8th November 2016 Our Ref: ARM/MIL/PQCQA/1.01/2016

Peter Stanley MSc BSc(Hons) CGeol FGS PIEMA
Geotechnical Engineer;
Geoscience
Cyfoeth Naturiol Cymru / Natural Resources Wales
Tŷ Cambria,
29 Newport Road,
Cardiff
CF24 0TP

For the attention of Peter Stanley

Parrys Quarry Landfill Site, Mold
Compaction Trial Provisional Summary Findings and Recommendations

Further to the Compaction Trial held on the 27th October at the above captioned site I have set out below the findings and recommendations for lining works as follows:

Recommendations

Placement of 275mm layers using CAT D6T track type dozer.

Compaction of 275mm un-compacted layers with a minimum six passes with HAMM H13i pad foot roller or equivalent, (specification attached), to achieve 250mm compacted lift thickness. Note the pad foot roller to be operated at slow speed and traverse on return pass off set to reduce lamination effect on side wall.

Place second lift to same specification.

Director : Andy Morris
Office: 597 Walsall Road, Great Wyrley, Staffs WS6 6AE Tel: 01922 412209 Mobile: 07801 980984
whiterockenvironmental@btconnect.com
Registration No. 6879778

Placement of second lift

Place 200mm sacrificial layer which is then compacted at slow speed using HAMM H13I smooth drum roller to prevent and seal any potential laminations.

To leave sacrificial layer in place once completed. In the event of cessation of side wall lining works additional protection may be required such as a Terram or Visqueen sheet to help with further protection of the sub grade layer for the GCL.

Any variation to prescribed plant will require an additional compaction trial to ensure that the placement results remain acceptable.

No placement of clay with a temperature below 3°C, to prevent placement with ice within the clay matrix.

No placement of clay in wet conditions due to narrow upper moisture content limit of 19% and field moistures of 185 recorded during field trial and some stockpile checks at 19%.

Site CQA Project Manager Andrew Morris
Site CQA Engineer Stuart Le-luan
Site Field CQA Technician Daniel Kirk

Placement of sacrificial layer using HAMM H13i smooth drum roller

Findings

The conditioned clay moisture content had an acceptable moisture content range of 17-19%.

Shear vanes achieved 60-90kPa as a general figure with mid 70Kpa values achieved on Lift 1 and Lift 2.

Clay when compacted achieved less than 5% air voids, see attached graphs.

Clay performed plastically and hand puddle tests showed acceptability.

Particle density results showed an increase in SG values for the Etruria Marl and more typical of Upper Coal Measures including sandstone with a range from 2.72 to 2.78 with an average value of 2.76 used the for site Dry Density: Moisture Content plots. Therefore, as these are higher than previously found it is considered that Particle Density testing should be increased to one test per 250m^3 to coincide with linear density tests.

Hand shear vane tests are to be carried out every 100m^3 of placed compacted clay.

No significant increase in compaction was noted when increasing the number of passes with the roller from six to eight passes.

Director : Andy Morris
Office: 597 Walsall Road, Great Wyrley, Staffs WS6 6AE Tel: 01922 412209 Mobile: 07801 980984
whiterockenvironmental@btconnect.com
Registration No. 6879778

Clay puddle test

Other

The Client is aware that commencing works without Permit and awaiting additional testing reports is completely at risk.

Large sheer box tests have been arranged for testing at Geospec for the geocomposite drainage layer & ECL. It is not considered likely that the results will fail, however it has been pointed out to the Client that proceeding without results is at risk and may require potential re-design and may then require removal of placed material.

If you have any queries please do not hesitate to contact me on 07801 980984.

Yours sincerely

A.R.Morris.

A.R.Morris B.Sc, M.Sc, CGeol, FGS, CEnv, MICWM

Director : Andy Morris
Office: 597 Walsall Road, Great Wyrley, Staffs WS6 6AE Tel: 01922 412209 Mobile: 07801 980984
whiterockenvironmental@btconnect.com
Registration No. 6879778

Appendix 1:

Compaction Plant Specification

H 13i P

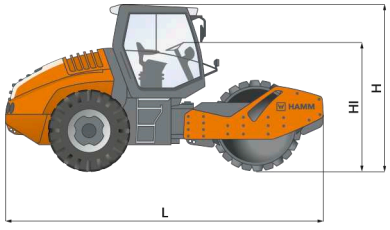
Compactor with padfoot drum

Compactors Series H / Series H234

HIGHLIGHTS H

- 3-point swivel joint for optimum driving comfort
- Optimum ease of maintenance, long service intervals
- Ergonomic driver seat for perfect all-round visibility
- Excellent hill climbing ability via self-locking differential
- Hydrostatic steering
- Clear information display

Machine dimensions		
Total length (L)	mm	5850
Width (B)	mm	2284
Total height (H)	mm	2960
Drum width (X)	mm	2140
Height loading, min. (Hl)	mm	2308



TIER 4

EU Stage IV / EPA Tier 4

TECHNICAL DATA	Unit	H 13i P
Weights		
Operating weight with cab	kg	13680
Operating weight with ROPS	kg	13420
Operating weight, max.	kg	15210
Axle load, front/rear	kg	7735/5945
Machine dimensions		
Total length	mm	5850
Total height with cab	mm	2960
Height loading, min.	mm	2308
Wheel base	mm	3150
Ground clearance, centre	mm	390
Total width with cab	mm	2284
Turning radius, inside	mm	3870
Angle of driving slope, front/rear	°	53/32
Drum dimensions		
Drum width, front	mm	2140
Drum diameter, front	mm	1684
Drum type, front		Padfoot
Drum thickness, front	mm	20
Height of the padfeet	mm	100
Padfeet, number		140
Wheel dimensions		
Size of tyres, rear		TR 23.1-26 12 PR
Diesel engine		
Manufacturer		DEUTZ
Version		TCD 4.1 L4
Number of cylinders		4
Power rat. ISO 14396, kW/PS/rpm		115,0/156,4/2300
Power rating SAE J1349, kW/HP/rpm		115,0/154,1/2300
Emissions standard EU/USA		EU Stage IV / EPA Tier 4
Exhaust gas after-treatment		DOC-DPF-SCR
Drive		
Speed, infinitely variable	km/h	0 - 14,0
Regulation, infinitely variable		Hammtronic
Climbing ability, vibration on/off	%	65/70
Vibration		
Vibration frequency, front, I/II	Hz	30/36
Amplitude, front, I/II	mm	1,76/0,81
Centrifugal force, front, I/II	kN	249/166
Steering		
Oscillation angle +/-	°	10
Steering, type		Articulated steering
Tank capacity/Fill capacity		
Fuel tank, capacity	L	280
AdBlue/DEF tank, content	L	32
Sound level		
Acoustic power LW(A), sticker		105
Acoustic power LW(A), measured		103

EQUIPMENT

2 large working and rear view mirrors, 2 multiply-adjustable armrests, 3-point articulation, Storage bin, lockable, Dashboard with displays, indicator lights and function key, Automatic traction control and anti-slip control, Operating concept Easy Drive, ECO mode, Spring-mounted, rotatable and horizontally adjustable driver's seat with armrest, Speed preselect, Cup holder, Hammtronic - electronic machine management, Hose protection on front vehicle, Vibration-isolated operator's platform, Space for cold box, Stepless hydrostatic all-wheel drive, Automatic vibration system, ROPS, rigid

OPTIONAL EQUIPMENT

Working lights, Back-up alarm (reversing), Frequency control, HCQ-GPS compaction documentation, preparation, HAMM Compaction Meter, Radio, Rotating beacon, Dozer blade, Protective roof, Padfoot shells, Auxiliary heater, Rear area camera, Telematics interface, Bonnet with electrical easy access engine cover release, ROPS cabin with heating, FOPS-approved (level I), ROPS cabin with heating and air conditioning, FOPS-approved (level I), Safety belt monitoring device, Automatic engine-off function, Armrest, Combination scraper for smooth drum and padfoot shells, Steering column with comfort exit and tiltable dashboard, Rotating seat adapter

HAMM AG
Hammstraße 1
D-95643 Tirschenreuth
Tel. +49 9631 80-0
Fax +49 9631 80-111
www.hamm.eu

HAMM

Compactors / Series H EU Stage IV / EPA Tier 4/ H 13i P 10.16 2459387 en-GB V1
Further data on request / subject to change
Illustrations may contain optional features.

H 13i

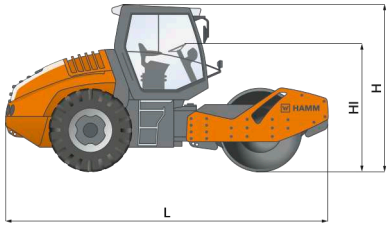
Compactor with smooth drum

Compactors Series H / Series H234

HIGHLIGHTS H

- 3-point swivel joint for optimum driving comfort
- Optimum ease of maintenance, long service intervals
- Ergonomic driver seat for perfect all-round visibility
- Excellent hill climbing ability via self-locking differential
- Hydrostatic steering
- Clear information display

Machine dimensions		
Total length (L)	mm	5850
Width (B)	mm	2284
Total height (H)	mm	2960
Drum width (X)	mm	2140
Height loading, min. (Hl)	mm	2308



TIER 4

EU Stage IV / EPA Tier 4

TECHNICAL DATA	Unit	H 13i
Weights		
Operating weight with cab	kg	12860
Operating weight with ROPS	kg	12600
Operating weight, max.	kg	15870
Axle load, front/rear	kg	7115/5745
Static linear load, front	kg/cm	33,2
Machine dimensions		
Total length	mm	5850
Total height with cab	mm	2960
Height loading, min.	mm	2308
Wheel base	mm	3150
Ground clearance, centre	mm	390
Total width with cab	mm	2284
Turning radius, inside	mm	3870
Angle of driving slope, front/rear	°	53/32
Drum dimensions		
Drum width, front	mm	2140
Drum diameter, front	mm	1504
Drum type, front		smooth/non-divided
Drum thickness, front	mm	30
Wheel dimensions		
Size of tyres, rear		AW 23.1-26 12 PR
Diesel engine		
Manufacturer		DEUTZ
Version		TCD 4.1 L4
Number of cylinders		4
Power rat. ISO 14396, kW/PS/rpm		115,0/156,4/2300
Power rating SAE J1349, kW/HP/rpm		115,0/154,1/2300
Emissions standard EU/USA		EU Stage IV / EPA Tier 4
Exhaust gas after-treatment		DOC-DPF-SCR
Drive		
Speed, infinitely variable	km/h	0 - 14,0
Regulation, infinitely variable		Hammtronic
Climbing ability, vibration on/off	%	57/62
Vibration		
Vibration frequency, front, I/II	Hz	30/36
Amplitude, front, I/II	mm	1,93/0,89
Centrifugal force, front, I/II	kN	249/166
Steering		
Oscillation angle +/-	°	10
Steering, type		Articulated steering
Tank capacity/Fill capacity		
Fuel tank, capacity	L	280
AdBlue/DEF tank, content	L	32
Sound level		
Acoustic power LW(A), sticker		105
Acoustic power LW(A), measured		103

EQUIPMENT

2 large working and rear view mirrors, 2 multiply-adjustable armrests, 3-point articulation, Storage bin, lockable, Dashboard with displays, indicator lights and function key, Automatic traction control and anti-slip control, Operating concept Easy Drive, ECO mode, Spring-mounted, rotatable and horizontally adjustable driver's seat with armrest, Speed preselect, Cup holder, Hammtronic - electronic machine management, Hose protection on front vehicle, Vibration-isolated operator's platform, Space for cold box, Stepless hydrostatic all-wheel drive, Automatic vibration system, ROPS, rigid

OPTIONAL EQUIPMENT

Working lights, Back-up alarm (reversing), Frequency control, HCQ-GPS compaction documentation, preparation, HAMM Compaction Meter, Radio, Rotating beacon, Dozer blade, Protective roof, Padfoot shells, Auxiliary heater, Rear area camera, Telematics interface, Bonnet with electrical easy access engine cover release, ROPS cabin with heating, FOPS-approved (level I), ROPS cabin with heating and air conditioning, FOPS-approved (level I), Safety belt monitoring device, Automatic engine-off function, Armrest, Vibration plate, complete, Combination scraper for smooth drum and padfoot shells, Steering column with comfort exit and tiltable dashboard, Rotating seat adapter

HAMM AG
Hammstraße 1
D-95643 Tirschenreuth
Tel. +49 9631 80-0
Fax +49 9631 80-111
www.hamm.eu

HAMM

Compactors / Series H EU Stage IV / EPA Tier 4/ H 13i 10.16 2459385 en-GB V1

Appendix 2:

Linear Density Test Results

TERRA TEK
SITE INVESTIGATION & LABORATORY SERVICES

White Rock GeoEnvironmental Ltd.
597 Walsall Road,
Great Wyrley
Staffs.
WS6 6AE

For the attention of Mr. S. LeLuan

Report No: C5871
Issue No 01

LABORATORY TEST REPORT

Project Name	**PARRYS QUARRY, SOURCE 1 - CELL 1**		
Project Number	**C5871**	Date samples received	31/10/2016
Your Ref		Date written instructions received	31/10/2016
Purchase Order	PO_014_01_Cell 1_Terratek	Date testing commenced	31/10/2016

Please find enclosed the results as summarised below

Figure / Table	Test Quantity	Description	ISO 17025 Accredited
2.41	8	Linear Density	Yes

Remarks :

Issued by : Julie Hopkins Date of Issue : 01/11/2016

Approved Signatories : 01/11/2016

G Wilson (JMD/Laboratories Director), M D Brown (Quality Manager), L Anaz (Supervisor), Julie Hopkins (Administrator), A Davison (Supervisor)

Key to symbols used in this report
S/C : Testing was sub-contracted

Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
The results reported relate to samples received in the laboratory only.
All results contained in this report are provisional unless signed by an approved signatory
This report should not be reproduced except in full without the written approval of the laboratory.
Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory.
The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw
our report if we have not received cleared funds in accordance with our standard terms and conditions
Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation.
Feedback on the this report may be left via our website www.terratek.co.uk/contact-us

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 0126
25 YEARS 1990-2015

Unit 2 Springfield Road, Chesham, Bucks, HP51PW
Tel: +44 (0)1494 810 136 Fax: +44 (0)1494 784 837
chesham@terratek.co.uk
www.terratek.co.uk
Terra Tek Ltd is registered in Scotland No. 121594
Offices in Airdrie, Birmingham, Belfast and Chesham
Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

01/11/2016 11:44
www.terra-tek.co.uk
Unit 2 Springfield Road Industrial Estate, Chesham. HP5 1PW

TERRA TEK
Site Investigation & Laboratory Services

Site: PARRYS QUARRY, SOURCE 1 - CELL 1

Client: White Rock GeoEnvironmental Ltd.

Engineer: -

Contract No: C5871

Sample Date	Sample Ref.	Sample Type	Description	NMC %	Bulk Density Mg/m³	Dry Density Mg/m³
	SWTL1/L1/01 C		Dark reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse with rare cobbles.	16	2.14	1.84
	SWTL1/L1/02 C		Dark reddish brown mottled olive grey slightly sandy gravelly CLAY. Gravel is fine to coarse.	17	2.11	1.80
	SWTL1/L1/03 C		Dark reeddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse.	17	2.13	1.82
	SWTL1/L1/04 C		Dark reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse.	17	2.12	1.82
	SWTL1/L2/05 C		Dark reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse.	17	2.15	1.84
	SWTL/L2/06 C		Dark reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse.	18	2.12	1.80
	SWTL1/L2/07 C		Dark reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse.	17	2.14	1.83

Originator	Checked & Approved	**DENSITY** BS1377:Part 2:1990:Clause 7.2 - Linear density method	
JH	01/11/2016		Sheet 1 of 1

Appendix 3:

Particle Density Test Results

TERRA TEK
SITE INVESTIGATION & LABORATORY SERVICES

White Rock GeoEnvironmental Ltd.
597 Walsall Road,
Great Wyrley
Staffs.
WS6 6AE

For the attention of Mr. S. LeLuan

Report No: C5871
Issue No 02

LABORATORY TEST REPORT

Project Name	**PARRYS QUARRY, SOURCE 1 - CELL 1**		
Project Number	**C5871**	Date samples received	31/10/2016
Your Ref		Date written instructions received	31/10/2016
Purchase Order	PO_014_01_Cell 1_Terratek	Date testing commenced	01/11/2016

Please find enclosed the results as summarised below

Figure / Table	Test Quantity	Description	ISO 17025 Accredited
2.52	5	Particle Density	Yes

Remarks :

Issued by : Julie Hopkins Date of Issue : 07/11/2016

Approved Signatories : 07/11/2016

G Wilson (JMD/Laboratories Director), M D Brown (Quality Manager), L Anaz (Supervisor), Julie Hopkins (Administrator), A Davison (Supervisor)

Key to symbols used in this report
S/C : Testing was sub-contracted

Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
The results reported relate to samples received in the laboratory only.
All results contained in this report are provisional unless signed by an approved signatory
This report should not be reproduced except in full without the written approval of the laboratory.
Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory.
The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw
our report if we have not received cleared funds in accordance with our standard terms and conditions
Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation.
Feedback on the this report may be left via our website www.terratek.co.uk/contact-us

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 0126
25 YEARS 1990-2015

Unit 2 Springfield Road, Chesham, Bucks, HP51PW
Tel: +44 (0)1494 810 136 Fax: +44 (0)1494 784 837
chesham@terratek.co.uk
www.terratek.co.uk
Terra Tek Ltd is registered in Scotland No. 121594
Offices in Airdrie, Birmingham, Belfast and Chesham
Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

www.terra-tek.co.uk
Version 027 - 27/0:

TERRA TEK
Site Investigation & Laboratory Services

Site	PARRYS QUARRY, SOURCE 1 - CELL 1
Client	White Rock GeoEnvironmental Ltd.
Engineer	-

Contract No **C5871**

Sample Date	Sample Ref	Sample Ref.	Description	Particle Density Mg/m^3
27/10/2016	SWTL1/L1/01 B	B	Dark reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse.	2.72
27/10/2016	SWTL1/L1/02 B	B	Dark reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse.	2.77
27/10/2016	SWTL1/L1/03 B	B	Dark reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse.	2.77
27/10/2016	SWTL1/L2/06 B	B	Dark reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse.	2.78
27/10/2016	SWTL1/L2/07 B	B	Dark reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse.	2.76

Originator	Checked & Approved
JH	07/11/2016

PARTICLE DENSITY
BS 1377 : Part 2 : Clause 8.3 : 1990
Determination of Particle Density (Small Pyknometer Method)

Unit 2 Springfield Road Industrial Estate, Chesham HP5 1PW
Lab Project No C5871 : 07/11/2016 08:46:21

Appendix 4:

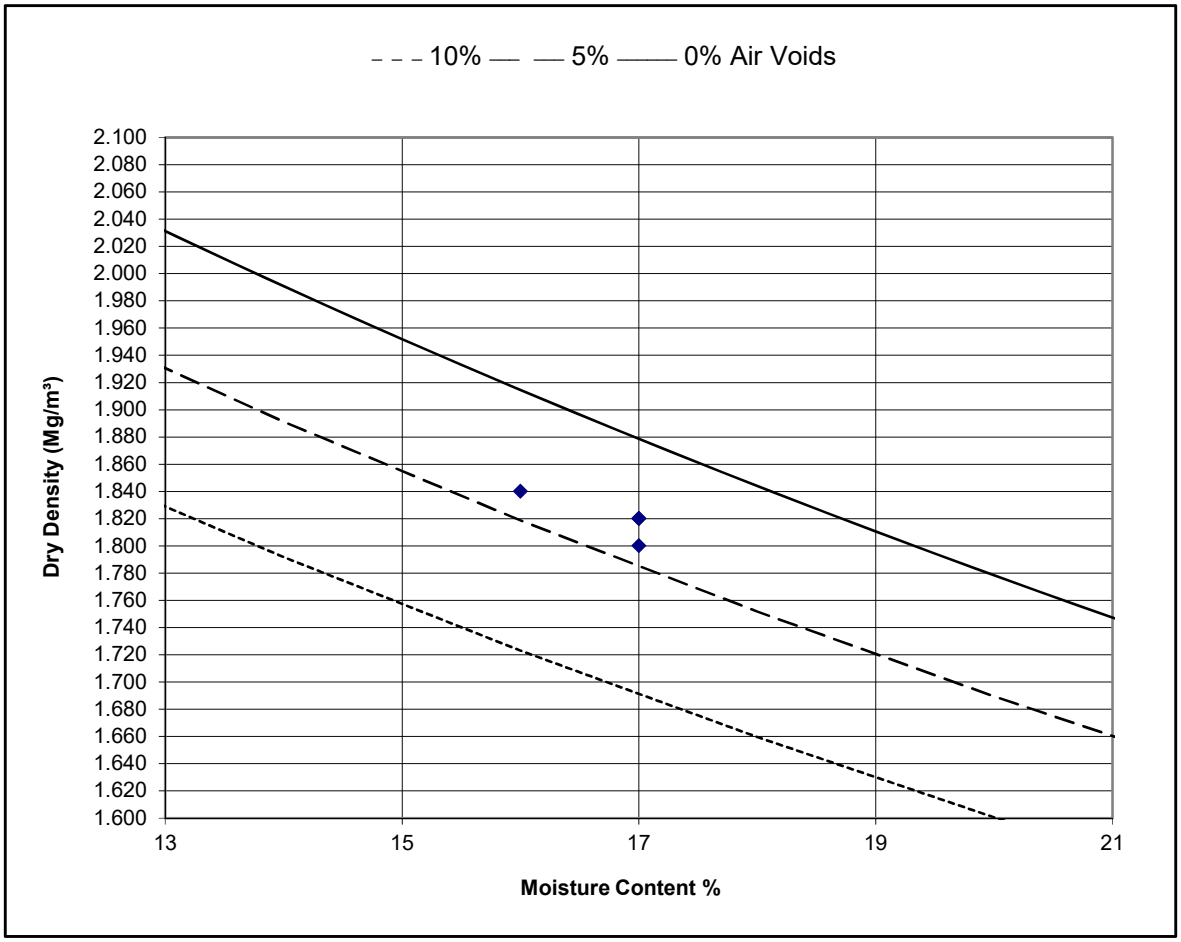
Density Moisture Content Plots

Client:- **Mold Investments Ltd**
Site:Parrys Quarry Compaction Trial Lift 1

WHITE ROCK GEO-ENVIRONMENTAL LIMITED

Graph 1 2.76 Average SG

Compaction Trial



MC	Density
16	1.840
17	1.800
17	1.820
17	1.820
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000

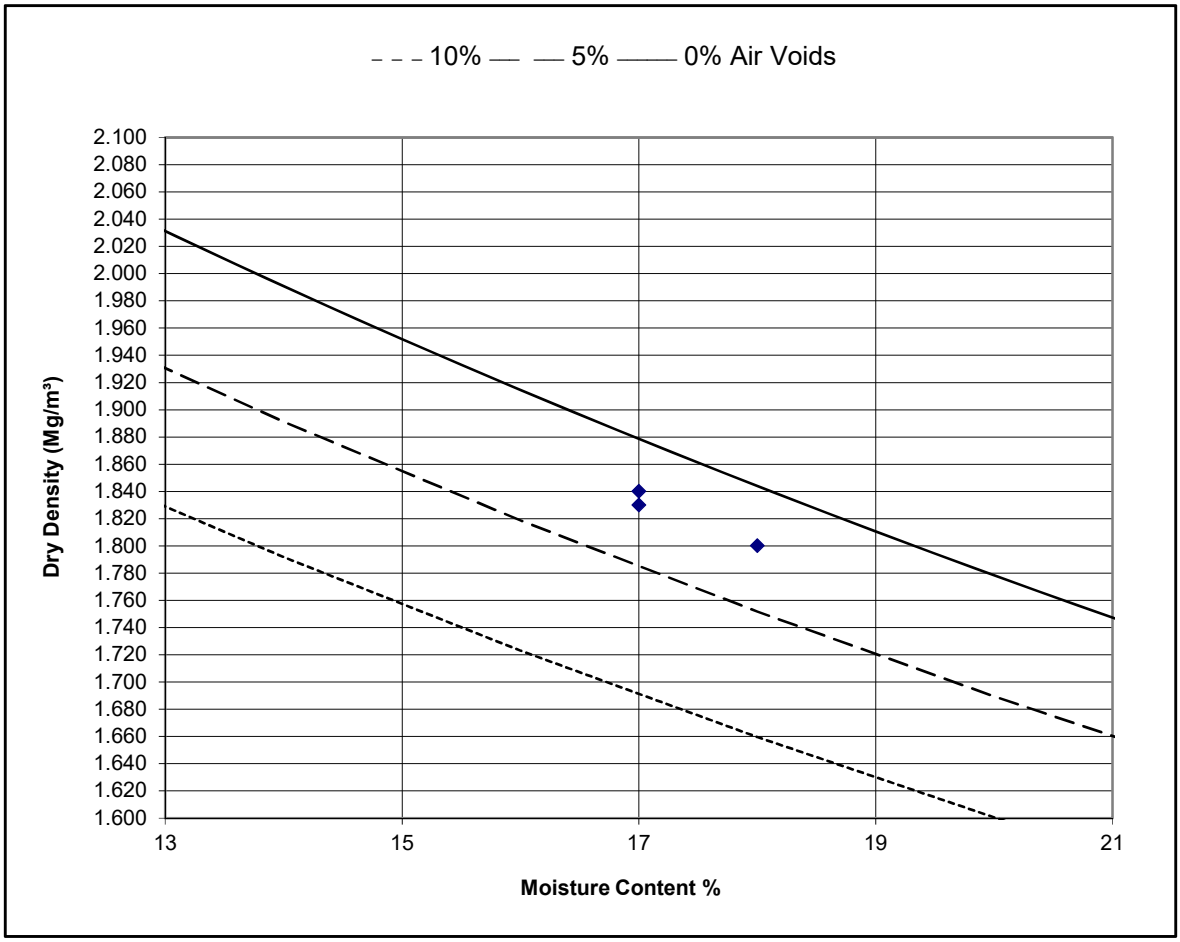
Particle density	2.760

Client:- **Mold Investments Ltd**
Site:Parrys Quarry Compaction Trial Lift 2

WHITE ROCK GEO-ENVIRONMENTAL LIMITED

Graph 2 2.76 Average SG

Compaction Trial



MC	Density
17	1.840
18	1.800
17	1.830
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000

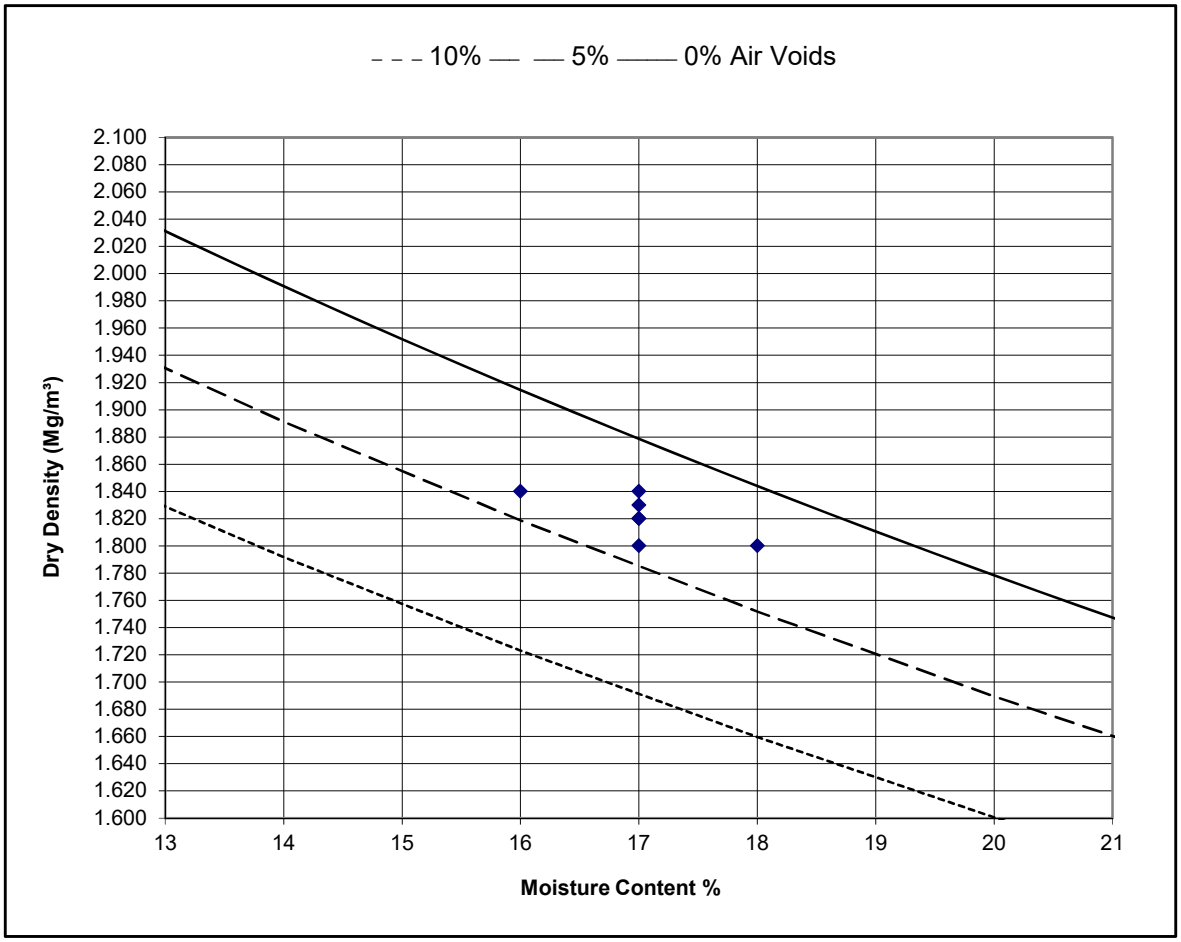
Particle density	2.760

Client:- **Mold Investments Ltd**
Site:Parrys Quarry Compaction Trial Composite Plot

WHITE ROCK GEO-ENVIRONMENTAL LIMITED

Graph 3 2.76 Average SG

Compaction Trial



MC	Density
16	1.840
17	1.800
17	1.820
17	1.820
17	1.840
18	1.800
17	1.830
0	0.000
0	0.000
0	0.000
0	0.000

Particle density	2.760