M25 junction 28 improvement scheme

TR010029

9.25 Ground Investigation Report: Appendices A-G

Rule 5(2)(q)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

Volume 9

January 2021

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

M25 junction 28 scheme

Development Consent Order 202[x]

9.25 Ground Investigation Report: Appendices A-G

Rule Number:	Rule 5(2)(q)
Planning Inspectorate Scheme Reference	TR010029
Application Document Reference	TR010029/EXAM/9.25
Author:	M25 junction 28 improvement scheme project team, Highways England

Version	Date	Status of Version
0	21 January 2021	Deadline 1

8. Appendices

Appendix A. **PCF3 General Arrangement Plans**

DO NOT SCALE

Millimetres 100 0 10

FOR CONTINUATION REFER TO SHEET 3

MAYLANDS GOLF COURSE

M25 J28 LOOP ROAD

WEALD BROOK

GROVE FARM UNDERPASS

ALDER WOOD BRIDGE

BRENTWOOD BC
LB HAVERING

GROVE FARM

M25 NORTHBOUND ON-SLIP

M25 SOUTHBOUND OFF-SLIP

INGREBOURNE RIVER

MAYLANDS BRIDGE

BROOK STREET VIADUCT

A12 EASTBOUND OFF-SLIP

POPLARS EAST BRIDGE

VICARAGE CLOSE

DAGNAM PARK DR

FAIRFORD CLOSE

FAIRFORD WAY

KENILWORTH AVENUE

WOODSTOCK AVENUE

PETERSFIELD AVENUE

A12

A12 EASTBOUND TO BRENTWOOD

A12 WESTBOUND TO ROMFORD

THE PARADE

COLCHESTER ROAD

MAYLANDS WAY

HAROLD PARK

THURSO CLOSE

HAROLD COURT ROAD

WILLOW WAY

HOMEWAY

M25 NORTHBOUND TO M11

M25 SOUTHBOUND TO A127

ROMAN ROAD

A1023 BROOK STREET

LB HAVERING
BRENTWOOD BC

GROVE BRIDGE

POPLARS WEST BRIDGE

A12 WESTBOUND ON-SLIP

PROPOSED CULVERT EXTENSION

M25 NORTHBOUND OFF-SLIP

M25 SOUTHBOUND ON-SLIP

M25 JUNCTION 28

INGREBOURNE RIVER

WEALD BROOK

LB HAVERING
BRENTWOOD BC

FOR CONTINUATION REFER TO SHEET 2

FOR CONTINUATION REFER TO SHEET 4

Scale 1:2500

50m 0m 50m 100m 150m

NOTES:

1. THIS SKETCH ILLUSTRATES THE PROPOSED LAYOUT FOR THE M25 JUNCTION 28 IMPROVEMENT SCHEME.
2. THE PROPOSED SCHEME LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY AND WILL BE SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT.

SHEET LAYOUT
N.T.S

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
DCO Application	S3	---	NK	CG	CG	---	11/09/19
Draft DCO Application for Review & Comments	0	PJH	---	---	---	---	---

Drawing Suitability

Status

Project Title: M25 junction 28 improvement scheme

Drawing Title: SCHEME LAYOUT PLANS REGULATION 5(2)(o)

SHEET 1 OF 4

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Client: Working on behalf of highways england

Drawing Number: TR010029/APP/2.6

Rev: 0

HE PIN: HE551519 | Scale: 1:2500 | Original Size: A1

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO SHEET 1

WIGLEY BUSH LANE BRIDGE

WEALD PARKWAY BRIDGE

WEALD PARK WAY

A12 EASTBOUND TO BRENTWOOD

A12 WESTBOUND TO ROMFORD

A12

WINGRAVE COURT

LEONARD WAY

WIGLEY BUSH LANE

WINGRAVE CRESCENT

TERN WAY

RIVER ROAD

SPITAL LANE

BROOK ROAD

TALBROOK

SELWOOD ROAD

BELVEDERE ROAD

LINKWAY ROAD

LANGLEY Dr

WANSFORD CLOSE

HILLSIDE WALK

S WEALD ROAD

A1023 BROOK STREET

NAG'S HEAD LANE

BRENTWOOD

EXISTING RAILWAY

Scale 1:2500

50m 0m 50m 100m 150m

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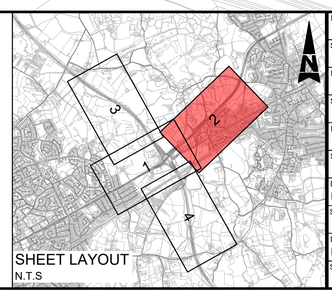

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SHEET 2 OF 4

Drawing Number: TR010029/APP/2.6

Rev: 0

HE PIN: HE551519

Scale: 1:2500

Original Size: A1

DO NOT SCALE

Millimetres 0 10 100

WEALD BROOK

BRENTWOOD BC
LB HAVERING

M25 SOUTHBOUND TO A127

M25 NORTHBOUND TO M11

PROPOSED CULVERT EXTENSION

PROPOSED CULVERT EXTENSION

WEALD BROOK

WEALD BROOK

BRENTWOOD BC
LB HAVERING

M25

MAYLANDS GOLF COURSE

FOR CONTINUATION REFER TO SHEET 1

Scale 1:2500

50m 0m 50m 100m 150m

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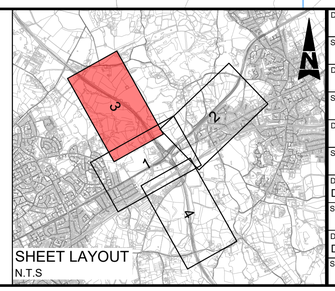

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N.T.S

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Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description	DCO Application					
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
	S3	---	NK	CG	CG	---	11/09/19
Description	Draft DCO Application for Review & Comments					
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
	0	PJH	---	---	---	---	---

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Drawing Title: SCHEME LAYOUT PLANS REGULATION 5(2)(o)

SHEET 3 OF 4

Drawing Number: TR010029/APP/2.6

Rev: 0

HE PIN: HE551519

Scale: 1:2500

Original Size: A1

This Drawing is saved on ProjectWise. Plotted: 21/02/2020 17:50:07 By: HUNT3289

DO NOT SCALE

Millimetres 0 10 100

FOR CONTINUATION REFER TO SHEET 1

POPLARS RAILWAY BRIDGE

NAG'S HEAD LANE BRIDGE

NAG'S HEAD LANE

POPLARS RAILWAY BRIDGE

BRENTWOOD BC
LB HAVERING

BOYLESS COURT BRIDGE

M25 SOUTHBOUND TO A127

M25 NORTHBOUND TO M11

WARLEY ROAD

M25

WARLEY ROAD BRIDGE

EXISTING RAILWAY LINE

NAG'S HEAD LANE

BRENTWOOD BC
LB HAVERING

Scale 1:2500

50m 0m 50m 100m 150m

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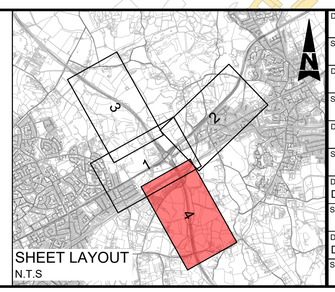

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N.T.S

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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: DCO Application	S3	---	NK	CG	CG	---	12/09/19
Description: Draft DCO Application for Review & Comments	0	PJH	---	---	---	---	---

Drawing Suitability

Status

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SHEET 4 OF 4

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Drawing Number: TR010029/APP/2.6

Rev: 0

HE PIN: HE551519 | Scale: 1:2500 | Original Size: A1

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Appendix B. **Exploratory Hole Location Plans**

DO NOT SCALE

Millimetres 100 0 10

GROVE FARM

GLEBELANDS (MAYLAND GOLF CBLUB)

WEALD BROOK

M25

A12

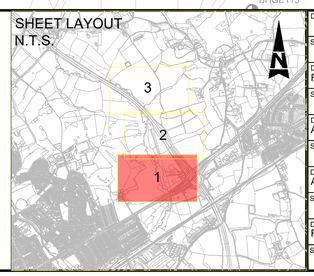
ATK-100 ATK-090 ATK-025B ATK-025A ATK-025 ATK-024 ATK-023 ATK-035 ATK-053 BHGE121 BHN78 BH152 SS15 BH153 SS12A SS11 SS12 SS14 SS13 BHGE119 ATK-017A BH154 ATK-022 BH155 ATK-017 BHLG307 BHN79 BHLG417 SS20 SS19 BHLG416 ATK-004 BHGE120 ATK-098 ATK-056 ATK-021 BH156 BHLG312 ATK-054 ATK-093 SS21 ATK-020 BH157 BHLG304 SS22 ATK-013 ATK-014 ATK-055 BHLG414 ATK-083 BHLG415 ATK-084 BHLG303 BH158 ATK-057 ATK-082 ATK-012 BHGE116 BH159 ATK-010 BHLG305 BHLG306 ATK-009A ATK-058 BH160 SS23 ATK-008 ATK-011 BH161 ATK-009 SS24 ATK-059 ATK-061 BHLG310 ATK-002 ATK-006 ATK-005 ATK-007 ATK-015 ATK-094 BHLG412 BHGE118 BHLG413 BHGE117 ATK-001 ATK-206 ATK-205 ATK-207 ATK-203 ATK-202 ATK-204 ATK-201 BHGE115

Scale 1:1250
10m 0m 10m 30m 50m 70m 90m

NOTES:
1. DO NOT SCALE FROM THIS DRAWING
2. TO BE READ IN CONJUNCTION WITH THE GROUND INVESTIGATION REPORT (GIR), REPORT NUMBER: HE551519-ATK-GEN-XX-RP-CE-000001.

HISTORICAL INVESTIGATION	2019 INVESTIGATION	
		DYNAMIC SAMPLE OR ROTARY CORE BOREHOLE
		CABLE PERCUSSION OR UNDEFINED BOREHOLE TYPE (WITH OR WITHOUT ROTARY FOLLOW ON)
		WINDOWLESS SAMPLE
		TRIAL PIT
		INSPECTION PIT
		STATIC CONE PENETRATION TESTING
		CONCRETE CORE

SHEET LAYOUT
N.T.S.



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FIRST ISSUE	A1	C01	AP	PM	SRM	PG	09/11/18
AMENDMENTS TO LOCATIONS	A1	C02	DD	PM	TR	PG	28/06/19
AMENDMENTS TO LOCATIONS FOLLOWING DF3	B1	C03	DD	PM	AC	PG	09/08/19
Rvised following completion of the 2019 investigation	S3	P04	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: EXPLORATORY HOLE PLAN FOR GROUND INVESTIGATION SHEET 1 OF 3

Drawing Number: HE551519 - ATK - HGT - J28 - DR - CE - 000001

Location | Type | Role | Number

Original Size: A1 | Scale: 1:1250 | Project Ref. No: 5158157 | Sheet: 1 of 3 | Rev: P04

DO NOT SCALE

Millimetres 100 0 10

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ATK-076
BHN74
BHN77
BHNS/24/2
ATK-075
BHNS/23/1
BH291
ATK-074
BHN75
BHN76
ATK-073
ATK-071
ATK-072
MG91
BHNS/25/1
ATK-070
BHLG29
BHNS/26/1
BHNS/25/2
ATK-069
ATK-068
BHNS/25/3
BH293
ATK-066
ATK-065
BHNS/24/3
BHN80
BHN82
BH149
MG93
BHNS/26/2
ATK-045
ATK-037
BH150
ATK-040
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ATK-041
ATK-049
HP02
ATK-034
BH294
HP04
HP03
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ATK-P-102
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ATK-P-009
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ATK-051
ATK-032
ATK-086
ATK-028
ATK-028A
ATK-092
ATK-027
ATK-026
BHN81
BHGE123
BHGE122
BHGE124
BH295

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Scale 1:1250
10m 0m 10m 30m 50m 70m 90m

NOTES:
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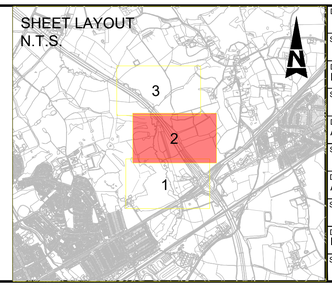
		WINDOWLESS SAMPLE
		TRIAL PIT
		INSPECTION PIT
		STATIC CONE PENETRATION TESTING
		CONCRETE CORE

SHEET LAYOUT
N.T.S.



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REVISED FOLLOWING COMPLETION OF THE 2019 INVESTIGAITON	S3	P04	JG	HF	SRM	PG	25/06/20

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Status: S3

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Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: EXPLORATORY HOLE PLAN FOR GROUND INVESTIGATION SHEET 2 OF 3

Drawing Number: Project HE551519 - Originator ATK - Volume HGT - Location J28 - Type DR - Role CE - Number 000002

Original Size: A1 | Scale: 1:1250 | Project Ref. No: 5158157 | Sheet: 2 of 3 | Rev: P04

DO NOT SCALE

Millimetres 0 10 100

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MG83
MG84
MG85
BH285
MG86
BH571
BH286
MG88
BH572
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ATK-019
BH288
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MG89
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ATK-080
BH147A
BH289
BHN73
ATK-079
ATK-078
MG90
BHNS/24/1
ATK-077
BH290
BH147
ATK-076

Scale 1:1250
10m 0m 10m 30m 50m 70m 90m

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		WINDOWLESS SAMPLE
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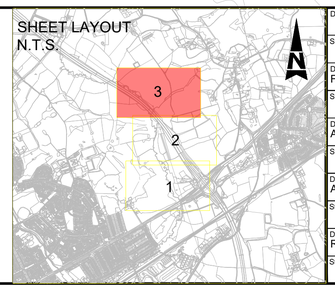
		INSPECTION PIT
		STATIC CONE PENETRATION TESTING
		CONCRETE CORE

SHEET LAYOUT
N.T.S.



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Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: EXPLORATORY HOLE PLAN FOR GROUND INVESTIGATION SHEET 3 OF 3

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551519 - ATK - HGT - J28 - DR - CE - 000003

Original Size: A1 | Scale: 1:1250 | Project Ref. No: 5158157 | Sheet: 3 of 3 | Rev: P04

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Appendix C. **Factual Ground Investigation Report**

Factual Report

35403 Final Report RevD.zip

AGS File:

35403 - 2020-04-27 1430 - Final - 5.zip

Appendix D. **Geo-Environmental Conceptual Ground Models**

Source	Receptor	Pathway	Baseline			Construction without mitigation			Mitigation measures	Construction with mitigation			Operation		
			Consequence of risk	Probability of risk	Classification of risk (assuming reasonable worst case)	Consequence of risk	Probability of risk	Classification of risk		Consequence of risk	Probability of risk	Classification of risk	Consequence of risk	Probability of risk	Classification of risk
Identified human health risks associated with localised beryllium, asbestos and elevated concentrations of ground gas (methane and carbon dioxide)	On-site members of the public in public spaces within the Scheme boundary	Inhalation, ingestion and/or dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**	The ground investigation (GI) and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters. No remediation / removal of contaminated material is required. However, if visual or olfactory signs of contamination are noted during construction, remediation / removal would be required. Use of ventilated temporary structures during construction. Use of appropriate hazard signage and / or ground gas protection measures within below ground chambers and ducts. Implementation of measures in the CEMP such as good management of stockpiles in accordance with Environment Agency Pollution Prevention Guidelines (PPG), implementation of pollution incident control e.g. plant drip trays and spill kits. Implementation of dust management systems. Risk Assessment and Method Statements (RAMS) to be completed prior to construction and risk management with appropriate Personal Protective Equipment (PPE).	Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Inhalation, ingestion and/or dermal contact with chemical parameters within perched water and shallow groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration and accumulation of ground gases and/or vapours followed by inhalation and/or ignition causing asphyxiation and/or explosion	Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**		Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**
		Inhalation, ingestion and/or dermal contact with chemical parameters within surface water	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
	On-site future construction workers and site maintenance workers associated with the Scheme	Inhalation, ingestion and/or dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Receptor not present at baseline			Medium	Low likelihood	**Moderate/Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Inhalation, ingestion and/or dermal contact with chemical parameters within perched water and shallow groundwater				Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration and accumulation of ground gases and/or vapours followed by inhalation and/or ignition causing asphyxiation and/or explosion				Severe	Unlikely	**Moderate/Low Risk**		Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**
		Inhalation, ingestion and/or dermal contact with chemical parameters within surface water				Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
	Off-site workers/visitors/users at industrial, agricultural and commercial premises and recreational facilities including those at Grove Farm (garden centre, RJ Waste Management Recycling, skip hire and rubbish clearance), agricultural land workers and residents including those at property on Grove Farm	Inhalation, ingestion and dermal contact with chemical parameters in windblown soil-derived dust and ACM fibres	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion	Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**		Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within surface water	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
	On-site underground services including the NG high pressure gas main and BPA pipeline, existing structures, piles and foundations associated with residential, industrial, agricultural and commercial properties and future structures, services, piles and foundations	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**	The GI and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters. No agressive ground conditions were observed based on the BRE sulphate suite results and interpretation. No remediation / removal of contaminated material is required. However, if visual or olfactory signs of contamination are noted during construction, remediation / removal would be required. Use of appropriate hazard signage and / or ground gas protection measures within below ground chambers and ducts.	Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Medium	Unlikely	**Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
	Off-site existing structures, services piles and foundations associated with residential, industrial, agricultural and commercial properties. Other property including agricultural crops and livestock	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	MIld	Unlikely	**Very Low Risk**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Migration of contamination in shallow groundwater and uptake by crops	Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Inhalation, ingestion and dermal contact with contaminants in soil and windblown soil-derived dust by livestock	Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
Identified exceedances of freshwater environmental quality standards for ammonium, sulphate, iron and manganese concentratiosn in shallow groundwater and soil-derived leachate.	On-site groundwater (superficial Secondary A aquifer and Secondary Undifferentiated aquifer), current surface water features (Ingrebourne River and Weald Brook) and future surface water features proposed as part of the Scheme (attenuation ponds)	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**	The GI and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters. Remediation/ removal of existing contamination if risk assessments deem necessary. Appropriate design measures for attenuation ponds, if risk assessments deem necessary e.g. incorporating pond lining. Controlled Waters Piling Risk Assessment (PRA) and use of appropriate piling methods. Implementation of measures in the CEMP such as good management of stockpiles in accordance with Environment Agency PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
		Lateral migration of chemical parameters in groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration of chemical parameters entrained in surface water / run-off	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
		Lateral migration of chemical parameters in shallow groundwater / perched water to surface waters	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration of perched water and / or surface water via preferential pathways e.g. attenuation ponds (if unlined) and pond outfalls	Pathway not present at baseline			Mild	High likelihood	**Moderate Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
	Off-site groundwater (superficial Secondary A aquifer and Secondary Undifferentiated aquifer) and current surface water features (Ingrebourne River and Weald Brook)	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
		Lateral migration of chemical parameters in groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration of chemical parameters entrained in surface water / run-off	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
		Lateral migration of chemical parameters in shallow groundwater to surface waters	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
Potential chemical parameters in soil/groundwater and gases/vapours associated with the following off-site sources: •Made Ground/infill of unknown provenance associated with	On-site members of the public in public spaces within the Scheme boundary	Inhalation, ingestion and dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**	The GI and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters. Use of ventilated temporary structures during construction. Use of appropriate hazard signage and / or ground gas	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Unlikely	**Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion	Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**		Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within surface water	Mild	Low likelihood	**Low Risk**	Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**

Source	Receptor	Pathway	Baseline			Construction without mitigation			Mitigation measures	Construction with mitigation			Operation		
			Consequence of risk	Probability of risk	Classification of risk (assuming reasonable worst case)	Consequence of risk	Probability of risk	Classification of risk		Consequence of risk	Probability of risk	Classification of risk	Consequence of risk	Probability of risk	Classification of risk
existing roads, off-site development infilled pits/ponds/watercourses; •Activities and land uses associated with Grove Farm, including a garden centre and RJ Waste Management Recycling, skip hire and rubbish clearance; •Other land uses including two active fuel stations and two former fuel stations; electricity substations, sewage treatment works, former aerodrome (wider area from the Scheme boundary), vehicle service garages, garden centre, farms and associated agricultural activities, vehicle cleaning services; and •Eight recorded pollution incidents. Potential chemical parameters of concern include a range of inorganic and organic contaminants including heavy metals, metalloids, PAH, TPH, unleaded kerosene/naphthalene (associated with former aerodrome), solvents, asbestos, PCBs, herbicides and pesticides.	On-site future construction workers and site maintenance workers associated with the Scheme	Inhalation, ingestion and dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Receptor not present at baseline			Medium	Low likelihood	**Moderate/Low Risk**	protection measures within below ground chambers and ducts. RAMS to be completed prior to construction and risk management with appropriate PPE.	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Unlikely	**Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater				Mild	Low likelihood	**Low Risk**		Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion				Severe	Unlikely	**Moderate/Low Risk**		Severe	Unlikely	**Moderate/Low Risk**	Severe	Unlikely	**Moderate/Low Risk**
		Inhalation, ingestion and dermal contact with chemical parameters within surface water				Mild	Low likelihood	**Low Risk**		Mild	Low likelihood	**Low Risk**	Mild	Unlikely	**Very Low Risk**
	On-site groundwater (superficial Secondary A aquifer and Secondary Undifferentiated aquifer), current surface water features (Ingrebourne River and Weald Brook) and future surface water features proposed as part of the Scheme (attenuation ponds)	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**	The GI and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters.	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Unlikely	**Low Risk**
		Lateral migration of chemical parameters in groundwater	Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Migration of chemical parameters entrained in surface water / run-off	Medium	Low likelihood	**Moderate/Low Risk**	Medium	Low likelihood	**Moderate/Low Risk**		Medium	Low likelihood	**Moderate/Low Risk**	Medium	Unlikely	**Low Risk**
		Lateral migration of chemical parameters in shallow groundwater / perched water to surface waters	Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
		Migration of perched / shallow groundwater and / or surface water via preferential pathways e.g. via piling	Pathway not present at baseline			Medium	Low likelihood	**Moderate/Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**
	On-site underground services including the NG high pressure gas main and BPA pipeline, existing structures, piles and foundations associated with residential, industrial, agricultural and commercial properties and future structures, services, piles and foundations	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Mild	Unlikely	**Very Low Risk**	Mild	Low likelihood	**Low Risk**	The GI and subsequent risk assessments have identified a few, localised exceedences of assessment criteria for human health and controlled waters. Use of appropriate hazard signage and / or ground gas protection measures within below ground chambers and ducts.	Mild	Unlikely	**Very Low Risk**	Mild	Unlikely	**Very Low Risk**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**		Medium	Unlikely	**Low Risk**	Medium	Unlikely	**Low Risk**

Source	Receptor	Pathway	Classification of risk (baseline)	Classification of risk (assuming reasonable worst case)	Impact (construction without mitigation)	Classification of risk (construction with mitigation)	Impact (construction with mitigation)	Classification of risk (operation)	Impact (during operation phase assuming mitigation was implemented)
Identified human health risks associated with localised beryllium, asbestos and elevated concentrations of ground gas (methane and carbon dioxide)	On-site members of the public in public spaces within the Scheme boundary	Inhalation, ingestion and/or dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Low Risk	**Minor Beneficial**	Low Risk	**Minor Beneficial**
		Inhalation, ingestion and/or dermal contact with chemical parameters within perched water and shallow groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration and accumulation of ground gases and/or vapours followed by inhalation and/or ignition causing asphyxiation	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**
		Inhalation, ingestion and/or dermal contact with chemical parameters within surface water	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
	On-site future construction workers and site maintenance workers associated with the Scheme	Inhalation, ingestion and/or dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Receptor not present at baseline	Moderate/Low Risk	**(Impact predicted to be moderate adverse given sensitivity of receptor)**	Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway being realised)**	Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway being realised)**
		Inhalation, ingestion and/or dermal contact with chemical parameters within perched water and shallow groundwater		Low Risk		Very Low Risk		Very Low Risk	
		Migration and accumulation of ground gases and/or vapours followed by inhalation and/or ignition causing asphyxiation and/or explosion		Moderate/Low Risk		Moderate/Low Risk		Moderate/Low Risk	
		Inhalation, ingestion and/or dermal contact with chemical parameters within surface water		Low Risk		Very Low Risk		Very Low Risk	
	Off-site workers/visitors/users at industrial, agricultural and commercial premises and recreational facilities including those at Grove Farm (garden centre, RJ Waste Management Recycling, skip hire and rubbish clearance), agricultural land workers and residents including those at property on Grove Farm	Inhalation, ingestion and dermal contact with chemical parameters in windblown soil-derived dust and ACM fibres	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Low Risk	**Minor Beneficial**	Low Risk	**Minor Beneficial**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater	Very Low Risk	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**
		Inhalation, ingestion and dermal contact with chemical parameters within surface water	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
	On-site underground services including the NG high pressure gas main and BPA pipeline, existing structures, piles and foundations associated with residential, industrial, agricultural and commercial properties and future structures, services, piles and foundations	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Low Risk	Moderate/Low Risk	**Minor Adverse**	Low Risk	**Negligible**	Low Risk	**Negligible**
	Off-site existing structures, services piles and foundations associated with residential, industrial, agricultural and commercial properties. Other property including agricultural crops and livestock	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Low Risk	**Negligible**
		Migration of contamination in shallow groundwater and uptake by crops	Very Low Risk	Very Low Risk	**(Impact predicted to be minor adverse given sensitivity of**	Very Low Risk	**(Impact predicted to be negligible given reduced**	Very Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway**
		Inhalation, ingestion and dermal contact with contaminants in soil and windblown soil-derived dust by livestock	Very Low Risk	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
Identified exceedances of freshwater environmental quality standards for ammonium, sulphate, iron and manganese concentratiosn in shallow groundwater and soil-derived leachate.	On-site groundwater (superficial Secondary A aquifer and Secondary Undifferentiated aquifer), current surface water features (Ingrebourne River and Weald Brook) and future surface water features proposed as part of the Scheme (attenuation ponds)	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration of chemical parameters entrained in surface water / run-off	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in shallow groundwater / perched water to surface waters	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration of perched water and / or surface water via preferential pathways e.g. attenuation ponds (if unlined) and pond outfalls	Pathway not present at baseline	Moderate Risk	**(Impact predicted to be moderate adverse given sensitivity of receptor)**	Low Risk	**(Impact predicted to be minor adverse given sensitivity of receptor)**	Very Low Risk	**(Impact predicted to be minor adverse given sensitivity of receptor)**
	Off-site groundwater (superficial Secondary A aquifer and Secondary	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**

Source	Receptor	Pathway	Classification of risk (baseline)	Classification of risk (assuming reasonable worst case)	Impact (construction without mitigation)	Classification of risk (construction with mitigation)	Impact (construction with mitigation)	Classification of risk (operation)	Impact (during operation phase assuming mitigation was implemented)
	Secondary A aquifer and Secondary Undifferentiated aquifer) and current surface water features (Ingrebourne River and Weald Brook)	Migration of chemical parameters entrained in surface water / run-off	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in shallow groundwater to surface waters	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
Potential chemical parameters in soil/groundwater and gases/vapours associated with the following off-site sources: •Made Ground/infill of unknown provenance associated with existing roads, off-site development infilled pits/ponds/watercourses; •Activities and land uses associated with Grove Farm, including a garden centre and RJ Waste Management Recycling, skip hire and rubbish clearance; •Other land uses including two active fuel stations and two former fuel stations; electricity substations, sewage treatment works, former aerodrome (wider area from the Scheme boundary), vehicle service garages, garden centre, farms and associated agricultural activities, vehicle cleaning services; and •Eight recorded pollution incidents. Potential chemical parameters of concern include a range of inorganic and organic contaminants including heavy metals, metalloids, PAH, TPH, unleaded kerosene/naphthalene (associated with former aerodrome), solvents, asbestos, PCBs, herbicides and pesticides.	On-site members of the public in public spaces within the Scheme boundary	Inhalation, ingestion and dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Low Risk	**Minor Beneficial**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**
		Inhalation, ingestion and dermal contact with chemical parameters within surface water	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Very Low Risk	**Minor Beneficial**
	On-site future construction workers and site maintenance workers associated with the Scheme	Inhalation, ingestion and dermal contact with chemical parameters in soil, soil-derived dust and ACM fibres	**Receptor not present at baseline**	Moderate/Low Risk	**(Impact predicted to be moderate adverse given sensitivity of receptor)**	Moderate/Low Risk	**Impact predicted to be negligible given the mitigation measures**	Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway being realised)**
		Inhalation, ingestion and dermal contact with chemical parameters within perched water and shallow groundwater		Low Risk		Very Low Risk		Very Low Risk	
		Migration and accumulation of ground gases and/or vapours followed by inhalation or ignition causing asphyxiation and/or explosion		Moderate/Low Risk		Moderate/Low Risk		Moderate/Low Risk	
		Inhalation, ingestion and dermal contact with chemical parameters within surface water		Low Risk		Low Risk		Very Low Risk	
	On-site groundwater (superficial Secondary A aquifer and Secondary Undifferentiated aquifer), current surface water features (Ingrebourne River and Weald Brook) and future surface water features proposed as part of the Scheme (attenuation ponds)	Leaching/ vertical migration of chemical parameters in soils to underlying groundwater	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in groundwater	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Low Risk	**Negligible**
		Migration of chemical parameters entrained in surface water / run-off	Moderate/Low Risk	Moderate/Low Risk	**Negligible**	Moderate/Low Risk	**Negligible**	Low Risk	**Minor Beneficial**
		Lateral migration of chemical parameters in shallow groundwater / perched water to surface waters	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Low Risk	**Negligible**
		Migration of perched / shallow groundwater and / or surface water via preferential pathways e.g. via piling	Pathway not present at baseline		**(Impact predicted to be minor adverse given sensitivity of receptor)**	Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway being realised)**	Low Risk	**(Impact predicted to be negligible given reduced likelihood of pathway being realised)**
	On-site underground services including the NG high pressure gas main and BPA pipeline, existing structures, piles and foundations associated with residential, industrial, agricultural and commercial properties and future structures, services, piles and foundations	Chemical attack of buried structures in contact with chemical parameters in soil or groundwater	Very Low Risk	Low Risk	**Minor Adverse**	Very Low Risk	**Negligible**	Very Low Risk	**Negligible**
		Migration of ground gases and/or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Low Risk	Low Risk	**Negligible**	Low Risk	**Negligible**	Low Risk	**Negligible**

Appendix E. **Surface Water Monitoring Plan**

Notes

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LEGEND

Ground Investigation Points

SW

ATKINS

Member of the SNC-Lavalin Group

Nova North, London

Client: Highways England

Project Title: M25 Junction 28 Improvement Scheme

Drawing Title: Surface Water Sampling Locations

Scale	Designed	Drawn	Checked	Authorised
1:5000	DM/KB	DM	CP	GM

Original Size	Date	Date	Date	Date
A4	17/09/2019	17/09/2019	22/06/2020	22/06/2020

Drawing Number: Drawing_J28_SW Sampling

Revision: 01

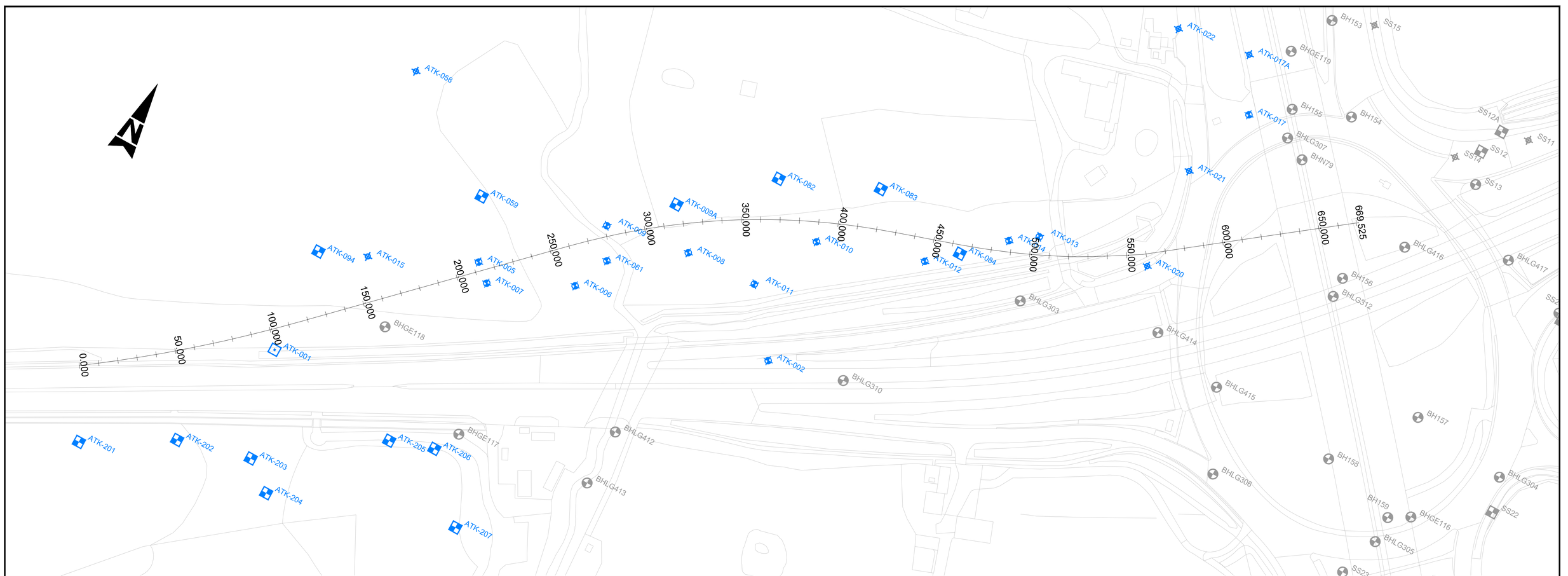
			Location ID		SW01	SW01	SW01	SW01	SW01	SW01	SW02	SW02	SW02	SW02	SW02	SW02
			Sample Date		2019-11-06	2019-11-14	2019-11-20	2020-01-08	2020-01-24	2020-02-04	2019-11-07	2019-11-13	2019-11-20	2020-01-08	2020-01-24	2020-02-04
Analyte	**Unit**	**LOD**	**EQS (Freshwater) or PNEC (mg/l)**	**EQS (Freshwater) or PNEC (ug/l)**												
Electrical Conductivity	uS/cm	10	-	-	1000	1100	1200	780	870	680	970	960	1000	780	820	710
BOD (Biochemical Oxygen Demand)	mg/l	1	-	-	1.4	13	7.9	1.1	1.6	5.3	1.1	1.5	7.8	< 1.0	1	8
Total Organic Carbon (TOC)	mg/l	0.1	-	-	17.2	13.2	25.4	12.3	12.1	12.1	15.9	13.9	18.8	12.2	11.8	13.2
Dissolved Organic Carbon (DOC)	mg/l	0.1	-	-	16.9	12.8	24.1	12	11.7	11.6	15.8	13.4	18.1	12.2	11	13.1
Sulphate as SO4	ug/l	45	400	400000	150000	120000	177000	127000	171000	82100	141000	164000	185000	133000	135000	117000
Chloride	mg/l	0.15	250	250000	110	210	120	63	61	48	110	96	97	64	60	56
Sulphide	ug/l	5	-	-	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	1400	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Cyanide	ug/l	10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Ammonia as NH3	ug/l	15	0.25	250	5400	41	26000	< 15	270	37	1600	30	3700	61	140	53
Free Cyanide	ug/l	10	0.001	1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Phosphorus (dissolved)	ug/l	20	-	-	200	167	111	76.3	48.7	101	143	124	87.5	72.5	74.6	75
Ammonium as NH4	ug/l	15	0.26	260	5700	43	28000	< 15	290	39	1700	31	3900	65	140	56
pH	pH Units		6.0-9.0		7.8	7.8	7.6	7.9	8	8.1	7.6	7.9	7.6	7.9	8.1	8
Chromium (hexavalent)	ug/l	5	0.0034	3.4	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0	1	1000	0.14	0.28	0.19	0.086	0.11	0.76	0.21	0.31	0.25	0.085	0.11	0.11
Lead (dissolved)	ug/l	0.2	0.01554	15.54	1.8	0.5	0.4	0.7	1.1	0.7	0.4	1.1	< 0.2	0.3	0.7	1.8
Magnesium (dissolved)	mg/l	0.01	-	-	17	14	19	15	20	14	19	18	19	17	17	15
Mercury (dissolved)	ug/l	0.05	0.00007	0.07	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	ug/l	0.05	-	-	2	2.1	1.3	1.6	1.7	1.6	2.3	1.9	1.5	1.4	2.5	1.6
Nickel (dissolved)	ug/l	0.5	0.02263	22.63	4.6	2.4	6.1	2.8	3.2	3.3	4.5	3.3	5.1	3.1	2.9	5.1
Potassium (dissolved)	mg/l	0.03	-	-	17	13	21	9	7	7.3	16	12	14	9.5	7.1	8.2
Sodium (dissolved)	mg/l	0.01	-	-	67	130	80	38	45	26	64	53	72	39	42	35
Tin (dissolved)	ug/l	0.2	0.025	25	0.32	0.49	0.93	0.22	0.47	0.71	0.44	0.84	0.7	0.38	0.24	0.57
Antimony (dissolved)	ug/l	0.4	-	-	1.3	1.5	1.6	0.9	0.9	0.9	1	1.1	1.3	1	0.9	0.9
Arsenic (dissolved)	ug/l	0.15	0.05	50	1.69	1.33	2.88	0.62	0.8	1.19	1.68	0.76	1.98	0.81	0.88	1.16
Barium (dissolved)	ug/l	0.06	-	-	30	29	42	34	33	27	31	29	40	34	29	28
Beryllium (dissolved)	ug/l	0.1	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	ug/l	10	2	2000	110	41	100	72	84	74	100	69	75	75	81	79
Cadmium (dissolved)	ug/l	0.02	0.00008	0.08	0.05	0.05	0.04	< 0.02	< 0.02	< 0.02	0.03	< 0.02	0.03	< 0.02	< 0.02	0.03
Chromium (dissolved)	ug/l	0.2	-	-	0.6	0.9	2.9	0.5	0.6	0.6	1.2	1.7	2.2	0.6	0.5	0.6
Cobalt (dissolved)	ug/l	0.2	0.003	3	1	0.3	1.2	0.4	0.5	0.3	0.6	0.3	0.6	0.3	0.4	0.7
Copper (dissolved)	ug/l	0.5	0.035	35	7.4	7.5	6.1	4.5	4.5	8	6.7	4.5	5.7	4.7	4.6	6.2
Vanadium (dissolved) - by ICP MS	ug/l	0.2	0.02	20	1.1	1.3	1	0.9	0.8	1	0.9	0.8	0.7	0.9	0.8	1.2
Zinc (dissolved)	ug/l	0.5	0.05601	56.01	20	19	17	3.6	4.1	4.2	12	40	13	3.9	4.3	7.3
Calcium (dissolved)	mg/l	0.01	-	-	95	98	110	100	110	78	100	110	140	110	100	96
Selenium (dissolved)	ug/l	0.6	-	-	1.5	1.1	1.9	1.1	1.2	1.2	2	1.2	0.8	1.1	1	1.2
Manganese (dissolved)	ug/l	0.05	0.28902	289.02	82	8.8	3.6	39	35	17	34	15	3.4	17	25	32
2,4-Dimethylphenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	ug/l	0.05	0.0077	7.7	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dichlorophenol	ug/l	0.05	0.0042	4.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	ug/l	0.05	0.04	40	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	ug/l	0.05	0.05	50	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Phenols (monohydric)	ug/l	10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
3&4-Methylphenol	ug/l	0.1	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sum Cresols (total) - calculated			-	-	0.05						0.05					
Ethylbenzene	ug/l	1	0.02	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/l	1	0.074	74	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sum Xylenes - calculated			0.03	30	1						1					
TPH-CWG - Aromatic >C7 - C8	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	ug/l	10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	ug/l	10	0.01	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	ug/l	10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Anthracene	ug/l	0.01	0.0001	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	ug/l	0.01	0.0000063	0.0063	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	ug/l	0.01	0.00000017	0.00017	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Di-benzo(a,h)anthracene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	ug/l	0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	ug/l	1	0.002	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	ug/l	0.01	0.002	2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total EPA-16 PAHs	ug/l	0.16	-	-	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
PAH Sum of 4 - calculated			-	-	0.01						0.01					
Styrene	ug/l	1	0.05	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	ug/l	1	0.02	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	ug/l	0.05	0.02	20	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dibromoethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Tetrachloromethane	ug/l	1	0.012	12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Pentachlorobenzene	ug/l		0.000007	0.007	< 0.03						< 0.03	< 0.03				
1,1,1,2-Tetrachloroethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	ug/l	1	0.0025	2.5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachloroethane	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,1,1-Trichloroethane	ug/l	1	0.1	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl chloride	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	ug/l	1	0.4	400	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	ug/l	1	0.01	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	ug/l		0.0006	0.6	< 0.03	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.03	< 0.03	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	ug/l	1	0.0006	0.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorotoluene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	ug/l	1	0.02	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	ug/l	0.05	0.02	20	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trimethylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachlorobenzene, 1,2,4,5-	ug/l		-	-	< 0.03						< 0.03	< 0.03				

			Location ID		SW01	SW01	SW01	SW01	SW01	SW01	SW02	SW02	SW02	SW02	SW02	SW02
			Sample Date		2019-11-06	2019-11-14	2019-11-20	2020-01-08	2020-01-24	2020-02-04	2019-11-07	2019-11-13	2019-11-20	2020-01-08	2020-01-24	2020-02-04
Analyte	**Unit**	**LOD**	**EQS (Freshwater) or PNEC (mg/l)**	**EQS (Freshwater) or PNEC (ug/l)**												
1,2-Dibromo-3-chloropropane	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sum Dichlorobenzenes - calculated			0.02	20	1						1					
Sum Dichlorobenzenes - calculated			0.02	20	0.05						0.05					
Sum Trihalomethanes - calculated			-	-	1						1					
Sum of TCE and PCE - calculated			-	-	1						1					
4-Nitroaniline	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Azobenzene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Trichlorobenzene, 1,3,5-	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Bis(2-chloroethyl)ether	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	ug/l		0.00005	0.05	< 0.03	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.03	< 0.03	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	ug/l	0.05	0.00005	0.05	< 0.05						< 0.05	< 0.05				
1,2,4-Trichlorobenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dinitrotoluene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	ug/l	0.05	0.8	800	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aniline	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	ug/l	0.05	0.2	200	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	ug/l	0.05	0.008	8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Butyl benzyl phthalate	ug/l	0.05	0.0075	7.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Carbazole	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Trichlorobenzene, 1,2,3-	ug/l		-	-	< 0.03						< 0.03	< 0.03				
1,2,3-Trichlorobenzene	ug/l	1	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Methylnaphthalene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	ug/l	0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Sum Trichlorobenzenes - calculated			0.0004	0.4	1						1					
Sum Trichlorobenzenes - calculated			0.0004	0.4	0.05						0.05					
Sum Trichlorobenzenes - calculated			0.0004	0.4	0.03						0.03					
Heptachlor exo-epoxide	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Endosulfan sulfate	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Tecnazene	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Dichlorprop	ug/l	0.02	-	-	< 0.02							< 0.02				
Malathion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Fenitrothion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Simazine	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Demeton-S	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Phosphamidon I	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Propazine	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Chlortoluron	ng/l	10	-	-	< 10						< 10	< 10				
Trifluralin	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Chlorothalonil	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Atrazine	ug/l	0.05	0.0006	0.6	< 0.05						< 0.05	< 0.05				
Trietazine	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Flumeturon	ng/l	10	-	-	< 10						< 10	< 10				
Cyanazine	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Dimethylvinphos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Phosalone	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Pirimiphos-ethyl	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Triazophos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Azinphos-ethyl	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Mevinphos , E-	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Chlorpyrifos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Pirimiphos-methyl	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Parathion-methyl	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Phorate	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Demeton-O	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Aldrin	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Propetamphos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
BHC-alpha (benzene hexachloride)	ug/l		-	-	< 0.03						< 0.03	< 0.03				
BHC-beta	ug/l		-	-	< 0.03						< 0.03	< 0.03				
BHC-delta	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Endosulfan II (beta isomer)	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Diazinon	ug/l		0.00001	0.01	< 0.03						< 0.03	< 0.03				
Mevinphos, Z-	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Isoproturon	ng/l	10	-	-	< 10						< 10	< 10				
DDE-o, p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Etrimfos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Isodrin	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Chlorfenvinphos (mixture of z and e isomers)	ug/l		0.0001	0.1	< 0.03						< 0.03	< 0.03				
DDT-p,p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Chlordane-cis	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Chlordane-trans	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Thidiazuron	ng/l	10	-	-	< 10						< 10	< 10				
DDD-o,p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Endrin ketone	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Fenthion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Ethion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Parathion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
BHC-gamma (Lindane, gamma HCH)	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Terbuthylazine	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Dimethoate	ug/l		0.00048	0.48	< 0.03						< 0.03	< 0.03				
Dieldrin	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Methacrifos	ug/l	0.03	-	-	< 0.03						< 0.03	< 0.03				
Dichlorvos	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Endrin	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Methoxychlor, p,p'-	ug/l		-	-	< 0.03						< 0.03	< 0.03				
DDD-p,p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
DDE-p,p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Prometryn	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Endrin aldehyde	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Heptachlor	ug/l		2E-10	0.0000002	< 0.03						< 0.03	< 0.03				
Carbophenothion	ug/l		-	-	< 0.03						< 0.03	< 0.03				
DDT-o,p'	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Azinphos-methyl	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Terbutryn	ug/l	0.05	-	-	< 0.05						< 0.05	< 0.05				
Dinoseb	ug/l	0.02	-	-	< 0.02							< 0.02				
MCPP (Mecoprop)	ug/l	0.02	0.018	18	0.28							0.03				
2,4,5-TP	ug/l	0.02	-	-	< 0.02							< 0.02				
2,4,5-T	ug/l	0.02	-	-	< 0.02							< 0.02				
MCPA	ug/l	0.02	-	-	< 0.02							< 0.02				
2,4-D	ug/l	0.02	-	-	< 0.02							< 0.02				
MCPB	ug/l	0.02	-	-	< 0.02							< 0.02				
2,4-DB	ug/l	0.02	-	-	< 0.02							< 0.02				
Endosulfan I (alpha isomer)	ug/l		-	-	< 0.03						< 0.03	< 0.03				
Sum Pesticides (other) - calculated			-	-	0.03						0.03					
Sum Pesticides (other) - calculated			-	-	0.02						0.02					
Sum Pesticides (other) - calculated			-	-	0.05						0.05					
Sum Pesticides (other) - calculated			0.00001	0.01	10						10					
Pesticides - Sum of four - calculated			-	-	0.03						0.03					
Sum Pesticides (total) - calculated			-	-	0.03						0.03					
Sum Pesticides (total) - calculated			-	-	0.02						10					
Sum Pesticides (total) - calculated			-	-	0.05						0.05					
Sum Pesticides (total) - calculated			-	-	10						10					
Bromophenyl phenyl ether	ug/l	0.05	0.00014	0.14	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PCBs	ug/l	0.3	-	-	< 0.300						< 0.300	< 0.300				
PCB Congener 118	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 77	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 105	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 169	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 156	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 189	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 167	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 126	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 123	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 157	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 81	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
PCB Congener 114	ug/l	0.02	-	-	< 0.020						< 0.020	< 0.020				
Dichlorobenzonitrile, 2,6-	ug/l		-	-	< 0.03						< 0.03	< 0.03				

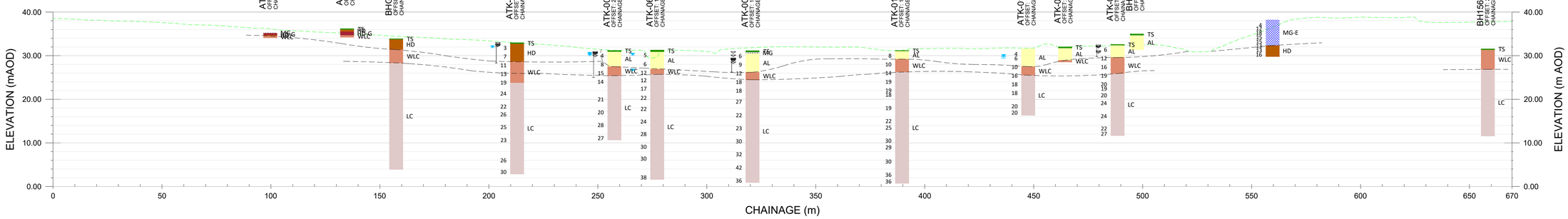
Appendix F. **Geotechnical Long Sections**

DO NOT SCALE

Millimetres 0 10 100



PLAN
SCALE 1:1000



A12 EASTBOUND OFF-SLIP
SCALE: 1:1000 (H); 1:500 (V)
2 x VERTICAL EXAGGERATION

HISTORICAL INVESTIGATION / 2019 INVESTIGATION

- DYNAMIC SAMPLE OR ROTARY CORE BOREHOLE
- CABLE PERCUSSION OR UNDEFINED BOREHOLE TYPE (WITH OR WITHOUT ROTARY FOLLOW ON)
- WINDOWLESS SAMPLE
- TRIAL PIT
- INSPECTION PIT
- STATIC CONE PENETRATION TESTING
- CONCRETE CORE

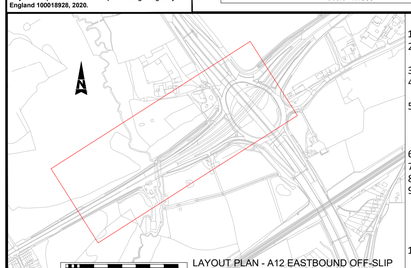
LEGEND

TS	TOPSOIL	
MG	MADE GROUND - UNDIFFERENTIATED	
MG-E	MADE GROUND - ENGINEERED FILL	
MG-R	MADE GROUND - RECENTLY DEPOSITED MATERIAL	
MG-L	MADE GROUND - LANDFILL MATERIAL	
AL	ALLUVIUM	
HD	HEAD DEPOSITS	
HD-G	HEAD DEPOSITS - GRAVEL	
WLC	WEATHERED LONDON CLAY FORMATION	
LC	LONDON CLAY FORMATION	

TOP OF RESPONSE ZONE
GROUNDWATER LEVEL DURING MONITORING
BASE OF RESPONSE ZONE
GROUNDWATER ROSE TO
GROUNDWATER STRIKE
SPT N VALUE

INTERPRETED STRATA BOUNDARY
EXISTING GROUND LEVEL

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



NOTES:

1. DO NOT SCALE FROM THE DRAWING.
2. TO BE READ IN CONJUNCTION WITH THE GROUND INVESTIGATION REPORT (GIR) REF HE551519-ATK-GEN-XX-RP-CE-000001.
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6. THE CHAINAGES SHOWN DO NOT CORRESPOND TO THE SCHEME CHAINAGE.
7. STANDARD PENETRATION TEST (SPT) N VALUES ARE UNCORRECTED.
8. FOR DETAILED INFORMATION REGARDING LITHOLOGY, REFER TO THE EXPLORATORY HOLE LOGS.
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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 GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Maintenance / Cleaning
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Use
NONE IDENTIFIED AT THIS STAGE

Decommissioning / Demolition
NONE IDENTIFIED AT THIS STAGE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR ISSUE WITH GIR	S3	P01	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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www.atkinsglobal.com

Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: M25 J28 GEOLOGICAL SECTION
A12 EASTBOUND OFF-SLIP
SHEET 1 OF 1

Drawing Number: Project HE551519 - Originator ATK - Volume HGT - Location XX - Type DR - Role CE - Number 001001

Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5158157 | Sheet: 1 of 1 | Rev: P01

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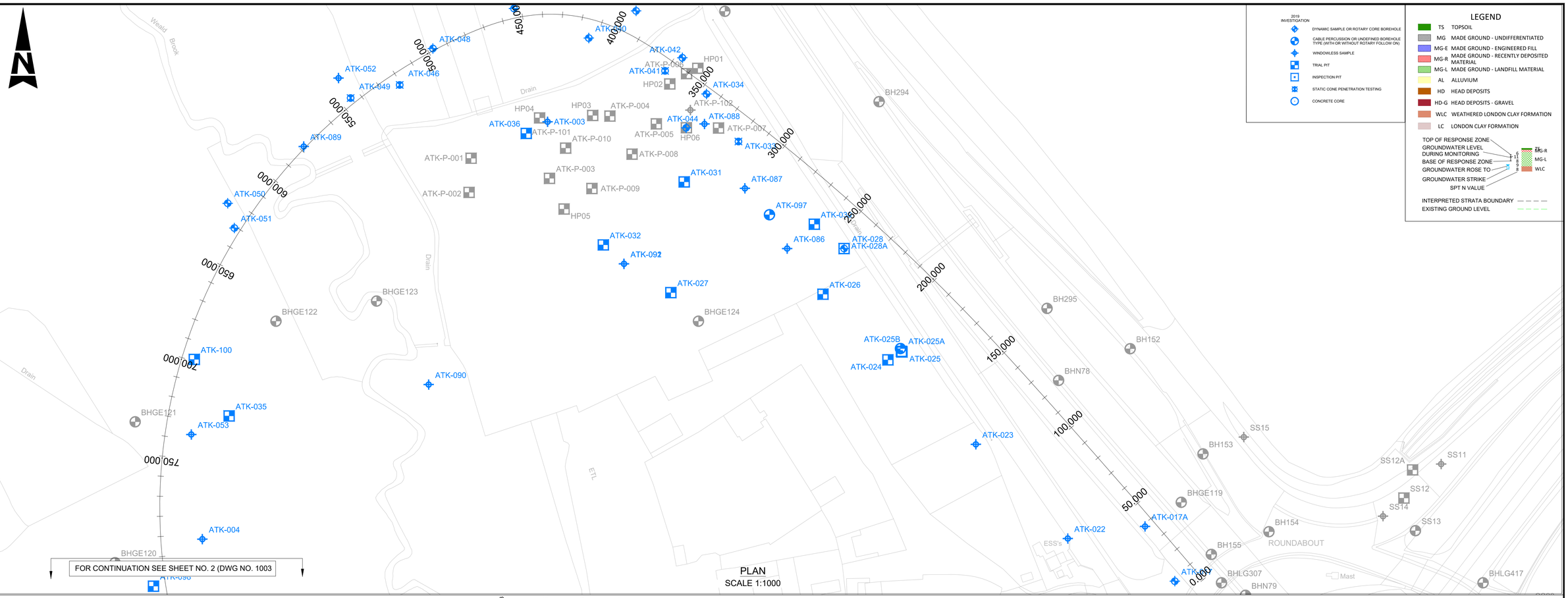


PLAN
SCALE 1:1000

2019 INVESTIGATION

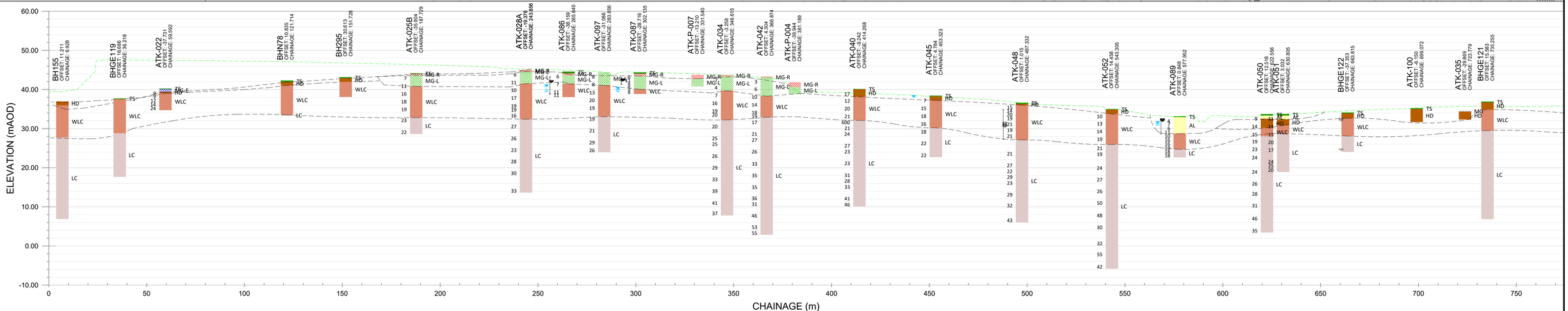
- DYNAMIC SAMPLE OR ROTARY CORE BOREHOLE
- CABLE PERCUSSION OR UNDEFINED BOREHOLE TYPE (WITH OR WITHOUT ROTARY FOLLOW ON)
- WINDOWLESS SAMPLE
- TRIAL PIT
- INSPECTION PIT
- STATIC CONE PENETRATION TESTING
- CONCRETE CORE

LEGEND

TS	TOPSOIL	
MG	MADE GROUND - UNDIFFERENTIATED	
MG-E	MADE GROUND - ENGINEERED FILL	
MG-R	MADE GROUND - RECENTLY DEPOSITED MATERIAL	
MG-L	MADE GROUND - LANDFILL MATERIAL	
AL	ALLUVIUM	
HD	HEAD DEPOSITS	
HD-G	HEAD DEPOSITS - GRAVEL	
WLC	WEATHERED LONDON CLAY FORMATION	
LC	LONDON CLAY FORMATION	

TOP OF RESPONSE ZONE
GROUNDWATER LEVEL DURING MONITORING
BASE OF RESPONSE ZONE
GROUNDWATER ROSE TO
GROUNDWATER STRIKE
SPT N VALUE

INTERPRETED STRATA BOUNDARY
EXISTING GROUND LEVEL



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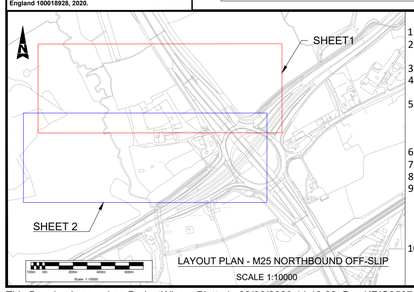
10m 0m 10m 20m 30m 40m 50m 60m 70m
Scale 1:1000

M25 ANTICLOCKWISE OFF-SLIP LOOP
SCALE: 1:1000 (H); 1:500 (V)
2 x VERTICAL EXAGGERATION



NOTES:
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Maintenance / Cleaning
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Use
NONE IDENTIFIED AT THIS STAGE

Decommissioning / Demolition
NONE IDENTIFIED AT THIS STAGE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR ISSUE WITH GIR	S3	P01	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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Fax: +44 (0)1245 345010
www.atkinsglobal.com

Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: M25 J28 GEOLOGICAL SECTION NORTHBOUND OFF - SLIP LOOP SHEET 1 OF 2

Drawing Number: Project HE551519 - Originator ATK - Volume HGT - Location XX - Type DR - Role CE - Number 001002

Original Size: A1 | Scale: 1:1000 | Project Ref. No. 5158157 | Sheet: 1 of 2 | Rev: P01

This Drawing is saved on ProjectWise. Plotted: 22/06/2020 14:18:22 By: KRIS9507

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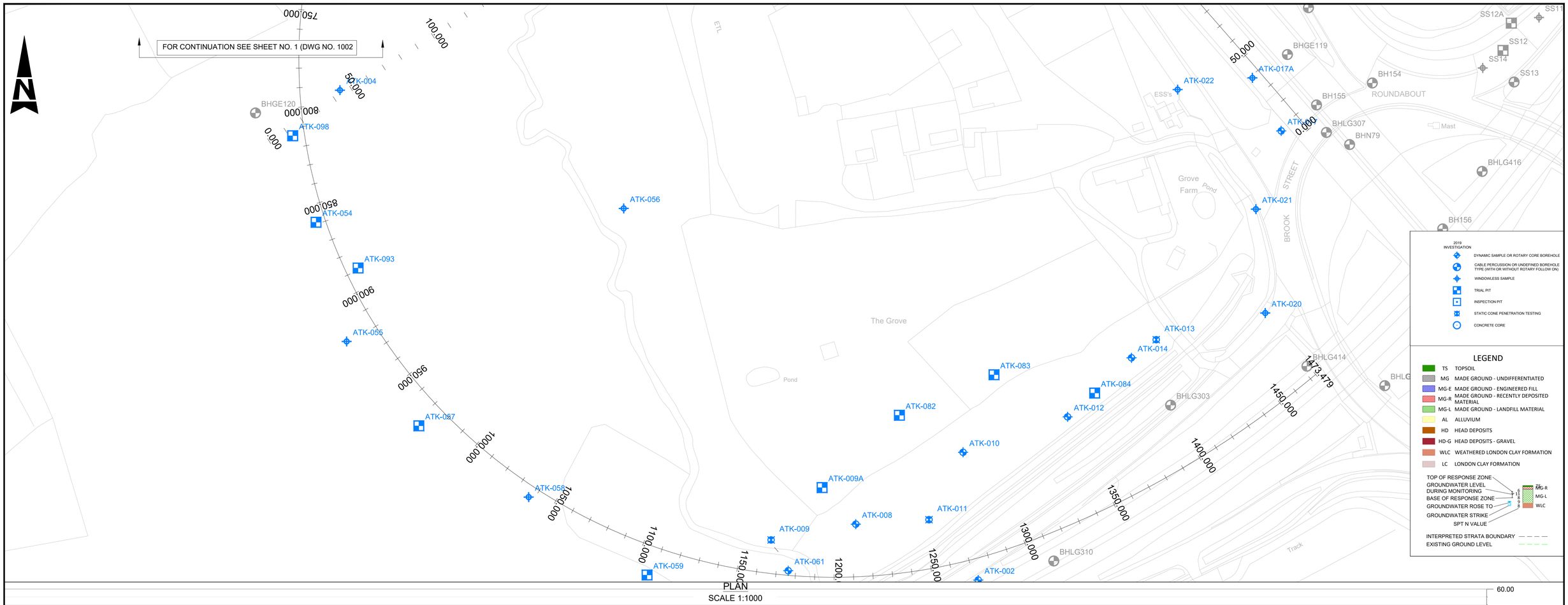
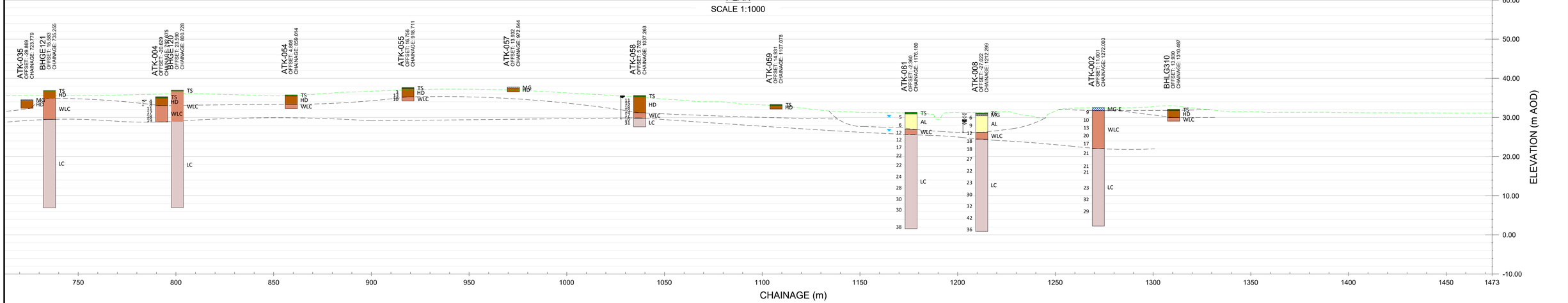




10m 0m 10m 20m 30m 40m 50m 60m 70m
Scale 1:1000

M25 ANTICLOCKWISE OFF-SLIP LOOP
SCALE: 1:1000 (H); 1:500 (V)
2 x VERTICAL EXAGGERATION

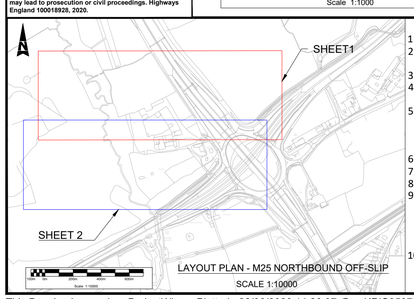
2019 INVESTIGATION
- DYNAMIC SAMPLE OR ROTARY CORE BOREHOLE
- CABLE PERCUSSION OR UNDEFINED BOREHOLE TYPE (WITH OR WITHOUT ROTARY FOLLOW ON)
- WINDOWLESS SAMPLE
- TRIAL PIT
- INSPECTION PIT
- STATIC CONE PENETRATION TESTING
- CONCRETE CORE

LEGEND

TS	TOPSOIL	
MG	MADE GROUND - UNDIFFERENTIATED	
MG-E	MADE GROUND - ENGINEERED FILL	
MG-R	MADE GROUND - RECENTLY DEPOSITED MATERIAL	
MG-L	MADE GROUND - LANDFILL MATERIAL	
AL	ALLUVIUM	
HD	HEAD DEPOSITS	
HD-G	HEAD DEPOSITS - GRAVEL	
WLC	WEATHERED LONDON CLAY FORMATION	
LC	LONDON CLAY FORMATION	

TOP OF RESPONSE ZONE
GROUNDWATER LEVEL DURING MONITORING
BASE OF RESPONSE ZONE
GROUNDWATER ROSE TO
GROUNDWATER STRIKE
SPT N VALUE

INTERPRETED STRATA BOUNDARY
EXISTING GROUND LEVEL



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Maintenance / Cleaning
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Use
NONE IDENTIFIED AT THIS STAGE

Decommissioning / Demolition
NONE IDENTIFIED AT THIS STAGE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR ISSUE WITH GIR	S3	P01	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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Fax: +44 (0)1245 345010
www.atkinsglobal.com

Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: M25 J28 GEOLOGICAL SECTION NORTHBOUND OFF - SLIP LOOP SHEET 2 OF 2

Drawing Number: Project HE551519 - Originator ATK - Volume HGT - Location XX - Type DR - Role CE - Number 001003

Original Size: A1 | Scale: 1:1000 | Project Ref. No.: 5158157 | Sheet: 2 of 2 | Rev: P01

DO NOT SCALE

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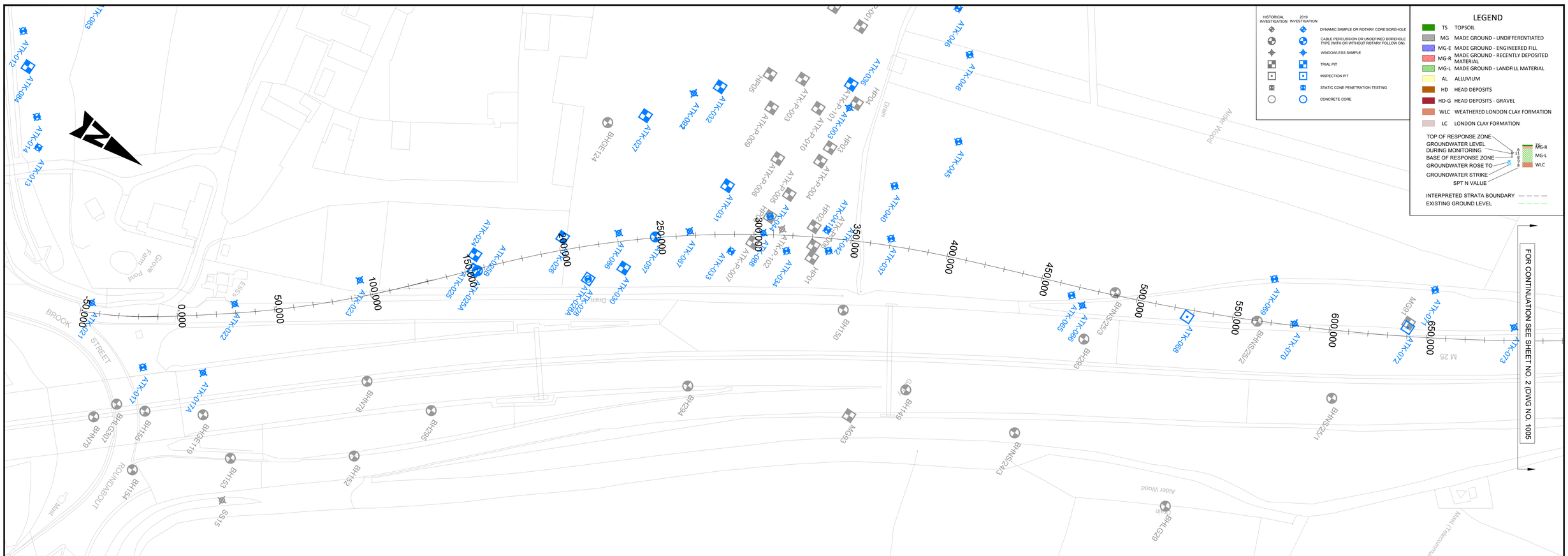

PLAN
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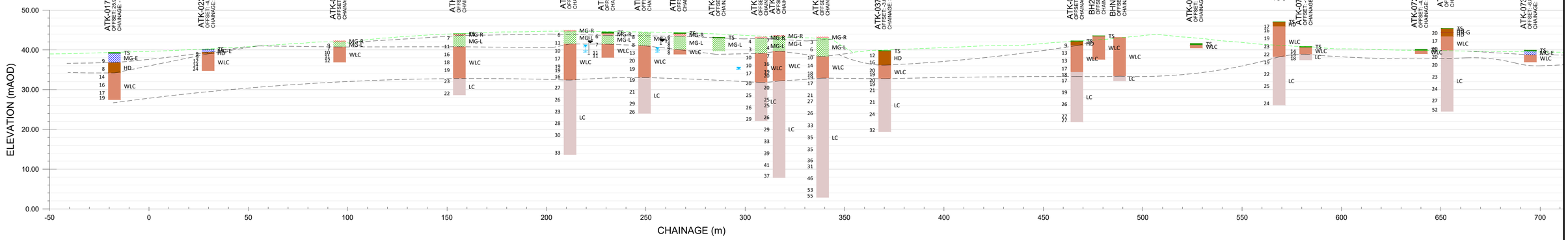
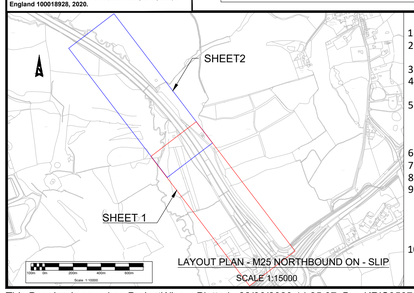


M25 ANTICLOCKWISE ON-SLIP
SCALE: 1:1000 (H); 1:500 (V)
2 x VERTICAL EXAGGERATION

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



NOTES:
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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 GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Maintenance / Cleaning
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Use
NONE IDENTIFIED AT THIS STAGE

Decommissioning / Demolition
NONE IDENTIFIED AT THIS STAGE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR ISSUE WITH GIR	S3	P01	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

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Fax: +44 (0)1245 345010
www.atkinsglobal.com

Client: Working on behalf of highways england

Project Title: M25 junction 28 improvement scheme

Drawing Title: M25 J28 GEOLOGICAL SECTION NORTHBOUND ON- SLIP LOOP SHEET1 OF 2

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551519 - ATK - HGT - XX - DR - CE - 001004

Original Size: A1 | Scale: 1:1000 | Project Ref. No: 5158157 | Sheet: 1 of 2 | Rev: P01

This Drawing is saved on ProjectWise. Plotted: 22/06/2020 14:25:07 By: KRIS9507

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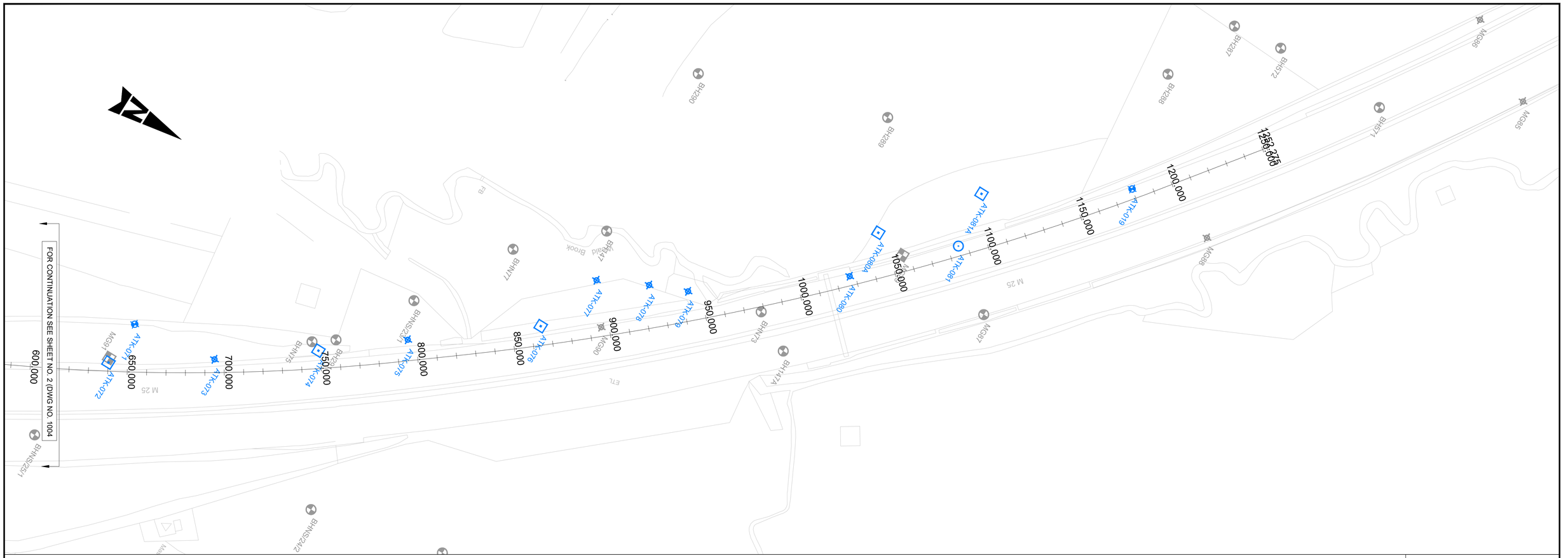

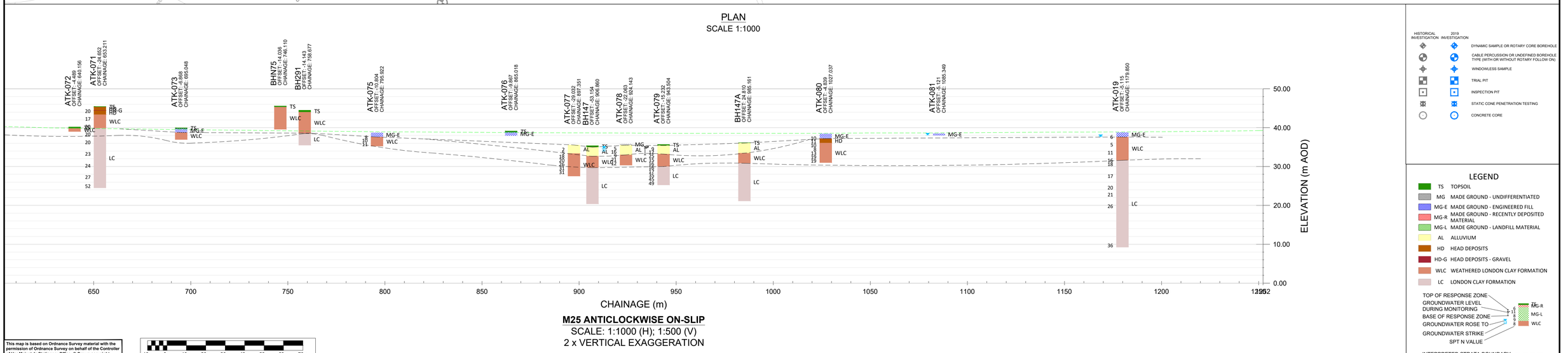

M25 ANTICLOCKWISE ON-SLIP
SCALE: 1:1000 (H); 1:500 (V)
2 x VERTICAL EXAGGERATION

HISTORICAL INVESTIGATION / 2019 INVESTIGATION

- DYNAMIC SAMPLE OR ROTARY CORE BOREHOLE
- CABLE PERCUSSION OR UNDEFINED BOREHOLE TYPE (WITH OR WITHOUT ROTARY FOLLOW ON)
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MG-E	MADE GROUND - ENGINEERED FILL	
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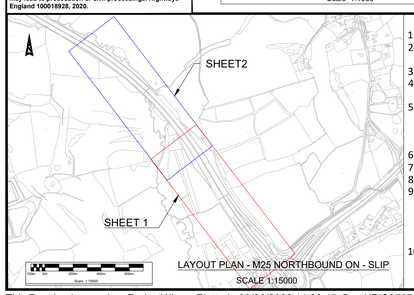
MG-L	MADE GROUND - LANDFILL MATERIAL	
AL	ALLUVIUM	
HD	HEAD DEPOSITS	
HD-G	HEAD DEPOSITS - GRAVEL	
WLC	WEATHERED LONDON CLAY FORMATION	
LC	LONDON CLAY FORMATION	

TOP OF RESPONSE ZONE
GROUNDWATER LEVEL DURING MONITORING
BASE OF RESPONSE ZONE
GROUNDWATER ROSE TO
GROUNDWATER STRIKE
SPT N VALUE

INTERPRETED STRATA BOUNDARY
EXISTING GROUND LEVEL

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



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Maintenance / Cleaning
REFER TO GIR (REF HE551519-ATK-GEN-XX-RP-CE-000001)

Use
NONE IDENTIFIED AT THIS STAGE

Decommissioning / Demolition
NONE IDENTIFIED AT THIS STAGE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR ISSUE WITH GIR	S3	P01	JG	HF	SRM	PG	25/06/20

Drawing Suitability: FOR REVIEW / COMMENT
Status: S3

Project Title: M25 junction 28 improvement scheme

Drawing Title: M25 J28 GEOLOGICAL SECTION NORTHBOUND ON- SLIP LOOP SHEET2 OF 2

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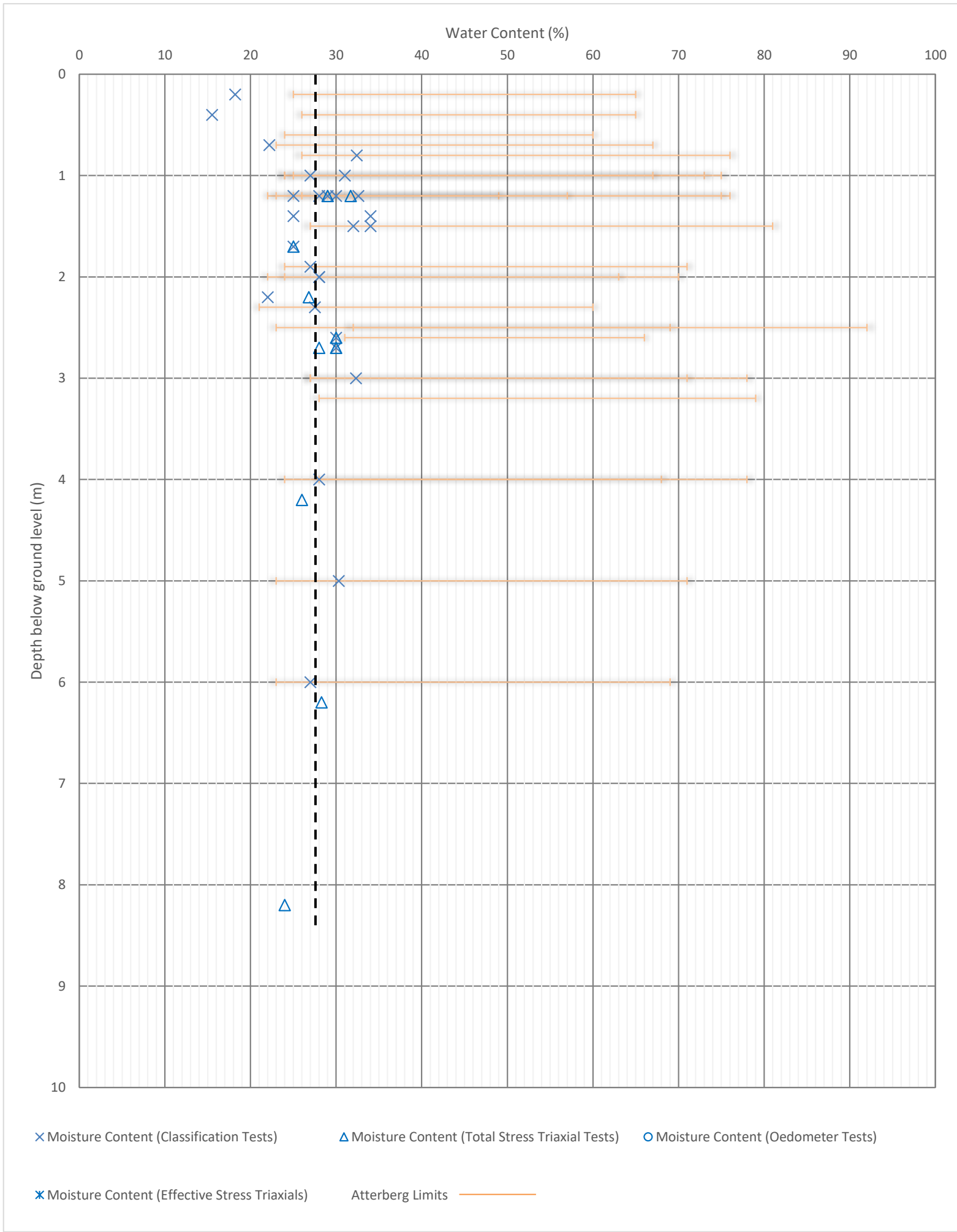
Client: Working on behalf of highways england

Drawing Number: Project HE551519 - Originator ATK - Volume HGT - Location XX - Type DR - Role CE - Number 001005

Original Size: A1 | Scale: 1:1000 | Project Ref. No. 5158157 | Sheet: 2 of 2 | Rev: P01

Appendix G. **Geotechnical Parameter Plots**



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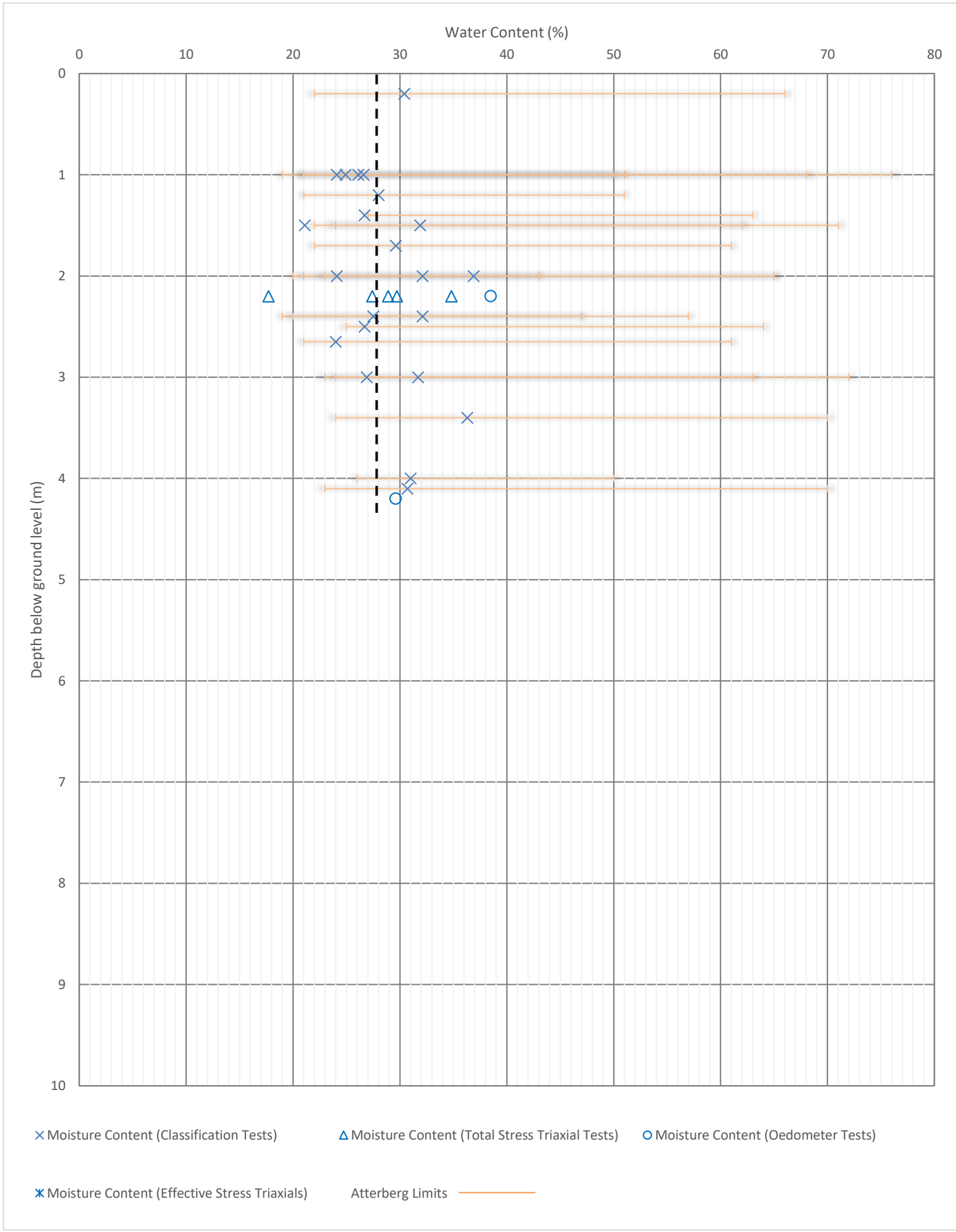
Client: **Highways England**	Title: **Water Content vs Depth -Made Ground - Engineered Fill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 01-1		Rev: P01.1



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Client: **Highways England**	Title: **Water Content vs Depth -Made Ground - Landfill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
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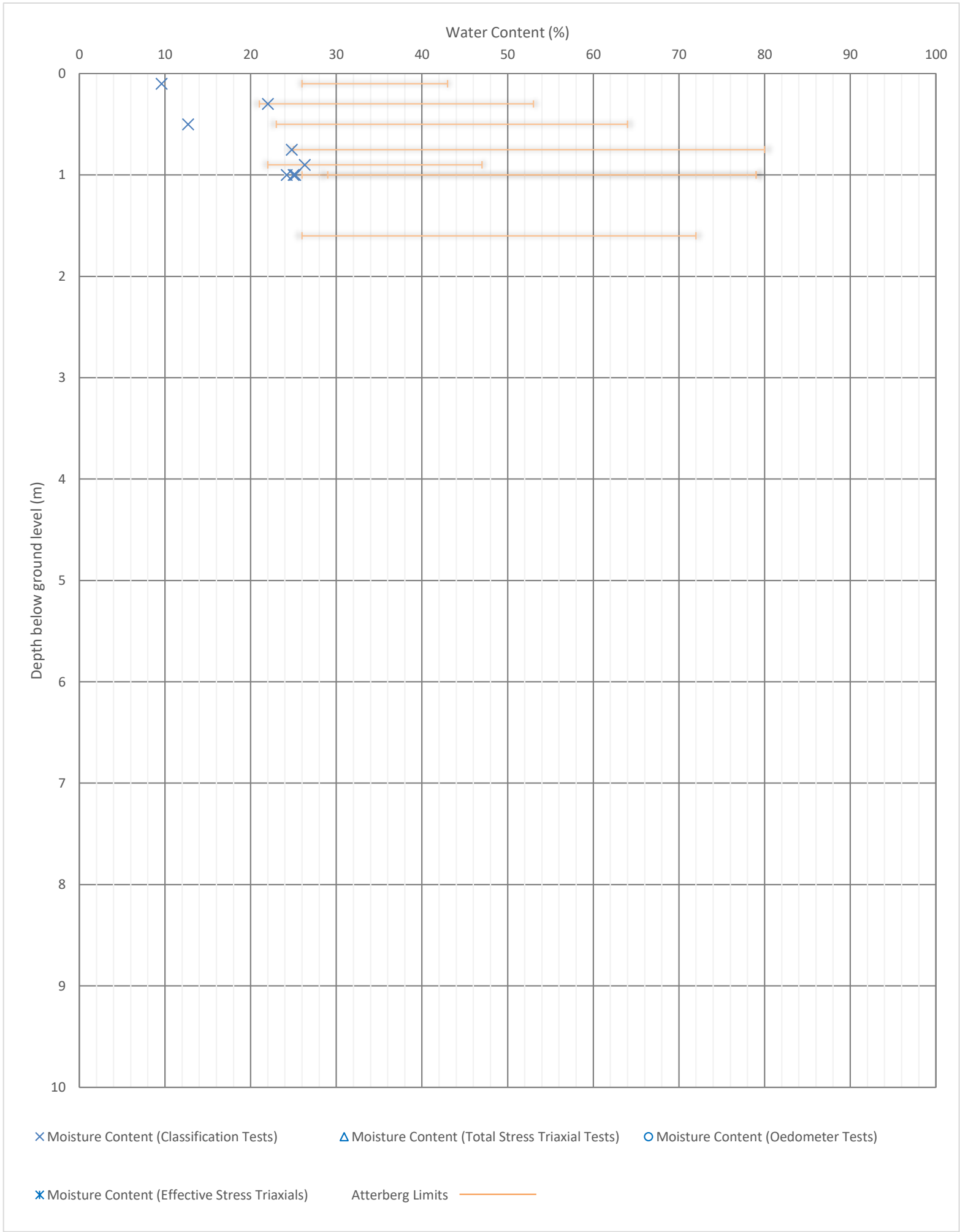
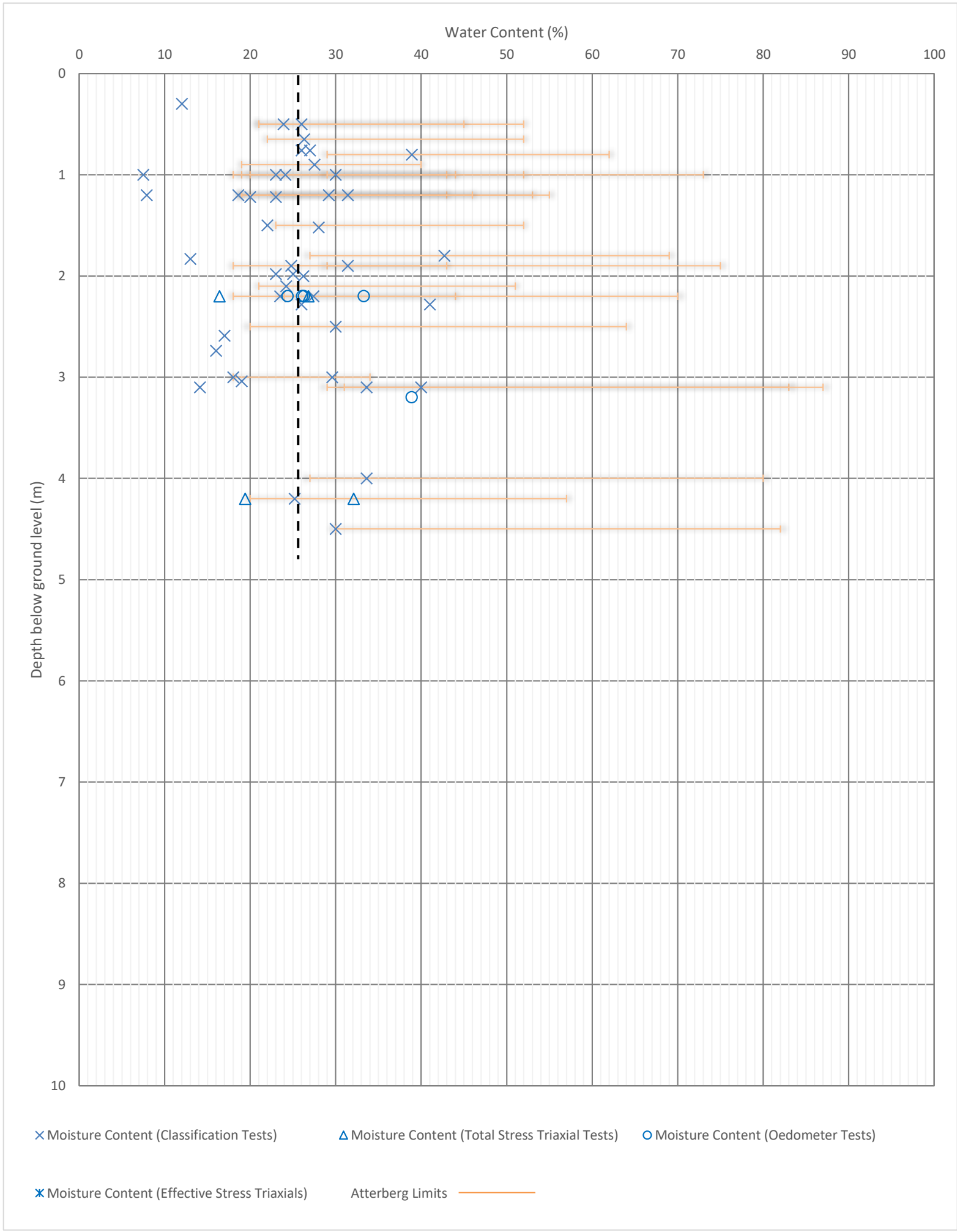


Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Water Content vs Depth - Made Ground - Undifferentiated**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Plot Number 01-4		Rev P01.1



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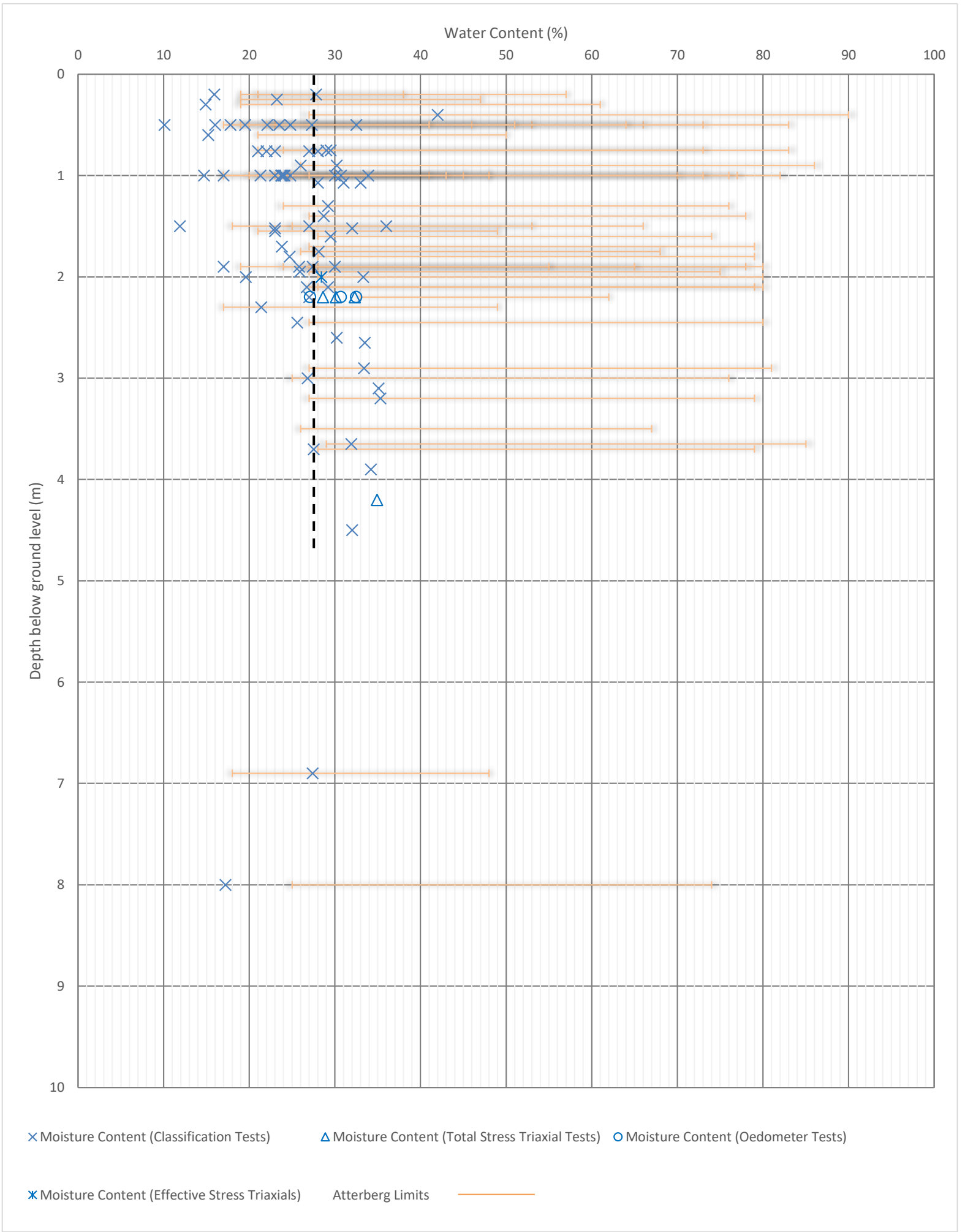
Client: **Highways England**	Title: **Water Content vs Depth -Alluvium**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 01-5		Rev: P01.1



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Client: **Highways England**	Title: **Water Content vs Depth -Head Deposits**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
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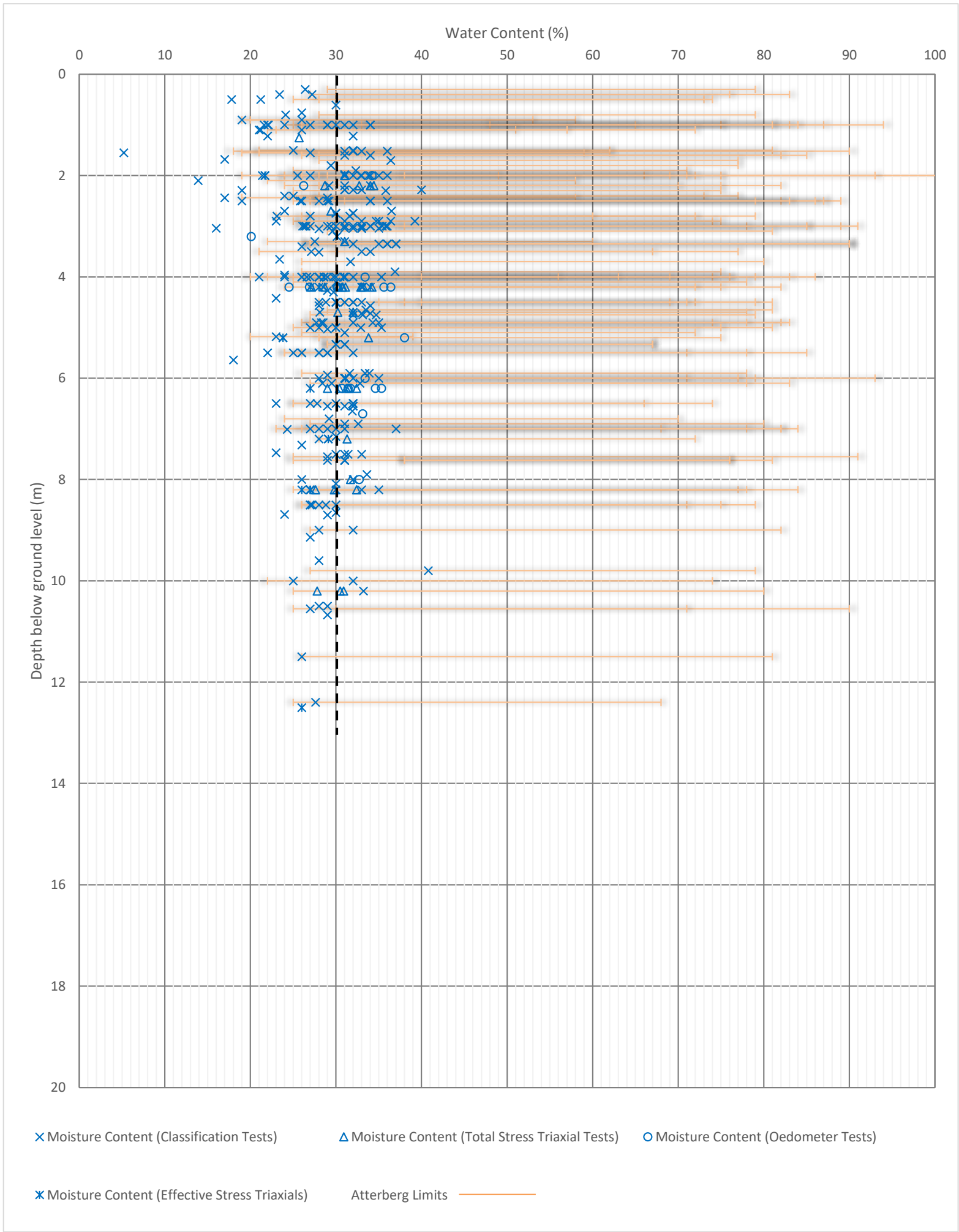
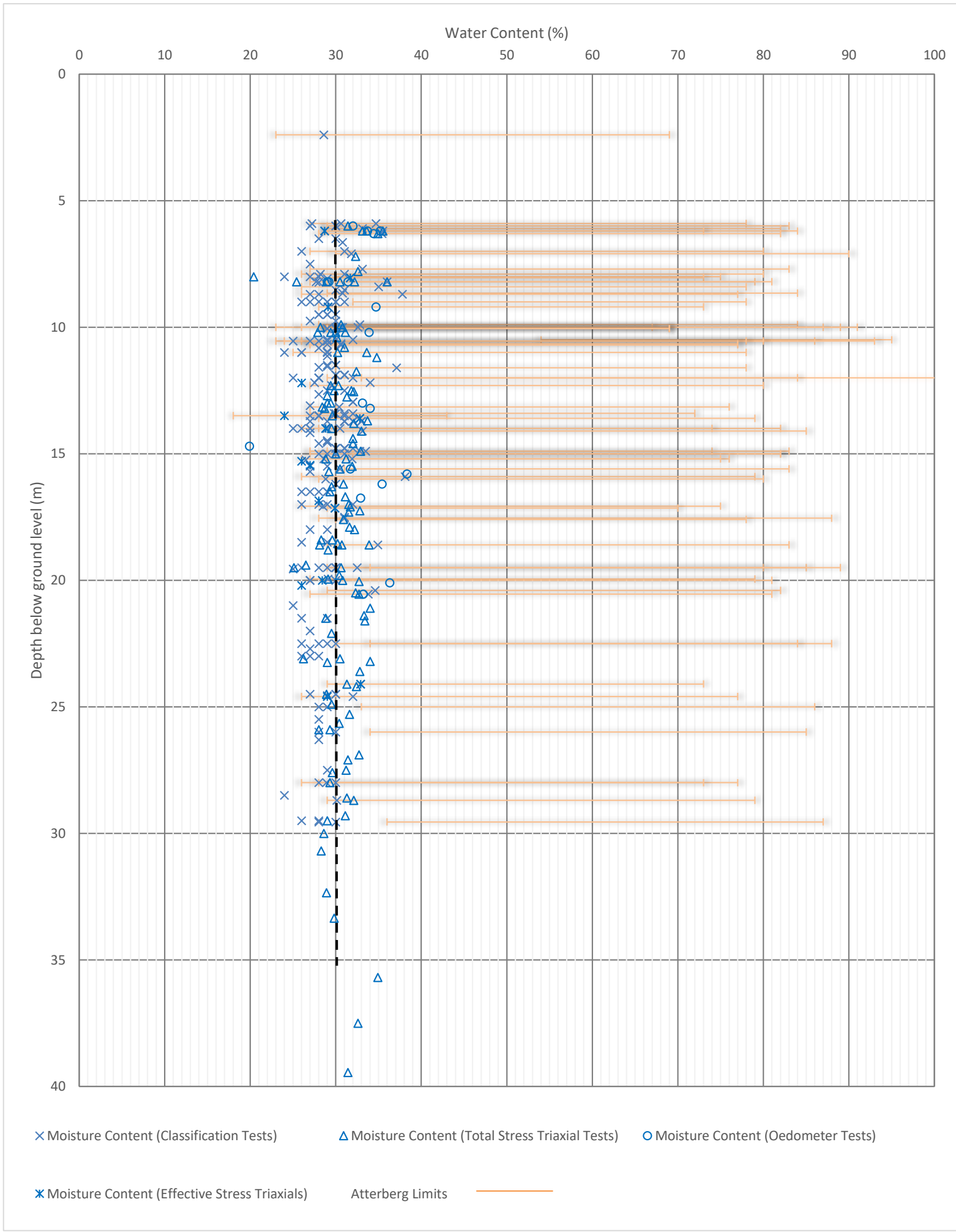


Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Water Content vs Depth -Weathered London Clay Formation**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Plot Number 01-8		Rev P01.1



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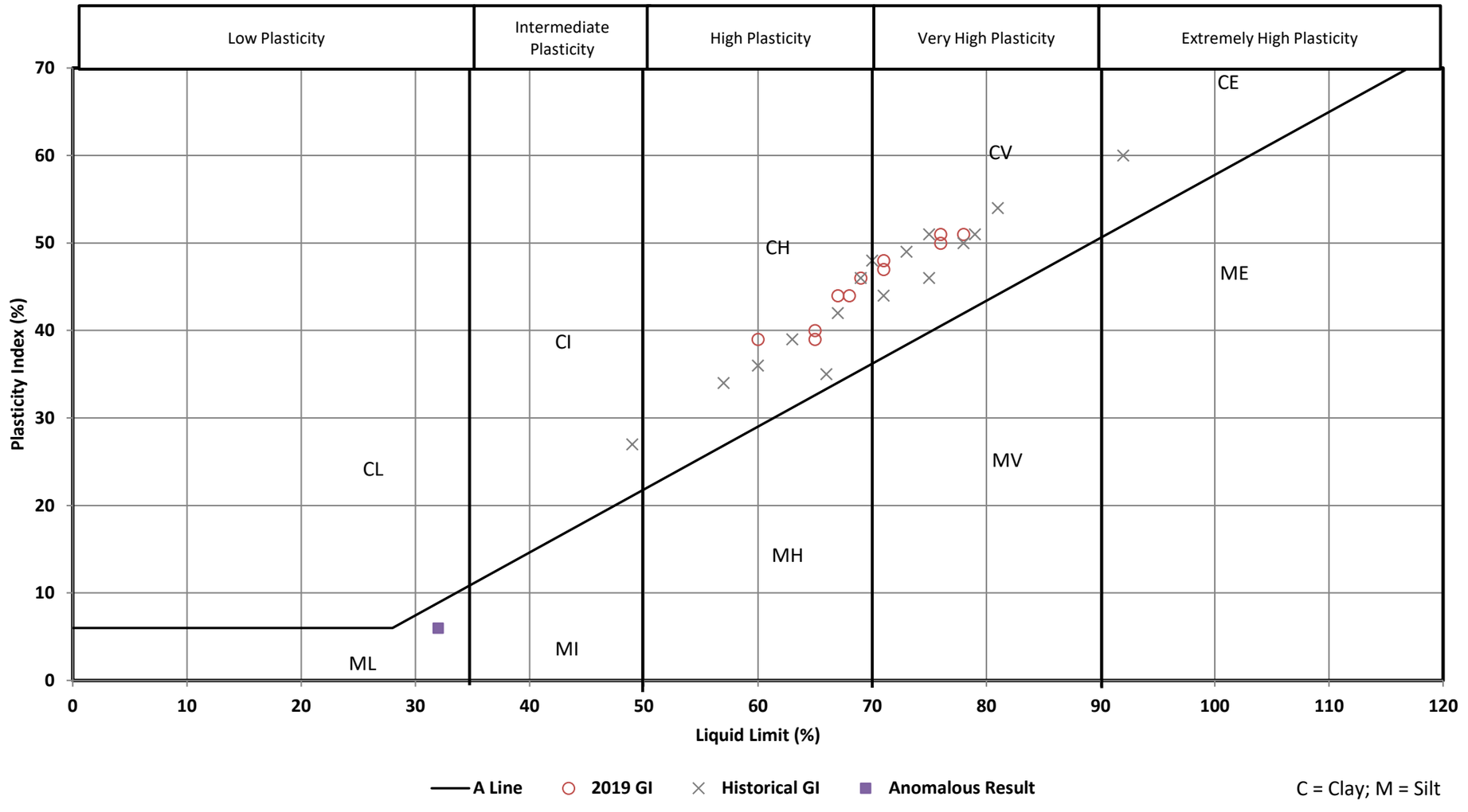

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Client: **Highways England**	Title: **A line plot for Made Ground - Engineered Fill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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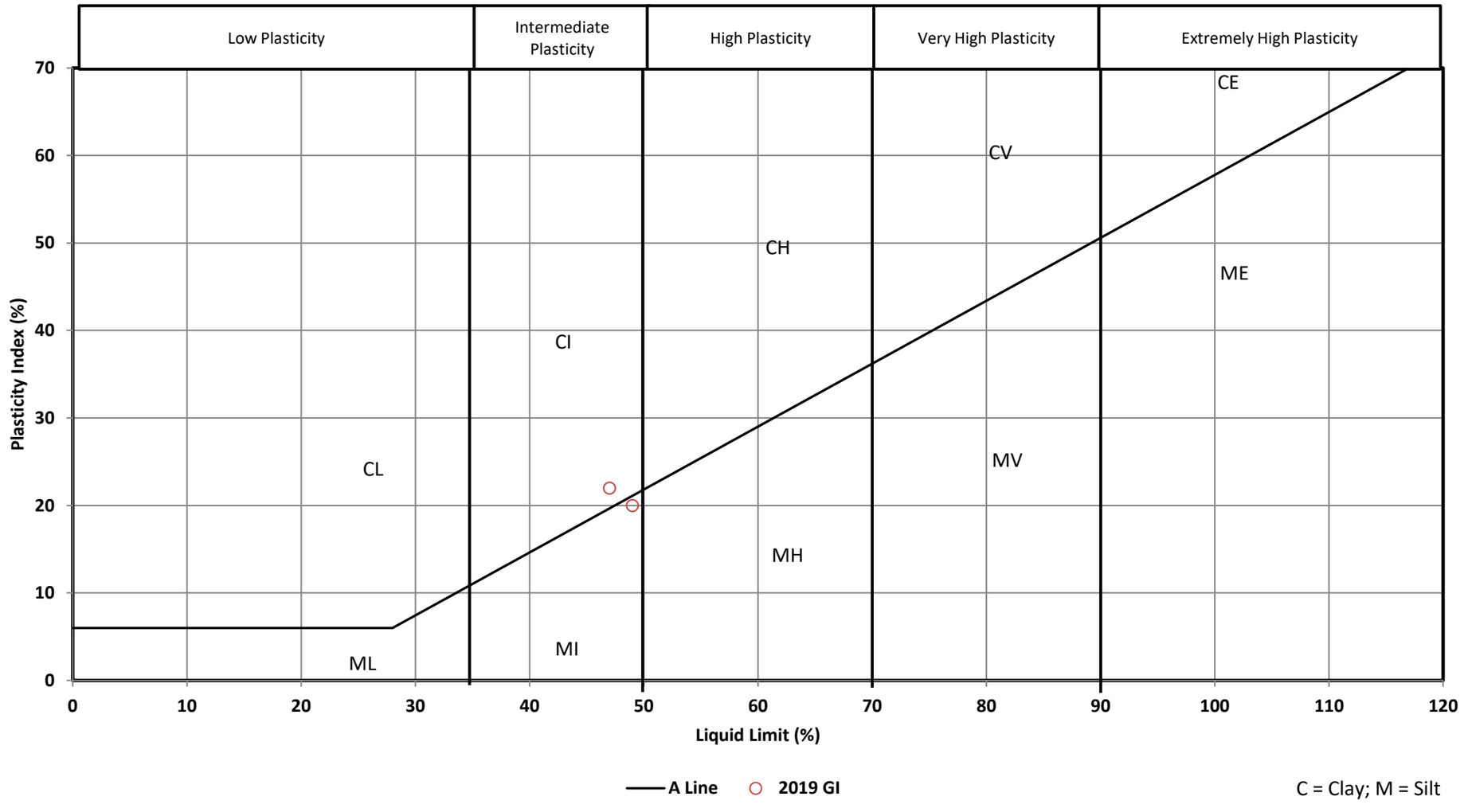

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Client	**Highways England**
Project	**M25 Junction 28 Improvement Scheme**
Title	**A line plot for Made Ground - Recently Deposited Material**

Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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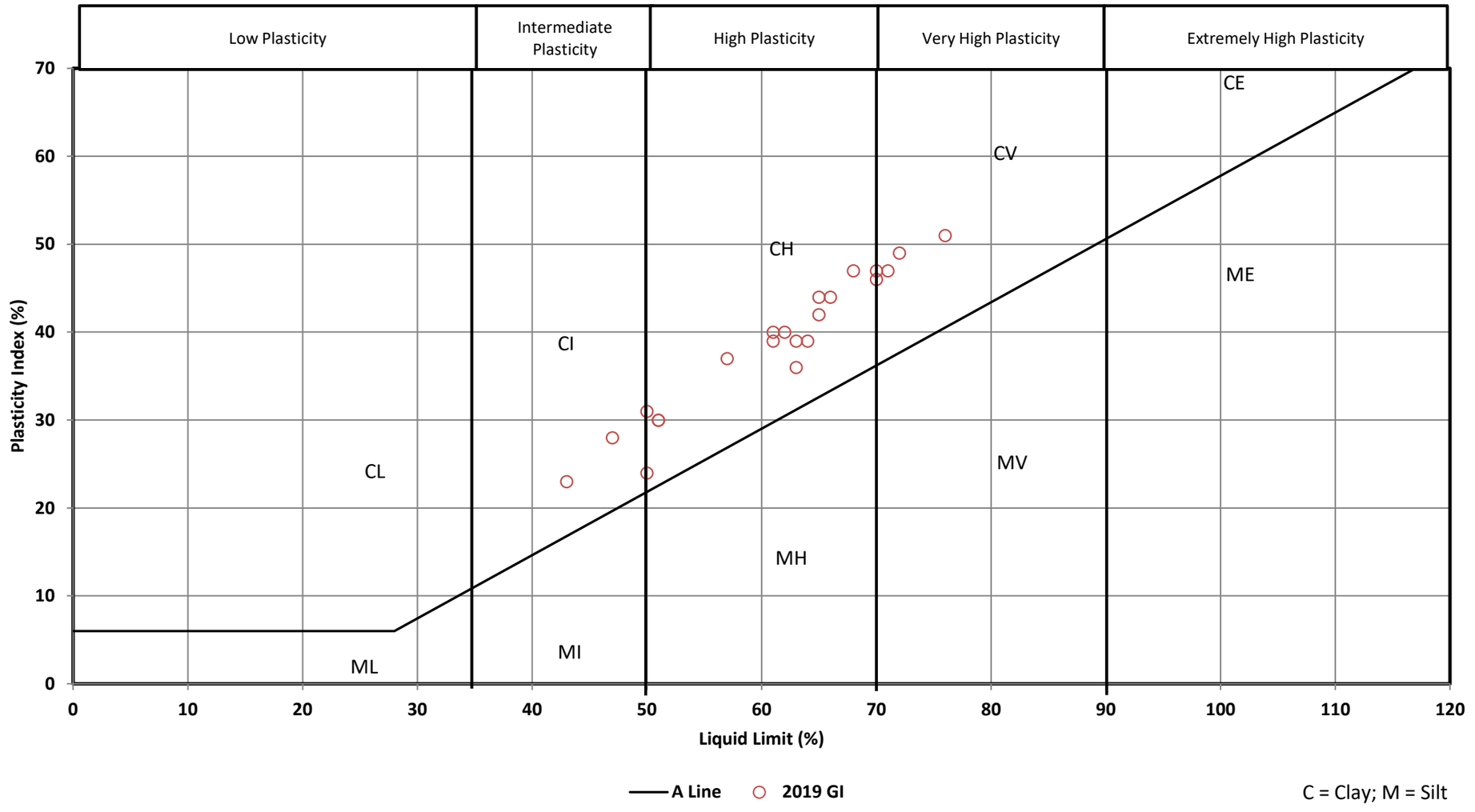

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Client: **Highways England**			Title: **A line plot for Made Ground - Landfill**	
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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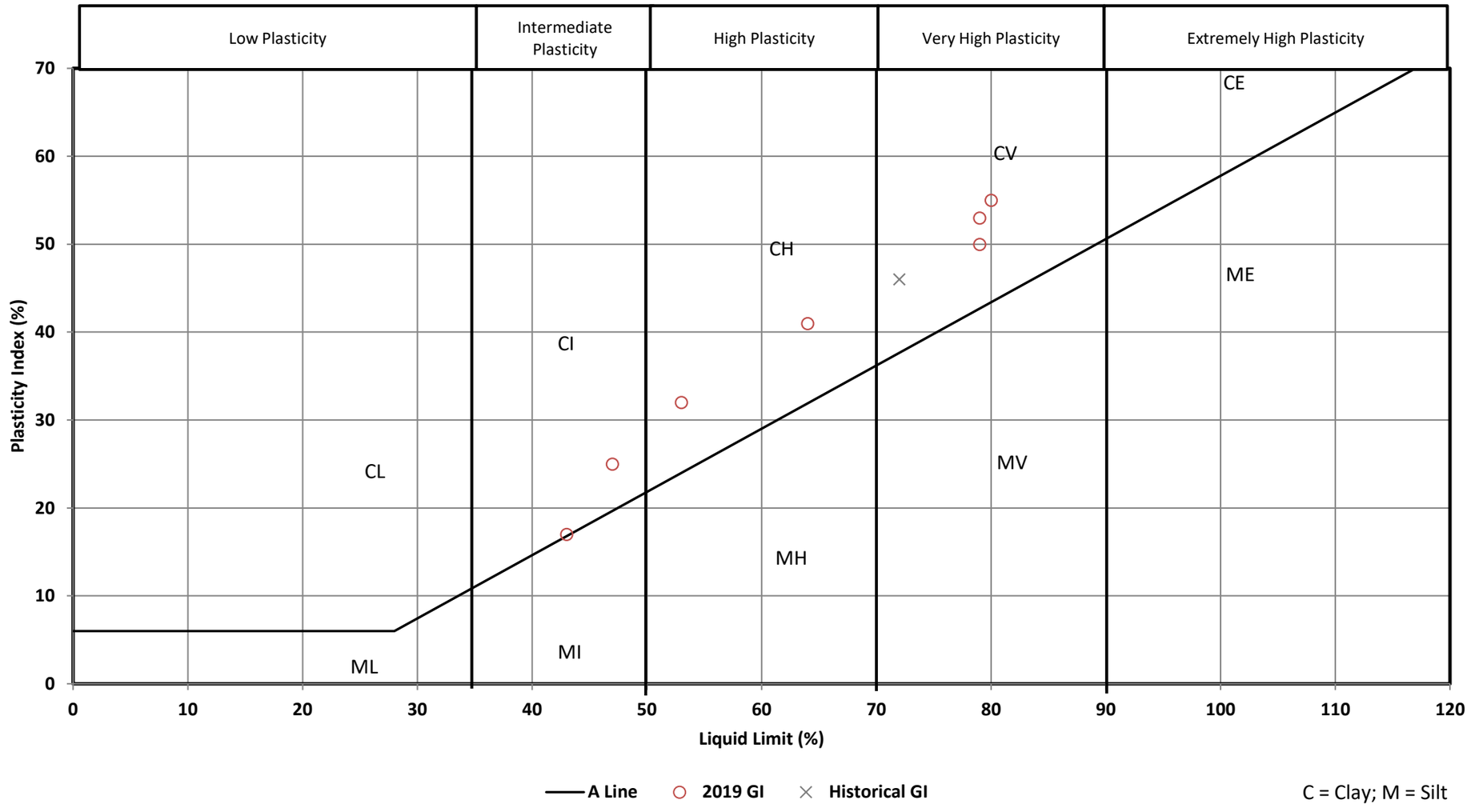

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Client	**Highways England**
Project	**M25 Junction 28 Improvement Scheme**
Title	**A line plot for Made Ground - Undifferentiated**

Sheet size	Drawn: BT	Checked: HF	Authorised: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
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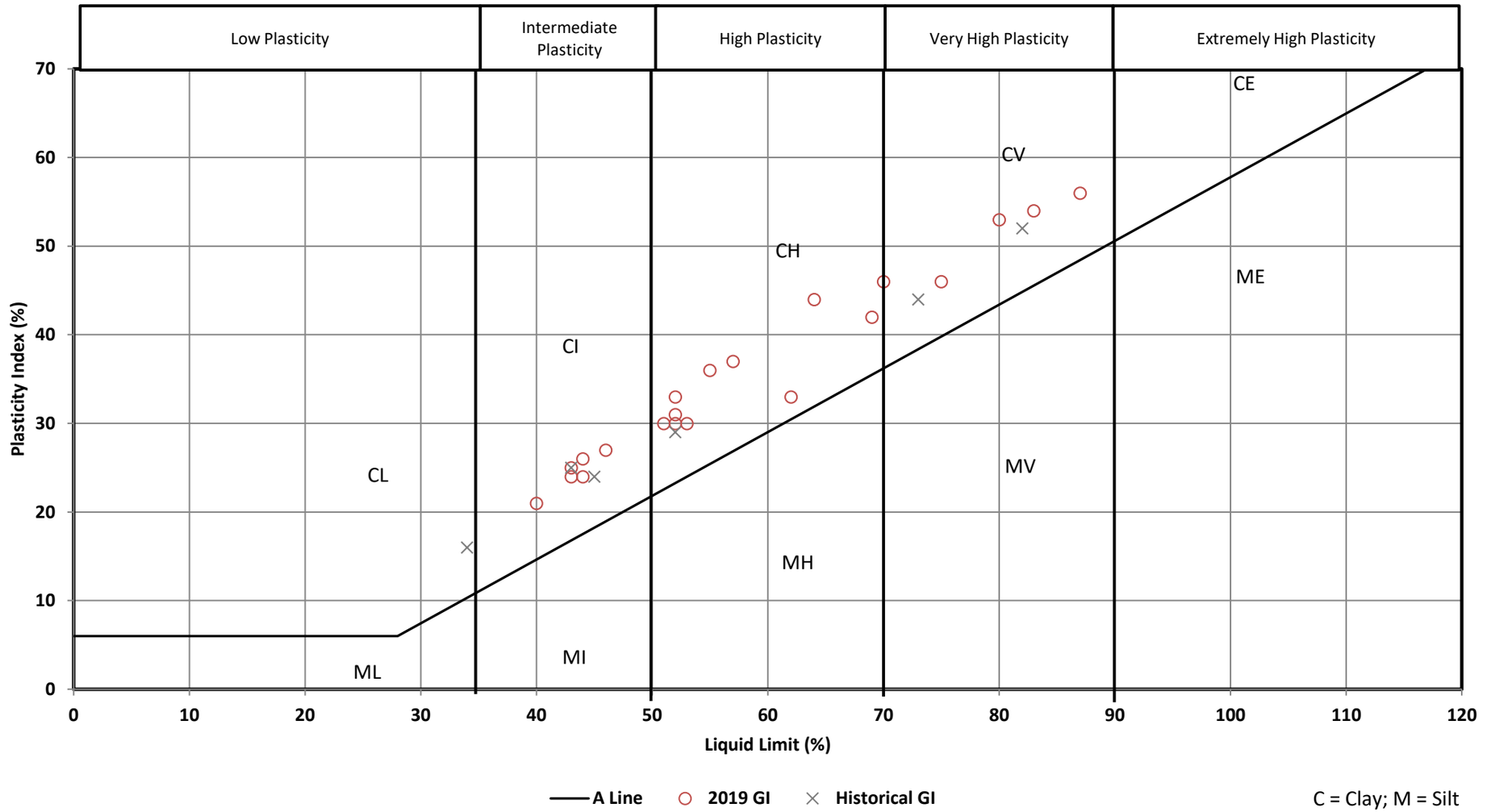

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Client	**Highways England**
Project	**M25 Junction 28 Improvement Scheme**
Title	**A line plot for Alluvium**

Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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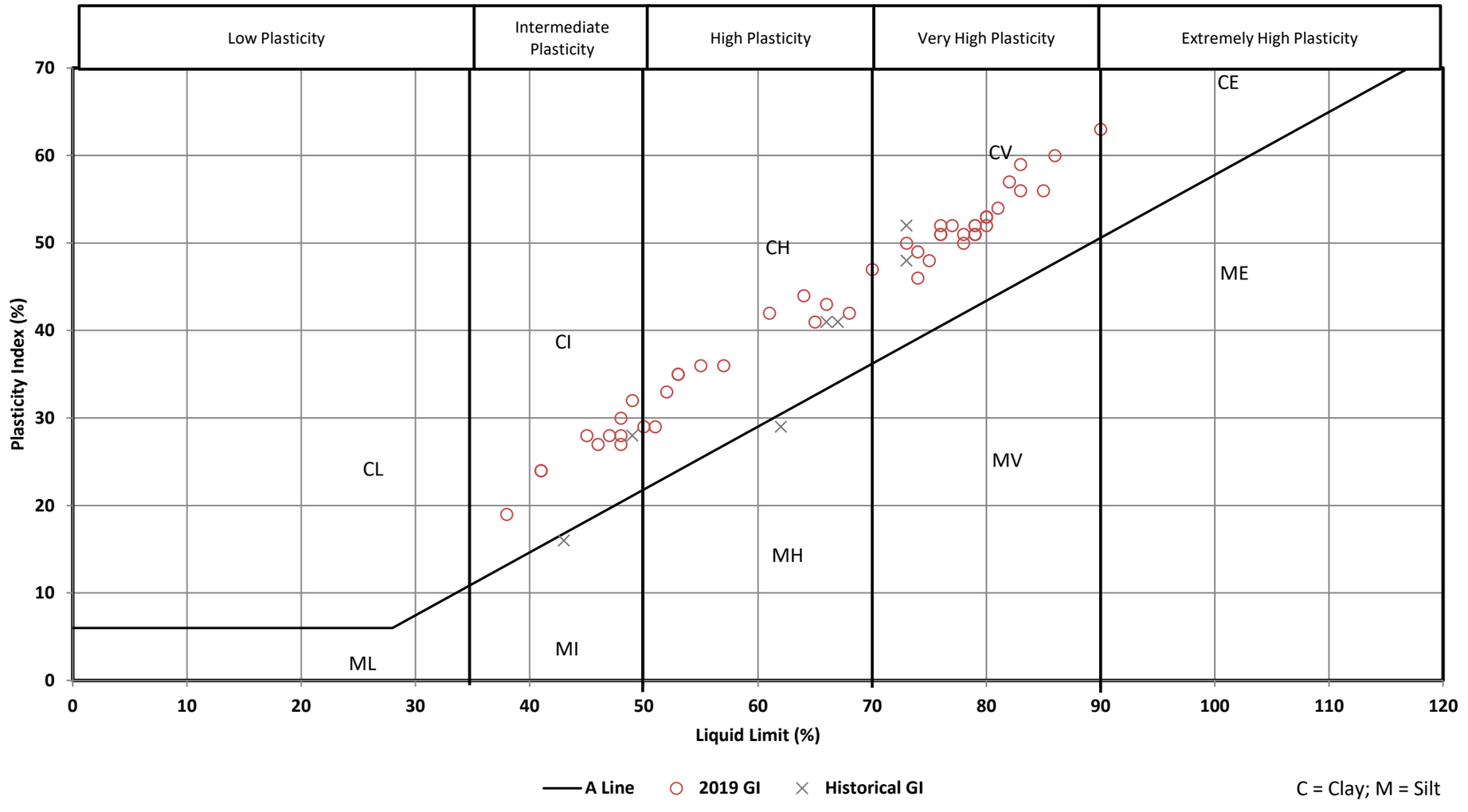

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Client: **Highways England**			Title: **A line plot for Head - Fine deposits**	
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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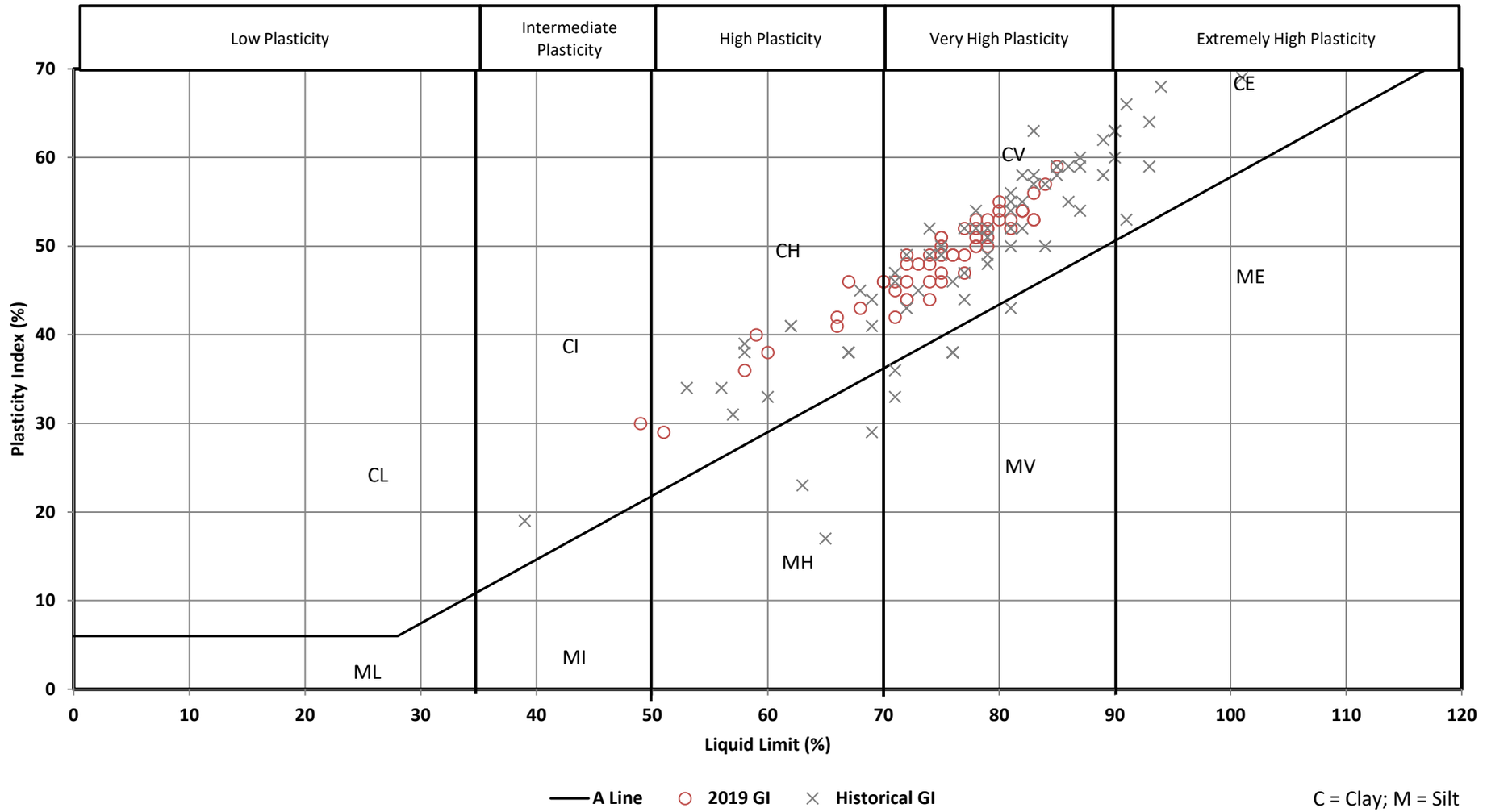

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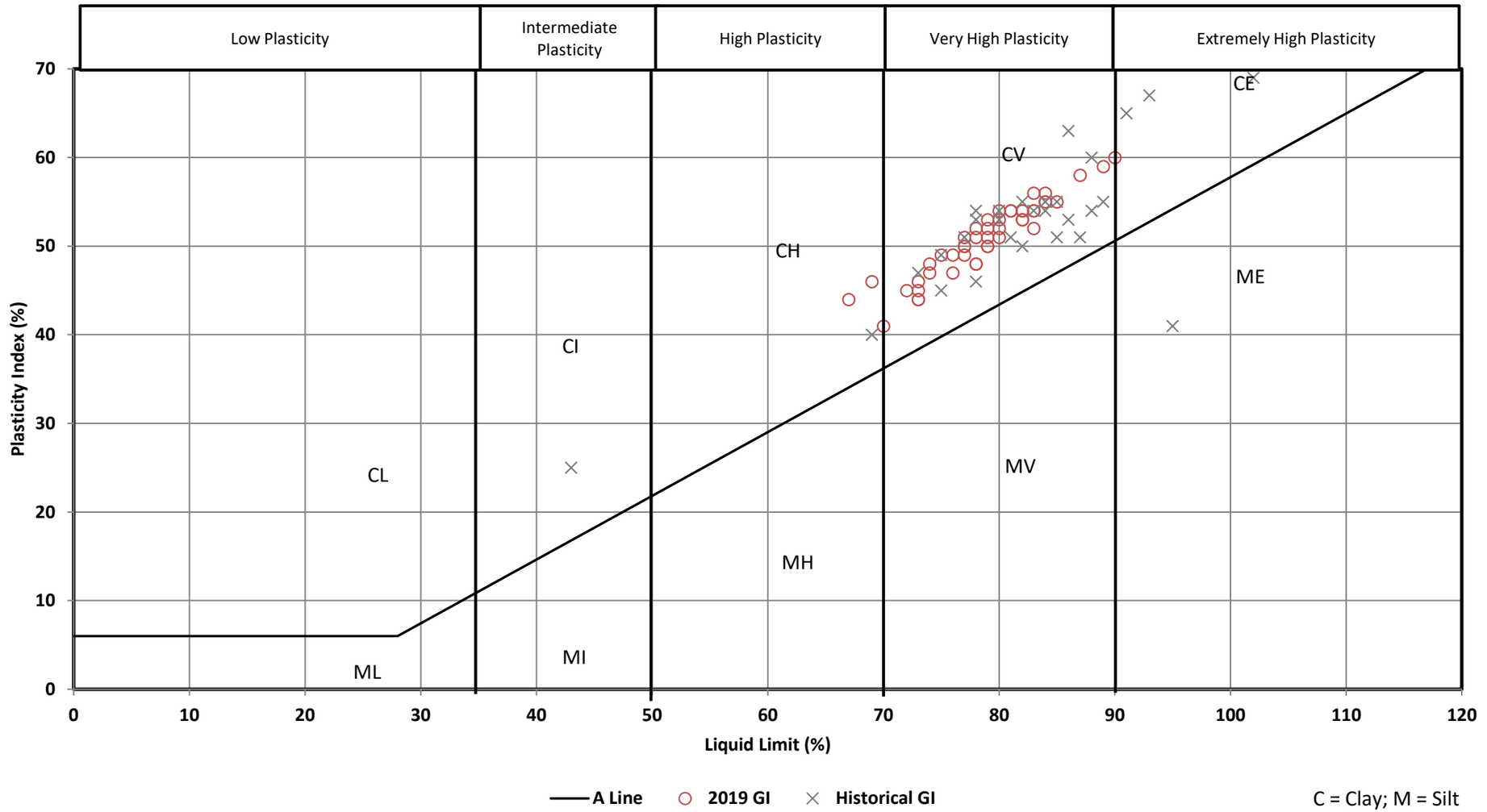
Client: **Highways England**	Title: **A line plot for Weathered London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 02-8		Rev: P01.1



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Client: **Highways England**			Title: **A line plot for London Clay Formation**	
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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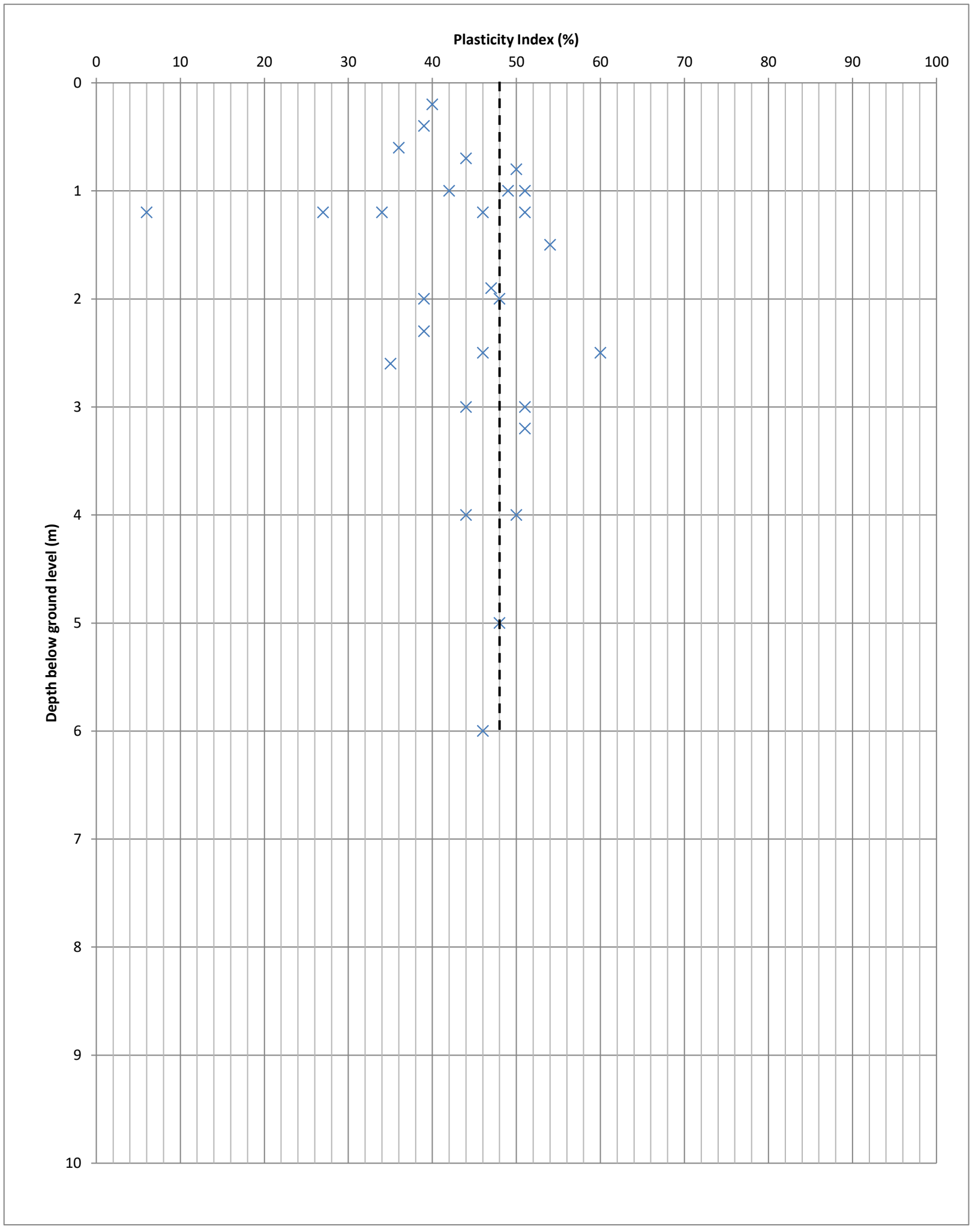

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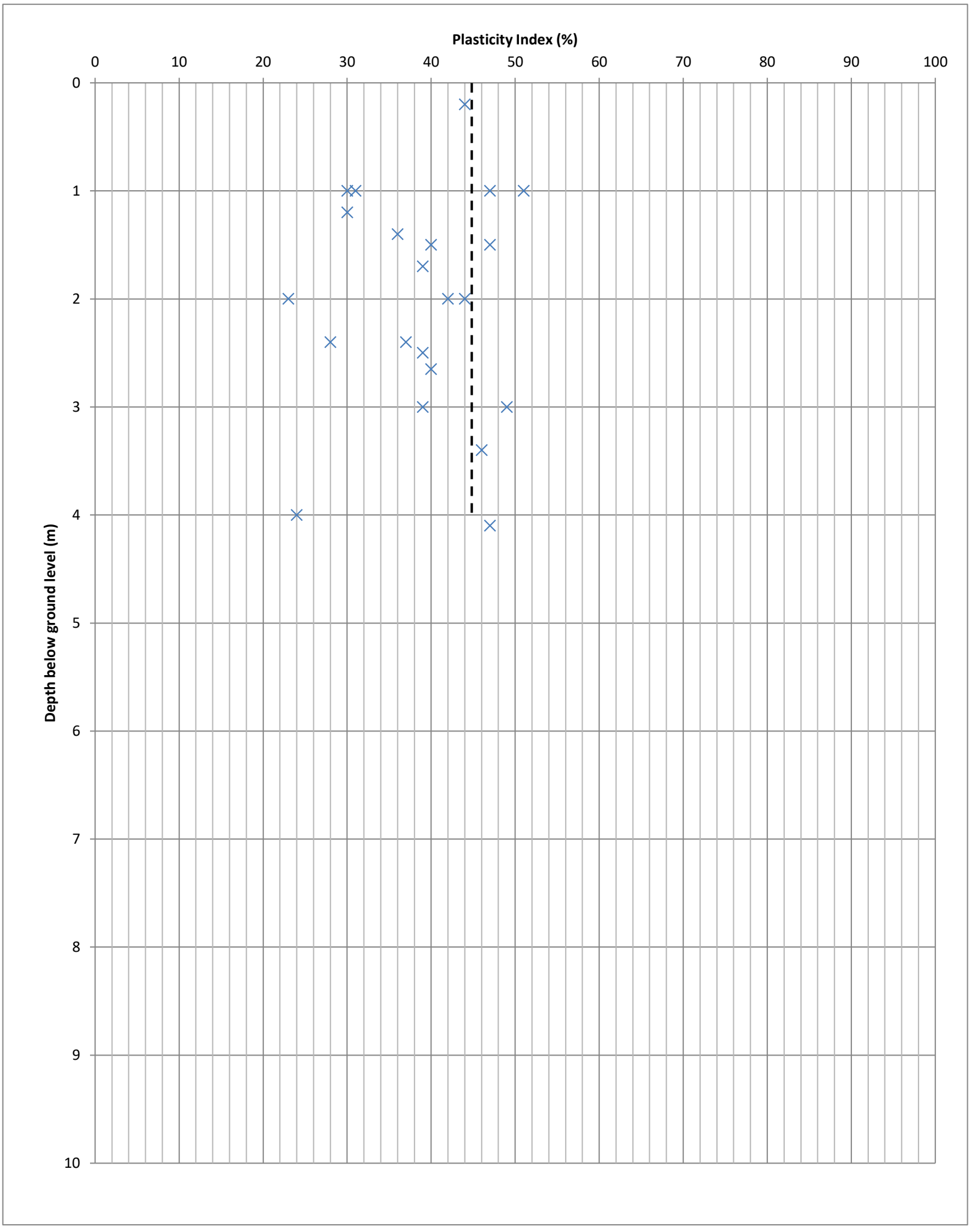
Client
Highways England

Project
M25 Junction 28 Improvement Scheme

Title
Plasticity Index vs Depth - Made Ground - Engineered Fill

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Plot Number: 03-1		Rev: P01.1



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Client: **Highways England**	Title: **Plasticity Index vs Depth - Made Ground - Landfill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
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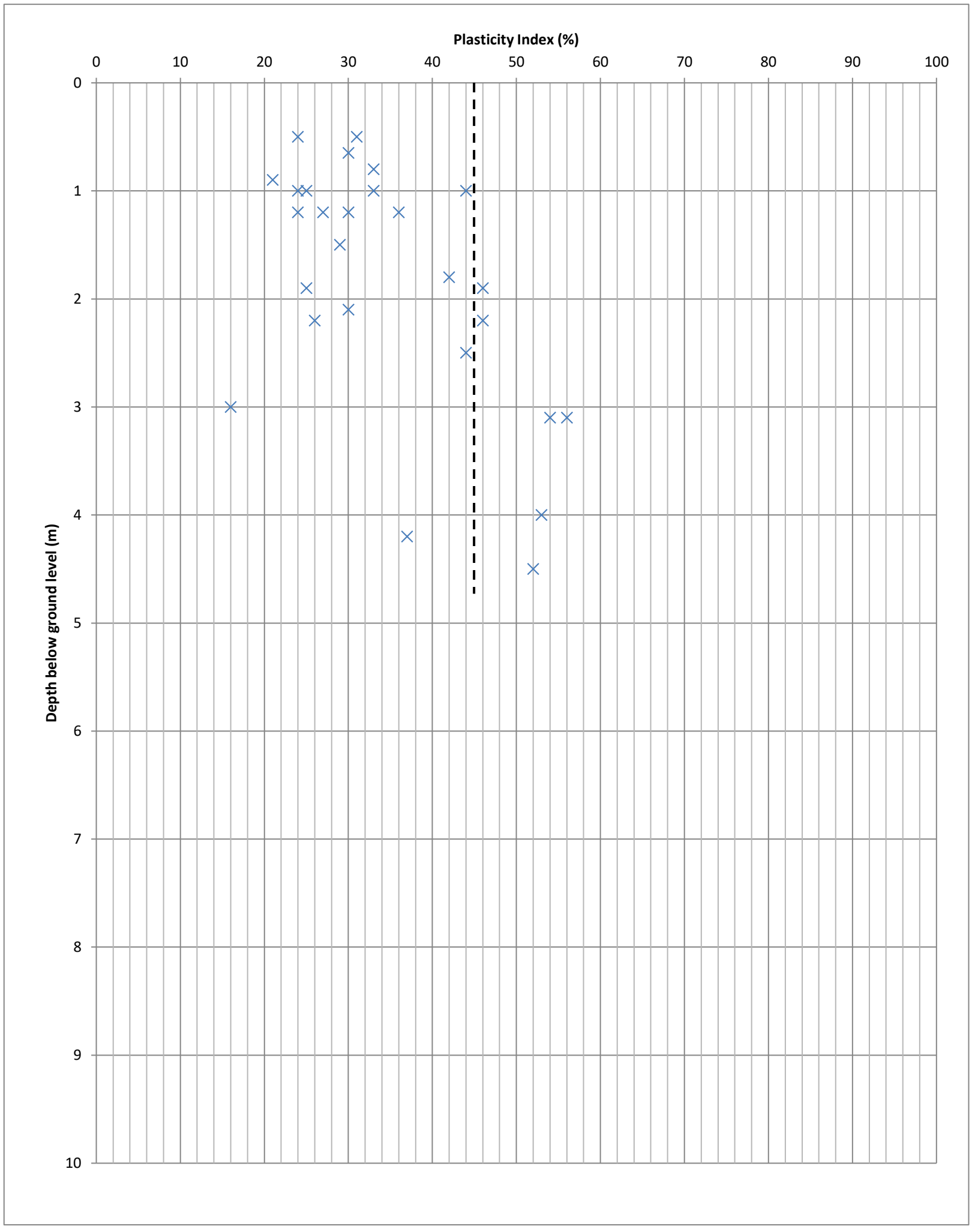

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Client: **Highways England**	Title: **Plasticity Index vs Depth - Alluvium**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
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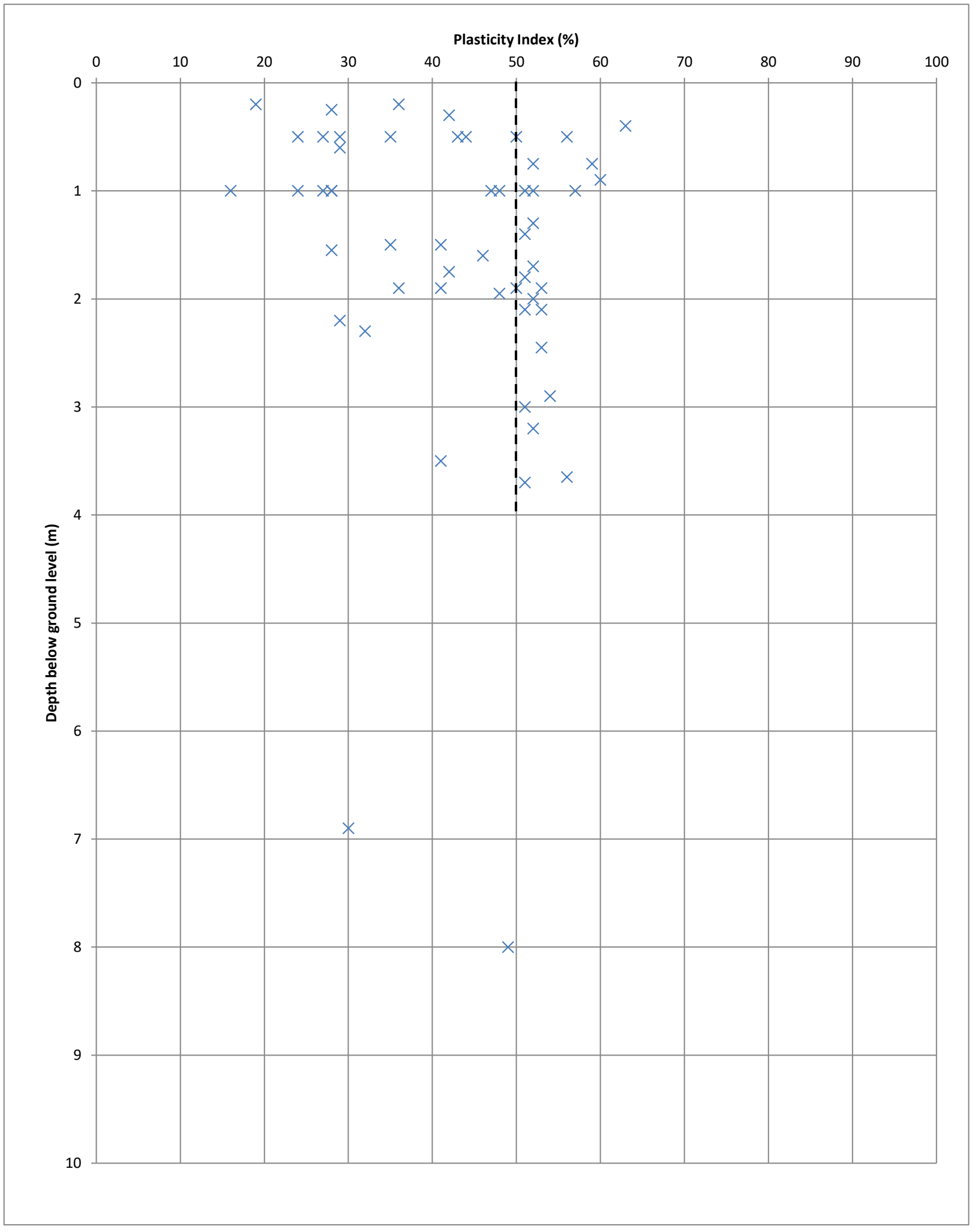

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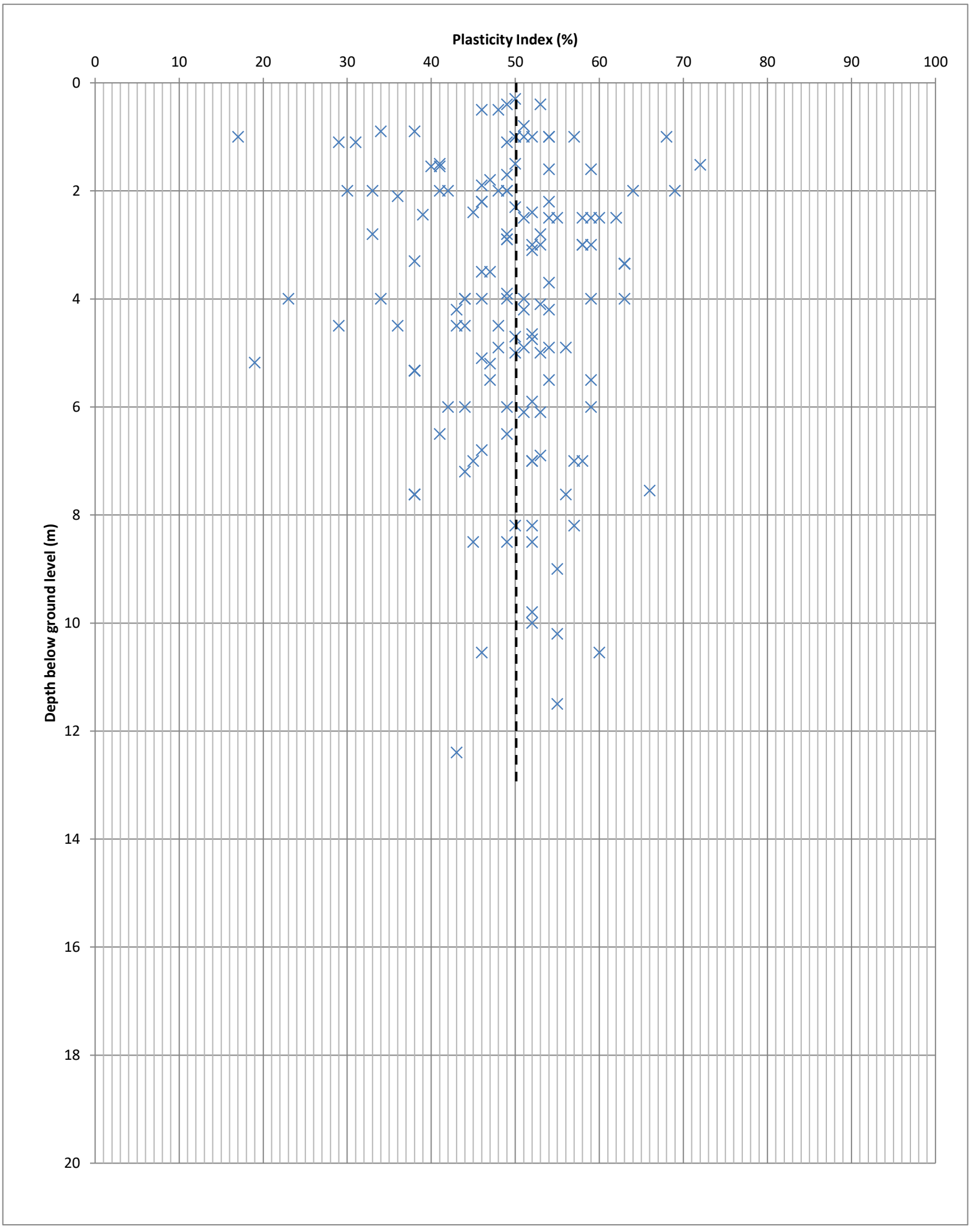
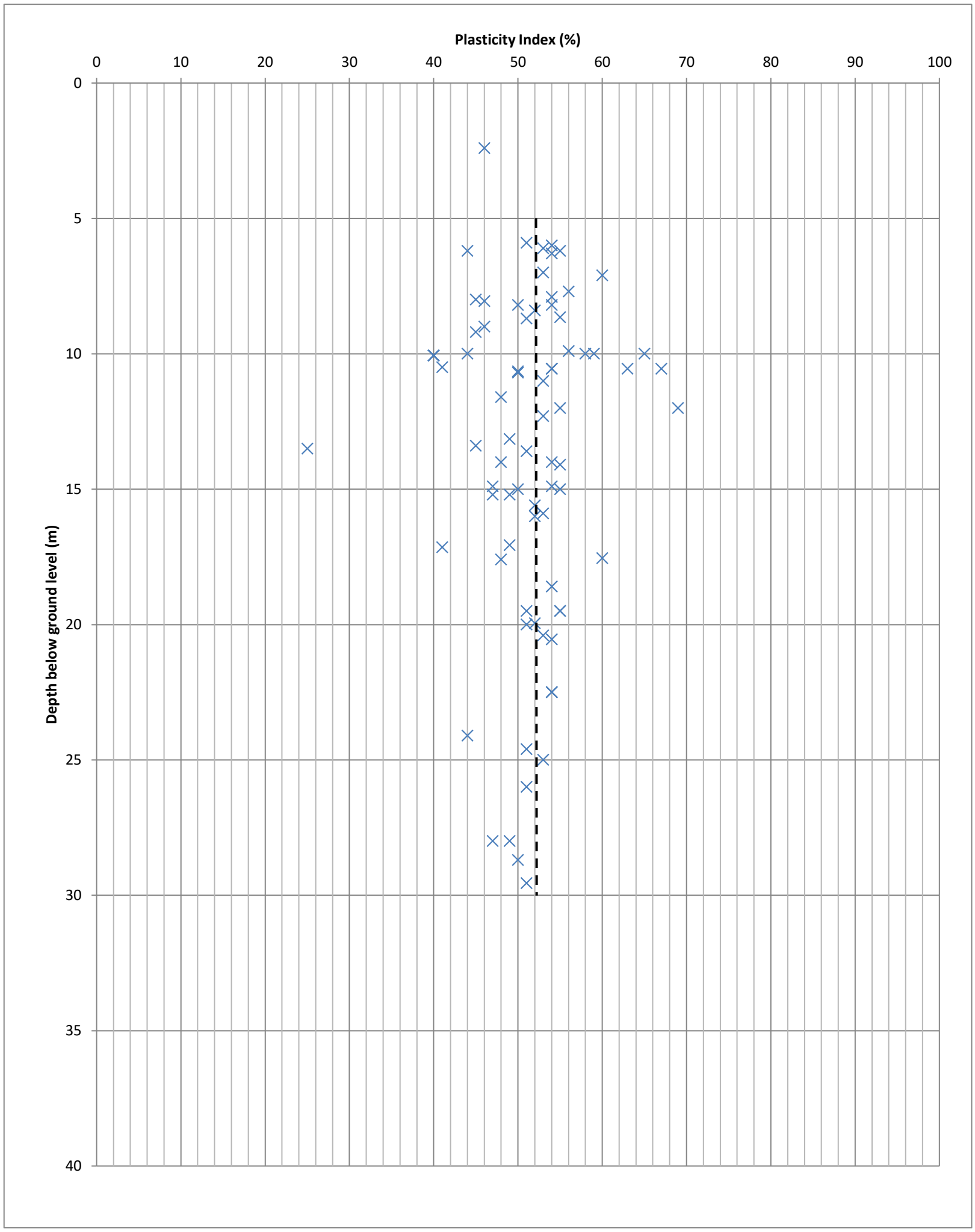
Client: **Highways England**	Title: **Plasticity Index vs Depth - Head Deposits**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 03-6		Rev: P01.1



Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Plasticity Index vs Depth - Weathered London Clay Formation**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Plot Number 03-8		Rev P01.1



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Client
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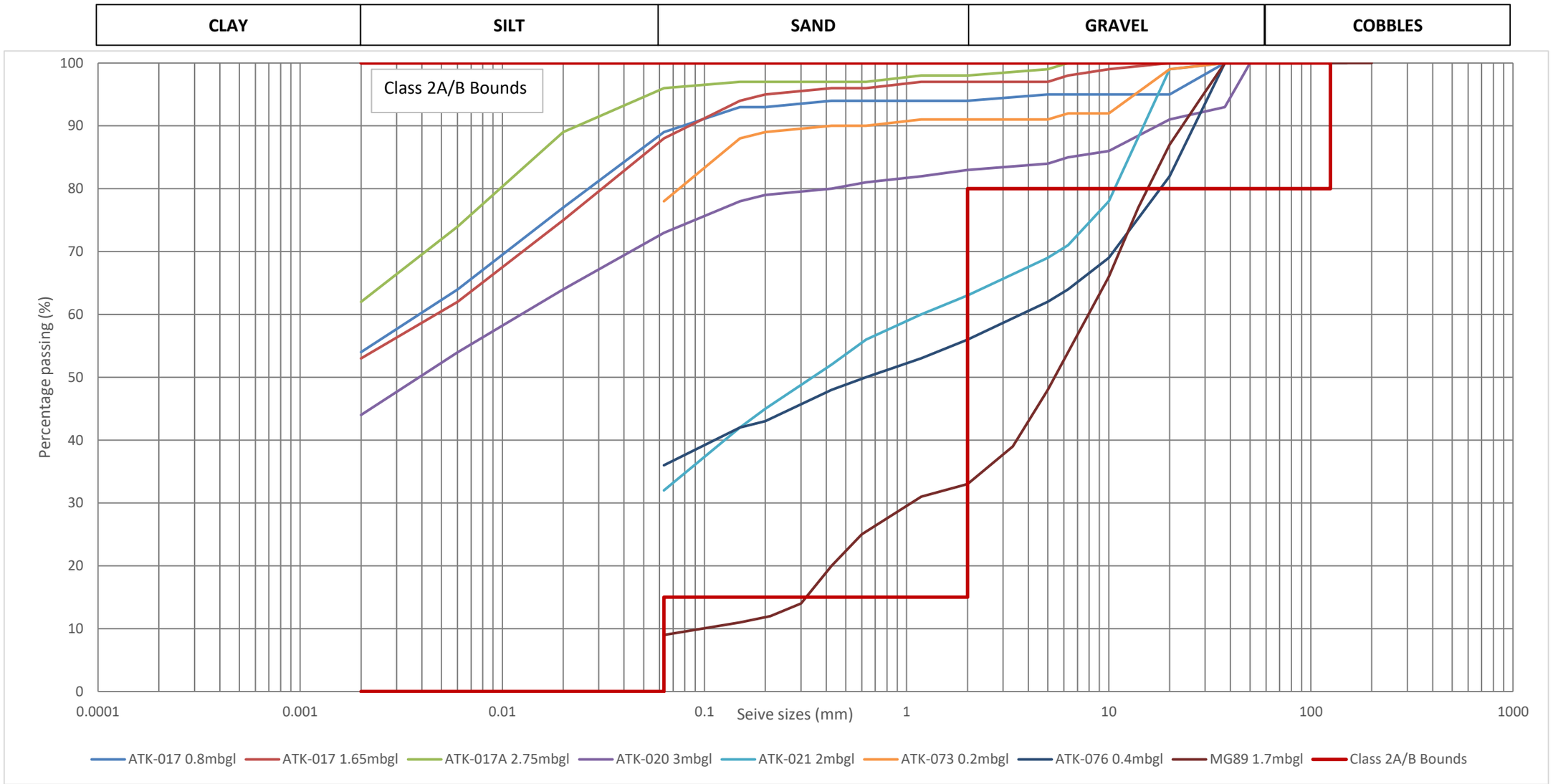
Project
M25 Junction 28 Improvement Scheme

Title
Plasticity Index vs Depth - London Clay Formation

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Plot Number	Rev
FINAL	03-9	P01.1



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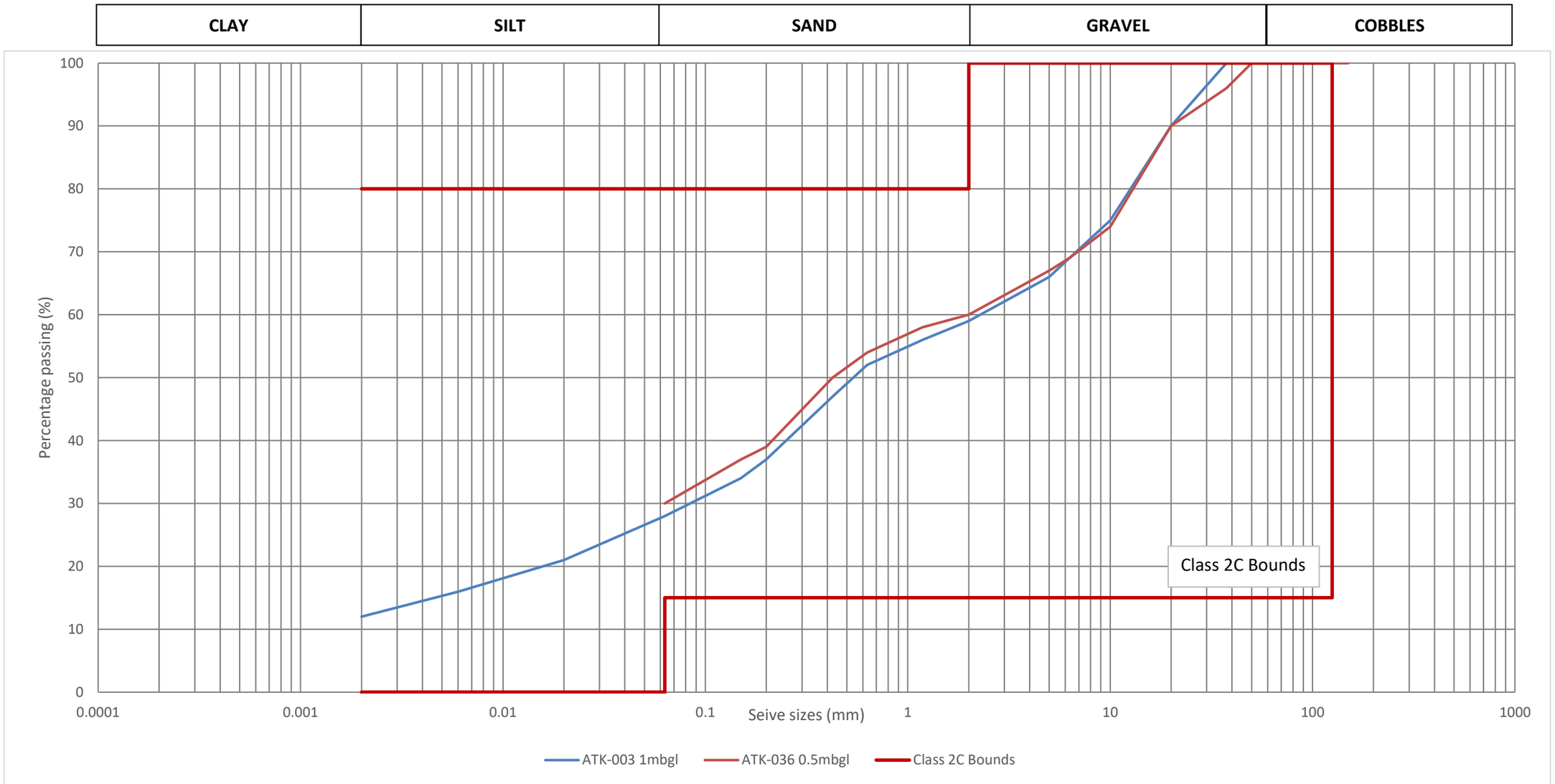
Client: **Highways England**			Title: **Particle Size Distribution for Made Ground - Engineered Fill**	
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-1		Rev: P01.1



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Client: **Highways England**	Title: **Particle Size Distribution for Made Ground - Recently Deposited Material**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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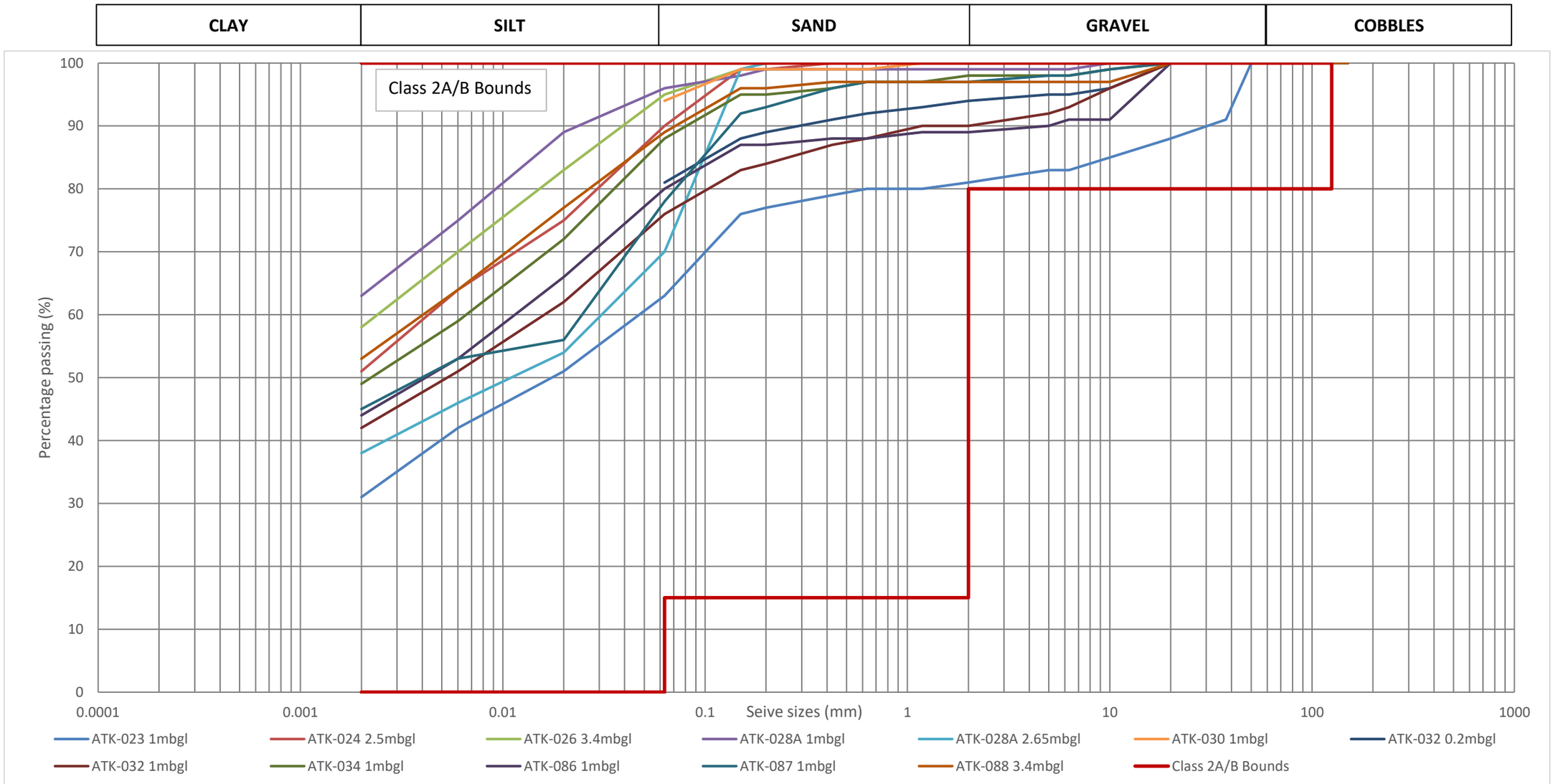

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Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
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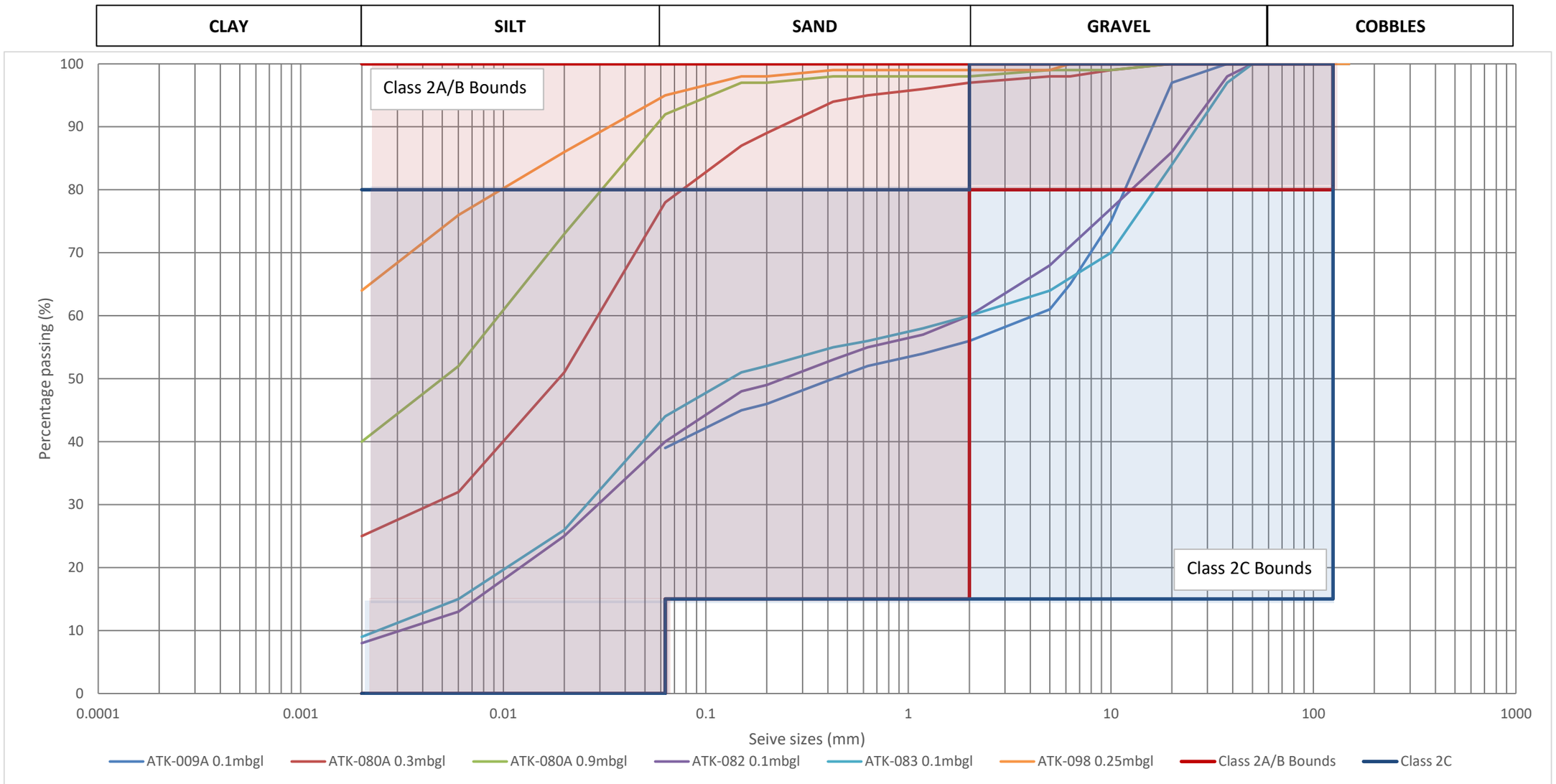

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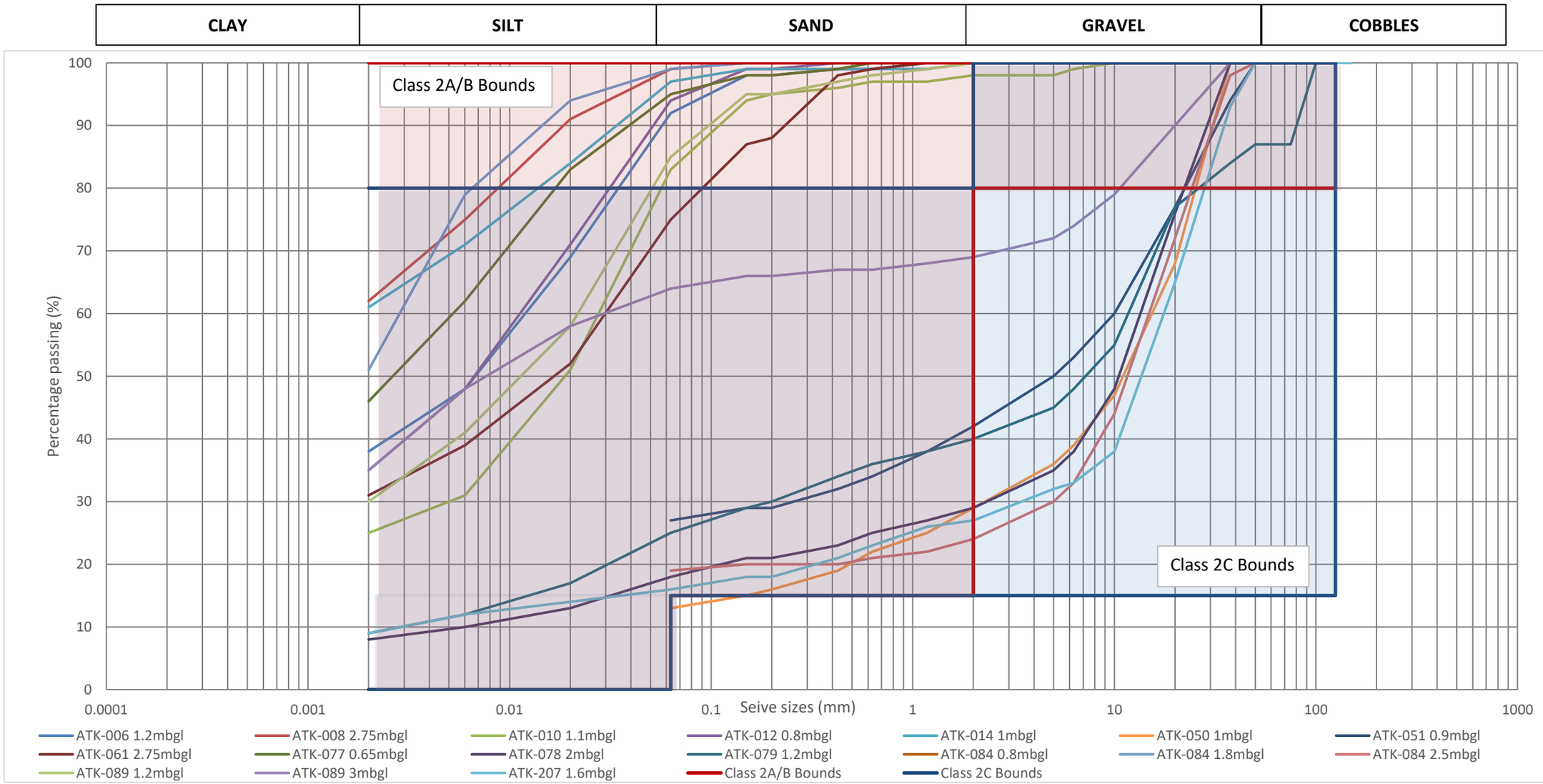
Client: **Highways England**			Title: **Particle Size Distribution for Made Ground - Undifferentiated**	
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-4		Rev: P01.1



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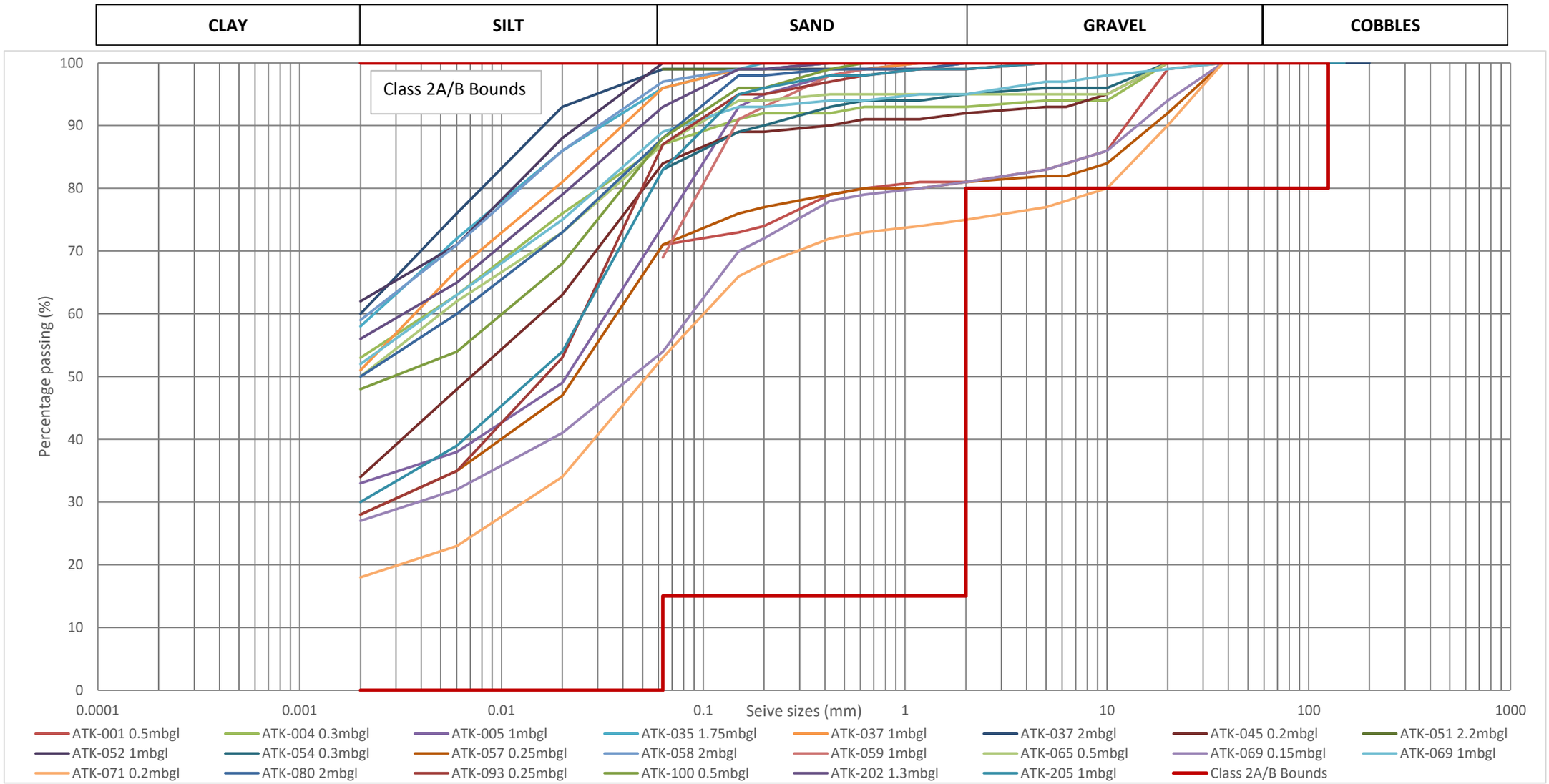
Client: **Highways England**	Title: **Particle Size Distribution for Alluvium - Undifferentiated**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-5		Rev: P01.1



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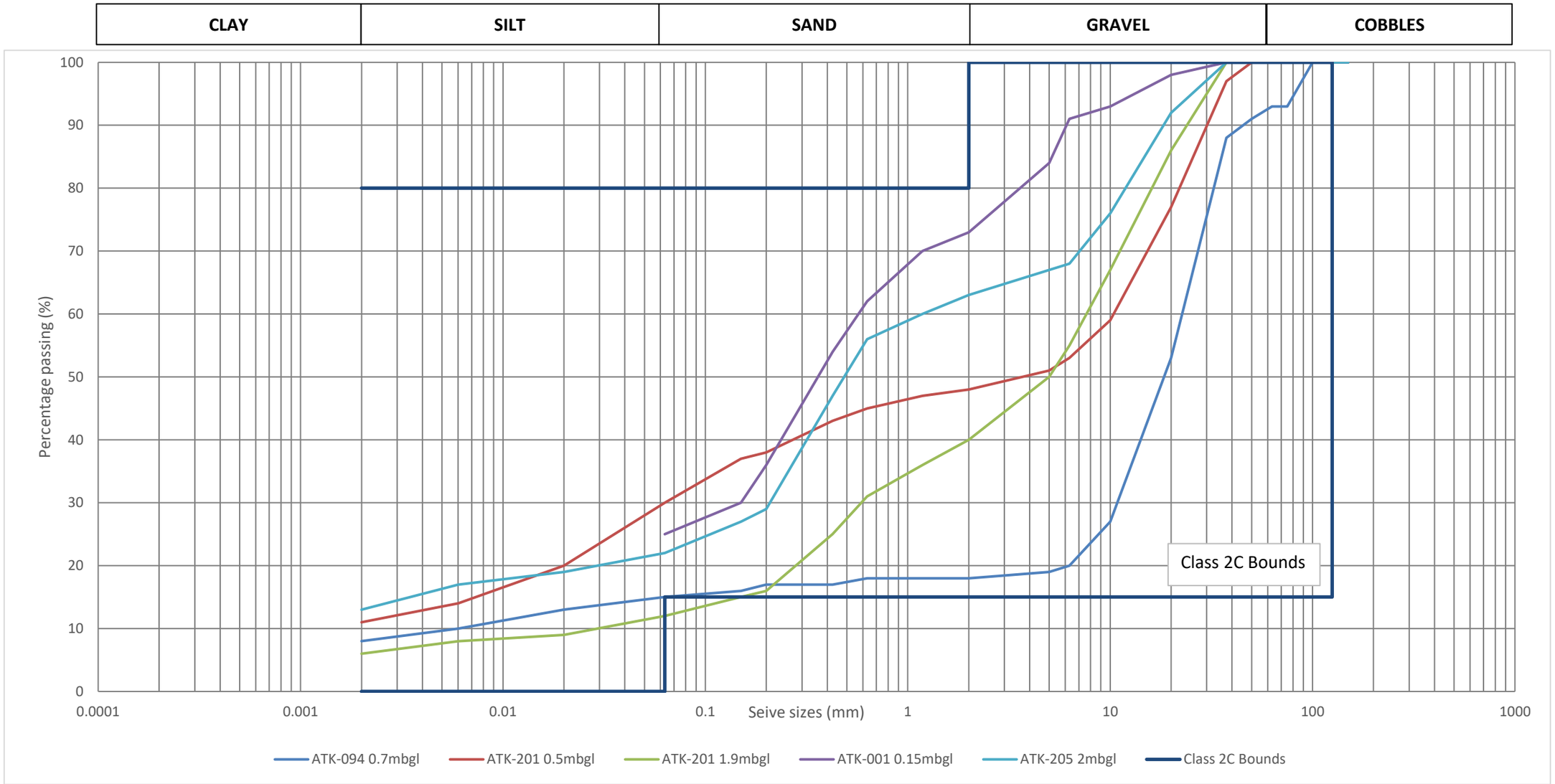
Client: **Highways England**	Title: **Particle Size Distribution for Head - Fines**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-6		Rev: P01.1



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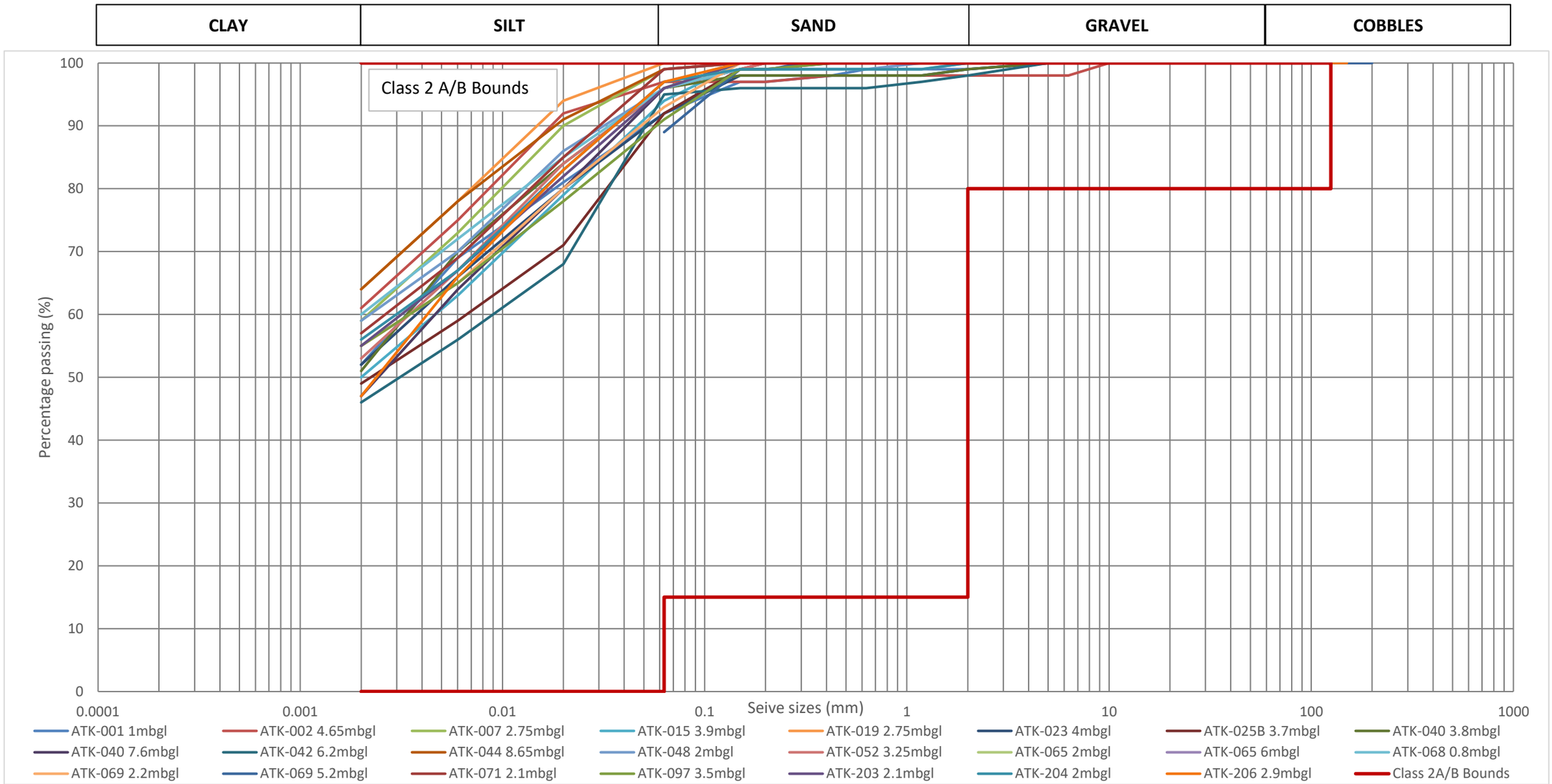
Client: **Highways England**	Title: **Particle Size Distribution for Head - Gravel**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-7		Rev: P01.1



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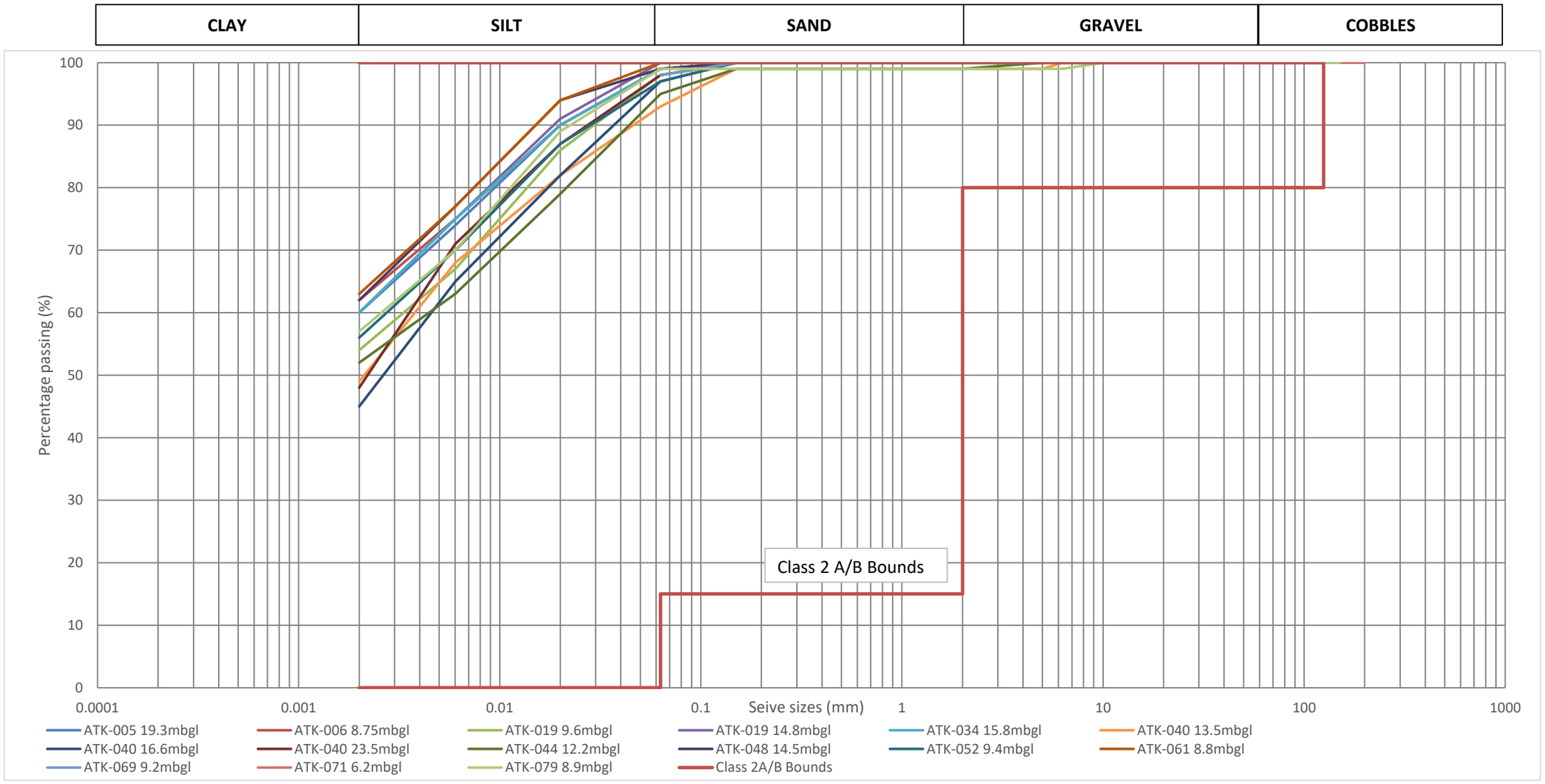
Client: **Highways England**	Title: **Particle Size Distribution for Weathered London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-8		Rev: P01.1



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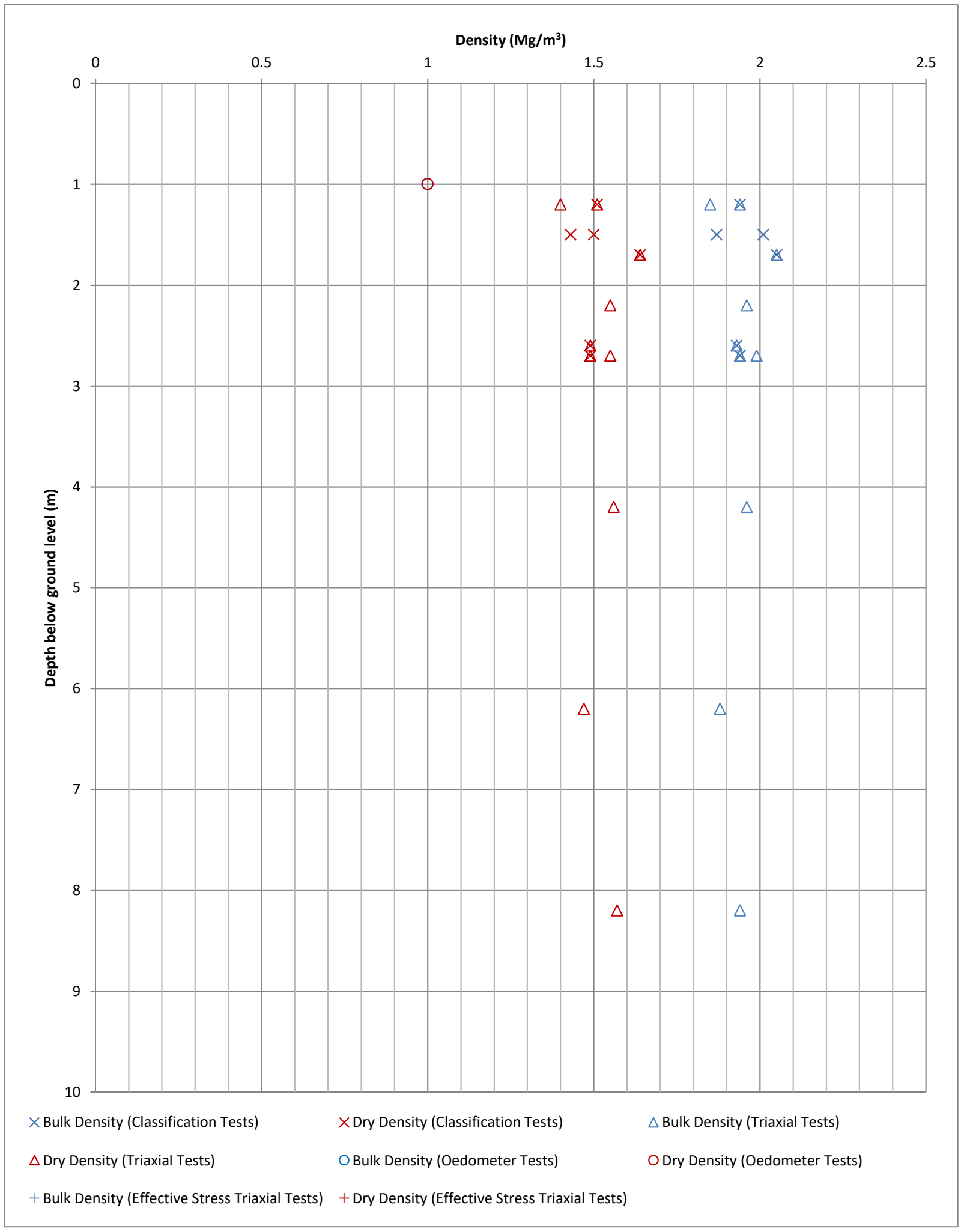
Client: **Highways England**	Title: **Particle Size Distribution for (unweathered) London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 04-9		Rev: P01.1



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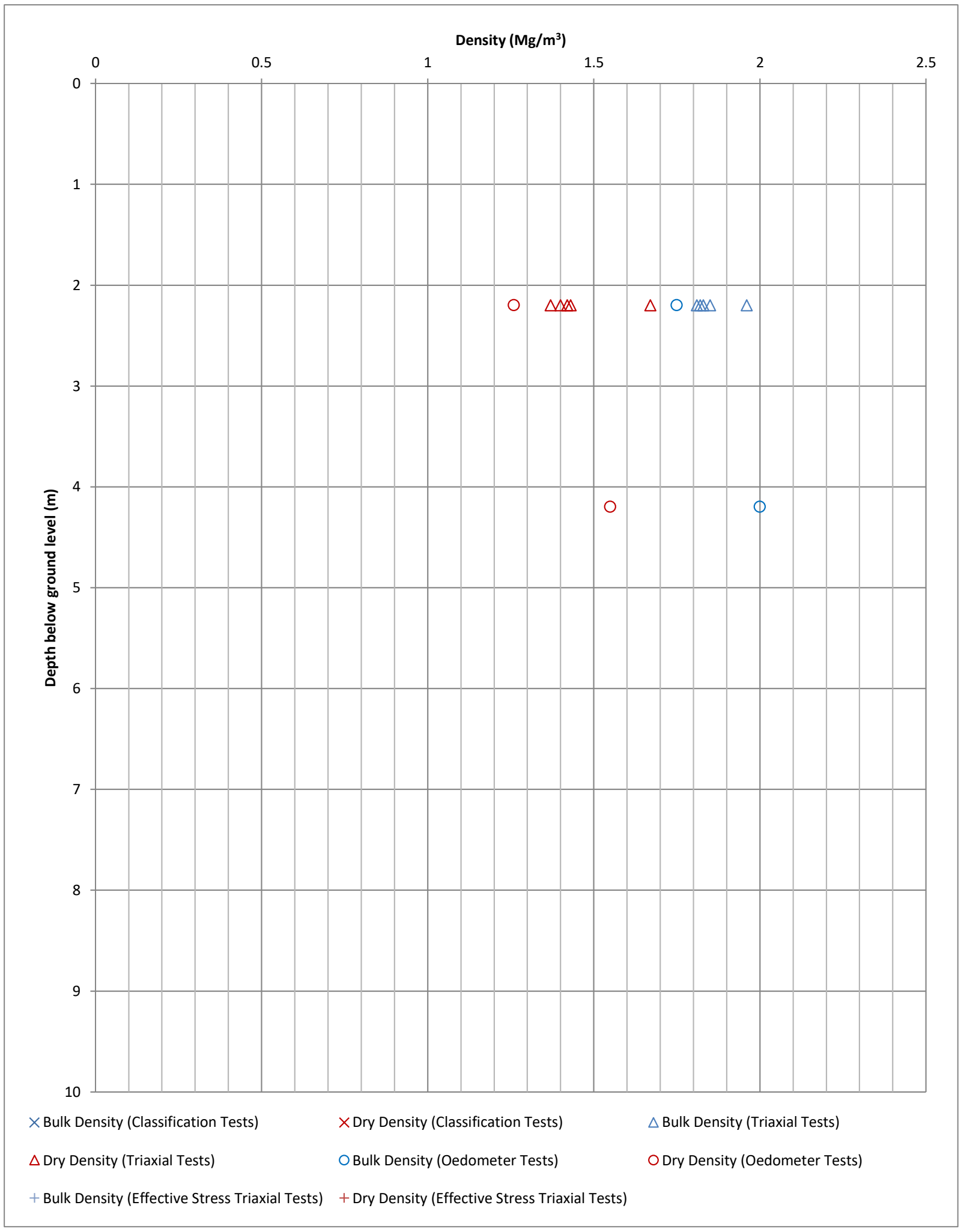
Client: **Highways England**	Title: **Density vs Depth - Made Ground - Engineered Fill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 05-1		Rev: P01.1



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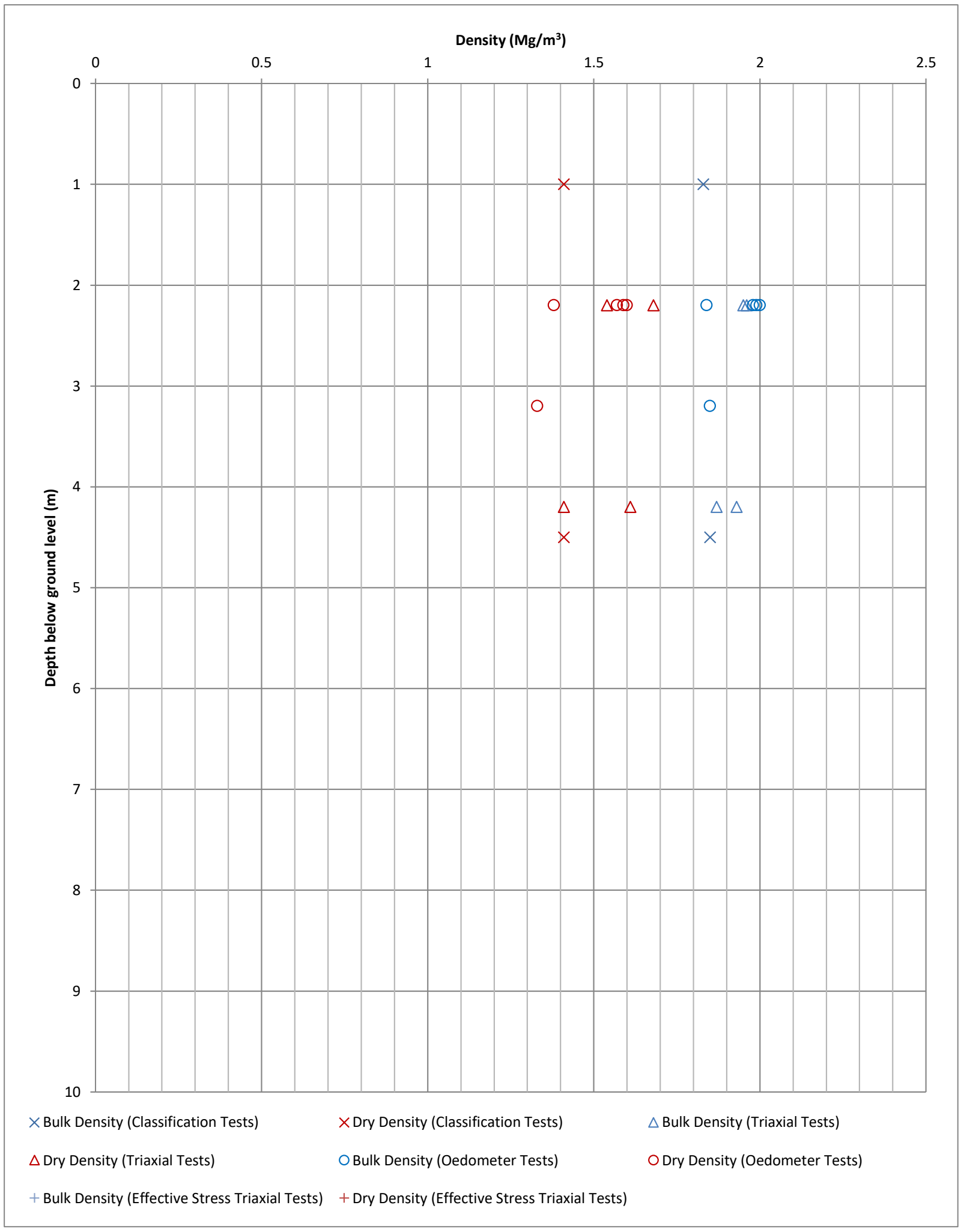
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Density vs Depth - Made Ground - Landfill**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Plot Number	Rev
FINAL	05-3	P01.1



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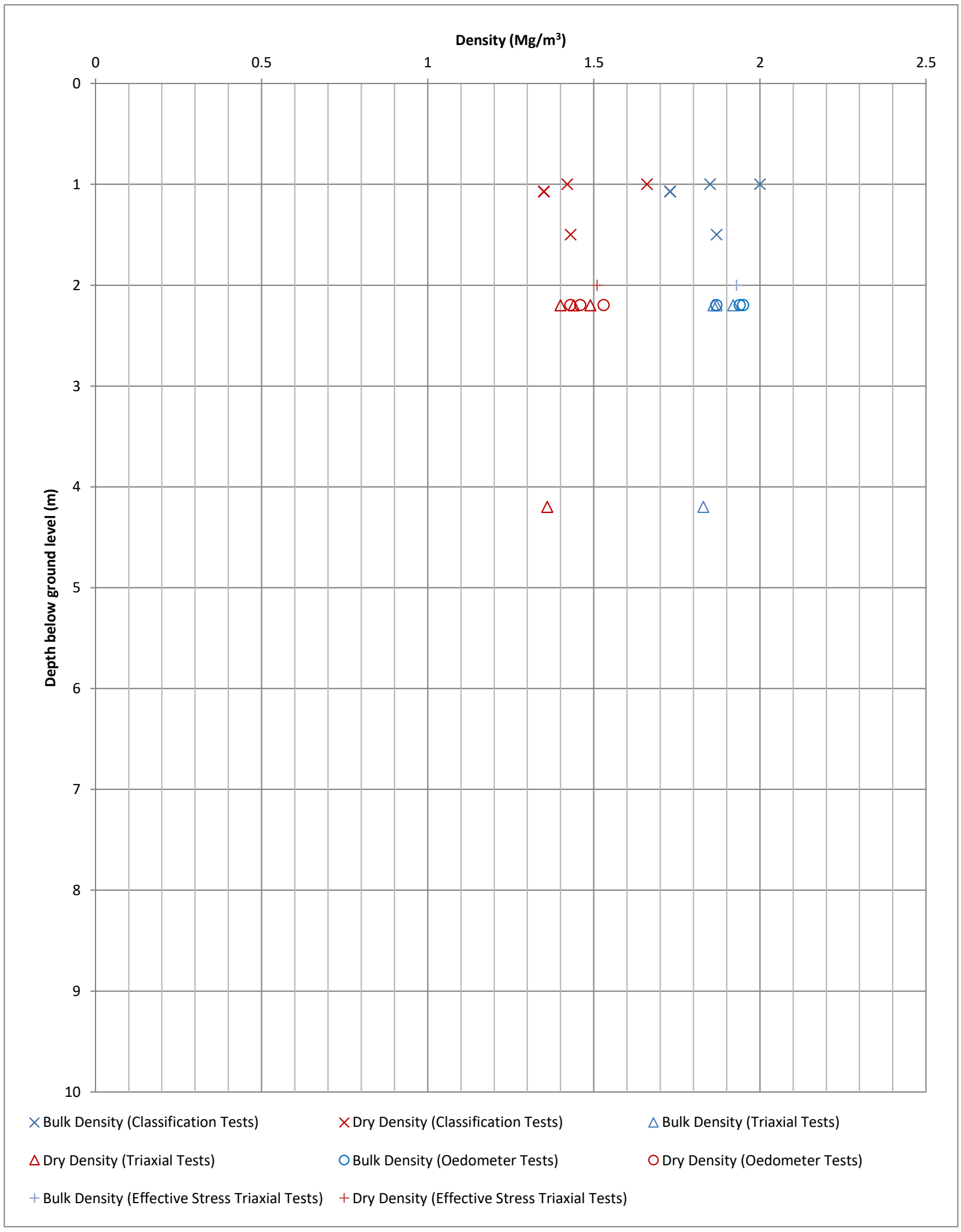
Client: **Highways England**	Title: **Density vs Depth - Alluvium**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 05-5		Rev: P01.1



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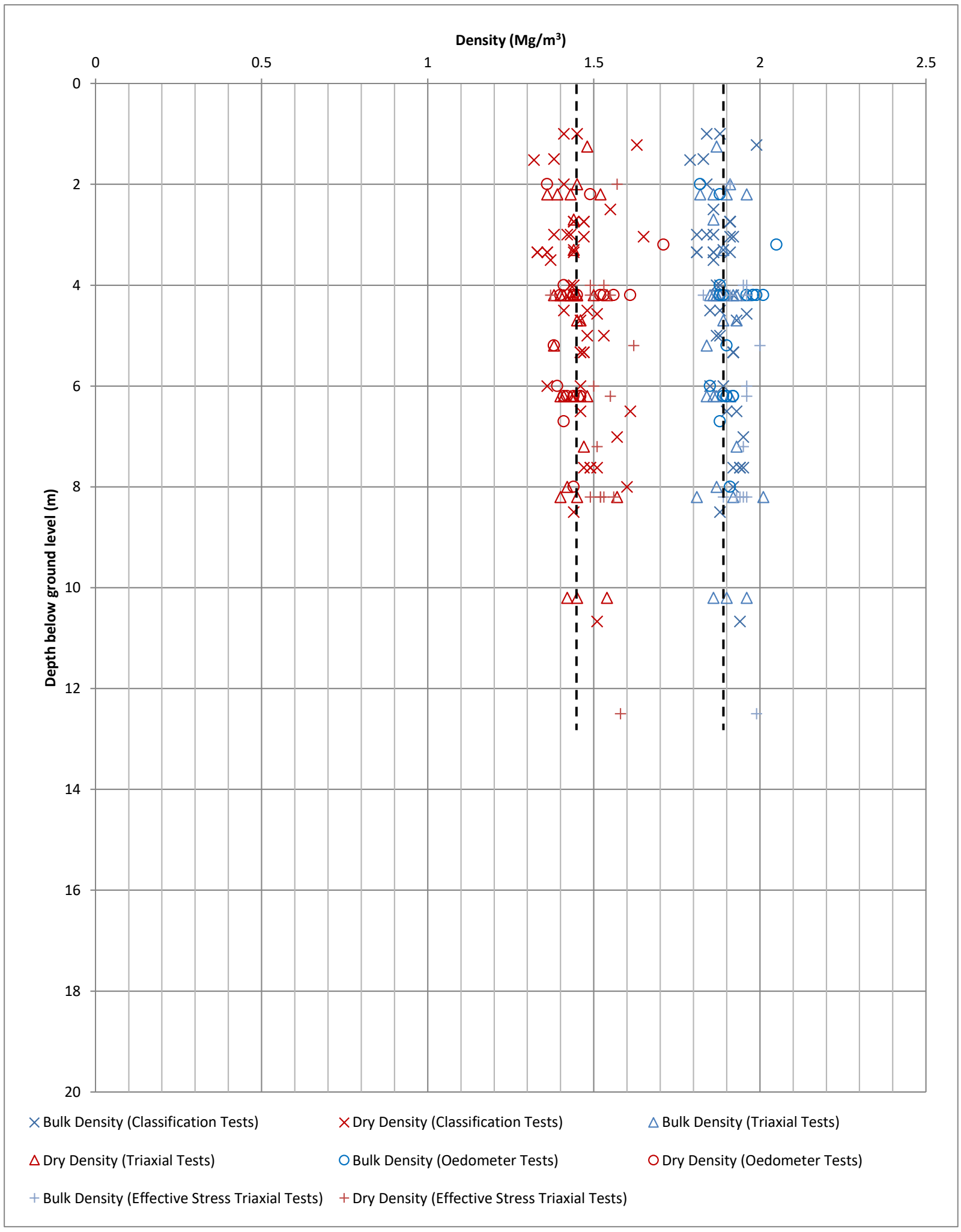
Client: **Highways England**	Title: **Density vs Depth - Head Deposits**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 05-6		Rev: P01.1



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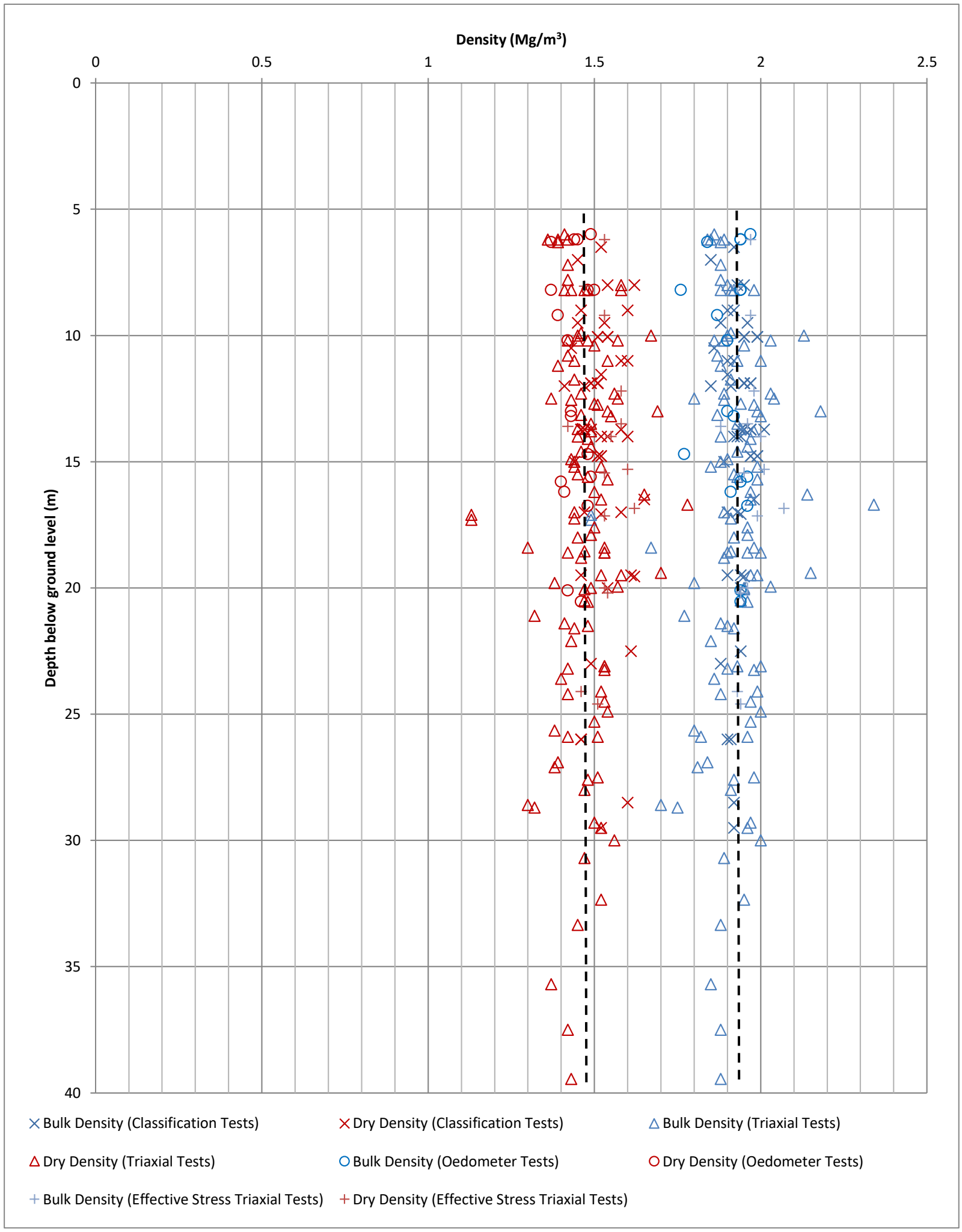
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Density vs Depth - Weathered London Clay Formation**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Plot Number	Rev
FINAL	05-8	P01.1



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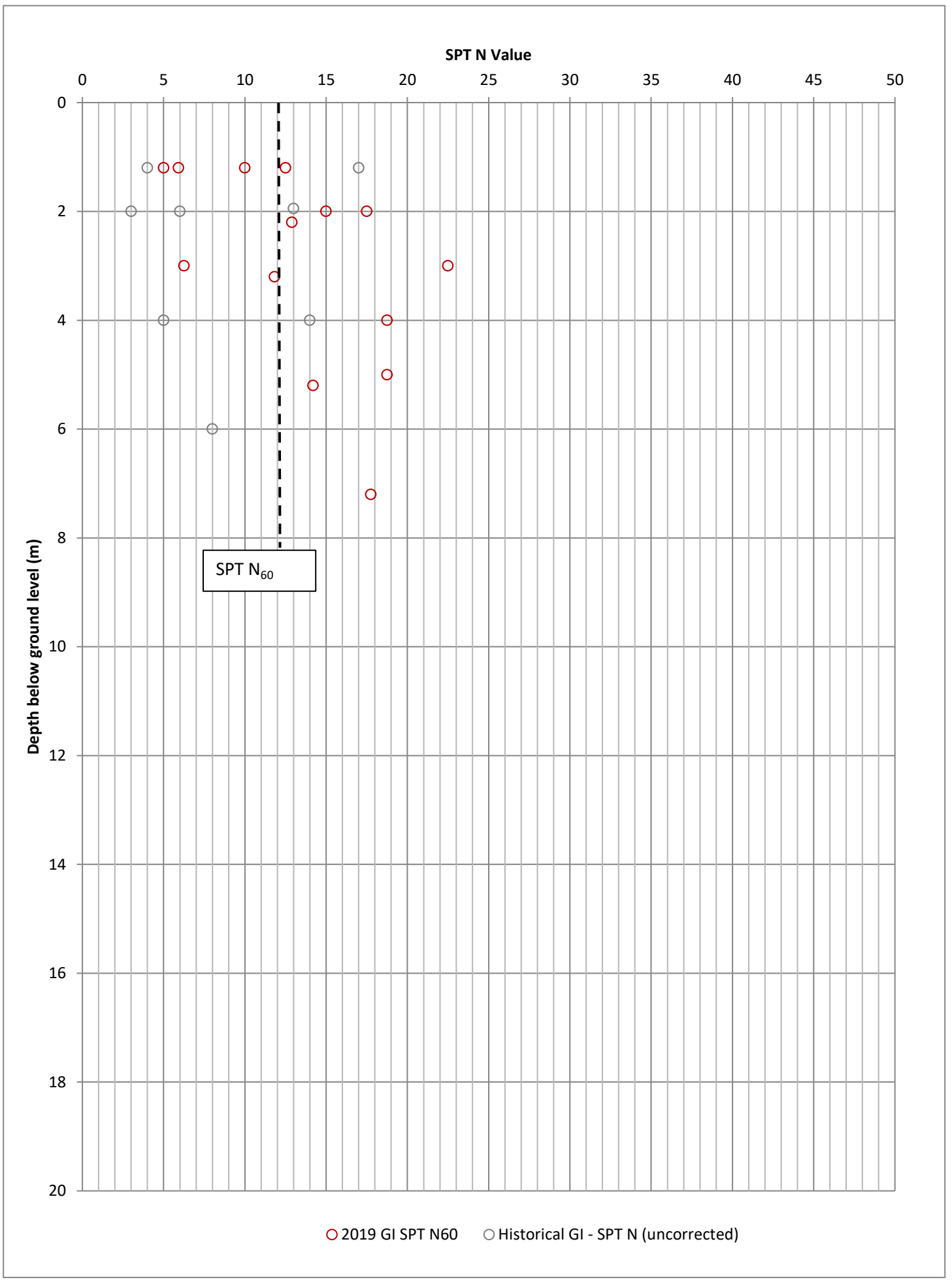
Client: **Highways England**	Title: **Density vs Depth - London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Plot Number: 05-9		Rev: P01.1



Maximum Extrapolated N Value	200

z = Top of Stratum

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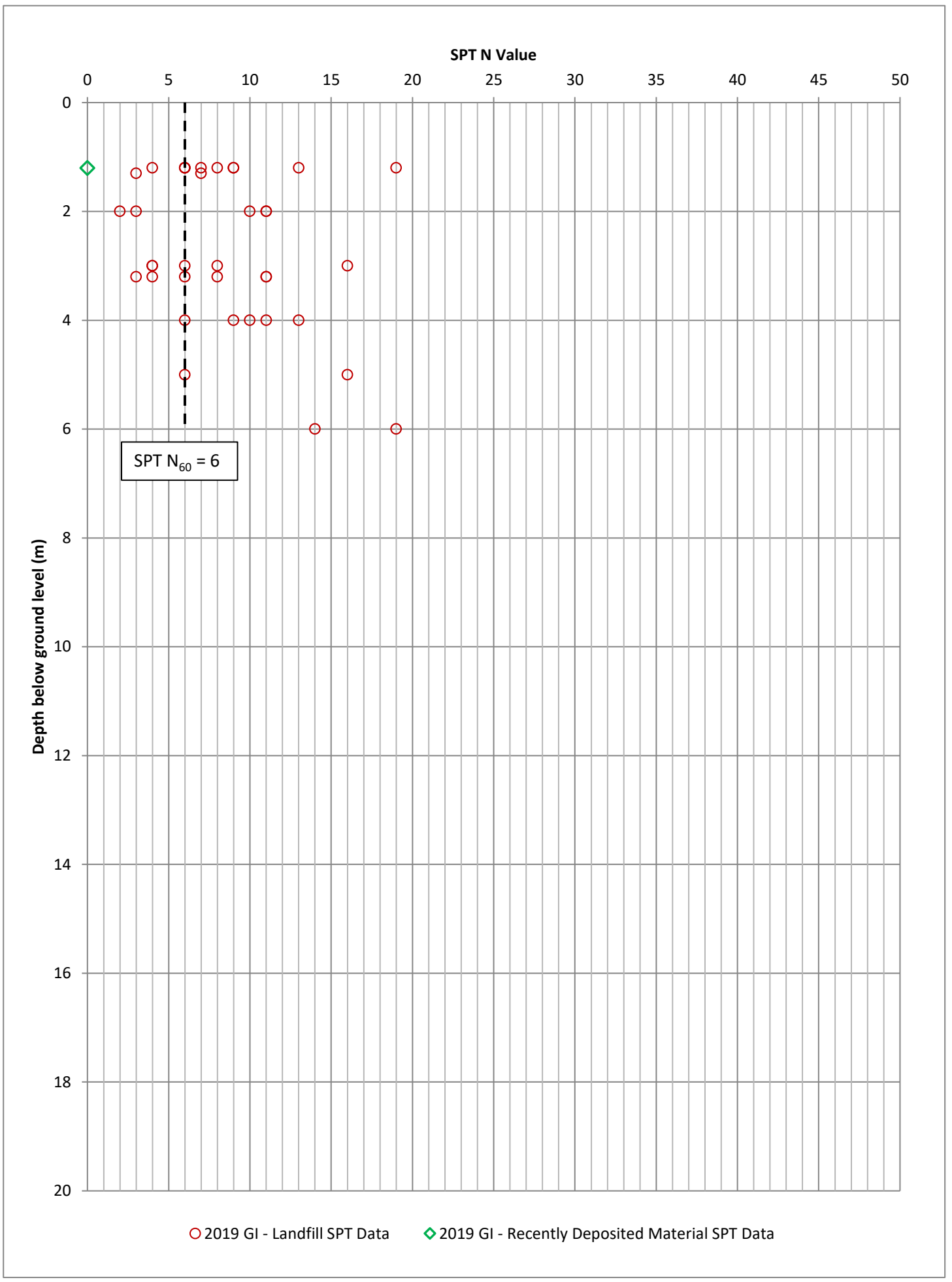
Client: **Highways England**	Title: **SPT N Value vs Depth for Made Ground - Engineered Fill**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 06-1		Rev: P01.1



Maximum Extrapolated N Value	200

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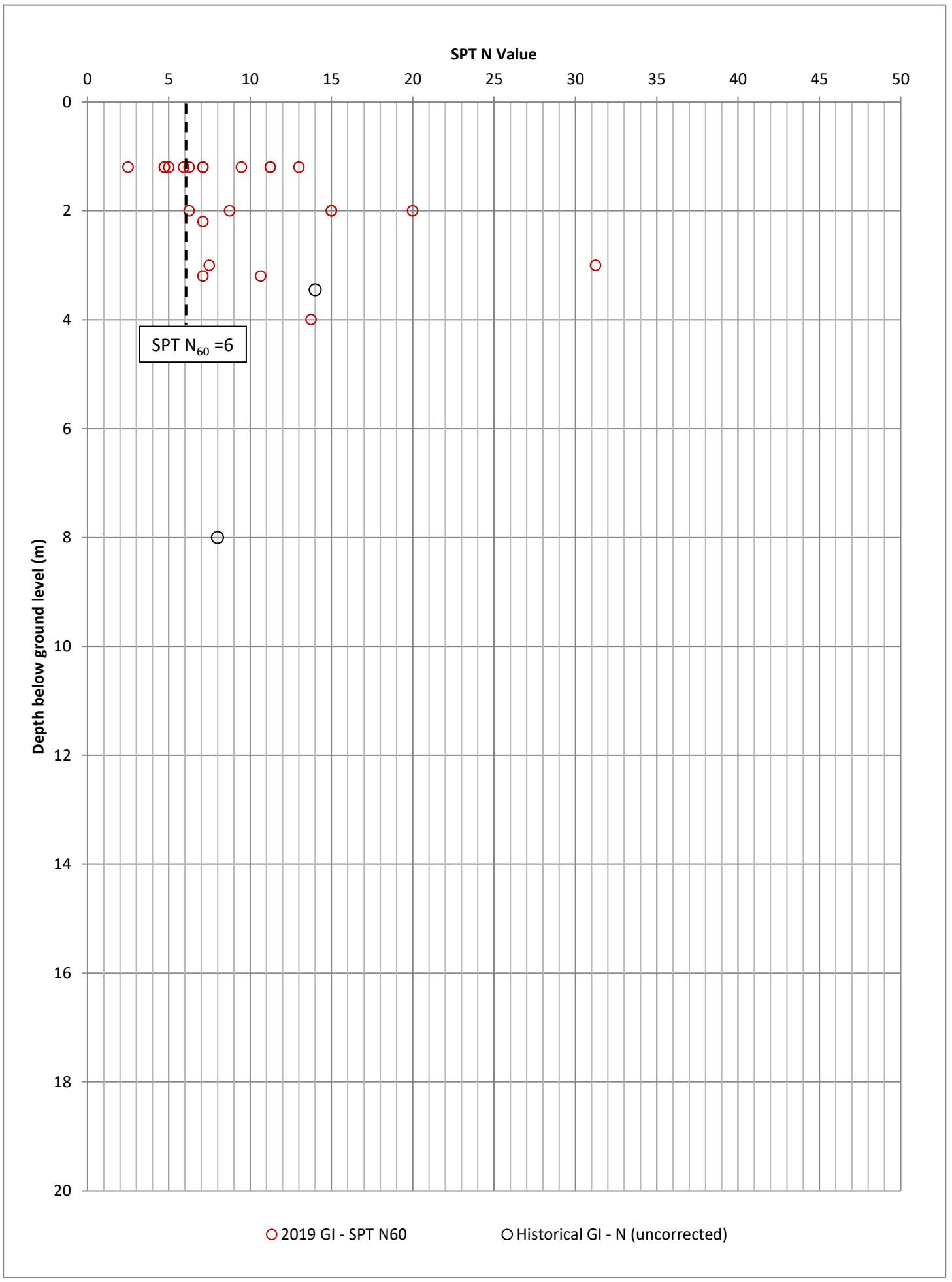
Client: **Highways England**	Title: **SPT N Value vs Depth for Made Ground - Landfill & Made Ground - Recently Deposited Material**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 06-2/3		Rev: P01.1



Maximum Extrapolated N Value	200

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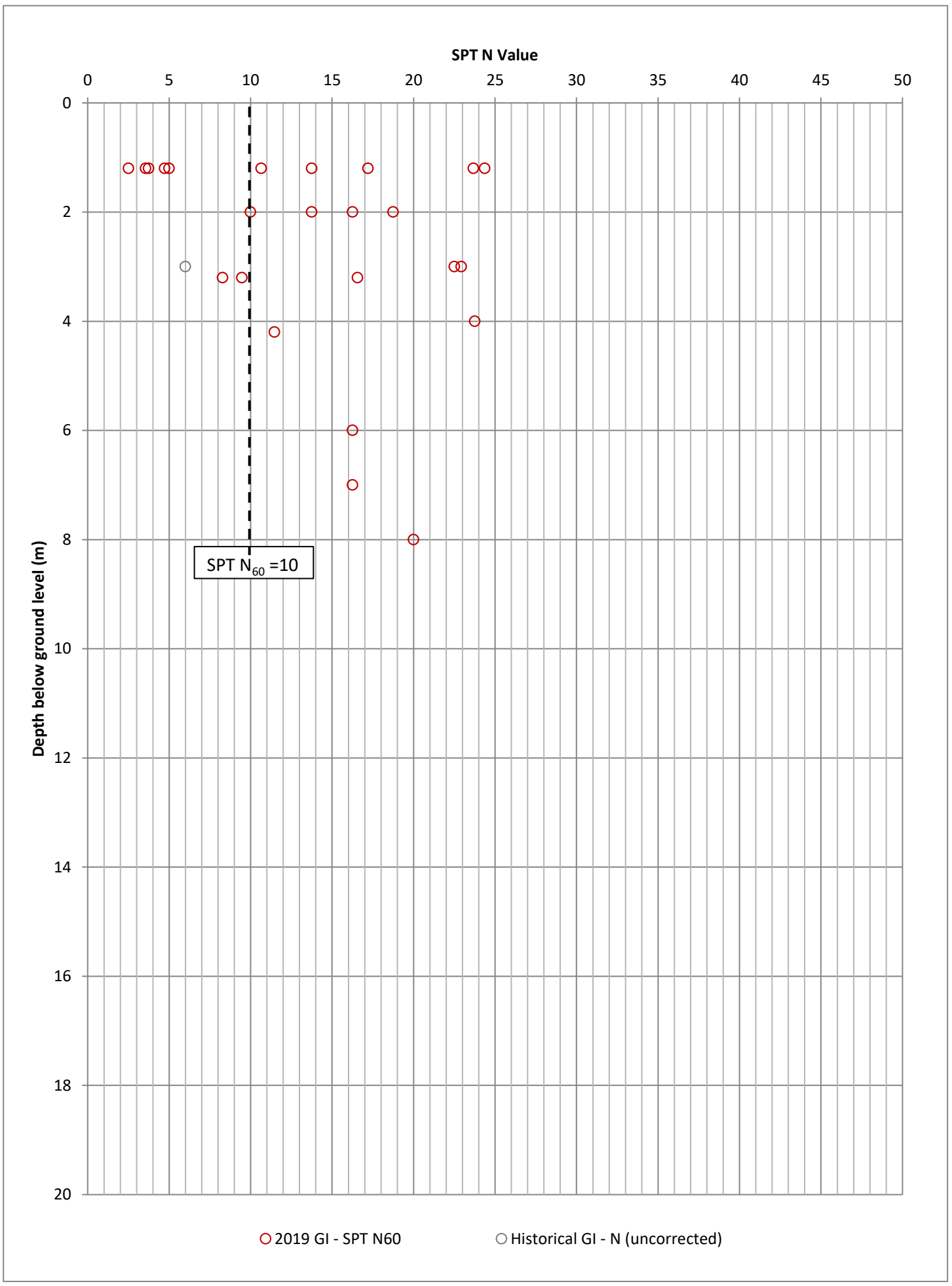
Client	Title			
Highways England	**SPT N Value vs Depth for Alluvium**			
Project	Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
	A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
M25 Junction 28 Improvement Scheme	Status	Figure Number		Rev
	FINAL	06-5		P01.1



Maximum Extrapolated N Value	200

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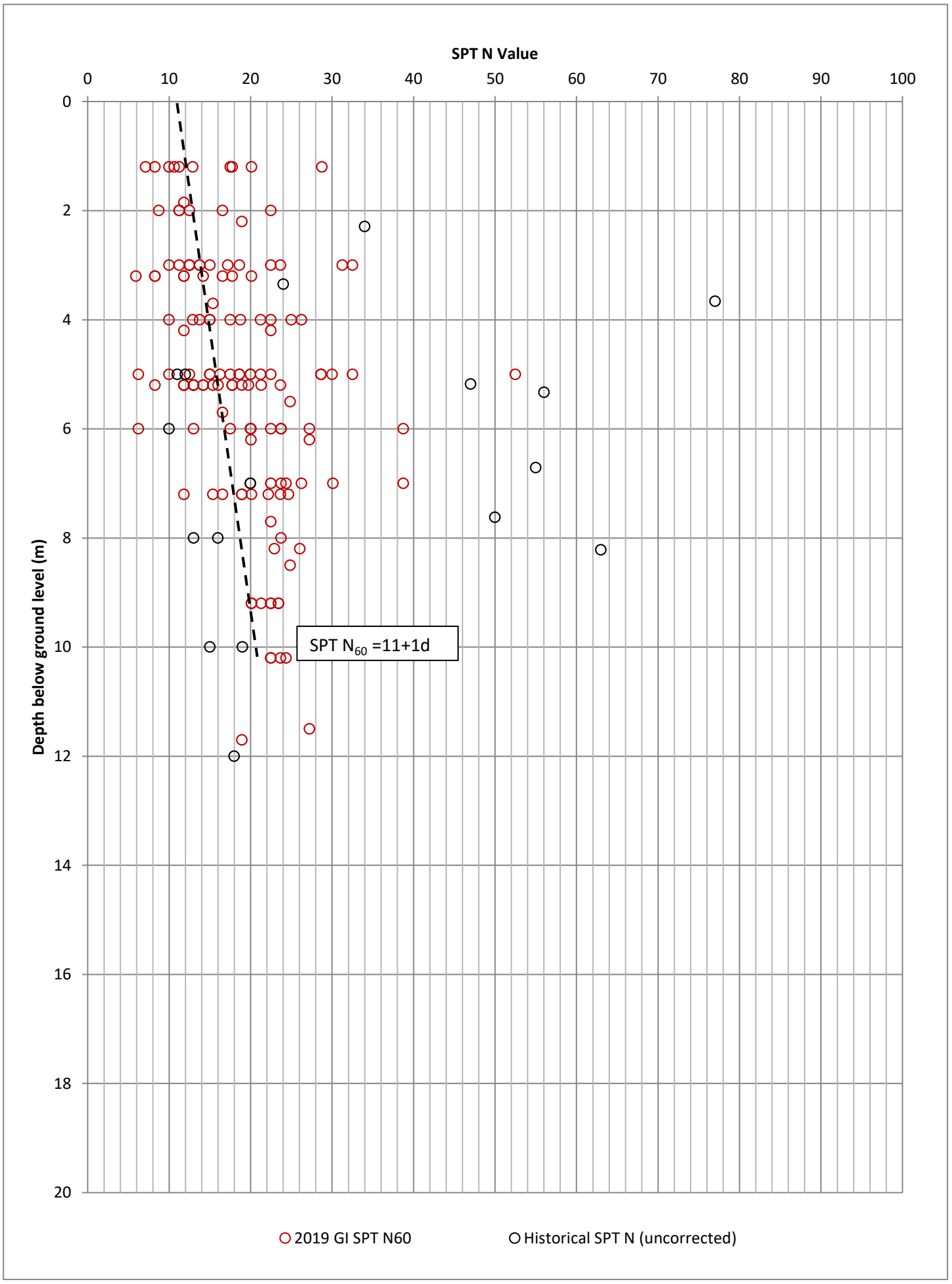
Client: **Highways England**	Title: **SPT N Value vs Depth for Head Deposits**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 06-6		Rev: P01.1



Maximum Extrapolated N Value	200

d = Depth below ground level

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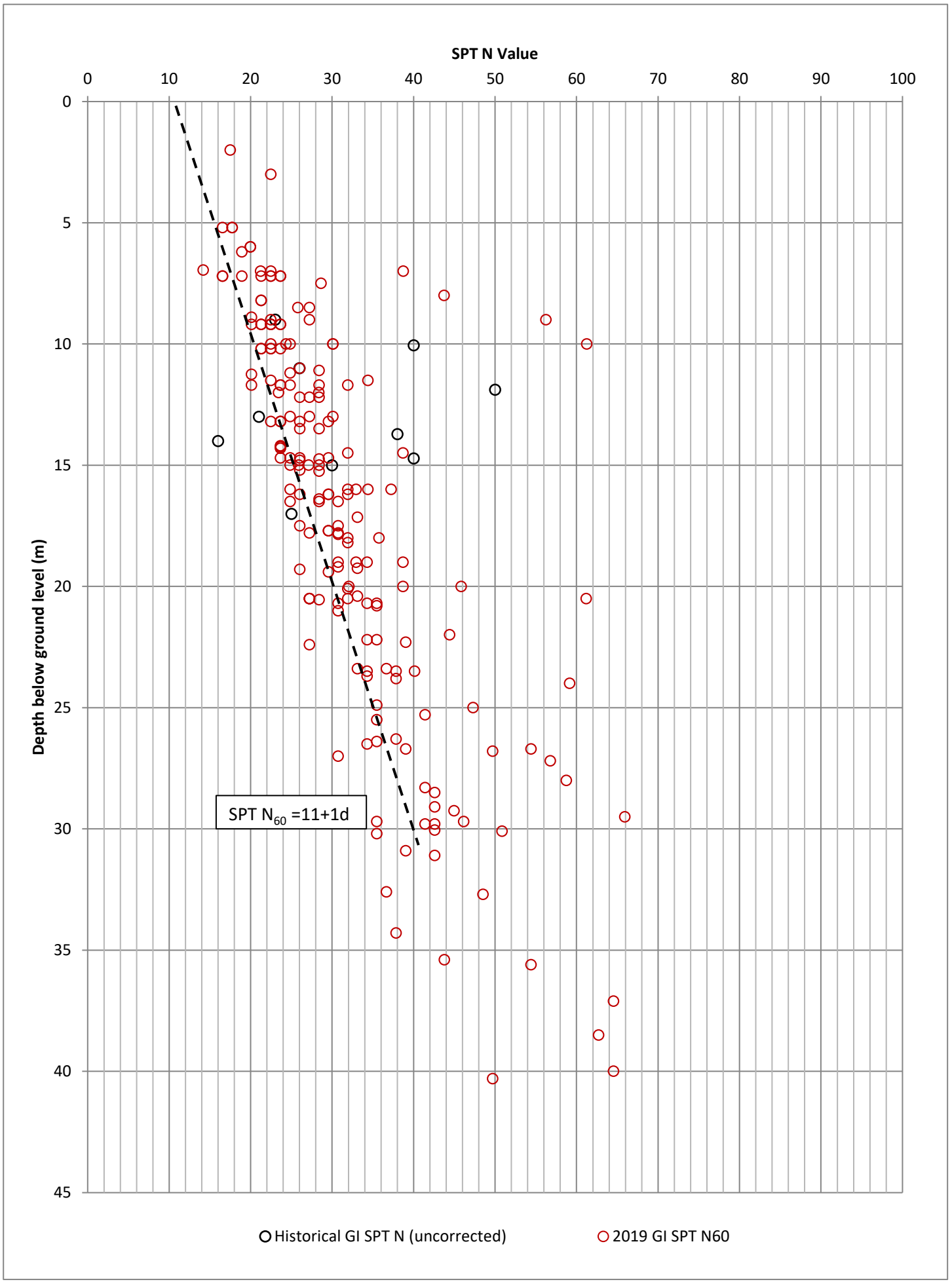
Client: **Highways England**	Title: **SPT N Value vs Depth for Weathered London Clay**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 06-8		Rev: P01.1



Maximum Extrapolated N Value	200

d = Depth below ground level

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Client: **Highways England**	Title: **SPT N Value vs Depth for London Clay**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 06-9		Rev: P01.1

Maximum Extrapolated N Value	0

d = Depth below ground level

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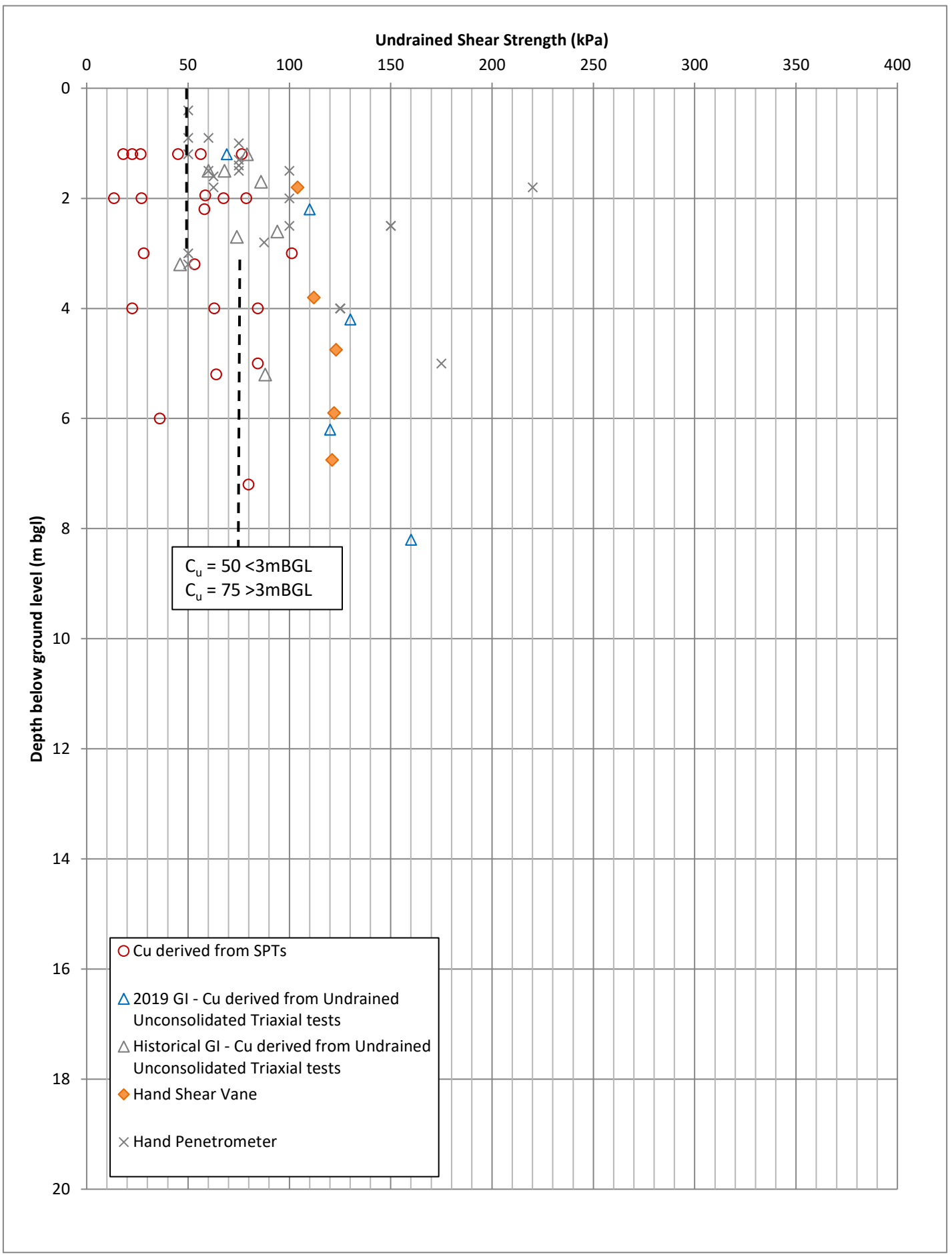
	Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20 / Reviewed: SM Date: 12/06/20
		Status: FINAL	Figure Number: 06-8/9	Rev: P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

z = Top of Stratum

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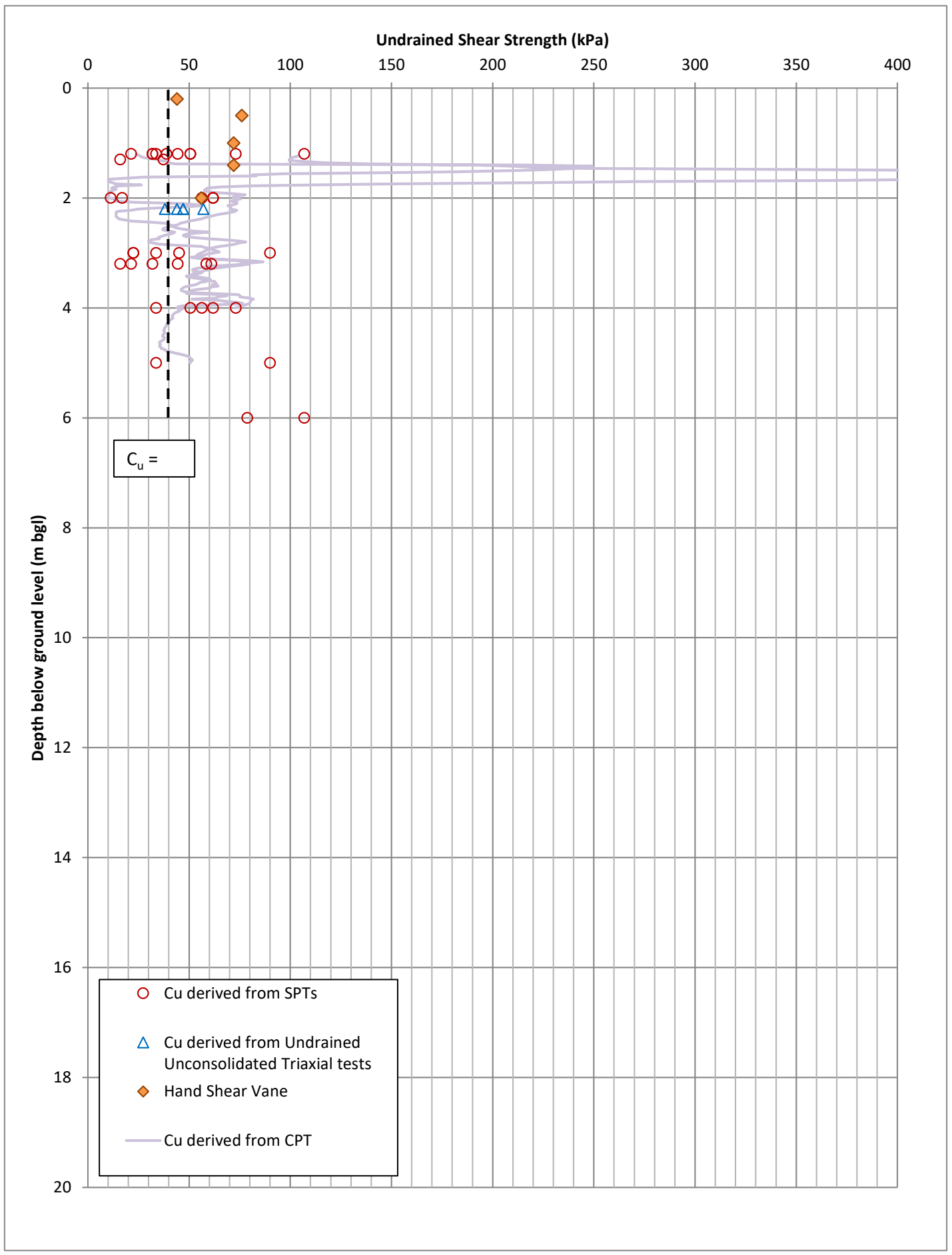
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for Made Ground - Engineered Fill**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 07-1		Rev: P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

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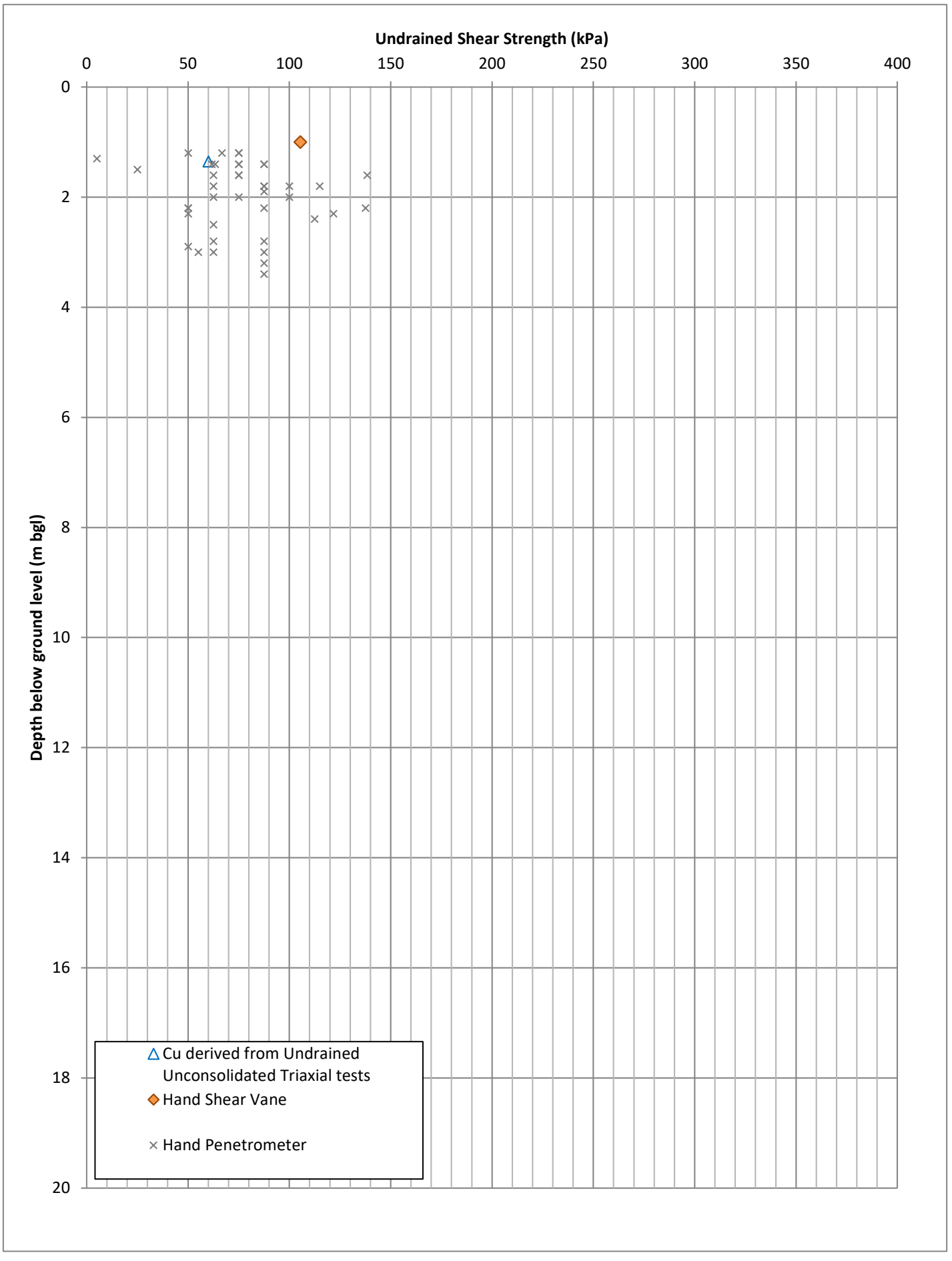
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **SPT N Value vs Depth for Made Ground - Landfill & Made Ground - Recently Deposited Material**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
FINAL	07-3	P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

Note: A characteristic C_u has not been determined for the Made Ground - Undifferentiated Stratum

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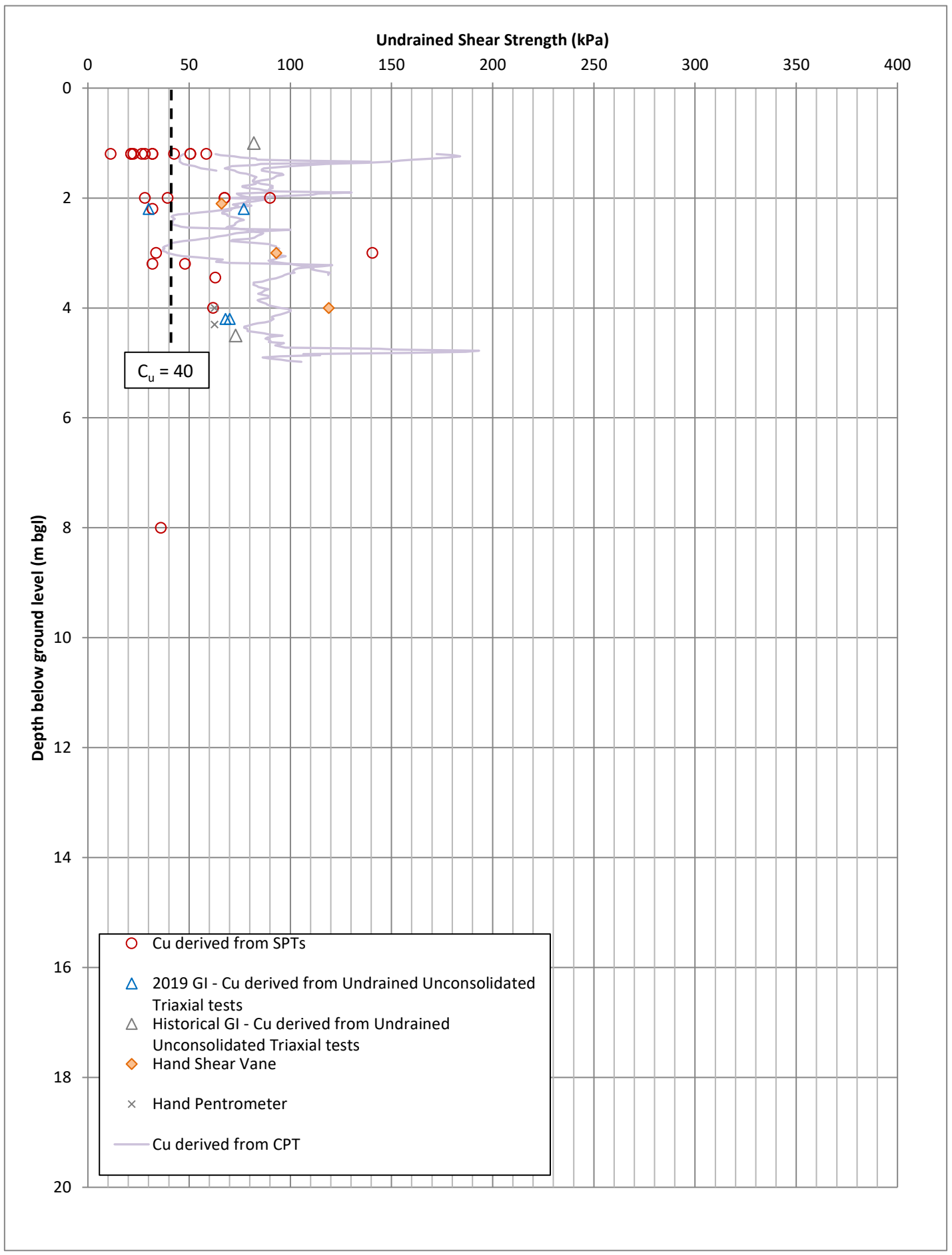
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for Made Ground - Undifferentiated**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
FINAL	07-4	P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

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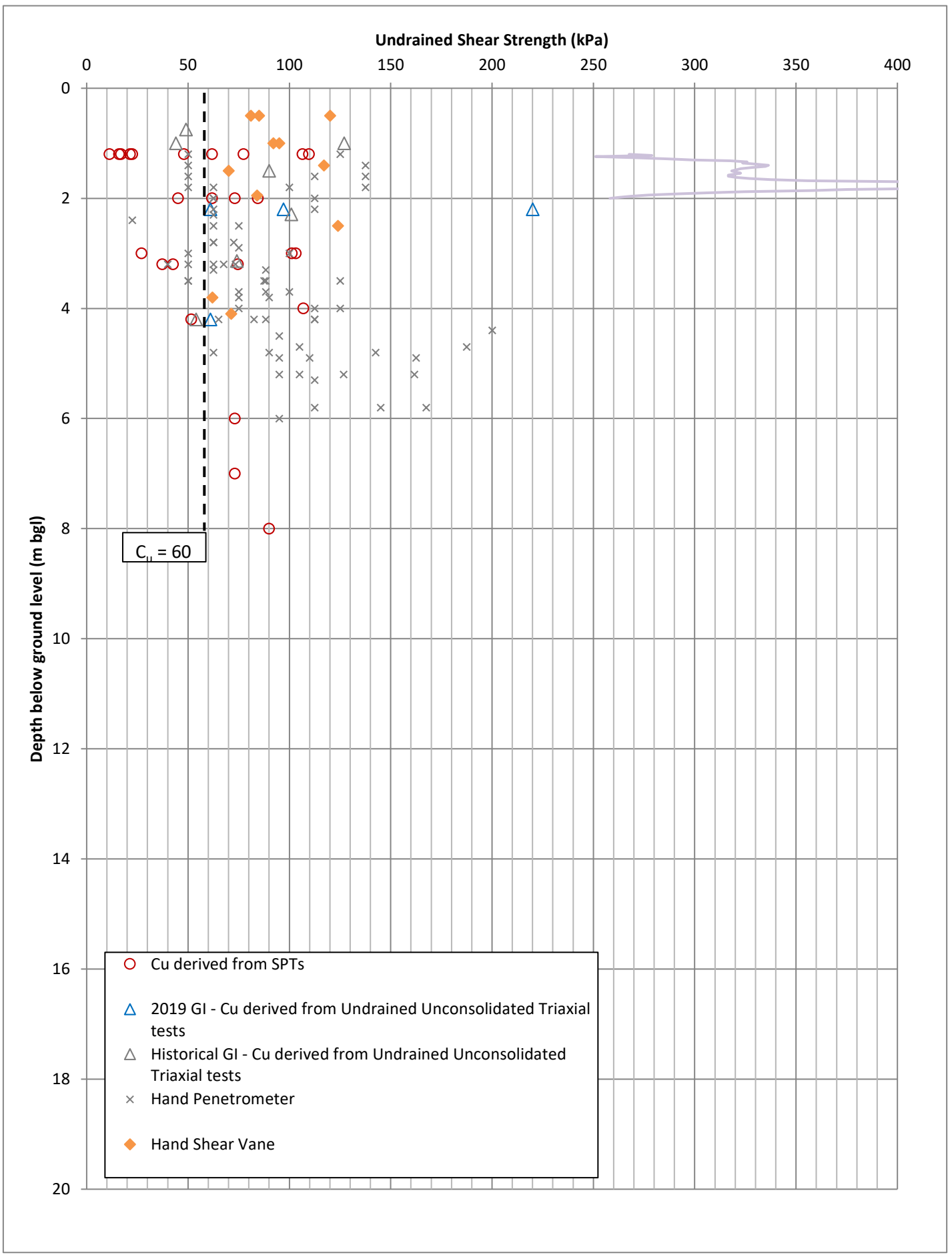
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for Alluvium**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
FINAL	07-5	P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

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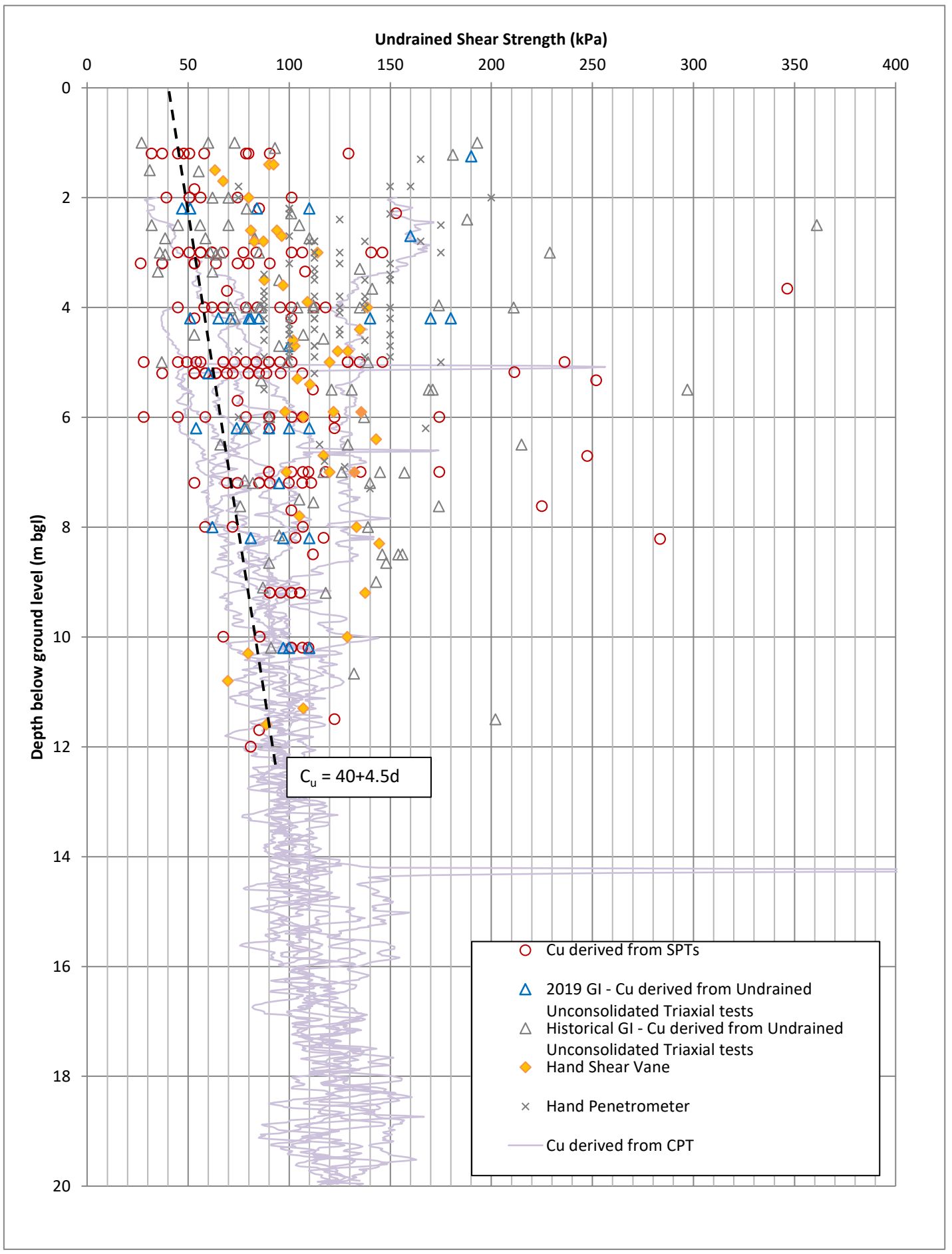
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for Head Deposits**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 07-6		Rev: P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

d = Depth below ground level

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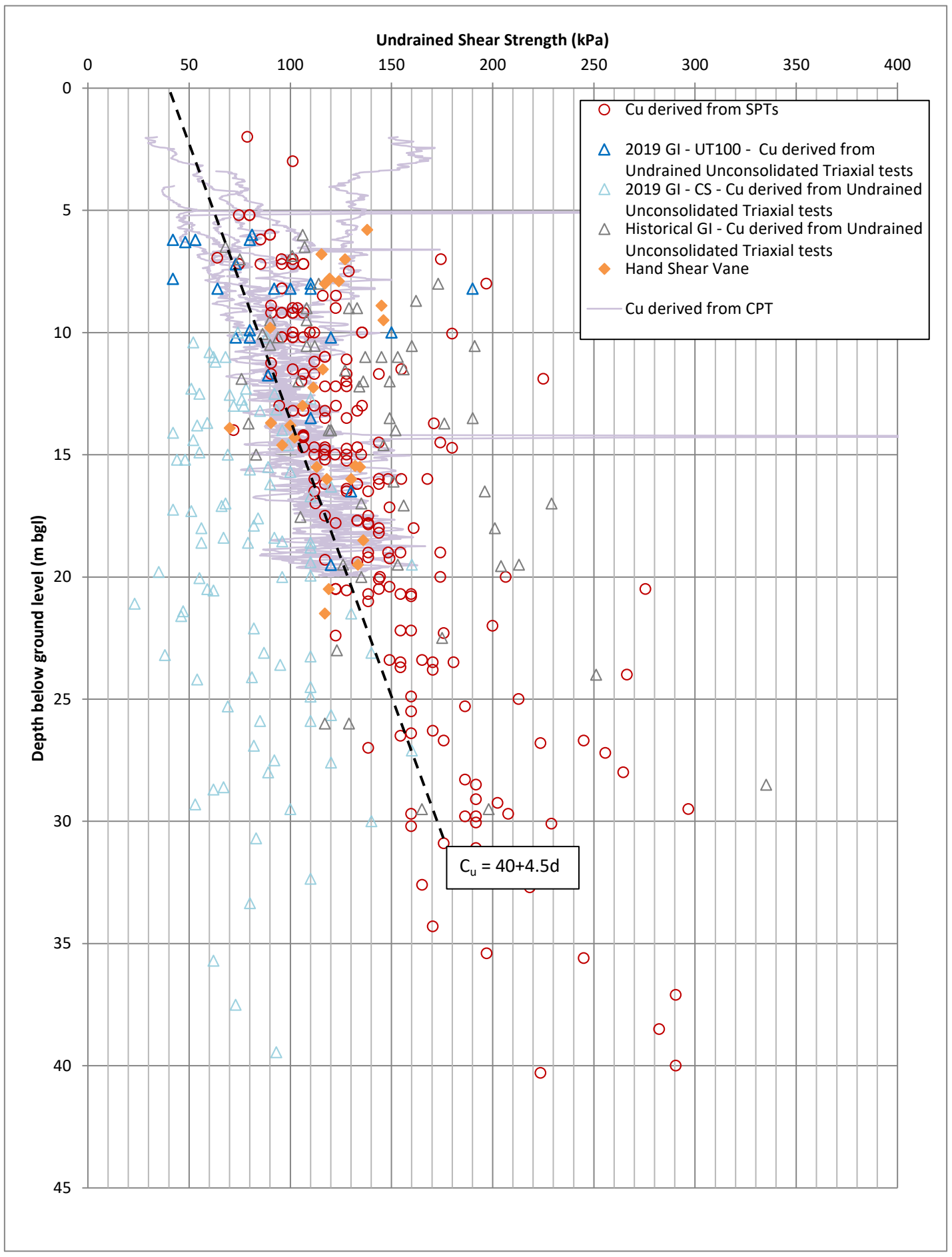
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for Weathered London Clay**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 07-8		Rev: P01.1



Maximum Extrapolated N Value	200
f, value (Cu = f_1N)	4.5

d = Depth below ground level

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Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for London Clay**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
FINAL	07-9	P01.1

Maximum Extrapolated N Value	0
f, value (Cu = f_1N)	0

d = Depth below ground level

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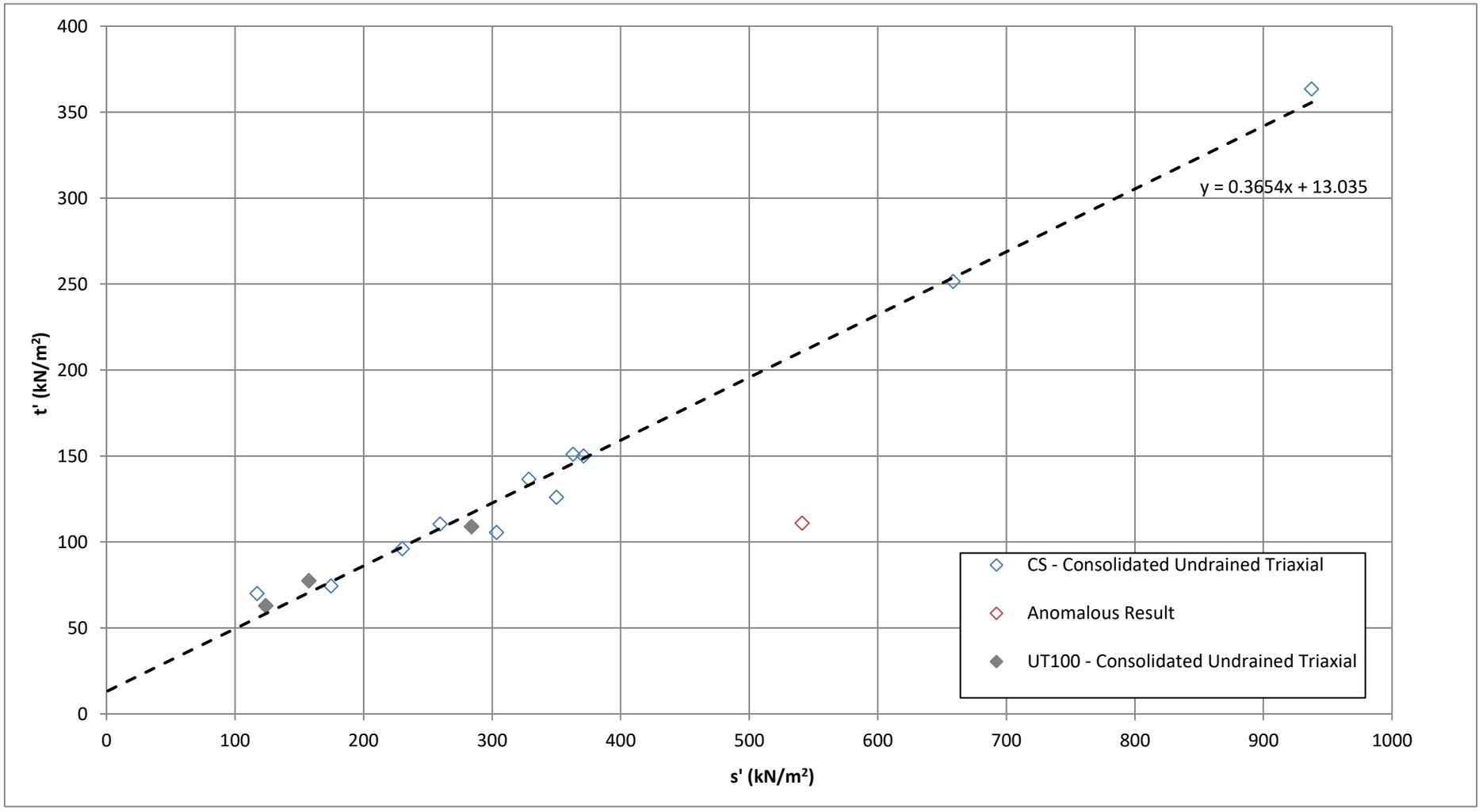
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Undrained Shear Strength vs Depth for all London Clay Formation results**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 07-8/9		Rev: P01.1



c' =	14.0
ϕ' =	21.4

Note: Trendline is best-fit through data point and not cautious estimate of the mean

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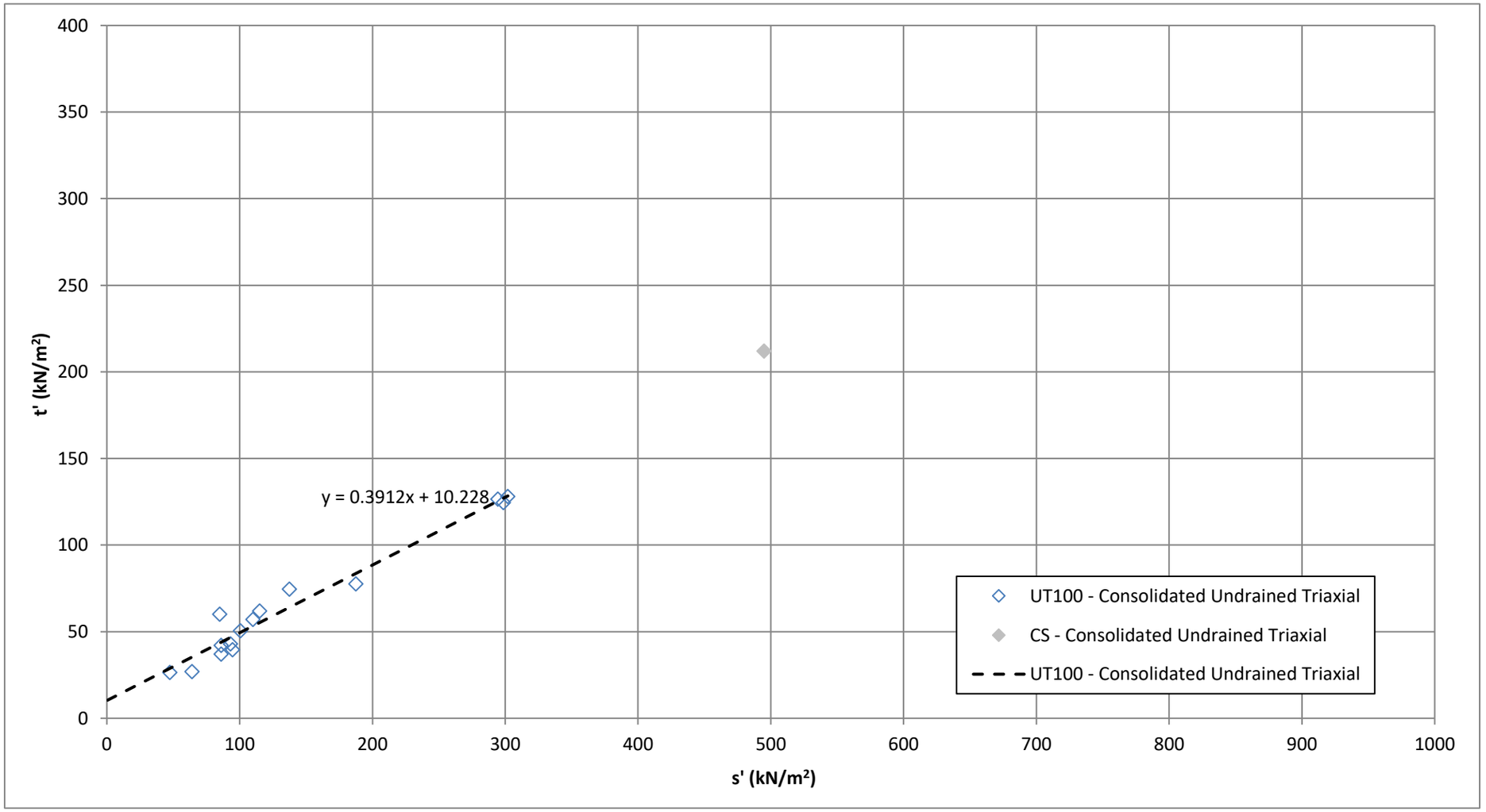
Client: **Highways England**	Title: **Effective Strength plot for London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Authorised: SM Date: 12/06/20
	Status: FINAL	Figure Number: 08-9		Rev: P01.1



c' =	11.1
ϕ' =	23.0

Note: Trendline is best-fit through data point and not cautious estimate of the mean

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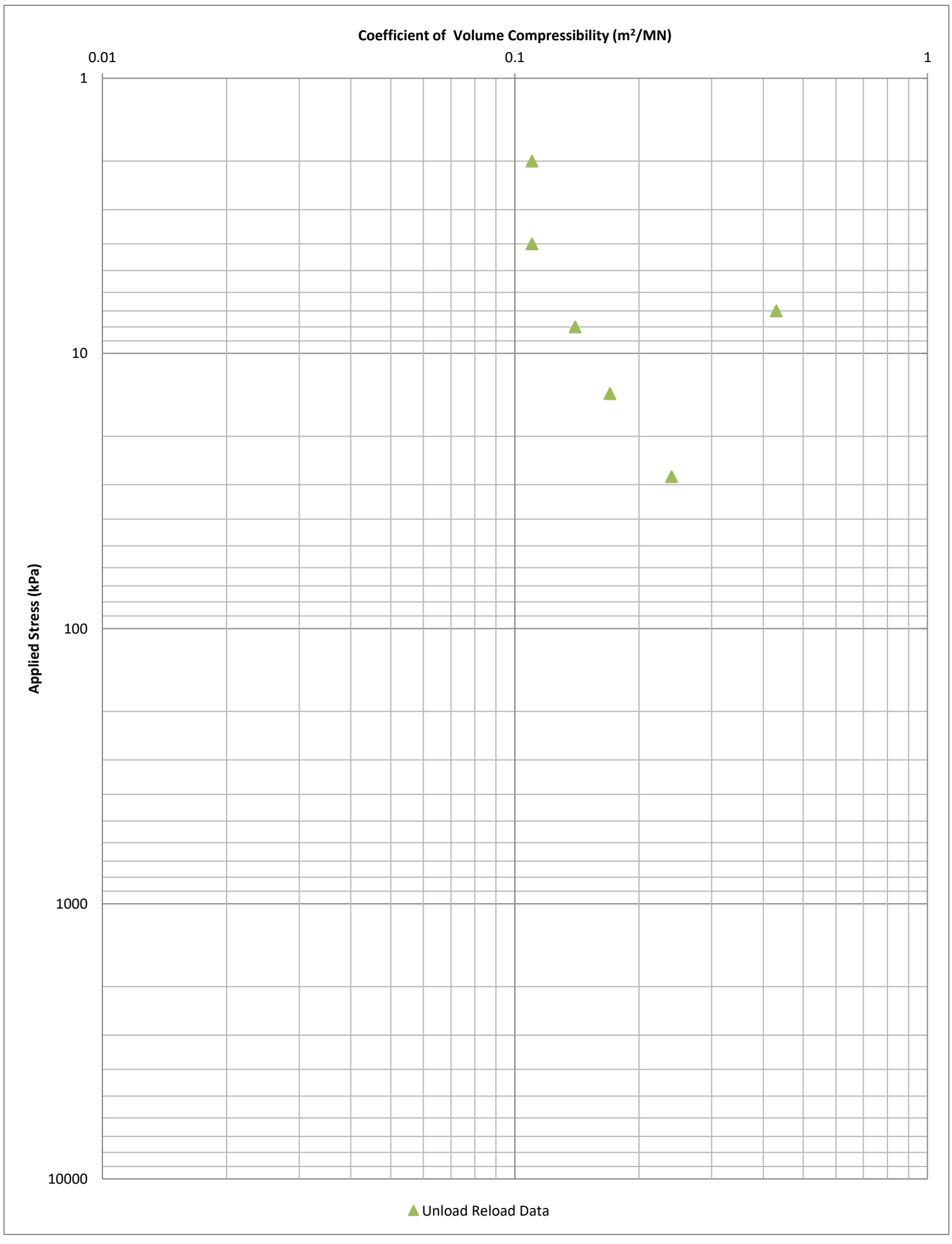
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

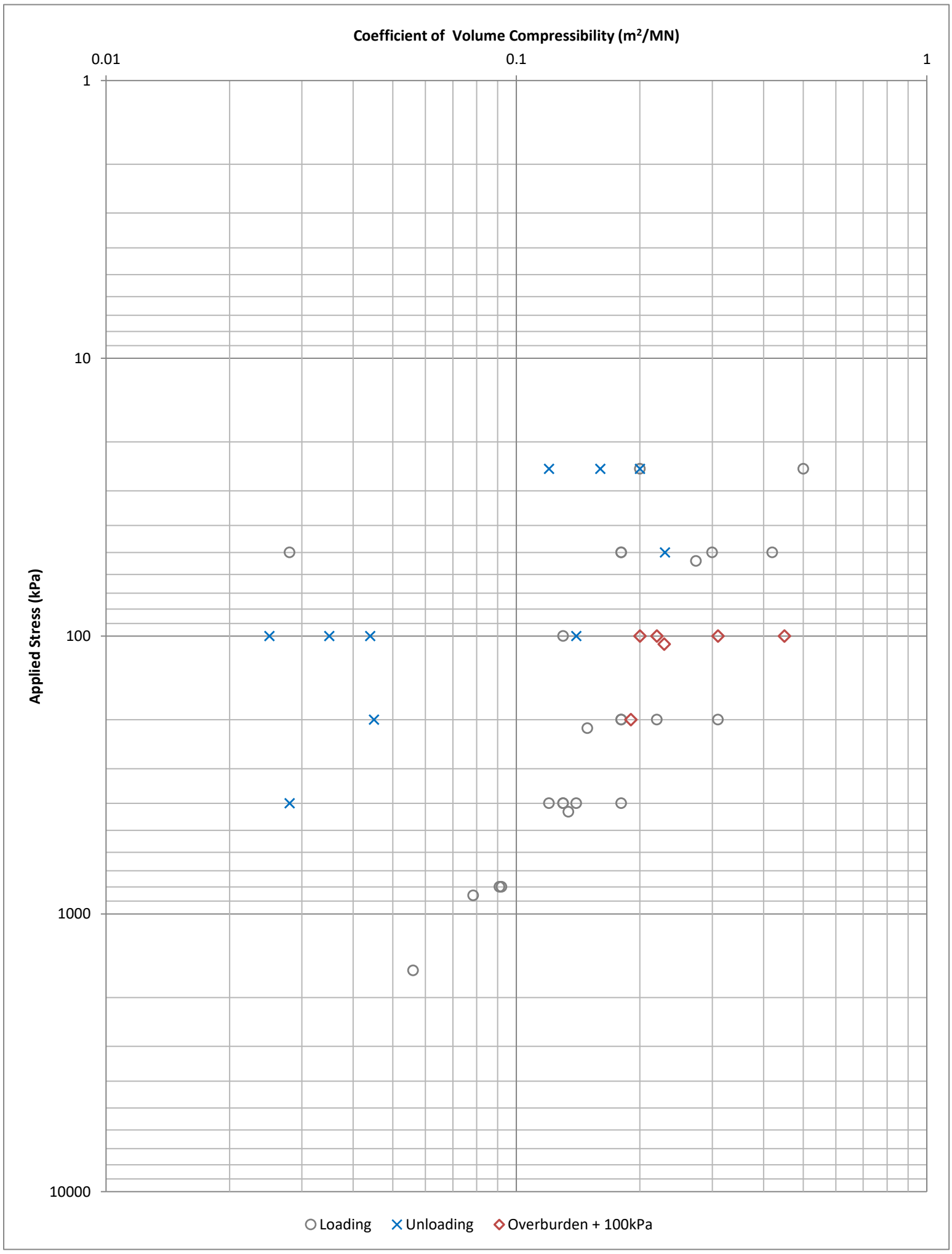
Title: **Effective Strength plot for Weathered London Clay Formation**

Sheet size	Drawn: BT	Checked: HF	Authorised: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20

Status	Figure Number	Rev
FINAL	08-8	P01.1



Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Volume Compressibility vs Applied Stress for Made Ground - Landfill**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 09-3		Rev P01.1



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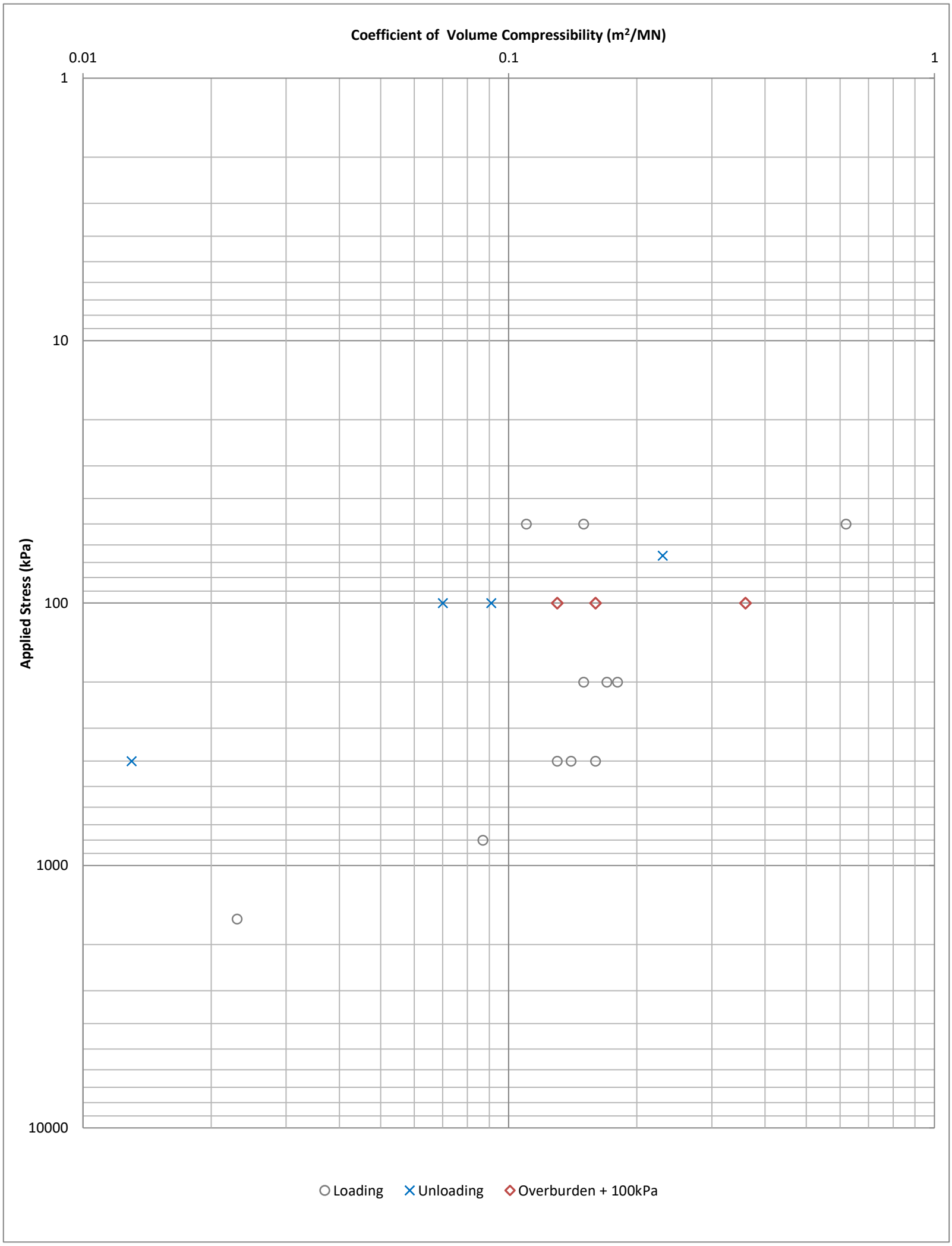
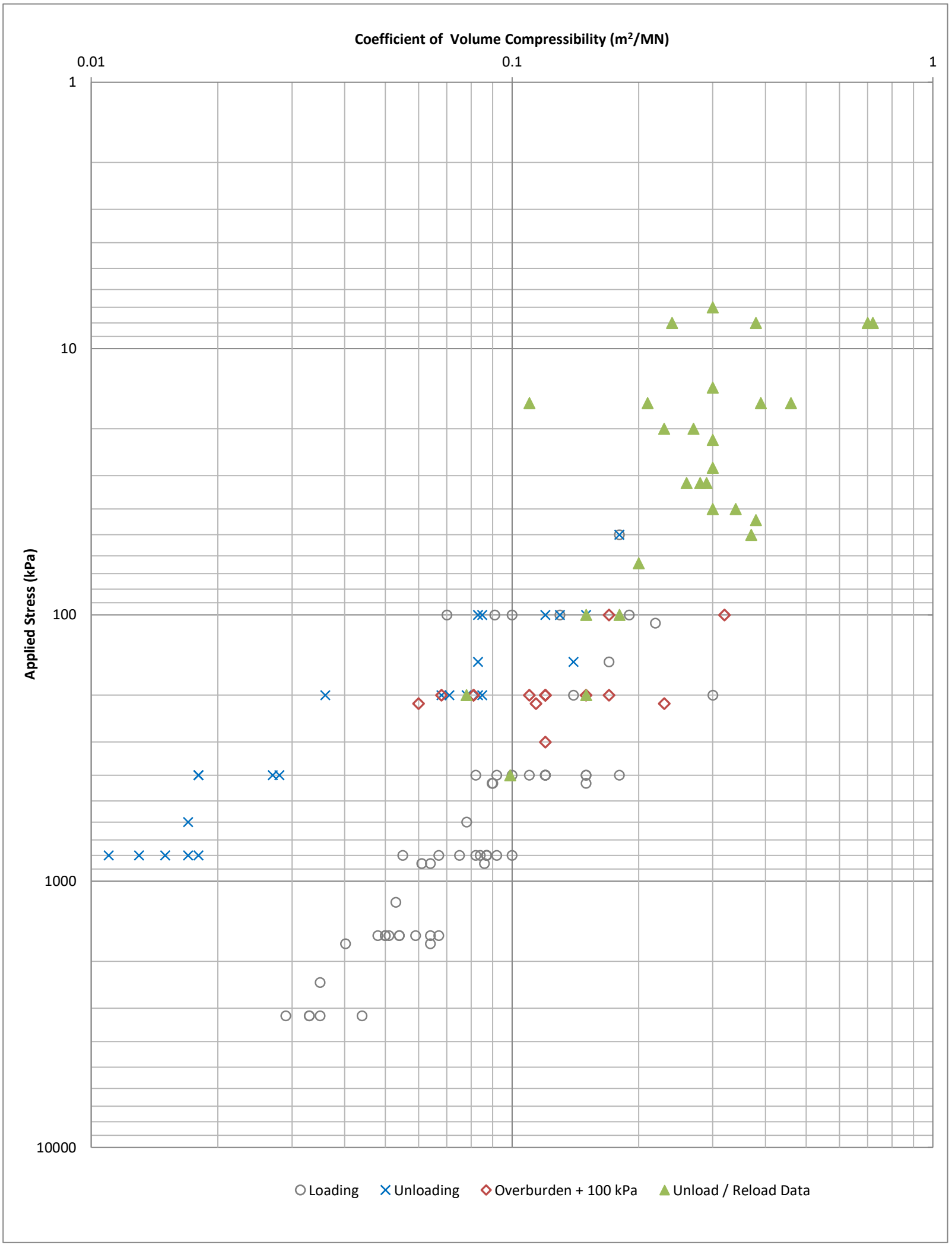
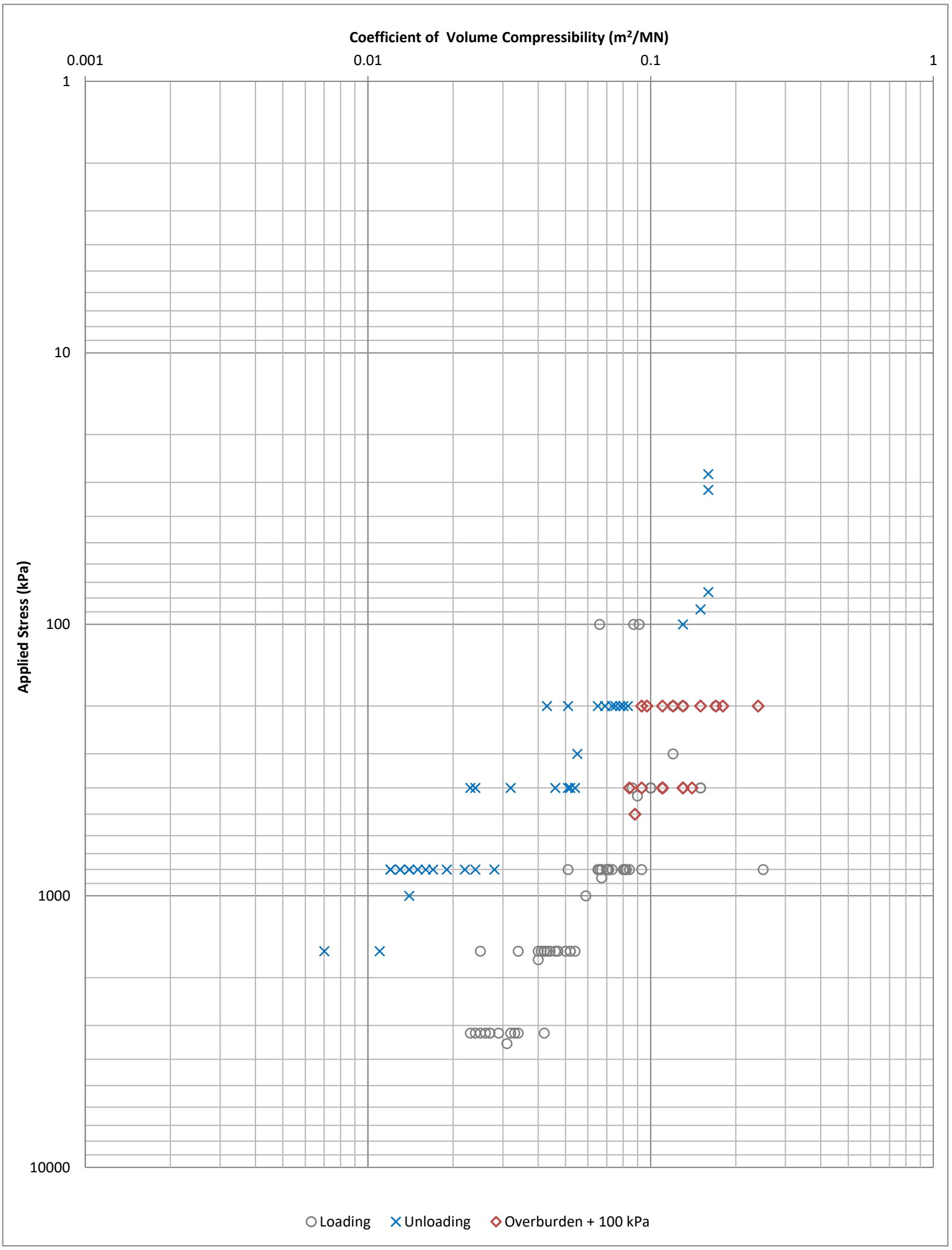
Client: **Highways England**	Title: **Coefficient of Volume Compressibility vs Applied Stress for Alluvium**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet Size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure No: 09-5		Rev: P01.1



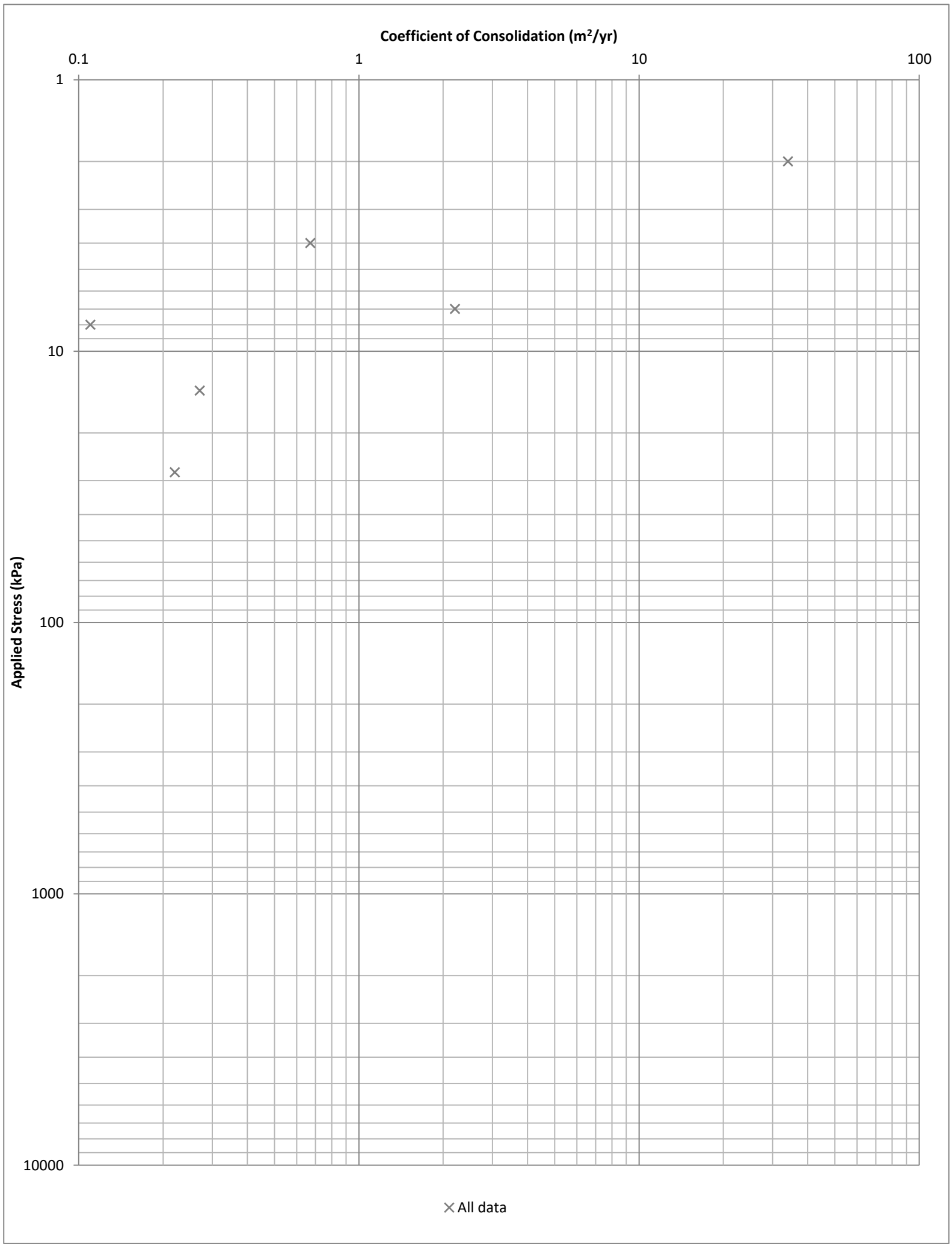
Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Volume Compressibility vs Applied Stress for Head - Fine**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 09-6		Rev P01.1



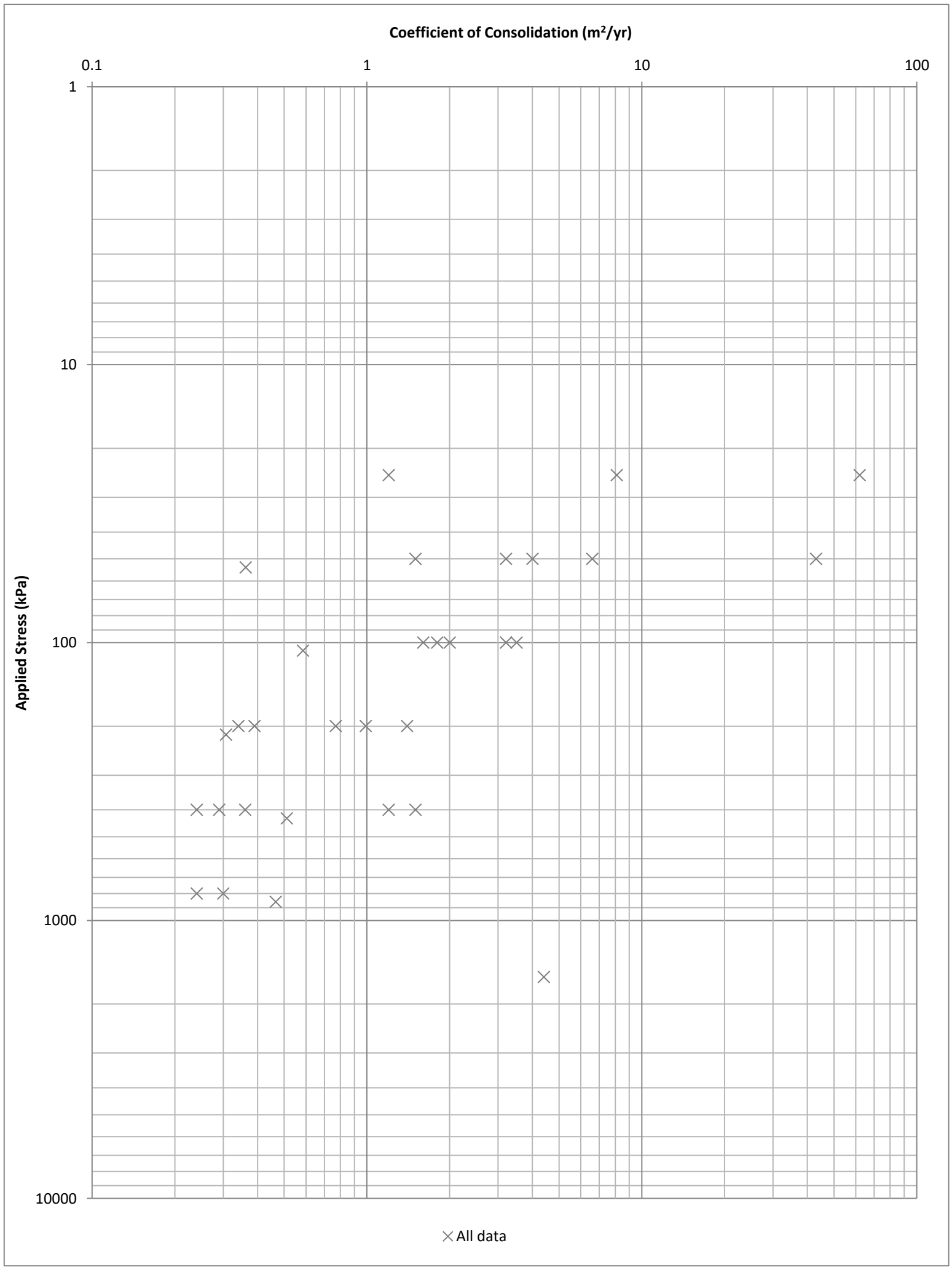
Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Volume Compressibility vs Applied Stress for Weathered London Clay Formation**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 09-8		Rev P01.1



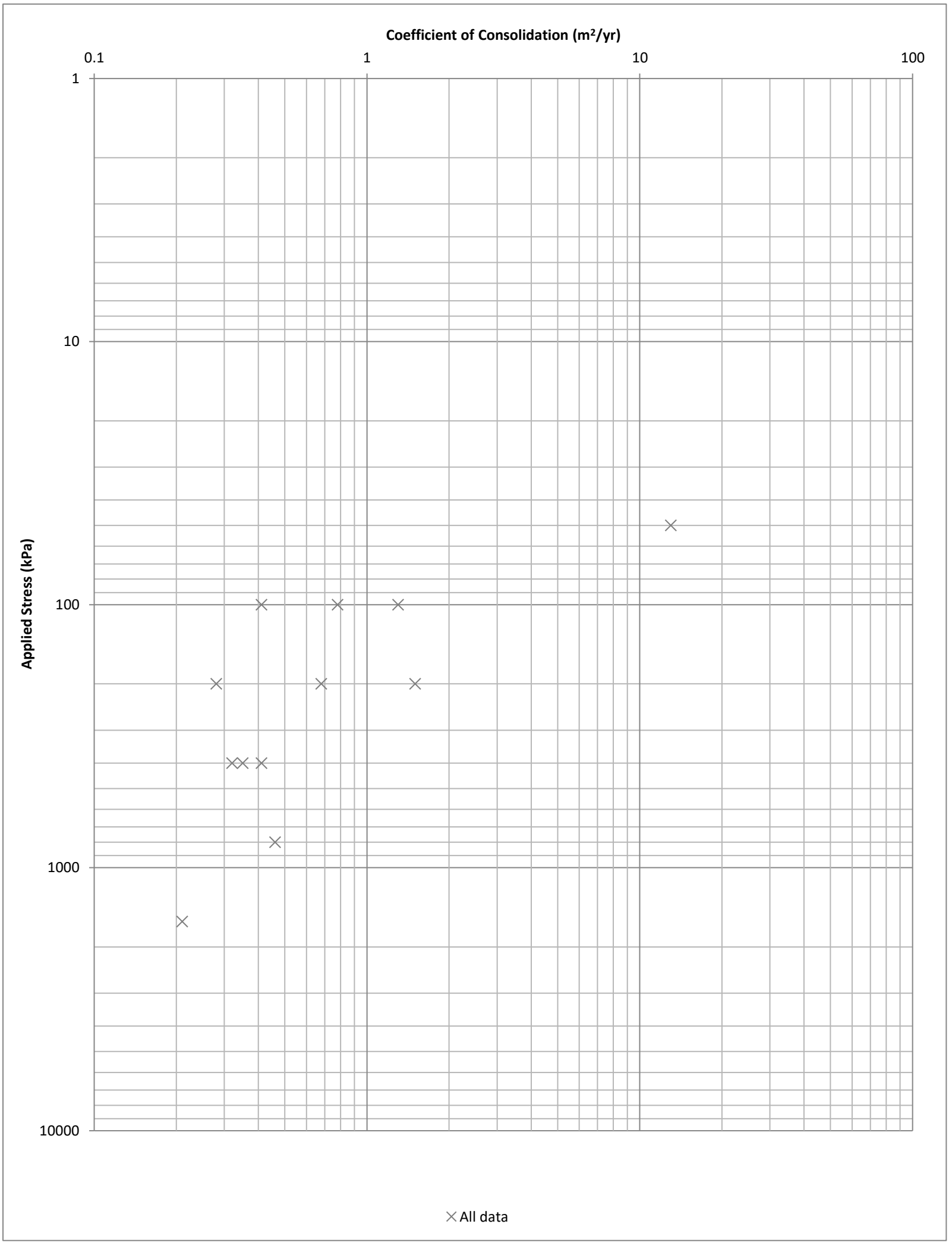
Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Volume Compressibility vs Applied Stress for London Clay Formation**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 09-9		Rev P01.1



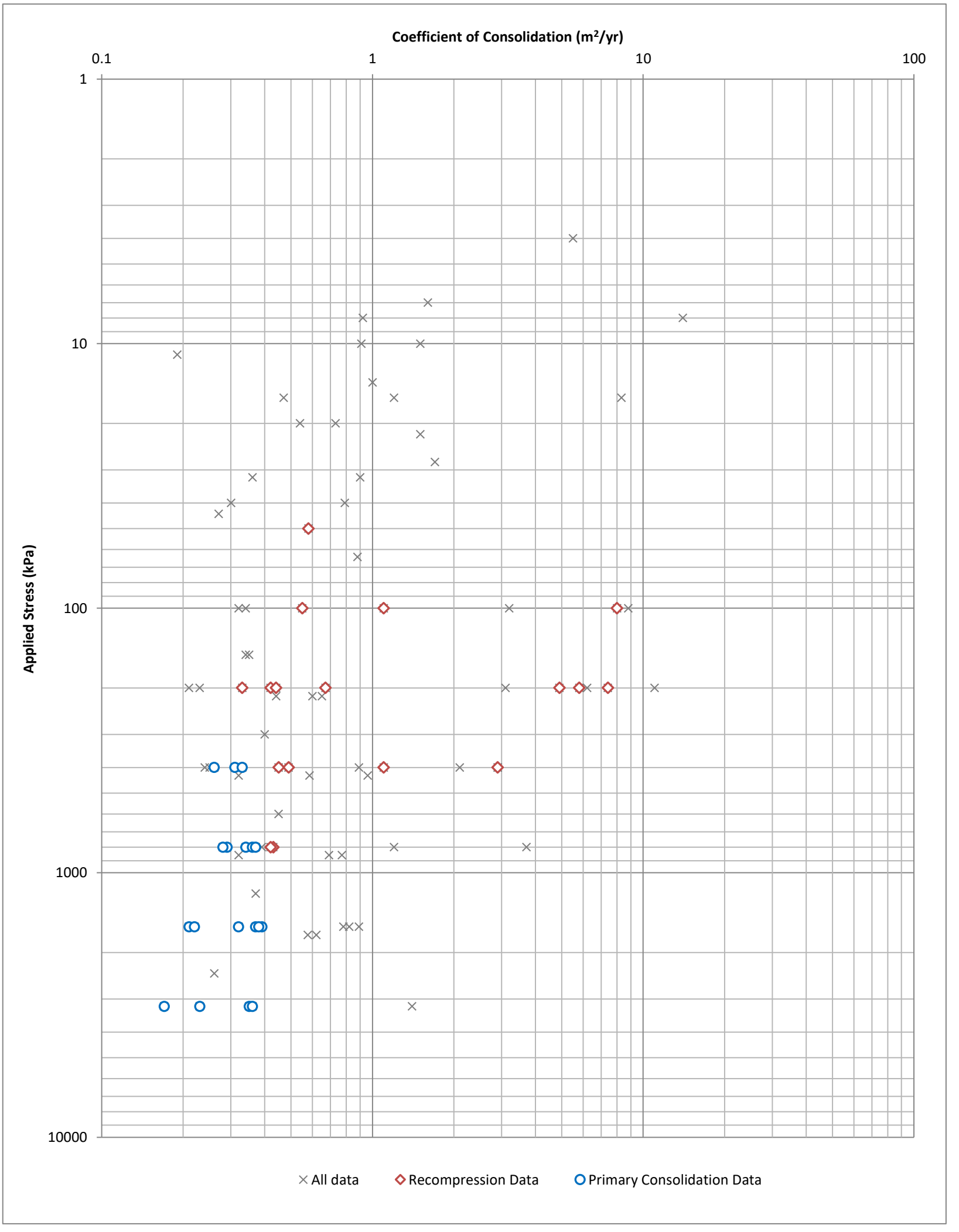
Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Consolidation vs Applied Stress for Made Ground - Landfill**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 10-3		Rev P01.1



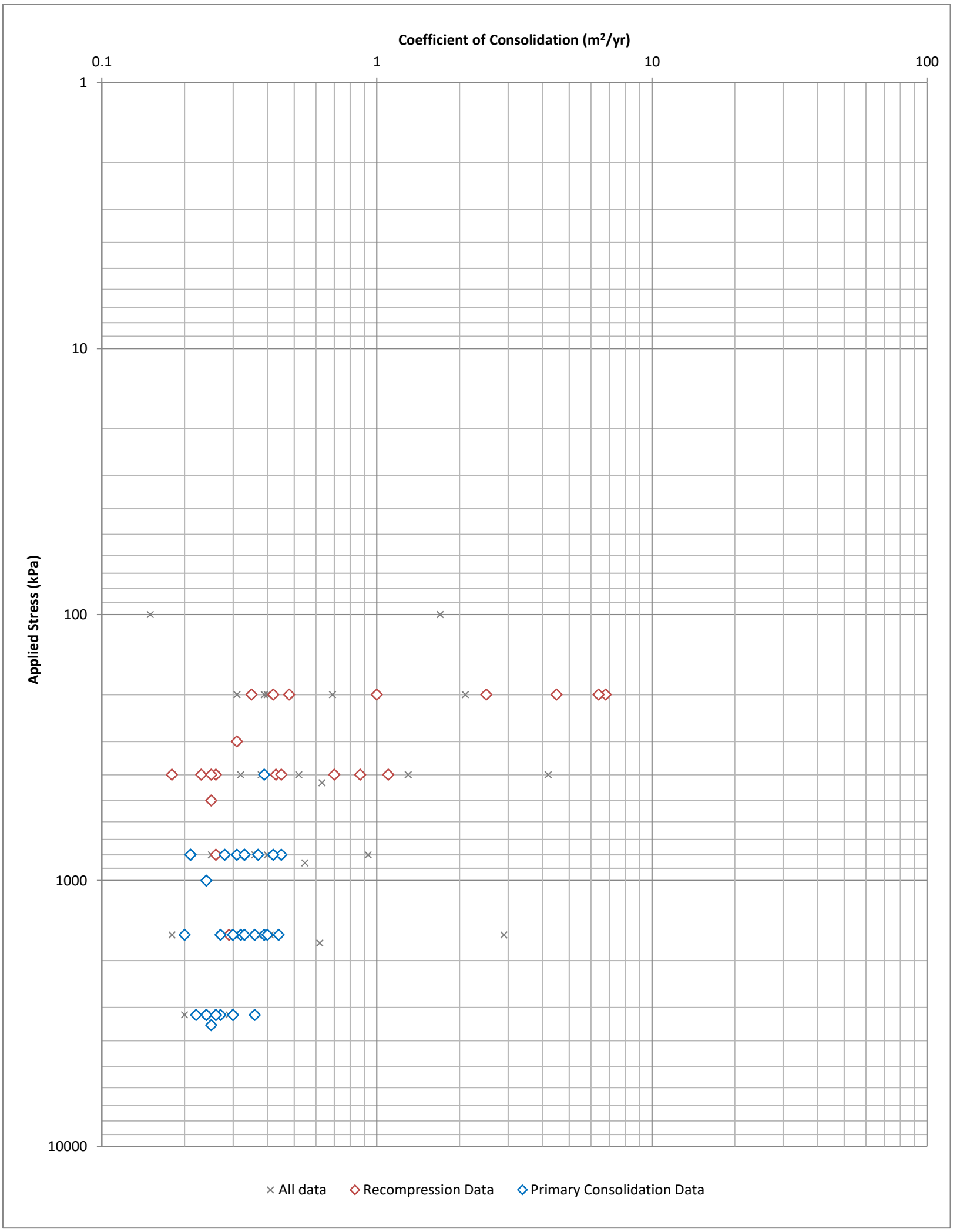
Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Consolidation vs Applied Stress for Alluvium**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 10-5		Rev P01.1



Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Consolidation vs Applied Stress for Head - Fine**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 10-6		Rev P01.1



Atkins Limited Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Coefficient of Consolidation vs Applied Stress for Weathered London Clay Formation**		
	Project **M25 Junction 28 Improvement Scheme**	Sheet Size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure No 10-8		Rev P01.1



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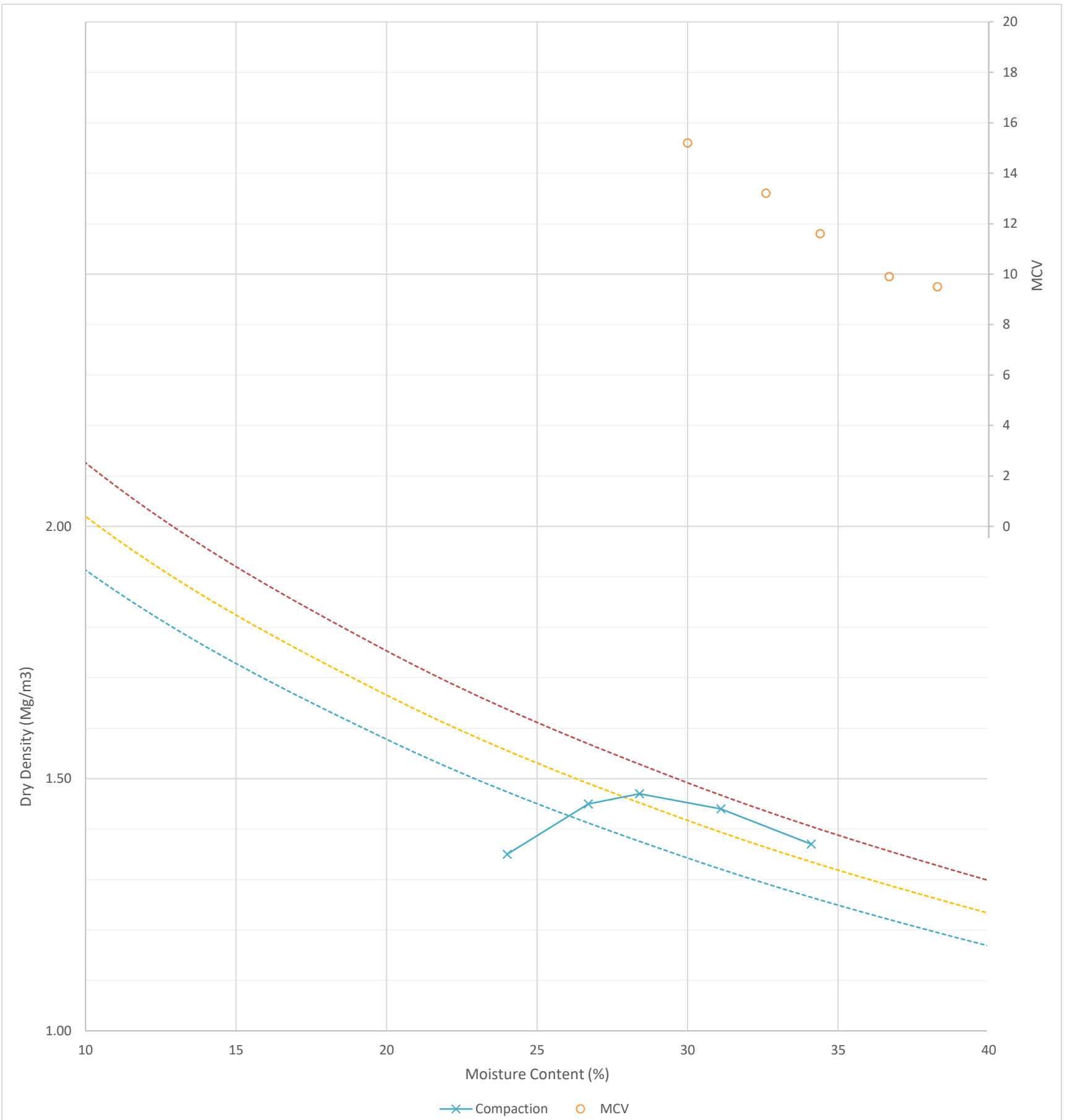
Client: **Highways England**	Title: **Coefficient of Consolidation vs Applied Stress for London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet Size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure No: 10-9		Rev: P01.1



Test methods	2.5 Kg Rammer Test
remarks:	
– – – – – represents 0% air voids curve	
– – – – – represents 5% air voids curve	
– – – – – represents 10% air voids curve	
# denotes particle density has been assigned an assumed value.	

Notes:	
Mean proportion retained on 20mm sieve (%)	0.00
Mean proportion retained on 37.5mm sieve (%)	0.00
Mean particle density (Mg/m^3)	2.65
Mean maximum dry density (Mg/m^3)	1.47
Mean optimum moisture content (%)	28.00

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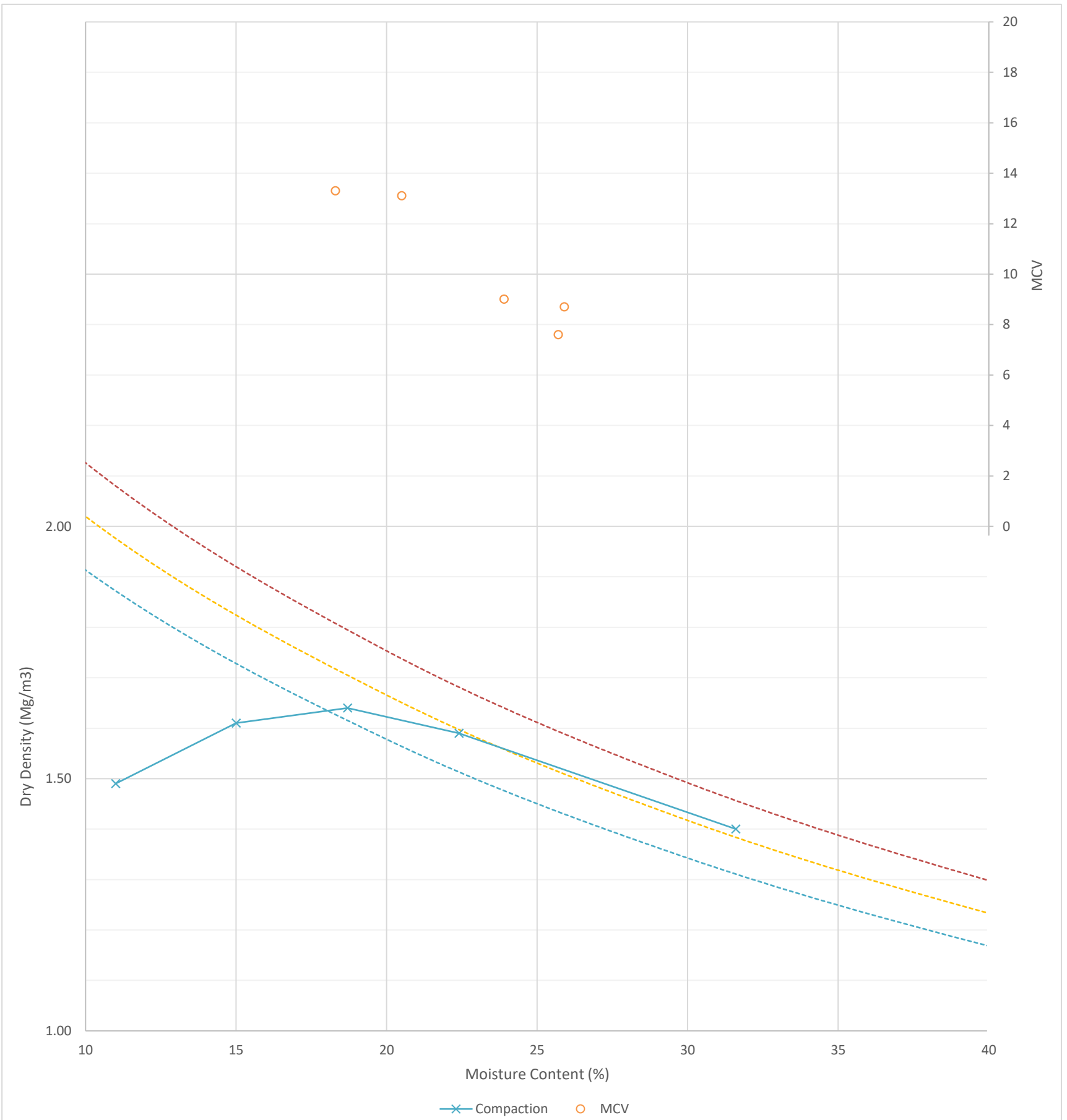
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Dry Density Moisture Content Relationship for Made Ground - Undifferentiated**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 11-4		Rev: P01.1



Test methods	2.5 Kg Rammer Test
remarks:	
– – – – – represents 0% air voids curve	
– – – – – represents 5% air voids curve	
– – – – – represents 10% air voids curve	
# denotes particle density has been assigned an assumed value.	

Notes:	
Mean proportion retained on 20mm sieve (%)	3.00
Mean proportion retained on 37.5mm sieve (%)	5.00
Mean particle density (Mg/m^3)	2.57
Mean maximum dry density (Mg/m^3)	1.64
Mean optimum moisture content (%)	19.00

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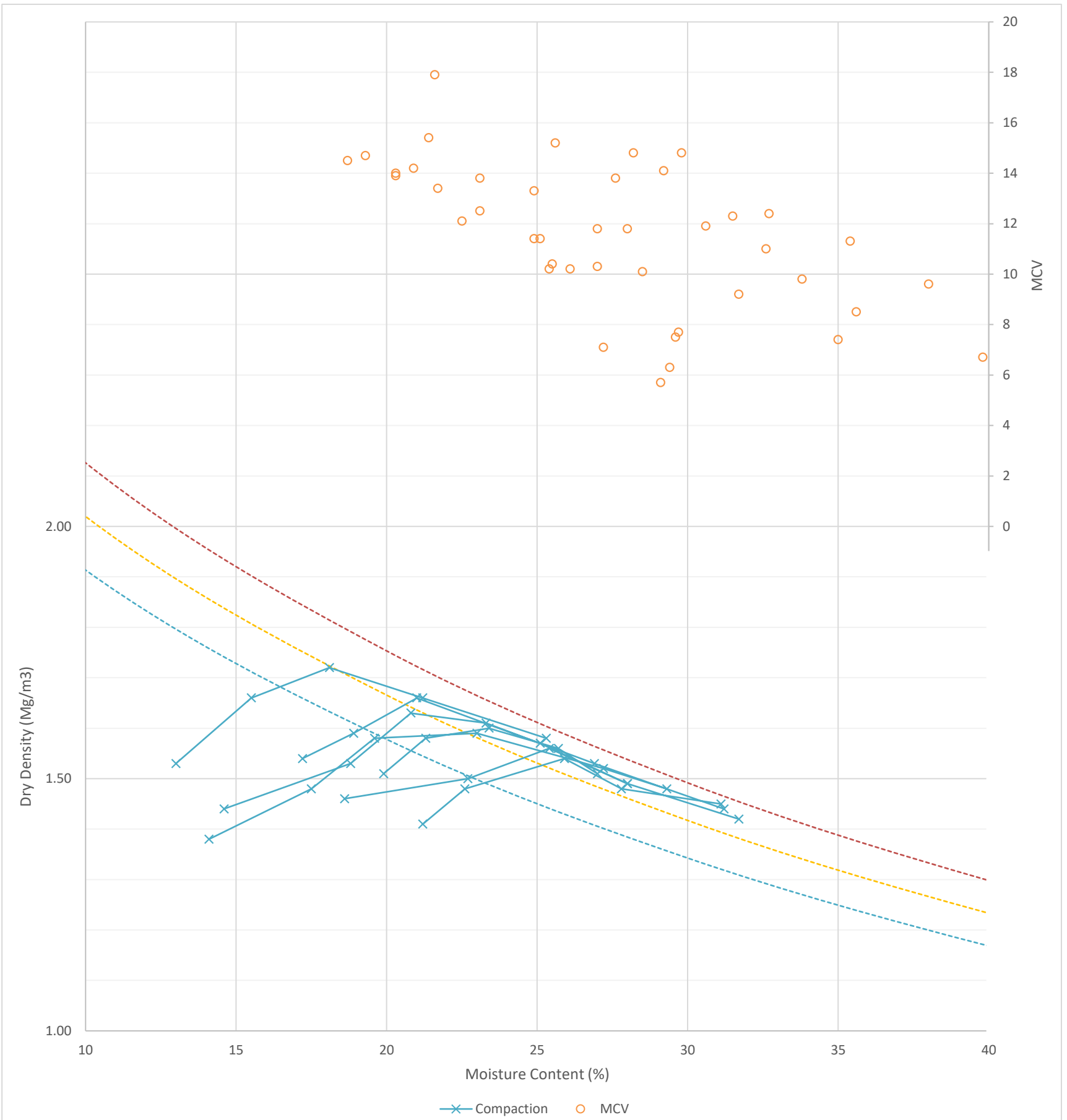
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Dry Density Moisture Content Relationship for Made Ground - Recently deposited Material**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 11-2		Rev: P01.1



Test methods	2.5 Kg Rammer Test
remarks:	
– – – – – represents 0% air voids curve	
– – – – – represents 5% air voids curve	
– – – – – represents 10% air voids curve	
# denotes particle density has been assigned an assumed value.	

Notes:	
Mean proportion retained on 20mm sieve (%)	0.00
Mean proportion retained on 37.5mm sieve (%)	0.00
Mean particle density (Mg/m^3)	2.66
Mean maximum dry density (Mg/m^3)	1.62
Mean optimum moisture content (%)	22.24

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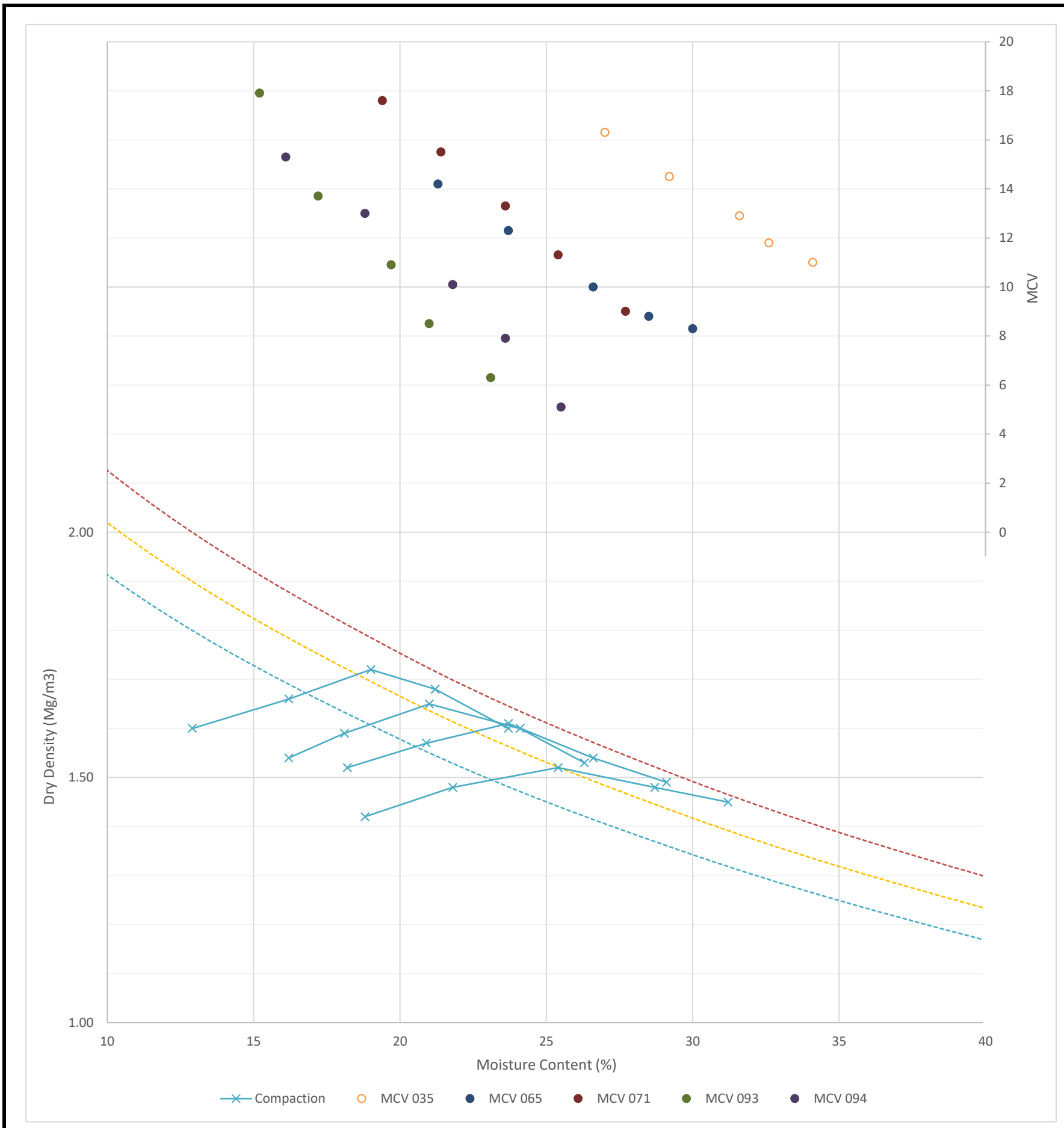
Client: **Highways England**

Project: **M25 Junction 28 Improvement Scheme**

Title: **Dry Density Moisture Content Relationship for Made Ground - Landfill**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 11-3		Rev: P01.1



Test methods	2.5 Kg Rammer Test
remarks:	
– – – – – represents 0% air voids curve	
– – – – – represents 5% air voids curve	
– – – – – represents 10% air voids curve	
# denotes particle density has been assigned an assumed value.	

Notes:	
Mean proportion retained on 20mm sieve (%)	0.00
Mean proportion retained on 37.5mm sieve (%)	0.00
Mean particle density (Mg/m^3)	2.65
Mean maximum dry density (Mg/m^3)	1.63
Mean optimum moisture content (%)	22.00

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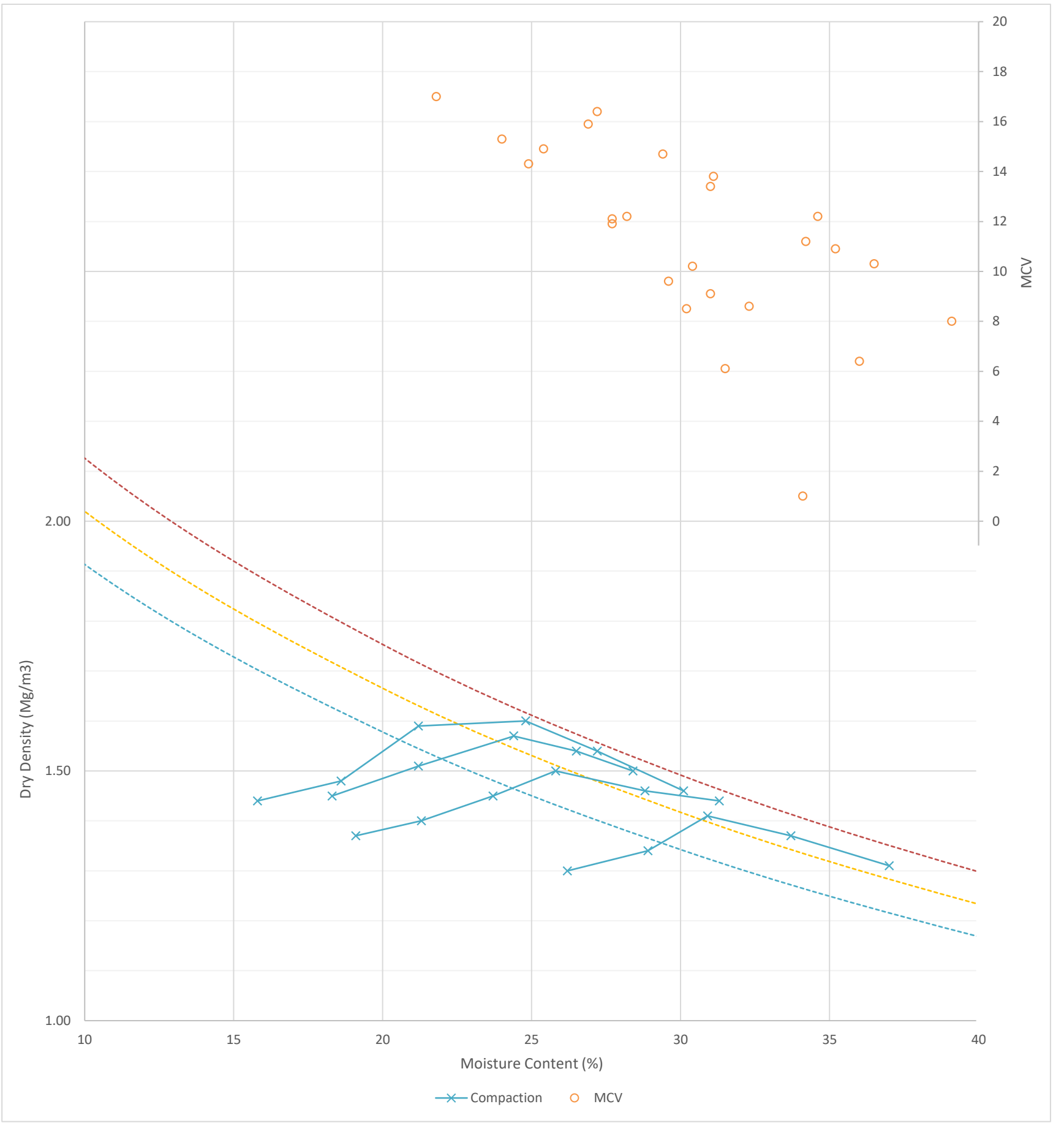
Client
Highways England

Project
M25 Junction 28 Improvement Scheme

Title
Dry Density Moisture Content Relationship for Head - Fine deposits

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 11-6		Rev: P01.1



Test methods	2.5 Kg Rammer Test
remarks:	
– – – – – represents 0% air voids curve	
– – – – – represents 5% air voids curve	
– – – – – represents 10% air voids curve	
# denotes particle density has been assigned an assumed value.	

Notes:	
Mean proportion retained on 20mm sieve (%)	0.00
Mean proportion retained on 37.5mm sieve (%)	0.00
Mean particle density (Mg/m^3)	2.65
Mean maximum dry density (Mg/m^3)	1.53
Mean optimum moisture content (%)	26.09

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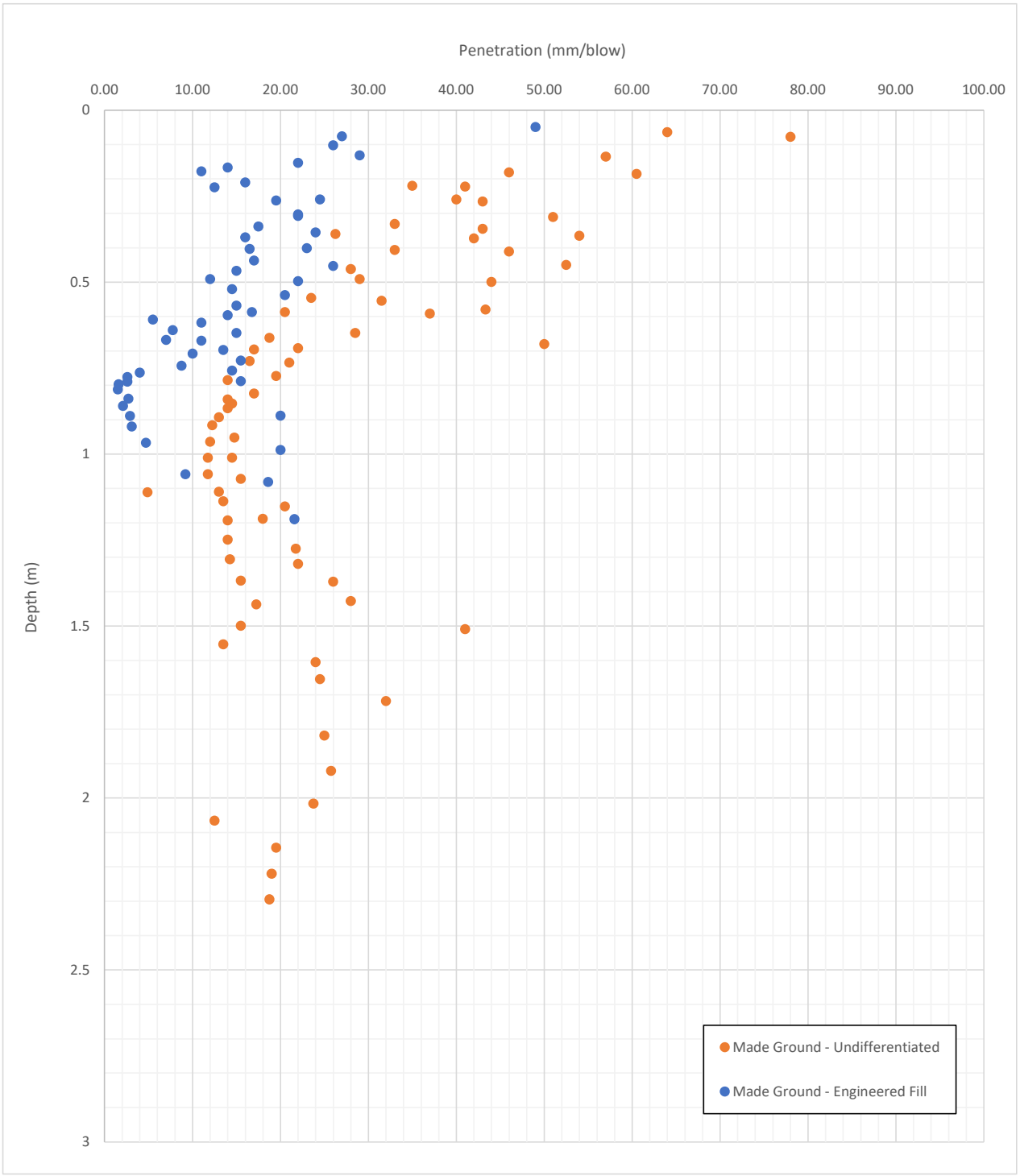
Client: **Highways England**

Title: **Dry Density Moisture Content Relationship for Weathered London Clay**

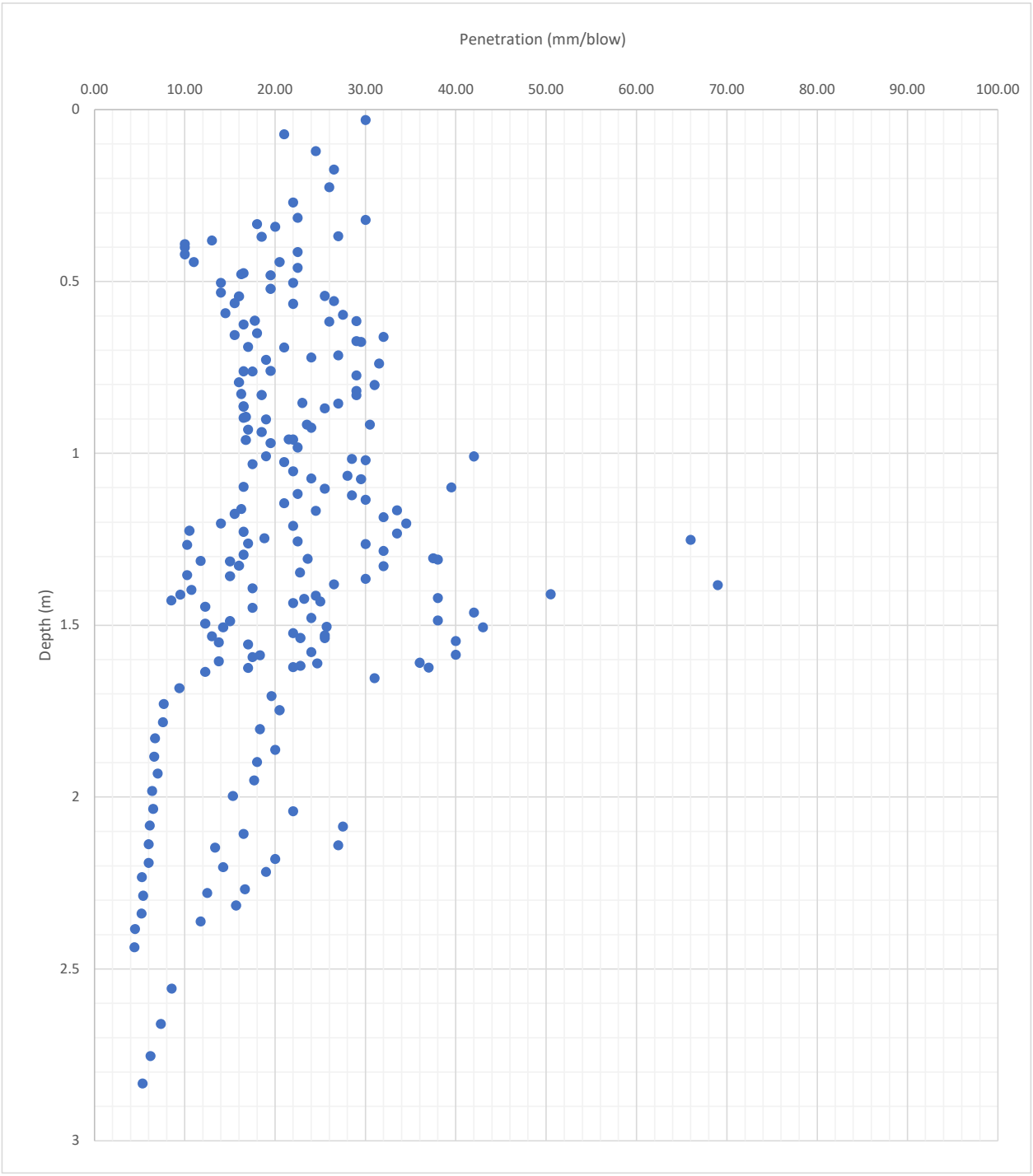
Project: **M25 Junction 28 Improvement Scheme**

Sheet size	Drawn: BT	Checked: HF	Reviewed: SM
A4	Date: 29/05/20	Date: 09/06/20	Date: 12/06/20
Status: FINAL	Figure Number: 11-8		Rev: P01.1



Note: A characteristic depth relationship has not been determined for the Made Ground - Undifferentiated Stratum

ATKINS Member of the SNC-Lavalin Group **Atkins Limited** Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Dynamic Cone Penetration (DCP) depth plot for Made Ground Strata**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure Number 12-1/4		Rev P01.1



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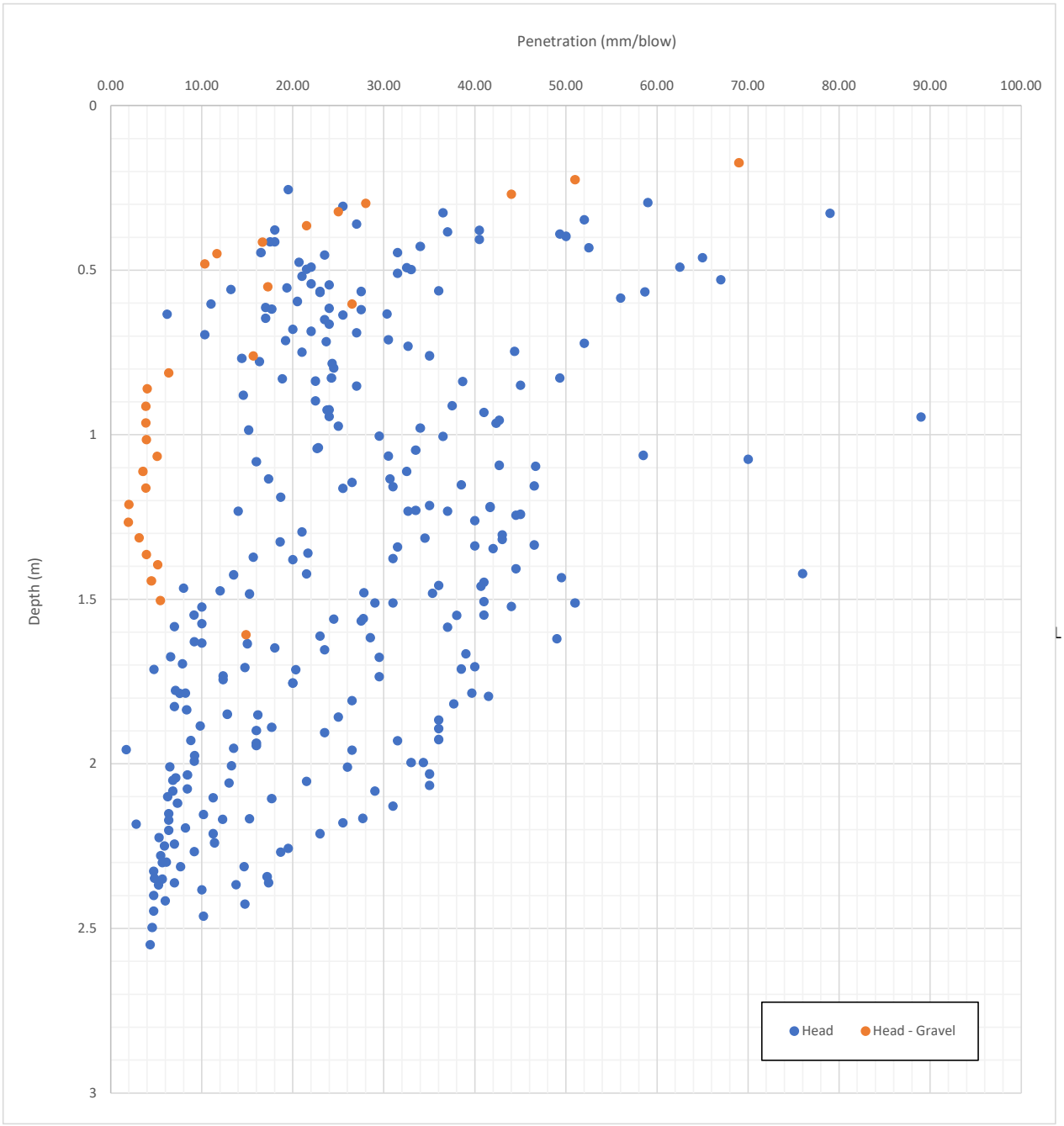
Client: **Highways England**	Title: **Dynamic Cone Penetration (DCP) depth plot for Weathered London Clay Formation**			
Project: **M25 Junction 28 Improvement Scheme**	Sheet size: A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
	Status: FINAL	Figure Number: 12-8		Rev: P01.1



ATKINS Member of the SNC-Lavalin Group **Atkins Limited** Woodcote Grove Ashley Road Epsom KT18 5BW Tel: (01372) 726140 Fax: (01372) 740055	Client **Highways England**	Title **Dynamic Cone Penetration (DCP) depth plot for Fine and Coarse Head Deposits**			
	Project **M25 Junction 28 Improvement Scheme**	Sheet size A4	Drawn: BT Date: 29/05/20	Checked: HF Date: 09/06/20	Reviewed: SM Date: 12/06/20
		Status FINAL	Figure Number 12-6/7		Rev P01.1

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