

Report No: C660

Date: July 2024

LAND AT BELL LANE, BURY, LANCASHIRE, INTERPRETATIVE REPORT ON GROUND INVESTIGATION



Prepared for
Geo2 Remediation Ltd

Prepared by
G&M Consulting Ltd, The Chestnuts, Brackenhill Road, Haxey, Doncaster DN9 2LR





REPORT NUMBER:	C660	REPORT STATUS:	Final
REPORT TYPE:	Interpretative Report on Ground Investigation		
REPORT DATE:	July 2024		
SITE:	Land at Bell Lane, Bury, Lancashire		
PREPARED FOR:	Geo2 Remediation Ltd		
PREPARED BY:	G Swinbourne BSc. (Hons), MSc., DIC, FGS		
REVIEWED BY:	A Swinbourne BSc. (Hons), MEnvSc, ACIEH FGS		

This report is written for the sole use of Geo2 Remediation Ltd or their client. No other third party may rely on or reproduce the contents of this report without the written approval of G&M. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the authors do not owe them any of Duty of Care or Skill.

TABLE OF CONTENTS

TABLE OF CONTENTS	1
1.0 INTRODUCTION.	2
2.0 BACKGROUND INFORMATION.	2
2.1 Site Description.	2
2.2 Geology.....	2
3.0 FIELDWORK.	4
3.1 Scope of Works.....	4
3.2 Window Sample Boreholes	4
3.3 Laboratory Testing.....	5
4.0 GROUND CONDITIONS AND GEOTECHNICAL PROPERTIES.	5
4.1 Introduction.....	5
4.2 Made Ground.....	5
4.3 Diamicton Till.....	6
4.4 Hydrogeology	6
5.0 DISCUSSIONS AND CONCLUSIONS	7
5.1 Introduction.....	7
5.2 Foundations	8
5.3 Floor Slabs	8
5.4 Excavations.....	9
5.5 Buried Concrete	9
5.6 Soakaways	9

APPENDICES

APPENDIX A – DRAWINGS

APPENDIX B – EXPLORATORY HOLE RECORDS

APPENDIX C – FIELD DATA SHEETS/PLOTS

APPENDIX D – LABORATORY TEST RESULTS

LAND AT BELL LANE, BURY, LANCASHIRE,
INTERPRETATIVE REPORT ON GROUND INVESTIGATION

1.0 INTRODUCTION.

G&M Consulting Ltd (G&M) was commissioned by Geo2 Remediation Ltd (Geo2) to carry out a geotechnical appraisal of land at Bell Lane, Bury, Lancashire. The appraisal is based on a ground investigation carried out by Geo2.

The proposed development comprises a fuel filling station and fast-food outlet, with areas of parking. The proposed development is shown on Drawing No 2489.F.104.C, prepared by Walker Design. A copy of this drawing is presented in Appendix A of this report.

The site has been subject to a Phase 1 desk study investigation; Report Ref 23/1433.1.1, dated 11th October 2023, prepared by Geo2

The objective of this work was to establish the shallow ground profile by means of an intrusive ground investigation. The work comprised window sample boreholes, together with in-situ and laboratory testing and the preparation of this report, which contains a description of the site and the works carried out, the exploratory hole logs, in-situ and laboratory test results.

It is understood that the Geo2 ground investigation has been carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930: 2015 *Code of practice for ground investigations*, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal, atmospheric and/or other effects and may at times differ to those measured during the investigation.

2.0 BACKGROUND INFORMATION.

2.1 Site Description.

Information taken from the previously referenced Phase 1 report is shown below;

The site is occupied by a Car Time dealership, MOT and servicing centre and is located north of Bell Lane (B6222). The site is currently accessed by one ingress/egress point located at the western site boundary adjoining to Bridge St (Image 1). The site is also bound by Cobden St to the north and other commercial properties to the east (Images 25-30). Other Car Time dealerships are located directly south and west, opposite Bell Ln and Bridge St respectively (Images 28-30).

The site was observed to be gently sloping down to the west and to the north, with a steeper incline observed in the southwest corner (Image 2).

The site is occupied by two buildings. The larger L-shaped building is occupied by the car sales shop and offices, with the southern end of the building at a higher elevation (Image 9) due to the change of site levels. The eastern end of the L-shaped building is an MOT garage (Images 15 and 16).

The small warehouse-style building in the northeastern corner of the site is a vehicle servicing garage (Images 19 and 20). The remainder of the site is used for parking, with vehicles for sale located in the southern area (Images 5-8) and the northern car parking primarily used by staff, visitors and vehicles for the MOT or servicing garages (Images 10-12 and 19).

The northern and eastern boundaries comprise stone walls (Images 17 and 25), while the southern and western boundaries are generally open, with metal posts to prevent vehicle movements on / off site (Images 1-3).

2.2 Site History

Information taken from the Phase 1 report is shown below;

Key Historical Activities	
On-Site	Earliest mapping from 1849 shows the central area of the site was developed as a Gas Works, with a reservoir and chimney on the eastern boundary and two circular gasometers. Across the southern area of the site were two rows of terraced properties. The gas works was relabelled as a Cotton Mill by 1891, with the former gasometers now mapped as reservoirs. The site then became a Velvet Mill in 1910, named as Freetown Mill y 1939. The mill buildings extend northwards and westwards across the site unto 1960. By the late 1970s, the entire site has been redeveloped, with all historic buildings and terraced properties and the chimney being demolished and all reservoirs no longer mapped. Two large Garage buildings are constructed in the south. Mapping from the 1980s show further garage buildings added I the northeastern area of the site. By 2001, the site is established as the layout seen today, with a single garage building in the northeast corner and the southern-most building reduced to only occupy the southeast corner.
Off-Site	Early industrial land uses within 100m included Cotton Mills, Iron Foundries, Felt Hat Works and associated reservoirs, chimneys and tanks. Terraced housing dominated land use to the east and south. Since the 1960s, heavy industry and terraced properties have been replaced by commercial units and semi-detached housing, with a retail park also constructed from 150m southwest.

2.3 Geology.

Information on the geology of the site was obtained from the following sources published by the British Geological Survey (BGS):

- BGS map (England & Wales 1:50,000 Scale, Sheet 85 – Manchester – Solid and Drift Edition 2011.
- BGS online Geoindex - <http://mapapps2.bgs.ac.uk/geoindex/home.html>
- The BGS Lexicon of Named Rock Units, which provides typical descriptions for most geological units (www.bgs.ac.uk/lexicon).

The site is shown to be underlain by the following descending sequence of strata:

SUMMARY OF EXPECTED SITE GEOLOGY	
Geological Unit Name	Description
Made Ground	
None	None shown, but made ground assumed based on historical use of site.
Superficial Deposits	
Glacial Till	Diamicton- gravelly clay - Devensian in age
Bedrock	
Pennine Lower Coal Measures	Interbedded mudstone, siltstone and sandstone. Carboniferous age

3.0 FIELDWORK.

3.1 Scope of Works

The field work was carried out on the 14th May and 22nd May 2024 at exploratory hole locations shown on the drawing prepared by Geo2, a copy of which is presented in Appendix A of this report. The fieldwork was instructed and carried out by Geo2 and comprised:

SCOPE OF INTRUSIVE WORKS AND IN-SITU TESTING			
Number	Exploratory Hole or In-Situ Test Type	Hole / Test Numbers	Notes
12	Window Sample Holes	WS1 to WS14	Boreholes WS3 and WS11 not drilled Drilled to depths of between 0.75 m and 5.50 m below ground level (bgl).

The scope of the works and the exploratory positions were selected by Geo2 and adjusted where necessary to take account of buried or overhead services, or other restrictions.

The exploratory holes were logged by a Geo2 engineer in accordance with the recommendations of BS5930:2015+A1:2020. A representative from G&M was present on site during the drilling of the boreholes on the 14th May 2024. Detailed descriptions, together with relevant comments are given on the respective logs, prepared by both Geo2 and G&M (WS08, WS09, WS10 and WS12) are presented in Appendix B of this report.

3.2 Window Sample Boreholes.

The window sampling was carried out using a Dando Terrier tracked drilling rig. This uses a drop weight to drive steel sampling tubes with a plastic liner. The diameter of the hole reduces with depth to reduce friction on driving the sampling tubes.

The weight was set to 63.5 kg with a drop of 0.75m. This setting allows Standard Penetration Tests (SPT) to be carried out in the boreholes, in accordance with BS EN ISO 22476-3. Seating drives have been recorded in increments of 75 mm in accordance with recommended UK practice. The SPT results are shown on the borehole logs in Appendix B of this report. The SPT 'N' values shown on the borehole logs and discussed in this report have not been corrected for hammer efficiency.

Undisturbed U70 (70 mm) samples were taken from the window sample holes.

The undrained shear strength of the cohesive soils encountered was measured using a Pilcon hand shear vane.

Bulk and small disturbed soil samples were also taken by G&M from the exploratory holes at regular intervals.

3.3 Laboratory Testing

Selected soil samples were delivered to Professional Soils Laboratory (PSL) an external accredited geotechnical laboratory; a schedule of geotechnical testing was drawn up by G&M. Chemical tests were undertaken by the CTS Group a UKAS and MCERTS accredited laboratory, as part of the geotechnical schedule.

SUMMARY OF GEOTECHNICAL LABORATORY TESTING			
Number of tests	Test	Test Method	Notes
Classification Tests			
9	Moisture content	BS1377: Part 2.	Includes results from triaxial tests
3	Liquid and plastic (Atterberg) limits.	BS1377: Part 2.	-
5	Single stage undrained triaxial compression tests.	BS1377: Part 7.	
Chemical Tests: Soil			
3	Water soluble sulphate and pH value.	In-house Method	

The results of the geotechnical tests are presented in Appendix D of this report.

4.0 GROUND CONDITIONS AND GEOTECHNICAL PROPERTIES.

4.1 Introduction

A complete record of all the strata encountered is given on the attached exploratory hole logs, prepared by Geo2 and G&M. From these it can be seen that the site is underlain by made ground over gravelly clay, presumed to be the Diamicton till.

4.2 Made Ground

Made ground was encountered in all of the window sample holes, but only fully proven in seven of the holes, to depths of between 0.9 m (WS07) and 1.3 m bgl (WS01). The remaining holes terminated within the made ground, at depths of between 0.7 m and 1.0 m bgl. With the exception of WS02 and WS04, these appear to have terminated on concrete and are likely associated with various features referenced on the historical maps, refer to Section 2.2 of this report.

The surface material typically comprised asphalt, with the exception of WS04 to WS06 which comprised brick paving and WS07 which comprised a 250 mm thickness of topsoil.

These surface materials are typically underlain by either gravelly clays or slightly clayey and clayey gravels, or gravelly sands. Typically, the gravel component included concrete, mudstone, brick. Cobbles of bricks were recorded in WS04, WS07, WS08, WS10, WS12 (sandstone cobbles) and WS13.

Concrete ‘obstructions’ were broken through in WS01 (0.1-0.33m), WS09 (0.16-0.3m), WS13 (0.1-0.6m) and WS12 (0.05-0.2m).

No geotechnical laboratory testing of this material was undertaken as part of this investigation. No SPT testing was carried out in this material; ie wholly within this material.

4.3 Diamicton Till

The made ground is shown to be underlain by slightly gravelly, locally gravelly clay. The gravel content is recorded as fine to coarse of sandstone, mudstone, quartzite and coal. It is considered that this material represents the Diamicton till.

The consistency of the clay is predominantly recorded as firm, or firm to stiff on the logs, all though locally it is described as soft in places. In WS07, Geo2 record ‘very soft clay’ between 0.9 and 1.7 m bgl.

In borehole WS10 a slightly gravelly sand underlies the clay at 4.2m to the base of the hole at 5.5 m bgl. An SPT at 5.0 m within in this material returns an N value of 27 indicating medium dense conditions. A further thinner sand band was recorded above this in the same hole between 2.7 and 2.8 m bgl and also in WS01 between 4.6 and 4.7 m bgl.

The results of the moisture content tests for the gravelly clay are in the range 15% to 44%, this range also includes the moisture contents recorded for the triaxial tests. A plot of moisture content with depth is presented in Appendix C of this report, which shows a decrease in moisture content with depth.

The Atterberg limit test results show the gravelly clay to be low plasticity, with a Liquid Limit in the range 30% to 68%, Plastic Limit of 16% to 31% and Plasticity Index of 14% to 37%. A modified Plasticity Index of 12% to 37% is calculated based on the percentage of material passing the 0.425mm sieve. This indicates the material to be of low to medium volume change potential in accordance with NHBC Standards, Chapter 4.2 “Building Near Trees”.

Calculation of the consistency index using the above results, records values of between 0.64 and 1.07, which would indicate a consistency of firm to very stiff.

The undrained shear strength of the clay has been measured directly by two methods, hand shear vanes and triaxial tests. It has also been determined indirectly from the SPT N values using the correlation proposed by Stroud where the undrained shear strength $C_u = f \times \text{SPT N value}$, where f is a factor based on the plasticity index of the clay. For this site a value of $f = 5$ has been assumed.

Hand vanes undertaken during the fieldwork, within the glacial till recorded undrained shear strengths of between 28 kPa and 102 kPa, indicating low to high strength. The gravel content of the clay may have an effect on these results both reducing the test result by disturbing the sample whilst drilling or increasing the result if the vane catches a large gravel fragment.

The undrained triaxial test results returned an undrained shear strength of between 43 kPa and 74 kPa for the five samples tested, indicating medium strength. The mode of failure for all samples was recorded as ‘plastic’.

The SPT N values within the gravelly clay range from 7 to 29, indicating an undrained shear strength of between 35kPa to 145kPa, low to high strength. As this is a correlation these values should be used as a guide only.

A plot of the undrained shear strength verses depth, from the three sources, is presented in Appendix C of this report.

From the plot of undrained shear strength with depth a value of 40 kPa is suggested for preliminary design purposes for shallow foundations within the clay (Diamicton till).

4.4 Hydrogeology

Monitoring wells were installed in seven of the twelve exploratory holes. Details of the installations are shown on the respective borehole logs presented in Appendix B of this report.

Monitoring of the wells has been carried out by G&M on one occasion on the 12th June 2024 with water levels recorded as follows;

Borehole No	Water Level (m bgl)
WS01	1.11
WS05	0.59
WS06	0.51
WS07	0.76
WS10	2.49
WS12	2.53
WS14	0.74

Two falling head permeability tests were undertaken in the monitoring wells, installed in WS10 and WS12, in general accordance with BS EN ISO 22282.

The field data sheets for the tests, are presented in Appendix C of this report. The data sheets indicate some drainage within the thin veneer of made ground at these locations. However, the tests were terminated, when no further significant drop in water levels was recorded. This reduction in drop in water level coincided with the approximate interface between the made ground and the underlying cohesive subsoils, recorded on the respective borehole logs. Indicating a significantly lower permeability within these underlying natural soils.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 Introduction

G&M Consulting Ltd (G&M) was commissioned by Geo2 Remediation Ltd (Geo2) to carry out a geotechnical appraisal of land at Bell Lane, Bury, Lancashire. The appraisal is based on a ground investigation carried out by Geo2.

The proposed development comprises a fuel filling station and fast-food outlet, with areas of parking. The proposed development is shown on Drawing No 2489.F.104.C, prepared by Walker Design. A copy of this drawing is presented in Appendix A of this report.

The following discussion is based on the results of the Geo2 ground investigation. G&M were not involved in the scoping of the work but did undertake some logging of the exploratory holes.

At the time of writing details of the proposed foundation loadings have not been issued to the writer, the following discussions are therefore based on general assumptions and only general comments can be made. They should be reassessed in view of the final development.

It is also assumed that proposed finished development levels do not vary significantly from those at the time of the fieldwork, on site. If these assumptions are not the case significant alteration to the recommendations may be required.

Any proposed foundation option should be discussed with a structural engineer responsible for the design.

5.2 Foundations

Made ground in general is not considered suitable for foundations, without first pretreatment, due to the potential for variability of content and strength.

On this site the proven depth of made ground varies between 0.90 m (WS07) and 1.3 m bgl (WS01). Foundations should be taken to the underlying gravelly clay (Diamicton till).

The volume change potential of the gravelly clay indicates a minimum foundation depth of 0.75 m, based on the NHBC guidance. This depth is where foundations are outside the influencing distance of trees. The proven depth of the made ground across the site is in excess of this, such that foundations would therefore need to be over deepened across much of the site.

It is suggested that for the preliminary design of foundations placed in the gravelly clay an undrained shear strength for the clay of 40 kPa be used. Based on this an initial net safe bearing capacity of 80 kPa is estimated, based on a factor of safety of 3.

The thickness of made ground was only fully proven in seven of the twelve boreholes drilled, the remaining holes all terminated on obstructions within the made ground, considered likely to be concrete. Therefore, it is possible that a greater thickness of made ground may be present that has not been identified as part of this investigation. It is therefore recommended that in due course, further ground investigation is undertaken to fully prove these thicknesses, before finalising the foundation design.

Construction of shallow foundations prove to be problematic through any deeper made ground with high standing water levels and may not be cost effective, or if the bearing capacity quoted above is insufficient, then the use of piled foundations as an alternative could be considered.

If piled foundations are considered, either bored or driven piles could be used. However, the vibration from driven piles should be considered with regard to the adjacent properties.

The load capacity of piles is dependent on the type and method of installation and as such the advice of a specialist piling company should be sought with regard to the most suitable type of pile for the site and likely achievable loads. Depending on the advice of the piling company, further investigation of the site may be required to support the pile design.

5.3 Floor Slabs

Given the variable thickness of made ground beneath the site and depending on the requirement of the floor slab, a suspended slab may be required. If a ground bearing floor slab is preferred the made ground would need to be excavated out and replaced with suitable engineered backfill.

All formation level soils should be proof-rolled, and all loose, soft, organic or otherwise unsuitable materials should be removed and replaced with a suitable, well-compacted granular fill. Hard spots such as old foundations should also be removed.

5.4 Excavations

The shallow soils encountered at the site are considered suitable for excavation by standard mechanical plant such as a wheeled backhoe excavator to depths indicated by the termination depth of the exploratory holes.

The use of hydraulic or pneumatic breakers may be required if obstructions or old foundations associated with former structures are encountered.

The high standing ground water could affect excavation stability, some dewatering may therefore be required within excavations. Surface water run-off from rainfall may also enter excavations.

It should be noted that groundwater levels may change due to seasonal or other variations. Advice on suitable dewatering techniques is given in CIRIA Report C515 *Groundwater Control – design and practice*.

All excavations should be planned, and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in *Health and Safety in Construction*.

5.5 Buried Concrete

This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment*. Third Edition.

Water soluble sulphate (SO_4) and pH tests were carried out on three samples of the natural soils. These recorded concentrations of SO_4 of between 28 mg/l and 140 mg/l, together with a pH of between 6.2 and 8.2.

Based on the guidance in SD1, where there are less than five samples tested (on each type of material/soil/water present on site), the characteristic value for the pH is taken as the lowest value and that of the water soluble sulphate, the highest value.

Therefore, a characteristic value for pH of 6.2 and characteristic value for water soluble sulphate of 140 mg/l is determined for the natural soils.

Based on these characteristic values and Table C2 (SD1) for brownfield sites, a Design Sulphate Class for the natural soils of DS-1 is indicated.

5.6 Soakaways.

The falling head tests indicated some drainage within the thin veneer of made ground at the locations where the tests were undertaken. However, the tests were terminated, when no further significant drop in water levels was recorded. This reduction in drop in water level coincided with the approximate interface between the made ground and the underlying cohesive subsoils, recorded on the respective borehole logs. Indicating a significantly lower permeability within these underlying soils. In addition monitoring of the installations has recorded high groundwater levels, possibly perched within the made ground or at the interface of the made ground and underlying natural cohesive subsoils. Levels were typically recorded in the monitoring wells between 0.51 m and 1.11 m bgl, although in two of the installations levels were recorded between 2.49 m and 2.53 m bgl

Based on the above it is considered unlikely that traditional soakaways will prove a suitable method for the disposal of surface water from the proposed development



APPENDIX A

DRAWINGS



NOTE: DO NOT SCALE FROM THIS DRAWING. ALL ERRORS AND OMISSIONS TO BE REPORTED TO WALKER DESIGN. ALL INFORMATION TO BE CHECKED ON SITE PRIOR TO WORKS COMMENCING AND READ IN CONJUNCTION WITH ALL RELEVANT CONSULTANTS AND HEALTH AND SAFETY DRAWINGS AND INFORMATION

AREA SCHEDULE

Site Area		1.44a
Gross Internal Area	PFS	371sqm / 4000sqft
Gross Internal Area	Retail Unit	214sqm / 2303sqft
Gross Internal Area	Retail Unit	25sqm / 270sqft

PARKING SCHEDULE

Parking Spaces	44
Staff Spaces	06
Accessible	07
EV	07

The Site
Bell Lane
Bury
BL9 6BB

Legend

	Brushed Concrete Finish
	Tarmac pavement
	Tarmac
	Whiteline
	Existing Levels to be retained
	Existing Levels
	Proposed Levels - Refer to Engineer's Drawings
Proposed Levels to be confirmed by Drainage Engineer	
	Existing Boundary Wall to be retained
	Proposed Boundary Fence
	Proposed Internal Fence
	Proposed Lamp Post
	Proposed Canopy Lights - TBC by the client
	Visibility Splays



PEARL FORECOURTS LTD
CLIENT

BELL LANE, BURY
PROJECT

PROPOSED SITE PLAN
TITLE

2489.F.104.C
DRAWING NO.

1:250
SCALE@A1
SW/ ADs
DRAWN





APPENDIX B

EXPLORATORY HOLE RECORDS



Borehole Log

WS01
Sheet 1 of 1

Hole Type BH	Easting 381231.19	Northing 411292.42	Ground Level (m) 99.78	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433		Start Date 2024-05-23	End Date 2024-05-23

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata						
		Depth (m)	Type/ Ref	Results			Legend	Description					
		0.65	ES	N=7 (1,2/1,1,2,3)	99.68	(0.10) 0.10		MADE GROUND: Asphalt.					
						(0.23)		MADE GROUND: Concrete.					
					99.45	0.33		MADE GROUND: Soft brown to dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick and concrete.		0.5			
						(0.32)							
			99.13		0.65		MADE GROUND: Black sandy GRAVEL of angular fine to coarse brick, mudstone and concrete. Oily sheen observed on the gravel.						
					(0.20)								
			98.93		0.85		MADE GROUND: Soft brown to dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick and concrete.	1.0					
			98.83		(0.10) 0.95		MADE GROUND: Brown slightly clayey sandy GRAVEL of angular fine to coarse brick. Sand is fine to coarse.						
			98.68		(0.15)		MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, mudstone and concrete.						
					(0.20)		MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, mudstone and concrete.						
			98.48		1.30		Soft greyish brown sandy slightly gravelly CLAY. sand is fine to coarse. Gravel is subrounded fine of quartzite and sandstone.	1.5					
		1.70	ES										
2.00	SPT	N=20 (2,3/4,4,5,7)					Becoming firm (2.00 - 2.10m)	2.0					
4.00	SPT	N=29 (1,2/3,7,8,11)						2.5					
		</											

Remarks Terminated at 5.45m bgl at desired depth.	Method, Plant, Stability, Dimensions 0.00 - 5.45m BH	Logger A Tabb
	Checked By: S Hyde Status: FINAL	



Hole Type BH	Easting 381224.03	Northing 411273.02	Ground Level (m) 99.69	Scale 1:25
Project Name Site off Bell Lane, Bury		Project No. 1433	Start Date 2024-05-23	End Date 2024-05-23

Client	Contractor	Consultant
Pearl Forecourts	Cape Site Services	GEO2 - Paolo De Marchi

[illegible]

Remarks	Method, Plant, Stability, Dimensions	Logger
Terminated at 1.0m bgl due to refusal within Made Ground.	0.00 - 1.00m BH	A Tabb
Checked By: S Hyde Status: FINAL		



Borehole Log

WS05
Sheet 1 of 1

Hole Type BH	Easting 381234.39	Northing 411226.56	Ground Level (m) 101.37	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433		Start Date 2024-05-14	End Date 2024-05-14

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.30	PID	0.20	101.32	(0.05) 0.05		MADE GROUND: Brick pavement.	
						(0.45)		MADE GROUND: Greyish sandy gravel with brick fragments. Gravels are fine to coarse subangular and subrounded.	
		1.00 1.00 1.00	SPT PID ES	N=8 (1,1/1,2,2,3) 0.30	100.87	0.50		MADE GROUND: Brick gravel and cobbles, fine to coarse subangular and angular.	0.5
						(0.40)			
		1.00 1.00 1.00	SPT PID ES	N=8 (1,1/1,2,2,3) 0.30	100.47	0.90		MADE GROUND: Brown sandy silty gravel, with numerous brick fragments.	1.0
						(0.20)			
		1.50	PID	0.10	100.27	1.10		Light brown gravelly silty sandy soft CLAY. Occasional small coal fragments. Gravels are fine to medium subrounded and subagular.	1.5
						(1.30)			
		2.60	PID	0.10	98.97	2.40		Brown mottled grey gravelly silty soft CLAY. Gravels are fine to medium subangular and subrounded.	2.5
						(0.70)			
		3.00	SPT	N=31 (5,5/6,6,9,10)	98.27	3.10		Dark grey slightly sandy silty gravelly firm to stiff CLAY, dry. Gravels are fine to coarse subrounded.	3.0
		3.50	PID	0.10					3.5
		4.00	SPT	N=50 (7,9/10,12,15,13 for 290mm)		(1.90)			4.0
		4.80 4.80	PID ES	0.10					4.5
		96.37			96.37	5.00	End of Borehole at 5.00m		5.0

Remarks Terminated at 5m on clay.	Method, Plant, Stability, Dimensions 0.00 - 5.00m BH	Logger P De Marchi
	Checked By: S Hyde Status: FINAL	



Borehole Log

WS07
Sheet 1 of 1

Hole Type BH	Easting 381250.82	Northing 411220.70	Ground Level (m) 101.62	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433	Start Date 2024-05-23	End Date 2024-05-23	

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level	Depth	Strata			
		Depth (m)	Type/ Ref	Results	(m)	(m) (thickness)	Legend	Description		
		0.60	ES		101.37	(0.25)		TOPSOIL	0.5	
						0.25		MADE GROUND: Brown slightly clayey sandy GRAVEL of angular to subangular fine to coarse brick, mudstone and quartzite. Sand is fine to coarse.		
						(0.20)		MADE GROUND: Brick cobble.		
						101.17	0.45			MADE GROUND: Soft dark brown to black slightly sandy slightly gravelly CLAY with occasional organic material. Sand is fine to coarse. Gravel is angular to subangular fine to medium brick and mudstone. Slight organic odour.
						101.09	(0.08)			
							0.53			
							(0.37)			
						100.72	0.90			Very soft light brown to grey CLAY
						1.00				
						1.00				
1.00										
		1.00 1.00 1.00	ES B UT		99.92	1.70		Firm light to dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded to subrounded fine quartzite. Occasional relict roots.	2.0	
		1.00 1.00 1.00	ES B UT		97.82	3.80		End of Borehole at 3.80m	4.0	
		1.00 1.00 1.00	ES B UT						4.5	
		1.00 1.00 1.00	ES B UT						5.0	

Remarks Terminated at 3.8m bgl due to machine refusal.	Method, Plant, Stability, Dimensions 0.00 - 3.80m BH	Logger A Tabb
Checked By: S Hyde Status: FINAL		



Borehole Log

WS09
Sheet 1 of 1

Hole Type BH	Easting 381242.82	Northing 411294.86	Ground Level (m) 99.96	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433		Start Date 2024-05-14	End Date 2024-05-14

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.50 0.50	PID ES	0.40	99.89	(0.07)		TARMAC	0.5
					99.88	(0.08)		MADE GROUND: Grey gravel of fill, fine to coarse subangular and subrounded.	
					99.66	(0.22)		TARMAC	
					99.56	(0.10)		CONCRETE with rebar.	
					99.46	(0.10)		MADE GROUND: Grey gravel of fill, medium to coarse subangular and subrounded.	
		1.20	PID	0.30		(0.10)		MADE GROUND: Light brown gravelly sand. Gravels are fine to medium subangular.	1.0
						(0.50)		MADE GROUND: Brown to black gravelly sand. Numerous brick fragments. Gravels are fine to coarse subangular.	
						(0.60)			
					98.86	1.10		Brown slightly gravelly silty stiff CLAY. Occasional medium coal fragments. Grey silty faults with rootlets.	
		1.80	PID	0.20					1.5
		2.60 2.60	PID ES	0.10					2.0
		3.50	PID	0.10					2.5
		3.90	PID	0.10					3.0
		2.70			97.26	2.70		Greyish sandy gravelly CLAY. Gravels are fine to coarse subrounded.	3.5
		4.00							4.0
		4.00			95.96	4.00		End of Borehole at 4.00m	4.5
									5.0

Remarks Terminated at 4m on clay.	Method, Plant, Stability, Dimensions 0.00 - 4.00m BH	Logger P De Marchi
	Checked By: S Hyde Status: FINAL	



Borehole Log

WS10
Sheet 1 of 2

Hole Type BH	Easting 381257.57	Northing 411282.72	Ground Level (m) 100.28	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433	Start Date 2024-05-14	End Date 2024-05-14	

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata	
		Depth (m)	Type/ Ref	Results			Legend	Description
		0.30	PID	1.80	100.18	(0.10) 0.10		TARMAC
						(0.30)		MADE GROUND: Black sandy gravel, fine to coarse subangular. Numerous brik fragments and cobbles.
		0.90 0.90 1.00	PID ES SPT	1.00 N=5 (3,2/1,1,1,2)	99.88	0.40 (0.40)		MADE GROUND: Grey loose gravel of fill with numerous brick fragments and cobbles.
					99.48	0.80 (0.40)		MADE GROUND: Light brown gravelly cobbly clay. Brick fragments and cobbles. Gravels are fine to coarse subangular.
		1.80	PID	0.50	99.08	1.20 (0.30)		No Recovery
					98.78	1.50 (1.20)		Brown slightly gravelly silty stiff CLAY. Gravels are fine to medium subrounded.
		2.90 3.00	PID SPT	0.40 N=10 (1,2/2,2,3,3)	97.58	2.70 (0.10)		Grey SAND band.
					97.48	2.80		Grey sandy gravelly cobbly CLAY. Gravels are fine to coarse subrounded.
		3.50	PID	0.30		(1.40)		
		4.00	SPT	N=19 (3,3/4,4,5,6)				
		4.50	PID	0.60	96.08	4.20 (1.30)		Grey slightly gravelly SAND. Gravels are fine to coarse subrounded. Occasional siltstone cobble at 4.7m bgl.
								Continued on next page



Borehole Log

WS10
Sheet 2 of 2

Hole Type BH	Easting 381257.57	Northing 411282.72	Ground Level (m) 100.28	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433		Start Date 2024-05-14	End Date 2024-05-14

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (m) (thickness)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		5.00	SPT	N=27 (4,3/5,6,7,9)					
					94.78	5.50		End of Borehole at 5.50m	5.5
									6.0
									6.5
									7.0
									7.5
									8.0
									8.5
									9.0
									9.5
									10.0

Remarks Terminated at 5.5m on clayey sand.	Method, Plant, Stability, Dimensions 0.00 - 5.50mBH	Logger P De Marchi
Checked By: S Hyde Status: FINAL		



Borehole Log

WS12
Sheet 1 of 1

Hole Type BH	Easting 381274.31	Northing 411288.90	Ground Level (m) 100.41	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433	Start Date 2024-05-14	End Date 2024-05-14	

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.30	PID	1.50	100.36	(0.05)		TARMAC	0.5
					100.21	(0.15)		MADE GROUND: Concrete with rebar. Plastic membrane at bottom.	
		0.80	PID ES	47.40	100.21	0.20		MADE GROUND: Grey gravelly sandy silty clay with occasional sandstone cobbles. Numerous brick fragments. Gravels are fine to coarse subangular. Hydrocarbon odour.	0.5
		1.00	SPT	N=12 (2,2/2,3,3,4)	99.41	1.00		Grey gravelly sandy silty cobbly CLAY. Gravels are fine to coarse, subangular and subrounded. Occasional fine to coarse coal gravels. Becoming less gravelly and stiffer with depth.	1.0
		1.30	PID	15.10	99.41	(3.00)			1.5
		1.80	PID	2.80	99.41	(3.00)			2.0
		2.00	SPT	N=12 (1,2/2,3,3,4)	99.41	(3.00)			2.5
		2.50	PID	2.00	99.41	(3.00)			3.0
		3.00	SPT	N=12 (2,2/2,3,3,4)	99.41	(3.00)			3.5
		3.50	PID	1.60	99.41	(3.00)			4.0
		4.00	SPT	N=11 (2,2/2,3,3,3)	96.41	4.00		Grey and brownish gravelly sandy silty CLAY. Gravels are fine to medium subangular and subrounded.	4.5
		4.90	PID ES	1.30	95.41	5.00		End of Borehole at 5.00m	5.0

Remarks Terminated at 5m on stiff clay.	Method, Plant, Stability, Dimensions 0.00 - 5.00m BH	Logger P De Marchi
	Checked By: S Hyde Status: FINAL	



Borehole Log

WS13
Sheet 1 of 1

Hole Type BH	Easting 381278.72	Northing 411272.96	Ground Level (m) 100.34	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433	Start Date 2024-05-14	End Date 2024-05-14	

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (m) (thickness)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
					100.24	(0.10) 0.10		TARMAC	
						0.10		MADE GROUND: Concrete	
						(0.50)			0.5
					99.74	0.60			
						(0.20)		MADE GROUND: Occasional bricks and brick fragments. Concrete floor at 0.8m.	
					99.54	0.80		End of Borehole at 0.80m	
									1.0
									1.5
									2.0
									2.5
									3.0
									3.5
									4.0
									4.5
									5.0

Remarks Terminated at 0.8m on concrete.	Method, Plant, Stability, Dimensions 0.00 - 0.80m BH	Logger P De Marchi
	Checked By: S Hyde Status: FINAL	



Borehole Log

WS14
Sheet 1 of 1

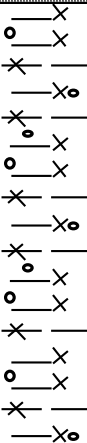
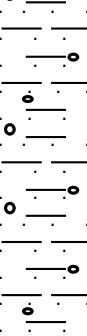
Hole Type BH	Easting 381271.90	Northing 411274.07	Ground Level (m) 100.30	Scale 1:25
Project Name Site off Bell Lane, Bury	Project No. 1433		Start Date 2024-05-14	End Date 2024-05-14

Client Pearl Forecourts	Contractor Cape Site Services	Consultant GEO2 - Paolo De Marchi
----------------------------	----------------------------------	--------------------------------------

Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.30	PID	0.40	100.20	(0.10) 0.10		TARMAC	
						(0.90)		MADE GROUND: Grey and black sandy gravel of fill, fine to coarse, angular and subangular. Numerous brick fragments.	0.5
					99.30	1.00		No Recovery. Concrete floor at 5m.	1.0
						(4.00)			3.0
									4.0
									4.5
					95.30	5.00		End of Borehole at 5.00m	5.0

Remarks Terminated at 5m on concrete. Borehole collapsed while being installed for monitoring.	Method, Plant, Stability, Dimensions 0.00 - 5.00m BH	Logger P De Marchi
Checked By: S Hyde Status: FINAL		

Window Sampling Borehole				BH No		WS5			
Method:	Windowless sampling borehole		Site	Bell Lane, Bury		Contract No		C660	
						Date		14.05.24	
						Scale		1:25	
						Logged By		AS	
Sample Details			Client	Geo2 Remediation Ltd					
Type	Depth To-from (m)	Records	Description			Depth (m)	Level (mAOD)	Legend	
CPT	1.00-1.45	N=6 (1,1/1,2,2,3)	MADE GROUND: Brick Pavers			0.05			
			MADE GROUND: Dark grey sandy subangular to subrounded fine to coarse GRAVEL sized fragments of brick, concrete and clinker. Sand is fine to coarse			0.50			
			MADE GROUND: Dark grey locally speckled orange, angular to subangular fine to coarse GRAVEL sized fragments of brick and concrete with a low cobble content. Cobbles are subangular of brick			1.10			
HV	1.50	28	Soft, locally firm, dark grey slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of mudstone, coal and sandstone						
D	1.80								
HV	1.90	40							
U70	2.00-2.45	24 Blows							
			From 2.40m: Becoming Greyish brown mottled dark grey						
HV	3.00	66	Firm locally stiff, slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of coal siltstone and sandstone			3.10			
SPT	3.00-3.45	N=31 (5,5/6,6,9,10)							
HV	3.50	84							
CPT	4.00-4.45	N=50 (9,9/10,12,5,13/10mm)							
			Window Sample Complete at 4.45m			4.45			
Remarks				Sample Types					
No groundwater encountered				D - Disturbed U-Undisturbed					
				W - Water Hv - Hand Vane					

Window Sampling Borehole				BH No		WS9	
Method: Windowless sampling borehole		Site	Bell Lane, Bury	Contract No		C660	
				Date		14.05.24	
				Scale		1:25	
				Logged By		AS	
Sample Details			Client	Geo2 Remediation Ltd			
Type	Depth To-from (m)	Records	Description		Depth (m)	Level (mAOD)	Legend
			MADE GROUND: Tarmacadam		0.10		
			MADE GROUND: Type 1 Fill		0.15		
			MADE GROUND: Tarmacadam		0.20		
			MADE GROUND: Type 1 Fill		0.25		
			MADE GROUND: Dark brownish grey locally black very gravelly fine to coarse SAND, locally very sandy angular to subangular fine to coarse GRAVEL sized fragments of brick, concrete and clinker.		1.10		
HV	1.50	80	Stiff, locally firm greyish brown slightly gravelly silty CLAY. Gravel is subangular fine to coarse of mudstone, coal and sandstone				
HV	2.00	58					
			From 2.40m: Becoming indistinctly fissured with grey silt noted on subvertical fissures		2.70		
HV	3.00	42	Firm, slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of coal and sandstone				
HV	3.50	44					
					4.00		
			Window Sample Complete at 4.00m				
Remarks			Sample Types				
No groundwater encountered			D - Disturbed U-Undisturbed				
			W - Water Hv - Hand Vane				

Window Sampling Borehole				BH No		WS10		
Method: Windowless sampling borehole		Site	Bell Lane, Bury	Contract No		C660		
				Date		14.05.24		
				Scale		1:25		
Sample Details			Client	Geo2 Remediation Ltd	Logged By		AS	
					Type	Depth To-from (m)	Records	Description
CPT	1.00-1.45	N=5 (3,2/1,1,1,2)	MADE GROUND: Tarmacadam		0.10			
			MADE GROUND: Black locally dark grey clayey sandy subangular fine to coarse GRAVEL sized fragments of clinker and brick. Sand is fine to coarse		1.20			
			NO RECOVERY		1.50			
HV	1.80	102	Stiff, locally very stiff, greyish brown slightly gravelly silty CLAY. Gravel is subangular fine to coarse of mudstone, coal and sandstone		2.80			
U70	2.00-2.45	27 Blows	From 2.00m: Becoming indistinctly fissued with grey silt noted on subvertical fissures					
			From 2.60-2.80m: Light grey fine to medium sand					
D	3.00	N=10 (1,2/2,2,3,3)	Firm, slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of coal and sandstone		4.20			
SPT	3.00-3.45		From 3.10m: Becoming firm locally stiff and slightly sandy. Clay now includes subangular fine to coarse gravel of siltstone					
HV	3.60	58			4.60			
HV	4.00	88 N=19 (3,3/4,4,5,6)						
SPT	4.00-4.45							
			Light grey slightly gravelly silty fine to coarse SAND. Gravel is subrounded to rounded of quartzite		5.00			
			Firm, slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of coal siltstone and sandstone					
SPT	5.00-5.45	N=27 (4,3/5,6,7,9)	Medium dense light grey slightly gravelly silty fine to coarse SAND. Gravel is subrounded to rounded of quartzite					
					5.45			
Window Sample Complete at 5.45m								
Remarks				Sample Types				
No groundwater encountered				D - Disturbed				
				U-Undisturbed				
				W - Water				
						Hv - Hand Vane		

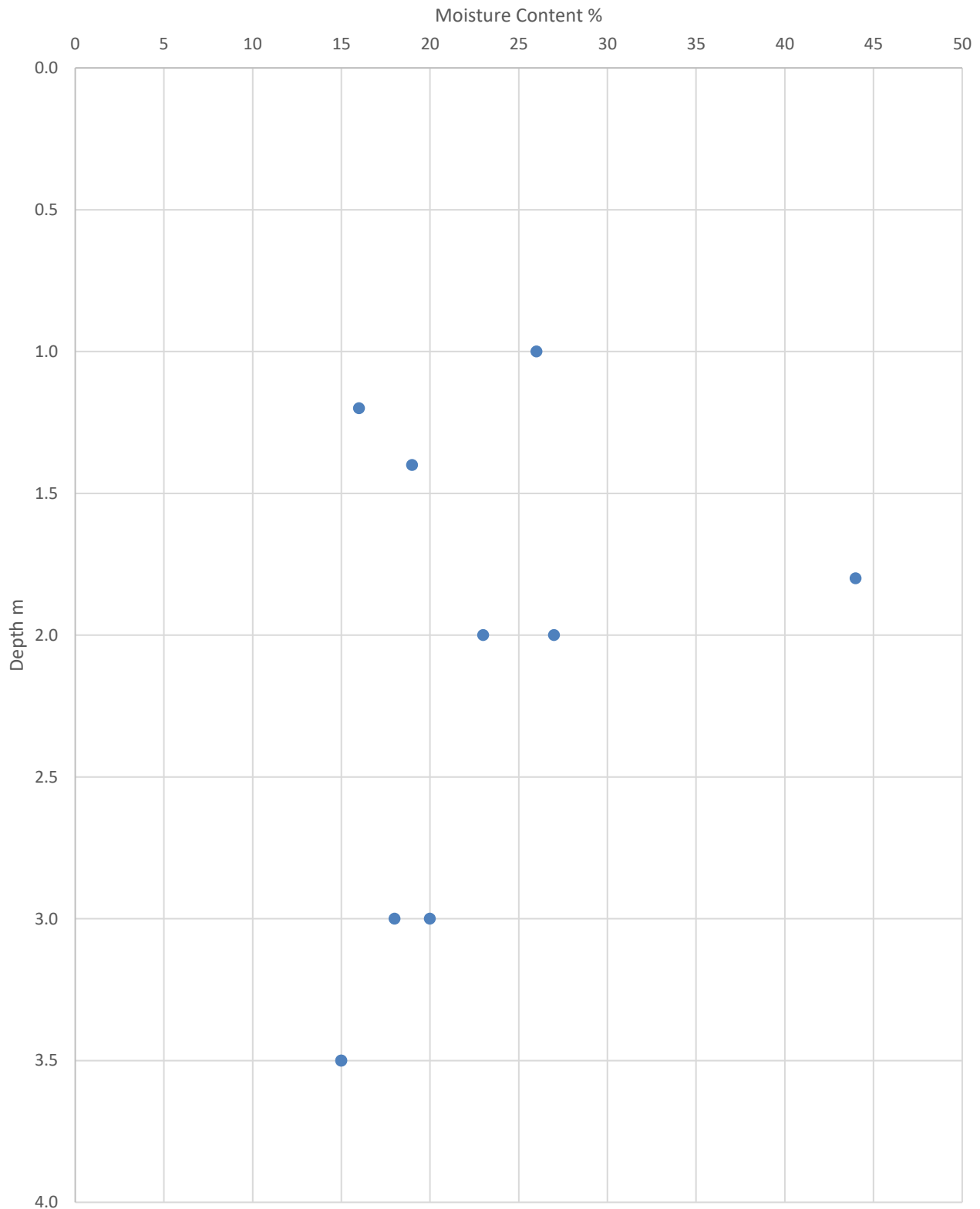
Window Sampling Borehole				BH No		WS12		
Method: Windowless sampling borehole		Site	Bell Lane, Bury	Contract No		C660		
				Date		14.05.24		
				Scale		1:25		
Sample Details			Client	Geo2 Remediation Ltd	Logged By		AS	
					Type	Depth To-from (m)	Records	Description
CPT HV	1.00-1.45	N=12 (2,2/2,3,3,4) 40	MADE GROUND: Tarmacadam		0.05			
	1.00		MADE GROUND: Light grey CONCRETE: 70% Aggregates, aggregate is subangular to rounded of limestone and quartzite		0.20			
D	1.20		MADE GROUND: Firm, light grey locally speckled orange sandy gravelly CLAY with a low cobble content. Sand is fine to coarse, gravel sized fragments are subangular fine to coarse of brick and sandstone. Cobbles are subangular of sandstone		1.00			
HV	1.50	42						
CPT HV	2.00-2.45	N=12 (1,2/2,3,3,4) 46	Firm, dark grey slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of mudstone, coal and sandstone					
	2.00							
HV	2.50	50,44						
CPT	3.00-3.45	N=12 (2,2/2,3,3,4)						
D	3.50							
CPT HV	4.00-4.45	N=11 (2,2/2,3,3,3) 46	From 4.00m: Becoming brownish grey					
	4.00							
CPT HV	5.00-5.45	N=21 (4,4/5,5,5,6) >130	From 4.80m: Becoming very stiff					
	5.00					5.45		
			Window Sample Complete at 5.45m					
Remarks No groundwater encountered				Sample Types D - Disturbed U-Undisturbed		W - Water Hv - Hand Vane		
								



APPENDIX C

FIELD DATA SHEETS/PLOTS

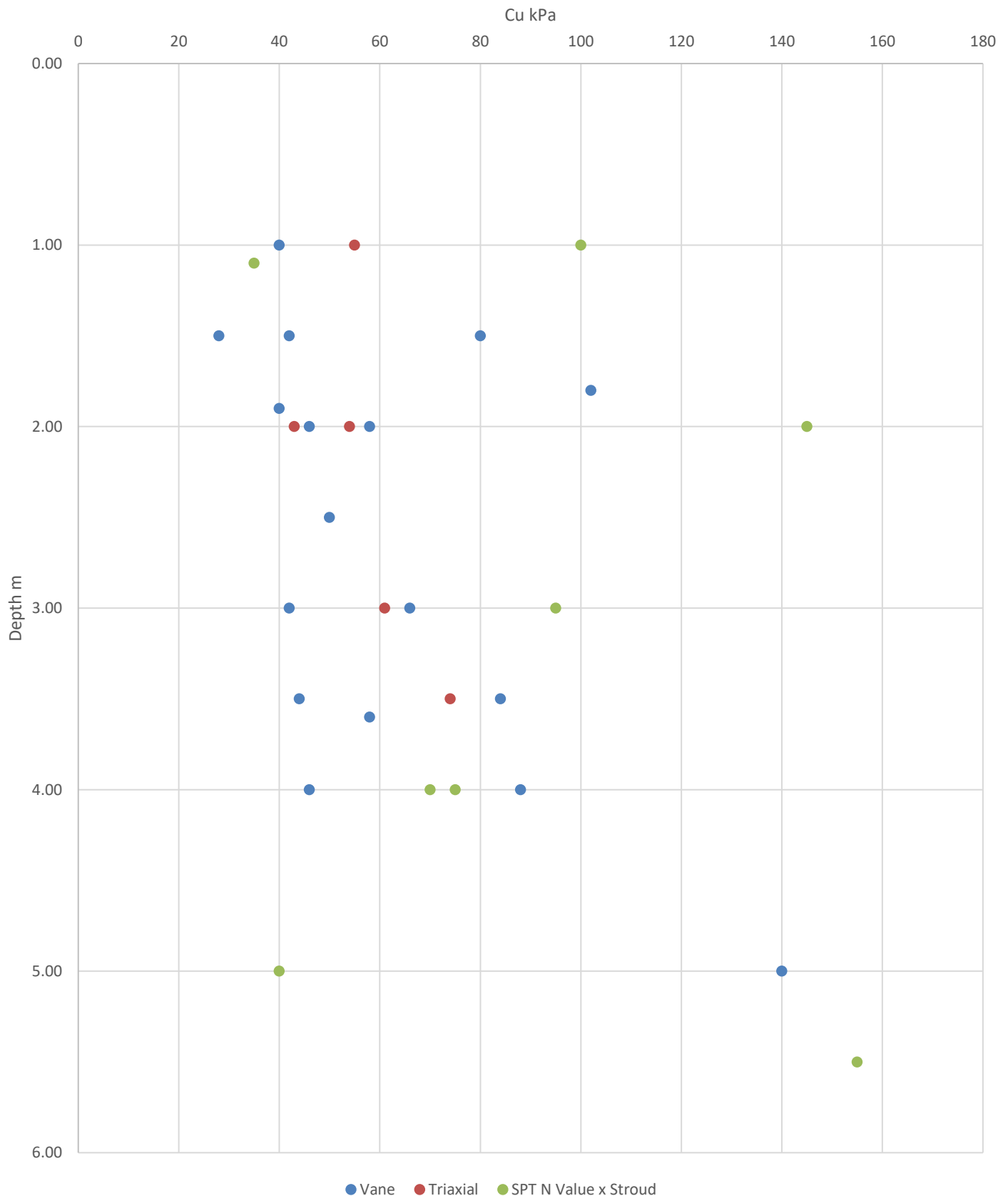
Moisture Content V Depth



Contract Number: C660		
Contract Bell Lane, Bury	Plotted by ATS	Approved GS
	Drawing Name: Moisture Content Vs Depth	
Client Geo2 Remediation Ltd		



Undrained Shear Strength Cu V Depth



Contract Number:	C660		
Contract	Bell Lane, Bury	Plotted by	ATS
		Approved	GS
Client	Geo2 Remediation Ltd	Drawing Name:	
		Shear Strength Vs Depth	



**RECORD OF MEASURED VALUES – FIELD RECORD**
IN-SITU PERMEABILITY TEST in BOREHOLE or STANDPIPE

Contract: Bell Lane, Bury		Client Geo2		Borehole Ref: WS10
Contract Ref: C660	Test date: 12.06.24	Weather: Cloudy and warm		Test No: 1
Eastings (m BNG):	Northings (m BNG):	Elevation (m AOD)	Borehole orientation	Borehole inclination

**1. INITIAL
CONDITIONS**

Datum type: (highlight correct):	GROUND LEVEL / TOP OF CASING PIPE COVER
Height of Datum above GL (negative if below GL): 0.0	(m)
Groundwater level from datum prior to test: 2.49	(m)

2. TEST PROCEDURE AND EQUIPMENT

TEST TYPE (highlight correct):		Rising / Falling	
TEST IN BOREHOLE		TEST IN STANDPIPE	
Casing Used? YES/NO		Pipe Type: Piezometer / Standpipe	
Casing diameter: (If none enter X)	Inner Dia: (mm)	Standpipe	Inner Dia: 45 (mm)
	Outer Dia: (mm)	Diameter:	Outer Dia 50 (mm)
Borehole diameter: (mm)		Filter Material: Sand/ Gravel /Unknown	
Depth from Datum to:		Depth from Datum to:	
Base of Casing:	(m)	Top of Response Zone	1.0 (m)
Base of Hole:	(m)	Bottom of Response Zone	4.0 (m)
Test section supported? YES/NO		Test Section (Borehole) Diameter: 80 (mm)	
If yes, type of filter support?		Standpipe fitted with Geotextile? YES / NO	
Isolation Device Type?			
(If NONE, the casing is the filter tube)			
ALL TESTS			
Borehole drilling method(s): (circle all correct options)		Cable Percussion / Rotary Core / Open Hole / Flight Auger Dynamic Sample / Window Sample / Sonic / Unknown	
Soil / rock description over test section (if known):			
Hydrogeological conditions in test section: (circle correct)		Entire test section below GW (fully saturated) Part of test section below GW (partially saturated) Test section dry (unsaturated)	
Method used to change level (circle correct)			
Volume of water added/removed: (ltr)		Time taken: 10 (mins)	

**PERMEABILITY TEST in BOREHOLE or STANDPIPE RECORD
OF MEASURED VALUES – FIELD RECORD**

Contract: Bell Lane, Bury		Client Geo2	Borehole Ref: WS12
Contract Ref: C660	Test date: 12.06.24	Weather: Cloudy and warm	Test No: 1

3. TEST MEASUREMENTS	Start time of test (i.e. 13:25:02):																					
	Time		Depth to water		Time		Depth to water															
	Hr	M	S	from datum: (m)	Hr	M	S	from datum: (m)	Hr	M	S	from datum: (m)										
	0		0.0		45		1.16															
	1		0.620		60		1.19															
	2		0.660		75		1.200															
	3		0.720		90		1.220															
	4		0.750		105		1.240															
	5		0.800																			
	10		0.950																			
	15		1.040																			
	20		1.080																			
	25		1.120																			
	30		-																			
4. GENERAL REMARKS	(Note any blockages, collapse, tidal conditions, etc.) Borehole log indicates made ground to 1.2m, over cohesive subsoil																					
5. PROJECT ENGINEER USE ONLY - COMPLETE BEFORE SUBMITTING FOR PROCESSING	Standing water level to be used in calcations: 2.49 / DRY																					
	How should this test be processed? (highlight correct):																					
	Falling Head Permeability			Rising Head Permeability			Soakaway (BRE Digest 365)															
	Standpipe or Borehole			Standpipe or Borehole?			Standpipe or Borehole?															
	Calculate result YES /NO			Calculate result YES/NO			Calculate result YES/NO															
Use: a) Data inside casing b) Data below casing																						
Test Operator	Print: G Swinbourne			Sign:			Employer: G&M															

**RECORD OF MEASURED VALUES – FIELD RECORD
IN-SITU PERMEABILITY TEST in BOREHOLE or STANDPIPE**

Contract: Bell Lane, Bury		Client Geo2		Borehole Ref: WS12
Contract Ref: C660	Test date: 12.06.24	Weather: Cloudy and warm		Test No: 1
Eastings (m BNG):	Northings (m BNG):	Elevation (m AOD)	Borehole orientation	Borehole inclination

**1. INITIAL
CONDITIONS**

Datum type: (highlight correct):	GROUND LEVEL / TOP OF CASING PIPE COVER
Height of Datum above GL (negative if below GL): 0.0	(m)
Groundwater level from datum prior to test: 2.53	(m)

2. TEST PROCEDURE AND EQUIPMENT

TEST TYPE (highlight correct):		Rising / Falling	
TEST IN BOREHOLE		TEST IN STANDPIPE	
Casing Used? YES/NO		Pipe Type: Piezometer / Standpipe	
Casing diameter: (If none enter X)	Inner Dia: (mm)	Standpipe	Inner Dia: 45 (mm)
	Outer Dia: (mm)	Diameter:	Outer Dia 50 (mm)
Borehole diameter: (mm)		Filter Material: Sand/ Gravel /Unknown	
Depth from Datum to:		Depth from Datum to:	
Base of Casing:	(m)	Top of Response Zone	1.0 (m)
Base of Hole:	(m)	Bottom of Response Zone	4.0 (m)
Test section supported? YES/NO		Test Section (Borehole) Diameter: 80 (mm)	
If yes, type of filter support?		Standpipe fitted with Geotextile? YES / NO	
Isolation Device Type?			
(If NONE, the casing is the filter tube)			
ALL TESTS			
Borehole drilling method(s): (circle all correct options)	Cable Percussion / Rotary Core / Open Hole / Flight Auger Dynamic Sample / Window Sample / Sonic / Unknown		
Soil / rock description over test section (if known):			
Hydrogeological conditions in test section: (circle correct)	Entire test section below GW (fully saturated) Part of test section below GW (partially saturated) Test section dry (unsaturated)		
Method used to change level (circle correct)			
Volume of water added/removed: (ltr)		Time taken: 10 (mins)	

**PERMEABILITY TEST in BOREHOLE or STANDPIPE RECORD
OF MEASURED VALUES – FIELD RECORD**

Contract: Bell Lane, Bury		Client Geo2	Borehole Ref: WS12
Contract Ref: C660	Test date: 12.06.24	Weather: Cloudy and warm	Test No: 1

3. TEST MEASUREMENTS	Start time of test (i.e. 13:25:02):																					
	Time		Depth to water		Time		Depth to water															
	Hr	M	S	from datum: (m)	Hr	M	S	from datum: (m)	Hr	M	S	from datum: (m)										
	0		0.0		45		0.895															
	1		0.335		60		0.905															
	2		0.440		75		0.985															
	3		0.535		90		1.050															
	4		0.565		105		1.060															
	5		0.600																			
	10		0.720																			
	15		0.775																			
	20		0.820																			
	25		-																			
	30		0.840																			
4. GENERAL REMARKS	(Note any blockages, collapse, tidal conditions, etc.) Borehole log indicates made ground to 1.0m, over cohesive subsoil																					
5. PROJECT ENGINEER USE ONLY - COMPLETE BEFORE SUBMITTING FOR PROCESSING	Standing water level to be used in calculations: 2.53 / DRY																					
	How should this test be processed? (highlight correct):																					
	Falling Head Permeability			Rising Head Permeability			Soakaway (BRE Digest 365)															
	Standpipe or Borehole			Standpipe or Borehole?			Standpipe or Borehole?															
	Calculate result YES /NO			Calculate result YES/NO			Calculate result YES/NO															
Use: a) Data inside casing b) Data below casing																						
Test Operator	Print: G Swinbourne			Sign:			Employer: G&M															



APPENDIX D

LABORATORY TEST RESULTS



LABORATORY REPORT



Contract Number: PSL24/3537

Report Date: 05 June 2024

Client's Reference: C660

Client Name: G&M Consulting Ltd
Howard House
Lowfields Road
Leeds
West Yorkshire
LS12 6BS

For the attention of: Graeme Swinbourne

Contract Title: Bell Lane Bury

Date Received: 21/5/2024

Date Commenced: 21/5/2024

Date Completed: 5/6/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Managing Director)

R Berriman
(Associate Director)

S Royle
(Laboratory Manager)


L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Bell Lane Bury

Contract No:

PSL24/3537

Client Ref:

C660

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



Bell Lane Bury

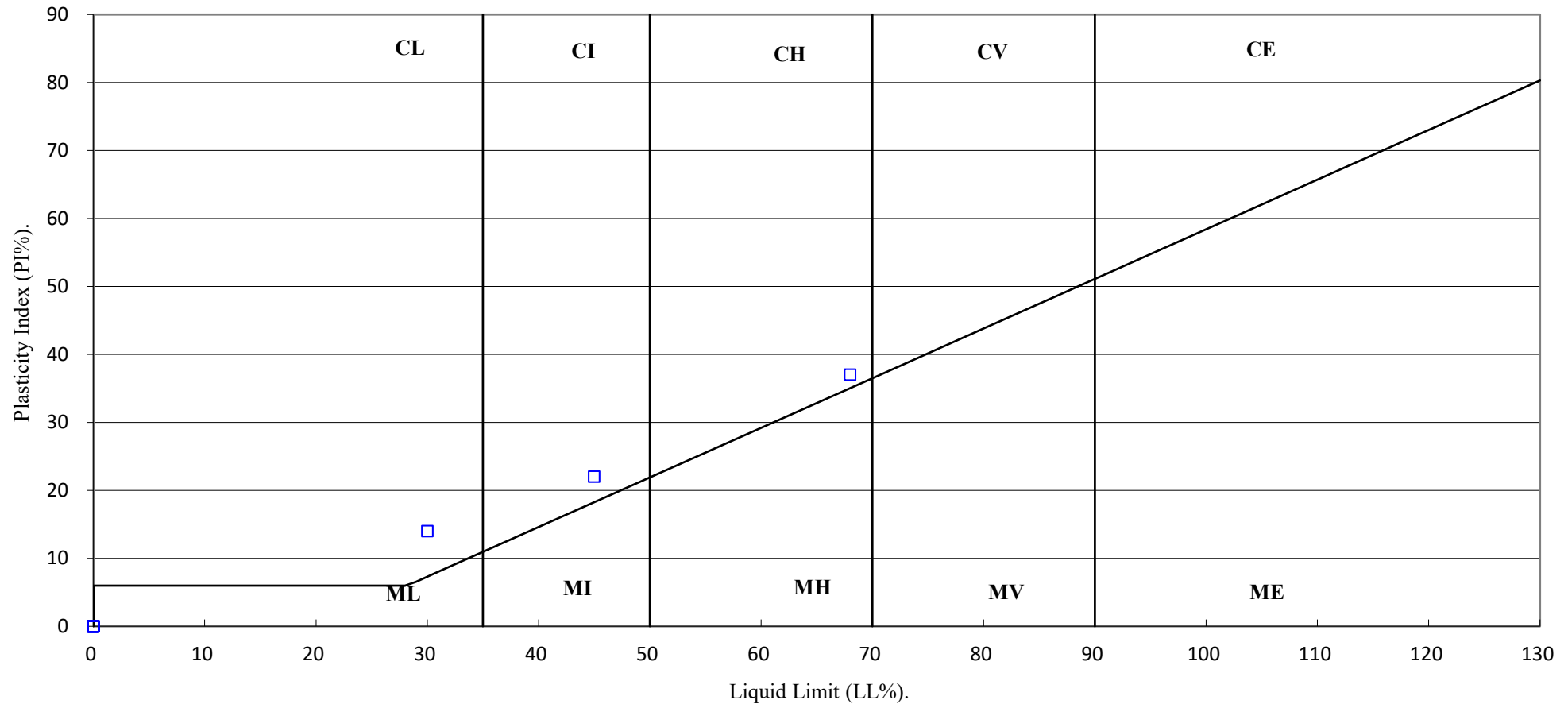
Contract No:

PSL24/3537

Client Ref:

C660

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Bell Lane Bury

Contract No:

PSL24/3537

Client Ref:

C660

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

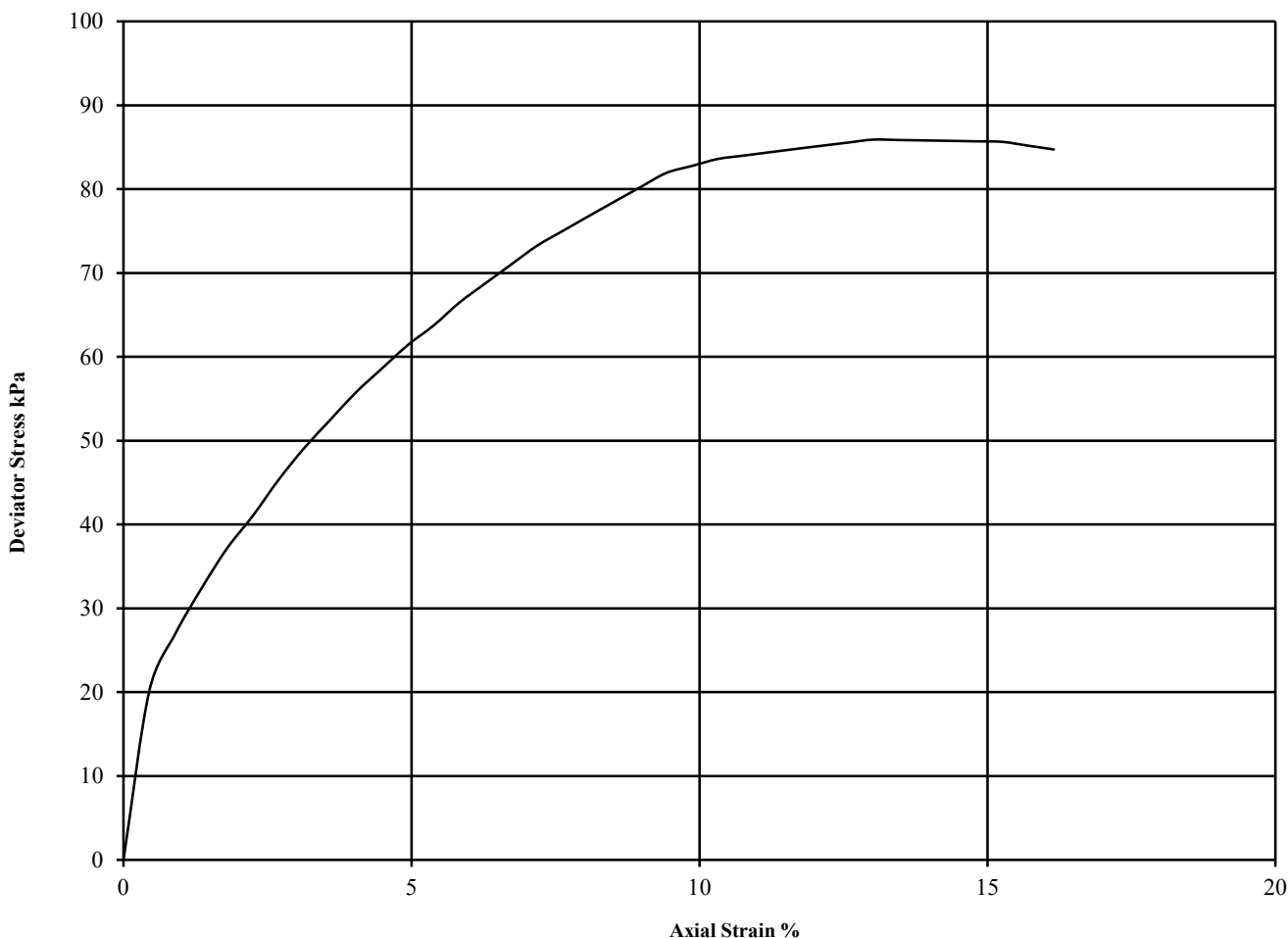
Hole Number: WS5

Top Depth (m): 2.00

Sample Number:

Base Depth (m): 2.45

Sample Type U70



Diameter (mm):		70	Height (mm):		156	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			Sample taken from top of tube
									Rate of strain = 2 %/min
									Latex Membrane used 0.2 mm thick,
									Correction applied 0.49
1	27	1.89	1.49	40	86	43	13.0	Plastic	See summary of soil descriptions



Bell Lane Bury

Contract No:

PSL24/3537

Client Ref:

C660

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

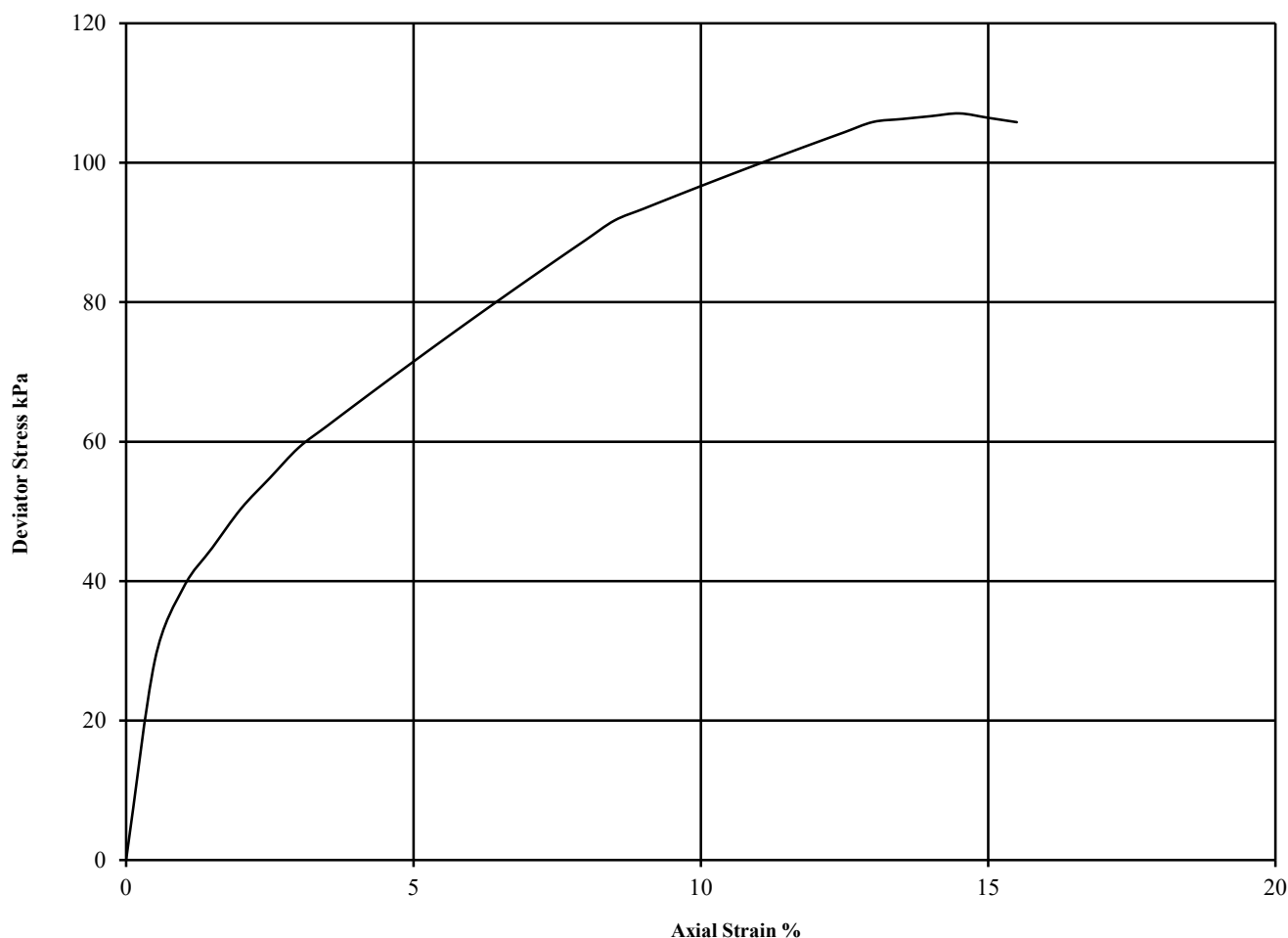
Hole Number: WS10

Top Depth (m): 2.00

Sample Number:

Base Depth (m): 2.45

Sample Type U70



Diameter (mm):		38		Height (mm):		76		Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.79 See summary of soil descriptions		
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$					
1	23	2.07	1.68	40	107	54	14.5	Plastic			



Bell Lane Bury

Contract No:

PSL24/3537

Client Ref:

C660



7 - 11 Harding Street
Leicester
LE1 4DH

Professional Soils Laboratory
5/7 Hexthorpe Road
Hexthorpe
Doncaster
DN4 0AR

Analytical Test Report: L24/04962/PSL - 24-45884

Your Project Reference:	PSL24/3537 Bell Lane Bury		
Your Order Number:	PSL24/3537	Samples Received / Instructed:	03/06/2024 / 03/06/2024
Report Issue Number:	1	Sample Tested:	03/06 to 07/06/2024
Samples Analysed:	3 soil samples	Report issued:	07/06/2024

Signed

David Ratcliffe
Operations Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 29.05.2024

Issued by: J. Gane

Issue No: 4

Rev No: 10



7 - 11 Harding Street
Leicester
LE1 4DH

L24/04962/PSL - 24-45884

Project Reference - PSL24/3537 Bell Lane Bury

Analytical Test Results - Chemical Analysis

Lab Reference				369083	369084	369085
Client Sample ID				-	-	-
Client Sample Location				WS5	WS9	WS10
Client Sample Type				D	D	D
Client Sample Number				-	-	-
Depth - Top (m)				1.80	1.40	3.00
Depth - Bottom (m)				1.80	1.40	3.00
Date of Sampling				-	-	-
Time of Sampling				-	-	-
Sample Matrix				Clay	Clay	Clay
Determinant	Units	Accreditation				
Water soluble sulphate (as SO ₄)	(mg/l)	u	140	28	130	
pH Value	pH Units	MCERTS	6.2	8.0	8.2	



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L24/04962/PSL - 24-45884

Project Reference - PSL24/3537 Bell Lane Bury

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
369083	-	WS5	D	-	Greyish light brown slightly gravelly silty clay	-	-	100
369084	-	WS9	D	-	Dark greyish brown slightly gravelly slightly sandy silty clay	-	-	100
369085	-	WS10	D	-	Dark greyish brown slightly gravelly slightly sandy silty clay	-	-	100



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L24/04962/PSL - 24-45884

Project Reference - PSL24/3537 Bell Lane Bury

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
369083	-	WS5	D	-	
369084	-	WS9	D	-	
369085	-	WS10	D	-	



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L24/04962/PSL - 24-45884

Project Reference - PSL24/3537 Bell Lane Bury

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L24/04962/PSL - 24-45884

Project Reference - PSL24/3537 Bell Lane Bury

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided

C - Received in inappropriate container

H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
369083	-	WS5	D	-		A
369084	-	WS9	D	-		A
369085	-	WS10	D	-		A



LABORATORY REPORT



Contract Number: PSL24/3899

Report Date: 22 June 2024

Client's Reference: C660

Client Name: G&M Consulting Ltd
Howard House
Lowfields Road
Leeds
West Yorkshire
LS12 6BS

For the attention of: Graeme Swinbourne

Contract Title: Bell Lane Bury

Date Received: 4/6/2024

Date Commenced: 4/6/2024

Date Completed: 22/6/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Managing Director)

R Berriman
(Associate Director)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)


A Fry
(Section Manager)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Bell Lane Bury

Contract No:

PSL24/3899

Client Ref:

C660

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

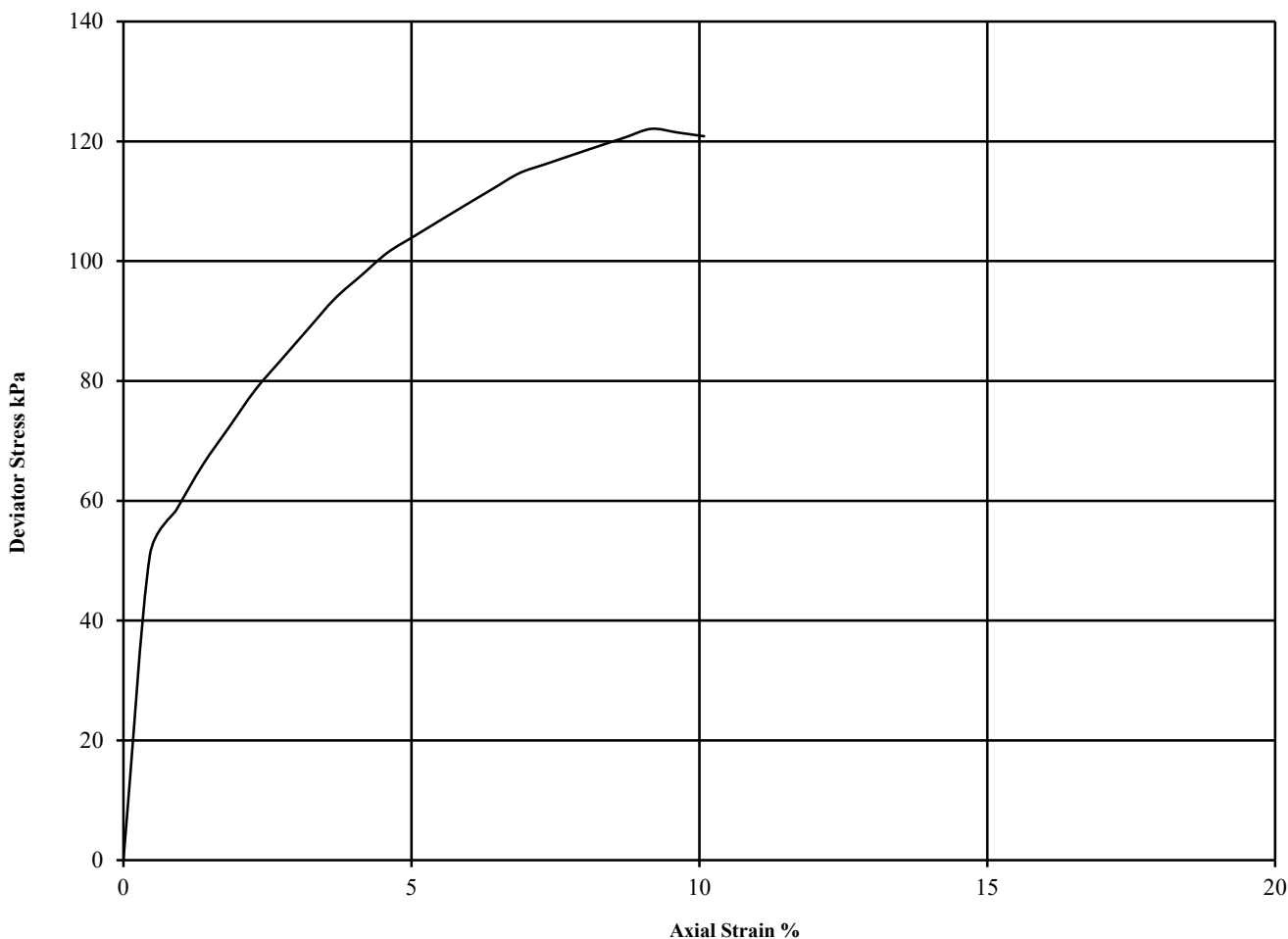
Hole Number: WS1

Top Depth (m): 3.00

Sample Number:

Base Depth (m): 3.50

Sample Type U70



Diameter (mm):		55	Height (mm):		120	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			Sample taken from top of tube
									Rate of strain = 2 %/min
									Latex Membrane used 0.2 mm thick,
									Correction applied 0.63
1	20	1.85	1.55	65	122	61	9.2	Plastic	See summary of soil descriptions



Bell Lane Bury

Contract No:

PSL24/3899

Client Ref:

C660

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

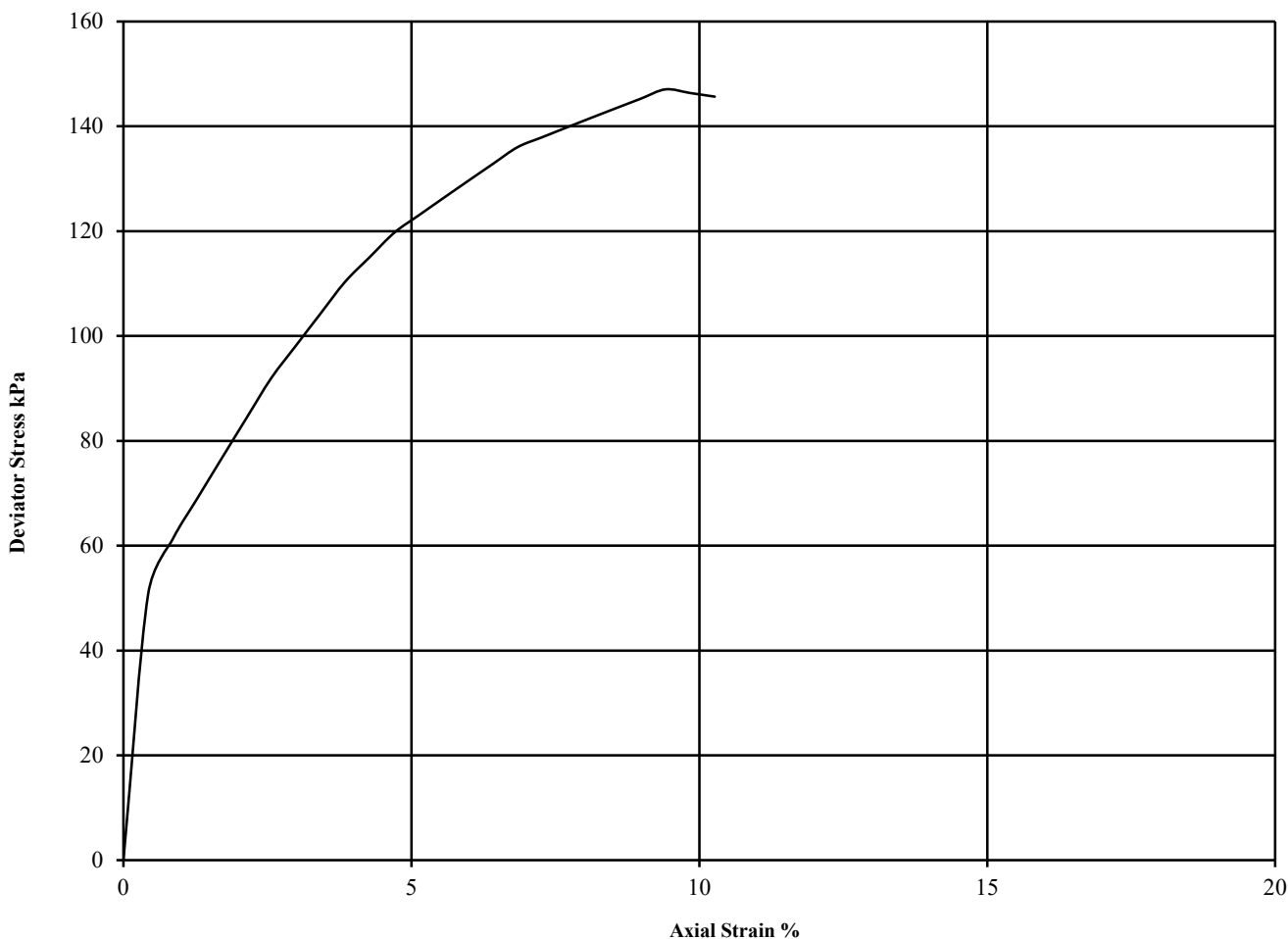
Hole Number: WS1

Top Depth (m): 3.50

Sample Number:

Base Depth (m): 4.00

Sample Type U70



Diameter (mm):		50	Height (mm):		117	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.68 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	15	2.41	2.10	70	147	74	9.4	Plastic	



Bell Lane Bury

Contract No:

PSL24/3899

Client Ref:

C660

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

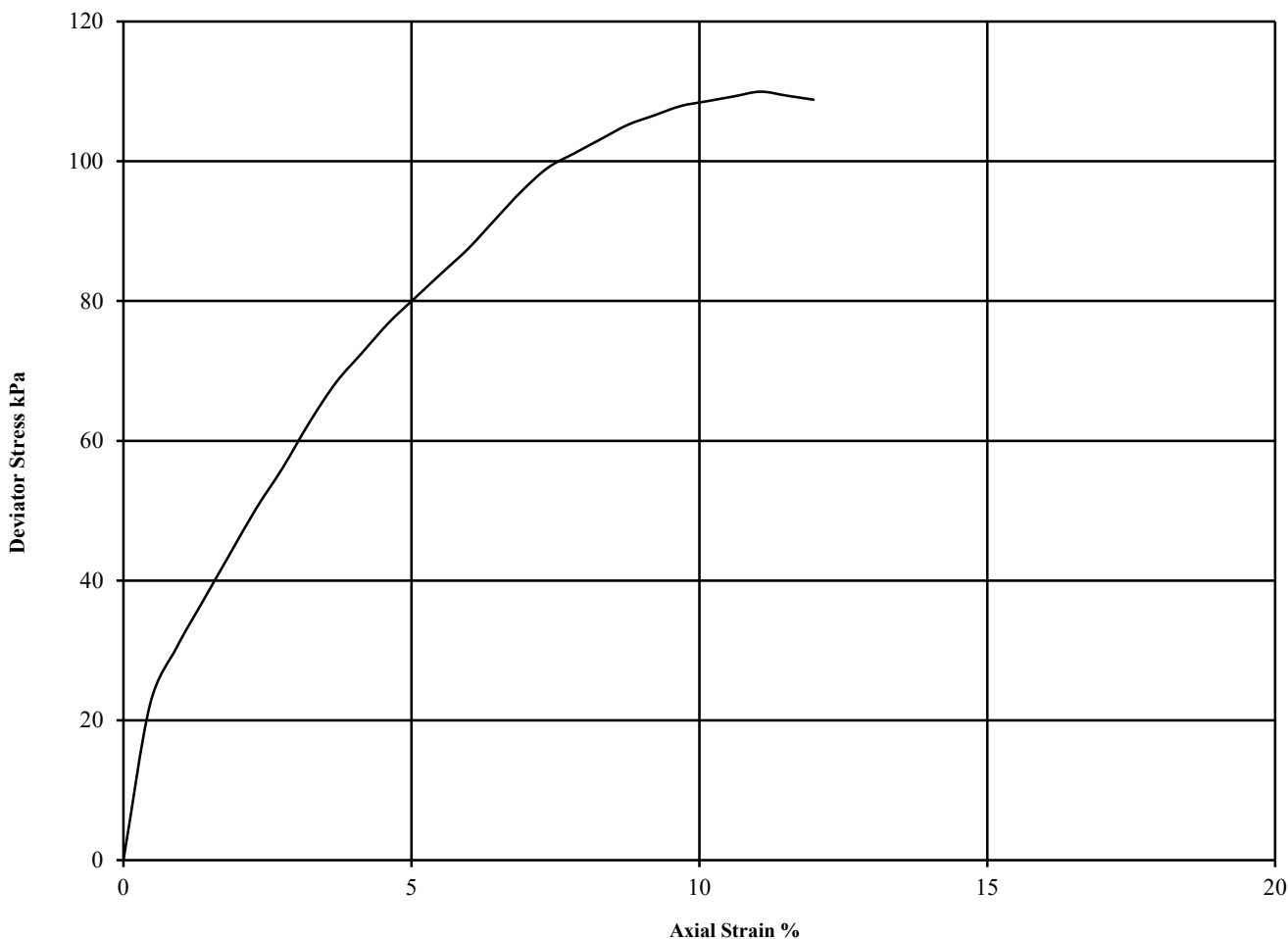
Hole Number: WS17

Top Depth (m): 1.00

Sample Number:

Base Depth (m): 1.50

Sample Type U70



Diameter (mm):		70	Height (mm):		152	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.50 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	26	1.90	1.51	25	110	55	11.1	Plastic	



Bell Lane Bury

Contract No:

PSL24/3899

Client Ref:

C660