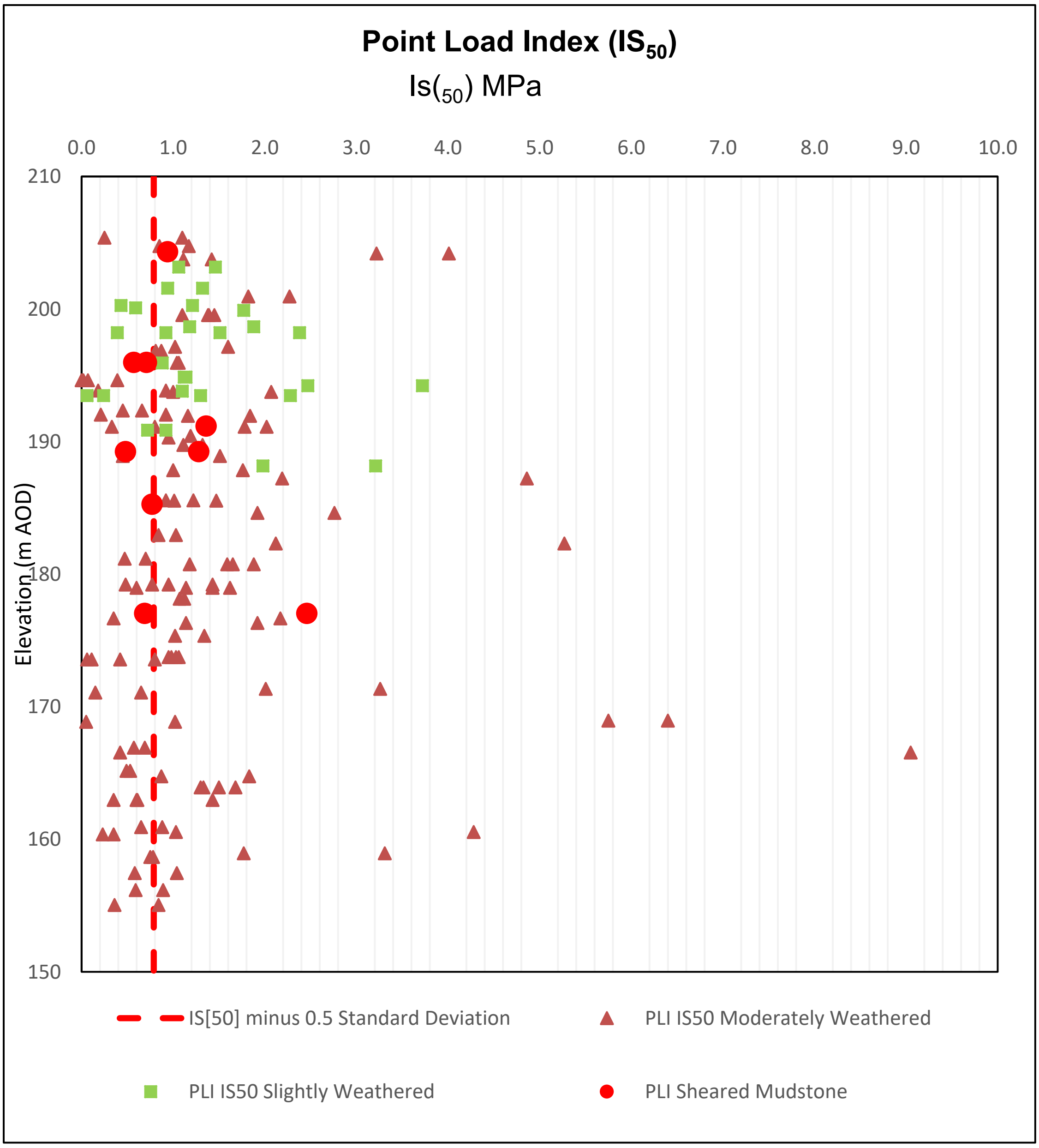
Mudstone

6.8.23 Six SPT's were undertaken within the Eastern Cutting Mudstone stratum. A plot of N_{60} values are shown in Section 10.5. No clear trend was observed between SPT-N_{60} values and depth.

6.8.24 Derived UCS values from SPT-N_{60} data values range between 0.25 to 0.65MPa.

6.8.25 A total of 165 Point Load Index tests were undertaken on cored Mudstone samples from the Eastern Cutting. Testing was only recorded on moderately and slightly Weathered specimens. No clear variation in $I_s(_{50})$ values and varying weathering grades was observed in this part of the site. PLTs were also undertaken on cored length intervals where slickenslided and polished surfaces were recorded within the exploratory field logs (See Boreholes BH48, BH49 and BH50). $I_s(_{50})$ values for these data points fell within the range of the moderately and slightly weathered Mudstone data points. The reader should note that $I_s(_{50})$ data points recored in the slickenslided and polished surface intervals are not likely to represent strength values of the failure plane. A Plot of $I_s(_{50})$ data points against depth is shown in Figure 6.8.3. A characteristics $Is(_{50})$ value of 0.8MPa is considered appropriate for moderately to slightly weathered Mudstone. No information is available for Highly weathered Mudstone units within the eastern cutting.

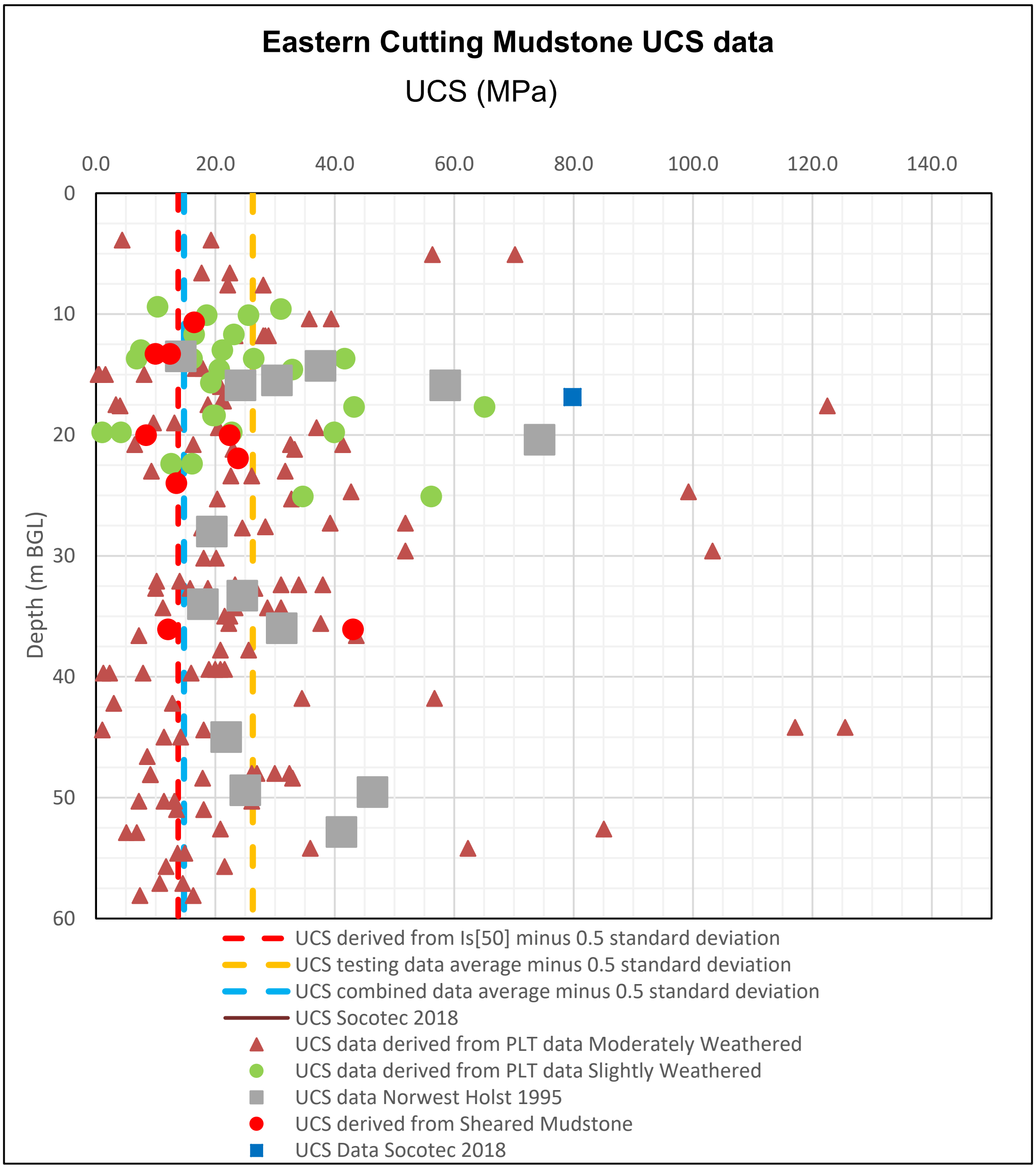
Figure 6.8.3: Eastern Cutting Mudstone $Is(_{50})$ MPa datapoints vs depth (m bgl).



6.8.26 15 no UCS tests were undertaken on slightly weathered cored Mudstone samples from the Eastern Cutting. One sample was successfully tested during the 2018

Socotec Ground Investigation. Additional samples were scheduled. However feedback from the laboratory during the 2018 Ground Investigation stated that a number of samples broke apart during preparation for testing. Successfully tested samples provided a UCS range of between 14 to 80MPa.

Figure 6.8.4: Mottram Eastern Cutting UCS datapoints vs depth (m bgl).



6.8.27 A chart of combined derived UCS data is shown on Figure 6.8.4. UCS values for the stratum range from 0.4 to 181MPa. Point Load Tested data points generally correlate well with tested UCS data points. It should be noted that UCS tested data points will represent core samples which are of good rock quality.

6.8.28 A characteristic UCS value of highly weathered Mudstone stratum of 0.30MPa is considered to be appropriate for the stratum. This value has been derived from a statistical analysis of the SPT-N_{60} derived data for the highly weathered Mudstone Stratum. A characteristic UCS value of 14MPa is considered to be appropriate for the moderately to slightly weathered Mudstone unit. This value has been derived by subtracting half a standard deviation for the Mudstone's UCS from the $I_{s(50)}$ statistical mean.

6.8.29 A televiewer assessment was undertaken in boreholes BH416 and BH417 positioned within the cutting. It should be noted that findings from televiewer information relates to Mudstone, Siltstone and Sandstone units. Findings from BH1416 show the bedding to predominantly dip between 6 and 26 degrees. The majority of data points were found to dip towards 120 to 140 degrees. Bedding spacing was measured to vary from between 0.03and 4.75m. The majority of the specimens' bedding / laminations varied between 0.03 to 0.23m spacing, which equates to a thinly laminated to medium bedded unit.

6.8.30 Steeper joint sets were recorded to dip up to 90 degrees with the majority dipping between 47 and 67 degrees.

Figure 6.8.5: Borehole BH416 televiewer histrogram Dip measurements.

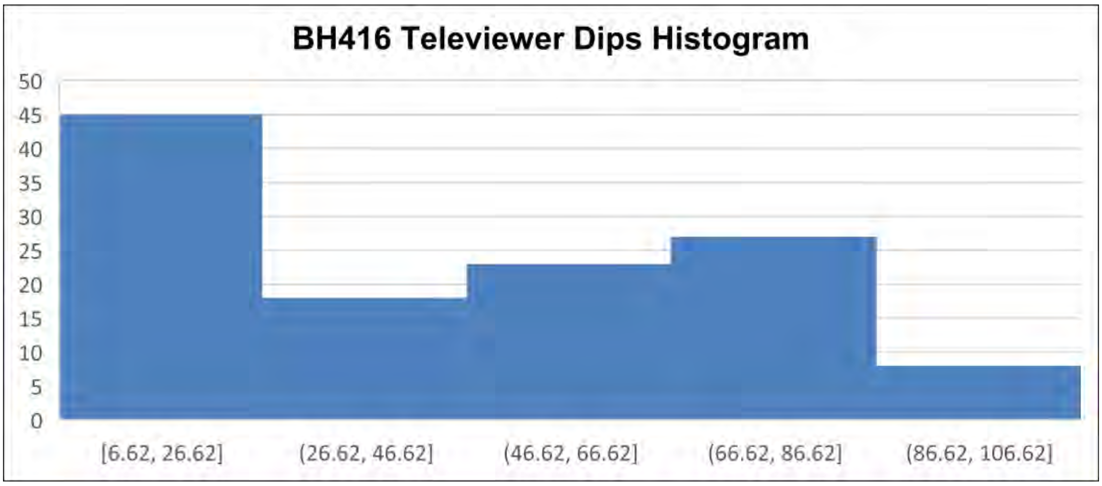
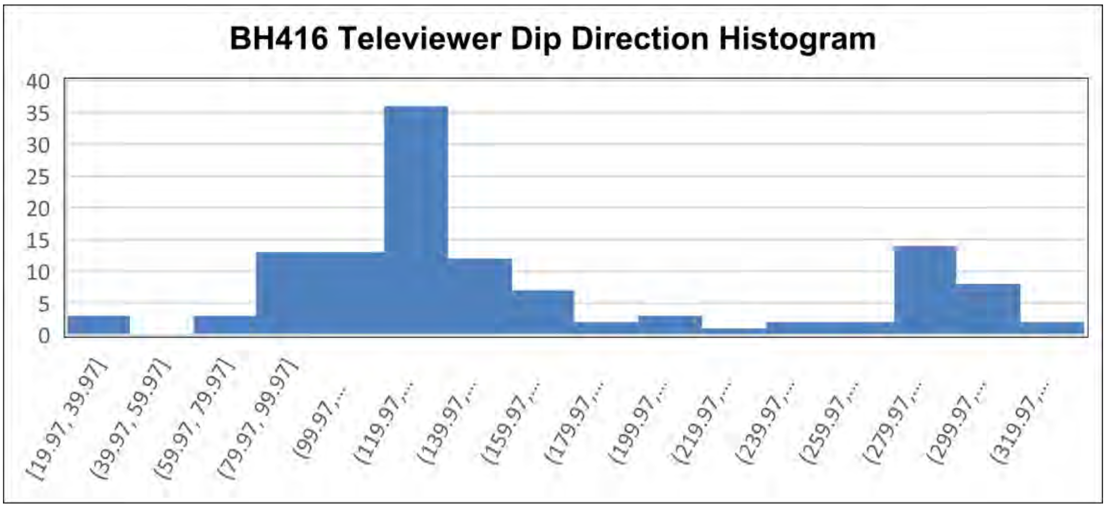


Figure 6.8.6: Borehole BH416 televiewer histrogram Dip Direction measurements.



6.8.31 Findings from BH417 show a similar trend to that observed in BH416. Significantly fewer near vertical joint sets are recorded in BH417. The majority of bedding /

lamination planes in BH417 are recorded to dip by between 10 and 15 degrees towards 120 to 160 degrees. A review of the exploratory hole logging descriptions is in good agreement with findings from the televiewer data.

Figure 6.8.7: Borehole BH417 televiewer histrogram Dip measurements.

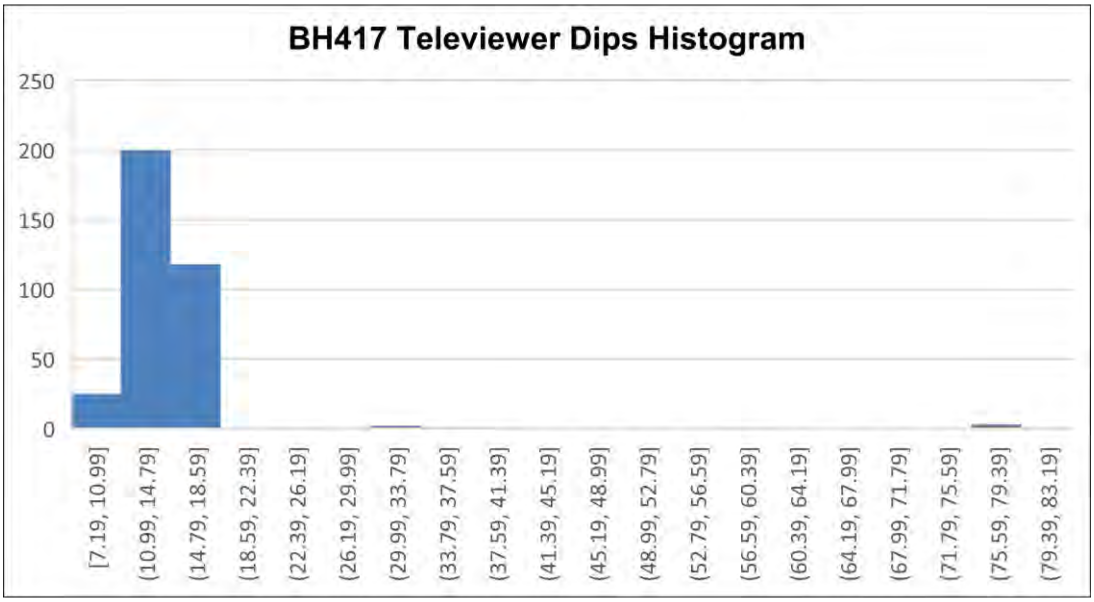
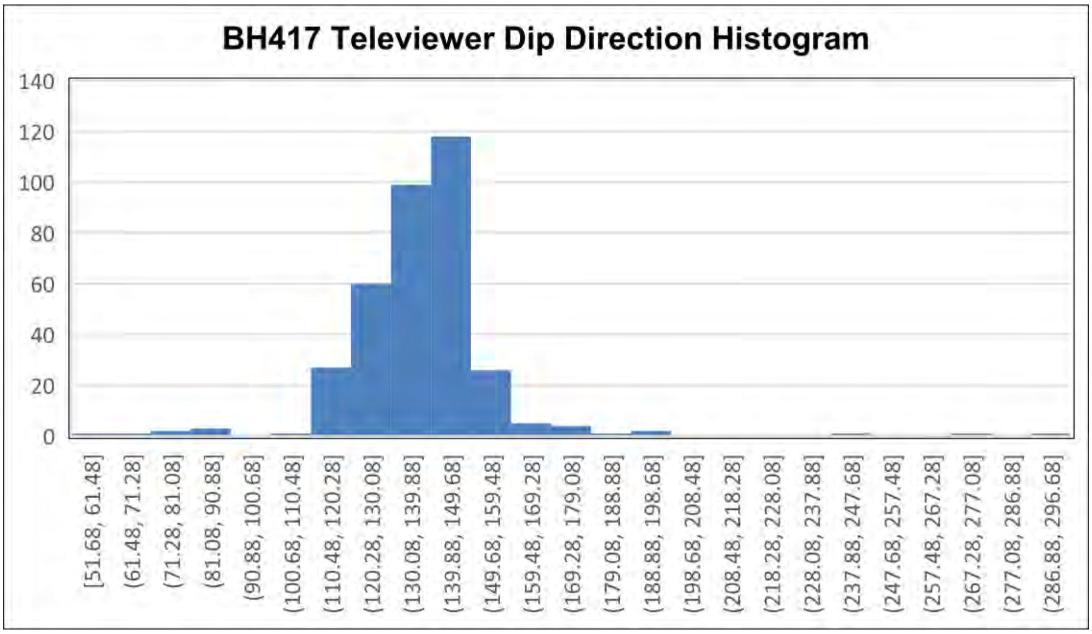


Figure 6.8.8: Borehole BH416 televiewer histrogram Dip Direction measurements.



6.8.32 A review of exploratory hole field logs indicates that discontinuity planes are typically planar smooth, occasionally rough with occasional clay infill.

6.8.33 Direct shear testing was scheduled to be undertaken on Mudstone core specimens recovered during the 2018 ground investigation. Feedback from the laboratories indicates that mudstone sample specimens crumbled whilst being handled.

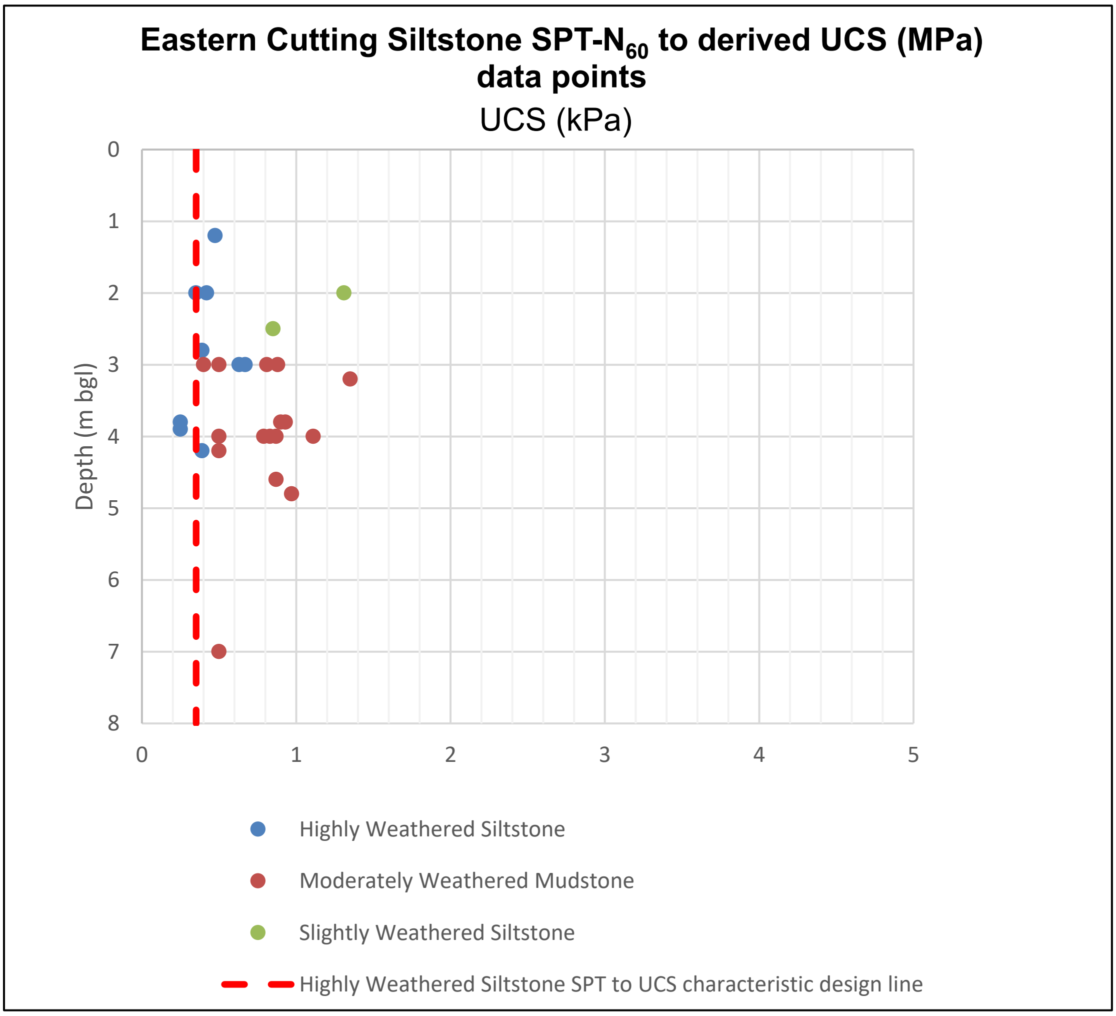
6.8.34 Average fracture spacing within the Mudstone Unit in BH416 between 12m to 22m bgl ranged between 40 and 250mm. RQD values recorded within this depth range varied between 0% and 43%, with the majority of the values falling between 0% and 15%.

Siltstone

6.8.35 SPT's undertaken within the Siltstone stratum recorded N_{60} values ranging between 40 and 300. No clear variation in trend from highly to slightly weathered Siltstone horizons were shown.

6.8.36 UCS data points derived from SPT-N_{60} data points for the highly weathered stratum provided a range of 0.25 to 0.67MPa. A slightly higher UCS ranges of between 0.5 to 1.35 MPa was measured for the moderately and slightly weathered Siltstone.

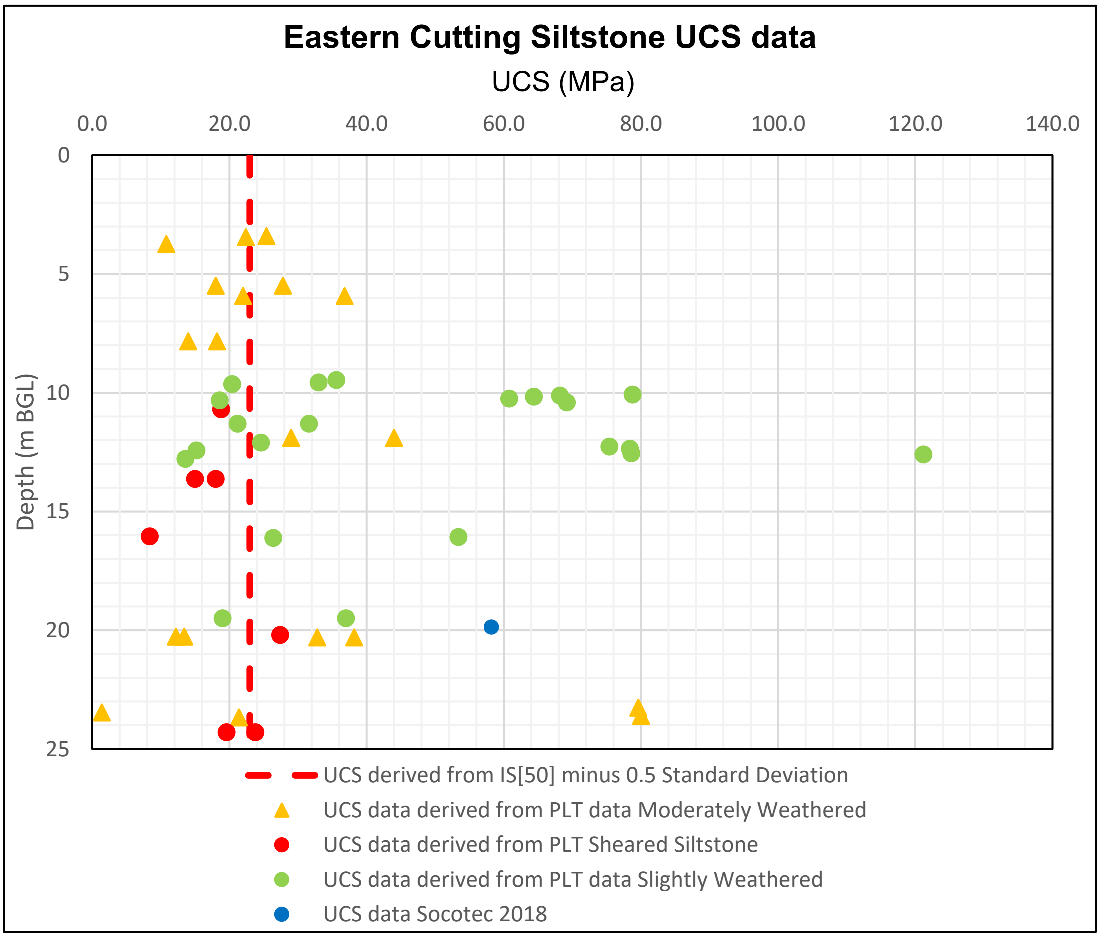
Figure 6.8.9: Mottram Eastern Cutting UCS datapoints derived from SPT-N_{60} data vs depth (m bgl).



6.8.37 Point Load Index testing was undertaken on 48 specimens and provided an $I_s(50)$ range of 0.07 to 6.06) MPa for samples which have been corrected for size. Data points include Siltstone data points which are recovered adjacent to zones of recorded shearing in BH49 and BH50. The range of $I_s(50)$ data points is shown to generally remain between 0.42 to 2.2MPa between 3.45m to 24.3m bgl. A characteristic $I_s(50)$ value for moderately and slightly weathered Siltstone of 1.1MPa is considered appropriate. No $I_s(50)$ data is available for highly weathered specimens.

6.8.38 One UCS tests was undertaken on a Siltstone sample. A value of 58MPa was recorded.

Figure 6.8.10: Mottram Eastern Cutting UCS datapoints vs depth (m bgl).



6.8.39 $I_s(50)$ data points converted to UCS data points as discussed in Section 6.2, provided a UCS range of 1.4 to 121MPa. A Plot of UCS data points derived from $I_s(50)$ data and direct UCS tests are shown in Figure 10.6.1.

6.8.40 A characteristic UCS value of highly weathered Siltstone stratum of 0.35MPa is considered to be appropriate for the stratum. This value has been derived from a statistical analysis of the SPT-N_{60} derived data for the highly weathered Siltstone Stratum. A characteristic UCS value of 23MPa is considered to be appropriate for the moderately to slightly weathered Mudstone unit. This value has been derived by half a standard deviation for the Mudstone's UCS statistical Mean.

6.8.41 Direct shear tests were undertaken on two Siltstone samples from the cutting. Additional samples were scheduled for testing but these where, however, reported to have crumbled during preparation.

6.8.42 A drained peak cohesion (c'^{p}) range of 0.01 to 0.03MPa was recorded for samples tested. A peak angle of internal friction (Phi'^{P}) range of 34 to 42 degrees was recorded. Discontinuities tested were at 0 and 10 degrees from the horizontal. Tested horizons are reported to have been saw cut in the laboratory. Saw cut planes were tested due to the lack of suitable Silstone core samples with natural discontinuity planes. Testing undertaken on Sandstone samples discussed in Section 6.8.54 were undertaken on natural discontinuity planes.

6.8.43 Residual cohesion (c'_R) and angles of internal friction (Phi'_R) ranges of 0.01 to 0.03 and 11.9 to 35.7 were also recorded for the Siltstone unit.

6.8.44 Lower c'_R and Phi'_R values in comparison to those discussed in Section 6.8.43 and Section 6.8.54 should be anticipated for areas of faulting within the cutting.

6.8.45 Discontinuities within the stratum are reported to generally be smooth with occasional granular infill of quartzite and pyrite (BH47, 17.9 to 21.75m bgl). Records of surfaces being rough, with an open aperture and iron oxide staining are reported in BH48 between 8.00m to 12.40m bgl.

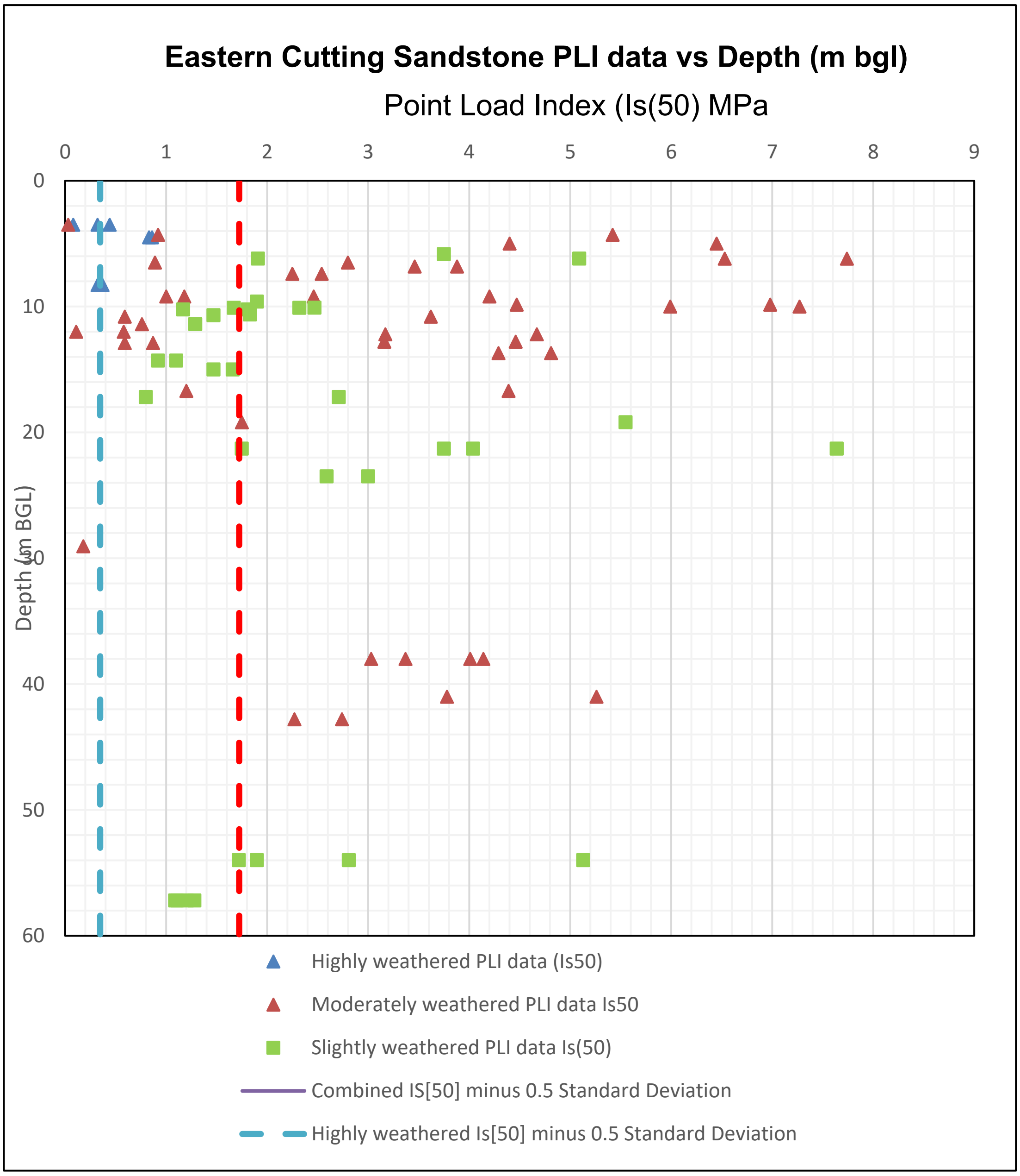
6.8.46 An average fracture spacing of between 30mm to 80mm was recorded within the Siltstone Unit in BH416 up to a depth of 9.50m bgl (201.96m AoD). RQD values recorded in BH416 ranged from 0 to 15%, with one out of seven core runs undertaken to 9.50m recording an RQD of 0%. Solid Core Recovery (SCR) values from 0 to 54% in BH416 for the same depth interval. Fracture spacing recorded in BH417 up to a depth of 12.90m bgl (193.97m AoD) ranged from 40mm to 160mm. RQD values within this range were recorded as 0%. SCR values within the same interval ranged from 35 to 88%. Both SCR and RQD values were recorded to improve with depth from 10.60m bgl (196.27m AoD). Depths of 10.60m bgl or greater fall below the base of the cutting in this part of the site.

Sandstone

6.8.47 Four SPT's were undertaken within the Sandstone unit. N_{60} values are shown to range from between 50 to 91. Insufficient SPT-N_{60} data points are available to make a meaningful comment on how SPT-N_{60} values vary with increasing depth within the Sandstone unit.

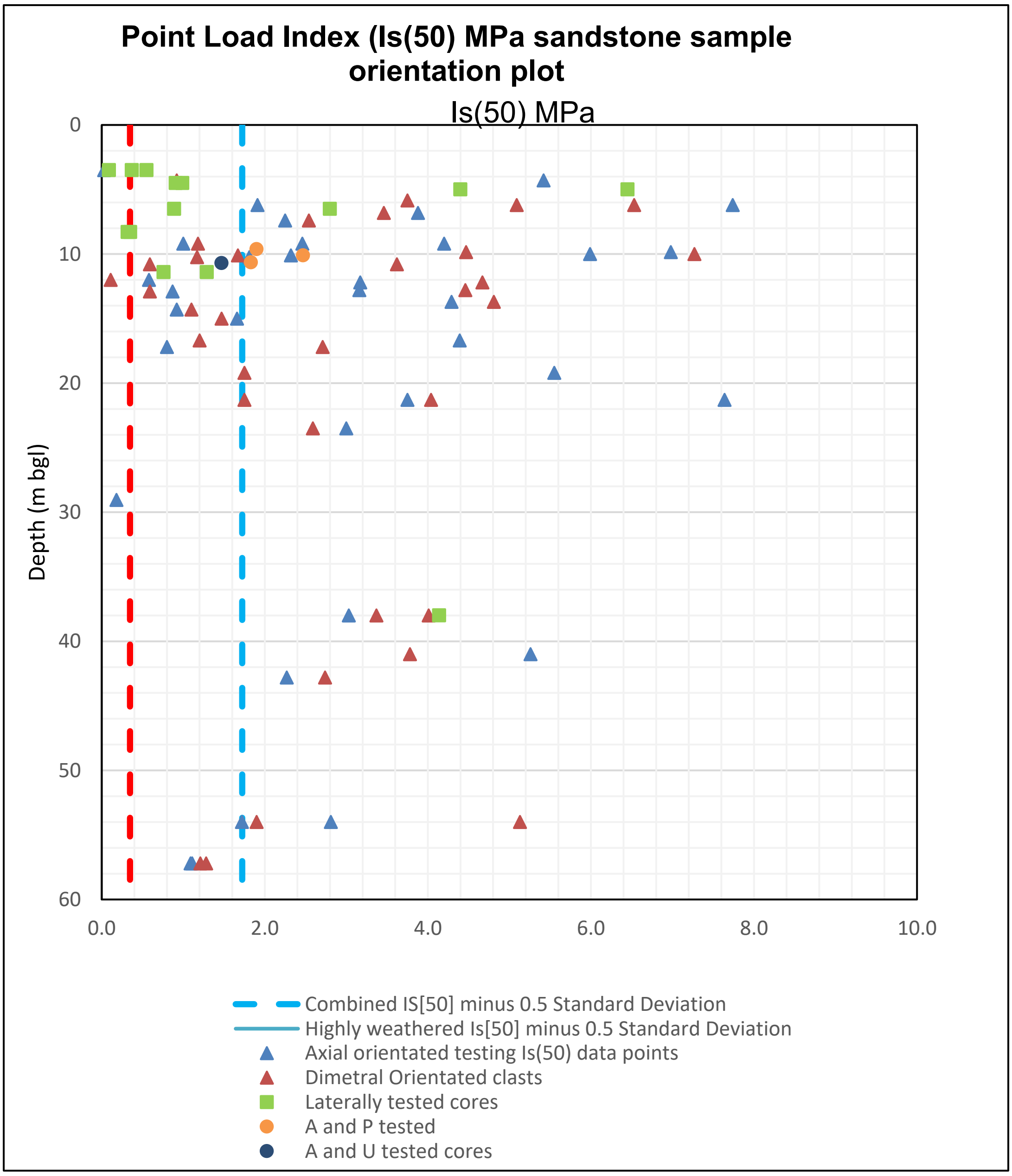
6.8.48 A review of $I_s(50)$ data points (size corrected) plotted against depth shows a significant scatter of $I_s(50)$ data points for the moderately and slightly weathered Sandstone unit. $I_s(50)$ values for highly weathered specimens range from 0.09 to 0.99MPa, whereas specimens of moderately and slightly weathered specimens ranged from between 0.03 to 7.74MPa, as shown in Figure 6.8.11. A characteristic $I_s(50)$ value of 0.3MPa is considered to be appropriate for the Highly Weathered Sandstone rock material. A characteristic $I_s(50)$ of 1.7MPa is considered appropriate for the Moderately and Slightly weathered Sandstone Unit.

Figure 6.8.11: Eastern Cutting Sandstone $I_{s(50)}$ MPa datapoints vs depth (m bgl).



6.8.49 A plot of PLI orientation against depth for the Sandstone Unit, See Figure 6.8.12, generally shows the dimetrical orientated sample results to be higher than the axial orientated tested specimens, indicating that the Sandstone Unit is anisotropic and stronger in the horizontal direction.

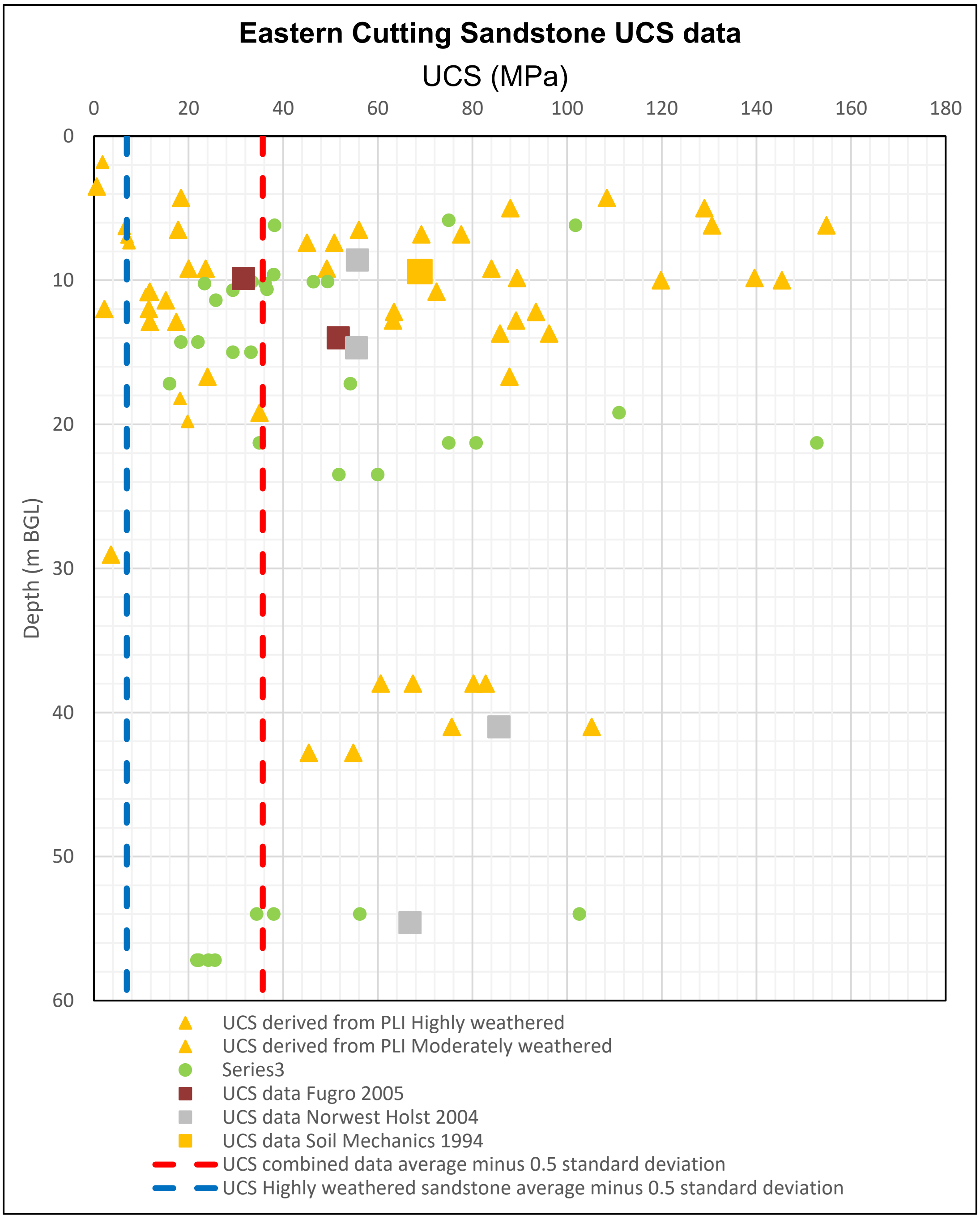
Figure 6.8.12: Eastern Cutting Sandstone $I_{s(50)}$ test orientation datapoints vs depth (m bgl).



6.8.50 Seven UCS tests were undertaken on the Sandstone core specimens. A UCS range of between 31.6 and 85.6MPa was measured. A slight increase in UCS with depth is evident with core samples tested as shown on Figure 6.8.13. A characteristic UCS of 6.9MPa for the highly weathered Sandstone. A characteristic UCS of 35MPa is considered to be appropriate for the slightly weathered Sandstone Unit.

6.8.51 An horizon of reported BRECCIA was recorded in BH215 from depths of between 18.30m to 20.00m bgl (191.33m to 189.63m AoD). Three dissolution features are recorded within this deposit with Pyritic infilling. This feature is considered to form a "fault BRECCIA". BRECCIA horizons of this nature are considered likely to have a significantly lower UCS in comparison to less disturbed Sandstone Units. The presence of dissolution features may relate to piping features formed by groundwater migration through the material.

Figure 6.8.13: Eastern Cutting Sandstone UCS MPa datapoints vs depth (m bgl).



6.8.52 Commentary on the discontinuity dip and dip direction for Bedrock encountered in the Cutting is discussed from Section 6.8.29 to Section 6.8.31.

6.8.53 Direct shear tests were undertaken on four Sandstone samples from the cutting. Additional samples were scheduled for testing. These were, however, reported to have crumbled during preparation. Direct shear tests undertaken on one natural shear plane and three saw cut specimens.

6.8.54 A peak cohesion c'^{p} and Phi'^{P} of 0.04MPa and 37 degrees was recorded for the Sandstone samples tested and a natural joint surface. A c'^{R} and Phi'^{R} of 0.02MPa and 35 degrees was recorded.

6.8.55 Sampled tested along a saw cut surface recorded a c'^R and Phi'^R range of 0.02 to 0.05MPa and 18 to 27 degrees. Additionally, c'^R and Phi'^R range of 0.02 to 0.05MPa and 23 to 27 degrees were measured.

6.8.56 It is anticipated that the lower values recorded in the saw cut specimens may be due to the lack of a joint roughness profile along the tested planes. Values reported within the saw cut samples are therefore anticipated to be conservative. Slickenslided and polished surfaces within the Sandstone unit would form an exception to this.

6.8.57 Sandstone units are typically described as thinly laminated and thinly interbedded to mediumly spaced within the cutting. Bedding and laminations are recorded to typically dip at between 5 and 20 degrees. Steeper joint sets were measured to dip at up to 80 degrees (BH50 at 16.50m to 18.60m bgl). Bedding and joints within the Sandstone unit are recorded to be predominantly planar rough with staining along discontinuity plans.

6.8.58 RQD values within the Sandstone unit from 2.50m - 15.0m bgl (207.13 – 194.63m AoD) in BH215 ranged from 0% to 50%. Frequent horizons were recorded to be highly fractured and non intact.

6.8.59 A higher RQD range of 16 to 86% was recorded in BH150-1A from 3.40m (192.42 AoD) to the base of the borehole at 10m bgl (185.52m AoD). Potentially sporadic areas of less fractured Sandstone are likely to result in areas of harder excavation conditions within the Sandstone Unit.

Table 43: Derived Rock geotechnical parameters – Eastern Cutting.

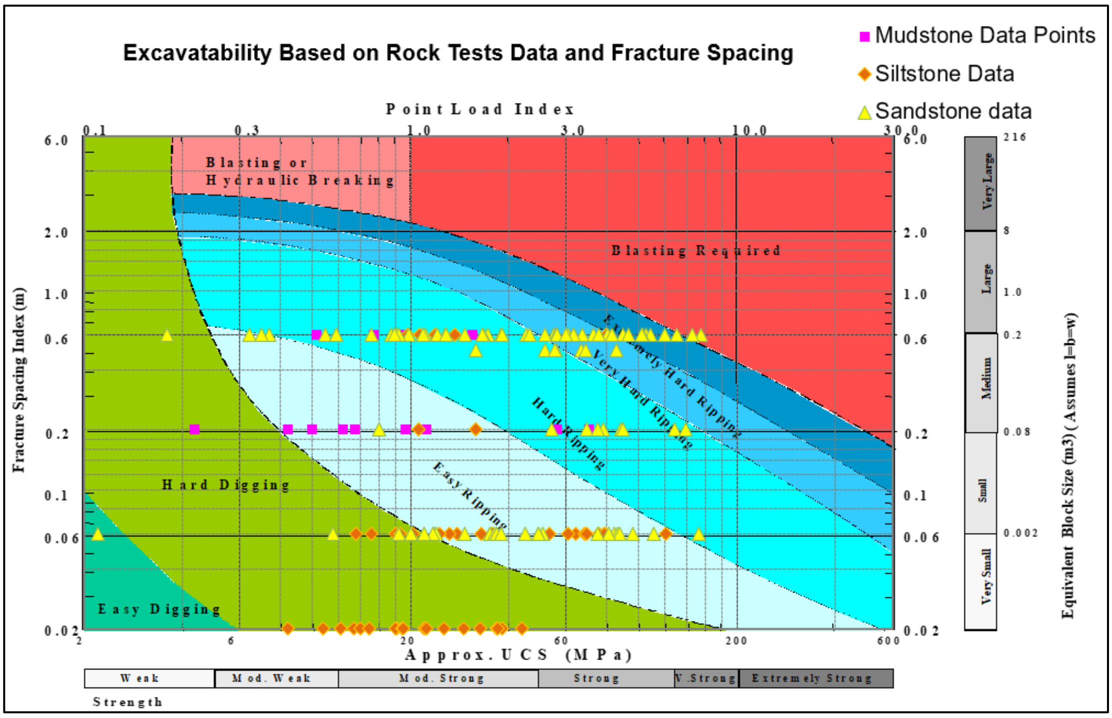
Measured Geotechnical Parameter	Mudstone			Siltstone			Sandstone		
	H	M	S	H	M	S	H	M	S
Unit Weight (kN/m^3)	22	23	24	21	22	24	21	22	24
$I_{s(50)}$ (MPa)	-	0.80	0.80	-	1.1	1.1	0.30	1.7	1.7
Uniaxial Compressive Strength (UCS) (MPa)	0.30	14	14	0.40	23	23	6.9	35	35
Peak Drained Cohesion (c') (MPa)	*				0.02			0.02	
Peak Angle of Internal l Friction (°)	*				23			23	
Residual Drained Cohesion (c') (MPa)	*				0.01			0.01	

Measured Geotechnical Parameter	Mudstone			Siltstone			Sandstone		
	H	M	S	H	M	S	H	M	S
Residual Angle of Internal I Friction (°)		*			19			19	
Youngs Modulus (E') (MPa)	94	420		88	690			1050	

6.8.60 An excavatability assessment has been undertaken for Millstone Grit Group encountered at the Eastern Cutting. Findings from the assessment indicate that excavation conditions vary from easy digging to blasting required as shown on Figure 6.8.14. The majority of the data points fall below a bedrock material that requires hard ripping but occasional points indicate that blasting could be necessary. The specific excavation method will be decided upon by the contractor. Consideration for blasting in semi-urban environment should be accounted for when deciding on excavation method.

6.8.61 Sporadic units of strong, widely spaced Sandstone units were recorded in BH52, BH202, BH203, BH204 and BH215 within the footprint of the eastern cutting. These localised units are anticipated to provide difficult excavation conditions. Additionally, observations made at Hobson Moor Quarry indicate that good quality Sandstone bedrock may be present in areas not affected by tectonic deformation.

Figure 6.8.14: Eastern Cutting excavatability assessment.



6.8.62 The main controlling factor of excavatability in this part of the site relates to fracture spacing. The area of faulting is anticipated to have a reduced fracture spacing in comparison to areas of lesser observed tectonic deformation.

6.8.63 A Rock Mass Rating (RMR) of the Millstone Grit Group has been undertaken in the area of the proposed Eastern Cutting.

6.8.64 An assessment, considering slopes, has been undertaken for the Northern and Southern Cutting slopes. Bedding orientation within the northern slope is considered to be unfavourable, whereas the southern slope is considered to be favourable.

6.8.65 A worst and best case assessment, considering Mudstone and Sandstone from the Millstone Grit Ground has been undertaken. Both assessments consider the cuttings in-situ condition where groundwater is anticipated to flow. A worst case assessment considering the presence of a slickenslide surface has been included within the Mudstone Assessment. The best case assessment considered the maximum UCS range recorded for the Sandstone Unit.

Figure 6.8.15: Eastern Cutting Northern face Mudstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group Mudstone Northern Face

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	5-25MPa		2
2	RQD (%) [2]	<25%		3
3	Spacing of joints	60-200mm		8
4	Condition of joints	Slicken-sided surfaces		10
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Unfavourable	-50

Output:

RMR (-)	-27
Class number (-)	V
Description	Very poor rock

Figure 6.8.16: Eastern Cutting Northern face Sandstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group Sandstone Northern Face

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	100-250MPa		12
2	RQD (%) [2]	25-50%		8
3	Spacing of joints	60-200mm		8
4	Condition of joints	Slightly rough surfaces; highly weathered walls		20
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Unfavourable	-50

Output:

RMR (-)	-2
Class number (-)	V
Description	Very poor rock

6.8.66 Finding for the Northern Slope show both rock mass units to have a very poor rock quality. The presence of unfavourable bedding planes has a large influencing factor on the assessment. A revison of the RMR for the northern slope should be undertaken during detailed design to determine whether the discontinuity orientation is truly unfavourable with regards to the designed cutting slope face angle. Additionally, the presence of functional drainage post construction may further improve the ground water conditions item for the northern cutting face.

Figure 6.8.17: Eastern Cutting Southern face Mudstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group Sandstone Northern Face

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	5-25MPa		2
2	RQD (%) [2]	<25%		3
3	Spacing of joints	60-200mm		8
4	Condition of joints	Slicken-sided surfaces		10
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Favourable	-5

Output:

RMR (-)	18
Class number (-)	V
Description	Very poor rock

Figure 6.8.18: Eastern Cutting Southern face Sandstone RMR assessment.

Rock mass rating (RMR) system to Bieniawski (1989):

Unit name: Millstone Grit Group Sandstone Northern Face

Input:

	Parameter	Category		Rating
1	UCS (MPa) [1]	100-250MPa		12
2	RQD (%) [2]	25-50%		8
3	Spacing of joints	60-200mm		8
4	Condition of joints	Slightly rough surfaces; highly weathered walls		20
5	Groundwater conditions	Flowing		0
6	Discontinuity orientation	Slopes	Favourable	-5

Output:

RMR (-)	43
Class number (-)	III
Description	Fair rock

6.8.1 Finding for the Southern Slope show the Millstone Grit Group to range from a Very Poor to Fair Quality rock mass quality. The assessment may further be improved when considering the implication of funcation drainage post construction.

6.8.2 The presence of the fault shown on BGS survey sheet 86 for Glossop may result in areas of poor rock mass qualities.

6.9 Section 4 – Eastern Embankments

6.9.1 A summary of ground conditions encountered along the eastern embankments are summarised in Section 5.3.79 to Section 5.3.83. Summaries of measured and derived geotechnical parameters can be found in Table 44 and Table 45 respectively.

Table 44: Eastern Embankments Measured Geotechnical Parameters Summary Table.

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Head	Cohesive Glacial Till	River Terrace Deposits
Moisture Content W (%)		16-37 {8}	-	12-36 {5}	12-27 {3}	6-47 {72}	-
Liquid Limit (%)		31-47 {6}	-	55-65 {5}	33-34 {3}	24-65 {81}	-
Plastic Limit (%)		15-23 {6}	-	24-30 {5}	17-19 {3}	11-30 {80}	-
Plasticity Index (%)		14-25 {6}	-	27-36 {5}	17-19 {3}	5-36 {80}	-
Bulk Density γ (Mg/m)		-	-	1.93-2.14 {2}	1.96-2.2 {3}	1.91-2.22 {14}	-
Dry Density γ (Mg/m)		-	-	-	-	1.46-2 {24}	-
Particle Density (Mg/m^3)		-	-	-	-	2.65-2.8 {24}	-
SPT – N_{60} values (Blows)		-	4-19 {3}	9-29 {7}	5-11 {3}	9-50 {45}	7-56 {18}
Particle size Distribution (%)	**Cobbles**	-	-	0 {3}	0 {4}	0-34 {30}	0-20 {7}
	Gravel	-	-	0-5 {3}	5-30 {4}	0-64 {30}	15-55 {7}
	Sand	-	-	5-15 {3}	35-45 {4}	21-48 {30}	25-80 {7}
	Silt	-	-	40-50 {3}	22-35 {4}	18-37 {30}	0-5 {7}
	Clay	-	-	30-55 {3}	8-15 {4}	12-60 {30}	

Measured Geotechnical Parameter	Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Head	Cohesive Glacial Till	River Terrace Deposits
Coefficient of Volume Compressibility m_v (m2/mN) (Oedometer)	-	-	-	-	0.001-0.84 {24}	-
Coefficient of Consolidation Root Time (m^2/yr) (Oedometer)	-	-	-	-	0.48-62 {24}	-
California Bearing Ratio (CBR) %	-	1.9 {1}	1.6 {1}	1 {1}	-	-

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.9.2 Geotechnical considerations of topsoil have not been taken into account along the eastern embankments. It is assumed that the topsoil will be removed prior to construction.

Cohesive Made Ground

6.9.3 Natural moisture contents (NMC), Plastic Limit (PL) and Liquid Limit (LL) values are available for the Cohesive Made Ground and are shown in Figure 10.7.1. A characteristic Plasticity Index for the Cohesive Made Ground of 18% is considered appropriate from the Plasticity Index results plotted in Figure 10.7.2.

6.9.4 One SPT-N_{60} result of 4 for Cohesive Made Ground can be seen in Figure 10.7.4. Using a characteristic Plasticity Index of 18% results in an undrained shear strength of 20kPa for the material.

6.9.5 A characteristic Drained Youngs Modulus of 3MPa derived from SPT-N_{60} data can be seen in Figure 10.7.5.

Granular Made Ground

6.9.6 Two SPT-N_{60} data points for the Granular Made Ground are also shown on Figure 10.7.4.

6.9.7 The drained angle of internal friction has been derived from the SPT-N_{60} data using the Peck (1974) equation. Values range from 28° to 33° with a conservative characteristic Phi' of 28° considered appropriate due to the limited amount of data available.

6.9.8 The drained Youngs Modulus (E') of the material has also been derived from SPT-N_{60} data which is shown in Figure 10.7.5

Cohesive Alluvium

6.9.9 Due to areas of the Eastern Embankments overlapping with the River Etherow Bridge section, the interpretation of results for cohesive alluvium for both sections can be found in 6.13.17 to 6.13.32.

Head deposits

6.9.10 Due to areas of the Eastern Embankments overlapping with the River Etherow Bridge section, the interpretation of results for Head Deposits for both sections can be found in 6.13.4 to 6.13.16.

River Terrace Deposits / Glacio-fluvial deposits

6.9.11 Due to areas of the Eastern Embankments overlapping with the River Etherow Bridge section, the interpretation of results for River Terrace Deposits for both sections can be found in 6.13.33 to 6.13.36.

Cohesive Glacial Till

6.9.12 Figure 10.7.6 shows Natural Moisture Contents (NMC), Plastic Limits (PL) and Liquid Limits (LL) within the Glacial Till stratum. Plasticity Index values

6.9.13 Measured Plastic Limit (PL) and Liquid Limit (LL) values (Figure 10.7.6) range between 11 and 30% and 24 to 65% respectively for the stratum.

6.9.14 The A-Line Plot for the stratum shows the Cohesive Glacial Till to generally be a Clay of Low to Intermediate Plasticity(Figure 10.7.7).

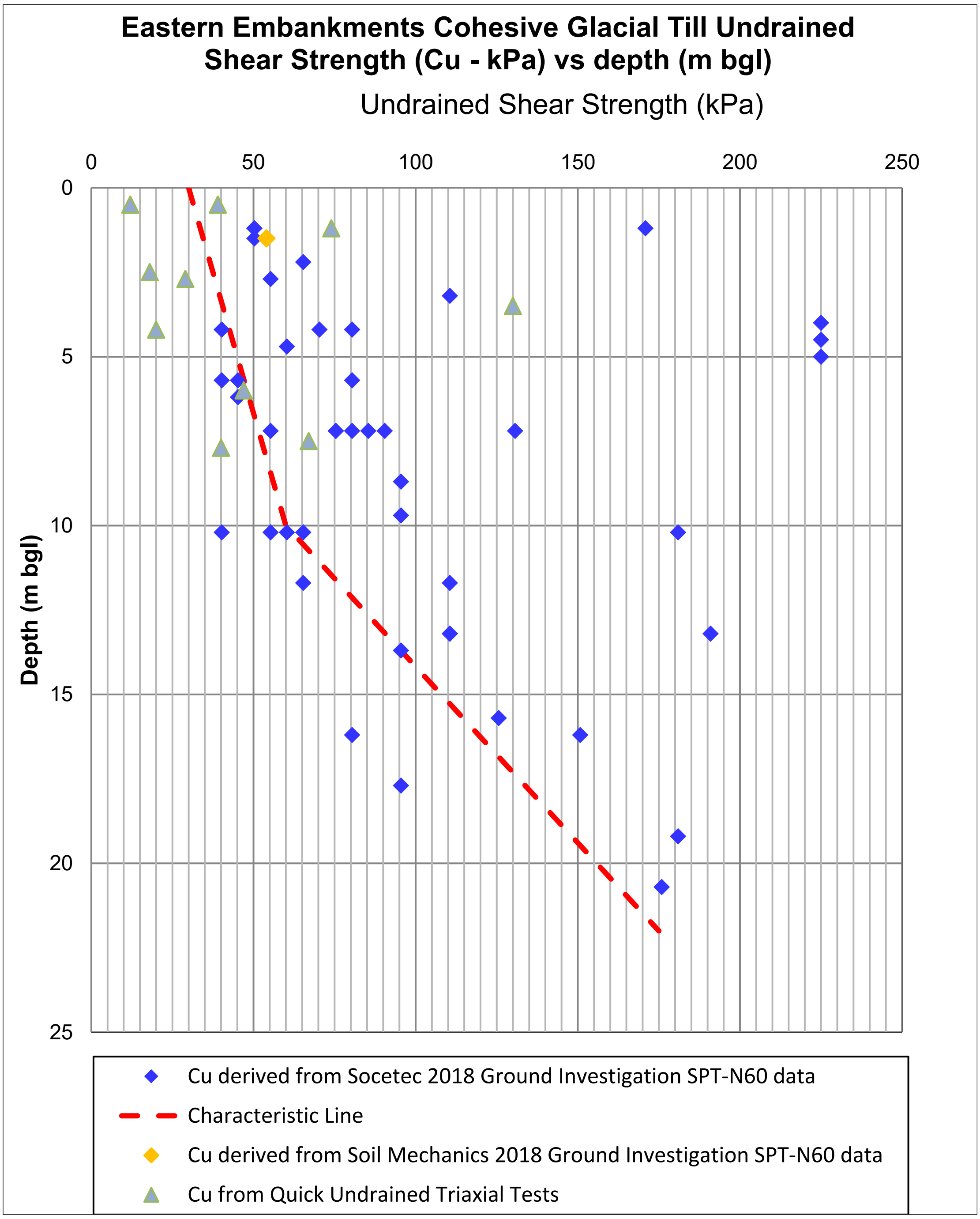
6.9.15 Measured Bulk Density values, measured from oedometer testing range from 1.91 to 2.22 Mg/m^3.

6.9.16 SPT-N_{60} data points range from 9 to refusal with a plot of SPT-N_{60} against depth presented in Figure 10.7.8.

6.9.17 Thirty PSD grading tests have been carried out on Cohesive Glacial Till soils within the vicinity of the proposed Eastern Embankments (Figure 10.7.9). All Glacial Till samples were shown to be well graded cohesive soils.

6.9.18 Undrained Shear Strength (Cu) parameters for the Glacial Till stratum were derived using SPT-N_{60} data. A plot of Cu derived from both SPT tests and Triaxial tests against Depth for the Eastern Embankments is shown in Figure 6.9.1 below.

Figure 6.9.1: Eastern Embankments Cohesive Glacial Till Undrained Shear Strength.



6.9.19 A drained cohesion (c') of 0 kPa is recommended for the stratum.

6.9.20 A characteristic drained friction angle (Phi') of 26˚ is recommended for the stratum. This value has been derived using Atterberg Limits data and guidance from BS 8004:2015.

6.9.21 A total of nine oedometer tests were scheduled in order to determine the stratums one – dimensional consolidation (m_v) parameters along the proposed Eastern Embankments at depths between 0.5m and 16.7m bgl. A plot of the Coefficient of Volume Compressibility (m^2/MN) against Applied Stress (kPa) is presented in Figure 10.7.11. Findings generally show a linear reduction in m_v values with increasing stress.

6.9.22 Glacial Till m_v values derived from SPT-N_{60} data show a general reduction with depth (Figure 10.7.13).

6.9.23 A comparison of laboratory m_v values and derived in-situ m_v data shows both sets of data to correlate well (Figure 10.7.12).

6.9.24 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing ranged from 0.67 to 4.8 m^2/yr.

6.9.25 An undrained Youngs Modulus (Eu) profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.7.14, along with a characteristic line, the equation of which can be seen in Table 45.

6.9.26 Drained Youngs Modulus (E') values derived from SPT-N_{60} data for Cohesive Glacial Till is presented in Figure 10.7.15. A characteristic line for the E' profile can be seen in the figure with an equation for the line shown in Table 45.

Table 45: Eastern Embankments Derived Geotechnical Parameters Summary Table.

Derived Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Head	Cohesive Glacial Till	River Terrace Deposits
Unit weight ɣ (kN/m3)		16	20	16	19	17	19
Undrained Shear Strength (Cu) kPa		-	-	40	25	<10m = 30+3d 20-22m = 60+9.58d	-
Effective Cohesion (c') kPa		0	-	0	0	0	-
Effective angle of internal friction ϕ' (°)		26	28	23	26	26	33+(d-8.7)
Coefficient of Volume Compressibility m_v (m^2/mN)		-	-	0.18-0.4	-	Refer to Figure 10.7.12	-
Drained Youngs Modulus (E')		3MPa	28MPa	4MPa	10MPa	<10m = 9 10-22m = 9+2.08(d-10)	7+(d-8.7)7.5
Undrained Youngs Modulus (E_u)		-	-	10MPa	6MPa	<10m = 12 10-22m = 12+2.75(d-10)	-
Optimum dry density	**Maximum DD (Mg/m3)**					1.91	

Derived Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Alluvium	Head	Cohesive Glacial Till	River Terrace Deposits
(DD) Optimum moisture content (MC) (2.5kg Rammer)	**Optimum MC** (%)					14	

6.10 Section 4 – Longdendale Aqueduct

6.10.1 A summary of ground conditions encountered at the anticipated location of the Longdendale Aqueduct are summarised in Section 5.3.85to Section 5.3.91

Table 46: Longdendale Aqueduct Measured Geotechnical Parameter Summary Table.

Measured Geotechnical Parameter		Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Glacial Till
Moisture Content w (%)		-	-	13-29 {10}
Liquid Limit (%)		33-38 {3}		25-58 {20}
Plastic Limit (%)		19-23 {3}		11-30 {20}
Plasticity Index (%)		14-15 {3}		5-32 {20}
Bulk Density γ (Mg/m)		-	-	1.91-2.22 {11}
Dry Density γ (Mg/m)		-	-	1.46-1.96 {7}
Particle Density (Mg/m^3)		-	-	2.65 {7}
SPT – N_{60} values (Blows)		-	4-19 {3}	9-50 {11}
Particle size Distribution (%)	**Cobbles**	-	-	-
	Gravel	-	-	3-42 {4}
	Sand	-	-	25-36 {4}
	Silt	-	-	22-35 {4}
	Clay	-	-	11-27 {4}
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer)		-	-	0.001-0.59 {7}
Coefficient of Consolidation Root Time (m^2/yr) (Oedometer)		-	-	0.67-4.8 {7}

**Note: Upper figure gives the data range. Lower figure in {} gives number of data points.*

Topsoil

6.10.2 Geotechnical considerations for Topsoil have not been taken into account at Longdendale Aqueduct. It is assumed that the topsoil will be removed prior to construction.

Made Ground (Granular and Cohesive)

6.10.3 A location and description of both cohesive and granular Made Ground encountered in the vicinity of the Longdendale Aqueduct is discussed in Section 5.3.85. to 5.3.91.

6.10.4 No NMC information is available for Made Ground soils encountered over this part of the site. However three Atterberg Limit tests are available and are presented in Figure 10.8.1 and Figure 10.8.2. A characteristic Plasticity Index of 15% is considered appropriate for design purposes.

6.10.5 Three SPT's were undertaken in Granular Made Ground and are presented in Figure 10.8.3. Made Ground soils are considered to be highly variable across this part of the site.

Cohesive Glacial Till

6.10.6 NMC, Plastic Limits (PL) and Liquid Limits (LL) recorded for the Glacial Till stratum are shown in Figure 10.8.4. Plasticity Index values are plotted on Figure 10.8.5 and indicate a characteristic Plasticity Index of 20% is considered appropriate for design purposes.

6.10.7 It should be noted that BH422 will be considered in the Mottram Moor Roundabout and in the Longdendale Aqueduct sections as this position overlaps both structures.

6.10.8 A total of eleven SPT's have been undertaken in boreholes near the Longdendale Aqueduct with results plotted in Figure 10.8.6.

6.10.9 Four PSD grading tests have been undertaken in the vicinity of the Longdendale Aqueduct. All tested specimens were well graded cohesive soils.

6.10.10 A Cu vs depth plot, inclusive of Cu parameters derived using SPT-N_{60} data and quick undrained triaxial tests data from the Longdendale Aqueduct area is shown in Figure 10.8.8. The characteristic line takes into consideration both data sets with the equation of the line shown in Table 47.

6.10.11 A total of two consolidated, undrained triaxial tests with pore water pressure measurements was undertaken on samples from BH422 at depths of 5.70m and 14.7m bgl. Measured c' values ranged from 0 to 4kPa. A characteristic c' of 0kPa is considered to be appropriate for Glacial Till.

6.10.12 Phi' values obtained from the two consolidated, undrained triaxial tests with pore water pressure measurements ranged from 28˚ to 29˚. Measured Phi' values are slightly higher in comparison to the site wide statistical Phi' of 26˚ derived for the Glacial Till soil using Atterberg Limits data and guidance from BS 8004:2015. Values derived from triaxial testing are anticipated to be higher in comparison to Atterberg Limits data due to the granular content described in tested specimens. A characteristic Phi' value of 28˚ is considered to be appropriate for Glacial Till soils encountered at the Longdendale Aqueduct.

6.10.13 A total of seven oedometer tests were scheduled in order to determine the stratum's m_v parameter values at the Longdendale Aqueduct. A plot of m_v (m^2/MN) against

Applied Stress (kPa) is presented in Figure 10.8.9. Findings generally show a non-linear reduction in m_v values with increasing stress.

6.10.14 M_v values derived via SPT-N_{60} data are displayed in Figure 10.8.10.

6.10.15 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing ranged from 0.67 to 4.8 m^2/yr (Figure 10.8.11). The Plot of C_v against applied stresses did not show any clear trends between C_v values and applied stresses.

6.10.16 A Eu profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.8.12. A characteristic design line is plotted on the figure with the equation of the line displayed in Table 47

6.10.17 Drained Youngs Modulus values derived from SPT-N_{60} results are displayed in Figure 10.8.13. The values generally increase with depth with a characteristic design line fitted to the data, the equation for which is shown inTable 47.

Table 47: Longdendale Aqueduct Derived Geotechnical Parameters Summary Table.

Derived Geotechnical Parameter	Made Ground (Cohesive)	Made Ground (Granular)	Cohesive Glacial Till
Unit weight ɣ (kN/m3)	16	20	18
Undrained Shear Strength (Cu) kPa	-	-	40+6.11d
Effective Cohesion (c') kPa	0	-	0
Effective angle of internal friction ɸ' (°)	27	28	28
Drained Cohesion (C')	0	-	0
Coefficient of Volume Compressibility m_v (m^2/mN)	-	-	Refer to Figure 10.8.9
Drained Youngs Modulus (E')	-	4MPa	6+0.76d
Undrained Youngs Modulus (E_u)	-	-	10+d

Mudstone

Table 48: Summary of measured Rock geotechnical parameters – Longdendale Aqueduct.

Measured Geotechnical Parameter	Mudstone	Siltstone	Sandstone
SPT-N_{60}	50		32 – 92
$Is_{(50)}$ corrected (MPa)	0.07 – 5.99 {4}	0.17 – 12.90 {31}	0.68 – 5.47 {28}

Measured Geotechnical Parameter	Mudstone	Siltstone	Sandstone
Uniaxial Compressive Strength tests (UCS) (MPa)	-	58.8 – 79.8 {2}	69.6 – 100 {4}
UCS derived via SPT-N_{60} conversion (MPa)	1.23 – 104.8 {4}	3.40 – 258.0 {31}	13.6 – 109.4 {28}

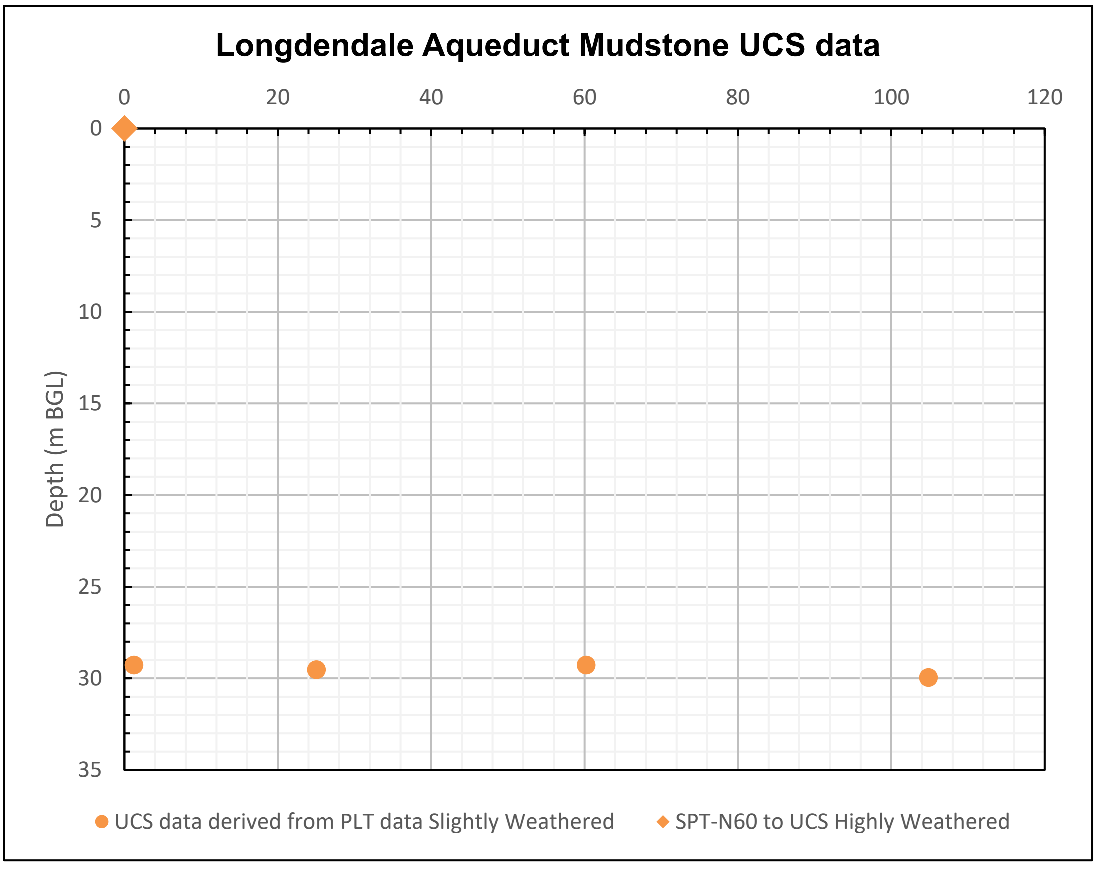
6.10.18 One SPT was undertaken in the highly weathered Mudstone unit. An extrapolated SPT-N_{60} value of 50 was recorded for the unit. The recorded SPT-N_{60} values corresponds to a derived UCS value of 0.250MPa. It is recommended that the SPT-N_{60} profile recorded the highly weathered strata encountered in the Eastern Cutting are applied to the Longdendale Aqueduct area given the lack of SPT-N_{60} data available in this part of the site.

6.10.19 A total of four Point Load tests were undertaken on Mudstone samples from the Longdendale Aqueduct slightly weathered samples. Insufficient data points are available to make clear correlations of variation in strength with increasing depth. Derived $Is_{(50)}$ values plotted against depth are shown in Section 10.8. It is recommended that a similar characteristic value to that used in the cutting (0.80MPa) is adopted for moderately to slightly weathered Mudstone at the Longdendale Aqueduct.

6.10.20 No direct UCS testing was undertaken within this part of the site.

6.10.21 A chart of derived UCS data is shown on Figure 6.10.1. UCS values for the stratum range from 1.23 to 104.8MPa. It is recommended that a similar characteristic value for the moderately to slightly weathered strata to that used in the cutting is adopted for the Longdendale Aqueduct. A characteristic UCS value of 14MPa is considered to be appropriate for the moderately to slightly weathered Mudstone unit.

Figure 6.10.1: Longdendale Aqueduct Mudstone UCS datapoints vs depth (m bgl).



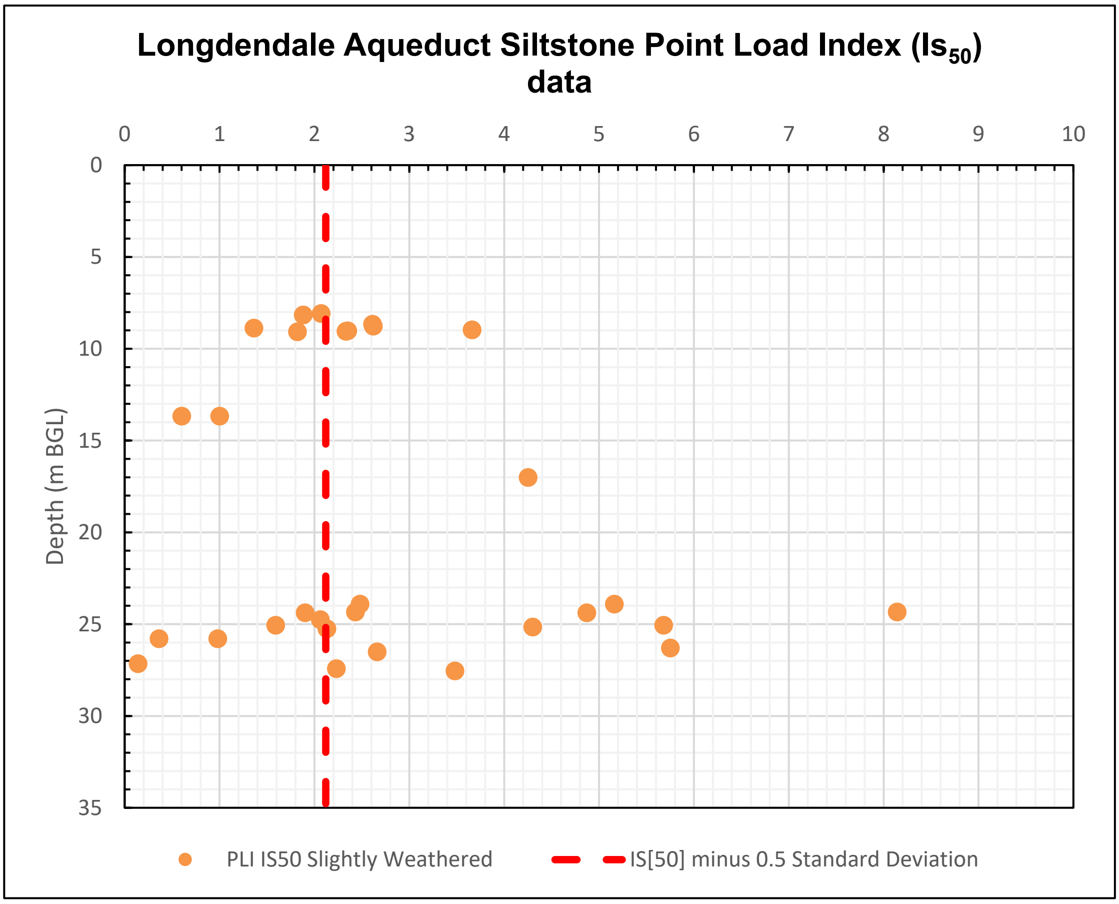
6.10.22 An average fracture spacing of 60mm was recorded in a Mudstone unit encountered in BH422 from 28.26m to 30.16m bgl (144.11m to 142.21m AoD). Discontinuities within this unit were described as closely, locally very closely spaced, undulating, smooth to rough.

Siltstone

6.10.23 No SPT's are recorded within Siltstone bedrock encountered at the Longdendale Aqueduct. It is recommended that the SPT-N_{60} profile recorded the highly weathered strata encountered in the Eastern Cutting are applied to the Longdendale Aqueduct area given the lack of SPT-N_{60} data available in this part of the site.

6.10.24 Point Load testing was undertaken on 38 specimens and provided a $Is_{(50)}$ range of 0.17 to 12.90 MPa for samples after correction for size. The range of $Is_{(50)}$ data points are not shown to vary consistently with increasing depth. A characteristic $Is_{(50)}$ value for slightly weathered Siltstone clasts of 2.1MPa is considered appropriate. No $Is_{(50)}$ data is available for highly or moderately weathered specimens.

Figure 6.10.2: Longdendale Aqueduct Siltstone $I_s(50)$ datapoints vs depth (m bgl).



6.10.25 Two UCS tests were undertaken on slightly Siltstone stratum at this location. UCS values ranged from between 59 to 80MPa.

6.10.26 A plot of $Is(_{50})$ data points and direct UCS testing results converted to UCS data points is shown in Figure 6.10.2. Derived data points from the $Is(_{50})$ derived UCS data points range from 3.40 to 258MPa. A Plot of UCS data points derive from $Is(_{50})$ data and direct UCS tests are A characteristic UCS value of 43MPa is considered to be appropriate for the Moderately to Slightly weathered Siltstone unit. A UCS characteristic value of 0.4MPa is considered to be appropriate for the highly weathered Siltstone as per findings from SPT-N_{60} values derived from the eastern cutting.

6.10.27 Field descriptions of weak to extremely weak are recorded within the Siltstone unit at moderate depth (BH421 at11.10m bgl (175.82m AoD) and 13.15m to 20.00m bgl (173.77 to 166.92m AoD)). Localised reductions of rock strength should be anticipated within the Millstone Grit Group.

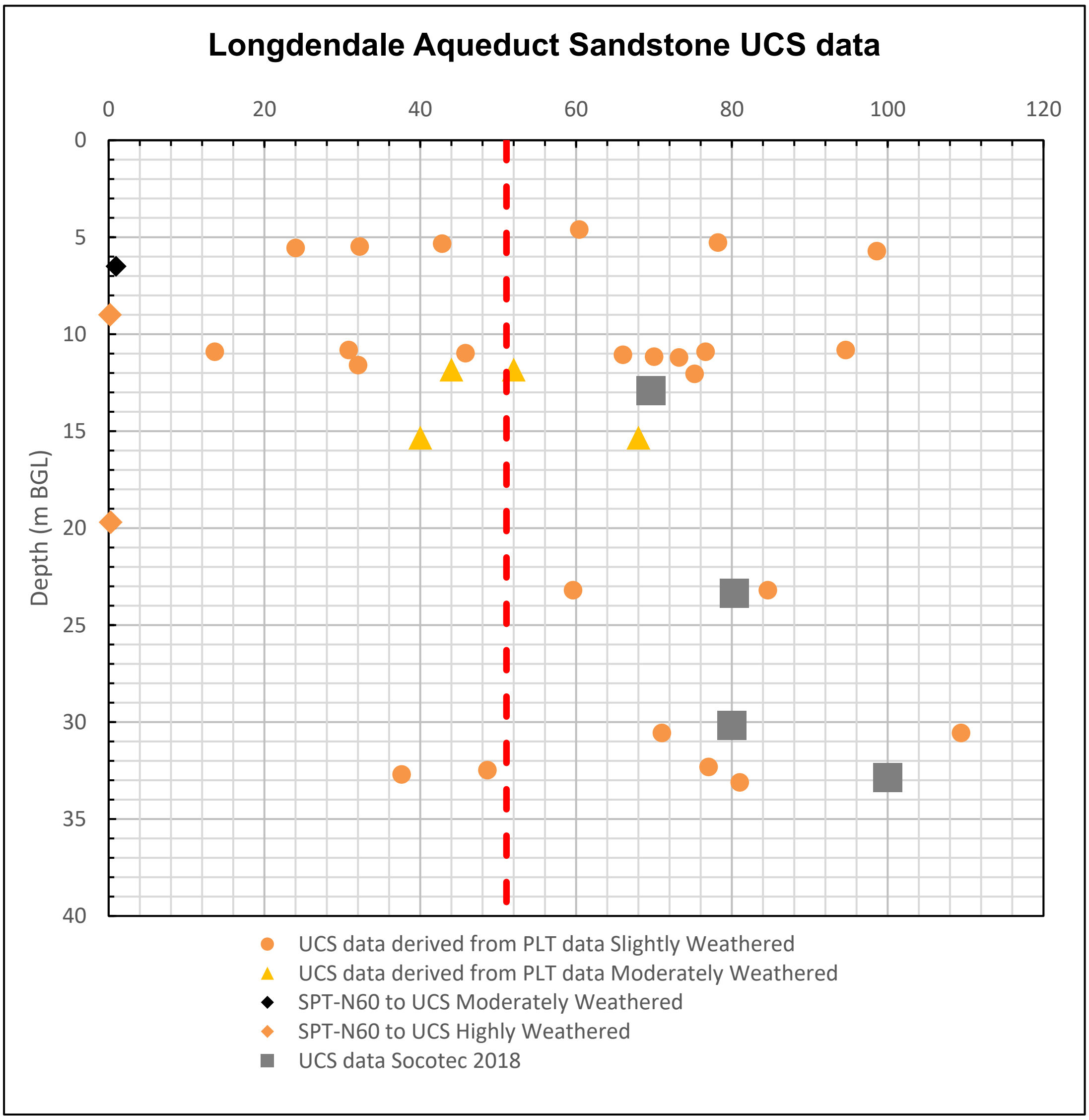
6.10.28 An average fracture spacing of between 60mm to 100mm was recorded within BH422 between depths of 23.36m to 28.26 mbg (149.01 to 144.11m AoD). Siltstone recovered in BH421 from between 4.73m to 10.30m bgl (182.19m to 176.62m AoD) was largely recorded to be non-intact. RQD's of between 0 and 25% were recorded for this interval. Siltstone rock quality was shown to improve from 13.15m bgl (173.77m AoD) where RQD's of 42 and 67% were recorded for the unit. Average fracture spacings of 180 to 350mm were recorded from 13.15m bgl (173.77m AoD).

Sandstone

6.10.29 Three SPT's were undertaken within highly to moderately weathered Sandstone unit. N_{60} values are shown to range from between 32 to 95. Insufficient SPT-N_{60} data points are available to make a meaningful comment on how SPT-N_{60} values vary with increasing depth within the Sandstone unit.

6.10.30 Size corrected $Is_{(50)}$ data points plotted against depth shows a wide scatter of data points for moderately and slightly weathered Sandstone specimens. No clear variations can be seen when comparing moderately and slightly weathered data points. No data points for the highly weathered stratum are present over this part of the site. $Is_{(50)}$ values ranged from between 0.68 to 5.47MPa. A characteristic $Is_{(50)}$ of 2.4MPa is considered appropriate for the moderately and slightly weathered Sandstone Unit.

Figure 6.10.3: Longdendale Aqueduct Sandstone derived and direct UCS datapoints vs depth (m bgl).



6.10.31 Four UCS tests were undertaken on slightly weathered Sandstone core specimens. A UCS range of between 70 to 100MPa was measured. A slight increase in UCS with depth is evident with core samples tested as shown on Figure 6.10.3. A characteristic UCS of 50MPa is considered to be appropriate for the slightly and moderately weathered Sandstone unit. Sandstone recovered in BH421 between 10.30m to

13.15m bgl (176.62 to 173.77m AoD) was recorded as non-intact and recovered predominantly as gravel and cobbles. Horizons of extremely weak to very weak Siltstone were recorded within this horizon. Local variations of rock strength can be anticipated over this area of the site. Discontinuities are generally recorded as sub-horizontal, closely spaced, planar, undulating and rough. RQD and Average Fracture spacing within this interval are recorded as 37% and 90mm respectively.

Table 49: Derived Rock geotechnical parameters – Longdendale Aqueduct.

Measured Geotechnical Parameter	Mudstone			Siltstone			Sandstone		
	H	M	S	H	M	S	H	M	S
$I_{s(50)}$	-	0.80	0.80		2.4	24.	-	2.4	2.4
Uniaxial Compressive Strength (UCS) (MPa)	0.3	13	13		43	43	-	50	50
Drained Youngs Modulus (E') (MPa)	94	390		88	1290			3750	

6.11 Section 4 - Mottram Moor Roundabout

6.11.1 A summary of ground conditions encountered at the location of the proposed Mottram Moor Roundabout are summarised in Section 5.3.92 to Section 5.3.22.

Table 50: Mottram Moor Roundabout Measured Geotechnical Parameters Summary Table.

Measured Geotechnical Parameter	Made Ground (Cohesive)	Colluvium	Cohesive Glacial Till
Moisture Content w (%)	35 {1}	40 {1}	13-29 {7}
Liquid Limit (%)	47 {1}	58 {1}	27-58 {7}
Plastic Limit (%)	22 {1}	25 {1}	15-26 {7}
Plasticity Index (%)	25 {1}	33 {1}	12-32 {7}
Bulk Density γ (Mg/m)	-		1.91-2.26 {9}
Dry Density γ (Mg/m)	-		1.46-2.00 {9}
Particle Density (Mg/m^3)	-		2.65-2.7 {9}
SPT – N_{60} values (Blows)	(4-19) {3}		9-28 {13}
Particle size Distribution – Cobbles	-		0-12 {12}

(%)	**Gravel**	-		3-54 {12}
	Sand	-		27-35 {12}
	Silt	-		25-30 {12}
	Clay	-		17-33 {12}
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer)		-		0.0026-0.59 {9}
Coefficient of Consolidation Root Time (m^2/yr) (Oedometer)		-		0.67-62 {9}
Ring Shear Testing	**Residual Drained Cohesion (c'^R) (kPa)**			Assumed to be zero
	Effective residual angle of internal friction (˚)			22 – 25 {2}

Topsoil

6.11.2 Geotechnical considerations for Topsoil have not been taken into account at Mottram Moor Roundabout. It is assumed that the topsoil will be removed prior to construction.

Made Ground

6.11.3 Made Ground soils encountered at this location were limited to the A57 carriageway crossing and TT402. No geotechnical tests were scheduled on Made Ground associated with the A57 carriageway.

6.11.4 Cohesive Made Ground, likely to be associated with the approximately 4.0m deep water main identified to the south to TT401, was recorded to have a NMC of 35%. The LL and PL were measured to be 47 and 22% respectively. A PI of 25 was determined for the material (Figure 10.9.1).

Colluvium

6.11.5 Colluvium soils were locally encountered in TT402 and are anticipated to be localised to the base of the gully feature encountered between CH1750 to CH1810.

6.11.6 A NMC of 40% was recorded for the stratum. The LL and PL were measured to be 58 and 25% respectively. A PI of 33% was determined for the material. An A-Line plot shows this material to be of High Plasticity (Figure 10.9.1).

Alluvium

6.11.7 Alluvium soils were locally encountered in TT402 and are anticipated to be localised to the base of the gully feature encountered between CH1750 to CH1810.

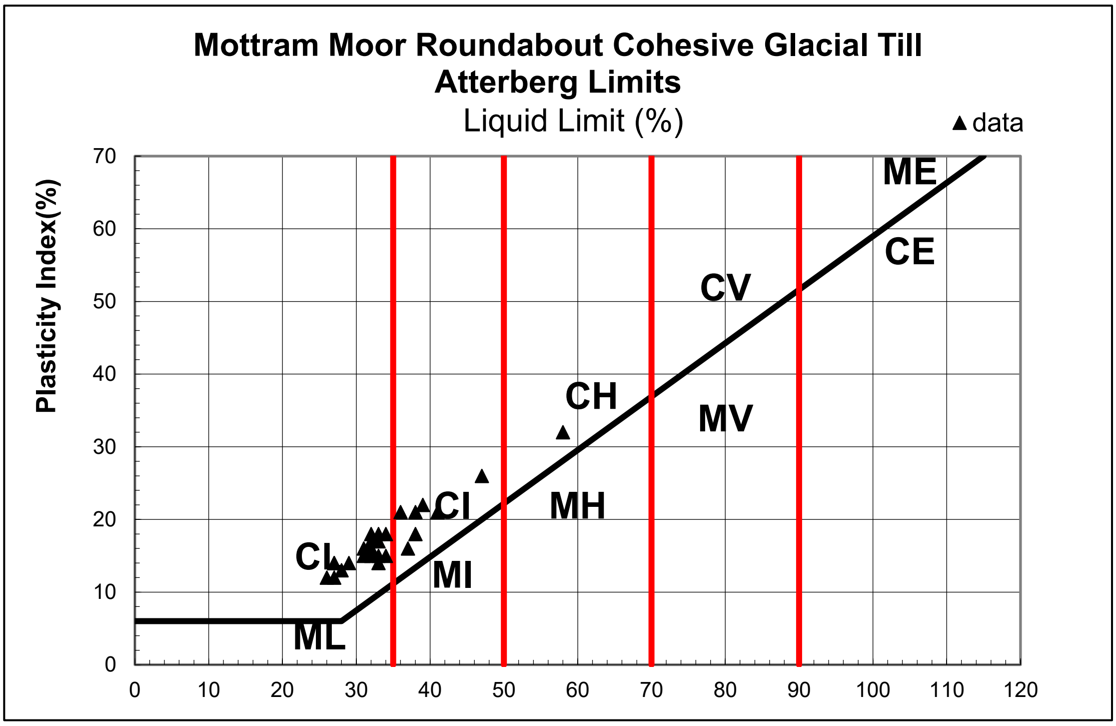
6.11.8 A NMC of 55% was recorded for the stratum. The materials LL and PL was measured to be 71 and 25% respectively. A PI of 46% was determined for the material. An A-Line plot shows this material to be of Very High Plasticity (Figure 10.9.1).

Glacial Till

6.11.9 A total of 28 no NMC tests were undertaken on samples from the Mottram Moor Roundabout with the results displayed in Figure 10.9.2. with LL and PL data.

6.11.10 Atterberg Limits testing shows the Glacial Till to be of Low to Intermediate Plasticity. An A-Line plot of Glacial Till soils tested at the proposed Mottram Moor Roundabout is presented inFigure 10.9.3. A characteristic Plasticity Index of 22% is considered appropriate for design.

Figure 6.11.1: Mottram Moor Roundabout Cohesive Glacial Till Atterberg Limits.



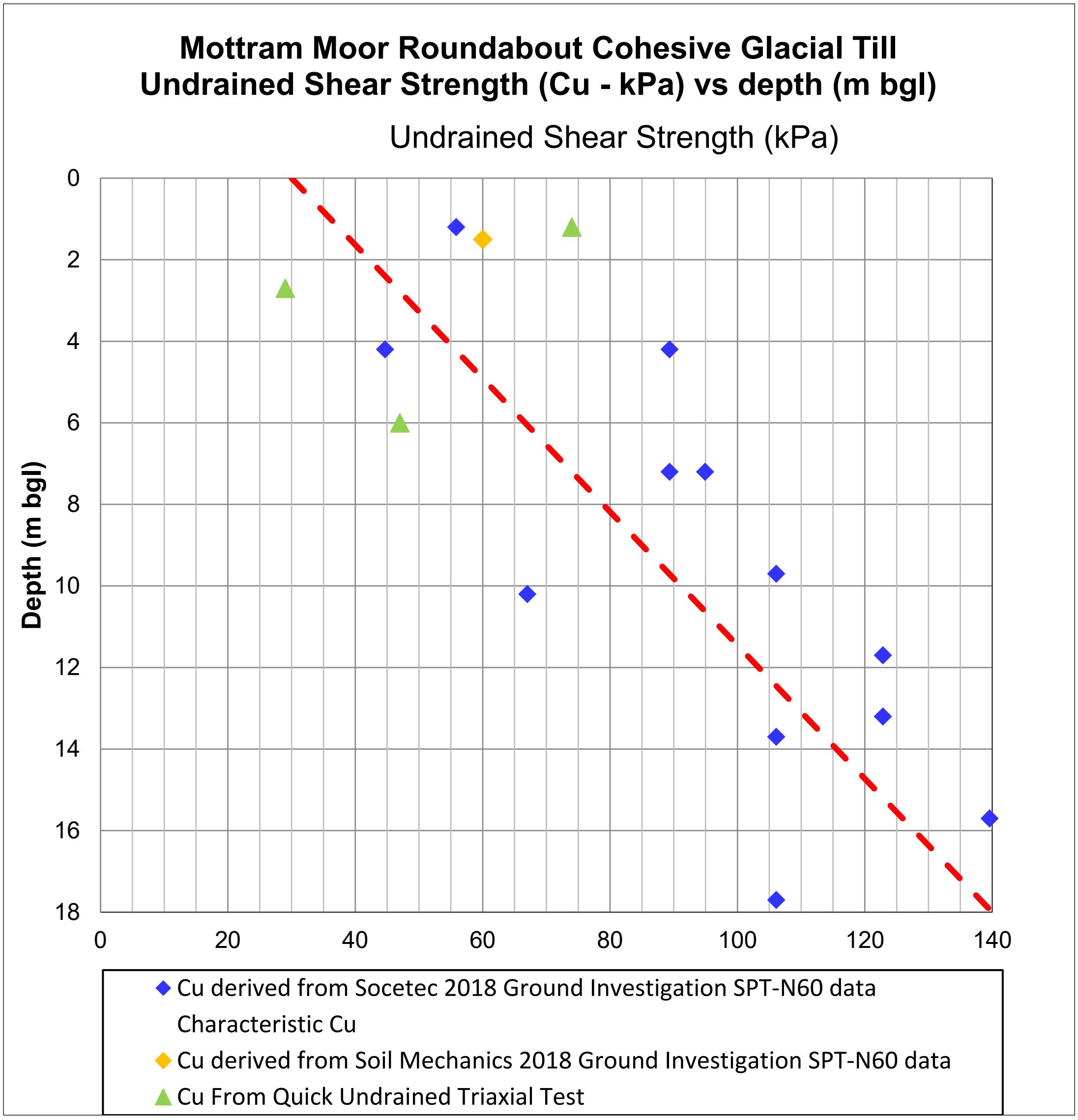
6.11.11 A total of 15 no SPT's have been undertaken in the area of the proposed Mottram Moor Roundabout. SPT-N_{60} values are generally shown to linearly increase with depth following a characteristic line detailed in Figure 10.9.4.

6.11.12 A total of twelve PSD tests have been undertaken at the Mottram Moor Roundabout. One specimen recorded a much higher sand and gravel content than the rest and is considered to be a localised granular lens within the Glacial Till (Figure 10.9.5). The till is indicated to be a sandy silty Clay.

6.11.13 A Cu vs depth plot, inclusive of Cu parameters derived using SPT-N_{60} data and Quick Undrained Triaxial test data showing a characteristic line is presented as Figure 10.9.6.

6.11.14 A total of three consolidated, undrained triaxial tests with pore water pressure measurements was undertaken on at depths of 3.0m, 5.70m and 14.7m bgl. Measured c' values ranged from 0 to 4kPa. A c' of 0kPa is considered to be appropriate for Glacial Till soils encountered at Mottram Moor Roundabout.

Figure 6.11.2: Mottram Moor Roundabout Cohesive Glacial Till Undrained Shear Strength.



6.11.15 A Phi' value of 28˚ has been derived for the material from the Atterberg Limits testing results (total of 26 No tests). One consolidated undrained triaxial with pore water pressure measurements is available for the Mottram Moor Roundabout. This specimen was from BH423 at 3.00m bgl. Findings from the triaxial tests measured a Phi' of 33˚. A characteristic Phi' of 28 is considered to be appropriate for the deposit, based on the number of Atterberg test compared to one consolidated undrained triaxial.

6.11.16 A total of two residual shear strength tests were undertaken on undisturbed samples obtained from BH423 from 1.80m and 4.80m bgl. Residual shear strength values (Phi'R) of 22˚ and 25˚ were measured. Both values are considered to be higher than anticipated. The higher Phi'R values are considered to due to the high granular content of the samples which were described as a slightly gravely, sandy CLAY. A comparison of the findings from the PSD data from this area of the site shows that the grading of the samples tested for residual shear strength reflect site in-situ conditions.

6.11.17 A total of five oedometer tests were scheduled in order to determine the stratums m_v parameter values at the proposed Mottram Moor Roundabout. A plot of m_v (m^2/MN) against depth (m BGL) is presented in Figure 10.9.7 showing both laboratory based results and SPT-N_{60} derived values. Findings generally show a linear reduction in m_v values with increasing stress with a characteristic design line shown on the figure.

6.11.18 Coefficient of Consolidation (m^2/yr) values measured at various applied stresses during the oedometer testing ranged from 0.67 to 4.8 m^2/yr. The Plot of C_v against applied stresses (Figure 10.9.8) did not show any clear trends between C_v values and applied stresses.

6.11.19 A Eu profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.9.9. Eu values for the Glacial Till are shown to increase linearly with depth. A characteristic Eu line is displayed in the figure with the equation of the line shown in Table 51.

6.11.20 An E' profile for the Cohesive Glacial Till, derived from SPT-N_{60} data is presented in Figure 10.9.10. A characteristic design line for the material is shown on the figure with the equation of the line in Table 51 below.

Table 51: Mottram Moor Roundabout Derived Geotechnical Parameters Summary Table.

Derived Geotechnical Parameter	Made Ground (Granular)	Cohesive Glacial Till
Unit weight ɣ (kN/m3)	19	18
Undrained Shear Strength (Cu) kPa	-	30+6.11d
Residual Shear Strength angle of internal friction (°)	-	22
Residual Shear Strength drained cohesion (kPa)		0
Effective angle of internal friction ϕ' (°)	30	28
Coefficient of Volume Compressibility m_v (m^2/mN)	-	0.0026-0.59
Drained Youngs Modulus (E')	-	7+0.77d
Undrained Youngs Modulus (Eu)	-	10+d

6.12 Section 4 – Carrhouse Lane Underpass

6.12.1 A summary of ground conditions encountered at the location of the proposed Carrhouse Lane Underpass are summarised in Section 5.3.99 to Section 5.3.102.

Table 52: Carrhouse Lane Underpass Measured Geotechnical Parameter Summary Table.

Measured Geotechnical Parameter		Cohesive Glacial Till
Moisture Content w (%)		11-47 {14}
Liquid Limit (%)		25-41 {14}
Plastic Limit (%)		14-20 {14}
Plasticity Index (%)		11-21 {14}
Bulk Density γ (Mg/m)		2-2.18 {3}
Dry Density γ (Mg/m)		1.78-1.91 {3}
Particle Density (Mg/m^3)		2.65-2.7 {3}
SPT – N_{60} values (Blows)		9-50 {14}
Particle size Distribution (%)	**Cobbles**	0-34 {6}
	Gravel	4-34 {6}
	Sand	21-42 {6}
	Silt	19-38 {6}
	Clay	11-22 {6}
Coefficient of Volume Compressibility m_v (m^2/mN) (Oedometer) **3 no Tests**		0.015-0.67 {23}
Coefficient of Consolidation (Root Time method) (m^2/yr) (Oedometer) **3 no Tests**		0.48-32 {15}
California Bearing Ratio (CBR) %	**Top**	1.8-2.7 {2}
	Bottom	2.6-3.3 {2}

Topsoil

6.12.2 Geotechnical considerations for Topsoil have not been taken into account at Carrhouse Lane. It is assumed that the topsoil will be removed prior to construction.

Cohesive Glacial Till

6.12.3 Figure 10.10.1 shows Natural Moisture Contents (NMC), Plastic Limits (PL) and Liquid Limits (LL) within the Glacial Till stratum. Plasticity Index values are displayed in

Figure 10.10.2 with a characteristic Plasticity Index of 20% considered appropriate for design. It should be noted that one sample from TP423 at a depth of 1.8m BGL recorded a NMC of 47%, well above the LL of 36%. The trial pit log does not indicate any very soft material in the description and describes the clay as stiff to very stiff. This high NMC may have been due to incorrect storage or handling of the sample.

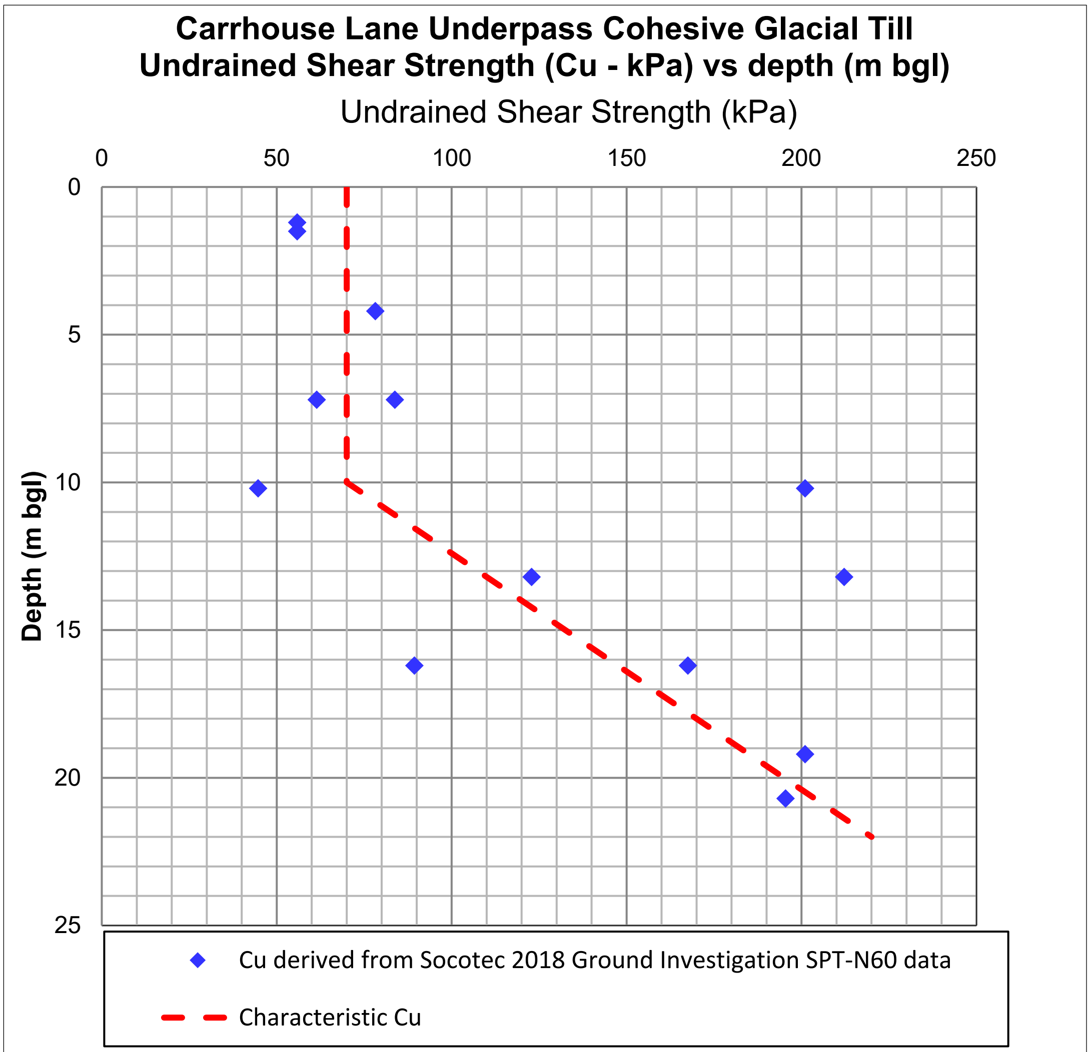
6.12.4 Bulk Density values, measured in oedometer testing range from 2.0 to 2.18 Mg/m^3.

6.12.5 SPT-N_{60} data points are presented in Figure 10.10.3 and show a general increase with depth.

6.12.6 Six PSD grading tests have been carried out on Glacial Till soils within the vicinity of the proposed Carrhouse Lane underpass and are shown in Figure 10.10.4. All Glacial Till samples were shown to be well graded cohesive soils.

6.12.7 Undrained Shear Strength (Cu) parameters for the Glacial Till stratum were derived using SPT-N_{60} data, the results of which can be seen in Figure 10.10.5. A characteristic design line for undrained shear strength is also shown on the figure with the equation for the design line stated in Table 53.

Figure 6.12.1: Carrhouse Lane Underpass Cohesive Glacial Till Undrained Shear Strength.



6.12.8 A drained cohesion (c') of 0 kPa is recommended for the stratum.

6.12.9 A characteristic drained friction angle (Phi') of 26° is recommended for the stratum. This value has been derived using Atterberg Limits data and guidance from BS 8004:2015. A plot of drained friction angle against depth is shown in Figure 10.10.6.

6.12.10 A total of three oedometer tests were scheduled in order to determine the stratums one – dimensional consolidation (m_v) parameter values. A plot of the Coefficient of Volume Compressibility (m^2/MN) against depth (m BGL) is presented in Figure 10.10.7. Findings generally show a significant scatter with possibly a linear reduction in m_v values with increasing depth.

6.12.11 Glacial Till m_v values derived from SPT-N_{60} data show a linear reduction with depth (Figure 10.10.8).

6.12.12 A comparison of laboratory m_v values and derived in-situ m_v data shows both sets of data to correlate well and is shown in Figure 10.10.7. along with a characteristic line.

6.12.13 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing ranged from 0.48 to 9.8 m^2/yr and are presented in Figure 10.10.9.

6.12.14 An undrained Youngs Modulus (E_u) profile for Glacial Till soils, derived from SPT-N_{60} data is presented as Figure 10.10.10 along with a characteristic E_u line. The equation for the line is displayed in Table 53 below.

6.12.15 Drained Youngs Modulus values derived from SPT-N_{60} results along with a characteristic line are presented in Figure 10.10.11. The equation of the design line can be found in Table 53 below.

Table 53: Carrhouse Lane Underpass Derived Geotechnical Parameter Summary Table.

Derived Geotechnical Parameter	Cohesive Glacial Till
Unit weight ɣ (kN/m3)	18
Undrained Shear Strength Cu (kPa)	<10m = 70 10-22m = 70 + 12.5(d – 10)
Effective Cohesion c' (kPa)	0
Effective angle of internal friction ϕ' (°)	26
Drained Youngs Modulus (E') MPa	<10m = 10 10m-22m = 10 + 1.91(d-10)
Undrained Youngs Modulus (E_u) MPa	<10m = 14 10-22m = 14 + 2.5(d – 10)
Coefficient of Volume Compressibility m_v (m^2/MN)	2.5

Derived Geotechnical Parameter		Cohesive Glacial Till
Optimum dry density (DD) Optimum moisture content (MC) (2.5kg Rammer)	**Maximum DD (Mg/m3)**	1.81
	Optimum MC (%)	16

6.13 Section 4 – River Etherow Bridge

6.13.1 A summary of ground conditions encountered at the River Etherow Bridge Crossing is summarised in Section 5.2.100 to Section 5.2.103.

6.13.2 Referenced Figures discussed below are located in Section 10.11

Table 54: River Etherow Bridge Measured Geotechnical Parameters Summary Table.

Measured Geotechnical Parameter		Head	Cohesive Alluvium	River Terrace Deposits
Moisture Content W (%)		12 – 27 {3}	12 – 36 {9}	
Liquid Limit (%)		33 – 34 {3}	55 – 65 {5}	
Plastic Limit (%)		17 – 19 {3}	24 – 30 {5}	
Plasticity Index (%)		17 – 19 {3}	27 – 36 {5}	
Bulk Density γ (Mg/m)		1.96 – 2.2 {3}	1.93 - 2.14 {2}	
SPT – N_{60} values (Blows)		5 – 11 {3}	9 – 29 {7}	7 – 56 {18}
Particle size Distribution (%)	**Cobbles**	0 {4}	0 {3}	20 – 0 {7}
	Gravel	30 – 5 {4}	0 – 5 {3}	55 – 15 {7}
	Sand	45 – 35 {4}	15 – 5 {3}	80 – 25 {7}
	Silt	35 – 22 {4}	40 – 50 {3}	5 – 0 {7}
	Clay	15 – 8 {4}	55 – 30 {3}	

Coefficient of Volume Compressibility m_v (m^2/MN) (Oedometer)	0.48 – 0.0093 {2}	0.35 – 0.072 {1}	
Coefficient of Consolidation (Root Time method) (m^2/yr) (Oedometer)	5.5 – 22 {2}	0.72 – 1.30 {1}	
California Bearing Ratio (CBR) %	1.9 {1}	1.6 {1}	1 {1}

Topsoil

6.13.3 Geotechnical considerations for Topsoil have not been taken into account at The River Etherow Crossing. It is assumed that the topsoil will be removed prior to construction.

Head Deposits

6.13.4 Head deposits have not been recorded on exploratory borehole logs in the location of the River Etherow. However, a review of the grading and Atterberg Limits data for a cohesive deposit found to overlie Alluvium indicates that this material is likely to form a Glacial Head deposit.

6.13.5 Natural Moisture Content (NMC), Plastic Limit (PL) and Liquid Limit (LL) for the head deposits are presented in Figure 10.11.1.

6.13.6 An A-Line plot shows Head deposits to comprise a Low to Intermediate Plasticity soil with a characteristic Plasticity Index of 20% considered appropriate for design (Figure 10.11.2).

6.13.7 A total of four PSD's were completed on Head soil samples with the results displayed in Figure 10.11.3. The grading curves for this material are shown to be similar to Glacial Till soils.

6.13.8 Three SPT's were completed in Head deposits (Figure 10.11.4). SPT-N_{60} values ranged from between 5 to 11 for the deposit. It is not possible to identify a trend in profile with depth for the deposit.

6.13.9 Cu data points derived from SPT-N_{60} data points do not shown any clear relationships with increasing depth (Figure 10.11.5). A a cautious estimate of the mean for Cu of 25kPa is recommended as a characteristic value for the stratum given the low SPT values and records of very soft consistencies at depth.

6.13.10 A c' of 0 kPa is considered to be appropriate for the stratum.

6.13.11 A characteristic drained friction angle (Phi') of 26° is recommended for the stratum (Figure 10.11.6). This value has been derived using Atterberg Limits data and guidance from BS 8004:2015.

6.13.12 Two oedometer tests were completed on Head deposit samples. A plot of the Coefficient of Volume Compressibility (m^2/MN) against Applied Stress (kPa) is presented in Figure 10.11.7. Findings generally show a linear reduction in m_v values with increasing stress.

6.13.13 M_v values derived from SPT-N_{60} data points do not show any clear trends with increasing depth (Figure 10.11.8) and are shown to range from between 0.22 m2/MN to 0.5 m2/MN which equates to a material of High to Medium Compressibility.

6.13.14 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing ranged from 5.5 to 22 m^2/yr.

6.13.15 An Eu profile for Head deposits soils, derived from SPT-N_{60} data is presented as Figure 10.11.9. A characteristic Eu of 6MPa is recommended for design purposes.

6.13.16 An E' profile for Head deposits, derived from SPT-N_{60} data is presented in Figure 10.11.10. A characteristic E' of 4.5MPa is recommended for design.

Cohesive Alluvium

6.13.17 A total of 9 no samples were tested for NMC. NMC values ranged from between 12 to 36% and are shown to increase with depth (Figure 10.11.11).

6.13.18 LL values typically range between 32 to 65%. PL data points are also shown to increase with depth and lie within a range of 18 to 30%.

6.13.19 Alluvium soils are shown to be of High Plasticity. PI values for Alluvium range from 27 to 36% (Figure 10.11.12).

6.13.20 Gradings tests on Alluvium samples showed the material to be sandy to slightly sandy very silty Clay (Figure 10.11.13).

6.13.21 Seven SPT's were completed in cohesive alluvial soils (Figure 10.11.14). SPT-N_{60} values show no trend with depth and so a cautious estimate of the mean has been used as a characteristic value.

6.13.22 An f1 value of 4 has been adopted for alluvium soils given the soils High Plasticity characteristics. A plot of Cu against depth (Figure 10.11.15) shows no consistent increase with depth. High SPT derived Cu values are considered to be due to granular pockets which may not represent the materials in-situ condition. One Quick undrained triaxial testing undertaken in BH432 at 7.70m bgl recorded a Cu of 40kPa for alluvium soils tested. A characteristic Cu of 40kPa is considered to be appropriate for the stratum.

6.13.23 A c' of 0 kPa is considered to be appropriate for the stratum.

6.13.24 A characteristic drained friction angle (Phi') of 24˚ is recommended for the stratum (Figure 10.11.16). This value has been derived using Atterberg Limits data and guidance from BS 8004:2015.

6.13.25 One oedometer test was completed on a sample from a depth of 4.70m in BH432. A plot of the Coefficient of Volume Compressibility (m^2/MN) against Applied Stress (kPa) is presented in Figure 10.11.17. Findings generally show a non-linear reduction in m_v values with increasing stress.

6.13.26 A general m_v range of between 0.35 to 0.2 m^2/MN were measured for samples tested at an Applied Stress of less than 160kPa. This equates to a soil of High Compressibility

6.13.27 The remaining m_v values were recorded to range between 0.12 to 0.072 m^2/MN for samples tested up to an applied stress of 640kPa. This compressibility range corresponds to a soil of Low to Medium compressibility.

6.13.28 An f2 value of 400 has been adopted for alluvium soils given the soils High Plasticity characteristics. The m_v values derived from SPT-N_{60} data points do not show any clear trends with increasing depth and are shown, in Figure 10.11.18, to range from between 0.26 to 0.08. Lower bound values have been omitted due to possible granular materials encountered within the Alluvium. SPT-N_{60} derived m_v values show the material to be a Medium Compressibility soil.

6.13.29 Oedometer derived m_v values are shown to correlate well with SPT-N_{60} values when soils tested at an applied stress of great than 160kPa are compared to SPT-N_{60} data points from between 4.70m to 10.2m bgl.

6.13.30 Coefficients of Consolidation (m^2/yr) values measured at varying applied stresses during the oedometer testing ranged from 0.72 to 1.3 m^2/yr.

6.13.31 An Eu profile for Alluvium soils, derived from SPT-N_{60} data is presented as Figure 10.11.19. A characteristic Eu of 12MPa is recommended for design purposes.

6.13.32 An E' profile for Cohesive Alluvium, derived from SPT-N_{60} data is presented in Figure 10.11.20. A characteristic E' of 9MPa is recommended for design.

River Terrace Deposits / Glacio-fluvial deposits

6.13.33 A total of eight PSD's were completed on River Terrace Deposit samples, the results of which can be seen in Figure 10.11.21.

6.13.34 A total of 18 no SPT's were undertaken within the River Terrace Deposits. SPT-N_{60} values ranged from 7 to refusal (Figure 10.11.22). There is a general correlation between increasing N_{60} values and depth.

6.13.35 A derivation of Phi' properties for the stratum was undertaken using SPT-N_{60} data and guidance from Peck (1974). A plot of Phi' values against depth is shown on Figure 10.11.23. Findings show the derived Phi' value to increase by 2° per meter depth from 8.7m to 14.7m bgl. A characteristic Phi' design line of 33 + (d – 8.7) is recommended for the stratum.

6.13.36 E' characteristics for the stratum have been derived using guidance from CIRIA 143. E' values are shown to increase with depth and a characteristic E' deign line is shown in Figure 10.11.24.

Table 55: River Etherow Bridge Derived Geotechnical Parameters Summary Table.

Derived Geotechnical Parameter	Head	Cohesive Alluvium	River Terrace Deposits
Unit weight ɣ (kN/m3)	19	16	19
Undrained Shear Strength derived from SPT-N correlations (Cu) kPa (Stroud and Butler)	25	40	
Drained Cohesion c' (kPa)	0	0	
Effective angle of internal friction ϕ' (°)	26	23	33 + (d – 8.7)
Drained Youngs Modulus (E') (kPa)	4.5	9	30+10(d-8.7)

Derived Geotechnical Parameter	Head	Cohesive Alluvium	River Terrace Deposits
(CIRIA 143)			
Undrained Youngs Modulus (E_u) (kPa) (CIRIA 143)	6	12	

Mudstone

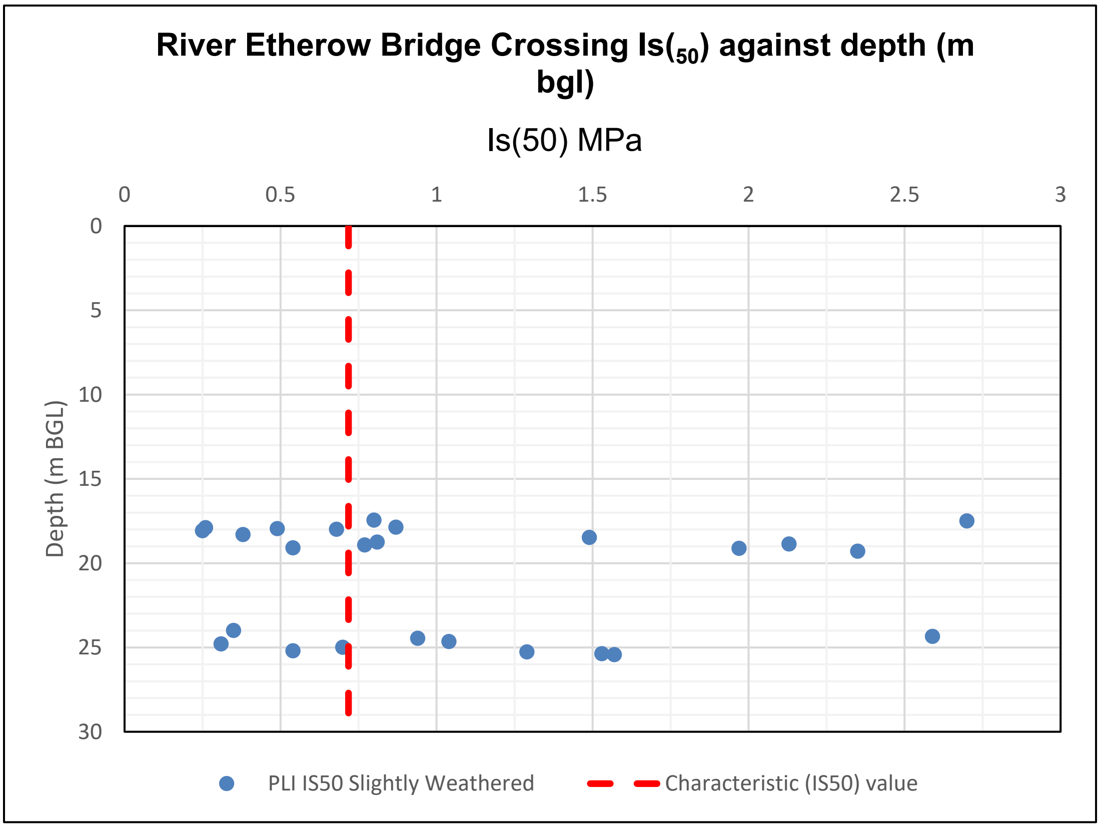
Table 56: Summary of measured Rock geotechnical parameters – River Etherow.

Measured Geotechnical Parameter	Mudstone	Siltstone	Sandstone
SPT-N_{60}	58 – 250 {3}	168 – 258 {3}	25 – 239 {4}
Is(50) corrected (MPa)	0.25 – 2.70 {25}	1.03 – 1.11 {2}	0.11 – 0.78 {3}
UCS derived via SPT-N_{60} conversion (MPa)	4.38 – 47.3 {25}	20.6 – 22.2 {2}	2.20 – 15.6 {3}

6.13.37 Three SPT's were undertaken within the highly to moderately weathered Mudstone unit at the River Etherow Bridge Crossing. No correlation between SPT-N_{60} values and depth can be made with the number of data points available at the River Etherow Bridge crossing.

6.13.38 A total of 25 no PLI tests were undertaken on Mudstone samples from the River Etherow Bridge Crossing. A data plot showing $I_s(50)$ values plotted against depth is shown in Figure 6.13.1. PLI data points plotted against depth show a wide scatter of data points. No clear correlation between $I_s(50)$ values and depth are shown. $I_s(50)$ data points are shown to range between 0.25 to 2.70MPa and a characteristics $I_s(50)$ value of 0.70MPa is considered to be appropriate for the moderately to slightly weathered Mudstone Unit. No PLT were undertaken on Highly Weathered specimens.

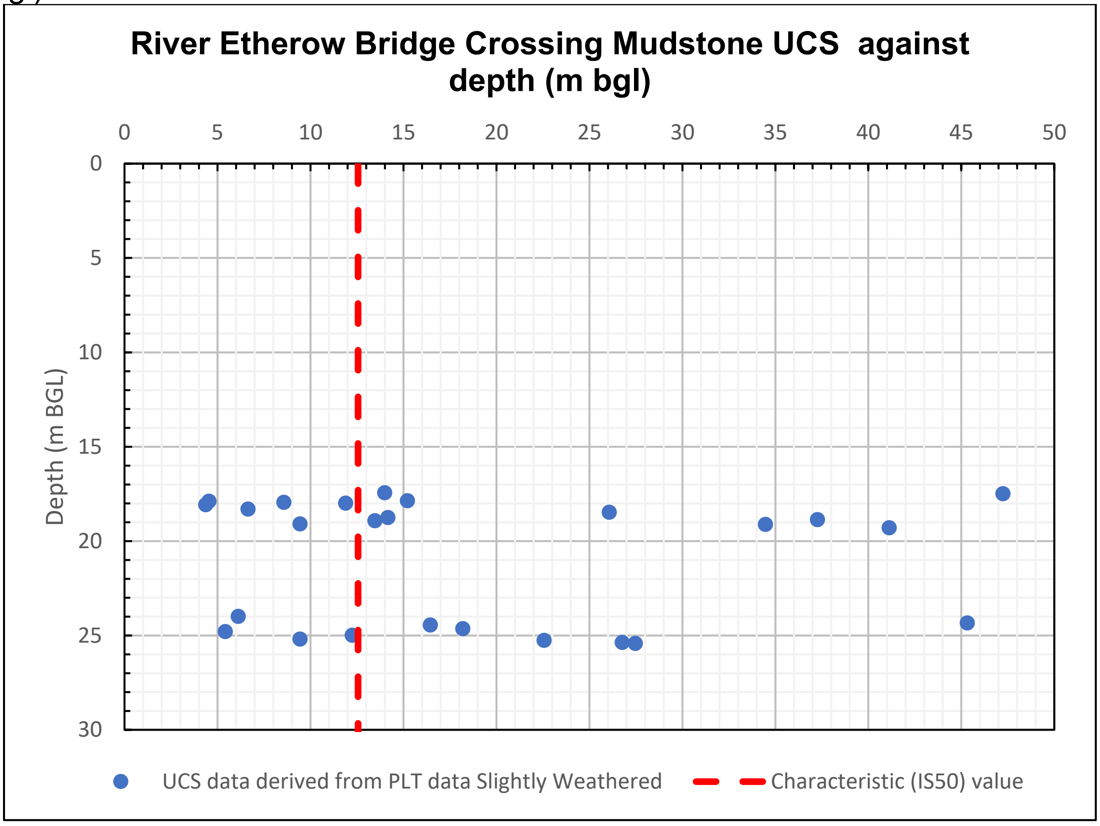
Figure 6.13.1: River Etherow Bridge Crossing Mudstone $I_s(50)$ datapoints vs depth (m bgl).



6.13.39 No direct UCS testing was undertaken within this part of the site.

6.13.40 A plot of UCS data points derived from PLI samples is shown on Figure 6.13.2. UCS values for the stratum range from 4.38 – 47.3MPa. A characteristic UCS value of 13MPa is considered to be appropriate for the moderately to slightly weathered Mudstone unit. A characteristic UCS value of 0.3MPa is considered to be appropriate for the highly weathered Stratum. This value has been derived using a cautious lower bound SPT-N_{60} value of 58 for the highly weathered Mudstone Unit.

Figure 6.13.2: River Etherow Bridge Crossing Mudstone UCS datapoints vs depth (m bgl)



6.13.41 Discontinuities are typically closely to very closely spaced, planar smooth to planar rough with a typically clean surface within the Mudstone Unit. An average fracture spacing of 40mm to 90mm was recorded. RQD values for the Unit ranged between 0 to 37%.

Siltstone

6.13.42 Three SPT's were undertaken within the moderately weathered Siltstone unit at the River Etherow Bridge Crossing. No correlation between SPT-N_{60} values and depth can be made with the number of data points available at the River Etherow Bridge crossing.

6.13.43 Point Load Index testing was undertaken on two specimens of slightly weathered Siltstone and provided an $I_s(50)$ range of 1.03 to 1.11MPa for samples which have been corrected for size. No meaningful observations of $I_s(50)$ values and increasing depth can be made at this location. No $I_s(50)$ data is available for highly or moderately weathered specimens.

6.13.44 No direct UCS testing was undertaken within this part of the site.

6.13.45 A derivation of UCS data points from PLI testing values equates to a UCS range of 20.6 to 22.2MPa. Field descriptions of the Siltstone strata range from extremely weak to very weak (0.6 to 5.0MPa), indicating that the limited UCS data provides an over-estimation of the material's strength in this part of the site. A characteristic UCS of 0.8MPa, derived from a correlation of the SPT-N_{60} data, is considered suitable for the Siltstone stratum at the River Etherow Bridge Crossing.

6.13.46 Exploratory field descriptions of Weak to Extremely Weak are recorded within the Siltstone unit at depth (BH421 at11.10m bgl (175.82m AoD) and 13.15m to 20.00m bgl (173.77 to 166.92m AoD)). Localised reductions of rock strength should be anticipated within the Millstone Grit Group.

6.13.47 Discontinuities are recorded to be very closely to closely spaced, planar and locally stepped with an occasional silt infill. An average fracture spacing of 45mm was recorded in addition to an RQD of 0%.

Sandstone

6.13.48 Four SPT's were undertaken within the Sandstone Unit. N_{60} values are shown to range from between 25 to 239. Limited SPT-N_{60} data points are available to make a meaningful comment on how SPT-N_{60} values vary with increasing depth within the Sandstone unit.

6.13.49 Three $I_s(50)$ data point is available for Sandstone specimens from the River Etherow Bridge Crossing. $I_s(50)$ values, size corrected) were shown to vary between 0.13 to 0.71MPa. Limited $I_s(50)$ data points area available to make a correlation between strength and depth for Sandstone Units over this part of the site. A lower bound $I_s(50)$ value of 0.13 is considered to be appropriate for Sandstone over this part of the site for design purposes.

6.13.50 No UCS tests were undertaken on the Sandstone core specimens over this part of the site.

6.13.51 A UCS range, derived from $I_s(50)$ data points is shown to vary between 2.20 to 15.6MPa. Field log strength descriptions of extremely weak and very weak are recorded for the Sandstone Stratum. A cautions characteristic lower bound UCS value of 2.20MPa is considered to be appropriate given the field logging descriptions for the stratum.

Table 57: Derived Rock geotechnical parameters – River Etherow Bridge Crossing.

Measured Geotechnical Parameter	Mudstone			Siltstone			Sandstone		
	H	M	S	H	M	S	H	M	S
$I_s(50)$	-	0.70	0.70	-	-	-	-	0.13	0.13
Uniaxial Compressive Strength (UCS) (MPa)	0.30	12	12	0.80	0.80	0.80	-	2.20	2.20
Drained Youngs Modulus (E') (MPa)	-	360		360	-		-	-	

6.14 California Bearing Ratio (CBR)

6.14.1 A CBR assessment was undertaken which took into consideration data from In Situ Plate Load tests, TRL Dynamic Cone Penetrometer and Laboratory based CBR tests. The results of this can be seen in Figure 10.12.1. A characteristic value of 2.5% is considered appropriate for the purposes of design.

6.15 Soil and Rock Chemistry

6.15.1 The results of pH and sulphate testing of soil and groundwater samples are summarised in Table 58 below. The Design Sulphate and ACEC class for the materials have been determined in accordance with BRE Special Digest 1 (BRE, 2005).

6.15.2 The majority of samples tested in the Cohesive Glacial Till indicate a Design Sulphate Class of DS-1 or DS-2. Only one sample was classed as DS-5 in BH406 at a depth of 6.2m BGL. The chemical classification of material should be checked at detailed design.

6.15.3 For Sandstone in the Millstone Grit Group, 9 out of 11 samples gave a Design Sulphate Class of DS-1 and ACEC class of AC-1s. Two samples gave DS classes of DS-2 and DS-4 in BH414 and BH410 at depths of 7.82m and 3.14m BGL respectively.

Table 58: BRE Sulphate and pH testing by geology summary table.

Material		Made Ground	Peat	Cohesive Alluvium	Granular Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till	Millstone Grit Group		
									Mudstone	Siltstone	Sandstone
pH	**No. of samples**	12	3	1	5	102	5	2	26	22	16
	Range	4.8-7.94	3.05-5.8	7	5.28-7.3	3.24-8.6	7.4-8.5	8.2	4.2-8.6	5.7-8.5	5.1-8.5
Total Sulphate SO_4 (mg/l)	**No. of samples**	-	-	-	-	-	-	-	-	-	-
	Range	-	-	-	-	-	-	-	-	-	-
2:1 soil/water extract SO_4 (mg/l)	**No. of samples**	4	-	1	3	65	5	2	24	16	11
	Range	10-860	-	13	10-21	10-3580	10-40	70-4690	10-1310	10-972	10-65
Groundwater Sulphate SO_4 (mg/l)	**No. of samples**	-	-	-	-	-	-	-	-	-	-
	Range	-	-	-	-	-	-	-	-	-	-
Total Sulphur (%)	**No. of samples**	4	-	1	3	65	4	2	24	16	11
	Range	0.039-0.133	-	0.035	0.019-0.03	0.01-1.73	0.014-0.03	0.04-0.06	0.01-2.93	0.023-1.44	0.01-0.402

Material		Made Ground	Peat	Cohesive Alluvium	Granular Alluvium	Cohesive Glacial Till	Granular Glacial Till	Laminated Glacial Till	Millstone Grit Group		
									Mudstone	Siltstone	Sandstone
Oxidisable Sulphides (%SO_4)	**No. of samples**	4	-	1	3	64	4	2	24	16	11
	Range	0.08-0.314	-	0.0859	0.0476-0.0722	0.01-3.63	0.0379-0.0814	0.09-0.13	-0.02-8.538	0.0642-4.1223	0.02-1.18
Total Potential Sulphate % (SO_4)	**No. of samples**	4	-	1	3	65	4	2	24	16	11
	Range	0.117-0.399	-	0.105	0.057-0.09	0.03-5.19	0.042-0.09	0.12-0.18	0.03-8.79	0.069-4.32	0.03-1.206
Design Sulphate Class (BRE SD1, 2005)		DS-2	-	DS-1	DS-1	DS-5*	DS-1	DS-4	DS-5	DS-5	DS-4*
Aggressive Chemical Environment for concrete (BRE SD1, 2005)		AC-1s	-	AC-2z	AC-2z	AC-5*	AC-1s	AC-3s	AC-5	AC-5	AC-3s*

**Denotes a classification with further explanation in 6.15.2 to 6.15.3.*

7 GEOTECHNICAL RISK REGISTER

7.1 Summary

7.1.1 A review of the geotechnical risks associated with the scheme has been undertaken. The risks have been evaluated using the risk evaluation matrix suggested in Part 2 of HD22/08 'Managing Geotechnical Risk', which is reproduced as below.

7.2 Risk Matrix

7.2.1 The below matrix shall be used to help assess the impact and likelihood of a hazard before and after the mitigation measures.

Table 59: Risk Matrix Part 1.

Score		Impact				
		Very Low 1	Low 2	Medium 3	High 4	Very High 5
Likelihood	Very High 5	5	10	15	20	25
	High 4	4	8	12	16	20
	Medium 3	3	6	9	12	15
	Low 2	2	4	6	8	10
	Very Low 1	1	2	3	4	5

Table 60: Risk Matrix Part 2.

Rating	1 Very Low	2 Low	3 Medium	4 High	5 Very High
Likelihood	<5%	5% - 20%	21% - 50%	51% - 75%	>75%
Impact					
Time (Weeks)	0 -1w	1-4w	4-8w	8-12w	>12 weeks
Reputation	Public criticism of less than one day requiring minimal additional press office involvement.	Public criticism of over one day to one week and/or requiring a project team response.	Public criticism of over one to two weeks and/or requiring a significant project team response.	Public criticism of over one to two weeks and/or requiring a Chief Executive response.	Public criticism over three to four weeks and/or requiring a Secretary of State response.
Health & Safety (Effect on project employees or any other parties).	Minor injuries (non reportable); minor health or welfare issue (non reportable)	Reportable < 3 day incident; health or welfare issue affecting < 100 people for < 3 days; significant near miss	Reportable: major injury or dangerous occurrence; health or welfare issue affecting >100 people < 3 days or <100 people > 3 days.	Single fatality; health or welfare issue affecting >100 people > 3 days.	Multiple fatalities or single fatality and multiple injuries. health or welfare issue affecting > 1000 people > 3 days.
Environmental	Minor pollution event contained within site. Failure to achieve local sustainability measures.	Contamination off site - no lasting damage; failure to achieve Highways England sustainability targets < 1 week.	Contamination off site - damage < 1 month); failure to achieve Highways England sustainability targets < 1 month.	Contamination off site - damage < 1 year; failure to achieve Highways England sustainability targets < 1 year.	Contamination off site - damage > 1 year; failure to achieve Highways England sustainability targets > 1 year.

7.3 Geotechnical Risk Register

Table 61: Geotechnical Risk Register.

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
1	Unknown ground conditions. Limited ground investigation allows for areas of unknown material e.g. soft spots and possible faulted Breccia.	Localised subsidence or slope instability leading to injury during construction and/or damage to infrastructure.	Route wide	4	2	8	Ground Investigation Report (GIR) to highlight any known areas of potential weak material e.g. soft spots. During construction, Contractor is required to record and inform the detailed design of any areas of unexpected material.	4	1	4
2	High voltage overhead cables located next to the proposed development.	Possibility of injury or death during construction/operation of highway. Limitations to plant movement during construction.	Route wide	5	2	10	Detailed design of earthworks should take into consideration the vertical alignment and height of the overhead cable. Geological Long Section drawings highlight the hazard (Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044 to 3051). Contractor to have suitable RAMs in place for working near overhead cables.	5	1	5
3	Construction of proposed development on or near surface depressions (Kettle Holes). Possibility of working near water.	Localised subsidence or slope instability leading to injury during construction and/or damage to infrastructure. Possible injury or death from falling into water.	Route wide	3	2	6	It is recommended to investigate these features during detailed design to understand the origins of these features to enable a safe temporary and permanent works design to be prepared. Geological Long Section drawings highlight the hazard (Drawings HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044 to 3051).	2	2	4
4	Encountering granular lenses during construction of cuttings.	Groundwater ingress within cut slopes causing localised instability of slopes, fine wash out and surface erosion.	Route wide	3	3	9	Granular lenses should be identified during construction of cuttings. Temporary works drainage design to take account of water ingress from perched water tables.	3	1	3
5	Construction of proposed development on or near laminated glacial till.	Localised slope instability leading to damage to infrastructure.	Route wide	3	2	6	Laminations to be considered during detailed design of slope stability. During construction, Contractor is required to record and inform the detailed design of any areas of unexpected material.	3	1	3
6	Impact of earthworks affecting adjacent land, infrastructure and services	Localised subsidence or slope instability causing damage to existing/proposed infrastructure.	Route wide	3	2	6	Detailed design to take account of possible effects outside boundary. Slope design to consider risk of instability affecting third party land.	3	1	3

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
7	Impact of proposed development on Longdendale Aqueduct Air Shaft.	Damage to airshaft - collapse, impact on water supply. Potential damage to surrounding infrastructure.	M67 to Mottram Village	4	1	4	Hazard must be recorded on construction drawings prepared during detailed design. Detailed design of embankments to consider position and location of the airshaft. Effects from embankment on feature to be analysed if necessary to demonstrate safety of shaft.	2	1	2
8	Deep excavations for the Mottram underpass and associated wingwalls.	Falling from height leading to injury or death.	Mainline CH890 to 1075	5	2	10	If practical, risk to be designed out in detailed design, for example, with railings along top of retaining walls. Contractor to have suitable RAMs in place for working at height.	4	2	8
9	**Construction and lifecycle use of the Mottram Underpass and associated wingwalls in areas of artesian groundwater.**	**Inundation, by water or soil inflow, or collapse of excavations leading to Injury due to ground movements or drowning due to water inundation.**	**Mainline CH890 to 1075.**	**5**	**3**	**15**	**Hazard must be recorded on construction drawings prepared during detailed design. Temporary works designer to develop safe construction methodology for artesian groundwater.**	**5**	**1**	**5**
10	Construction of Mottram underpass and associated wingwalls in a faulted zone. Possibility of unforeseen ground conditions during construction.	Instability and/or rapid groundwater or soil inflow. Injury due to ground movements, or drowning due to water inundation	Mainline CH890 to 1075	5	3	15	The extent of the fault zone has been further clarified following the recent 2018 ground investigation. See drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3052, 3053, 3054 and 3062. Proven ground conditions are to be considered for detailed design with awareness of the probability of variations in the ground and their likely effect. Hazard must be recorded on construction drawings prepared during detailed design. Temporary works designer to develop safe construction methodology.	4	2	8

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
11	Movement of faults in Mottram Village.	Damage to properties in Mottram village and underpass and associated wingwalls due to stress changes from underpass construction	Mainline CH890 to 1075	2	1	2	Underpass to be designed for a predicted movement. However, likelihood and impact considered very low.	2	1	2
12	Construction of the eastern cutting in an area of faulting.	Instability of cutting during excavation and uneven profile of cutting due to dip in bedrock level.	Mainline CH1250 to 1350	4	2	8	Further ground investigation should be undertaken in and around this area to better understand the properties of the fault i.e. size and quality. Detailed design and construction methodology to take account of probable non-homogeneity of ground and groundwater conditions over short distances. May be more prudent to extend length of underpass through fault zone	2	1	2
13	Construction of the eastern cutting in an area of artesian groundwater.	Localised instability in the rock and glacial till. Possible rockfalls during construction. Weak ground in fault zone may be impacted by reducing groundwater pressures	Mainline CH1075 to 1450	4	3	8	Detailed design of the cuttings to consider the effects of the cutting on the groundwater regime and the impact on weak ground in the faulted zone of the reduction in groundwater pressures. Drainage features to collect any water ingress through the slope face. Detailed design and construction methodology to take account of probable non-homogeneity of ground and groundwater conditions over short distances. Contractor’s RAMS to address mitigations against the possibility of rockfalls.	4	1	4
14	Longdendale Aqueduct, exact location, ground conditions and construction method unknown.	Damage to Aqueduct - collapse, impact on water supply. Potential damage to surrounding infrastructure.	Mainline CH1650	5	3	15	For the Longdendale Aqueduct Protection Structure refer to Structures Option Report: HE551473-ARC-SGN-TPU-RP-Z-3167. United Utilities have already been contacted and Arcadis is awaiting further information and surveys from them. Depending on the final chosen option, further surveys would be required to confirm the material surrounding the Aqueduct, as well as its construction and location.	5	2	10

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
15	Construction of Mottram Moor Roundabout on top of pre-existing land slips.	Localised slope instability leading causing damage to the embankment and existing/proposed infrastructure.	Mainline CH1775 (Centre of roundabout)	4	2	8	See drawing HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3056 for a geomorphological plan of the area. A slope stability assessment must be carried out at detailed design using the latest GI information available. Use appropriate design and construction to stabilise the landslips to the extent that there is no threat to the proposed works.	4	1	4
16	Construction of embankments on top of Head deposits.	Localised slope instability caused by possibly solifluction surfaces.	Mainline CH2250 to CH2450	3	2	6	No head deposits were logged in the 2018 GI but are thought to be present through interpretation. Design process should consider slip surfaces and poor material. Ensure rigorous stabilising techniques or if economical, dig out and replace slipped material.	3	1	3
17	River Etherow Bridge, Construction of bridge near a water course.	Inundation of foundation during construction phase due to river flooding, as well as working near or over a water body during foundation construction.	River Etherow	4	3	12	Hazard must be recorded on construction drawings prepared during detailed design. Temporary works designer to develop safe construction methodology and be aware of the potential flood risk. Design temporary works for construction for scour risk. Discuss maximum likely flow rates with United Utilities given that their reservoirs control the river catchment.	3	2	6
18	Construction of Mottram Underpass, cuttings and dewatering.	Settlement of infrastructure and properties in and around Mottram village due to underpass construction – including live carriageways over proposed route	In and around Mottram Village	4	3	12	Detailed design to analyse the effects of the underpass for before, during and after construction using finite element analysis to estimate settlement, and to permit assessment and implementation of mitigation measures	4	2	8
19	Excavability of underlying rock.	Delays to construction programme and high construction costs.	Mottram Village and East Cutting	3	3	9	An excavability assessment of the bedrock should be carried out at detailed design. Contractor to choose appropriate excavation techniques for the bedrock.	3	1	3
20	Aggressive ground on buried concrete	Degradation of concrete strength causing failure of a structure.	Route wide	3	1	3	Risk to be design out in detailed design using results from BRE SD1 suite tests to be addressed on a structure specific basis in detailed design.	2	1	2

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
21	Boulders or obstructions encountered within the superficial material during construction of piles.	Delays to construction programme and high construction costs.	Route wide	4	2	8	Unable to avoid - possible redesign of pile foundations during construction to allow for a different arrangement within the pile group.	4	2	8
22	Encountering existing services during construction	Damage to existing services, proposed infrastructure or injury or death of construction workers	Route wide	4	3	12	Latest statutory services to be used during construction. However, this does not fully mitigate against unrecorded services. Contractor to observe ground surface after stripping to identify made ground which could be in service trenches.	4	2	8
23	Site won material not suitable for re-use. Material may be found to be contaminated or unsuitable for engineering features i.e. low strength material	More material to be imported from off site. Unsuitable material may need to go to landfill or need remediation. Overall higher construction costs.	Route wide	3	2	6	A detailed earth works specification is to be carried out at detailed design to determine volume of material to be reused including an assessment of the suitability of the soil for lime or cement stabilisation. Contractor to develop material plan that protects re-useable material from degradation e.g. from wetting.	3	1	3
24	Limited information regarding the rock quality at the River Etherow	Overly conservative design of pile foundations, wrong piling technique chosen for construction.	River Etherow	2	3	6	Further GI is recommended in this area for detailed design. This will allow for better understanding of the quality of the bedrock.	2	1	2
25	Localsied minor voiding recorded within possible faulted Breccia encountered within the Mottram Underpass	Unfavourable pile end bearing and skin resistance capacilty. Pile Limit equilibrium and Servicability State Failure	Site wide	3	4	12	Adoption of pile testing rational to be implemented following pile installation to verify stratum pile capacity. Downhole geophysical density measurements should be considered to assess extent of voiding. Hazard to be considered during detailed design.	2	4	8
26	Sporadic reduction of bedrock strength and rock quality with depth – localised reductions in ground bearing capacity	Excessive settlement, unfavourable impact on earth pressure co-efficients for retaining wall design	Site wide	3	4	12	Reported lower range rock strength and rock quality values to be considered during detailed design.	2	4	8

Geotechnical Risk Register – A57/A628 Trans-Pennine Upgrade										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
27	Unrecorded steeper joint sets within rock mass	Cutting slope rock failure	Eastern Cutting	3	4	12	Inspection of exposed rock mass to be undertaken during construction of the cutting. Bedrock samples to be obtained from exposed cutting and direct shear testing to be undertaken on joint sets for cutting slope design. Allowance to be made in construction sequencing to account for rock testing.	2	3	6

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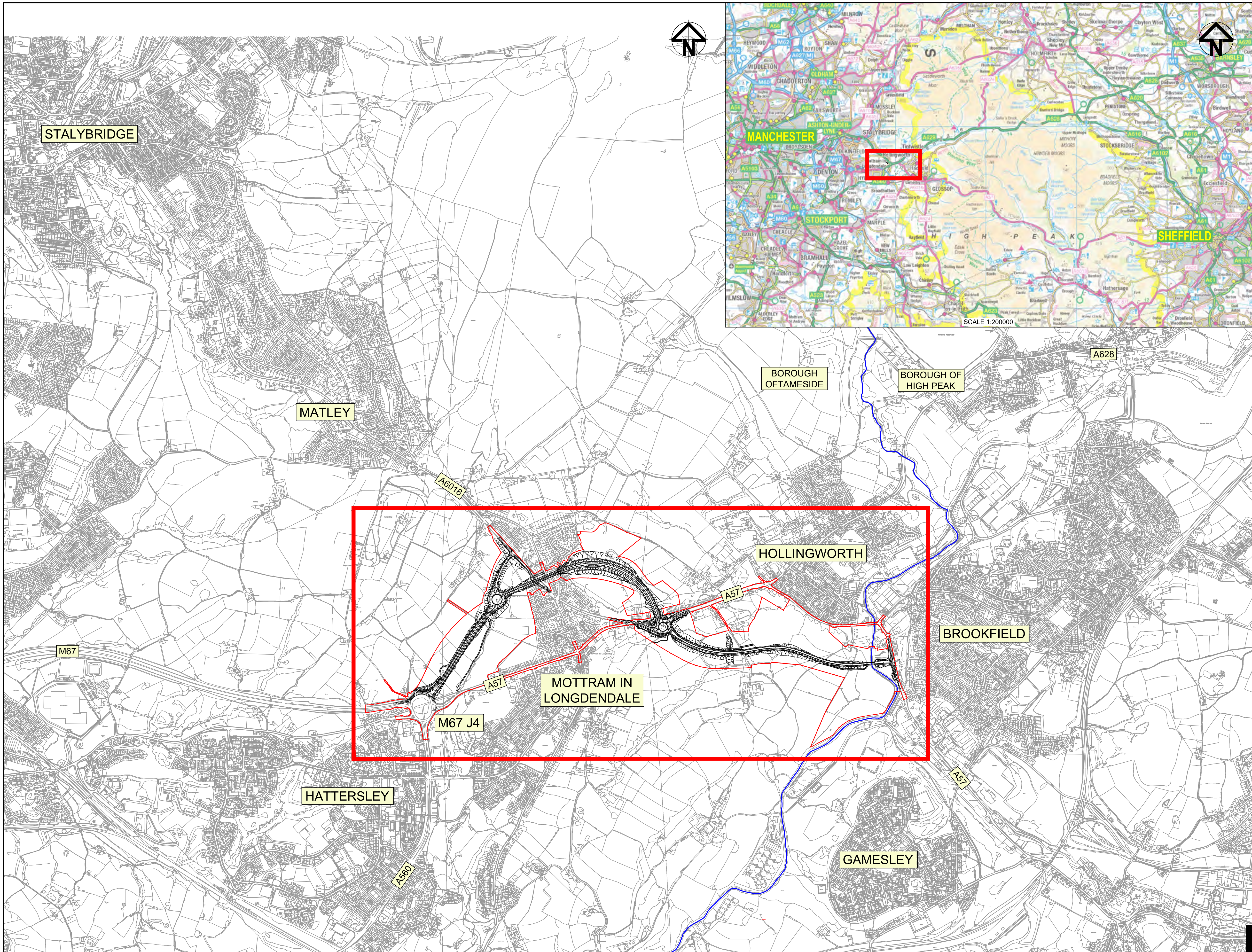
9 SCHEME DRAWINGS AND LONG SECTIONS



SCALE - 1:10000

Notes
1. This drawing should be read in conjunction with all plans and documents included in the DCO application.
2. This plan is submitted to identify the location of the project at a wider scale. It is not required to be submitted under regulations 5(2) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009, so is presented at a scale larger than 1:2500.

Key

Scheme Location

The Scheme

Local Authority Boundary

Limits of Land to be Acquired or Used Permanently or Temporarily

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P01	S8	25/04/2018	DCO SUBMISSION	APS	ID	CS

Client

highways england

Designer

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
5th Floor, 401 Faraday Street
Birchwood
Warrington
WA3 6GA

Project

TRANS-PENNINE UPGRADE

Drawing Title

LOCATION PLAN
REGULATION 5(2)(o)

[redacted]

PINS No. TR010034 | Original Size A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)

HE551473-ARC-HGN-SZ_ZZ000-DR-D-3100

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SCALE 1:10000 (A1) METRES

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	BN	JC	DS
P01	S2	05OCT18	FIRST ISSUE	BN	JC	DS

NOTES:

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

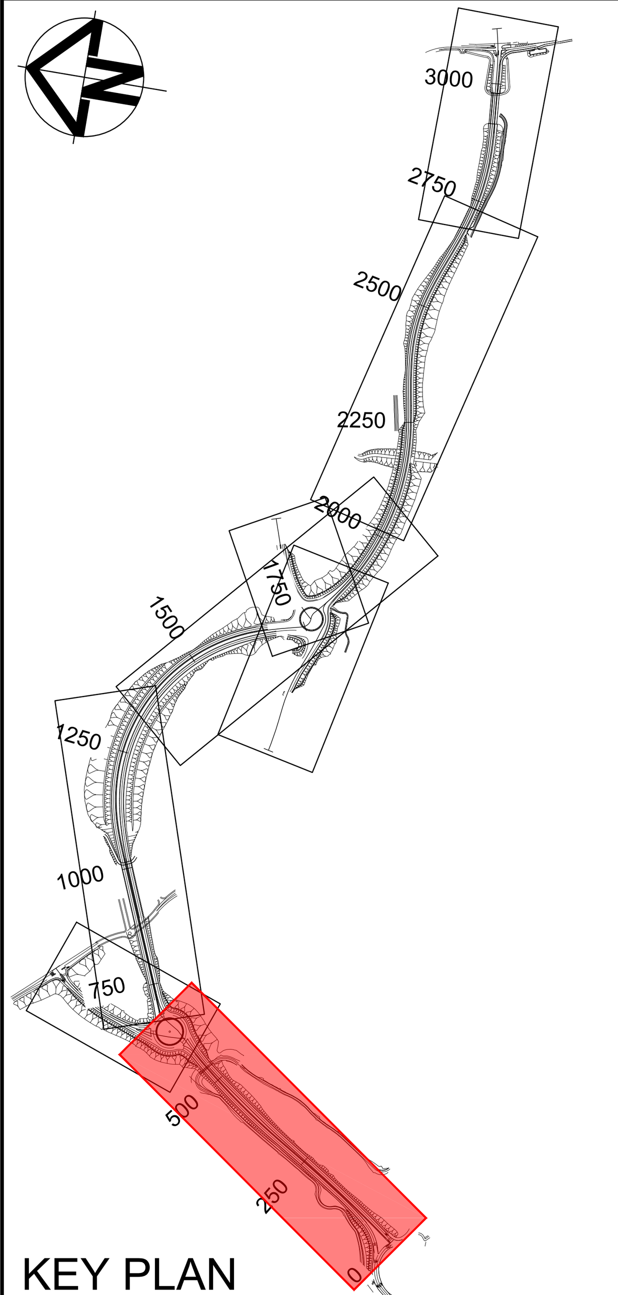
Registered office: Arcadis House, 34 York Way, London, N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

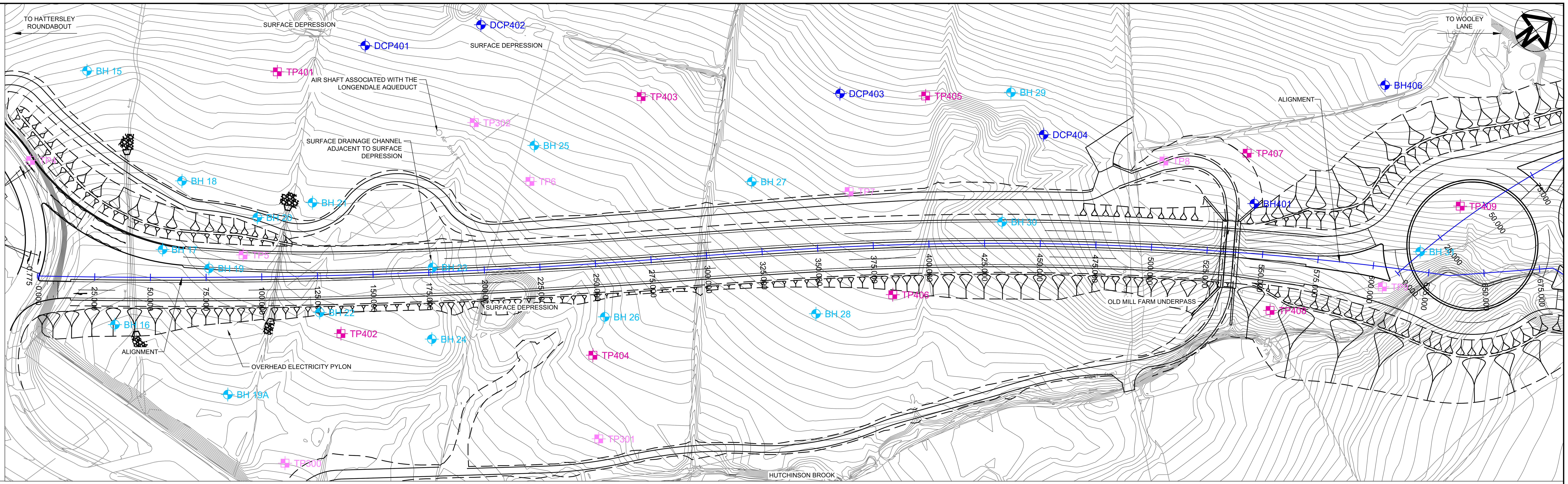
Project: TRANS-PENNINE UPGRADE

Drawing Title: PROPOSED DEVELOPMENT WITH LONG SECTION TITLES

Status	S2 - FOR INFORMATION
Revision	P02
Scale	NOT TO SCALE
Date	31JAN2019
Drawn By	[redacted]
Checked By	
Approved By	
PINS No.	TR010034
Original Size	A1
Drawing number (HE PIN, Originator, Volume, Location, Type, Role, Number)	HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3067



KEY PLAN
NTS

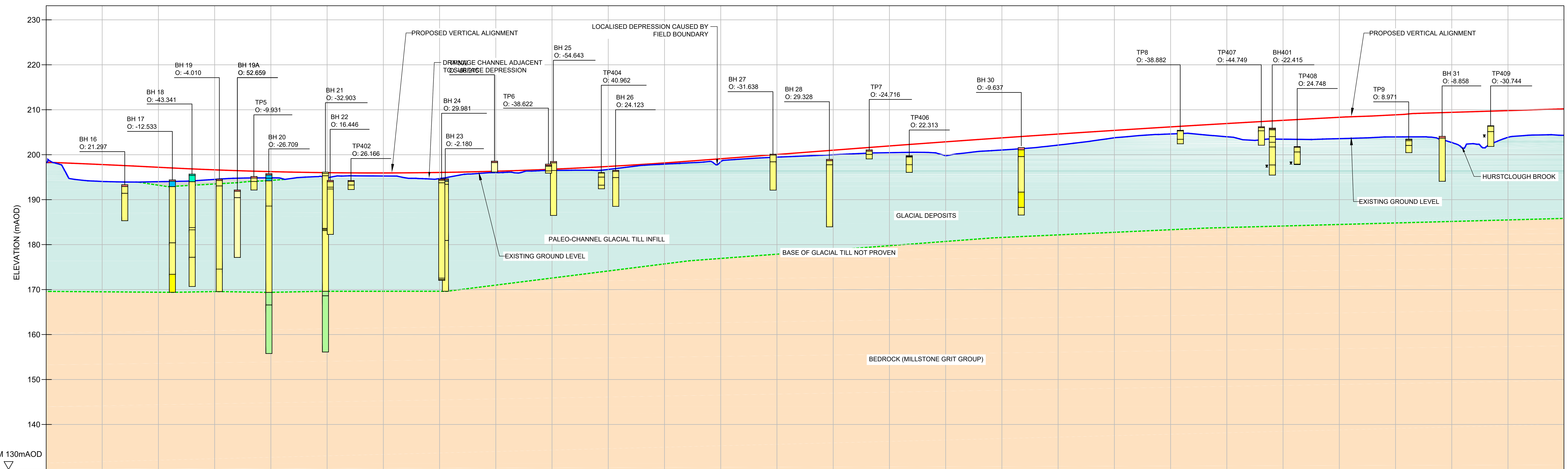


PLAN
SCALE 1:1000

0 10 20 40 60 80 100m

LITHOLOGY KEY	
MG	MADE GROUND
TS	TOPSOIL
SUPERFICIAL GEOLOGY	
HEAD	HEAD DEPOSITS
PEAT	PEAT
ALVC	ALLUVIUM COHESIVE
ALVG	ALLUVIUM GRANULAR
ALVP	ALLUVIUM PEAT
RTD-GF	RIVER TERRACE DEPOSIT*
GLTC	GLACIAL TILL COHESIVE
GLTL	GLACIAL TILL LAMINATED
GLTG	GLACIAL TILL GRANULAR
GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**	
MSGG-M	MUDSTONE
MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
MSGG-M-M	MODERATELY WEATHERED MUDSTONE
MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
MSGG-SLT	SILTSTONE
MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
MSGG-SND	SANDSTONE
MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
MSGG-SS	SLICKENSIDE SURFACE
ACL	NO RECOVERY

*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



DATUM 130mAOD

CHAINAGE (m)	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675
PROPOSED LEVEL (mAOD)	198.23	197.81	197.20	196.63	196.24	196.01	195.94	196.05	196.33	196.78	197.39	198.17	199.10	200.06	201.01	201.95	202.87	203.75	204.60	205.41	206.19	206.94	207.65	208.32	208.97	209.43	209.81	210.21

COMMENTS: M67 ROUNDABOUT IMMEDIATELY LEFT OF LONG SECTION; LOCALISED ALLUVIUM; EXTENTS OF CRICKET GROUND ROUNDABOUT

GEOLOGICAL CROSS-SECTION

(50M BUFFER)
HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m
SCALE 1:1000 HORIZONTAL

0 5 10 20 30 40 50m
SCALE 1:500 VERTICAL

LEGEND			
BH153	HISTORICAL EXPLORATORY BOREHOLES		PROPOSED ROAD LEVEL
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS		INFERRED GEOLOGICAL BOUNDARY
TP63	HISTORICAL TRIAL PITS		WATER STRIKE DEPTH DURING DRILLING
TT401	2018 GROUND INVESTIGATION TRIAL PITS		WATER DEPTH ON COMPLETION OF HOLE
	EXISTING GROUND LEVEL		

NOTES:

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2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
3. ALL DRAWINGS ARE TO BE PRINTED IN COLOUR.
4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
5. EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN BY THIRD PARTY GROUND INVESTIGATION CONTRACTORS AND ARE ASSUMED TO BE ACCURATE.
6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-**PENNINE GROUND INVESTIGATION REPORT**.
7. GROUNDWATER STRIKES ONLY SHOWN FOR 2018 SOCOTEC GROUND INVESTIGATION.
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9. THE LONG SECTIONS PROVIDES AN ILLUSTRATION OF THE GENERAL DISPOSITION OF STRATA, IT IS NOT INTENDED TO SUPPORT DETAILED DESIGN OR THE ASSESSMENT OF EARTHWORKS QUANTITIES.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

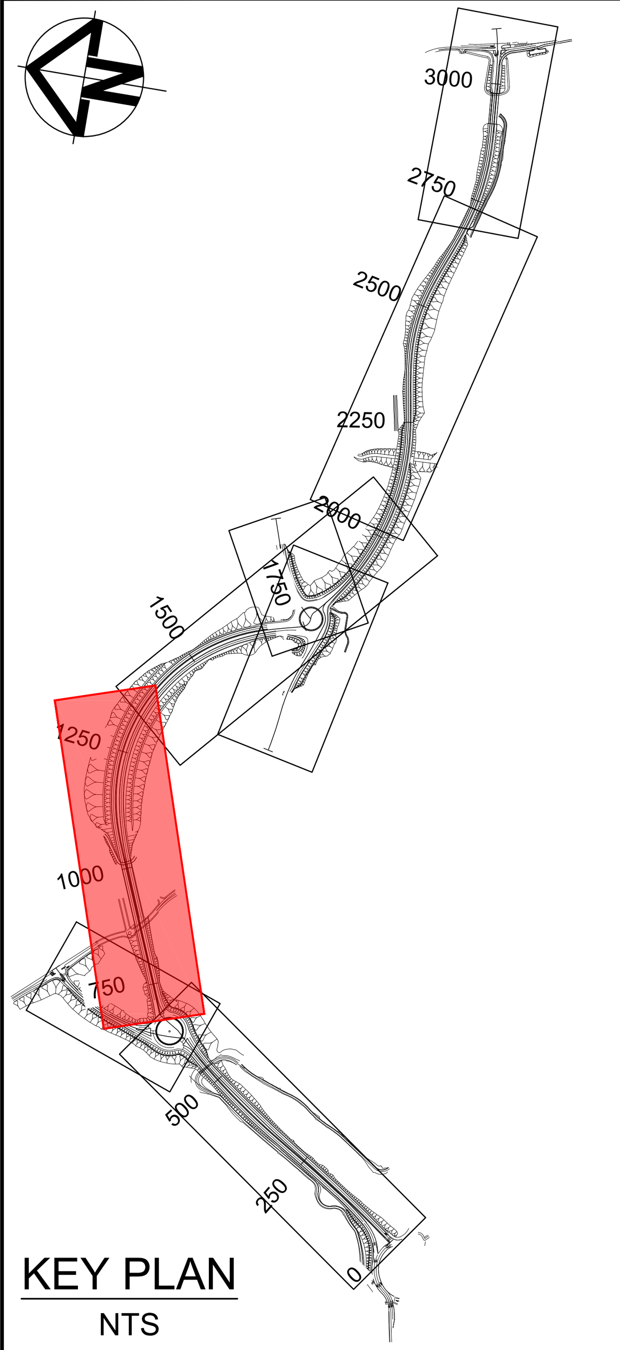
Client: highways england

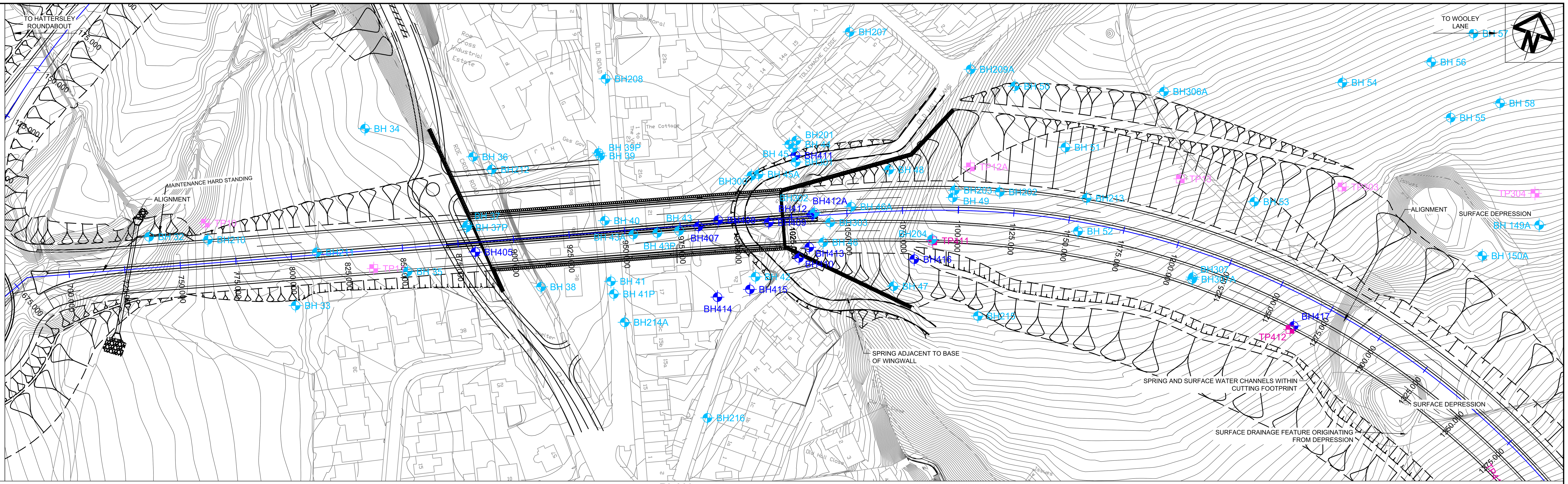
Designer: ARCADIS Design & Consultancy for natural and built assets
Registered office: Arcadis House, 34 York Way, London, N1 9AB
Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 01 OF 08

Status	S2 - FOR INFORMATION
Revision	P02
Scale	As shown
Date	31JAN19
Drawn By	[redacted]
Checked By	
Approved By	
PINS No.	- TR010034
Original Size	A1
Drawing number (HE PIN / Originator / Volume / Location / Type / Role / Number)	HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3044

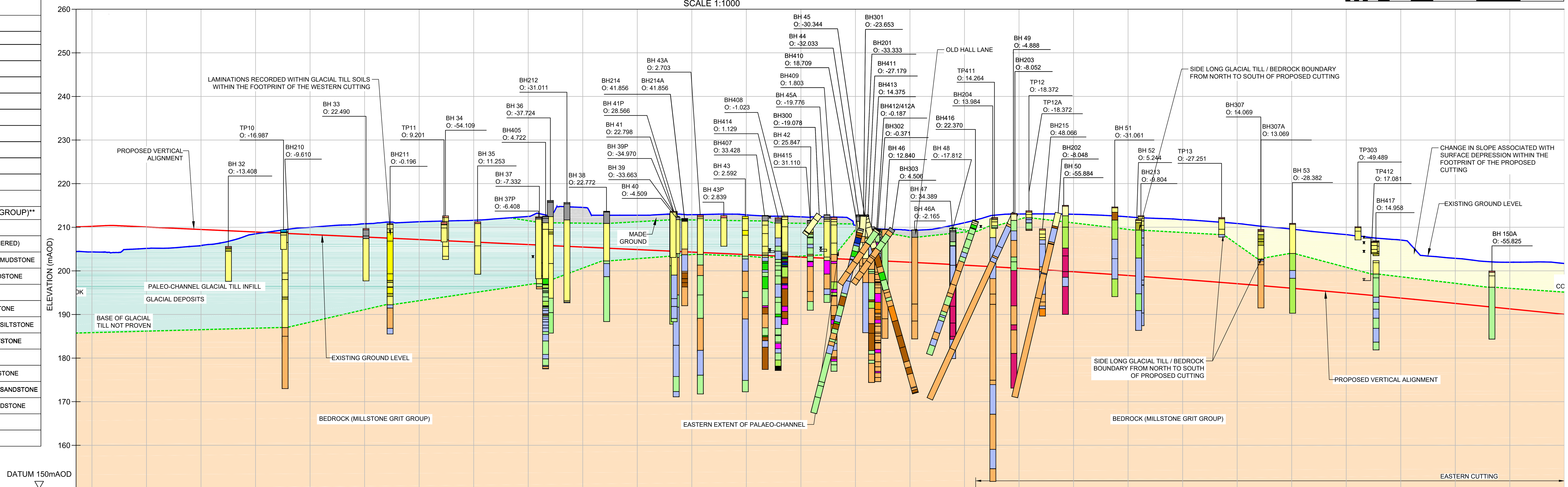




PLAN
SCALE 1:1000

LITHOLOGY KEY	
MG	MADE GROUND
TS	TOPSOIL
SUPERFICIAL GEOLOGY	
HEAD	HEAD DEPOSITS
PEAT	PEAT
ALVC	ALLUVIUM COHESIVE
ALVG	ALLUVIUM GRANULAR
ALVP	ALLUVIUM PEAT
RTD-GF	RIVER TERRACE DEPOSIT*
GLTC	GLACIAL TILL COHESIVE
GLTL	GLACIAL TILL LAMINATED
GLTG	GLACIAL TILL GRANULAR
GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**	
MSGG-M	MUDSTONE
MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
MSGG-M-M	MODERATELY WEATHERED MUDSTONE
MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
MSGG-SLT	SILTSTONE
MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
MSGG-SND	SANDSTONE
MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
MSGG-SS	SLICKENSIDE SURFACE
ACL	NO RECOVERY

*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



CHAINAGE (m)	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300	1325	1350
PROPOSED LEVEL (mAOD)	210.21	210.05	209.47	208.90	208.32	207.75	207.17	206.60	206.02	205.44	204.87	204.29	203.72	203.14	202.56	201.96	201.30	200.57	199.78	198.93	198.02	197.04	196.01	194.91	193.75	192.52	191.27	190.02

COMMENTS: ROE CROSS ROAD — MOTTRAM UNDERPASS TUNNEL AND WING WALLS EXTENT — GLACIAL TILL / BEDROCK LITHOLOGICAL SIDE LONG PROFILE

GEOLOGICAL CROSS-SECTION

(50M BUFFER)
HORZ 1:1000 & VERT 1:500

SCALE 1:1000 HORIZONTAL
SCALE 1:500 VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

LEGEND			
BH153	HISTORICAL EXPLORATORY BOREHOLES		PROPOSED ROAD LEVEL
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	EXISTING GROUND LEVEL		

NOTES:

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Registered office:
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N1 9AB

Coordinating office:
5th Floor, 401 Faraday Street
Birchwood
Warrington
WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 02 OF 08

Status: S2 - FOR INFORMATION

Revision: P02

Date: 31JAN19

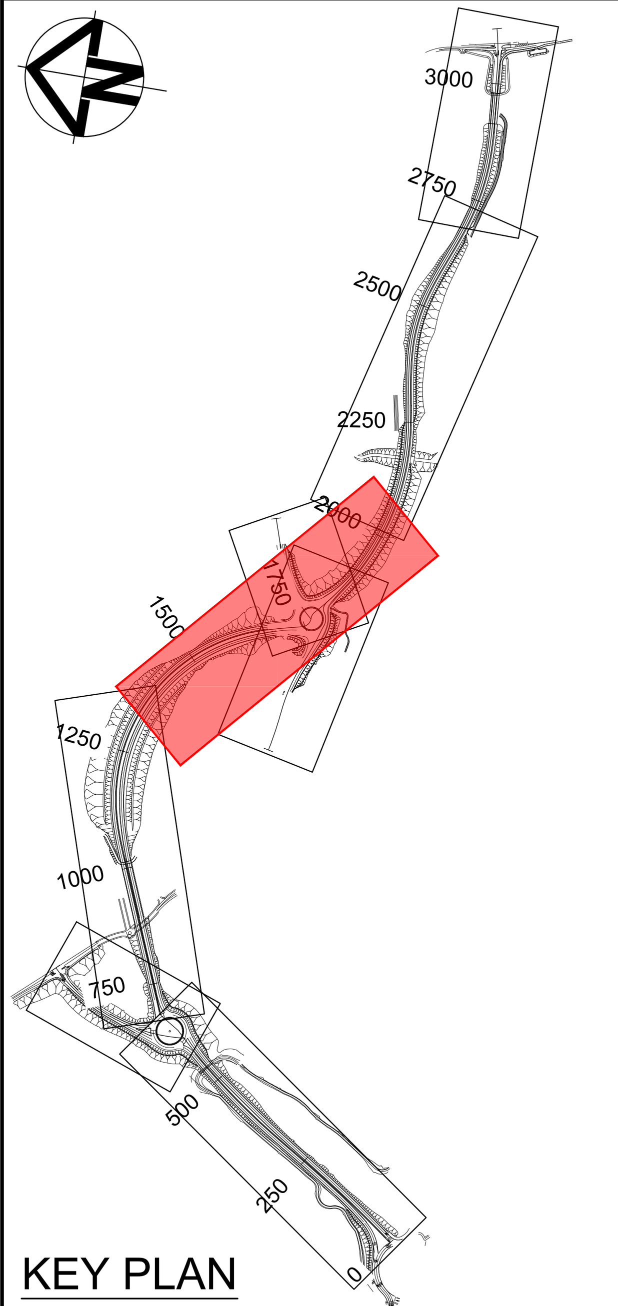
[redacted]

PINS No.: - TR010034

Original Size: A1

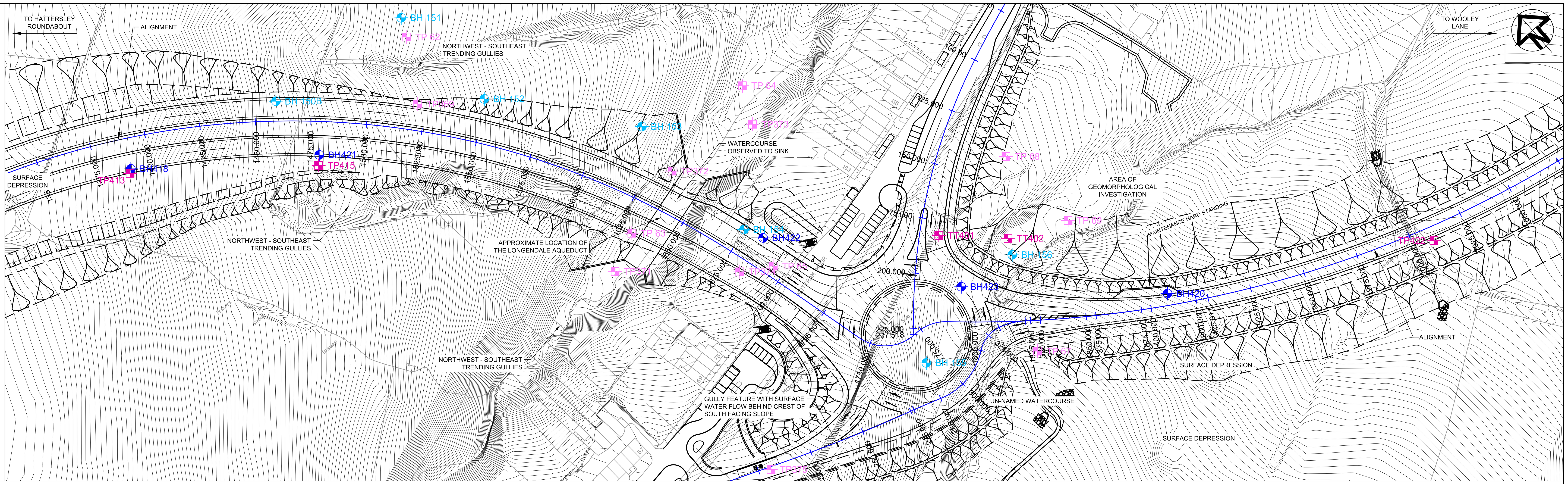
Drawing number: HE PIN | Originator | Volume | Location | Type | Role | Number

HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3045



KEY PLAN

NTS



PLAN

SCALE 1:1000

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	PEAT	PEAT
	ALVC	ALLUVIUM COHESIVE
	ALVG	ALLUVIUM GRANULAR
	ALVP	ALLUVIUM PEAT
	RTD-GF	RIVER TERRACE DEPOSIT*
	GLTC	GLACIAL TILL COHESIVE
	GLTL	GLACIAL TILL LAMINATED
	GLTG	GLACIAL TILL GRANULAR
	GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**		
	MSGG-M	MUDSTONE
	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
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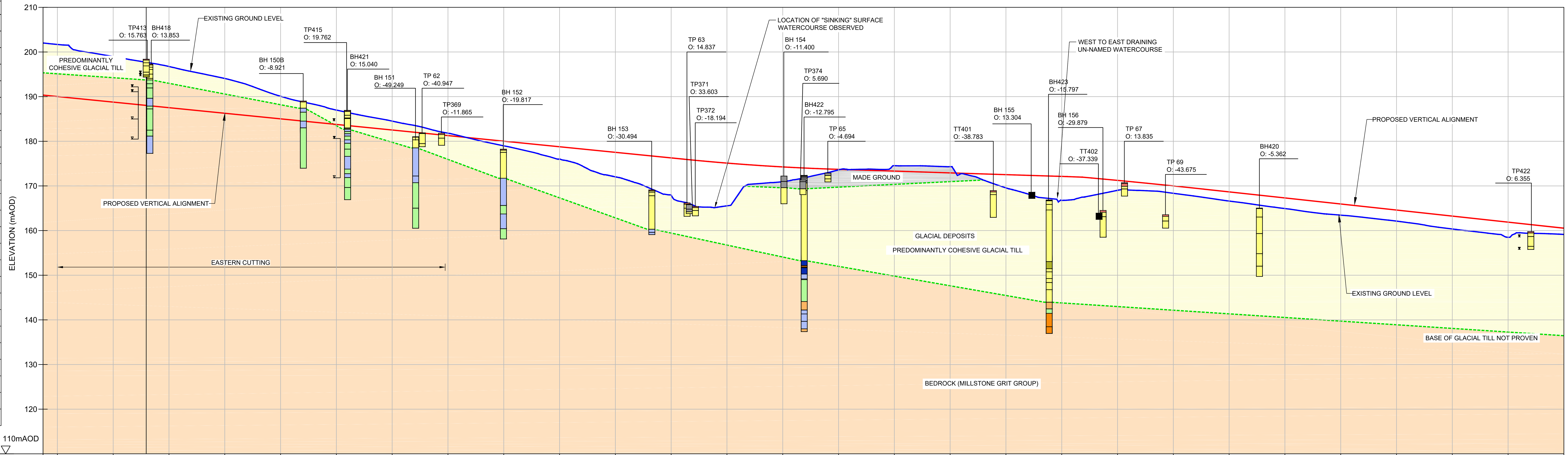
	MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
	MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
	MSGG-SS	SLICKENSIDE SURFACE
	ACL	NO RECOVERY

*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



DATUM 110mAOD

CHAINAGE (m)	1350	1375	1400	1425	1450	1475	1500	1525	1550	1575	1600	1625	1650	1675	1700	1725	1750	1775	1800	1825	1850	1875	1900	1925	1950	1975	2000	2025
PROPOSED LEVEL (mAOD)	190.02	188.77	187.52	186.27	185.02	183.77	182.52	181.27	180.02	178.77	177.52	176.27	175.11	174.26	173.71	173.32	172.92	172.53	172.13	171.24	170.00	168.66	167.31	165.95	164.60	163.24	161.89	160.53

COMMENTS: GLACIAL TILL / BEDROCK LITHOLOGICAL SIDE LONG PROFILE; CURRENT A57 ROAD

GEOLOGICAL CROSS-SECTION

(50M BUFFER)

HORZ 1:1000 & VERT 1:500

SCALE 1:1000 HORIZONTAL

SCALE 1:500 VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

LEGEND			
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Registered office: Arcadis House, 34 York Way, London, N1 9AB

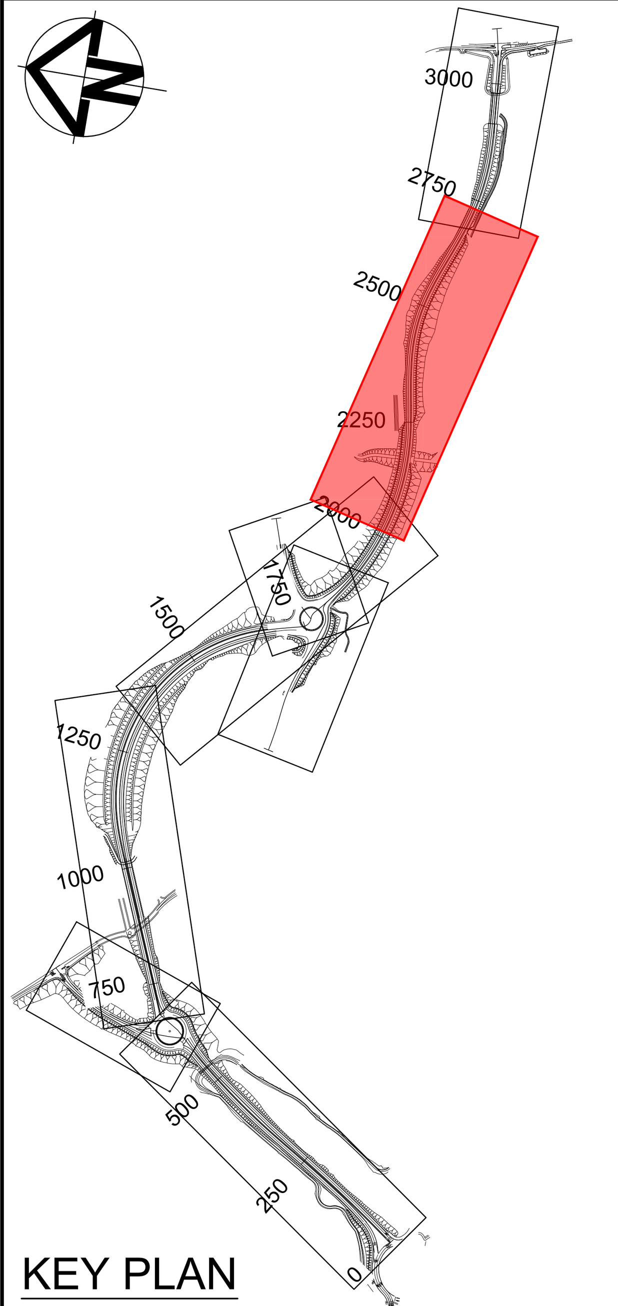
Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 03 OF 08

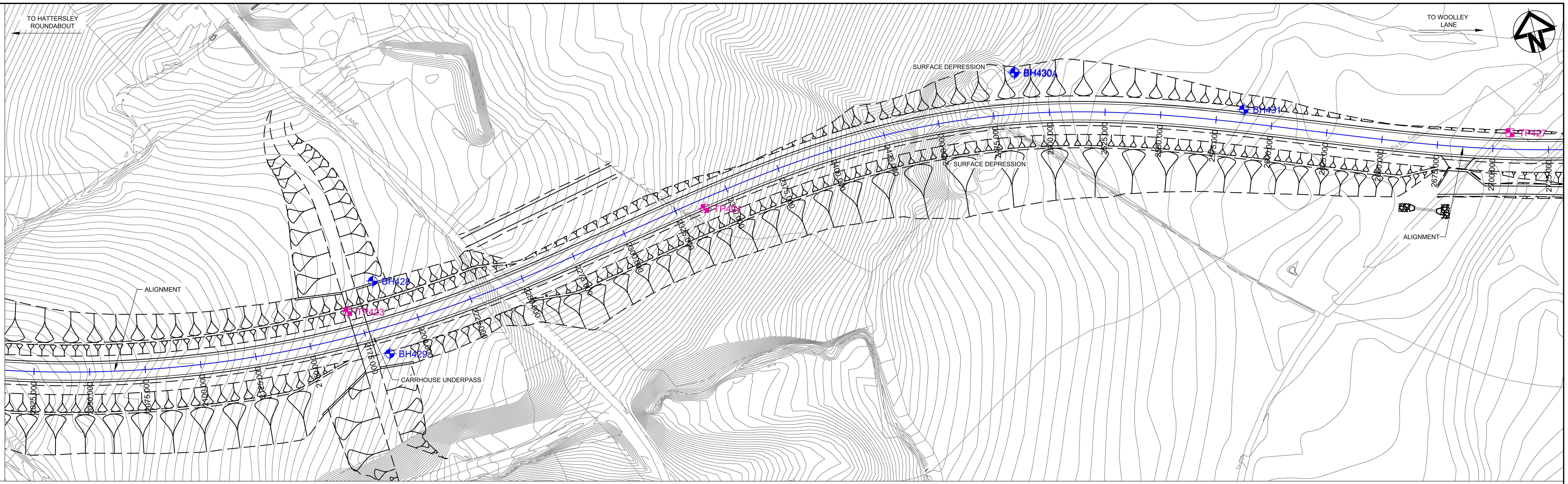
Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown	Date	31JAN19
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN / Originator / Volume / Location / Type / Role / Number): HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3046



KEY PLAN

NTS



PLAN

SCALE 1:1000

0 10 20 40 60 80 100m

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	PEAT	PEAT
	ALVC	ALLUVIUM COHESIVE
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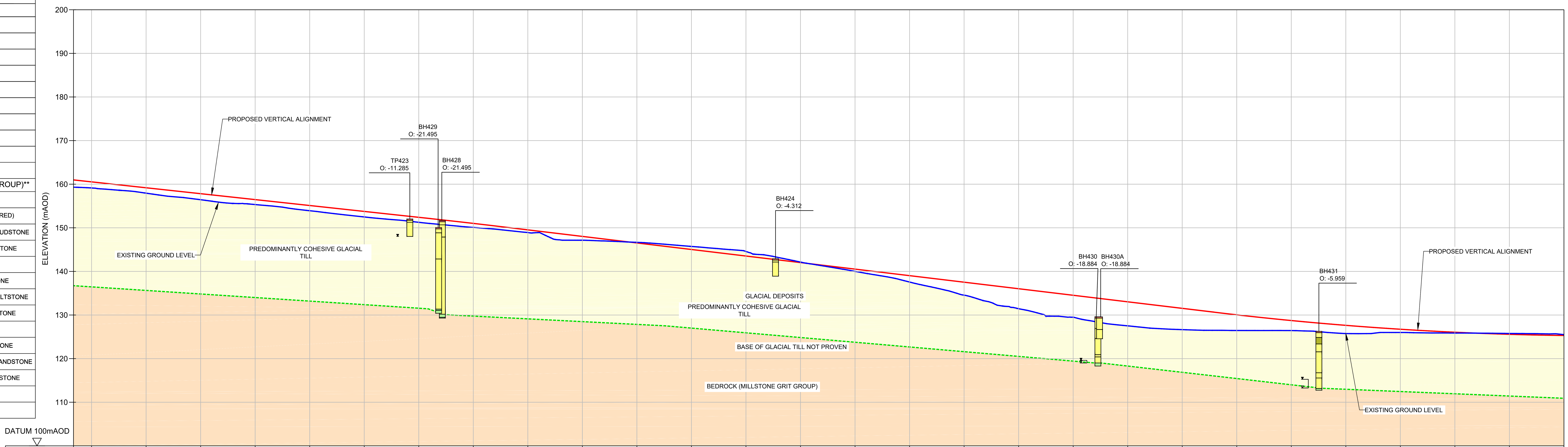
*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



CHAINAGE (m)	2025	2050	2075	2100	2125	2150	2175	2200	2225	2250	2275	2300	2325	2350	2375	2400	2425	2450	2475	2500	2525	2550	2575	2600	2625	2650	2675	2700
PROPOSED LEVEL (mAOD)	160.53	159.18	157.82	156.46	155.11	153.75	152.40	151.01	149.52	148.02	146.52	145.02	143.52	142.02	140.52	139.02	137.52	136.02	134.52	133.02	131.52	130.04	128.73	127.63	126.74	126.05	125.58	125.31
COMMENTS	CARRHOUSE CROSSING UNDERPASS																		BGS MAPPED HEAD DEPOSITS									

GEOLOGICAL CROSS-SECTION

(50M BUFFER)

HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m

SCALE 1:1000 HORIZONTAL

0 5 10 20 30 40 50m

SCALE 1:500 VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

LEGEND			
BH153	HISTORICAL EXPLORATORY BOREHOLES		PROPOSED ROAD LEVEL
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS		INFERRED GEOLOGICAL BOUNDARY
TP63	HISTORICAL TRIAL PITS		WATER STRIKE DEPTH DURING DRILLING
TT401	2018 GROUND INVESTIGATION TRIAL PITS		WATER DEPTH ON COMPLETION OF HOLE
	EXISTING GROUND LEVEL		

NOTES:

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2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
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4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
5. EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN BY THIRD PARTY GROUND INVESTIGATION CONTRACTORS AND ARE ASSUMED TO BE ACCURATE.
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9. THE LONG SECTIONS PROVIDES AN ILLUSTRATION OF THE GENERAL DISPOSITION OF STRATA, IT IS NOT INTENDED TO SUPPORT DETAILED DESIGN OR THE ASSESSMENT OF EARTHWORKS QUANTITIES.

Client

highways england

Designer

ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House 34 York Way London N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street Birchwood Warrington WA3 6GA

Project

TRANS-PENNINE UPGRADE

Drawing Title

GEOLOGICAL PLAN & PROFILE SHEET 04 OF 08

Status: S2 - FOR INFORMATION

Revision: P02

Scale: As shown

Date: 31JAN2019

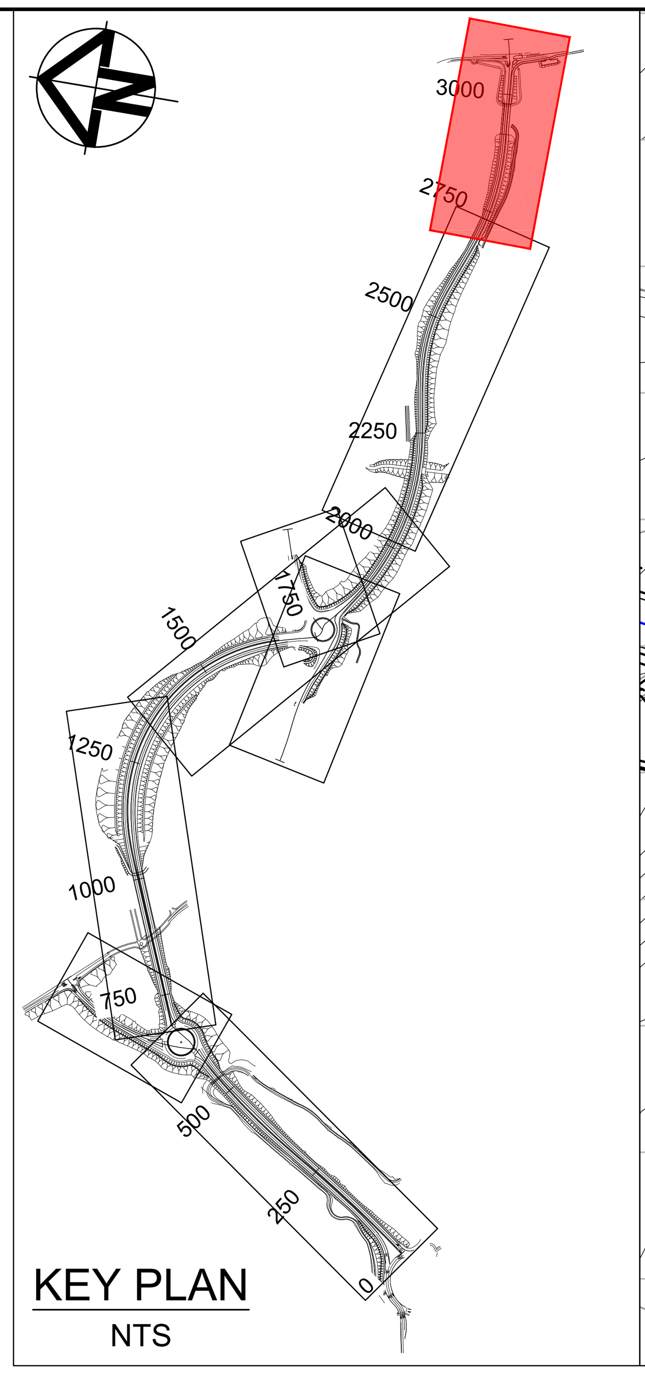
Drawn By: [redacted]
Checked By:
Approved By:

PINS No. - TR010034

Original Size: A1

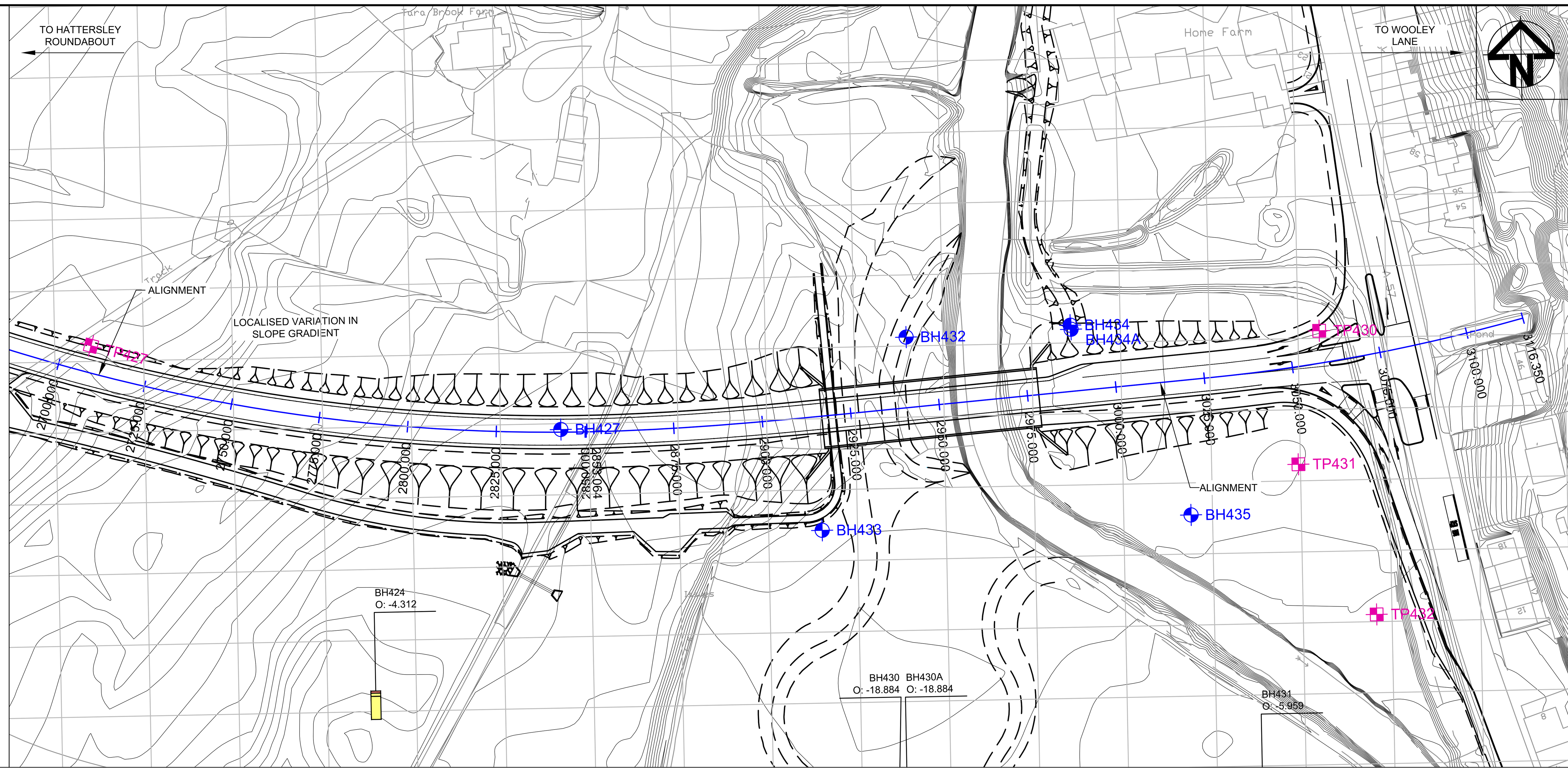
Drawing number: HE PIN | Originator | Volume | Location | Type | Role | Number

HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3047



KEY PLAN

NTS



PLAN

SCALE 1:1000

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	PEAT	PEAT
	ALVC	ALLUVIUM COHESIVE
	ALVG	ALLUVIUM GRANULAR
	ALVP	ALLUVIUM PEAT
	RTD-GF	RIVER TERRACE DEPOSIT*
	GLTC	GLACIAL TILL COHESIVE
	GLTL	GLACIAL TILL LAMINATED
	GLTG	GLACIAL TILL GRANULAR
	GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**		
	MSGG-M	MUDSTONE
	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
	MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
	MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
	MSGG-SND	SANDSTONE
	MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
	MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
	MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
	MSGG-SS	SLICKENSIDE SURFACE
	ACL	NO RECOVERY

*GLACIO-FLUVIAL
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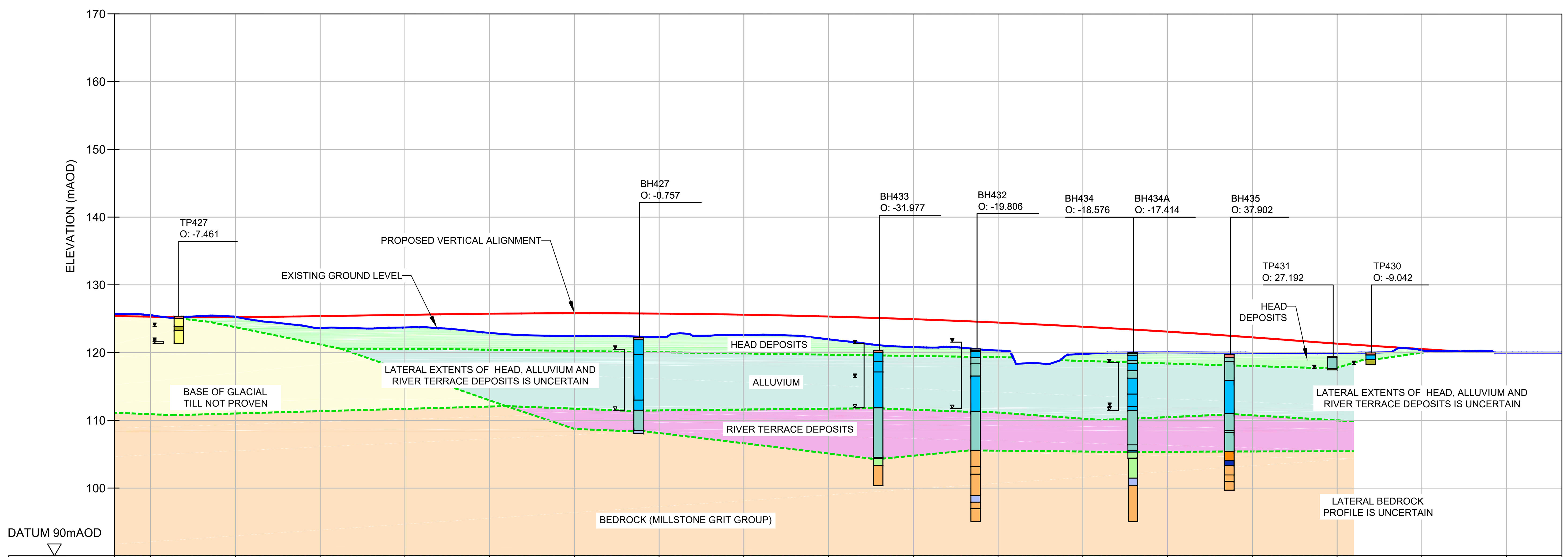

CHAINAGE (m)	2700	2725	2750	2775	2800	2825	2850	2875	2900	2925	2950	2975	3000	3025	3050	3075	3100
PROPOSED LEVEL (mAOD)	125.31	125.25	125.39	125.58	125.74	125.81	125.76	125.60	125.32	124.93	124.43	123.82	123.09	122.25	121.32	120.52	
COMMENTS	BGS MAPPED HEAD DEPOSITS									RIVER ETHEROW CROSSING							

GEOLOGICAL CROSS-SECTION

(50M BUFFER)

HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m

SCALE 1:1000 HORIZONTAL

0 5 10 20 30 40 50m

SCALE 1:500 VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Appr'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

LEGEND			
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Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

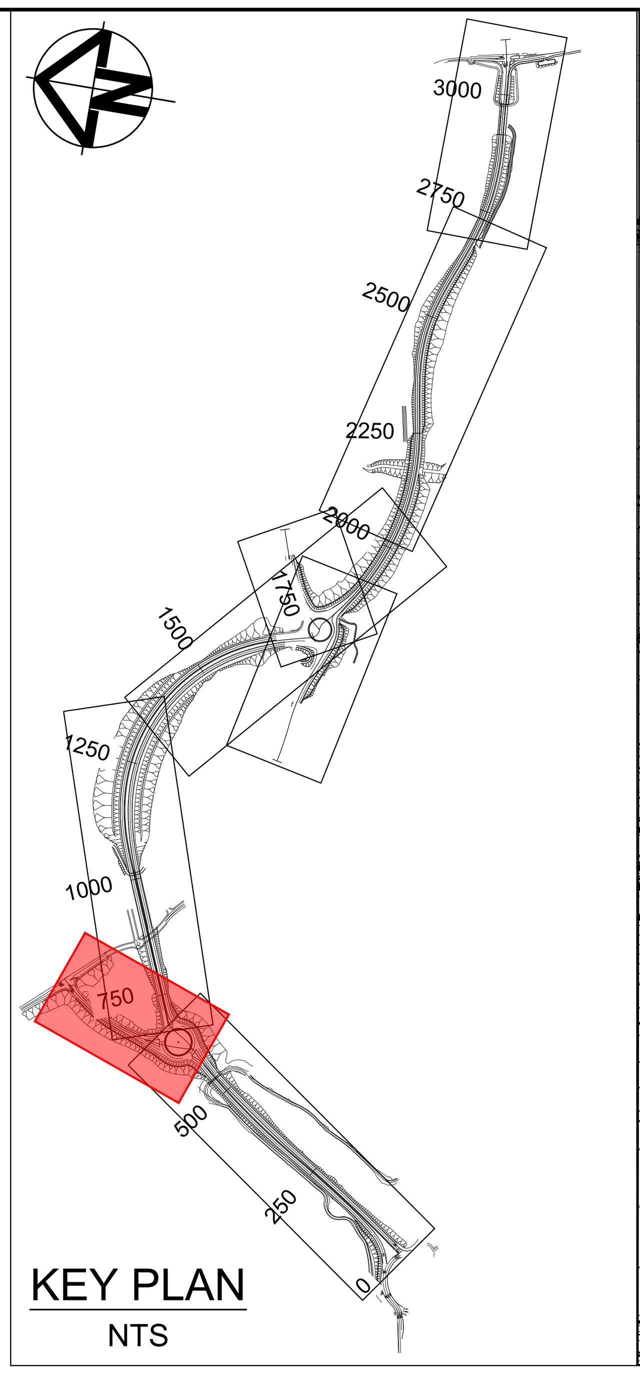
Registered office: Arcadis House, 34 York Way, London, N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

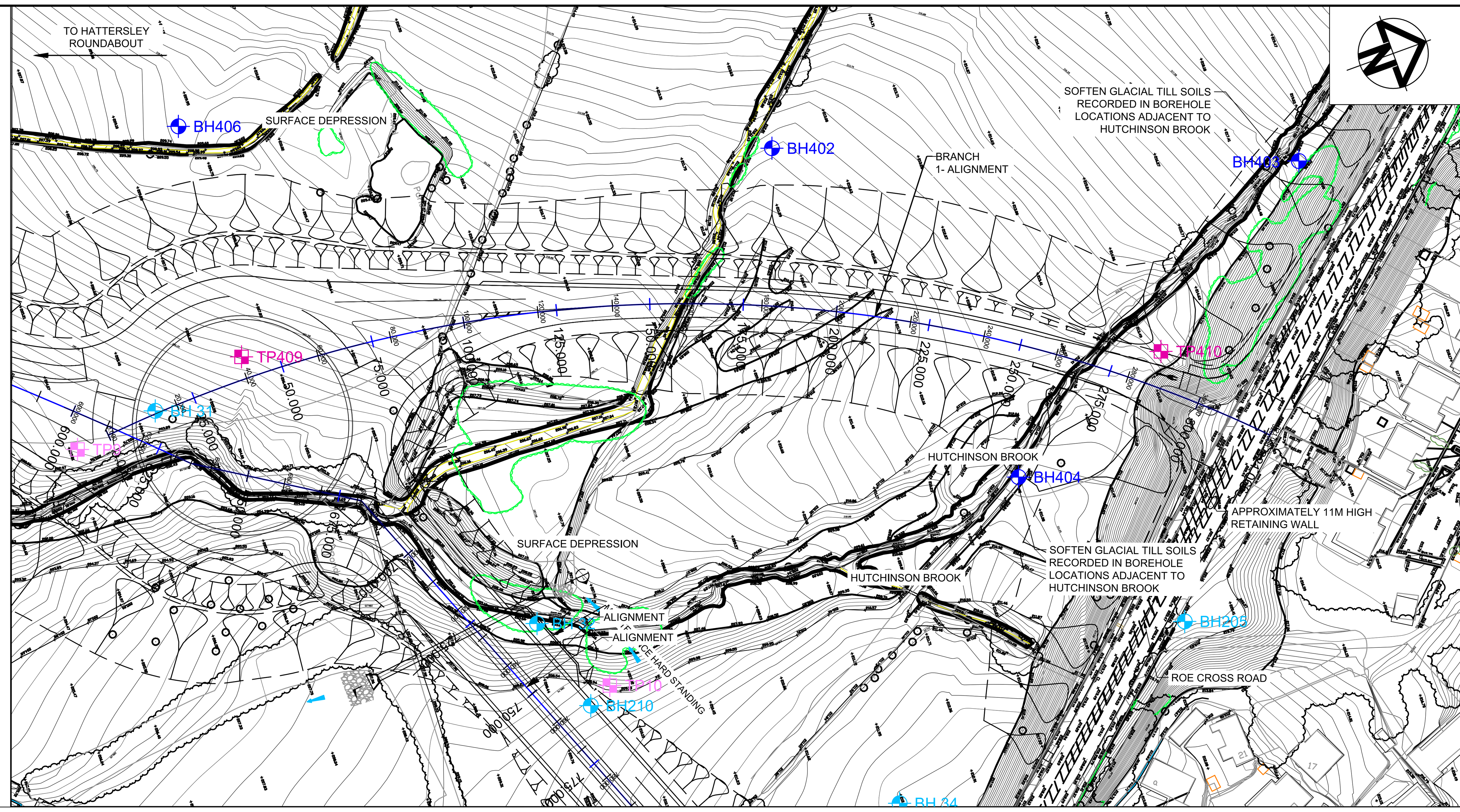
Project: TRANS-PENNINE UPGRADE

Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 05 OF 08

Status	S2 - FOR INFORMATION
Revision	P02
Scale	As shown
Date	31JAN2019
Drawn By	[redacted]
Checked By	
Approved By	
PINS No.	- TR010034
Original Size	A1
Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)	HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3048



KEY PLAN
NTS



PLAN
SCALE 1:1000

0 10 20 40 60 80 100m

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	PEAT	PEAT
	ALVC	ALLUVIUM COHESIVE
	ALVG	ALLUVIUM GRANULAR
	ALVP	ALLUVIUM PEAT
	RTD-GF	RIVER TERRACE DEPOSIT*
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BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**		
	MSGG-M	MUDSTONE
	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
	MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
	MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
	MSGG-SND	SANDSTONE
	MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
	MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
	MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
	MSGG-SS	SLICKENSIDE SURFACE
	ACL	NO RECOVERY

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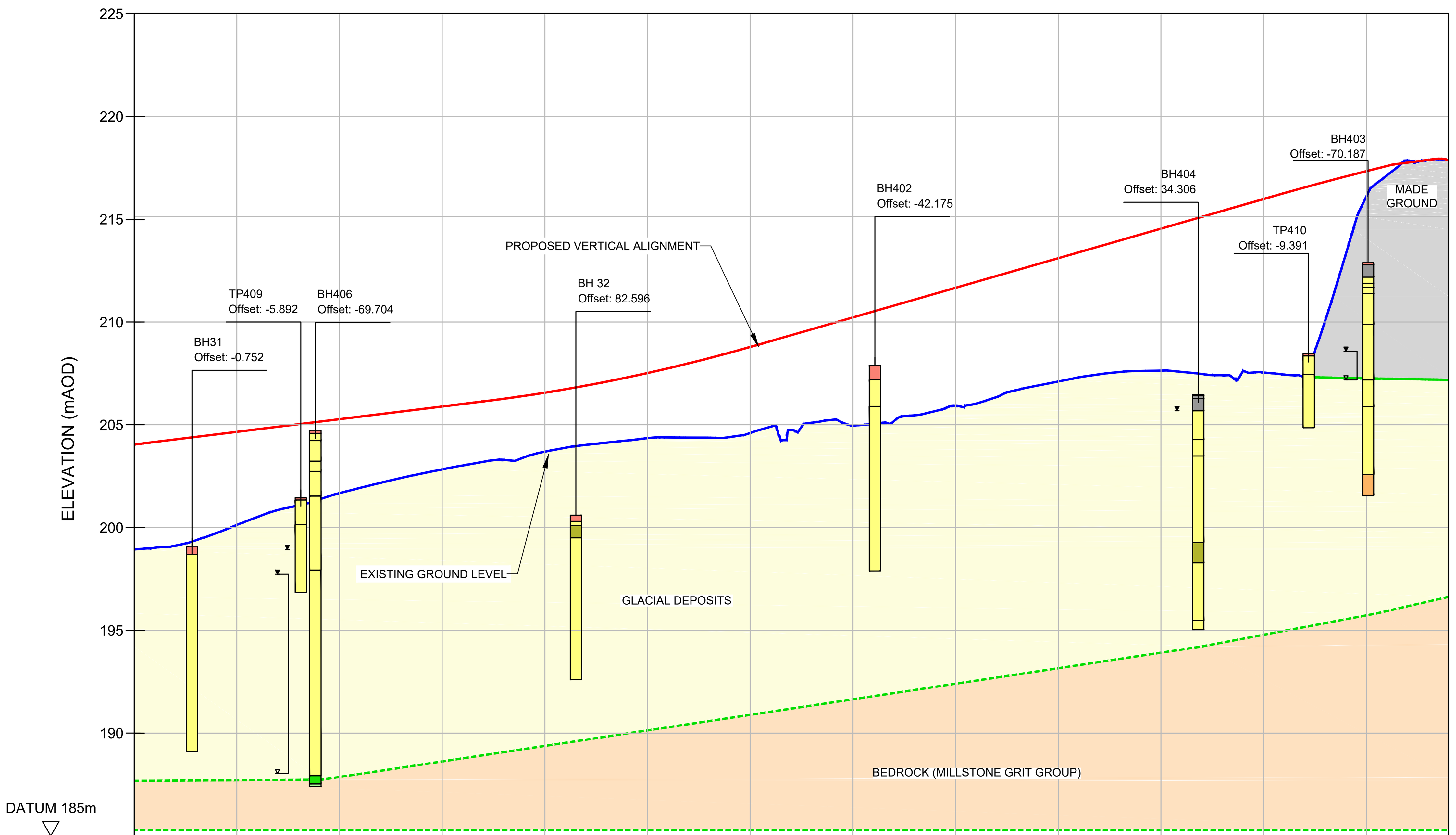

Chainage (m)	0	25	50	75	100	125	150	175	200	225	250	275	300	321
Proposed Level (mAOD)	209.04	209.66	210.27	210.89	211.56	212.52	213.79	215.22	216.66	218.10	219.54	220.98	222.34	222.78
Comments														

GEOLOGICAL CROSS-SECTION
(50M BUFFER)
HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m
SCALE 1:1000 HORIZONTAL

0 5 10 20 30 40 50m
SCALE 1:500 VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

LEGEND			
BH153	HISTORICAL EXPLORATORY BOREHOLES		PROPOSED ROAD LEVEL
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS		INFERRED GEOLOGICAL BOUNDARY
TP83	HISTORICAL TRIAL PITS		WATER STRIKE DEPTH DURING DRILLING
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	EXISTING GROUND LEVEL		

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Registered office:
Arcadis House
34 York Way
London
N1 9AB

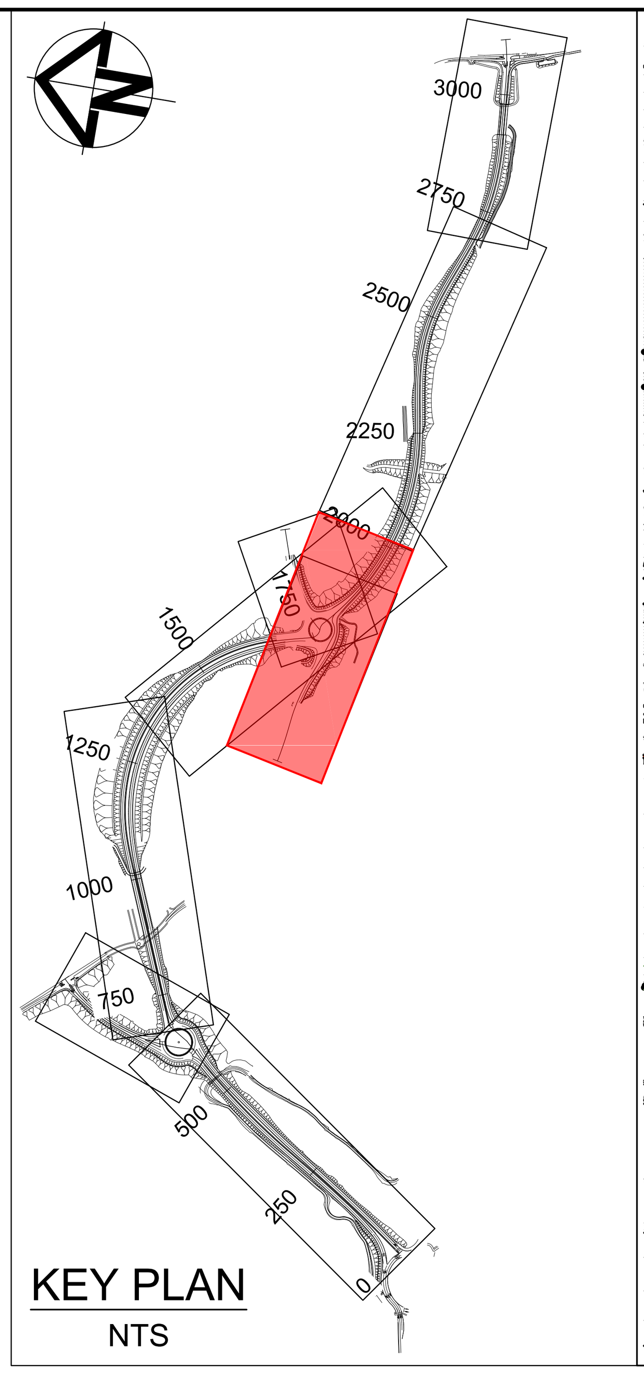
Coordinating office:
5th Floor, 401 Faraday Street
Birchwood
Warrington
WA3 6GA

Project: TRANS-PENNINE UPGRADE

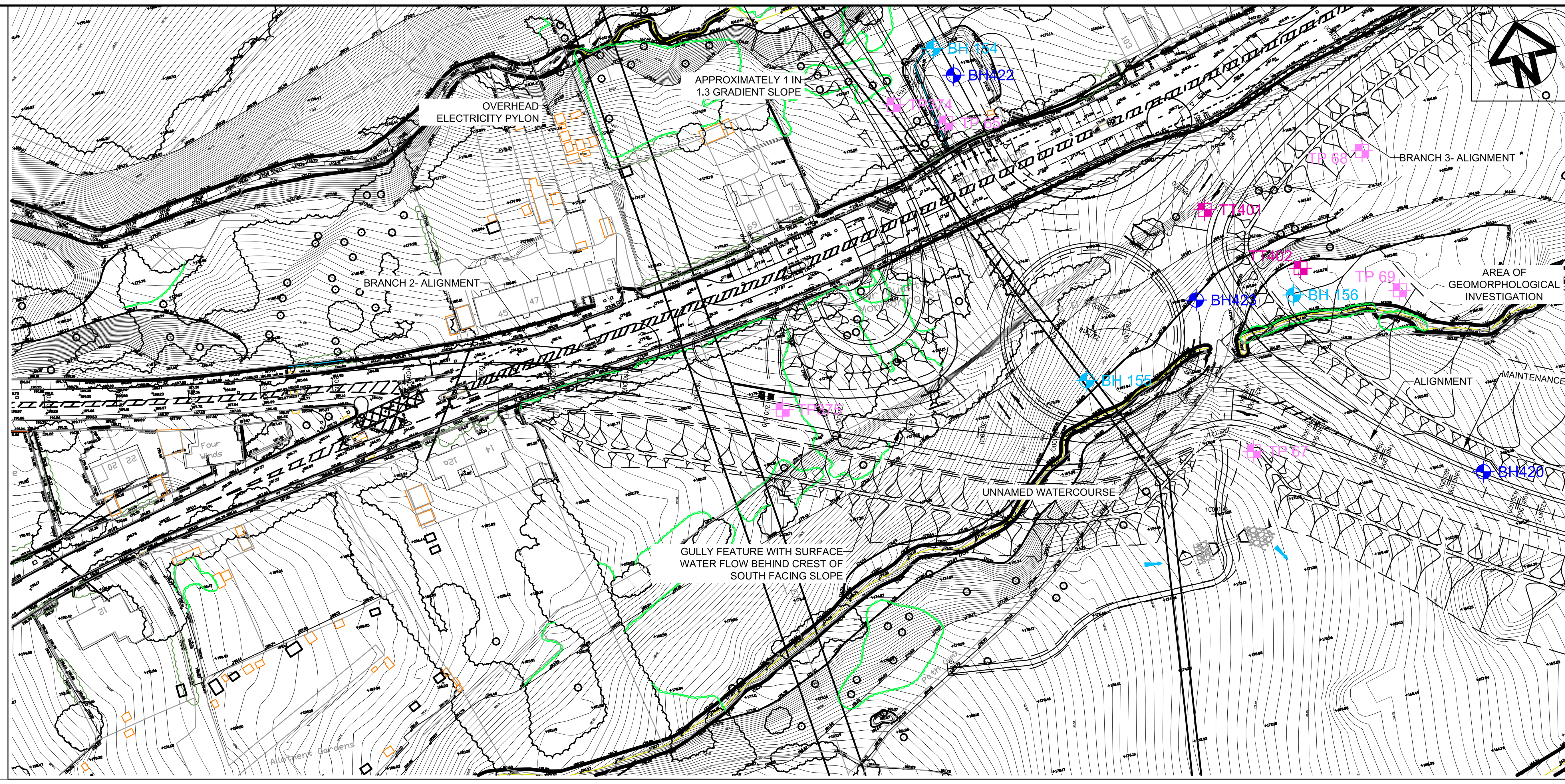
Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 06 OF 08

Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown	Date	31JAN2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)
HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3049



KEY PLAN
NTS



PLAN
SCALE 1:1000

0 10 20 40 60 80 100m

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	PEAT	PEAT
	ALVC	ALLUVIUM COHESIVE
	ALVG	ALLUVIUM GRANULAR
	ALVP	ALLUVIUM PEAT
	RTD-GF	RIVER TERRACE DEPOSIT*
	GLTC	GLACIAL TILL COHESIVE
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BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**		
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	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
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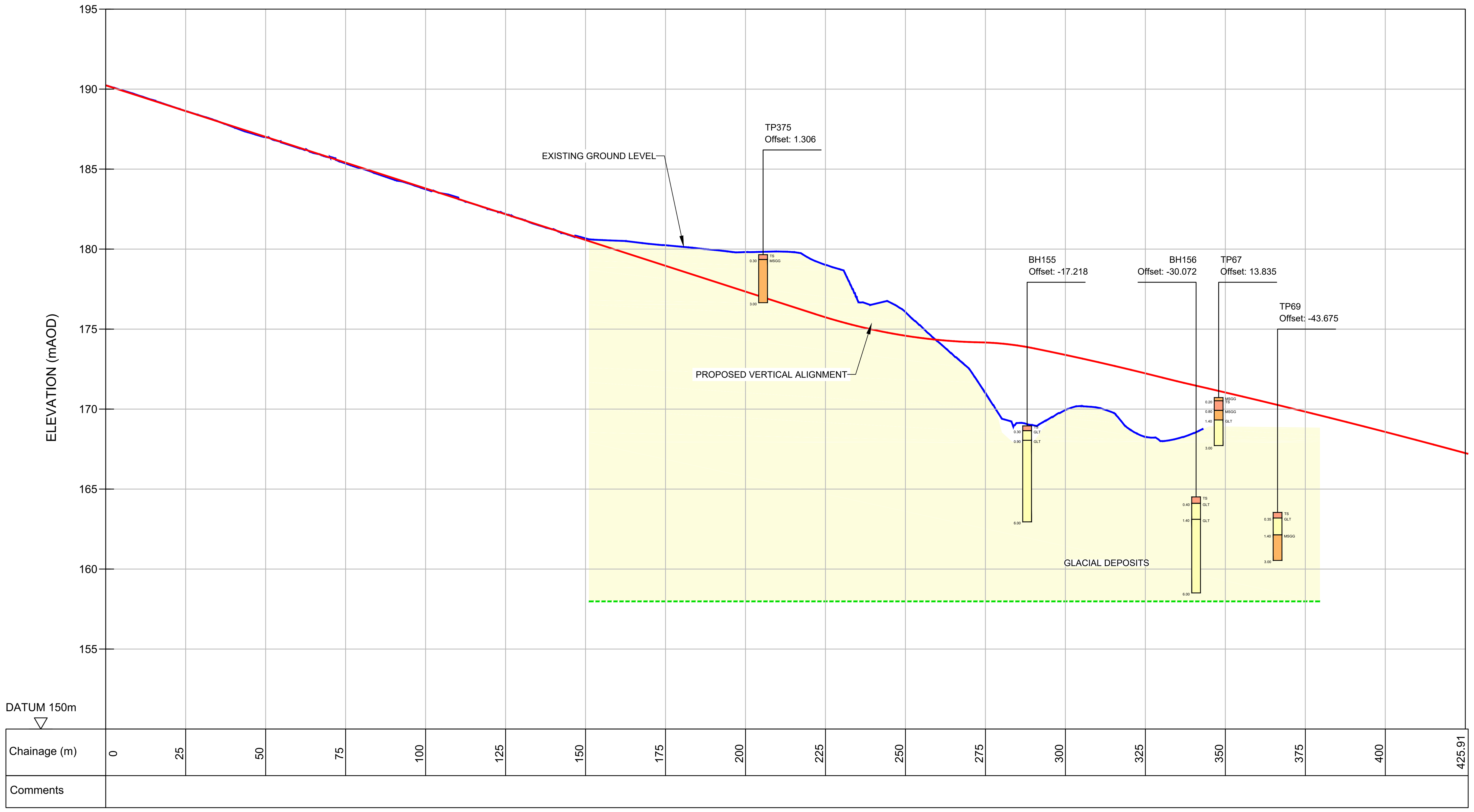
	ACL	NO RECOVERY

*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



GEOLOGICAL CROSS-SECTION
(50M BUFFER)
HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m
SCALE 1:1000 HORIZONTAL

0 5 10 20 30 40 50m
SCALE 1:500 VERTICAL

LEGEND			
BH153	HISTORICAL EXPLORATORY BOREHOLES		PROPOSED ROAD LEVEL
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS		INFERRED GEOLOGICAL BOUNDARY
TP63	HISTORICAL TRIAL PITS		WATER STRIKE DEPTH DURING DRILLING
TT401	2018 GROUND INVESTIGATION TRIAL PITS		WATER DEPTH ON COMPLETION OF HOLE
	EXISTING GROUND LEVEL		

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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Appr'd
P02	S2	31JAN19	SECOND ISSUE	JC	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JC	JC	DS

Client
highways england

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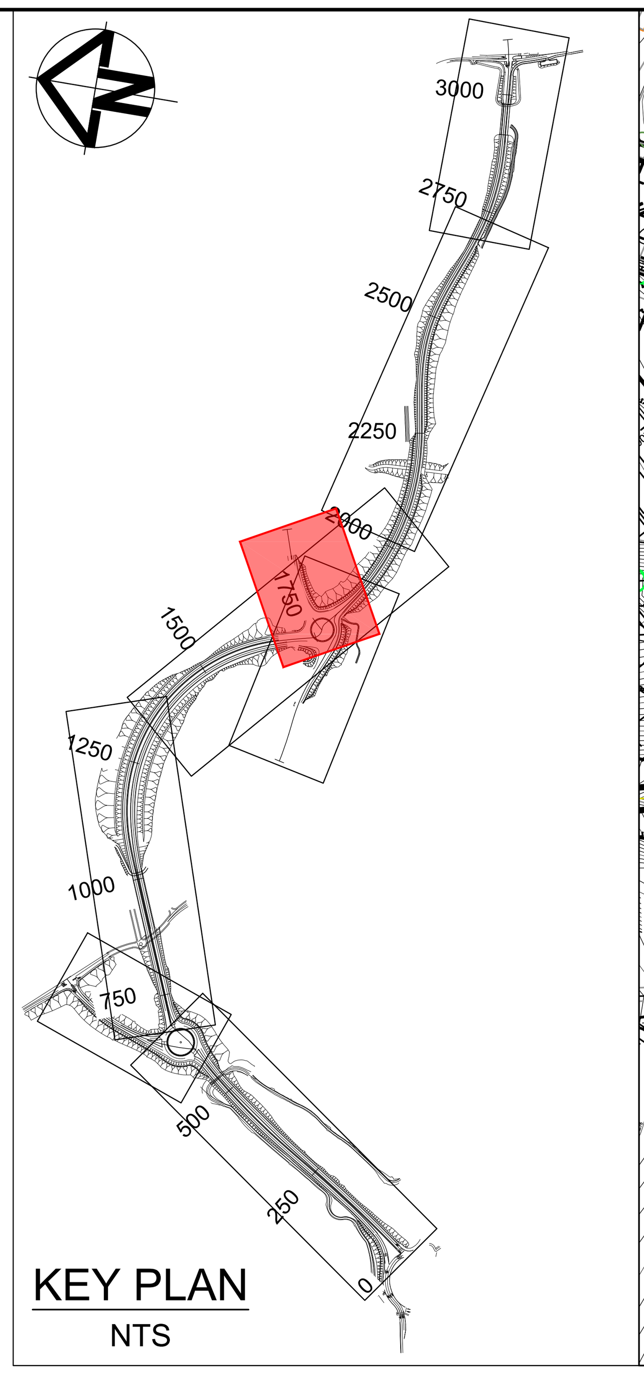
Project
TRANS-PENNINE UPGRADE

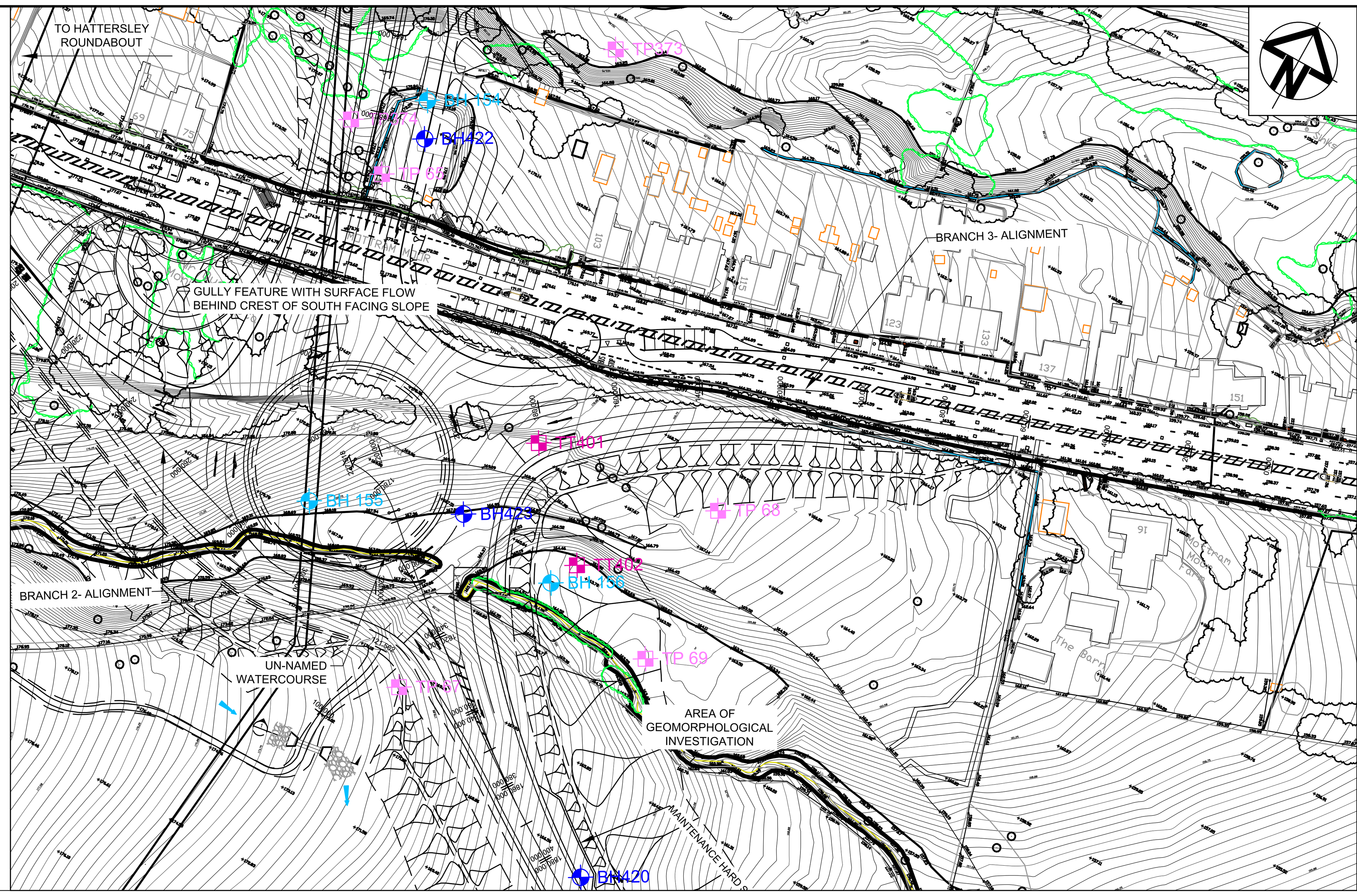
Drawing Title
GEOLOGICAL PLAN & PROFILE
SHEET 07 OF 08

Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown	Date	31JAN2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number | HE PIN | Originator | Volume | Location | Type | Role | Number
HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3050



KEY PLAN
NTS



PLAN
SCALE 1:1000

0 10 20 40 60 80 100m

LITHOLOGY KEY	
MG	MADE GROUND
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SUPERFICIAL GEOLOGY	
HEAD	HEAD DEPOSITS
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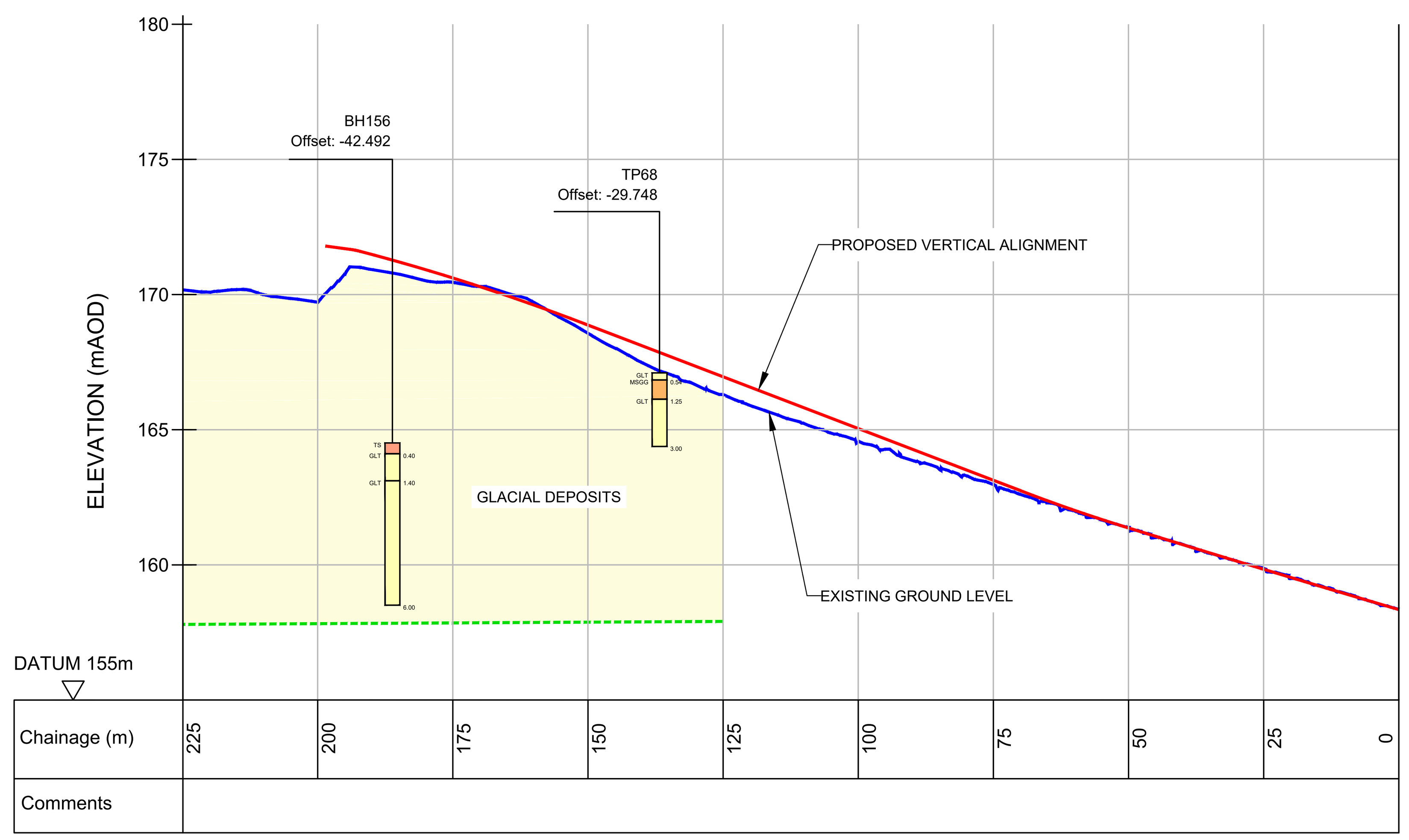

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(50M BUFFER)
HORZ 1:1000 & VERT 1:500

0 10 20 40 60 80 100m
SCALE 1:1000 HORIZONTAL

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SCALE 1:500 VERTICAL

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Project: TRANS-PENNINE UPGRADE

Drawing Title: GEOLOGICAL PLAN & PROFILE SHEET 08 OF 08

Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown	Date	31JAN2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number): HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3051

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
3. ALL DRAWINGS ARE TO BE PRINTED IN COLOUR.
4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
5. EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN BY THIRD PARTY GROUND INVESTIGATION CONTRACTORS AND ARE ASSUMED TO BE ACCURATE.
6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-PENNINE GROUND INVESTIGATION REPORT.

LEGEND	
BH153	HISTORICAL EXPLORATORY BOREHOLES
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS
TP63	HISTORICAL TRIAL PITS
TT401	2018 GROUND INVESTIGATION TRIAL PITS
	CONTIGUOUS PILE WALL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House, 34 York Way, London, N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

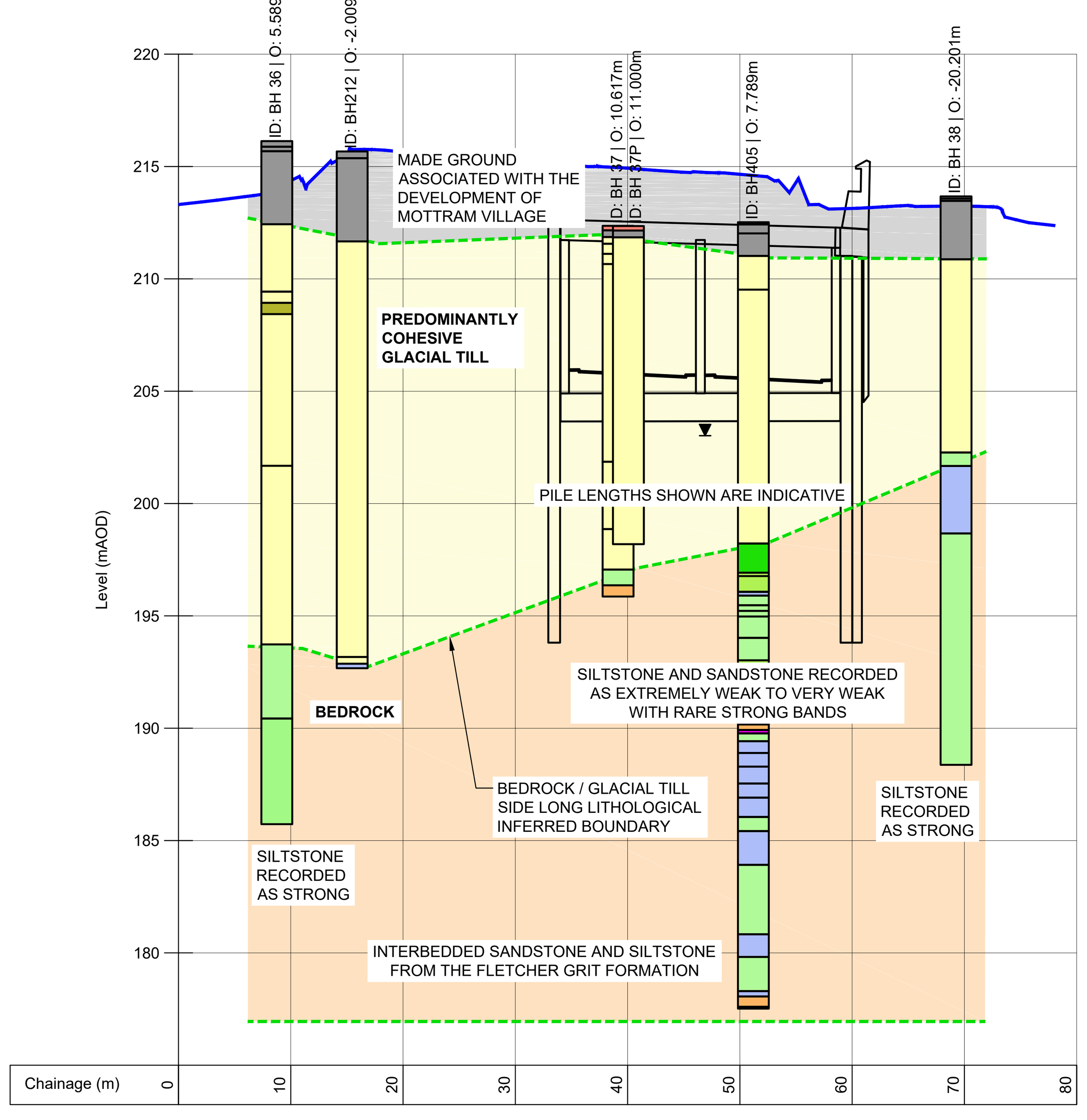
Project: TRANS-PENNINE UPGRADE

Drawing Title: MOTTRAM UNDERPASS GENERAL ARRANGEMENT

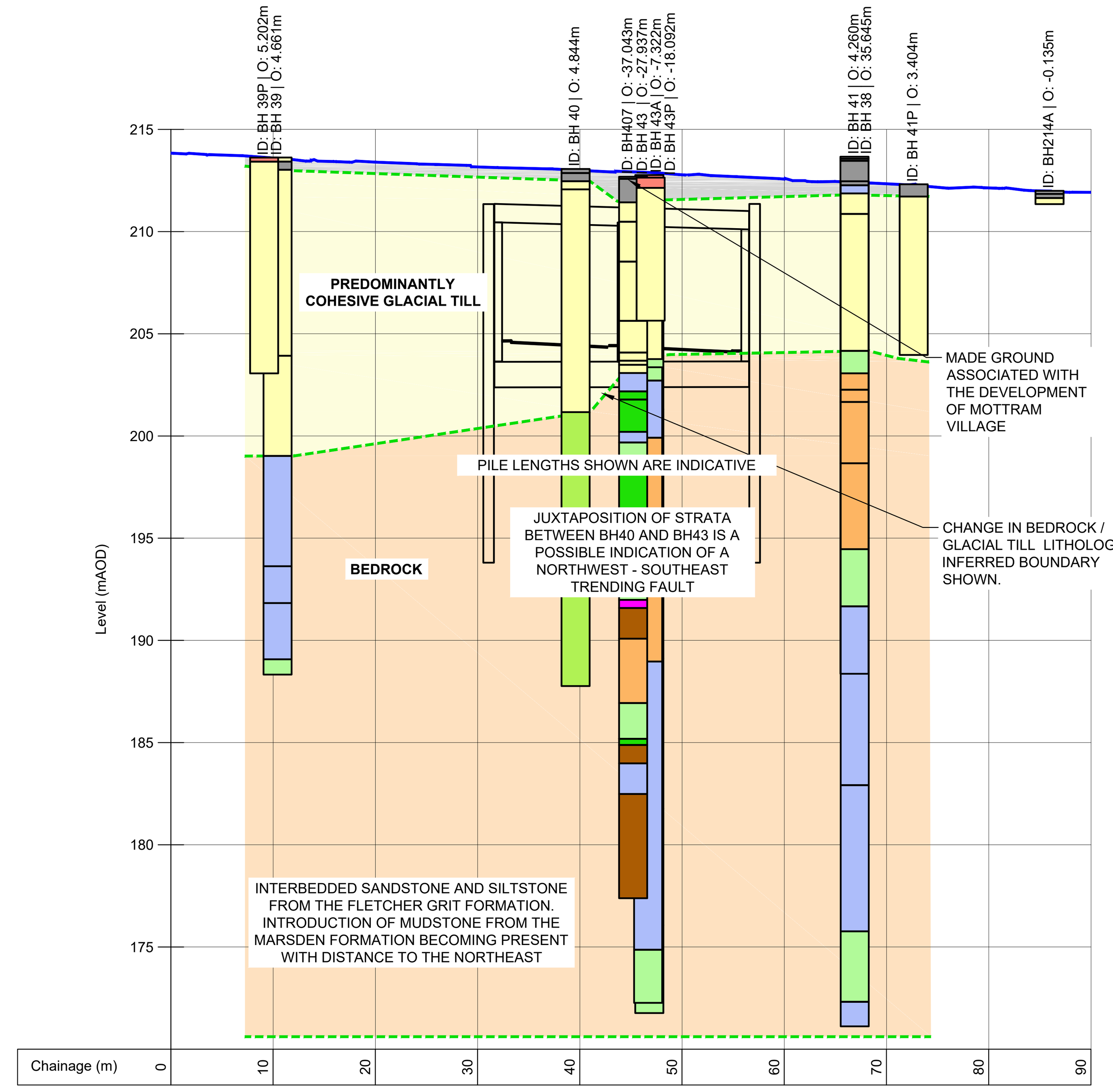
Status	S2 - FOR INFORMATION
Revision	P02
Scale	1:500
Date	31JAN2019
Drawn By	[redacted]
Checked By	
Approved By	
PINS No.	- TR010034
Original Size	A1
Drawing number (HE PIN / Originator / Volume / Location / Type / Role / Number)	HE551473-ARC-HGT-S2_ML001-DR-CE-3052

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	GLTC	GLACIAL TILL COHESIVE
	GLTL	GLACIAL TILL LAMINATED
	GLTG	GLACIAL TILL GRANULAR
	GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**		
	MSGG-M	MUDSTONE
	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
	MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
	MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
	MSGG-SND	SANDSTONE
	MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
	MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
	MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
	MSGG-SS	SLICKENSIDE SURFACE
	ACL	NO RECOVERY
▼	WATER DEPTH ON COMPLETION OF HOLE	
▽	WATER STRIKE DEPTH DURING DRILLING	
	EXISTING GROUND LEVEL	
	PROPOSED STRUCTURE (INDICATIVE)	
	INFERRED GEOLOGICAL BOUNDARY	
	EXTENT OF FAULTED AREA	
	HIGHLY DISTURBED FAULTED ZONE	
	POTENTIAL BEDDING	

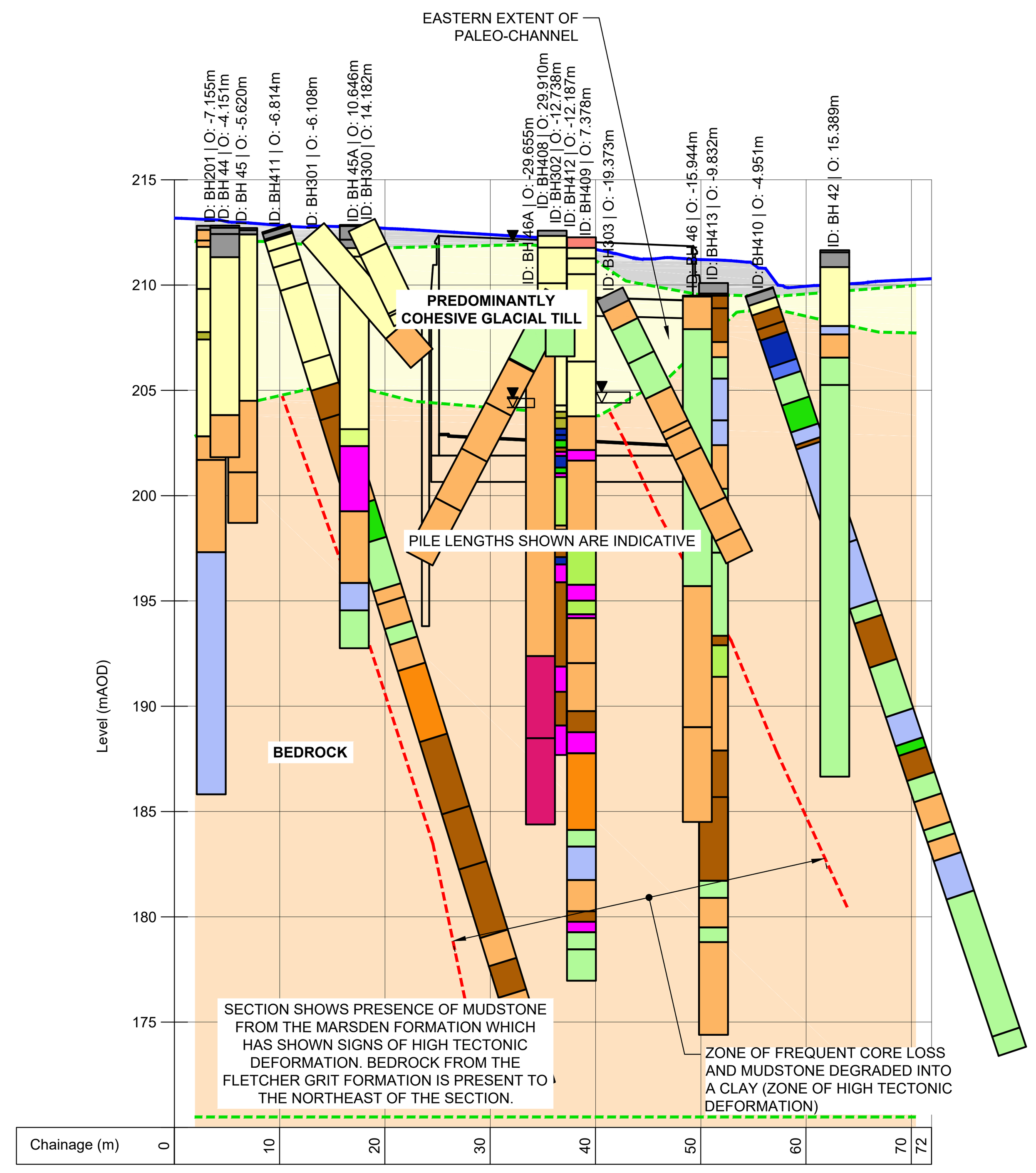
*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



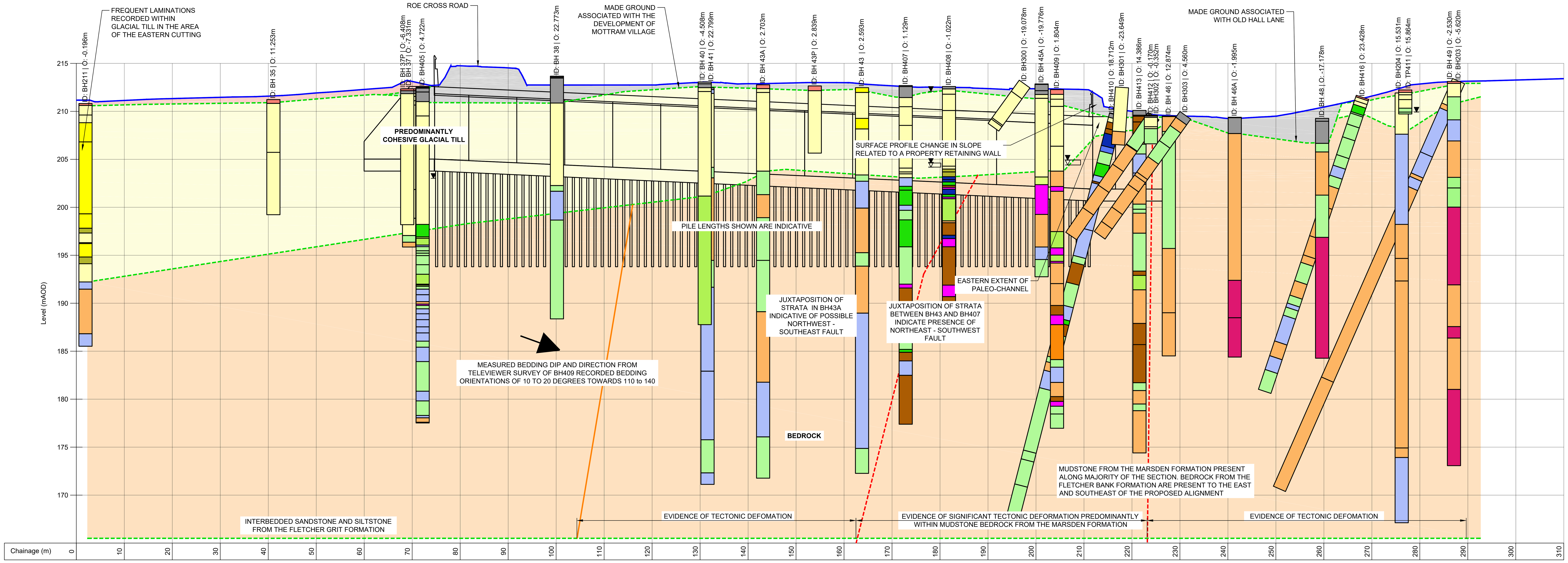
SECTION A-A | SCALE: H 1:500,V 1:250



SECTION B-B | SCALE: H 1:500,V 1:250



SECTION C-C | SCALE: H 1:500,V 1:250



SECTION D-D | SCALE: H 1:500,V 1:250

0 5 10 20 30 40 50m
SCALE 1:500 HORIZONTAL

0 10 20 40 60 80 100m
SCALE 1:250M VERTICAL

NOTES:
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2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
3. ALL DRAWINGS ARE TO BE PRINTED IN COLOUR.
4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
5. EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN BY THIRD PARTY GROUND INVESTIGATION CONTRACTORS AND ARE ASSUMED TO BE ACCURATE.
6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-PENNINE GROUND INVESTIGATION REPORT.
7. GROUNDWATER STRIKES ONLY SHOWN FOR 2018 SOCOTEC GROUND INVESTIGATION.
8. THE LINES BETWEEN BOREHOLES REPRESENT OUR INTERPRETATION OF GROUND CONDITIONS, OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN. THE DEPTH OF STRATA BOUNDARIES AT THE LINE OF SECTION ARE INDICATIVE AND HAVE BEEN INTERPRETED FROM BOREHOLES OFFSET FROM THE SECTION.
9. THE LONG SECTIONS PROVIDES AN ILLUSTRATION OF THE GENERAL DISPOSITION OF STRATA, IT IS NOT INTENDED TO SUPPORT DETAILED DESIGN OR THE ASSESSMENT OF EARTHWORKS QUANTITIES.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets
Registered office: Arcadis House, 34 York Way, London, N1 9AB
Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: MOTTRAM UNDERPASS GEOTECHNICAL SECTIONS SHEET 01 OF 02

Status: S2 - FOR INFORMATION
Revision: P02
Scale: As shown
Date: 31JAN2019
Drawn By: [redacted]
Checked By:
Approved By:
PINS No.: -
4
Original Size: A1
Drawing number: HE551473-ARC-HGT-S2_ML001-DR-CE-3053

LITHOLOGY KEY	
MG	MADE GROUND
TS	TOPSOIL
SUPERFICIAL GEOLOGY	
HEAD	HEAD DEPOSITS
GLTC	GLACIAL TILL COHESIVE
GLTL	GLACIAL TILL LAMINATED
GLTG	GLACIAL TILL GRANULAR
GLTB	GLACIAL TILL BOULDER
BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**	
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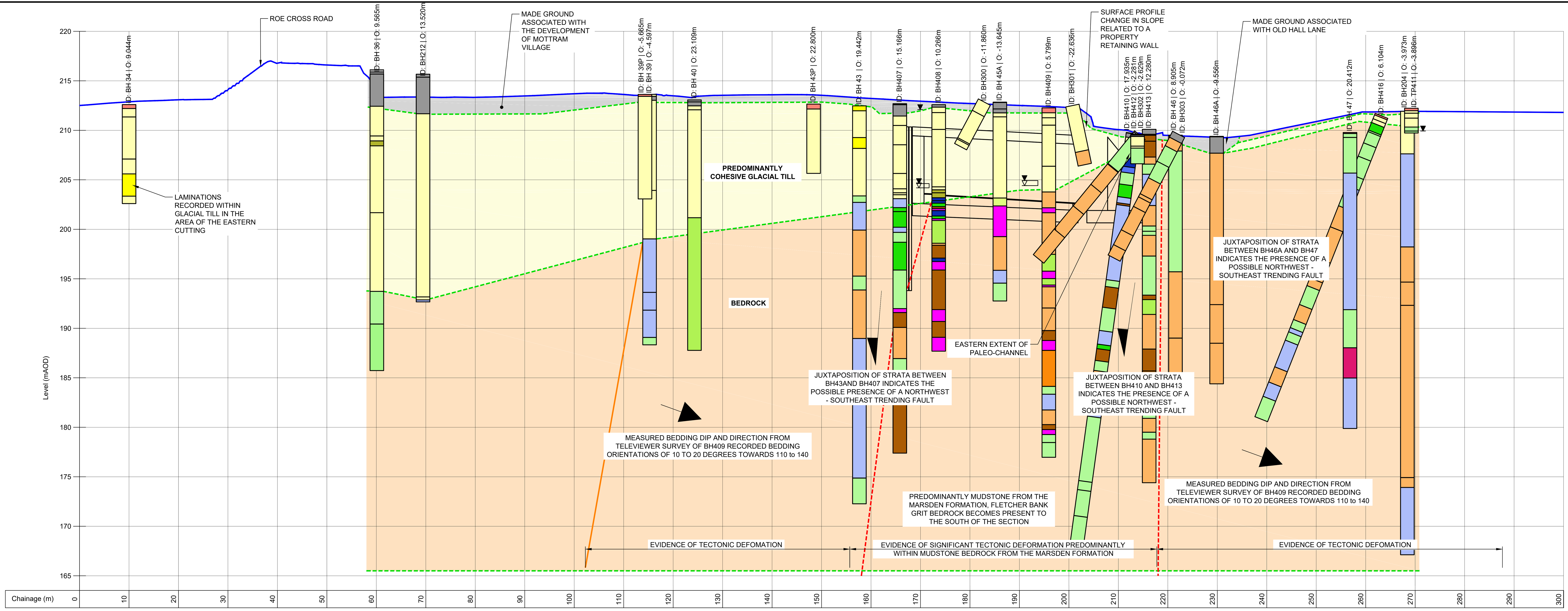
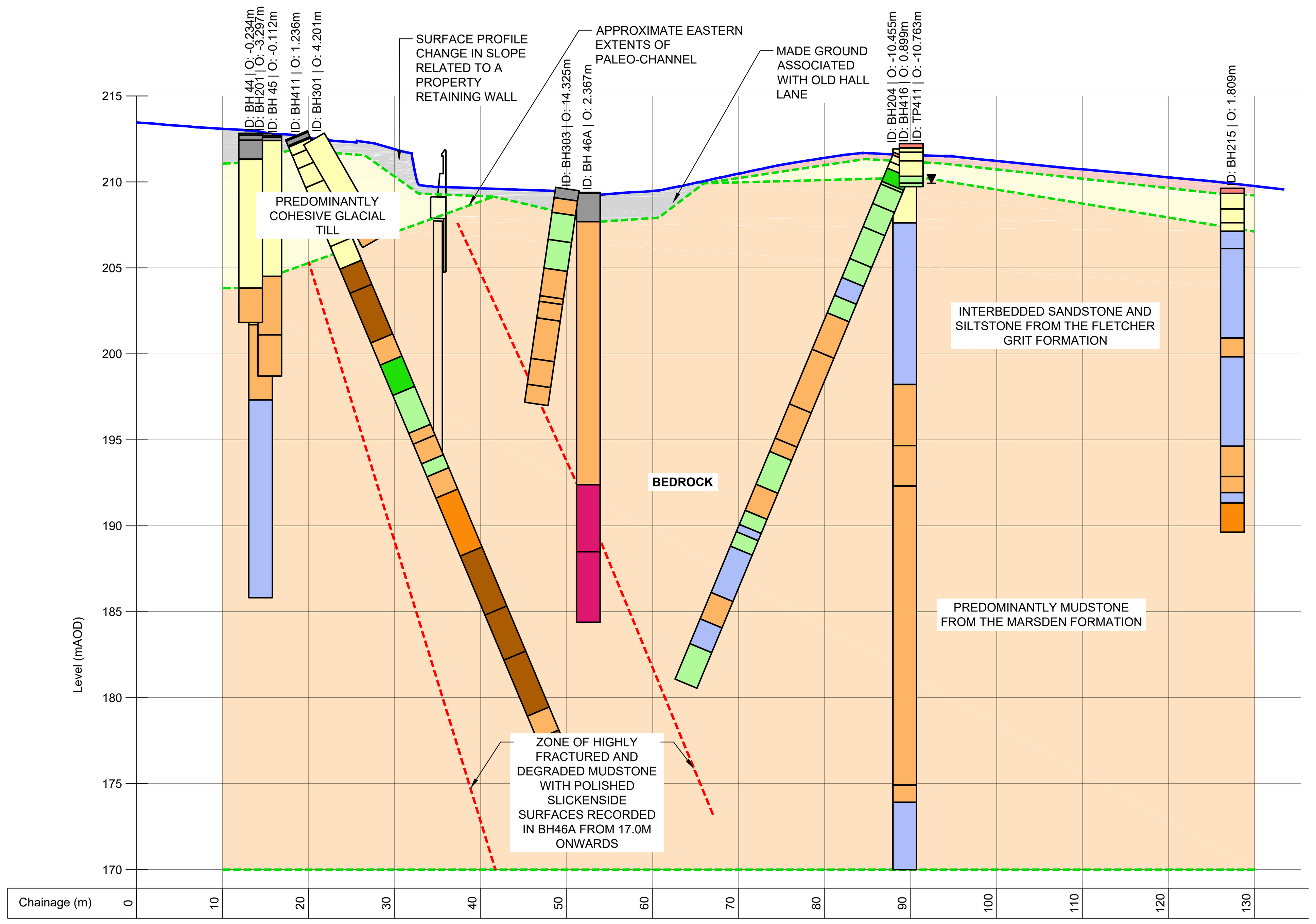
MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
MSGG-M-M	MODERATELY WEATHERED MUDSTONE
MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
MSGG-SLT	SILTSTONE
MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
MSGG-SND	SANDSTONE
MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
MSGG-SND-M	MODERATELY WEATHERED SANDSTONE
MSGG-SND-S	SLIGHTLY WEATHERED SANDSTONE
MSGG-SS	SLICKENSIDE SURFACE
ACL	NO RECOVERY
	WATER DEPTH ON COMPLETION OF HOLE
	WATER STRIKE DEPTH DURING DRILLING
	EXISTING GROUND LEVEL
	PROPOSED STRUCTURE (INDICATIVE)
	INFERRED GEOLOGICAL BOUNDARY
	EXTENT OF FAULTED AREA
	HIGHLY DISTURBED FAULTED ZONE
	POTENTIAL BEDDING

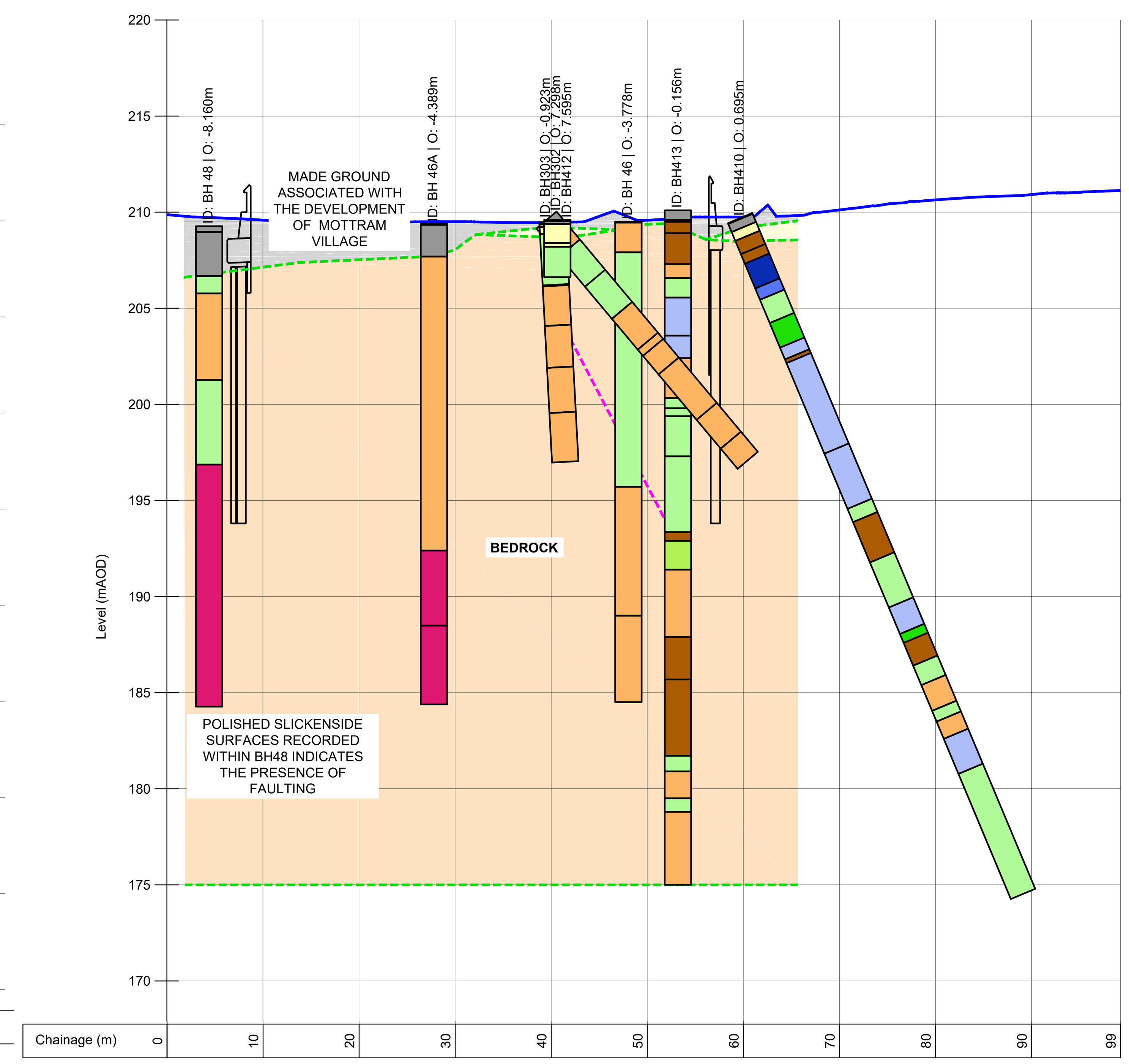
*GLACIO-FLUVIAL
** ALL BEDROCK IS MILLSTONE GRIT GROUP



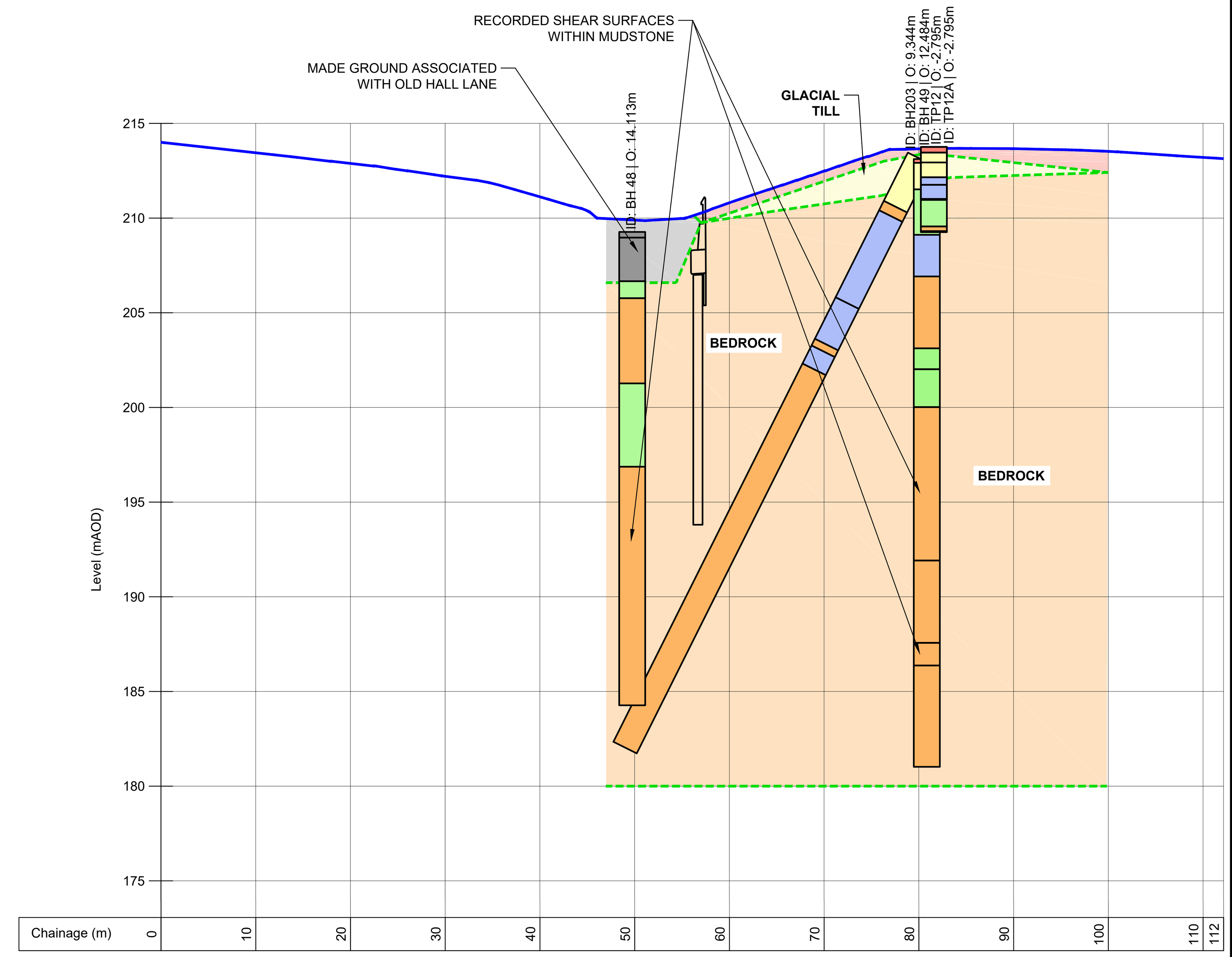
SECTION E-E | SCALE: H 1:500,V 1:250



SECTION F-F | SCALE: H 1:500,V 1:250



SECTION G-G | SCALE: H 1:500,V 1:250



SECTION H-H | SCALE: H 1:500,V 1:250

SCALE 1:500 HORIZONTAL

SCALE 1:250M VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

NOTES:

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4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
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6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-PENNINE GROUND INVESTIGATION REPORT.
7. GROUNDWATER STRIKES ONLY SHOWN FOR 2018 SOCOTEC GROUND INVESTIGATION.
8. THE LINES BETWEEN BOREHOLES REPRESENT OUR INTERPRETATION OF GROUND CONDITIONS, OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN. THE DEPTH OF STRATA BOUNDARIES AT THE LINE OF SECTION ARE INDICATIVE AND HAVE BEEN INTERPRETED FROM BOREHOLES OFFSET FROM THE SECTION.
9. THE LONG SECTIONS PROVIDES AN ILLUSTRATION OF THE GENERAL DISPOSITION OF STRATA, IT IS NOT INTENDED TO SUPPORT DETAILED DESIGN OR THE ASSESSMENT OF EARTHWORKS QUANTITIES.

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House, 34 York Way, London, N1 9AB

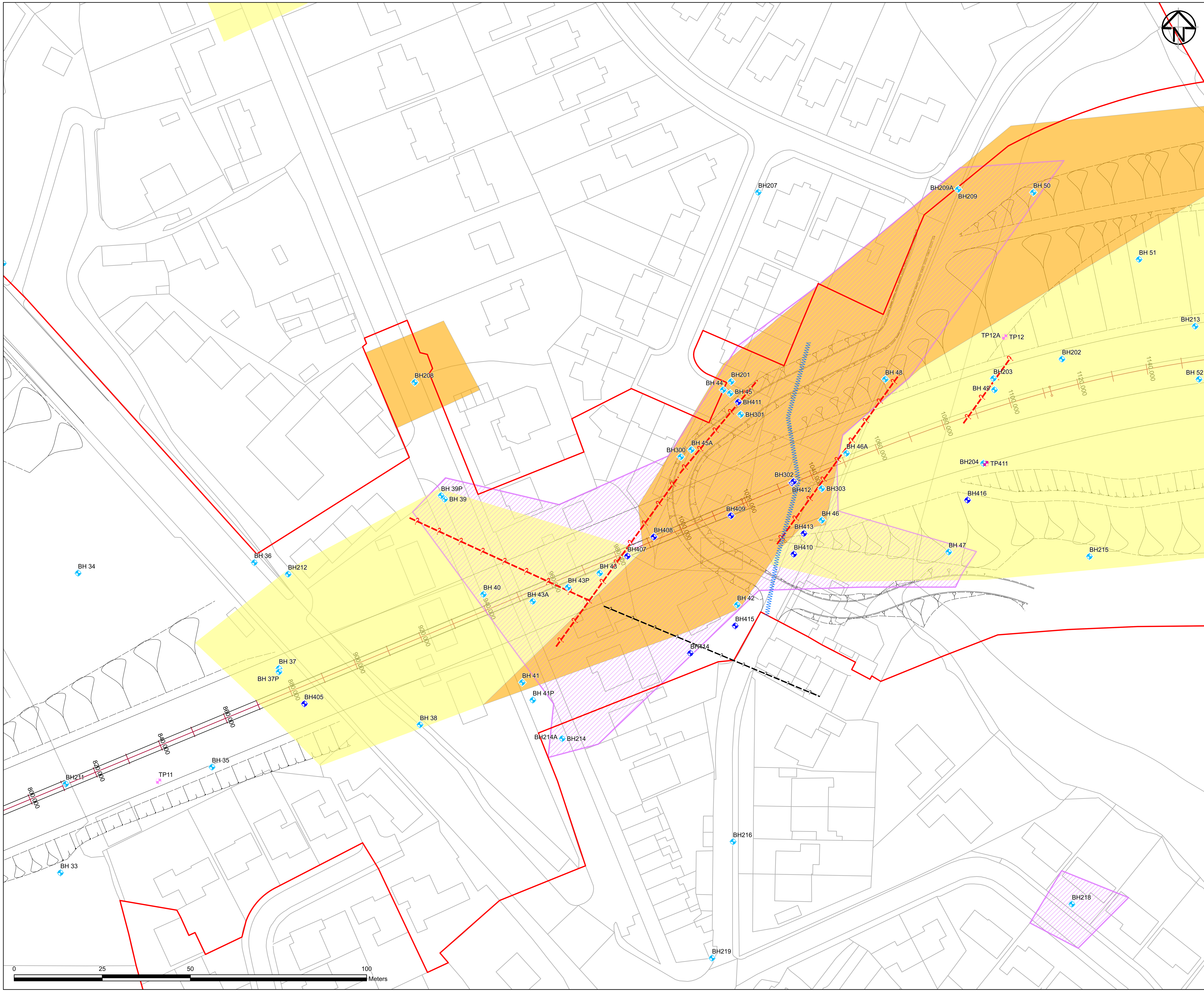
Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: MOTTRAM UNDERPASS GEOTECHNICAL SECTIONS SHEET 02 OF 02

Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown [redacted]	Date	31JAN2019
Drawn By			
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number): HE551473-ARC-HGT-S2_ML001-DR-CE-3054



LEGEND

- Historical Exploratory Borehole
- 2018 Exploratory Borehole
- Historical Exploratory Trial Pit
- 2018 Exploratory Trial Pit
- Red Line Boundary
- Inferred Fault
- Possible Fault
- Western Extent of Palaeo-Channel
- Shear Zone Extents
- FLETCHER BANK GRIT Sandstone and Siltstone
- MARSDEN FORMATION Mudstone

NOTES

1. All levels are in metres relative to Ordnance Datum Newlyn.
2. All drawings are to be printed in colour.
3. All structures and culverts shown are indicative.
4. Exploratory hole locations have been surveyed in by third party ground investigation contractors and are assumed to be accurate.
5. Individual geological units have been interpreted from information provided on exploratory hole details in the 2018 Arcadis Trans-Pennine ground investigation report.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P01	S2	02 OCT 18	First issue	J.M.	J.C.	D.S.

Client

highways england

Designer

ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House 34 York Way London N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street Birchwood Warrington WA3 6GA

Project

TRANS-PENNINE UPGRADE

Drawing Title

MOTTRAM UNDERPASS SOLID GEOLOGY PLAN

Status	S2 - FOR INFORMATION	Revision	P01
Scale	1:500	Date	02/10/2018
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No.	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)

HE551473-ARC-HGT-S2_ML001-DR-CE-3062

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
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LEGEND	
BH153	HISTORICAL EXPLORATORY BOREHOLES
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS
TP63	HISTORICAL TRIAL PITS
TT401	2018 GROUND INVESTIGATION TRIAL PITS

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House, 34 York Way, London, N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: EASTERN CUTTING GENERAL ARRANGEMENT

Status	S2 - FOR INFORMATION	Revision	P02
Scale	1:1000	Date	31JAN2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)

HE551473-ARC-HGT-S2_ML002-DR-CE-3057

		LITHOLOGY KEY
	MG	MADE GROUND
	TS	TOPSOIL
		SUPERFICIAL GEOLOGY
	HEAD	HEAD DEPOSITS
	GLTC	GLACIAL TILL COHESIVE
	GLTL	GLACIAL TILL LAMINATED
	GLTG	GLACIAL TILL GRANULAR
	GLTB	GLACIAL TILL BOULDER
		BEDROCK GEOLOGY (MILLSTONE GRIT GROUP)**
	MSGG-M	MUDSTONE
	MSGG-MH	MUDSTONE (HIGHLY WEATHERED)
	MSGG-M-M	MODERATELY WEATHERED MUDSTONE
	MSGG-M-S	SLIGHTLY WEATHERED MUDSTONE
	MSGG-SLT	SILTSTONE
	MSGG-SLT-H	HIGHLY WEATHERED SILTSTONE
	MSGG-SLT-M	MODERATELY WEATHERED SILTSTONE
	MSGG-SLT-S	SLIGHTLY WEATHERED SILTSTONE
	MSGG-SND	SANDSTONE
	MSGG-SND-H	HIGHLY WEATHERED SANDSTONE
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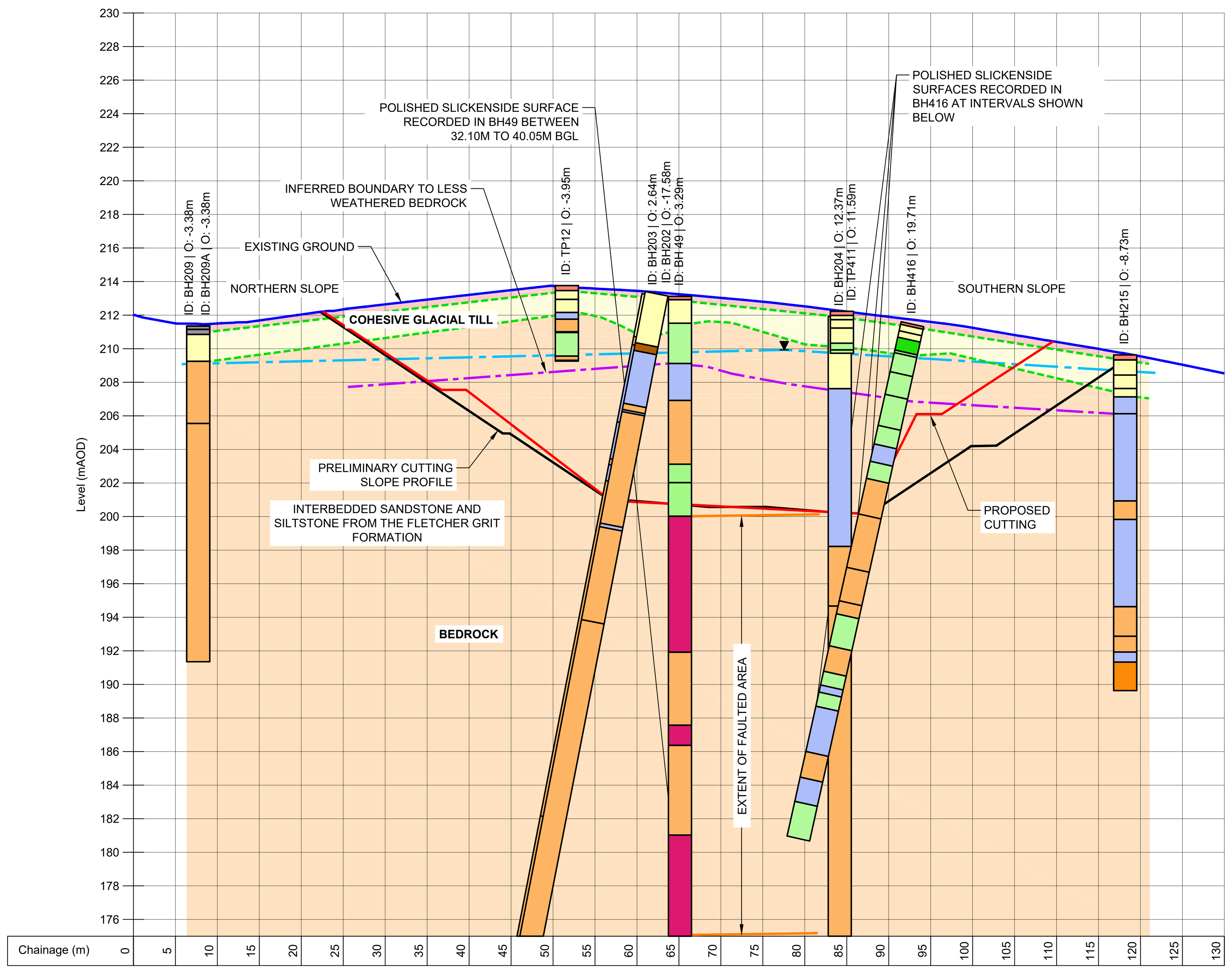
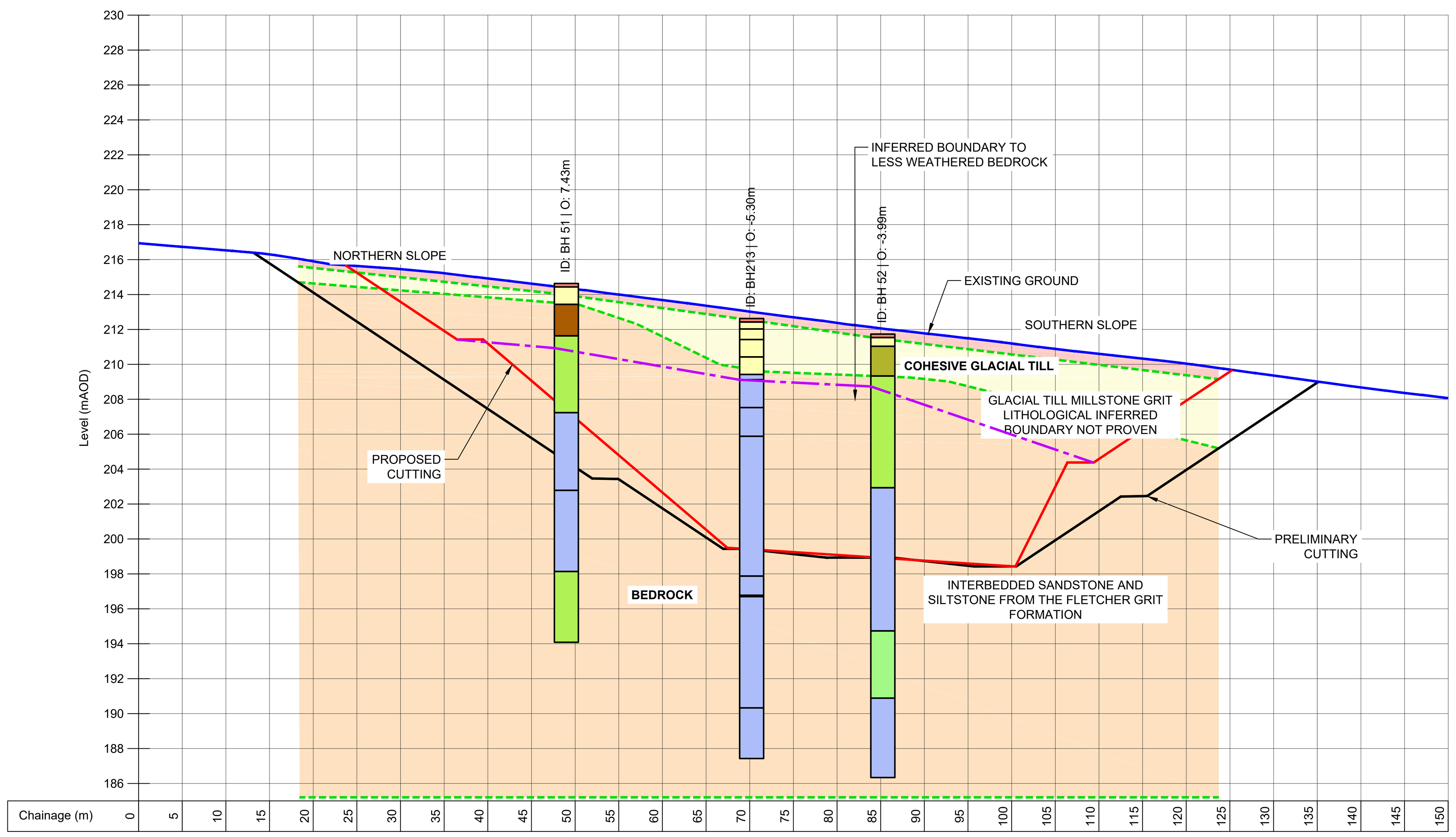
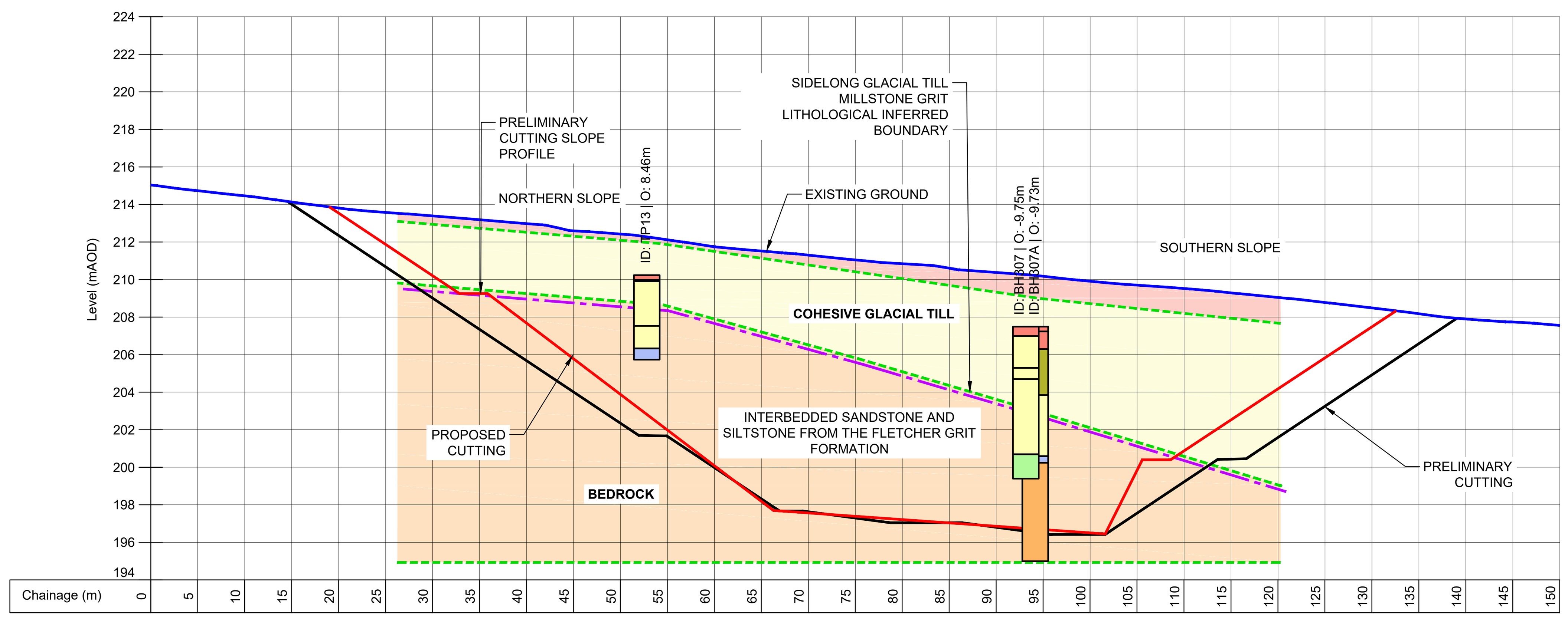
	MSGG-SS	SLICKENSIDE SURFACE
	ACL	NO RECOVERY
▼	WATER DEPTH ON COMPLETION OF HOLE	
∇	WATER STRIKE DEPTH DURING DRILLING	
	EXISTING GROUND LEVEL	
	PROPOSED CUTTING SLOPE PROFILE	
	PRELIMINARY CUTTING SLOPE PROFILE	
	INFERRED GEOLOGICAL BOUNDARY	
	EXTENT OF FAULTED AREA	
	INFERRED WEATHERED BEDROCK BOUNDARY	
	INFERRED GROUND WATER LEVEL (WHERE NOT SHOWN, NO WATER STRIKES RECORDED	



SECTION A-A | SCALE: H 1:500,V 1:250



SECTION B-B | SCALE: H 1:500,V 1:250



SECTION C-C | SCALE: H 1:500,V 1:250

0 5 10 20 30 40 50m
SCALE 1:500 HORIZONTAL

0 10 20 40 60 80 100m
SCALE 1:250M VERTICAL

NOTES:

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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

Designer: ARCADIS

Registered office: Arcadis House, 34 York Way, London, N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: EASTERN CUTTING GEOTECHNICAL SECTIONS SHEET 01 OF 02

Status	S2 - FOR INFORMATION
Revision	P02
Scale	As shown
Date	31JAN2019
Drawn By / Checked By / Approved By	[redacted]
PINS No.	TR010034
Original Size	A1
Drawing number	HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3058

LITHOLOGY KEY		
	MG	MADE GROUND
	TS	TOPSOIL
SUPERFICIAL GEOLOGY		
	HEAD	HEAD DEPOSITS
	GLTC	GLACIAL TILL COHESIVE
	GLTL	GLACIAL TILL LAMINATED
	GLTG	GLACIAL TILL GRANULAR
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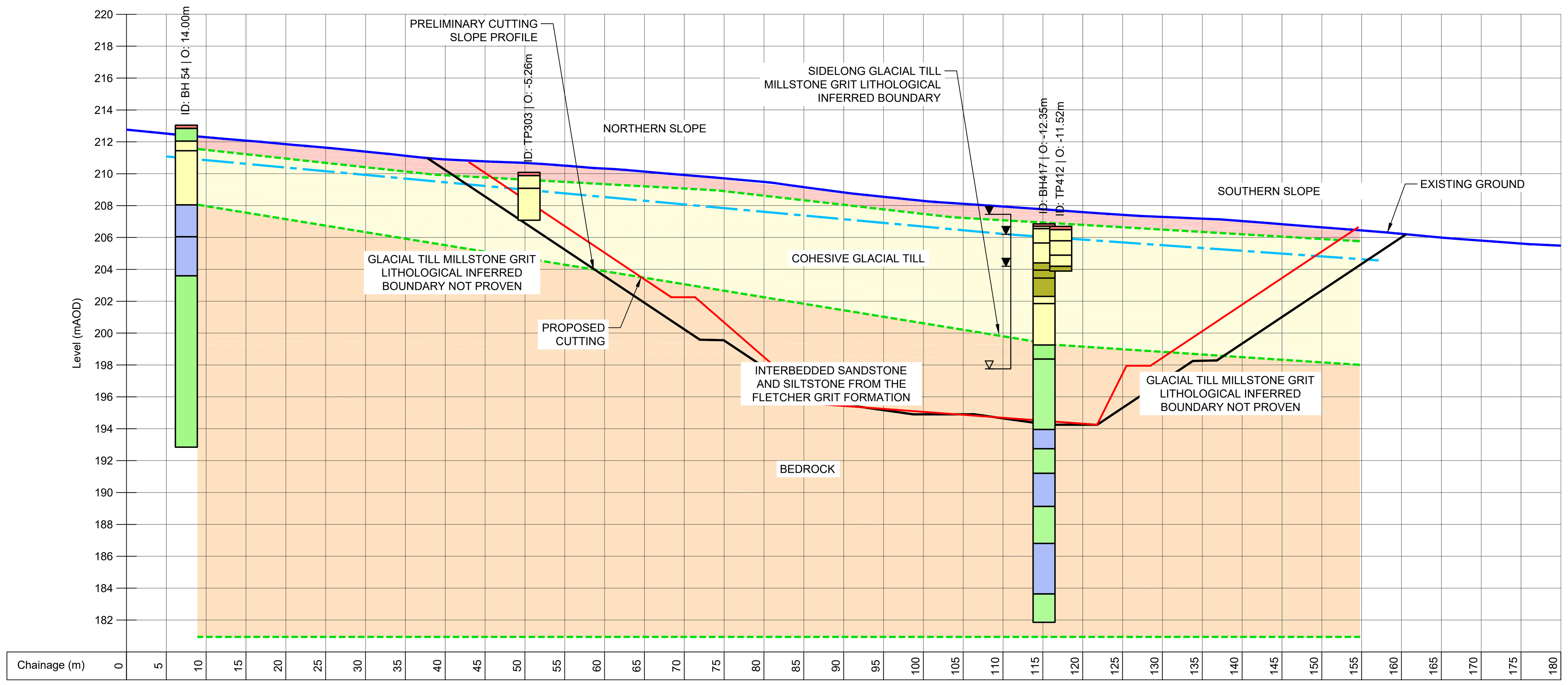
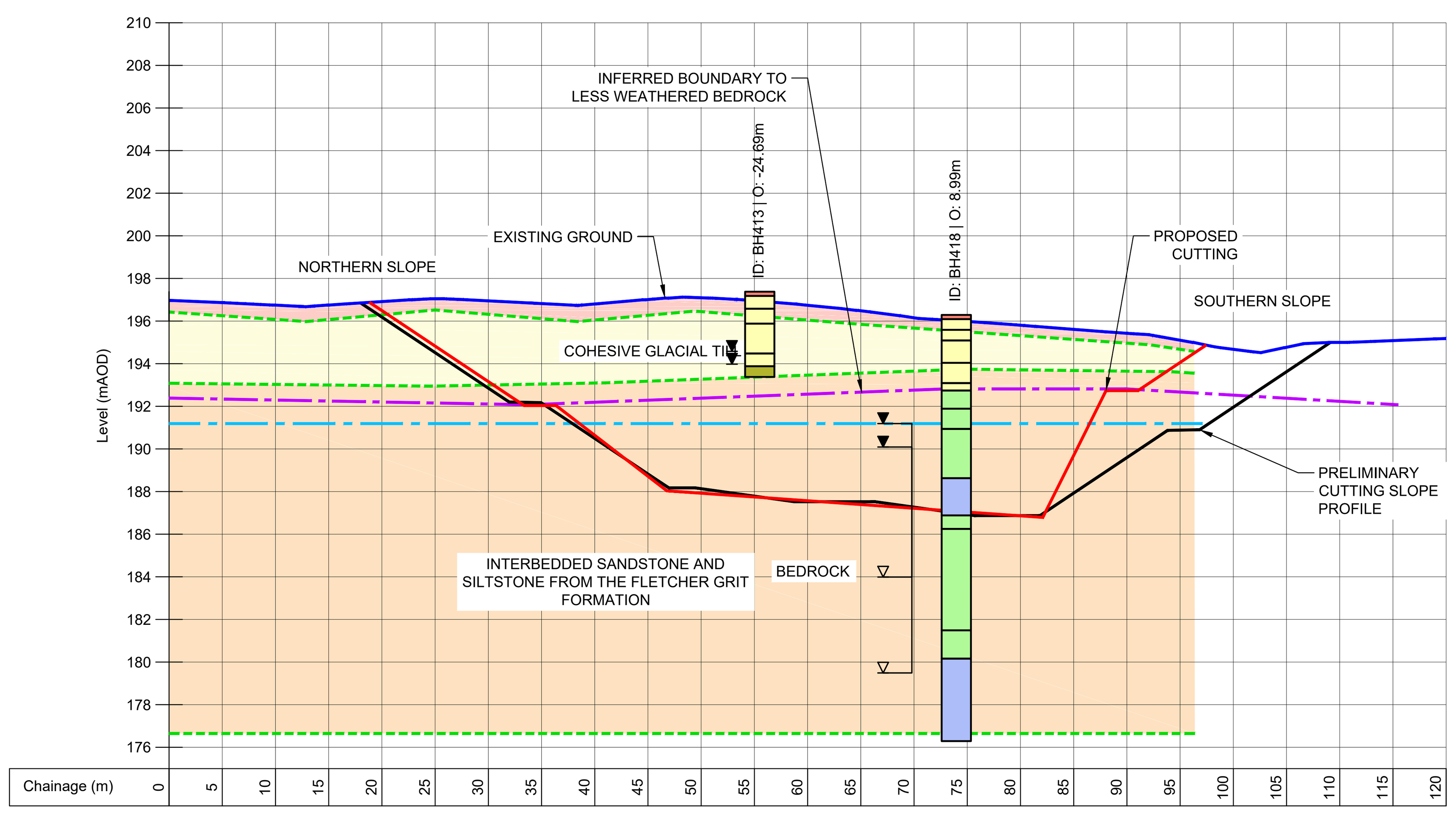
		PROPOSED CUTTING SLOPE PROFILE
		PRELIMINARY CUTTING SLOPE PROFILE
		INFERRED GEOLOGICAL BOUNDARY
		EXTENT OF FAULTED AREA
		INFERRED WEATHERED BEDROCK BOUNDARY
		INFERRED GROUND WATER LEVEL



SECTION E-E | SCALE: H 1:500,V 1:250



SECTION E-E | SCALE: H 1:500,V 1:250

0 5 10 20 30 40 50m
SCALE 1:500 HORIZONTAL

0 10 20 40 60 80 100m
SCALE 1:250M VERTICAL

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

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Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets
Registered office: Arcadis House, 34 York Way, London, N1 9AB
Coordinating office: 5th Floor, 401 Faraday Street, Birchwood, Warrington, WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: EASTERN CUTTING GEOTECHNICAL SECTIONS SHEET 2 OF 2

Status	S2 - FOR INFORMATION	Revision	P02
Scale	As shown	Date	31JAN2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No. -	TR010034	Original Size	A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)
HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3059

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN.
3. ALL DRAWINGS ARE TO BE PRINTED IN COLOUR.
4. ALL STRUCTURES AND CULVERTS SHOWN ARE INDICATIVE.
5. EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN BY THIRD PARTY GROUND INVESTIGATION CONTRACTORS AND ARE ASSUMED TO BE ACCURATE.
6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-PENNINE GROUND INVESTIGATION REPORT.

LEGEND	
BH153	HISTORICAL EXPLORATORY BOREHOLES
BH421	2018 GROUND INVESTIGATION EXPLORATORY HOLE POSITIONS
TP63	HISTORICAL TRIAL PITS
TT401	2018 GROUND INVESTIGATION TRIAL PITS

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S2	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S2	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

Designer: ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
5th Floor, 401 Faraday Street
Birchwood
Warrington
WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title:

MOTTRAM MOOR ROUNDABOUT TRIAL TRENCH GENERAL ARRANGEMENT

Status	S2 - FOR INFORMATION
Revision	P02
Scale	1:250
Date	31JAN2019
Drawn By	[redacted]
Checked By	
Approved By	
PINS No.	- TR010034
Original Size	A1
Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)	HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3064

LITHOLOGY KEY

	MADE GROUND
	TOPSOIL
	COLLUVIUM
	ALLUVIUM 1
	ALLUVIUM 2
	ALLUVIUM 3
	ALLUVIUM 4
	GLACIAL TILL
	INFERRED MADE GROUND
	INFERRED COLLUVIUM
	INFERRED ALLUVIUM
	EXISTING GROUND
	PROPOSED GROUND LEVEL
	PROPOSED STRUCTURE (INDICATIVE)
	INFERRED GEOLOGICAL BOUNDARY

[redacted]

10 20 30 40 50m

SCALE 1:250 HORIZONTAL

[redacted]

6. INDIVIDUAL GEOLOGICAL UNITS HAVE BEEN INTERPRETED FROM INFORMATION PROVIDED ON EXPLORATORY HOLE DETAILS IN THE 2018 ARCADIS TRANS-PENNINE GROUND INVESTIGATION REPORT.
7. GROUNDWATER STRIKES ONLY SHOWN FOR 2018 SOCOTEC GROUND INVESTIGATION.
8. THE LINES BETWEEN BOREHOLES REPRESENT OUR INTERPRETATION OF GROUND CONDITIONS, OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN. THE DEPTH OF STRATA BOUNDARIES AT THE LINE OF SECTION ARE INDICATIVE AND HAVE BEEN INTERPRETED FROM BOREHOLES OFFSET FROM THE SECTION.
9. THE LONG SECTIONS PROVIDES AN ILLUSTRATION OF THE GENERAL DISPOSITION OF STRATA, IT IS NOT INTENDED TO SUPPORT DETAILED DESIGN OR THE ASSESSMENT OF EARTHWORKS QUANTITIES.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S1	31JAN19	SECOND ISSUE	JM	JC	DS
P01	S1	05OCT18	FIRST ISSUE	JM	JC	DS

Client: highways england

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Warrington
WA3 6GA

Project: TRANS-PENNINE UPGRADE

Drawing Title: MOTTRAM MOOR ROUNDABOUT TRIAL TRENCH CROSS SECTIONS

Status	S2 - FOR INFORMATION
Revision	P02
Scale	[redacted]
Drawn By	[redacted]
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Approved By	
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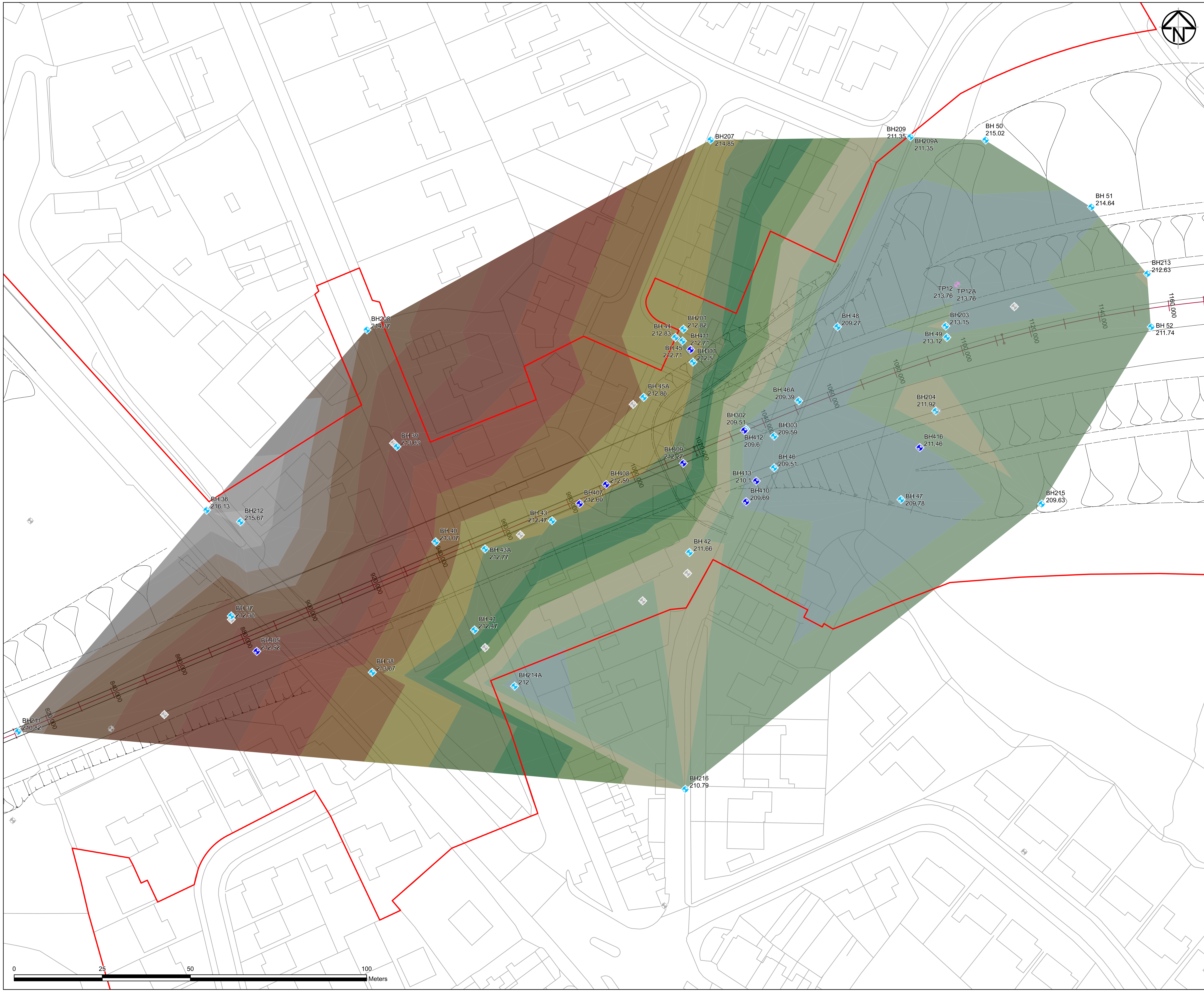
HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3061



LEGEND

- Historical Exploratory Borehole
- 2018 Exploratory Borehole
- Historical Exploratory Trial Pit
- 2018 Exploratory Trial Pit
- Borehole or Trial Pit not used in the Analysis
- Red Line Boundary

Depth to base of Glacial Till (mBGL)

- 22.5 - 24.0
- 21.0 - 22.5
- 19.5 - 21.0
- 18.0 - 19.5
- 16.5 - 18.0
- 15.0 - 16.5
- 13.5 - 15.0
- 12.0 - 13.5
- 10.5 - 12.0
- 9.0 - 10.5
- 7.5 - 9.0
- 6.0 - 7.5
- 4.5 - 6.0
- 3.0 - 4.5
- 1.5 - 3.0
- 0.0 - 1.5

NOTES

1. All levels are in metres relative to Ordnance Datum Newlyn.
2. All drawings are to be printed in colour.
3. All structures and culverts shown are indicative.
4. Exploratory hole locations have been surveyed in by third party ground investigation contractors and are assumed to be accurate.
5. Individual geological units have been interpreted from information provided on exploratory hole details in the 2018 Arcadis Trans-Pennine ground investigation report.
6. Borehole labels denotes borehole ID and surveyed ground level of borehole

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P01	S2	02 OCT 18	First issue	J.M.	J.C.	D.S.

Client

highways england

Designer

ARCADIS Design & Consultancy for natural and built assets

Registered office: Arcadis House 34 York Way London N1 9AB

Coordinating office: 5th Floor, 401 Faraday Street Birchwood Warrington WA3 6GA

Project

TRANS-PENNINE UPGRADE

Drawing Title

MOTTRAM UNDERPASS GLACIAL TILL THICKNESS (mBGL)

Status: S2 - FOR INFORMATION

Revision: P01

Scale: 1:500

Date: 02/10/2018

Drawn By / Checked By / Approved By / PINS No.: [redacted]

Original Size: A1

Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)

HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3055

LEGEND

- Historical Exploratory Borehole
- 2018 Exploratory Borehole
- Historical Exploratory Trial Pit
- 2018 Exploratory Trial Pit
- Red Line Boundary
- Badger Sett
- Hydrophilic vegetation
- Leaning Tree
- Ponded Water
- Gradual Concave Change in Slope
- Gradual Convex Change in Slope
- Gully
- Inferred Fault
- Marked Concave Change in Slope
- Possible Backscarp
- Possible Fault
- Surface Water Seepage

Existing Slope (degrees)

- 8-10
- 10-15
- 15-25
- 25-35
- > 35
- 0-8 Excluded

NOTES

1. All levels are in metres relative to Ordnance Datum Newlyn.
2. All drawings are to be printed in colour.
3. All structures and culverts shown are indicative.
4. Exploratory hole locations have been surveyed in by third party ground investigation contractors and are assumed to be accurate.
5. Individual geological units have been interpreted from information provided on exploratory hole details in the 2018 Arcadis trans pennine ground investigation report.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
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Client

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Designer

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Warrington
WA3 6GA

Project

TRANS-PENNINE UPGRADE

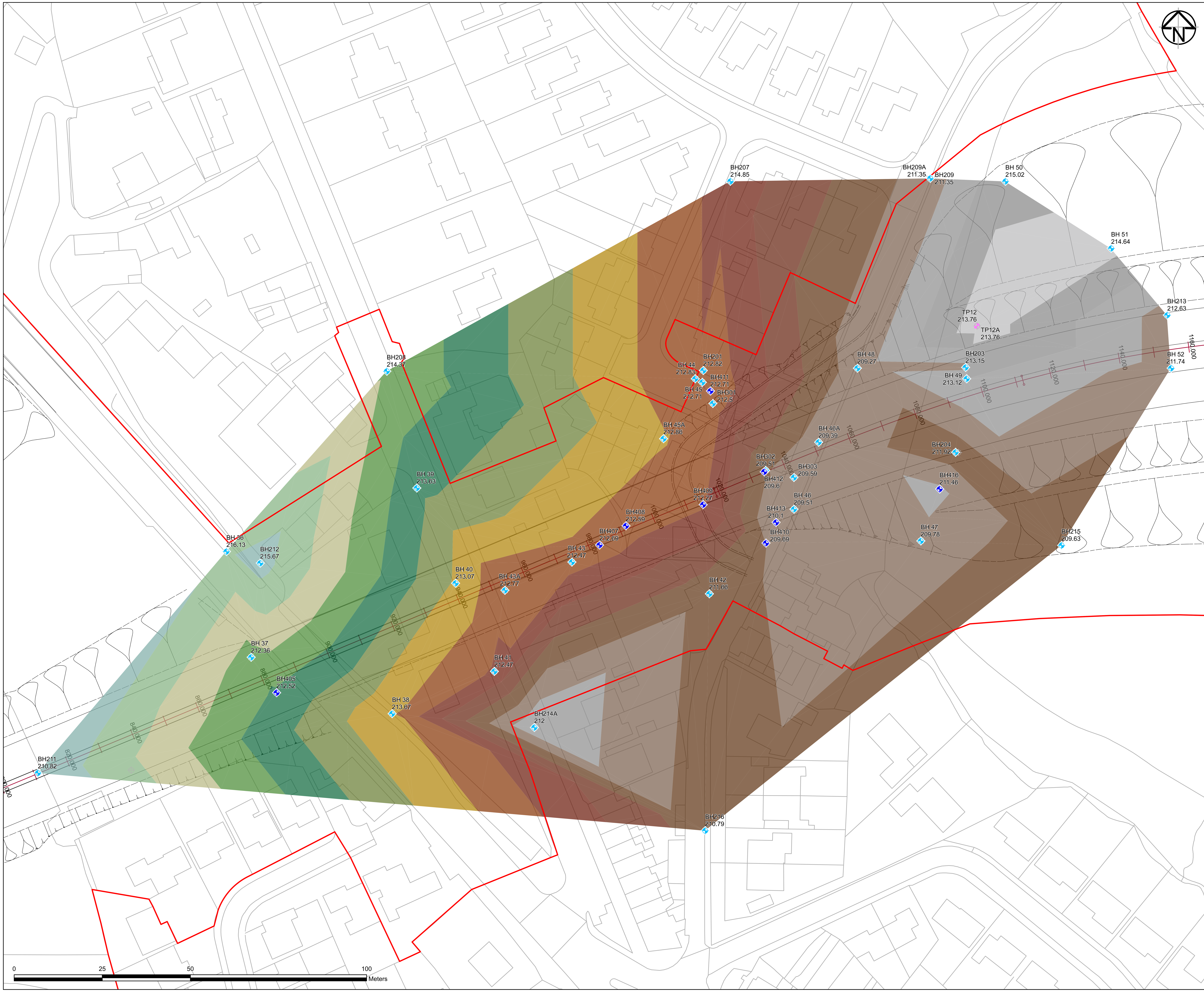
Drawing Title

MOTTRAM MOOR ROUNDABOUT GEOMORPHOLOGICAL PLAN

Status	S2 - FOR INFORMATION	Revision	P02
Scale	1:500	Date	25/01/2019
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No.	TR010034	Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number

HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3056



LEGEND

- Historical Exploratory Borehole
- 2018 Exploratory Borehole
- Historical Exploratory Trial Pit
- 2018 Exploratory Trial Pit
- Borehole or Trial Pit not used in the Analysis
- Red Line Boundary

Thickness of Glacial Till (mAOD)

- 213.0 - 214.5
- 211.5 - 213.0
- 210.0 - 211.5
- 208.5 - 210.0
- 207.0 - 208.5
- 205.5 - 207.0
- 204.0 - 205.5
- 202.5 - 204.0
- 201.0 - 202.5
- 199.5 - 201.0
- 198.0 - 199.5
- 196.5 - 198.0
- 195.0 - 196.5
- 193.5 - 195.0
- 192.0 - 193.5

NOTES

1. All levels are in metres relative to Ordnance Datum Newlyn.
2. All drawings are to be printed in colour.
3. All structures and culverts shown are indicative.
4. Exploratory hole locations have been surveyed in by third party ground investigation contractors and are assumed to be accurate.
5. Individual geological units have been interpreted from information provided on exploratory hole details in the 2018 Arcadis trans pennine ground investigation report.
6. Borehole labels denotes borehole ID and surveyed ground level of borehole

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P01	S2	02 OCT 18	First issue	J.M.	J.C.	D.S.

Client

highways england

Designer

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Registered office:
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Coordinating office:
5th Floor, 401 Faraday Street
Birchwood
Warrington
WA3 6GA

Project

TRANS-PENNINE UPGRADE

Drawing Title

MOTTRAM UNDERPASS GLACIAL TILL BASE (mAOD)

Status	S2 - FOR INFORMATION	Revision	P01
Scale	1:500	Date	02/10/2018
Drawn By	[redacted]		
Checked By			
Approved By			
PINS No.	TR010034	Original Size	A1

Drawing number | HE PIN | Originator | Volume | Location | Type | Role | Number

HE551473-ARC-HGT-SZ_ZZ000-DR-CE-3066

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10 MATERIAL PROPERTIES RESULTS

10.1 Western Embankments data plots

Figure 10.1.1: Western Embankments Made Ground Moisture Content vs Depth.

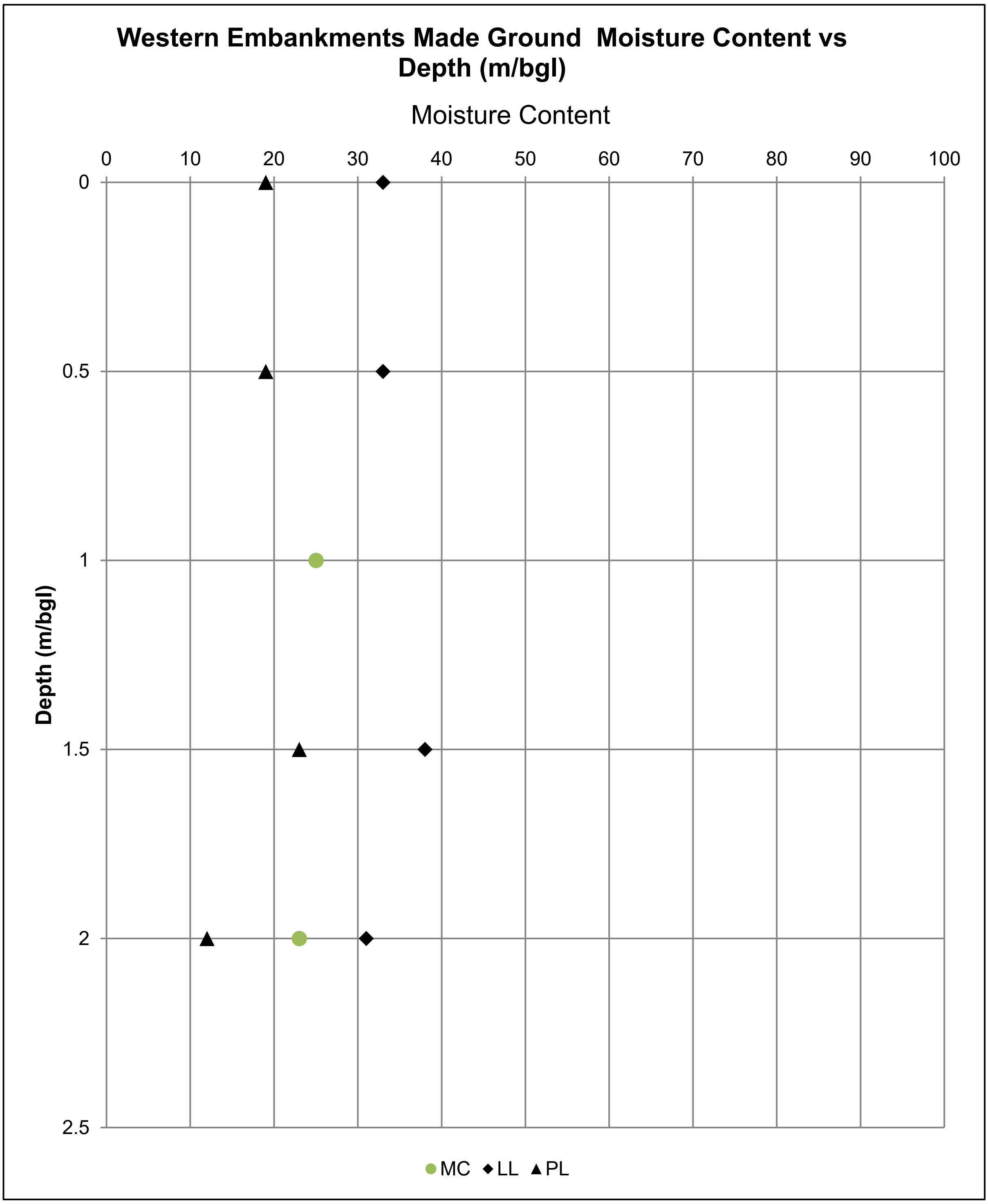


Figure 10.1.2: Western Embankments Made Ground Plasticity Index vs Liquid Limit.

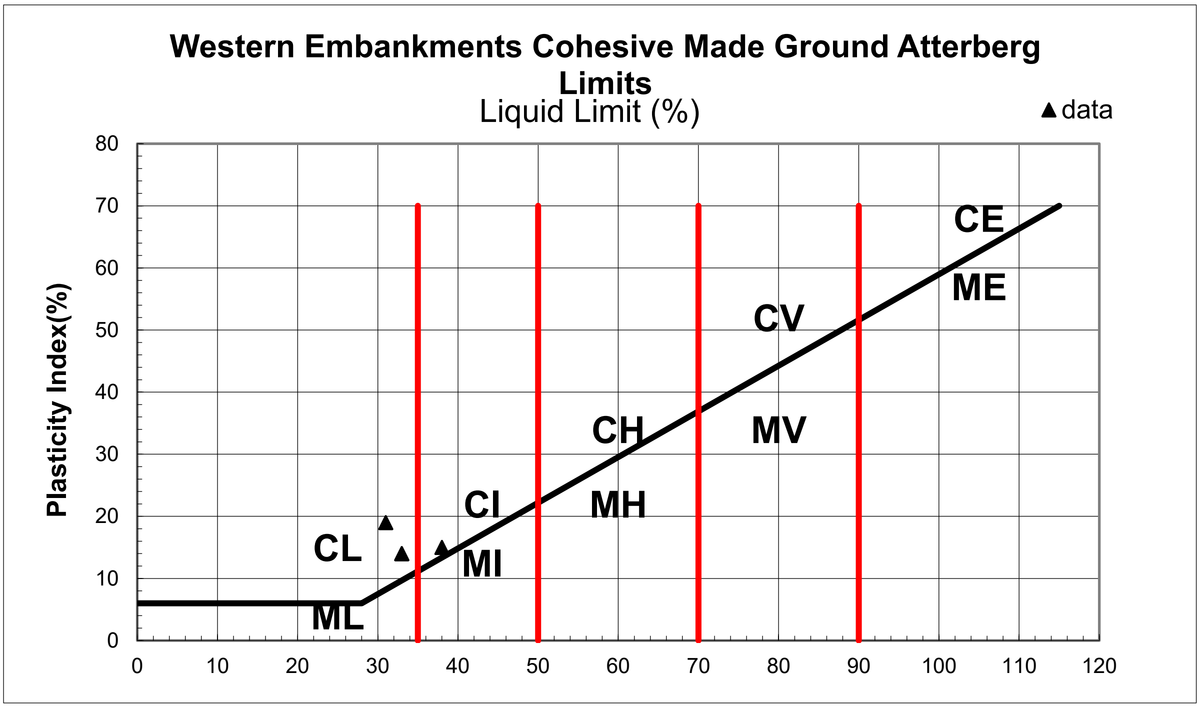


Figure 10.1.3: Western Embankments Made Ground SPT-N_{60}.

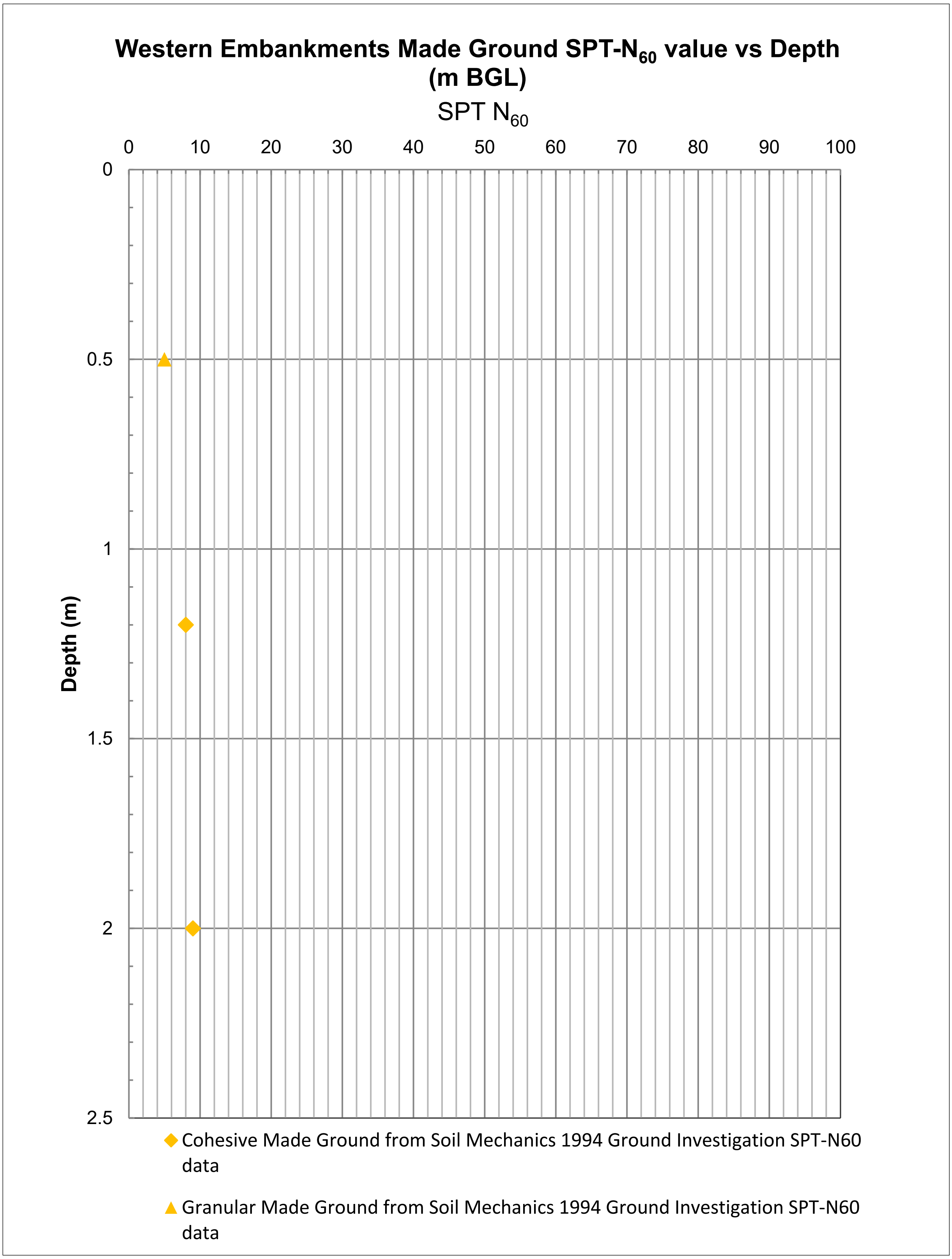


Figure 10.1.4: Western Embankments Cohesive Made Ground Undrained Shear Strength.

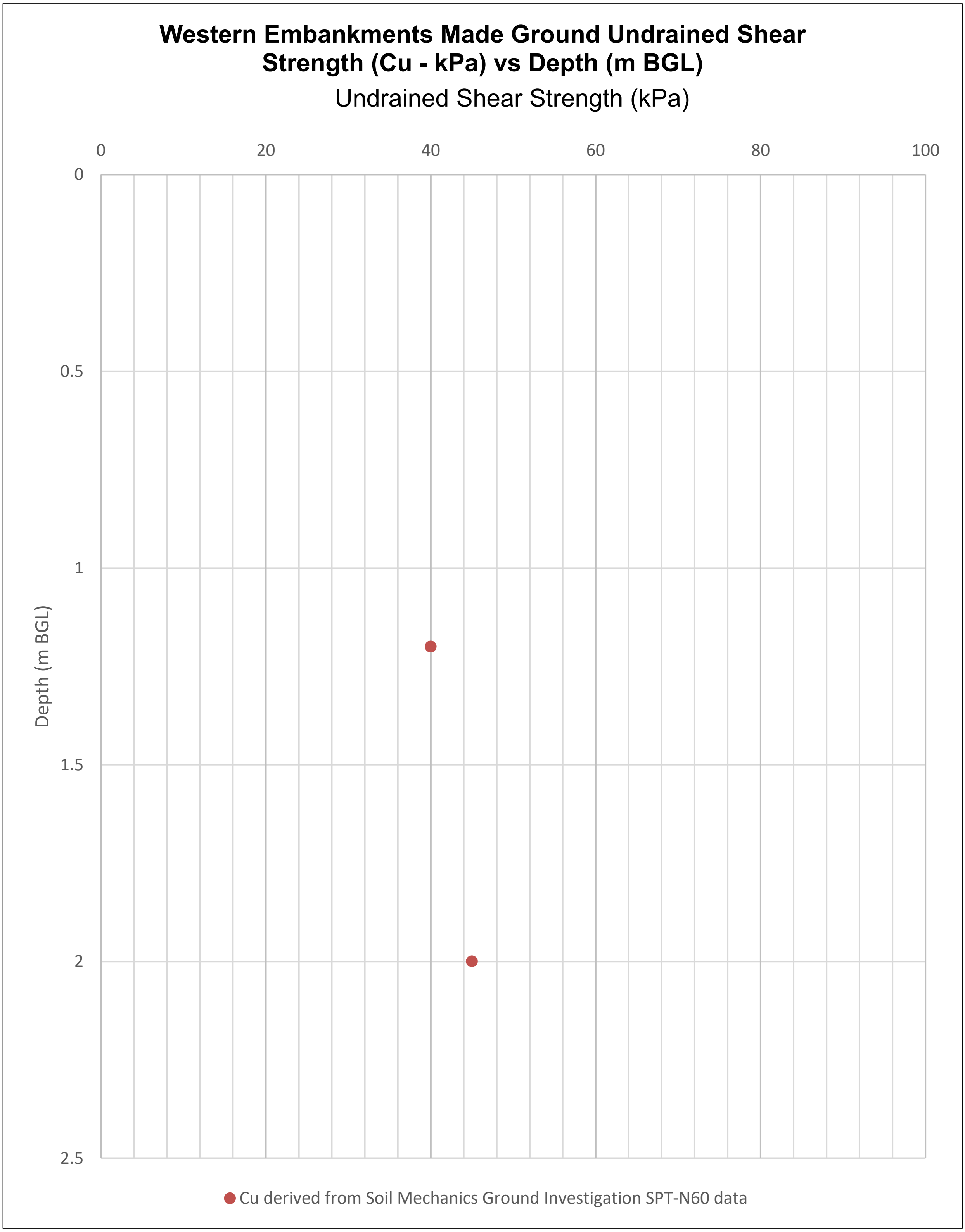


Figure 10.1.5: Western Embankments Cohesive Made Ground Coefficient of Volume Compressibility.

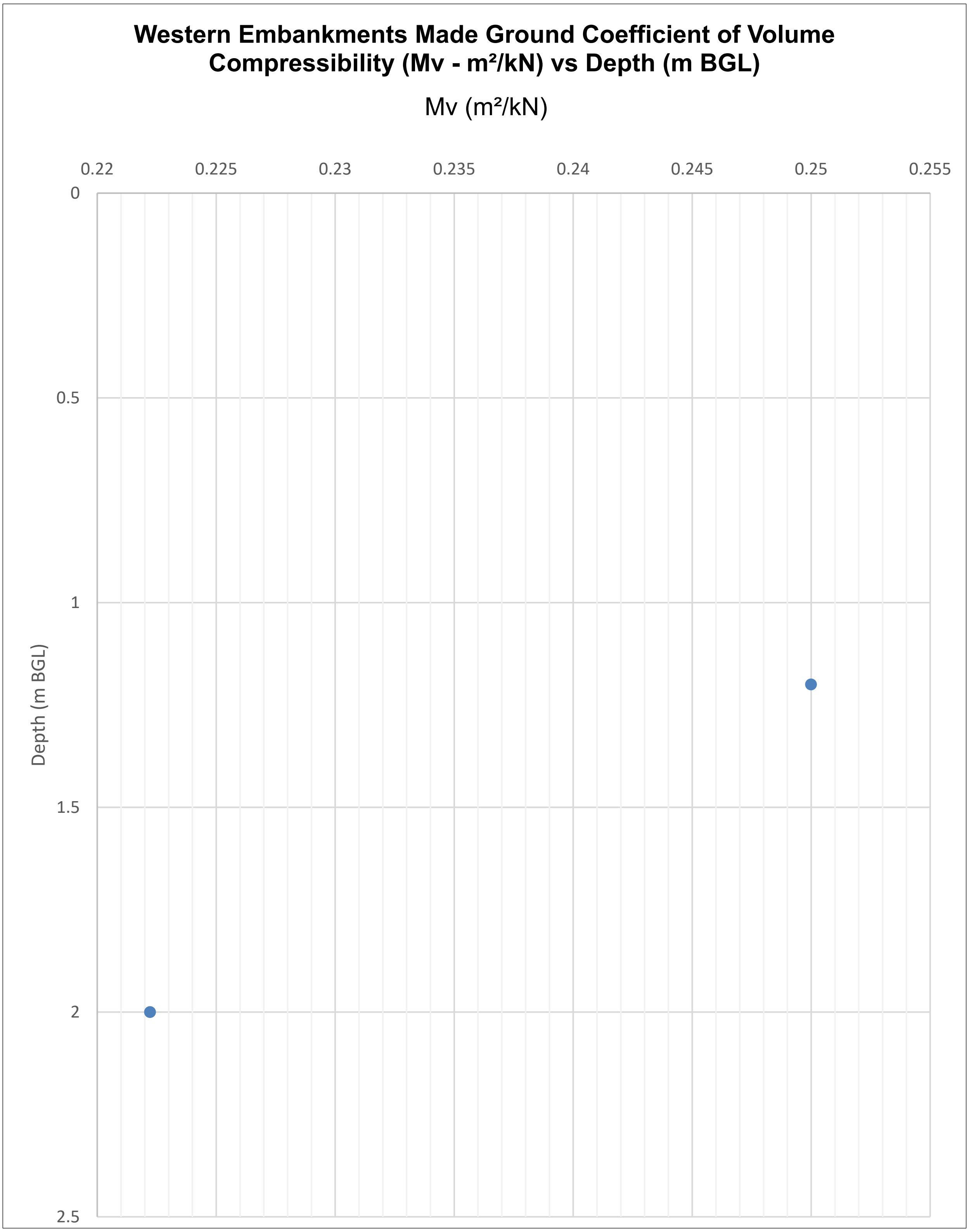


Figure 10.1.6: Western Embankments Cohesive Made Ground Drained and Undrained Youngs Modulus.

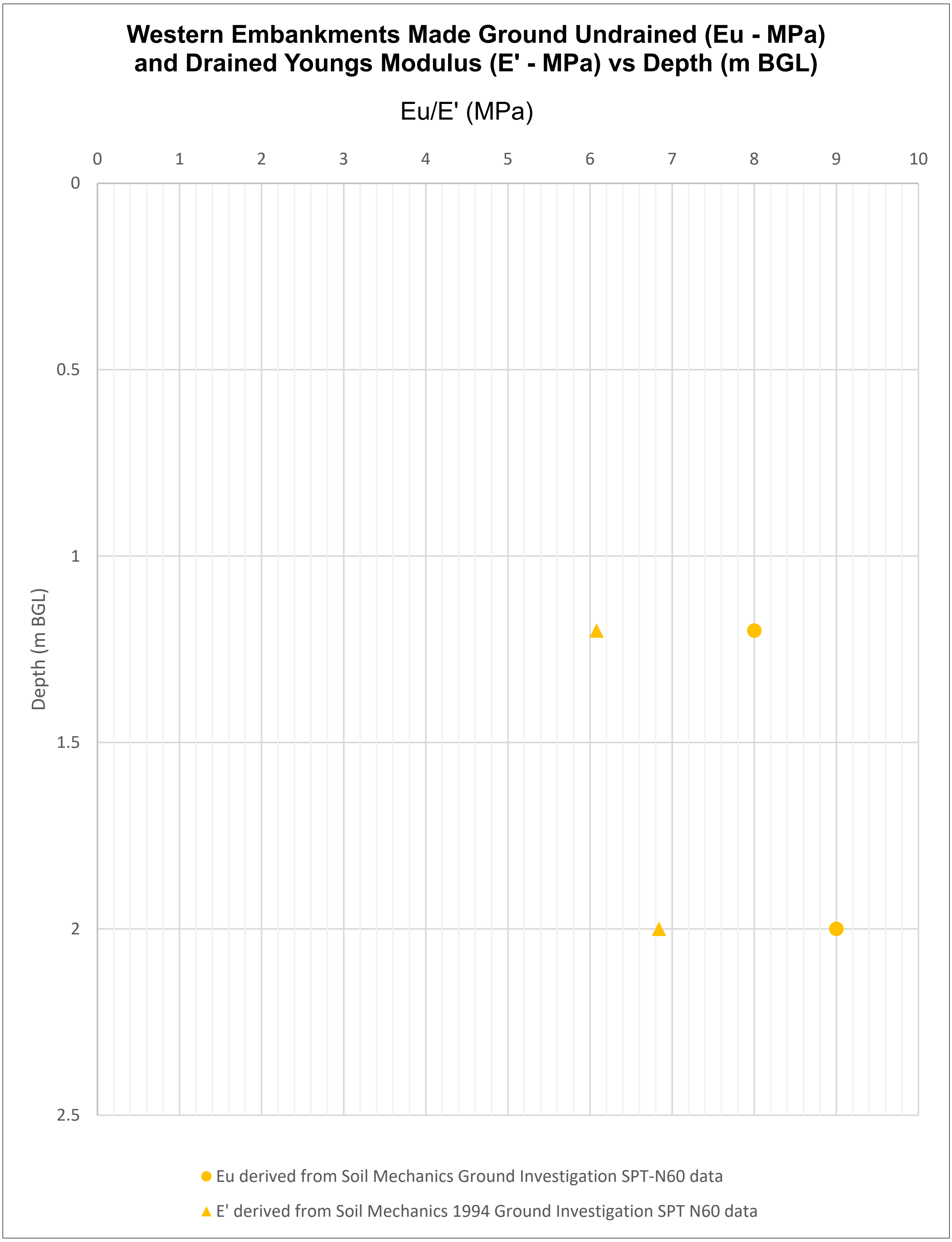


Figure 10.1.7: Western Embankments Peat Moisture Content.

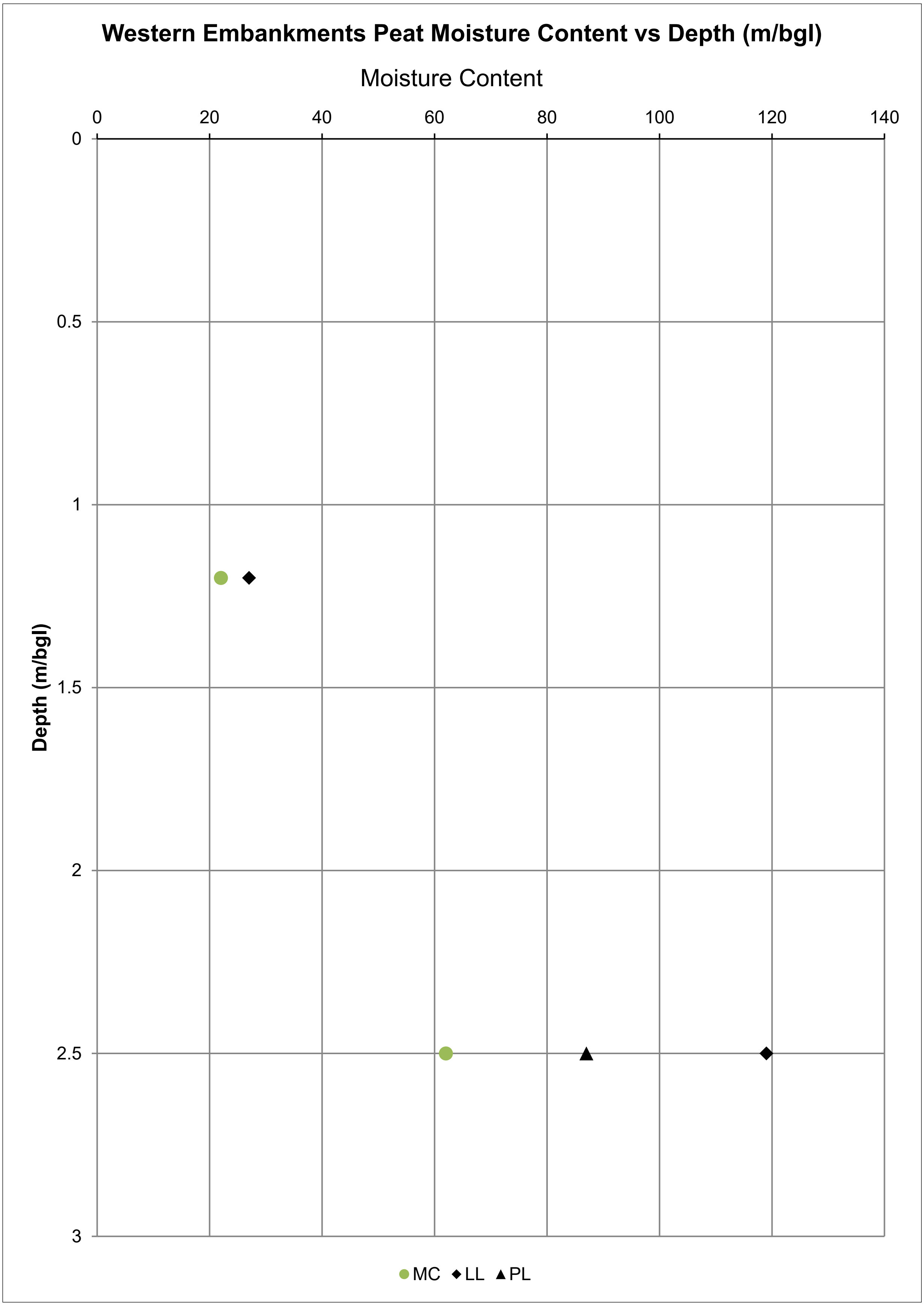


Figure 10.1.8: Western Embankments Granular Alluvium Moisture Content.

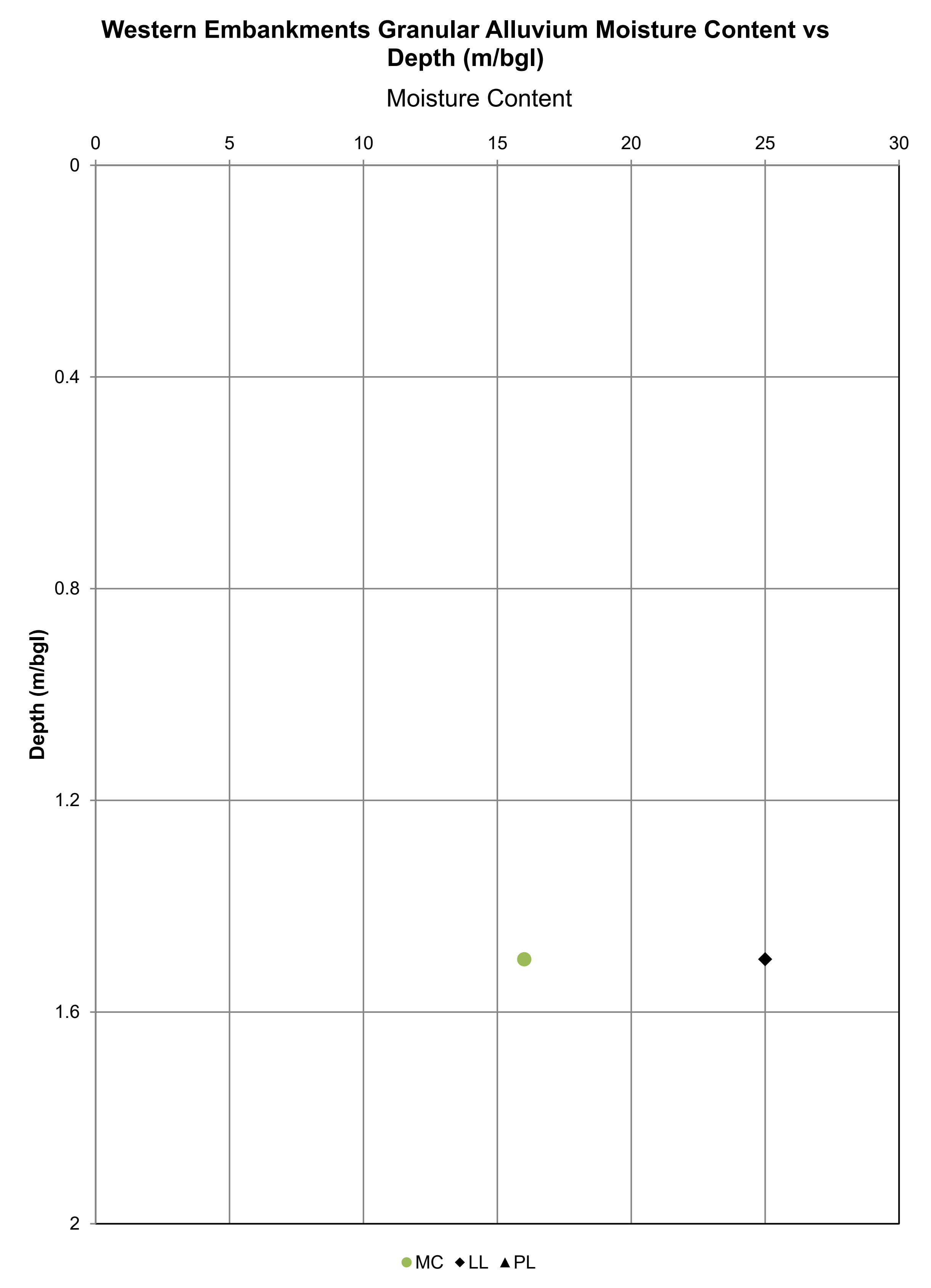


Figure 10.1.9: Western Embankments Cohesive Alluvium Moisture Content.

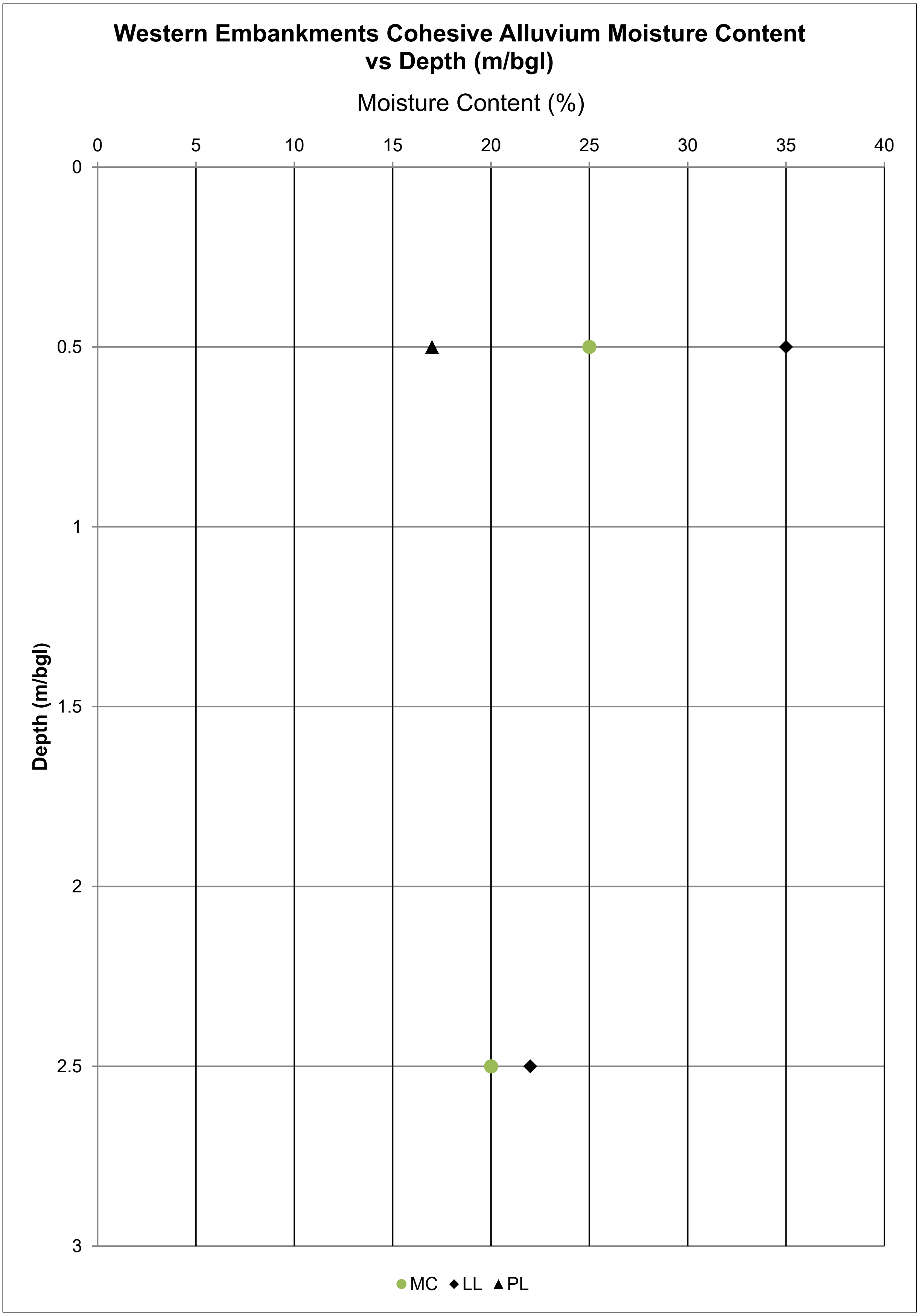


Figure 10.1.10: Western Embankments Cohesive Alluvium Plasticity Index vs Liquid Limit.

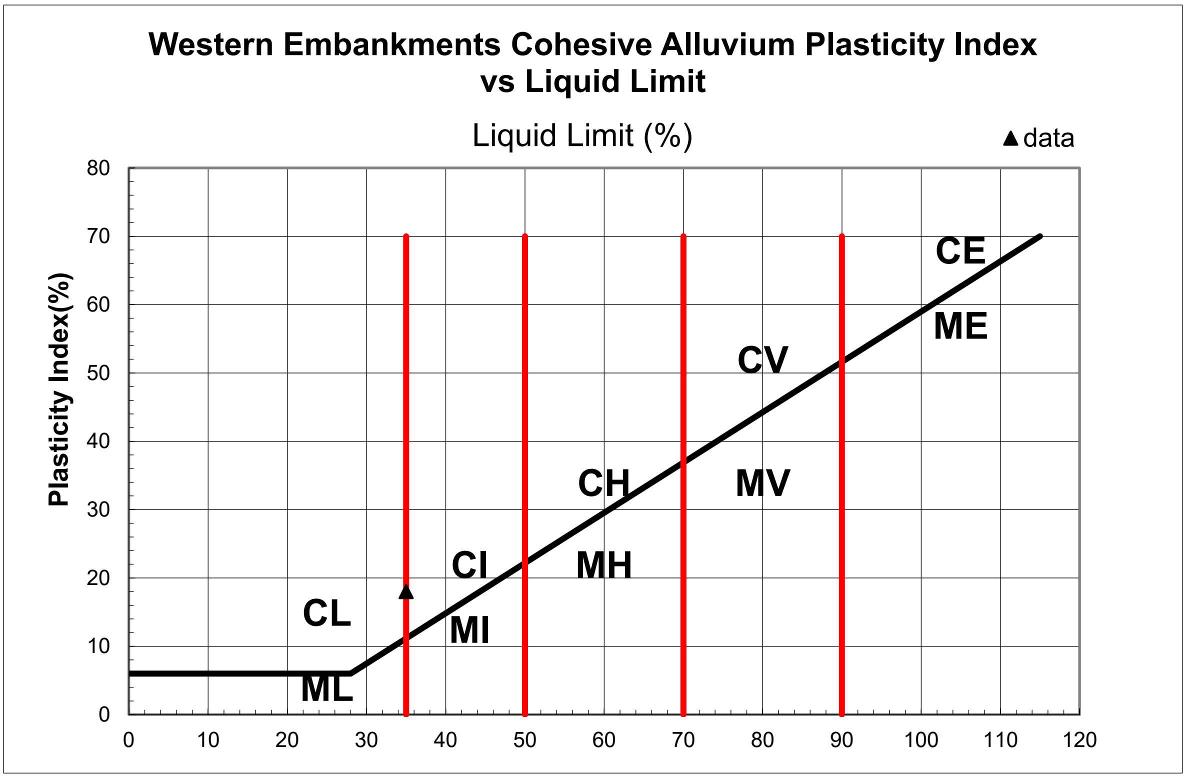


Figure 10.1.11: Western Embankments Cohesive Glacial Till Moisture Content.

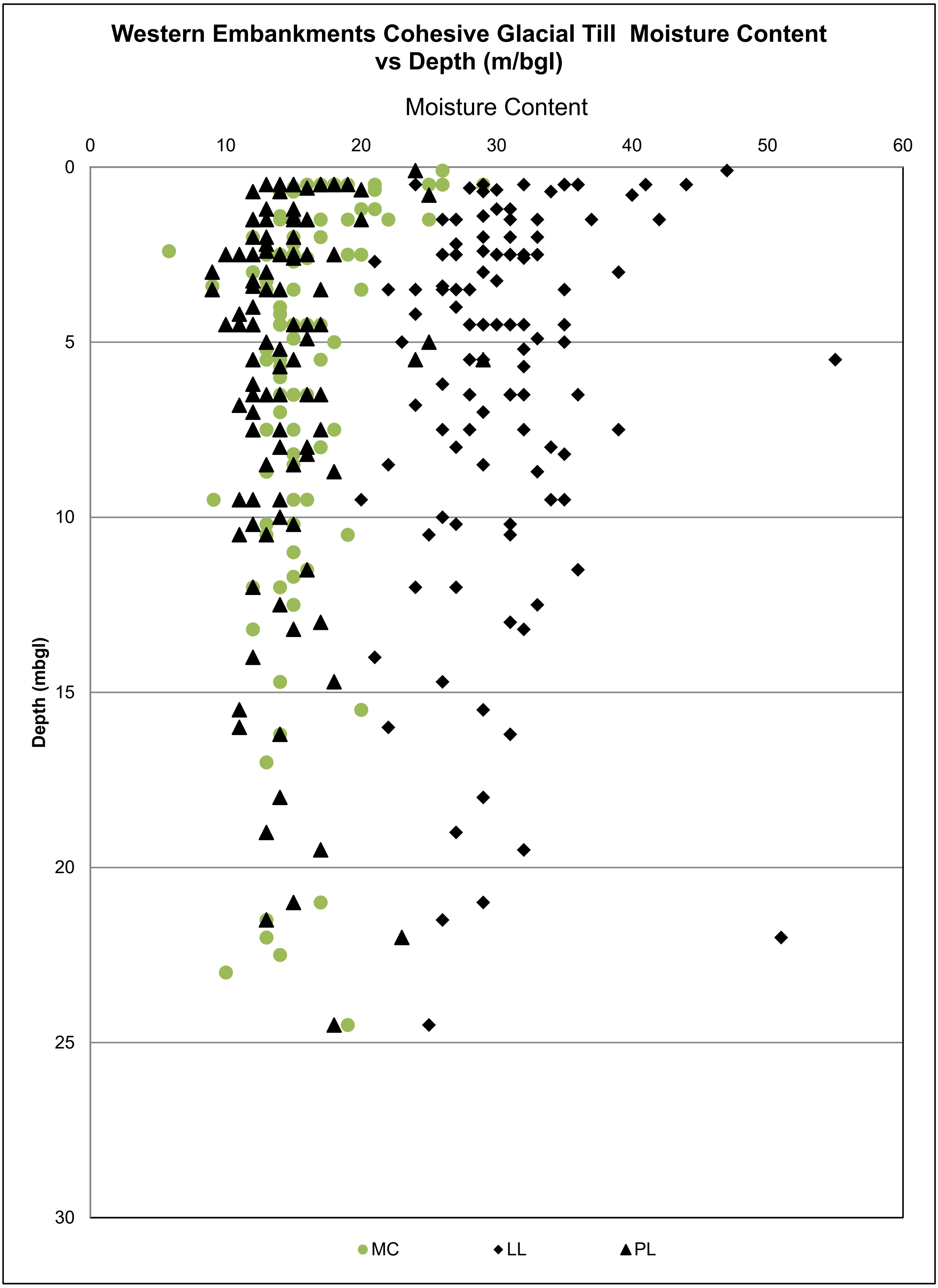


Figure 10.1.12: Western Embankments Cohesive Glacial Till Plasticity Index vs Liquid Limit.

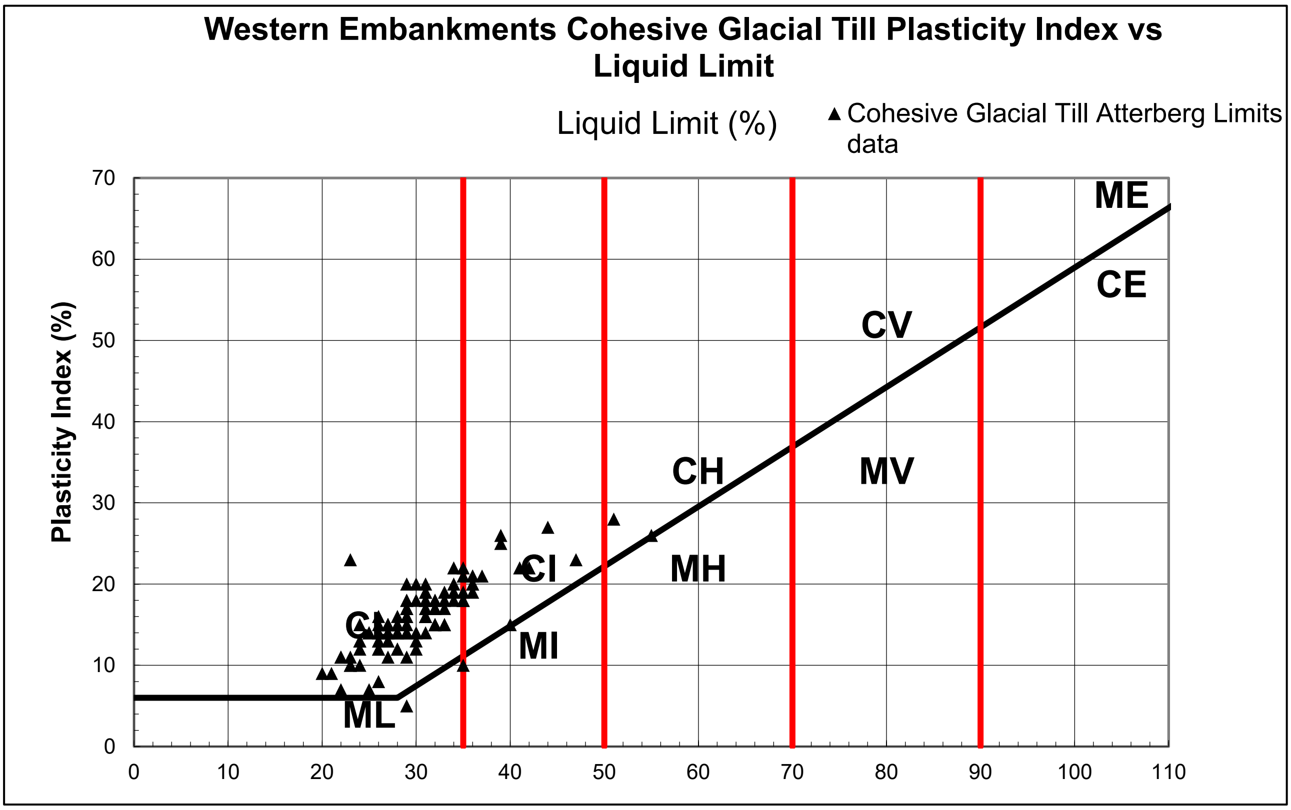


Figure 10.1.13: Western Embankments Cohesive Glacial Till Internal Friction Angle.

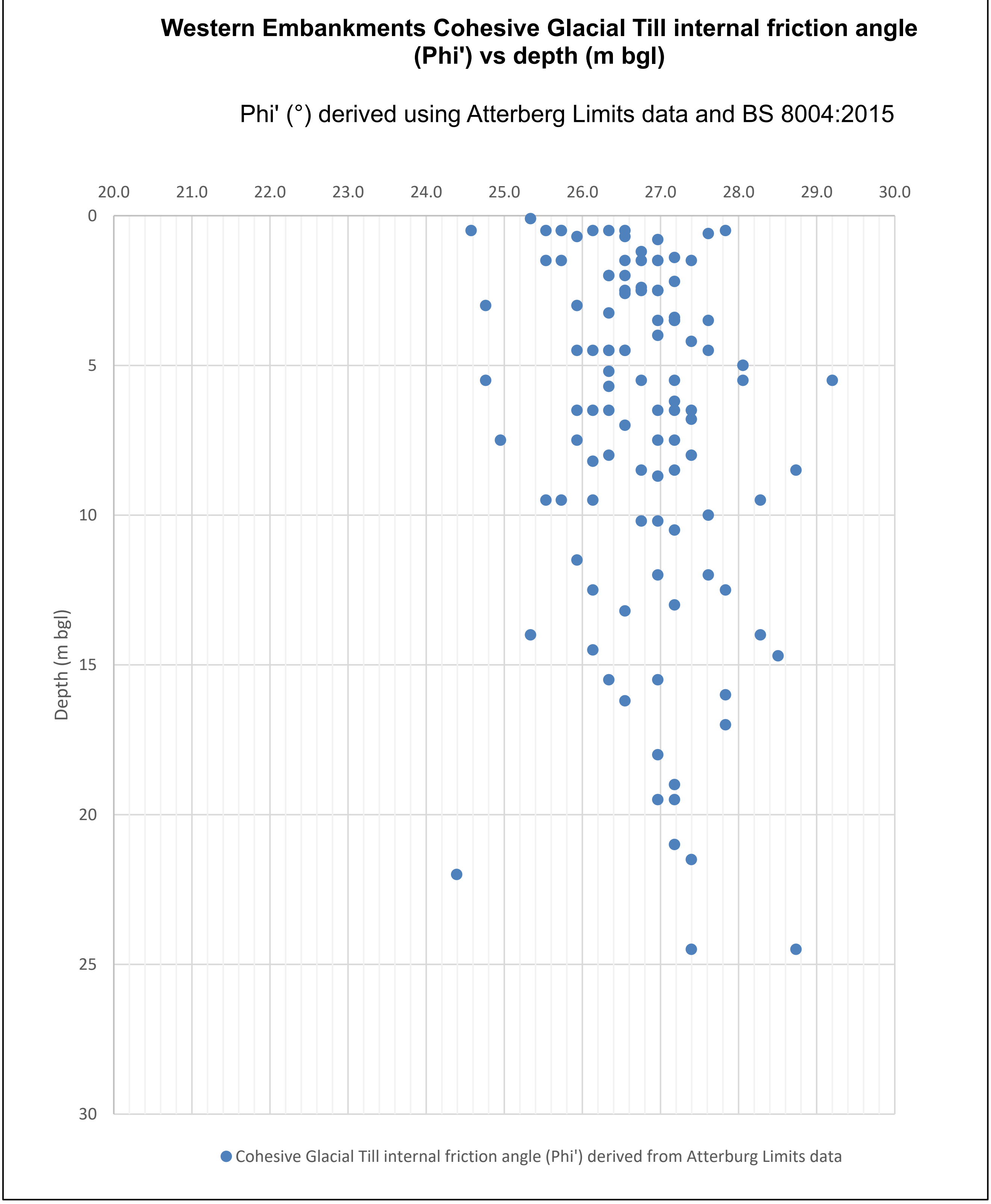


Figure 10.1.14: Western Embankments Cohesive Glacial Till Particle Size Distribution.

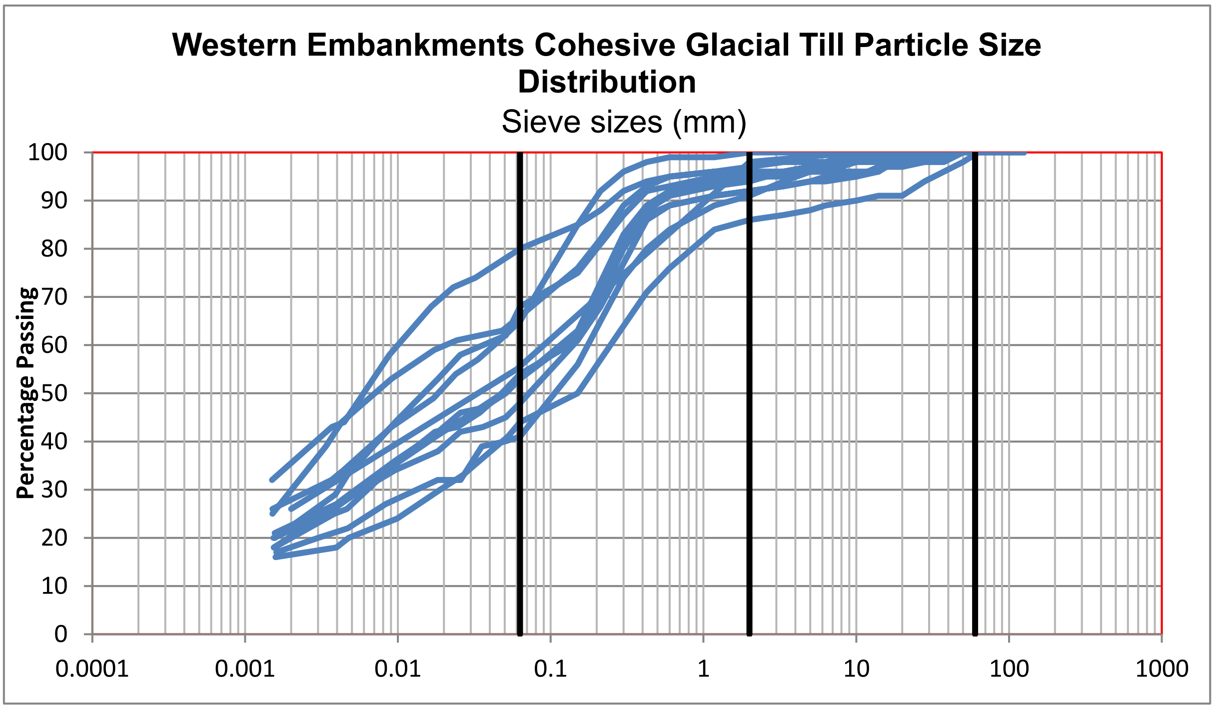


Figure 10.1.15: Western Embankments Cohesive Glacial Till SPT N_{60}.

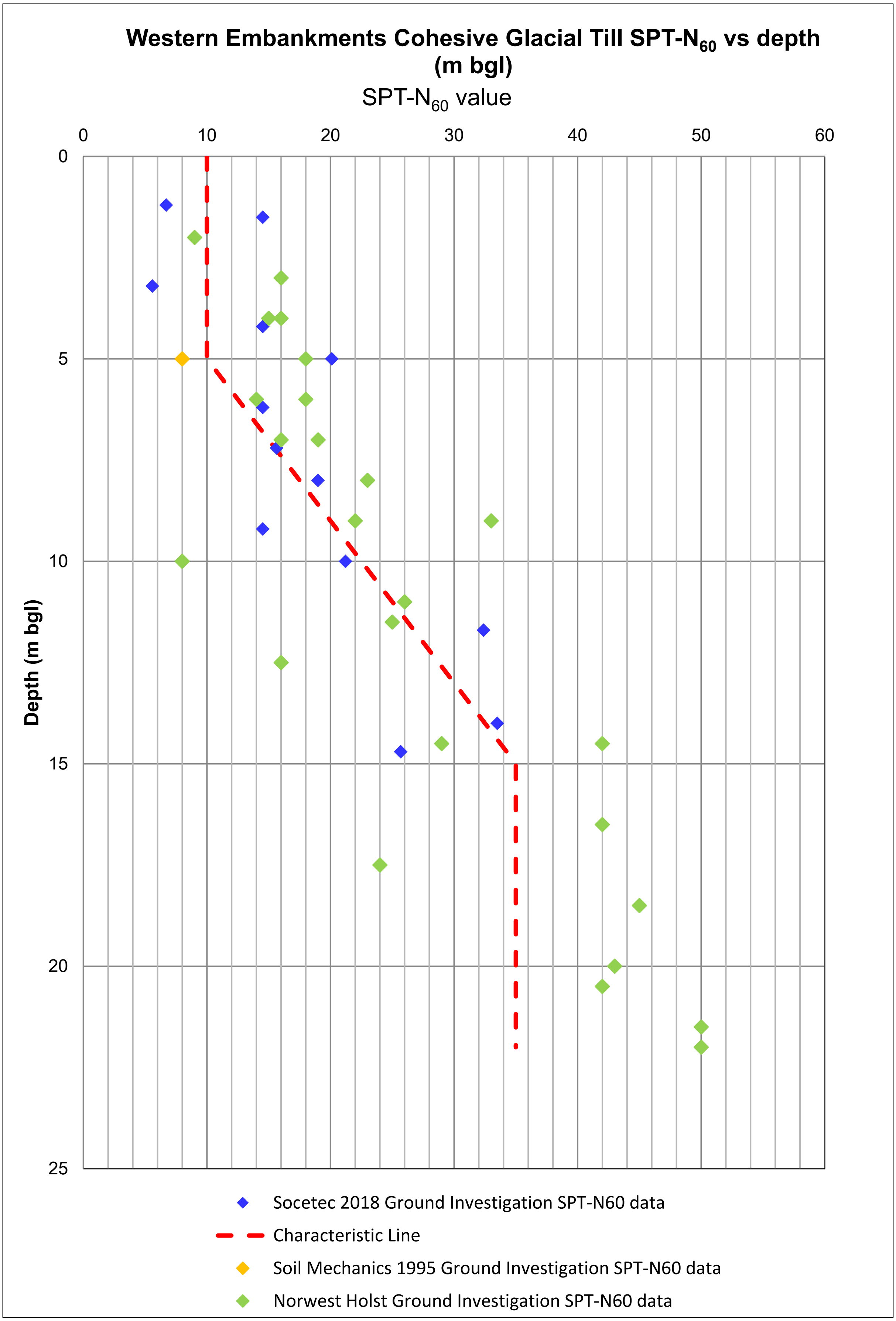


Figure 10.1.16: Western Embankments Cohesive Glacial Till Undrained Shear Strength.

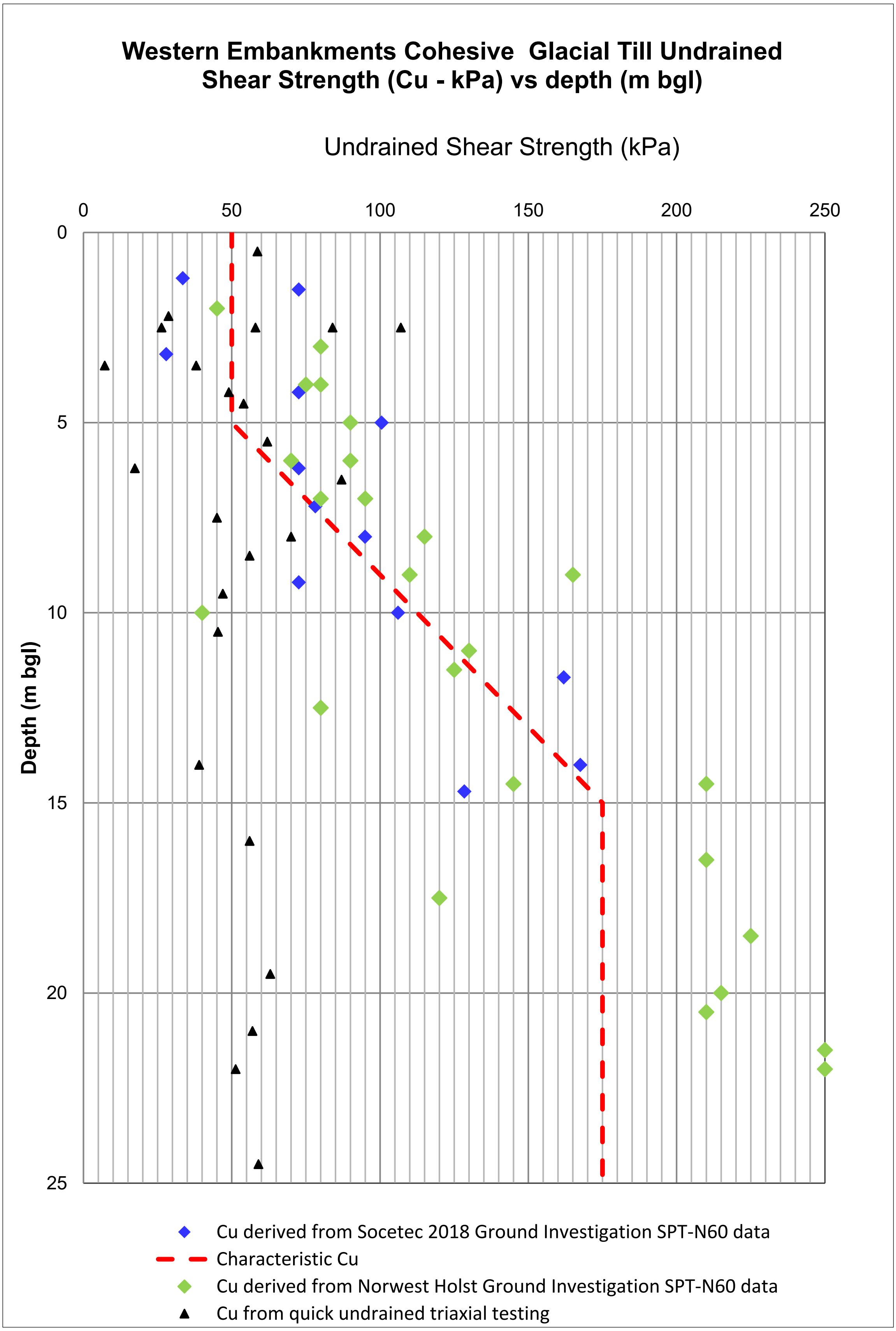


Figure 10.1.17: Western Embankments Cohesive Glacial Till Drained Youngs Modulus.

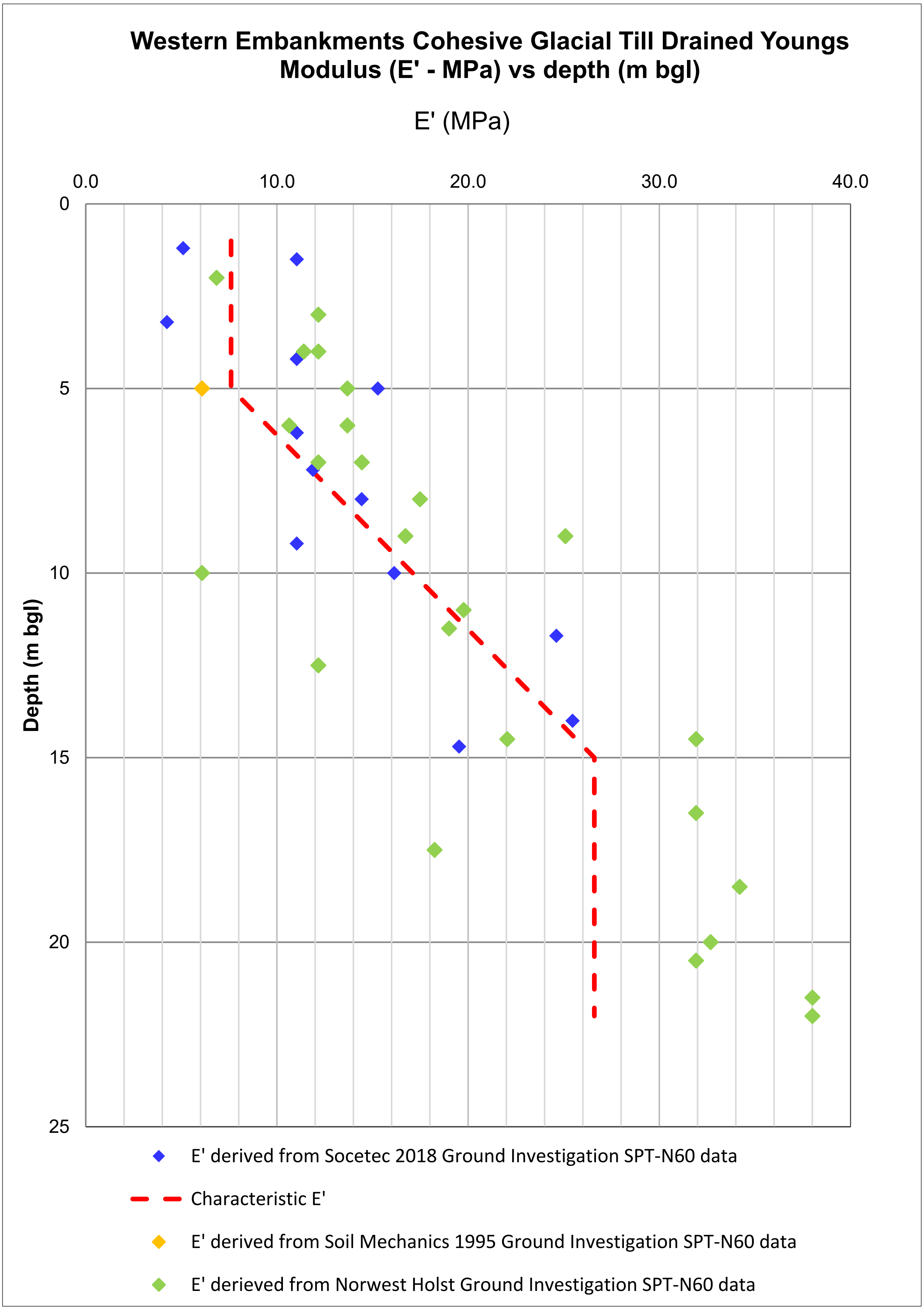


Figure 10.1.18: Western Embankments Cohesive Glacial Till Undrained Youngs Modulus.

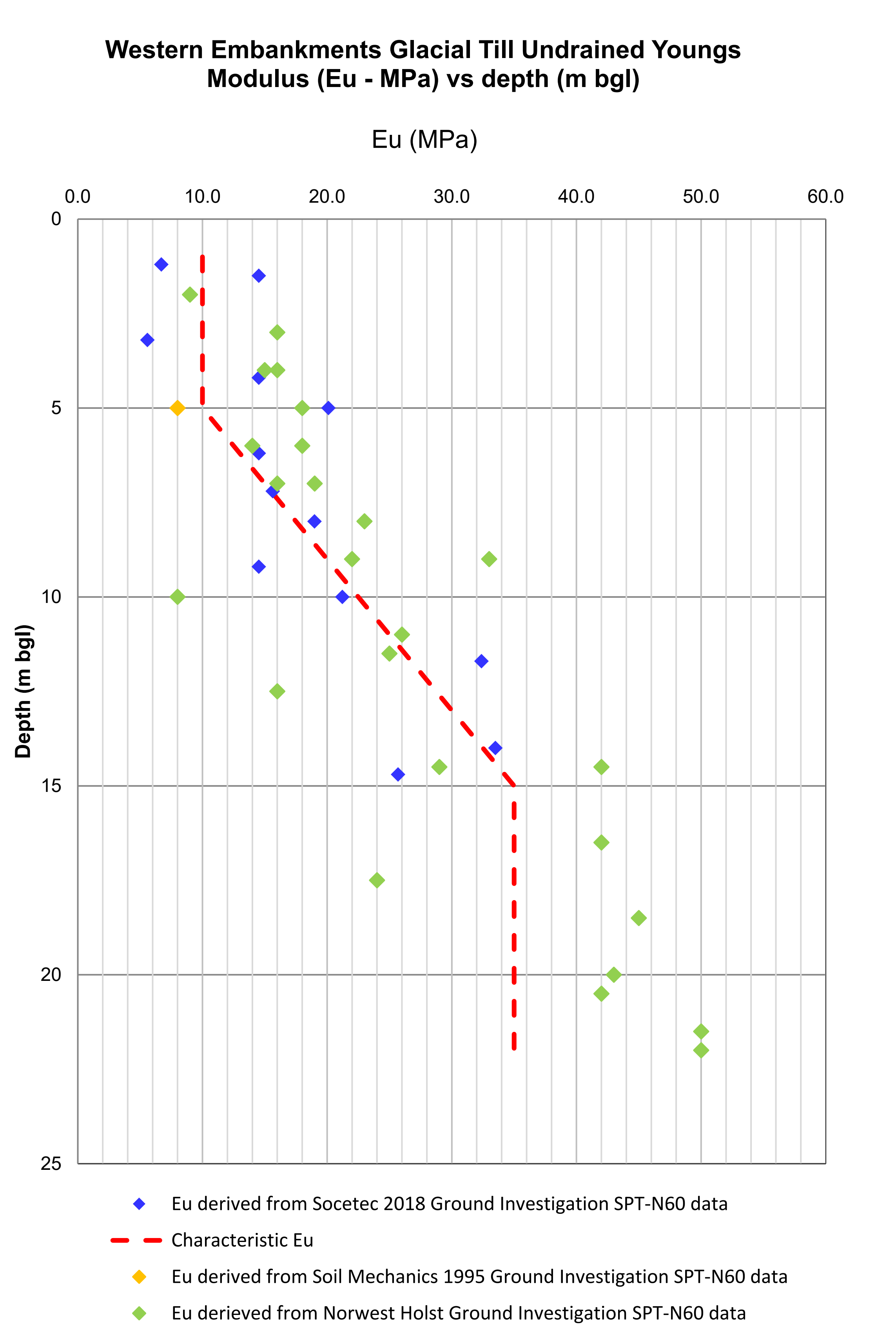


Figure 10.1.19: Western Embankments Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT).

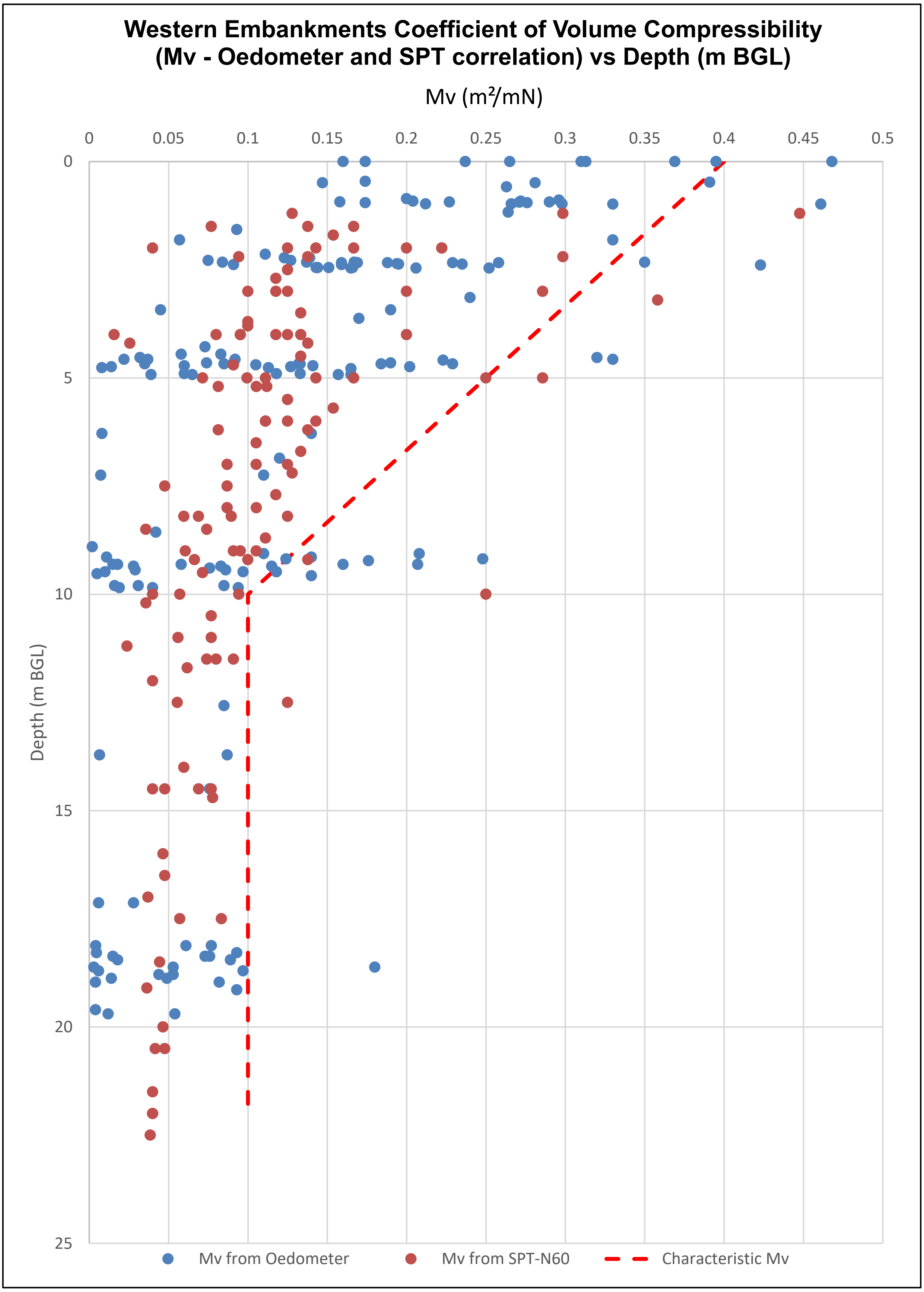


Figure 10.1.20: Western Embankments Cohesive Glacial Till Compaction Testing.

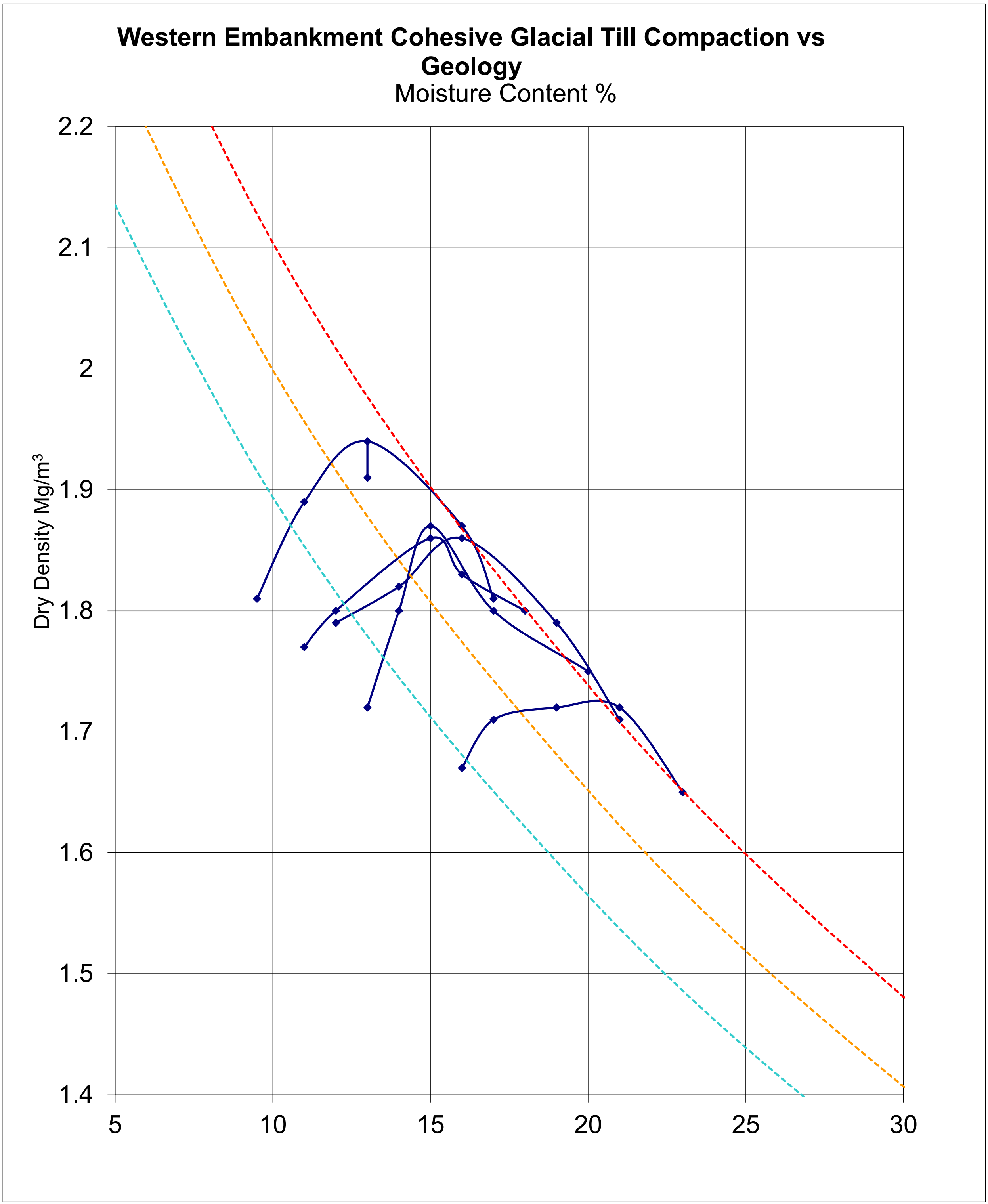


Figure 10.1.21: Western Embankments Granular Glacial Till SPT-N_{60}.

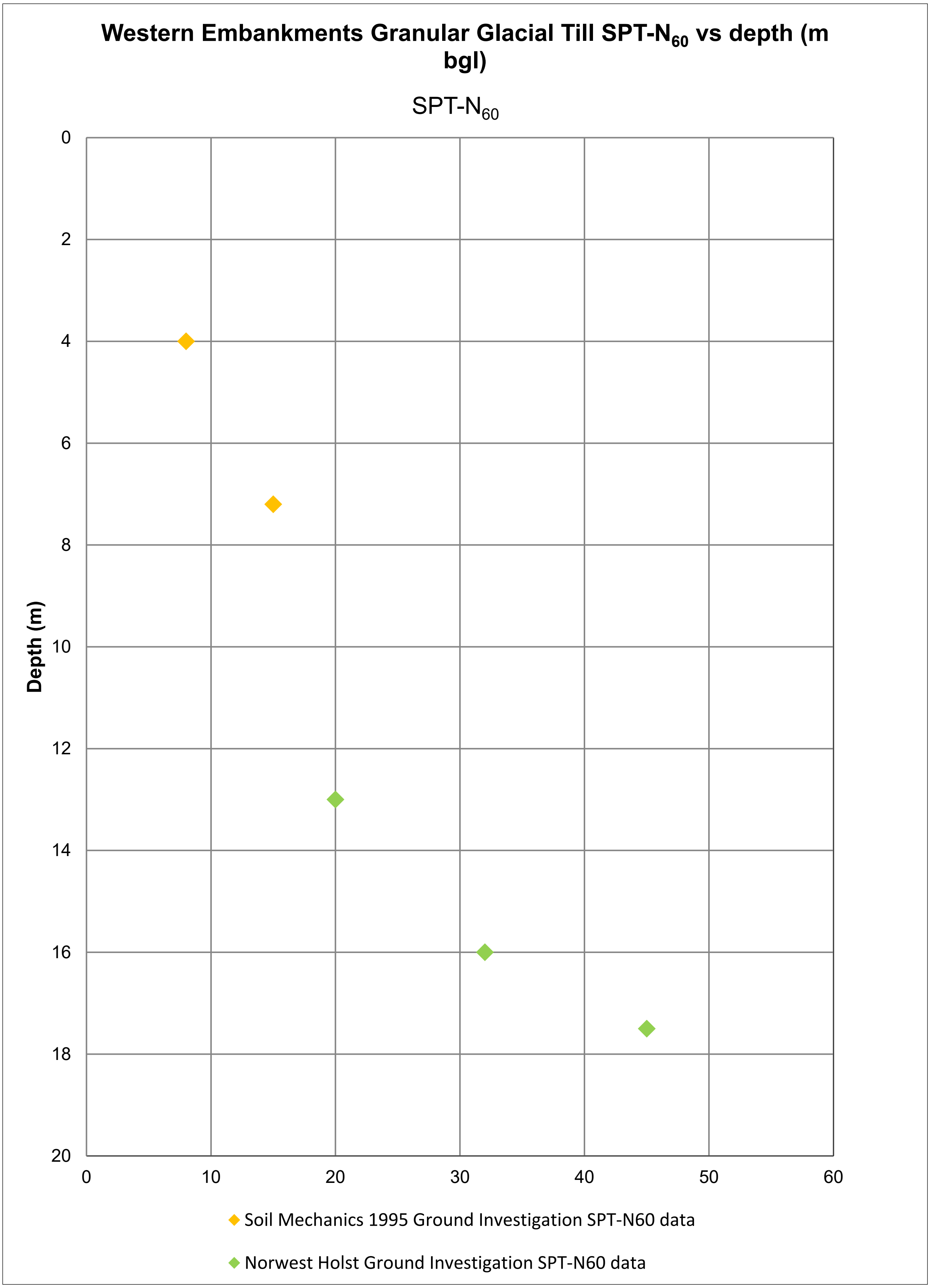


Figure 10.1.22: Western Embankments Granular Glacial Till Drained Friction Angle.

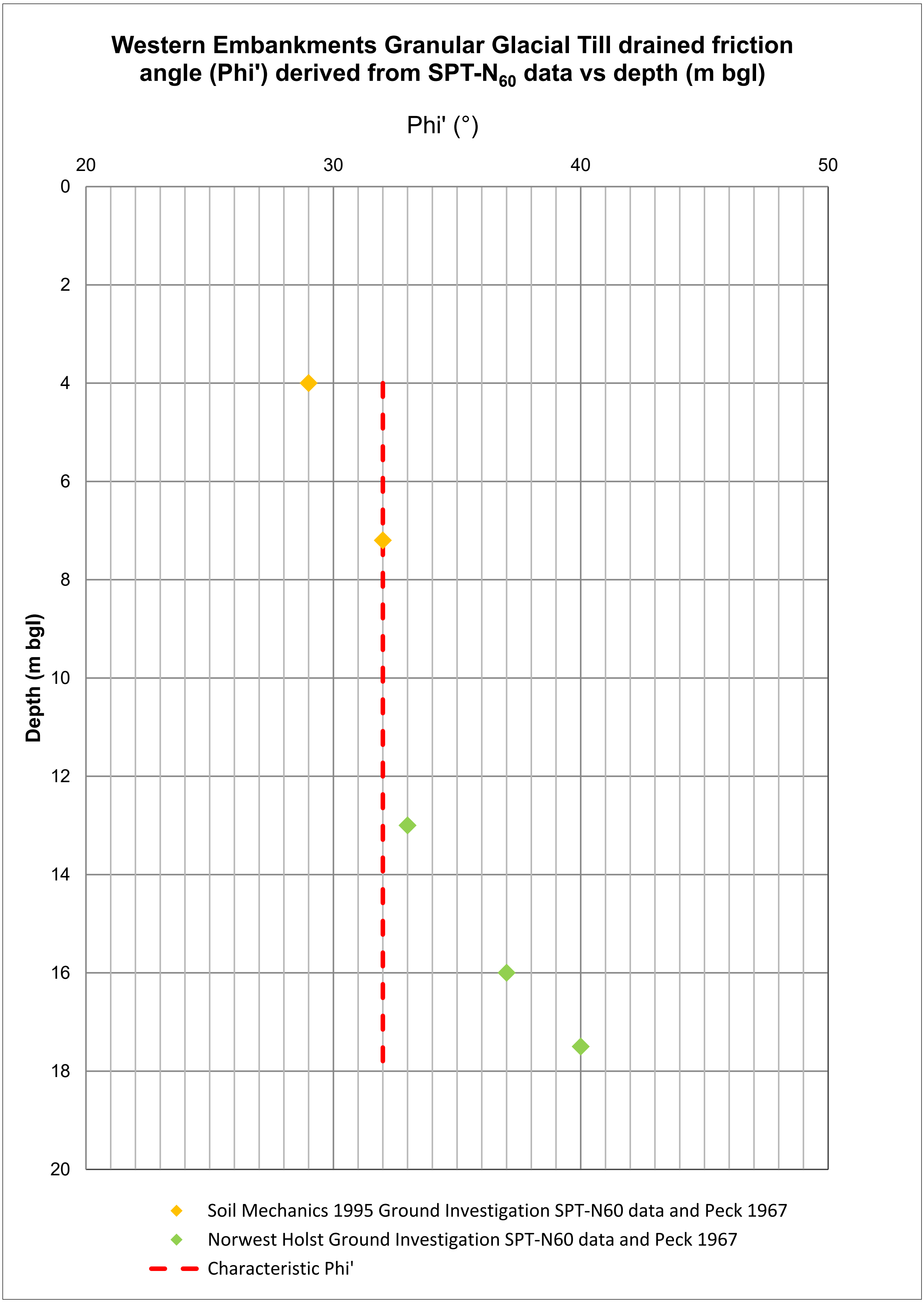


Figure 10.1.23: Western Embankments Granular Glacial Till Drained Youngs Modulus.

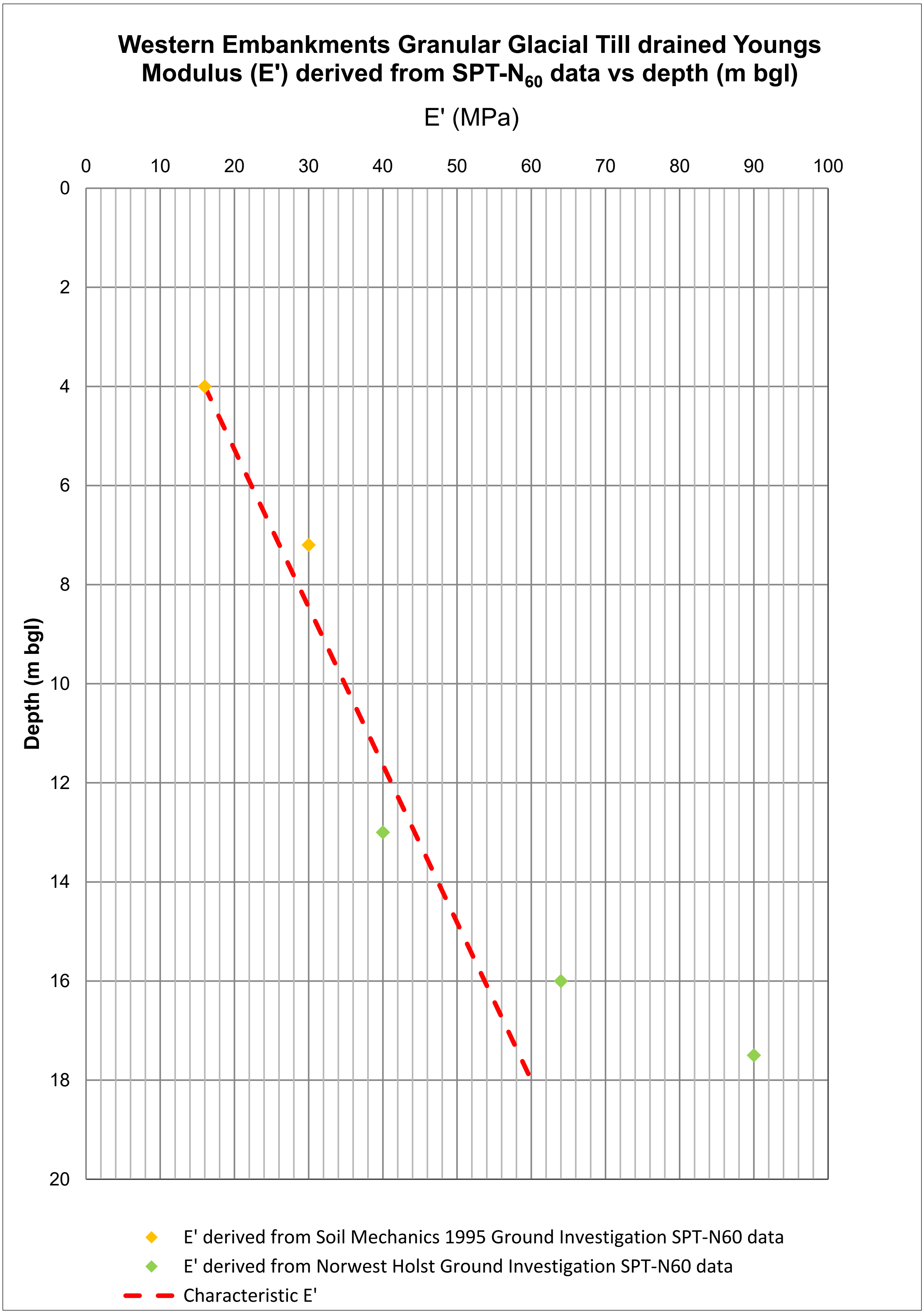


Figure 10.1.24: Western Embankments Laminated Glacial Till Moisture Content.

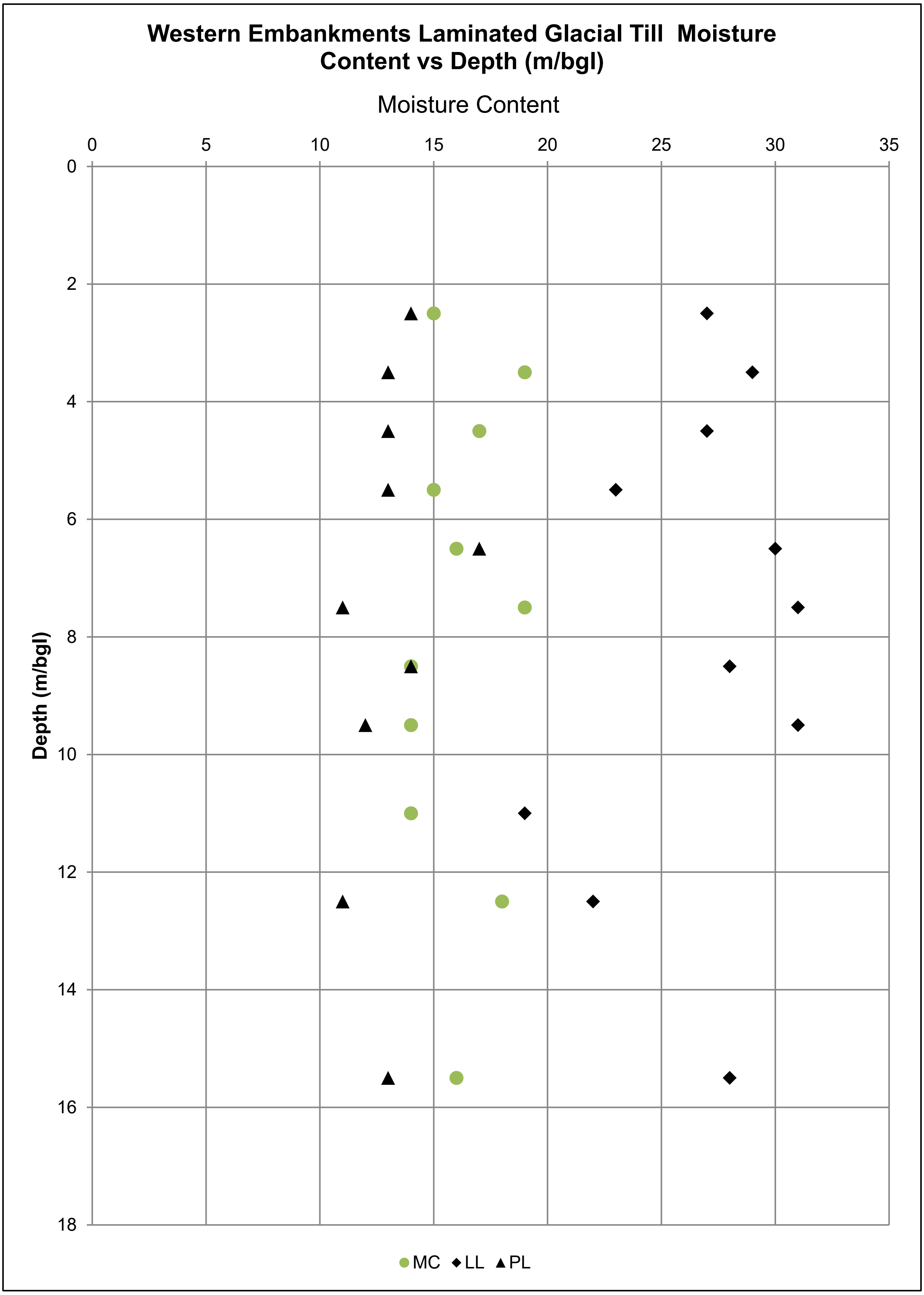


Figure 10.1.25: Western Embankments Laminated Glacial Till Plasticity Index vs Liquid Limit.

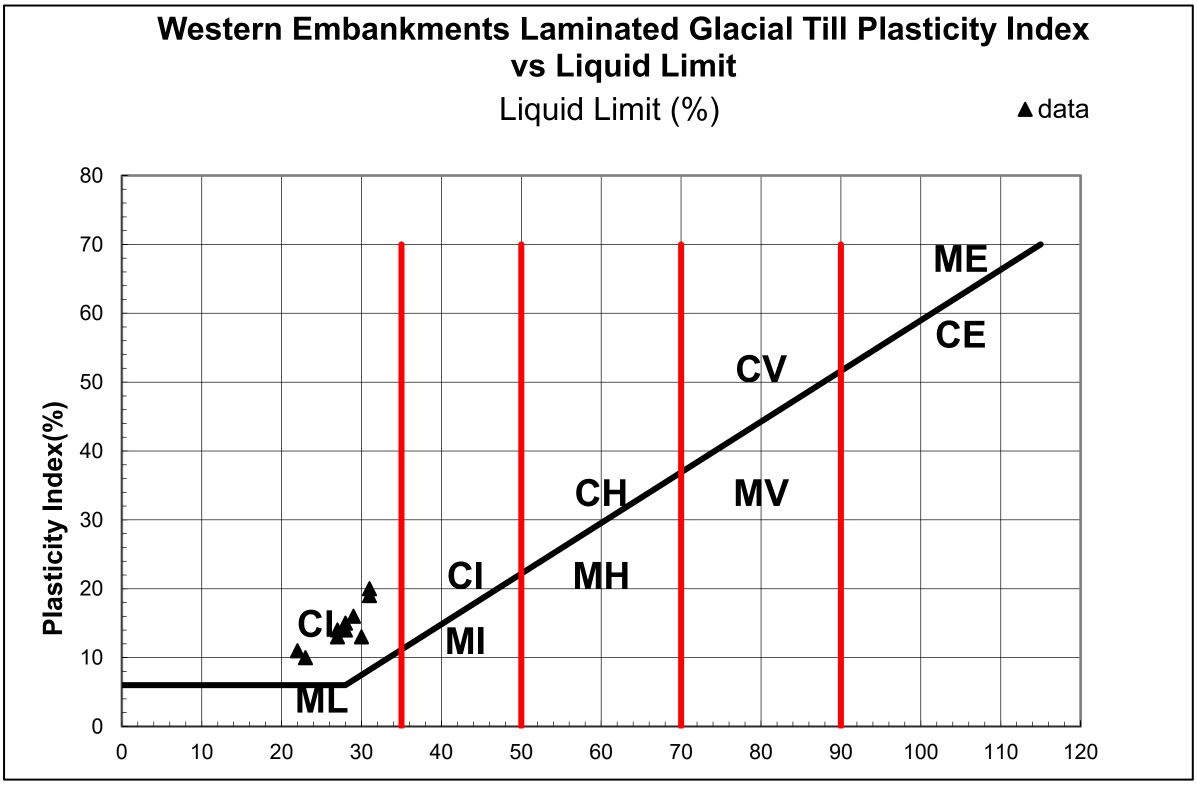


Figure 10.1.26: Western Embankments Laminated Glacial Till Internal Friction Angle.

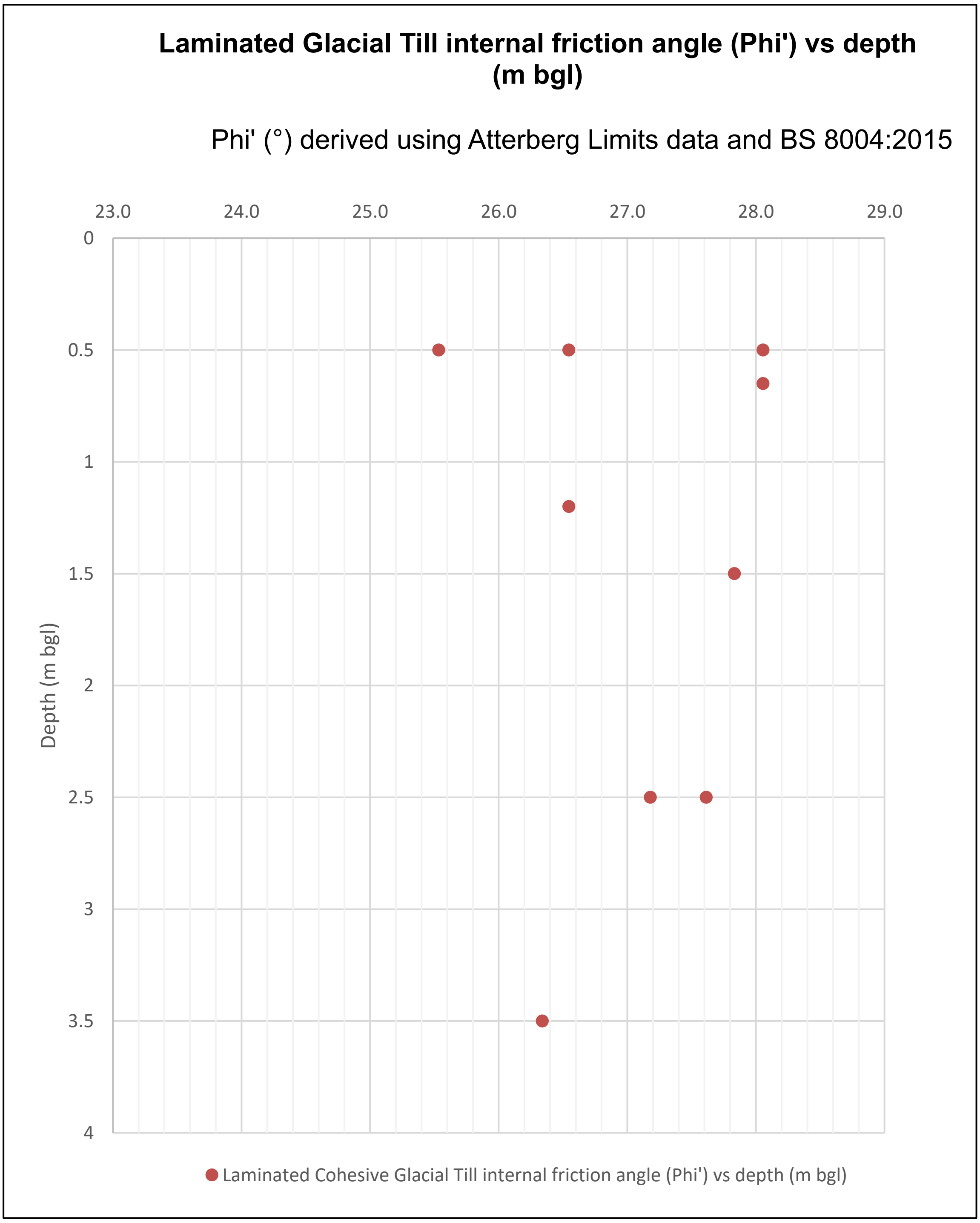


Figure 10.1.27: Western Embankments Laminated Glacial Till SPT-N_{60}.

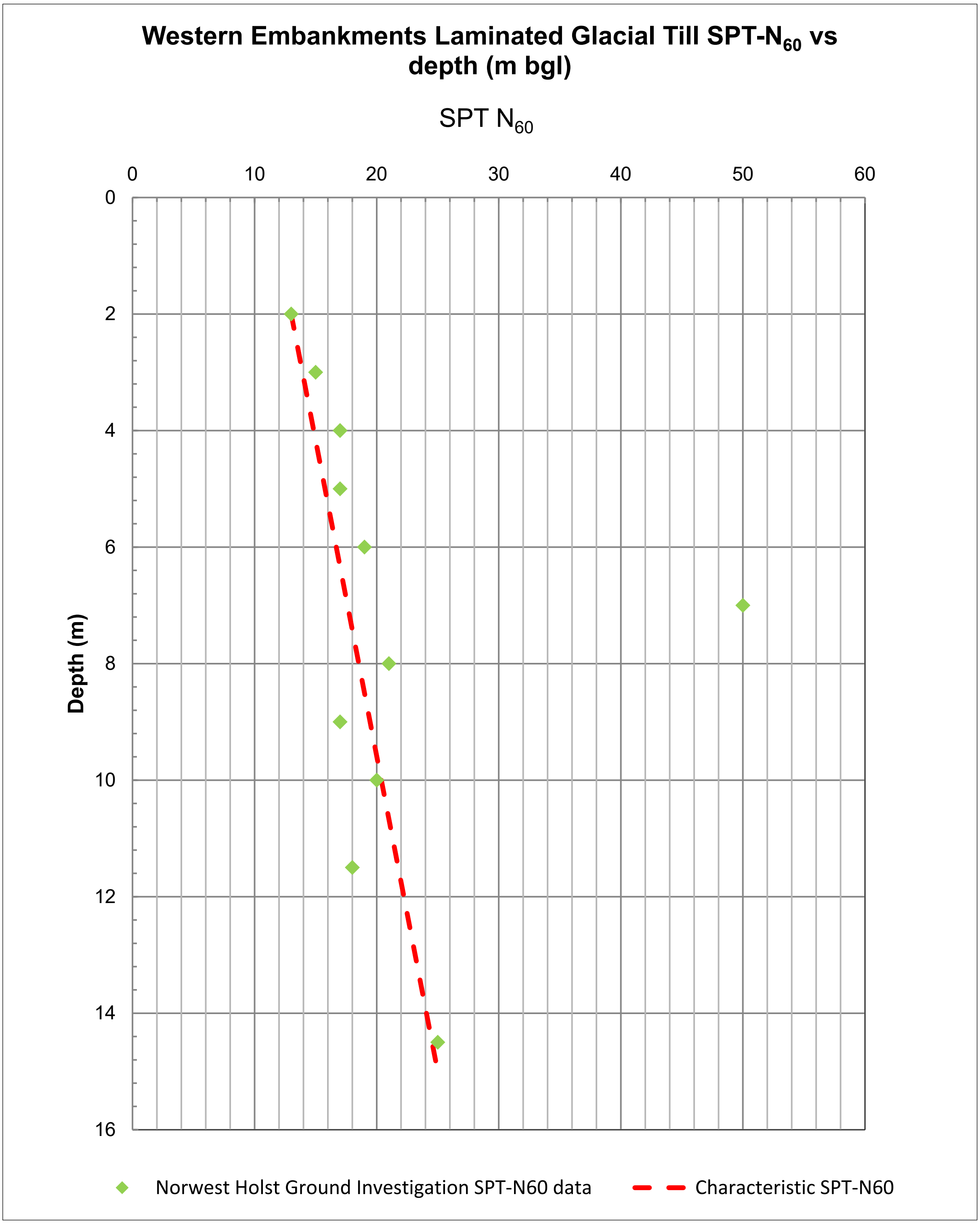


Figure 10.1.28: Western Embankments Laminated Glacial Till Undrained Shear Strength.

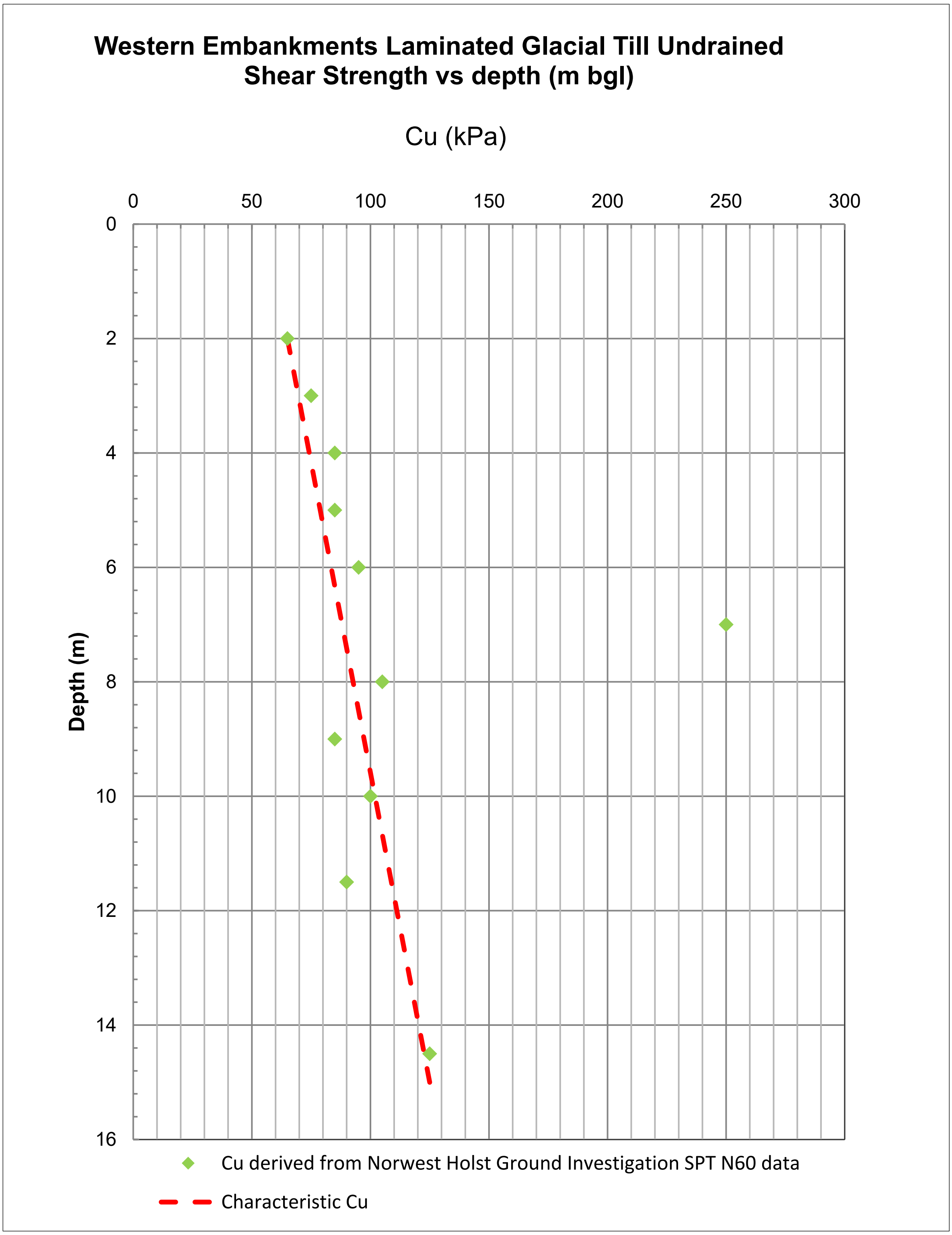


Figure 10.1.29: Western Embankments Laminated Glacial Till Coefficient of Volume Compressibility.

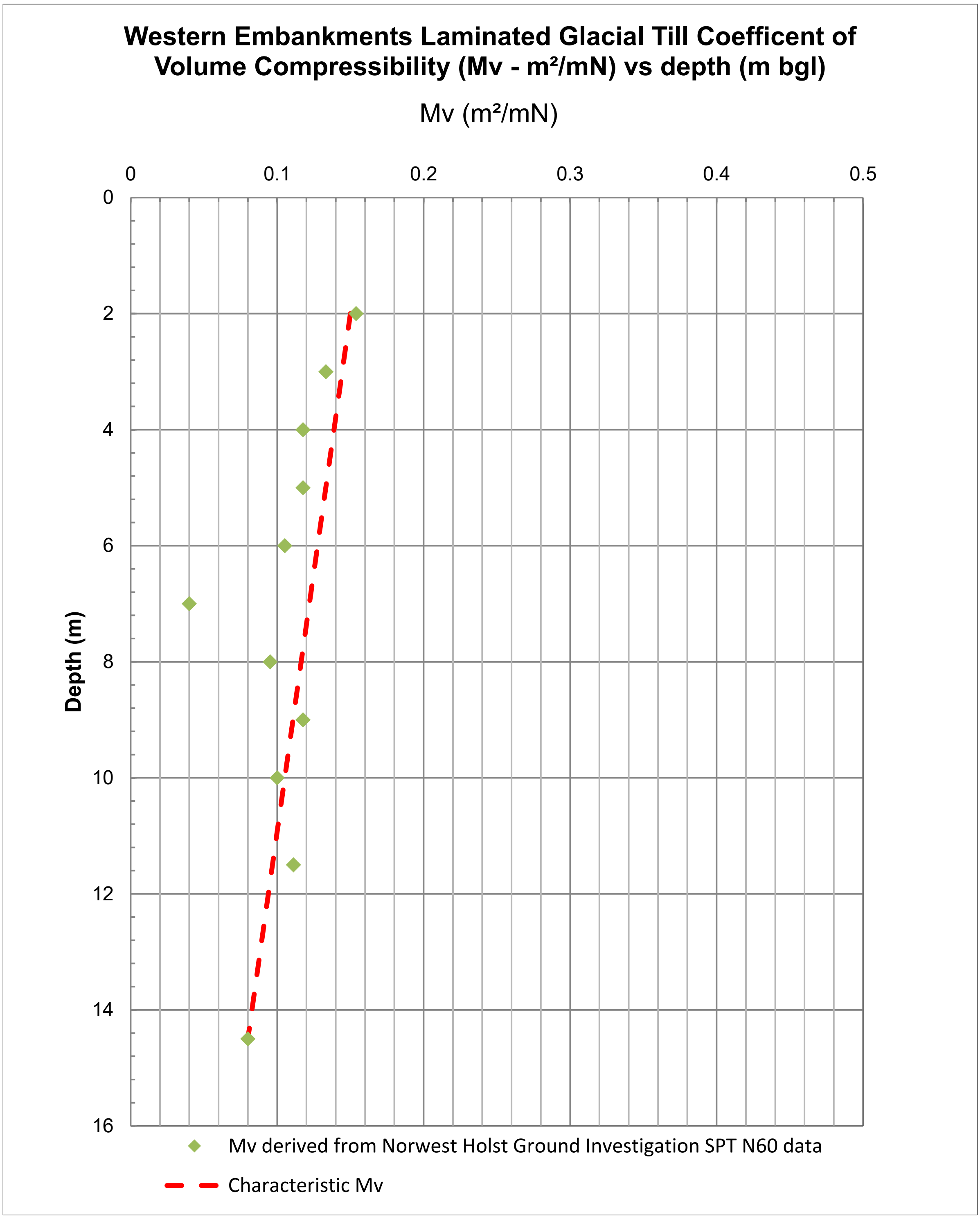


Figure 10.1.30: Western Embankments Laminated Glacial Till Undrained Youngs Modulus.

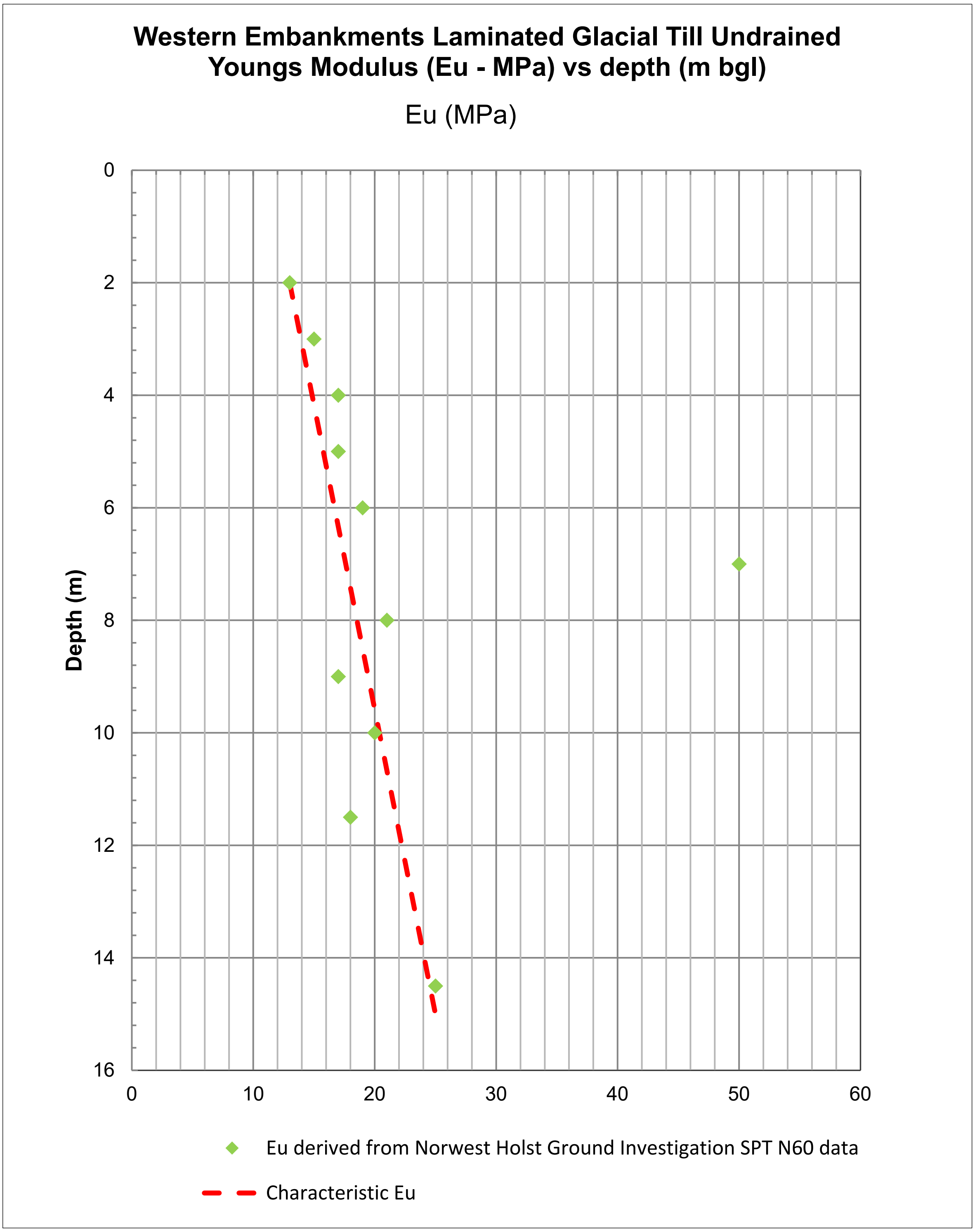


Figure 10.1.31: Western Embankments Laminated Glacial Till Drained Youngs Modulus.

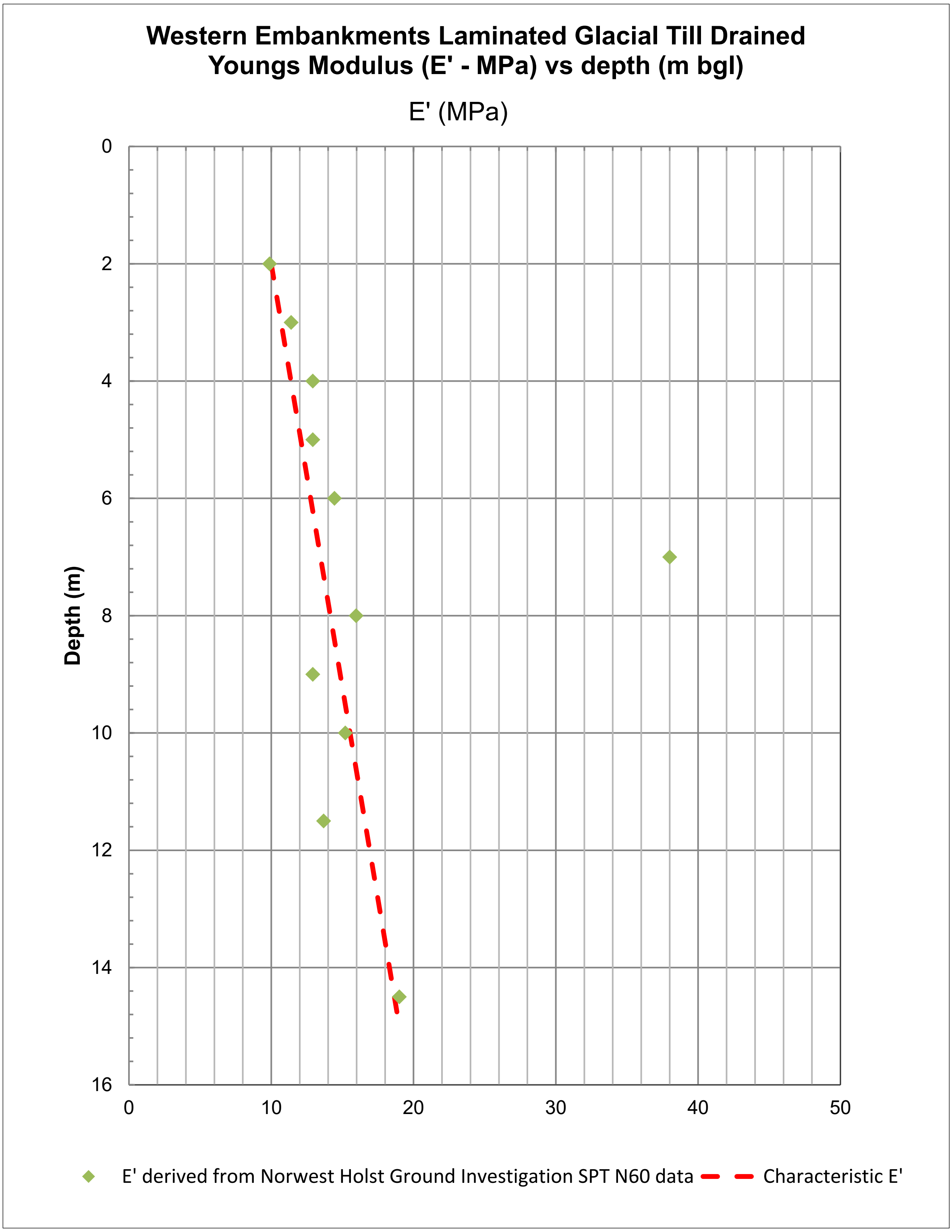
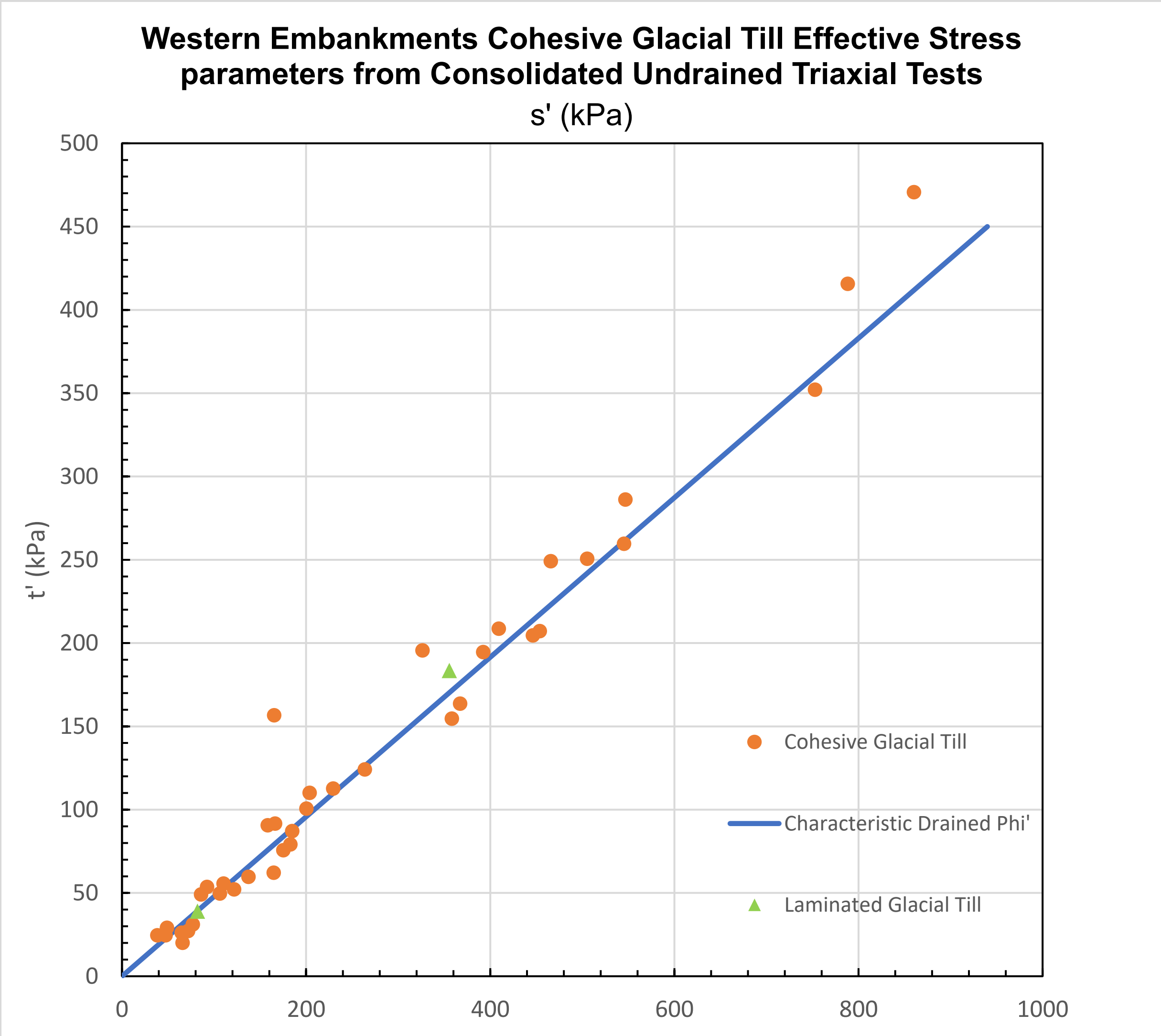


Figure 10.1.32: Western Embankments Cohesive/Laminated Glacial Till Effective Stress parameters.



10.2 Old Mill Farm Underpass

Figure 10.2.1: Old Mill Farm Underpass Cohesive Glacial Till Moisture Content.

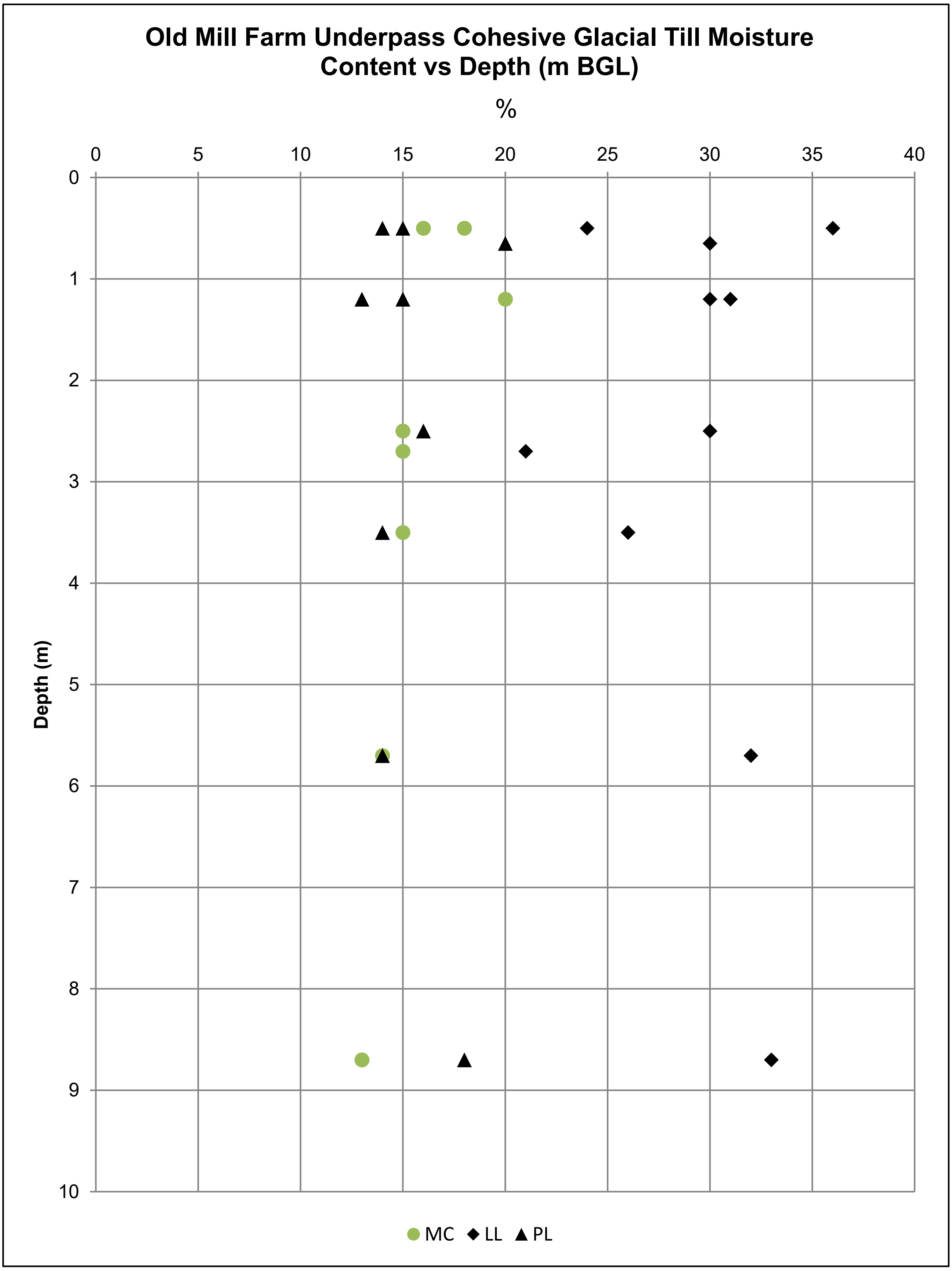


Figure 10.2.2: Old Mill Farm Underpass Cohesive Glacial Till Plasticity Index vs Liquid Limit.

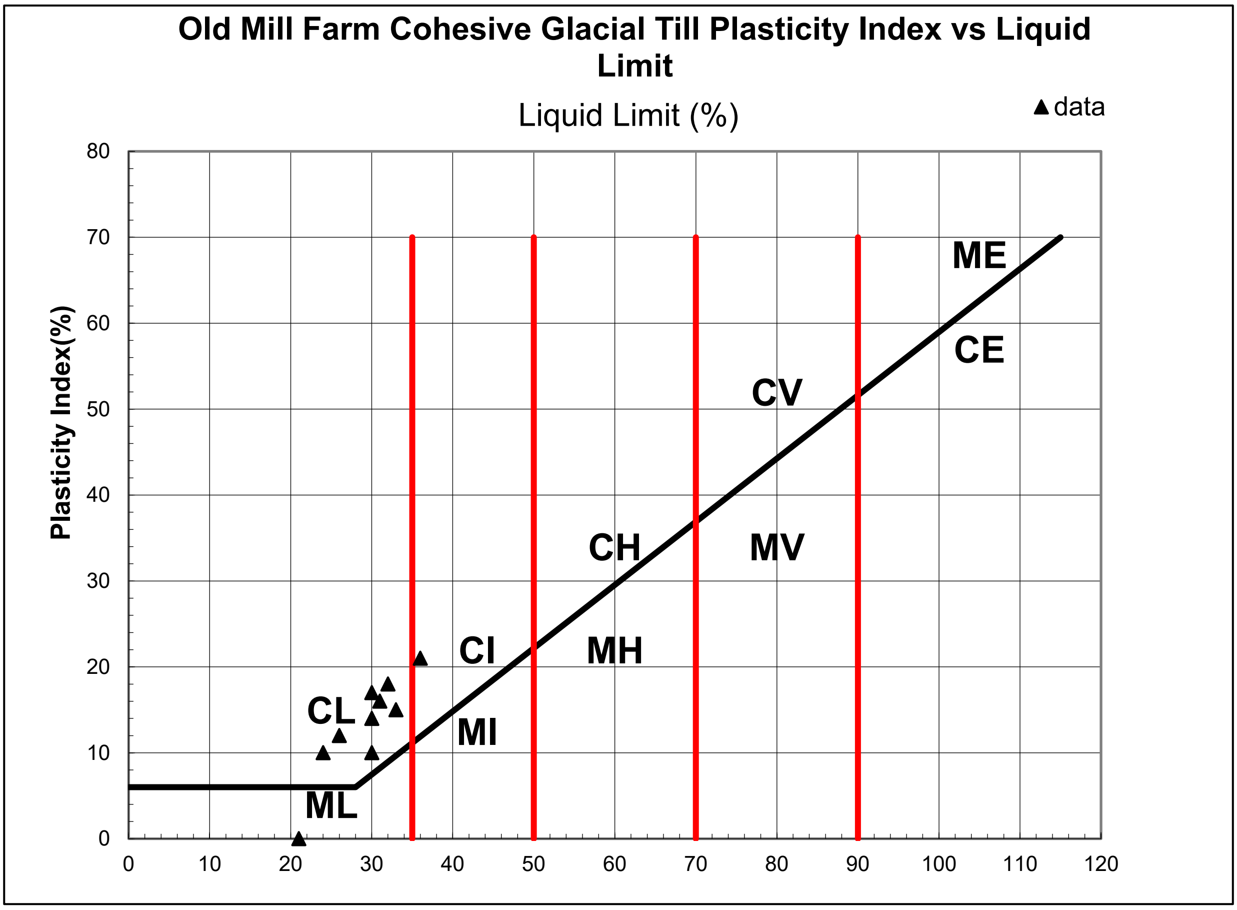


Figure 10.2.3: Old Mill Farm Underpass Cohesive Glacial Till Particle Size Distribution.

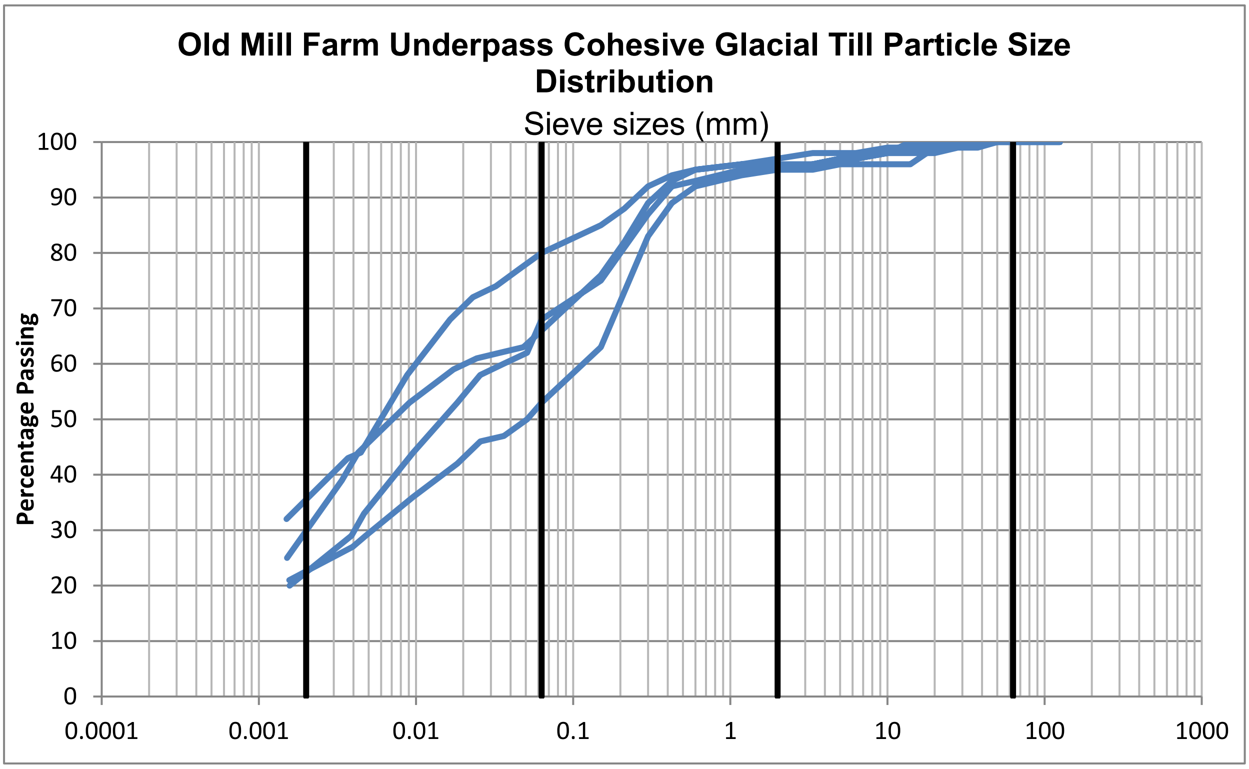


Figure 10.2.4: Old Mill Farm Underpass Cohesive Glacial Till SPT-N_{60}.

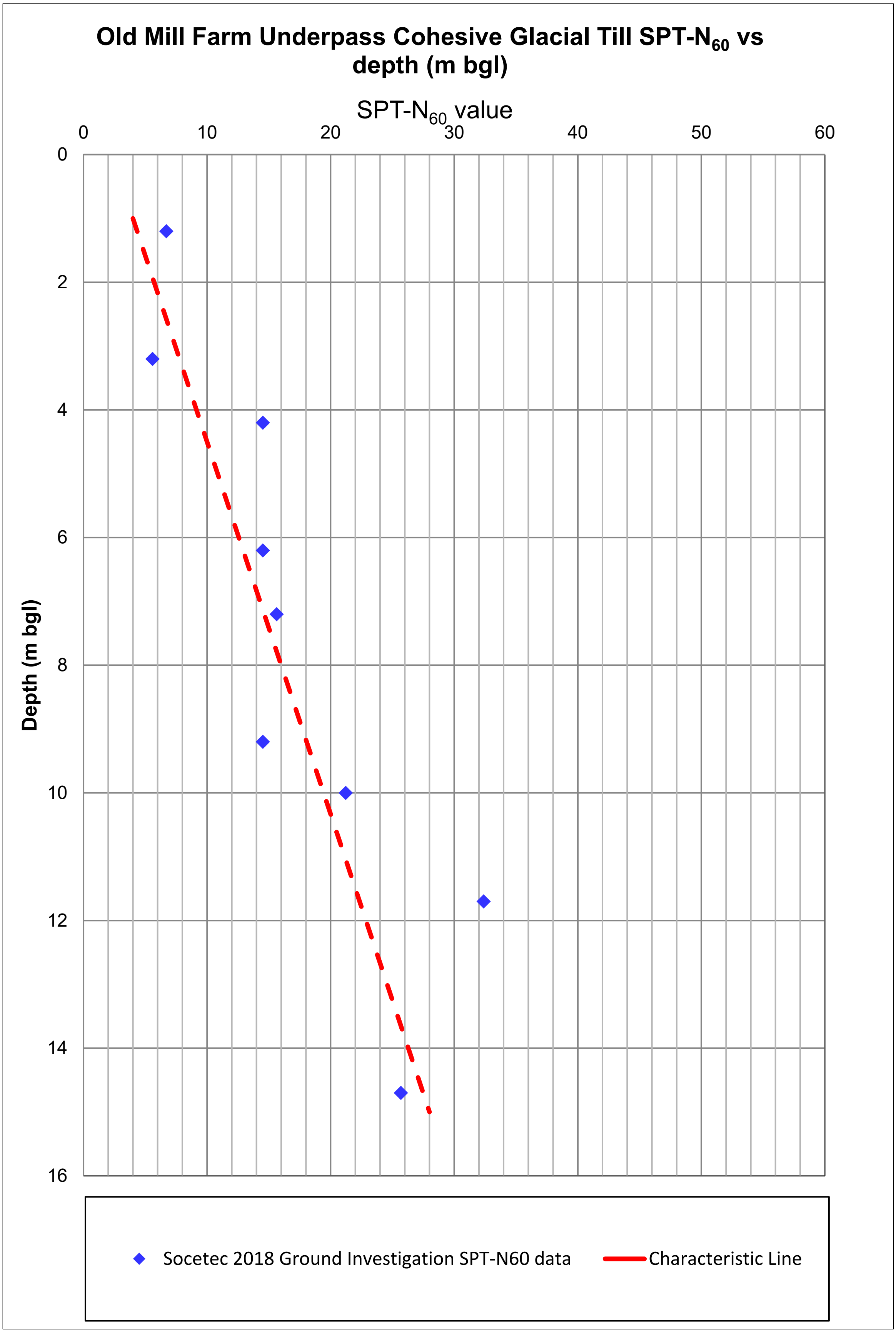


Figure 10.2.5: Old Mill Farm Underpass Cohesive Glacial Till Undrained Shear Strength.

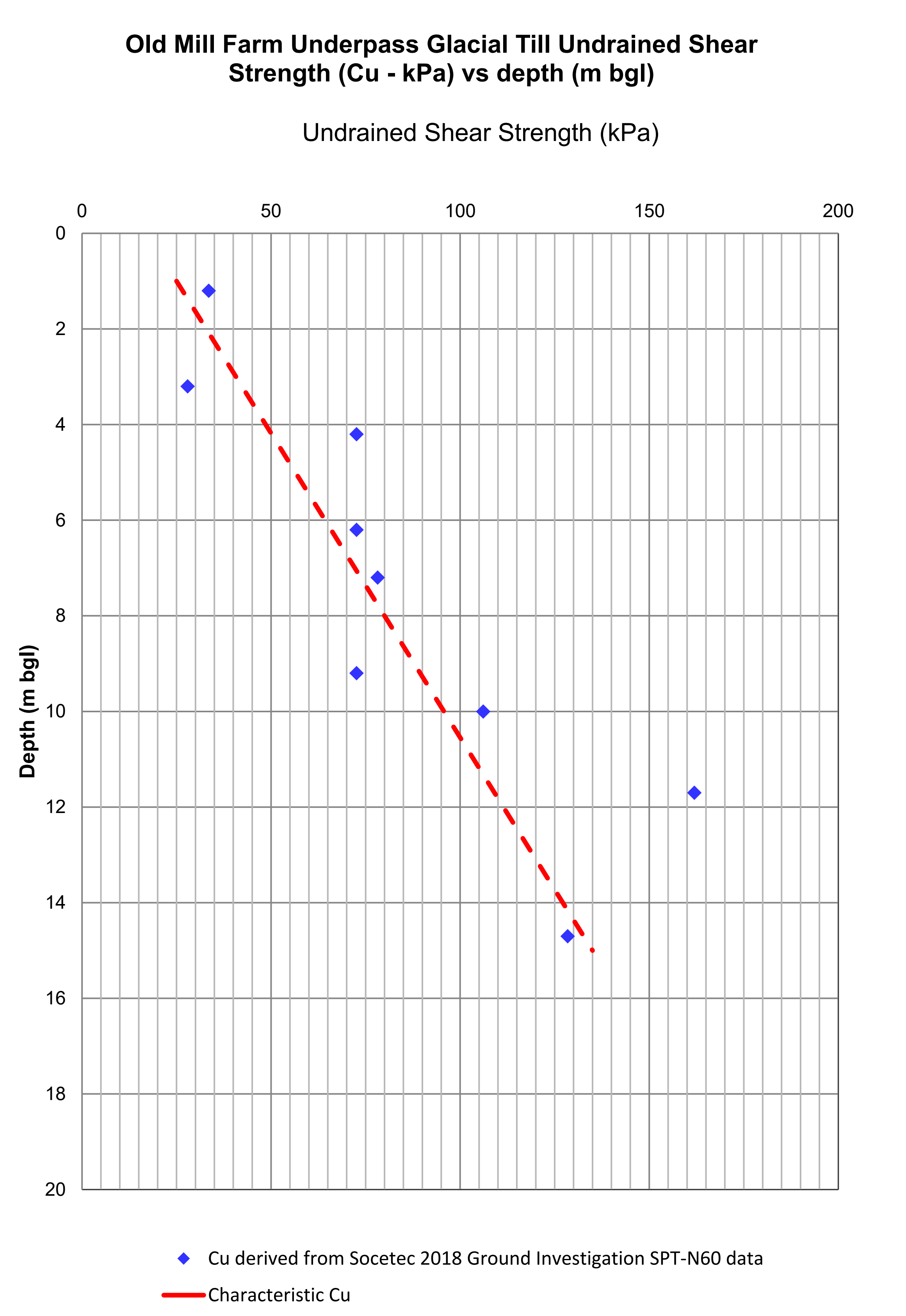


Figure 10.2.6: Old Mill Farm Underpass Cohesive Glacial Till Coefficient of Volume Compressibility.

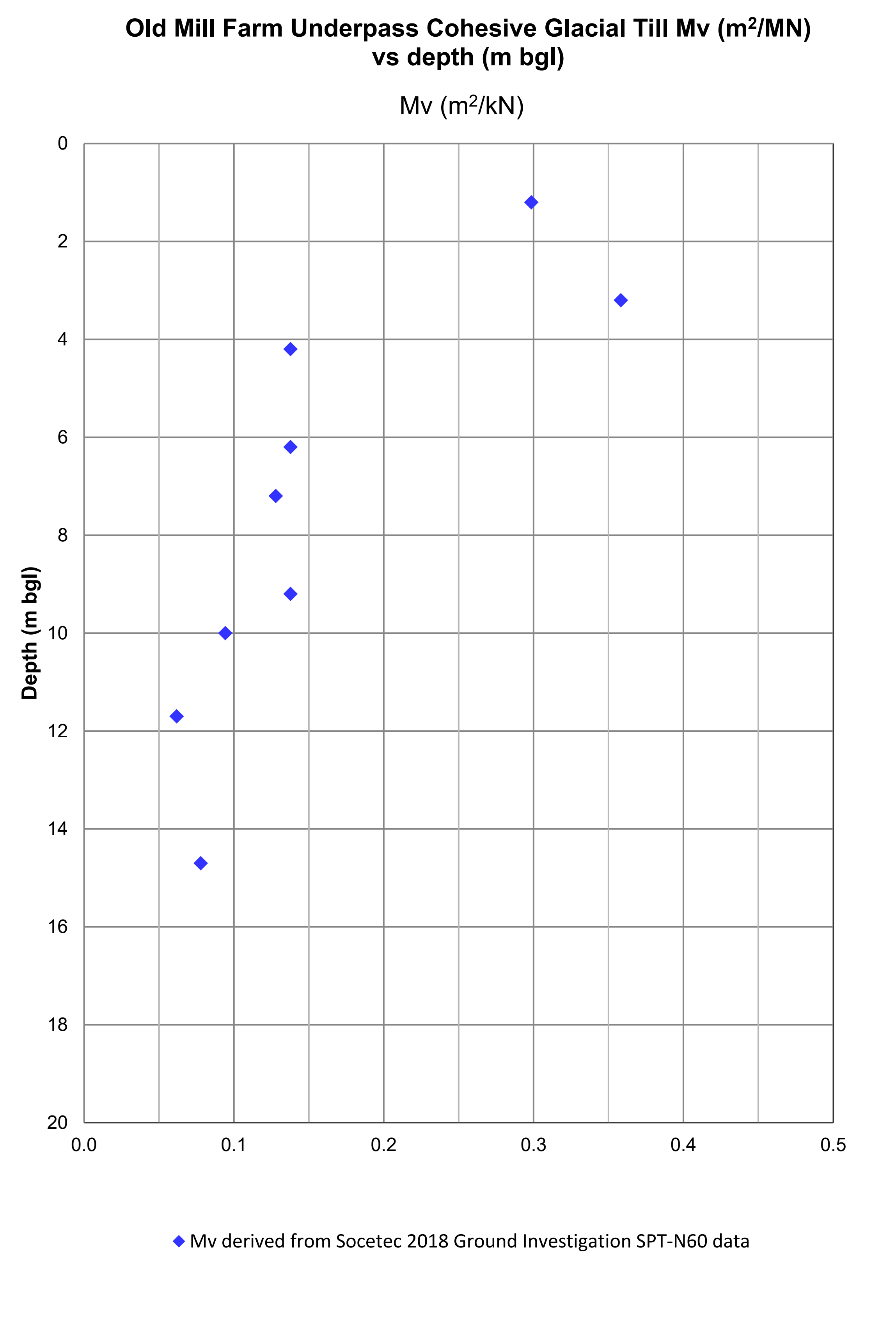


Figure 10.2.7: Old Mill Farm Underpass Cohesive Glacial Till Undrained Youngs Modulus.

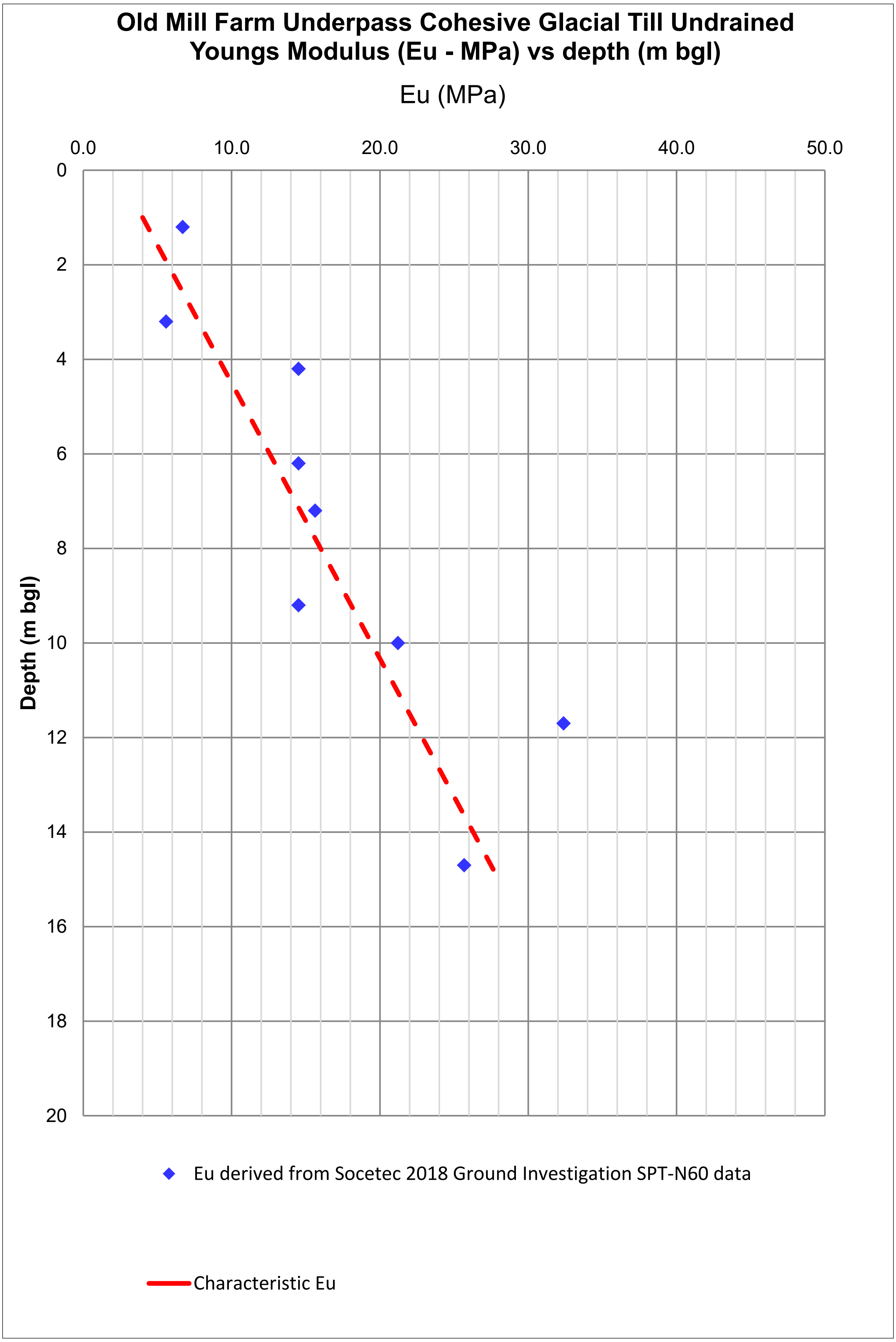


Figure 10.2.8: Old Mill Farm Underpass Cohesive Glacial Till Drained Youngs Modulus.

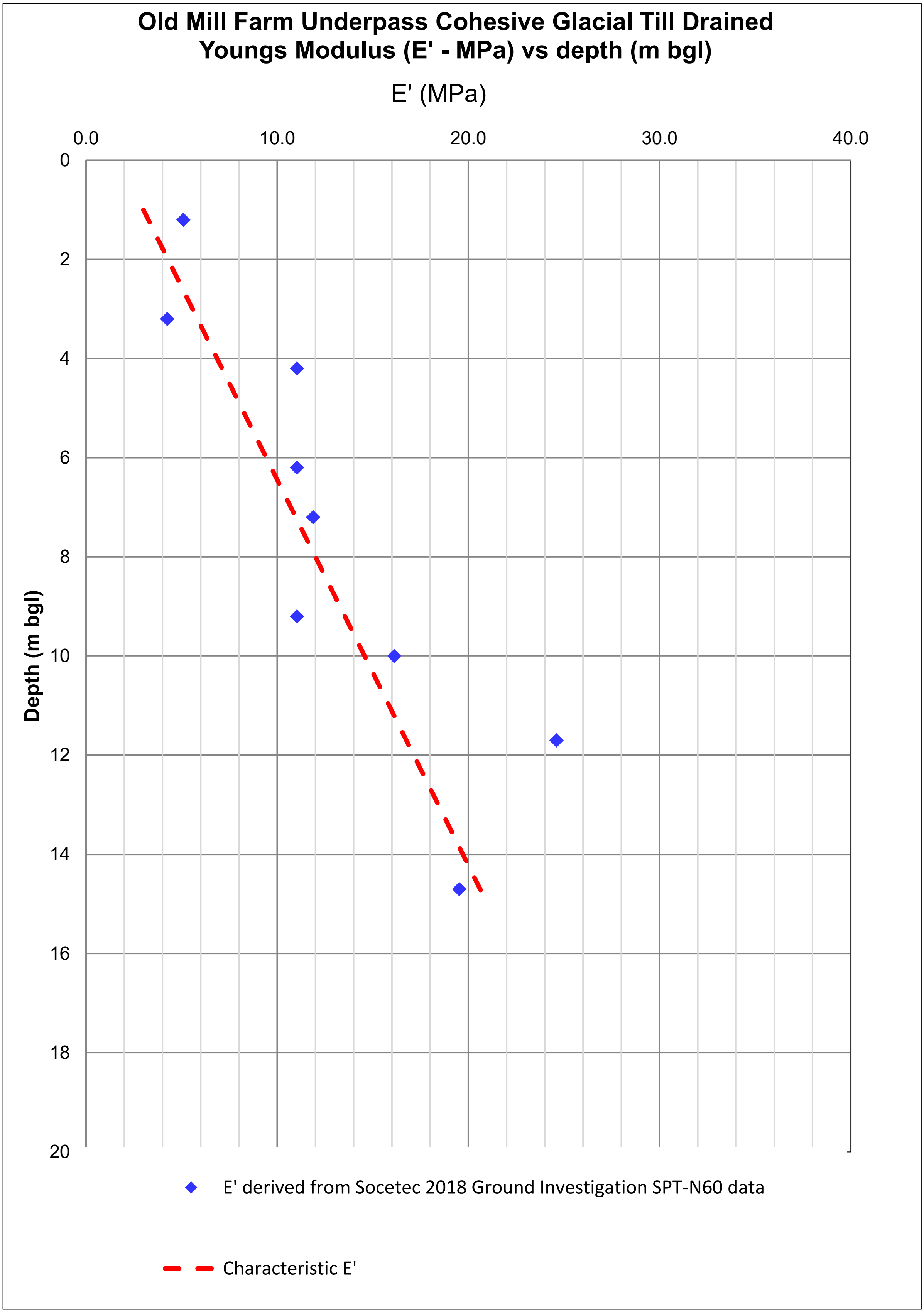


Figure 10.2.9: Old Mill Farm Underpass Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer).

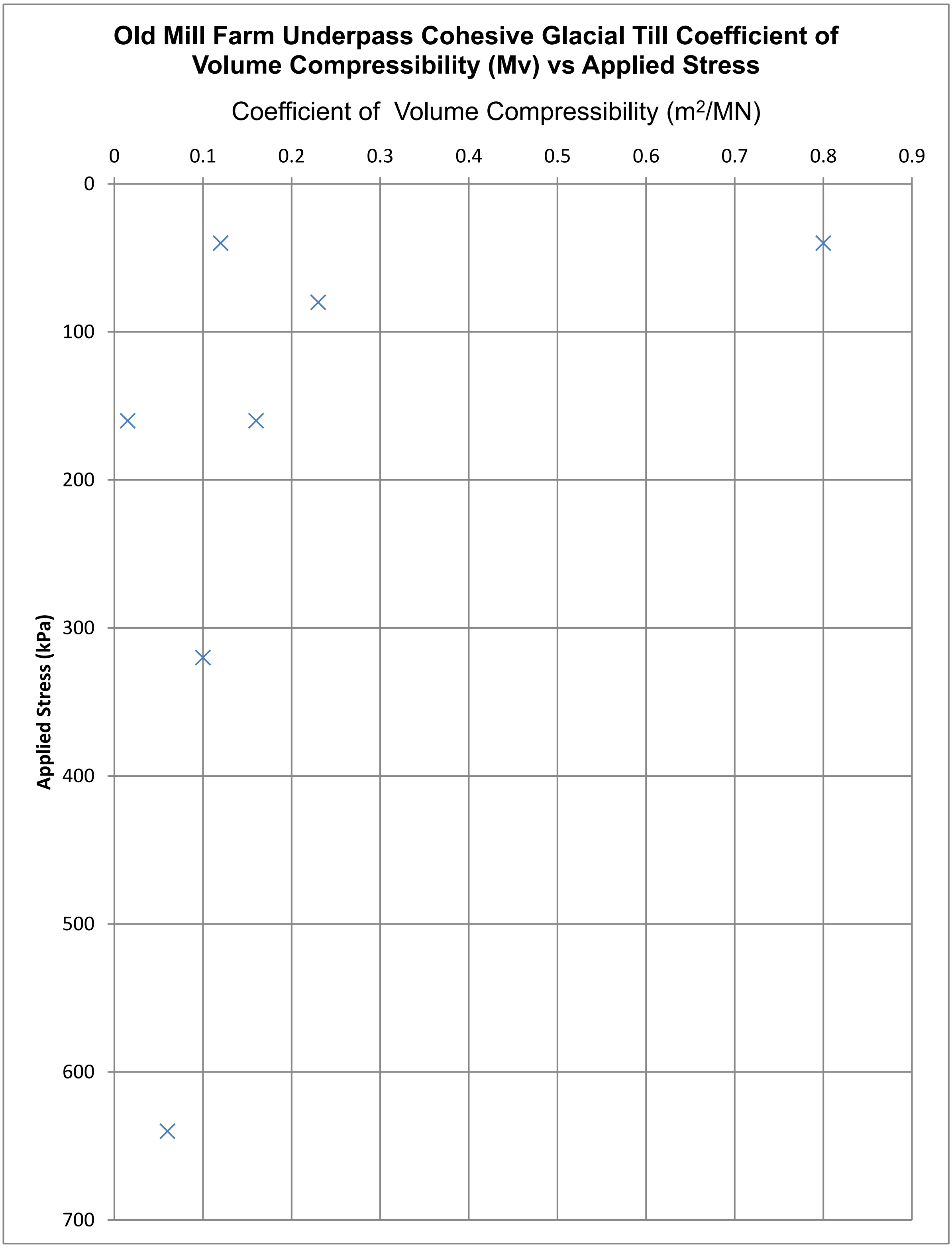


Figure 10.2.10: Old Mill Farm Underpass Cohesive Glacial Till Angle of Internal Friction.

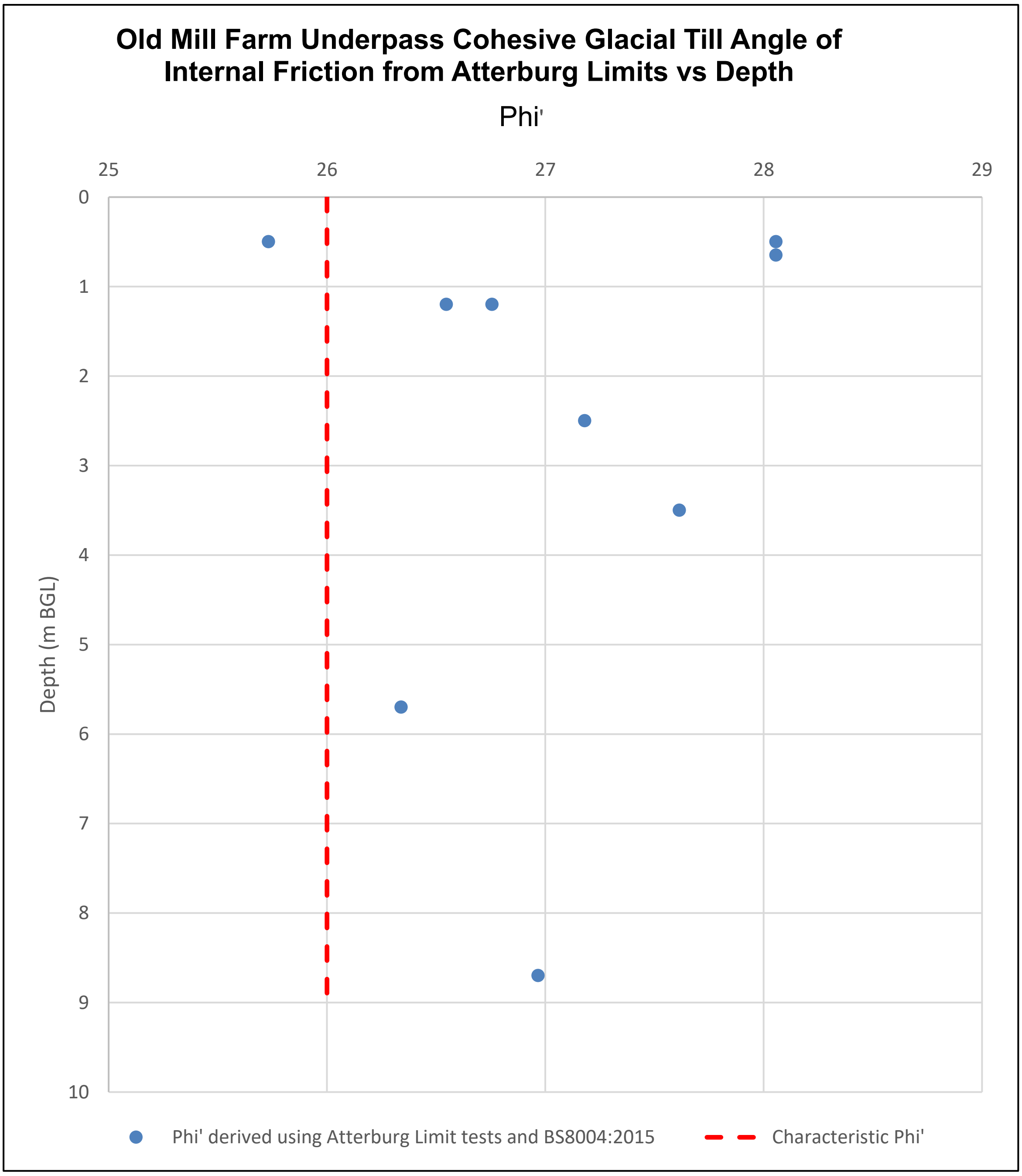


Figure 10.2.11: Old Mill Farm Underpass Cohesive Glacial Till drained parameters from Consolidated Undrained Triaxial Tests.

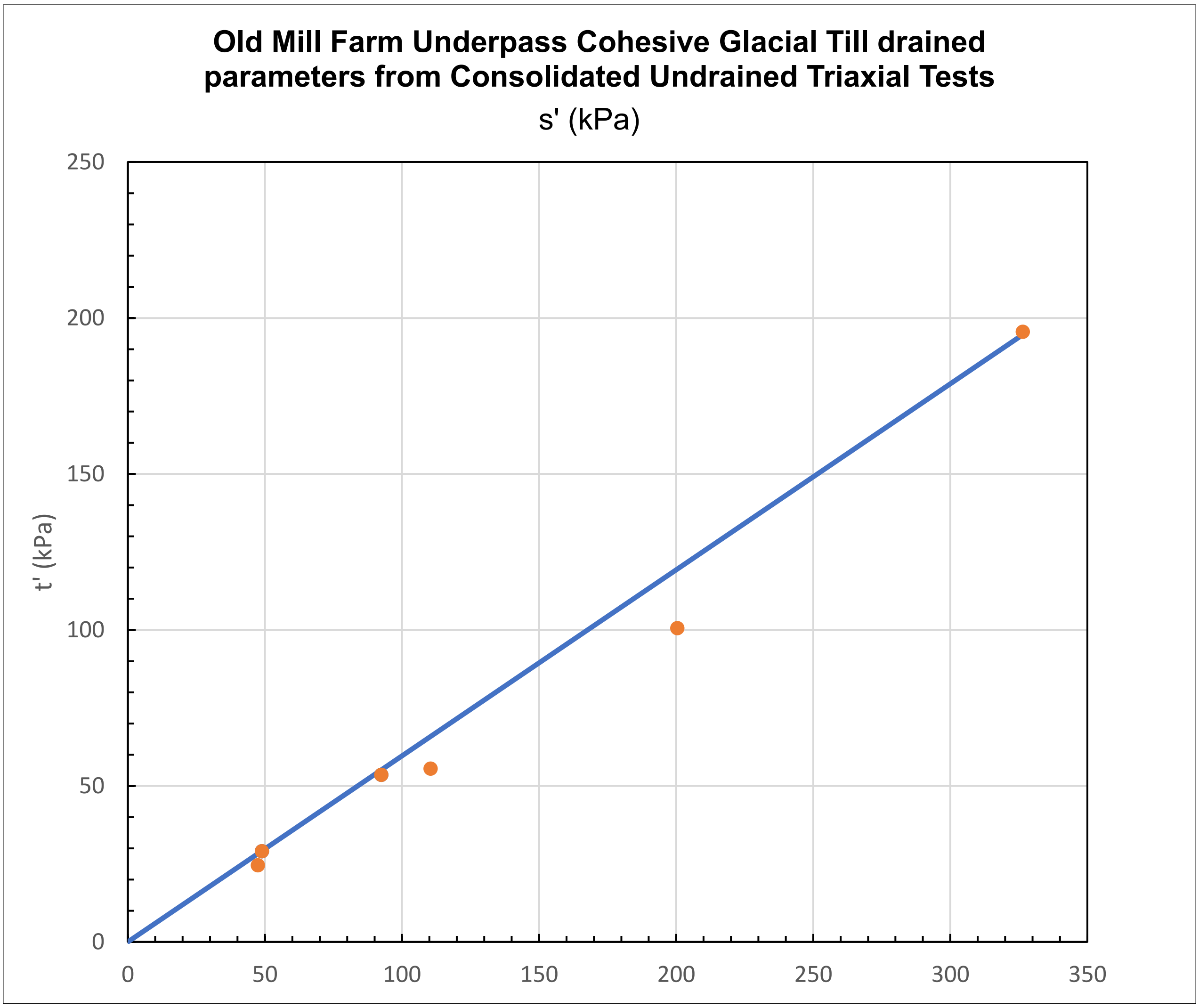


Figure 10.2.12: Old Mill Farm Underpass Cohesive Glacial Till m_v values (SPT and Oedometer).

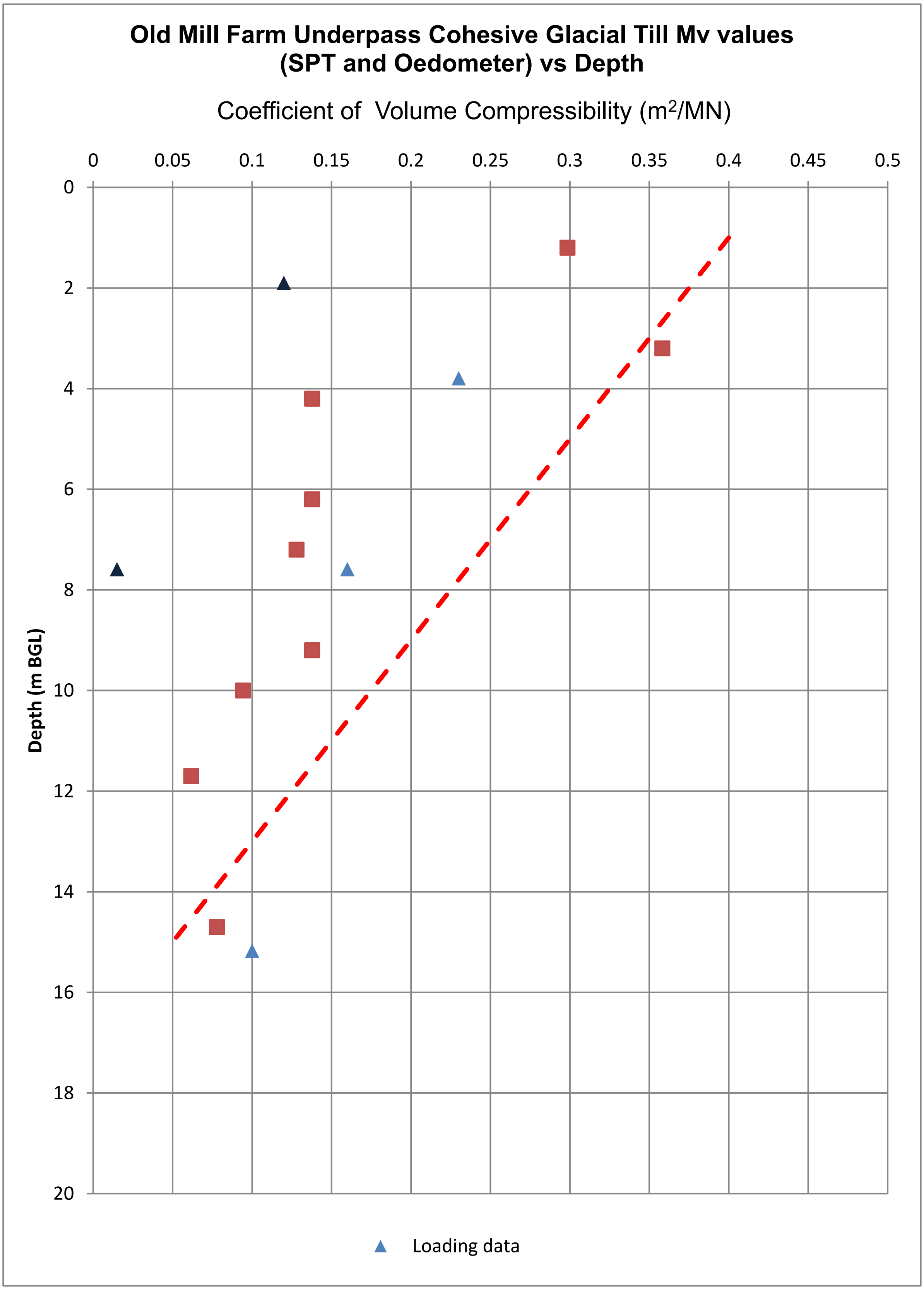


Figure 10.2.13: Old Mill Farm Underpass Cohesive Glacial Till Coefficient of Consolidation.

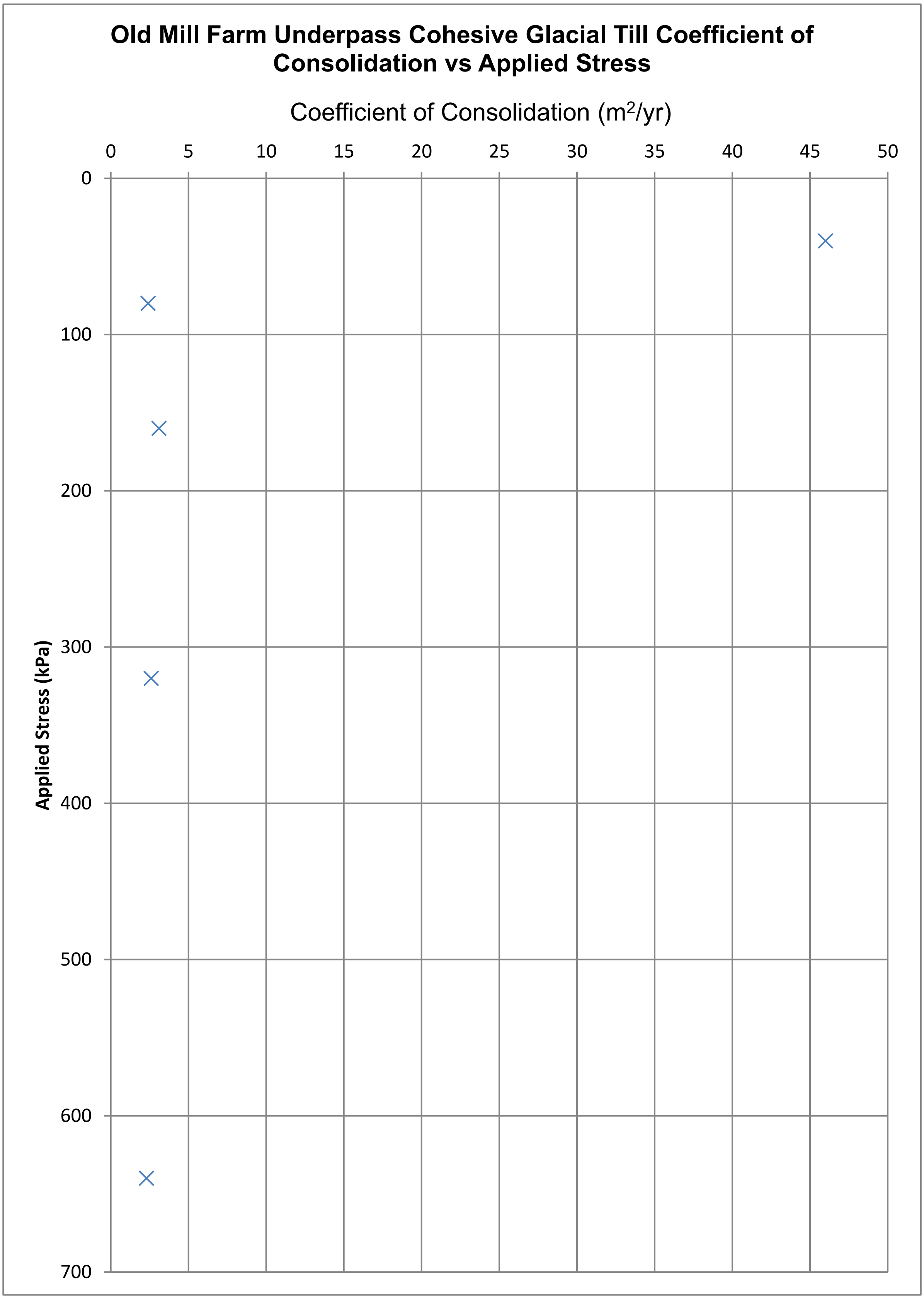
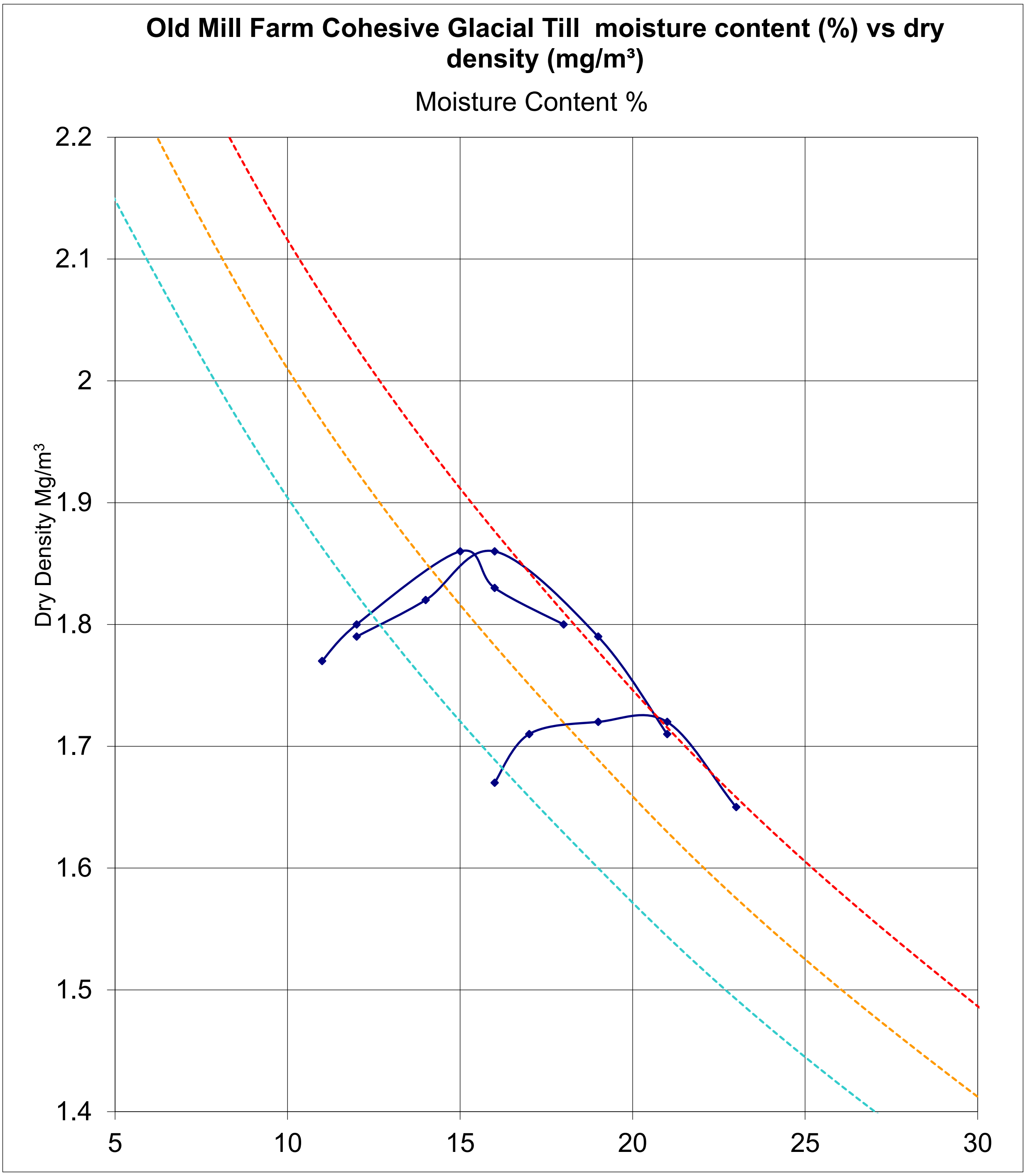


Figure 10.2.14: Old Mill Farm Underpass Cohesive Glacial Till Optimum Moisture Content vs Maximum Dry Density.



10.3 Roe Cross Link Road

Figure 10.3.1: Roe Cross Link Road Made Ground Particle Size Distribution

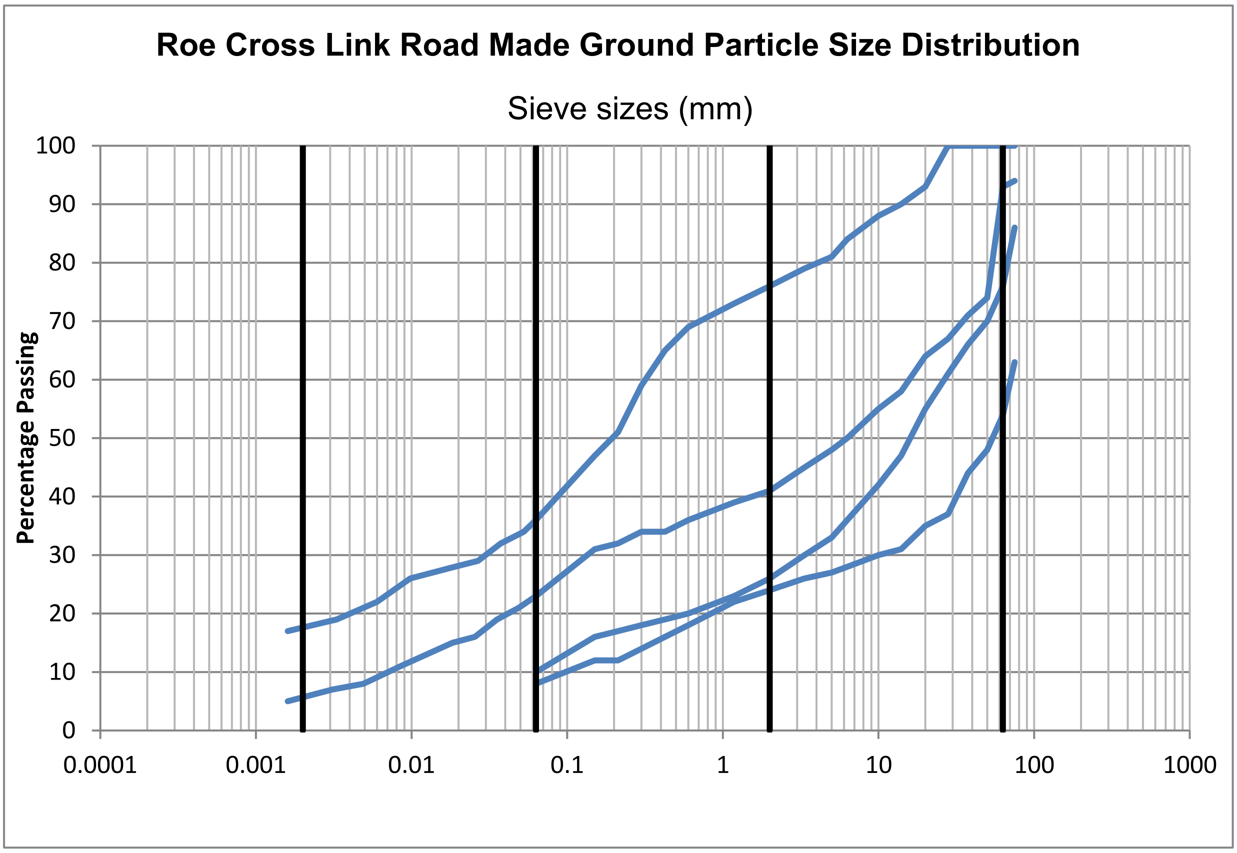


Figure 10.3.2: Roe Cross Link Road Made Ground SPT-N60.

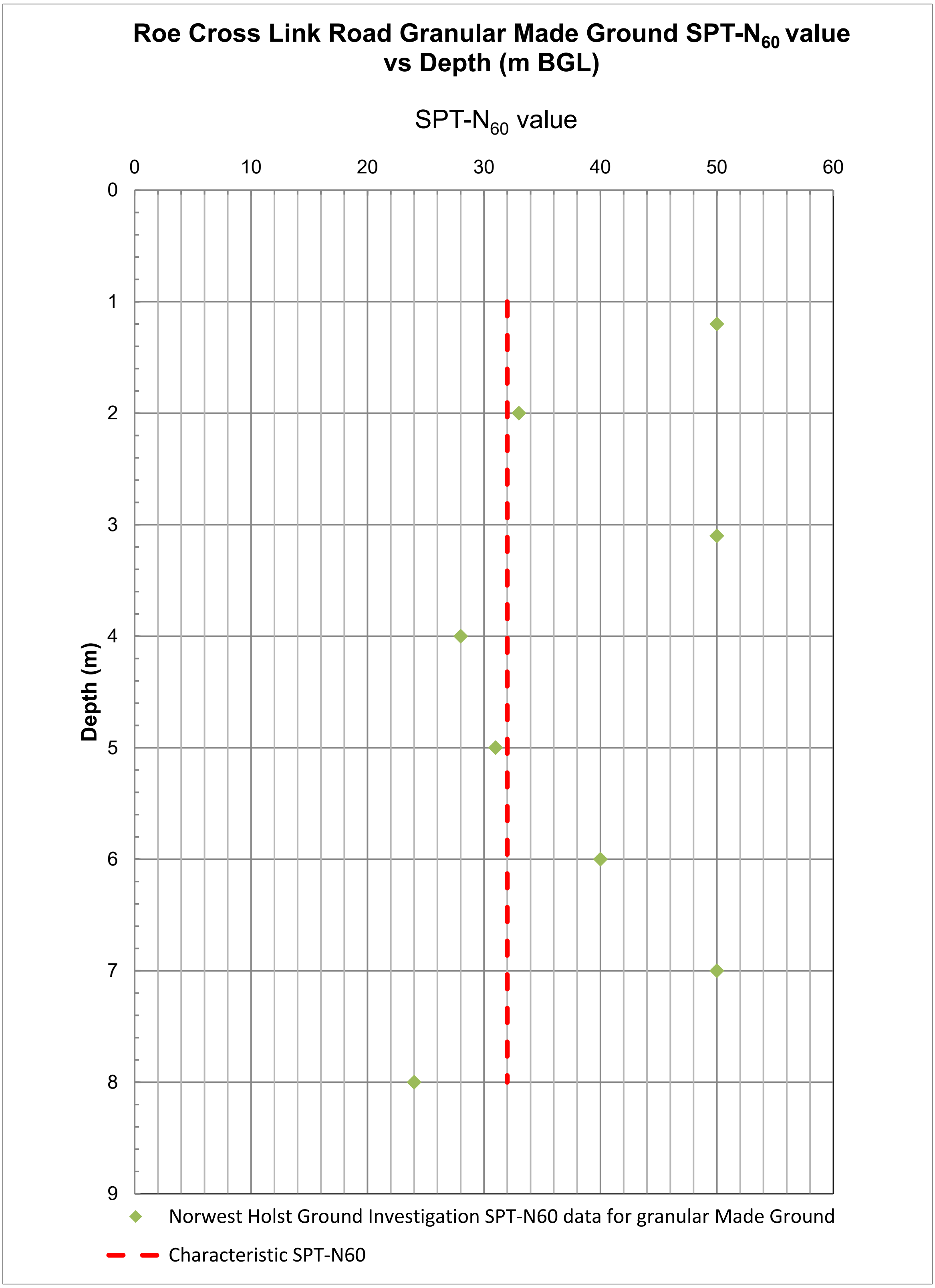


Figure 10.3.3: Roe Cross Link Road Made Ground Angle of Internal Friction from SPT-N_{60}.

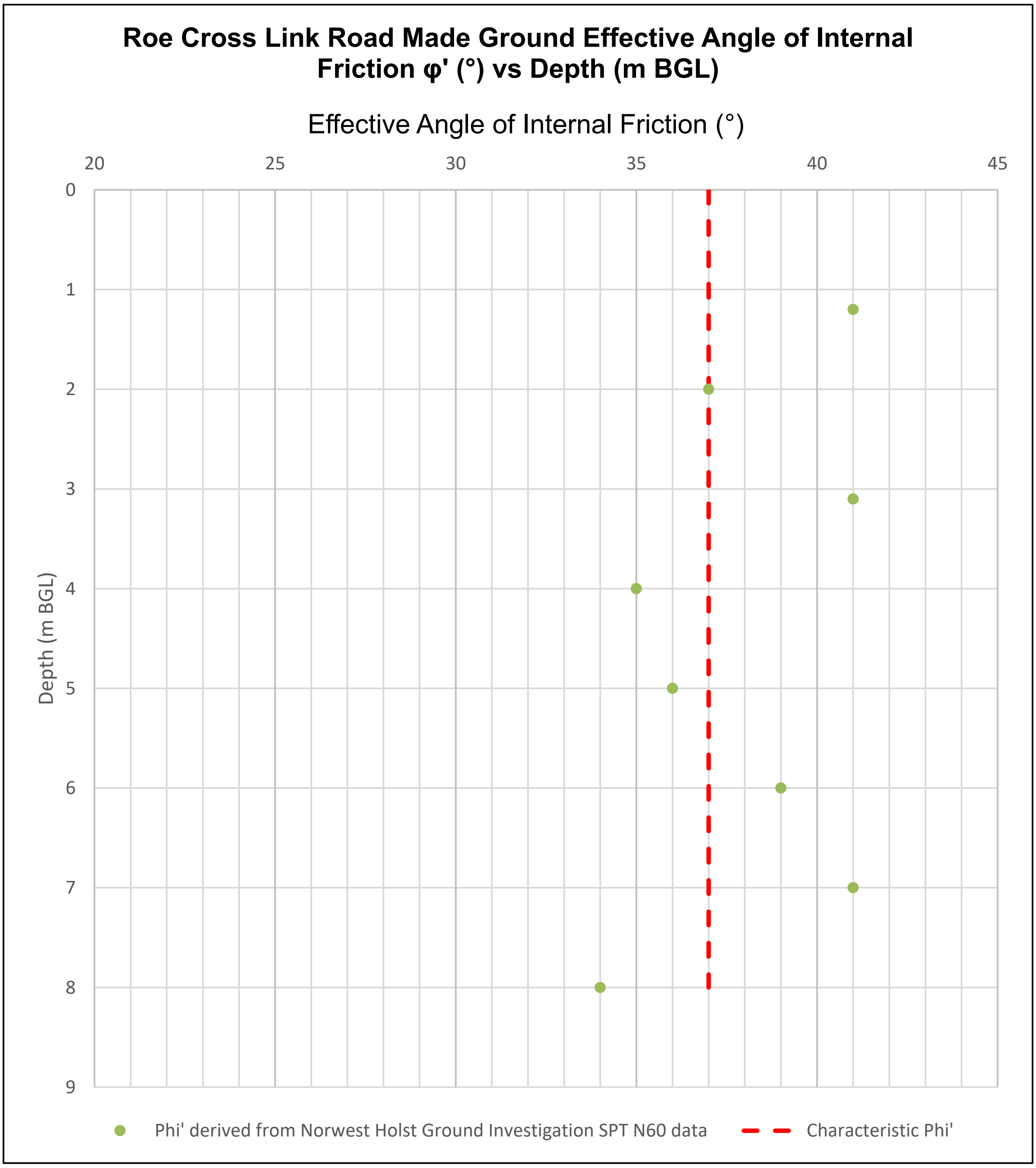


Figure 10.3.4: Roe Cross Link Road Made Ground Drained Youngs Modulus.

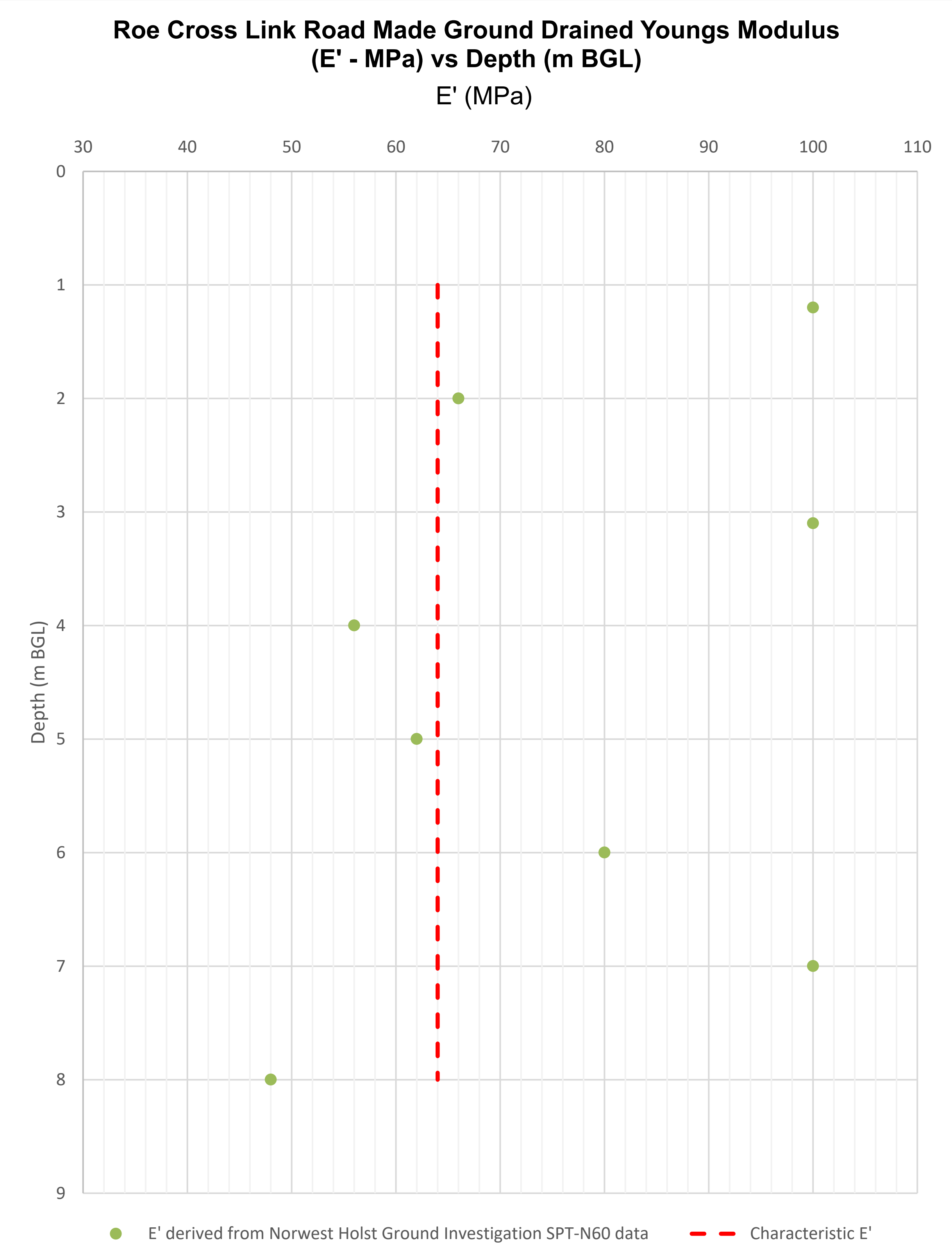


Figure 10.3.5: Roe Cross Link Road Cohesive Glacial Till Moisture Content.

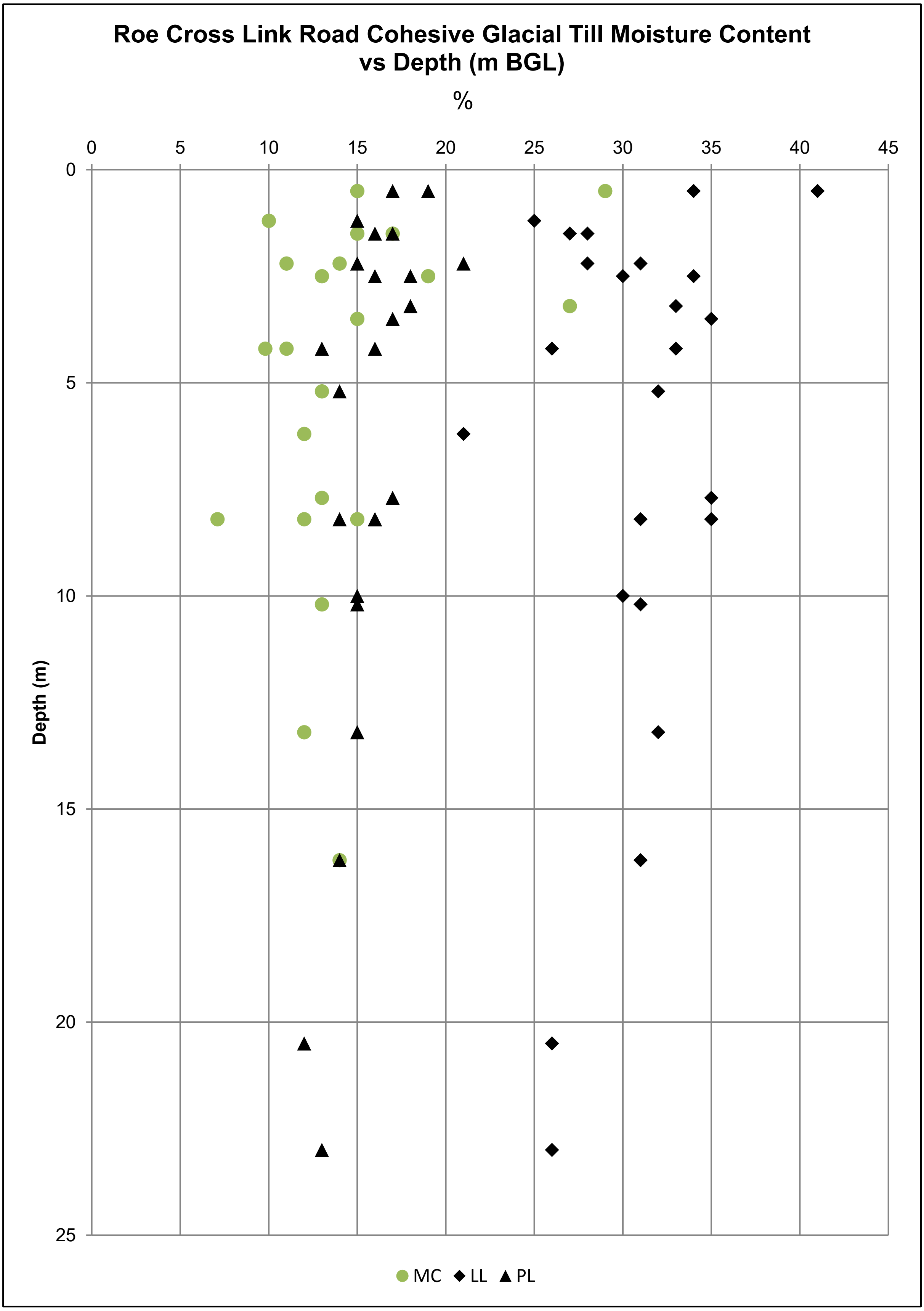


Figure 10.3.6: Roe Cross Link Road Cohesive Glacial Till Atterberg Limits.

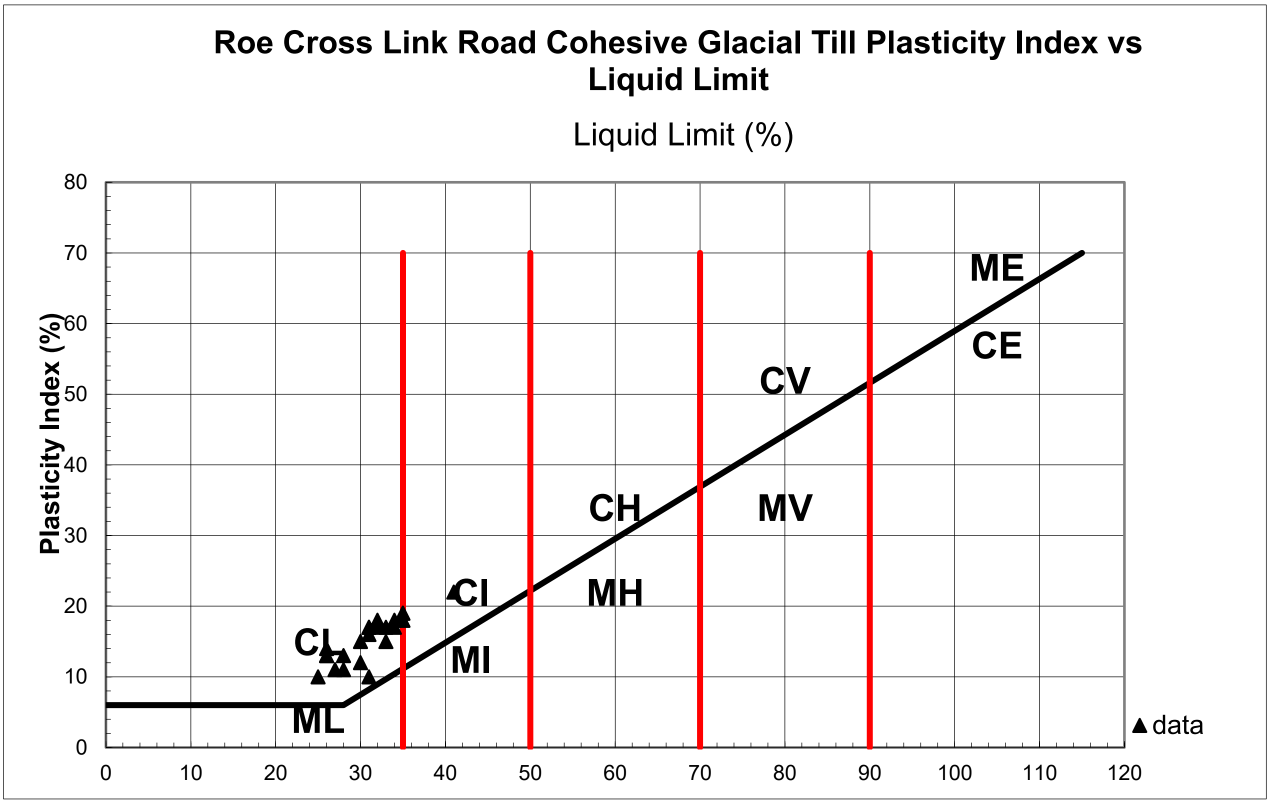


Figure 10.3.7: Roe Cross Link Road Cohesive Glacial Till Particle Size Distribution.

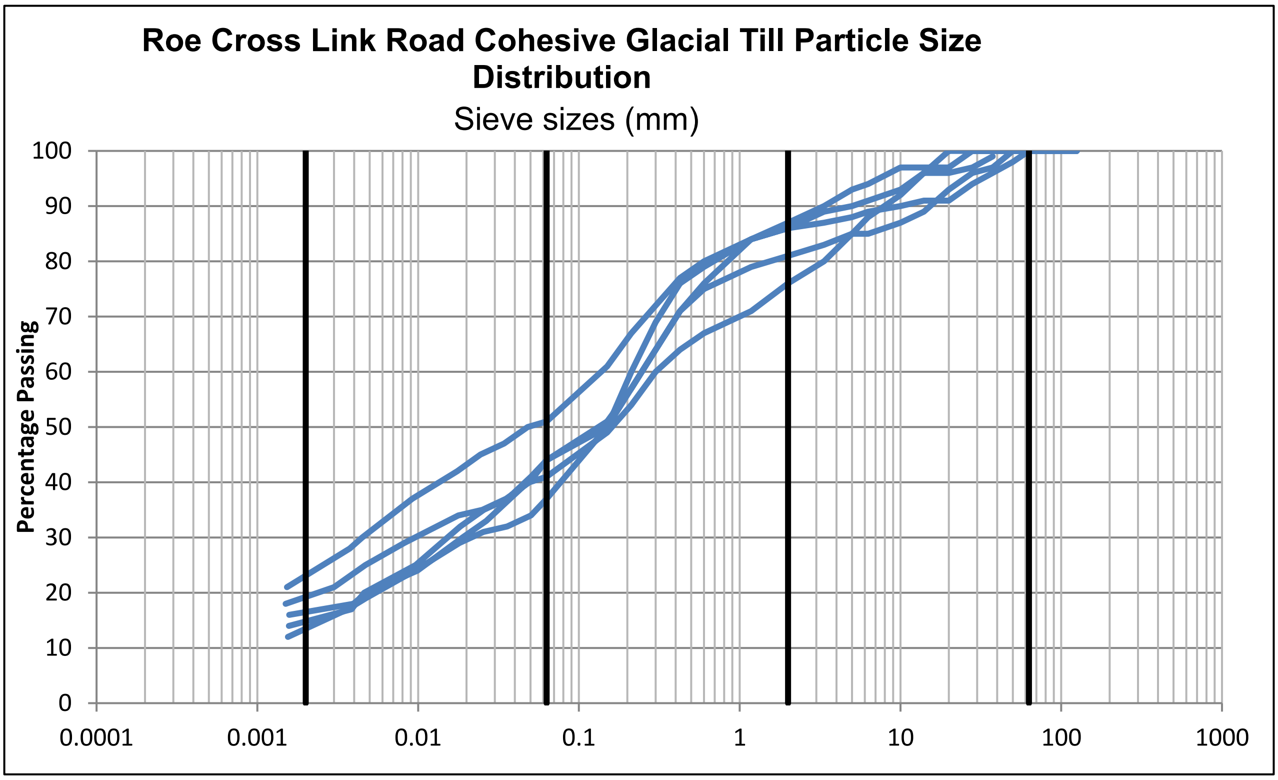


Figure 10.3.8: Roe Cross Link Road Cohesive Glacial Till SPT-N60.

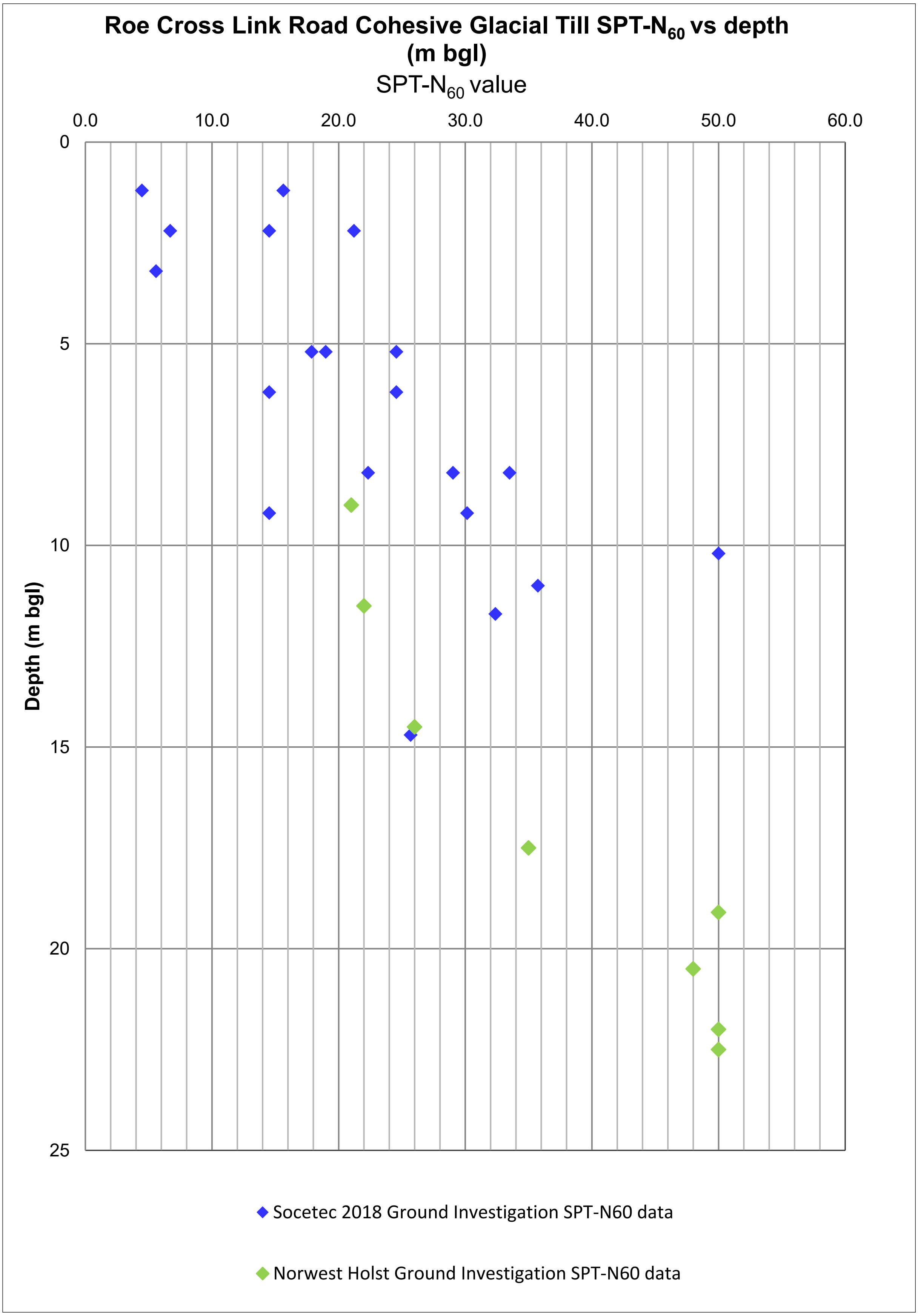


Figure 10.3.9: Roe Cross Link Road Cohesive Glacial Till Undrained Shear Strength.

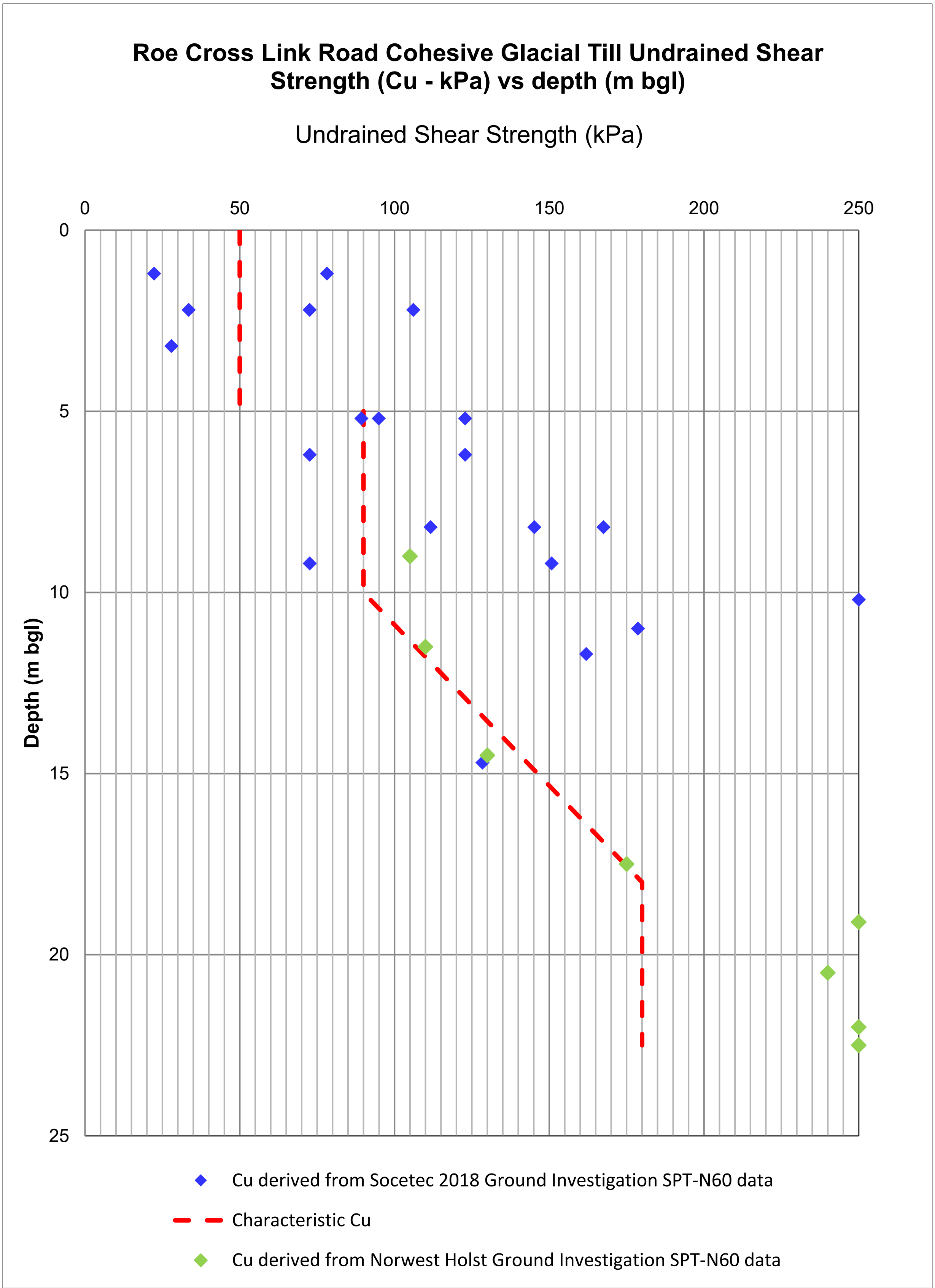


Figure 10.3.10: Roe Cross Link Road Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

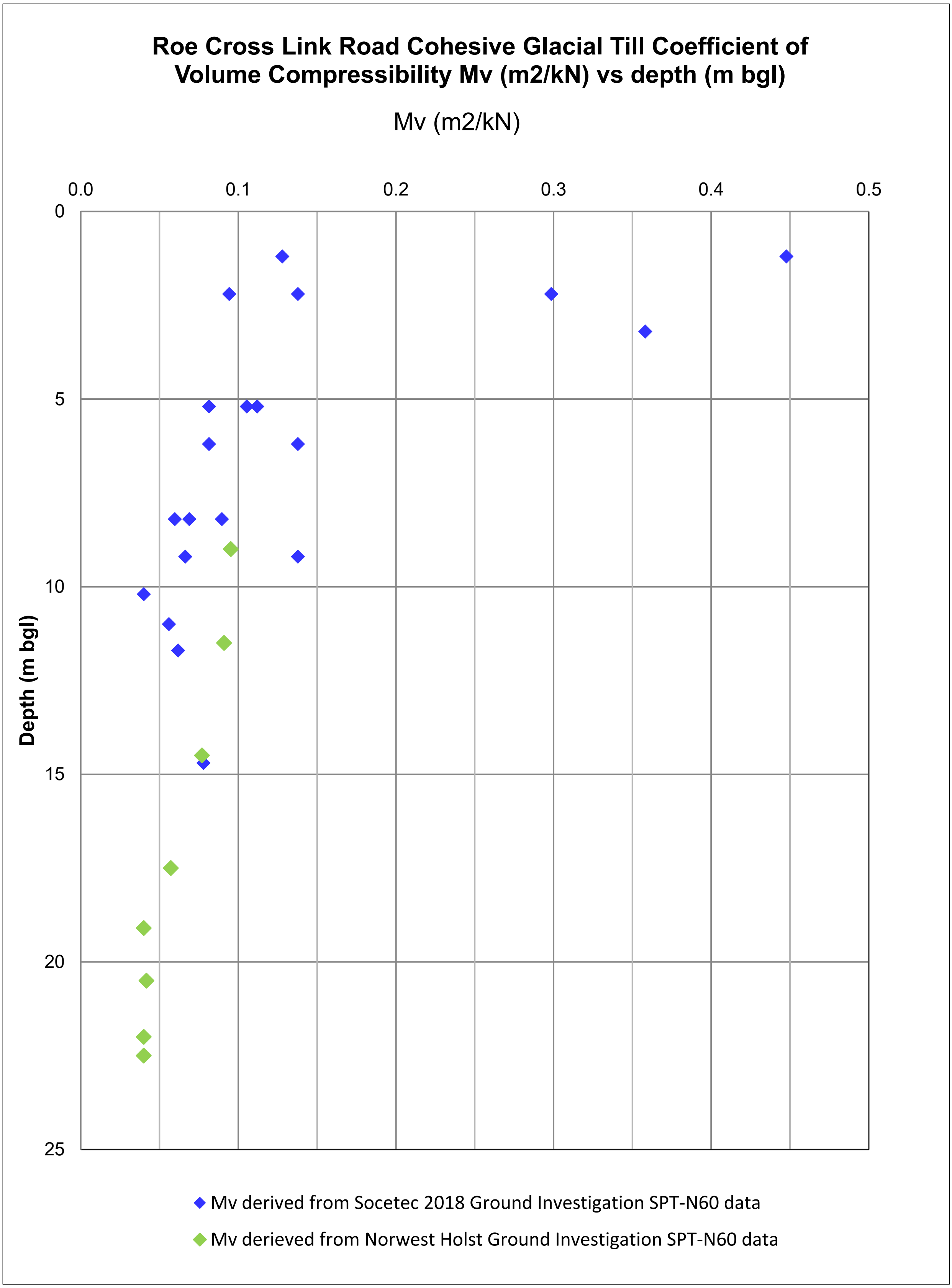


Figure 10.3.11: Roe Cross Link Road Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer).

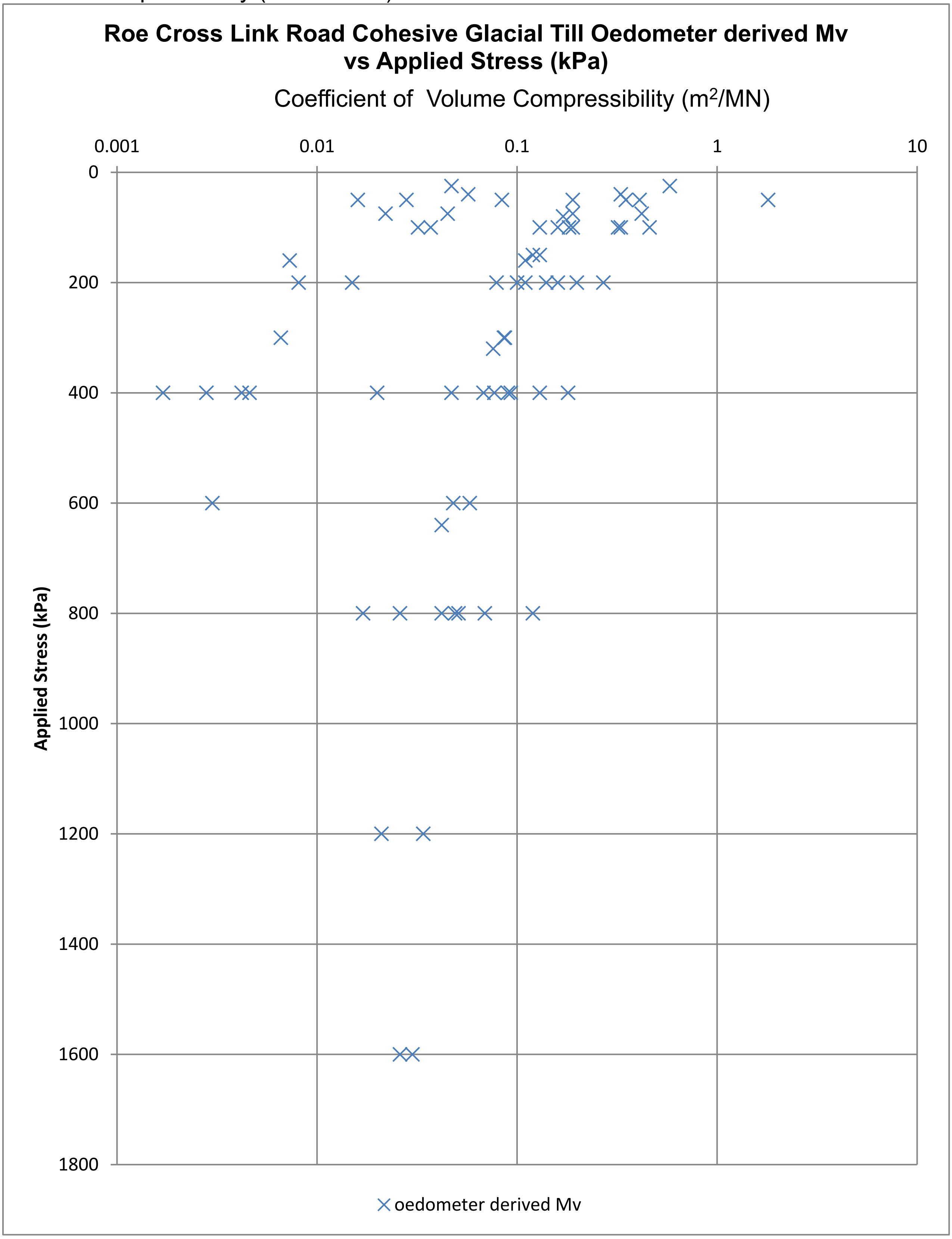


Figure 10.3.12: Roe Cross Link Road Cohesive Glacial Till Undrained Youngs Modulus.

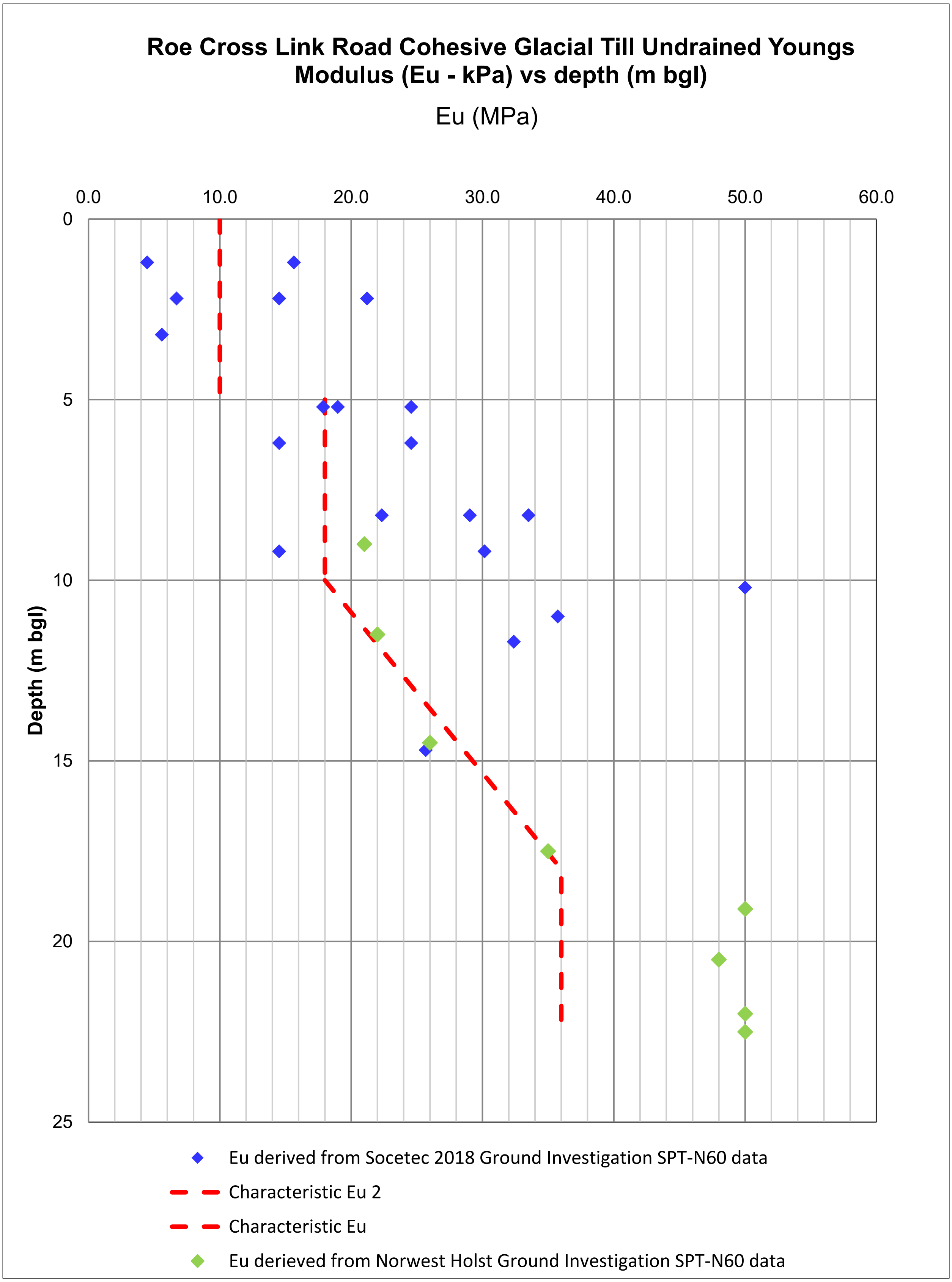


Figure 10.3.13: Roe Cross Link Road Cohesive Glacial Till Drained Youngs Modulus.

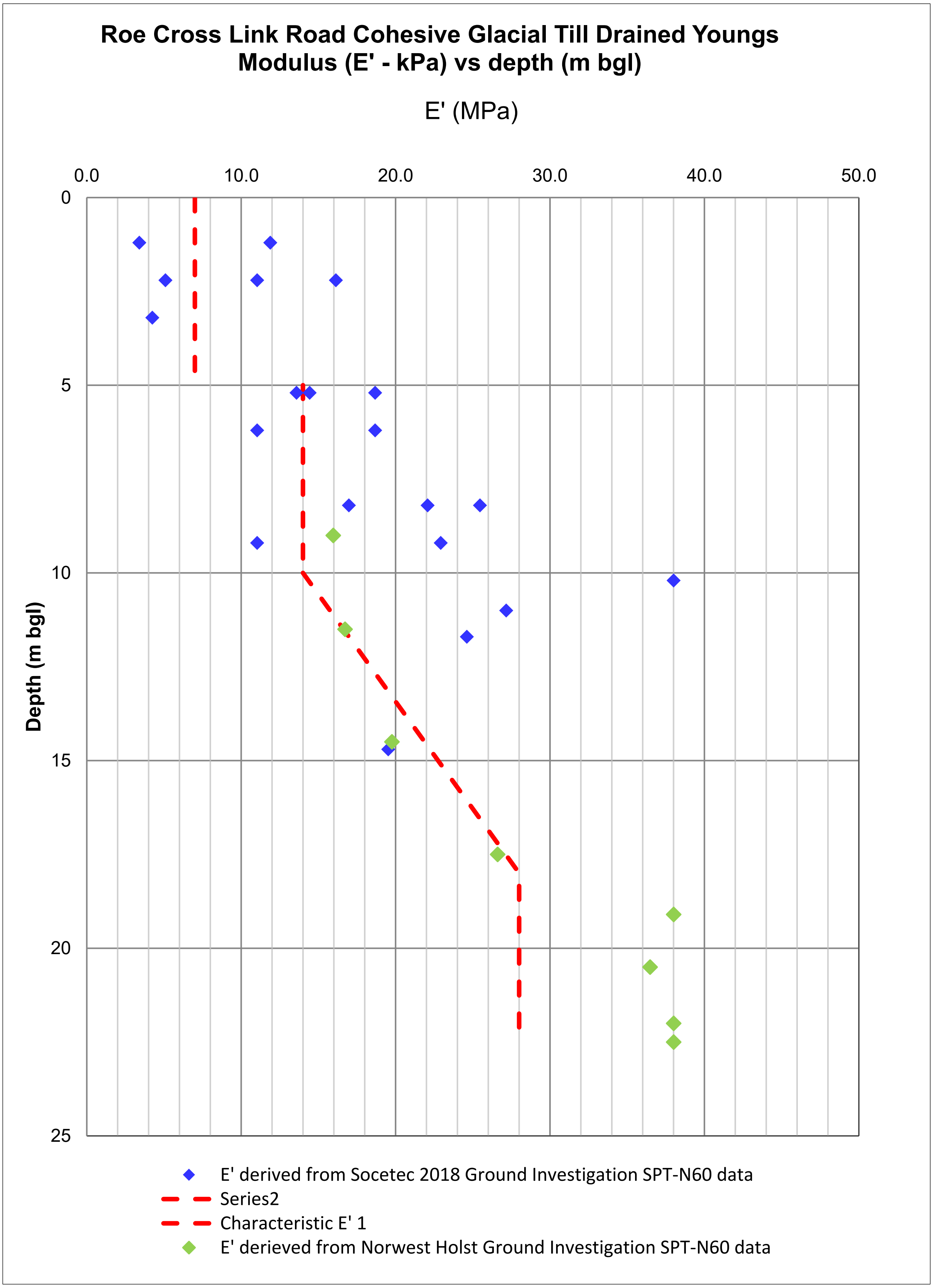
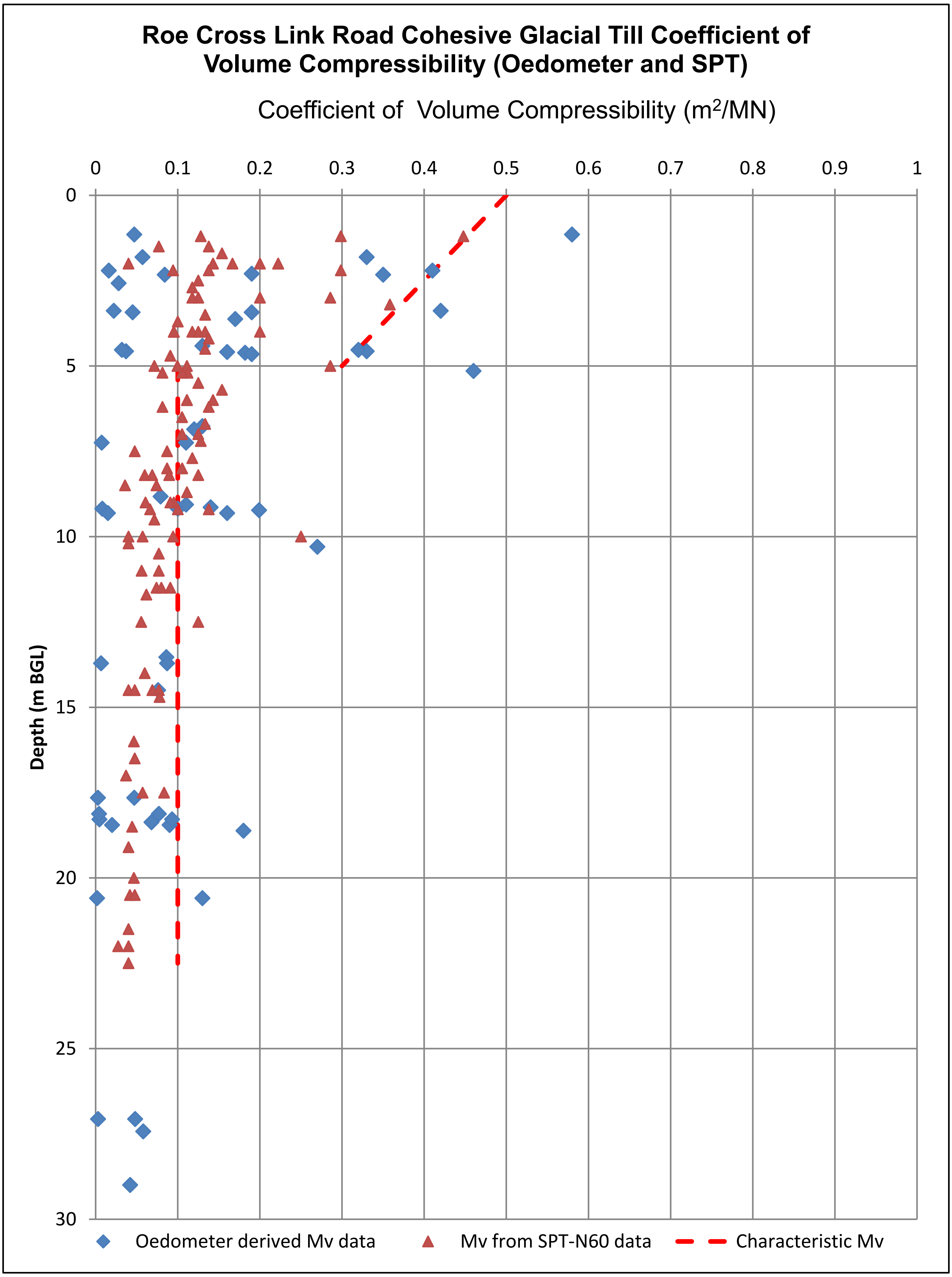


Figure 10.3.14: Roe Cross Link Road Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT data).



10.4 Western Cutting data plots

Figure 10.4.1: Western Cutting Made Ground SPT-N60.

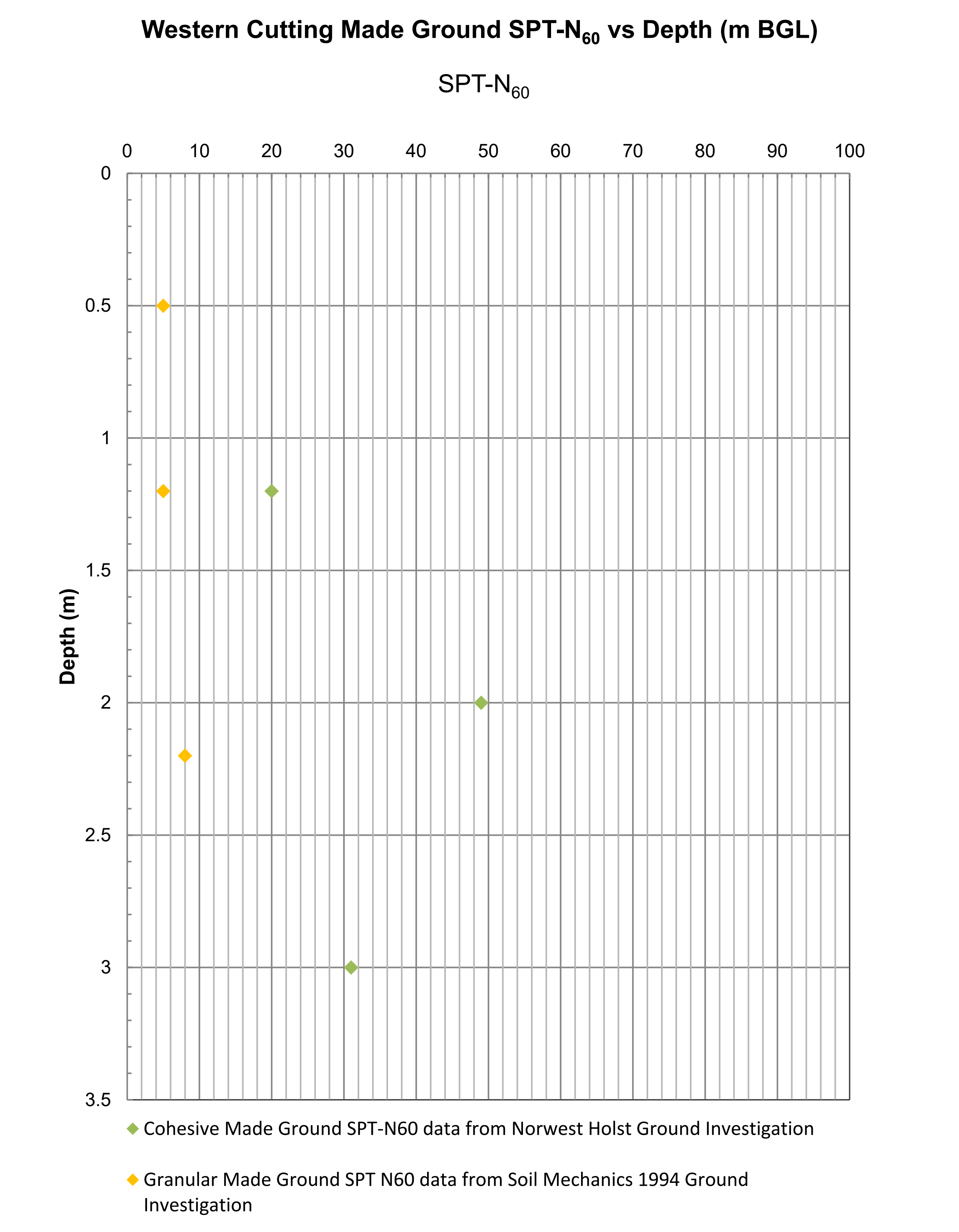


Figure 10.4.2: Western Cutting Granular Made Ground Particle Size Distribution.

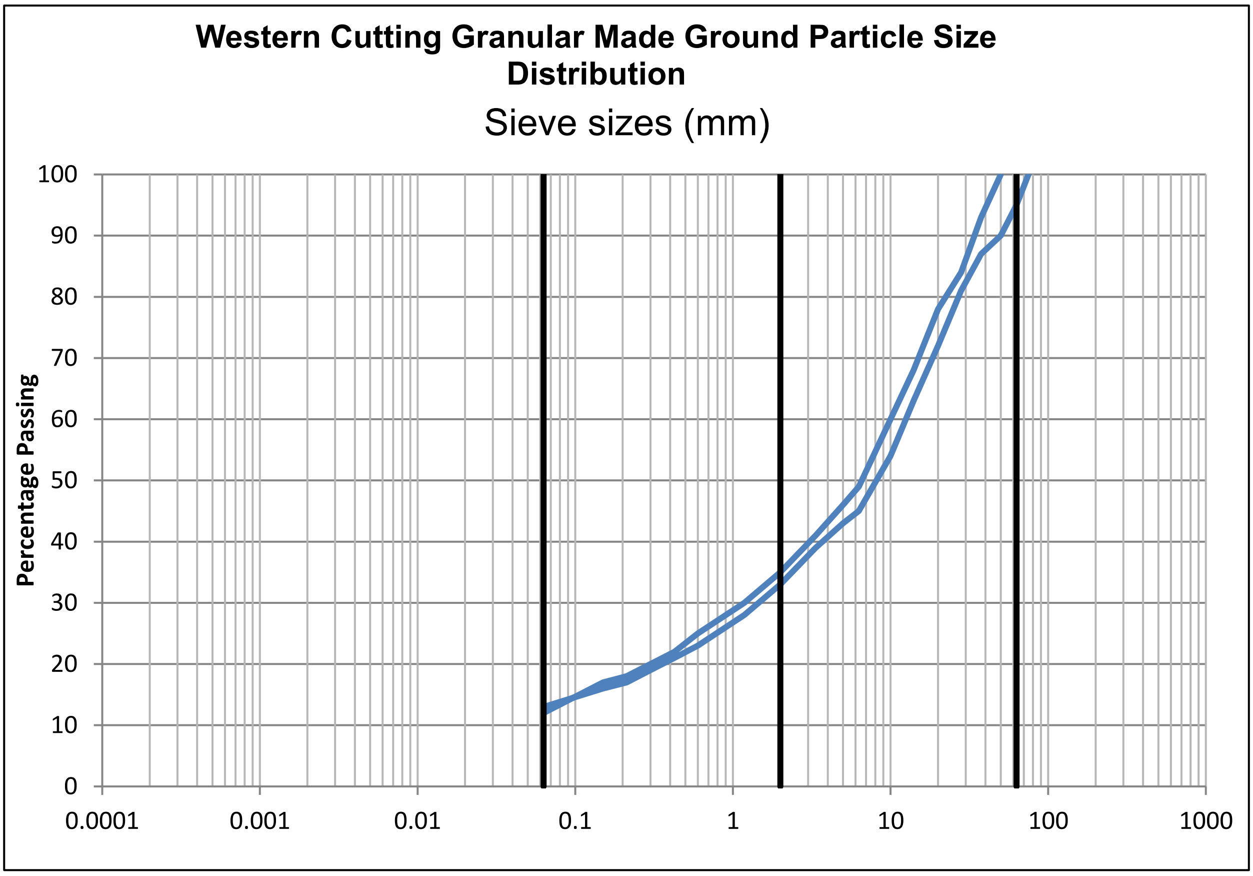


Figure 10.4.3: Western Cutting Cohesive Glacial Till Moisture Content.

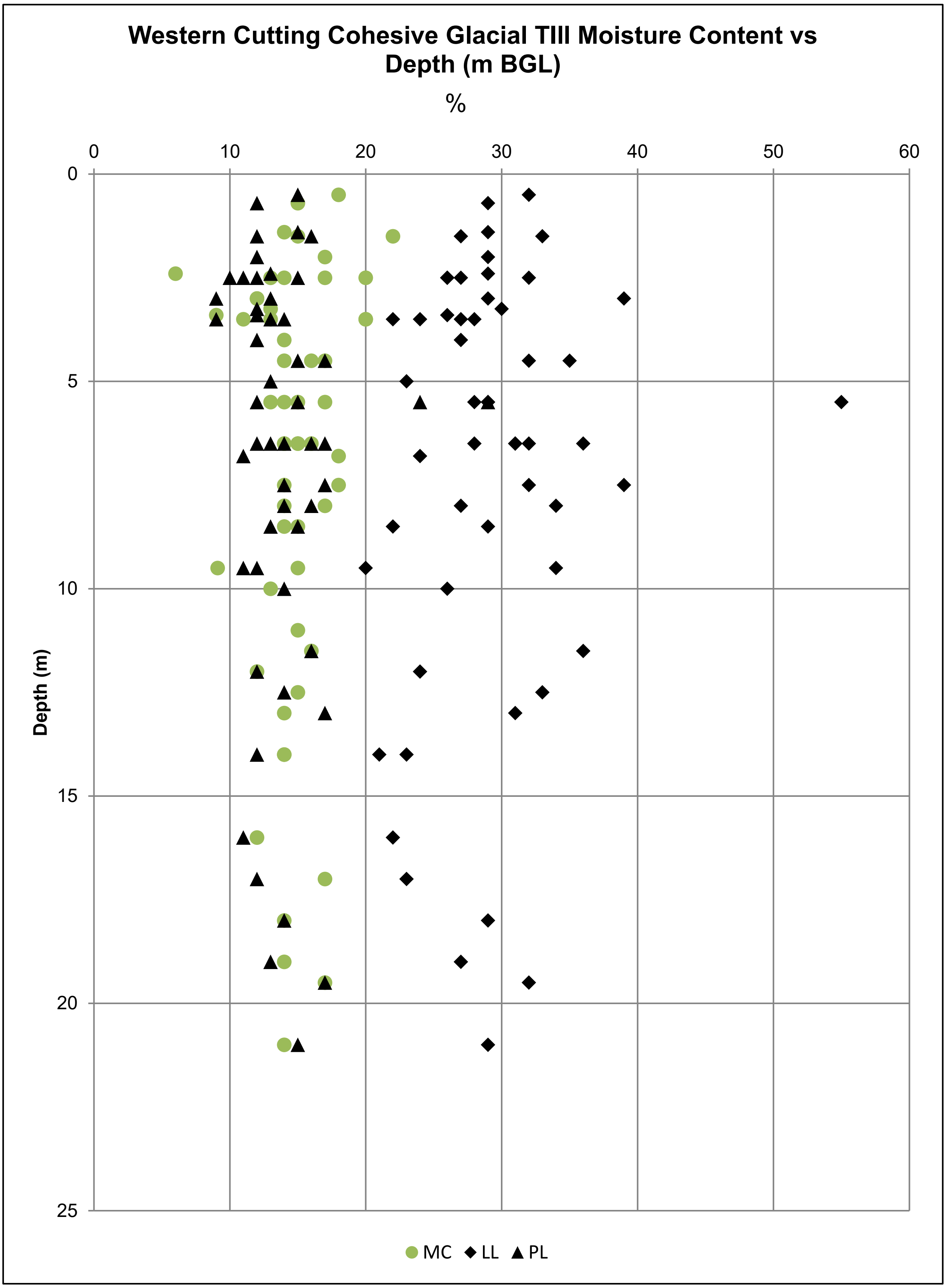


Figure 10.4.4: Western Cutting Cohesive Glacial Till Plasticity Index against Liquid Limit.

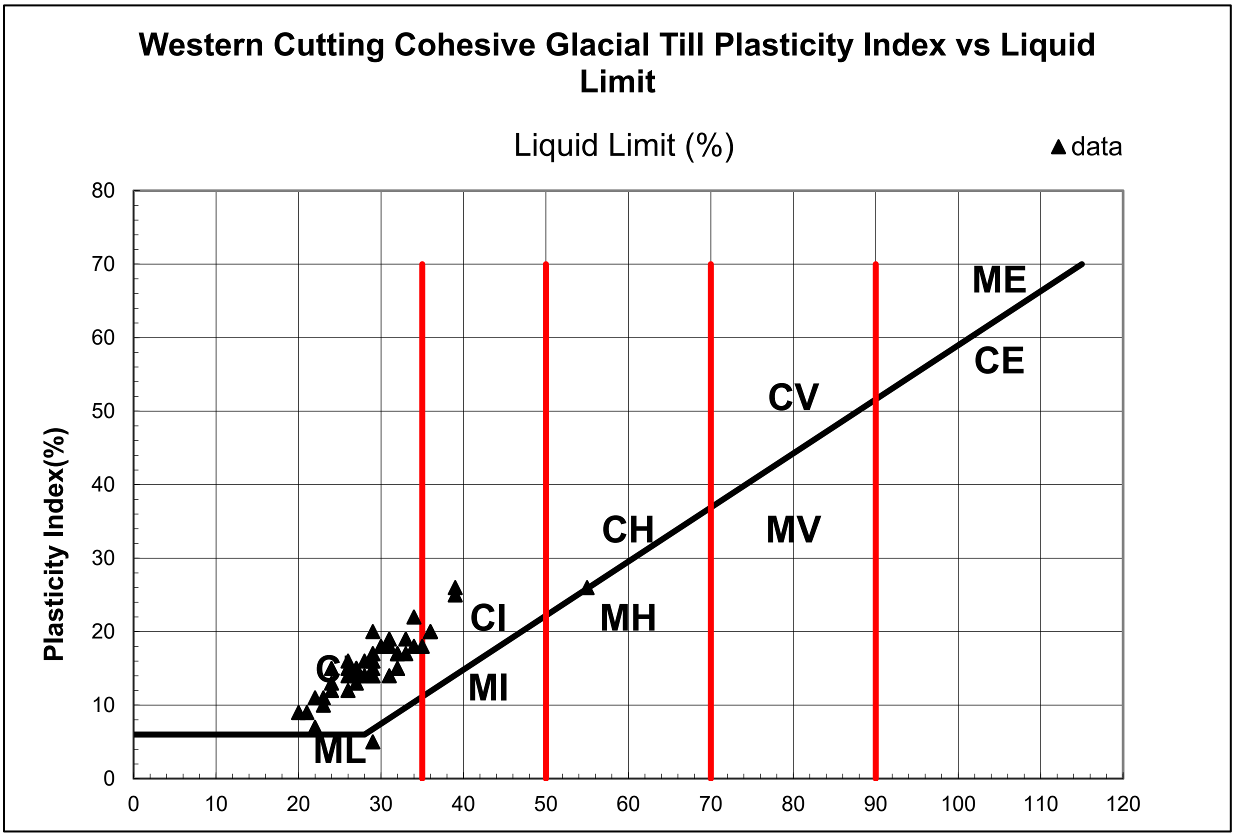


Figure 10.4.5: Western Cutting Cohesive Glacial Till SPT-N60.

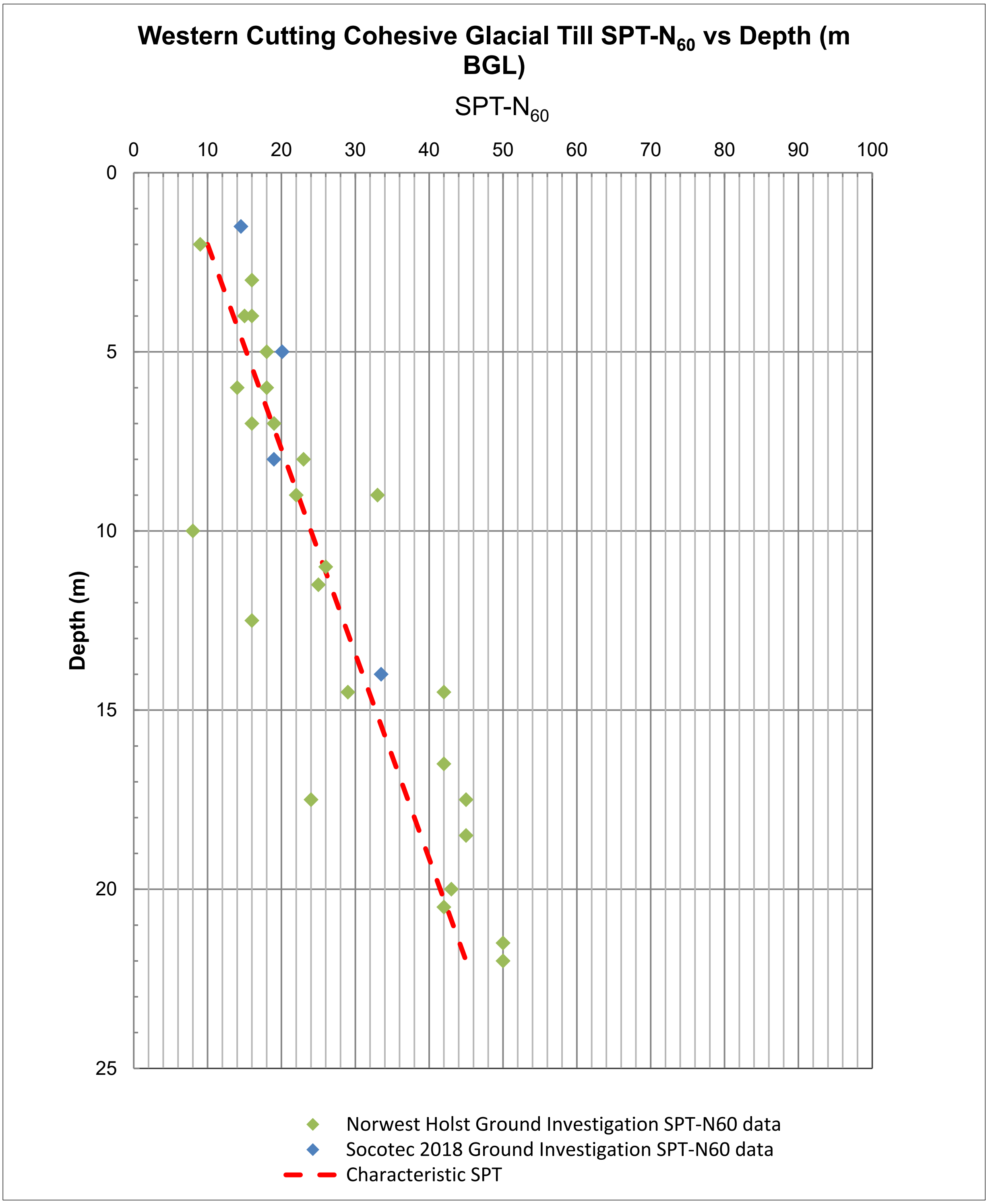


Figure 10.4.6: Western Cutting Cohesive Glacial Till Particle Size Distribution.

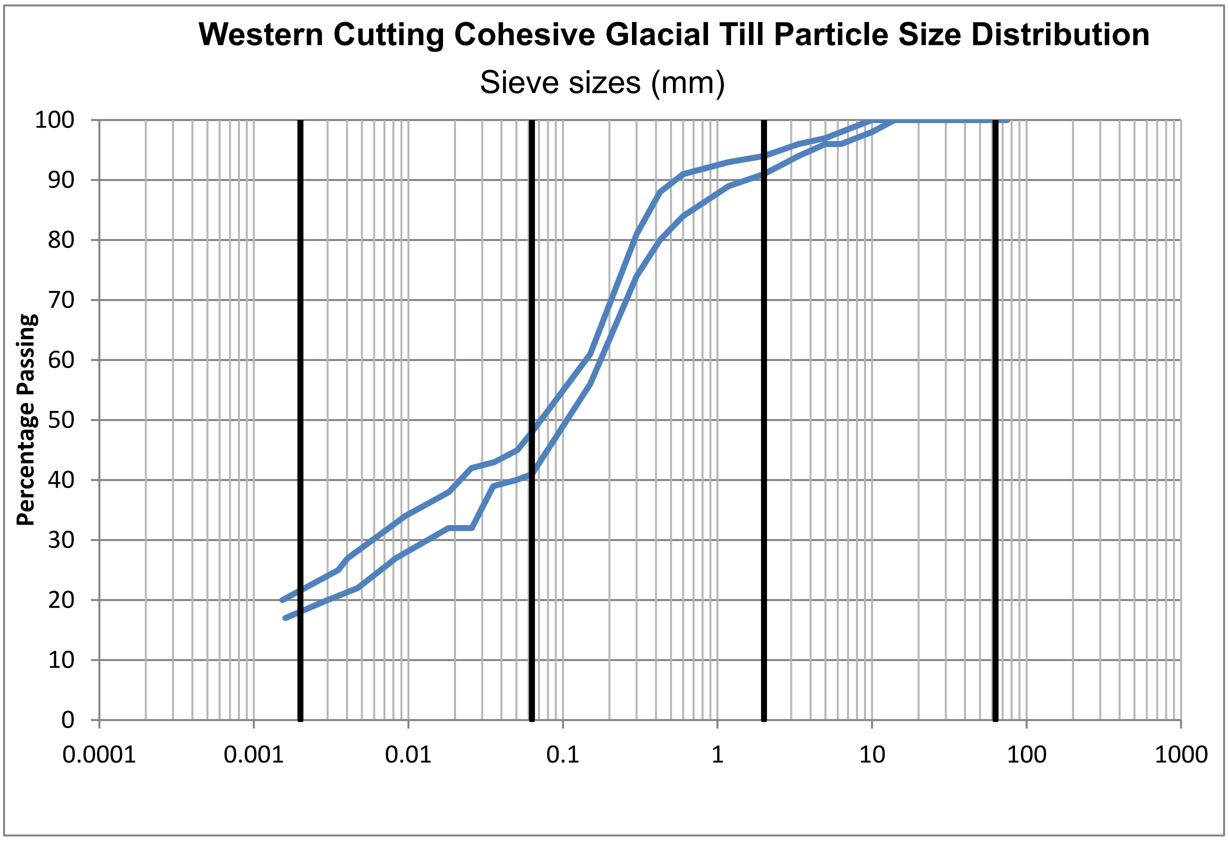


Figure 10.4.7: Western Cutting Cohesive Glacial Till Undrained Shear Strength.

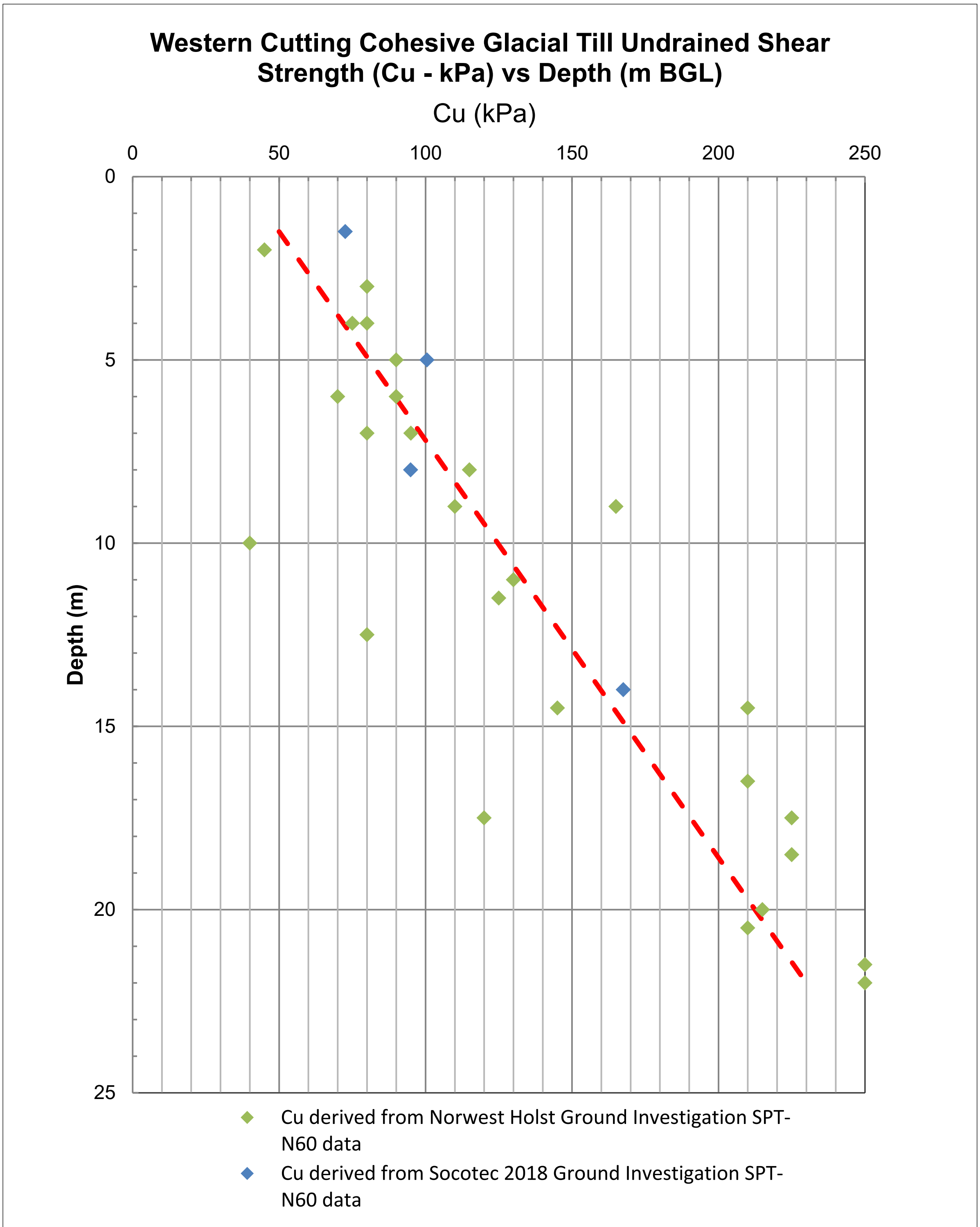


Figure 10.4.8: Western Cutting Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer).

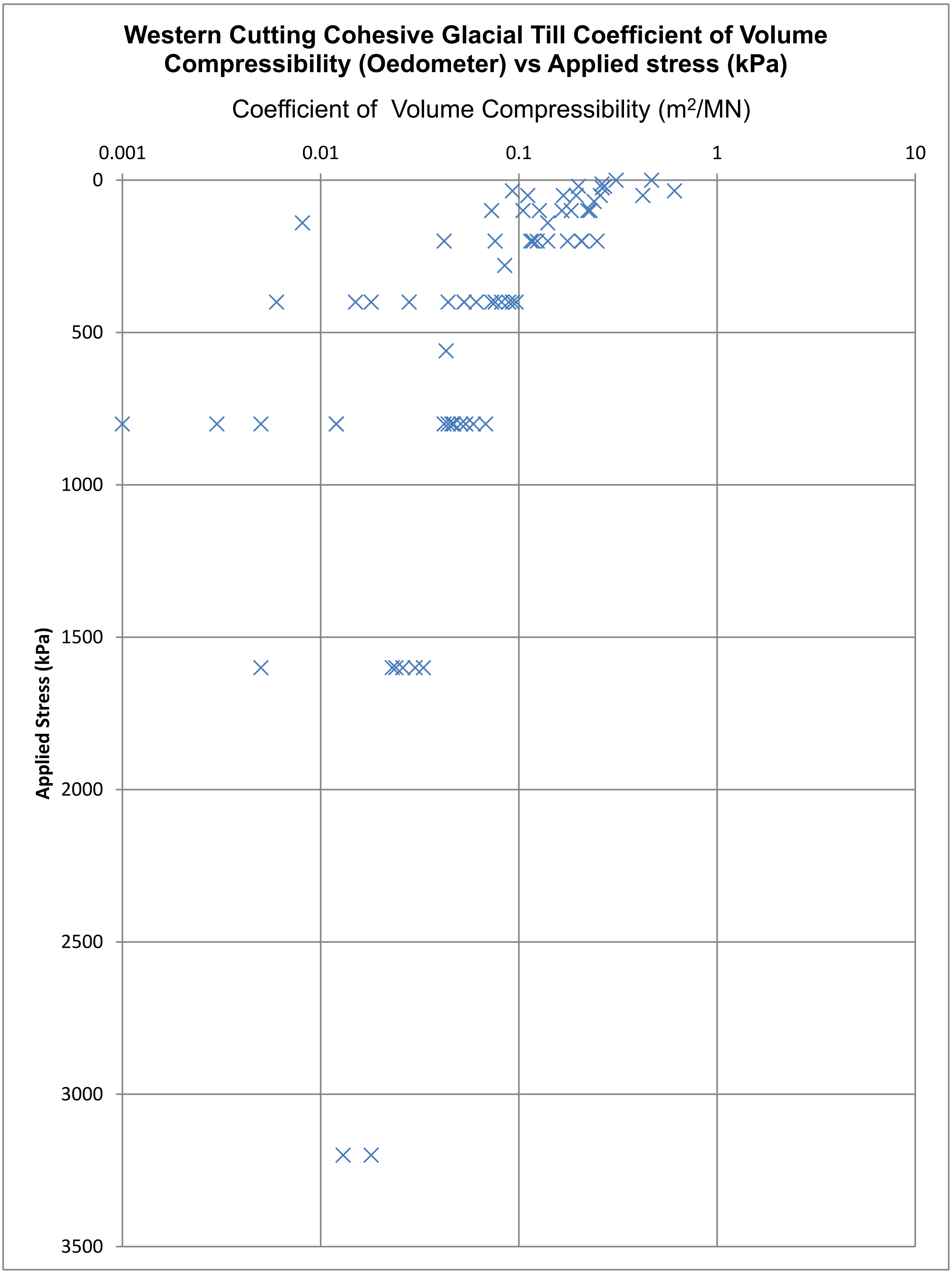


Figure 10.4.9: Western Cutting Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

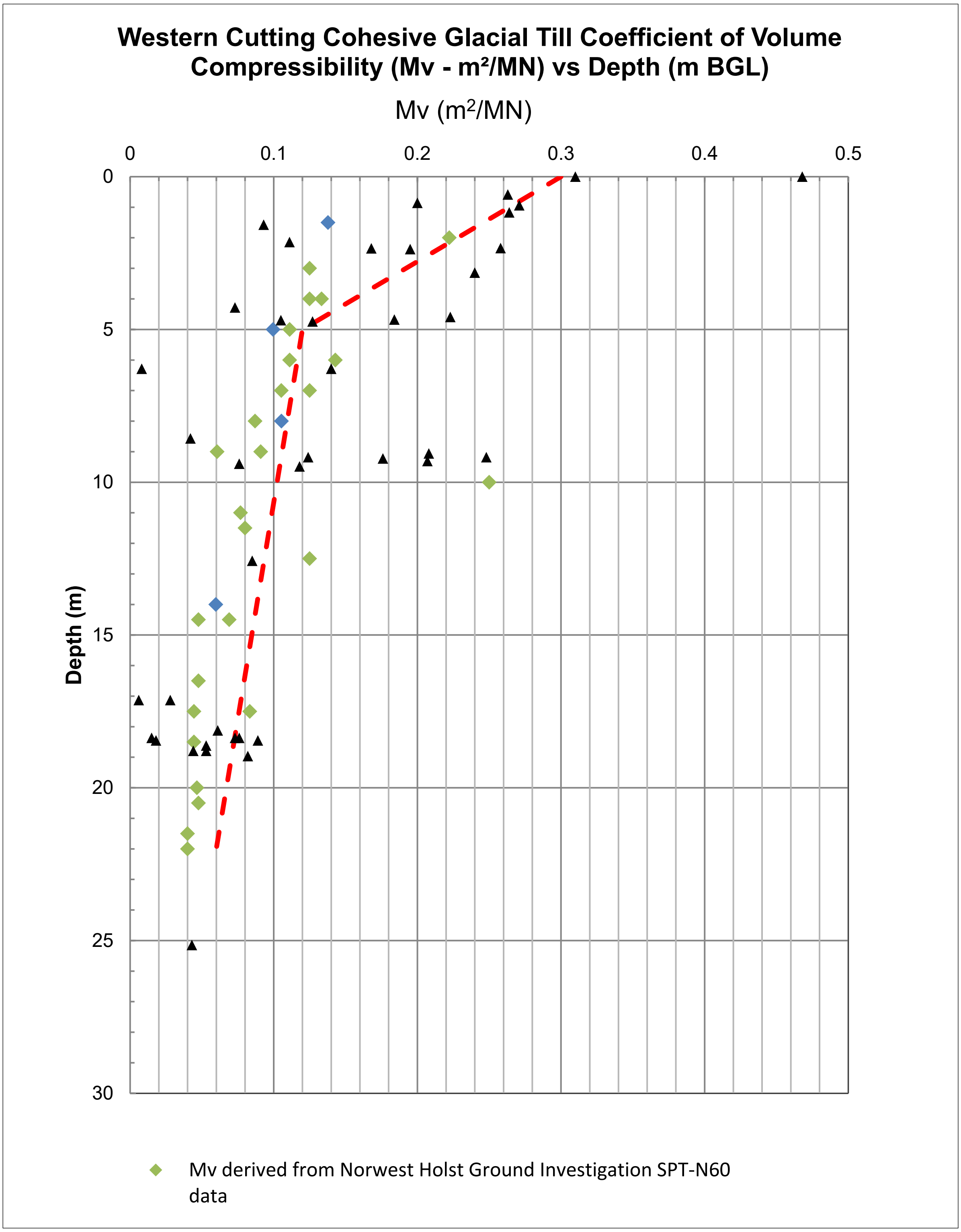


Figure 10.4.10: Western Cutting Cohesive Glacial Till Undrained Youngs Modulus (SPT).

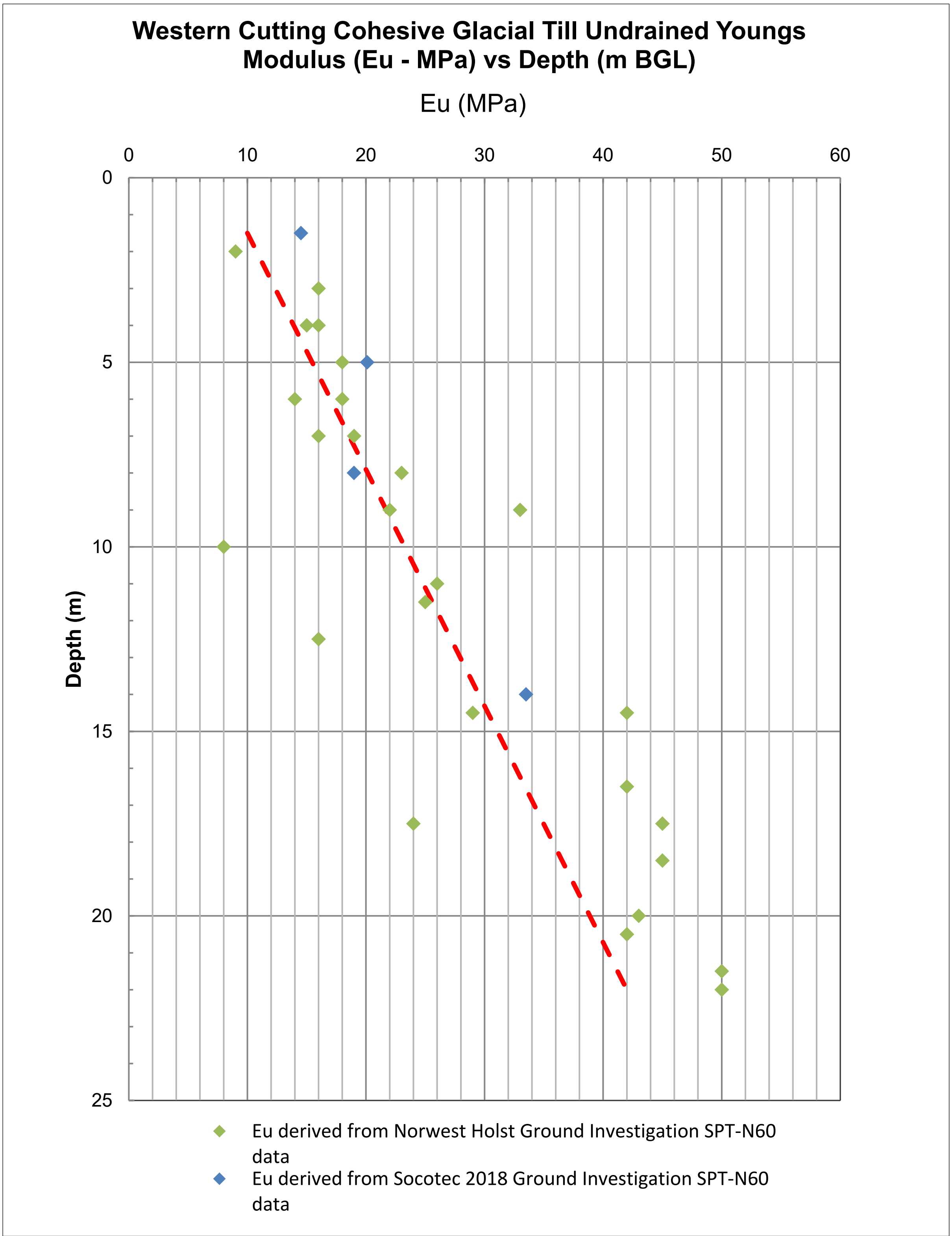


Figure 10.4.11: Western Cutting Cohesive Glacial Till Drained Youngs Modulus (SPT).

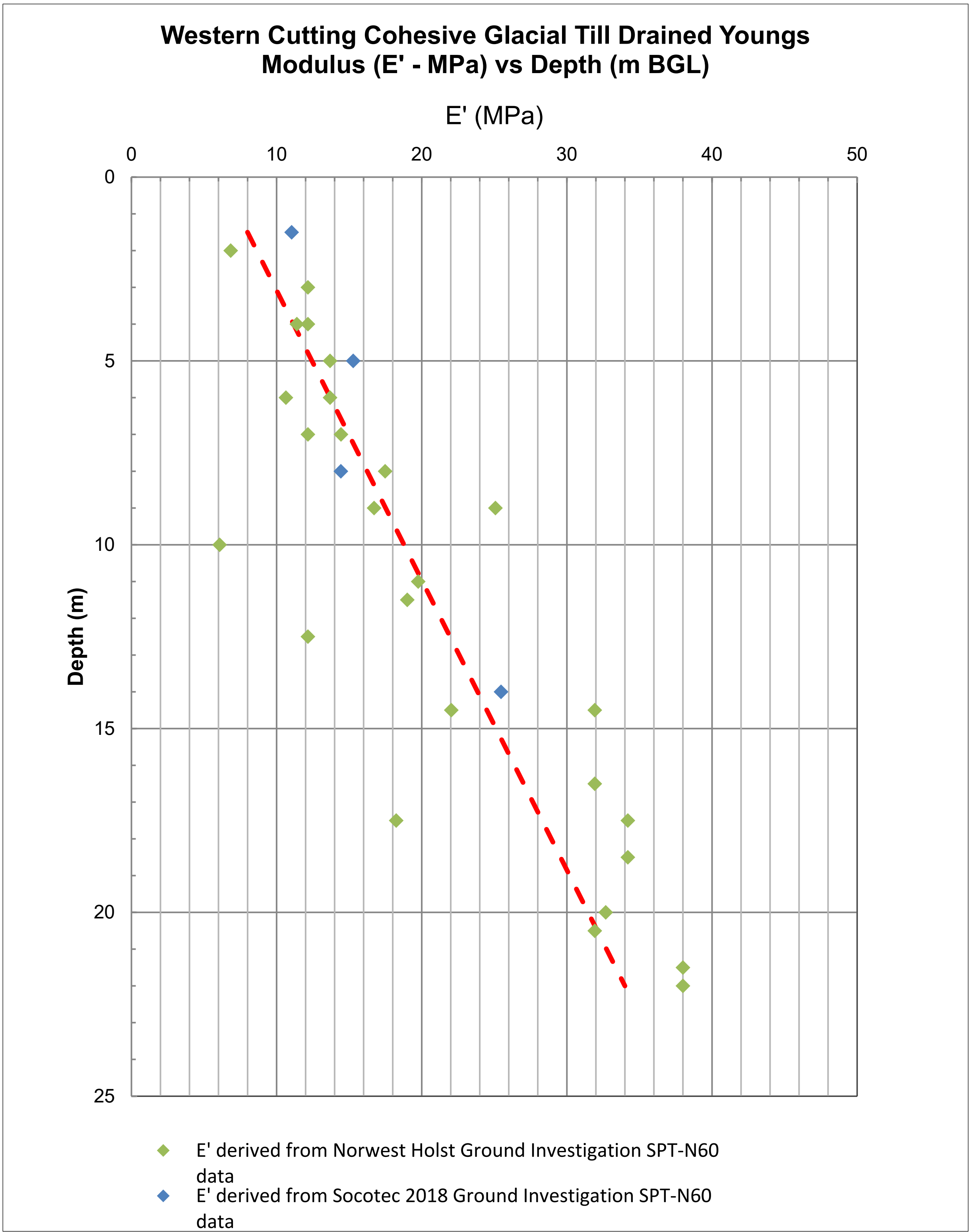


Figure 10.4.12: Western Cutting Laminated Glacial Till Moisture Content.

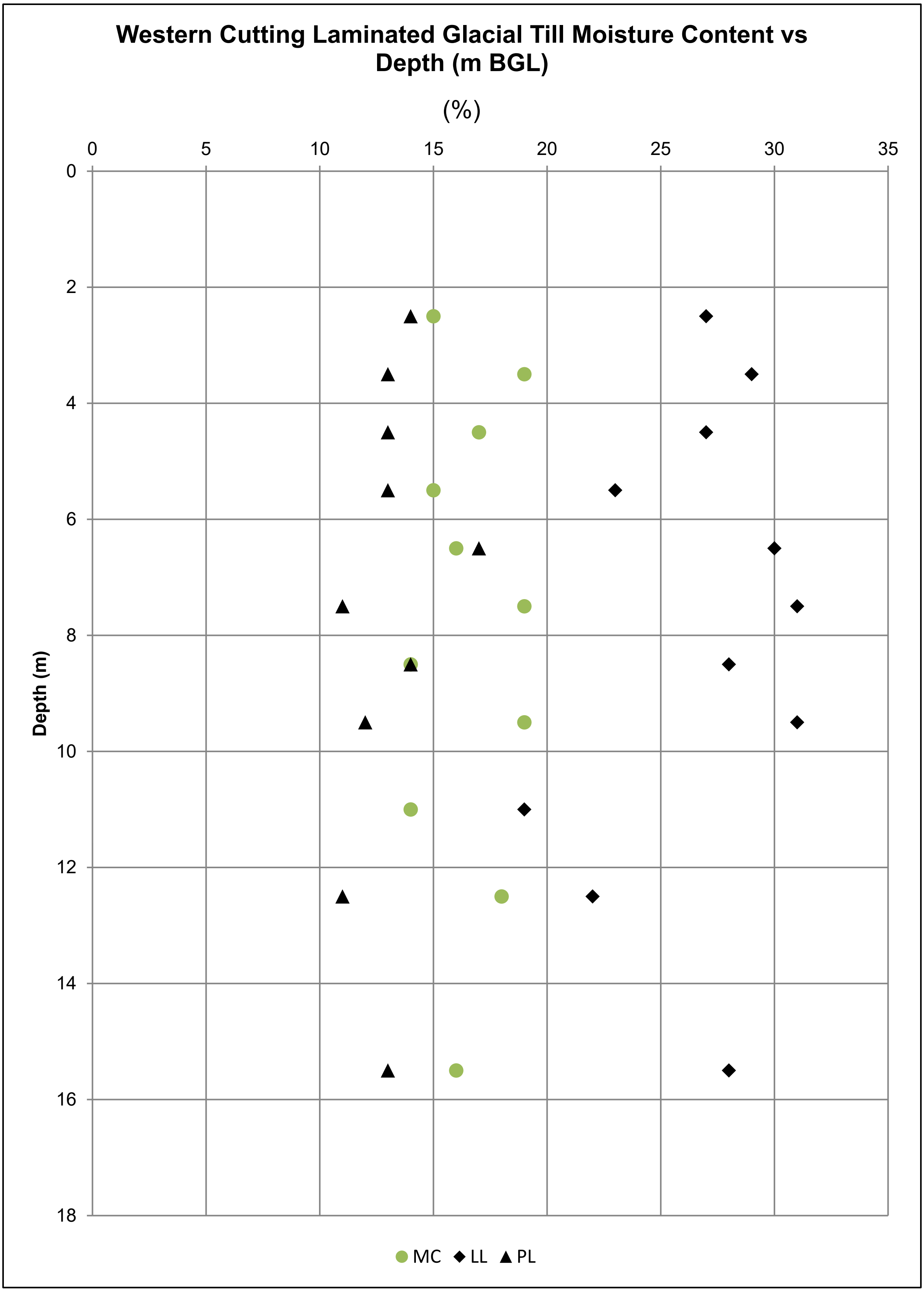


Figure 10.4.13: Western Cutting Laminated Glacial Till Plasticity Index vs Liquid Limit.

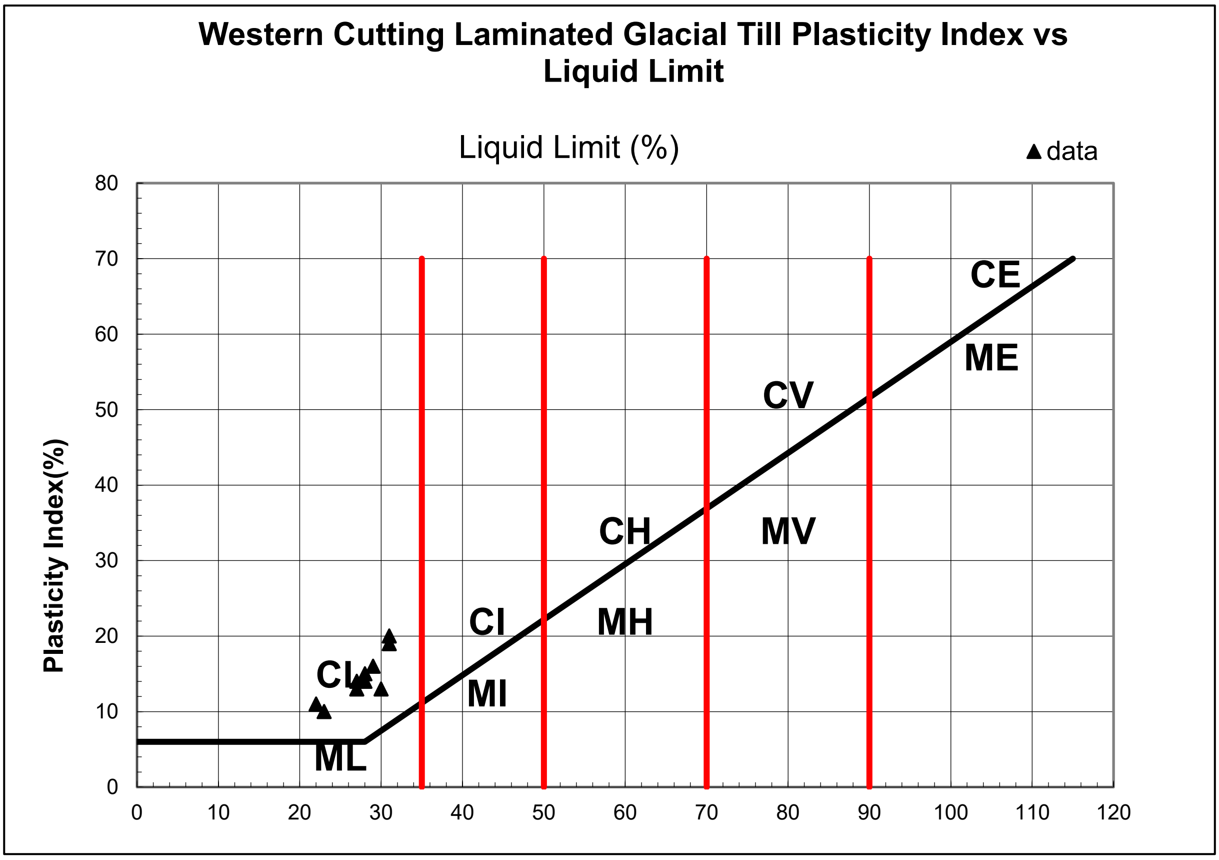


Figure 10.4.14: Western Cutting Laminated Glacial Till SPT-N_{60}.

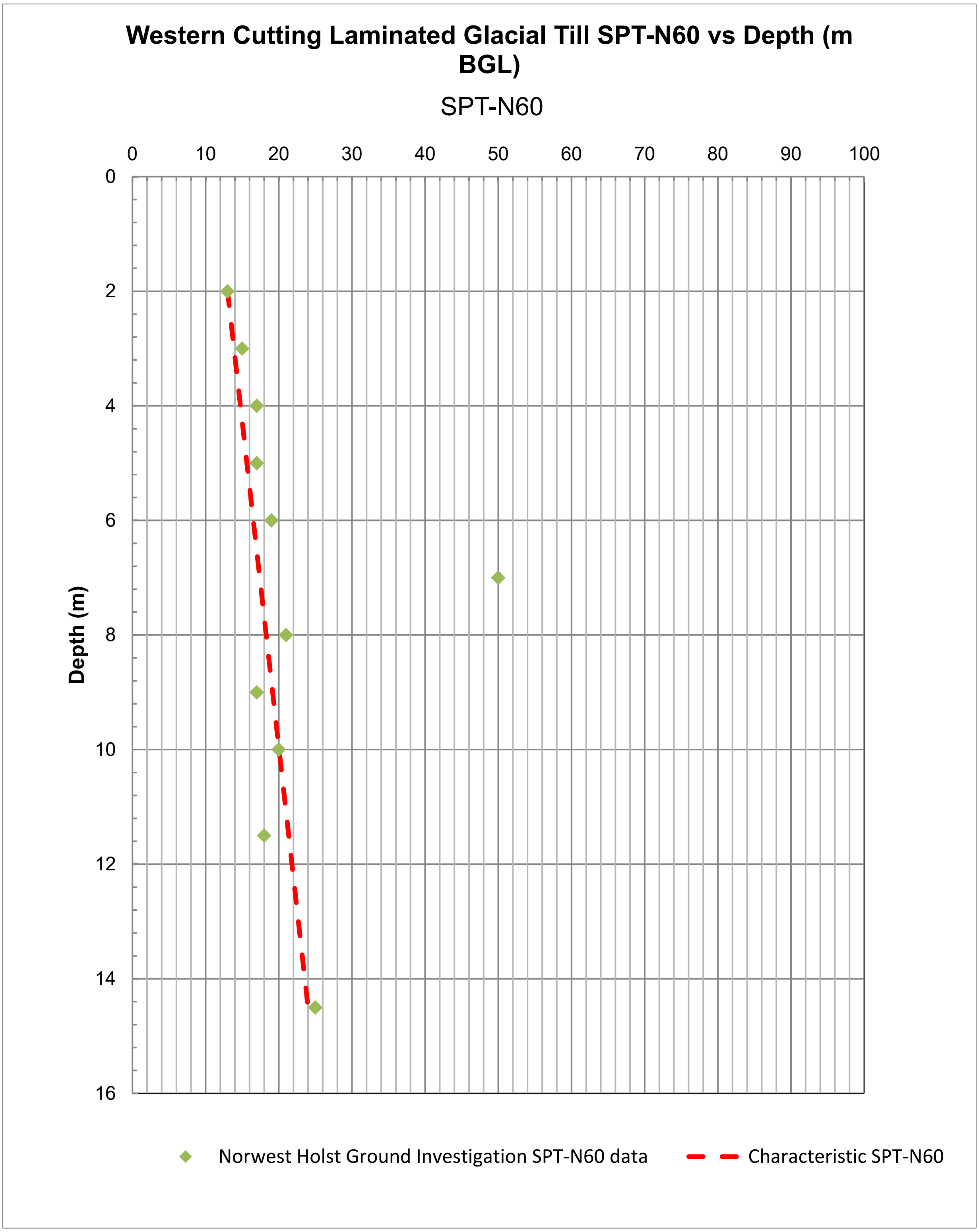


Figure 10.4.15: Western Cutting Laminated Glacial Till Undrained Shear Strength.

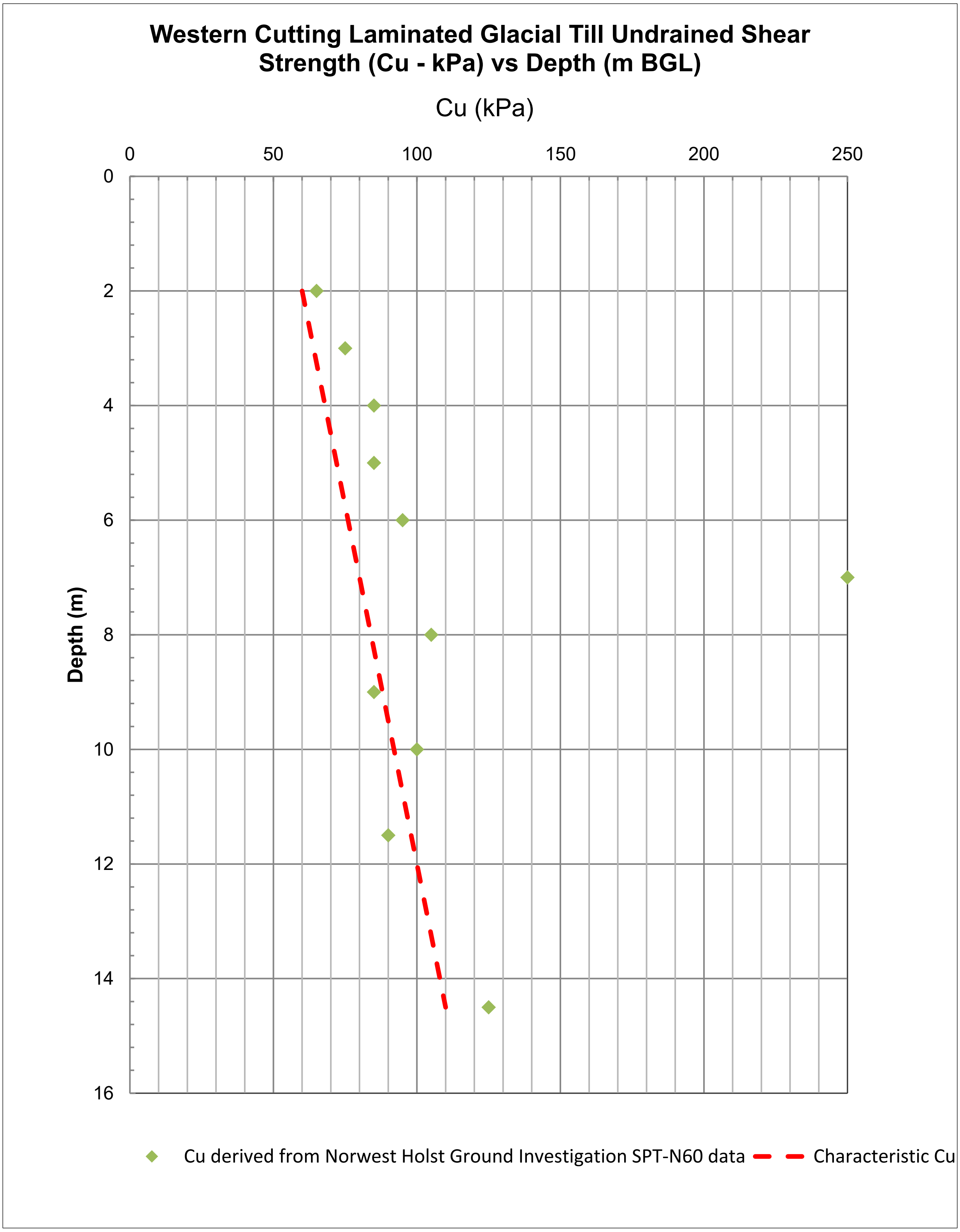


Figure 10.4.16: Western Cutting Laminated Glacial Till Coefficient of Volume Compressibility (Oedometer).

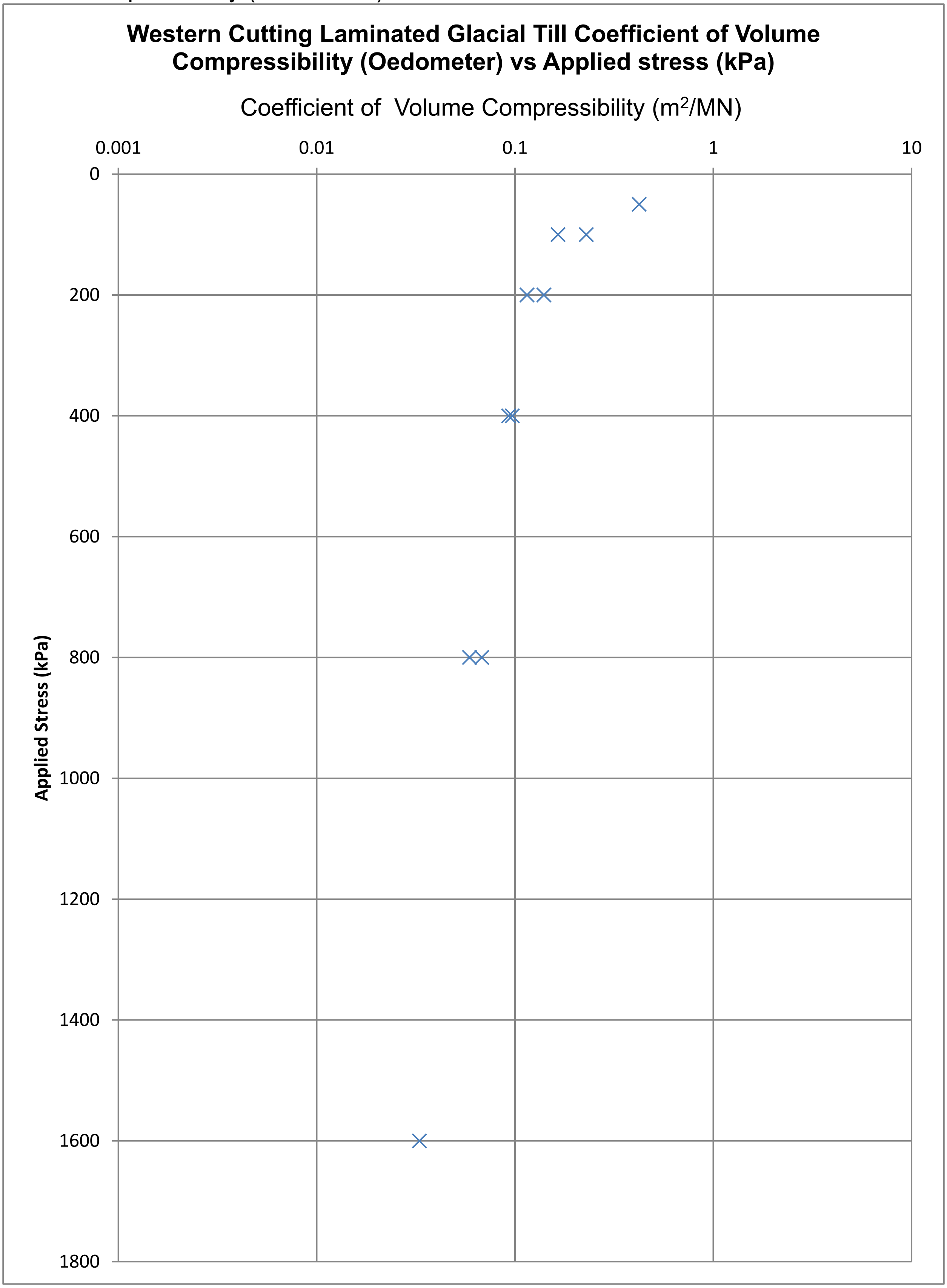


Figure 10.4.17: Western Cutting Laminated Glacial Till Coefficient of Volume Compressibility (SPT).

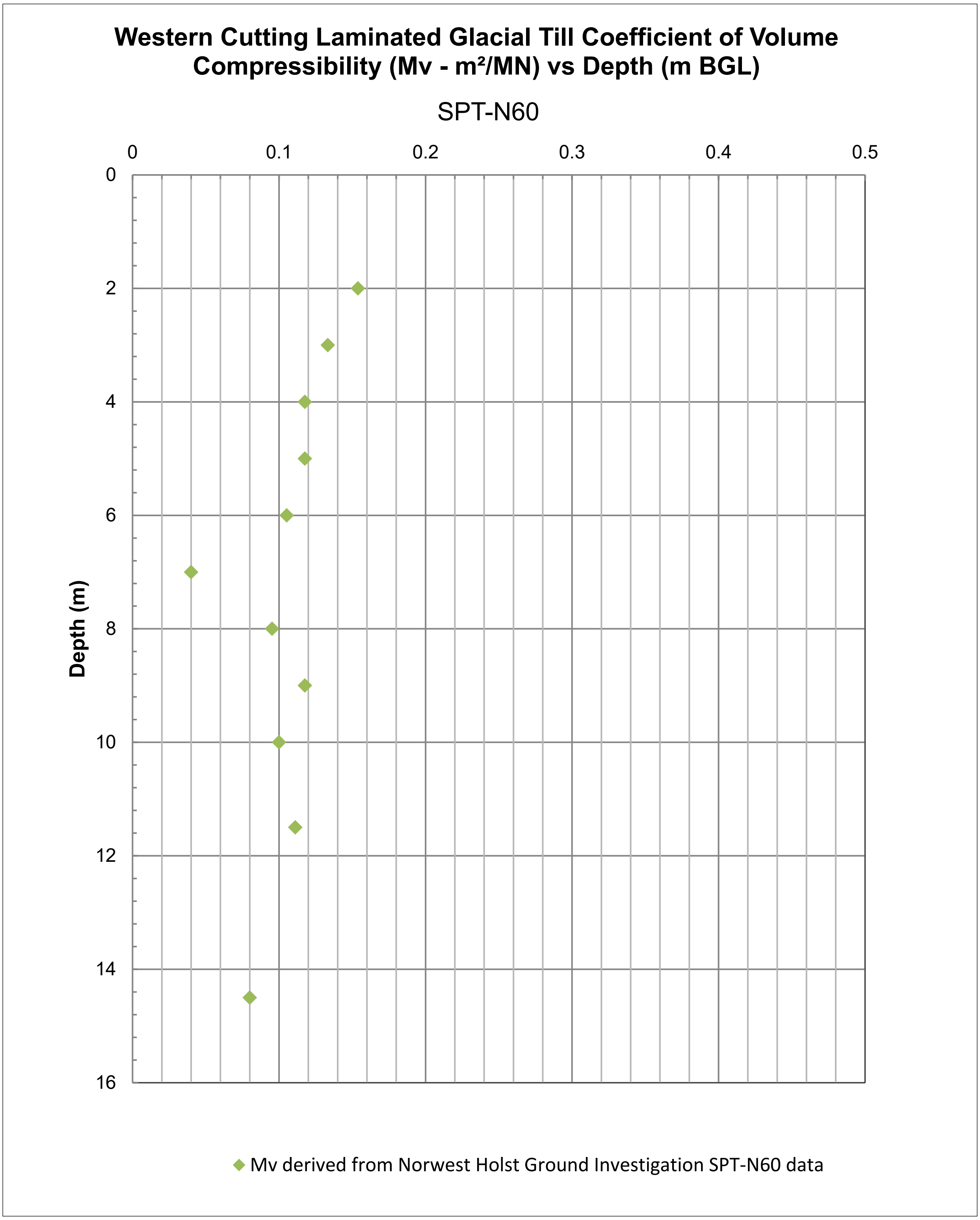


Figure 10.4.18: Western Cutting Laminated Glacial Till Undrained Youngs Modulus (SPT).

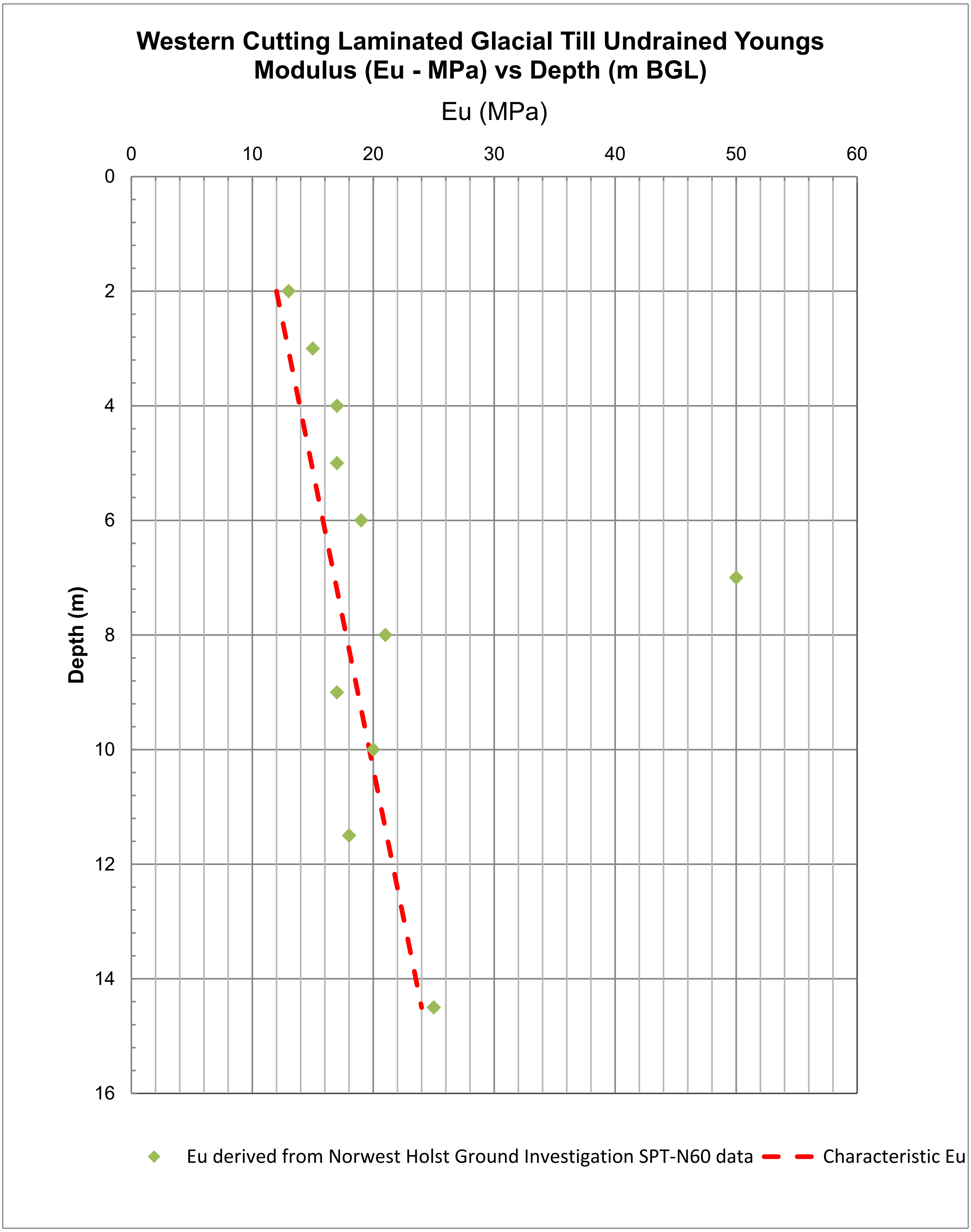


Figure 10.4.19: Western Cutting Laminated Glacial Till Drained Youngs Modulus (SPT).

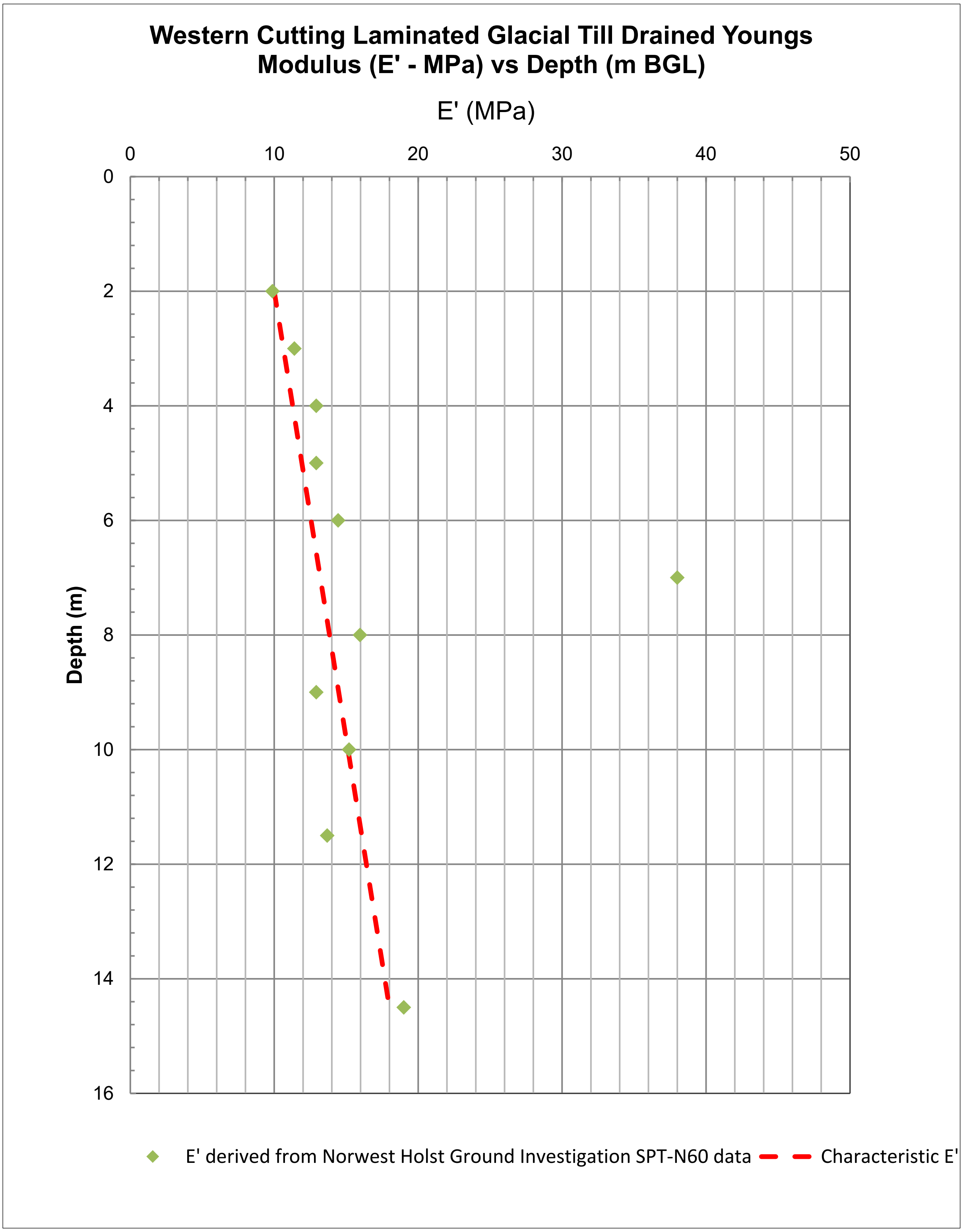


Figure 10.4.20: Western Cutting Cohesive Glacial Till Angle of Internal Friction.

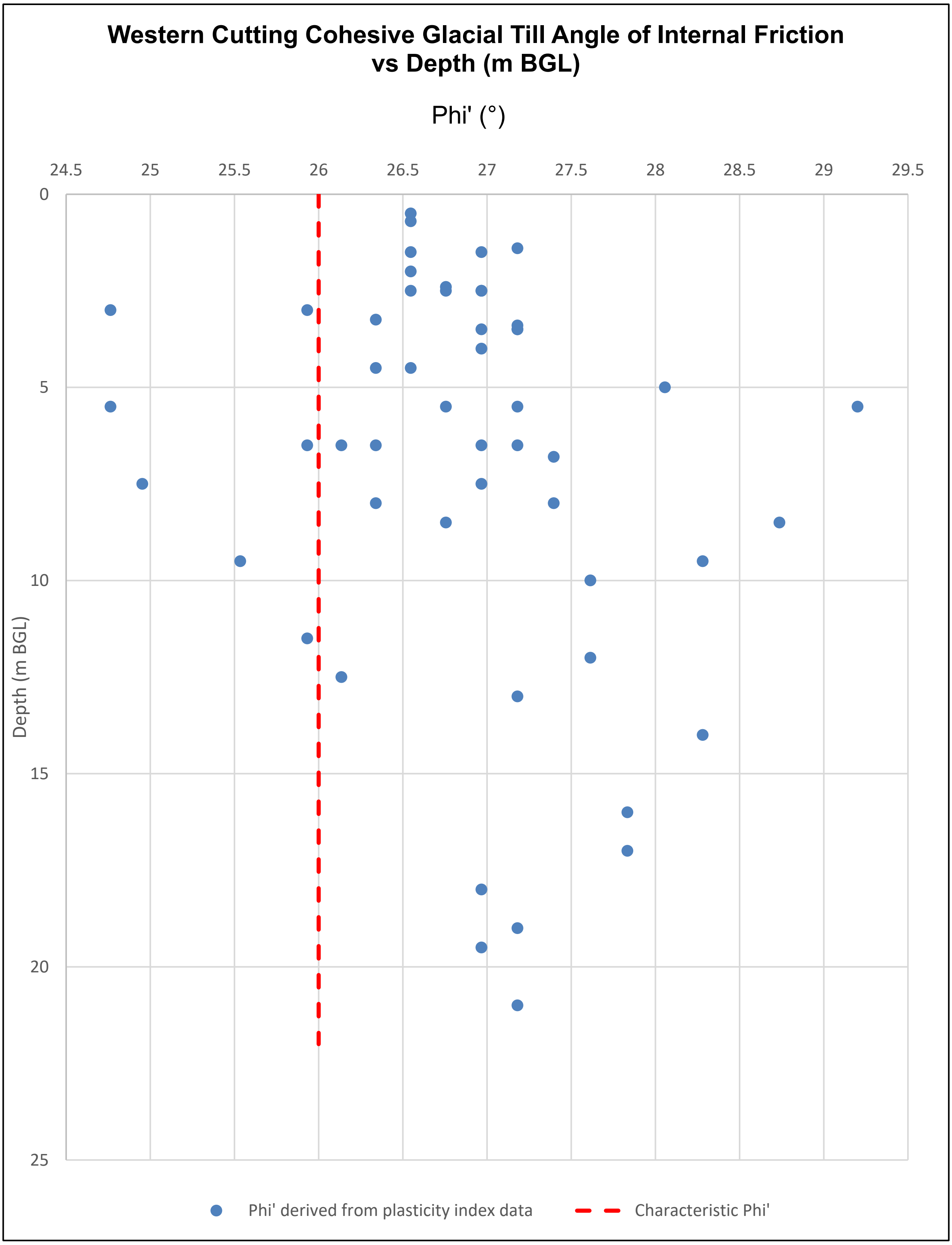


Figure 10.4.21: Western Cutting Cohesive Glacial Till Coefficient of Consolidation.

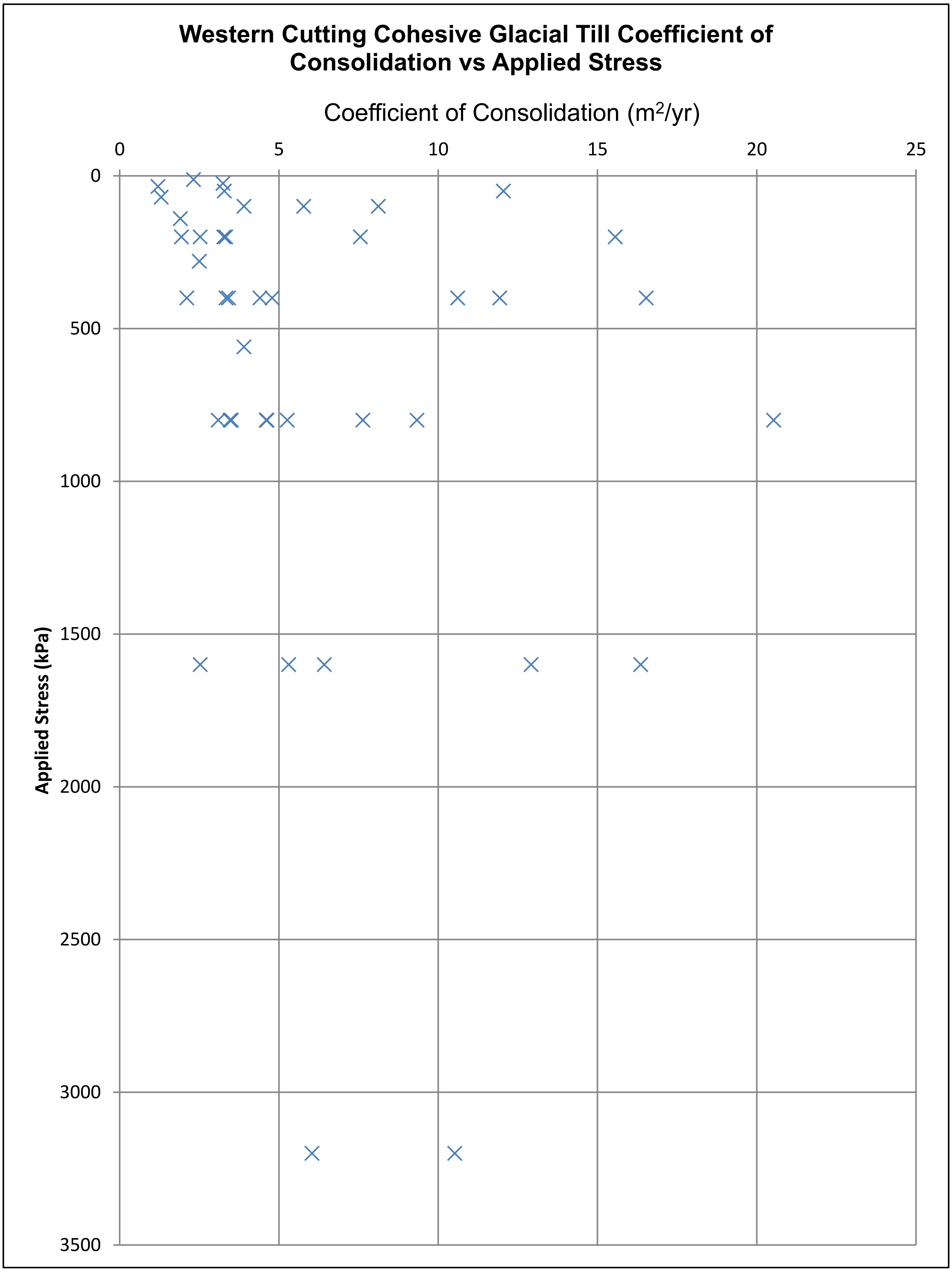


Figure 10.4.22: Western Cutting Laminated Glacial Till Angle of Internal Friction.

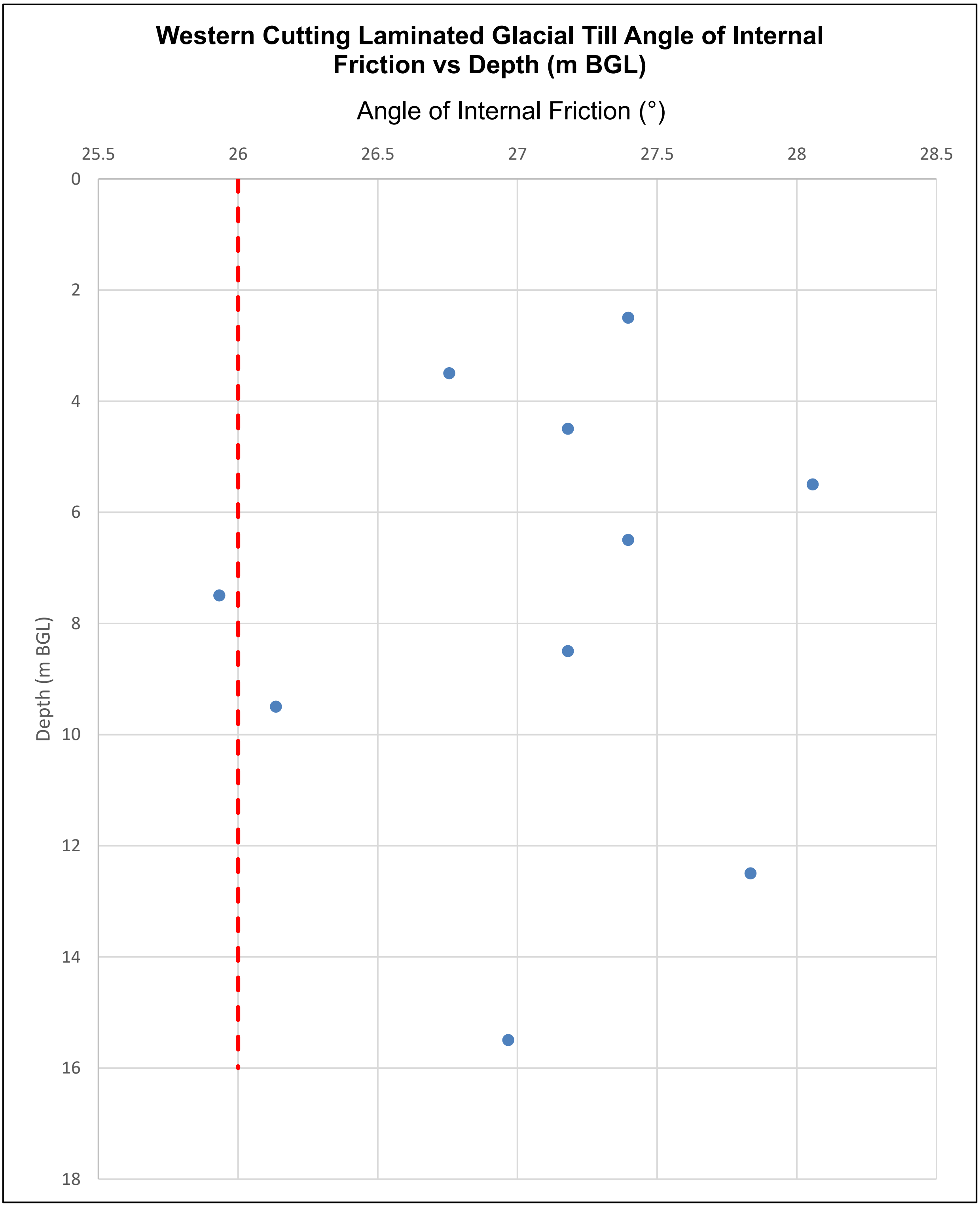


Figure 10.4.23: Western Cutting Laminated Glacial Till Coefficient of Consolidation against Applied Stress.

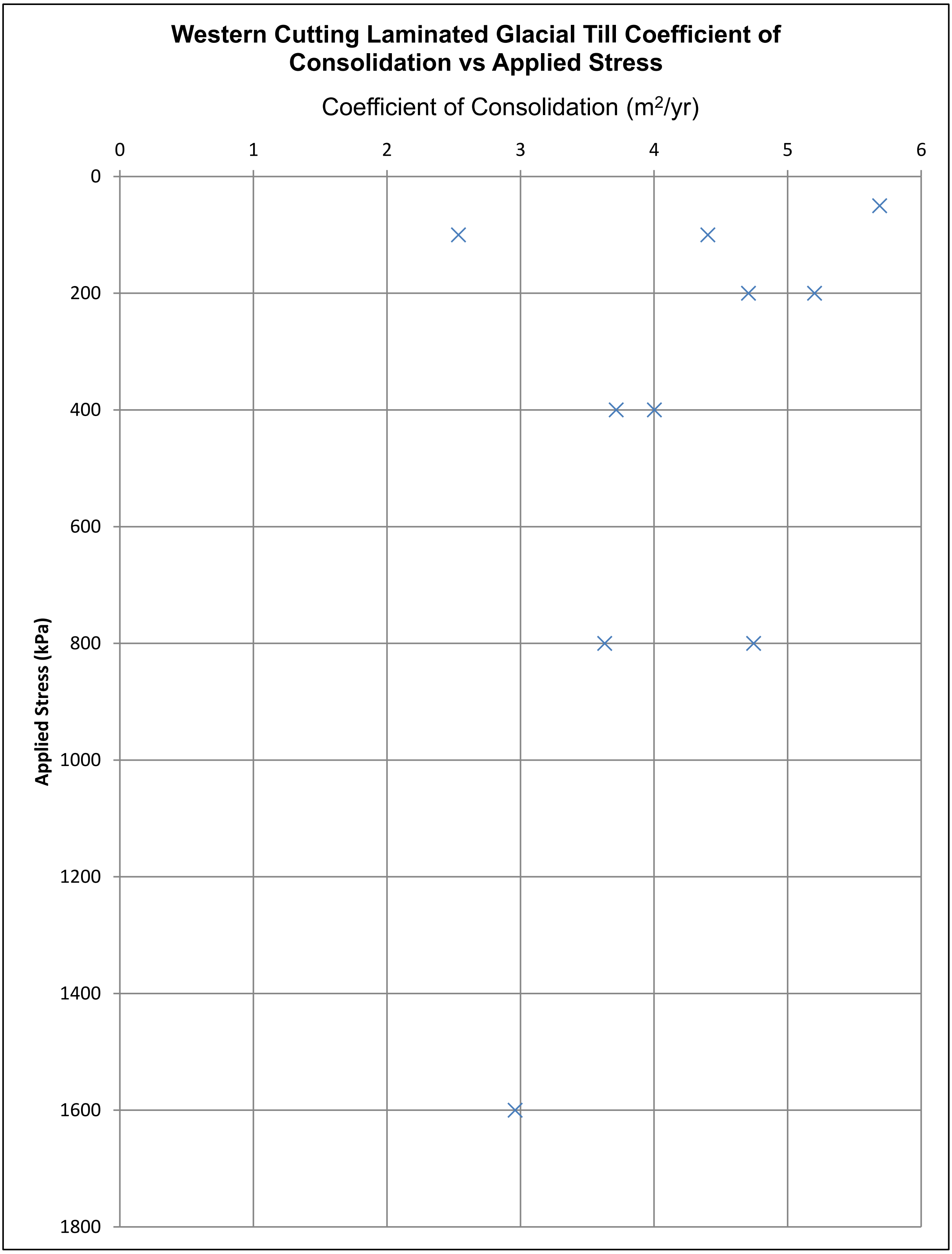


Figure 10.4.24: Western Cutting Granular Glacial Till SPT-N_{60}.

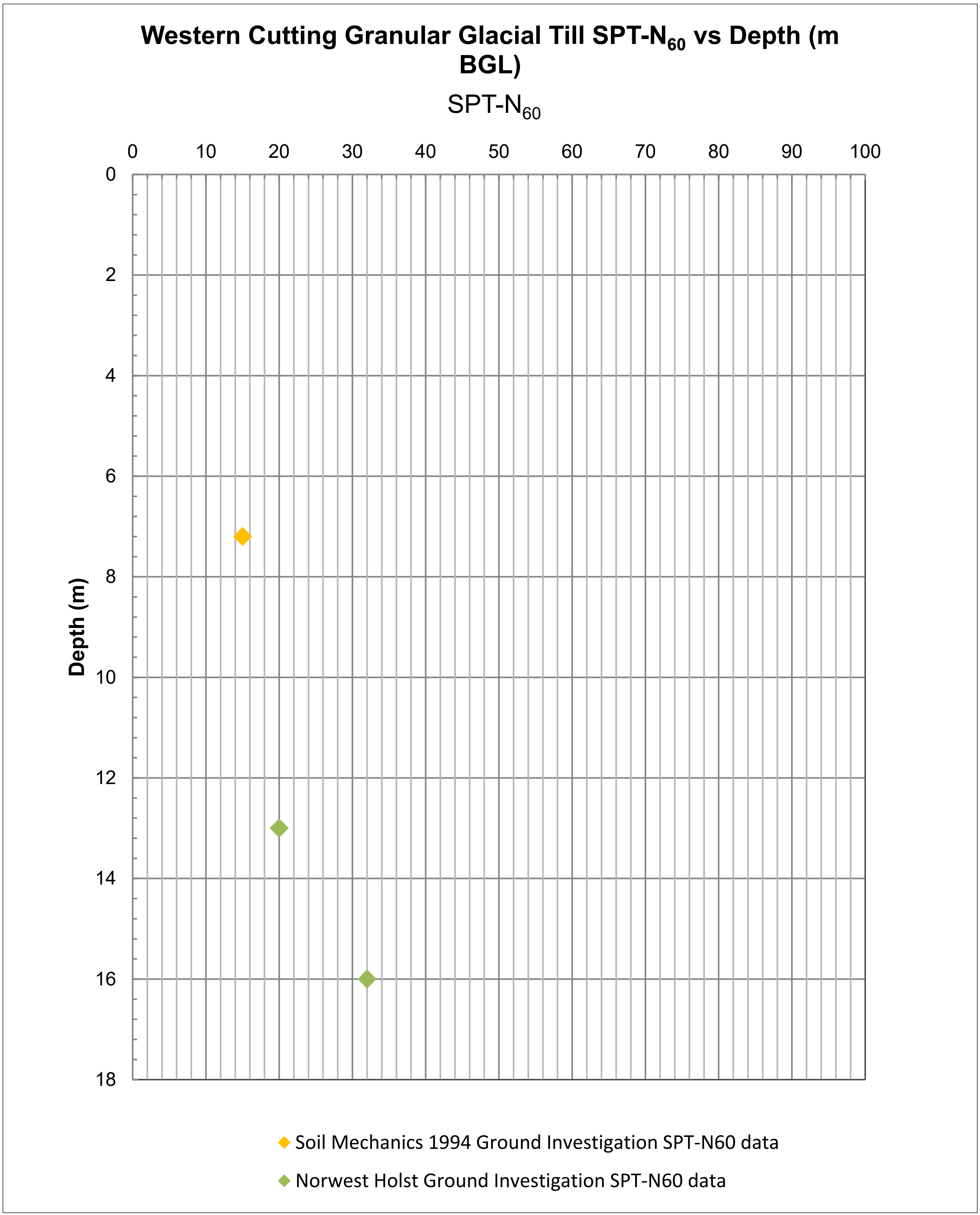


Figure 10.4.25: Western Cutting Granular Glacial Till Angle of Internal Friction.

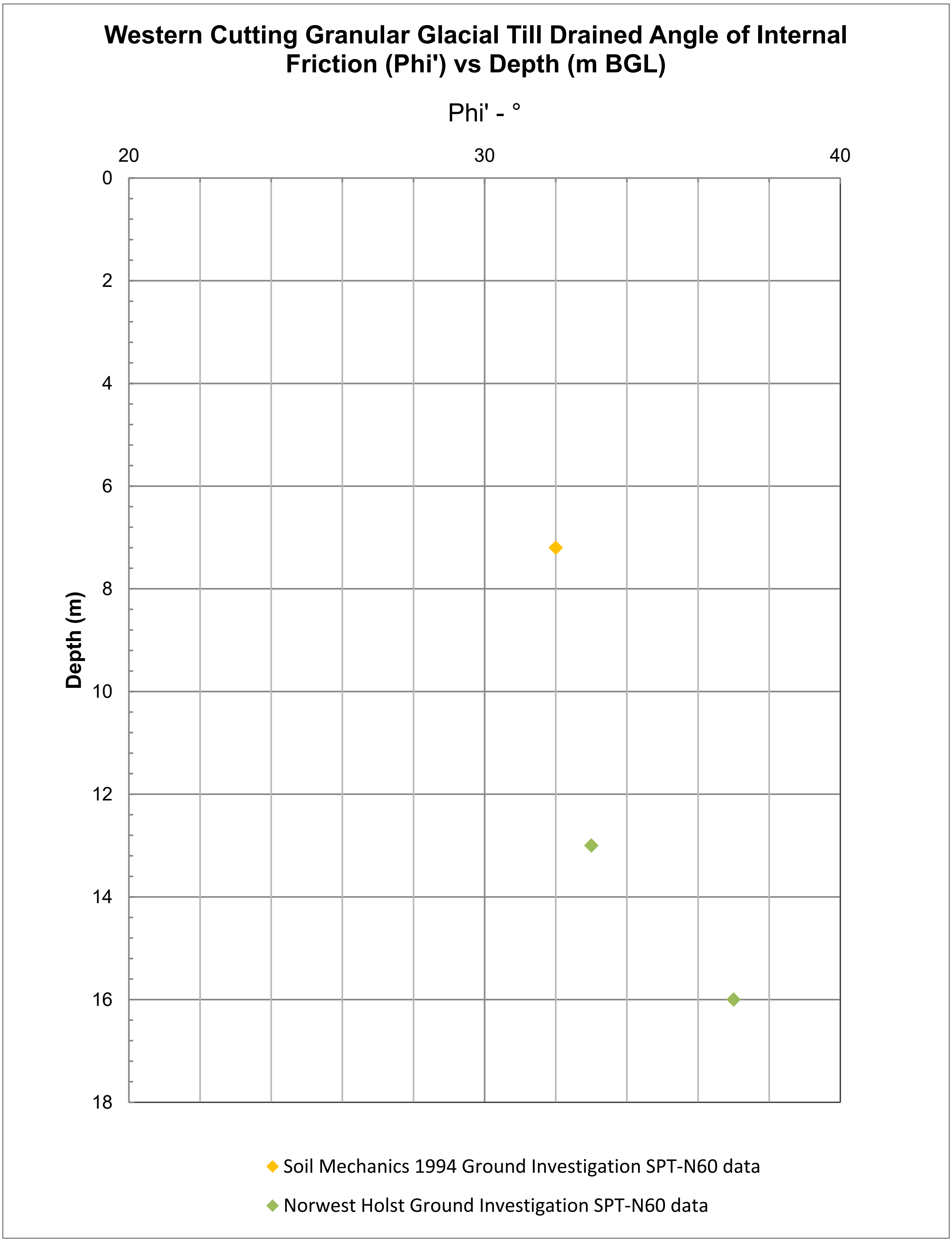
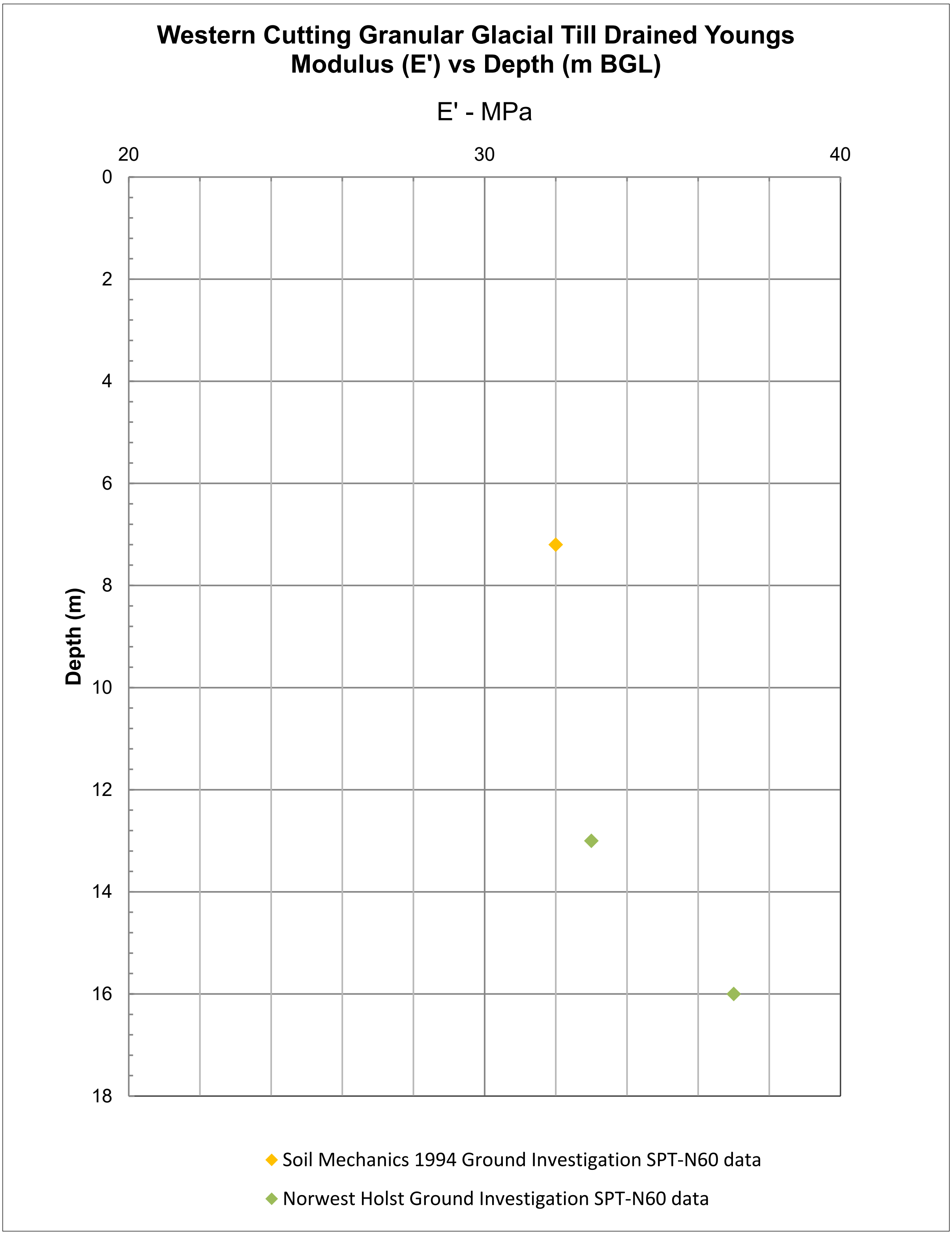


Figure 10.4.26: Western Cutting Granular Glacial Till Drained Youngs Modulus.



10.5 Mottram Underpass data plots

Figure 10.5.1: Mottram Underpass Made Ground SPT-N60.

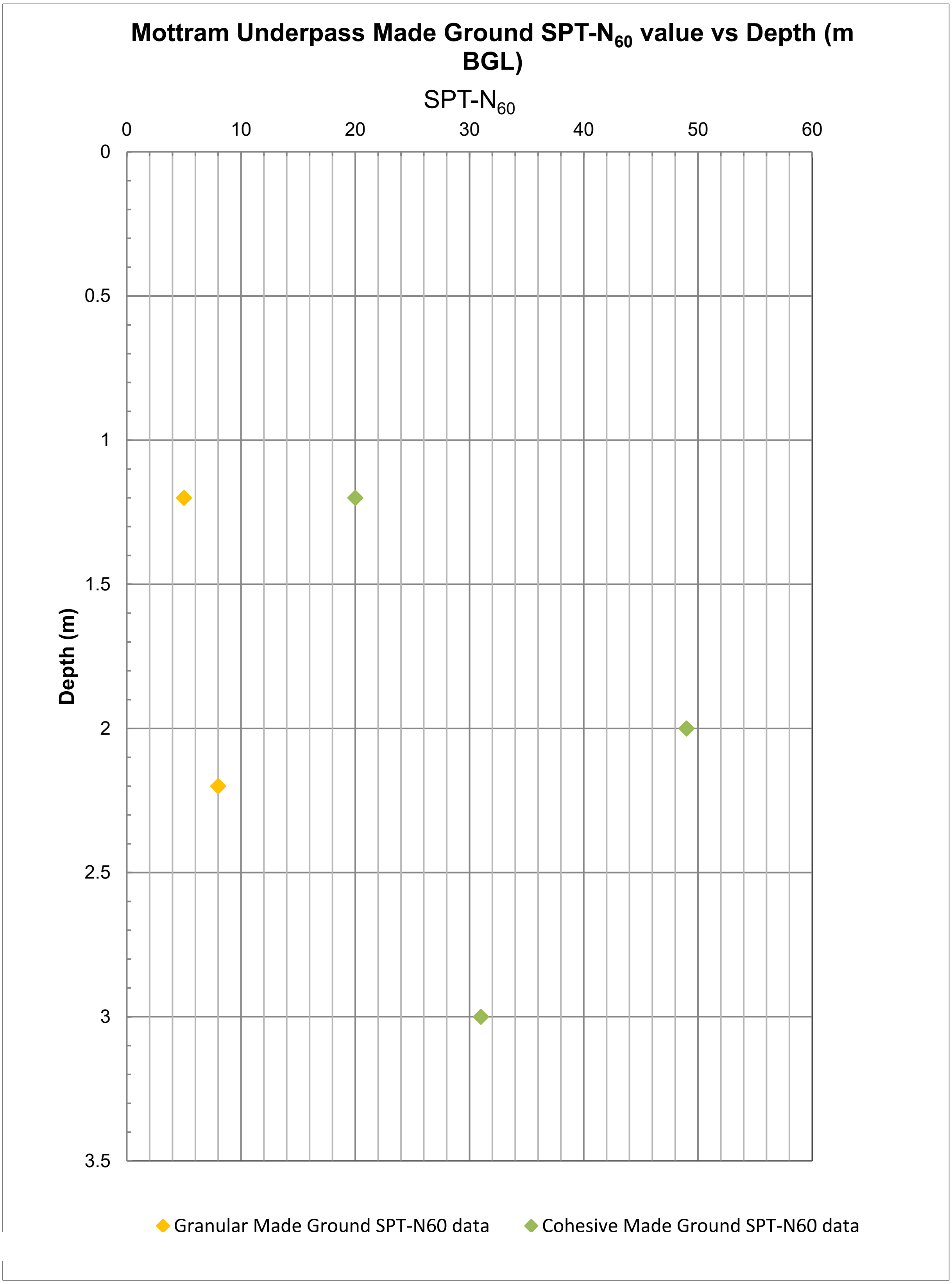


Figure 10.5.2: Mottram Underpass Cohesive Glacial Till Moisture Content.

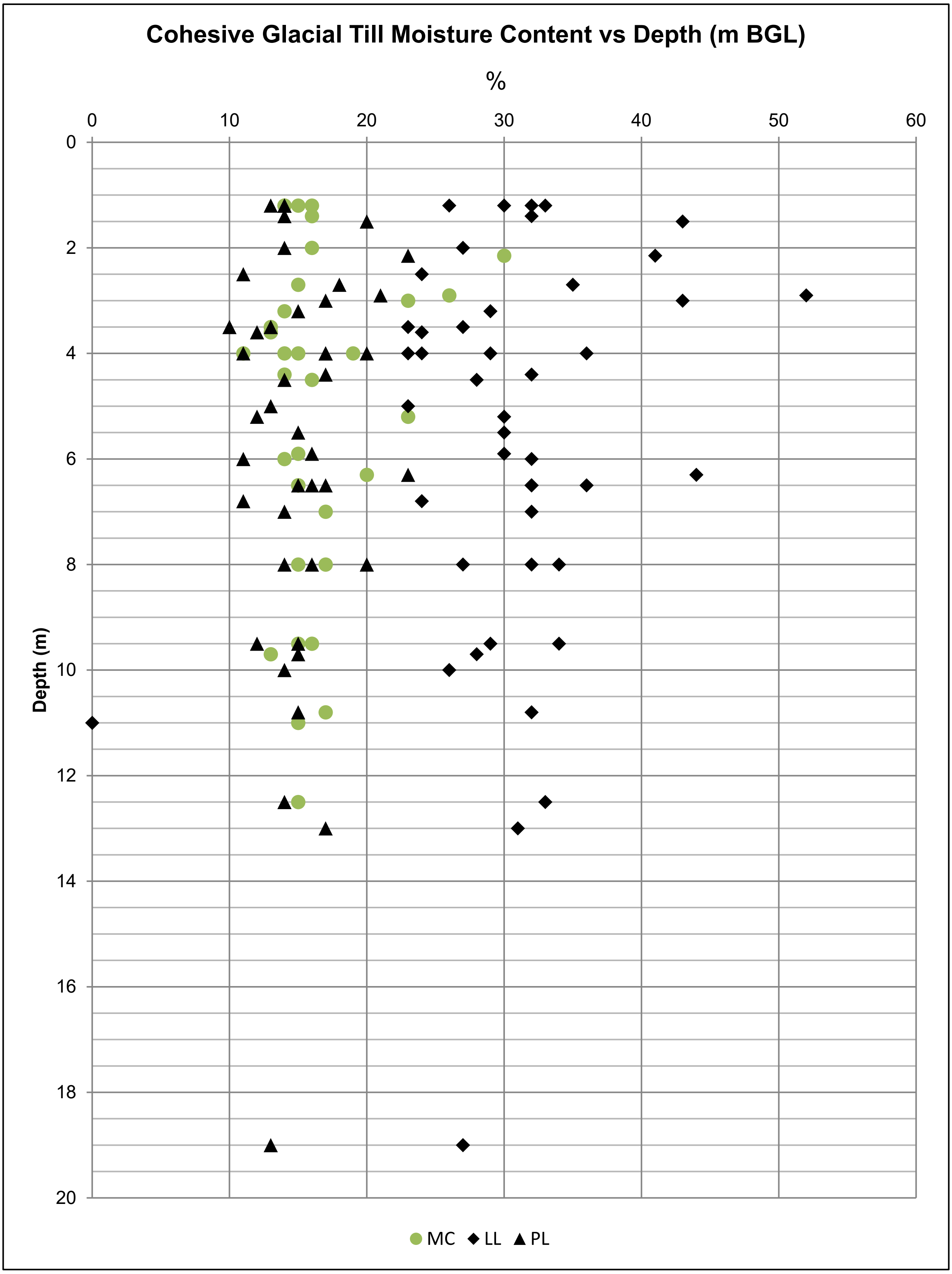


Figure 10.5.3: Mottram Underpass Cohesive Glacial TIll Atterburg Limits.

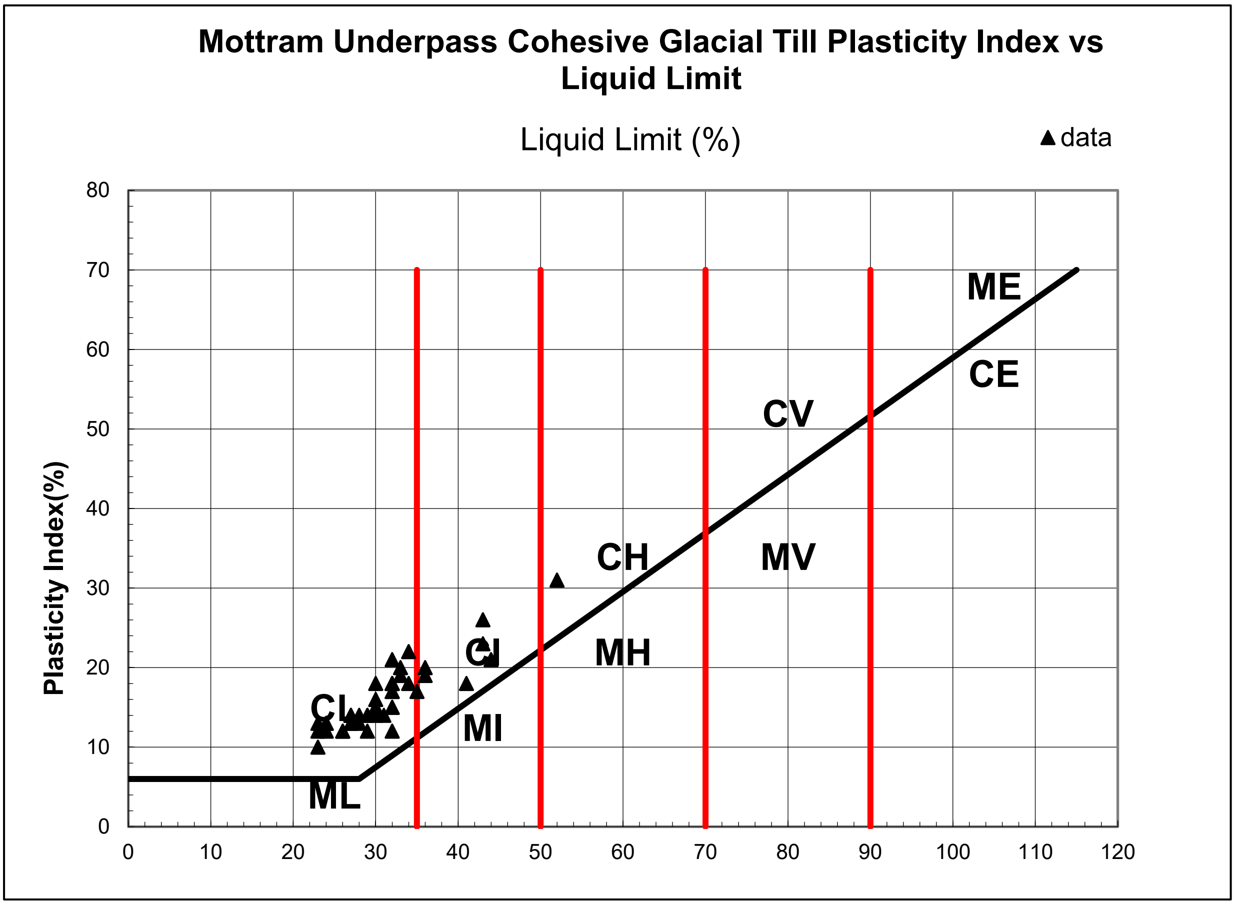


Figure 10.5.4: Mottram Underpass Cohesive Glacial Till SPT-N_{60}.

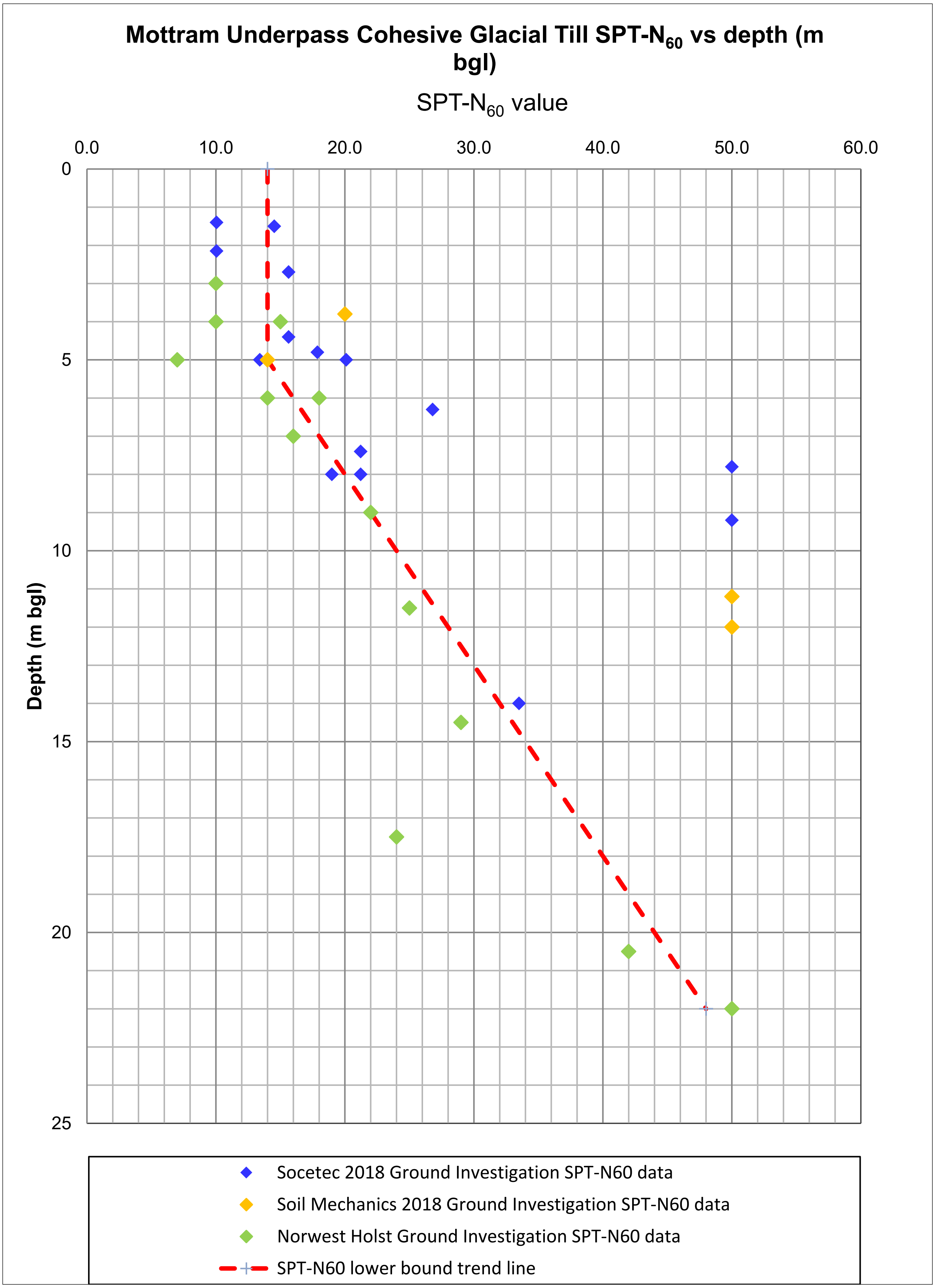


Figure 10.5.5: Mottram Underpass Cohesive Glacial Till Particle Size Distribution.

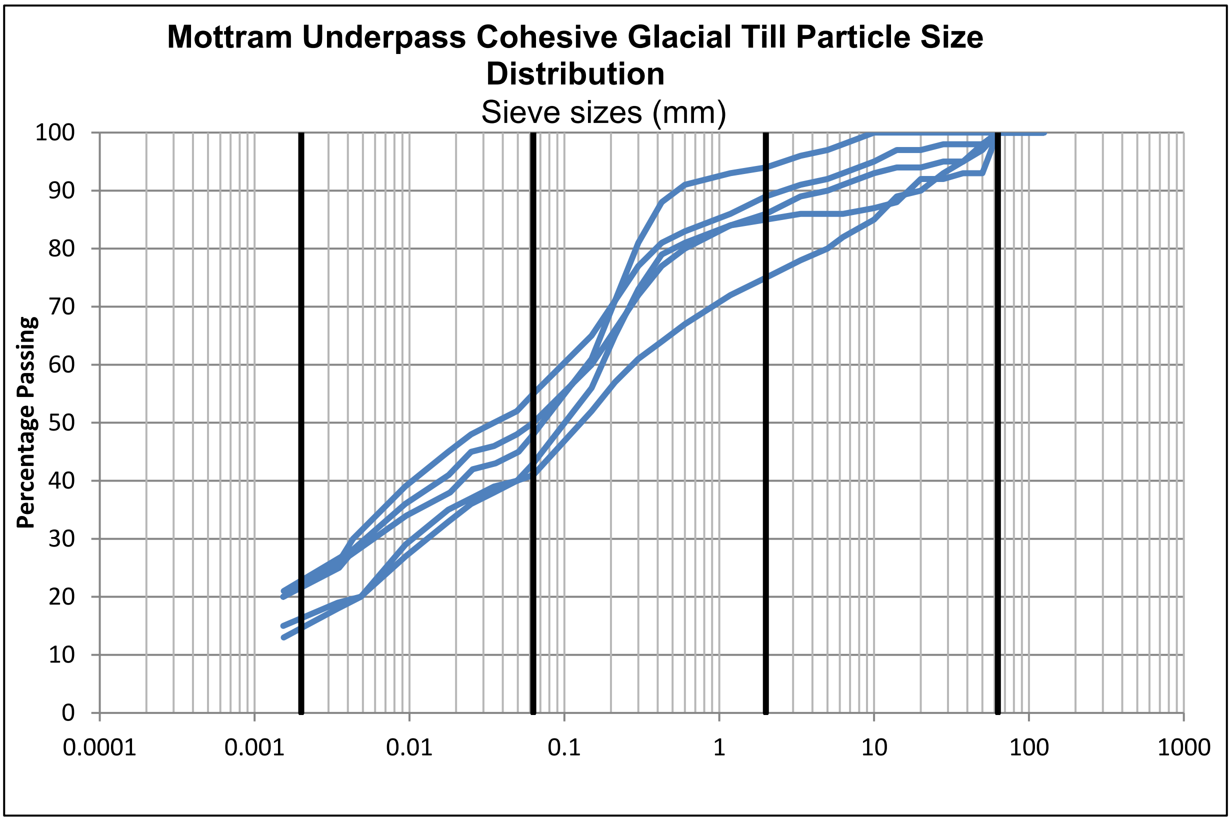


Figure 10.5.6: Mottram Underpass Cohesive Glacial Till Undrained Shear Strength.

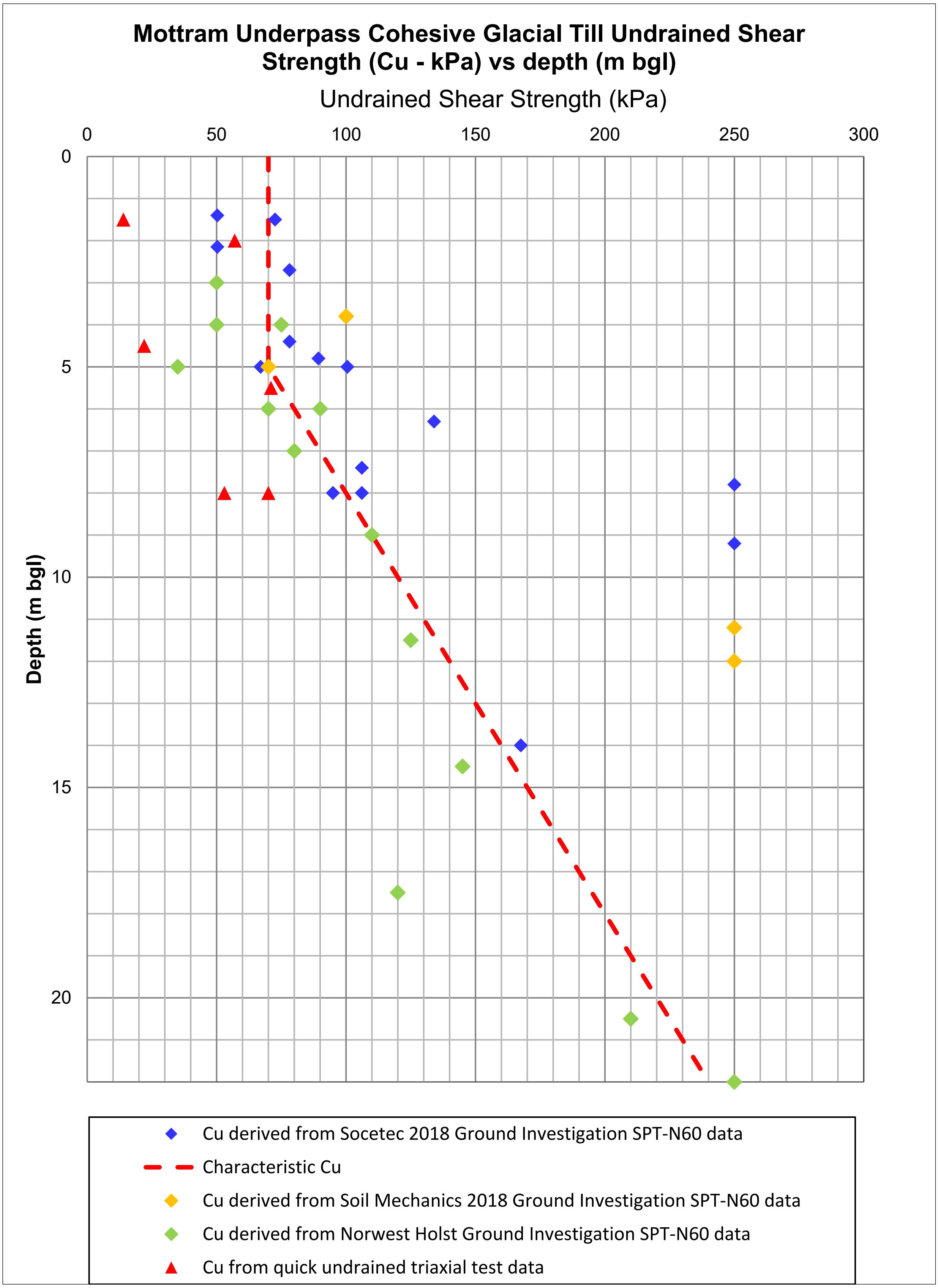


Figure 10.5.7: Mottram Underpass Cohesive Glacial Till drained parameters from Consolidated Undrained Triaxial Tests.

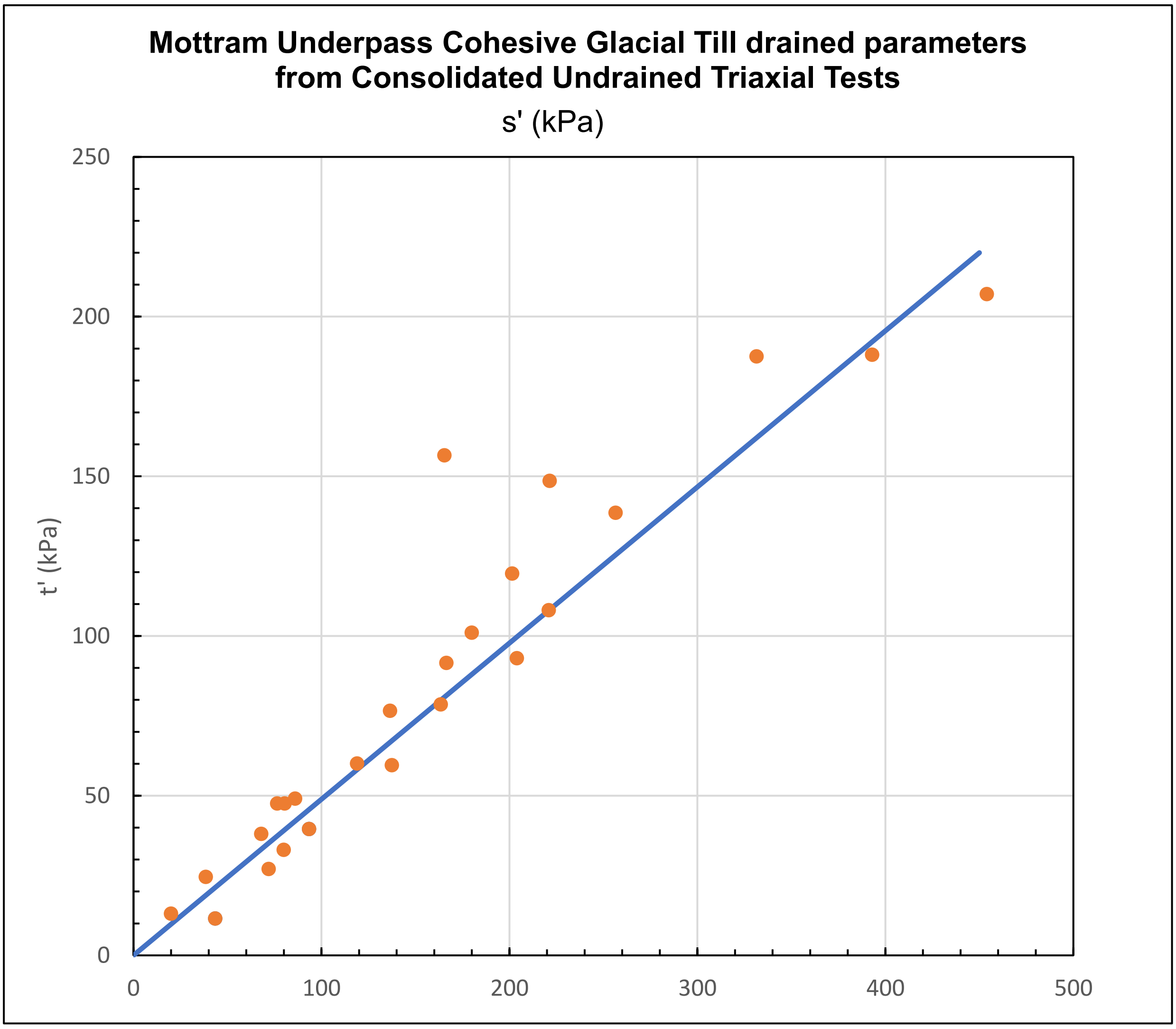


Figure 10.5.8: Mottram Underpass Cohesive Glacial Till Coefficient of Volume Compressibility.

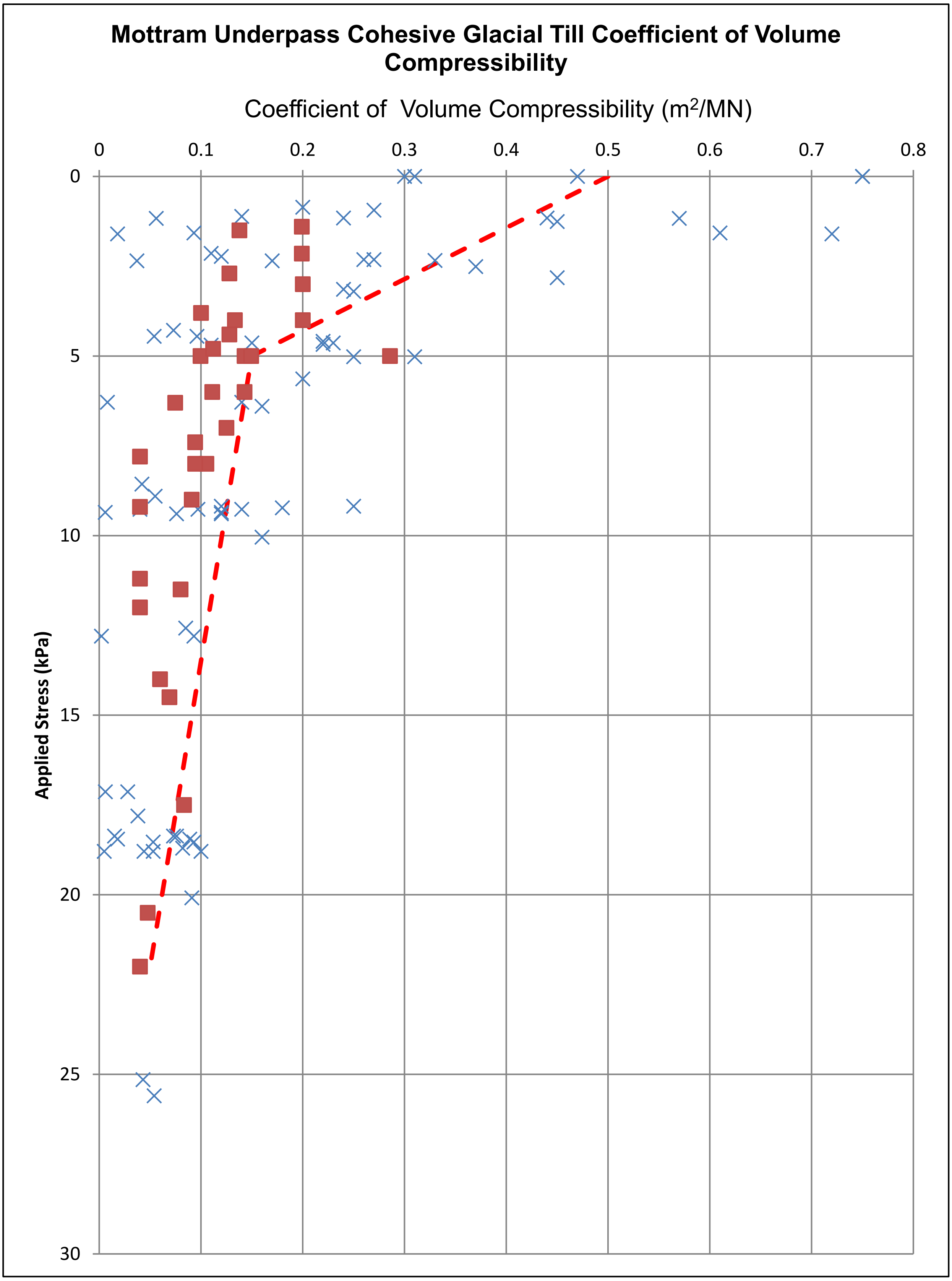


Figure 10.5.9: Mottram Underpass Cohesive Glacial Till m_v (SPT).

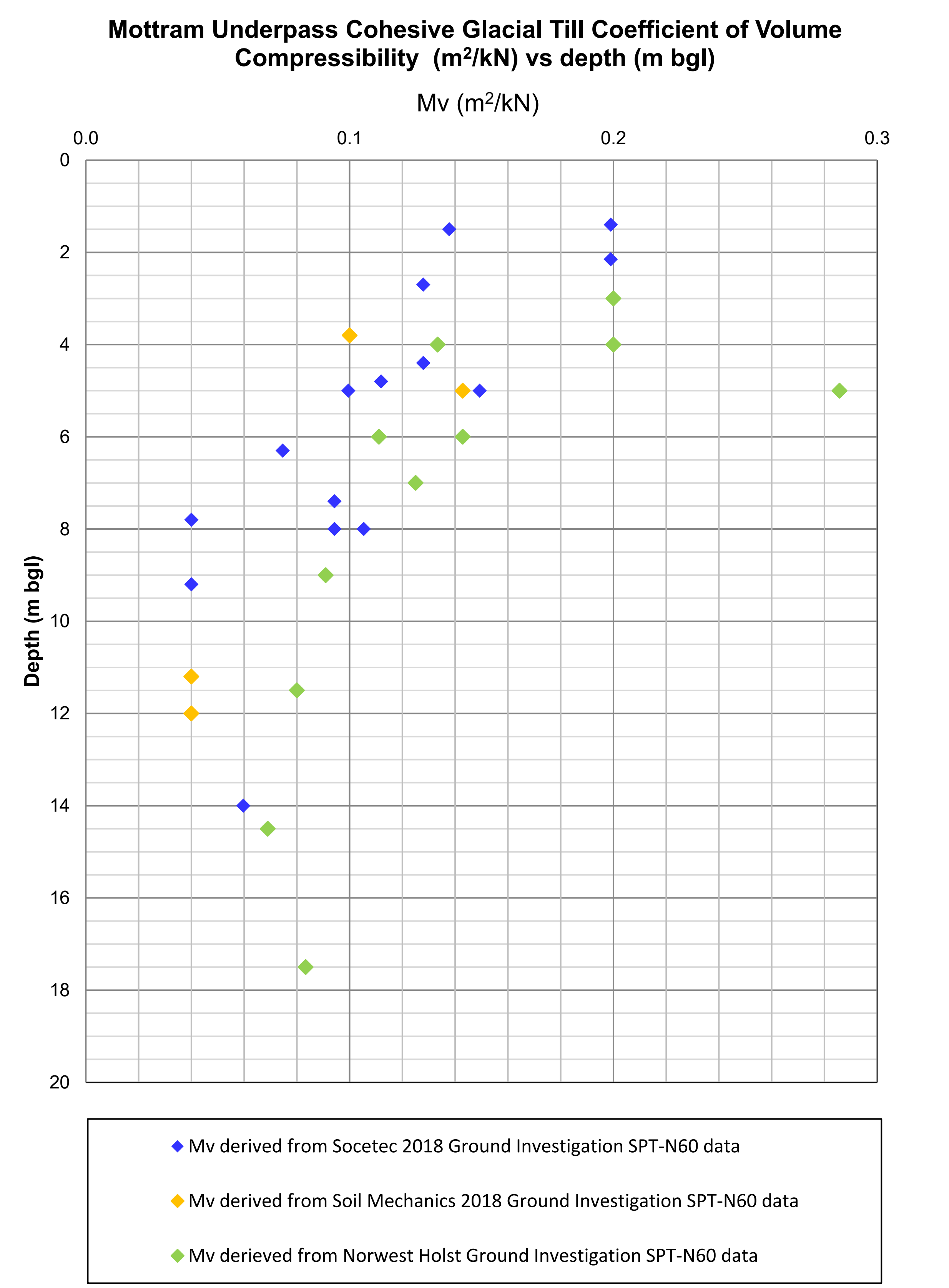


Figure 10.5.10: Mottram Underpass Cohesive Glacial Till Coefficient of Consolidation.

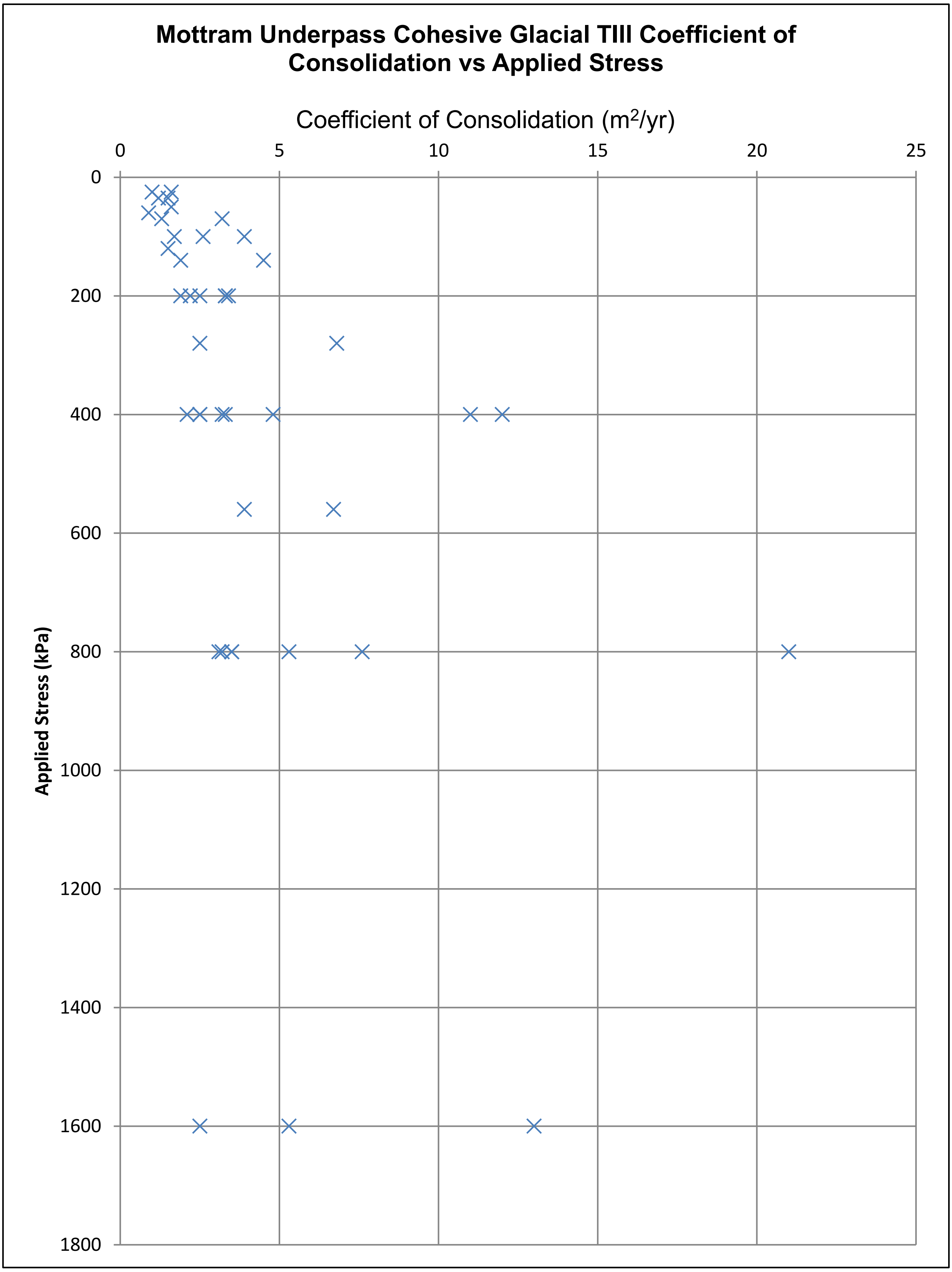


Figure 10.5.11: Mottram Underpass Cohesive Glacial Till Undrained Youngs Modulus.

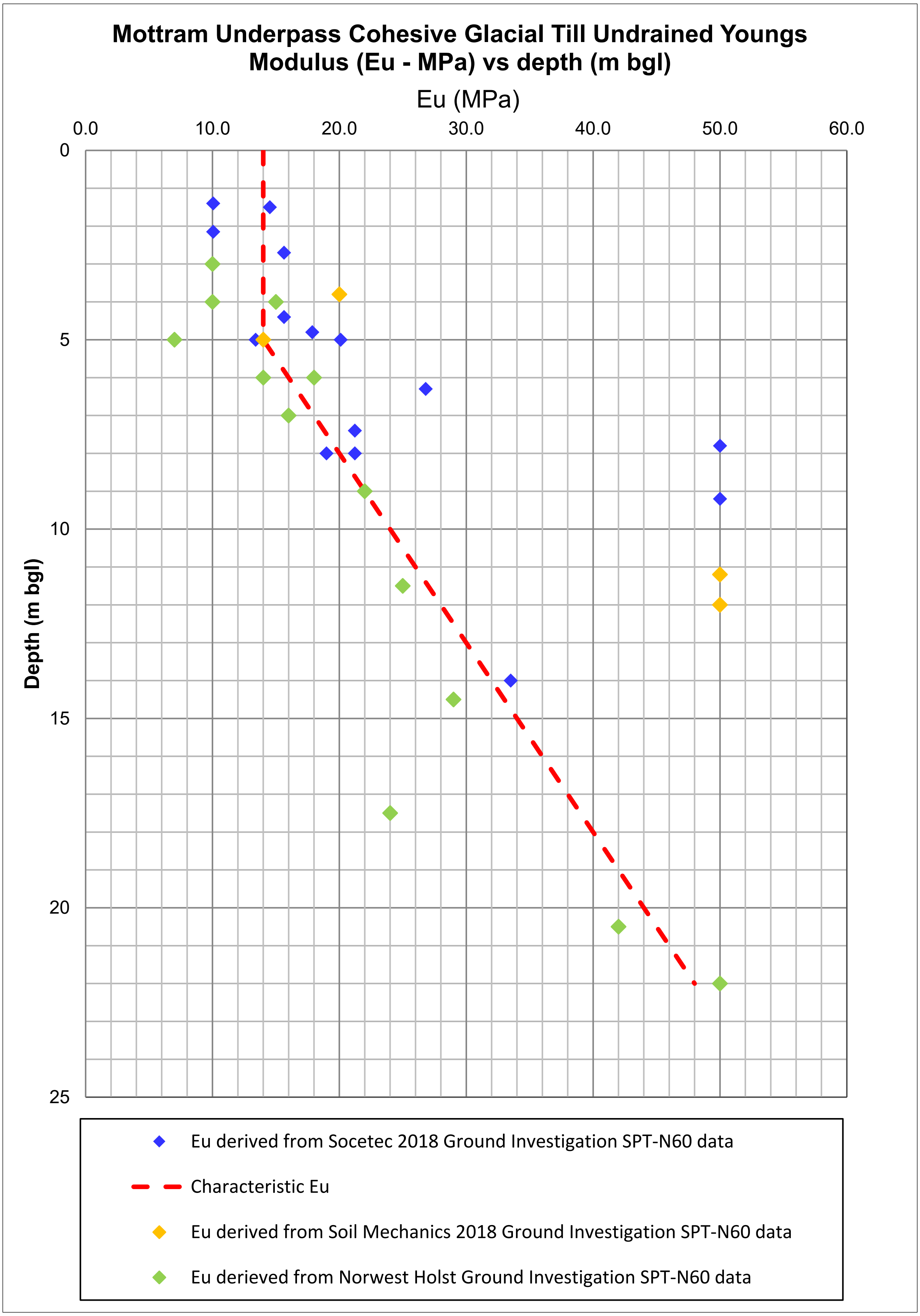


Figure 10.5.12: Mottram Underpass Cohesive Glacial TIll Drained Youngs Modulus.

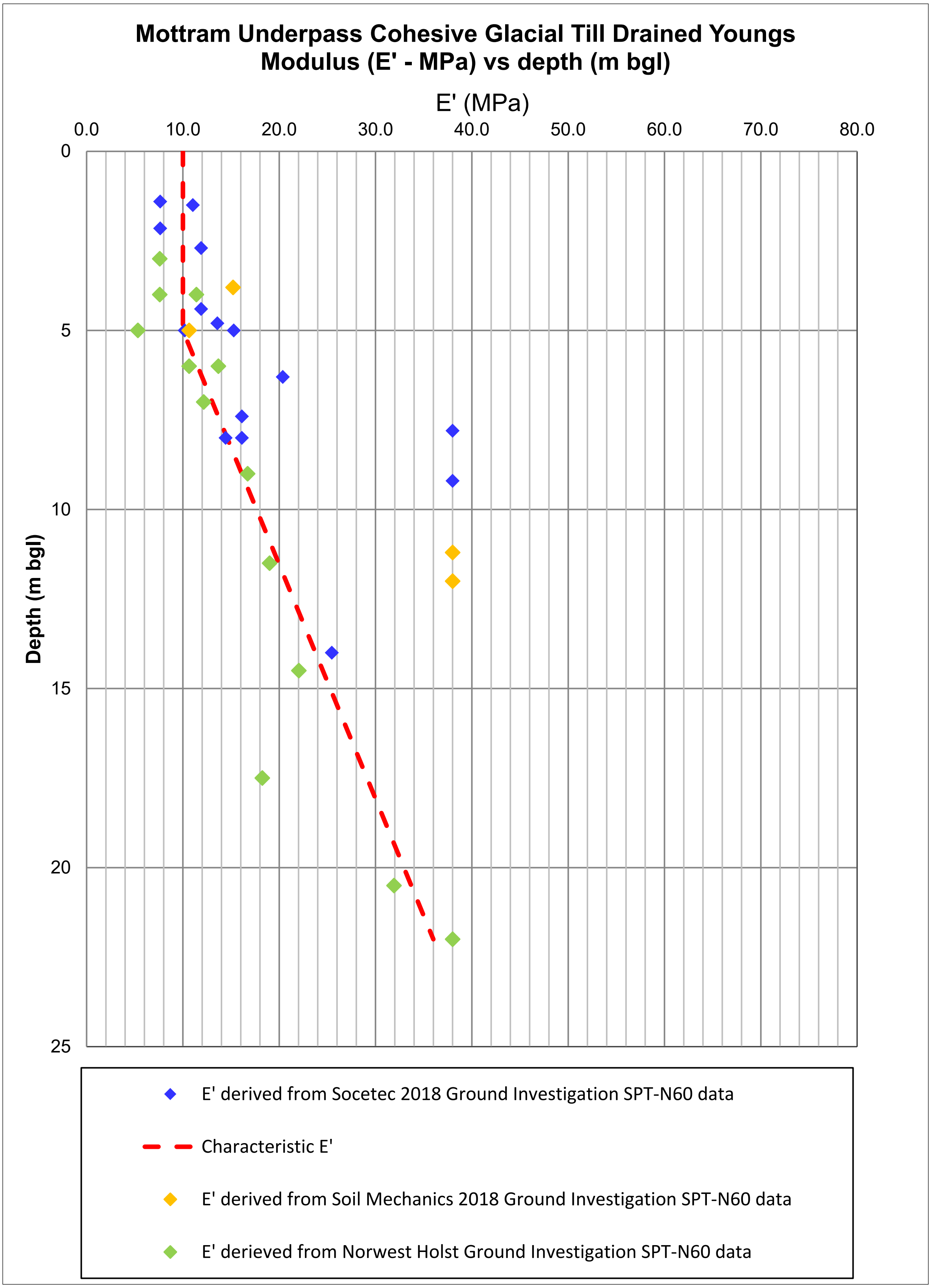


Figure 10.5.13: Mottram Underpass Cohesive Glacial Till Optimum Moisture Content.

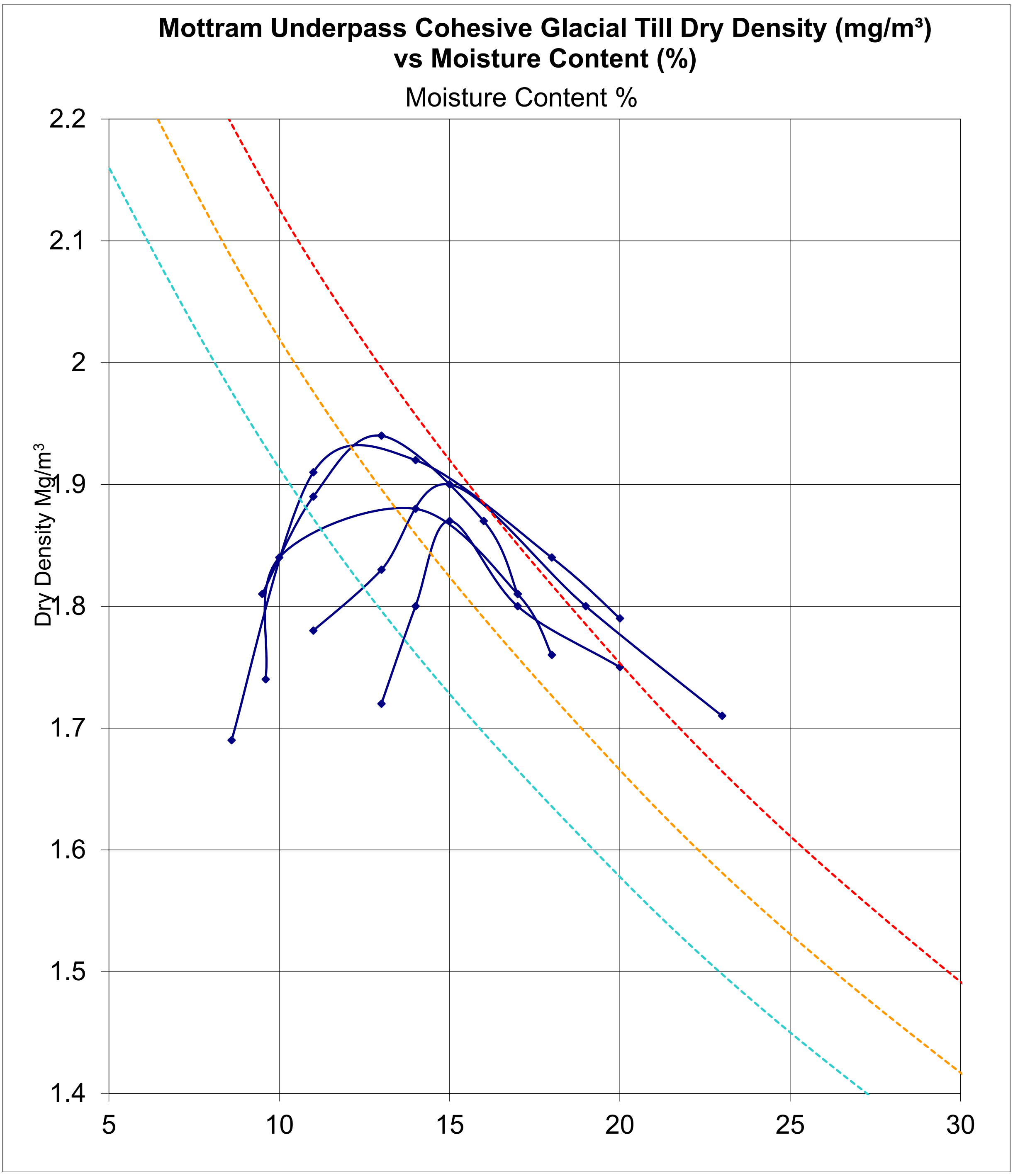


Figure 10.5.14: Mottram Underpass Granular Glacial Till SPT-N_{60} data.

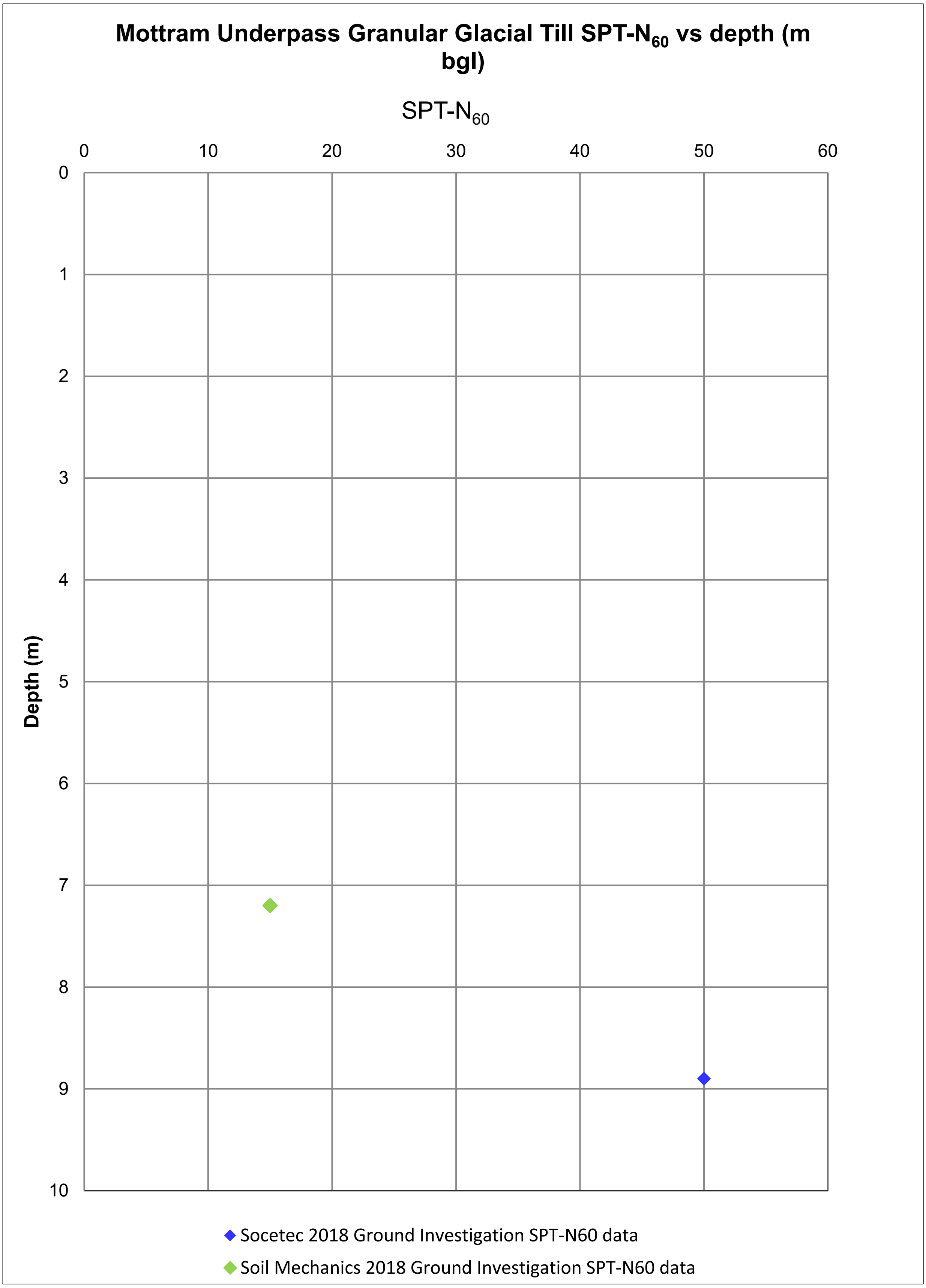


Figure 10.5.15: Mottram Underpass Granular Glacial Till Particle Size Distribution.

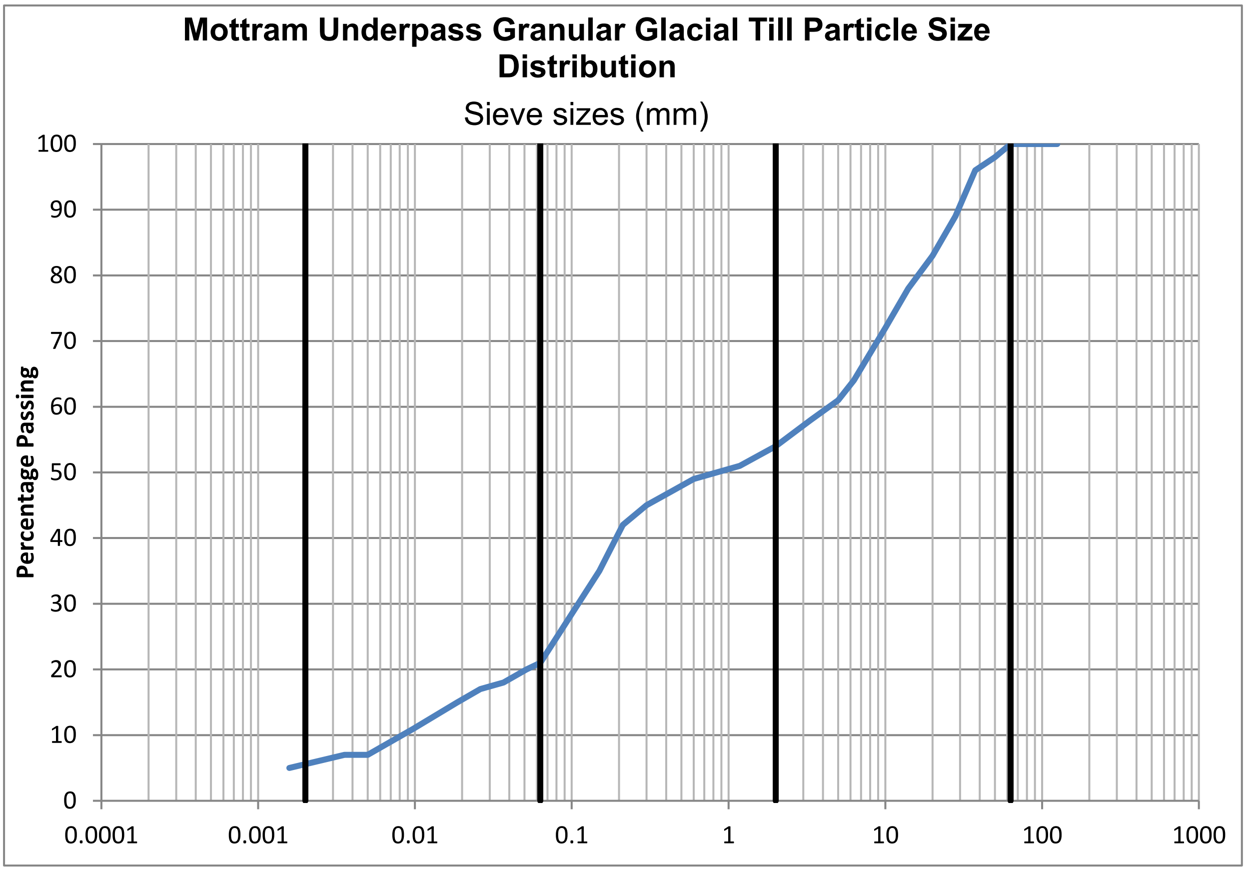
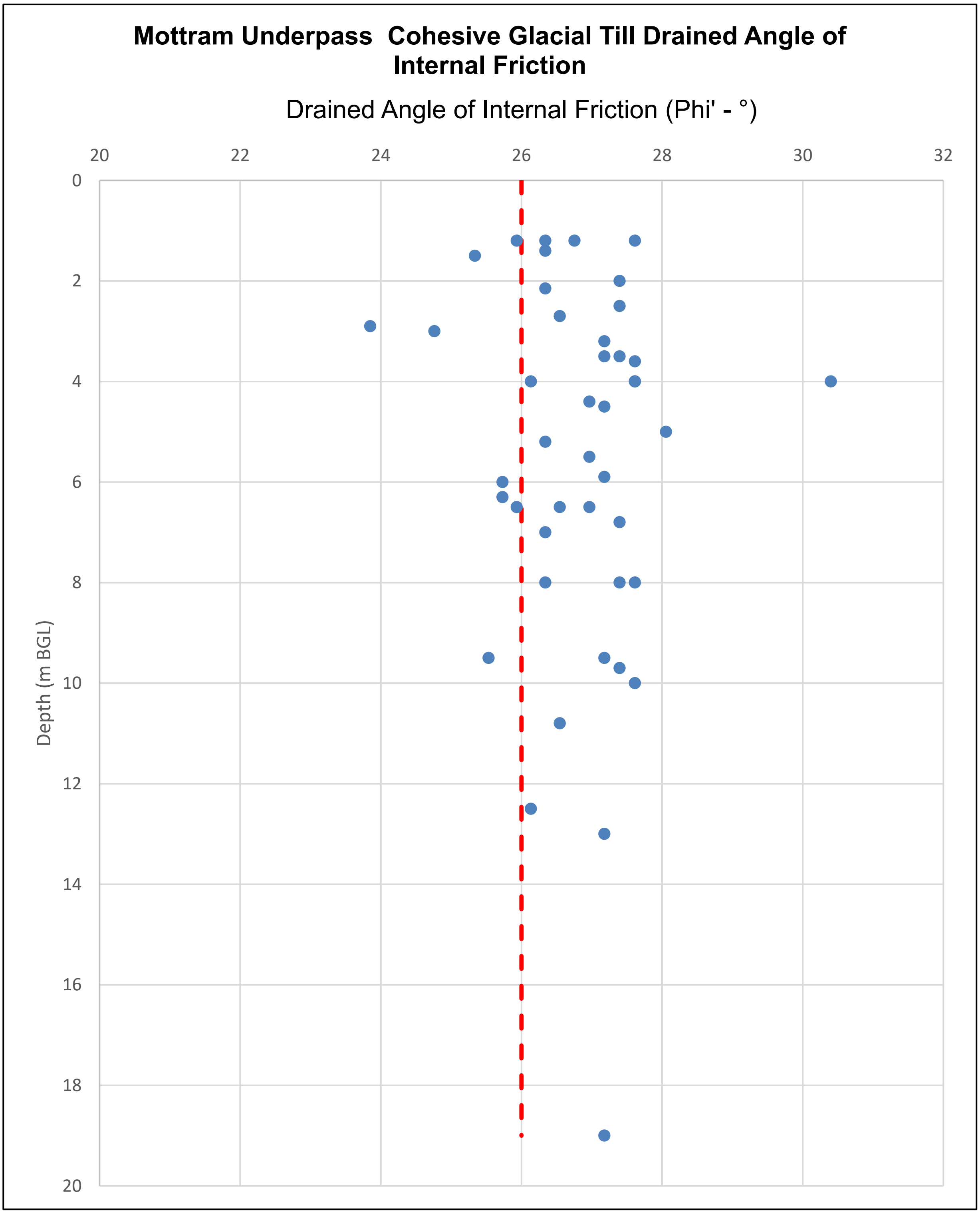


Figure 10.5.16: Mottram Underpass Cohesive Glacial Till Drained Angle of Internal Friction.



10.6 Eastern Cutting data plots

Figure 10.6.1: Eastern Cutting Cohesive Glacial Till Moisture Content.

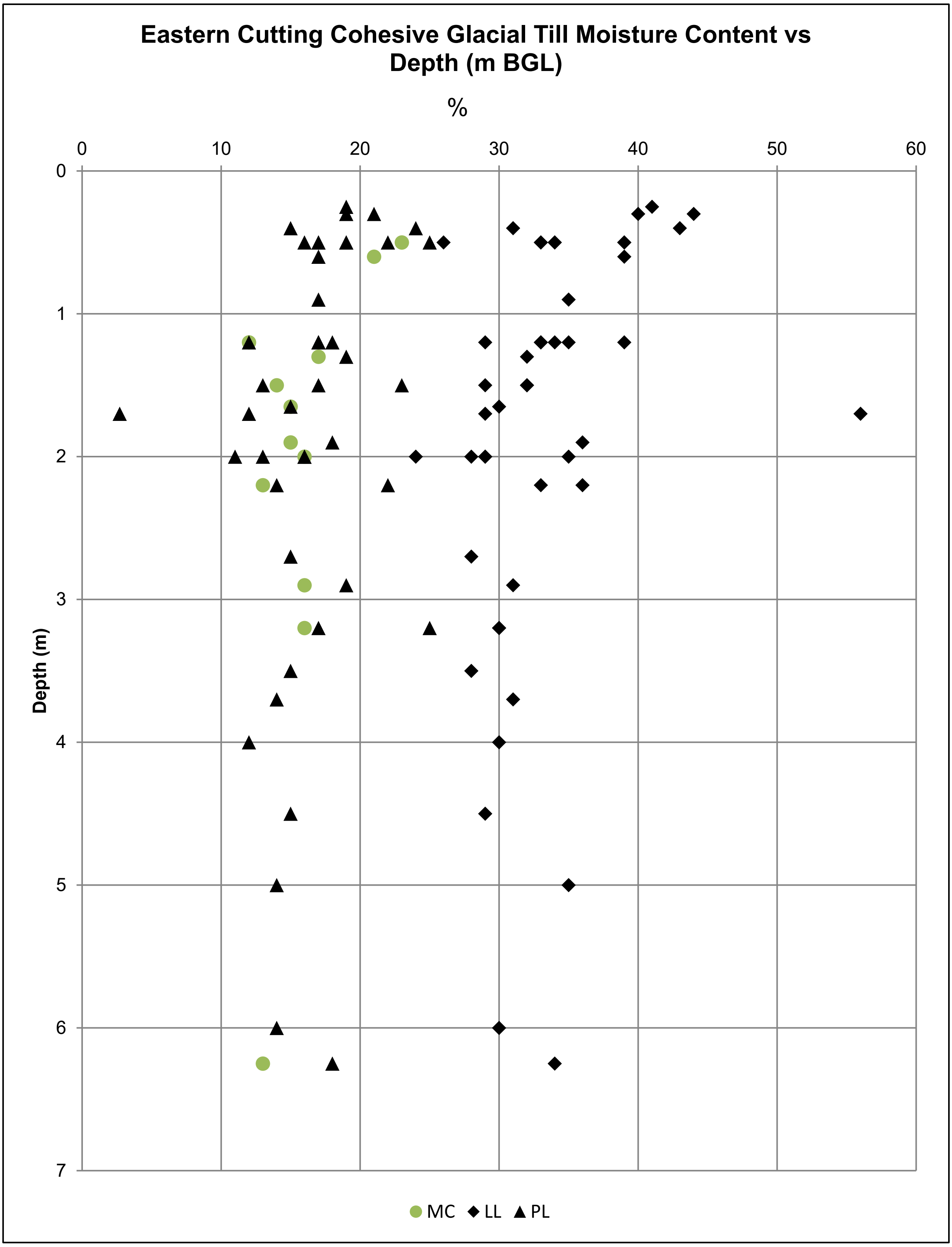


Figure 10.6.2: Eastern Cutting Cohesive Glacial till Plasticity Index vs Liquid Limit.

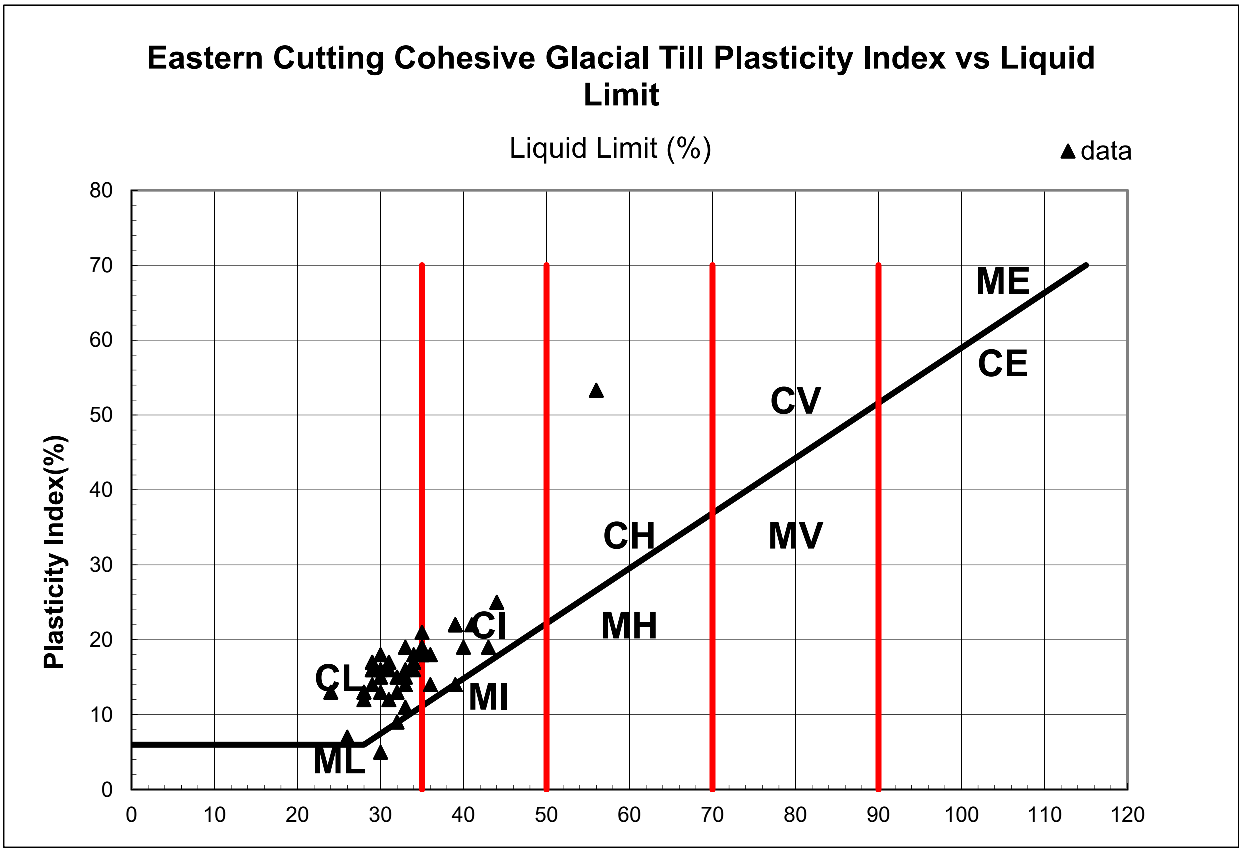


Figure 10.6.3: Eastern Cutting Cohesive Glacial Till SPT-N_{60}.

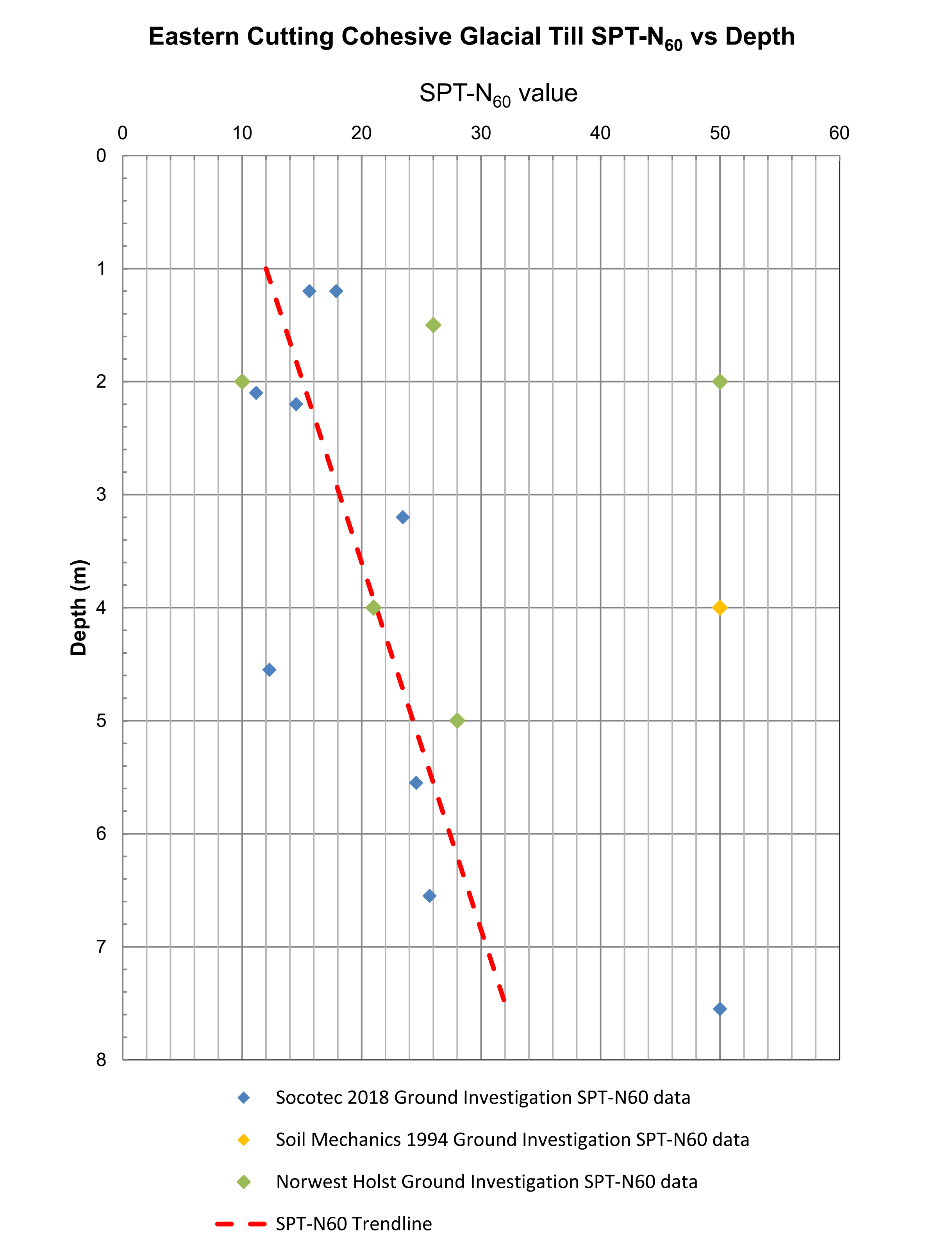


Figure 10.6.4: Eastern Cutting Cohesive Glacial Till Particle Size Distribution.

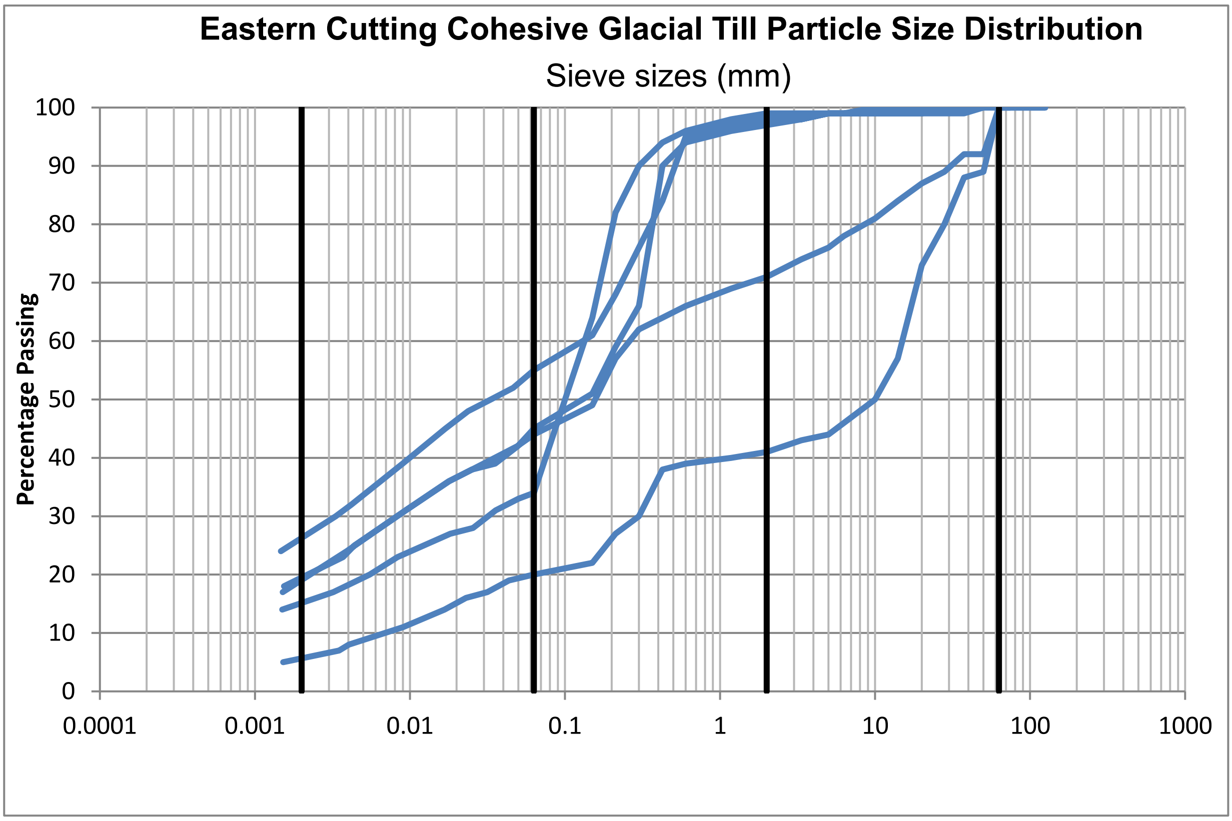


Figure 10.6.5: Eastern Cutting Cohesive Glacial Till Undrained Shear Strength.

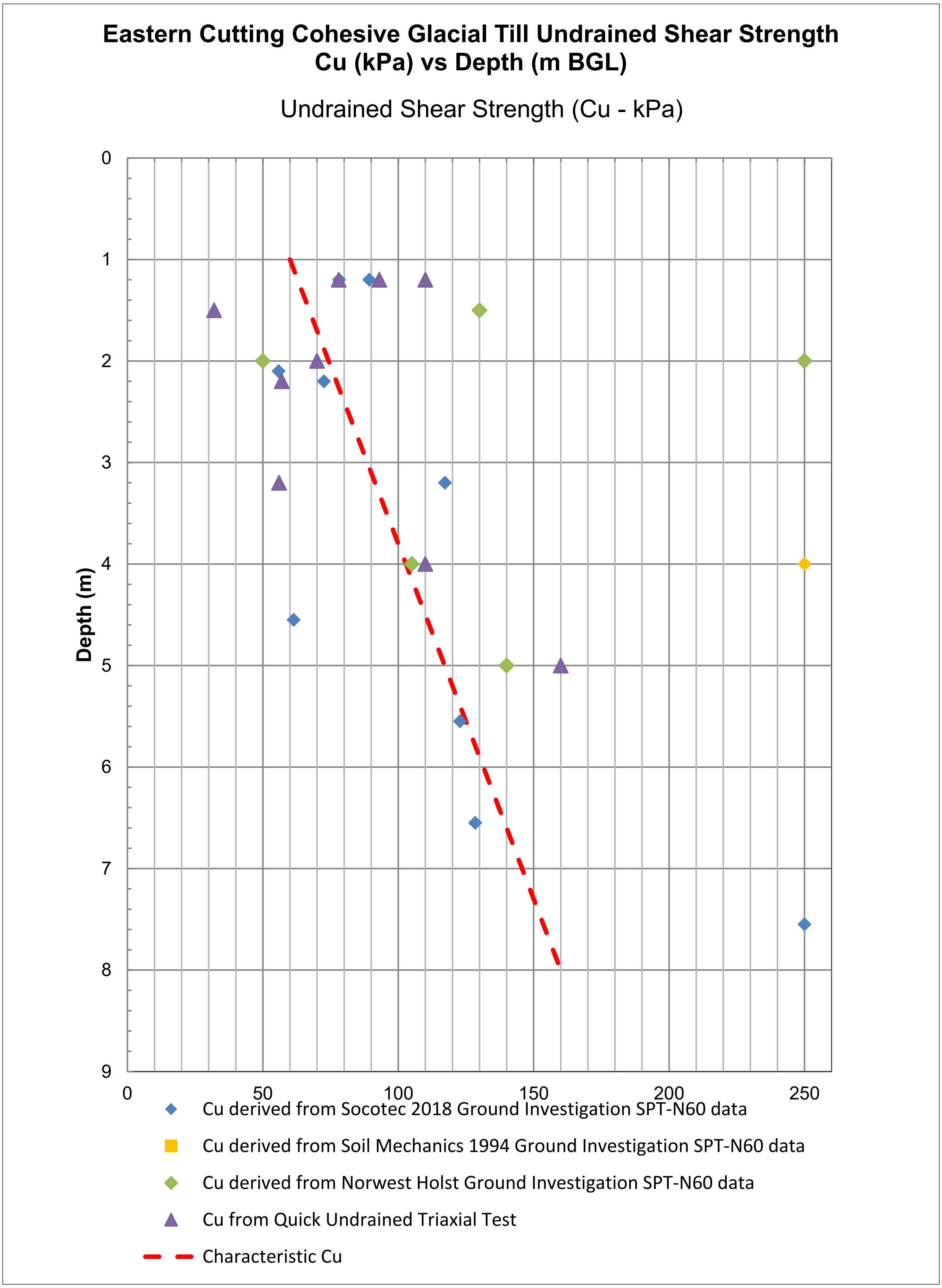


Figure 10.6.6: Eastern Cutting Cohesive Glacial Till Angle of Internal Friction.

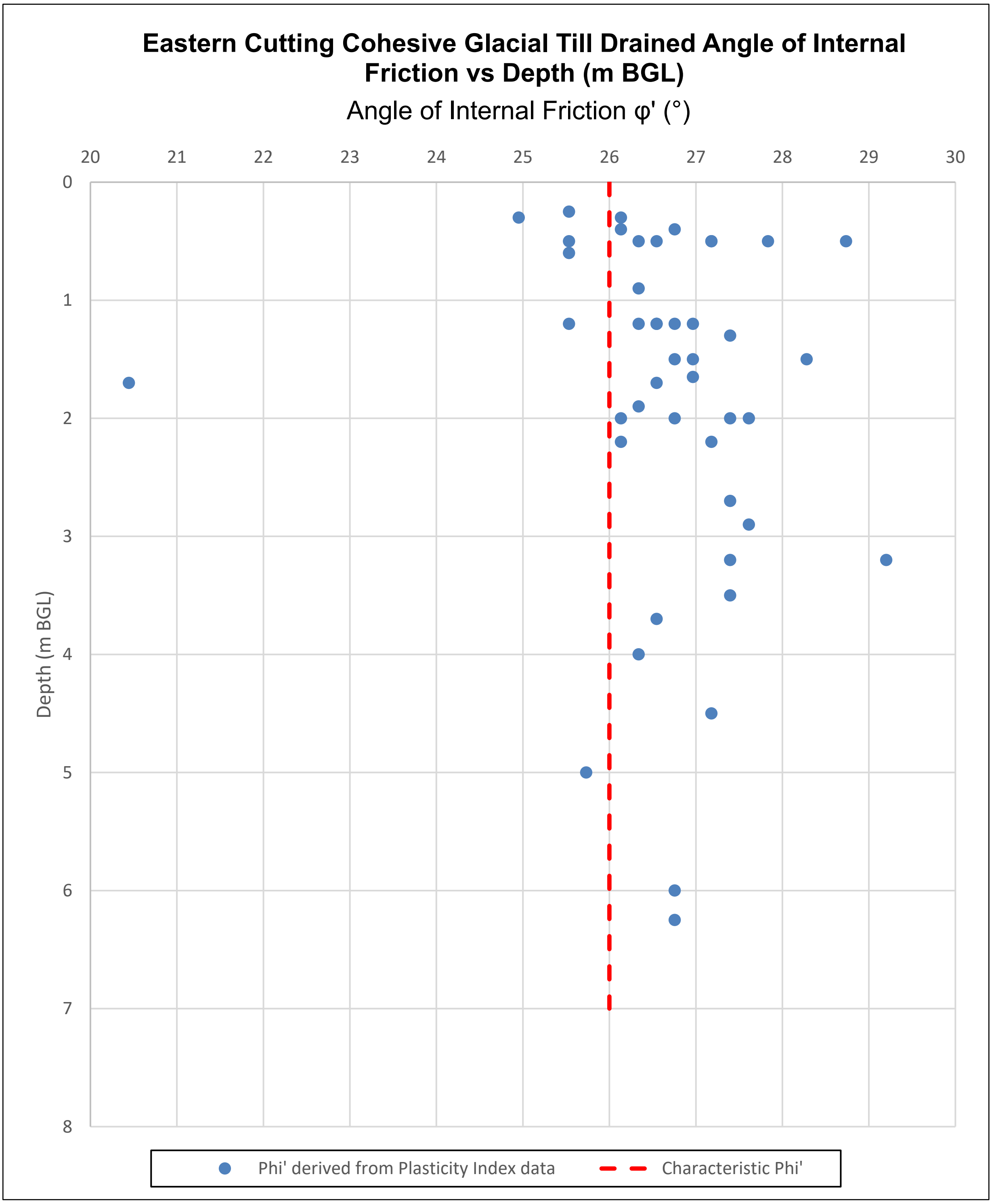


Figure 10.6.7: Eastern Cutting Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT).

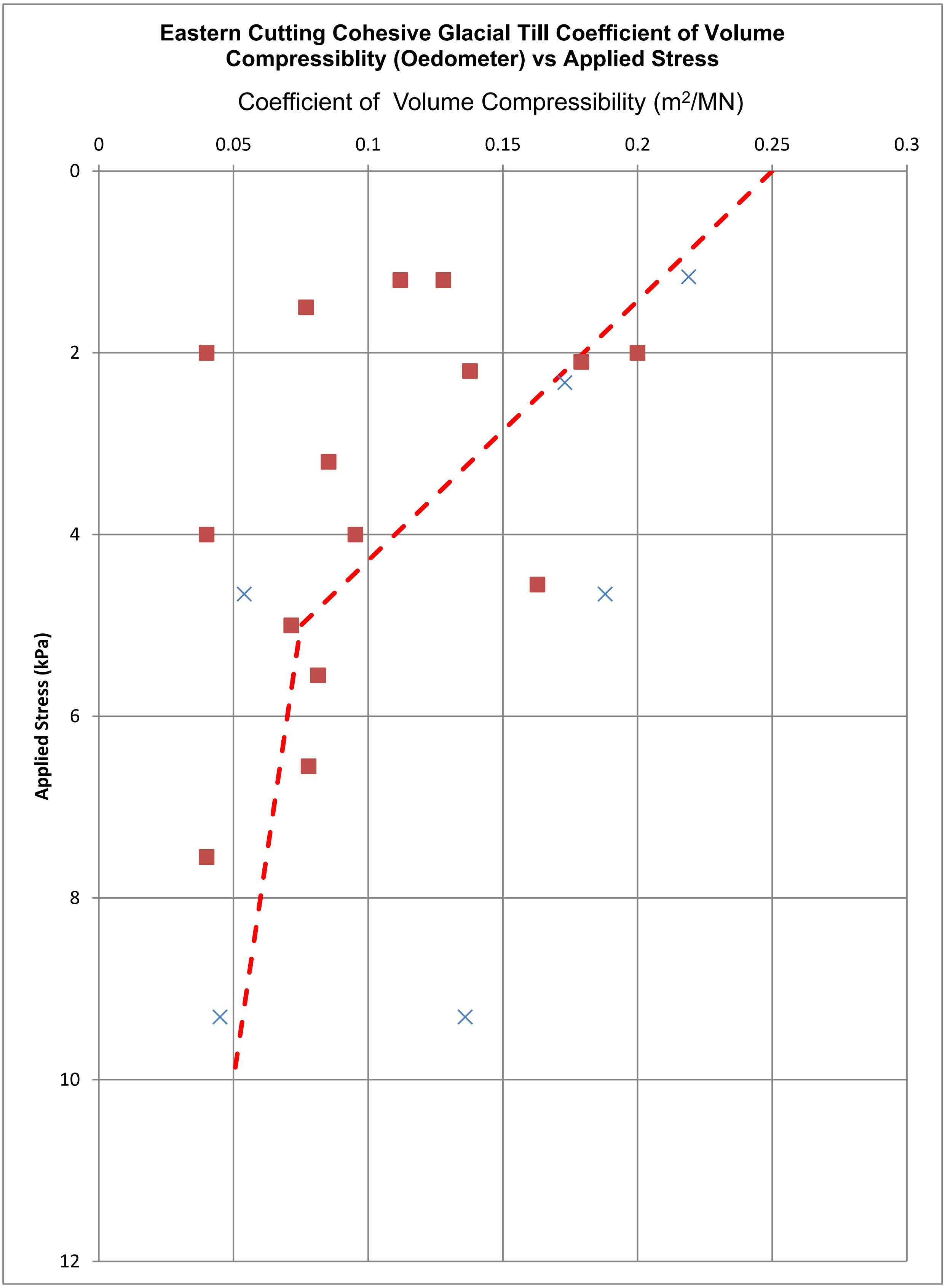


Figure 10.6.8: Eastern Cutting Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

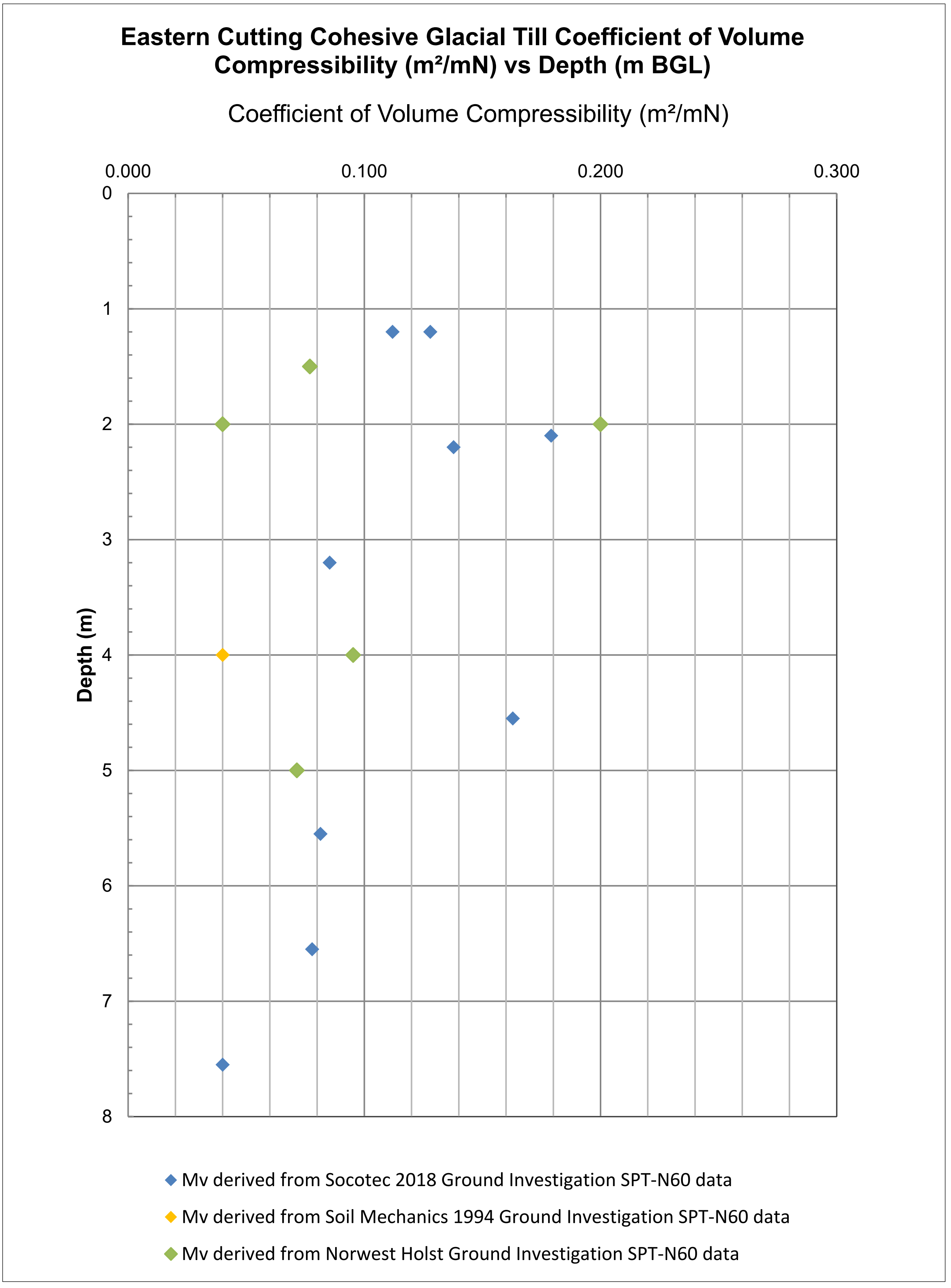


Figure 10.6.9: Eastern Cutting Cohesive Glacial Till Undrained Youngs Modulus.

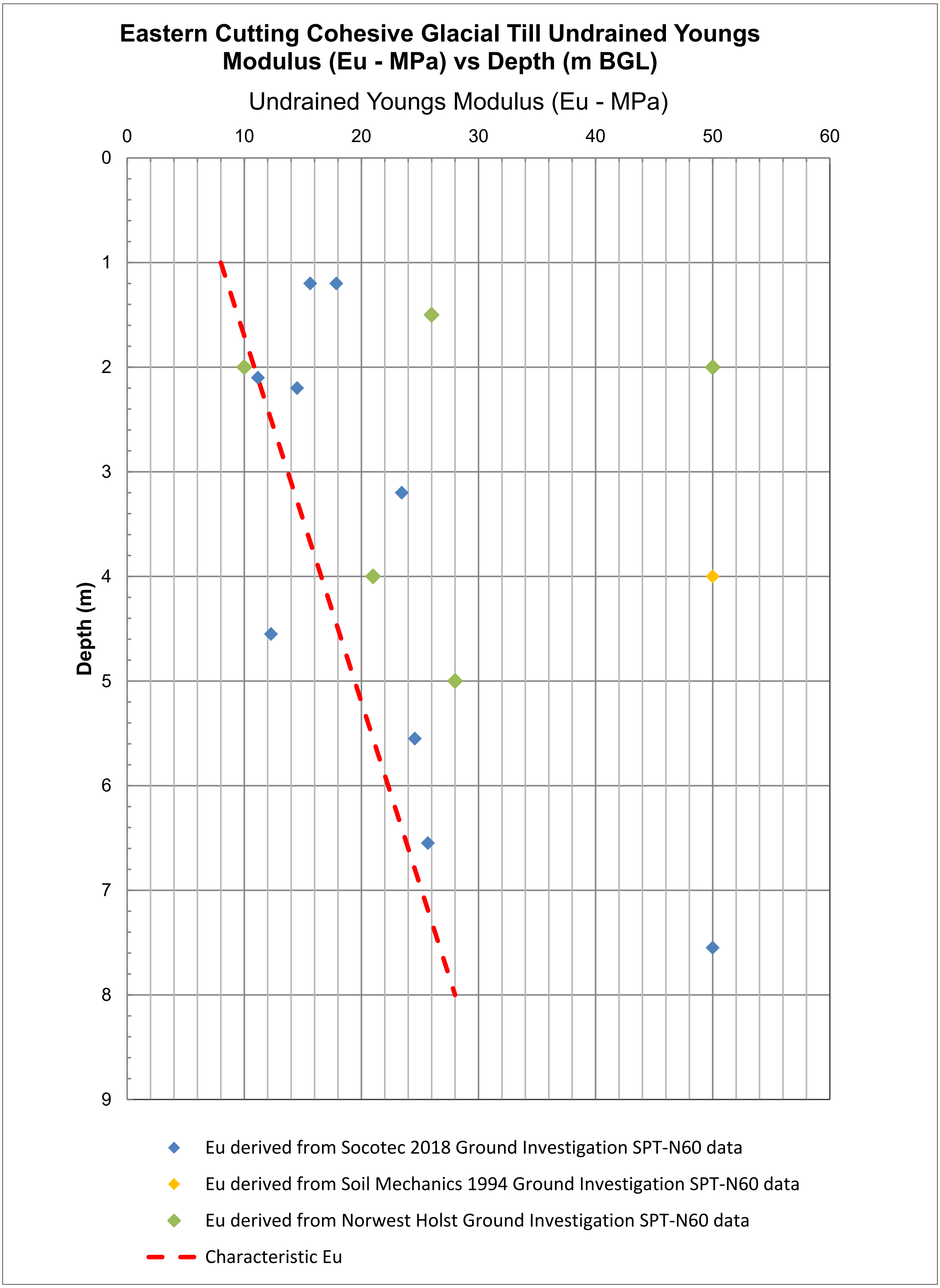


Figure 10.6.10: Eastern Cutting Cohesive Glacial Till Drained Youngs Modulus.

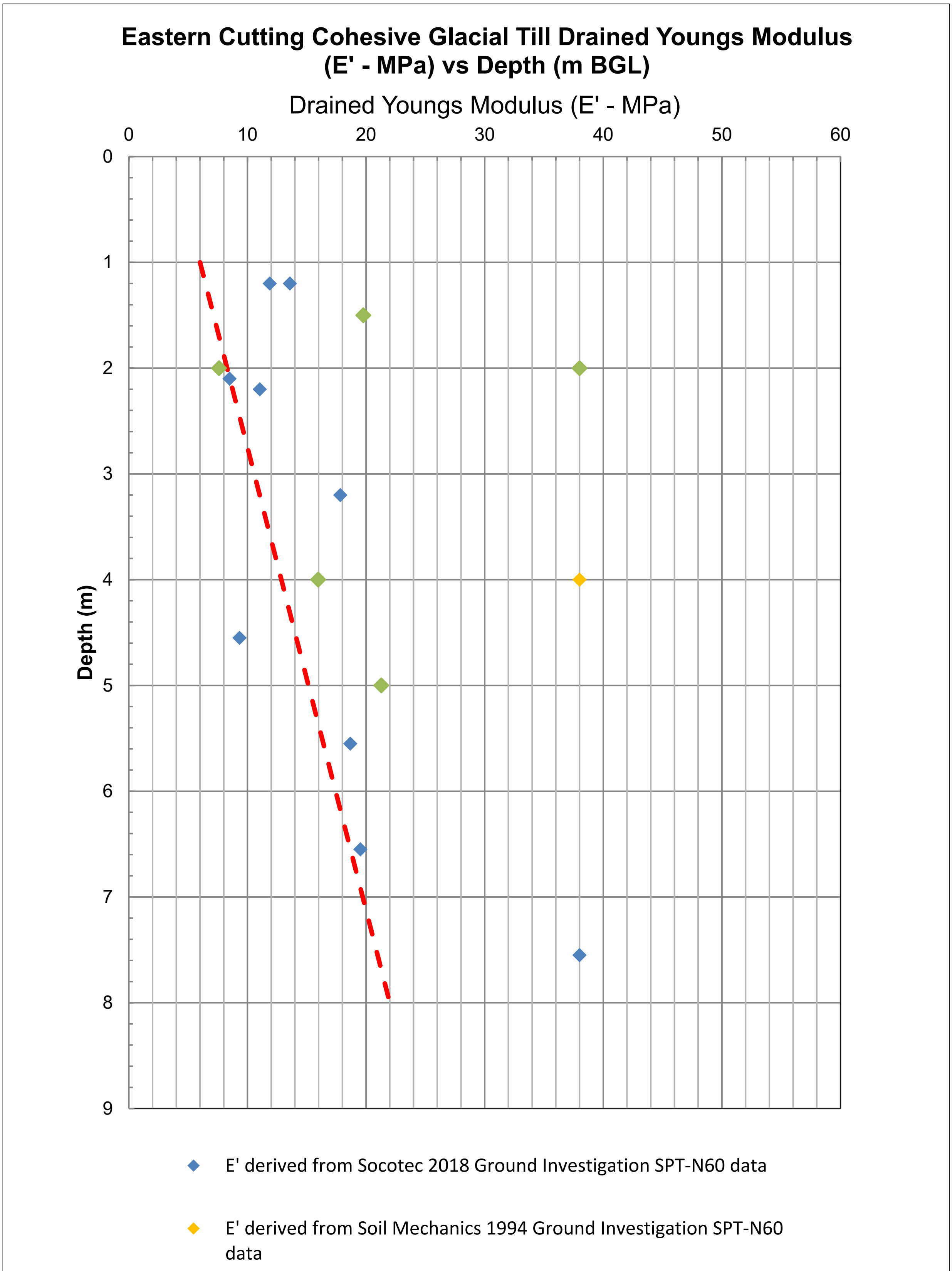


Figure 10.6.11: Eastern Cutting Granular Glacial Till Particle Size Distribution.

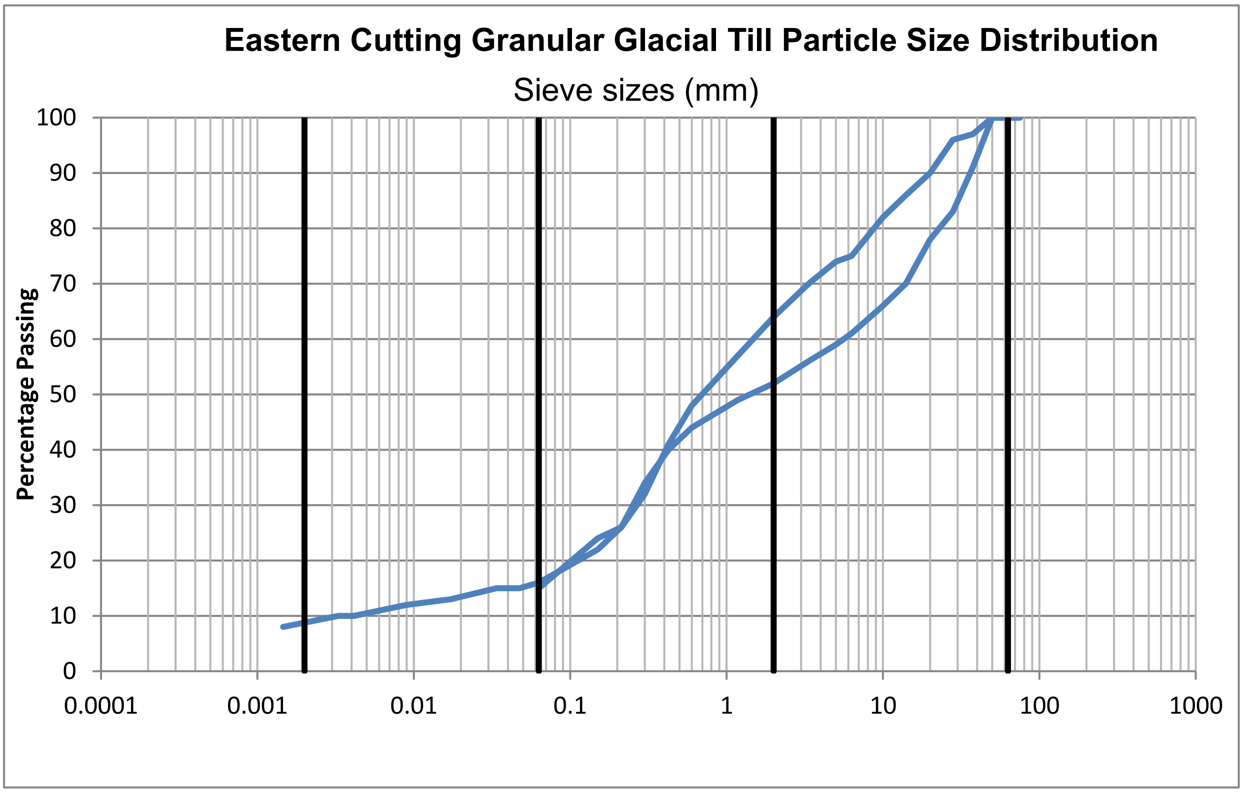
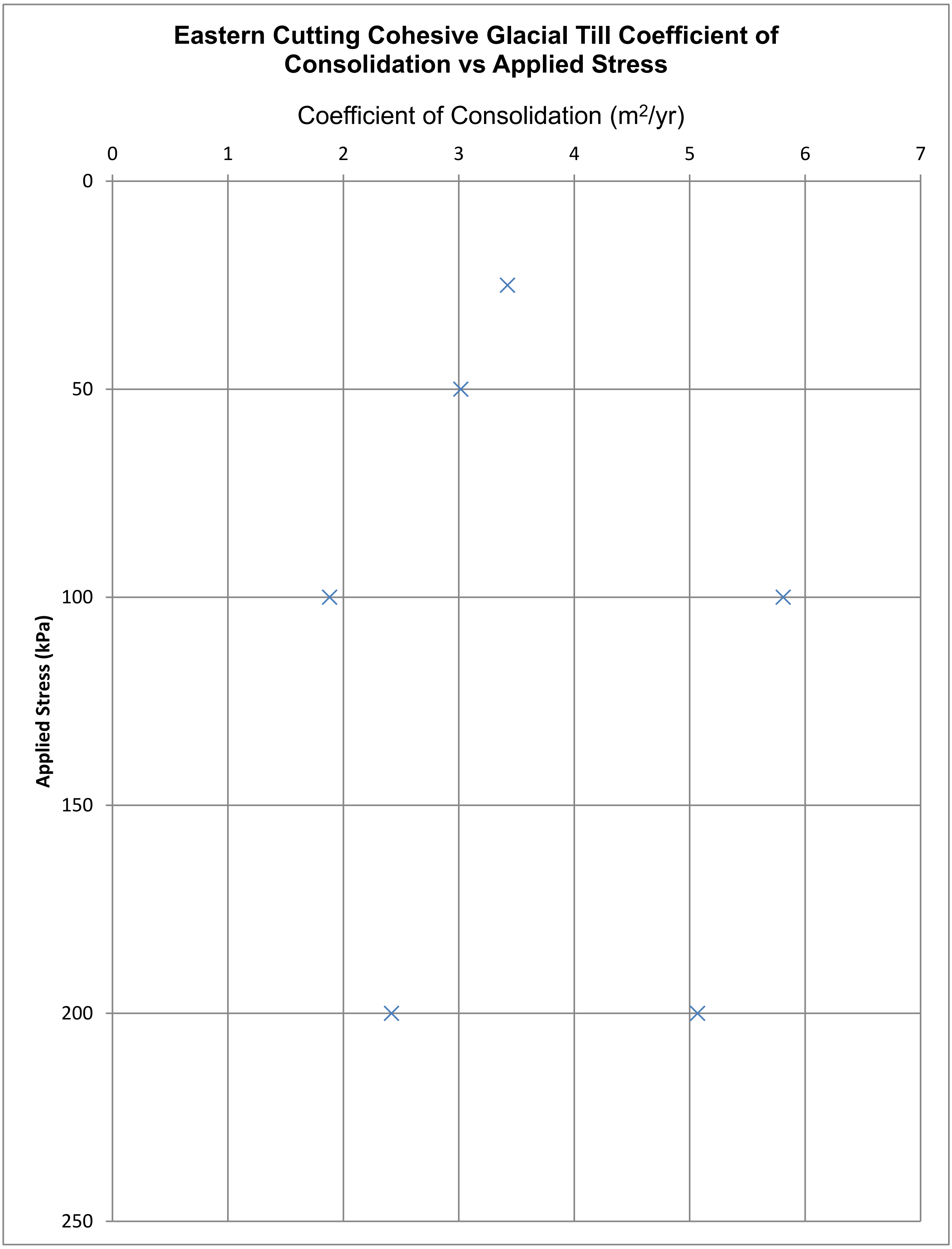


Figure 10.6.12: Eastern Cutting Cohesive Glacial Till Coefficient of Consolidation.



10.7 Eastern Embankments data plots

Figure 10.7.1: Eastern Embankments Cohesive Made Ground Moisture Content.

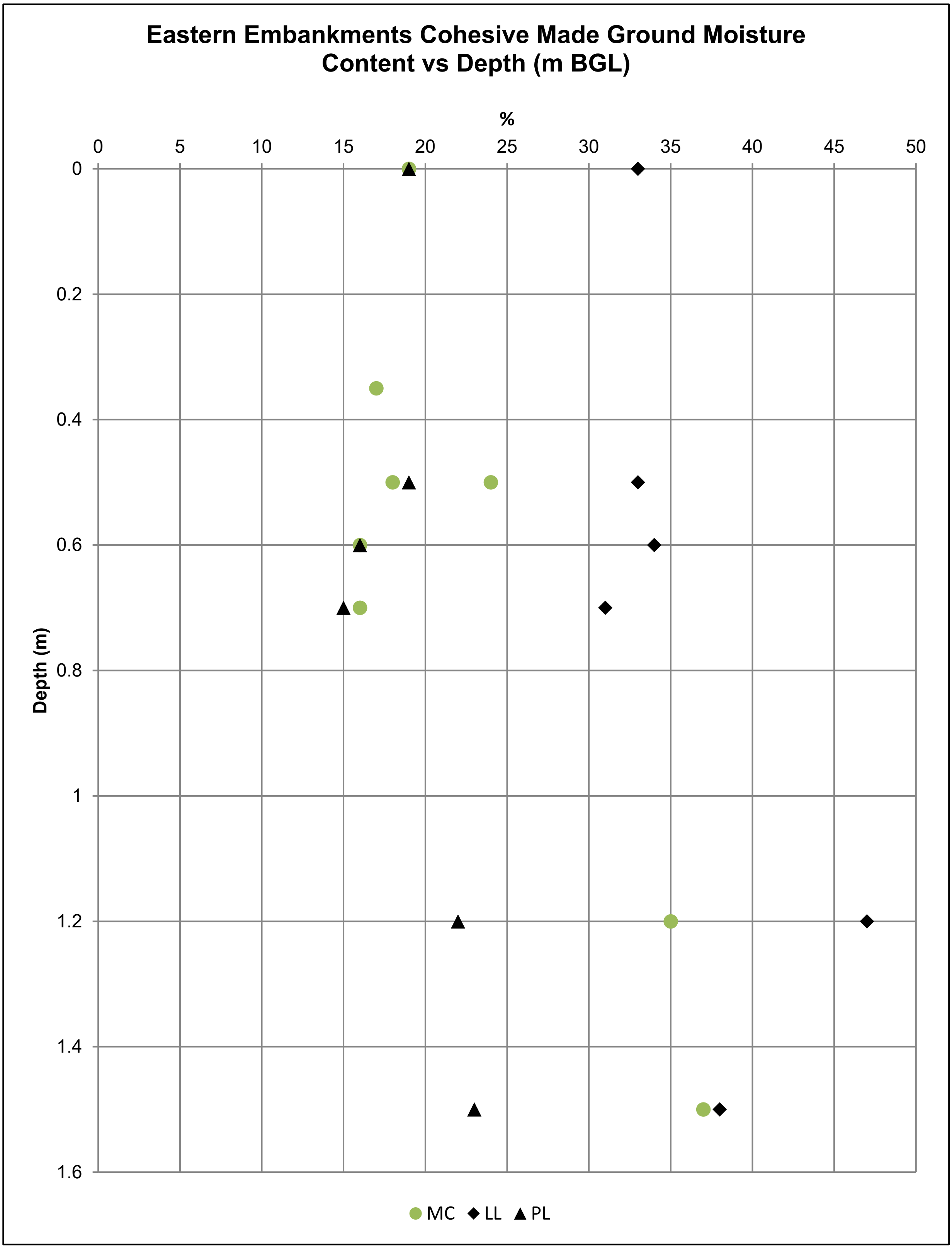


Figure 10.7.2: Eastern Embankments Cohesive Made Ground Plasticity Index against Liquid Limit.

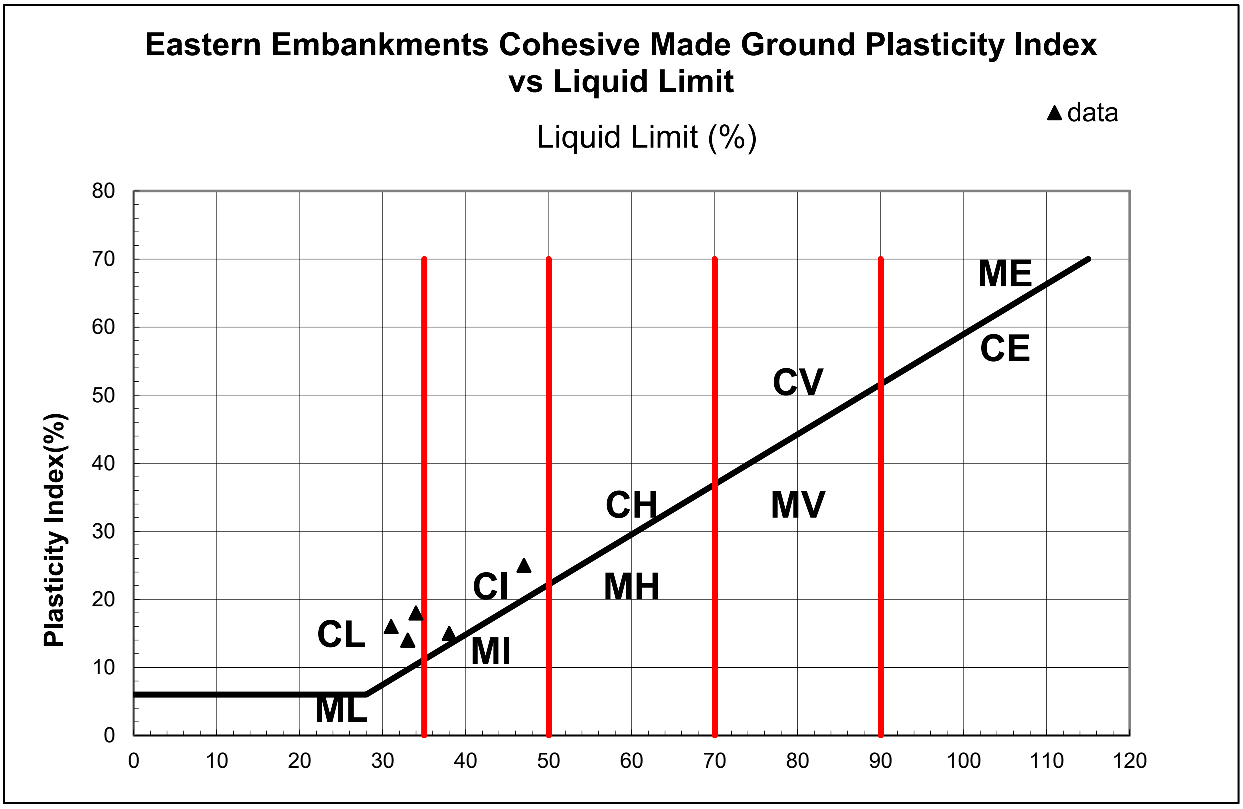


Figure 10.7.3: Eastern Embankments Cohesive Made Ground Angle of Internal Friction.

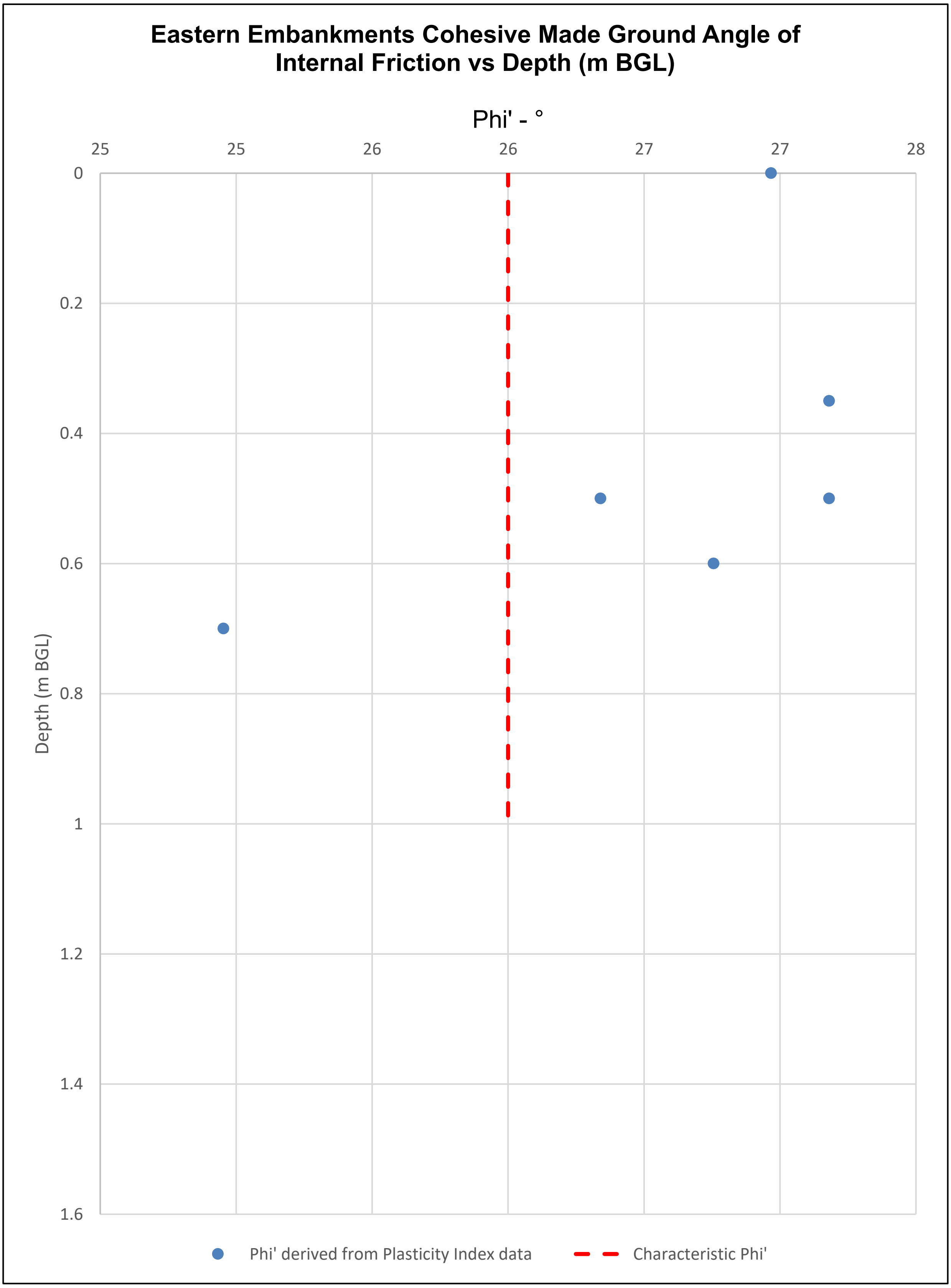


Figure 10.7.4: Eastern Embankments Made Ground SPT-N60.

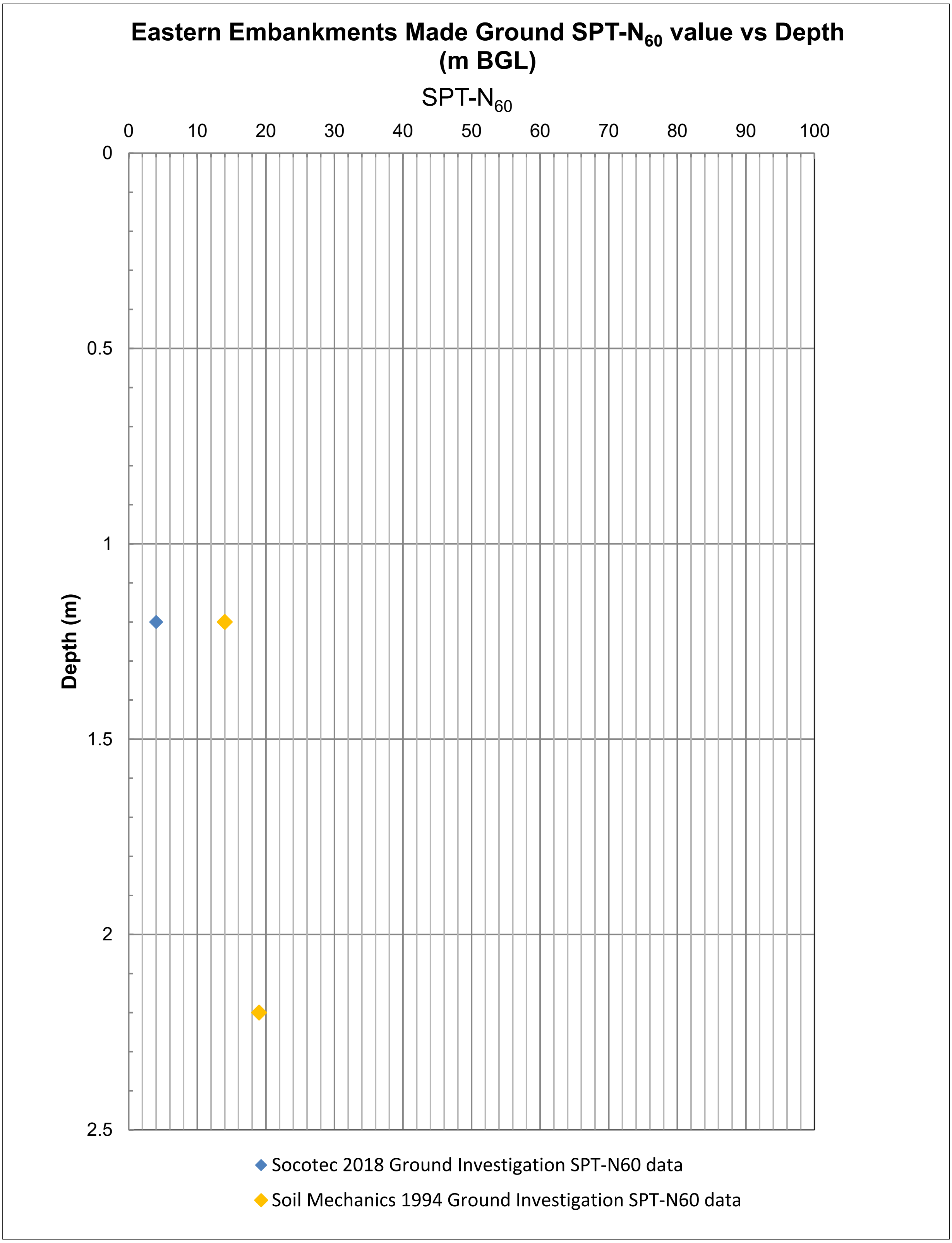


Figure 10.7.5: Eastern Embankments Made Ground Drained Youngs Modulus.

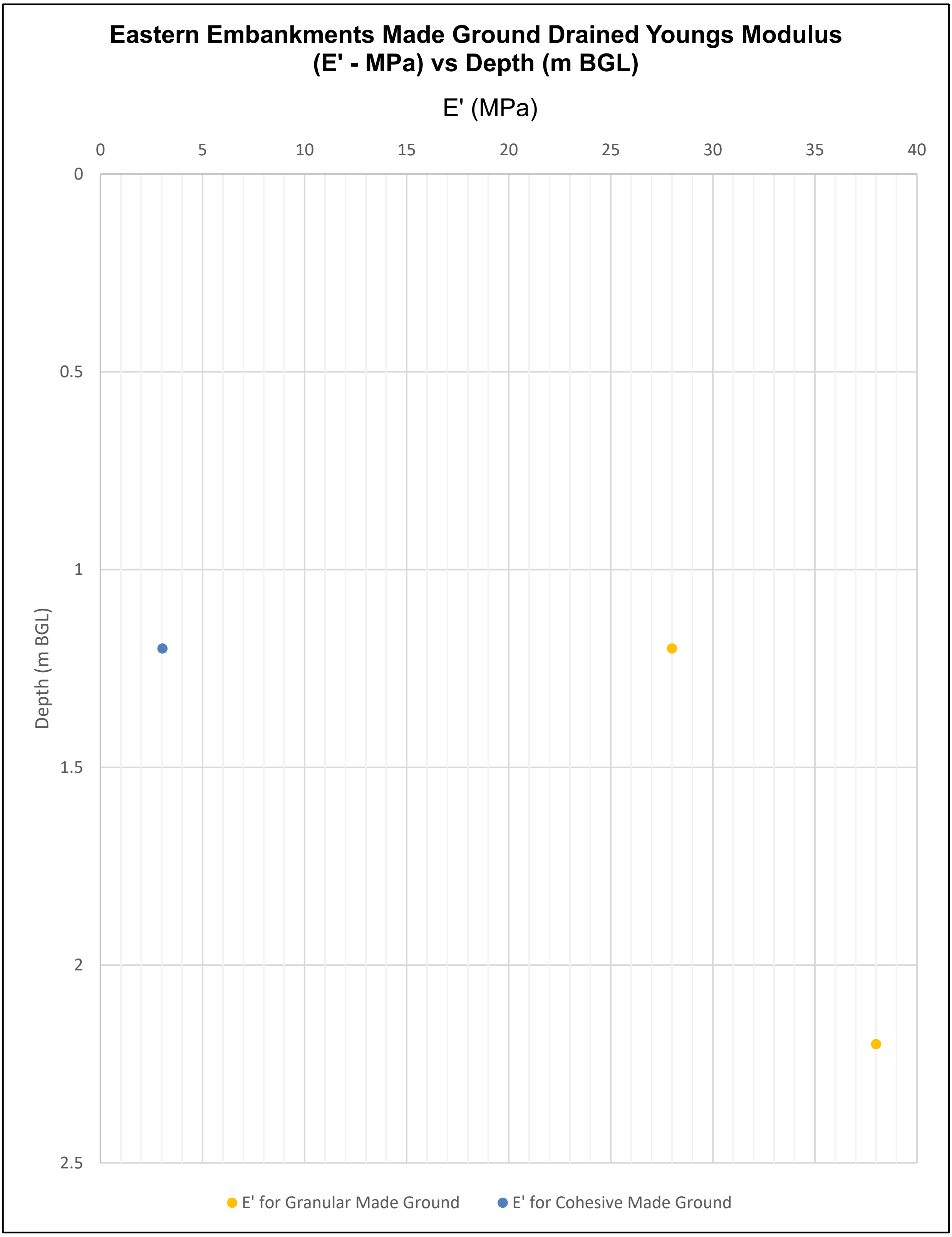


Figure 10.7.6: Eastern Embankments Cohesive Glacial Till Moisture Content.

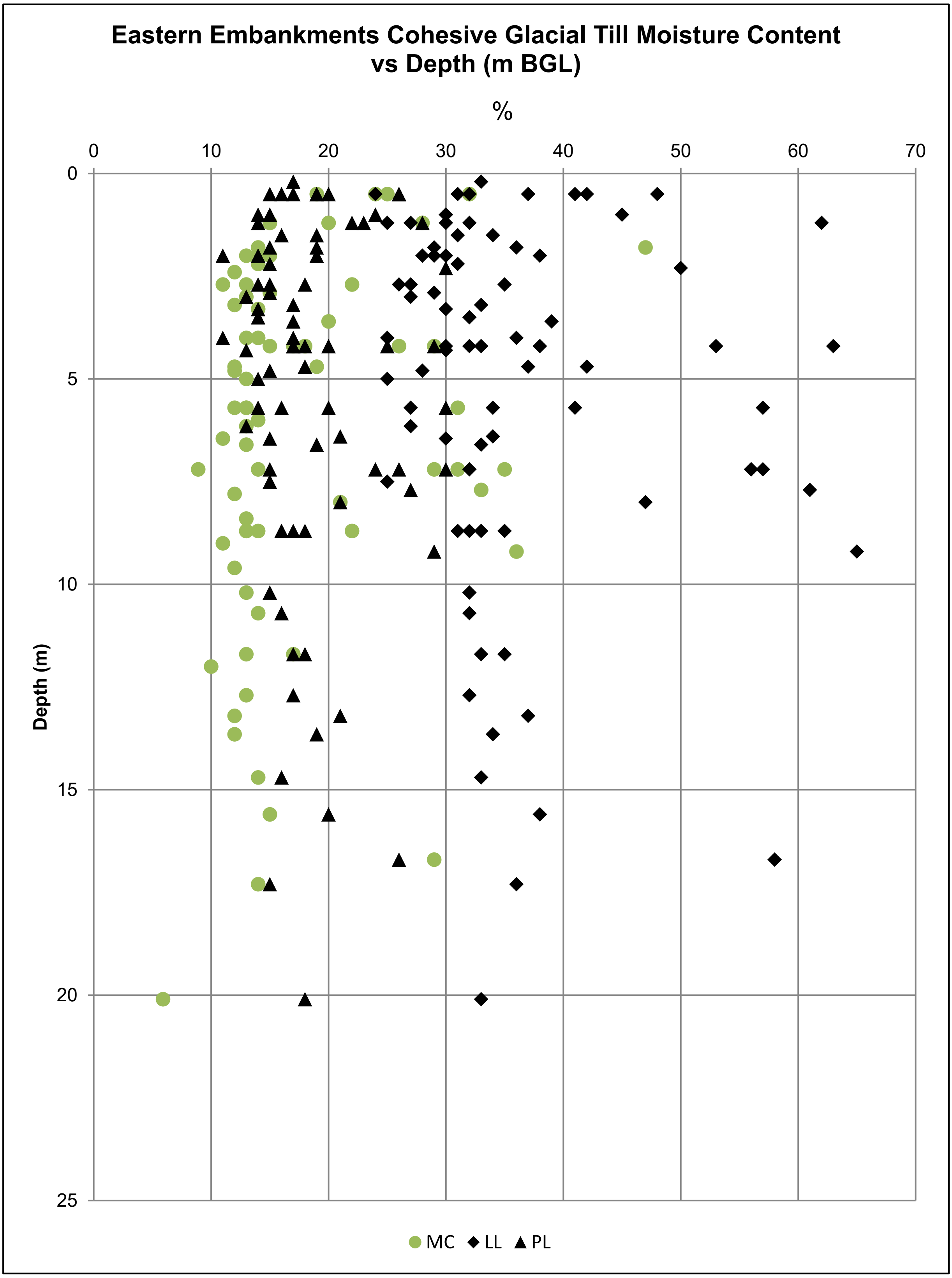


Figure 10.7.7: Eastern Embankments Cohesive Glacial Till Plasticity Index against Liquid Limit.

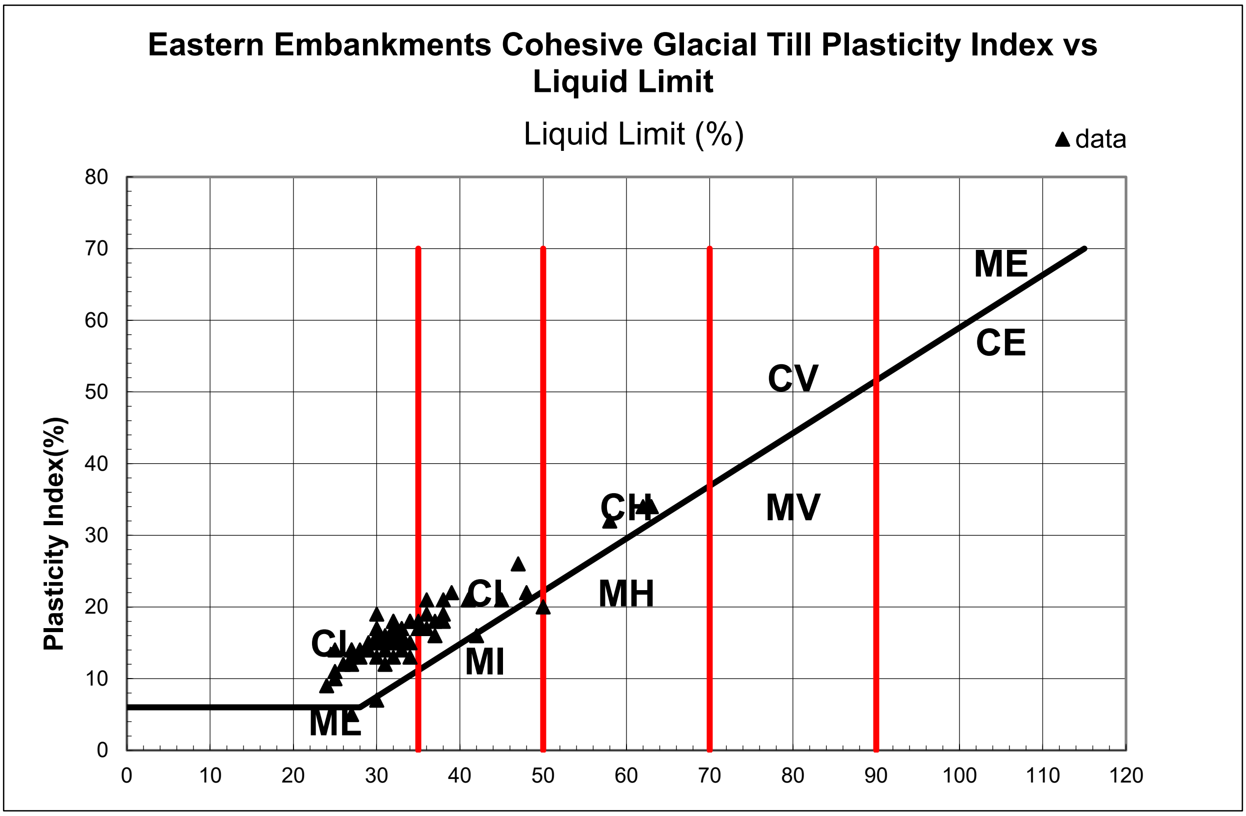


Figure 10.7.8: Eastern Embankments Cohesive Glacial Till SPT-N60.

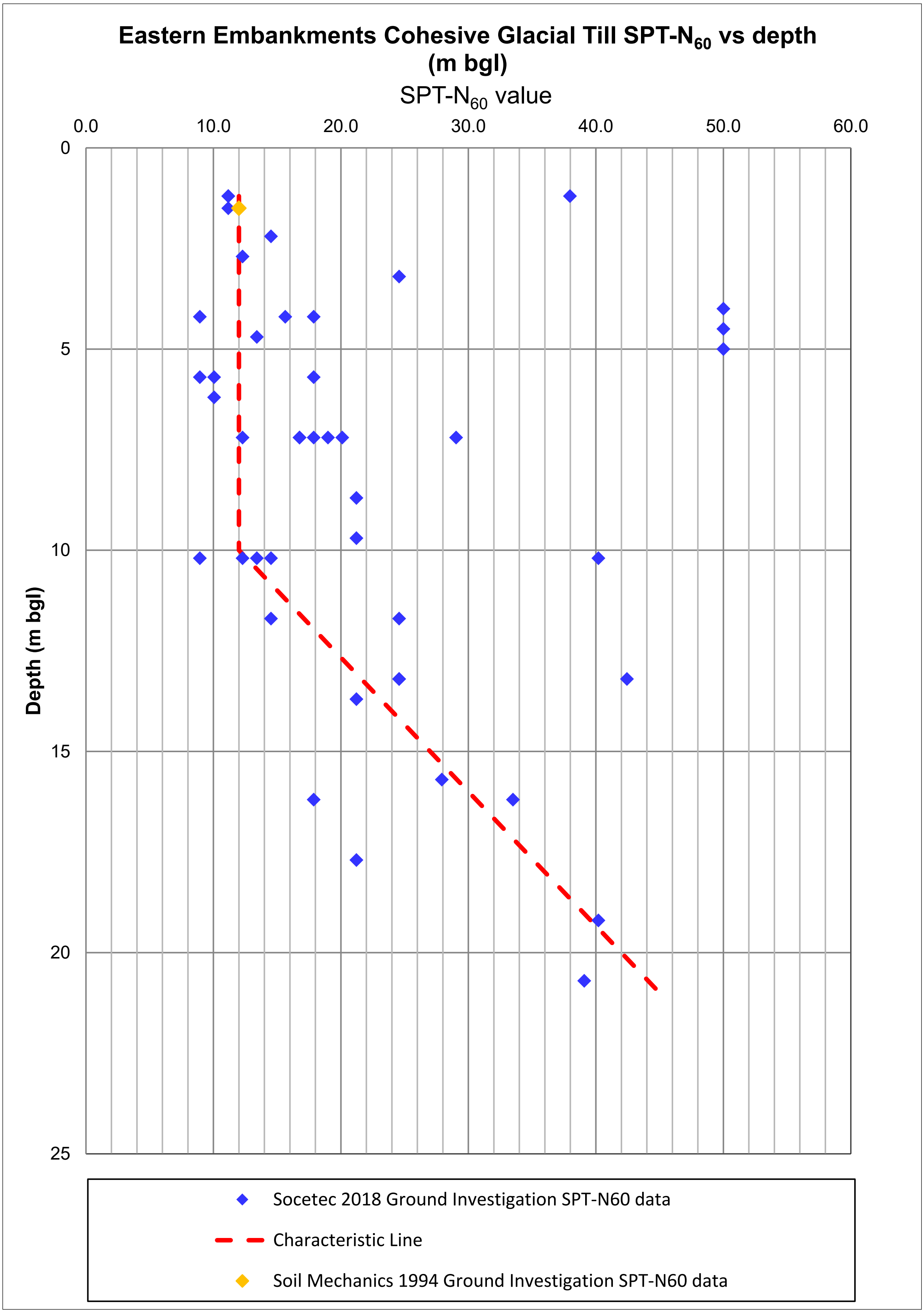


Figure 10.7.9: Eastern Embankments Cohesive Glacial Till Particle Size Distribution.

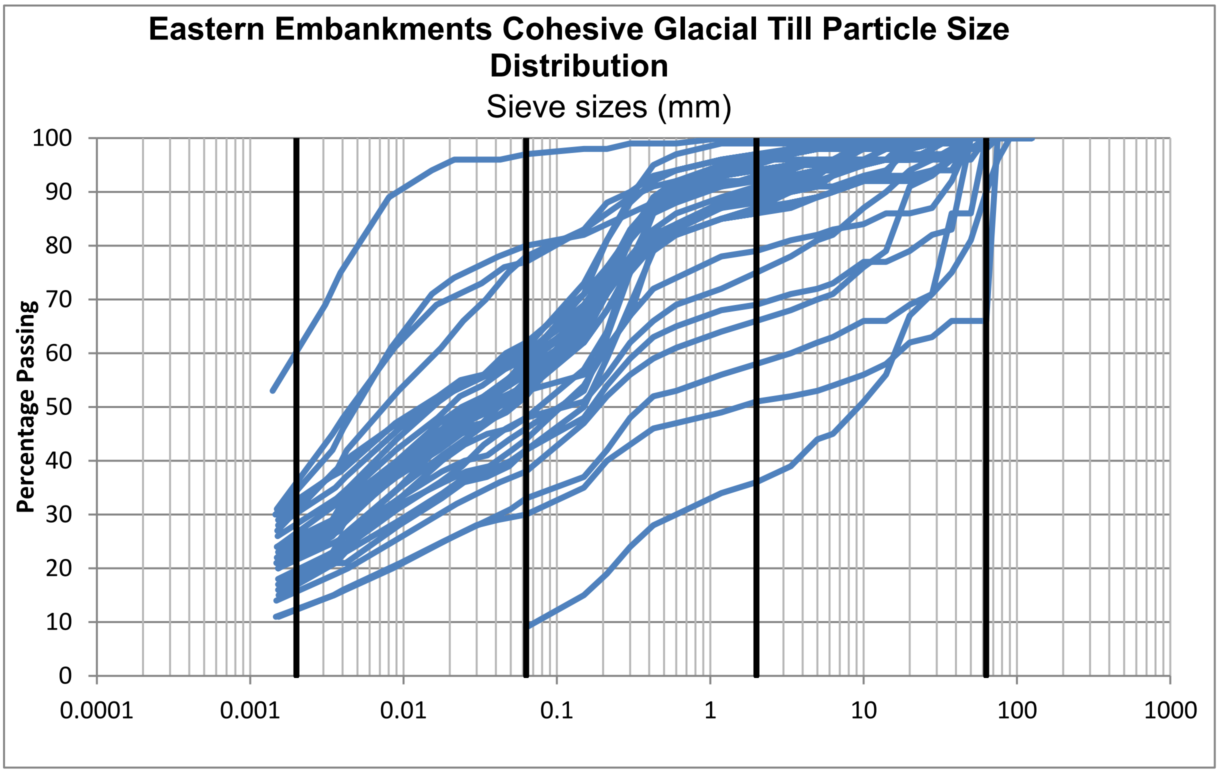


Figure 10.7.10: Eastern Embankments Cohesive Glacial Till Undrained Shear Strength.

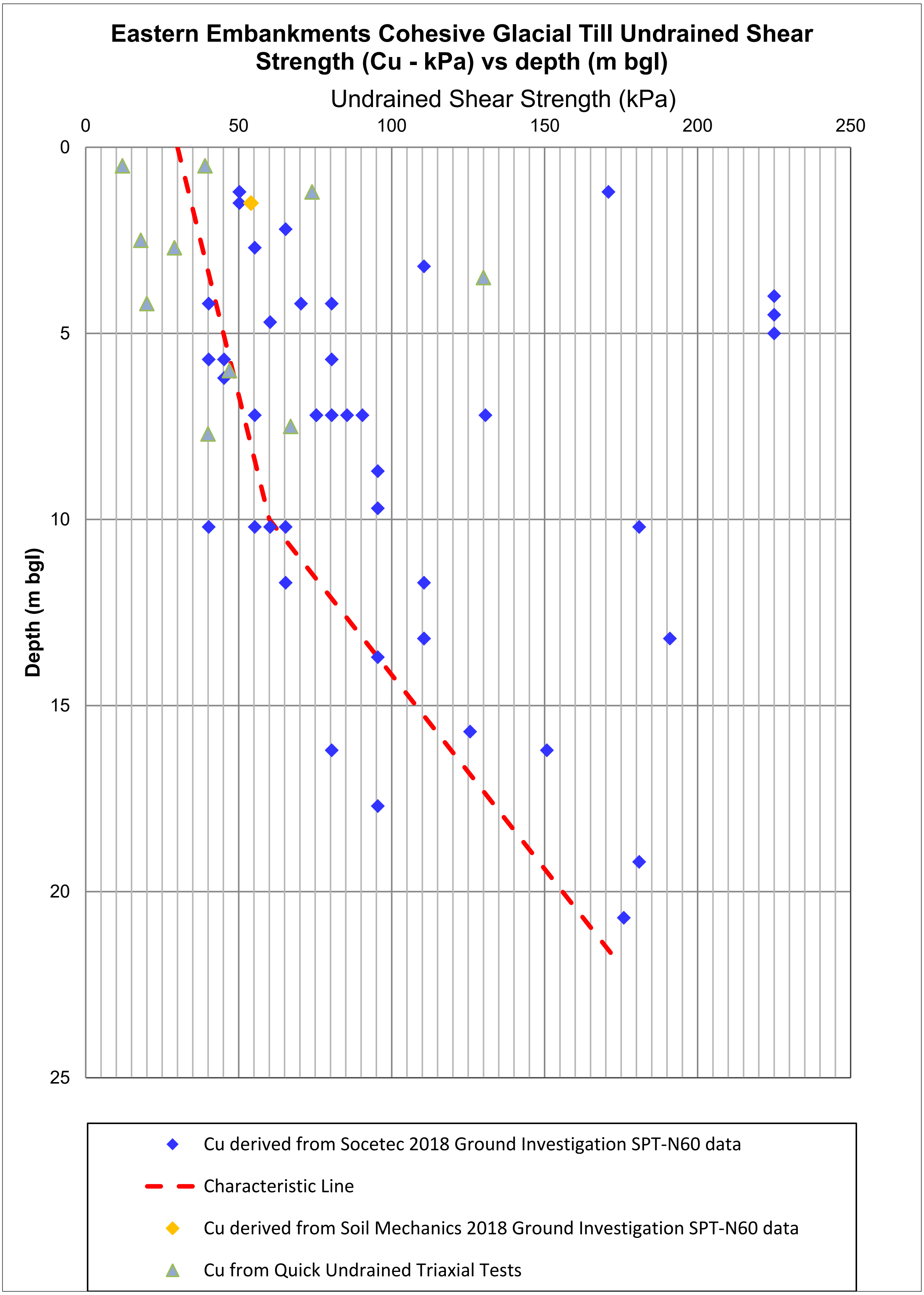


Figure 10.7.11: Eastern Embankments Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer).

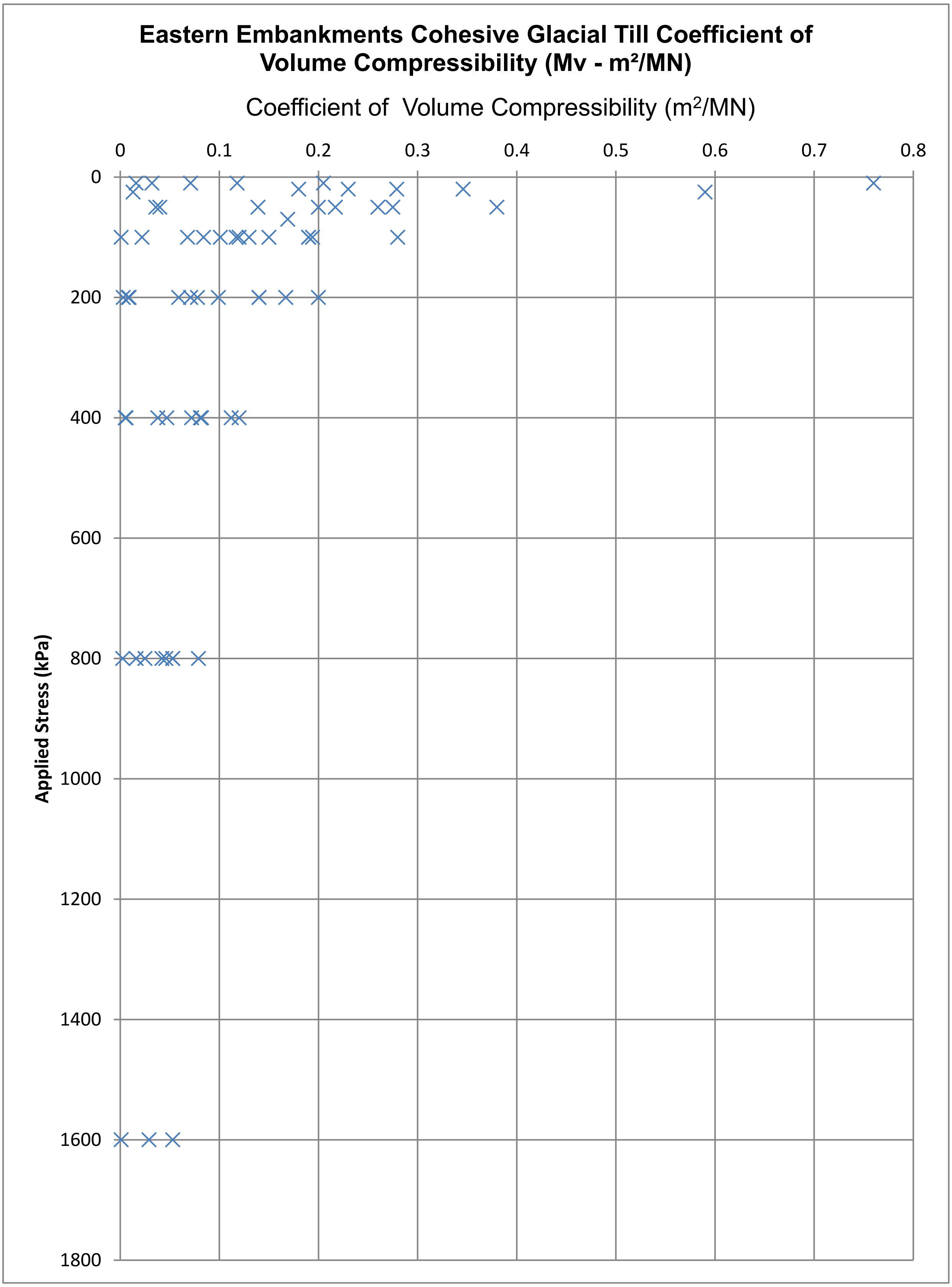


Figure 10.7.12: Eastern Embankments Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT).

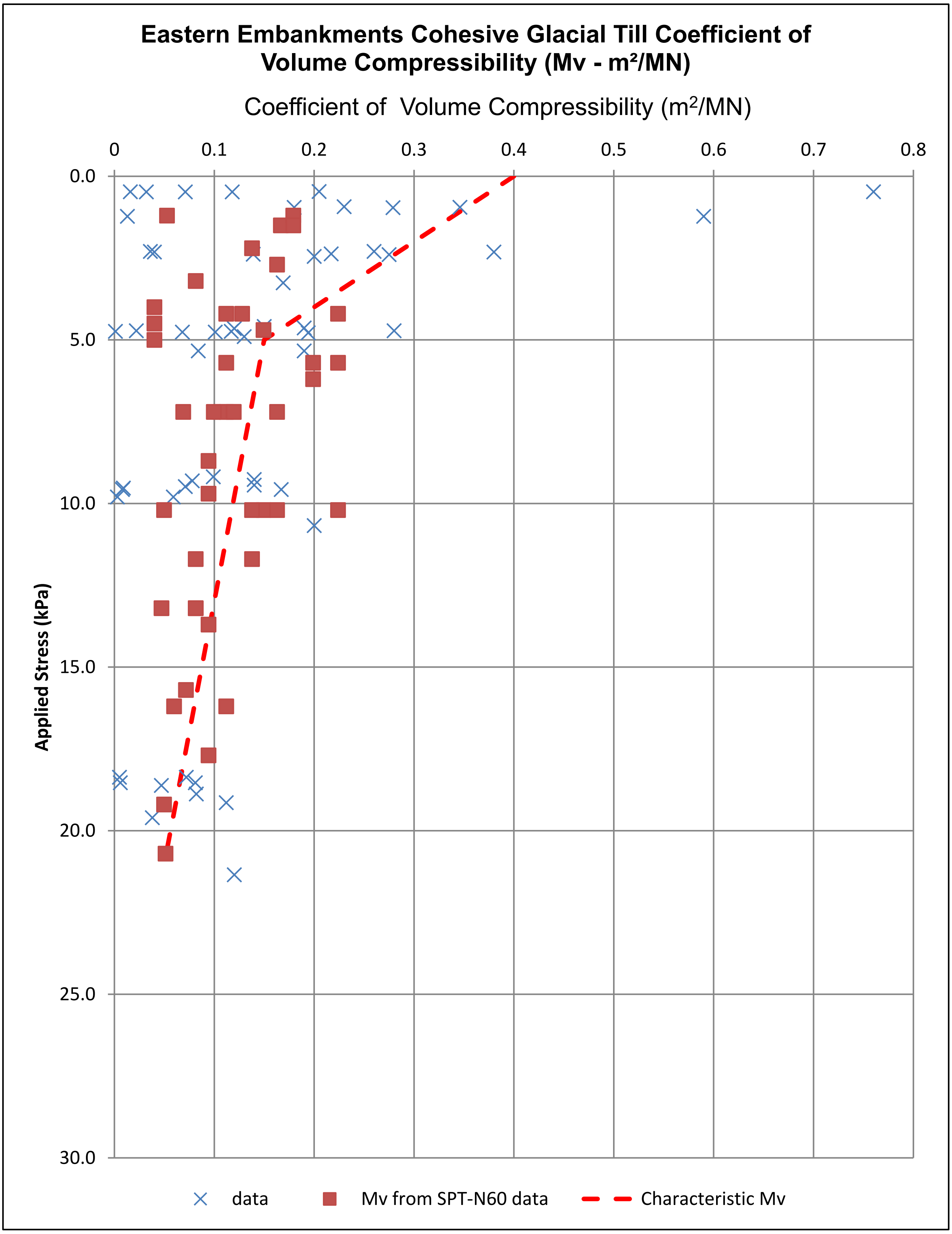


Figure 10.7.13: Eastern Embankments Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

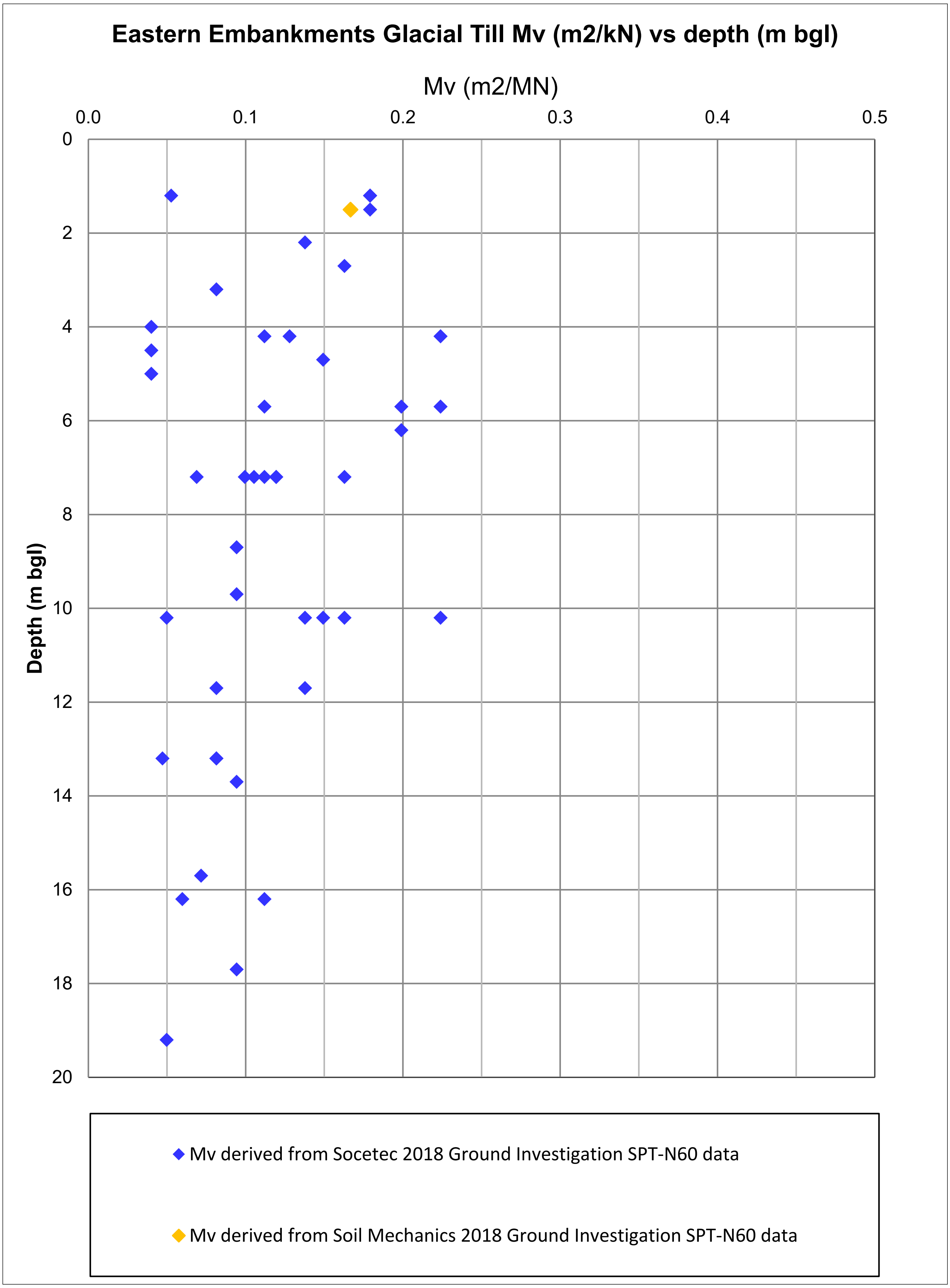


Figure 10.7.14: Eastern Embankments Cohesive Glacial Till Undrained Youngs Modulus.

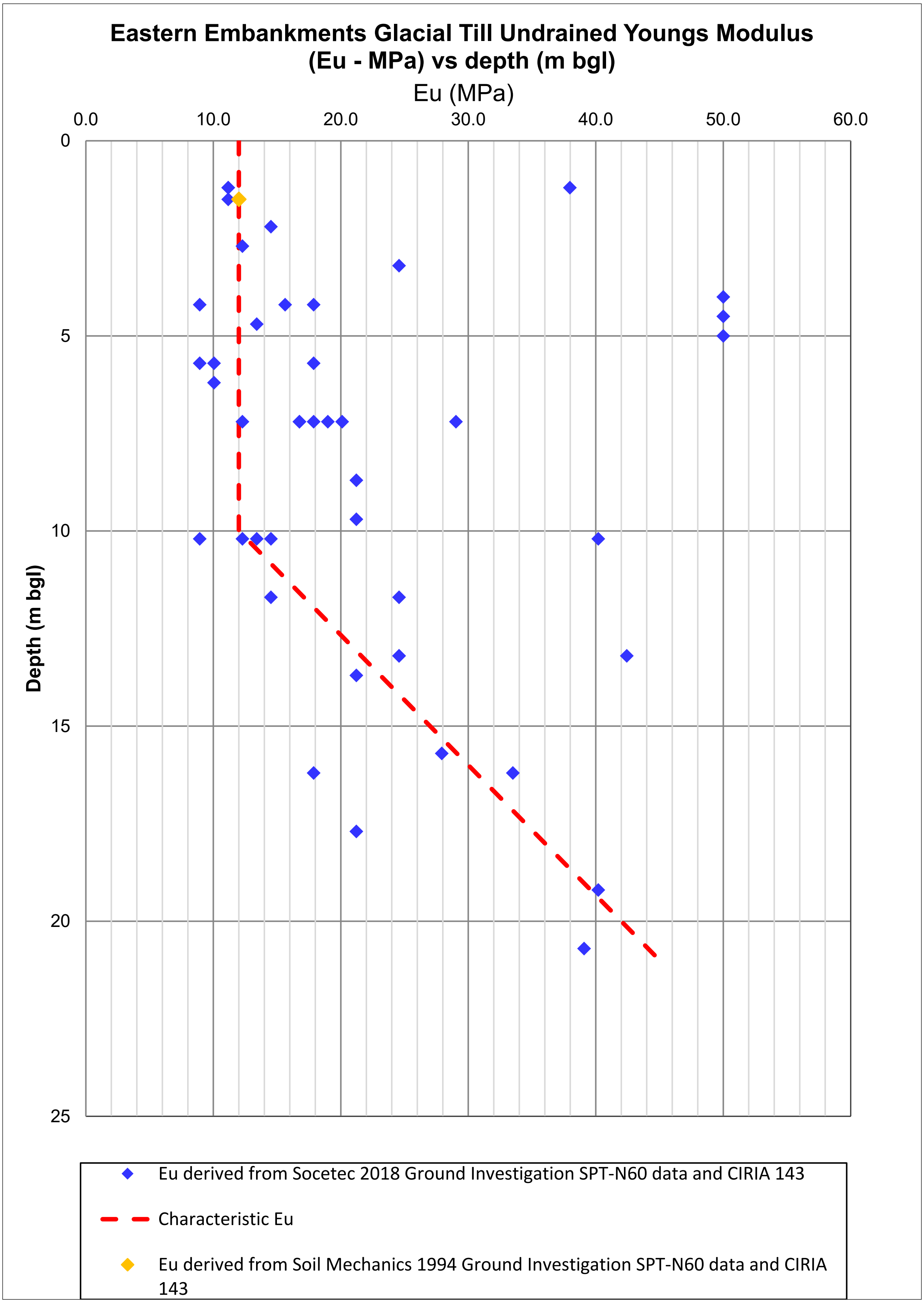


Figure 10.7.15: Eastern Embankments Cohesive Glacial Till Drained Youngs Modulus.

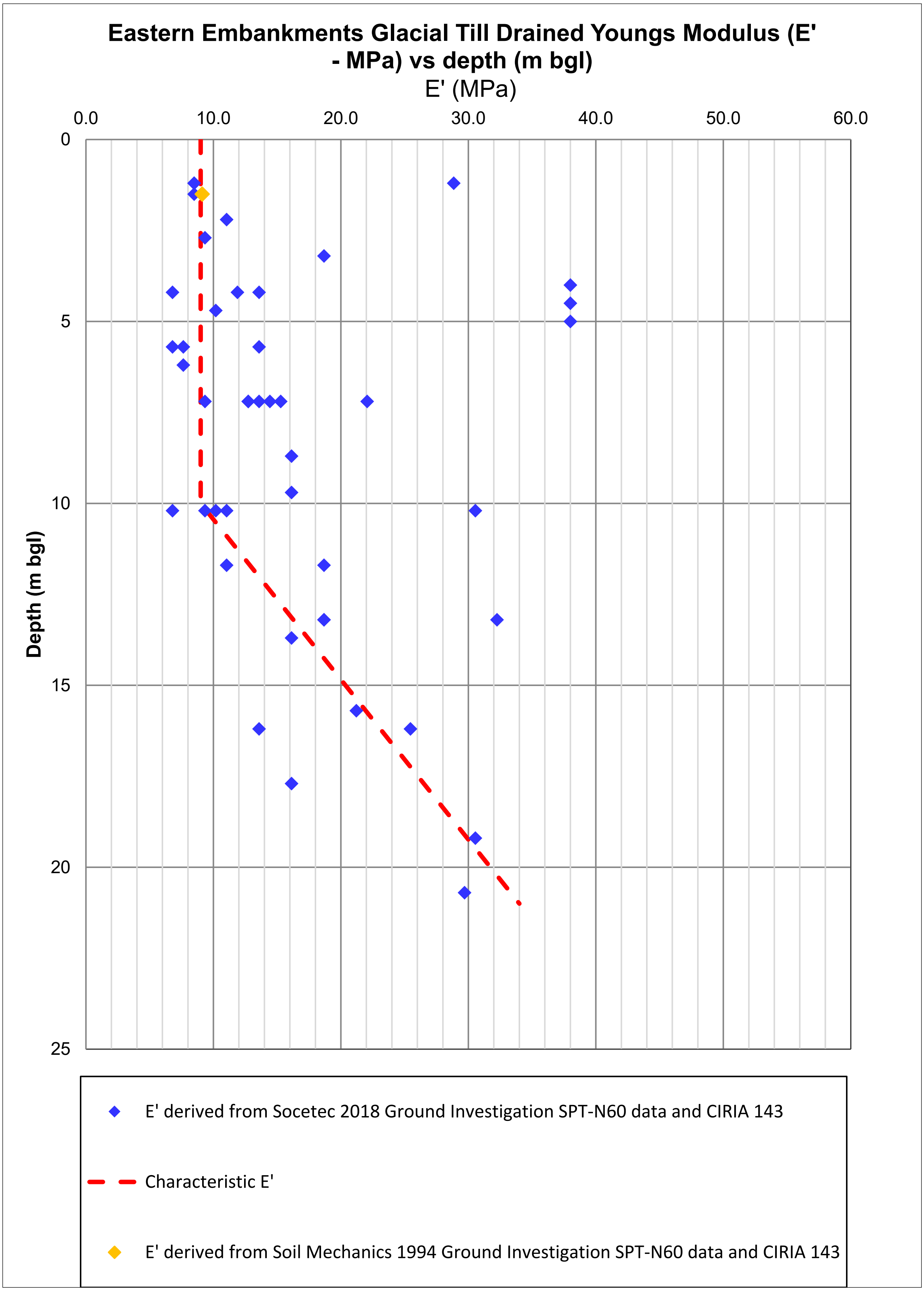


Figure 10.7.16: Eastern Embankments Granular Glacial Till Moisture Content.

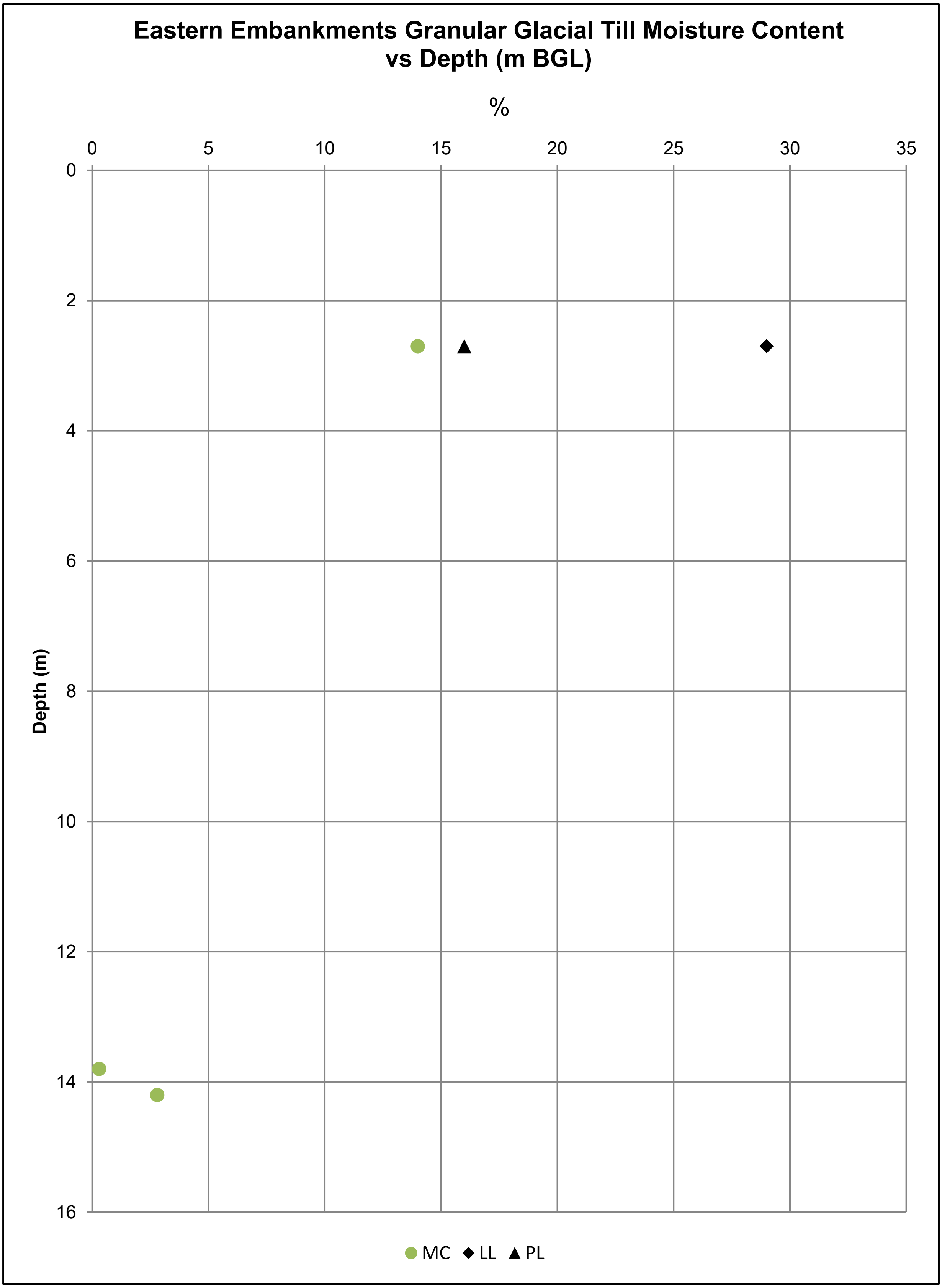


Figure 10.7.17: Eastern Embankments Granular Glacial Till SPT-N_{60}.

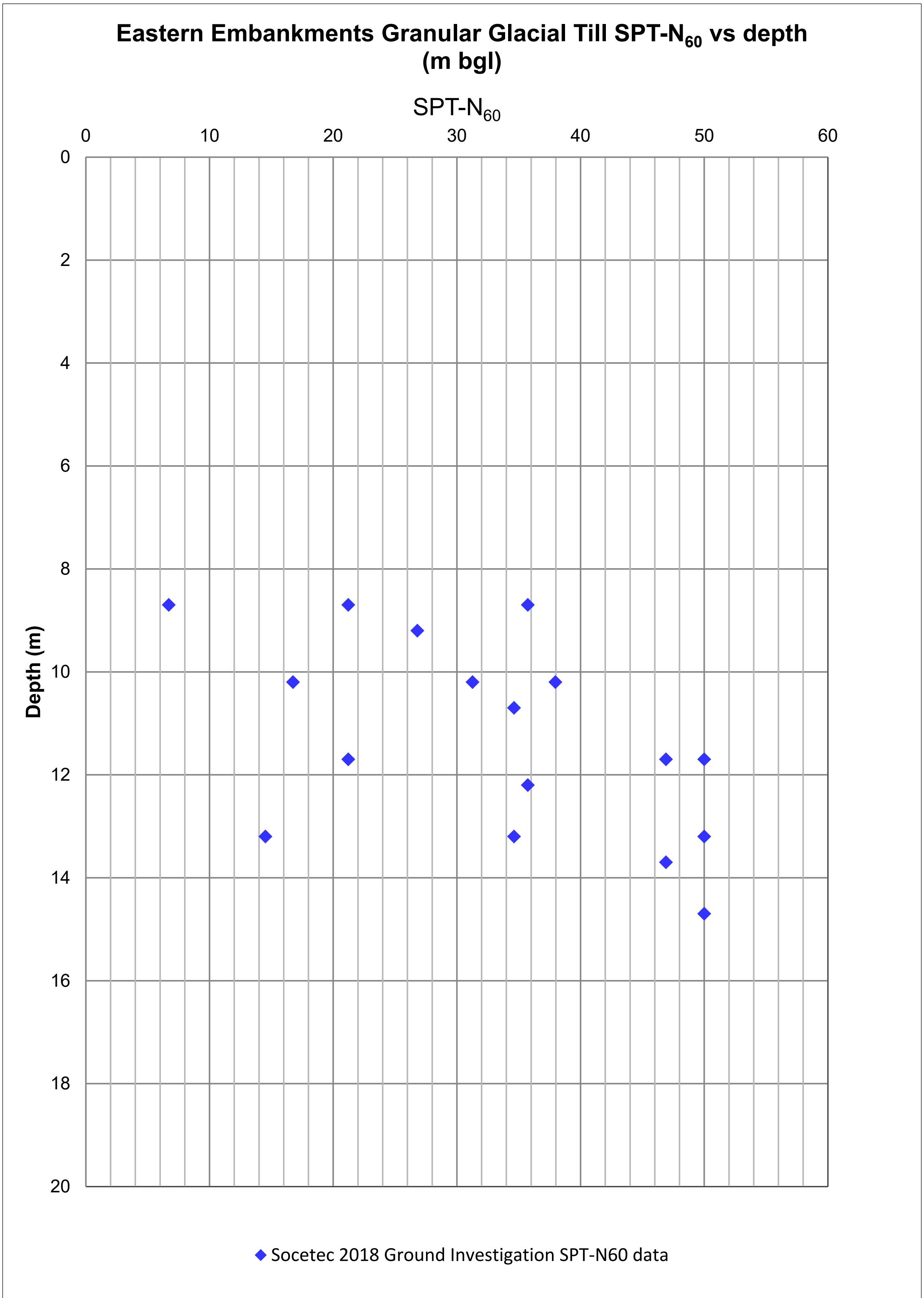


Figure 10.7.18: Eastern Embankments Granular Glacial Till Angle of Internal Friction.

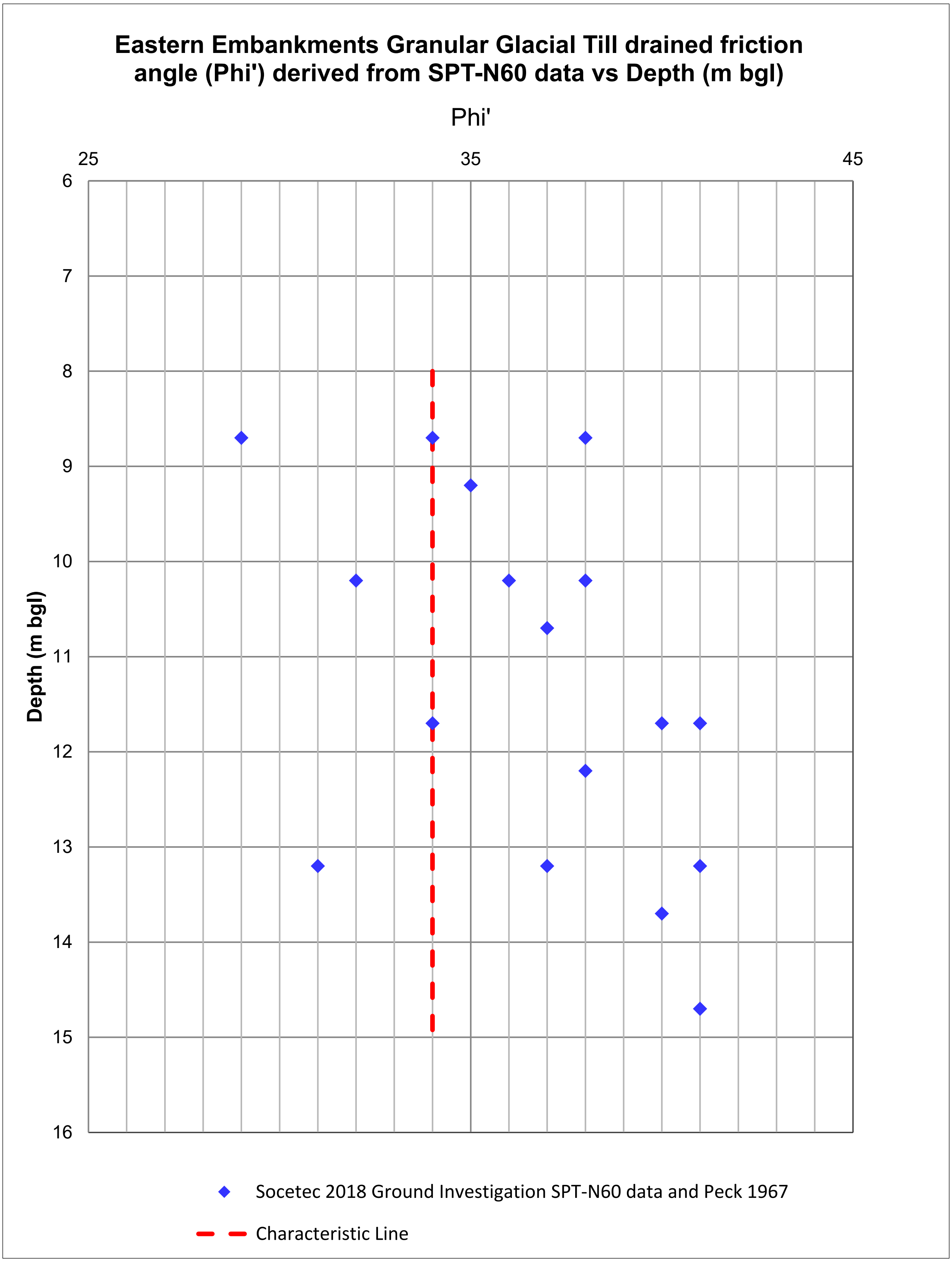
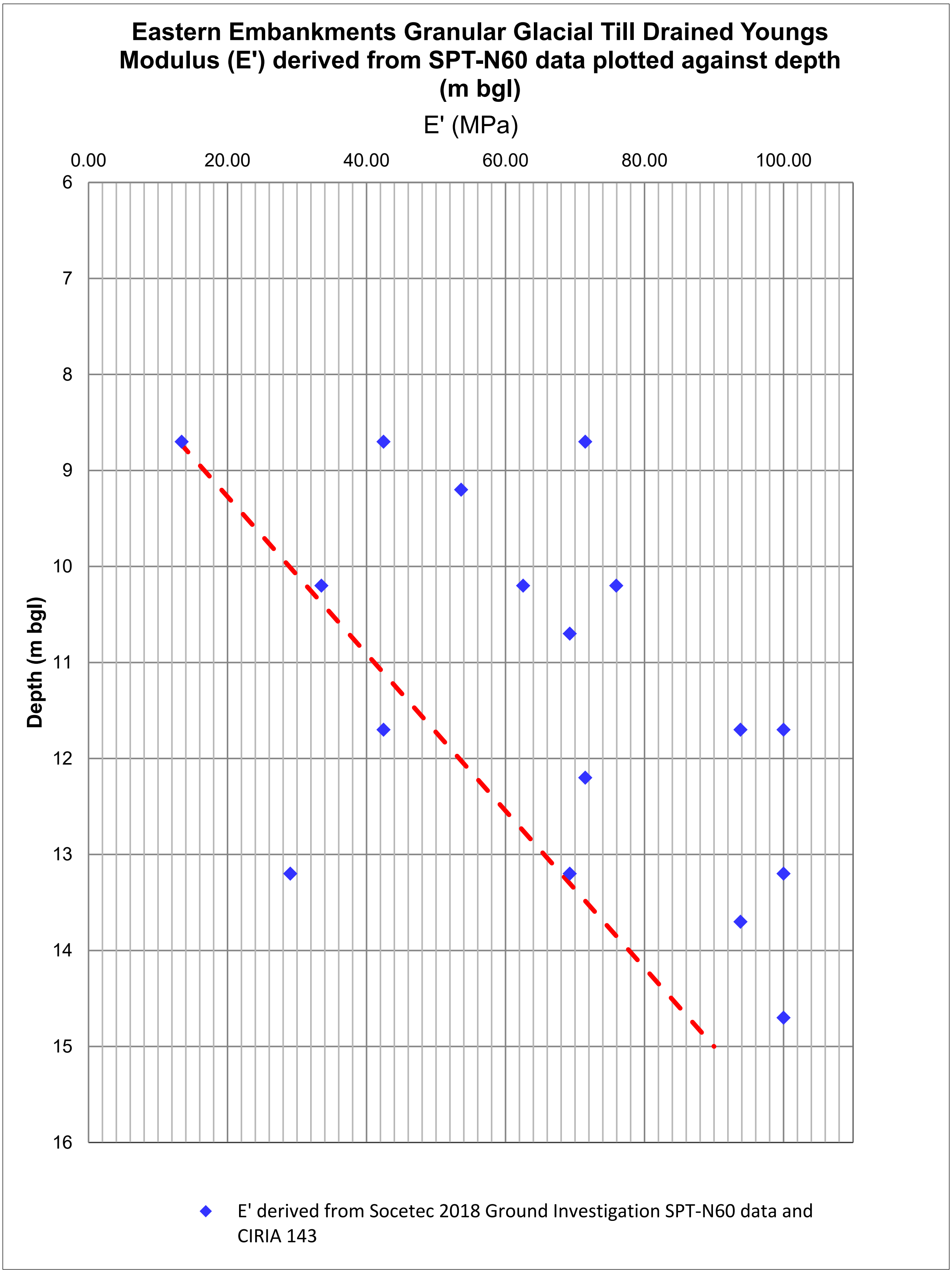


Figure 10.7.19: Eastern Embankments Granular Glacial Till Drained Youngs Modulus.



10.8 Longdendale Aqueduct data plots

Figure 10.8.1: Longdendale Aqueduct Cohesive Made Ground Plastic Limits and Liquid Limits.

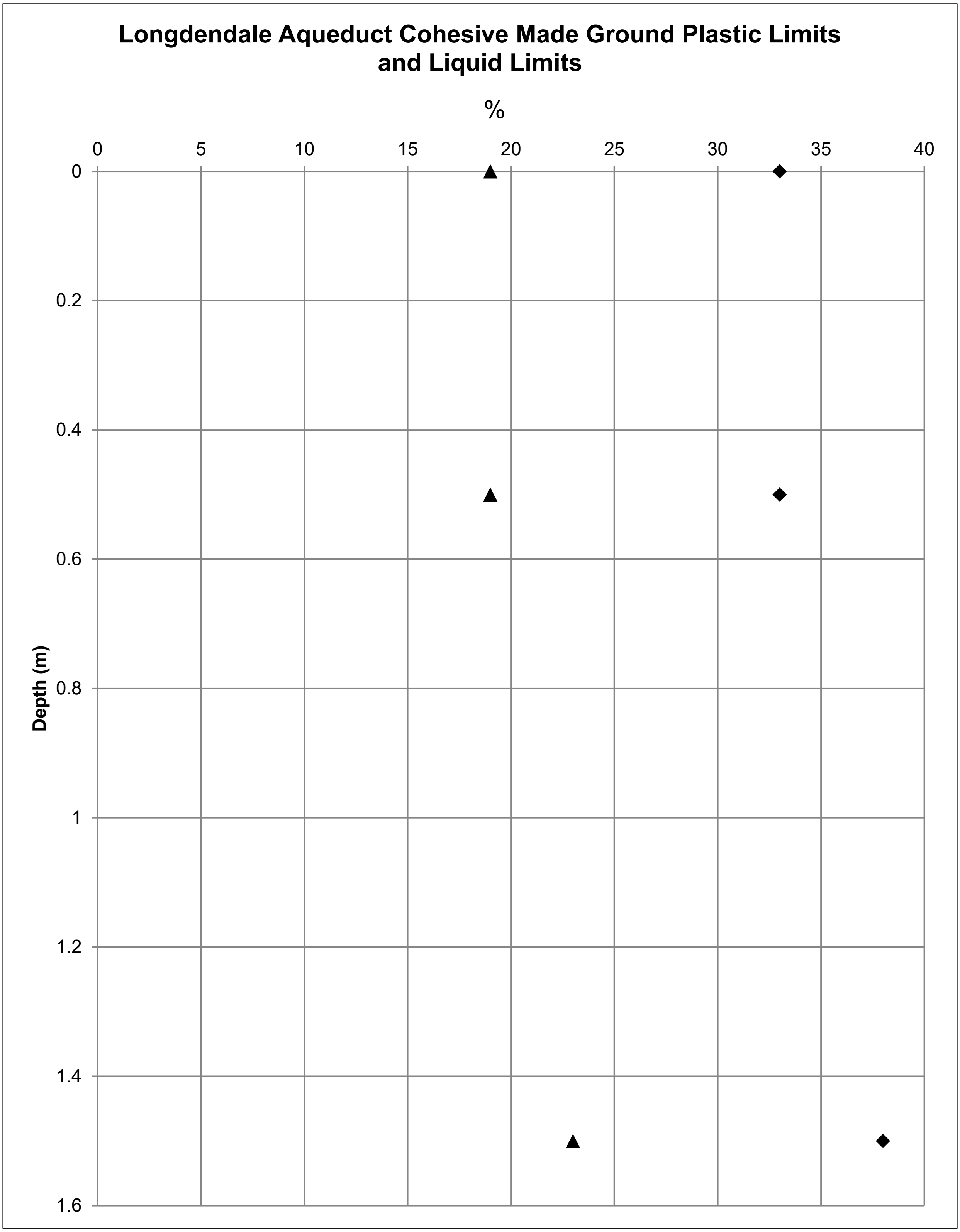


Figure 10.8.2: Longdendale Aqueduct Cohesive Made Ground Plasticity Index vs Liquid Limit.

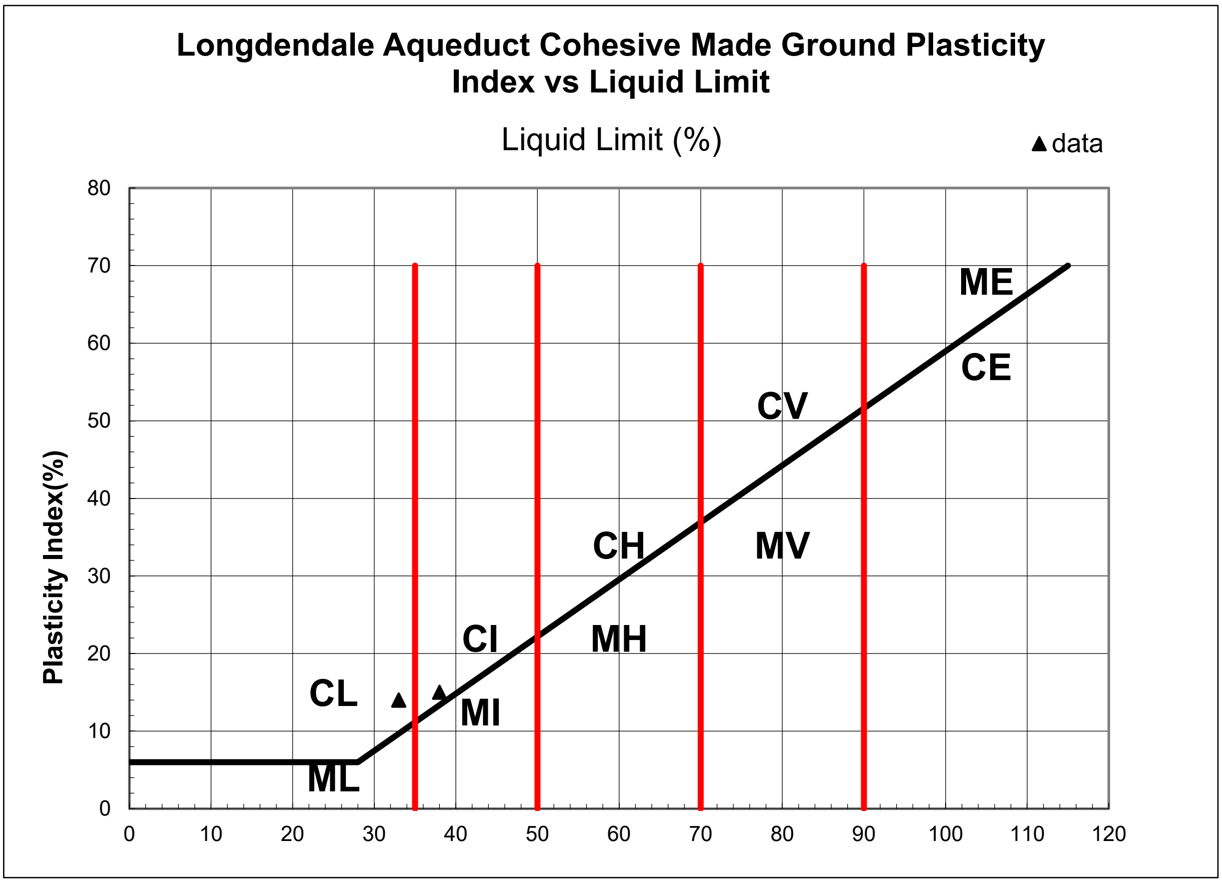


Figure 10.8.3: Longdendale Aqueduct Granular Made Ground SPT-N60.

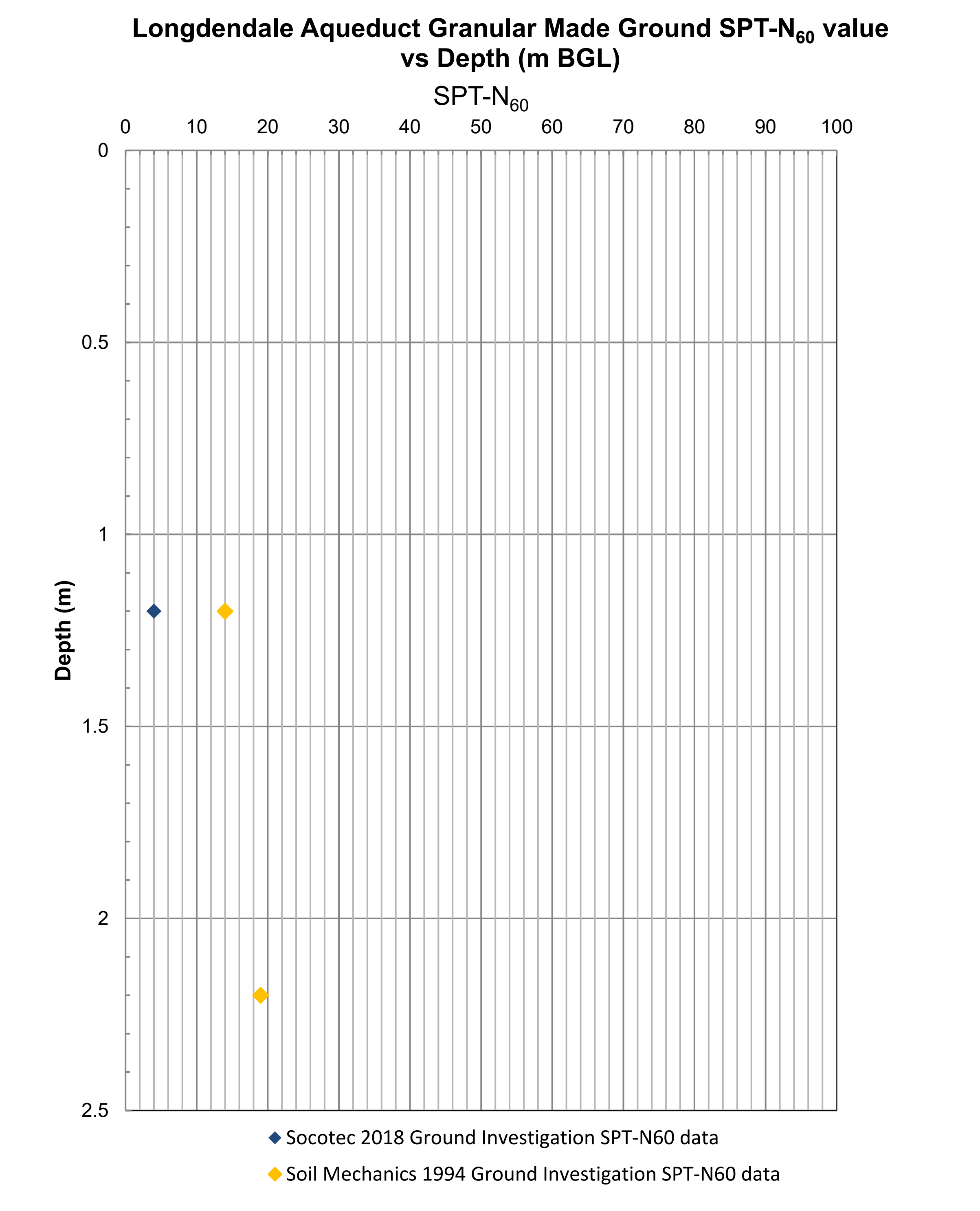


Figure 10.8.4: Longdendale Aqueduct Cohesive Glacial Till Moisture Content.

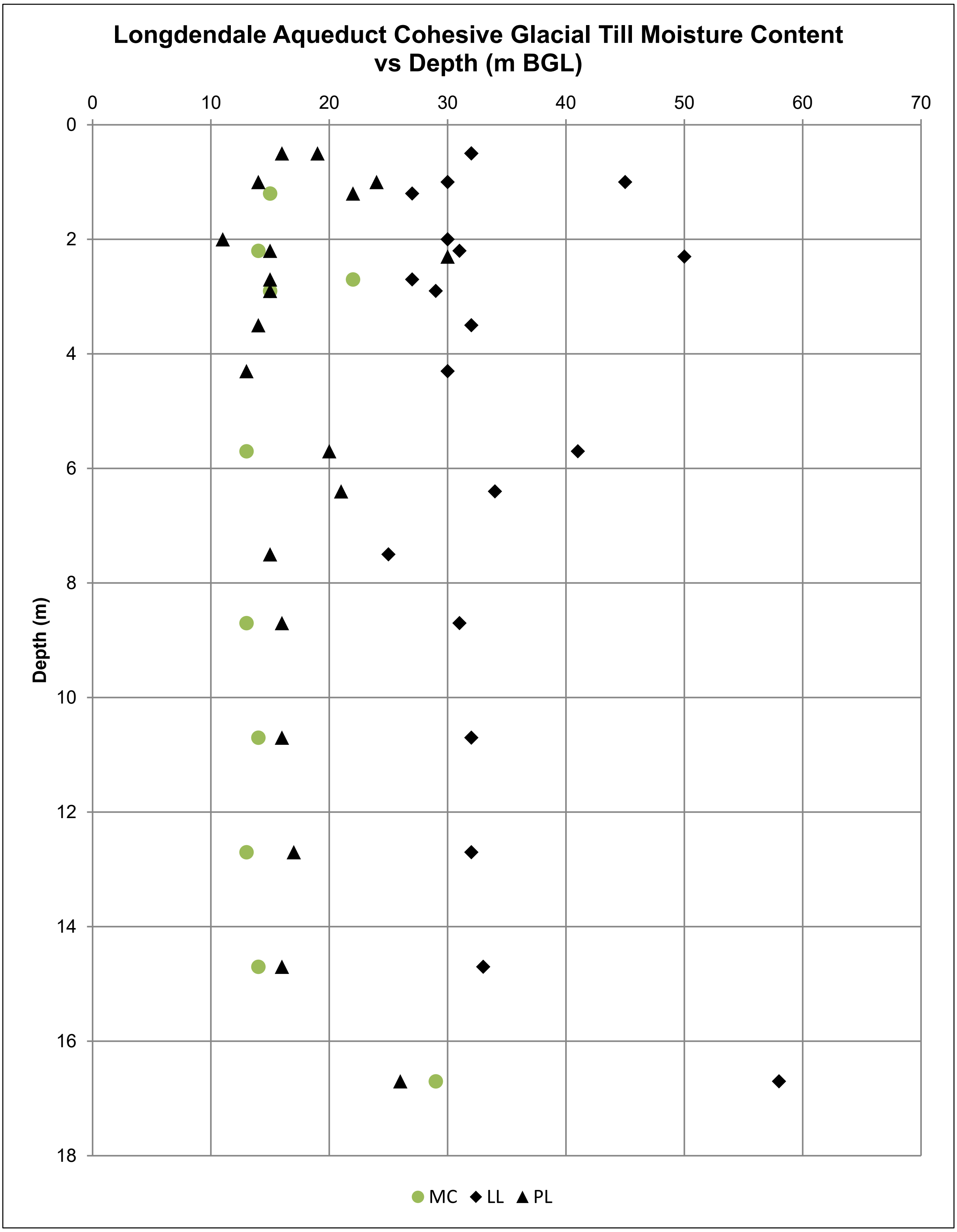


Figure 10.8.5: Longdendale Aqueduct Cohesive Glacial Till Plasticity Index against Liquid Limit.

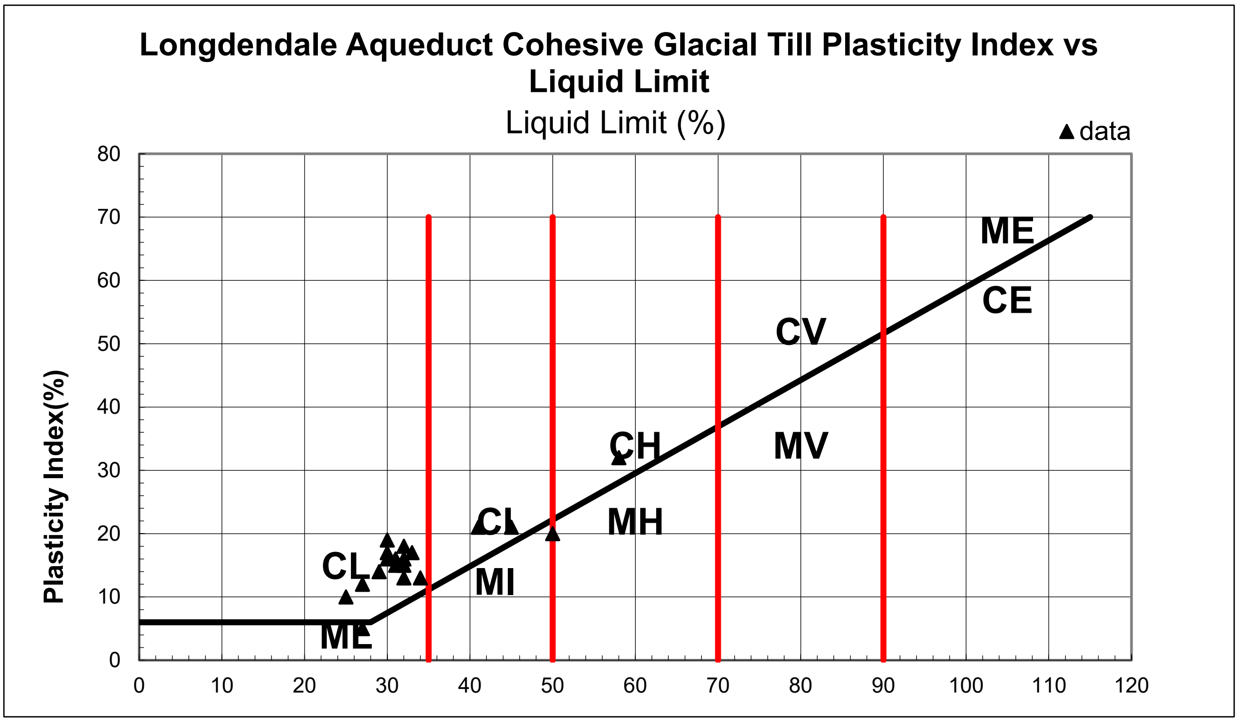


Figure 10.8.6: Longdendale Aqueduct Cohesive Glacial Till SPT-N60.

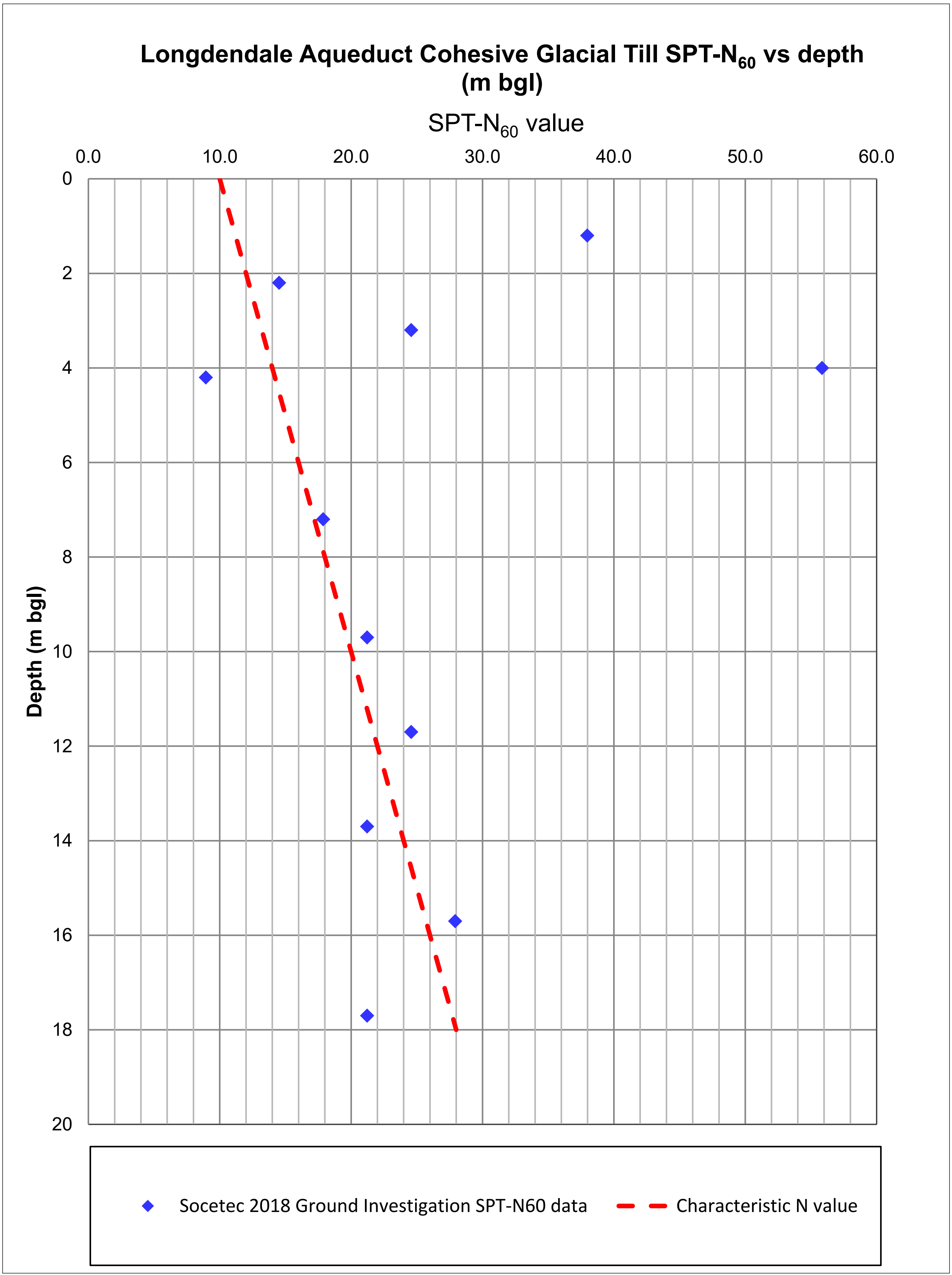


Figure 10.8.7: Longdendale Aqueduct Cohesive Glacial Till Particle Size Distribution.

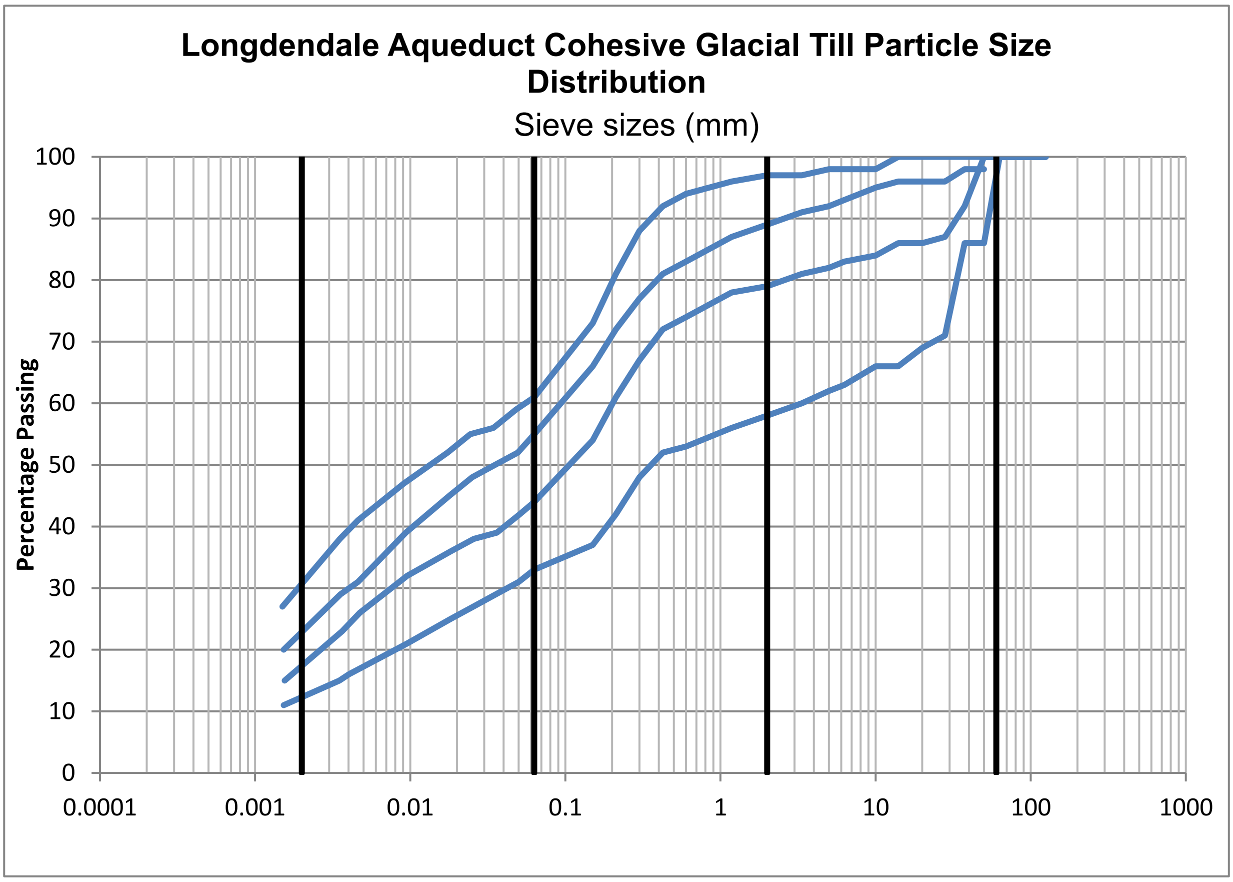


Figure 10.8.8: Longdendale Aqueduct Cohesive Glacial Till Undrained Shear Strength.

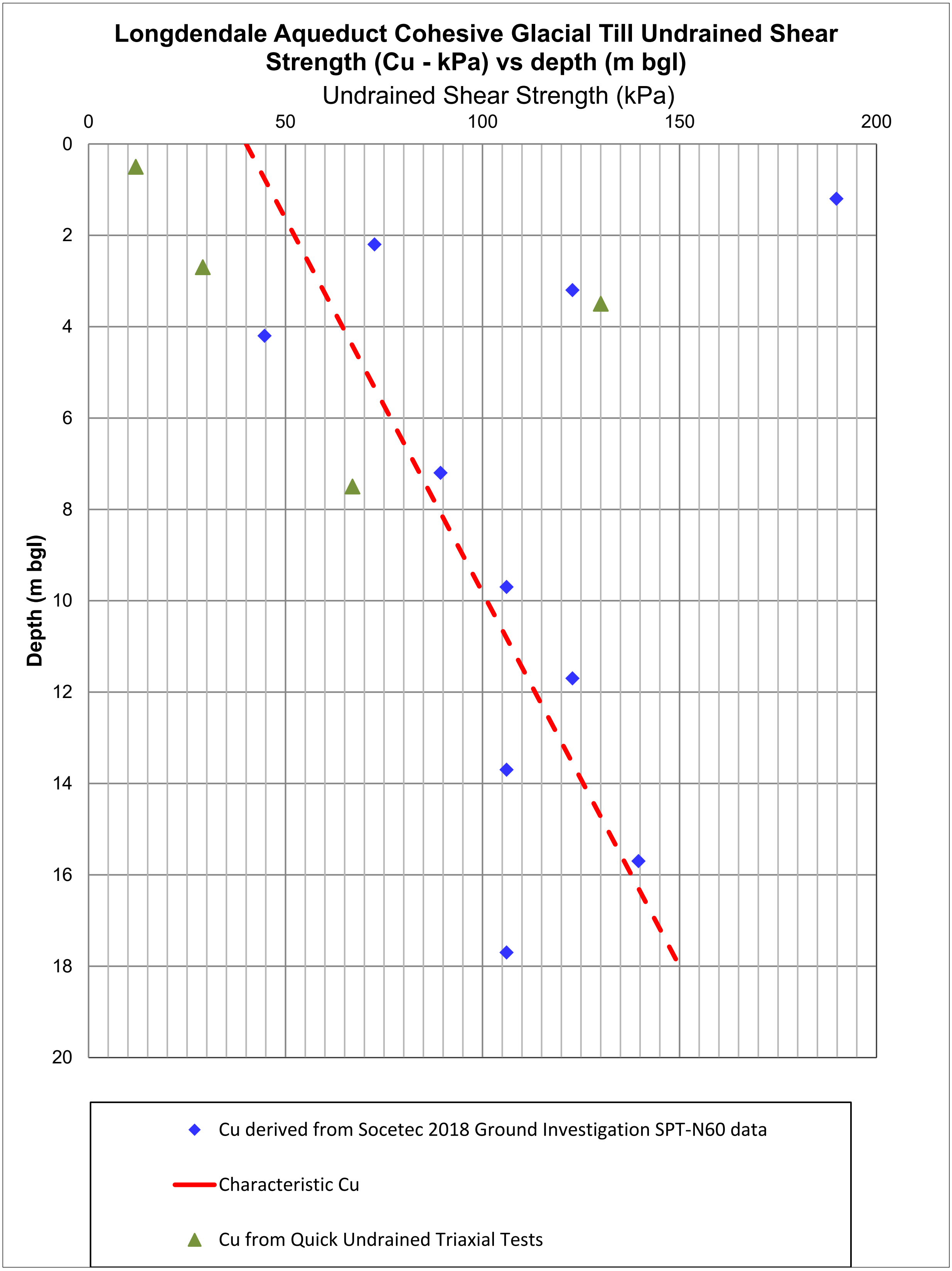


Figure 10.8.9: Longdendale Aqueduct Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT).

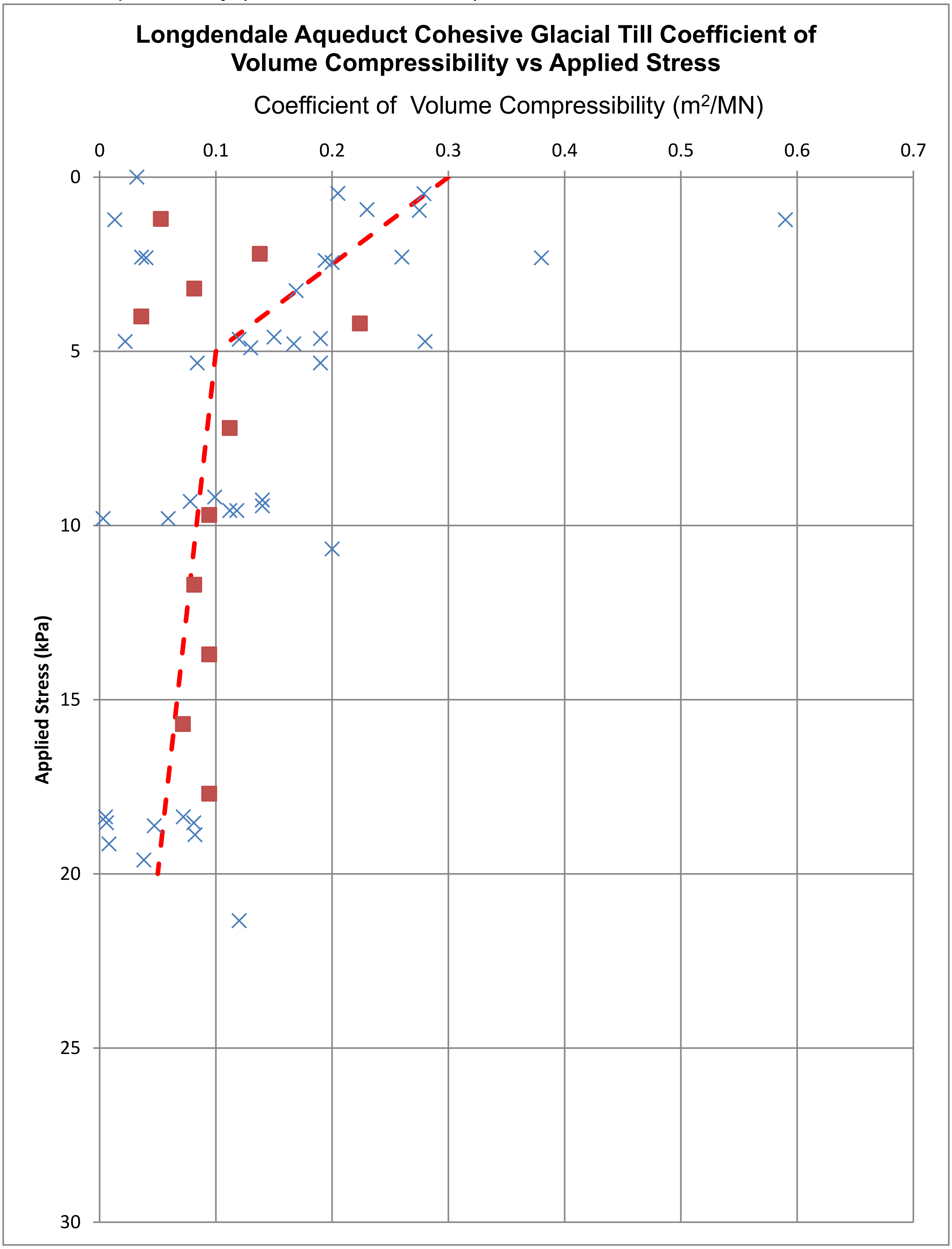


Figure 10.8.10: Longdendale Aqueduct Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

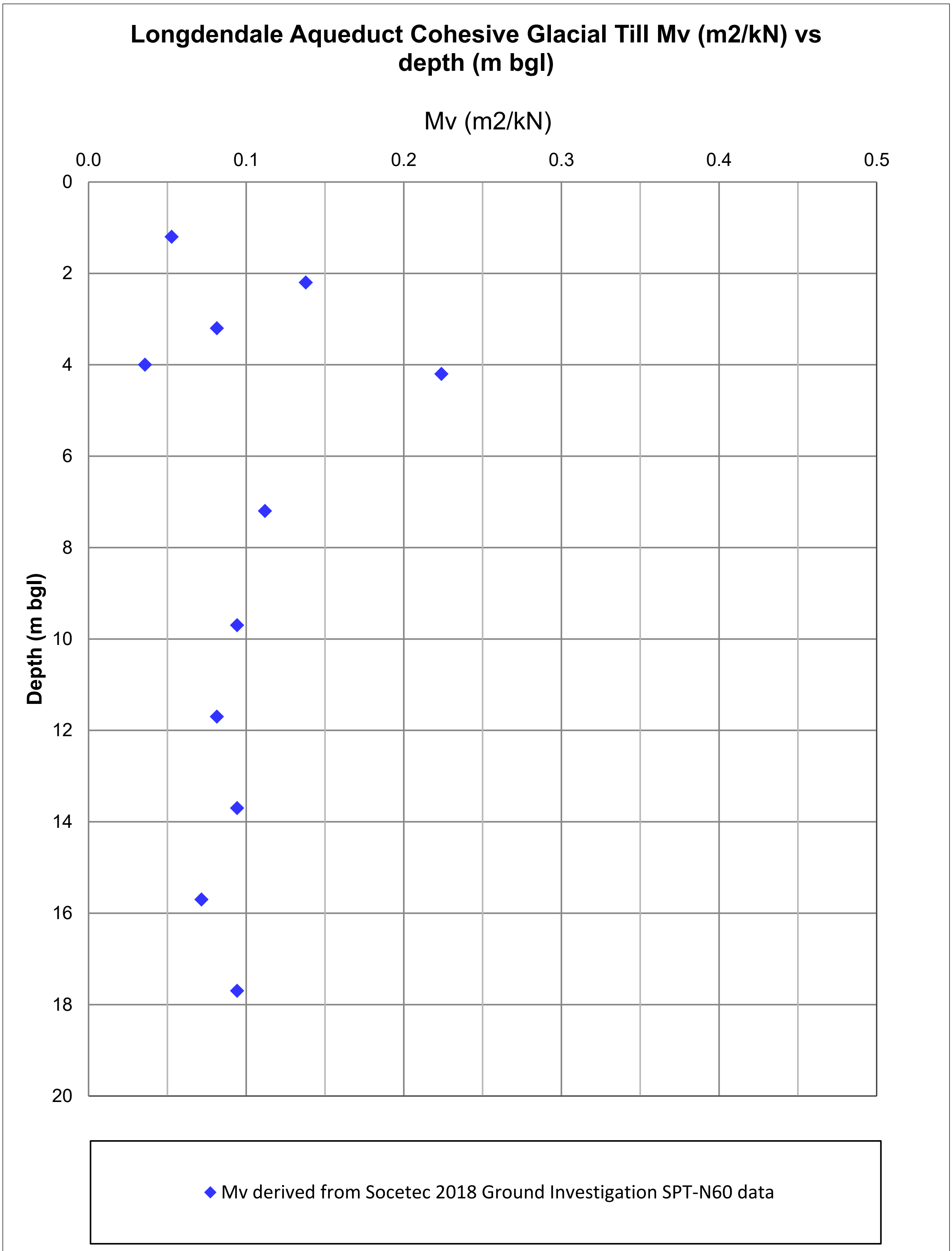


Figure 10.8.11: Longdendale Aqueduct Cohesive Glacial Till Coefficient of Consolidation.

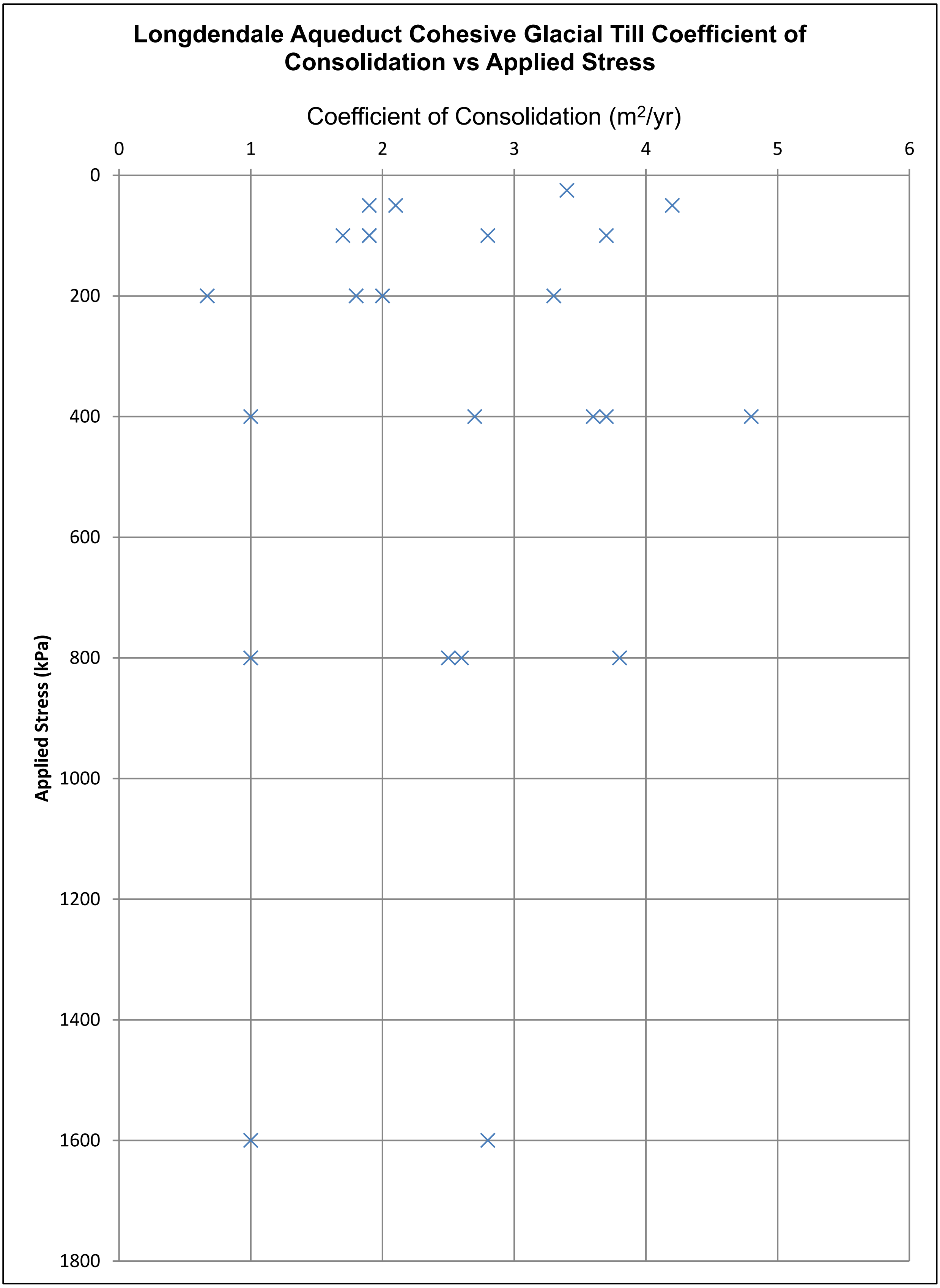


Figure 10.8.12: Longdendale Aqueduct Cohesive Glacial Till Undrained Youngs Modulus.

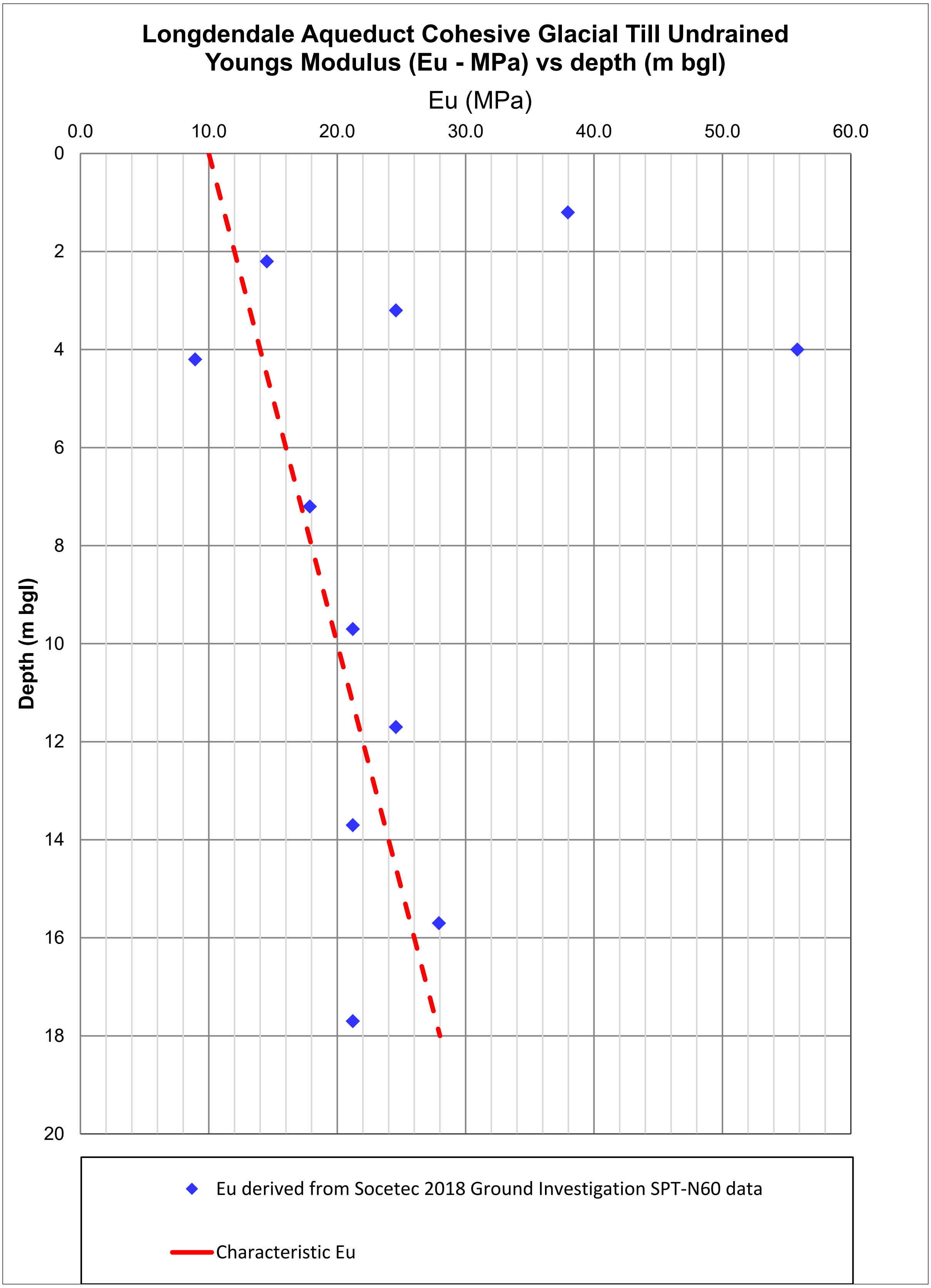
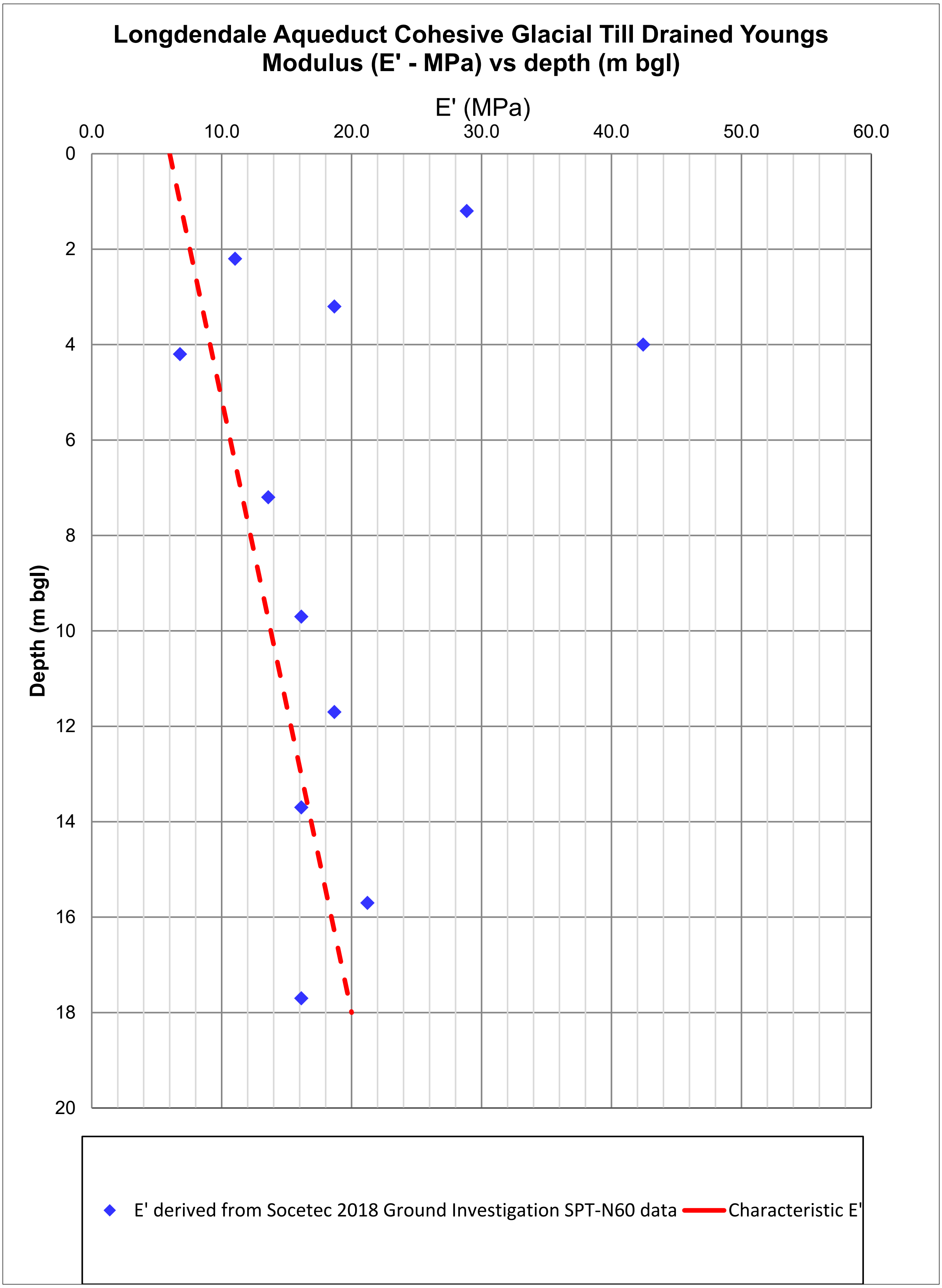


Figure 10.8.13: Longdendale Aqueduct Cohesive Glacial Till Drained Youngs Modulus.



10.9 Mottram Moor Roundabout data plots

Figure 10.9.1: Mottram Moor Roundabout Atterberg Limits for Made Ground, Alluvium and Colluvium

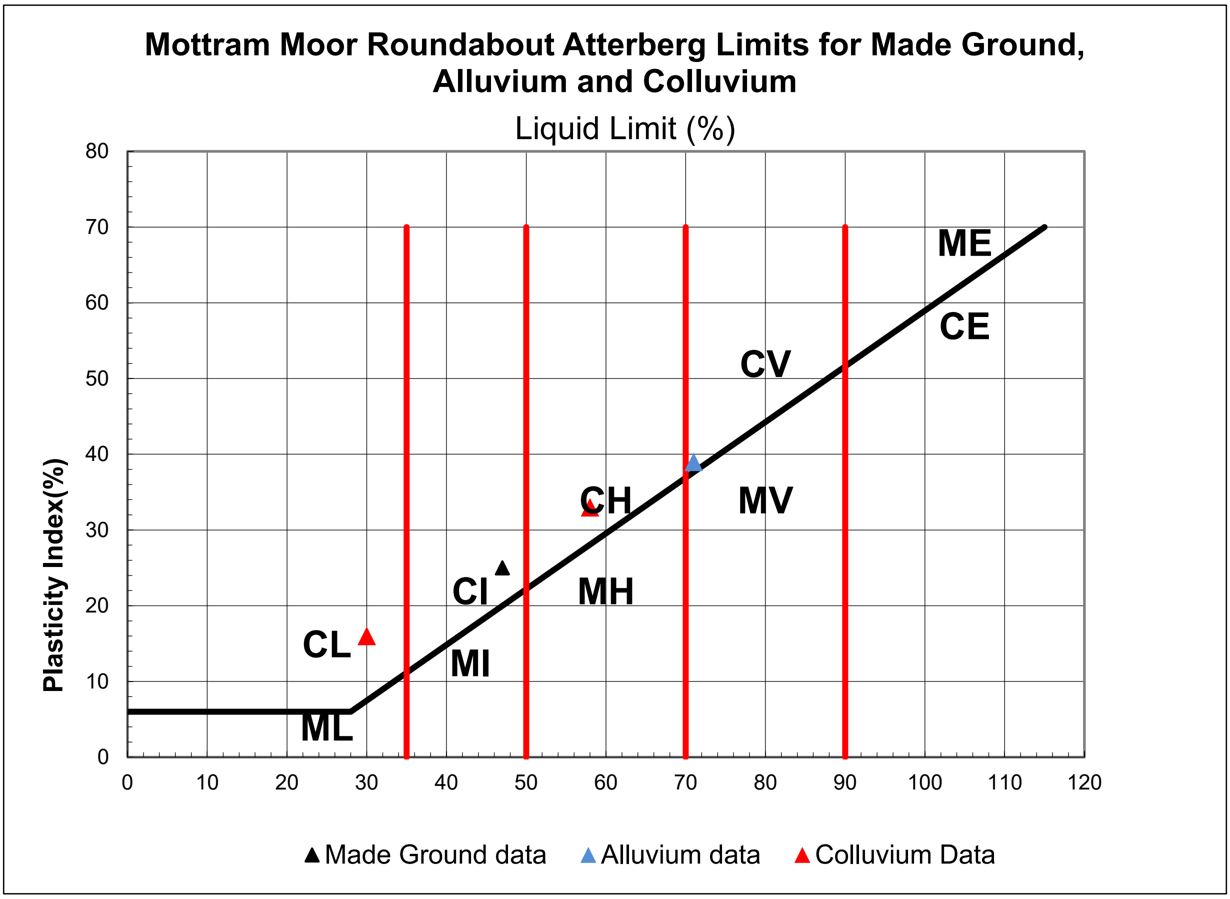


Figure 10.9.2: Mottram Moor Roundabout Cohesive Glacial Till Moisture Content

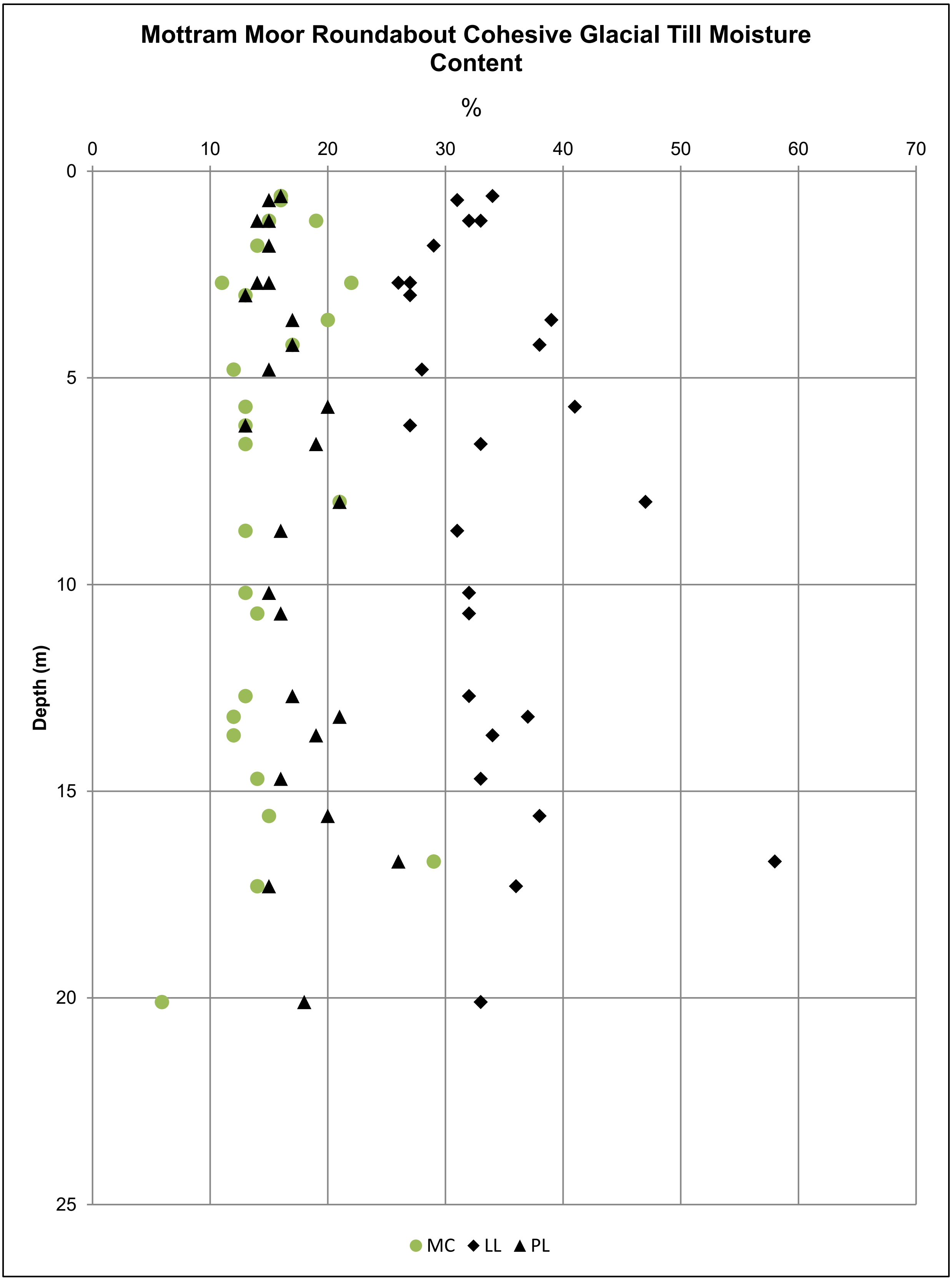


Figure 10.9.3: Mottram Moor Roundabout Cohesive Glacial Till Atterburg Limits.

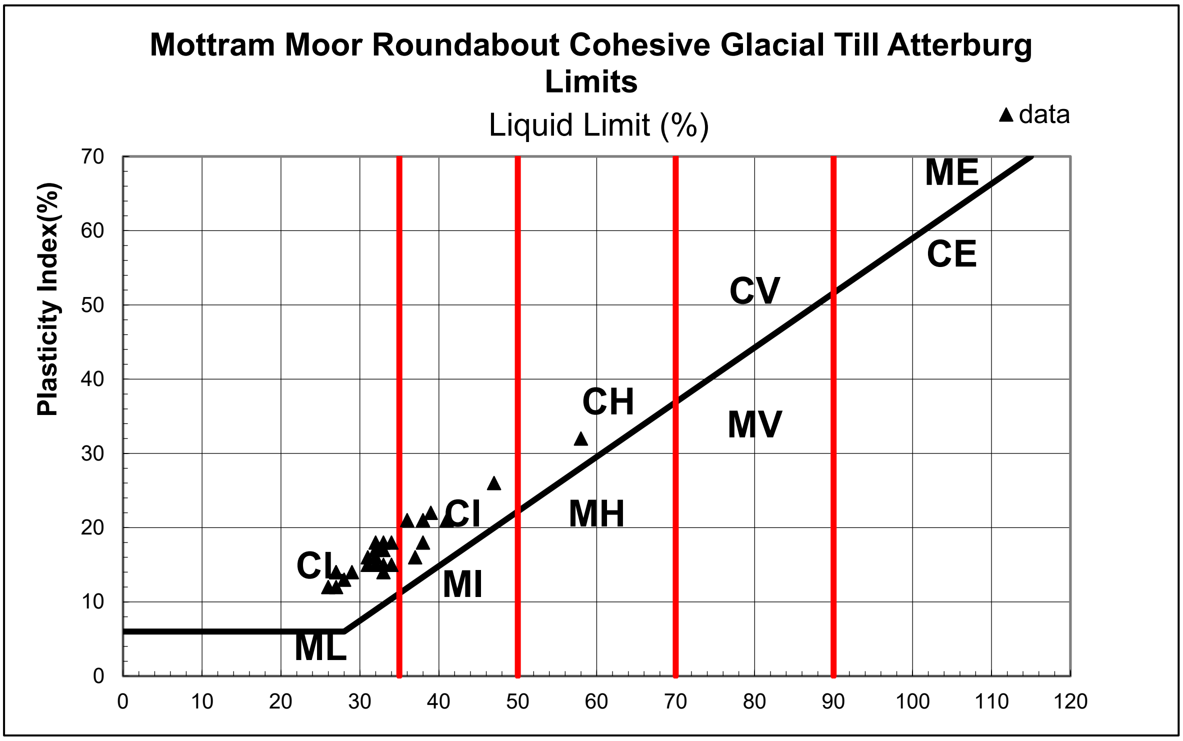


Figure 10.9.4: Mottram Moor Roundabout Cohesive Glacial Till SPT-N60.

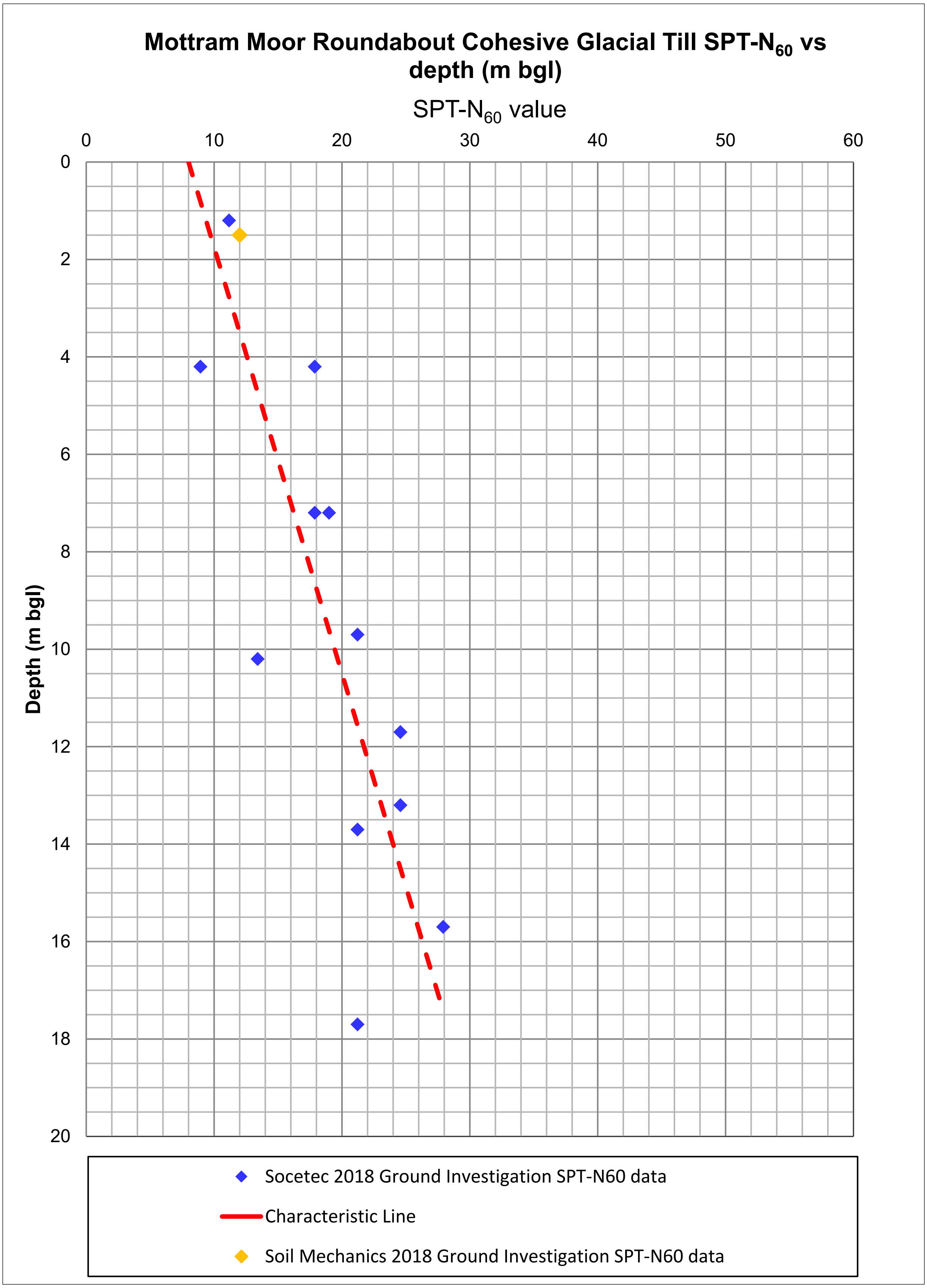


Figure 10.9.5: Mottram Moor Roundabout Cohesive Glacial Till Particle Size Distribution

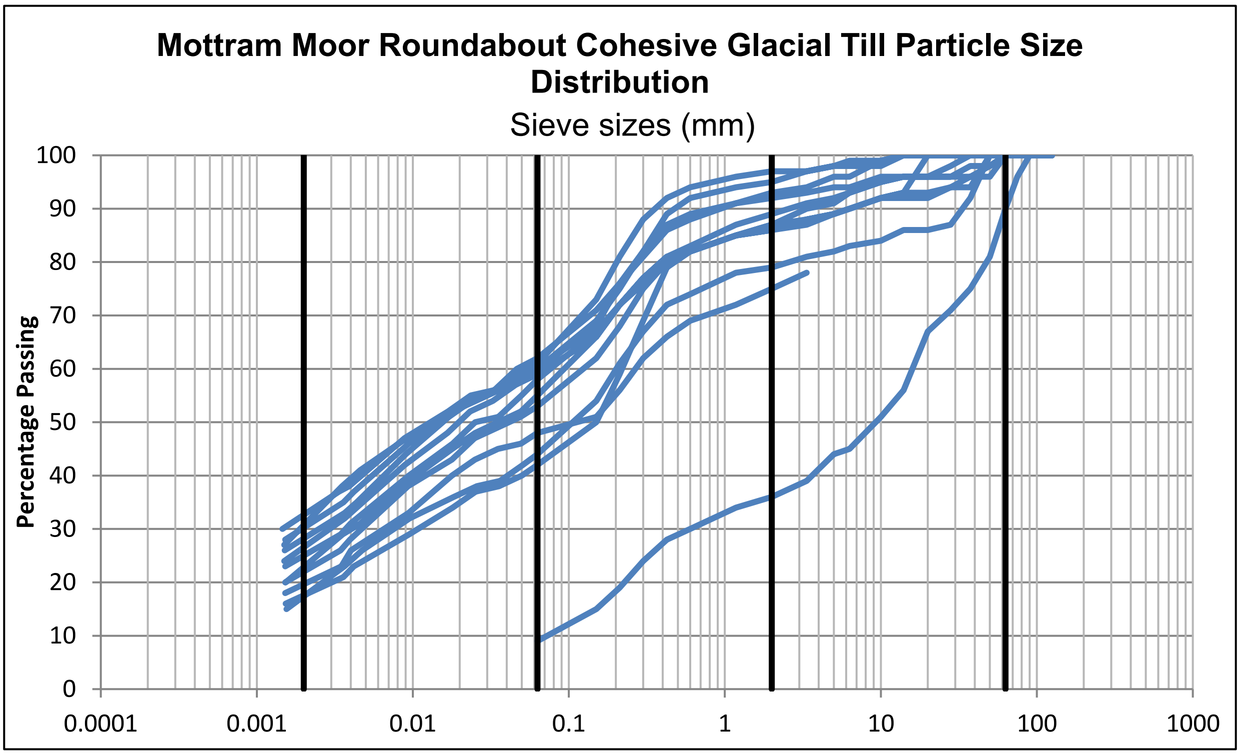


Figure 10.9.6: Mottram Moor Roundabout Cohesive Glacial Till Undrained Shear Strength.

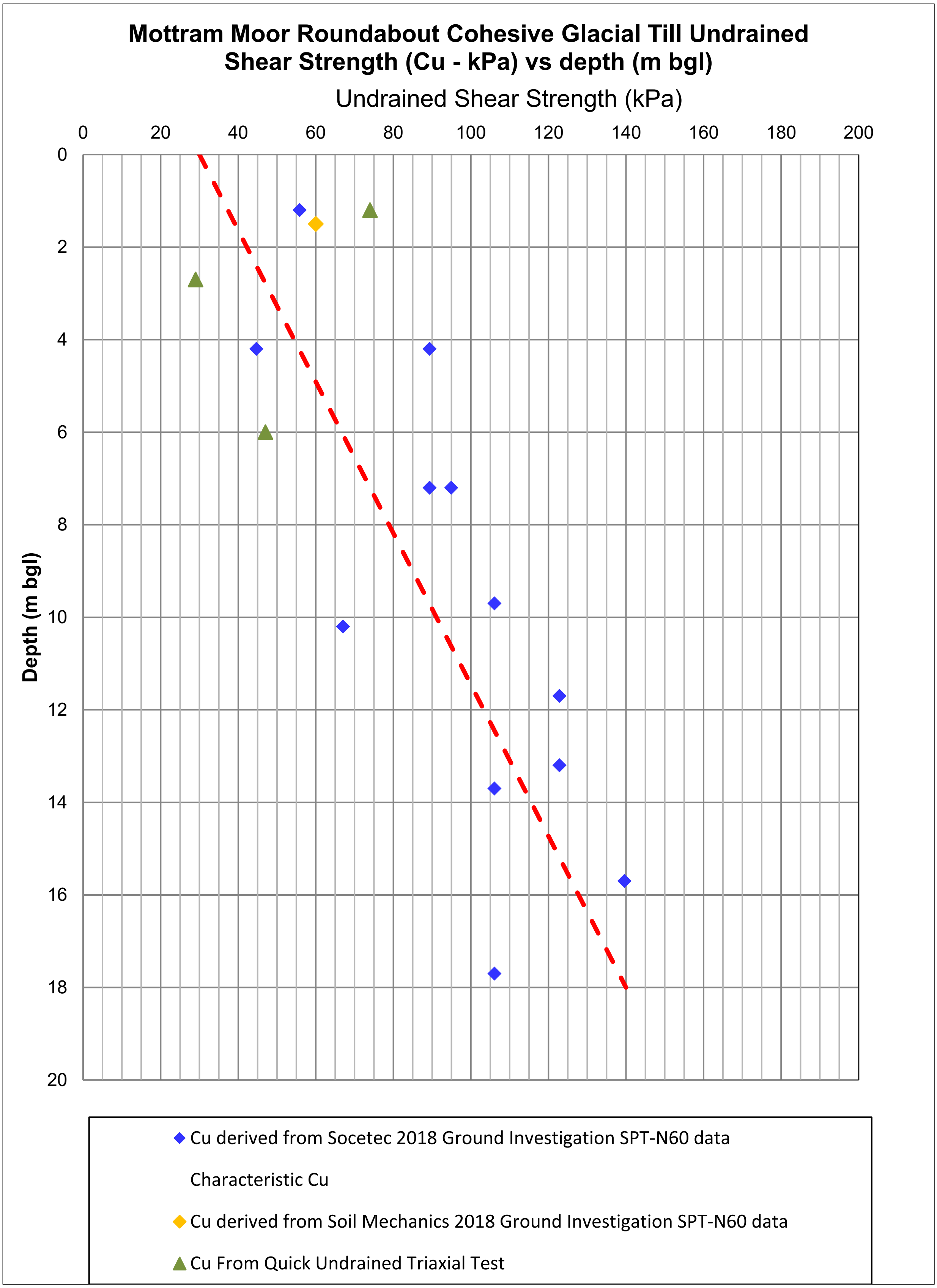


Figure 10.9.7: Mottram Moor Roundabout Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer and SPT)

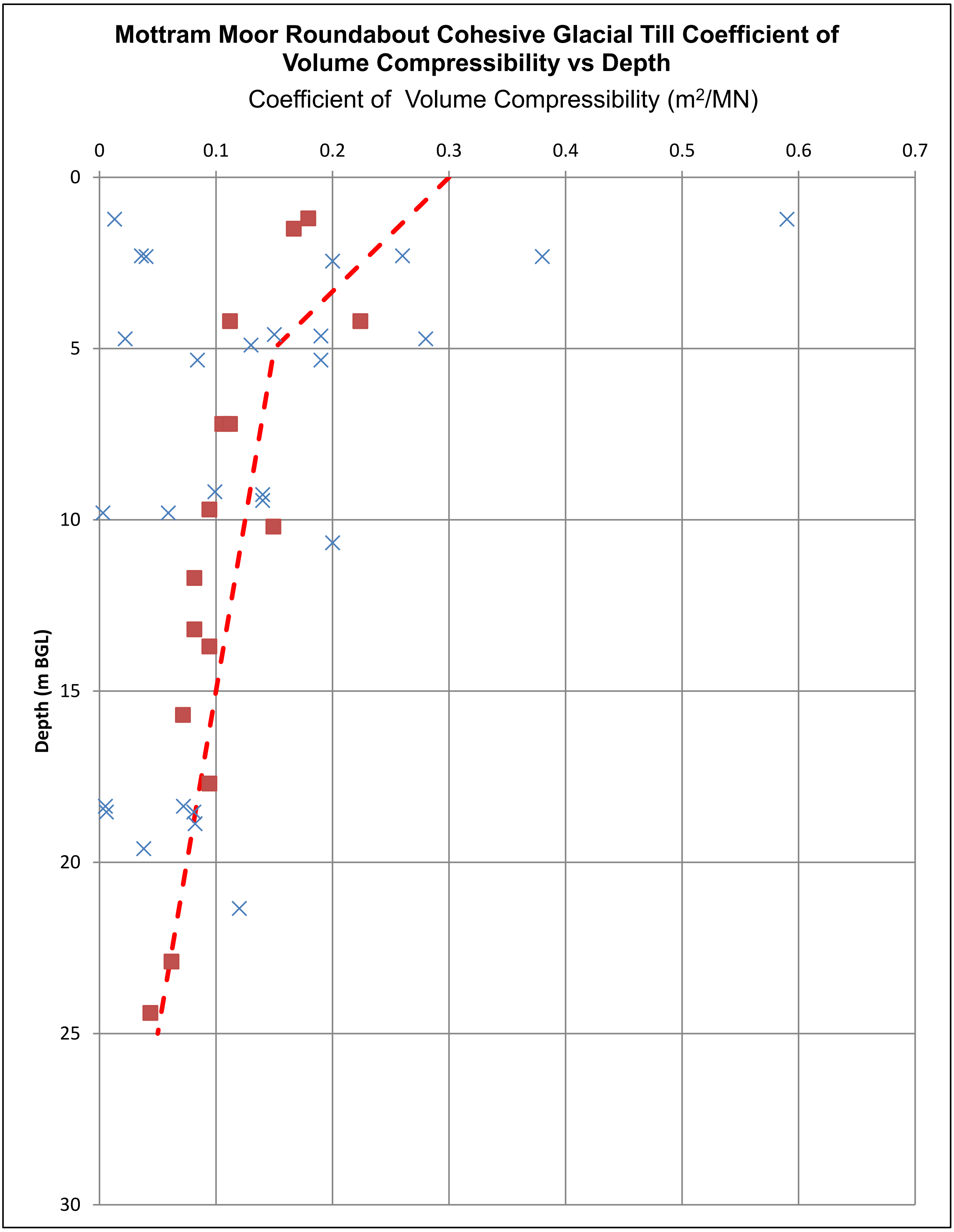


Figure 10.9.8: Mottram Moor Roundabout Cohesive Glacial Till Coefficient of Consolidation.

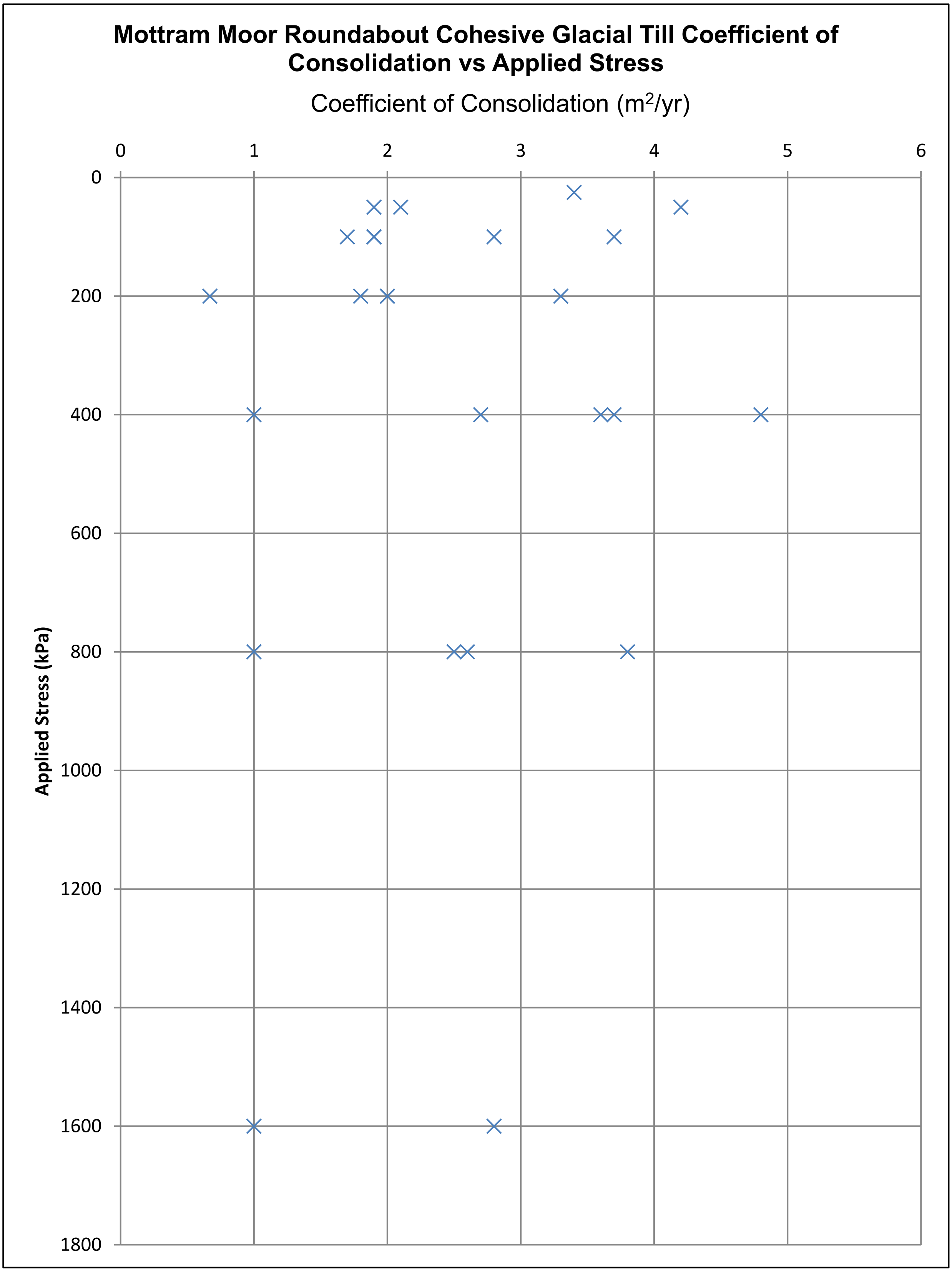


Figure 10.9.9: Mottram Moor Roundabout Cohesive Glacial Till Undrained Youngs Modulus.

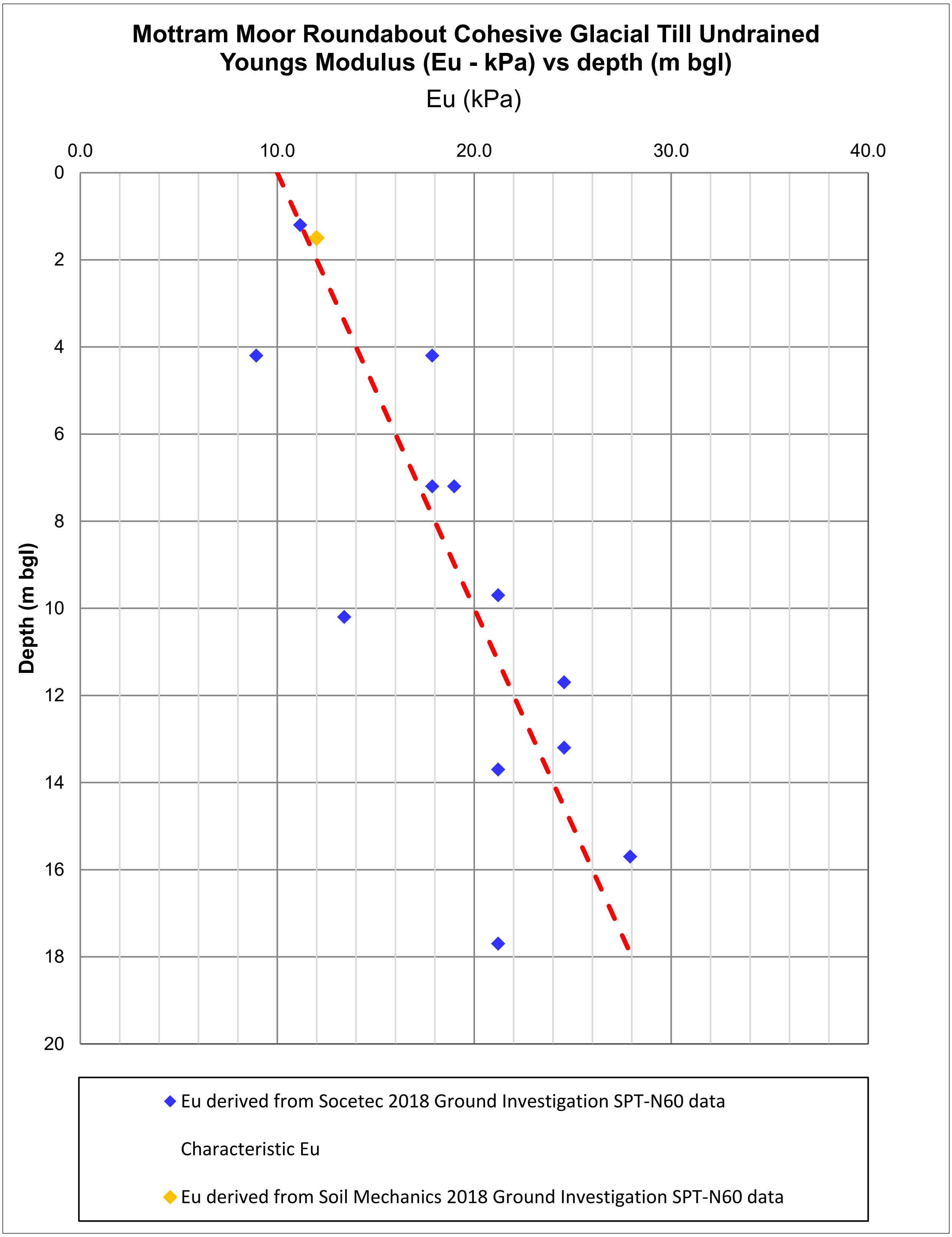
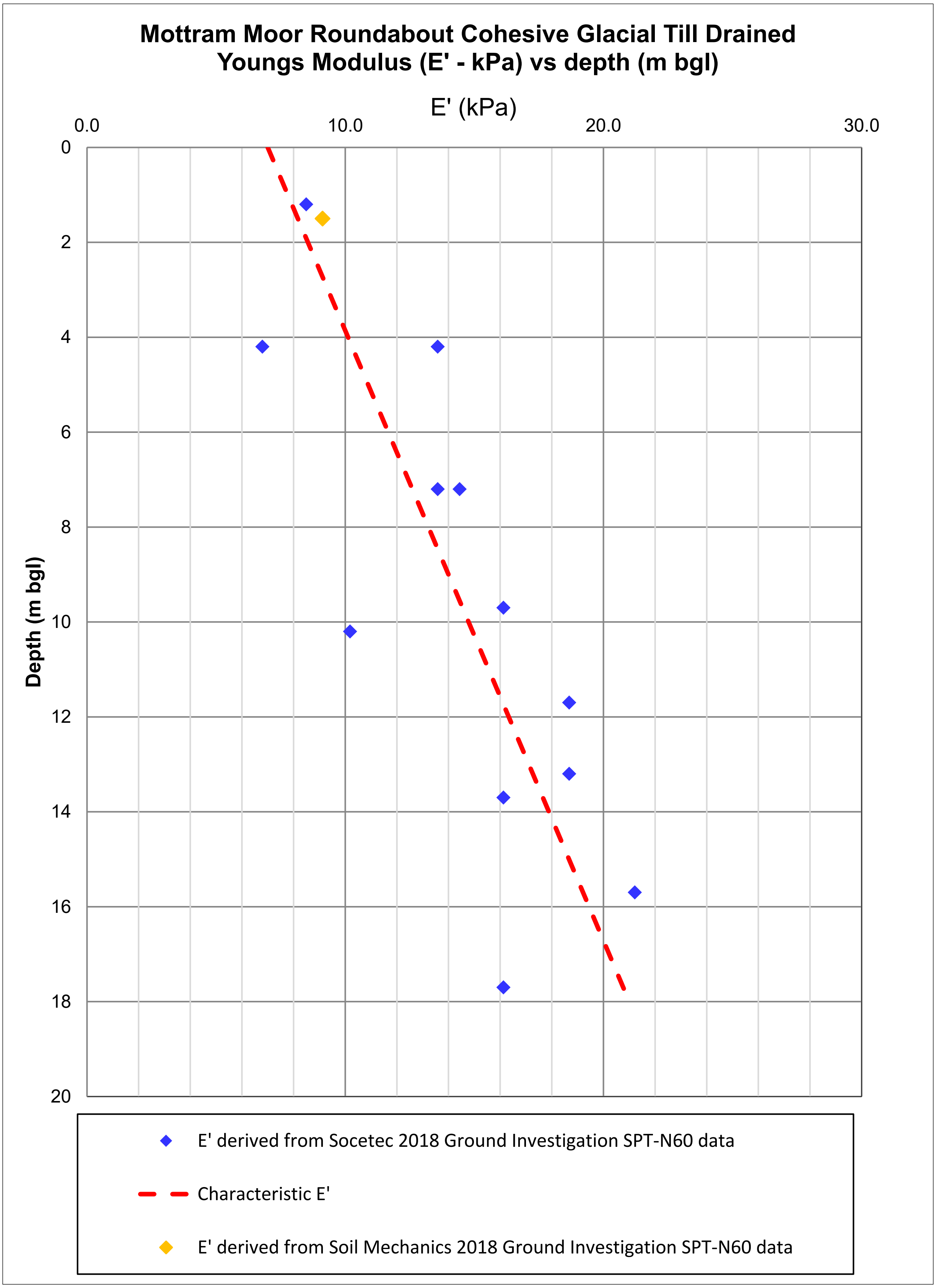


Figure 10.9.10: Mottram Moor Roundabout Cohesive Glacial Till Drained Youngs Modulus.



10.10 Carrhouse Lane Underpass data plots

Figure 10.10.1: Carrhouse Lane Underpass Cohesive Glacial Till Moisture Content.

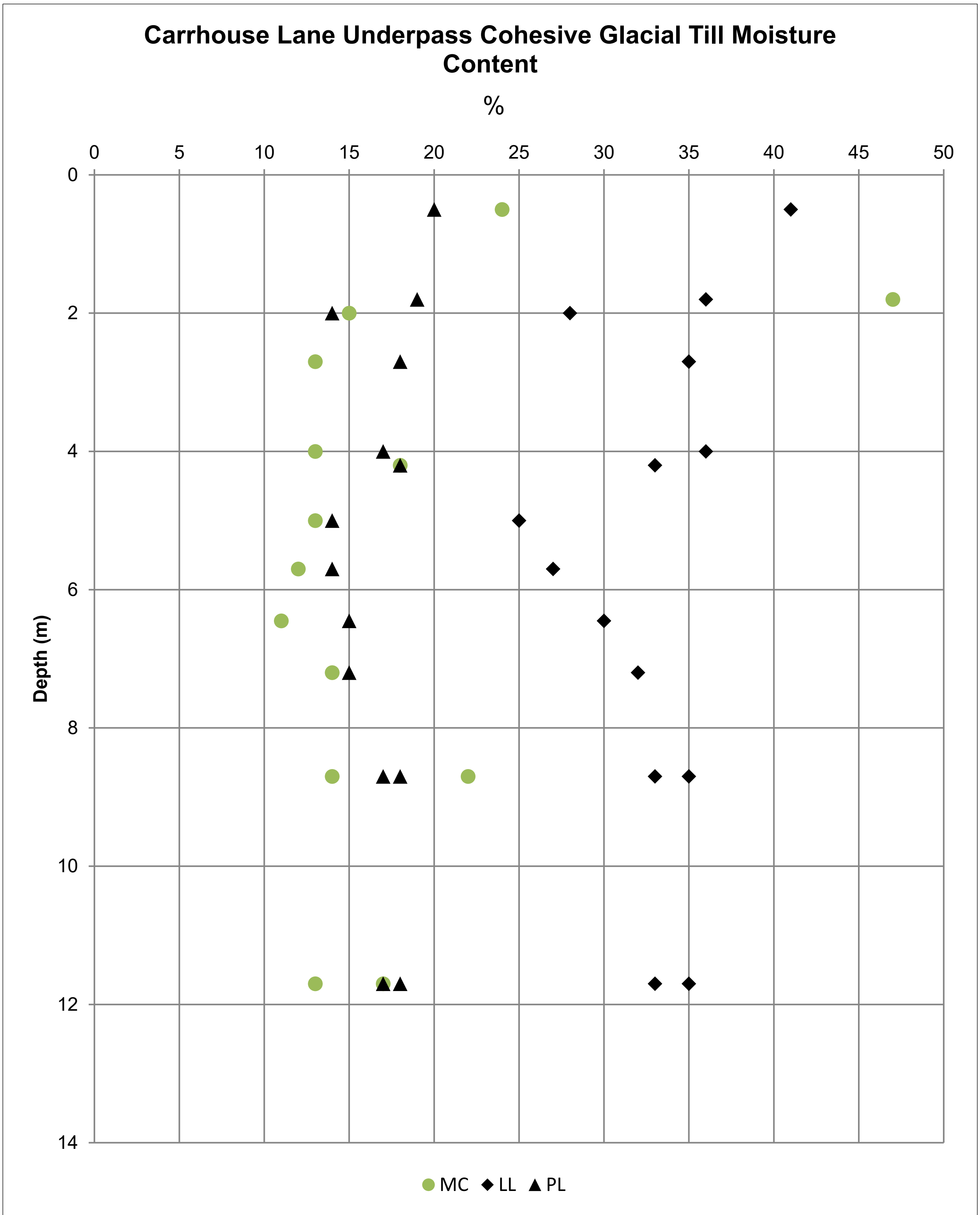
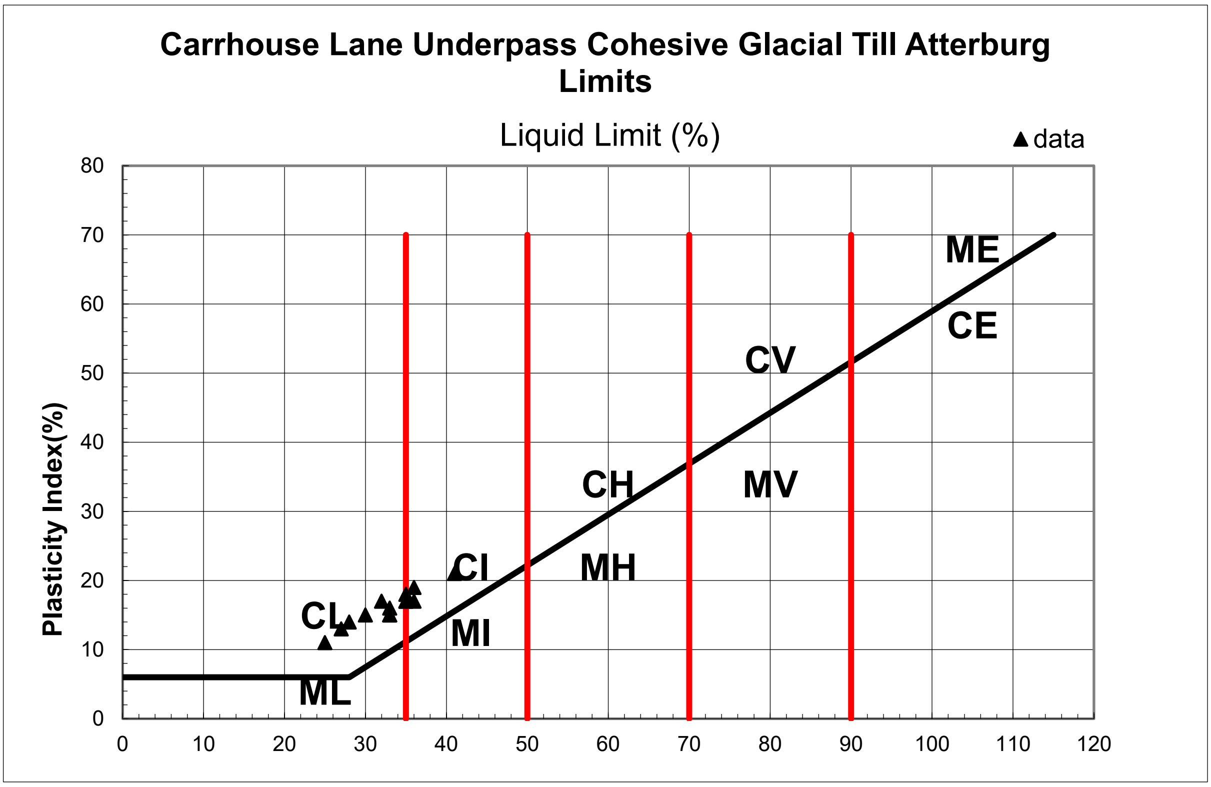


Figure 10.10.2: Carrhouse Lane Underpass Cohesive Glacial Till Atterburg



Limits.

Figure 10.10.3: Carrhouse Lane Underpass Cohesive Glacial Till SPT-N_{60} data.

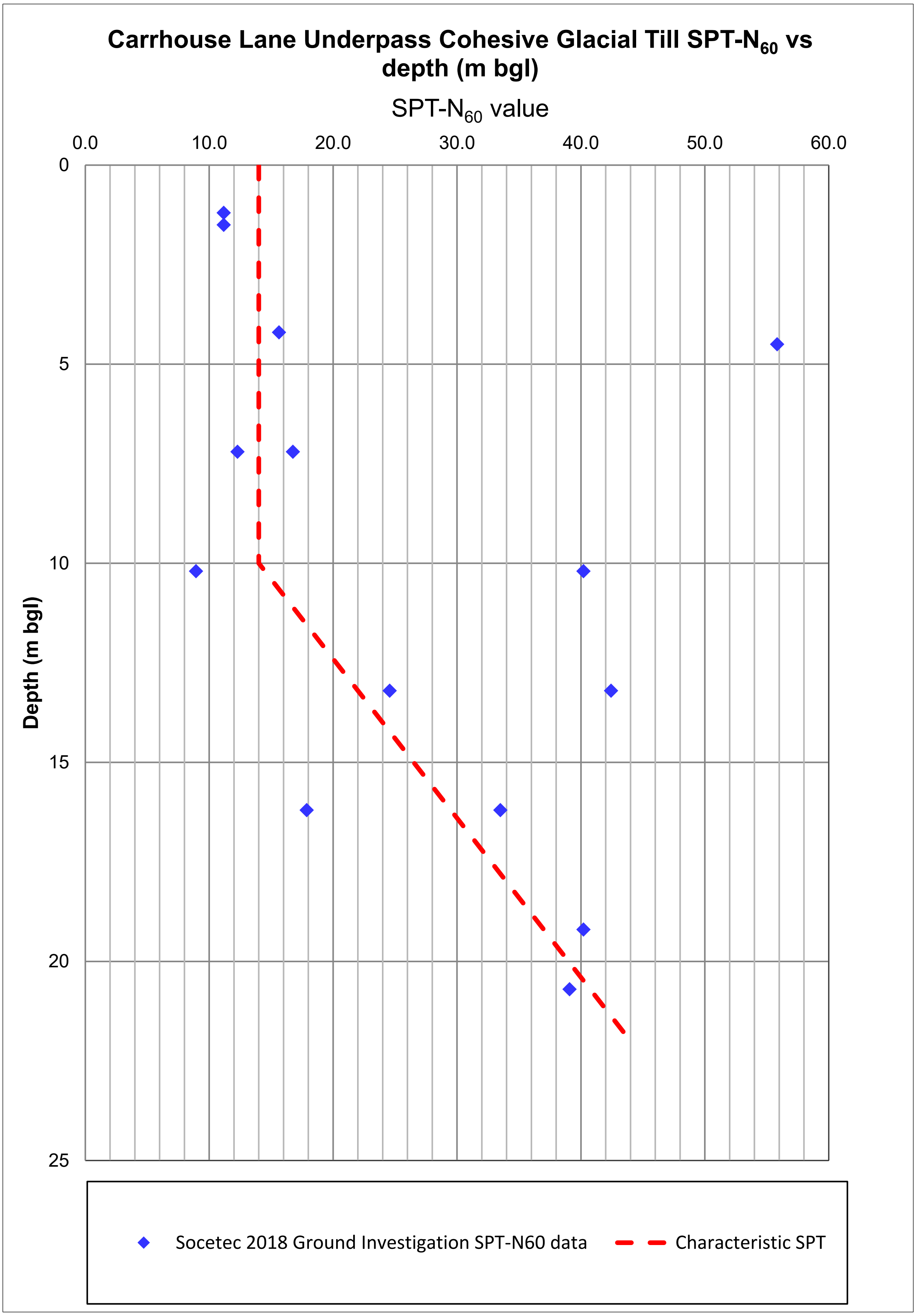


Figure 10.10.4: Carrhouse Lane Underpass Cohesive Glacial Till Particle Size Distribution

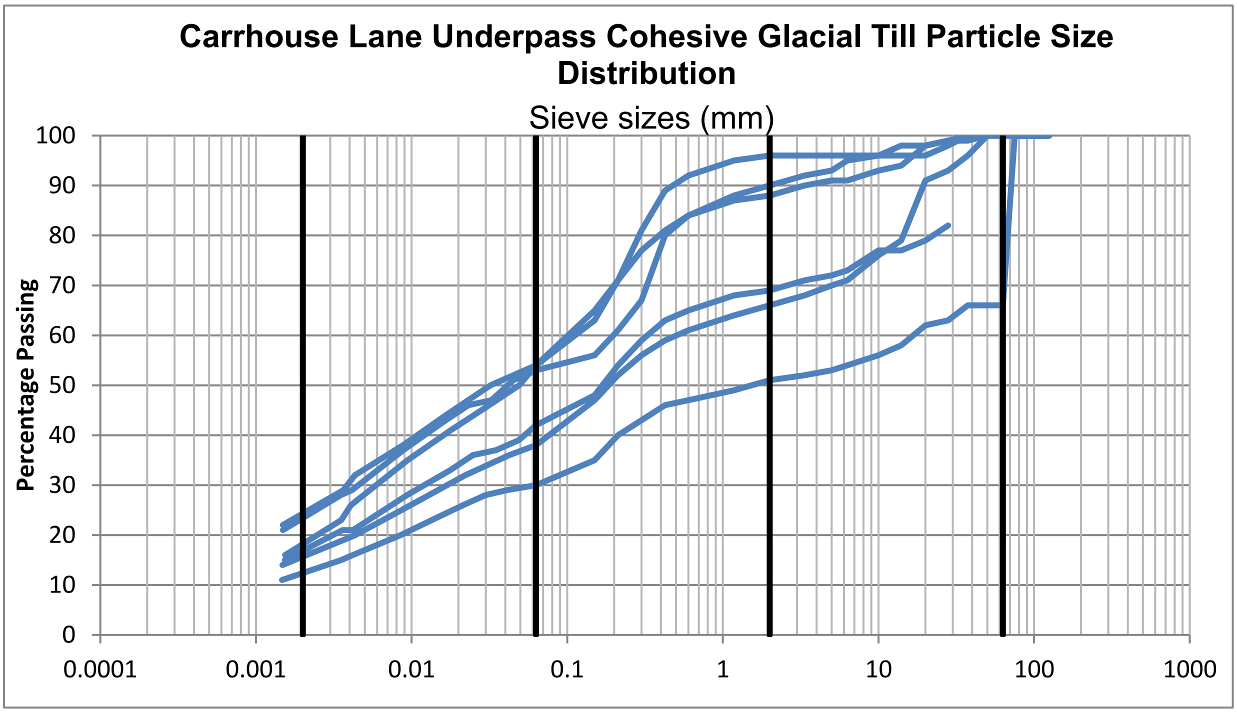


Figure 10.10.5: Carrhouse Lane Underpass Cohesive Glacial Till Undrained Shear Strength.

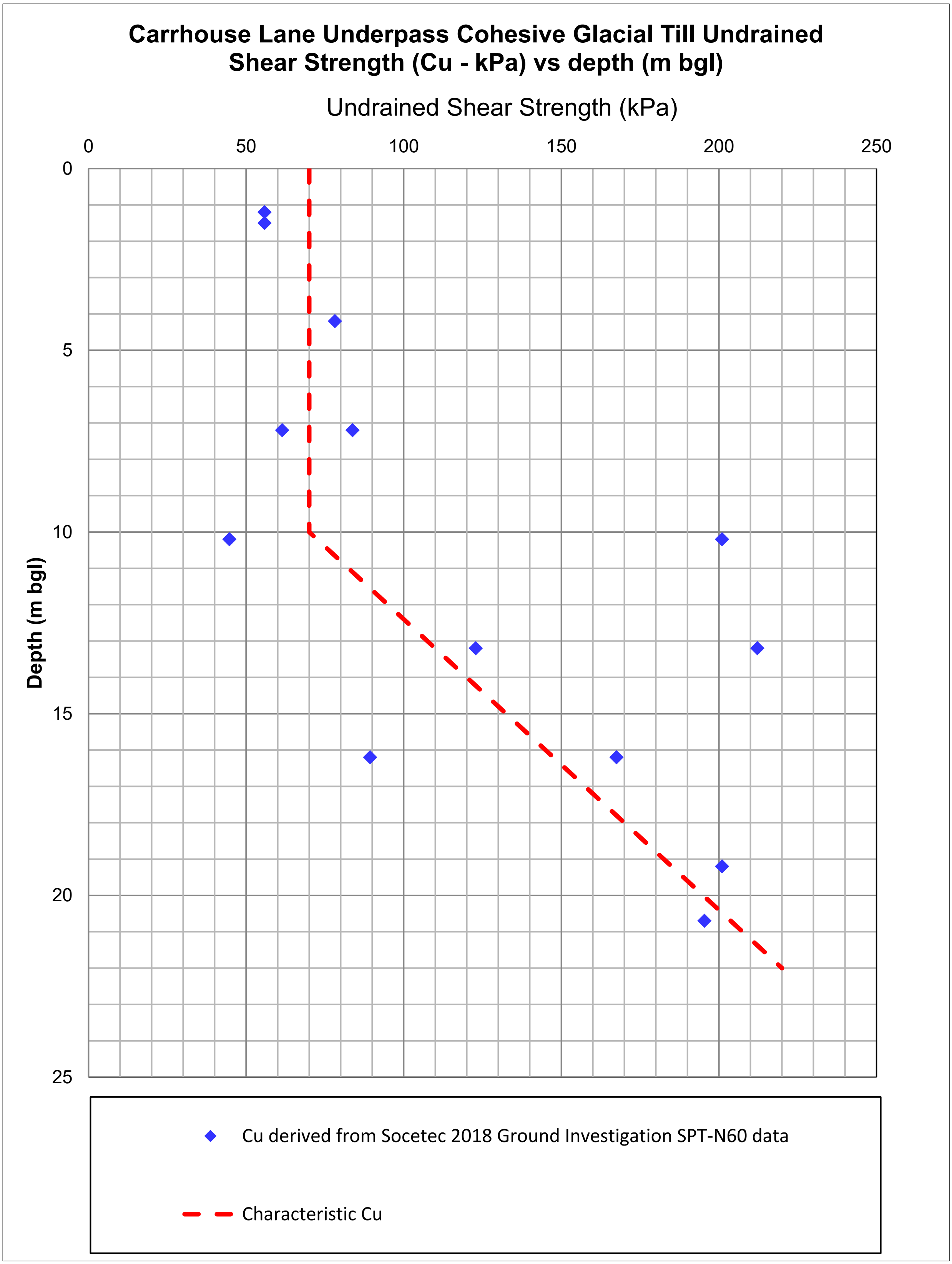


Figure 10.10.6: Carrhouse Lane Underpass Cohesive Glacial Till Angle of Internal Friction.

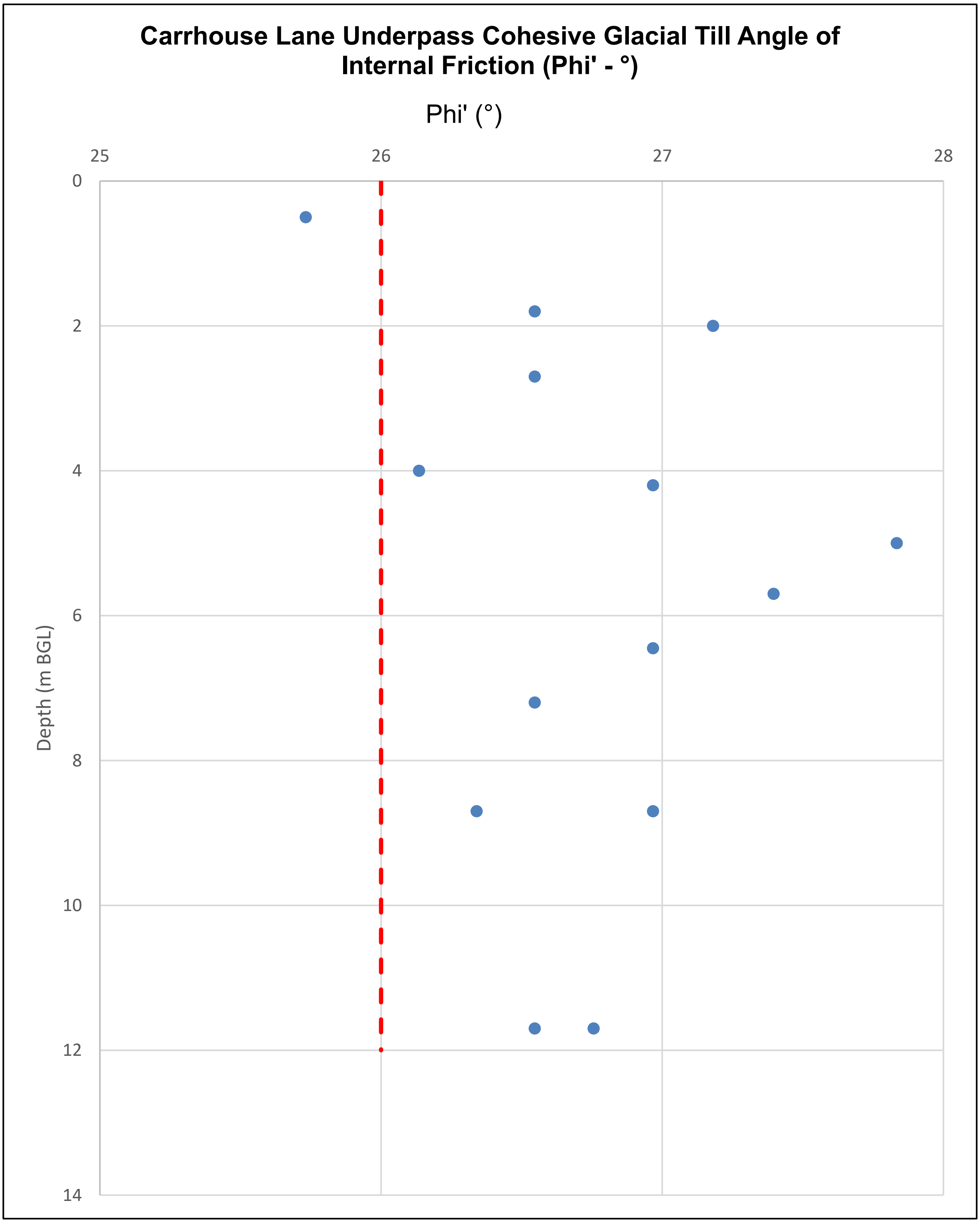


Figure 10.10.7: Carrhouse Lane Underpass Cohesive Glacial Till Coefficient of Volume Compressibility (Oedometer).

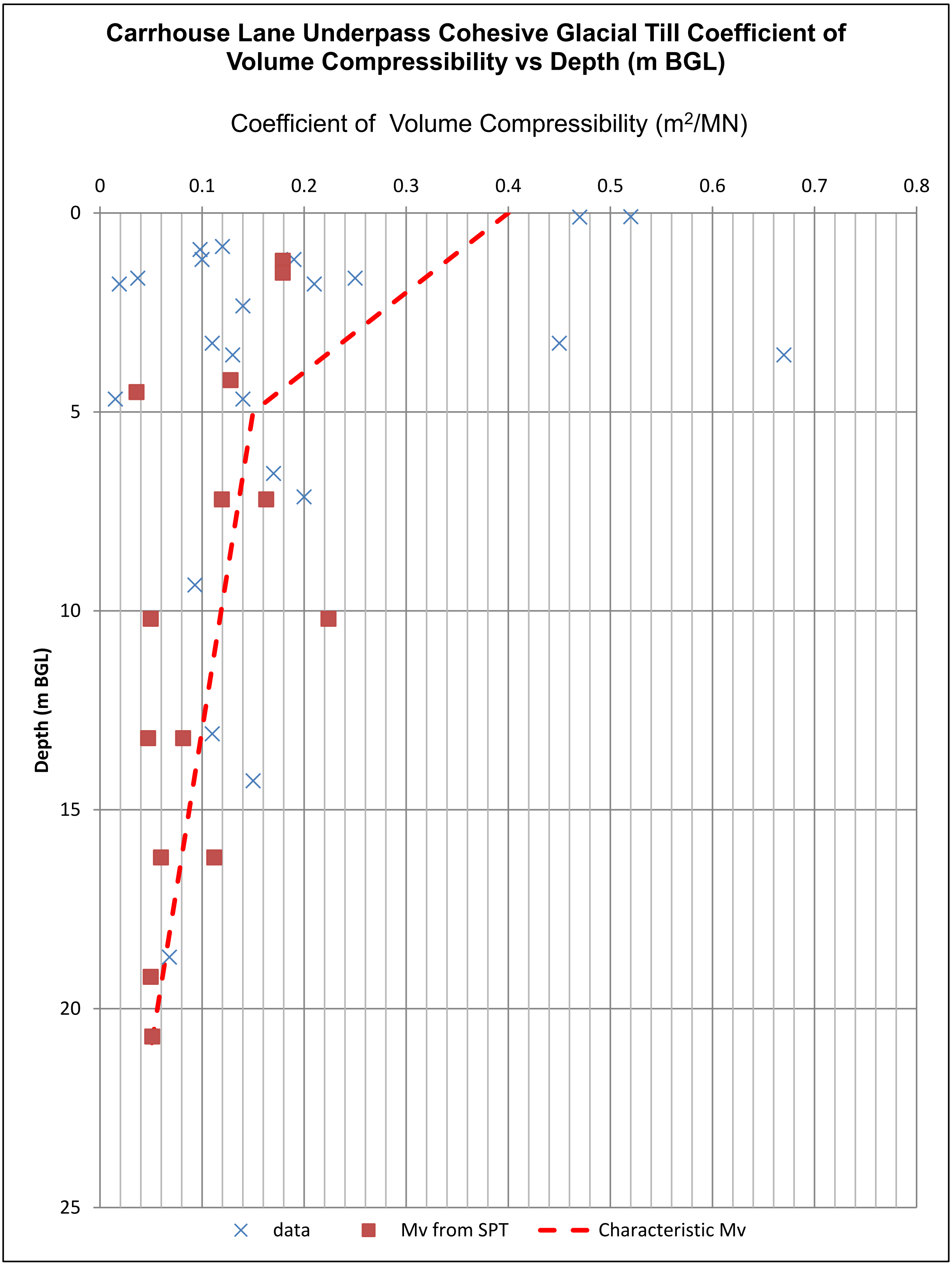


Figure 10.10.8: Carrhouse Lane Underpass Cohesive Glacial Till Coefficient of Volume Compressibility (SPT).

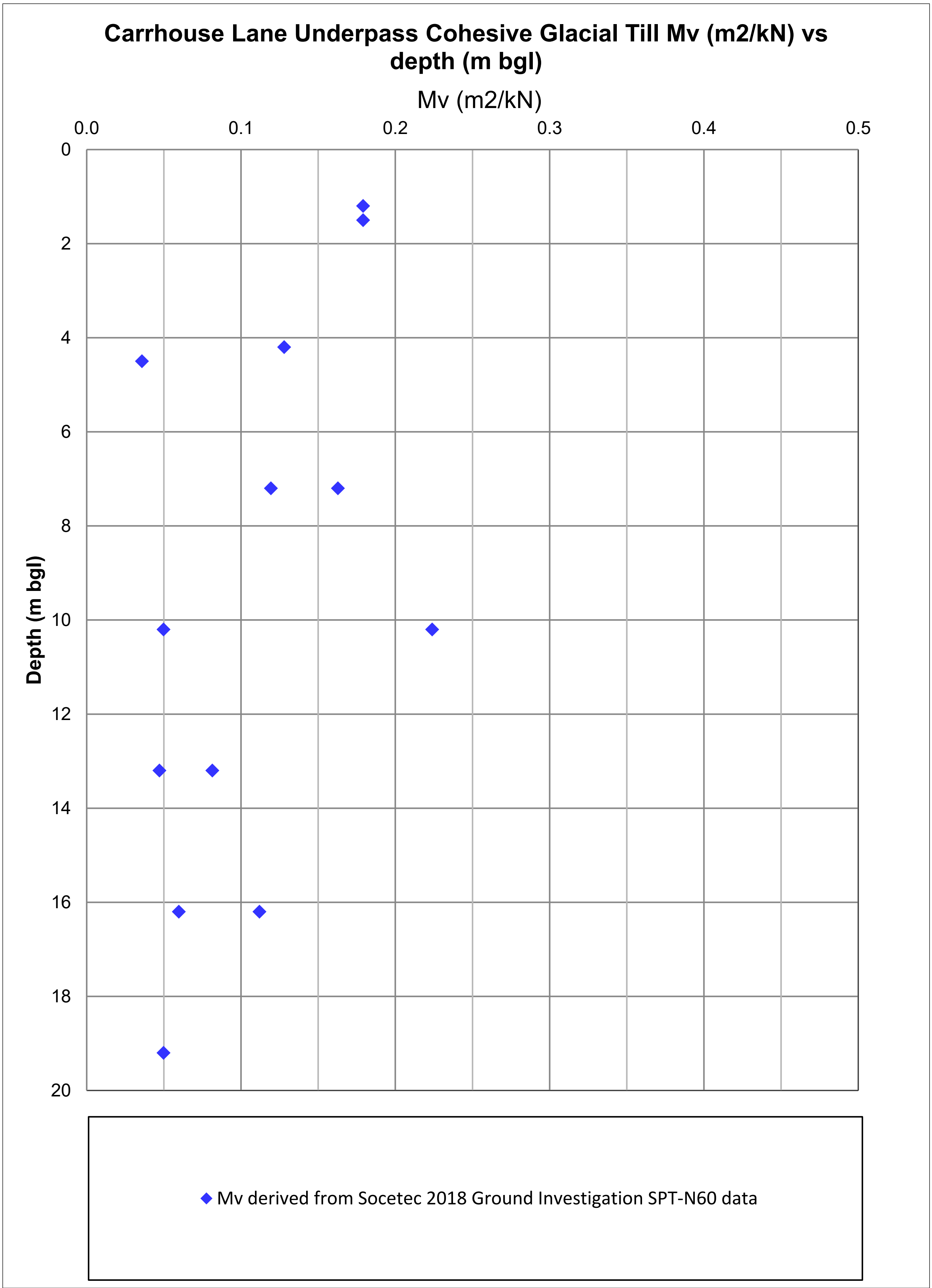


Figure 10.10.9: Carrhouse Lane Underpass Cohesive Glacial Till Coefficient of Consolidation.

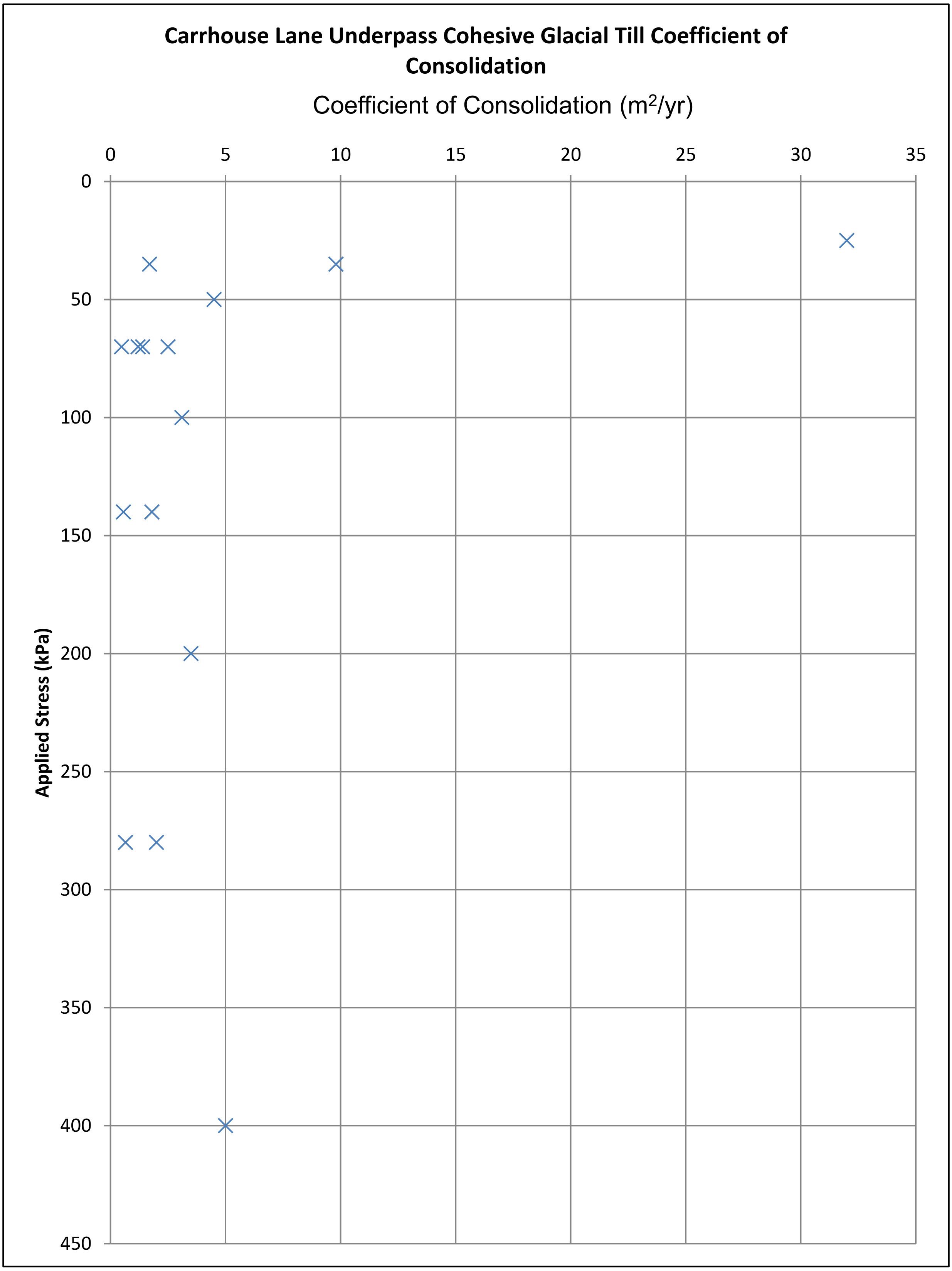


Figure 10.10.10: Carrhouse Lane Underpass Cohesive Glacial Till Undrained Youngs Modulus.

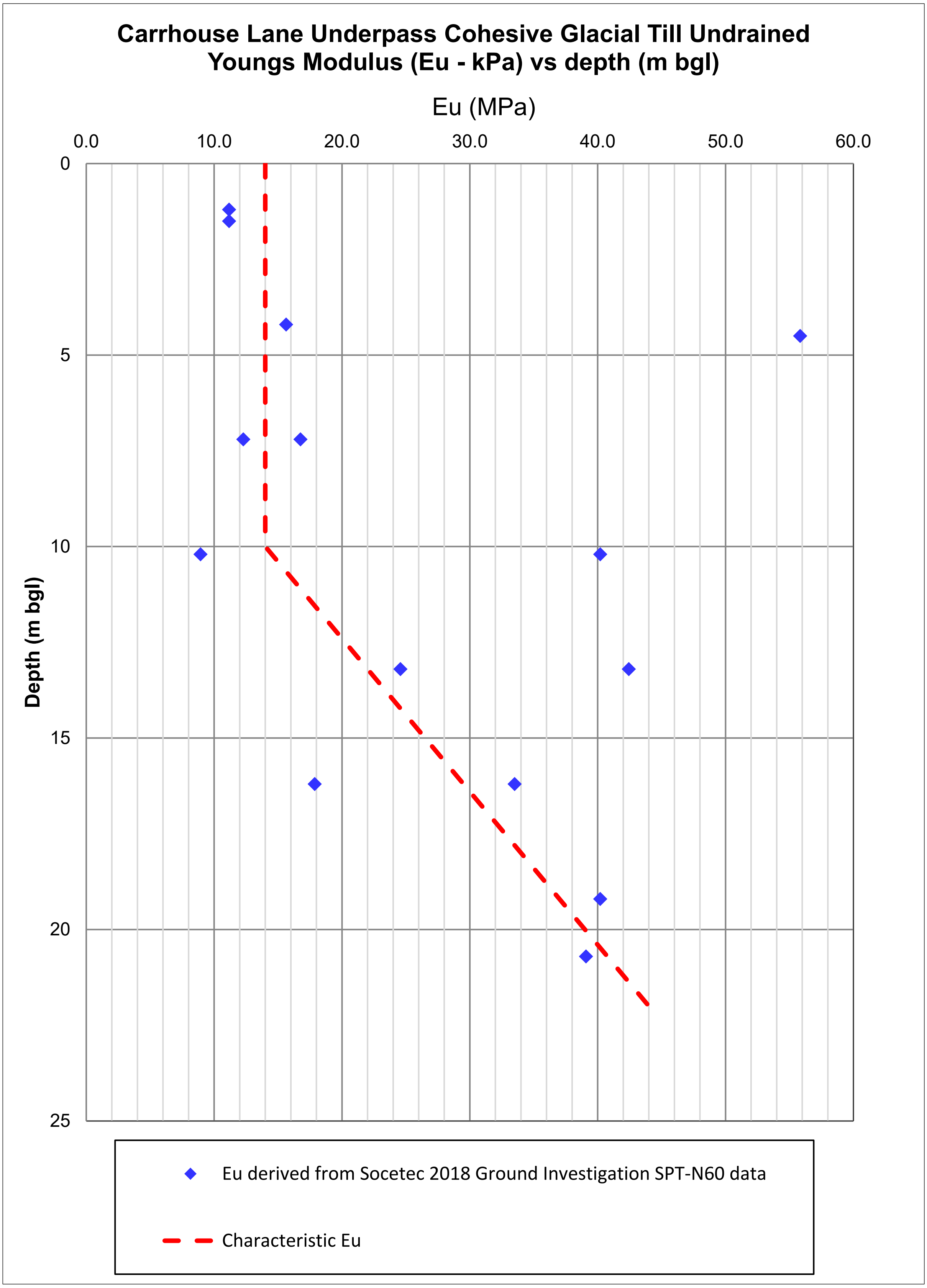
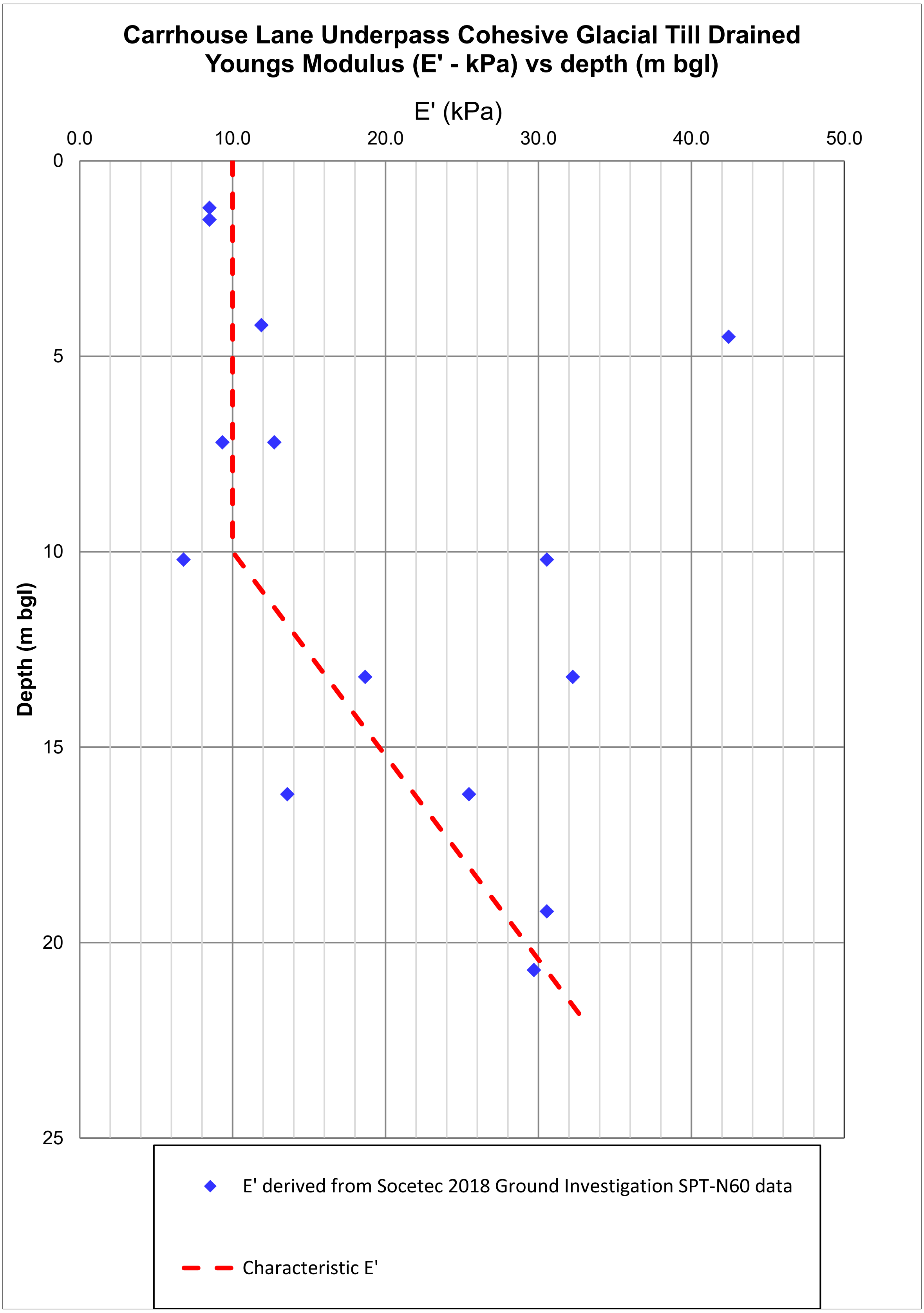


Figure 10.10.11: Carrhouse Lane Underpass Cohesive Glacial Till Drained Youngs Modulus.



10.11 River Etherow Bridge data plots

Figure 10.11.1: River Etherow Bridge Head Deposits Moisture Content.

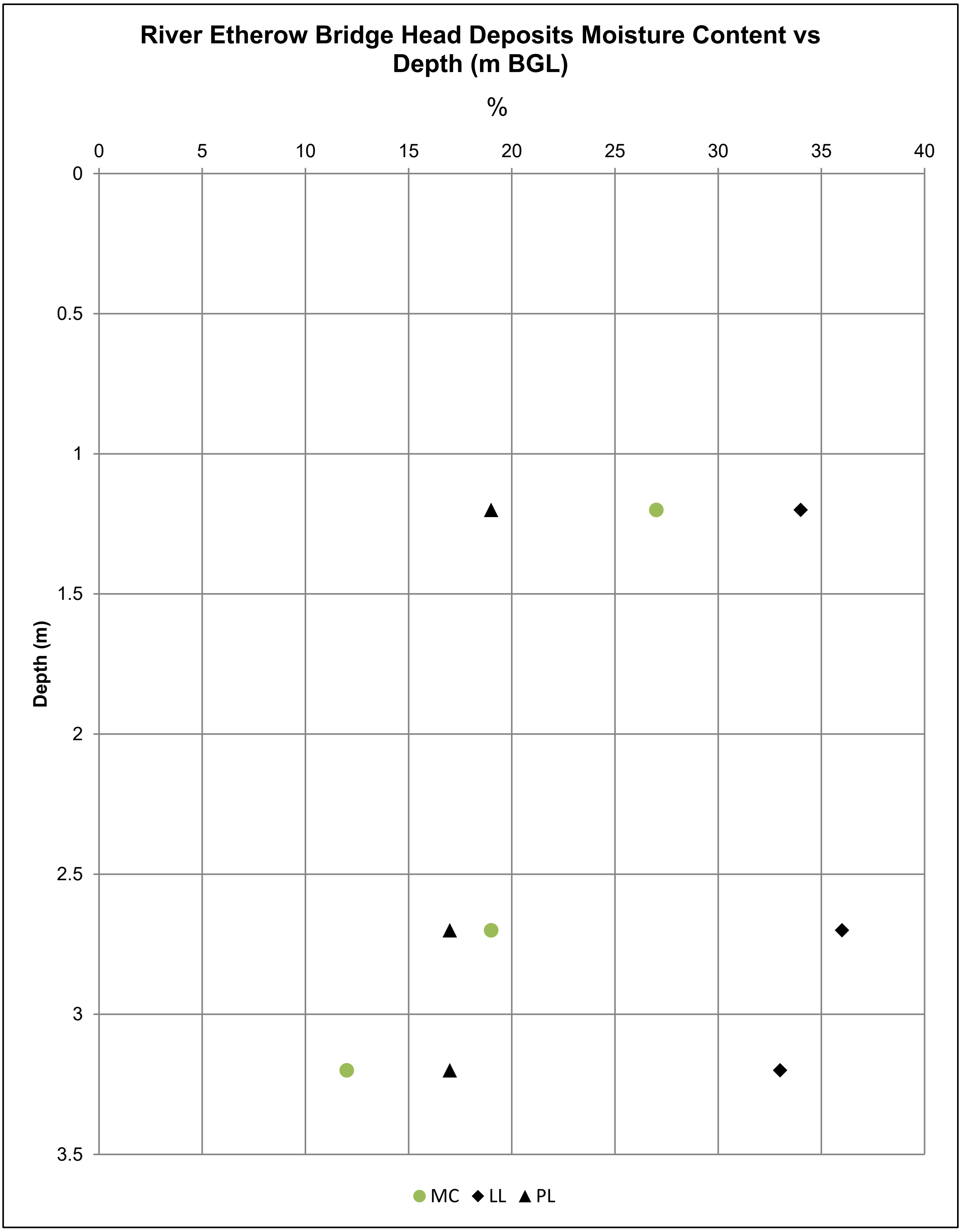


Figure 10.11.2: River Etherow Bridge Head Deposits Atterburg Limits.

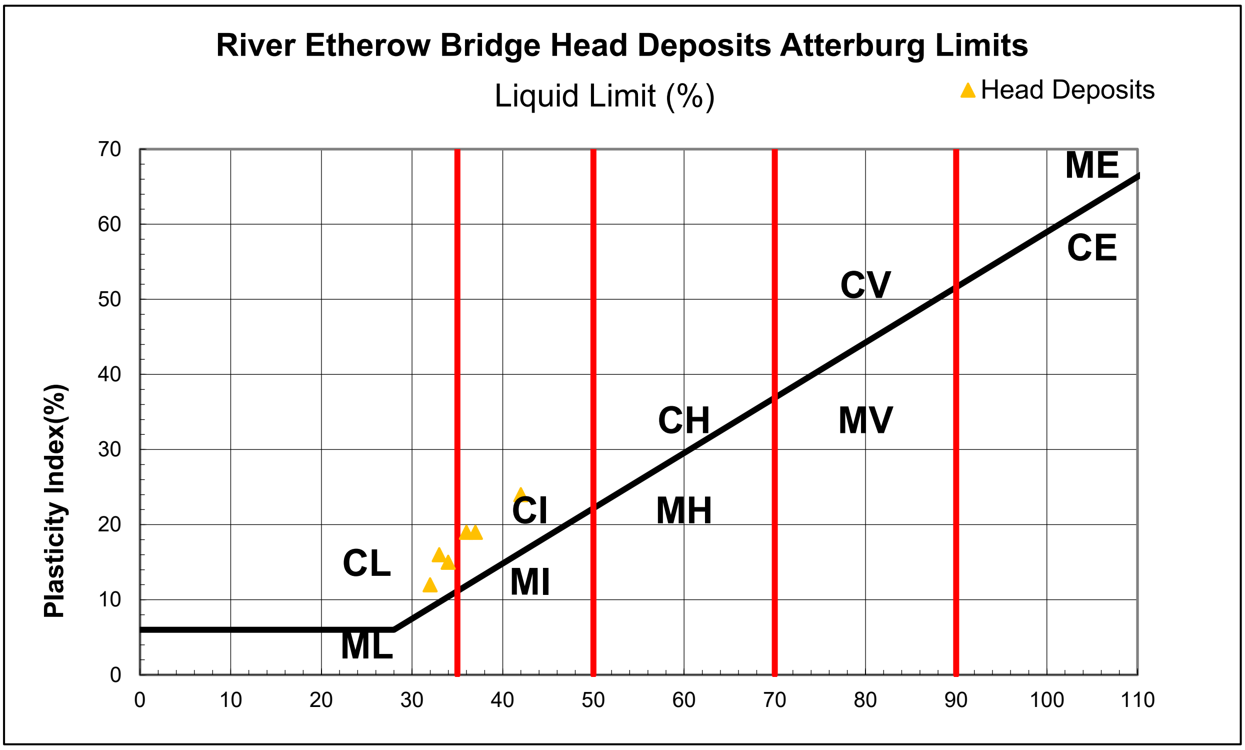


Figure 10.11.3: River Etherow Bridge Head Deposits Particle Size Distribution.

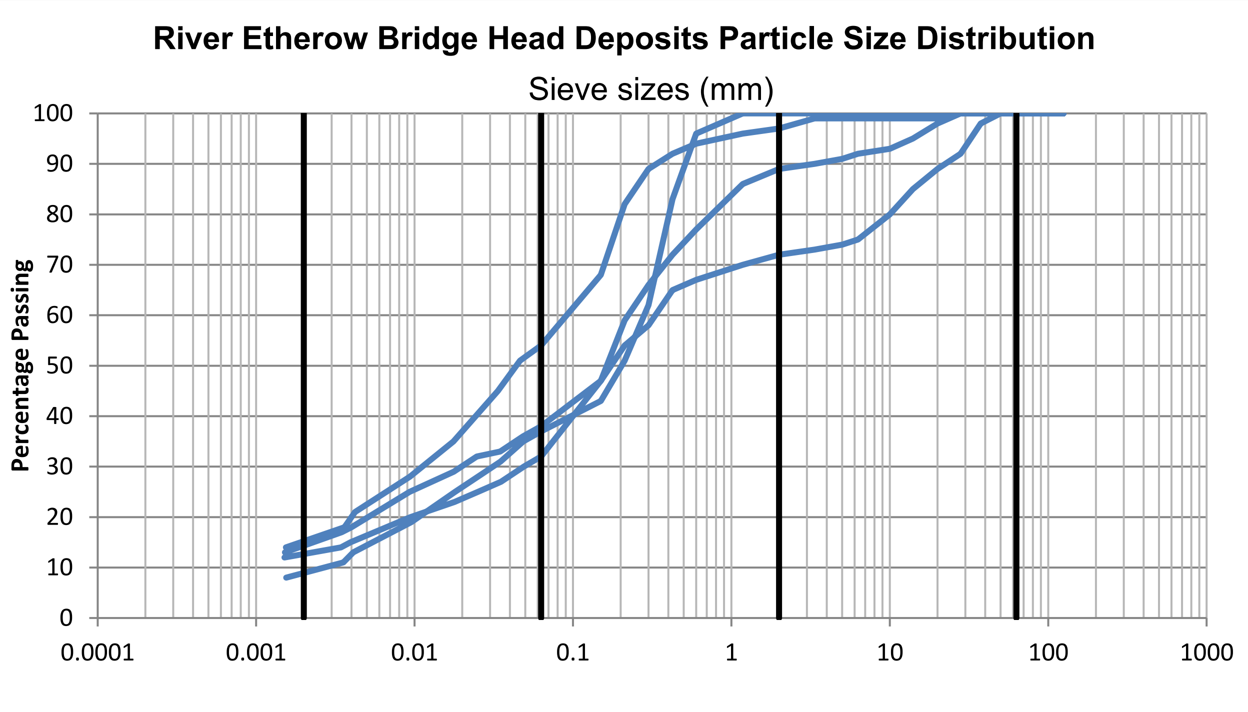


Figure 10.11.4: River Etherow Bridge Head Deposits SPT-N_{60}.

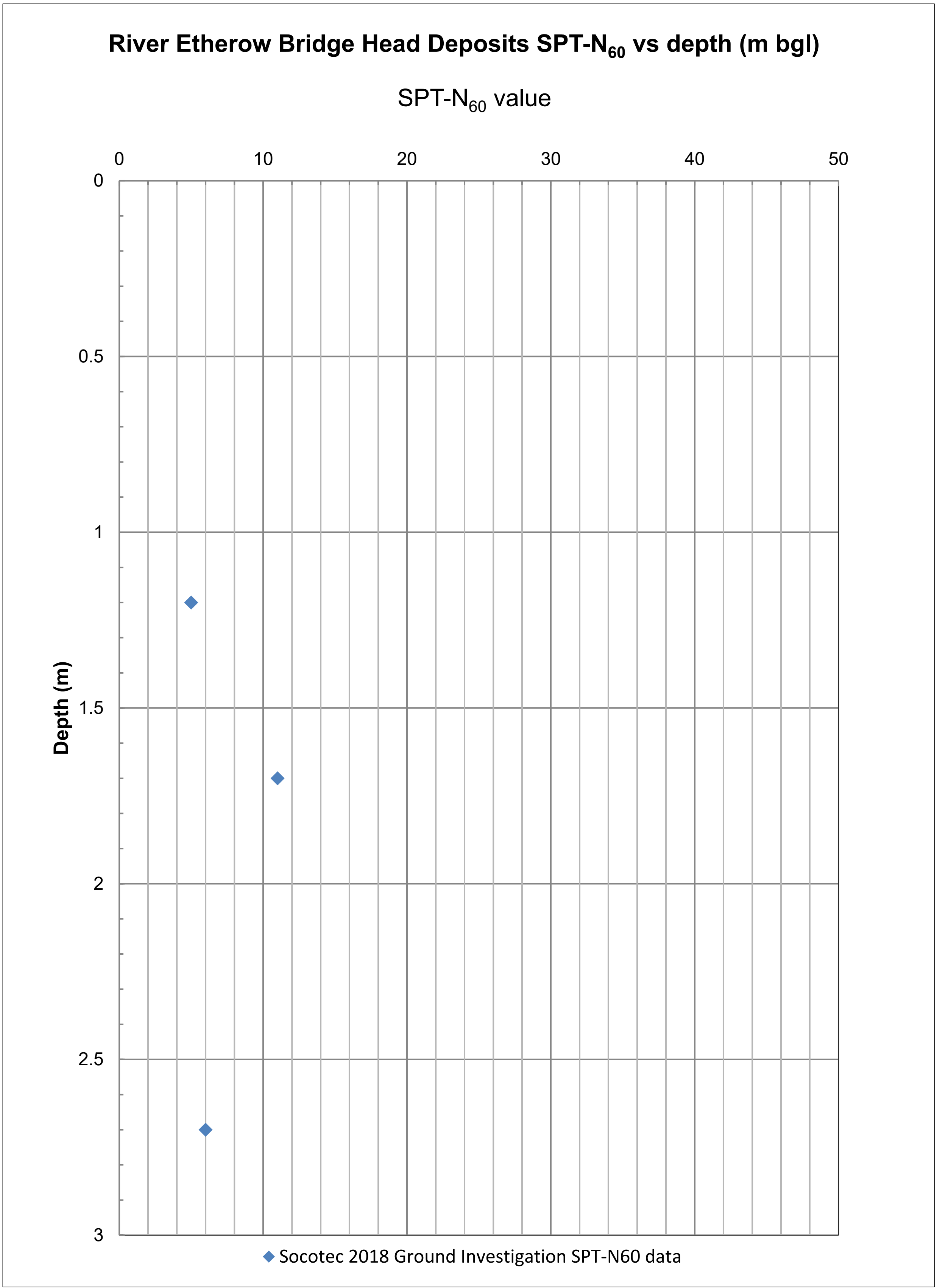


Figure 10.11.5: River Etherow Bridge Head Deposits Undrained Shear Strength.

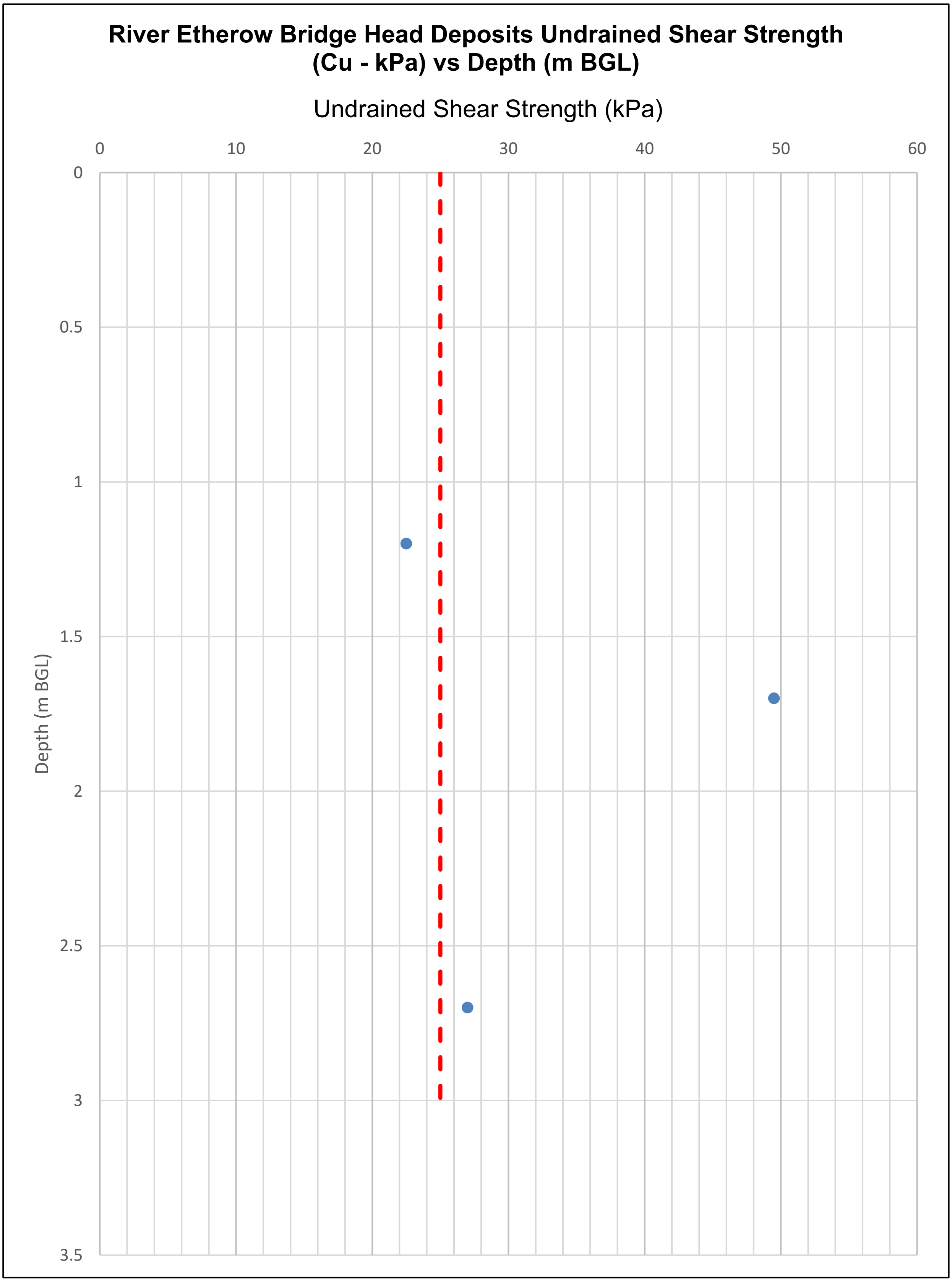


Figure 10.11.6: River Etherow Bridge Head Deposits Angle of Internal Friction.

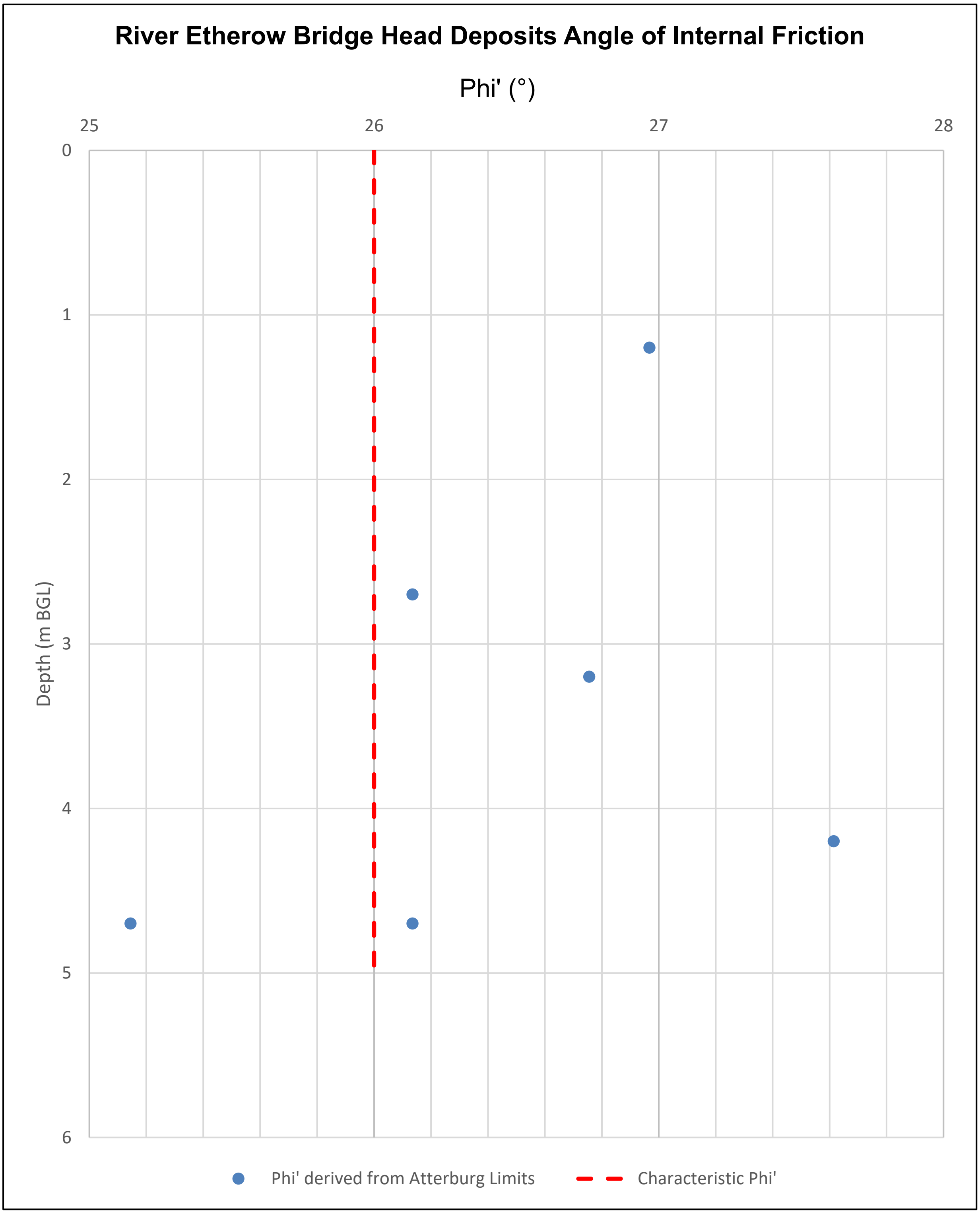


Figure 10.11.7: River Etherow Bridge Head Deposits Coefficient of Volume Compressibility (Oedometer).

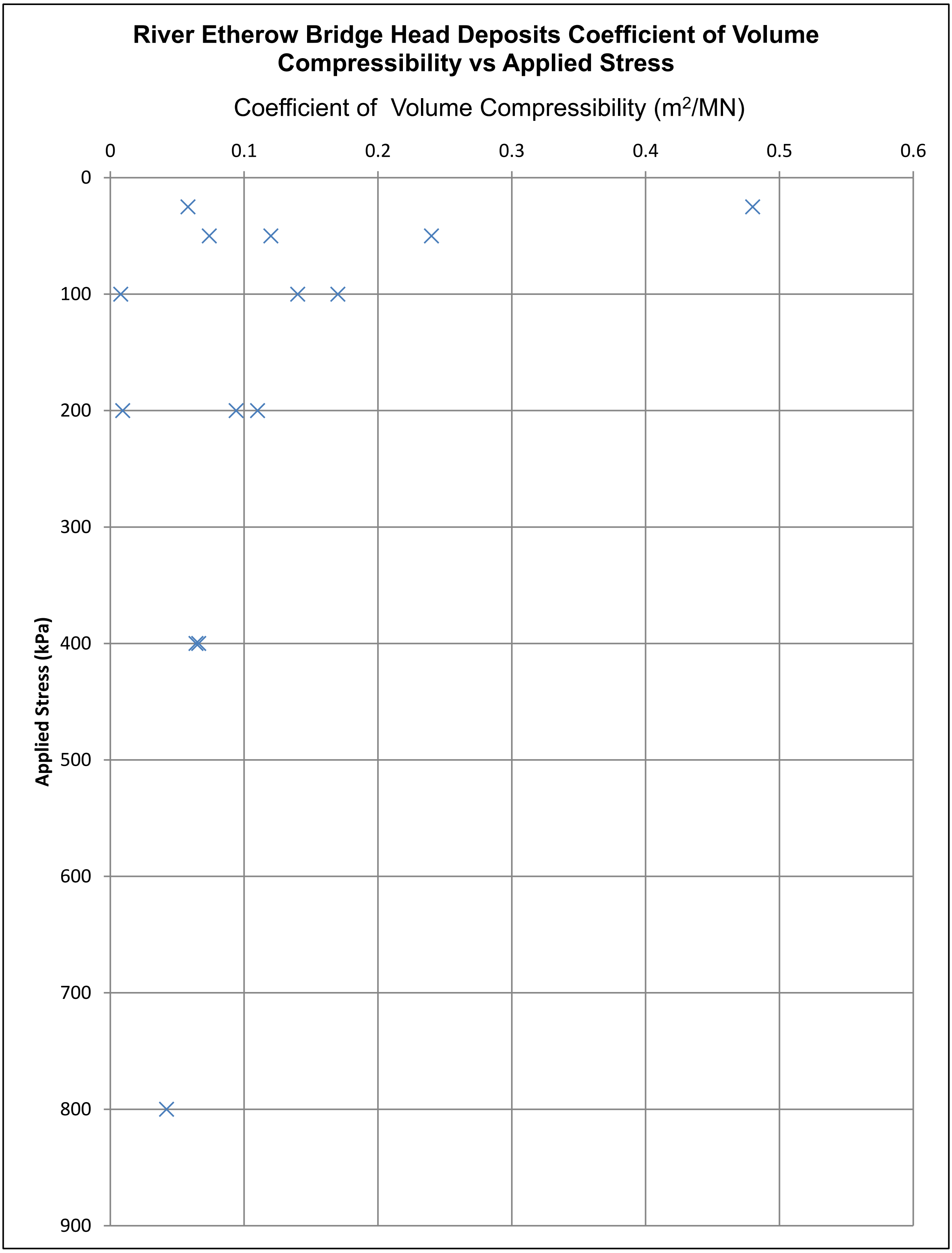


Figure 10.11.8: River Etherow Bridge Coefficient of Volume Compressibility (SPT).

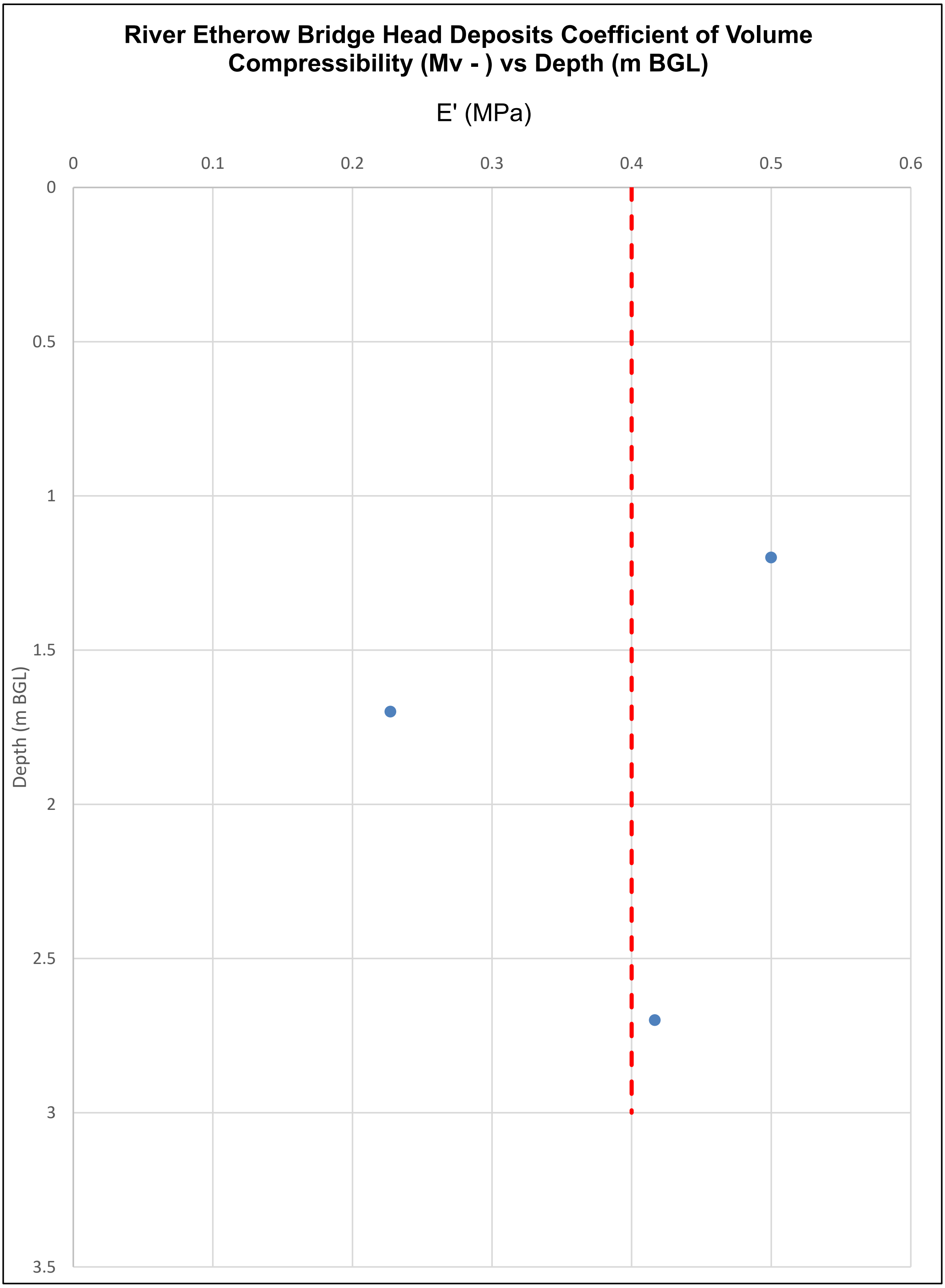


Figure 10.11.9: River Etherow Head Deposits Undrained Youngs Modulus from SPT.

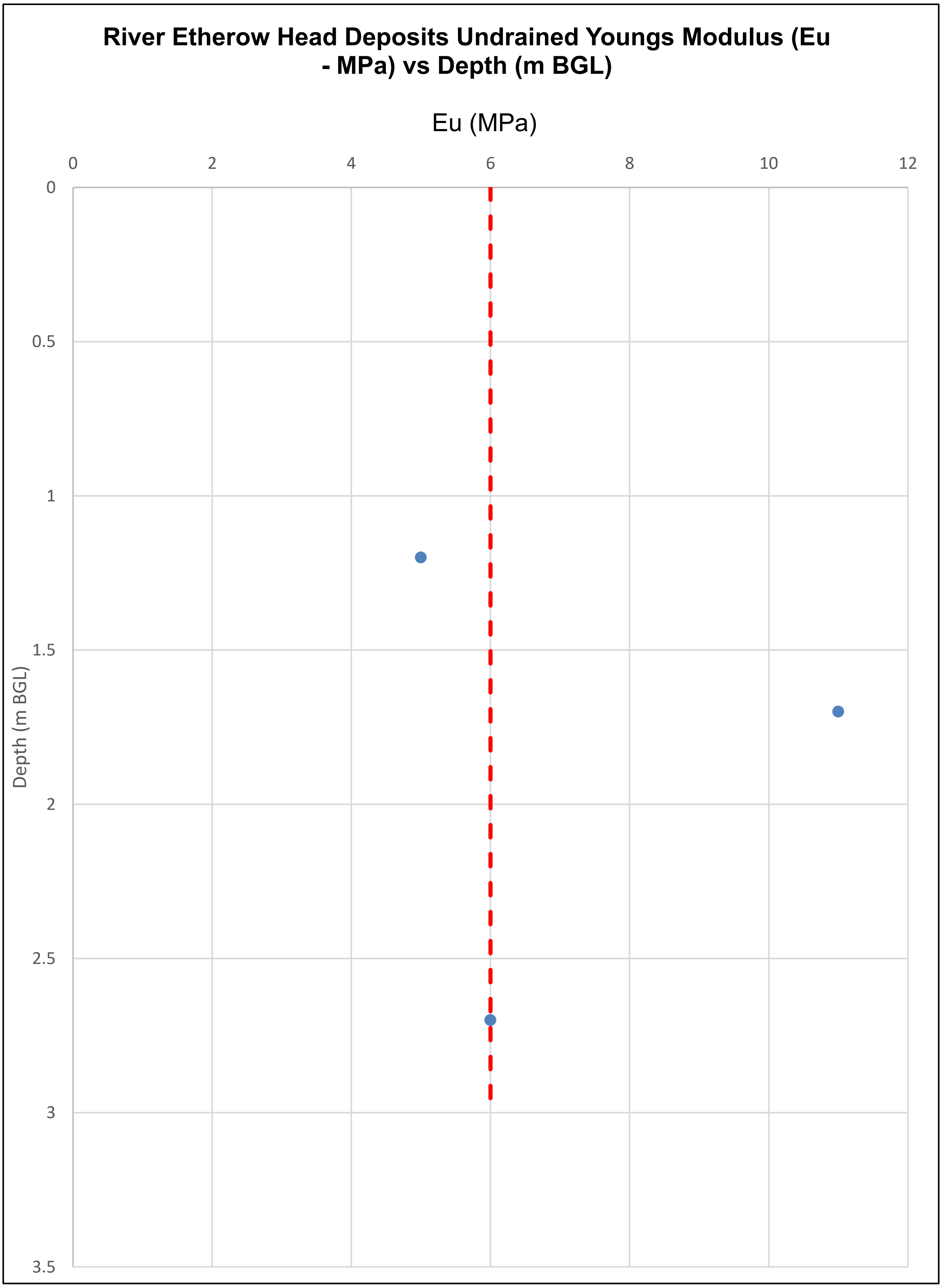


Figure 10.11.10: River Etherow Bridge Head Deposits Drained Youngs Modulus.

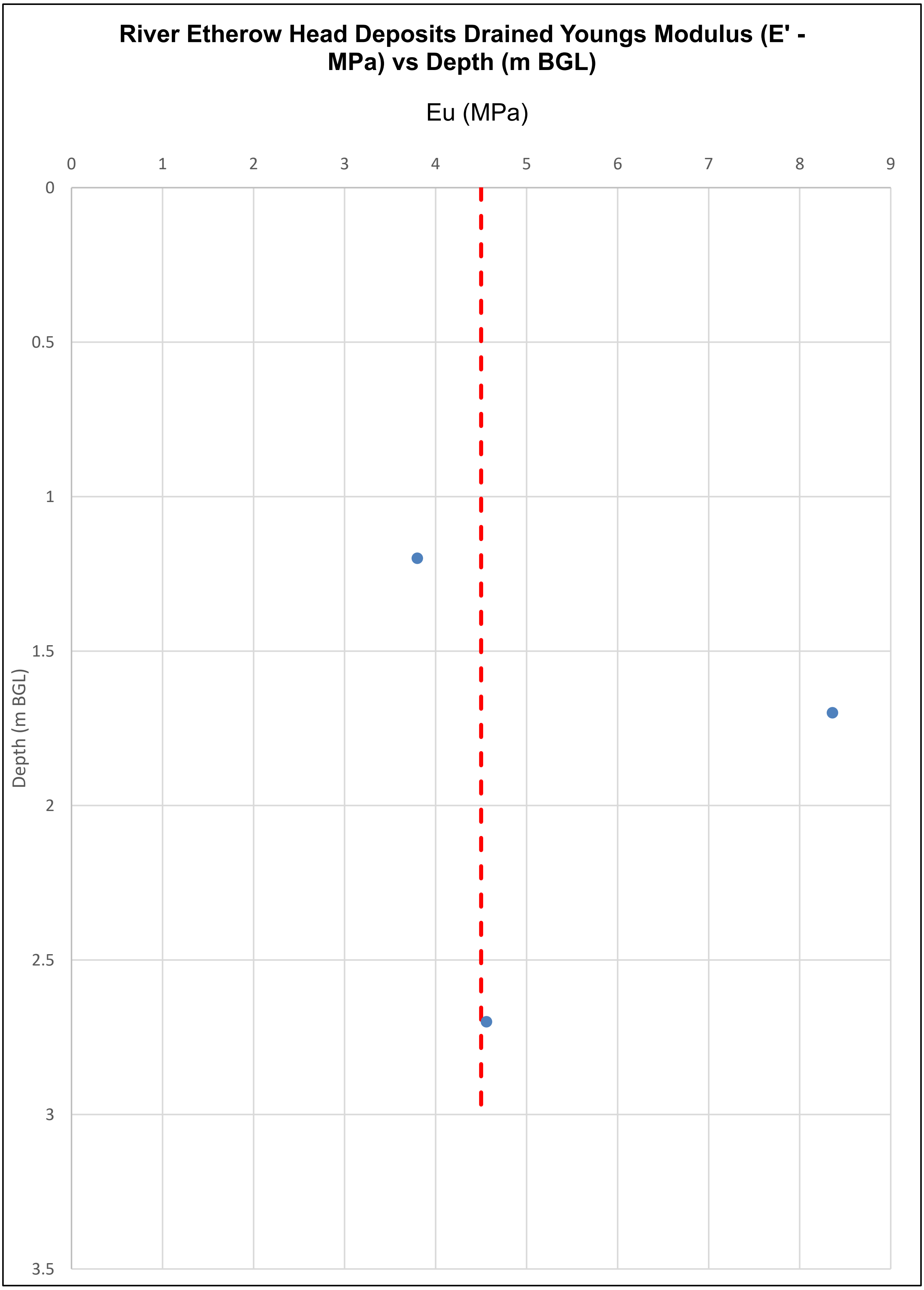


Figure 10.11.11: River Etherow Bridge Cohesive Alluvium Moisture Contents.

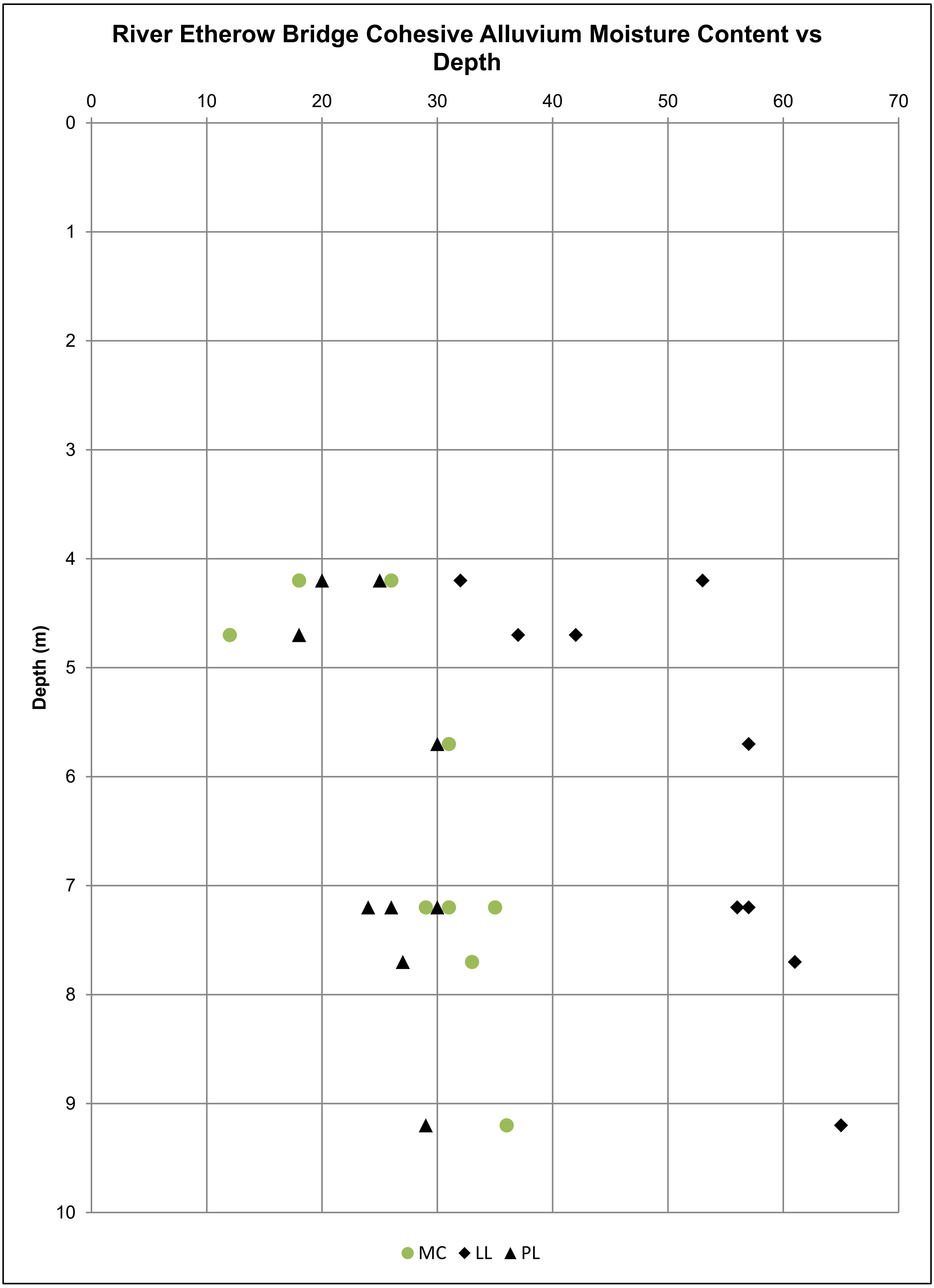


Figure 10.11.12: River Etherow Bridge Cohesive Alluvium Atterberg Limits.

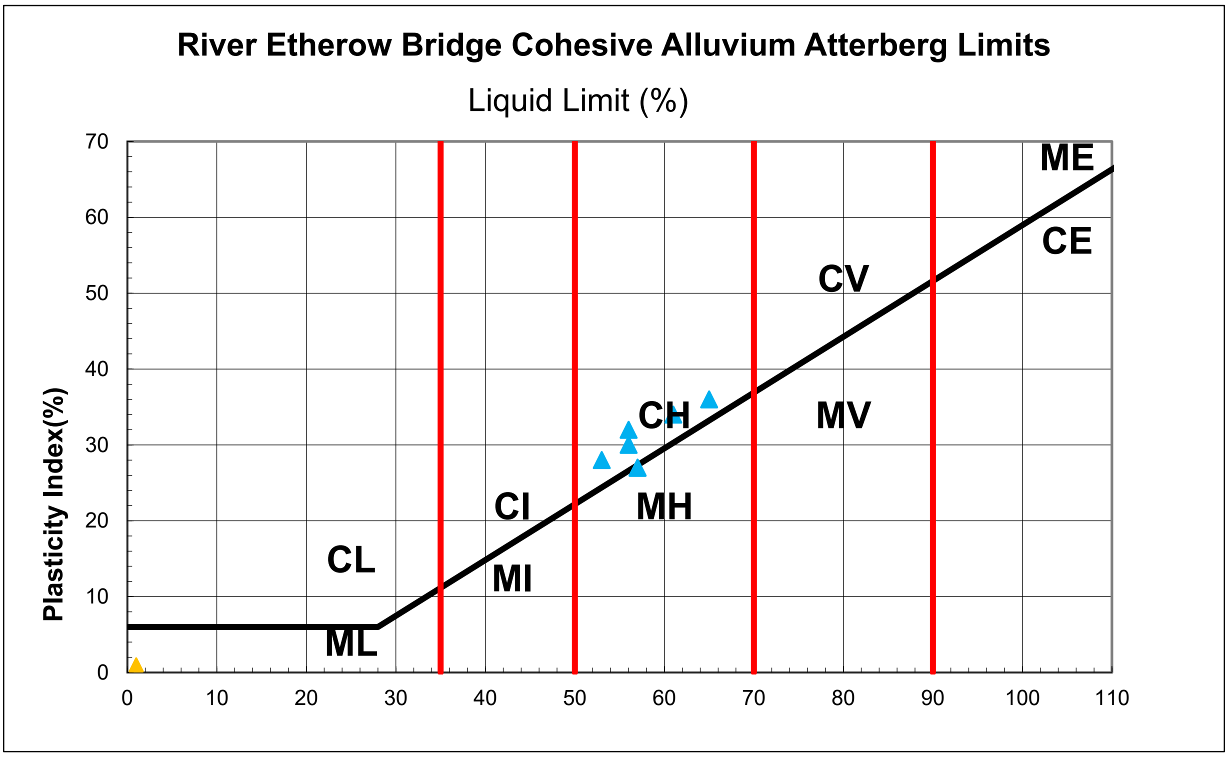


Figure 10.11.13: River Etherow Bridge Cohesive Alluvium Particle Size Distribution.

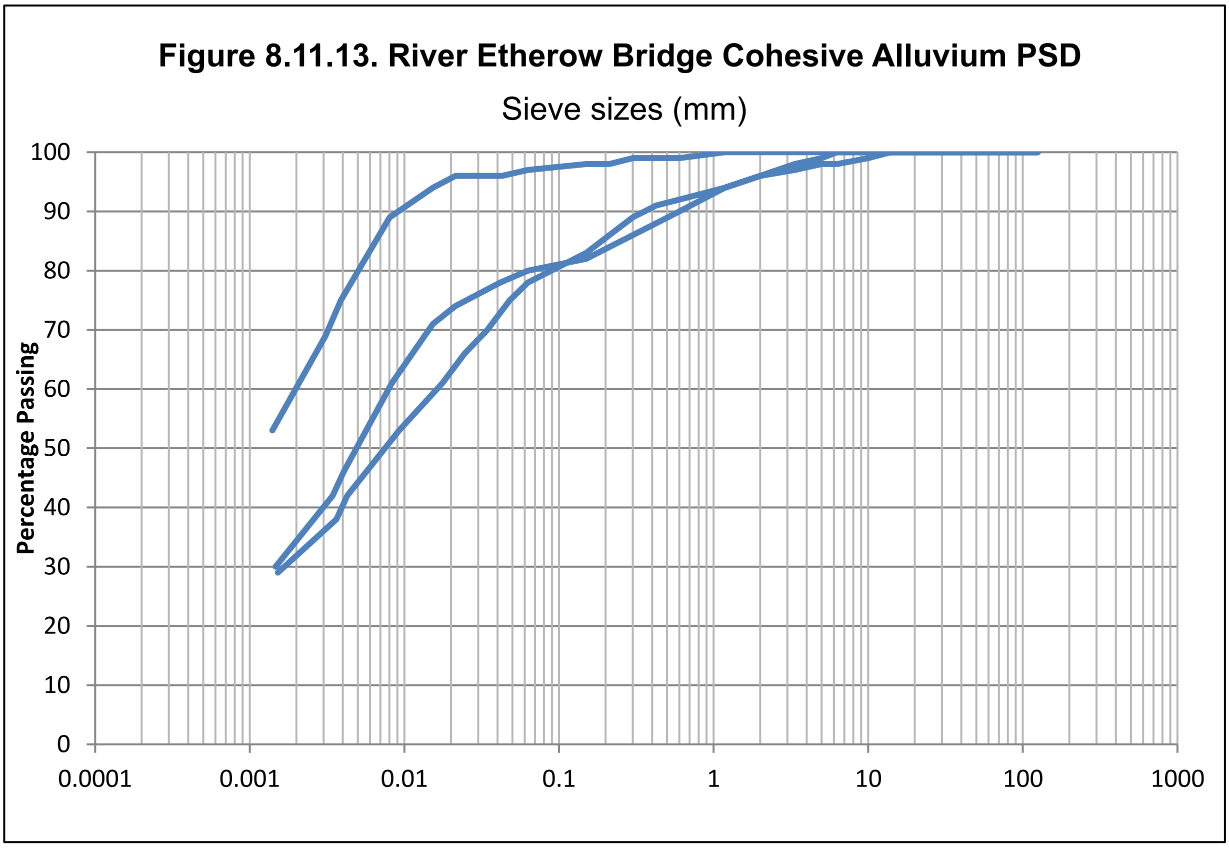


Figure 10.11.14: River Etherow Cohesive Alluvium SPT-N_{60}.

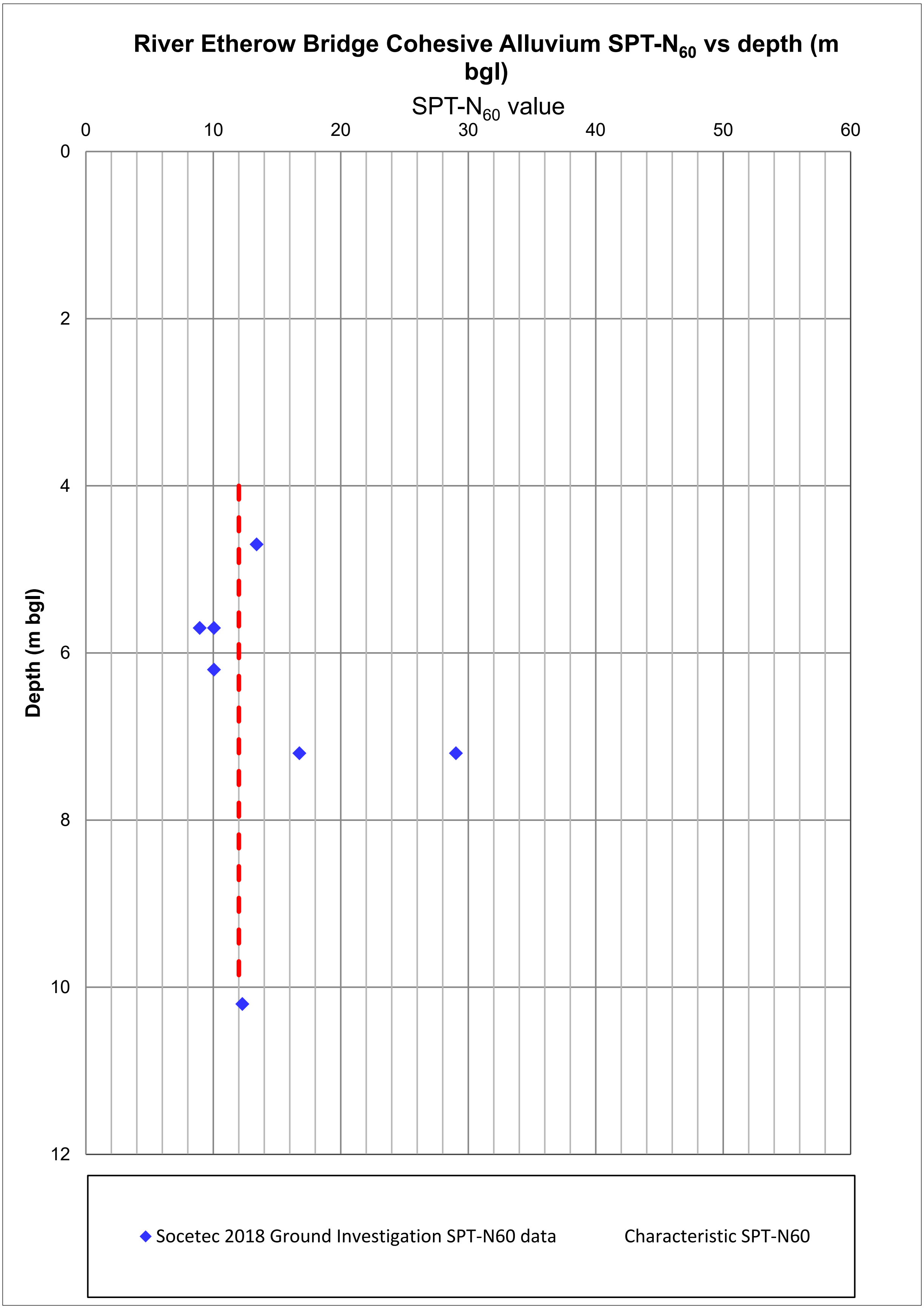


Figure 10.11.15: River Etherow Bridge Cohesive Alluvium Undrained Shear Strength.

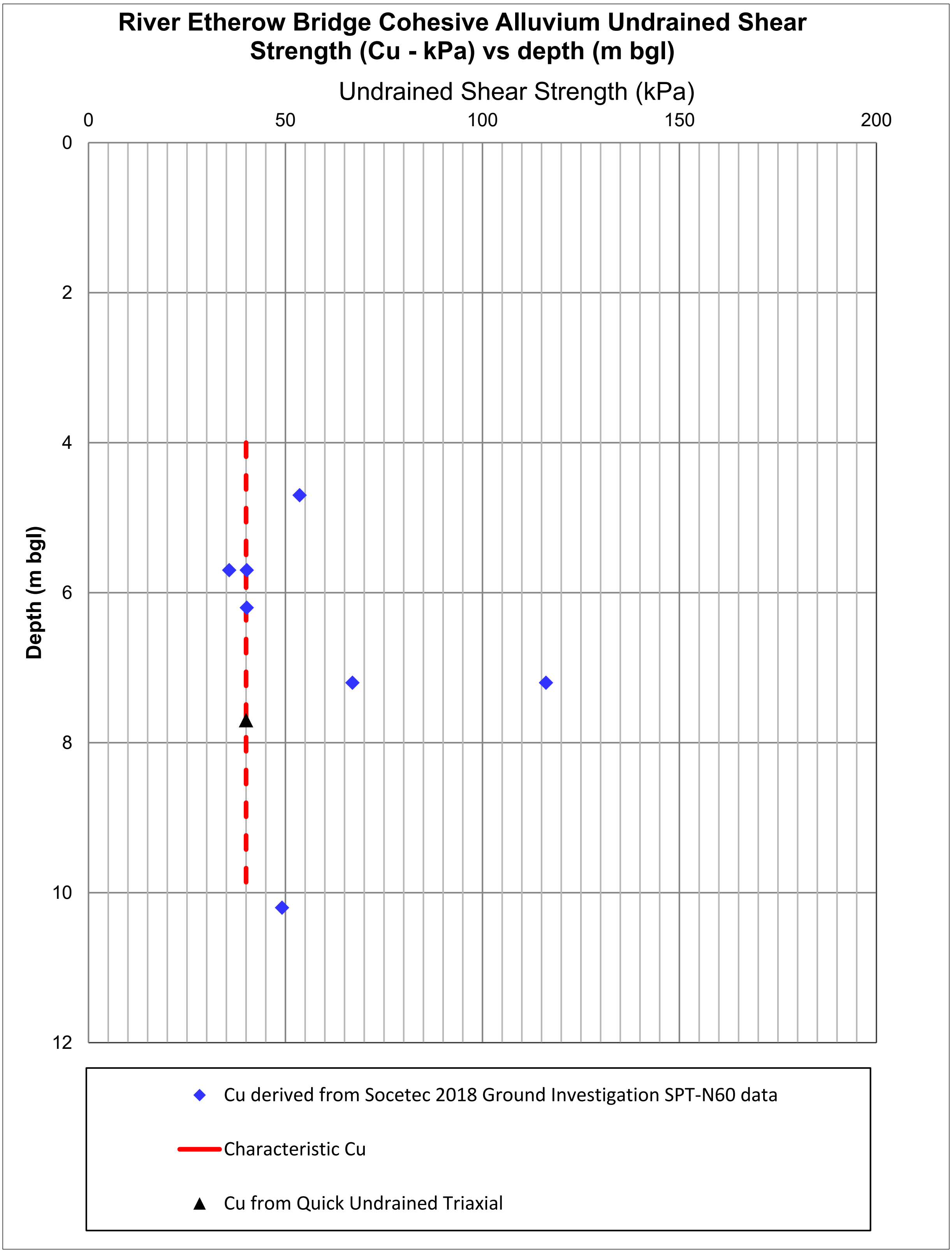


Figure 10.11.16: River Etherow Bridge Cohesive Alluvium Angle of Internal Friction.

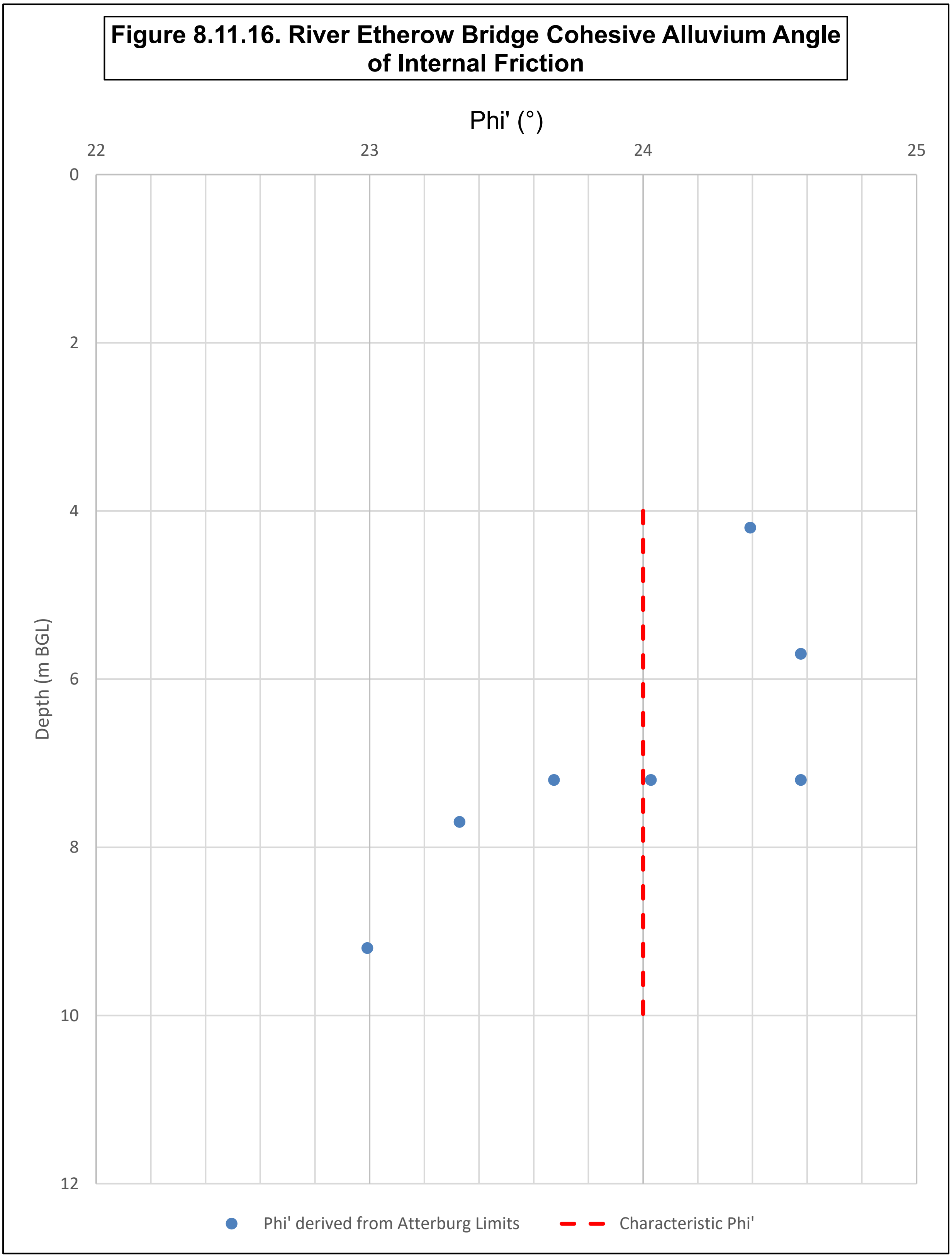


Figure 10.11.17: River Etherow Bridge Cohesive Alluvium Coefficient of Volume Compressibility (Oedometer).

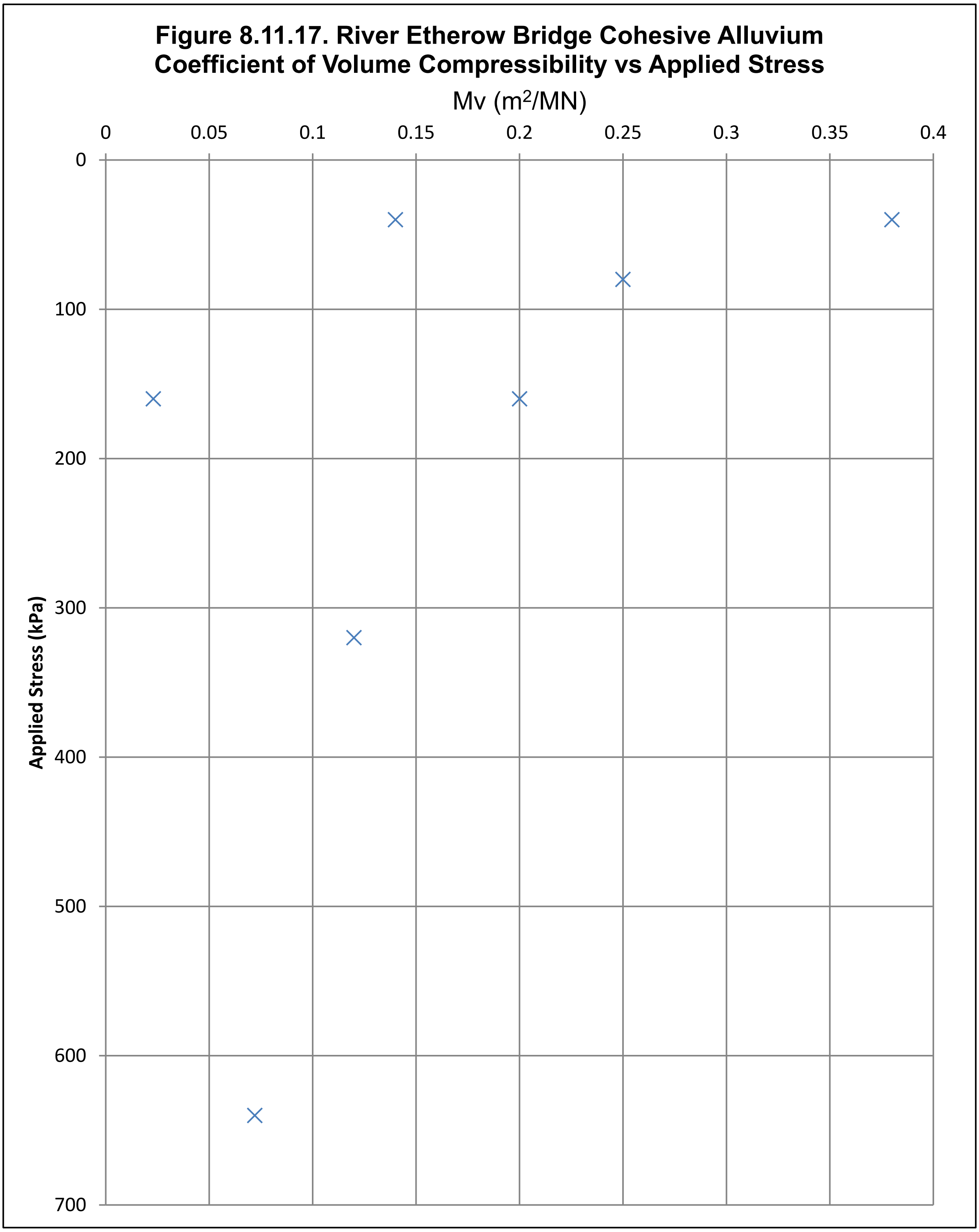


Figure 10.11.18: River Etherow Bridge Cohesive Alluvium Coefficient of Volume Compressibility (SPT).

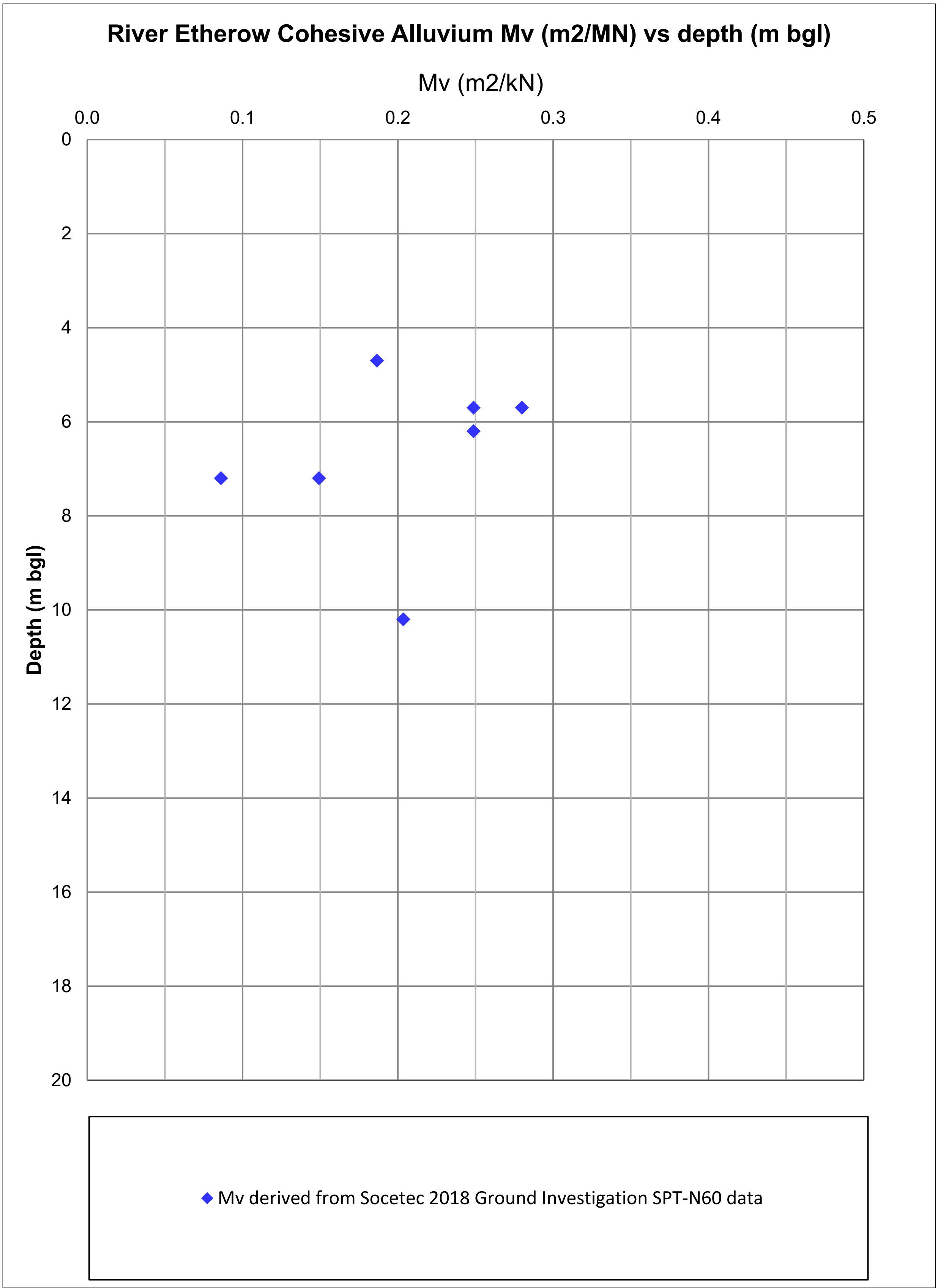


Figure 10.11.19: River Etherow Bridge Cohesive Alluvium Undrained Youngs Modulus.

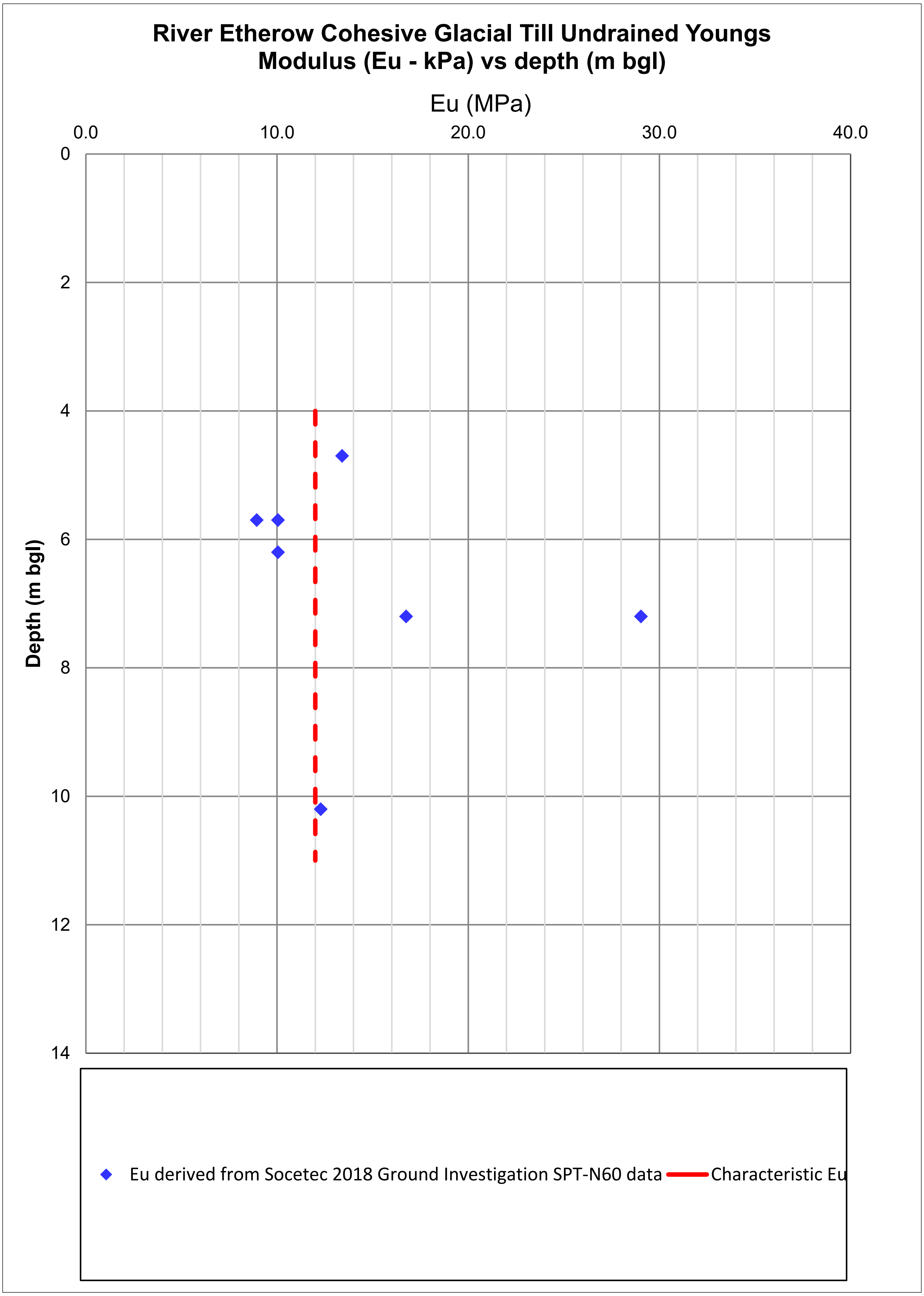


Figure 10.11.20: River Etherow Bridge Cohesive Alluvium Drained Youngs Modulus.

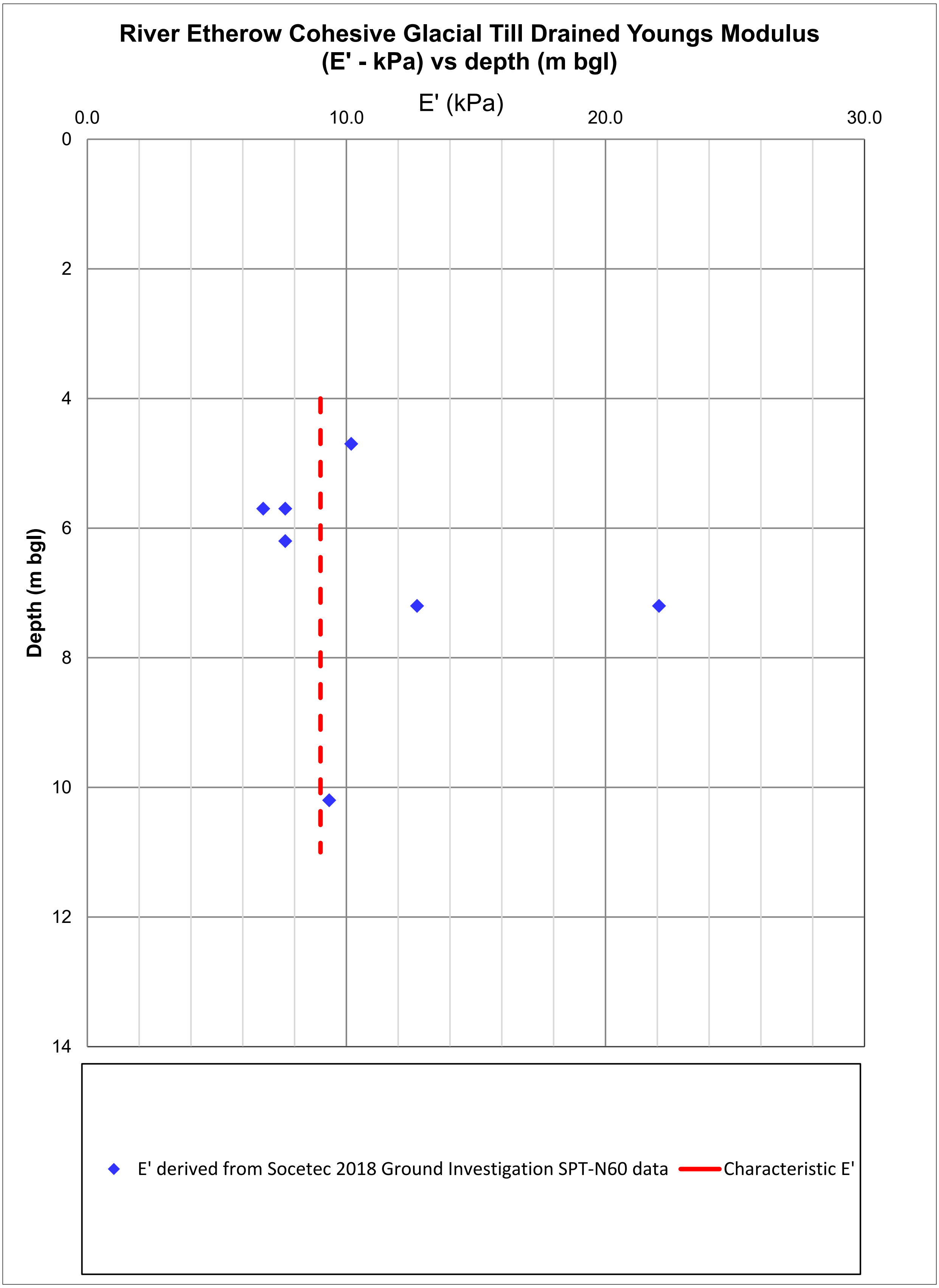


Figure 10.11.21: River Etherow Bridge River Terrace Deposits Particle Size Distribution.

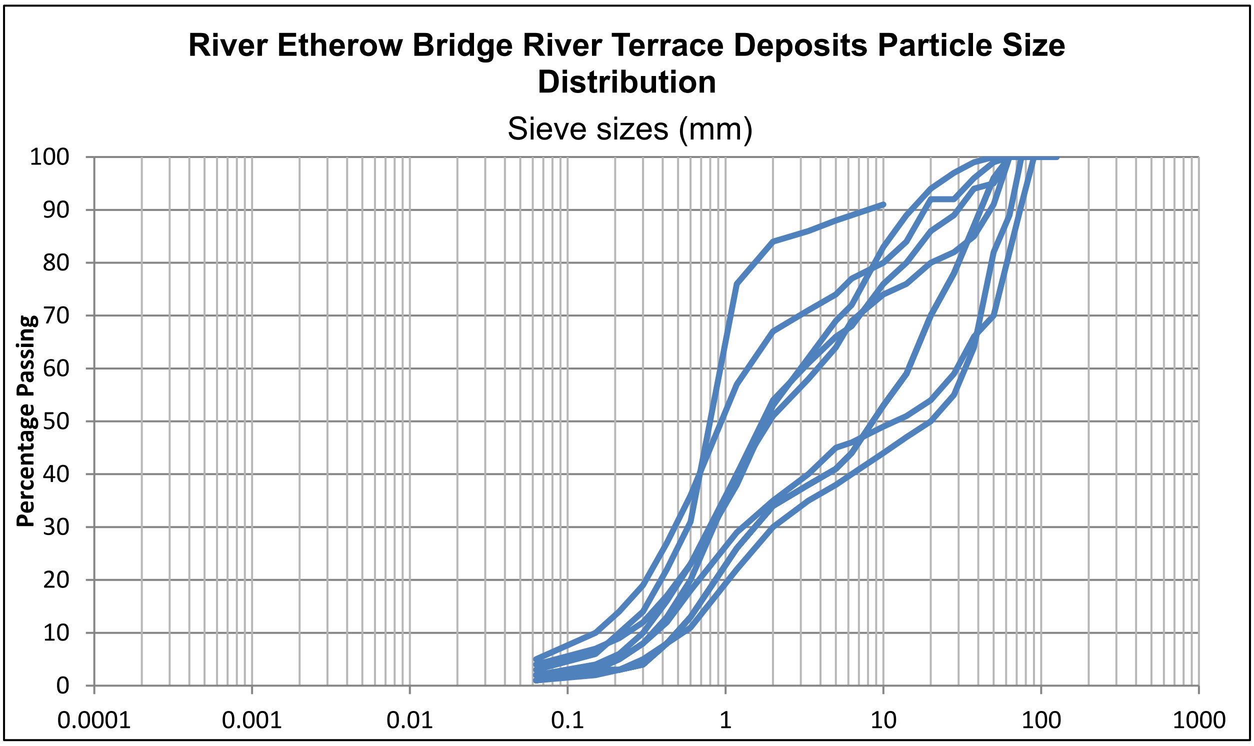


Figure 10.11.22: River Etherow Bridge River Terrace Deposits SPT-N_{60}.

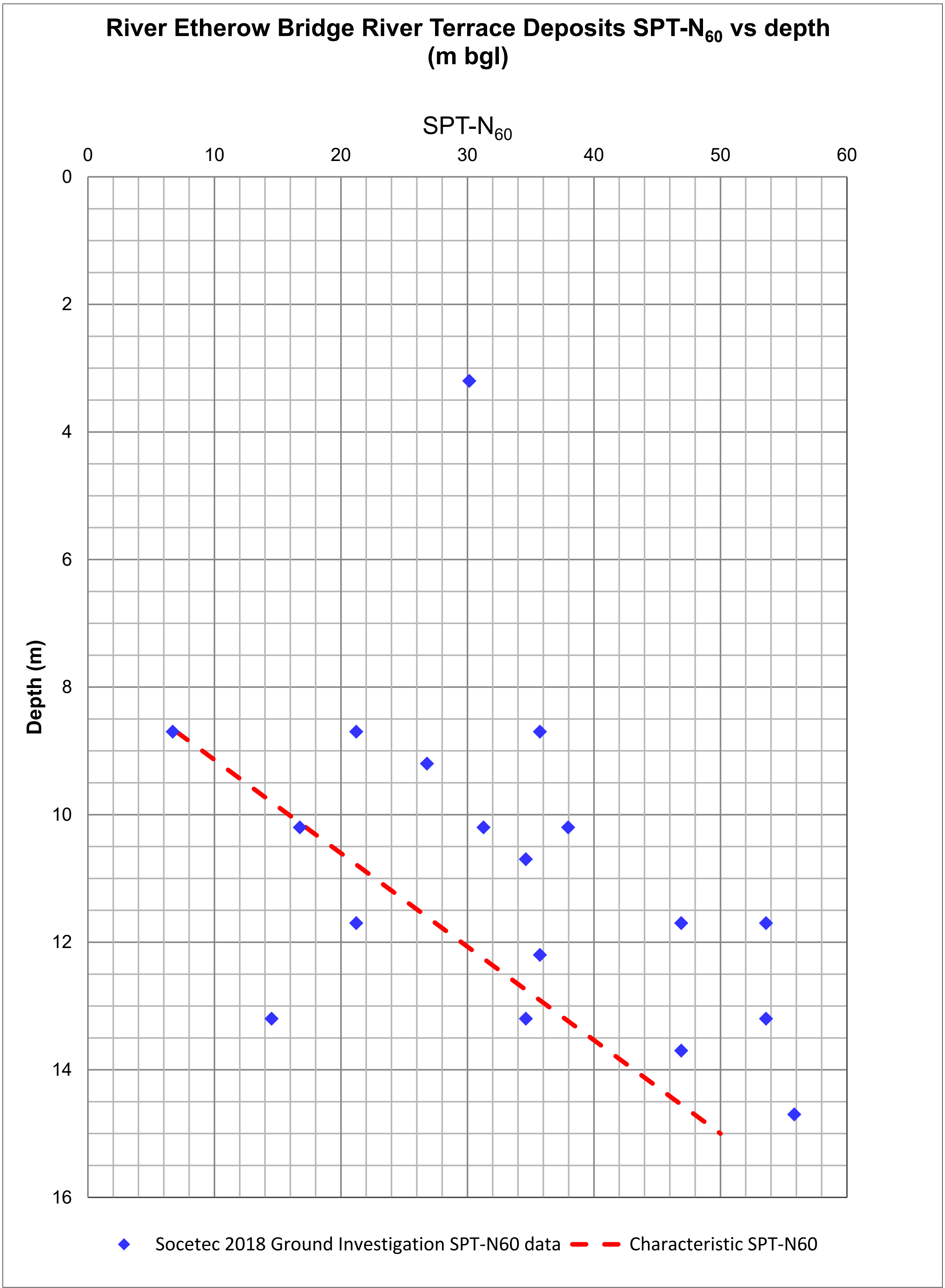


Figure 10.11.23: River Etherow Bridge River Terrace Deposits Angle of Internal Friction.

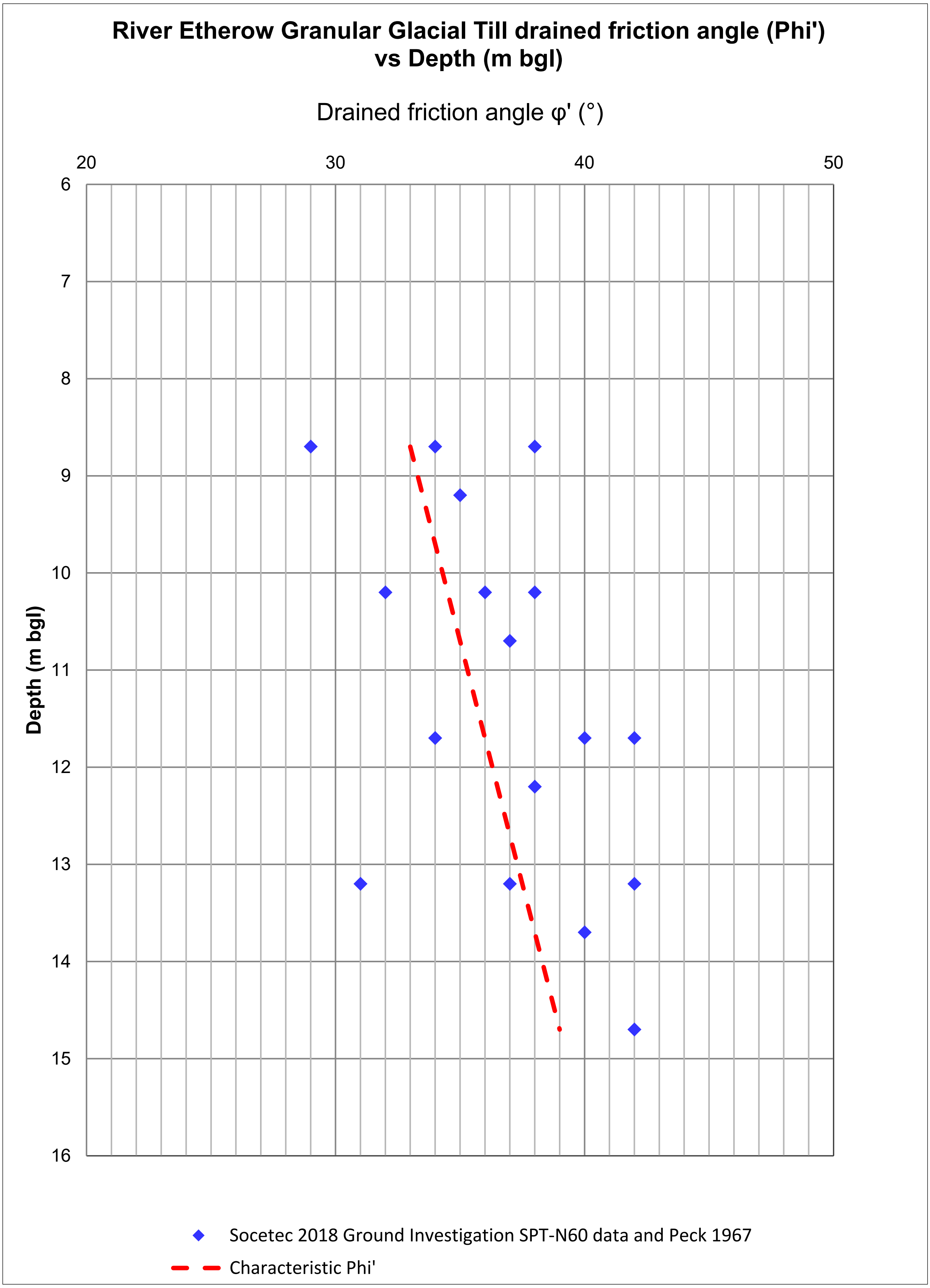
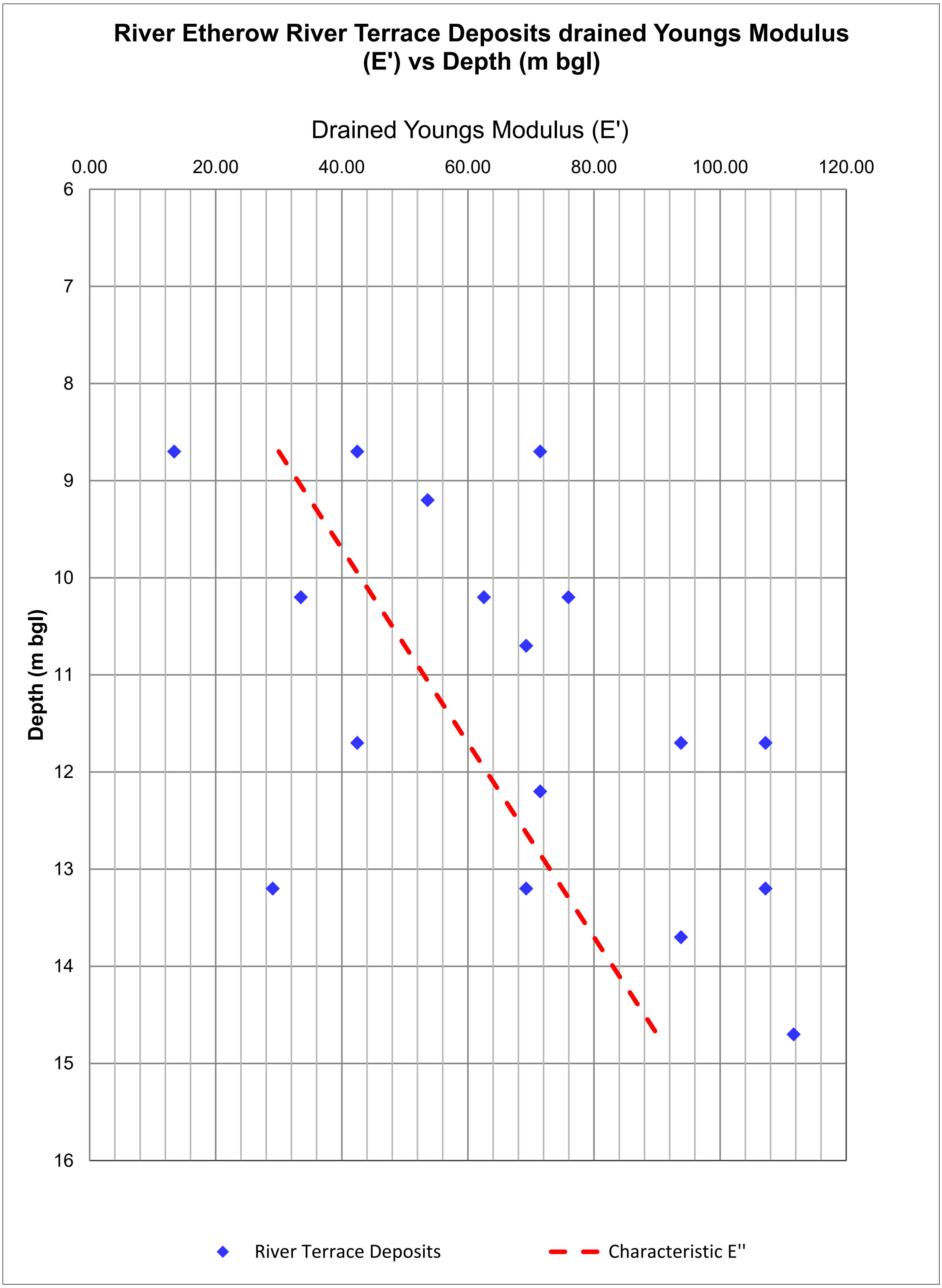
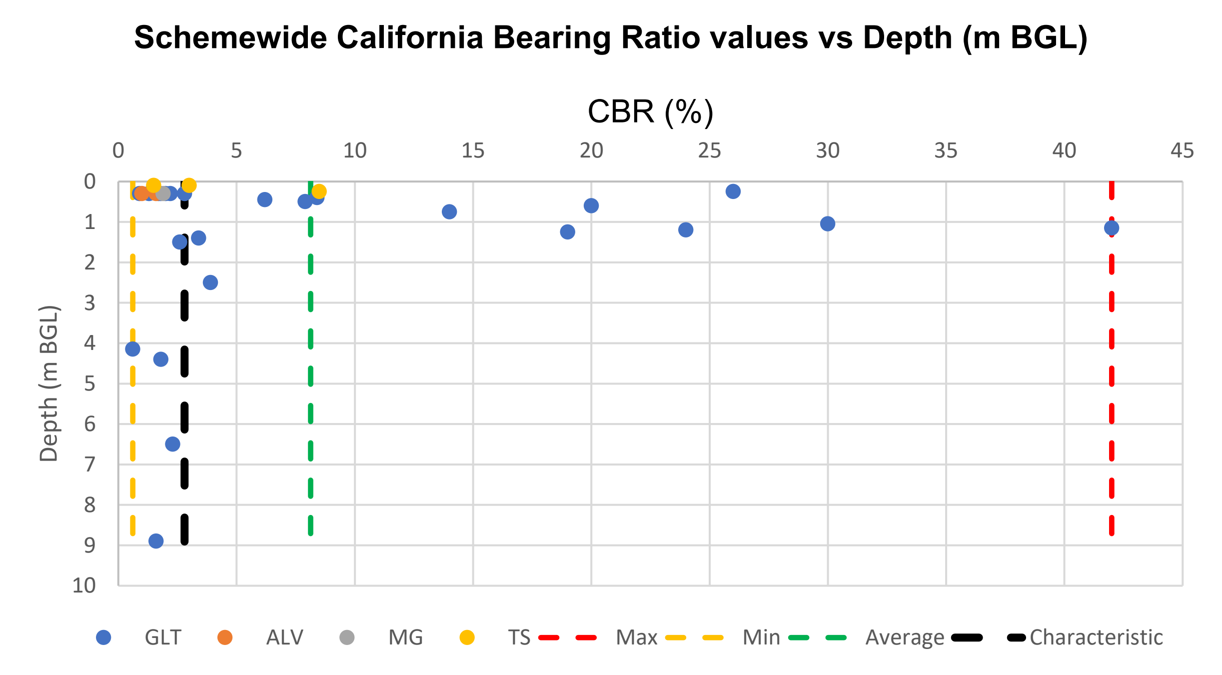


Figure 10.11.24: River Etherow Bridge River Terrace Deposits Drained Youngs Modulus.



10.12 Schemewide California Bearing Ratio

Figure 10.12.1: Schemewide California Bearing Ratio (CBR).



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Appendix A – Geo Environmental Assessment

11.1 Geo - Environmental Information

11.1.1 Geo-environmental information pertinent to the site has been summarised in Table A1 below, as reported in the Preliminary Sources Study Report (Ref. 1) Trans-Pennine Upgrade Programme. The reader should be mindful that the DCO application area extends beyond that of the proposed new highway. Therefore a number of the features detailed below whilst within the application area are some distance from the proposed highway.

Table A1 - Summary of pertinent geo-environmental information.

Feature	Details	Potential to impact the site
Current/ Historical Landfill sites within 250m of the scheme	Carrhouse Lane historical landfill is located within the DCO application and approximately 150m to the north of the proposed highway. Information from the Environment Agency suggests that the landfill accepted spoil from construction waste. Land adjacent to Woolley Lane Gas Works historical landfill is located within the DCO red line boundary but is approximately 225m north of the proposed highway. The landfill received inert waste (topsoil, subsoil and hardcore) between 1993 and 1996. Disused Railway Line historical landfill is located approximately 100m east beyond the DCO boundary and received inert, construction and demolition waste from between 1990 to 1991. Melandra Road Waste Disposal Site is located approximately 100m south east beyond the DCO application and approximately 350m from the proposed highway. This landfill received inert, industrial, commercial, household and liquid sludge between 1977 and 1981.	The historic landfill sites are a potential source of landfill gas and of contamination mobile within groundwater. However, given the relatively large off-set distances, impact to the proposed highway alignment is unlikely to be a major constraint.
Pollution incidents within 250m of the scheme	None	N/A
Coal mining	The site lies within a coal mining reporting area, and two mine entries are	From the PSSR, the risk of shallow coal mining is low, and the two mining entries

Feature	Details	Potential to impact the site
	recorded within the western area of the Scheme.	shown relate to the same United Utilities Longdendale Aqueduct Mottram Tunnel airshaft. Coal Seams recorded within the 2005 Fugro Investigation found coal beneath the proposed route to be of the thickness of between 0.01m and 0.20m, which is generally uneconomic for large scale extraction.
Non-coal mining	No non-coal mining features have been identified on the proposed route, but the Roe Cross Quarry was historically recorded 200m north of the scheme.	There is potential for the former quarry to have been infilled with unknown material which may contain potential contaminants.
Potentially contaminative land uses	• Landfills • Farms • Historical tanks, industrial features including a gas works mills, garages, bleach works and petrol filling stations. • Unknown Made Ground • Number of sites with unknown filled ground (ponds & quarries) • Sewage tanks • Infrastructure and manufacture sites.	Based on the site history, mapped and known land uses there is the potential for localised Made Ground and contamination to be present along the proposed highway, which might contain contaminants.
Historic land uses	The site has predominantly remained as pasture and agricultural land with limited on-scheme development, however the surrounding land has had a number of potentially contaminative land uses. The earliest maps (circa 1881) show the towns of Mottram to the south, Roe Cross to the north and Hollingworth to the east. Pertinent features include a quarry near Roe Cross (250m north) and Mottram Old Mill (Woollen) which is located adjacent to the proposed western roundabout.	There is minimal potential for off-site sources of contamination to impact soils and groundwater. Limited potential for ground gas generation. Due to the distances involved, the sources

Feature	Details	Potential to impact the site
	In 1910, a small gas works is mapped approximately 200m to the south of the western end near Hollingworth and a Bleach Works and associated tanks and Mersey Mills are located adjacent to River Etherow to the east. In 1950, additional industrial activities (Rhodes Mill (disused), Longdendale (Works) are shown to the east of the study area near Woolley Bridge near to the Bleach Works. A sewage works can be seen approximately 300m to the south of the Scheme in Longdendale. By 1983 residential development in Mottram and Hollingworth has significantly increased. The industry to the north in Lower Roe Cross is no longer shown. A garage is located in the vicinity of the gas works which is no longer indicated.	are unlikely to impact the Scheme.
Geology	General sequence comprises Glacial Till across the majority of the Scheme, with Head and Alluvial deposits and River Terrace Gravels (superficial deposits) associated with the River Etherow to the east. The Solid geology is formations from the Millstone Grit Group. Two faults are recorded as traversing the route of the Scheme.	There is are potential geotechnical issues in relation to ground stability with respect to the two recorded faults.
Aquifer Designation	Glacial Till – Secondary Undifferentiated Aquifer Alluvium and Head deposits – Secondary A aquifer Solid Geology (Millstone Grit Group) – Secondary A Aquifer	Controlled Waters
Abstractions	No abstractions are recorded within influencing distance of the scheme.	N/A
Hydrology within 250m of the scheme	The site lies within the River Etherow catchment and the new highway crosses this river at the eastern end. Land drainage ditches and ponds are present within the surrounding agricultural land. The Hurstclough	Controlled Waters

Feature	Details	Potential to impact the site
	Brook is located in the western part of the Scheme.	
Sensitive land uses within 250m of the scheme	None recorded	N/A

11.2 Preliminary Conceptual Model

11.2.1 A Preliminary Conceptual Model has been developed based on the information obtained from desk-based research to identify potential sources, pathways and receptors of contamination based on the proposed use of the site as a highway.

Potential Sources

Table A2 – Potential sources of contamination.

Contamination source	Location
Historic landfills	Carrhouse Lane historical landfill is located adjacent to (directly north) the eastern end of the scheme and the Land Adjacent to Wooley Lane Gas Works historical landfill is approximately 150m north of the proposed highway.
Roe Cross Quarry (1881)	250m north
Mottram Woollen Mill (1881)	Adjacent to M67 Roundabout
Gas works & later adjacent garage (1910)	200m south of western end of scheme.
Mill and Bleach Works (1950)	East of scheme in Hollingworth
Sewage works (1950)	300m south in Longendale

Potential Pathways

- Direct contact including ingestion or dermal contact with contaminated soils and windblown dust.
- Surface runoff from disturbed ground.
- Direct contact or ingestion with contaminated runoff/ groundwater.
- Inhalation of contamination in dust, vapour or gas.
- Leaching from Made Ground into controlled waters or aquifers.
- Generation and migration of ground gas and vapours via permeable strata or preferential pathways along engineered structures (services or piles).

Potential Receptors

- Human health including members of the public (vehicle breakdowns as no pedestrian pavements) and future maintenance workers.
- Controlled Waters including superficial deposits, classified as Secondary Undifferentiated and Secondary A Aquifers and the solid geology is Millstone Grit Group, classified as a Secondary A Aquifer; and surface water receptors including the River Etherow, Hurstclough Brook, ponds and drainage channels.

11.3 Geo-Environmental Assessment

11.3.1 As part of the site investigation 108 soil samples and 8 groundwater samples were collected and analysed. Full details of the intrusive investigation including the full laboratory results and exploratory hole location plan can be located within the Socotec Factual Report (Ref 2).

Human Health Risk Assessment

11.3.2 The analytical results of the soil, soil-derived leachate, and groundwater laboratory testing of samples collected from across the scheme route have been assessed to determine the potential risk to human health and the water environment. The following sub-sections provide a screening assessment of the suite of contaminants analysed against the current applicable Suitable 4 Use Levels (S4ULs) (Ref 3), Category 4 Screening Levels (Ref 4) and Water Quality Standards & Drinking Water Standards (Ref 5 and Ref 6).

11.3.3 The primary potential receptors are offsite residents and members of the public where the route runs near public footpath, or residential areas. There is also potential for members of the public to come into contact with soils in the event of them leaving their vehicles or walking near the carriageway along existing pedestrian rights of way.

11.3.4 Contamination risks to construction / maintenance workers are not appraised by chronic (long-term) exposure human health risk assessments and would be addressed under UK employment law, in accordance with the Health and Safety Executive publication entitled “Protection of Workers and the General Public during the Development of Contaminated Land”, 1991 (HSG 66) (Ref. 7), the Construction Design and Management (CDM) Regulations (2015) (Ref. 8) or any other relevant guidance.

Visual/ Olfactory Evidence of Contamination

11.3.5 Logs for 57No. exploratory holes for the recent site investigation were reviewed. The following visual/ olfactory evidence of potential contamination was identified:

- BH422: Faint hydrocarbon odour noted in Made Ground soils at 1.20 to 1.70mbgl.

Made Ground

11.3.6 Made Ground of significant thickness was, in general, not encountered, with the exception of the following locations which were greater than 1m in depth:

- BH405, where both granular and cohesive Made Ground (Light yellow sandy slightly clayey GRAVEL with a low cobble content, Soft dark greyish brown slightly sandy slightly gravelly CLAY & Dark brownish grey slightly clayey slightly sandy GRAVEL with a medium cobble content) was encountered to a depth of 1.50mbgl.

- BH407, where cohesive Made Ground (Very soft, locally soft, dark brown, becoming dark greyish brown, slightly sandy slightly gravelly silty CLAY with low cobble content) was encountered to a depth of 1.25mbgl.
- BH422, where granular Made Ground (Light brown stained black ashy GRAVEL, Brownish grey gravelly fine to coarse SAND, Dark greyish brown clayey sandy GRAVEL & dark brownish grey clayey slightly sandy GRAVEL – the stratum which noted the faint hydrocarbon odour) was encountered to a depth of 1.70mbgl.

Soil Assessment

Soil Screening Values (SSVs)

11.3.7 In line with CLR11 (DEFRA & EA, 2004), a Generic Quantitative Risk Assessment (GQRA) has been undertaken to determine the significance of the concentrations measured through chemical analysis. The results of chemical analysis of 84 soil samples were screened against the Suitable 4 Use Levels (LQM / CIEH S4ULs) appropriate to Public Open Space near residential housing scenario as defined in CL:AIRE report SP1010 (Ref. 4) to provide a conservative and general indication of any potentially significant contamination that could pose a risk to human health. In the absence of a S4UL for lead, the Category 4 Screening Level (C4SL) has been adopted. For Tier 1 screening, a soil organic matter (SOM) level of 1% was applied to the site.

11.3.8 A Soil Organic Matter (SOM) content of 1% has been used in the assessment as a precautionary approach, i.e. soils with a low organic matter content are less able to attenuate organic contaminants.

11.3.9 The SSVs are presented below in Table A3: These are pure risk based values, and do not take account other limiting requirements. In practical delivery, lower limits would be applied to ensure low overall concentrations of, for example, hydrocarbons, that whilst not fractions are harmful to health, limits would need to be applied to assure soil amenity value and low odour, for example.

Table A3 Soil Screening Values.

Compound name	Soil Screening Values (mg/kg)
	Public Open Space (Resi)
Arsenic	79
Boron	21000
Beryllium	2.2
Cadmium	120
Chromium	1500
Chromium (hexavalent)	7.7
Copper	12000
Lead*	630
Mercury	40

Compound name	Soil Screening Values (mg/kg)
	Public Open Space (Resi)
Nickel	230
Selenium	1100
Zinc	81000
Free Cyanide	N/A
Total Cyanide	
pH	6-9
PAH compounds (1% SOM)	
Acenaphthylene	15000
Anthracene	74000
Benzo(a)anthracene	29
Benzo(a)pyrene	5.7
Benzo(b)fluoranthene	7.1
Benzo(k)fluoranthene	190
Benzo(ghi)perylene	640
Acenaphthene	15000
Chrysene	57
Di-benzo(a,h)anthracene	0.57
Fluoranthene	3100
Fluorene	9900
Indeno(1,2,3-cd)pyrene	82
Naphthalene	4900
Phenanthrene	3100
Pyrene	7400
Total Phenols (monohydric)	N/A
TPH Fractions (1%SOM)	
Aliphatic C5-6	570000
Aliphatic C6-8	600000
Aliphatic 8-10	13000
Aliphatic 10-12	13000
Aliphatic 12-16	13000
Aliphatic 16-35	250000
Aliphatic 35-44	250000
Aromatic C5-7	56000

Compound name	Soil Screening Values (mg/kg)
	Public Open Space (Resi)
Aromatic C7-8	56000
Aromatic C8-10	5000
Aromatic C10-12	5000
Aromatic C12-16	5100
Aromatic 16-21	3800
Aromatic C21-35	3800
Aromatic C35-44	3800

**C4SL*

Soil Results

Inorganics

11.3.10 The inorganic contaminant results for all the soil samples analysed have been compared to appropriate SSV criteria. A single exceedance of the Lead SSV was recorded within Topsoil in BH427 (0.20mbgl) with a value of 842.7mg/kg compared with a SSV of 630mg/kg (C4UL value). No visual or olfactory evidence of contamination was present within the borehole.

11.3.11 All other determinants were recorded below the criteria. All concentrations of cyanide were recorded below the level of detection.

11.3.12 The pH value measured within Mudstone in BH409 9.00m (4.2 pH units) is lower than the pH range of a normal soil (6-9 pH units). Whilst this alone does not necessarily indicate contamination it does indicate that soils of an unusually acidic pH are present.

Organics

11.3.13 Samples were analysed for Polycyclic Aromatic Hydrocarbons (PAH) compounds, Semi Volatile Organic Compounds (SVOC), Poly Chlorinated Biphenyl's (PCBs) and Total Petroleum Hydrocarbons (TPH) fractions. The results were compared to the relevant SSV criteria and the majority of samples did not record any exceedances for public open space for human health criteria.

11.3.14 A single minor exceedance of the PAH compound Dibenz(ah)anthracene was recorded within Made Ground in BH411 at 0.30mbgl with a value of 0.67mg/kg compared with a SSV of 0.57mg/kg. No visual or olfactory evidence of contamination was present within the borehole, however tarmacadam was recorded at ground level, and it is possible that this potentially cross contaminated the sample during the drilling process.

Asbestos Identification

11.3.15 72 soil samples were screened for asbestos. No asbestos fibres were detected above the laboratory detection limit within the soil samples analysed.

11.4 Controlled Waters Risk Assessment

Water Quality Standards

11.4.1 Groundwater sampling was undertaken from the installed boreholes along the proposed highway and analysis carried out. To assess the groundwater in terms of its potential to act as a source of contamination or migration pathway, each contaminant concentration has been compared to appropriate Water Quality Standards (WQS), such as Environmental Quality Standards (EQS) for freshwater (Ref 4) and UK Drinking Water Standards (DWS) (Ref 5).

11.4.2 EQS are considered protective of surface water (River Etherow, Hurstclough Brook, land drainage ditches and ponds) and DWS are protective of groundwater which may be used as a potable supply (Secondary Undifferentiated Aquifer and Secondary A Aquifer).

11.4.3 The EQS values have been taken from the Water Framework Directive (WFD) which provides stringent screening values to be protective to the surface water environment.

11.4.4 When considering EQS values, for a number of contaminants, the hardness of the receiving water must be considered to determine the EQS. To be conservative the most stringent concentrations have been used (i.e. for the lowest hardness band - <50mg/l $CaCO_3$).

11.4.5 Where materials are to be re-used onsite, consideration should be given to protection of surface waters from leachable heavy metals and further assessment may be required to demonstrate suitability for reuse.

Groundwater Results

11.4.6 Eight groundwater samples were tested to help inform the risk to controlled waters and potential of groundwater beneath the site to be a source or pathway of contamination.

11.4.7 Exceedances recorded above the relevant screening values are detailed within Table A4 below.

Table A4 Summary of groundwater exceedances.

Determinand	Range of results (µg/l)	EQS (<50mg/L CaCO3) (µg/l)	UKDWS (µg/l)	Location of EQS Exceedances	Location of UKDWS Exceedances	Geology
Zinc	*2 – 722	12.1	3000	BH403	-	Glacial Till
				BH418	-	Siltstone Bedrock
				BH421	-	Sandstone & Siltstone
				BH422	-	Glacial Till
Chromium III	<0.01 - 6	4.7	N/A	BH422	-	Glacial Till
Chromium VI	<0.01 - 6	3.4	50	BH418	-	Glacial Till
Benzo(b)fluoranthene	<0.01 – 0.03	-	0.025	-	BH403	Glacial Till
				-	BH403	
Benzo(ghi)perylene	<0.01 – 0.05	-	0.025	-	BH404	Glacial Till
Benzo(k)fluoranthene	<0.01 – 0.04	-	0.025	-	BH404	Glacial Till
Benzo(a)pyrene	<0.01 – 0.07	0.00017	0.01	BH403	BH403	Glacial Till
				BH404	BH404	
Indeno(123)pyrene	<0.01 – 0.05	-	0.025	-	BH404	Glacial Till
Concentration of TPH (Aliphatic C8-C40)	<10 - 22	10	10	BH404	BH404	Bedrock & Glacial Till

Determinand	Range of results (µg/l)	EQS (<50mg/L CaCO3) (µg/l)	UKDWS (µg/l)	Location of EQS Exceedances	Location of UKDWS Exceedances	Geology
				BH406 BH413 BH422	BH406 BH413 BH422	

11.4.8 Minor groundwater exceedances of some inorganic contaminants (EQS) and PAH compounds (DWS) have been identified in the northern section of the proposed route. BH403, BH404, BH406 and BH413 are located around the urban areas whilst BH418, BH421 and BH422 are located within the fields to the east of the proposed underpass.

11.4.9 The EQS values adopted are generally very stringent and in the majority of case there is only a marginal exceedance. In the case for Zinc the screening value has been calculated based on assumed dissolved organic carbon (DOC) and Calcium values and using the bioavailability guideline. It is likely that the screening value is conservative. The exceedances are recorded within the bedrock or Glacial Till. The main surface water feature (River Etherow) is some distance from these sample locations and therefore these exceedances are unlikely to cause an impact to this watercourse. The presence of Zinc may need to be considered during dewatering activities and may prevent direct discharge to surface waters.

11.4.10 The sample from BH422 recorded a concentration above the level of detection for GRO (Gasoline Range Organics), with a concentration of 2.15mg/l. The majority this is from the aliphatic C5 to C6 fraction. No significant TPH soil contamination was found in this location and there is no obvious source for this contamination. The TPH analysis does also not reflect this result with 0.013mg/l recorded. It is considered that this concentrations is an error in the laboratory or sampling technique and does not represent the concentration in this area.

11.4.11 All other contaminant concentrations were recorded below the relevant WQS criteria.

11.5 Ground Gas Risk Assessment

11.5.1 The potential sources of ground gas include the historic landfill sites located near to the proposed highway.

11.5.2 Full details of the gas monitoring results can be located within the Socotec Factual Report (Ref. 2).

11.5.3 Three rounds of gas monitoring were carried out by SOCOTEC on the 26/06/2018, 05/07/2018 and 25/07/2018 within 6 installations including BH401, BH403, BH404, BH406, BH421 and BH422 and

11.5.4 recorded the following:

- Gas flow rate between -4.2 and 0.4l/hr;
- Carbon dioxide between non-detect and 9.4 %v/v (Maximum concentration recorded within BH404 during a single monitoring visit, installed within Glacial Till. The following visit recorded concentration of 0.4%v/v);
- Methane between non-detect and 0.7%v/v;
- Carbon Monoxide between non-detect and 19ppm; and
- Hydrogen Sulphide between non-detect and 1ppm.

11.5.5 Atmospheric pressure does influence ground gas flow. According to CIRIA C665 Assessing the risks posed by hazardous ground gases to buildings (Ref. 9) “at falling pressure increased emission rates occur as the gas increases in volume. Rising pressure causes air to flow into the ground, diluting soil gas concentrations. The rate of change in barometric pressure is also important. A swift drop over a small range has the potential to release a greater concentration of gas than a gradual drop over a greater pressure range”.

11.5.6 Atmospheric pressure data for the monitoring period was obtained from the Wunderground Historical Data Website (Ref. 10). The data was obtained from a monitoring station at Ashton Under Lyne, located approximately 5km northwest of the site.

11.5.7 A summary of the atmospheric pressure conditions for each monitoring round is as follows.

- 26/06/2018: High and steady atmospheric pressure (1026 – 1027 millibars (mb))
- 05/07/2018: Medium and rising atmospheric pressure (1014 – 1020 mb)
- 25/07/2018: Medium and rising atmospheric pressure (1018 – 1023 mb)

11.5.8 Thus the data set has been obtained during periods of atmospheric pressure unlikely to have supported "worst case" conditions.

11.5.9 CIRIA guidance (CIRIA C665) (Ref. 9) has been used to inform the ground gas assessment. This guidance which adopts the method proposed by Wilson and Card (Situation A) and NHBC (Situation B). For the proposed highway Situation A is considered appropriate.

11.5.10 For this approach, the ground gas concentration and borehole flow rate are used to calculate a Gas Screening Value.

11.5.11 A Gas Screening Value (GSV) is calculated using the following equation:

GSV (l/h) = borehole flow rate (l/h) x ground gas concentration (v/v %)

11.5.12 Using the maximum concentrations and flow rate the following GSVs have been calculated. The maximum GSV for the scheme is 0.0376l/h (BH404). Based on the values calculated, the Methane and Carbon Dioxide GSVs are considered to be Characteristic Situation 1 (CS1), very low risk.

11.5.13 Furthermore, no elevated concentrations of Methane were recorded at the site above the CS1 threshold of 1.0%v/v.

11.5.14 Elevated concentrations of Carbon Dioxide were recorded at the site above the CS1 threshold of 5%v/v within a single installation, BH404.

11.5.15 Therefore, within the area of BH404, the site may be classified as Characteristic Situation 2 "low risk" (Situation A). The remainder of the site may be classified as Characteristic Situation 1, where no protection measures would be required for new residential properties.

11.5.16 These results need to be considered in relation to a highway scheme, where no residential properties are being built.

11.5.17 Taking that into consideration, the results are indicative a low rather than "no" gas risk on site and it is understood that potential confined spaces will be either present or constructed along the route, which include:

- The Mottram Underpass
- Deep drainage manholes

11.5.18 The available data set is limited, whilst potential risk from ground gas is considered to be low, given the potential landfill sources and the proposed confined spaces a plausible acute risk to construction / maintenance workers needs to be considered.

Therefore basic gas protection measures may be required for confined spaces structures within affected areas.

11.5.19 The CO concentrations were recorded below the 30ppm Health and Safety Executive (HSE) Workplace Exposure Limits (WEL) for an 8 hour (long term) exposure period (Ref. 11).

11.5.20 Appropriate risk assessment or appropriate specialist advice should be obtained if access to below ground features and or potentially confined spaces is necessary.

11.6 Pollutant Linkages Discussion

11.6.1 Two concentrations above the appropriate SSVs for Lead and Dibenz(ah)anthracene were identified during the intrusive investigation. This appears not to be representative of site wide gross contamination, and “non-contaminated” areas do exist within the footprint of the site. Much of the underlying natural drift deposits is “non-contaminated”.

11.6.2 The driving exposure pathways for Lead and Dibenz(ah)anthracene comprise direct exposure pathways including soil ingestion/inhalation and dermal contact. Therefore, as the proposed highway comprises hard-standing or similar, no such potential pollution linkage would exist, and hence no specific remedial measures would be required. As the scheme is not residential no further remedial action is likely to be required, based upon the existing data set. The hardstanding incorporated into the scheme should be sufficient to sever the contamination pathway.

11.6.3 Also PAH’s are considered to be hydrophobic i.e. they do not readily dissolve in water but tend to sorb to organic matter in the soil. Their low mobility in groundwater therefore considerably reduces the risk to Controlled Water. Therefore, based on the collected soil samples analysed and assessment, it is unlikely that there is a significant risk to humans or controlled water from underlying shallow soils.

11.6.4 Mudstone of unusually acidic pH was identified in BH409 which is a potential irritant risk, however due to the depth that this was encountered, it is not considered to pose a risk to future site users.

11.6.5 Minor groundwater exceedances have been identified along the entire route within the Glacial Till and Bedrock Deposits It is unknown whether the overlying Made Ground or an offsite source of contamination is the cause of the elevated concentrations in the groundwater samples. The concentrations within the overlying Made Ground and Natural Deposits do not indicate a significant source of contamination, though leach tests were not undertaken. Elevated concentrations of metals, PAHs & TPH are minor and do not pose an unacceptable to either the scheme or controlled waters within influencing distance of the site.

11.6.6 The data for TPH, PAH and BTEX have been compared to the Arcadis Generic Assessment Criteria for vapour inhalation from groundwater. The risk of vapour inhalation from groundwater is considered to be unlikely.

11.6.7 As no elevated concentrations of TPH were recorded within shallow Made Ground soils It is not clear, as to where the minor exceedances observed have arisen from. Based on the limited distribution across the Site and the fact that concentrations were measured in the same order of magnitude as the GAC, the risk to the water resources posed by TPH is not considered to warrant further works. It is further noted that for TPH, the compliance criteria selected relates to taste and odour thresholds. Given this context and the absence of drinking water abstractions in the vicinity of the Site, the measured concentration is not considered to present a significant risk to the identified receptors.

11.6.8 It is further noted that for TPH, the compliance criteria selected relates to taste and odour thresholds. Given this context and the absence of drinking water abstractions in the vicinity of the Site, the measured concentration is not considered to present a significant risk to the identified receptors.

11.6.9 All other contaminant concentrations were recorded below the relevant WQS criteria.

11.6.10 Elevated concentrations of Carbon Dioxide above the CS1/CS2 threshold has been recorded within BH404 during one monitoring visit. Therefore, within the area of BH404, the site is classified as Characteristic Situation 2. The remainder of the site should be classified as Characteristic Situation 1, where no protection measures are required. The results from BH404 indicate a low gas risk, especially within confined spaces, where there may be an acute risk to construction / maintenance workers. Therefore, basic gas protection measures may be required for confined spaces structures within the affected area.

11.7 Health, Safety & Environment

11.7.1 Despite the findings of the testing of generally low risk conditions, there remains a potential for impacted soils (possible Fill Material) to be encountered, and consideration should be given to the level of PPE that should be provided to future site operatives.

11.7.2 All work on site should be conducted in accordance with appropriate Health and Safety guidance, with particular reference to HSG66 (HSE, 1991) (Ref.7) and the Construction Design and Management (CDM) Regulations 2015 (Ref. 8).

11.7.3 Care should be taken to minimise the risk of potentially contaminative incidents occurring during redevelopment. Good working practices should be adopted during construction works in order to minimise the risk of contamination occurring as a result of spillage or leakage of fuels, oils or chemicals stored or used at the site during re-development. All such materials should be sited on an impervious base within a bund and should be adequately secured. In particular, care should be taken to prevent fuel, oils or other mobile contamination sources from entering any surface water drains at the site. The site is located on a secondary aquifer and any spillages or leakages have the potential to impact a sensitive water resource.

11.7.4 Throughout any redevelopment works, due regard should be given to potential detrimental effects on the surroundings including noise, vibration, odour and dust.

11.8 Unexpected Contamination

11.8.1 This investigation is based on data gained from specific intrusive positions and does not account for any contamination which may be located between these positions. In this regard during any excavation or intrusive works a watching brief should be adopted. If visual or olfactory evidence of contamination is encountered, including the presence of suspected asbestos or asbestos containing materials, the specific works should be stopped until an assessment by a suitably qualified and experienced professional can be made.

11.8.2 The investigation works assessed in the above assessment were concentrated along the proposed new highway alignment. If improvement works are taking place beyond this, ground conditions are uncertain and therefore a watching brief protocol is vital to ensure previously unidentified contamination is dealt with appropriately during such works.

11.9 Waste and Material Re-Use – Preliminary Assessment

Waste Arisings

11.9.1 EU Directives, UK Government policy and regulations require that construction waste to landfill is minimised. Where possible (of benefit to the planned development) all excavation arisings as a result of any groundworks for the proposed development should be re-used on site as either engineering fill or landscaping fill. To comply with current legislation and regulations any re-use of excavated materials within the site could be undertaken via either of two routes – Environmental Permitting (formerly Waste Exemptions); or in accordance with the CL:AIRE Definition of Waste: Development Industry Code of Practice (Ref.12). Whichever route is chosen soils must be proved certain to be used and demonstrated to be “suitable for use” in the area to be deposited. A Materials Management Plan (or method statement) should be produced during the design phase for the scheme.

11.9.2 Should the excavated material not be required or be physically or chemically unsuitable for use as backfill or as other engineering fill within the site, the excess material would be waste and will need to be removed off site in a manner compliant with waste legislation. If only disposal to landfill was an option, further Waste Acceptance Criteria (WAC) testing and separation of waste for off-site disposal may be required to ensure appropriate classification. Natural excavated arisings may be classified as inert if segregated from Made Ground materials. Inert waste would be the least expensive for disposal and the material could be more easily reused.

11.9.3 Arisings should be stored in an appropriate manner to prevent leaching of contaminants from the material and with suspected inert, non-hazardous and hazardous material stored separately where appropriate to avoid cross contamination.

11.9.4 Under European Council Directive (91/689/EC), known as the Hazardous Waste Directive, a list of all wastes, hazardous or otherwise has been compiled known as the European Waste Catalogue (EWC, 1994, Commission Decision 94/3/EC). A revised EWC was released in 2002 under Commission Decision 2000/532/EC. This commission decision has been amended in turn by Commission Decisions 2001/118/EC, 2001/119/EC and 2001/573/EC. The EWC is a catalogue of all wastes, grouped according to generic industry, process or waste type. It differentiates between non-hazardous and hazardous.

Preliminary Waste Classification

11.9.5 The chemical testing results for 84 samples were screened using HazWasteOnline software to provide a preliminary indication of whether excavated materials would be likely classified as hazardous or non-hazardous waste, if they were to require off-site disposal.

11.9.6 The List of Wastes Code used in the assessment was 17.05.04; soils and stones other than those mentioned in 17.05.03 (for non-hazardous material), whilst the code for the hazardous material would be 17.05.03. The results of the assessment are presented in Section A.

11.9.7 The initial screen of the data indicated that nine samples would classify as potentially hazardous with regard to HP3 flammable due to the concentration of Total Petroleum Hydrocarbons (TPH) (48 to 110 mg/kg). However, this assessment has been revised to non-hazardous with regard to HP3 flammable, as TPH in soil is very unlikely to be flammable at concentrations below 1,000 mg/kg, and no evidence of liquid free-phase product, odour or staining was identified on the exploratory hole logs.

11.9.8 A further seven samples were identified as potentially hazardous with regard to HP2 Oxidising (waste which may, generally by providing oxygen cause or contribute to the combustion of other materials) due to the marginally elevated concentrations of Chromium VI (0.385mg/kg to 0.962mg/kg).

11.9.9 Therefore, the remaining 79 samples would classify as non-hazardous based on the determinands analysed. If these samples are shown to be representative of the material to be disposed of (via further testing and assessment), the material could be suitable for disposal as either non-hazardous waste or inert pending the results of WAC testing.

11.9.10 It should be noted that a waste management facility may require testing of the actual material that is to be disposed of off-site prior to acceptance, and that there is no obligation on a landfill operator to accept the waste.

11.9.11 Care should be taken not to mix soils suspected of being hazardous with inert soils, and contaminated soils should not be used elsewhere around the site as fill material. Any imported fill used for the works must be clean, fit for purpose and validated as necessary.

11.10 Geo-Environmental Conclusions/ Mitigation Measures

11.10.1 The following geo-environmental conclusions and recommendations have been made based on the information gathered within this assessment for the proposed highway.

11.10.2 Two minor exceedances for Lead and the PAH species Dibenz(ah)anthracene were recorded within the soils analysed for the assessment criteria for human health. There was no asbestos detected within the samples. Based on these results a significant risk to human health is not anticipated.

11.10.3 Minor groundwater exceedances have been identified It is unknown whether the overlying Made Ground or an offsite source of contamination is the cause of the elevated concentrations in the groundwater samples. The concentrations within the overlying Made Ground and Natural Deposits do not indicate a significant source of contamination and do not pose an unacceptable to either the scheme or controlled waters within influencing distance of the site.

11.10.4 Where materials are to be re-used onsite, consideration should be given to protection of surface waters from leachable heavy metals and further assessment may be required to verify that soils a suitable for reuse.

11.10.5 The limited available data available would indicate that the potential risk of ground gas is considered to be low. However, given the potential landfill sources and the proposed confined spaces there may be an acute risk to construction / maintenance workers within the area of BH404. Therefore, basic gas protection measures may be required for confined spaces structures within affected areas.

11.10.6 Based on initial soil analysis results, materials are likely to be chemically suitable for reuse on the scheme, subject to further detailed design taking into account the proposed use of the material. An MMP or environmental permit will be required.

11.10.7 The majority of excavated materials from the site, if in excess to re-use requirements, are likely to be classed as non-hazardous and may likely be suitable for classification as inert, subject to the results of WAC testing.

11.10.8 The following recommendations are provided with regards to the land quality and moving forward with the proposed development:

- Appropriate construction management practices should be adopted during construction works to intercept surface run off.
- Suitable PPE and health and safety procedures should be used on site during the development in order to adequately mitigate the potential risk of contamination to construction workers and site users.
- A watching brief should be undertaken during the works to identify the presence of any potential contamination not detected by the site investigation. If the presence of potential contamination is identified, works should be stopped in that area and the occurance should be assessed by a suitably qualified professional.
- Standard health and safety practices with respect to monitoring and verifying the absence of ground gas and vapour during the excavation works should be adopted in accordance with the recommendations HSE guidance. Excavations and confined spaces should be monitored for gas and depleted oxygen prior to man entry.
- Good material management practices should be used and material suspected of being hazardous should not be used elsewhere on site. Early liaison with a waste management facility is recommended. Imported fill should be fit for purpose and validated as necessary.

11.11 References

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10. https://www.wunderground.com/, Accessed September 2018.
11. Health and Safety Executive (HSE), EH40/2005 Workplace Exposure Limits, 2nd Edition, 2011.
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Section A – Hazwaste Online Data.

HazWasteOnline™

Waste Classification Report

CGQQX-YA9A4-PVZ2N

Job name

TPUP

Description/Comments

Project

Site

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

[redacted]

[redacted]

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	BH407	0.35	Non Hazardous		4
2	BH407[1]	0.8	Non Hazardous		6
3	BH407[2]	1.8	Non Hazardous		8
4	BH408	0.5	Non Hazardous		10
5	BH409	02-Jan	Non Hazardous		12
6	TP401	0.1	Non Hazardous		14
7	TP401[1]	4	Non Hazardous		16
8	TP402	0.1	Non Hazardous		18
9	TP402[1]	1.05	Non Hazardous		20
10	TP403	0.1	Non Hazardous		22
11	TP403[1]	1	Non Hazardous		24
12	TP404	0.05	Non Hazardous		26
13	TP405	0.1	Non Hazardous		28
14	TP405[1]	1	Non Hazardous		30
15	TP406	0.1	Non Hazardous		32
16	TP406[1]	1	Non Hazardous		34

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
17	TP402[2]	0.5	Non Hazardous		36
18	TP403[2]	0.5	Non Hazardous		37
19	TP404[1]	0.5	Non Hazardous		38
20	TP405[2]	0.5	Non Hazardous		39
21	TP406[2]	0.5	Non Hazardous		40
22	BH406	0.2	Non Hazardous		41
23	BH406[1]	1.2	Non Hazardous		43
24	BH406[2]	0.8	Non Hazardous		45
25	BH401	0.25	Non Hazardous		47
26	BH401[1]	0.6	Non Hazardous		49
27	TP407	0.1	Non Hazardous		51
28	TP408	0.1	Non Hazardous		53
29	TP408[1]	4	Non Hazardous		55
30	TP409	0.05	Non Hazardous		57
31	TP409[1]	2	Non Hazardous		59
32	TP410	0.05	Non Hazardous		60
33	TP410[1]	1.1	Non Hazardous		62
34	TP407[1]	0.5	Non Hazardous		64
35	TP407[2]	1	Non Hazardous		65
36	TP409[2]	1	Non Hazardous		66
37	BH404	0.1	Non Hazardous		67
38	BH404[1]	0.8	Non Hazardous		69
39	BH402	0.15	Non Hazardous		71
40	BH402[1]	0.6	Non Hazardous		73
41	BH402[2]	1.2	Non Hazardous		74
42	BH403	0.15	Non Hazardous		76
43	BH403[1]	1.2	Non Hazardous		78
44	BH411	0.3	Non Hazardous		80
45	BH411[1]	1	Non Hazardous		82
46	BH418	0.15	Non Hazardous		85
47	BH418[1]	1.2	Non Hazardous		87
48	TP411	0.15	Non Hazardous		90
49	TP411[1]	1.2	Non Hazardous		93
50	TP412	0.5	Potentially Hazardous	HP 2	95
51	TP413	0.5	Potentially Hazardous	HP 2	97
52	TP415	1	Non Hazardous		99
53	TP430	0.15	Non Hazardous		101
54	TP430[1]	0.5	Non Hazardous		104
55	TP431	0.1	Non Hazardous		106
56	TP431[1]	0.5	Non Hazardous		108
57	TP431[2]	1	Non Hazardous		111
58	TP432	0.5	Non Hazardous		113
59	BH421	0.15	Non Hazardous		116
60	BH421[1]	0.6	Non Hazardous		118
61	BH417	0.2	Non Hazardous		120
62	BH417[1]	0.5	Potentially Hazardous	HP 2	122
63	BH417[2]	1	Potentially Hazardous	HP 2	124
64	BH416	0.5	Non Hazardous		126
65	BH434	0.2	Non Hazardous		128
66	BH434[1]	1	Potentially Hazardous	HP 2	131
67	BH435	0.2	Non Hazardous		133
68	BH435[1]	0.5	Non Hazardous		135
69	TP422	0.1	Non Hazardous		137
70	TP422[1]	0.5	Non Hazardous		139
71	TP423	0.1	Non Hazardous		141
72	BH428	0.5	Potentially Hazardous	HP 2	143
73	BH428[1]	0.2	Non Hazardous		145
74	BH429	0.1	Non Hazardous		147
75	BH429[1]	1	Non Hazardous		149

Classification of sample: BH407

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH407		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.35 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
24.9% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 24.9% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		10.6	mg/kg	1.32	13.995	mg/kg	0.0014 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.2	mg/kg	3.22	3.864	mg/kg	0.000386 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.3	mg/kg	1.142	0.343	mg/kg	0.0000343 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		10.1	mg/kg	1.462	14.762	mg/kg	0.00148 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		28.1	mg/kg	1.126	31.637	mg/kg	0.00316 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	77.9	mg/kg	1.56	121.51	mg/kg	0.00779 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		10.6	mg/kg	2.976	31.548	mg/kg	0.00315 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11		zinc { zinc chromate } 024-007-00-3		49	mg/kg	2.774	135.933	mg/kg	0.0136 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.8	pH		7.8	pH	7.8 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene	201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene	201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene	201-581-5	85-01-8		0.4	mg/kg		0.4	mg/kg	0.00004 %		
19	●	anthracene	204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene	205-912-4	206-44-0		0.88	mg/kg		0.88	mg/kg	0.000088 %		
21	●	pyrene	204-927-3	129-00-0		0.83	mg/kg		0.83	mg/kg	0.000083 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.45	mg/kg		0.45	mg/kg	0.000045 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.45	mg/kg		0.45	mg/kg	0.000045 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.21	mg/kg		0.21	mg/kg	0.000021 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.45	mg/kg		0.45	mg/kg	0.000045 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.39	mg/kg		0.39	mg/kg	0.000039 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.27	mg/kg		0.27	mg/kg	0.000027 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0321 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH407[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH407[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.8 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
27.7% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 27.7% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		26.7	mg/kg	1.32	35.253	mg/kg	0.00353 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.47	mg/kg	1.142	0.537	mg/kg	0.0000537 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		13	mg/kg	1.462	19	mg/kg	0.0019 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		53.8	mg/kg	1.126	60.573	mg/kg	0.00606 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	358	mg/kg	1.56	558.414	mg/kg	0.0358 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.57	mg/kg	1.353	0.771	mg/kg	0.0000771 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		16.3	mg/kg	2.976	48.513	mg/kg	0.00485 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11	zinc { zinc chromate } 024-007-00-3		106.3	mg/kg	2.774	294.892	mg/kg	0.0295 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH 		PH		7.7	pH		7.7	pH	7.7 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene 	205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene 	201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene 	201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene 	201-581-5	85-01-8		0.82	mg/kg		0.82	mg/kg	0.000082 %		
19	●	anthracene 	204-371-1	120-12-7		0.19	mg/kg		0.19	mg/kg	0.000019 %		
20	●	fluoranthene 	205-912-4	206-44-0		1.36	mg/kg		1.36	mg/kg	0.000136 %		
21	●	pyrene 	204-927-3	129-00-0		1.19	mg/kg		1.19	mg/kg	0.000119 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.66	mg/kg		0.66	mg/kg	0.000066 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.66	mg/kg		0.66	mg/kg	0.000066 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.89	mg/kg		0.89	mg/kg	0.000089 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.3	mg/kg		0.3	mg/kg	0.00003 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.64	mg/kg		0.64	mg/kg	0.000064 %		
27	●	indeno[123-cd]pyrene 	205-893-2	193-39-5		0.51	mg/kg		0.51	mg/kg	0.000051 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
29	●	benzo[ghi]perylene 	205-883-8	191-24-2		0.37	mg/kg		0.37	mg/kg	0.000037 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0833 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH407[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH407[2]
Sample Depth:
1.8 m
Moisture content:
26.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 26.3% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		7.1	mg/kg	1.32	9.374	mg/kg	0.000937 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.6	mg/kg	3.22	5.152	mg/kg	0.000515 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.22	mg/kg	1.142	0.251	mg/kg	0.0000251 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		17	mg/kg	1.462	24.846	mg/kg	0.00248 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		18.3	mg/kg	1.126	20.604	mg/kg	0.00206 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	31.5	mg/kg	1.56	49.134	mg/kg	0.00315 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.55	mg/kg	1.353	0.744	mg/kg	0.0000744 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		11.8	mg/kg	2.976	35.12	mg/kg	0.00351 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11		zinc { zinc chromate } 024-007-00-3		42.8	mg/kg	2.774	118.733	mg/kg	0.0119 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.6	pH		7.6	pH	7.6 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0252 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH408

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH408		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
23.5% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 23.5% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.2	mg/kg	1.32	12.147	mg/kg	0.00121 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.26	mg/kg	1.142	0.297	mg/kg	0.0000297 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		16.3	mg/kg	1.462	23.823	mg/kg	0.00238 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		21.3	mg/kg	1.126	23.981	mg/kg	0.0024 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	59.3	mg/kg	1.56	92.497	mg/kg	0.00593 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		11.8	mg/kg	2.976	35.12	mg/kg	0.00351 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				59	mg/kg	2.774	163.675	mg/kg	0.0164 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH				8	pH		8	pH	8pH		
				PH									
14		naphthalene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-052-00-2	202-049-5	91-20-3									
15	●	acenaphthylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-917-1	208-96-8									
16	●	acenaphthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-469-6	83-32-9									
17	●	fluorene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-695-5	86-73-7									
18	●	phenanthrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-581-5	85-01-8									
19	●	anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-371-1	120-12-7									
20	●	fluoranthene				0.24	mg/kg		0.24	mg/kg	0.000024 %		
			205-912-4	206-44-0									
21	●	pyrene				0.23	mg/kg		0.23	mg/kg	0.000023 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
		601-032-00-3	200-028-5	50-32-8									
27	●	indeno[123-cd]pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-041-00-2	200-181-8	53-70-3									
29	●	benzo[ghi]perylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-883-8	191-24-2									
30		phenol				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0328 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH409

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH409
Sample Depth:
02-Jan m
Moisture content:
23.7%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23.7% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9 mg/kg	1.32	11.883 mg/kg	0.00119 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.8 mg/kg	3.22	2.576 mg/kg	0.000258 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.24 mg/kg	1.142	0.274 mg/kg	0.0000274 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		14.4 mg/kg	1.462	21.046 mg/kg	0.0021 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		23.2 mg/kg	1.126	26.121 mg/kg	0.00261 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	119.6 mg/kg	1.56	186.554 mg/kg	0.012 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		13.3 mg/kg	2.976	39.584 mg/kg	0.00396 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5 mg/kg	2.554	1.277 mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				54.8 mg/kg	2.774	152.023 mg/kg	0.0152 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7 mg/kg	1.884	1.319 mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.7	pH		7.7	pH	7.7 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.84	mg/kg		0.84	mg/kg	0.000084 %		
19	●	anthracene	204-371-1	120-12-7		0.41	mg/kg		0.41	mg/kg	0.000041 %		
20	●	fluoranthene	205-912-4	206-44-0		2.4	mg/kg		2.4	mg/kg	0.00024 %		
21	●	pyrene	204-927-3	129-00-0		2.11	mg/kg		2.11	mg/kg	0.000211 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.96	mg/kg		0.96	mg/kg	0.000096 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.96	mg/kg		0.96	mg/kg	0.000096 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		1.17	mg/kg		1.17	mg/kg	0.000117 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.5	mg/kg		0.5	mg/kg	0.00005 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.9	mg/kg		0.9	mg/kg	0.00009 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.6	mg/kg		0.6	mg/kg	0.00006 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.14	mg/kg		0.14	mg/kg	0.000014 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.5	mg/kg		0.5	mg/kg	0.00005 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0389 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP401

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP401		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
22.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 22.2% No Moisture Correction applied (MC)

#		Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		10.4	mg/kg	1.32	13.731	mg/kg	0.00137 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.28	mg/kg	1.142	0.32	mg/kg	0.000032 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		18.6	mg/kg	1.462	27.185	mg/kg	0.00272 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		21.5	mg/kg	1.126	24.207	mg/kg	0.00242 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	40.9	mg/kg	1.56	63.796	mg/kg	0.00409 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		13.9	mg/kg	2.976	41.37	mg/kg	0.00414 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11		zinc { zinc chromate } 024-007-00-3		57.2	mg/kg	2.774	158.681	mg/kg	0.0159 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH		PH		7.8	pH		7.8	pH	7.8 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.15	mg/kg		0.15	mg/kg	0.000015 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.31	mg/kg		0.31	mg/kg	0.000031 %		
21	●	pyrene	204-927-3	129-00-0		0.28	mg/kg		0.28	mg/kg	0.000028 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.18	mg/kg		0.18	mg/kg	0.000018 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.18	mg/kg		0.18	mg/kg	0.000018 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.24	mg/kg		0.24	mg/kg	0.000024 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.17	mg/kg		0.17	mg/kg	0.000017 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.14	mg/kg		0.14	mg/kg	0.000014 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.13	mg/kg		0.13	mg/kg	0.000013 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0316 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP401[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP401[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
4 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
17.8% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 17.8% No Moisture Correction applied (MC)

#	Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		2.3	mg/kg	1.32	3.037	mg/kg	0.000304 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.21	mg/kg	1.142	0.24	mg/kg	0.000024 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		7.9	mg/kg	1.462	11.546	mg/kg	0.00115 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		8.7	mg/kg	1.126	9.795	mg/kg	0.00098 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	10.1	mg/kg	1.56	15.754	mg/kg	0.00101 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		5.5	mg/kg	2.976	16.369	mg/kg	0.00164 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		19.6	mg/kg	2.774	54.373	mg/kg	0.00544 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.4	pH		7.4	pH	7.4 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0113 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP402

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP402
Sample Depth:
0.1 m
Moisture content:
38.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 38.3% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		arsenic { arsenic trioxide }				14.5	mg/kg	1.32	19.145	mg/kg	0.00191 %		
		033-003-00-0	215-481-4	1327-53-3									
2		boron { diboron trioxide; boric oxide }				1.6	mg/kg	3.22	5.152	mg/kg	0.000515 %		
		005-008-00-8	215-125-8	1303-86-2									
3		cadmium { cadmium oxide }				0.61	mg/kg	1.142	0.697	mg/kg	0.0000697 %		
		048-002-00-0	215-146-2	1306-19-0									
4		chromium in chromium(III) compounds { chromium(III) oxide }				48.1	mg/kg	1.462	70.301	mg/kg	0.00703 %		
			215-160-9	1308-38-9									
5		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
6		copper { dicopper oxide; copper (I) oxide }				37.4	mg/kg	1.126	42.108	mg/kg	0.00421 %		
		029-002-00-X	215-270-7	1317-39-1									
7		lead { lead chromate }			1	86.6	mg/kg	1.56	135.08	mg/kg	0.00866 %		
		082-004-00-2	231-846-0	7758-97-6									
8		mercury { mercury dichloride }				0.8	mg/kg	1.353	1.083	mg/kg	0.000108 %		
		080-010-00-X	231-299-8	7487-94-7									
9		nickel { nickel chromate }				17.4	mg/kg	2.976	51.787	mg/kg	0.00518 %		
		028-035-00-7	238-766-5	14721-18-7									
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
		034-002-00-8											
11		zinc { zinc chromate }				127.9	mg/kg	2.774	354.813	mg/kg	0.0355 %		
		024-007-00-3											
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		
		006-007-00-5											

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.6 pH		7.6 pH	7.6 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.13 mg/kg		0.13 mg/kg	0.000013 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.13 mg/kg		0.13 mg/kg	0.000013 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.13 mg/kg		0.13 mg/kg	0.000013 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.13 mg/kg		0.13 mg/kg	0.000013 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.21 mg/kg		0.21 mg/kg	0.000021 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.13 mg/kg		0.13 mg/kg	0.000013 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.47 mg/kg		0.47 mg/kg	0.000047 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.42 mg/kg		0.42 mg/kg	0.000042 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.26 mg/kg		0.26 mg/kg	0.000026 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.26 mg/kg		0.26 mg/kg	0.000026 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.39 mg/kg		0.39 mg/kg	0.000039 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.13 mg/kg		0.13 mg/kg	0.000013 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.26 mg/kg		0.26 mg/kg	0.000026 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.23 mg/kg		0.23 mg/kg	0.000023 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.13 mg/kg		0.13 mg/kg	0.000013 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.21 mg/kg		0.21 mg/kg	0.000021 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.8 mg/kg		0.8 mg/kg	0.00008 %		
						Total:	0.064 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP402[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP402[1]
Sample Depth:
1.05 m
Moisture content:
10.8%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 10.8% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.2	mg/kg	1.32	9.506	mg/kg	0.000951 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22	mg/kg	1.462	32.154	mg/kg	0.00322 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20.2	mg/kg	1.126	22.743	mg/kg	0.00227 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	10.7	mg/kg	1.56	16.69	mg/kg	0.00107 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		26.2	mg/kg	2.976	77.978	mg/kg	0.0078 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				49.6	mg/kg	2.774	137.598	mg/kg	0.0138 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand CLP index number	 EC Number	 CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH 	 	 PH		8.5	pH		8.5	pH	8.5 pH		
14		naphthalene 601-052-00-2	 202-049-5	 91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene 	 205-917-1	 208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene 	 201-469-6	 83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene 	 201-695-5	 86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene 	 201-581-5	 85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene 	 204-371-1	 120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene 	 205-912-4	 206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene 	 204-927-3	 129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene 601-033-00-9	 200-280-6	 56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene 601-048-00-0	 205-923-4	 218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene 601-034-00-4	 205-911-9	 205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene 601-036-00-5	 205-916-6	 207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	 200-028-5	 50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene 	 205-893-2	 193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene 601-041-00-2	 200-181-8	 53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene 	 205-883-8	 191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol 604-001-00-2	 203-632-7	 108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0298 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP403

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP403		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
25.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 25.2% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		22.4	mg/kg	1.32	29.575	mg/kg	0.00296 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.37	mg/kg	1.142	0.423	mg/kg	0.0000423 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		35.3	mg/kg	1.462	51.593	mg/kg	0.00516 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		45.2	mg/kg	1.126	50.89	mg/kg	0.00509 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	116	mg/kg	1.56	180.939	mg/kg	0.0116 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.67	mg/kg	1.353	0.907	mg/kg	0.0000907 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		17.9	mg/kg	2.976	53.275	mg/kg	0.00533 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11	zinc { zinc chromate } 024-007-00-3		79.2	mg/kg	2.774	219.712	mg/kg	0.022 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.9	pH		7.9	pH	7.9 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0532 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP403[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP403[1]
Sample Depth:
1 m
Moisture content:
14.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.6% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		3.7 mg/kg	1.32	4.885 mg/kg	0.000489 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.6 mg/kg	3.22	1.932 mg/kg	0.000193 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.25 mg/kg	1.142	0.286 mg/kg	0.0000286 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		22 mg/kg	1.462	32.154 mg/kg	0.00322 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		17.3 mg/kg	1.126	19.478 mg/kg	0.00195 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	11.9 mg/kg	1.56	18.562 mg/kg	0.00119 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		24.9 mg/kg	2.976	74.109 mg/kg	0.00741 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5 mg/kg	2.554	1.277 mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		48 mg/kg	2.774	133.159 mg/kg	0.0133 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.7	pH		7.7	pH	7.7 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene		201-469-6	83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene		201-695-5	86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene		201-581-5	85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene		204-371-1	120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene		205-912-4	206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene		204-927-3	129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0283 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP404

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP404
Sample Depth:
0.05 m
Moisture content:
39.7%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 39.7% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		9	mg/kg	1.32	11.883	mg/kg	0.00119 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.9	mg/kg	3.22	6.118	mg/kg	0.000612 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.42	mg/kg	1.142	0.48	mg/kg	0.000048 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		49.6	mg/kg	1.462	72.493	mg/kg	0.00725 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		31.5	mg/kg	1.126	35.465	mg/kg	0.00355 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	53.6	mg/kg	1.56	83.606	mg/kg	0.00536 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.62	mg/kg	1.353	0.839	mg/kg	0.0000839 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		12.4	mg/kg	2.976	36.906	mg/kg	0.00369 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate } 024-007-00-3		95.9	mg/kg	2.774	266.041	mg/kg	0.0266 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.6	pH		7.6	pH	7.6 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
16	●	acenaphthene	201-469-6	83-32-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
17	●	fluorene	201-695-5	86-73-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
18	●	phenanthrene	201-581-5	85-01-8		0.22	mg/kg		0.22	mg/kg	0.000022 %		
19	●	anthracene	204-371-1	120-12-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
20	●	fluoranthene	205-912-4	206-44-0		0.45	mg/kg		0.45	mg/kg	0.000045 %		
21	●	pyrene	204-927-3	129-00-0		0.41	mg/kg		0.41	mg/kg	0.000041 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.25	mg/kg		0.25	mg/kg	0.000025 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.25	mg/kg		0.25	mg/kg	0.000025 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.33	mg/kg		0.33	mg/kg	0.000033 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.25	mg/kg		0.25	mg/kg	0.000025 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.2	mg/kg		0.2	mg/kg	0.00002 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.2	mg/kg		0.2	mg/kg	0.00002 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
										Total:	0.0491 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP405

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP405
Sample Depth:
0.1 m
Moisture content:
27.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 27.9% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		17	mg/kg	1.32	22.446	mg/kg	0.00224 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.3	mg/kg	1.142	0.343	mg/kg	0.0000343 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22.4	mg/kg	1.462	32.739	mg/kg	0.00327 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		29.3	mg/kg	1.126	32.989	mg/kg	0.0033 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	80.8	mg/kg	1.56	126.033	mg/kg	0.00808 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.57	mg/kg	1.353	0.771	mg/kg	0.0000771 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		13.5	mg/kg	2.976	40.18	mg/kg	0.00402 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11	zinc { zinc chromate }	024-007-00-3				69.6	mg/kg	2.774	193.081	mg/kg	0.0193 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.4	pH		7.4	pH	7.4 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene		201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene		201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene		201-581-5	85-01-8		0.14	mg/kg		0.14	mg/kg	0.000014 %		
19	●	anthracene		204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene		205-912-4	206-44-0		0.29	mg/kg		0.29	mg/kg	0.000029 %		
21	●	pyrene		204-927-3	129-00-0		0.28	mg/kg		0.28	mg/kg	0.000028 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.17	mg/kg		0.17	mg/kg	0.000017 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.17	mg/kg		0.17	mg/kg	0.000017 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.24	mg/kg		0.24	mg/kg	0.000024 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.15	mg/kg		0.15	mg/kg	0.000015 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.14	mg/kg		0.14	mg/kg	0.000014 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
											Total:	0.0412 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP405[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP405[1]
Sample Depth:
1 m
Moisture content:
15.1%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15.1% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6 mg/kg	1.32	7.922 mg/kg	0.000792 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.7 mg/kg	3.22	2.254 mg/kg	0.000225 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.228 mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		21.5 mg/kg	1.462	31.423 mg/kg	0.00314 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		18.9 mg/kg	1.126	21.279 mg/kg	0.00213 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	10.8 mg/kg	1.56	16.846 mg/kg	0.00108 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		24 mg/kg	2.976	71.43 mg/kg	0.00714 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5 mg/kg	2.554	1.277 mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				49 mg/kg	2.774	135.933 mg/kg	0.0136 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		8.8	pH		8.8	pH	8.8 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene		201-469-6	83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene		201-695-5	86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene		201-581-5	85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene		204-371-1	120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene		205-912-4	206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene		204-927-3	129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0287 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP406

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP406
Sample Depth:
0.1 m
Moisture content:
26.8%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 26.8% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		18.2	mg/kg	1.32	24.03	mg/kg	0.0024 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1	mg/kg	3.22	3.22	mg/kg	0.000322 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.4	mg/kg	1.142	0.457	mg/kg	0.0000457 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		52.5	mg/kg	1.462	76.732	mg/kg	0.00767 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		34.4	mg/kg	1.126	38.731	mg/kg	0.00387 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	88.3	mg/kg	1.56	137.732	mg/kg	0.00883 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.55	mg/kg	1.353	0.744	mg/kg	0.0000744 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		17.5	mg/kg	2.976	52.085	mg/kg	0.00521 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11		zinc { zinc chromate } 024-007-00-3		70.4	mg/kg	2.774	195.3	mg/kg	0.0195 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.2	pH		7.2	pH	7.2 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene		201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene		201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene		201-581-5	85-01-8		0.36	mg/kg		0.36	mg/kg	0.000036 %		
19	●	anthracene		204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene		205-912-4	206-44-0		0.63	mg/kg		0.63	mg/kg	0.000063 %		
21	●	pyrene		204-927-3	129-00-0		0.59	mg/kg		0.59	mg/kg	0.000059 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.33	mg/kg		0.33	mg/kg	0.000033 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.33	mg/kg		0.33	mg/kg	0.000033 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.44	mg/kg		0.44	mg/kg	0.000044 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.15	mg/kg		0.15	mg/kg	0.000015 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.31	mg/kg		0.31	mg/kg	0.000031 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.23	mg/kg		0.23	mg/kg	0.000023 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.22	mg/kg		0.22	mg/kg	0.000022 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
											Total:	0.0488 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP406[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP406[1]
Sample Depth:
1 m
Moisture content:
21.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21.3% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		10	mg/kg	1.32	13.203	mg/kg	0.00132 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		1.3	mg/kg	3.22	4.186	mg/kg	0.000419 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.21	mg/kg	1.142	0.24	mg/kg	0.000024 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		26.3	mg/kg	1.462	38.439	mg/kg	0.00384 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		15.7	mg/kg	1.126	17.676	mg/kg	0.00177 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	15.4	mg/kg	1.56	24.021	mg/kg	0.00154 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		22	mg/kg	2.976	65.478	mg/kg	0.00655 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				35.4	mg/kg	2.774	98.205	mg/kg	0.00982 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7	pH		7	pH	7pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0258 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP402[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP402[2]
Sample Depth:
0.5 m
Moisture content:
14.7%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.7% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key
User supplied data

Classification of sample: TP403[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP403[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
14.5% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 14.5% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

User supplied data

Classification of sample: TP404[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP404[1]
Sample Depth:
0.5 m
Moisture content:
18.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 18.6% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key
User supplied data

Classification of sample: TP405[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP405[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
14.8% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 14.8% No Moisture Correction applied (MC)

#		Determinand CLP index number | EC Number | CAS Number	CLP Note	**User entered data**	Conv. Factor	Compound conc.	**Classification value**	MC Applied	Conc. Not Used
						Total:	0%		

Key

User supplied data

Classification of sample: TP406[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP406[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
17.6% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 17.6% No Moisture Correction applied (MC)

#		Determinand			CLP Note	**User entered data**	Conv. Factor	Compound conc.	**Classification value**	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

User supplied data

Classification of sample: BH406

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH406		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
32.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 32.2% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		4.2	mg/kg	1.32	5.545	mg/kg	0.000555 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.25	mg/kg	1.142	0.286	mg/kg	0.0000286 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		19.4	mg/kg	1.462	28.354	mg/kg	0.00284 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		18.9	mg/kg	1.126	21.279	mg/kg	0.00213 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	35.9	mg/kg	1.56	55.997	mg/kg	0.00359 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		11.2	mg/kg	2.976	33.334	mg/kg	0.00333 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate } 024-007-00-3				77.8	mg/kg	2.774	215.829	mg/kg	0.0216 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.6	pH		6.6	pH	6.6 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
16	●	acenaphthene	201-469-6	83-32-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
17	●	fluorene	201-695-5	86-73-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
18	●	phenanthrene	201-581-5	85-01-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
19	●	anthracene	204-371-1	120-12-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
20	●	fluoranthene	205-912-4	206-44-0		0.12	mg/kg		0.12	mg/kg	0.000012 %		
21	●	pyrene	204-927-3	129-00-0		0.12	mg/kg		0.12	mg/kg	0.000012 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.12	mg/kg		0.12	mg/kg	0.000012 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0349 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH406[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	**BH406[1]**	LoW Code:	
Sample Depth:	**1.2 m**	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	**15.7%** (no correction)	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15.7% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		2.2	mg/kg	1.32	2.905	mg/kg	0.00029 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		21	mg/kg	1.462	30.693	mg/kg	0.00307 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		22	mg/kg	1.126	24.77	mg/kg	0.00248 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	13.8	mg/kg	1.56	21.525	mg/kg	0.00138 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		16.3	mg/kg	2.976	48.513	mg/kg	0.00485 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				42.7	mg/kg	2.774	118.456	mg/kg	0.0118 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		6.6 pH		6.6 pH	6.6 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
16	●	acenaphthene		201-469-6	83-32-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
17	●	fluorene		201-695-5	86-73-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
18	●	phenanthrene		201-581-5	85-01-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
19	●	anthracene		204-371-1	120-12-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
20	●	fluoranthene		205-912-4	206-44-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
21	●	pyrene		204-927-3	129-00-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09 mg/kg		0.09 mg/kg	0.000009 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6 mg/kg		0.6 mg/kg	0.00006 %		
									Total:	0.0246 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH406[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH406[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.8 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
15.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 15.2% No Moisture Correction applied (MC)

#		Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	●	TPH (C6 to C40) petroleum group		TPH		48	mg/kg		48	mg/kg	0.0048 %		
2		benzene 601-020-00-8	200-753-7	71-43-2		0.012	mg/kg		0.012	mg/kg	0.0000012 %		
3		toluene 601-021-00-3	203-625-9	108-88-3		0.012	mg/kg		0.012	mg/kg	0.0000012 %		
4	●	ethylbenzene 601-023-00-4	202-849-4	100-41-4		0.012	mg/kg		0.012	mg/kg	0.0000012 %		
5		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		0.012	mg/kg		0.012	mg/kg	0.0000012 %		
										Total:	0.0048 %		

Key

(yellow)	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 2; H225 "Highly flammable liquid and vapour."

Because of determinands:

benzene: (conc.: 1.2e-06%)
toluene: (conc.: 1.2e-06%)
ethylbenzene: (conc.: 1.2e-06%)

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.0048%)
xylene: (conc.: 1.2e-06%)

Classification of sample: BH401

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH401		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.25 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
20.6% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 20.6% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		11 mg/kg	1.32	14.524 mg/kg	0.00145 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.7 mg/kg	3.22	2.254 mg/kg	0.000225 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.22 mg/kg	1.142	0.251 mg/kg	0.0000251 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		17.5 mg/kg	1.462	25.577 mg/kg	0.00256 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		17 mg/kg	1.126	19.14 mg/kg	0.00191 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	32.7 mg/kg	1.56	51.006 mg/kg	0.00327 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		13.4 mg/kg	2.976	39.882 mg/kg	0.00399 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5 mg/kg	2.554	1.277 mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		56.6 mg/kg	2.774	157.017 mg/kg	0.0157 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	•	pH				8.2	pH		8.2	pH	8.2 pH		
				PH									
14		naphthalene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-052-00-2	202-049-5	91-20-3									
15	•	acenaphthylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-917-1	208-96-8									
16	•	acenaphthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-469-6	83-32-9									
17	•	fluorene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-695-5	86-73-7									
18	•	phenanthrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-581-5	85-01-8									
19	•	anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-371-1	120-12-7									
20	•	fluoranthene				0.24	mg/kg		0.24	mg/kg	0.000024 %		
			205-912-4	206-44-0									
21	•	pyrene				0.21	mg/kg		0.21	mg/kg	0.000021 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		601-032-00-3	200-028-5	50-32-8									
27	•	indeno[123-cd]pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-041-00-2	200-181-8	53-70-3									
29	•	benzo[ghi]perylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-883-8	191-24-2									
30		phenol				0.6	mg/kg		0.6	mg/kg	0.00006 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0297 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH401[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH401[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.6 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
21.6% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 21.6% No Moisture Correction applied (MC)

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	●	TPH (C6 to C40) petroleum group		TPH		51	mg/kg		51	mg/kg	0.0051 %		
2		benzene 601-020-00-8	200-753-7	71-43-2		0.013	mg/kg		0.013	mg/kg	0.0000013 %		
3		toluene 601-021-00-3	203-625-9	108-88-3		0.013	mg/kg		0.013	mg/kg	0.0000013 %		
4	●	ethylbenzene 601-023-00-4	202-849-4	100-41-4		0.013	mg/kg		0.013	mg/kg	0.0000013 %		
5		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		0.013	mg/kg		0.013	mg/kg	0.0000013 %		
										Total:	0.00511 %		

Key

User supplied data

● Determinand defined or amended by HazWasteOnline (see Appendix A)

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 2; H225 "Highly flammable liquid and vapour."

Because of determinands:

benzene: (conc.: 1.3e-06%)
toluene: (conc.: 1.3e-06%)
ethylbenzene: (conc.: 1.3e-06%)

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.0051%)
xylene: (conc.: 1.3e-06%)

Classification of sample: TP407

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP407		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
30.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 30.1% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		23.8	mg/kg	1.32	31.424	mg/kg	0.00314 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.1	mg/kg	3.22	3.542	mg/kg	0.000354 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5	mg/kg	1.142	0.571	mg/kg	0.0000571 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		20.2	mg/kg	1.462	29.523	mg/kg	0.00295 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		34.5	mg/kg	1.126	38.843	mg/kg	0.00388 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	104	mg/kg	1.56	162.221	mg/kg	0.0104 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.52	mg/kg	1.353	0.704	mg/kg	0.0000704 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		14.7	mg/kg	2.976	43.751	mg/kg	0.00438 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.1	mg/kg	2.554	2.809	mg/kg	0.000281 %		
11	zinc { zinc chromate }	024-007-00-3				88.4	mg/kg	2.774	245.235	mg/kg	0.0245 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.6	pH		7.6	pH	7.6 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.2	mg/kg		0.2	mg/kg	0.00002 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.5	mg/kg		0.5	mg/kg	0.00005 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.44	mg/kg		0.44	mg/kg	0.000044 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.26	mg/kg		0.26	mg/kg	0.000026 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.26	mg/kg		0.26	mg/kg	0.000026 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.39	mg/kg		0.39	mg/kg	0.000039 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.14	mg/kg		0.14	mg/kg	0.000014 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.27	mg/kg		0.27	mg/kg	0.000027 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.21	mg/kg		0.21	mg/kg	0.000021 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.2	mg/kg		0.2	mg/kg	0.00002 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0506 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP408

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP408		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
36.4% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 36.4% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11.3	mg/kg	1.32	14.92	mg/kg	0.00149 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.31	mg/kg	1.142	0.354	mg/kg	0.0000354 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		43.9	mg/kg	1.462	64.162	mg/kg	0.00642 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		26.7	mg/kg	1.126	30.061	mg/kg	0.00301 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	58.7	mg/kg	1.56	91.561	mg/kg	0.00587 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		14.4	mg/kg	2.976	42.858	mg/kg	0.00429 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				82.4	mg/kg	2.774	228.59	mg/kg	0.0229 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	•	pH			PH		7	pH		7	pH	7pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
15	•	acenaphthylene		205-917-1	208-96-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
16	•	acenaphthene		201-469-6	83-32-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
17	•	fluorene		201-695-5	86-73-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
18	•	phenanthrene		201-581-5	85-01-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
19	•	anthracene		204-371-1	120-12-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
20	•	fluoranthene		205-912-4	206-44-0		0.19	mg/kg		0.19	mg/kg	0.000019 %		
21	•	pyrene		204-927-3	129-00-0		0.17	mg/kg		0.17	mg/kg	0.000017 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.14	mg/kg		0.14	mg/kg	0.000014 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.14	mg/kg		0.14	mg/kg	0.000014 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.14	mg/kg		0.14	mg/kg	0.000014 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
27	•	indeno[123-cd]pyrene		205-893-2	193-39-5		0.13	mg/kg		0.13	mg/kg	0.000013 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
29	•	benzo[ghi]perylene		205-883-8	191-24-2		0.13	mg/kg		0.13	mg/kg	0.000013 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
											Total:	0.0449 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP408[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP408[1]
Sample Depth:
4 m
Moisture content:
17.5%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 17.5% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		3.5	mg/kg	1.32	4.621	mg/kg	0.000462 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		19	mg/kg	1.462	27.77	mg/kg	0.00278 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		11.1	mg/kg	1.126	12.497	mg/kg	0.00125 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	13	mg/kg	1.56	20.278	mg/kg	0.0013 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		14.1	mg/kg	2.976	41.965	mg/kg	0.0042 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		29.6	mg/kg	2.774	82.115	mg/kg	0.00821 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7	pH		7	pH	7pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene		201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene		201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene		201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene		204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene		205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene		204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0189 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP409

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP409		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.05 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
38.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 38.1% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		7.3	mg/kg	1.32	9.638	mg/kg	0.000964 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.3	mg/kg	1.142	0.343	mg/kg	0.0000343 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		65.7	mg/kg	1.462	96.024	mg/kg	0.0096 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		34.9	mg/kg	1.126	39.294	mg/kg	0.00393 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	38	mg/kg	1.56	59.273	mg/kg	0.0038 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		14.7	mg/kg	2.976	43.751	mg/kg	0.00438 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate } 024-007-00-3				79.3	mg/kg	2.774	219.99	mg/kg	0.022 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.7	pH		7.7	pH	7.7 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
16	●	acenaphthene	201-469-6	83-32-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
17	●	fluorene	201-695-5	86-73-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
18	●	phenanthrene	201-581-5	85-01-8		0.32	mg/kg		0.32	mg/kg	0.000032 %		
19	●	anthracene	204-371-1	120-12-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
20	●	fluoranthene	205-912-4	206-44-0		0.57	mg/kg		0.57	mg/kg	0.000057 %		
21	●	pyrene	204-927-3	129-00-0		0.48	mg/kg		0.48	mg/kg	0.000048 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.27	mg/kg		0.27	mg/kg	0.000027 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.27	mg/kg		0.27	mg/kg	0.000027 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.31	mg/kg		0.31	mg/kg	0.000031 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.26	mg/kg		0.26	mg/kg	0.000026 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.18	mg/kg		0.18	mg/kg	0.000018 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.16	mg/kg		0.16	mg/kg	0.000016 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
										Total:	0.0458 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP409[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name: **TP409[1]**	LoW Code:	
Sample Depth: **2 m**	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content: **21.7%** (no correction)	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21.7% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
						Total:	0%		

Key

User supplied data

Classification of sample: TP410

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP410		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.05 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
24.8% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 24.8% No Moisture Correction applied (MC)

#		Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		7.8	mg/kg	1.32	10.299	mg/kg	0.00103 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.29	mg/kg	1.142	0.331	mg/kg	0.0000331 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		17.8	mg/kg	1.462	26.016	mg/kg	0.0026 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		20.4	mg/kg	1.126	22.968	mg/kg	0.0023 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	105	mg/kg	1.56	163.781	mg/kg	0.0105 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		13.3	mg/kg	2.976	39.584	mg/kg	0.00396 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		49.3	mg/kg	2.774	136.765	mg/kg	0.0137 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		5.9	pH		5.9	pH	5.9 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0348 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP410[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP410[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
16.3% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 16.3% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		5	mg/kg	1.32	6.602	mg/kg	0.00066 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.3	mg/kg	1.142	0.343	mg/kg	0.0000343 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		25.4	mg/kg	1.462	37.124	mg/kg	0.00371 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		21.9	mg/kg	1.126	24.657	mg/kg	0.00247 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	14.4	mg/kg	1.56	22.461	mg/kg	0.00144 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		42.6	mg/kg	2.976	126.789	mg/kg	0.0127 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		63.3	mg/kg	2.774	175.603	mg/kg	0.0176 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.5	pH		6.5	pH	6.5 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0393 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP407[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP407[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
15.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 15.2% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

	User supplied data

Classification of sample: TP407[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP407[2]
Sample Depth:
1 m
Moisture content:
21.1%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21.1% No Moisture Correction applied (MC)

#		Determinand			CLP Note	**User entered data**	Conv. Factor	Compound conc.	**Classification value**	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

User supplied data

Classification of sample: TP409[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP409[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
23.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 23.1% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

	User supplied data

Classification of sample: BH404

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH404		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
12.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 12.1% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		3	mg/kg	1.32	3.961	mg/kg	0.000396 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		1.38	mg/kg	1.142	1.576	mg/kg	0.000158 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		35	mg/kg	1.462	51.154	mg/kg	0.00512 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		34.4	mg/kg	1.126	38.731	mg/kg	0.00387 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	23.7	mg/kg	1.56	36.968	mg/kg	0.00237 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.53	mg/kg	1.353	0.717	mg/kg	0.0000717 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		43.4	mg/kg	2.976	129.17	mg/kg	0.0129 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				157.8	mg/kg	2.774	437.76	mg/kg	0.0438 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.3	pH		7.3	pH	7.3 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene		201-469-6	83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene		201-695-5	86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene		201-581-5	85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene		204-371-1	120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene		205-912-4	206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene		204-927-3	129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0693 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH404[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH404[1]
Sample Depth:
0.8 m
Moisture content:
16.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 16.6% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		3.6	mg/kg	1.32	4.753	mg/kg	0.000475 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.51	mg/kg	1.142	0.583	mg/kg	0.0000583 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		26.5	mg/kg	1.462	38.731	mg/kg	0.00387 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		23.4	mg/kg	1.126	26.346	mg/kg	0.00263 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	21.4	mg/kg	1.56	33.38	mg/kg	0.00214 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		30.6	mg/kg	2.976	91.074	mg/kg	0.00911 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				94.3	mg/kg	2.774	261.602	mg/kg	0.0262 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.4	pH		7.4	pH	7.4 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0452 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH402

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH402
Sample Depth:
0.15 m
Moisture content:
59.1%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 59.1% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		18.8	mg/kg	1.32	24.822	mg/kg	0.00248 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		2.2	mg/kg	3.22	7.084	mg/kg	0.000708 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.59	mg/kg	1.142	0.674	mg/kg	0.0000674 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		27.8	mg/kg	1.462	40.631	mg/kg	0.00406 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		46	mg/kg	1.126	51.791	mg/kg	0.00518 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	100.3	mg/kg	1.56	156.449	mg/kg	0.01 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.85	mg/kg	1.353	1.15	mg/kg	0.000115 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		26.1	mg/kg	2.976	77.681	mg/kg	0.00777 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2.4	mg/kg	2.554	6.129	mg/kg	0.000613 %		
11	zinc { zinc chromate }	024-007-00-3				83	mg/kg	2.774	230.254	mg/kg	0.023 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				1.2	mg/kg	1.884	2.261	mg/kg	0.000226 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6	pH		6	pH	6pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.2	mg/kg		0.2	mg/kg	0.00002 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.2	mg/kg		0.2	mg/kg	0.00002 %		
16	●	acenaphthene	201-469-6	83-32-9		0.2	mg/kg		0.2	mg/kg	0.00002 %		
17	●	fluorene	201-695-5	86-73-7		0.2	mg/kg		0.2	mg/kg	0.00002 %		
18	●	phenanthrene	201-581-5	85-01-8		0.49	mg/kg		0.49	mg/kg	0.000049 %		
19	●	anthracene	204-371-1	120-12-7		0.2	mg/kg		0.2	mg/kg	0.00002 %		
20	●	fluoranthene	205-912-4	206-44-0		1.27	mg/kg		1.27	mg/kg	0.000127 %		
21	●	pyrene	204-927-3	129-00-0		1.12	mg/kg		1.12	mg/kg	0.000112 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.76	mg/kg		0.76	mg/kg	0.000076 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.76	mg/kg		0.76	mg/kg	0.000076 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		1.03	mg/kg		1.03	mg/kg	0.000103 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.32	mg/kg		0.32	mg/kg	0.000032 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.71	mg/kg		0.71	mg/kg	0.000071 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.51	mg/kg		0.51	mg/kg	0.000051 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.2	mg/kg		0.2	mg/kg	0.00002 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.39	mg/kg		0.39	mg/kg	0.000039 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		1.2	mg/kg		1.2	mg/kg	0.00012 %		
										Total:	0.0553 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH402[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH402[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.6 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
49% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 49% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
						Total:	0%		

Key

	User supplied data

Classification of sample: BH402[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:	
BH402[2]	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
1.2 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:		
19.9% (no correction)		

Hazard properties

None identified

Determinands

Moisture content: 19.9% No Moisture Correction applied (MC)

#		Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		1.5	mg/kg	1.32	1.98	mg/kg	0.000198 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		16.1	mg/kg	1.462	23.531	mg/kg	0.00235 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		16.5	mg/kg	1.126	18.577	mg/kg	0.00186 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	9.6	mg/kg	1.56	14.974	mg/kg	0.00096 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		14.7	mg/kg	2.976	43.751	mg/kg	0.00438 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11		zinc { zinc chromate } 024-007-00-3		31.4	mg/kg	2.774	87.108	mg/kg	0.00871 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.5	pH		6.5	pH	6.5 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0193 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH403

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH403
Sample Depth:
0.15 m
Moisture content:
12.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 12.6% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4.6 mg/kg	1.32	6.073 mg/kg	0.000607 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5 mg/kg	3.22	1.61 mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.51 mg/kg	1.142	0.583 mg/kg	0.0000583 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		30.4 mg/kg	1.462	44.431 mg/kg	0.00444 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		33 mg/kg	1.126	37.154 mg/kg	0.00372 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	27.2 mg/kg	1.56	42.427 mg/kg	0.00272 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		35.5 mg/kg	2.976	105.657 mg/kg	0.0106 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5 mg/kg	2.554	1.277 mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				116.7 mg/kg	2.774	323.743 mg/kg	0.0324 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.4	pH		6.4	pH	6.4 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.56	mg/kg		0.56	mg/kg	0.000056 %		
16	●	acenaphthene	201-469-6	83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene	201-695-5	86-73-7		0.39	mg/kg		0.39	mg/kg	0.000039 %		
18	●	phenanthrene	201-581-5	85-01-8		3.82	mg/kg		3.82	mg/kg	0.000382 %		
19	●	anthracene	204-371-1	120-12-7		1.43	mg/kg		1.43	mg/kg	0.000143 %		
20	●	fluoranthene	205-912-4	206-44-0		8.07	mg/kg		8.07	mg/kg	0.000807 %		
21	●	pyrene	204-927-3	129-00-0		7.45	mg/kg		7.45	mg/kg	0.000745 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		4.77	mg/kg		4.77	mg/kg	0.000477 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		4.77	mg/kg		4.77	mg/kg	0.000477 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		4.59	mg/kg		4.59	mg/kg	0.000459 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		1.51	mg/kg		1.51	mg/kg	0.000151 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		4.27	mg/kg		4.27	mg/kg	0.000427 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		2.6	mg/kg		2.6	mg/kg	0.00026 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.56	mg/kg		0.56	mg/kg	0.000056 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		1.98	mg/kg		1.98	mg/kg	0.000198 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0597 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH403[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	**BH403[1]**	LoW Code:	
Sample Depth:	**1.2 m**	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	**29.7%** (no correction)	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 29.7% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		3.5 mg/kg	1.32	4.621 mg/kg	0.000462 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.8 mg/kg	3.22	2.576 mg/kg	0.000258 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.228 mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		12.9 mg/kg	1.462	18.854 mg/kg	0.00189 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1 mg/kg	1.923	<0.192 mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		14.6 mg/kg	1.126	16.438 mg/kg	0.00164 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	22.6 mg/kg	1.56	35.252 mg/kg	0.00226 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.57 mg/kg	1.353	0.771 mg/kg	0.0000771 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		10 mg/kg	2.976	29.763 mg/kg	0.00298 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6 mg/kg	2.554	1.532 mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				29.1 mg/kg	2.774	80.728 mg/kg	0.00807 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7 mg/kg	1.884	1.319 mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.2	pH		6.2	pH	6.2 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene	201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene	201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene	201-581-5	85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	●	anthracene	204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene	205-912-4	206-44-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21	●	pyrene	204-927-3	129-00-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0182 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH411

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH411		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.3 m			
Moisture content:			
5.3% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 5.3% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		2.2	mg/kg	1.32	2.905	mg/kg	0.00029 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		1.42	mg/kg	1.142	1.622	mg/kg	0.000162 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		6.6	mg/kg	1.462	9.646	mg/kg	0.000965 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		9.5	mg/kg	1.126	10.696	mg/kg	0.00107 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	40.51	mg/kg	1.56	63.188	mg/kg	0.00405 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		9.5	mg/kg	2.976	28.275	mg/kg	0.00283 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		44.61	mg/kg	2.774	123.755	mg/kg	0.0124 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.53	mg/kg	1.884	0.999	mg/kg	0.0000999 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		9	pH		9	pH	9pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.084	mg/kg		0.084	mg/kg	0.0000084 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.401	mg/kg		0.401	mg/kg	0.0000401 %		
16	●	acenaphthene	201-469-6	83-32-9		0.095	mg/kg		0.095	mg/kg	0.0000095 %		
17	●	fluorene	201-695-5	86-73-7		0.275	mg/kg		0.275	mg/kg	0.0000275 %		
18	●	phenanthrene	201-581-5	85-01-8		2.587	mg/kg		2.587	mg/kg	0.000259 %		
19	●	anthracene	204-371-1	120-12-7		0.887	mg/kg		0.887	mg/kg	0.0000887 %		
20	●	fluoranthene	205-912-4	206-44-0		8.437	mg/kg		8.437	mg/kg	0.000844 %		
21	●	pyrene	204-927-3	129-00-0		7.825	mg/kg		7.825	mg/kg	0.000783 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		3.168	mg/kg		3.168	mg/kg	0.000317 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		3.168	mg/kg		3.168	mg/kg	0.000317 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		4.213	mg/kg		4.213	mg/kg	0.000421 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		1.732	mg/kg		1.732	mg/kg	0.000173 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		4.171	mg/kg		4.171	mg/kg	0.000417 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		3.052	mg/kg		3.052	mg/kg	0.000305 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.76	mg/kg		0.76	mg/kg	0.000076 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		2.418	mg/kg		2.418	mg/kg	0.000242 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.53	mg/kg		0.53	mg/kg	0.000053 %		
										Total:	0.0266 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH411[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH411[1]
Sample Depth:
1 m
Moisture content:
14.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.3% No Moisture Correction applied (MC)

#		Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		4.4	mg/kg	1.32	5.809	mg/kg	0.000581 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.38	mg/kg	1.142	0.434	mg/kg	0.0000434 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		14.2	mg/kg	1.462	20.754	mg/kg	0.00208 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		8.4	mg/kg	1.126	9.457	mg/kg	0.000946 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	13	mg/kg	1.56	20.278	mg/kg	0.0013 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		11.4	mg/kg	2.976	33.929	mg/kg	0.00339 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		31.3	mg/kg	2.774	86.831	mg/kg	0.00868 %		
12		TPH (C6 to C40) petroleum group TPH		46	mg/kg		46	mg/kg	0.0046 %		

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		
14	pH			PH		7.8 pH		7.8 pH	7.8 pH		
15	naphthalene	601-052-00-2	202-049-5	91-20-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
16	acenaphthylene		205-917-1	208-96-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
17	acenaphthene		201-469-6	83-32-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
18	fluorene		201-695-5	86-73-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
19	phenanthrene		201-581-5	85-01-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
20	anthracene		204-371-1	120-12-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
21	fluoranthene		205-912-4	206-44-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
22	pyrene		204-927-3	129-00-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
24	chrysene	601-048-00-0	205-923-4	218-01-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
28	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09 mg/kg		0.09 mg/kg	0.000009 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
30	benzo[ghi]perylene		205-883-8	191-24-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
31	phenol	604-001-00-2	203-632-7	108-95-2		0.6 mg/kg		0.6 mg/kg	0.00006 %		
								Total:	0.0223 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0046%)

Classification of sample: BH418

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH418
Sample Depth:
0.15 m
Moisture content:
24.4%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 24.4% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		16	mg/kg	1.32	21.125	mg/kg	0.00211 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.26	mg/kg	1.142	0.297	mg/kg	0.0000297 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		24	mg/kg	1.462	35.077	mg/kg	0.00351 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		28	mg/kg	1.126	31.525	mg/kg	0.00315 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	63	mg/kg	1.56	98.268	mg/kg	0.0063 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.56	mg/kg	1.353	0.758	mg/kg	0.0000758 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		15.5	mg/kg	2.976	46.132	mg/kg	0.00461 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11	zinc { zinc chromate }	024-007-00-3				74	mg/kg	2.774	205.287	mg/kg	0.0205 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		6.1	pH		6.1	pH	6.1 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene		201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene		201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene		201-581-5	85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	●	anthracene		204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene		205-912-4	206-44-0		0.17	mg/kg		0.17	mg/kg	0.000017 %		
21	●	pyrene		204-927-3	129-00-0		0.16	mg/kg		0.16	mg/kg	0.000016 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.15	mg/kg		0.15	mg/kg	0.000015 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
											Total:	0.0412 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH418[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH418[1]
Sample Depth:
1.2 m
Moisture content:
22.8%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22.8% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6.8	mg/kg	1.32	8.978	mg/kg	0.000898 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.23	mg/kg	1.142	0.263	mg/kg	0.0000263 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		28	mg/kg	1.462	40.924	mg/kg	0.00409 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		27	mg/kg	1.126	30.399	mg/kg	0.00304 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	17.1	mg/kg	1.56	26.673	mg/kg	0.00171 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		29	mg/kg	2.976	86.312	mg/kg	0.00863 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				63.4	mg/kg	2.774	175.881	mg/kg	0.0176 %		
12	TPH (C6 to C40) petroleum group			TPH		52	mg/kg		52	mg/kg	0.0052 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13		cyanides { ● salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
14	●	pH			PH		6.4	pH		6.4	pH	6.4 pH		
15		naphthalene	601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthylene		205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	acenaphthene		201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	fluorene		201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	phenanthrene		201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	anthracene		204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	fluoranthene		205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22	●	pyrene		204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		chrysene	601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30	●	benzo[ghi]perylene		205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
31		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0421 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0052%)

Classification of sample: TP411

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP411		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.15 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
26.4% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 26.4% No Moisture Correction applied (MC)

#		Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		15.1	mg/kg	1.32	19.937	mg/kg	0.00199 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.39	mg/kg	1.142	0.446	mg/kg	0.0000446 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		29.6	mg/kg	1.462	43.262	mg/kg	0.00433 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		41.5	mg/kg	1.126	46.724	mg/kg	0.00467 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	109.1	mg/kg	1.56	170.176	mg/kg	0.0109 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.55	mg/kg	1.353	0.744	mg/kg	0.0000744 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		16.7	mg/kg	2.976	49.704	mg/kg	0.00497 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11		zinc { zinc chromate } 024-007-00-3		104.6	mg/kg	2.774	290.176	mg/kg	0.029 %		
12		TPH (C6 to C40) petroleum group TPH		104	mg/kg		104	mg/kg	0.0104 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		
14		pH PH		6.4	pH		6.4	pH	6.4 pH		
15		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16		acenaphthylene 205-917-1 / 208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17		acenaphthene 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18		fluorene 201-695-5 / 86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19		phenanthrene 201-581-5 / 85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20		anthracene 204-371-1 / 120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21		fluoranthene 205-912-4 / 206-44-0		0.27	mg/kg		0.27	mg/kg	0.000027 %		
22		pyrene 204-927-3 / 129-00-0		0.24	mg/kg		0.24	mg/kg	0.000024 %		
23		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.16	mg/kg		0.16	mg/kg	0.000016 %		
24		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.16	mg/kg		0.16	mg/kg	0.000016 %		
25		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.18	mg/kg		0.18	mg/kg	0.000018 %		
26		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.15	mg/kg		0.15	mg/kg	0.000015 %		
28		indeno[123-cd]pyrene 205-893-2 / 193-39-5		0.12	mg/kg		0.12	mg/kg	0.000012 %		
29		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		benzo[ghi]perylene 205-883-8 / 191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
31		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0674 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0104%)

Classification of sample: TP411[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	**TP411[1]**	LoW Code:	
Sample Depth:	**1.2 m**	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	**15.3%** (no correction)	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15.3% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		1.4	mg/kg	1.32	1.848	mg/kg	0.000185 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		32.3	mg/kg	1.462	47.208	mg/kg	0.00472 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		40.5	mg/kg	1.126	45.598	mg/kg	0.00456 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	5.8	mg/kg	1.56	9.047	mg/kg	0.00058 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		31.7	mg/kg	2.976	94.348	mg/kg	0.00943 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		31.8	mg/kg	2.774	88.218	mg/kg	0.00882 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		6.5	pH		6.5	pH	6.5 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene		201-469-6	83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene		201-695-5	86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene		201-581-5	85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene		204-371-1	120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene		205-912-4	206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene		204-927-3	129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.029 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP412

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP412		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
19.4% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00003%)

Determinands

Moisture content: 19.4% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4.3	mg/kg	1.32	5.677	mg/kg	0.000568 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		17.5	mg/kg	1.462	25.577	mg/kg	0.00256 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		0.2	mg/kg	1.923	0.385	mg/kg	0.0000385 %		
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		8.9	mg/kg	1.126	10.02	mg/kg	0.001 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	15.9	mg/kg	1.56	24.801	mg/kg	0.00159 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		12.3	mg/kg	2.976	36.608	mg/kg	0.00366 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				29.2	mg/kg	2.774	81.005	mg/kg	0.0081 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
		006-007-00-5											
13		pH				7.3	pH		7.3	pH	7.3 pH		
				PH									
14		naphthalene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-917-1	208-96-8									
16		acenaphthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-469-6	83-32-9									
17		fluorene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-695-5	86-73-7									
18		phenanthrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-581-5	85-01-8									
19		anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			204-371-1	120-12-7									
20		fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-912-4	206-44-0									
21		pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-883-8	191-24-2									
30		phenol				0.6	mg/kg		0.6	mg/kg	0.00006 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0182 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP413

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP413		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
19.4% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00007%)

Determinands

Moisture content: 19.4% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.1 mg/kg	1.32	12.015 mg/kg	0.0012 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5 mg/kg	3.22	1.61 mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.228 mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		21.9 mg/kg	1.462	32.008 mg/kg	0.0032 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		0.4 mg/kg	1.923	0.769 mg/kg	0.0000769 %		
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		12.7 mg/kg	1.126	14.299 mg/kg	0.00143 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	24.2 mg/kg	1.56	37.748 mg/kg	0.00242 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		11.6 mg/kg	2.976	34.525 mg/kg	0.00345 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.2 mg/kg	2.554	3.064 mg/kg	0.000306 %		
11	zinc { zinc chromate }	024-007-00-3				29.4 mg/kg	2.774	81.56 mg/kg	0.00816 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
		006-007-00-5											
13		pH				7.4	pH		7.4	pH	7.4 pH		
				PH									
14		naphthalene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-917-1	208-96-8									
16		acenaphthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-469-6	83-32-9									
17		fluorene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-695-5	86-73-7									
18		phenanthrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-581-5	85-01-8									
19		anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			204-371-1	120-12-7									
20		fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-912-4	206-44-0									
21		pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-883-8	191-24-2									
30		phenol				0.6	mg/kg		0.6	mg/kg	0.00006 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0208 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP415

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP415		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
13.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 13.2% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		6.8	mg/kg	1.32	8.978	mg/kg	0.000898 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.31	mg/kg	1.142	0.354	mg/kg	0.0000354 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		23.1	mg/kg	1.462	33.762	mg/kg	0.00338 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		17.6	mg/kg	1.126	19.816	mg/kg	0.00198 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	14.7	mg/kg	1.56	22.929	mg/kg	0.00147 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		19.5	mg/kg	2.976	58.037	mg/kg	0.0058 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		2	mg/kg	2.554	5.107	mg/kg	0.000511 %		
11	zinc { zinc chromate } 024-007-00-3		43.2	mg/kg	2.774	119.843	mg/kg	0.012 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		6 pH		6 pH	6pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.09 mg/kg		0.09 mg/kg	0.000009 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.09 mg/kg		0.09 mg/kg	0.000009 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.09 mg/kg		0.09 mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.09 mg/kg		0.09 mg/kg	0.000009 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.09 mg/kg		0.09 mg/kg	0.000009 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.09 mg/kg		0.09 mg/kg	0.000009 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.6 mg/kg		0.6 mg/kg	0.00006 %		
						Total:	0.0266 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP430

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP430
Sample Depth:
0.15 m
Moisture content:
39.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 39.9% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		46.5	mg/kg	1.32	61.395	mg/kg	0.00614 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.6	mg/kg	3.22	5.152	mg/kg	0.000515 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		2.42	mg/kg	1.142	2.764	mg/kg	0.000276 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		100.9	mg/kg	1.462	147.471	mg/kg	0.0147 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		149.4	mg/kg	1.126	168.208	mg/kg	0.0168 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	177.6	mg/kg	1.56	277.023	mg/kg	0.0178 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.65	mg/kg	1.353	0.88	mg/kg	0.000088 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		34.6	mg/kg	2.976	102.979	mg/kg	0.0103 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.8	mg/kg	2.554	4.596	mg/kg	0.00046 %		
11	zinc { zinc chromate }	024-007-00-3				280.5	mg/kg	2.774	778.148	mg/kg	0.0778 %		
12	TPH (C6 to C40) petroleum group			TPH		52	mg/kg		52	mg/kg	0.0052 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		
14		pH PH		5.9	pH		5.9	pH	5.9 pH		
15		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
16		acenaphthylene 205-917-1 / 208-96-8		0.25	mg/kg		0.25	mg/kg	0.000025 %		
17		acenaphthene 201-469-6 / 83-32-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
18		fluorene 201-695-5 / 86-73-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
19		phenanthrene 201-581-5 / 85-01-8		1.65	mg/kg		1.65	mg/kg	0.000165 %		
20		anthracene 204-371-1 / 120-12-7		0.4	mg/kg		0.4	mg/kg	0.00004 %		
21		fluoranthene 205-912-4 / 206-44-0		3.68	mg/kg		3.68	mg/kg	0.000368 %		
22		pyrene 204-927-3 / 129-00-0		3.39	mg/kg		3.39	mg/kg	0.000339 %		
23		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		1.86	mg/kg		1.86	mg/kg	0.000186 %		
24		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		1.86	mg/kg		1.86	mg/kg	0.000186 %		
25		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		2.21	mg/kg		2.21	mg/kg	0.000221 %		
26		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.87	mg/kg		0.87	mg/kg	0.000087 %		
27		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		1.76	mg/kg		1.76	mg/kg	0.000176 %		
28		indeno[123-cd]pyrene 205-893-2 / 193-39-5		1.05	mg/kg		1.05	mg/kg	0.000105 %		
29		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.23	mg/kg		0.23	mg/kg	0.000023 %		
30		benzo[ghi]perylene 205-883-8 / 191-24-2		0.9	mg/kg		0.9	mg/kg	0.00009 %		
31		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
								Total:	0.152 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0052%)

Classification of sample: TP430[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP430[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
17.4% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 17.4% No Moisture Correction applied (MC)

#		Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		4.3	mg/kg	1.32	5.677	mg/kg	0.000568 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4		chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		15.4	mg/kg	1.462	22.508	mg/kg	0.00225 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		15.1	mg/kg	1.126	17.001	mg/kg	0.0017 %		
7		lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	24.1	mg/kg	1.56	37.592	mg/kg	0.00241 %		
8		mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		15	mg/kg	2.976	44.644	mg/kg	0.00446 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3				45.3	mg/kg	2.774	125.669	mg/kg	0.0126 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	•	pH		PH		6.7	pH		6.7	pH	6.7 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	•	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	•	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	•	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	•	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	•	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	•	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	•	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	•	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	•	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0247 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP431

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP431
Sample Depth:
0.1 m
Moisture content:
26.4%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 26.4% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		26.5	mg/kg	1.32	34.989	mg/kg	0.0035 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.61	mg/kg	1.142	0.697	mg/kg	0.0000697 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		59.4	mg/kg	1.462	86.816	mg/kg	0.00868 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		63.5	mg/kg	1.126	71.494	mg/kg	0.00715 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	136.7	mg/kg	1.56	213.227	mg/kg	0.0137 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.54	mg/kg	1.353	0.731	mg/kg	0.0000731 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		40.6	mg/kg	2.976	120.836	mg/kg	0.0121 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				1.2	mg/kg	2.554	3.064	mg/kg	0.000306 %		
11	zinc { zinc chromate } 024-007-00-3				154.9	mg/kg	2.774	429.715	mg/kg	0.043 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		6.4	pH		6.4	pH	6.4 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.48	mg/kg		0.48	mg/kg	0.000048 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.26	mg/kg		0.26	mg/kg	0.000026 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		2.81	mg/kg		2.81	mg/kg	0.000281 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.9	mg/kg		0.9	mg/kg	0.00009 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		4.51	mg/kg		4.51	mg/kg	0.000451 %		
21	●	pyrene / 204-927-3 / 129-00-0		4.08	mg/kg		4.08	mg/kg	0.000408 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		2.11	mg/kg		2.11	mg/kg	0.000211 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		2.11	mg/kg		2.11	mg/kg	0.000211 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		2.23	mg/kg		2.23	mg/kg	0.000223 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.84	mg/kg		0.84	mg/kg	0.000084 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		1.82	mg/kg		1.82	mg/kg	0.000182 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.9	mg/kg		0.9	mg/kg	0.00009 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.22	mg/kg		0.22	mg/kg	0.000022 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0914 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
(icon)	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP431[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP431[1]
Sample Depth:
0.5 m
Moisture content:
22.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22.6% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4	mg/kg	1.32	5.281	mg/kg	0.000528 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.21	mg/kg	1.142	0.24	mg/kg	0.000024 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		180.5	mg/kg	1.462	263.811	mg/kg	0.0264 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		14.9	mg/kg	1.126	16.776	mg/kg	0.00168 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	17.9	mg/kg	1.56	27.921	mg/kg	0.00179 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		18.1	mg/kg	2.976	53.87	mg/kg	0.00539 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11	zinc { zinc chromate }	024-007-00-3				43	mg/kg	2.774	119.288	mg/kg	0.0119 %		
12	TPH (C6 to C40) petroleum group			TPH		53	mg/kg		53	mg/kg	0.0053 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
14		pH			PH		6.6	pH		6.6	pH	6.6 pH		
15		naphthalene	601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16		acenaphthylene		205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17		acenaphthene		201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18		fluorene		201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19		phenanthrene		201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20		anthracene		204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21		fluoranthene		205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		pyrene		204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		chrysene	601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		indeno[123-cd]pyrene		205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		benzo[ghi]perylene		205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
31		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0538 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0053%)

Classification of sample: TP431[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP431[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
21.8% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 21.8% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		2.9	mg/kg	1.32	3.829	mg/kg	0.000383 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		11.9	mg/kg	1.462	17.393	mg/kg	0.00174 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		12.7	mg/kg	1.126	14.299	mg/kg	0.00143 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	15.2	mg/kg	1.56	23.709	mg/kg	0.00152 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		12.6	mg/kg	2.976	37.501	mg/kg	0.00375 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				36	mg/kg	2.774	99.869	mg/kg	0.00999 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.4	pH		6.4	pH	6.4 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.38	mg/kg		0.38	mg/kg	0.000038 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.47	mg/kg		0.47	mg/kg	0.000047 %		
21	●	pyrene	204-927-3	129-00-0		0.41	mg/kg		0.41	mg/kg	0.000041 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.23	mg/kg		0.23	mg/kg	0.000023 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.23	mg/kg		0.23	mg/kg	0.000023 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.22	mg/kg		0.22	mg/kg	0.000022 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.18	mg/kg		0.18	mg/kg	0.000018 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0197 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP432

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP432
Sample Depth:
0.5 m
Moisture content:
23.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23.9% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		7.9	mg/kg	1.32	10.431	mg/kg	0.00104 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.24	mg/kg	1.142	0.274	mg/kg	0.0000274 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		20.9	mg/kg	1.462	30.547	mg/kg	0.00305 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		25.3	mg/kg	1.126	28.485	mg/kg	0.00285 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	37.6	mg/kg	1.56	58.649	mg/kg	0.00376 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		21.1	mg/kg	2.976	62.799	mg/kg	0.00628 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11	zinc { zinc chromate } 024-007-00-3				74.3	mg/kg	2.774	206.119	mg/kg	0.0206 %		
12	TPH (C6 to C40) petroleum group		TPH		53	mg/kg		53	mg/kg	0.0053 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		
		006-007-00-5											
14	•	pH				7	pH		7	pH	7pH		
				PH									
15		naphthalene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-052-00-2	202-049-5	91-20-3									
16	•	acenaphthylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-917-1	208-96-8									
17	•	acenaphthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-469-6	83-32-9									
18	•	fluorene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-695-5	86-73-7									
19	•	phenanthrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-581-5	85-01-8									
20	•	anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-371-1	120-12-7									
21	•	fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-912-4	206-44-0									
22	•	pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-927-3	129-00-0									
23		benzo[a]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-033-00-9	200-280-6	56-55-3									
24		chrysene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-048-00-0	205-923-4	218-01-9									
25		benzo[b]fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-034-00-4	205-911-9	205-99-2									
26		benzo[k]fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-036-00-5	205-916-6	207-08-9									
27		benzo[a]pyrene; benzo[def]chrysene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-032-00-3	200-028-5	50-32-8									
28	•	indeno[123-cd]pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-893-2	193-39-5									
29		dibenz[a,h]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-041-00-2	200-181-8	53-70-3									
30	•	benzo[ghi]perylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-883-8	191-24-2									
31		phenol				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0438 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0053%)

Classification of sample: BH421

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH421
Sample Depth:
0.15 m
Moisture content:
22.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22.9% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		12	mg/kg	1.32	15.844	mg/kg	0.00158 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.23	mg/kg	1.142	0.263	mg/kg	0.0000263 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		27.1	mg/kg	1.462	39.608	mg/kg	0.00396 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		1	mg/kg	1.126	1.126	mg/kg	0.000113 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	52.9	mg/kg	1.56	82.514	mg/kg	0.00529 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		15.4	mg/kg	2.976	45.834	mg/kg	0.00458 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11		zinc { zinc chromate } 024-007-00-3		88.2	mg/kg	2.774	244.68	mg/kg	0.0245 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.2	pH		6.2	pH	6.2 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.23	mg/kg		0.23	mg/kg	0.000023 %		
21	●	pyrene	204-927-3	129-00-0		0.22	mg/kg		0.22	mg/kg	0.000022 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.14	mg/kg		0.14	mg/kg	0.000014 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.14	mg/kg		0.14	mg/kg	0.000014 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.18	mg/kg		0.18	mg/kg	0.000018 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.16	mg/kg		0.16	mg/kg	0.000016 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.12	mg/kg		0.12	mg/kg	0.000012 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0409 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH421[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH421[1]
Sample Depth:
0.6 m
Moisture content:
17.9%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 17.9% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		5.2	mg/kg	1.32	6.866	mg/kg	0.000687 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		18.9	mg/kg	1.462	27.623	mg/kg	0.00276 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		11.7	mg/kg	1.126	13.173	mg/kg	0.00132 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	12.7	mg/kg	1.56	19.81	mg/kg	0.00127 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		14	mg/kg	2.976	41.668	mg/kg	0.00417 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		38.6	mg/kg	2.774	107.082	mg/kg	0.0107 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7	pH		7	pH	7pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0216 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH417

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH417		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
31.3% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 31.3% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		14.5	mg/kg	1.32	19.145	mg/kg	0.00191 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.53	mg/kg	1.142	0.605	mg/kg	0.0000605 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		54.2	mg/kg	1.462	79.216	mg/kg	0.00792 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		45	mg/kg	1.126	50.665	mg/kg	0.00507 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	87.9	mg/kg	1.56	137.108	mg/kg	0.00879 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.56	mg/kg	1.353	0.758	mg/kg	0.0000758 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		18.8	mg/kg	2.976	55.954	mg/kg	0.0056 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11		zinc { zinc chromate } 024-007-00-3		134.2	mg/kg	2.774	372.29	mg/kg	0.0372 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.4	pH		6.4	pH	6.4 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
16	●	acenaphthene	201-469-6	83-32-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
17	●	fluorene	201-695-5	86-73-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
18	●	phenanthrene	201-581-5	85-01-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
19	●	anthracene	204-371-1	120-12-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
20	●	fluoranthene	205-912-4	206-44-0		0.23	mg/kg		0.23	mg/kg	0.000023 %		
21	●	pyrene	204-927-3	129-00-0		0.22	mg/kg		0.22	mg/kg	0.000022 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.15	mg/kg		0.15	mg/kg	0.000015 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.15	mg/kg		0.15	mg/kg	0.000015 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.19	mg/kg		0.19	mg/kg	0.000019 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.12	mg/kg		0.12	mg/kg	0.000012 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0676 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH417[1]

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
BH417[1]
Sample Depth:
0.5 m
Moisture content:
18.8%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00005%)

Determinands

Moisture content: 18.8% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.6	mg/kg	1.32	10.034	mg/kg	0.001 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		33.8	mg/kg	1.462	49.401	mg/kg	0.00494 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		0.3	mg/kg	1.923	0.577	mg/kg	0.0000577 %		
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		15	mg/kg	1.126	16.888	mg/kg	0.00169 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16.1	mg/kg	1.56	25.113	mg/kg	0.00161 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		22.1	mg/kg	2.976	65.775	mg/kg	0.00658 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				31.6	mg/kg	2.774	87.663	mg/kg	0.00877 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
13		pH PH		7.2	pH		7.2	pH	7.2 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15		acenaphthylene 205-917-1 / 208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16		acenaphthene 201-469-6 / 83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17		fluorene 201-695-5 / 86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18		phenanthrene 201-581-5 / 85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19		anthracene 204-371-1 / 120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20		fluoranthene 205-912-4 / 206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21		pyrene 204-927-3 / 129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27		indeno[123-cd]pyrene 205-893-2 / 193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29		benzo[ghi]perylene 205-883-8 / 191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
								Total:	0.0254 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH417[2]

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH417[2]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
17.7% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00005%)

Determinands

Moisture content: 17.7% No Moisture Correction applied (MC)

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		7	mg/kg	1.32	9.242	mg/kg	0.000924 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4		chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		24.2	mg/kg	1.462	35.37	mg/kg	0.00354 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		0.3	mg/kg	1.923	0.577	mg/kg	0.0000577 %		
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		20.3	mg/kg	1.126	22.856	mg/kg	0.00229 %		
7		lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	13.2	mg/kg	1.56	20.59	mg/kg	0.00132 %		
8		mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		17.5	mg/kg	2.976	52.085	mg/kg	0.00521 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3		35	mg/kg	2.774	97.095	mg/kg	0.00971 %		

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6 mg/kg	1.884	1.13 mg/kg	0.000113 %		
13	pH			PH		7.4 pH		7.4 pH	7.4 pH		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
15	acenaphthylene		205-917-1	208-96-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
16	acenaphthene		201-469-6	83-32-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
17	fluorene		201-695-5	86-73-7		0.1 mg/kg		0.1 mg/kg	0.00001 %		
18	phenanthrene		201-581-5	85-01-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
19	anthracene		204-371-1	120-12-7		0.1 mg/kg		0.1 mg/kg	0.00001 %		
20	fluoranthene		205-912-4	206-44-0		0.1 mg/kg		0.1 mg/kg	0.00001 %		
21	pyrene		204-927-3	129-00-0		0.1 mg/kg		0.1 mg/kg	0.00001 %		
22	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
23	chrysene	601-048-00-0	205-923-4	218-01-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
24	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.1 mg/kg		0.1 mg/kg	0.00001 %		
25	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
27	indeno[123-cd]pyrene		205-893-2	193-39-5		0.1 mg/kg		0.1 mg/kg	0.00001 %		
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
29	benzo[ghi]perylene		205-883-8	191-24-2		0.1 mg/kg		0.1 mg/kg	0.00001 %		
30	phenol	604-001-00-2	203-632-7	108-95-2		0.6 mg/kg		0.6 mg/kg	0.00006 %		
								Total:	0.0238 %		

Key

	User supplied data
	Potentially Hazardous result
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH416

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH416
Sample Depth:
0.5 m
Moisture content:
19.2%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 19.2% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		6.8	mg/kg	1.32	8.978	mg/kg	0.000898 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		41	mg/kg	1.462	59.924	mg/kg	0.00599 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		33.7	mg/kg	1.126	37.942	mg/kg	0.00379 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	16.5	mg/kg	1.56	25.737	mg/kg	0.00165 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		34.7	mg/kg	2.976	103.276	mg/kg	0.0103 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3		79	mg/kg	2.774	219.158	mg/kg	0.0219 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7.1	pH		7.1	pH	7.1 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0453 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH434

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH434
Sample Depth:
0.2 m
Moisture content:
32.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 32.3% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		25.8	mg/kg	1.32	34.064	mg/kg	0.00341 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.73	mg/kg	1.142	0.834	mg/kg	0.0000834 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		20	mg/kg	1.462	29.231	mg/kg	0.00292 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		78.4	mg/kg	1.126	88.27	mg/kg	0.00883 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	130	mg/kg	1.56	202.776	mg/kg	0.013 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.56	mg/kg	1.353	0.758	mg/kg	0.0000758 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		24.8	mg/kg	2.976	73.811	mg/kg	0.00738 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11	zinc { zinc chromate }	024-007-00-3				176.2	mg/kg	2.774	488.805	mg/kg	0.0489 %		
12	TPH (C6 to C40) petroleum group			TPH		110	mg/kg		110	mg/kg	0.011 %		
13	benzene	601-020-00-8	200-753-7	71-43-2		14.7	mg/kg		14.7	mg/kg	0.00147 %		
14	toluene	601-021-00-3	203-625-9	108-88-3		14.7	mg/kg		14.7	mg/kg	0.00147 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
15	●	ethylbenzene 601-023-00-4	202-849-4	100-41-4		29.5	mg/kg		29.5	mg/kg	0.00295 %		
16		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		14.7	mg/kg		14.7	mg/kg	0.00147 %		
17		cyanides { ● salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		
18	●	pH		PH		6.2	pH		6.2	pH	6.2 pH		
19		naphthalene 601-052-00-2	202-049-5	91-20-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
20	●	acenaphthylene	205-917-1	208-96-8		0.16	mg/kg		0.16	mg/kg	0.000016 %		
21	●	acenaphthene	201-469-6	83-32-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
22	●	fluorene	201-695-5	86-73-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
23	●	phenanthrene	201-581-5	85-01-8		1.31	mg/kg		1.31	mg/kg	0.000131 %		
24	●	anthracene	204-371-1	120-12-7		0.35	mg/kg		0.35	mg/kg	0.000035 %		
25	●	fluoranthene	205-912-4	206-44-0		2.33	mg/kg		2.33	mg/kg	0.000233 %		
26	●	pyrene	204-927-3	129-00-0		2.18	mg/kg		2.18	mg/kg	0.000218 %		
27		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		1.21	mg/kg		1.21	mg/kg	0.000121 %		
28		chrysene 601-048-00-0	205-923-4	218-01-9		1.21	mg/kg		1.21	mg/kg	0.000121 %		
29		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		1.27	mg/kg		1.27	mg/kg	0.000127 %		
30		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.46	mg/kg		0.46	mg/kg	0.000046 %		
31		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		1.14	mg/kg		1.14	mg/kg	0.000114 %		
32	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.69	mg/kg		0.69	mg/kg	0.000069 %		
33		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.16	mg/kg		0.16	mg/kg	0.000016 %		
34	●	benzo[ghi]perylene	205-883-8	191-24-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
35		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.105 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because no liquid phase

Hazard Statements hit:

Flam. Liq. 2; H225 "Highly flammable liquid and vapour."

Because of determinands:

benzene: (conc.: 0.00147%)
toluene: (conc.: 0.00147%)
ethylbenzene: (conc.: 0.00295%)

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.011%)
xylene: (conc.: 0.00147%)

Classification of sample: BH434[1]

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH434[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
16.3% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00009%)

Determinands

Moisture content: 16.3% No Moisture Correction applied (MC)

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		6.2	mg/kg	1.32	8.186	mg/kg	0.000819 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3		cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.21	mg/kg	1.142	0.24	mg/kg	0.000024 %		
4		chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		14.5	mg/kg	1.462	21.193	mg/kg	0.00212 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		0.5	mg/kg	1.923	0.962	mg/kg	0.0000962 %		
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		21.4	mg/kg	1.126	24.094	mg/kg	0.00241 %		
7		lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	29.8	mg/kg	1.56	46.482	mg/kg	0.00298 %		
8		mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9		nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		15.1	mg/kg	2.976	44.942	mg/kg	0.00449 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11		zinc { zinc chromate } 024-007-00-3				69.5	mg/kg	2.774	192.803	mg/kg	0.0193 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		
		006-007-00-5											
13		pH				6.1	pH		6.1	pH	6.1 pH		
				PH									
14		naphthalene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-917-1	208-96-8									
16		acenaphthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-469-6	83-32-9									
17		fluorene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-695-5	86-73-7									
18		phenanthrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-581-5	85-01-8									
19		anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			204-371-1	120-12-7									
20		fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-912-4	206-44-0									
21		pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-883-8	191-24-2									
30		phenol				0.6	mg/kg		0.6	mg/kg	0.00006 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0329 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH435

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH435
Sample Depth:
0.2 m
Moisture content:
35.7%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 35.7% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		33.1	mg/kg	1.32	43.703	mg/kg	0.00437 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.3	mg/kg	3.22	4.186	mg/kg	0.000419 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.71	mg/kg	1.142	0.811	mg/kg	0.0000811 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		23.9	mg/kg	1.462	34.931	mg/kg	0.00349 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		78.4	mg/kg	1.126	88.27	mg/kg	0.00883 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	160	mg/kg	1.56	249.57	mg/kg	0.016 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		27.8	mg/kg	2.976	82.74	mg/kg	0.00827 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.9	mg/kg	2.554	2.298	mg/kg	0.00023 %		
11	zinc { zinc chromate } 024-007-00-3		197.9	mg/kg	2.774	549.004	mg/kg	0.0549 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	•	pH			PH		6.6 pH		6.6 pH	6.6 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.12 mg/kg		0.12 mg/kg	0.000012 %		
15	•	acenaphthylene		205-917-1	208-96-8		0.16 mg/kg		0.16 mg/kg	0.000016 %		
16	•	acenaphthene		201-469-6	83-32-9		0.12 mg/kg		0.12 mg/kg	0.000012 %		
17	•	fluorene		201-695-5	86-73-7		0.12 mg/kg		0.12 mg/kg	0.000012 %		
18	•	phenanthrene		201-581-5	85-01-8		1.1 mg/kg		1.1 mg/kg	0.00011 %		
19	•	anthracene		204-371-1	120-12-7		0.28 mg/kg		0.28 mg/kg	0.000028 %		
20	•	fluoranthene		205-912-4	206-44-0		1.31 mg/kg		1.31 mg/kg	0.000131 %		
21	•	pyrene		204-927-3	129-00-0		1.21 mg/kg		1.21 mg/kg	0.000121 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.61 mg/kg		0.61 mg/kg	0.000061 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.61 mg/kg		0.61 mg/kg	0.000061 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.61 mg/kg		0.61 mg/kg	0.000061 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.23 mg/kg		0.23 mg/kg	0.000023 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.48 mg/kg		0.48 mg/kg	0.000048 %		
27	•	indeno[123-cd]pyrene		205-893-2	193-39-5		0.25 mg/kg		0.25 mg/kg	0.000025 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.12 mg/kg		0.12 mg/kg	0.000012 %		
29	•	benzo[ghi]perylene		205-883-8	191-24-2		0.28 mg/kg		0.28 mg/kg	0.000028 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.8 mg/kg		0.8 mg/kg	0.00008 %		
									Total:	0.0977 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
(icon)	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH435[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH435[1]
Sample Depth:
0.5 m
Moisture content:
21.1%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21.1% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.4	mg/kg	1.32	9.77	mg/kg	0.000977 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		19.5	mg/kg	1.462	28.5	mg/kg	0.00285 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		24.5	mg/kg	1.126	27.584	mg/kg	0.00276 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	33	mg/kg	1.56	51.474	mg/kg	0.0033 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		20.1	mg/kg	2.976	59.823	mg/kg	0.00598 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				71.4	mg/kg	2.774	198.074	mg/kg	0.0198 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.2	pH		7.2	pH	7.2 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene		201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene		201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene		201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene		204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene		205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene		204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
											Total:	0.0364 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP422

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP422
Sample Depth:
0.1 m
Moisture content:
27.1%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 27.1% No Moisture Correction applied (MC)

#	Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		13.6	mg/kg	1.32	17.956	mg/kg	0.0018 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.22	mg/kg	1.142	0.251	mg/kg	0.0000251 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		13.6	mg/kg	1.462	19.877	mg/kg	0.00199 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		19	mg/kg	1.126	21.392	mg/kg	0.00214 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	50.9	mg/kg	1.56	79.395	mg/kg	0.00509 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		10.3	mg/kg	2.976	30.656	mg/kg	0.00307 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				55.1	mg/kg	2.774	152.855	mg/kg	0.0153 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	•	pH 		PH		6.2	pH		6.2	pH	6.2 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	•	acenaphthylene 	205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	•	acenaphthene 	201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	•	fluorene 	201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	•	phenanthrene 	201-581-5	85-01-8		0.15	mg/kg		0.15	mg/kg	0.000015 %		
19	•	anthracene 	204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	•	fluoranthene 	205-912-4	206-44-0		0.34	mg/kg		0.34	mg/kg	0.000034 %		
21	•	pyrene 	204-927-3	129-00-0		0.33	mg/kg		0.33	mg/kg	0.000033 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.23	mg/kg		0.23	mg/kg	0.000023 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.23	mg/kg		0.23	mg/kg	0.000023 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.27	mg/kg		0.27	mg/kg	0.000027 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.22	mg/kg		0.22	mg/kg	0.000022 %		
27	•	indeno[123-cd]pyrene 	205-893-2	193-39-5		0.14	mg/kg		0.14	mg/kg	0.000014 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	•	benzo[ghi]perylene 	205-883-8	191-24-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0303 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP422[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP422[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
32.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 32.2% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.2	mg/kg	1.32	16.108	mg/kg	0.00161 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.24	mg/kg	1.142	0.274	mg/kg	0.0000274 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		17.8	mg/kg	1.462	26.016	mg/kg	0.0026 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		15	mg/kg	1.126	16.888	mg/kg	0.00169 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	42	mg/kg	1.56	65.512	mg/kg	0.0042 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		12	mg/kg	2.976	35.715	mg/kg	0.00357 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				49.3	mg/kg	2.774	136.765	mg/kg	0.0137 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	•	pH		PH		6.6	pH		6.6	pH	6.6 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
15	•	acenaphthylene	205-917-1	208-96-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
16	•	acenaphthene	201-469-6	83-32-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
17	•	fluorene	201-695-5	86-73-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
18	•	phenanthrene	201-581-5	85-01-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
19	•	anthracene	204-371-1	120-12-7		0.12	mg/kg		0.12	mg/kg	0.000012 %		
20	•	fluoranthene	205-912-4	206-44-0		0.12	mg/kg		0.12	mg/kg	0.000012 %		
21	•	pyrene	204-927-3	129-00-0		0.12	mg/kg		0.12	mg/kg	0.000012 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.12	mg/kg		0.12	mg/kg	0.000012 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.12	mg/kg		0.12	mg/kg	0.000012 %		
27	•	indeno[123-cd]pyrene	205-893-2	193-39-5		0.12	mg/kg		0.12	mg/kg	0.000012 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.12	mg/kg		0.12	mg/kg	0.000012 %		
29	•	benzo[ghi]perylene	205-883-8	191-24-2		0.12	mg/kg		0.12	mg/kg	0.000012 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0282 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP423

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP423		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
39.6% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 39.6% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		18.7	mg/kg	1.32	24.69	mg/kg	0.00247 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.4	mg/kg	3.22	4.508	mg/kg	0.000451 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.46	mg/kg	1.142	0.525	mg/kg	0.0000525 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } / 215-160-9 / 1308-38-9		25.1	mg/kg	1.462	36.685	mg/kg	0.00367 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		40.6	mg/kg	1.126	45.711	mg/kg	0.00457 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	94.8	mg/kg	1.56	147.87	mg/kg	0.00948 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.65	mg/kg	1.353	0.88	mg/kg	0.000088 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		22	mg/kg	2.976	65.478	mg/kg	0.00655 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.9	mg/kg	2.554	2.298	mg/kg	0.00023 %		
11	zinc { zinc chromate } 024-007-00-3		195.1	mg/kg	2.774	541.236	mg/kg	0.0541 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.8	mg/kg	1.884	1.507	mg/kg	0.000151 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.3	pH		6.3	pH	6.3 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.13	mg/kg		0.13	mg/kg	0.000013 %		
16	●	acenaphthene	201-469-6	83-32-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
17	●	fluorene	201-695-5	86-73-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
18	●	phenanthrene	201-581-5	85-01-8		0.17	mg/kg		0.17	mg/kg	0.000017 %		
19	●	anthracene	204-371-1	120-12-7		0.13	mg/kg		0.13	mg/kg	0.000013 %		
20	●	fluoranthene	205-912-4	206-44-0		0.36	mg/kg		0.36	mg/kg	0.000036 %		
21	●	pyrene	204-927-3	129-00-0		0.33	mg/kg		0.33	mg/kg	0.000033 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.22	mg/kg		0.22	mg/kg	0.000022 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.22	mg/kg		0.22	mg/kg	0.000022 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.26	mg/kg		0.26	mg/kg	0.000026 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.13	mg/kg		0.13	mg/kg	0.000013 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.2	mg/kg		0.2	mg/kg	0.00002 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.13	mg/kg		0.13	mg/kg	0.000013 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.13	mg/kg		0.13	mg/kg	0.000013 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.13	mg/kg		0.13	mg/kg	0.000013 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.8	mg/kg		0.8	mg/kg	0.00008 %		
										Total:	0.0822 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH428

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH428		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
30.3% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00003%)

Determinands

Moisture content: 30.3% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		9	mg/kg	1.32	11.883	mg/kg	0.00119 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		31	mg/kg	1.462	45.308	mg/kg	0.00453 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		0.2	mg/kg	1.923	0.385	mg/kg	0.0000385 %		
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		17.9	mg/kg	1.126	20.153	mg/kg	0.00202 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	20	mg/kg	1.56	31.196	mg/kg	0.002 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		17	mg/kg	2.976	50.597	mg/kg	0.00506 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11	zinc { zinc chromate } 024-007-00-3				44.7	mg/kg	2.774	124.004	mg/kg	0.0124 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		
		006-007-00-5											
13		pH				8	pH		8	pH	8pH		
				PH									
14		naphthalene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-917-1	208-96-8									
16		acenaphthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-469-6	83-32-9									
17		fluorene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-695-5	86-73-7									
18		phenanthrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-581-5	85-01-8									
19		anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-371-1	120-12-7									
20		fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-912-4	206-44-0									
21		pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			205-883-8	191-24-2									
30		phenol				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0281 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH428[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH428[1]
Sample Depth:
0.2 m
Moisture content:
25.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 25.6% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		15.2	mg/kg	1.32	20.069	mg/kg	0.00201 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		1	mg/kg	3.22	3.22	mg/kg	0.000322 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.25	mg/kg	1.142	0.286	mg/kg	0.0000286 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		18.1	mg/kg	1.462	26.454	mg/kg	0.00265 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		29.9	mg/kg	1.126	33.664	mg/kg	0.00337 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	72	mg/kg	1.56	112.307	mg/kg	0.0072 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.52	mg/kg	1.353	0.704	mg/kg	0.0000704 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		16	mg/kg	2.976	47.62	mg/kg	0.00476 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				80.9	mg/kg	2.774	224.428	mg/kg	0.0224 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.1 pH		7.1 pH	7.1 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.11 mg/kg		0.11 mg/kg	0.000011 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.11 mg/kg		0.11 mg/kg	0.000011 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11 mg/kg		0.11 mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.11 mg/kg		0.11 mg/kg	0.000011 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.11 mg/kg		0.11 mg/kg	0.000011 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.11 mg/kg		0.11 mg/kg	0.000011 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.17 mg/kg		0.17 mg/kg	0.000017 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.16 mg/kg		0.16 mg/kg	0.000016 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.11 mg/kg		0.11 mg/kg	0.000011 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.11 mg/kg		0.11 mg/kg	0.000011 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.15 mg/kg		0.15 mg/kg	0.000015 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.11 mg/kg		0.11 mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.11 mg/kg		0.11 mg/kg	0.000011 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.11 mg/kg		0.11 mg/kg	0.000011 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.11 mg/kg		0.11 mg/kg	0.000011 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.11 mg/kg		0.11 mg/kg	0.000011 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7 mg/kg		0.7 mg/kg	0.00007 %		
						Total:	0.0434 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH429

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH429		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.1 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
44.7% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 44.7% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		23.4	mg/kg	1.32	30.896	mg/kg	0.00309 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1	mg/kg	3.22	3.22	mg/kg	0.000322 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.3	mg/kg	1.142	0.343	mg/kg	0.0000343 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		19.1	mg/kg	1.462	27.916	mg/kg	0.00279 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		40.3	mg/kg	1.126	45.373	mg/kg	0.00454 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	101.3	mg/kg	1.56	158.009	mg/kg	0.0101 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.57	mg/kg	1.353	0.771	mg/kg	0.0000771 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17.5	mg/kg	2.976	52.085	mg/kg	0.00521 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11	zinc { zinc chromate }	024-007-00-3				102.2	mg/kg	2.774	283.518	mg/kg	0.0284 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.9	mg/kg	1.884	1.696	mg/kg	0.00017 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		6.6	pH		6.6	pH	6.6 pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.14	mg/kg		0.14	mg/kg	0.000014 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.14	mg/kg		0.14	mg/kg	0.000014 %		
16	●	acenaphthene	201-469-6	83-32-9		0.14	mg/kg		0.14	mg/kg	0.000014 %		
17	●	fluorene	201-695-5	86-73-7		0.14	mg/kg		0.14	mg/kg	0.000014 %		
18	●	phenanthrene	201-581-5	85-01-8		0.22	mg/kg		0.22	mg/kg	0.000022 %		
19	●	anthracene	204-371-1	120-12-7		0.14	mg/kg		0.14	mg/kg	0.000014 %		
20	●	fluoranthene	205-912-4	206-44-0		0.54	mg/kg		0.54	mg/kg	0.000054 %		
21	●	pyrene	204-927-3	129-00-0		0.47	mg/kg		0.47	mg/kg	0.000047 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.29	mg/kg		0.29	mg/kg	0.000029 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.29	mg/kg		0.29	mg/kg	0.000029 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.4	mg/kg		0.4	mg/kg	0.00004 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.14	mg/kg		0.14	mg/kg	0.000014 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.29	mg/kg		0.29	mg/kg	0.000029 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.2	mg/kg		0.2	mg/kg	0.00002 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.14	mg/kg		0.14	mg/kg	0.000014 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.18	mg/kg		0.18	mg/kg	0.000018 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.9	mg/kg		0.9	mg/kg	0.00009 %		
										Total:	0.0554 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH429[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:	
BH429[1]	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
1 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:		
26.1% (no correction)		

Hazard properties

None identified

Determinands

Moisture content: 26.1% No Moisture Correction applied (MC)

#	Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		10.4	mg/kg	1.32	13.731	mg/kg	0.00137 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		36	mg/kg	1.462	52.616	mg/kg	0.00526 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		28.5	mg/kg	1.126	32.088	mg/kg	0.00321 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	19.5	mg/kg	1.56	30.416	mg/kg	0.00195 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.6	mg/kg	1.353	0.812	mg/kg	0.0000812 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		41.1	mg/kg	2.976	122.324	mg/kg	0.0122 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate } 024-007-00-3		76	mg/kg	2.774	210.835	mg/kg	0.0211 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	•	pH			PH		7.8	pH		7.8	pH	7.8 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	•	acenaphthylene		205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	•	acenaphthene		201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	•	fluorene		201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	•	phenanthrene		201-581-5	85-01-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
19	•	anthracene		204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	•	fluoranthene		205-912-4	206-44-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
21	•	pyrene		204-927-3	129-00-0		0.11	mg/kg		0.11	mg/kg	0.000011 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
27	•	indeno[123-cd]pyrene		205-893-2	193-39-5		0.11	mg/kg		0.11	mg/kg	0.000011 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	•	benzo[ghi]perylene		205-883-8	191-24-2		0.11	mg/kg		0.11	mg/kg	0.000011 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
											Total:	0.046 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP427

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP427
Sample Depth:
0.15 m
Moisture content:
23.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23.6% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		19.7	mg/kg	1.32	26.01	mg/kg	0.0026 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.46	mg/kg	1.142	0.525	mg/kg	0.0000525 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		41.8	mg/kg	1.462	61.093	mg/kg	0.00611 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		62.2	mg/kg	1.126	70.03	mg/kg	0.007 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	225.6	mg/kg	1.56	351.894	mg/kg	0.0226 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.56	mg/kg	1.353	0.758	mg/kg	0.0000758 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		20.5	mg/kg	2.976	61.013	mg/kg	0.0061 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.8	mg/kg	2.554	2.043	mg/kg	0.000204 %		
11	zinc { zinc chromate } 024-007-00-3				187	mg/kg	2.774	518.765	mg/kg	0.0519 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.8	pH		7.8	pH	7.8 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.24	mg/kg		0.24	mg/kg	0.000024 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.5	mg/kg		0.5	mg/kg	0.00005 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.46	mg/kg		0.46	mg/kg	0.000046 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.3	mg/kg		0.3	mg/kg	0.00003 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.3	mg/kg		0.3	mg/kg	0.00003 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.42	mg/kg		0.42	mg/kg	0.000042 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.16	mg/kg		0.16	mg/kg	0.000016 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.3	mg/kg		0.3	mg/kg	0.00003 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.24	mg/kg		0.24	mg/kg	0.000024 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.21	mg/kg		0.21	mg/kg	0.000021 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0974 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH423

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH423		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)
Moisture content:			
58.9% (no correction)			

Hazard properties (substances considered hazardous until shown otherwise)

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00003%)

Determinands

Moisture content: 58.9% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		31.1	mg/kg	1.32	41.062	mg/kg	0.00411 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		2	mg/kg	3.22	6.44	mg/kg	0.000644 %		
3		cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.9	mg/kg	1.142	1.028	mg/kg	0.000103 %		
4		chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		46.3	mg/kg	1.462	67.67	mg/kg	0.00677 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		0.2	mg/kg	1.923	0.385	mg/kg	0.0000385 %		
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		85.8	mg/kg	1.126	96.601	mg/kg	0.00966 %		
7		lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	247	mg/kg	1.56	385.274	mg/kg	0.0247 %		
8		mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.77	mg/kg	1.353	1.042	mg/kg	0.000104 %		
9		nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		27	mg/kg	2.976	80.359	mg/kg	0.00804 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				1.7	mg/kg	2.554	4.341	mg/kg	0.000434 %		
11		zinc { zinc chromate } 024-007-00-3				260.9	mg/kg	2.774	723.775	mg/kg	0.0724 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				1.2	mg/kg	1.884	2.261	mg/kg	0.000226 %		
		006-007-00-5											
13		pH				7.7	pH		7.7	pH	7.7 pH		
				PH									
14		naphthalene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			205-917-1	208-96-8									
16		acenaphthene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			201-469-6	83-32-9									
17		fluorene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			201-695-5	86-73-7									
18		phenanthrene				0.63	mg/kg		0.63	mg/kg	0.000063 %		
			201-581-5	85-01-8									
19		anthracene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
			204-371-1	120-12-7									
20		fluoranthene				1.9	mg/kg		1.9	mg/kg	0.00019 %		
			205-912-4	206-44-0									
21		pyrene				1.65	mg/kg		1.65	mg/kg	0.000165 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.88	mg/kg		0.88	mg/kg	0.000088 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.88	mg/kg		0.88	mg/kg	0.000088 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				1.39	mg/kg		1.39	mg/kg	0.000139 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.46	mg/kg		0.46	mg/kg	0.000046 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.92	mg/kg		0.92	mg/kg	0.000092 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.75	mg/kg		0.75	mg/kg	0.000075 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.19	mg/kg		0.19	mg/kg	0.000019 %		
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.66	mg/kg		0.66	mg/kg	0.000066 %		
			205-883-8	191-24-2									
30		phenol				1.2	mg/kg		1.2	mg/kg	0.00012 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.128 %		

Key

	User supplied data
	Potentially Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH423[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH423[1]
Sample Depth:
0.5 m
Moisture content:
22.6%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22.6% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9	mg/kg	1.32	11.883	mg/kg	0.00119 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		21.8	mg/kg	1.462	31.862	mg/kg	0.00319 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		19.1	mg/kg	1.126	21.504	mg/kg	0.00215 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	32.4	mg/kg	1.56	50.538	mg/kg	0.00324 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.55	mg/kg	1.353	0.744	mg/kg	0.0000744 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		16	mg/kg	2.976	47.62	mg/kg	0.00476 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				70.7	mg/kg	2.774	196.132	mg/kg	0.0196 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		7.7 pH		7.7 pH	7.7 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.1 mg/kg		0.1 mg/kg	0.00001 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.1 mg/kg		0.1 mg/kg	0.00001 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.1 mg/kg		0.1 mg/kg	0.00001 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.1 mg/kg		0.1 mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.1 mg/kg		0.1 mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.1 mg/kg		0.1 mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.1 mg/kg		0.1 mg/kg	0.00001 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.1 mg/kg		0.1 mg/kg	0.00001 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.6 mg/kg		0.6 mg/kg	0.00006 %		
						Total:	0.0349 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH430

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	**BH430**	LoW Code:	
Sample Depth:	**0.2 m**	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	**23.9%** (no correction)	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23.9% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.8	mg/kg	1.32	18.22	mg/kg	0.00182 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		19.3	mg/kg	1.462	28.208	mg/kg	0.00282 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		22.3	mg/kg	1.126	25.107	mg/kg	0.00251 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	48.9	mg/kg	1.56	76.275	mg/kg	0.00489 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.52	mg/kg	1.353	0.704	mg/kg	0.0000704 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		11.8	mg/kg	2.976	35.12	mg/kg	0.00351 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.7	mg/kg	2.554	1.788	mg/kg	0.000179 %		
11	zinc { zinc chromate }	024-007-00-3				61.3	mg/kg	2.774	170.055	mg/kg	0.017 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH			PH		7.5	pH		7.5	pH	7.5 pH		
14		naphthalene	601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene		205-917-1	208-96-8		0.2	mg/kg		0.2	mg/kg	0.00002 %		
16	●	acenaphthene		201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene		201-695-5	86-73-7		0.14	mg/kg		0.14	mg/kg	0.000014 %		
18	●	phenanthrene		201-581-5	85-01-8		1.39	mg/kg		1.39	mg/kg	0.000139 %		
19	●	anthracene		204-371-1	120-12-7		0.37	mg/kg		0.37	mg/kg	0.000037 %		
20	●	fluoranthene		205-912-4	206-44-0		1.68	mg/kg		1.68	mg/kg	0.000168 %		
21	●	pyrene		204-927-3	129-00-0		1.38	mg/kg		1.38	mg/kg	0.000138 %		
22		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.68	mg/kg		0.68	mg/kg	0.000068 %		
23		chrysene	601-048-00-0	205-923-4	218-01-9		0.68	mg/kg		0.68	mg/kg	0.000068 %		
24		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.68	mg/kg		0.68	mg/kg	0.000068 %		
25		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.24	mg/kg		0.24	mg/kg	0.000024 %		
26		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.53	mg/kg		0.53	mg/kg	0.000053 %		
27	●	indeno[123-cd]pyrene		205-893-2	193-39-5		0.33	mg/kg		0.33	mg/kg	0.000033 %		
28		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene		205-883-8	191-24-2		0.28	mg/kg		0.28	mg/kg	0.000028 %		
30		phenol	604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
											Total:	0.0341 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH431

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH431		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
27.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 27.1% No Moisture Correction applied (MC)

#	Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		14.7	mg/kg	1.32	19.409	mg/kg	0.00194 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		0.7	mg/kg	3.22	2.254	mg/kg	0.000225 %		
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		0.29	mg/kg	1.142	0.331	mg/kg	0.0000331 %		
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		21.7	mg/kg	1.462	31.716	mg/kg	0.00317 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		30	mg/kg	1.126	33.777	mg/kg	0.00338 %		
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	71	mg/kg	1.56	110.747	mg/kg	0.0071 %		
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		0.56	mg/kg	1.353	0.758	mg/kg	0.0000758 %		
9	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		17.3	mg/kg	2.976	51.489	mg/kg	0.00515 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate } 024-007-00-3		74.2	mg/kg	2.774	205.842	mg/kg	0.0206 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7	pH		7	pH	7pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.11	mg/kg		0.11	mg/kg	0.000011 %		
16	●	acenaphthene	201-469-6	83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene	201-695-5	86-73-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
18	●	phenanthrene	201-581-5	85-01-8		0.34	mg/kg		0.34	mg/kg	0.000034 %		
19	●	anthracene	204-371-1	120-12-7		0.11	mg/kg		0.11	mg/kg	0.000011 %		
20	●	fluoranthene	205-912-4	206-44-0		0.58	mg/kg		0.58	mg/kg	0.000058 %		
21	●	pyrene	204-927-3	129-00-0		0.49	mg/kg		0.49	mg/kg	0.000049 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.26	mg/kg		0.26	mg/kg	0.000026 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.26	mg/kg		0.26	mg/kg	0.000026 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.29	mg/kg		0.29	mg/kg	0.000029 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.23	mg/kg		0.23	mg/kg	0.000023 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.15	mg/kg		0.15	mg/kg	0.000015 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.11	mg/kg		0.11	mg/kg	0.000011 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.14	mg/kg		0.14	mg/kg	0.000014 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
										Total:	0.0424 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH431[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH431[1]		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.5 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
20.8% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 20.8% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5.6	mg/kg	1.32	7.394	mg/kg	0.000739 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22.7	mg/kg	1.462	33.177	mg/kg	0.00332 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		13.8	mg/kg	1.126	15.537	mg/kg	0.00155 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16.5	mg/kg	1.56	25.737	mg/kg	0.00165 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17.9	mg/kg	2.976	53.275	mg/kg	0.00533 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate }	024-007-00-3				40.8	mg/kg	2.774	113.185	mg/kg	0.0113 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
13	●	pH		PH		7	pH		7	pH	7pH		
14		naphthalene 601-052-00-2	202-049-5	91-20-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
15	●	acenaphthylene	205-917-1	208-96-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
16	●	acenaphthene	201-469-6	83-32-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
17	●	fluorene	201-695-5	86-73-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
18	●	phenanthrene	201-581-5	85-01-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
19	●	anthracene	204-371-1	120-12-7		0.1	mg/kg		0.1	mg/kg	0.00001 %		
20	●	fluoranthene	205-912-4	206-44-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
21	●	pyrene	204-927-3	129-00-0		0.1	mg/kg		0.1	mg/kg	0.00001 %		
22		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
23		chrysene 601-048-00-0	205-923-4	218-01-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
24		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
25		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.1	mg/kg		0.1	mg/kg	0.00001 %		
27	●	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1	mg/kg		0.1	mg/kg	0.00001 %		
28		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.1	mg/kg		0.1	mg/kg	0.00001 %		
29	●	benzo[ghi]perylene	205-883-8	191-24-2		0.1	mg/kg		0.1	mg/kg	0.00001 %		
30		phenol 604-001-00-2	203-632-7	108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
										Total:	0.0246 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH433

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH433		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
25.1% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 25.1% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14.4	mg/kg	1.32	19.013	mg/kg	0.0019 %		
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.42	mg/kg	1.142	0.48	mg/kg	0.000048 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		25.5	mg/kg	1.462	37.27	mg/kg	0.00373 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		36.2	mg/kg	1.126	40.757	mg/kg	0.00408 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	101	mg/kg	1.56	157.541	mg/kg	0.0101 %		
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.54	mg/kg	1.353	0.731	mg/kg	0.0000731 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		18.6	mg/kg	2.976	55.359	mg/kg	0.00554 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.6	mg/kg	2.554	1.532	mg/kg	0.000153 %		
11	zinc { zinc chromate }	024-007-00-3				119.6	mg/kg	2.774	331.788	mg/kg	0.0332 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.7	mg/kg	1.884	1.319	mg/kg	0.000132 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		6.5	pH		6.5	pH	6.5 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.29	mg/kg		0.29	mg/kg	0.000029 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.47	mg/kg		0.47	mg/kg	0.000047 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.11	mg/kg		0.11	mg/kg	0.000011 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.4	mg/kg		0.4	mg/kg	0.00004 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		3	mg/kg		3	mg/kg	0.0003 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.8	mg/kg		0.8	mg/kg	0.00008 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		3.62	mg/kg		3.62	mg/kg	0.000362 %		
21	●	pyrene / 204-927-3 / 129-00-0		3.07	mg/kg		3.07	mg/kg	0.000307 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		1.51	mg/kg		1.51	mg/kg	0.000151 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		1.51	mg/kg		1.51	mg/kg	0.000151 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		1.51	mg/kg		1.51	mg/kg	0.000151 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.57	mg/kg		0.57	mg/kg	0.000057 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		1.24	mg/kg		1.24	mg/kg	0.000124 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.73	mg/kg		0.73	mg/kg	0.000073 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.16	mg/kg		0.16	mg/kg	0.000016 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.63	mg/kg		0.63	mg/kg	0.000063 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.7	mg/kg		0.7	mg/kg	0.00007 %		
								Total:	0.0612 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH420

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
BH420		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
49.2% (no correction)			

Hazard properties

None identified

Determinands

Moisture content: 49.2% No Moisture Correction applied (MC)

#		Determinand CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		12	mg/kg	1.32	15.844	mg/kg	0.00158 %		
2		boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		2.4	mg/kg	3.22	7.728	mg/kg	0.000773 %		
3		cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.47	mg/kg	1.142	0.537	mg/kg	0.0000537 %		
4		chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		29.5	mg/kg	1.462	43.116	mg/kg	0.00431 %		
5		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		**<LOD**
6		copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		41.4	mg/kg	1.126	46.612	mg/kg	0.00466 %		
7		lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	392	mg/kg	1.56	611.448	mg/kg	0.0392 %		
8		mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.74	mg/kg	1.353	1.002	mg/kg	0.0001 %		
9		nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		18.8	mg/kg	2.976	55.954	mg/kg	0.0056 %		
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				1	mg/kg	2.554	2.554	mg/kg	0.000255 %		
11		zinc { zinc chromate } 024-007-00-3				135.4	mg/kg	2.774	375.619	mg/kg	0.0376 %		
12		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				1	mg/kg	1.884	1.884	mg/kg	0.000188 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		8.2	pH		8.2	pH	8.2 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.16	mg/kg		0.16	mg/kg	0.000016 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.16	mg/kg		0.16	mg/kg	0.000016 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.16	mg/kg		0.16	mg/kg	0.000016 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.16	mg/kg		0.16	mg/kg	0.000016 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.18	mg/kg		0.18	mg/kg	0.000018 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.16	mg/kg		0.16	mg/kg	0.000016 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.45	mg/kg		0.45	mg/kg	0.000045 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.39	mg/kg		0.39	mg/kg	0.000039 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.24	mg/kg		0.24	mg/kg	0.000024 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.24	mg/kg		0.24	mg/kg	0.000024 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.33	mg/kg		0.33	mg/kg	0.000033 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.16	mg/kg		0.16	mg/kg	0.000016 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.24	mg/kg		0.24	mg/kg	0.000024 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.2	mg/kg		0.2	mg/kg	0.00002 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.16	mg/kg		0.16	mg/kg	0.000016 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.2	mg/kg		0.2	mg/kg	0.00002 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		2.4	mg/kg		2.4	mg/kg	0.00024 %		
								Total:	0.0949 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH420[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH420[1]
Sample Depth:
1 m
Moisture content:
14.3%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.3% No Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		12	mg/kg	1.32	15.844	mg/kg	0.00158 %		
2	boron { diboron trioxide; boric oxide } 005-008-00-8	215-125-8	1303-86-2		0.5	mg/kg	3.22	1.61	mg/kg	0.000161 %		
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		21.4	mg/kg	1.462	31.277	mg/kg	0.00313 %		
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.1	mg/kg	1.923	<0.192	mg/kg	<0.0000192 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		15.4	mg/kg	1.126	17.339	mg/kg	0.00173 %		
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	20.6	mg/kg	1.56	32.132	mg/kg	0.00206 %		
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
9	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		20.4	mg/kg	2.976	60.716	mg/kg	0.00607 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				0.5	mg/kg	2.554	1.277	mg/kg	0.000128 %		
11	zinc { zinc chromate } 024-007-00-3				47.9	mg/kg	2.774	132.882	mg/kg	0.0133 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5				0.6	mg/kg	1.884	1.13	mg/kg	0.000113 %		

#		Determinand CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
13	●	pH / / PH		8.2	pH		8.2	pH	8.2 pH		
14		naphthalene 601-052-00-2 / 202-049-5 / 91-20-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
15	●	acenaphthylene / 205-917-1 / 208-96-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
16	●	acenaphthene / 201-469-6 / 83-32-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
17	●	fluorene / 201-695-5 / 86-73-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
18	●	phenanthrene / 201-581-5 / 85-01-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
19	●	anthracene / 204-371-1 / 120-12-7		0.09	mg/kg		0.09	mg/kg	0.000009 %		
20	●	fluoranthene / 205-912-4 / 206-44-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
21	●	pyrene / 204-927-3 / 129-00-0		0.09	mg/kg		0.09	mg/kg	0.000009 %		
22		benzo[a]anthracene 601-033-00-9 / 200-280-6 / 56-55-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
23		chrysene 601-048-00-0 / 205-923-4 / 218-01-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
24		benzo[b]fluoranthene 601-034-00-4 / 205-911-9 / 205-99-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
25		benzo[k]fluoranthene 601-036-00-5 / 205-916-6 / 207-08-9		0.09	mg/kg		0.09	mg/kg	0.000009 %		
26		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3 / 200-028-5 / 50-32-8		0.09	mg/kg		0.09	mg/kg	0.000009 %		
27	●	indeno[123-cd]pyrene / 205-893-2 / 193-39-5		0.09	mg/kg		0.09	mg/kg	0.000009 %		
28		dibenz[a,h]anthracene 601-041-00-2 / 200-181-8 / 53-70-3		0.09	mg/kg		0.09	mg/kg	0.000009 %		
29	●	benzo[ghi]perylene / 205-883-8 / 191-24-2		0.09	mg/kg		0.09	mg/kg	0.000009 %		
30		phenol 604-001-00-2 / 203-632-7 / 108-95-2		0.6	mg/kg		0.6	mg/kg	0.00006 %		
								Total:	0.0286 %		

Key

(yellow)	User supplied data
(grey)	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

chromium(III) oxide (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Risk Phrases: R61 , R60 , R50/53 , R43 , R42 , R38 , R37 , R36 , R22 , R20
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

dicopper oxide; copper (I) oxide (EC Number: 215-270-7, CAS Number: 1317-39-1)

CLP index number: 029-002-00-X
Description/Comments: M-factor for long-term aquatic hazard not included as per paragraph (5), ATP9
Data source: Regulation (EU) 2016/1179 of 19 July 2016 (ATP9)
Additional Risk Phrases: N R50/53 >= 0.25 %, N R50/53
Additional Hazard Statement(s): None.
Reason for additional Hazards Statement(s)/Risk Phrase(s):
10 Oct 2016 - N R50/53 >= 0.25 % risk phrase sourced from: WM3 v1 still uses ecotoxic risk phrases
10 Oct 2016 - N R50/53 risk phrase sourced from: WM3 v1 still uses ecotoxic risk phrases

salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

CLP index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Risk Phrases: None.
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s)/Risk Phrase(s):
14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Risk Phrases: None.
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Risk Phrases: R38 , R37 , R36 , R27 , R26 , R22
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Risk Phrases: N R51/53 , N R50/53 , R38 , R37 , R36
Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Risk Phrases: N R50/53
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Risk Phrases: N R50/53 , R43 , R40 , R38 , R37 , R36 , R22
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Risk Phrases: N R50/53 , R43 , R38 , R37 , R36
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Risk Phrases: N R50/53 , Xn R22
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Risk Phrases: N R50/53 , Xi R36/37/38
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Risk Phrases: R40
Hazard Statements: Carc. 2 H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Risk Phrases: N R50/53
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Risk Phrases: R65 , R63 , R51/53 , R46 , R45 , R10
Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Risk Phrases: None.
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s)/Risk Phrase(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition, May 2015
HazWasteOnline Classification Engine Version: 2018.157.3544.7274 (06 Jun 2018)
HazWasteOnline Database: 2018.157.3544.7274 (06 Jun 2018)

This classification utilises the following guidance and legislation:
WM3 - Waste Classification - May 2015
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

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Appendix B – Pumping Test Report

Trans-Pennine Upgrade

Pumping test at Mottram-in-Longdendale Interpretative Report

HE551473-ARC-VGN-TPU-RP-Z-3118
14 February 2019

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363

DOCUMENT CONTROL

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1.0	17 October 2018	First Issue to HE	Steve Cone
2.0	14 February 2019	Second Issue to HE	Steve Cone

REVIEWER LIST

Name	Role
[redacted]	

APPROVALS

Name	Signature	Title	Date of Issue	Version

TABLE OF CONTENTS

1 Introduction

1.1.1 As part of the proposed Trans-Pennine Upgrade scheme (the 'Scheme') a new underpass is proposed at Mottram in Longdendale ('Mottram village'). The construction of the underpass will require excavation into the Millstone Grit Group, a confined, fractured rock aquifer. The groundwater level of the Millstone Grit Group is close to the ground surface and artesian in places therefore it is expected that groundwater inflows will be encountered during future works.

1.1.2 As a part of a ground investigation completed in 2018, a pumping test was completed at Mottram village in the area of the proposed underpass. The objectives of the pumping test were to:

- Define the hydraulic properties of the Millstone Grit Group and the groundwater conditions;
- To provide information to improve estimation of the likely dewatering rates and volumes required for construction of the Scheme;
- To provide groundwater related information for assessment of longer term drainage requirements;
- Investigate whether faulting at Mottram village was transmissive along the fault;
- To help understand if the faulting acted as a barrier to groundwater flow or provides additional transmissivity; and
- Establish whether the water level in the Glacial Till responds to pumping within the Millstone Grit Group.

1.1.3 This report includes a brief description of the background geology and site, the boreholes installed and that were monitored, the test methodology and the results of analysis completed using the proprietary Aqtesolv™ software.

2 Existing environment

2.1 Geography

2.1.1 Mottram village lies at an elevation of 220 m above ordnance datum (m AOD) in the Metropolitan Borough of Tameside, Greater Manchester. It is approximately 3 miles west of the Peak District National Park. Average annual rainfall is 1,573 mm/year, with 869 mm (55%) of the annual rainfall falling in the winter months (Centre for Ecology and Hydrology, 2016). The land is drained by numerous surface water courses that ultimately discharge to the River Etherow.

2.2 Site description

2.2.1 The locations of the pumping and monitoring boreholes used in the pumping test at Mottram village are given in Figure 1. Monitoring boreholes BH407, BH408, BH409, BH413 and BH415 are located at radius' of between 16 to 45 m from the pumping borehole (BH414), which itself is to the south-west and approximately 5 m south-west of a fault (the 'Mottram Fault).

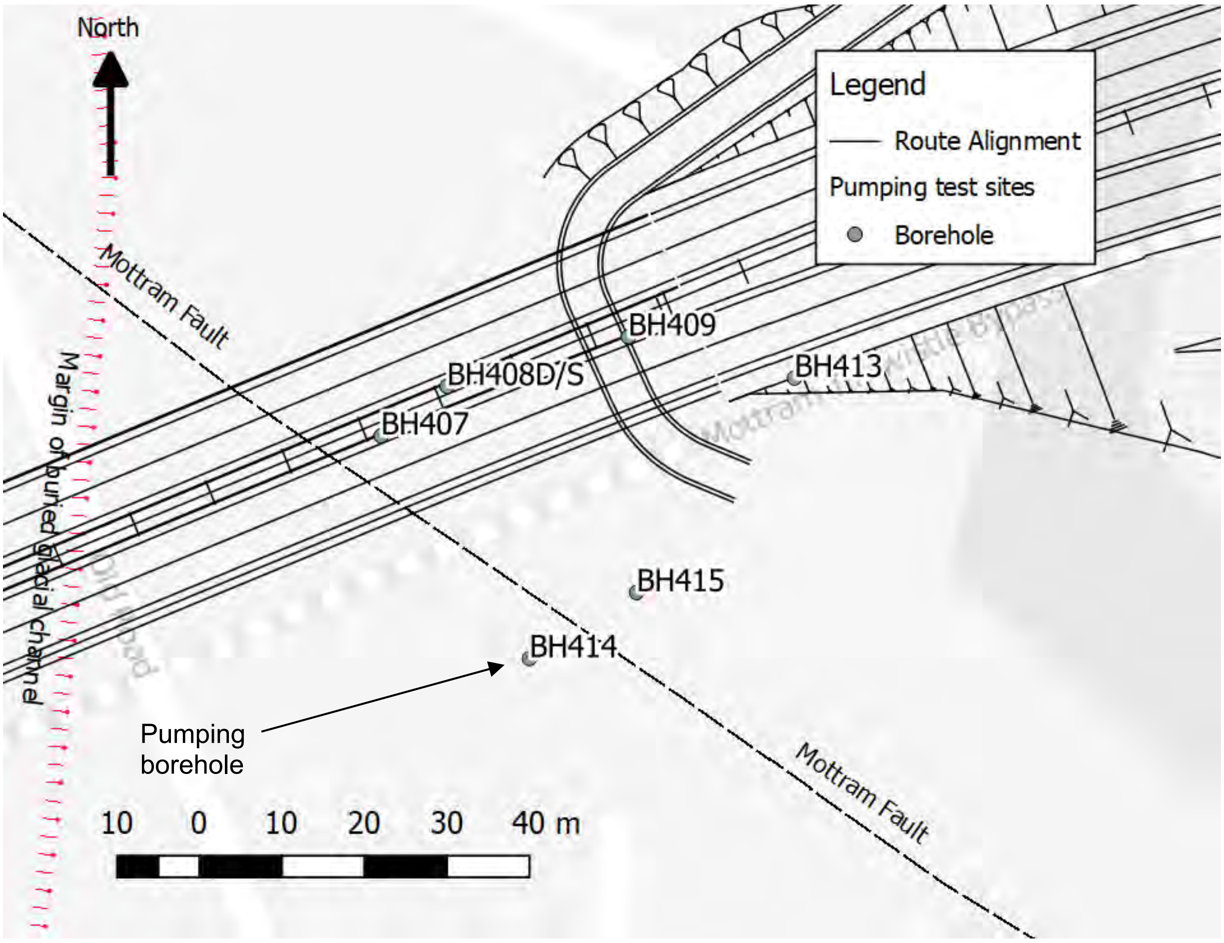


Figure 1: Site location plan.

2.3 Land use

2.3.1 The land around Mottram village is used for residential, commercial and pastoral purposes. The immediate area of the pumping test is residential. Here, the courses of natural drainage features have been modified and numerous additional town and highway drains are present.

2.4 Geology

2.4.1 The solid geology of the study area is dominated by the Carboniferous (Namurian) Millstone Grit Group (British Geological Survey, 2012). The series comprises a sequence of thick sandstone (or grit) units interbedded with mudstone and siltstone units. Around Mottram village, this includes the Fletcher Bank Grit and Marsden Formations. The Millstone Grit Group generally dips towards the south east at 10 to 20 degrees. The area has undergone tectonic deformation (folding and faulting) that has led to offsets of sandstone and mudstone units against one another and that creates a block-like sub-crop pattern of sandstone, siltstone and mudstone.

2.4.2 A zone of faulting with a north-west to south-east strike (the 'Mottram fault zone') bisects the Scheme. Mudstone and sandstone units are offset against one another across the fault zone. BH414, the pumping borehole is located on the western edge of the Mottram fault zone (see Drawing HE551473-ARC-HGT-S2_ML001-DR-CE-3062). BH407 is located north-west from BH414, also on the west side of the fault zone while the other monitoring sites are on the eastern side of it. In general, BH414 and BH407, on the western side of the Mottram fault zone, encountered deposits dominated by sandstone and siltstone. On the eastern side of the Mottram fault zone the borehole logs were dominated by mudstone with a sub-vertical joint set.

2.4.3 The formations of the Millstone Grit Group are overlain by Glacial Till. The Till is typically cohesive clay though contains occasional sand and silt material in discontinuous lenses (British Geological Survey, 2006).

2.5 Groundwater

2.5.1 The groundwater table is encountered within the pumping test area at between 197 m to 198 m AOD west of the Mottram fault zone. East of the Mottram fault zone it is encountered at an elevation of between 210 m to 213 m AOD and is artesian in places. East of the fault the groundwater level generally falls towards the south-east and west of the fault is falls more gradually to the south-west. The pumping test site is therefore situated on a groundwater divide. During drilling, groundwater was usually first encountered within the Millstone Grit Group because while the overlying Glacial Till is saturated, it yields very little or no water. Groundwater from the Millstone Grit Group is used locally for small groundwater sources.

3 Investigation borehole

3.1 Drilling and geology

3.1.1 Socatec Ltd. completed drilling of the investigation borehole between March 2018 and April 2018. The drilling was completed with a R62 Beretta T51 drilling rig, using a rotary core method (PWF size) and water flush. The pumping borehole was initially proposed to be BH413, however, during drilling it became clear that this would be a poor location and that BH414 would be more suited (see paragraph 3.1.2).

3.1.2 Over 30 m of mudstone was encountered at BH413. Packer testing indicated that the borehole had negligible transmissivity. During the equipment test, the borehole was only able to maintain a flow rate of less than 0.02 L/s. The site was abandoned as a pumping borehole for the pumping test as more favourable conditions were encountered during drilling of BH414.

3.1.3 BH414 encountered difficulties because of rapid loss of flush when drilling within the Millstone Grit Group. Where flush loss was evident, the borehole cores showed subvertical planar fractures and blocks of very weak siltstone with zones of ‘no-recovery’ and ‘recovery as gravel’. Packer testing within these intervals indicated significant hydraulic conductivity that confirmed the suitability of BH414 as an alternative pumping test borehole location.

3.1.4 provides a simplified geological profile of conditions encountered in the pumping test borehole (BH414). Drilling conditions were difficult because:

- The Millstone Grit Group was highly fractured with zones of significant confined or artesian water pressures;
- Where composed of mudstone the borehole was prone to collapse due to water pressure and the weakness and fractured nature of the formation; and
- Significant storage or transmissivity local to the borehole, possibly associated with fractured weak rock caused difficulty in the removal of cuttings due to flush loss.

Depth (m bgl)	Description
0.0 to 1.2	Topsoil
1.2 to 4.6	Soft to firm brown slightly gravelly sandy CLAY
4.6 to 9.54	Greyish brown fine-grained SANDSTONE, sometimes with slightly sandy micaceous siltstone
9.5 to 22.0	Weak, locally thinly to thickly laminated, dark brownish grey SILTSTONE, recovered as slightly sandy slightly clayey angular gravel.
22.0 to 25.4	Grey fine-grained SANDSTONE. Subvertical to 80 degree, dipping, undulating rough fractures, with likely calcite mineralisation.
25.4 to 34.0	SILTSTONE with occasional thinner sandstone layers. Steeply dipping, discontinuities, rough and planar usually mineralised with likely calcite. Thin (<20 cm) zones of non-recovery.

Table 1: Simplified geological profile at BH414.

3.2 Pumping borehole construction

3.2.1 The pumping borehole (BH414) installation is provided in Table 2.

Item	Depth (m)	Diameter (mm)
Casing	0.0 to 10.0	121
Screen	10.0 to 33.0	121
Sump	33.0 to 36	121

Table 2: Summary of construction details.

3.3 In-situ hydraulic conductivity testing

3.3.1 After the pumping borehole had been drilled (BH414), in-situ packer testing was carried out in the open hole in 3 m intervals from a depth of 30.0 m bgl to 7 m bgl.

3.3.2 In total, 8 packer tests were completed. contractors completing the tests had difficulty in:

- Providing sufficient water to the site;
- Providing sufficient water into the test zone; and
- Maintaining the packer seal in the fractured aquifer.

3.3.3 The analysis of the packer tests is reported in the 2018 Ground Investigation report and are replicated in Table 3. The large range of high and low hydraulic conductivity results highlight variability in the aquifer rock quality and is likely to be caused by the presence, or not, of discontinuities within a packer interval.

Test interval (m BGL)	Test result (m/s)	Comments
7-10	Stage 1: $1.6x10^{-5}$	Only the first step was successfully completed
10-13	Stage 1: $1.3x10^{-5}$	Only the first step was successfully completed
13-16	Stage 1: $1.4x10^{-5}$ Stage 2: $9.7x10^{-5}$	Second stage only partially completed
16-19	Stage 1: $1.0x10^{-5}$ Stage 2: $1.1x10^{-5}$	Failure of the packer seal in stage 2
19-21	Stage 1: $9.3x10^{-6}$ Stage 2: $8.9x10^{-6}$ Stage 3: $8.8x10^{-6}$ Stage 4: $7.9x10^{-6}$ Stage 5: $7.6x10^{-6}$	See note 2
21-24	Stage 1: $1.0x10^{-5}$	Unable to maintain pressure after 15 minutes of stage 1
24-27	Stage 1: $5.5x10^{-6}$ Stage 2: $7.3x10^{-6}$ Stage 3: $5.6x10^{-6}$	Contractor reported that ‘Pressure could not be removed’ after 3rd stage.

	Stage 4: No result Stage 5: 8.1×10^{-6}	
27-30	Stage 1: 3.6×10^{-7} Stage 2: 3.4×10^{-7} Stage 3: 5.5×10^{-7} Stage 4: 4.8×10^{-7} Stage 5: 6.4×10^{-7}	See note 3
Minimum	3.4×10^{-7}	
Maximum	9.7×10^{-5}	
Geometric average[1]	5.0×10^{-6}	
[1]The geometric mean does not include values for negative test results where no value was calculated due to failure of the test either due to high or low hydraulic conductivity in the formation [2]The test result may indicate that void filling has occurred, as the "at rest" result decreases without regard to the water pressure. In this case, the initial value (stage 1) is likely most representative of the formation. [3]The increase in hydraulic conductivity that occurs with higher pressures did not reduce as the pressure was later reduced. This result may be indicative of wash-out, where seepage has induced permanent damage to the rock mass, usually due to infillings wash out or permanent rock movements. In this case, the initial value (stage 1) is likely most representative of the formation.		

Table 3: Summary of packer testing at the pumping borehole.

4 Monitoring boreholes

4.1 Borehole construction

4.1.1 Table 4 provides information of the construction of monitoring boreholes monitored during the pumping test:

- BH414 (the pumping borehole) and BH413 were monitored using manual water level dips as well as automated loggers; and
- The remaining monitoring boreholes (BH405, BH407, BH408D, BH408S, BH409 and BH415) were installed with vibrating wire piezometers (VWPs).

Hole I.D.	Instrument Type	Instrument level (m BGL)	Top of response Zone (m BGL)	Bottom of response zone (m BGL)	Screened unit
BH405	VWP	15.00	13.00	17.00	Millstone Grit Group
BH407	VWP	15.00	13.50	16.50	Millstone Grit Group
BH408D	VWP	16.00	14.50	17.50	Millstone Grit Group
BH408S	VWP	7.25	6.50	8.00	Glacial Till
BH409	VWP	17.00	15.00	19.00	Millstone Grit Group
BH413	Standpipe	33.00	9.50	33.00	Millstone Grit Group
BH414	Standpipe	31.50	9.50	30.50	Millstone Grit Group
BH415	VWP	17.00	14.00	18.00	Millstone Grit Group

Table 4: Construction details for monitoring boreholes.

5 Constant rate pumping test

5.1 Timeline

5.1.1 The following key events occurred during pumping testing:

- 29/05/18 - equipment test and step test;
- 30/05/18 - constant rate test began at 9 am;
- 31/05/18 - riser parted at about 0300 to 0400 hrs and first day of constant rate test is halted;
- 01/06/18 - riser replaced, gate valve recalibrated, constant rate test commenced at 1530;
- 02/05/18 - flow rate adjusted as the borehole was drying out;
- 04/06/18 - flow rate adjusted as the borehole was drying out; and
- 12/06/18 - pumping discontinued from 1000 hrs for recovery.

5.2 Pre-test monitoring

5.2.1 Pre-test monitoring included barometric pressure and groundwater level measurement.

5.2.2 Figure 2 shows the barometric pressure record for March 2018 to July 2018. After the initial test start on the 30th May the barometric pressure rose to a maximum of 10.16 m on the 3rd of June. A significant low-pressure system moved across the site close to the end of the test on the 13th and 14th of June, recording the minimum barometric pressure observed during the period of 9.95 mH_2O.

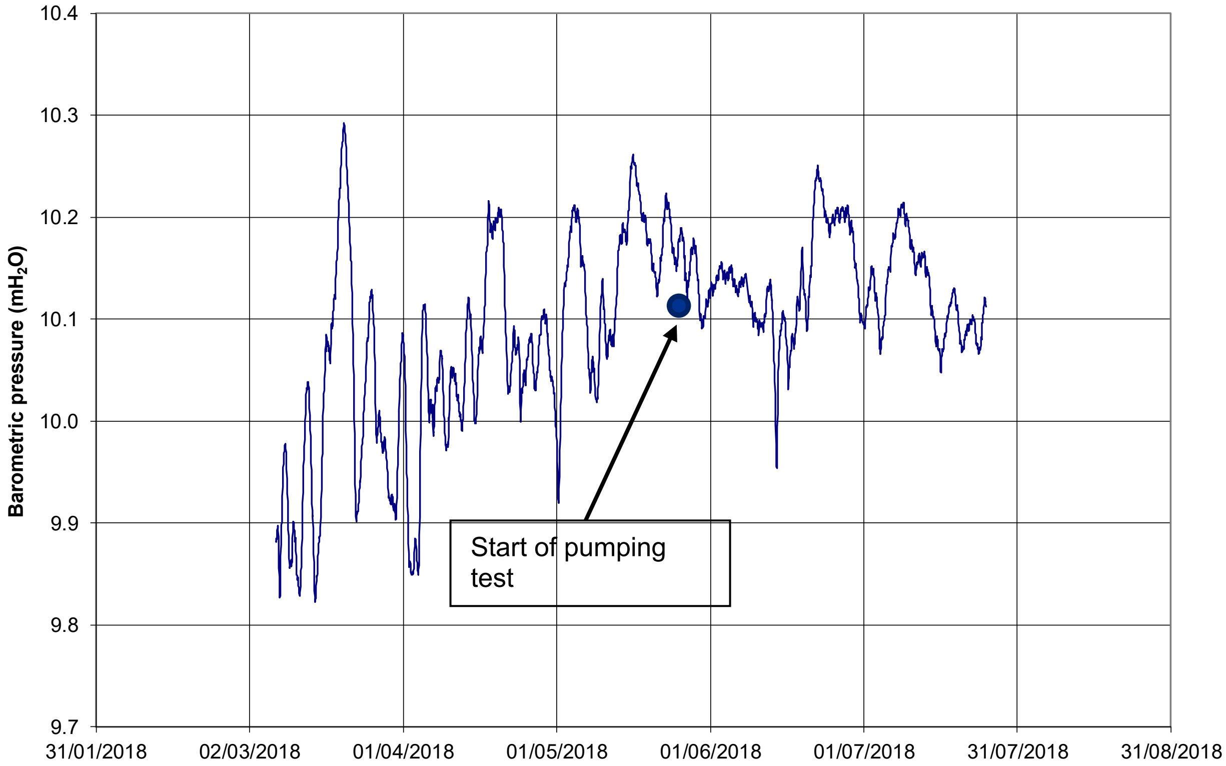


Figure 2: Barometric pressure prior to and through the test period

5.2.3 A plot of the water level monitoring data collected is shown in Figure 2. The monitoring was undertaken continuously from shortly after the installation of each site and for at least 3 days before the start of testing. Automated logger and VWP data were adjusted for barometric pressure changes where required (see Appendix A for the method of adjustment).

5.2.4 The pre-test monitoring, given in Figure 3, shows that:

- The groundwater level was declining at a rate of approximately 0.005 m/d at boreholes BH408D, BH408S, BH409 and BH415 from March 2018. Boreholes BH407, BH413 and BH414 do not clearly show this trend.
- BH407 shows evidence for infiltration of recharge to groundwater from rainfall, while the remaining sites do not show this clearly.

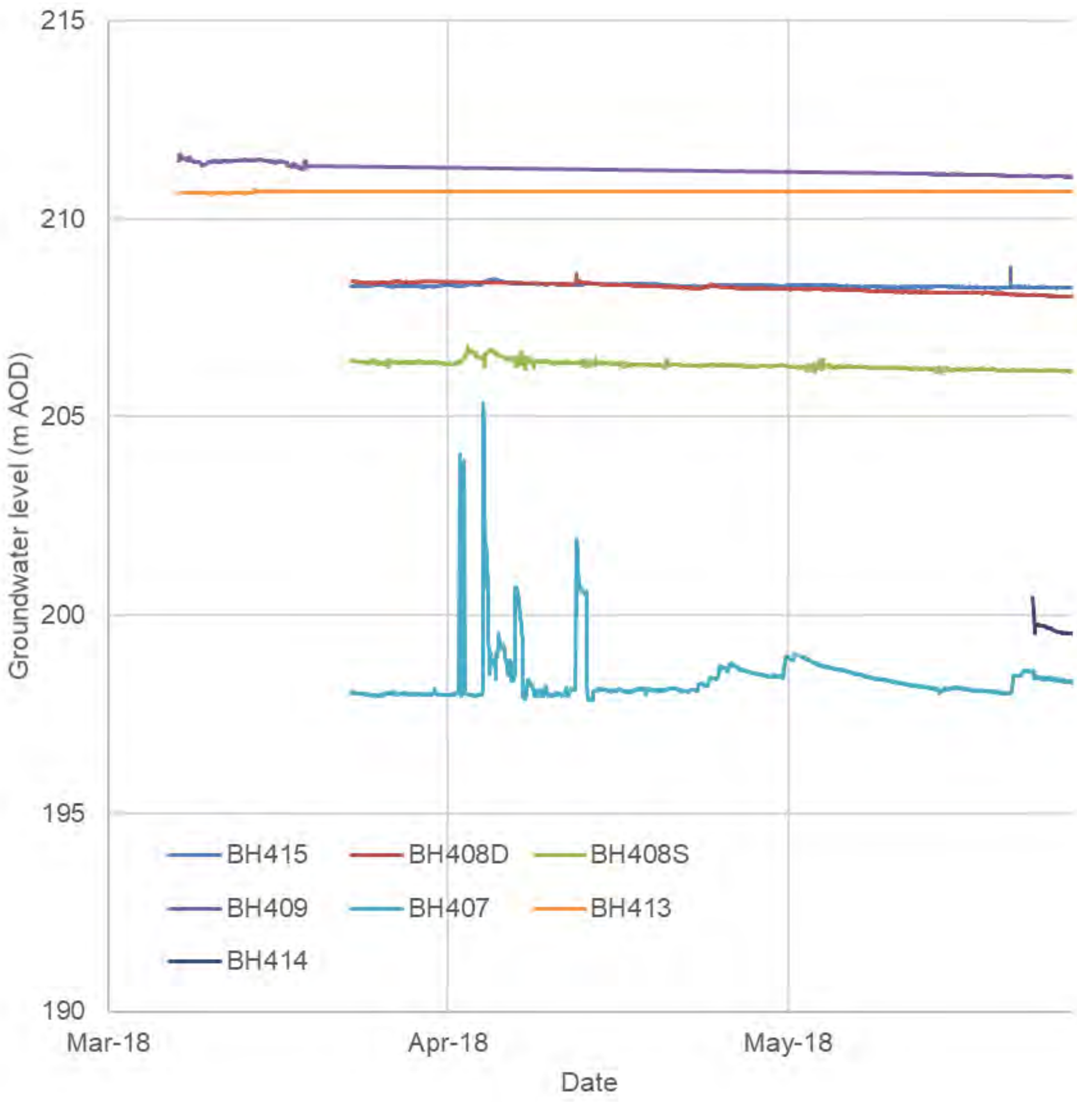


Figure 3: Pre-test groundwater levels.

5.3 Stepped-rate pumping test

5.3.1 Following the pre-test monitoring, a stepped rate pumping test was undertaken on the 29th May 2018. Testing was terminated soon after commencement of the fourth step as the planned pumping rate could not be sustained (due to drawdown limitations).

5.3.2 The results show that for three successful steps a stable water level was rapidly achieved. As the slope for each step is approximately horizontal it is considered that non-linear borehole losses are minimal, i.e. S_w/Q=B and C=0 (where S_w=drawdown, B=linear aquifer losses and C = non-linear borehole losses).

5.3.3 Plotting S_w/Q against Q for test steps 1, 2, and 3 results in value for B of 0.88 and a value for C of -0.0064 (approximately zero, confirming non-linear borehole losses are minimal). The results from the test are summarised in Table 5 and the time-drawdown plot given in Figure 4.

Step	Pump rate (L/s)	Drawdown (m)	Specific capacity (L/s/m)	Comment
1	0.26	17.17	0.015	
2	0.46	21.31	0.022	
3	0.53	30.26	0.018	
4	0.46	23.06	0.020	Recovering as target rate could not be achieved

Table 5: Summary of step rate test at BH414.

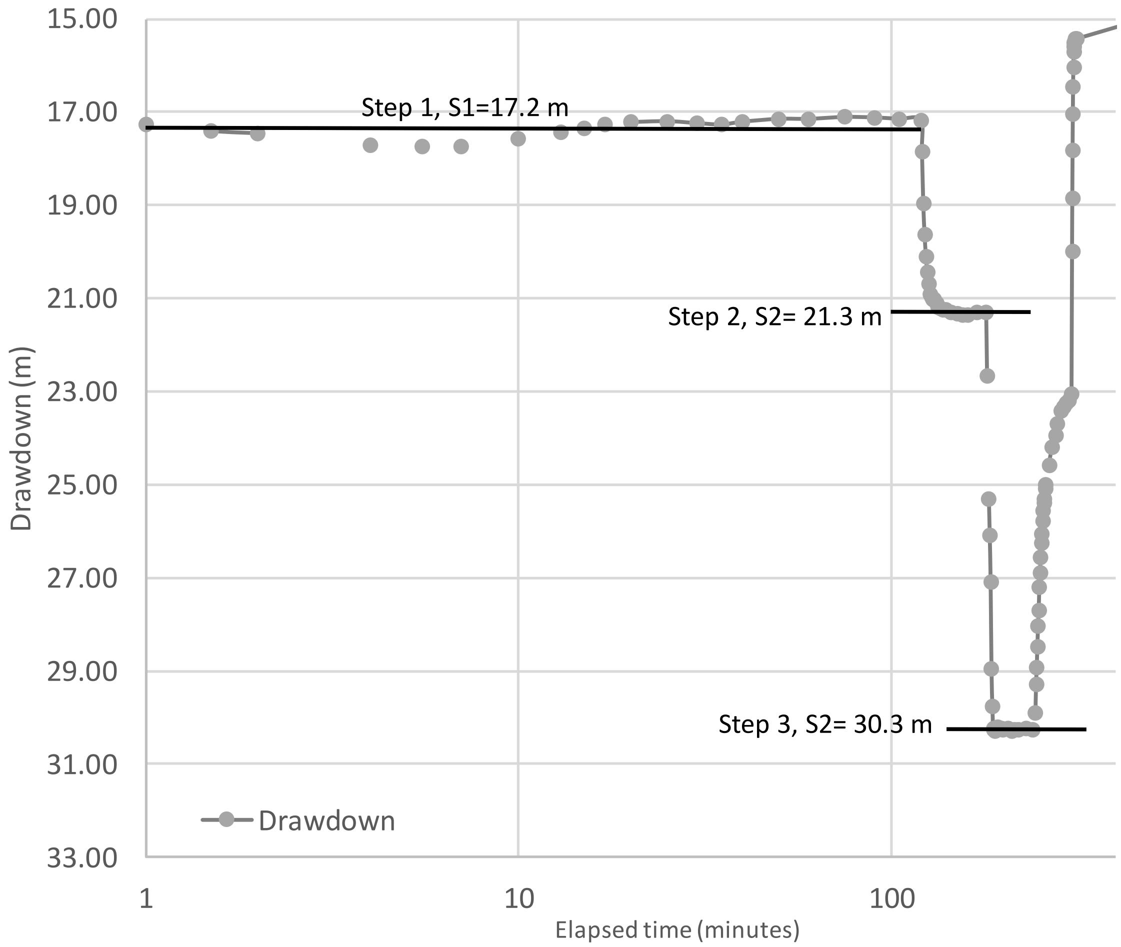


Figure 4: Time-drawdown plot of field data from the step test at BH414.

5.4 Constant rate pumping test

5.4.1 After completing the stepped rate test, a 3-day period was allowed for the water levels in the pumping borehole and observation boreholes to recover before commencement of the pumping test.

5.4.2 The constant rate pumping test started with a pumping rate of 0.46 L/s on 30th May 2018 at 9:00 am. The pump failed at approximately 7:30 am. on 31 May 2018 and the pumping test not restarted until a new pump was installed on 01 June 2018.

5.4.3 Figure 5 shows the drawdown and pumping rate achieved during the test. Ideally a constant rate should have been used during the test however the pumping rate had to be adjusted as follows:

- An initial pumping rate of 0.46 L/s for 81,000 seconds, prior to pump failure;
- Pumping at a rate of between 0.4 L/s and 0.46 L/s until 191,700 seconds following restarting of the pump;
- A reduction in the rate to between 0.2 L/s to 0.25 L/s until 345,600 seconds;
- A reduction in the rate to 0.08 L/s until 887,400 seconds; and
- A reduction in the rate to between 0.02 L/s and 0.03 L/s until the test was halted at 1,045,800 seconds.

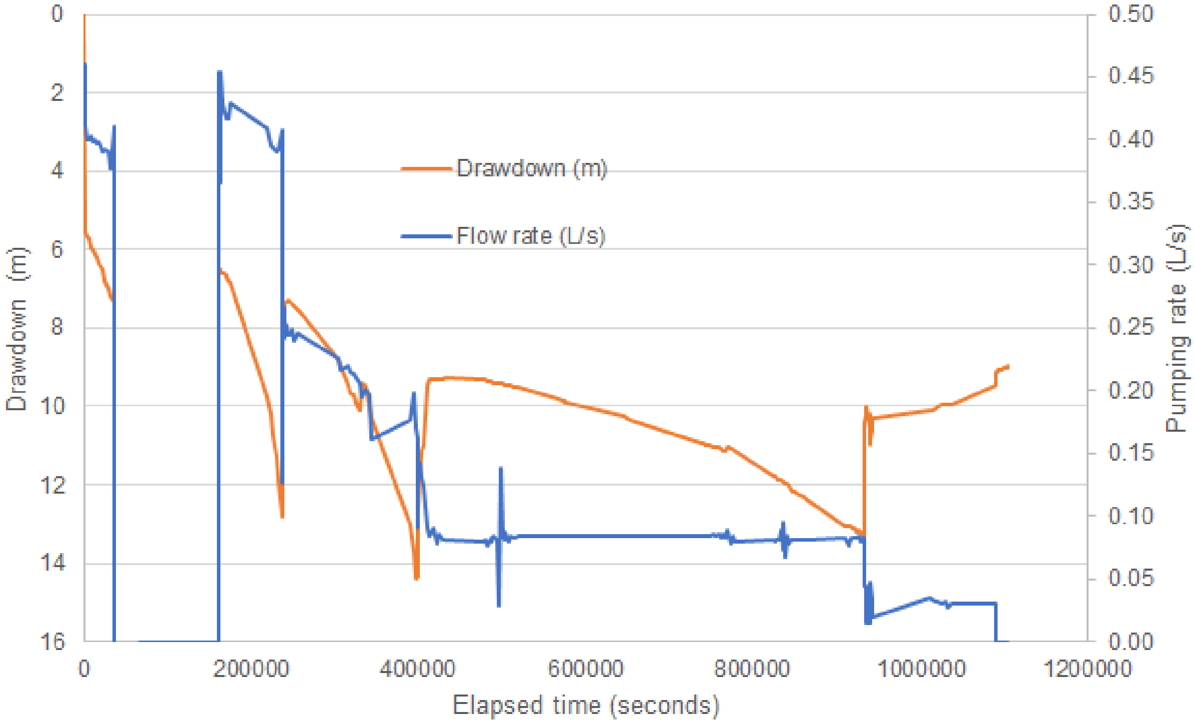


Figure 5: Drawdown and flow rate for the pumping borehole (BH414).

5.5 Groundwater responses at monitoring boreholes

5.5.1 Groundwater levels were monitored at the monitoring boreholes BH407, BH408, BH409, BH413 and BH415. All monitoring data was recorded using automated loggers or VWPs. A correction has been applied to the observed data to account for changes in barometric pressure and the natural downward trend evident in groundwater levels (where observed in pre-test monitoring). A correction for the natural downward trend in the groundwater level was also applied for BH408D, BH408S, BH409 and BH415.

5.5.2 After correction for the natural downtrend trend and barometric pressure, BH409, BH415 and BH413 did not show any significant drawdown during the pumping test. The sites that responded to the pumping at BH414 were BH407 and BH408D (Millstone Grit Group).

5.5.3 The corrected data are provided for each site in Appendix A and the final drawdown curves are given in Figure 6.

5.5.4 There was no drawdown in the Glacial Till at BH408S, though drawdown was seen at BH408D in the Millstone Grit Group. It is apparent that there is very little or no hydraulic connection between the Glacial Till and the Millstone Grit Group at this site. As the Glacial Till is composed of cohesive clay, a material that has very low hydraulic conductivity, this is to be expected.

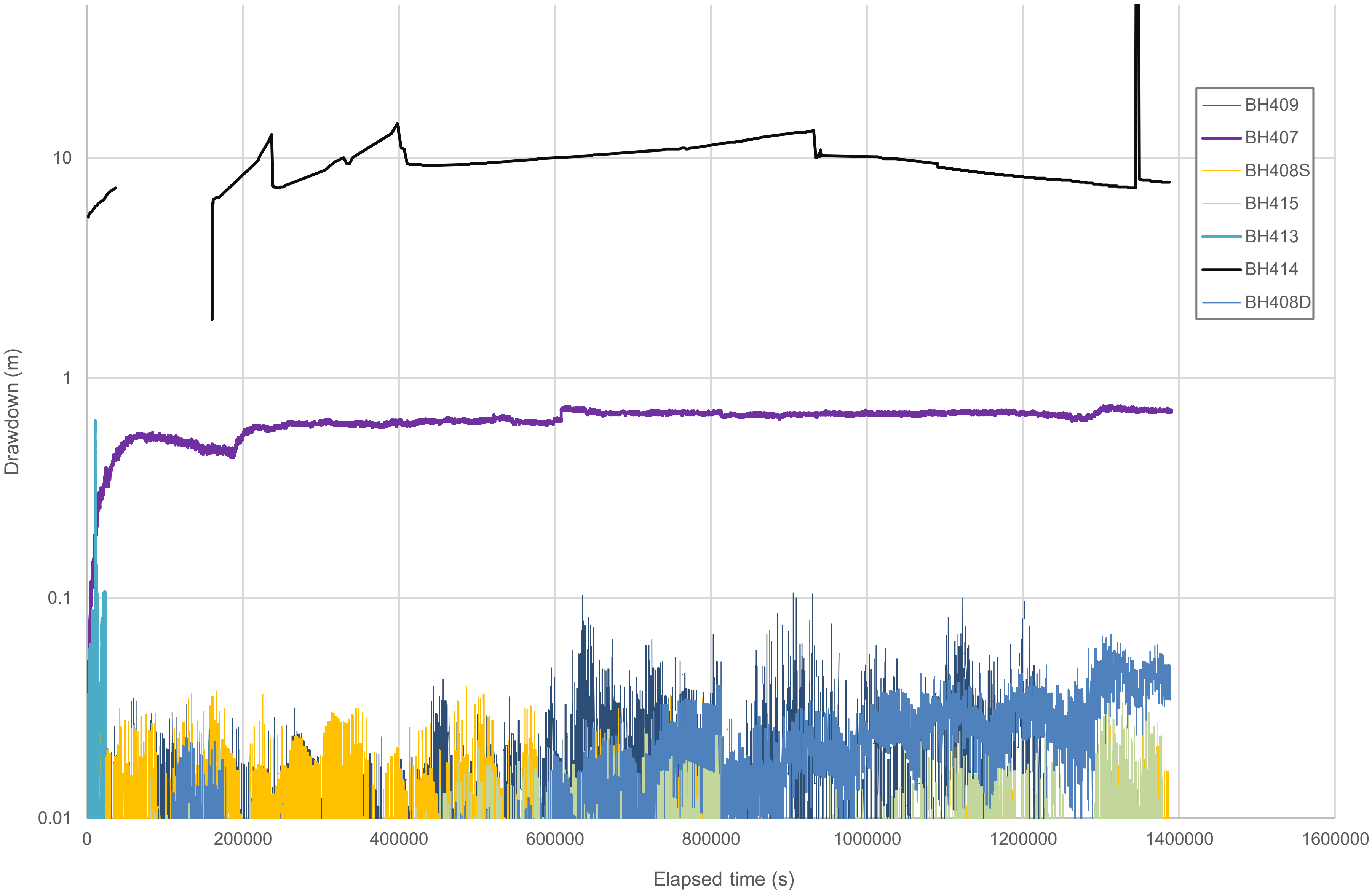


Figure 6: Drawdown, adjusted for barometric pressure changes and trends in water level, where applicable.

5.6 Analysis of the pumping test using Aqtesolve™

5.6.1 Analysis has been performed on drawdown and pumping rate data from 9:00 am on the 30th May 2018 for BH414, BH407 and BH408D, as these were the only sites to display any significant drawdown. The drawdown data was input into Aqtesolve™ and compared with the pumping rate. Known aquifer parameter settings applied to the analysis are given in Table 6. Borehole specific properties used in the analysis are provided in Table 7.

5.6.2 No satisfactory solutions were able to be produced for the latter part of the pumping test, after the restart of the test following the break-down of the pump. In this later period, the pumping rate was sporadically reduced as the borehole yield decreased, while drawdown at the borehole did not recover. For this reason, it was necessary to focus on achieving an estimate for aquifer parameters from the first 1.5 days of the test. During this period, the pumping rate was relatively constant, with the rate varying between 0.4 L/s and 0.46 L/s

Aquifer parameter	Value
Saturated length of borehole screen (L)	18 m
Upper aquitard thickness at BH414 (b')	3.7 m
Fracture aquifer data (block thickness)	3 m
Boundary conditions	nil

Table 6: Fixed aquifer parameters used for pumping test analysis.

Borehole parameter	BH414	BH408D	BH408S	BH407
Borehole configuration	Vertical Screen with partial penetration	Vertical, piezometer	Vertical, piezometer	Vertical, piezometer
Depth from unit top or water table (m)[1]	??	7.8	??	6.9
Screen interval	??	Not applicable	Not applicable	Not applicable
Unit	Pumped aquifer	Pumped aquifer	Pumped aquifer	Pumped aquifer
Radius inside borehole casing	0.06	0.06	0.06	0.06
Radius of downhole equipment	0.03	Not applicable	Not applicable	Not applicable
Outer radius of borehole skin (disturbed zone enveloping filter pack)	Variable	0.06	0.06	0.06
[1]The top of the unit is the top of the Millstone Grit Aquifer, in which the piezometric head is being measured				

Table 7: Borehole parameters used for pumping test analysis.

5.7 Aqtesolve™ solution results

5.7.1 The results from analysis are presented in **Table 8** and summarised in the bullets below:

- The Moench Prickett solution for non-leaky aquifers that allow change from confined to unconfined conditions during the test was found to be the most applicable for BH407 and BH414. However, the Moench Prickett solution is not valid for pumping tests with varying pump rates and does not include wellbore storage. A good solution was found when the transmissivity was $7.19\text{x}10^{-5}$ m^2/s. This is equivalent to a hydraulic conductivity of $2.93\text{x}10^{-6}$ m/s (assuming that the aquifer thickness is equivalent to the screen length);
- The Moench solution for a fractured aquifer with 3 m blocks was found most suitable for BH408D when the hydraulic conductivity was $2.55\text{x}10^{-6}$ m/s. This very similar to the value derived for BH407. The solution result indicates the presence of a set of discontinuities with relatively low hydraulic conductivity and high storage coefficient; and
- Both solutions had a similar storage characteristic of 0.0003 (BH408D) and 0.0002 (BH414/BH407). Sy was calculated for BH407/BH414 as approximately 0.4 %.

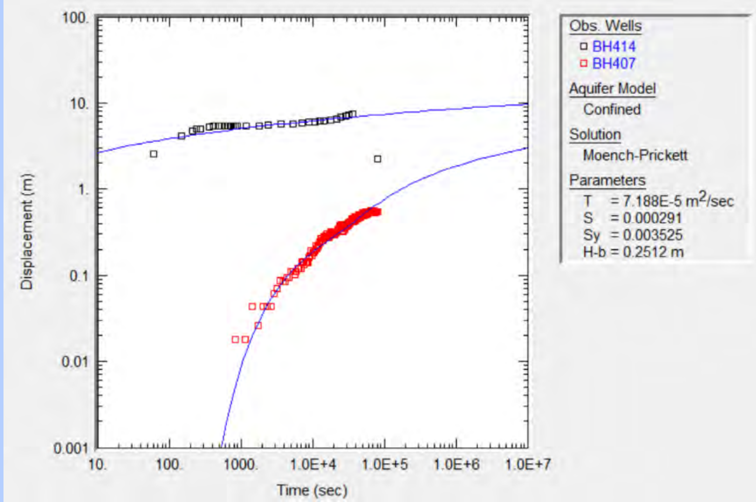
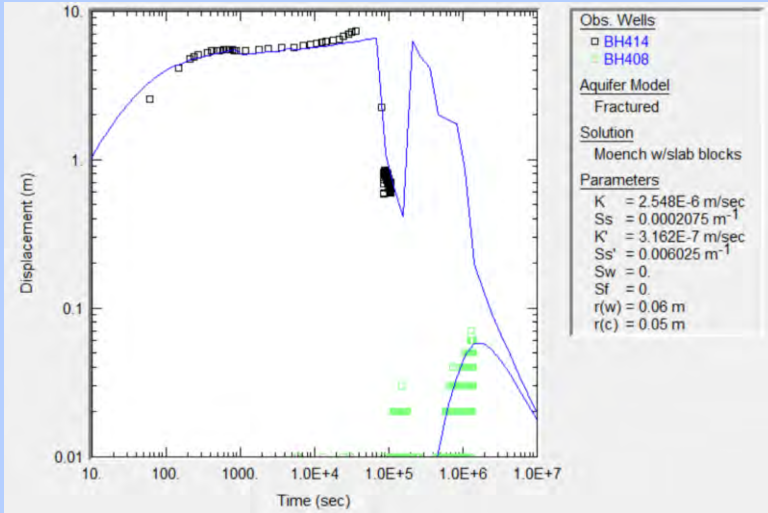
Site	Solution	Parameters	Fit
BH407 and BH414	Moench-Prickett confined solution with conversion to unconfined	T = 7.32x10-5 m2/s S = 0.0002 Sy = 0.004 H-b = 0.2512 m Aquifer thickness = 24.3 m	
BH408D	Moench fractured aquifer with slab blocks, well bore storage and variable flow rates	K = 2.55x10-6 m/s Ss = 0.0002/m K' = 3.16x10-7 m/s Ss' = 0.006/m Sw and Sf = 0 m Block thickness = 3 m	

Table 8: Results of pumping test analysis from Aqtesolve.

6 Recovery

6.1 Observed recovery

6.1.1 Recovery data is presented in Figure 7. Full recovery was not achieved by the end of the recovery period ($4x10^6$ seconds), with a further 1 m of water level still to be recovered.

6.1.2 A period of erroneous data measurements is noted between 1174800 seconds and 1369800 seconds after the start of pumping testing. The reason for this is unknown, however considered likely to be an artefact associated with demobilisation of pumping equipment or downloading of the logger. This data is excluded from the recovery analysis.

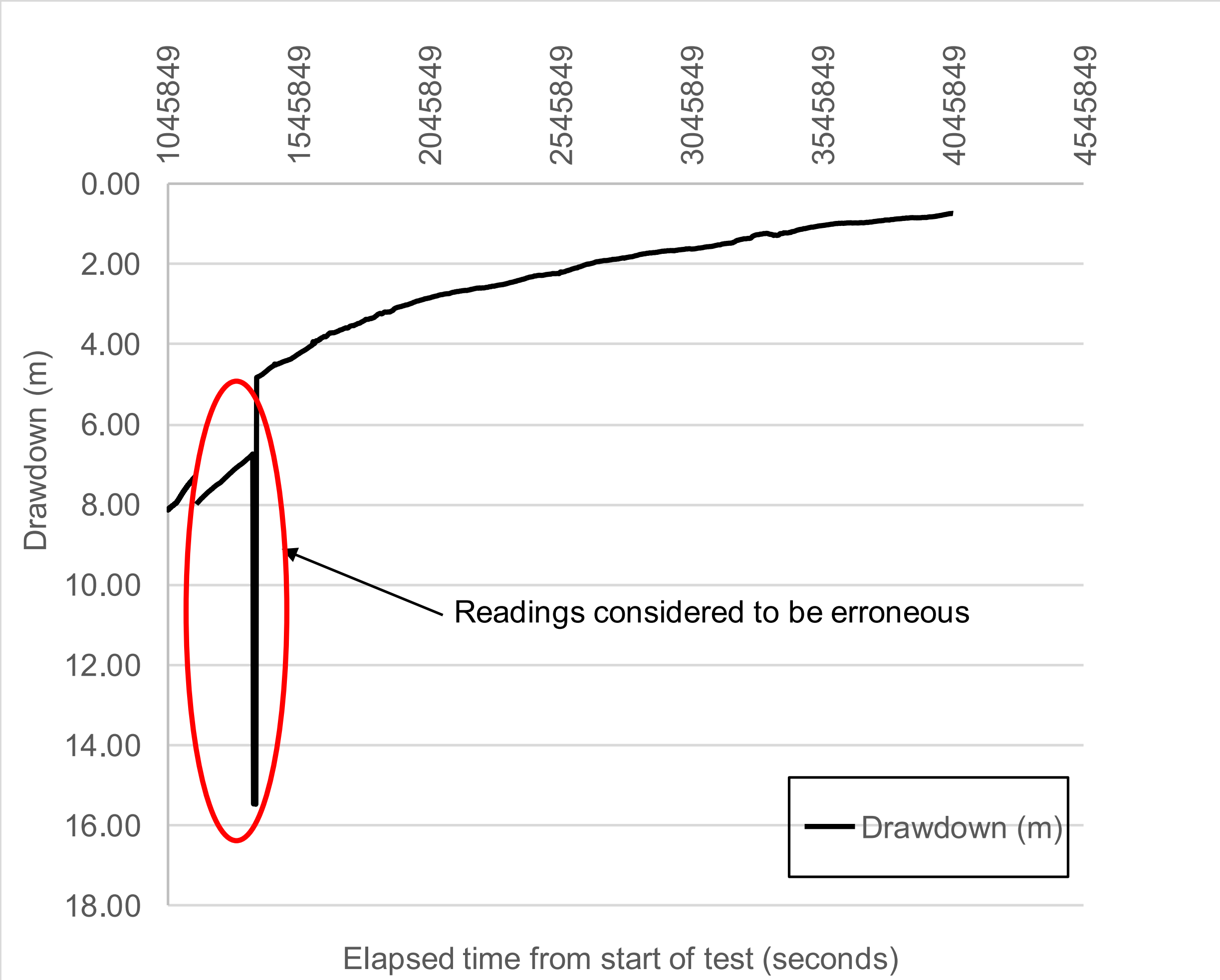


Figure 7: Recovery drawdown at the pumping borehole.

6.2 Aqtesolve™ solution for the pumping borehole recovery

6.2.1 A solution for recovery data was completed using the residual drawdown plot and a combination of manual and automated methods (Figure 8).

6.2.2 The Moench slab block solution provided a good match however a reasonable match was only obtained with the borehole radius increased to 1.6 m. This is much larger than the actual drilled borehole radius (0.06 m). The solution fit using such a marked increase in borehole radius is only plausible if storage is locally enhanced by discontinuities (such as faulting) and the disturbed zone close to the borehole. This is considered reasonable given the issues that occurred during drilling and testing including:

- Loss of substantial volumes of drilling fluid whilst drilling;

- Failure of some packer tests due to inability to supply enough water in the packer zone; and
- Difficult drilling conditions with highly fractured and weathered materials in an area that has suffered a high degree of tectonic deformation.

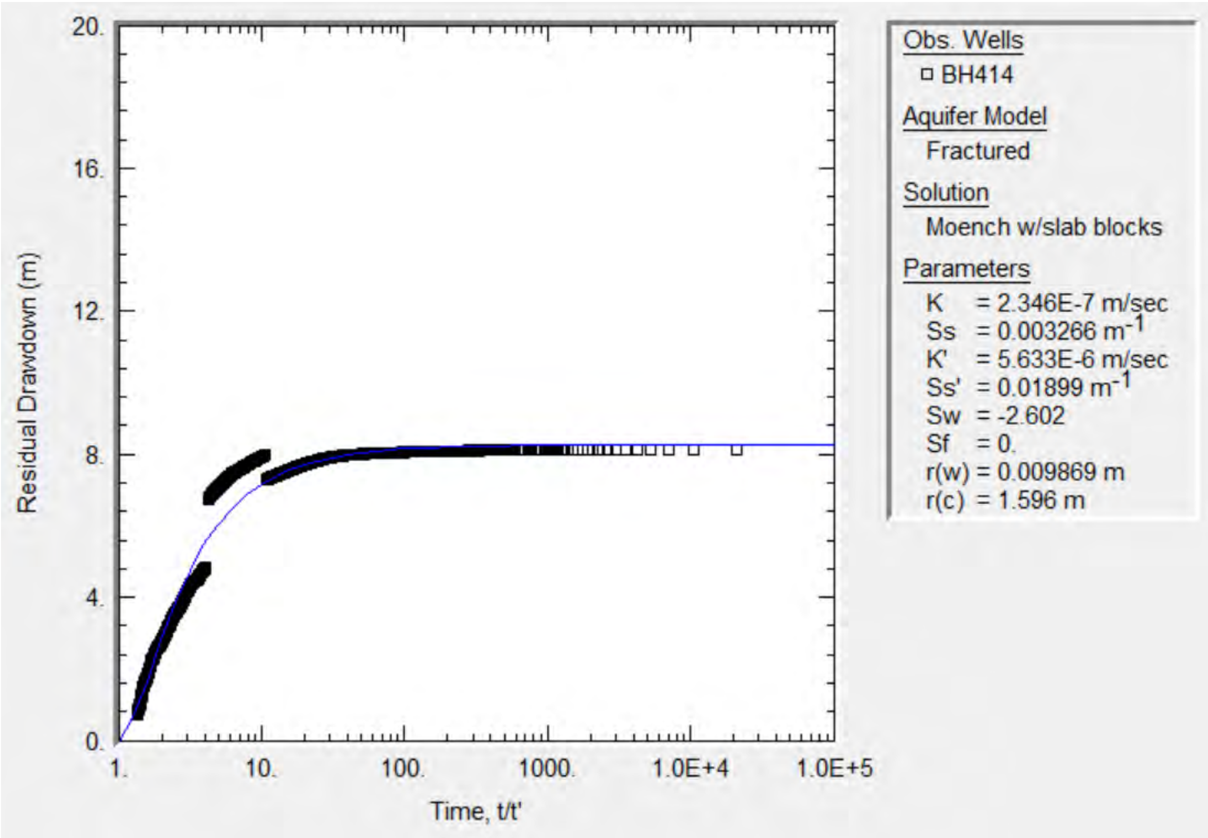


Figure 8: Moench fractured aquifer with slab blocks solution for BH414 recovery data, produced in Aqtesolv™.

7 Conclusions

7.1.1 The pumping test investigation undertaken at Mottram village has established the following:

- Parallel to the NW-SE trending fault the hydraulic conductivity was between 2.3x10^{-7} m/s and 7.2x10^{-5} m/s, with a geometric average of 3.5x10^{-6} m/s. The hydraulic conductivity of the Millstone Grit Group is very similar to the geometric average of packer tests completed at BH414, which gave a geometric average of 5.0x10^{-6} m/s (Table 3). The response of the piezometric head propagated rapidly from BH414 towards BH407, along the western margin of the fault. As the pumping test progressed the aquifer transitioned from confined to unconfined conditions;
- Transmissivity perpendicular to the fault is extremely low. Although the pumping test was 10 days long and the pumping borehole was almost dewatered, no drawdown was observed to the east of it; and
- The storage coefficient of the Millstone Grit Group at Mottram village is between 0.0002 and 0.0003 and the specific yield is approximately 0.35%.

7.1.2 There was no drawdown in the Glacial Till at BH408S, though drawdown was seen at BH408D in the Millstone Grit Group. It is apparent that there is very little or no hydraulic connection between the Glacial Till and the Millstone Grit Group at this site. As the Glacial Till is composed of cohesive clay, a material that has very low hydraulic conductivity, this is to be expected.

7.1.3 The analysis of recovery data from BH414, in combination with experience during drilling, shows that significant secondary hydraulic conductivity and storage may be present at some sites. If these areas were to be excavated there could be reasonable groundwater inflows for a short period, however the test result has shown that the aquifer has poor connectivity and that the inflows would likely diminish quickly.

7.1.4 The applicability of the Moench fractured rock aquifer solutions show that the Millstone Grit Group is a fractured rock aquifer. The results of the packer tests, pumping test and recovery analysis show that it has low hydraulic conductivity and is very heterogeneous.

8 Appendix A – Correction of automated level loggers for barometric pressure for pumping test period

8.1.1 A correction has been applied to the observed data in the pumping test period to account for changes in barometric pressure. An additional correction is necessary to correct drawdown for the change in barometric pressure that has occurred at time t_i compared to t_0 as follows:

$$\boldsymbol{ds_t} = \left(\boldsymbol{WL_t} - \boldsymbol{BE}(\boldsymbol{dpa_t})\right) - \boldsymbol{WL_{t0}}$$
$$ds = drawdown\ (m)$$
$$WL = water\ level\ in\ well\ (m)(measured\ pressure - barometric\ pressure)$$
$$BE\ (barometric\ efficiency\ during\ pre - test\ monitoring)$$
$$dpa = barometric\ pressure\ variation\ from\ start\ of\ test$$

8.1.2 Barometric efficiency is the absolute gradient of the linear relationship between the logged Head (m) and Barometric pressure (m). The barometric efficiency is determined by plotting the change in pressure against the change in head for a time period with pressure changes and no recharge (17 May to 23 May 2018).

8.1.3 The barometric efficiency applied at each site is given in Table A1.

- BH414 (the pumping borehole) showed very little variation with barometric pressure changes, which is indicative of an aquifer with significant storage, in which most of the pressure is borne by the water;
- BH413 provided a significant response to variations in barometric pressure and one that is indicative of a well confined aquifer in which most of the pressure is borne from the rock skeleton;
- BH407, BH409 and BH415 had significant changes with barometric pressure indicative of a confined aquifer;
- BH408D had some changes with barometric pressure indicating that the aquifer may be leaky confined at this site;
- BH408S monitored the water level within the Glacial Till and had results suggestive of a self-confining aquifer; and
- BH409 had a strongly confined response with strong variation in water level as a response to changes in barometric pressure.

Borehole	Barometric efficiency	Comment
BH413[1]	0.97	A value close to 1 indicates a perfect confined aquifer system
BH414[1]	0.00	A value close to zero indicates a perfect unconfined response or large amount of storage
BH407	0.98	A value close to 1 indicates a perfect confined aquifer system
BH408D	0.87	This value may indicate a partially confined or leaky aquifer system
BH408S	0.97	A value close to 1 indicates a perfect confined aquifer system
BH409	1.00	A value close to 1 indicates a perfect confined aquifer system

BH415	0.75	This value may indicate a partially confined or leaky aquifer system
[1]These boreholes were monitored using a logger within an open hole. All other sites were monitored using VWPS within a two to three m thick gravel interval.		

Table A1: Barometric efficiencies used for logger and VWP correction.

8.1.4 An adjustment has been performed on data for the previously mentioned monitoring sites to correct for barometric pressure, except for BH414, where BE was zero.

8.1.5 Figure A-1 shows the drawdown, pre and post adjustment for barometric pressure, for BH413. The impact of low barometric pressure associated with passing low pressure weather systems is removed. An unusual spike in drawdown occurs at approximately 7,400 minutes. This is not readily explained by events within the pumping test itself or with passing weather systems. It is possible that the contractor removed something from the borehole, such as a pump that was used to test the borehole after its construction.

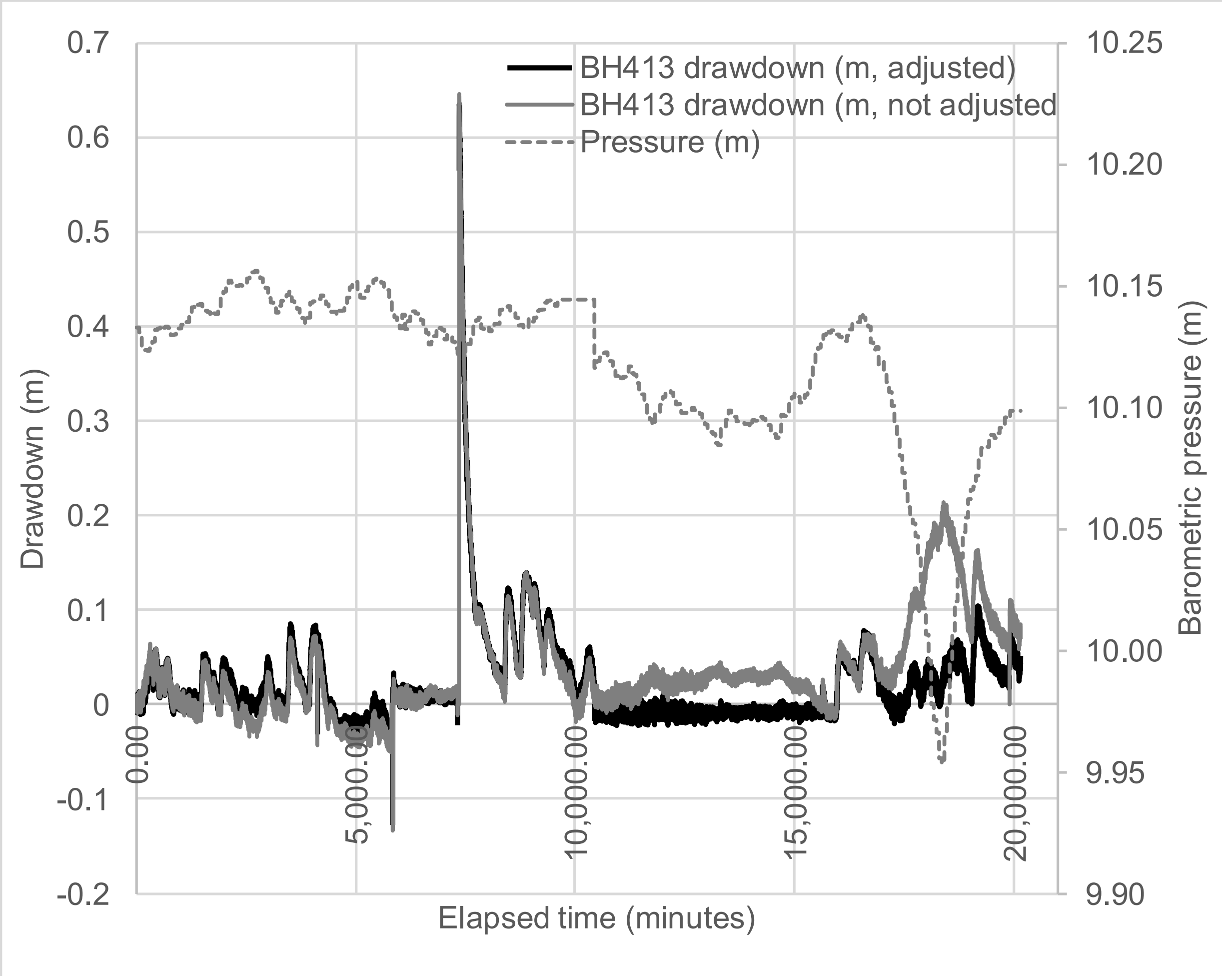
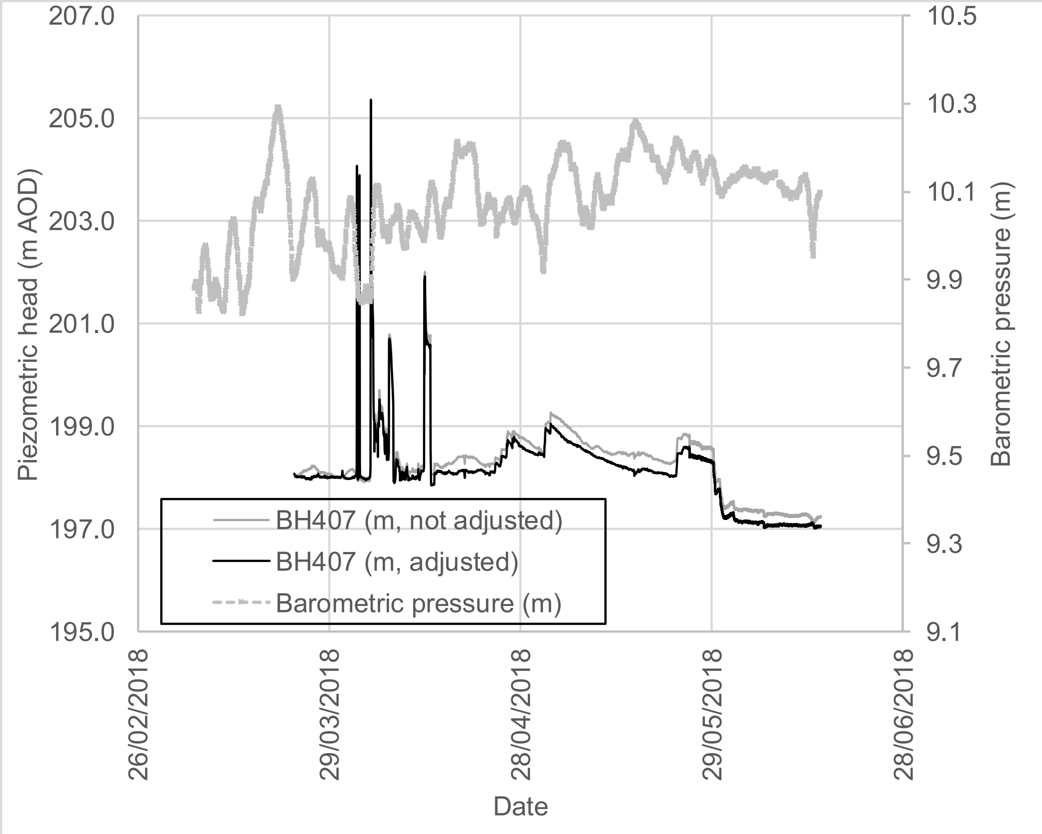


Figure A-1: BH413 Drawdown in the Millstone Grit Group.

8.1.6 The piezometric head for BH407 is shown in Figure A-2.Figure A-2 shows a relatively flat water level with no trend. Recharge is likely the cause of the increases and subsequent recessions of the piezometric head around the 7th April and 30th April 2018. The results of the application of an adjustment for barometric pressure is shown on the figure.

8.1.7 Drawdown at BH407 is shown on Figure A-3. BH407 has the most drawdown of all the monitoring sites, reaching a maximum of 0.77 m.



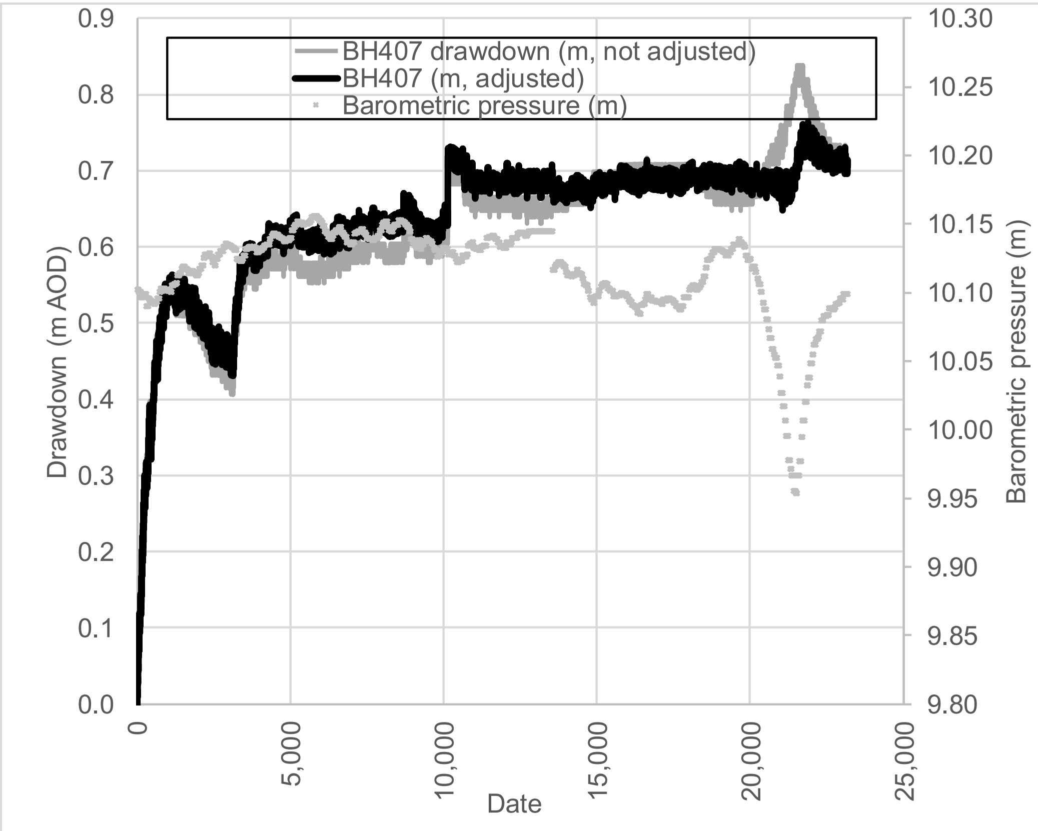


Figure A-2: BH407 Piezometric head in the Millstone Grit Group.

Figure A-3: BH407 Drawdown in the Millstone Grit Group.

8.1.8 The piezometric head for BH408D is shown in Figure A-4. It shows a long-term downward trend in the water level associated with a dry period (reduced recharge) through the later spring and summer months of 2018. Prior to compensation for atmospheric pressure and trend, the apparent drawdown is quite variable and is quite dynamic. Once compensated, the actual drawdown shows increases approximately linearly with elapsed time (Figure A-5).

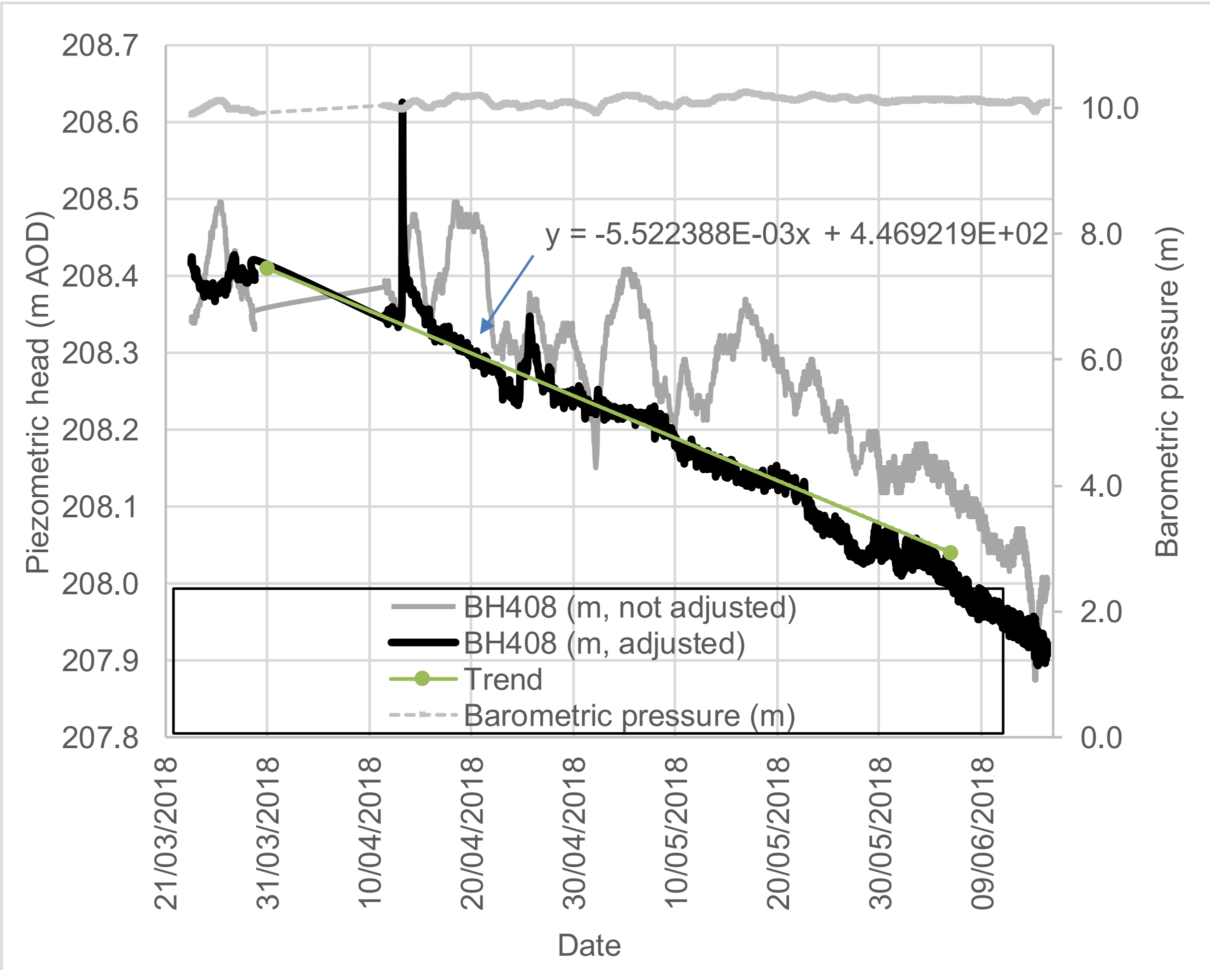


Figure A-4: BH408D Piezometric level and adjustment for barometric pressure and including trend in the Millstone Grit Group.

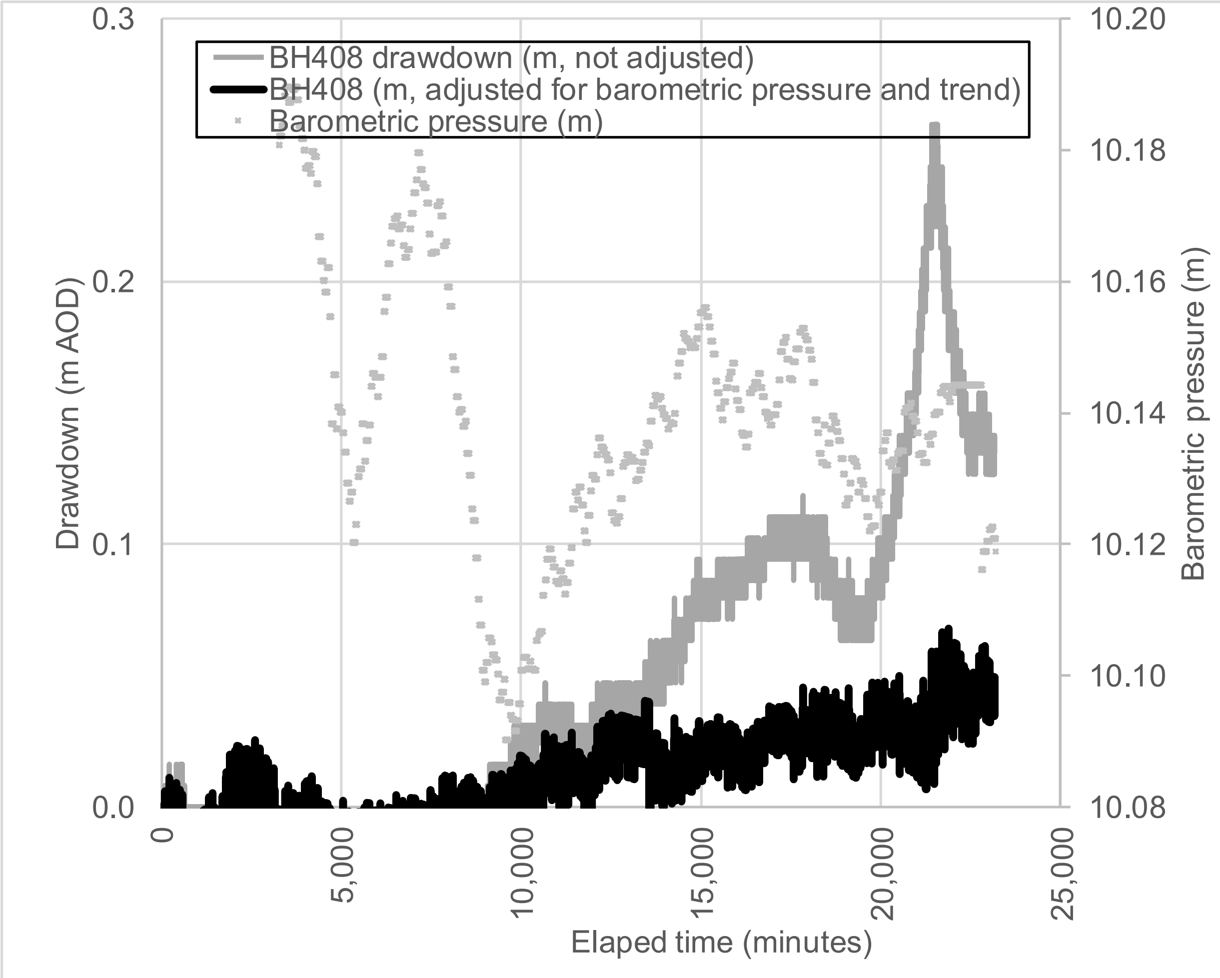


Figure A-5: BH408D Drawdown in the Millstone Grit Group.

8.1.9 A similar adjustment has been applied to BH408S as was completed for BH408D. BH408S also displayed a long-term downward trend in the groundwater level, this time in the Glacial Till, shown in Figure A-6. Removal of the downward trend from the drawdown calculation resulted in no meaningful drawdown being observed at the site, as would be expected for a non-aquifer. Drawdown for BH408S is shown on Figure A-7.

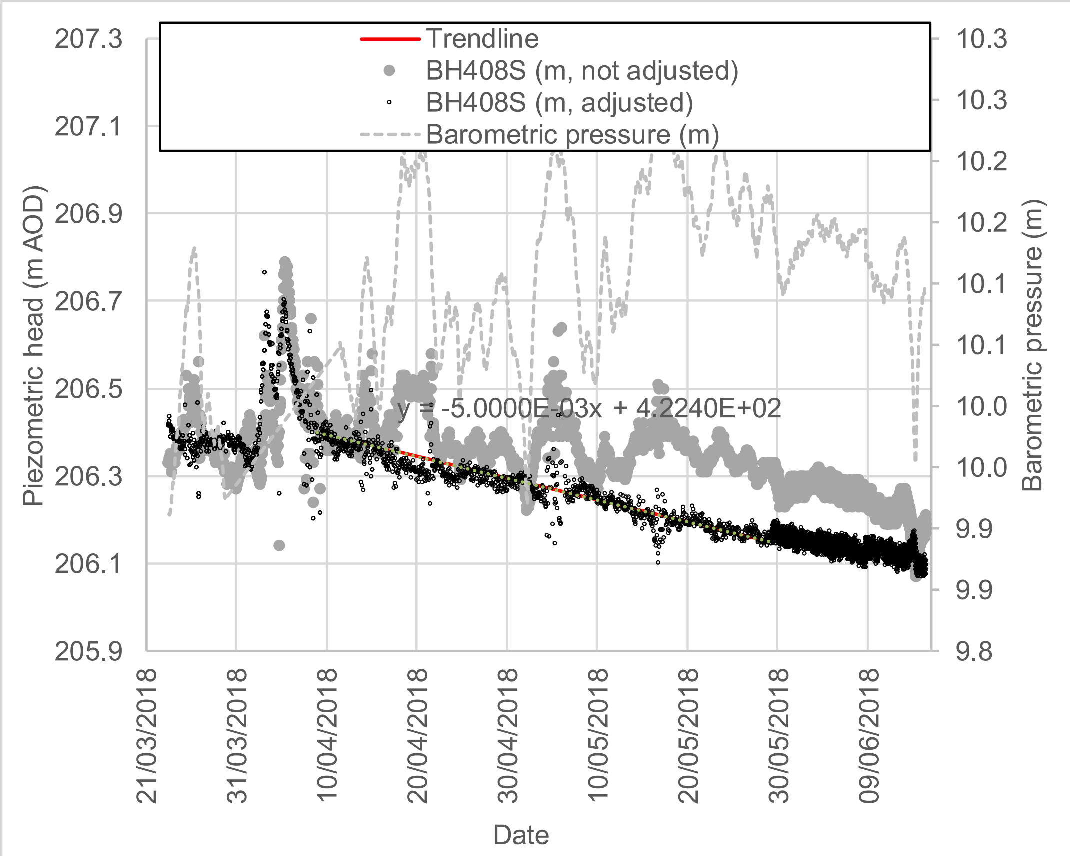


Figure A-6: BH408S Water level in the Glacial Till (Shallow).

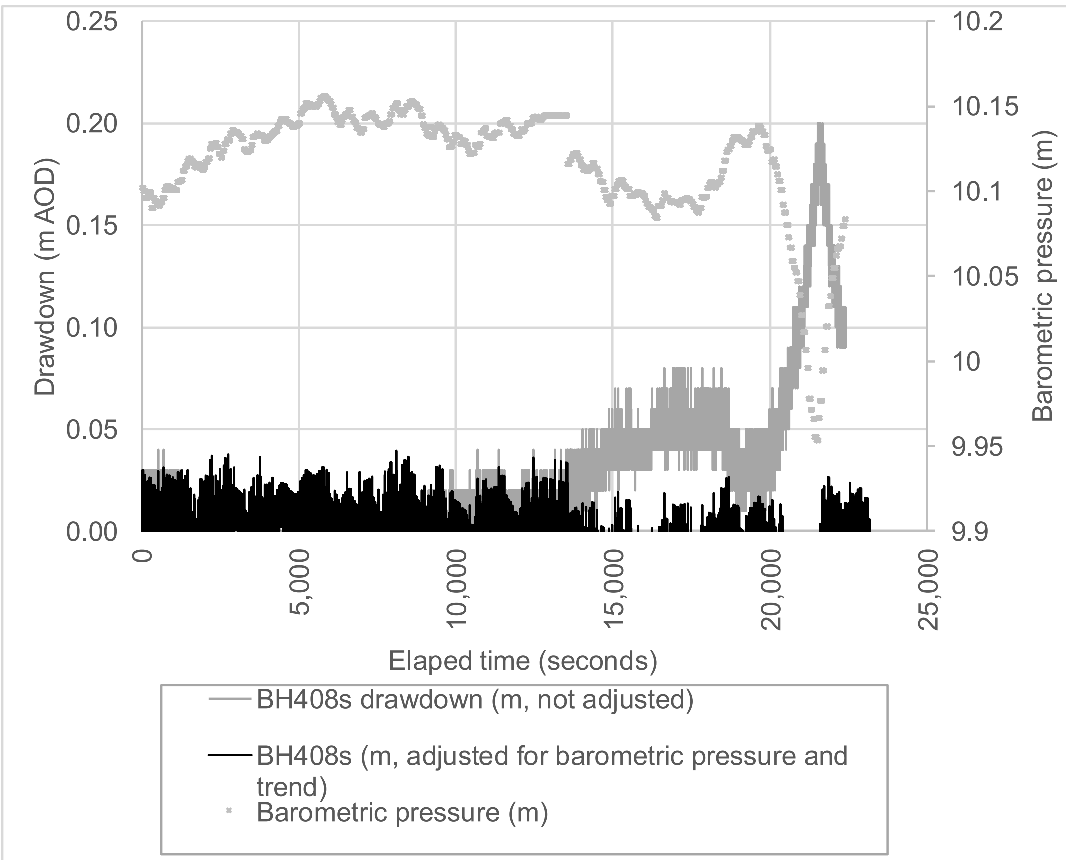


Figure A-7: BH408S Drawdown in the Glacial Till (shallow).

8.1.10 BH415 is located between BH413, which had no drawdown, and BH414 (the pumping borehole). A downward trend in the piezometric head was also observed at this site prior to the test, shown on Figure A-8. Removal of the trend during the pumping test period resulted in no meaningful drawdown being observed at the site, as shown in Figure A-9.

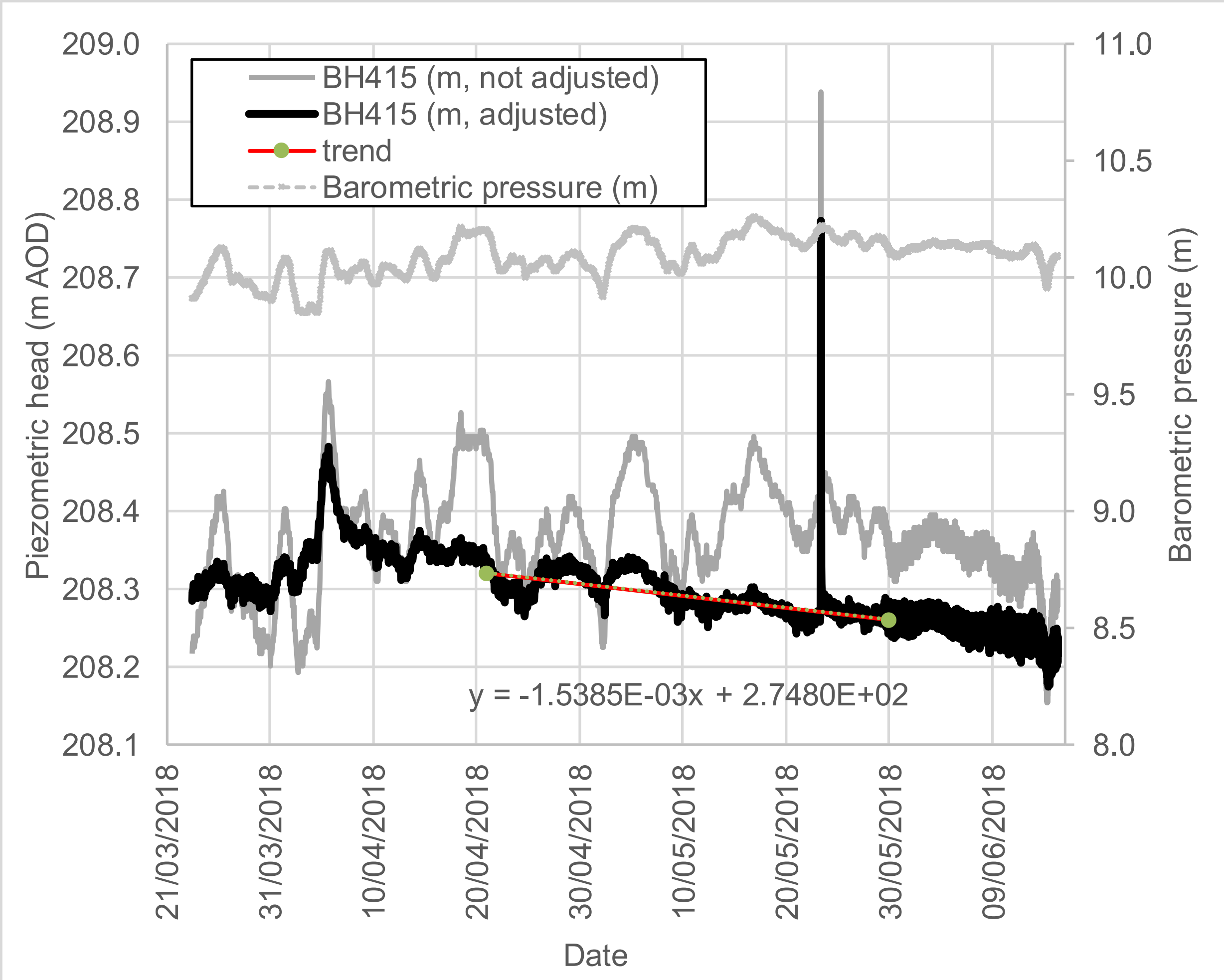


Figure A-8: BH415 Hydraulic head including adjustment for barometric and trend in the Millstone Grit Group.

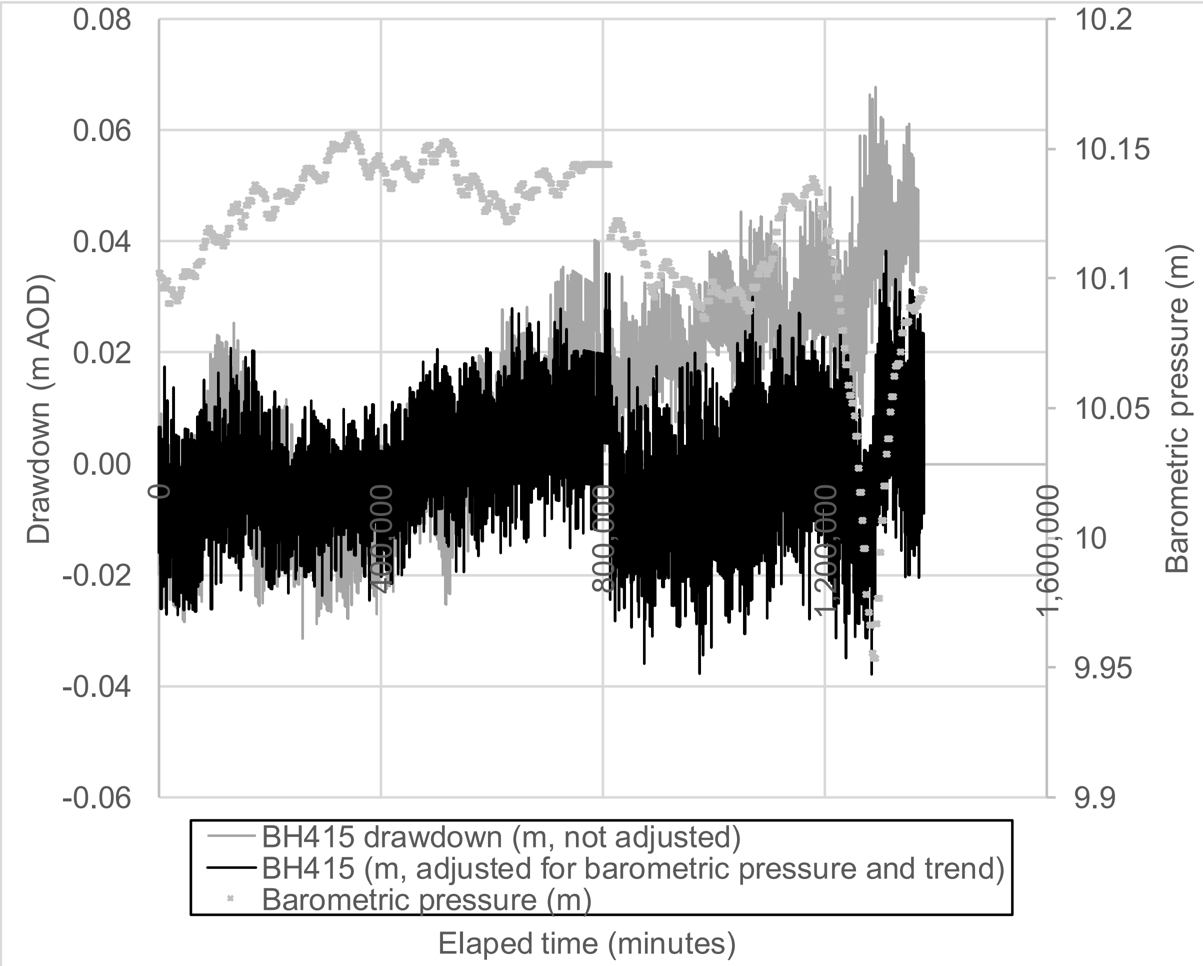


Figure A-9: BH415 Drawdown in the Millstone Grit Group.

8.1.11 The piezometric head at BH409 is shown in Figure A-10. The piezometric head shows a downward trend of with a similar gradient as for BH408D and BH415. Removal of the trend from drawdown data results in no drawdown being observed at this site (Figure A-11).

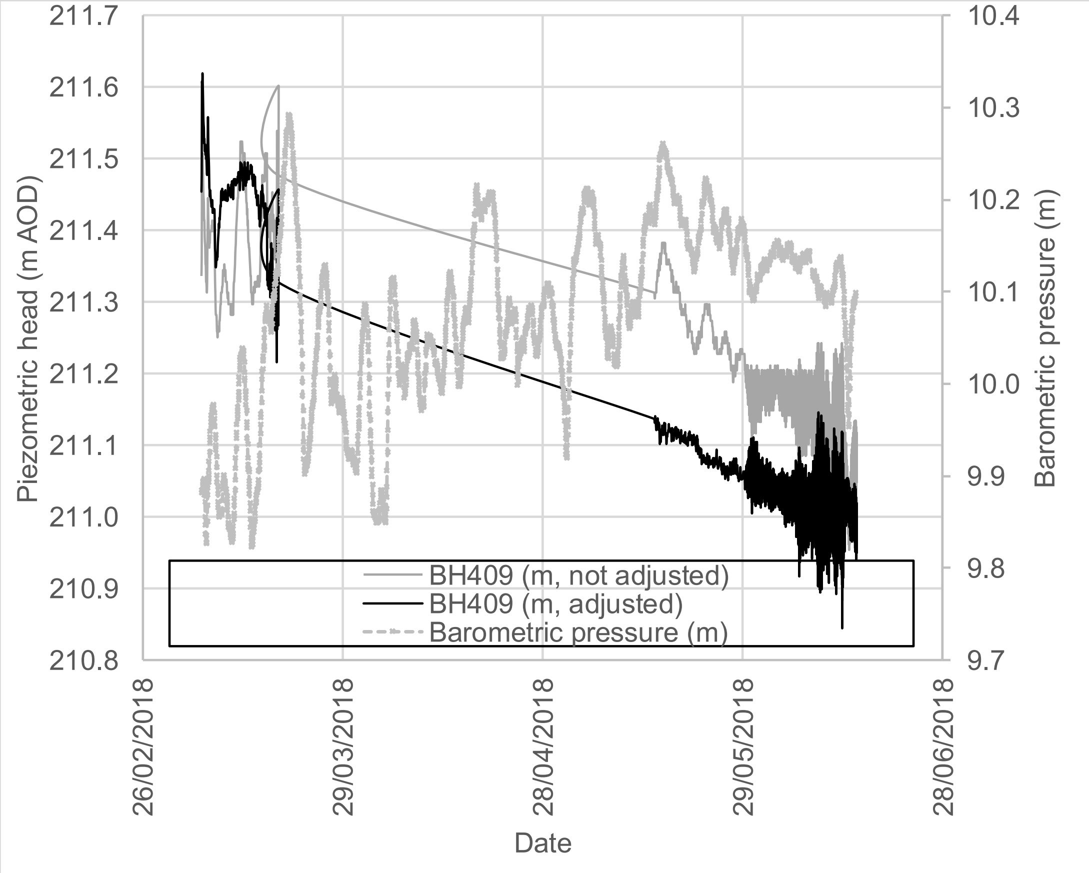


Figure A-10: BH409 Piezometric head in the Millstone Grit Group.

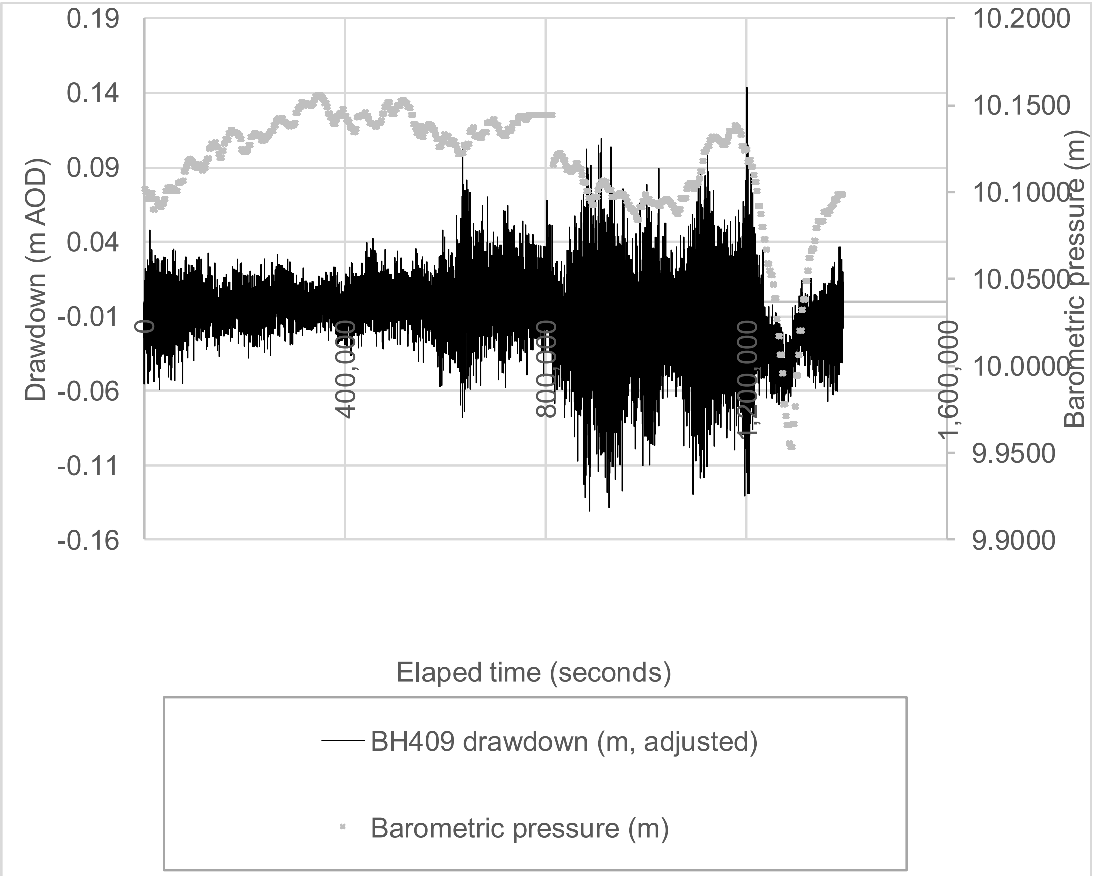


Figure A-11: BH409 Drawdown in the Millstone Grit Group.

8.1.12 BH405 shows no evidence of drawdown from the pumping test starting on 30th May. The piezometric head is presented in Figure A-12 (extracted from the ground investigation completed in 2018 (Socotec, 2018)). This site is situated 117 m due west of the abstraction borehole (BH414).

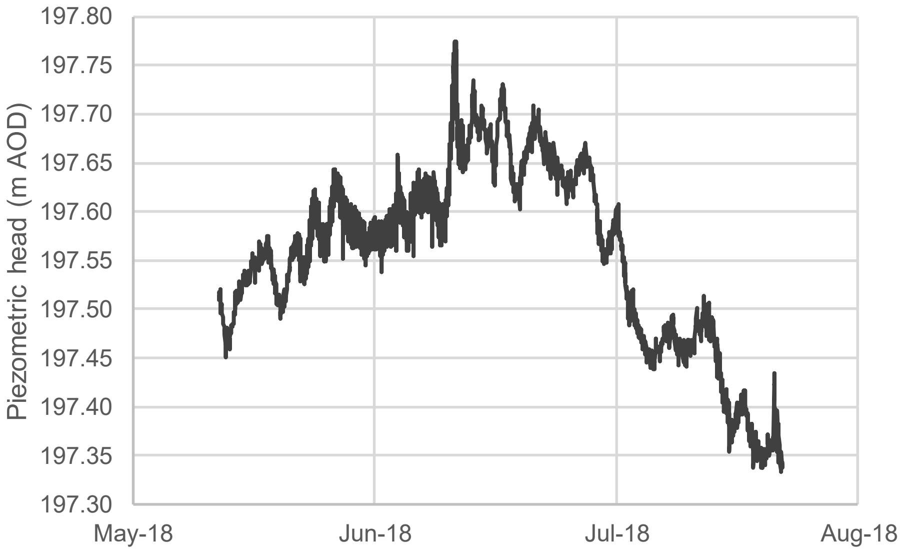


Figure A-12: BH405 Piezometric level in the Millstone Grit Group.

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Appendix C – Trial Trench Logs and Photos

Photo Log Sheet – Trans-Pennine Upgrade

TT401 – Face A

Project	Job No	Start Date	Logged By	Contractor	Final Depth	Length	Width
Trans-Pennine Upgrade Programme Stage 3	10013530	03/05/2018	JM	Arcadis Consulting (UK) Ltd.	2.0 m	4.0 m	2.0 m

Client	End Date	Equipment Used
Highways England	04/05/2018	Tracked Excavator

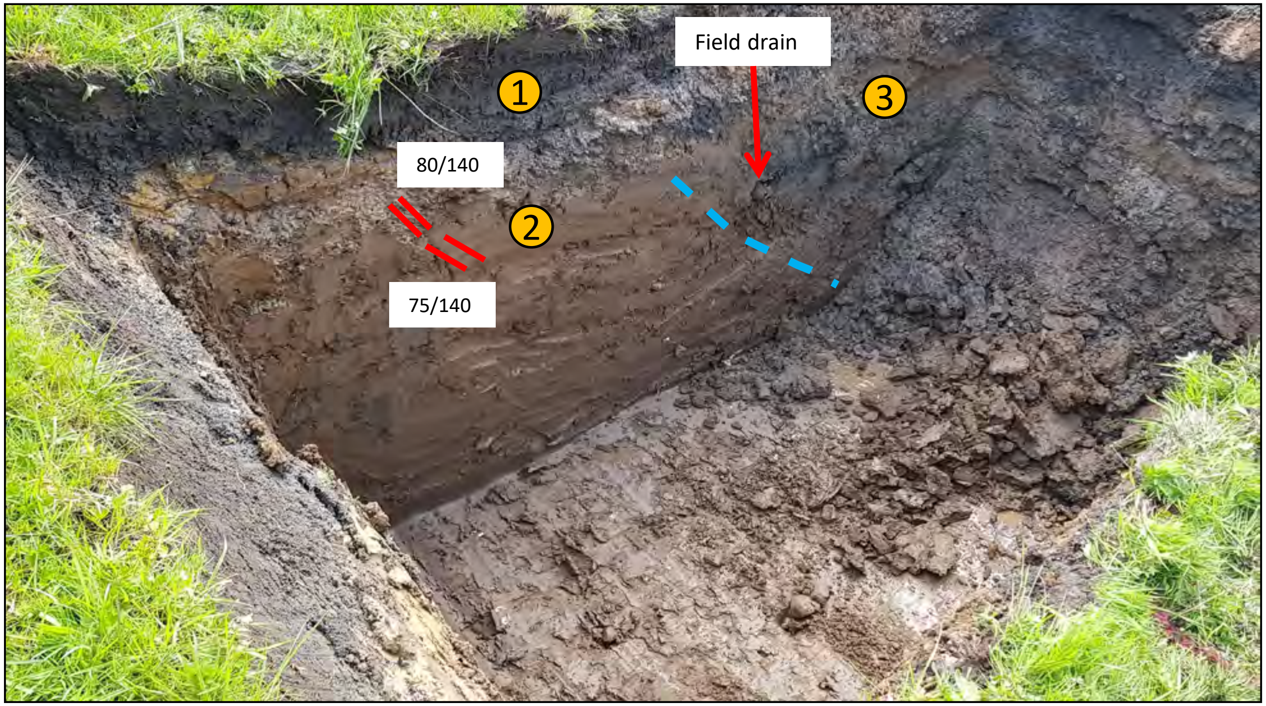
[East side of trench]

Start of Trench

Easting (OS mE) **367364.686**
Ground Level (mAOD) **118.435**
Northing (OS mN) **86147.087**

End of Trench

Easting (OS mE) **367365**
Ground Level (mAOD) **118.404**
Northing (OS mN) **86142**



Key

Lithological boundary

Fissure

Evidence of possible slip surface

Legend

1) Brown sandy slightly gravelly SILT (TOPSOIL).
2) (GLACIAL TILL): Stiff brown fissured slightly sandy slightly gravelly CLAY with rare cobbles and rare rootlets. Gravel is round medium to coarse of mixed lithology. Fissures are typically horizontal and occasionally vertical
3) MADE GROUND: Soft brown organic slightly sandy gravelly CLAY. Note: Made Ground likely to be associated with approx. 2.0 m deep water main and field drain

Notes

80° shallowing to 75° feature denotes possible slip surface. Feature could not be traced from below ~0.5m bgl.

![ARCADIS]

Photo Log Sheet – Trans-Pennine Upgrade

TT401 – Face A

Project	Job No	Start Date	Logged By	Contractor	Final Depth	Length	Width
Trans-Pennine Upgrade Programme Stage 3	10013530	03/05/2018	JM	Arcadis Consulting (UK) Ltd.	2.0 m	4.0 m	2.0 m
Client		**End Date**	**Equipment Used**				
Highways England		04/05/2018	Tracked Excavator				

Photo 01: Possible 80 shallowing to 75 degree slip surface in-situ (annotated)

Photo 02: Possible 80 shallowing to 75 degree slip surface in-situ (non – annotated)

Photo Log Sheet – Trans-Pennine Upgrade

TT401 – Face A

Project **Trans-Pennine Upgrade Programme Stage 3**	Job No **10013530**	Start Date **03/05/2018**	Logged By **JM**	Contractor **Arcadis Consulting (UK) Ltd.**	Final Depth **2.0 m**	Length **4.0 m**	Width **2.0 m**
Client **Highways England**		End Date **04/05/2018**	Equipment Used **Tracked Excavator**				

Photo 03: Possible 80 shallowing to 75 degree slip surface ex-situ. Block sample crumbled on extraction. Smooth surface preserved on face shown

Photo 04: Vertical fissure recorded within the Trial Trench Face B (see next page)

Photo Log Sheet – Trans-Pennine Upgrade

TT401 – Face B

Project	Job No	Start Date	Logged By	Contractor	Final Depth	Length	Width
Trans-Pennine Upgrade Programme Stage 3	10013530	03/05/2018	JM	Arcadis Consulting (UK) Ltd.	2.0 m	4.0 m	2.0 m

Client	End Date	Equipment Used
Highways England	04/05/2018	Tracked Excavator

[West side of trench]

Start of Trench

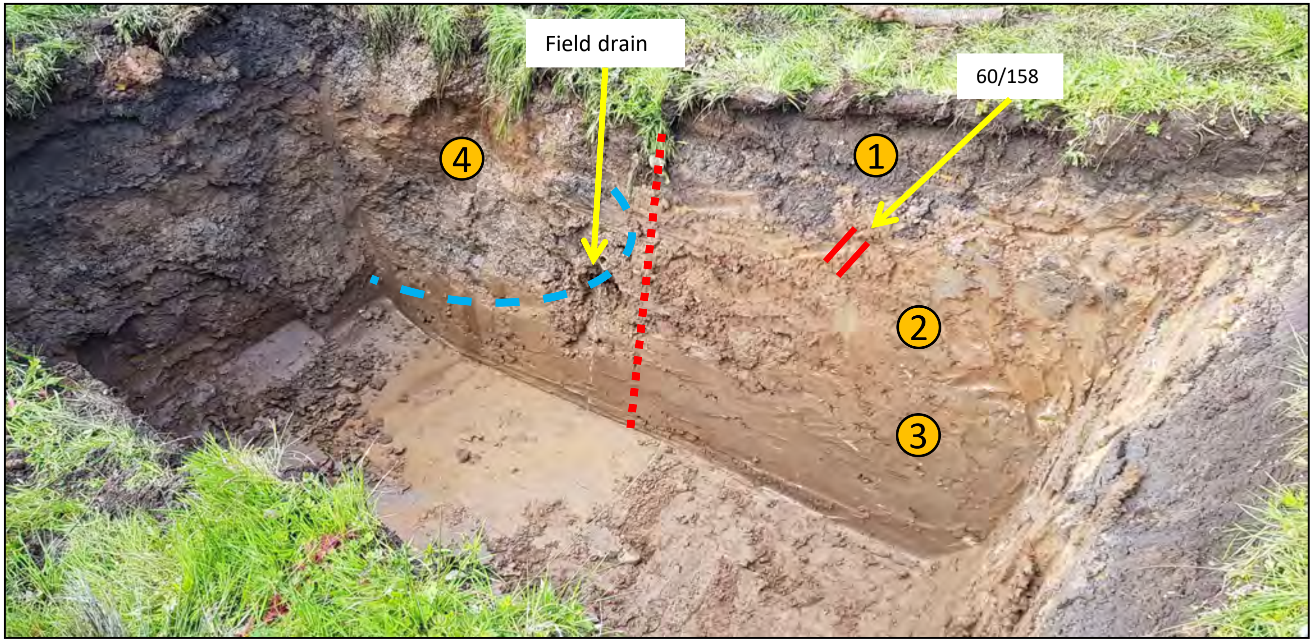
Easting (OS mE) **367364.686** Ground Level (mAOD) **118.435**

Northing (OS mN) **86147.087**

End of Trench

Easting (OS mE) **367365** Ground Level (mAOD) **118.404**

Northing (OS mN) **86142**



Key

Lithological boundary

Greyed vertical fissure, See Photo 03

60 degree shallowing to 45 degree possible slip (See Photo 05 and 06)

Legend

1) Brown sandy slightly gravelly SILT. TOPSOIL.
2) Firm brown occasionally mottled grey slightly sandy gravelly CLAY with rare rootlets. Gravel is medium to coarse subrounded to rounded of mixed lithology. (GLACIAL TILL)
3) Stiff brown fissured slightly sandy slightly gravelly CLAY with rare cobbles and rare rootlets. Gravel is rounded medium to coarse of mixed lithology. Mottling becomes less with depth along fissures. Fissures are typically horizontal and occasional vertical. (GLACIAL TILL)
4) MADE GROUND: Soft brown organic slightly sandy gravelly CLAY. Note: Made Ground likely to be associated with approx. 2.0 m deep water main and field drain.

NOTE

Ground unstable in section `4` – not possible to remove shoring whilst personal within trial pit.

Project	Job No	Start Date	Logged By	Contractor	Final Depth	Length	Width
Trans-Pennine Upgrade Programme Stage 3	10013530	03/05/2018	JM	Arcadis Consulting (UK) Ltd.	2.0 m	4.0 m	2.0 m
Client		**End Date**	**Equipment Used**				
Highways England		04/05/2018	Tracked Excavator				

[West side of trench]

Start of Trench

Easting (OS mE) **367364.686**

Ground Level (mAOD) **118.435**

Northing (OS mN) **86147.087**

End of Trench

Easting (OS mE) **367365**

Ground Level (mAOD) **118.404**

Northing (OS mN) **86142**

Photo 05: Possible 60 shallowing to 45 degree slip surface identified in Face B (annotated)

Photo 06: Possible 60 shallowing to 45 degree slip surface identified in Face B

ARCADIS **Photo Log Sheet – Trans-Pennine Upgrade**

TT402 – Face A

Sheet 6 of 7

Project
Trans-Pennine Upgrade Programme Stage 3

Job No
10013530

Start Date
08/05/2018

Logged By
JM

Contractor
Arcadis Consulting (UK) Ltd.

Final Depth
2.0 m

Length
4.0 m

Width
2.0 m

Client
Highways England

End Date
11/05/2018

Equipment Used
Tracked Excavator

N

[East side of trench]

Start of Trench

Easting (OS mE)
367364.686

Ground Level (mAOD)
118.435

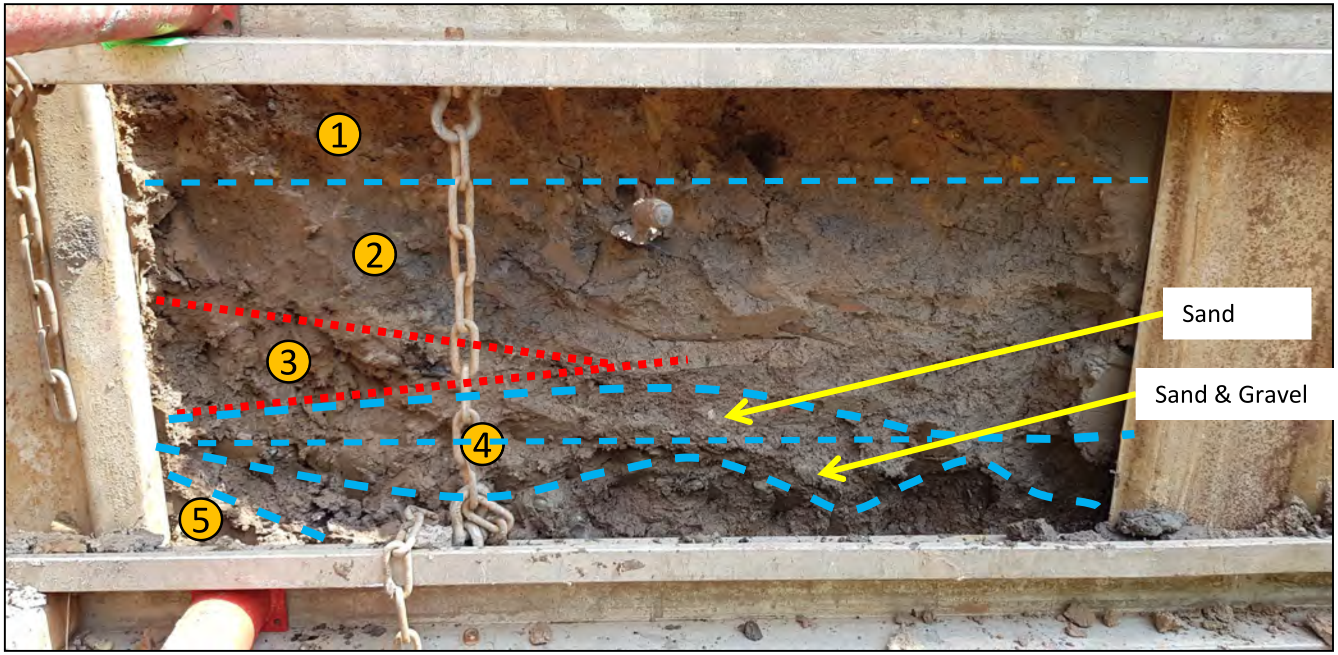
Northing (OS mN)
86147.087

End of Trench

Easting (OS mE)
367365

Ground Level (mAOD)
118.404

Northing (OS mN)
86142



Key

Lithological boundary

Uncertain lithological boundaries

Legend

1) Soft orangish brown occasionally stained black slightly sandy gravelly CLAY with frequent amounts of rootlets and rare wooden fragments from mature trees. Sand is fine to medium. Gravel is rounded to subrounded fine to coarse of mixed lithology. (COLLUVIUM)
2) Firm light grey slightly sandy gravelly CLAY with rare sand lenses. Sand is fine to coarse. Gravel is subrounded fine of mixed lithologies. Occasional horizontal (10 to 20 mm) sand lenses, slight organic odour and rare wooden fragments from branches. (ALLUVIUM)
3) Frim dark grey sandy slightly gravelly CLAY with rare sand lenses. Sand is fine to coarse. Gravel is subrounded fine of mixed lithologies. (ALLUVIUM)
4) Grey fine to medium SAND gradually grading into SAND & GRAVEL with rare cobbles of mixed lithologies. Sand is fine to coarse. Gravel is rounded fine to coarse (Granular ALLUVIUM)
5) Soft becoming firm brown mottled grey slightly sandy gravelly CLAY with rare cobbles of mixed lithology. (GLACIAL TILL)

NOTE

Not possible to remove shoring to the southern face due to the trial pit instablility.

Photo Log Sheet – Trans-Pennine Upgrade

TT402 – Face B

Project	Job No	Start Date	Logged By	Contractor	Final Depth	Length	Width
Trans-Pennine Upgrade Programme Stage 3	10013530	08/05/2018	JM	Arcadis Consulting (UK) Ltd.	2.0 m	4.0 m	2.0 m

Client	End Date	Equipment Used
Highways England	11/05/2018	Tracked Excavator

N

[West side of trench]

Start of Trench

Easting (OS mE)
367364.686

Ground Level (mAOD)
118.435

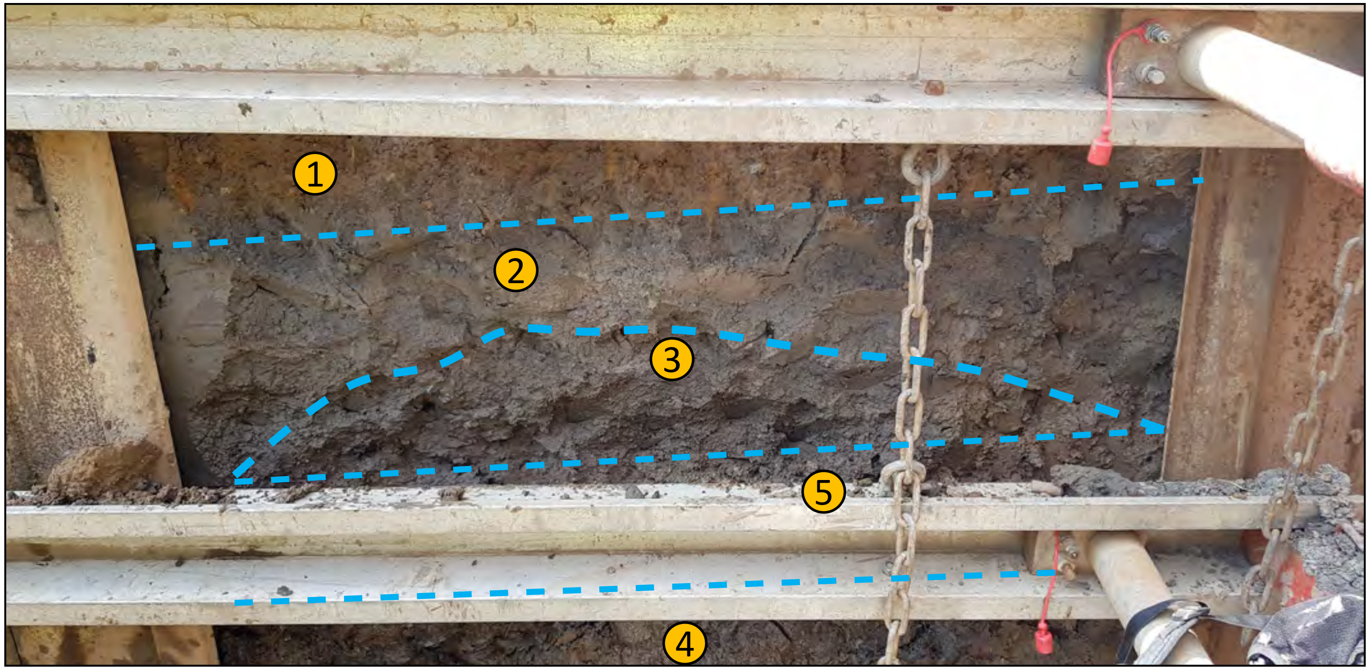
Northing (OS mN)
86147.087

End of Trench

Easting (OS mE)
367365

Ground Level (mAOD)
118.404

Northing (OS mN)
86142



Key

Lithological boundary

Legend

1) Soft orangish brown occasionally stained black slightly sandy gravelly CLAY with frequent amounts of rootlets and rare wooden fragments from mature trees. Sand is fine to medium. Gravel is rounded to subrounded fine to coarse of mixed lithology.
2) Firm grey slightly sandy gravelly CLAY with rare sand lenses. Sand is fine to coarse. Gravel is subrounded fine siltstone, sandstone and quartz. Occasional horizontal (10 to 20 mm) sand lenses, slight organic odour and rare wooden fragments from branches. (ALLUVIUM)
3) Stiff grey sandy slightly gravelly CLAY with rare sand lenses. Sand is fine to coarse. Gravel is subrounded fine siltstone and sandstone.
4) Soft becoming firm brown mottled grey slightly sandy gravelly CLAY with rare cobbles of siltstone and sandstone. (GLACIAL TILL)
5) Grey fine to medium SAND gradually grading into SAND & GRAVEL with rare cobbles of siltstone and sandstone. Sand is fine to coarse. Gravel is rounded fine to coarse (RIVER TERRACE GRAVEL)

NOTE

Not possible to remove shoring to observe more material due to the trial pit been unstable.

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