TerraConsult

December 2020
Report 3125-R6-2

FLETCHER BANK LANDFILL SITE PHASE 1 - CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

VALIDATION REPORT

Prepared For

Churchill Enviro Ltd

FLETCHER BANK LANDFILL SITE

PHASE 1 - CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

VALIDATION REPORT

Date: December 2020

Prepared For

Churchill Enviro Ltd

By

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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3125-R6-2	**Fletcher Bank Landfill Site, Phase 1 - Cell 1 Non-Hazardous Construction Works Validation Report**

Issue History

Issue	Status	Date	Prepared By	Signature	Date
2	Final	**December 2020**	M. Gill	M. Gill	08.12.2020
			Checked & Approved By: J. Waterworth	J. Waterworth	08.12.2020

DISCLAIMER

This consultancy contract was completed by TerraConsult Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

TerraConsult Ltd cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

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FLETCHER BANK LANDFILL SITE
PHASE 1 - CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

VALIDATION REPORT

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FLETCHER BANK LANDFILL SITE
PHASE 1 - CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

1 INTRODUCTION

The lining system to the base and sideslopes of Phase 1 Cell 1 at Fletcher Bank Landfill Site has been constructed in order to allow the continuation of landfilling operations. The Cell enabling and lining works were carried out in 3 Stages to fit in with site works programmes and weather. Stage 1 was carried out between August and September 2018; Stage 2 was carried out during July 2019 and Stage 3 was carried out between May and June 2020.

Drawing No. 3125/4/004 shows the top of Clay Liner contours and approximate extent and location of the area of liner validated by this report.

TerraConsult were commissioned by Churchill Enviro Ltd to:

a) supply a suitably qualified and experienced CQA Engineer to oversee the construction quality aspects of the project and to delegate responsibilities for quality assurance on site to a CQA Inspector;

b) supply a suitably qualified and experienced CQA Inspector together with all necessary site sampling and testing equipment;

c) organise independent testing at soils testing laboratories;

d) prepare and submit a comprehensive validation report following the completion of the works using site records, field test data and laboratory test results.

This report describes the construction work and the quality assurance monitoring carried out during the construction of the Cell 1 lining system and includes the results of field and laboratory testing. This report also provides certification of the works as having been carried out in accordance with the Design Specification and QA Plan.

The quality assurance of the proposed lining works was the responsibility of the CQA Engineer, J. Waterworth, BSc C.Geol, FGS.

Suitably experienced CQA Inspectors supervised the site works on a full-time basis, reporting to and supervised by the CQA Engineer.

The CQA Inspector maintained a daily record of the progress of the Works. The records made are attached at Appendix A. Representative photos of the works are shown at Appendix D.

2 SUMMARY OF WORKS COMPLETED

The cell containment works comprised the following elements:

- Trimming and preparation of the existing formation layer;
- Placement of additional regulating material as required;
- Earthworks comprising filling and compaction to form the cell design formation;
- the placement of a minimum 500mm layer of engineered clay at a permeability of $< 1x10^{-8}$ m/s across the base and side walls of the cell;

3 FORMATION

The CQA Engineer ensured that the Contractor prepared the formation surface such that the as constructed formation levels, presented on Drawing No. 3125/4/002 were in accordance with design requirements. The formation level was achieved by cut and fill operations to the cell base. Material from the cut operations were placed and compacted as general backfill to construct some of the cell base, in accordance with the agreed design detail. Before any filling took place the Contractor and the CQA Engineer jointly inspected every surface that was to receive fill.

The CQA Engineer inspected the existing ground surface and ensured that all soft or open textured areas were excavated and replaced with material compliant with the Specification, placed and compacted in accordance with the Specification for Highways Works, as defined in the Specification.

The CQA Engineer ensured that all existing ground surfaces were free of vegetation, putrescible material and hollow areas. The backfill material was placed and compacted over the cell base in accordance with the Specification.

The CQA Inspector ensured that the liner formation surface was firm, smoothly graded, proof-rolled and surveyed prior to the placement of the first layer of the clay liner. The CQA Inspector measured the in-situ shear strength of the compacted formation using a hand shear vane. The results are attached at Appendix B1 and indicate that the compacted clay had a shear strength of greater than the agreed minimum requirement of $45kN/m^2$ on the cell base and sideslopes.

The formation surface was released for the placement of clay liner by the CQA Inspector using subgrade release forms. The forms are attached at Appendix B2.

4 CLAY LINER

4.1 General Background

The source of clay used to form the clay liner was imported material named as the `Langley Road` clay source. The source was evaluated and accepted as being suitable as detailed in the in the clay source report referenced 3125-R4-1; dated August 2019, attached at Appendix C1. The results of source evaluation testing indicate that the material is suitable for use in forming the low permeability artificial geological barrier necessary in the clay liner construction..

4.2 Trial Liner

The Contractor undertook two trial liners that were relevant to the area of the cell validated by this report to prove that the proposed clay liner construction methods would achieve the required Specification. The trial was completed with TerraConsult in attendance and using the plant proposed for the works. Trials were carried out on the cell base and on the sideslope. TerraConsult report referenced 3125-R5-1; dated August 2020 describes and reports on trial liners 1 and 2 carried out including compliance field and laboratory testing. The field trials were undertaken using the same plant and techniques proposed to be utilised to construct the clay liner. The same compaction plant was utilised during the second and third stages of works during 2019 and 2020. The trial liners indicated that the proposed plant and methods would provide a compliant clay liner. Trial liner report is presented within Appendix C2.

4.3 Earthworks

The clay liner was constructed in accordance with the following:

- The clay liner was placed in separate layers of nominal thickness 250mm using a bulldozer;
- The clay liner source material was moisture conditioned using a water bowser both at the stockpile location and during placement within the cell area;
- A self-propelled vibrating smooth drum roller (13tonne Bomag 213DH) was used to compact the clay liner in accordance with the parameters set following source evaluation testing and compaction trials;
- The clay liner was placed in separate panels. The edge of a previously compacted panel was cut back prior to the placement and compaction of an adjacent panel, resulting in a stepped seal between two adjacent panels.

4.4 Compliance Testing

The results of source evaluation laboratory testing and the results of site and laboratory testing carried out on samples collected from the trial liner were used to provide the compaction parameters for the clay liner.

Testing of the in-situ density and moisture content of each layer of the clay liner was carried out using the core cutter method. The results of the in-situ testing are presented as tables and plotted onto density/moisture relationship graphs attached at Appendix C3. The test results indicate that the clay liner constructed met the requirements of the Specification.

The CQA Inspector measured the in-situ shear strength of the compacted clay liner using a hand shear vane with readings taken at each of the core cutter test locations. The results are attached at Appendix C4 and indicate that the compacted clay had a shear strength of greater than the agreed minimum requirement of 50kN/m^2 on the cell base and bunds.

The particle density used to indicate compliance of the material on the relationship graphs was 2.64Mg/m^3 based on source test results.

Clay classification testing was carried out on disturbed bulk samples collected from the liner to confirm conformance with the Specification and to confirm consistency with material previously tested. Copies of the particle density, particle size distribution and plasticity test results are presented at Appendix C5. The results indicate that the material met the requirements of the Specification and was consistent with that previously tested.

Undisturbed core cutter samples were tested for permeability using the constant head test method. The results are presented at Appendix C6 and indicate that the material tested met the requirements of the Specification.

The locations at which core cutter tests were carried out were recorded for each layer of compacted clay liner using a grid location system presented on Drawing No. 3125/4/001. Other in-situ test locations such as hand shear vanes, together with bulk and permeability sample locations are cross referenced to the corresponding core cutter number and are presented within Appendix C7,

4.5 Liner Thickness

Topographical surveys were carried out by the Contractor on the prepared clay liner formation surface and on the upper surface of the completed liner to ensure that the specified liner thickness had been achieved.

The results of the post trim surveys have been used to produce a liner thickness plan, shown on Drawing No. 3125/4/003 and as built clay liner levels shown on Drawing No. 3125/4/004. The survey results indicate that the clay liner is equal to or more than the minimum allowable thickness in all locations, plus twice the

tolerance of the surveying equipment. The survey tolerance used for the Clay liner was 20mm, doubled as per specification requirements = 40mm tolerance.

5 LEACHATE MONITORING POINT

The leachate monitoring point shown on Design Drawing 3125/2/001 is to be installed during a future phase of works after the commencement of waste placement. The leachate monitoring point is to be constructed from a platform of waste to prevent damage to the underlying cell lining system.

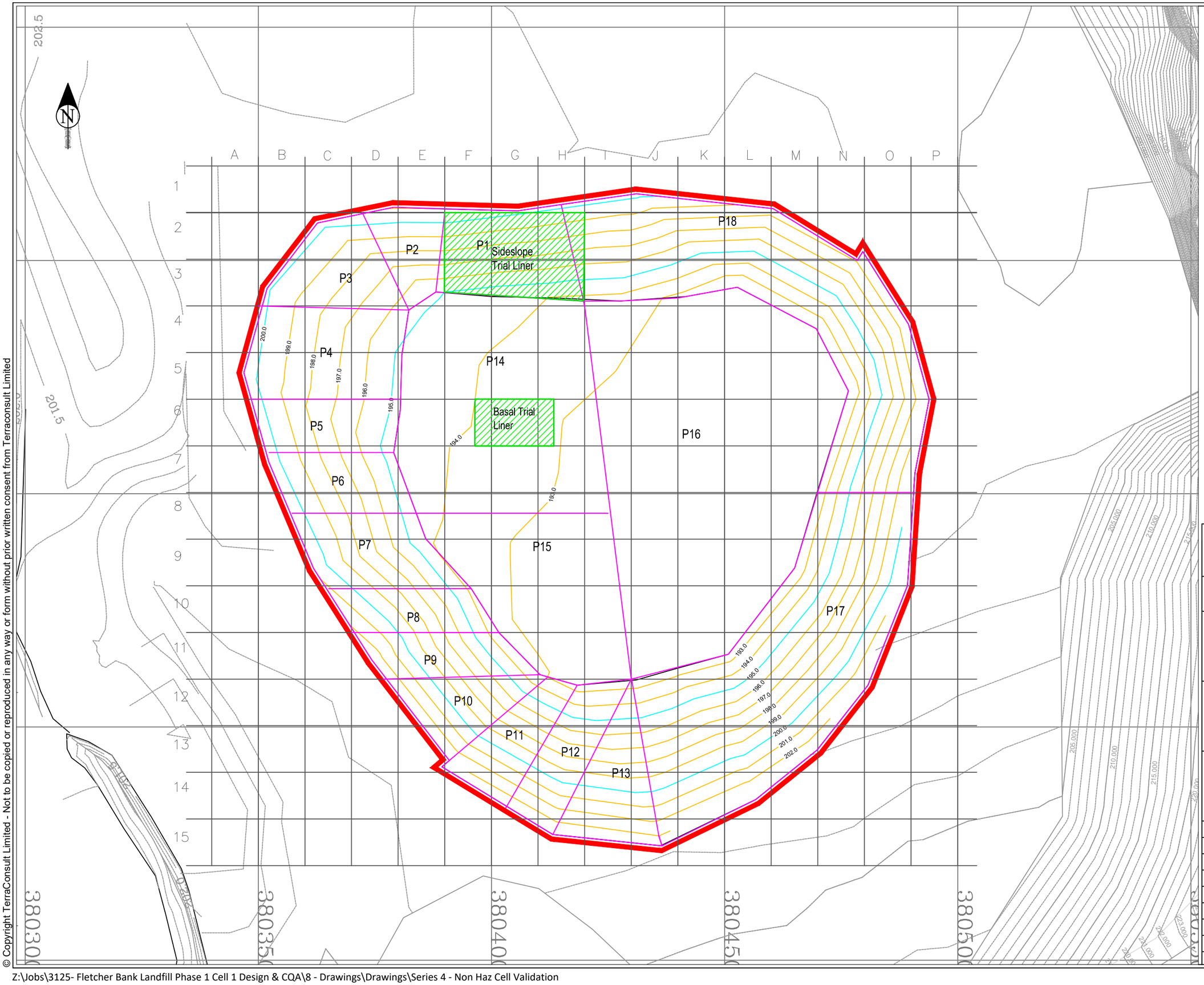
6 NON-COMPLIANCES

No non–compliances against the Specification were recorded during the installation of the liner system.

7 CONCLUSION

TerraConsult are satisfied that the clay liner to the cell base and bunds described above and as shown on the Drawings were constructed and installed within the Cell 1 area at Fletcher Bank Landfill Site in accordance with the requirements of the agreed Design Specification and QA Plan.

DRAWINGS



Key

- Existing ground contours
- Proposed top of liner contours
- LMP — Proposed leachate monitoring point
- CQA Grid (10m x 1m)
- Engineered liner panel reference
- Trial liner location

Notes

1. Do not scale.
2. All levels are in metres above Ordnance Datum.
3. Any anomalies on this drawing are to be brought to the attention of Terraconsult prior to construction

TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client: HURCHILL ENVIRONMENTAL, INC

Site: **Fletcher Bank Landfill Site**

Title: **CQA Test and Sample Location Grid**

Scale	1:750	@ A3
Drawing No.	3125/4/001	

Rev	Date	Description

File	3125.4.001 CQA Grid		
Date	11/20	Engineer	IJ
Drawn	JM	Checked	MG

Z:\Jobs\3125- Fletcher Bank Landfill Phase 1 Cell 1 Design & CQA\8 - Drawings\Drawings\Series 4 - Non Haz Cell Validation

Notes

1. Do not scale
2. All dimensions are in millimetres and all levels are in metres above Ordnance datum
3. Any anomalies on this drawing are to be brought to the attention of Terraconsult Ltd

150 Existing Contours (mOD)

Formation level contours (mOD)

193.241 Formation levels (m)

Extent of formation survey

TerraConsult
A BYRNELOOBY COMPANY

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

HURCHILL ENVIRONMENTAL, INC

Site

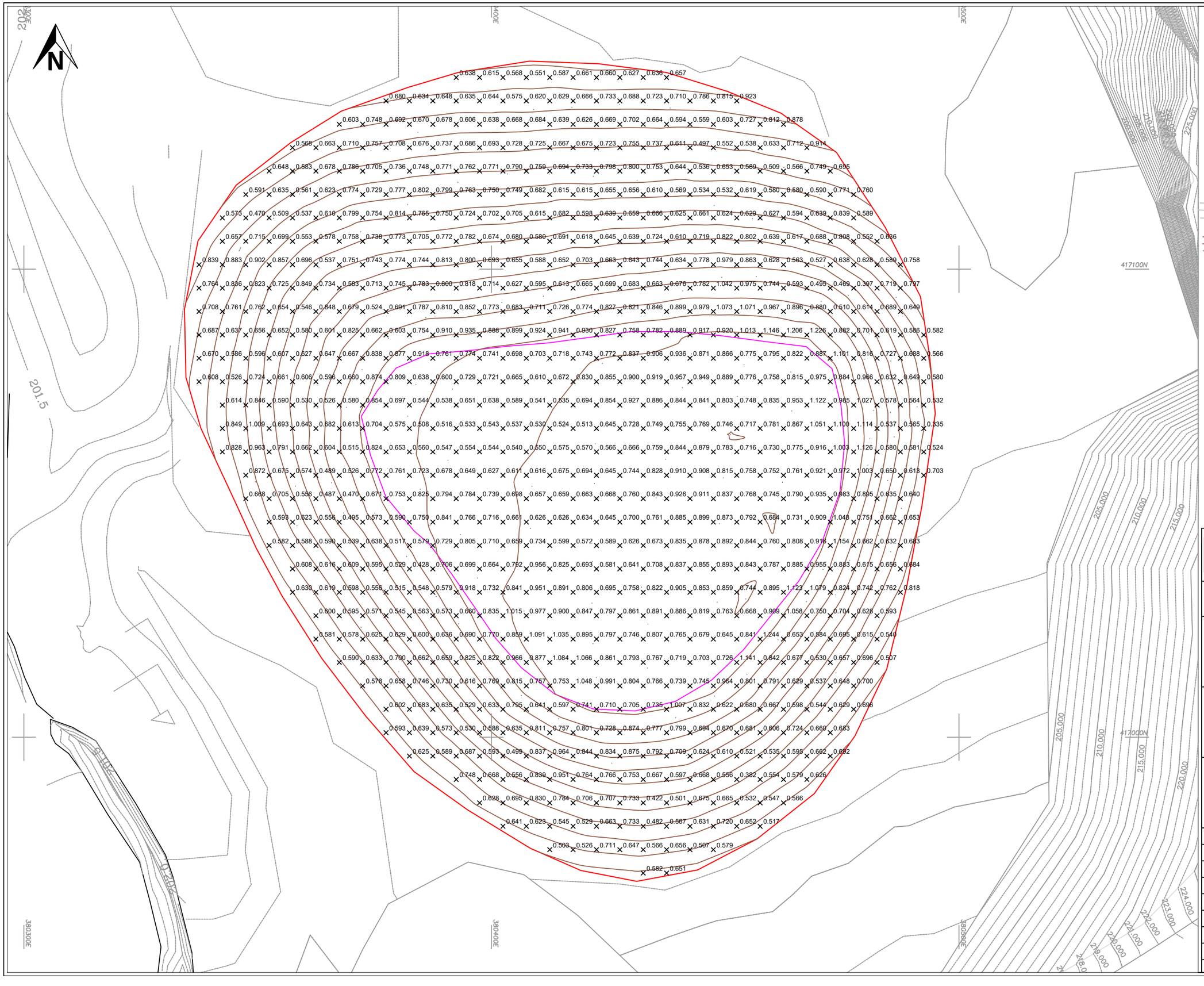
Fletcher Bank Quarry Landfill

Title

Formation Level

Scale	1:750	@ A3
Drawing No.	3125/4/002	
Rev	Date	Description
File	3125.4.002 Formation Level	
Date	10/20	Engineer MG
Drawn	JM	Checked MG

Z:\Jobs\3125- Fletcher Bank Landfill Phase 1 Cell 1 Design & CQA\8 - Drawings\Drawings\Series 4 - Non Haz Cell Validation



Notes

1. Do not scale
2. All dimensions are in millimetres and all levels are in metres above Ordnance datum
3. Any anomalies on this drawing are to be brought to the attention of Terraconsult Ltd

KEY

150 — Existing Contours (mOD)

Top of clay liner contours (mOD)

193.241 — Top of Clay Liner levels (m)

Clay liner validation area

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Client

HURCHILL ENVIRONMENTAL, INC

Site

Fletcher Bank Quarry Landfill

Title

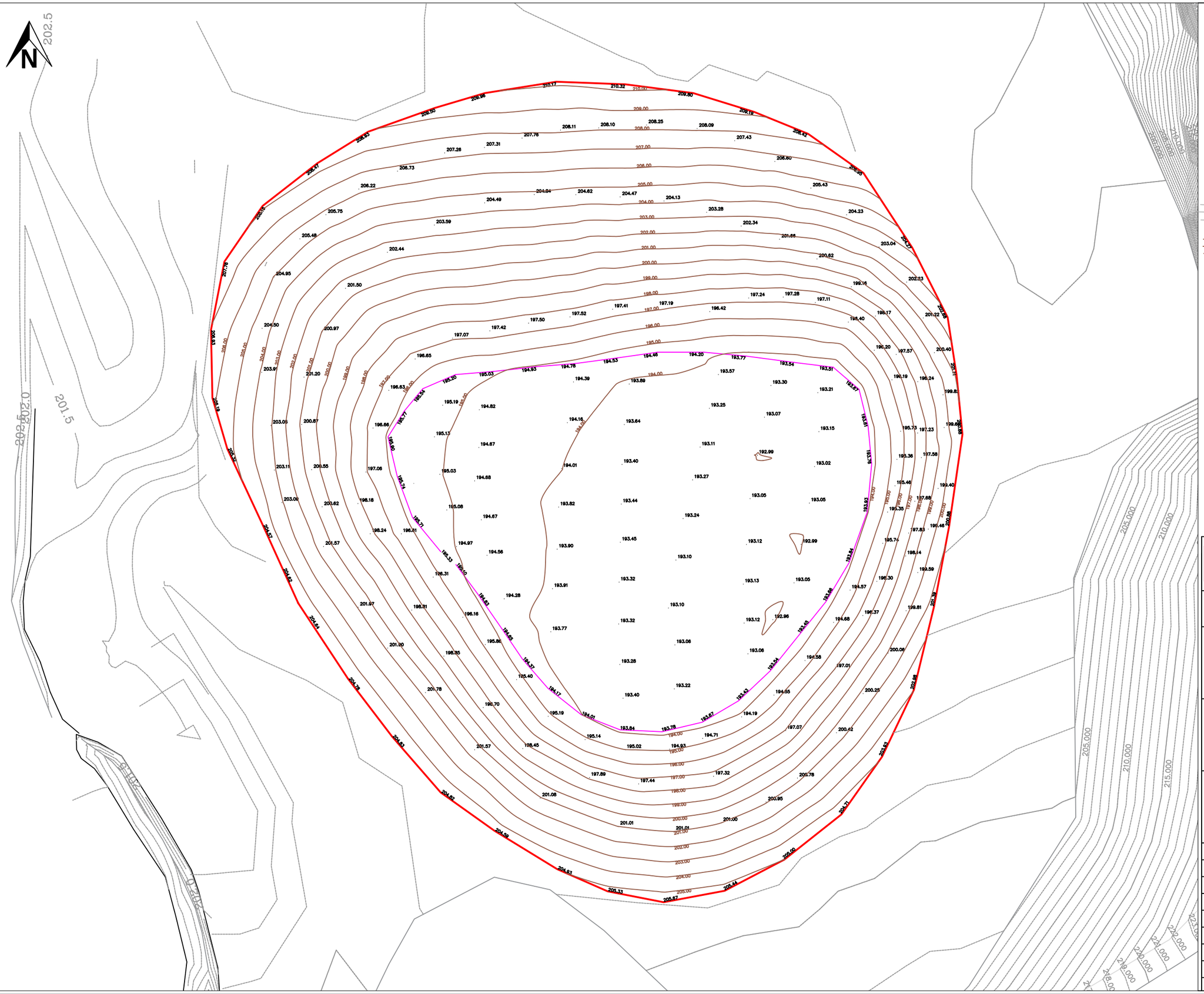
Engineered Clay Liner Thickness

Scale	1:750	@ A3
Drawing No.	3125/4/003	

Rev	Date	Description

File 3125.4.003 Clay Liner Thickness

Date	10/20	Engineer	GH
Drawn	JM	Checked	MG



Notes

1. Do not scale
2. All dimensions are in millimetres and all levels are in metres above Ordnance datum
3. Any anomalies on this drawing are to be brought to the attention of Terraconsult Ltd

KEY

150 — Existing Contours (mOD)

Top of clay liner contours (mOD)

193.241 — Top of Clay Liner levels (m)

Clay liner validation area

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Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

HURCHILL ENVIRONMENTAL, INC

Site

Fletcher Bank Quarry Landfill

Title

Top of Engineered Clay liner Levels

Scale	1:750	@ A3
Drawing No.	3125/4/004	

Rev	Date	Description

File	3125.4.004 Top of Engineered Clay Liner		
Date	Levels 10/20	Engineer	GH
Drawn	JM	Checked	MG

APPENDIX A

Daily Record Sheets

TerraConsult

Staff Member	Iain Jones	**Day/Date**	Wednesday 15th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast light rain showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Nnanna not onsite, Iain Jones onsite providing cover, EA informed of the situation.

Rain showers have hampered work slow progress

Maher's prepare P12 subgrade and proof roll using roller. Shear vanes taken across the surface all in excess of 50kPa.

Maher's then deploy layer 1 to P12 using clay stockpiled on cell floor.

Roller sealing all surfaces.

P8/L1/21 taken and tested passed ok, P8/L2 placed but not compacted only sealed using roller. Surface of layer 1 scarified using dozer tracks prior to placement of layer 2. P9-P12 also sealed but not compacted due to anticipated heavy rainfall.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Ged Maher	Director	07.30-17.00				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer	Cell 1	07.30-16.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Bomag 12t smooth drum roller	Cell 1	07.30-16.00		

TerraConsult

Staff Member	Iain Jones	**Day/Date**	Thursday 16th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast light wind		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Heavy rain over night has saturated the cell area. No lining works undertaken, Maher's moving clay stockpile to placement area in anticipation of placement

CQA left site 10:30

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Mahor	Manager	Onsite				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1	07.30-10.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1	07.30-10.00		

TerraConsult

Staff Member	Iain Jones	**Day/Date**	Friday 17th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast light wind		
List of Visitors			
1. Ged Maher	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Clay surfaces have dried since yesterday. Handover with John Phelan.

Panels 9 to 12 have been placed but require compacting 6no passes of the roller.

Layer 2 on Panels 9 to 12 placed.

Samples taken and tested for Moisture Content/Dry Density.

Bulk and Permeability Samples taken.

Shear Vanes were taken and shear strength is over 50 kN/m2.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	Onsite				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1	07.30-10.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1	07.30-10.00		

TerraConsult

Staff Member	John Phelan	**Day/Date**	Monday 20th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast		
List of Visitors			
1. Ged Maher	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Clay surfaces slightly wet in the the morning dried out during the day.

Layer 2 on Panels 9 to 12 placed and compacted.

2 Trial Pits were excavated on the base and the shear strength was over 50kN/m2.

8 Trial Pits were excavated on the south and east side walls and tested using a shear vane.

Taking hand shear vanes, shear strength was over 50kN/m2.

Samples taken and tested for Moisture Content/Dry Density.

Bulk and Permeability Samples taken.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	Onsite				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1	07.30-10.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1	07.30-10.00		

TerraConsult

Staff Member	John Phelan	**Day/Date**	Tuesday 21th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast		
List of Visitors			
1. Ged Maher	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Clay surfaces slightly wet in the morning dried out during the day.

Stripping and reworking clay on Panel 13.

4 Trial Pits were excavated on the base, shear vanes taken and the shear strength was over 50kN/m2.

Stripping and reworking clay on the base.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	Onsite				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1	07.30-10.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1	07.30-10.00		

TerraConsult

Staff Member	John Phelan	**Day/Date**	Wednesday 22nd August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with light showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No progress due to rain.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	Onsite				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1	07.30-10.00		
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1	07.30-10.00		

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Staff Member	John Phelan	**Day/Date**	Friday 24th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Heavy showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No progress due to rain.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Tuesday 28th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with light showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No work on the cell due to rain.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Wednesday 29th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with sunny spells		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No work on the cell due to wet clay surfaces.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Thursday 30th August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with sunny spells		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No work on the cell due to the contractor being off-site.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Maher	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Friday 31st August 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with sunny spells		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No work on the cell due to the contractor being off-site.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Mahor	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahers road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Monday 3rd September 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No progress on the cell due to rain.

Bulk samples and core cutter samples taken for permeability testing.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Mahor	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Tuesday 4th September 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with showers		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No progress on the cell due to rain.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Mahor	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1			

TerraConsult

Staff Member	John Phelan	**Day/Date**	Wednesday 5th September 2018
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Overcast with sunny spells		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

No work on the cell due to the contractor being off-site.

Problems Encountered

Weather conditions

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
Josh Mahor	Manager	No				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar excavator	Cell 1			
Caterpillar D6 Dozer	Site/Cell 1	When available		
Mahors road wagon	Cell 1			

TerraConsult

Staff Member	J Gibson	**Day/Date**	Tue 23rd July 2019
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and hot		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Dozer trimmed off top layer of liner materials in section of cell base.

Material conditioned with bowser and re-trimmed to form layer 2

Basal Trial Liner undertaken in grid square F6 for layers 1 and 2 with samples retained for lab testing

Basal area compacted to seal, though will need further compaction when dried out.

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer	Cell 1	08.00 to 15.00		
Bomag BW213 roller	Cell 1			

TerraConsult

Staff Member	J Gibson	**Day/Date**	Wed 24th July 2019
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and hot		
List of Visitors			

1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Overnight showers dampened down cell. No works during morning.

Layer 2 mineral liner sampled and site tested for moisture density. Samples retained for lab testing.

Ponded water allowed to dry in eastern half of base during morning

Problems Encountered

Cell too soft to compact during morning due to overnight rainfall

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer	Cell 1	08.00 to 16.00		
Bomag BW213 roller	Cell 1			

TerraConsult

Staff Member	J Gibson	**Day/Date**	Thu 25th July 2019
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and hot		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Western half of base re-rolled and compacted.

Ponded water pushed out towards northern drain and most of softened mineral liner trimmed off.

Testing carried out in eastern base to prove mineral liner quality

Dozer trimmed section of south east sidewall, removed thin vegetation and stone wash outs.

Further samples collected from mineral liner layer 1, via trial cuts and layer 2.

Problems Encountered

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer	Cell 1	08.00 to 15.00		
Bomag BW213 roller	Cell 1			

TerraConsult

Staff Member	J Gibson	**Day/Date**	Fri 26th July 2019
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and cloudy		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Replacement CQA visited site for handover.

Dozer and excavator trimmed some of unsuitable material from cell bund and soft material spread out to dry in base area.

Problems Encountered

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer	Cell 1	12.00 to 15.00		
Excavator	Cell 1			

TerraConsult

Staff Member	J Gibson	**Day/Date**	Tue 26th May 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and warm		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Site walkover with client, no works carried out.

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site

Plant	Area Working in	Hours worked	Standing	Breakdowns
		08.00 to 10.00		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Wed 27th May 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and warm		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

D6 dozer back bladed the basal area to help dry out surface.

Formation dampened down with bowser prior to placement of inert liner.

Plant began placement of site stockpiled silty inert liner material. Compacted to specification with smooth drum roller

Liner material same source as previously placed on other sections of cell 1, based on results gained from site and laboratory testing and trial liner construction and testing- no requirement to carry out further trial liner testing.

Problems Encountered

Dumper breakdown between 9.30 and 11.00, fitter carried out repair.

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Thu 28th May 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and hot		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Plant continued construction of upper cell 1 sidewall liner using site stockpiled material

Compaction of liner material carried out and subsequent sampling and site testing carried out. Laboratory samples were also collected.

Surveyor checked layer thickness of placed liner and marked up levels on the surface

Problems Encountered

Excavator breakdown for 2hrs during afternoon, broken pin repaired.

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Fri 29th May 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and warm		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Plant continued with placement of mineral liner on upper slope of Cell 1 using site stockpiled material

Continued sampling and site testing engineered liner material with samples also stored for laboratory testing

Plant completed layer 1 during early afternoon and conditioned surface before commencing layer 2 installation.

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Monday 1st June 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and warm/breezy		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Plant continued placement of inert liner layer 2 across upper section of cell 1 sidewall. Samples tested on site and retained for laboratory testing.

Surveyor checked liner thickness on upper sidewall.

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Tuesday 2nd June 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Dry and warm		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Plant continued placement of second layer of engineered liner across upper sidewall. Surface conditioning undertaken throughout placement. Small section of water damaged surface redressed with conditioned mineral liner.

Sampling and site testing of liner material undertaken, with samples retained for laboratory testing.

Surveyor checked levels on newly placed engineered liner

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Wednesday 3rd June 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather	Showers throughout and cooler		
List of Visitors			
1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Works mostly completed yesterday, prior to showers. Remainder of cell 1 to by smooth rolled/back-bladed once ground conditions improve and become drier.

Samples for laboratory left outside cabin for collection by courier

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
J Gibson	CQA	07.00 to 11.00				

Plant	Area Working in	Hours worked	Standing	Breakdowns

TerraConsult

Staff Member	J Gibson	**Day/Date**	Thursday 4th June 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather			
List of Visitors			

1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

TerraConsult

Staff Member	J Gibson	**Day/Date**	Friday 5th June 2020
Client	Churchill Enviro Ltd	**Site**	Fletcher Bank Landfill Site
Project	Cell 1 Non Hazardous Engineering Works		
Weather			
List of Visitors			

1.	2.	3.	4.
5.	6.	7.	8.

Details of Site Work and CQA Work :

Progress / Works Completed

Problems Encountered

None

Miscellaneous Plant and Workers Used

Contract Personnel	Position	On Site		Contract Personnel	Position	On Site
4 x plant drivers J Gibson	CQA	07.00 to 16.30				

Plant	Area Working in	Hours worked	Standing	Breakdowns
Caterpillar D6 Dozer Volvo Dumper A30 Excavator 35t Tractor and bowser Bomag Smooth drum roller BW213	Cell 1	07.00 to 16.30		

APPENDIX B

Formation Level

B1 Formation Hand Shear Vanes
B2 Subgrade Approval Records

B1 Formation Hand Shear Vanes

TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: A. Mudhar, Nnanna, Iain Jones
Material: Formation Surface

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
13.08.18	P1/SWTL	H3	100	106	102	103
13.08.18	P1/SWTL	G2	95	80	91	89
13.08.18	P2	F3	90	100	108	99
13.08.18	P2	E2	110	82	96	96
13.08.18	P3	D4	96	80	110	95
13.08.18	P3	C3	79	85	80	81
13.08.18	P4	D5	101	79	82	87
13.08.18	P4	B4	79	97	92	89
14.08.18	P5	D6	87	78	90	85
14.08.18	P5	B6	108	89	101	99
14.08.18	P6	D7	109	82	79	90
14.08.18	P6	C8	87	99	93	93
14.08.18	P7	E9	88	82	71	80
14.08.18	P7	C9	103	107	90	100
14.08.18	P8	E10	76	102	110	96
14.08.18	P8	D10	109	84	76	90
14.08.18	P9	F11	72	98	92	87
14.08.18	P9	E12	108	103	109	107
14.08.18	P10	G12	95	78	88	87
14.08.18	P10	F13	88	99	86	91
14.08.18	P11	H12	88	77	81	82
14.08.18	P11	G14	70	83	82	78
15.08.18	P12	H13	86	106	97	96
15.08.18	P12	H14	79	107	79	88
20.08.18	P13	I13	83	80	106	90
20.08.18	P13	I14	99	94	51	81
22.07.19	P14	G5	66	71	72	70
22.07.19	P14	F7	81	50	50	60
22.07.19	P14	H7	52	86	93	77
22.07.19	P14	E4	93	80	78	84
22.07.19	P15	H5	90	55	83	76
22.07.19	P15	G10	93	78	94	88
22.07.19	P15	H10	86	66	51	68
22.07.19	P16	I4	73	57	53	61
22.07.19	P16	K4	94	100	52	82
22.07.19	P16	I6	100	77	61	79
22.07.19	P16	K6	85	107	85	92
22.07.19	P16	M6	96	60	52	69
22.07.19	P16	J8	97	76	64	79
22.07.19	P16	L8	88	59	92	80
22.07.19	P16	K10	94	102	100	99
22.07.19	P17	N8	93	52	109	85
22.07.19	P17	M11	82	88	74	81
22.07.19	P17	L12	61	103	81	82
22.07.19	P17	K13	50	100	103	84

TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: A. Mudhar, Nnanna, Iain Jones
Material: Formation Surface

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
22.05.20	P18	E1	73	72	105	83
22.05.20	P18	G1	87	83	104	91
22.05.20	P18	I1	78	97	104	93
22.05.20	P18	J1	92	101	69	87
22.05.20	P18	L3	92	66	79	79
22.05.20	P18	N4	54	94	97	82
22.05.20	P18	O6	101	95	88	95

B2 Subgrade Approval Records

TerraConsult

CLAY LINER SUBGRADE APPROVAL RECORD

CQA Form 5

SITE : Fletcher Bank Landfill site	**DATE : 13/08/18**
JOB NO : 3125	**CQA INSPECTOR: Ash Mudhar, Nnanna**

Clay Liner Panel Reference	Remedial Works Completed :	Time of Day Approved :	Remarks :
P1/SWTL, P2, P3, P4	Surface graded and proof rolled	Ongoing	All surfaces >50kPa

TerraConsult

CLAY LINER SUBGRADE APPROVAL RECORD

CQA Form 5

SITE : Fletcher Bank Landfill site	**DATE : 14/08/18**
JOB NO : 3125	**CQA INSPECTOR: Nnanna**

Clay Liner Panel Reference	Remedial Works Completed :	Time of Day Approved :	Remarks :
P5 to P11	Surface graded and proof rolled	Ongoing	All surfaces >50kPa

TerraConsult

CLAY LINER SUBGRADE APPROVAL RECORD

CQA Form 5

SITE : Fletcher Bank Landfill site	**DATE : 15/08/18**
JOB NO : 3125	**CQA INSPECTOR: Iain Jones**

Clay Liner Panel Reference	Remedial Works Completed :	Time of Day Approved :	Remarks :
P12-P13	Surface graded and proof rolled using the smooth drum roller	13:30	All surfaces >50kPa

TerraConsult

CLAY LINER SUBGRADE APPROVAL RECORD

CQA Form 5

SITE : Fletcher Bank Landfill site	**DATE : 22/07/19**
JOB NO : 3125	**CQA INSPECTOR: Jim Gibson**

Clay Liner Panel Reference	Remedial Works Completed :	Time of Day Approved :	Remarks :
P14-P17	Surface graded and proof rolled using the smooth drum roller	10:00	All surfaces >50kPa

TerraConsult

CLAY LINER SUBGRADE APPROVAL RECORD

CQA Form 5

SITE : Fletcher Bank Landfill site	**DATE : 26/05/20**
JOB NO : 3125	**CQA INSPECTOR: Jim Gibson**

Clay Liner Panel Reference	Remedial Works Completed :	Time of Day Approved :	Remarks :
P18	Surface graded and proof rolled using the smooth drum roller	10:00	All surfaces >50kPa

APPENDIX C

Clay Liner

C1 Source Results
C2 Trial Liner Results
C3 Core Cutter Test Results
C4 Hand Shear Vane Test Results
C5 Classification Test Results
C6 Permeability Test Results
C7 Test and Sample Locations

C1 Source Results

TerraConsult

August 2019
Report No 3125-R4-1

FLETCHER BANK LANDFILL SITE PHASE 1 – CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

SOURCE EVALUATION REPORT

Prepared for

Churchill Enviro Ltd

FLETCHER BANK LANDFILL SITE PHASE 1 – CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

SOURCE EVALUATION REPORT

Date: August 2019

Prepared for

Churchill Enviro Ltd

By

TerraConsult Limited

Bold Business Centre
Bold Lane, Sutton
St. Helens, Merseyside
WA9 4TX
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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3125-R4-1	**Fletcher Bank Landfill Site** **Phase 1 - Cell 1 Non-Hazardous Construction Works** **Source Evaluation Report**

Issue History

Issue	Status	Date	Prepared By	Signature	Date
1	**Final**	**August 2019**	I. Jones	*I. Jones*	05/08/2019
			Checked By: M Gill	*M Gill*	05/08/2019
			Authorised By: J. Waterworth	*J. Waterworth*	05/08/2019

DISCLAIMER

This consultancy contract was completed by TerraConsult Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

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FLETCHER BANK LANDFILL SITE
CELL 1 – PHASE 1 NON-HAZARDOUS CONSTRUCTION WORKS

SOURCE EVALUATION REPORT

CONTENTS

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1 INTRODUCTION ……1

APPENDICES

Appendix A Langley Road Clay Source

A1 Source Evaluation and Conclusions
A2 Site Location Drawing
A3 Laboratory Test Results
A4 Target Compaction Graph

APPENDIX A

Langley Road Clay Source

A1 Source Evaluation and Conclusions
A2 Site Location Drawing
A3 Laboratory Test Results
A4 Target Compaction Graph

A1 Source Evaluation and Conclusions

LANGLEY ROAD CLAY SOURCE

The source material was excavated during development works at Angel Gardens, Ancoats, Manchester and subsequently stockpiled at Langley Road, Pendlebury, Salford. The material was stockpiled at Langley Road due to the confined city centre development site and timeframes required to excavate the material. Laboratory testing and analysis were carried out on samples taken from the stockpiled material located at Langley Road. The site is located as shown in Appendix A2 at national grid reference SJ833972. This report presents the results of the source evaluation and draws conclusions on the suitability of the clay to form a landfill liner.

The investigation and testing was undertaken in consideration of the need for the material to meet design criteria to be agreed with the Environment Agency.

The clay stockpile was visually inspected by an engineer from TerraConsult and was described as being a brown slightly gravelly sandy clay. The trial pits completed during the investigation were inspected and recorded to have no significant vertical or horizontal variation, the clay was found to be well broken down and uniformly graded.

Source Tests Completed

The laboratory test result sheets are summarised below.

Test Description	Clay Sample (05/17)	Sample 1 (09/17)	Sample 2 (09/17)	Sample 3 (09/17)	Sample 1 (10/17)	Sample 2 (10/17)
Natural moisture content	✓	✓	✓	✓	✓	✓
Liquid and plastic limits	✓	✓	✓	✓	✓	
Particle size distribution – coarse and fine	✓	✓	✓	✓	✓	
Particle density	✓			✓	✓	
2.5 kg compaction test	✓			✓	✓	
Remoulded triaxial constant head permeability test	✓	✓	✓	✓	✓	✓
Quick undrained shear strength	✓	✓	✓	✓	✓	

Laboratory Test Results

Analysis of the results of classification testing indicates that the clay has an intermediate plasticity. The source has a plasticity index which meets the published requirements of the Environment Agency.

The results of particle size distribution testing have been compared with the published requirements of the Environment Agency for material properties and the results of the comparison are set out in the table below.

Test Description	Definition	EA Spec'n	Clay Sample (05/17)	Sample 1 (09/17)	Sample 2 (09/17)	Sample 3 (09/17)	Sample 1 (10/17)
Percentage fines	Particles <0.063mm	≥20 (min clay content 8%)	48%	82%	59%	68%	55%
Percentage gravel	Particles >5mm	<30%	0%	2%	6%	4%	5%
Maximum particle size		<125mm	<5mm	<20mm	<22mm	<22mm	<14mm

The natural moisture content of the source equal to the optimum moisture content recorded during moisture / density relationship testing carried out on material. The natural moisture content is recorded to be in the range between 14% and 23%.

The Specification for the Langley Road clay source includes a minimum allowable moisture content equal to the plastic limit of 14%. The maximum allowable moisture content is to be controlled by the need to achieve 50kPa undrained shear strength. The clay is to contain no greater than 5% air voids using a particle density of 2.64Mg/m^3. A target compaction graph has been developed using the results of the laboratory testing and is attached at Appendix A4.

Six samples were tested for permeability. The measured permeability for the clay source varied between 1.2 x 10^{-10} m/s and 8.3 x 10^{-11} m/s when tested using the remoulded constant head triaxial method. The measured rates of permeability were less than the maximum allowable in the clay liner specification and the maximum allowable as published by the Environment Agency.

Conclusions and Recommendations

From the results of the laboratory testing and following a visual inspection of the source stockpile we would conclude that the material would be acceptable for use as a primary mineral liner to a landfill site.

The moisture content of the material is equal to the plastic limit / lower moisture limit and will require targeted moisture conditioning in order to produce a lining material compliant with the site Specification.

The permeability test results, detailed above, indicate that the clay out-performs the maximum allowed rate of permeability by more than two orders of magnitude.

FLETCHER BANK LANDFILL SITE
PHASE 1 – CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS
SOURCE EVALUATION REPORT

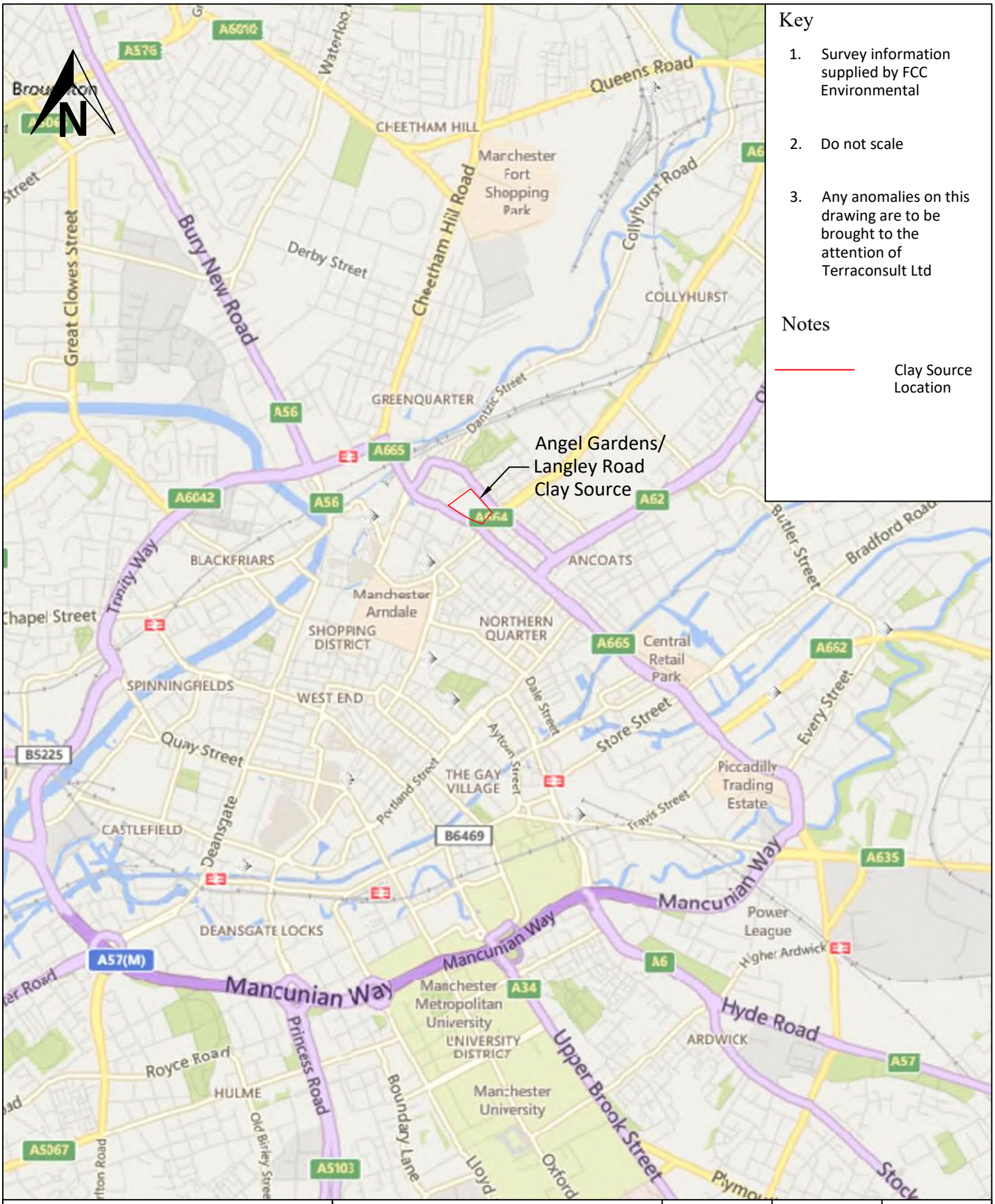
1. INTRODUCTION

1.1 This report presents the results of laboratory testing and analysis carried out on the proposed clay source to be used in the construction of the Phase 1 – Cell 1 Non Hazardous construction works to prove the source would achieve the required specification.

1.2 This report is presented as appendices and relates to the laboratory testing and analysis of the proposed Langley Road clay liner source.

1.3 Laboratory testing and analysis were carried out initially on samples taken from the stockpiled material located at Langley Road, Pendlebury, Salford.

A2 Site Location Drawing



TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

Churchill Enviro

Site

Fletcher Bank Quarry Landfill

Title

Angel Gardens / Langley Road Clay Source.

Scale	1:20'000	@ A4
Drawing No.	3125/5/001	
Rev	Date	Description
File	3125.5.001Clay Source.dwg	
Date	11/20	Engineer PCT
Drawn	JM	Checked MG

A3 Laboratory Test Results

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client W Maher & Sons Ltd

Address Rixton Old Hall
Manchester Road
Warrington
WA3 6EW

Contract Not advised

Job Number MRN 2545/49
Date of Issue 12 May 2017

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

33C, Vauxhall Industrial Estate, Greg Street, Reddish, Stockport SK5 7BR Tel: 0161 475 0870 Fax: 0161 475 0871
Email: steve@mtt-uk.com Website: www.murrayrix.com
Also at: London: 020 8523 1999

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

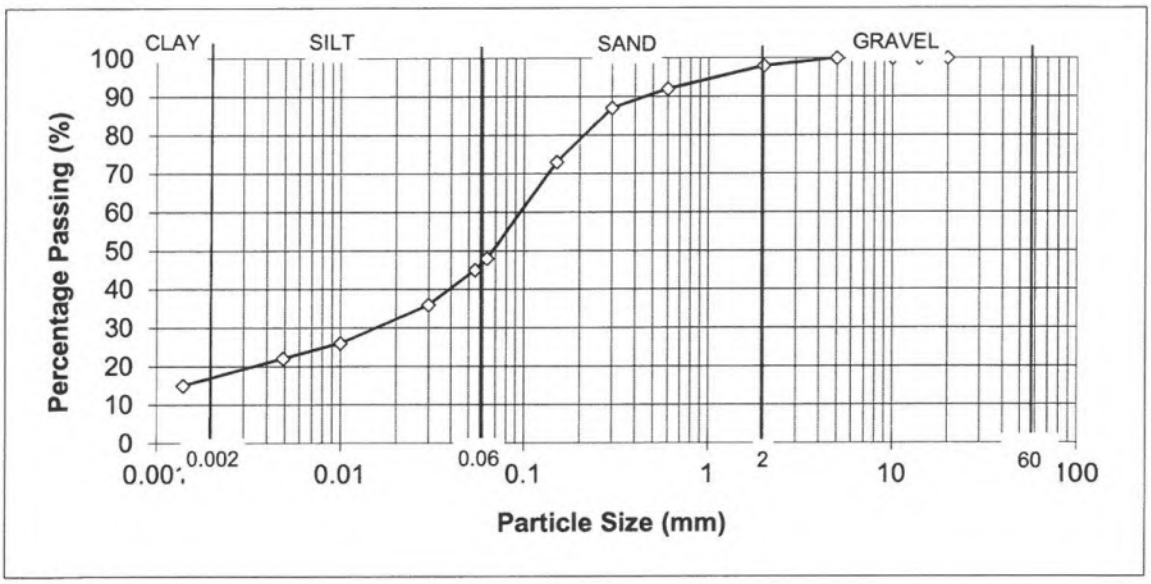
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	W Maher & Sons Ltd
SITE	Not advised
JOB NUMBER	MRN 2545/49

SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not advised
LAB SAMPLE No	69460	DATE RECEIVED	30-Mar-17
DATE TESTED	04-Apr-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty slightly sandy CLAY with a little gravel
ADVISED SOURCE	Site Won

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
20	100	0.15	73
14	100	0.063	48
10	100	0.054	45
5	100	0.03	36
2	98	0.01	26
0.6	92	0.0049	22
0.3	87	0.0014	15



REMARKS

As received moisture content = 23%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 12-May-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

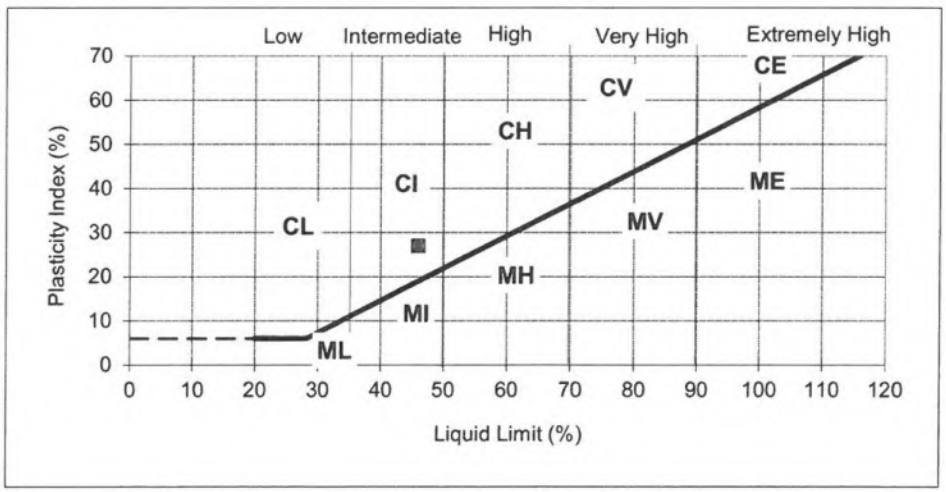
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	W Mahers & Sons Ltd
SITE	Not advised
JOB NUMBER	MRN 2545/49

SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not advised
SAMPLE No.	69460	DATE RECEIVED	30-Mar-17
DATE TESTED	04-Apr-17	SAMPLED BY	Murray Rix

MATERIAL	Stiff brown silty slightly sandy CLAY with a little gravel
ADVISED SOURCE	Site Won

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
23	46	19	27	90



REMARKS

Sample tested in natural condition

SIGNED

NAME O.P. Davies DATE 12-May-17

(Deputy Laboratory Manager)

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 & SPECIFICATION FOR HIGHWAY WORKS CLAUSE 633

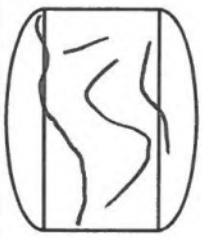
CLIENT	W Maher & Sons Ltd
SITE	Not advised
JOB NUMBER	MRN 2542/49

SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not advised
LAB SAMPLE No	69460	DATE RECEIVED	30 March 2017
DATE TESTED	04 April 2017	SAMPLED BY	Client

MATERIAL	Fill
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	23	%
BULK DENSITY	2.02	Mg/m^3
DRY DENSITY	1.64	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	mm
RATE OF STRAIN	1.0	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

Specimen at Failure



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max. Deviator Stress (kPa)	Shear Stress Cu (kPa)
200	20	2.0	193.9	97

REMARKS
Sample was recompacted at as received moisture content using the 2.5kg rammer
Original sample contained 0% material retaining 20mm test sieve

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 12 May 2017

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
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TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

CLIENT	W Maher & Sons Ltd
SITE	Not Advised
JOB NUMBER	MRN 2545/49

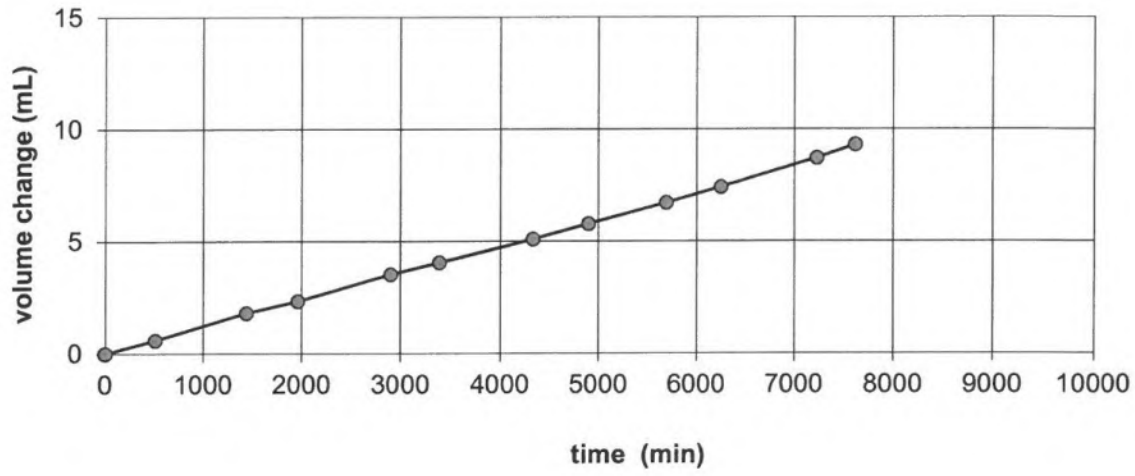
SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not Advised
LAB SAMPLE No.	69460	DATE RECEIVED	30/03/2017
DATE TESTED	04/04/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty slightly sandy CLAY with a little gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at as received moisture content using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS	
Height	100 mm		
Diameter	100 mm		
Bulk Density	2.02 Mg/m3	Bulk Density	2.05 Mg/m3
Moist. cont.	23 %	Moist. cont.	24 %
Dry Density	1.64 Mg/m3	Dry Density	1.65 Mg/m3
Flow Direction	vertical upwards		

Permeability (k) 9.5E-11 m/sec

PERMEABILITY STAGE		
Mean Effective Stress	100	kPa
Cell Pressure	415	kPa
Base Pressure	330	kPa
Top Pressure	300	kPa
Differential Head	30	kPa
Temperature	20	deg. C
Steady State Flow	1.38E-03	ml/min



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.95

Signed

Name S.J. Hutchings (Director) Date 19-May-17

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client W Maher & Sons Ltd

Address Rixton Old Hall
Manchester Road
Warrington
WA3 6EW

Contract Langley Road

Job Number MRN 2545/54
Date of Issue 15 September 2017
Page **1 of 13**

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

UKAS TESTING 1580

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Also at: London: 020 8523 1999

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

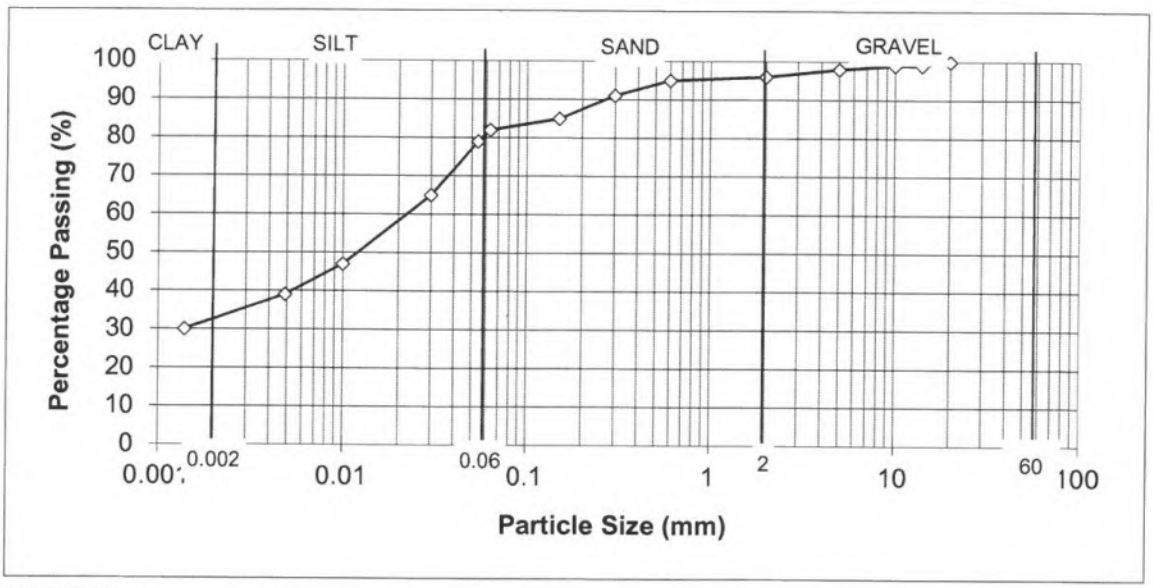
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 1	DATE SAMPLED	22-Aug-17
LAB SAMPLE No	71546	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
20	100	0.15	85
14	99	0.063	82
10	99	0.054	79
5	98	0.03	65
2	96	0.01	47
0.6	95	0.0049	39
0.3	91	0.0014	30



REMARKS

As received moisture content = 20%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15-Sep-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

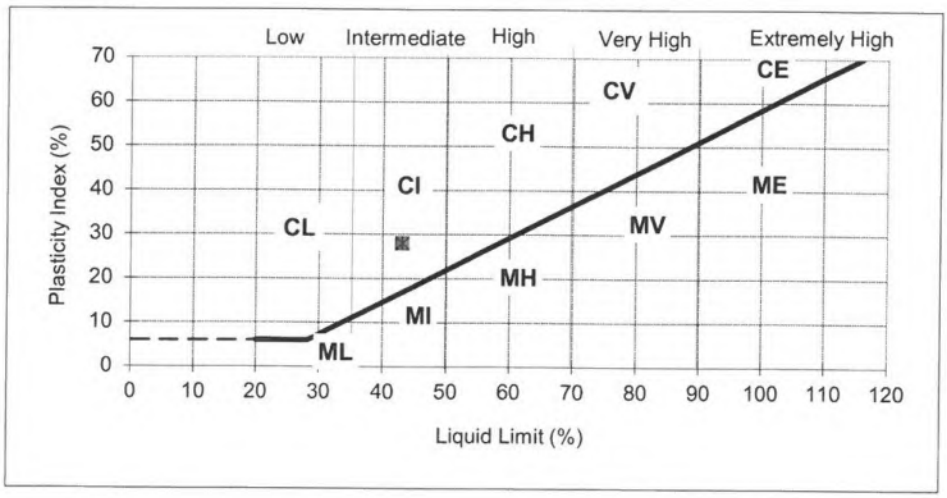
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	W Mahers & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 1	DATE SAMPLED	22-Aug-17
SAMPLE No.	71546	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20	43	15	28	94



REMARKS

Sample tested in natural condition

SIGNED

NAME O.P. Davies DATE 15-Sep-17

(Deputy Laboratory Manager)

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 & SPECIFICATION FOR HIGHWAY WORKS CLAUSE 633

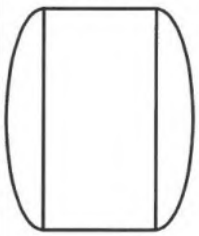
CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2542/54

SAMPLE LABEL	Sample 1	DATE SAMPLED	22 August 2017
LAB SAMPLE No	71546	DATE RECEIVED	22 August 2017
DATE TESTED	24 August 2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	20	%
BULK DENSITY	2.19	Mg/m^3
DRY DENSITY	1.83	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	mm
RATE OF STRAIN	1.0	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

Specimen at Failure



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max. Deviator Stress (kPa)	Shear Stress Cu (kPa)
200	20	2.0	163.9	82

REMARKS
Sample was recompacted at as received moisture content using the 2.5kg rammer
Original sample contained 0% material retaining 20mm test sieve

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15 August 2017

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
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TEL 020 8523 1999 FAX 020 8523 1888

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

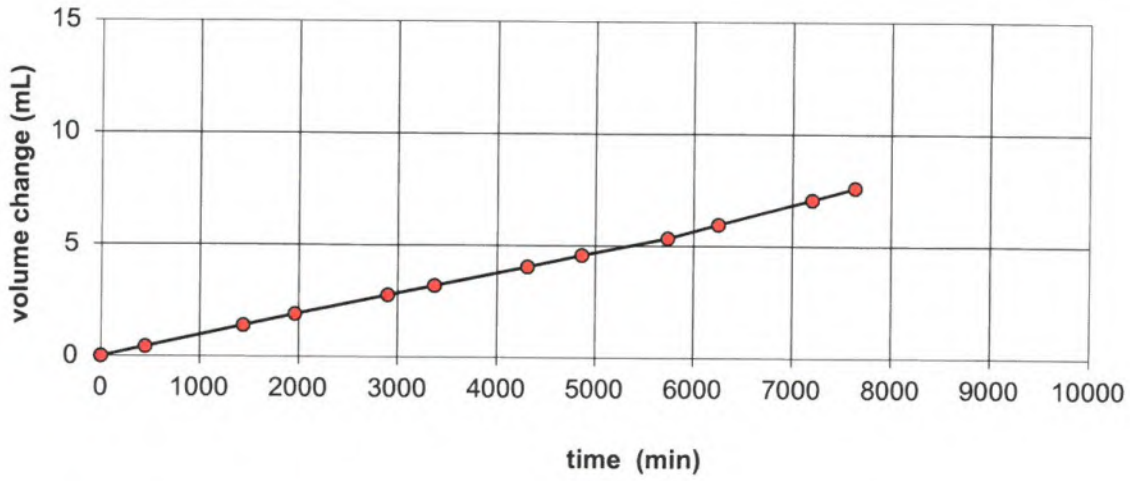
SAMPLE LABEL	Sample 1	DATE SAMPLED	22/08/2017
LAB SAMPLE No.	71546	DATE RECEIVED	22/08/2017
DATE TESTED	24/08/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at as received moisture content using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS	
Height	100 mm		
Diameter	100 mm		
Bulk Density	2.20 Mg/m3	Bulk Density	2.23 Mg/m3
Moist. cont.	20 %	Moist. cont.	21 %
Dry Density	1.83 Mg/m3	Dry Density	1.84 Mg/m3
Flow Direction	vertical upwards		

Permeability (k) 8.3E-11 m/sec

PERMEABILITY STAGE		
Mean Effective Stress	100	kPa
Cell Pressure	415	kPa
Base Pressure	330	kPa
Top Pressure	300	kPa
Differential Head	30	kPa
Temperature	20	deg. C
Steady State Flow	1.20E-03	ml/min



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.95

Signed

Name S.J. Hutchings (Director) Date 15-Sep-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

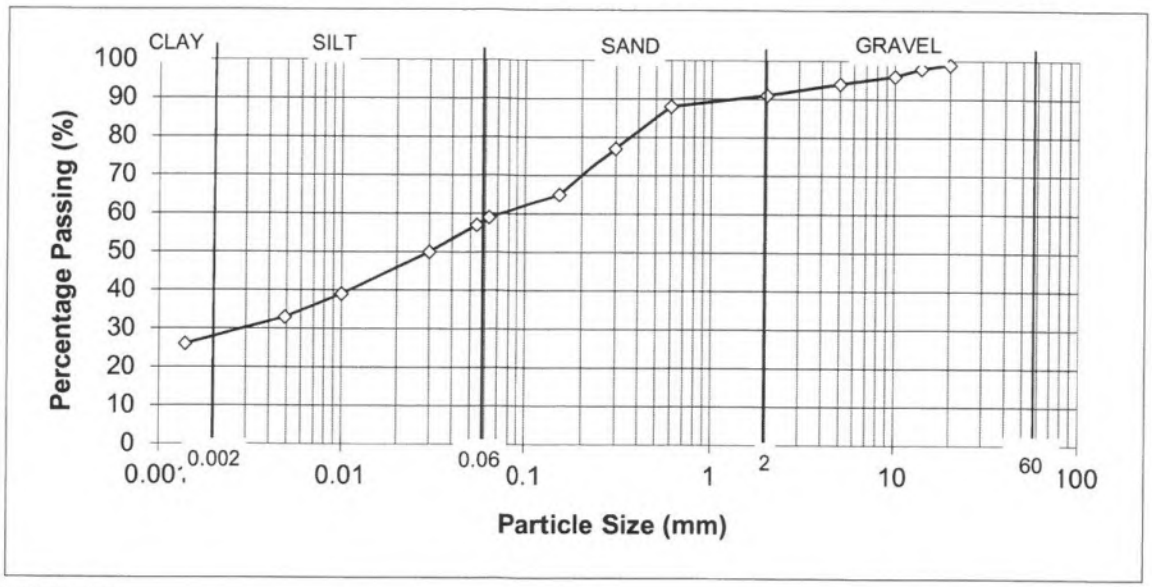
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 2	DATE SAMPLED	22-Aug-17
LAB SAMPLE No	71547	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
20	99	0.15	65
14	98	0.063	59
10	96	0.054	57
5	94	0.03	50
2	91	0.01	39
0.6	88	0.0049	33
0.3	77	0.0014	26



REMARKS

As received moisture content = 17%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15-Sep-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

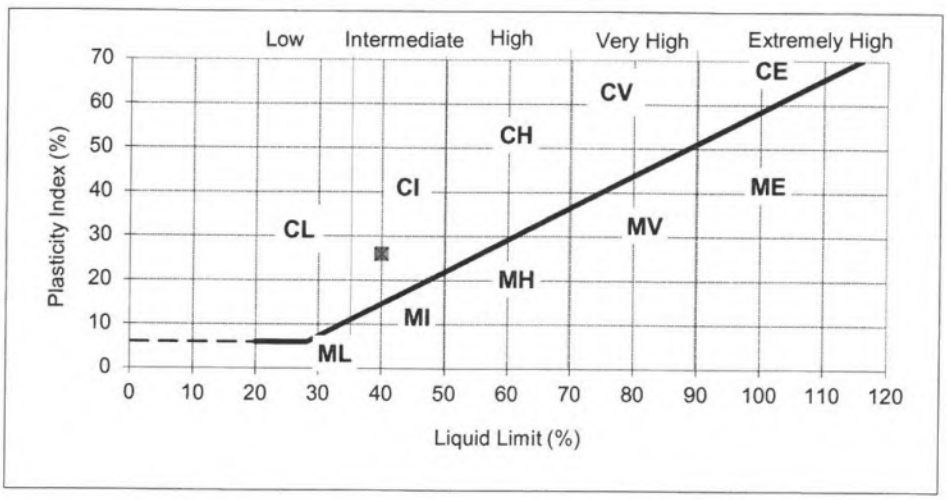
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	W Mahers & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 2	DATE SAMPLED	22-Aug-17
SAMPLE No.	71547	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
17	40	14	26	83



REMARKS

Sample tested in natural condition

SIGNED

NAME O.P. Davies DATE 15-Sep-17

(Deputy Laboratory Manager)

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 & SPECIFICATION FOR HIGHWAY WORKS CLAUSE 633

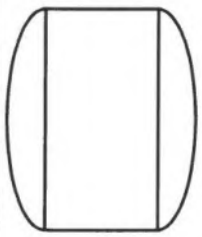
CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2542/54

SAMPLE LABEL	Sample 2	DATE SAMPLED	22 August 2017
LAB SAMPLE No	71547	DATE RECEIVED	22 August 2017
DATE TESTED	24 August 2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	17	%
BULK DENSITY	2.10	Mg/m^3
DRY DENSITY	1.80	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	mm
RATE OF STRAIN	1.0	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

Specimen at Failure



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max. Deviator Stress (kPa)	Shear Stress Cu (kPa)
200	20	2.0	178.4	89

REMARKS
Sample was recompacted at as received moisture content using the 2.5kg rammer
Original sample contained 1% material retaining 20mm test sieve

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15 August 2017

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 020 8523 1999 FAX 020 8523 1888

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

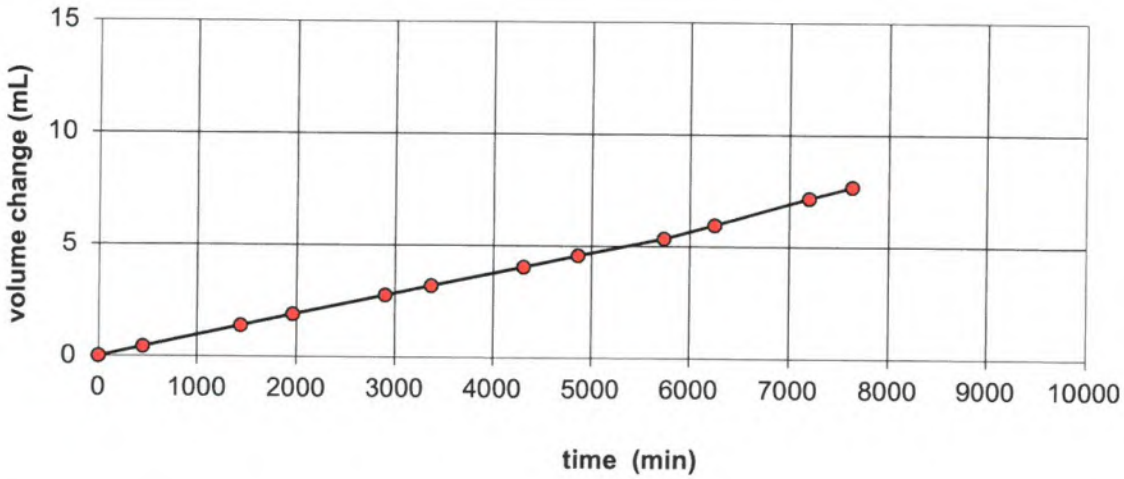
SAMPLE LABEL	Sample 2	DATE SAMPLED	22/08/2017
LAB SAMPLE No.	71547	DATE RECEIVED	22/08/2017
DATE TESTED	24/08/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at as received moisture content using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS	
Height	100 mm		
Diameter	100 mm		
Bulk Density	2.11 Mg/m3	Bulk Density	2.14 Mg/m3
Moist. cont.	17 %	Moist. cont.	18 %
Dry Density	1.80 Mg/m3	Dry Density	1.81 Mg/m3
Flow Direction	vertical upwards		

Permeability (k) 8.6E-11 m/sec

PERMEABILITY STAGE		
Mean Effective Stress	100	kPa
Cell Pressure	415	kPa
Base Pressure	330	kPa
Top Pressure	300	kPa
Differential Head	30	kPa
Temperature	20	deg. C
Steady State Flow	1.25E-03	ml/min



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.95

Signed

Name S.J. Hutchings (Director) Date 15-Sep-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

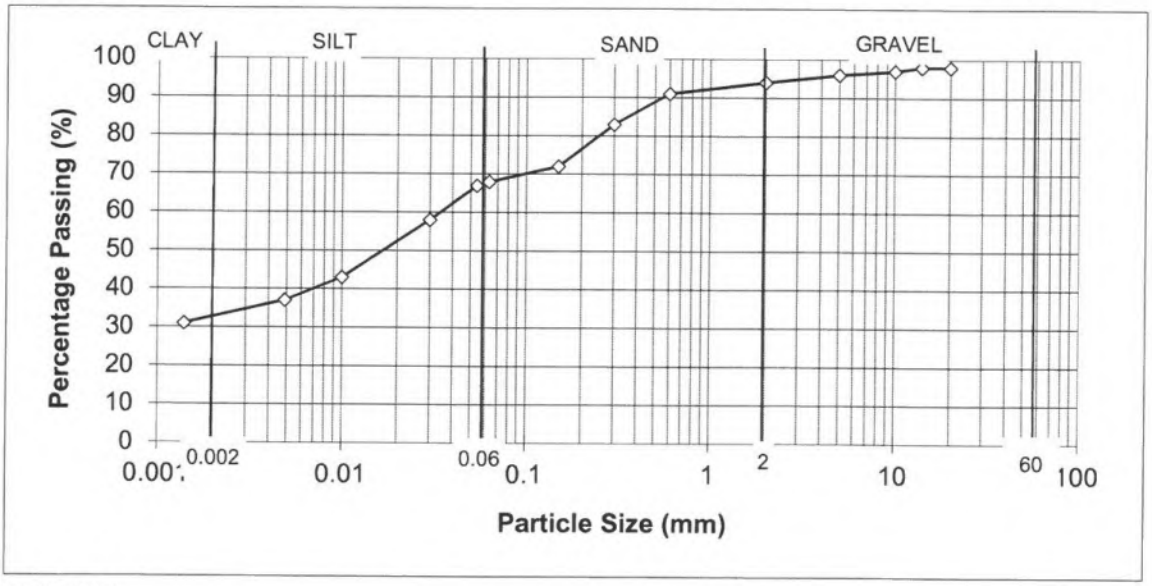
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 3	DATE SAMPLED	22-Aug-17
LAB SAMPLE No	71548	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
20	98	0.15	72
14	98	0.063	68
10	97	0.054	67
5	96	0.03	58
2	94	0.01	43
0.6	91	0.0049	37
0.3	83	0.0014	31



REMARKS

As received moisture content = 18%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15-Sep-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

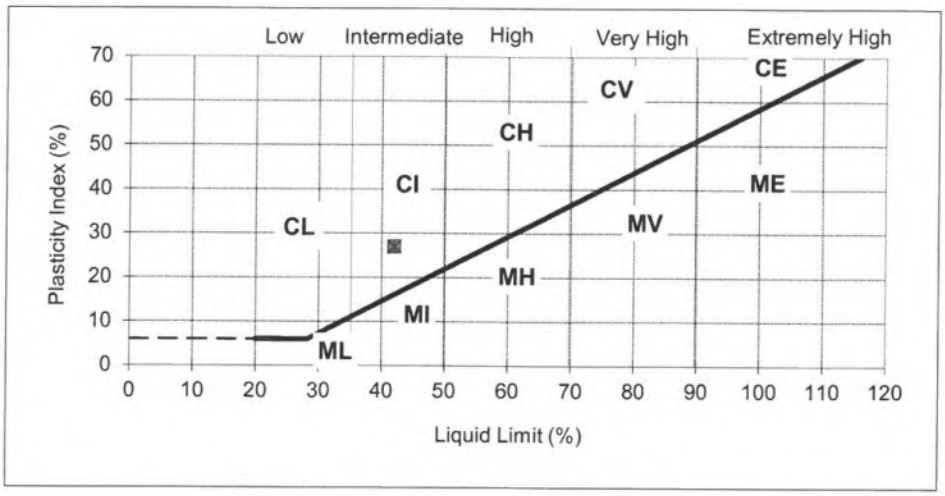
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	W Mahers & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

SAMPLE LABEL	Sample 3	DATE SAMPLED	22-Aug-17
SAMPLE No.	71548	DATE RECEIVED	22-Aug-17
DATE TESTED	24-Aug-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18	42	15	27	87



REMARKS

Sample tested in natural condition

SIGNED

NAME O.P. Davies DATE 15-Sep-17

(Deputy Laboratory Manager)

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 & SPECIFICATION FOR HIGHWAY WORKS CLAUSE 633

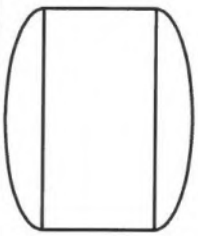
CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2542/54

SAMPLE LABEL	Sample 3	DATE SAMPLED	22 August 2017
LAB SAMPLE No	71548	DATE RECEIVED	22 August 2017
DATE TESTED	24 August 2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	18	%
BULK DENSITY	2.15	Mg/m^3
DRY DENSITY	1.82	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	mm
RATE OF STRAIN	1.0	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

Specimen at Failure



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max. Deviator Stress (kPa)	Shear Stress Cu (kPa)
200	20	2.0	170.1	85

REMARKS
Sample was recompacted at as received moisture content using the 2.5kg rammer
Original sample contained 2% material retaining 20mm test sieve

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 15 August 2017

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/54

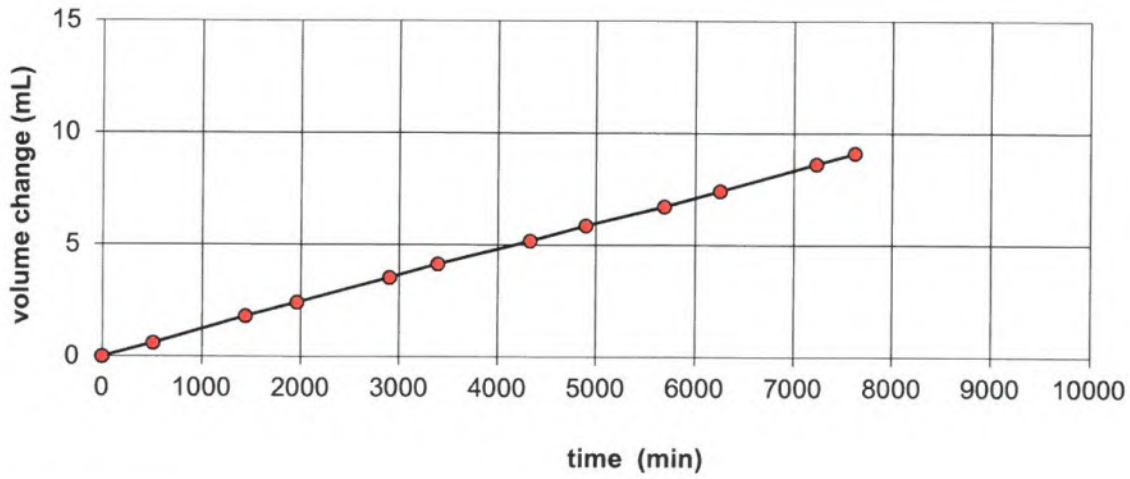
SAMPLE LABEL	Sample 3	DATE SAMPLED	22/08/2017
LAB SAMPLE No.	71548	DATE RECEIVED	22/08/2017
DATE TESTED	24/08/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at as received moisture content using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS	
Height	100 mm		
Diameter	100 mm		
Bulk Density	2.15 Mg/m3	Bulk Density	2.18 Mg/m3
Moist. cont.	18 %	Moist. cont.	19 %
Dry Density	1.82 Mg/m3	Dry Density	1.83 Mg/m3
Flow Direction	vertical upwards		

Permeability (k) 8.5E-11 m/sec

PERMEABILITY STAGE		
Mean Effective Stress	100	kPa
Cell Pressure	415	kPa
Base Pressure	330	kPa
Top Pressure	300	kPa
Differential Head	30	kPa
Temperature	20	deg. C
Steady State Flow	1.23E-03	ml/min



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.96

Signed

Name S.J. Hutchings (Director) Date 15-Sep-17

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client W Maher & Sons Ltd

Address Soapstone Way
Irlam
Manchester
M44 6RA

Contract Langley Road

Job Number MRN 2545/59
Date of Issue 27 October 2017

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

UKAS TESTING 1580
33C, Vauxhall Industrial Estate, Greg Street, Reddish, Stockport SK5 7BR Tel: 0161 475 0870 Fax: 0161 475 0871
Email: steve@mtt-uk.com Website: www.murrayrix.com
Also at: London: 020 8523 1999

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
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TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.5: 1990

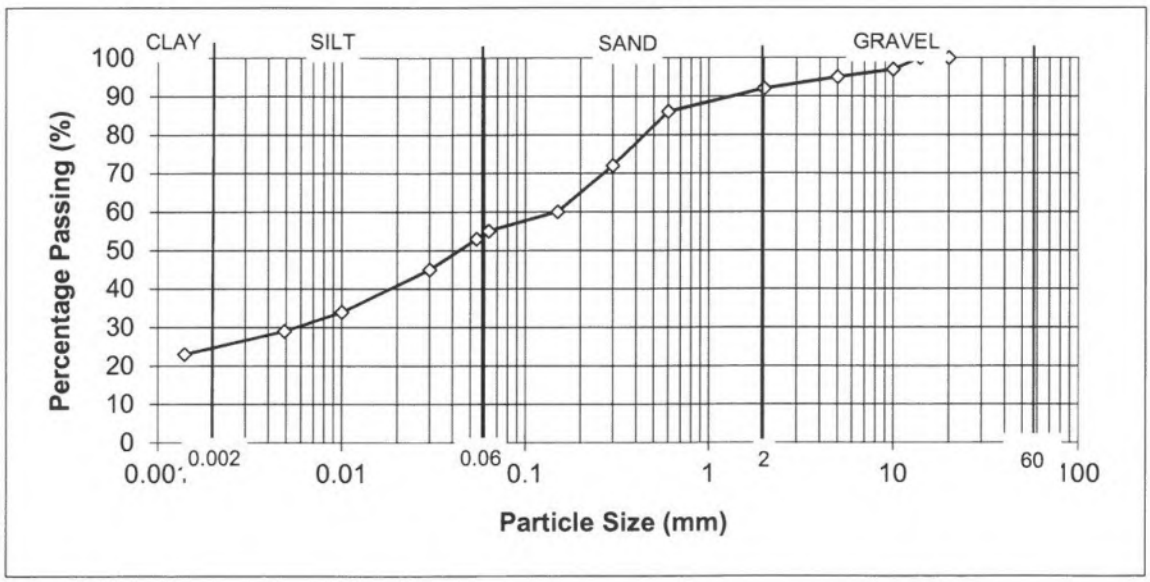
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/59

SAMPLE LABEL	Sample 1	DATE SAMPLED	25-Sep-17
LAB SAMPLE No	72507	DATE RECEIVED	25-Sep-17
DATE TESTED	26-Sep-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
20	100	0.15	60
14	100	0.063	55
10	97	0.054	53
5	95	0.03	45
2	92	0.01	34
0.6	86	0.0049	29
0.3	72	0.0014	23



REMARKS

As received moisture content = 15%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 03-Oct-17

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

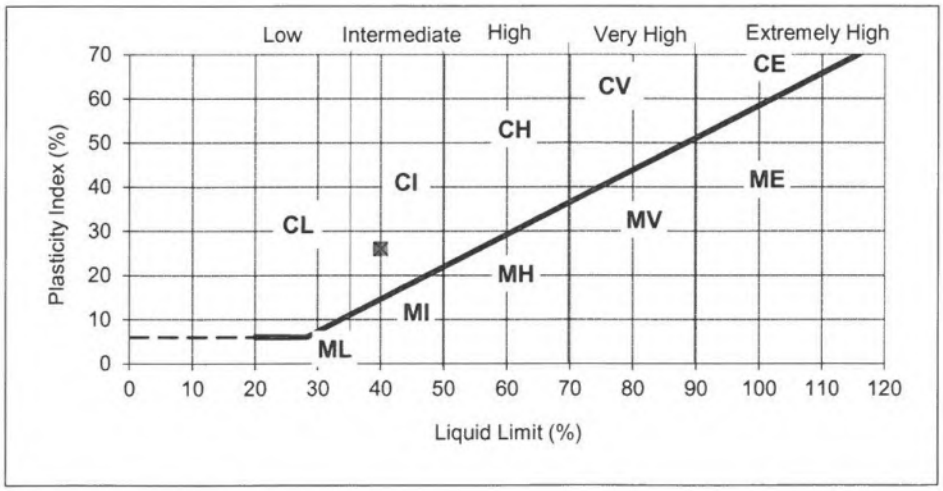
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	W Mahers & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/59

SAMPLE LABEL	Sample 1	DATE SAMPLED	25-Sep-17
SAMPLE No.	72507	DATE RECEIVED	25-Sep-17
DATE TESTED	26-Sep-17	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15	40	14	26	80



REMARKS

Sample tested in natural condition

SIGNED

NAME O.P. Davies DATE 03-Oct-17

(Deputy Laboratory Manager)

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 161 475N 0871

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 9 MULTI STAGE

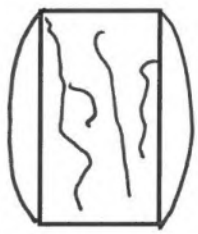
CLIENT	W Mahers & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/59

SAMPLE LABEL	Sample 1	DATE SAMPLED	25 September 2017
LAB SAMPLE No	72507	DATE RECEIVED	25 September 2017
DATE TESTED	27 September 2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	15	%
BULK DENSITY	2.13	Mg/m^3
DRY DENSITY	1.85	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
100	16	2.0	176.1	88
200	18	2.0	180.4	90
400	20	2.0	185.9	93

REMARKS
Sample received as a disturbed bulk sample. Sample was re-compacted at 15% moisture with a 2.5kg rammer.

SIGNED

NAME O.P. Davies
(Deputy Laboratory Manager)

DATE 03 October 2017

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

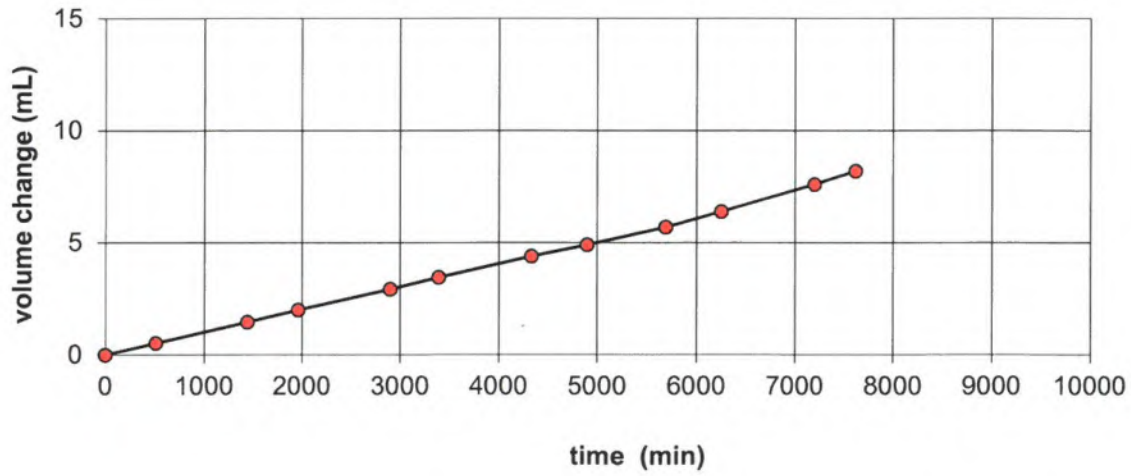
CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/59

SAMPLE LABEL	Sample 1	DATE SAMPLED	25/09/2017
LAB SAMPLE No.	72507	DATE RECEIVED	25/09/2017
DATE TESTED	26/09/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at a moisture content 15% using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS		PERMEABILITY STAGE		
Height	100 mm			Mean Effective Stress	100	kPa
Diameter	100 mm			Cell Pressure	415	kPa
Bulk Density	2.13 Mg/m3	Bulk Density	2.16 Mg/m3	Base Pressure	330	kPa
Moist. cont.	15 %	Moist. cont.	16 %	Top Pressure	300	kPa
Dry Density	1.85 Mg/m3	Dry Density	1.86 Mg/m3	Differential Head	30	kPa
Flow Direction	vertical upwards			Temperature	20	deg. C
				Steady State Flow	1.33E-03	ml/min

Permeability (k) 9.2E-11 m/sec



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.95

Signed

Name S.J. Hutchings (Director) Date 27-Oct-17

form triaperm

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DETERMINATION OF CONSTANT HEAD PERMEABILITY IN THE TRIAXIAL CELL
BS 1377 : Part 6 : Clause 6 : 1990

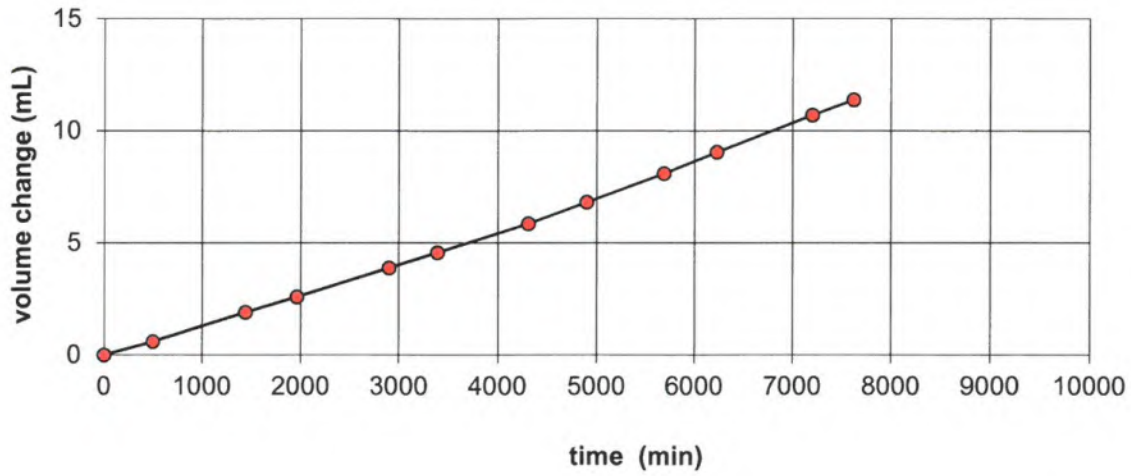
CLIENT	W Maher & Sons Ltd
SITE	Langley Road
JOB NUMBER	MRN 2545/59

SAMPLE LABEL	Sample 2	DATE SAMPLED	25/09/2017
LAB SAMPLE No.	72508	DATE RECEIVED	25/09/2017
DATE TESTED	26/09/2017	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Recompacted at a moisture content 14% using the 2.5kg rammer

INITIAL CONDITIONS		FINAL CONDITIONS		PERMEABILITY STAGE		
Height	100 mm			Mean Effective Stress	100	kPa
Diameter	100 mm			Cell Pressure	415	kPa
Bulk Density	2.07 Mg/m3	Bulk Density	2.12 Mg/m3	Base Pressure	330	kPa
Moist. cont.	14 %	Moist. cont.	15 %	Top Pressure	300	kPa
Dry Density	1.82 Mg/m3	Dry Density	1.84 Mg/m3	Differential Head	30	kPa
Flow Direction	vertical upwards			Temperature	20	deg. C
				Steady State Flow	1.68E-03	ml/min

Permeability (k) 1.2E-10 m/sec



Remarks/Abnormalities
Method of Saturation = Cell and Back Pressure
Value of pore pressure coefficient, B, achieved = 0.99

Signed

Name S.J. Hutchings (Director) Date 27-Oct-17

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client W Maher & Sons Ltd

Address Rixton Old Hall
Manchester Road
Warrington
WA3 6EW

Contract Fletcher Bank Quarry LFS

Job Number MRN 3295/8
Date of Issue 25 May 2018

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

UKAS TESTING 1580
33C, Vauxhall Industrial Estate, Greg Street, Reddish, Stockport SK5 7BR Tel: 0161 475 0870 Fax: 0161 475 0871
Email: steve@mtt-uk.com Website: www.murrayrix.com
Also at: London: 020 8523 1999

form omcram

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE

GREG STREET, REDDISH, STOCKPORT SK5 7BR

TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER

BS1377: PART 4: 1990

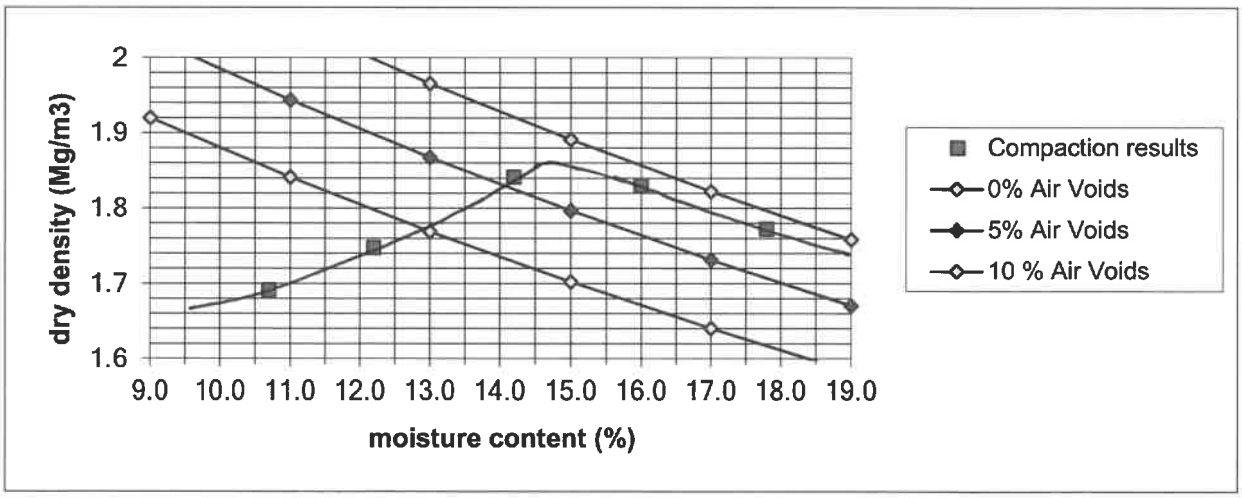
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	W Maher & Sons Ltd
SITE	Fletcher Bank LFS
JOB NUMBER	MRN 3295/8

SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not advised
LAB SAMPLE No	76714	DATE RECEIVED	03-May-18
DATE TESTED	09-May-18	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Air Dried/Separate batches

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		10.7	1.691
2		12.2	1.747
3		14.2	1.841
4		16.0	1.830
5		17.8	1.772
	Optimum	15.0	
	Maximum		1.86
	Particle Density	2.64 (Measured)	



REMARKS/ABNORMALITIES

Percentage of material retained on 37.5mm sieve = 0%

Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 25-May-18

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 161 475N 0871

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 9 MULTI STAGE

CLIENT	W Mahers & Sons Ltd
SITE	Fletcher Bank Quarry LFS
JOB NUMBER	MRN 3295/8

SAMPLE LABEL	Clay Sample	DATE SAMPLED	Not advised
LAB SAMPLE No	76714	DATE RECEIVED	03 May 2018
DATE TESTED	09 May 2018	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	17	%
BULK DENSITY	2.12	Mg/m^3
DRY DENSITY	1.81	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE

Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
100	16	2.0	214.2	107
200	18	2.0	218.0	109
400	20	2.0	223.9	112

REMARKS
Sample received as a disturbed bulk sample. Sample was re-compacted at received moisture with a 2.5kg rammer. 0% of material was retained on the 20mm test sieve.

SIGNED

NAME O.P. Davies
(Deputy Laboratory Manager)

DATE 25 May 2018

form omcram

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE

GREG STREET, REDDISH, STOCKPORT SK5 7BR

TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1680

TEST CERTIFICATE

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER

BS1377: PART 4: 1990

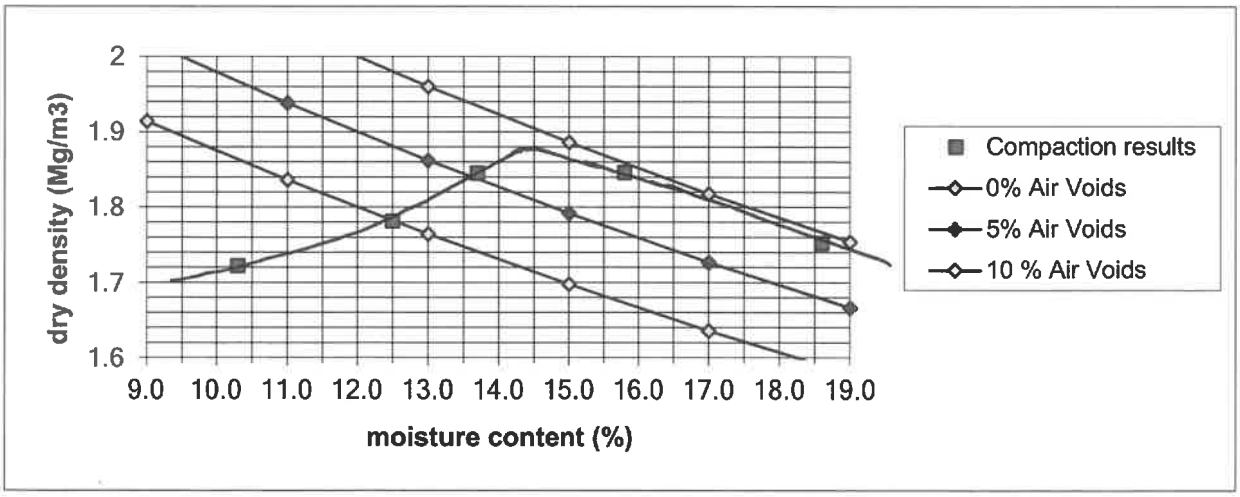
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	W Maher & Sons Ltd
SITE	Fletcher Bank LFS
JOB NUMBER	MRN 3295/8

SAMPLE LABEL	Sample - 3	DATE SAMPLED	Not advised
LAB SAMPLE No	76715	DATE RECEIVED	03-May-18
DATE TESTED	09-May-18	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Air Dried/Separate batches

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		10.3	1.722
2		12.5	1.781
3		13.7	1.845
4		15.8	1.846
5		18.6	1.752
	Optimum	14.0	
	Maximum		1.88
	Particle Density	2.63 (Measured)	



REMARKS/ABNORMALITIES

Percentage of material retained on 37.5mm sieve = 0%

Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 25-May-18

MURRAY RIX
33C VAUXHALL INDUSTRIAL ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 161 475N 0871

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 9 MULTI STAGE

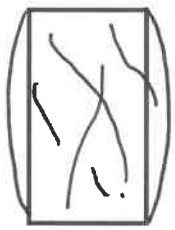
CLIENT	W Mahers & Sons Ltd
SITE	Fletcher Bank Quarry LFS
JOB NUMBER	MRN 3295/8

SAMPLE LABEL	Sample 3	DATE SAMPLED	Not advised
LAB SAMPLE No	76715	DATE RECEIVED	03 May 2018
DATE TESTED	09 May 2018	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	17	%
BULK DENSITY	2.12	Mg/m^3
DRY DENSITY	1.81	Mg/m^3
DEPTH OF TOP OF SPECIMEN	N/A	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
100	16	2.0	199.5	100
200	18	2.0	203.9	102
400	20	2.0	208.0	104

REMARKS
Sample received as a disturbed bulk sample. Sample was re-compacted at received moisture with a 2.5kg rammer. 0% of material was retained on the 20mm test sieve.

SIGNED

NAME O.P. Davies
(Deputy Laboratory Manager)

DATE 25 May 2018

form omcram

MURRAY RIX

33C VAUXHALL INDUSTRIAL ESTATE

GREG STREET, REDDISH, STOCKPORT SK5 7BR

TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER

BS1377: PART 4: 1990

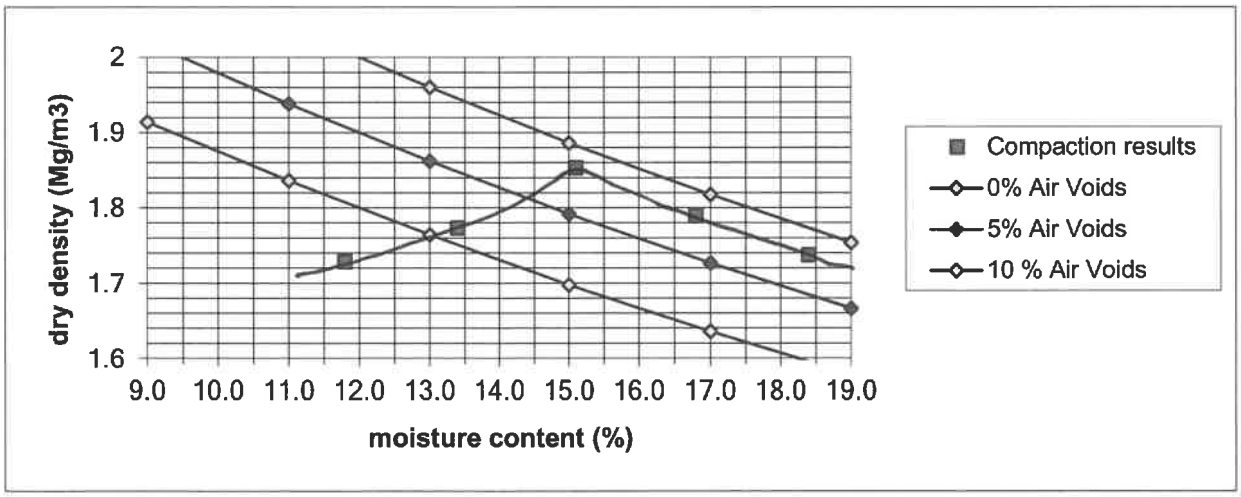
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	W Maher & Sons Ltd
SITE	Fletcher Bank LFS
JOB NUMBER	MRN 3295/8

SAMPLE LABEL	Sample 1	DATE SAMPLED	Not advised
LAB SAMPLE No	76716	DATE RECEIVED	03-May-18
DATE TESTED	09-May-18	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Won
PRE TREATMENT	Air Dried/Separate batches

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		11.8	1.728
2		13.4	1.773
3		15.1	1.853
4		16.8	1.789
5		18.4	1.737
	Optimum	15.0	
	Maximum		1.87
	Particle Density	2.63 (Measured)	



REMARKS/ABNORMALITIES

Percentage of material retained on 37.5mm sieve = 0%

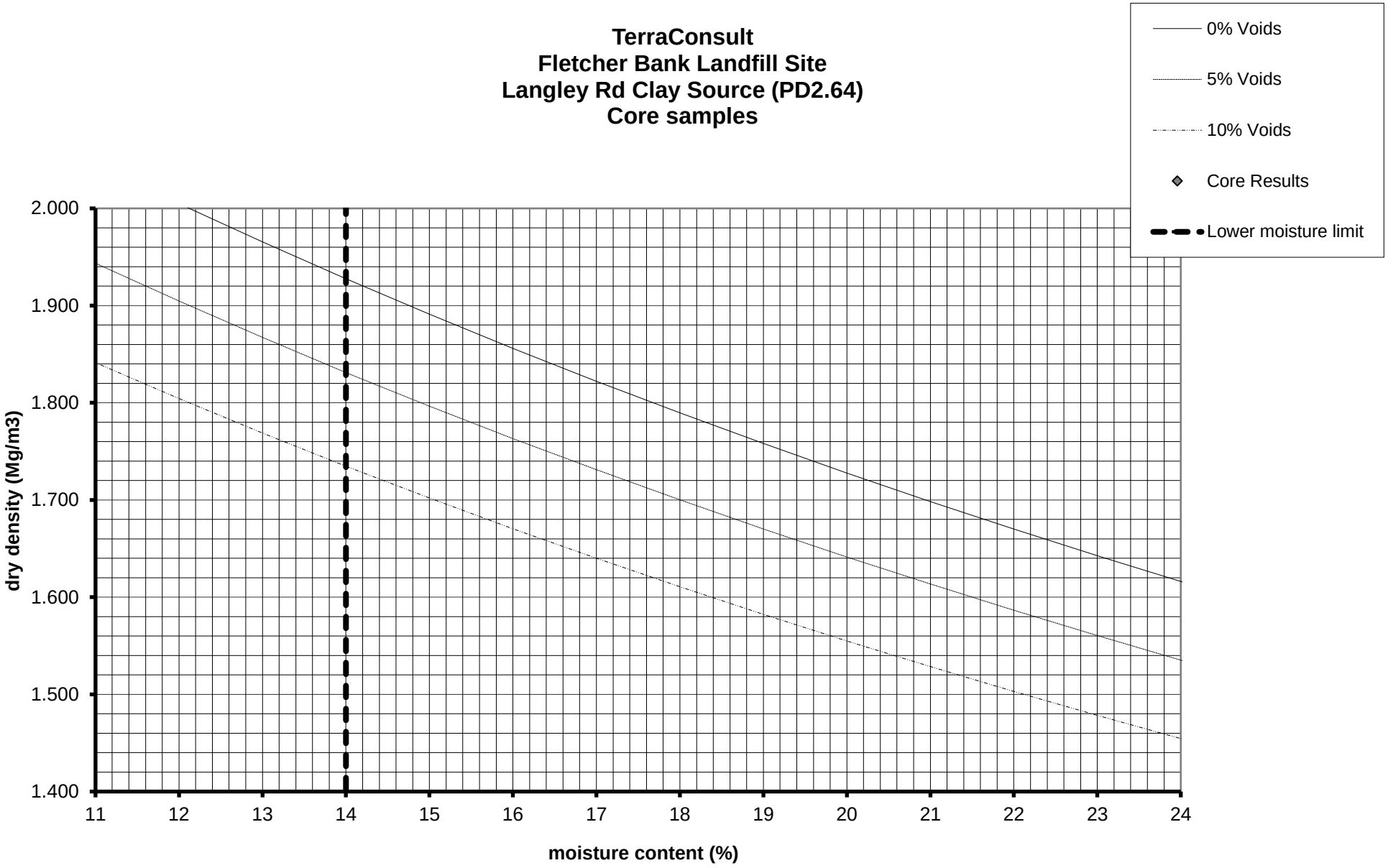
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies (Deputy Laboratory Manager) DATE 25-May-18

A4 Target Compaction Graph

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



C2 Trial Liner Results

TerraConsult

August 2020
Report No 3125-R5-1

FLETCHER BANK LANDFILL SITE PHASE 1 – CELL 1 NON-HAZARDOUS CONSTRUCTION ENGINEERING WORKS

TRIAL LINER REPORT

Prepared for

Churchill Enviro Ltd

FLETCHER BANK LANDFILL SITE
PHASE 1 CELL 1 NON-HAZARDOUS CONSTRUCTION ENGINEERING WORKS

TRIAL LINER REPORT

Date: August 2020

Prepared for

Churchill Enviro Ltd

By

TerraConsult Limited

Bold Business Centre
Bold Lane, Sutton
St. Helens, Merseyside
WA9 4TX
Telephone: 01925 291111
Facsimile: 01925 291191

DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3125-R5-1	**Fletcher Bank Landfill Site** **Phase 1 Cell 1 Non-Hazardous Construction Works** **Trial Liner Report**

Issue History

Issue	Status	Date	Prepared By	Signature	Date
1	Final	**August 2020**	M.Gill	*M. Gill*	30/08/2020
			Checked and Authorised By: J. Waterworth	*J. Waterworth*	30/08/2020

DISCLAIMER

This consultancy contract was completed by TerraConsult Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

TerraConsult Ltd cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

This report is issued solely to the client and TerraConsult cannot accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.

FLETCHER BANK QUARRY LANDFILL SITE

PHASE 1 CELL 1 NON-HAZARDOUS CONSTRUCTION WORKS

TRIAL LINER REPORT

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Plasticity Index Test Results
Constant Head Permeability Test Results

FLETCHER BANK LANDFILL SITE

TRIAL LINER REPORT

1 INTRODUCTION

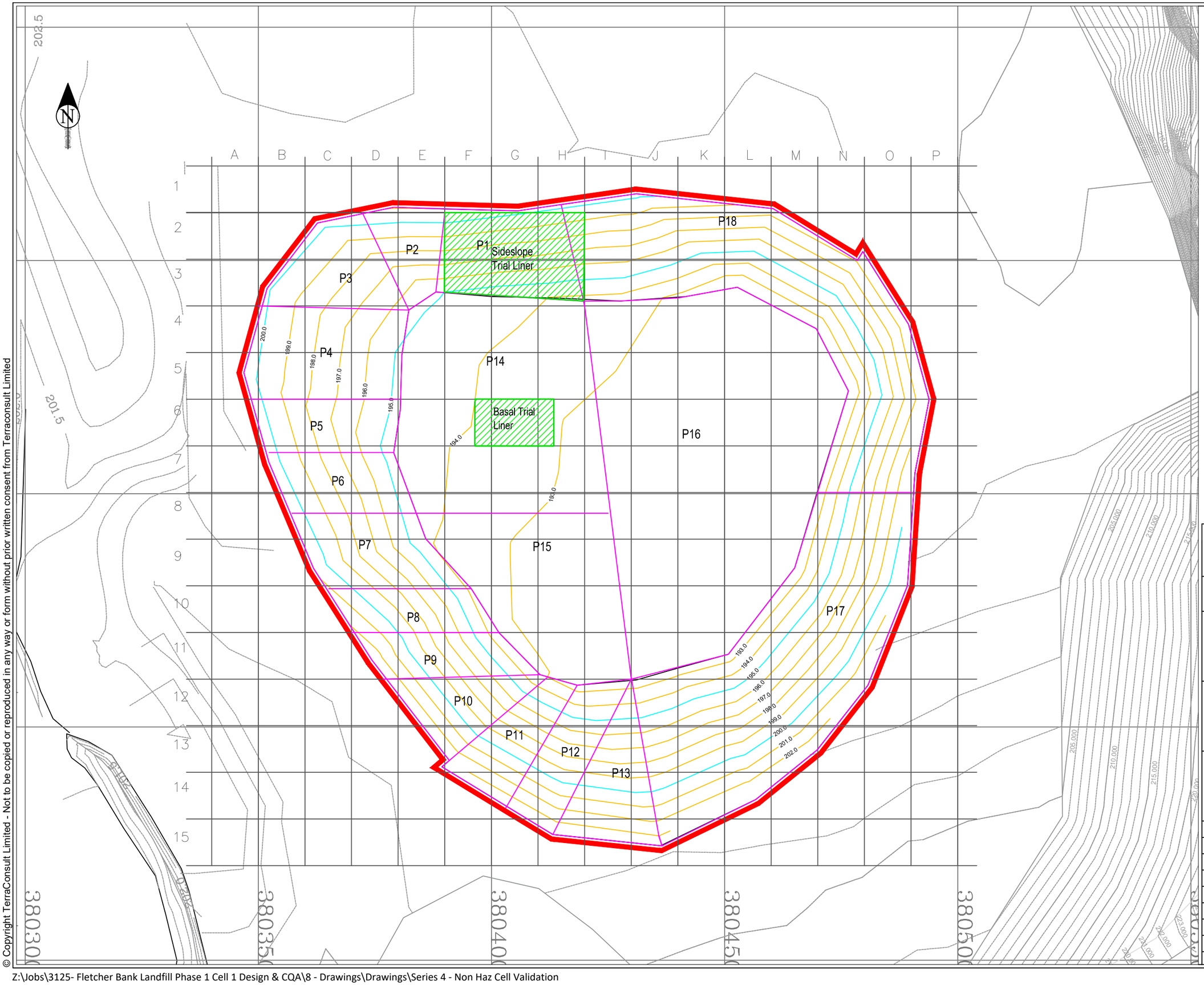
1.1 This report presents the results of field and laboratory testing, and detailed conclusions drawn from the compaction triasl carried out during the liner construction works to Phase 1 Cell 1 at Fletcher Bank Landfill Site. The lower sideslope and basal compaction trials were undertaken to prove that proposed methods for the construction of the mineral liner would achieve the required specification.

1.2 The report is presented as appendices with Appendices A and B relating to the compaction trial carried out on materials that have been used to form the mineral liner within Phase 1 Cell 1.

1.3 The trial liners were carried out using clay imported to site. The Langley Road source was excavated, imported and stockpiled on site during 2018.

1.4 The Langley Road clay source has been identified as being a brown slightly gravelly sandy clay.

DRAWING



Key

- Existing ground contours
- Proposed top of liner contours
- LMP — Proposed leachate monitoring point
- CQA Grid (10m x 1m)
- Engineered liner panel reference
- Trial liner location

Notes

1. Do not scale.
2. All levels are in metres above Ordnance Datum.
3. Any anomalies on this drawing are to be brought to the attention of Terraconsult prior to construction

TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client: HURCHILL ENVIRONMENTAL, INC

Site: **Fletcher Bank Landfill Site**

Title: **CQA Test and Sample Location Grid**

Scale	1:750	@ A3
Drawing No.	3125/4/001	

Rev	Date	Description

File	3125.4.001 CQA Grid		
Date	11/20	Engineer	IJ
Drawn	JM	Checked	MG

Z:\Jobs\3125- Fletcher Bank Landfill Phase 1 Cell 1 Design & CQA\8 - Drawings\Drawings\Series 4 - Non Haz Cell Validation

APPENDIX A

Sideslope Trial Liner

A1 Plant, Equipment and Methodology

A2 In Situ Testing

Core Cutter Test Results
Shear Vane Test Results

A3 Laboratory Testing

Constant Head Permeability Test Results
Particle Density Test Results
Particle Size Distribution Test Results
Plasticity Index Test Results

A1 Plant, Equipment and Methodology

Langley Road Clay Source Lower Sideslope Trial Liner
9th to 13th August 2018

Material

The clay has been identified as being a brown slightly gravelly sandy clay. It has been identified as a Class 2C material imported to site from excavation works undertaken at Angel Gardens, Ancoats, Manchester subsequently stockpiled at Langley Road, Salford and termed the `Langley Road` clay source.

Equipment Used

A CAT D6 dozer was used to spread out and level the material.
A Bomag BW213 self-propelled 13 tonne smooth drum vibrating roller set on vibration, was used to compact the material.

Trial Liner Parameters

The trial liner comprised of two lifts of mineral liner having an area of approximately 600m², compacted over an area of compacted lower sideslope formation surface approved by the CQA Inspector.

The methodology used to carry out the lower sideslope trial liner is set out below:

a) The work was carried out in general accordance with the recommendations made in The Highways Agency Specification For Highway Works, Series 600 - Earthworks, 2018.

b) The formation surface was scarified using the bulldozer tracks before placement of the material commenced.

c) Material was excavated from the Langley Road clay source stockpile, loaded, hauled and tipped by dump truck on the mineral layer. The clay was spread out, tracked in and graded level to form a layer thickness between 275mm and 300mm.

d) The layer was then compacted using a self -propelled vibratory roller with 6no. passes undertaken over the layer to form a final layer thickness of 250mm. The layer was then tested and sampled as specified in the agreed CQA Plan.

e) The surface of the placed layer was scarified using the dozer tracks prior to placement of the 2nd lift.

f) The second layer of mineral was then placed using the same methodology as per the initial layer and compacted using the self-propelled vibratory roller with 6no. passes undertaken over the layer. The layer was then tested and sampled as specified in the agreed CQA Plan

g) The trial liner was then partially dismantled to check for adequate inter-layer bonding. The trial was found to be in compliance with the Specification and remained in-situ as part of the permanent works.

Trial Liner Field Testing and Results

A total of 8no. in situ moisture / density tests were carried out using core cutter samples (BS 1377, Part 9, Method 2.4) at a frequency of four tests per lift; evenly distributed throughout each layer.

The results of the core cutter testing on indicated that the moisture / density requirements of the Specification had been met using 8no. passes.

Undrained shear strengths were measured using a hand shear vane at each of the core cutter test locations. The results indicated that the requirements of the Specification had been met using 8no. passes.

Trial Liner Laboratory Testing

The following is a list of laboratory tests carried out on samples removed from the compacted trial liner. The test results are presented at Appendix A3 to this report.

a) Undisturbed core cutter samples for constant head permeability testing in accordance with BS 1377: 1990; Part 6, Method 6. Permeability testing was carried out on 1no. sample from lift 1 and 1no. sample from lift 2. The results indicate that the mineral liner compacted using 8no. passes of the roller had a permeability less than the maximum allowed by the Specification.

b) Bulk samples for plasticity index in accordance with BS 1377 Part 2 Method 5. Plasticity testing was carried out on 1no. sample from lift 1 and 1no. sample from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

c) Bulk samples for particle density in accordance with BS1377 Part 2 Method 8. Particle density testing was carried out on 1no. sample from lift 1 and 1no. sample from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

d) Bulk samples for particle size distribution in accordance with BS1377 Part 2 Method 9.2 and Method 9.5. Particle size distribution testing was carried out on 1no. sample from lift 1 and 1no. sample from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

Conclusions and Recommendations

The results of core cutter testing carried out on site to determine the moisture content / dry density relationship of the mineral liner used to form the trial liner indicate that the density requirements of the specification had been met following 6no. passes of the roller.

The results of the trial and laboratory testing confirm that the methods and equipment used in undertaking the trial liner will produce a mineral liner which meets the requirements of the Specification.

A2 In Situ Testing

Core Cutter Test Results
Shear Vane Test Results

TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

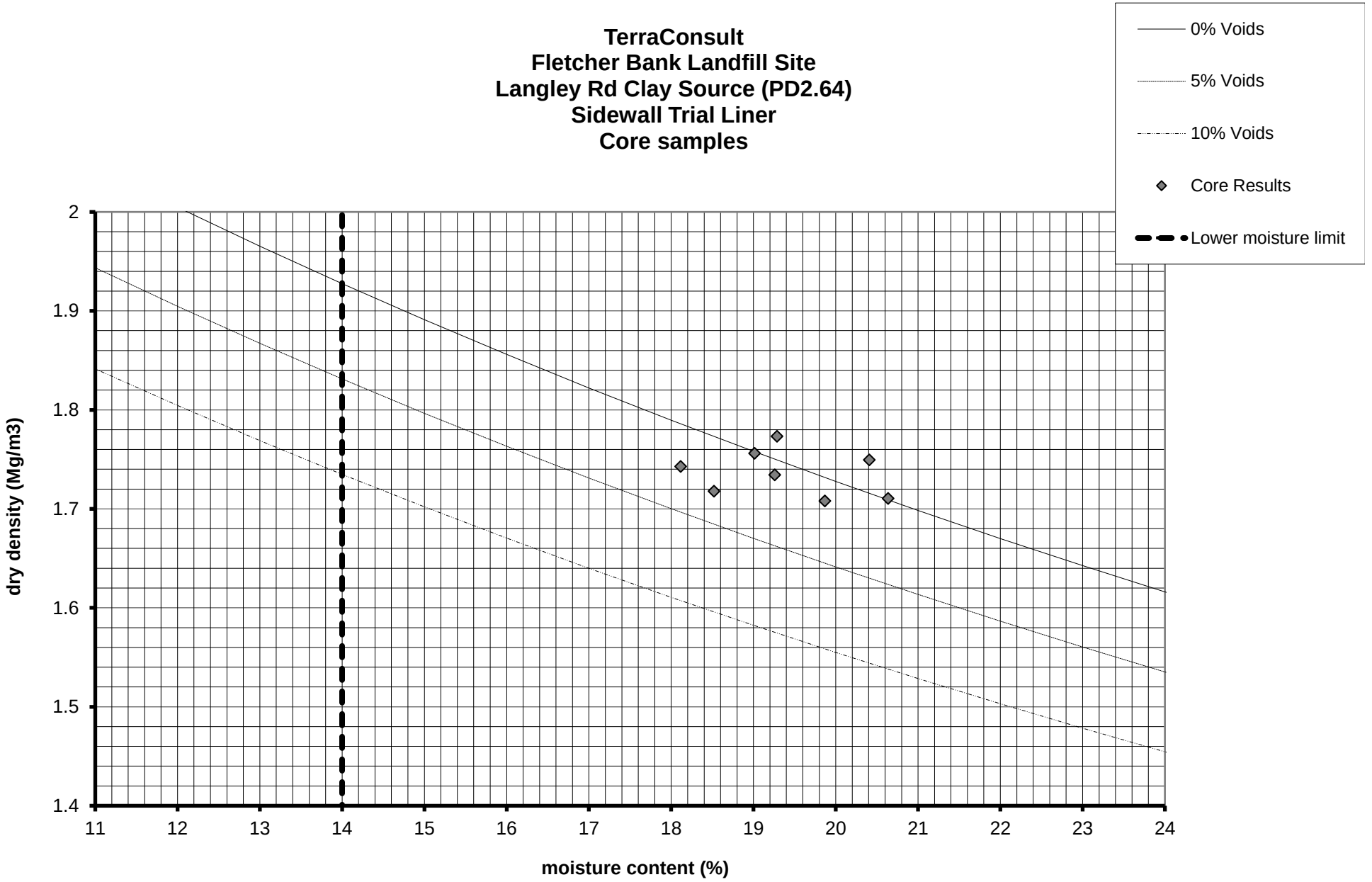
Job No: 3125

Engineer: Ash Mudhar
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Ref	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
09.08.18	SWTL/L1/01	F2	1025	2120	235	396	370	2.07	19.3	1.73	Pass
09.08.18	SWTL/L1/02	H2	1054	2146	235	395	370	2.04	18.5	1.72	Pass
09.08.18	SWTL/L1/03	F3	1054	2175	235	387	361	2.06	20.6	1.71	Pass
09.08.18	SWTL/L1/04	G3	1033	2159	235	404	377	2.09	19.0	1.76	Pass
13.08.18	SWTL/L2/05	G2	1005	2117	235	412	382	2.11	20.4	1.75	Pass
13.08.18	SWTL/L2/06	H2	1054	2158	235	416	386	2.05	19.9	1.71	Pass
13.08.18	SWTL/L2/07	F3	1025	2110	235	398	373	2.06	18.1	1.74	Pass
13.08.18	SWTL/L2/08	H3	1005	2126	235	402	375	2.12	19.3	1.77	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Sidewall Trial Liner
Core samples



TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: A. Mudhar
Material: Engineered Clay

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
09.08.18	SWTL/L1/01	F2	54	52	52	53
09.08.18	SWTL/L1/02	H2	110	88	80	93
09.08.18	SWTL/L1/03	F3	64	90	84	79
09.08.18	SWTL/L1/04	G3	60	58	50	56
13.08.18	SWTL/L2/05	G2	74	56	68	66
13.08.18	SWTL/L2/06	H2	62	84	68	71
13.08.18	SWTL/L2/07	F3	54	50	58	54
13.08.18	SWTL/L2/08	H3	94	72	70	79

A3 Laboratory Testing

Constant Head Permeability Test Results
Particle Density Test Results
Particle Size Distribution Test Results
Plasticity Index Test Results

LABORATORY REPORT

REPORT

4043

Contract Number: PSL18/4121

Report Date: 27 September 2018

Client's Reference: 3125

Client Name: Terra Consult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: Ash Mudhar/Nnanna Obilor

Contract Title: Fletcher Bank LFS

Date Received: 16/8/2018
Date Commenced: 16/8/2018
Date Completed: 27/9/2018

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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Doncaster DN4 0AR
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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
	SWTL/L1/01				Brown gravelly very sandy CLAY.
	SWTL/L1/01				Brown gravelly very sandy CLAY.
	SWTL/L2/07				Brown gravelly very sandy CLAY.
	SWTL/L2/07				Brown gravelly very sandy CLAY.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL18/4121 Client Ref: 3125

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
	SWTL/L1/01				19		2.61	36	17	19	83	Intermediate plasticity CI.
	SWTL/L2/07				19		2.64	35	16	19	78	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

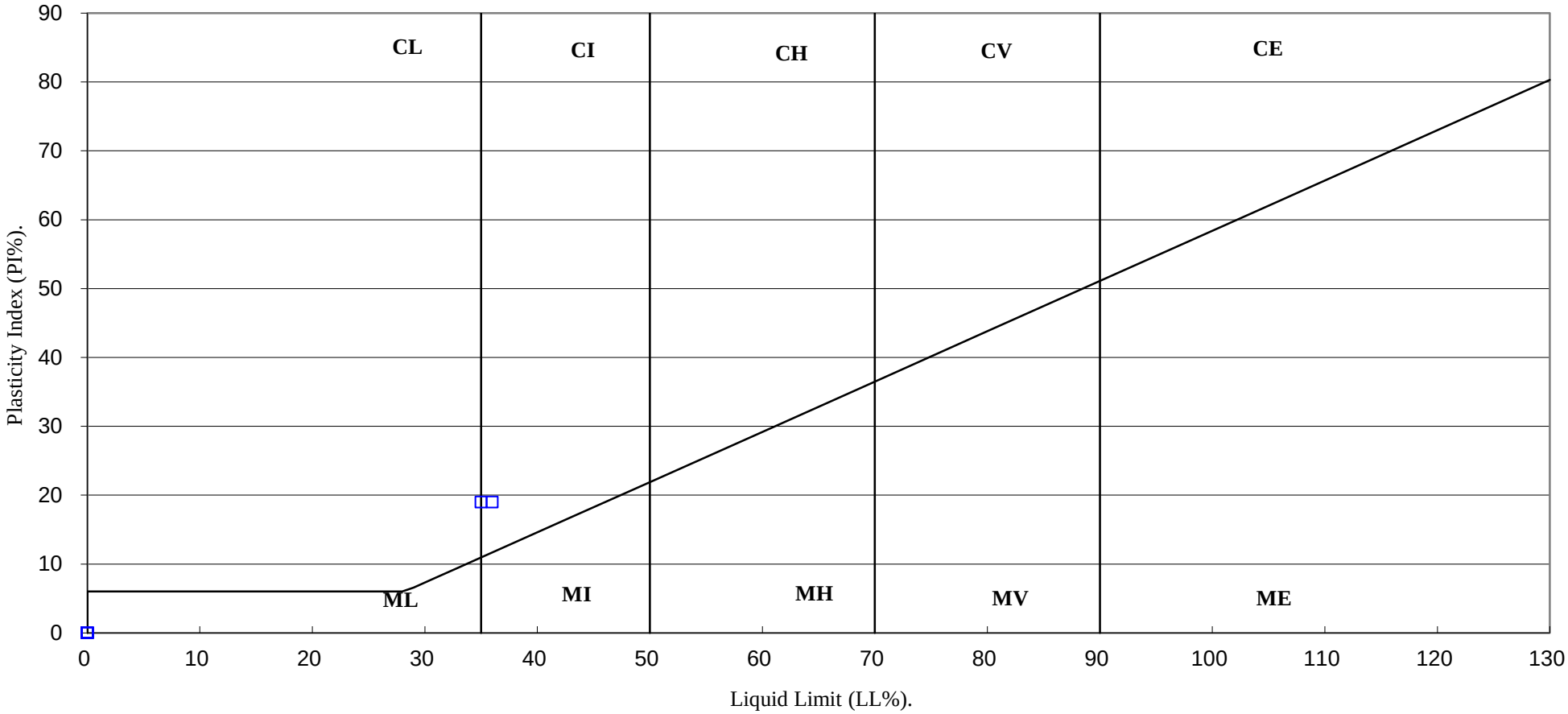
PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No: PSL18/4121

Client Ref: 3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Fletcher Bank LFS**	**Contract No:** PSL18/4121 **Client Ref:** 3125

PARTICLE SIZE DISTRIBUTION TEST

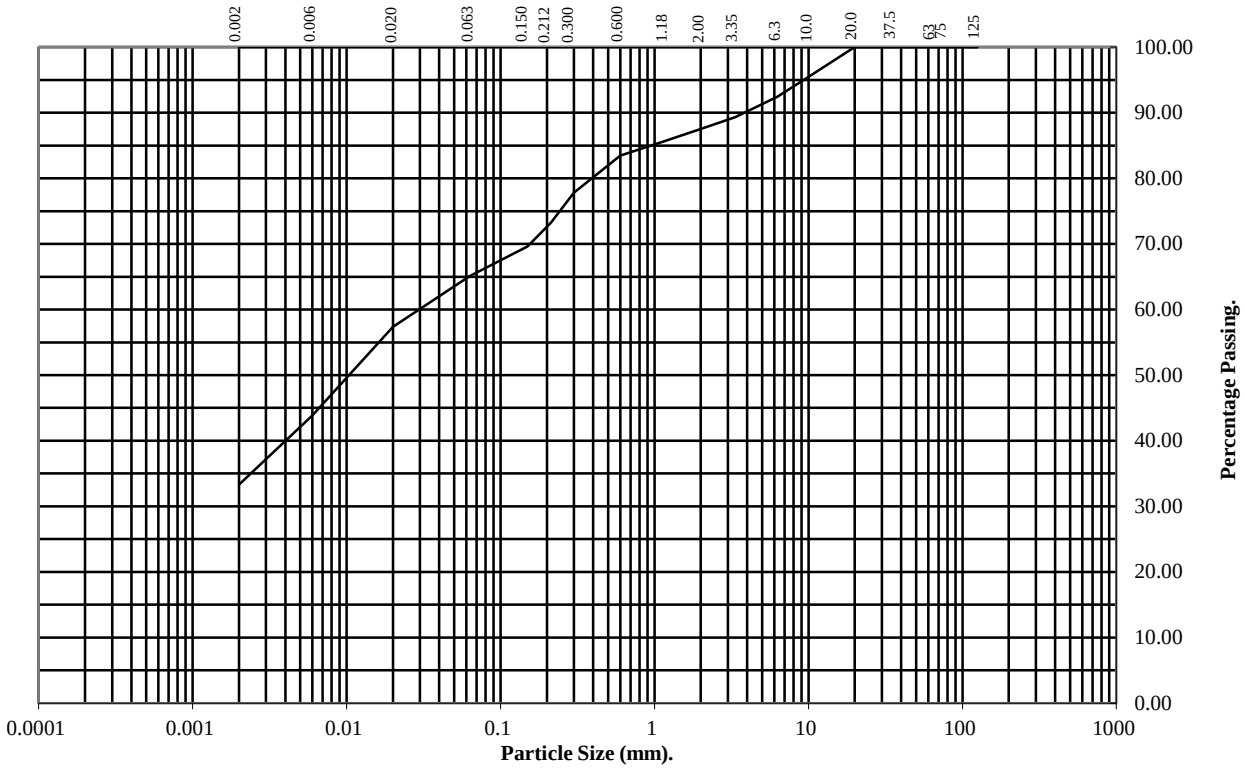
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **SWTL/L1/01** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	95
6.3	92
3.35	89
2	88
1.18	86
0.6	83
0.3	78
0.212	73
0.15	70
0.063	65

Particle Diameter	Percentage Passing
0.02	57
0.006	44
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	12
Sand	23
Silt	32
Clay	33

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

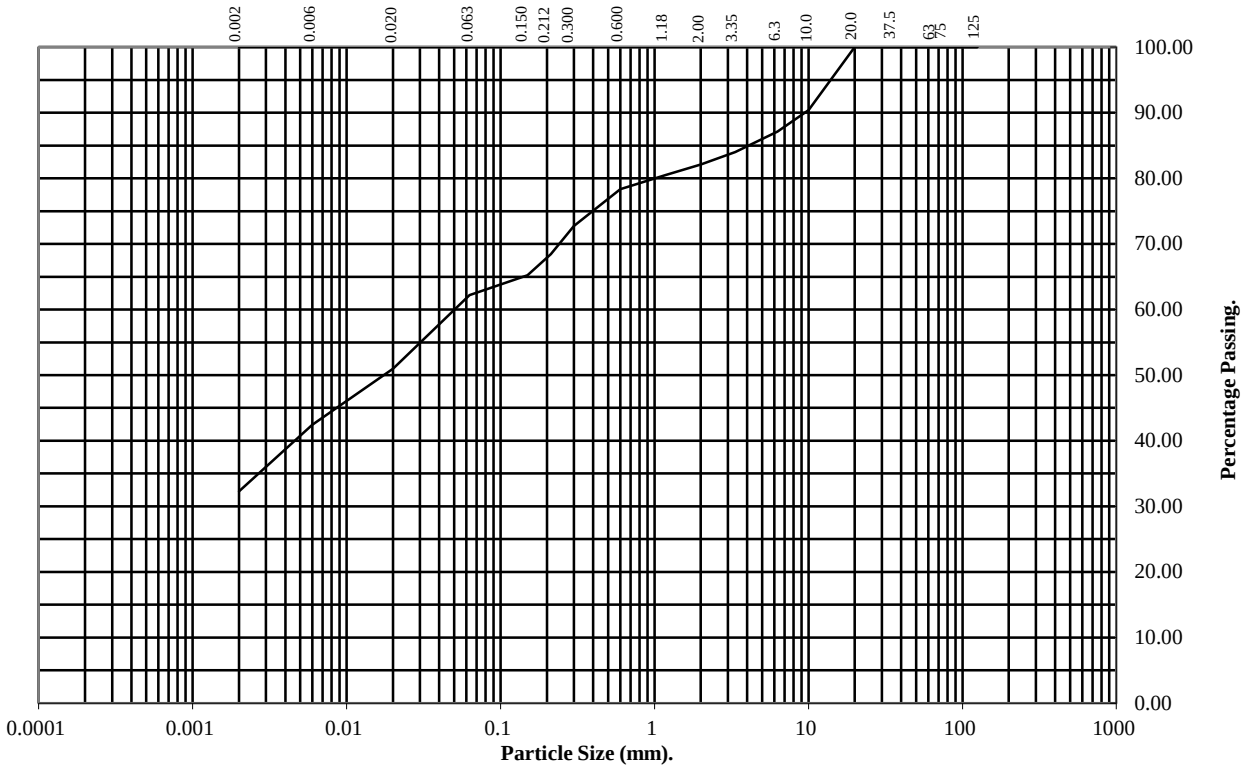
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **SWTL/L2/07** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	90
6.3	87
3.35	84
2	82
1.18	81
0.6	78
0.3	73
0.212	68
0.15	65
0.063	62

Particle Diameter	Percentage Passing
0.02	51
0.006	42
0.002	32

Soil Fraction	Total Percentage
Cobbles	0
Gravel	18
Sand	20
Silt	30
Clay	32

Remarks:

See Summary of Soil Descriptions

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**SWTL/L1/01**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**09/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.78
Diameter	mm	101.18
Area	mm^2	8040.43
Volume	cm^3	810.31
Mass	g	1676
Dry Mass	g	1404
Bulk Density	Mg/m^3	2.07
Dry Density	Mg/m^3	1.73
Moisture Content	%	19
Voids Ratio	-	0.529
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

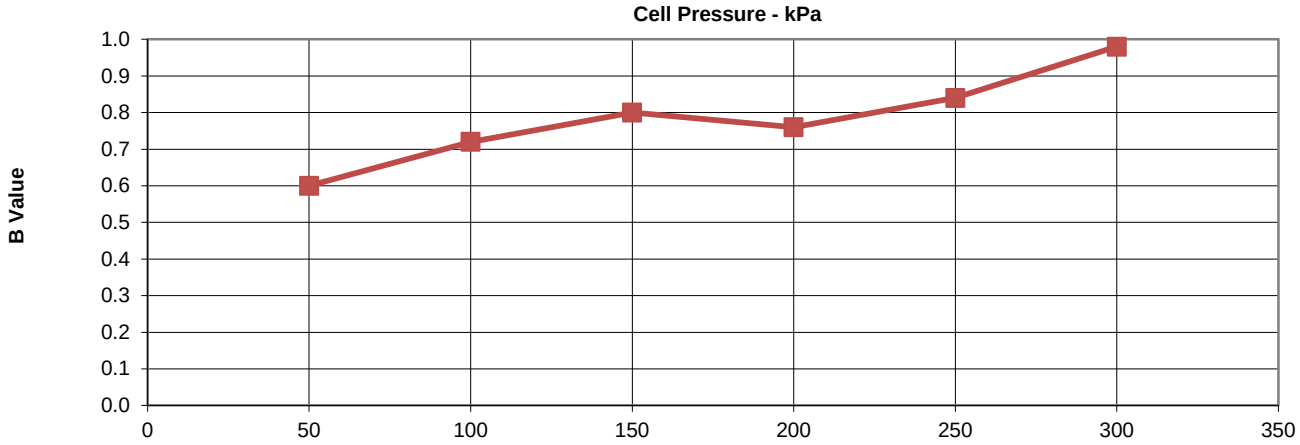
Final Specimen Conditions		
Moisture Content	%	19
Bulk Density	Mg/m^3	2.06
Dry Density	Mg/m^3	1.73

Test Setup		
Date Started		07/09/2018
Date Finished		17/09/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	4
Permeability Time	Days	3

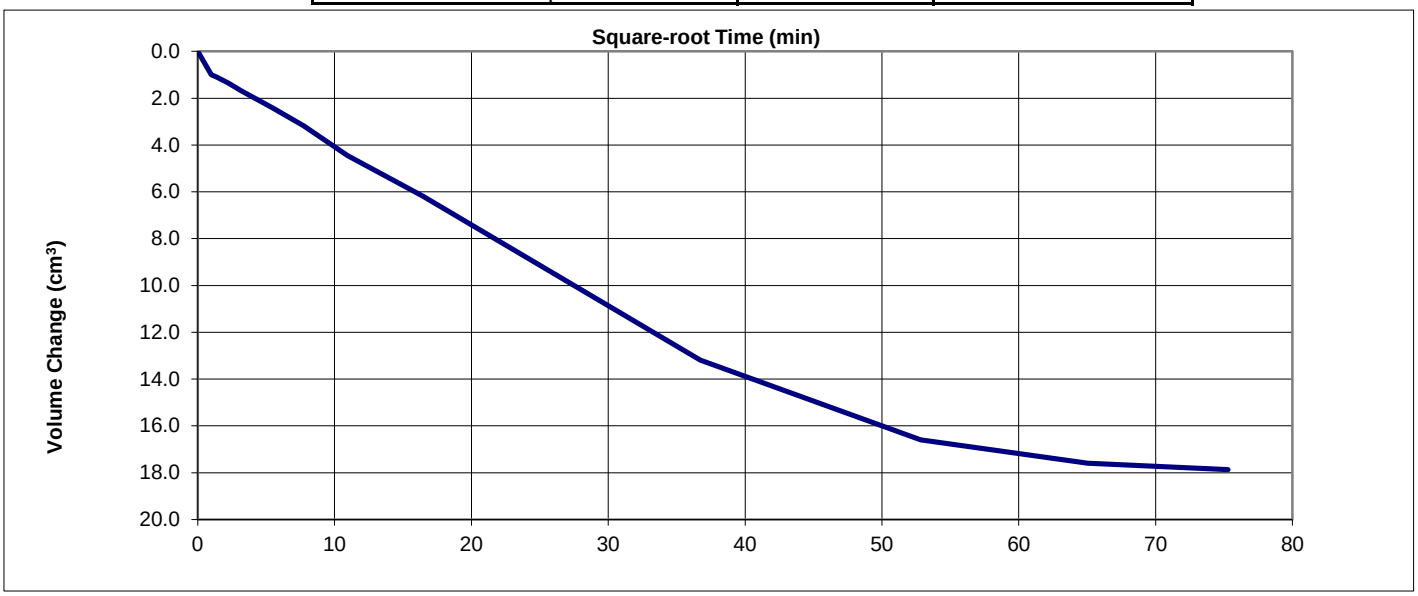
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		SWTL/L1/01
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	301
PWP dissipation	%	98



UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

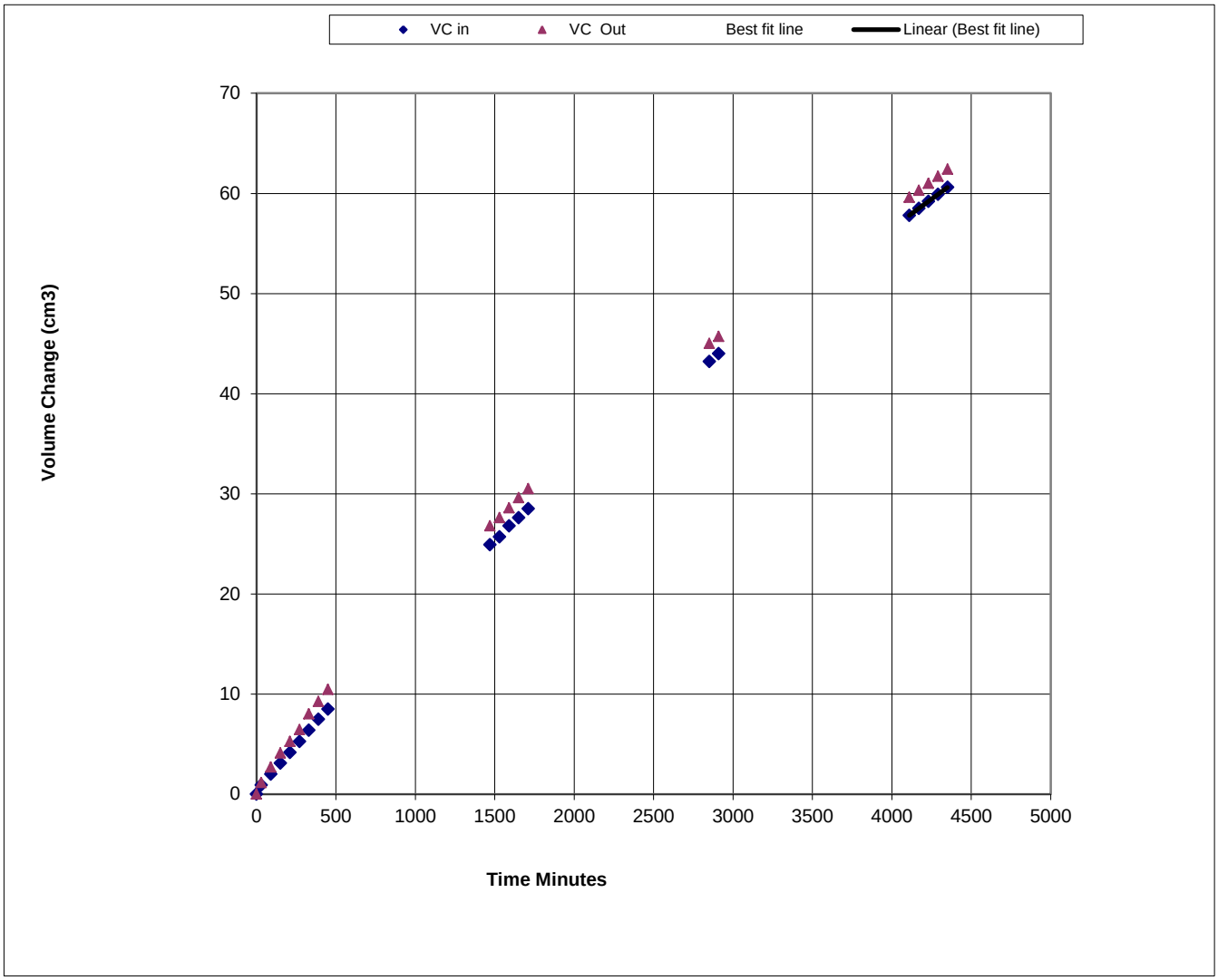
Contract No.
PSL18/4121
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		SWTL/L1/01
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0117
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.2E-09

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**SWTL/L2/07**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**13/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.53
Diameter	mm	101.24
Area	mm^2	8049.97
Volume	cm^3	809.26
Mass	g	1659
Dry Mass	g	1404
Bulk Density	Mg/m^3	2.05
Dry Density	Mg/m^3	1.74
Moisture Content	%	18
Voids Ratio	-	0.527
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

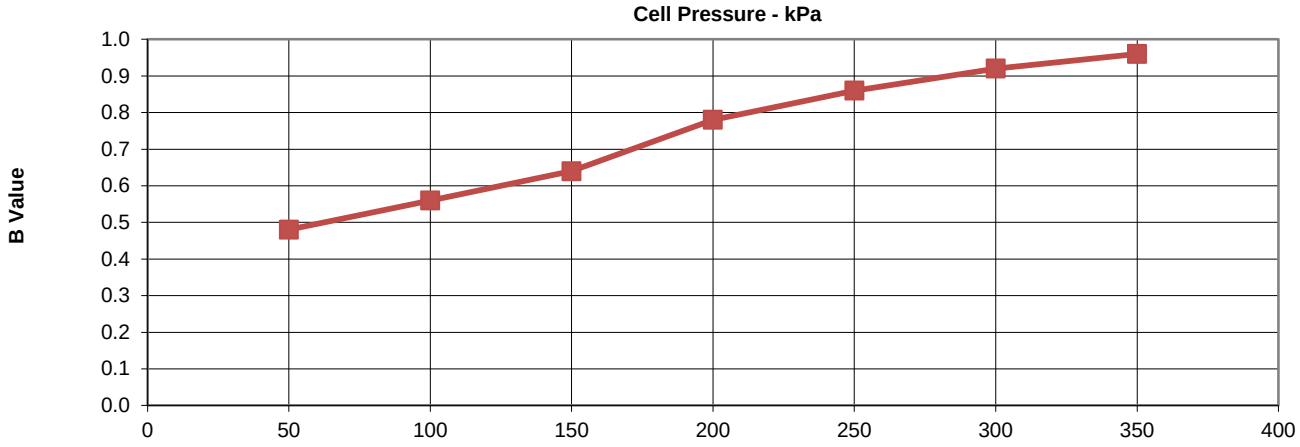
Final Specimen Conditions		
Moisture Content	%	19
Bulk Density	Mg/m^3	2.07
Dry Density	Mg/m^3	1.74

Test Setup		
Date Started		12/09/2018
Date Finished		22/09/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	4
Permeability Time	Days	2

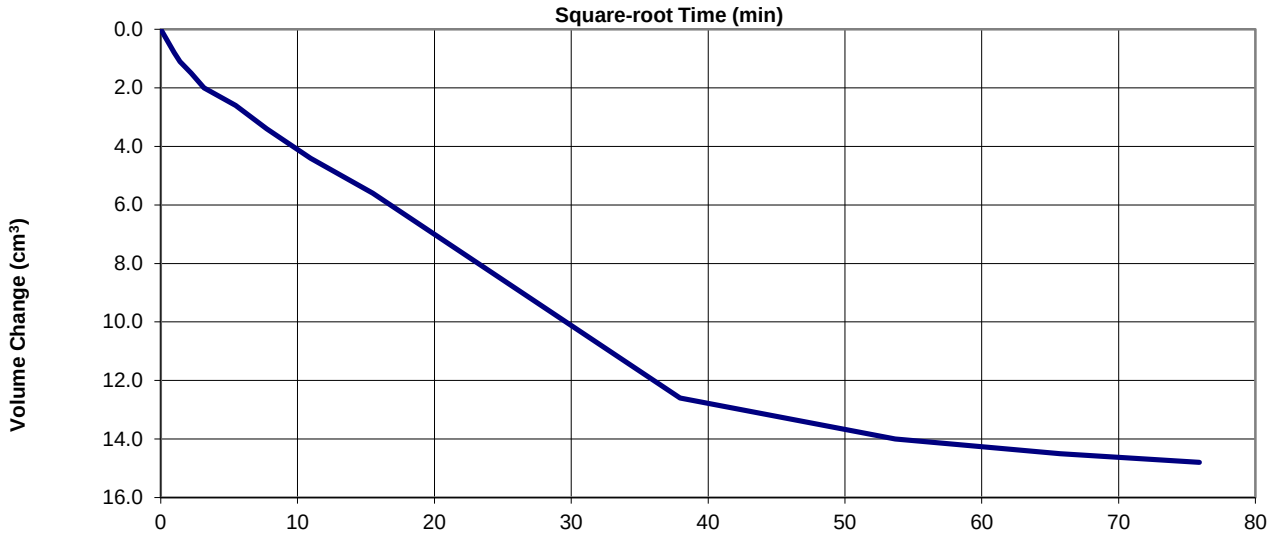
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		SWTL/L2/07
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	450
Back Pressure	kPa	350
Final PWP	kPa	304
PWP dissipation	%	95

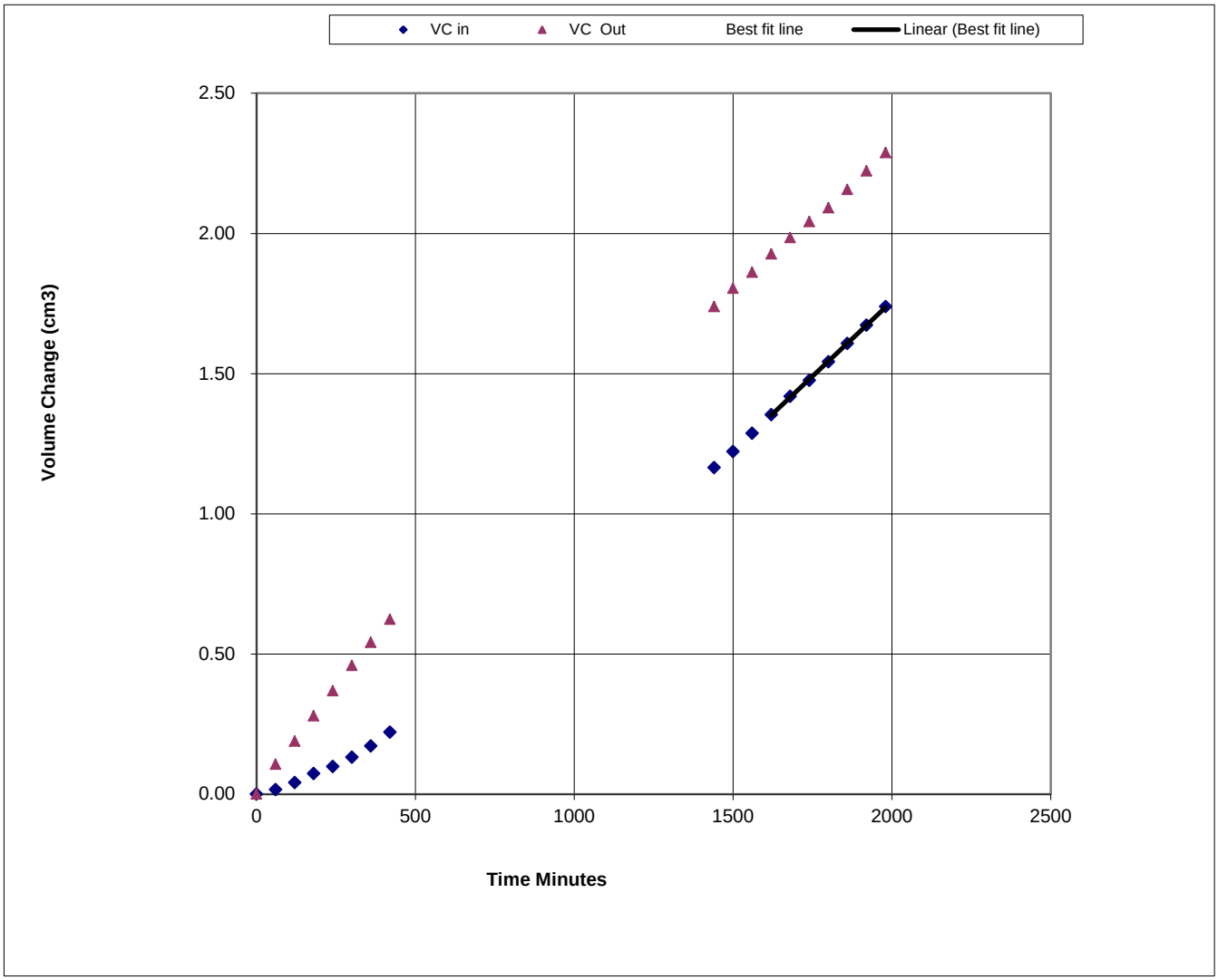


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		SWTL/L2/07
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	450
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0131
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.3E-09

APPENDIX B

Basal Trial Liner

B1 Plant, Equipment and Methodology

B2 In Situ Testing

Core Cutter Test Results
Shear Vane Test Results

B3 Laboratory Testing

Constant Head Permeability Test Results
Particle Density Test Results
Particle Size Distribution Test Results
Plasticity Index Test Results

B1 Plant, Equipment and Methodology

Langley Road Clay Source Basal Trial Liner
23rd July 2019

Material

The clay has been identified as being a brown slightly gravelly sandy clay. It has been identified as a Class 2C material imported to site from excavation works undertaken at Angel Gardens, Ancoats, Manchester subsequently stockpiled at Langley Road, Salford and termed the `Langley Road` clay source.

Equipment Used

A CAT D6 dozer was used to spread out and level the material.
A Bomag BW213 self-propelled 13 tonne smooth drum vibrating roller set on vibration, was used to compact the material.

Trial Liner Parameters

The trial liner comprised of two lifts of mineral liner having an area of approximately 100m², compacted over an area of compacted basal formation surface approved by the CQA Inspector.

The methodology used to carry out the basal trial liner is set out below:

a) The work was carried out in general accordance with the recommendations made in The Highways Agency Specification For Highway Works, Series 600 - Earthworks, 2018.

b) The formation surface was scarified using the bulldozer tracks before placement of the material commenced.

c) Material was excavated from the Langley Road clay source stockpile, loaded, hauled and tipped by dump truck on the mineral layer. The clay was spread out, tracked in and graded level to form a layer thickness between 275mm and 300mm.

d) The layer was then compacted using a self -propelled vibratory roller with 6no. passes undertaken over the layer to form a final layer thickness of 250mm. The layer was then tested and sampled as specified in the agreed CQA Plan.

e) The surface of the placed layer was scarified using the dozer tracks prior to placement of the 2nd lift.

f) The second layer of mineral was then placed using the same methodology as per the initial layer and compacted using the self-propelled vibratory roller with 6no. passes undertaken over the layer. The layer was then tested and sampled as specified in the agreed CQA Plan

g) The trial liner was then partially dismantled to check for adequate inter-layer bonding. The trial was found to be in compliance with the Specification remained in-situ as part of the permanent works.

Trial Liner Field Testing and Results

A total of 8no. in situ moisture / density tests were carried out using core cutter samples (BS 1377, Part 9, Method 2.4) at a frequency of four tests per lift; evenly distributed throughout each layer.

The results of the core cutter testing on indicated that the moisture / density requirements of the Specification had been met using 8no. passes.

Undrained shear strengths were measured using a hand shear vane at each of the core cutter test locations. The results indicated that the requirements of the Specification had been met using 6no. passes.

Trial Liner Laboratory Testing

The following is a list of laboratory tests carried out on samples removed from the compacted trial liner. The test results are presented at Appendix B3 to this report.

a) Undisturbed core cutter samples for constant head permeability testing in accordance with BS 1377: 1990; Part 6, Method 6. Permeability testing was carried out on 2no. samples from lift 1 and 2no. samples from lift 2. The results indicate that the mineral liner compacted using 8no. passes of the roller had a permeability less than the maximum allowed by the Specification.

b) Bulk samples for plasticity index in accordance with BS 1377 Part 2 Method 5. Plasticity testing was carried out on 2no. samples from lift 1 and 2no. samples from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

c) Bulk samples for particle density in accordance with BS1377 Part 2 Method 8. Particle density testing was carried out on 2no. samples from lift 1 and 2no. samples from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

d) Bulk samples for particle size distribution in accordance with BS1377 Part 2 Method 9.2 and Method 9.5. Particle size distribution testing was carried out on 2no. samples from lift 1 and 2no. samples from lift 2. The results indicate that the mineral liner material was compliant with the Specification.

Conclusions and Recommendations

The results of core cutter testing carried out on site to determine the moisture content / dry density relationship of the mineral liner used to form the trial liner indicate that the density requirements of the specification had been met following 6no. passes of the roller.

The results of the trial and laboratory testing confirm that the methods and equipment used in undertaking the trial liner will produce a mineral liner which meets the requirements of the Specification.

B2 In Situ Testing

Core Cutter Test Results
Shear Vane Test Results

TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

Job No: 3125

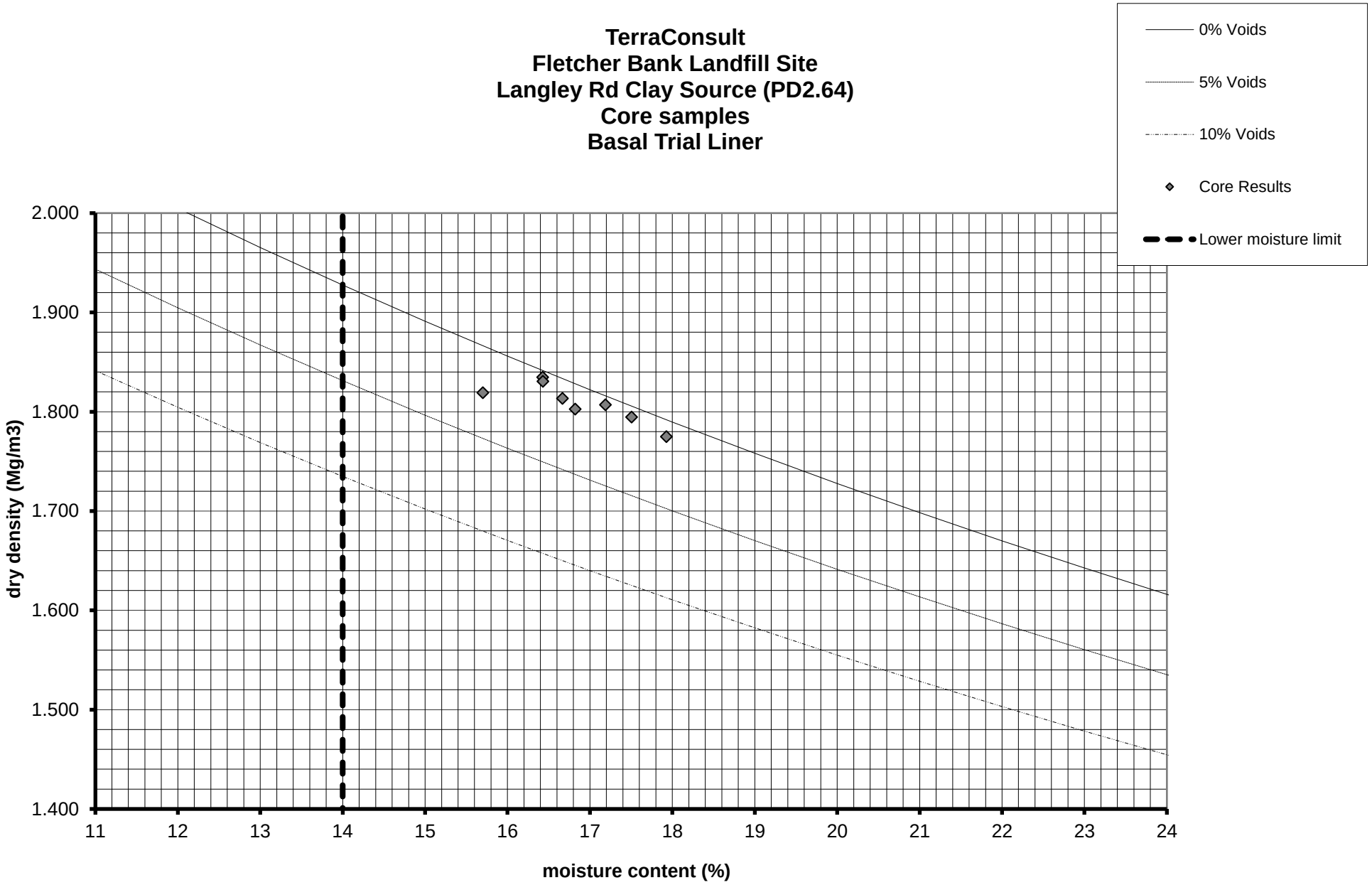
Basal Trial Liner

Engineer J Gibson
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
23/07/2019	BTL/L1/01	F6	1021	2181	384	866	798	2.14	16.4	1.83	Pass
23/07/2019	BTL/L1/02	F6	1021	2137	384	805	741	2.09	17.9	1.77	Pass
23/07/2019	BTL/L1/03	F6	1021	2160	384	965	882	2.12	16.7	1.81	Pass
23/07/2019	BTL/L1/04	F6	1021	2150	384	891	818	2.11	16.8	1.80	Pass
23/07/2019	BTL/L2/07	F6	1021	2149	384	863	798	2.10	15.7	1.82	Pass
23/07/2019	BTL/L2/08	F6	1021	2176	384	873	804	2.13	16.4	1.83	Pass
23/07/2019	BTL/L2/09	F6	1021	2153	384	921	841	2.11	17.5	1.79	Pass
23/07/2019	BTL/L2/10	F6	1021	2162	384	909	832	2.12	17.2	1.81	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples
Basal Trial Liner



TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: J Gibson
Material: Engineered Clay

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
23/07/2019	BTL/L1/01	F6	128	120	118	122
23/07/2019	BTL/L1/02	F6	130	120	124	125
23/07/2019	BTL/L1/03	F6	142	140	146	143
23/07/2019	BTL/L1/04	F6	140	140	130	137
23/07/2019	BTL/L1/05 PERM	F6	140	140	130	137
23/07/2019	BTL/L1/06 PERM	F6	142	140	146	143
23/07/2019	BTL/L2/07	F6	120	118	122	120
23/07/2019	BTL/L2/08	F6	138	138	130	135
23/07/2019	BTL/L2/09	F6	140	128	130	133
23/07/2019	BTL/L2/10	F6	120	116	112	116
23/07/2019	BTL/L2/11 PERM	F6	120	116	112	116
23/07/2019	BTL/L2/12 PERM	F6	138	138	130	135

B3 Laboratory Testing

Constant Head Permeability Test Results
Particle Density Test Results
Particle Size Distribution Test Results
Plasticity Index Test Results

LABORATORY REPORT

4043

Contract Number: PSL19/4653

Report Date: 14 August 2019

Client's Reference: 3125-8

Client Name: TerraConsult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: Jim Gibson

Contract Title: Fletcher Bank LFS

Date Received: 1/8/2019
Date Commenced: 1/8/2019
Date Completed: 14/8/2019

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
S Royle (Laboratory Manager)	S Eyre (Senior Technician)	L Knight (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BTL/L1/01B				Brown slightly gravelly sandy CLAY.
BTL/L1/03B				Brown slightly gravelly sandy CLAY.
BTL/L2/08B				Brown slightly gravelly sandy CLAY.
BTL/L2/09B				Brown slightly gravelly sandy CLAY.
BTL/L1/05P				Brown slightly gravelly sandy CLAY.
BTL/L1/06P				Brown slightly gravelly sandy CLAY.
BTL/L2/11P				Brown slightly gravelly sandy CLAY.
BTL/L2/12P				Brown slightly gravelly sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BTL/L1/01B				17		2.65	37	17	20	88	Intermediate plasticity CI.
BTL/L1/03B				16		2.65	41	19	22	89	Intermediate plasticity CI.
BTL/L2/08B				17		2.63	36	17	19	87	Intermediate plasticity CI.
BTL/L2/09B				16		2.63	38	18	20	90	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

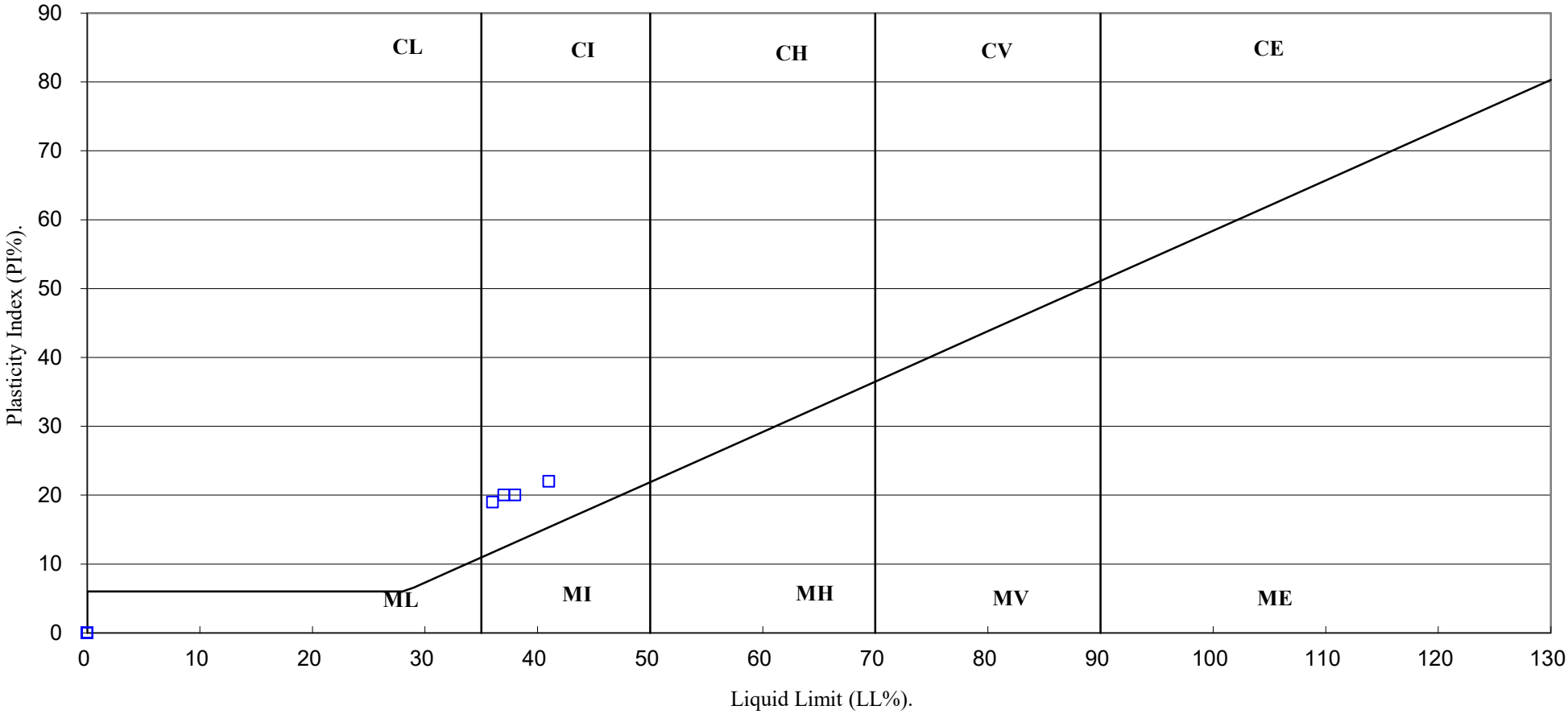
Contract No:

PSL19/4653

Client Ref:

3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL19/4653 Client Ref: 3125

PARTICLE SIZE DISTRIBUTION TEST

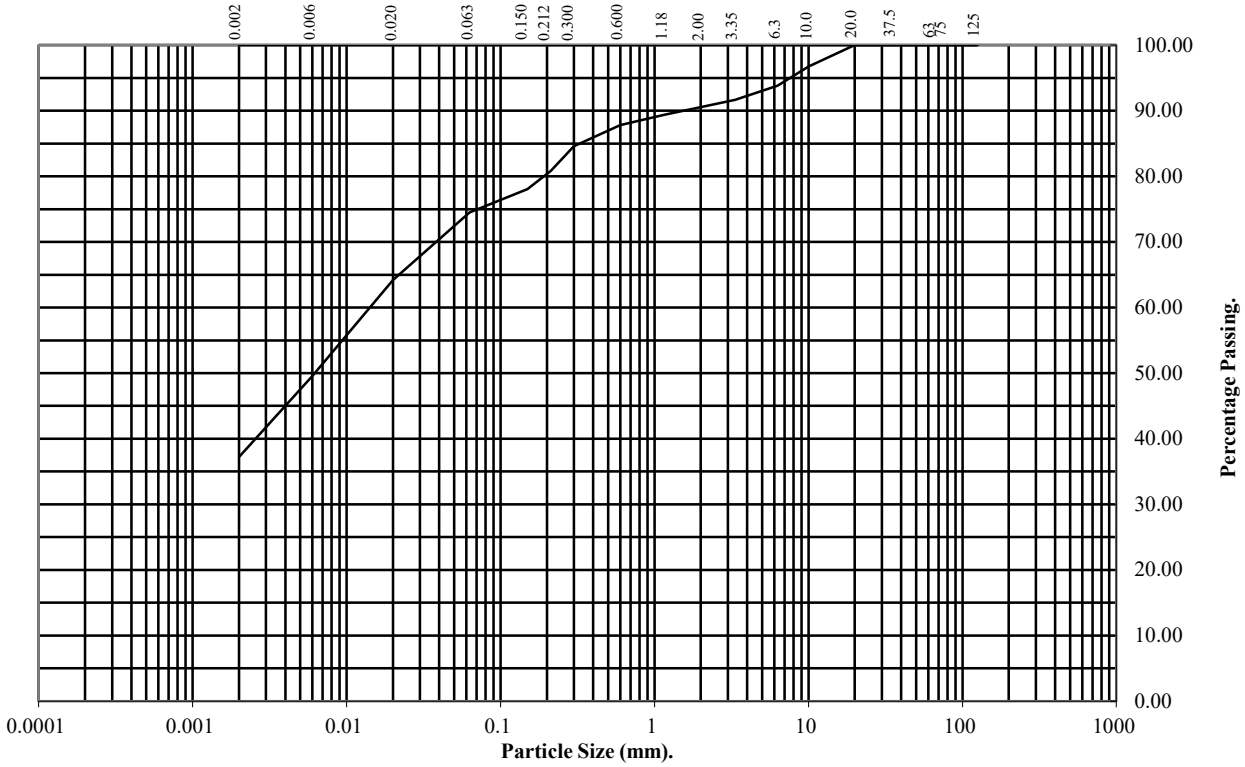
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **BTL/L1/01B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	94
3.35	92
2	91
1.18	89
0.6	88
0.3	85
0.212	81
0.15	78
0.063	75

Particle Diameter	Percentage Passing
0.02	64
0.006	50
0.002	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	16
Silt	38
Clay	37

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

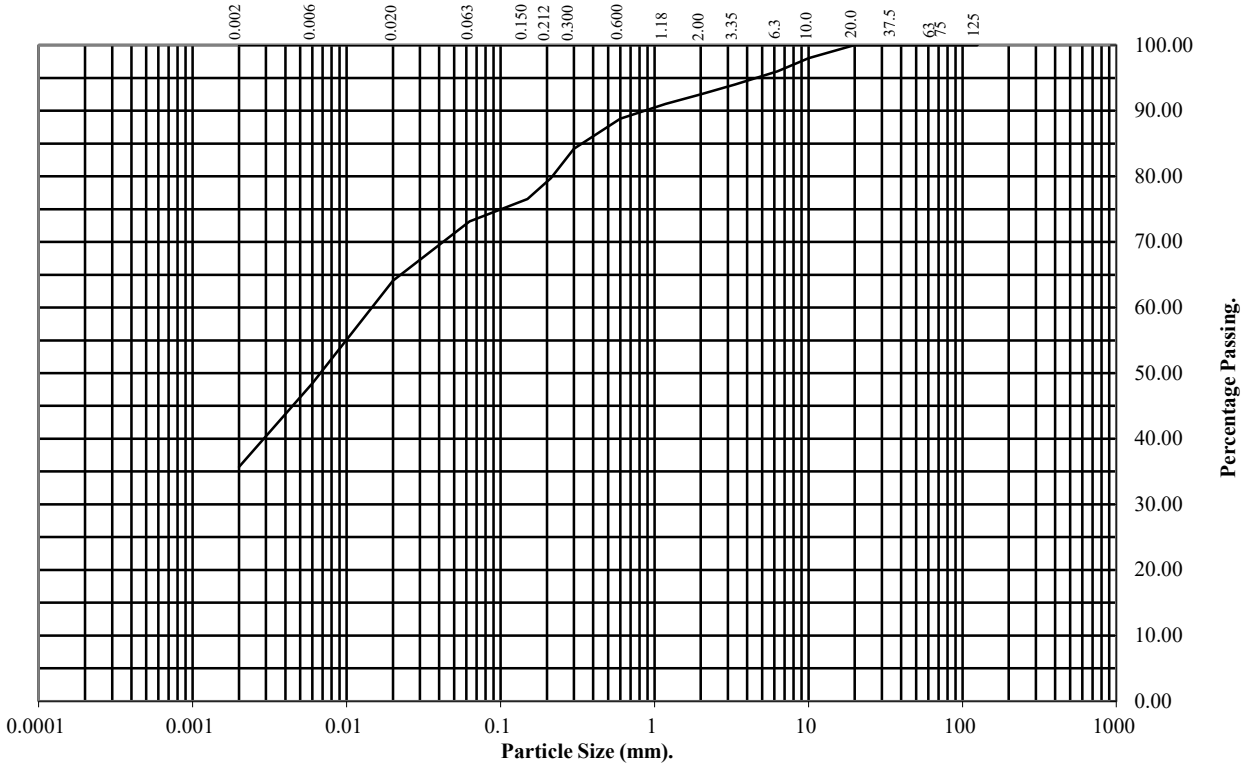
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **BTL/L1/03B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	96
3.35	94
2	93
1.18	91
0.6	89
0.3	84
0.212	80
0.15	77
0.063	73

Particle Diameter	Percentage Passing
0.02	64
0.006	48
0.002	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	20
Silt	37
Clay	36

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

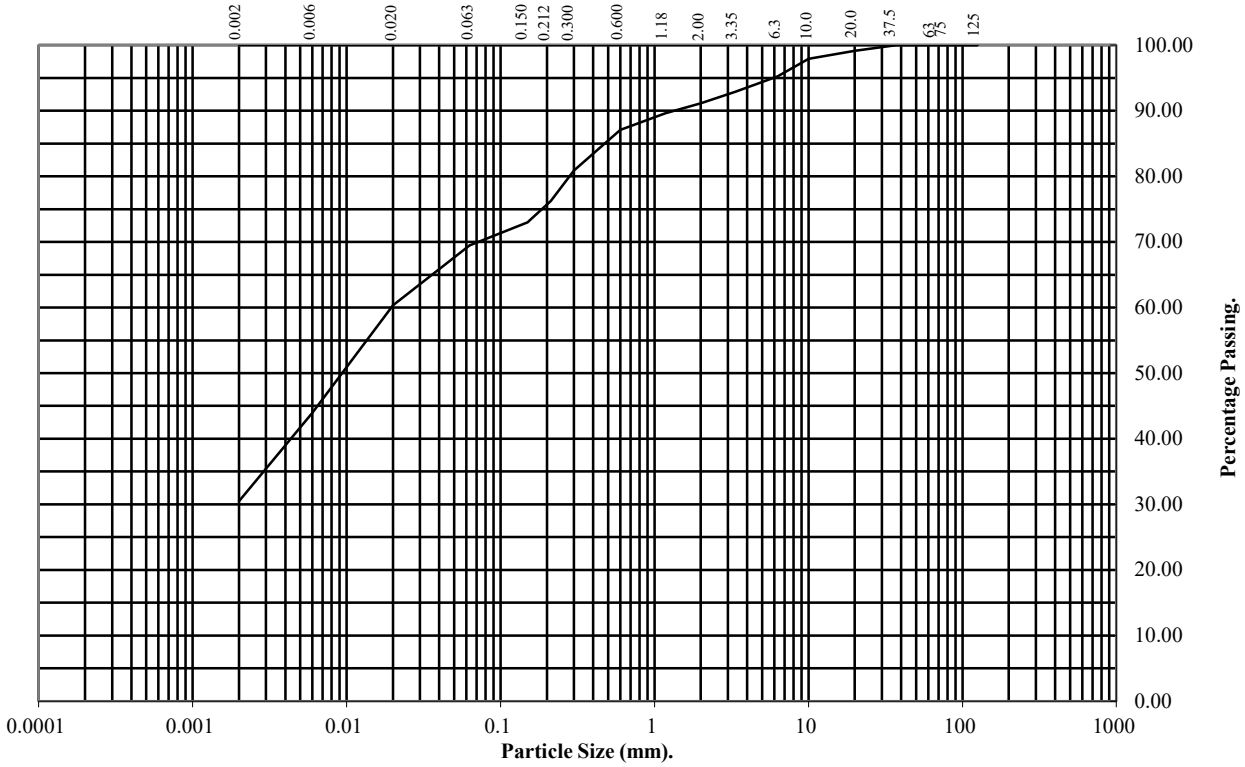
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **BTL/L2/08B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	98
6.3	95
3.35	93
2	91
1.18	90
0.6	87
0.3	81
0.212	76
0.15	73
0.063	69

Particle Diameter	Percentage Passing
0.02	60
0.006	44
0.002	31

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	22
Silt	38
Clay	31

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

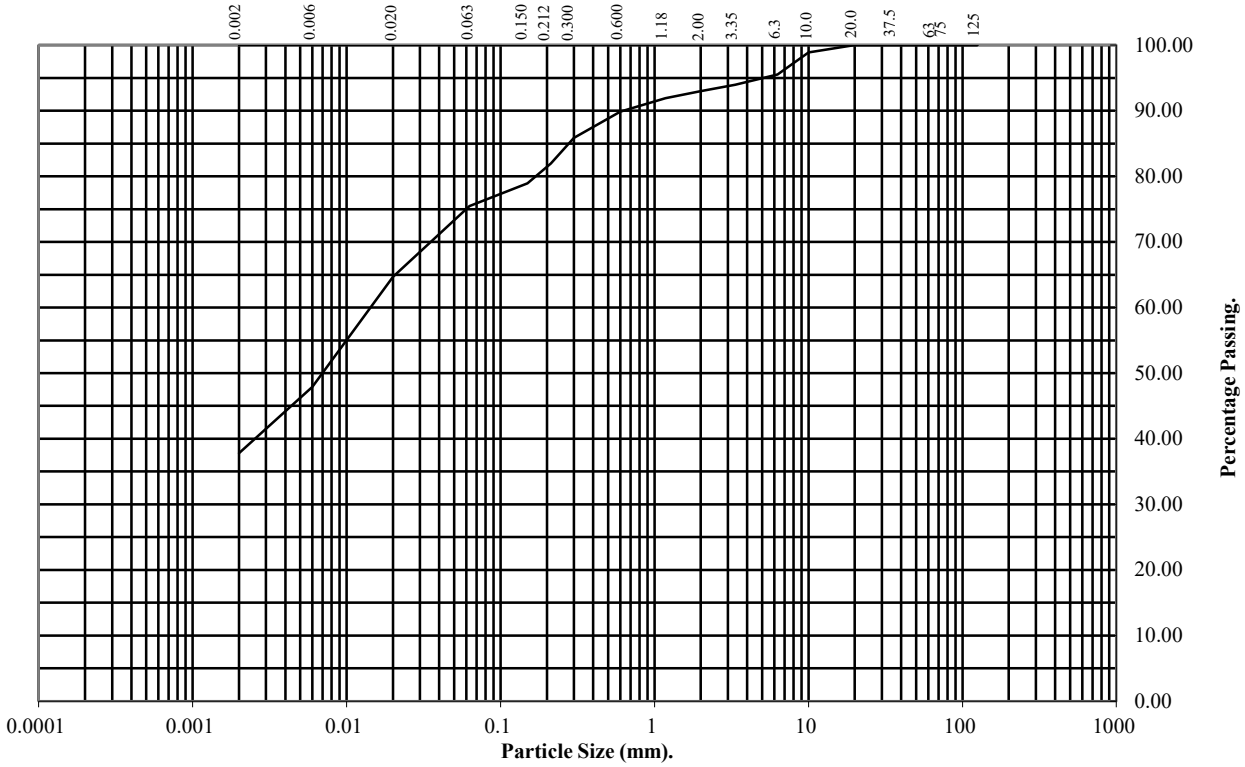
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **BTL/L2/09B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	96
3.35	94
2	93
1.18	92
0.6	90
0.3	86
0.212	82
0.15	79
0.063	75

Particle Diameter	Percentage Passing
0.02	65
0.006	48
0.002	38

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	18
Silt	37
Clay	38

Remarks:

See Summary of Soil Descriptions

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **BTL/L1/05P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil escriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	101.91
Diameter	mm	100.70
Area	mm^2	7964.32
Volume	cm^3	811.64
Mass	g	1722
Dry Mass	g	1486
Bulk Density	Mg/m^3	2.12
Dry Density	Mg/m^3	1.83
Moisture Content	%	16
Voids Ratio	-	0.448
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

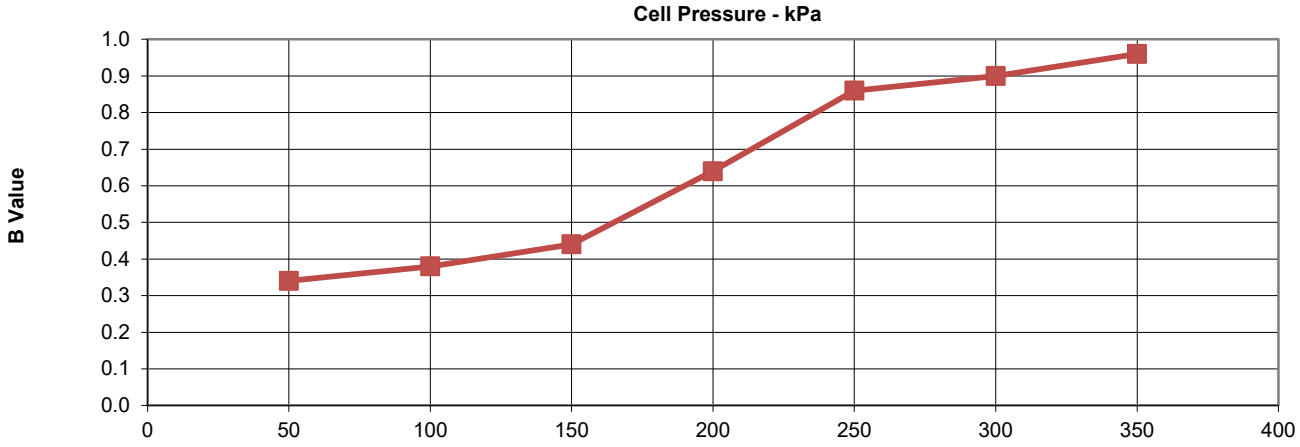
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.83

Test Setup		
Date Started		30/08/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	7
Permeability Time	Days	2

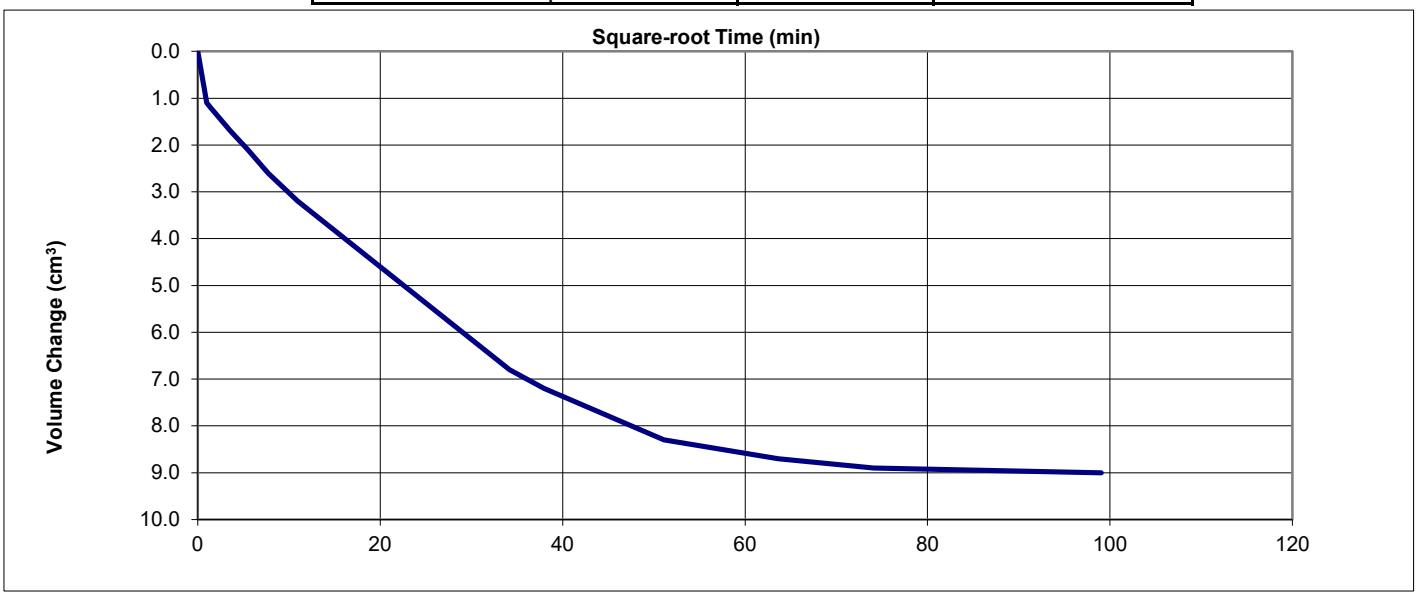
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		BTL/L1/05P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	450
Back Pressure	kPa	350
Final PWP	kPa	354
PWP dissipation	%	95

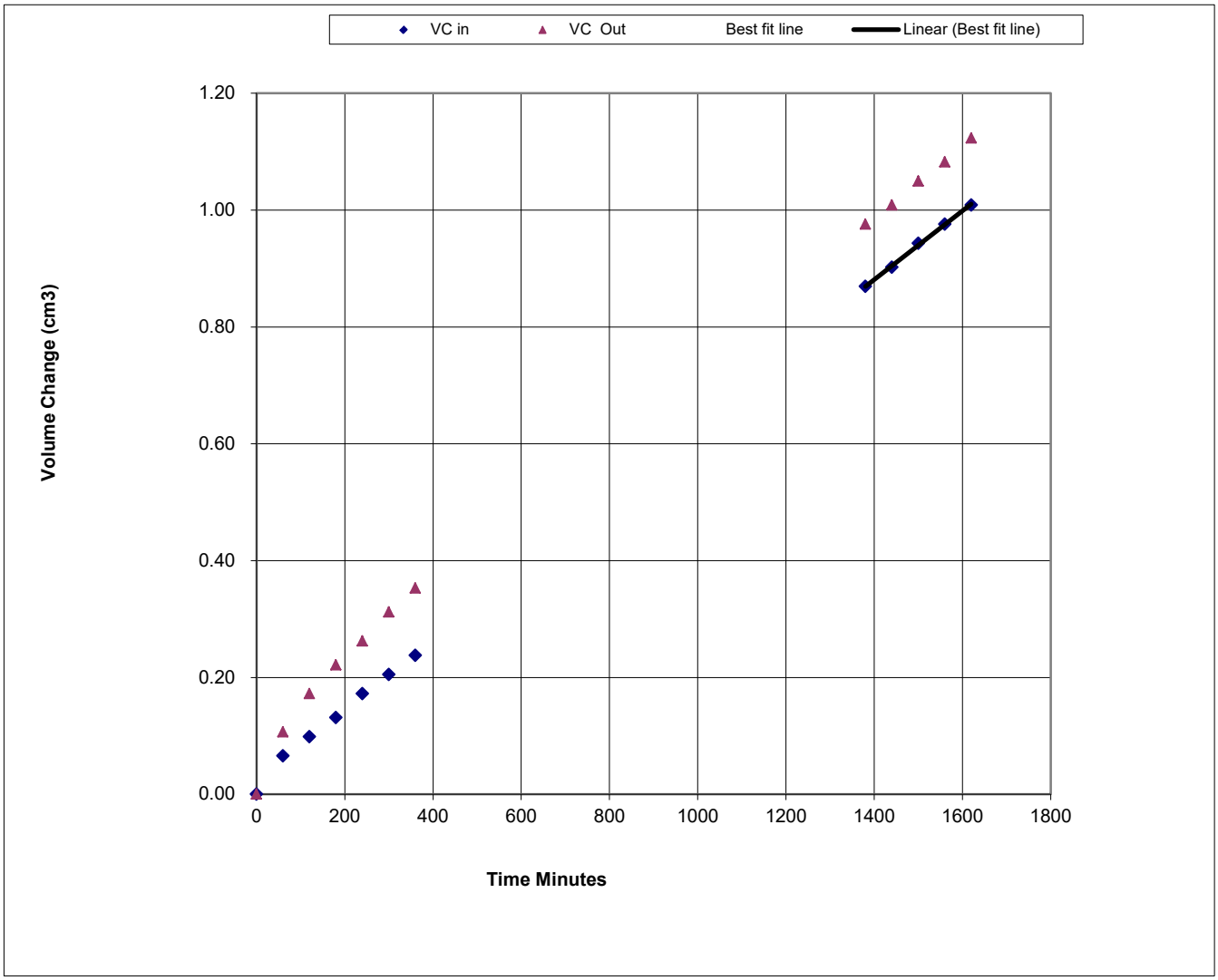


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		BTL/L1/05P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	450
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0006
Average Temperature	'C	23
Vertical Permeability Kv	m/s	6.1E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **BTL/L1/06P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.12
Diameter	mm	101.00
Area	mm^2	8011.85
Volume	cm^3	818.17
Mass	g	1735
Dry Mass	g	1501
Bulk Density	Mg/m^3	2.12
Dry Density	Mg/m^3	1.83
Moisture Content	%	16
Voids Ratio	-	0.445
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

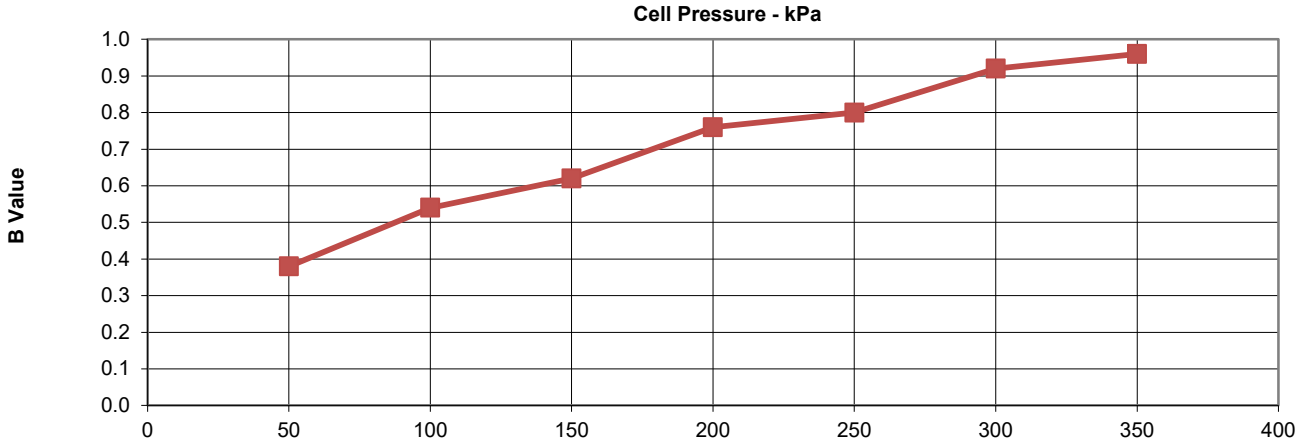
Final Specimen Conditions		
Moisture Content	%	16
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.83

Test Setup		
Date Started		30/08/2019
Date Finished		06/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	3
Permeability Time	Days	2

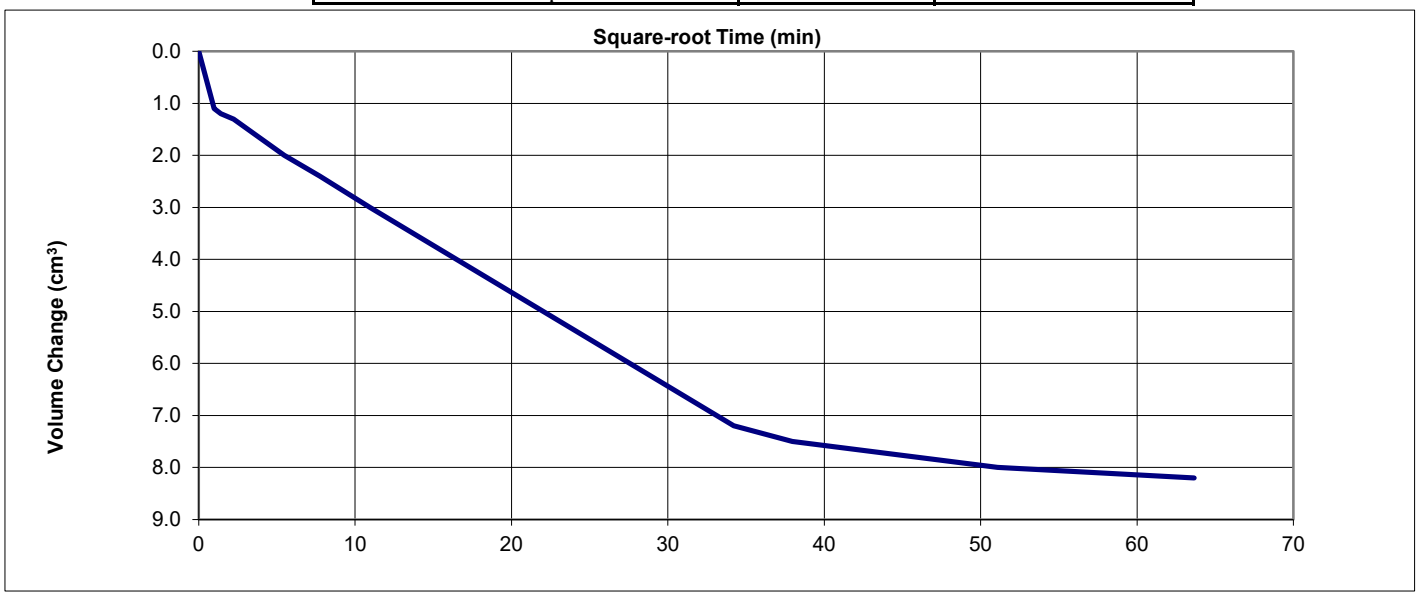
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		BTL/L1/06P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	450
Back Pressure	kPa	350
Final PWP	kPa	350
PWP dissipation	%	100

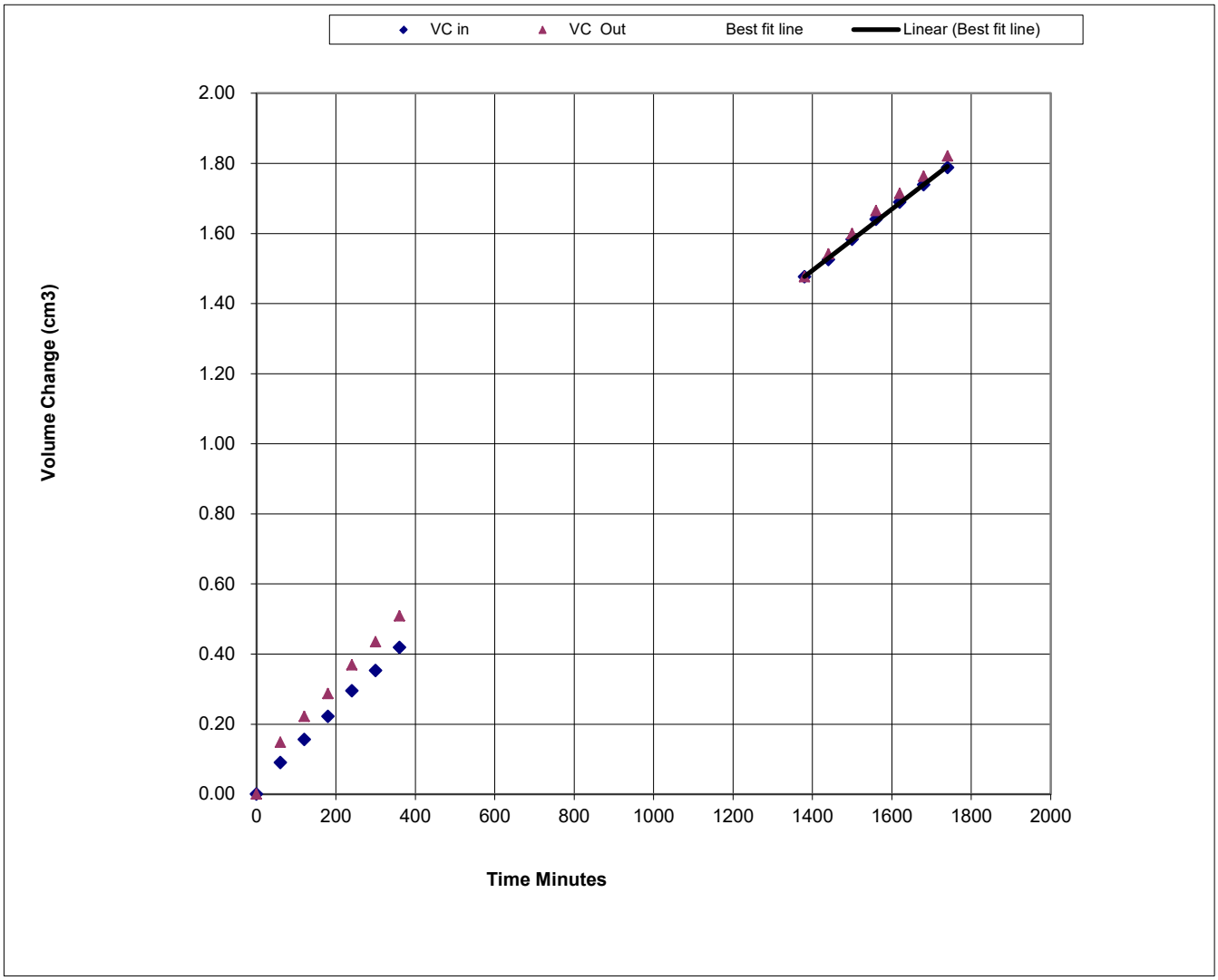


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		BTL/L1/06P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	450
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0009
Average Temperature	'C	23
Vertical Permeability Kv	m/s	8.9E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **BTL/L2/11P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.84
Diameter	mm	101.00
Area	mm^2	8011.85
Volume	cm^3	823.94
Mass	g	1741
Dry Mass	g	1486
Bulk Density	Mg/m^3	2.11
Dry Density	Mg/m^3	1.80
Moisture Content	%	17
Voids Ratio	-	0.469
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

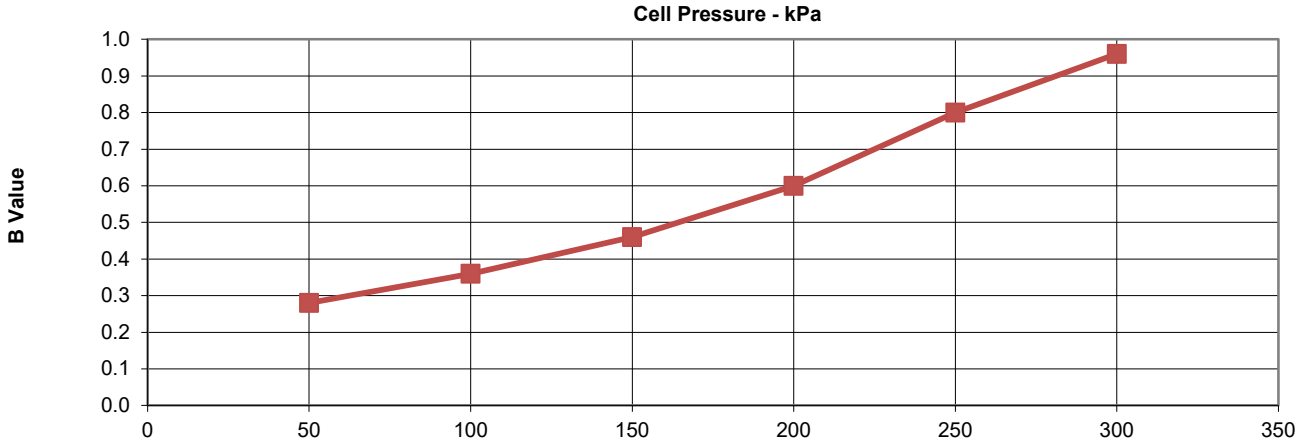
Final Specimen Conditions		
Moisture Content	%	18
Bulk Density	Mg/m^3	2.12
Dry Density	Mg/m^3	1.80

Test Setup		
Date Started		30/08/2019
Date Finished		05/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	2
Permeability Time	Days	2

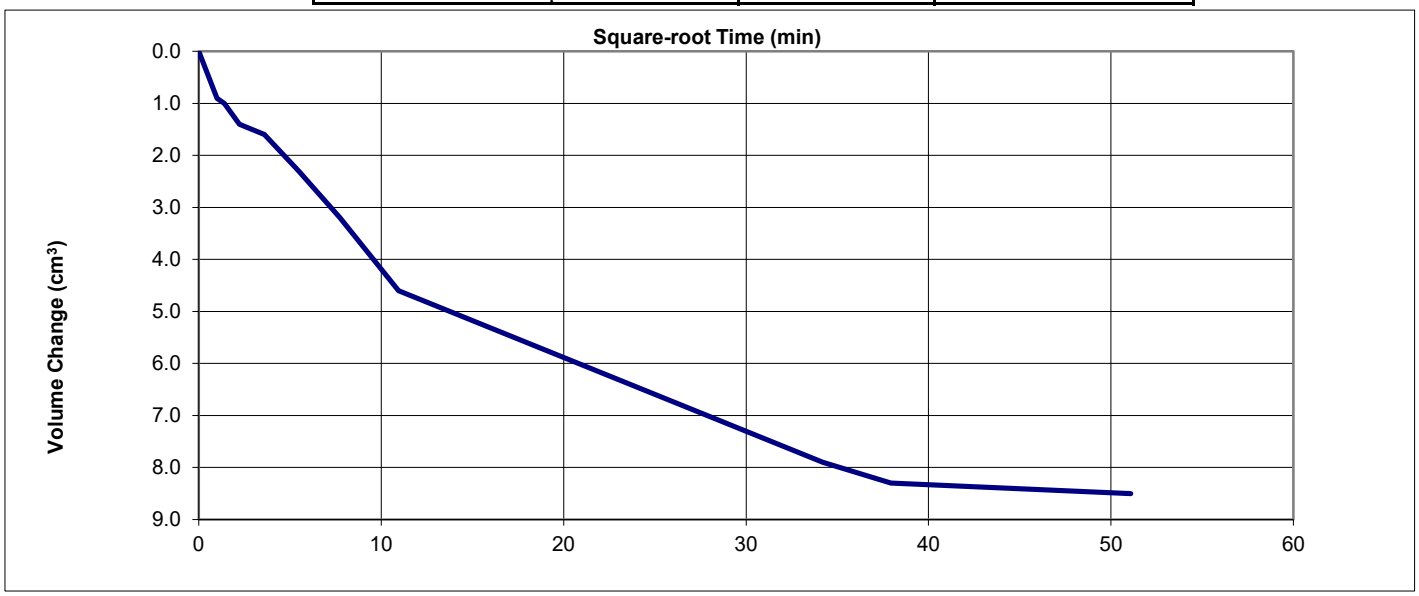
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		BTL/L2/11P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	96

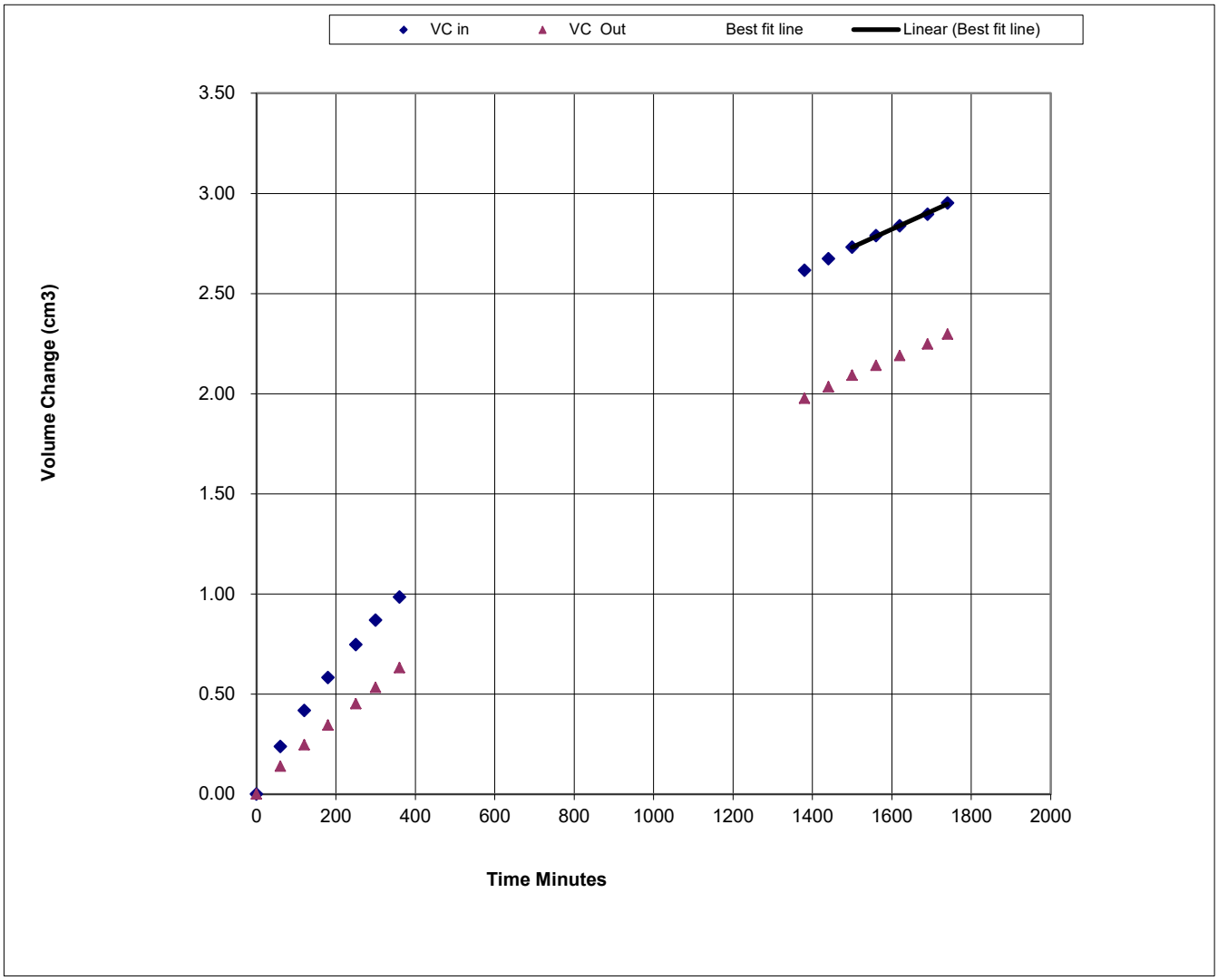


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		BTL/L2/11P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0009
Average Temperature	'C	23
Vertical Permeability Kv	m/s	9.3E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **BTL/L2/12P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.20
Diameter	mm	101.00
Area	mm^2	8011.85
Volume	cm^3	818.81
Mass	g	1737
Dry Mass	g	1481
Bulk Density	Mg/m^3	2.12
Dry Density	Mg/m^3	1.81
Moisture Content	%	17
Voids Ratio	-	0.465
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

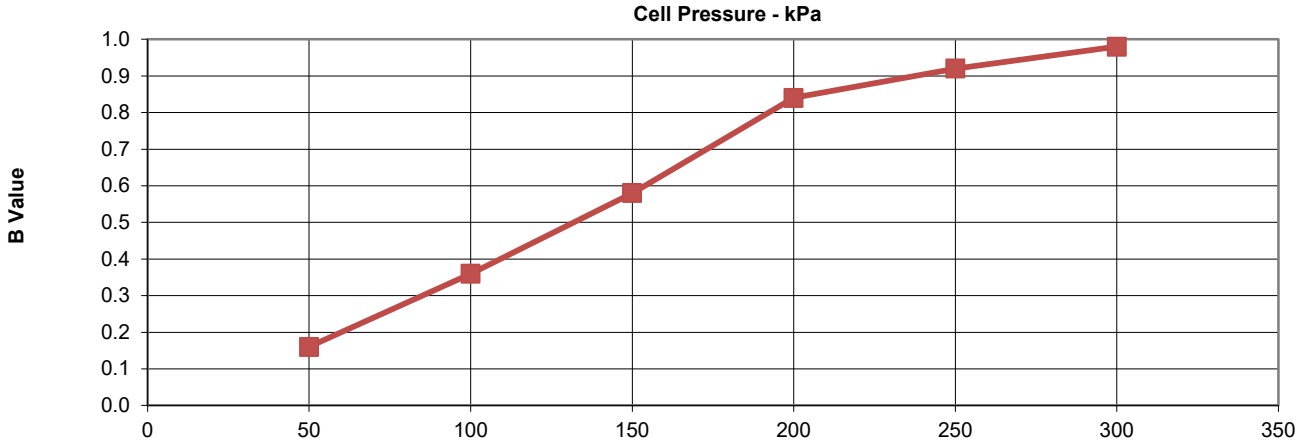
Final Specimen Conditions		
Moisture Content	%	18
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.81

Test Setup		
Date Started		30/08/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	9
Permeability Time	Days	2

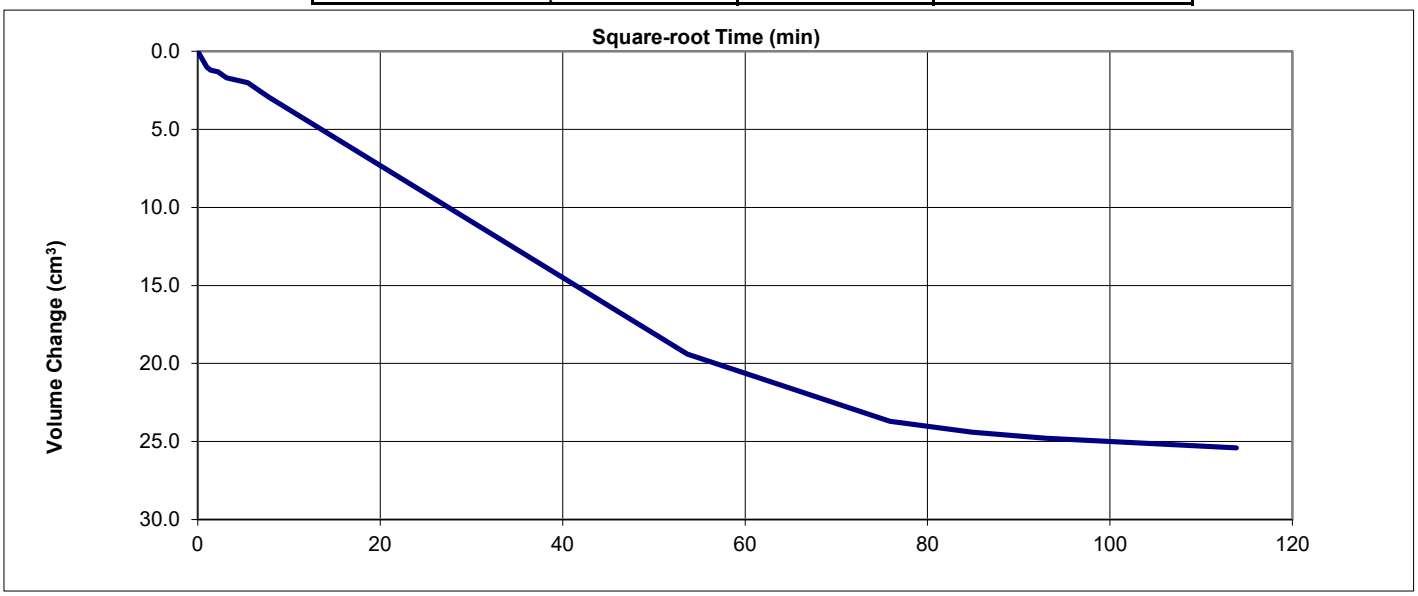
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		BTL/L2/12P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	304
PWP dissipation	%	96

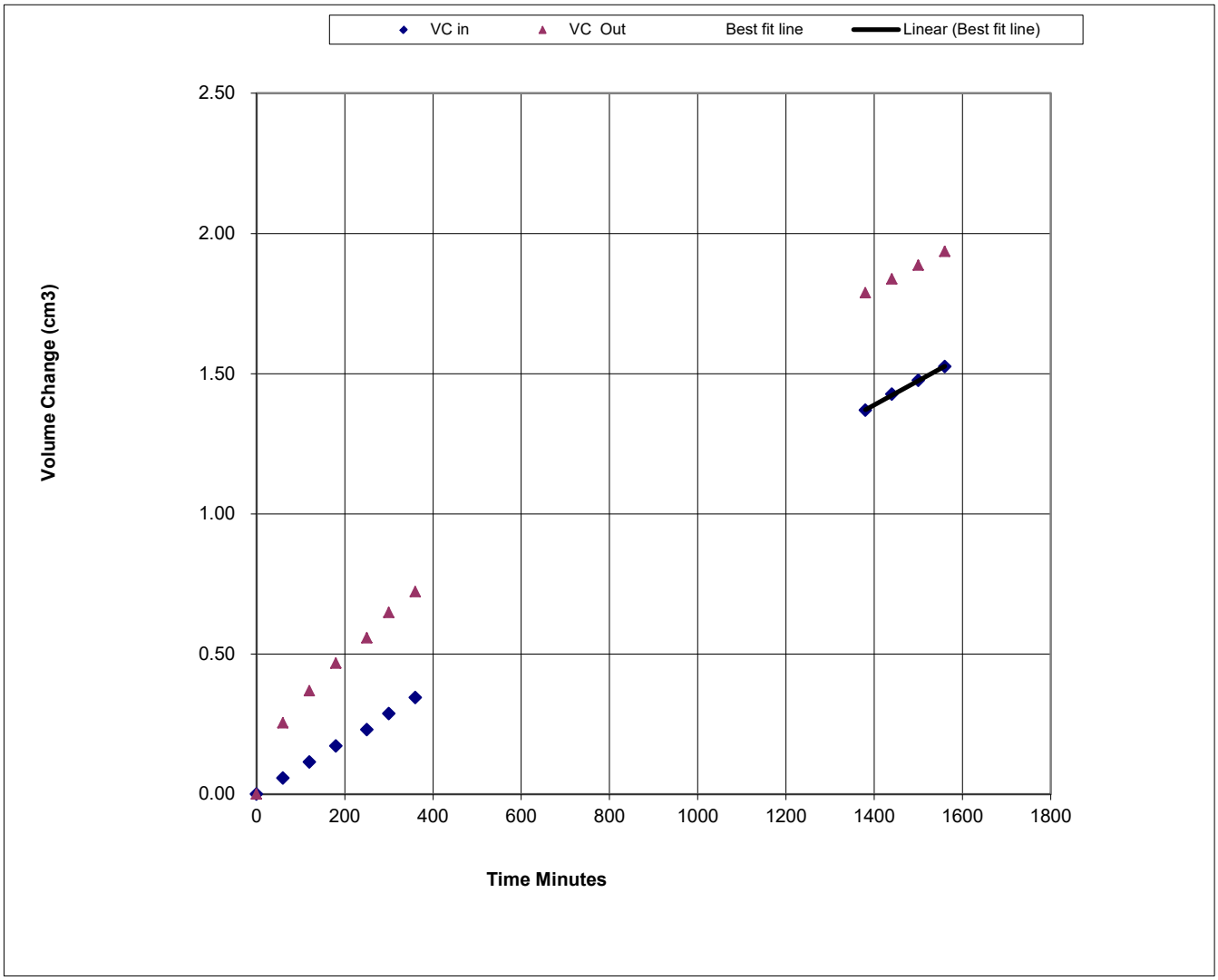


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		BTL/L2/12P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0009
Average Temperature	'C	23
Vertical Permeability Kv	m/s	9.2E-11

C3 Core Cutter Test Results

TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

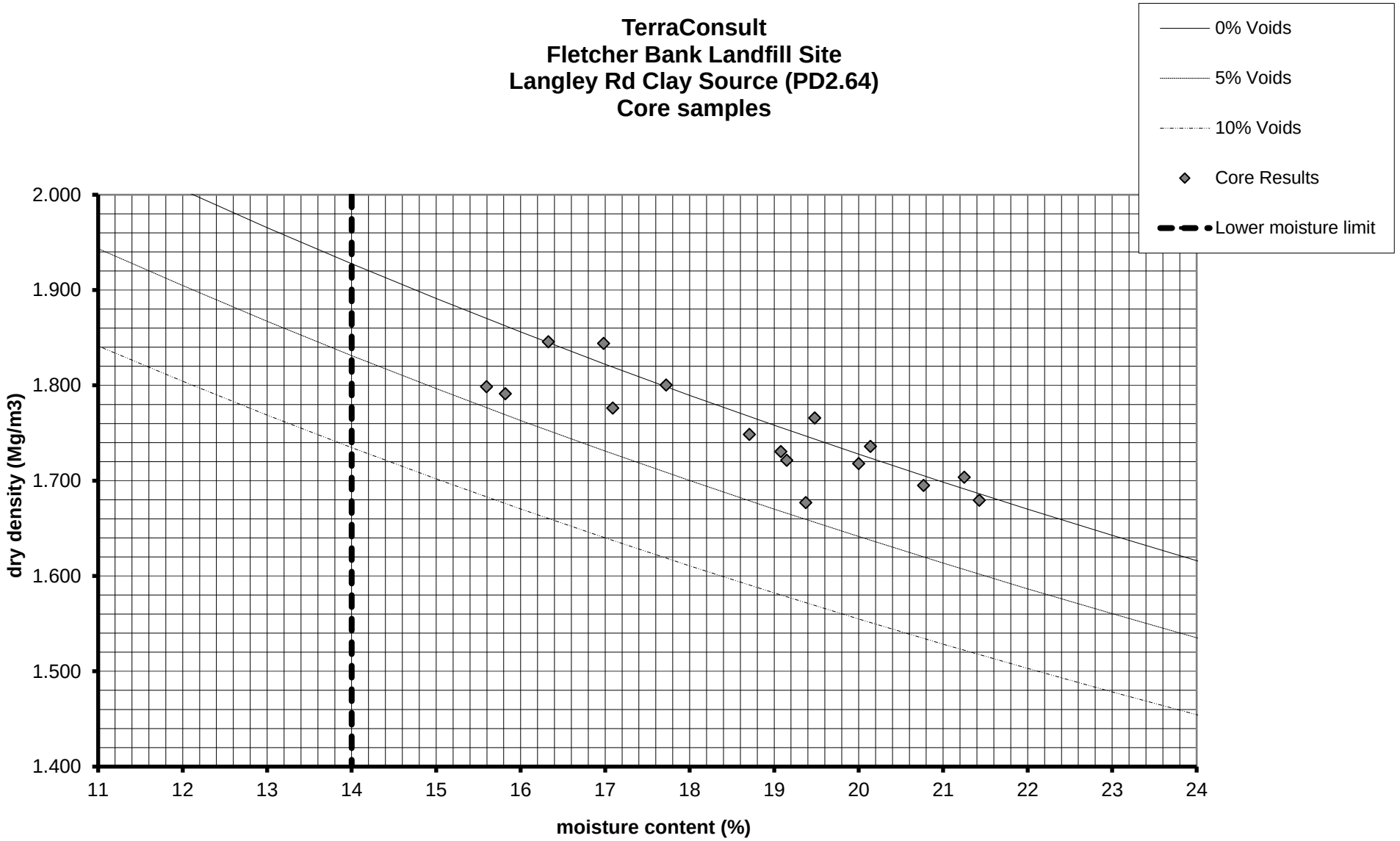
Job No: 3125

Engineer: Ash Mudhar, Nnanna, Iain Jones
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
13.08.18	P2/L1/09	E2	1020	2117	235	400	374	2.08	18.7	1.75	Pass
13.08.18	P3/L1/10	D3	1020	2102	235	416	387	2.06	19.1	1.73	Pass
13.08.18	P3/L2/11	C3	1005	2096	235	408	379	2.09	20.1	1.74	Pass
13.08.18	P2/L2/12	E3	1005	2072	235	397	370	2.06	20.0	1.72	Pass
13.08.18	P4/L1/13	C4	1020	2107	235	429	395	2.07	21.3	1.70	Pass
14.08.18	P4/L2/14	D5	1020	2092	235	403	376	2.05	19.1	1.72	Pass
14.08.18	P5/L1/15	B6	1005	2168	235	421	394	2.16	17.0	1.84	Pass
14.08.18	P6/L1/16	D7	1020	2152	235	419	389	2.11	19.5	1.77	Pass
14.08.18	P7/L1/17	D9	1005	2130	235	421	393	2.12	17.7	1.80	Pass
14.08.18	P5/L2/18	B5	1005	2090	235	420	393	2.08	17.1	1.78	Pass
14.08.18	P6/L2/19	C8	1020	2088	235	392	365	2.05	20.8	1.70	Pass
14.08.18	P7/L2/20	C9	1020	2042	235	426	395	2.00	19.4	1.68	Pass
15.08.18	P8/L1/21	E10	1041	2123	235	439	403	2.04	21.4	1.68	Pass
17.08.18	P9/L1/22	F11	1034	2220	235	406	382	2.15	16.3	1.85	Pass
17.08.18	P10/L1/23	E12	1034	2150	380	632	598	2.08	15.6	1.80	Pass
20.08.18	P11/L1/24	G13	1034	2145	380	585	557	2.07	15.8	1.79	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

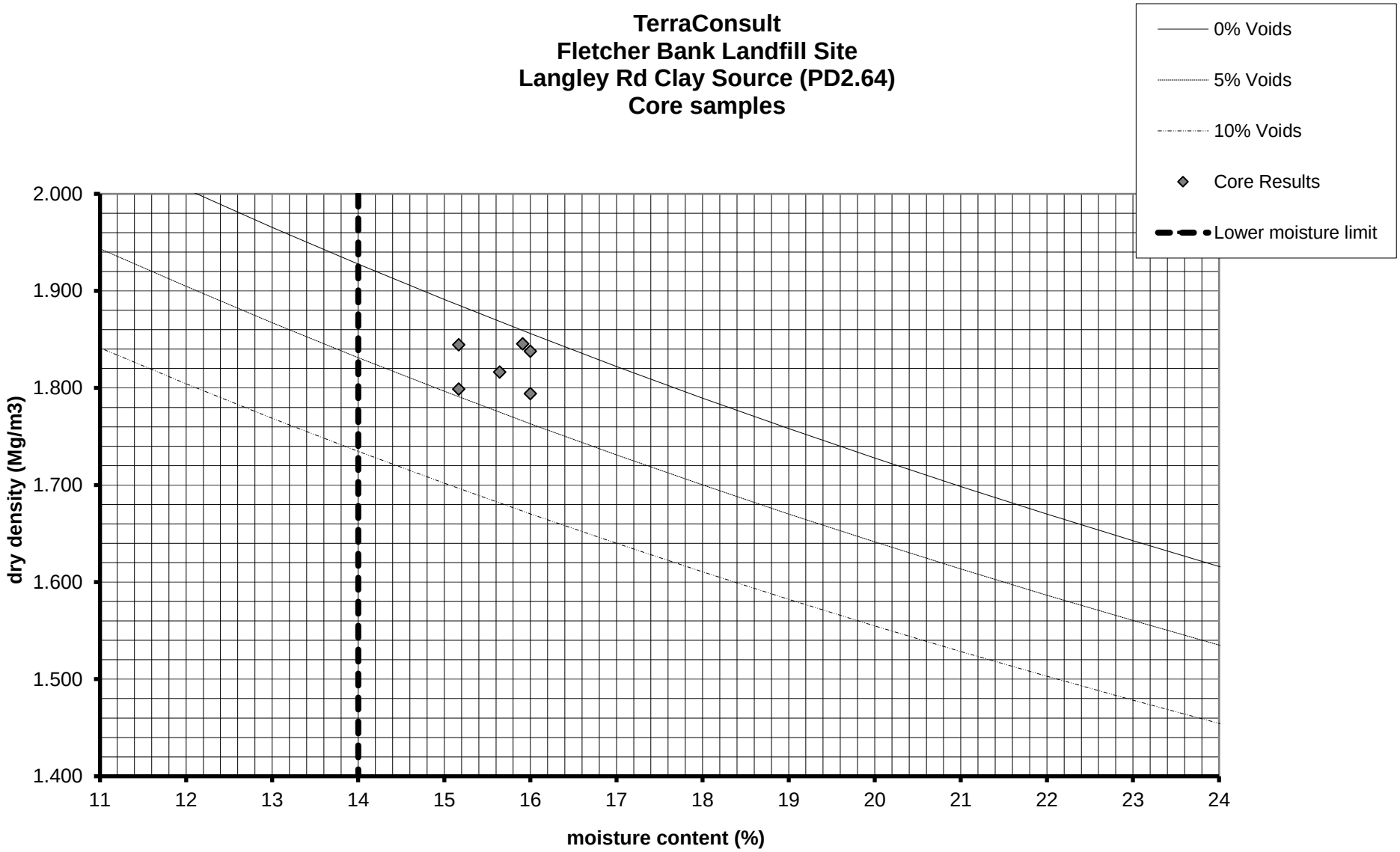
Job No: 3125

Engineer: Ash Mudhar, Nnanna, Iain Jones, John Phelan
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
20.08.18	P12/L1/25	H13	1034	2212	380	584	556	2.14	15.9	1.85	Pass
20.08.18	P9/L2/26	E11	1045	2165	380	585	558	2.07	15.2	1.80	Pass
20.08.18	P10/L2/27	F12	1045	2175	380	583	555	2.08	16.0	1.79	Pass
20.08.18	P11/L2/28	G13	1045	2228	380	612	580	2.13	16.0	1.84	Pass
20.08.18	P12/L2/29	H14	1045	2220	380	585	558	2.12	15.2	1.84	Pass
03.09.18	P12/L2/30	H15	1045	2195	380	587	559	2.10	15.6	1.82	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

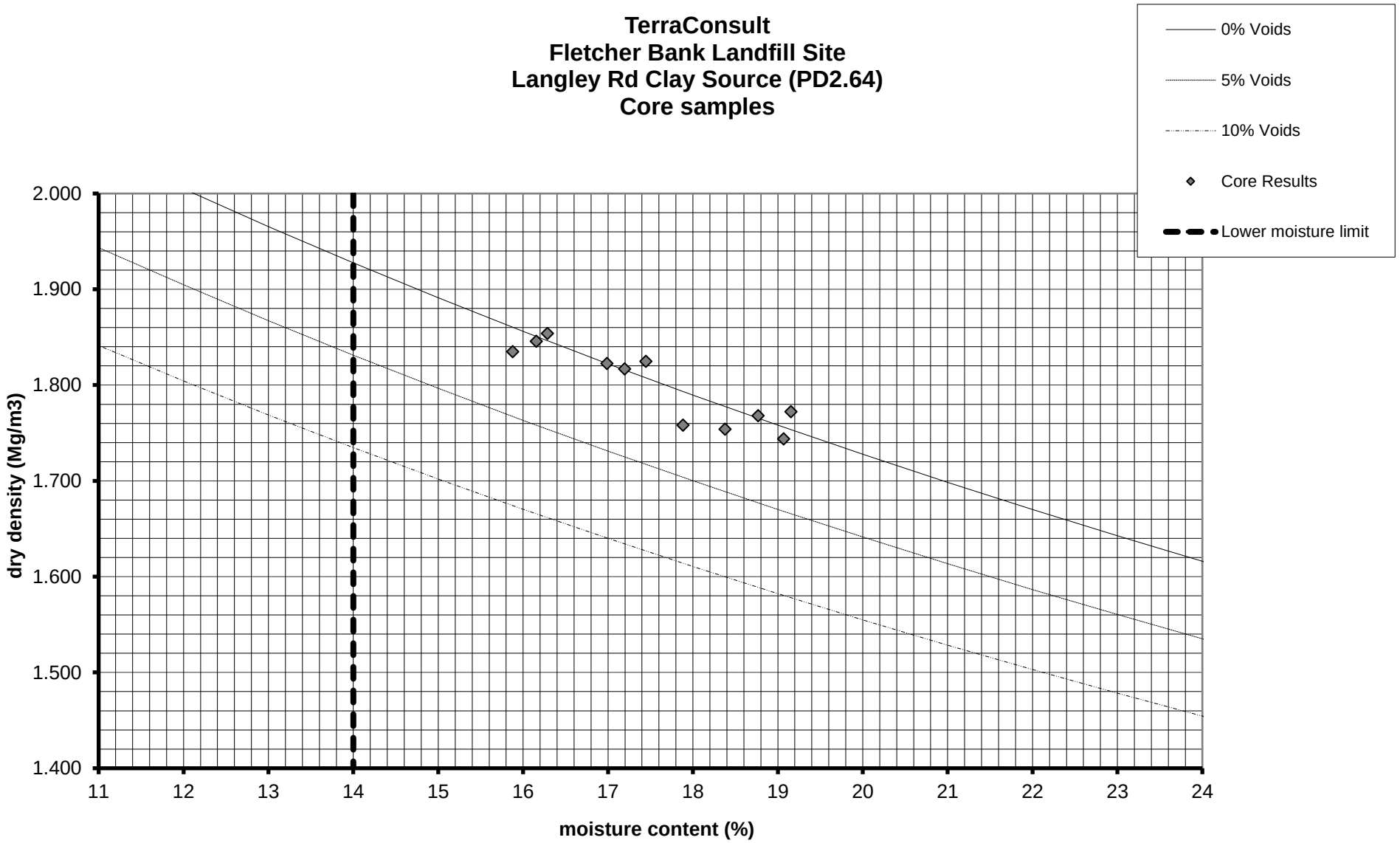
Job No: 3125

Engineer J Gibson
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
24/07/2019	P14/L1/13	F4	1021	2189	384	837	774	2.14	16.2	1.85	Pass
24/07/2019	P14/L2/14	H6	1021	2171	384	873	806	2.13	15.9	1.84	Pass
24/07/2019	P14/2/15	G8	1021	2201	384	841	777	2.16	16.3	1.85	Pass
24/07/2019	P15/L2/16	H9	1021	2174	384	902	826	2.13	17.2	1.82	Pass
24/07/2019	P15/L2/17	H10	1021	2188	384	862	791	2.14	17.4	1.82	Pass
24/07/2019	P15/L2/18	F9	1021	2116	384	852	781	2.07	17.9	1.76	Pass
24/07/2019	P14/L2/19	H4	1021	2177	384	873	802	2.13	17.0	1.82	Pass
24/07/2019	P16/L1/20	K4	1021	2120	384	880	803	2.08	18.4	1.75	Pass
24/07/2019	P16/L1/21	K6	1021	2156	384	919	833	2.11	19.2	1.77	Pass
24/07/2019	P16/L1/22	K8	1021	2144	384	808	741	2.10	18.8	1.77	Pass
24/07/2019	P16/L1/23	J9	1021	2120	384	921	835	2.08	19.1	1.74	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

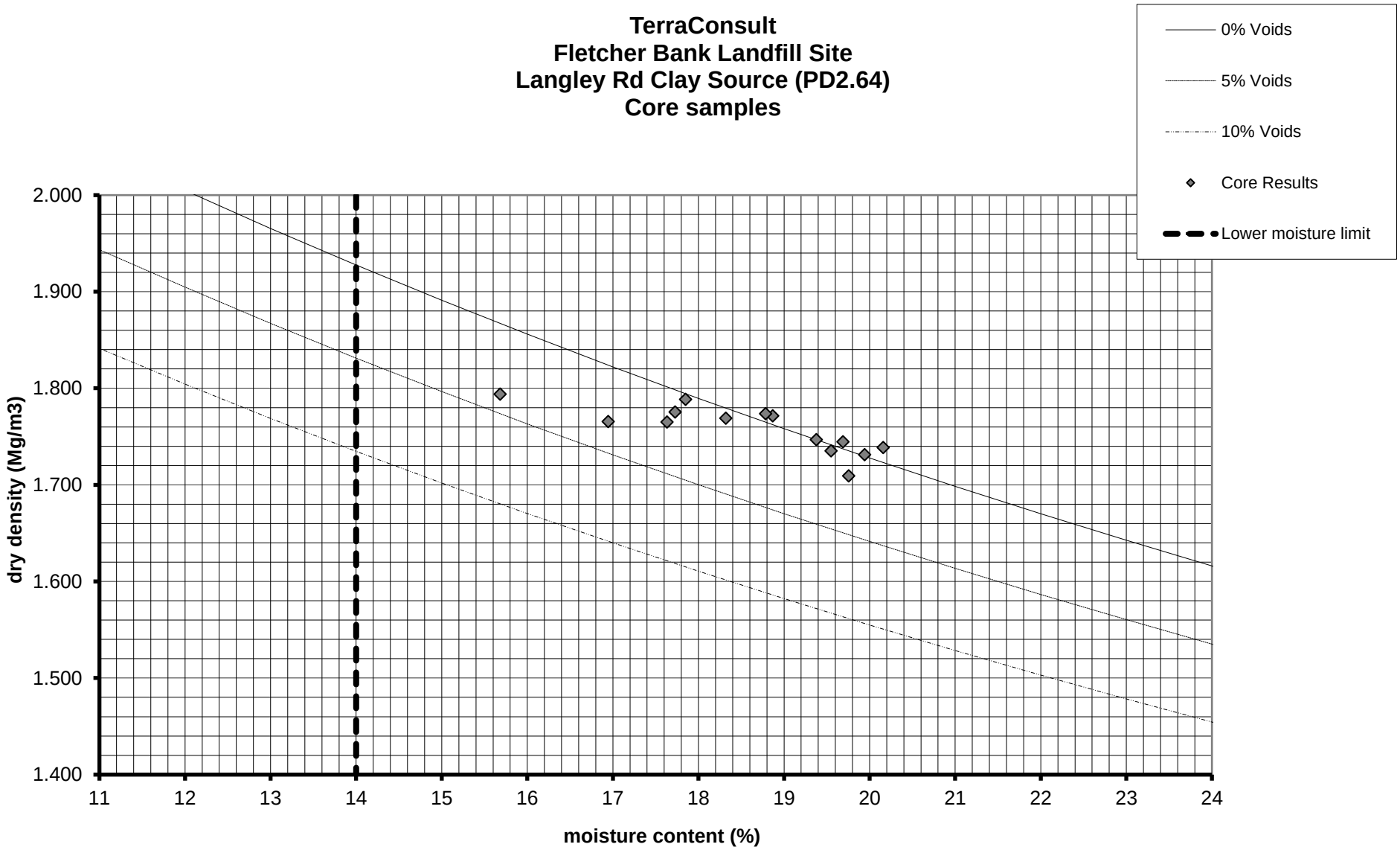
Job No: 3125

Engineer J Gbson
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
25/07/2019	P17/L1/24	K12	1021	2129	384	883	802	2.09	19.4	1.75	Pass
25/07/2019	P17/L1/25	K14	1021	2134	384	902	824	2.09	17.7	1.78	Pass
25/07/2019	P17/L1/26	M12	1021	2090	384	875	794	2.05	19.8	1.71	Pass
25/07/2019	P17/L1/27	M10	1021	2133	384	837	761	2.09	20.2	1.74	Pass
25/07/2019	P17/L1/28	O9	1021	2132	384	846	770	2.09	19.7	1.74	Pass
25/07/2019	P17/L2/29	N9	1021	2108	384	874	803	2.06	16.9	1.77	Pass
25/07/2019	P17/L2/30	N11	1021	2120	384	831	764	2.08	17.6	1.77	Pass
25/07/2019	P17/L2/31	L11	1021	2152	384	866	793	2.11	17.8	1.79	Pass
25/07/2019	P17/L2/32	L13	1021	2150	384	825	755	2.11	18.9	1.77	Pass
25/07/2019	P17/L2/33	J13	1021	2120	384	799	730	2.08	19.9	1.73	Pass
25/07/2019	P16/L2/34	J4	1021	2151	384	833	762	2.11	18.8	1.77	Pass
25/07/2019	P16/L2/35	J6	1021	2137	384	849	777	2.09	18.3	1.77	Pass
25/07/2019	P16/L2/36	J8	1021	2119	384	893	824	2.08	15.7	1.79	Pass
25/07/2019	P16/L2/37	J10	1021	2118	384	861	783	2.07	19.5	1.74	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



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CQA Form 7

Site: Fletcher Bank Landfill Site May/June 2020

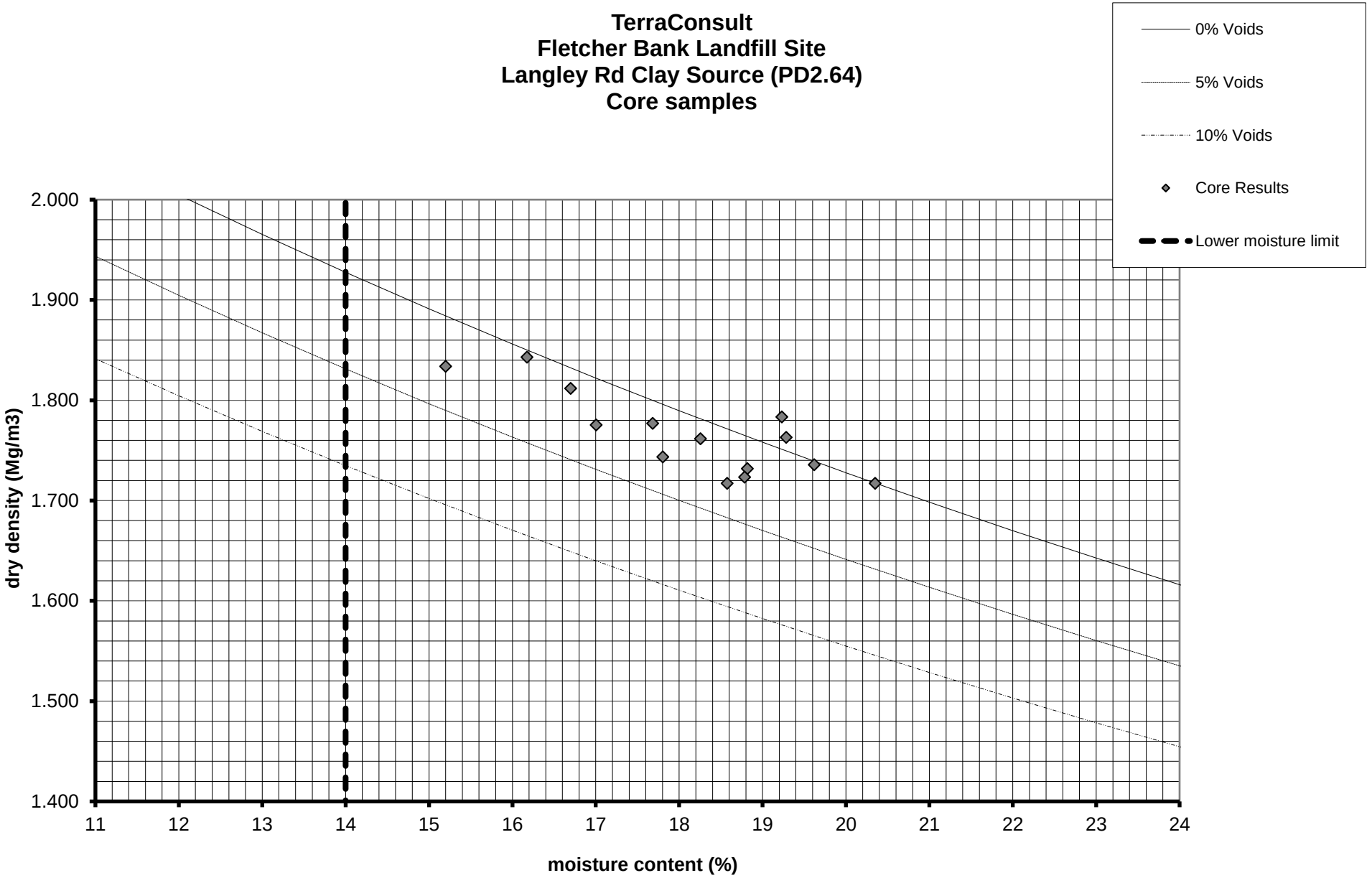
Job No: 3125

Engineer J Gbson
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
28/05/2020	P18/L1/38	C1	1021	2101	523	1066	980	2.06	18.8	1.73	Pass
28/05/2020	P18/L1/39	D0	1021	2110	523	1073	980	2.07	20.4	1.72	Pass
28/05/2020	P18/L1/40	B2	1021	2097	523	1059	978	2.05	17.8	1.74	Pass
28/05/2020	P18/L1/41	E-1	1021	2079	523	1072	986	2.04	18.6	1.72	Pass
28/05/2020	P18/L1/42	G0	1021	2171	523	1081	991	2.13	19.2	1.78	Pass
28/05/2020	P18/L1/43	G-2	1021	2127	523	1119	1027	2.08	18.3	1.76	Pass
29/05/2020	P18/L1/44	I1	981	2063	523	1123	1026	2.10	19.3	1.76	Pass
29/05/2020	P18/L1/45	H-1	1021	2120	523	1151	1048	2.08	19.6	1.74	Pass
29/05/2020	P18/L1/46	J-1	1021	2090	523	1168	1066	2.05	18.8	1.72	Pass
29/05/2020	P18/L1/47	K1	1005	2125	523	1152	1062	2.11	16.7	1.81	Pass
29/05/2020	P18/L1/48	L0	1021	2135	523	1102	1015	2.09	17.7	1.78	Pass
29/05/2020	P18/L1/49	I-2	1021	2186	523	1112	1030	2.14	16.2	1.84	Pass
01/06/2020	P18/L2/50	D2	1021	2121	523	1101	1017	2.08	17.0	1.78	Pass
01/06/2020	P18/L2/51	F0	1021	2157	523	1099	1023	2.11	15.2	1.83	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



TerraConsult

CQA Form 7

Site: Fletcher Bank Landfill Site

May/June 2020

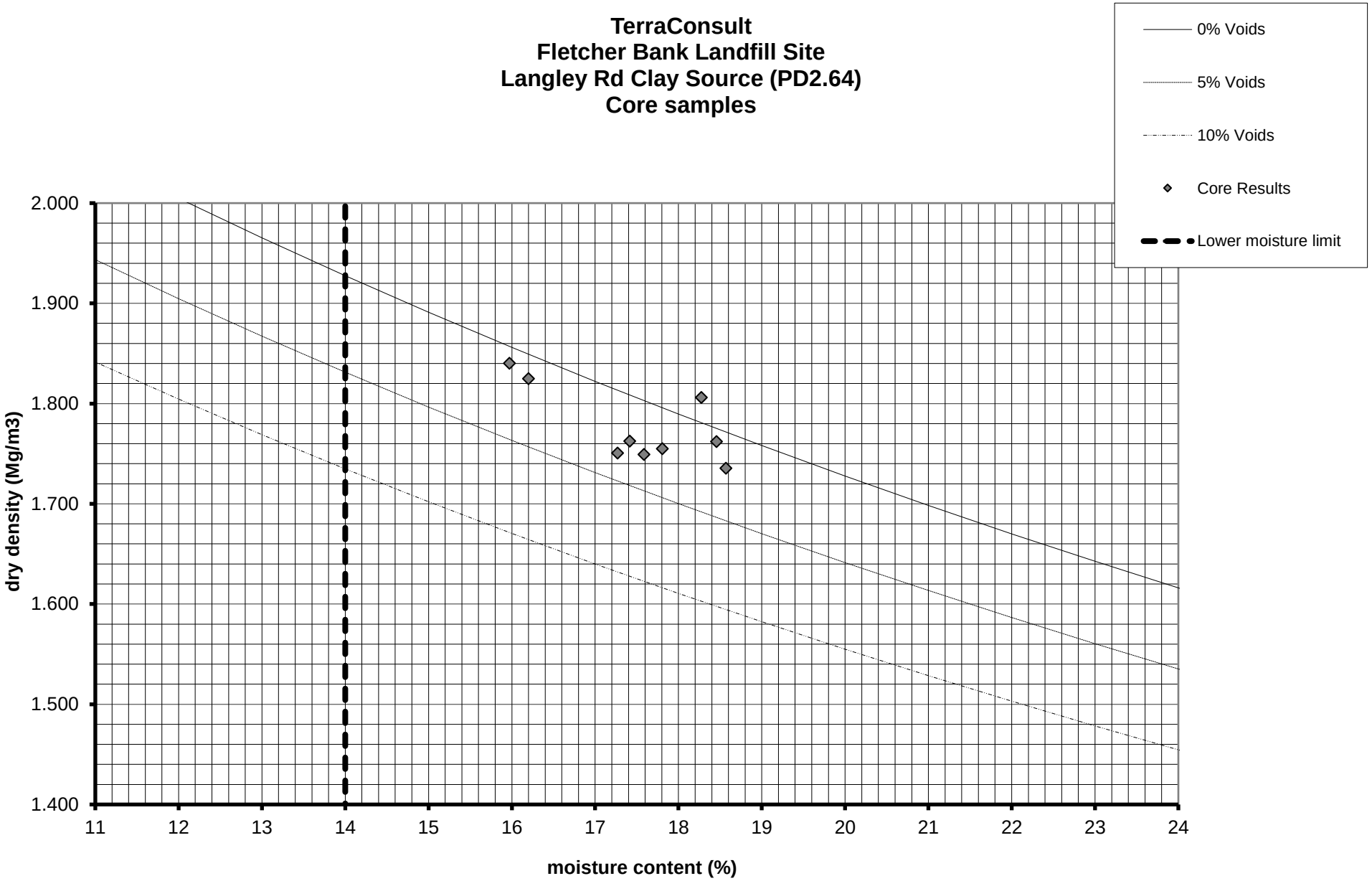
Job No: 3125

Engineer J Gbson
Material: Langley Rd Clay Source
Roller: Bomag 213DH Smooth drum Vibratory Roller

Core Readings

Sample Details			Core Sample		Sub Sample			Results			
Date	Test No.	CQA Grid Location	Volume of Cutter cm3	Wet Weight (grams)	Weight of Plate (grams)	Plate + Wet Sample (grams)	Plate + Dry Sample (grams)	Bulk Density Mg/m3	Moisture Content %	Dry Density Mg/m3	Pass/Fail
01/06/2020	P18/L2/52	G-1	1021	2096	523	1141	1050	2.05	17.3	1.75	Pass
01/06/2020	P18/L2/53	G1	1021	2113	523	1150	1057	2.07	17.4	1.76	Pass
01/06/2020	P18/L2/54	H0	1021	2179	523	1133	1049	2.13	16.0	1.84	Pass
01/06/2020	P18/L2/55	H-2	1021	2111	523	1178	1079	2.07	17.8	1.76	Pass
01/06/2020	P18/L2/56	I-1	1021	2181	523	1099	1010	2.14	18.3	1.81	Pass
02/06/2020	P18/L2/57	J0	1021	2101	523	1053	970	2.06	18.6	1.74	Pass
02/06/2020	P18/L2/58	K-1	1021	2131	523	1075	989	2.09	18.5	1.76	Pass
02/06/2020	P18/L2/59	L1	1021	2100	523	1098	1012	2.06	17.6	1.75	Pass
02/06/2020	P18/L2/60	M0	1021	2165	523	1061	986	2.12	16.2	1.82	Pass

TerraConsult
Fletcher Bank Landfill Site
Langley Rd Clay Source (PD2.64)
Core samples



C4 Hand Shear Vane Test Results

TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: A. Mudhar, Nnanna, Iain Jones, John Phelan
Material: Engineered Clay

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
13.08.18	P2/L1/09	E2	92	82	84	86
13.08.18	P3/L1/10	D3	70	69	83	74
13.08.18	P3/L2/11	C3	67	85	68	73
13.08.18	P2/L2/12	E3	74	65	92	77
13.08.18	P4/L1/13	C4	68	90	63	74
14.08.18	P4/L2/14	D5	74	77	74	75
14.08.18	P5/L1/15	B6	86	73	71	77
14.08.18	P6/L1/16	D7	80	90	69	80
14.08.18	P7/L1/17	D9	85	69	98	84
14.08.18	P5/L2/18	B5	98	90	71	86
14.08.18	P6/L2/19	C8	92	61	77	77
14.08.18	P7/L2/20	C9	74	89	63	75
15.08.18	P8/L1/21	E10	93	97	65	85
17.08.18	P9/L1/22	E11	110	96	82	96
17.08.18	P10/L1/23	F12	110	108	88	102
20.08.18	P8/L2/24	D10	100	110	105	105
20.08.18	P12/L1/25	H13	105	110	115	110
20.08.18	P9/L2/26	E11	76	110	98	95
20.08.18	P10/L2/27	F12	96	110	90	99
20.08.18	P11/L2/28	G13	88	90	72	83
20.08.18	P12/L2/29	H14	85	78	90	84

TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank
Job No : 3125
Project: Cell 1
Engineer: J Gibson
Material: Engineered Clay

24/07/2019	P14/L2/13	F4	100	102	100	101
24/07/2019	P14/L2/14	H6	108	106	110	108
24/07/2019	P15/L2/15	G8	102	90	96	96
24/07/2019	P15/L2/16	H9	90	96	104	97
24/07/2019	P15/L2/17	H10	120	122	126	123
24/07/2019	P15/L2/18	F9	130	128	122	127
24/07/2019	P14/L2/19	H4	112	118	120	117
24/07/2019	P16/L1/20	K4	116	116	110	114
24/07/2019	P16/L1/21	K6	90	120	116	109
24/07/2019	P16/L1/22	K8	122	128	120	123
24/07/2019	P16/L1/23	J9	118	118	128	121
25/07/2019	P17/L1/24	K12	90	92	96	93
25/07/2019	P17/L1/25	K14	90	88	86	88
25/07/2019	P17/L1/26	M12	86	88	90	88
25/07/2019	P17/L1/27	M10	92	94	90	92
25/07/2019	P17/L1/28	O9	100	104	100	101
25/07/2019	P17/L2/29	N9	106	110	106	107
25/07/2019	P17/L2/30	N11	108	108	110	109
25/07/2019	P17/L2/31	L11	112	110	118	113
25/07/2019	P17/L2/32	L13	108	110	110	109
25/07/2019	P17/L2/33	J13	112	108	110	110
25/07/2019	P16/L2/34	J4	102	110	112	108
25/07/2019	P16/L2/35	J6	100	98	96	98
25/07/2019	P16/L2/36	J8	108	90	110	103
25/07/2019	P16/L2/37	J10	110	120	98	109

TerraConsult

HAND VANE - SHEAR STRENGTH RECORD TEST

Site: Fletcher Bank May/June 2020
Job No : 3125
Project: Cell 1
Engineer: J Gibson
Material: Engineered Clay

Date	Test No	CQA Test Grid Ref.	Shear Strength (kN/m2)			Average (kN/m2)
28/05/2020	P18/L1/38	C1	76	78	82	79
28/05/2020	P18/L1/39	D0	68	74	80	74
28/05/2020	P18/L1/40	B2	98	102	90	97
28/05/2020	P18/L1/41	E-1	66	70	66	67
28/05/2020	P18/L1/42	G0	72	80	78	77
28/05/2020	P18/L1/43	G-2	90	98	88	92
29/05/2020	P18/L1/44	I1	100	108	106	105
29/05/2020	P18/L1/45	H-1	80	80	90	83
29/05/2020	P18/L1/46	J-1	104	110	110	108
29/05/2020	P18/L1/47	K1	90	108	110	103
29/05/2020	P18/L1/48	L0	106	106	110	107
29/05/2020	P18/L1/49	I-2	98	88	110	99
01/06/2020	P18/L2/50	D2	108	110	106	108
01/06/2020	P18/L2/51	F0	128	120	126	125
01/06/2020	P18/L2/52	G-1	120	120	118	119
01/06/2020	P18/L2/53	G1	110	110	120	113
01/06/2020	P18/L2/54	H0	124	120	128	124
01/06/2020	P18/L2/55	H-2	116	118	120	118
01/01/1900	P18/L1/56	I-1	118	118	126	121
02/06/2020	P18/L2/57	J0	110	114	110	111
02/06/2020	P18/L2/58	K-1	120	102	104	109
02/06/2020	P18/L2/59	L1	122	128	120	123
02/06/2020	P18/L2/60	M0	118	120	128	122

C5 Classification Test Results

LABORATORY REPORT

REPORT

4043

Contract Number: PSL18/4122

Report Date: 17 September 2018

Client's Reference: 3125

Client Name: Terra Consult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: Iain Jones

Contract Title: Fletcher Bank LFS

Date Received: 16/8/2018
Date Commenced: 16/8/2018
Date Completed: 17/9/2018

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
	P3/L1/10				Brown slightly gravelly very sandy CLAY.
	P3/L1/10				Brown slightly gravelly very sandy CLAY.
	P4/L1/13				Brown slightly gravelly very sandy CLAY.
	P6/L1/16				Brown slightly gravelly very sandy CLAY.
	P6/L1/16				Brown slightly gravelly very sandy CLAY.
	P5/L2/18				Brown slightly gravelly very sandy CLAY.
	P5/L2/18				Brown slightly gravelly very sandy CLAY.
	P7/L2/20				Brown slightly gravelly very sandy CLAY.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL18/4122 Client Ref: 3125

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
	P3/L1/10				19		2.64	38	18	20	90	Intermediate plasticity CI.
	P4/L1/13				18			38	18	20	91	Intermediate plasticity CI.
	P6/L1/16				20		2.63	40	19	21	88	Intermediate plasticity CI.
	P5/L2/18				18		2.64	35	17	18	86	Intermediate plasticity CI.
	P7/L2/20				18			36	17	19	93	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

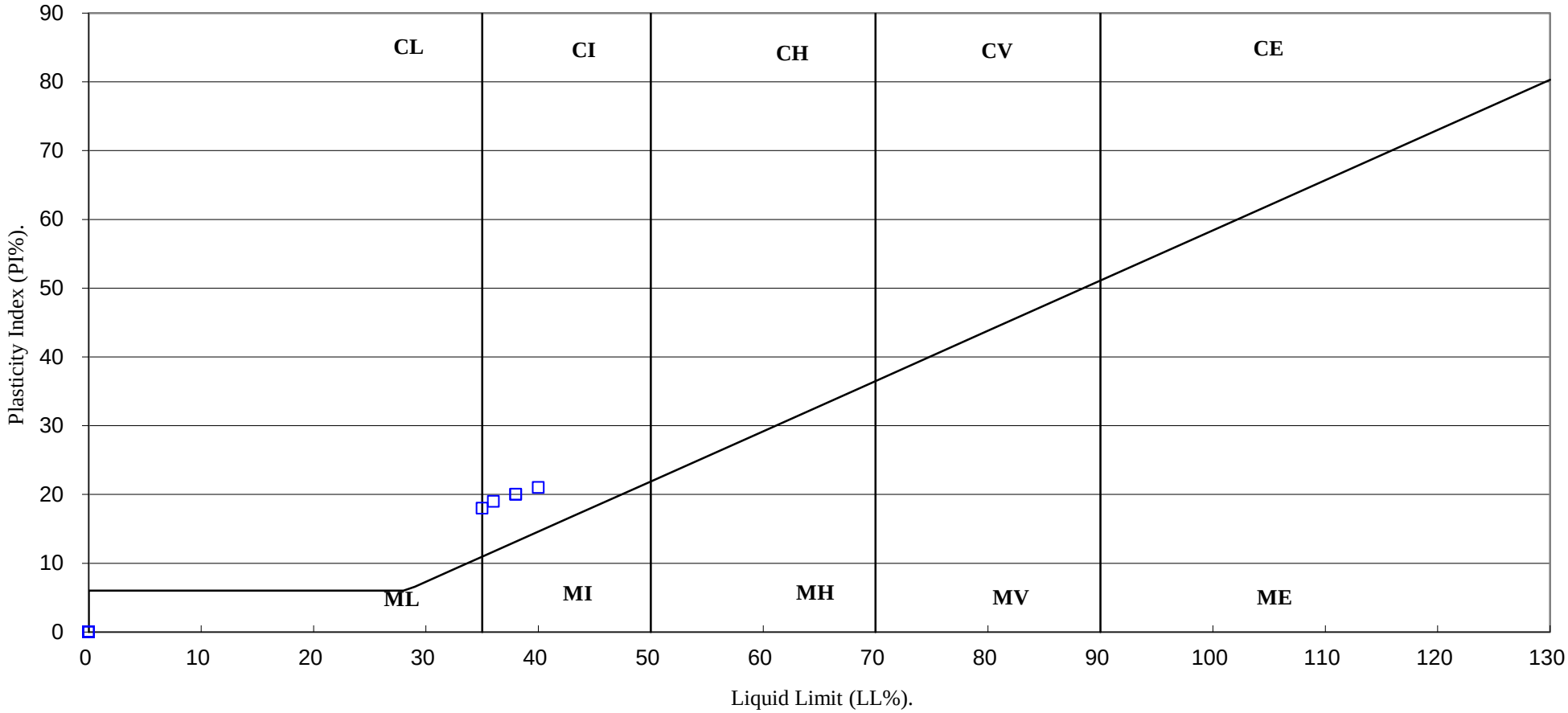
PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No: PSL18/4122

Client Ref: 3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Fletcher Bank LFS**	**Contract No:** PSL18/4122 **Client Ref:** 3125

PARTICLE SIZE DISTRIBUTION TEST

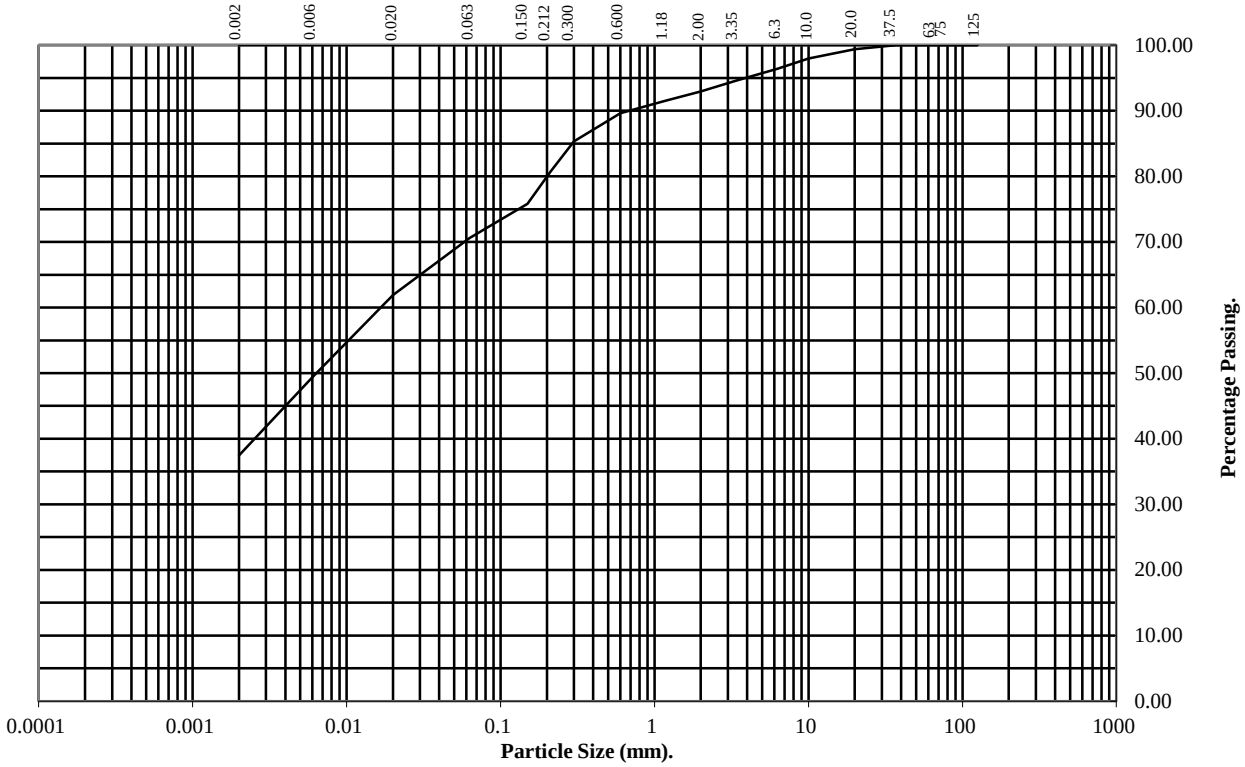
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P3/L1/10** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	98
6.3	96
3.35	95
2	93
1.18	92
0.6	90
0.3	85
0.212	81
0.15	76
0.063	71

Particle Diameter	Percentage Passing
0.02	62
0.006	49
0.002	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	22
Silt	34
Clay	37

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

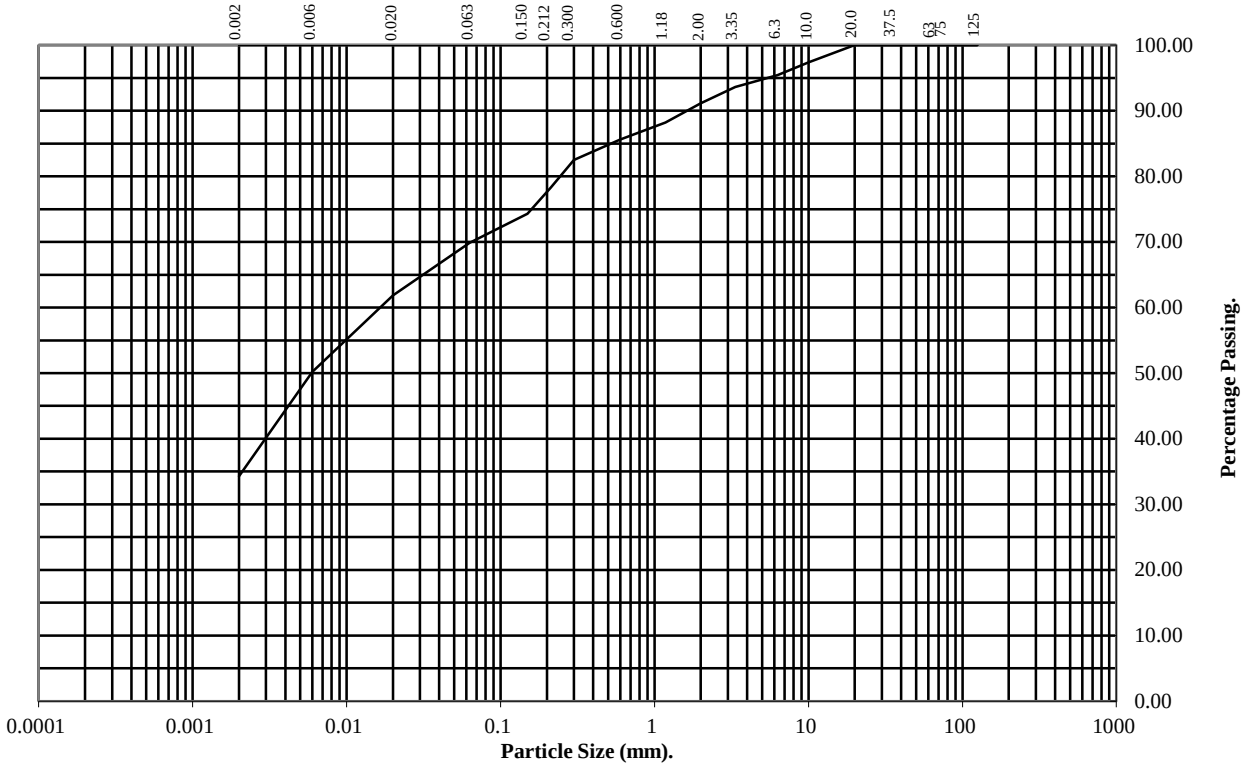
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P5/L2/18** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	95
3.35	94
2	91
1.18	88
0.6	86
0.3	82
0.212	78
0.15	74
0.063	70

Particle Diameter	Percentage Passing
0.02	62
0.006	50
0.002	34

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	21
Silt	36
Clay	34

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

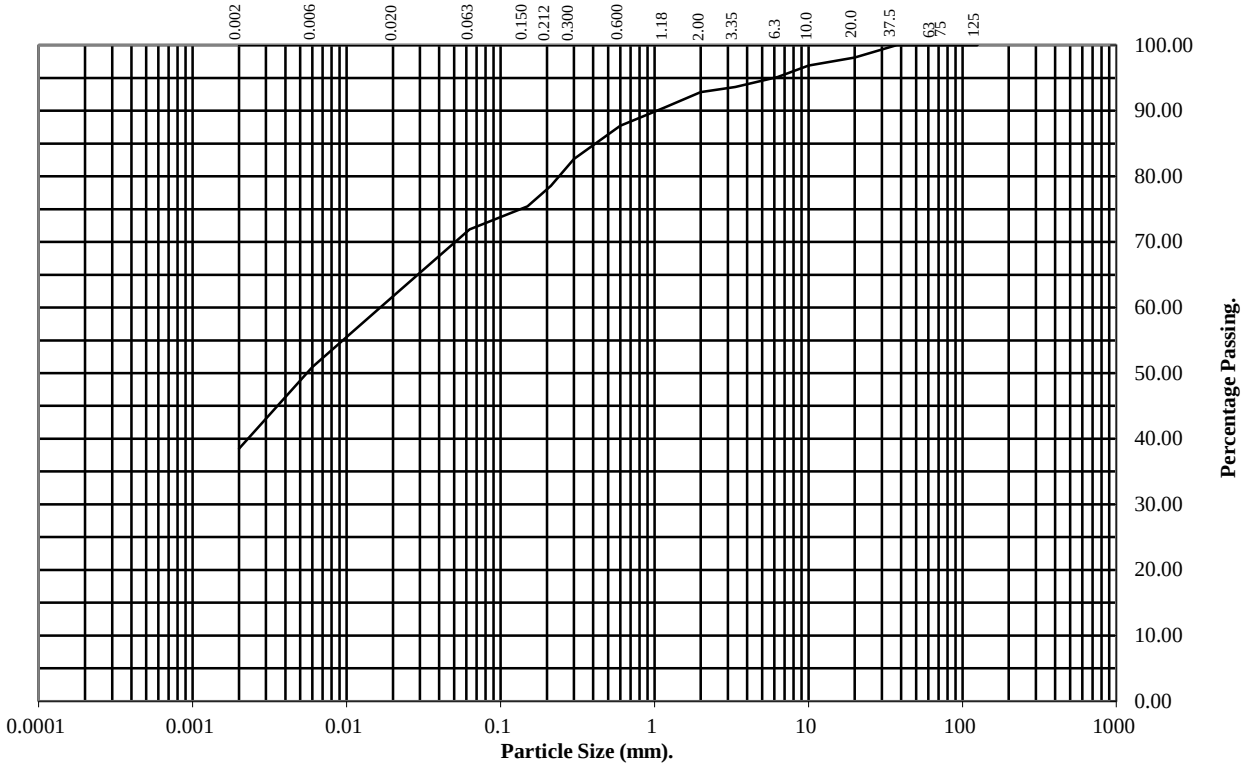
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P6/L1/16** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	97
6.3	95
3.35	94
2	93
1.18	91
0.6	88
0.3	83
0.212	79
0.15	75
0.063	72

Particle Diameter	Percentage Passing
0.02	62
0.006	51
0.002	39

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	21
Silt	33
Clay	39

Remarks:

See Summary of Soil Descriptions

LABORATORY REPORT

REPORT

4043

Contract Number: PSL18/4299

Report Date: 27 September 2018

Client's Reference: 3125

Client Name: Terra Consult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: John Phelan

Contract Title: Fletcher Bank LFS

Date Received: 29/8/2018
Date Commenced: 29/8/2018
Date Completed: 27/9/2018

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
	P10/L1/23				Brown gravelly very sandy CLAY.
	P10/L1/23				Brown gravelly very sandy CLAY.
	P11/L2/28				Brown gravelly very sandy CLAY.
	P11/L2/28				Brown gravelly very sandy CLAY.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL18/4121 Client Ref: 3125

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
	P10/L1/23				19		2.63	37	19	18	89	Intermediate plasticity CI.
	P11/L2/28				18		2.64	35	18	17	83	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

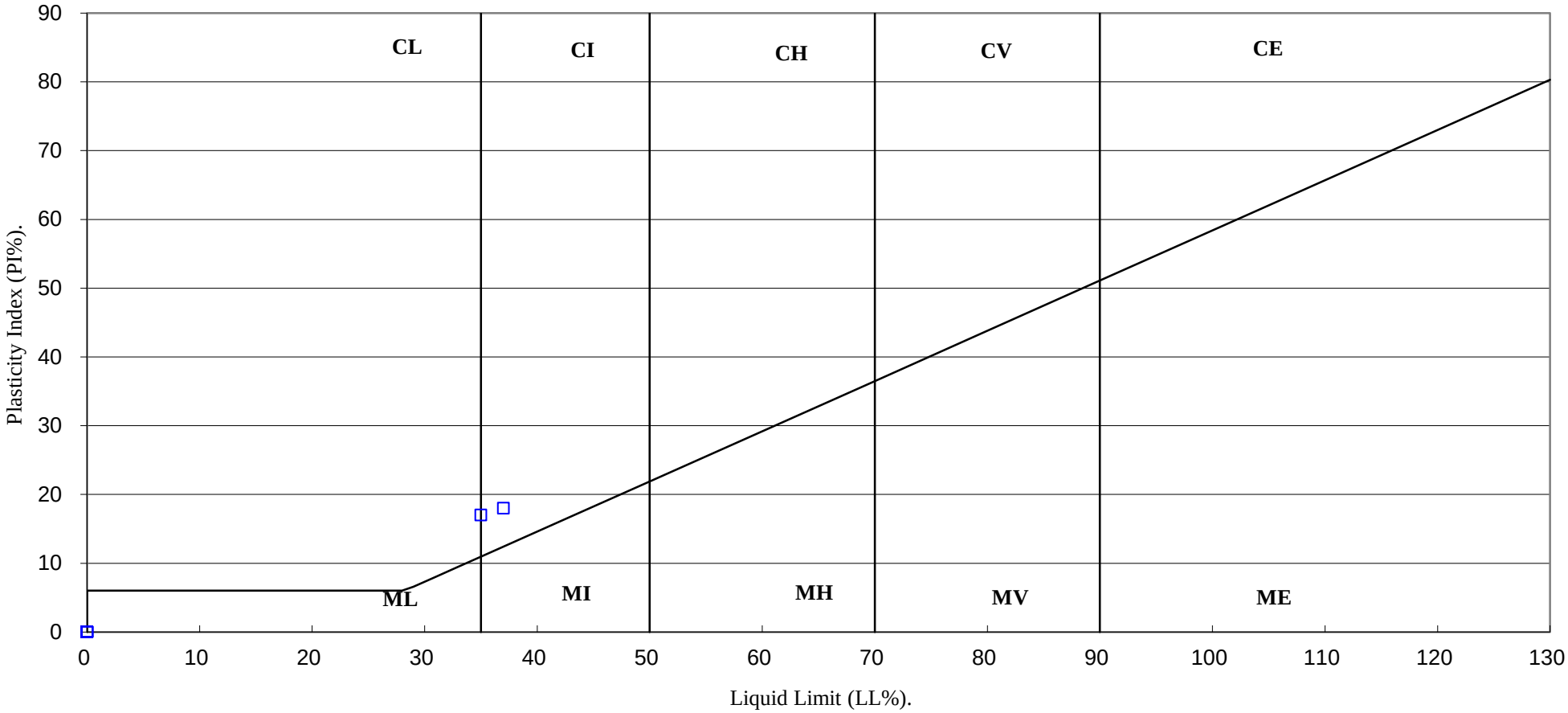
Contract No:

PSL18/4299

Client Ref:

3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Fletcher Bank LFS**	**Contract No:** PSL18/4299 **Client Ref:** 3125

PARTICLE SIZE DISTRIBUTION TEST

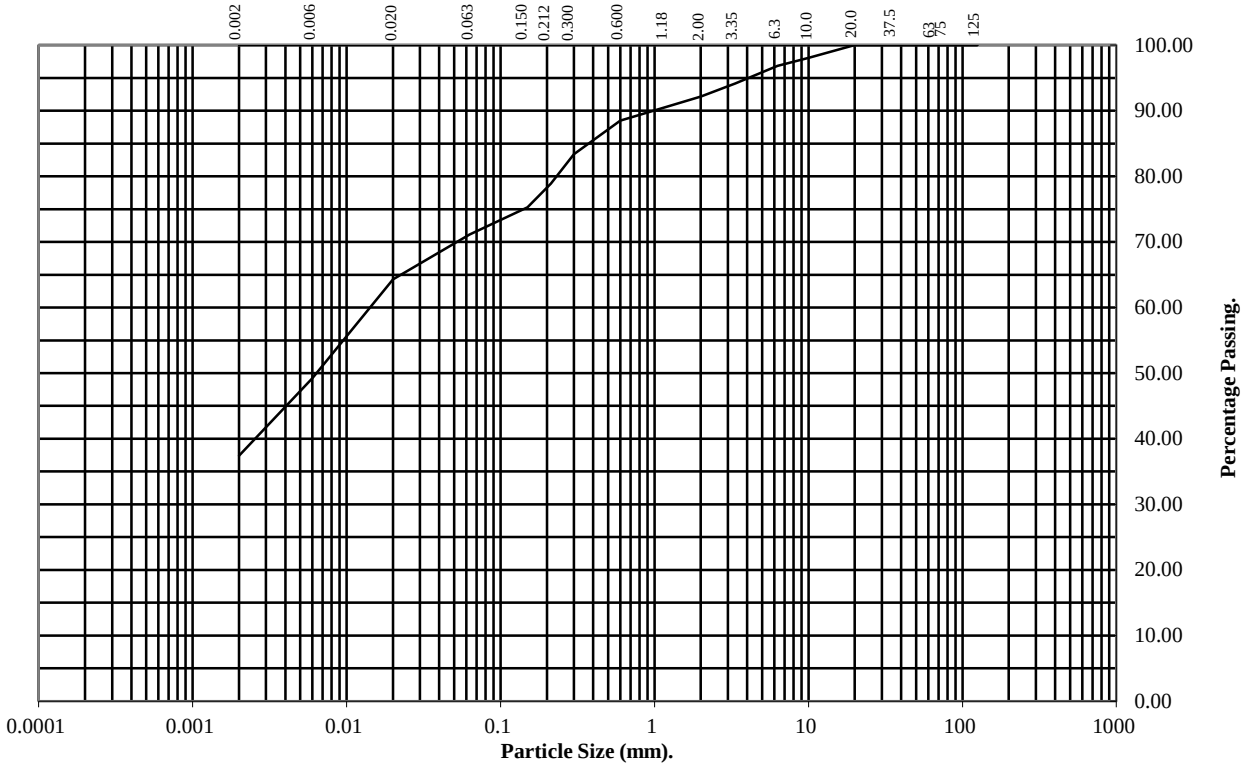
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P10/L1/23** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	97
3.35	94
2	92
1.18	91
0.6	89
0.3	83
0.212	79
0.15	75
0.063	71

Particle Diameter	Percentage Passing
0.02	64
0.006	49
0.002	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	8
Sand	21
Silt	34
Clay	37

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

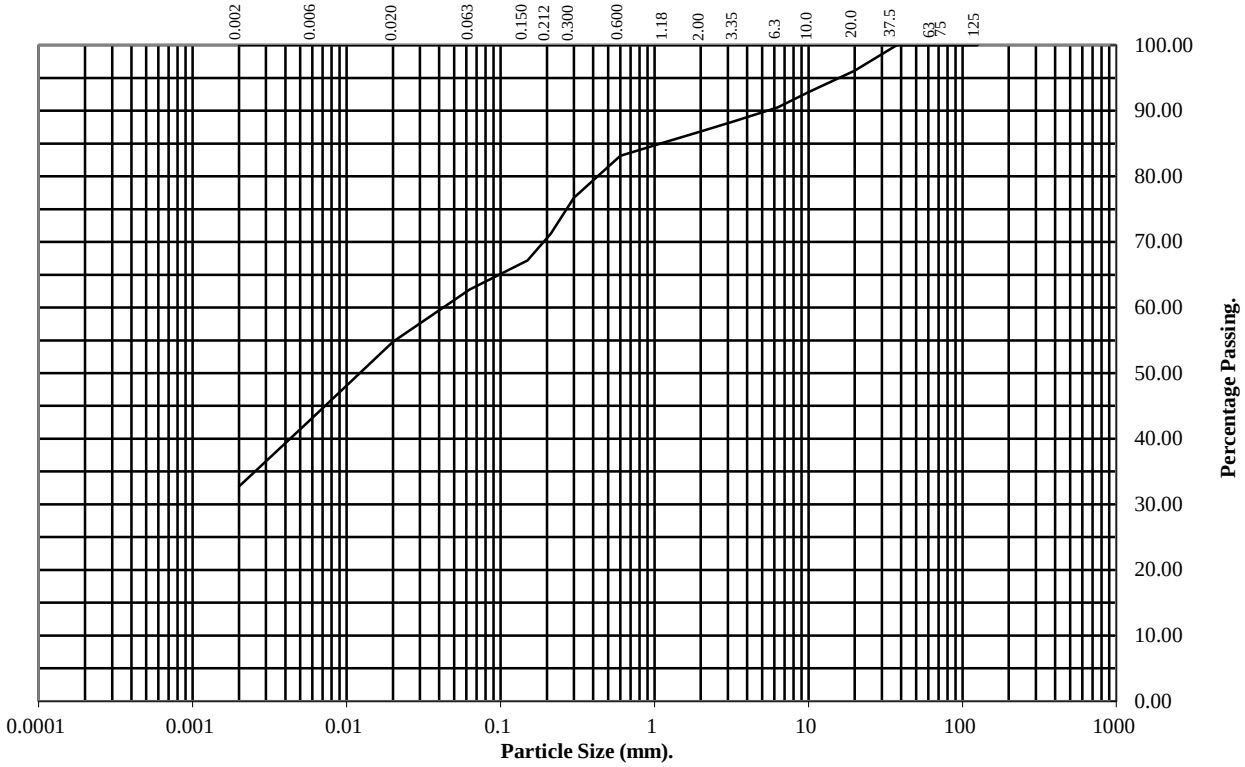
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P11/L2/28** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	93
6.3	91
3.35	88
2	87
1.18	85
0.6	83
0.3	77
0.212	71
0.15	67
0.063	63

Particle Diameter	Percentage Passing
0.02	55
0.006	43
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	13
Sand	24
Silt	30
Clay	33

Remarks:

See Summary of Soil Descriptions

LABORATORY REPORT

REPORT

4043

Contract Number: PSL18/4643

Report Date: 19 October 2018

Client's Reference: 3125

Client Name: Terra Consult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: John Phelan

Contract Title: Fletcher Bank LFS

Date Received: 13/9/2018
Date Commenced: 13/9/2018
Date Completed: 19/10/2018

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
	P12/L1/25				Brown slightly gravelly sandy CLAY.
	P14/L1/30				Brown slightly gravelly sandy CLAY.
	P15/L1/33				Brown slightly gravelly sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
	P12/L1/25				16			40	18	22	96	Intermediate plasticity CI.
	P14/L1/30				15		2.63	41	19	22	95	Intermediate plasticity CI.
	P15/L1/33				17		2.65	39	18	21	97	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

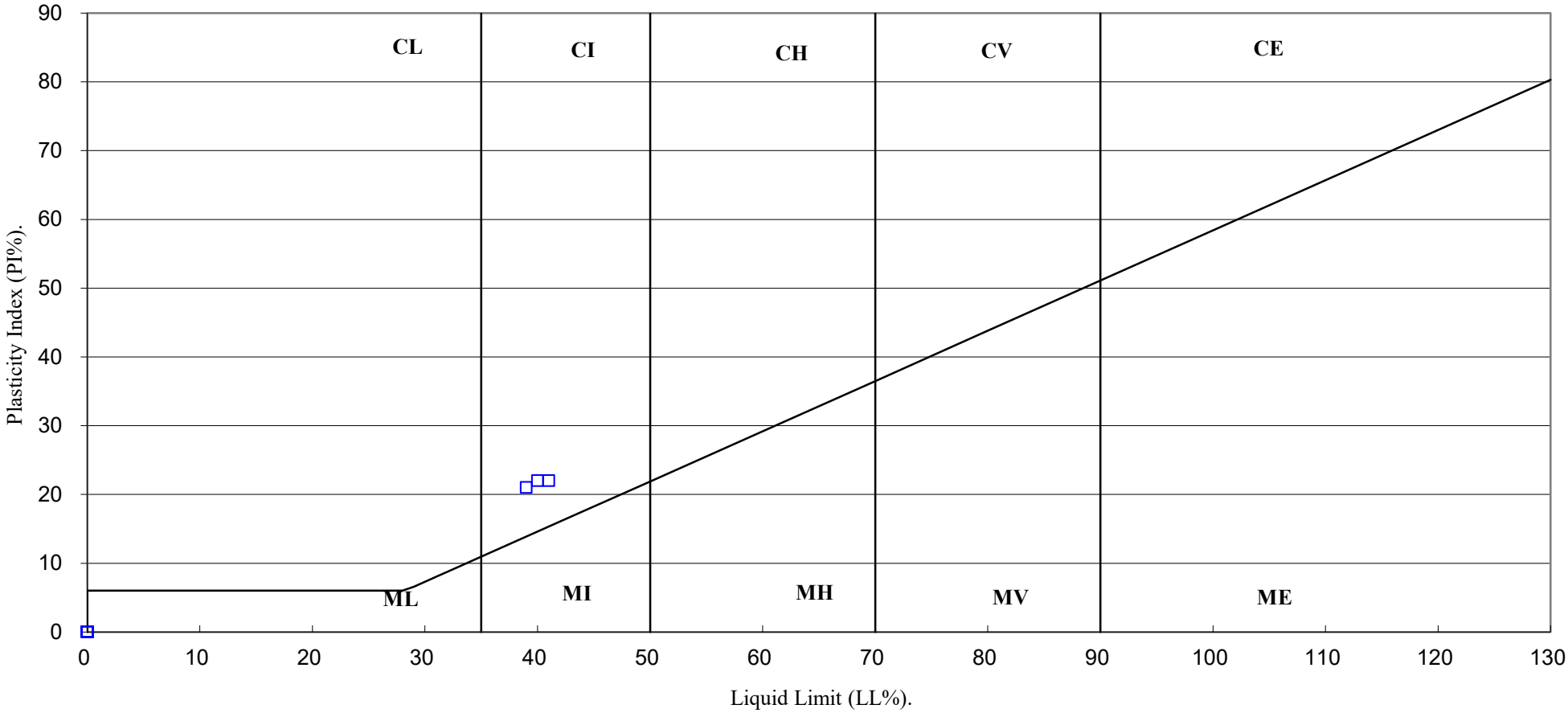
PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No: PSL18/4643

Client Ref: 3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL18/4643 Client Ref: 3125

PARTICLE SIZE DISTRIBUTION TEST

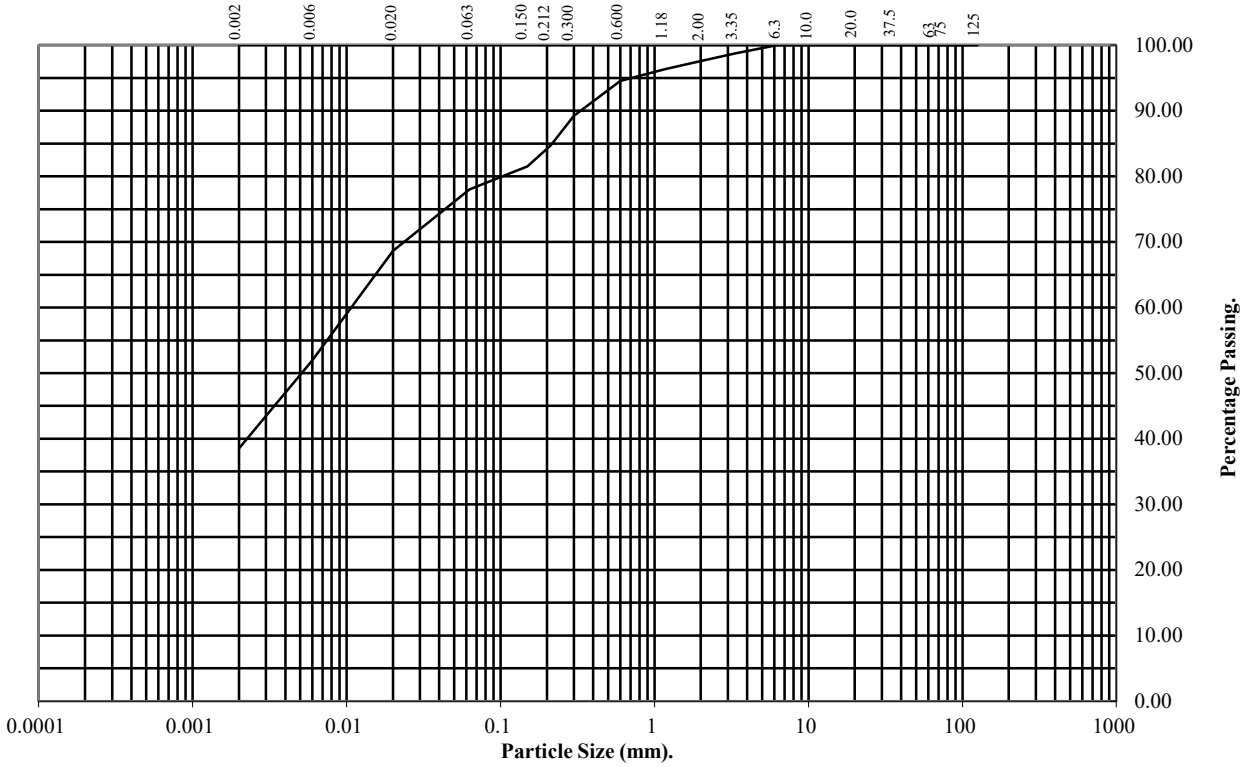
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P14/L1/30** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	98
1.18	96
0.6	95
0.3	89
0.212	85
0.15	82
0.063	78

Particle Diameter	Percentage Passing
0.02	69
0.006	52
0.002	39

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	20
Silt	39
Clay	39

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

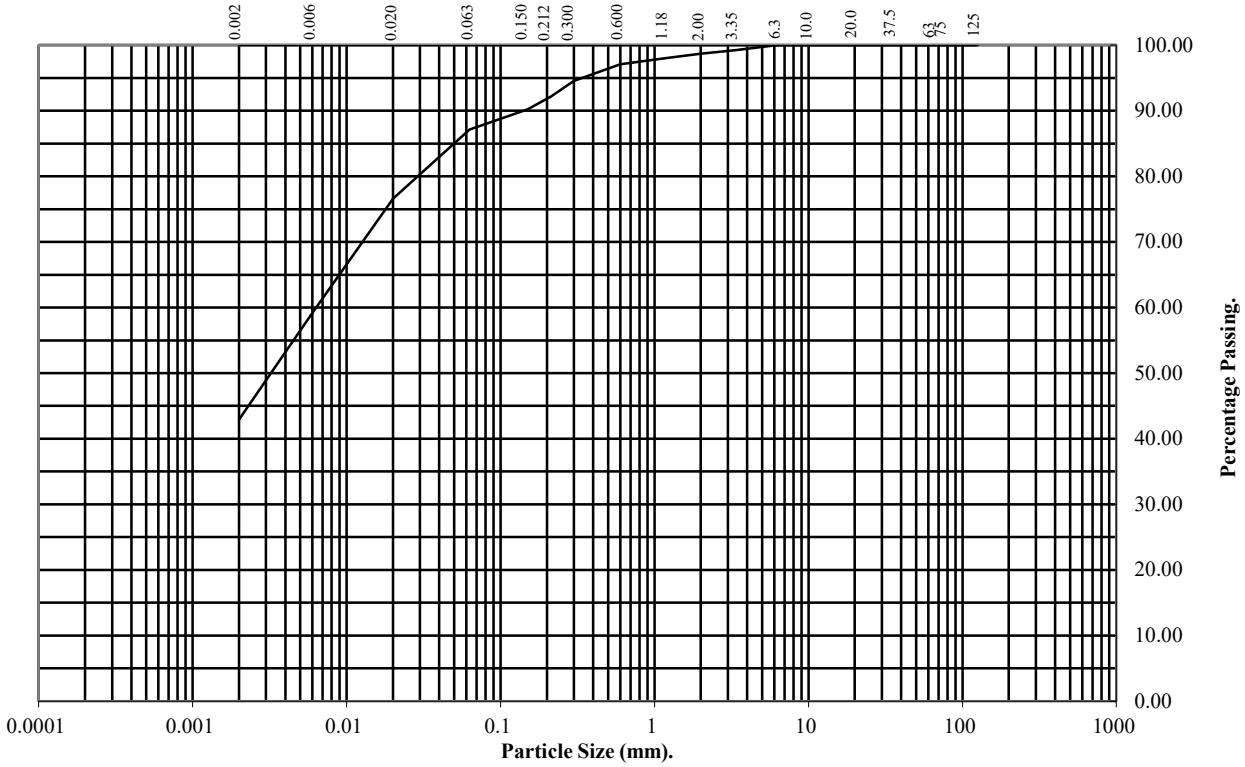
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P15/L1/33** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	99
1.18	98
0.6	97
0.3	95
0.212	92
0.15	90
0.063	87

Particle Diameter	Percentage Passing
0.02	77
0.006	59
0.002	43

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	12
Silt	44
Clay	43

Remarks:

See Summary of Soil Descriptions

LABORATORY REPORT

4043

Contract Number: PSL19/4654

Report Date: 14 August 2019

Client's Reference: 3125-9

Client Name: TerraConsult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: Jim Gibson

Contract Title: Fletcher Bank LFS

Date Received: 1/8/2019
Date Commenced: 1/8/2019
Date Completed: 14/8/2019

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:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
S Royle (Laboratory Manager)	S Eyre (Senior Technician)	L Knight (Senior Technician)

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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
P14/L2/14B				Brown slightly gravelly sandy CLAY.
P15/L2/16B				Brown slightly gravelly sandy CLAY.
P15/L2/17P				Brown slightly gravelly sandy CLAY.
P14/L2/19B				Brown slightly gravelly sandy CLAY.
P16/L1/22B				Brown slightly gravelly sandy CLAY.
P16/L1/23B				Brown slightly gravelly sandy CLAY.
P17/L1/25B				Brown slightly gravelly sandy CLAY.
P17/L1/27P				Brown slightly gravelly sandy CLAY.
P17/L1/28B				Brown slightly gravelly sandy CLAY.
P17/L2/30B				Brown slightly gravelly sandy CLAY.
P17/L2/32P				Brown slightly gravelly sandy CLAY.
P17/L2/33B				Brown slightly gravelly sandy CLAY.
P16/L2/36B				Brown slightly gravelly sandy CLAY.
P16/L2/37P				Brown slightly gravelly sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
P14/L2/14B				20		2.61	37	18	19	89	Intermediate plasticity CI.
P15/L2/16B				19			38	18	20	97	Intermediate plasticity CI.
P14/L2/19B				16		2.64	39	19	20	97	Intermediate plasticity CI.
P16/L1/23B				20			38	19	19	97	Intermediate plasticity CI.
P17/L1/25B				21		2.63	40	19	21	90	Intermediate plasticity CI.
P17/L1/28B				20			46	22	24	98	Intermediate plasticity CI.
P17/L2/30B				19		2.65	39	18	21	96	Intermediate plasticity CI.
P17/L2/33B				19			38	17	21	96	Intermediate plasticity CI.
P16/L2/36B				18		2.64	36	17	19	96	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

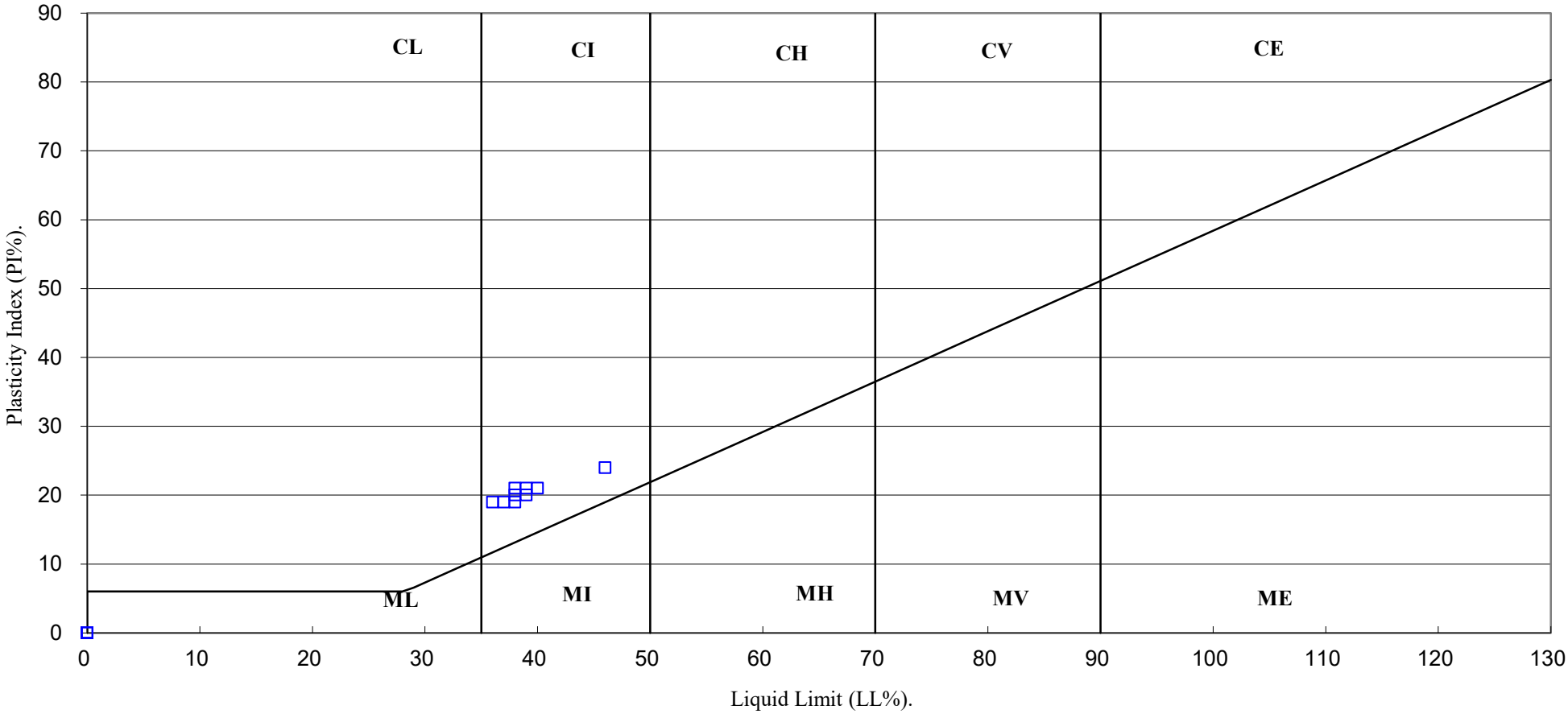
Contract No:

PSL19/4654

Client Ref:

3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Fletcher Bank LFS	Contract No: PSL19/4654 Client Ref: 3125

PARTICLE SIZE DISTRIBUTION TEST

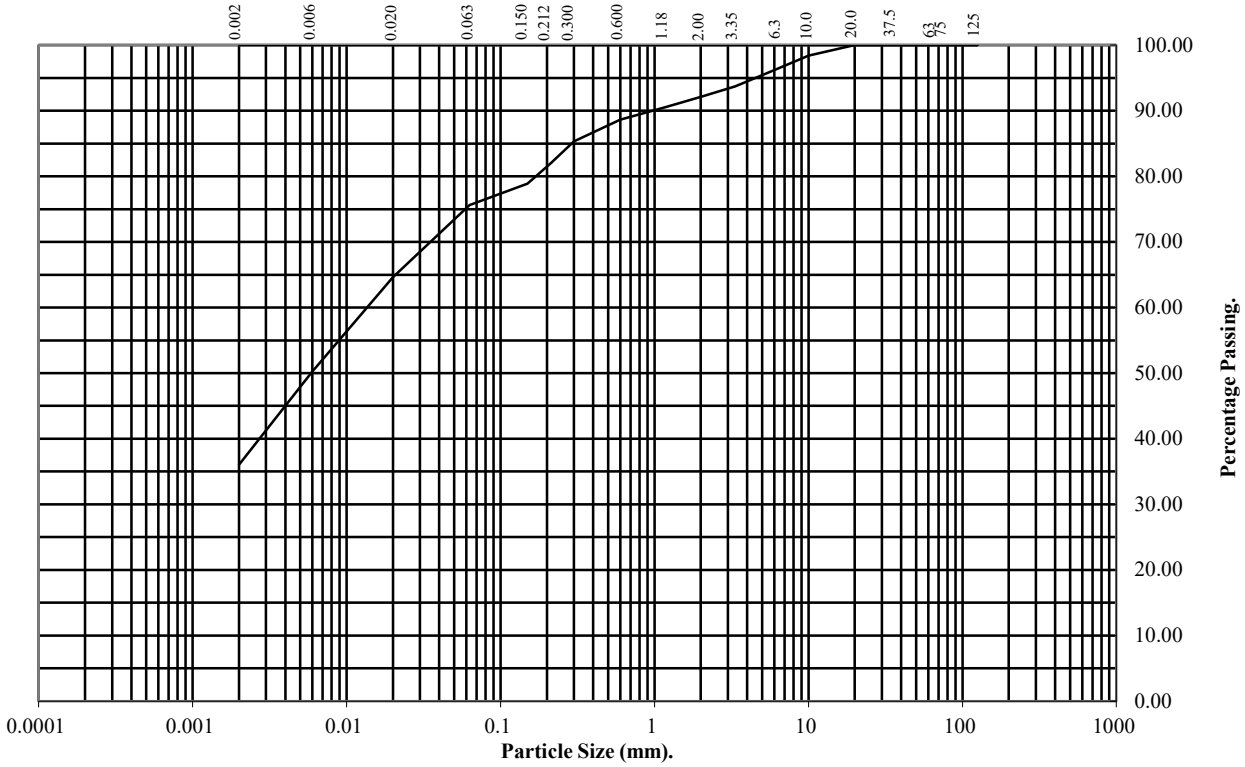
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P14/L2/14B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	96
3.35	94
2	92
1.18	91
0.6	89
0.3	85
0.212	82
0.15	79
0.063	76

Particle Diameter	Percentage Passing
0.02	65
0.006	50
0.002	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	8
Sand	16
Silt	40
Clay	36

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

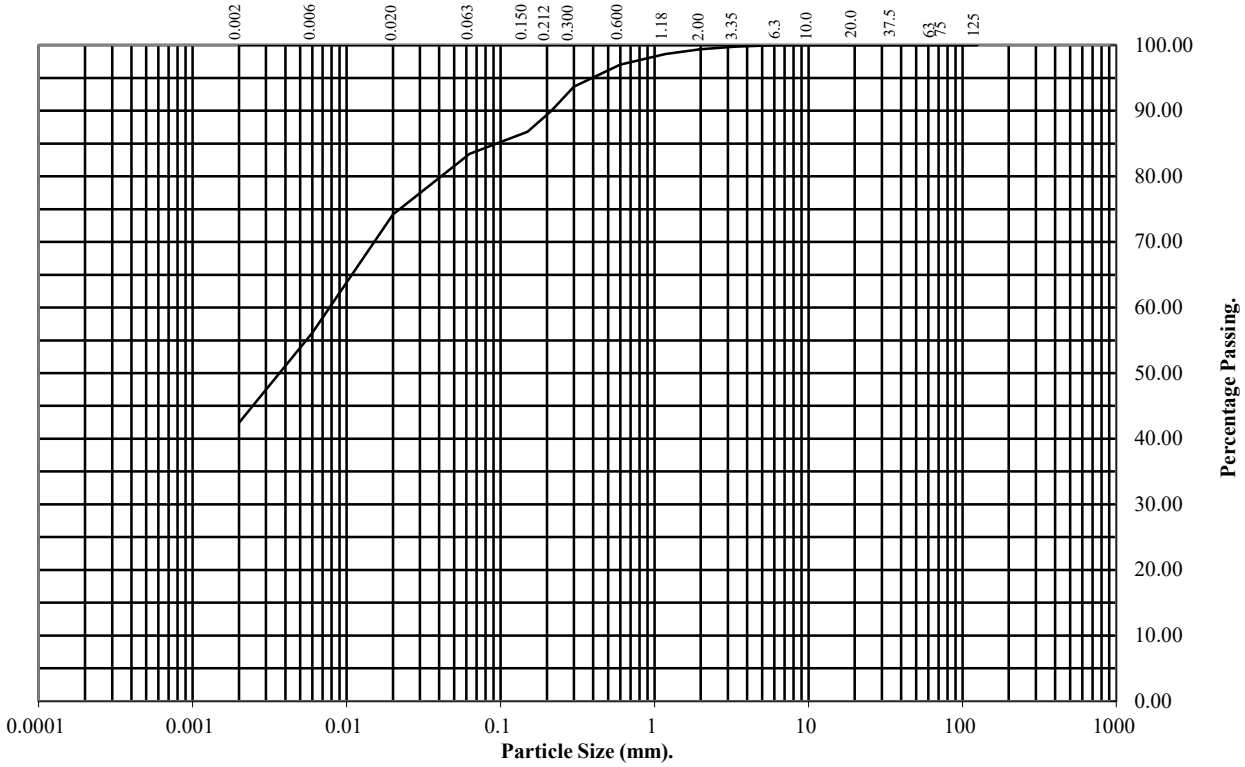
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P14/L2/19B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	99
0.6	97
0.3	94
0.212	90
0.15	87
0.063	83

Particle Diameter	Percentage Passing
0.02	74
0.006	56
0.002	42

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	16
Silt	41
Clay	42

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

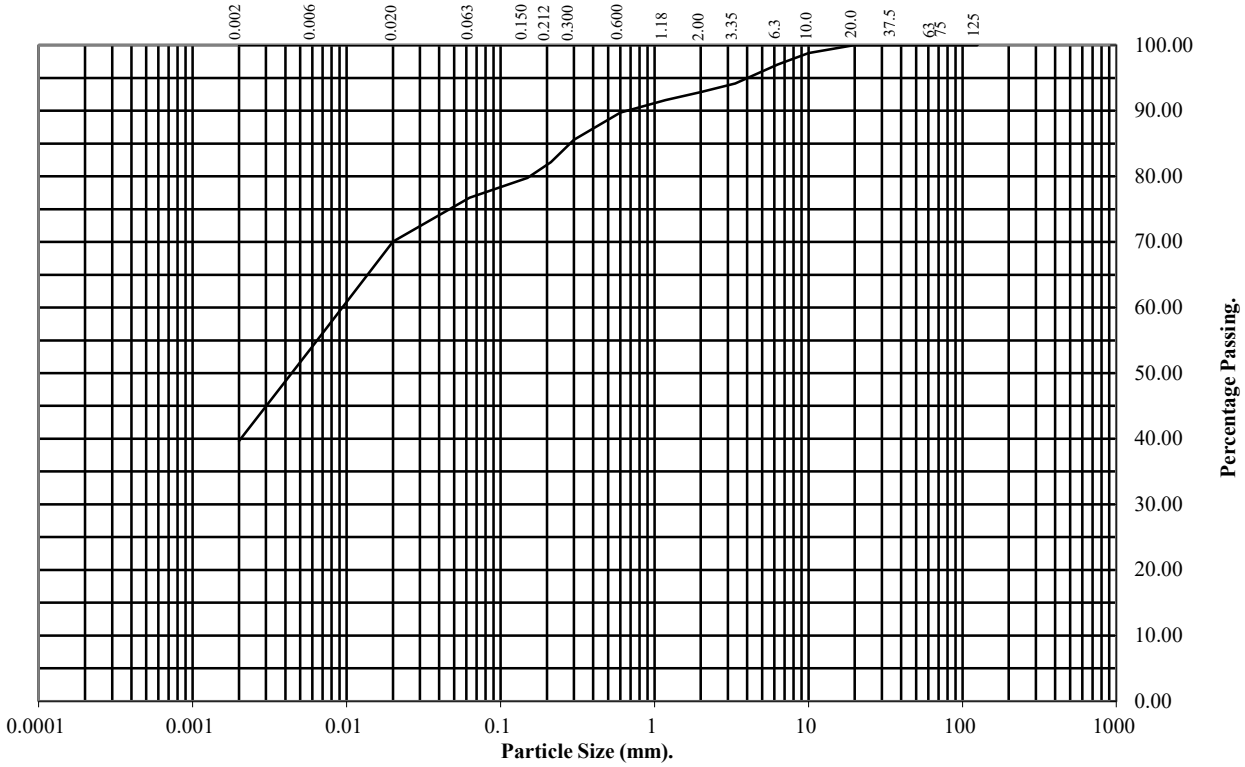
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P17/L1/25B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	97
3.35	94
2	93
1.18	92
0.6	90
0.3	86
0.212	82
0.15	80
0.063	77

Particle Diameter	Percentage Passing
0.02	70
0.006	54
0.002	40

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	16
Silt	37
Clay	40

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

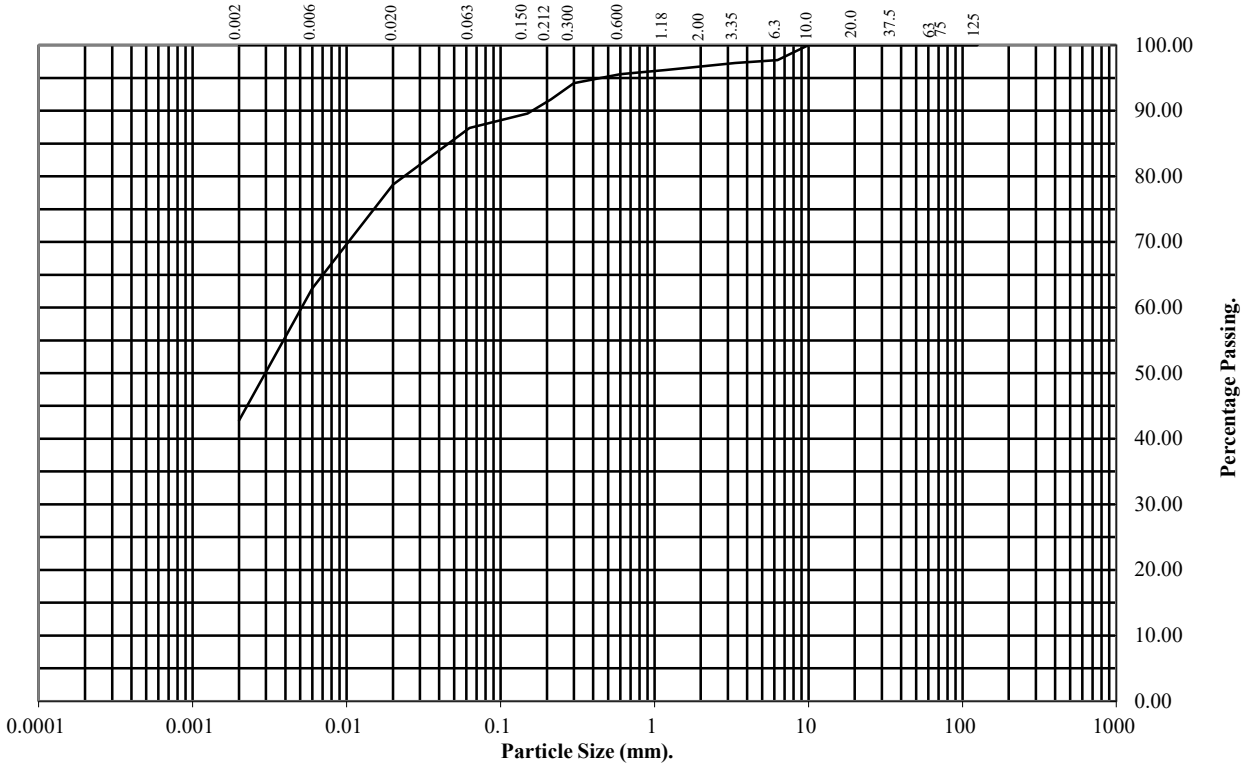
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P17/L2/30B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	98
3.35	97
2	97
1.18	96
0.6	96
0.3	94
0.212	92
0.15	90
0.063	87

Particle Diameter	Percentage Passing
0.02	79
0.006	63
0.002	43

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	10
Silt	44
Clay	43

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

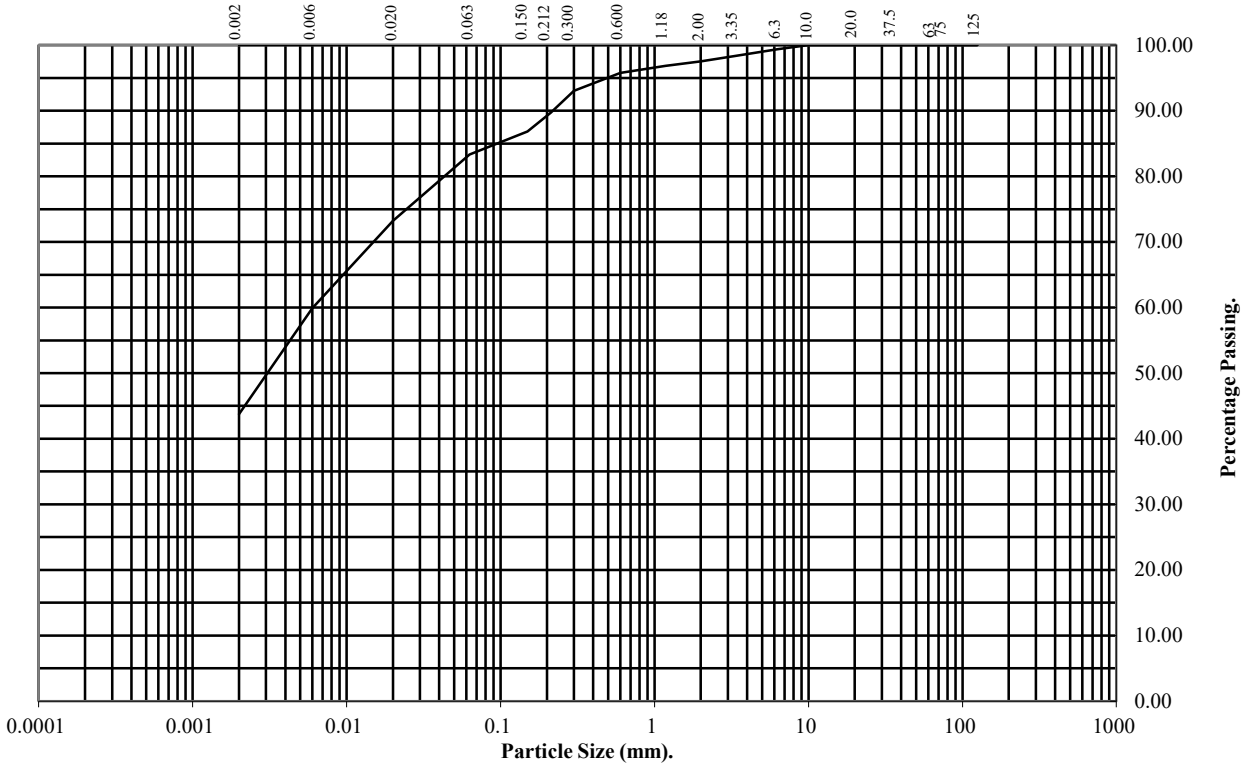
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **Top Depth (m):**

Sample Number: **P16/L2/36B** **Base Depth(m):**

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	98
2	98
1.18	97
0.6	96
0.3	93
0.212	90
0.15	87
0.063	83

Particle Diameter	Percentage Passing
0.02	73
0.006	60
0.002	44

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	15
Silt	39
Clay	44

Remarks:

See Summary of Soil Descriptions

LABORATORY REPORT

4043

Contract Number: PSL20/2729

Report Date: 03 July 2020

Client's Reference: 3125

Client Name: TerraConsult
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

For the attention of: Jim Gibson

Contract Title: Fletcher Bank LFS

Date Received: 5/6/2020
Date Commenced: 5/6/2020
Date Completed: 3/7/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

S Royle (Laboratory Manager)
S Eyre (Senior Technician)
L Knight (Senior Technician)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Sample Number	Layer Number	Grid Ref	Sample Type	Sample Date	Description of Sample
P18/L1/39B				28/05/2020	Brown slightly gravelly very sandy CLAY.
P18/L1/43B				28/05/2020	Brown slightly gravelly very sandy CLAY.
P18/L1/42P				28/05/2020	Brown slightly gravelly very sandy CLAY.
P18/L1/45B				29/05/2020	Brown slightly gravelly very sandy CLAY.
P18/L1/47P				29/05/2020	Brown slightly gravelly very sandy CLAY.
P18/L1/48B				29/05/2020	Brown slightly gravelly very sandy CLAY.
P19/L2/50B				01/06/2020	Brown slightly gravelly very sandy CLAY.
P18/L2/52P				01/06/2020	Brown slightly gravelly very sandy CLAY.
P18/L2/53B				01/06/2020	Brown slightly gravelly very sandy CLAY.
P18/L2/56B				01/06/2020	Brown slightly gravelly very sandy CLAY.
P18/L2/57P				02/06/2020	Brown slightly gravelly very sandy CLAY.
P19/L2/58B				02/06/2020	Brown slightly gravelly very sandy CLAY.
P18/L2/60B				02/06/2020	Brown slightly gravelly very sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Sample Number	Layer Number	Grid Ref	Sample Type	Sample Date	Moisture Content % Clause 3.2	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
P18/L1/39B				28/05/2020	15	2.66	35	18	17	85	Intermediate plasticity CI.
P18/L1/43B				28/05/2020	18		38	18	20	88	Intermediate plasticity CI.
P18/L1/45B				29/02/2020	18	2.65	41	20	21	84	Intermediate plasticity CI.
P18/L1/48B				29/02/2020	16		36	17	19	86	Intermediate plasticity CI.
P19/L2/50B				01/06/2020	16	2.66	36	18	18	87	Intermediate plasticity CI.
P18/L2/53B				01/06/2020	15		35	17	18	85	Intermediate plasticity CI.
P18/L2/56B				01/06/2020	18	2.64	37	18	19	84	Intermediate plasticity CI.
P19/L2/58B				02/06/2020	16		37	19	18	88	Intermediate plasticity CI.
P18/L2/60B				02/06/2020	19	2.64	39	19	20	81	Intermediate plasticity CI.

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

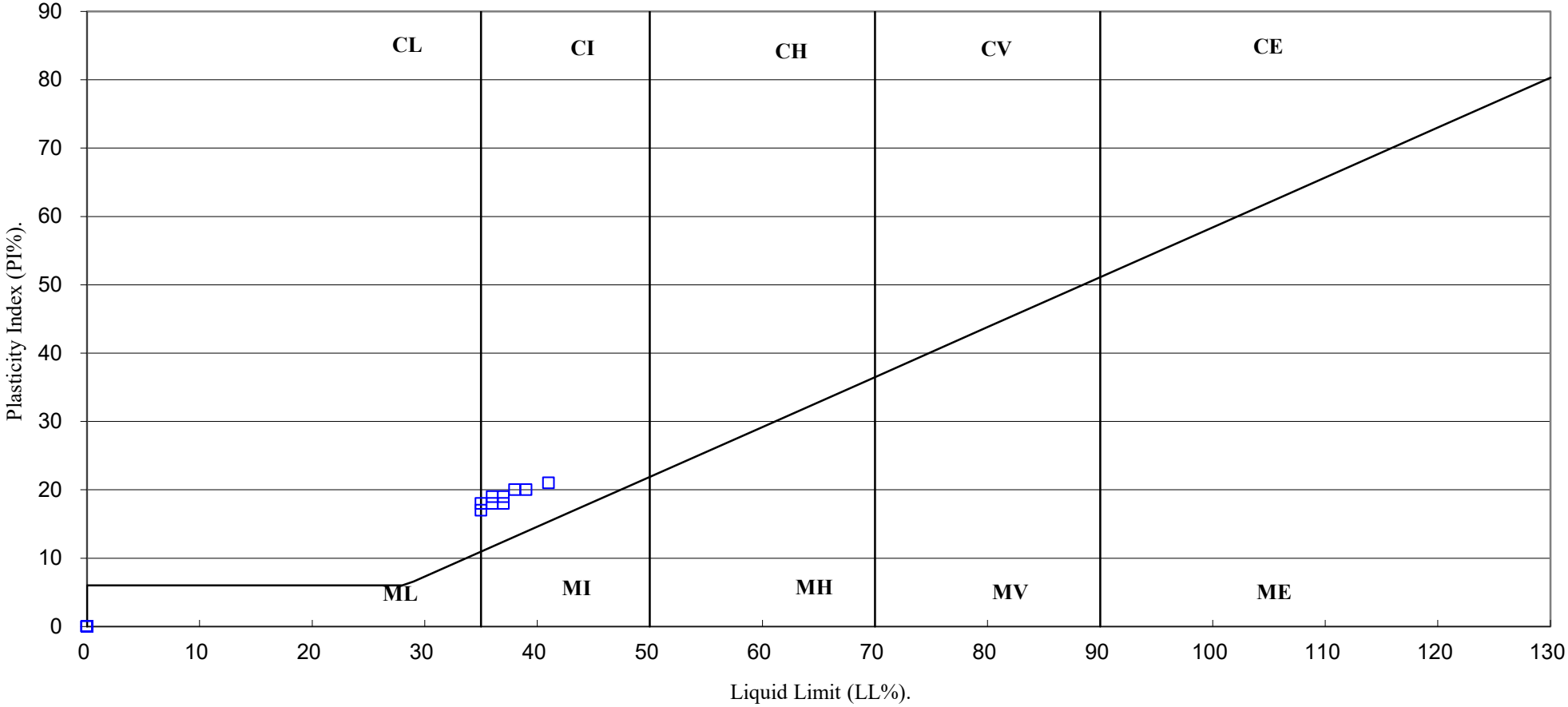
PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No:
PSL20/2729
Client Ref:
3125

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Fletcher Bank LFS**	**Contract No:** PSL20/2729 **Client Ref:** 3125

PARTICLE SIZE DISTRIBUTION TEST

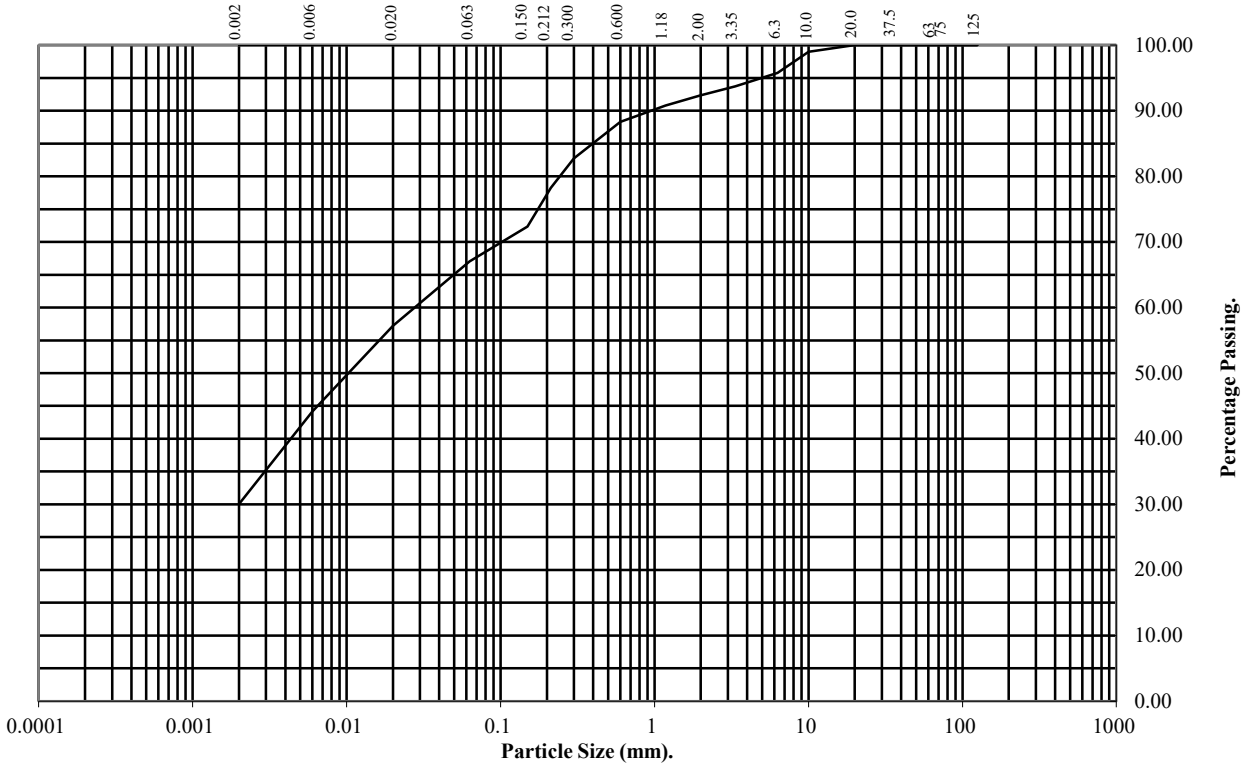
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Sample Number: P18/L1/39B **Grid Ref:**

Layer Number: **Sample Date:** 28/05/2020

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	96
3.35	94
2	92
1.18	91
0.6	88
0.3	83
0.212	78
0.15	72
0.063	67

Particle Diameter	Percentage Passing
0.02	57
0.006	44
0.002	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	8
Sand	25
Silt	37
Clay	30

Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

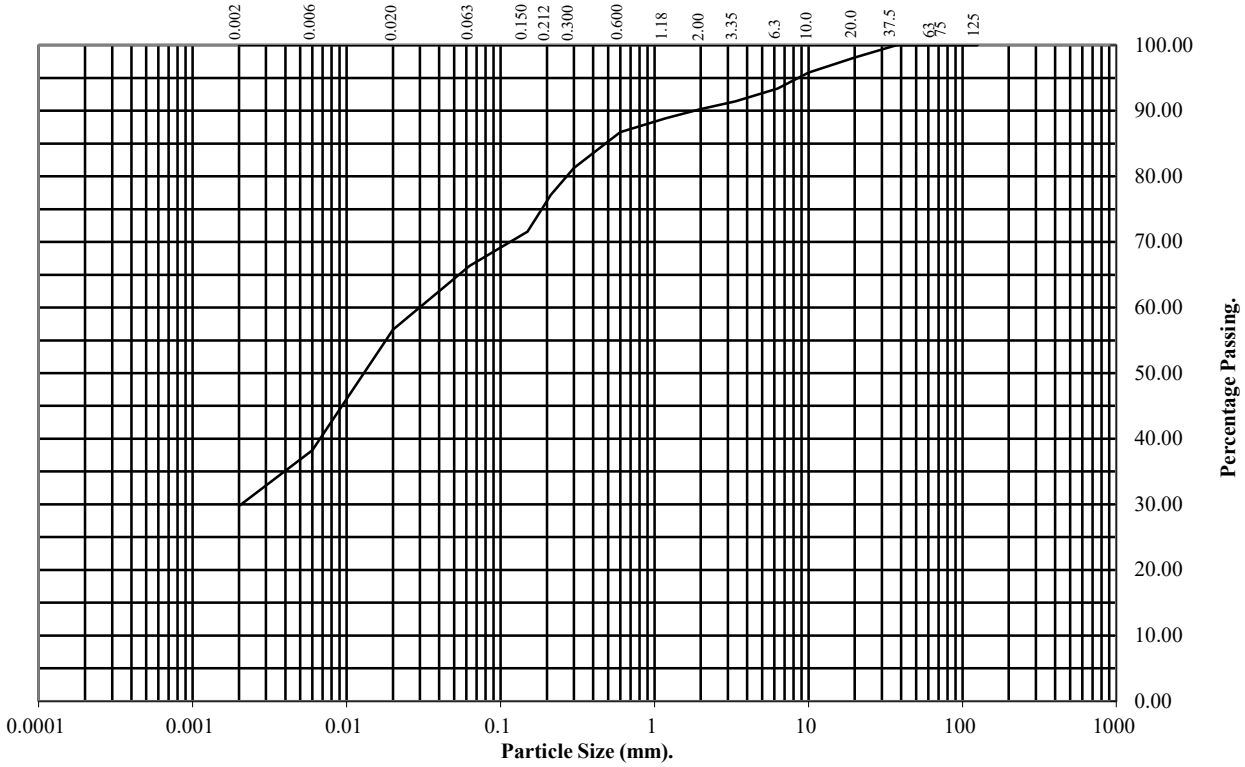
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Sample Number: P18/L1/45B **Grid Ref:**

Layer Number: **Sample Date:** 29/05/2020

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	96
6.3	93
3.35	91
2	90
1.18	89
0.6	87
0.3	81
0.212	77
0.15	72
0.063	66

Particle Diameter	Percentage Passing
0.02	57
0.006	38
0.002	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	24
Silt	36
Clay	30

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No:
PSL20/2729
Client Ref:
3125

PARTICLE SIZE DISTRIBUTION TEST

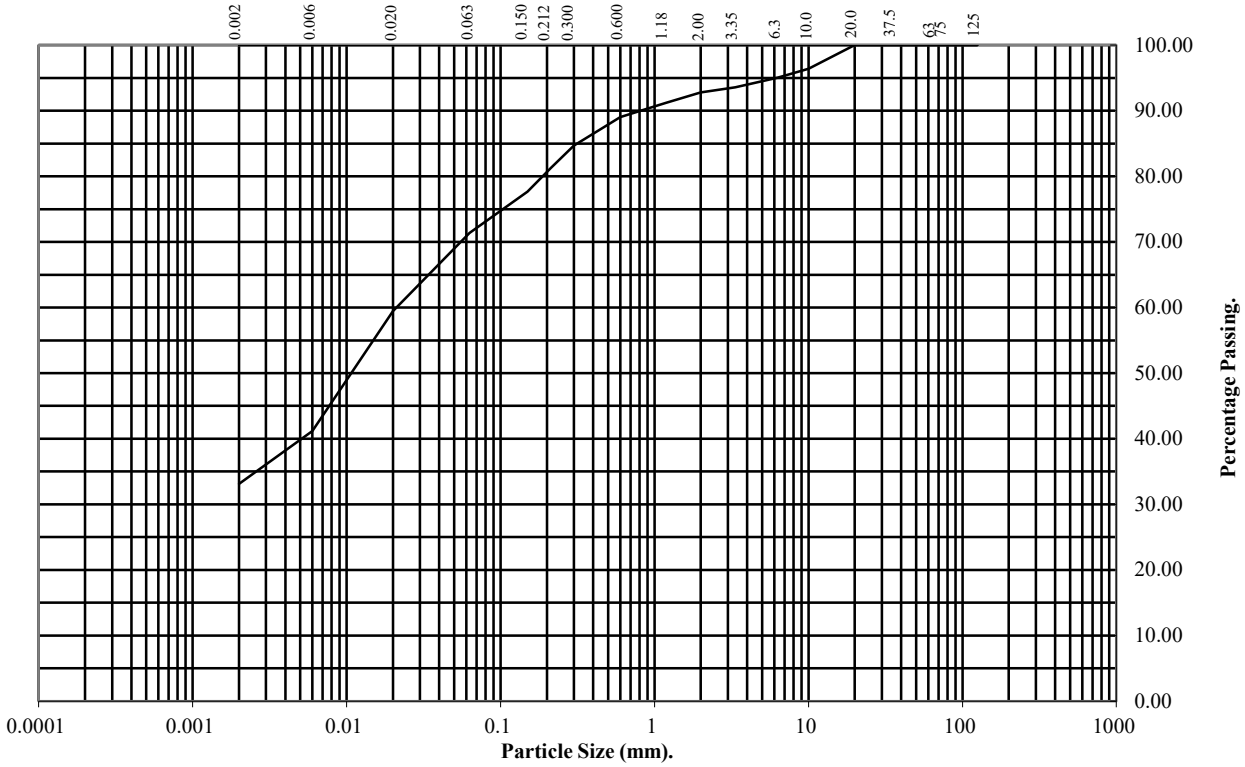
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Sample Number: P18/L2/50B **Grid Ref:**

Layer Number: **Sample Date:** 01/06/2020

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	95
3.35	94
2	93
1.18	91
0.6	89
0.3	85
0.212	81
0.15	78
0.063	71

Particle Diameter	Percentage Passing
0.02	59
0.006	41
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	22
Silt	38
Clay	33

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

Contract No:
PSL20/2729
Client Ref:
3125

PARTICLE SIZE DISTRIBUTION TEST

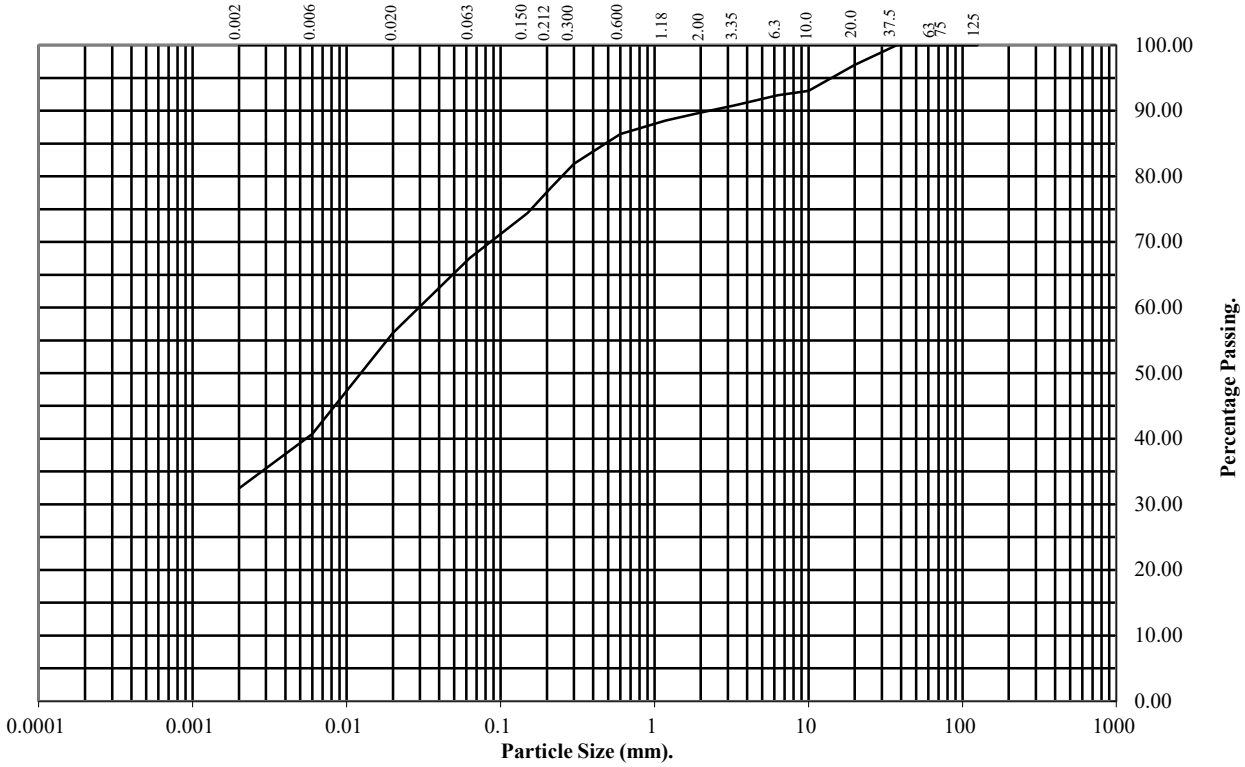
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Sample Number: P18/L2/56B **Grid Ref:**

Layer Number: **Sample Date:** 01/06/2020

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	93
6.3	92
3.35	91
2	90
1.18	88
0.6	86
0.3	82
0.212	78
0.15	74
0.063	67

Particle Diameter	Percentage Passing
0.02	56
0.006	41
0.002	32

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	23
Silt	35
Clay	32

Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

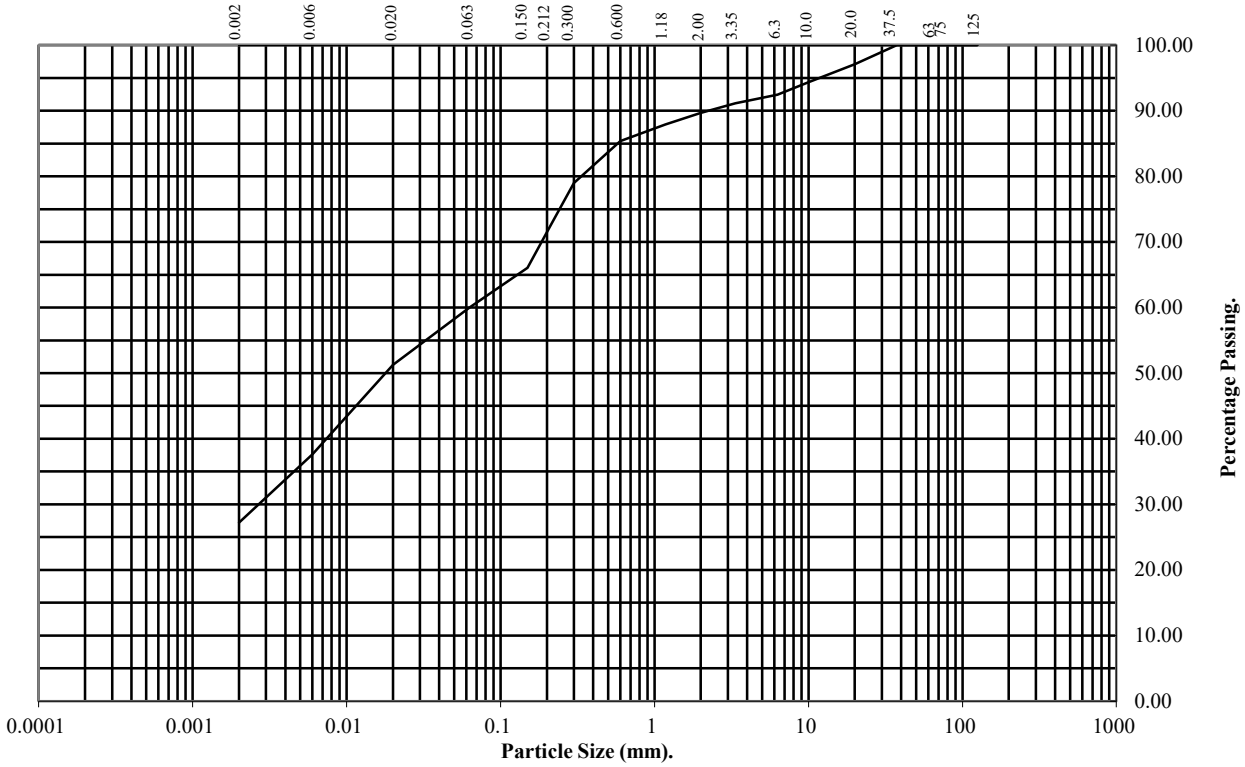
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Sample Number: P18/L2/60B **Grid Ref:**

Layer Number: **Sample Date:** 02/06/2020

Sample Type:



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	94
6.3	92
3.35	91
2	90
1.18	88
0.6	85
0.3	79
0.212	73
0.15	66
0.063	60

Particle Diameter	Percentage Passing
0.02	51
0.006	38
0.002	27

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	30
Silt	33
Clay	27

Remarks:
See Summary of Soil Descriptions

C6 Permeability Test Results

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**P3/L1/10**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**13/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.72
Diameter	mm	101.28
Area	mm^2	8056.33
Volume	cm^3	811.43
Mass	g	1738
Dry Mass	g	1481
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.82
Moisture Content	%	17
Voids Ratio	-	0.452
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

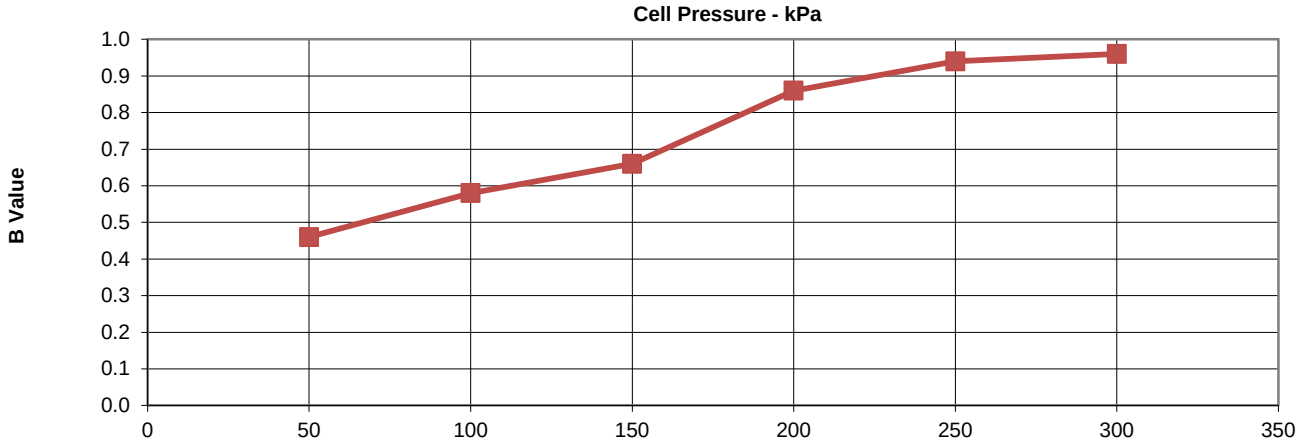
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.82

Test Setup		
Date Started		07/09/2018
Date Finished		17/09/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	4
Permeability Time	Days	3

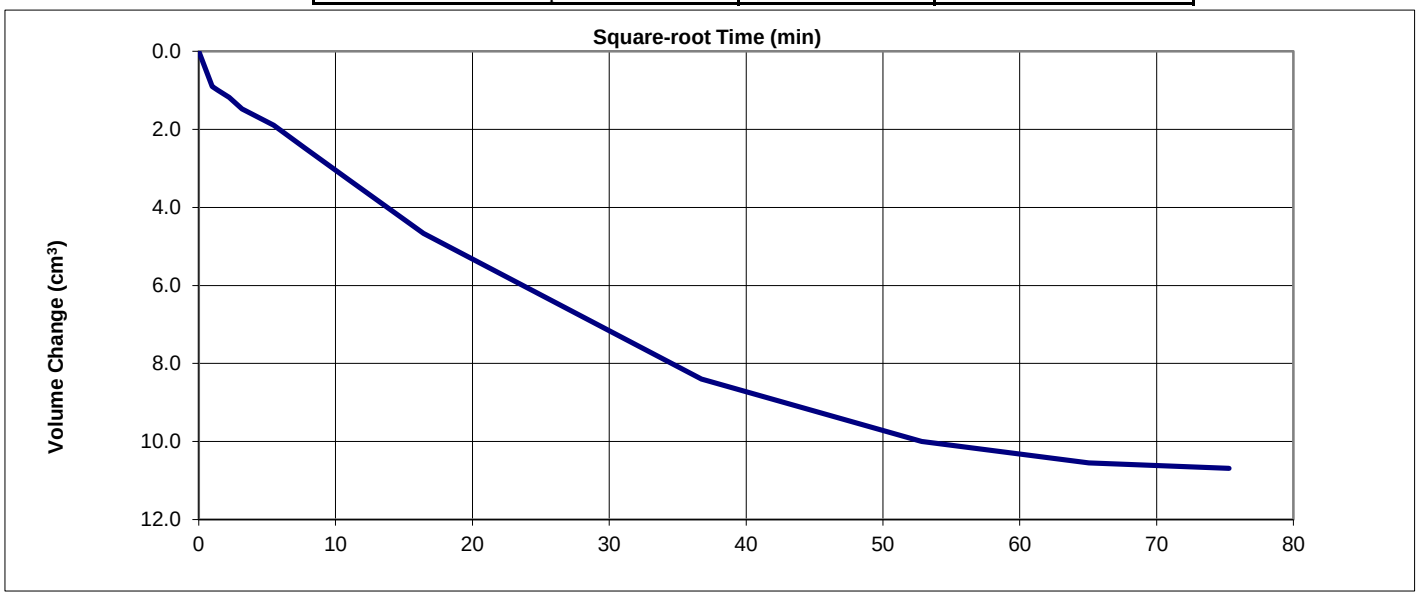
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P3/L1/10
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	300
PWP dissipation	%	100



UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

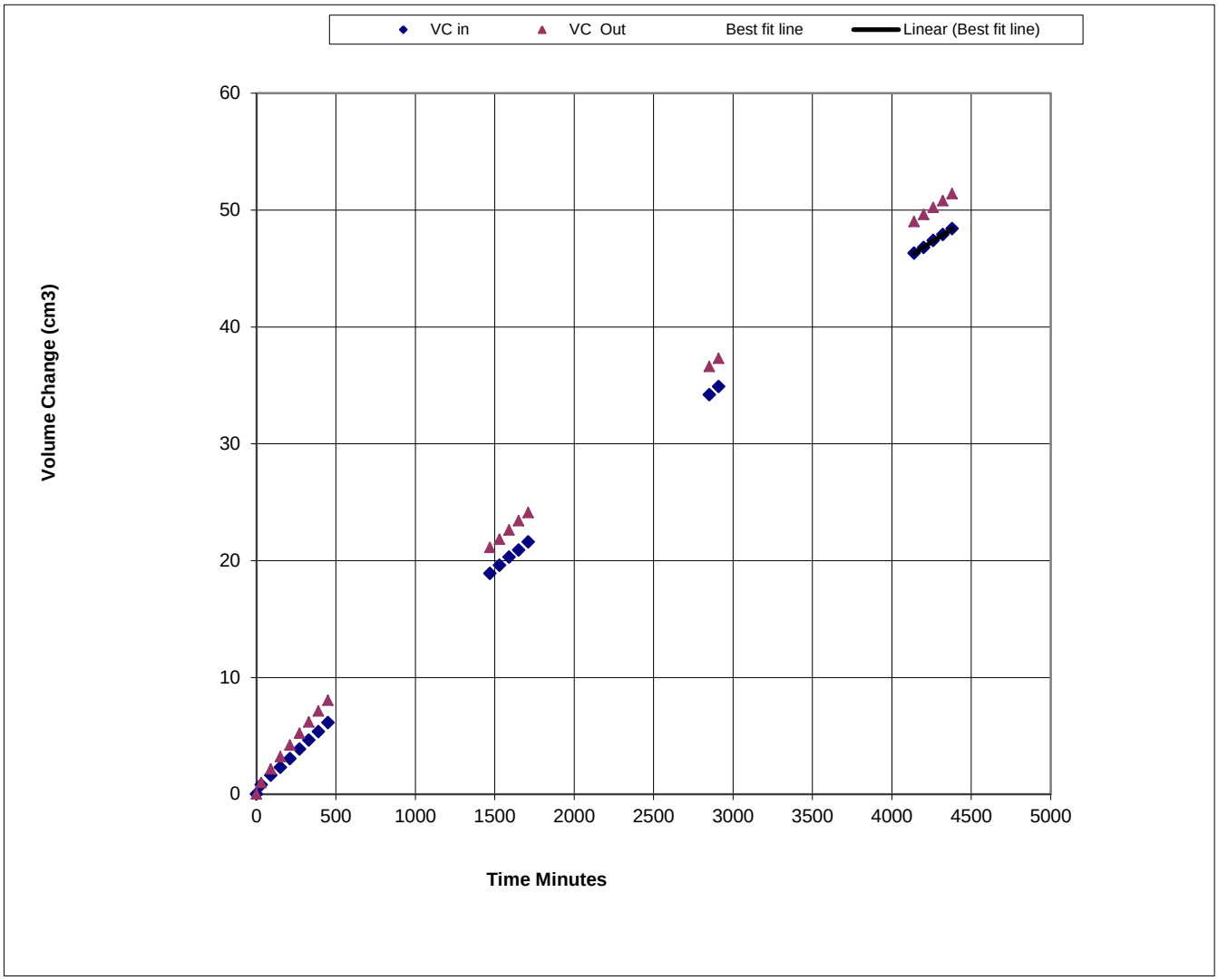
Contract No.
PSL18/4122
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P3/L1/10
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0088
Average Temperature	'C	20
Vertical Permeability Kv	m/s	8.9E-10

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**P5/L2/18**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**14/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.92
Diameter	mm	101.36
Area	mm^2	8069.06
Volume	cm^3	814.33
Mass	g	1740
Dry Mass	g	1487
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.83
Moisture Content	%	17
Voids Ratio	-	0.451
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

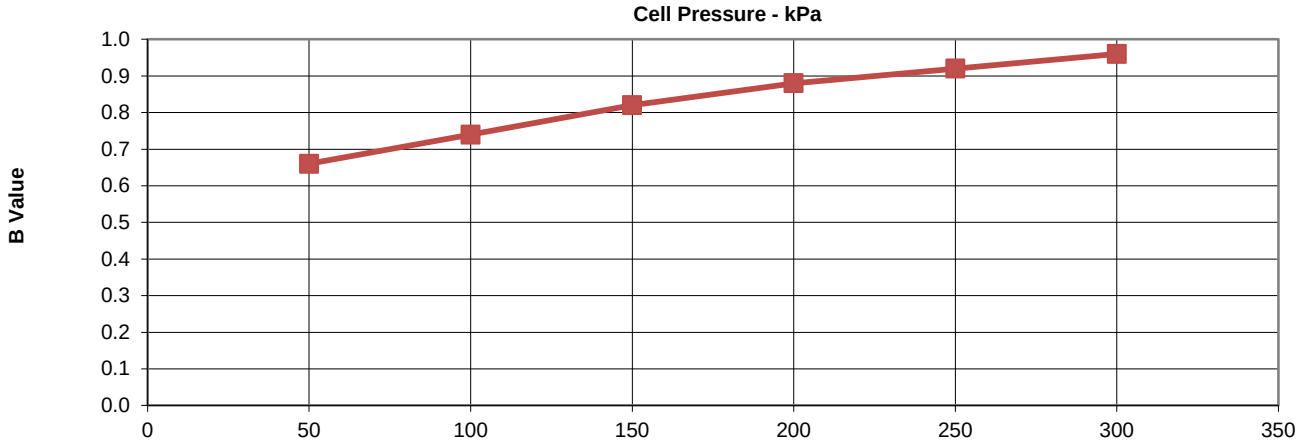
Final Specimen Conditions		
Moisture Content	%	16
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.83

Test Setup		
Date Started		07/09/2018
Date Finished		17/09/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	4
Permeability Time	Days	3

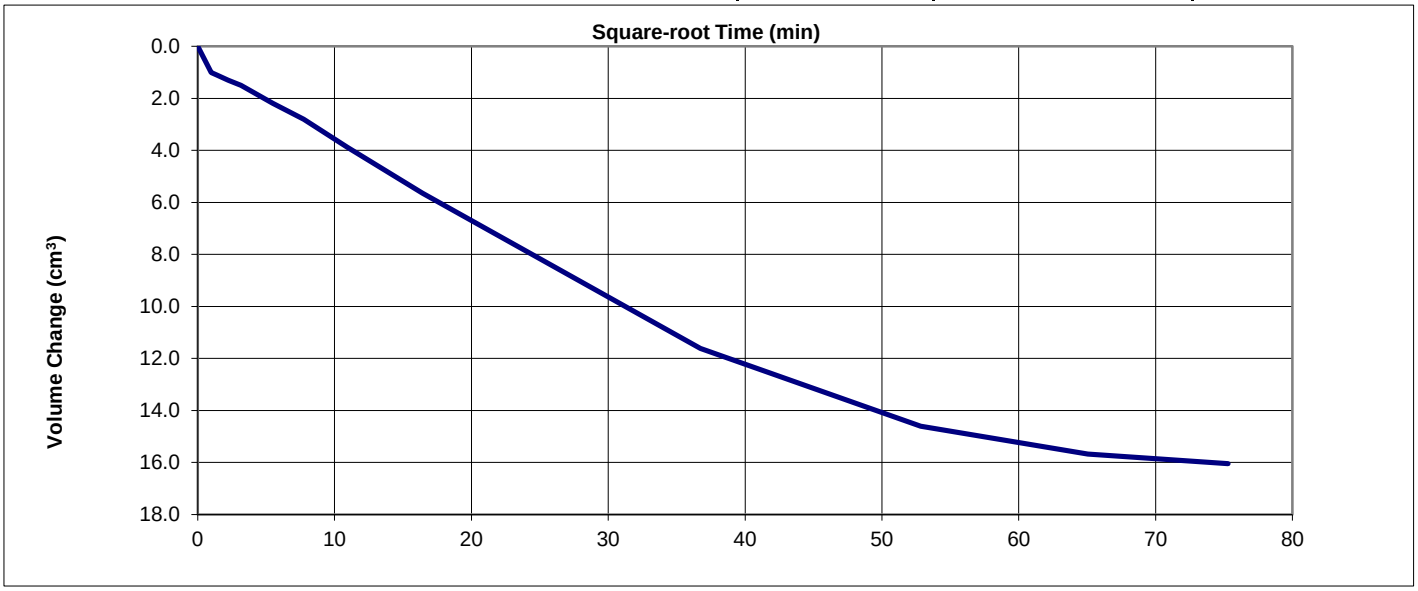
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P5/L2/18
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	96

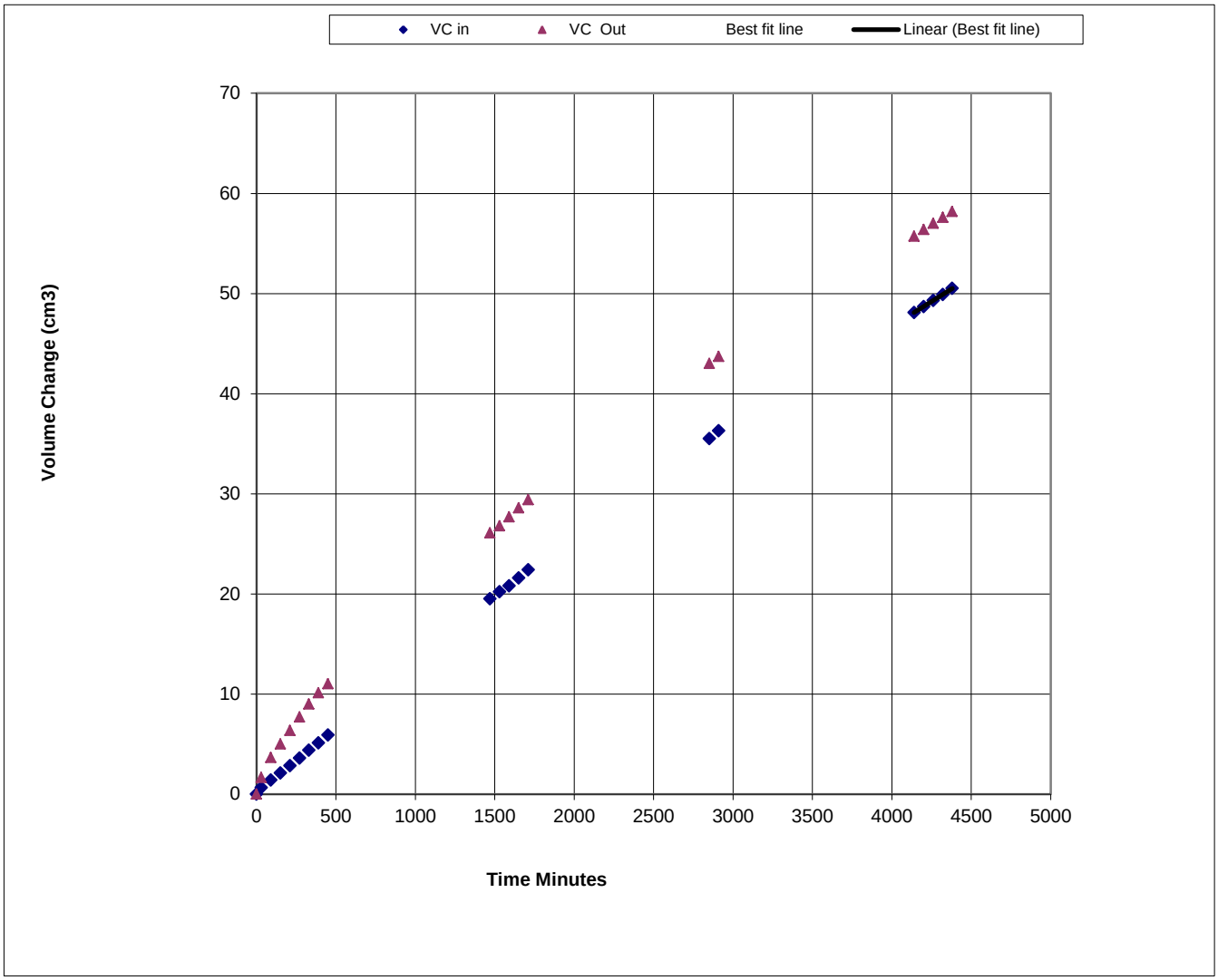


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P5/L2/18
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0100
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.0E-09

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**P6/L1/16**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**13.08.18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.70
Diameter	mm	101.24
Area	mm^2	8049.97
Volume	cm^3	810.63
Mass	g	1729
Dry Mass	g	1472
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.82
Moisture Content	%	17
Voids Ratio	-	0.459
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

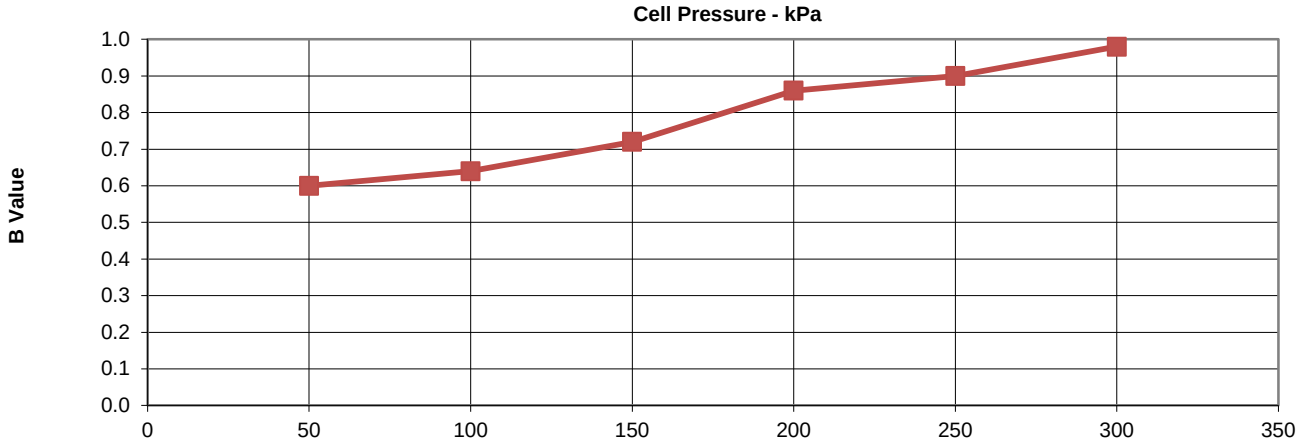
Final Specimen Conditions		
Moisture Content	%	18
Bulk Density	Mg/m^3	2.15
Dry Density	Mg/m^3	1.82

Test Setup		
Date Started		07/09/2018
Date Finished		17/09/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	4
Permeability Time	Days	2

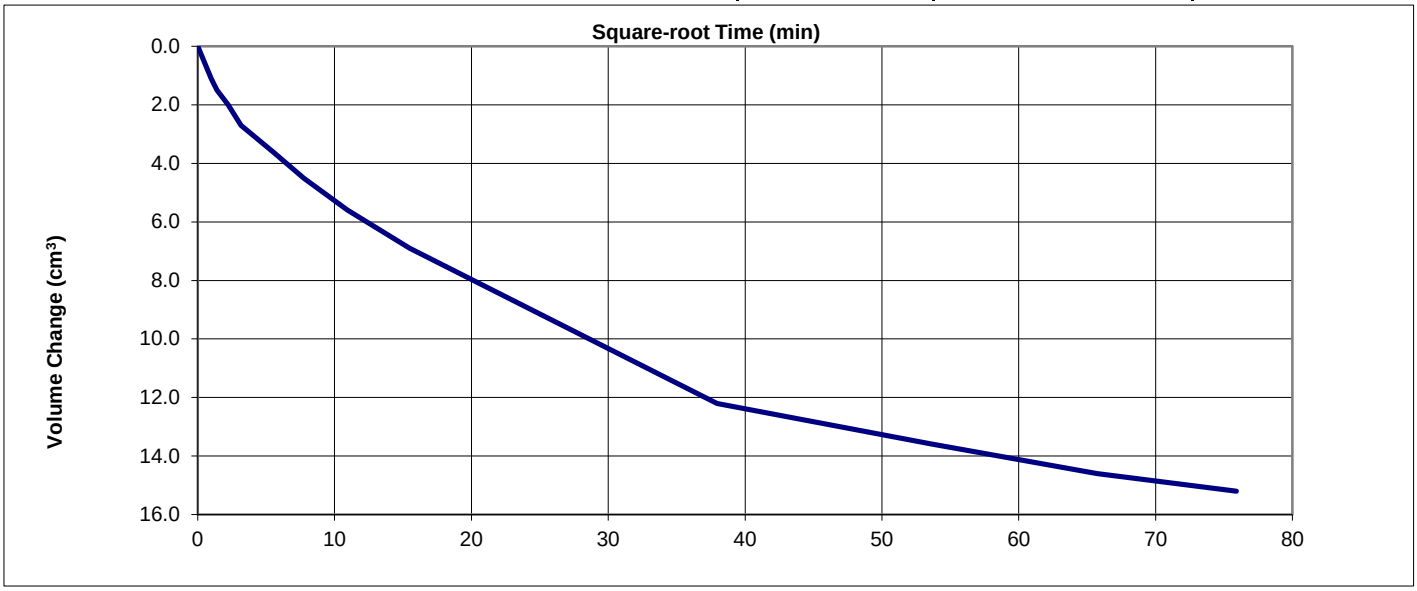
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P6/L1/16
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	304
PWP dissipation	%	95

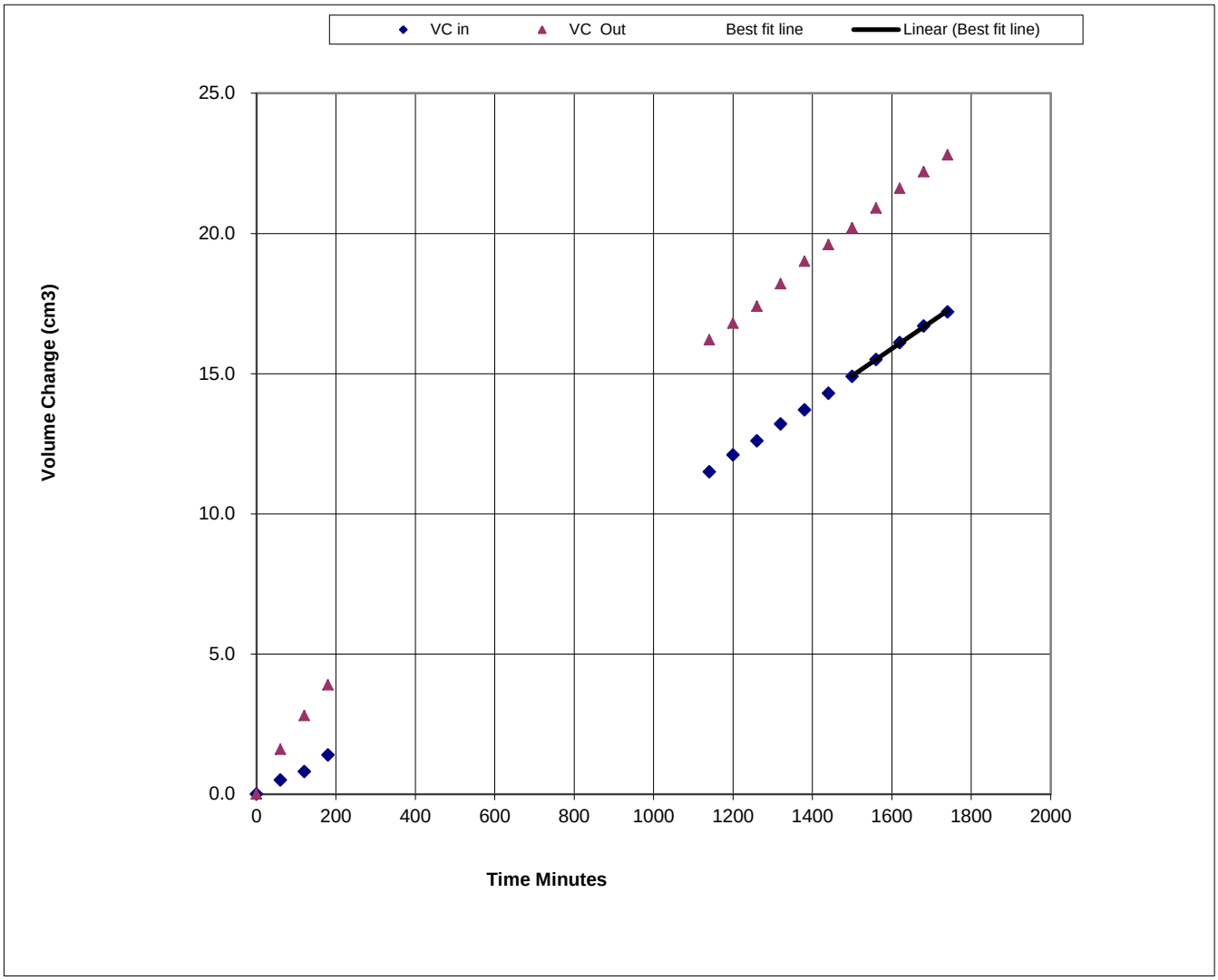


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P6/L1/16
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0096
Average Temperature	'C	20
Vertical Permeability Kv	m/s	9.8E-10

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**P10/L1/23**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**17/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.78
Diameter	mm	101.40
Area	mm^2	8075.43
Volume	cm^3	813.84
Mass	g	1759
Dry Mass	g	1515
Bulk Density	Mg/m^3	2.16
Dry Density	Mg/m^3	1.86
Moisture Content	%	16
Voids Ratio	-	0.424
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

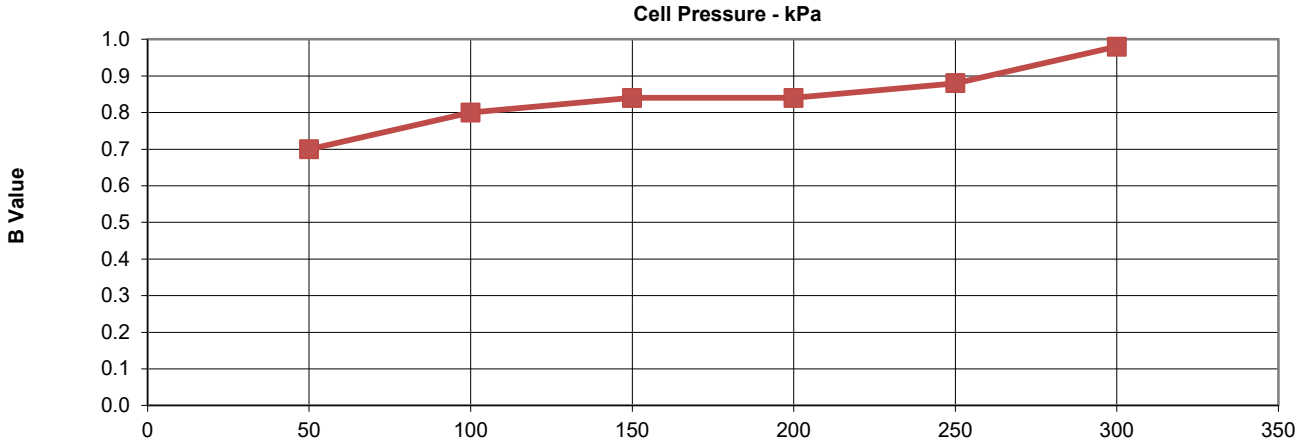
Final Specimen Conditions		
Moisture Content	%	16
Bulk Density	Mg/m^3	2.16
Dry Density	Mg/m^3	1.86

Test Setup		
Date Started		25/09/2018
Date Finished		04/10/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	5
Permeability Time	Days	2

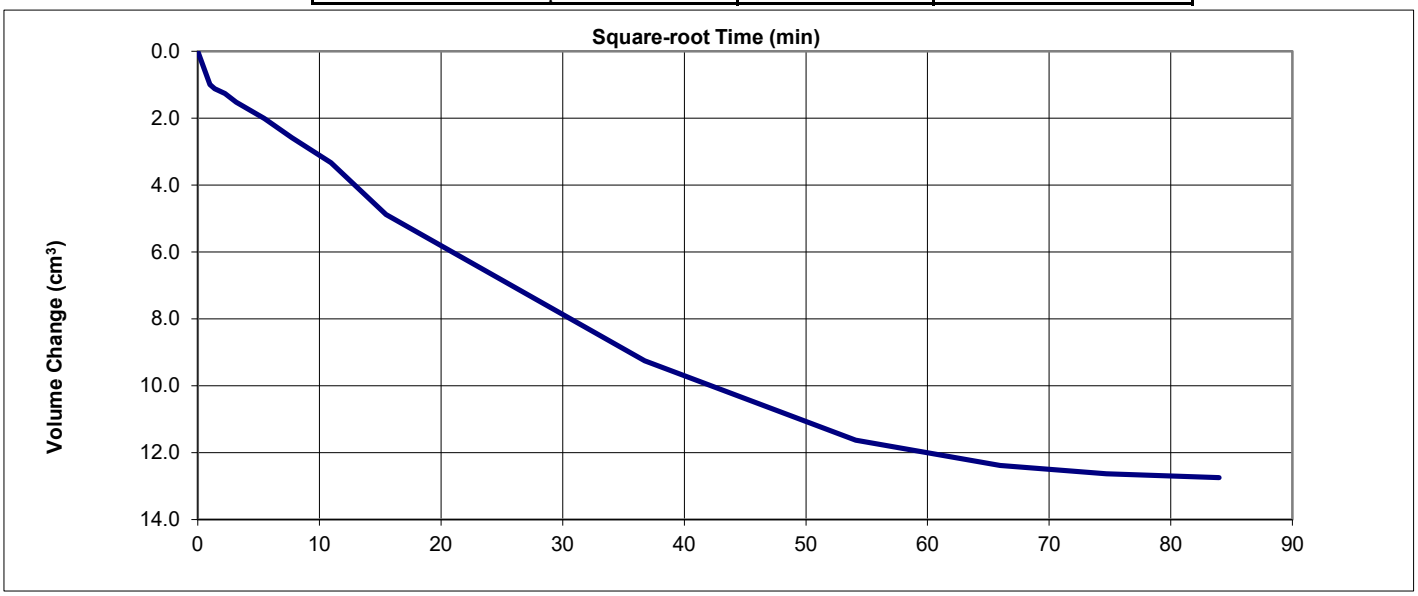
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P10/L1/23
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	300
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	304
PWP dissipation	%	95



UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

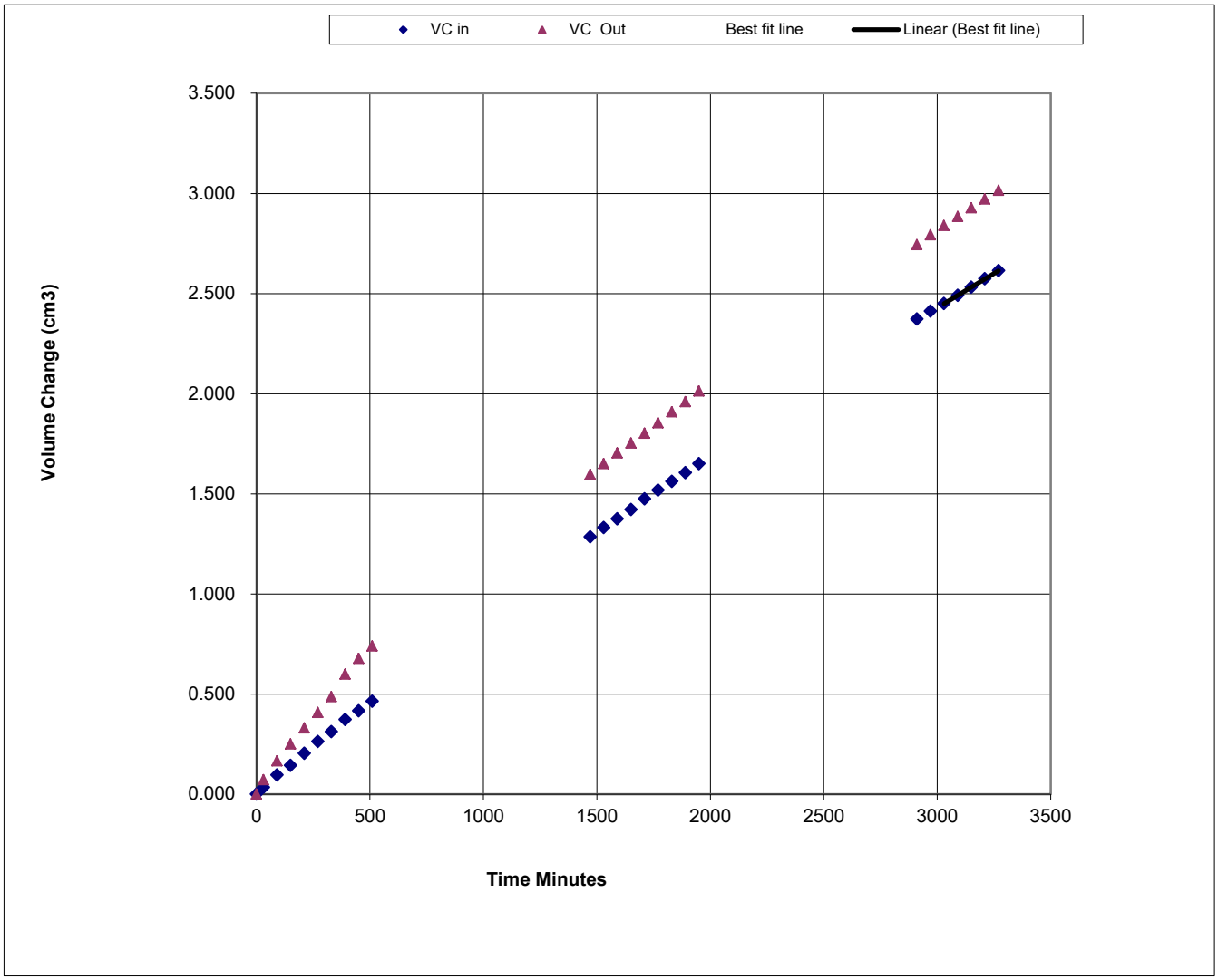
Contract No.
PSL18/4299
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P10/L1/23
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0007
Average Temperature	'C	20
Vertical Permeability Kv	m/s	7.0E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:	**P11/L2/28**	**Top Depth (m) :**	
Sample Number:		**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**17/08/18**	**Grid Reference:**	

Description of Specimen
See summary of soils description sheet.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.62
Diameter	mm	101.30
Area	mm^2	8059.51
Volume	cm^3	810.95
Mass	g	1763
Dry Mass	g	1513
Bulk Density	Mg/m^3	2.17
Dry Density	Mg/m^3	1.87
Moisture Content	%	17
Voids Ratio	-	0.420
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

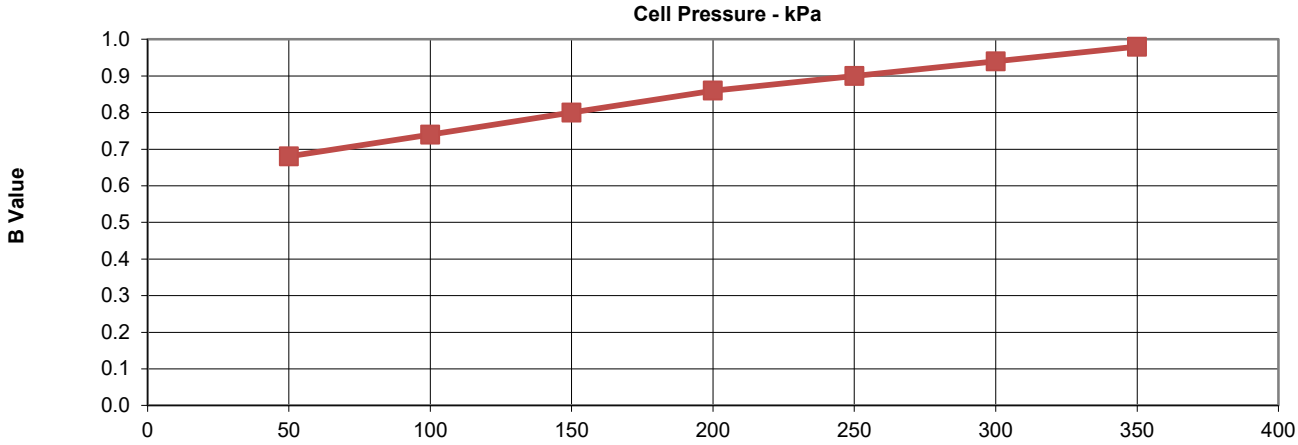
Final Specimen Conditions		
Moisture Content	%	18
Bulk Density	Mg/m^3	2.20
Dry Density	Mg/m^3	1.87

Test Setup		
Date Started		28/09/2018
Date Finished		08/10/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	5
Permeability Time	Days	2

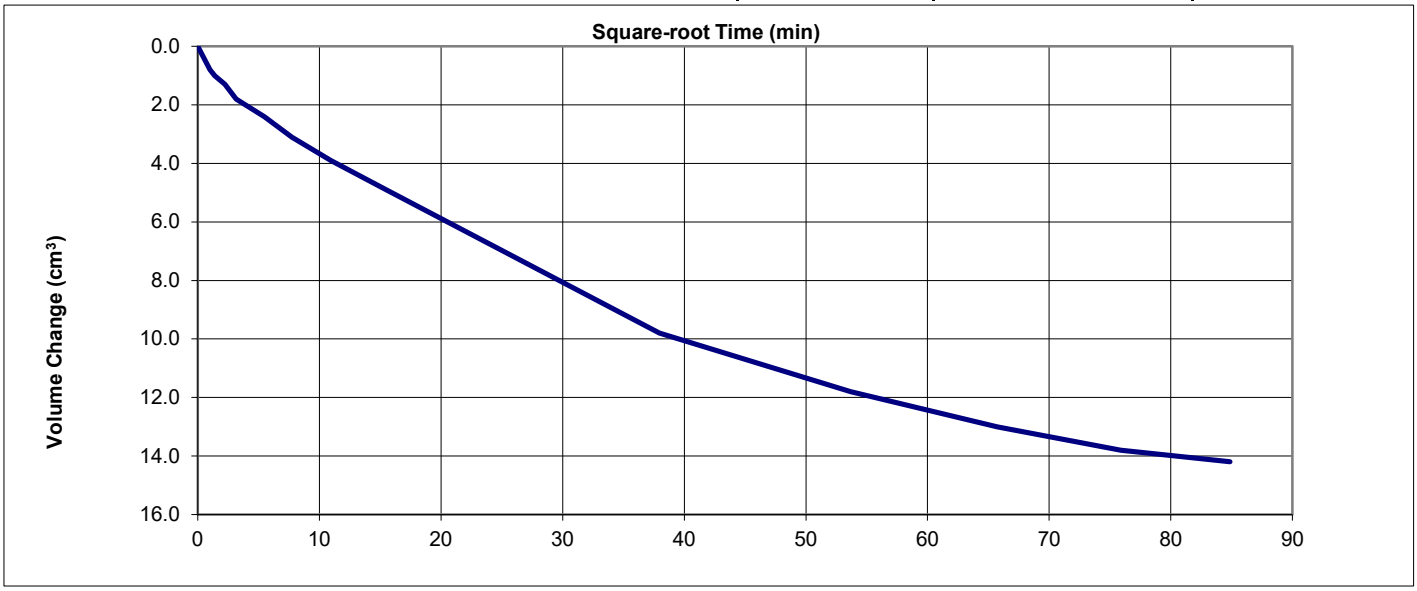
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P11/L2/28
Sample Depth	m	
Sample No,		
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	36



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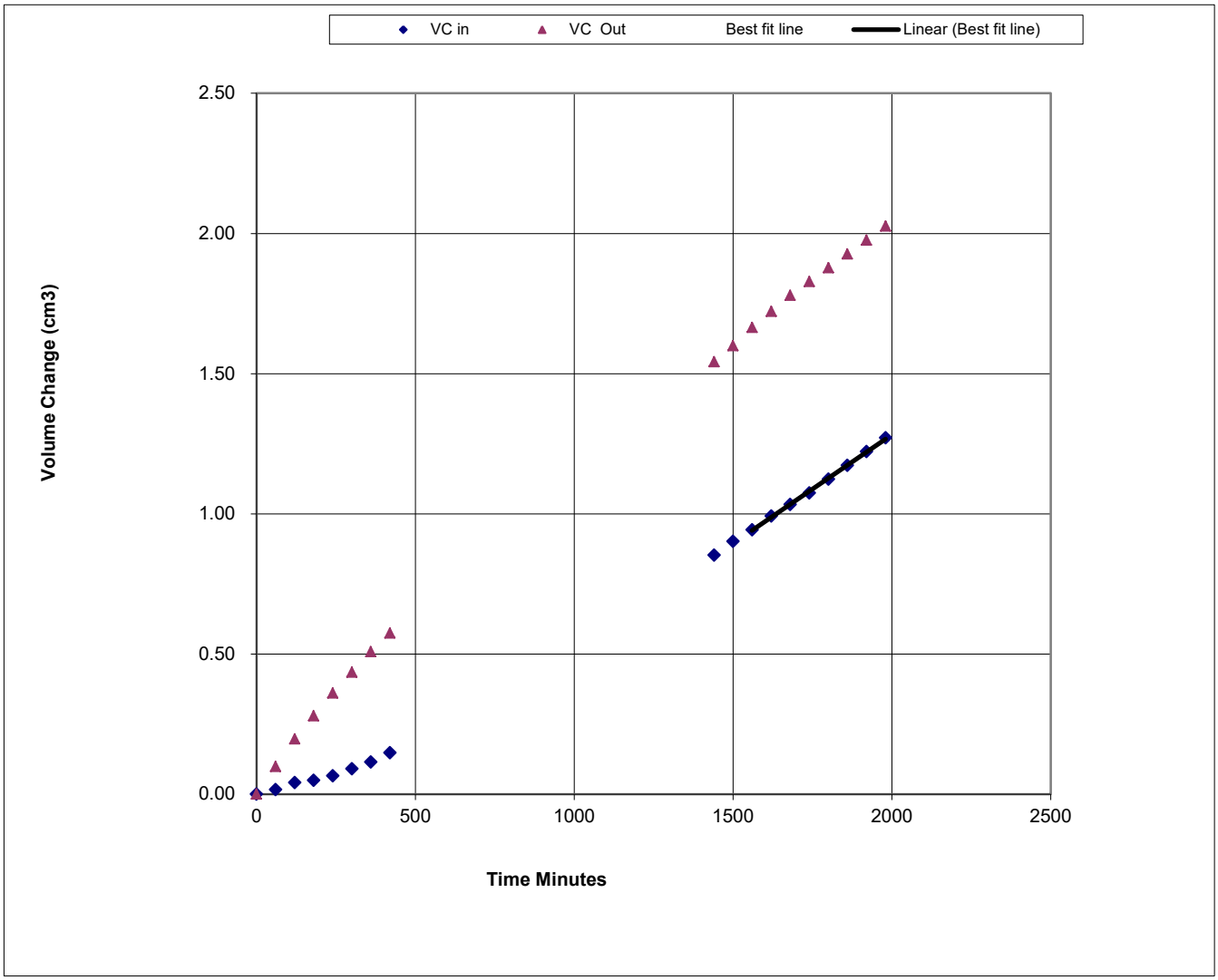
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		P11/L2/28
Sample Depth	m	
Sample No.		
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0008
Average Temperature	'C	20
Vertical Permeability Kv	m/s	8.0E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number:		**Top Depth (m) :**	
Sample Number:	**P14/L1/30**	**Base Depth (m) :**	
Sample Type:	**C**	**Lift Number:**	
Date	**03/09/18**	**Grid Reference:**	

Description of Specimen
See summary of soil descriptions.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	114.00
Diameter	mm	98.00
Area	mm^2	7542.96
Volume	cm^3	859.90
Mass	g	1850
Dry Mass	g	1613
Bulk Density	Mg/m^3	2.15
Dry Density	Mg/m^3	1.88
Moisture Content	%	15
Voids Ratio	-	0.413
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

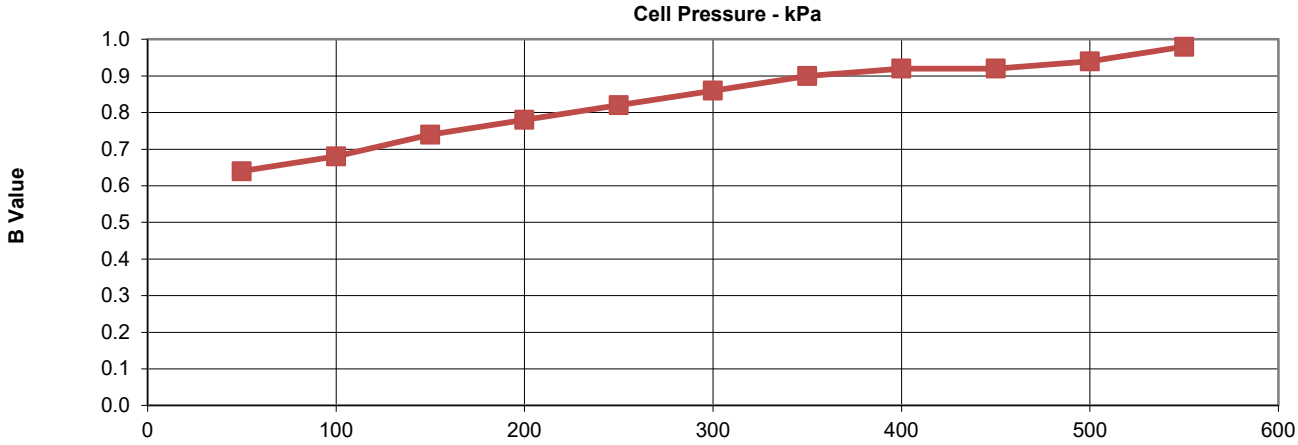
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.19
Dry Density	Mg/m^3	1.88

Test Setup		
Date Started		01/10/2018
Date Finished		12/10/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	5
Permeability Time	Days	2

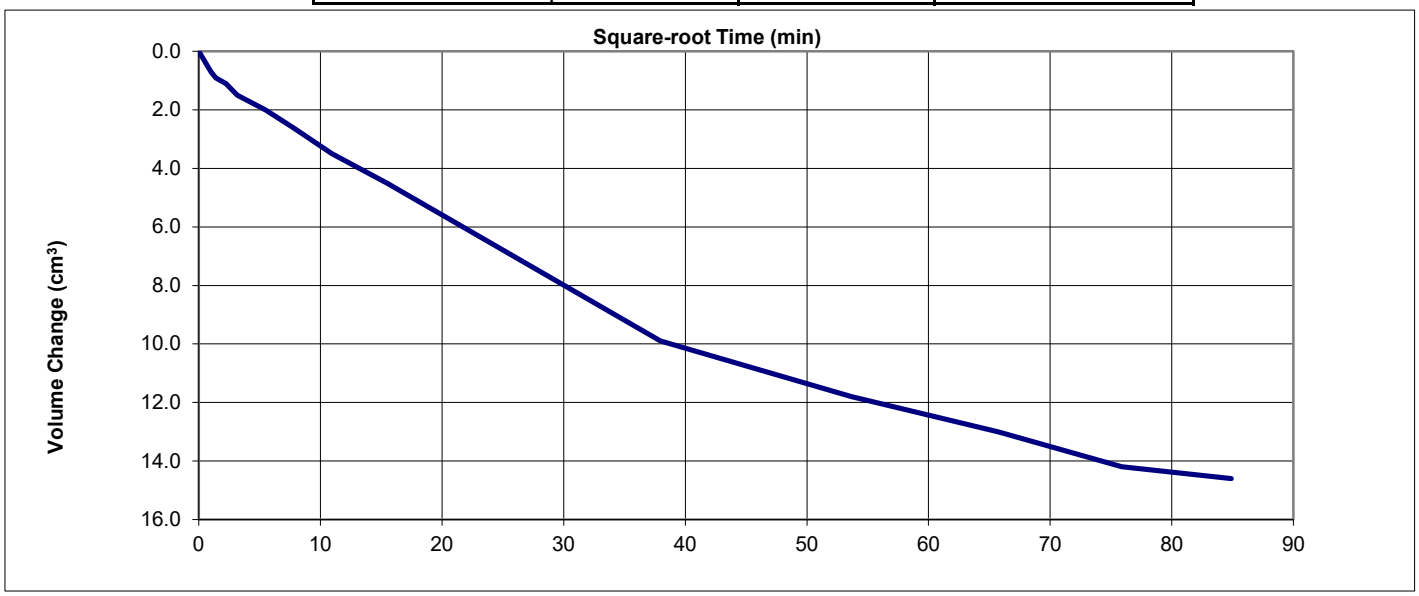
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P14/L1/30
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	550
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	600
Back Pressure	kPa	500
Final PWP	kPa	503
PWP dissipation	%	97

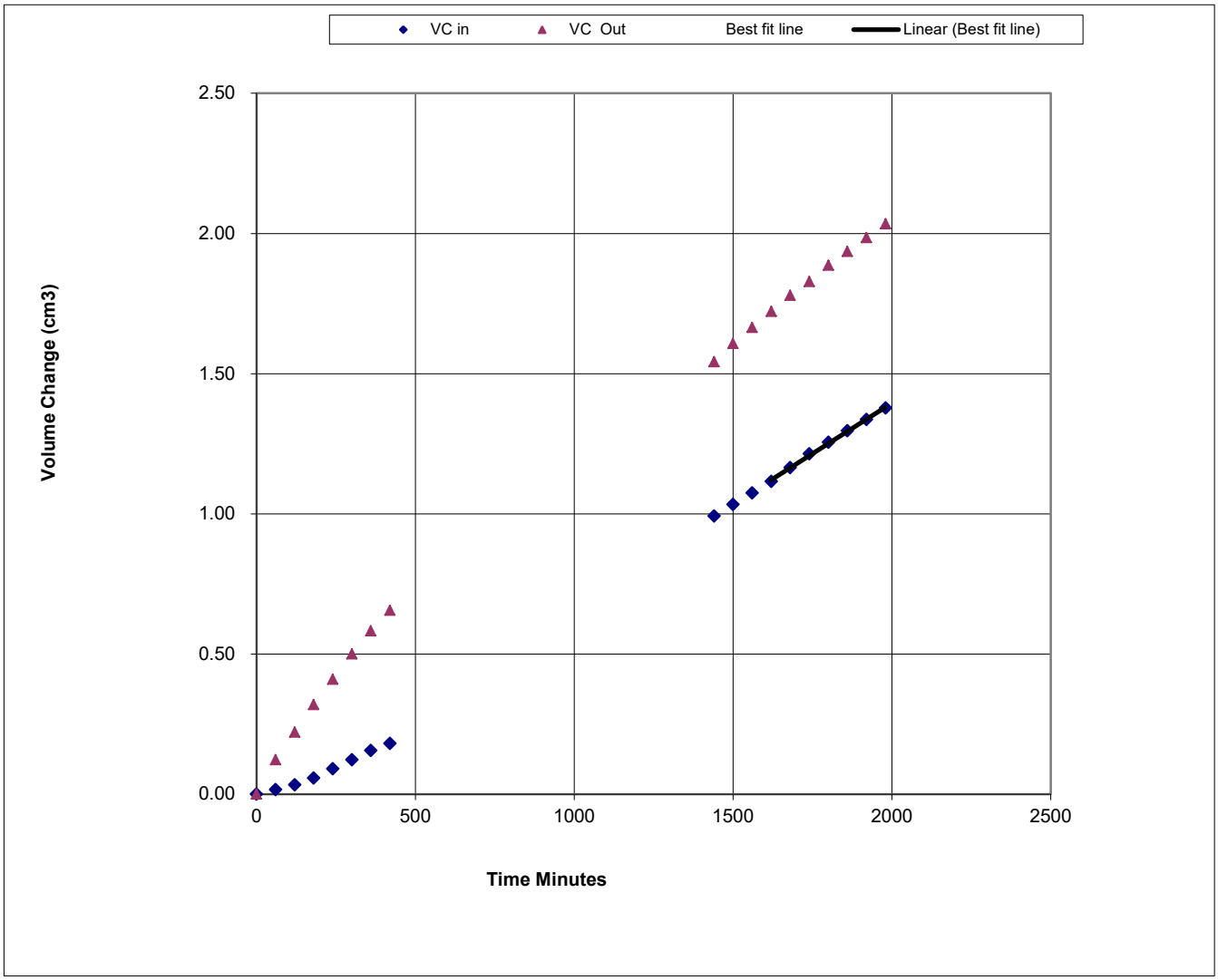


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P14/L1/30
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	600
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0007
Average Temperature	'C	20
Vertical Permeability Kv	m/s	8.9E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P15/L1/33** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **03/09/18** **Grid Reference:**

Description of Specimen
See summary of soil descriptions.
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	100.72
Diameter	mm	100.68
Area	mm^2	7961.16
Volume	cm^3	801.85
Mass	g	1714
Dry Mass	g	1462
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.82
Moisture Content	%	17
Voids Ratio	-	0.453
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

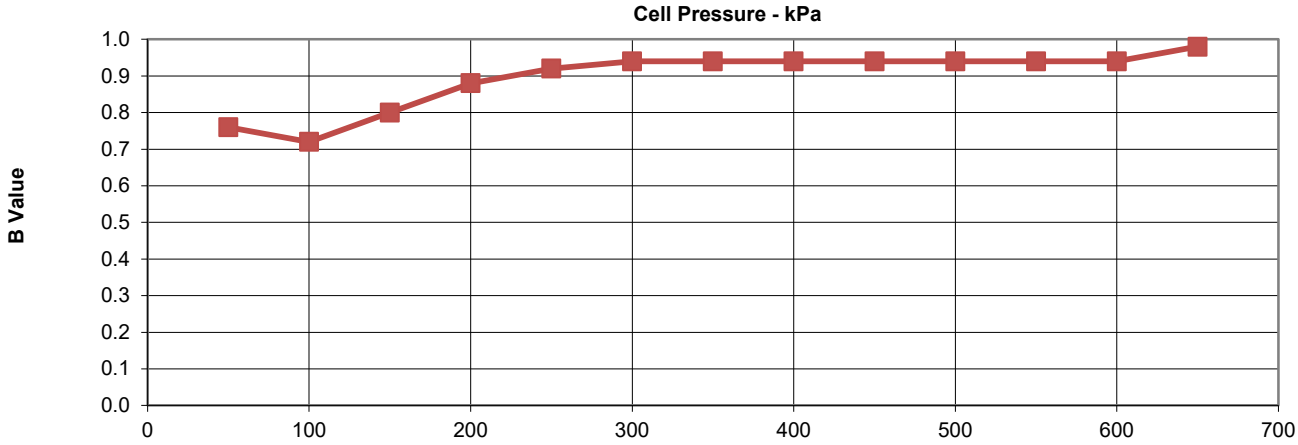
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.82

Test Setup		
Date Started		01/10/2018
Date Finished		12/10/2018
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	5
Permeability Time	Days	3

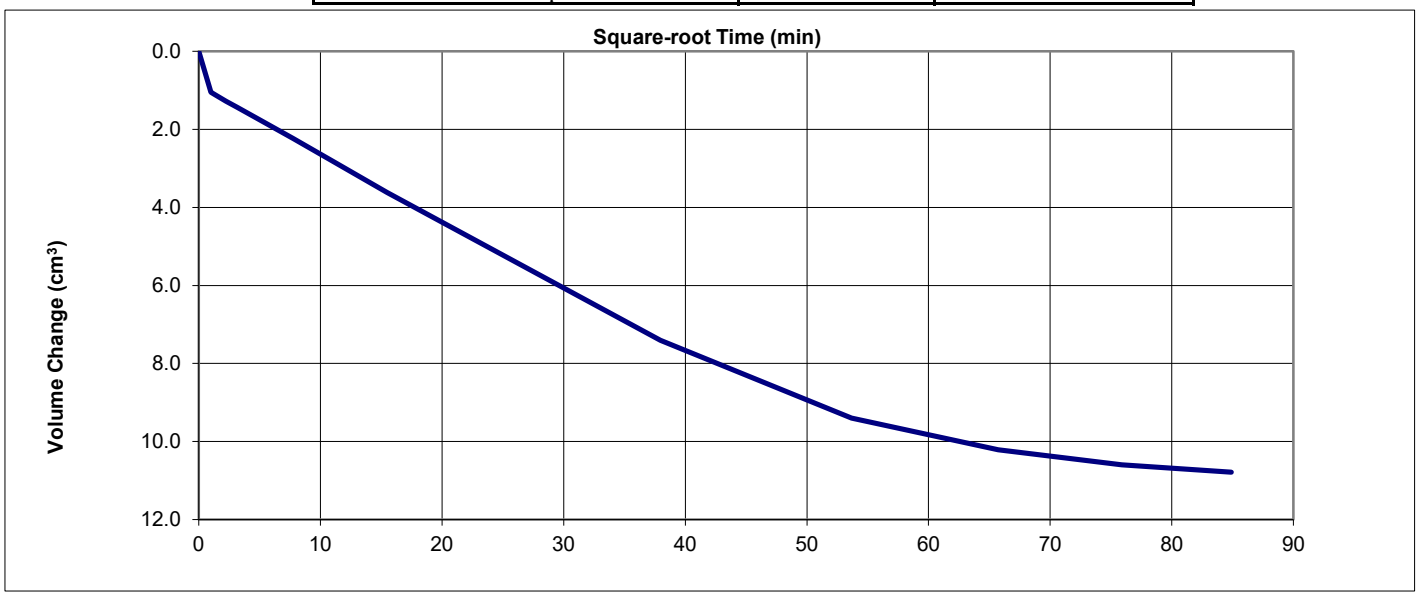
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P15/L1/33
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	650
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	700
Back Pressure	kPa	600
Final PWP	kPa	300
PWP dissipation	%	100



PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P15/L1/33
Grid Reference		
Lift Number		

Permeability Stage

Permeability Stage		
Cell Pressure	kPa	700
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0006
Average Temperature	'C	20
Vertical Permeability Kv	m/s	5.8E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P15/L2/17P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.22
Diameter	mm	101.50
Area	mm^2	8091.37
Volume	cm^3	827.10
Mass	g	1747
Dry Mass	g	1472
Bulk Density	Mg/m^3	2.11
Dry Density	Mg/m^3	1.78
Moisture Content	%	19
Voids Ratio	-	0.489
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

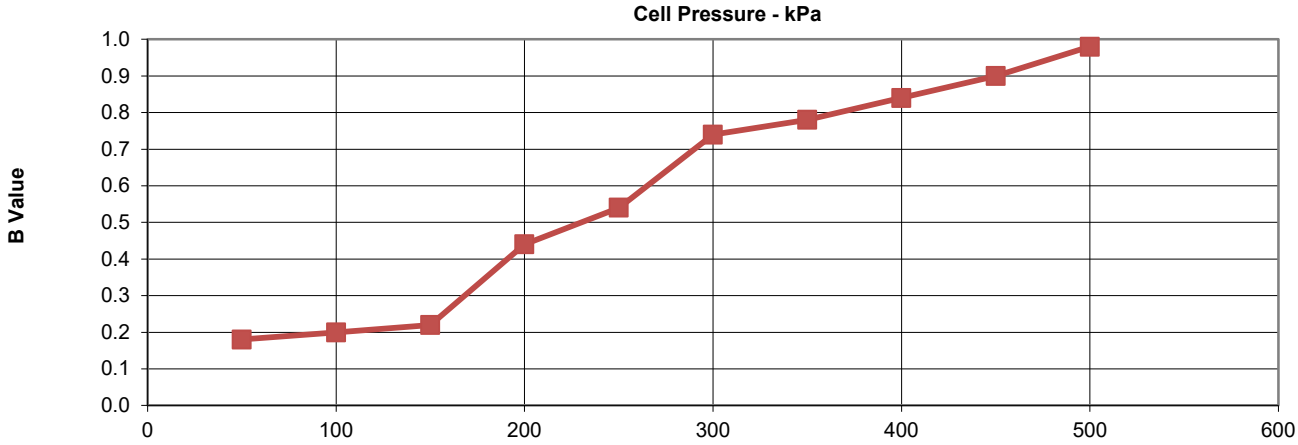
Final Specimen Conditions		
Moisture Content	%	20
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.78

Test Setup		
Date Started		30/08/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	6
Permeability Time	Days	2

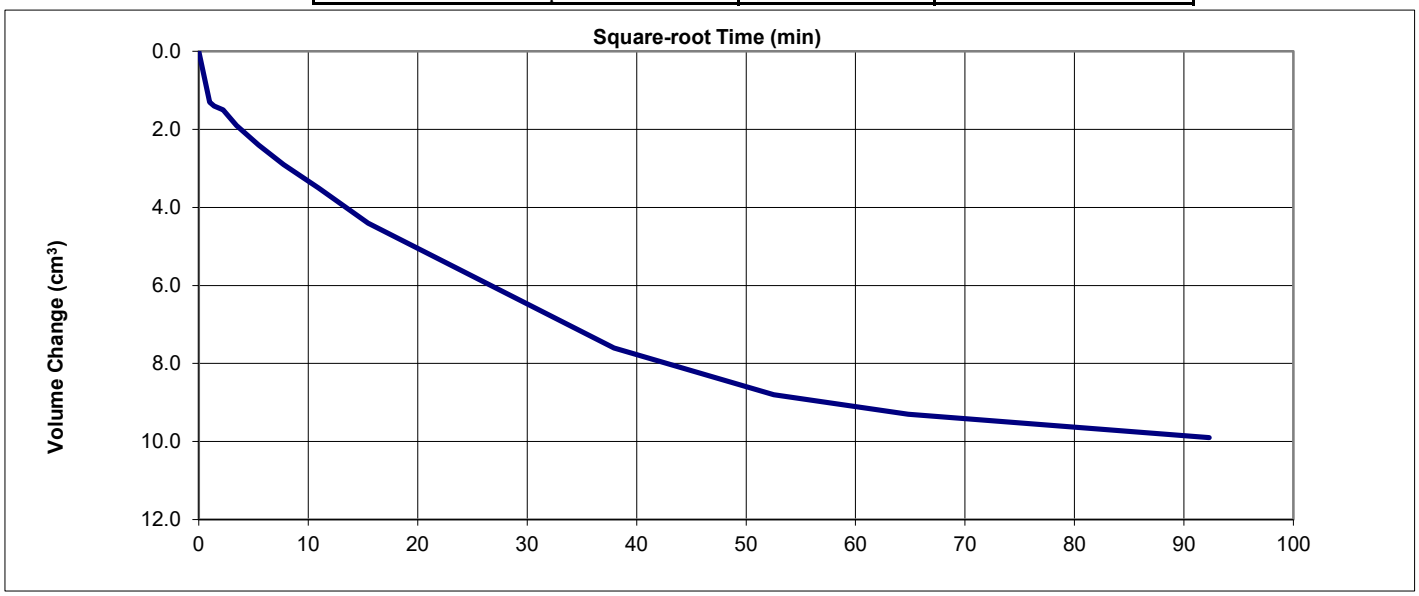
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P15/L2/17P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	500
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	600
Back Pressure	kPa	500
Final PWP	kPa	502
PWP dissipation	%	97



UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

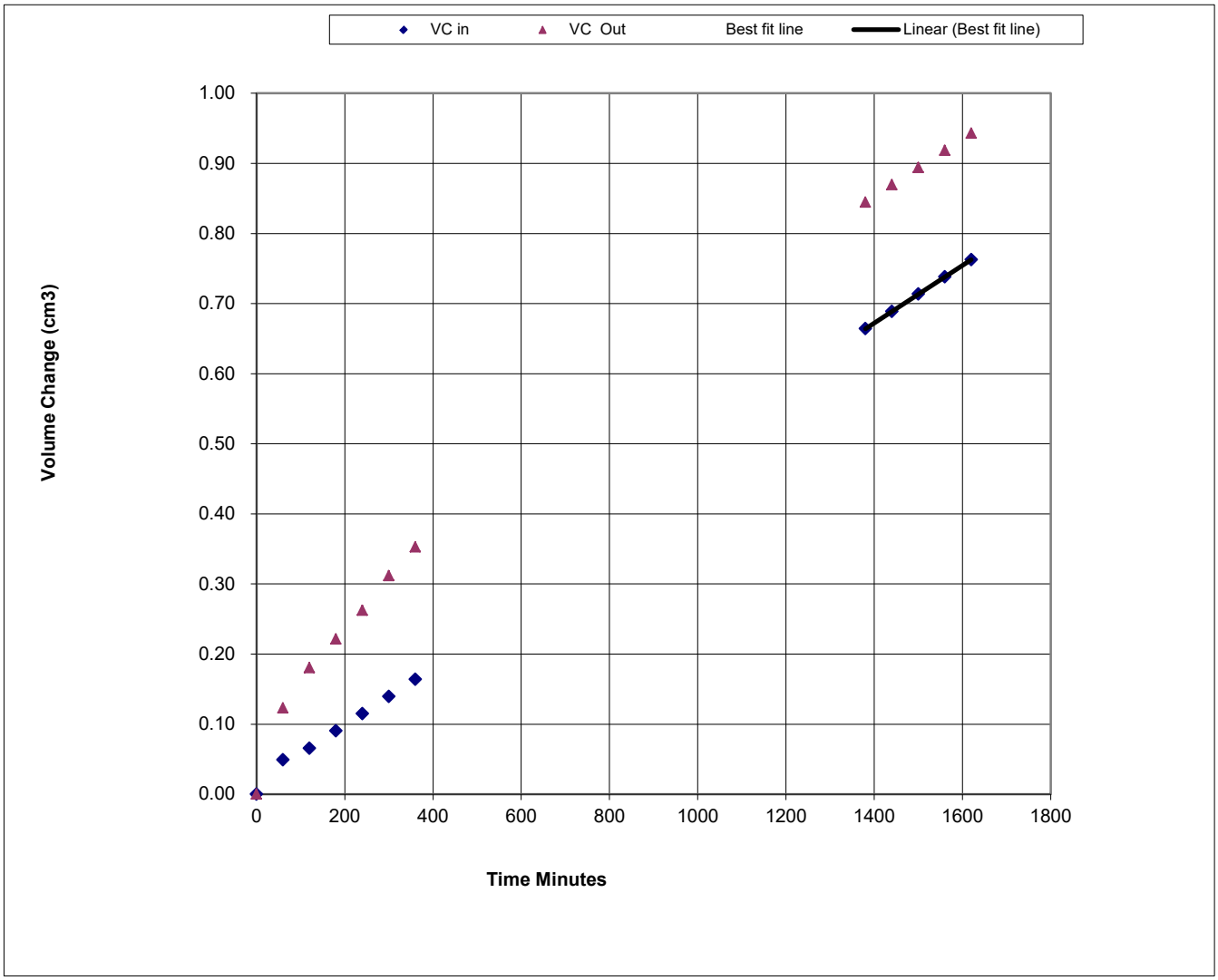
Contract No.
PSL19/4654
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P15/L2/17P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	600
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0004
Average Temperature	'C	20
Vertical Permeability Kv	m/s	4.3E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P16/L1/22P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	103.01
Diameter	mm	101.50
Area	mm^2	8091.37
Volume	cm^3	833.49
Mass	g	1754
Dry Mass	g	1481
Bulk Density	Mg/m^3	2.10
Dry Density	Mg/m^3	1.78
Moisture Content	%	18
Voids Ratio	-	0.492
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

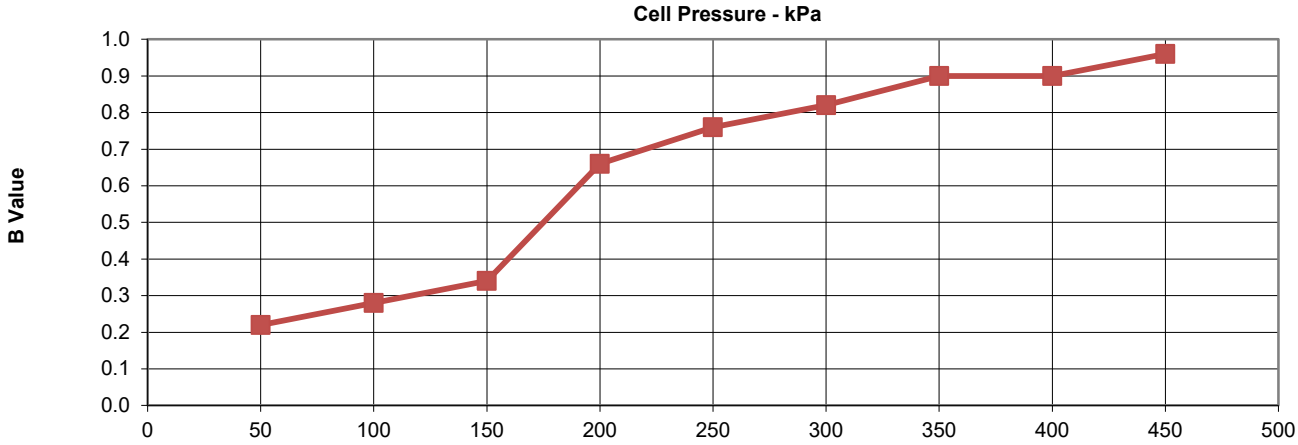
Final Specimen Conditions		
Moisture Content	%	19
Bulk Density	Mg/m^3	2.11
Dry Density	Mg/m^3	1.78

Test Setup		
Date Started		02/09/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	5
Permeability Time	Days	2

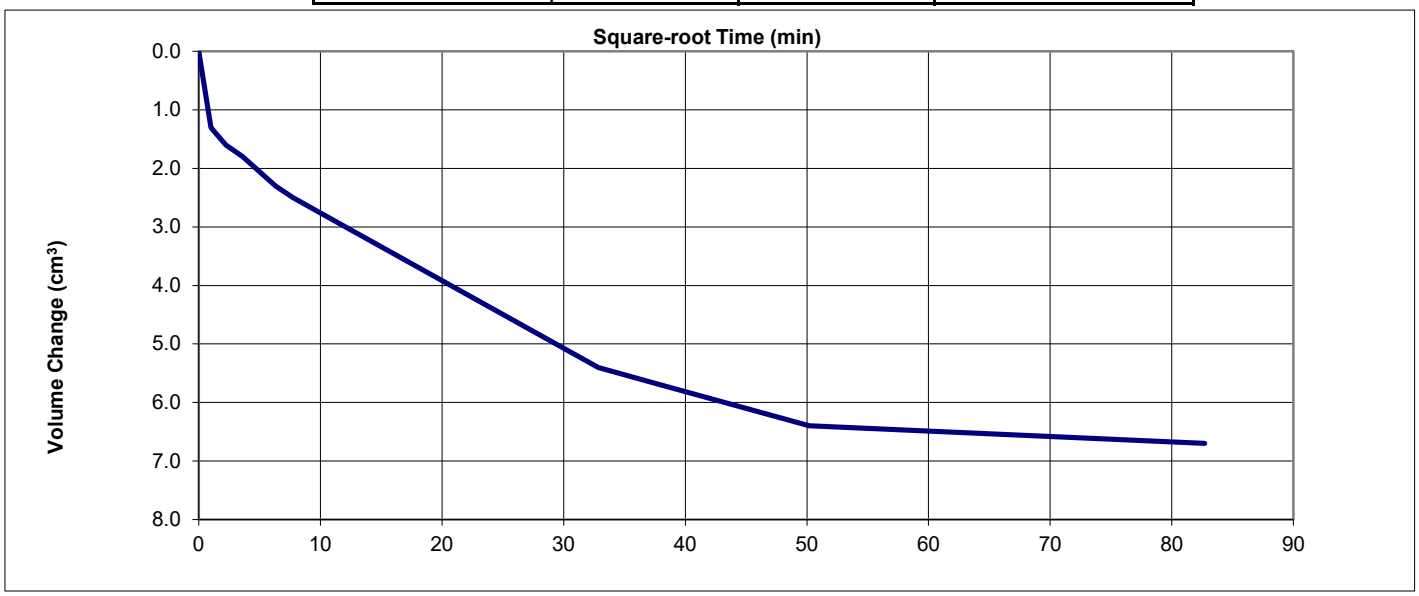
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P16/L1/22P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	450
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	550
Back Pressure	kPa	450
Final PWP	kPa	450
PWP dissipation	%	100



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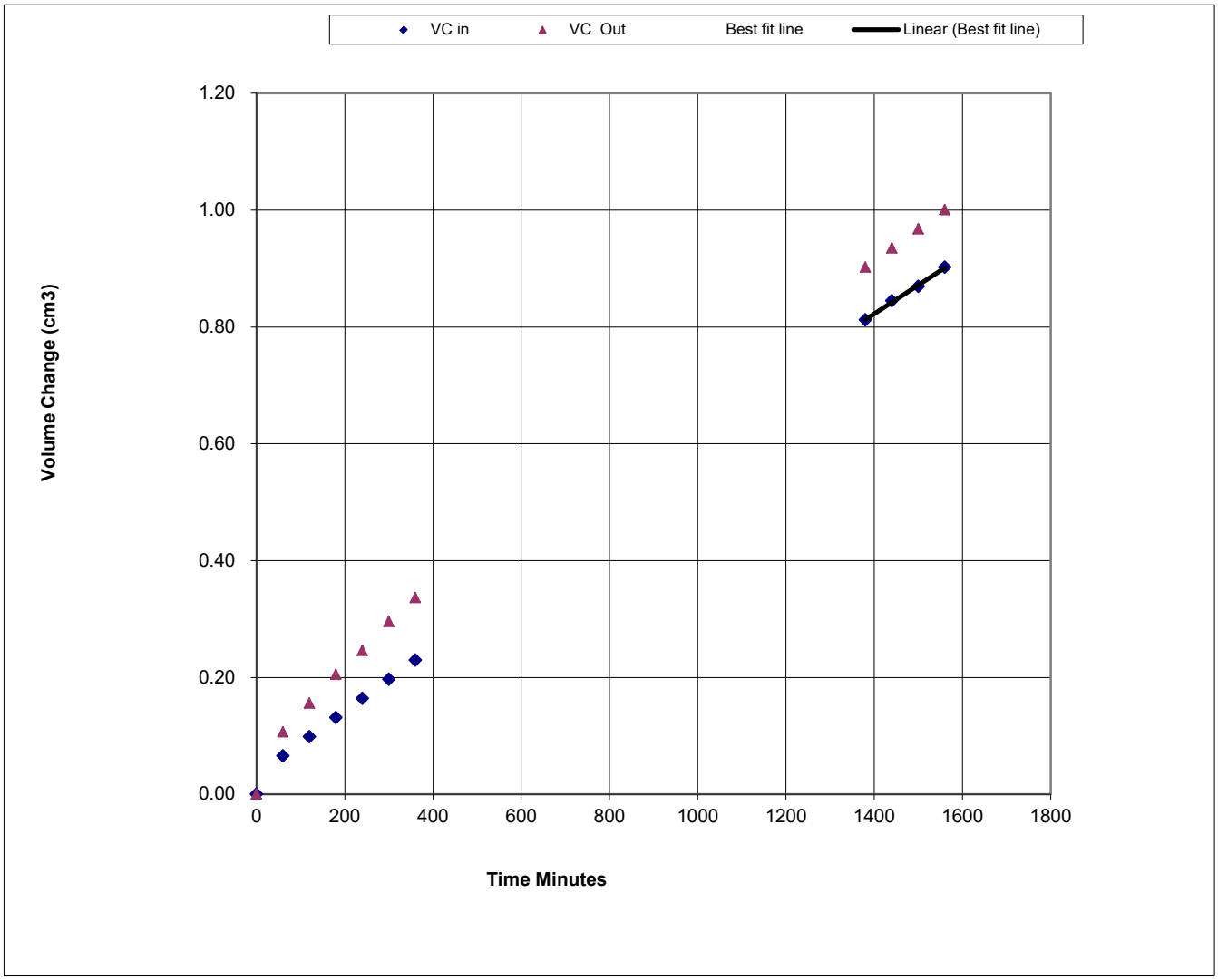
PSL19/4654
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P16/L1/22P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	550
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0005
Average Temperature	'C	20
Vertical Permeability Kv	m/s	5.2E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P16/L2/37P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.46
Diameter	mm	99.84
Area	mm^2	7828.87
Volume	cm^3	802.15
Mass	g	1713
Dry Mass	g	1470
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.83
Moisture Content	%	17
Voids Ratio	-	0.446
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

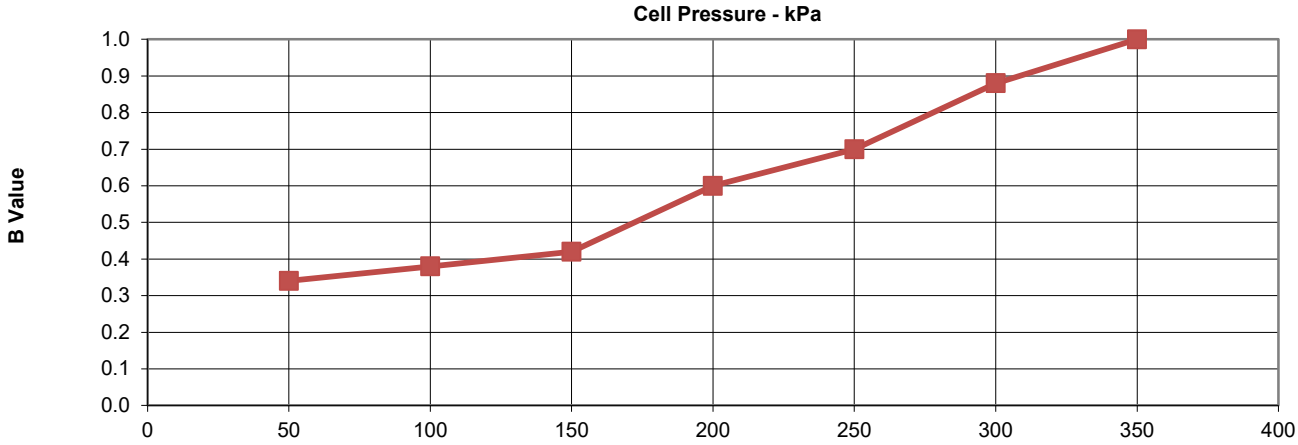
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.15
Dry Density	Mg/m^3	1.83

Test Setup		
Date Started		02/09/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	6
Permeability Time	Days	1

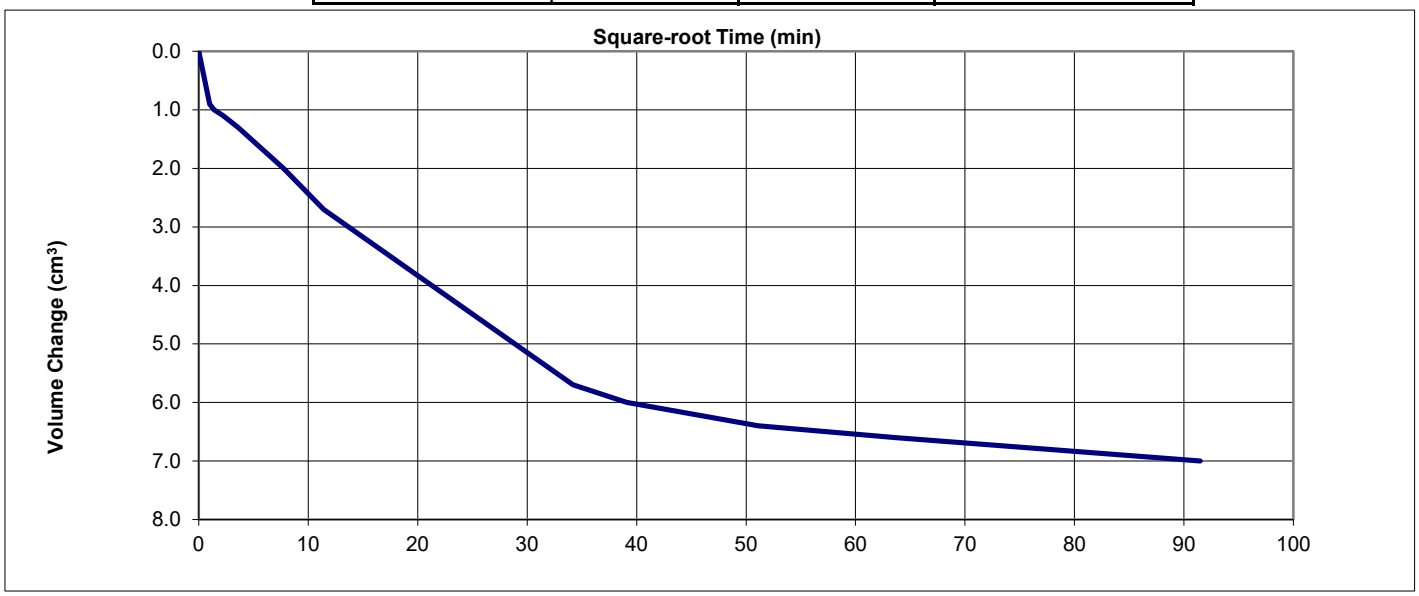
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P16/L2/37P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	1.00



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	450
Back Pressure	kPa	350
Final PWP	kPa	353
PWP dissipation	%	95

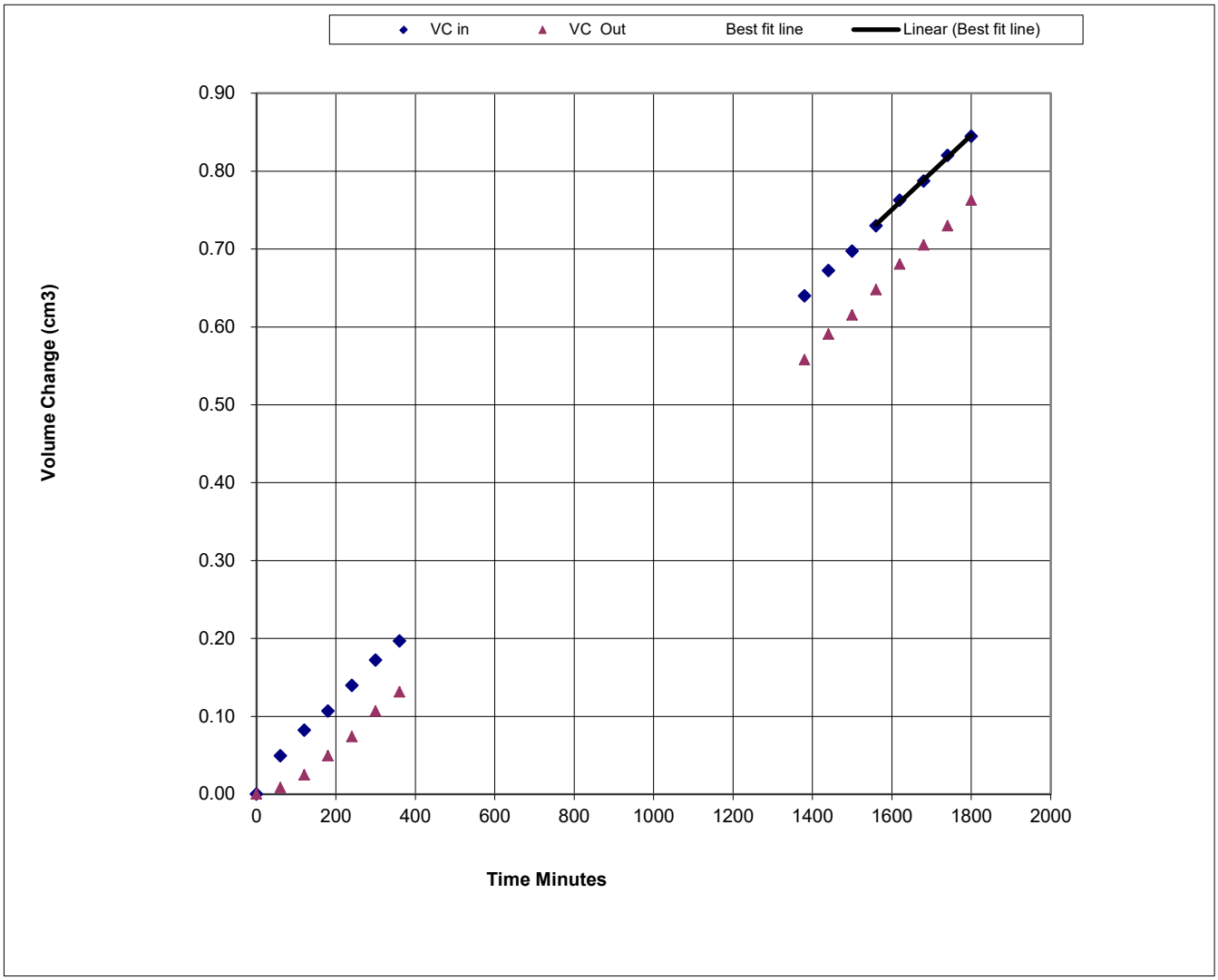


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P16/L2/37P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	450
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0005
Average Temperature	'C	20
Vertical Permeability Kv	m/s	4.9E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P17/L1/27P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.66
Diameter	mm	98.86
Area	mm^2	7675.93
Volume	cm^3	788.01
Mass	g	1679
Dry Mass	g	1421
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.80
Moisture Content	%	18
Voids Ratio	-	0.470
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

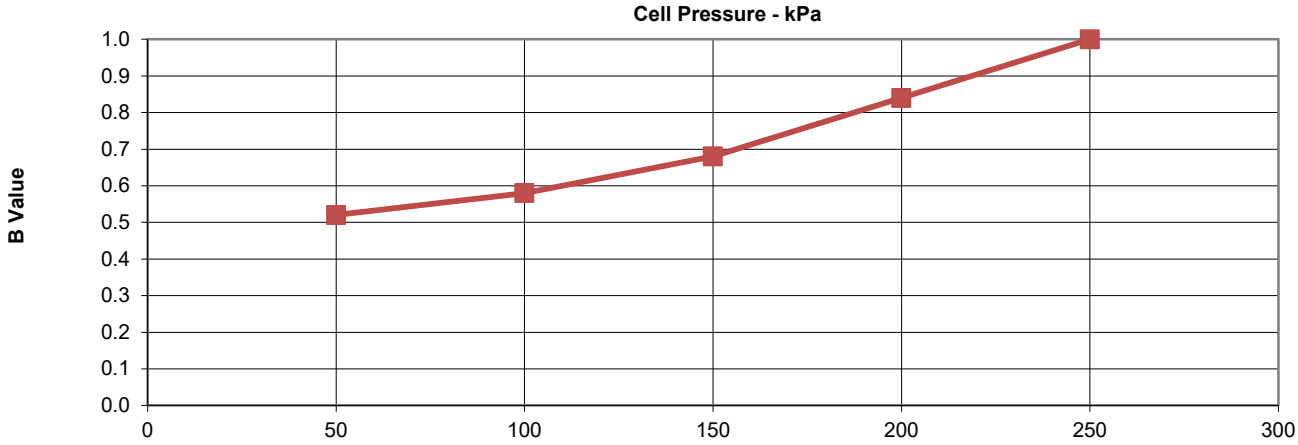
Final Specimen Conditions		
Moisture Content	%	19
Bulk Density	Mg/m^3	2.14
Dry Density	Mg/m^3	1.80

Test Setup		
Date Started		02/09/2019
Date Finished		11/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	6
Permeability Time	Days	2

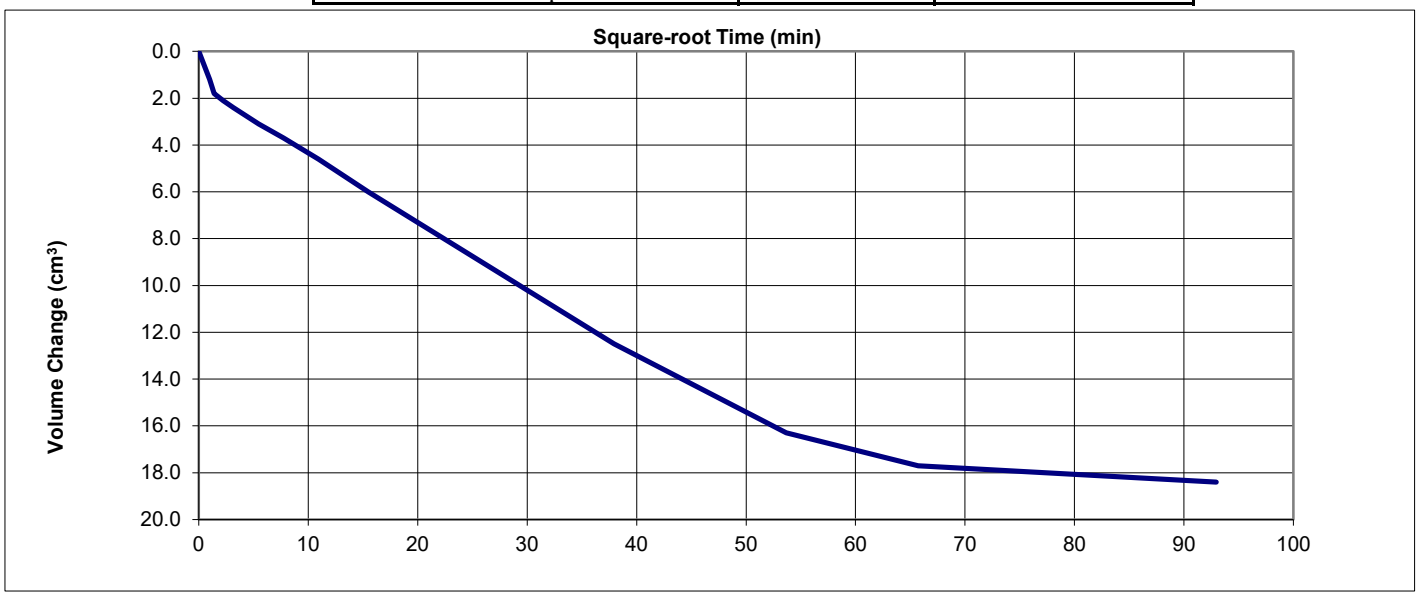
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P17/L1/27P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	250
Final B Value	-	1.00



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	304
PWP dissipation	%	95

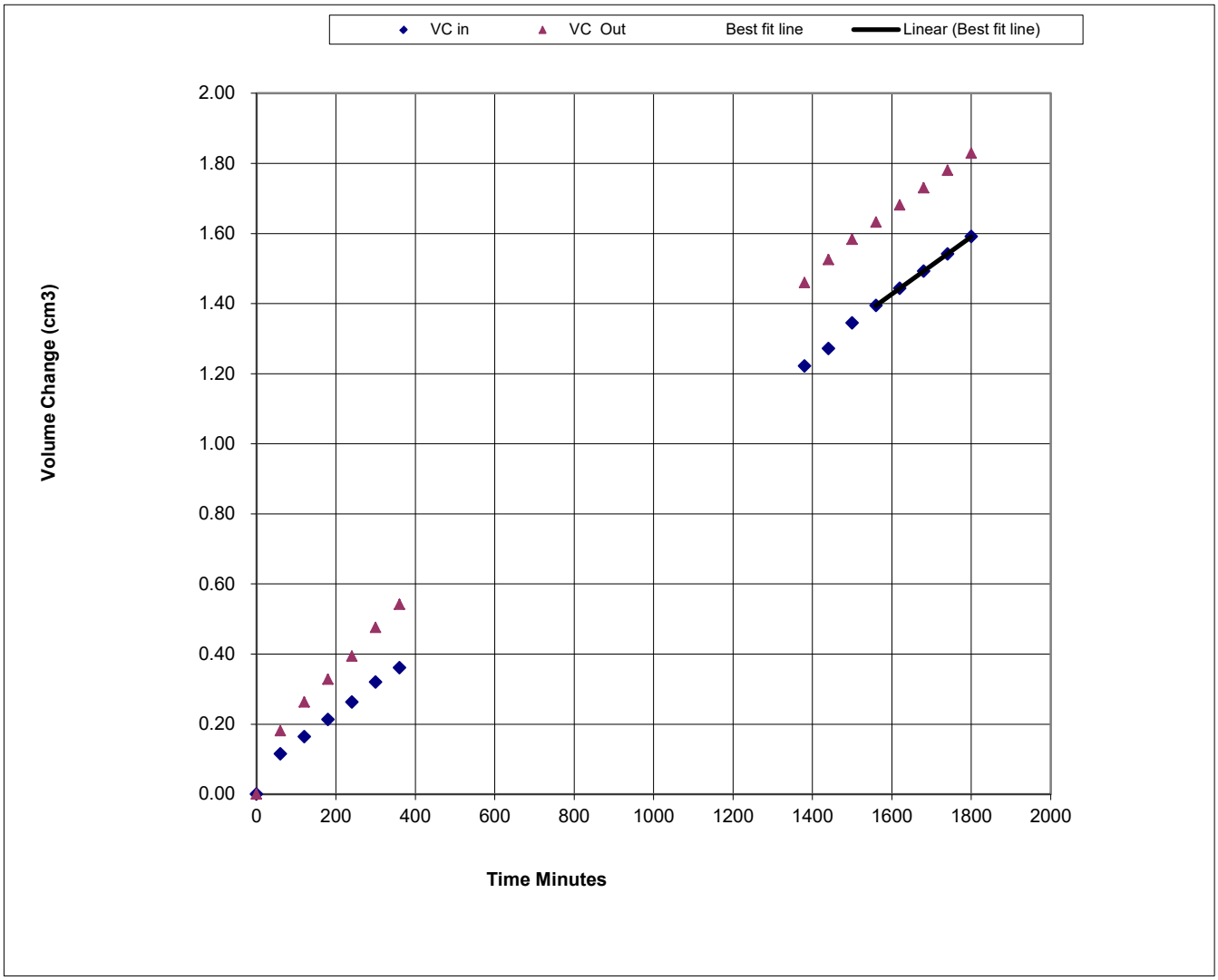


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P17/L1/27P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0008
Average Temperature	'C	20
Vertical Permeability Kv	m/s	9.1E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Hole Number: **Top Depth (m) :**

Sample Number: **P17/L2/32P** **Base Depth (m) :**

Sample Type: **C** **Lift Number:**

Date **Grid Reference:**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.84
Diameter	mm	100.64
Area	mm^2	7954.83
Volume	cm^3	818.08
Mass	g	1673
Dry Mass	g	1394
Bulk Density	Mg/m^3	2.04
Dry Density	Mg/m^3	1.70
Moisture Content	%	20
Voids Ratio	-	0.555
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

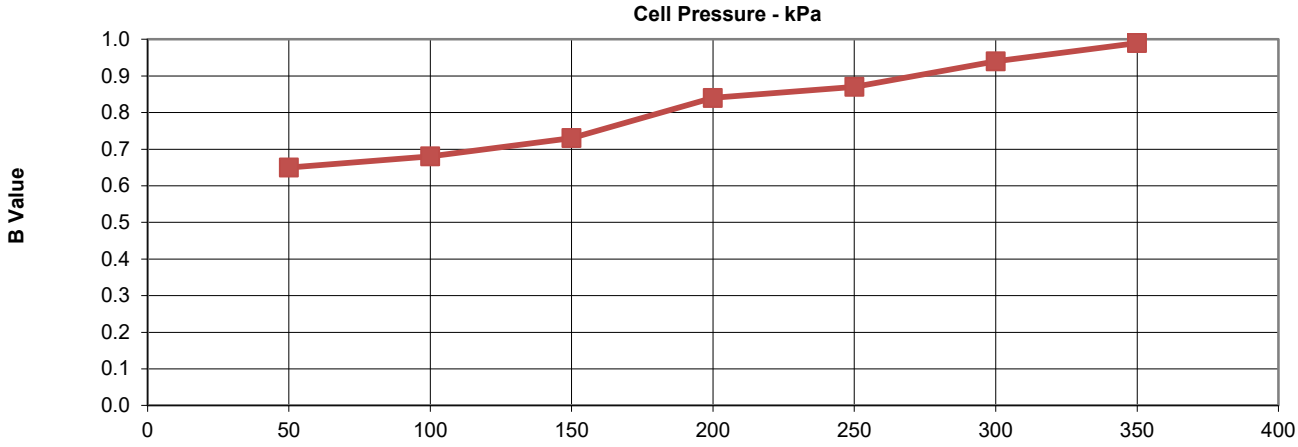
Final Specimen Conditions		
Moisture Content	%	20
Bulk Density	Mg/m^3	2.04
Dry Density	Mg/m^3	1.70

Test Setup		
Date Started		02/09/2019
Date Finished		10/09/2019
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	4
Permeability Time	Days	1

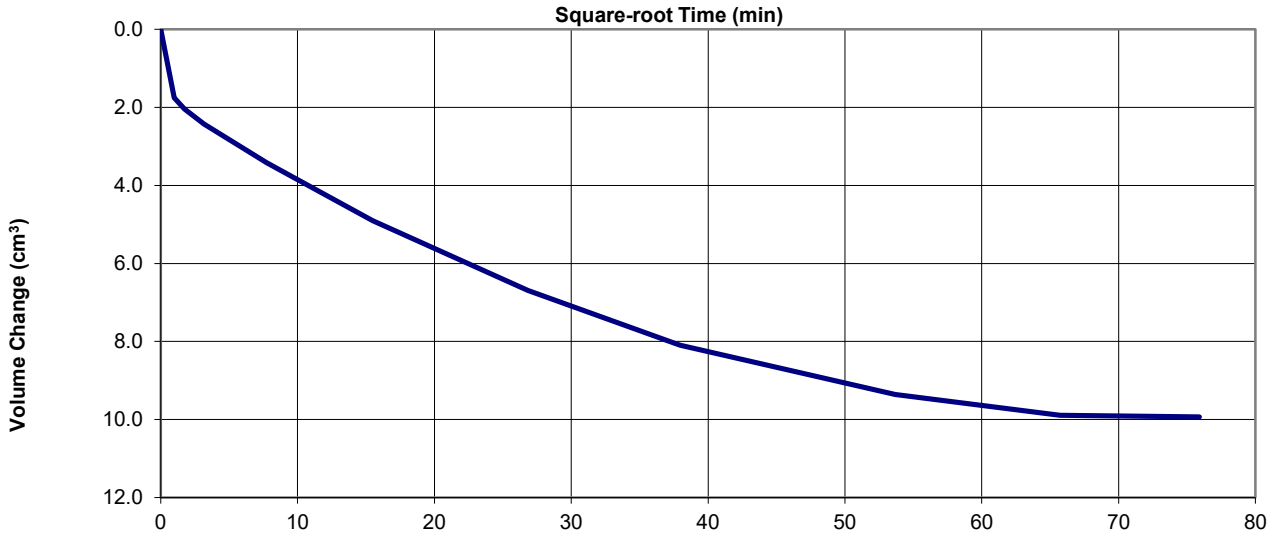
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No,		P17/L2/32P
Grid Reference		
Lift Number		
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	350
Final B Value	-	0.99



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	450
Back Pressure	kPa	350
Final PWP	kPa	352
PWP dissipation	%	97

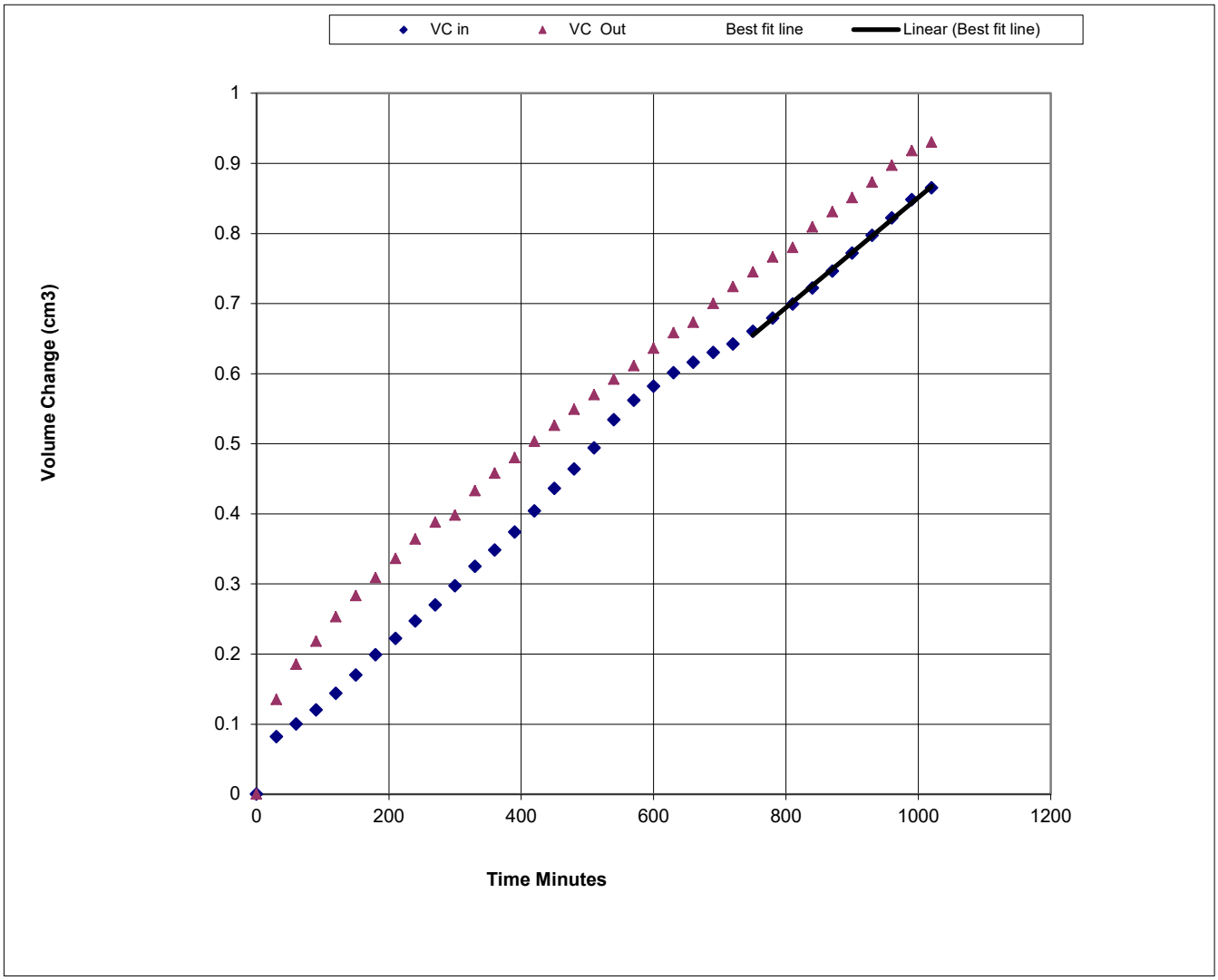


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Hole Number		
Sample Depth	m	
Sample No.		P17/L2/32P
Grid Reference		
Lift Number		

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	450
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0008
Average Temperature	'C	20
Vertical Permeability Kv	m/s	8.0E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Sample Number: **P18/L1/42P** **Grid Ref:**

Layer Number: **Sample Date:** **28/05/2020**

Sample Type: **C**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	103.20
Diameter	mm	101.23
Area	mm^2	8048.38
Volume	cm^3	830.59
Mass	g	1744
Dry Mass	g	1482
Bulk Density	Mg/m^3	2.10
Dry Density	Mg/m^3	1.78
Moisture Content	%	18
Voids Ratio	-	0.486
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

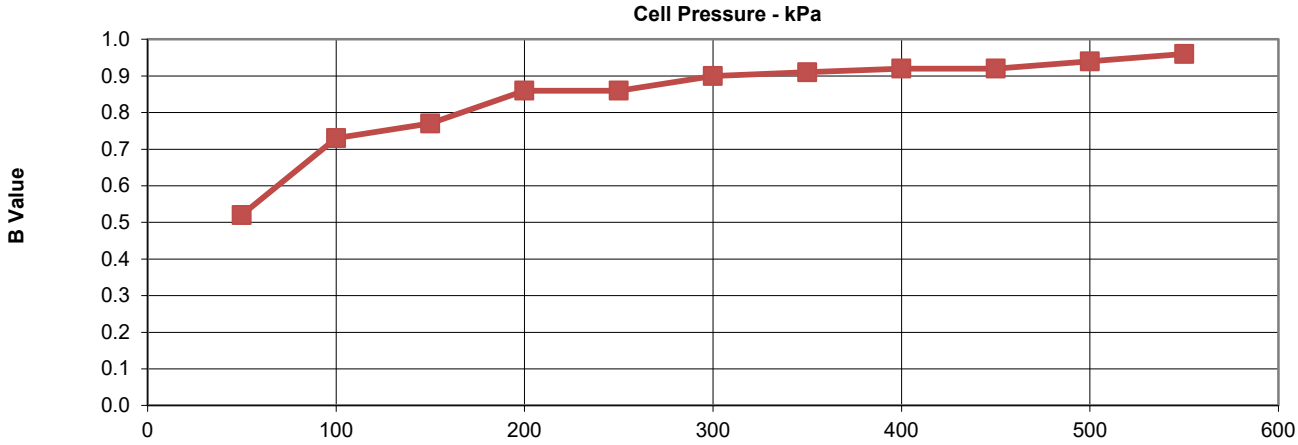
Final Specimen Conditions		
Moisture Content	%	17
Bulk Density	Mg/m^3	2.09
Dry Density	Mg/m^3	1.78

Test Setup		
Date Started		19/06/2020
Date Finished		26/06/2020
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	1

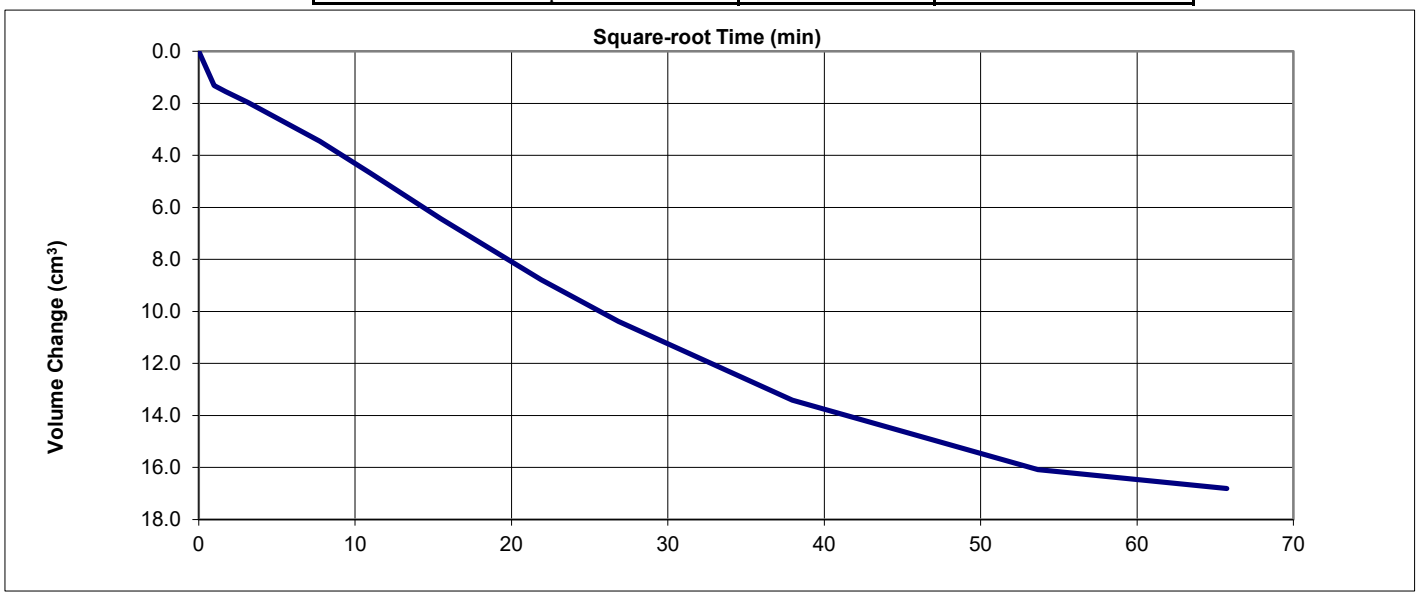
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L1/42P
Layer Number		
Grid Reference		
Sample Date		28/05/2020
Sample Type		C
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	550
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	650
Back Pressure	kPa	550
Final PWP	kPa	554
PWP dissipation	%	96

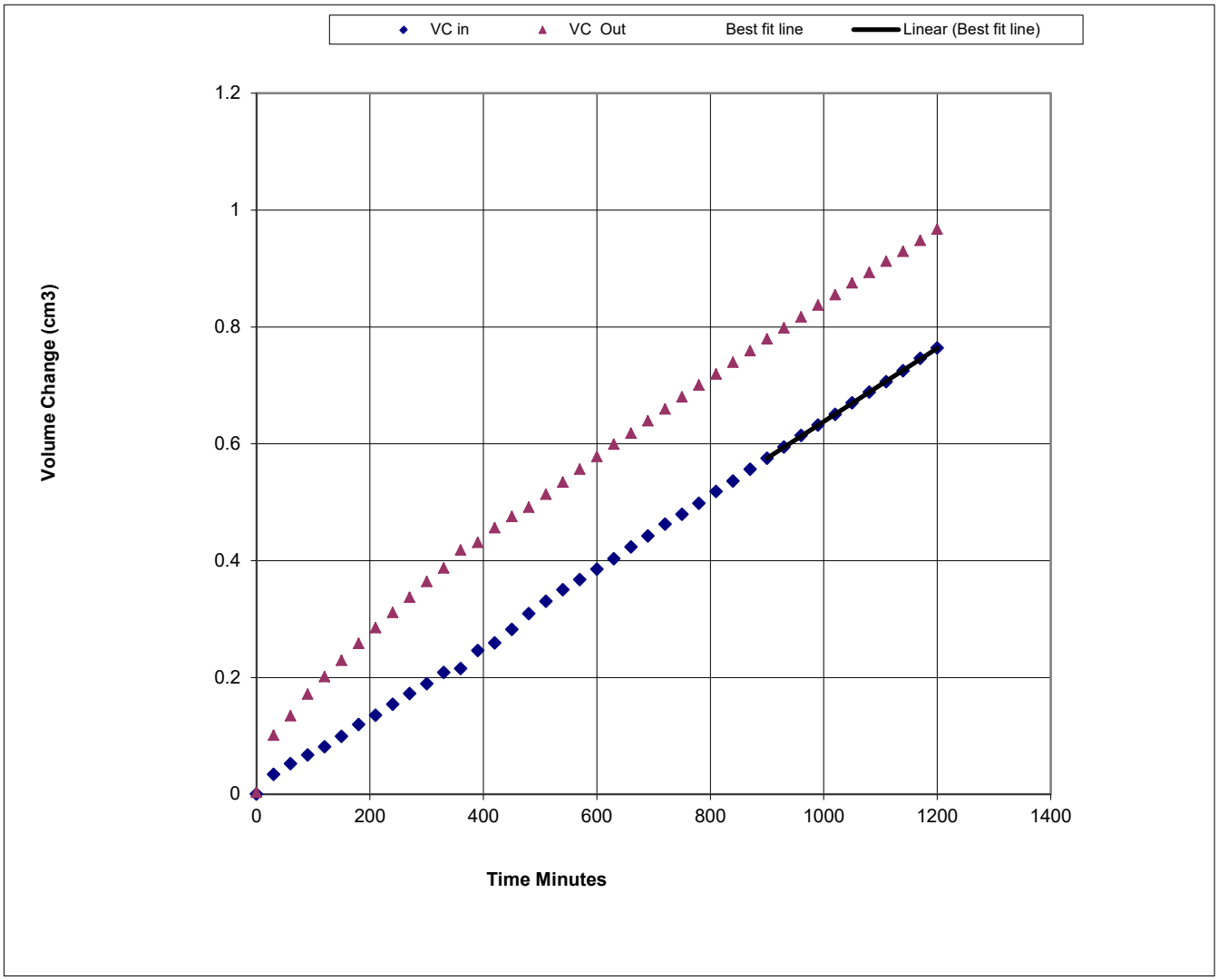


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L1/42P
Layer Number	m	
Grid Reference		
Sample Date		28/05/2020
Sample Type		C

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	650
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0006
Average Temperature	'C	20
Vertical Permeability Kv	m/s	6.6E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Sample Number: **P18/L1/47P** **Grid Ref:**

Layer Number: **Sample Date:** **29/05/2020**

Sample Type: **C**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.89
Diameter	mm	101.40
Area	mm^2	8075.43
Volume	cm^3	830.88
Mass	g	1799
Dry Mass	g	1566
Bulk Density	Mg/m^3	2.16
Dry Density	Mg/m^3	1.88
Moisture Content	%	15
Voids Ratio	-	0.406
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

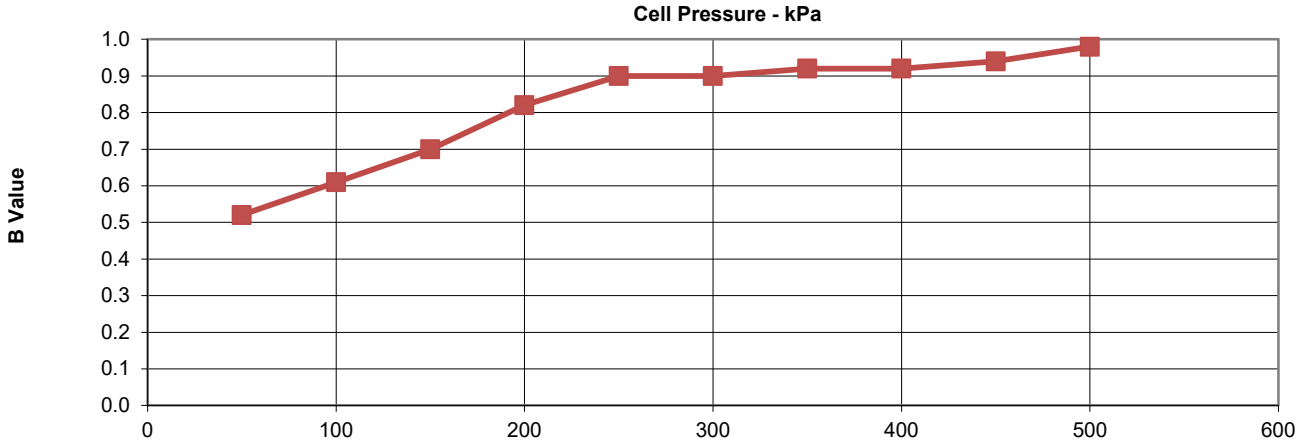
Final Specimen Conditions		
Moisture Content	%	15
Bulk Density	Mg/m^3	2.16
Dry Density	Mg/m^3	1.88

Test Setup		
Date Started		19/06/2020
Date Finished		26/06/2020
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	2
Permeability Time	Days	1

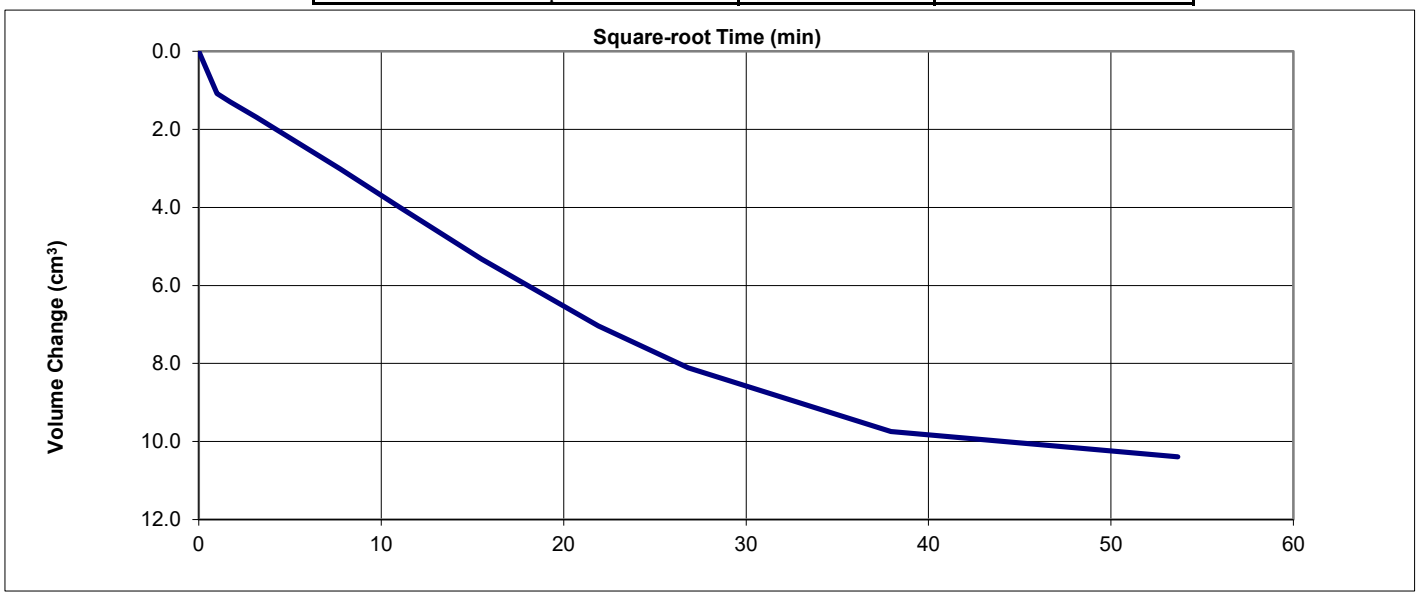
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L1/47P
Layer Number		
Grid Reference		
Sample Date		29/05/2020
Sample Type		C
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	500
Final B Value	-	0.98



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	600
Back Pressure	kPa	500
Final PWP	kPa	503
PWP dissipation	%	96

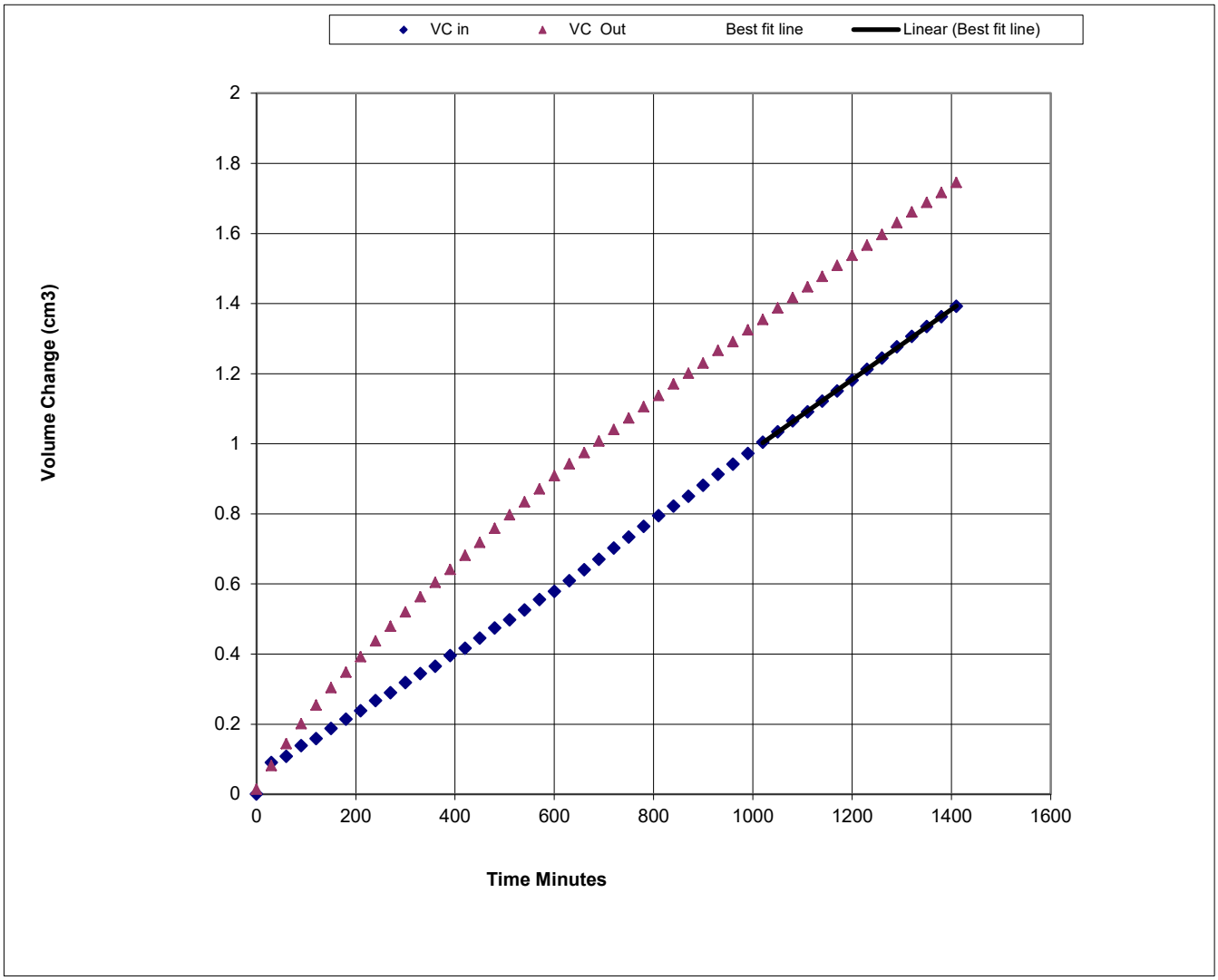


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L1/47P
Layer Number	m	
Grid Reference		
Sample Date		29/05/2020
Sample Type		C

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	600
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0010
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.0E-10

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Sample Number: **P18/L2/52P** **Grid Ref:**

Layer Number: **Sample Date:** **01/06/2020**

Sample Type: **C**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.17
Diameter	mm	100.87
Area	mm^2	7991.24
Volume	cm^3	816.46
Mass	g	1758
Dry Mass	g	1516
Bulk Density	Mg/m^3	2.15
Dry Density	Mg/m^3	1.86
Moisture Content	%	16
Voids Ratio	-	0.428
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

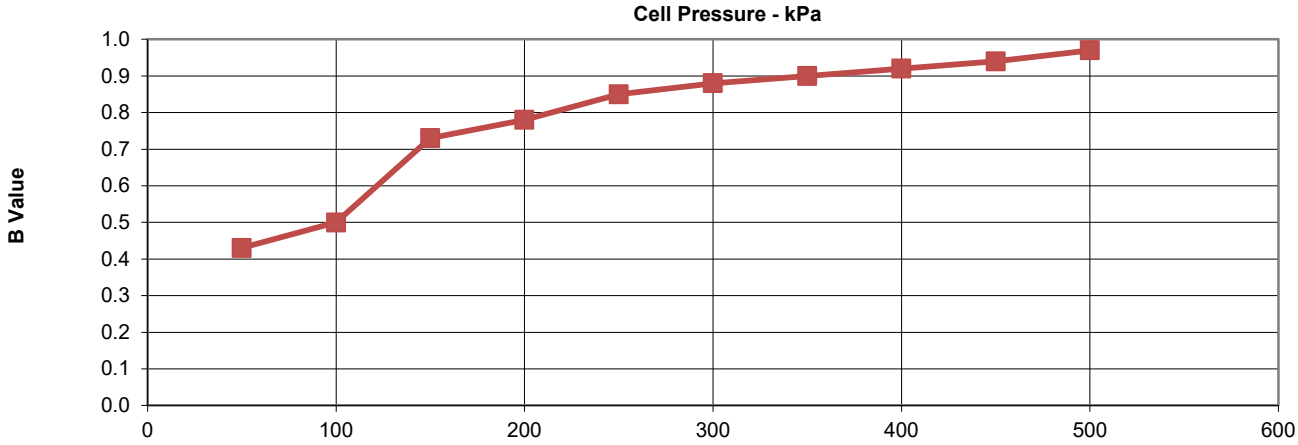
Final Specimen Conditions		
Moisture Content	%	16
Bulk Density	Mg/m^3	2.15
Dry Density	Mg/m^3	1.86

Test Setup		
Date Started		19/06/2020
Date Finished		26/06/2020
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	1

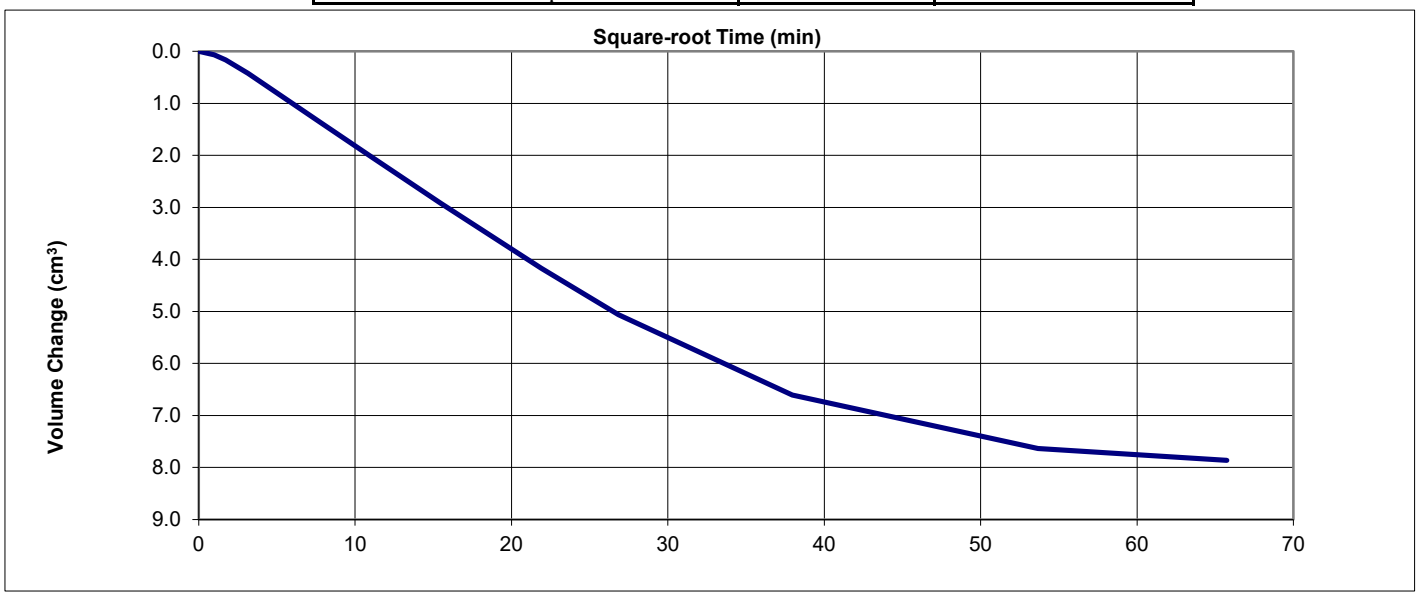
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L2/52P
Layer Number		
Grid Reference		
Sample Date		01/06/2020
Sample Type		C
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	500
Final B Value	-	0.97



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	600
Back Pressure	kPa	500
Final PWP	kPa	504
PWP dissipation	%	95



UKAS TESTING 4043

PSL Professional Soils Laboratory

Fletcher Bank LFS

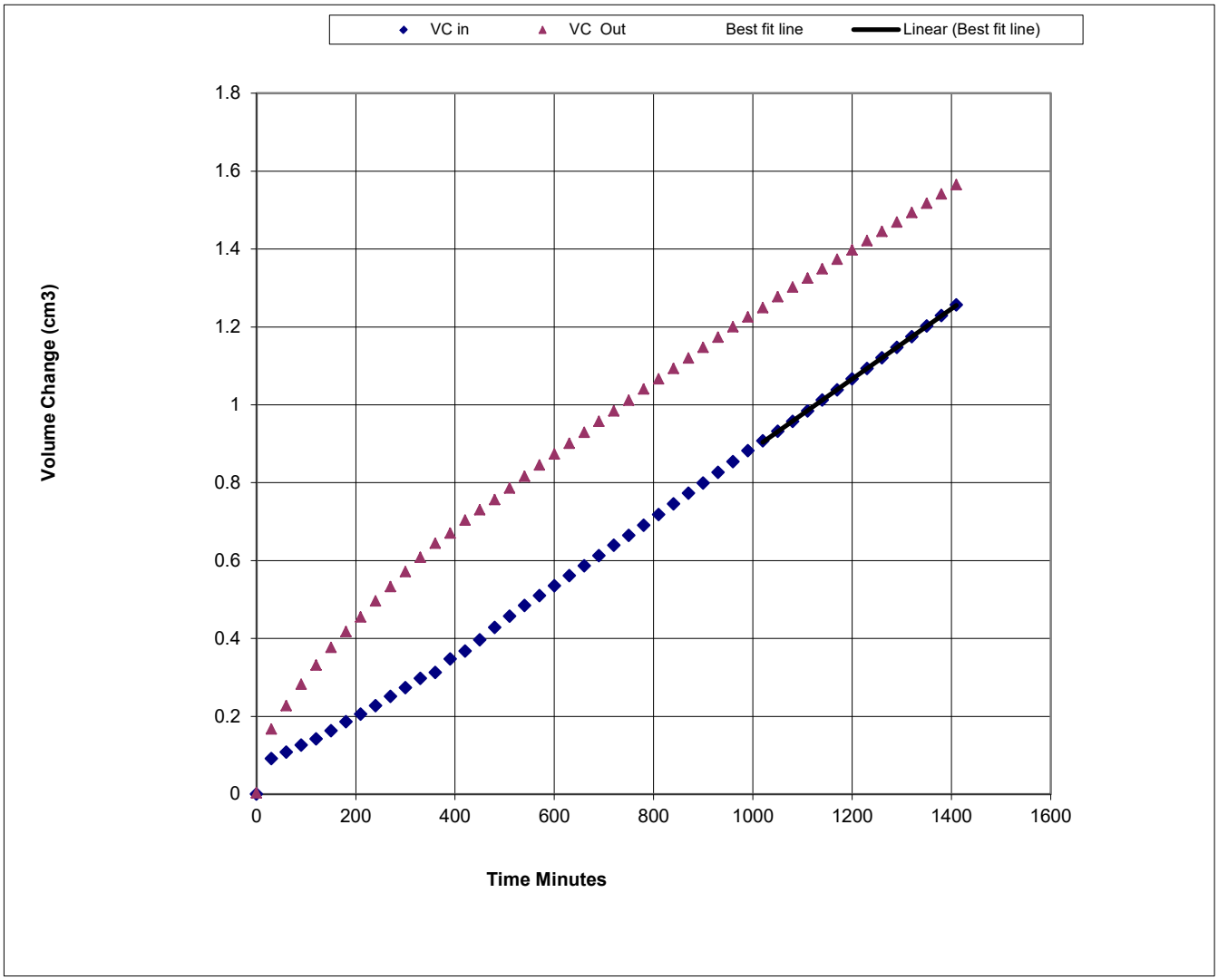
Contract No.
PSL20/2729
Client Ref
3125

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L2/52P
Layer Number	m	
Grid Reference		
Sample Date		01/06/2020
Sample Type		C

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	600
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0009
Average Temperature	'C	20
Vertical Permeability Kv	m/s	9.3E-11

PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990: Clause 6

Sample Number: **P18/L2/57P** **Grid Ref:**

Layer Number: **Sample Date:** **02/06/2020**

Sample Type: **C**

Description of Specimen
See summary of soil descriptions
Remarks
Undisturbed

Initial Specimen Conditions		
Height	mm	102.74
Diameter	mm	99.13
Area	mm^2	7717.92
Volume	cm^3	792.94
Mass	g	1686
Dry Mass	g	1424
Bulk Density	Mg/m^3	2.13
Dry Density	Mg/m^3	1.80
Moisture Content	%	18
Voids Ratio	-	0.476
Specific Gravity	Mg/m^3	2.65
(assumed/measured)	-	assumed

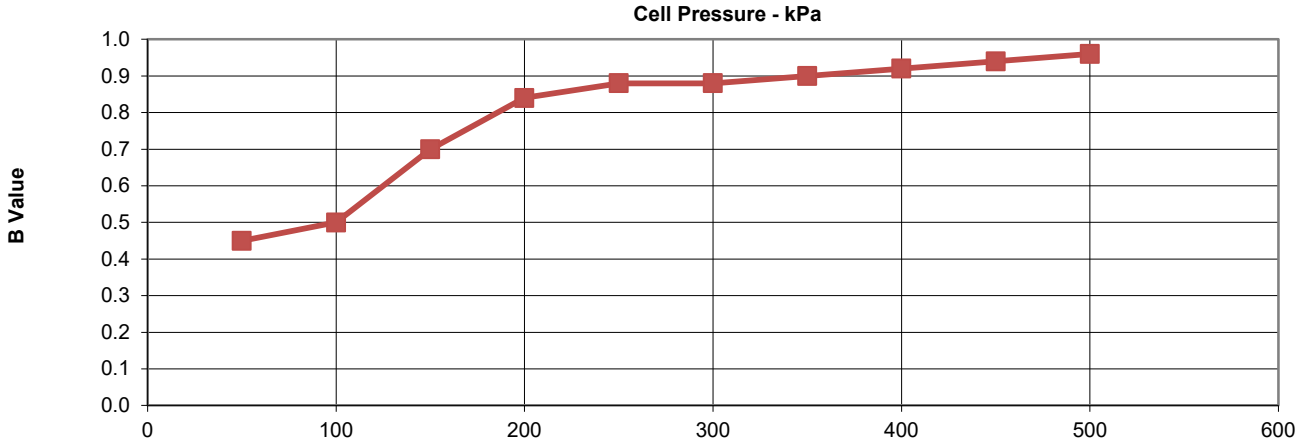
Final Specimen Conditions		
Moisture Content	%	18
Bulk Density	Mg/m^3	2.12
Dry Density	Mg/m^3	1.80

Test Setup		
Date Started		19/06/2020
Date Finished		26/06/2020
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	1

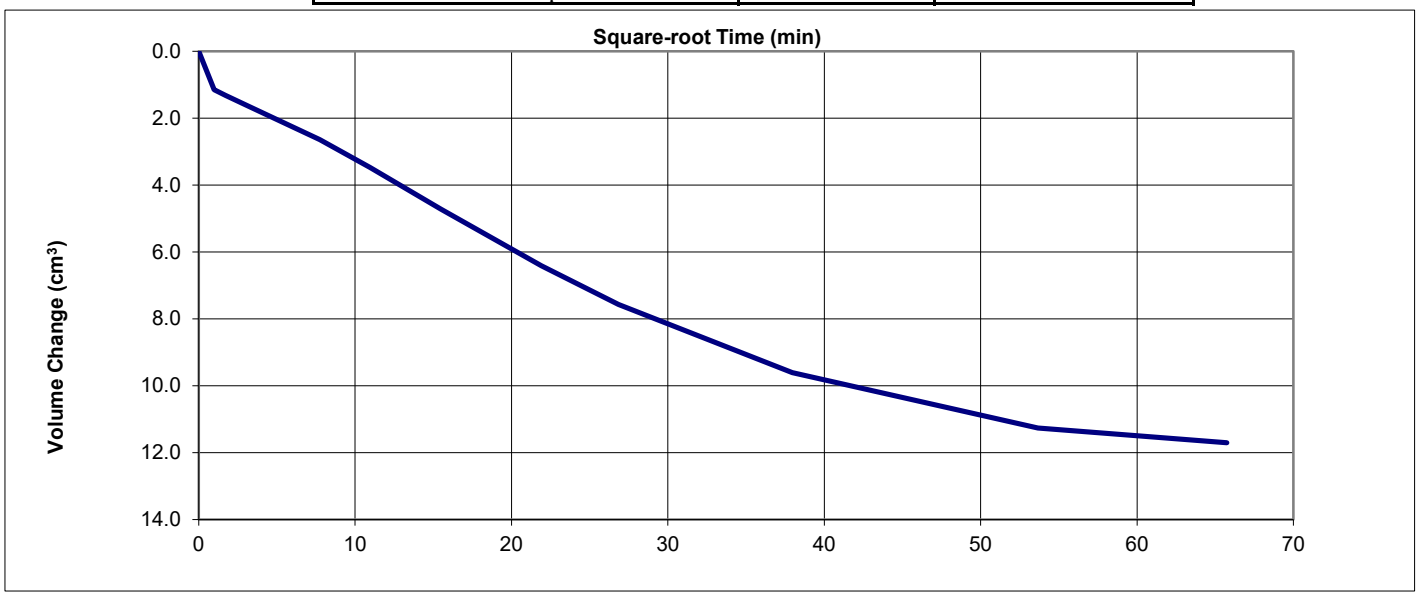
PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L2/57P
Layer Number		
Grid Reference		
Sample Date		02/06/2020
Sample Type		C
Saturation		
Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	500
Final B Value	-	0.96



Consolidation		
Effective Pressure	kPa	100
Cell Pressure	kPa	600
Back Pressure	kPa	500
Final PWP	kPa	504
PWP dissipation	%	96

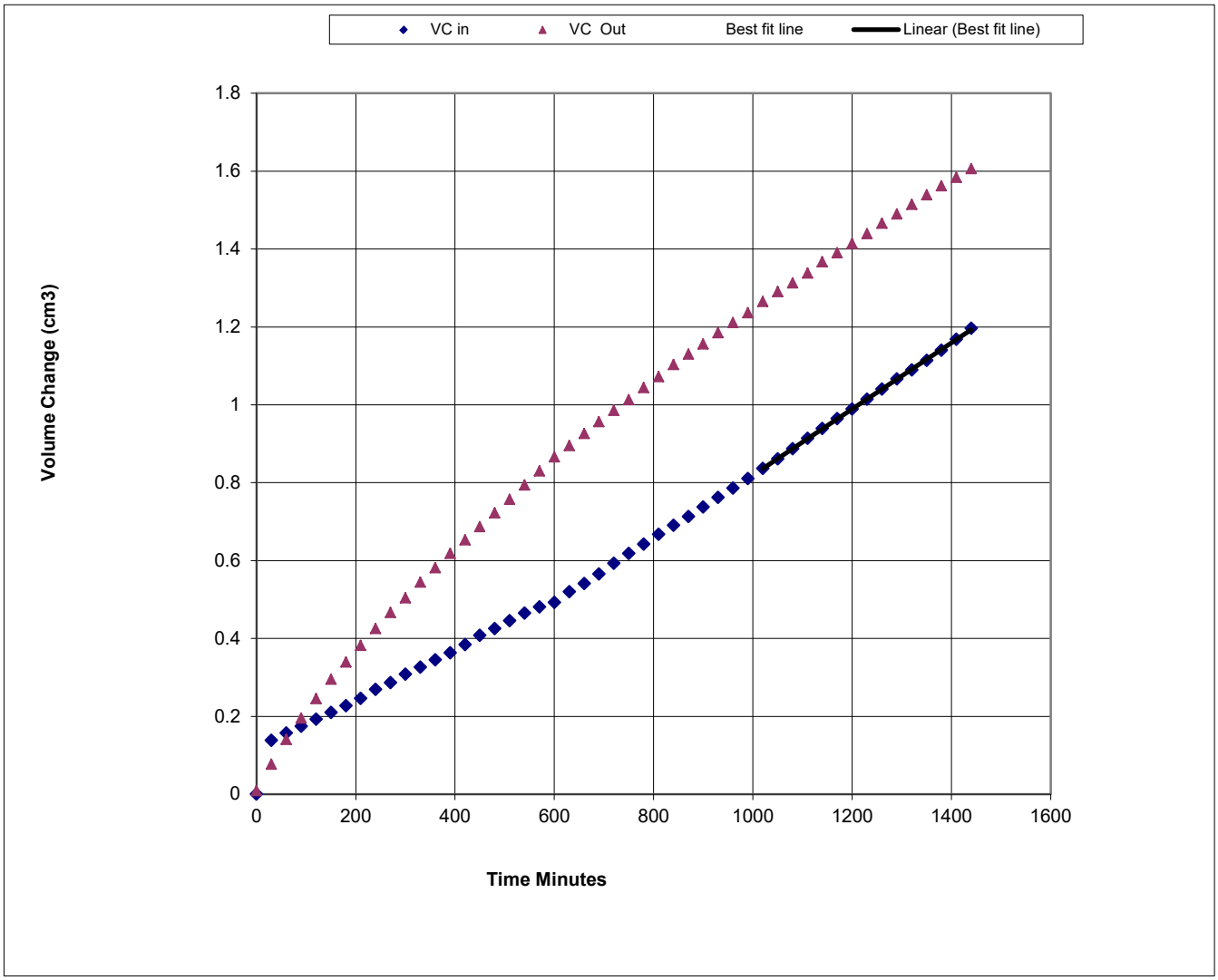


PERMEABILITY IN A TRIAXIAL CELL

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details		
Sample Number		P18/L2/57P
Layer Number	m	
Grid Reference		
Sample Date		02/06/2020
Sample Type		C

Permeability Stage



Permeability Stage		
Cell Pressure	kPa	600
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	20
Mean Rate of Flow	ml/min	0.0009
Average Temperature	'C	20
Vertical Permeability Kv	m/s	9.3E-11

C7 Test and Sample Locations

TerraConsult

Site: Fletcher Bank **Job No.:** 3125

Engineer: Ash Mudhar, Nnanna, Iain Jones, John Phelan

Clay Liners - Test and Sample Locations

Date	Testing Detail	Test Location Grid Ref.	Core Sample	Bulk Sample	Permeability Sample	Comments
13.08.18	P2/L1/09	E2	X			
13.08.18	P3/L1/10	D3	X	X	X	
13.08.18	P3/L2/11	C3	X			
13.08.18	P2/L2/12	E3	X			
13.08.18	P4/L1/13	C4	X	X		
14.08.18	P4/L2/14	D5	X			
14.08.18	P5/L1/15	B6	X			
14.08.18	P6/L1/16	D7	X	X	X	
14.08.18	P7/L1/17	D9	X			
14.08.18	P5/L2/18	B5	X	X	X	
14.08.18	P6/L2/19	C8	X			
14.08.18	P7/L2/20	C9	X	X		
15.08.18	P8/L1/21	E10	X			
17.08.18	P9/L1/22	F11	X			
17.08.18	P10/L1/23	E12	X	X	X	
20.08.18	P11/L1/24	G13	X			
20.08.18	P12/L1/25	H13	X	X		
20.08.18	P9/L2/26	E13	X			
20.08.18	P10/L2/27	F12	X			
20.08.18	P11/L2/28	G13	X	X	X	
20.08.18	P12/L2/29	H14	X			
03.09.18	P13/L2/30	H15	X			

TerraConsult

Site: Fletcher Bank **Job No.:** 3125

Engineer: J GIBSON

Clay Liners - Test and Sample Locations

Date	Testing Detail	Test Location Grid Ref.	Core Sample	Bulk Sample	Permeability Sample	Comments
23/07/2019	BTL/L1/01C	F6	X			
23/07/2019	BTL/L1/01B	F6		X		
23/07/2019	BTL/L1/02C	F6	X			
23/07/2019	BTL/L1/03C	F6	X			
23/07/2019	BTL/L1/03B	F6		X		
23/07/2019	BTL/L1/04C	F6	X			
23/07/2019	BTL/L1/05P	F6			X	
23/07/2019	BTL/L1/06P	F6			X	
23/07/2019	BTL/L2/07C	F6	X			
23/07/2019	BTL/L2/08C	F6	X			
23/07/2019	BTL/L2/08B	F6		X		
23/07/2019	BTL/L2/09C	F6	X			
23/07/2019	BTL/L2/09B	F6		X		
23/07/2019	BTL/L2/10C	F6	X			
23/07/2019	BTL/L2/11P	F6			X	
23/07/2019	BTL/L2/12P	F6			X	
24/07/2019	P14/L2/13C	F4	X			
24/07/2019	P14/L2/14C	H6	X			
24/07/2019	P14/L2/14B	H6		X		
24/07/2019	P15/L2/15C	G8	X			
24/07/2019	P15/L2/16C	H9	X			
24/07/2019	P15/L2/16B	H9		X		
24/07/2019	P15/L2/17C	H10	X			
24/07/2019	P15/L2/17P	H10			X	
24/07/2019	P15/L2/18C	F9	X			
24/07/2019	P14/L2/19C	H4	X			
24/07/2019	P14/L2/19B	H4		X		
24/07/2019	P16/L1/20C	K4	X			
24/07/2019	P16/L1/21C	K6	X			
24/07/2019	P16/L1/22C	K8	X			
24/07/2019	P16/L1/22P	K8			X	
24/07/2019	P16/L1/23C	J9	X			
24/07/2019	P16/L1/23B	J9		X		
25/07/2019	P17/L1/24C	K12	X			
25/07/2019	P17/L1/25C	K14	X			
25/07/2019	P17/L1/25B	K14		X		
25/07/2019	P17/L1/26C	M12	X			
25/07/2019	P17/L1/27C	M10	X			
25/07/2019	P17/L1/27P	M10			X	
25/07/2019	P17/L1/28C	O9	X			
25/07/2019	P17/L1/28B	O9		X		
25/07/2019	P17/L2/29C	N9	X			
25/07/2019	P17/L2/30C	N11	X			
25/07/2019	P17/L2/30B	N11		X		
25/07/2019	P17/L2/31C	L11	X			
25/07/2019	P17/L2/32C	L13	X			
25/07/2019	P17/L2/32P	L13			X	

TerraConsult

Site: Fletcher Bank **Job No.:** 3125

Engineer: J GIBSON

Clay Liners - Test and Sample Locations

Date	Testing Detail	Test Location Grid Ref.	Core Sample	Bulk Sample	Permeability Sample	Comments
25/07/2019	P17/L2/33C	J13	X			
25/07/2019	P17/L2/33B	J13		X		
25/07/2019	P16/L2/34C	J4	X			
25/07/2019	P16/L2/35C	J6	X			
25/07/2019	P16/L2/36C	J8	X			
25/07/2019	P16/L2/36B	J8		X		
25/07/2019	P16/L2/37C	J10	X			
25/07/2019	P16/L2/37P	J10			X	

TerraConsult

Site: Fletcher Bank May/June 2020 **Job No.:** 3125

Engineer: J GIBSON

Clay Liners - Test and Sample Locations

Date	Testing Detail	Test Location Grid Ref.	Core Sample	Bulk Sample	Permeability Sample	Comments
28/05/2020	P18/L1/38C	C1	X			
28/05/2020	P18/L1/39C	D0	X			
28/05/2020	P18/L1/39B	D0		X		
28/05/2020	P18/L1/40C	B2	X			
28/05/2020	P18/L1/41C	E-1	X			
28/05/2020	P18/L1/42C	G0	X			
28/05/2020	P18/L1/42P	G0			X	
28/05/2020	P18/L1/43C	G-2	X			
28/05/2020	P18/L1/43B	G-2		X		
29/05/2020	P18/L1/44C	I1	X			
29/05/2020	P18/L1/45C	H-1	X			
29/05/2020	P18/L1/45B	H-1		X		
29/05/2020	P18/L1/46C	J-1	X			
29/05/2020	P18/L1/47C	K1	X			
29/05/2020	P18/L1/47P	K1			X	
29/05/2020	P18/L1/48C	L0	X			
29/05/2020	P18/L1/48B	L0		X		
29/05/2020	P18/L1/49C	I-2	X			
01/06/2020	P18/L2/50C	D2	X			
01/06/2020	P18/L2/50B	D2		X		
01/06/2020	P18/L2/51C	F0	X			
01/06/2020	P18/L2/52C	G-1	X			
01/06/2020	P18/L2/52P	G-1			X	
01/06/2020	P18/L2/53C	G1	X			
01/06/2020	P18/L2/53B	G1		X		
01/06/2020	P18/L2/54C	H0	X			
01/06/2020	P18/L2/55C	H-2	X			
01/06/2020	P18/L2/56C	I-1	X			
01/06/2020	P18/L2/56B	I-1		X		
02/06/2020	P18/L2/57C	J0	X			
02/06/2020	P18/L2/57P	J0			X	
02/06/2020	P18/L2/58C	K-1	X			
02/06/2020	P18/L2/58B	K-1		X		
02/06/2020	P18/L2/59C	L1	X			
02/06/2020	P18/L2/60C	M0	X			
02/06/2020	P18/L2/60B	M0		X		

APPENDIX D

Photographic Record

FLETCHER BANK CELL 1 – VALIDATION PHOTOGRAPHS