HOLE No: BD-BHL202B
Sheet 3 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL202B
Sheet 3 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Solid tube	23.00	100													
Wash Bore	23.55														
SPT	24.00	64			N=14										
Wash Bore	24.55														
SPT	25.00	62			N=14										
Wash Bore	25.55														
SPT	26.00	78			N=13										
Wash Bore	26.55														
SPT	27.00	76			N=16										
Wash Bore	27.55														
SPT	28.00	76			N=17										
Wash Bore	28.55														
SPT	29.00	56			N=12										
Wash Bore	29.55														
SPT	30.00	53			N=17										
Wash Bore	31.05														
SPT	31.50	56			N=16										
NWD4	32.55	32													

0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

23.50

Wet orangeish light brown medium dense fine to medium grained SAND with abundant shell fragments present. (Harbour Beds).

HOLE No: BD-BHL202B
Sheet 4 of 4

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HOLE No: BD-BHL202B
Sheet 4 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT	33.00	64			N=24										
Wash Bore	33.55														
SPT	34.00	53			N=22										
NWD4	35.00	28	10												

DEPTH Scale 1:50

33
34
35

34.50
35.00

Orangeish whitish brown highly weathered soft to medium hard rock SILTSTONE with abundant shell fragments present. (Cretaceous).

NOTES

1) End of borehole at 35.0m below ground level.

2) Final depth of HW casing at 33.50m.

3) Borehole backfilled with cement bentonite grout to ground level.

CONTRACTOR : Geopractica
MACHINE : GXY-2B
DRILLED BY : Joseph
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 04/11/2008
DATE : 11/12/2008

DATE : 11/02/09 15:15
TEXT : ..\BHOLES\BDC798~1.TXT

ELEVATION : 3.610 (m) CD
X-COORD : 3306783.217
Y-COORD : -1516.402

HOLE No: BD-BHL202B

dot.PLOT 5003 J&W

BD-BHL202B 0.00 to 23.00m BOX 1 of 3

BD-BHL202B 23 to 33.55m BOX 2 of 3

BD-BHL202B 33.55 to 35.0m BOX 3 of 3

HOLE No: BD-BHL203
Sheet 1 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203
Sheet 1 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.50	100	-	-	N=32*	-	-	-	-	-	-	-	-		
Wash Bore	1.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	100	-	-	N=33*	-	-	-	-	-	-	-	-		
Wash Bore	3.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50	100	-	-	N=46*	-	-	-	-	-	-	-	-		
Wash Bore	4.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	89	-	-	N=56*	-	-	-	-	-	-	-	-		
Wash Bore	6.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50	71	-	-	N=65*	-	-	-	-	-	-	-	-		
Wash Bore	7.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00	60	-	-	N=68*	-	-	-	-	-	-	-	-		
Wash Bore	9.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	10.50	62	-	-	N=72*	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

0.00 Moist pinkish light brown apparently dense fine to coarse grained gravelly SAND with abundant shell fragments. (Hydraulic Fill).

1.50 Moist light orangish greyish brown dense fine to medium grained SAND with abundant shell fragments. (Hydraulic Fill).

5.50 As above but very dense.

HOLE No: BD-BHL203
Sheet 2 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203
Sheet 2 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		-	-	-	N=52*	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT					N=Ref 15,19*	-	-	-	-	-	-	-	-		
	13.90														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		-	-	-	N=Ref 23*	-	-	-	-	-	-	-	-		
	15.30														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	16.35														
NWD4		69	69	-	-	-	-	-	-	-	-	-	-		
	17.00														
NWD4		54	54	-	-	-	-	-	-	-	-	-	-		
	18.60														
NWD4		68	68	-	-	-	-	-	-	-	-	-	-		
	19.00														
NWD4		67	67	-	-	-	-	-	-	-	-	-	-		
	19.60														
NWD4		50	50	-	-	-	-	-	-	-	-	-	-		
	20.10														
NWD4		29	29	-	-	-	-	-	-	-	-	-	-		
	21.00														
NWD4		23	23	-	-	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

16.35

Boulders of bluish grey to brown slightly to medium weathered medium hard to very hard rock Tillite. (Quay Wall Rockfill).

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HOLE No: BD-BHL203
Sheet 3 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	22.25														
NWD4		8	8	-	-	-	-	-	-	-	-	-	-		
	23.75														
NWD4		6	6	-	-	-	-	-	-	-	-	-	-		
	25.25														
NWD4		8	8	-	-	-	-	-	-	-	-	-	-		
	26.75														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	27.30														
SPT		36	-	-	N=37*	-	-	-	-	-	-	-	-		
	27.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	28.30														
SPT		44	-	-	N=33*	-	-	-	-	-	-	-	-		
	28.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	29.30														
SPT		40	-	-	N=30*	-	-	-	-	-	-	-	-		
	29.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.30														
SPT		44	-	-	N=41*	-	-	-	-	-	-	-	-		
	30.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	31.30														
SPT		47	-	-	N=43*	-	-	-	-	-	-	-	-		
	31.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	32.30														
SPT		47	-	-	N=36*	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

26.75 — Moist blackish brown stiff sandy CLAY. (Harbour Beds).

28.00 — Wet light orangish dark brown becoming light reddish dark brown with depth dense slightly silty SAND. (Harbour Beds).

HOLE No: BD-BHL203
Sheet 4 of 5

JOB NUMBER: 07-395

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Sheet 4 of 5

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	32.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	33.30														
SPT		38	-	-	N=38*	-	-	-	-	-	-	-	-		
	33.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	34.30														
SPT		38	-	-	N=43*	-	-	-	-	-	-	-	-		
	34.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	35.30														
SPT		42	-	-	N=47*	-	-	-	-	-	-	-	-		
	35.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	37.25														
SPT		44	-	-	N=58*	-	-	-	-	-	-	-	-		
	37.70														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	38.75														
SPT		56	-	-	N=38*	-	-	-	-	-	-	-	-		
	39.20														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	40.25														
Wash Bore		44	-	-	N=44*	-	-	-	-	-	-	-	-		
	40.70														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	41.75														
SPT		67	-	-	N=43*	-	-	-	-	-	-	-	-		
	42.20														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	43.25														
SPT		89	-	-	N=41*	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

36.50

As above but light reddish dark brown and very dense.

38.50

As above but dense.

HOLE No: BD-BHL203
Sheet 5 of 5

JOB NUMBER: 07-395

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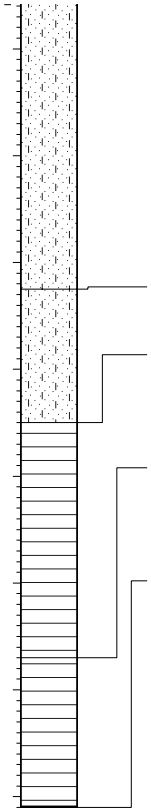
HOLE No: BD-BHL203
Sheet 5 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	43.70														
NWD4		86	-	-	-	-	-	-	-	-	-	-	-	-	
	44.75														
SPT		89	-	-	N=43*	-	-	-	-	-	-	-	-	-	
	45.20														
NWD4		79	-	-	-	-	-	-	-	-	-	-	-	-	
	46.25														
SPT		67	-	-	Ref 13,15*	-	-	-	-	-	-	-	-	-	
	46.55														
NWD4		67	10	-	-	1 2	85 0-10	C C	PLA PLA	SRJ SRJ	slt slt	<1 <1	1		
	47.60														
NWD4		45	45	-	-	1 2	0-10 45	C-M C-M	PLA PLA	SRJ SRJ	slt slt	<1 <1	7		
	48.60														
NWD4		88	88	62	-	1	0-10	C-M	PLA	SRJ	slt	<1	6		
	49.60														
NWD4		100	100	67	-	1	0-10	C-M	PLA	SRJ	slt	<1	9		
	51.10														

DEPTH Scale 1:50

44 45 46 47 48 49 50 51



46.25 — As above but greyish brown and very dense. (Residual Cretaceous).

47.50 — Brown highly weathered thinly to medium bedded closely to medium jointed very soft to soft rock SILTSTONE. (Cretaceous).

49.70 — Olive greenish grey medium weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE. (Cretaceous).

51.10

NOTES

1) End of borehole at 51.10m below ground level.

2) Final depth of HW casing at 27.3m and NW casing to 46.0m.

3) Borehole backfilled with cement bentonite grout to ground level.

4) Defective SPT's shown as N=60* are considered unrepresentative of the insitu material.

5) Therefore BD-BHL203 is to be redrilled as BD BHL203B (BD BHL230A was positioned and relocated as BD BHL203B before drilling could start).

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel M/ Lawrence
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 25/09/2008
DATE : 17/10/2008

DATE : 13/02/09 15:11
TEXT : ..\BHOLES\BD548A~1.TXT

ELEVATION : 3.690 (m) CD
X-COORD : 3306762.856
Y-COORD : -1601.059

HOLE No: BD-BHL203

dot.PLOT 5003 J&W

BD-BHL203 0.0 to 7.95m BOX 1 of 5

BD-BHL203 7.95 to 15.30m BOX 2 of 5

BD-BHL203 15.3 to 32.75m BOX 3 of 5

BD-BHL203 32.75 to 45.20m BOX 4 of 5

BD-BHL203 45.20 to 51.10m BOX 5 of 5

HOLE No: BD-BHL203B
Sheet 1 of 5

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL203B
Sheet 1 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.50	73	-	-	N=13	-	-	-	-	-	-	-	-		
Wash Bore	1.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	82	-	-	N=14	-	-	-	-	-	-	-	-		
Wash Bore	3.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50	73	-	-	N=12	-	-	-	-	-	-	-	-		
Wash Bore	4.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	66	-	-	N=15	-	-	-	-	-	-	-	-		
Wash Bore	6.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50	75	-	-	N=13	-	-	-	-	-	-	-	-		
Wash Bore	7.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00	82	-	-	N=9	-	-	-	-	-	-	-	-		
Wash Bore	9.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	10.50	77	-	-	N=12	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

Wet light greyish brown loose to medium dense slightly silty medium grained SAND. (Hydraulic Fill).

HOLE No: BD-BHL203B
Sheet 2 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
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VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
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IRR-irregular

ROCK HARDNESS
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GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS

Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL203B
Sheet 2 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		62	-	-	N=9	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		68	-	-	N=12	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		75	-	-	N=7	-	-	-	-	-	-	-	-		
	15.45														
Wash Bore		6	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
NWD4		17	17	-	-	-	-	-	-	-	-	-	-		
	18.00														
NWD4		45	45	-	-	-	-	-	-	-	-	-	-		
	19.50														
NWD4		72	72	-	-	-	-	-	-	-	-	-	-		
	20.00														
NWD4		76	76	-	-	-	-	-	-	-	-	-	-		
	21.00														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

0.00

16.50

Boulders oof bluish grey slighlty weathered hard rock Tillite. (Quay Wall Rockfill).

HOLE No: BD-BHL203B
Sheet 3 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203B
Sheet 3 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		13	13	-											
	22.50														
NWD4		8	8	-	-	-	-	-	-	-	-	-	-		
	24.00														
SPT		73	-	-	N=14	-	-	-	-	-	-	-	-		
	24.45														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	25.00														
SPT		0	-	-	N=13	-	-	-	-	-	-	-	-		
	25.45														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	26.00														
NWD4		83	-	-	-	-	-	-	-	-	-	-	-		
	26.55														
SPT		44	-	-	N=16	-	-	-	-	-	-	-	-		
	27.00														
Solid Tube		33	-	-	-	-	-	-	-	-	-	-	-		
	28.50														
SPT		73	-	-	N=11	-	-	-	-	-	-	-	-		
	28.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	29.50														
SPT		73	-	-	N=10	-	-	-	-	-	-	-	-		
	29.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.50														
SPT		62	-	-	N=6	-	-	-	-	-	-	-	-		
	30.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	31.50														
SPT		57	-	-	N=12	-	-	-	-	-	-	-	-		
	31.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	32.50														

Fracture Frequency: 0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

24.00 — Wet very dark grey brown firm to stiff slightly silty CLAY. (Harbour Beds).

28.50 — Wet dark brown firm slightly clayey slightly sandy SILT. (Harbour Beds).

30.25 — Wet dark grey brown speckled white loose to medium dense silty medium grained SAND. (Harbour Beds).

HOLE No: BD-BHL203B
Sheet 4 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203B
Sheet 4 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50
														0 1 2 3 4 5		
SPT	32.95	44	-	-	N=8	-	-	-	-	-	-	-	-			33
Wash Bore	33.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	33.95	33	-	-	N=9	-	-	-	-	-	-	-	-			34
Wash Bore	34.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	34.95	37	-	-	N=11	-	-	-	-	-	-	-	-			35
Wash Bore	35.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	35.95	62	-	-	N=10	-	-	-	-	-	-	-	-			36
Wash Bore	36.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	36.95	48	-	-	N=10	-	-	-	-	-	-	-	-			37
Wash Bore	37.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	37.95	46	-	-	N=13	-	-	-	-	-	-	-	-			38
Wash Bore	38.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	38.95	44	-	-	N=10	-	-	-	-	-	-	-	-			39
Wash Bore	39.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	39.95	42	-	-	N=13	-	-	-	-	-	-	-	-			40
Wash Bore	40.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	40.95	42	-	-	N=17	-	-	-	-	-	-	-	-			41
Wash Bore	41.50	-	-	-	-	-	-	-	-	-	-	-	-			
SPT	41.95	42	-	-	N=10	-	-	-	-	-	-	-	-			42
Wash Bore	43.00	-	-	-	-	-	-	-	-	-	-	-	-			43

43.00

HOLE No: BD-BHL203B
Sheet 5 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203B
Sheet 5 of 5

JOB NUMBER: 07-395

NOTES

1) End of borehole at 43.0m below ground level.

2) Final depth of NW casing at 41.50m.

3) Borehole backfilled with cement bentonite grout to ground level.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE : XY1B
DRILLED BY : Petrus
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 25/11/2008
DATE : 29/11/2008

DATE : 04/03/09 14:04
TEXT : ..\BHOLES\BDCB98~1.TXT

ELEVATION : 3.725 (m) CD
X-COORD : 3306762.234
Y-COORD : -1604.917

HOLE No: BD-BHL203B

dot.PLOT 5003 J&W

BD-BHL203B 0.0 to 16.50m BOX 1 of 3

BD-BHL203B 16.50 to 32.50m BOX 2 of 3

BD-BHL203B 32.50 to 43.00m BOX 3 of 3

HOLE No: BD-BHL203.5
Sheet 1 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203.5
Sheet 1 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.50 / 1.95	44	-	-	N=8	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00 / 3.45	40	-	-	N=11	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50 / 4.95	30	-	-	N=14	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00 / 6.45	44	-	-	N=16	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50 / 7.95	49	-	-	N=19	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00 / 9.45	42	-	-	N=19	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	10.50	38	-	-	N=20	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

0.00 Moist light reddish greyish brown apparently loose fine to coarse grained SAND with abundant shell fragments. (Hydraulic Fill).

2.00 Moist light greyish brown loose becoming medium dense with depth fine to medium grained SAND with tiny shell fragments. (Hydraulic Fill).

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HOLE No: BD-BHL203.5
Sheet 2 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95													0 1 2 3 4 5	
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		44	-	-	N=22	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		44	-	-	N=23	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		40	-	-	N=26	-	-	-	-	-	-	-	-		
	15.45														
TNW		22	22	-	-	-	-	-	-	-	-	-	-		
	16.50														
TNW		11	11	-	-	-	-	-	-	-	-	-	-		
	18.00														
TNW		15	15	-	-	-	-	-	-	-	-	-	-		
	18.80														
TNW		16	16	-	-	-	-	-	-	-	-	-	-		
	19.50														
TNW		20	20	-	-	-	-	-	-	-	-	-	-		
	20.00														
TNW		20	20	-	-	-	-	-	-	-	-	-	-		
	21.00														
TNW		38	38	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

15.45

Boulders of bluish grey medium weathered hard rock Tillite. (Quay Wall Rockfill).

HOLE No: BD-BHL203.5
Sheet 3 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHL203.5
Sheet 3 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	22.00														
TNW		35	35	-	-	-	-	-	-	-	-	-	-		
	23.00														
TNW		23	23	-	-	-	-	-	-	-	-	-	-		
	24.00														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	24.55														
SPT		100	-	-	N=15	-	-	-	-	-	-	-	-		
	25.00														
NWD4		95	-	-	-	-	-	-	-	-	-	-	-		
	25.55														
SPT		91	-	-	N=26	-	-	-	-	-	-	-	-		
	26.00														
Shelby		0	-	-	-	-	-	-	-	-	-	-	-		
	26.60														
SPT		89	-	-	N=33	-	-	-	-	-	-	-	-		
	27.05														
NWD4		128	-	-	-	-	-	-	-	-	-	-	-		
	27.55														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	28.10														
SPT		100	-	-	N=25	-	-	-	-	-	-	-	-		
	28.55														
NWD4		73	-	-	-	-	-	-	-	-	-	-	-		
	29.10														
SPT		100	-	-	N=14	-	-	-	-	-	-	-	-		
	29.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.10														
SPT		44	-	-	N=20	-	-	-	-	-	-	-	-		
	30.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	31.10														
SPT		49	-	-	N=14	-	-	-	-	-	-	-	-		
	31.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	32.10														
SPT		36	-	-	N=20	-	-	-	-	-	-	-	-		
	32.55														

DEPTH Scale 1:50

24.00
Wet brownish dark grey firm to stiff silty CLAY. (Harbour Beds).

29.80
Wet light orangish brown medium dense silty fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

HOLE No: BD-BHL203.5
Sheet 4 of 5

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL203.5
Sheet 4 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore	33.10	-	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
SPT	33.55	33	-	-	N=23	-	-	-	-	-	-	-	-		
Wash Bore	34.10	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	34.55	40	-	-	N=27	-	-	-	-	-	-	-	-		
Wash Bore	35.60	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	36.05	49	-	-	N=29	-	-	-	-	-	-	-	-		
Wash Bore	37.10	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	37.55	33	-	-	N=Ref 12,17,25	-	-	-	-	-	-	-	-		
NWD4	39.05	61	61	21	-	1	0-10	C-M	PLA	SJ-SRJ	slt	<1	11		
NWD4	40.55	79	79	37	-	1	0-10	C-M	PLA	SJ-SRJ	slt	<1	7		
NWD4	42.05	95	95	63	-	1	0-10	C-M	PLA	SJ-SRJ	slt	<1	12		

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42

36.50 — As above but very dense.

37.55 — Light greyish brown highly to completely weathered thinly to medium bedded and closely to medium jointed very soft rock SILTSTONE. (Cretaceous).

40.55 — Olive greenish dark grey highly weathered thinly to medium bedded and closely to medium jointed soft rock SILTSTONE. (Cretaceous).

42.05

HOLE No: BD-BHL203.5
Sheet 5 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

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HOLE No: BD-BHL203.5
Sheet 5 of 5

JOB NUMBER: 07-395

NOTES

1) End of borehole at 42.05m below ground level.

2) Final depth of NW casing to 37.10m.

3) Borehole backfilled with cement bentonite grout to ground level.

4) BH-BHL203.5 located midway between BHL203 and BHL204.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel B
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 25/09/2008
DATE : 17/10/2008

DATE : 13/02/09 15:12
TEXT : ..\BHOLES\BDC88B~1.TXT

ELEVATION : 3.720 (m) CD
X-COORD : 3306748.284
Y-COORD : -1666.456

HOLE No: BD-BHL203.5

dot.PLOT 5003 J&W

BD-BHL203.5 0.0 to 12.00m BOX 1 of 4

BD-BHL203.5 12.00 to 26.60m BOX 2 of 4

BD-BHL203.5 26.60 to 34.55m BOX 3 of 4

BD-BHL203.5 34.55 to 42.05m BOX 4 of 4

HOLE No: BD-BHL204
Sheet 1 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL204
Sheet 1 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		80	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	1.50														
Wash Bore		97	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		100	-	-	N=42*	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		90	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		50	-	-	-	-	-	-	-	-	-	-	-		
	5.00														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	6.05														
SPT		100	-	-	N=43*	-	-	-	-	-	-	-	-		
	6.50														
Wash Bore		53	-	-	-	-	-	-	-	-	-	-	-		
	7.55														
SPT		47	-	-	N=51*	-	-	-	-	-	-	-	-		
	8.00														
Wash Bore		48	-	-	-	-	-	-	-	-	-	-	-		
	9.05														
SPT		78	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	9.50														
Wash Bore		48	-	-	-	-	-	-	-	-	-	-	-		
	10.55														
Shelby		86	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

Scale 1:50

0.00

Wet light brown speckled black orange and blotched grey dense coarse becoming fine to medium grained SAND with some tiny shell fragments. (Hydraulic Fill).

7.00

As above but very dense.

HOLE No: BD-BHL204
Sheet 2 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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GF -gneissose
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EHR-extremely hard rock
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL204
Sheet 2 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.90													0 1 2 3 4 5	
Wash Bore		39	-	-	-	-	-	-	-	-	-	-	-		
	11.95														
SPT		71	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	12.40														
Wash Bore		48	-	-	-	-	-	-	-	-	-	-	-		
	13.45														
SPT		89	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	13.90														
Wash Bore		44	-	-	-	-	-	-	-	-	-	-	-		
	14.95														
NWD4		35	35	-	-	-	-	-	-	-	-	-	-		
	16.45														
NWD4		40	40	-	-	-	-	-	-	-	-	-	-		
	17.45														
NWD4		41	41	-	-	-	-	-	-	-	-	-	-		
	18.95														
NWD4		76	76	-	-	-	-	-	-	-	-	-	-		
	20.00														
Wash Bore		32	-	-	-	-	-	-	-	-	-	-	-		
	21.05														
SPT		78	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	21.50														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

14.95

Boulders and gravel of bluish grey stained brown slightly to medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill).

20.00

Wet greyish brown speckled orange white and black very dense medium becoming fine grained SAND with tiny shell fragments. (Harbour Beds).

HOLE No: BD-BHL204
Sheet 3 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL204
Sheet 3 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	22.55														
SPT		63	-	-	N=Ref 25	-	-	-	-	-	-	-	-		
	22.90														
Wash Bore		43	-	-	-	-	-	-	-	-	-	-	-		
	23.95														
SPT		0	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	24.30														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	25.55														
Wash Bore		46	-	-	-	-	-	-	-	-	-	-	-		
	26.55														
SPT		87	-	-	N=Ref 19*	-	-	-	-	-	-	-	-		
	26.85														
Wash Bore		48	-	-	: -	-	-	-	-	-	-	-	-		
	27.90														
SPT		0	-	-	N=Ref 13,17*	-	-	-	-	-	-	-	-		
	28.25														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-		
	29.30														
SPT		86	-	-	N=Ref 18,21*	-	-	-	-	-	-	-	-		
	29.65														
Wash Bore		41	-	-	-	-	-	-	-	-	-	-	-		
	30.70														
SPT		85	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	31.15														
Wash Bore		43	-	-	-	-	-	-	-	-	-	-	-		
	32.20														
SPT		73	-	-	N=Ref 17,20*	-	-	-	-	-	-	-	-		
	32.50														

DEPTH Scale 1:50

22
23
24
25
26
27
28
29
30
31
32

22.50

Wet light orangish brown speckled white and black very dense fine to medium grained SAND containing tiny shell fragments. (Harbour Beds).

HOLE No: BD-BHL204
Sheet 4 of 5

JOB NUMBER: 07-395

ROCK FABRIC
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HOLE No: BD-BHL204
Sheet 4 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		44	-	-	-	-	-	-	-	-	-	-	-		
	33.55														
SPT		0	-	-	N=Ref*	-	-	-	-	-	-	-	-		
	33.70														
NWD4		49	-	-	-	-	-	-	-	-	-	-	-		
	35.10														
NWD4		52	-	-	-	-	-	-	-	-	-	-	-		
	36.15														
SPT		0	-	-	N=39*	-	-	-	-	-	-	-	-		
	36.60														
NWD4		50	-	-	-	-	-	-	-	-	-	-	-		
	37.60														
NWD4		83	83	-	UCS=1.050MPa	1	0-10	C-M	PLA	SJ-SRJ	slt	<1	2		
	39.10														
NWD4		73	73	-	UCS=1.144MPa	1	0-10	C-M	PLA	SJ-SRJ	slt	<1	3		
	40.60														
NWD4		100	100	-	-	1	0-5	C-M	PLA	SJ-SRJ	slt	<1	2		
	41.10														
NWD4		53	53	-	UCS=0.431MPa	1	0-5	C-M	PLA	SJ-SRJ	slt	<1	1		
	42.60														

DEPTH Scale 1:50

33.55 — Wet greyish brown apparently very stiff sandy CLAY. (Residual Cretaceous).

35.10 — Wet orangey brown dense fine grained silty SAND. Residual Siltstone. (Cretaceous).
Shelby refused at 35.10m.

37.60 — Brown completely to highly weathered thinly to medium bedded closely to medium jointed very soft rock SILTSTONE. (Cretaceous).

39.10 — As above but medium to slightly weathered medium bedded closely to medium jointed soft to medium hard rock fine grained SANDSTONE with fossils present. (Cretaceous).

40.60 — Brown completely to highly weathered thinly to medium bedded closely to medium jointed fine grained soft rock SILTSTONE. (Cretaceous).

42.60

HOLE No: BD-BHL204
Sheet 5 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
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GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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HOLE No: BD-BHL204
Sheet 5 of 5

JOB NUMBER: 07-395

NOTES

1) End of borehole at 42.60m below ground level.

2) Final depth of NW casing at 36.0m.

3) Borehole grouted with cement bentonite grout to 14m BGL and slotted standpipe surrounded with sand installed from 14m BGL to ground level.

4) Defective SPT's shown as N=60* are considered unrepresentative of the insitu material.

5) Therefore BD-BHL204 is to be redrilled at BD-BHL204A.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel M
PROFILED BY : SAP
TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 05/07/2008
DATE : 22/07/2008
DATE : 24/02/09 16:14
TEXT : ..\BHOLES\BD588A~1.TXT

ELEVATION : 3.652 (m) CD
X-COORD : 3306733.700
Y-COORD : -1730.169

HOLE No: BD-BHL204

dot.PLOT 5003 J&W

BD-BHL204 0.0 to 9.05m BOX 1 of 4

BD-BHL204 9.05 to 22.55m BOX 2 of 4

BD-BHL204 22.55 to 35.10m BOX 3 of 4

BD-BHL204 35.10 to 42.60m BOX 4 of 4

HOLE No: BD-BHL204A
Sheet 1 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
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GRAIN SIZE
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL204A
Sheet 1 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
SPT		73	-	-	N=11	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		78	-	-	N=12	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
SPT		51	-	-	N=14	-	-	-	-	-	-	-	-		
	4.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		67	-	-	N=14	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		58	-	-	N=14	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		44	-	-	N=8	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
SPT		60	-	-	N=10	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

Moist greyish brown medium dense and occasionally loose fine to medium grained SAND with tiny shell fragments. (Hydraulic Fill).

HOLE No: BD-BHL204A
Sheet 2 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
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HOLE No: BD-BHL204A
Sheet 2 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		73	-	-	N=13	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		56	-	-	N=16	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		58	-	-	N=9	-	-	-	-	-	-	-	-		
	15.45														
NWD4		25	25	-	-	-	-	-	-	-	-	-	-		
	16.50														
NWD4		56	56	-	-	-	-	-	-	-	-	-	-		
	18.00														
NWD4		27	27	-	-	-	-	-	-	-	-	-	-		
	19.50														
NWD4		8	6	-	-	-	-	-	-	-	-	-	-		
	21.00														

0 1 2 3 4 5

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

0.00

15.45

Boulders of bluish grey occasionally stained brown medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill).
Boulders are mixed with brown sand at depth 17.82-18.00m.
Blackish grey apparently firm to stiff CLAY at depths 19.50-21.00m and 21.00-22.50m.

HOLE No: BD-BHL204A
Sheet 3 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL204A
Sheet 3 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		12	8	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	22.50														
Solid Tube		0	-	-	-	-	-	-	-	-	-	-	-		
	24.00														
SPT		0	-	-	N=17	-	-	-	-	-	-	-	-		
	24.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	25.00														
SPT		69	-	-	N=11	-	-	-	-	-	-	-	-		
	25.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	26.00														
SPT		56	-	-	N=10	-	-	-	-	-	-	-	-		
	26.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	27.00														
SPT		100	-	-	N=19	-	-	-	-	-	-	-	-		
	27.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	28.00														
SPT		69	-	-	N=16	-	-	-	-	-	-	-	-		
	28.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	29.00														
SPT		64	-	-	N=15	-	-	-	-	-	-	-	-		
	29.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.00														
SPT		73	-	-	N=15	-	-	-	-	-	-	-	-		
	30.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	31.00														
SPT		51	-	-	N=11	-	-	-	-	-	-	-	-		
	31.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	32.00														
SPT		64	-	-	N=13	-	-	-	-	-	-	-	-		
	32.45														

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

22.50 — Solid tube. No recovery.

24.00 — No recovery. SPT.

24.45 — Wet brownish grey medium dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

27.80 — Wet orangish brown occasionally blotched dark grey medium dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

32.45

HOLE No: BD-BHL204A
Sheet 4 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
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MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
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PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

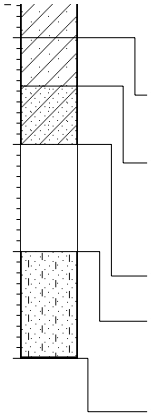
HOLE No: BD-BHL204A
Sheet 4 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4	33.00	100	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5		
SPT	33.45	42	-	-	N=39	-	-	-	-	-	-	-			
NWD4	34.00	100	-	-	-	-	-	-	-	-	-	-			
Shelby	34.55	0	-	-	-	-	-	-	-	-	-	-			
SPT	35.00	0	-	-	N=19	-	-	-	-	-	-	-			
NWD4	36.00	100	-	-	-	-	-	-	-	-	-	-			

DEPTH Scale 1:50

33
34
35
36



Wet light to dark grey apparently stiff to very stiff slightly sandy CLAY. (Harbour Beds).

Wet light grey stiff slightly sandy CLAY. (Harbour Beds).

Wet light to dark grey apparently stiff to very stiff slightly sandy CLAY with a very thin lense of brown apparently medium dense to dense SAND. (Harbour Beds).

Shelby and SPT. No recovery.

Wet reddish brown apparently very dense micaceous fine grained silty SAND. (Residual Cretaceous).

NOTES

1) End of borehole at 36.00m below ground level.

2) Final depth of NW casing at 35.50m.

3) Borehole backfilled with cement bentonite grout to ground level.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Petrus
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 31/10/2008
DATE : 12/11/2008

DATE : 13/02/09 15:12
TEXT : ..\BHOLES\BDCF9C~1.TXT

ELEVATION : 3.645 (m) CD
X-COORD : 3306734.719
Y-COORD : -1726.299

HOLE No: BD-BHL204A

dot.PLOT 5003 J&W

BD-BHL204A 0.0 to 18.00m BOX 1 of 3

BD-BHL204A 18.00 to 24.55m BOX 2 of 3

BD-BHL204A 34.55 to 36.00m BOX 3 of 3

HOLE No: BD-BHL205
Sheet 1 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
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JOINT ROUGHNESS
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SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL205
Sheet 1 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
SPT		44	-	-	N=15	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		56	-	-	N=13	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
SPT		56	-	-	N=13	-	-	-	-	-	-	-	-		
	4.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		56	-	-	N=14	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		67	-	-	N=12	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		62	-	-	N=11	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
SPT		67	-	-	N=13	-	-	-	-	-	-	-	-		

Weathering code: 0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

Moist brownish grey medium dense fine to medium grained SAND. (Hydraulic Fill).

HOLE No: BD-BHL205
Sheet 2 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL205
Sheet 2 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		78	-	-	N=12	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		44	-	-	N=12	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		89	-	-	N=11	-	-	-	-	-	-	-	-		
	15.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
NWD4		-	-	-	-	-	-	-	-	-	-	-	-		
	17.00														
NWD4		40	40	-	-	-	-	-	-	-	-	-	-		
	18.50														
NWD4		18	9	-	-	-	-	-	-	-	-	-	-		
	20.00														
NWD4		80	-	-	-	-	-	-	-	-	-	-	-		
	21.50														

0 1 2 3 4 5

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

0.00

16.50 — Boulders and gravel consisting of bluish grey slightly to medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill). With some dark brown apparently dense sandy CLAY.

20.00 — Wet brown apparently medium dense slightly clayey silty SAND. (Harbour Beds). (Logged from the wash sample).

21.50

HOLE No: BD-BHL205
Sheet 3 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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FF -foliated
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SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
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JOINT SPACING
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UND-undulating
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ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL205
Sheet 3 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Shelby	22.05	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Solid Tube	23.65	100	-	-	-	-	-	-	-	-	-	-	-		
SPT	24.10	60	-	-	N=25	-	-	-	-	-	-	-	-		
NWD4	25.15	62	-	-	-	-	-	-	-	-	-	-	-		
Shelby	25.70	100	-	-	-	-	-	-	-	-	-	-	-		
NWD4	27.20	60	-	-	-	-	-	-	-	-	-	-	-		
SPT	27.65	67	-	-	N=31	-	-	-	-	-	-	-	-		
NWD4	28.70	48	-	-	-	-	-	-	-	-	-	-	-		
SPT	29.15	44	-	-	N=31	-	-	-	-	-	-	-	-		
NWD4	30.20	95	-	-	-	-	-	-	-	-	-	-	-		
Shelby	30.40	100	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	31.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	31.90	31	-	-	N=28	-	-	-	-	-	-	-	-		
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

Wet brown becoming brownish grey stiff slightly sandy silty CLAY. (Harbour Beds).

30.40

Wet greyish brown medium dense slightly silty fine to medium grained SAND. (Harbour Beds).

32.50

HOLE No: BD-BHL205
Sheet 4 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
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ROCK HARDNESS
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL205
Sheet 4 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	32.95														
SPT		49	-	-	N=23	-	-	-	-	-	-	-	-	-	
	33.40														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-	-	
	34.45														
SPT		58	-	-	N=25	-	-	-	-	-	-	-	-	-	
	34.90														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-	-	
	35.95														
SPT		56	-	-	N=26	-	-	-	-	-	-	-	-	-	
	36.40														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-	-	
	37.45														
NWD4		100	81	59	-	1	0-10	C-M	PLA	SRJ	slt	<1	4		
	38.55														
NWD4		86	86	57	-	1	0-5	C-M	PLA	SRJ	slt	<1	4		
	39.25														
NWD4		93	93	59	-	1	0-10	C-M	PLA	SRJ	slt	<1	10		
	40.75														

DEPTH Scale 1:50

33 34 35 36 37 38 39 40

0 1 2 3 4 5

37.80

40.75

Wet orangish brown medium dense fine becoming coarse grained SAND. (Harbour Beds).

Olive greenish dark grey completely to highly weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE with fossils and shells present. (Cretaceous).

NOTES

1) End of borehole at 40.75m below ground level.

2) Final depth of HW casing at 37.50m.

3) Borehole backfilled with cement bentonite grout to ground level.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel B
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 08/08/2008
DATE : 02/09/2008

DATE : 04/03/09 14:04
TEXT : ..\BHOLES\BD5C8A~1.TXT

ELEVATION : 3.630 (m) CD
X-COORD : 3306706.010
Y-COORD : -1852.269

HOLE No: BD-BHL205

dot.PLOT 5003 J&W

BD-BHL205 0.0 to 12.00m BOX 1 of 4

BD-BHL205 12.00 to 25.70m BOX 2 of 4

BD-BHL205 25.70 to 36.40m BOX 3 of 4

BD-BHL205 36.40 to 40.75m BOX 4 of 4

HOLE No: BD-BHL206
Sheet 1 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
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JOINT ROUGHNESS
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SJ -smooth
RJ -rough

JOINT SHAPE
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UND-undulating
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ROCK HARDNESS
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VHR-very hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL206
Sheet 1 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.50	42	-	-	N=7	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	56	-	-	N=7	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50	64	-	-	N=10	-	-	-	-	-	-	-	-		
	4.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	62	-	-	N=12	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50	53	-	-	N=13	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00	62	-	-	N=17	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	10.50	44	-	-	N=16	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

0.00

Moist orangish brown loose fine to coarse grained SAND with shell fragments. (Hydraulic Fill).

4.00

Moist to wet light greyish brown medium dense fine to medium grained SAND with tiny shell fragments. (Hydraulic Fill).

HOLE No: BD-BHL206
Sheet 2 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
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IRR-irregular

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL206
Sheet 2 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		58	-	-	N=14	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		62	-	-	N=18	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		76	-	-	N=19	-	-	-	-	-	-	-	-		
	15.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
NWD4		42	42	-	-	-	-	-	-	-	-	-	-		
	17.50	54	54	-											
NWD4					-	-	-	-	-	-	-	-	-		
	18.00														
NWD4		25	25	-	-	-	-	-	-	-	-	-	-		
	19.50														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	20.05														
Solid Tube		100	-	-	-	-	-	-	-	-	-	-	-		
	21.55														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

16.50

Boulders of bluish grey medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill).

19.50

Wet dark brown stiff slightly silty CLAY. (Harbour Beds).

HOLE No: BD-BHL206
Sheet 3 of 4

JOB NUMBER: 07-395

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HOLE No: BD-BHL206
Sheet 3 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT	22.00	40	-	-	N=26	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	22.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	23.00	80	-	-	N=17	-	-	-	-	-	-	-	-		
Wash Bore	23.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	24.00	51	-	-	N=24	-	-	-	-	-	-	-	-		
Wash Bore	24.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	25.00	47	-	-	N=24	-	-	-	-	-	-	-	-		
Wash Bore	25.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	26.00	67	-	-	N=18	-	-	-	-	-	-	-	-		
Wash Bore	26.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	27.00	36	-	-	N=19	-	-	-	-	-	-	-	-		
Wash Bore	27.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	28.00	38	-	-	N=20	-	-	-	-	-	-	-	-		
Wash Bore	28.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	29.00	33	-	-	N=20	-	-	-	-	-	-	-	-		
Wash Bore	29.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	30.00	40	-	-	N=23	-	-	-	-	-	-	-	-		
Wash Bore	30.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	31.00	33	-	-	N=24	-	-	-	-	-	-	-	-		
Wash Bore	32.05	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	32.50	38	-	-	N=24	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22.25

Wet orangish light brown medium dense fine to medium grained SAND. (Harbour Beds).

HOLE No: BD-BHL206
Sheet 4 of 4

JOB NUMBER: 07-395

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HOLE No: BD-BHL206
Sheet 4 of 4

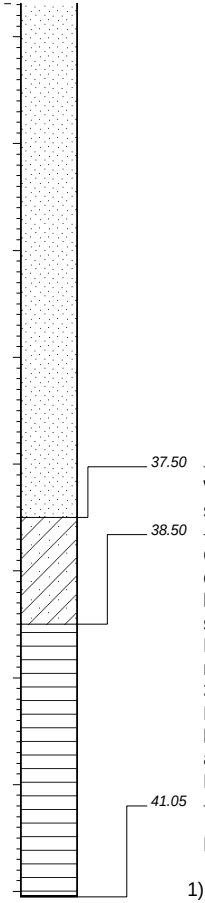
JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	33.55														
SPT		36	-	-	N=26	-	-	-	-	-	-	-	-		
	34.00														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	35.05														
SPT		27	-	-	N=26	-	-	-	-	-	-	-	-		
	35.50														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	36.55														
SPT		38	-	-	N=28	-	-	-	-	-	-	-	-		
	37.00														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	38.05														
SPT		76	-	-	N=35	-	-	-	-	-	-	-	-		
	38.50														
NWD4		100	100	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	9		
	39.55														
NWD4		70	70	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	4		
	40.05														
NWD4		73	73	50	-	1	0-5	C-M	PLA	SRJ	slt	<1	7		
	41.05														

0 1 2 3 4 5

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41



37.50 Wet blackish dark brown stiff slightly sandy CLAY. (Residual Cretaceous).

38.50 Olive greenish blackish dark brown completely weathered thinly to mediuim bedded closely to medium jointed very soft rock SILTSTONE. (Cretaceous).
Bands of light grey medium weathered medium hard rock SILTSTONE at depths 39.41-39.55m and 40.05-40.20m.
Bands of olive greenish dark brown highly weathered soft rock SILTSTONE at depth 40.20-41.05m.
Fossils and shells are common.

41.05

NOTES

1) End of borehole at 41.05m below ground level.

2) Final depth of NW casing at 38.0m.

3) Borehole backfilled with cement bentonite grout to ground level.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel B
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 10/09/2008
DATE : 20/10/2008

DATE : 11/02/09 15:18
TEXT : ..\BHOLES\BD509A~1.TXT

ELEVATION : 3.758 (m) CD
X-COORD : 3306689.890
Y-COORD : -1923.350

HOLE No: BD-BHL206

dot.PLOT 5003 J&W

BD-BHL206 0.0 to 12.00m BOX 1 of 4

BD-BHL206 12.00 to 25.00m BOX 2 of 4

BD-BHL206 25.00 to 36.55m BOX 3 of 4

BD-BHL206 36.55 to 41.05m BOX 4 of 4

HOLE No: BD-BHL207
Sheet 1 of 6

JOB NUMBER: 07-395

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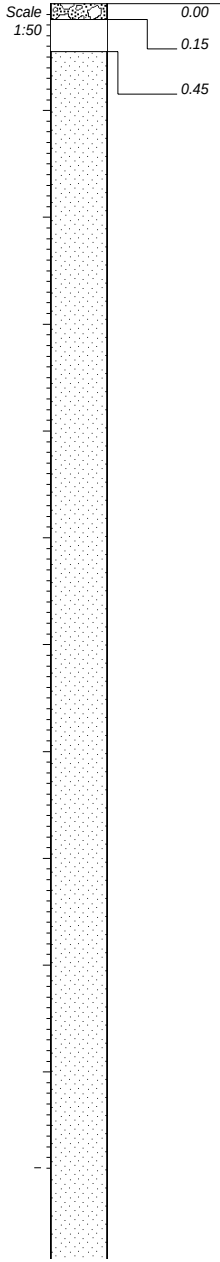
HOLE No: BD-BHL207
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	1.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		100	-	-	N=24	-	-	-	-	-	-	-	-		
	3.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	5.05														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		100	-	-	N=27	-	-	-	-	-	-	-	-		
	6.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		100	-	-	N=28	-	-	-	-	-	-	-	-		
	7.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		100	-	-	N=11	-	-	-	-	-	-	-	-		
	9.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50



Concrete.

Crusher Run.

Moist greyish brown medium dense with zones of loose, fine to medium grained SAND. (Hydraulic Fill).

HOLE No: BD-BHL207
Sheet 2 of 6

JOB NUMBER: 07-395

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Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)
Wash (N)	11.05	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	12.00	100	-	-	N=19	-	-	-	-	-	-	-	-		
Wash (N)	12.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	13.50	100	-	-	N=11	-	-	-	-	-	-	-	-		
Wash (N)	13.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	15.00	100	-	-	N=31	-	-	-	-	-	-	-	-		
NWD4	15.45	16	10	-	-	-	-	-	-	-	-	-	-		
Wash (N)	16.50	-	-	-	-	-	-	-	-	-	-	-	-		
Wash (N)	18.00	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	19.50	100	-	-	N=27	-	-	-	-	-	-	-	-		
NWD4	19.95	20	-	-	-	-	-	-	-	-	-	-	-		
SPT	21.00	100	-	-	N=23	-	-	-	-	-	-	-	-		
	21.45														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

15.45 — 16.50

Boulders and gravel consisting of greyish blue, unweathered, hard rock Tillite within medium dense SAND. (Quay Wall Rockfill).

Wet yellowish brown medium dense fine to medium grained SAND with occasional small fragments of shells. (Harbour Beds).

HOLE No: BD-BHL207
Sheet 3 of 6

JOB NUMBER: 07-395

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Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
														0 1 2 3 4 5	
NWD4		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	22.45	100	-	-	N=20	-	-	-	-	-	-	-	-		
	22.90														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	23.40														
Wash (N)		-	-	-											
	23.90														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	24.35														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	24.85														
Wash (N)		-	-	-											
	25.35														
SPT		100	-	-	N=16	-	-	-	-	-	-	-	-		
	25.80														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	26.30														
Wash (N)		-	-	-											
	26.80														
SPT		0	-	-	N=21	-	-	-	-	-	-	-	-		
	27.25														
Wash (N)		-	-	-	-										
	27.75														
Wash (N)		-	-	-	-										
	28.25														
SPT		0	-	-	N=17	-	-	-	-	-	-	-	-		
	28.70														
Wash (N)		-	-	-	-										
	29.20														
NWD4		34	-	-	-										
	30.00														
SPT		100	-	-	N=31	-	-	-	-	-	-	-	-		
	30.45														
Wash (N)		-	-	-											
	30.95														
NWD4		82	-	-	-	-	-	-	-	-	-	-	-		
	31.45														
SPT		100	-	-	N=45	-	-	-	-	-	-	-	-		
	31.90														
Wash (N)		-	-	-	-										

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

29.50

Wet yellowish brown dense slightly clayey SAND. (Harbour Beds).

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Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	33.00					-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Shelby		100	-	-	Shelby										
	33.55														
NWD4		94	76	62	-	1	0-10	M	PLA	SRJ	slt	<1mm	3		
	35.05														
NWD4		98	98	40	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	16		
	36.55														
NWD4		94	80	58	-	-	-	-	-	-	-	-	6		
	38.05														
NWD4		100	78	70	-	-	-	-	-	-	-	-	8		
	39.55														
NWD4		62	37	17	-	-	-	-	-	-	-	-	8		
	41.05														
NWD4		100	93	80	-	1	0-10	M-W	PLA	SRJ	slt	<1mm	6		
	42.55														
NWD4		97	89	89	-	1	0-10	M-W	PLA	SRJ	slt	<1mm	5		

DEPTH Scale 1:50

33.55

Dark grey to black highly to completely weathered very soft rock SILTSTONE. St Lucia Formation. (Cretaceous).

35.00

Yellowish brown mottled olive and grey streaked and speckled white very soft rock SILTSTONE with bands of very dense silty sand and medium hard rock SANDSTONE. Well preserved, fossils and shell fragments. (Cretaceous).

37.00

Olive to dark greyish green completely to highly weathered very soft rock SILTSTONE with bands of completely weathered apparently very dense silty SAND. (Residual Cretaceous).

HOLE No: BD-BHL207
Sheet 5 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL207
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	44.05														
NWD4		100	7	18	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	9		
	45.55														
NWD4		96	24	9	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	6		
	47.05														
NWD4		98	89	80	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	3		
	48.55														
NWD4		92	86	73	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	9		
	50.05														
NWD4		100	78	67	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	10		
	51.55														
NWD4		100	81	68	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	12		
	53.05														
NWD4		95	82	50	-	1	0-10	C-M	PLA	SRJ	slt	<1mm	11		

0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

HOLE No: BD-BHL207
Sheet 6 of 6

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HOLE No: BD-BHL207
Sheet 6 of 6

JOB NUMBER: 07-395

54.55

54.55

NOTES

1) End of borehole at 54.55m below ground level.

2) Final depth of NW casing at 33.0m.

3) Borehole backfilled with cement bentonite grout to ground level.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : PM
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 20/05/2008
DATE : 06/06/2008

DATE : 04/03/09 14:05
TEXT : ..\BHOLES\BD549A~1.TXT

ELEVATION : 3.690 (m) CD
X-COORD : 3306664.953
Y-COORD : -2028.976

HOLE No: BD-BHL207

dot.PLOT 5003 J&W

BD-BHL207 0.0 to 15.45m BOX 1 of 6

BD-BHL207 15.65 to 30.00m BOX 2 of 6

BD-BHL207 30.00 to 38.06m BOX 3 of 6

BD-BHL207 38.75 to 46.05m BOX 4 of 6

BD-BHL207 46.05 to 53.05m BOX 5 of 6

BD-BHL207 53.05 to 54.55m BOX 6 of 6

HOLE No: BD-BHL208
Sheet 1 of 7

JOB NUMBER: 07-395

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HOLE No: BD-BHL208
Sheet 1 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
														0 1 2 3 4 5	
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
SPT		27	-	-	N=14	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		46	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		27	-	-	N=14	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		42	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	5.05														
Wash Bore		45	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		27	-	-	N=16	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		38	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		27	-	-	-	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		29	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		27	-	-	N=17	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		29	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
Shelby		0	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

Scale 1:50

0.00 Slightly moist medium dark brown speckled black and orange medium dense SAND with tiny shell fragments. (Hydraulic Fill).

5.05 Slightly moist to moist brownish grey speckled black medium dense SAND with tiny shell fragments. (Hydraulic Fill).

HOLE No: BD-BHL208
Sheet 2 of 7

JOB NUMBER: 07-395

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Sheet 2 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.05													0 1 2 3 4 5	
Wash Bore		44	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		27	-	-	N=21	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		29	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		27	-	-	N=22	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		35	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
NWD4		11	11	-	-	-	-	-	-	-	-	-	-		
	16.50														
NWD4		13	13	-	-	-	-	-	-	-	-	-	-		
	18.00														
Wash Bore		50	-	-	-	-	-	-	-	-	-	-	-		
	18.50														
Wash Bore		56	-	-	-	-	-	-	-	-	-	-	-		
	19.00														
SPT		27	-	-	N=19	-	-	-	-	-	-	-	-		
	19.45														
Wash Bore		36	-	-	-	-	-	-	-	-	-	-	-		
	20.00														
Wash Bore		50	-	-	-	-	-	-	-	-	-	-	-		
	20.50														
SPT		27	-	-	N=21	-	-	-	-	-	-	-	-		
	20.95														
Wash Bore		42	-	-	-	-	-	-	-	-	-	-	-		
	21.50														
Wash															

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

15.00
Boulders and gravel consisting of purplish grey to blue grey slightly to medium weathered hard rock Tillite. (Quay Wall Rockfill).

18.00
Wet slightly brownish dark grey medium dense fine grained SAND with tiny shell fragments. (Harbour Beds).

19.80
Wet slightly pinkish to greyish light brown medium dense fine to coarse grained SAND. (Harbour Beds).

HOLE No: BD-BHL208
Sheet 3 of 7

JOB NUMBER: 07-395

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HOLE No: BD-BHL208
Sheet 3 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
		48	-	-		-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Bore	22.00														
SPT		27	-	-	N=23	-	-	-	-	-	-	-	-		
	22.45														
Wash Bore		49	-	-	-	-	-	-	-	-	-	-	-		
	23.00														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	23.50														
SPT		27	-	-	N=28	-	-	-	-	-	-	-	-		
	23.95														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	24.45														
Wash Bore		50	-	-	-	-	-	-	-	-	-	-	-		
	24.95														
SPT		0	-	-	N=27	-	-	-	-	-	-	-	-		
	25.40														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	25.90														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	26.40														
SPT		27	-	-	N=25	-	-	-	-	-	-	-	-		
	26.88														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	27.35														
Wash Bore		44	-	-	-	-	-	-	-	-	-	-	-		
	27.85														
SPT		0	-	-	N=27	-	-	-	-	-	-	-	-		
	28.30														
Wash Bore		50	-	-	-	-	-	-	-	-	-	-	-		
	28.80														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	29.30														
SPT		27	-	-	N=23	-	-	-	-	-	-	-	-		
	29.75														
Wash Bore		50	-	-	-	-	-	-	-	-	-	-	-		
	30.25														
Wash Bore		60	-	-	-	-	-	-	-	-	-	-	-		
	30.75														
SPT		27	-	-	N=27	-	-	-	-	-	-	-	-		
	31.20														
Wash Bore		46	-	-	-	-	-	-	-	-	-	-	-		
	31.70														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	32.20														
SPT		27	-	-	N=24	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

32.65

HOLE No: BD-BHL208
Sheet 4 of 7

JOB NUMBER: 07-395

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	32.65														
Wash Bore		74	-	-	-	-	-	-	-	-	-	-	-		
	33.70														
SPT		27	-	-	N=28	-	-	-	-	-	-	-	-		
	34.15														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	35.10														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	35.65														
Wash Bore		38	-	-	-	-	-	-	-	-	-	-	-		
	36.65														
SPT		33	-	-	N=31	-	-	-	-	-	-	-	-		
	37.10														
NWD4		87	85	50	-	1	5-10	C-M	PLA	SRJ	slt	<1	11		
	38.00														
NWD4		58	58	45	-	1	5-10	C-M	PLA-UND	SJ-SRJ	slt	<1	17		
	39.50														
NWD4		57	57	38	-	1	5-10	C-M	PLA-UND	SJ-SRJ	slt	<1	9		
	41.00														
NWD4		30	30	12	-	1	5-10	C-M	PLA	SRJ	slt	<1	4		
	42.50														
NWD4		40	40	25	-	1	5-20	C-M	PLA	SRJ	slt	<1	5		

0 1 2 3 4 5

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

34.15

Wet dark grey stiff silty CLAY. (Harbour Beds).

Wet slightly greyish brown stiff slightly sandy CLAY. (Harbour Beds).

37.10

Dark grey highly weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE with tiny shell fragments. (Cretaceous).
With occational bands of light grey medium weathered closely to medium bedded closly jointed medium hard rock SILTSTONE.

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	44.00														
NWD4		70	70	23	-	1	5-10	C-M	PLA	SRJ	slt	<1	11		
	45.50														
NWD4		70	20	53	-	1	5-10	C-M	PLA	SRJ	slt	<1	8		
	47.00														
NWD4		93	93	53	-	1	5-10	C-M	PLA	SRJ	slt	<1	10		
	48.50														
NWD4		70	70	37	-	1	5-10	C-M	PLA	SRJ	slt	<1	9		
	50.00														
NWD4		100	-	-	-	1	5-10	C-M	PLA	SRJ	slt	<1	6		
	50.30														
NWD4		11	11	-	-	-	-	-	-	-	-	-	-		
	51.50														
NWD4		37	30	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	5		
	53.00														
NWD4		63	63	51	-	1	0-10	C-M	PLA	SRJ	slt	<1	3		

0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

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	54.50													0 1 2 3 4 5	
NWD4		45	45	10	-	1 2	0-10 75	C-M C-M	PLA PLA	SRJ SRJ	slt slt	<1 <1	9		
	56.00														
NWD4		32	32	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	10		
	57.50														
NWD4		46	46	12	-	1	0-10	C-M	PLA	SRJ	slt	<1	9		
	59.00														
NWD4		49	49	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	9		
	60.50														
NWD4		70	70	38	-	1	0-10	C-M	PLA	SRJ	cl	<1	10		
	62.00														
NWD4		100	100	15	-	1	0-10	C-M	PLA	SRJ	slt	<1	7		
	62.90														
NWD4		50	50	22	-	1	0-10	C-M	PLA	SRJ	slt	<1	12		
	63.50														
NWD4		38	30	-	-	1	0-10	C-M	PLA	SRJ	slt	<1	10		
	65.00														

DEPTH Scale 1:50

55 56 57 58 59 60 61 62 63 64 65

HOLE No: BD-BHL208
Sheet 7 of 7

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL208
Sheet 7 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		44	44	-	-	1	0-10	C-M	PLA	SRJ	cl	<1	5		
	66.50														
NWD4		87	87	11	-	1	0-10	C-M	PLA	SRJ	slt	<1	13		
	68.00														

0 1 2 3 4 5

DEPTH Scale 1:50

66
67
68

68.00

NOTES

1) End of borehole at 68.00m below ground level.

2) Final depth of HW casing at 37.16m and NW casing at 47.0m.

3) Borehole backfilled with cement bentonite grout to ground level.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Micheal
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 19/05/2008
DATE : 30/06/2008

DATE : 04/03/09 14:05
TEXT : ..\BHOLES\BD589A~1.TXT

ELEVATION : 3.730 (m) CD
X-COORD : 3306647.125
Y-COORD : -2104.493

HOLE No: BD-BHL208

dot.PLOT 5003 J&W

BD-BHL208 0.0 to 16.50m BOX 1 of 6

BD-BHL208 16.5 to 29.30m BOX 2 of 6

BD-BHL208 29.30 to 39.50m BOX 3 of 6

BD-BHL208 39.50 to 50.30m BOX 4 of 6

BD-BHL208 50.30 to 62.90m BOX 5 of 6

BD-BHL208 62.90 to 68.00m BOX 6 of 6

HOLE No: BD-BHL209
Sheet 1 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHL209
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash (N)		-	-	-		-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	1.50														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	1.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		100	-	-	N=14	-	-	-	-	-	-	-	-		
	3.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	5.05														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	6.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		100	-	-	N=Ref	-	-	-	-	-	-	-	-		
	7.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		100	-	-	N=27	-	-	-	-	-	-	-	-		
	9.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

Scale 1:50

0.00 Wet reddish orangey brown apparently loose to medium grained dense fine to medium SAND. (Hydraulic Fill).

1.50 Wet mid greyish brown speckled white medium dense with occasional very dense bands medium grained SAND with sparse shell fragments. (Hydraulic Fill).

HOLE No: BD-BHL209
Sheet 2 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHL209
Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.05														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		100	-	-	N=26	-	-	-	-	-	-	-	-		
	12.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		100	-	-	N=26	-	-	-	-	-	-	-	-		
	13.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		100	-	-	N=28	-	-	-	-	-	-	-	-		
	15.45														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
SPT		100	-	-	N=27	-	-	-	-	-	-	-	-		
	16.95														
Wash (N)		-	-	-	-	-	-	-	-	-	-	-	-		
	18.00														
NWD4		15	15	-	-	-	-	-	-	-	-	-	-		
	19.50														
NWD4		3	3	-	-	-	-	-	-	-	-	-	-		
	21.00														

0 1 2 3 4 5

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

18.00

Gravel and boulders of bluish grey slightly weathered hard rock Tillite. (Quay Wall Rockfill).

HOLE No: BD-BHL209
Sheet 3 of 6

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL209
Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code 0 1 2 3 4 5	Elevation (m.a.m.s.l.)
NWD4		9	9	-											
	22.50														
NWD4		13	7	7	-	-	-	-	-	-	-	-	-		
	24.00														
NWD4		30	30	30	-	-	-	-	-	-	-	-	-		
	24.50														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	25.05														
NWD4		68	-	-	-	-	-	-	-	-	-	-	-		
	26.00														
SPT		100	-	-	N=15	-	-	-	-	-	-	-	-		
	26.45														
NWD4		35	-	-	-	-	-	-	-	-	-	-	-		
	27.00														
SPT		44	-	-	N=Ref	-	-	-	-	-	-	-	-		
	27.45														
NWD4		18	-	-	-	-	-	-	-	-	-	-	-		
	28.00														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	28.55														
SPT		100	-	-	N=45	-	-	-	-	-	-	-	-		
	29.00														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	29.50														
Shelby		64	-	-	Shelby	-	-	-	-	-	-	-	-		
	30.05														
NWD4		74	-	-	-	-	-	-	-	-	-	-	-		
	30.55														
SPT		67	-	-	N=38	-	-	-	-	-	-	-	-		
	31.00														
NWD4		56	-	-	-	-	-	-	-	-	-	-	-		
	31.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	32.05														
NWD4		78	-	-	-	-	-	-	-	-	-	-	-		
	32.55														

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

24.50
Wet dark olive grey firm slightly silty CLAY. (Harbour Beds).

26.80
Wet dark grey brown very stiff slightly silty slightly sandy CLAY. (Harbour Beds).

30.45
Wet greyish mid grey dense clayey fine grained SAND. (Harbour Beds).

HOLE No: BD-BHL209
Sheet 4 of 6

JOB NUMBER: 07-395

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JOINT SHAPE
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IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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HOLE No: BD-BHL209
Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT		100	-	-	N=45	-	-	-	-	-	-	-	-		
	33.00														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	33.50														
NWD4		41	32	32	-	1	10	C-M	PLA	SRJ	slt	<1	3		
	35.00														
NWD4		30	22	22	-	1	10	C-M	PLA	SRJ	slt	<1	2		
	36.50														
NWD4		36	21	21	-	1	10	C-M	PLA	SRJ	slt	<1	2		
	38.00														
SPT		100	-	-	N=Ref 16,25	-	-	-	-	-	-	-	-		
	38.10														
NWD4		83	-	-	-	-	-	-	-	-	-	-	-		
	38.70														
NWD4		77	-	-	-	-	-	-	-	-	-	-	-		
	39.50														
NWD4		96	75	66	-	1	10	C-M	PLA	SRJ	slt	<1	3		
	41.00														
NWD4		93	87	73	-	1 2	10 20	M M	PLA PLA	SJ-SRJ SJ-SRJ	slt slt	<1 <1	6		
	42.50														
NWD4		44	35	16	-	1 2	10 20	M M	PLA PLA	SJ-SRJ SJ-SRJ	slt slt	<1 <1	6		

0 1 2 3 4 5

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

33.00 — Wet very dark grey brown apparently very firm slightly silty CLAY. (Harbour Beds).

33.50 — Light to dark brown medium to highly weathered thinly to medium bedded closely to medium jointed soft to medium hard rock SILTSTONE.(Cretaceous). Shelby refused at 33.50m.

38.00 — Wet dark olive grey speckled white apparently very dense slightly sandy SILT with well preserved shell fragments. (Residual Cretaceous).

39.00 — Dark grey medium weathered fine to medium grained medium jointed thinly to medium bedded medium hard rock SILTSTONE with some shell fragments and fossils. (Cretaceous).

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HOLE No: BD-BHL209
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	44.00														
NWD4		100	95	50	-	1 2	10 20	M M	PLA PLA	SJ-SRJ SJ-SRJ	slt slt	<1 <1	3		
	45.50														
NWD4		50	39	6	-	1	10	M	PLA	SJ-SRJ	slt	<1	6		
	47.00														
NWD4		60	15	0	-	-	-	-	-	-	-	-	-		
	48.50														
NWD4		21	10	10	-	1	0-5	C	PLA	SJ-SRJ	slt	<1	3		
	50.00														
NWD4		27	23	16	-	1	10	M	UND	SRJ	slt	<1	3		
	51.50														
NWD4		38	34	27	-	1	10	M	UND	SRJ	slt	<1	3		
	53.00														
NWD4		60	57	32	-	1 2	0-5 70-80	M M	PLA IRR	SJ-SRJ SJ-SRJ	slt slt	<1 <1	7		

0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

45.25

As above, but highly weathered closely to medium jointed soft rock.

HOLE No: BD-BHL209
Sheet 6 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHL209
Sheet 6 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	54.50														
NWD4		52	40	27	-	1	0-5	C-M	PLA	SJ-SRJ	slt	<1	4	-	
	56.00														

0 1 2 3 4 5

DEPTH Scale 1:50

55

56

56.00

NOTES

1) End of borehole at 56.00m below ground level.

2) Final depth of HW casing at 32.0m whilst standing.

3) Borehole backfilled with cement bentonite grout to ground level.

4) Driller's log indicates that the boreholes collapsed after 56.0m. The hole was left to stand for 2 days at a depth of 56.0m between 6/6/08 and 9/6/08 with casing at 32.0m only.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Daniel
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 27/05/2008
DATE : 12/06/2008

DATE : 04/03/09 14:05
TEXT : ..\BHOLES\BD5C9A~1.TXT

ELEVATION : 3.730 (m) CD
X-COORD : 3306617.719
Y-COORD : -2229.048

HOLE No: BD-BHL209

dot.PLOT 5003 J&W

BD-BHL209 0.0 to 15.00m BOX 1 of 5

BD-BHL209 15.00 to 30.55m BOX 2 of 5

BD-BHL209 30.55 to 41.00m BOX 3 of 5

BD-BHL209 41.00 to 53.00m BOX 4 of 5

BD-BHL209 53.00 to 59.00m BOX 5 of 5

HOLE No: BD-BHL210
Sheet 1 of 6

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-		-	-	-	-	-	-	-	-		
	1.50														
SPT		66	-	-	N=15	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		66	-	-	N=16	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	5.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		66	-	-	N=10	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
SPT		66	-	-	N=14	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		66	-	-	N=6	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	10.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

1 2 3 4 5 6 7 8 9 10

Scale 1:50

0.00 Concrete.

0.12

Wet medium dark brown speckled black and white medium dense fine grained silty SAND with tiny shell fragments. (Hydraulic Fill).

8.50

As above but loose.

HOLE No: BD-BHL210
Sheet 2 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210
Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	12.00														
SPT		66	-	-	N=13	-	-	-	-	-	-	-	-		
	12.45														
		-	-	-		-	-	-	-	-	-	-	-		
	13.50														
		50	3	-		-	-	-	-	-	-	-	-		
	15.00														
Wash Bore		0	-	-		-	-	-	-	-	-	-	-		
	16.50														
		0	-	-		-	-	-	-	-	-	-	-		
	18.00														
		-	-	-		-	-	-	-	-	-	-	-		
	19.50				-										
NWD4		27	-	-		-	-	-	-	-	-	-	-		
	21.00														
Solid															

DEPTH Scale 1:50

11.50 — As above but medium dense.

13.50 — Slightly moist brown medium dense silty SAND with some small boulders of bluish grey medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill).

15.00 — No recovery: Anticipate (Quay Wall Rockfill).

18.00 — Wet dark brownish grey apparently medium dense fine grained silty SAND. (Harbour Beds). (Logged from the wash sample).

19.50 — Wet brownish black apparently firm to stiff fissured silty CLAY with lenses of very stiff material. (Harbour Beds).
No SPT taken by Contractor in the clay. The borehole was redrilled as BD BHL210A.

HOLE No: BD-BHL210
Sheet 3 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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GF -gneissose
LF -laminated

GRAIN SIZE
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CG -coarse grain

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VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210
Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
tube		100	-	-		-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	22.50														
NWD4		57	-	-		-	-	-	-	-	-	-	-		
	24.00														
NWD4		100	-	-		-	-	-	-	-	-	-	-		
	25.50														
NWD4		100	-	-		-	-	-	-	-	-	-	-		
	27.00														
SPT		66	-	-	N=17	-	-	-	-	-	-	-	-		
	27.45														
NWD4		90	-	-	-	-	-	-	-	-	-	-	-		
	28.50														
SPT		66	-	-	N=31	-	-	-	-	-	-	-	-		
	28.95														
NWD4		76	-	-	-	-	-	-	-	-	-	-	-		
	30.00														
SPT		66	-	-	N=43	-	-	-	-	-	-	-	-		
	30.45														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	31.50														
Shelby		0	-	-	Shelby	-	-	-	-	-	-	-	-		
	32.05														
NWD4		46	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

26.50

As above but very stiff.

HOLE No: BD-BHL210
Sheet 4 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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GF -gneissose
LF -laminated

GRAIN SIZE
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210
Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	33.00														
SPT		66	-	-	N=7	-	-	-	-	-	-	-	-		
	33.45														
wash Bore		46	-	-	-	-	-	-	-	-	-	-	-		
	34.50														
SPT		66	-	-	N=10	-	-	-	-	-	-	-	-		
	34.95														
Wash Bore		43	-	-	-	-	-	-	-	-	-	-	-		
	36.00														
SPT		66	-	-	N=5	-	-	-	-	-	-	-	-		
	36.45														
Wash Bore		33	-	-	-	-	-	-	-	-	-	-	-		
	37.50														
SPT		66	-	-	N=7	-	-	-	-	-	-	-	-		
	37.95														
Wash Bore		35	-	-	-	-	-	-	-	-	-	-	-		
	39.00														
SPT		66	-	-	N=5	-	-	-	-	-	-	-	-		
	39.45														
Wash Bore		36	-	-	-	-	-	-	-	-	-	-	-		
	40.50														
SPT		46	-	-	N=9	-	-	-	-	-	-	-	-		
	40.95														
Wash Bore		39	-	-	-	-	-	-	-	-	-	-	-		
	42.00														
SPT		66	-	-	N=10	-	-	-	-	-	-	-	-		
	42.45														
Wash Bore		29	-	-	-	-	-	-	-	-	-	-	-		
	43.50														

0 1 2 3 4 5

DEPTH Scale 1:50

33
34
35
36
37
38
39
40
41
42
43

33.00

Wet light to medium dark brown to light brown blotched black, loose fine to medium grained silty SAND. (Harbour Beds).

43.50

HOLE No: BD-BHL210
Sheet 5 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
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CG -coarse grain

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HOLE No: BD-BHL210
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT	43.95	66	-	-	N=24	-	-	-	-	-	-	-	-		
NWD4	45.00	100	-	-	-	-	-	-	-	-	-	-	-		
NWD4	46.50	13	-	-	-	-	-	-	-	-	-	-	-		
NWD4	48.00	33	3	-	-	-	-	-	-	-	-	-	-		
NWD4	49.50	80	73	20	-	1	5-10	C-M	PLA-IRR	SJ-SRJ	slt	<1	9		
NWD4	51.00	86	86	40	-	1	5-10	M	PLA	SJ-SRJ	slt	<1	6		
NWD4	52.00	34	14	14	-	1	5-10	M	PLA	SJ-SRJ	slt	<1	1		
NWD4	53.50	77	77	46	-	1	5-10	M	PLA	SJ-SRJ	slt	<1	9		
NWD4	53.86	100	100	-	-	1	5-10	C	PLA	SJ-SRJ	slt	<1	5		

0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

46.30 Wet brownish black stiff silty CLAY. (Harbour Beds).

46.50 Dark bluish grey fine grained medium weathered, medium hard rock highly fractured SILTSTONE. (Cretaceous).

47.95 Wet dark brown apparently medium dense silty SAND. (Residual Cretaceous).

48.00 Dark blueish grey fine grained moderately weathered medium hard highly fractured SILTSTONE. (Cretaceous).

Wet black highly weathered closely to medium jointed thinly bedded soft rock SILTSTONE. (Cretaceous).

HOLE No: BD-BHL210
Sheet 6 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
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GF -gneissose
LF -laminated

GRAIN SIZE
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CG -coarse grain

JOINT SPACING
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JOINT ROUGHNESS
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JOINT SHAPE
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ROCK HARDNESS
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210
Sheet 6 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		95	53	26		1	5-10	C	PLA	SJ-SRJ	slt	<1			
	55.00												6		
NWD4		50	60	30	-	1	5-10	C	PLA	SJ-SRJ	slt	<1			
	56.50														
NWD4		43	17	-	-	-	-	-	-	-	-	-	-		
	58.00														
NWD4		79	73	19	-	1	5-10	C-M	PLA	SJ-SRJ	slt	<1	10		
	59.50														

DEPTH Scale 1:50

55
56
57
58
59

56.50

As above but highly weathered with zones of completely weathered, highly fractured, very soft rock SILTSTONE (recovered as small fragments). (Cretaceous).

58.00

Black highly weathered closely to medium jointed thinly to medium bedded soft rock SILTSTONE. (Cretaceous).

59.50

NOTES

1) End of borehole at 59.50m below ground level.

2) Final depth of HW casing at 46.0m

3) Borehole grouted with cement bentonite grout to 14m BGL and a slotted standpipe surrounded with sand was installed from 14m BGL to ground level.

4) BD-BHL210 is to be redrilled as BD-BHL210A due to no SPT sample recovery in the clay material.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : PM
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 05/06/2008
DATE : 29/05/2008

DATE : 04/03/09 14:06
TEXT : ..\BHOLES\BD5874~1.TXT

ELEVATION : 3.970 (m) CD
X-COORD : 3306604.021
Y-COORD : -2289.982

HOLE No: BD-BHL210

dot.PLOT 5003 J&W

BD-BHL210 0.0 to 21.00m BOX 1 of 5

BD-BHL210 21.00 to 30.45m BOX 2 of 5

BD-BHL210 30.45 to 43.50m BOX 3 of 5

BD-BHL210 43.50 to 53.86m BOX 4 of 5

BD-BHL210 53.86 to 59.50m BOX 5 of 5

HOLE No: BD-BHL210A
Sheet 1 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
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SF -schistose
GF -gneissose
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GRAIN SIZE
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HOLE No: BD-BHL210A
Sheet 1 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-		-	-	-	-	-	-	-	-		
SPT	1.50	73	-	-	N=20	-	-	-	-	-	-	-	-		
	1.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	69	-	-	N=24	-	-	-	-	-	-	-	-		
	3.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50	76	-	-	N=31	-	-	-	-	-	-	-	-		
	4.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	69	-	-	N=32	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50	82	-	-	N=36	-	-	-	-	-	-	-	-		
	7.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00	67	-	-	N=36	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	10.50	87	-	-	N=38	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

0.00

Moist brownish grey medium dense becoming dense with depth fine to medium grained SAND with tiny shell fragments. (Hydraulic Fill).

10.00

Moist greyish brown dense fine to medium grained SAND with tiny shell fragments. (Hydraulic Fill).

HOLE No: BD-BHL210A
Sheet 2 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
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GRAIN SIZE
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210A
Sheet 2 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		67	-	-	N=32	-	-	-	-	-	-	-	-		
	12.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
SPT		82	-	-	N=41	-	-	-	-	-	-	-	-		
	13.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT		67	-	-	N=36	-	-	-	-	-	-	-	-		
	15.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
SPT		78	-	-	N=42	-	-	-	-	-	-	-	-		
	16.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	18.00														
NWD4		20	20	-	-	-	-	-	-	-	-	-	-		
	18.50														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	19.05														
SPT		73	-	-	N=45	-	-	-	-	-	-	-	-		
	19.50														
NWD4		78	-	-	-	-	-	-	-	-	-	-	-		
	20.02														
SPT		53	-	-	N=56	-	-	-	-	-	-	-	-		
	20.50														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	21.05														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	21.60														

0 1 2 3 4 5

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

18.00 — Boulders of bluish dark grey medium weathered medium hard to hard rock Tillite. (Quay Wall Rockfill).

18.50 — Wet greyish brown dense fine to medium grained SAND. (Harbour Beds). (Logged from the wash sample).

19.50 — Wet brownish dark grey very stiff slightly silty CLAY. (Harbour Beds).

HOLE No: BD-BHL210A
Sheet 3 of 4

JOB NUMBER: 07-395

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HOLE No: BD-BHL210A
Sheet 3 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		91	-	-	-	-	-	-	-	-	-	-	-		
	22.15														
SPT		67	-	-	N=70	-	-	-	-	-	-	-	-		
	22.60														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	23.15														
SPT		56	-	-	N=67	-	-	-	-	-	-	-	-		
	23.60														
NWD4		91	-	-	-	-	-	-	-	-	-	-	-		
	24.15														
Solid Tube		100	-	-	-	-	-	-	-	-	-	-	-		
	25.65														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	26.20														
Solid Tube		100	-	-	-	-	-	-	-	-	-	-	-		
	27.70														
Shelby		0	-	-	-	-	-	-	-	-	-	-	-		
	28.25														
SPT		100	-	-	N=55	-	-	-	-	-	-	-	-		
	28.70														
Shelby		60	-	-	-	-	-	-	-	-	-	-	-		
	29.25														
SPT		100	-	-	N=59	-	-	-	-	-	-	-	-		
	29.70														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	30.25														
SPT		69	-	-	N=69	-	-	-	-	-	-	-	-		
	30.70														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	31.25														
SPT		67	-	-	N=65	-	-	-	-	-	-	-	-		
	31.70														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	32.25														
SPT		67	-	-	N=68	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

HOLE No: BD-BHL210A
Sheet 4 of 4

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHL210A
Sheet 4 of 4

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	32.70														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	33.25														
SPT		89	-	-	N=56	-	-	-	-	-	-	-	-		
	33.70														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	34.25														
SPT		100	-	-	N=23	-	-	-	-	-	-	-	-		
	34.70														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	35.25														
SPT		56	-	-	N=25	-	-	-	-	-	-	-	-		
	35.70														

0 1 2 3 4 5

DEPTH Scale 1:50

33
34
35

34.00
35.70

Wet brownish grey to reddish brown medium dense fine to medium grained slightly silty SAND. (Harbour Beds).

NOTES

1) End of borehole at 35.70m below ground level.

2) Final depth of NW casing at 31.0m.

3) Borehole backfilled with cement bentonite grout to ground level.

4) Borehole carried out to take SPTs in the clay omitted in borehole BD-BHL210 and to obtain further samples of the clay.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Petrus
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 06/09/2008
DATE : 21/10/2008

DATE : 04/03/09 14:06
TEXT : ..\BHOLES\BDCF8E~1.TXT

ELEVATION : 3.953 (m) CD
X-COORD : 3306604.512
Y-COORD : -2284.988

HOLE No: BD-BHL210A

dot.PLOT 5003 J&W

BD-BHL210A 0.0 to 12.00m BOX 1 of 4

BD-BHL210A 12.00 to 23.15m BOX 2 of 4

BD-BHL210A 23.15 to 33.70m BOX 3 of 4

BD-BHL210A 33.70 to 35.70m BOX 4 of 4

HOLE No: BD-BHM206
Sheet 1 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
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JOINT SPACING
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM206
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.50	100	-	-	N=31	-	-	-	-	-	-	-	-		
Wash Bore	1.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	100	-	-	N=35	-	-	-	-	-	-	-	-		
Wash Bore	3.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.50	100	-	-	N=34	-	-	-	-	-	-	-	-		
Wash Bore	4.95	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	100	-	-	N= Ref 64	-	-	-	-	-	-	-	-		
Wash Bore	6.45	-	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	7.55	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	8.00	100	-	-	N=Ref 21	-	-	-	-	-	-	-	-		
Wash Bore	8.22	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.50	100	-	-	N=Ref 41	-	-	-	-	-	-	-	-		
Wash Bore	9.78	-	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

Scale 1:50

0.00 Wet light brown medium dense becoming dense with depth, slightly silty fine to medium grained SAND. (Harbour Beds).

5.50 As above but very dense. (Harbour Beds).

7.00 Wet yellowish brown very dense slightly silty fine to medium grained SAND. (Harbour Beds).

HOLE No: BD-BHM206
Sheet 2 of 6

JOB NUMBER: 07-395

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MF -massive
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HOLE No: BD-BHM206
Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.00													0 1 2 3 4 5	
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	12.50														
SPT		100	-	-	N=60	-	-	-	-	-	-	-	-		
	12.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	14.00														
SPT		100	-	-	N=60	-	-	-	-	-	-	-	-		
	14.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	15.50														
SPT		100	-	-	N=55	-	-	-	-	-	-	-	-		
	15.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	17.00														
SPT		100	-	-	N=50	-	-	-	-	-	-	-	-		
	17.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	18.50														
NWD4		41	33	-	-	1	0-5	C-M	PLA	SRJ	slt	<1	4		
	19.25														
NWD4		55	55	35	-	1	0-5	C-M	PLA	SRJ	slt	<1	4		
	20.19														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	21.69														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

18.50

Dark olive grey completely to highly weathered medium bedded closely jointed very soft rock SILTSTONE. Shells and fossil fragments fairly common. (Cretaceous) St Lucia Formation.

20.19

Wet olive to grey dense silty micaceous fine SAND. (Residual Cretaceous).

HOLE No: BD-BHM206
Sheet 3 of 6

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM206
Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT		100	-	-	N=35	-	-	-	-	-	-	-	-		
	22.14														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	23.19														
SPT		100	-	-	N=36	-	-	-	-	-	-	-	-		
	23.64														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	24.60														
SPT		100	-	-	N=39	-	-	-	-	-	-	-	-		
	25.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	26.00														
SPT		100	-	-	N=32	-	-	-	-	-	-	-	-		
	26.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	27.50														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	27.79														
SPT		100	-	-	N=33	-	-	-	-	-	-	-	-		
	28.24														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	28.79														
SPT		100	-	-	N=36	-	-	-	-	-	-	-	-		
	29.24														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	29.79														
SPT		100	-	-	N=34	-	-	-	-	-	-	-	-		
	30.24														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.79														
TNW		88	88	35	-	1 2	0-5 45	C-M W	PLA PLA	SJ-SRJ SJ-SRJ	slt slt	<1 <1	9	0 1 2 3 4 5	
	32.29														
TNW		60	60	-	-	1	0-5	C	PLA	SJ-SRJ	slt	<1	2		

DEPTH Scale 1:50

30.79

Dark olive grey highly weathered thinly to medium bedded closely to medium jointed very soft rock SILTSTONE. (Cretaceous).
Note: medium hard to hard rock band at 32.6-32.8m. Fossil shell fragments fairly common.

HOLE No: BD-BHM206
Sheet 4 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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GRAIN SIZE
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ROCK HARDNESS
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HOLE No: BD-BHM206
Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	32.81														
Wash Bore	33.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	33.76	100	-	-	N=32	-	-	-	-	-	-	-	-		
Wash Bore	34.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	34.76	100	-	-	N=35	-	-	-	-	-	-	-	-		
Wash Bore	35.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	35.76	100	-	-	N=32	-	-	-	-	-	-	-	-		
Wash Bore	36.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	36.76	100	-	-	N=33	-	-	-	-	-	-	-	-		
Wash Bore	37.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	37.76	100	-	-	N=35	-	-	-	-	-	-	-	-		
Wash Bore	38.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	38.76	100	-	-	N=37	-	-	-	-	-	-	-	-		
Wash Bore	39.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	39.76	100	-	-	N=34	-	-	-	-	-	-	-	-		
Wash Bore	40.31	-	-	-	-	-	-	-	-	-	-	-	-		
NWD4	40.81	40	40	-	-	-	-	-	-	-	-	-	-		
NWD4	41.31	40	40	-	-	-	-	-	-	-	-	-	-		
Wash Bore	41.81	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	42.26	100	-	-	N=33	-	-	-	-	-	-	-	-		
Wash Bore	42.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	42.76	100	-	-	N=35	-	-	-	-	-	-	-	-		
Wash Bore	43.31	-	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

32.81

Wet olive to grey dense silty micaceous fine SAND. (Residual Cretaceous).

40.31

Dark and light olive grey completely to highly weathered with medium weathered bands generally very soft rock with thin bands of (100 to 300mm thick) medium hard rock SILTSTONE with fossil shell fragments fairly common. (Cretaceous). Core recovery very poor.

41.31

Wet olive to grey dense silty micaceous fine SAND. (Residual Cretaceous).

HOLE No: BD-BHM206
Sheet 5 of 6

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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HOLE No: BD-BHM206
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT	43.76	100	-	-	N=35	-	-	-	-	-	-	-	-		
TNW	44.31	100	65	39	-	1	0-5	C-M	PLA	SRJ	slt	<1	2		
TNW	44.81	100	88	76	UCS=1.154MPa	1	0-5	C-M	PLA	SRJ	slt	<1	3		
TNW	45.31	96	96	28	-	1	0-5	C-M	PLA	SRJ	slt	<1	6		
TNW	45.81	100	76	50	UCS=1.317MPa	1	0-5	C-M	PLA	SRJ	slt	<1	3		
TNW	47.31	93	93	88	UCS=1.731MPa UCS=1.588MPa	1	0-5	C-W	PLA	SRJ	slt	<1	5		
TNW	48.81	52	39	7	-	1	0-5	C-M	PLA	SRJ	slt	<1	5		
TNW	49.31	70	60	-	-	-	-	-	-	-	-	-	-		
Wash Bore	49.81	-	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	50.81	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	51.26	100	-	-	N=49	-	-	-	-	-	-	-	-		
Wash Bore	52.31	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	52.76	100	-	-	N=50	-	-	-	-	-	-	-	-		
Wash Bore	53.81	-	-	-	-	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

43.76
Pale olive grey medium weathered thinly to medium bedded closely to medium jointed medium hard to hard rock SILTSTONE. (Cretaceous).
Note: Fossil shell fragments fairly common.

44.31
Dark olive grey with occasional light olive grey bands highly weathered medium bedded with zones of wide and thinly bedded medium jointed with widely and closely jointed zones very soft rock SILTSTONE. (Cretaceous).
Note: Bands of medium hard to hard rock at 44.81-45.15m; 45.7-49.0m; 47.31-47.40m. Fossil shell fragments fairly common.

48.30
Dark olive grey completely to highly weathered very soft rock with zones of very stiff silt, SILTSTONE. (Cretaceous).

49.31
Wet greyish brown very dense silty fine to medium grained SAND. Note: Possible (Residual Cretaceous).
However brown colour suggests contamination with harbour bed sand. Drillers log indicates casing final depth at 43.0m.

53.81

HOLE No: BD-BHM206
Sheet 6 of 6

JOB NUMBER: 07-395

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VSR-very soft rock

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM206
Sheet 6 of 6

JOB NUMBER: 07-395

NOTES

1) End of borehole at 53.81m below sea floor.

2) Final depth of NW casing at 43.0m.

3) Borehole carried out from jack up barge.

4) Possible contamination of Cretaceous has occured with Harbour Bed or fill materials from above.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin/ Lawrence/ Mike
PROFILED BY : MVR

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 30/07/2008
DATE : 12/08/2008

DATE : 24/02/09 15:27
TEXT : ..\BHOLES\BD-BHM~1.TXT

ELEVATION : -12.9 (m) CD
X-COORD : 3306642.005
Y-COORD : -1919.433

HOLE No: BD-BHM206

dot.PLOT 5003 J&W

BD-BHM206 0.0 to 19.52m BOX 1 of 4

BD-BHM206 19.52 to 32.29m BOX 2 of 4

BD-BHM206 32.29 to 44.55m BOX 3 of 4

BD-BHM206 44.55 to 53.81m BOX 4 of 4

HOLE No: BD-BHM207
Sheet 1 of 5

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
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HOLE No: BD-BHM207
Sheet 1 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		34	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
Wash Bore		44	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		0	-	-	N=15	-	-	-	-	-	-	-	-		
	3.47														
Wash Bore		54	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
SPT		29	-	-	N=19	-	-	-	-	-	-	-	-		
	6.45														
Wash Bore		51	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
Wash Bore		37	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		40	-	-	N=17	-	-	-	-	-	-	-	-		
	9.45														
Wash Bore		30	-	-	-	-	-	-	-	-	-	-	-		
	10.50														

Fracture Frequency: 0 1 2 3 4 5

DEPTH Scale 1:50: 1 2 3 4 5 6 7 8 9 10

Scale 1:50

0.00

Wet medium dark brown speckled black orange and white medium dense slightly silty SAND with some shell fragments. (Harbour Beds).

10.50

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HOLE No: BD-BHM207
Sheet 2 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		0	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
Wash Bore		17	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
Wash Bore		0	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
SPT	15.45	29	-	-	N=19	-	-	-	-	-	-	-	-		
Wash Bore		15	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
SPT	16.95	38	-	-	N=22	-	-	-	-	-	-	-	-		
Wash Bore		10	-	-	-	-	-	-	-	-	-	-	-		
	18.20														
NWD4		10	10	-	-	-	-	-	-	-	-	-	-		
	19.35														
NWD4		9	9	-	-	-	-	-	-	-	-	-	-		
	20.35														
NWD4		20	20	-	UCS=1.184MPa	1	0-5	C	UND	SRJ	slt	<1	3	2-3	

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

12.00 — No sample recovery.

12.00 — Wet medium dark greyish brown speckled black orange and white medium dense slightly silty SAND with some shell fragments. (Harbour Beds).

15.95 — Wet dark grey medium dense fine grained silty SAND with some shell fragments. (Harbour Beds).

18.20 — Light grey stained brown slightly weathered fine grained apparently medium hard rock SANDSTONE containing fossils. (Cretaceous). Very poor core recovery.

20.35 — Dark grey moderately to highly weathered thinly bedded closely jointed soft rock SILTSTONE. (Cretaceous). Very poor core recovery.

HOLE No: BD-BHM207
Sheet 3 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHM207
Sheet 3 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	21.85														
NWD4		29	20	-	-	1	5-10	C	UND	SRJ	slt	<1	3	3-4	
	23.35														
Wash Bore		0	0	0	-	-	-	-	-	-	-	-	-	-	
	24.85														
Wash Bore		0	0	0	-	-	-	-	-	-	-	-	-	-	
	26.35														
NWD4		47	47	-	-	1	0-10	C	UND	SRJ	slt	<1	5	3-4	
	27.87														
NWD4		23	23	-	-	1	0-10	C	UND	SRJ	slt	<1	-	-	
	29.19														
NWD4		23	23	-	UCS=1.331MPa	1	0-10	C	UND	SRJ	slt	<1	6	3-4	
	30.69														
NWD4		36	36	11	-	1	0-10	C	PLA	SRJ	slt	<1	5	3-4	
	32.19														
NWD4		76	76	-	UCS=1.249MPa	1	0-5	C	PLA	SRJ	slt	<1	1	3-4	

0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

21.85 — As above but completely weathered.

21.98 — Dark grey highly to completely weathered thinly to medium bedded closely jointed soft rock SILTSTONE. (Cretaceous). Very poor core recovery.

23.35 — No sample recovery.

26.35 — Dark grey highly to completely weathered thinly bedded closely jointed soft rock SILTSTONE. (Cretaceous). Poor core recovery.

HOLE No: BD-BHM207
Sheet 4 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHM207
Sheet 4 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	32.94														
NWD4		32	32	21	-	1	0-5	C	PLA	SRJ	slt	<1	2	3-4	
	33.69														
NWD4		42	28	24	-	1	0-5	C	PLA	SRJ	slt	<1	0	3	
	34.40														
NWD4		59	59	-	-	1	0-10	C	PLA	SRJ	slt	<1	4	3-4	
	35.19														
NWD4		25	25	-	-	1 2	0-10 85	C M	PLA UND	SRJ SRJ	slt slt	<1 <1	3	2-4	
	36.99														
NWD4		15	15	-	-	-	-	-	-	-	-	-	-	-	
	38.49														
NWD4		67	67	-	-	-	-	-	-	-	-	-	-	-	
	38.70														
NWD4		30	30	-	-	1	5-20	C	PLA	SRJ	slt	<1	8	2-4	
	40.20														
TNW		100	100	13	UCS=1.031MPa	1 2	0-5 40	C M	PLA UND	SJ-SRJ SJ-SRJ	slt slt	<2 <2	6	2-4	
	41.48														
TNW		100	100	47	UCS=1.058MPa	1	0-10	C	PLA	SJ-SRJ	slt	<2	12	2-4	
	42.96														
TNW		100	100	82	-	1	0-10	C	PLA	SJ-SRJ	slt	<2	4	3	
	43.29														

0 1 2 3 4 5

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

36.90

Dark grey medium to highly weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE. (Cretaceous). Generally poor core recovery to 40.2m; thereafter improvement from 80 to 100%.

HOLE No: BD-BHM207
Sheet 5 of 5

JOB NUMBER: 07-395

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HOLE No: BD-BHM207
Sheet 5 of 5

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
TNW		100	100	43	-	1 2	0-20 65	C C	PLA PLA	SJ-SRJ SJ-SRJ	slt slt	<2 <2	10	2-3	
	44.79														
TNW		100	100	67	UCS=1.219MPa	1	0-20	C	PLA	SJ-SRJ	slt	<2	4	2-3	
	46.29														
TNW		90	90	85	-	1	0-5	C	PLA	SJ-SRJ	slt	<2	4	3	
	47.79														
TNW		100	100	33	UCS=1.951MPa	1	0-5	C	PLA	SJ-SRJ	slt	<2	3	2-4	
	49.29														
TNW		80	80	28	UCS=1.781MPa	1	0-5	C	PLA	SJ-SRJ	slt	<2	3	3-4	
	50.79														
TNW		100	100	40	UCS=2.613MPa	1	0-5	C	PLA	SJ-SRJ	slt	<2	4	3-4	
	52.29														

0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52

52.29

NOTES

1) End of borehole at 52.29m below sea floor.

2) Final depth of HW casing at 15.0m and NW casing at 38.5m.

3) Borehole carried out from jack up barge.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin/ Lawrence
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 27/06/2008
DATE : 03/07/2008

DATE : 24/02/09 16:18
TEXT : ..\BHOLES\BD-BHM~2.TXT

ELEVATION : -16.01 (m) CD
X-COORD : 3306617.188
Y-COORD : -2018.854

HOLE No: BD-BHM207

dot.PLOT 5003 J&W

BD-BHM207 0.0 to 23.35m BOX 1 of 4

BD-BHM207 23.35 to 41.48m BOX 2 of 4

BD-BHM207 41.48 to 47.79m BOX 3 of 4

BD-BHM207 47.79 to 52.29m BOX 4 of 4

HOLE No: BD-BHM208
Sheet 1 of 3

JOB NUMBER: 07-395

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HOLE No: BD-BHM208
Sheet 1 of 3

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		28	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
SPT	1.50	60	-	-	N=13	-	-	-	-	-	-	-	-		
NWD4	1.95	29	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.00	53	-	-	N=15	-	-	-	-	-	-	-	-		
Wash Bore	3.45	0	-	-	-	-	-	-	-	-	-	-	-		
Shelby	4.50	0	-	-	Shelby	-	-	-	-	-	-	-	-		
Wash Bore	5.05	21	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.00	57	-	-	N=24	-	-	-	-	-	-	-	-		
Wash Bore	6.45	24	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.50	51	-	-	N=32	-	-	-	-	-	-	-	-		
Wash Bore	7.95	21	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.00	60	-	-	N=29	-	-	-	-	-	-	-	-		
Wash Bore	9.45	19	-	-	-	-	-	-	-	-	-	-	-		
Shelby	10.50	0	-	-	Shelby	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

Scale 1:50

0.00 Wet medium dark brown speckled orange and black medium dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds). (Logged from the wash sample).

1.95 Wet dark grey, apparently very stiff silty CLAY. (Harbour Beds).

3.00 Wet light brown speckled orange and black medium dense to dense with depth fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

8.50 Wet medium dark brown speckled orange and black medium dense to dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

HOLE No: BD-BHM208
Sheet 2 of 3

JOB NUMBER: 07-395

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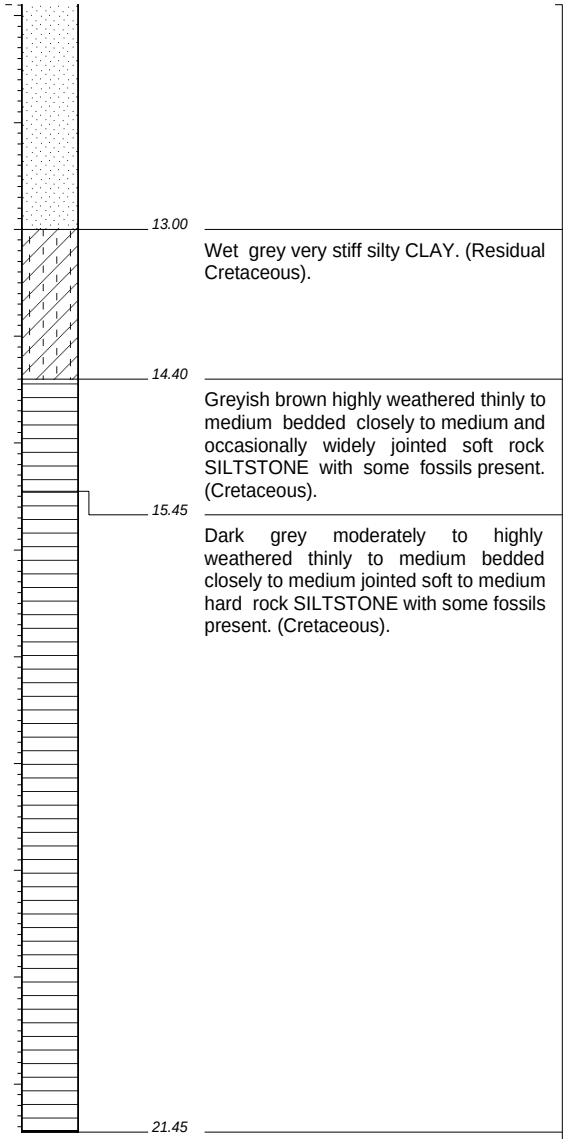
HOLE No: BD-BHM208
Sheet 2 of 3

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.05														
Wash Bore		21	-	-	-	-	-	-	-	-	-	-	-	-	
	12.00														
SPT		49	-	-	N=34	-	-	-	-	-	-	-	-	-	
	12.45														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-	-	
	13.50														
SPT		44	-	-	N=62	-	-	-	-	-	-	-	-	-	
	13.95														
NWD4		97	86	50	UCS=1.9MPa	1 2	0-10 70	C-M W	PLA-UND PLA-UND	SJ-SRJ SJ-SRJ	slt cl	<1 <1	14	3-4	
	15.45														
NWD4		80	80	27	UCS=2.5MPa	1	0-10	C-M	PLA-UND	SJ-SRJ	slt	<1	16	2-3	
	16.95														
NWD4		85	85	15	UCS=2.4MPa	1	0-10	C-M	PLA-UND	SJ-SRJ	slt	<1	19	2-3	
	18.45														
NWD4		97	97	27	-	1	0-10	C-M	PLA-UND	SJ-SRJ	slt	<1	14	3-4	
	19.95														
NWD4		98	98	47	UCS=2.2MPa	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	15	2-3	
	21.45														

DEPTH Scale 1:50



13.00 — Wet grey very stiff silty CLAY. (Residual Cretaceous).

14.40 — Greyish brown highly weathered thinly to medium bedded closely to medium and occasionally widely jointed soft rock SILTSTONE with some fossils present. (Cretaceous).

15.45 — Dark grey moderately to highly weathered thinly to medium bedded closely to medium jointed soft to medium hard rock SILTSTONE with some fossils present. (Cretaceous).

21.45

HOLE No: BD-BHM208
Sheet 3 of 3

JOB NUMBER: 07-395

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VSR-very soft rock

MOORE SPENCE JONES
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GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS

Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM208
Sheet 3 of 3

JOB NUMBER: 07-395

NOTES

1) End of borehole at 21.45m below sea floor.

2) Final depth of NW casing at 19.0m.

3) Borehole terminated due to passing tug rocking the floating platform causing the casing to snap.

4) Borehole carried out from floating platform.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : PM
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 26/06/2008
DATE : 02/07/2008

DATE : 24/02/09 16:16
TEXT : ..\BHOLES\BD-BHM~3.TXT

ELEVATION : -13.118 (m) CD
X-COORD : 3306605.55
Y-COORD : -2096.114

HOLE No: BD-BHM208

dot.PLOT 5003 J&W

BD-BHM208 0.0 to 15.45m BOX 1 of 2

BD-BHM208 15.45 to 21.45m BOX 2 of 2

HOLE No: BD-BHCPTM208
Sheet 1 of 2

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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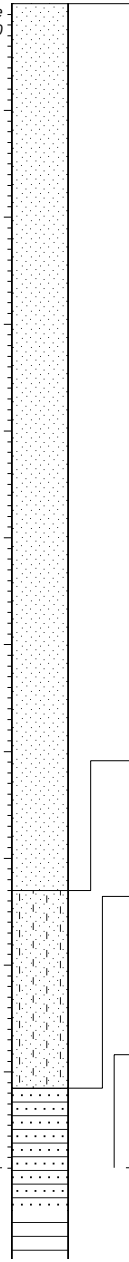
HOLE No: BD-BHCPTM208
Sheet 1 of 2

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
SPT	0.45	0	-	-	N=25	-	-	-	-	-	-	-	-		
Wash	1.45	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	1.90	0	-	-	N=26	-	-	-	-	-	-	-	-		
Wash	2.90	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	3.35	0	-	-	N=24	-	-	-	-	-	-	-	-		
Wash	4.35	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	4.80	0	-	-	N=23	-	-	-	-	-	-	-	-		
Wash	5.80	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	6.25	0	-	-	N=27	-	-	-	-	-	-	-	-		
Wash	7.25	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	7.70	0	-	-	N=27	-	-	-	-	-	-	-	-		
Wash	8.70	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.15	0	-	-	N=29	-	-	-	-	-	-	-	-		
Wash	10.15	-	-	-	-	-	-	-	-	-	-	-	-		
NWD4		26	26	11	UCS=2.512MPa	1	0-5	C-M	PLA	SJ-SRJ	slt	<1	6	2-3	

DEPTH Scale 1:50: 1 2 3 4 5 6 7 8 9 10

Scale 1:50



0.00 – No SPT recovery. Anticipate wet light yellowish brown to light bluish grey speckled white and range medium dense fine to medium grained SAND. (Harbour Beds). (Logged from the wash samples).

8.30 – Wet dark olive brown speckled white and dark bluish grey medium dense fine to medium grained slightly silty SAND. (Harbour Beds). (Logged from the wash sample).

10.15 – Light grey stained brown medium weathered thinly bedded closely to medium jointed medium hard rock SANDSTONE with shells and fossils present. (Cretaceous). Very poor core recovery.

11.30 – Slightly olivish greenish brownish dark grey highly weathered very soft to soft rock SILTSTONE with shells and fossils present. (Cretaceous).

11.90

HOLE No: BD-BHCPTM208
Sheet 2 of 2

JOB NUMBER: 07-395

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HOLE No: BD-BHCPTM208
Sheet 2 of 2

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.30														
NWD4		82	51	21	-	1	0-5	C-M	PLA	SJ-SRJ	slt	<1	5	2-3	
	12.05														
NWD4		100	90	28	UCS=1.611MPa	1	0-5	C	PLA	SJ-SRJ	slt	<1	8	3-4	
	12.80														
NWD4		100	95	81	UCS=3.922MPa	1 2	0-5 10-20	M M	PLA PLA	SRJ-MRJ SRJ-MRJ	slt slt	<1 <1	5	2-3	
	14.30														

DEPTH Scale 1:50

11.90 — Light grey stained brown medium weathered thinly bedded closely to medium jointed medium hard rock SANDSTONE with shells and fossils present. (Cretaceous).

12.05 — Slightly olivish greenish brownish dark grey highly to completely weathered very soft rock SILTSTONE with shells and fossils present. (Cretaceous).

12.80 — Olive greenish dark grey medium to highly weathered thinly bedded medium jointed soft to medium hard rock SILTSTONE with shells and fossils present. (Cretaceous).

13.80 — Light grey stained brown medium weathered medium bedded closely to medium jointed medium hard SANDSTONE with shells and fossils present. (Cretaceous).

13.95 — Olive greenish dark grey medium to highly weathered medium bedded medium jointed soft to medium hard rock SILTSTONE with shells and fossils present. (Cretaceous).

14.30

NOTES

1) End of bore at 14.30m below sea floor.

2) Final depth of NW casing at 12.0m.

3) Borehole carried out from the jack up barge.

4) This borehole was drilled at the proposed location of a marine CPT whilst waiting for berth occupation.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 11/07/2008
DATE : 02/07/2008

DATE : 24/02/09 15:29
TEXT : ..\BHOLES\BD-BHC~1.TXT

ELEVATION : -14.57 (m) CD
X-COORD : 3306624.410
Y-COORD : -2097.020

HOLE No: BD-BHCPTM208

dot.PLOT 5003 J&W

BD-CPTM208 0.00 to m 14.30m BOX 1 of 1

HOLE No: BD-BHM209
Sheet 1 of 6

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM209
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)
Wash Bore		0	-	-	-	-	-	-	-	-	-	-	-		
	1.00														
HW		40	-	-	-	-	-	-	-	-	-	-	-		
	2.50														
SPT		44	-	-	N=16	-	-	-	-	-	-	-	-		
	2.95														
HW		48	-	-	-	-	-	-	-	-	-	-	-		
	4.00														
HW		44	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		100	-	-	Shelby	-	-	-	-	-	-	-	-		
	4.97														
SPT		100	-	-	N=19	-	-	-	-	-	-	-	-		
	5.42														
HW		77	-	-	-	-	-	-	-	-	-	-	-		
	6.91														
HW		36	-	-	-	-	-	-	-	-	-	-	-		
	8.47														
HW		53	-	-	-	-	-	-	-	-	-	-	-		
	9.97														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	10.42														

DEPTH Scale 1:50

Scale 1:50

0.00

Wet dark grey to black stiff silty CLAY. (Harbour Beds).

1.2m

2

10.42

HOLE No: BD-BHM209
Sheet 2 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHM209
Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
													0 1 2 3 4 5		
HW		100	-	-	-	-	-	-	-	-	-	-	-		
	11.42														
HW		100	-	-	-	-	-	-	-	-	-	-	-		
	13.42														
SPT	13.87	44	-	-	N=32	-	-	-	-	-	-	-	-		
HW		57	-	-	-	-	-	-	-	-	-	-	-		
	15.37														
HW	15.87	100	-	-	-	-	-	-	-	-	-	-	-		
HW		23	-	-	-	-	-	-	-	-	-	-	-		
	17.37														
HW		20	-	-	-	-	-	-	-	-	-	-	-		
	18.87														
SPT	19.32	100	-	-	N=20	-	-	-	-	-	-	-	-		
HW		63	-	-	-	-	-	-	-	-	-	-	-		
	20.37														
Wash Bore		0	-	-	-	-	-	-	-	-	-	-	-		
	21.42														

DEPTH Scale 1:50

11.42 ●

Wet slightly greyish apparently medium brown speckled black medium dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds).

12.30

Wet dark grey to black stiff silty CLAY. (Harbour Beds).
At 21.42m the driller reports running sand from 21.42m to 27.32m. NW casing installed inside HW casing at this depth.

13.42m ●

21.00

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HOLE No: BD-BHM209
Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore		47	-	-	-	-	-	-	-	-	-	-	-		
	22.82														
Wash Bore		17	-	-	-	-	-	-	-	-	-	-	-		
	24.34														
Wash Bore		18	-	-	-	-	-	-	-	-	-	-	-		
	25.82														
Wash Bore		36	-	-	-	-	-	-	-	-	-	-	-		
	27.32														
Wash Bore		15	-	-	-	-	-	-	-	-	-	-	-		
	29.33														
SPT		100	-	-	N=15	-	-	-	-	-	-	-	-		
	29.78														
Wash Bore		38	-	-	-	-	-	-	-	-	-	-	-		
	30.88														
Wash Bore		38	-	-	-	-	-	-	-	-	-	-	-		
	31.80														
Wash		25	-	-	-	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

Wet, slightly greyish medium brown speckled black medium dense fine to medium grained SAND with tiny shell fragments. (Harbour Beds). (Logged from wash samples and 1 SPT sample).
At 33.30m the HW casing and NW casing jammed. All casing removed and NW casing only reinstalled.

HOLE No: BD-BHM209
Sheet 4 of 6

JOB NUMBER: 07-395

ROCK FABRIC
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HOLE No: BD-BHM209
Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Bore															
	33.30														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-	-	
	34.80														
Wash Bore		35	-	-	-	-	-	-	-	-	-	-	-	-	
	36.63														
Wash Bore		0	-	-	-	-	-	-	-	-	-	-	-	-	
	38.15														
SPT		44	-	-	N=14	-	-	-	-	-	-	-	-	-	
	38.60														
Wash Bore		21	-	-	-	-	-	-	-	-	-	-	-	-	
	40.10														
NWD4		67	-	-	UCS=2.1MPa	-	-	-	-	-	-	-	-	-	
	41.30														
NWD4		33	33	-	-	-	-	-	-	-	-	-	-	3-4	
	43.10														

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

36.63
As above but slightly greyish brown.

40.10
Wet dark blackish grey apparently firm silty CLAY. (Harbour Beds).

40.80
Light grey to dark grey highly to completely weathered thinly to medium bedded very closely to closely jointed soft rock to medium hard rock SILTSTONE with some fossils present. (Cretaceous). Very poor core recovery.

43.00

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HOLE No: BD-BHM209
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		20	20	8	-	1	0-10	C-M	PLA	SRJ	slt	<1	3	2-3	
	44.60														
NWD4		51	51	-	-	1	0-10	C-M	PLA	SRJ	slt	<1	3	3-4	
	46.10														
NWD4		20	20	-	-	1	0-10	C-M	PLA	SRJ	slt	<1	3	2	
	47.60														
NWD4		17	17	-	-	1	0-10	C-M	PLA	SRJ	slt	<1	3	2-4	
	49.10														
NWD4		97	97	21	UCS=2.9MPa	1	0-10	C-M	PLA	SRJ	slt	<1	>20	2-4	
	50.63														
NWD4		100	100	50	UCS=1.8MPa	1	0-10	C-M	PLA	SRJ	slt	<1	13	2-4	
	52.13														
NWD4		100	100	70	UCS=2.5MPa	1	0-5	M	PLA	SRJ	slt	<1	5	3-4	
	52.63														
NWD4		100	100	17	-	1	0-5	M	PLA	SRJ	slt	<1	7	3-4	

Weathering code: 0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

Light grey to olive, medium to highly weathered thinly to medium bedded closely to medium jointed very soft rock SILTSTONE with fossils. (Cretaceous). (Note: very poor core recovery to 49.10m).

HOLE No: BD-BHM209
Sheet 6 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHM209
Sheet 6 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	55.13														
NWD4		68	60	27	-	1	0-5	M	PLA	SRJ	slt	<1	9	2-3	
	56.65														
NWD4		100	100	77	UCS=2.4MPa UCS=2.4MPa	1	0-5	M	PLA	SRJ	slt	<1	6	2-3	
	58.15														
NWD4		64	64	34	-	1 2	0-5 45	M M	PLA PLA	SRJ SRJ	slt slt	<1 <1	12	2-3	
	60.63														
NWD4		78	78	30	-	1	0-5	M	PLA	SRJ	slt	<1	13	2-3	
	62.00														

DEPTH Scale 1:50

55 56 57 58 59 60 61 62

62.00

NOTES

1) End of borehole at 62.00m below sea floor.

2) Final depth of HW casing at 27.32m and NW casing at 40.10m)

3) From run 11.42 to 13.42m (2m) there are 2 drill runs on the drillers log but only 1.2m of sample in the core box.

4) Borehole carried out from jack up barge.

5) The depths on the core markers in the core boxes are labled as refernced from the deck level of the jack up barge, while the drillers log has been corrected to sea bed level.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin / Mike / Daniel
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 16/06/2008
DATE : 04/07/2008

DATE : 24/02/09 15:28
TEXT : ..\BHOLES\BD-BHM~4.TXT

ELEVATION : -13.01 (m) CD
X-COORD : 3306577.189
Y-COORD : -2218.109

HOLE No: BD-BHM209

dot.PLOT 5003 J&W

BD-BHM209 18.00 to 30.30m BOX 1 of 5

Core markers in the core box indicate that the drilling started from the top of the jackup barge at 18.0m and not from sea bed level at 0m.

BD-BHM209 30.30 to 40.82m BOX 2 of 5

BD-BHM209 40.82 to 58.80m BOX 3 of 5

BD-BHM209 58.80 to 70.84m BOX 4 of 5

BD-BHM209 70.84 to 80.00m BOX 5 of 5

HOLE No: BD-BHM210
Sheet 1 of 3

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
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GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS

Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210
Sheet 1 of 3

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		45	32	6	-	-	-	-	-	-	-	-	-		
	1.50														
NWD4		20	0	0	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		51	-	-	N=37	-	-	-	-	-	-	-	-		
	3.45														
NWD4		77	-	-	-	-	-	-	-	-	-	-	-		
	4.50														
Shelby		0	-	-	-	-	-	-	-	-	-	-	-		
	4.60														
NWD4		7	5	-	-	-	-	-	-	-	-	-	-		
	6.00														
NWD4		9	5	-	-	-	-	-	-	-	-	-	-		
	7.50														
NWD4		20	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
SPT		44	-	-	N=64	-	-	-	-	-	-	-	-		
	9.45														
NWD4		67	-	-	-	-	-	-	-	-	-	-	-		
	10.50														

Fracture Frequency: 0 1 2 3 4 5

DEPTH Scale 1:50: 1 2 3 4 5 6 7 8 9 10

Scale 1:50

0.00 — Light greyish blue pinkish grey and bluish grey slightly weathered subangular cobbles and boulders of Sandstone Shale and Tillite. (Quay Wall Rockfill).

3.00 — Moist dark bluish grey stiff intact slightly silty CLAY. (Harbour Beds).

4.50 — Light greyish blue pinkish grey and bluish grey slightly weathered subangular cobbles and boulders of Sandstone, Shale and Tillite. (Quay Wall Rockfill). Suspect collapse of rockfill material from above. (Difficult to explain rockfill below Harbour Beds. Could be material falling down casing?).
At 6.00m the driller reports having to change the casing shoe.

7.50 — Moist dark bluish grey very stiff intact slightly silty CLAY. (Harbour Beds). Shattered structure from 15.14-15.50m.
Shelby refused at 10.50m.

HOLE No: BD-BHM210
Sheet 2 of 3

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
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MG -medium grain
CG -coarse grain

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SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
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IRR-irregular

ROCK HARDNESS
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

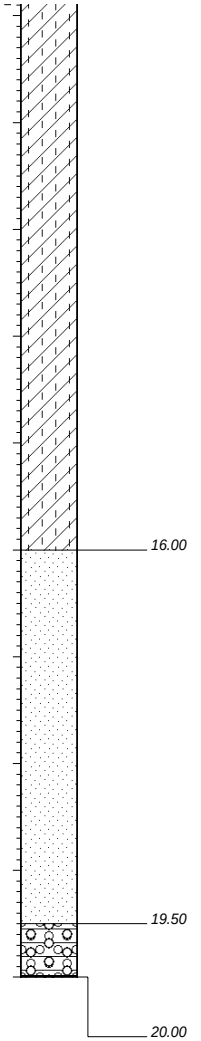
HOLE No: BD-BHM210
Sheet 2 of 3

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
														0 1 2 3 4 5	
NWD4		29	-	-	-	-	-	-	-	-	-	-	-		
	12.00														
SPT		47	-	-	N=54	-	-	-	-	-	-	-	-		
	12.45														
NWD4		65	-	-	-	-	-	-	-	-	-	-	-		
	13.50														
NWD4		39	-	-	-	-	-	-	-	-	-	-	-		
	15.00														
NWD4		71	-	-	-	-	-	-	-	-	-	-	-		
	16.50														
SPT		40	-	-	N=18	-	-	-	-	-	-	-	-		
	16.95														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	18.00														
Wash Bored		-	-	-	-	-	-	-	-	-	-	-	-		
	19.50														
NWD4		36	0	0	-	-	-	-	-	-	-	-	-		
	20.00														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20



16.00 — Wet orangey brown streaked bluish grey speckled white orange and black medium dense fine to medium grained SAND. (Harbour Beds). (Logged from the wash sample and 1 SPT sample).

19.50 — Wet bluish grey large gravel and cobbles of fresh Tillite. (Quay Wall Rockfill). (Material appears to have fallen down casing from upper layer).

20.00

HOLE No: BD-BHM210
Sheet 3 of 3

JOB NUMBER: 07-395

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MF -massive
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CF -cleaved
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GF -gneissose
LF -laminated

GRAIN SIZE
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Client: TRANSNET PROJECTS
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HOLE No: BD-BHM210
Sheet 3 of 3

JOB NUMBER: 07-395

NOTES

1) End of borehole at 20.00m below sea floor.

2) Final depth of NW casing at 19.5m.

3) Significant Tillite quay wall rockfill were found in the Harbour bed material at depths 4.50-7.50m and 19.50-20.0m.

4) At 20.0m driller reports the casing shoe needed replacing and all casing was removed from the borehole.

5) Borehole carried out from floating platform.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Petrus
PROFILED BY : BC

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 03/07/2008
DATE : 30/07/2008

DATE : 24/02/09 15:29
TEXT : ..\BHOLES\BD5875~1.TXT

ELEVATION : -12.82 (m) CD
X-COORD : 3306557.380
Y-COORD : -2278.051

HOLE No: BD-BHM210

dot.PLOT 5003 J&W

BD-BHM210 0.00 to 15.50m BOX 1 of 2

BD-BHM210 15.50 to 20.00m BOX 2 of 2

HOLE No: BD-BHM210A
Sheet 1 of 7

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210A
Sheet 1 of 7

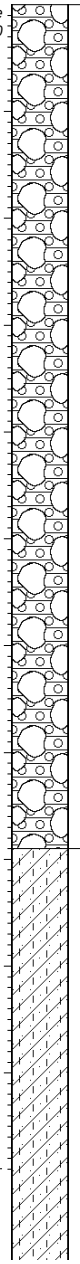
JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4	1.30	16	16	-	-	-	-	-	-	-	-	-	-		
NWD4	2.80	0	-	-	-	-	-	-	-	-	-	-	-		
NWD4	4.80	0	-	-	-	-	-	-	-	-	-	-	-		
NWD4	6.40	0	-	-	-	-	-	-	-	-	-	-	-		
NWD4	7.90	7	-	-	-	-	-	-	-	-	-	-	-		
NWD4	9.40	-	-	-	-	-	-	-	-	-	-	-	-		
SPT	9.85	33	-	-	N=48	-	-	-	-	-	-	-	-		
NWD4		-	-	-	-	-	-	-	-	-	-	-	-		

0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50



0.00

Angular to subangular boulders of bluish grey slightly weathered hard to very hard rock Tillite. (Quay Wall Rockfill/Rip Rap).

7.90

Wet dark grey to very dark olive grey very stiff very silty CLAY. (Harbour Beds). Becomes slightly sandy with depth.

HOLE No: BD-BHM210A
Sheet 2 of 7

JOB NUMBER: 07-395

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210A
Sheet 2 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	11.15														
SPT		44	-	-	N=46	-	-	-	-	-	-	-	-		
	11.60														
Shelby		100	-	-	-	-	-	-	-	-	-	-	-		
	11.96														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	12.57														
Solid Tube		100	-	-	-	-	-	-	-	-	-	-	-		
	14.07														
NWD4		0	-	-	-	-	-	-	-	-	-	-	-		
	15.57														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	16.07														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	16.57														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	17.07														
NWD4		80	-	-	-	-	-	-	-	-	-	-	-		
	18.07														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-		
	19.65														
SPT		44	-	-	N=25	-	-	-	-	-	-	-	-		
	20.10														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-		
	21.15														
SPT		44	-	-	N=27	-	-	-	-	-	-	-	-		
	21.60														

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

18.50

Wet dark brown medium dense to dense with depth silty fine to medium grained SAND. (Harbour Beds).

ROCK FABRIC
MF -massive
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GRAIN SIZE
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210A
Sheet 3 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	22.65														
SPT		44	-	-	N=33	-	-	-	-	-	-	-	-		
	23.10														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	24.10														
SPT		33	-	-	N=31	-	-	-	-	-	-	-	-		
	24.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	25.60														
SPT		100	-	-	N=34	-	-	-	-	-	-	-	-		
	26.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	27.10														
SPT		100	-	-	N=37	-	-	-	-	-	-	-	-		
	27.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	28.60														
SPT		100	-	-	N=34	-	-	-	-	-	-	-	-		
	29.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	30.10														
SPT		100	-	-	N=37	-	-	-	-	-	-	-	-		
	30.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	31.60														
SPT		100	-	-	N=34	-	-	-	-	-	-	-	-		
	32.05														
Wash		-	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22
23
24
25
26
27
28
29
30
31
32

23.10

Wet orangey brown dense silty fine to medium grained SAND with sparse shell fragments. (Harbour Beds).

HOLE No: BD-BHM210A
Sheet 4 of 7

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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HOLE No: BD-BHM210A
Sheet 4 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
														0 1 2 3 4 5	
Bore															
SPT	33.10	100	-	-	N=37	-	-	-	-	-	-	-	-		
	33.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	34.60														
SPT		100	-	-	N=38	-	-	-	-	-	-	-	-		
	35.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	36.10														
SPT		100	-	-	N=34	-	-	-	-	-	-	-	-		
	36.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	37.60														
SPT		100	-	-	N=39	-	-	-	-	-	-	-	-		
	38.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	38.60														
SPT		44	-	-	N=41	-	-	-	-	-	-	-	-		
	39.05														
Wash Bore		38	-	-	-	-	-	-	-	-	-	-	-		
	40.10														
SPT		44	-	-	N=45	-	-	-	-	-	-	-	-		
	40.55														
Wash Bore		43	-	-	-	-	-	-	-	-	-	-	-		
	41.60														
SPT		47	-	-	N=50	-	-	-	-	-	-	-	-		
	42.05														
Wash Bore		24	-	-	-	-	-	-	-	-	-	-	-		
	43.10														
SPT		44	-	-	N=51	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

33 34 35 36 37 38 39 40 41 42 43

39.50

Wet very dark greyish brown dense to very dense with depth clayey silty fine grained SAND with sparse shell fragments. (Harbour Beds).

HOLE No: BD-BHM210A
Sheet 5 of 7

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
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HOLE No: BD-BHM210A
Sheet 5 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	43.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	44.60														
SPT		47	-	-	N=52	-	-	-	-	-	-	-	-		
	45.05														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	46.10														
SPT		100	-	-	N=44	-	-	-	-	-	-	-	-		
	46.55														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	48.00														
SPT		100	-	-	N=50	-	-	-	-	-	-	-	-		
	48.45														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	49.55														
SPT		100	-	-	N=55	-	-	-	-	-	-	-	-		
	50.00														
NWD4		100	100	25	-	1	90	M	UND	SRJ	slt	1	-		
	50.50														
NWD4		95	20	0	-	1	90	C	IRR	MRJ	slt	1	-		
	51.00														
NWD4		85	22	0	-	1	90	C	IRR	MRJ	slt	1	-		
	51.75														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	52.25														
		-	-	-	-	-	-	-	-	-	-	-	-		
	52.65														
NWD4		98	60	0	-	1	90	M	UND	SRJ	slt	1	-		
	53.25														
Wash Bore		-	-	-	-	-	-	-	-	-	-	-	-		
	53.75														
NWD4		54	54	-	-	-	-	-	-	-	-	-	-		
	54.25														
Wash		-	-	-											

Fracture Frequency: 0 1 2 3 4 5

DEPTH Scale 1:50

44 45 46 47 48 49 50 51 52 53 54

50.00

Dark olive grey medium to completely weathered very soft rock SILTSTONE with lenses / bands of medium hard rock and some lenses of residual dark grey medium to coarse grained SAND. (Cretaceous).

HOLE No: BD-BHM210A
Sheet 6 of 7

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
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IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210A
Sheet 6 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Bore	54.75	-	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	55.25	-	-	-	-	-	-	-	-	-	-	-	-		
NWD4	55.75	100	100	33	-	1	90	C	UND	MRJ	slt	1	>20		
NWD4	56.25	68	68	-	-	-	-	-	-	-	-	-	-		
NWD4	56.75	100	100	60	-	1	0-50	C-M	UND	SRJ	slt	<1	6		
NWD4	57.25	100	100	80	-	1	0-50	C-M	UND	SRJ	slt	<1	2		
NWD4	57.75	100	100	80	-	1	0-50	C-M	UND	SRJ	slt	<1	4		
NWD4	58.25	72	72	70	-	1	0-50	C-M	UND	SRJ	slt	<1	4		
NWD4	58.75	76	76	-	-	1	0-50	C-M	UND	SRJ	slt	<1	8		
NWD4	60.25	100	100	67	-	1	0-50	C-M	UND	SRJ	slt	<1	7		
NWD4	61.00	93	93	93	-	1 2	0-50 65	M M	UND UND	SRJ SRJ	slt slt	<1 <1	2		
NWD4	61.70	97	97	43	-	1	0-50	C-M	UND	SRJ	slt	<1	5		
NWD4	62.50	100	100	75	-	1	0-50	C-M	UND	MRJ	slt	<1	13		
NWD4	63.30	100	100	81	-	1	0-50	M	UND	SRJ	slt	<1	4		
NWD4	63.90	100	100	-	-	-	-	-	-	-	-	-	-		
NWD4		100	100	73	-	1	0-50	M	UND	SRJ	slt	<1	9		

0 1 2 3 4 5

DEPTH Scale 1:50

55 56 57 58 59 60 61 62 63 64 65

55.25

Very dark olivish grey medium weathered soft rock SILTSTONE with abundant fossils. (Cretaceous).

56.25

As above but medium weathered soft to medium hard rock SILTSTONE with abundant fossils. (Cretaceous). With lenses of completely weathered very soft rock Siltstone at 63.30-63.90m.

HOLE No: BD-BHM210A
Sheet 7 of 7

JOB NUMBER: 07-395

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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM210A
Sheet 7 of 7

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	65.40														
NWD4		100	100	86	-	1	5	C	UND	SRJ	slt	<1	8		
	66.90														
NWD4		100	100	80	-	1	0-10	C-M	UND	SRJ	slt	<1	10		
	68.40														

DEPTH Scale 1:50

66
67
68

68.40

NOTES

1) End of borehole at 68.40m below sea floor.

2) Final depth of NW casing at 46.0m.

3) Borehole carried out from jack up barge.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin/ Mike / Lawrence
PROFILED BY : LD

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 01/09/2008
DATE : 25/09/2008

DATE : 04/03/09 14:06
TEXT : ..\BHOLES\BDCF87~1.TXT

ELEVATION : -13.205 (m) CD
X-COORD : 3306551.300
Y-COORD : -2280.970

HOLE No: BD-BHM210A

dot.PLOT 5003 J&W

BD-BHM210A 0.00 to m 17.05m BOX 1 of 6

BD-BHM210A 17.05 to 32.05m BOX 2 of 6

BD-BHM210A 32.05 to 46.55m BOX 3 of 6

BD-BHM210A 46.55 to 55.25m BOX 4 of 6

BD-BHM210A 55.25 to 61.70m BOX 5 of 6

BD-BHM210A 61.70 to 68.40m BOX 6 of 6

HOLE No: BD-BHM211
Sheet 1 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHM211
Sheet 1 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
NWD4		63	-	-	-	-	-	-	-	-	-	-	-		
	1.50														
NWD4		82	-	-	-	-	-	-	-	-	-	-	-		
	3.00														
SPT		100	-	-	N=18	-	-	-	-	-	-	-	-		
	3.45														
NWD4		67	-	-	-	-	-	-	-	-	-	-	-		
	4.95														
NWD4		41	-	-	-	-	-	-	-	-	-	-	-		
	6.00														
NWD4		43	-	-	-	-	-	-	-	-	-	-	-		
	7.50														
Shelby		100	-	-	Shelby	-	-	-	-	-	-	-	-		
	8.05														
NWD4		100	-	-	-	-	-	-	-	-	-	-	-		
	9.00														
NWD4		71	-	-	-	-	-	-	-	-	-	-	-		
	10.40														
SPT		100	-	-	N=24	-	-	-	-	-	-	-	-		

Fracture Frequency: 0 1 2 3 4 5

DEPTH Scale 1:50

Scale 1:50

Wet dark grey to brownish dark grey stiff shattered silty CLAY. (Harbour Beds).

HOLE No: BD-BHM211
Sheet 2 of 6

JOB NUMBER: 07-395

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HOLE No: BD-BHM211
Sheet 2 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	10.85														
NWD4		48	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	11.90														
NWD4		100	-	-	N=22	-	-	-	-	-	-	-	-		
	12.35														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-		
	13.40														
SPT		100	-	-	N=12	-	-	-	-	-	-	-	-		
	13.85														
Wash Bore		100	-	-	-	-	-	-	-	-	-	-	-		
	14.90														
Solid Tube		100	-	-	-	-	-	-	-	-	-	-	-		
	16.40														
SPT		100	-	-	N=16	-	-	-	-	-	-	-	-		
	16.85														
Wash Bore		97	-	-	-	-	-	-	-	-	-	-	-		
	17.90														
Wash Bore		32	-	-	-	-	-	-	-	-	-	-	-		
	19.40														
Wash Bore		17	-	-	-	-	-	-	-	-	-	-	-		
	20.90														
Wash		27	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

11 12 13 14 15 16 17 18 19 20 21

0.00

17.00 — Wet greyish light brown speckled black and orange medium dense fine grained SAND. (Harbour Beds). (Logged from the wash sample).

19.40 — Wet orangey brown medium dense fine grained SAND. (Harbour Beds). (Logged from the wash sample and 1 SPT sample).

HOLE No: BD-BHM211
Sheet 3 of 6

JOB NUMBER: 07-395

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JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHM211
Sheet 3 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Bore															
	22.40														
SPT		100	-	-	N=24	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
	22.85														
Wash Bore		31	-	-	-	-	-	-	-	-	-	-	-		
	23.90														
Wash Bore		20	-	-	-	-	-	-	-	-	-	-	-		
	25.40														
SPT		100	-	-	N=22	-	-	-	-	-	-	-	-		
	25.85														
Wash Bore		27	-	-	-	-	-	-	-	-	-	-	-		
	26.90														
Wash Bore		21	-	-	-	-	-	-	-	-	-	-	-		
	28.40														
SPT		100	-	-	N=23	-	-	-	-	-	-	-	-		
	28.85														
Wash Bore		29	-	-	-	-	-	-	-	-	-	-	-		
	29.90														
Wash Bore		18	-	-	-	-	-	-	-	-	-	-	-		
	31.40														
SPT		100	-	-	N=22	-	-	-	-	-	-	-	-		
	31.85														
Wash Bore		24	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

22 23 24 25 26 27 28 29 30 31 32

23.90

Wet dark greyish brown medium dense fine to medium grained SAND. (Harbour Beds).

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HOLE No: BD-BHM211
Sheet 4 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	32.90													0 1 2 3 4 5	
Wash Bore		17	-	-	-	-	-	-	-	-	-	-	-		
	34.40														
Wash Bore		27	-	-	-	-	-	-	-	-	-	-	-		
	35.45														
SPT		100	-	-	N=65	-	-	-	-	-	-	-	-		
	35.90														
Wash Bore		41	-	-	-	-	-	-	-	-	-	-	-		
	37.50														
Wash Bore		41	-	-	-	-	-	-	-	-	-	-	-		
	38.80														
SPT		0	-	-	N=60	-	-	-	-	-	-	-	-		
	39.25														
Wash Bore		40	-	-	-	-	-	-	-	-	-	-	-		
	40.75														
Wash Bore		47	-	-	-	-	-	-	-	-	-	-	-		
	42.25														
NWD4		47	10	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

33
34
35
36
37
38
39
40
41
42
43

34.40

Wet light greyish brown very dense fine to medium grained SAND. (Harbour Beds). (Logged from the wash sample and 1 SPT sample).

42.75

HOLE No: BD-BHM211
Sheet 5 of 6

JOB NUMBER: 07-395

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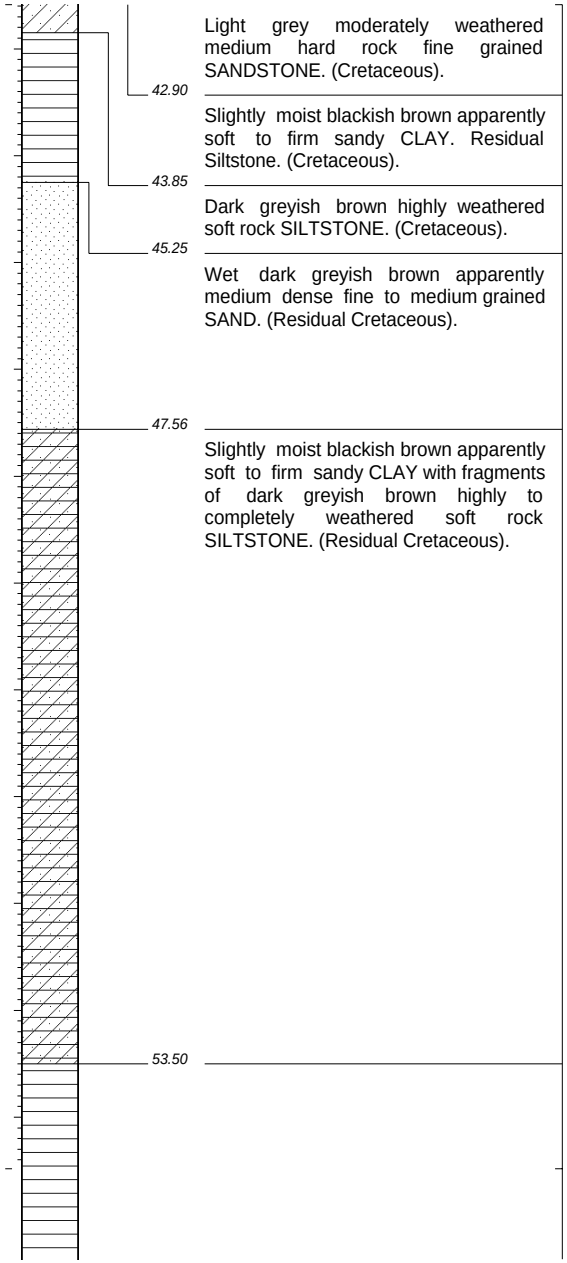
HOLE No: BD-BHM211
Sheet 5 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	43.75														
NWD4		68	60	20	UCS=1.875MPa	-	-	-	-	-	-	-	-		
	45.25														
Wash Bore		52	-	-	-	-	-	-	-	-	-	-	-		
	46.06														
Wash Bore		27	-	-	-	-	-	-	-	-	-	-	-		
	47.56														
NWD4		63	13	-	-	-	-	-	-	-	-	-	-		
	49.06														
NWD4		87	20	-	-	-	-	-	-	-	-	-	-		
	50.56														
NWD4		53	47	-	-	-	-	-	-	-	-	-	-		
	52.06														
NWD4		41	7	-	-	-	-	-	-	-	-	-	-		
	53.56														
NWD4		29	29	-	-	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	5	0 1 2 3 4 5	

DEPTH Scale 1:50



Light grey moderately weathered medium hard rock fine grained SANDSTONE. (Cretaceous).

Slightly moist blackish brown apparently soft to firm sandy CLAY. Residual Siltstone. (Cretaceous).

Dark greyish brown highly weathered soft rock SILTSTONE. (Cretaceous).

Wet dark greyish brown apparently medium dense fine to medium grained SAND. (Residual Cretaceous).

Slightly moist blackish brown apparently soft to firm sandy CLAY with fragments of dark greyish brown highly to completely weathered soft rock SILTSTONE. (Residual Cretaceous).

HOLE No: BD-BHM211
Sheet 6 of 6

JOB NUMBER: 07-395

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Sheet 6 of 6

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
	55.06														
NWD4		64	64	-	-	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	13		
	56.56														
NWD4		53	36	-	-	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	5		
	57.94														
NWD4		87	80	-	UCS=2.152MPa	1 2	0-5 75-85	C-M C	PLA-UND PLA	SJ-SRJ SJ-SRJ	slt slt	<1 <1	4		
	59.44														
NWD4		100	100	17	UCS=1.830MPa UCS=2.10MPa	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	9		
	60.94														
		33	33	17	UCS=1.131MPa	1	0-5	C-M	PLA-UND	SJ-SRJ	slt	<1	3		
	61.44														
NWD4		0	0	0	-	-	-	-	-	-	-	-	-		
	62.44														

0 1 2 3 4 5

DEPTH Scale 1:50

55 56 57 58 59 60 61 62

Light grey to dark grey moderately to completely weathered thinly to medium bedded closely to medium jointed soft to medium hard rock SILTSTONE with some fossils present. (Cretaceous). Note: Clay lenses at the following depths of 57.63-57.83m and 59.28-59.44m.

61.44

No core recovery. Core dropped out of core barrel.

62.44

NOTES

1) End of borehole at 62.44m below sea floor.

2) Final depth of HW casing at 38.5m and NW casing at 59.44m. (Interpreted from the driller's log).

3) Borehole carried out from jack up barge.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Martin/ Mike/ Lawrence
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 03/07/2008
DATE : 21/07/2008

DATE : 24/02/09 16:18
TEXT : ..\BHOLES\BD5C75~1.TXT

ELEVATION : -12.187 (m) CD
X-COORD : 3306547.080
Y-COORD : -2356.105

HOLE No: BD-BHM211

dot.PLOT 5003 J&W

BD-BHM211 0.00 to m 9.63m BOX 1 of 5

BD-BHM211 9.63 to 20.90m BOX 2 of 5

BD-BHM211 20.90 to 40.75m BOX 3 of 5

BD-BHM211 40.75 to 53.56m BOX 4 of 5

BD-BHM211 53.56 to 61.44m BOX 5 of 5

HOLE No: BD-BHP2A
Sheet 1 of 2

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

MOORE SPENCE JONES
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GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS

Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHP2A
Sheet 1 of 2

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50
Wash Bore	1.50	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5		1
Wash Bore	3.00	100	-	-	-	-	-	-	-	-	-	-	-			2
Wash Bore	4.50	100	-	-	-	-	-	-	-	-	-	-	-			3
Wash Bore	6.00	100	-	-	-	-	-	-	-	-	-	-	-			4
Wash Bore	7.50	100	-	-	-	-	-	-	-	-	-	-	-			5
Wash Bore	9.00	100	-	-	-	-	-	-	-	-	-	-	-			6
Wash Bore	10.50	100	-	-	-	-	-	-	-	-	-	-	-			7
																8
																9
																10

Scale 1:50

Slightly moist light brown apparently loose to medium dense fine to medium grained SAND. (Hydraulic Fill). (Logged from the wash sample).

HOLE No: BD-BHP2A
Sheet 2 of 2

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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VWJ-very wide spacng

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RJ -rough

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PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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SR -soft rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

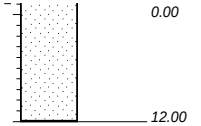
HOLE No: BD-BHP2A
Sheet 2 of 2

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore	12.00	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	

DEPTH Scale 1:50

11
12



NOTES

1) End of borehole at 12.00m below ground level.

2) Final depth of NW casing at 12.0m.

3) Drilled without Bentonite or Eezimix.

4) Backfill for 0.5m with sand, install piezo of 11.5m length, fill up with sand for 1.5m, install bentonite seal and complete filling of the borehole with bentonite and cement.

5) A steel piezo cap was installed.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Lawrence
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 04/12/2008
DATE : 11/02/2009

DATE : 17/02/09 12:21
TEXT : ..\BHOLES\OTHERS\BHP2A.TXT

ELEVATION : 3.730 (m) CD
X-COORD : 3306755.416
Y-COORD : -1619.162

HOLE No: BD-BHP2A

dot.PLOT 5003 J&W

HOLE No: BD-BHP2B
Sheet 1 of 2

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
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GF -gneissose
LF -laminated

GRAIN SIZE
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IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
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SR -soft rock
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHP2B
Sheet 1 of 2

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore	1.50	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	3.00	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	4.50	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	6.00	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	7.50	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	
Wash Bore	9.00	100	-	-	-	-	-	-	-	-	-	-	-	0 1 2 3 4 5	

DEPTH Scale 1:50

Scale 1:50

0.00

Slightly moist light brown apparently medium dense fine to medium grained SAND. (Hydraulic Fill). (Logged from the wash sample).

9.00

HOLE No: BD-BHP2B
Sheet 2 of 2

JOB NUMBER: 07-395

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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHP2B
Sheet 2 of 2

JOB NUMBER: 07-395

NOTES

1) End of borehole at 9.00m below ground level.

2) Final depth of NW casing at 9.0m.

3) Drilled without Bentonite or Eezimix.

4) Backfill for 0.5m with sand, install piezo of 8.5m length, fill up with sand for 1.5m, install bentonite seal and complete filling of the borehole with bentonite and cement.

5) A steel piezo cap was installed.

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code (0 1 2 3 4 5)	Elevation (m.a.m.s.l.)	DEPTH Scale 1:50

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Lawrence
PROFILED BY : SAP
TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 05/12/2008
DATE : 11/02/2009
DATE : 17/02/09 12:24
TEXT : ..\BHOLES\OTHERS\BHP2B.TXT

ELEVATION : 3.728 (m) CD
X-COORD : 3306754.974
Y-COORD : -1621.113

HOLE No: BD-BHP2B

dot.PLOT 5003 J&W

HOLE No: BD-BHP2C
Sheet 1 of 1

JOB NUMBER: 07-395

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
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LF -laminated

GRAIN SIZE
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Client: TRANSNET PROJECTS
Project name: **Durban Harbour Berth Deepening**

HOLE No: BD-BHP2C
Sheet 1 of 1

JOB NUMBER: 07-395

Drill Method and Size	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Test Results	Set No.	Inclination (°)	Spacing	Joint shape	Roughness	Fill type	Fill thickness (mm)	Fracture Frequency	Weathering code	Elevation (m.a.m.s.l.)
Wash Bore	1.50	100	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	3.00	100	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	4.50	100	-	-	-	-	-	-	-	-	-	-	-		
Wash Bore	6.00	100	-	-	-	-	-	-	-	-	-	-	-		

DEPTH Scale 1:50

0 1 2 3 4 5 6

Scale 1:50

0.00

Slightly moist light brown apparently medium dense fine to coarse grained SAND. (Hydraulic Fill). (Logged from the wash sample).

6.00

NOTES

1) End of borehole at 6.00m below ground level.

2) Final depth of NW casing at 6.0m.

3) Drilled without Bentonite or Eezimix.

4) Backfill for 0.5m with sand, install piezo of 5.5m length, fill up with sand for 1.5m, install bentonite seal and complete filling of the borehole with bentonite and cement.

5) A steel piezo cap was installed.

CONTRACTOR : Geopractica
MACHINE :
DRILLED BY : Lawrence
PROFILED BY : SAP

TYPE SET BY : Rev 0
SETUP FILE : MSJA3.SET

INCLINATION : 90°
DIAM : N
DATE : 05/12/2008
DATE : 11/02/2009

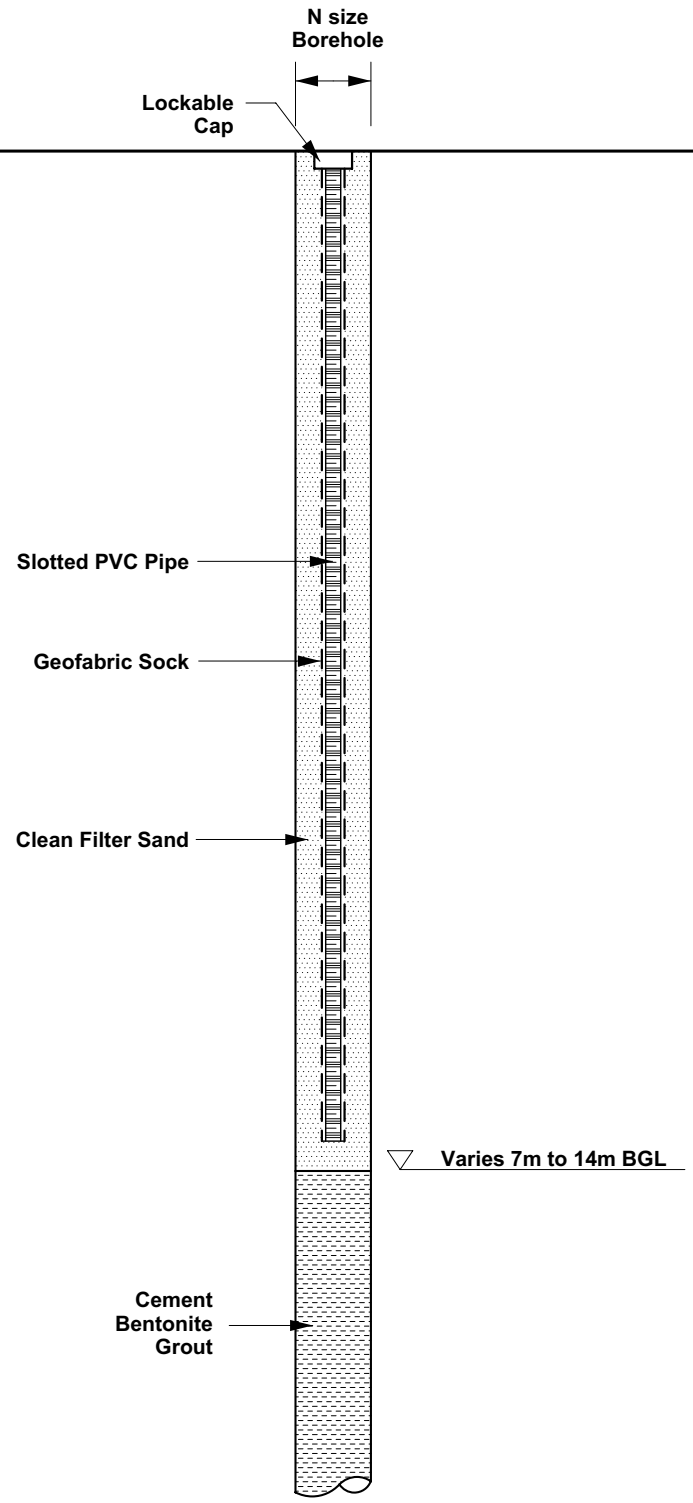
DATE : 17/02/09 12:21
TEXT : ..\BHOLES\OTHERS\BHP2C.TXT

ELEVATION : 3.720 (m) CD
X-COORD : 3306754.532
Y-COORD : -1623.063

HOLE No: BD-BHP2C

dot.PLOT 5003 J&W

APPENDIX B



Sketch of Typical Piezometer in Land Based Borehole : Phases 1 to 3

Not to Scale

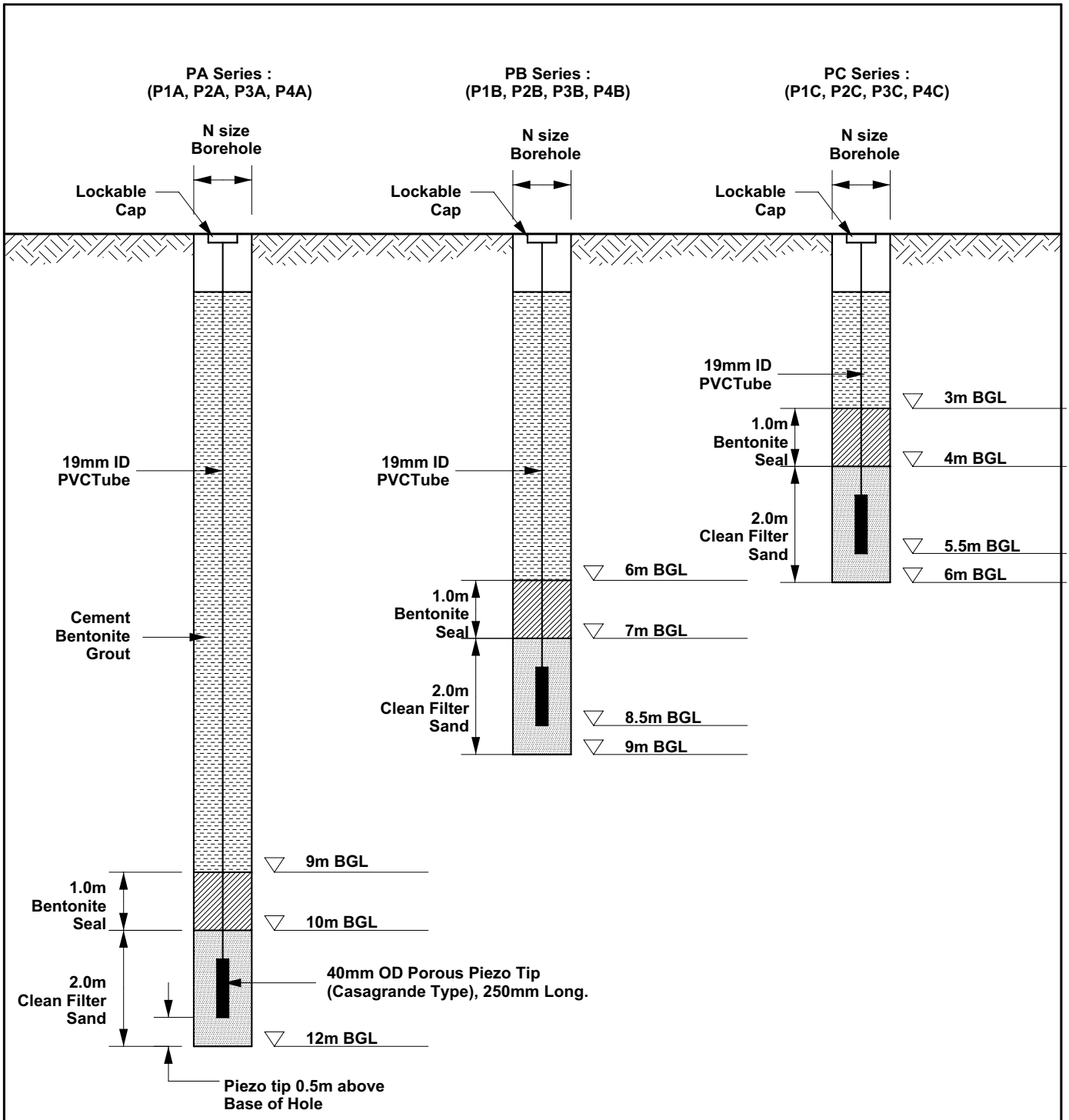
TRANSNET PROJECTS

Durban Berth Deepening Feasability Study, Port of Durban.

MOORE SPENCE JONES
CONSULTING GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS
CONSULTING GEOLOGISTS & SCIENTISTS

DATE	16/02/2009
DRAWN	A.S.
CHECK	M.R.
REFERENCE No.	07 -395
STANDARD DETAIL	1

BOREHOLE SECTIONS/LAND BOREHOLE DETAIL.DRG



Sketch of Multi Level Piezometer Installation in Boreholes :
P1A to P1C
P2A to P2C
P3A to P3C and
P4A to P4C

Not to Scale

TRANSNET PROJECTS

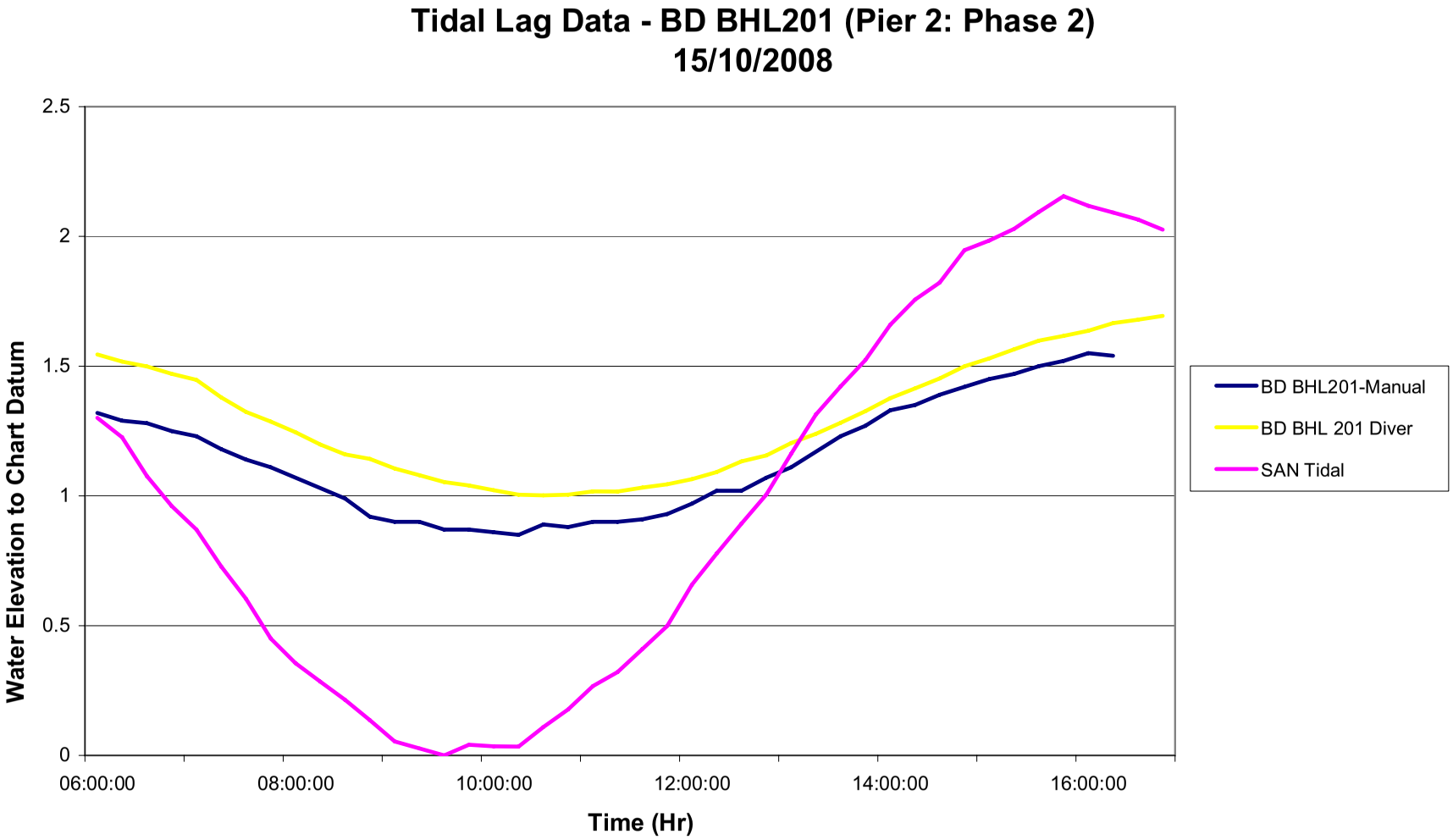
Durban Berth Deepening Feasability Study, Port of Durban.

MOORE SPENCE JONES
CONSULTING GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS
CONSULTING GEOLOGISTS & SCIENTISTS

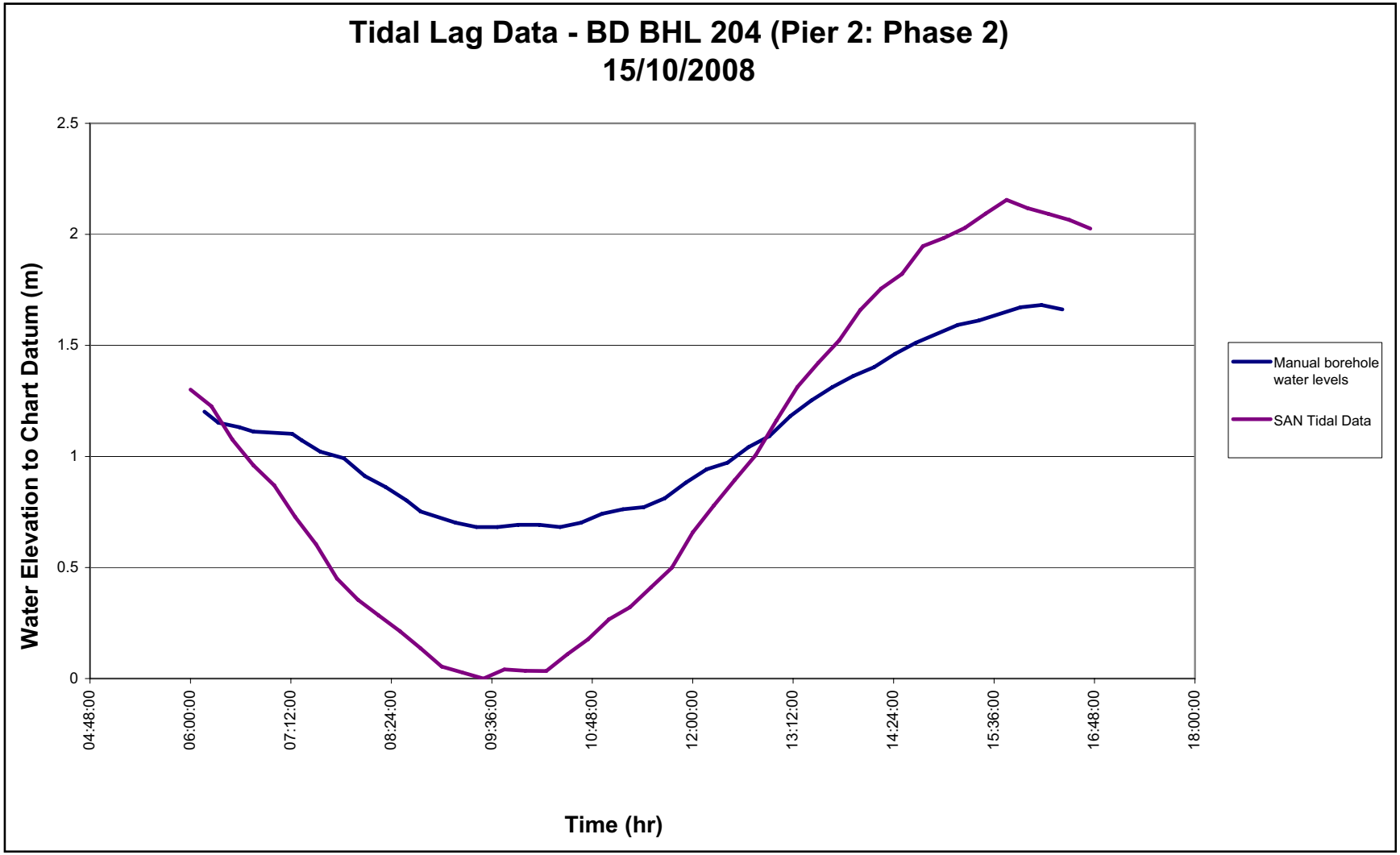
DATE	16/02/2009
DRAWN	A.S.
CHECK	M.R.
REFERENCE No.	07 -395
STANDARD DETAIL	2

BOREHOLE SECTIONS/MULTI PIEZO DETAIL.DRG

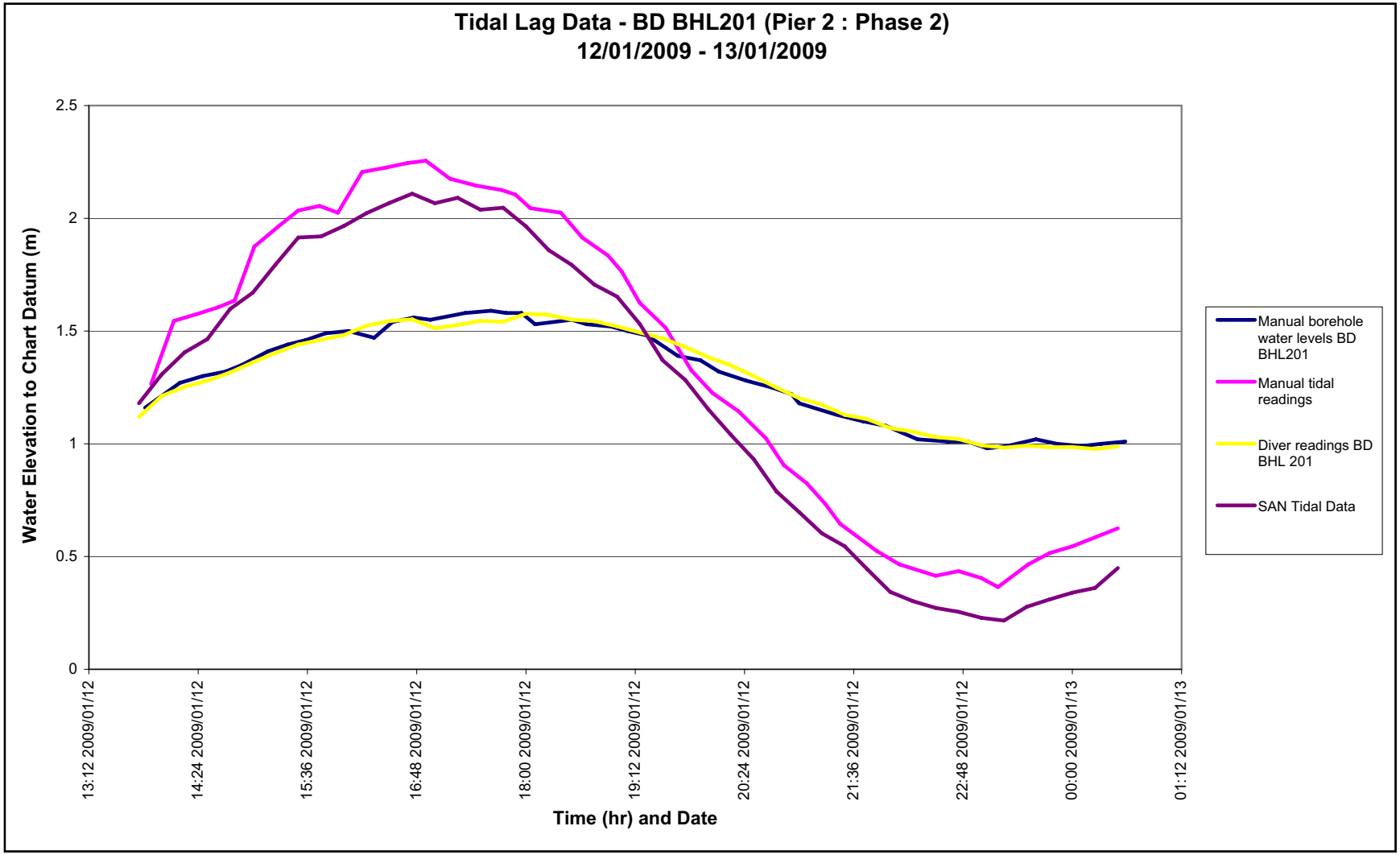
APPENDIX C


Tidal Lag Data - BD BHL201 (Pier 2: Phase 2)
15/10/2008
Water Elevation to Chart Datum
2.5
2
1.5
1
0.5
0
06:00:00
08:00:00
10:00:00
12:00:00
14:00:00
16:00:00
Time (Hr)
BD BHL201-Manual
BD BHL 201 Diver
SAN Tidal

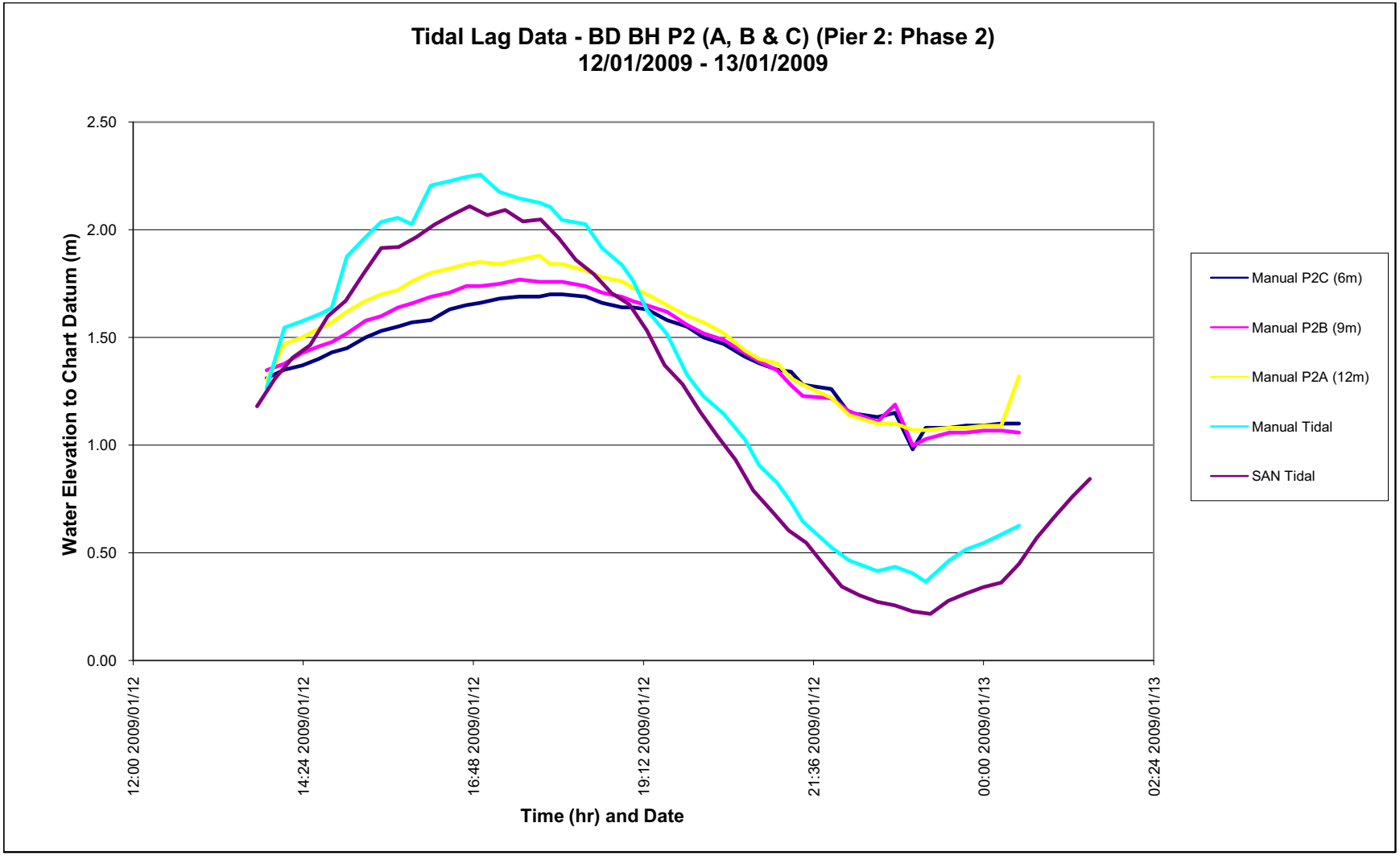
Time (hr)	BD BHL 201 - Manual water depth reading (m BGL)	BD BHL 201 - Manual water depth reading (subtracted from 3.63m Top of borehole level) (m CD)	Time (hr) of Diver reading BD BHL 201	BD BHL 201 Diver data	Atmospheric pressure 12 Jan (HectoPascals = Millibars)	Conversion to Kilopascals	Conversion to water column (m)	Elevation Corrected Zero Point Offset value for 4m elevation	Net Barometric Pressure	Diver reading corrected for atmospheric pressure	Salinity Correction Divide by 1.025	Diver readings corrected for length of Diver line (subtracted from 10m) Depth of water (m BGL)	Final corrected Diver reading (subtract from 3.63m Top of borehole level) (m CD)	Time (hr) of SAN data	SA Navy Tidal data (m CD)
06:00:00	2.31	1.32	06:00:00	9.0525	1021	102.1	10.43462	9.495157385	0.939	8.113	7.915	2.085	1.545	06:00:00	1.301
06:15:00	2.34	1.29	06:15:00	9.02389					0.939	8.085	7.888	2.112	1.518	06:15:00	1.226
06:30:00	2.35	1.28	06:30:00	9.00483					0.939	8.066	7.869	2.131	1.499	06:30:00	1.076
06:45:00	2.38	1.25	06:45:00	8.97552					0.939	8.037	7.841	2.159	1.471	06:45:00	0.961
07:00:00	2.4	1.23	07:00:00	8.95146					0.939	8.012	7.817	2.183	1.447	07:00:00	0.87
07:15:00	2.45	1.18	07:15:00	8.8824					0.939	7.943	7.750	2.250	1.380	07:15:00	0.728
07:30:00	2.49	1.14	07:30:00	8.8253					0.939	7.886	7.694	2.306	1.324	07:30:00	0.604
07:45:00	2.52	1.11	07:45:00	8.78671					0.939	7.848	7.656	2.344	1.286	07:45:00	0.45
08:00:00	2.56	1.07	08:00:00	8.74449					0.939	7.805	7.615	2.385	1.245	08:00:00	0.355
08:15:00	2.6	1.03	08:15:00	8.69632					0.939	7.757	7.568	2.432	1.198	08:15:00	0.284
08:30:00	2.64	0.99	08:30:00	8.6572					0.939	7.718	7.530	2.470	1.160	08:30:00	0.214
08:45:00	2.71	0.92	08:45:00	8.6396					0.939	7.701	7.513	2.487	1.143	08:45:00	0.136
09:00:00	2.73	0.9	09:00:00	8.60159					0.939	7.663	7.476	2.524	1.106	09:00:00	0.054
09:15:00	2.73	0.9	09:15:00	8.57484					0.939	7.636	7.450	2.550	1.080	09:15:00	0.027
09:30:00	2.76	0.87	09:30:00	8.548					0.939	7.609	7.423	2.577	1.053	09:30:00	0
09:45:00	2.76	0.87	09:45:00	8.53424					0.939	7.595	7.410	2.590	1.040	09:45:00	0.041
10:00:00	2.77	0.86	10:00:00	8.51582					0.939	7.577	7.392	2.608	1.022	10:00:00	0.035
10:15:00	2.78	0.85	10:15:00	8.49784					0.939	7.559	7.374	2.626	1.004	10:15:00	0.034
10:30:00	2.74	0.89	10:30:00	8.49541					0.939	7.556	7.372	2.628	1.002	10:30:00	0.109
10:45:00	2.75	0.88	10:45:00	8.49823					0.939	7.559	7.375	2.625	1.005	10:45:00	0.177
11:00:00	2.73	0.9	11:00:00	8.51085					0.939	7.572	7.387	2.613	1.017	11:00:00	0.267
11:15:00	2.73	0.9	11:15:00	8.51029					0.939	7.571	7.387	2.613	1.017	11:15:00	0.321
11:30:00	2.72	0.91	11:30:00	8.52634					0.939	7.587	7.402	2.598	1.032	11:30:00	0.41
11:45:00	2.7	0.93	11:45:00	8.53903					0.939	7.600	7.415	2.585	1.045	11:45:00	0.499
12:00:00	2.66	0.97	12:00:00	8.55947					0.939	7.620	7.435	2.565	1.065	12:00:00	0.658
12:15:00	2.61	1.02	12:15:00	8.58765					0.939	7.649	7.462	2.538	1.092	12:15:00	0.778
12:30:00	2.61	1.02	12:30:00	8.6295					0.939	7.691	7.503	2.497	1.133	12:30:00	0.893
12:45:00	2.56	1.07	12:45:00	8.65277					0.939	7.714	7.526	2.474	1.156	12:45:00	1.005
13:00:00	2.52	1.11	13:00:00	8.70177					0.939	7.763	7.573	2.427	1.203	13:00:00	1.162
13:15:00	2.46	1.17	13:15:00	8.73846					0.939	7.799	7.609	2.391	1.239	13:15:00	1.313
13:30:00	2.4	1.23	13:30:00	8.78198					0.939	7.843	7.652	2.348	1.282	13:30:00	1.422
13:45:00	2.36	1.27	13:45:00	8.82772					0.939	7.889	7.696	2.304	1.326	13:45:00	1.523
14:00:00	2.3	1.33	14:00:00	8.8795					0.939	7.941	7.747	2.253	1.377	14:00:00	1.659
14:15:00	2.28	1.35	14:15:00	8.91768					0.939	7.979	7.784	2.216	1.414	14:15:00	1.756
14:30:00	2.24	1.39	14:30:00	8.95716					0.939	8.018	7.823	2.177	1.453	14:30:00	1.822
14:45:00	2.21	1.42	14:45:00	9.00499					0.939	8.066	7.869	2.131	1.499	14:45:00	1.947
15:00:00	2.18	1.45	15:00:00	9.03646					0.939	8.097	7.900	2.100	1.530	15:00:00	1.984
15:15:00	2.16	1.47	15:15:00	9.07225					0.939	8.133	7.935	2.065	1.565	15:15:00	2.029
15:30:00	2.13	1.5	15:30:00	9.10666					0.939	8.168	7.968	2.032	1.598	15:30:00	2.094
15:45:00	2.11	1.52	15:45:00	9.12524					0.939	8.186	7.987	2.013	1.617	15:45:00	2.155
16:00:00	2.08	1.55	16:00:00	9.14555					0.939	8.207	8.006	1.994	1.636	16:00:00	2.118
16:15:00	2.09	1.54	16:15:00	9.17559					0.939	8.237	8.036	1.964	1.666	16:15:00	2.092
16:30:00			16:30:00	9.18927					0.939	8.250	8.049	1.951	1.679	16:30:00	2.065
16:45:00			16:45:00	9.20425					0.939	8.265	8.064	1.936	1.694	16:45:00	2.026


Tidal Lag Data - BD BHL 204 (Pier 2: Phase 2)
15/10/2008
Water Elevation to Chart Datum (m)
2.5
2
1.5
1
0.5
0
04:48:00
06:00:00
07:12:00
08:24:00
09:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
16:48:00
18:00:00
Time (hr)
Manual borehole water levels
SAN Tidal Data

Time (hr)	BD BHL 204 - Manual water depth reading (m BGL)	BD BHL 204 - Manual water depth reading (subtracted from 3.652m Top of borehole level) (m CD)	Time (hr) of SAN data	SA Navy Tidal data (m CD)
06:10 2008/10/15	2.45	1.202	06:00 2008/10/15	1.301
06:20 2008/10/15	2.5	1.152	06:15 2008/10/15	1.226
06:35 2008/10/15	2.52	1.132	06:30 2008/10/15	1.076
06:45 2008/10/15	2.54	1.112	06:45 2008/10/15	0.961
07:13 2008/10/15	2.55	1.102	07:00 2008/10/15	0.87
07:20 2008/10/15	2.58	1.072	07:15 2008/10/15	0.728
07:33 2008/10/15	2.63	1.022	07:30 2008/10/15	0.604
07:50 2008/10/15	2.66	0.992	07:45 2008/10/15	0.45
08:05 2008/10/15	2.74	0.912	08:00 2008/10/15	0.355
08:20 2008/10/15	2.79	0.862	08:15 2008/10/15	0.284
08:35 2008/10/15	2.85	0.802	08:30 2008/10/15	0.214
08:45 2008/10/15	2.9	0.752	08:45 2008/10/15	0.136
09:10 2008/10/15	2.95	0.702	09:00 2008/10/15	0.054
09:25 2008/10/15	2.97	0.682	09:15 2008/10/15	0.027
09:40 2008/10/15	2.97	0.682	09:30 2008/10/15	0
09:55 2008/10/15	2.96	0.692	09:45 2008/10/15	0.041
10:10 2008/10/15	2.96	0.692	10:00 2008/10/15	0.035
10:25 2008/10/15	2.97	0.682	10:15 2008/10/15	0.034
10:40 2008/10/15	2.95	0.702	10:30 2008/10/15	0.109
10:55 2008/10/15	2.91	0.742	10:45 2008/10/15	0.177
11:10 2008/10/15	2.89	0.762	11:00 2008/10/15	0.267
11:25 2008/10/15	2.88	0.772	11:15 2008/10/15	0.321
11:40 2008/10/15	2.84	0.812	11:30 2008/10/15	0.41
11:55 2008/10/15	2.77	0.882	11:45 2008/10/15	0.499
12:10 2008/10/15	2.71	0.942	12:00 2008/10/15	0.658
12:25 2008/10/15	2.68	0.972	12:15 2008/10/15	0.778
12:40 2008/10/15	2.61	1.042	12:30 2008/10/15	0.893
12:55 2008/10/15	2.56	1.092	12:45 2008/10/15	1.005
13:10 2008/10/15	2.47	1.182	13:00 2008/10/15	1.162
13:25 2008/10/15	2.4	1.252	13:15 2008/10/15	1.313
13:40 2008/10/15	2.34	1.312	13:30 2008/10/15	1.422
13:55 2008/10/15	2.29	1.362	13:45 2008/10/15	1.523
14:10 2008/10/15	2.25	1.402	14:00 2008/10/15	1.659
14:25 2008/10/15	2.19	1.462	14:15 2008/10/15	1.756
14:40 2008/10/15	2.14	1.512	14:30 2008/10/15	1.822
14:55 2008/10/15	2.1	1.552	14:45 2008/10/15	1.947
15:10 2008/10/15	2.06	1.592	15:00 2008/10/15	1.984
15:25 2008/10/15	2.04	1.612	15:15 2008/10/15	2.029
15:40 2008/10/15	2.01	1.642	15:30 2008/10/15	2.094
15:55 2008/10/15	1.98	1.672	15:45 2008/10/15	2.155
16:10 2008/10/15	1.97	1.682	16:00 2008/10/15	2.118
16:25 2008/10/15	1.99	1.662	16:15 2008/10/15	2.092
			16:30 2008/10/15	2.065
			16:45 2008/10/15	2.026

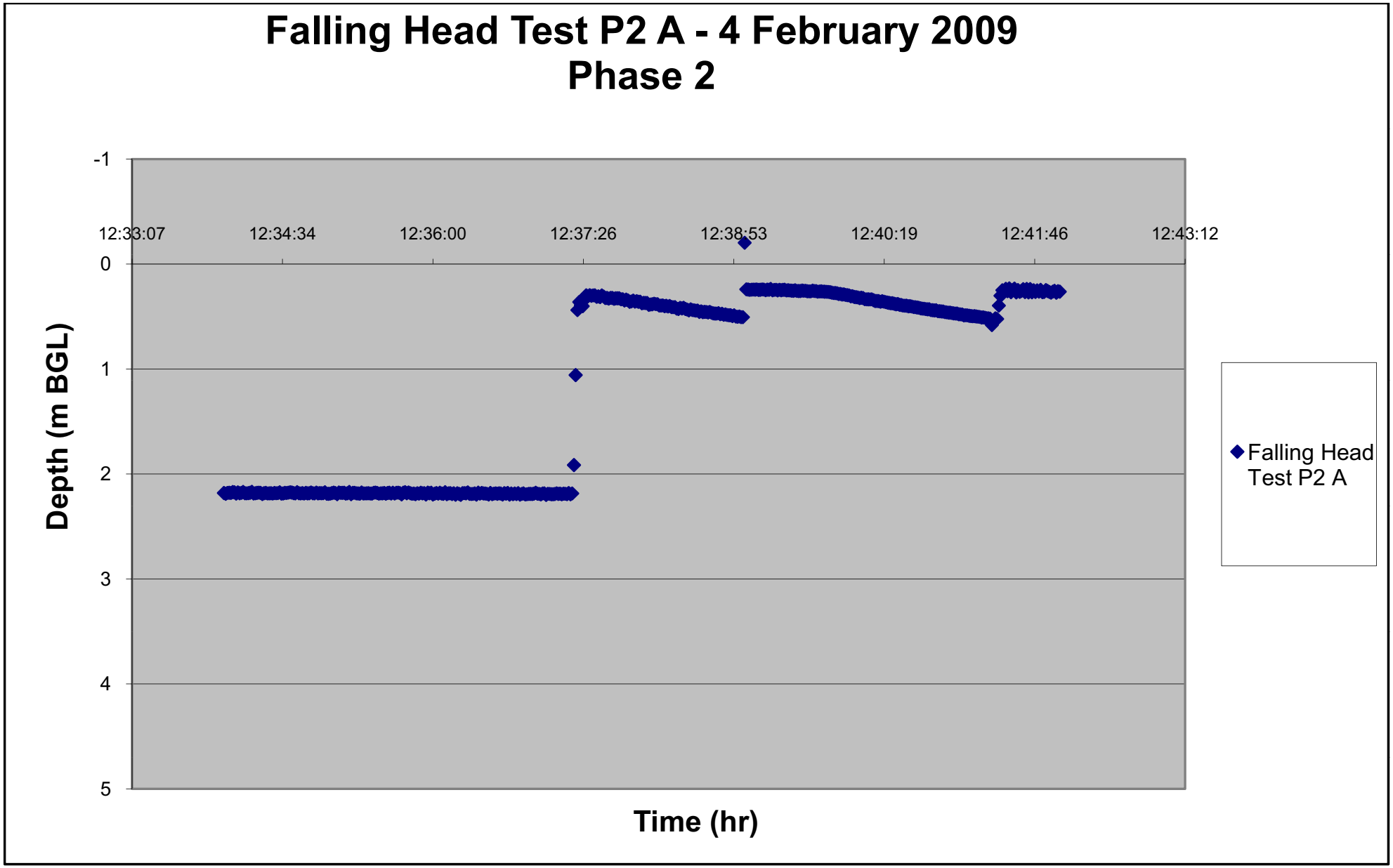

Tidal Lag Data - BD BHL201 (Pier 2 : Phase 2)
12/01/2009 - 13/01/2009
Water Elevation to Chart Datum (m)
2.5
2
1.5
1
0.5
0
13:12 2009/01/12
14:24 2009/01/12
15:36 2009/01/12
16:48 2009/01/12
18:00 2009/01/12
19:12 2009/01/12
20:24 2009/01/12
21:36 2009/01/12
22:48 2009/01/12
00:00 2009/01/13
01:12 2009/01/13
Time (hr) and Date
Manual borehole water levels BD BHL201
Manual tidal readings
Diver readings BD BHL 201
SAN Tidal Data

Time (hr)	BD BHL 201 Manual water depth readings (m BGL)	Manual water depth readings (subtracted from 3.63m Top of borehole level) (m CD)	Time (hr)	Water level in the Harbour adjacent to BD BHL P2 (m BGL)	Water level in Harbour adjacent to BD BHL P2 (subtracted from 3.725m Top of borehole level) (m CD)	BD BHL 201 Diver Readings Time (hr)	Diver Data BD BHL 201	Atmospheric pressure 12 Jan (HectoPascals = Millibars)	Conversion to Kilopascals	Conversion to water column (m)	Elevation Corrected Zero Point Offset value for 4m elevation	Net Barometric Pressure	Diver reading corrected for atmospheric pressure	Salinity correction divide by 1.025	Diver readings corrected for length of Diver line (subtracted from 10m) Depth of water (m BGL)	Final corrected Diver reading (subtracted from 3.63m Top of borehole level) (m CD)	Time (hr) of SAN Data	SAN Tidal data (m CD)
13:49 2009/01/12	2.47	1.16	13:53 2009/01/12	2.46	1.265	13:45 2009/01/12	8.524	1012.000	101.200	10.343	9.495	0.847	7.676	7.489	2.511	1.119	13:45 2009/01/12	1.180
14:12 2009/01/12	2.36	1.27	14:08 2009/01/12	2.18	1.545	14:00 2009/01/12	8.619					0.847	7.771	7.582	2.418	1.212	14:00 2009/01/12	1.308
14:27 2009/01/12	2.33	1.3	14:23 2009/01/12	2.15	1.575	14:15 2009/01/12	8.661					0.847	7.813	7.623	2.377	1.253	14:15 2009/01/12	1.405
14:42 2009/01/12	2.31	1.32	14:37 2009/01/12	2.12	1.605	14:30 2009/01/12	8.688					0.847	7.841	7.649	2.351	1.279	14:30 2009/01/12	1.464
14:53 2009/01/12	2.28	1.35	14:48 2009/01/12	2.09	1.635	14:45 2009/01/12	8.726					0.847	7.879	7.687	2.313	1.317	14:45 2009/01/12	1.598
15:10 2009/01/12	2.22	1.41	15:01 2009/01/12	1.85	1.875	15:00 2009/01/12	8.772					0.847	7.925	7.732	2.268	1.362	15:00 2009/01/12	1.670
15:23 2009/01/12	2.19	1.44	15:17 2009/01/12	1.76	1.965	15:15 2009/01/12	8.816					0.847	7.968	7.774	2.226	1.404	15:15 2009/01/12	1.795
15:35 2009/01/12	2.17	1.46	15:30 2009/01/12	1.69	2.035	15:30 2009/01/12	8.853					0.847	8.005	7.810	2.190	1.440	15:30 2009/01/12	1.915
15:48 2009/01/12	2.14	1.49	15:44 2009/01/12	1.67	2.055	15:45 2009/01/12	8.875					0.847	8.027	7.831	2.169	1.461	15:45 2009/01/12	1.920
16:03 2009/01/12	2.13	1.5	15:56 2009/01/12	1.7	2.025	16:00 2009/01/12	8.896					0.847	8.048	7.852	2.148	1.482	16:00 2009/01/12	1.966
16:20 2009/01/12	2.16	1.47	16:12 2009/01/12	1.52	2.205	16:15 2009/01/12	8.939					0.847	8.091	7.894	2.106	1.524	16:15 2009/01/12	2.023
16:32 2009/01/12	2.09	1.54	16:28 2009/01/12	1.5	2.225	16:30 2009/01/12	8.960					0.847	8.112	7.914	2.086	1.544	16:30 2009/01/12	2.068
16:46 2009/01/12	2.07	1.56	16:42 2009/01/12	1.48	2.245	16:45 2009/01/12	8.967					0.847	8.120	7.922	2.078	1.552	16:45 2009/01/12	2.109
16:57 2009/01/12	2.08	1.55	16:54 2009/01/12	1.47	2.255	17:00 2009/01/12	8.927					0.847	8.080	7.883	2.117	1.513	17:00 2009/01/12	2.067
17:20 2009/01/12	2.05	1.58	17:10 2009/01/12	1.55	2.175	17:15 2009/01/12	8.942					0.847	8.094	7.897	2.103	1.527	17:15 2009/01/12	2.091
17:37 2009/01/12	2.04	1.59	17:27 2009/01/12	1.58	2.145	17:30 2009/01/12	8.961					0.847	8.113	7.915	2.085	1.545	17:30 2009/01/12	2.038
17:47 2009/01/12	2.05	1.58	17:44 2009/01/12	1.6	2.125	17:45 2009/01/12	8.956					0.847	8.109	7.911	2.089	1.541	17:45 2009/01/12	2.047
17:57 2009/01/12	2.05	1.58	17:53 2009/01/12	1.62	2.105	18:00 2009/01/12	8.993					0.847	8.145	7.947	2.053	1.577	18:00 2009/01/12	1.964
18:06 2009/01/12	2.1	1.53	18:03 2009/01/12	1.68	2.045	18:15 2009/01/12	8.988					0.847	8.140	7.942	2.058	1.572	18:15 2009/01/12	1.859
18:30 2009/01/12	2.08	1.55	18:23 2009/01/12	1.7	2.025	18:30 2009/01/12	8.966					0.847	8.118	7.920	2.080	1.550	18:30 2009/01/12	1.794
18:40 2009/01/12	2.1	1.53	18:37 2009/01/12	1.81	1.915	18:45 2009/01/12	8.959					0.847	8.112	7.914	2.086	1.544	18:45 2009/01/12	1.706
18:56 2009/01/12	2.11	1.52	18:54 2009/01/12	1.89	1.835	19:00 2009/01/12	8.935					0.847	8.088	7.891	2.109	1.521	19:00 2009/01/12	1.653
19:07 2009/01/12	2.13	1.5	19:03 2009/01/12	1.96	1.765	19:15 2009/01/12	8.908					0.847	8.060	7.863	2.137	1.493	19:15 2009/01/12	1.532
19:20 2009/01/12	2.15	1.48	19:15 2009/01/12	2.1	1.625	19:30 2009/01/12	8.881					0.847	8.034	7.838	2.162	1.468	19:30 2009/01/12	1.371
19:40 2009/01/12	2.24	1.39	19:32 2009/01/12	2.21	1.515	19:45 2009/01/12	8.842					0.847	7.994	7.799	2.201	1.429	19:45 2009/01/12	1.283
19:55 2009/01/12	2.26	1.37	19:49 2009/01/12	2.4	1.325	20:00 2009/01/12	8.796					0.847	7.949	7.755	2.245	1.385	20:00 2009/01/12	1.154
20:07 2009/01/12	2.31	1.32	20:03 2009/01/12	2.5	1.225	20:15 2009/01/12	8.758					0.847	7.910	7.718	2.282	1.348	20:15 2009/01/12	1.040
20:25 2009/01/12	2.35	1.28	20:20 2009/01/12	2.58	1.145	20:30 2009/01/12	8.710					0.847	7.863	7.671	2.329	1.301	20:30 2009/01/12	0.932
20:42 2009/01/12	2.38	1.25	20:38 2009/01/12	2.7	1.025	20:45 2009/01/12	8.657					0.847	7.809	7.619	2.381	1.249	20:45 2009/01/12	0.789
20:55 2009/01/12	2.41	1.22	20:50 2009/01/12	2.82	0.905	21:00 2009/01/12	8.609					0.847	7.762	7.573	2.427	1.203	21:00 2009/01/12	0.697
21:00 2009/01/12	2.45	1.18	21:05 2009/01/12	2.9	0.825	21:15 2009/01/12	8.579					0.847	7.731	7.543	2.457	1.173	21:15 2009/01/12	0.603
21:24 2009/01/12	2.5	1.13	21:17 2009/01/12	2.99	0.735	21:30 2009/01/12	8.534					0.847	7.686	7.499	2.501	1.129	21:30 2009/01/12	0.546
21:42 2009/01/12	2.53	1.1	21:27 2009/01/12	3.08	0.645	21:45 2009/01/12	8.514					0.847	7.666	7.479	2.521	1.109	21:45 2009/01/12	0.443
21:57 2009/01/12	2.55	1.08	21:51 2009/01/12	3.2	0.525	22:00 2009/01/12	8.473					0.847	7.626	7.440	2.560	1.070	22:00 2009/01/12	0.343
22:18 2009/01/12	2.61	1.02	22:06 2009/01/12	3.26	0.465	22:15 2009/01/12	8.457					0.847	7.609	7.424	2.576	1.054	22:15 2009/01/12	0.302
22:38 2009/01/12	2.62	1.01	22:30 2009/01/12	3.31	0.415	22:30 2009/01/12	8.432					0.847	7.585	7.400	2.600	1.030	22:30 2009/01/12	0.272
22:51 2009/01/12	2.62	1.01	22:45 2009/01/12	3.29	0.435	22:45 2009/01/12	8.423					0.847	7.576	7.391	2.609	1.021	22:45 2009/01/12	0.255
23:04 2009/01/12	2.65	0.98	23:00 2009/01/12	3.32	0.405	23:00 2009/01/12	8.395					0.847	7.547	7.363	2.637	0.993	23:00 2009/01/12	0.228
23:17 2009/01/12	2.64	0.99	23:11 2009/01/12	3.36	0.365	23:15 2009/01/12	8.384					0.847	7.536	7.353	2.647	0.983	23:15 2009/01/12	0.216
23:36 2009/01/12	2.61	1.02	23:31 2009/01/12	3.26	0.465	23:30 2009/01/12	8.394					0.847	7.546	7.362	2.638	0.992	23:30 2009/01/12	0.277
23:50 2009/01/12	2.63	1	23:45 2009/01/12	3.21	0.515	23:45 2009/01/12	8.386					0.847	7.539	7.355	2.645	0.985	23:45 2009/01/12	0.310
00:06 2009/01/13	2.64	0.99	00:00 2009/01/13	3.18	0.545	00:00 2009/01/13	8.387					0.847	7.540	7.356	2.644	0.986	00:00 2009/01/13	0.340
00:19 2009/01/13	2.63	1	00:15 2009/01/13	3.14	0.585	00:15 2009/01/13	8.378					0.847	7.531	7.347	2.653	0.977	00:15 2009/01/13	0.361
00:35 2009/01/13	2.62	1.01	00:30 2009/01/13	3.1	0.625	00:30 2009/01/13	8.390					0.847	7.542	7.358	2.642	0.988	00:30 2009/01/13	0.449


Tidal Lag Data - BD BH P2 (A, B & C) (Pier 2: Phase 2)
12/01/2009 - 13/01/2009
Water Elevation to Chart Datum (m)
2.50
2.00
1.50
1.00
0.50
0.00
12:00 2009/01/12
14:24 2009/01/12
16:48 2009/01/12
19:12 2009/01/12
21:36 2009/01/12
00:00 2009/01/13
02:24 2009/01/13
Time (hr) and Date
Manual P2C (6m)
Manual P2B (9m)
Manual P2A (12m)
Manual Tidal
SAN Tidal

READING (m BGL)					READING (m CD)					
Time (hr)	BD BHLP2 (A-12m)	BD BHLP2 (B-9m)	BD BHLP2 (C-6m)	Water level in the Harbour adjacent to BD BHLP2	BD BHLP2A (Subtracted from 3.73m Top of borehole level)	BD BHLP2B (Subtracted from 3.728m Top of borehole level)	BD BHLP2C (Subtracted from 3.72m Top of borehole level)	Water level in the Harbour adjacent to BD BHLP2	Time (hr) of SAN Data	SAN Tidal data (m CD)
13:53 2009/01/12	2.42	2.38	2.42	2.46	1.3	1.348	1.31	1.265	13:45 2009/01/12	1.180
14:08 2009/01/12	2.25	2.35	2.38	2.18	1.47	1.378	1.35	1.545	14:00 2009/01/12	1.308
14:23 2009/01/12	2.22	2.3	2.36	2.15	1.5	1.428	1.37	1.575	14:15 2009/01/12	1.405
14:37 2009/01/12	2.18	2.27	2.33	2.12	1.54	1.458	1.40	1.605	14:30 2009/01/12	1.464
14:48 2009/01/12	2.15	2.25	2.3	2.09	1.57	1.478	1.43	1.635	14:45 2009/01/12	1.598
15:01 2009/01/12	2.1	2.21	2.28	1.85	1.62	1.518	1.45	1.875	15:00 2009/01/12	1.670
15:17 2009/01/12	2.05	2.15	2.23	1.76	1.67	1.578	1.50	1.965	15:15 2009/01/12	1.795
15:30 2009/01/12	2.02	2.13	2.2	1.69	1.7	1.598	1.53	2.035	15:30 2009/01/12	1.915
15:44 2009/01/12	2	2.09	2.18	1.67	1.72	1.638	1.55	2.055	15:45 2009/01/12	1.920
15:56 2009/01/12	1.96	2.07	2.16	1.7	1.76	1.658	1.57	2.025	16:00 2009/01/12	1.966
16:12 2009/01/12	1.92	2.04	2.15	1.52	1.8	1.688	1.58	2.205	16:15 2009/01/12	2.023
16:28 2009/01/12	1.9	2.02	2.1	1.5	1.82	1.708	1.63	2.225	16:30 2009/01/12	2.068
16:42 2009/01/12	1.88	1.99	2.08	1.48	1.84	1.738	1.65	2.245	16:45 2009/01/12	2.109
16:54 2009/01/12	1.87	1.99	2.07	1.47	1.85	1.738	1.66	2.255	17:00 2009/01/12	2.067
17:10 2009/01/12	1.88	1.98	2.05	1.55	1.84	1.748	1.68	2.175	17:15 2009/01/12	2.091
17:27 2009/01/12	1.86	1.96	2.04	1.58	1.86	1.768	1.69	2.145	17:30 2009/01/12	2.038
17:44 2009/01/12	1.84	1.97	2.04	1.6	1.88	1.758	1.69	2.125	17:45 2009/01/12	2.047
17:53 2009/01/12	1.88	1.97	2.03	1.62	1.84	1.758	1.70	2.105	18:00 2009/01/12	1.964
18:03 2009/01/12	1.88	1.97	2.03	1.68	1.84	1.758	1.70	2.045	18:15 2009/01/12	1.859
18:23 2009/01/12	1.91	1.99	2.04	1.7	1.81	1.738	1.69	2.025	18:30 2009/01/12	1.794
18:37 2009/01/12	1.94	2.02	2.07	1.81	1.78	1.708	1.66	1.915	18:45 2009/01/12	1.706
18:54 2009/01/12	1.96	2.04	2.09	1.89	1.76	1.688	1.64	1.835	19:00 2009/01/12	1.653
19:03 2009/01/12	1.99	2.06	2.09	1.96	1.73	1.668	1.64	1.765	19:15 2009/01/12	1.532
19:15 2009/01/12	2.02	2.08	2.1	2.1	1.7	1.648	1.63	1.625	19:30 2009/01/12	1.371
19:32 2009/01/12	2.07	2.11	2.15	2.21	1.65	1.618	1.58	1.515	19:45 2009/01/12	1.283
19:49 2009/01/12	2.12	2.17	2.18	2.4	1.6	1.558	1.55	1.325	20:00 2009/01/12	1.154
20:03 2009/01/12	2.15	2.21	2.23	2.5	1.57	1.518	1.50	1.225	20:15 2009/01/12	1.040
20:20 2009/01/12	2.2	2.24	2.26	2.58	1.52	1.488	1.47	1.145	20:30 2009/01/12	0.932
20:38 2009/01/12	2.28	2.3	2.32	2.7	1.44	1.428	1.41	1.025	20:45 2009/01/12	0.789
20:50 2009/01/12	2.32	2.34	2.35	2.82	1.4	1.388	1.38	0.905	21:00 2009/01/12	0.697
21:05 2009/01/12	2.34	2.38	2.38	2.9	1.38	1.348	1.35	0.825	21:15 2009/01/12	0.603
21:17 2009/01/12	2.41	2.45	2.39	2.99	1.31	1.278	1.34	0.735	21:30 2009/01/12	0.546
21:27 2009/01/12	2.44	2.5	2.45	3.08	1.28	1.228	1.28	0.645	21:45 2009/01/12	0.443
21:51 2009/01/12	2.5	2.51	2.47	3.2	1.22	1.218	1.26	0.525	22:00 2009/01/12	0.343
22:06 2009/01/12	2.58	2.57	2.58	3.26	1.14	1.158	1.15	0.465	22:15 2009/01/12	0.302
22:30 2009/01/12	2.62	2.62	2.6	3.31	1.1	1.108	1.13	0.415	22:30 2009/01/12	0.272
22:45 2009/01/12	2.62	2.54	2.58	3.29	1.1	1.188	1.15	0.435	22:45 2009/01/12	0.255
23:00 2009/01/12	2.65	2.73	2.75	3.32	1.07	0.998	0.98	0.405	23:00 2009/01/12	0.228
23:11 2009/01/12	2.65	2.7	2.65	3.36	1.07	1.028	1.08	0.365	23:15 2009/01/12	0.216
23:31 2009/01/12	2.64	2.67	2.65	3.26	1.08	1.058	1.08	0.465	23:30 2009/01/12	0.277
23:45 2009/01/12	2.64	2.67	2.64	3.21	1.08	1.058	1.09	0.515	23:45 2009/01/12	0.310
00:00 2009/01/13	2.63	2.66	2.64	3.18	1.09	1.068	1.09	0.545	00:00 2009/01/13	0.340
00:15 2009/01/13	2.63	2.66	2.63	3.14	1.09	1.068	1.10	0.585	00:15 2009/01/13	0.361
00:30 2009/01/13	2.4	2.67	2.63	3.1	1.32	1.058	1.10	0.625	00:30 2009/01/13	0.449

APPENDIX D


Falling Head Test P2 A - 4 February 2009
Phase 2
-1
0
1
2
3
4
5
12:33:07
12:34:34
12:36:00
12:37:26
12:38:53
12:40:19
12:41:46
12:43:12
Depth (m BGL)
Time (hr)
Falling Head Test P2 A

Falling Head Test P2A

Time	T1	T2	T2-T1	Depth of water at start of test	Depth from Top of BH start	Depth from Top of BH Finish	H1	H2	H1/H2	Log e H1/H2	F	A/F(T2-T1)	K permeability	
12:26	12:39:48	12:41:20	92	2.19	0.2670	0.5210	1.9180	1.6640	1.1526	0.142058634	3.7574	0.000002	3.3051E-07	3.31E-07

Outside Diameter NW casing OD (mm) 0.089 mm
Radius of hole 0.0445 mm
Area of borehole 0.0062 mm2
Internal area of tubing (mm) 0.0008 mm2

Hvorslev Permeability k = A/(F(t2-t1))*LN(H1/H2)

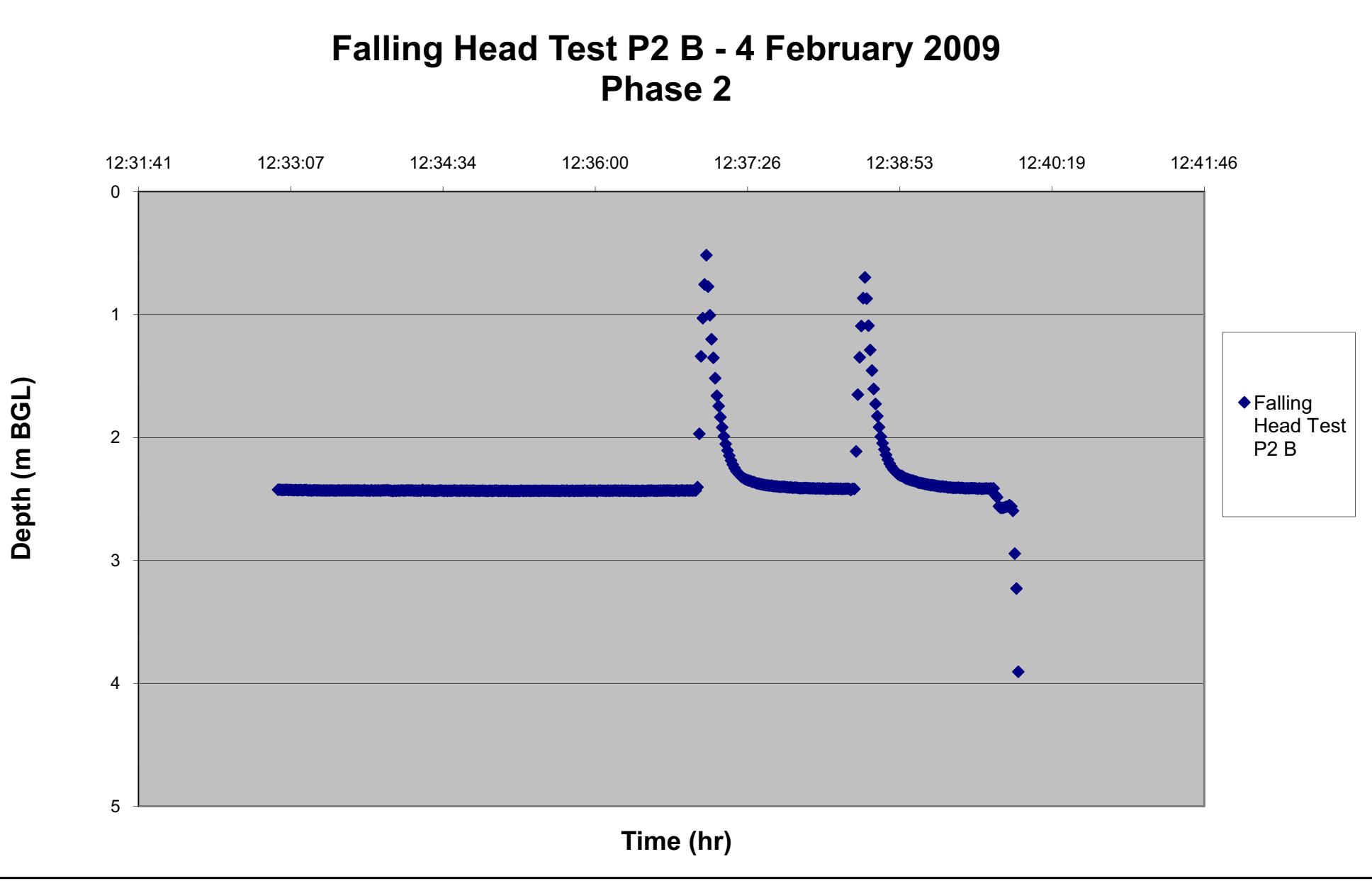
Intake Factor F/D = ((2.32 PI)(L/D))/(Log e(1.1(L/D)+SQRT(1+1.1(L/D)^2)

For piezometer with response zone length of 2m

F 3.7574

Manual record of water level at start of test 2.15m BGL

Falling Head Test P2 B - 4 February 2009
Phase 2



Falling Head Test P2B

Time	T1	T2	T2-T1	Depth of water at start of test	Depth from Top of BH start	Depth from Top of BH Finish	H1	H2	H1/H2	Log e H1/H2	F	A/F(T2-T1)	K permeability		Material BD BHL 204A	BD BHL 204
12:26	12:37:05	12:37:13	8	2.40	1.0050	1.9900	1.3980	0.4130	3.3850	1.21935033	3.7574	0.000027	3.26E-05	0.000033	Loose fine to medium grained sand	98% sand @9.05m

Outside Diameter NW casing OD (mm) 0.089 mm

Radius of hole 0.0445 mm

Area of borehole 0.0062 mm2

Internal area of tubing (mm) 0.0008 mm2

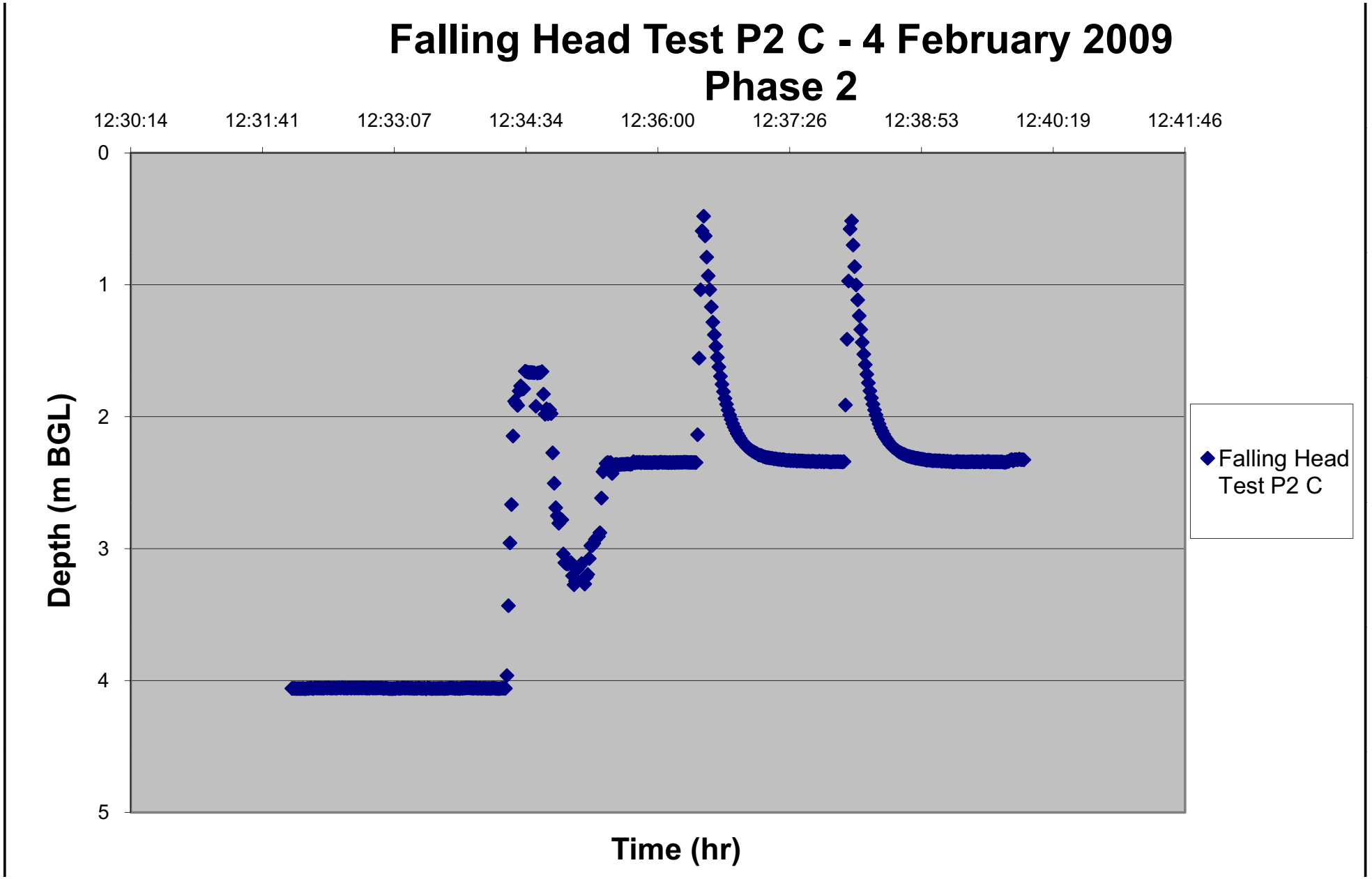
Hvorslev Permeability k = A/(F(t2-t1))*LN(H1/H2)

Intake Factor F/D = ((2.32 PI)(L/D))/(Log e(1.1(L/D)+SQRT(1+1.1(L/D)^2)

For piezometer with response zone length of 2m

F 3.7574

Manual record of water level at start of test 2.21m BGL


Falling Head Test P2 C - 4 February 2009
Phase 2
12:30:14
12:31:41
12:33:07
12:34:34
12:36:00
12:37:26
12:38:53
12:40:19
12:41:46
0
1
2
3
4
5
Depth (m BGL)
Time (hr)
Falling Head Test P2 C

Falling Head Test P2C

Time	T1	T2	T2-T1	Depth of water at start of test	Depth from Top of BH start	Depth from Top of BH Finish	H1	H2	H1/H2	Log e H1/H2	F	A/F(T2-T1)	K permeability		Material BD BHL 204A
12:29	12:36:34	12:36:46	12	2.34	1.0370	1.9490	1.3030	0.3910	3.3325	1.2037	3.7574	0.000018	2.15E-05	0.000021	Medium Dense fine to medium grained sand

Outside Diameter NW casing OD (mm) 0.089 mm
Radius of hole 0.0445 mm
Area of borehole 0.0062 mm2
Internal area of tubing (mm) 0.0008 mm2

Hvorslev Permeability k = A/(F(t2-t1))*LN(H1/H2)

Intake Factor F/D = ((2.32 PI)(L/D))/(Log e(1.1(L/D)+SQRT(1+1.1(L/D)^2)

For piezometer with response zone length of 2m

F 3.7574

Manual record of water level at start of test 2.22m BGL

5.2: Laboratory Report for Phases 1, 2 & 3: Volume 1 & 2

(MSJ RPT No. 07-395Rev0; June 2009)

Transnet Projects

Port of Durban Berth Deepening Feasibility Study

Laboratory Report for Phases 1, 2 & 3

VOLUME 1

Reference : 07-395Rev0

Dated : 30 June 2009

MOORE SPENCE JONES (PTY) LTD
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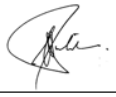
	Name	Designation	Signature	Date
Approved By	M Richter	Director		30 June 2009

Factual Geotechnical Report : Phase 2 (Pier 2 : Berths 203 to 205)					
Revision	**Date**	**Author**	**Checked**	**Status**	**Approved**
Rev 0	30 June 2009	Sue-Anya Pillay		Ok	

Transnet Projects

Port of Durban Berth Deepening Feasibility Study

Laboratory Report for Phases 1, 2 & 3

VOLUME 1

Reference : 07-395Rev0	**Dated : 30 June 2009**

VOLUME 1 of 2

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Transnet Projects

Port of Durban Berth Deepening Feasibility Study

Laboratory Report for Phases 1, 2 & 3

VOLUME 1

Reference : 07- 395Rev0	**Dated : 30 June 2009**

1. INTRODUCTION AND TERMS OF REFERENCE

Transnet are presently deepening and widening the entrance channel to the port of Durban in order to accommodate post-panamax container vessels in the vessel class of 9 200 TEU. In order to accommodate this class of ship, selected berths of the existing container terminal quay wall, located at Pier 1 and Pier 2 will need to be deepened. In addition, the stability of the existing quays is to be confirmed. As a result a geotechnical investigation was commissioned by Transnet in April 2008 to evaluate the existing geological conditions beneath the affected piers.

Three separate phases have been designated for the proposed development of the harbour deepening project as shown in Figure 1. These are as follows:

- Phase 1 : Pier 1 (Berths 100 to 104),
- Phase 2 : Pier 2 (Berths 203 to 205), and
- Phase 3 : Cross-berth area between Pier 1 and 2 (Berths 108 to 109) and Pier 2 (Berths 200 to 202).

This report provides the laboratory test results received from various laboratories for the following:

i) Atterberg Limits and Grading Analysis
ii) Quick Undrained Triaxial tests
iii) Consolidated Undrained Triaxial tests
iv) Dry density moisture content test
v) Minimum and Maximum dry density tests
vi) Shear Box tests
vii) Unconfined Compressive Strength tests

Volume 1 of this report discusses the laboratory tests carried out, the test methods employed and provides all results in summary format. Volume 2 contains the detailed laboratory test results and comprises Appendix A through Appendix E:

- Appendix A – Indicator and Grading Analysis Test Results
- Appendix B – Quick Undrained Triaxial Test Results
- Appendix C – Consolidated Undrained Triaxial Test Results
- Appendix D – Shear box Test Results and Dry density moisture content Test Result
- Appendix E – Unconfined Compressive Strength Test Results

2. SCOPE OF CONSULTANT'S INVOLVEMENT

In March 2008, Moore Spence Jones were employed by HMG Joint Venture to provide specialist geotechnical consultancy services to the Berth Deepening Pre Feasibility Study under Contract No. H500272-CPS003. HMGJV were employed by Transnet to provide project management and technical services for the Pre Feasibility Study.

The geotechnical Contractors (Geopractica, Franki and Subtech) were employed directly by Transnet. The geotechnical investigation was supervised from a technical perspective by Moore Spence Jones.

Moore Spence Jones were also employed to undertake interpretative reporting for the project and a stability assessment of the quay wall. These are reported separately.

While Moore Spence Jones scheduled laboratory testing with the various commercial soils laboratories contracted for this work, the testing schedule was largely agreed on in conjunction with HMG JV.

3. SAMPLING AND SAMPLE PRESERVATION

Samples from the geotechnical investigation were sent to different laboratories in Durban and Ireland for laboratory testing. The samples were submitted in the following forms:

1. Undisturbed Samples (from boreholes)
    - Shelby Samples
    - Double tube cored samples
    - Rock core samples

2. Disturbed Samples
    - Bulk samples from inspection pit
    - SPT samples from boreholes

The Shelby tubes containing the samples were sealed with wax at either end while on site and dispatched to the laboratory without being extruded.

The double tube samples were extruded on site. During extrusion, sub-samples of the clay were taken and immediately covered in cling film and waxed twice before being dispatched to the laboratory.

The disturbed samples consisted mainly of sandy materials. In some cases to obtain sufficient sample of Reclamation Fill and Harbour Bed sands for the scheduled tests it was necessary to blend the SPT samples of similar soils from several boreholes to form composite samples.

4. LABORATORY TESTING

The laboratory testing for Phase 1, 2 and 3 was carried out over the period June 2008 to February 2009 and comprised the following.

i) Atterberg Limits and Grading Analysis
ii) Quick Undrained Triaxial tests
iii) Consolidated Undrained Triaxial tests
iv) Dry density moisture content test
v) Minimum and maximum dry density tests
vi) Shear Box tests
vii) Unconfined Compressive Strength tests

All laboratory results are summarised in Table 1 attached.

Samples were sent to local (Durban) laboratories Soilco, Matrolab and Thekwini Soils Laboratories, and NMTL in Ireland, for testing. Soilco and Matrolab are accredited with the South African National System (SANAS). This ensures that the laboratories have externally accredited procedures in place for management of the laboratory and that testing takes place to recognised National Standards. Thekwini Soils Laboratory, however, do not have an accreditation system.

In addition to samples obtained from the current investigation, one Shelby sample from an investigation carried out by Transnet at Salisbury Island in 2007 was also recovered from storage and tested under this Contract. The results are included in this report and the borehole is denoted as SI-BH108.

4.1 Atterberg Limits and Grading Analysis

4.1.1 Atterberg Limits

Atterberg Limits determinations were carried out on the disturbed and undisturbed samples. The following testing standards and procedures were adhered to:

- TMH1: A2, A3, A4 & A5 (Matrolab and Soilco)
- BS1377:1990:Part 2 : Clause 4.3 (NMTL), and
- BS1377:1990:Part 2 : Clause 4.6 (Thekwini Soils).

Where the Plasticity Index value was too low to be determined by the test method, abbreviations for Slightly Plastic (SP/EP) and Non Plastic (NP) were reported on result sheets by local laboratories.

4.1.2 Grading Analysis

Particle size distribution or grading is the percentages of the various grain sizes present in a soil as determined by sieving and sedimentation (hydrometer test). Sieve analysis is used for particle size distribution to 0.075 mm while the hydrometer test is used for particle size distribution from 0.075 mm to 0.002 mm i.e. fine grained (clayey) materials held in suspension.

The following testing standards and procedures were adhered to:

- TMH Method A1(a) wet sieve for the Materials Test, TMH Method A1(a) wet sieve followed by hydrometer to ASTM D422 for the Hydrometer Test and sieve analysis to TMH1 – Method B4 for the Aggregate Test (Soilco),
- TMH1: A2, A3, A4 & A5 (Matrolab),
- BS1377:1990:Part 2 : Clause 9.2 wet sieving and Clause 9.5 sedimentation by the hydrometer method (NMTL), and
- TMH1: Wet sieving (Thekwini Soils Laboratory).

The Atterberg Limits and the Grading Analysis results provided by Soilco, Matrolab, Thekwini Soils and NMTL Laboratories are summarised in Table 1. Detailed results of these tests are given in Appendix A contained in Volume 2 of this report.

4.2 Quick Undrained Triaxial (QUT) Tests

This test is to determine the undrained shear strength of cohesive soils.

Both the Thekwini Soils and NMTL Laboratories used the BS 1377 : 1990: Part 7 : Clause 8 method to execute the QUT tests. This method provides the determination of the undrained strength of a specimen of cohesive soil when it is subjected to a constant confining pressure and to strain-controlled axial loading, when no change in total moisture content is allowed. Tests are usually carried out on a set of similar specimens, subjected to different confining pressures. The test is carried out in the triaxial apparatus on specimens in the form of cylinders. The specimen is confined in an impervious membrane between impervious end caps in a triaxial cell which can be pressurized by water. The axial rate of strain until the specimen fails is normally within a period of 5 to 15 minutes.

The QUT test results provided by both NMTL and Thekwini Soils Laboratory are summarised in Table 1. The detailed test results are provided in Appendix B, Volume 2 of this report.

4.3 Consolidated Undrained Triaxial (CUT) Tests

Consolidated undrained triaxial (CUT) compression tests were carried out by NMTL in Ireland. The CUT tests also include measurement of pore pressure on undisturbed clay samples using the BS 1377 : Part 8: Clause 7. From a set of tests the effective shear strength parameters at failure, effective cohesion c' and effective angle of friction Φ' can be derived. The test is carried out in three stages: saturation, to

ensure the fluid in the pores and measuring system does not contain free air, consolidation to a predetermined stress level and the shearing with cell pressures usually within the range 25 to 800 KN/m^2. During shearing the specimen is not allowed to drain i.e. the volume is held constant and the pore pressure is monitored to determine the effective stresses.

The CUT test results are summarised in Table 1. The detailed test results are provided in Appendix C, Volume 2 of this report.

4.4 Dry Density Moisture Content Test

A single dry density moisture content test was carried out by Soilco Laboratory in accordance with TMH1 Method A7. The test was carried out on a bulk sample of Hydraulic Fill obtained from Berth 203, Phase 2 of the Durban Harbour Berth Deepening Feasibility Study.

The maximum dry density and optimum moisture content are attained by establishing the moisture-density relationship of the material when prepared and compacted at the Modified AASHTO compaction effort at different moisture contents.

The detailed test result is provided in Appendix D, Volume 2 of this report.

4.5 Minimum and Maximum Dry Density Tests

This test determines an indication of the degree of compaction or insitu density of a cohesionless or granular (free-draining) soil, by relating its dry density to its minimum and maximum possible densities.

Density tests on Hydraulic Fill sands, which were obtained from composite SPT samples, were carried out in accordance with BS1377 1990 Part 4.2 and Part 4.4 at the Thekwini Soils Laboratory. However, the maximum dry density test deviates from the BS 1377 method as no vibrating hammer was used. The results are summarised in Table 1.

4.6 Shear Box Tests

The shear box test is carried out to determine the effective shear strength parameter Φ' (angle of shearing resistance) for the granular material of the Hydraulic Fill and Harbour Beds sands.

Thekwini Soils Lab used the BS 1377 : 1990 : Part 7 method of testing where a direct shear test on a square prism of soil laterally restrained in a 60mm^2 shear box is sheared along a mechanically induced horizontal plane while subjected to a pressure applied normal to that plane. The shearing resistance offered by the soil as one portion is made to slide on the other is measured at regular intervals of displacement. Failure occurs when the shearing resistance reaches the maximum value which the soil can sustain. By carrying out the test on a set of (usually three) similar specimens of the same soil under different normal pressures, the relationship between measured shear stress at failure and normal applied stress is obtained. The specimen is consolidated under a vertical normal load until the primary consolidation is completed. The specimen is then sheared at a rate of displacement that is slow enough to prevent development of excess pore pressures. Test data enables the effective shear strength parameters c' and Φ' to be derived. After the test was completed, the samples were placed in a metal bowl and oven dried overnight. The weight was then divided by the volume of the shear box as filled by the sample (rather than standard volume) to provide the correct density. Relative density was then determined with regards to the maximum and minimum obtained from the density tests.

The tests conducted by Thekwini Soils Laboratory deviated from BS 1377 in that the vertical deformation during load placing was not measured.

The shear box test results are summarised in Table 1. The detailed test results are provided in Appendix D, Volume 2 of this report.

4.7 Unconfined Compressive Strength (UCS) Tests

The unconfined compressive strength (UCS) of an intact rock sample is used as the basis for foundation design with an allowance being made for the structure of the rock mass. A specimen of intact rock (usually cylindrical - borehole core) is subjected to a steadily increasing axial compression until failure occurs. The axial force is the only force applied to the specimen. The test provides an immediate approximate value of the compressive strength of the rock. UCS tests were carried out at Soilco and Thekwini Soils on core samples of intact rock sampled from boreholes. The Soilco method for the UCS test is carried out in accordance with the TMH 1 B4 while Thekwini Soils Laboratory have used the BS 1377 : 1975 : Test 20 : done in triaxial load frame.

In addition, Thekwini Soils Laboratory was requested to carry out strain gauge measurements during some of the tests conducted to determine the percentage strain at failure. The UCS test results are summarised in Table 1. Detailed test results are provided in Appendix E, Volume 2 of this report.

Table 1
Summary of all lab results

Durban Berth Deepening
Summary of Laboratory Testing

Hole No.	Sample					Specimen	Specimen	Testing Laboratory	Moisture Content (%)	Atterbeg Limits			Grading				QUT	CUT	UCS (MPa)	Relative Density		Shear Box
	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
BD-BHL101B	18.95	19.37	TW	Harbour Beds	Clay	1	18.95	Thekwini	50.7	40	24	16	16	42	15	27	99					
BD-BHL101B	18.95	19.37	TW	Harbour Beds	Clay	2		Thekwini	42.7								162					
BD-BHL101B	18.95	19.37	TW	Harbour Beds	Clay	3		Thekwini	48.6								175					
BD-BHL102	7.50	7.95	SPT	Fill	Sand	1	7.5	SoilCo		NP			1	94	5							
BD-BHL102	15.00	15.45	SPT	Fill	Sand	1	15	SoilCo		NP			0	93	7							
BD-BHL102	19.50	21.00	Wash	Fill	Sand	1	19.5	SoilCo		23	17	6	0	62	16	22						
BD-BHL102	28.95	30.00	NWD4	Harbour Beds	Gravel	1	28.95	SoilCo		60	33	27	70	5	11	14						
BD-BHL102	31.00	31.40	TW	Harbour Beds	Sand	1	31	NMTL		NP			0	86	7	7		✓				
BD-BHL102	32.00	33.25	NWD4	Harbour Beds	Sand	1	32	SoilCo		SP			0	76	14	10						
BD-BHL102	35.30	35.75	SPT	Harbour Beds	Sand	1	35.3	SoilCo		NP			10	82	8							
BD-BHL102	38.20	38.65	SPT	Harbour Beds	Sand			SoilCo		NP			3	81	5	11						
BD-BHL102	41.00	42.65	NWD4	Harbour Beds	Sand		42.62	SoilCo	24.1	NP			3	85	6	6						
BD-BHL102	40.43	40.62	C	Cretaceous	Siltstone	1	40.43	SoilCo											2.1			
BD-BHL103	9.00	9.45	SPT	Fill	Sand	1	9	SoilCo					1	95	4							
BD-BHL103	29.05	29.50	SPT	Harbour Beds	Clay	1	29.05	SoilCo		SP			1	76	9	14						
BD-BHL103	30.55	31.00	SPT	Harbour Beds	Sand	1	30.55	SoilCo		SP			5	85	10							
BD-BHL103A	27.80	28.35	TW	Harbour Beds	Clay	1		Thekwini	55.3	64	34	30	7	12	18	63	78					
BD-BHL103A	27.80	28.35	TW	Harbour Beds	Clay	2		Thekwini	56.4								143					
BD-BHL103A	27.80	28.35	TW	Harbour Beds	Clay	3		Thekwini	54.6								184					
BD-BHL103A	28.80	29.35	TW	Harbour Beds	Clay	1	28.8	NMTL	35.3	55	18	37	6	48	34	12		✓				
BD-BHL103A	28.80	29.35	TW	Harbour Beds	Clay	2	29	NMTL	34	62	23	39	0	44	42	15		✓				
BD-BHL103A	28.80	29.35	TW	Harbour Beds	Clay	3	29.15	NMTL	38.8	70	24	46	0	26	53	21		✓				
BD-BHL104	24.50	24.95	SPT	Harbour Beds	Sand	1	24.5	SoilCo					0	98	2							
BD-BHL104	28.00	29.50	NWD4	Harbour Beds	Sand	1	28	SoilCo		33	22	11	0	60	12	28						
BD-BHL105	25.50	25.95	SPT	Harbour Beds	Sand	1	25.5	SoilCo		NP			11	85	4							
BD-BHL105	37.25	37.50	C	Cretaceous	Siltstone	1	37.25	SoilCo											2.0			
BD-BHL105	34.50	34.95	SPT	Harbour Beds	Sand	1	34.5	SoilCo		41	22	19	1	41	42	16						
BD-BHL106	7.50	7.95	SPT	Fill	Sand	1	7.5	SoilCo		NP			0	92	8							
BD-BHL107	7.50	7.95	SPT	Fill	Sand	1	7.5	SoilCo		NP			31	63	6							
BD-BHL107	31.19	31.64	SPT	Harbour Beds	Sand	1	31.19	SoilCo		22	15	7	6	69	15	10						
BD-BHL107	32.64	33.09	SPT	Harbour Beds	Silt	1	32.64	SoilCo		28	18	10	0	70	20	10						
BD-BHL107A	12.00	12.60	TW	Fill	Sand	1	12	SoilCo		NP			16	80	1	3						
BD-BHL107A	30.80	31.25	SPT	Harbour Beds	Clay	1	30.8	SoilCo		28	23	5	7	70	16	7						
BD-BHL107A	36.05	36.50	SPT	Harbour Beds	Clay	1	36.05	SoilCo		26	23	3	3	75	16	6						
BD-BHL107A	37.06	38.07	C	Cretaceous	Siltstone	1	37.06	SoilCo											1.7			
BD-BHL107A	38.38	38.48	C	Cretaceous	Sandstone	1	38.38	SoilCo											22.9			
BD-BHL108	23.10	23.55	SPT	Harbour Beds	Sand	1	23.1	SoilCo		NP			0	86	14							
BD-BHL108	23.55	25.05	NWD4	Harbour Beds	Clay	1	23.55	SoilCo		36	25	11	0	50	38	12						
BD-BHL108	34.35	34.80	SPT	Harbour Beds	Clay	1	34.35	SoilCo		NP			0	80	9	11						
BD-BHL201	7.50	7.95	SPT	Fill	Sand	1	7.5	Matrolab		NP			0	92	8							
BD-BHL201	29.00	29.45	SPT	Harbour Beds	Clay	1	29	Matrolab	44.6	41	24	17	6	64	12	18						
BD-BHL201A	21.07	21.62	TW	Harbour Beds	Clay	1	21.07	NMTL	79	97	37	60	8	3	64	26	19.8					
BD-BHL201A	21.07	21.62	TW	Harbour Beds	Clay	2		NMTL	76.7	98	38	60	2	3	59	36	20.9					
BD-BHL201A	22.47	23.02	TW	Harbour Beds	Clay	1	22.47	NMTL	78.2	99	38	61	0	4	62	34		✓				
BD-BHL201A	22.47	23.02	TW	Harbour Beds	Clay	2	22.65	NMTL	70.8	93	33	60	1	4	64	31		✓				
BD-BHL201A	22.47	23.02	TW	Harbour Beds	Clay	3	22.8	NMTL	64.5	85	32	53	5	6	54	36		✓				
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	1A	20.68	NMTL	51.4	72	28	44	0	32	39	29		✓				
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	1B	20.78	NMTL														
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	2	20.89	NMTL	44	56	22	34	0	40	44	16	14.8					
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	3	21.05	NMTL	36.4	45	18	27	0	55	25	20		✓				
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	4	21.21	NMTL	32.2	33	19	14	0	68	15	17		✓				
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	5	21.37	NMTL	30	33	18	15	0	69	17	14		✓				
BD-BHL202	21.30	22.80	C	Harbour Beds	Clay	6	21.53	NMTL	27.1	28	17	11	0	76	14	10		✓				
BD-BHL203B	24.45	25.00	TW	Harbour Beds	Clay	1	24.45	NMTL	74.5	96	35	61	0	4	65	31		✓				
BD-BHL203B	24.45	25.00	TW	Harbour Beds	Clay	2	24.6	NMTL	81.6	93	32	61	0	3	68	28		✓				
BD-BHL203B	24.45	25.00	TW	Harbour Beds	Clay	3	24.8	NMTL	79.2	95	33	62	0	3	67	30		✓				
BD-BHL203B	25.45	26.00	TW	Harbour Beds	Clay	1		Thekwini	66.9	55	29	26	3	7	27	63	30					
BD-BHL203B	25.45	26.00	TW	Harbour Beds	Clay	2		Thekwini	69.9								34					
BD-BHL203B	25.45	26.00	TW	Harbour Beds	Clay	3		Thekwini	63.8								38					
BD-BHL203_5	24.00	24.55	TW	Harbour Beds	Clay	1	24	NMTL	66.7	95	37	58	14	6	53	28	47.2					
BD-BHL203_5	24.00	24.55	TW	Harbour Beds	Clay	2		NMTL	64.4	94	40	54	0	5	72	23	60.5					
BD-BHL204	4.50	5.00	TW	Fill	Sand	1	4.5	SoilCo		NP			0	97	1	2						
BD-BHL204	9.05	9.50	SPT	Fill	Sand	1	9.05	SoilCo		NP			0	98	2							
BD-BHL204	10.55	10.90	TW	Fill	Sand	1	10.55	SoilCo		NP			1	95	1	3						
BD-BHL204	26.55	26.85	SPT	Harbour Beds	Sand	1	26.55	SoilCo		NP			1	95	4							
BD-BHL204	37.67	37.82	C	Cretaceous	Siltstone	1	37.67	Thekwini											1.1			
BD-BHL204	39.80	40.00	C	Cretaceous	Siltstone	1	39.80	Thekwini											1.1			
BD-BHL204	41.24	41.38	C	Cretaceous	Siltstone	1	41.24	Thekwini											0.4			

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Durban Berth Deepening
Summary of Laboratory Testing

Hole No.	Sample					Specimen	Specimen	Testing Laboratory	Moisture Content (%)	Atterbeg Limits			Grading				QUT	CUT	UCS (MPa)	Relative Density		Shear Box
	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
BD-BHL205	21.50	22.05	TW	Harbour Beds	Clay	4	21.5	NMTL	27.1	51	17	34	1	62	12	24						
BD-BHL205	21.50	22.05	TW	Harbour Beds	Clay	1	21.5	NMTL										✓				
BD-BHL205	21.50	22.05	TW	Harbour Beds	Clay	2	21.65	NMTL										✓				
BD-BHL205	21.50	22.05	TW	Harbour Beds	Clay	3	21.8	NMTL										✓				
BD-BHL205	21.50	22.05	TW	Harbour Beds	Clay	5	22.05	NMTL	41.8	87	28	59	0	1	36	62						
BD-BHL205	22.05	23.65	C	Harbour Beds	Clay	1	22.05	NMTL	61.1	72	28	44	1	12	38	49	10					
BD-BHL205	22.05	23.65	C	Harbour Beds	Clay	2	22.21	NMTL	60.4	73	30	43	1	8	51	40		✓				
BD-BHL205	22.05	23.65	C	Harbour Beds	Clay	3	22.37	NMTL	56.8	75	30	45	4	3	43	50		✓				
BD-BHL205	22.05	23.65	C	Harbour Beds	Clay	4	22.54	NMTL	61.5	76	33	43	0	5	46	49		✓				
BD-BHL205	22.05	23.65	C	Harbour Beds	Clay	5	22.7	NMTL	56.9	74	32	42	8	3	54	35		✓				
BD-BHL205	25.15	25.70	TW	Harbour Beds	Clay	4	25.15	NMTL	64.1	67	27	40	0	14	48	37						
BD-BHL205	25.15	25.70	TW	Harbour Beds	Clay	1	25.15	NMTL										✓				
BD-BHL205	25.15	25.70	TW	Harbour Beds	Clay	2	25.3	NMTL										✓				
BD-BHL205	25.15	25.70	TW	Harbour Beds	Clay	3	25.45	NMTL										✓				
BD-BHL205	25.15	25.70	TW	Harbour Beds	Clay	5	25.7	NMTL	55.2	80	27	53	0	7	51	43						
BD-BHL206	19.50	20.05	TW	Harbour Beds	Clay	1	19.5	SoilCo		51	30	21	23	27	28	22						
BD-BHL206	20.05	21.55	C	Harbour Beds	Clay	1	20.34	NMTL	56	68	27	41	19	10	43	28		✓				
BD-BHL206	20.05	21.55	C	Harbour Beds	Clay	2	20.64	NMTL	61.8	73	28	45	0	4	53	44		✓				
BD-BHL206	20.05	21.55	C	Harbour Beds	Clay	3	20.86	NMTL	52.6	72	30	42	2	4	57	37		✓				
BD-BHL206	20.05	21.55	C	Harbour Beds	Clay	4	21.1	NMTL	41.8	69	24	45	0	6	57	37	59.3					
BD-BHL206	20.05	21.55	C	Harbour Beds	Clay	5	21.31	NMTL	45.5	65	24	41	0	3	56	42	58.9					
BD-BHL207	13.50	13.95	SPT	Fill	Sand	1	13.5	SoilCo					0	96	4							
BD-BHL207	31.45	31.90	SPT	Harbour Beds	Sand	1	31.45	SoilCo		NP			2	82	6	10						
BD-BHL207	33.22	33.35	C	Cretaceous	Siltstone	1	33.22	SoilCo											2.5			
BD-BHL207	33.35	33.55	C	Cretaceous	Siltstone	1	33.35	SoilCo											2.0			
BD-BHL208	12.10	12.45	SPT	Fill	Sand	1	12.1	SoilCo		NP			0	97	3							
BD-BHL208	27.85	28.30	SPT	Harbour Beds	Sand	1	27.85	SoilCo		NP			0	95	5							
BD-BHL209	13.50	13.95	SPT	Fill	Sand	1	13.5	Matrolab		NP			37	19	44							
BD-BHL209	26.00	26.45	SPT	Harbour Beds	Sand	1	26	Matrolab		NP			0	94	2	4						
BD-BHL209	28.55	29.00	SPT	Harbour Beds	Clay	1	28.55	Matrolab	33.8	36	24	12	25	55	13	7						
BD-BHL209	29.50	30.05	TW	Harbour Beds	Clay	4	29.72	NMTL	27.5				69	4	20	7		✓				
BD-BHL209	29.50	30.05	TW	Harbour Beds	Clay	1	29.86	NMTL	41.2	68	28	40	1	7	75	17		✓				
BD-BHL209	30.55	31.00	SPT	Harbour Beds	Sand	1	30.55	Matrolab	45.6	39	27	12	1	32	57	10						
BD-BHL210	21.00	22.50	C	Harbour Beds	Clay	1	21.25	NMTL	54.5	95	33	62	0	2	73	25		✓				
BD-BHL210	21.00	22.50	C	Harbour Beds	Clay	2	21.45	NMTL										✓				
BD-BHL210	21.00	22.50	C	Harbour Beds	Clay	3	22.09	NMTL	59	78	31	47	0	3	71	26		✓				
BD-BHL210	21.00	22.50	C	Harbour Beds	Clay	4	22.35	NMTL	64.5	102	41	61	0	0	63	37		✓				
BD-BHL210A	21.05	21.60	TW	Harbour Beds	Clay	1	21.05	NMTL	56.1	83	34	49	0	2	78	20	36					
BD-BHL210A	21.05	21.60	TW	Harbour Beds	Clay	2		NMTL	60.2	77	28	49	0	4	78	18	25.9					
BD-BHL210A	24.15	25.65	C	Harbour Beds	Clay	1	24.35	NMTL	63.7	89	29	60	0	4	71	25	46.4					
BD-BHL210A	24.15	25.65	C	Harbour Beds	Clay	2	24.75	NMTL	60.9	90	31	59	0	1	68	31	53.8					
BD-BHL210A	25.14	25.34	C	Harbour Beds	Clay		25.14	NMTL	59	86	34	52	0	2	69	29						
BD-BHL210A	25.65	26.20	TW	Harbour Beds	Clay	1		Thekwini	58.1	57	26	26	0	3	34	63	29					
BD-BHL210A	25.65	26.20	TW	Harbour Beds	Clay	2		Thekwini	58.6								38					
BD-BHL210A	25.65	26.20	TW	Harbour Beds	Clay	3		Thekwini	51.2								90					
BD-BHL210A	26.20	27.70	C	Harbour Beds	Clay	1	26.41	NMTL	32	50	18	32	0	17	71	12	141.1					
BD-BHL210A	28.70	29.25	TW	Harbour Beds	Clay	1	28.7	Thekwini	39.4	43	23	20	0	10	43	47	25					
BD-BHL301	12.10	12.45	SPT	Fill	Sand	1	12.1	SoilCo		NP			0	96	0	4						
BD-BHL301	23.00	23.45	SPT	Harbour Beds	Clay	1	23	SoilCo		53	31	22	4	17	37	42						
BD-BHL301	26.00	26.45	SPT	Harbour Beds	Clay	1	26	SoilCo		50	30	20	0	30	44	26						
BD-BHL301	28.00	28.45	SPT	Harbour Beds	Clay	1	28	SoilCo		37	23	14	0	38	50	12						
BD-BHL301	29.50	30.10	TW	Harbour Beds	Clay	1	29.5	NMTL	41.4	62	25	37	0	8	75	17		✓				
BD-BHL301	29.50	30.10	TW	Harbour Beds	Clay	2	29.82	NMTL										✓				
BD-BHL301	29.50	30.10	TW	Harbour Beds	Clay	3	29.96	NMTL										✓				
BD-BHL301	30.10	31.60	C	Harbour Beds	Clay	1	30.1	NMTL	71.3	69	25	44	2	9	68	22		✓				
BD-BHL301	30.10	31.60	C	Harbour Beds	Clay	2	30.26	NMTL	54.3	64	30	34	2	16	65	17		✓				
BD-BHL301	30.10	31.60	C	Harbour Beds	Clay	5	30.81	NMTL	37.1	52	22	30	0	33	60	7	81.4					
BD-BHL301	30.10	31.60	C	Harbour Beds	Clay	3	31.04	NMTL	44.5	61	26	35	2	25	58	16		✓				
BD-BHL301	30.10	31.60	C	Harbour Beds	Clay	4	31.19	NMTL	31.9	50	23	27	0	45	44	11		✓				
BD-BHL301	34.90	35.35	SPT	Harbour Beds	Clay	1	34.9	SoilCo		22	14	8	1	68	22	9						
BD-BHL301	45.11	45.27	C	Cretaceous	Siltstone	1	45.11	Thekwini											3.5			
BD-BHL301	46.74	46.88	C	Cretaceous	Siltstone	1	46.74	Thekwini											1.1			
BD-BHL301	47.30	47.47	C	Cretaceous	Siltstone	1	47.30	Thekwini											1.7			
BD-BHL301	49.74	49.90	C	Cretaceous	Siltstone	1	49.74	Thekwini											1.6			
BD-BHL309	12.00	12.45	SPT	Fill	Sand	1	12	SoilCo		NP			0	97	3							
BD-BHL309	22.00	22.45	SPT	Harbour Beds	Sand	1	22	SoilCo		NP			0	96	4							
BD-BHL309	26.00	26.45	SPT	Harbour Beds	Sand	1	26	SoilCo		NP			0	96	4							
BD-BHL309	34.25	35.44	C	Cretaceous	Siltstone	1	34.25	Thekwini											1.8			

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Durban Berth Deepening
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Hole No.	Sample					Specimen	Specimen	Testing Laboratory	Moisture Content (%)	Atterbeg Limits			Grading				QUT	CUT	UCS (MPa)	Relative Density		Shear Box
	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
BD-BHL309	39.40	39.61	C	Cretaceous	Siltstone	1	39.40	Thekwini											1.9			
BD-BHL309	40.84	41.02	C	Cretaceous	Siltstone	1	40.84	Thekwini											1.5			
BD-BHL309	41.05	41.32	C	Cretaceous	Siltstone	1	41.05	Thekwini											1.8			
BD-BHL309	41.57	41.86	C	Cretaceous	Siltstone	1	41.57	Thekwini											1.6			
BD-BHL314	6.65	7.10	SPT	Fill	Sand	1	6.65	Matrolab		NP			9	88	3							
BD-BHL314	23.15	23.60	SPT	Harbour Beds	Sand	1	23.15	Matrolab		NP			1	91	8							
BD-BHL314	24.60	25.15	TW	Harbour Beds	Sand	4	24.6	NMTL	22.3	NP			20	69	5	6						
BD-BHL314	24.60	25.15	TW	Harbour Beds	Clay	1	24.6	NMTL										✓				
BD-BHL314	24.60	25.15	TW	Harbour Beds	Clay	2	24.8	NMTL										✓				
BD-BHL314	24.60	25.15	TW	Harbour Beds	Clay	3	25	NMTL										✓				
BD-BHL314	24.60	25.15	TW	Harbour Beds	Clay	5	25.15	NMTL	23.8	58	30	28	0	44	24	32						
BD-BHL314	26.20	26.65	SPT	Harbour Beds	Clay	1	26.2	Matrolab	26.5	23	15	8	1	54	16	29						
BD-BHL314	29.20	29.65	SPT	Harbour Beds	Clay	1	29.2	Matrolab	25.4	EP			3	74	5	18						
BD-BHL314	31.70	32.15	SPT	Harbour Beds	Clay	1	31.7	Matrolab	33.5	NP			2	84	3	11						
BD-BHL315	9.45	10.50	Wash	Fill	Sand	1	9.45	SoilCo					0	97	3							
BD-BHL315	27.22	28.22	NWD4	Harbour Beds	Clay	1	27.22	SoilCo		20	11	9	0	62	24	14						
BD-BHL315	33.00	33.45	SPT	Harbour Beds	Sand	1	33	SoilCo		NP			22	69	9							
BD-BHL315	40.50	40.83	SPT	Residual Cretaceous	Silt	1	40.5	SoilCo		SP			2	78	12	8						
BD-BHL315	46.41	46.59	C	Cretaceous	Siltstone	1	46.41	SoilCo											6.6			
BD-BHL316	4.50	5.00	TW	Fill	Sand	1	4.5	SoilCo		NP			1	96	0	3						
BD-BHL316	13.35	14.00	SPT	Fill	Sand	1	13.35	SoilCo		NP			0	92	8							
BD-BHL316	24.05	24.50	SPT	Harbour Beds	Sand	1	24.05	SoilCo		NP			0	90	10							
BD-BHL317	4.50	5.00	TW	Fill	Sand	1	4.5	SoilCo		NP			1	94	2	3						
BD-BHL317	13.40	13.85	SPT	Fill	Sand	1	13.4	SoilCo		NP			0	98	2							
BD-BHL317	20.10	20.55	SPT	Harbour Beds	Sand	1	20.1	SoilCo		NP			0	95	5							
BD-BHM101	7.50	7.95	SPT	Harbour Beds	Clay	1	7.5	Matrolab	59.3	40	27	13	4	60	22	14						
BD-BHM101	9.00	9.45	SPT	Harbour Beds	Clay	1	9	Matrolab	35.7	SP			1	70	13	16						
BD-BHM101	13.79	14.24	SPT	Harbour Beds	Sand	1	13.79	Matrolab		NP			2	93	5							
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	3	16.94	NMTL	31.3	38	21	17	0	64	25	12		✓				
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	4	17.1	NMTL	38.9	68	27	41	0	21	50	29		✓				
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	5	17.26	NMTL	37.4	62	23	39	0	33	43	25		✓				
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	6	17.41	NMTL	28.7	47	20	27	0	34	40	27		✓				
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	7	17.57	NMTL	31.7	59	22	37	0	33	48	19		✓				
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	1	17.73	NMTL	32.7	50	19	31	0	48	39	13	163.1					
BD-BHM101	16.79	18.29	C	Harbour Beds	Clay	2	17.89	NMTL	29.3	37	22	15	0	65	22	13	22.5					
BD-BHM101	22.34	22.78	SPT	Harbour Beds	Sand	1	22.34	Matrolab		NP			0	97	3							
BD-BHM101	31.20	31.42	C	Cretaceous	Siltstone	1	31.2	Thekwini											0.9			
BD-BHM101	32.82	33.02	C	Cretaceous	Siltstone	1	32.82	Thekwini											0.8			
BD-BHM101	34.23	34.41	C	Cretaceous	Siltstone	1	34.23	Thekwini											1.4			
BD-BHM101	38.23	38.48	C	Cretaceous	Siltstone	1	38.23	Thekwini											1.7			
BD-BHM101	40.97	41.21	C	Cretaceous	Siltstone	1	40.97	Thekwini											1.0			
BD-BHM101	42.59	42.78	C	Cretaceous	Siltstone	1	42.59	Thekwini											2.1			
BD-BHM101	45.29	45.52	C	Cretaceous	Sandstone	1	45.29	Thekwini											28.0			
BD-BHM101	47.46	47.69	C	Cretaceous	Siltstone	1	47.46	Thekwini											1.4			
BD-BHM101	52.08	52.24	C	Cretaceous	Siltstone	1	52.08	Thekwini											1.7			
BD-BHM101	53.58	53.74	C	Cretaceous	Siltstone	1	53.58	Thekwini											2.3			
BD-BHM101	56.17	56.33	C	Cretaceous	Siltstone	1	56.17	Thekwini											2.0			
BD-BHM101	56.63	56.89	C	Cretaceous	Siltstone	1	56.63	Thekwini											1.3			
BD-BHM101	57.96	58.08	C	Cretaceous	Siltstone	1	57.96	Thekwini											0.5			
BD-BHM101	58.61	58.79	C	Cretaceous	Siltstone	1	58.61	Thekwini											0.4			
BD-BHM101	59.58	59.74	C	Cretaceous	Siltstone	1	59.58	Thekwini											0.3			
BD-BHM101C	2.35	2.90	TW	Harbour Beds	Clay	1	2.35	NMTL	58.5	57	23	34	12	61	22	5		✓				
BD-BHM101C	2.35	2.90	TW	Harbour Beds	Clay	2	2.55	NMTL	66.9	83	34	49	3	30	51	16		✓				
BD-BHM101C	2.35	2.90	TW	Harbour Beds	Clay	3	2.75	NMTL	59.2	84	31	53	1	9	63	26		✓				
BD-BHM101C	3.35	3.90	TW	Harbour Beds	Clay	1	3.35	Thekwini	56.3	11		21	2	26	29	43	22					
BD-BHM101C	3.35	3.90	TW	Harbour Beds	Clay	2		Thekwini	51.9								36					
BD-BHM101C	4.90	5.35	TW	Harbour Beds	Clay	1	4.9	Thekwini	27	43	25	18	0	29	36	35	46					
BD-BHM101C	4.90	5.35	TW	Harbour Beds	Clay	2		Thekwini	29.9								55					
BD-BHM101C	4.90	5.35	TW	Harbour Beds	Clay	3		Thekwini	27								161					
BD-BHM101C	5.35	5.90		Harbour Beds	Clay		5.35	SoilCo		25	17	8	1	65	22	12						
BD-BHM101C	6.35	6.90		Harbour Beds	Clay		6.35	SoilCo		27	13	14	0	62	24	14						
BD-BHM102	6.00	6.45	SPT	Harbour Beds	Sand	1	6	Matrolab		NP			1	95	4							
BD-BHM102	16.50	16.95	SPT	Harbour Beds	Sand	1	16.5	Matrolab		NP			0	92	8							
BD-BHM102	31.80	31.95	C	Cretaceous	Siltstone	1	31.80	Thekwini											7.6			
BD-BHM102	41.10	41.29	C	Cretaceous	Siltstone	1	41.10	Thekwini											0.7			
BD-BHM102	42.45	42.58	C	Cretaceous	Siltstone	1	42.45	Thekwini											1.6			
BD-BHM102	43.54	43.66	C	Cretaceous	Siltstone	1	43.54	Thekwini											1.2			
BD-BHM102	46.70	46.90	C	Cretaceous	Siltstone	1	46.70	Thekwini											1.4			

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Durban Berth Deepening
Summary of Laboratory Testing

Hole No.	Sample					Specimen	Specimen	Testing Laboratory	Moisture Content (%)	Atterbeg Limits			Grading				QUT	CUT	UCS (MPa)	Relative Density		Shear Box
	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
BD-BHM102	48.36	48.49	C	Cretaceous	Siltstone	1	48.36	Thekwini											2.8			
BD-BHM103	4.55	5.00	SPT	Harbour Beds	Sand	1	4.55	SoilCo		NP			2	95	3							
BD-BHM103	23.09	23.54	SPT	KW	Sand	1	23.09	SoilCo		NP			7	83	10							
BD-BHM103	32.13	32.29	C	Cretaceous	Siltstone	1	32.13	Thekwini											8.7			
BD-BHM103	34.52	34.76	C	Cretaceous	Siltstone	1	34.52	Thekwini											1.4			
BD-BHM103	35.65	35.83	C	Cretaceous	Siltstone	1	35.65	Thekwini											1.3			
BD-BHM103	40.38	40.55	C	Cretaceous	Siltstone	1	40.38	Thekwini											1.4			
BD-BHM103	40.55	40.81	C	Cretaceous	Siltstone	1	40.55	Thekwini											1.8			
BD-BHM103	42.52	42.83	C	Cretaceous	Siltstone	1	42.52	Thekwini											1.4			
BD-BHM103	45.00	45.19	C	Cretaceous	Siltstone	1	45.00	Thekwini											1.4			
BD-BHM103	46.05	46.21	C	Cretaceous	Siltstone	1	46.05	Thekwini											1.2			
BD-BHM103	48.90	49.05	C	Cretaceous	Siltstone	1	48.90	Thekwini											1.0			
BD-BHM103	49.75	49.88	C	Cretaceous	Siltstone	1	49.75	Thekwini											3.3			
BD-BHM104	10.50	10.95	SPT	Harbour Beds	Sand	1	10.5	Matrolab		NP			0	95	5							
BD-BHM104	22.05	22.23	C	Cretaceous	Siltstone	1	22.05	Thekwini											1.0			
BD-BHM104	23.90	24.03	C	Cretaceous	Siltstone	1	23.90	Thekwini											1.2			
BD-BHM104	24.16	24.36	C	Cretaceous	Sandstone	1	24.16	Thekwini											7.6			
BD-BHM104	24.80	24.93	C	Cretaceous	Sandstone	1	24.80	Thekwini											29.0			
BD-BHM104	27.62	27.80	C	Cretaceous	Sandstone	1	27.62	Thekwini											20.9			
BD-BHM104	28.10	28.30	C	Cretaceous	Sandstone	1	28.10	Thekwini											3.9			
BD-BHM104	31.30	31.54	C	Cretaceous	Siltstone	1	31.30	Thekwini											1.3			
BD-BHM104	34.33	34.55	C	Cretaceous	Siltstone	1	34.33	Thekwini											1.6			
BD-BHM104	45.29	45.47	C	Cretaceous	Siltstone	1	45.29	Thekwini											1.5			
BD-BHM105A	25.85	26.20	C	Cretaceous	Siltstone	1	25.85	Thekwini											1.6			
BD-BHM105A	36.32	36.52	C	Cretaceous	Siltstone	1	36.32	Thekwini											1.5			
BD-BHM105A	38.00	38.15	C	Cretaceous	Siltstone	1	38.00	Thekwini											1.2			
BD-BHM105A	39.26	39.43	C	Cretaceous	Siltstone	1	39.26	Thekwini											1.3			
BD-BHM106	21.25	21.41	C	Cretaceous	Siltstone	1	21.25	Thekwini											0.8			
BD-BHM106	22.83	23.01	C	Cretaceous	Siltstone	1	22.83	Thekwini											1.3			
BD-BHM106	31.43	31.61	C	Cretaceous	Siltstone	1	31.43	Thekwini											1.6			
BD-BHM106	33.51	33.66	C	Cretaceous	Siltstone	1	33.51	Thekwini											1.2			
BD-BHM107	29.63	29.82	C	Cretaceous	Siltstone	1	29.63	Thekwini											1.2			
BD-BHM107	34.06	34.28	C	Cretaceous	Siltstone	1	34.06	Thekwini											1.9			
BD-BHM107	35.11	35.34	C	Cretaceous	Siltstone	1	35.11	Thekwini											1.7			
BD-BHM107	37.91	38.15	C	Cretaceous	Siltstone	1	37.91	Thekwini											1.5			
BD-BHM206	44.53	44.68	C	Cretaceous	Siltstone	1	44.53	Thekwini											1.2			
BD-BHM206	45.31	45.48	C	Cretaceous	Siltstone	1	45.31	Thekwini											1.3			
BD-BHM206	45.90	46.07	C	Cretaceous	Siltstone	1	45.90	Thekwini											1.7			
BD-BHM206	46.57	46.78	C	Cretaceous	Siltstone	1	46.57	Thekwini											1.6			
BD-BHM207	9.00	9.45	SPT	Harbour Beds	Sand	1	9	SoilCo		NP			1	94	5							
BD-BHM207	16.50	16.95	SPT	Harbour Beds	Sand	1	16.5	SoilCo		NP			1	79	20							
BD-BHM207	20.45	20.58	C	Cretaceous	Siltstone	1	20.45	Thekwini											1.2			
BD-BHM207	29.71	29.87	C	Cretaceous	Siltstone	1	29.71	Thekwini											1.3			
BD-BHM207	32.23	32.38	C	Cretaceous	Siltstone	1	32.23	Thekwini											1.2			
BD-BHM207	40.85	41.05	C	Cretaceous	Siltstone	1	40.85	Thekwini											1.0			
BD-BHM207	42.23	42.46	C	Cretaceous	Siltstone	1	42.23	Thekwini											1.1			
BD-BHM207	45.09	45.27	C	Cretaceous	Siltstone	1	45.09	Thekwini											1.2			
BD-BHM207	48.62	48.88	C	Cretaceous	Siltstone	1	48.62	Thekwini											2.0			
BD-BHM207	49.70	49.88	C	Cretaceous	Siltstone	1	49.70	Thekwini											1.8			
BD-BHM207	51.80	52.03	C	Cretaceous	Siltstone	1	51.80	Thekwini											2.6			
BD-BHM208	7.50	7.95	SPT	Harbour Beds	Sand	1	7.5	SoilCo		NP			0	93	7							
BD-BHM208	13.50	13.95	SPT	KW	Sand	1	13.5	SoilCo		NP			2	79	19							
BD-BHM208	15.14	15.30	C	Cretaceous	Siltstone	1	15.14	SoilCo											1.9			
BD-BHM208	16.20	16.36	C	Cretaceous	Siltstone	1	16.20	SoilCo											2.5			
BD-BHM208	17.28	17.49	C	Cretaceous	Siltstone	1	17.28	SoilCo											2.4			
BD-BHM208	20.32	20.44	C	Cretaceous	Siltstone	1	20.32	SoilCo											2.2			
BD-BHM209	4.50	4.97	TW	Harbour Beds	Clay	1	4.5	NMTL	56.8	89	39	50	0	1	73	26		✓				
BD-BHM209	4.50	4.97	TW	Harbour Beds	Clay	2	4.65	NMTL										✓				
BD-BHM209	4.50	4.97	TW	Harbour Beds	Clay	3	4.85	NMTL										✓				
BD-BHM209	4.97	5.42	SPT	Harbour Beds	Clay	1	4.97	SoilCo		45	27	18	0	39	43	18						
BD-BHM209	18.87	19.32	SPT	Harbour Beds	Clay	1	18.87	SoilCo		33	22	11	0	53	38	9						
BD-BHM209	40.63	40.78	C	Cretaceous	Siltstone	1	40.63	SoilCo											2.1			
BD-BHM209	49.32	49.50	C	Cretaceous	Siltstone	1	49.32	SoilCo											2.9			
BD-BHM209	51.48	51.62	C	Cretaceous	Siltstone	1	51.48	SoilCo											1.8			
BD-BHM209	52.36	52.53	C	Cretaceous	Siltstone	1	52.36	SoilCo											2.5			
BD-BHM209	56.79	56.96	C	Cretaceous	Siltstone	1	56.79	SoilCo											2.4			
BD-BHM209	57.31	57.47	C	Cretaceous	Siltstone	1	57.31	SoilCo											2.4			
BD-BHM210A	12.57	14.07	C	Harbour Beds	Clay	1	12.76	NMTL	44.2	71	24	47	0	12	74	14	46.8					

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Durban Berth Deepening
Summary of Laboratory Testing

Hole No.	Sample					Specimen	Specimen	Testing Laboratory	Moisture Content (%)	Atterbeg Limits			Grading				QUT	CUT	UCS (MPa)	Relative Density		Shear Box
	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
BD-BHM210A	12.57	14.07	C	Harbour Beds	Clay	2	13.65	NMTL	36	61	22	39	5	18	67	10	57.9					
BD-BHM211	3.00	3.45	SPT	Harbour Beds	Clay	1	3	SoilCo		47	27	20	1	27	52	20						
BD-BHM211	10.40	10.85	SPT	Harbour Beds	Clay	1	10.4	SoilCo		42	24	18	0	39	45	16						
BD-BHM211	11.90	12.35	SPT	Harbour Beds	Clay	1	11.9	SoilCo		37	21	16	0	45	39	16						
BD-BHM211	13.40	13.85	SPT	Harbour Beds	Clay	1	13.4	SoilCo		NP			0	92	8							
BD-BHM211	14.90	16.40	C	Harbour Beds	Clay	1	15.08	NMTL	61.1	81	29	52	0	3	73	24		✓				
BD-BHM211	14.90	16.40	C	Harbour Beds	Clay	2	15.23	NMTL	55.2	76	26	50	0	4	82	14		✓				
BD-BHM211	14.90	16.40	C	Harbour Beds	Clay	3	15.42	NMTL	52.2	62	21	41	0	17	69	14		✓				
BD-BHM211	14.90	16.40	C	Harbour Beds	Clay	4	15.56	NMTL	53.6	77	30	47	0	13	65	21		✓				
BD-BHM211	14.90	16.40	C	Harbour Beds	Clay	5	15.92	NMTL	63.5	86	29	57	0	9	65	26	18.5					
BD-BHM211	44.11	44.27	C	Cretaceous	Siltstone	1	44.11	Thekwini											1.9			
BD-BHM211	58.20	58.42	C	Cretaceous	Siltstone	1	58.20	Thekwini											2.2			
BD-BHM211	59.66	59.85	C	Cretaceous	Siltstone	1	59.66	Thekwini											1.8			
BD-BHM211	60.55	60.74	C	Cretaceous	Siltstone	1	60.55	Thekwini											2.1			
BD-BHM211	61.02	61.18	C	Cretaceous	Siltstone	1	61.02	Thekwini											1.1			
BD-CPTM208	10.20	10.34	C	Cretaceous	Siltstone	1	10.20	Thekwini											2.5			
BD-CPTM208	12.93	13.15	C	Cretaceous	Siltstone	1	12.93	Thekwini											1.6			
BD-CPTM208	13.80	13.95	C	Cretaceous	Siltstone	1	13.80	Thekwini											3.9			
SI-BH108	25.00	26.00	TW	Harbour Beds	Clay	4	25	NMTL	52.6	90	37	53	0	11	61	27						
SI-BH108	25.00	26.00	TW	Harbour Beds	Clay	1	25	NMTL										✓				
SI-BH108	25.00	26.00	TW	Harbour Beds	Clay	2	25.3	NMTL										✓				
SI-BH108	25.00	26.00	TW	Harbour Beds	Clay	3	25.43	NMTL										✓				
Phase 1			Bulk	Fill	Sand	1750.5 kg/m^3 - 90% MDD (Lab No. 10145)	*	Thekwini	21	20.6			3	93	1	3						37°
Phase 1			Bulk	Fill	Sand	1808.85 kg/m^3 - 93% MDD (Lab No. 10145)	*	Thekwini	21													36°
Phase 1			Bulk	Fill	Sand	1847.75 kg/m^3 - 95% MDD (Lab No. 10145)	*	Thekwini	21													36°
Phase 1			Bulk	Fill	Sand	A- Lightly Poured: 1582 kg/m^3 - Dr = 37% (Lab No. 10145 / A)	*	Thekwini	23.5											1769	1470	33°
Phase 1			Bulk	Fill	Sand	B - Lightly Tamped: 1627 kg/m^3 - Dr = 59% (Lab No. 10145 / B)	*	Thekwini	22.5													36°
Phase 1			Bulk	Fill	Sand	C - Heavily Tamped: 1716 kg/m^3 - Dr = 82% (Lab No. 10145 / C)	*	Thekwini	20.6													37°
Phase 1			Bulk	Harbour Beds	Sand	1744.2 kg/m^3 - 90% MDD (Lab No. 10146)	*	Thekwini	15.6	18.5			5	88	0	7						34°
Phase 1			Bulk	Harbour Beds	Sand	1734.45 kg/m^3 - 93% MDD (Lab No. 10146)	*	Thekwini	15.6													36°
Phase 1			Bulk	Harbour Beds	Sand	1841.1 kg/m^3 - 95% MDD (Lab No. 10146)	*	Thekwini	15.6													36°
Phase2			Bulk	Fill	Sand	1731.6 kg/m^3 - 90% MDD (Lab No. 10148)	*	Thekwini	22.7	22.5			1	97	0	2						34°
Phase2			Bulk	Fill	Sand	1789.32 kg/m^3 - 93% MDD (Lab No. 10148)	*	Thekwini	22.7													36°
Phase2			Bulk	Fill	Sand	1827.8 kg/m^3 - 95% MDD (Lab No. 10148)	*	Thekwini	22.7													36°
Phase2			Bulk	Fill	Sand	A- Lightly Poured: 1433 kg/m^3 - Dr = 37% (Lab No. 10148 / A)	*	Thekwini	22.6											1727	1451	32°
Phase2			Bulk	Fill	Sand	B - Lightly Tamped: 1610 kg/m^3 = Dr = 59% (Lab No. 10148 / B)	*	Thekwini	24.4													37°
Phase2			Bulk	Fill	Sand	C - Heavily Tamped: 1716 kg/m^3 - Dr = 82% (Lab No. 10148 / C)	*	Thekwini	21.8													39°
Phase2			Bulk	Harbour Beds	Sand	1678.5 kg/m^3 - 90% MDD (Lab No. 10147)	*	Thekwini	17.9	18.4			1	90	2	7						33°
Phase2			Bulk	Harbour Beds	Sand	1734.45 kg/m^3 - 93% MDD (Lab No. 10147)	*	Thekwini	17.9													34°
Phase2			Bulk	Harbour Beds	Sand	1771.75 kg/m^3 - 95% MDD (Lab No. 10147)	*	Thekwini	17.9													34°

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Summary of Laboratory Testing

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	Top	Base	Type	Strata	Material	Ref	Depth			LL	PL	PI	Gravel	Sand	Silt	Clay	C_u (kPa)			Maximum Density (kg/m^3)	Minimum Density (kg/m^3)	Friction Angle
Phase3			Bulk	Fill	Sand	1731.6 kg/m^3 - 90% MDD (Lab No. 10150)	*	Thekwini	22.8	21.5			1	91	1	7						34°
Phase3			Bulk	Fill	Sand	1789.32 kg/m^3 - 93% MDD (Lab No. 10150)	*	Thekwini	22.8													36°
Phase3			Bulk	Fill	Sand	1827.8 kg/m^3 - 95% MDD (Lab No. 10150)	*	Thekwini	22.8													37°
Phase3			Bulk	Fill	Sand	A- Lightly Poured: 1313 kg/m^3 - Dr = 37% (Lab No. 10150 / A)	*	Thekwini	25.1											1712	1437	31°
Phase3			Bulk	Fill	Sand	B - Lightly Tamped: 1489 kg/m^3 - Dr = 59% (Lab No. 10150 / B)	*	Thekwini	24.6													33°
Phase3			Bulk	Fill	Sand	C - Heavily Tamped: 1673 kg/m^3 - Dr = 82% (Lab No. 10150 / C)	*	Thekwini	21.4													39°
Phase3			Bulk	Harbour Beds	Sand	1698.3 kg/m^3 - 90% MDD (Lab No. 10149)	*	Thekwini	15.8	18.2			3	93	1	3						33°
Phase3			Bulk	Harbour Beds	Sand	1754.91 kg/m^3 - 93% MDD (Lab No. 10149)	*	Thekwini	15.8													33°
Phase3			Bulk	Harbour Beds	Sand	1792.65 kg/m^3 - 95% MDD (Lab No. 10149)	*	Thekwini	15.8													35°
Phase 2 -Berth203			Bulk	Fill	Sand	1538.1 kg/m^3 - 90% MDD (Lab No. 07089)	**	Thekwini	13.5													33°
Phase 2 -Berth203			Bulk	Fill	Sand	1589.37 kg/m^3 - 93% MDD (Lab No. 07089)	**	Thekwini	13.5													34°
Phase 2 -Berth203			Bulk	Fill	Sand	1623.55 kg/m^3 - 95% MDD (Lab No. 07089)	**	Thekwini	13.5													36°
Phase 2 -Berth203			Bulk	Fill	Sand	1674.82 kg/m^3 - 98% MDD (Lab No. 07089)	**	Thekwini	13.5													39°
Phase 2 -Berth203			Bulk	Fill	Sand	1709 kg/m^3 - 100% MDD (Lab No. 07089)	**	Thekwini	13.5													42°
Phase 2 -Berth203			Bulk	Fill	Sand	1512.18 kg/m^3 - 93% MDD (Lab No. 10013a)	**	Thekwini	14													34°
Phase 2 -Berth203			Bulk	Fill	Sand	1544.7 kg/m^3 - 95% MDD (Lab No. 10013b)	**	Thekwini	14													35°

Note :
* Composite samples from SPT
** Composite samples from test pits dug on Pier 2
Incorrect specimen depth - Still to be changed by NMTL

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Abbreviations:

LL	-	Liquid Limit	GM	-	Grading Modulus
PI	-	Plasticity Index	MDD	-	Maximum Dry Density
LS	-	Linear Shrinkage	OMC	-	Optimum Moisture Content
NP	-	Non-Plastic	SP/EP	-	Slightly Plastic
CBD	-	Cannot be determined			

Classification in Terms of: USPRA
Unified Soil Classification System

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Transnet Projects

Port of Durban Berth Deepening Feasibility Study

Laboratory Report for Phases 1, 2 & 3

VOLUME 2

Reference : 07-395Rev0

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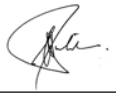
MOORE SPENCE JONES (PTY) LTD

	Name	Designation	Signature	Date
Approved By	M Richter	Director		30 June 2009

Factual Geotechnical Report : Phase 2 (Pier 2 : Berths 203 to 205)					
Revision	**Date**	**Author**	**Checked**	**Status**	**Approved**
Rev 0	30 June 2009	Sue-Anya Pillay		Ok	

Transnet Projects

Port of Durban Berth Deepening Feasibility Study

Laboratory Report for Phases 1, 2 & 3

VOLUME 2

Reference : 07-395Rev0	**Dated : 30 June 2009**

VOLUME 1 of 2

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APPENDIX A

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

a SANAS Accredited Laboratory, No. T0213

SANAS ACCREDITED LABORATORY

Client : Moore Spence Jones | **Job Card No : 128791**

Project : Durban Harbour 07-395 | **Date Received : 2008-07-08**

Date Tested : 2008-07-11

Sample delivered by : - Customer | **Date Reported : 2008-07-17**

AGGREGATE TEST REPORT

Laboratory No.		4579	4609	4618	4622	
Field No.		BD - BHL 104	BD - BHL 315	BD - BHL 103	BD - BHL 207	
Position in Field						
Depth (mm)		24.50 - 24.95	9.45 - 10.50	9.0 - 9.45	13.50 - 13.95	
Material Description		Dk.Br. Sty.Sand Natural	G.Br. Sand Natural	Br.G. Sand Natural	Br.G. Sand Natural	
Sieve Analysis (% Passing) TMH 1 - Method B4						
Sieve Aperture	**75.0**	**mm**				
	63.0	**mm**				
	53.0	**mm**				
	37.5	**mm**				
	26.5	**mm**				
	19.0	**mm**				
	16.0	**mm**				
	13.2	**mm**				
	9.5	**mm**				
	6.7	**mm**				
	4.75	**mm**				
	3.35	**mm**			100	
	2.36	**mm**	100	100	99	
	1.18	**mm**	95	99	98	100
	0.600	**mm**	62	98	97	99
	0.425	**mm**	35	93	94	98
	0.300	**mm**	17	75	81	90
	0.150	**mm**	4	9	14	16
	0.075	**mm**	2	3	4	4
Material Characteristics						
Fineness Modulus		**TMH 1 B13**	2.22	1.20	1.11	0.95
Flakiness Index (%)		**TMH 1 B3**				
Average Least Dimension (mm)		**TMH 1 B18(a)**				
Aggregate Crushing Value (%)		**TMH 1 B1**				
10% Fact (kN)		**TMH 1 B2**				
Water Absorption (%)		**TMH B14 or B15**				
Presence of Sugar	*	**SABS 833**				
Organic Impurity	**	**TMH 1 B6**				
Sand Equivalent		**SABS 838**				
Apparent Relative Density		**Colto - 8100**				

The above test results are pertinent only to the samples received and tested at the laboratory. This report shall not be reproduced, except in full, without the prior consent of SOILCO MATERIALS INVESTIGATIONS (Pty) Ltd.

*** * Denotes that if the colour of the liquid layer is darker than that of the reference solution, further tests should be carried out to determine the presence or quantity of organic impurities present. Results are not accurate and are merely an indication.**

Tests marked * in this report are " Not SANAS Accredited " and are not included in the SANAS Schedule of Accreditation for this Laboratory.

 # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07
25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATA
TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za
a SANAS Accredited Testing Laboratory, No. T0213

Customer : Moore Spence Jones
Project : Durban Harbour 07 -395 Phase 1
Sample delivered by : Customer

Job Card No. : 129815 / 128791
Date Received : 2008-07-29
Date Tested : 2003-04-30 to 2003-05-02
Date Reported : 2008-07-30

MATERIALS TEST REPORT

Laboratory Number		4596	4587	4592	4620	4575
Field Number						
Position in field		BD BHL 102	BD BHL 102	BD BHL 102	BD BHL 103	BD BHL 105
Depth	(mm)	7.5 - 7.95	15.0 - 15.45	35.3 - 35.75	30.55 - 31.00	25.50 - 25.95
Sample Description		Dk.Br.Sty.Sand	Dk.Br.Sty.Sand	Ol.Br.Sty.Sand	Y.Br.Sty.Sand	G.Br.Sty.Sand
Stabilising Agent		Natural	Natural	Natural	Natural	Natural

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm				100		
26.50	mm				91		
19.00	mm				91		
13.20	mm				91	100	100
4.75	mm		100		91	99	95
2.00	mm		99	100	90	95	89
0.425	mm		94	98	60	75	79
0.075	mm		5	7	8	10	4
Grading Modulus			1.02	0.95	1.41	1.2	1.28

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	5	2	33	21	11
Coarse - Fine Sand	(%)	30	22	30	32	33
Medium - Fine Sand	(%)	53	59	21	30	45
Fine - Fine Sand	(%)	7	10	7	7	6
Silt and Clay	(%)	5	7	9	10	4

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD	CBD	CBD
Plasticity Index	(%)	NP	NP	NP	SP	NP
Linear Shrinkage	(%)	0.0	0.0	0.0	1.0	0.0
Classification Group Index		A-3(0)	A-3(0)	A-3(0)	A-2-4(0)	A-3(0)
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

Remarks:

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CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATA
TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za
a SANAS Accredited Testing Laboratory, No. T0213

Customer	: Moore Spence Jones	**Job Card No.**	: 129815 / 128791
Project	: Durban Harbour 07 -395 Phase 1	**Date Received**	: 2008-07-29
		Date Tested	: 2003-04-30 to 2003-05-02
Sample delivered by	: Customer	**Date Reported**	: 2008-07-30

MATERIALS TEST REPORT

Laboratory Number		4578	4606	4582		
Field Number						
Position in field		BD BHL 106	BD BHL 107	BD BHL 108		
Depth	(mm)	7.50 - 7.95	7.5 - 7.95	23.10 - 23.55		
Sample Description		G.Br.Sl.Gravelly Sty.Sand	G.Bl.Gravelly Sty.Sand	Br.G.Sty.Sand		
Stabilising Agent		Natural	Natural	Natural		

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm			100			
13.20	mm			97			
4.75	mm			89			
2.00	mm		100	69	100		
0.425	mm		97	47	99		
0.075	mm		8	6	14		
Grading Modulus			0.95	1.78	0.87		

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	3	31	1		
Coarse - Fine Sand	(%)	29	15	25		
Medium - Fine Sand	(%)	50	40	53		
Fine - Fine Sand	(%)	10	5	7		
Silt and Clay	(%)	8	9	14		

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD		
Plasticity Index	(%)	NP	NP	NP		
Linear Shrinkage	(%)	0.0	1.0	1.0		
Classification Group Index		A-3(0)	A-1-b(0)	A-1-b(0)		
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

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a SANAS Accredited Testing Laboratory, No. T0213

Customer : Moore Spence Jones

Project : Durban Harbour 07 -395 Phase 2

Sample delivered by : Customer

Job Card No. : 129815 / 128791

Date Received : 2008-07-29

Date Tested : 2003-04-30 to 2003-05-02

Date Reported : 2008-07-30

MATERIALS TEST REPORT

Laboratory Number		5137	5138	5139	5140	
Field Number						
Position in field		BD BHL 204	BD BHL 204	BD BHL 208	BD BHL 208	
Depth	(mm)	9.05 - 9.5	26.55 - 26.85	12.10 - 12.45	27.85 - 28.30	
Sample Description		Lt.Br.Sand	Lt.O.Br.Sand	Br.G.Speck. Bl.Sand	Sl.P.G.Lt.Br.Sand	
Stabilising Agent		Natural	Natural	Natural	Natural	

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm						
13.20	mm						
4.75	mm			100			
2.00	mm		100	99	100	100	
0.425	mm		98	94	98	92	
0.075	mm		2	4	3	5	
Grading Modulus			1.00	1.03	1.00	1.03	

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	2	5	2	8	
Coarse - Fine Sand	(%)	16	24	21	45	
Medium - Fine Sand	(%)	70	52	61	37	
Fine - Fine Sand	(%)	11	14	12	5	
Silt and Clay	(%)	2	4	3	5	

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD	CBD	
Plasticity Index	(%)	NP	NP	NP	NP	
Linear Shrinkage	(%)	0.0	0.0	0.0	0.0	
Classification Group Index		A-3(0)	A-3(0)	A-3(0)	A-3(0)	
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

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a SANAS Accredited Testing Laboratory, No. T0213

Customer	:	Moore Spence Jones	**Job Card No.**	:	129815 / 128791
Project	:	Durban Harbour 07 -395 Phase 3	**Date Received**	:	2008-07-29
			Date Tested	:	2003-04-30 to 2003-05-02
Sample delivered by	:	Customer	**Date Reported**	:	2008-07-30

MATERIALS TEST REPORT

Laboratory Number		5148	5149	5150	4611	
Field Number						
Position in field		BD BHL 309	BD BHL 309	BD BHL 309	BD BHL 315	
Depth	(mm)	12.0 - 12.45	22.0 - 22.45	26.0 - 26.45	33.0 - 33.45	
Sample Description		Beige Br.Sand	Beige Br.Sand	Beige Br.Sand	O.Br.Mic.Sand	
Stabilising Agent		Natural	Natural	Natural	Natural	

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm					100	
13.20	mm					94	
4.75	mm					88	
2.00	mm		100	100	100	78	
0.425	mm		98	92	71	36	
0.075	mm		3	4	4	9	
Grading Modulus			0.99	1.04	1.25	1.77	

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	2	8	29	54	
Coarse - Fine Sand	(%)	20	31	43	19	
Medium - Fine Sand	(%)	61	46	20	10	
Fine - Fine Sand	(%)	15	11	4	6	
Silt and Clay	(%)	3	4	4	11	

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD	CBD	
Plasticity Index	(%)	NP	NP	NP	NP	
Linear Shrinkage	(%)	0.0	0.0	0.0	0.0	
Classification Group Index		A-3(0)	A-3(0)	A-3(0)	A-1-b(0)	
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and interpretations expressed herein are Outside the Scope of SANAS Accreditation.

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a SANAS Accredited Testing Laboratory, No. T0213

Customer	:	Moore Spence Jones	**Job Card No.**	:	129815 / 128791
Project	:	Durban Harbour 07 -395 Phase 1	**Date Received**	:	2008-07-29
			Date Tested	:	2003-04-30 to 2003-05-02
Sample delivered by	:	Customer	**Date Reported**	:	2008-07-30

MATERIALS TEST REPORT

Laboratory Number		5127	5128			
Field Number						
Position in field		BD BHM 103	BD BHM 103			
Depth	(mm)	4.55 - 5.00	23.09 - 23.54			
Sample Description		Br.Speck. O.Wth.Bl.Sand	Dk.Br.G.Sand			
Stabilising Agent		Natural	Natural			

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm						
13.20	mm						
4.75	mm		100				
2.00	mm		98	100			
0.425	mm		37	93			
0.075	mm		3	10			
Grading Modulus			2.10	1.05			

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	62	7			
Coarse - Fine Sand	(%)	18	8			
Medium - Fine Sand	(%)	10	15			
Fine - Fine Sand	(%)	7	51			
Silt and Clay	(%)	3	20			

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD			
Plasticity Index	(%)	NP	NP			
Linear Shrinkage	(%)	0.0	0.0			
Classification Group Index		A-1-b(0)	A-2-4(0)			
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

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a SANAS Accredited Testing Laboratory, No. T0213

Customer	:	Moore Spence Jones	**Job Card No.**	:	129815 / 128791
Project	:	Durban Harbour 07 -395 Phase 2	**Date Received**	:	2008-07-29
			Date Tested	:	2003-04-30 to 2003-05-02
Sample delivered by	:	Customer	**Date Reported**	:	2008-07-30

MATERIALS TEST REPORT

Laboratory Number		5129	5130	5131	5132	5136
Field Number						
Position in field		BD BHM 207	BD BHM 207	BD BHM 208	BD BHM 208	BD BHM 211
Depth	(mm)	9.0 - 9.45	16.5 - 16.95	7.50 - 7.95	13.5 - 13.95	13.40 - 13.85
Sample Description		Dk.Br.Sl.Sty.Sand	Dk.G.Sty.Sand	Lt.Br.Sand	Dk.Br.Sand	G.Lt.Br.Speck. Bl.O.Sand
Stabilising Agent		Natural	Natural	Natural	Natural	Natural

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm						
13.20	mm					100	
4.75	mm		100	100		99	
2.00	mm		99	99	100	98	100
0.425	mm		74	85	97	92	96
0.075	mm		5	20	7	19	8
Grading Modulus			1.03	0.96	0.95	0.91	0.96

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	25	14	3	7	4
Coarse - Fine Sand	(%)	35	11	19	5	19
Medium - Fine Sand	(%)	30	11	50	12	46
Fine - Fine Sand	(%)	5	44	21	58	22
Silt and Clay	(%)	5	20	7	19	8

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD	CBD	CBD
Plasticity Index	(%)	NP	NP	NP	NP	NP
Linear Shrinkage	(%)	0.0	0.0	0.0	0.0	0.0
Classification Group Index		A-3(0)	A-2-4(0)	A-3(0)	A-2-4(0)	A-3(0)
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

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TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

a SANAS Accredited Testing Laboratory, No. T0213

Customer : Moore Spence Jones

Project : Durban Harbour 07 -395 Phase 3

Sample delivered by : Customer

Job Card No. : 129815 / 128791

Date Received : 2008-07-29

Date Tested : 2003-04-30 to 2003-05-02

Date Reported : 2008-07-30

MATERIALS TEST REPORT

Laboratory Number		5151	5152	5153	5154	
Field Number						
Position in field		BD BHL 316	BD BHL 316	BD BHL 317	BD BHL 317	
Depth	(mm)	13.35 - 14.00	24.05 - 24.50	13.40 - 13.85	20.10 - 20.55	
Sample Description		G.Br.Sand	Br.Speck.O.Sty. Sand	Dk.Br.Speck.Bl.O. Sty.Sand	Lt.Br.Speck. Bl.O.Sand	
Stabilising Agent		Natural	Natural	Natural	Natural	

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

63.00	mm	Percentage Passing					
53.00	mm						
37.50	mm						
26.50	mm						
19.00	mm						
13.20	mm						
4.75	mm						
2.00	mm		100	100	100	100	
0.425	mm		98	84	96	73	
0.075	mm		8	10	2	5	
Grading Modulus			0.94	1.07	1.02	1.22	

Mechanical Analysis - TMH1 - Method A5

Coarse Sand	(%)	2	16	4	27	
Coarse - Fine Sand	(%)	18	30	24	31	
Medium - Fine Sand	(%)	58	36	59	29	
Fine - Fine Sand	(%)	15	8	11	8	
Silt and Clay	(%)	8	10	2	5	

Atterberg Limits - TMH1 - Methods A2, A3, A4

Liquid Limit	(%)	CBD	CBD	CBD	CBD	
Plasticity Index	(%)	NP	NP	NP	NP	
Linear Shrinkage	(%)	0.0	0.0	0.0	0.0	
Classification Group Index		A-3(0)	A-3(0)	A-3(0)	A-3(0)	
TRH 14 Classification (1985)	#					

Maximum Dry Density and Optimum Moisture Content - TMH1 - Method A7

Optimum Moisture Content	(%)					
Maximum Dry Density	(kg/m^3)					

California Bearing Ratio - TMH1 - Method A8

CBR	@	100 % Compaction					
CBR	@	98 % Compaction					
CBR	@	95 % Compaction					
CBR	@	93 % Compaction					
CBR	@	90 % Compaction					
Swell	@	100 % Compaction					

The above test results are pertinent only to the samples received and tested at the laboratory. Deviation from TMH1, A8 ; 90% compaction 20 blows, with 3 layers, with tamper mass of 4.536kg and drop of 457.2mm. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as "the wet curve method". This report shall not be reproduced, except in full, without the prior consent of Soilco Materials Investigations (Pty) Ltd. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

Remarks:

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Job Card No : 128791/129815/130867 A

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Sample delivered by : - Customer

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.		6226	6227	4588	4590	4591
Field No.						
Position in Field		BD BHM 101C	BD BHM 101C	BD BHL 102	BD BHL 102	BD BHL 102
Depth (mm)		6.35 - 6.90	5.35 - 5.90	19.50 - 21.00	28.95 - 30.00	32.00 - 33.25
Material Description		Sl.Sdy.Clay HB	Sl.Sdy.Clay HB	B.G.Cly.Sand	Dk.G.Sty.Clay	Dk.G.Sty.Sand
Stabilising Agent		Natural	Natural	Natural	Natural	Natural
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)						
Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**				100	
	37.5	**mm**				78	
	26.5	**mm**				61	
	19.0	**mm**				37	
	13.2	**mm**				31	
	4.75	**mm**		100		30	
	2.00	**mm**	100	99		30	100
	0.425	**mm**	99	99	100	30	99
	0.075	**mm**	50	50	51	26	28
Hydrometer Analysis (ASTM - D422)							
Sieve Aperture	**0.060**	**mm**	38	34	38	25	24
	0.050	**mm**	36	32	36	25	24
	0.026	**mm**	28	26	30	23	20
	0.015	**mm**	24	22	28	21	18
	0.010	**mm**	20	18	24	20	16
	0.0074	**mm**	16	16	24	18	14
	0.005	**mm**	14	14	22	16	12
	0.0036	**mm**	14	12	22	15	10
	0.0020	**mm**	14	12	22	14	10
	0.0015	**mm**	12	10	20	11	8
Soil Mortar Analysis							
Coarse Sand		**%**	1	0	0	0	1
Fine Sand		**%**	61	66	62	16	75
Silt		**%**	24	22	16	38	14
Clay		**%**	14	12	22	46	10
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	27	25	23	60	CBD
Plasticity Index		**%**	14	8	6	27	SP
Linear Shrinkage		**%**	6	4	3	13	1
Equivalent PI		**%**	13.9	7.9	6.0	8.1	0.0
Classification (Group Index)			A-6-5(5)	A-4(3)	A-4(3)	A-2-7(2)	A-2-4(0)

For Soilco : _____

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Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867 A

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6226

Position in field : BD BHM 101C

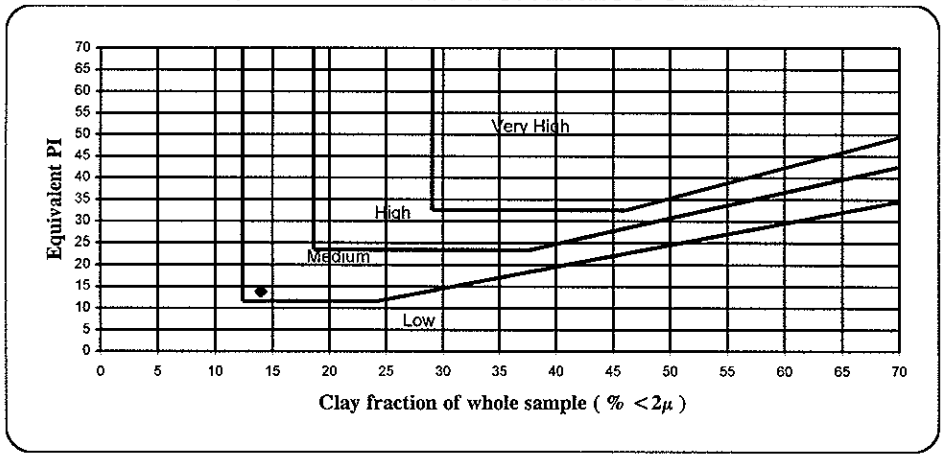
Sample Description : Sl.Sdy.Clay HB

Field or Pit Number :

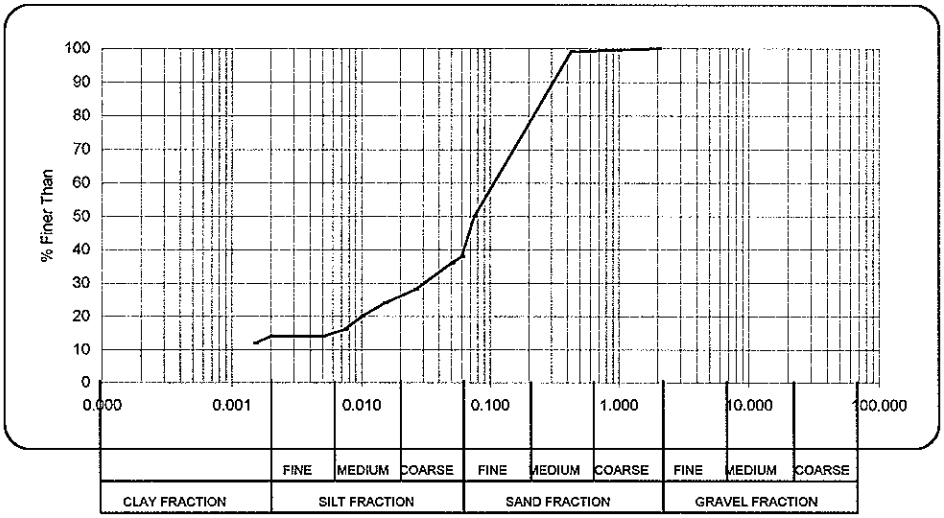
Depth (mm) : 6.35 - 6.90

Equivalent PI : 13.86 **Clay fraction of whole sample (% <2μ)** : 14

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6227

Position in field : BD BHM 101C

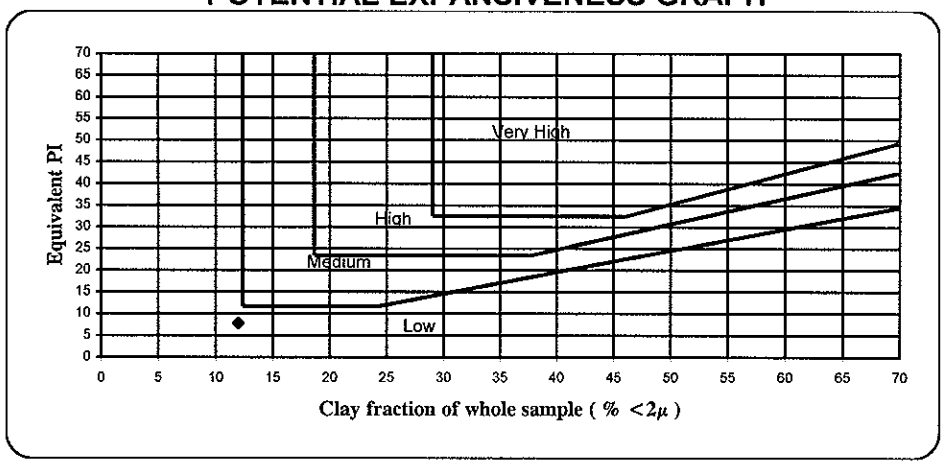
Sample Description : Sl.Sdy.Clay HB

Field or Pit Number :

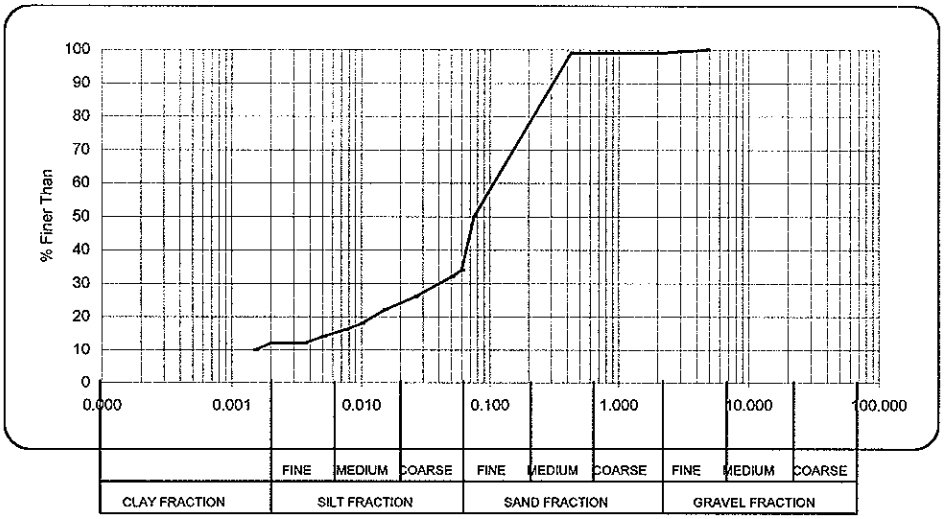
Depth (mm) : 5.35 - 5.90

Equivalent PI : 7.9 **Clay fraction of whole sample (% <2μ)** : 12

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4588

Position in field : BD BHL 102

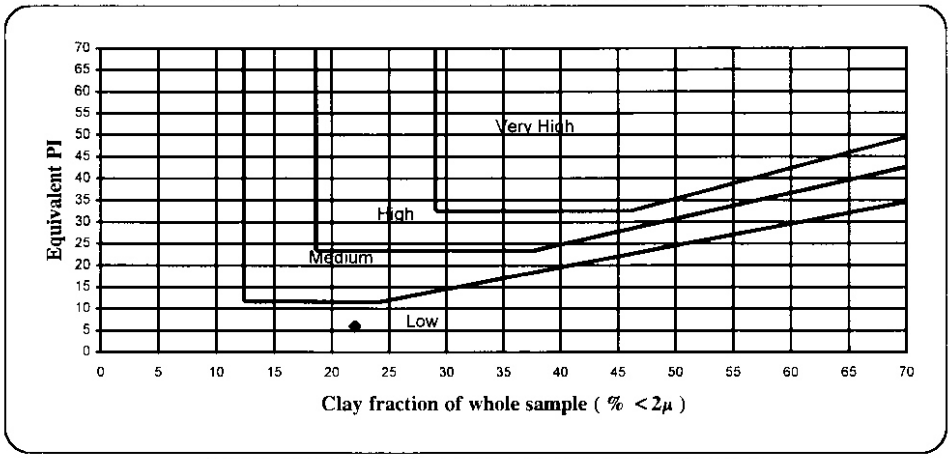
Sample Description : B.G.Cly.Sand

Field or Pit Number :

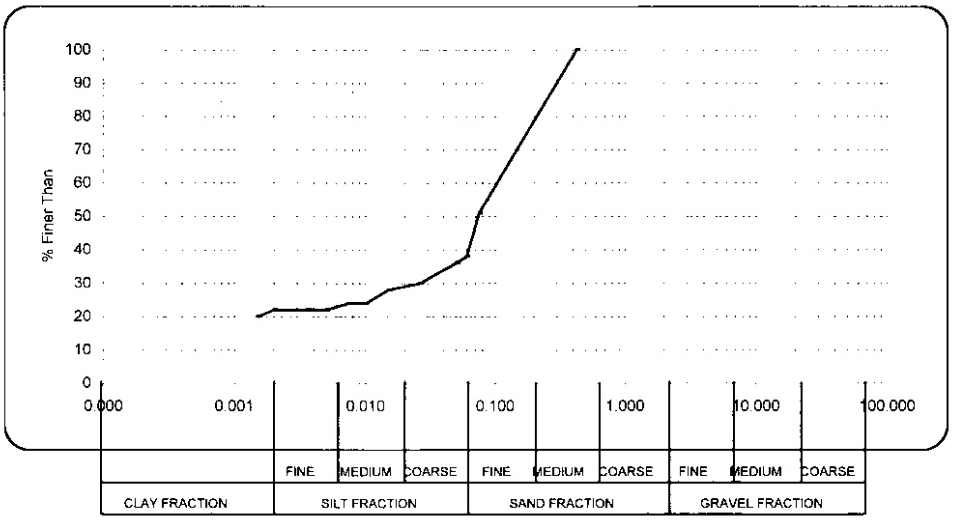
Depth (mm) : 19.50 - 21.00

Equivalent PI : 6 **Clay fraction of whole sample (% <2μ)** : 22

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4590

Position in field : BD BHL 102

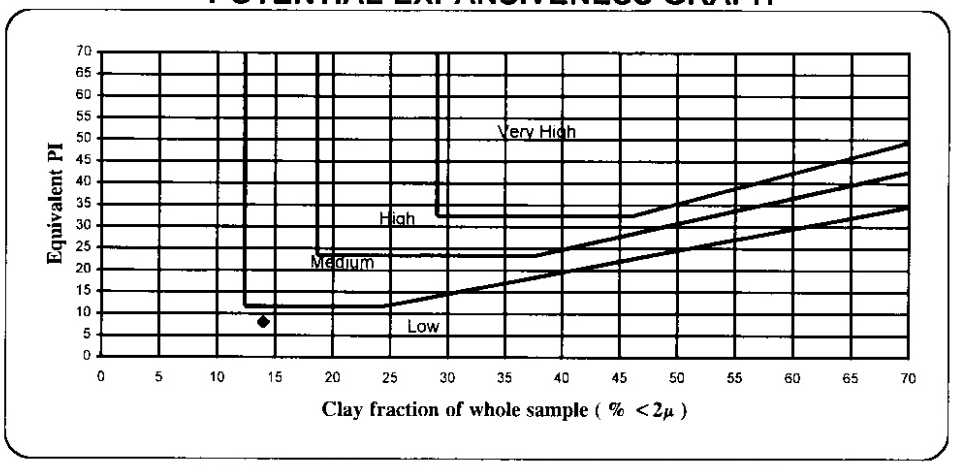
Sample Description : Dk.G.Sty.Clay

Field or Pit Number :

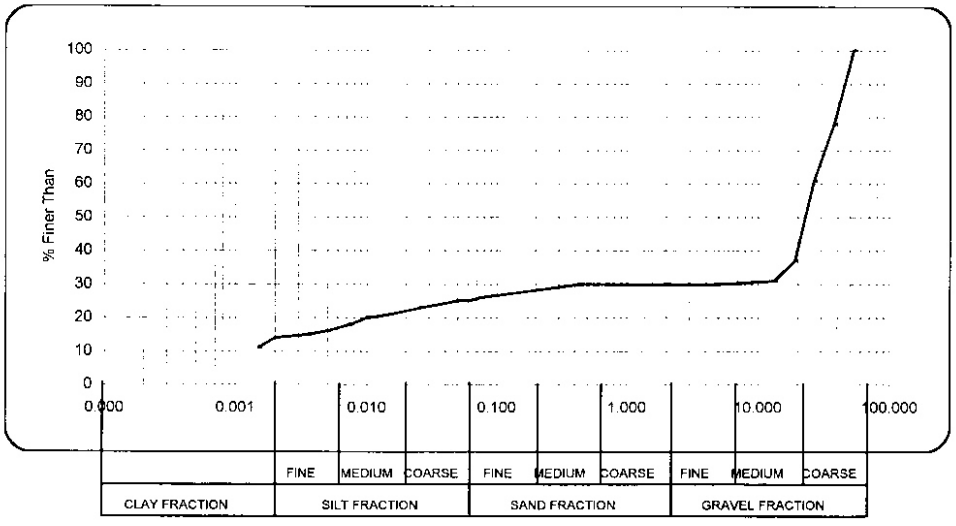
Depth (mm) : 28.95 - 30.00

Equivalent PI : 8.1 **Clay fraction of whole sample (% <2μ)** : 14

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4591

Position in field : BD BHL 102

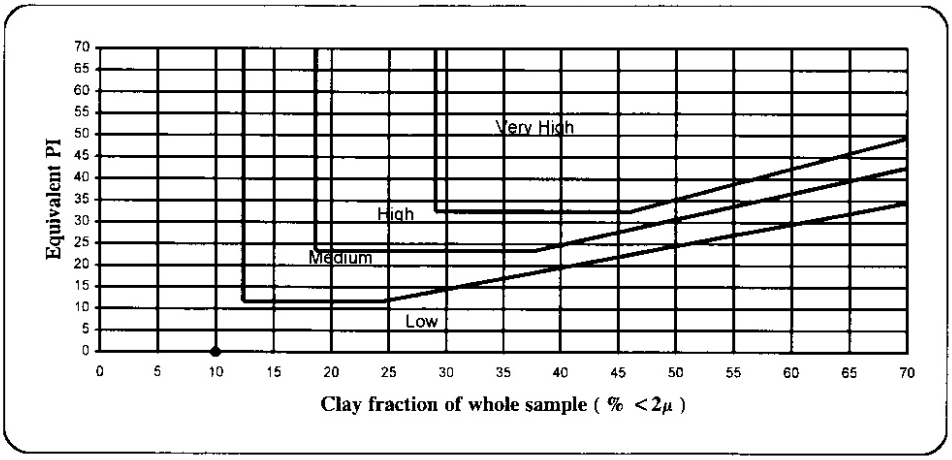
Sample Description : Dk.G.Sty.Sand

Field or Pit Number :

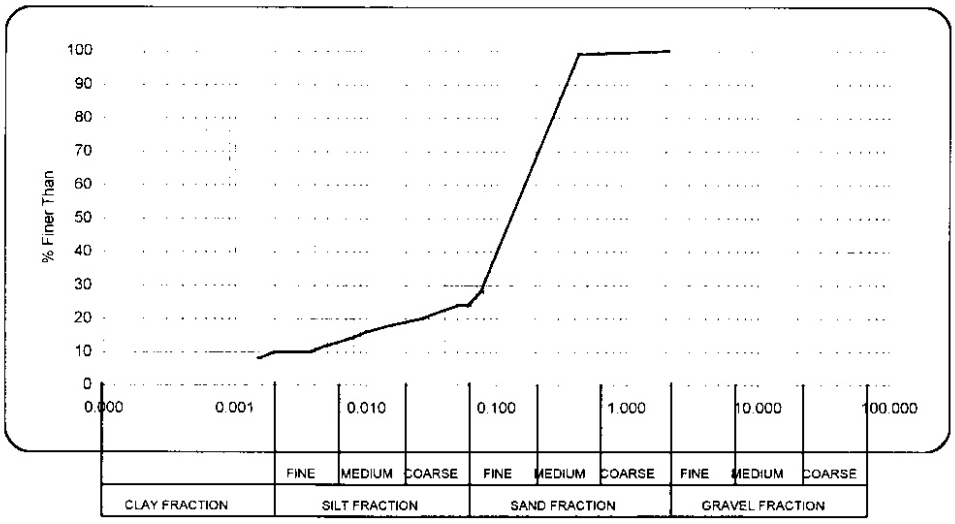
Depth (mm) : 32.00 - 33.25

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 10

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Job Card No : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

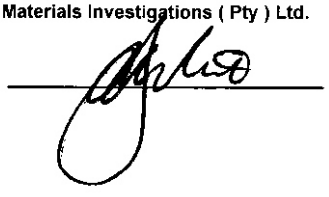
Sample delivered by : - Customer

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.		4593	4595	4619	4580	4576
Field No.						
Position in Field		BD BHL 102	BD BHL 102	BD BHL 103	BD BHL 104	BD BHL 105
Depth (mm)		38.20 - 38.65	41.0 - 42.65	29.05 - 29.50	28.00 - 29.50	34.50 - 34.95
Material Description		O.Y.Sand	G.Sl.Cly.Sty.Sand	Dk.G.Br.Silty Sand	Dk.Br.Clayey Sand	Dk.G.Sandy Silt
Stabilising Agent		Natural	Natural	Natural	Natural	Natural
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)						
Sieve Aperture	**75.0**	**mm**				
	63.0	**mm**				
	53.0	**mm**				
	37.5	**mm**				
	26.5	**mm**				
	19.0	**mm**		100		
	13.2	**mm**		99		
	4.75	**mm**	100	98	100	100
	2.00	**mm**	97	97	99	99
	0.425	**mm**	77	96	85	100	98
	0.075	**mm**	15	16	23	43	83
Hydrometer Analysis (ASTM - D422)							
Sieve Aperture	**0.060**	**mm**	15	12	22	40	57
	0.050	**mm**	15	11	20	40	53
	0.026	**mm**	14	11	19	36	39
	0.015	**mm**	14	9	17	36	33
	0.010	**mm**	12	9	17	36	29
	0.0074	**mm**	12	8	15	34	26
	0.005	**mm**	11	6	14	32	22
	0.0036	**mm**	11	6	14	30	20
	0.0020	**mm**	11	6	14	28	16
	0.0015	**mm**	9	6	12	28	14
Soil Mortar Analysis							
Coarse Sand		**%**	21	21	14	0	1
Fine Sand		**%**	64	67	64	60	42
Silt		**%**	5	6	9	12	42
Clay		**%**	11	6	14	28	16
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	CBD	CBD	CBD	33	41
Plasticity Index		**%**	NP	NP	SP	11	19
Linear Shrinkage		**%**	0	0	1	6	10
Equivalent PI		**%**	0.0	0.0	0.0	10.9	18.6
(Classification (Group Index)			A-2-4(0)	A-2-4(0)	A-2-4(0)	A-6(8)	A-7-6(12)

For Soilco :



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Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4593

Position in field : BD BHL 102

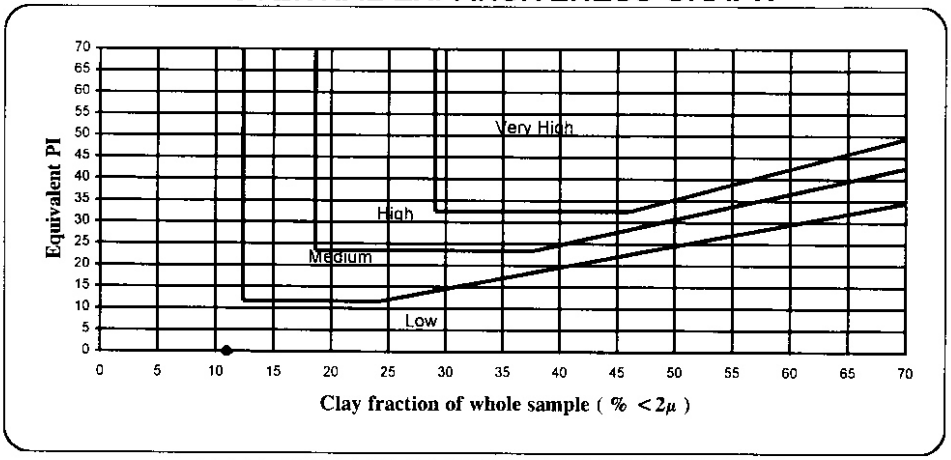
Sample Description : O.Y.Sand

Field or Pit Number :

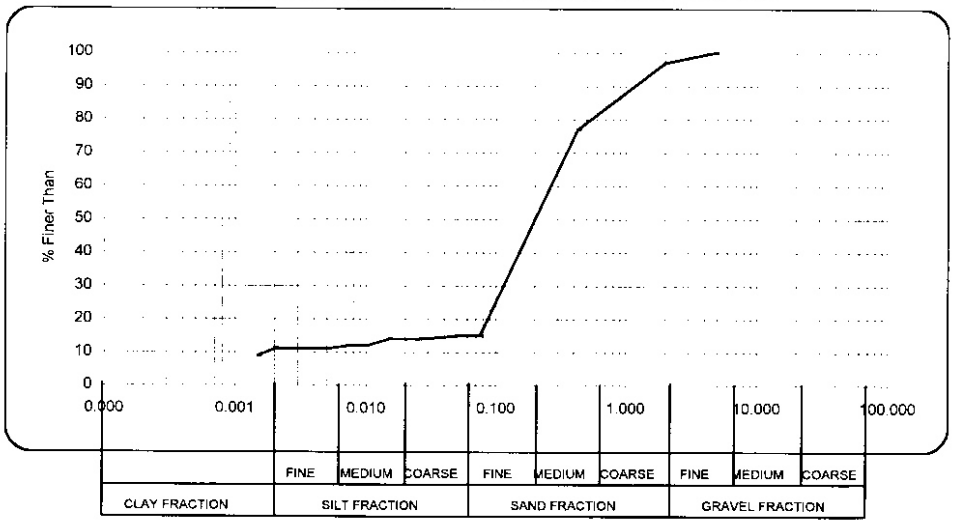
Depth (mm) : 38.20 - 38.65

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 11

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4595

Position in field : BD BHL 102

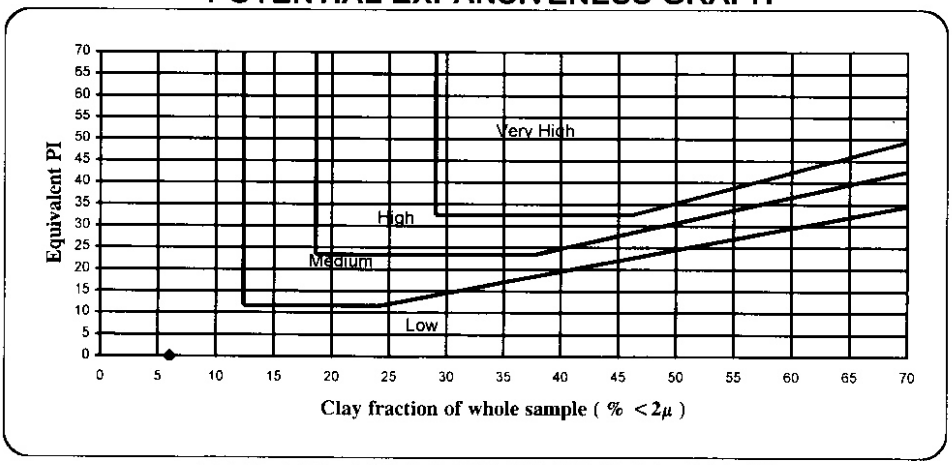
Sample Description : G.SI.Cly.Sty.Sand

Field or Pit Number :

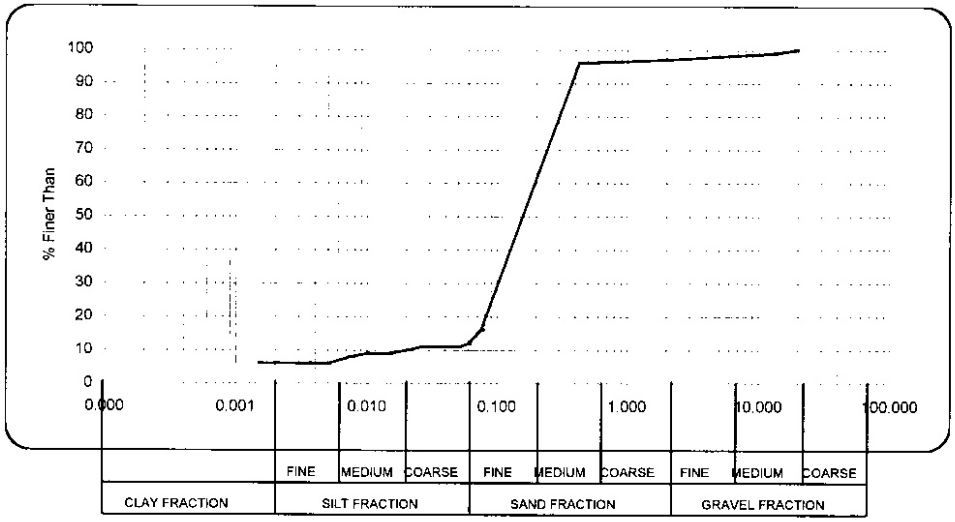
Depth (mm) : 41.0 - 42.65

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 6

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc : _____

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4619

Position in field : BD BHL 103

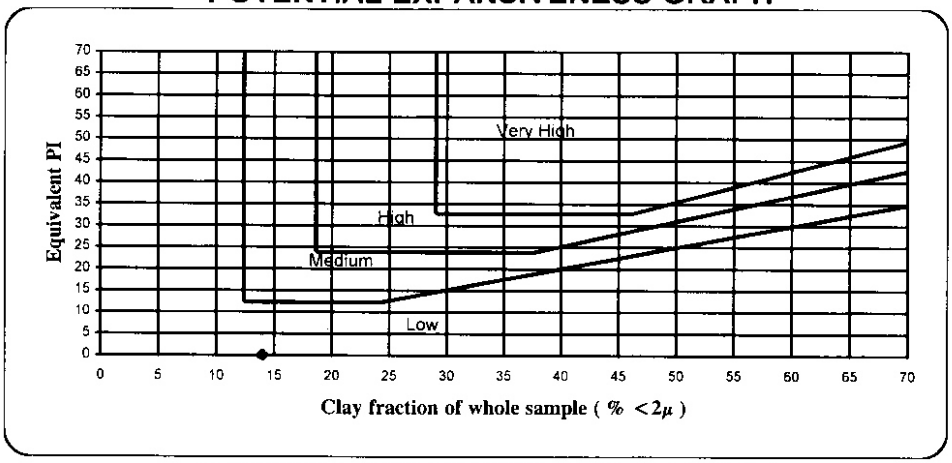
Sample Description : Dk.G.Br.Silty Sand

Field or Pit Number :

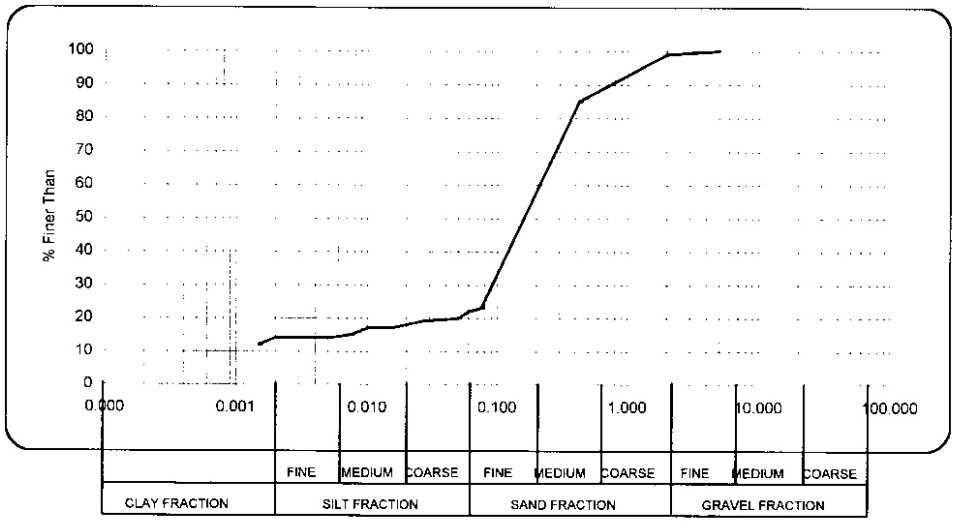
Depth (mm) : 29.05 - 29.50

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 14

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4580

Position in field : BD BHL 104

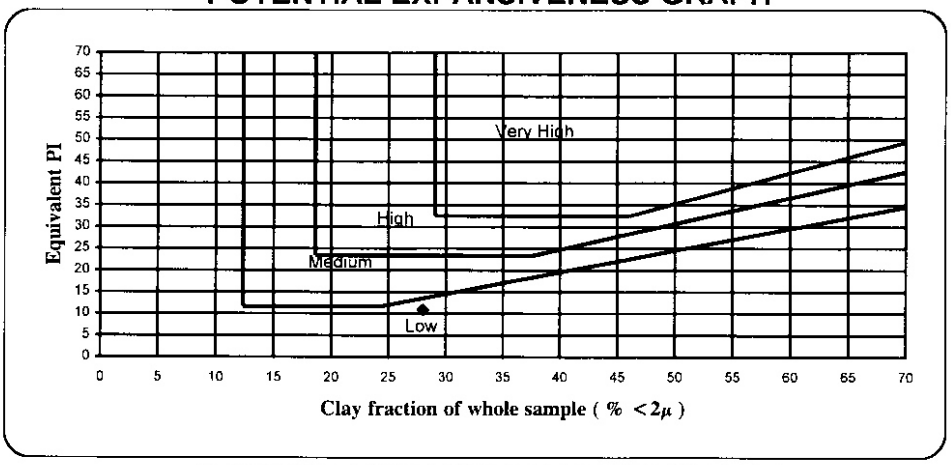
Sample Description : Dk.Br.Clayey Sand

Field or Pit Number :

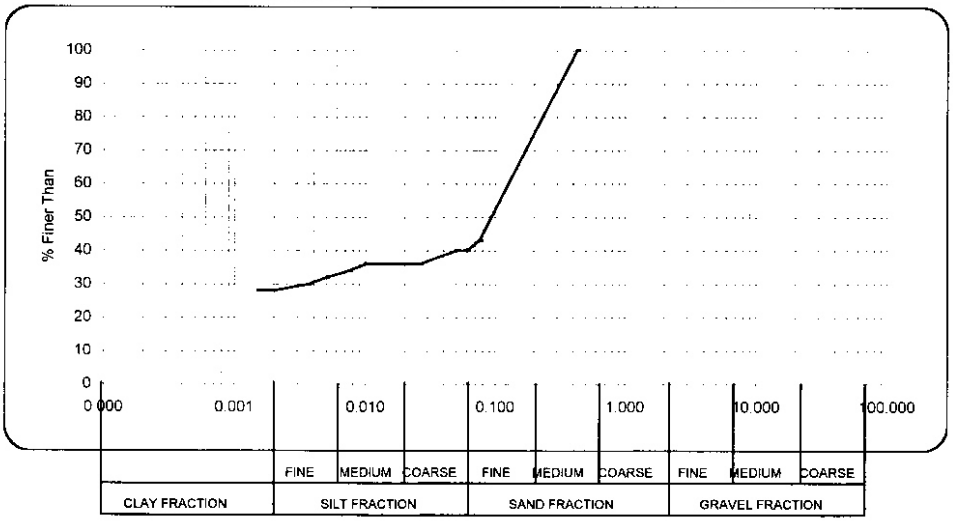
Depth (mm) : 28.00 - 29.50

Equivalent PI : 10.9 **Clay fraction of whole sample (% <2μ)** : 28

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4576

Position in field : BD BHL 105

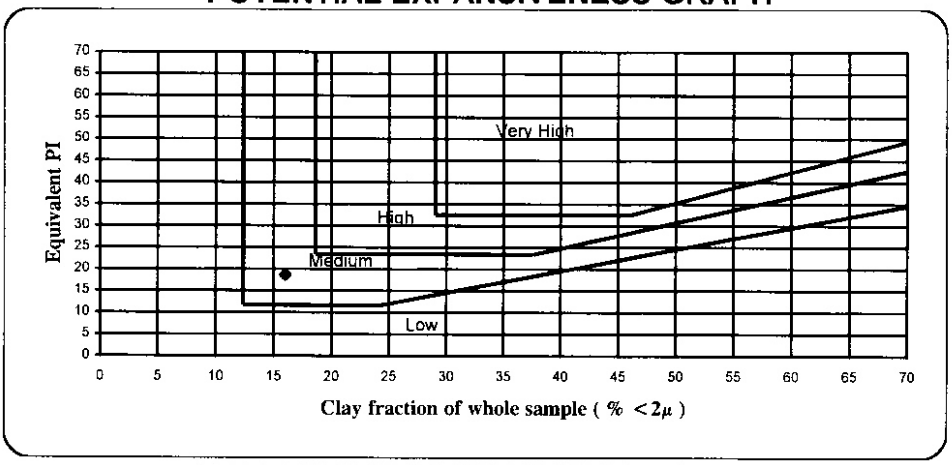
Sample Description : Dk.G.Sandy Silt

Field or Pit Number :

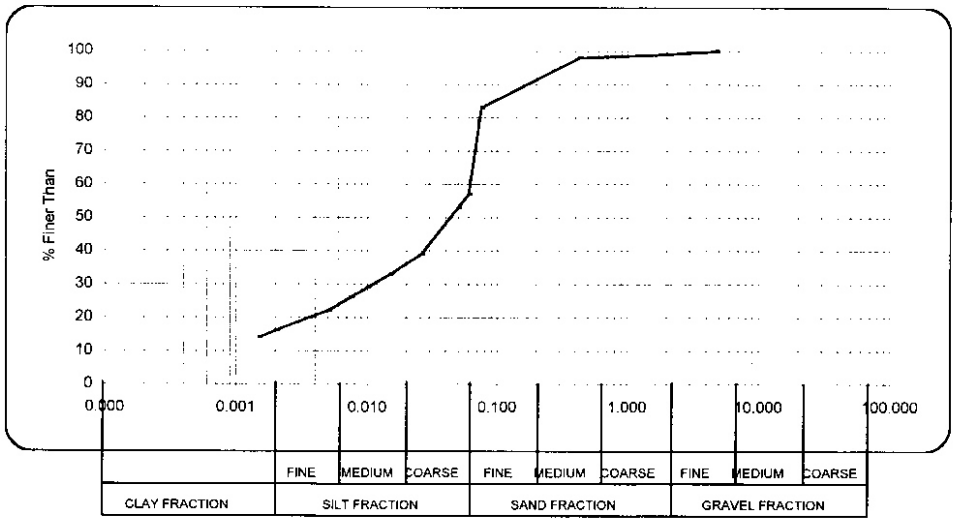
Depth (mm) : 34.50 - 34.95

Equivalent PI : 18.6 **Clay fraction of whole sample (% <2μ)** : 16

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample delivered by : - Customer

Job Card No : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.			4607	4608	6085	4616	4615
Field No.							
Position in Field			BD BHL 107	BD BHL 107	BD BHL 107A	BD BHL 107A	BD BHL 107A
Depth (mm)			31.19 - 31.64	32.64 - 33.09	12.0 - 12.6	36.05 - 36.50	30.80 - 31.25
Material Description			Dk.Br.Sty.Sand	Dk.G.Br.Sty.Sand	Br.Dk.G.F.M.H. Gravel Sand	G.Bl.Sty.Sand	G.Bl.Sty.Sand
Stabilising Agent			Natural	Natural	Natural	Natural	Natural
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)							
Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**			100		
	19.0	**mm**	100		97	100	100
	13.2	**mm**	98		91	99	97
	4.75	**mm**	96		86	97	94
	2.00	**mm**	94	100	84	97	93
	0.425	**mm**	92	99	79	97	89
	0.075	**mm**	67	40	4	21	33
Hydrometer Analysis (ASTM - D422)							
Sieve Aperture	**0.060**	**mm**	24	30	4	21	23
	0.050	**mm**	24	30	4	19	23
	0.026	**mm**	20	26	3	18	20
	0.015	**mm**	18	22	3	14	16
	0.010	**mm**	17	20	3	14	14
	0.0074	**mm**	13	16	3	10	13
	0.005	**mm**	11	14	3	10	11
	0.0036	**mm**	9	12	3	8	9
	0.0020	**mm**	9	10	3	6	7
	0.0015	**mm**	7	8	3	6	7
Soil Mortar Analysis							
Coarse Sand		**%**	2	1	6	0	4
Fine Sand		**%**	72	69	89	78	71
Silt		**%**	16	20	1	16	17
Clay		**%**	10	10	4	6	8
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	22	28	CBD	26	28
Plasticity Index		**%**	7	10	NP	3	5
Linear Shrinkage		**%**	3	5	0	2	3
Equivalent PI		**%**	6.4	9.9	0.0	2.9	4.5
Classification (Group Index)			A-4(6)	A-4(1)	A-3(0)	A-2-4(0)	A-2-4(0)

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4607

Position in field : BD BHL 107

Sample Description : Dk.Br.Sty.Sand

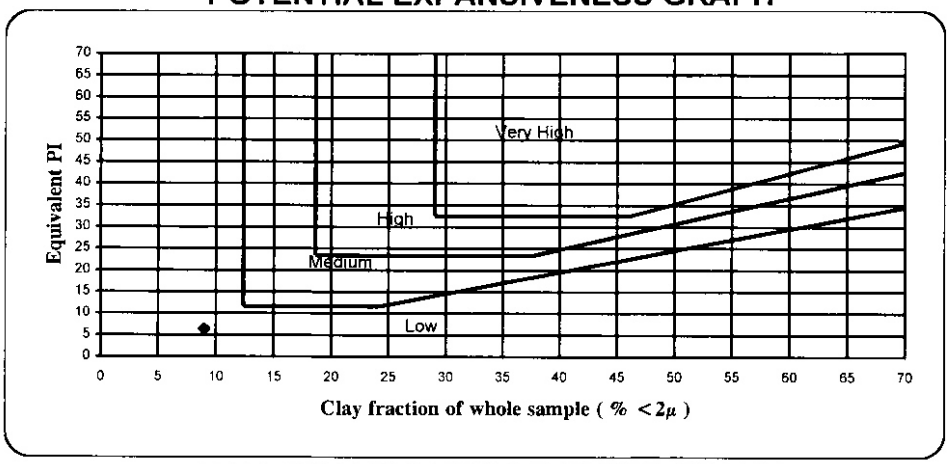
Field or Pit Number :

Depth (mm) : 31.19 - 31.64

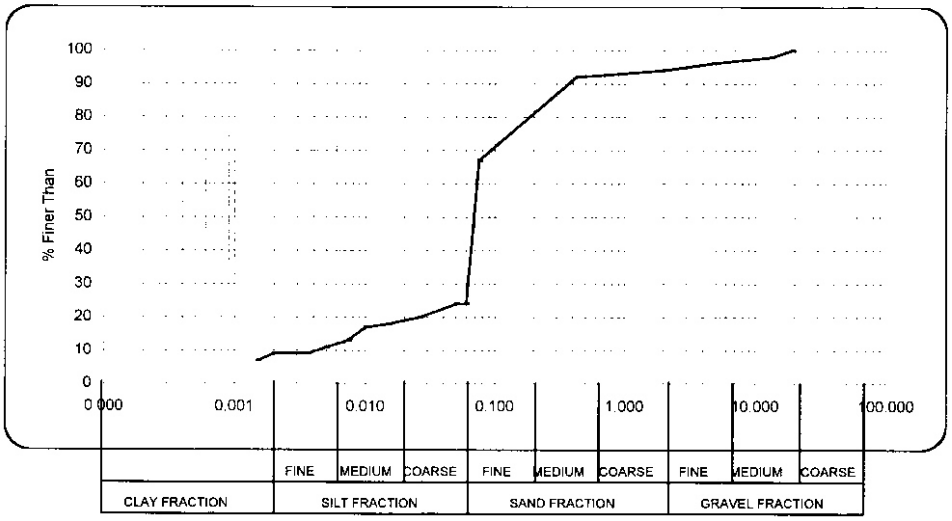
Equivalent PI : 6.4

Clay fraction of whole sample (% <2μ) : 9

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4608

Position in field : BD BHL 107

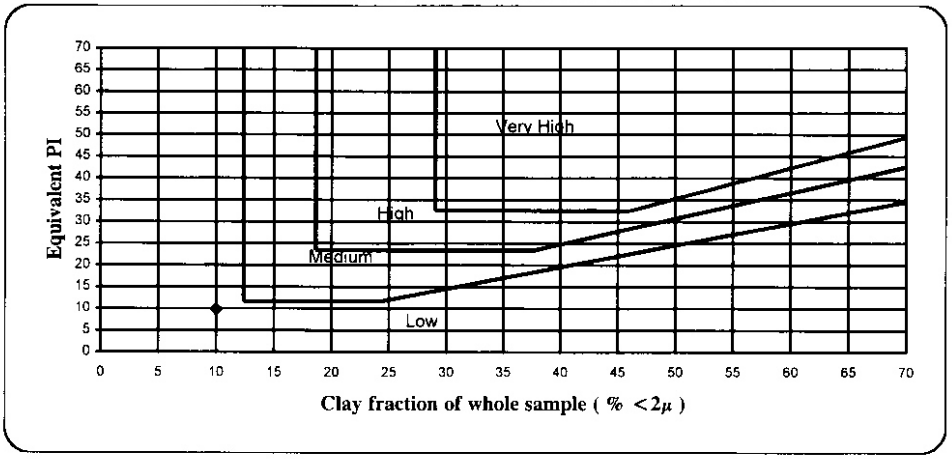
Sample Description : Dk.G.Br.Sty.Sand

Field or Pit Number :

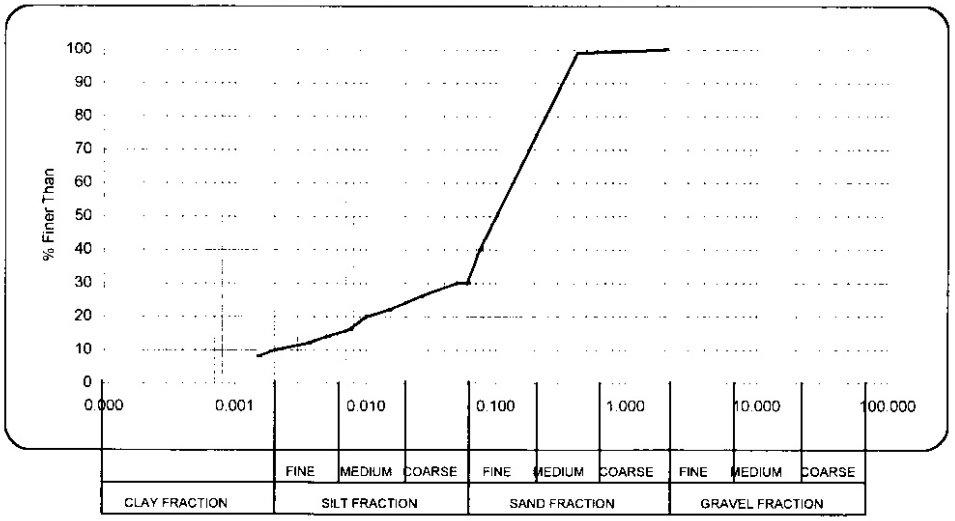
Depth (mm) : 32.64 - 33.09

Equivalent PI : 9.9 **Clay fraction of whole sample (% <2μ)** : 10

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6085

Position in field : BD BHL 107A

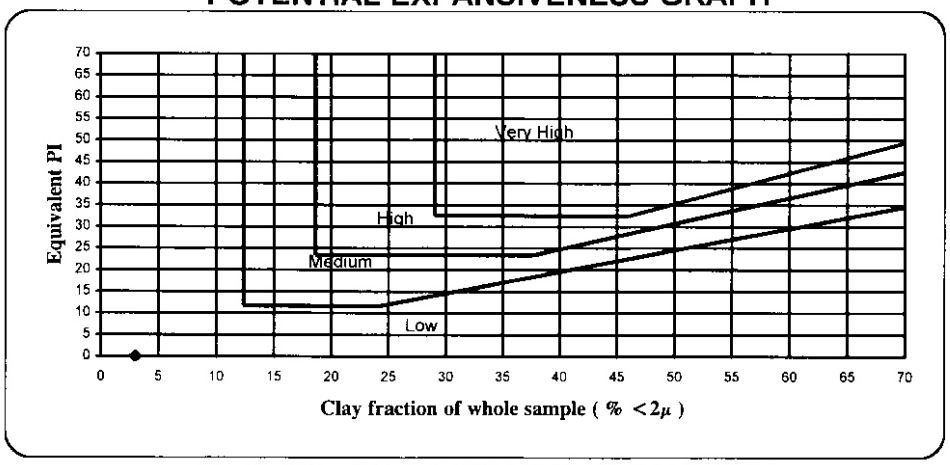
Sample Description : Br.Dk.G.F.M.H. Gravel Sand

Field or Pit Number :

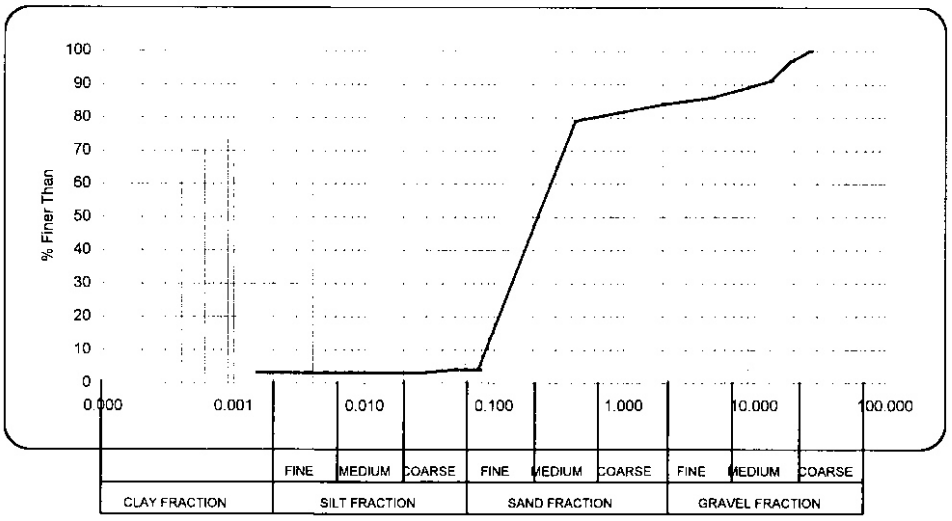
Depth (mm) : 12.0 - 12.6

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 3

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc : _____

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4616

Position in field : BD BHL 107A

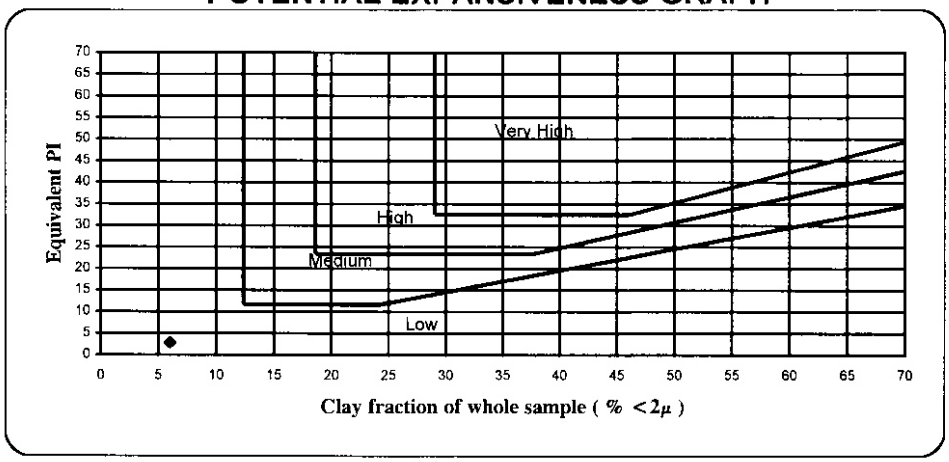
Sample Description : G.Bl.Sty.Sand

Field or Pit Number :

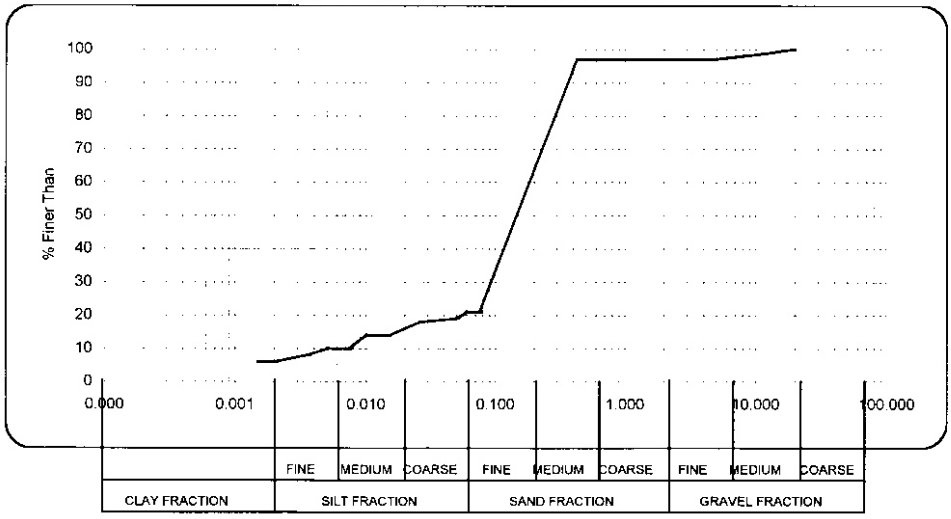
Depth (mm) : 36.05 - 36.50

Equivalent PI : 2.9 **Clay fraction of whole sample (% <2μ)** : 6

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4615

Position in field : BD BHL 107A

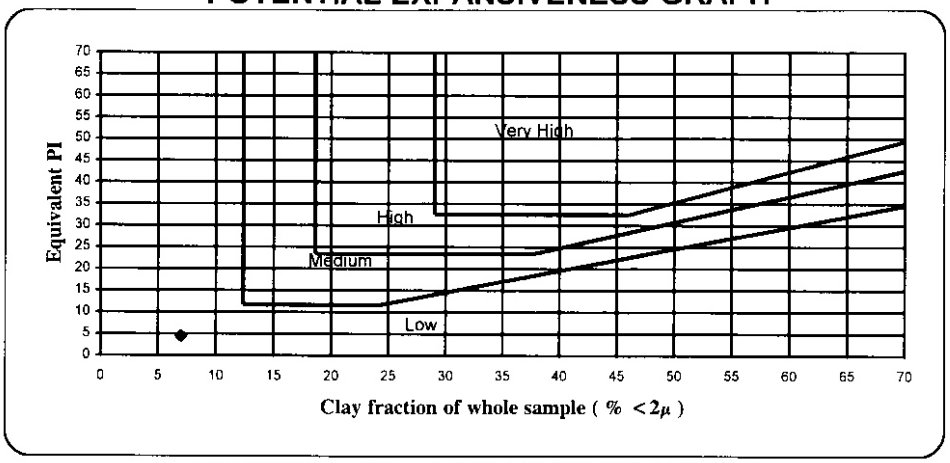
Sample Description : G.Bl.Sty.Sand

Field or Pit Number :

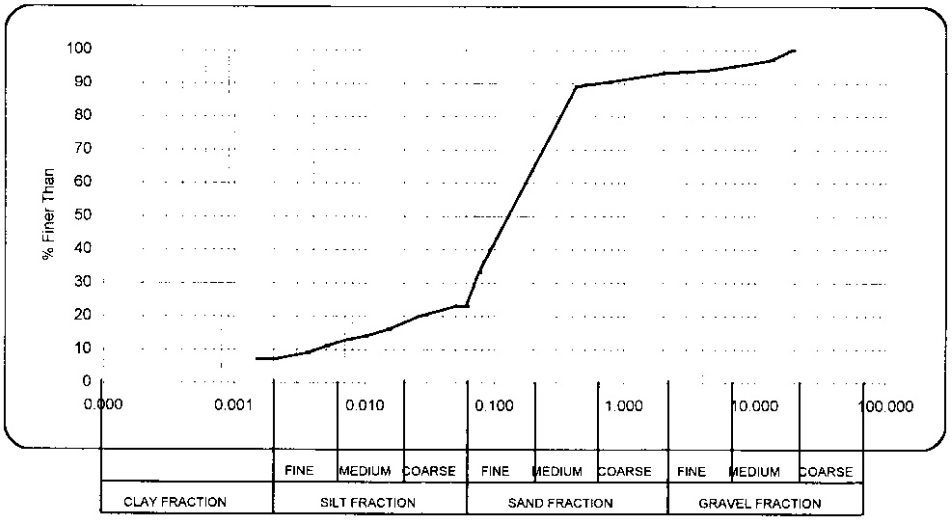
Depth (mm) : 30.80 - 31.25

Equivalent PI : 4.5 **Clay fraction of whole sample (% <2μ)** : 7

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc : _____

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TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample delivered by : - Customer

Job Card No : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.			4583	4585	4610	4612	
Field No.							
Position in Field			BD BHL 108	BD BHL 108	BD BHL 315	BD BHL 315	
Depth (mm)			23.55 - 25.05	34.35 - 34.80	27.22 - 28.22	40.50 - 40.83	
Material Description			Br.Bl.Sl.Sdy.Sty. Sand	Br.Bl.Sand	Dk.Br.Silty Sand	Dk.G.Br.Silty Sand	
Stabilising Agent			Natural	Natural	Natural	Natural	
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)							
Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**					
	19.0	**mm**					
	13.2	**mm**					
	4.75	**mm**				100	
	2.00	**mm**	100	100	100	98	
	0.425	**mm**	99	94	99	97	
	0.075	**mm**	87	87	45	26	
Hydrometer Analysis (ASTM - D422)							
Sieve Aperture	**0.060**	**mm**	50	50	38	19	
	0.050	**mm**	46	46	36	19	
	0.026	**mm**	36	36	30	16	
	0.015	**mm**	30	30	26	16	
	0.010	**mm**	28	28	24	12	
	0.0074	**mm**	20	20	18	10	
	0.005	**mm**	16	16	16	8	
	0.0036	**mm**	12	12	14	8	
	0.0020	**mm**	12	12	14	8	
	0.0015	**mm**	10	10	14	8	
Soil Mortar Analysis							
Coarse Sand		**%**	1	6	1	1	
Fine Sand		**%**	50	73	61	79	
Silt		**%**	38	9	24	12	
Clay		**%**	12	11	14	8	
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	36	CBD	20	CBD	
Plasticity Index		**%**	11	NP	9	SP	
Linear Shrinkage		**%**	6	0	4	1	
Equivalent PI		**%**	10.9	0.0	8.9	0.0	
Classification (Group Index)			A-6(8)	A-2-4(0)	A-4(2)	A-2-4(0)	

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4583

Position in field : BD BHL 108

Sample Description : Br.Bl.Sl.Sdy.Sty. Sand

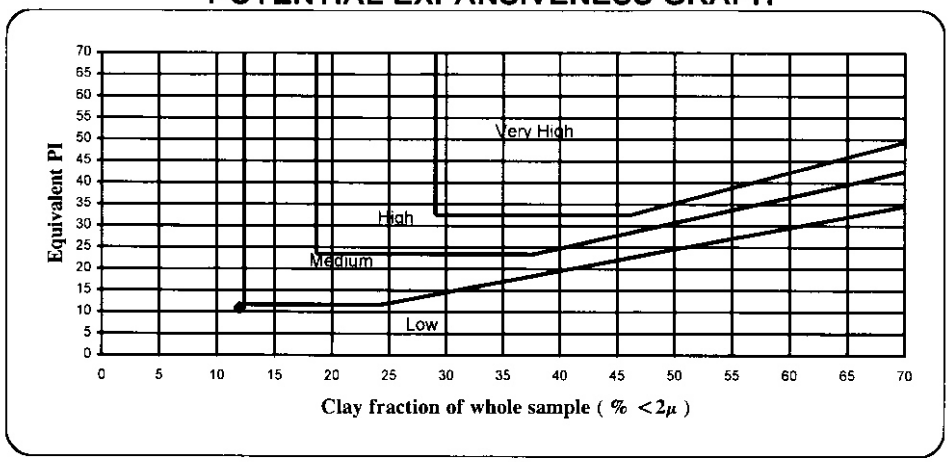
Field or Pit Number :

Depth (mm) : 23.55 - 25.05

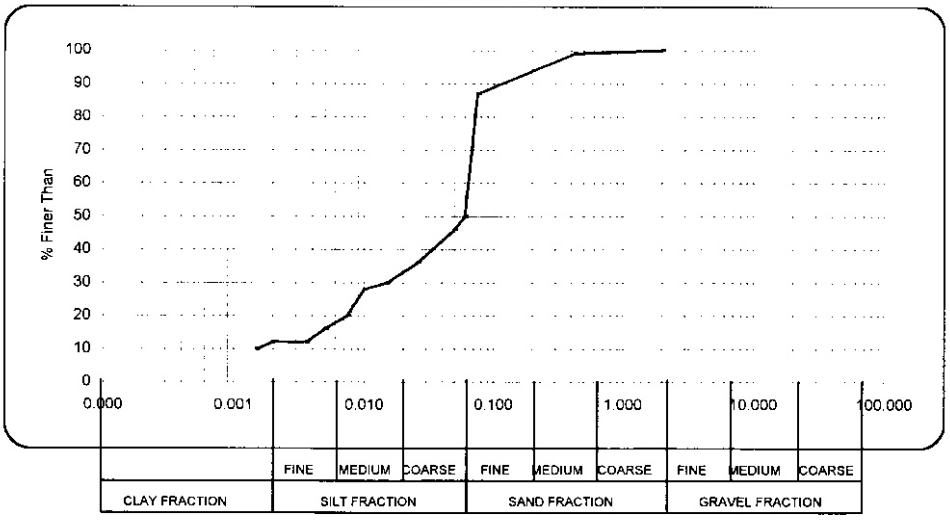
Equivalent PI : 10.9

Clay fraction of whole sample (% $<2\mu$) : 12

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilco :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4585

Position in field : BD BHL 108

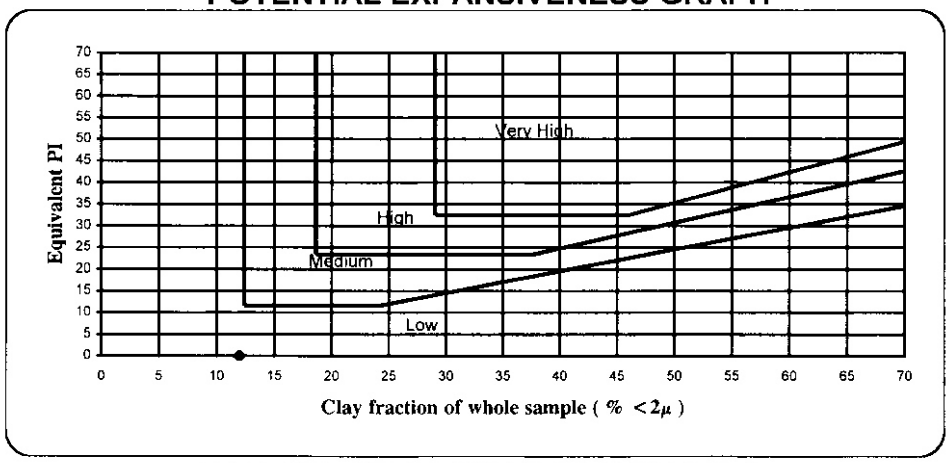
Sample Description : Br.Bl.Sand

Field or Pit Number :

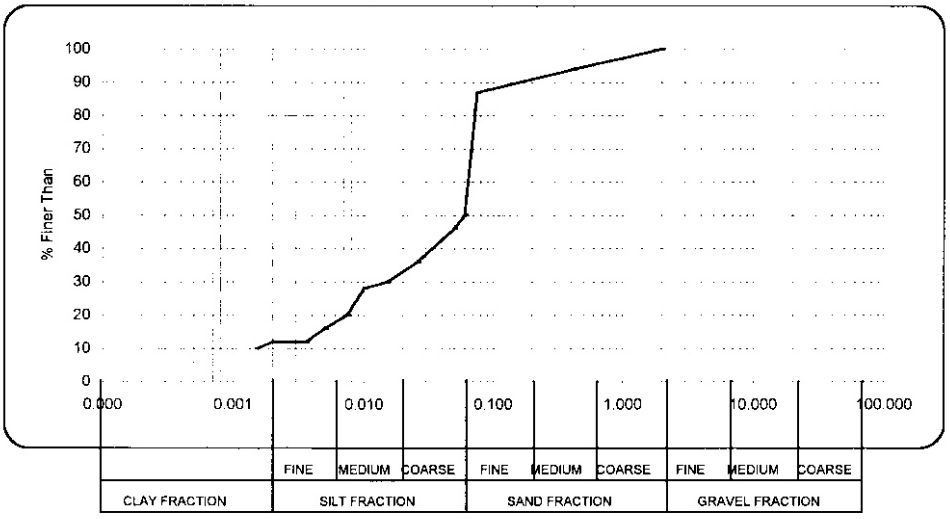
Depth (mm) : 34.35 - 34.80

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 12

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4610

Position in field : BD BHL 315

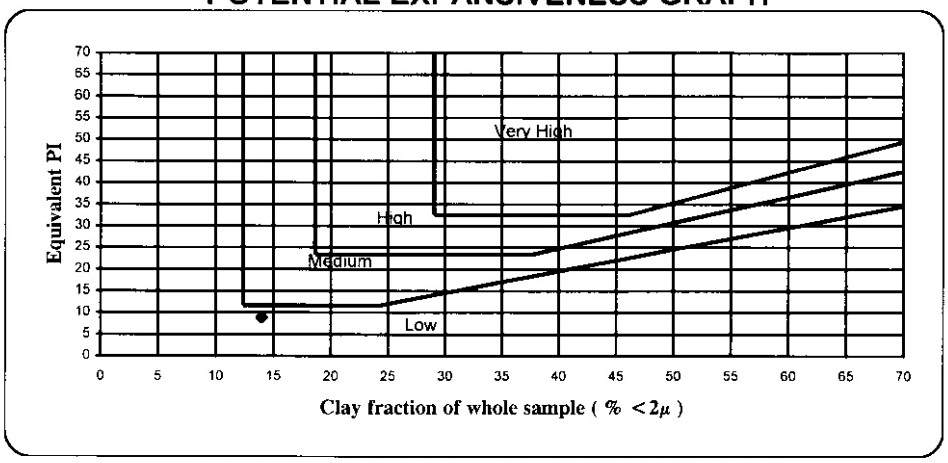
Sample Description : Dk.Br.Silty Sand

Field or Pit Number :

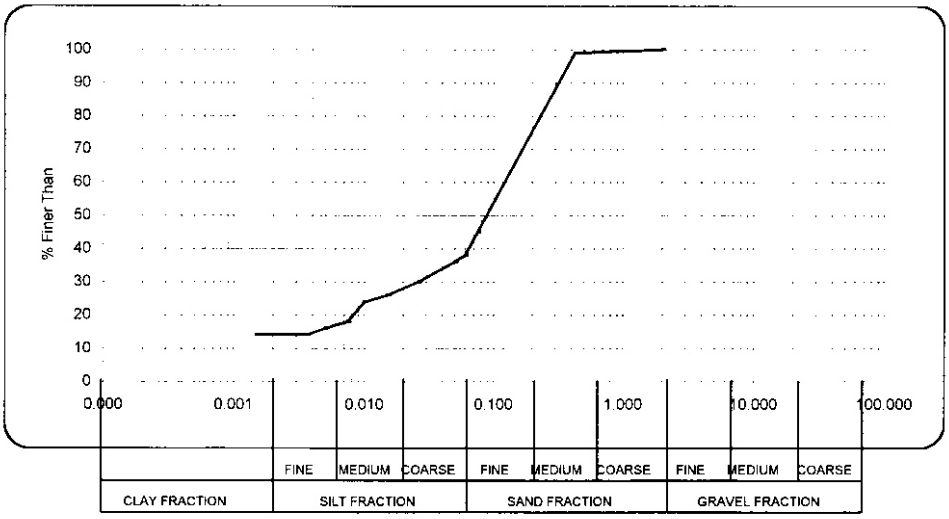
Depth (mm) : 27.22 - 28.22

Equivalent PI : 8.9 **Clay fraction of whole sample (% <2μ)** : 14

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4612

Position in field : BD BHL 315

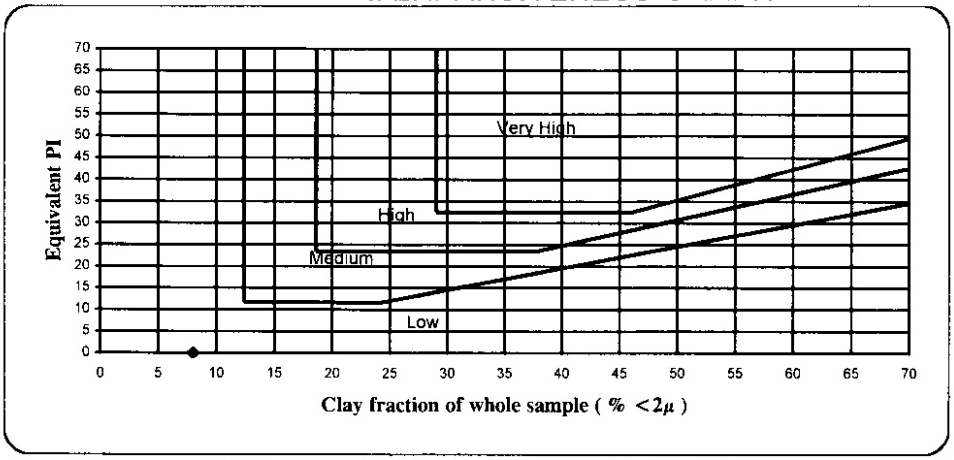
Sample Description : Dk.G.Br.Silty Sand

Field or Pit Number :

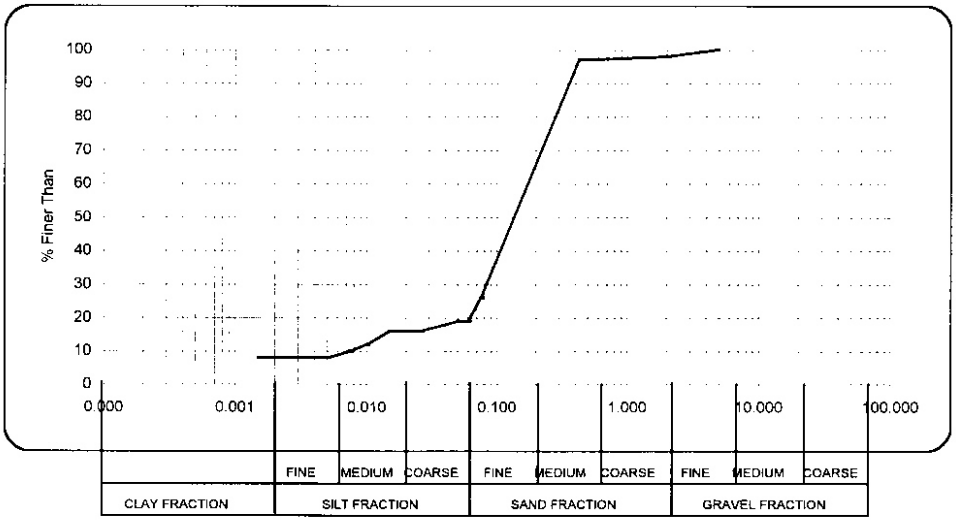
Depth (mm) : 40.50 - 40.83

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 8

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Job Card No : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Sample delivered by : - Customer

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.		6084	6083			
Field No.						
Position in Field		BD BHL 316	BD BHL 317			
Depth (mm)		4.5 - 5.0	4.5 - 5.0			
Material Description		G.Dk.Br.F.M.Gravel Sand	Dk.Br.Speck. Bl.O.Sty.Sand			
Stabilising Agent		Natural	Natural			

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**					
	19.0	**mm**					
	13.2	**mm**					
	4.75	**mm**	100	100			
	2.00	**mm**	99	99			
	0.425	**mm**	87	91			
	0.075	**mm**	3	5			

Hydrometer Analysis (ASTM - D422)

Sieve Aperture	**0.060**	**mm**	3	5			
	0.050	**mm**	3	5			
	0.026	**mm**	3	5			
	0.015	**mm**	3	5			
	0.010	**mm**	3	4			
	0.0074	**mm**	3	4			
	0.005	**mm**	3	4			
	0.0036	**mm**	3	4			
	0.0020	**mm**	3	3			
	0.0015	**mm**	3	3			

Soil Mortar Analysis

Coarse Sand	**%**	12	8			
Fine Sand	**%**	85	87			
Silt	**%**	0	2			
Clay	**%**	3	3			

Atterberg Limits TMH 1 - Methods A2, A3, A4

Liquid Limit	**%**	CBD	CBD			
Plasticity Index	**%**	NP	NP			
Linear Shrinkage	**%**	0	0			
Equivalent PI	**%**	0.0	0.0			
Classification (Group Index)		A-3(0)	A-3(0)			

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

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TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6084

Position in field : BD BHL 316

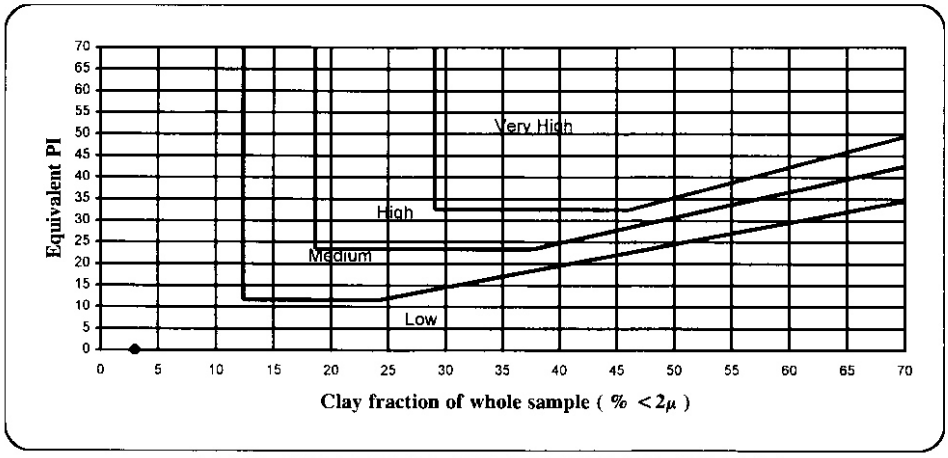
Sample Description : G.Dk.Br.F.M.Gravel Sand

Field or Pit Number :

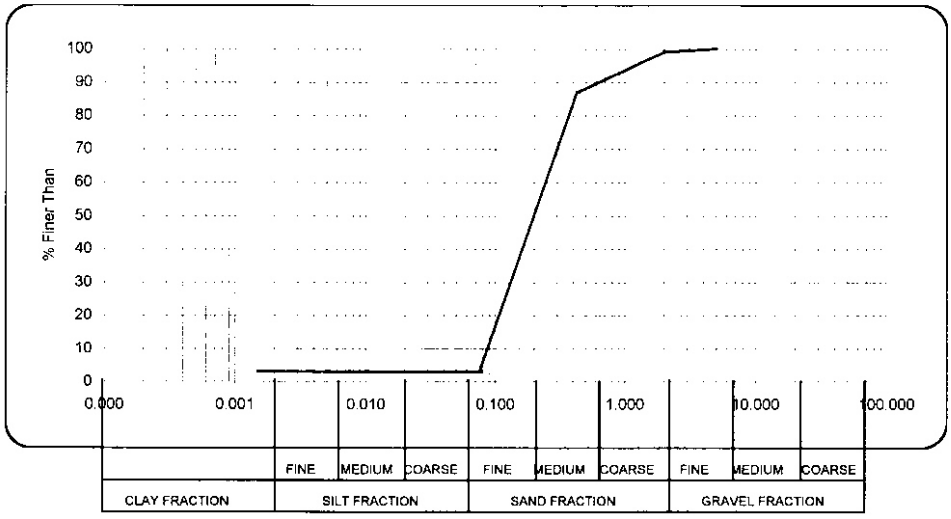
Depth (mm) : 4.5 - 5.0

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 3

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 1

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6083

Position in field : BD BHL 317

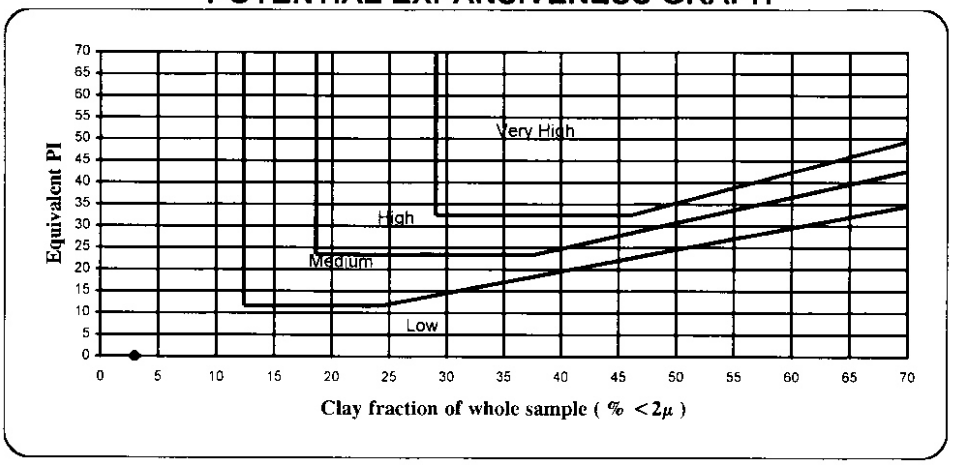
Sample Description : Dk.Br.Speck. Bl.O.Sty.Sand

Field or Pit Number :

Depth (mm) : 4.5 - 5.0

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 3

POTENTIAL EXPANSIVENESS GRAPH



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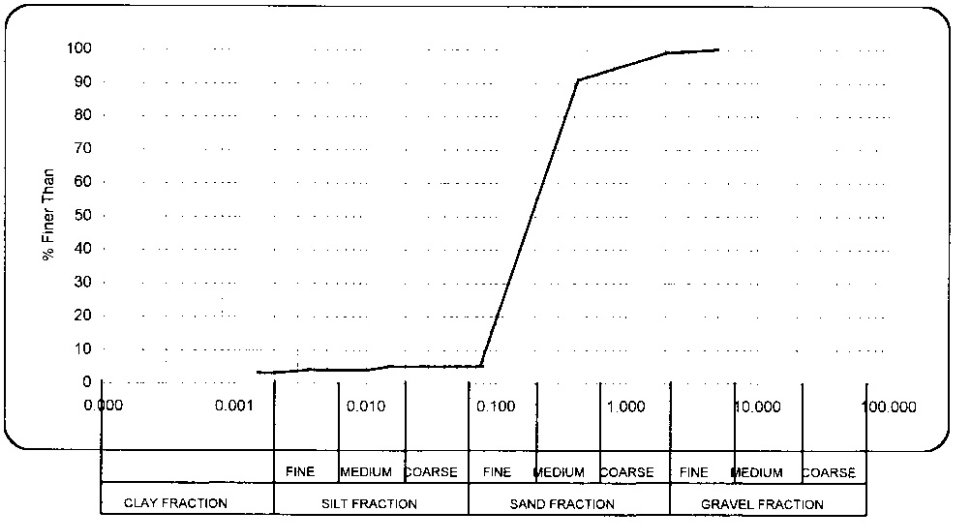

For Soilco :

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TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones **Job Card No : 128791/129815/130867**

Project : Durban Harbour 07-395 - Phase 2 **Date Received : 2008-07-08**

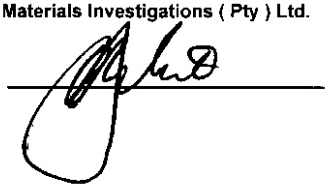
Date Tested : 2008-07-21/2008-10-17

Sample delivered by : - Customer **Date Reported : 2009-03-26**

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.		6081	6082	6225	4624	
Field No.						
Position in Field		BD BHL 204	BD BHL 204	BD BHL 206	BD BHL 207	
Depth (mm)		4.5 - 5.0	10.55 - 10.90	19.5 - 20.05	31.45 - 31.90	
Material Description		Lt.Br.Speck. Bl.O.G.F.M.Sand Shell Frags.	Lt.Br.Speck. Bl.O.G.Sand Shell Frags.	Sl.Sdy.Clay HB	Y.Br.Sl.Cly.Sand	
Stabilising Agent		Natural	Natural	Natural	Natural	
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)						
Sieve Aperture	**75.0**	**mm**				
	63.0	**mm**				
	53.0	**mm**				
	37.5	**mm**			100	
	26.5	**mm**			92	
	19.0	**mm**			84	
	13.2	**mm**			81	100
	4.75	**mm**		100	79	99
	2.00	**mm**	100	99	77	98
	0.425	**mm**	97	97	75	94
	0.075	**mm**	3	4	67	17
Hydrometer Analysis (ASTM - D422)						
Sieve Aperture	**0.060**	**mm**	3	4	51	15
	0.050	**mm**	3	4	50	15
	0.026	**mm**	3	4	44	13
	0.015	**mm**	3	4	36	13
	0.010	**mm**	2	3	33	13
	0.0074	**mm**	2	3	30	11
	0.005	**mm**	2	3	27	9
	0.0036	**mm**	2	3	24	9
	0.0020	**mm**	2	3	23	9
	0.0015	**mm**	2	3	21	9
Soil Mortar Analysis						
Coarse Sand		**%**	3	2	3	4
Fine Sand		**%**	94	94	31	81
Silt		**%**	1	1	37	6
Clay		**%**	2	3	29	10
Atterberg Limits TMH 1 - Methods A2, A3, A4						
Liquid Limit		**%**	CBD	CBD	51	CBD
Plasticity Index		**%**	NP	NP	21	NP
Linear Shrinkage		**%**	0	0	10	0
Equivalent PI		**%**	0.0	0.0	15.8	0.0
Classification (Group Index)			A-3(0)	A-3(0)	A-7-5(13)	A-2-4(0)

For Soilco :



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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6081

Field or Pit Number :

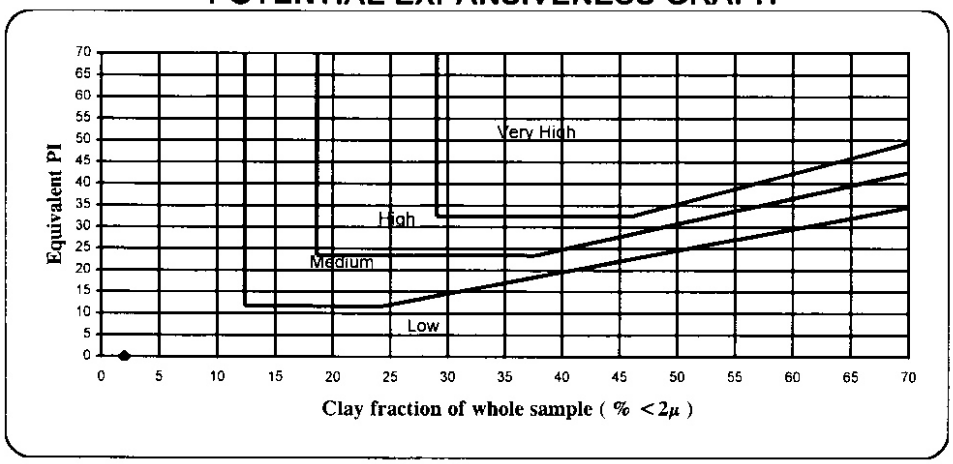
Position in field : BD BHL 204

Depth (mm) : 4.5 - 5.0

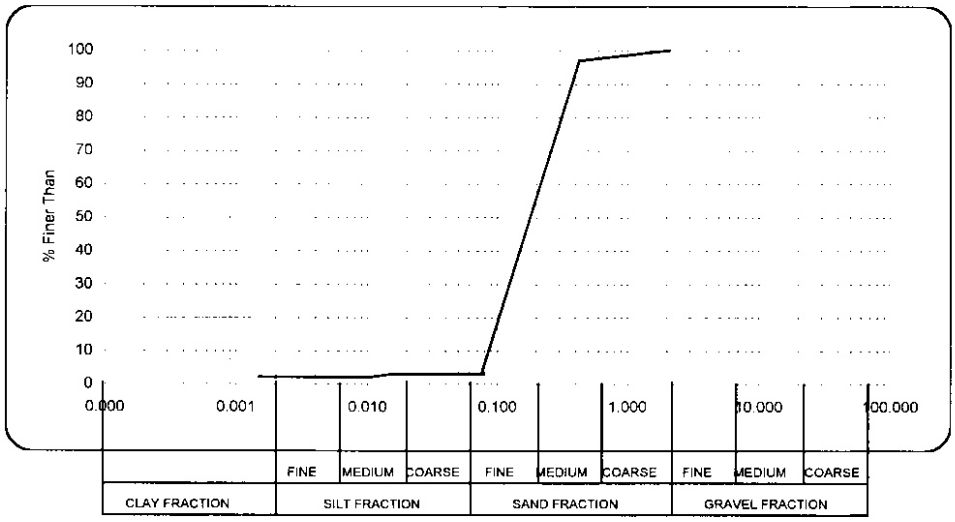
Sample Description : Lt.Br.Speck. Bl.O.G.F.M.Sand Shell Frags.

Equivalent PI : 0 **Clay fraction of whole sample (% $<2\mu$)** : 2

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6082

Field or Pit Number :

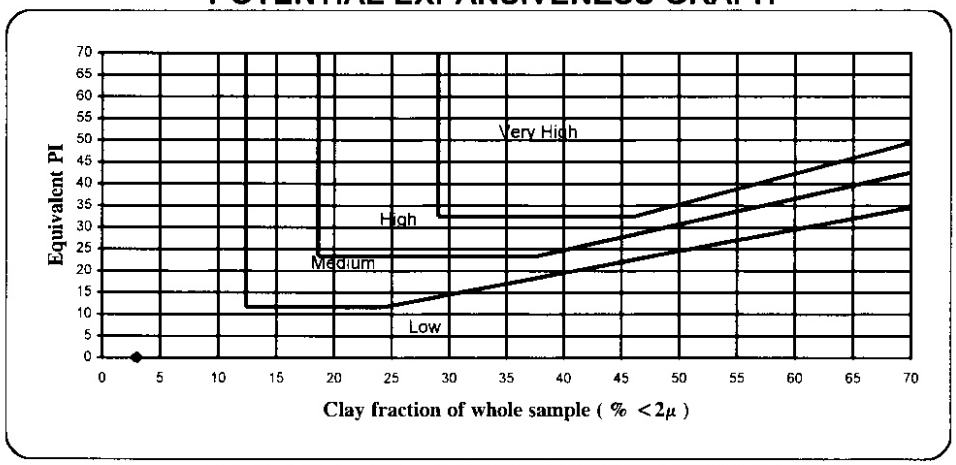
Position in field : BD BHL 204

Depth (mm) : 10.55 - 10.90

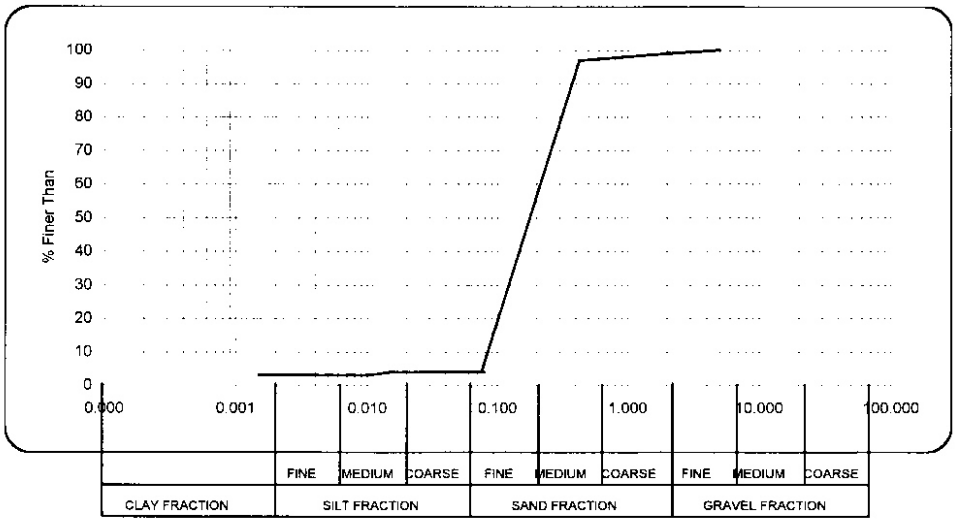
Sample Description : Lt.Br.Speck. Bl.O.G.Sand Shell Frags.

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 3

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 6225

Position in field : BD BHL 206

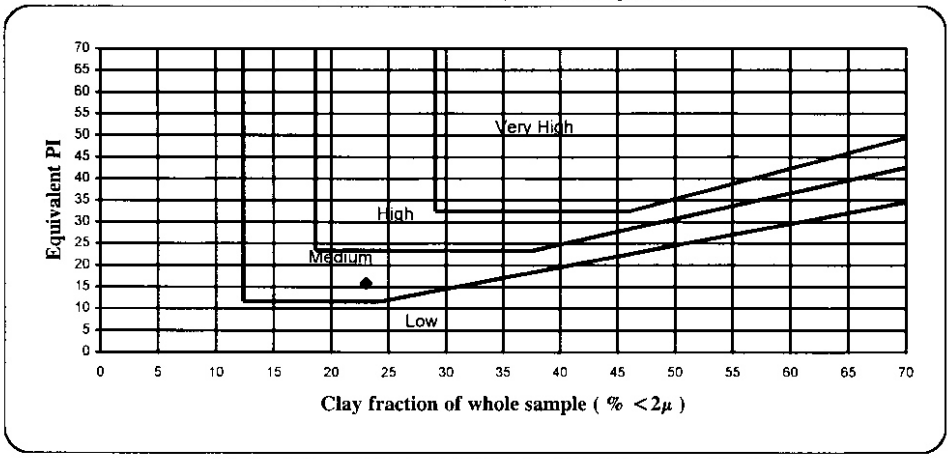
Sample Description : Sl.Sdy.Clay HB

Field or Pit Number :

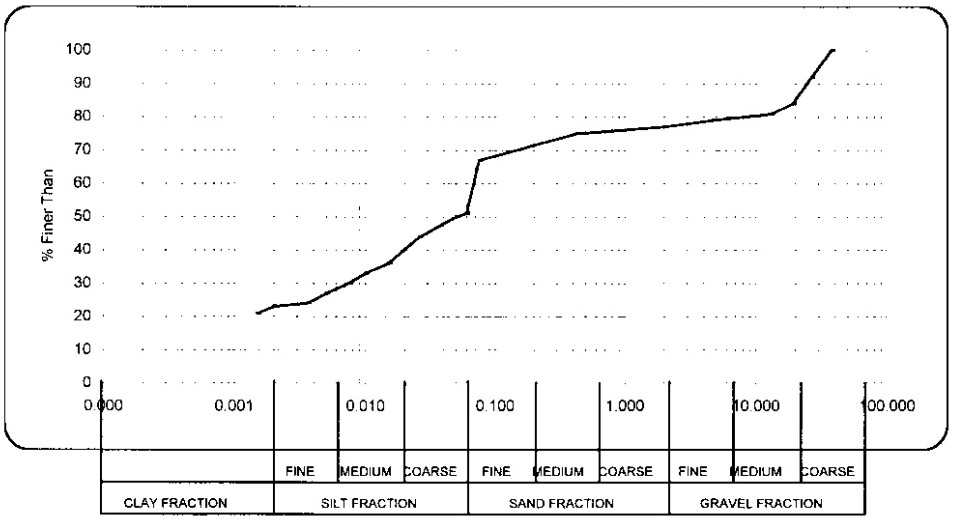
Depth (mm) : 19.5 - 20.05

Equivalent PI : 15.8 **Clay fraction of whole sample (% <2μ)** : 23

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 4624

Position in field : BD BHL 207

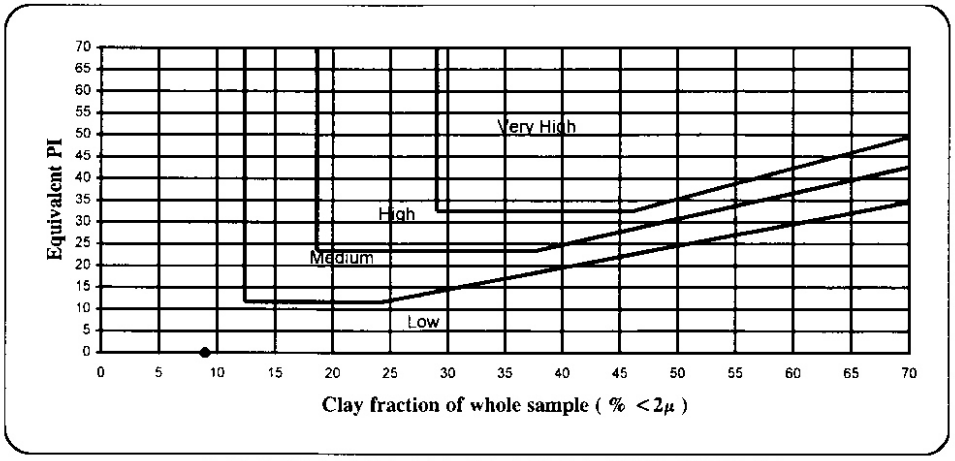
Sample Description : Y.Br.Sl.Cly.Sand

Field or Pit Number :

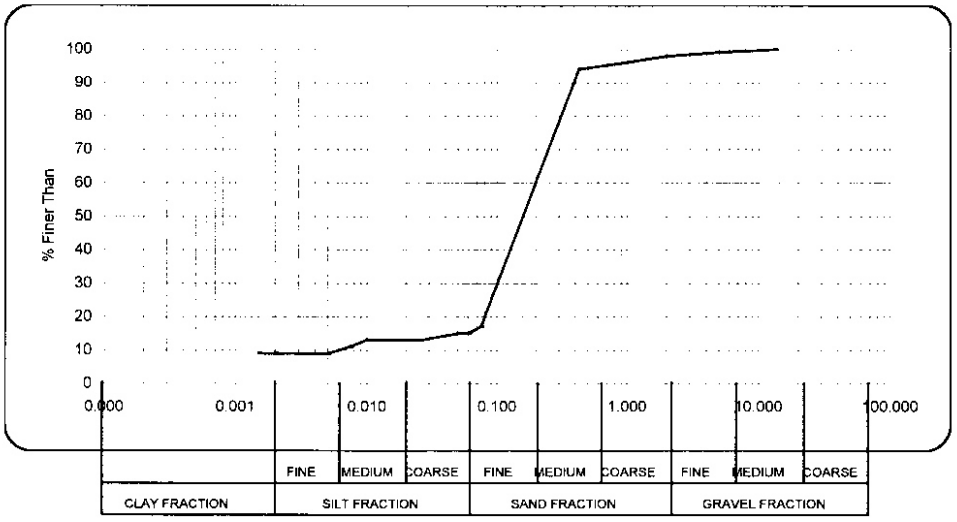
Depth (mm) : 31.45 - 31.90

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 9

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

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Reg. No. : 1965/09585/07

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TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Sample delivered by : - Customer

Job Card No : 129815

Date Received : 2008-08-05

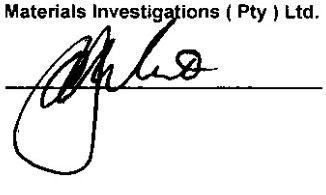
Date Tested : 2008-08-07/2008-08-19

Date Reported : 2008-08-22

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.			5143	5144	5145	5146	5147
Field No.							
Position in Field			BD BHL 301	BD BHL 301	BD BHL 301	BD BHL 301	BD BHL 301
Depth (m)			12.10 - 12.45	23.0 - 23.45	26.0 - 26.45	28.0 - 28.45	34.9 - 35.35
Material Description			Lt.Br. Sand	Dk.G.Silty Clay	Br.B.Clay Silt	Br.Bl.Sandy Silt	Br.Bl.Silty Sand
Stabilising Agent			Natural	Natural	Natural	Natural	Natural
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)							
Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**					
	19.0	**mm**					
	13.2	**mm**		100			
	4.75	**mm**		99			100
	2.00	**mm**	100	96	100	100	99
	0.425	**mm**	95	90	99	99	94
	0.075	**mm**	5	82	93	82	39
Hydrometer Analysis (ASTM - D422)							
Sieve Aperture	**0.060**	**mm**	4	74	69	61	30
	0.050	**mm**	4	71	67	55	28
	0.026	**mm**	4	63	57	42	24
	0.015	**mm**	4	56	50	32	21
	0.010	**mm**	4	53	44	26	19
	0.0074	**mm**	4	48	38	22	15
	0.005	**mm**	4	45	34	17	13
	0.0036	**mm**	4	42	30	14	11
	0.0020	**mm**	4	39	26	12	9
	0.0015	**mm**	4	36	24	10	6
Soil Mortar Analysis							
Coarse Sand		**%**	5	15	1	1	5
Fine Sand		**%**	91	2	30	38	65
Silt		**%**	0	39	44	50	22
Clay		**%**	4	44	26	12	9
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	CBD	53	50	37	22
Plasticity Index		**%**	NP	22	20	14	8
Linear Shrinkage		**%**	0	11	10	7	4
Equivalent PI		**%**	0.0	19.8	19.8	13.9	7.5
Classification (Group Index)			A-3(0)	A-7-5(14)	A-7-5(14)	A-6(10)	A-4(1)

For Soilco :



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Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Sample Delivered by : Customer

Job Card No. : 129815

Date Received : 2008-08-05

Date Tested : 2008-08-07/2008-08-19

Date Reported : 2008-08-22

Sample Number : 5143

Position in field :

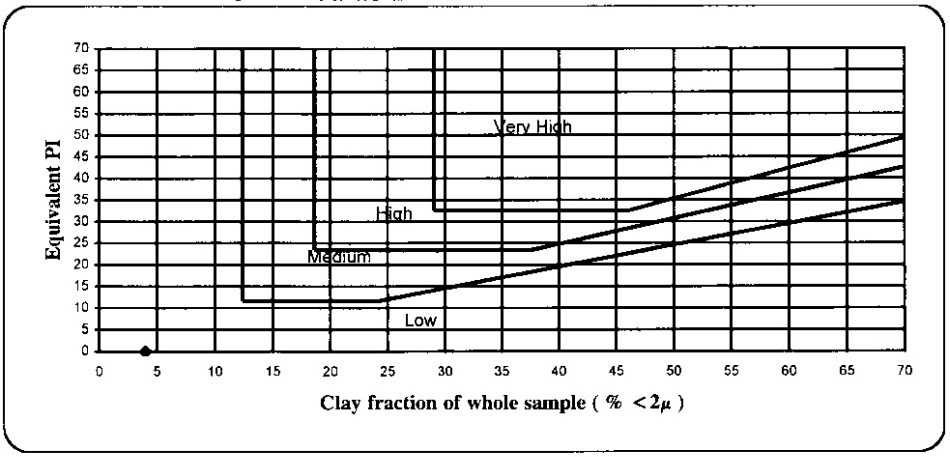
Sample Description : Lt.Br. Sand

Field or Pit Number : 0

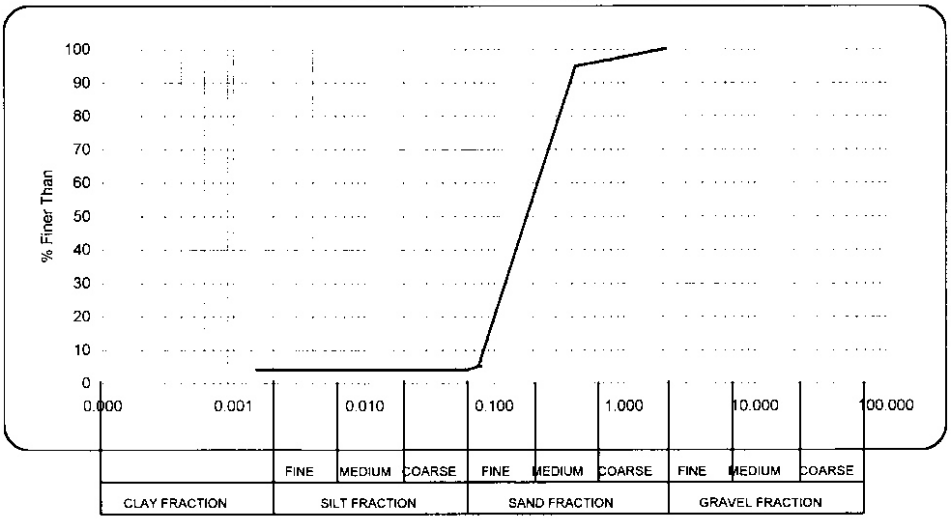
Depth (m) : 12.10 - 12.45

Equivalent PI : 0 **Clay fraction of whole sample (% <2μ)** : 4

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Sample Delivered by : Customer

Job Card No. : 129815

Date Received : 2008-08-05

Date Tested : 2008-08-07/2008-08-19

Date Reported : 2008-08-22

Sample Number : 5144

Position in field :

Sample Description : Dk.G.Silty Clay

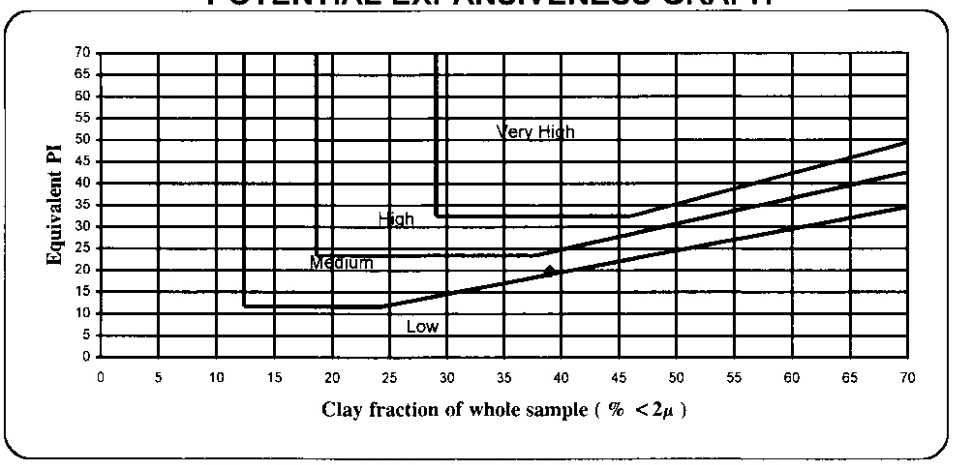
Field or Pit Number : 0

Depth (m) : 23.0 - 23.45

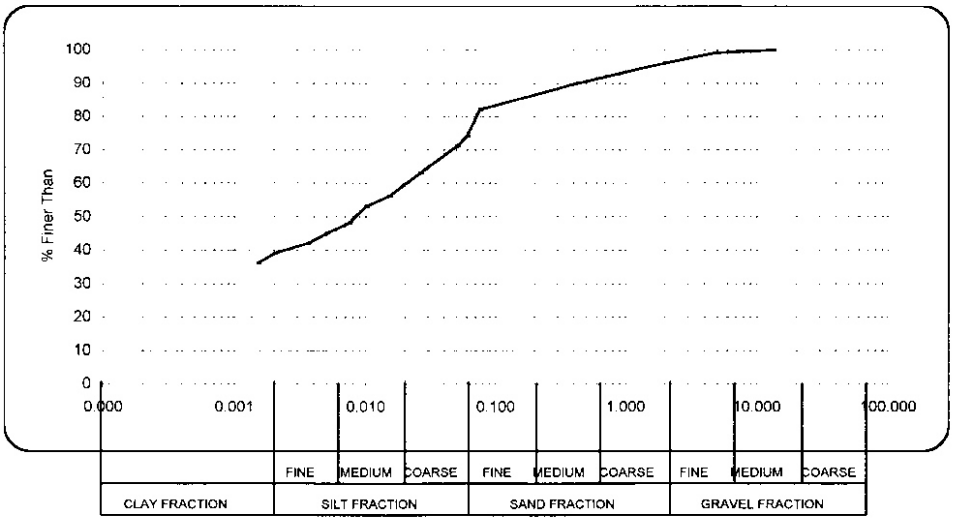
Equivalent PI : 19.8

Clay fraction of whole sample (% $<2\mu$) : 39

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Sample Delivered by : Customer

Job Card No. : 129815

Date Received : 2008-08-05

Date Tested : 2008-08-07/2008-08-19

Date Reported : 2008-08-22

Sample Number : 5145

Position in field :

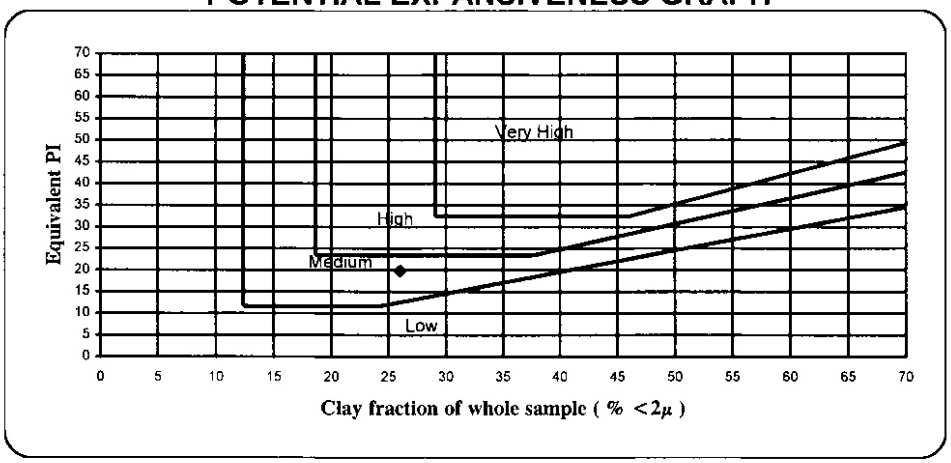
Sample Description : Br.B.Clay Silt

Field or Pit Number : 0

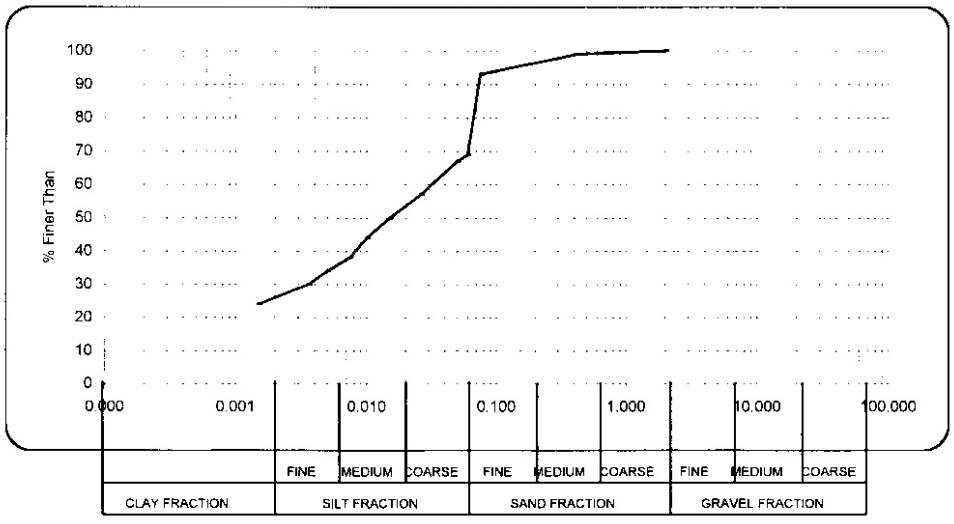
Depth (m) : 26.0 - 26.45

Equivalent PI : 19.8 **Clay fraction of whole sample (% <2μ)** : 26

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Sample Delivered by : Customer

Job Card No. : 129815

Date Received : 2008-08-05

Date Tested : 2008-08-07/2008-08-19

Date Reported : 2008-08-22

Sample Number : 5146

Position in field :

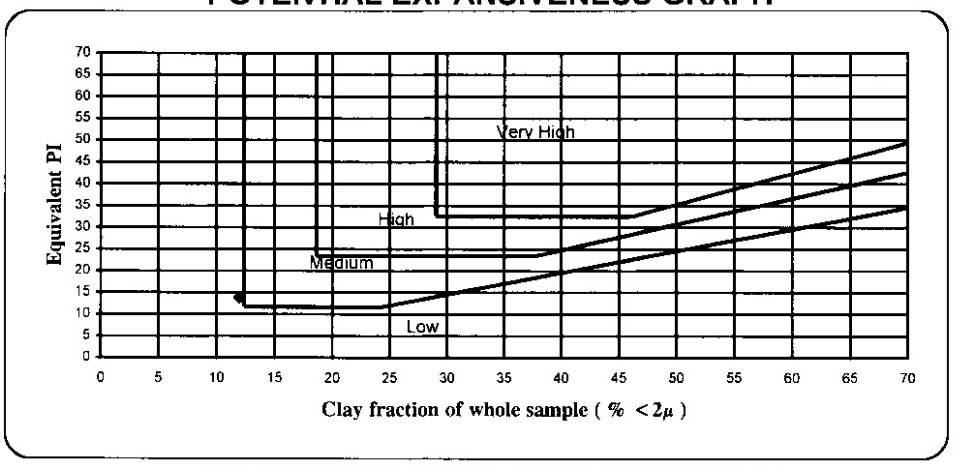
Sample Description : Br.Bl.Sandy Silt

Field or Pit Number : 0

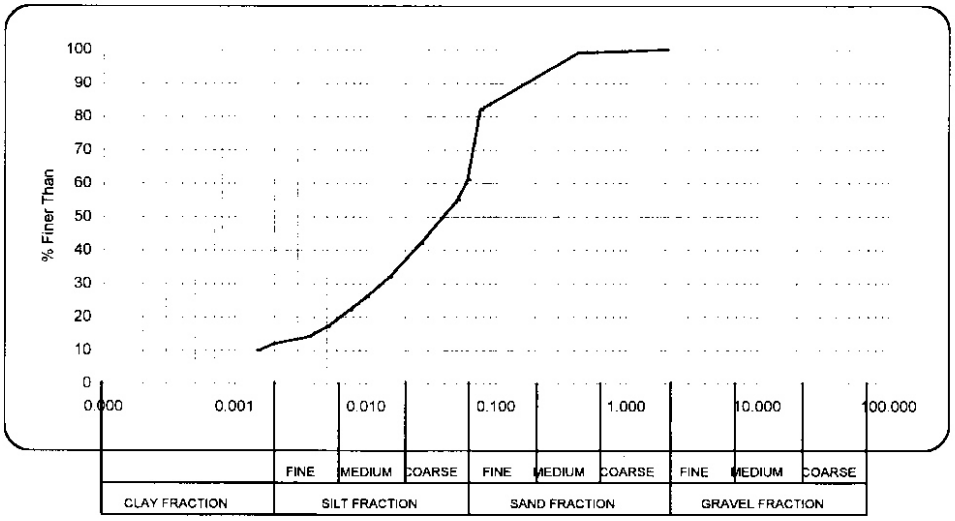
Depth (m) : 28.0 - 28.45

Equivalent PI : 13.86 **Clay fraction of whole sample (% <2μ)** : 12

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour Berth 07 - 395 Phase 3

Job Card No. : 129815

Date Received : 2008-08-05

Date Tested : 2008-08-07/2008-08-19

Sample Delivered by : Customer

Date Reported : 2008-08-22

Sample Number : 5147

Field or Pit Number : 0

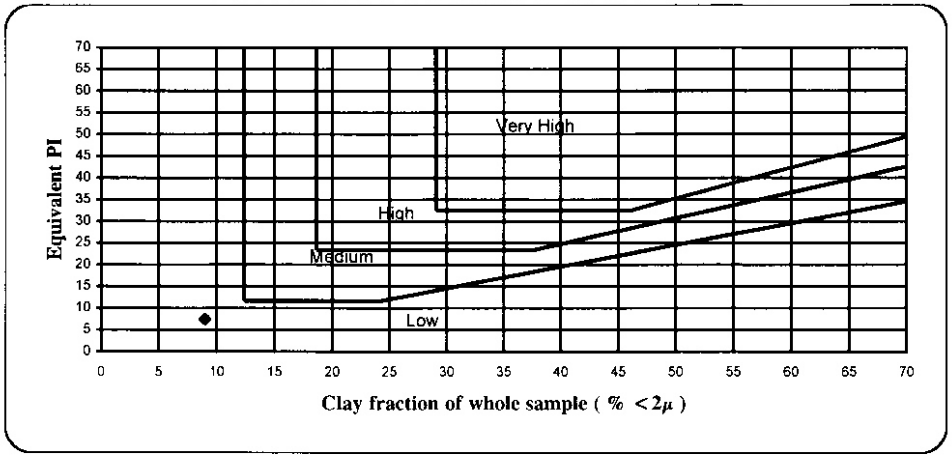
Position in field :

Depth (m) : 34.9 - 35.35

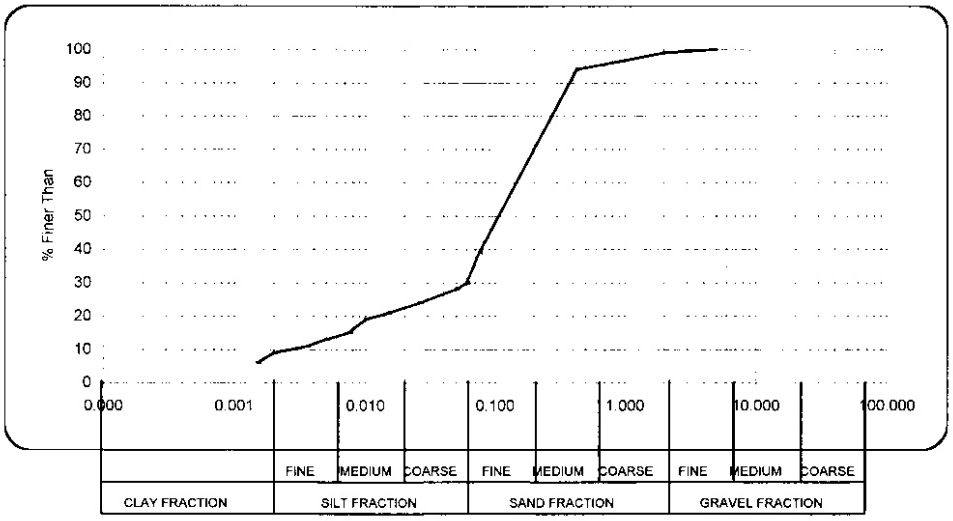
Sample Description : Br.Bl.Silty Sand

Equivalent PI : 7.52 **Clay fraction of whole sample (% <2μ)** : 9

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample delivered by : - Customer

Job Card No : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.		5141	5142	5133	5134	5134
Field No.						
Position in Field		BD BHM 209	BD BHM 209	BD BHM 211	BD BHM 211	BD BHM 211
Depth (mm)		4.97 - 5.42	18.87 - 19.32	3.0 - 3.45	10.40 - 10.85	11.9 - 12.35
Material Description		Dk.G.Bl.Sandy Silt	Dk.G.Bl.Silty Sand	Dk.G.Brl.Sandy Silt	Dk.G.Br.Sandy Silt	Dk.G.Br.Silty Sand
Stabilising Agent		Natural	Natural	Natural	Natural	Natural
Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)						
Sieve Aperture	**75.0**	**mm**				
	63.0	**mm**				
	53.0	**mm**				
	37.5	**mm**				
	26.5	**mm**				
	19.0	**mm**				
	13.2	**mm**				
	4.75	**mm**			100	
	2.00	**mm**	100		99	100	100
	0.425	**mm**	98	100	99	98	97
	0.075	**mm**	91	72	95	88	77
Hydrometer Analysis (ASTM - D422)						
Sieve Aperture	**0.060**	**mm**	61	47	71	61	54
	0.050	**mm**	59	44	67	59	52
	0.026	**mm**	47	32	54	43	41
	0.015	**mm**	35	22	42	35	31
	0.010	**mm**	29	18	38	27	27
	0.0074	**mm**	26	16	32	24	25
	0.005	**mm**	24	12	26	20	21
	0.0036	**mm**	22	11	22	18	19
	0.0020	**mm**	18	9	20	16	16
	0.0015	**mm**	16	8	18	14	14
Soil Mortar Analysis							
Coarse Sand		**%**	2	0	0	2	3
Fine Sand		**%**	37	53	28	37	43
Silt		**%**	43	38	52	45	39
Clay		**%**	18	9	20	16	16
Atterberg Limits TMH 1 - Methods A2, A3, A4							
Liquid Limit		**%**	45	33	47	42	37
Plasticity Index		**%**	18	11	20	18	16
Linear Shrinkage		**%**	9	6	10	9	8
Equivalent PI		**%**	17.6	11.0	19.8	17.6	15.5
Classification (Group Index)			A-7-6(12)	A-6(8)	A-7-6(13)	A-7-6(13)	A-6(10)

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 5141

Position in field : BD BHM 209

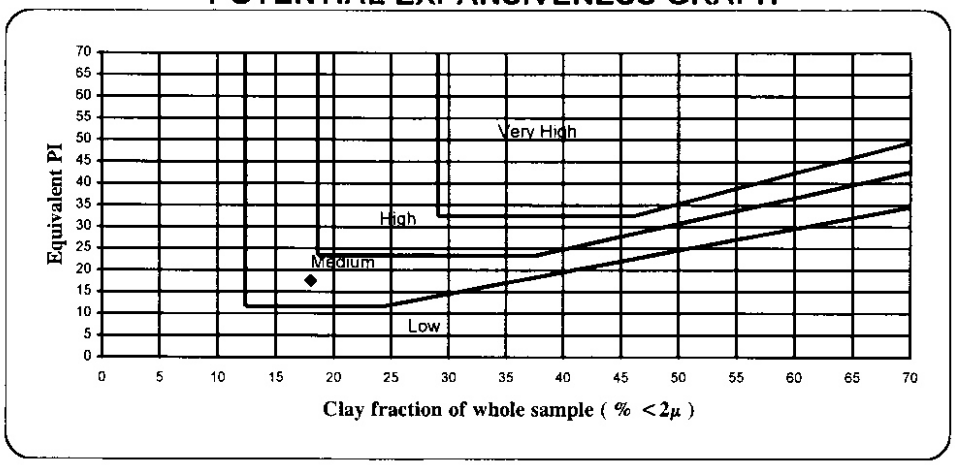
Sample Description : Dk.G.Bl.Sandy Silt

Field or Pit Number :

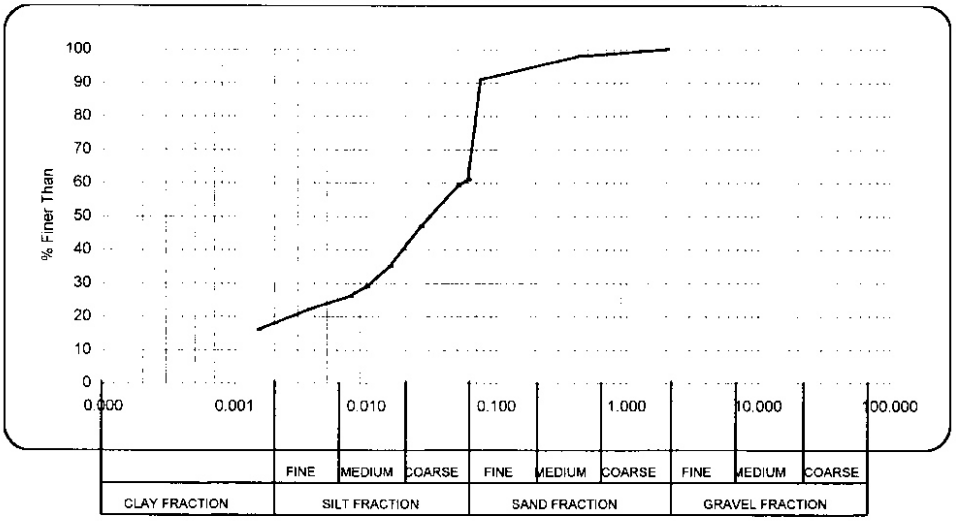
Depth (mm) : 4.97 - 5.42

Equivalent PI : 17.6 **Clay fraction of whole sample (% <2μ)** : 18

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 5142

Position in field : BD BHM 209

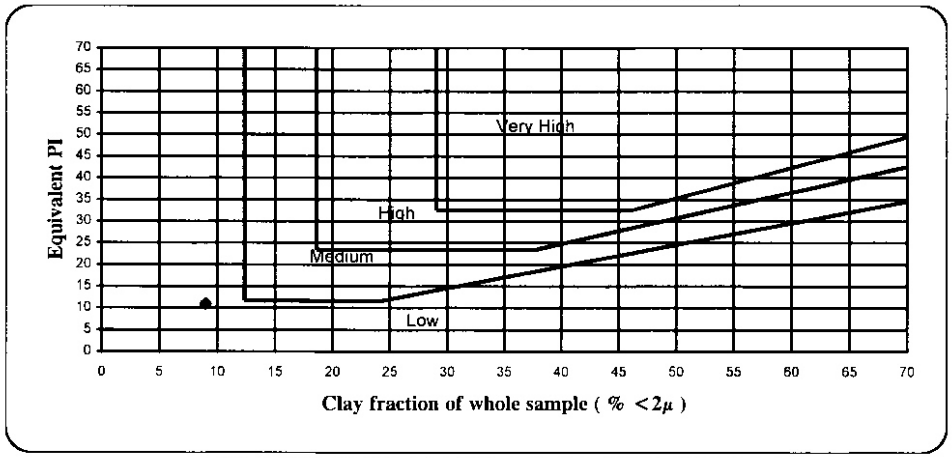
Sample Description : Dk.G.Bl.Silty Sand

Field or Pit Number :

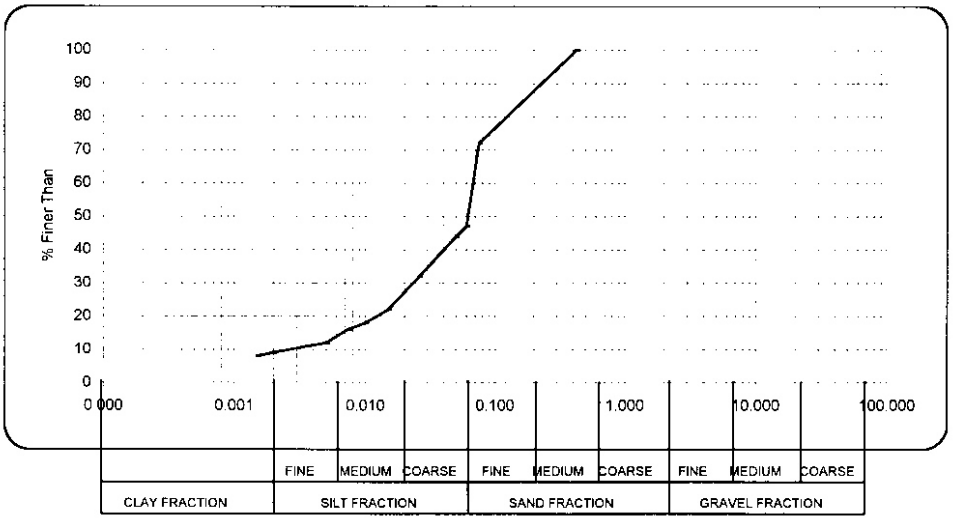
Depth (mm) : 18.87 - 19.32

Equivalent PI : 11 **Clay fraction of whole sample (% <2μ)** : 9

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 5133

Position in field : BD BHM 211

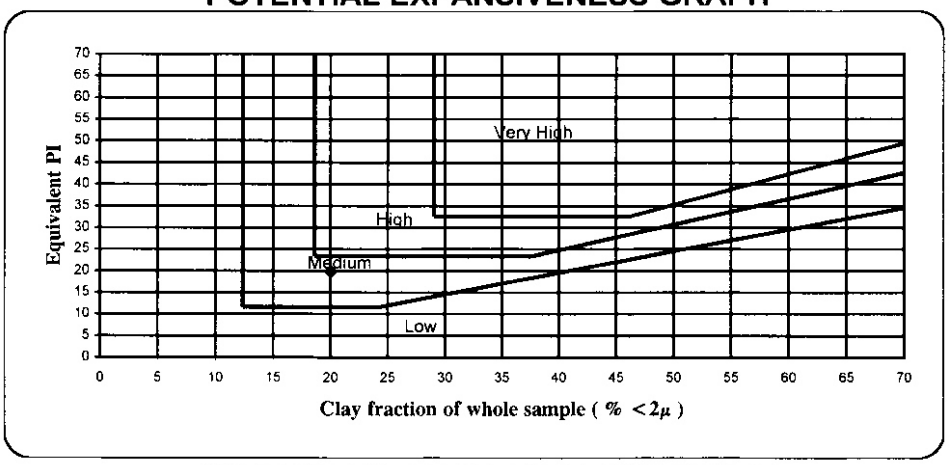
Sample Description : Dk.G.Brl.Sandy Silt

Field or Pit Number :

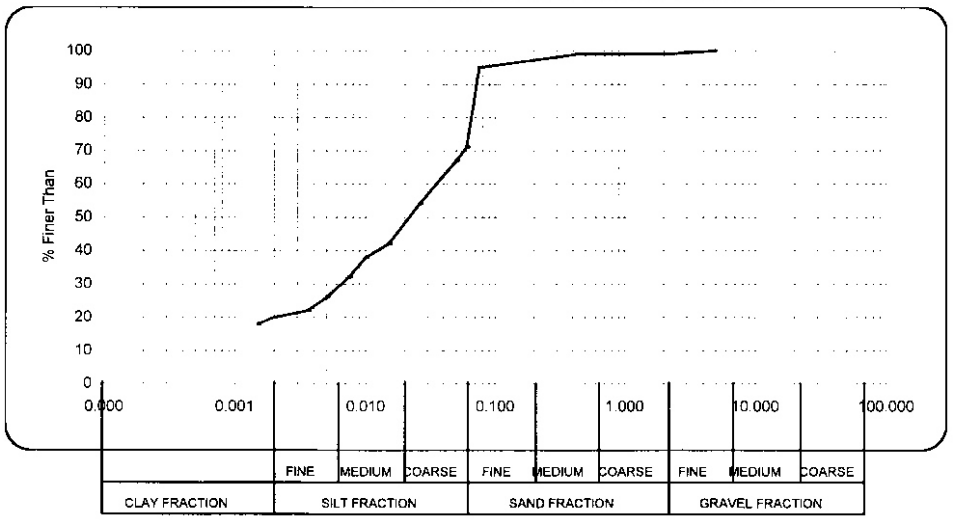
Depth (mm) : 3.0 - 3.45

Equivalent PI : 19.8 **Clay fraction of whole sample (% <2μ)** : 20

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

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Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 5134

Position in field : BD BHM 211

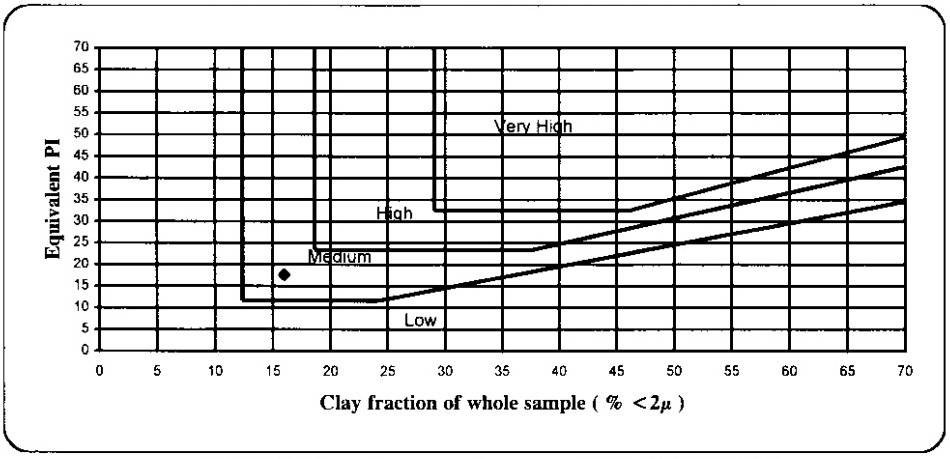
Sample Description : Dk.G.Br.Sandy Silt

Field or Pit Number :

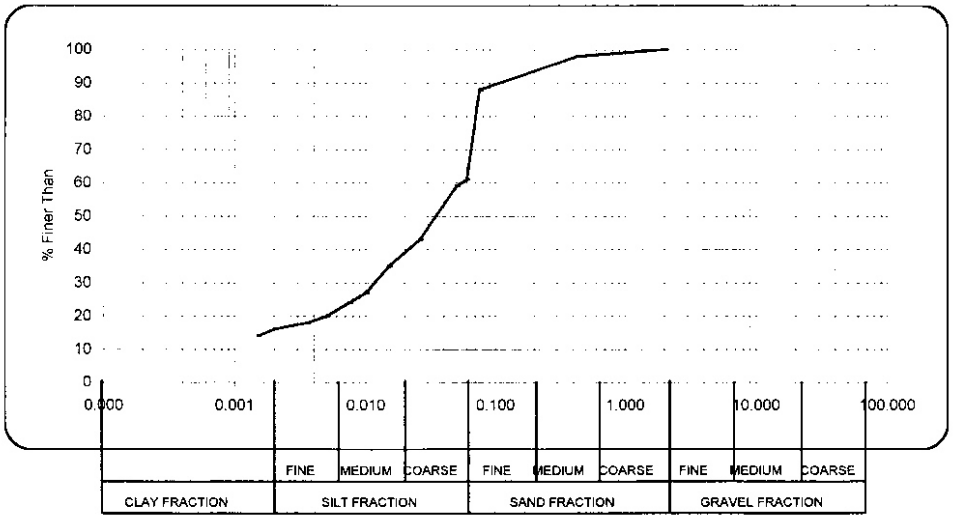
Depth (mm) : 10.40 - 10.85

Equivalent PI : 17.6 **Clay fraction of whole sample (% <2μ)** : 16

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : (031) 7004325 TELEFAX : (031) 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Durban Harbour 07-395 - Phase 2

Sample Delivered by : Customer

Job Card No. : 128791/129815/130867

Date Received : 2008-07-08

Date Tested : 2008-07-21/2008-10-17

Date Reported : 2009-03-26

Sample Number : 5134

Position in field : BD BHM 211

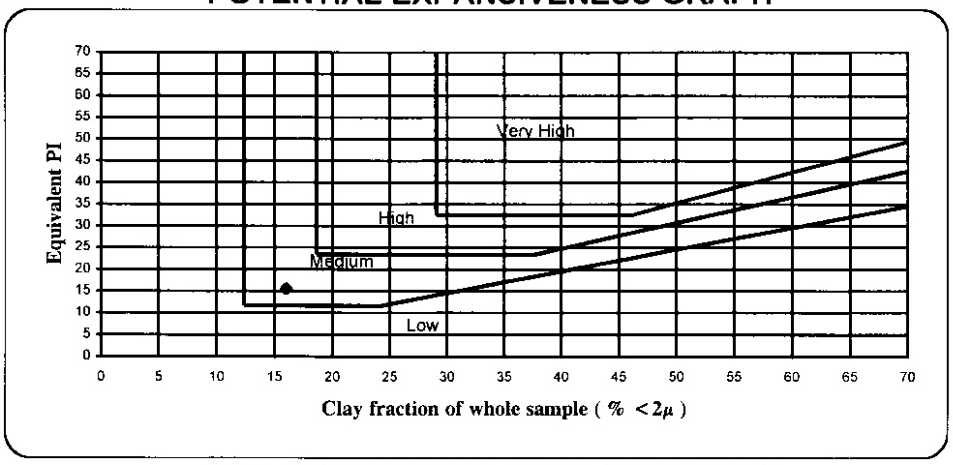
Sample Description : Dk.G.Br.Silty Sand

Field or Pit Number :

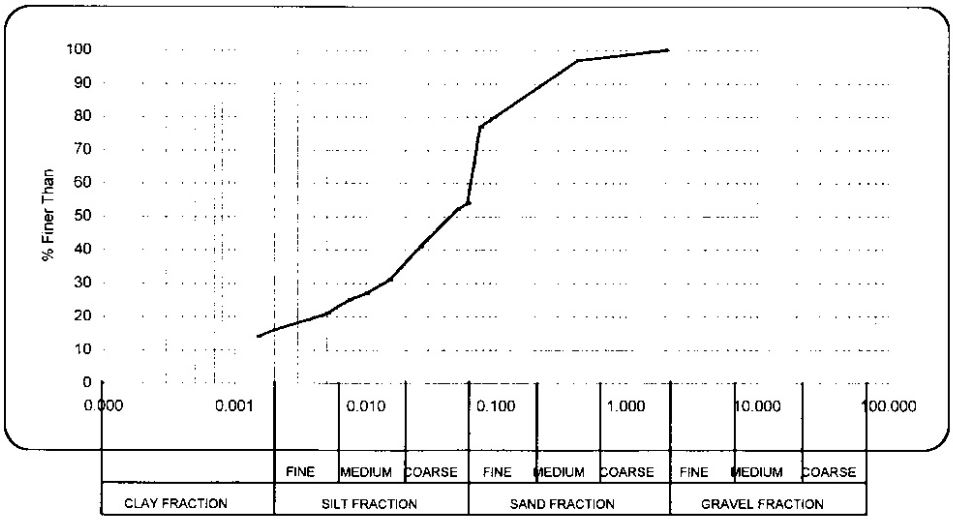
Depth (mm) : 11.9 - 12.35

Equivalent PI : 15.5 **Clay fraction of whole sample (% <2μ)** : 16

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilcc :

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

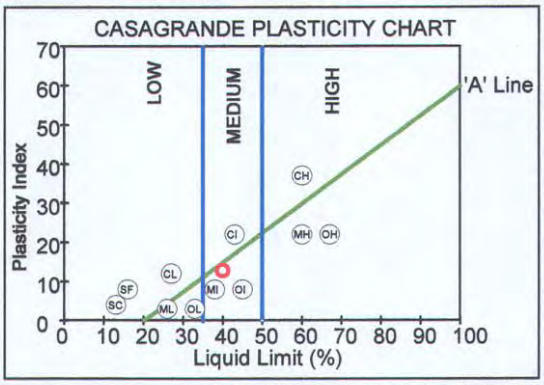
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

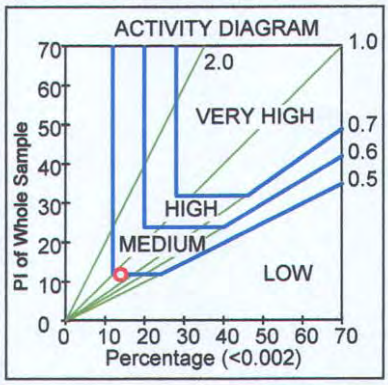
FOUNDATION INDICATOR (ASTM: D422)

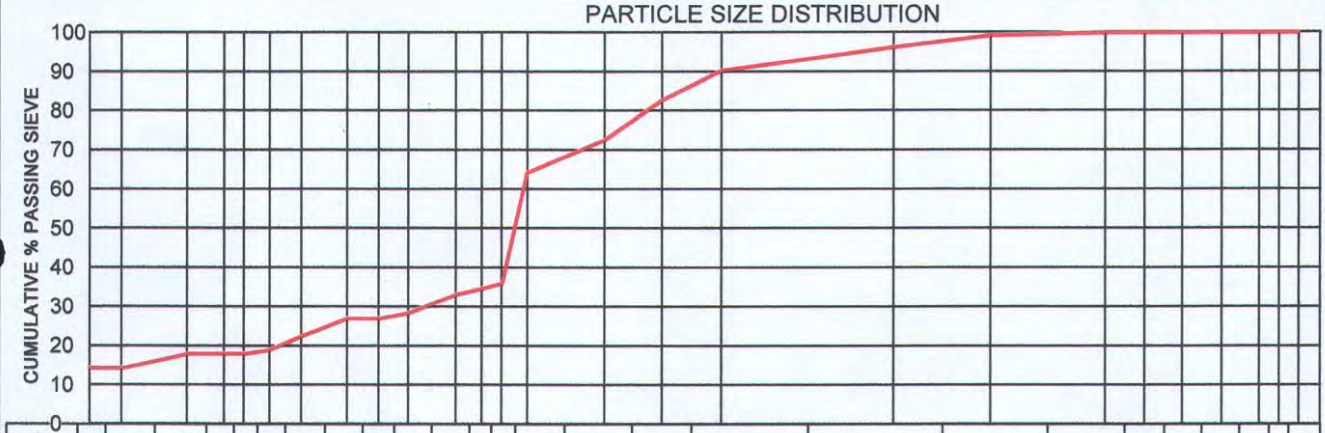
Sample No. :	: 2151
Hole No. :	: BD BHM101
Depth (mm) :	: 7.5-7.95
Liquid Limit (%)	: 40
Plasticity Index	: 13
Linear Shrinkage (%)	: 6.5
PI of Whole Sample	: 12
P.R.A. Classification	: A-6(7)
Unified Soil Classification	: OL
Activity	: 0.83
Heave Classification	: MEDIUM
Grading Modulus	: 0.49
Percentage (<0.002)	: 14.0
Moisture Content (%)	: 59.3

Material Description : Bluish Grey SANDY SILT

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	18.1	16.6	61.7	3.6	SILTY SAND
Astm	18.1	46.3	35.0	0.7	SANDY SILT
British Standard	14.5	21.7	60.2	3.6	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	14	14	18	18	18	19	23	27	27	29	33	35	36	64	73	83	90	96	99	100	100	100	100	100	100	100

JENN	CLAY		SILT		SAND				GRAVEL	
ASTM	CLAY		SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND		FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.
- CIVIL ENGINEERING SERVICES -

a SANAS Accredited Testing Laboratory, No. TO239

UNIT 7, PENNYLANE PARK, 64 EBONYFIELD AVE., SPRINGFIELD PARK
P.O.BOX 74663, ROCHDALE PARK, 4034

Tel. : 031-5791220/1
Fax : 031-5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: MR MARK RICHTER

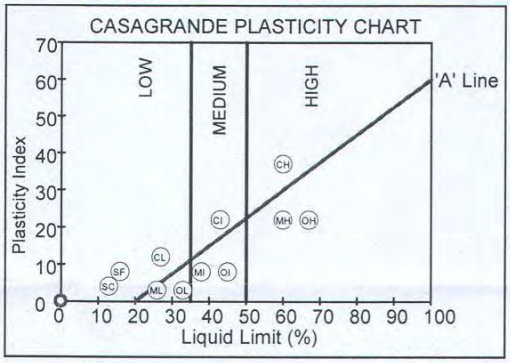
Project : DURBAN HABOUR BERTH DEEPENING
: FEASIBILITY STUDY(07-395)
Your Ref : 5801
Our Ref : 046035
Date Reported : 04.03.2009

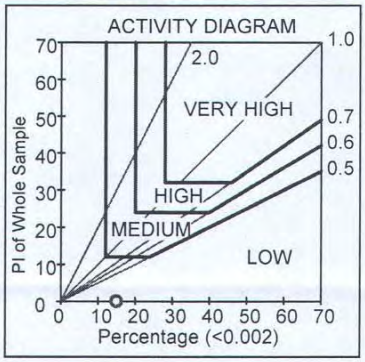
FOUNDATION INDICATOR (ASTM: D422)

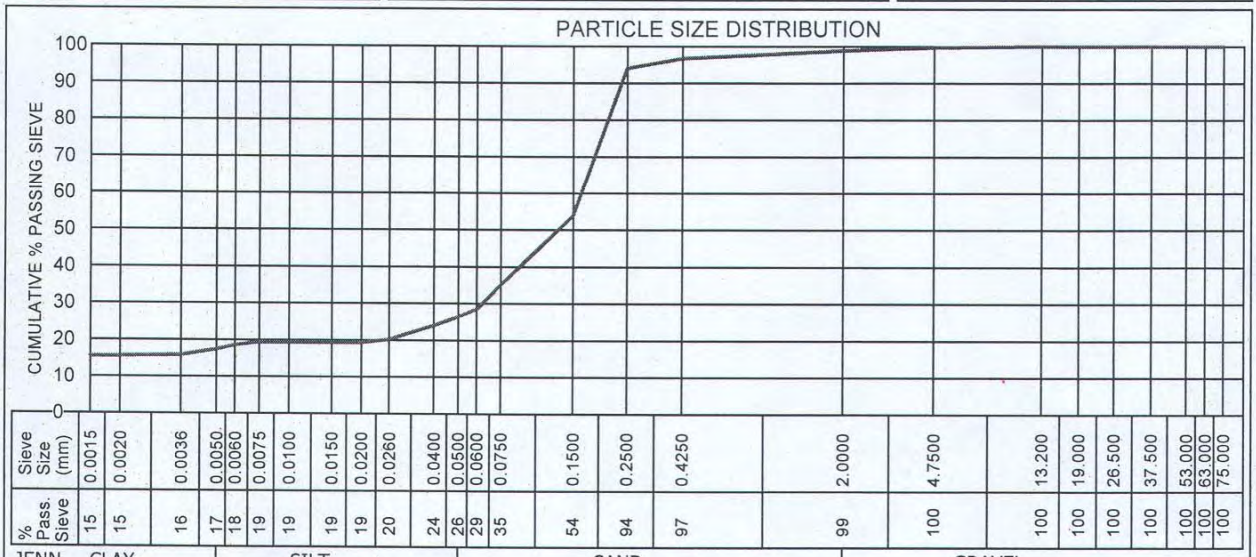
Sample No. :	: 2152
Hole No. :	: BD BHM101
Depth (mm) :	: 9.0-9.45
Liquid Limit (%)	: -
Plasticity Index	: SP
Linear Shrinkage (%)	: 0.5
PI of Whole Sample	: 0
P.R.A. Classification	: A-4(0)
Unified Soil Classification	: SC
Activity	: 0.00
Heave Classification	: LOW
Grading Modulus	: 0.69
Percentage (<0.002)	: 15.0
Moisture Content (%)	: 35.7

Material Description : BLUISH GREY SILTY SAND

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	17.4	8.9	72.5	1.2	SILTY SAND
Astm	17.4	17.7	64.7	0.3	SILTY SAND
British Standard	15.5	13.1	70.3	1.2	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	15	15	16	17	18	19	19	19	19	20	24	26	29	35	54	94	97	99	100	100	100	100	100	100	100	100

JENN	CLAY	SILT		SAND			GRAVEL			
ASTM	CLAY	SILT		FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL			
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : SAMPLES DELIVERED BY CLIENT
Ammendment to Report issued on 08.09.2008.
Depth corrected.

FORM: A6 Program ver 3.0R(21.10.2008) Technical Signatory : Lawrence Govender

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

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P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

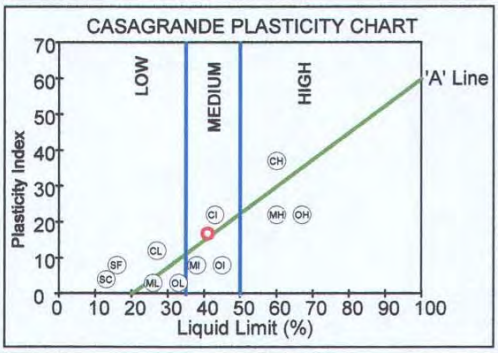
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

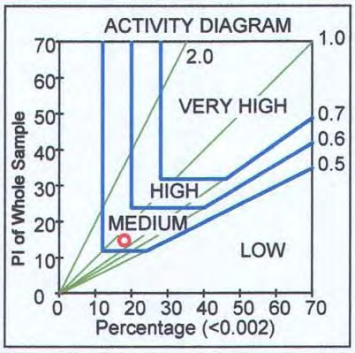
FOUNDATION INDICATOR (ASTM: D422)

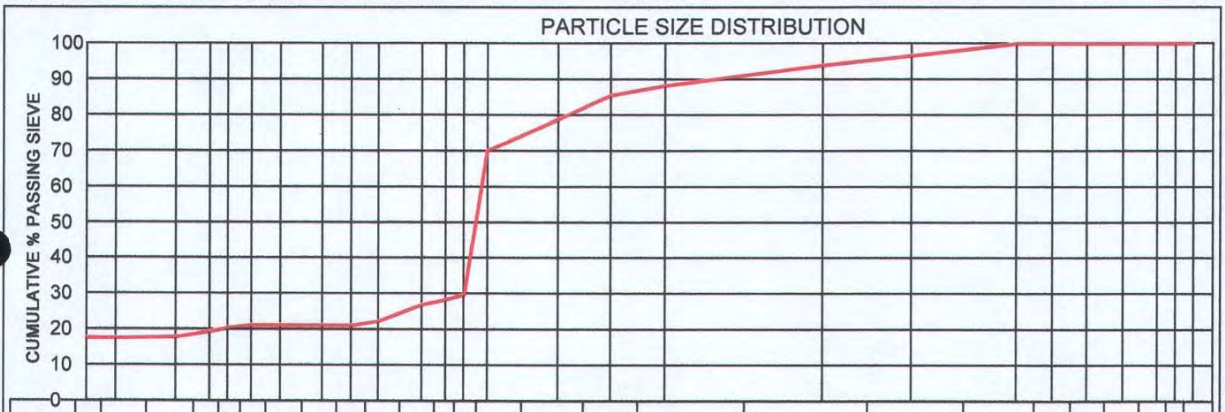
Sample No. :	: 2159
Hole No. :	: BD BHL201
Depth (mm) :	: 29.0-29.45
Liquid Limit (%)	: 41
Plasticity Index	: 17
Linear Shrinkage (%)	: 8.0
PI of Whole Sample	: 15
P.R.A. Classification	: A-7-6(10)
Unified Soil Classification	: CL
Activity	: 0.85
Heave Classification	: MEDIUM
Grading Modulus	: 0.48
Percentage (<0.002)	: 18.0
Moisture Content (%)	: 44.6

Material Description : Brownish Black CLAYEY SILT

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	19.4	9.0	65.6	6.0	CLAYEY SAND
Astm	19.4	50.7	26.6	3.3	CLAYEY SILT
British Standard	17.7	12.2	64.2	6.0	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	18	18	18	19	20	21	21	21	21	22	27	28	30	70	79	86	88	94	97	100	100	100	100	100	100	100

JENN CLAY		SILT			SAND			GRAVEL		
ASTM CLAY		SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL	
BS CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL	

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.
- CIVIL ENGINEERING SERVICES -

a SANAS Accredited Testing Laboratory, No. TO239

UNIT 7, PENNYLANE PARK, 64 EBONYFIELD AVE., SPRINGFIELD PARK
P.O.BOX 74663, ROCHDALE PARK, 4034

Tel. : 031-5791220/1
Fax : 031-5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: MR MARK RICHTER

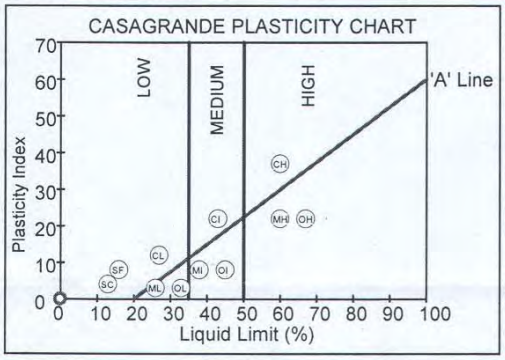
Project : DURBAN HABOUR BERTH DEEPENING
: FEASIBILITY STUDY(07-395)
Your Ref : 5801
Our Ref : 046035
Date Reported : 04.03.2009

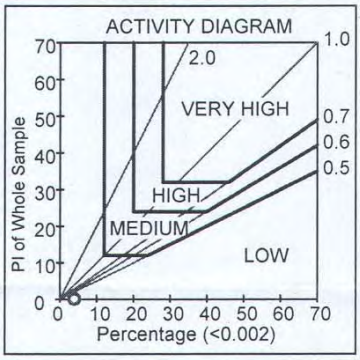
FOUNDATION INDICATOR (ASTM: D422)

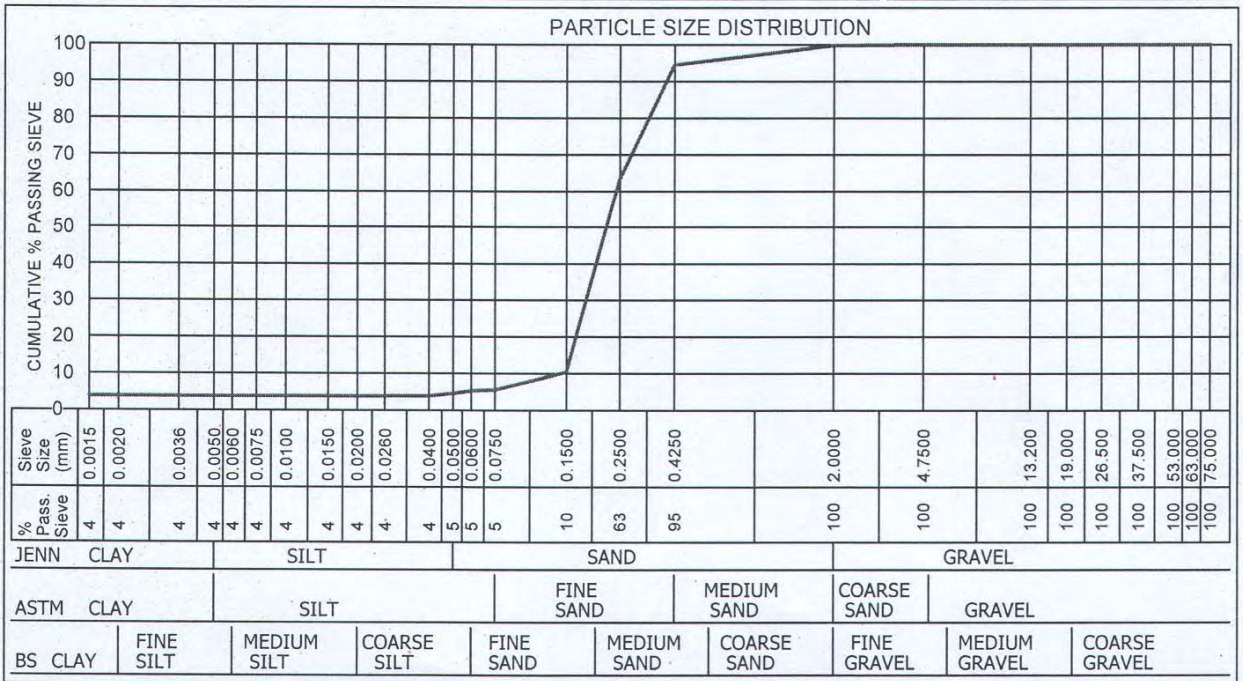
Sample No. :	: 2148.
Hole No. :	: BD BHL209
Depth (mm) :	: 26.0-26.45
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0.0
PI of Whole Sample	: 0
P.R.A. Classification	: A-3(0)
Unified Soil Classification	: SW-SC
Activity	: 0.00
Heave Classification	: LOW
Grading Modulus	: 1.00
Percentage (<0.002)	: 4.0
Moisture Content (%)	: 26.3

Material Description : DARK OLIVE GREY SAND

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	3.8	0.8	95.3	0.2	SAND
Astm	3.8	1.7	94.5	0.0	SAND
British Standard	3.8	1.5	94.6	0.2	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	4	4	4	4	4	4	4	4	4	4	4	5	5	5	10	63	95	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL		
ASTM	CLAY	SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : SAMPLES DELIVERED BY CLIENT
Ammendment to Report issued on 08.09.2008.
Depth and Description corrected.

FORM: A6 Program ver 3.0R(21.10.2008) Technical Signatory : Lawrence Govender

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

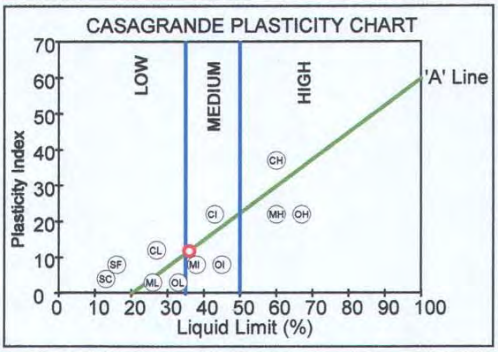
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

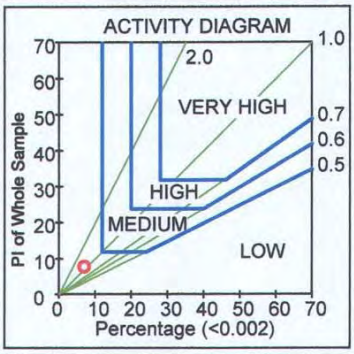
FOUNDATION INDICATOR (ASTM: D422)

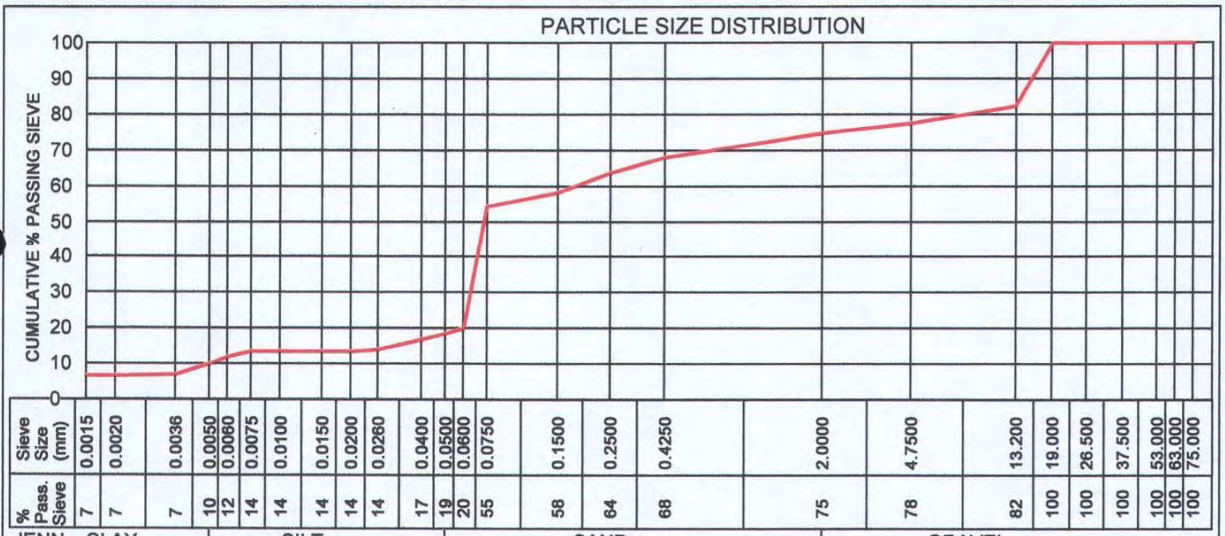
Sample No. :	: 2149
Hole No. :	: BD BHL209
Depth (mm) :	: 28.55-29
Liquid Limit (%)	: 36
Plasticity Index	: 12
Linear Shrinkage (%)	: 5.5
PI of Whole Sample	: 8
P.R.A. Classification	: A-6(5)
Unified Soil Classification	: CL
Activity	: 1.17
Heave Classification	: LOW
Grading Modulus	: 1.02
Percentage (<0.002)	: 7.0
Moisture Content (%)	: 33.8

Material Description : Dark Grey Brown SANDY SILT

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	10.1	8.5	56.5	25.0	SILTY SAND
Astm	10.1	44.5	23.1	22.3	SANDY SILT
British Standard	6.8	13.3	54.9	25.0	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0280	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	7	7	7	10	12	14	14	14	14	14	17	19	20	55	58	64	68	75	78	82	100	100	100	100	100	100

JENN CLAY	SILT	SAND	GRAVEL	
ASTM CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
BS CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

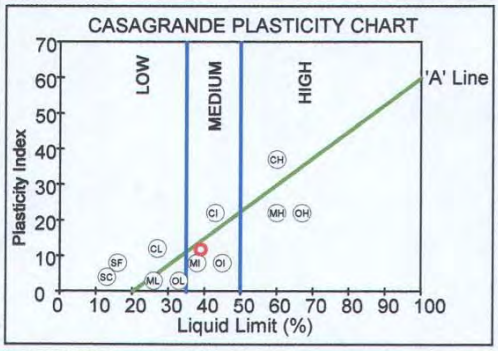
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

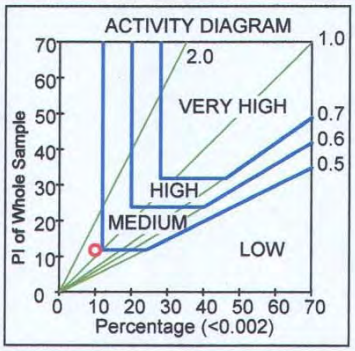
FOUNDATION INDICATOR (ASTM: D422)

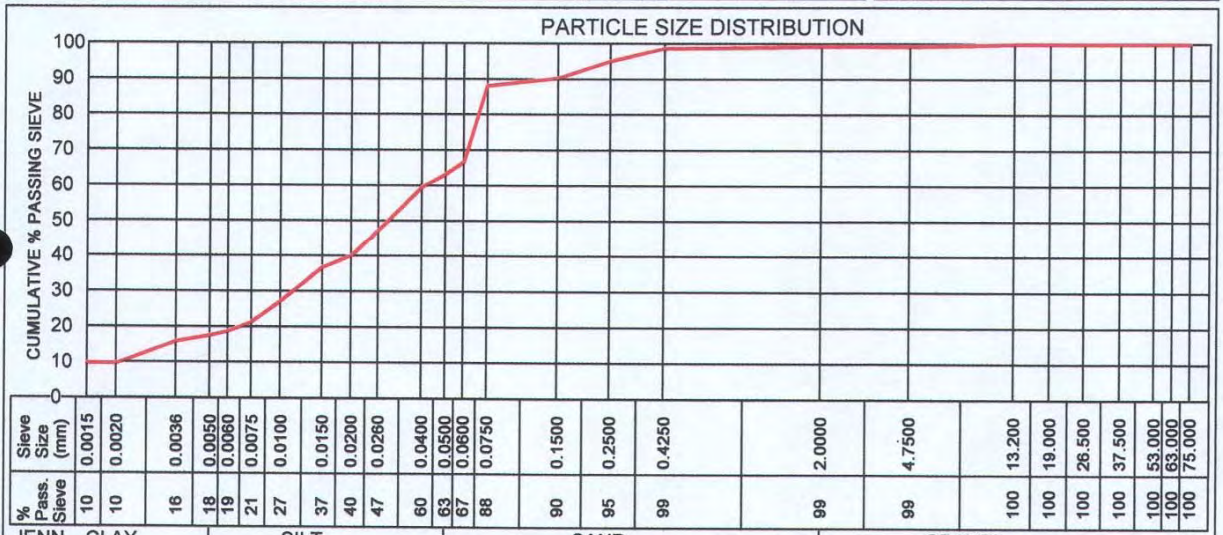
Sample No. :	: 2150
Hole No. :	: BD BHL209
Depth (mm) :	: 30.55-31.0
Liquid Limit (%)	: 39
Plasticity Index	: 12
Linear Shrinkage (%)	: 6.0
PI of Whole Sample	: 12
P.R.A. Classification	: A-6(9)
Unified Soil Classification	: OL
Activity	: 1.22
Heave Classification	: LOW
Grading Modulus	: 0.14
Percentage (<0.002)	: 10.0
Moisture Content (%)	: 45.6

Material Description : Grey SANDY SILT

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	17.7	45.6	36.0	0.6	SANDY SILT
Astm	17.7	70.6	11.1	0.6	SANDY SILT
British Standard	9.9	57.0	32.5	0.6	SANDY SILT







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	10	10	16	18	19	21	27	37	40	47	60	63	67	88	90	95	99	99	99	100	100	100	100	100	100	100

JENN	CLAY	SILT		SAND			GRAVEL		
ASTM	CLAY	SILT		FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

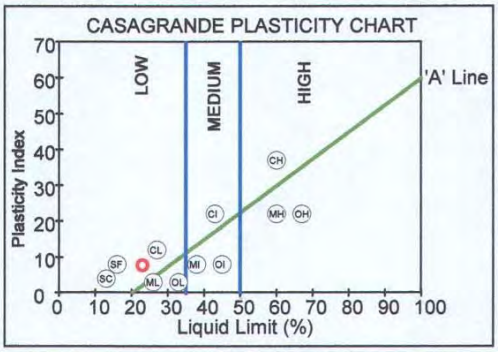
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

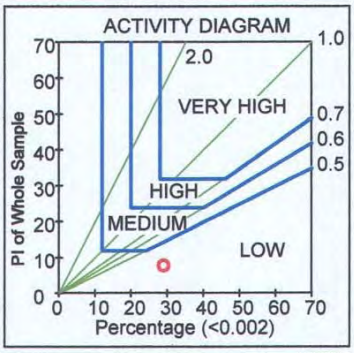
FOUNDATION INDICATOR (ASTM: D422)

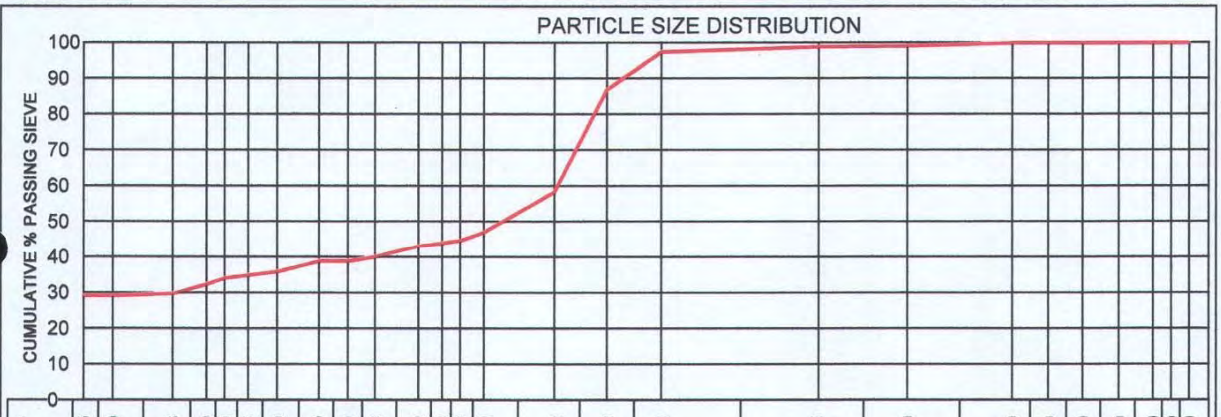
Sample No. :	: 2162
Hole No. :	: BD BHL314
Depth (mm) :	: 26.2-26.65
Liquid Limit (%)	: 23
Plasticity Index	: 8
Linear Shrinkage (%)	: 3.5
PI of Whole Sample	: 8
P.R.A. Classification	: A-4(2)
Unified Soil Classification	: SC
Activity	: 0.27
Heave Classification	: LAAG
Grading Modulus	: 0.56
Percentage (<0.002)	: 29.0
Moisture Content (%)	: 26.5

Material Description : Brownish Grey SAND.KLEI

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	32.5	11.6	54.8	1.0	SAND.KLEI
Astm	32.5	14.7	52.0	0.8	SAND.KLEI
British Standard	29.3	15.7	54.0	1.0	KL.SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	29	29	30	33	34	35	36	39	39	40	43	44	45	47	59	87	98	99	99	100	100	100	100	100	100	100

JENN	CLAY		SILT		SAND			GRAVEL	
ASTM	CLAY		SILT		FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

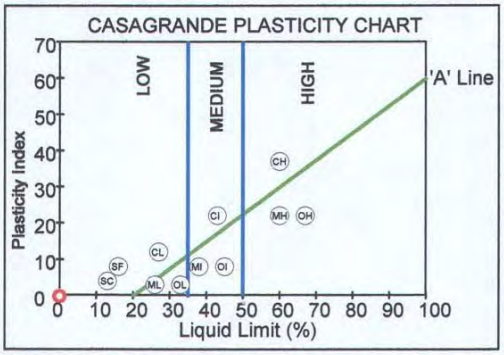
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

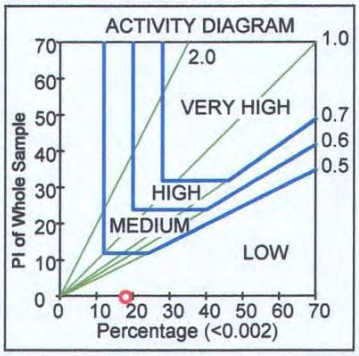
FOUNDATION INDICATOR (ASTM: D422)

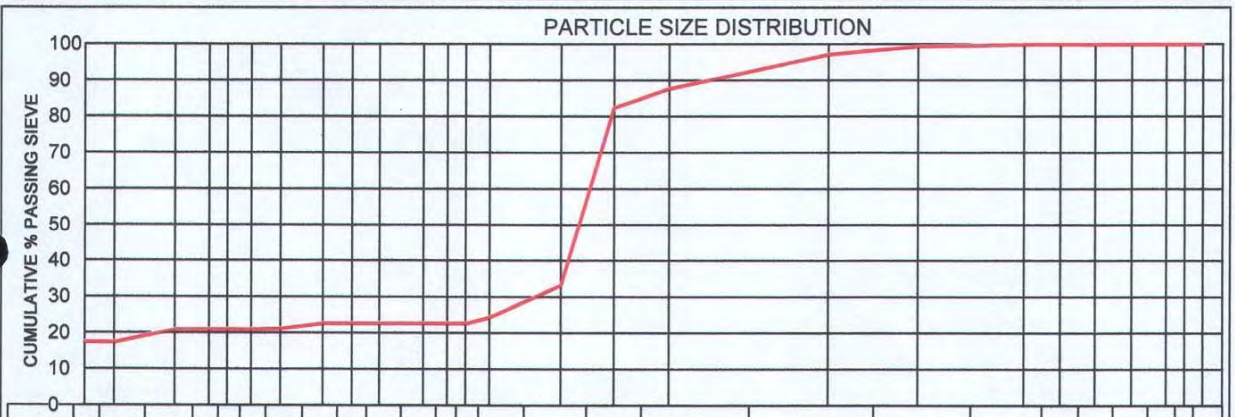
Sample No. :	: 2163
Hole No. :	: BD BHL314
Depth (mm) :	: 29.2-29.65
Liquid Limit (%)	: -
Plasticity Index	: EP
Linear Shrinkage (%)	: 0.5
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classification	: SC
Activity	: 0.00
Heave Classification	: LAAG
Grading Modulus	: 0.90
Percentage (<0.002)	: 18.0
Moisture Content (%)	: 25.4

Material Description : Greyish Brown KL.SAND

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	21.1	1.8	74.5	2.7	KL.SAND
Astm	21.1	3.3	75.0	0.5	KL.SAND
British Standard	17.6	5.3	74.5	2.7	SL.SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	18	18	21	21	21	21	21	23	23	23	23	23	23	24	33	83	88	97	99	100	100	100	100	100	100	100

JENN CLAY	SILT	SAND	GRAVEL	
ASTM CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL
BS CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

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Tel. : 031 5791220
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TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

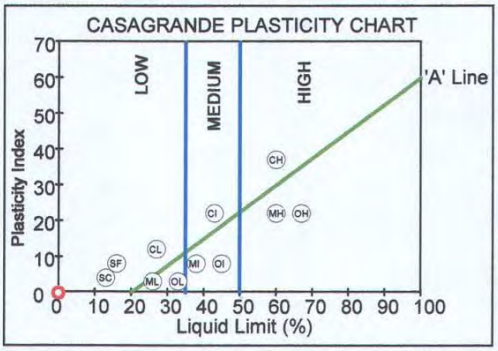
Your Ref : 07-395
Our Ref : 046035
Date Reported : 05.09.2008

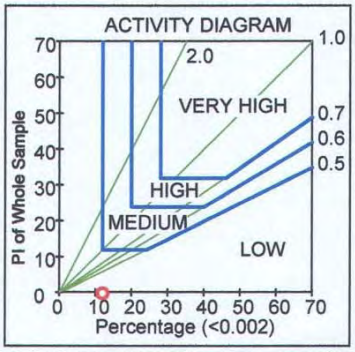
FOUNDATION INDICATOR (ASTM: D422)

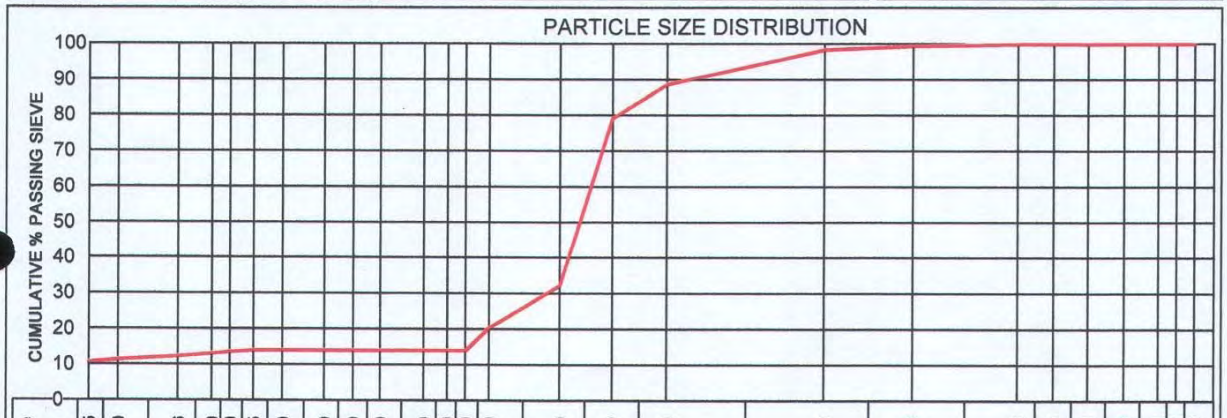
Sample No. :	: 2164
Hole No. :	: BD BHL314
Depth (mm) :	: 31.7-32.15
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0.0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classification	: SC
Activity	: 0.00
Heave Classification	: LAAG
Grading Modulus	: 0.92
Percentage (<0.002)	: 12.0
Moisture Content (%)	: 33.5

Material Description : Dark grey to black SL.SAND

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	13.3	0.9	84.2	1.6	SAND
Astm	13.3	7.2	79.0	0.5	SL.SAND
British Standard	11.5	2.7	84.2	1.6	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	11	12	13	13	14	14	14	14	14	14	14	14	14	20	32	79	89	98	99	100	100	100	100	100	100	100

JENN	CLAY	SILT		SAND			GRAVEL		
ASTM	CLAY	SILT		FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Samples delivered by client.

FORM: A6

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

Your Ref : 07-395
Our Ref : 046035
Date Reported : 08.09.2008

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR, UCS(TMH1:A1-A5)

SAMPLE NO.	2147	2153	2154	2155
HOLE NO.	BD BHL 209	BD BHM 101	BD BHM 101	BD BHM 102
ROAD NO.				
DEPTH (mm)	13.5-13.95	13.79-14.24	22.34-22.78	6.0-6.45
CHAINAGE				
LAYER TYPE				
STABILISED WITH	Natural	Natural	Natural	Natural
SUPPLIER				
CURING METHOD				
DESCRIPTION	Gr Br speck Wh Sand	Pink Br Blue Gr Sand	Bl Gr Speck Wh Sand	Lt Yel Br Lt Bl Sand
SIEVE ANALYSIS (% PASSING)				
75 mm				
63 mm				
53 mm				
37.5 mm				
26.5 mm	100			
19.0 mm	90	100		
13.2 mm	82	99		
4.75 mm	71	98		100
2.0 mm	63	98	100	99
0.425 mm	47	89	75	62
0.075 mm	44	5	3	4
SOIL MORTAR				
COARSE SAND<2.000mm >0.425mm	25	9	25	37
FINE SAND <0.425mm >0.075mm	5	86	72	59
MATERIAL <0.075mm	70	5	3	4
CONSTANTS				
GRADING MODULUS	1.46	1.08	1.22	1.35
PRA CLASSIFICATION	A-6(2)	A-3(0)	A-3(0)	A-3(0)
LIQUID LIMIT (%)	36	-	-	-
PLASTICITY INDEX (0.425mm)	12	NP	NP	NP
LINEAR SHRINKAGE (%)	5.5	0.0	0.0	0.0

Remarks : Samples delivered by client.

FORM: A1

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

SANAS ACCREDITED LABORATORY

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

Your Ref : 07-395
Our Ref : 046035b
Date Reported : 08.09.2008

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR, UCS(TMH1:A1-A5)

SAMPLE NO.	2156	2157	2158	
HOLE NO.	BD BHM 102	BD BHM 104	BD BHL 201	
ROAD NO.				
DEPTH (mm)	16.5-16.95	10.5-10.95	7.5-7.95	
CHAINAGE				
LAYER TYPE				
STABILISED WITH	Natural	Natural	Natural	
SUPPLIER				
CURING METHOD				
DESCRIPTION	Ol Br Speck Wh Or Black Sand	Or Lt Br Speck Bl White Sand	Gr Lt Br Speck Or Bl Sand	
SIEVE ANALYSIS (% PASSING)				
75 mm				
63 mm				
53 mm				
37.5 mm				
26.5 mm				
19.0 mm				
13.2 mm				
4.75 mm	100	100		
2.0 mm	100	100	100	
0.425 mm	97	88	97	
0.075 mm	8	5	8	
SOIL MORTAR				
COARSE SAND<2.000mm >0.425mm	3	12	3	
FINE SAND <0.425mm >0.075mm	89	83	89	
MATERIAL <0.075mm	8	5	8	
CONSTANTS				
GRADING MODULUS	0.95	1.07	0.95	
PRA CLASSIFICATION	A-3(0)	A-3(0)	A-3(0)	
LIQUID LIMIT (%)	-	-	-	
PLASTICITY INDEX (0.425mm)	NP	NP	NP	
LINEAR SHRINKAGE (%)	0.0	0.0	0.0	

Remarks : Samples delivered by client.

FORM: A1

Program ver 3.0 (23.07.2008)

Technical Signatory : LAWRENCE GOVENDER

MATROLAB GROUP (PTY.) LTD.

- CIVIL ENGINEERING SERVICES -

Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587

a SANAS Accredited Testing Laboratory, No. T0239

Unit 7, Pennylane Park, 64 Ebonyfield Ave, Springfield Park
P O Box 74663, Rochdale Park, 4034

Tel. : 031 5791220
Fax : 031 5791344
Email : lawrenceg@matrolab.co.za

SANAS ACCREDITED LABORATORY

TEST RESULTS

MOORE SPENCE JONES (PTY) LTD
P.O.BOX 1263
WANDSBECK
3631
Attention: Mr Mark Richter

Project : Durban Harbour Berth

Your Ref : 07-395
Our Ref : 045035c
Date Reported : 08.09.2008

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR, UCS(TMH1:A1-A5)

SAMPLE NO.	2160	2161		
HOLE NO.	BD BHL 314	BD BHL 314		
ROAD NO.				
DEPTH (mm)	6.65-7.1	23.15-23.6		
CHAINAGE				
LAYER TYPE				
STABILISED WITH	Natural	Natural		
SUPPLIER				
CURING METHOD				
DESCRIPTION	Grey to Brown Sand	Light brown Sand		
SIEVE ANALYSIS (% PASSING)				
75 mm				
63 mm				
53 mm				
37.5 mm				
26.5 mm				
19.0 mm	100			
13.2 mm	98	100		
4.75 mm	97	100		
2.0 mm	91	99		
0.425 mm	64	94		
0.075 mm	3	8		
SOIL MORTAR				
COARSE SAND<2.000mm >0.425mm	30	5		
FINE SAND <0.425mm >0.075mm	67	87		
MATERIAL <0.075mm	3	8		
CONSTANTS				
GRADING MODULUS	1.42	0.99		
PRA CLASSIFICATION	A-3(0)	A-3(0)		
LIQUID LIMIT (%)	-	-		
PLASTICITY INDEX (0.425mm)	NP	NP		
LINEAR SHRINKAGE (%)	0.0	0.0		

Remarks : Samples delivered by client.

FORM: A1

Program ver 3.0 (23.07.2008)

Technical Signatory: LAWRENCE GOVENDER

Laboratory Test Summary

THEKWINI SOILS LAB. CC

Job Description: Durban Harbour Berth Deepening
Job no.: 5480
Date: 12-11-2008

Lab no.		10145	10146	10147	10148	10149	10150				
Location		Phase 1	Phase 1	Phase 2	Phase 2	Phase 3	Phase 3				
Depth		-	-	-	-	-	-				
Description		Fill	Harbour Bed	Harbour Bed	Fill	Harbour Bed	Fil				
		Sands	Sands	Sands	Sands	Sands	Sands				
Binder Material		-	-	-	-	-	-				
Particle Size (mm)	75										
	53										
	37.5										
	26.5										
	19										
	13.2										
	9.5	100	100								
	4.75	100	100	100	100	100	100				
	2	97	95	99	99	99	98				
	0.425	89	76	86	90	76	93				
	0.25	60	49	56	63	49	69				
	0.15	12	20	22	10	21	13				
	0.075	4	11	11	3	12	4				
	0.05	4	9	10	2	10	3				
	0.02	3	9	9	2	9	3				
	0.005	3	9	8	2	9	3				
	0.002	2	8	6	2	7	2				
Soil Mortar	Coarse Sand <2.0 >0.425mm	8.1	20.1	13.2	9.3	23.7	5.9				
	Fine Sand <0.425>0.05mm	88.3	72.7	78.1	88.6	68.3	91.3				
	Silt <0.05 >0.005	0.7	0.0	2.2	0.0	1.1	0.0				
	Clay <0.005	2.9	7.2	6.5	2.0	6.8	2.8				
Atterberg Limits	Liquid Limit	20.6	18.5	18.4	22.5	18.2	21.5				
	Plasticity Index	0	0	0	0	0	0				
	Linear Shrinkage	0	0	0	0	0	0				
	Natural MC	-	-	-	-	-	-				
Mod AASHTO Density	Density Kg/m^3										
	OMC										
CBR	100%										
	98%										
	95%										
	93% (Inferred)										
	90%										
	CBR Swell										
AASHTO Soil Classification		A - 3 (0)	A - 2 - 4 (0)	A - 2 - 4 (0)	A - 3 (0)	A - 2 - 4 (0)	A - 3 (0)				
Grading Modulus		1.09	1.18	1.03	1.09	1.13	1.05				
Test Method BS 1377-90 Part 4											
Maximum Density kg/m^3		1769			1727		1712				
Minimum Density kg/m^3		1470			1451		1437				

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10145 **Borehole/Pit no.:** Phase 1 **Fig no.:** 1

Depth: -

Grading Analysis

Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	99.9
2	97.3
0.425	89.5
0.25	60.0
0.15	12.4
0.075	4.4
0.05	4.0
0.02	3.2
0.005	3.2
0.002	2.4

M.I.T SIZE CLASSIFICATION

Cobble%		0.0
Gravel%	2.7	
Coarse		0.0
Medium		0.1
Fine		2.6
Sand%	93.2	
Coarse		7.0
Medium		54.2
Fine		32.0
Silt%	1.7	
Coarse		1.0
Medium		0.0
Fine		0.8
Clay%	2.4	

PLASTICITY

Liquid Limit	20.6
Plasticity Index	0
Linear Shrinkage	0

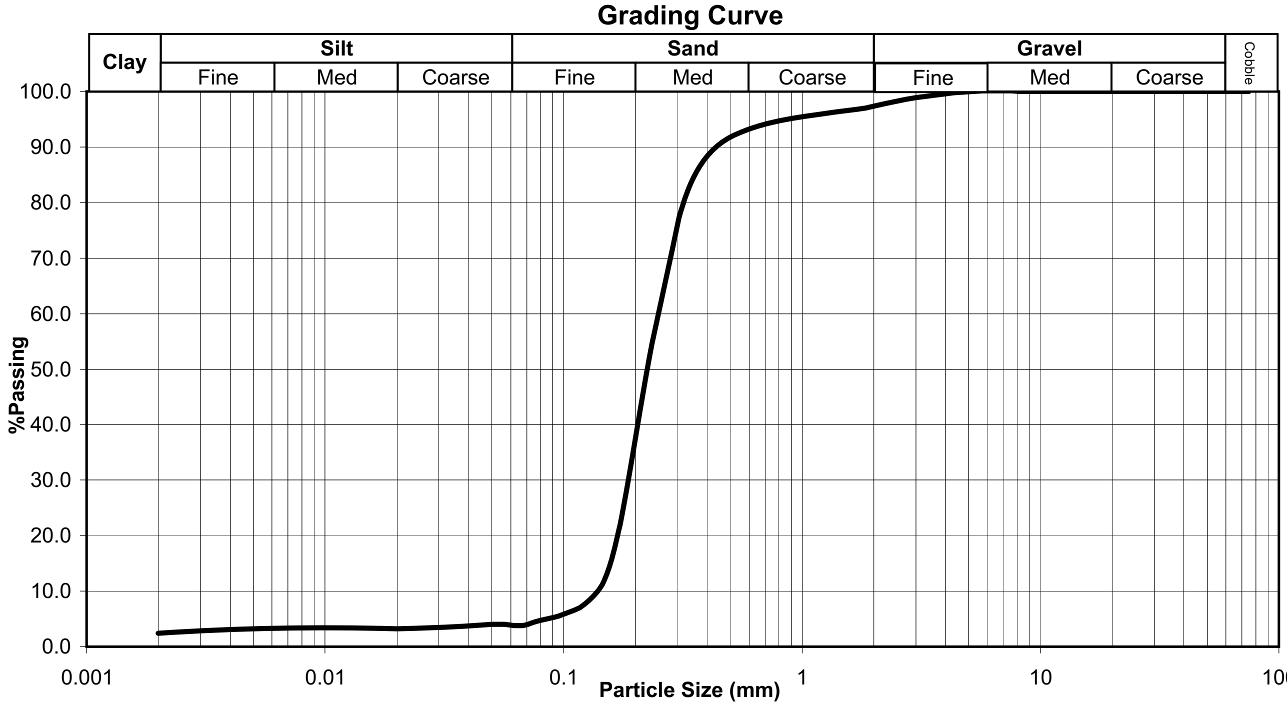
GRADING

D10 Size (mm)	0.12
Uniformity Coefficient	2.05
Grading Modulus	1.09

CLASSIFICATION

Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 3
Unified Classification	SP

Grading Curve



MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10146 **Borehole/Pit no.:** Phase 1 **Fig no.:** 2

Depth: -

Grading Analysis

Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	99.7
2	95.4
0.425	76.2
0.25	48.9
0.15	20.3
0.075	10.6
0.05	9.0
0.02	9.0
0.005	9.0
0.002	7.5

M.I.T SIZE CLASSIFICATION

Cobble%		0.0
Gravel%	4.6	
Coarse		0.0
Medium		0.2
Fine		4.4
Sand%	85.7	
Coarse		17.0
Medium		43.8
Fine		24.9
Silt%	2.1	
Coarse		0.6
Medium		0.0
Fine		1.5
Clay%	7.5	

PLASTICITY

Liquid Limit	18.5
Plasticity Index	0
Linear Shrinkage	0

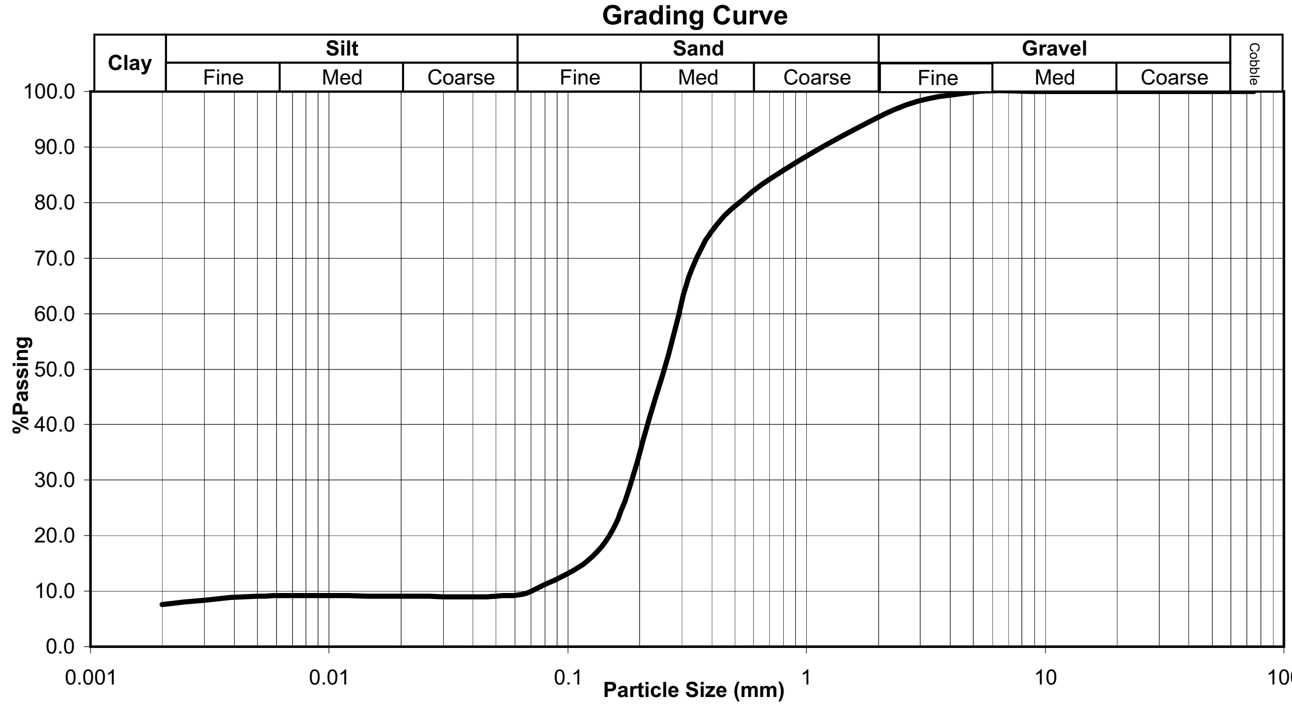
GRADING

D10 Size (mm)	0.065
Uniformity Coefficient	4.80
Grading Modulus	1.18

CLASSIFICATION

Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 2 - 4
Unified Classification	SP - SM

Grading Curve



MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10147 **Borehole/Pit no.:** Phase 2 **Fig no.:** 3

Depth: -

Grading Analysis

Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	99.4
0.425	86.4
0.25	55.9
0.15	22.4
0.075	11.3
0.05	10.0
0.02	8.8
0.005	7.5
0.002	6.3

M.I.T SIZE CLASSIFICATION

Cobble%		0.0
Gravel%	0.6	
Coarse		0.0
Medium		0.0
Fine		0.6
Sand%	88.9	
Coarse		11.6
Medium		48.7
Fine		28.6
Silt%	4.3	
Coarse		1.8
Medium		1.2
Fine		1.3
Clay%	6.3	

PLASTICITY

Liquid Limit	18.4
Plasticity Index	0
Linear Shrinkage	0

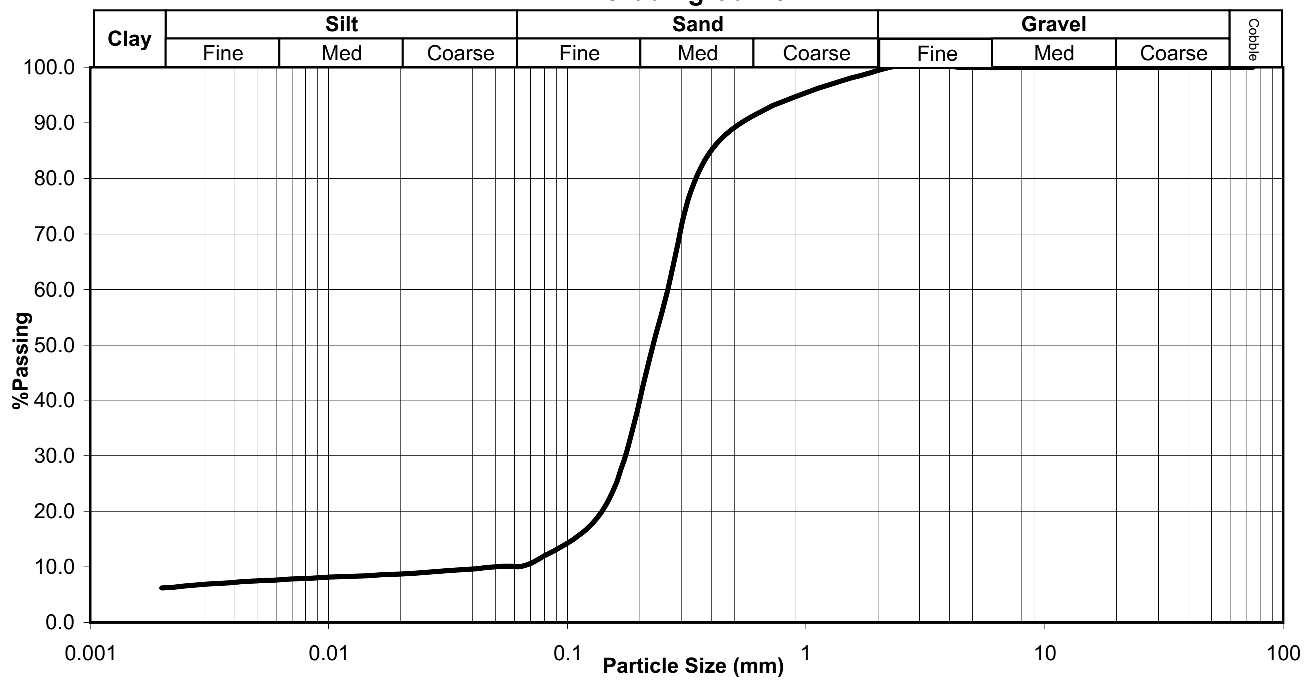
GRADING

D10 Size (mm)	0.049
Uniformity Coefficient	5.47
Grading Modulus	1.03

CLASSIFICATION

Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 2 - 4
Unified Classification	SP - SM

Grading Curve



MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10148 **Borehole/Pit no.:** Phase 2 **Fig no.:** 4

Depth: -

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	98.8
0.425	89.6
0.25	63.2
0.15	9.5
0.075	2.8
0.05	2.3
0.02	2.3
0.005	2.3
0.002	1.7

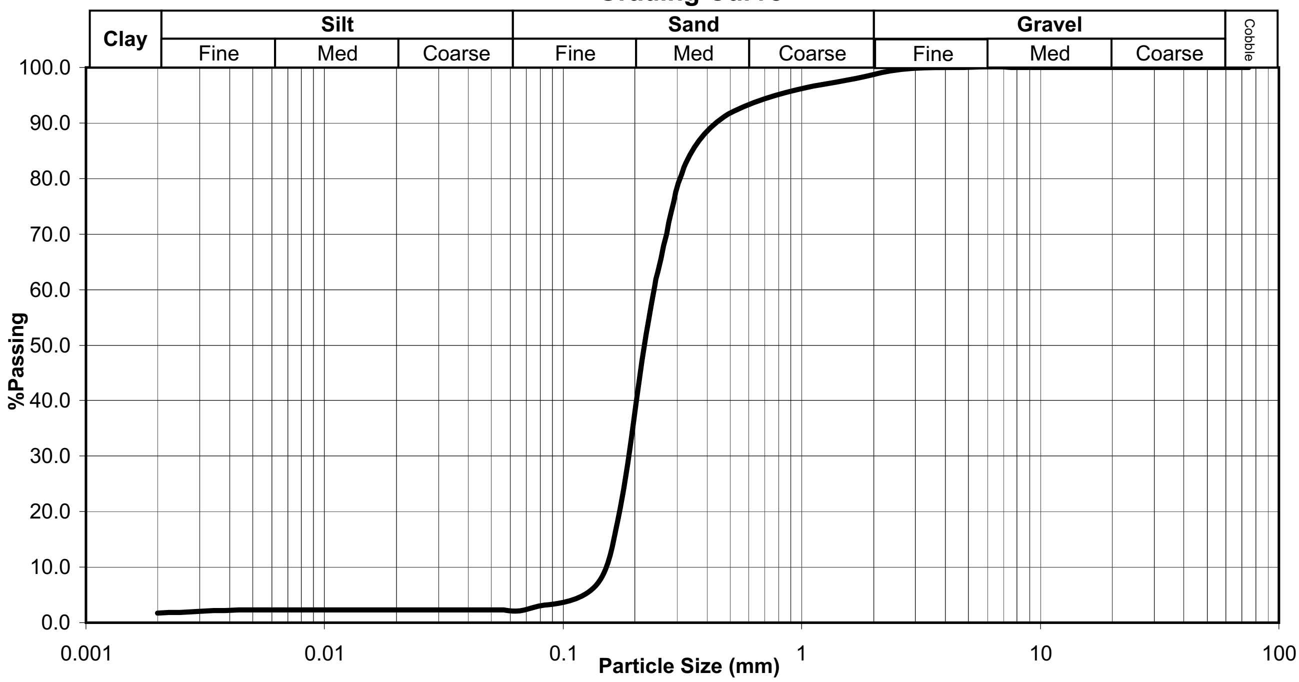
M.I.T SIZE CLASSIFICATION		
Cobble%		0.0
Gravel%	1.2	
Coarse		0.0
Medium		0.0
Fine		1.2
Sand%	96.3	
Coarse		8.2
Medium		54.2
Fine		33.9
Silt%	0.8	
Coarse		0.2
Medium		0.0
Fine		0.6
Clay%	1.7	

PLASTICITY	
Liquid Limit	22.5
Plasticity Index	0
Linear Shrinkage	0

GRADING	
D10 Size (mm)	0.15
Uniformity Coefficient	1.61
Grading Modulus	1.09

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 3
Unified Classification	SP

Grading Curve



MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
VAT REGISTRATION NO: 4085178661
98 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10149 **Borehole/Pit no.:** Phase 3 **Fig no.:** 5

Depth: -

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	99.2
0.425	75.7
0.25	48.9
0.15	21.3
0.075	11.9
0.05	10.4
0.02	8.9
0.005	8.9
0.002	7.5

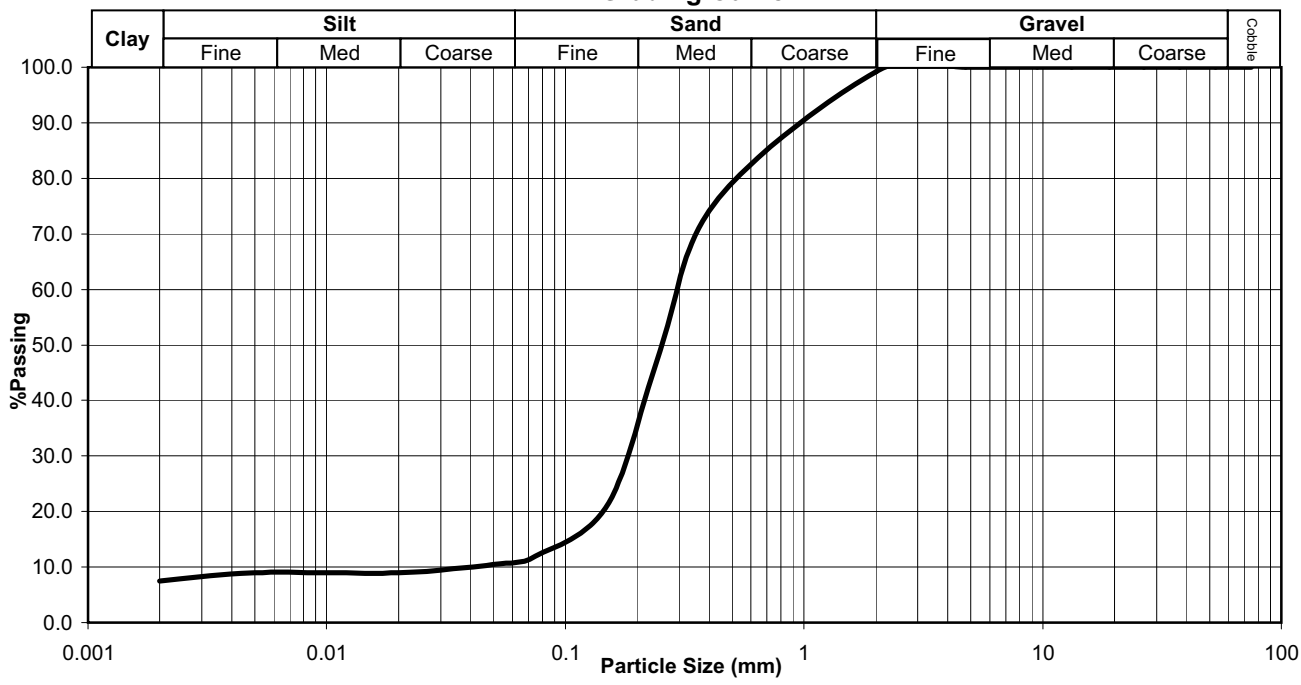
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	0.8
Coarse	0.0
Medium	0.0
Fine	0.8
Sand%	88.2
Coarse	20.9
Medium	43.2
Fine	24.1
Silt%	3.6
Coarse	2.1
Medium	0.0
Fine	1.5
Clay%	7.5

PLASTICITY	
Liquid Limit	18.2
Plasticity Index	0
Linear Shrinkage	0

GRADING	
D10 Size (mm)	0.038
Uniformity Coefficient	8.14
Grading Modulus	1.13

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 2 - 4
Unified Classification	SW - SM

Grading Curve



Ref no.: 5480 Fig no.: 5

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4580/1860
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Project: Durban Harbour Berth Deepening

Ref no.: 5480 **Lab no.:** 10150 **Borehole/Pit no.:** Phase 3 **Fig no.:** 6

Depth: -

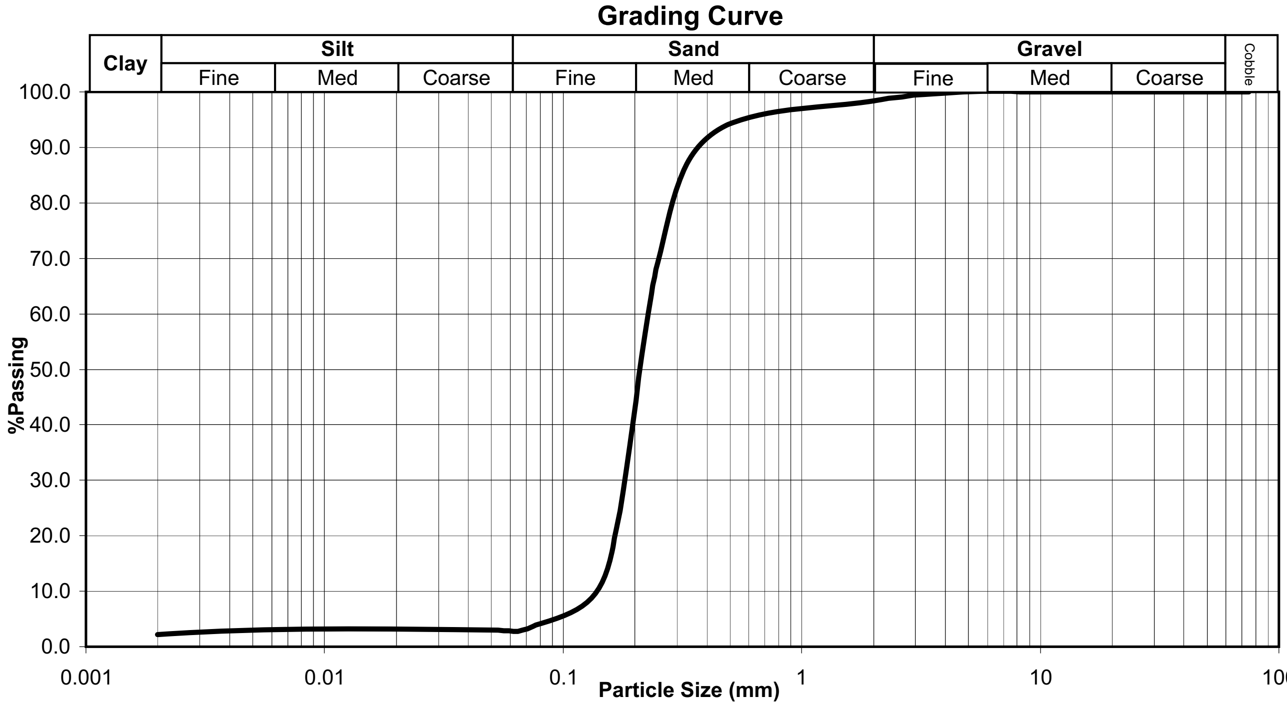
Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	98.4
0.425	92.5
0.25	69.3
0.15	13.0
0.075	3.7
0.05	2.9
0.02	2.9
0.005	2.9
0.002	2.2

M.I.T SIZE CLASSIFICATION		
Cobble%		0.0
Gravel%	1.6	
Coarse		0.0
Medium		0.0
Fine		1.6
Sand%	95.1	
Coarse		5.2
Medium		52.1
Fine		37.9
Silt%	1.0	
Coarse		0.3
Medium		0.0
Fine		0.7
Clay%	2.2	

PLASTICITY	
Liquid Limit	21.5
Plasticity Index	0
Linear Shrinkage	0

GRADING	
D10 Size (mm)	0.12
Uniformity Coefficient	1.91
Grading Modulus	1.05

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 3
Unified Classification	SP



Laboratory Test Summary

THEKWINI SOILS LAB. CC

Job Description: Berth Deepening - Durban Harbour
Job no.: 5531
Date: 20-01-2009

Lab no.		01025	01026	01027	01028	01029	01030	01031	01032		
Location		BHL 103A	BHL 203B	BHL 210A	BHL 302	BHM 101C	BHL 101 B	BHL 210A	BHM 101C		
Depth		27.80 - 28.35	25.45 - 26.00	25.65 - 26.20	24.45 - 25.95	4.90 - 5.35	18.95 19.37	28.70 - 29.25	3.35 - 3.90		
Description		-	-	-	-	-	-	-	-		
		-	-	-	-	-	-	-	-		
Binder Material		-	-	-	-	-	-	-	-		
Particle Size (mm)	75										
	53										
	37.5										
	26.5										
	19										
	13.2	100					100				
	9.5	96	100				95		100		
	4.75	93	98			100	88		98		
	2	93	97			100	84	100	98		
	0.425	92	96		100	99	82	100	97		
	0.25	92	96	100	99	99	75	99	95		
	0.15	91	96	99	96	89	62	96	86		
	0.075	89	96	99	93	80	56	93	82		
	0.05	87	93	97	91	71	51	91	73		
	0.02	79	80	83	76	54	41	75	57		
	0.005	69	65	63	54	35	33	48	44		
	0.002	60	56	52	41	30	28	36	37		
Soil Mortar	Coarse Sand <2.0 >0.425mm	1.1	0.3	0.0	0.0	0.3	3.3	0.3	0.7		
	Fine Sand <0.425>0.05mm	12.4	6.6	3.2	8.8	29.2	47.3	9.1	26.8		
	Silt <0.05 >0.005	18.8	28.3	33.9	37.1	35.5	17.7	43.3	28.8		
	Clay <0.005	67.8	64.8	62.9	54.1	35.0	31.8	47.4	43.8		
Atterberg Limits	Liquid Limit	63.8	54.9	56.6	47.1	42.6	39.3	42.9	10.7		
	Plasticity Index	30.3	26.2	26.3	21.1	18.2	15.8	19.6	21.1		
	Linear Shrinkage	15.3	13.3	13.3	10.7	9.3	8	10	10.7		
	Natural MC	-	-	-	-	-	-	-	-		
Mod AASHTO Density	Density Kg/m^3										
	OMC										
CBR	100%										
	98%										
	95%										
	93% (Inferred)										
	90%										
	CBR Swell										
AASHTO Soil Classification		A - 7 - 5 (33)	A - 7 - 6 (30)	A - 7 - 5 (32)	A - 7 - 6 (22)	A - 7 - 6 (15)	A - 6 (7)	A - 7 - 6 (20)	A - 6 (10)		
Grading Modulus		0.25	0.11	0.01	0.07	0.21	0.78	0.07	0.23		
TRH 14 (1985)											

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01025 **Borehole/Pit no.:** BHL 103A **Fig no.:** 1

Depth: 27.80 - 28.35

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	95.9
4.75	93.3
2	93.3
0.425	92.3
0.25	91.8
0.15	90.8
0.075	89.5
0.05	87.5
0.02	79.5
0.005	68.5
0.002	59.5

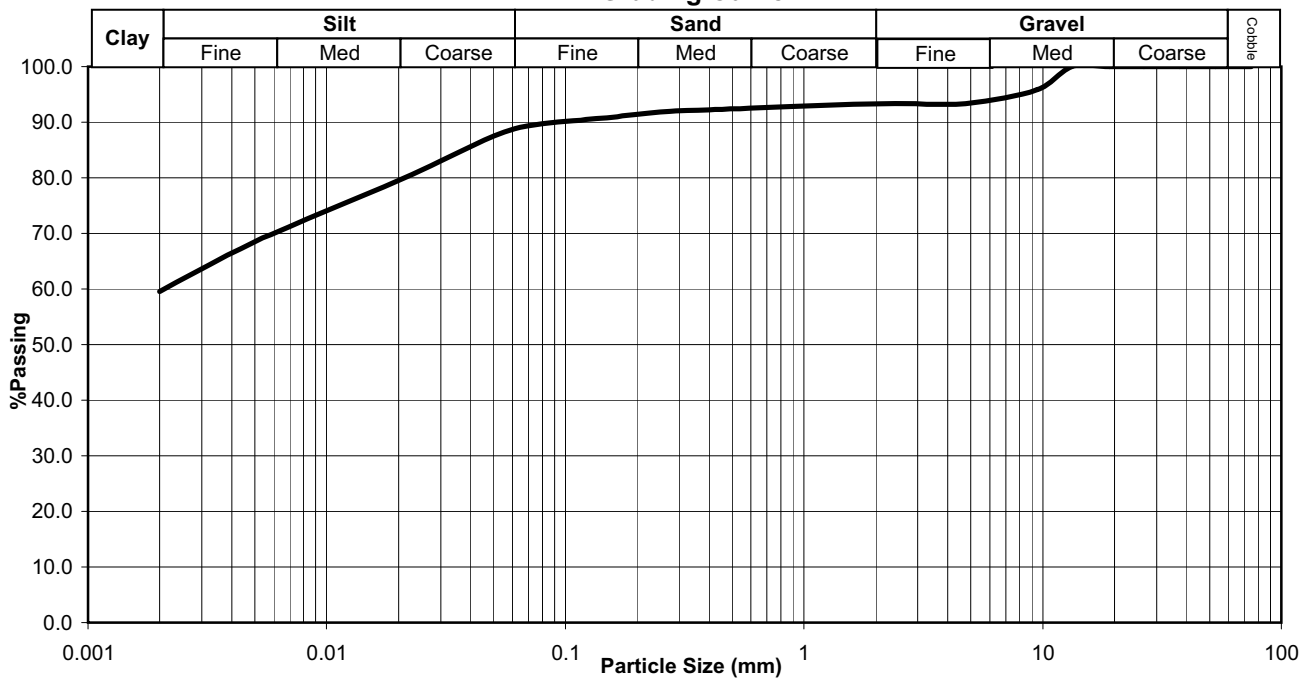
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	6.7
Coarse	0.0
Medium	6.0
Fine	0.7
Sand%	5.0
Coarse	0.9
Medium	1.1
Fine	3.0
Silt%	28.8
Coarse	8.8
Medium	10.3
Fine	9.7
Clay%	59.5

PLASTICITY	
Liquid Limit	63.8
Plasticity Index	30.3
Linear Shrinkage	15.3

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.25

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	33
AASHTO Soil Classification	A - 7 - 5
Unified Classification	MH or OH

Grading Curve



Ref no.: 5531 Fig no.: 1

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01026 **Borehole/Pit no.:** BHL 203B **Fig no.:** 2

Depth: 25.45 - 26.00

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	97.6
2	96.7
0.425	96.4
0.25	96.2
0.15	96.2
0.075	95.6
0.05	93.4
0.02	80.3
0.005	65.0
0.002	56.3

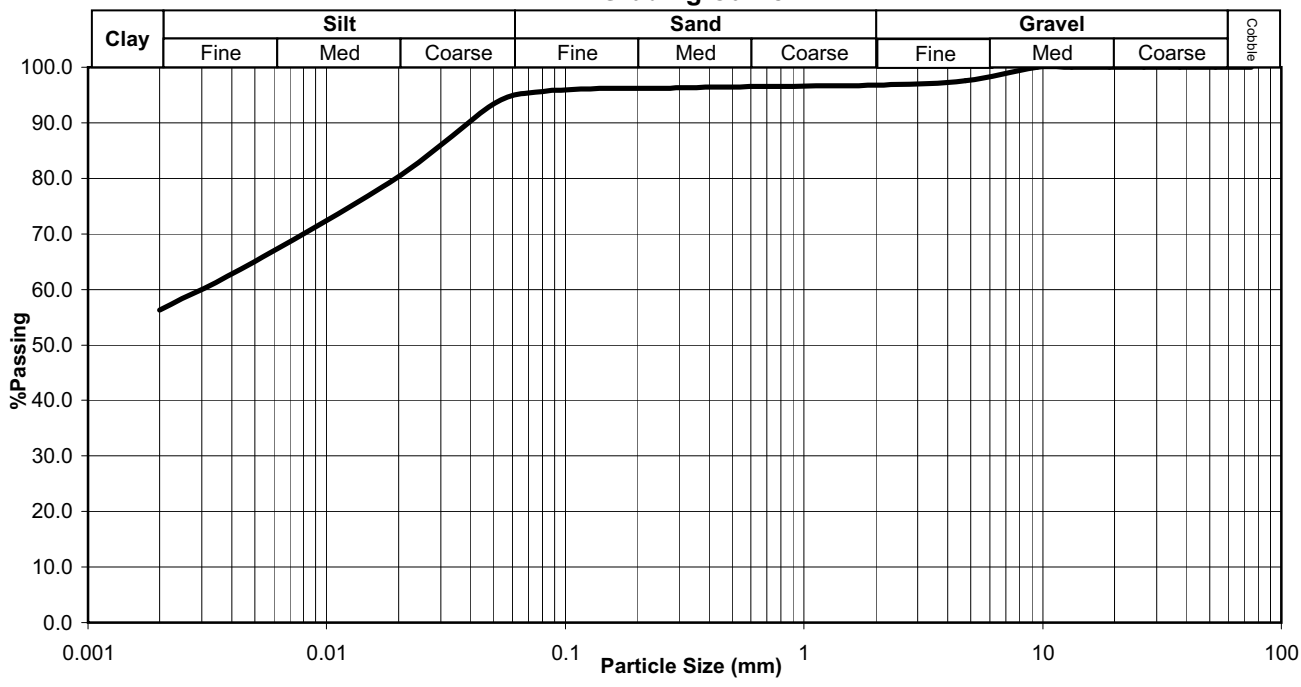
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	3.3
Coarse	0.0
Medium	1.7
Fine	1.5
Sand%	2.5
Coarse	0.3
Medium	0.3
Fine	1.9
Silt%	38.0
Coarse	14.0
Medium	14.3
Fine	9.7
Clay%	56.3

PLASTICITY	
Liquid Limit	54.9
Plasticity Index	26.2
Linear Shrinkage	13.3

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.11

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	30
AASHTO Soil Classification	A - 7 - 6
Unified Classification	CH or OH

Grading Curve



Ref no.: 5531 Fig no.: 2

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01027 **Borehole/Pit no.:** BHL 210A **Fig no.:** 3

Depth: 25.65 - 26.20

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	100.0
0.425	100.0
0.25	100.0
0.15	99.4
0.075	99.1
0.05	96.8
0.02	83.3
0.005	62.9
0.002	51.6

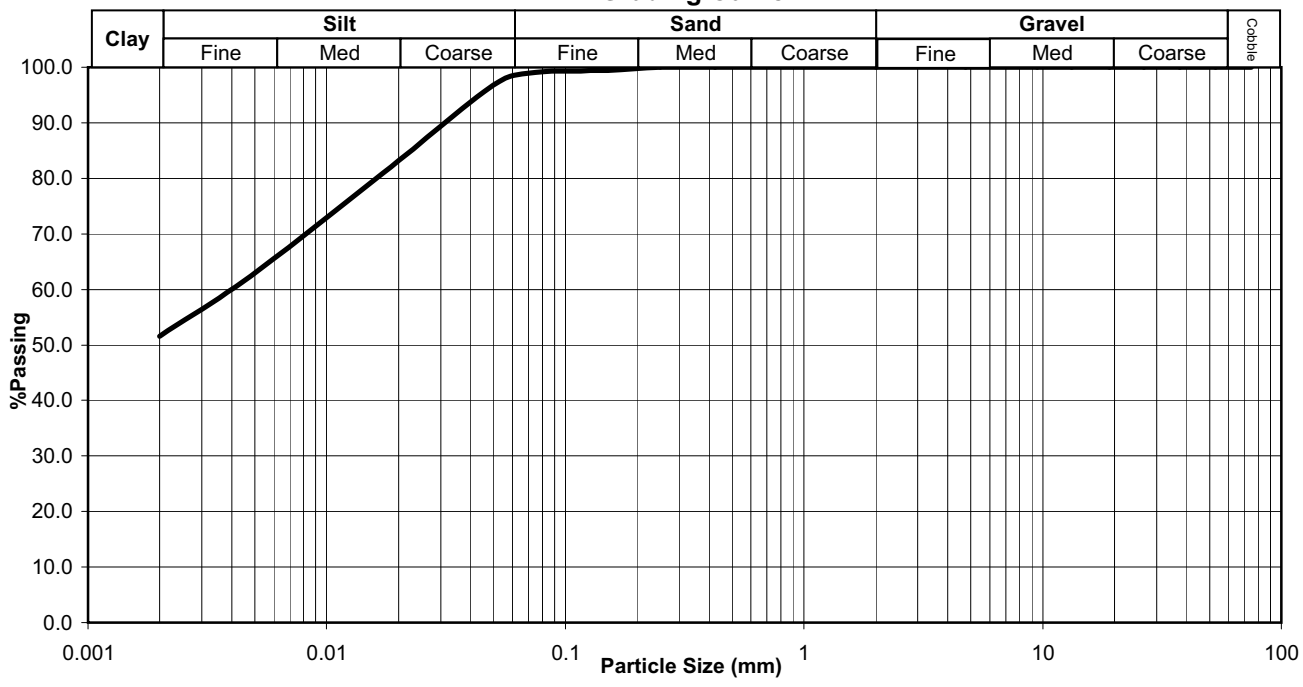
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	0.0
Coarse	0.0
Medium	0.0
Fine	0.0
Sand%	2.3
Coarse	0.0
Medium	0.3
Fine	2.0
Silt%	46.2
Coarse	14.5
Medium	19.0
Fine	12.7
Clay%	51.6

PLASTICITY	
Liquid Limit	56.6
Plasticity Index	26.3
Linear Shrinkage	13.3

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.01

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	32
AASHTO Soil Classification	A - 7 - 5
Unified Classification	MH or OH

Grading Curve



Ref no.: 5531 Fig no.: 3

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01028 **Borehole/Pit no.:** BHL 302 **Fig no.:** 4

Depth: 24.45 - 25.95

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	100.0
0.425	100.0
0.25	99.2
0.15	95.6
0.075	93.3
0.05	91.2
0.02	75.9
0.005	54.1
0.002	41.0

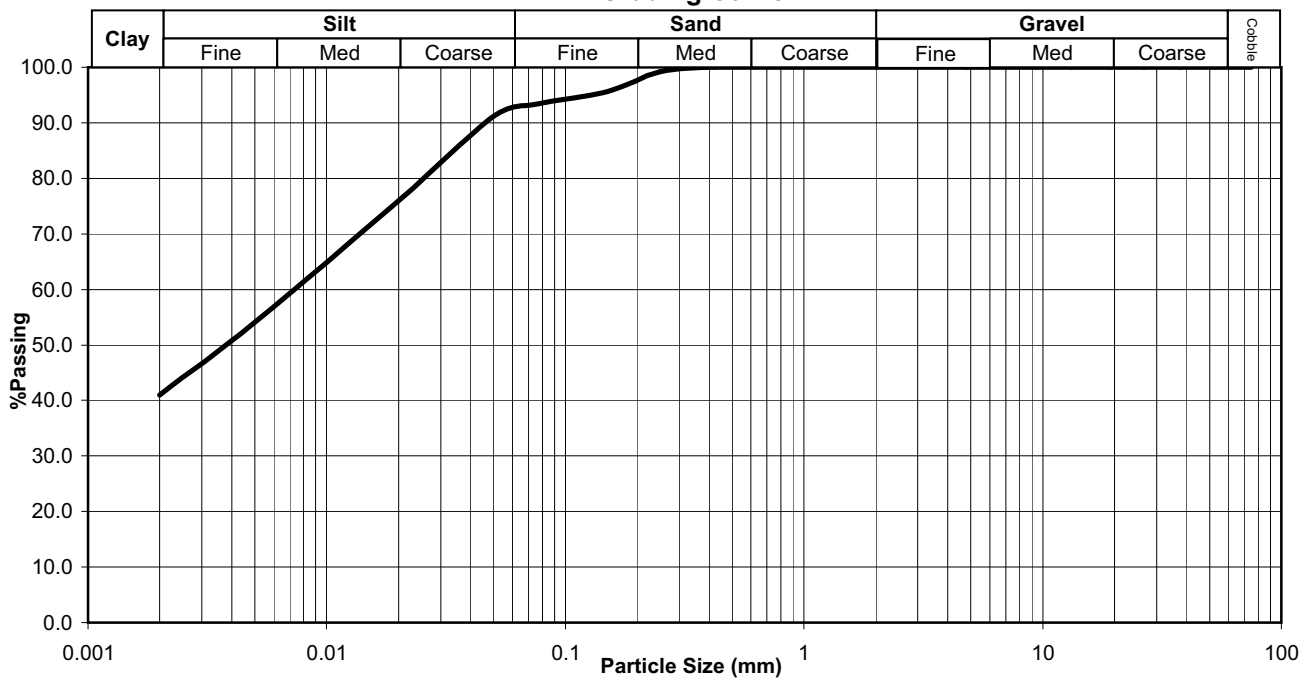
M.I.T SIZE CLASSIFICATION		
Cobble%		0.0
Gravel%	0.0	
Coarse		0.0
Medium		0.0
Fine		0.0
Sand%	8.0	
Coarse		0.0
Medium		2.6
Fine		5.4
Silt%	51.0	
Coarse		16.1
Medium		20.4
Fine		14.5
Clay%	41.0	

PLASTICITY	
Liquid Limit	47.1
Plasticity Index	21.1
Linear Shrinkage	10.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.07

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	22
AASHTO Soil Classification	A - 7 - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 5531 Fig no.: 4

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01029 **Borehole/Pit no.:** BHM 101C **Fig no.:** 5

Depth: 4.90 - 5.35

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	99.7
0.425	99.4
0.25	99.1
0.15	88.9
0.075	80.2
0.05	70.7
0.02	54.1
0.005	35.1
0.002	30.4

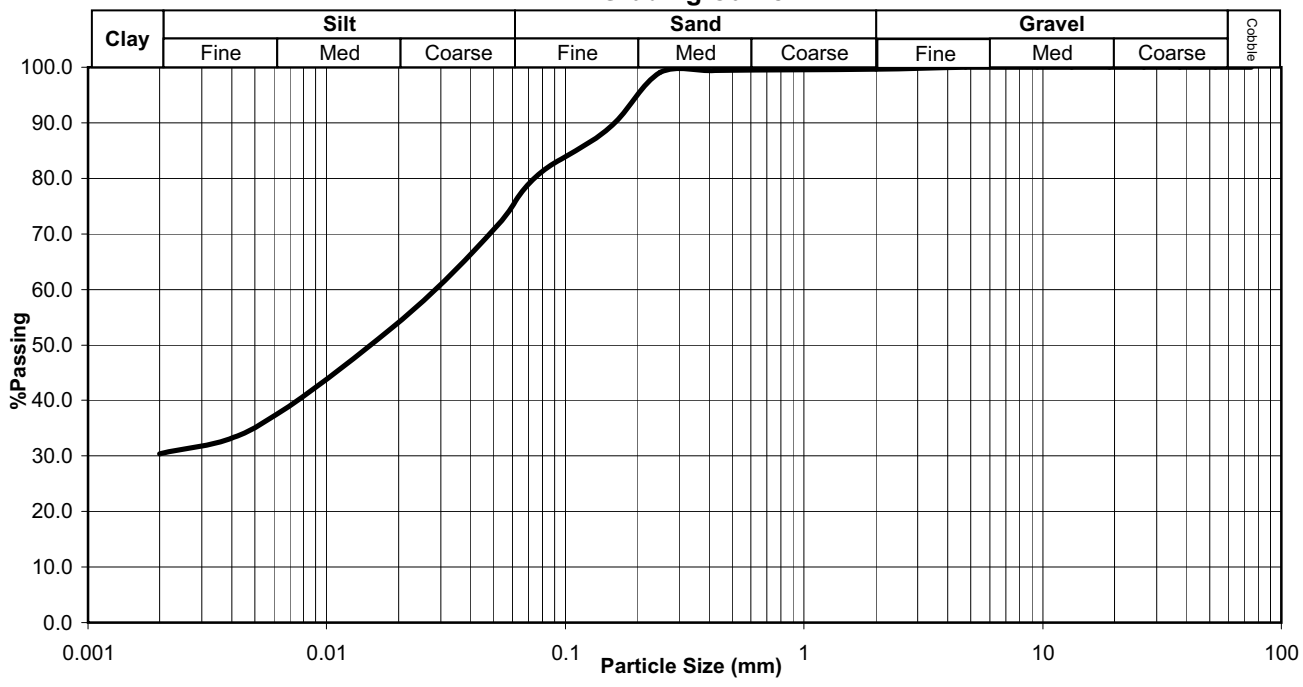
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	0.3
Coarse	0.0
Medium	0.0
Fine	0.3
Sand%	25.2
Coarse	0.3
Medium	5.5
Fine	19.5
Silt%	44.1
Coarse	20.4
Medium	17.7
Fine	6.0
Clay%	30.4

PLASTICITY	
Liquid Limit	42.6
Plasticity Index	18.2
Linear Shrinkage	9.3

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.21

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	15
AASHTO Soil Classification	A - 7 - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 5531 Fig no.: 5

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01030 **Borehole/Pit no.:** BHL 101 B **Fig no.:** 6

Depth: 18.95 19.37

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	95.5
4.75	88.2
2	84.3
0.425	81.5
0.25	74.9
0.15	62.4
0.075	56.1
0.05	51.1
0.02	41.2
0.005	32.9
0.002	27.9

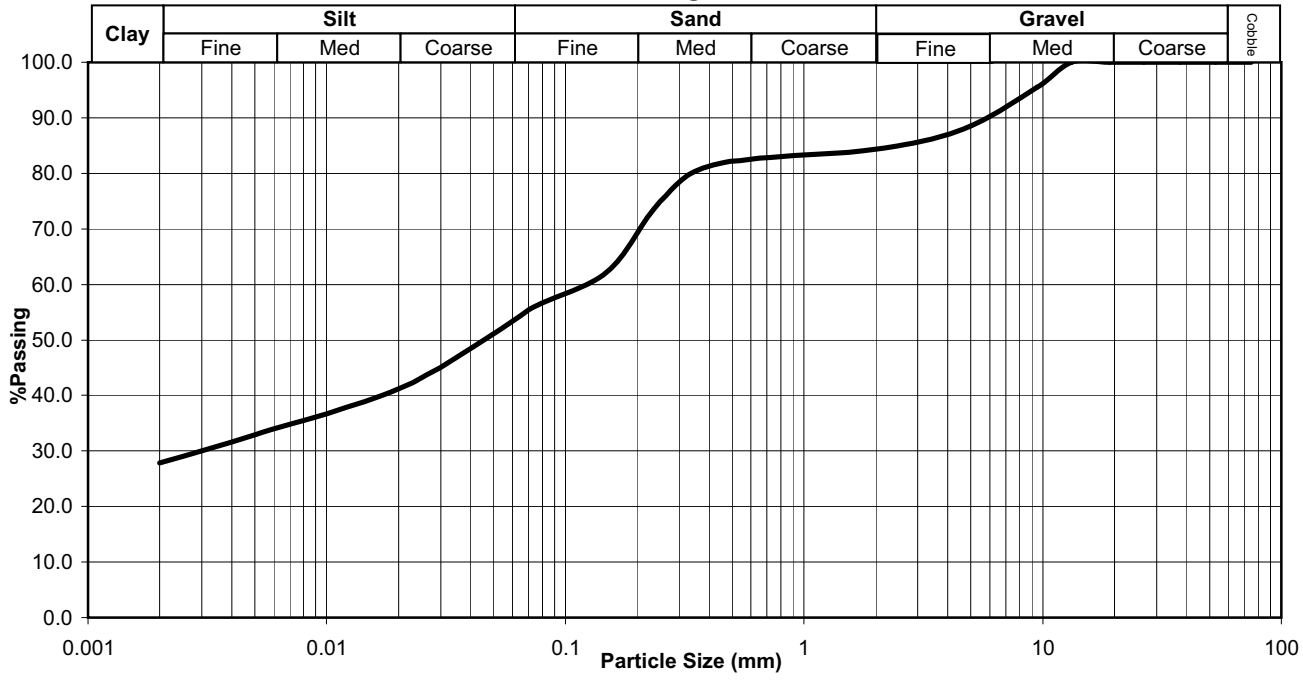
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	15.7
Coarse	0.0
Medium	9.9
Fine	5.8
Sand%	31.2
Coarse	2.5
Medium	13.2
Fine	15.5
Silt%	25.2
Coarse	11.9
Medium	7.7
Fine	5.5
Clay%	27.9

PLASTICITY	
Liquid Limit	39.3
Plasticity Index	15.8
Linear Shrinkage	8

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.78

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	7
AASHTO Soil Classification	A - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 5531 Fig no.: 6

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01031 **Borehole/Pit no.:** BHL 210A **Fig no.:** 7

Depth: 28.70 - 29.25

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	100.0
0.425	99.7
0.25	99.0
0.15	95.9
0.075	93.2
0.05	90.9
0.02	74.9
0.005	47.5
0.002	36.1

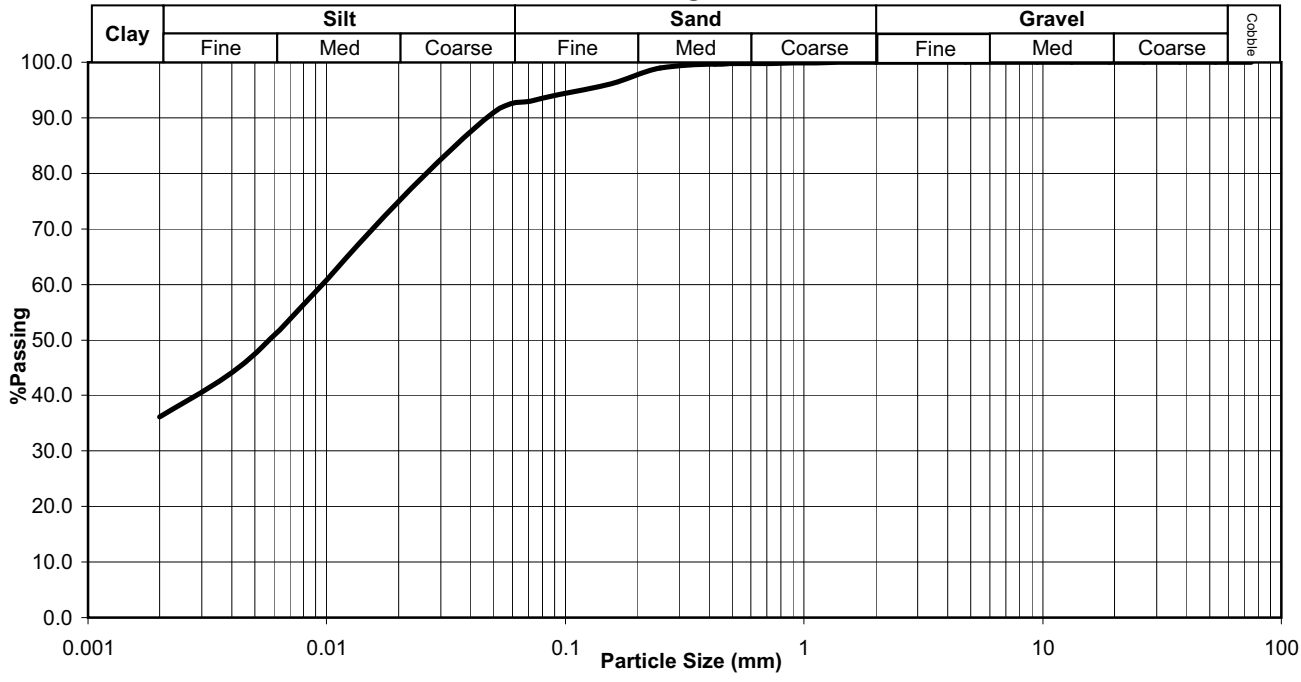
M.I.T SIZE CLASSIFICATION		
Cobble%		0.0
Gravel%	0.0	
Coarse		0.0
Medium		0.0
Fine		0.0
Sand%	8.2	
Coarse		0.3
Medium		2.2
Fine		5.6
Silt%	55.7	
Coarse		16.9
Medium		25.6
Fine		13.2
Clay%	36.1	

PLASTICITY	
Liquid Limit	42.9
Plasticity Index	19.6
Linear Shrinkage	10

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.07

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	20
AASHTO Soil Classification	A - 7 - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 5531 Fig no.: 7

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

Project: Berth Deepening - Durban Harbour

Ref no.: 5531 **Lab no.:** 01032 **Borehole/Pit no.:** BHM 101C **Fig no.:** 8

Depth: 3.35 - 3.90

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	98.4
2	97.7
0.425	97.0
0.25	95.1
0.15	86.2
0.075	82.0
0.05	73.1
0.02	57.5
0.005	44.1
0.002	37.4

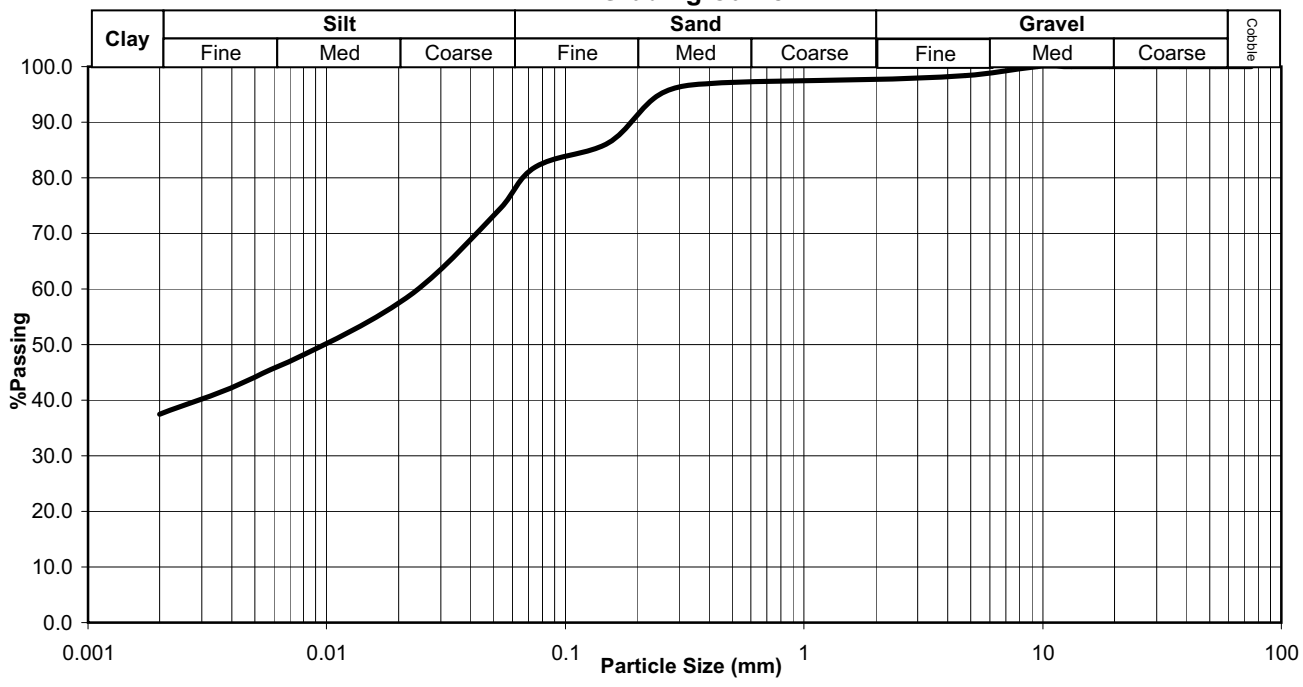
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	2.3
Coarse	0.0
Medium	1.2
Fine	1.1
Sand%	21.1
Coarse	0.6
Medium	6.5
Fine	14.0
Silt%	39.2
Coarse	19.2
Medium	12.5
Fine	7.6
Clay%	37.4

PLASTICITY	
Liquid Limit	10.7
Plasticity Index	21.1
Linear Shrinkage	10.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.23

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	10
AASHTO Soil Classification	A - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 5531 Fig no.: 8

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties			Cell	Undrained Triaxial Tests				
Borehole	Sub-Sample	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Failure	Remarks
No	No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Mode	
Pier 1: Phase 1															
BD BHL102		31.00	24.1		73.8	Non Plastic									
BD BHL103A	1	28.80-29.35	35.3		78.8	55	18	37							
	2		34.0		98.4	62	23	39							
	3		38.8		98.4	70	24	46							
SI BH108		25.0-25.60	52.6		88.5	90	37	53							
BD BHM101		16.94-17.10	31.3		99.7	38	21	17							
BD BHM101		17.10-17.26	38.9		99.9	68	27	41							
BD BHM101		17.26-17.41	37.4		99.8	62	23	39							
BD BHM101		17.41-17.57	28.7		99.9	47	20	27							
BD BHM101		17.57-17.73	31.7		99.8	59	22	37							
BD BHM101		17.73-17.89	32.7		99.7	50	19	31	1.91	155	326.3	1.81	163.1	Brittle	
BD BHM101		17.89-18.05	29.3		99.7	37	22	15	1.96	160	44.9	3.32	22.5	Plastic	Disturbed
BD BHM101	C	18.05-18.21								300	Unsuitable for triaxial test				Disturbed
BD BHM101C	1-Top	2.35-2.90	58.5		86.4	57	23	34							
	2-Middle	2.35-2.90	66.9		96.3	83	34	49							
	3-Base	2.35-2.90	59.2		97.7	84	31	53							
BD BHM101	C	18.05-18.21								300	Unsuitable for triaxial test				Disturbed
Pier 2: Phase 2															
BD BHL201A	1-Top	21.07-21.62	79.0		91.9	97	37	60	1.62	400	39.6	10.12	19.8	Plastic	
	2-Middle	21.07-21.62	76.7		97.3	98	38	60	1.63	600	41.8	11.54	20.9	Plastic	
	3														No test required
BD BH201A	1	22.47-23.02	78.2		99.6	99	38	61							
	2		70.8		99.0	93	33	60							
	3		64.5		94.5	85	32	53							
BD BHL202		20.68-20.89	51.4		99.0	72	28	44							
BD BHL202		20.89-21.05	44.0		98.1	56	22	34	1.82	215	29.5	8.29	14.8	Plastic	

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties			Cell	Undrained Triaxial Tests				
Borehole	Sub-Sample	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Failure	Remarks
No	No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Mode	
BD BHL202		21.05-21.21	36.4		97.8	45	18	27							
BD BHL202		21.21-21.37	32.2		97.5	33	19	14							
BD BHL202		21.37-21.53	30.0		96.5	33	18	15							
BD BHL202		21.53-21.69	27.1		95.3	28	17	11							
BD BHL203B	1	24.45-25.00	74.5		99.7	96	35	61							
	2		81.6		99.6	93	32	61							
	3		79.2		99.6	95	33	62							
BD BHL203.5	1-Top	24.00-24.55	66.7		85.2	95	37	58	1.60	450	94.4	10.12	47.2	Plastic	
	2-Middle	24.00-24.55	64.4		99.5	94	40	54	1.64	700	121.0	6.78	60.5	Plastic	
	3														No test required
BD BHL205		21.50-22.05	27.1		69.5	51	17	34							Top
BD BHL205		21.50-22.05	41.8		100.0	87	28	59							Base
BD BHL205		22.05-22.21	61.1		96.4	72	28	44	1.63	225	20.1	4.14	10.0	Plastic	Disturbed
BD BHL205		22.21-22.37	60.4		96.5	73	30	43							
BD BHL205		22.37-22.54	56.8		95.4	75	30	45							
BD BHL205		22.54-22.70	61.5		99.4	76	33	43							
BD BHL205		22.70-22.82	56.9		91.7	74	32	42							
BD BHL205		25.15-25.70	64.1		99.0	67	27	40							Top
BD BHL205		25.15-25.70	55.2		99.1	80	27	53							Base
BD BHL206	C	20.34-20.84	56.0		79.1	68	27	41							
BD BHL206	C	20.64-20.86	61.8		98.1	73	28	45							
BD BHL206	C	20.86-21.10	52.6		96.0	72	30	42							
BD BHL206		21.10-21.31	41.8		99.8	69	24	45	1.78	215	118.6	8.50	59.3	Plastic	
BD BHL206		21.31-21.55	45.5		99.9	65	24	41	1.77	220	117.7	7.38	58.9	Plastic	
BD BHL209		29.72-29.86	27.5												Top
BD BHL209		29.86-30.05	41.2		99.1	68	28	40							Base
BD BHL210		21.25	54.5		99.9	95	33	62							

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties			Cell	Undrained Triaxial Tests				
Borehole	Sub-Sample	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Failure	Remarks
No	No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Mode	
BD BHL210		21.45			No Test										
BD BHL210	C	22.00-22.09								400		Insufficient core length			
BD BHL210		22.09	59.0		99.9	78	31	47							
BD BHL210		22.35	64.5		100.0	102	41	61							
BD BHL210A	1-Top	21.05-21.60	56.1		99.46	83	34	49	1.66	400	71.9	7.70	36.0	Plastic	
	2-Middle	21.05-21.60	60.2		99.82	77	28	49	1.64	800	51.7	9.27	25.9	Plastic	
	3														No test required
BD BHL210A		24.35-24.55	63.7		99.9	89	29	60	1.66	245	92.8	9.37	46.4	Plastic	
BD BHL210A	C	24.75-24.95	60.9		99.8	90	31	59	1.63	450	107.7	14.68	53.8	Plastic	
BD BHL210A	C	25.14-25.34	59.0		99.6	86	34	52		600	Unsuitable for triaxial test				Disturbed
BD BHL210A		26.41-26.61	32.0		99.7	50	18	32	1.94	265	282.3	3.67	141.1	Brittle	
BD BHM209		4.5-4.97	56.8		99.8	89	39	50							
BD BHM210A		12.76-12.96	44.2		99.0	71	24	47	1.72	115	93.7	10.55	46.8	Plastic	
BD BHM210A		13.56-13.75	36.0		94.2	61	22	39	1.74	120	115.8	7.00	57.9	Plastic	
BD BHM211		15.08-15.23	61.1		99.9	81	29	52							
BD BHM211		15.23-15.42	55.2		99.8	76	26	50							
BD BHM211		15.42-15.56	52.2		99.8	62	21	41							
BD BHM211		15.56-15.92	53.6		99.2	77	30	47							
BD BHM211		15.92-16.10	63.5		99.4	86	29	57	1.64	140	36.9	9.23	18.5	Plastic	Disturbed
Pier 2: Phase 3															
BD BHL301		29.50-30.10	41.4		99.7	62	25	37							
BD BHL301		30.10	71.3		96.5	69	25	44							
BD BHL301		30.26	54.3		97.2	64	30	34							
BD BHL301	C	30.81-30.93	37.1		99.4	52	22	30	1.87	600	162.8	12.94	81.4	Plastic	
BD BHL301		31.04	44.5		97.4	61	26	35							
BD BHL301		31.19	31.9		99.3	50	23	27							

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties			Cell	Undrained Triaxial Tests				
Borehole	Sub-Sample	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Failure	Remarks
No	No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Mode	
BD BHL314	24.60-25.15	22.3		76.8	Non Plastic									Top	
BD BHL314	24.60-25.15	23.8		98.7	58	30	28							Base	
NMTL	Notes :										Job ref No.	NMTL 523			Table
	1. All BS tests carried out using preferred (definitive) method unless otherwise stated.										Location	Durban Harbour Deepening			1

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.9
2.000	99.6
1.180	98.0
0.600	88.4
0.425	73.8
0.300	56.1
0.212	40.5
0.150	25.8
0.063	13.9
0.059	13.2
0.042	11.7
0.021	10.5
0.011	8.9
0.008	7.7
0.006	7.4
0.004	7.2
0.002	6.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
6.9		6.9			85.7			0.4		0.0	0.0

Sample Description	Light brow occasionally grey slightly clayey/silty SAND.					Project No.	NMTL 523
						Borehole no.	BHL102
Project	Durban Harbour Deepening Study					Sample No.	U
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	31.00m

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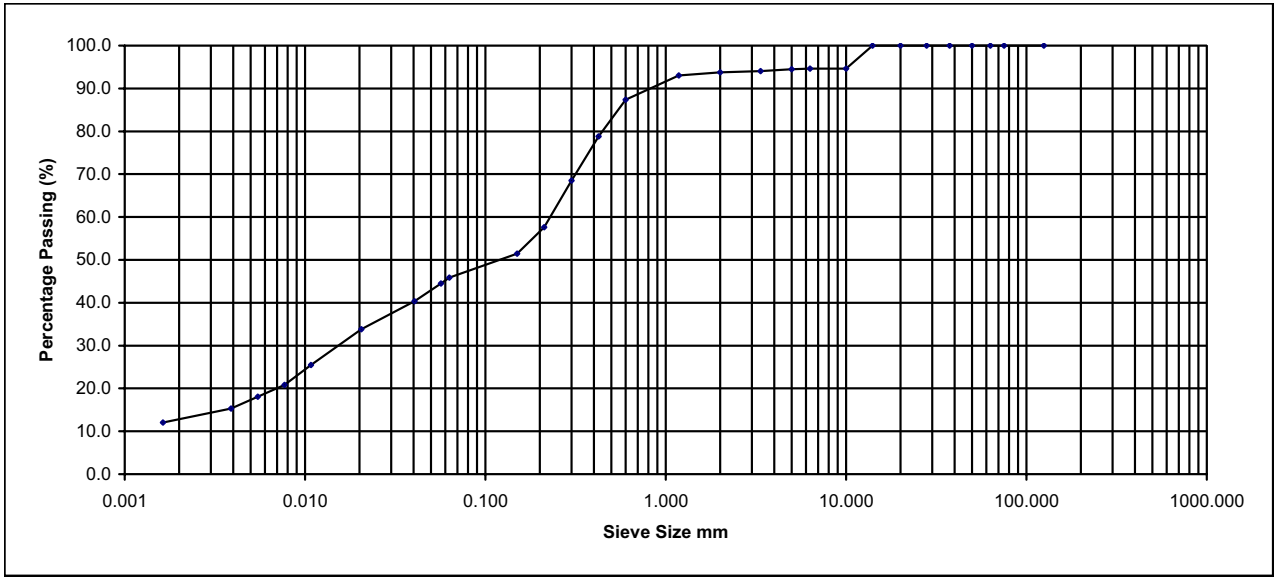
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	94.6
6.300	94.6
5.000	94.5
3.350	94.1
2.000	93.8
1.180	93.1
0.600	87.4
0.425	78.8
0.300	68.5
0.212	57.6
0.150	51.4
0.063	45.9
0.057	44.5
0.041	40.3
0.021	33.8
0.011	25.5
0.008	20.9
0.005	18.1
0.004	15.3
0.002	12.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.1		33.8			47.9			6.2		0.0	0.0

Sample Description: Dark grey sandy SILT/CLAY with trace of medium gravel.

Project: Durban Harbour

Operator	Mp/Mr	Checked	Nc	Approved	Bc	Date sample tested	09/02/2009

Project No.	NMTL523
Borehole No.	BHL103A
Sample No.	Top1
Depth	28.80-29.35m

NM TL Ltd

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.5
0.425	98.4
0.300	95.0
0.212	86.4
0.150	72.8
0.063	56.4
0.056	52.8
0.040	47.1
0.021	37.8
0.011	30.0
0.008	24.3
0.005	21.7
0.004	19.2
0.002	14.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.5		41.9			43.6			0.0		0.0	0.0

Sample Description	Dark grey some parts light brown sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL103A
Project	Durban Harbour					Sample No.	Middle2
Operator	Mp/Mr	Checked	Nc	Approved	Bc	Date sample tested	09/02/2009
						Depth	28.80-29.35m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.5
0.425	98.4
0.300	95.0
0.212	90.5
0.150	86.9
0.063	73.9
0.053	69.2
0.038	62.0
0.020	51.3
0.010	41.4
0.007	35.5
0.005	29.9
0.004	26.9
0.002	20.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
20.9		53.0			26.1			0.0		0.0	0.0

Sample Description	Dark grey some parts light brown sandy SILT.CLAY.					Project No.	NMTL523
						Borehole No.	BHL103A
Project	Durban Harbour					Sample No.	Base3
Operator	Mp/Mr	Checked	Nc	Approved	Bc	Date sample tested	09/02/2009
						Depth	28.80-29.35m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.9
2.000	99.7
1.180	99.0
0.600	98.3
0.425	97.9
0.300	97.2
0.212	95.7
0.150	94.2
0.063	88.5
0.052	82.4
0.038	73.0
0.019	60.3
0.010	48.0
0.007	41.9
0.005	38.1
0.004	35.3
0.002	27.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
27.3		61.2			11.1			0.3		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	SI BH108
Project	Durban Harbour Deepening Study					Sample No.	Shelby
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	14/10/2008	Depth	25.0-25.60

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.8
0.300	98.6
0.212	91.8
0.150	69.3
0.063	36.4
0.057	34.5
0.041	30.9
0.021	25.5
0.011	21.1
0.008	18.8
0.005	16.1
0.004	14.9
0.002	11.7

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
11.7		24.7			63.6			0.0		0.0	0.0

Sample Description	Dark grey to black very sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	03/12/2008	Depth	16.94-17.10m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.9
0.300	99.4
0.212	96.3
0.150	91.1
0.063	78.7
0.054	75.1
0.038	69.0
0.020	59.4
0.010	48.7
0.007	42.1
0.005	37.1
0.004	34.5
0.002	28.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
28.9		49.7			21.3			0.0		0.0	0.0

Sample Description	Dark grey slightly brown to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	20/11/2008	Depth	17.10-17.26m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.8
0.300	98.8
0.212	93.5
0.150	82.5
0.063	67.3
0.054	64.3
0.038	59.1
0.020	50.8
0.010	41.7
0.007	36.1
0.005	31.7
0.004	29.5
0.002	24.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
24.8		42.6			32.7			0.0		0.0	0.0

Sample Description	Dark gery to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	20/11/2008	Depth	17.26-17.41m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.9
0.300	99.0
0.212	94.5
0.150	83.3
0.063	66.3
0.054	64.0
0.039	59.0
0.020	49.9
0.010	42.5
0.007	37.0
0.005	33.4
0.004	31.1
0.002	26.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
26.5		39.8			33.7			0.0		0.0	0.0

Sample Description	Dark grey to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	20/11/2008	Depth	17.41-17.57m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.8
0.300	99.3
0.212	96.4
0.150	87.3
0.063	66.7
0.055	64.0
0.040	57.5
0.020	47.7
0.011	37.4
0.008	31.5
0.005	27.7
0.004	24.9
0.002	19.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
19.0		47.7			33.3			0.0		0.0	0.0

Sample Description	Dark grey to black sandy SILT/CLAY.	Project No.	NMTL 523
		Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study	Sample No.	Core

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	03/12/2008	Depth	17.57-17.73m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.9
0.425	99.7
0.300	99.0
0.212	94.7
0.150	80.4
0.063	51.7
0.055	48.6
0.039	43.2
0.020	36.3
0.011	29.8
0.008	25.3
0.005	22.2
0.004	20.7
0.002	13.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.0		38.6			48.3			0.0		0.0	0.0

Sample Description	Dark grey to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008	Depth	17.73-17.89m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.7
0.300	98.8
0.212	93.8
0.150	70.1
0.063	34.6
0.058	30.9
0.041	27.5
0.021	23.1
0.011	19.0
0.008	16.4
0.005	14.9
0.004	13.8
0.002	12.7

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.7		22.0			65.4			0.0		0.0	0.0

Sample Description	Dark grey to black clayey/silty SAND.							Project No.	NMTL 523
								Borehole no.	BD BHM101
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008	Depth	17.89-18.05m

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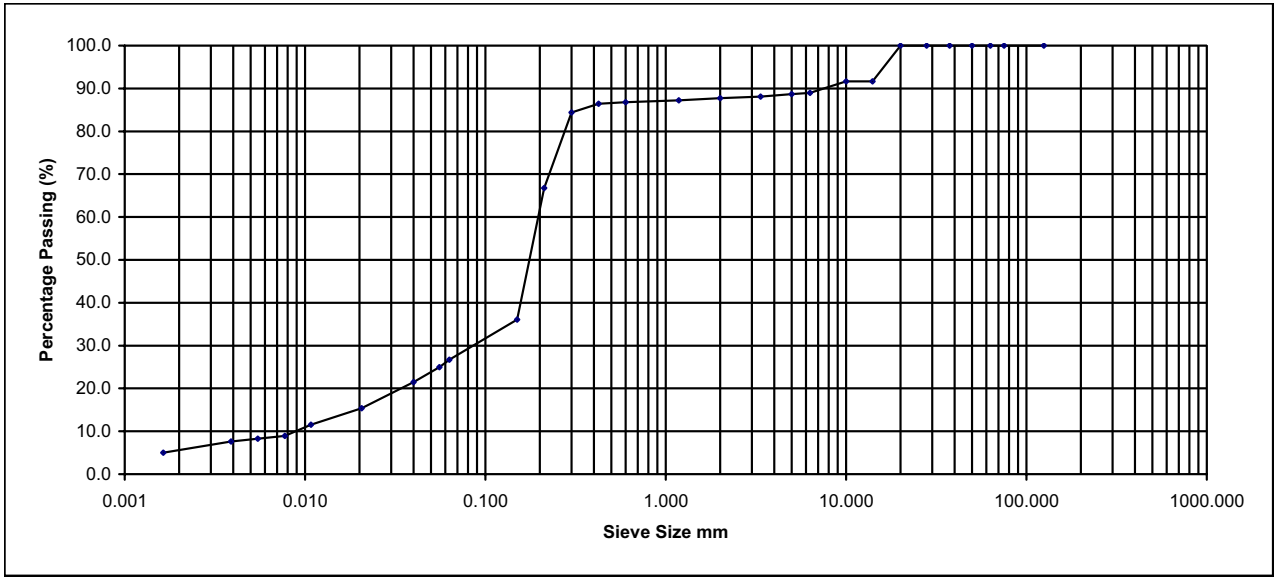
NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	91.7
10.000	91.7
6.300	88.9
5.000	88.7
3.350	88.1
2.000	87.7
1.180	87.2
0.600	86.8
0.425	86.4
0.300	84.4
0.212	66.8
0.150	36.1
0.063	26.7
0.056	25.0
0.040	21.5
0.021	15.4
0.011	11.5
0.008	8.9
0.005	8.3
0.004	7.6
0.002	5.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
5.0		21.7			61.0			12.3		0.0	0.0

Sample Description: Dark grey to light brown very sandy SILT/CLAY.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	13/01/2008

Project No.	NMTL523
Borehole No.	BHM101C
Sample No.	Top-1
Depth	2.35-2.90m

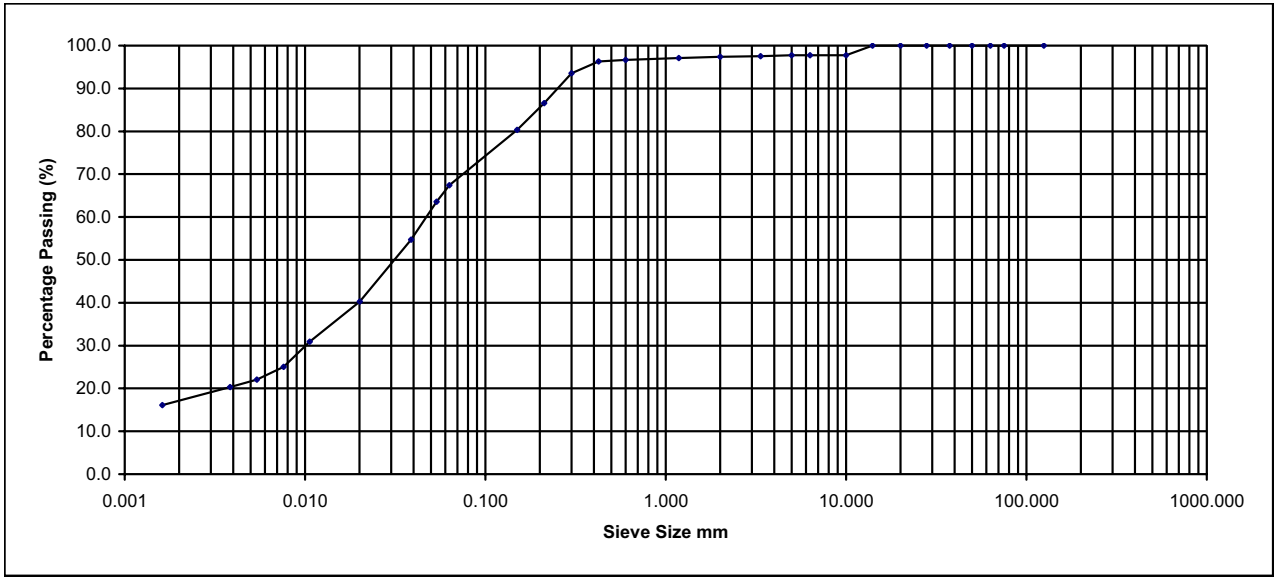
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	97.7
6.300	97.7
5.000	97.7
3.350	97.6
2.000	97.4
1.180	97.1
0.600	96.7
0.425	96.3
0.300	93.5
0.212	86.6
0.150	80.3
0.063	67.4
0.054	63.6
0.039	54.7
0.020	40.3
0.011	30.9
0.008	25.0
0.005	22.0
0.004	20.3
0.002	16.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.1		51.3			30.0			2.6		0.0	0.0

Sample Description	Dark grey to light brown sandy slightly gravelly SILT/CLAY.	Project No.	NMTL523
		Borehole No.	BHM101C
Project	Durban Harbour	Sample No.	Middle-2
Operator Mp	Checked Nc / Approved Bc / Date sample tested 13/01/2008	Depth	2.35-2.90m

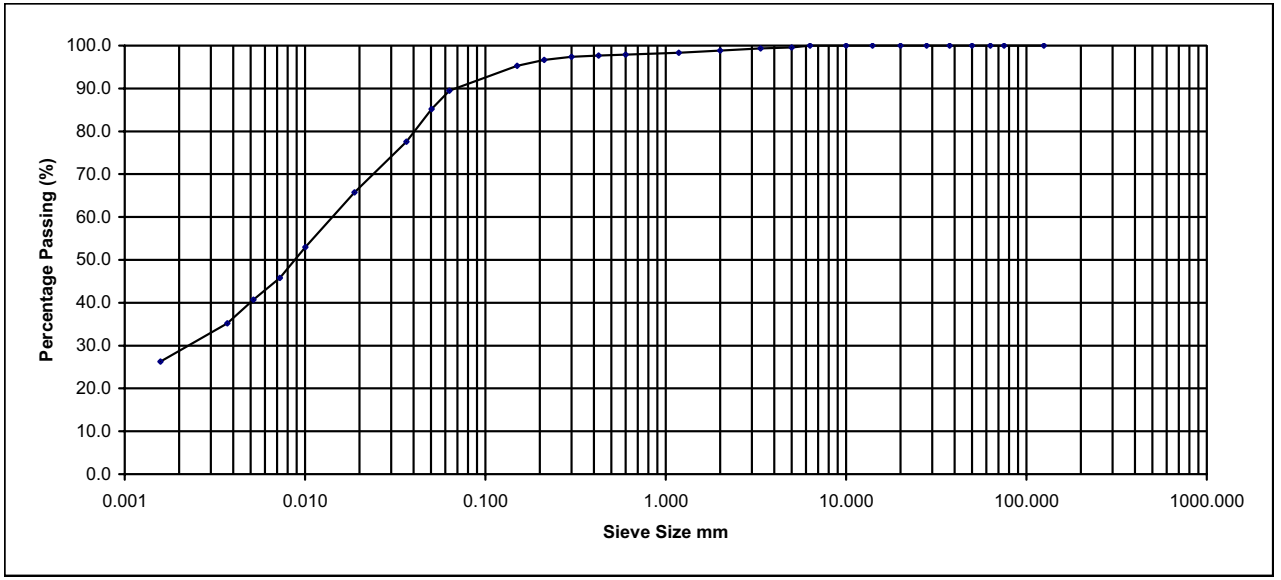
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.6
3.350	99.3
2.000	98.8
1.180	98.4
0.600	97.9
0.425	97.7
0.300	97.4
0.212	96.7
0.150	95.3
0.063	89.5
0.050	85.2
0.036	77.6
0.019	65.7
0.010	53.0
0.007	45.8
0.005	40.7
0.004	35.2
0.002	26.3



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
26.3		63.2			9.4			1.2		0.0	0.0

Sample Description: Dark grey/ brown slightly sandy CLAY/SILT.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	13/01/2008

Project No.	NMTL523
Borehole No.	BHM101C
Sample No.	Base-3
Depth	2.35-2.90m

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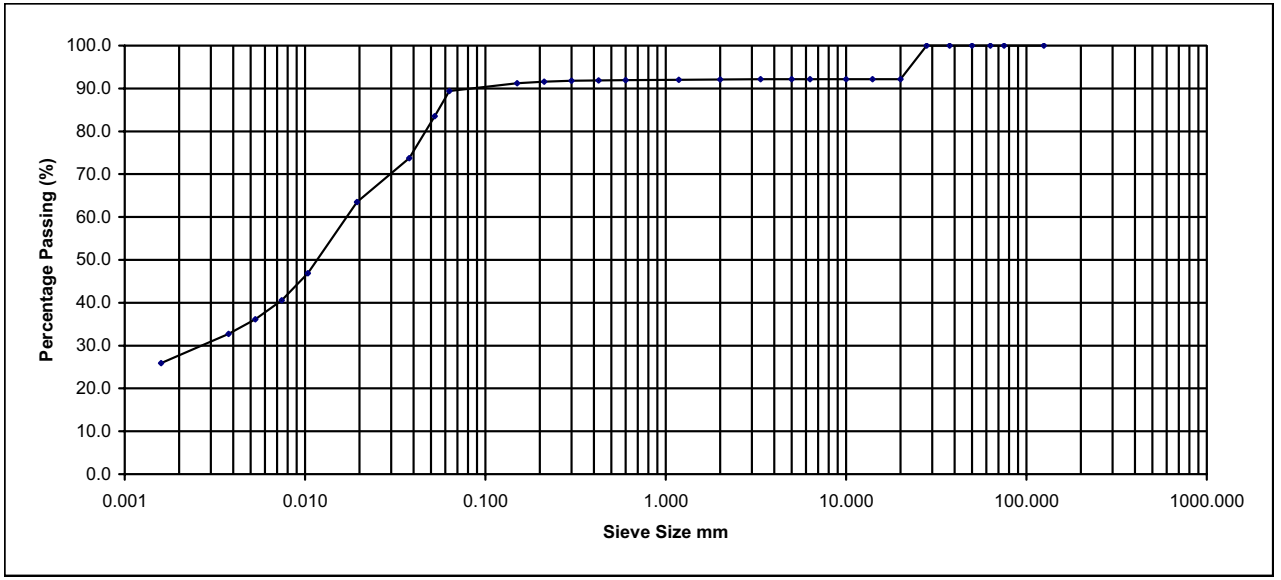
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	92.2
14.000	92.2
10.000	92.2
6.300	92.2
5.000	92.2
3.350	92.2
2.000	92.1
1.180	92.0
0.600	91.9
0.425	91.9
0.300	91.8
0.212	91.6
0.150	91.2
0.063	89.4
0.052	83.5
0.038	73.8
0.019	63.5
0.010	46.9
0.007	40.5
0.005	36.1
0.004	32.7
0.002	25.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
25.9		63.5			2.7			7.9		0.0	0.0

Sample Description	Light brown to dark brown slightly sandy slightly gravelly SILT/CLAY					Project No.	NMTL523
						Borehole No.	BHL201A
Project	Durban Harbour					Sample No.	Top1
Operator	Mp/Mr	Checked	Nc	Approved	Bc	Date sample tested	27/01/2009	Depth	21.07-21.62m

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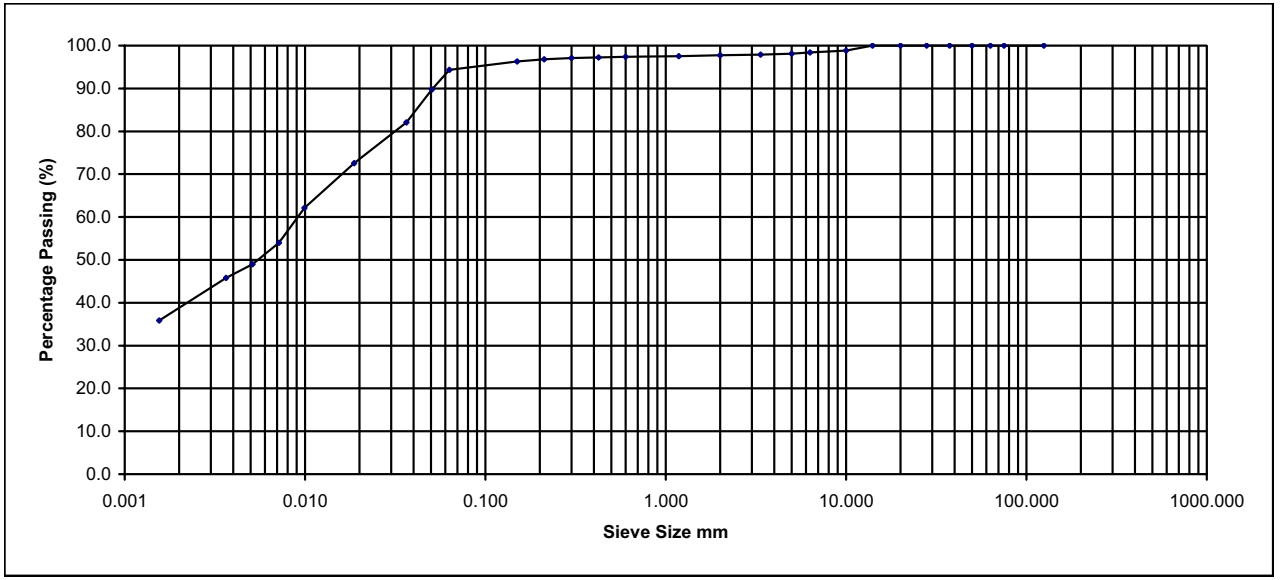
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	98.9
6.300	98.4
5.000	98.1
3.350	97.9
2.000	97.7
1.180	97.5
0.600	97.4
0.425	97.3
0.300	97.1
0.212	96.8
0.150	96.3
0.063	94.3
0.051	89.8
0.037	82.1
0.019	72.5
0.010	62.1
0.007	54.0
0.005	49.0
0.004	45.8
0.002	35.8



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
35.8		58.5			3.4			2.3		0.0	0.0

Sample Description	Dark grey / brown slightly sandy CLAY/SILT.	Project No.	NMTL523
	Gravel is shell fragments.	Borehole No.	BHL201A
Project	Durban Harbour	Sample No.	Middle2

Operator	Mp/Mr	Checked	Nc	Approved	Bc	Date sample tested	09/02/2009	Depth	21.07-21.62m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.7
2.000	99.6
1.180	99.6
0.600	99.6
0.425	99.6
0.300	99.4
0.212	99.1
0.150	98.6
0.063	96.1
0.051	91.7
0.037	83.9
0.019	72.8
0.010	62.6
0.007	55.8
0.005	50.0
0.004	44.6
0.002	34.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
34.0		62.1			3.6			0.4		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL201A
Project	Durban Harbour					Sample No.	Top1
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	27/01/2009	Depth	22.47-23.02m

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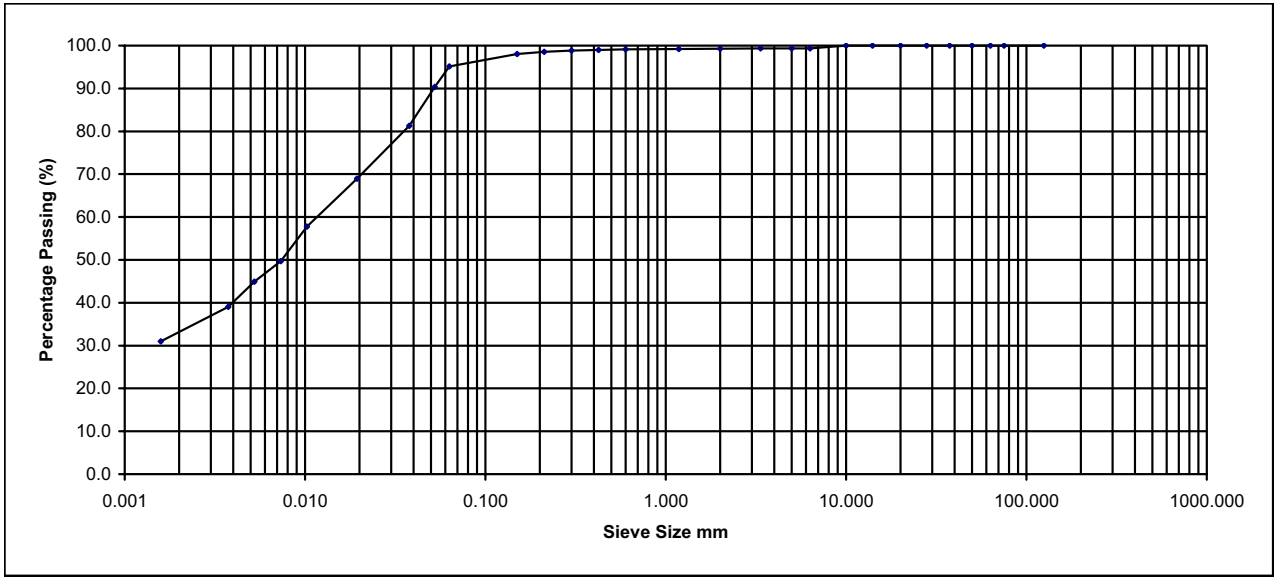
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	99.3
5.000	99.3
3.350	99.3
2.000	99.3
1.180	99.2
0.600	99.1
0.425	99.0
0.300	98.9
0.212	98.6
0.150	98.1
0.063	95.2
0.052	90.4
0.038	81.3
0.019	69.0
0.010	57.7
0.007	49.7
0.005	44.9
0.004	39.0
0.002	31.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
31.0		64.2			4.1			0.7		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL201A
Project	Durban Harbour					Sample No.	Middle 2
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	27/01/2009	Depth	22.47-23.02m

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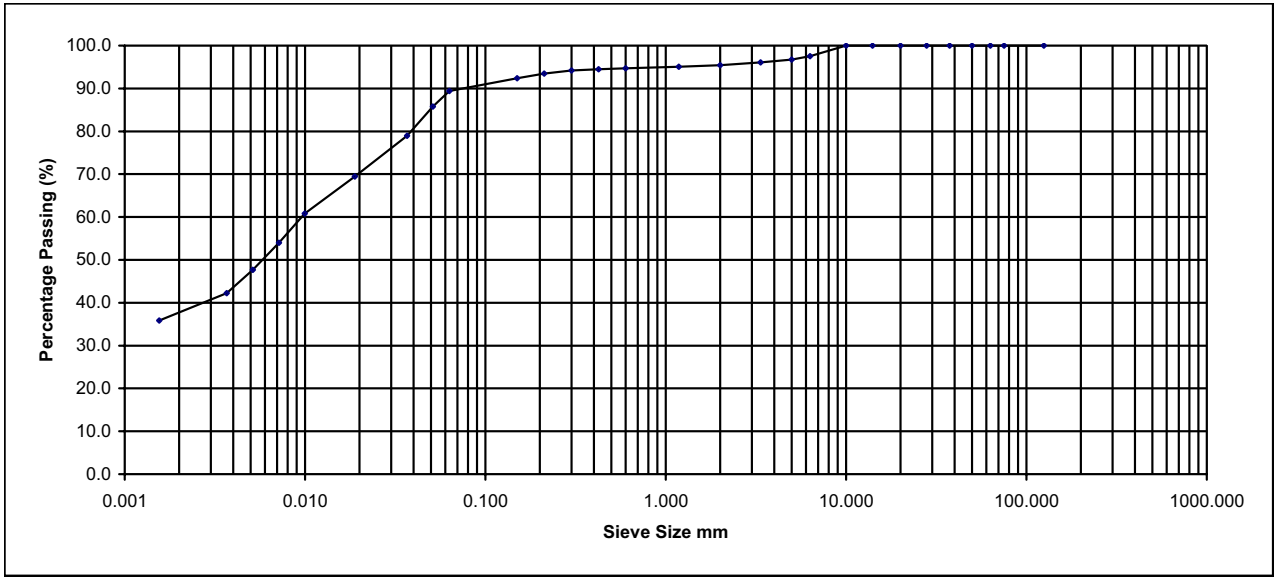
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	97.5
5.000	96.8
3.350	96.1
2.000	95.4
1.180	95.1
0.600	94.7
0.425	94.5
0.300	94.2
0.212	93.5
0.150	92.4
0.063	89.4
0.051	85.8
0.037	79.0
0.019	69.4
0.010	60.8
0.007	54.0
0.005	47.7
0.004	42.2
0.002	35.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
35.9		53.6			6.0			4.6		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.	Project No.	NMTL523
	Gravel is shell fragments	Borehole No.	BHL201A
Project	Durban Harbour	Sample No.	Base 3

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	09/02/2009	Depth	22.47-23.02m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.7
0.425	99.0
0.300	96.2
0.212	92.4
0.150	87.2
0.063	68.0
0.052	65.7
0.038	60.3
0.019	53.0
0.010	46.5
0.007	43.0
0.005	38.8
0.004	35.7
0.002	28.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
28.8		39.2			32.0			0.0		0.0	0.0

Sample Description	Dark grey to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	10/12/2008	Depth	20.68-20.89m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.9
3.350	99.6
2.000	99.6
1.180	99.4
0.600	99.0
0.425	98.1
0.300	94.2
0.212	84.3
0.150	73.8
0.063	60.1
0.054	56.8
0.039	50.6
0.020	41.2
0.011	30.5
0.008	24.7
0.005	21.8
0.004	20.6
0.002	16.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.1		44.1			39.4			0.4		0.0	0.0

Sample Description	Dark brown grey to black sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008	Depth	20.89-21.05m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.9
1.180	99.7
0.600	99.2
0.425	97.8
0.300	91.9
0.212	73.6
0.150	62.0
0.063	45.1
0.056	43.5
0.040	40.3
0.020	33.9
0.011	29.1
0.008	26.7
0.005	24.7
0.004	23.1
0.002	20.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
20.3		24.7			54.8			0.1		0.0	0.0

Sample Description	Dark grey to black very sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	16/12/2008	Depth	21.05-21.21m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.9
1.180	99.8
0.600	99.2
0.425	97.5
0.300	89.7
0.212	65.8
0.150	51.6
0.063	32.0
0.057	30.7
0.041	28.6
0.021	25.2
0.011	22.4
0.008	21.4
0.005	20.0
0.004	19.0
0.002	16.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.9		15.2			67.9			0.1		0.0	0.0

Sample Description	Dark grey clayey/silty fine to coarse SAND.					Project No.	NMTL 523
						Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	16/12/2008	Depth	21.21-21.37m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.7
3.350	99.7
2.000	99.6
1.180	99.4
0.600	98.6
0.425	96.5
0.300	88.2
0.212	64.3
0.150	49.8
0.063	31.1
0.057	29.2
0.041	26.6
0.021	22.8
0.011	20.2
0.008	18.3
0.005	17.0
0.004	15.7
0.002	14.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.1		17.0			68.5			0.4		0.0	0.0

Sample Description	Dark grey clayey/silty fine to coarse SAND..					Project No.	NMTL 523
						Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	16/12/2008	Depth	21.37-21.53m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.9
3.350	99.7
2.000	99.6
1.180	99.3
0.600	98.0
0.425	95.3
0.300	85.3
0.212	59.2
0.150	41.3
0.063	23.9
0.058	21.9
0.042	19.3
0.021	16.9
0.011	14.6
0.008	13.0
0.005	12.6
0.004	11.6
0.002	10.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
10.3		13.6			75.6			0.4		0.0	0.0

Sample Description	Dark grey clayey/silty fine to coarse SAND.					Project No.	NMTL 523
						Borehole no.	BD BHL202
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	16/12/2008	Depth	21.53-21.69m

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.8
0.425	99.7
0.300	99.6
0.212	99.3
0.150	98.7
0.063	95.7
0.053	93.9
0.038	91.1
0.019	75.5
0.010	62.8
0.007	57.6
0.005	51.3
0.004	45.5
0.002	30.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
30.5		65.1			4.3			0.0		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.	Project No.	NMTL523
		Borehole No.	BHL203B
Project	Durban Harbour	Sample No.	Top-1
Operator: Mp	Checked: Nc / Approved: Bc / Date sample tested: 12/01/2009	Depth	24.45-25.00m

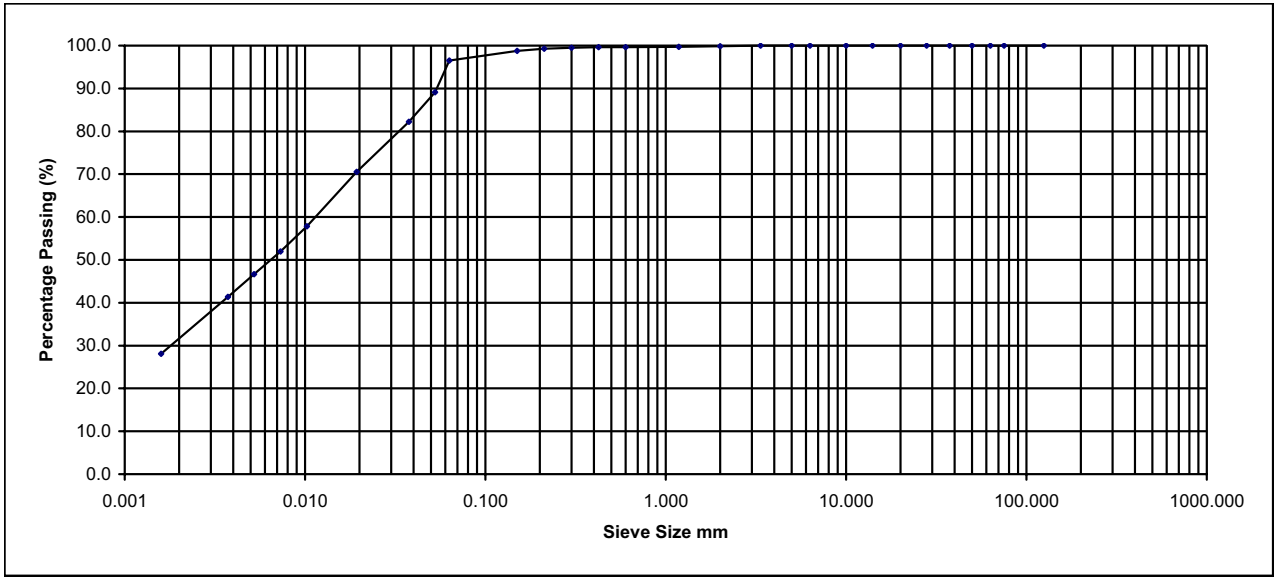
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.8
1.180	99.7
0.600	99.6
0.425	99.6
0.300	99.5
0.212	99.3
0.150	98.8
0.063	96.5
0.052	89.1
0.038	82.2
0.019	70.5
0.010	57.8
0.007	52.0
0.005	46.7
0.004	41.4
0.002	28.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
28.1		68.4			3.3			0.2		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL203B
Project	Durban Harbour					Sample No.	Middle-2
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	12/01/2009
						Depth	24.45-25.00m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.8
1.180	99.8
0.600	99.6
0.425	99.5
0.300	99.5
0.212	99.4
0.150	99.1
0.063	97.3
0.053	94.3
0.038	86.3
0.020	71.6
0.010	58.2
0.007	52.0
0.005	47.1
0.004	42.2
0.002	30.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
30.0		67.3			2.5			0.2		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL203B
Project	Durban Harbour					Sample No.	Base-3
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	14/01/2009	Depth	24.45-25.00m

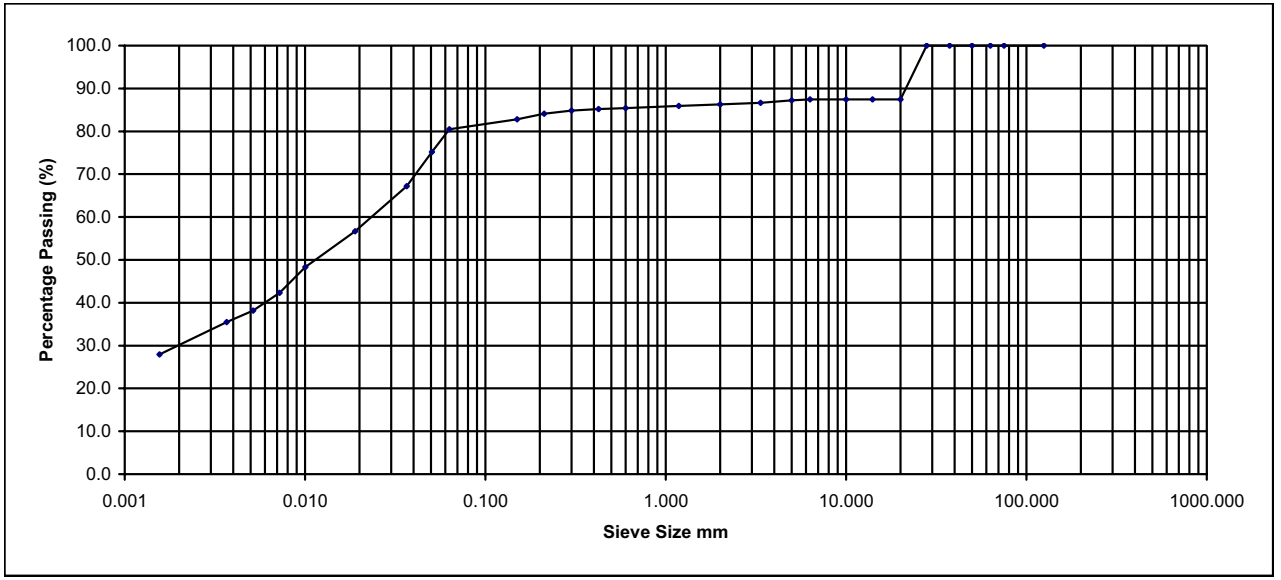
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	87.4
14.000	87.4
10.000	87.4
6.300	87.4
5.000	87.2
3.350	86.6
2.000	86.3
1.180	85.9
0.600	85.4
0.425	85.2
0.300	84.8
0.212	84.1
0.150	82.8
0.063	80.4
0.051	75.2
0.037	67.2
0.019	56.7
0.010	48.3
0.007	42.3
0.005	38.1
0.004	35.5
0.002	27.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
27.9		52.5			5.8			13.7		0.0	0.0

Sample Description	Dark grey to brown slightly sandy gravelly SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL203.5
Project	Durban Harbour					Sample No.	Top-1
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	15/01/2009	Depth	24.00-24.55

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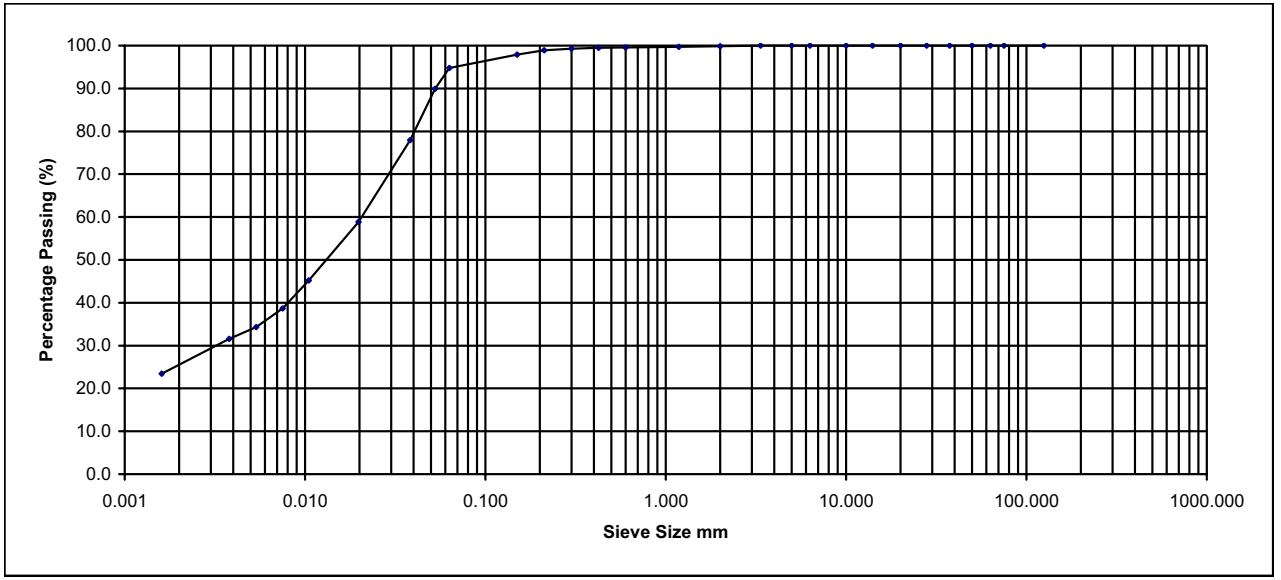
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.9
1.180	99.7
0.600	99.6
0.425	99.5
0.300	99.3
0.212	98.9
0.150	97.9
0.063	94.8
0.053	89.9
0.038	77.9
0.020	58.8
0.010	45.2
0.008	38.7
0.005	34.3
0.004	31.6
0.002	23.4



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
23.4		71.4			5.1			0.1		0.0	0.0

Sample Description: Dark grey brown slightly sandy SILT/CLAY.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	15/01/2009

Project No.	NMTL523
Borehole No.	BHL203.5
Sample No.	Middle-2
Depth	24.00-24.55

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	99.7
5.000	99.7
3.350	99.5
2.000	98.8
1.180	95.4
0.600	82.0
0.425	69.5
0.300	54.1
0.212	43.0
0.150	38.2
0.063	36.4
0.054	35.6
0.039	33.8
0.020	31.5
0.010	29.1
0.007	26.8
0.005	25.7
0.004	25.5
0.002	24.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
24.2		12.2			62.4			1.2		0.0	0.0

Sample Description	Brown occasionally grey slightly gravelly very sandy CLAY/SILT.							Project No.	NMTL 523
								Borehole no.	BD BHL205
Project	Durban Harbour Deepening Study							Sample No.	Top
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	07/11/2008	Depth	21.50-22.05m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.9
0.300	99.8
0.212	99.6
0.150	99.1
0.063	98.6
0.050	96.7
0.036	94.3
0.018	90.6
0.010	81.2
0.007	75.1
0.005	71.8
0.003	69.5
0.001	62.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
62.4		36.1			1.4			0.0		0.0	0.0

Sample Description	Dark grey brown slightly sandy CLAY/SILT.							Project No.	NMTL 523
								Borehole no.	BD BHL205
Project	Durban Harbour Deepening Study							Sample No.	Base
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	19/11/2008	Depth	21.5-22.05m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.7
2.000	99.5
1.180	98.7
0.600	97.2
0.425	96.4
0.300	95.4
0.212	94.6
0.150	92.1
0.063	87.5
0.048	84.7
0.034	81.5
0.018	75.4
0.009	67.3
0.007	61.6
0.005	58.0
0.003	55.2
0.001	49.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
49.1		38.4			12.0			0.5		0.0	0.0

Sample Description: Light brown to grey slightly sandy CLAY/SILT.

Project: Durban Harbour Deepening Study

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008

Project No.	NMTL 523
Borehole no.	BD BHL205
Sample No.	Core
Depth	22.05-22.21m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.7
2.000	99.5
1.180	98.9
0.600	97.7
0.425	96.5
0.300	94.9
0.212	93.4
0.150	92.4
0.063	91.3
0.050	87.6
0.035	83.9
0.018	75.7
0.010	67.1
0.007	61.3
0.005	57.2
0.004	54.3
0.002	39.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
39.9		51.4			8.1			0.5		0.0	0.0

Sample Description	Brown/yellow/grey slightly sandy CLAY/SILT.							Project No.	NMTL523
								Borehole No.	BHL205
Project	Durban Harbour							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008	Depth	22.21-22.37m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	95.9
6.300	95.9
5.000	95.9
3.350	95.9
2.000	95.9
1.180	95.9
0.600	95.7
0.425	95.4
0.300	94.9
0.212	94.3
0.150	93.8
0.063	93.1
0.047	90.1
0.034	86.4
0.017	80.5
0.009	71.0
0.007	65.5
0.005	61.8
0.003	58.1
0.001	50.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
50.0		43.0			2.9			4.1		0.0	0.0

Sample Description: Brown/yellow/grey slightly sandy slightly gravelly CLAY/SILT.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008

Project No.	NMTL523
Borehole No.	BHL205
Sample No.	Core
Depth	22.37-22.54m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.8
0.425	99.4
0.300	98.8
0.212	97.9
0.150	96.9
0.063	95.5
0.049	92.7
0.035	88.5
0.018	81.1
0.010	69.9
0.007	64.5
0.005	61.2
0.004	57.1
0.001	49.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
49.2		46.3			4.5			0.0		0.0	0.0

Sample Description	Brown/yellow/grey slightly sandy CLAY/SILT.							Project No.	NMTL523
								Borehole No.	BHL205
Project	Durban Harbour							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008	Depth	22.54-22.70m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	93.9
6.300	93.9
5.000	93.2
3.350	92.6
2.000	92.3
1.180	92.2
0.600	92.0
0.425	91.7
0.300	91.4
0.212	90.8
0.150	90.4
0.063	89.6
0.049	87.2
0.035	80.8
0.018	72.1
0.010	62.6
0.007	56.7
0.005	52.7
0.004	48.7
0.002	35.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
35.3		54.3			2.8			7.7		0.0	0.0

Sample Description	Brown/grey/orange slightly sandy slightly gravelly SILT/CLAY.							Project No.	NMTL523
								Borehole No.	BHL205
Project	Durban Harbour							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008	Depth	22.70-22.82m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.8
0.600	99.4
0.425	99.0
0.300	98.6
0.212	98.0
0.150	96.2
0.063	85.7
0.049	81.4
0.035	77.0
0.018	69.0
0.010	60.7
0.007	53.8
0.005	49.8
0.004	46.5
0.002	37.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
37.4		48.3			14.3			0.0		0.0	0.0

Sample Description: Brown/dark brown/some parts orange slightly sandy CLAY/SILT.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	17/11/2008

Project No.	NMTL523
Borehole No.	BHL205
Sample No.	Top
Depth	25.15-25.70m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.8
0.600	99.4
0.425	99.1
0.300	98.8
0.212	98.5
0.150	97.7
0.063	93.4
0.049	88.2
0.035	83.3
0.018	74.0
0.010	65.9
0.007	60.3
0.005	55.0
0.004	51.8
0.002	42.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
42.9		50.5			6.6			0.0		0.0	0.0

Sample Description	Brown/dark brown, oragne brown, grey slightly sandy CLAY/SILT.	Project No.	NMTL523
		Borehole No.	BHL205
Project	Durban Harbour	Sample No.	Base
Operator Mp	Checked Nc / Approved Bc / Date sample tested 27/11/2008	Depth	25.15-25.7m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	83.4
10.000	83.4
6.300	82.8
5.000	82.5
3.350	82.3
2.000	81.4
1.180	80.6
0.600	79.6
0.425	79.1
0.300	78.6
0.212	78.0
0.150	76.9
0.063	71.5
0.051	67.9
0.036	64.1
0.019	58.4
0.010	50.3
0.007	46.1
0.005	42.6
0.004	39.8
0.002	28.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
28.2		43.3			10.0			18.6		0.0	0.0

Sample Description	Light to dark brown/grey slightly sandy gravelly CLAY/SILT.					Project No.	NMTL523
						Borehole No.	BHL206
Project	Durban Harbour					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008
						Depth	20.34-20.64m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.8
1.180	99.3
0.600	98.9
0.425	98.7
0.300	98.5
0.212	98.2
0.150	97.8
0.063	96.3
0.050	93.1
0.036	87.1
0.019	78.3
0.010	68.2
0.007	62.2
0.005	58.1
0.004	53.9
0.002	43.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
43.8		52.5			3.5			0.2		0.0	0.0

Sample Description	Grery sligjhtly brown slightly sandy CLAY/SILT.					Project No.	NMTL523
						Borehole No.	BHL206
Project	Durban Harbour					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008
						Depth	20.64-20.86m

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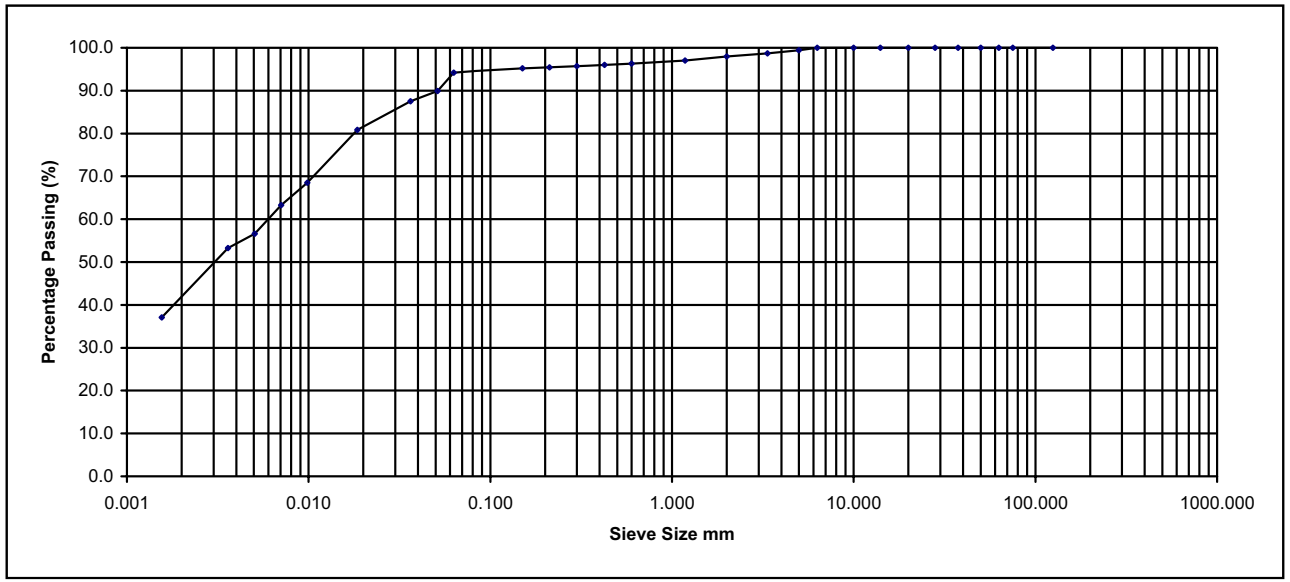
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.4
3.350	98.7
2.000	98.0
1.180	97.0
0.600	96.3
0.425	96.0
0.300	95.7
0.212	95.5
0.150	95.2
0.063	94.2
0.051	89.9
0.036	87.5
0.019	80.8
0.010	68.5
0.007	63.3
0.005	56.6
0.004	53.3
0.002	37.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
37.1		57.1			3.8			2.0		0.0	0.0

Sample Description	Dark brown/slightly yellow brown/grey slightly sandy gravelly CLAY/SILT.					Project No.	NMTL523
						Borehole No.	BHL206
Project	Durban Harbour					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	30/12/2008	Depth	20.86-21.10m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.8
0.425	99.8
0.300	99.7
0.212	99.5
0.150	99.0
0.063	94.4
0.050	90.9
0.036	84.9
0.019	73.3
0.010	62.1
0.007	56.0
0.005	50.9
0.004	47.0
0.002	37.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
37.1		57.3			5.6			0.0		0.0	0.0

Sample Description	Dark grey occasionally yellow brown slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL 206
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Depth	21.10-21.31m
				Date sample tested	27/11/2008		

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.9
0.300	99.9
0.212	99.8
0.150	99.4
0.063	97.2
0.049	94.6
0.035	89.0
0.018	78.3
0.010	67.6
0.007	61.2
0.005	54.8
0.004	50.5
0.001	41.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
41.5		55.6			2.8			0.0		0.0	0.0

Sample Description	Dark grey/brown slightly sandy SILT/CLAY.	Project No.	NMTL 523
		Borehole no.	BHL 206
Project	Durban Harbour Deepening Study	Sample No.	Core
Operator: Mp	Checked: Nc / Approved: Bc / Date sample tested: 27/11/2008	Depth	21.31-21.55m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	89.4
20.000	70.9
14.000	53.2
10.000	43.4
6.300	35.7
5.000	34.6
3.350	32.6
2.000	31.3
1.180	30.7
0.600	30.3
0.425	30.2
0.300	30.0
0.212	29.6
0.150	28.6
0.063	27.4
0.051	26.0
0.037	24.7
0.019	22.0
0.010	18.4
0.007	15.8
0.005	14.1
0.004	12.3
0.002	7.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
7.3		20.1			3.9			68.7		0.0	0.0

Sample Description	Dark grey/black slighty sandy gravelly SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BHL209
Project	Durban Harbour Deepening Study							Sample No.	Top
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	2008/10/02	Depth	29.72-29.86m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.7
3.350	99.5
2.000	99.3
1.180	99.3
0.600	99.2
0.425	99.1
0.300	98.7
0.212	97.8
0.150	96.0
0.063	92.0
0.052	87.6
0.037	80.3
0.019	65.6
0.010	47.5
0.007	38.2
0.005	30.8
0.004	25.9
0.002	16.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.6		75.4			7.3			0.7		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL209
Project	Durban Harbour Deepening Study					Sample No.	Base
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	2008/09/29	Depth	29.86-30.05m

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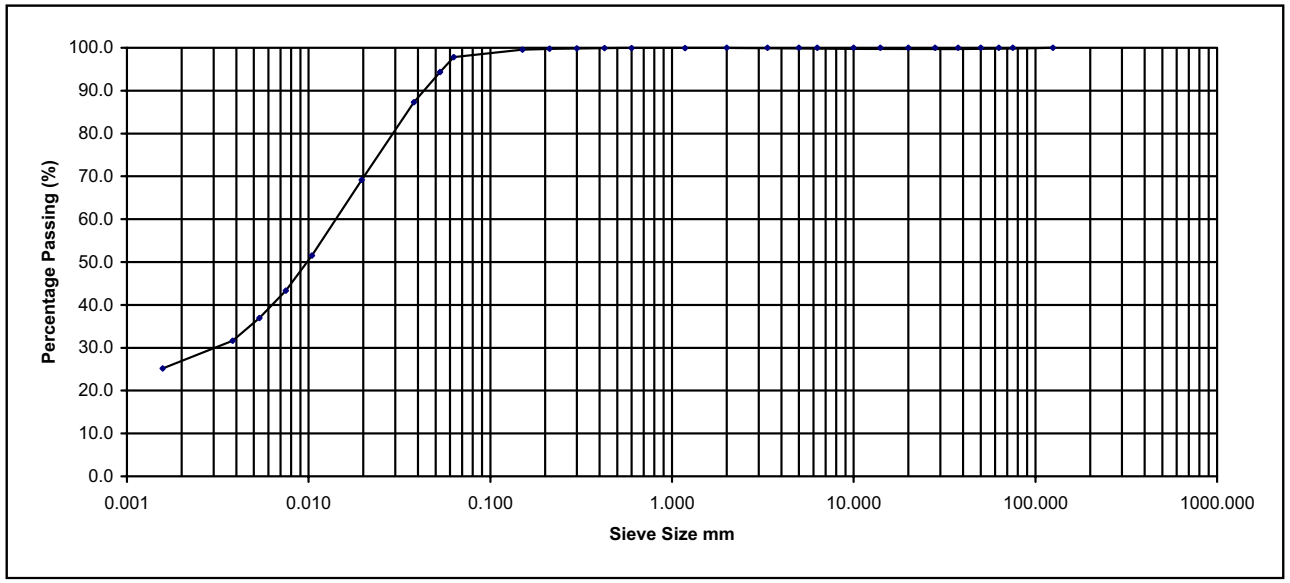
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.9
0.300	99.9
0.212	99.8
0.150	99.6
0.063	97.8
0.053	94.3
0.038	87.3
0.020	69.1
0.010	51.6
0.007	43.4
0.005	36.9
0.004	31.6
0.002	25.2



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
25.2		72.7			2.1			0.0		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL210
Project	Durban Harbour Deepening Study					Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	21.25-21.45m

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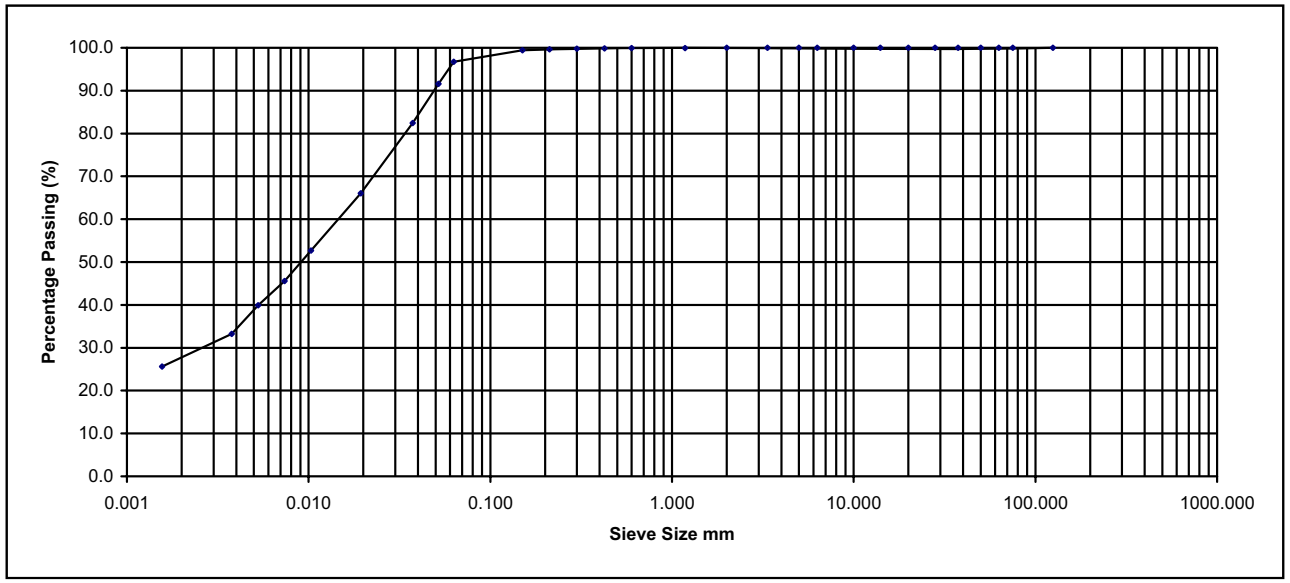
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.9
0.300	99.8
0.212	99.7
0.150	99.4
0.063	96.7
0.052	91.6
0.037	82.4
0.019	66.0
0.010	52.7
0.007	45.6
0.005	39.9
0.004	33.3
0.002	25.6



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
25.6		71.1			3.3			0.0		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL210
Project	Durban Harbour Deepening Study					Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	22.09-22.20m

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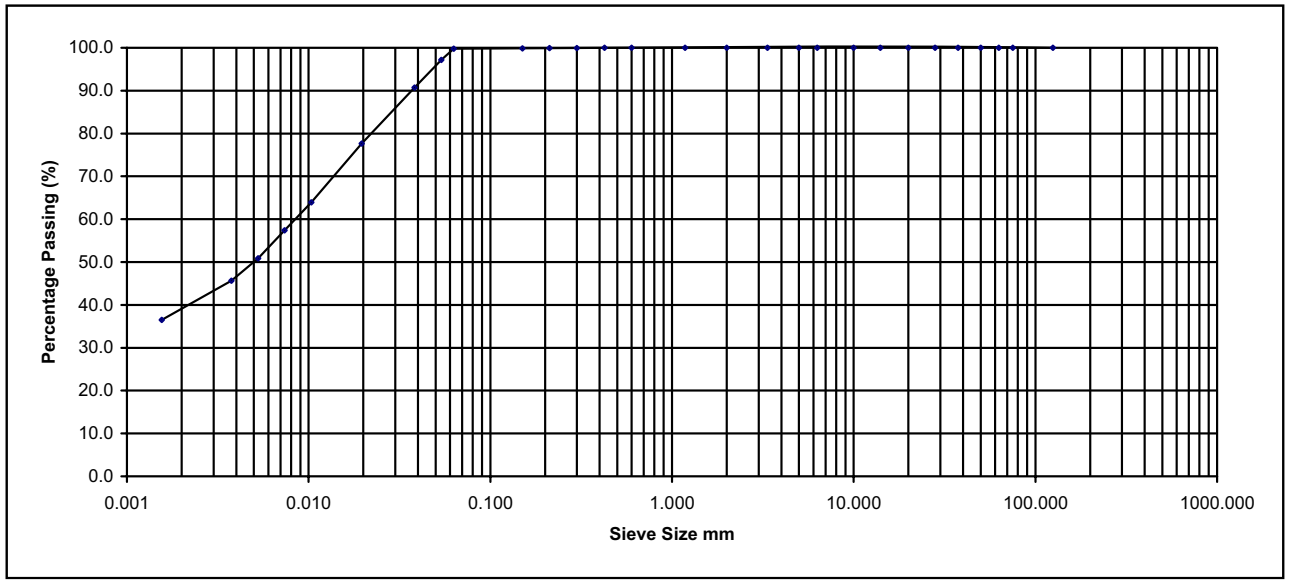
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	100.0
0.300	100.0
0.212	99.9
0.150	99.9
0.063	99.8
0.054	97.2
0.038	90.7
0.020	77.6
0.010	63.9
0.007	57.4
0.005	50.9
0.004	45.7
0.002	36.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
36.5		63.3			0.2			0.0		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BHL210
Project	Durban Harbour Deepening Study							Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	22.35-22.50m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.6
3.350	99.6
2.000	99.6
1.180	99.5
0.600	99.5
0.425	99.5
0.300	99.4
0.212	99.3
0.150	99.2
0.063	97.2
0.051	88.0
0.037	79.8
0.019	62.9
0.010	44.7
0.007	37.9
0.005	31.9
0.004	28.7
0.002	19.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
19.6		77.5			2.4			0.4		0.0	0.0

Sample Description	Dark brown some parts light brown and grey slightly sandy SILT/CLAY.	Project No.	NMTL523
		Borehole No.	BHL210A
Project	Durban Harbour	Sample No.	Top-1

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	15/01/2009	Depth	21.05-21.60m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.9
2.000	99.9
1.180	99.9
0.600	99.8
0.425	99.8
0.300	99.7
0.212	99.6
0.150	99.2
0.063	96.1
0.051	87.4
0.037	77.3
0.019	57.7
0.010	42.6
0.007	33.9
0.005	28.8
0.004	26.5
0.002	17.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
17.8		78.2			3.8			0.1		0.0	0.0

Sample Description	Dark brown slightly sandy SILT/CLAY.					Project No.	NMTL523
						Borehole No.	BHL210A
Project	Durban Harbour					Sample No.	Middle-2
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	15/01/2009
						Depth	21.05-21.60m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.8
0.425	99.8
0.300	99.8
0.212	99.7
0.150	99.5
0.063	99.2
0.053	95.1
0.038	86.9
0.019	75.2
0.010	58.7
0.007	51.1
0.005	46.4
0.004	39.9
0.002	31.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
31.1		68.1			0.7			0.0		0.0	0.0

Sample Description: Dark grey/ brown CLAY/SILT.

Project: Durban Harbour

Project No.: NMTL523

Borehole No.: BHL210A

Sample No.: Core

Depth: 24.75-24.95m

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	13/01/2008

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	99.9
0.300	99.8
0.212	99.2
0.150	98.0
0.063	96.3
0.052	92.6
0.038	83.2
0.019	65.3
0.010	48.9
0.007	41.1
0.005	35.8
0.004	33.2
0.002	25.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
25.3		71.1			3.7			0.0		0.0	0.0

Sample Description: Dark grey to black slightly sandy SILT/CLAY.

Project: Durban Harbour Deepening Study

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	24/11/2008

Project No.	NMTL 523
Borehole no.	BD BHL210A
Sample No.	Core
Depth	24.35-24.55m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.8
0.425	99.7
0.300	99.2
0.212	97.9
0.150	94.7
0.063	83.0
0.052	75.1
0.038	63.0
0.020	42.6
0.011	29.5
0.008	21.3
0.005	18.2
0.004	16.5
0.002	12.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.2		70.8			17.0			0.0		0.0	0.0

Sample Description	Dark grey to black slightly sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BD BHL210A
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	24/11/2008	Depth	26.41-26.61m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.9
1.180	99.8
0.600	99.7
0.425	99.6
0.300	99.5
0.212	99.2
0.150	98.6
0.063	97.3
0.050	92.7
0.036	84.4
0.019	72.9
0.010	57.7
0.007	48.4
0.005	44.3
0.004	38.3
0.002	28.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
28.6		68.7			2.6			0.1		0.0	0.0

Sample Description: Dark grey/ brown slightly sandy CLAY/SILT.

Project: Durban Harbour

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	13/01/2008

Project No.	NMTL523
Borehole No.	BHL210A
Sample No.	Core
Depth	25.14-25.34m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.9
3.350	99.9
2.000	99.9
1.180	99.8
0.600	99.8
0.425	99.8
0.300	99.7
0.212	99.6
0.150	99.4
0.063	98.5
0.051	92.6
0.037	83.8
0.019	69.1
0.010	53.9
0.007	45.1
0.005	39.7
0.004	35.8
0.002	26.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
26.0		72.5			1.4			0.1		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHM 209
Project	Durban Harbour Deepening Study					Sample No.	Shelby
Operator	Mp	Checked	Nc	Approved	Bc	Depth	4.50-4.97m
					Date sample tested	18/09/2008	

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.8
1.180	99.7
0.600	99.3
0.425	99.0
0.300	98.2
0.212	96.8
0.150	95.1
0.063	88.2
0.053	80.6
0.038	70.5
0.020	52.7
0.011	35.5
0.008	26.9
0.005	21.8
0.004	19.3
0.002	14.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.2		74.0			11.6			0.2		0.0	0.0

Sample Description	Dark grey to black slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHM210A
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008	Depth	12.76-12.96m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	97.9
5.000	96.7
3.350	95.7
2.000	95.4
1.180	95.1
0.600	94.6
0.425	94.2
0.300	93.1
0.212	90.7
0.150	87.1
0.063	77.5
0.053	70.1
0.039	56.8
0.020	38.0
0.011	24.8
0.008	17.4
0.006	13.8
0.004	12.4
0.002	10.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
10.1		67.4			17.9			4.6		0.0	0.0

Sample Description	Dark grey to black slightly sandy slightly gravelly SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BHM210A
Project	Durban Harbour Deepening Study							Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008	Depth	13.56-13.75m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.9
0.300	99.8
0.212	99.4
0.150	98.8
0.063	97.0
0.052	92.0
0.037	83.0
0.019	64.4
0.010	51.8
0.007	43.7
0.005	38.7
0.004	34.2
0.002	24.1

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
24.1		72.9			3.0			0.0		0.0	0.0

Sample Description	Dark grey to black slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BD BHM211
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Depth	15.08-15.23m
				Date sample tested	03/12/2008		

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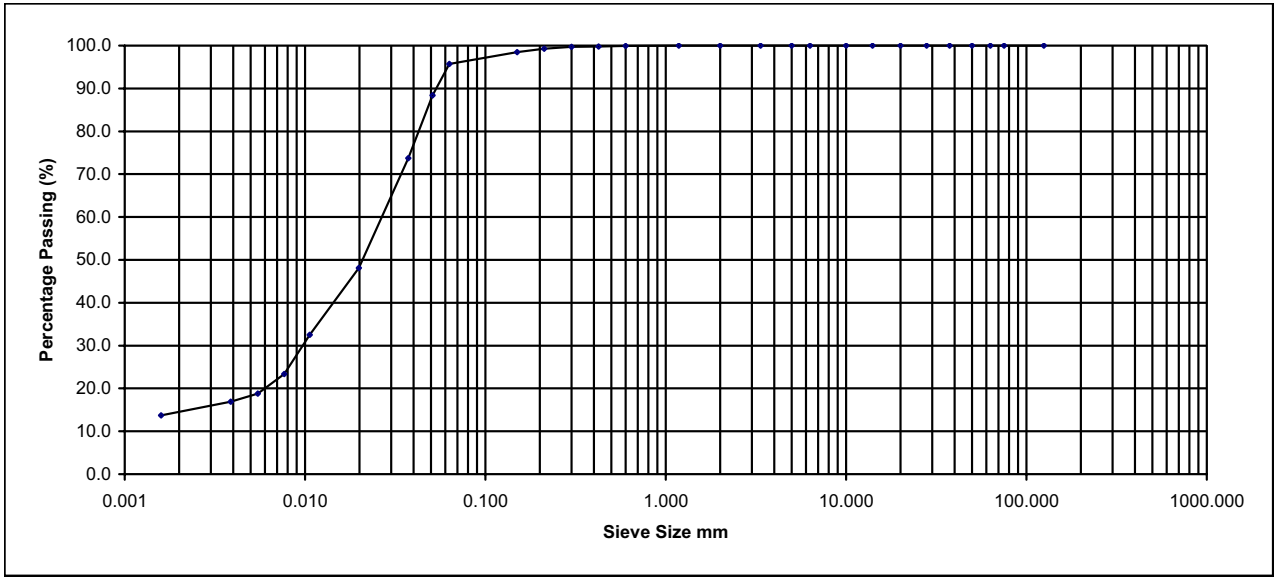
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.8
0.300	99.7
0.212	99.3
0.150	98.5
0.063	95.7
0.051	88.4
0.037	73.7
0.020	48.1
0.011	32.5
0.008	23.4
0.005	18.8
0.004	16.9
0.002	13.7



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.7		82.0			4.3			0.0		0.0	0.0

Sample Description	Dark grey to black slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BD BHM211
Project	Durban Harbour Deepening Study					Sample No.	Core
Operator	Mp	Checked	Nc	Approved	Bc	Depth	15.23-15.42m
				Date sample tested	03/12/2008		

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	99.9
0.425	99.8
0.300	99.3
0.212	97.6
0.150	93.8
0.063	83.2
0.052	74.8
0.038	64.3
0.020	45.4
0.011	33.6
0.008	26.5
0.005	22.7
0.004	19.3
0.002	14.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
14.3		69.0			16.8			0.0		0.0	0.0

Sample Description	Dark grey slightly sandy SILT/CLAY.	Project No.	NMTL 523
		Borehole no.	BD BHM211
Project	Durban Harbour Deepening Study	Sample No.	Core
Operator: Mp	Checked: Nc / Approved: Bc / Date sample tested: 08/12/2008	Depth	15.42-15.46m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.8
0.600	99.5
0.425	99.2
0.300	98.0
0.212	96.2
0.150	94.4
0.063	86.6
0.054	81.6
0.039	70.7
0.020	51.5
0.011	35.6
0.008	29.0
0.005	24.1
0.004	22.5
0.002	21.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
21.4		65.2			13.4			0.0		0.0	0.0

Sample Description	Dark grey to black slightly sandy SILT/CLAY.	Project No.	NMTL 523
		Borehole no.	BD BHM211
Project	Durban Harbour Deepening Study	Sample No.	Core

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	03/12/2008	Depth	15.56-15.92m

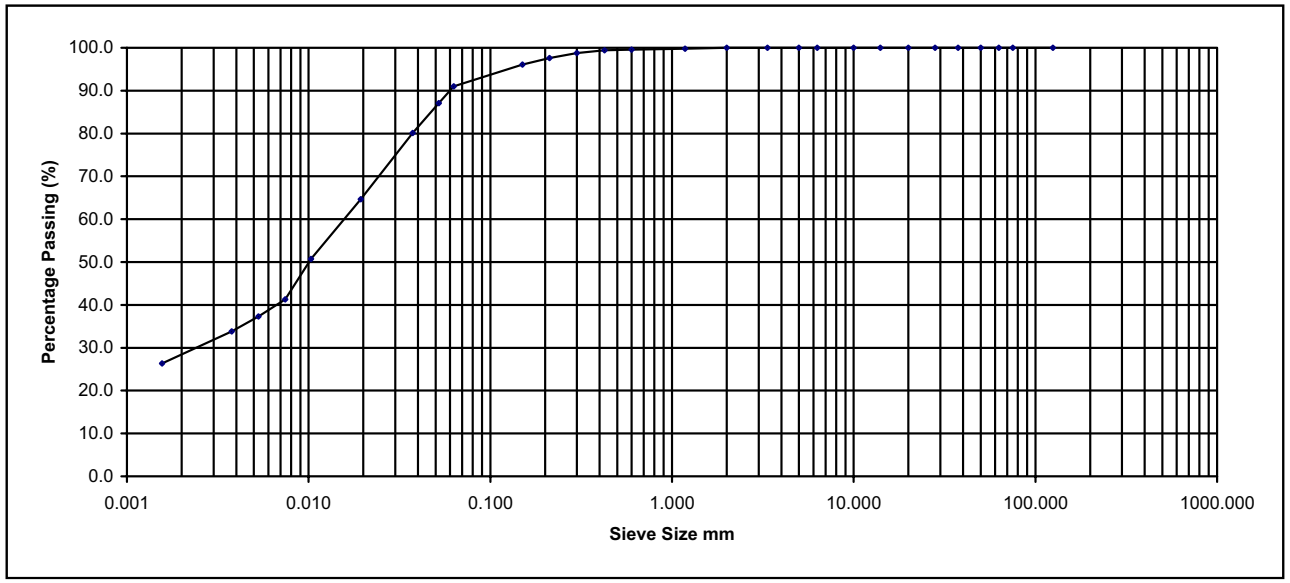
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.8
0.600	99.6
0.425	99.4
0.300	98.8
0.212	97.6
0.150	96.1
0.063	91.0
0.052	87.1
0.037	80.1
0.019	64.7
0.010	50.7
0.007	41.3
0.005	37.3
0.004	33.8
0.002	26.4



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
26.4		64.7			9.0			0.0		0.0	0.0

Sample Description: Dark grey to black slightly sandy SILT/CLAY.

Project: Durban Harbour Deepening Study

Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	21/11/2008

Project No.	NMTL 523
Borehole no.	BD BHM211
Sample No.	Core
Depth	15.92-16.10m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.8
2.000	99.8
1.180	99.8
0.600	99.8
0.425	99.7
0.300	99.5
0.212	98.8
0.150	97.1
0.063	92.0
0.051	88.8
0.037	80.4
0.019	59.5
0.010	39.5
0.008	30.2
0.005	25.6
0.004	22.3
0.002	17.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
17.2		74.8			7.8			0.2		0.0	0.0

Sample Description	Dark grey/black slightly sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL301
Project	Durban Harbour Deepening Study					Sample No.	Shelby
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	27/09/2008	Depth	29.5-30.10m

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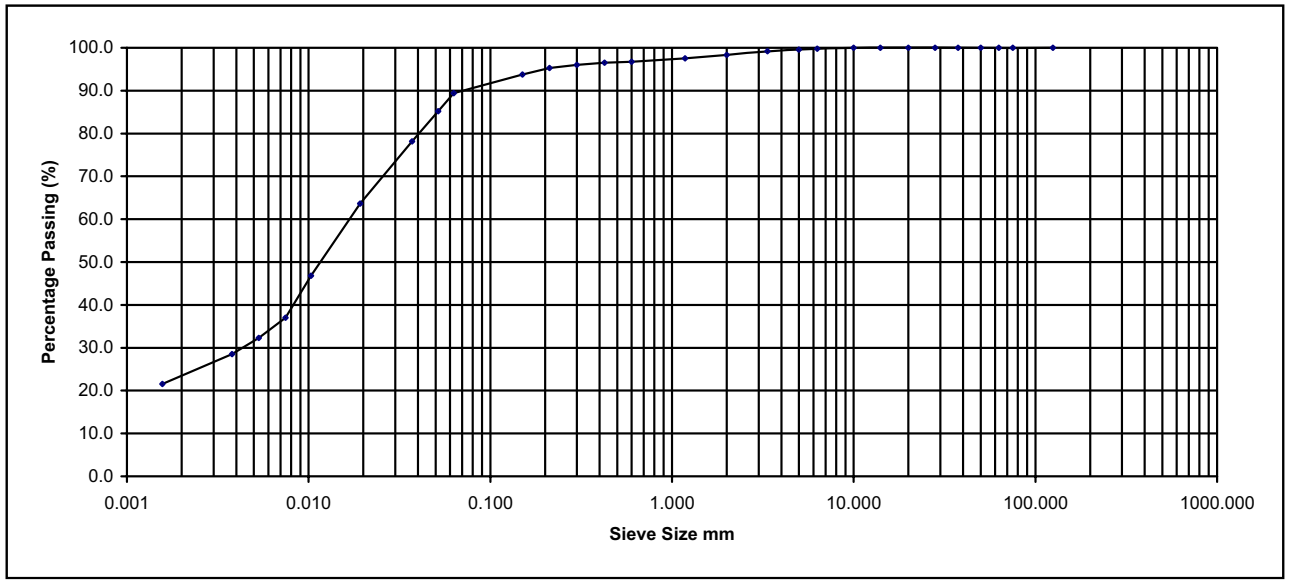
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	99.8
5.000	99.5
3.350	99.2
2.000	98.4
1.180	97.5
0.600	96.8
0.425	96.5
0.300	96.0
0.212	95.3
0.150	93.7
0.063	89.4
0.052	85.2
0.037	78.2
0.019	63.7
0.010	46.8
0.007	37.0
0.005	32.3
0.004	28.6
0.002	21.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
21.5		67.9			9.0			1.6		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.							Project No.	NMTL 523
								Borehole no.	BHL301
Project	Durban Harbour Deepening Study							Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	30.10-30.26m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	99.4
5.000	98.9
3.350	98.4
2.000	97.9
1.180	97.7
0.600	97.5
0.425	97.2
0.300	96.3
0.212	93.4
0.150	90.5
0.063	82.0
0.050	77.8
0.036	70.1
0.019	55.4
0.010	38.9
0.007	32.0
0.005	27.3
0.004	23.5
0.002	16.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
16.6		65.4			15.9			2.1		0.0	0.0

Sample Description	Dark grey/black slighty sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL301
Project	Durban Harbour Deepening Study					Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	30.26-30.54m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.8
0.425	99.4
0.300	97.9
0.212	93.1
0.150	83.1
0.063	67.4
0.054	61.0
0.039	53.2
0.020	38.0
0.011	22.9
0.008	16.4
0.006	14.3
0.004	13.0
0.002	7.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
7.3		60.1			32.6			0.0		0.0	0.0

Sample Description	Dark brown slightly sandy SILT/CLAY.	Project No.	NMTL523
		Borehole No.	BHL301
Project	Durban Harbour	Sample No.	Core
Operator: Mp	Checked: Nc	Approved: Bc	Date sample tested: 15/01/2009	Depth	30.81-30.93m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	99.6
3.350	99.2
2.000	98.3
1.180	98.2
0.600	97.9
0.425	97.4
0.300	95.7
0.212	91.1
0.150	86.7
0.063	73.9
0.053	69.2
0.038	61.9
0.020	46.5
0.011	35.0
0.008	28.6
0.005	23.5
0.004	20.5
0.002	15.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
15.8		58.1			24.5			1.7		0.0	0.0

Sample Description	Dark grey/black sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL301
Project	Durban Harbour Deepening Study					Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	31-04-31.19m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.9
0.600	99.7
0.425	99.3
0.300	97.5
0.212	91.3
0.150	75.9
0.063	54.8
0.056	50.8
0.040	42.0
0.021	28.5
0.011	17.5
0.008	13.1
0.006	12.3
0.004	11.8
0.002	11.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
11.0		43.8			45.2			0.0		0.0	0.0

Sample Description	Dark grey/black sandy SILT/CLAY.					Project No.	NMTL 523
						Borehole no.	BHL301
Project	Durban Harbour Deepening Study					Sample No.	CORE
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	18/09/2008	Depth	31.19-31.34m

NM TL Ltd

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	84.7
14.000	82.2
10.000	81.3
6.300	80.7
5.000	80.4
3.350	80.2
2.000	80.0
1.180	79.8
0.600	79.1
0.425	76.8
0.300	69.4
0.212	48.2
0.150	19.5
0.063	10.7
0.059	9.7
0.042	9.1
0.021	8.6
0.011	6.9
0.008	5.9
0.005	5.8
0.004	5.6
0.002	5.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
5.5		5.3			69.2			20.0		0.0	0.0

Sample Description	Light brown occasionally grey silty gravelly SAND.						Project No.	NMTL 523
							Borehole no.	BD BHL314
Project	Durban Harbour Deepening Study						Sample No.	Top
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	11/11/2008	Depth	24.60-25.15

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	99.8
0.600	99.5
0.425	98.7
0.300	95.8
0.212	84.5
0.150	68.9
0.063	56.4
0.057	54.5
0.041	51.4
0.021	45.8
0.011	39.5
0.008	36.4
0.005	34.5
0.004	33.9
0.002	32.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
32.0		24.4			43.5			0.0		0.0	0.0

Sample Description	Brown grey sandy CLAY/SILT.							Project No.	NMTL 523
								Borehole no.	BD BHL314
Project	Durban Harbour Deepening Study							Sample No.	Base
Operator	Mp	Checked	Nc	Approved	Bc	Date sample tested	07/11/2008	Depth	24.60-25.15

NMTL Ltd

APPENDIX B

Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01025
Depth: 27.80 - 28.35
Position: BD-BHL 103A
Description: -

THEKWINI SOILS LAB. CC
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68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Test 1		**Test 2**		**Test 3**	
Inputs		Inputs		Inputs	
L (cm)	8.11	L (cm)	8.11	L (cm)	8.10
A (cm^2)	11.06	A (cm^2)	11.39	A (cm^2)	11.45
V (cc)	89.73	V (cc)	92.38	V (cc)	92.75
Prooving Ring	33.58	Prooving Ring	33.70	Prooving Ring	33.70
Sigma3	250	Sigma3	500	Sigma3	750
MC Before (%)	55.3	MC Before (%)	56.4	MC Before (%)	54.6
MC After (%)	55.1	MC After (%)	56.2	MC After (%)	53.7
Bulk Density (kg/m3)	1665	Bulk Density (kg/m^3)	1685	Bulk Density (kg/m^3)	1680
Dry Density (kg/m3)	1073	Dry Density (kg/m^3)	1077	Dry Density (kg/m^3)	1087

Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.06	0	0	11.39	0	0	11.45	0	0
11.09	0.25	45.4	11.42	0.25	20.7	11.48	0.25	41.1
11.12	0.49	60.4	11.45	0.49	82.4	11.51	0.49	147.9
11.15	0.74	66.3	11.48	0.74	144.5	11.54	0.74	201.6
11.17	0.99	75.1	11.50	0.99	160.5	11.57	0.99	247.7
11.20	1.23	83.9	11.53	1.23	190.5	11.59	1.23	284.3
11.27	1.85	98.3	11.61	1.85	232.3	11.67	1.85	338.0
11.34	2.47	112.5	11.68	2.47	266.9	11.74	2.47	365.1
11.42	3.08	120.6	11.75	3.08	286.7	11.82	3.09	368.5
11.49	3.70	131.5	11.83	3.70	282.6			
11.56	4.32	139.4	11.90	4.32	276.0			
11.64	4.93	141.4	11.98	4.93	264.9			
11.71	5.55	146.2						
11.79	6.17	148.1						
11.87	6.78	152.8						
11.95	7.40	154.0						
12.03	8.01	154.9						
12.11	8.63	155.3						
12.19	9.25	154.8						
12.28	9.86	154.6						
12.36	10.48	154.9						
12.45	11.10	153.8						
12.53	11.71	152.7						
12.62	12.33	149.0						

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

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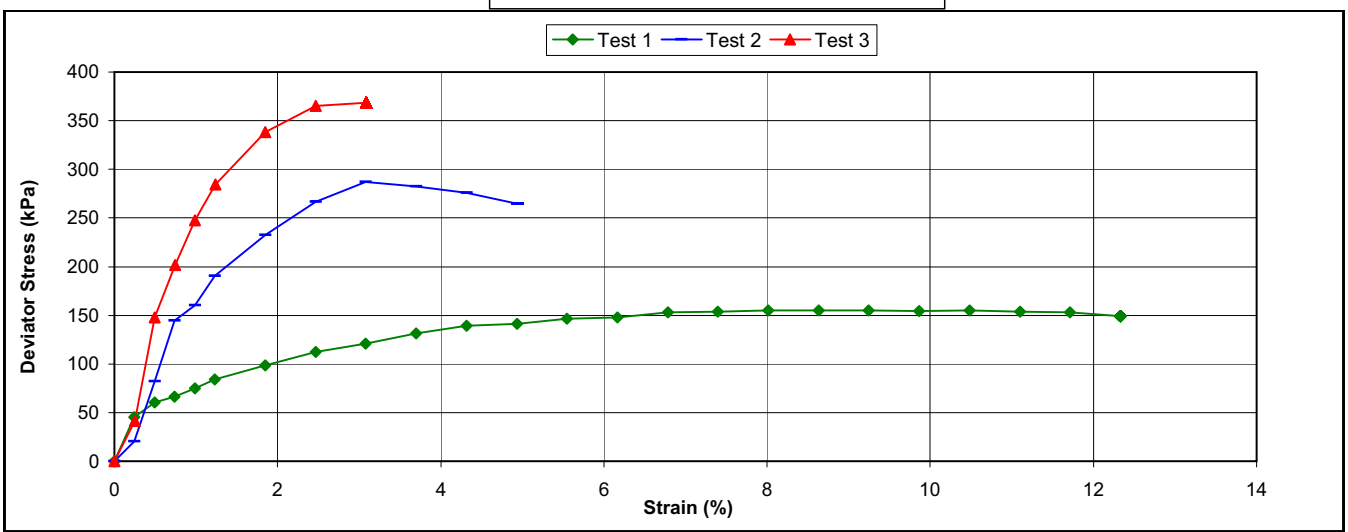
Fax : (031) 201-7920

Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01025
Depth (m): 27.80 - 28.35
Position: BD-BHL 103A
Description: -

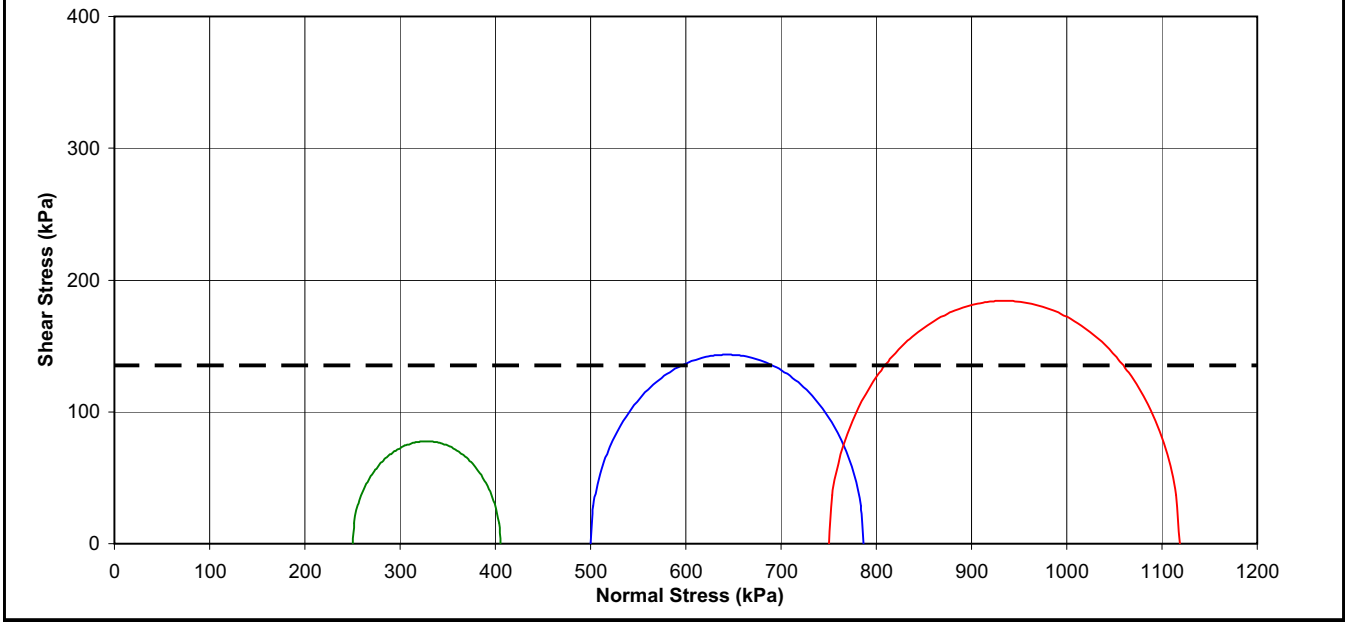
	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	250	500	750
Dry Density (kg/m^3)	1073	1077	1087
NMC(%)	55.3	56.4	54.6
Axial Strain (%)	8.63	3.08	3.09
Shear Stress at Failure (kPa)	78	143	184

Average Cohesion
C (kPa) 135

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01030
Depth: 18.95 - 19.37
Position: BD-BHL 101B
Description: -

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Test 1		**Test 2**		**Test 3**	
Inputs		Inputs		Inputs	
L (cm)	8.12	L (cm)	8.12	L (cm)	8.14
A (cm^2)	11.46	A (cm^2)	11.51	A (cm^2)	11.59
V (cc)	93.06	V (cc)	93.47	V (cc)	94.29
Prooving Ring	33.70	Prooving Ring	33.70	Prooving Ring	33.70
Sigma3	200	Sigma3	400	Sigma3	600
MC Before (%)	50.7	MC Before (%)	42.7	MC Before (%)	48.6
MC After (%)	50.5	MC After (%)	42.5	MC After (%)	48.5
Bulk Density (kg/m3)	1722	Bulk Density (kg/m^3)	1779	Bulk Density (kg/m^3)	1718
Dry Density (kg/m3)	1142	Dry Density (kg/m^3)	1247	Dry Density (kg/m^3)	1156

Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.46	0	0	11.51	0	0	11.59	0	0
11.49	0.25	57.2	11.54	0.25	88.2	11.62	0.25	11.6
11.52	0.49	96.6	11.57	0.49	174.8	11.65	0.49	92.6
11.55	0.74	111.5	11.60	0.74	233.1	11.68	0.74	185.3
11.57	0.99	122.3	11.63	0.99	276.0	11.71	0.98	254.8
11.60	1.23	128.4	11.65	1.23	305.1	11.74	1.23	304.4
11.68	1.85	142.0	11.73	1.85	324.7	11.81	1.84	350.4
11.75	2.46	149.1				11.88	2.46	348.8
11.82	3.08	156.7						
11.90	3.69	165.7						
11.98	4.31	171.1						
12.05	4.93	175.6						
12.13	5.54	178.3						
12.21	6.16	182.1						
12.29	6.77	184.2						
12.38	7.39	185.2						
12.46	8.00	187.2						
12.54	8.62	189.4						
12.63	9.24	192.2						
12.71	9.85	193.5						
12.80	10.47	195.3						
12.89	11.08	196.6						
12.98	11.70	197.3						
13.07	12.32	196.5						
13.16	12.93	197.1						
13.26	13.55	196.3						
13.35	14.16	194.9						
13.45	14.78	194.2						
13.55	15.39	193.6						
13.65	16.01	193.1						
13.75	16.63	193.7						
13.85	17.24	193.5						
13.95	17.86	193.2						
14.06	18.47	191.8						
14.16	19.09	188.4						

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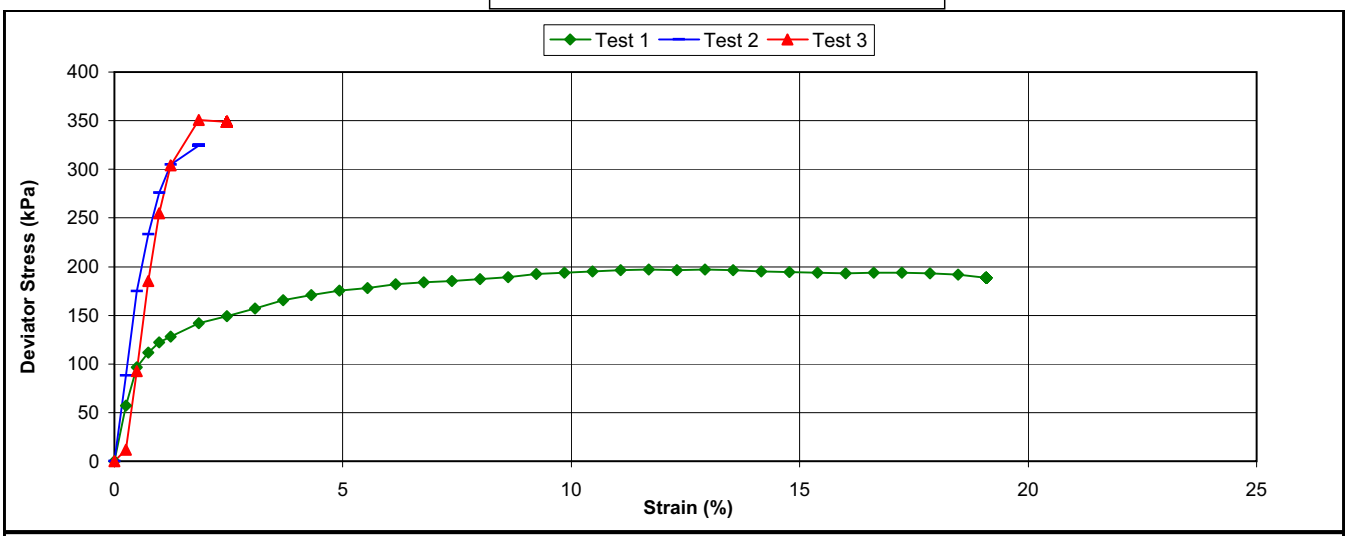
Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01030
Depth (m): 18.95 - 19.37
Position: BD-BHL 101B
Description: -

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	200	400	600
Dry Density (kg/m^3)	1142	1247	1156
NMC(%)	50.7	42.7	48.6
Axial Strain (%)	11.70	1.85	1.84
Shear Stress at Failure (kPa)	99	162	175

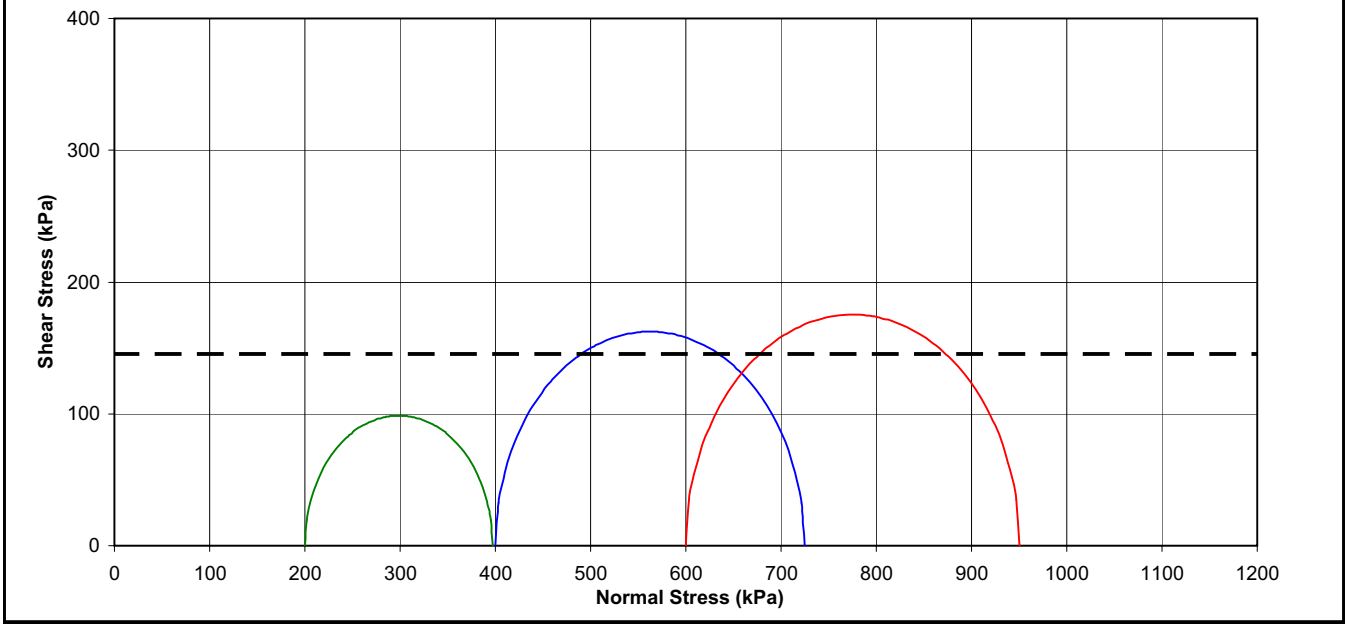
Average Cohesion

C (kPa) 145

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01032
Depth: 3.35 - 3.90
Position: BD-BHM 101C
Description: -

Test 1			**Test 2**			**Test 3**		
Inputs			Inputs			Inputs		
L (cm)	8.13		L (cm)	8.12		L (cm)	0.00	
A (cm^2)	11.38		A (cm^2)	11.18		A (cm^2)		
V (cc)	92.53		V (cc)	90.75		V (cc)		
Prooving Ring	34.22		Prooving Ring	34.16		Prooving Ring	0.00	
Sigma3	100		Sigma3	200		Sigma3	0	
MC Before (%)	56.3		MC Before (%)	51.9		MC Before (%)		
MC After (%)	56.1		MC After (%)	51.7		MC After (%)		
Bulk Density (kg/m3)	1634		Bulk Density (kg/m^3)	1667		Bulk Density (kg/m^3)		
Dry Density (kg/m3)	1046		Dry Density (kg/m^3)	1097		Dry Density (kg/m^3)		
Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.38	0	0	11.18	0	0		0	0
11.41	0.25	21.6	11.21	0.25	30.5			
11.44	0.49	26.9	11.24	0.49	41.0			
11.47	0.74	29.8	11.27	0.74	48.5			
11.49	0.98	32.7	11.29	0.99	54.4			
11.52	1.23	35.6	11.32	1.23	57.3			
11.59	1.85	40.7	11.39	1.85	63.0			
11.67	2.46	44.0	11.47	2.46	65.5			
11.74	3.08	43.7	11.54	3.08	66.6			
11.82	3.69	43.4	11.61	3.70	67.7			
11.89	4.31	43.2	11.69	4.31	67.8			
11.97	4.92	42.9	11.76	4.93	68.0			
12.05	5.54	42.6	11.84	5.55	67.8			
12.13	6.15	42.3	11.92	6.16	68.5			
12.21	6.77	42.1	12.00	6.78	68.9			
12.29	7.38	41.8	12.08	7.39	70.7			
12.37	8.00	41.5	12.16	8.01	71.7			
12.45	8.61	41.2	12.24	8.63	72.0			
12.54	9.23	40.9	12.32	9.24	71.5			
12.62	9.84	40.7	12.41	9.86	71.0			
12.71	10.46	40.4	12.49	10.47	70.8			
12.80	11.07	40.1	12.58	11.09	70.6			
12.89	11.69	39.8	12.67	11.71	70.1			
12.98	12.30	40.9	12.75	12.32	70.2			
13.07	12.92	40.6	12.84	12.94	71.3			
13.16	13.53	40.6	12.94	13.56	71.3			
13.26	14.15	40.3	13.03	14.17	72.1			
13.35	14.76	40.5	13.12	14.79	72.4			
13.45	15.38	40.2	13.22	15.40	72.4			
13.55	15.99	39.9	13.32	16.02	72.3			
13.65	16.61	39.6	13.41	16.64	71.8			
13.75	17.22	39.3	13.51	17.25	71.3			
13.85	17.84	39.0	13.62	17.87	70.8			
13.96	18.45	38.0	13.72	18.48	70.2			
14.06	19.07	37.0	13.82	19.10	69.7			
			13.93	19.72	68.9			
			14.04	20.33	68.4			
			14.15	20.95	68.8			
			14.26	21.57	69.5			
			14.37	22.18	69.4			
			14.48	22.80	69.6			
			14.60	23.41	69.0			
			14.72	24.03	68.7			
			14.84	24.65	66.8			
			14.96	25.26	66.2			
			15.09	25.88	65.7			
			15.21	26.49	65.1			
			15.34	27.11	64.1			
			15.47	27.73	62.9			
			15.61	28.34	63.0			
			15.74	28.96	62.5			
			15.88	29.57	62.0			
			16.02	30.19	61.8			
			16.16	30.81	61.3			

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

THEKWINI SOILS LAB. CC
68 Ridge Road,
Tollgate, DURBAN
Tel : (031) 201-8992
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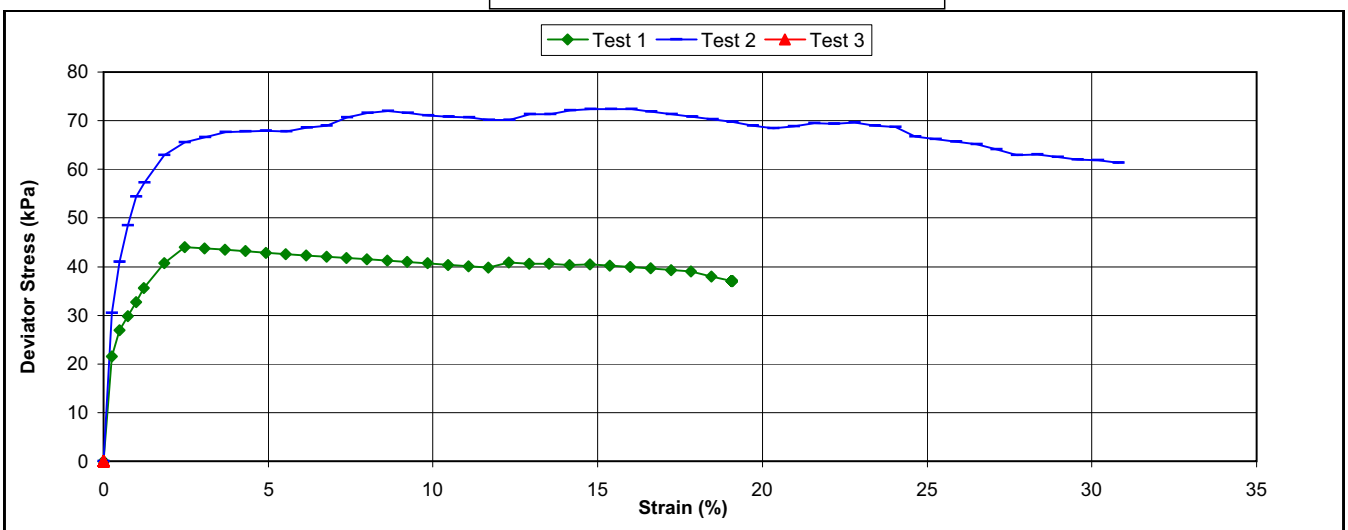
MAYVILLE, 4058
Fax : (031) 201-7920

Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01032
Depth (m): 3.35 - 3.90
Position: BD-BHM 101C
Description: -

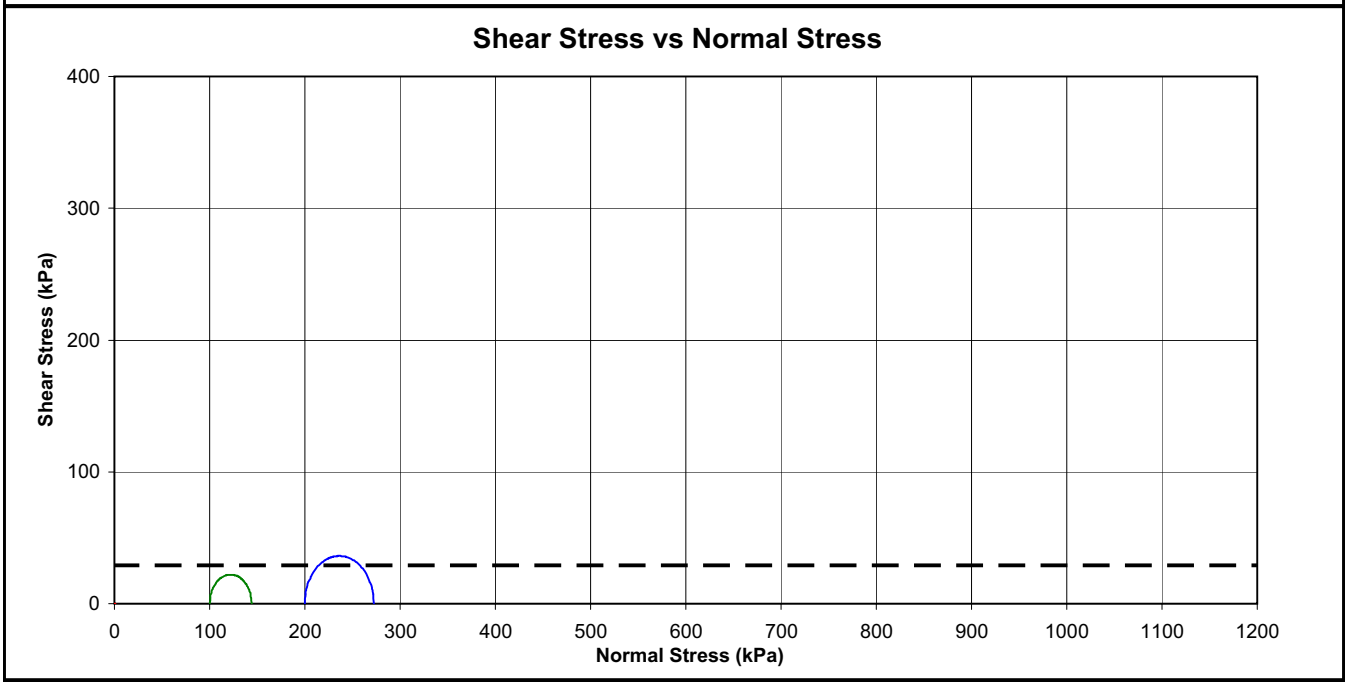
	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	0
Dry Density (kg/m^3)	1046	1097	0
NMC(%)	56.3	51.9	
Axial Strain (%)	2.46	14.79	0.00
Shear Stress at Failure (kPa)	22	36	0

Average Cohesion
C (kPa) 29

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01029
Depth: 4.90 - 5.35
Position: BD-BHM 101C
Description: -

THEKWINI SOILS LAB. CC
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Test 1			**Test 2**			**Test 3**		
Inputs			Inputs			Inputs		
L (cm)	8.12		L (cm)	8.12		L (cm)	8.10	
A (cm^2)	11.04		A (cm^2)	11.15		A (cm^2)	11.09	
V (cc)	89.68		V (cc)	90.56		V (cc)	89.86	
Prooving Ring	33.45		Prooving Ring	33.45		Prooving Ring	33.70	
Sigma3	100		Sigma3	200		Sigma3	400	
MC Before (%)	27.0		MC Before (%)	29.9		MC Before (%)	27.0	
MC After (%)	26.9		MC After (%)	29.8		MC After (%)	27.0	
Bulk Density (kg/m3)	1988		Bulk Density (kg/m^3)	1947		Bulk Density (kg/m^3)	1981	
Dry Density (kg/m3)	1565		Dry Density (kg/m^3)	1498		Dry Density (kg/m^3)	1559	
Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.04	0	0	11.15	0	0	11.09	0	0
11.07	0.25	18.7	11.18	0.25	49.4	11.12	0.25	53.0
11.10	0.49	22.6	11.21	0.49	69.2	11.15	0.49	85.2
11.13	0.74	24.0	11.24	0.74	83.4	11.18	0.74	111.0
11.15	0.99	26.7	11.26	0.99	91.5	11.20	0.99	135.3
11.18	1.23	27.5	11.29	1.23	94.8	11.23	1.23	158.4
11.25	1.85	32.7	11.36	1.85	103.0	11.30	1.85	208.7
11.32	2.46	36.0	11.43	2.46	106.8	11.37	2.47	252.4
11.40	3.08	39.6	11.51	3.08	109.0	11.45	3.09	283.2
11.47	3.69	43.2	11.58	3.69	109.8	11.52	3.70	300.7
11.54	4.31	46.4	11.66	4.31	109.6	11.59	4.32	312.4
11.62	4.93	49.5	11.73	4.93	110.9	11.67	4.94	317.6
11.69	5.54	52.1	11.81	5.54	110.5	11.75	5.56	321.3
11.77	6.16	53.4	11.88	6.16	109.8	11.82	6.17	322.6
11.85	6.77	56.5	11.96	6.77	109.0	11.90	6.79	322.8
11.93	7.39	59.5	12.04	7.39	108.3	11.98	7.41	322.1
12.01	8.00	61.3	12.12	8.00	107.1	12.06	8.02	321.3
12.09	8.62	63.7	12.21	8.62	106.3	12.14	8.64	321.4
12.17	9.24	65.7	12.29	9.24	105.6	12.23	9.26	319.2
12.25	9.85	68.0	12.37	9.85	105.4	12.31	9.88	316.2
12.34	10.47	70.5	12.46	10.47	103.4	12.39	10.49	314.0
12.42	11.08	72.2	12.54	11.08	101.9	12.48	11.11	312.7
12.51	11.70	74.3				12.57	11.73	310.5
12.60	12.32	75.7				12.66	12.35	308.3
12.68	12.93	76.5				12.75	12.96	304.6
12.78	13.55	78.5						
12.87	14.16	80.6						
12.96	14.78	82.3						
13.05	15.39	82.5						
13.15	16.01	83.9						
13.25	16.63	83.8						
13.35	17.24	85.5						
13.45	17.86	86.6						
13.55	18.47	85.9						
13.65	19.09	85.3						
13.76	19.70	85.1						
13.86	20.32	86.4						
13.97	20.94	86.7						
14.08	21.55	87.9						
14.19	22.17	89.1						
14.30	22.78	88.9						
14.42	23.40	88.6						
14.54	24.01	89.3						
14.65	24.63	89.0						
14.77	25.25	88.7						
14.90	25.86	89.8						
15.02	26.48	89.5						
15.15	27.09	90.3						
15.28	27.71	90.2						
15.41	28.33	91.2						
15.54	28.94	91.5						
15.68	29.56	92.2						
15.82	30.17	92.6						
15.96	30.79	92.7						

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

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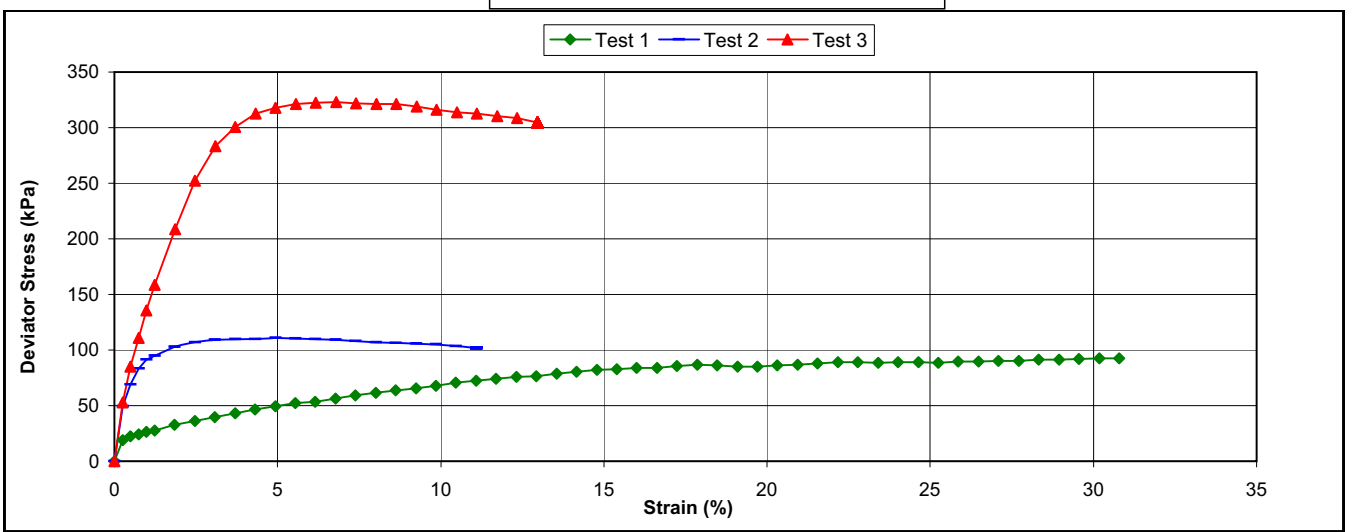
Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01029
Depth (m): 4.90 - 5.35
Position: BD-BHM 101C
Description: -

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1565	1498	1559
NMC(%)	27.0	29.9	27.0
Axial Strain (%)	30.79	4.93	6.79
Shear Stress at Failure (kPa)	46	55	161

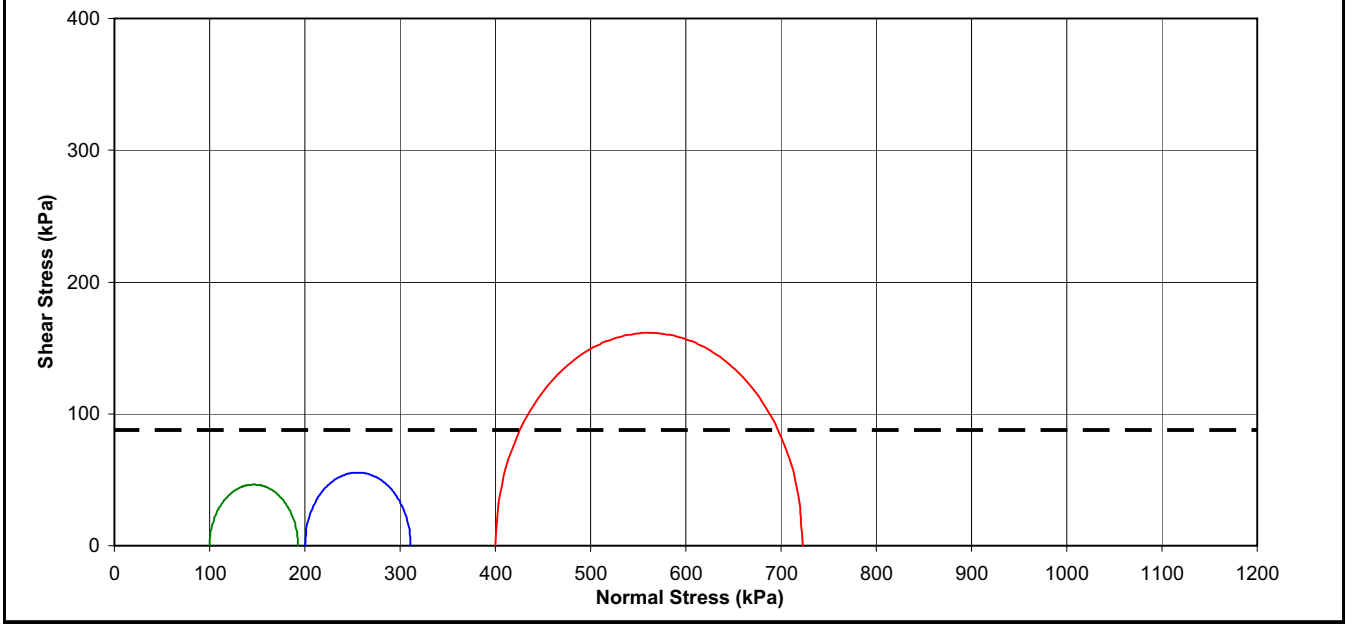
Average Cohesion

C (kPa) 88

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01026
Depth: 25.45 - 26.0
Position: BHL 203B
Description: -

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Test 1			**Test 2**			**Test 3**		
Inputs			Inputs			Inputs		
L (cm)	8.14		L (cm)	8.14		L (cm)	8.13	
A (cm^2)	10.99		A (cm^2)	11.03		A (cm^2)	11.17	
V (cc)	89.39		V (cc)	89.69		V (cc)	90.83	
Prooving Ring	34.20		Prooving Ring	34.20		Prooving Ring	33.95	
Sigma3	250		Sigma3	500		Sigma3	750	
MC Before (%)	66.9		MC Before (%)	69.9		MC Before (%)	63.8	
MC After (%)	66.9		MC After (%)	68.2		MC After (%)	53.2	
Bulk Density (kg/m3)	1566		Bulk Density (kg/m^3)	1574		Bulk Density (kg/m^3)	1715	
Dry Density (kg/m3)	938		Dry Density (kg/m^3)	926		Dry Density (kg/m^3)	1047	
Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
10.99	0	0	11.03	0	0	11.17	0	0
11.01	0.25	22.4	11.05	0.25	25.4	11.20	0.25	27.3
11.04	0.49	31.0	11.08	0.49	37.0	11.23	0.49	40.8
11.07	0.74	36.5	11.11	0.74	46.8	11.26	0.74	45.2
11.10	0.98	40.1	11.13	0.98	54.7	11.28	0.98	51.1
11.12	1.23	42.4	11.16	1.23	56.7	11.31	1.23	54.6
11.19	1.84	47.4	11.23	1.84	61.5	11.38	1.85	62.0
11.26	2.46	51.0	11.30	2.46	66.0	11.45	2.46	67.6
11.34	3.07	54.3	11.37	3.07	67.7	11.53	3.08	69.2
11.41	3.69	54.6	11.45	3.69	68.7	11.60	3.69	70.2
11.48	4.30	56.6	11.52	4.30	68.9	11.68	4.31	72.7
11.56	4.92	56.8	11.60	4.92	68.4	11.75	4.92	72.8
11.63	5.53	57.3	11.67	5.53	68.0	11.83	5.54	74.6
11.71	6.15	58.4	11.75	6.15	68.4	11.90	6.15	74.7
11.78	6.76	58.0	11.82	6.76	67.1	11.98	6.77	75.1
11.86	7.38	58.2	11.90	7.38	67.5	12.06	7.38	75.4
11.94	7.99	59.6	11.98	7.99	66.2	12.14	8.00	75.5
12.02	8.60	59.7	12.06	8.60	65.8	12.23	8.61	75.0
12.10	9.22	59.3	12.14	9.22	65.3	12.31	9.23	74.5
12.19	9.83	58.9	12.23	9.83	64.9	12.39	9.84	74.5
12.27	10.45	59.1	12.31	10.45	64.4	12.48	10.46	74.0
12.35	11.06	58.7	12.40	11.06	64.0	12.56	11.07	73.0
12.44	11.68	58.3	12.48	11.68	63.6	12.65	11.69	73.0
12.53	12.29	58.7	12.57	12.29	63.1	12.74	12.30	73.3
12.62	12.91	59.1	12.66	12.91	62.1	12.83	12.92	73.6
12.71	13.52	58.7				12.92	13.53	73.3
12.80	14.14	58.5				13.01	14.15	73.0
12.89	14.75	58.4				13.11	14.76	72.5
12.98	15.37	58.0				13.20	15.38	72.5
13.08	15.98	58.1				13.30	15.99	72.0
13.17	16.59	57.6				13.40	16.61	71.0
13.27	17.21	58.0				13.50	17.22	70.4
13.37	17.82	57.5				13.60	17.84	70.4
13.47	18.44	57.1				13.70	18.45	69.4
13.57	19.05	56.7				13.80	19.07	68.9
13.68	19.67	57.0				13.91	19.68	65.9
13.78	20.28	56.6				14.02	20.30	65.9
13.89	20.90	56.1				14.13	20.91	66.8
14.00	21.51	55.7				14.24	21.53	66.8
14.11	22.13	55.7				14.35	22.14	66.2
14.22	22.74	55.3				14.46	22.76	65.7
14.34	23.36	55.3				14.58	23.37	65.2
14.45	23.97	55.6				14.70	23.99	64.7
14.57	24.59	56.3				14.82	24.60	64.2
14.69	25.20	55.9				14.94	25.22	64.1
14.81	25.81	55.4				15.06	25.83	64.2
14.93	26.43	55.0				15.19	26.45	64.4
15.06	27.04	54.5				15.32	27.06	63.8
15.19	27.66	54.0				15.45	27.68	61.5
15.32	28.27	53.6				15.58	28.29	61.4
15.45	28.89	53.6				15.72	28.91	62.2
15.59	29.50	53.1				15.85	29.52	61.7
15.72	30.12	53.9				15.99	30.14	59.9
15.86	30.73	53.9				16.13	30.75	59.3

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

THEKWINI SOILS LAB. CC
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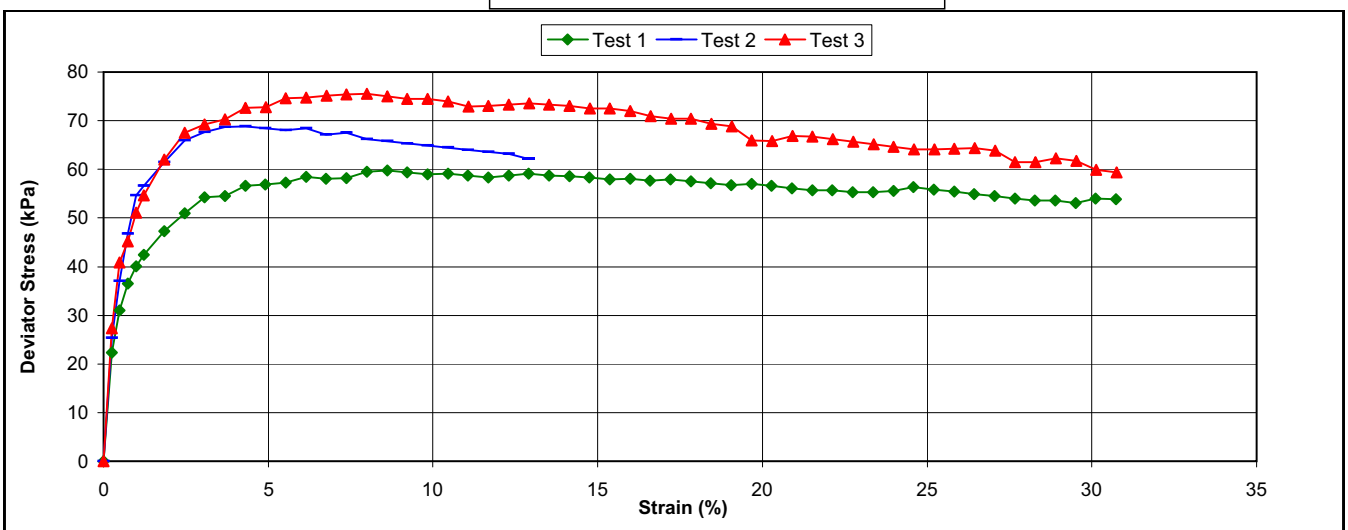
Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01026
Depth (m): 25.45 - 26.0
Position: BHL 203B
Description: -

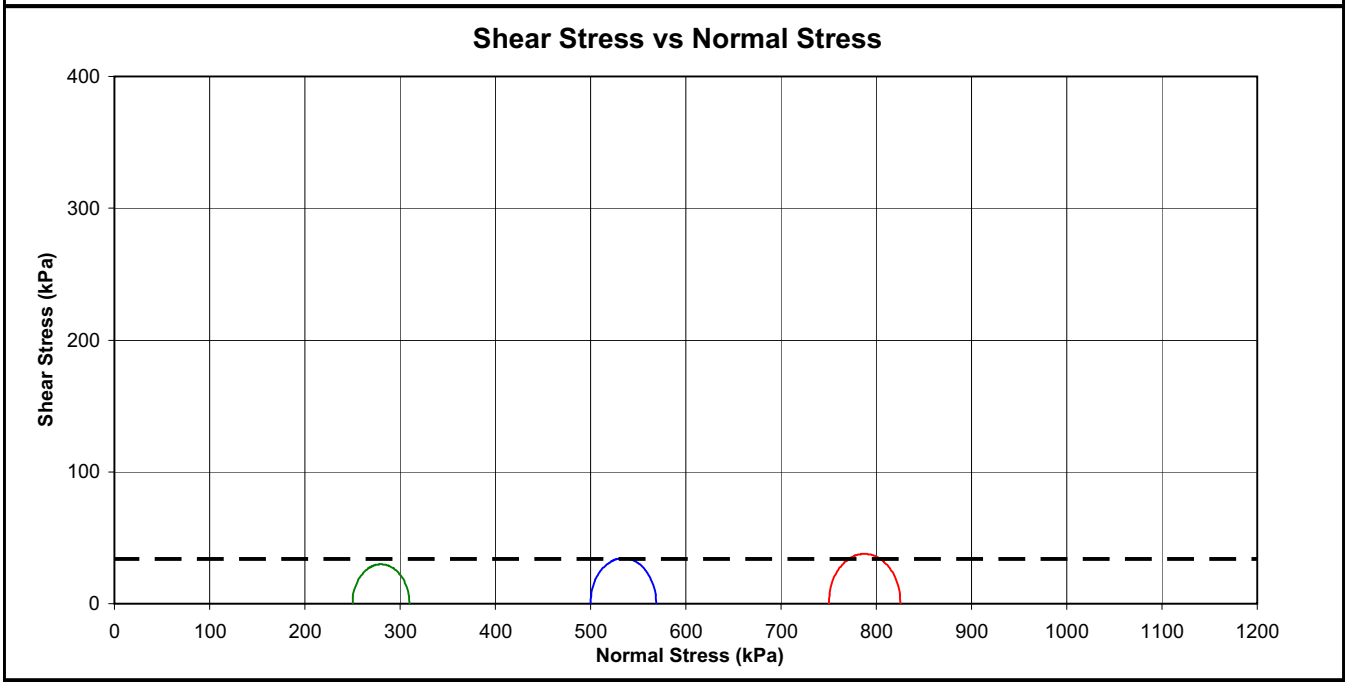
	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	250	500	750
Dry Density (kg/m^3)	938	926	1047
NMC(%)	66.9	69.9	63.8
Axial Strain (%)	8.60	4.30	8.00
Shear Stress at Failure (kPa)	30	34	38

Average Cohesion
C (kPa) 34

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01027
Depth: 25.65 - 26.20
Position: BHL 210A
Description: -

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Fax : (031) 201-7920

Test 1		**Test 2**		**Test 3**	
Inputs		Inputs		Inputs	
L (cm)	8.12	L (cm)	8.13	L (cm)	8.13
A (cm^2)	11.14	A (cm^2)	11.19	A (cm^2)	11.21
V (cc)	90.43	V (cc)	90.99	V (cc)	91.16
Prooving Ring	34.20	Prooving Ring	33.75	Prooving Ring	33.63
Sigma3	250	Sigma3	500	Sigma3	750
MC Before (%)	58.1	MC Before (%)	58.6	MC Before (%)	51.2
MC After (%)	57.8	MC After (%)	58.3	MC After (%)	51.1
Bulk Density (kg/m3)	1662	Bulk Density (kg/m^3)	1634	Bulk Density (kg/m^3)	1695
Dry Density (kg/m3)	1051	Dry Density (kg/m^3)	1030	Dry Density (kg/m^3)	1121

Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.14	0	0	11.19	0	0	11.21	0	0
11.17	0.25	19.9	11.22	0.25	23.5	11.24	0.25	41.3
11.20	0.49	24.4	11.25	0.49	36.0	11.27	0.49	83.6
11.23	0.74	26.8	11.28	0.74	42.5	11.30	0.74	110.2
11.25	0.99	27.4	11.30	0.98	45.4	11.32	0.98	123.3
11.28	1.23	29.7	11.33	1.23	48.2	11.35	1.23	135.7
11.35	1.85	33.1	11.40	1.85	53.3	11.42	1.85	150.7
11.42	2.46	35.6	11.47	2.46	55.9	11.49	2.46	160.9
11.50	3.08	38.1	11.55	3.08	57.9	11.57	3.08	168.6
11.57	3.70	39.0	11.62	3.69	59.5	11.64	3.69	171.9
11.65	4.31	40.5	11.70	4.31	61.2	11.72	4.31	175.7
11.72	4.93	40.9	11.77	4.92	64.5	11.79	4.92	177.4
11.80	5.55	42.0	11.85	5.54	65.5	11.87	5.54	178.5
11.87	6.16	43.2	11.93	6.15	66.5	11.95	6.15	179.6
11.95	6.78	43.5	12.00	6.77	67.5	12.03	6.77	179.0
12.03	7.39	44.9	12.08	7.38	67.0	12.11	7.38	177.8
12.11	8.01	45.2	12.17	8.00	68.0	12.19	8.00	176.6
12.19	8.63	46.3	12.25	8.61	68.9	12.27	8.61	175.4
12.28	9.24	47.4	12.33	9.23	69.0	12.35	9.23	174.8
12.36	9.86	47.0	12.41	9.84	70.1	12.44	9.84	175.8
12.45	10.47	47.3	12.50	10.46	70.7	12.52	10.46	175.9
12.53	11.09	48.6	12.59	11.07	71.9	12.61	11.07	175.5
12.62	11.71	48.8	12.67	11.69	72.4	12.70	11.69	174.3
12.71	12.32	48.4	12.76	12.30	74.0	12.78	12.30	172.3
12.80	12.94	48.6	12.85	12.92	74.1	12.88	12.92	171.1
12.89	13.56	48.3	12.94	13.53	75.1	12.97	13.53	168.6
12.98	14.17	48.7	13.04	14.15	75.1			
13.08	14.79	49.7	13.13	14.76	74.5			
13.17	15.40	49.9	13.23	15.38	76.6			
13.27	16.02	51.6	13.32	15.99	76.0			
13.37	16.64	51.7	13.42	16.61	75.4			
13.47	17.25	53.3	13.52	17.22	74.9			
13.57	17.87	52.9	13.62	17.84	75.6			
13.67	18.48	53.0	13.72	18.45	75.7			
13.77	19.10	52.6	13.83	19.07	75.2			
13.88	19.72	53.0	13.93	19.68	75.1			
13.99	20.33	53.3	14.04	20.30	75.0			
14.10	20.95	53.4	14.15	20.91	75.1			
14.21	21.57	53.4	14.26	21.53	75.3			
14.32	22.18	53.7	14.38	22.14	75.1			
14.43	22.80	54.5	14.49	22.76	74.5			
14.55	23.41	56.4	14.61	23.37	73.9			
14.67	24.03	56.0	14.72	23.99	72.2			
14.79	24.65	56.0						
14.91	25.26	56.9						
15.03	25.88	56.4						
15.16	26.49	56.4						
15.29	27.11	55.9						
15.42	27.73	55.9						
15.55	28.34	57.2						
15.69	28.96	56.7						
15.82	29.57	56.2						
15.96	30.19	56.8						
16.10	30.81	57.8						

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

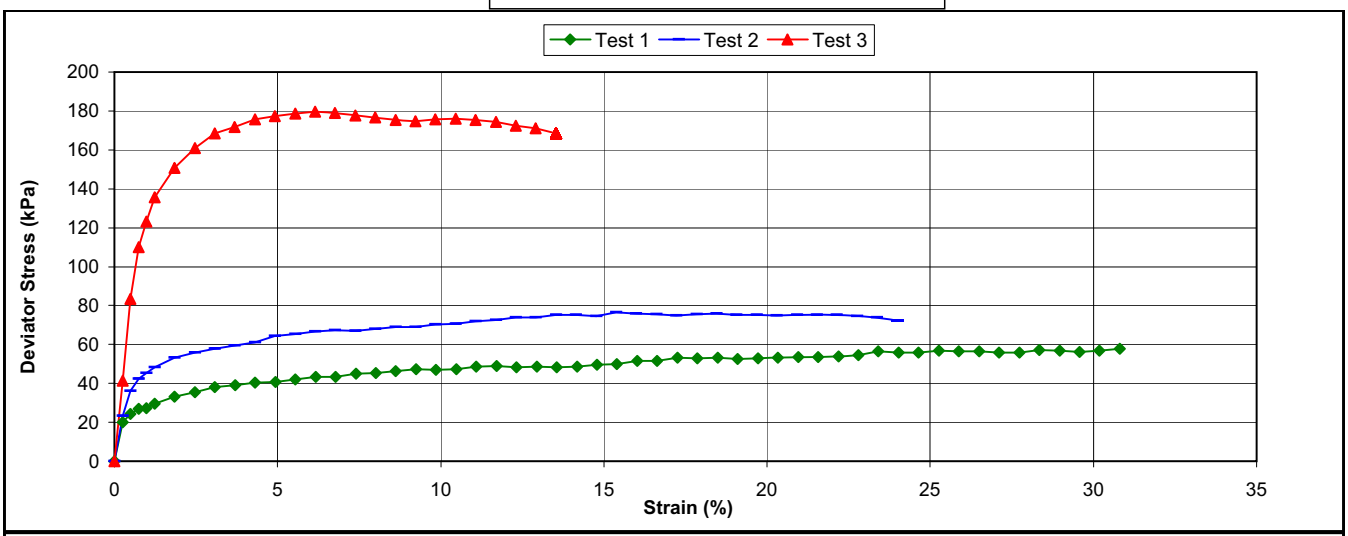
Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01027
Depth (m): 25.65 - 26.20
Position: BHL 210A
Description: -

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	250	500	750
Dry Density (kg/m^3)	1051	1030	1121
NMC(%)	58.1	58.6	51.2
Axial Strain (%)	30.81	15.38	6.15
Shear Stress at Failure (kPa)	29	38	90

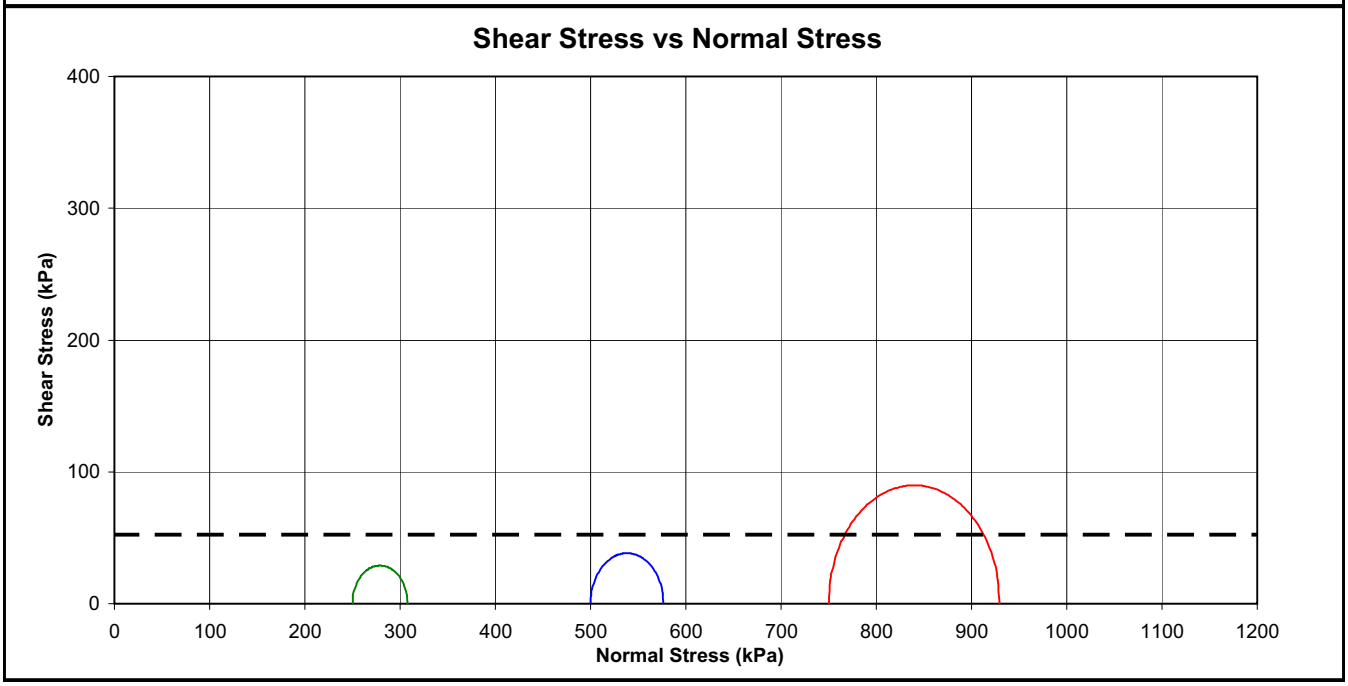
Average Cohesion

C (kPa) 52

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



Project: Berth Deepening - Durban Harbour
Ref no.: 5531
Lab no.: 01031
Depth: 28.70 - 29.25
Position: BHL 210A
Description: -

THEKWINI SOILS LAB. CC
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P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Test 1			**Test 2**			**Test 3**		
Inputs			Inputs			Inputs		
L (cm)	8.13		L (cm)	0.00		L (cm)	0.00	
A (cm^2)	11.03		A (cm^2)			A (cm^2)		
V (cc)	89.71		V (cc)			V (cc)		
Prooving Ring	34.22		Prooving Ring	0.00		Prooving Ring	0.00	
Sigma3	750		Sigma3	0		Sigma3	0	
MC Before (%)	39.4		MC Before (%)			MC Before (%)		
MC After (%)	39.2		MC After (%)			MC After (%)		
Bulk Density (kg/m3)	1794		Bulk Density (kg/m^3)			Bulk Density (kg/m^3)		
Dry Density (kg/m3)	1287		Dry Density (kg/m^3)			Dry Density (kg/m^3)		
Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)	Area at Test	%Strain	Deviator Stress (kPa)
11.03	0	0		0	0		0	0
11.06	0.25	27.8						
11.09	0.49	33.9						
11.12	0.74	35.4						
11.14	0.98	37.5						
11.17	1.23	39.8						
11.24	1.85	42.0						
11.31	2.46	43.9						
11.38	3.08	46.6						
11.46	3.69	47.8						
11.53	4.31	49.9						
11.61	4.92	49.5						
11.68	5.54	49.8						
11.76	6.15	49.5						
11.84	6.77	49.2						
11.91	7.38	48.8						
11.99	8.00	48.5						
12.07	8.61	48.2						
12.16	9.23	47.9						
12.24	9.84	47.5						
12.32	10.46	47.2						
12.41	11.07	45.5						
12.49	11.69	44.4						

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

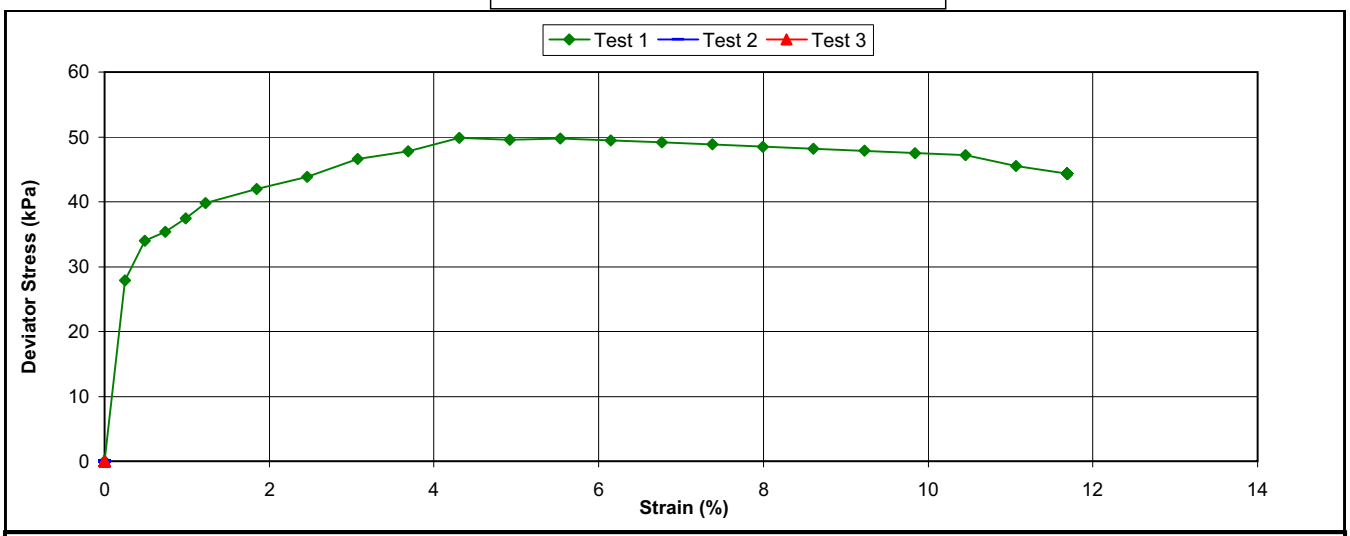
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Berth Deepening - Durban Harbour
Ref no. 5531
Lab no. 01031
Depth (m): 28.70 - 29.25
Position: BHL 210A
Description: -

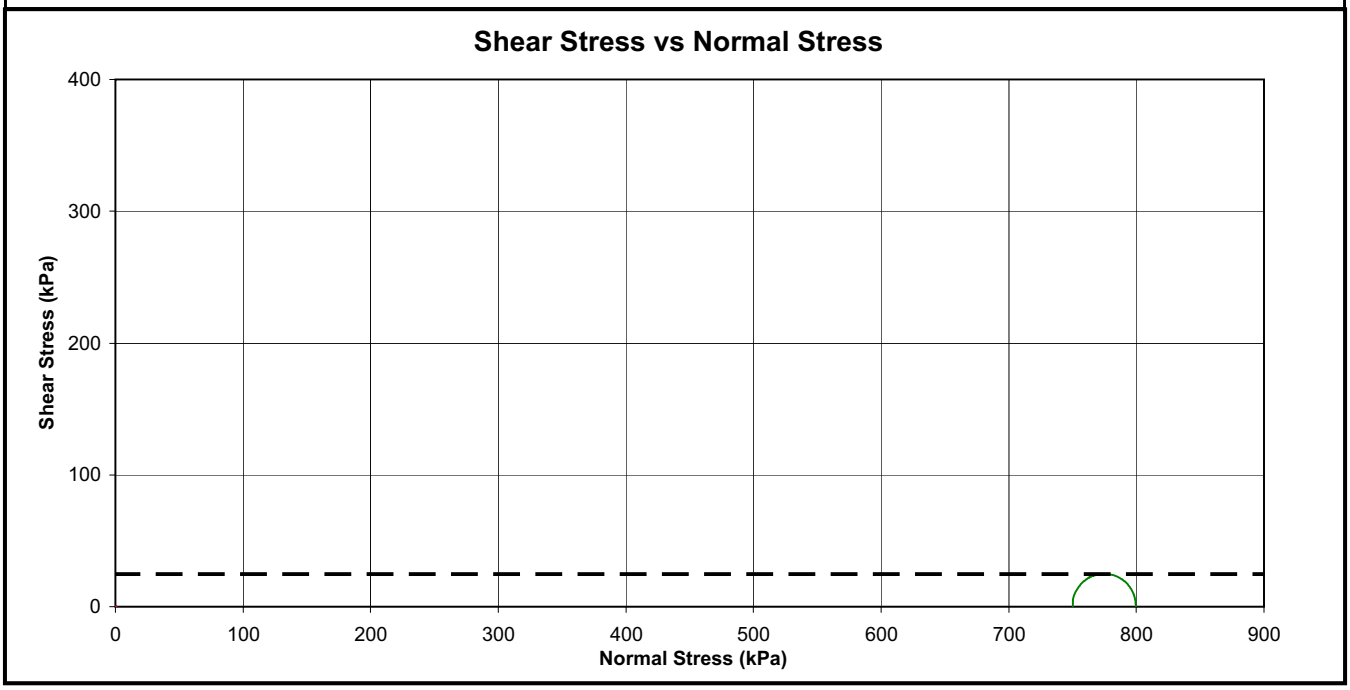
	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	750	0	0
Dry Density (kg/m^3)	1287	0	0
NMC(%)	39.4		
Axial Strain (%)	4.31	0.00	0.00
Shear Stress at Failure (kPa)	25	0	0

Average Cohesion
C (kPa) 25

Deviator Stress vs Axial Strain



Shear Stress vs Normal Stress



APPENDIX C

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.96	1.97
Specimen Length	mm	121.00	Dry Density	Mg/m3	1.58	1.60
Specimen Diameter	mm	58.50	Moisture	%	24.12	23.17
Area	mm2	2687.83	Saturation	%	92.30	90.80
Volume	cc	325.23	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	0.94	0.94
3	200	0.95	0.95
4	300	0.96	0.96
5	500	0.96	0.96

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

At Maximum Deviator stress

Deviator Stress (kPa)	783.4
External Axial Strain (%)	14.34
Shear Stress (kPa)	391.7
Pore Water Pressure (kPa)	-68
Radial Effective Stress (kPa)	268
Axial Effective Stress (kPa)	1051
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft brown slightly clayey/silty SAND.

Notes:

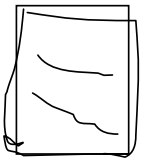
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

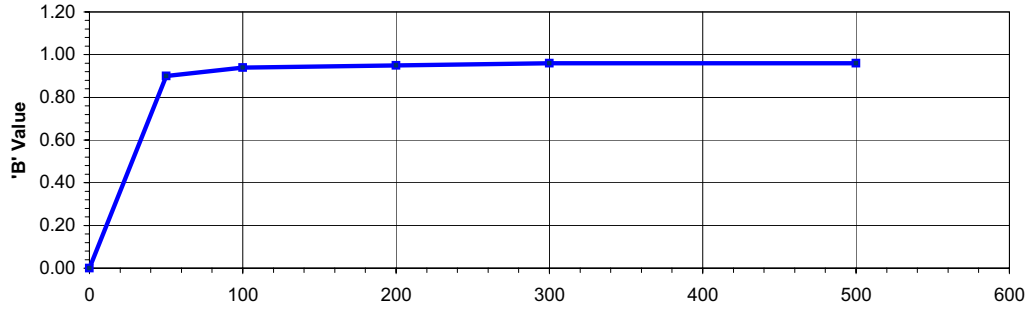
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL102
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	31.0m

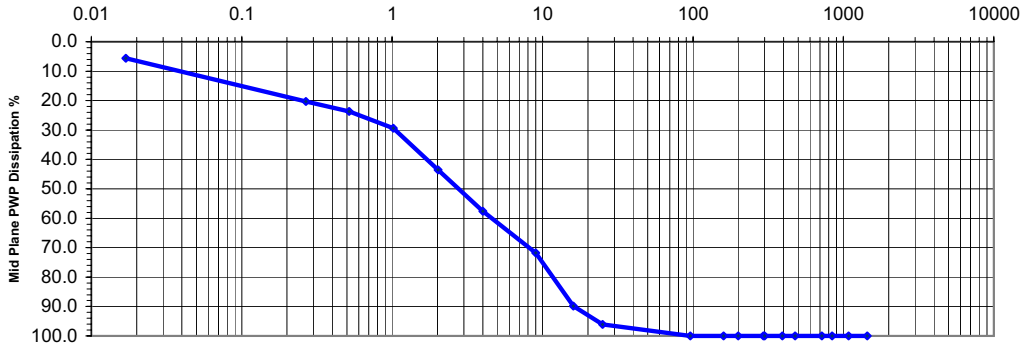
Saturation

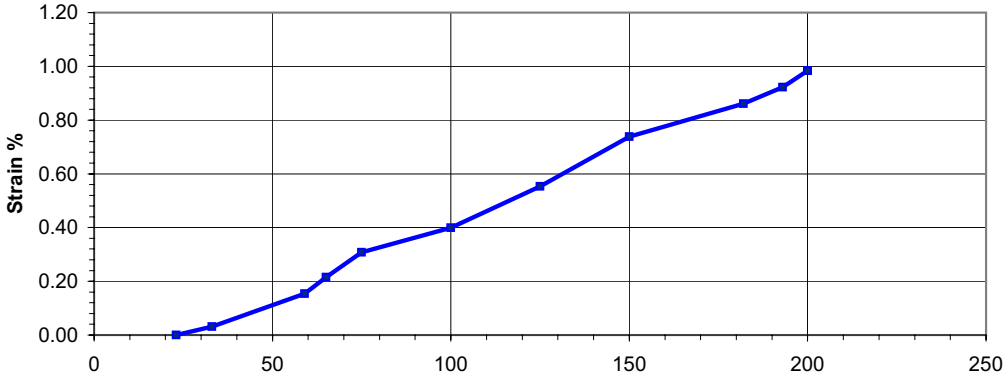


Cell Pressure kPa

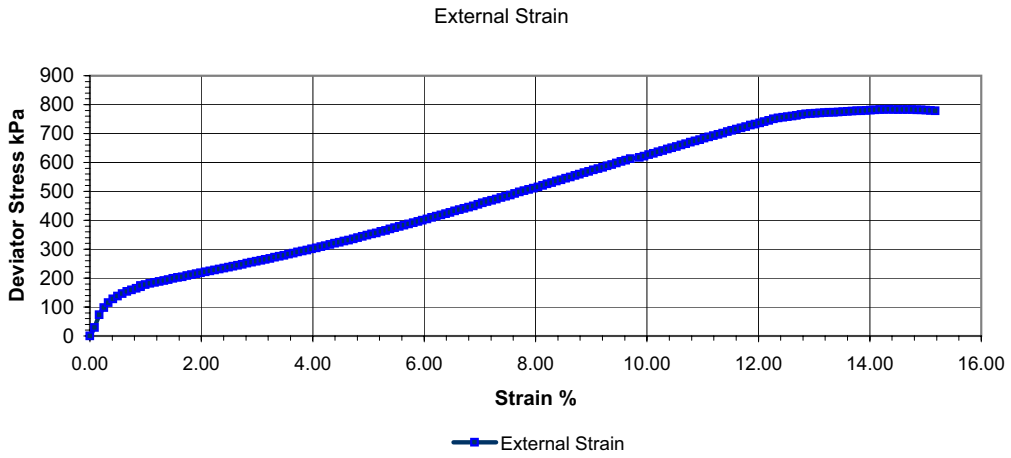
Isotropic Consoliadtion

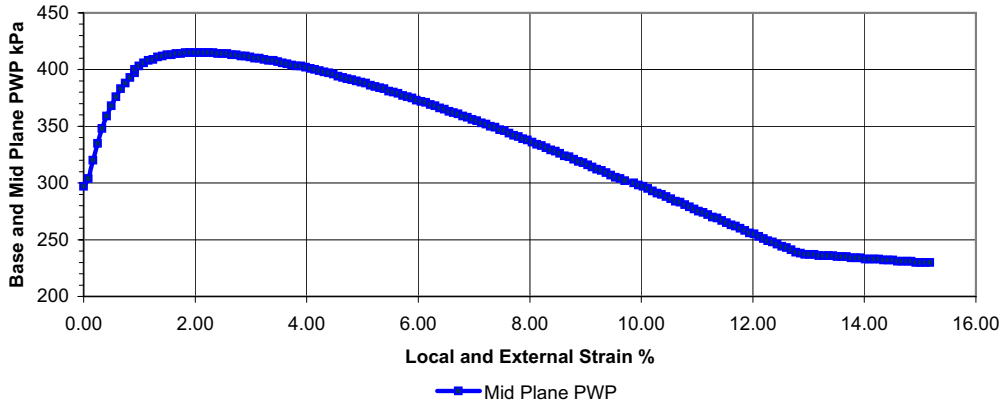
Time Mins

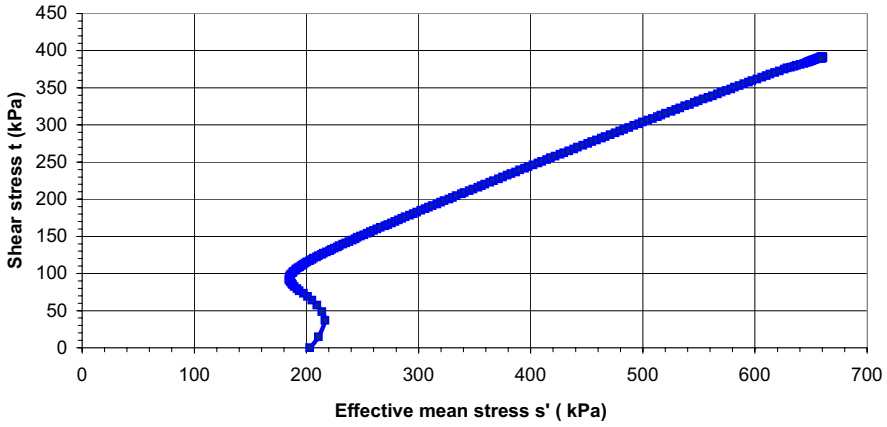




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BH102
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.0m

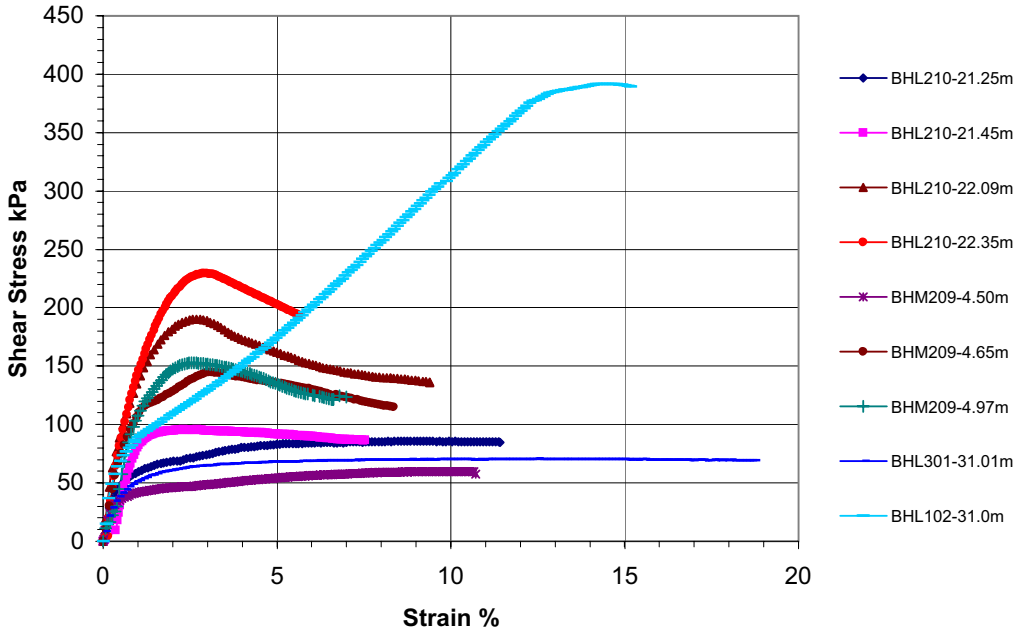


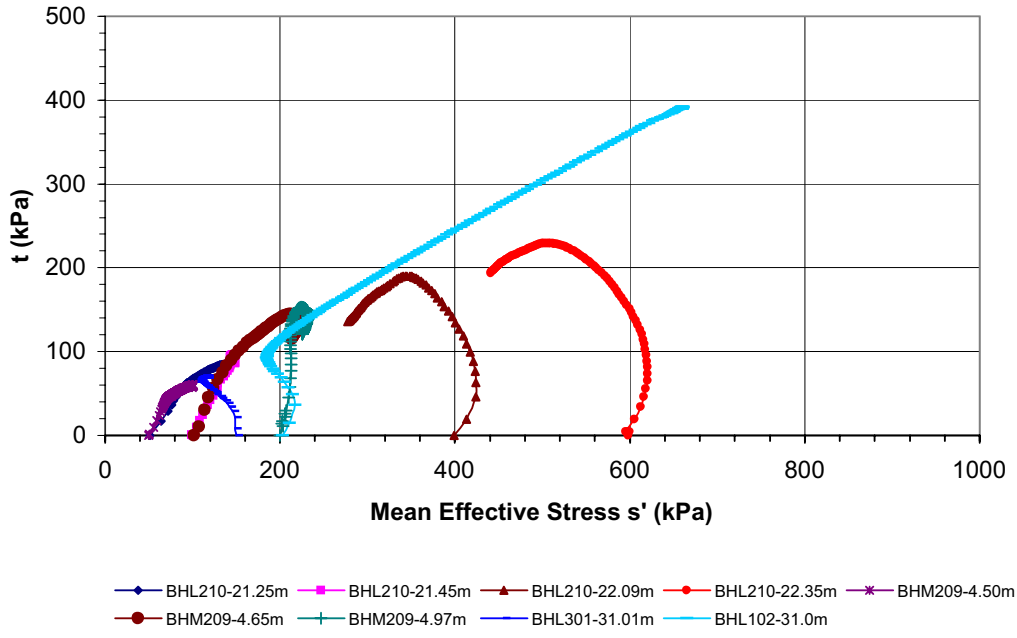




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL102
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.0m

Combined Stress Path Plots





c'	1	kPa	c'	1	kPa
Φ'	38.6°		Φ'	29.9°	

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL209-210-102
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth	21-45-22.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.82	1.89
Specimen Length	mm	123.04	Dry Density	Mg/m3	1.35	1.45
Specimen Diameter	mm	60.10	Moisture	%	35.27	30.41
Area	mm2	2836.87	Saturation	%	94.85	95.03
Volume	cc	349.05	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.78	0.78
2	100	0.94	0.94
3	150	0.96	0.96
4	200	1.00	1.00
5	300	0.99	0.99
6	450	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	450
Back Pressure	kPa	300
Radial Effective stress	kPa	150

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	131.0
External Axial Strain (%)	12.41
Shear Stress (kPa)	65.5
Pore Water Pressure (kPa)	98
Radial Effective Stress (kPa)	52
Axial Effective Stress (kPa)	183
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

Sample Description: Firm dark grey slightly brown sandy SILTY/CLAY with shell fragments.

Compound failure

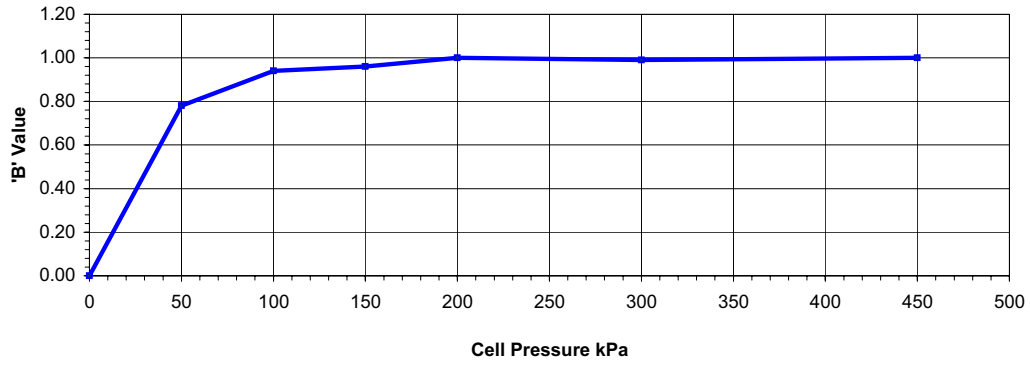
NM TL Ltd

Consolidated undrained triaxial compression test with base and mid plane pore pressure.

Project: Durban Harbour Berth Deepening Study

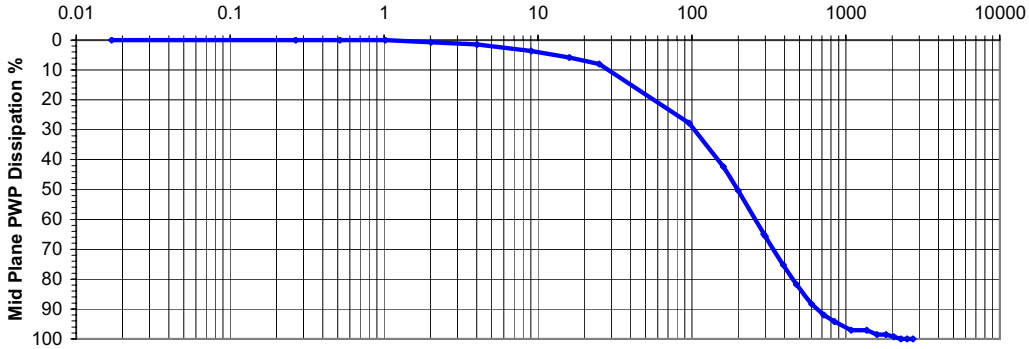
Project No.	NMTL-523
Borehole No.	BHL 103A
Sample No.	1-Top
Depth.	28.8-29.35m

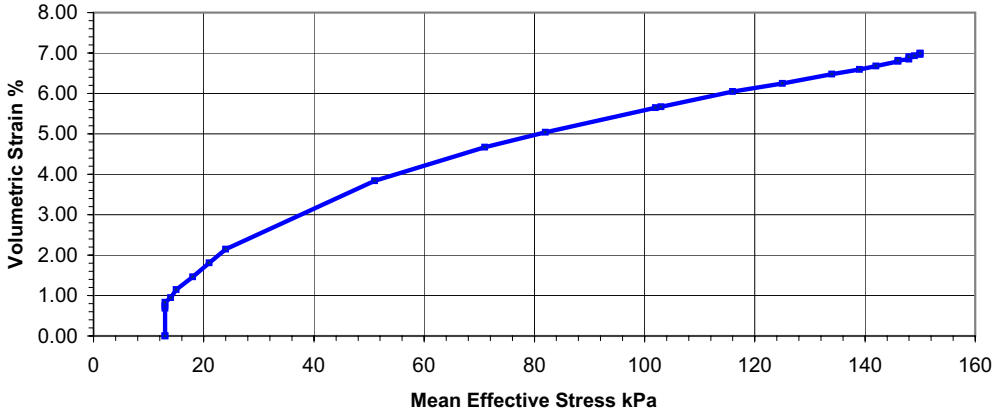
Saturation



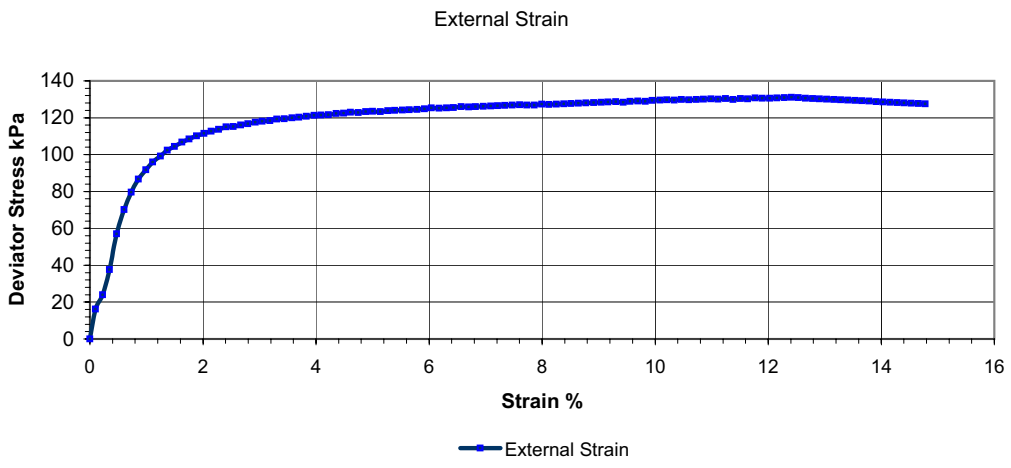
Isotropic Consoliadtion

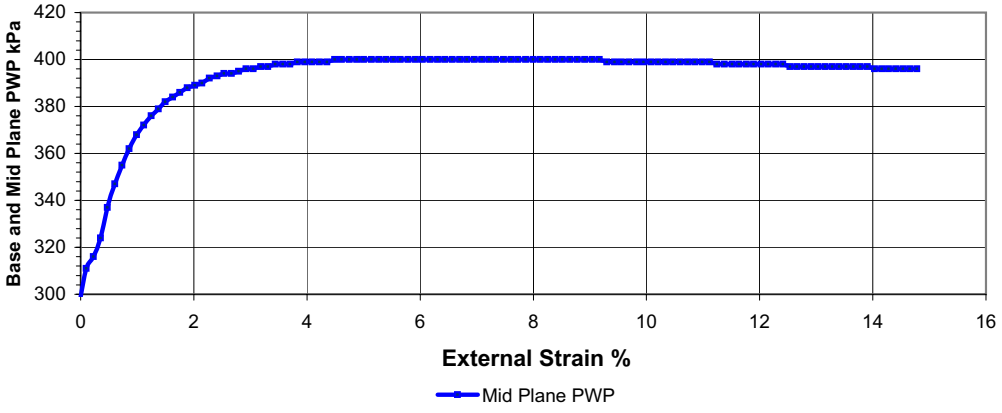
Time Mins

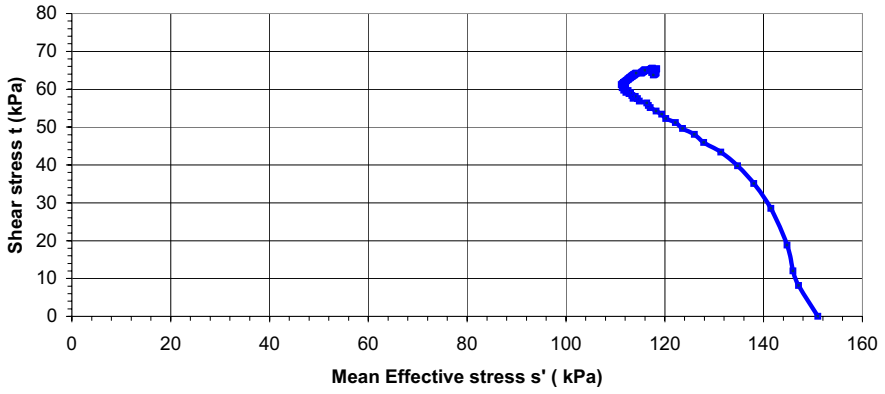




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	28.8-29.35m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	28.8-29.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.79	1.84
Specimen Length	mm	123.47	Dry Density	Mg/m3	1.33	1.36
Specimen Diameter	mm	60.33	Moisture	%	34.04	34.88
Area	mm2	2858.62	Saturation	%	89.55	95.71
Volume	cc	352.95	Sg(Assumed)	2.70		

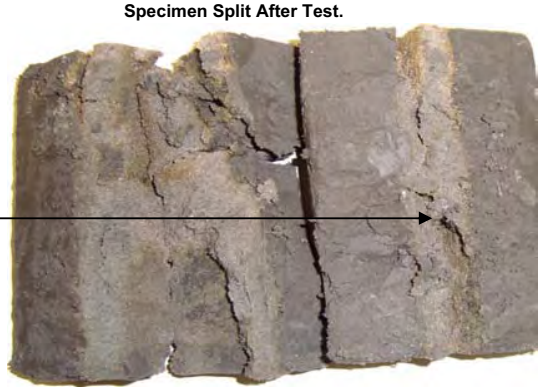
Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.38	0.38
2	100	0.72	0.72
3	150	0.68	0.68
4	200	0.66	0.66
5	250	0.80	0.80
6	300	0.86	0.86
7	400	0.92	0.92
8	500	0.96	0.96
9	600	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	600
Back Pressure	kPa	300
Radial Effective stress	kPa	300

A Layer of fine to medium sand running at the centre Of specimen. Layer 7 to 10mm thick

Specimen Split After Test.



At Maximum Deviator stress

Deviator Stress (kPa)	386.4
External Axial Strain (%)	1.88
Shear Stress (kPa)	193.2
Pore Water Pressure (kPa)	160
Radial Effective Stress (kPa)	140
Axial Effective Stress (kPa)	526
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Firm dark grey/brown sandy SILTY/CLAY with sand in middle of sample
	Brittle

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

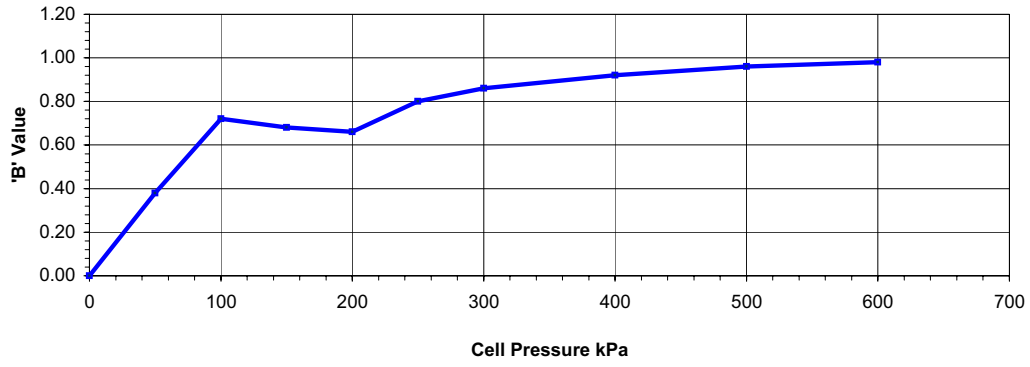
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

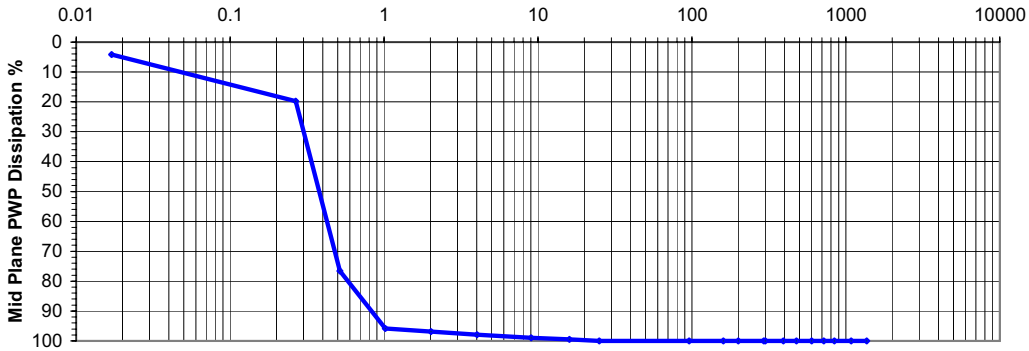
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	28.8-29.35m

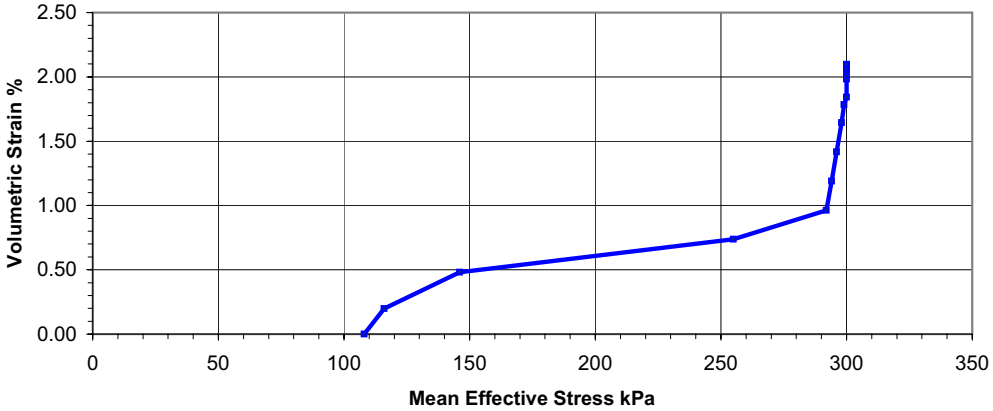
Saturation



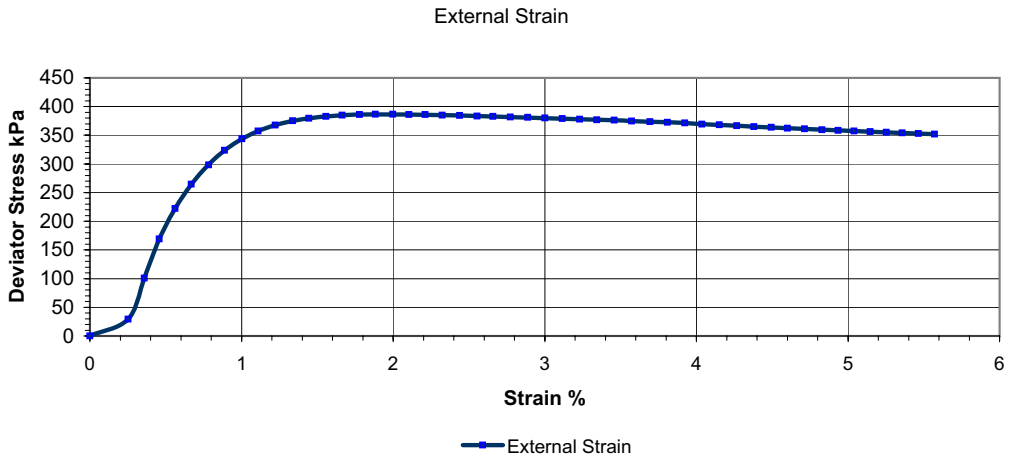
Isotropic Consoliadtion

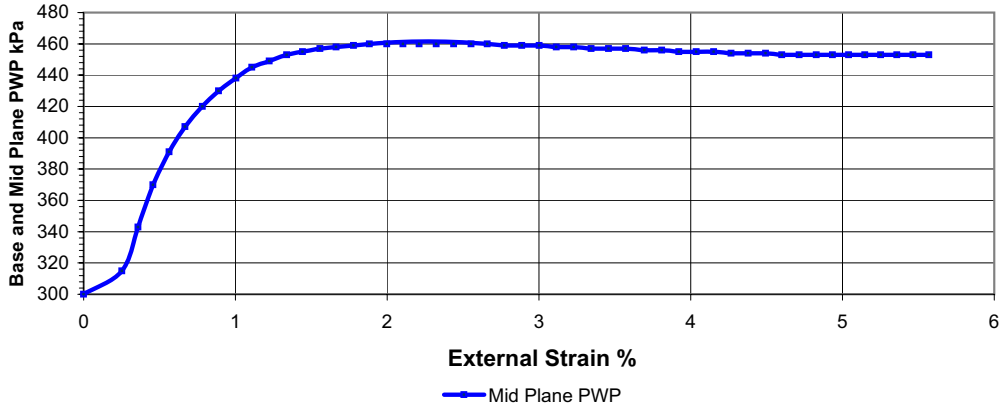
Time Mins

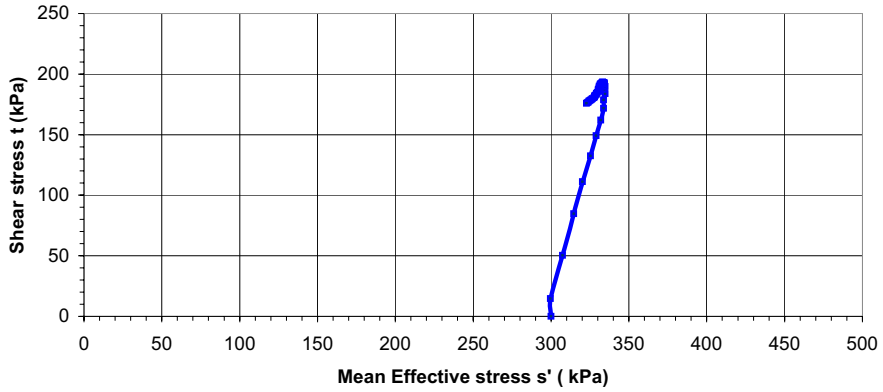




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	28.8-29.35m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	28.8-29.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.80	1.82
Specimen Length	mm	131.25	Dry Density	Mg/m3	1.30	1.34
Specimen Diameter	mm	60.62	Moisture	%	38.75	35.90
Area	mm2	2886.17	Saturation	%	96.46	95.85
Volume	cc	378.81	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.72	0.72
2	100	0.76	0.76
3	150	0.82	0.82
4	200	0.94	0.94
5	300	0.92	0.92
6	500	0.96	0.96
7	700	0.97	0.97
8	900	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	900
Back Pressure	kPa	300
Radial Effective stress	kPa	600

Fine to medium sand running at the centre of sample
Thickness 7 to 10mm

Sand Layer running vertically along the specimen, thickness 7 to 10mm

Specimen Split After Test.

At Maximum Deviator stress

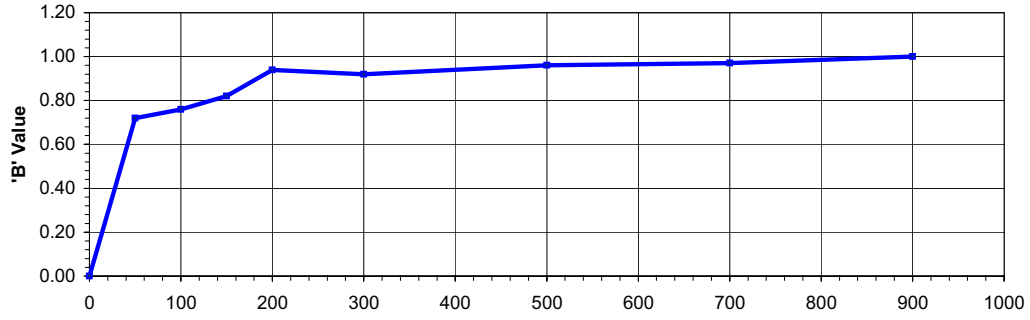
Deviator Stress (kPa)	487.0
External Axial Strain (%)	2.47
Shear Stress (kPa)	243.5
Pore Water Pressure (kPa)	351
Radial Effective Stress (kPa)	249
Axial Effective Stress (kPa)	736
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Firm dark grey sandy SILTY/CLAY with sand in middle of sample
	Brittle

Notes:
1 Test performed in accordance with Moors Spence Jones specification.
2 Side drain corrections not applied
3 Membrane correction not applied

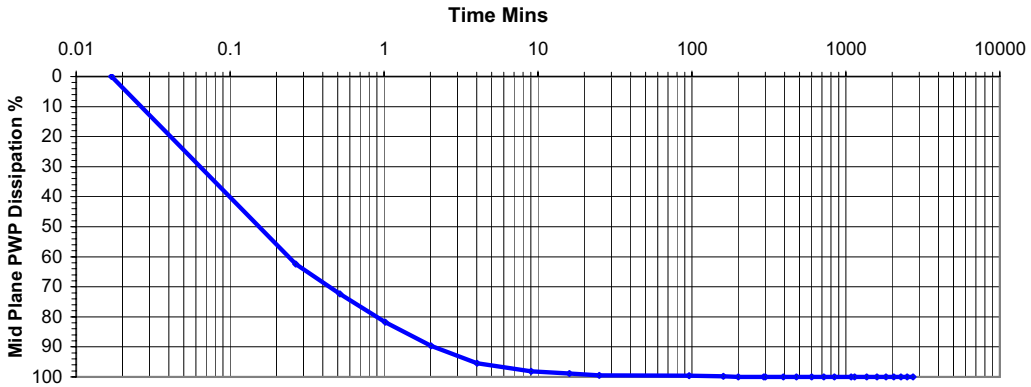
Specimen After Test

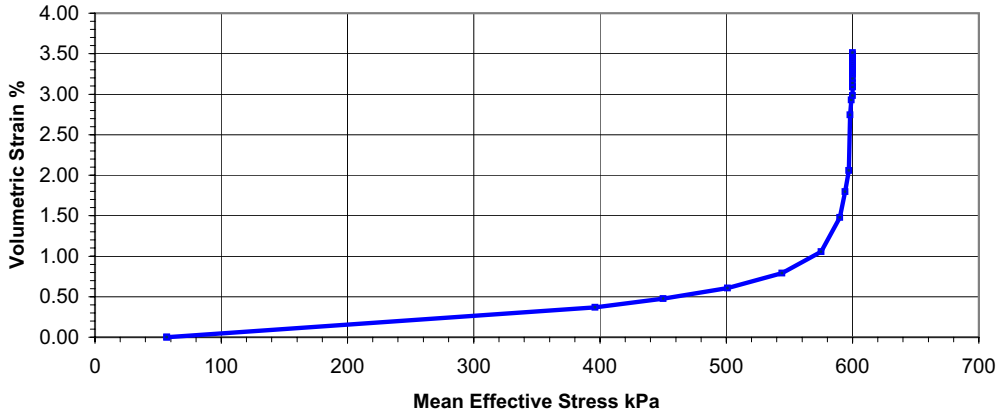
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	28.8-29.35m

Saturation

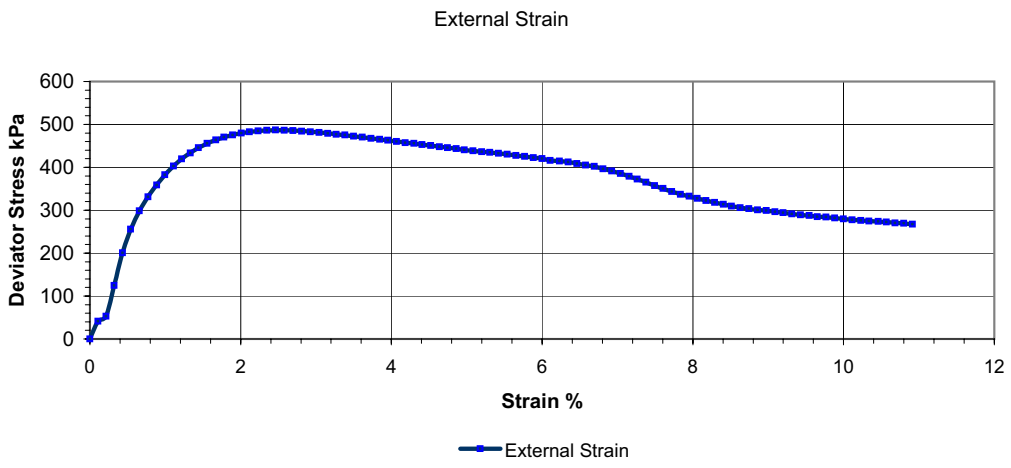


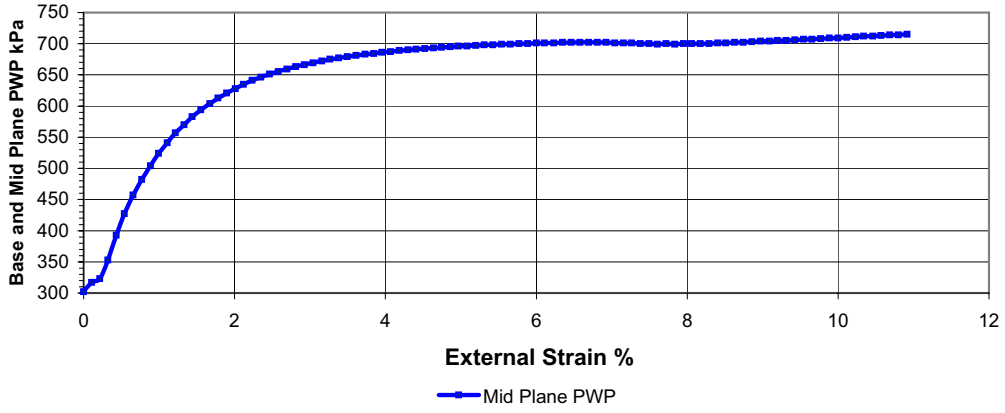
Isotropic Consoliadtion

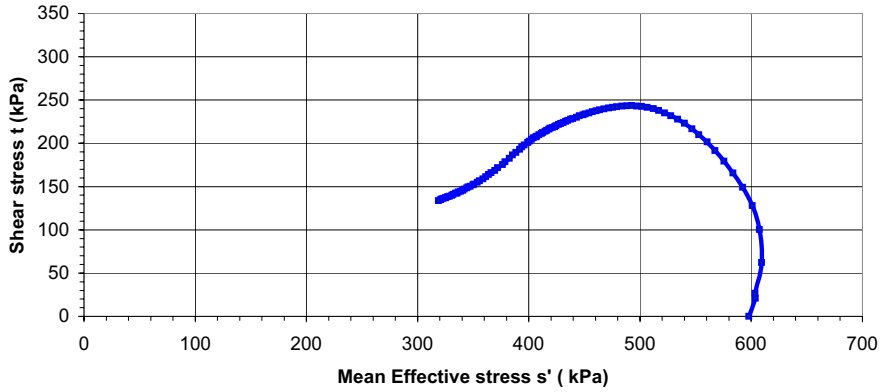




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	28.8-29.35m

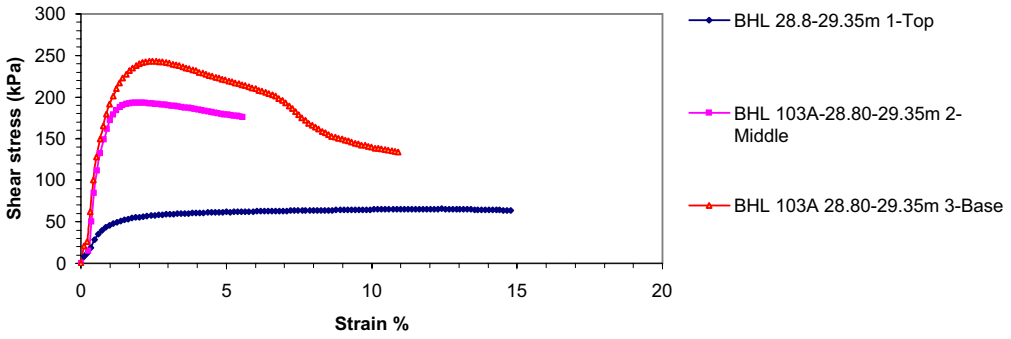


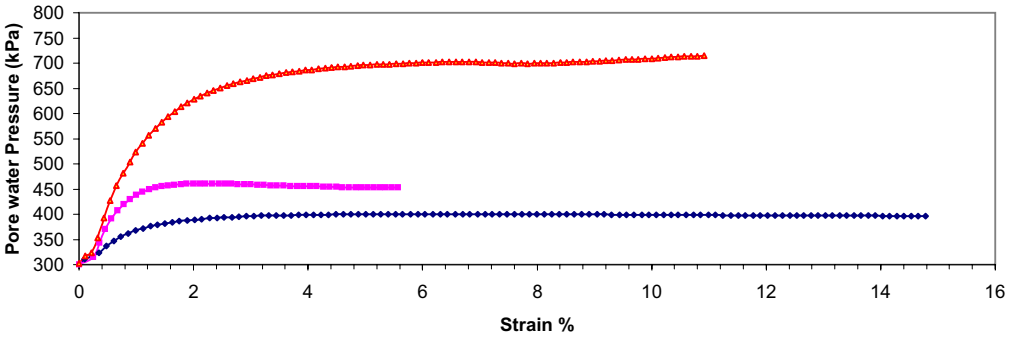


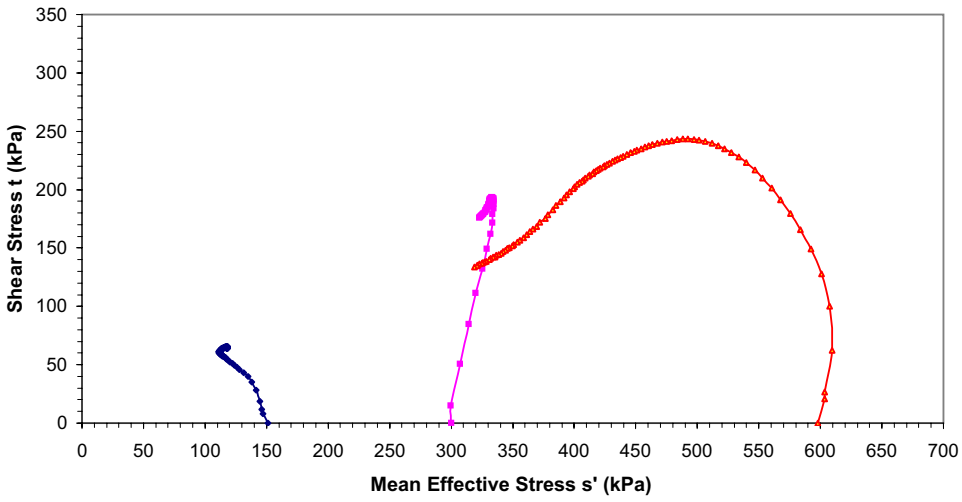


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	28.8-29.35m

Combined Stress Path Plots







c' **2.5** **kPa**
Φ' **32.9°**

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL103A
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth	28.80-29.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.57	1.67
Specimen Length	mm	122.00	Dry Density	Mg/m3	0.95	1.07
Specimen Diameter	mm	60.10	Moisture	%	64.53	56.37
Area	mm2	2836.87	Saturation	%	94.78	99.80
Volume	cc	346.10	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.94	0.94
3	200	0.96	0.96
4	300	0.96	0.96
5	400	1.00	1.00

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

At Maximum Deviator stress

Deviator Stress (kPa)	123.5
External Axial Strain (%)	6.99
Shear Stress (kPa)	61.7
Pore Water Pressure (kPa)	67
Radial Effective Stress (kPa)	33
Axial Effective Stress (kPa)	156
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Firm dark grey occasionally brown SILT/CLAY with shell fragments

Notes:

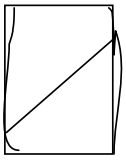
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

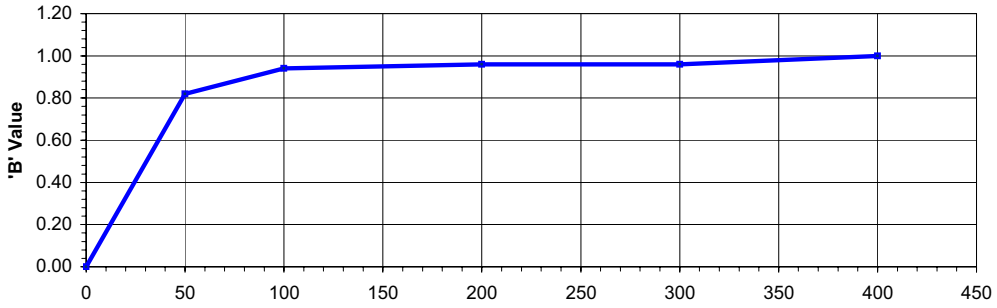
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.0m

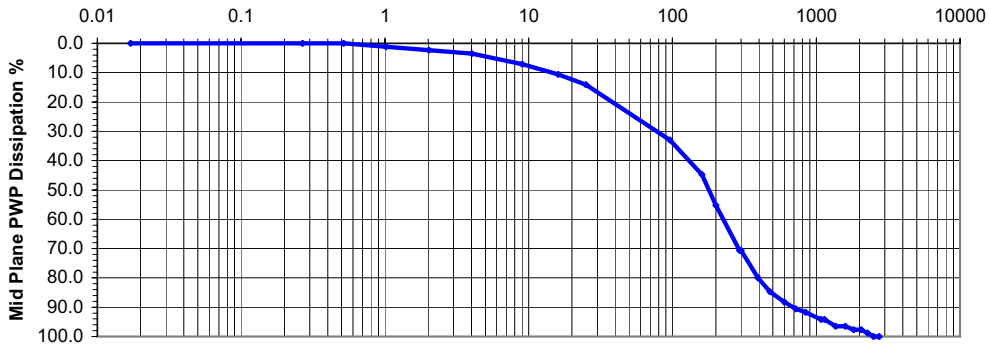
Saturation

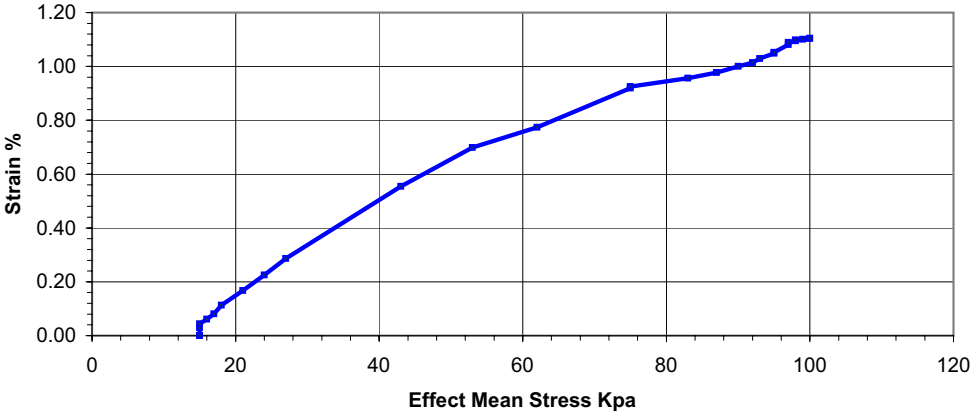


Cell Pressure kPa

Isotropic Consoliadtion

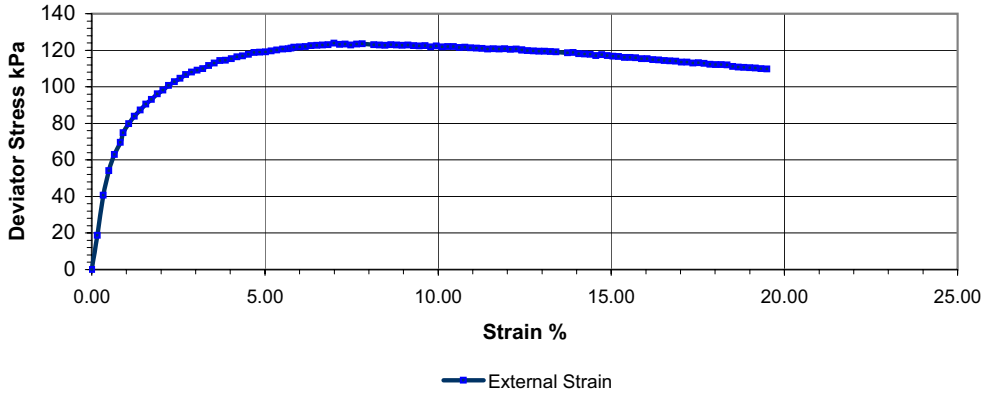
Time Mins

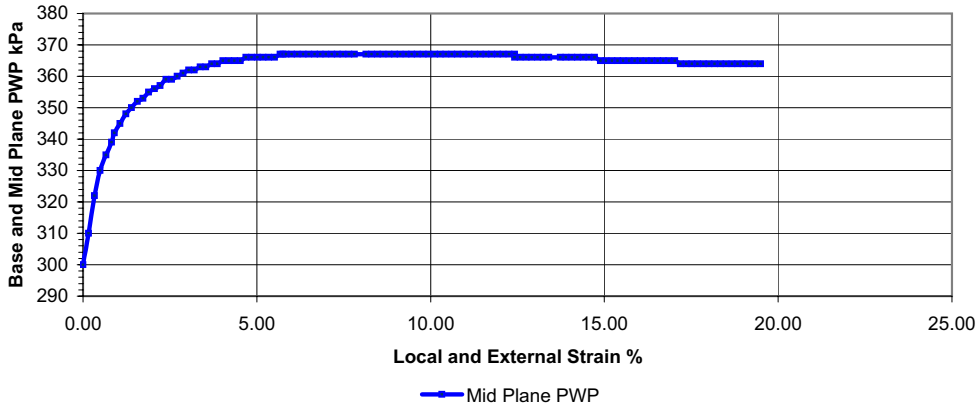


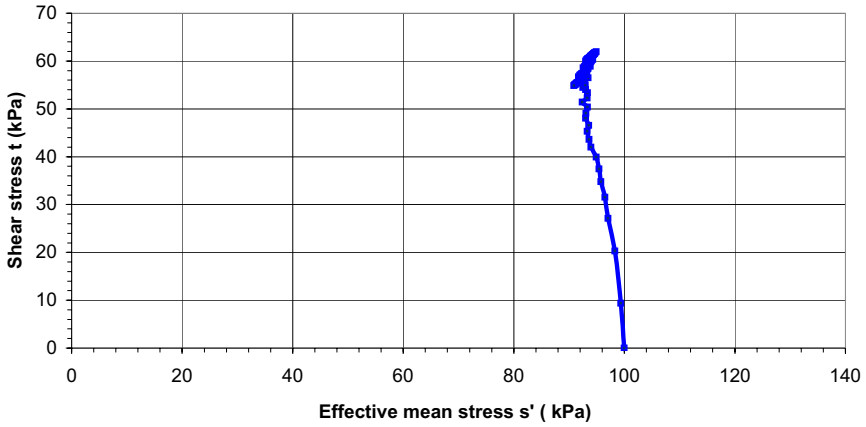


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.0m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.0m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.63	1.65
Specimen Length	mm	130.40	Dry Density	Mg/m3	1.03	1.04
Specimen Diameter	mm	60.10	Moisture	%	58.11	59.03
Area	mm2	2836.87	Saturation	%	97.01	99.45
Volume	cc	369.93	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.16	0.16
2	100	0.16	0.16
3	150	0.20	0.20
4	200	0.34	0.34
5	300	0.60	0.60
5	400	0.76	0.76
5	500	0.92	0.92

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

At Maximum Deviator stress

Deviator Stress (kPa)	247.8
External Axial Strain (%)	3.27
Shear Stress (kPa)	123.9
Pore Water Pressure (kPa)	130
Radial Effective Stress (kPa)	70
Axial Effective Stress (kPa)	318
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Firm dark grey occasionally brown SILT/CLAY with shell fragments

Notes:

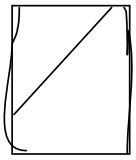
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

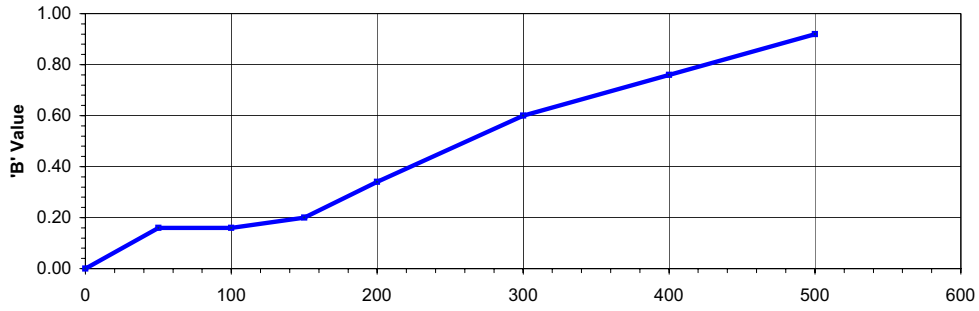
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.30m

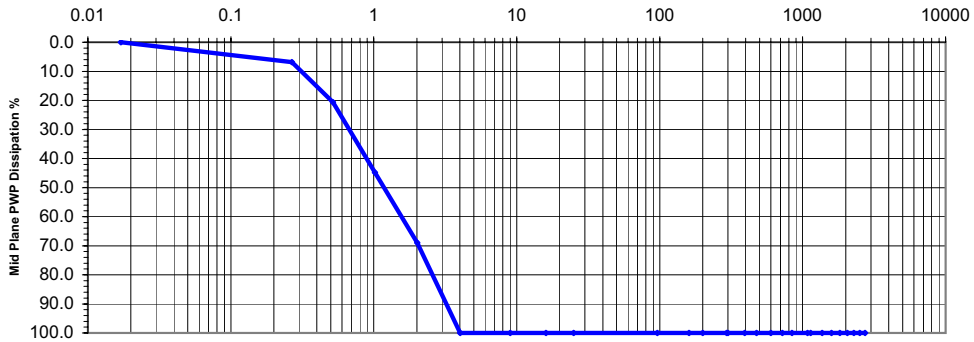
Saturation

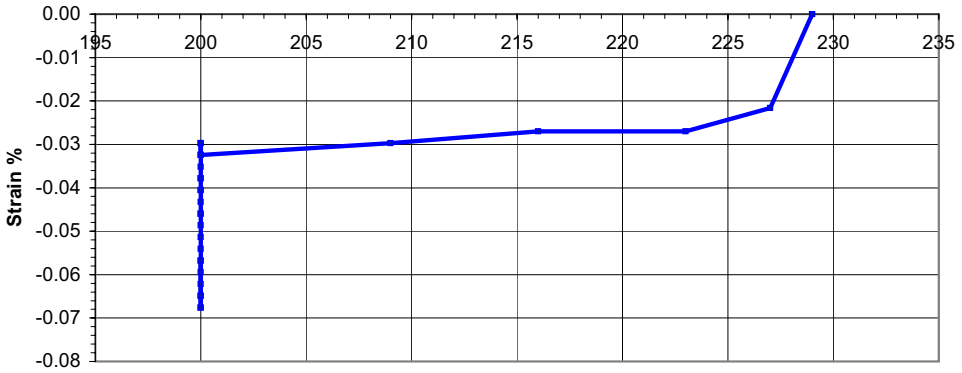


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

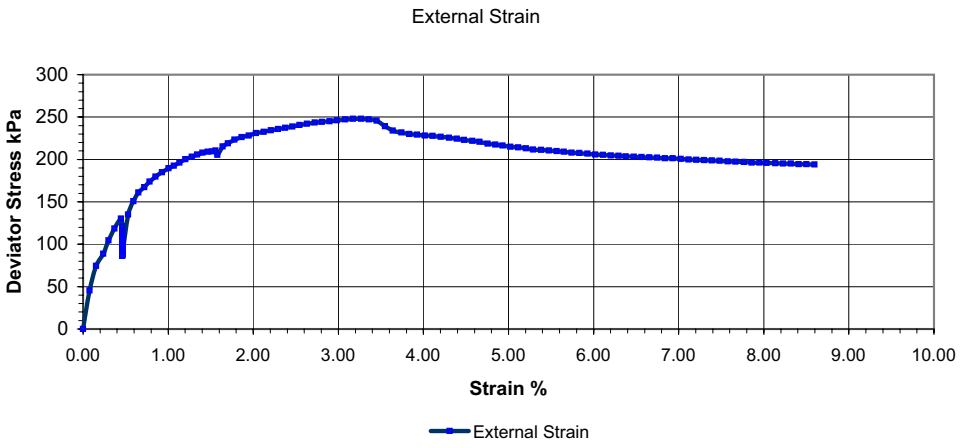


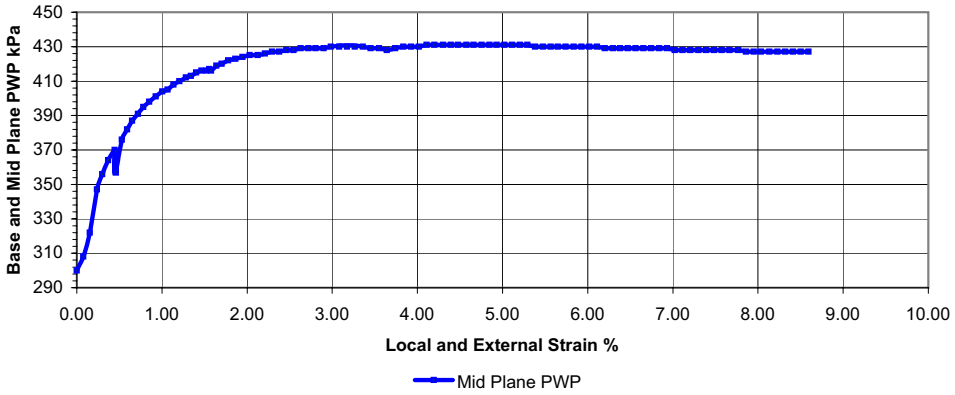


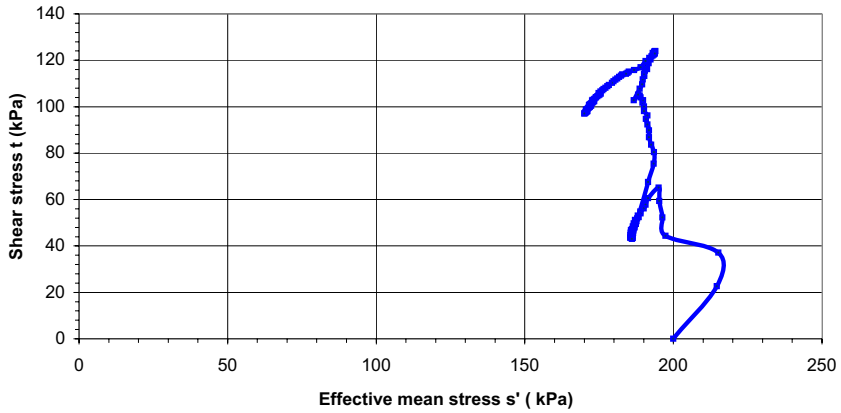
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.30m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.30m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.61	1.65
Specimen Length	mm	120.50	Dry Density	Mg/m3	1.03	1.06
Specimen Diameter	mm	60.20	Moisture	%	56.20	55.55
Area	mm2	2846.31	Saturation	%	94.11	96.86
Volume	cc	342.98	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.16	0.16
2	100	0.28	0.28
3	200	0.35	0.35
4	300	0.56	0.56
5	400	0.76	0.76
5	500	0.86	0.86
6	600	0.93	0.93
6	700	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

At Maximum Deviator stress

Deviator Stress (kPa)	375.5
External Axial Strain (%)	2.61
Shear Stress (kPa)	187.8
Pore Water Pressure (kPa)	282
Radial Effective Stress (kPa)	118
Axial Effective Stress (kPa)	494
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Firm dark grey occasionally brown SILT/CLAY with shell fragments

Notes:

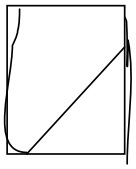
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

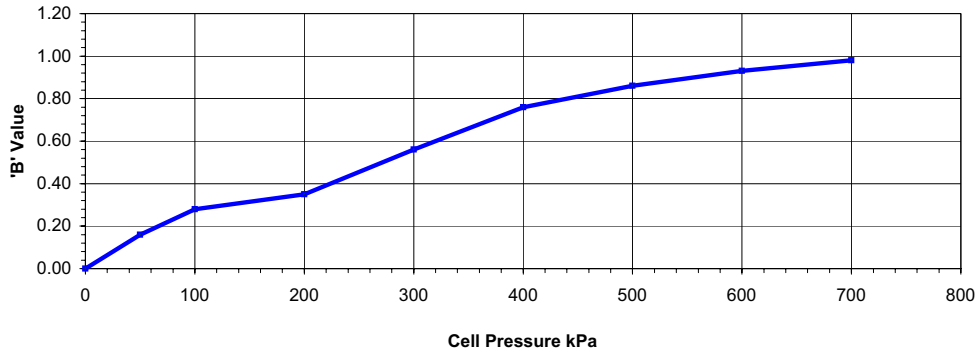
3 Side drain corrections not applied

Specimen After Test



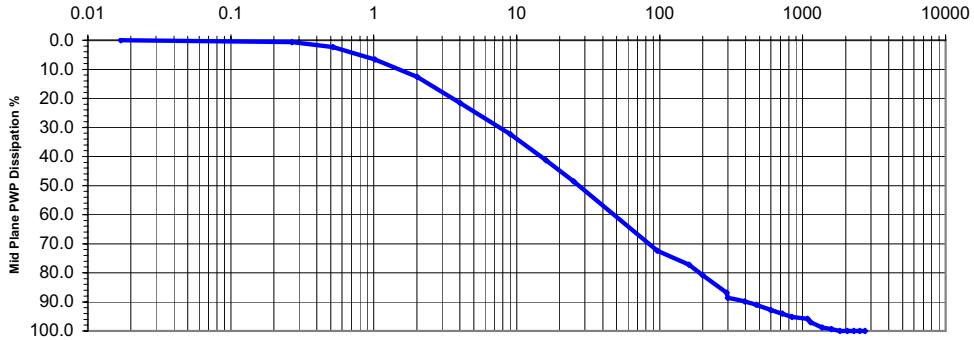
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.43m

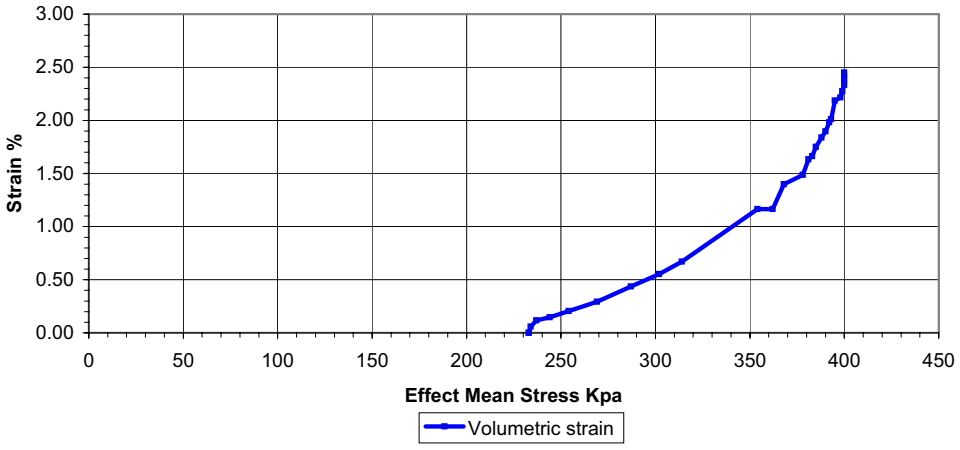
Saturation



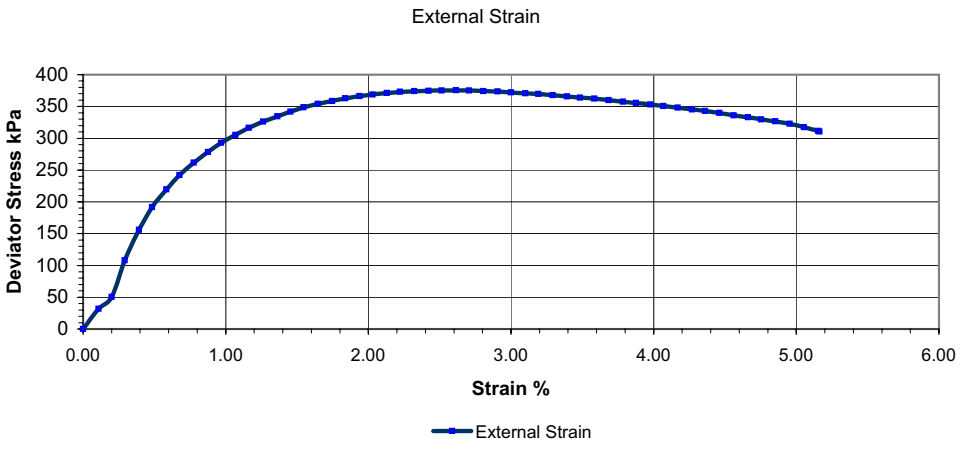
Isotropic Consoliadtion

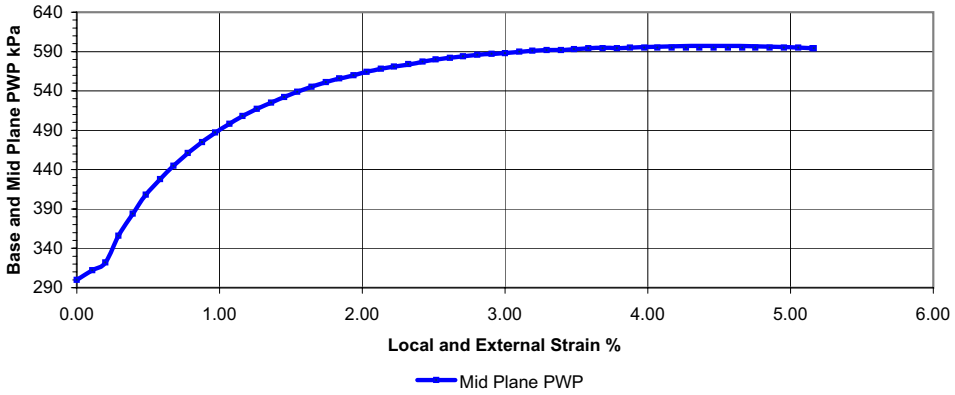
Time Mins

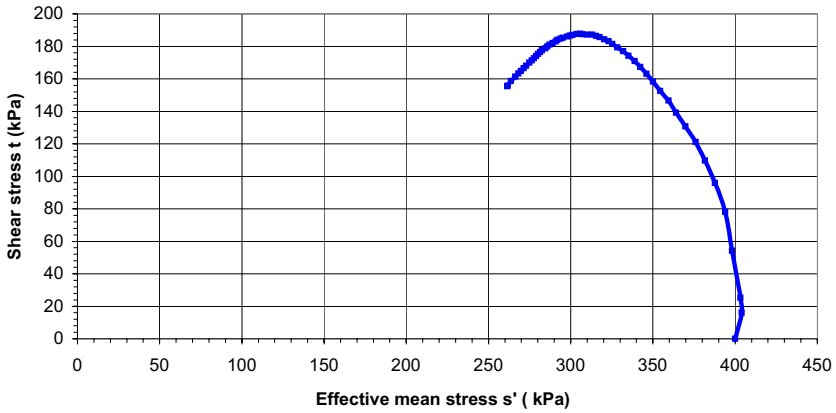




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.43m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH108
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	25.43m

Oedometer Settlement Tests

Test Method: BS177 : Part 5 : 1990 Clause 3

Sample Details

Soil description:		Firm dark grey ocassionally brown SILT/CLAY with shell frafments.
Initial height (mm)		20.0
Diameter (mm)		50
Initial wet weight of specimen (gms)		63.19
Bulk density (Mg/m3)		1.61
Particle density	(Assumed)	2.70

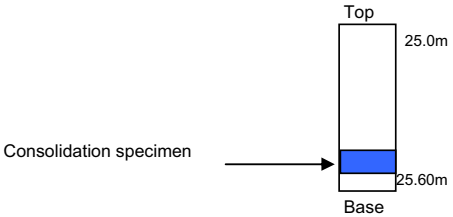
Initial conditions

Settlement Channel	GD033
Moisture content (%)	61.24
Dry density (Mg/m3)	1.00
Initial Voids Ratio	1.71
Deg of Saturation (%)	96.93
Swelling pressure (kPa)	n/a

Final conditions

Moisture Content (%)	52.0
Dry Density (Mg/m3)	1.13
Final voids ratio	1.38
Final degree of saturation (%)	101.58
Final settlement	2.731

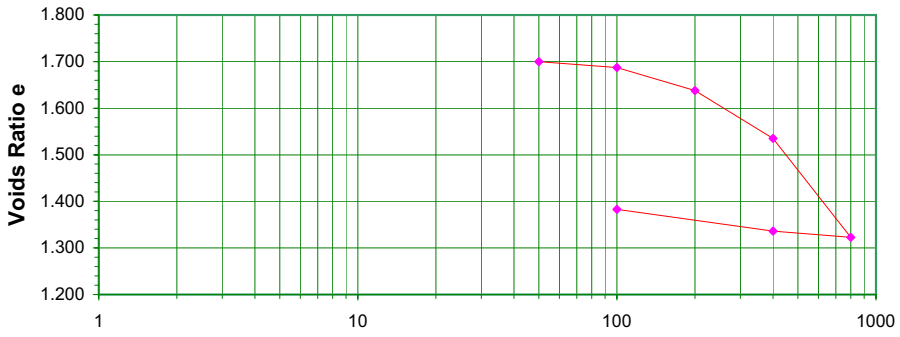
Notes:

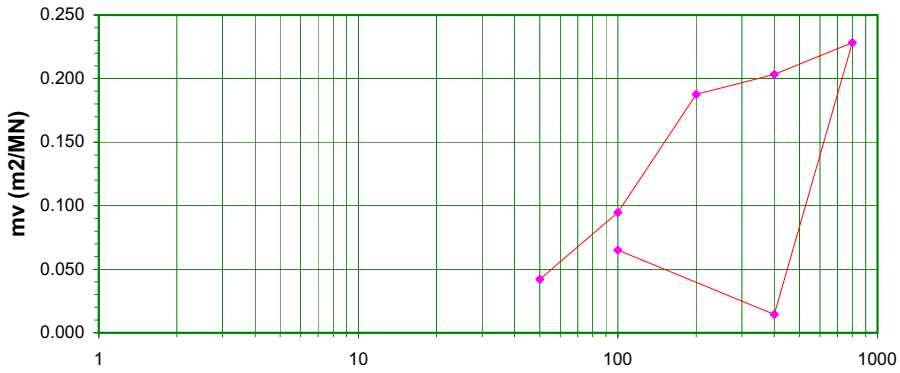


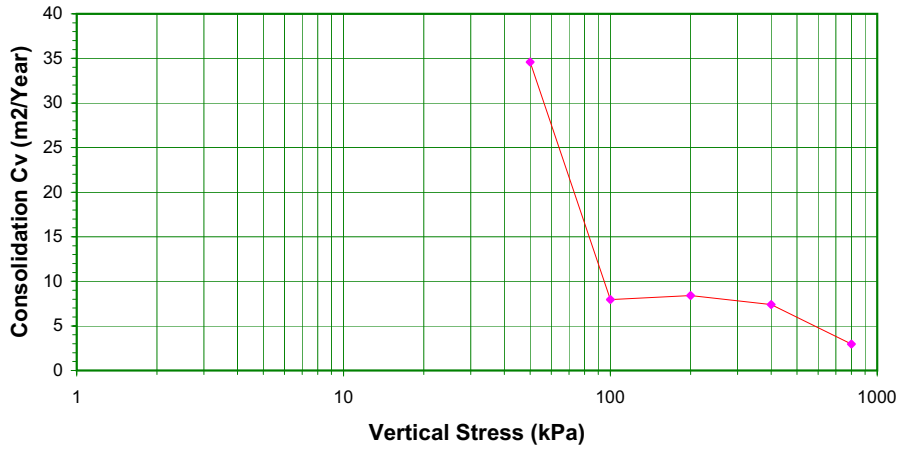
NM TL Ltd Standard	Project: Durban Harbour Deepening	Job No. NMTL-523 Borehole No. BH108 Sample No. U Depth m. 25.0m

Oedometer settlement Tests

Test Method: BS 1377 : Part 5: 1990 Clause 3







NM TL Ltd Standard	Project: Durban Harbour Deepening	Job No. NMTL-523 Borehole No. BH108 Sample No. U Depth m. 25.0m

Oedometer Test

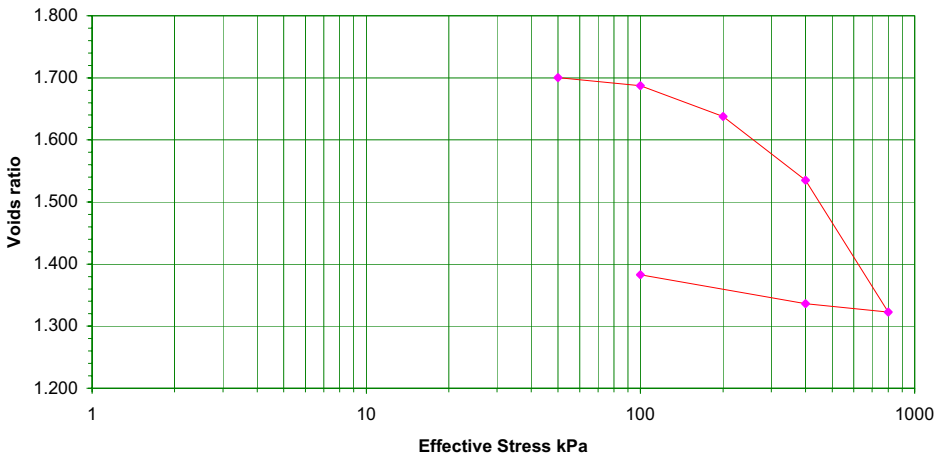
Test Method: BS 1377 : Part 6 1990 Clause 3

Sample Details

Description: Firm dark grey ocassionally brown SILT/CLAY with shell frafments.

Initial height (mm)		20.00
Diameter (mm)		50.00
Initial weight of specimen (gms)		63.19
Bulk Density (mg/m3)		1.609
Particle Density	(Assumed)	2.70

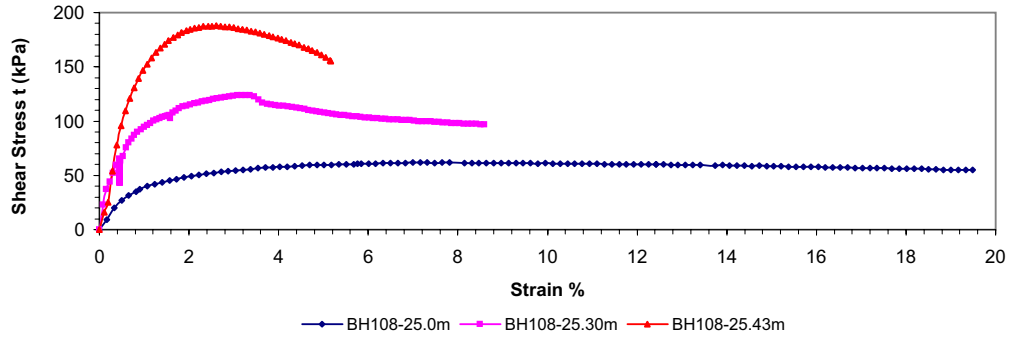
Initial Conditions		Final Conditions	
Moisture content	61.2	52.0	%
Dry Density	1.00	1.13	Mg/m3
Initial Voids Ratio	1.7059	1.3829	
Degree of Saturation	96.93	101.58	%

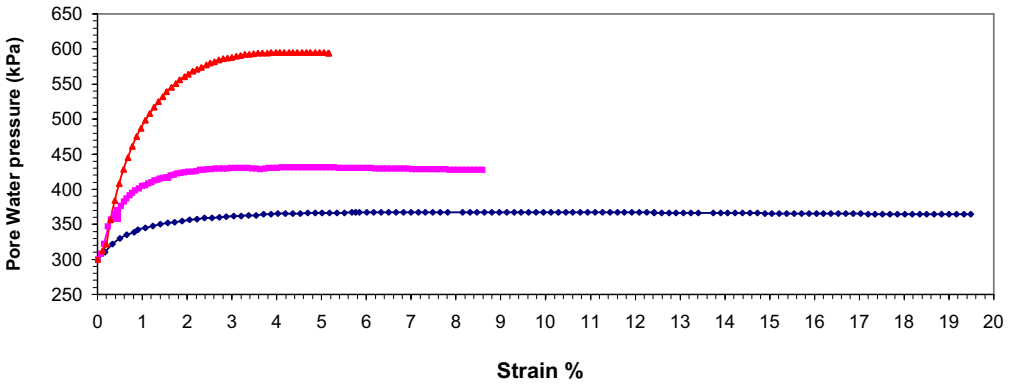


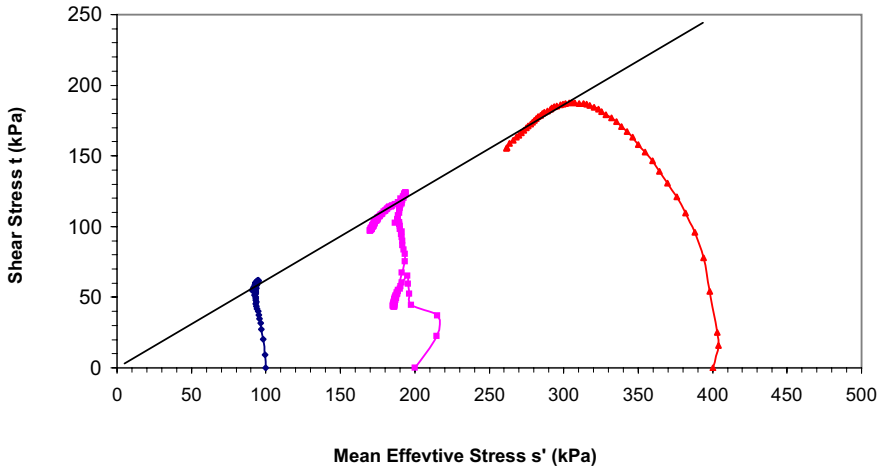
Stage No.	Effective Stress kPa	Voids Ratio	Mv m2/MN	Cv m2/Year	Settlement mm
1	50	1.7002	0.042	34.59	0.042
2	100	1.6875	0.095	7.94	0.136
3	200	1.6379	0.188	8.42	0.502
4	400	1.5348	0.203	7.39	1.264
5	800	1.3228	0.228	2.97	2.831
6	400	1.3364	0.014		2.731
7	100	1.3829	0.065		2.387

NM TL Ltd Standard	Project: Durban Harbour Deepening	Job No.	NMTL-523
		Borehole No.	BH108
		Sample No.	U
		Depth m.	25.0m

Combined Stress Path Plots







c' 8 **kPa**

Φ' 36.2°

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BH108
	Project:	Sample No.	Shelby
	Durban Harbour Berth Deepening Study	Depth	25.00-25.60m

SUMMARY OF TEST RESULTS

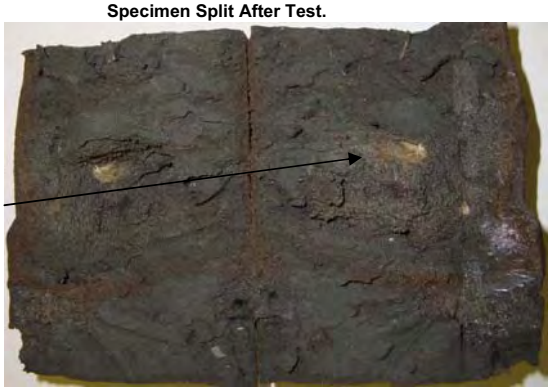
		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.71	1.75
Specimen Length	mm	139.05	Dry Density	Mg/m3	1.08	1.15
Specimen Diameter	mm	60.20	Moisture	%	58.53	52.44
Area	mm2	2846.31	Saturation	%	105.00	104.33
Volume	cc	395.78	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	1.00	1.00
3	150	1.00	1.00
4	200	1.00	1.00
5	300	1.00	1.00
6	400	1.00	1.00
7	425	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	425
Back Pressure	kPa	400
Radial Effective stress	kPa	25

Specimen Split After Test.



Single rounded -subrounded sandstone approximate size 35 to 40mm.

At Maximum Deviator stress

Deviator Stress (kPa)	46.8
External Axial Strain (%)	15.15
Shear Stress (kPa)	23.4
Pore Water Pressure (kPa)	13
Radial Effective Stress (kPa)	12
Axial Effective Stress (kPa)	59
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to firm dark grey/brown SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

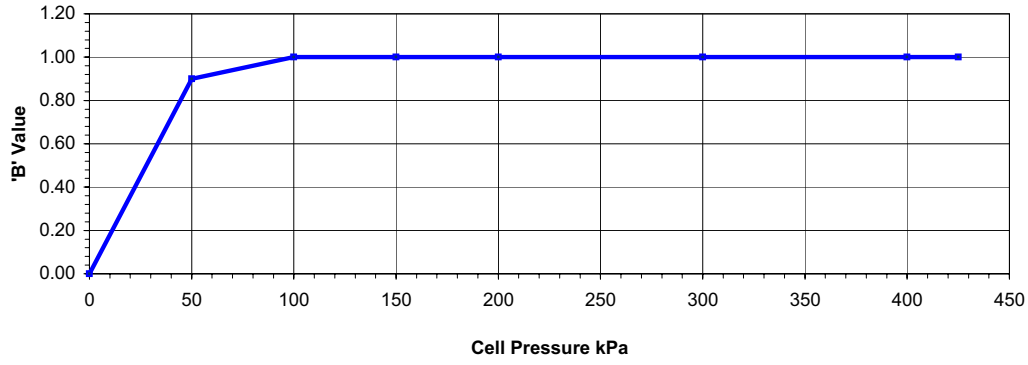
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

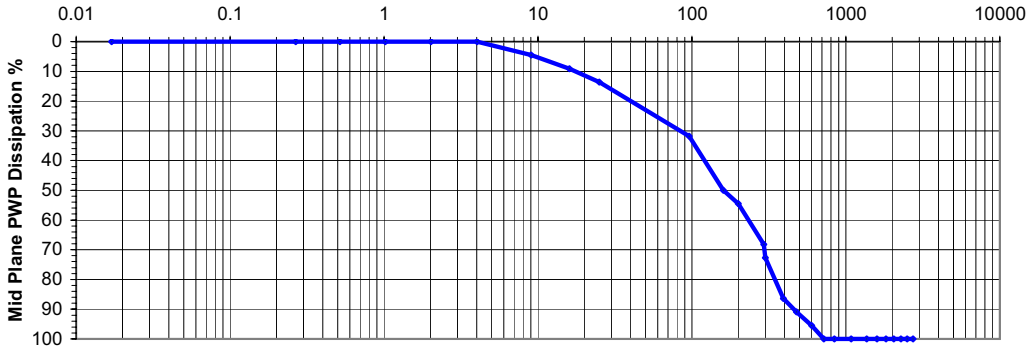
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	2.35-2.90m

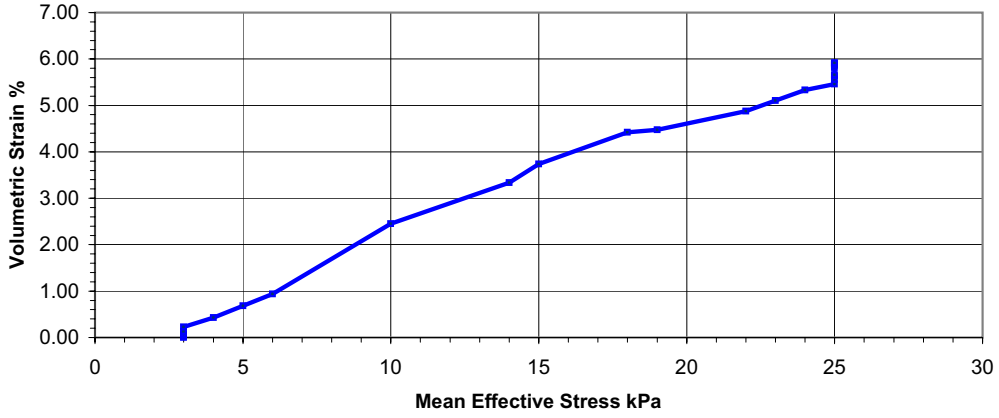
Saturation



Isotropic Consoliadtion

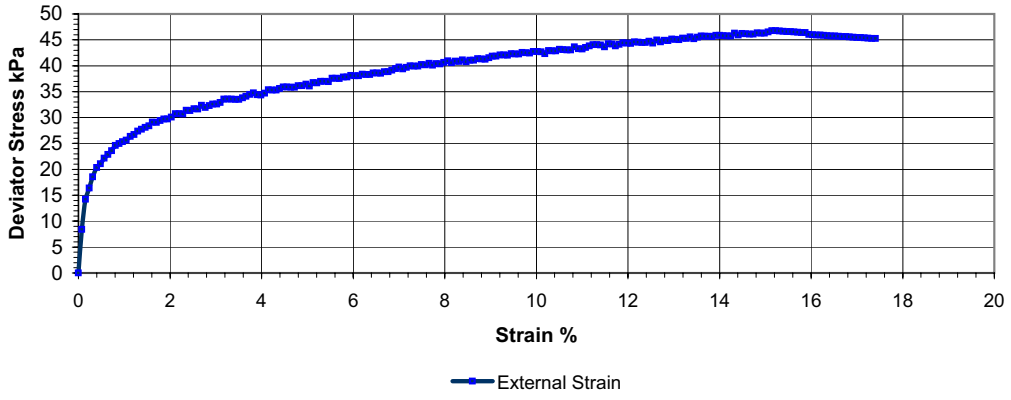
Time Mins

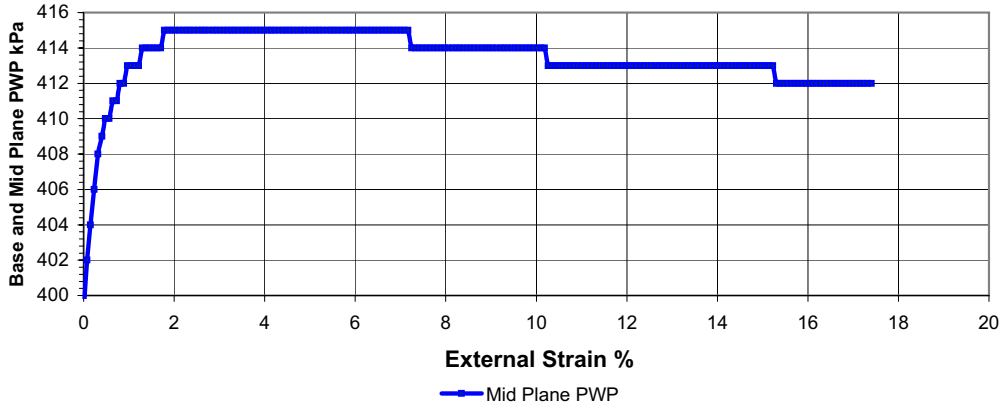


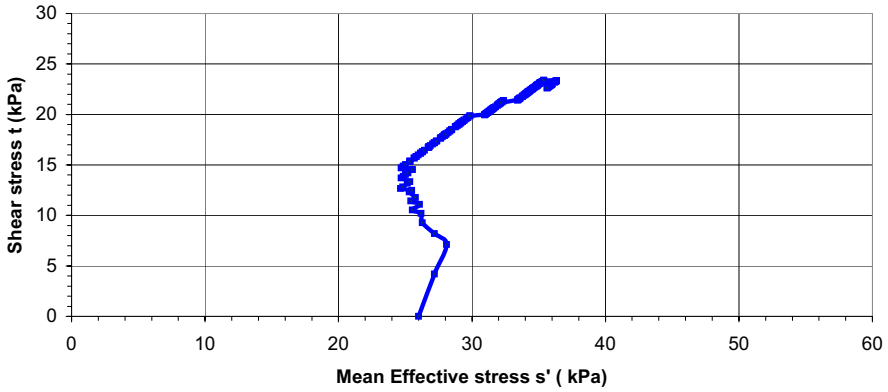


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	2.35-2.90m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	2.35-2.90m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.65	1.66
Specimen Length	mm	124.00	Dry Density	Mg/m3	0.99	1.01
Specimen Diameter	mm	60.40	Moisture	%	66.87	64.84
Area	mm2	2865.26	Saturation	%	104.34	104.32
Volume	cc	355.29	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.86	0.86
3	150	0.92	0.92
4	200	0.94	0.94
5	300	0.97	0.97
6	400	0.98	0.98
7	450	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	450
Back Pressure	kPa	400
Radial Effective stress	kPa	50

Specimen Split After Test.

Fine to medium sand

At Maximum Deviator stress

Deviator Stress (kPa)	75.7
External Axial Strain (%)	16.66
Shear Stress (kPa)	37.8
Pore Water Pressure (kPa)	25
Radial Effective Stress (kPa)	25
Axial Effective Stress (kPa)	101
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Firm dark grey SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

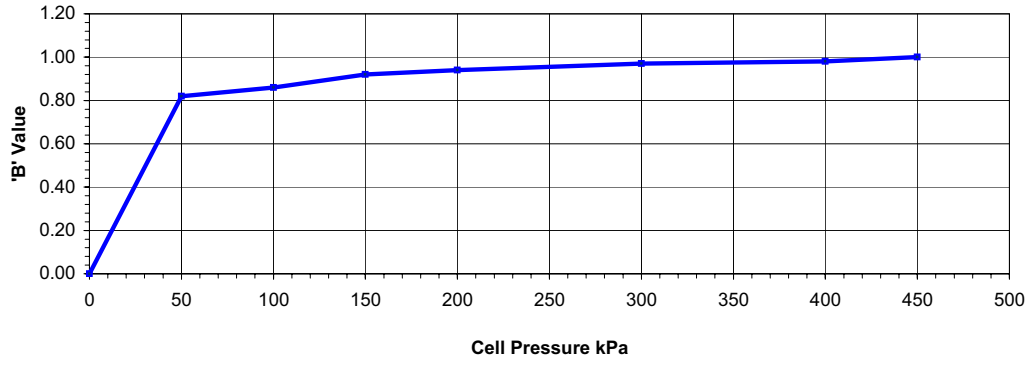
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

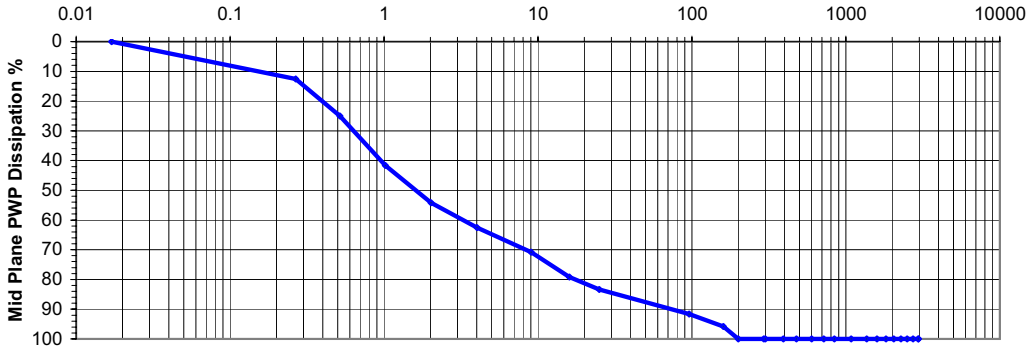
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	2.35-2.90m

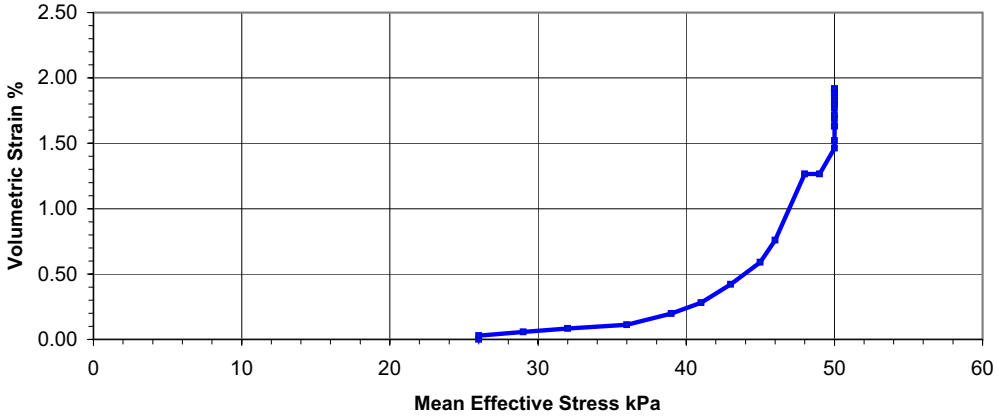
Saturation



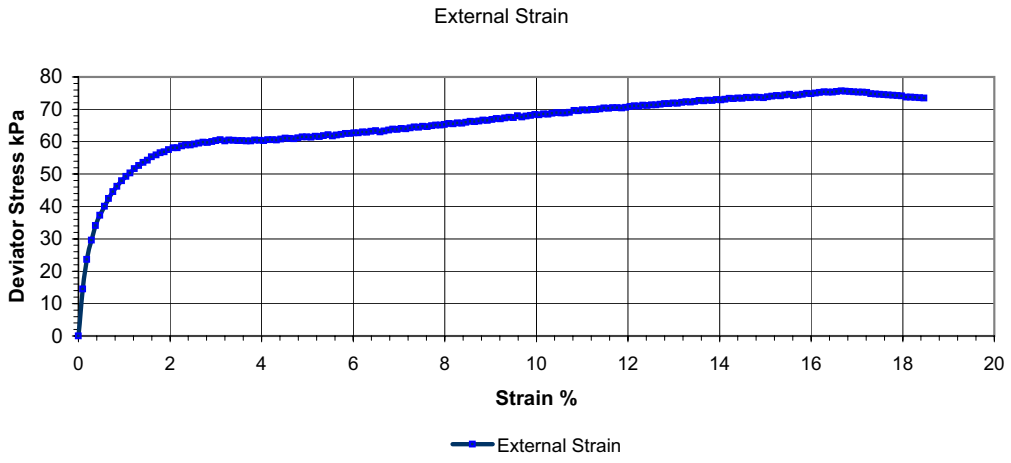
Isotropic Consoliadtion

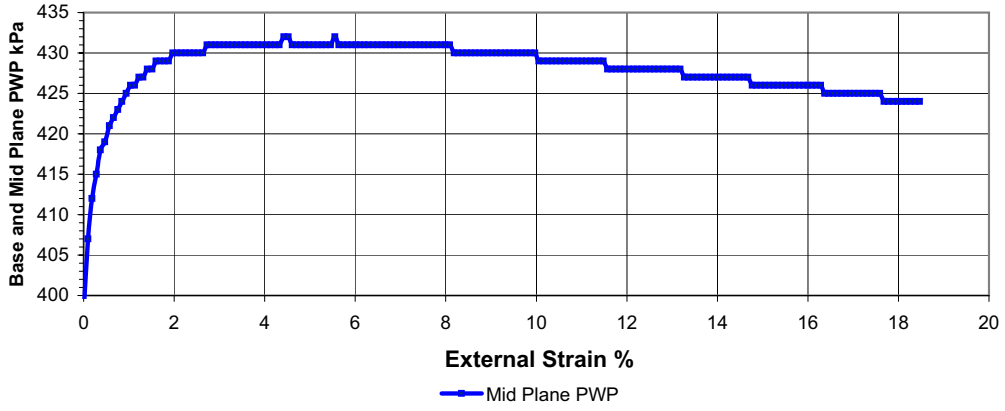
Time Mins

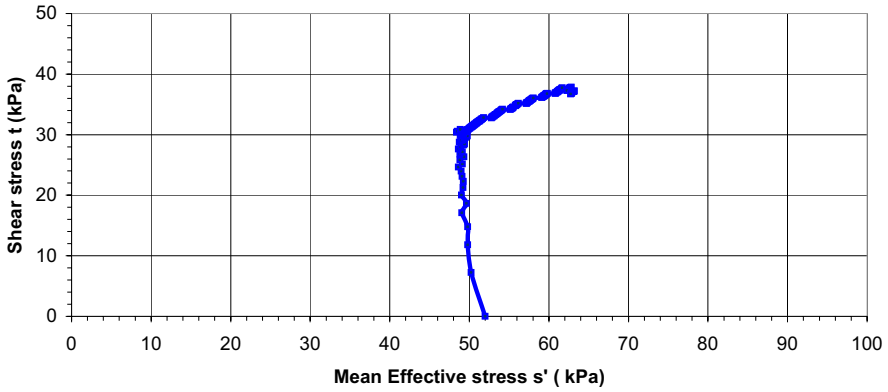




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	2.35-2.90m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	2.35-2.90m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.69	1.69
Specimen Length	mm	119.10	Dry Density	Mg/m3	1.06	1.06
Specimen Diameter	mm	60.20	Moisture	%	59.15	59.71
Area	mm2	2846.31	Saturation	%	103.53	103.60
Volume	cc	339.00	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.30	0.30
2	100	0.34	0.34
3	150	0.40	0.40
4	200	0.52	0.52
5	250	0.64	0.64
6	300	0.68	0.68
7	350	0.76	0.76
8	400	0.90	0.90
9	500	0.99	0.99

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	400
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	138.3
External Axial Strain (%)	4.40
Shear Stress (kPa)	69.2
Pore Water Pressure (kPa)	47
Radial Effective Stress (kPa)	53
Axial Effective Stress (kPa)	191
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

Sample Description: Firm to stiff dark grey fissured SILT/CLAY with shell fragments.

Brittle Failure

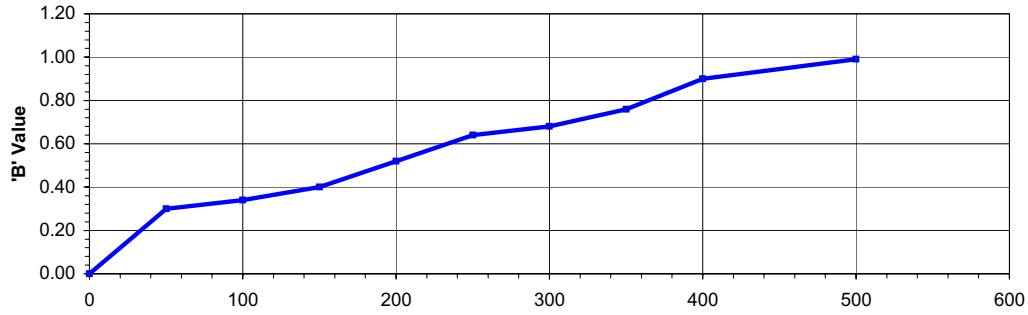
NM TL Ltd

Consolidated undrained triaxial compression test with base and mid plane pore pressure.

Project: Durban Harbour Berth Deepening Study

Project No.	NMTL-523
Borehole No.	BHM 101C
Sample No.	3-Base
Depth.	2.35-2.90m

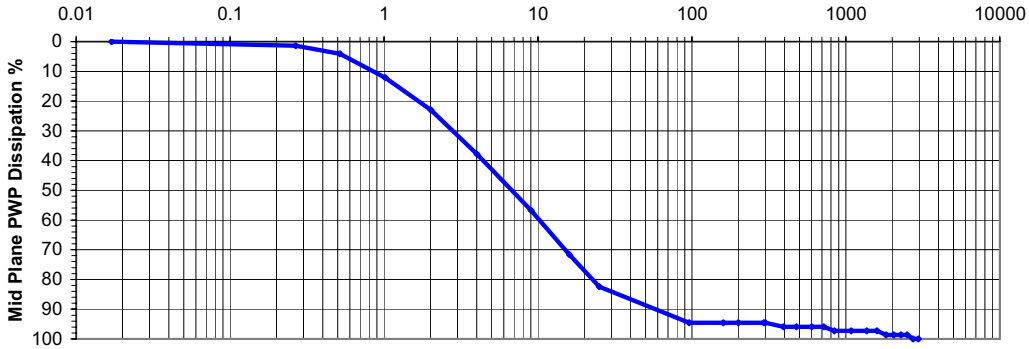
Saturation

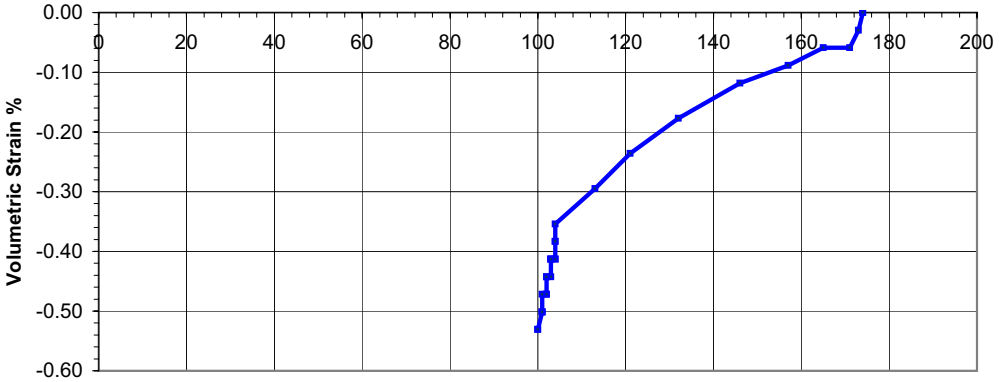


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

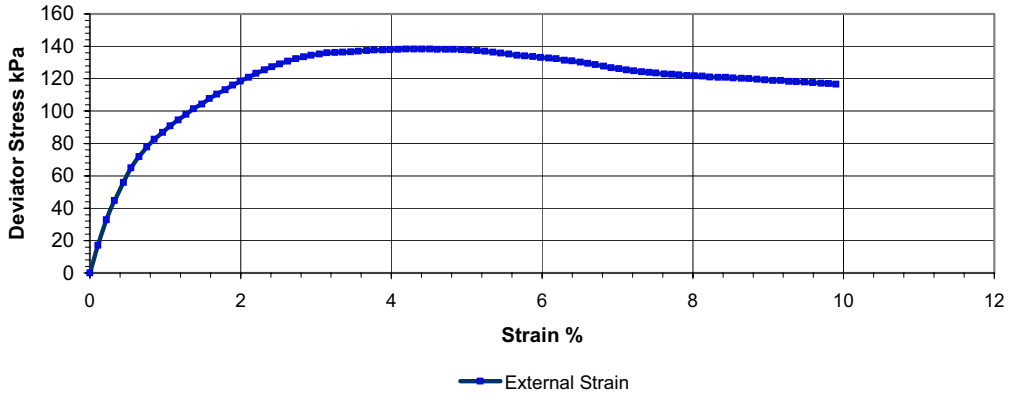


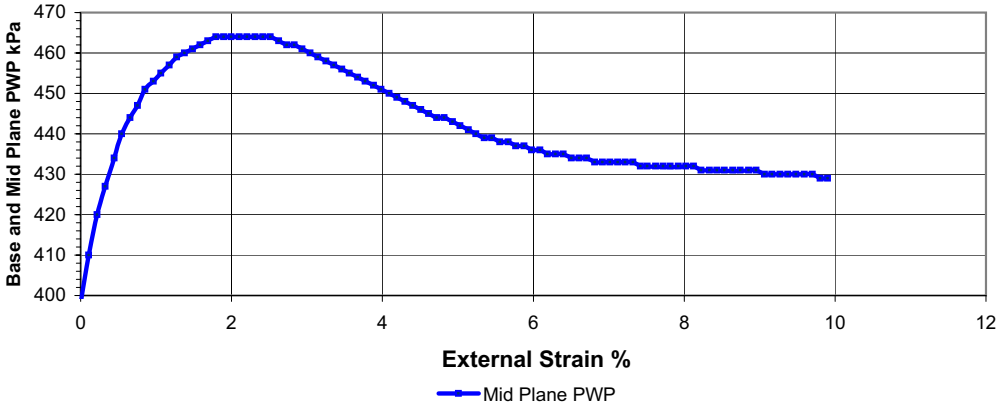


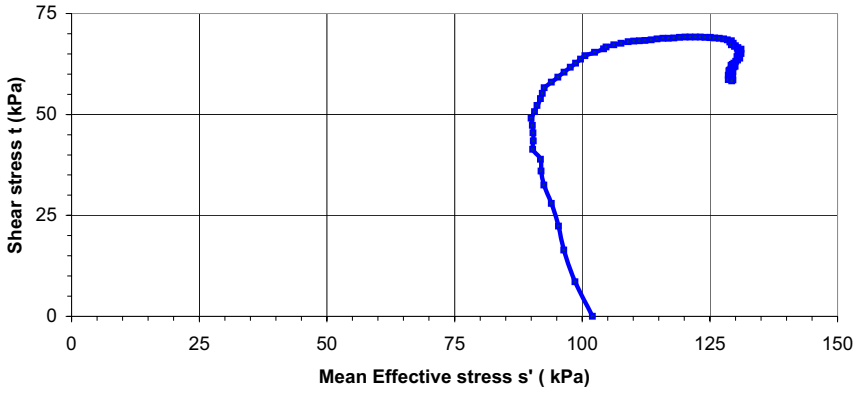
Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	2.35-2.90m

External Strain

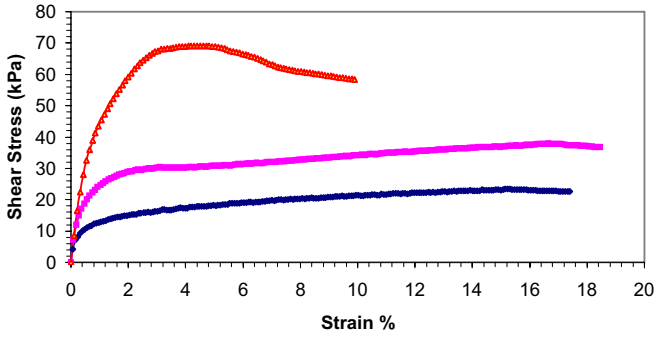


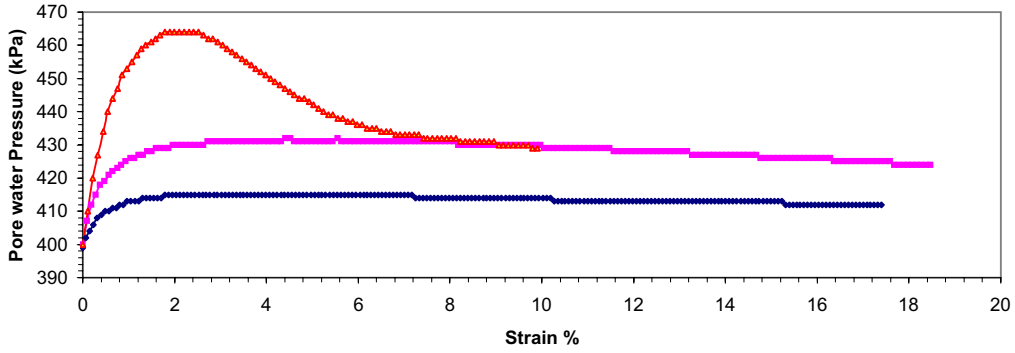


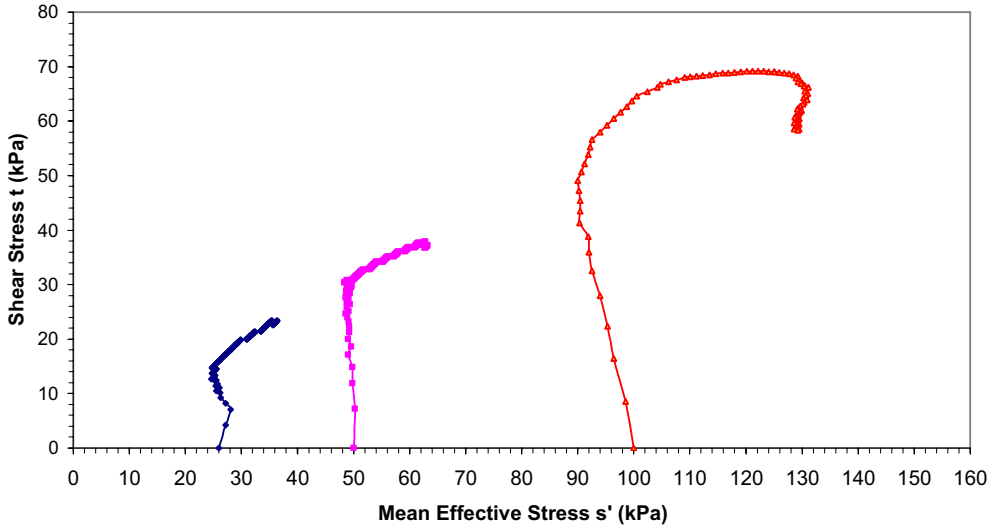


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101C
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	2.35-2.90m

Combined Stress Path Plots







c' **1.0** **kPa**

Φ' **38.1**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BHM 101C
Ltd	Project:	Sample No.	Shelby
	Durban Harbour Berth Deepening Study	Depth	2.35-2.90m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.91	1.91
Specimen Length	mm	108.50	Dry Density	Mg/m3	1.46	1.46
Specimen Diameter	mm	53.00	Moisture	%	31.26	30.42
Area	mm2	2206.18	Saturation	%	98.76	97.15
Volume	cc	239.37	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.70	0.70
2	100	0.92	0.92
3	200	0.97	0.97
4	300	0.98	0.98
5	325	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	325
Back Pressure	kPa	300
Radial Effective stress	kPa	25

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	120.4
External Axial Strain (%)	9.67
Shear Stress (kPa)	60.2
Pore Water Pressure (kPa)	-12.0
Radial Effective Stress (kPa)	37.0
Axial Effective Stress (kPa)	157.4
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft to firm dark grey sandy SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

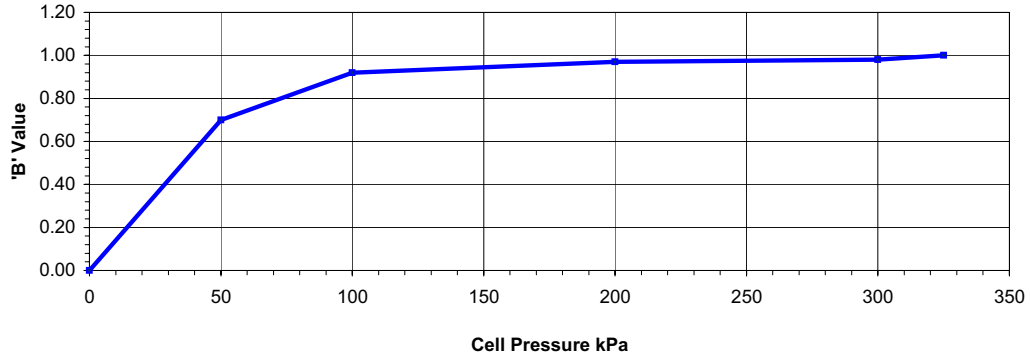
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

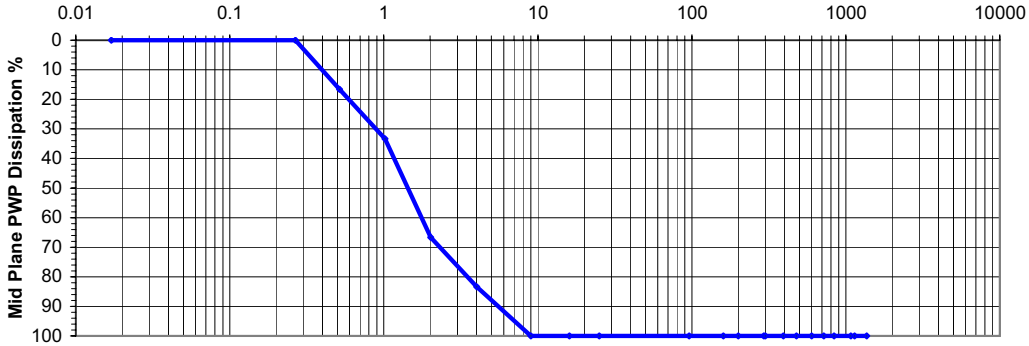
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No. 1
		Depth. 16.94-17.10m

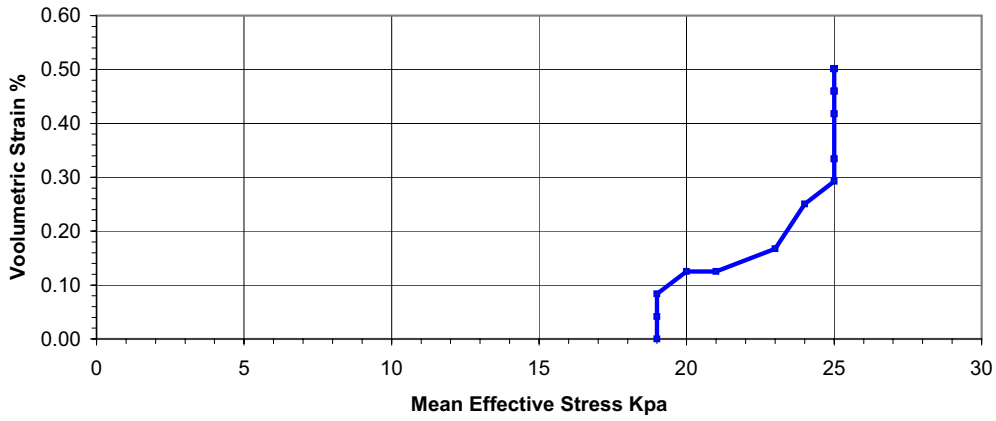
Saturation



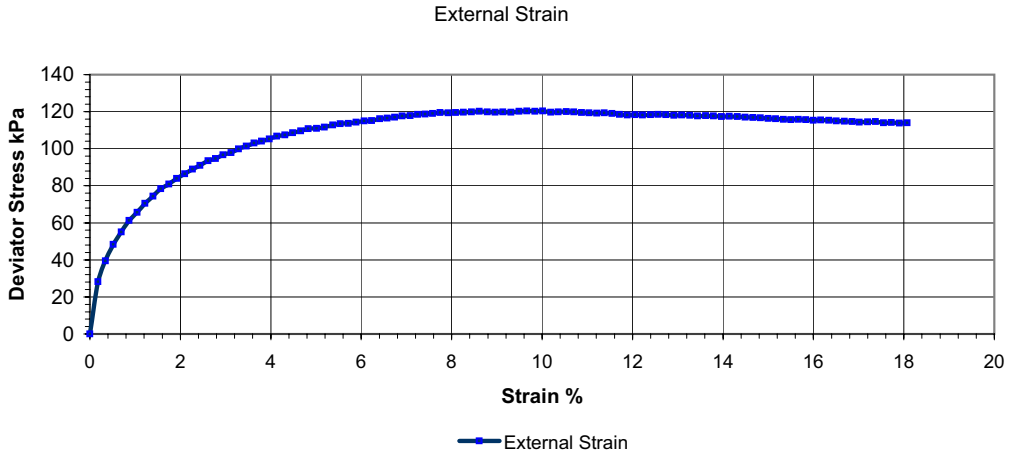
Isotropic Consoliadtion

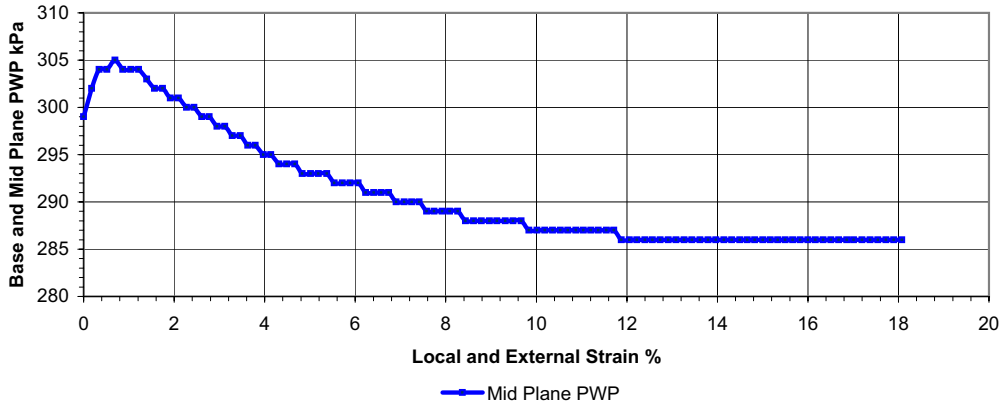
Time Mins

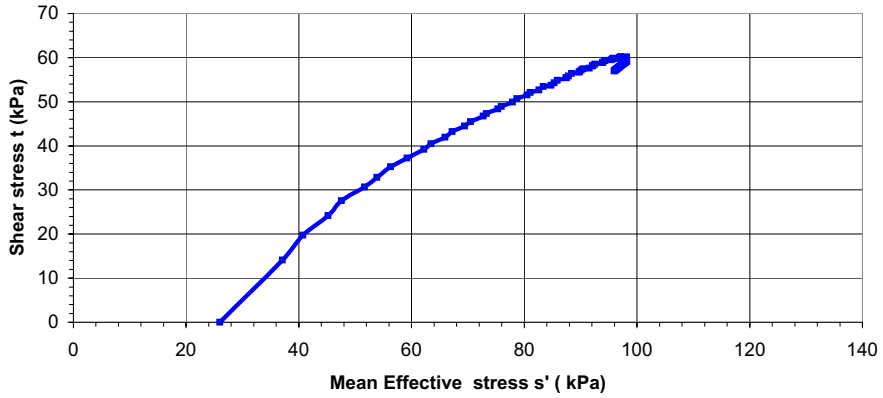




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	16.94-17.10m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No. 1
		Depth. 16.94-17.10m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.86	1.87
Specimen Length	mm	108.40	Dry Density	Mg/m3	1.34	1.33
Specimen Diameter	mm	51.30	Moisture	%	38.93	39.87
Area	mm2	2066.92	Saturation	%	103.67	105.23
Volume	cc	224.05	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.86	0.86
2	100	0.70	0.70
3	150	0.52	0.52
4	200	0.74	0.74
5	300	0.78	0.78
6	400	0.82	0.82
7	500	0.87	0.87
8	550	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	550
Back Pressure	kPa	500
Radial Effective stress	kPa	50

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	358.3
External Axial Strain (%)	1.79
Shear Stress (kPa)	179.1
Pore Water Pressure (kPa)	-3.0
Radial Effective Stress (kPa)	53.0
Axial Effective Stress (kPa)	411.3
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff dark grey sandy SILT/CLAY with shell fragments. **Brittle failure**

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

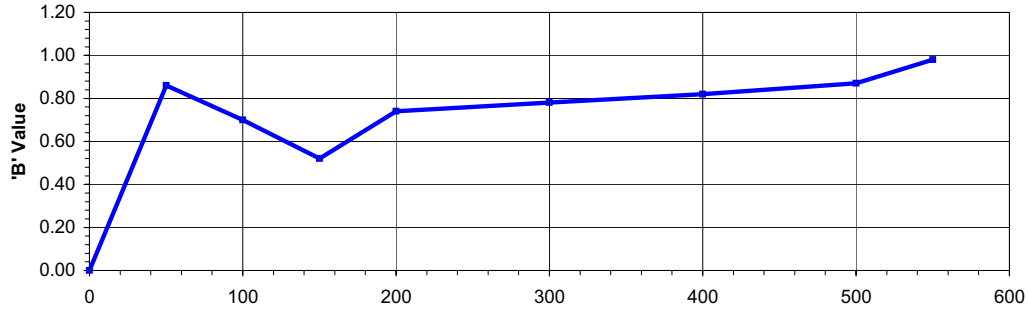
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	17.10-17.26m

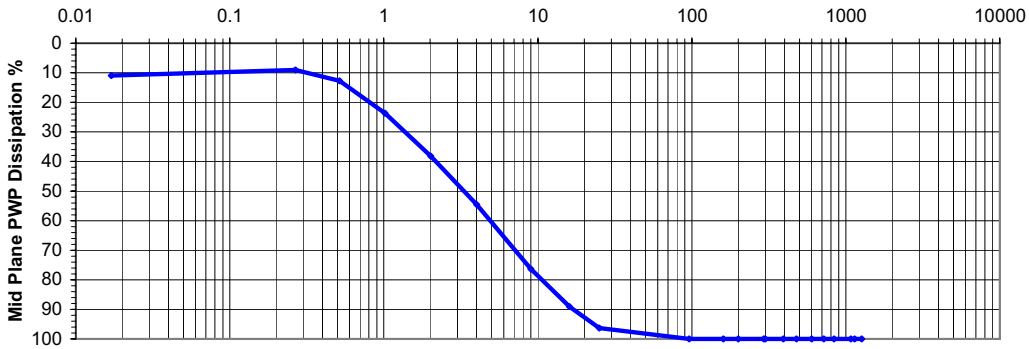
Saturation

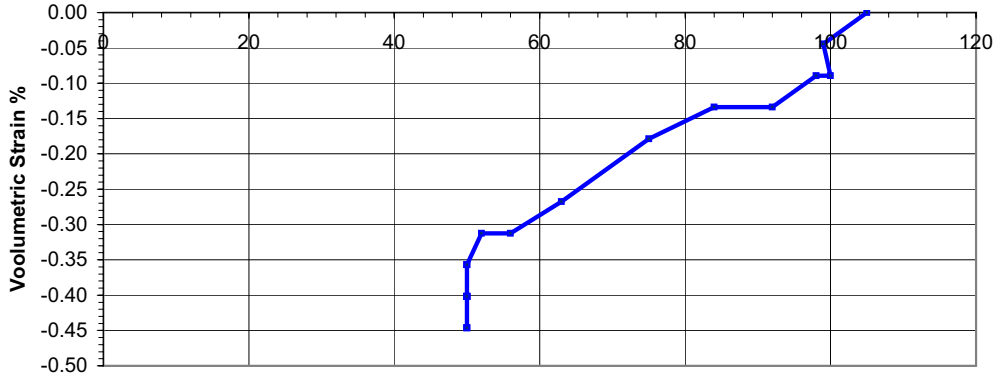


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

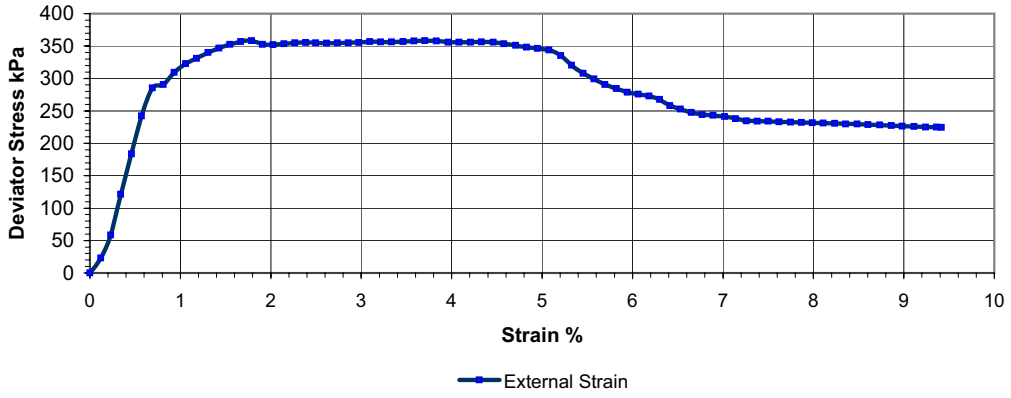


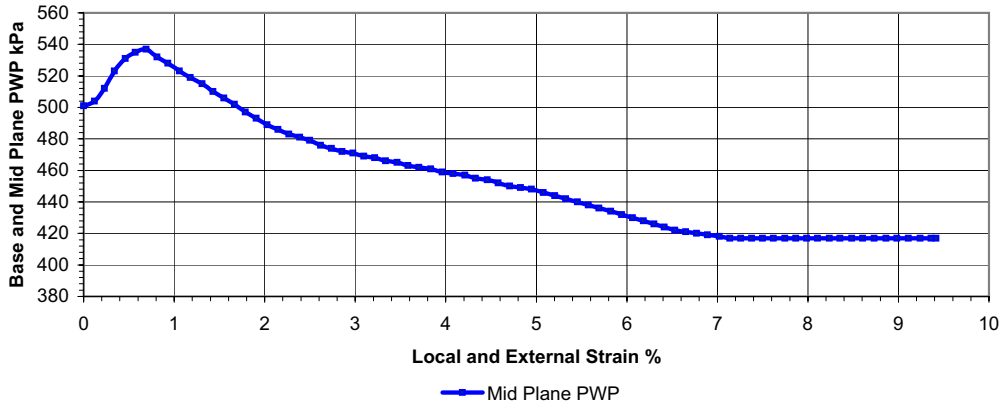


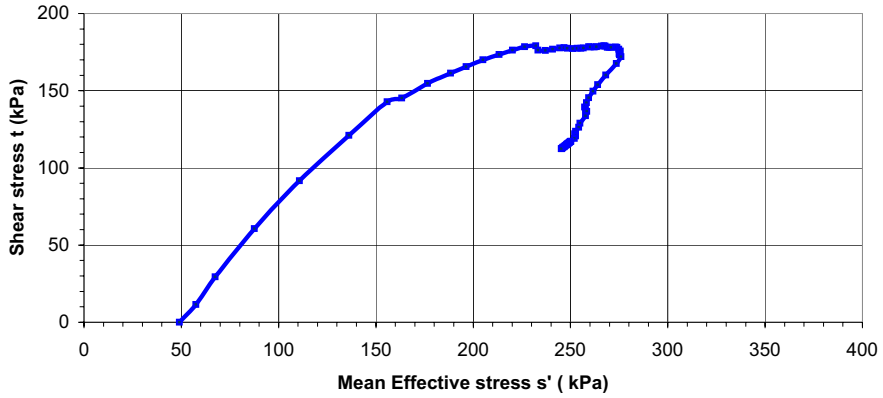
Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	17.10-17.26m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No. 2
		Depth. 17.10-17.26m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.89	1.89
Specimen Length	mm	108.00	Dry Density	Mg/m3	1.37	1.37
Specimen Diameter	mm	51.00	Moisture	%	37.40	37.66
Area	mm2	2042.82	Saturation	%	104.78	105.20
Volume	cc	220.62	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.54	0.54
2	100	0.64	0.64
3	150	0.68	0.68
4	200	0.74	0.74
5	300	0.74	0.74
6	400	0.76	0.76
7	500	0.86	0.86
8	600	0.96	0.96

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	600
Back Pressure	kPa	500
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	330.7
External Axial Strain (%)	6.00
Shear Stress (kPa)	165.3
Pore Water Pressure (kPa)	18.0
Radial Effective Stress (kPa)	82.0
Axial Effective Stress (kPa)	412.7
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff to very stiff dark grey SILT/CLAY
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

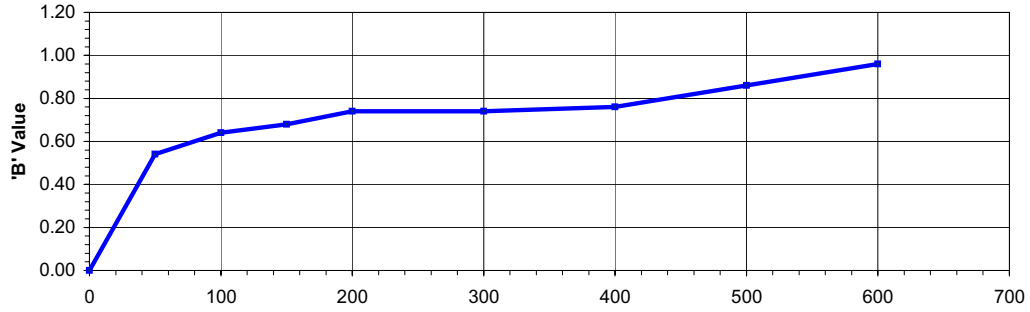
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	17.26-17.41m

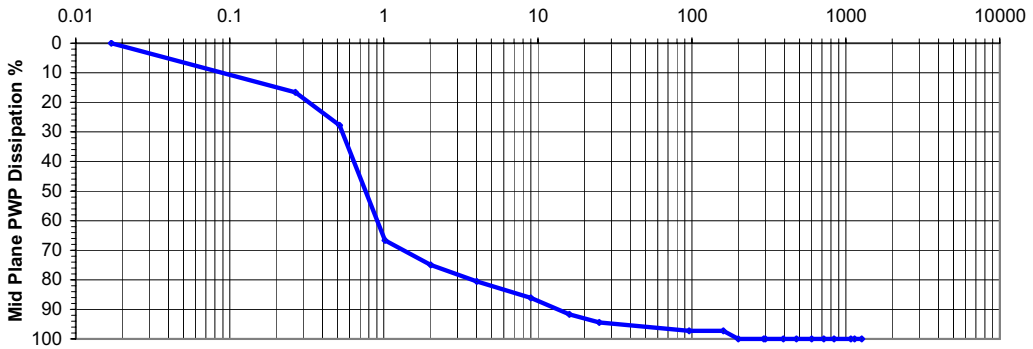
Saturation

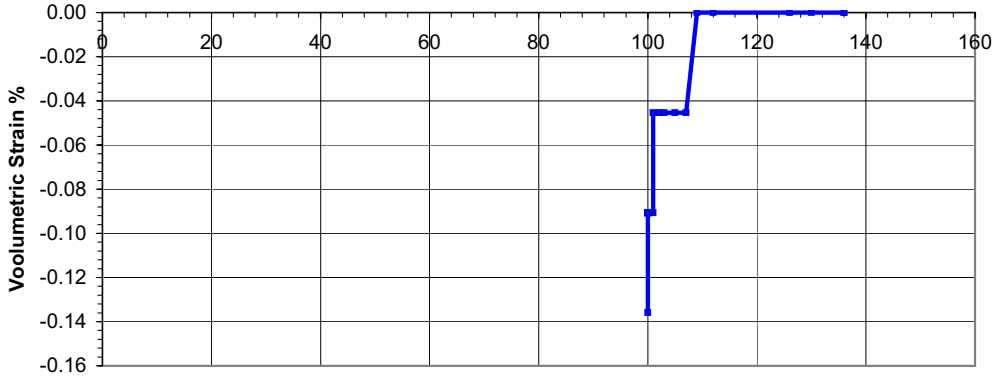


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

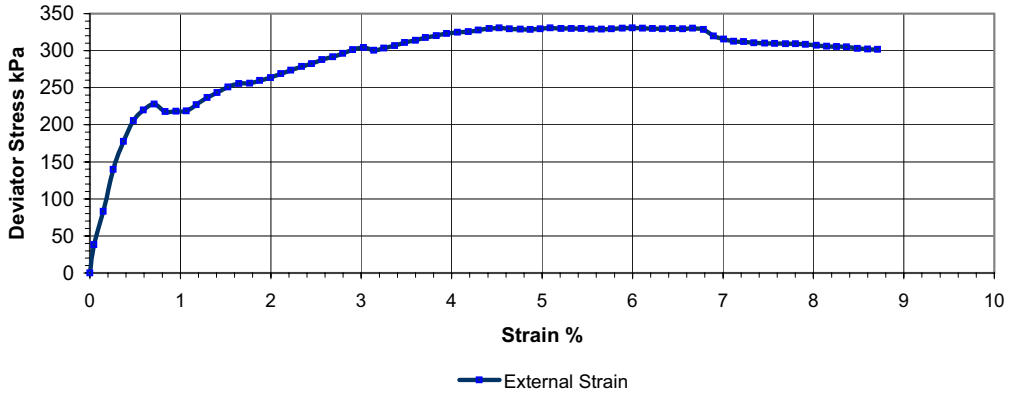


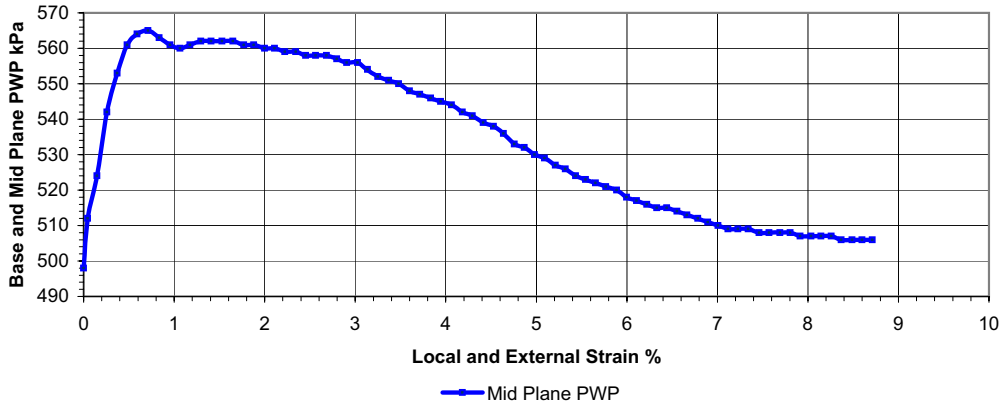


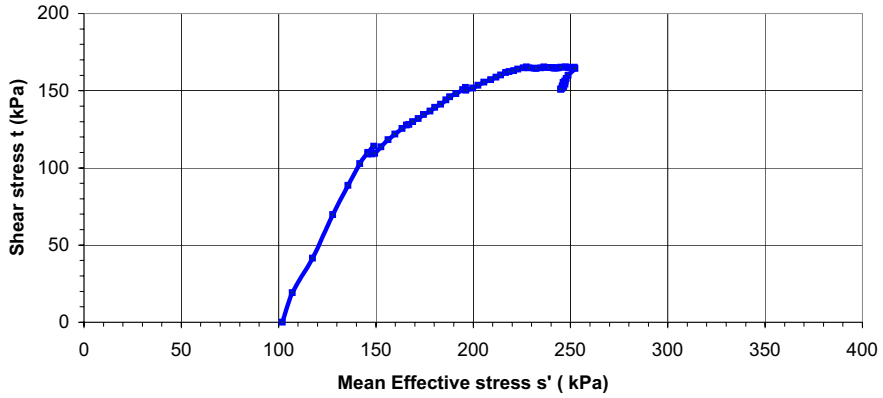
Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	17.26-17.41m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	17.26-17.41m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.98	2.04
Specimen Length	mm	108.40	Dry Density	Mg/m3	1.54	1.63
Specimen Diameter	mm	51.50	Moisture	%	28.69	24.94
Area	mm2	2083.07	Saturation	%	102.15	102.72
Volume	cc	225.81	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.74	0.74
2	100	0.86	0.86
3	150	0.90	0.90
4	200	0.96	0.96
5	300	0.97	0.97
6	400	0.96	0.96
7	500	0.99	0.99

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	414.7
External Axial Strain (%)	1.25
Shear Stress (kPa)	207.3
Pore Water Pressure (kPa)	71.0
Radial Effective Stress (kPa)	129.0
Axial Effective Stress (kPa)	543.7
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff to very stiff dark grey SILT/CLAY
	Brittle failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

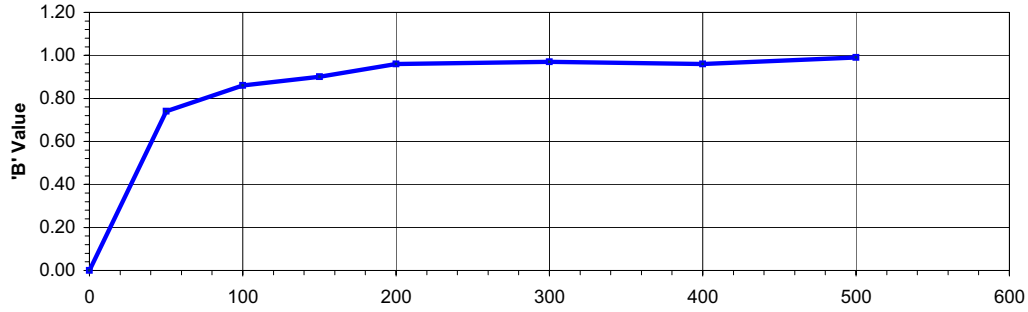
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No. 4
		Depth. 17.41-17.57m

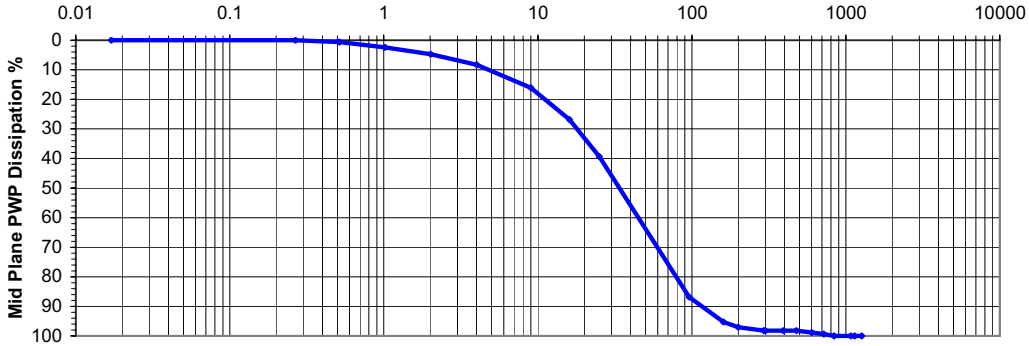
Saturation

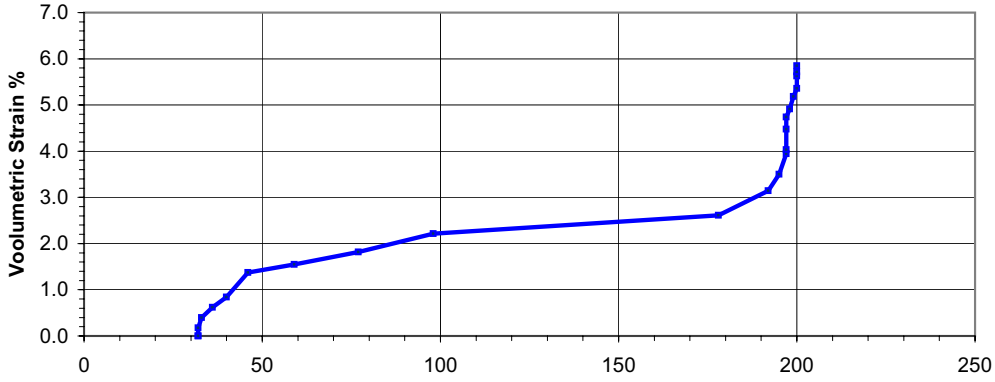


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

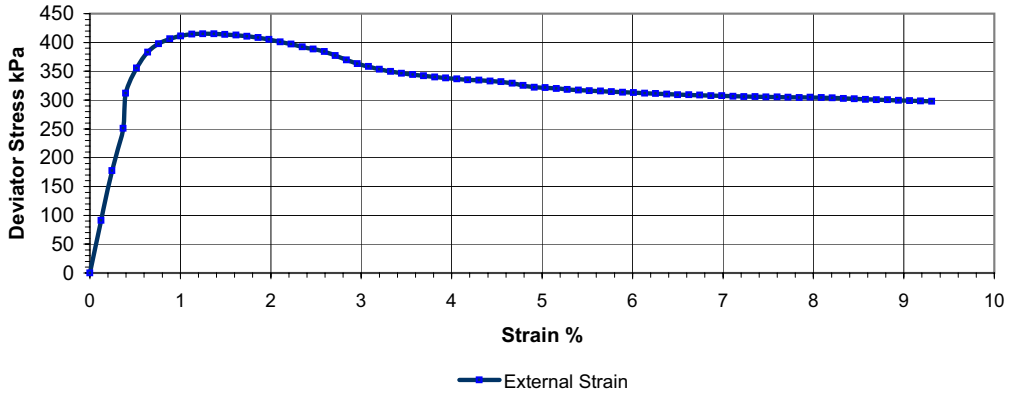


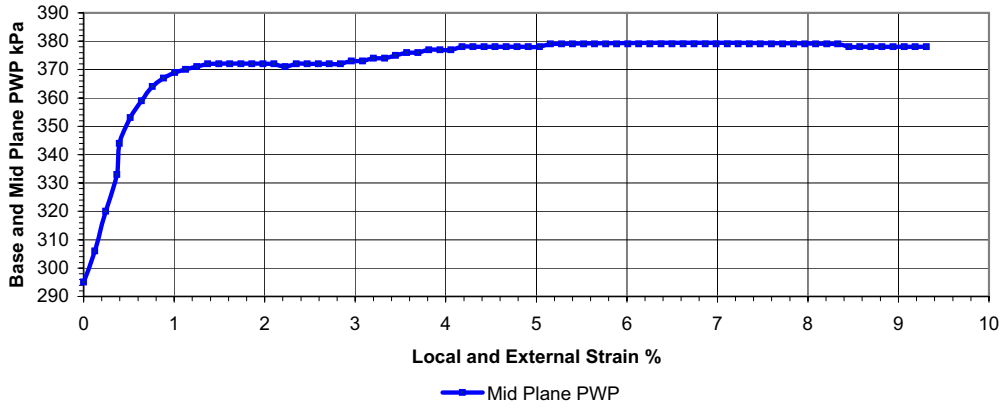


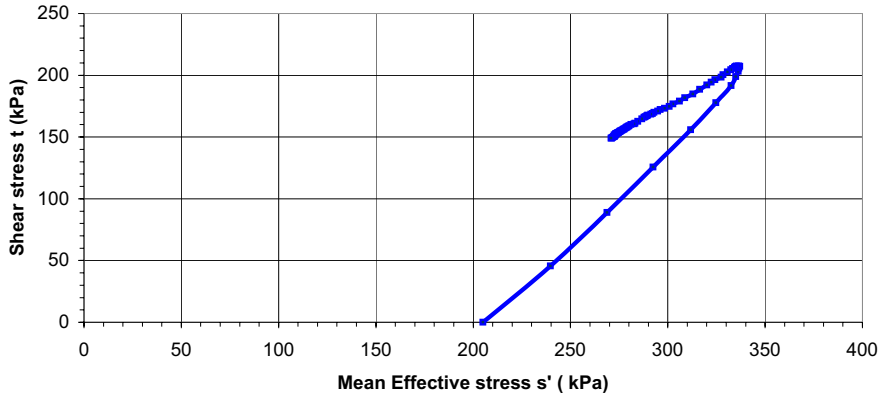
Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	4
		Depth.	17.41-17.57m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No. 4
		Depth. 17.41-17.57m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.92	1.95
Specimen Length	mm	108.50	Dry Density	Mg/m3	1.46	1.50
Specimen Diameter	mm	51.60	Moisture	%	31.67	30.50
Area	mm2	2091.17	Saturation	%	100.87	102.46
Volume	cc	226.89	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	0.92	0.92
3	150	0.98	0.98
4	200	0.94	0.94
5	300	0.98	0.98
6	400	0.98	0.98
7	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	517.0
External Axial Strain (%)	2.04
Shear Stress (kPa)	258.5
Pore Water Pressure (kPa)	212.0
Radial Effective Stress (kPa)	188.0
Axial Effective Stress (kPa)	705.0
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff dark grey sandy SILT/CLAY
	Brittle failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

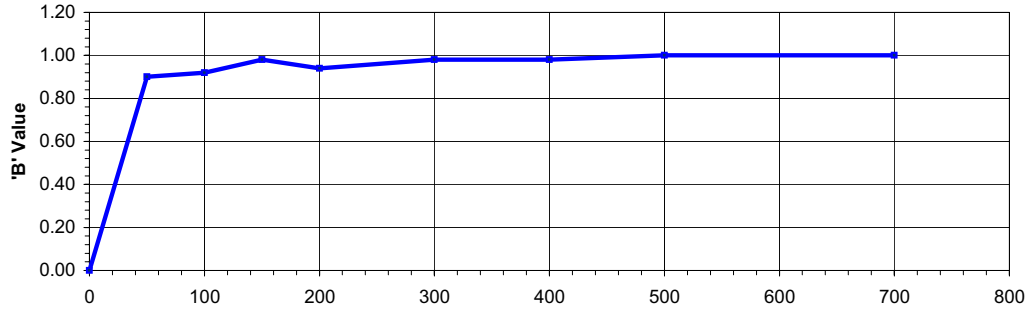
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	5
		Depth.	17.57-17.73m

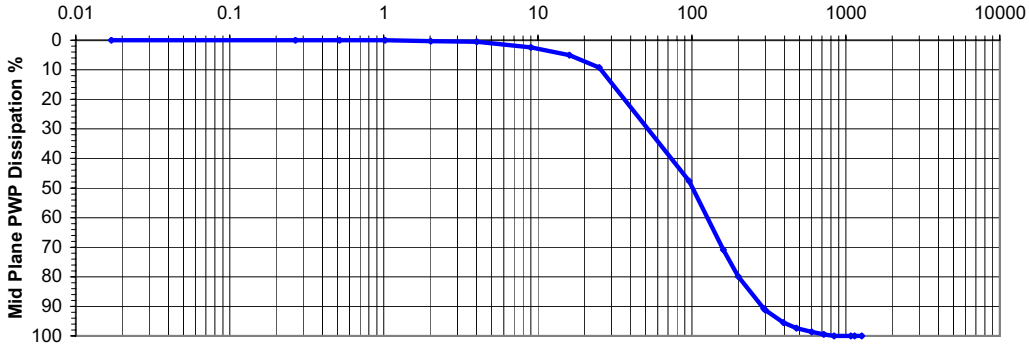
Saturation

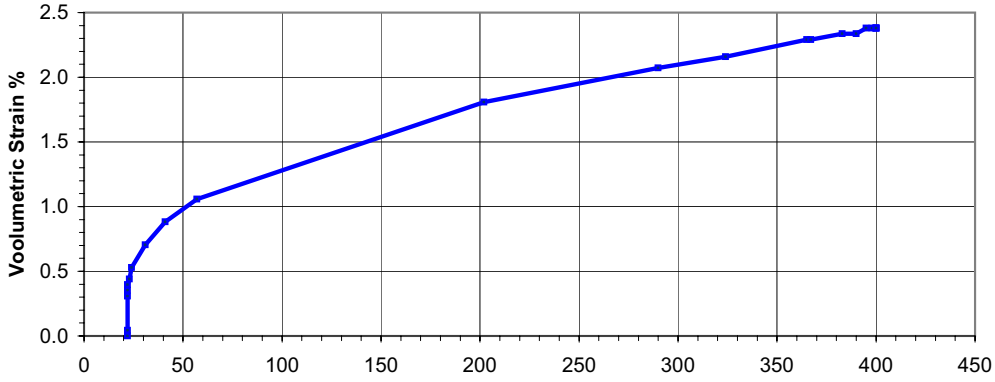


Cell Pressure kPa

Isotropic Consoliadtion

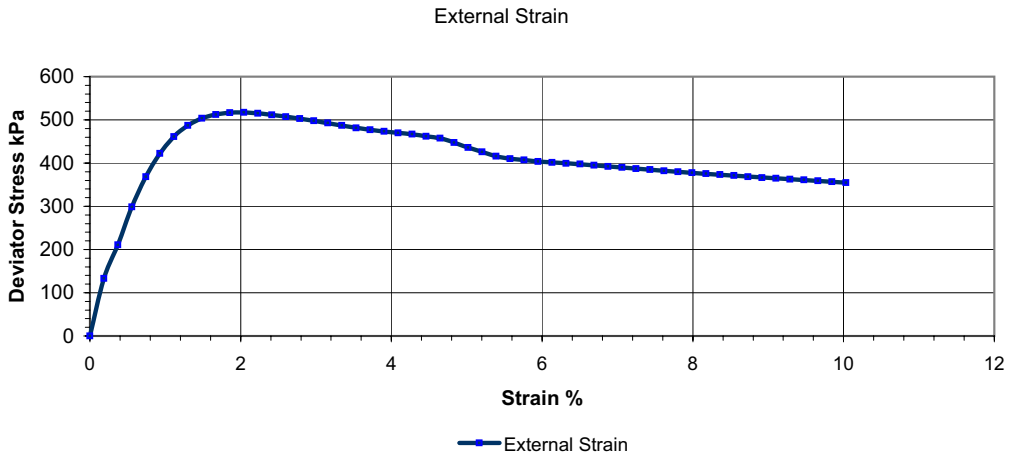
Time Mins

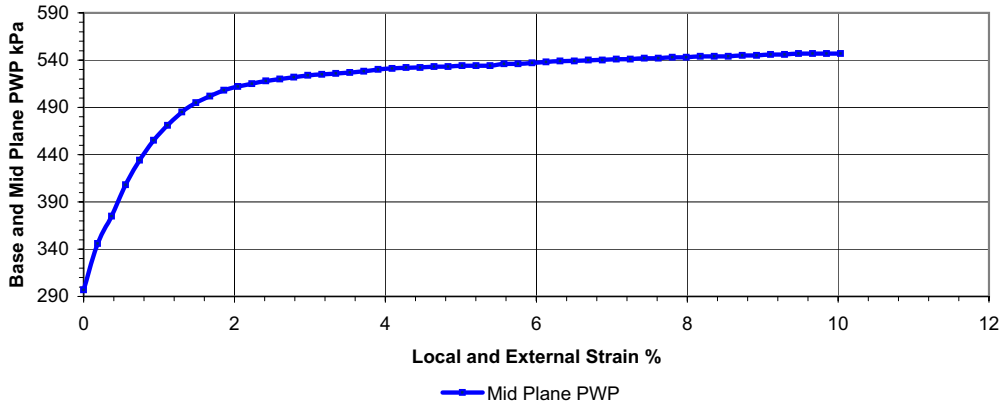


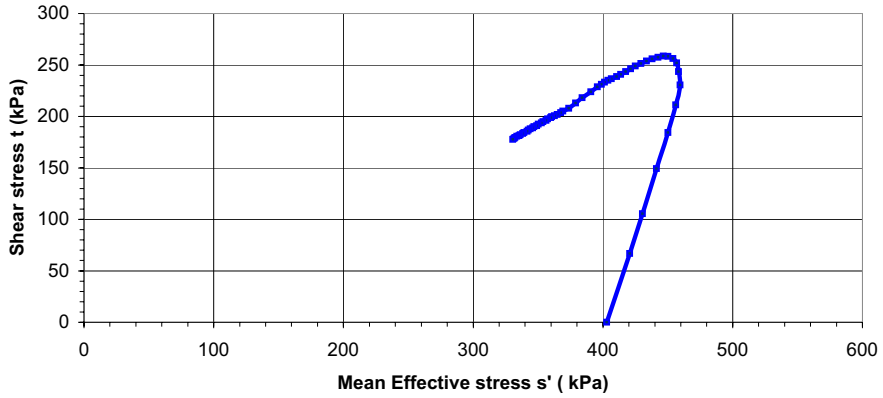


Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	5
		Depth.	17.57-17.73m

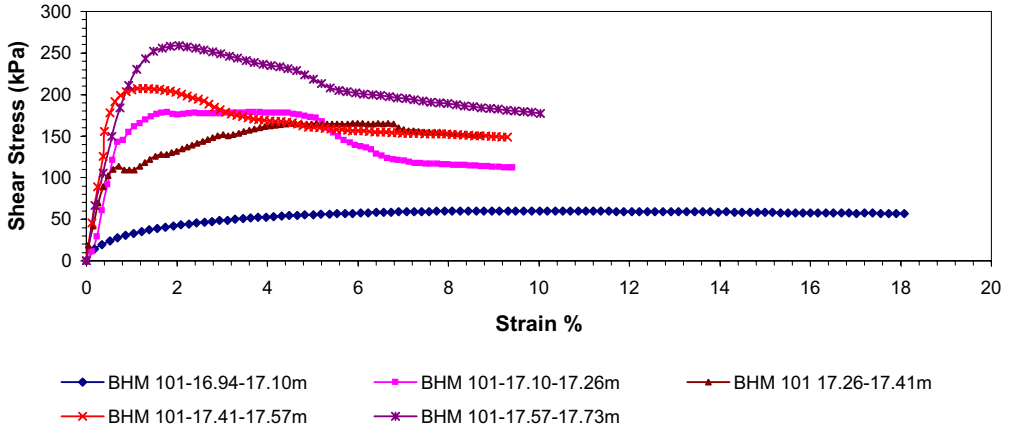


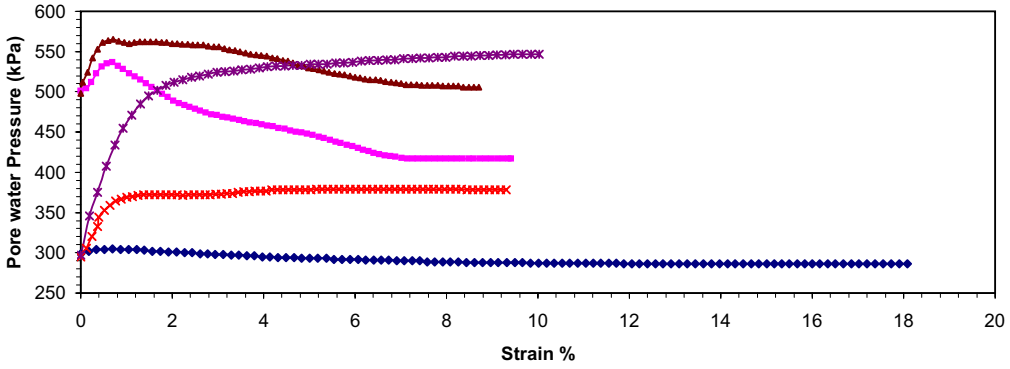


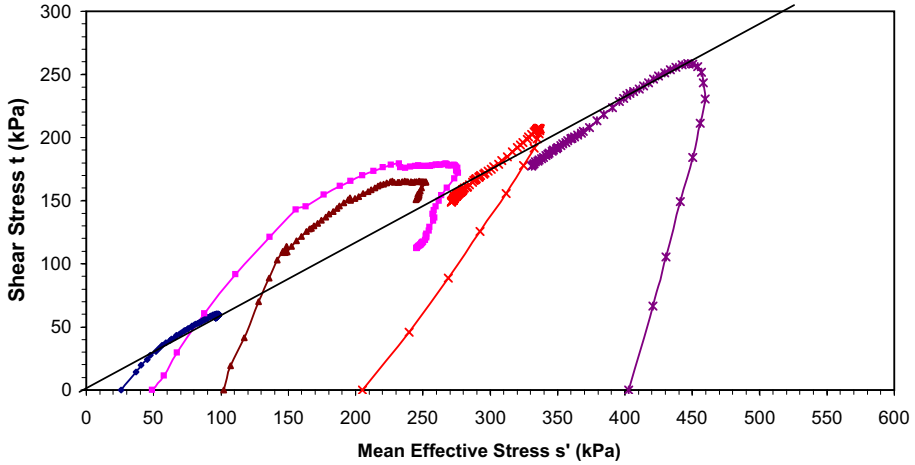


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 101
	Project: Durban Harbour Berth Deepening Study	Sample No.	5
		Depth.	17.57-17.73m

Combined Stress Path Plots







c' **3.29** **kPa**

Φ' **34.6°**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BHM 101
Ltd	Project:	Sample No.	Core
	Durban Harbour Berth Deepening Study	Depth	16.94-17.73m

SUMMARY OF TEST RESULTS

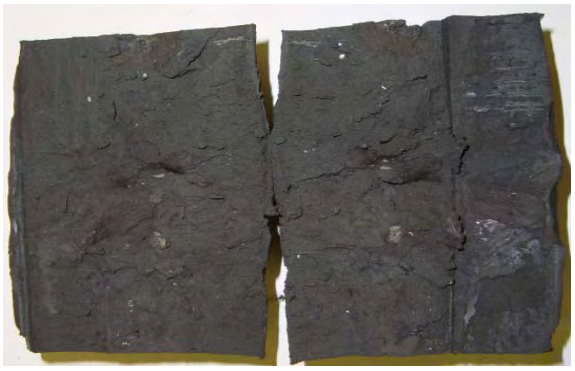
		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.54	1.60
Specimen Length	mm	125.00	Dry Density	Mg/m3	0.87	0.96
Specimen Diameter	mm	60.20	Moisture	%	78.21	65.94
Area	mm2	2846.31	Saturation	%	99.58	98.69
Volume	cc	355.79	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.86	0.86
2	100	0.96	0.96
3	200	0.97	0.97
4	300	0.99	0.99
5	400	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.



At Maximum Deviator stress

Deviator Stress (kPa)	69.0
External Axial Strain (%)	7.36
Shear Stress (kPa)	34.5
Pore Water Pressure (kPa)	70
Radial Effective Stress (kPa)	30
Axial Effective Stress (kPa)	99
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.003
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

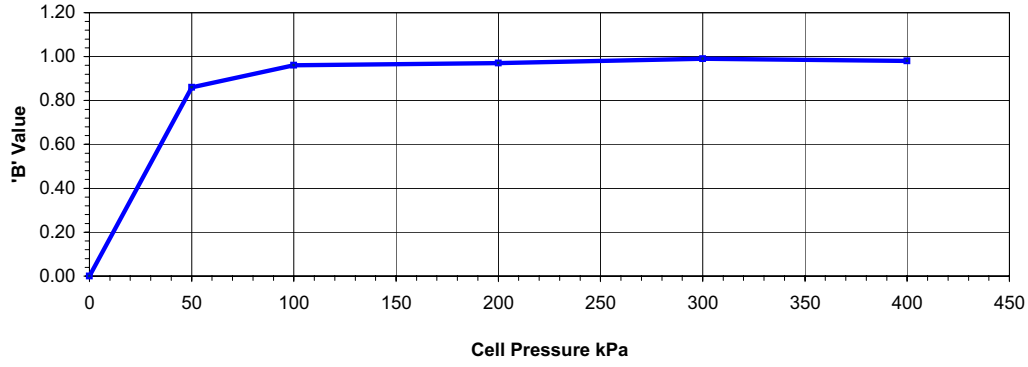
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

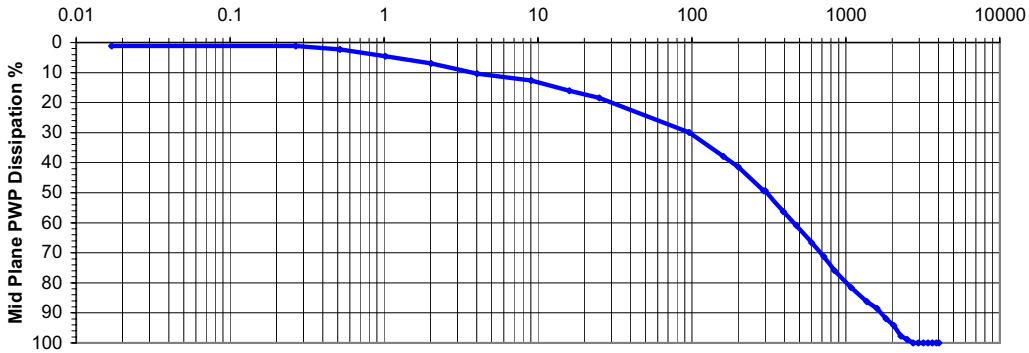
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	22.47-23.02m

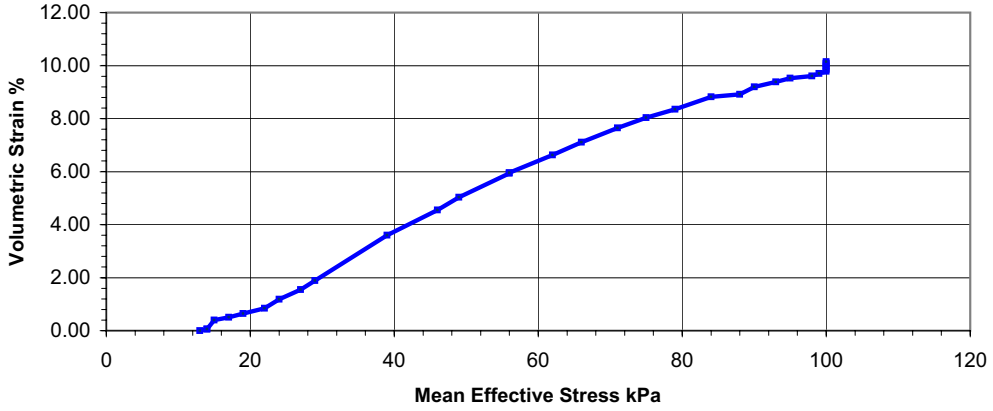
Saturation



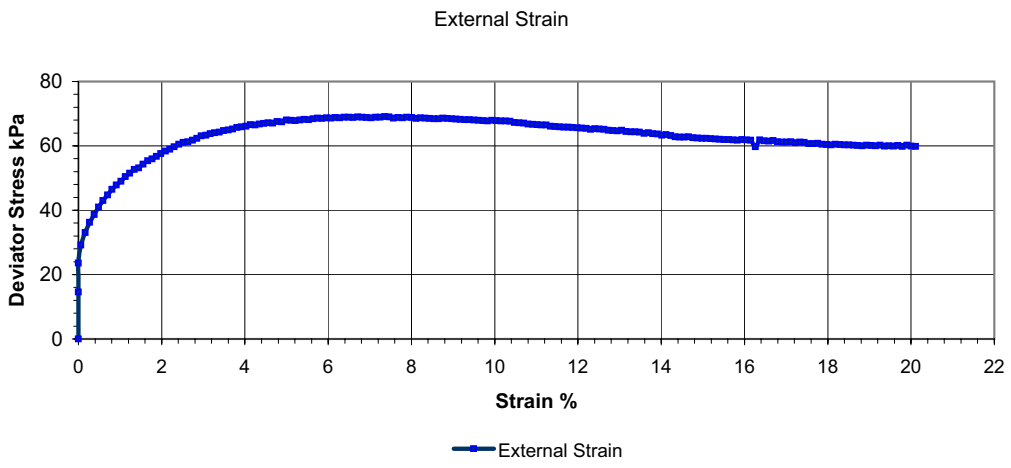
Isotropic Consoliadtion

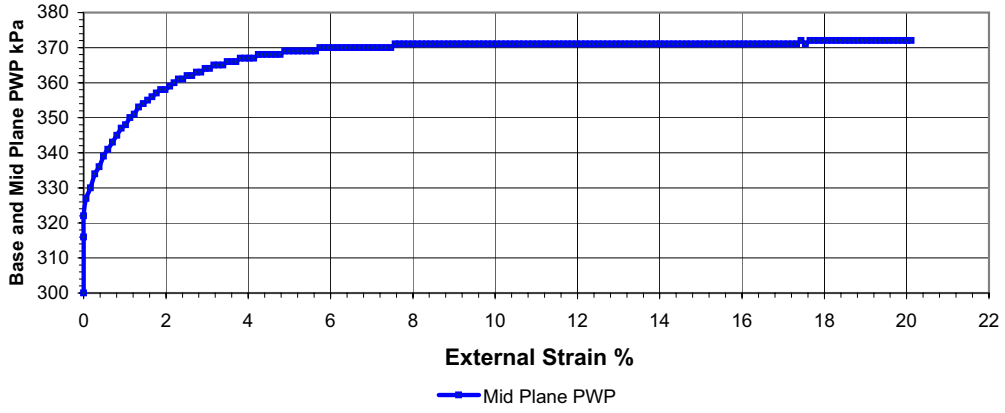
Time Mins

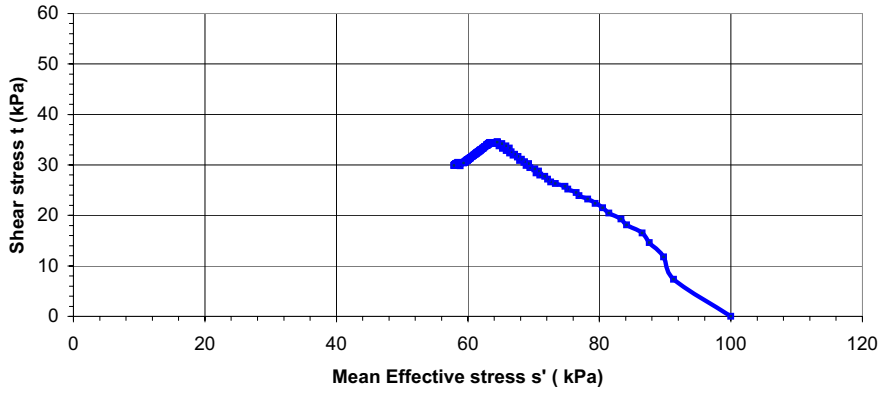




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	22.47-23.02m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	1-Top
		Depth.	22.47-23.02m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.60	1.69
Specimen Length	mm	124.96	Dry Density	Mg/m3	0.94	1.08
Specimen Diameter	mm	60.10	Moisture	%	70.75	55.81
Area	mm2	2836.87	Saturation	%	101.36	100.70
Volume	cc	354.49	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.62	0.62
2	100	0.98	0.98
3	200	0.99	0.99
4	300	0.99	0.99
5	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	142.6
External Axial Strain (%)	7.55
Shear Stress (kPa)	71.3
Pore Water Pressure (kPa)	137
Radial Effective Stress (kPa)	63
Axial Effective Stress (kPa)	206
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.003
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

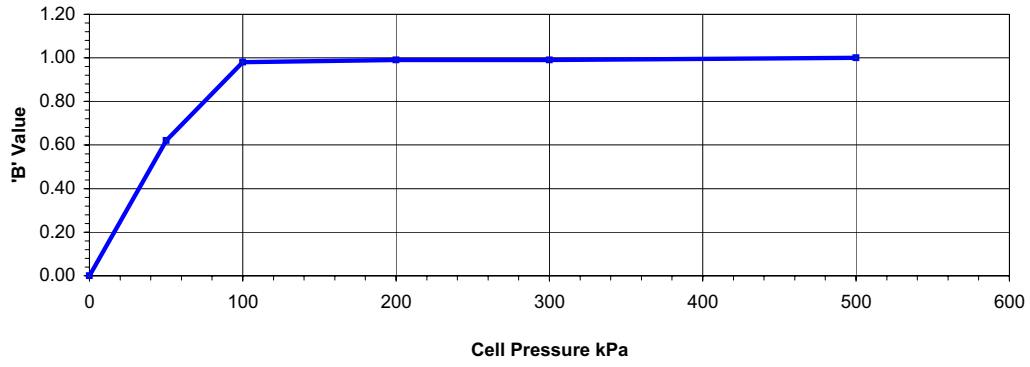
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

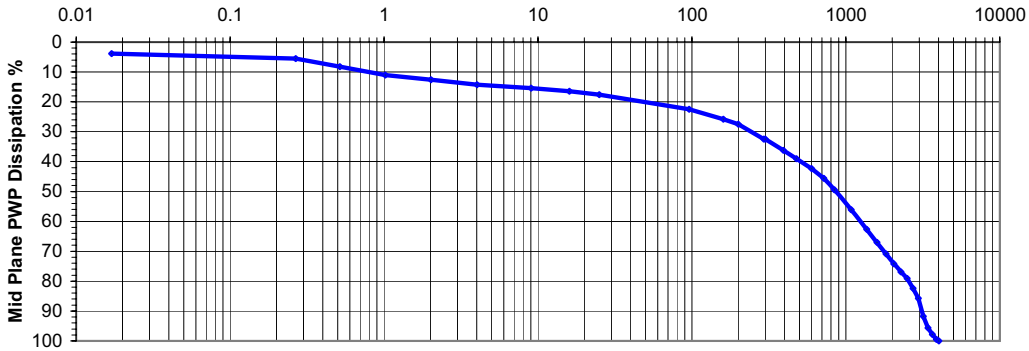
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	22.47-23.02m

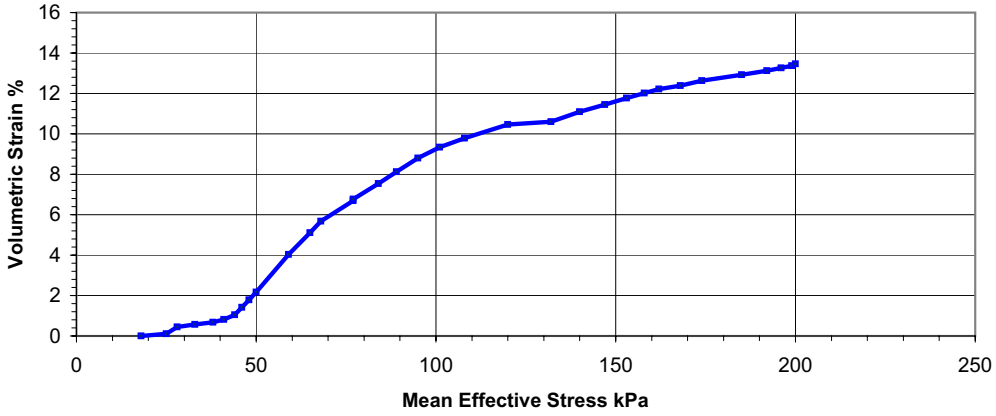
Saturation



Isotropic Consoliadtion

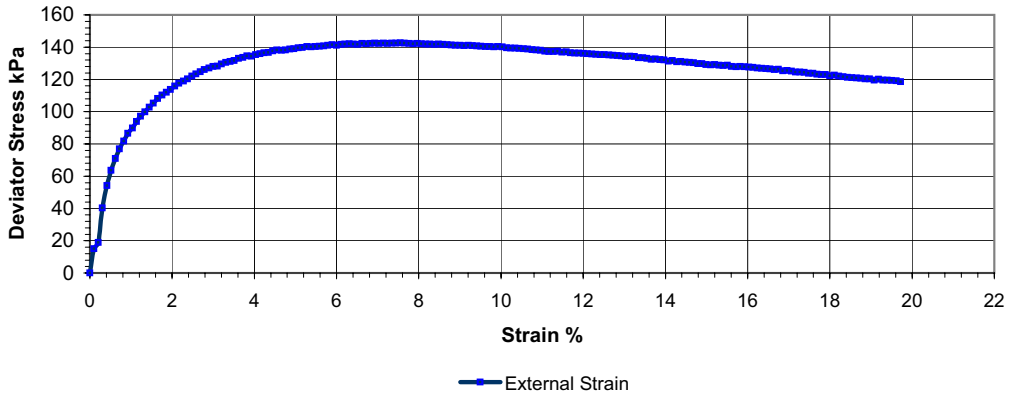
Time Mins

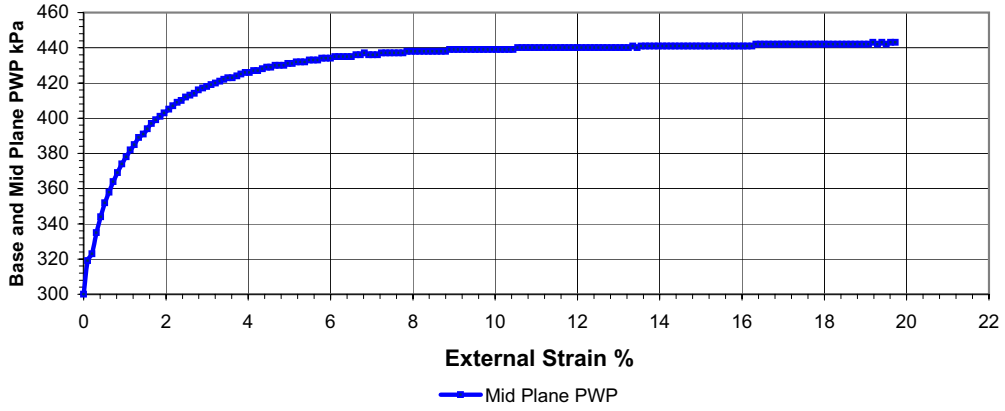


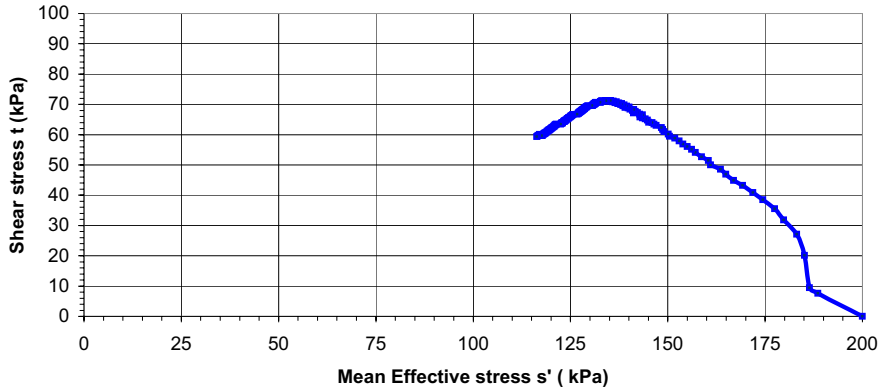


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	22.47-23.02m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	2-Middle
		Depth.	22.47-23.02m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.64	1.79
Specimen Length	mm	121.20	Dry Density	Mg/m3	1.00	1.22
Specimen Diameter	mm	60.10	Moisture	%	64.46	46.76
Area	mm2	2836.87	Saturation	%	101.74	104.47
Volume	cc	343.83	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.72	0.72
2	100	0.94	0.94
3	200	0.99	0.99
4	300	1.00	1.00
5	700	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	259.2
External Axial Strain (%)	8.11
Shear Stress (kPa)	129.6
Pore Water Pressure (kPa)	264
Radial Effective Stress (kPa)	136
Axial Effective Stress (kPa)	395
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.003
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

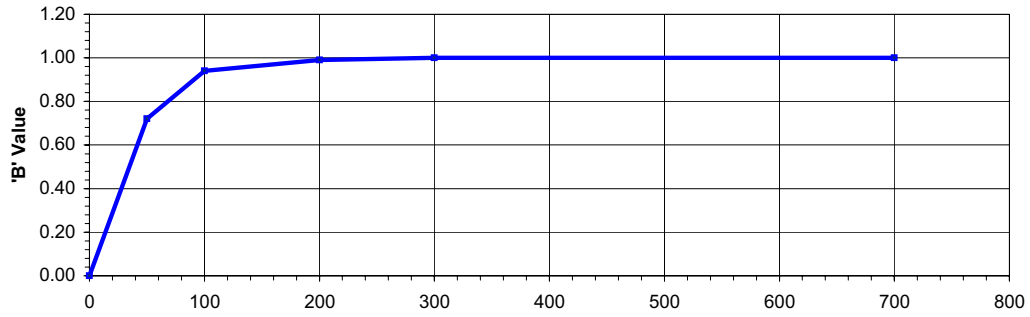
2 Side drain corrections not applied

3 Membrane correction not applied

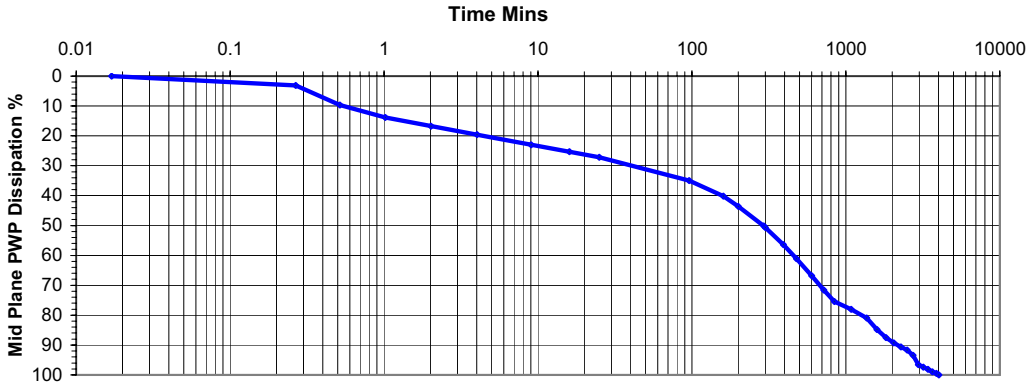
Specimen After Test

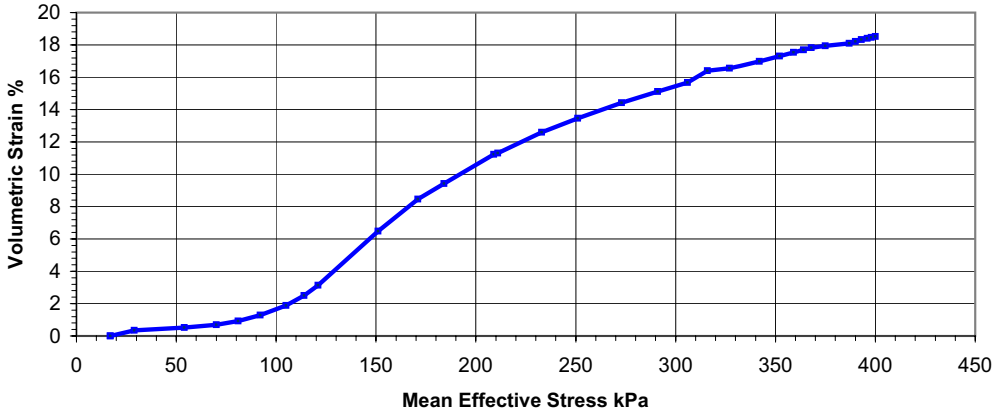
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	22.47-23.02m

Saturation

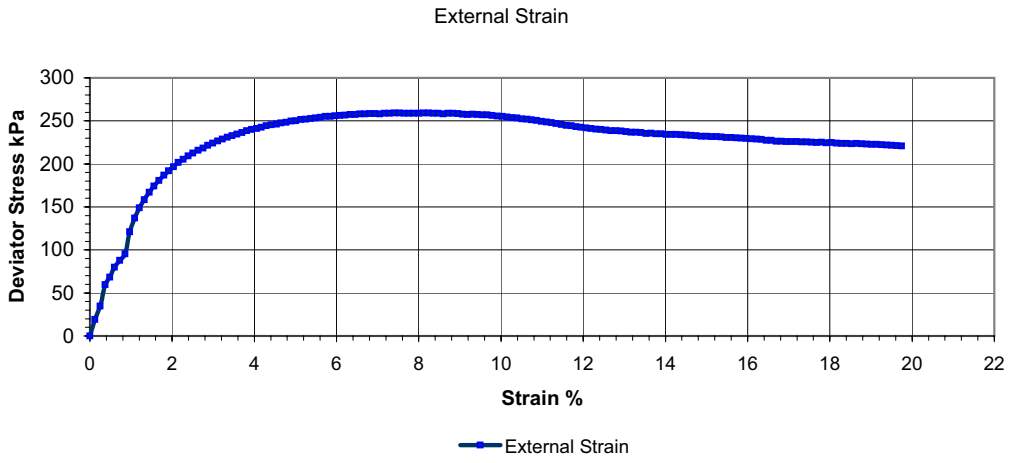


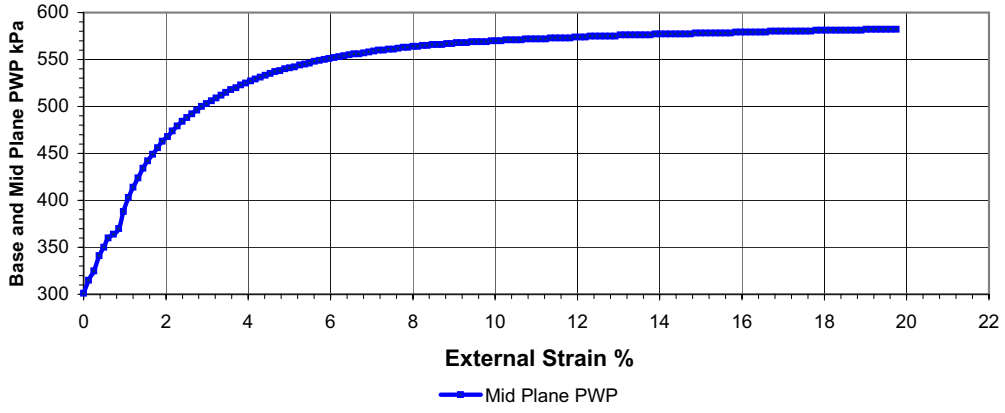
Isotropic Consoliadtion

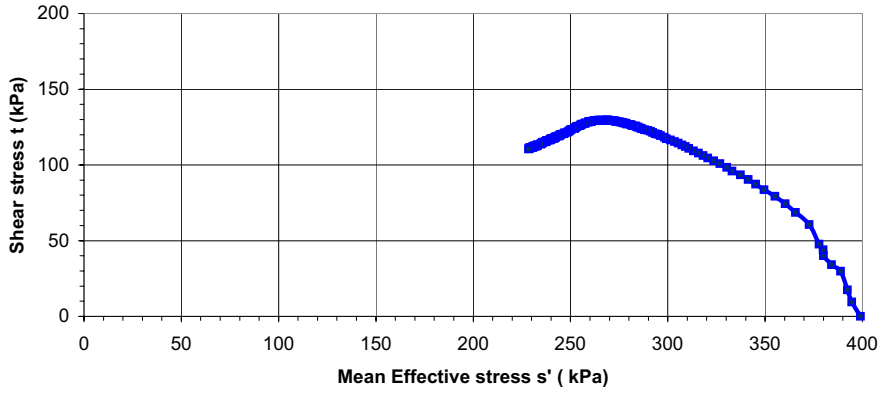




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	22.47-23.02m

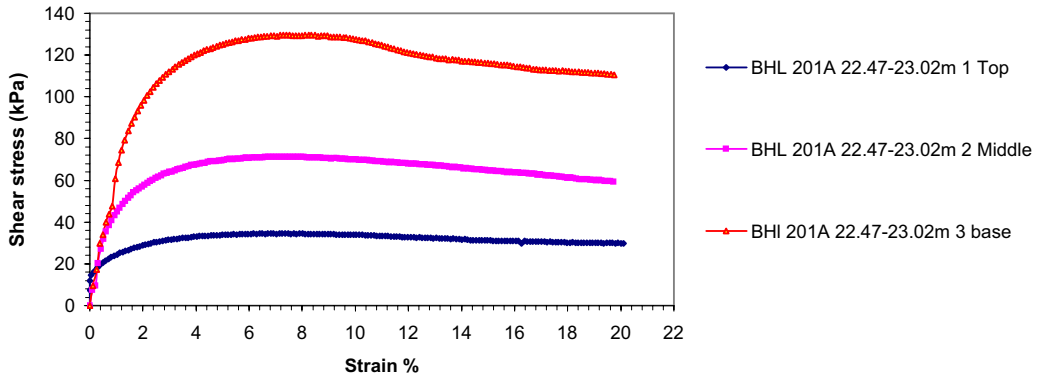


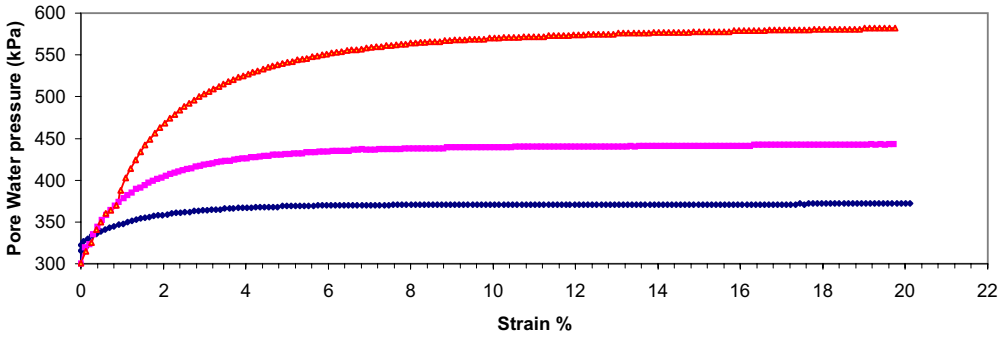


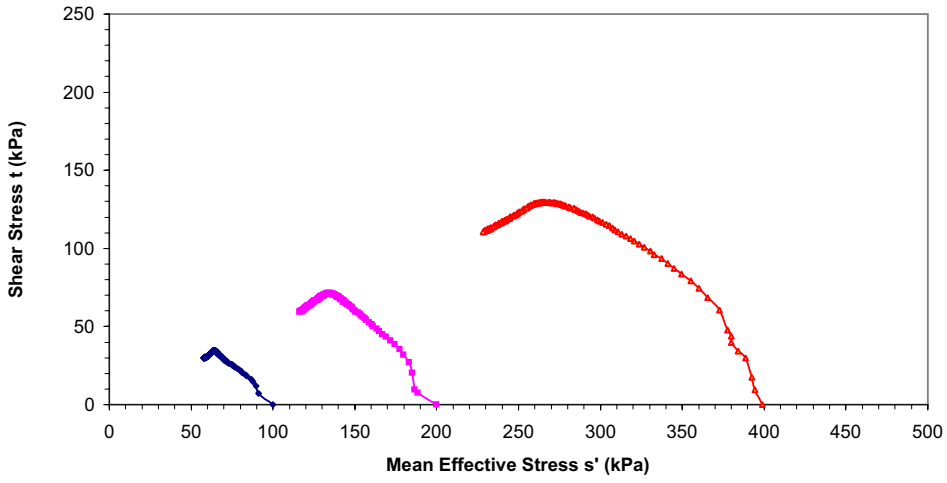


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 201A
	Project: Durban Harbour Berth Deepening Study	Sample No.	3-Base
		Depth.	22.47-23.02m

Combined Stress Path Plots







c' **1.5** **kPa**

Φ' **29.8°**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BHL 201A
Ltd	Project:	Sample No.	Shelby
	Durban Harbour Berth Deepening Study	Depth	22.47-23.02m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.76	1.78
Specimen Length	mm	102.20	Dry Density	Mg/m3	1.16	1.22
Specimen Diameter	mm	53.00	Moisture	%	51.44	46.02
Area	mm2	2206.18	Saturation	%	105.05	102.43
Volume	cc	225.47	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.88	0.88
3	200	0.95	0.95
4	300	0.97	0.97
5	350	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	47.9
External Axial Strain (%)	4.94
Shear Stress (kPa)	23.9
Pore Water Pressure (kPa)	26.0
Radial Effective Stress (kPa)	24.0
Axial Effective Stress (kPa)	71.9
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft to firm dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

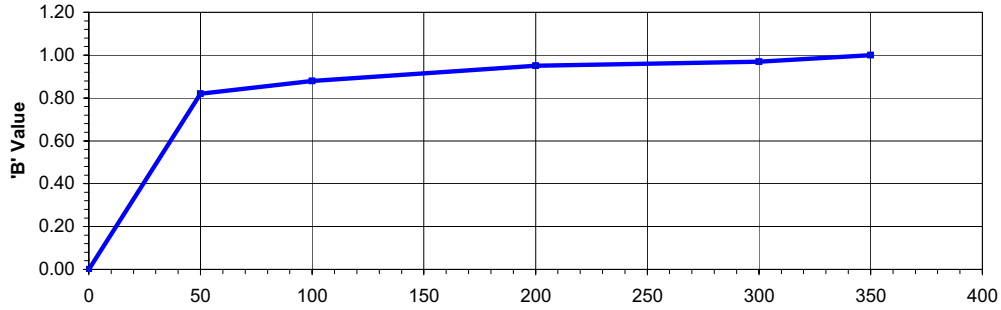
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	20.68-20.89m

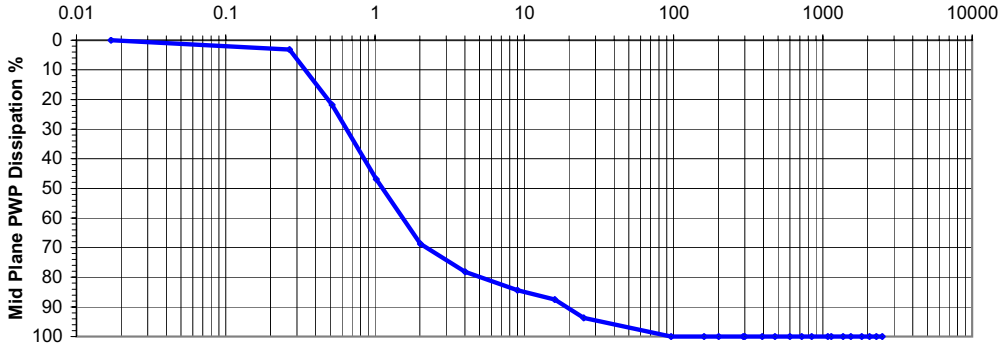
Saturation

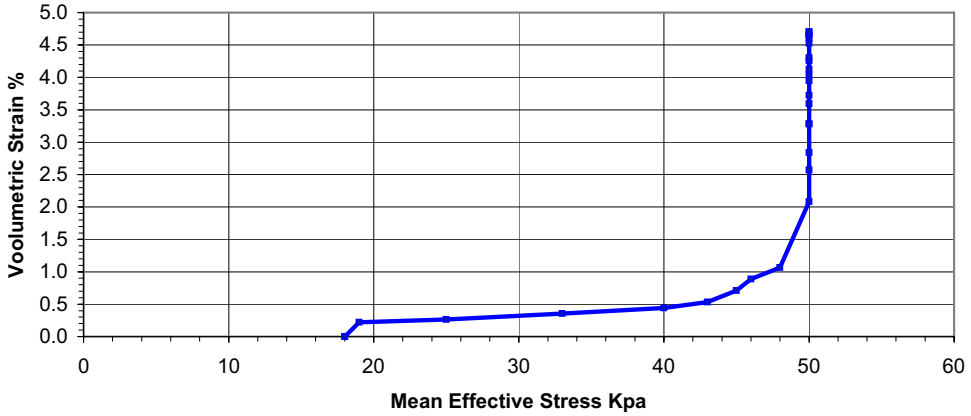


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

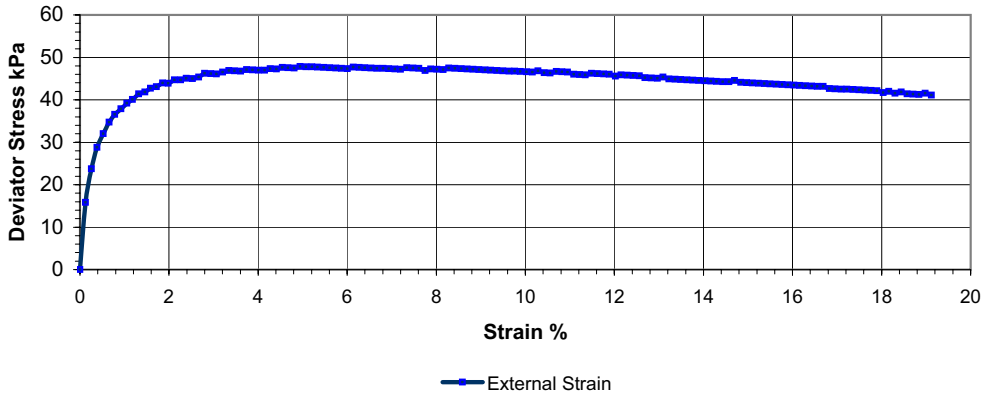


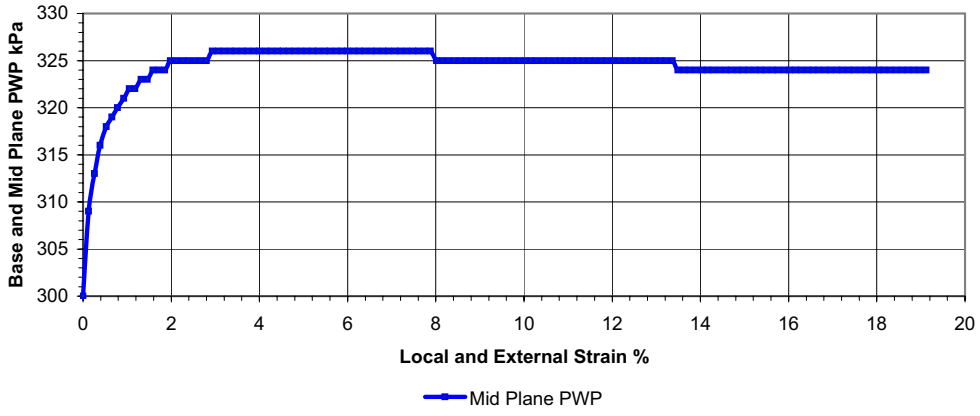


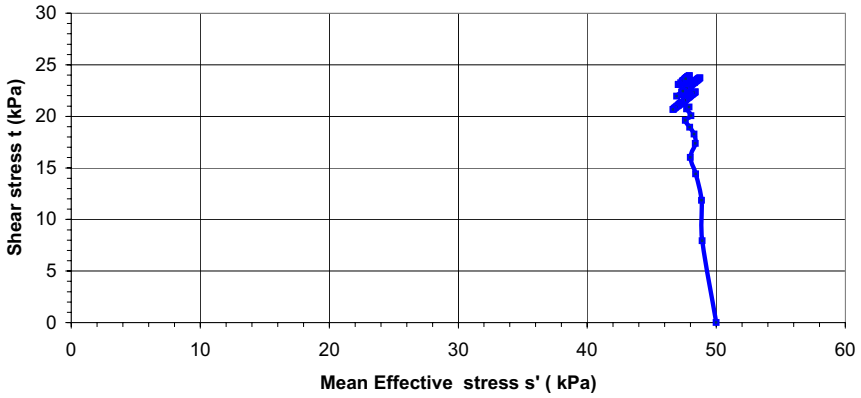
Mean Effective Stress Kpa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	20.68-20.89m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	20.68-20.89m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.73	1.80
Specimen Length	mm	103.80	Dry Density	Mg/m3	1.10	1.26
Specimen Diameter	mm	53.10	Moisture	%	57.31	43.19
Area	mm2	2214.52	Saturation	%	106.39	101.39
Volume	cc	229.87	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.74	0.74
2	100	0.86	0.86
3	200	1.00	1.00
4	300	0.96	0.96
5	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	154.1
External Axial Strain (%)	6.68
Shear Stress (kPa)	77.0
Pore Water Pressure (kPa)	132.0
Radial Effective Stress (kPa)	68.0
Axial Effective Stress (kPa)	222.1
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

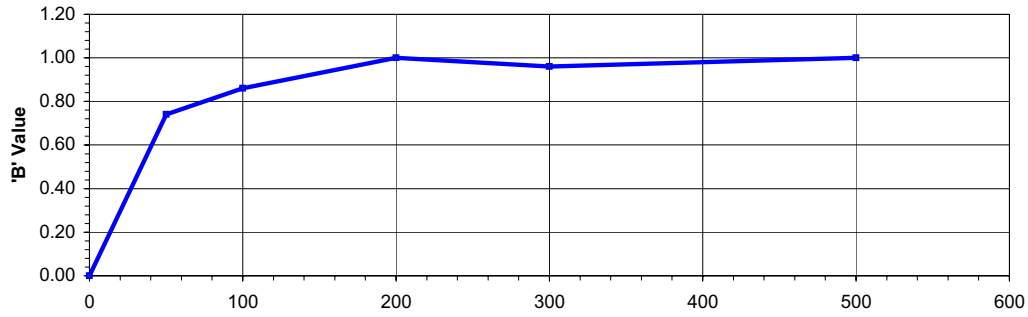
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	20.68-20.89m

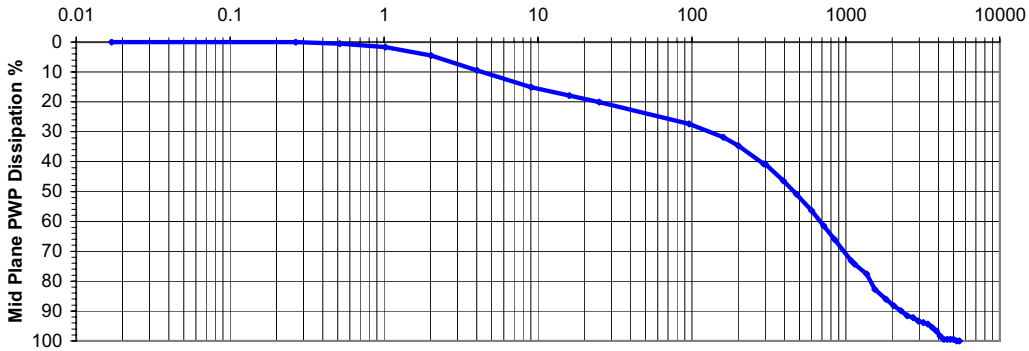
Saturation

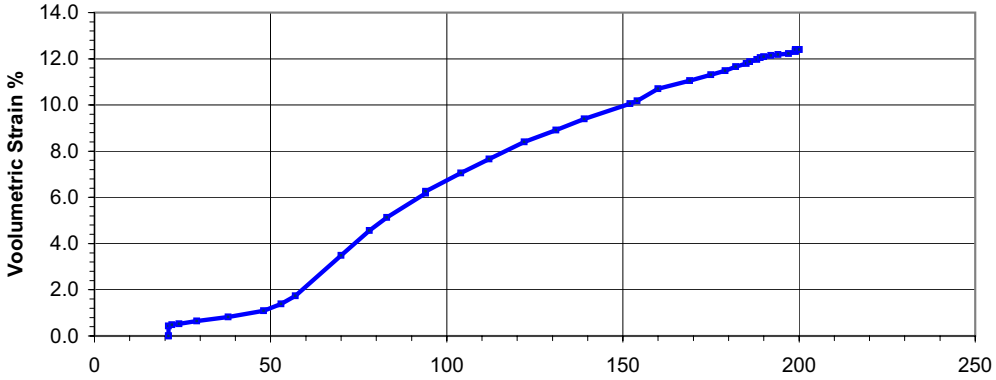


Cell Pressure kPa

Isotropic Consoliadtion

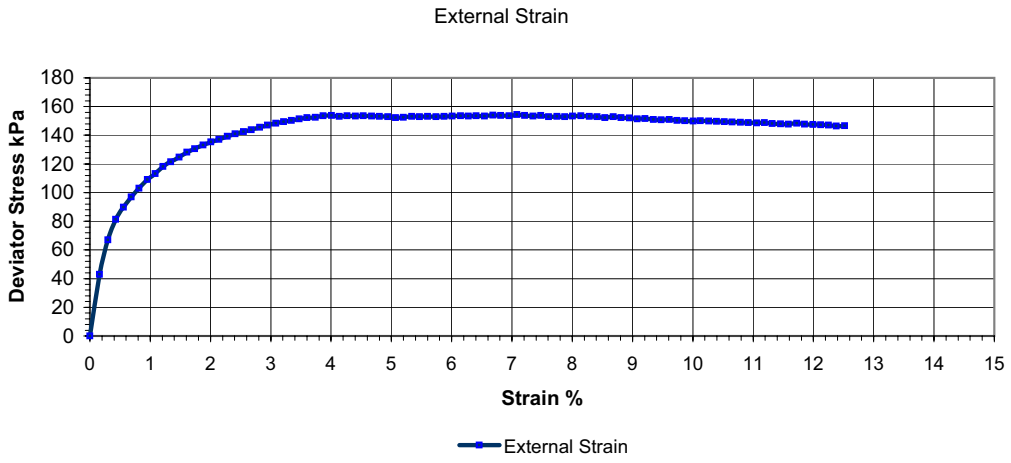
Time Mins

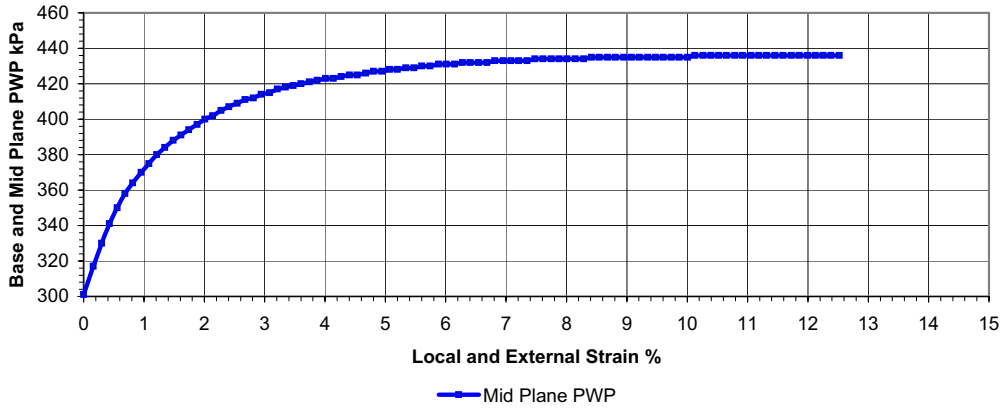


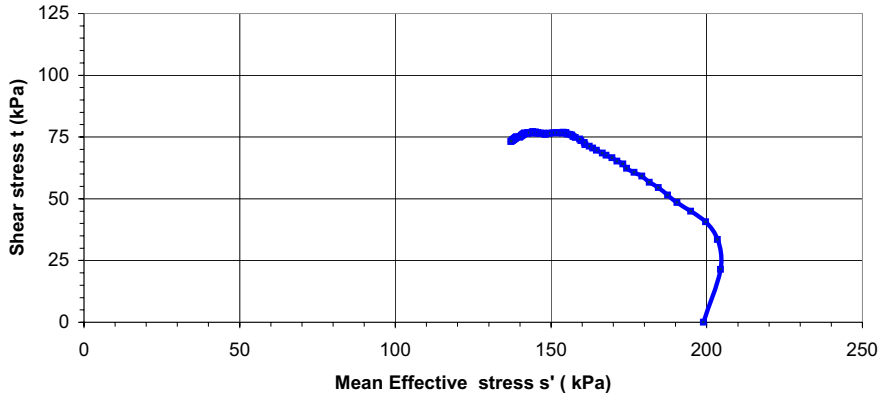


Mean Effective Stress Kpa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	20.68-20.89m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	20.68-20.89m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.87	1.88
Specimen Length	mm	108.10	Dry Density	Mg/m3	1.37	1.43
Specimen Diameter	mm	53.70	Moisture	%	36.39	31.96
Area	mm2	2264.84	Saturation	%	101.11	96.81
Volume	cc	244.83	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.86	0.86
3	150	0.94	0.94
4	200	0.96	0.96
5	300	0.97	0.97
6	350	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	51.1
External Axial Strain (%)	19.31
Shear Stress (kPa)	25.6
Pore Water Pressure (kPa)	28.0
Radial Effective Stress (kPa)	22.0
Axial Effective Stress (kPa)	73.1
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

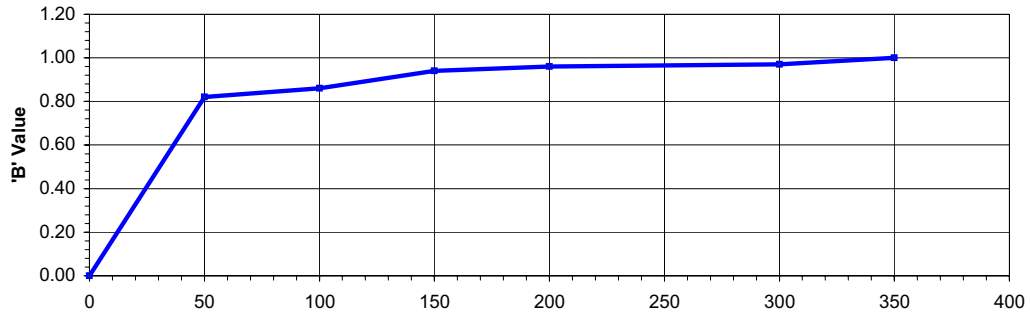
3 Membrane correction not applied

3 Side drain corrections not applied

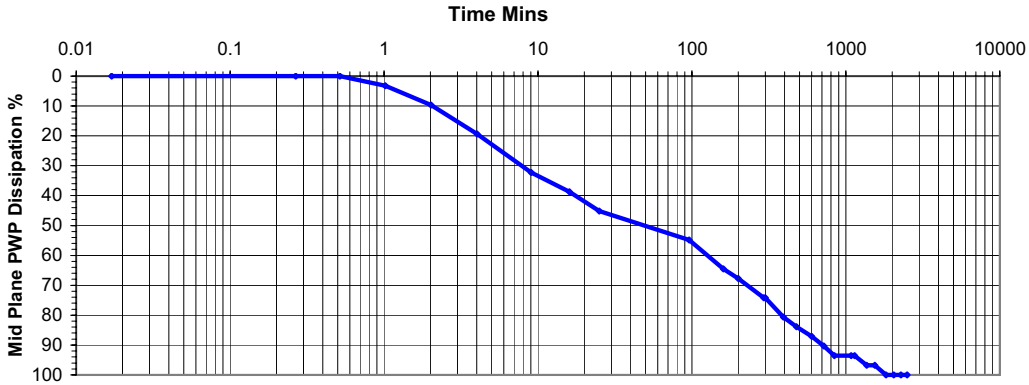
Specimen After Test

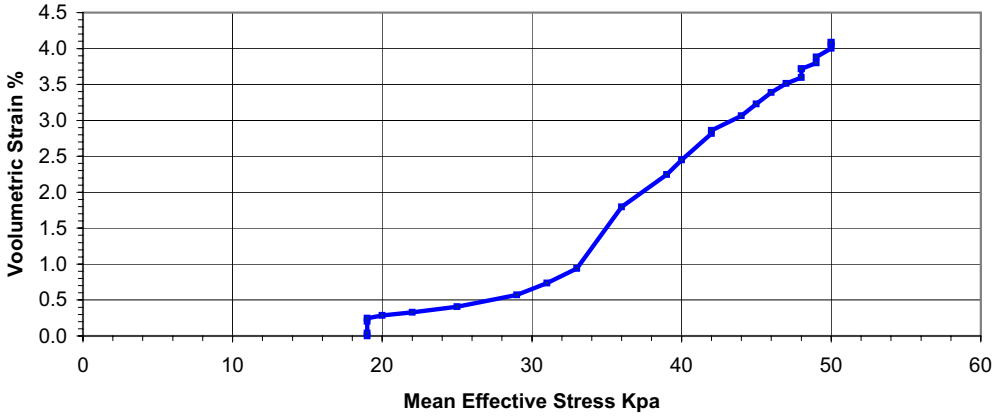
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.05-21.21m

Saturation



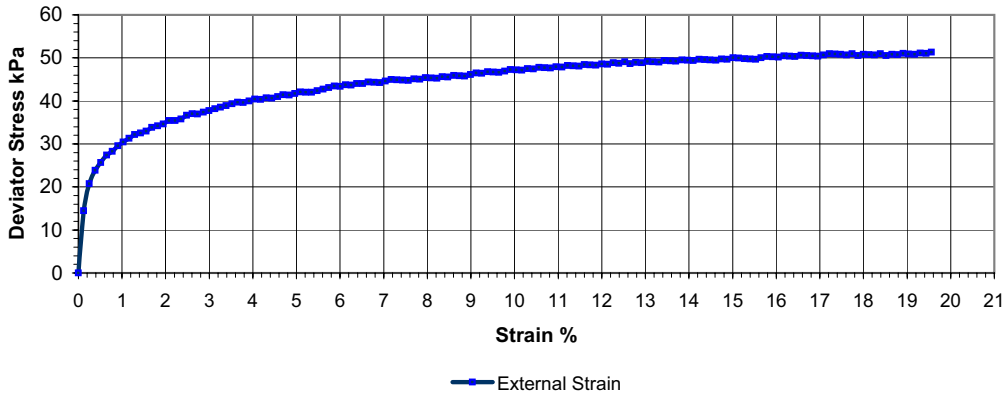
Isotropic Consoliadtion

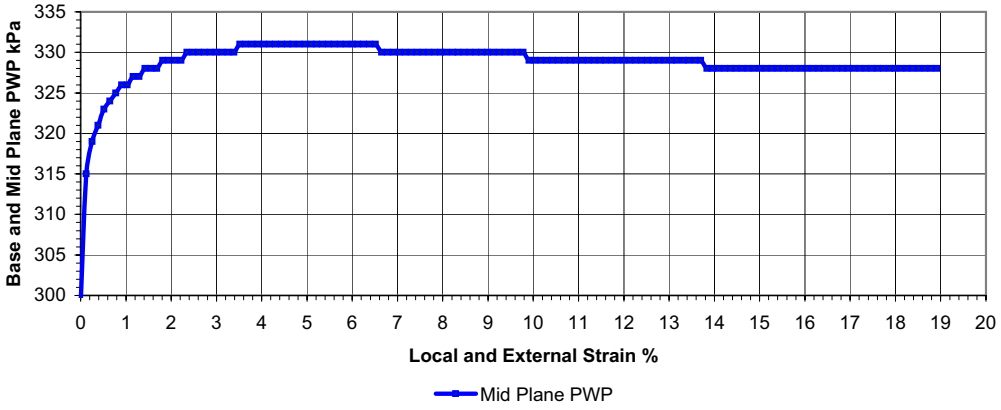


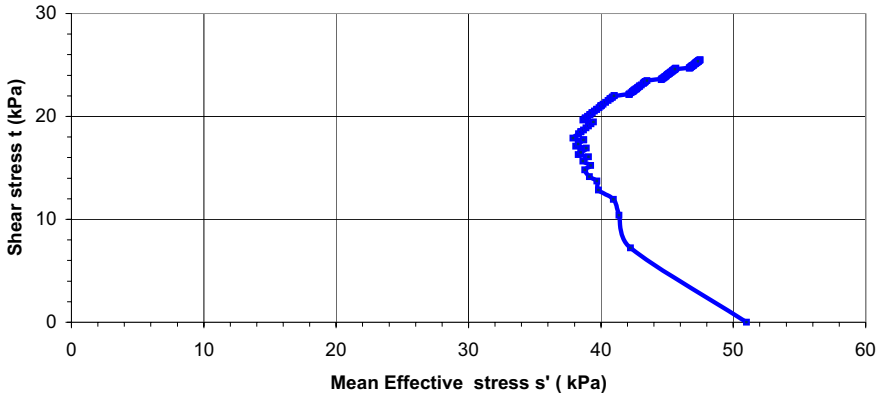


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.05-21.21m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.05-21.21m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.93	1.96
Specimen Length	mm	108.20	Dry Density	Mg/m3	1.46	1.56
Specimen Diameter	mm	54.00	Moisture	%	32.18	25.19
Area	mm2	2290.22	Saturation	%	102.67	93.55
Volume	cc	247.80	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.80	0.80
2	100	0.96	0.96
3	150	0.98	0.98
4	200	0.98	0.98
5	300	0.97	0.97
6	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	103.5
External Axial Strain (%)	18.21
Shear Stress (kPa)	51.7
Pore Water Pressure (kPa)	58.0
Radial Effective Stress (kPa)	42.0
Axial Effective Stress (kPa)	145.5
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

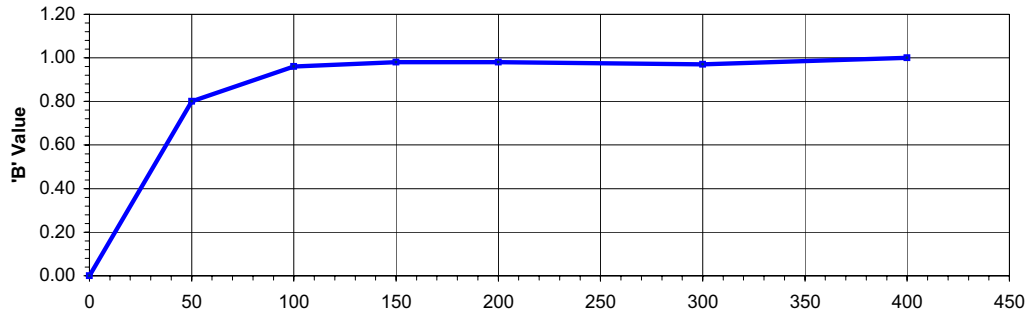
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

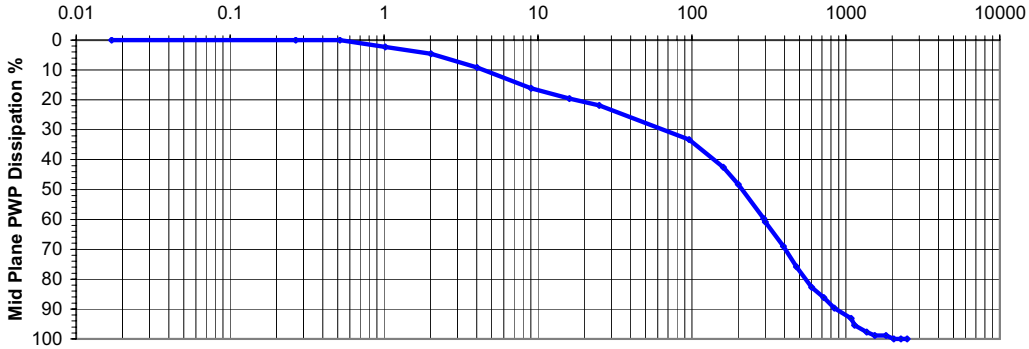
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.21-21.37m

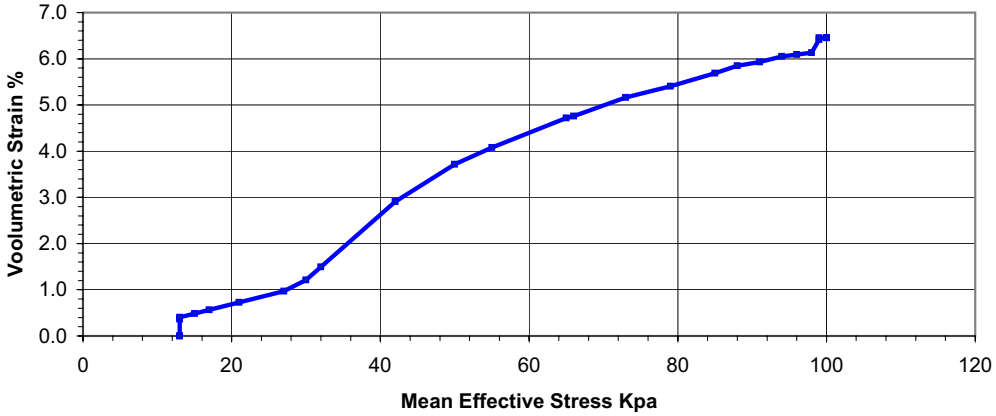
Saturation



Isotropic Consoliadtion

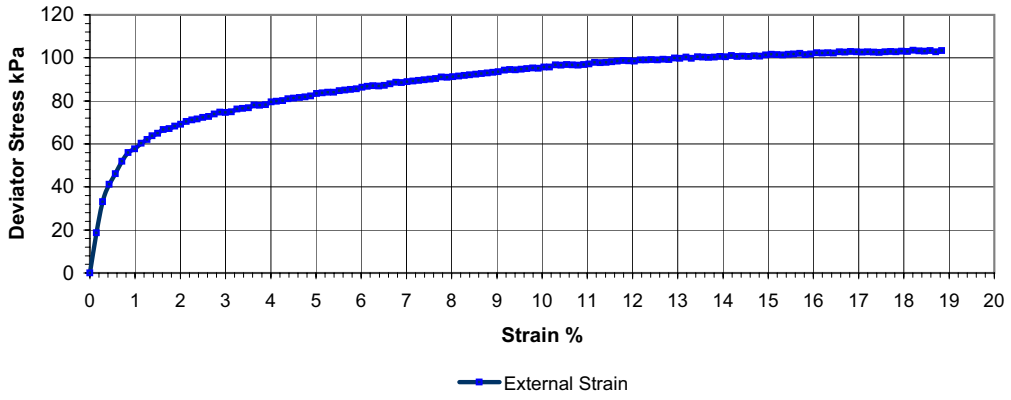
Time Mins

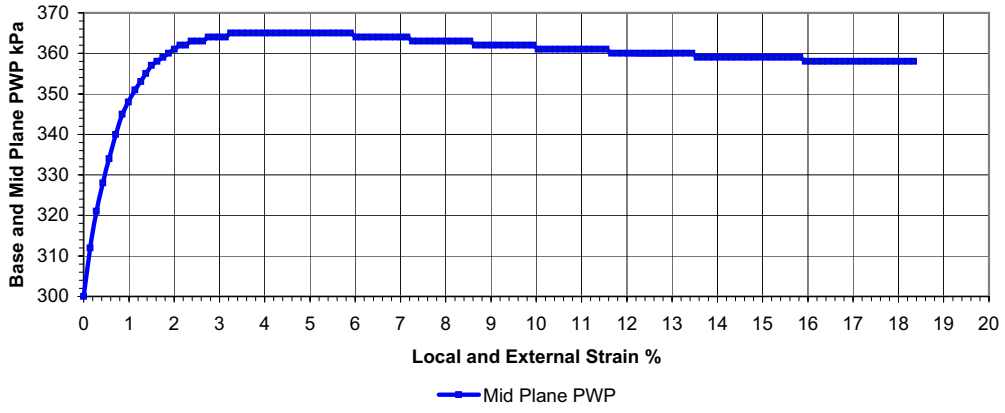


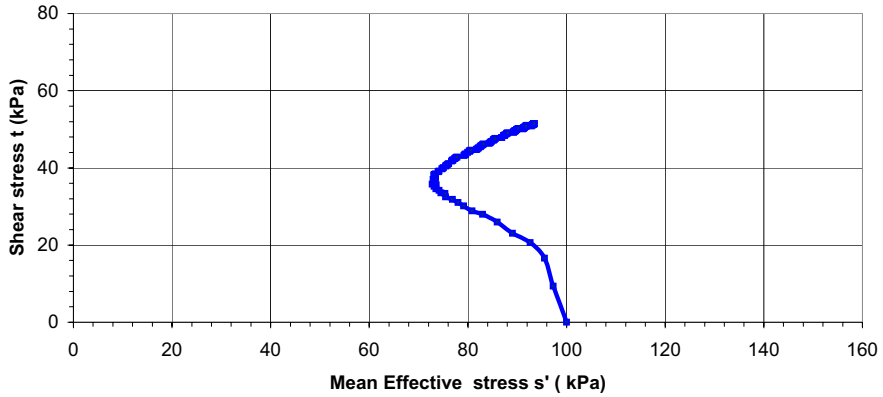


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.21-21.37m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 21.21-21.37m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.96	1.99
Specimen Length	mm	108.20	Dry Density	Mg/m3	1.50	1.61
Specimen Diameter	mm	54.00	Moisture	%	29.96	23.90
Area	mm2	2290.22	Saturation	%	101.83	95.31
Volume	cc	247.80	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.80	0.80
2	100	0.94	0.94
3	150	0.96	0.96
4	200	0.96	0.96
5	300	0.97	0.97
6	400	0.97	0.97

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	119.6
External Axial Strain (%)	13.88
Shear Stress (kPa)	59.8
Pore Water Pressure (kPa)	52.0
Radial Effective Stress (kPa)	48.0
Axial Effective Stress (kPa)	167.6
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

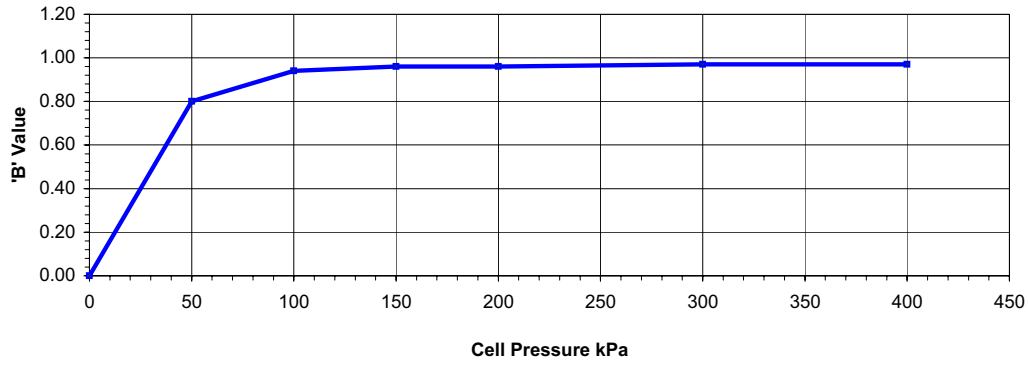
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

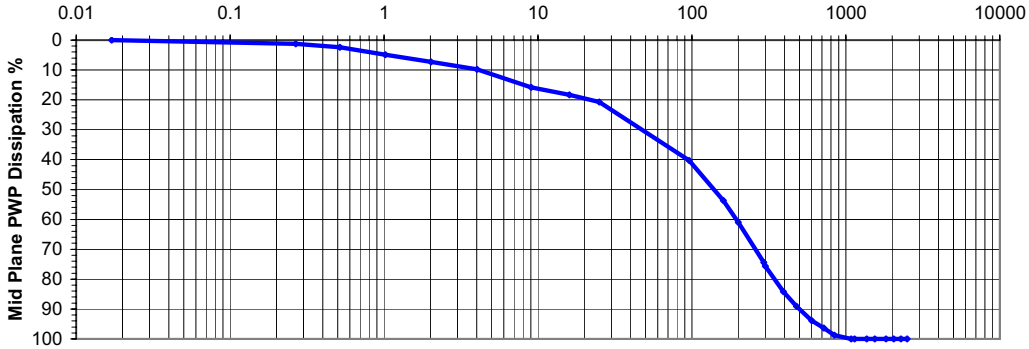
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.37-21.53m

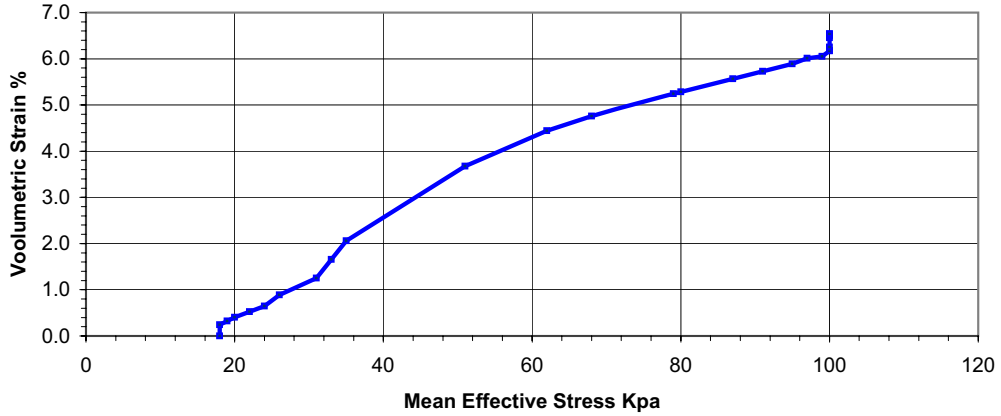
Saturation



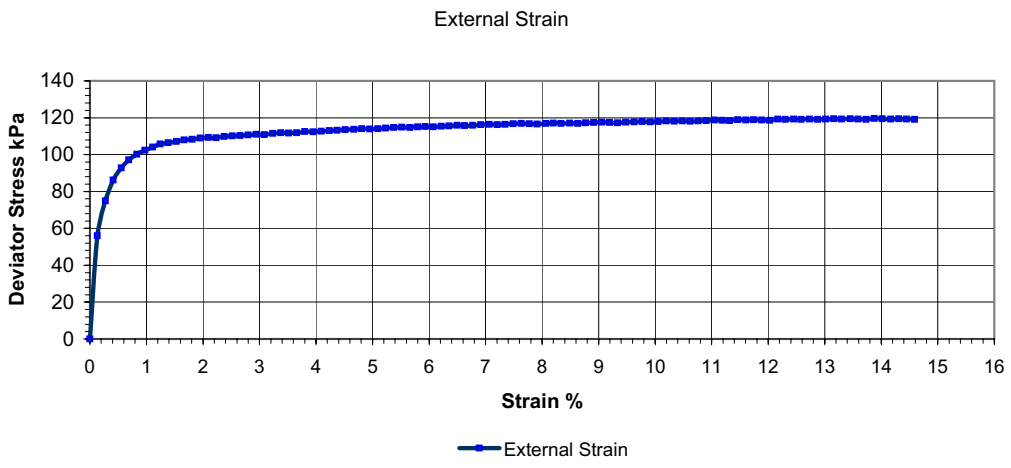
Isotropic Consoliadtion

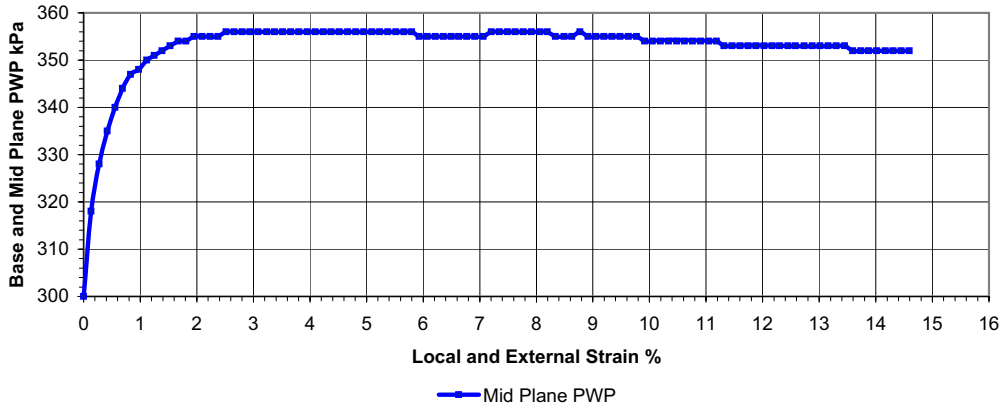
Time Mins

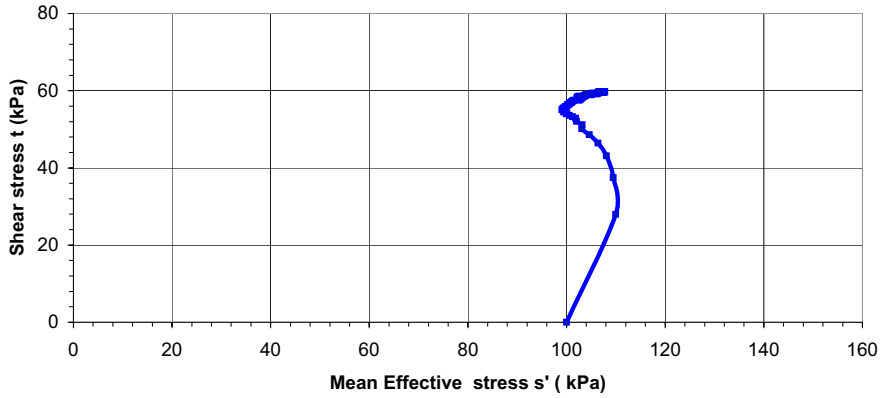




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.37-21.53m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 21.37-21.53m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	2.01	2.11
Specimen Length	mm	108.50	Dry Density	Mg/m3	1.58	1.75
Specimen Diameter	mm	54.20	Moisture	%	27.05	20.22
Area	mm2	2307.22	Saturation	%	103.29	101.35
Volume	cc	250.33	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	1.00	1.00
3	150	1.00	1.00
4	200	0.98	0.98
5	300	0.98	0.98
6	400	0.99	0.99
7	700	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	327.6
External Axial Strain (%)	18.84
Shear Stress (kPa)	163.8
Pore Water Pressure (kPa)	282.0
Radial Effective Stress (kPa)	118.0
Axial Effective Stress (kPa)	445.6
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0048
Sample Description	Soft dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

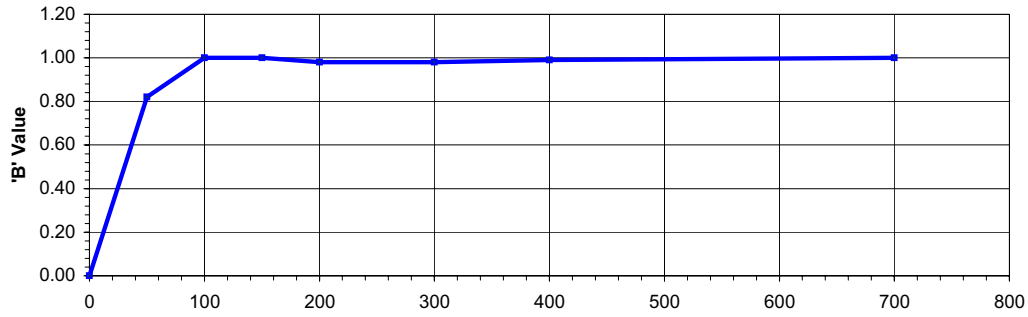
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

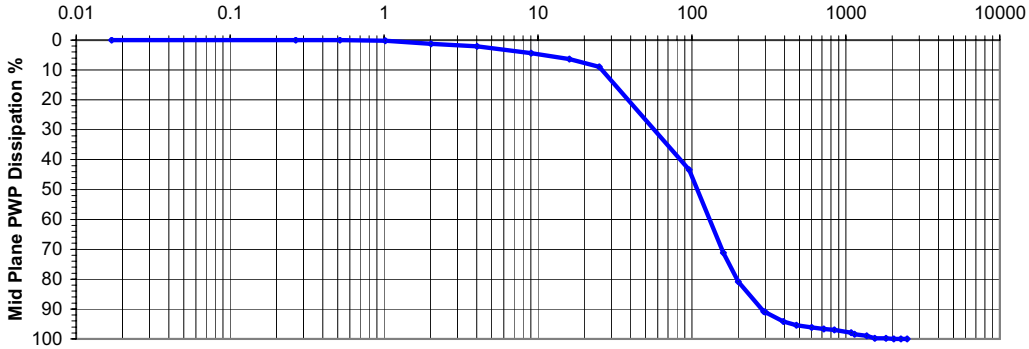
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.53-21.69m

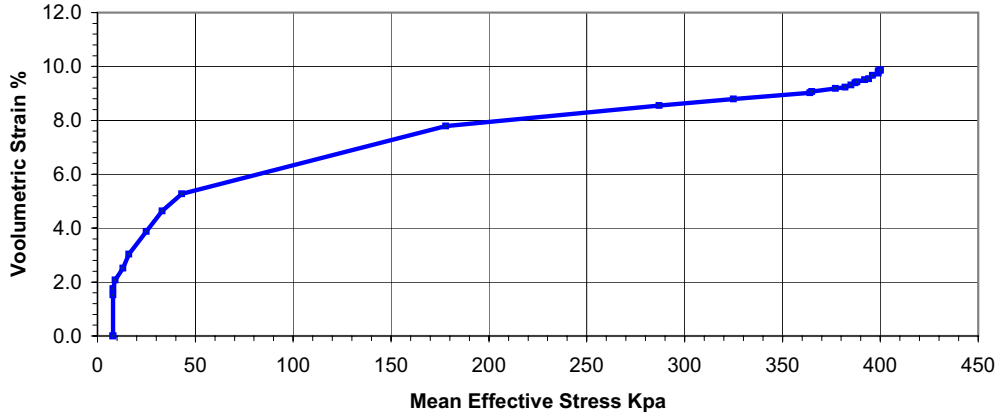
Saturation



Isotropic Consoliadtion

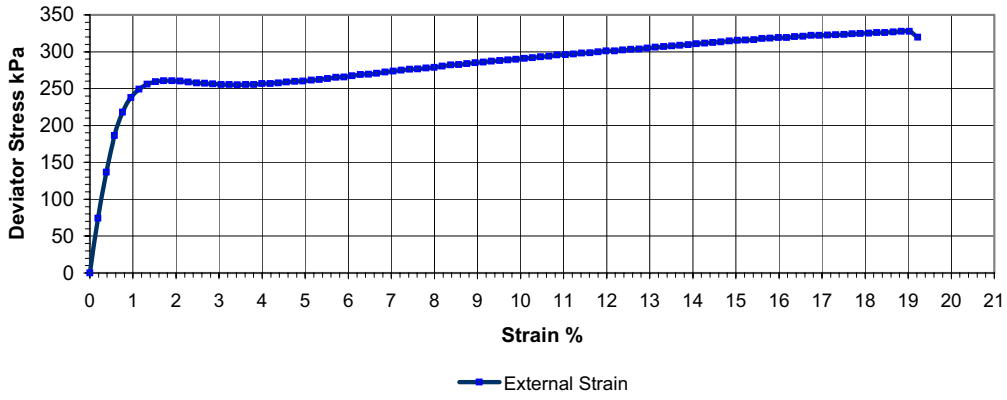
Time Mins

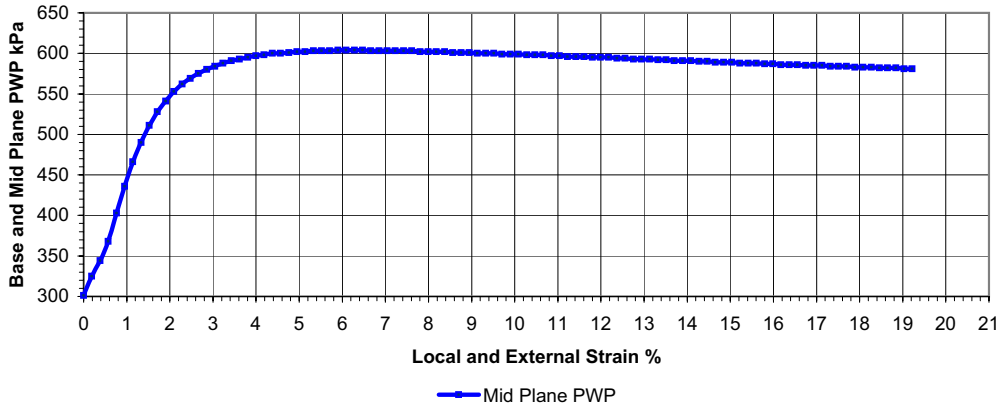


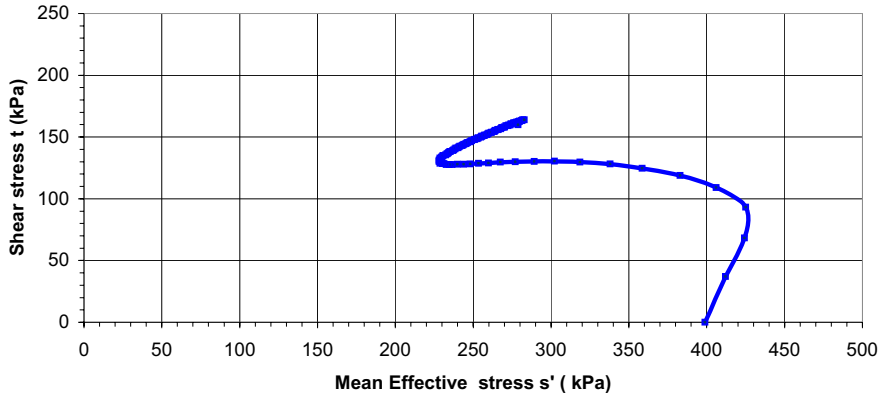


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.53-21.69m

External Strain

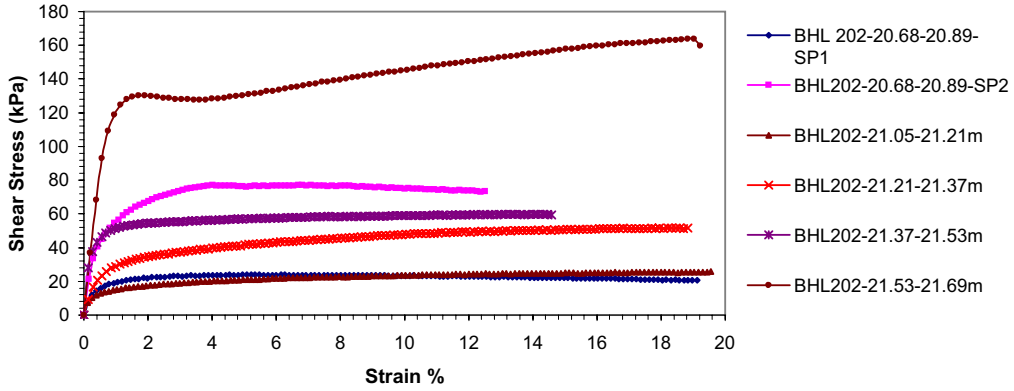


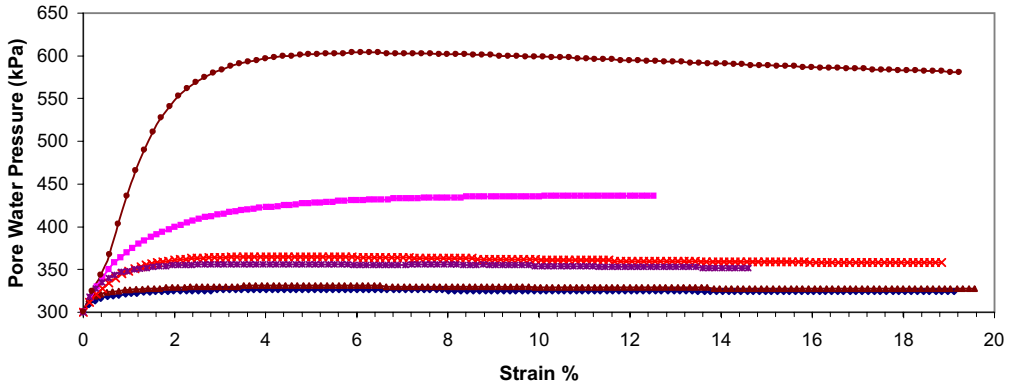


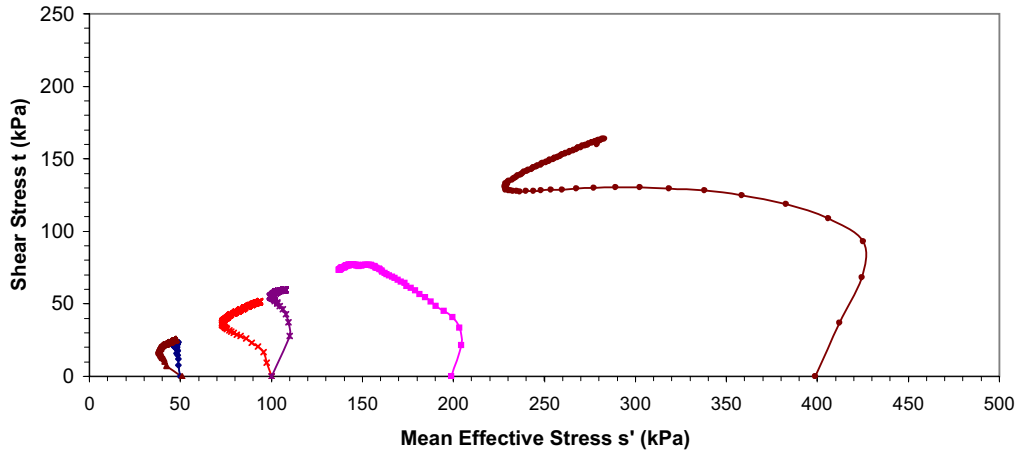


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	21.53-21.69m

Combined Stress Path Plots







c' 0 kPa

Φ' 33°

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL202
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth	20.68-21.69m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.59	1.61
Specimen Length	mm	122.30	Dry Density	Mg/m3	0.91	0.94
Specimen Diameter	mm	60.10	Moisture	%	75.40	71.05
Area	mm2	2836.87	Saturation	%	103.28	102.82
Volume	cc	346.95	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.48	0.48
2	100	0.82	0.82
3	150	0.90	0.90
4	200	0.96	0.96
5	300	0.96	0.96
6	425	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	425
Back Pressure	kPa	300
Radial Effective stress	kPa	125

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	95.4
External Axial Strain (%)	3.33
Shear Stress (kPa)	47.7
Pore Water Pressure (kPa)	75
Radial Effective Stress (kPa)	50
Axial Effective Stress (kPa)	145
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments. **Plastic**

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

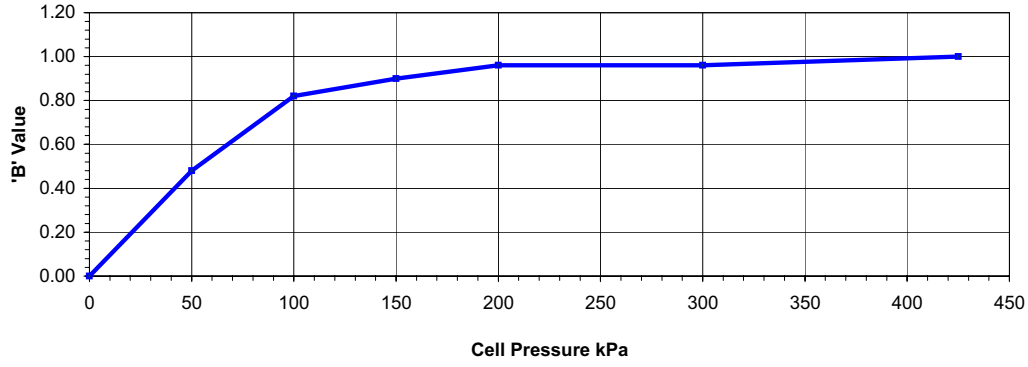
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

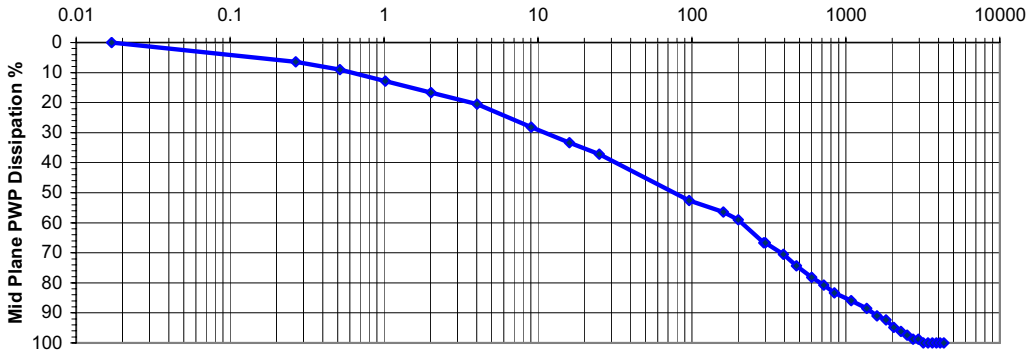
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	1_Top
		Depth.	24.45-25.0m

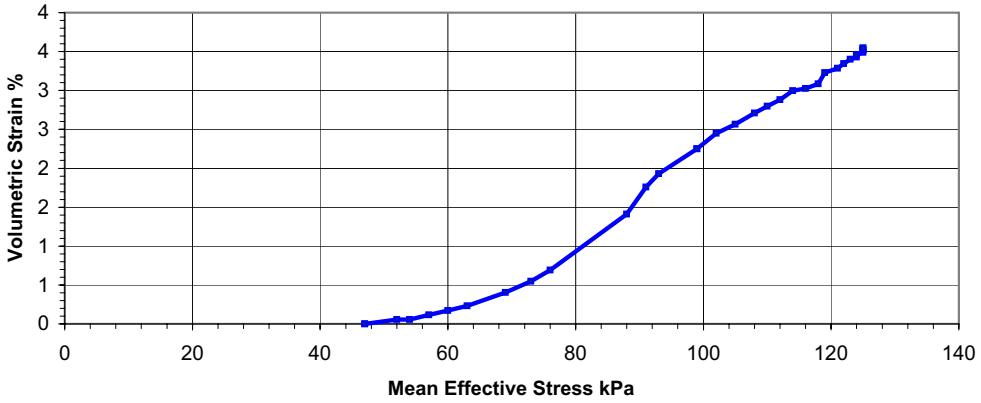
Saturation



Isotropic Consoliadtion

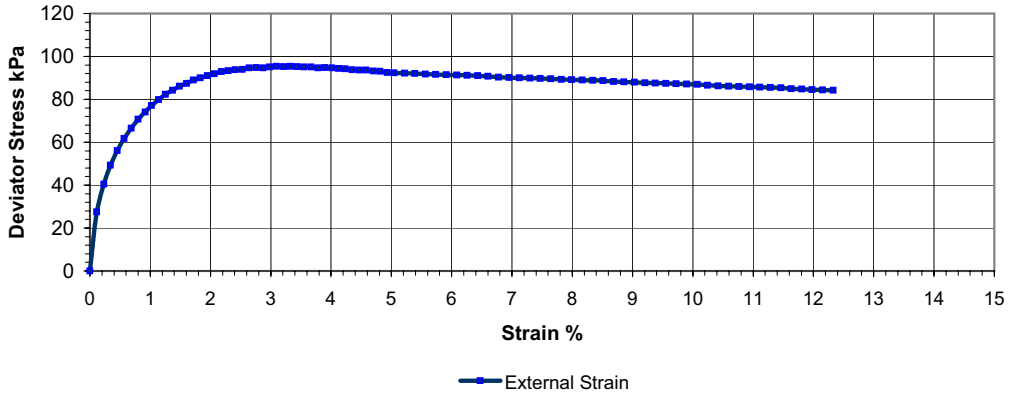
Time Mins

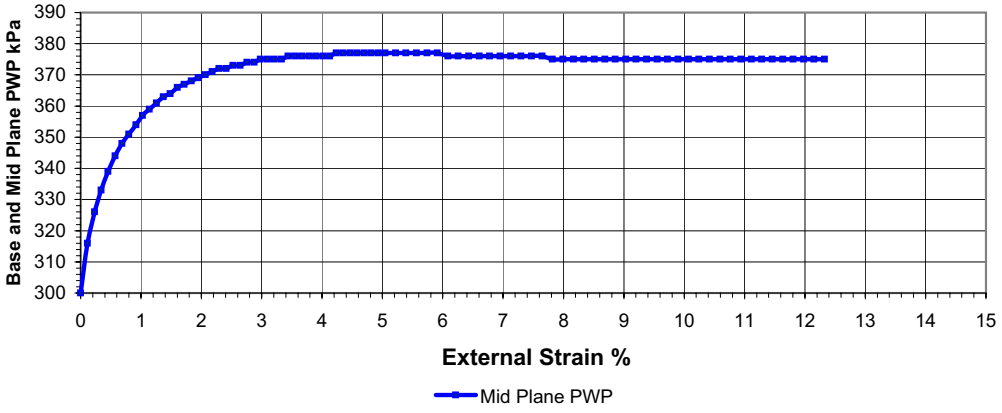


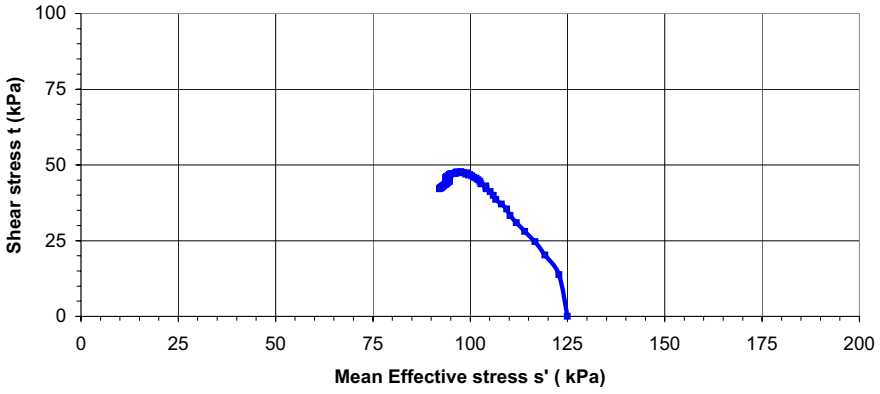


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	1_Top
		Depth.	24.45-25.0m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No. 1_Top
		Depth. 24.45-25.0m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.53	1.63
Specimen Length	mm	126.50	Dry Density	Mg/m3	0.84	1.03
Specimen Diameter	mm	60.20	Moisture	%	81.57	57.92
Area	mm2	2846.31	Saturation	%	100.01	96.61
Volume	cc	360.06	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.92	0.92
2	100	0.96	0.96
3	200	0.97	0.97
4	300	0.98	0.98
5	550	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	550
Back Pressure	kPa	300
Radial Effective stress	kPa	250

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	169.2
External Axial Strain (%)	4.79
Shear Stress (kPa)	84.6
Pore Water Pressure (kPa)	137
Radial Effective Stress (kPa)	113
Axial Effective Stress (kPa)	282
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

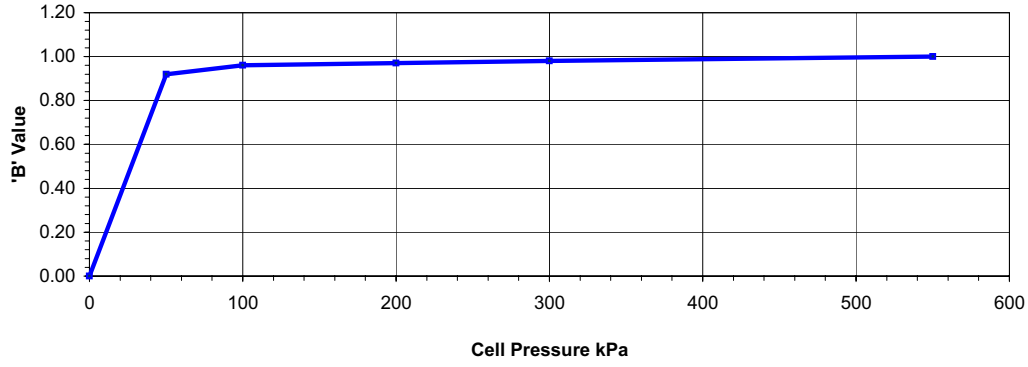
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

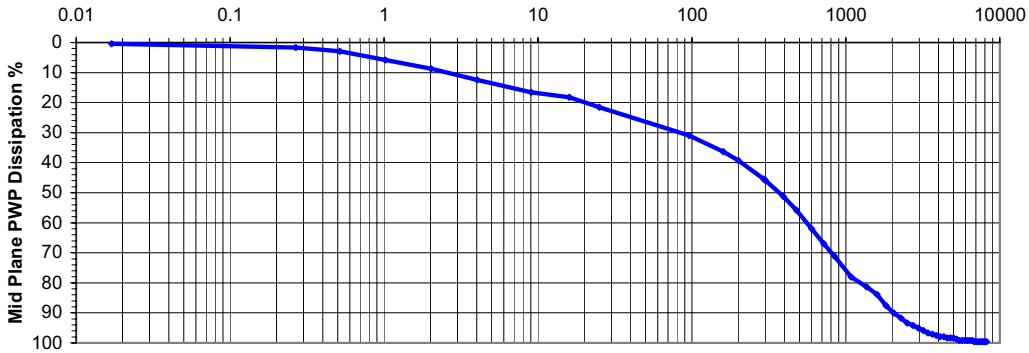
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	2_Middle
		Depth.	24.45-25.0m

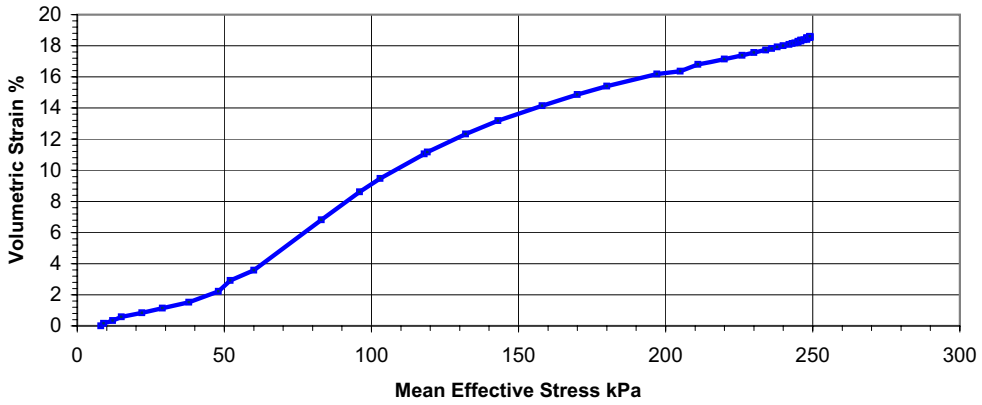
Saturation



Isotropic Consoliadtion

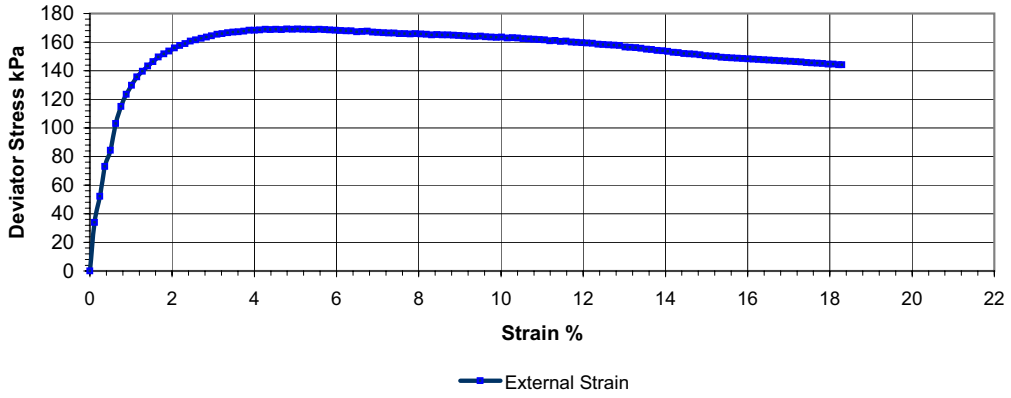
Time Mins

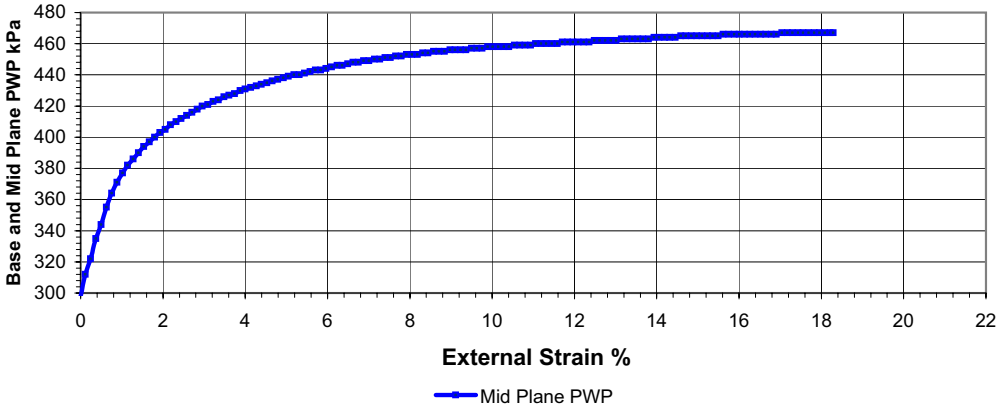


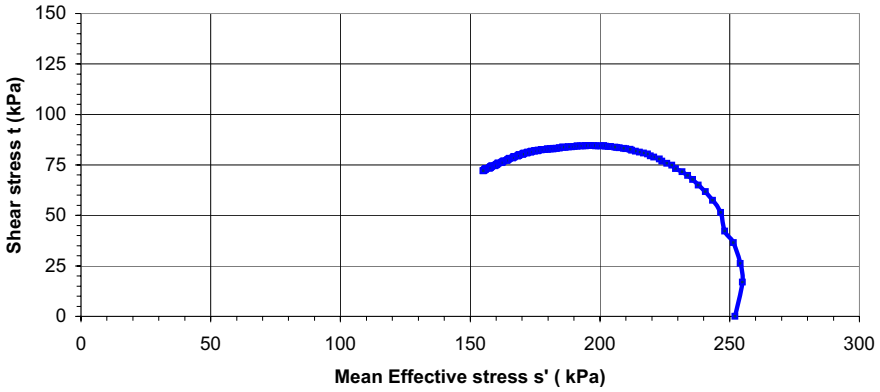


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	2_Middle
		Depth.	24.45-25.0m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	2_Middle
		Depth.	24.45-25.0m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.60	1.69
Specimen Length	mm	121.80	Dry Density	Mg/m3	0.90	1.08
Specimen Diameter	mm	59.85	Moisture	%	77.24	56.60
Area	mm2	2813.31	Saturation	%	104.54	102.23
Volume	cc	342.66	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.72	0.72
2	100	0.90	0.90
3	150	0.94	0.94
4	200	0.96	0.96
5	300	0.97	0.97
6	500	1.00	1.00
7	800	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	800
Back Pressure	kPa	300
Radial Effective stress	kPa	500

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	313.2
External Axial Strain (%)	6.99
Shear Stress (kPa)	156.6
Pore Water Pressure (kPa)	325
Radial Effective Stress (kPa)	175
Axial Effective Stress (kPa)	488
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Soft to firm dark grey SILT/CLAY with shell fragments. **Plastic**

Notes:

1 Test performed in accordance with Moore Spence Jones specification.

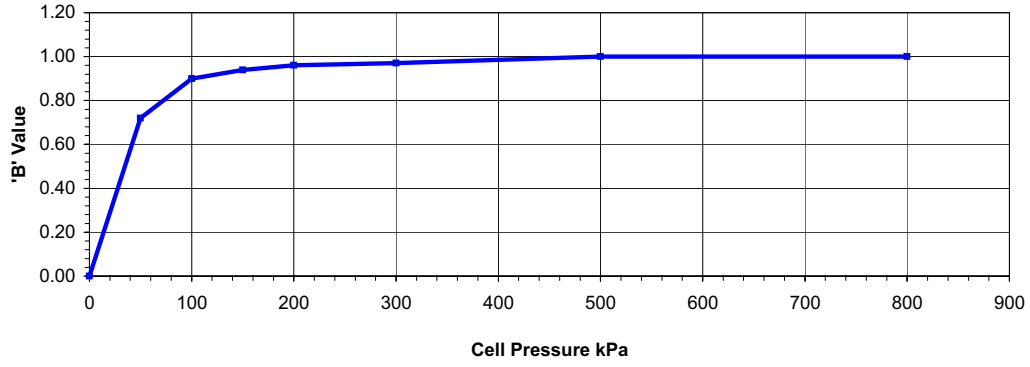
2 Side drain corrections not applied

3 Membrane correction not applied

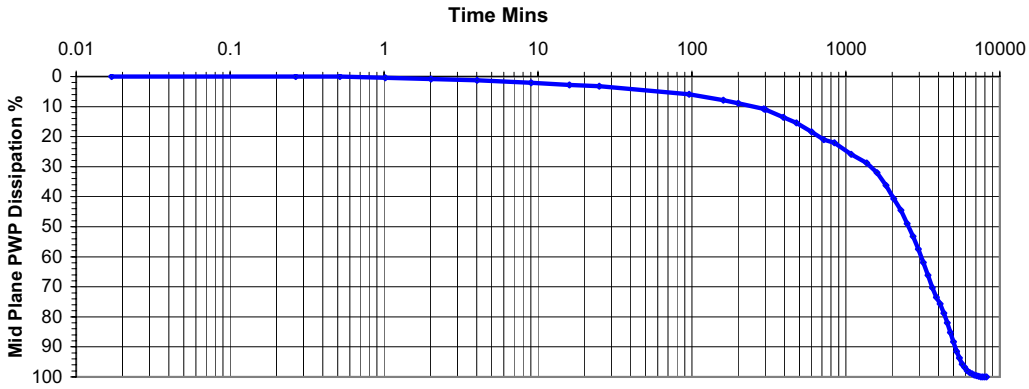
Specimen After Test

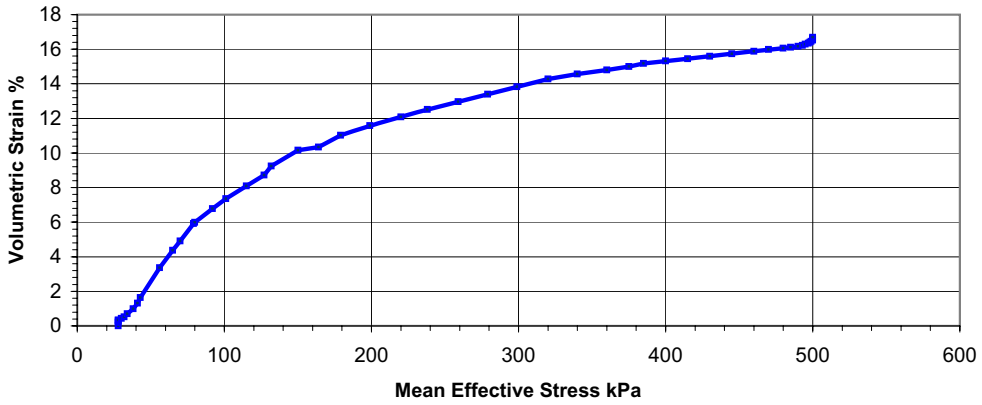
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	3_Base
		Depth.	24.45-25.0m

Saturation

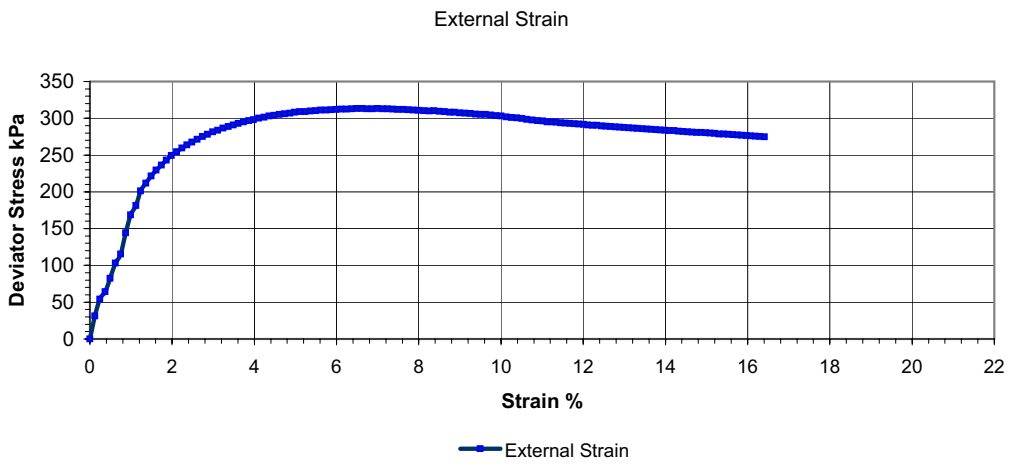


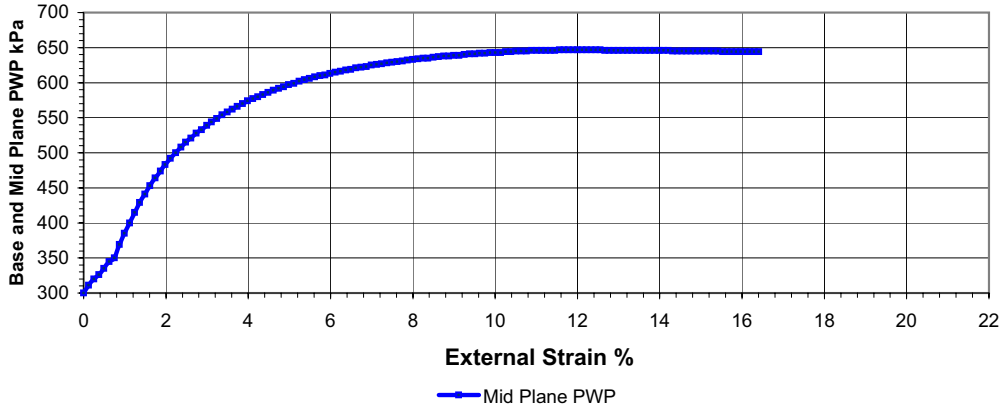
Isotropic Consoliadtion

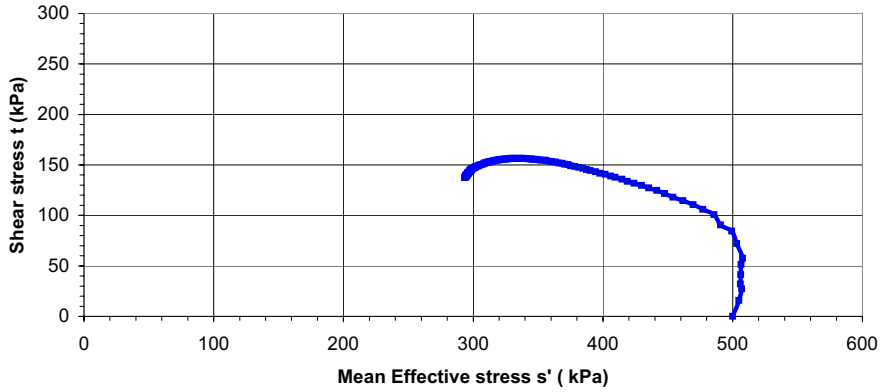




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	3_Base
		Depth.	24.45-25.0m

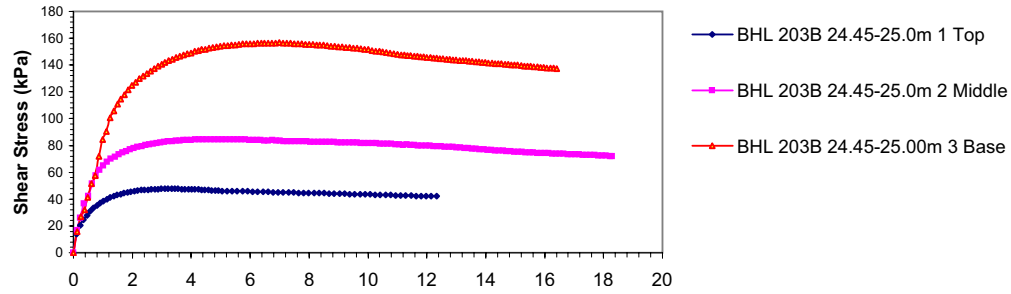


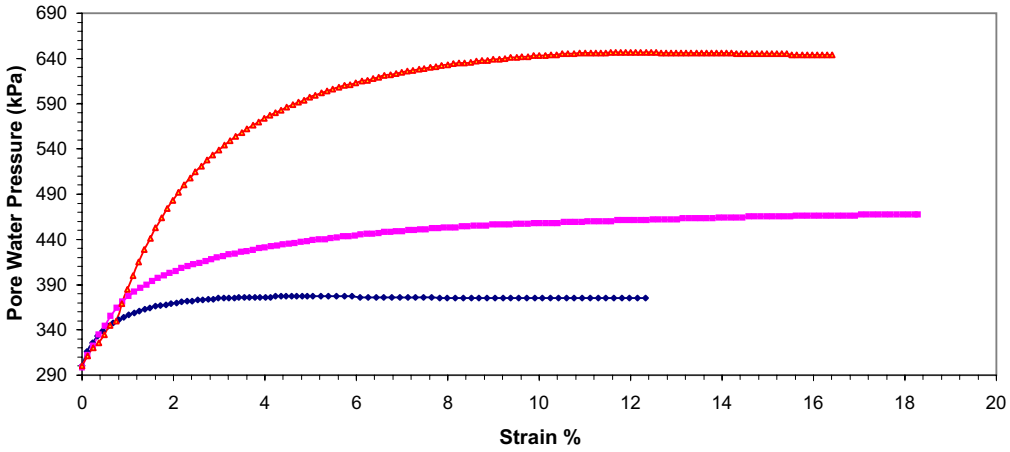


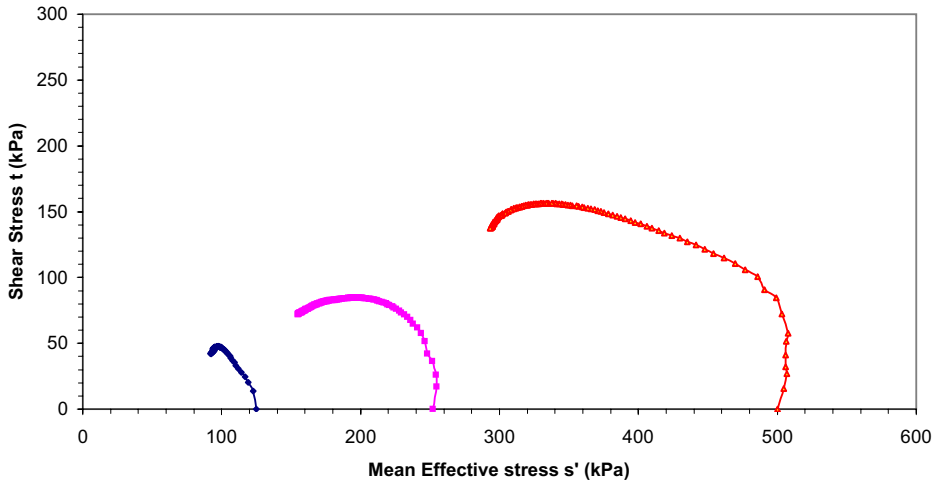


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 203B
	Project: Durban Harbour Berth Deepening Study	Sample No.	3_Base
		Depth.	24.45-25.0m

Combined Stress Path Plots







c' **2.0** **kPa**

Φ' **28.4°**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BHL 203B
Ltd	Project:	Sample No.	Shelby
	Durban Harbour Berth Deepening Study	Depth	24.45-25.0m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.98	2.02
Specimen Length	mm	121.00	Dry Density	Mg/m3	1.59	1.64
Specimen Diameter	mm	60.00	Moisture	%	24.76	23.00
Area	mm2	2827.43	Saturation	%	95.53	95.83
Volume	cc	342.12	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	0.82	0.82
3	200	0.93	0.93
4	300	0.96	0.96
5	400	0.99	0.99

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	131.6
External Axial Strain (%)	19.71
Shear Stress (kPa)	65.8
Pore Water Pressure (kPa)	44
Radial Effective Stress (kPa)	56
Axial Effective Stress (kPa)	188
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Light brown sandy SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

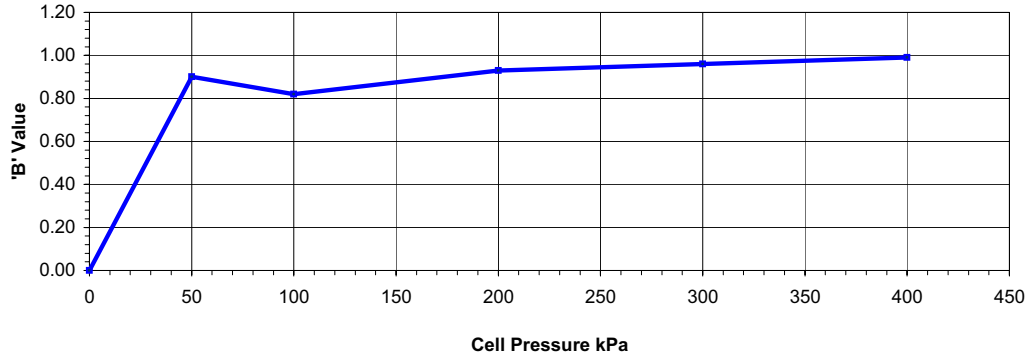
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

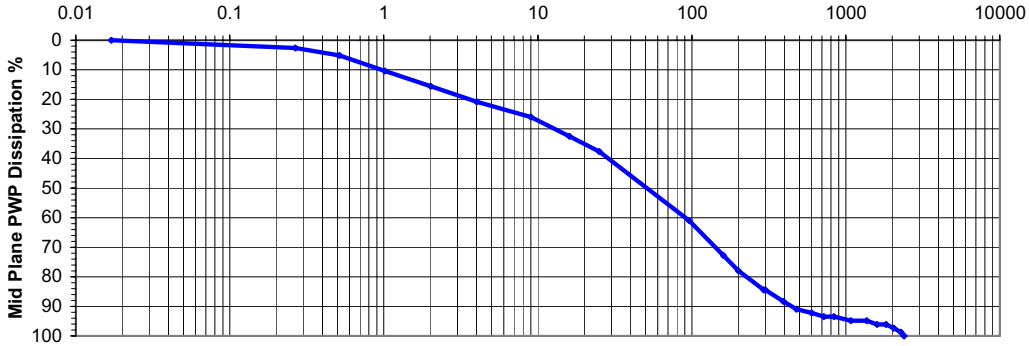
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No. 1
		Depth. 21.5-22.05m

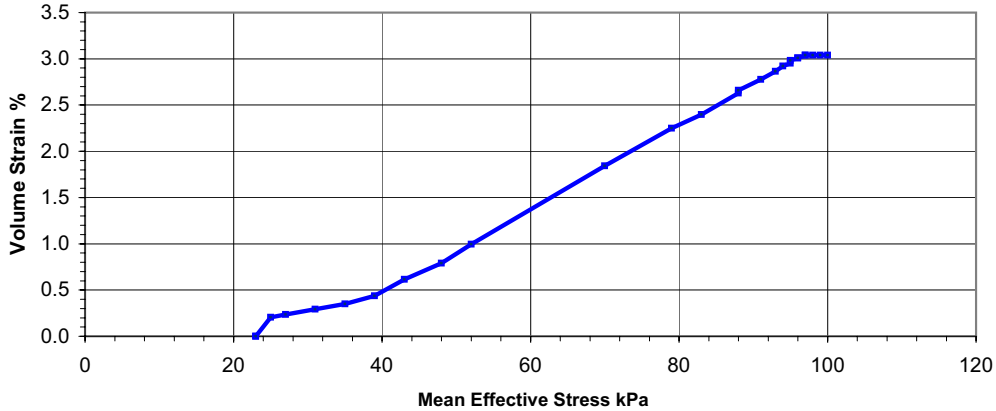
Saturation



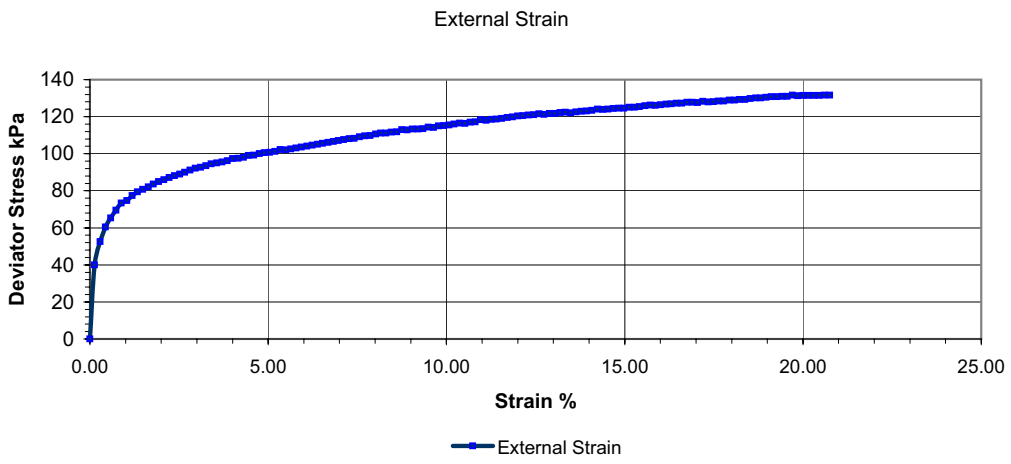
Isotropic Consoliadtion

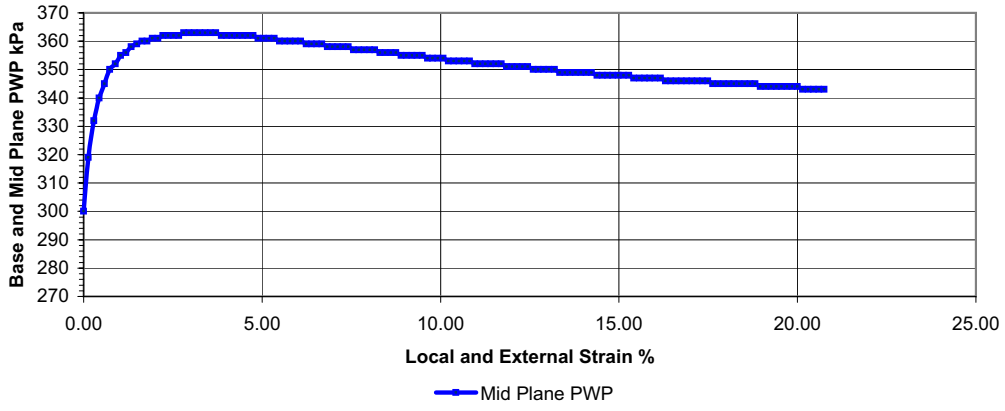
Time Mins

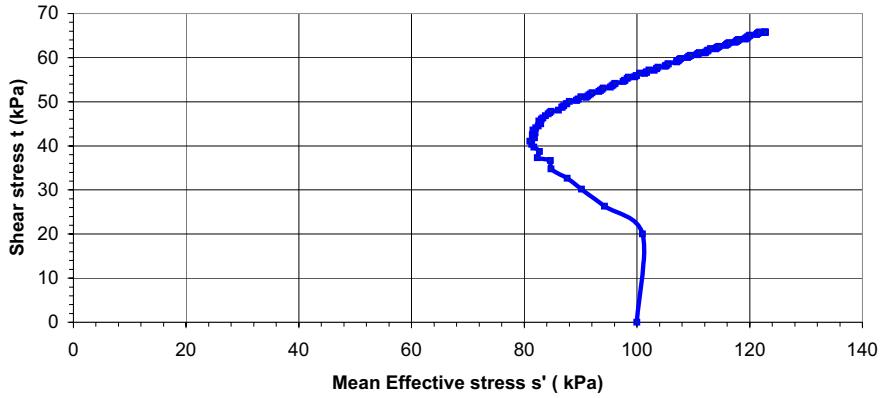




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	21.5-22.05m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	21.5-22.05m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.79	1.82
Specimen Length	mm	121.20	Dry Density	Mg/m3	1.23	1.28
Specimen Diameter	mm	60.00	Moisture	%	45.64	42.14
Area	mm2	2827.43	Saturation	%	102.80	102.85
Volume	cc	342.68	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.46	0.46
2	100	0.54	0.54
3	150	0.84	0.84
4	200	0.90	0.90
5	300	0.94	0.94
6	500	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split AfterTest

At Maximum Deviator stress

Deviator Stress (kPa)	121.7
External Axial Strain (%)	4.81
Shear Stress (kPa)	60.9
Pore Water Pressure (kPa)	93
Radial Effective Stress (kPa)	107
Axial Effective Stress (kPa)	229
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to firm brown slightly grey CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

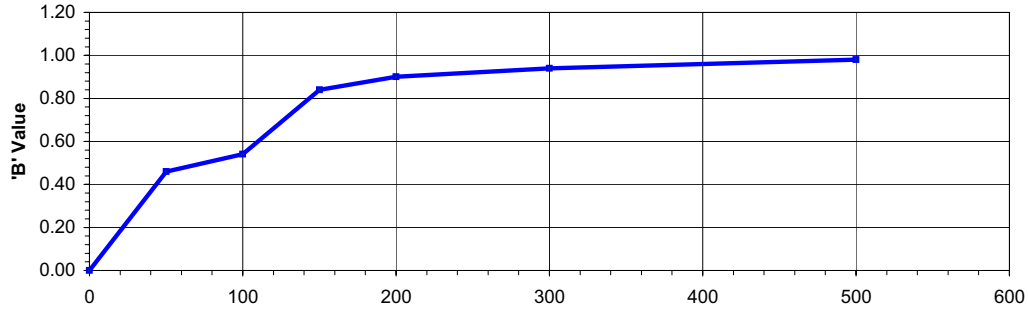
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	21.5-22.05m

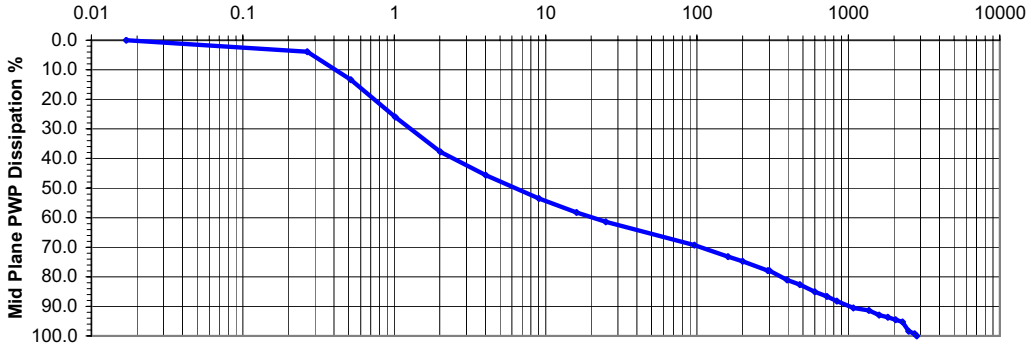
Saturation

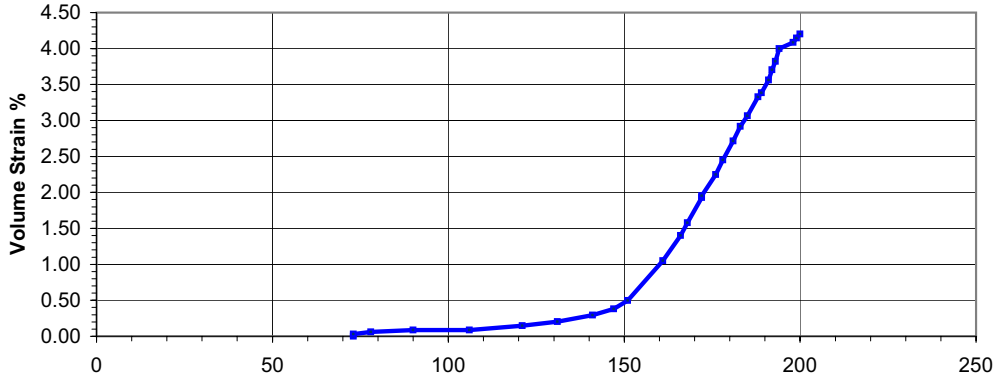


Cell Pressure kPa

Isotropic Consoliadtion

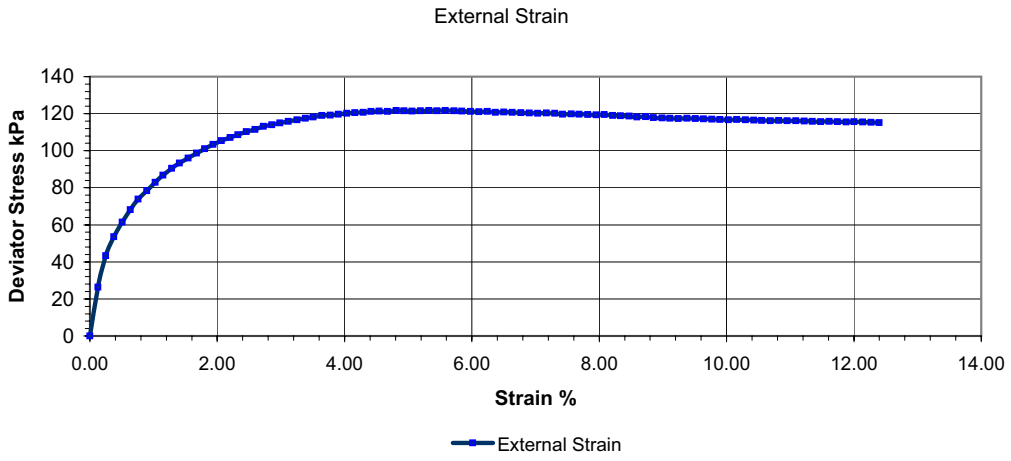
Time Mins

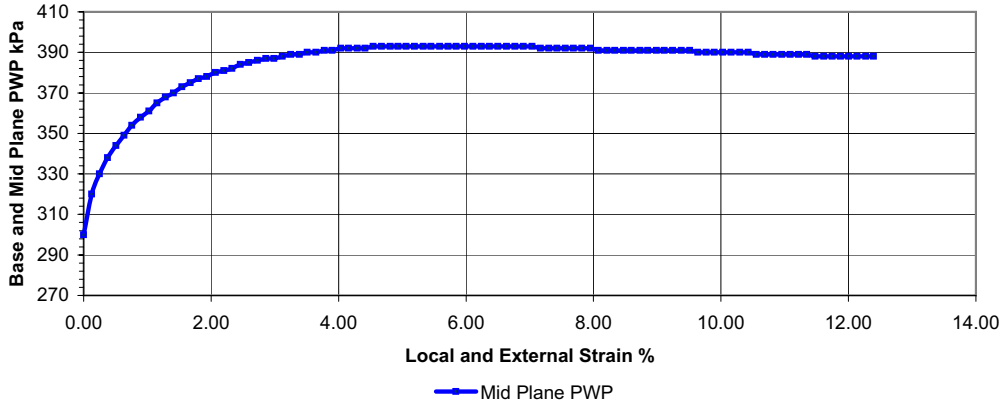


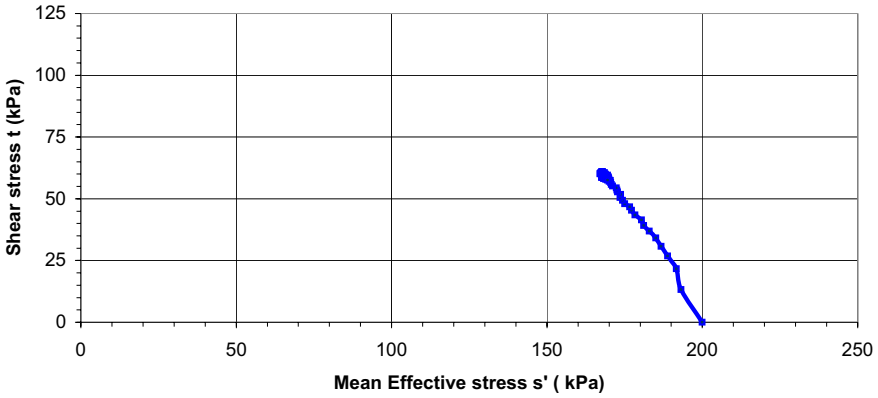


Mean Effective Stress Kpa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	21.5-22.05m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	21.5-22.05m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.79	1.81
Specimen Length	mm	125.40	Dry Density	Mg/m3	1.25	1.29
Specimen Diameter	mm	60.00	Moisture	%	43.39	40.72
Area	mm2	2827.43	Saturation	%	101.15	100.41
Volume	cc	354.56	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.12	0.12
2	100	0.44	0.44
3	150	0.58	0.58
4	200	0.76	0.76
5	300	0.88	0.88
6	400	0.98	0.98
7	700	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test

At Maximum Deviator stress

Deviator Stress (kPa)	236.1
External Axial Strain (%)	2.09
Shear Stress (kPa)	118.0
Pore Water Pressure (kPa)	167
Radial Effective Stress (kPa)	233
Axial Effective Stress (kPa)	469
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to firm mottled grey brown CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

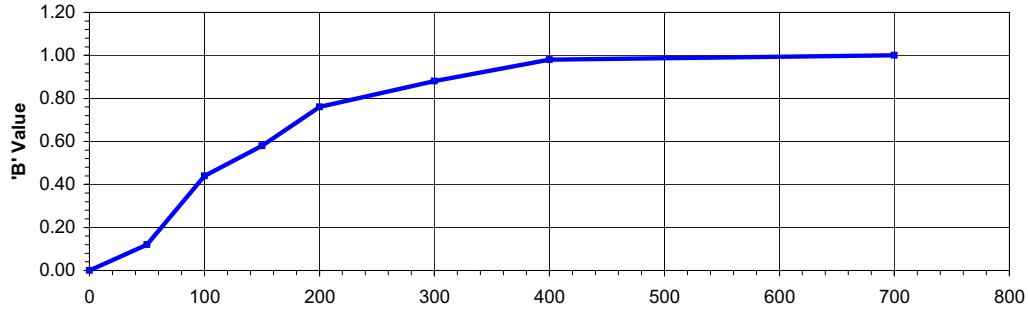
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	21.5-22.05m

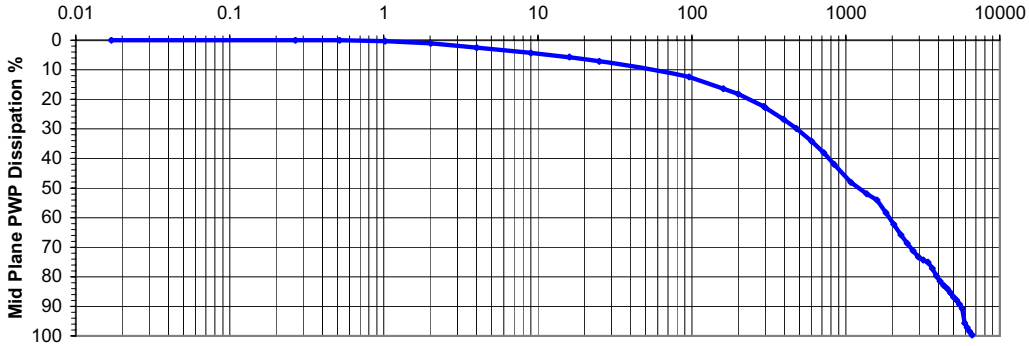
Saturation

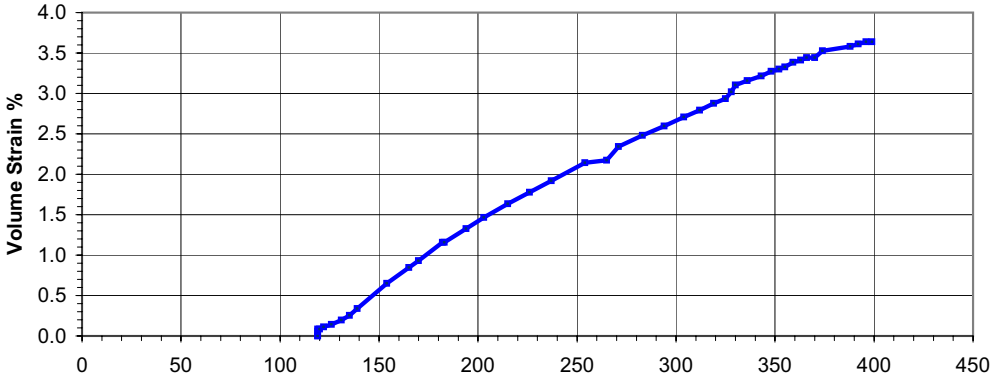


Cell Pressure kPa

Isotropic Consoliadtion

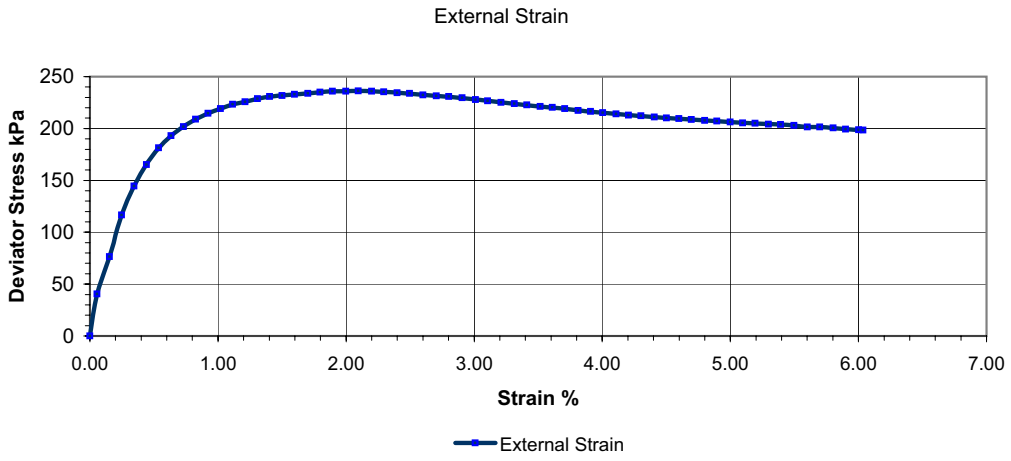
Time Mins

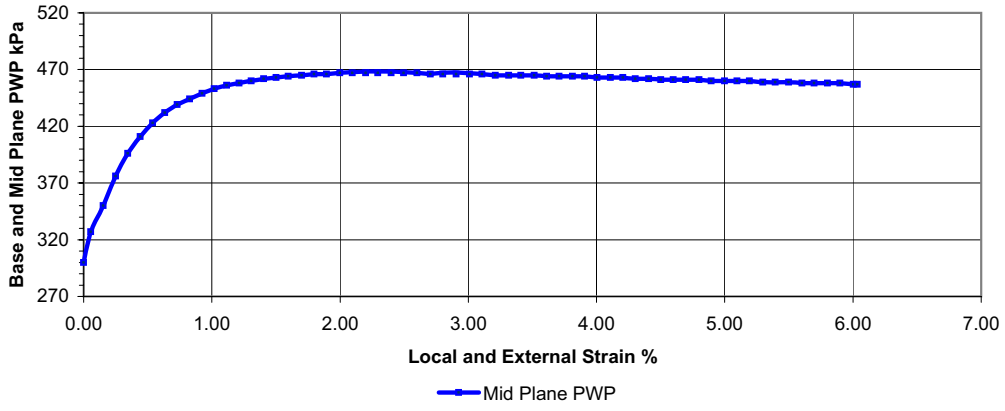


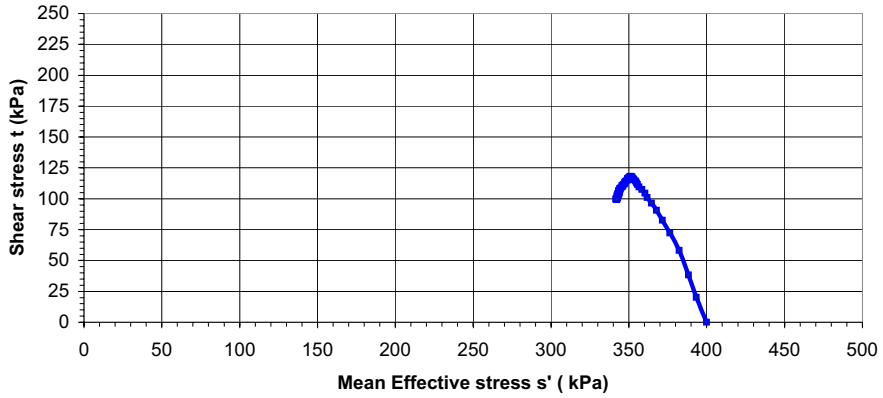


Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	21.5-22.05m

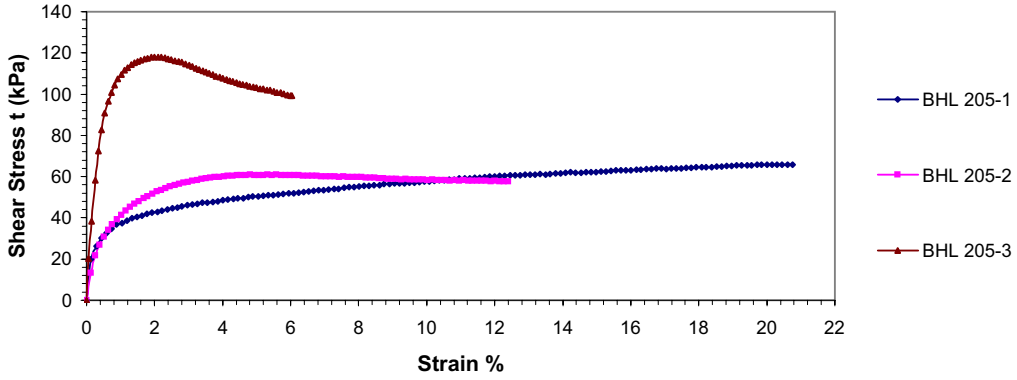


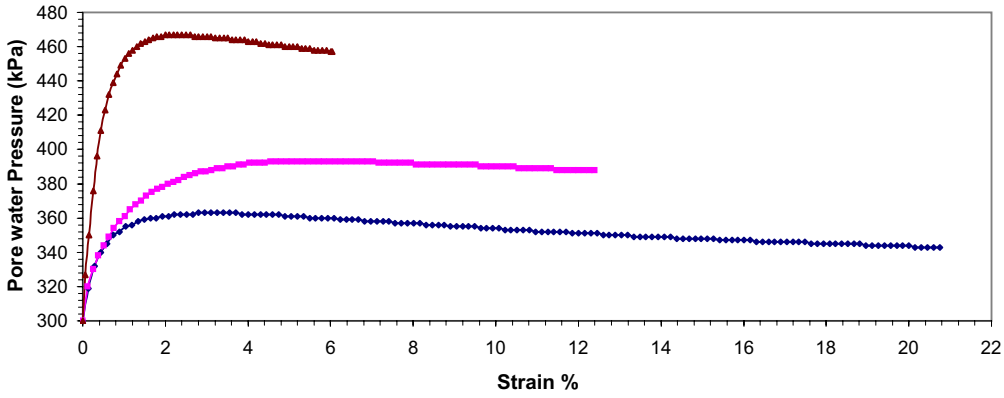


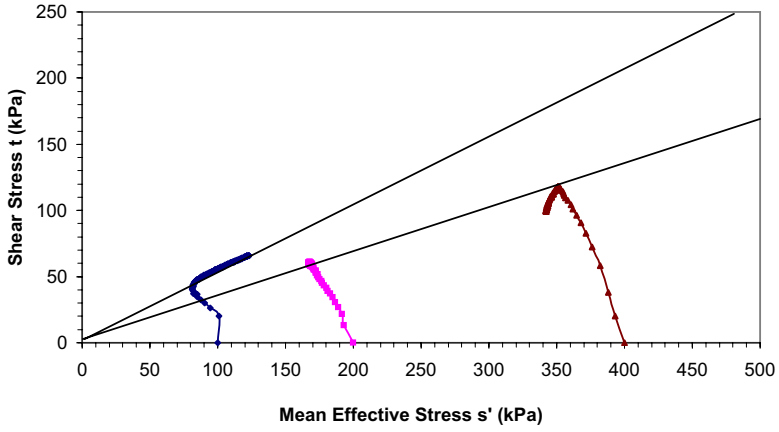


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	21.5-22.05m

Combined Stress Path Plots







c' 2.5 kPa

Φ' 30.9° & 19.2°

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL 205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth	21.50-22.05m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.70	1.74
Specimen Length	mm	109.00	Dry Density	Mg/m3	1.06	1.16
Specimen Diameter	mm	53.00	Moisture	%	60.32	50.81
Area	mm2	2206.18	Saturation	%	105.11	102.65
Volume	cc	240.47	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	0.96	0.96
3	200	0.98	0.98
4	300	0.99	0.99
5	350	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	30.3
External Axial Strain (%)	11.67
Shear Stress (kPa)	15.2
Pore Water Pressure (kPa)	22
Radial Effective Stress (kPa)	28
Axial Effective Stress (kPa)	58
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Light brown slightly grey SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

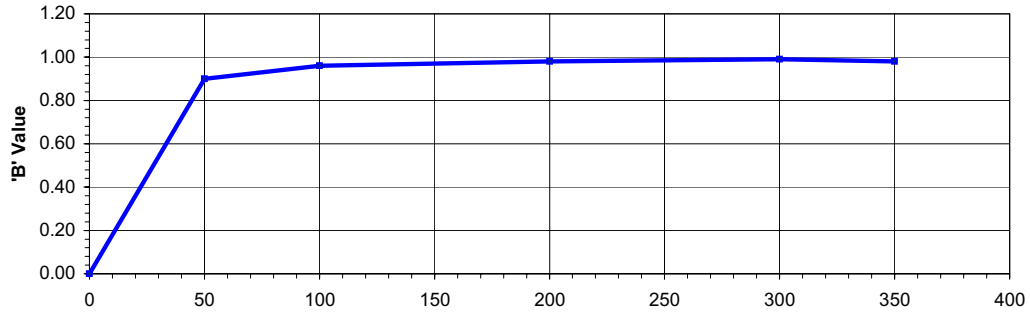
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

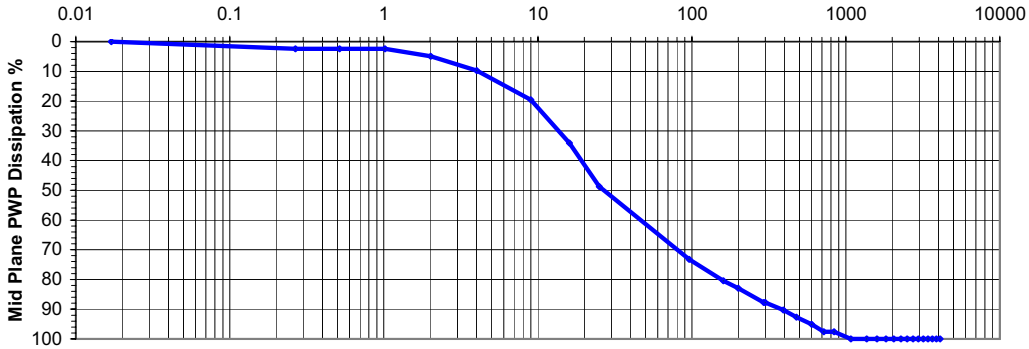
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 22.21-22.37m

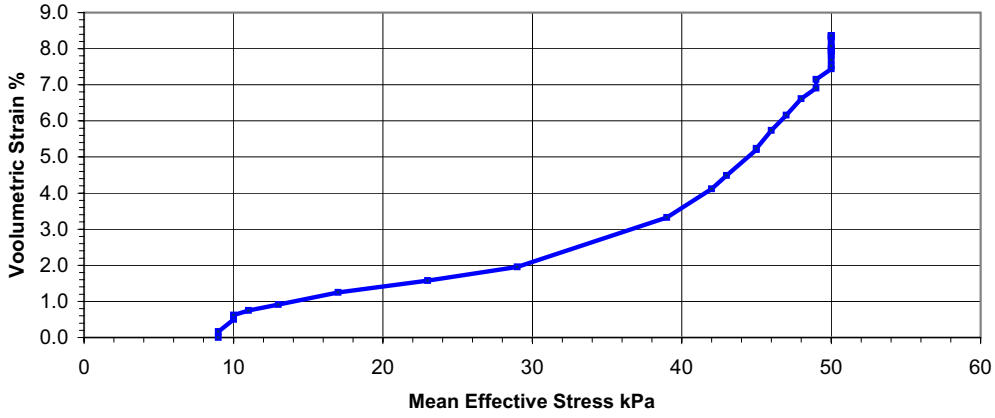
Saturation



Isotropic Consoliadtion

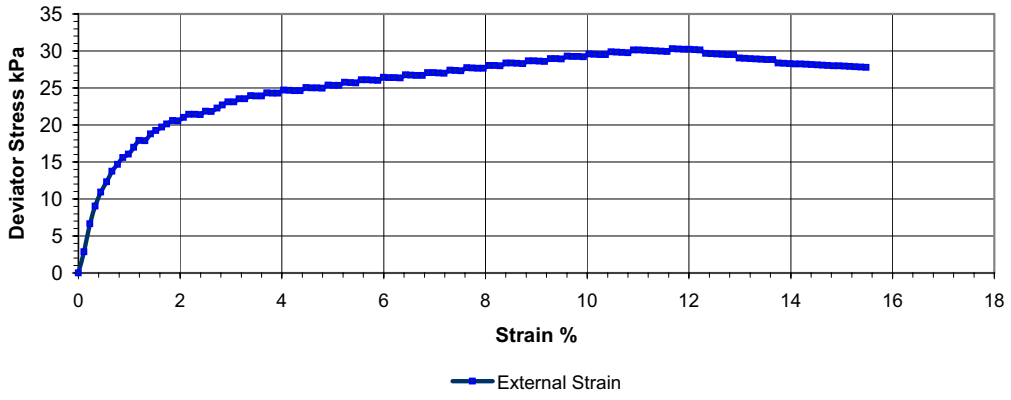
Time Mins

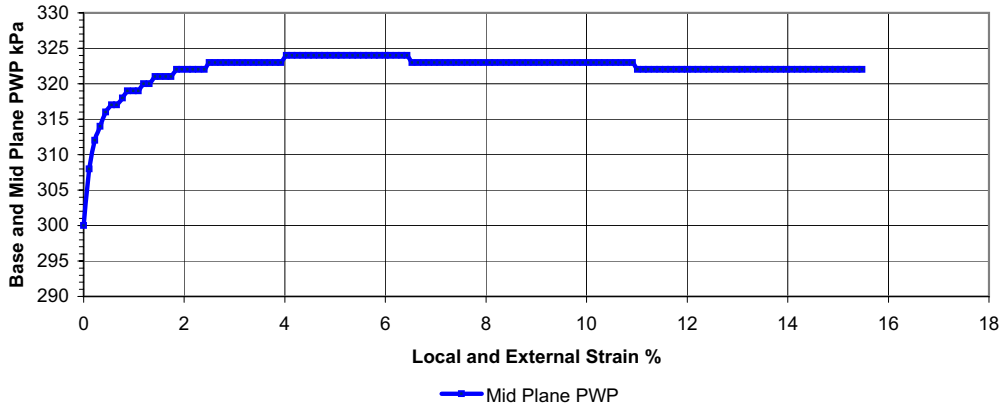


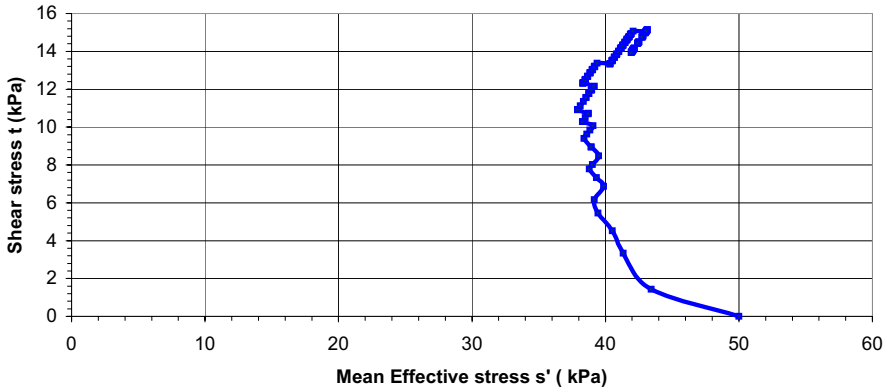


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.21-22.37m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.21-22.37m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.74	1.78
Specimen Length	mm	109.00	Dry Density	Mg/m3	1.11	1.22
Specimen Diameter	mm	53.50	Moisture	%	56.75	45.70
Area	mm2	2248.01	Saturation	%	106.94	101.94
Volume	cc	245.03	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.70	0.70
2	100	1.00	1.00
3	200	0.99	0.99
4	300	1.00	1.00
5	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	84.5
External Axial Strain (%)	12.07
Shear Stress (kPa)	42.2
Pore Water Pressure (kPa)	40
Radial Effective Stress (kPa)	60
Axial Effective Stress (kPa)	144
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Light brown occasionally grey SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

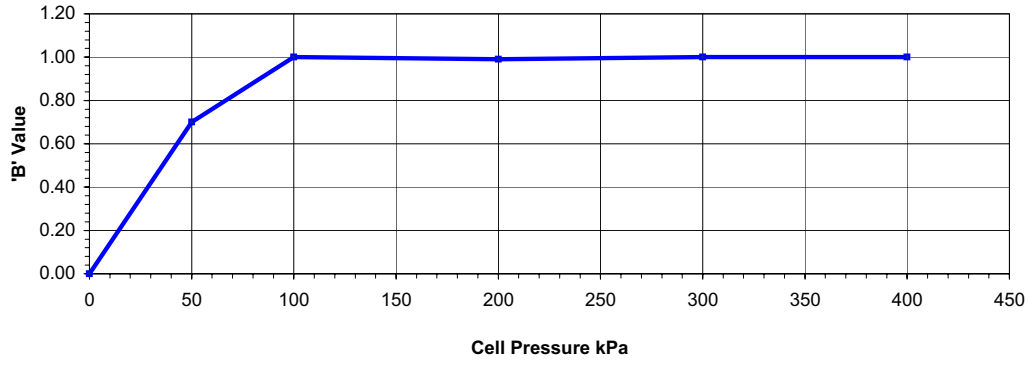
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

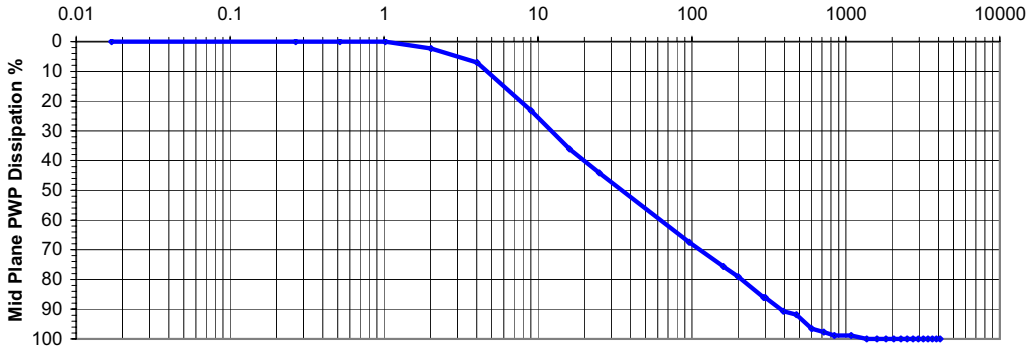
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.37-22.54m

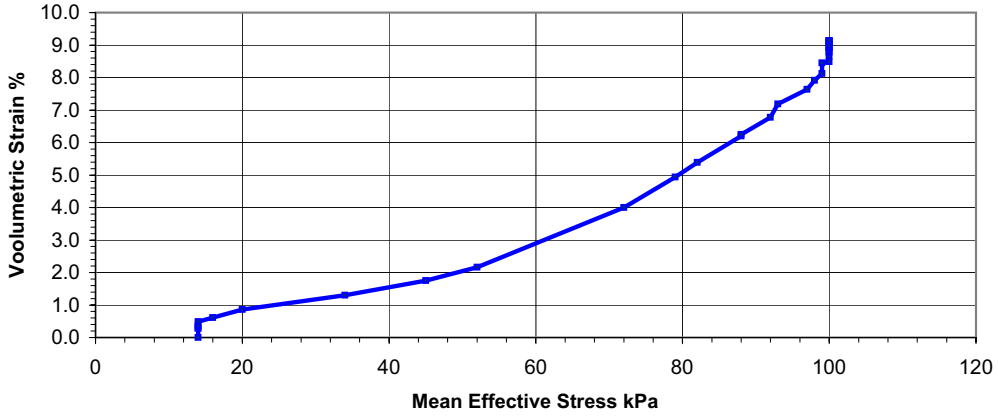
Saturation



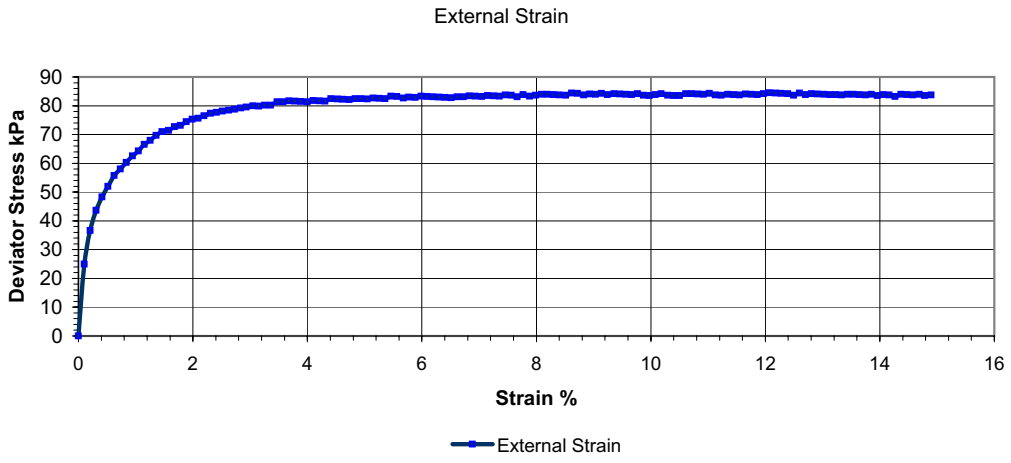
Isotropic Consoliadtion

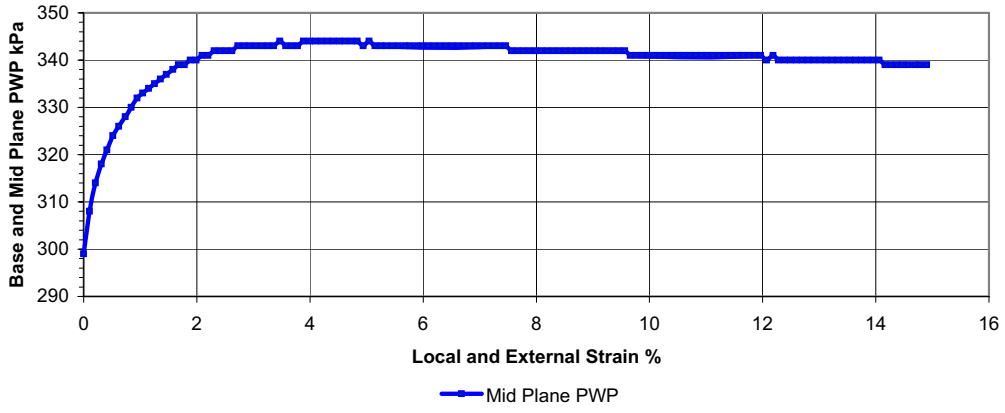
Time Mins

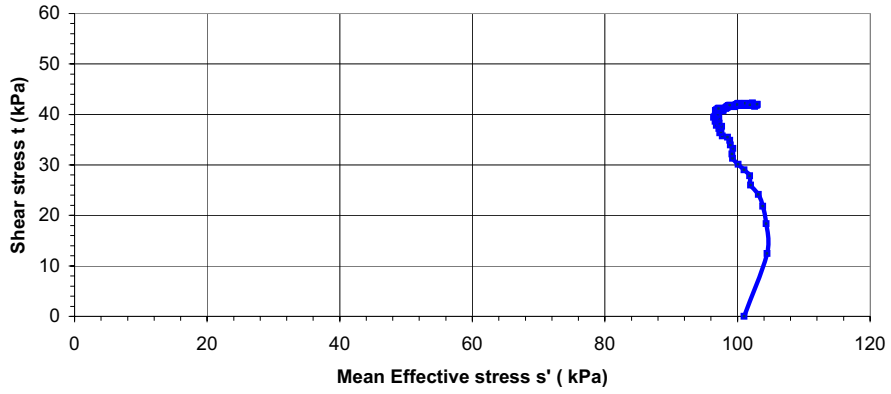




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.37-22.54m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 22.37-22.54m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.73	1.81
Specimen Length	mm	109.25	Dry Density	Mg/m3	1.07	1.26
Specimen Diameter	mm	53.20	Moisture	%	61.51	43.43
Area	mm2	2222.87	Saturation	%	108.97	102.99
Volume	cc	242.85	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.80	0.80
2	100	0.94	0.94
3	200	0.97	0.97
4	300	0.99	0.99
5	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	162.8
External Axial Strain (%)	4.94
Shear Stress (kPa)	81.4
Pore Water Pressure (kPa)	102
Radial Effective Stress (kPa)	98
Axial Effective Stress (kPa)	261
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Light brown slightly grey SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

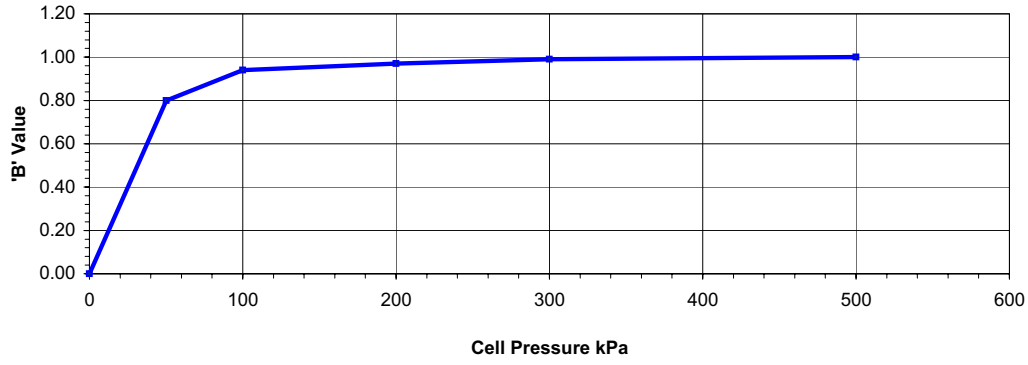
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

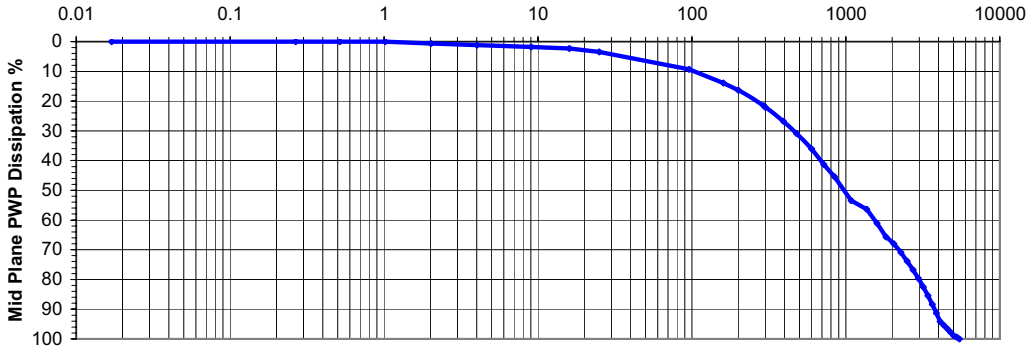
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.54-22.70m

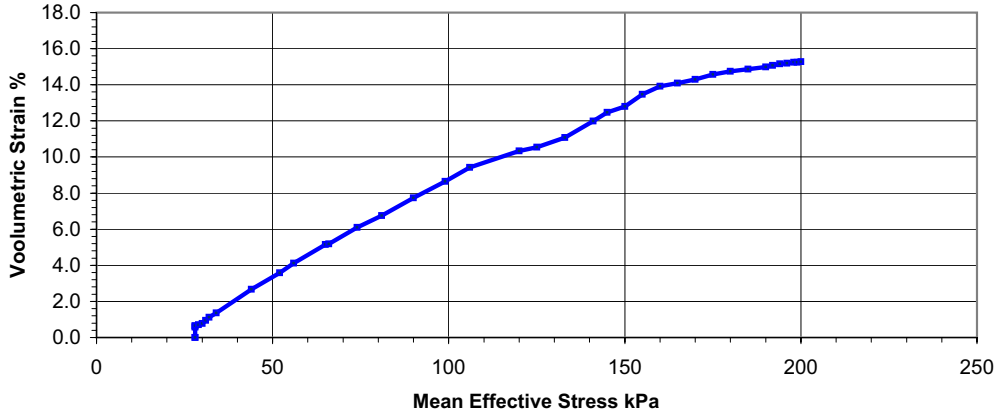
Saturation



Isotropic Consoliadtion

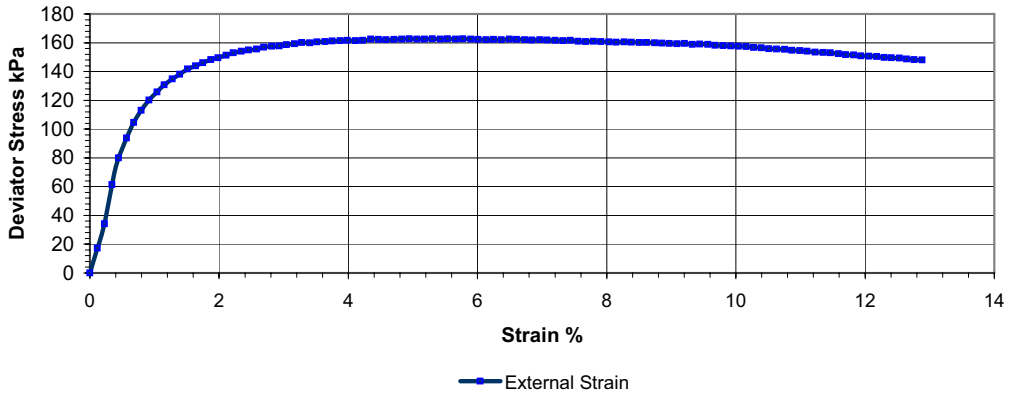
Time Mins

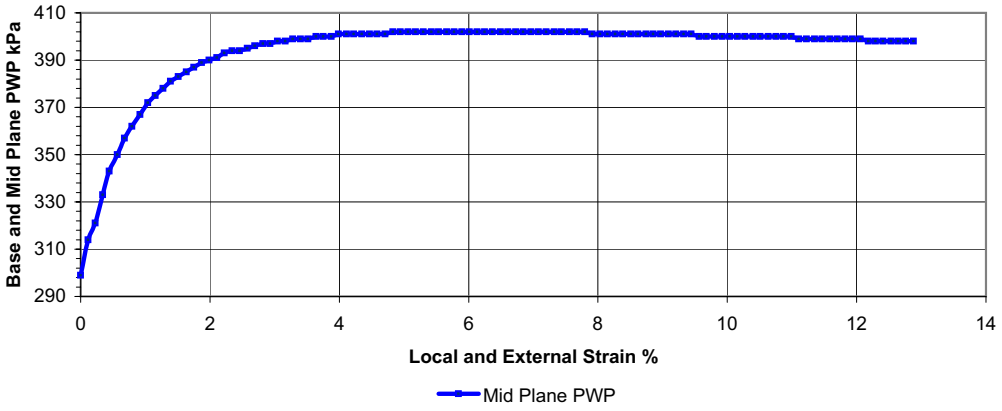


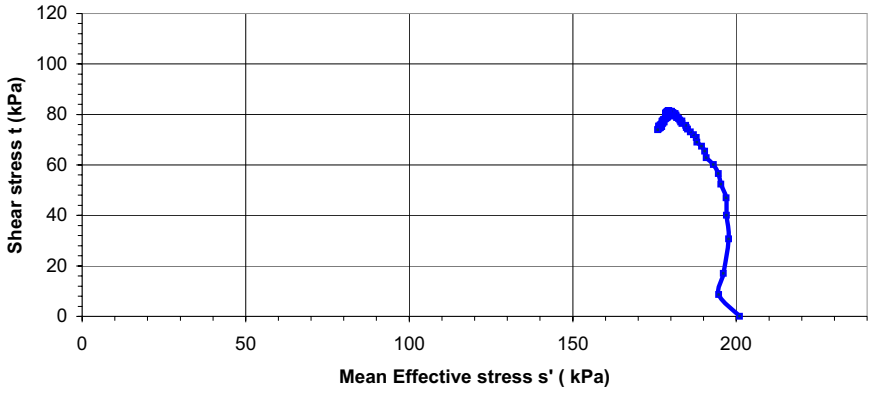


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.54-22.70m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.54-22.70m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.73	1.83
Specimen Length	mm	108.60	Dry Density	Mg/m3	1.10	1.29
Specimen Diameter	mm	53.40	Moisture	%	56.92	42.47
Area	mm2	2239.61	Saturation	%	106.23	104.28
Volume	cc	243.22	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.86	0.86
3	200	1.00	1.00
4	300	1.00	1.00
5	500	0.96	0.96
6	700	0.98	0.98

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	297.8
External Axial Strain (%)	5.04
Shear Stress (kPa)	148.9
Pore Water Pressure (kPa)	221
Radial Effective Stress (kPa)	179
Axial Effective Stress (kPa)	477
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Light brown slightly grey SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

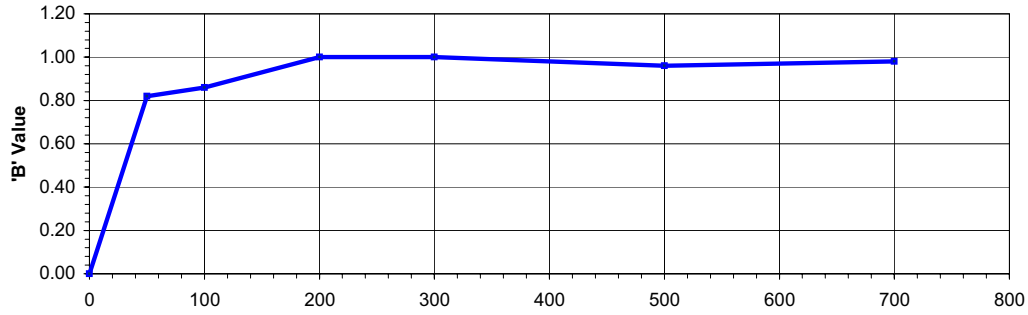
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

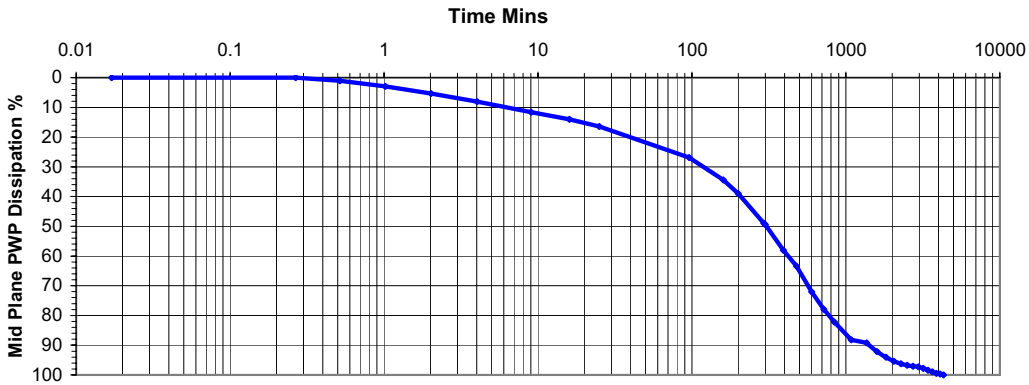
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.70-22.82m

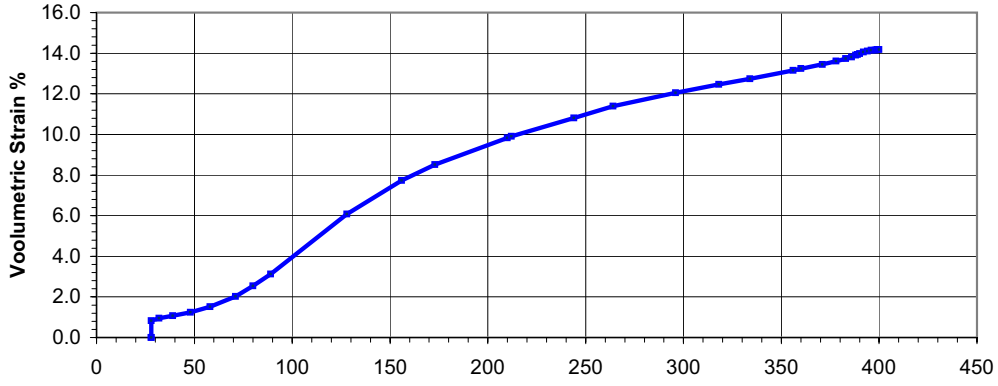
Saturation



Cell Pressure kPa

Isotropic Consoliadtion

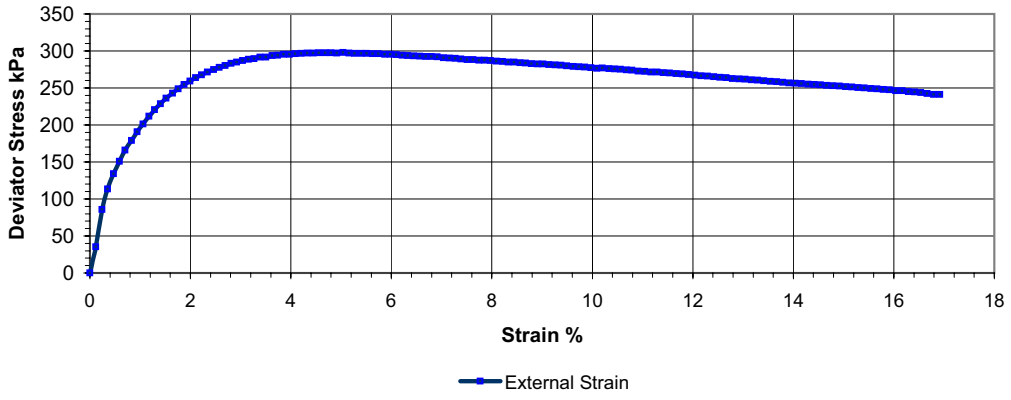


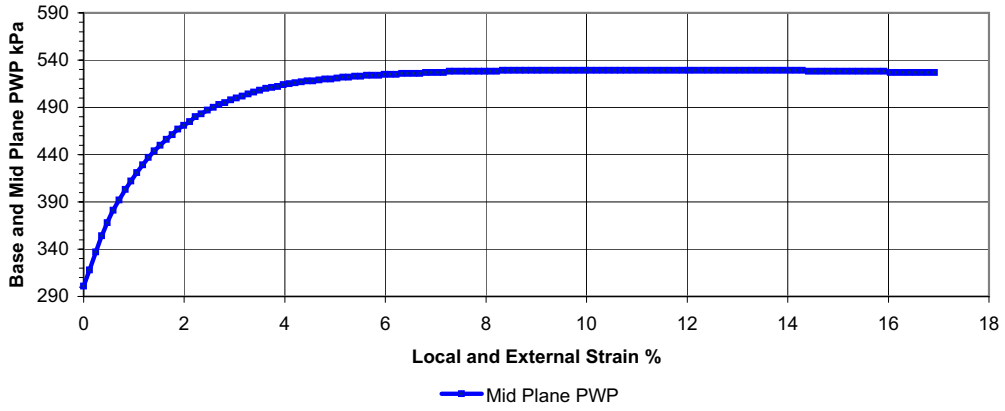


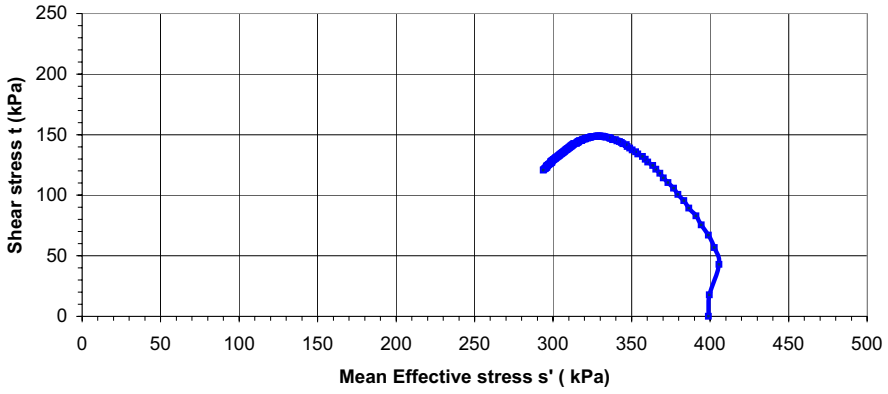
Mean Effective Stress kPa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.70-22.82m

External Strain

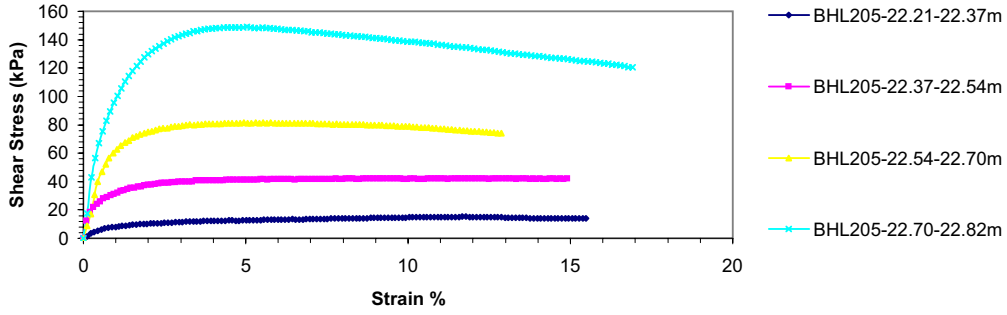


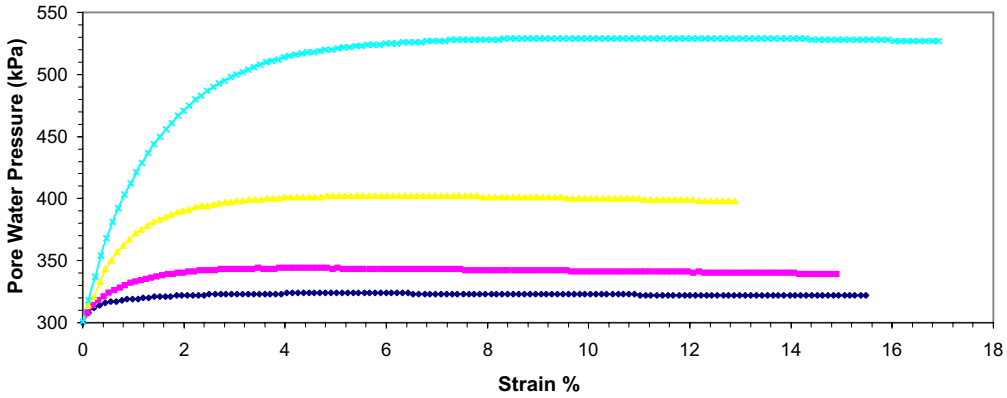


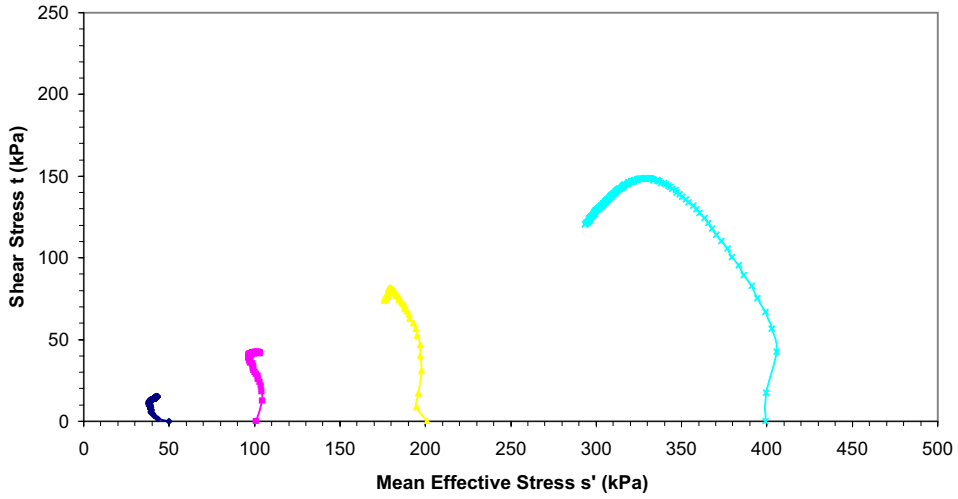


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 22.70-22.82m

Combined Stress Path Plots







c' **2.0** **kPa**

Φ' **26.5º**

NM **TL** **Ltd**	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BD BHL205
	Project: **Durban Harbour Berth Deepening Study**	Sample No.	Core
		Depth	22.21-22.82m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.72	1.80
Specimen Length	mm	117.00	Dry Density	Mg/m3	1.11	1.25
Specimen Diameter	mm	60.00	Moisture	%	55.16	44.21
Area	mm2	2827.43	Saturation	%	103.28	102.96
Volume	cc	330.81	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.88	0.88
2	100	0.96	0.96
3	200	0.98	0.98
4	300	1.00	1.00
5	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	91.5
External Axial Strain (%)	10.53
Shear Stress (kPa)	45.8
Pore Water Pressure (kPa)	64.0
Radial Effective Stress (kPa)	36.0
Axial Effective Stress (kPa)	127.5
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft brown and grey SILT/CLAY.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

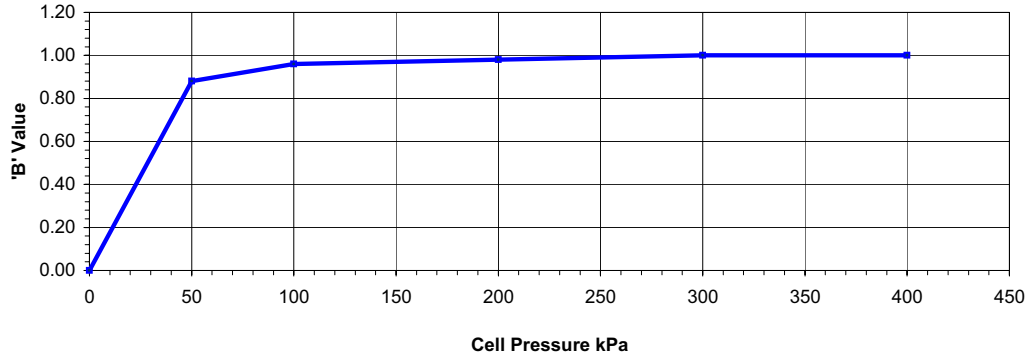
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

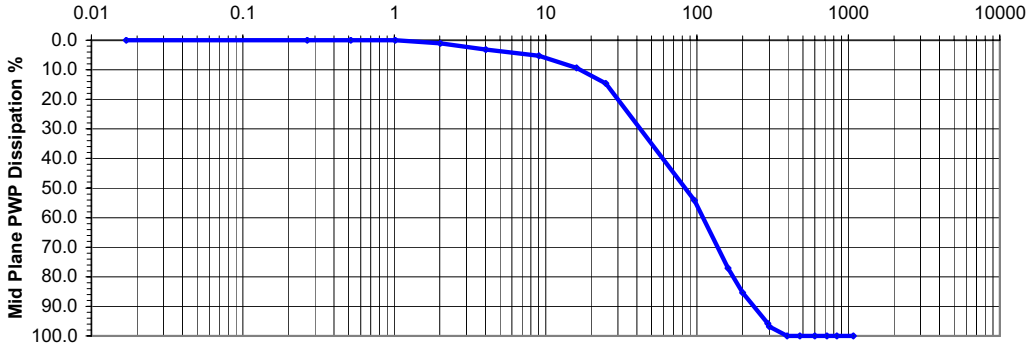
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	25.15-25.70m

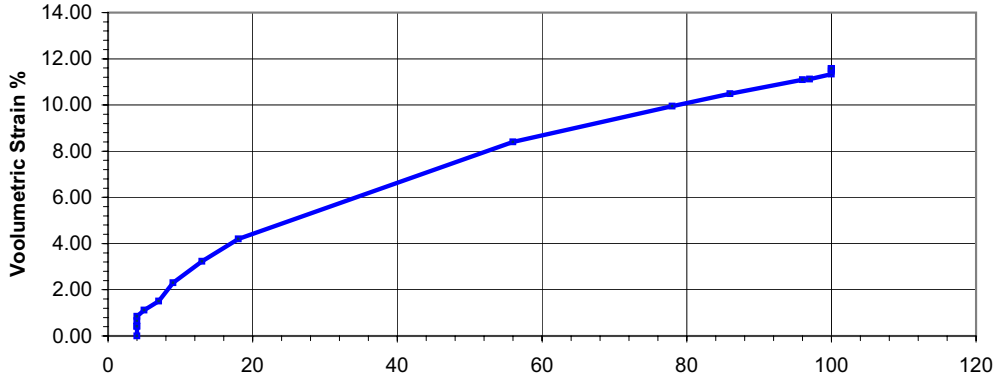
Saturation



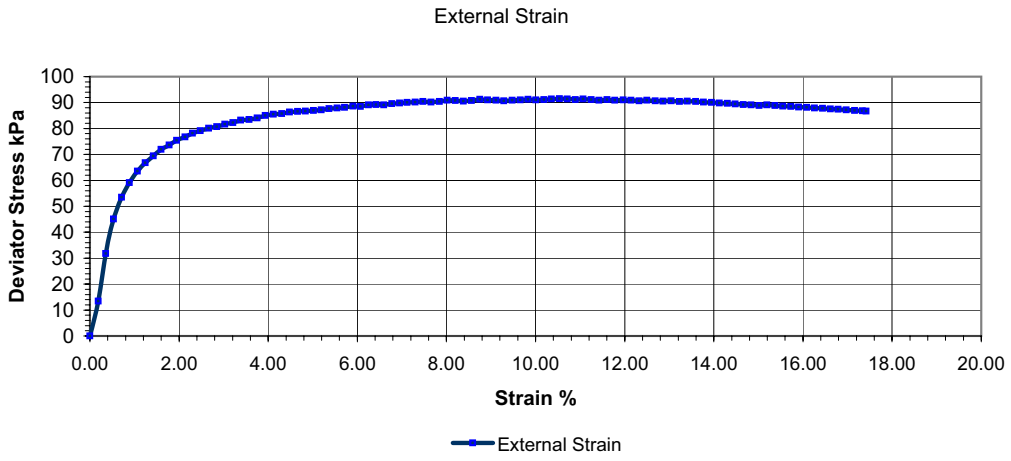
Isotropic Consoliadtion

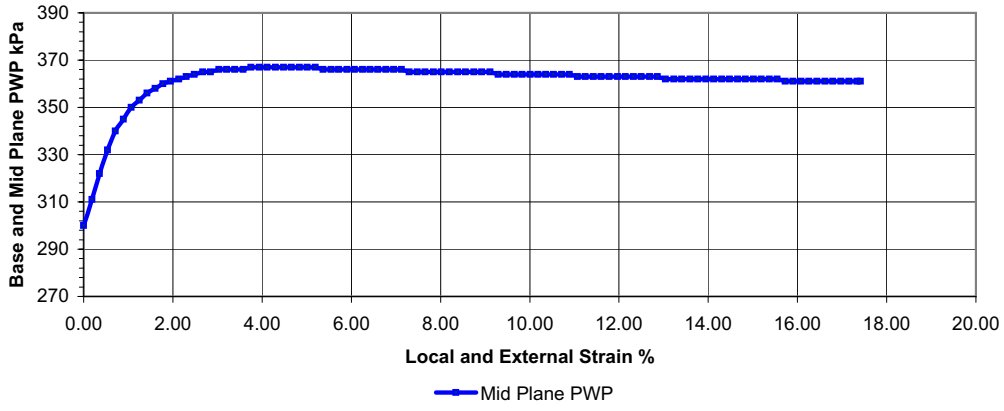
Time Mins

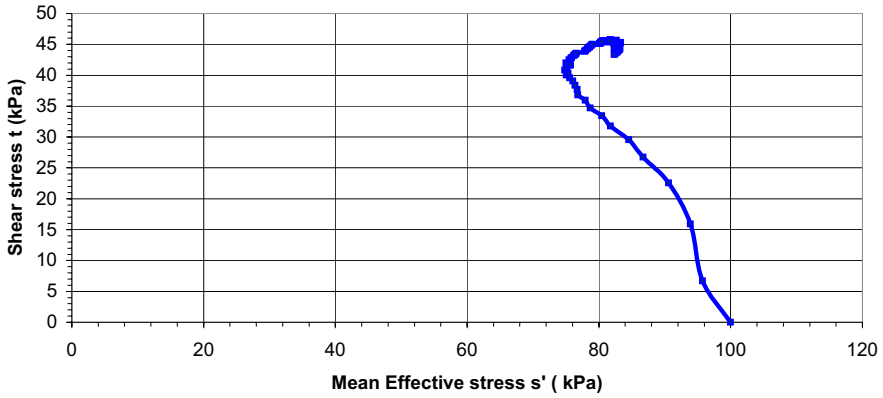




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	25.15-25.70m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	25.15-25.70m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.67	1.76
Specimen Length	mm	129.00	Dry Density	Mg/m3	1.05	1.20
Specimen Diameter	mm	60.10	Moisture	%	58.23	46.75
Area	mm2	2836.87	Saturation	%	100.83	100.63
Volume	cc	365.96	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.86	0.86
2	100	0.90	0.90
3	200	0.95	0.95
4	300	0.97	0.97
5	400	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	160.9
External Axial Strain (%)	4.17
Shear Stress (kPa)	80.5
Pore Water Pressure (kPa)	120
Radial Effective Stress (kPa)	80
Axial Effective Stress (kPa)	241
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft occasionally firm brown and grey SILT/CLAY.
	Compound failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

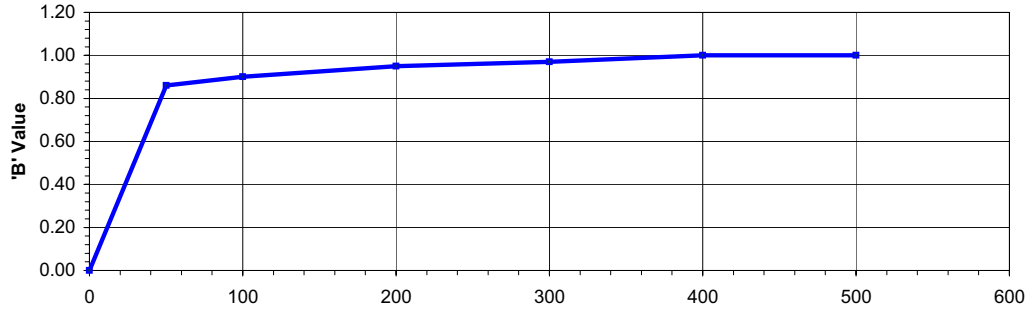
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	25.15-25.70m

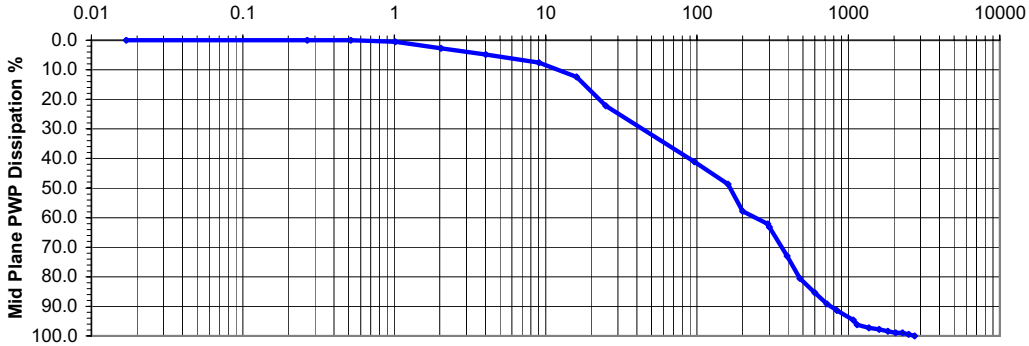
Saturation

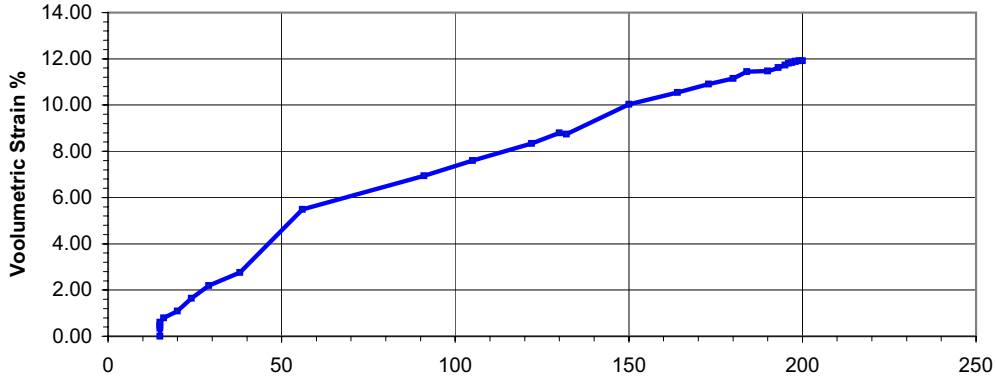


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

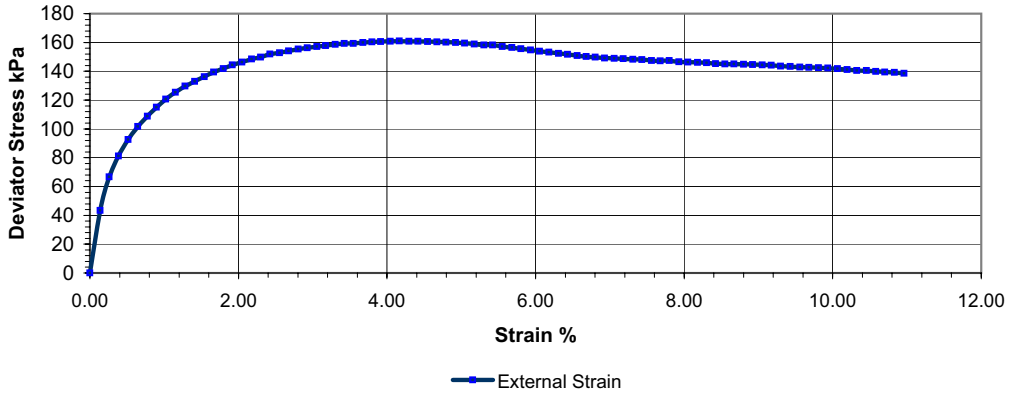


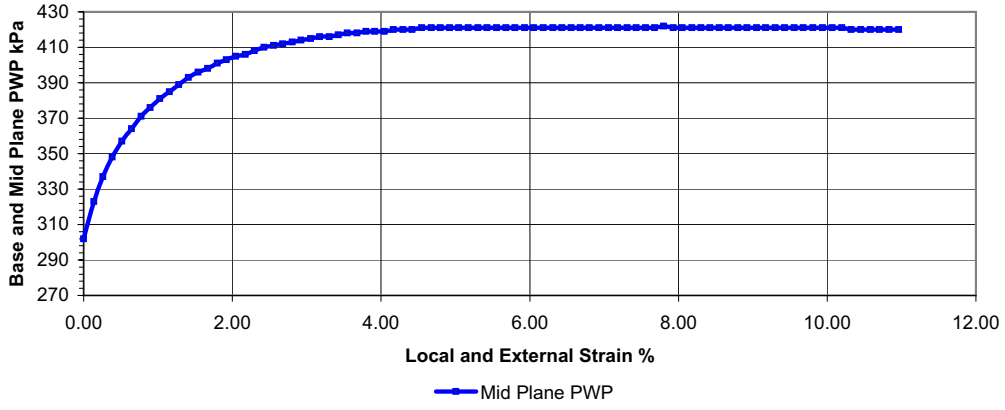


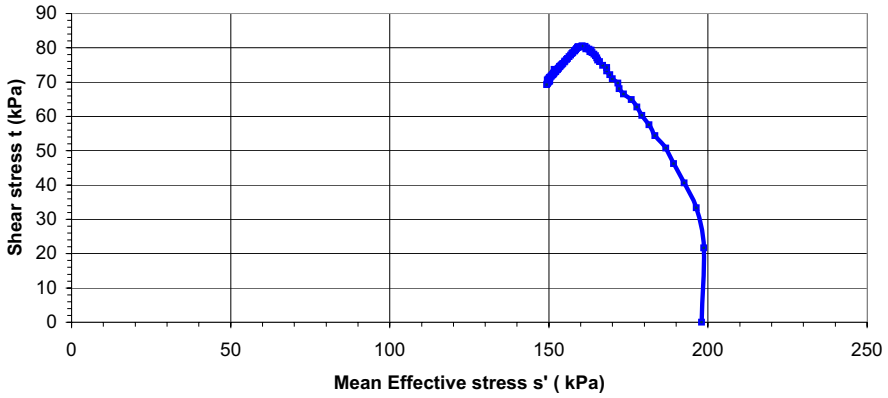
Mean Effective Stress Stress Kpa

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	25.15-25.70m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	25.15-25.70m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.71	1.81
Specimen Length	mm	126.30	Dry Density	Mg/m3	1.10	1.26
Specimen Diameter	mm	59.90	Moisture	%	55.28	43.68
Area	mm2	2818.02	Saturation	%	103.27	102.94
Volume	cc	355.92	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.84	0.84
2	100	0.94	0.94
3	200	0.97	0.97
4	300	0.97	0.97
5	400	0.97	0.97
6	700	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	262.4
External Axial Strain (%)	3.34
Shear Stress (kPa)	131.2
Pore Water Pressure (kPa)	227.0
Radial Effective Stress (kPa)	173.0
Axial Effective Stress (kPa)	435.4
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft to firm grey brown SILT/CLAY.
	Specimen failed at polished surface, brittle failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

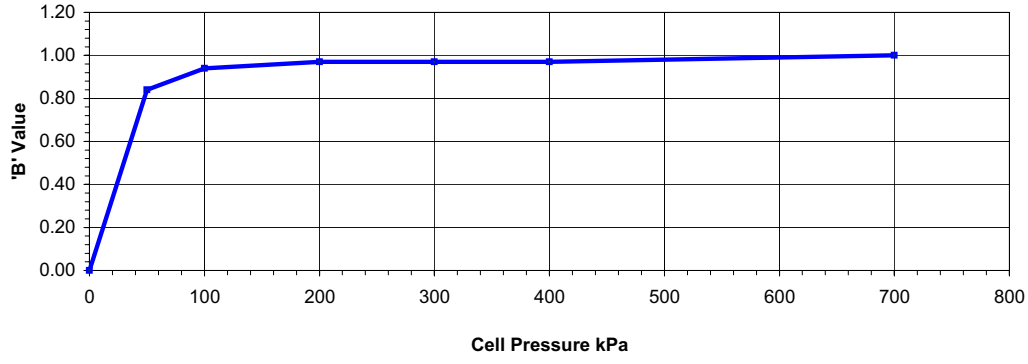
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

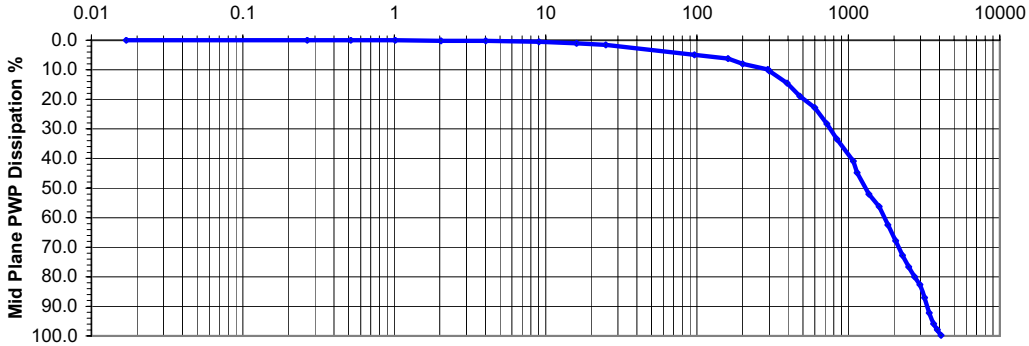
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	25.15-25.70m

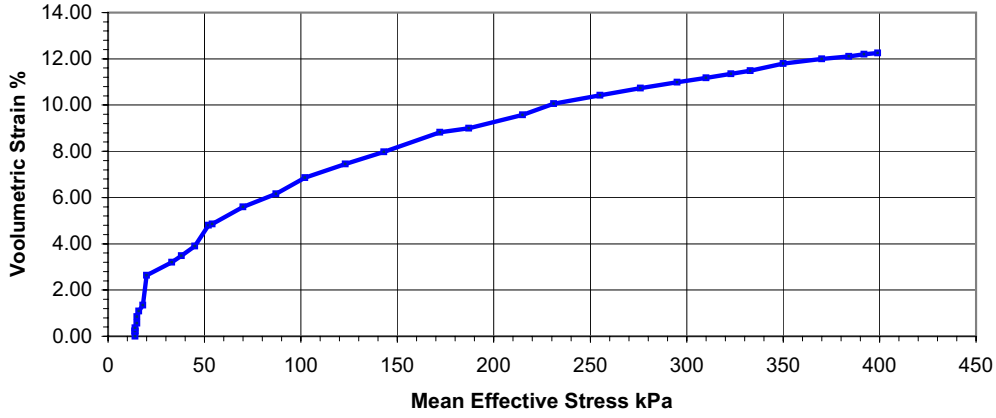
Saturation



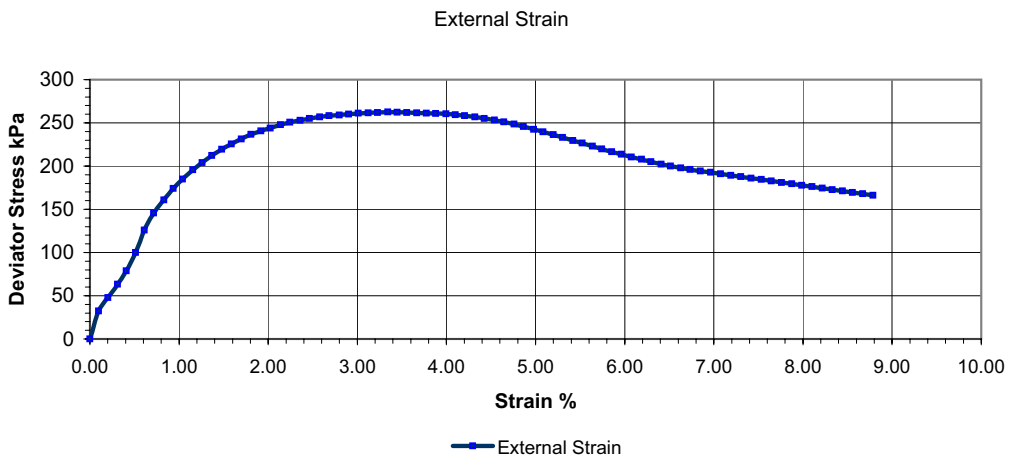
Isotropic Consoliadtion

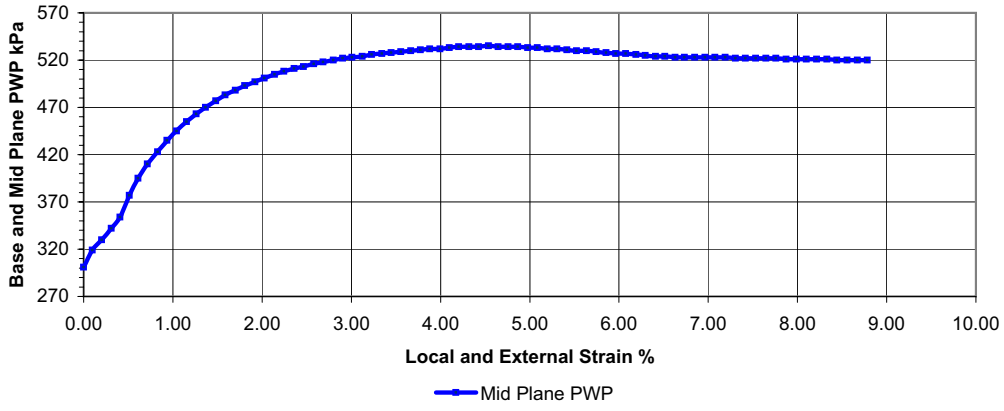
Time Mins

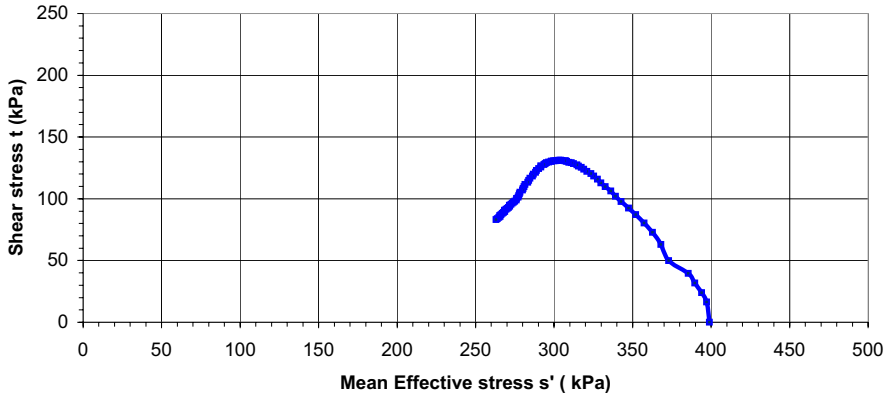




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	25.15-25.70m

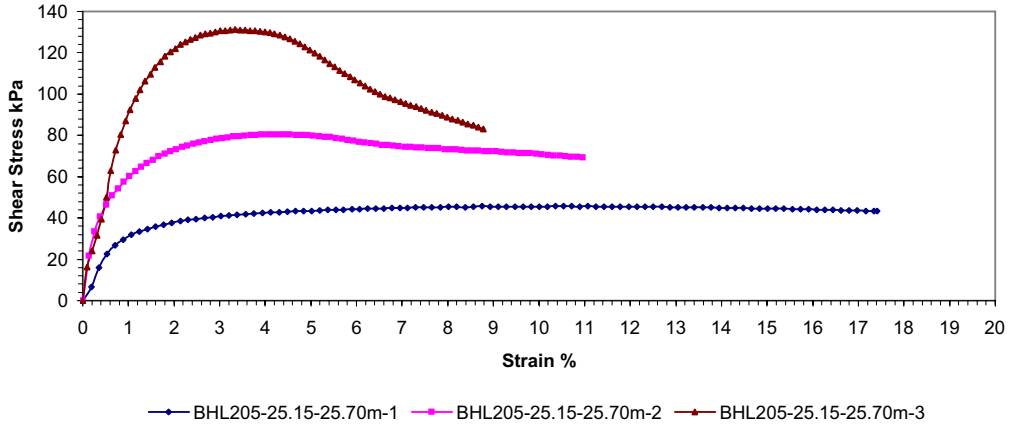


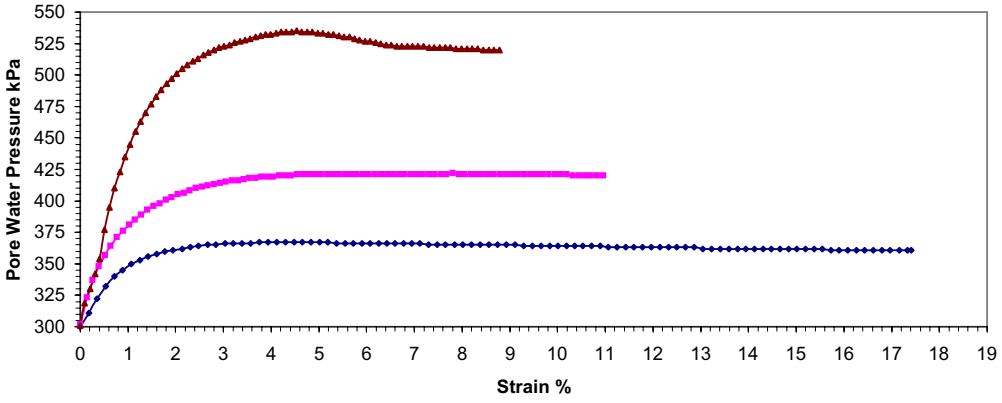


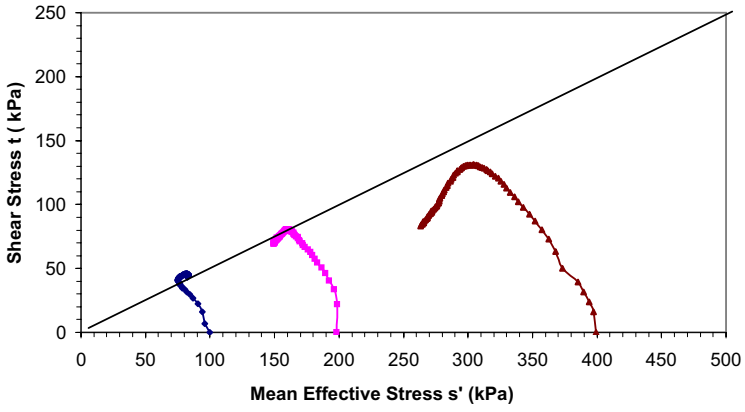


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH205
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	25.15-25.70m

Combined Stress Path Plots







c' 3.5 kPa

Φ' 29.3°

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL205
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth	25.15-25.70m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.75	1.76
Specimen Length	mm	108.50	Dry Density	Mg/m3	1.12	1.17
Specimen Diameter	mm	51.00	Moisture	%	55.57	50.17
Area	mm2	2042.82	Saturation	%	106.65	103.73
Volume	cc	221.65	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.88	0.88
3	150	0.92	0.92
4	200	0.92	0.92
5	300	0.97	0.97
6	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	120.8
External Axial Strain (%)	21.05
Shear Stress (kPa)	60.4
Pore Water Pressure (kPa)	38
Radial Effective Stress (kPa)	62
Axial Effective Stress (kPa)	183
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to firm grey brown CLAY/SILT.
	Compound Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

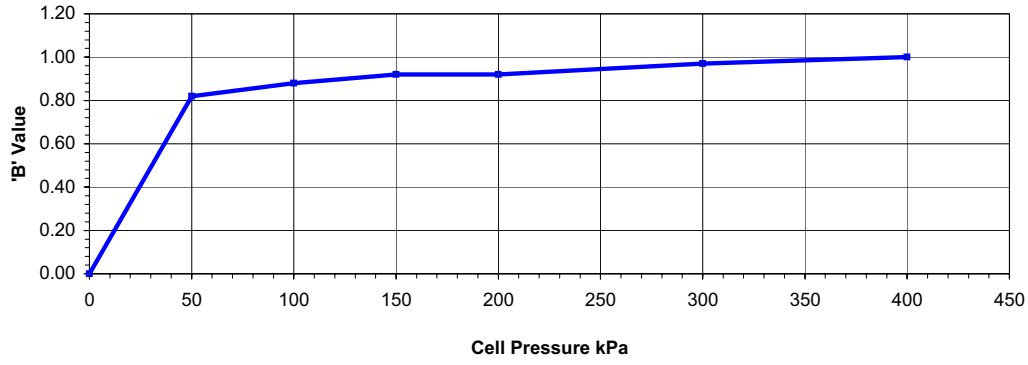
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

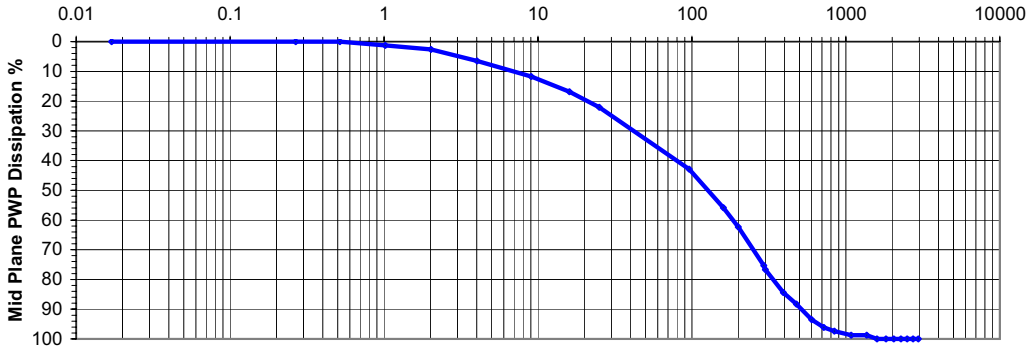
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 20.34-20.64m

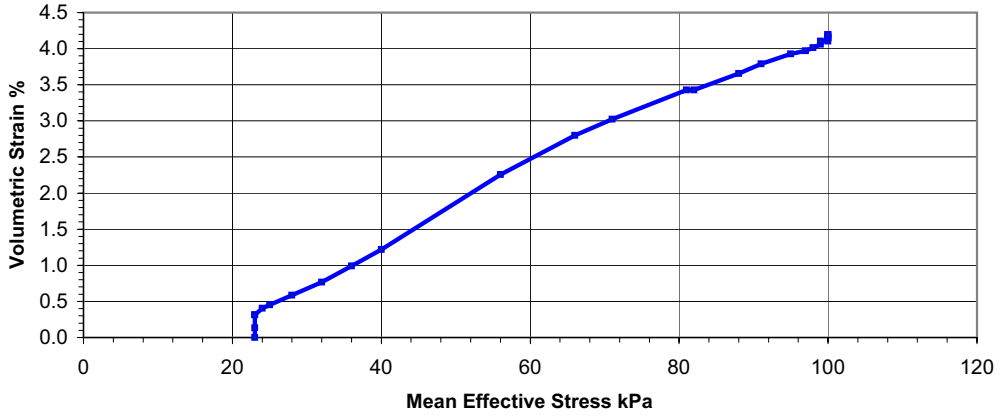
Saturation



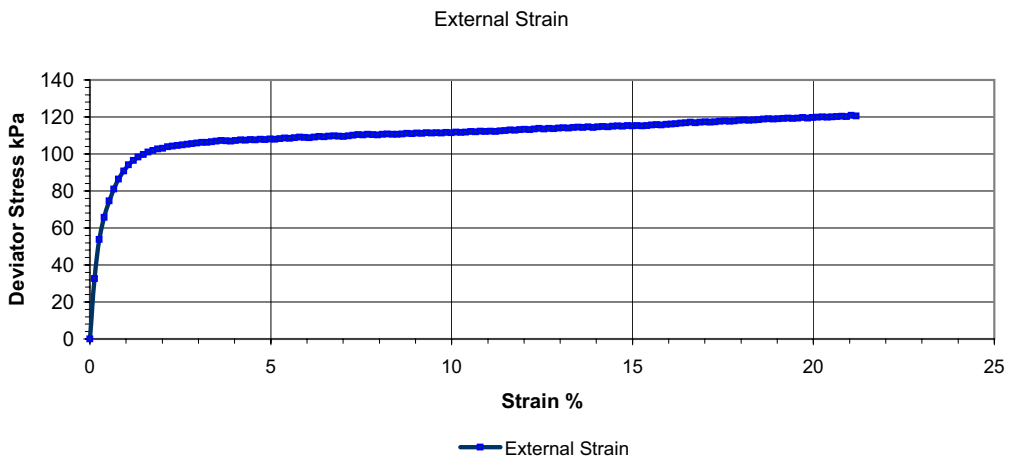
Isotropic Consoliadtion

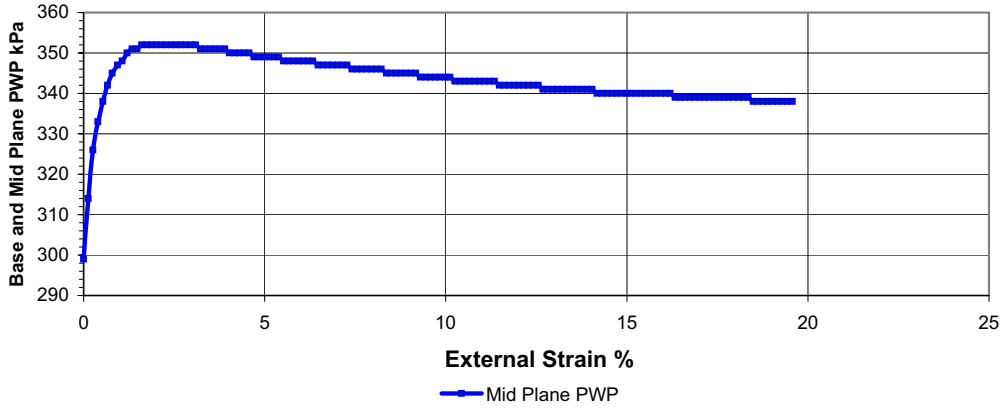
Time Mins

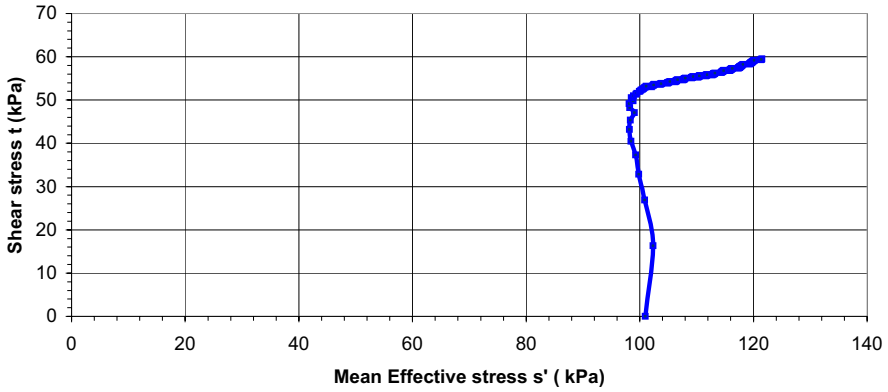




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.34-20.64m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 20.34-20.64m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.74	1.81
Specimen Length	mm	108.20	Dry Density	Mg/m3	1.12	1.25
Specimen Diameter	mm	52.10	Moisture	%	55.54	44.71
Area	mm2	2131.89	Saturation	%	106.47	104.44
Volume	cc	230.67	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.88	0.88
3	150	0.92	0.92
4	200	1.00	1.00
5	300	1.00	1.00
6	400	1.00	1.00
7	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	157.5
External Axial Strain (%)	4.18
Shear Stress (kPa)	78.8
Pore Water Pressure (kPa)	113
Radial Effective Stress (kPa)	86
Axial Effective Stress (kPa)	244
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to firm grey occasionally brown CLAY/SILT.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

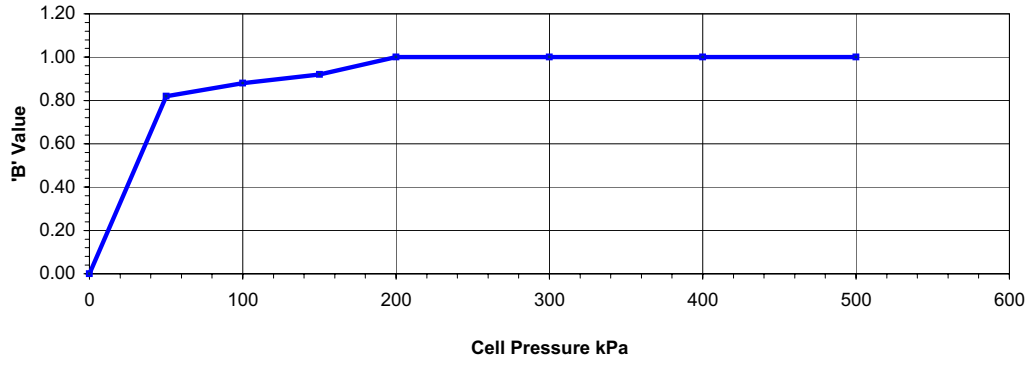
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

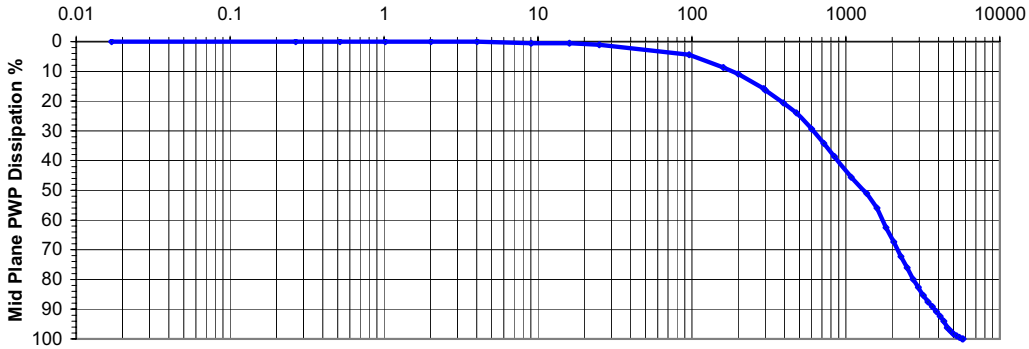
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.64-20.86m

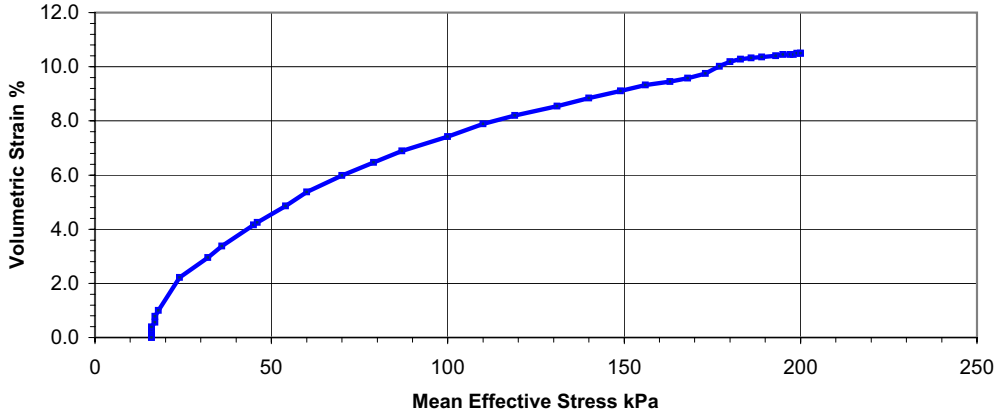
Saturation



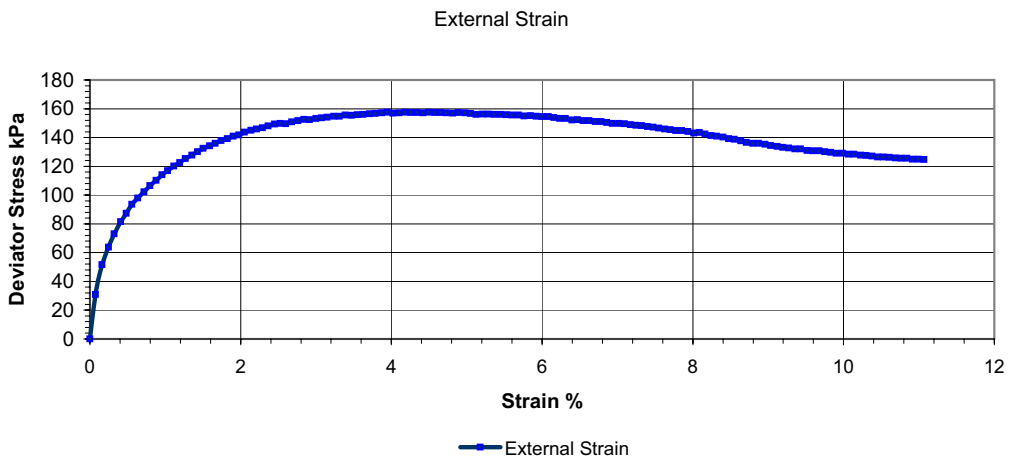
Isotropic Consoliadtion

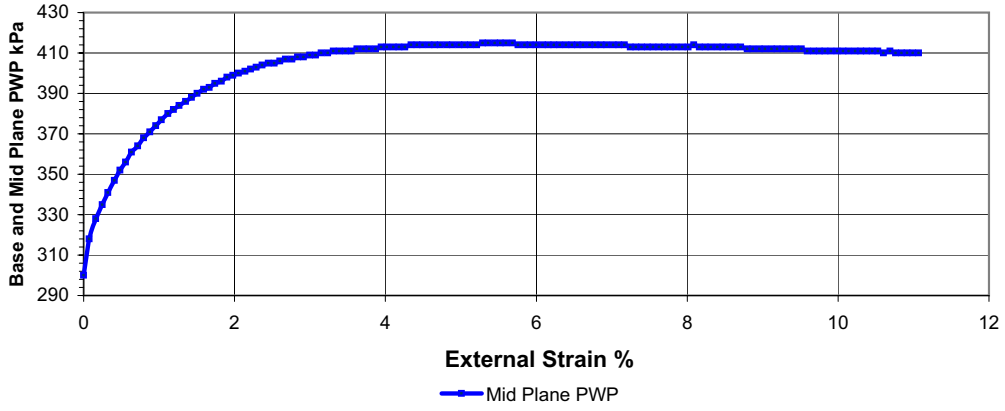
Time Mins

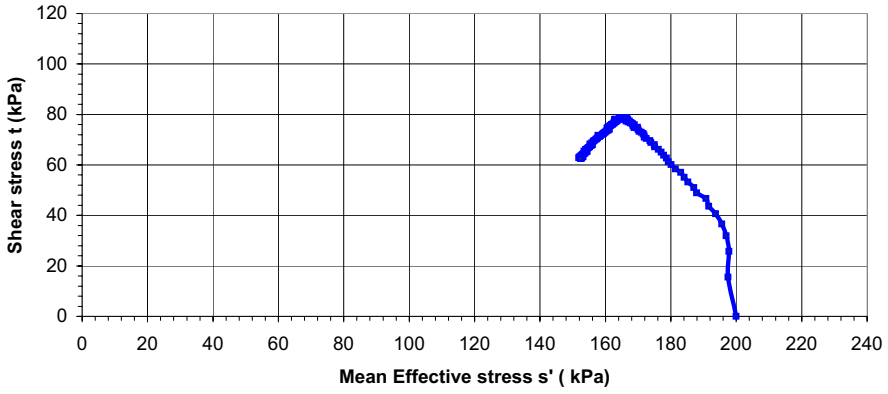




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.64-20.86m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.64-20.86m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.74	1.79
Specimen Length	mm	108.10	Dry Density	Mg/m3	1.13	1.21
Specimen Diameter	mm	54.60	Moisture	%	53.03	47.53
Area	mm2	2341.40	Saturation	%	103.65	104.58
Volume	cc	253.11	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.80	0.80
2	100	0.94	0.94
3	150	1.00	1.00
4	200	1.00	1.00
5	300	0.99	0.99
6	400	1.00	1.00
7	700	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	315.2
External Axial Strain (%)	3.20
Shear Stress (kPa)	157.6
Pore Water Pressure (kPa)	210
Radial Effective Stress (kPa)	190
Axial Effective Stress (kPa)	505
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Firm grey occasionally brown CLAY/SILT. **Brittle Failure**

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

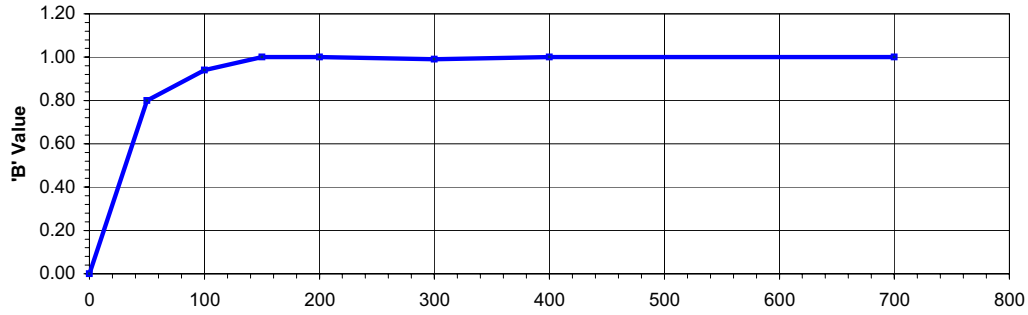
2 Side drain corrections not applied

3 Membrane correction not applied

Specimen After Test

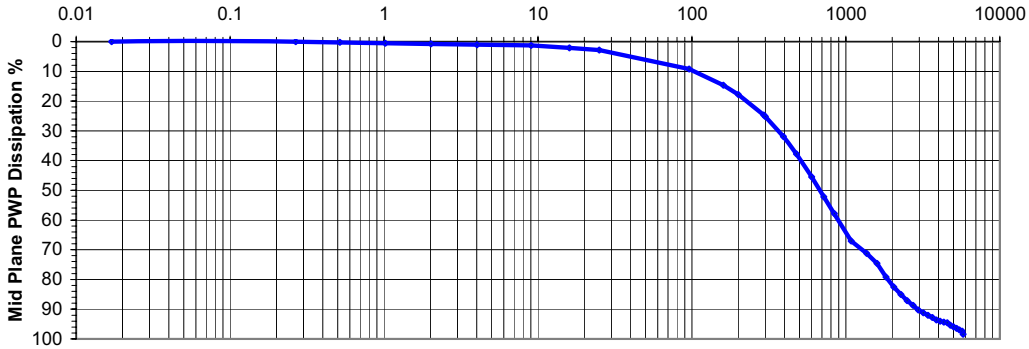
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.86-21.10m

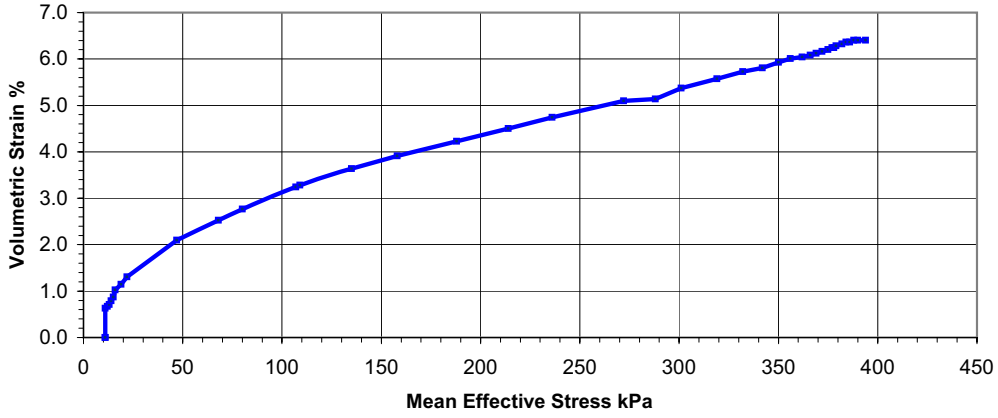
Saturation



Isotropic Consoliadtion

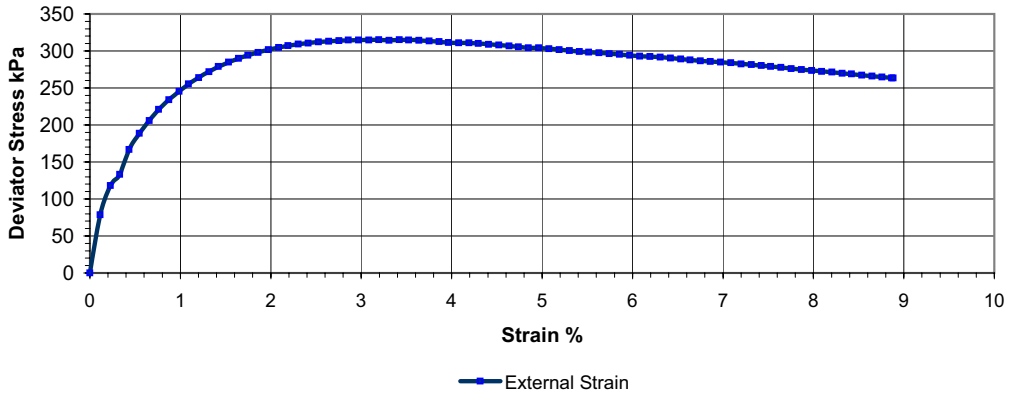
Time Mins

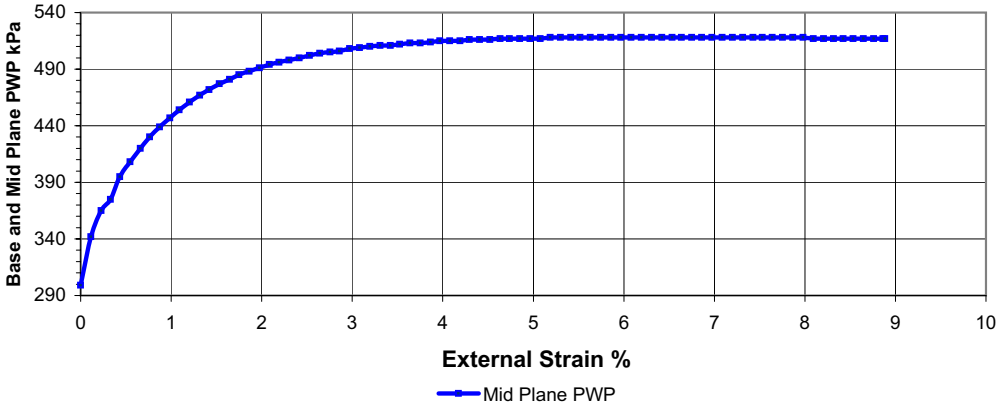


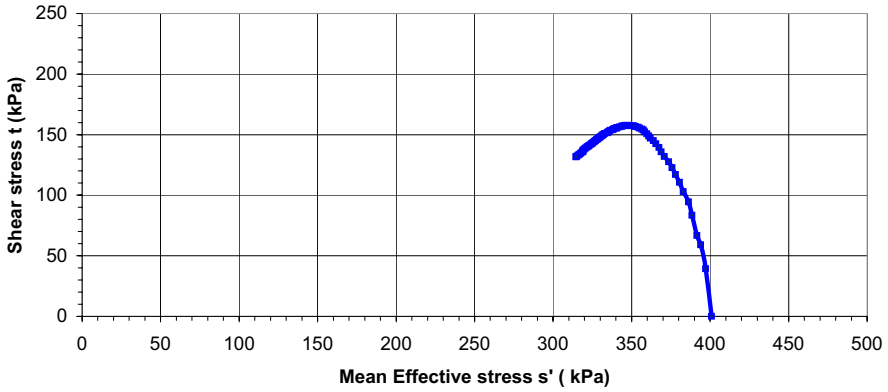


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.86-21.10m

External Strain

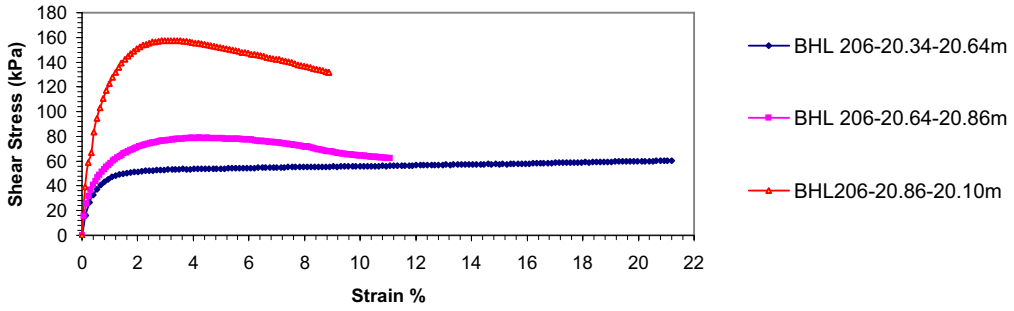


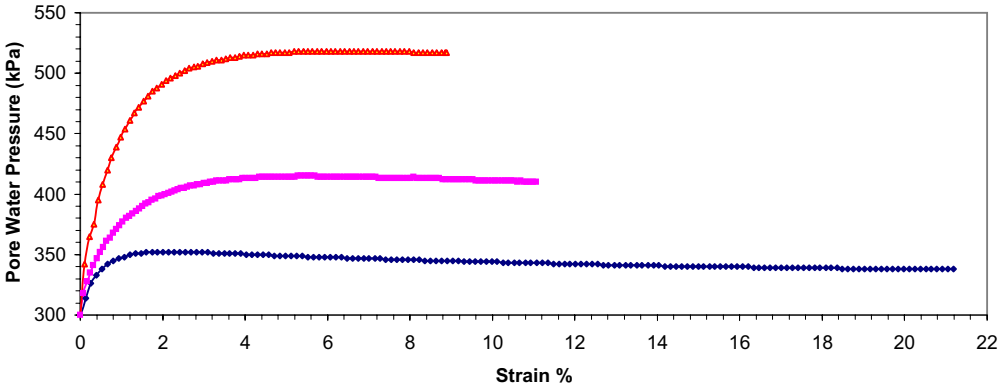


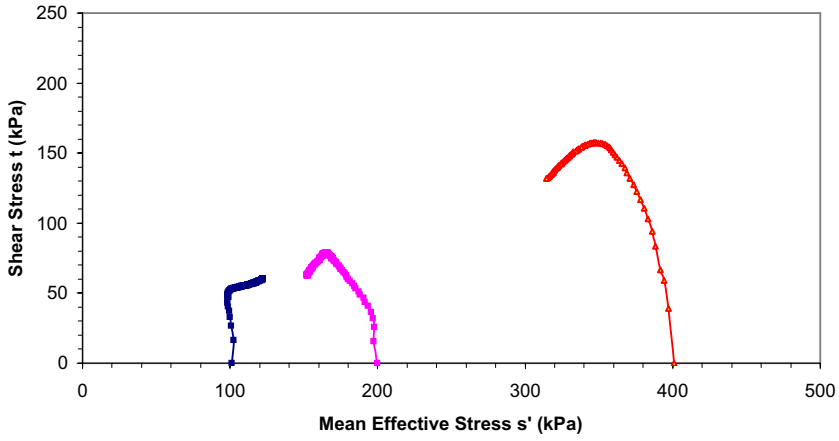


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL206
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	20.86-21.10m

Combined Stress Path Plots







c' **2.6** **kPa**

Φ' **26.5º**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BH206
Ltd	Project:	Sample No.	Core
	Durban Harbour Berth Deepening Study	Depth	20.34-21.10m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.86	1.88
Specimen Length	mm	124.00	Dry Density	Mg/m3	1.37	1.41
Specimen Diameter	mm	73.30	Moisture	%	35.86	33.76
Area	mm2	4219.86	Saturation	%	99.07	99.10
Volume	cc	523.26	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.68	0.68
2	100	0.74	0.74
3	150	0.96	0.96
4	200	0.97	0.97
5	300	0.99	0.99

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

At Maximum Deviator stress

Deviator Stress (kPa)	191.1
External Axial Strain (%)	5.19
Shear Stress (kPa)	95.5
Pore Water Pressure (kPa)	124
Radial Effective Stress (kPa)	76
Axial Effective Stress (kPa)	267
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Soft to Firm dark grey/black SILT/CLAY

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

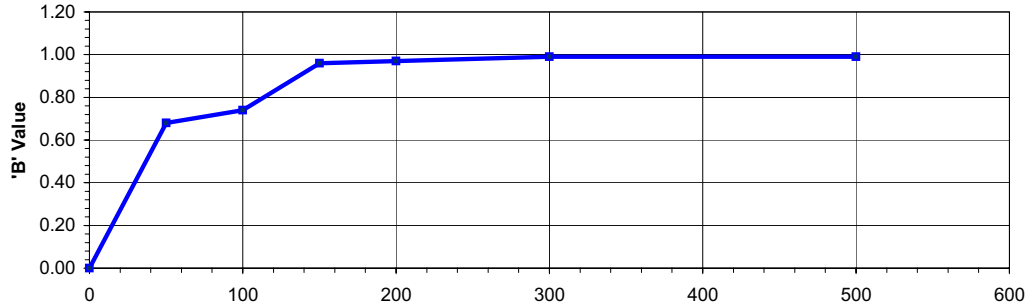
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.72-29.86m

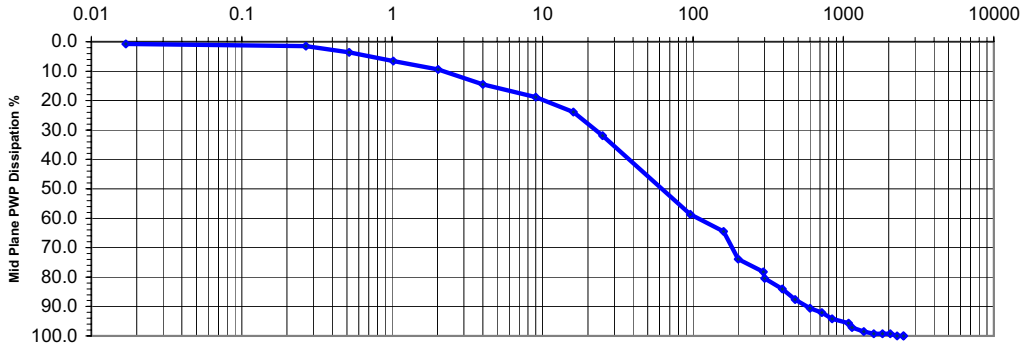
Saturation

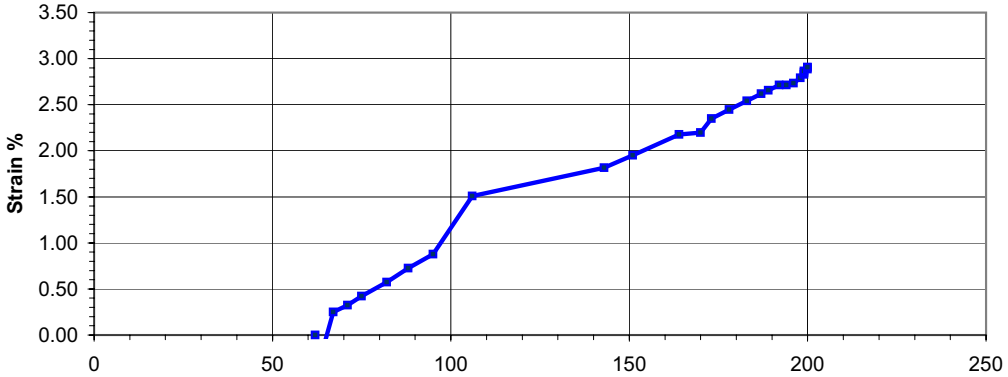


Cell Pressure kPa

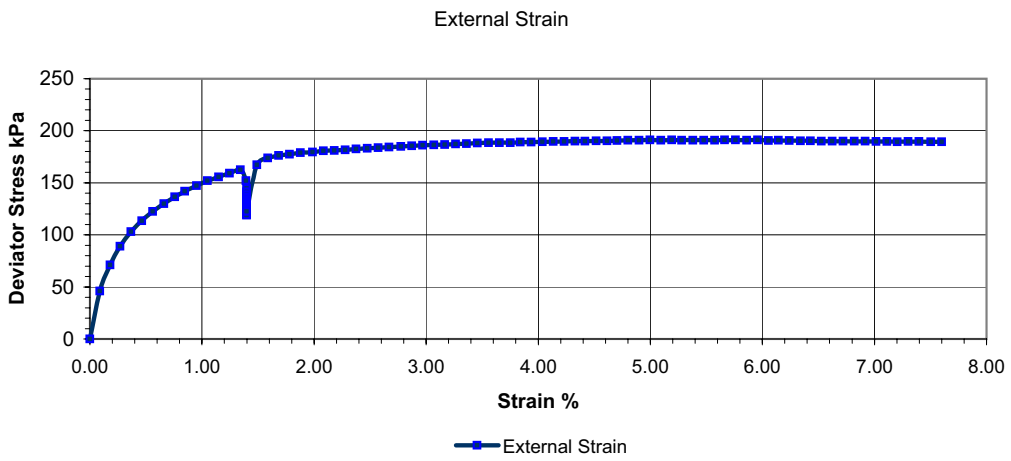
Isotropic Consoliadtion

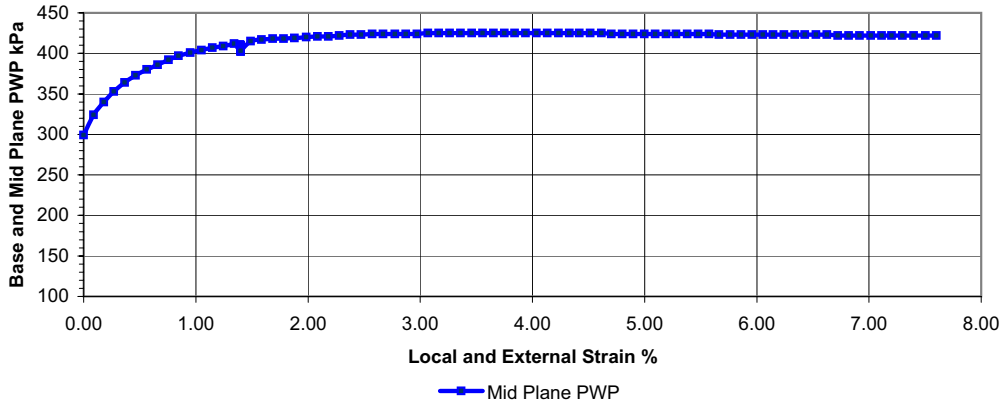
Time Mins

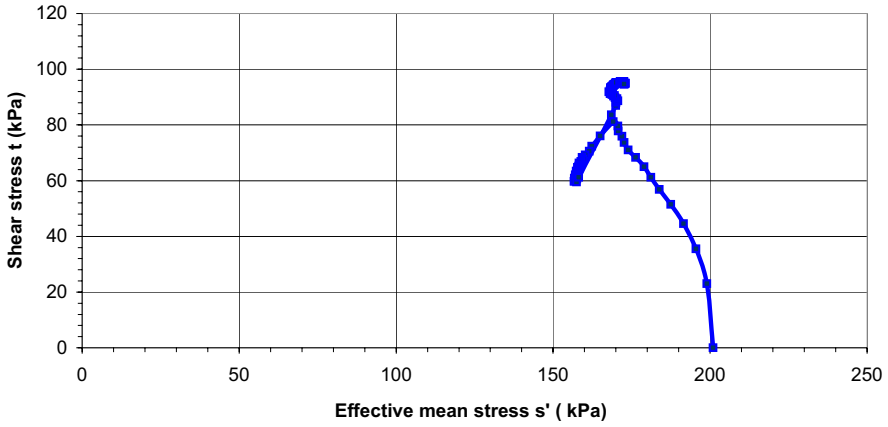




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	29.72-29.86m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	29.72-29.86m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.89	1.92
Specimen Length	mm	140.10	Dry Density	Mg/m3	1.42	1.47
Specimen Diameter	mm	73.60	Moisture	%	32.38	30.93
Area	mm2	4254.47	Saturation	%	97.72	99.37
Volume	cc	596.05	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.68	0.68
2	100	0.74	0.74
3	150	0.96	0.96
4	200	0.97	0.97
5	300	0.99	0.99

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

At Maximum Deviator stress

Deviator Stress (kPa)	403.8
External Axial Strain (%)	2.31
Shear Stress (kPa)	201.9
Pore Water Pressure (kPa)	223
Radial Effective Stress (kPa)	177
Axial Effective Stress (kPa)	581
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Frim to stiff dark grey / black SILT/CLAY

Notes:

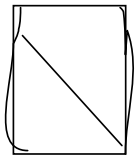
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

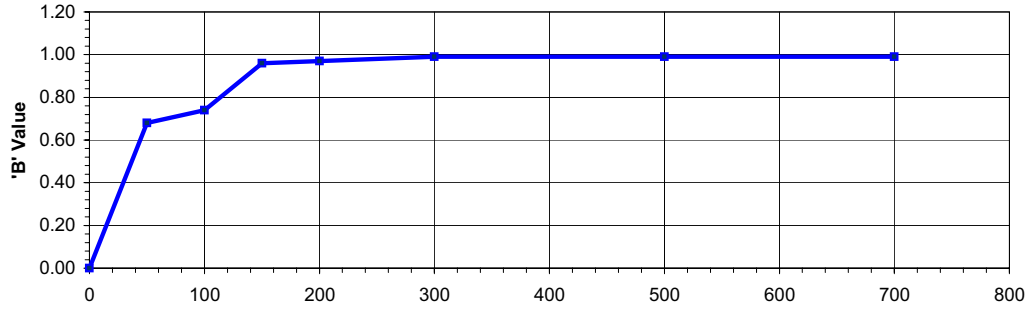
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.86-30.05m

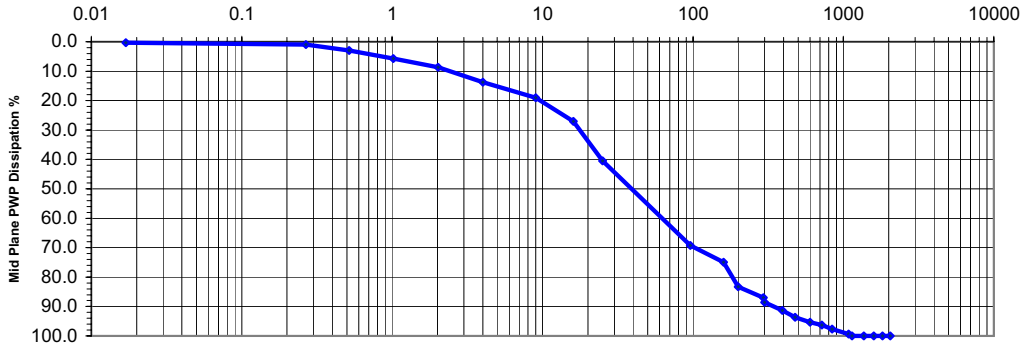
Saturation

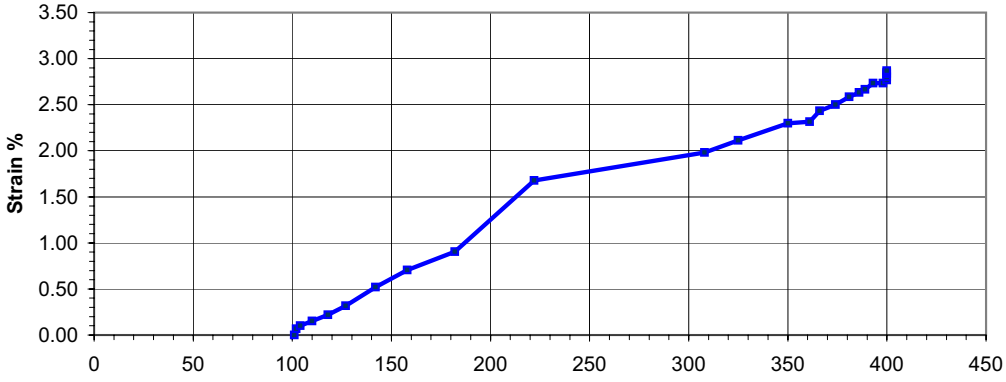


Cell Pressure kPa

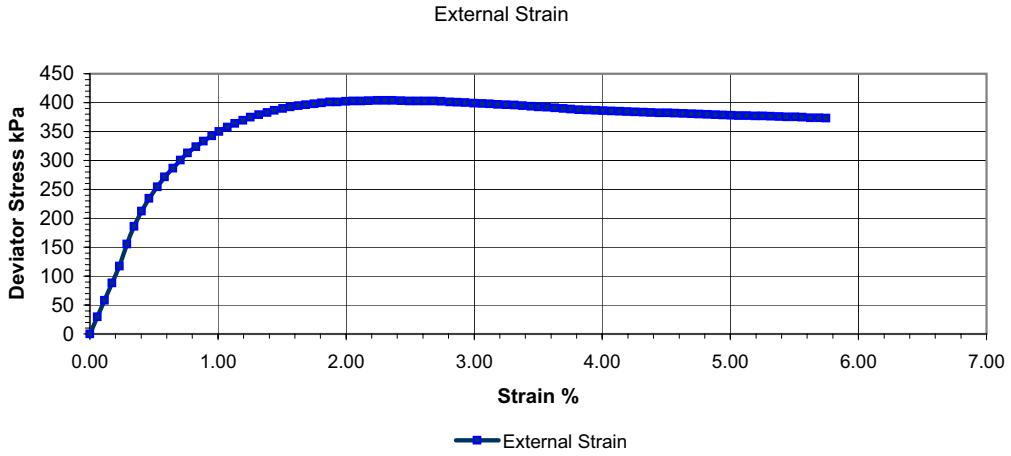
Isotropic Consoliadtion

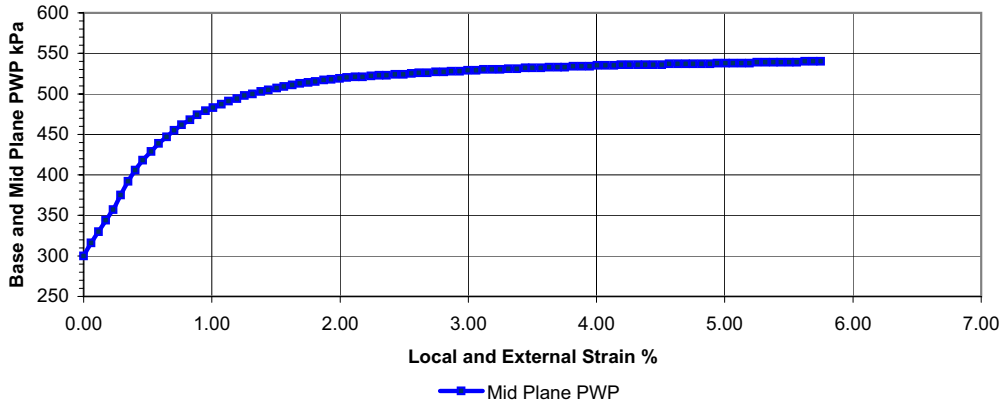
Time Mins

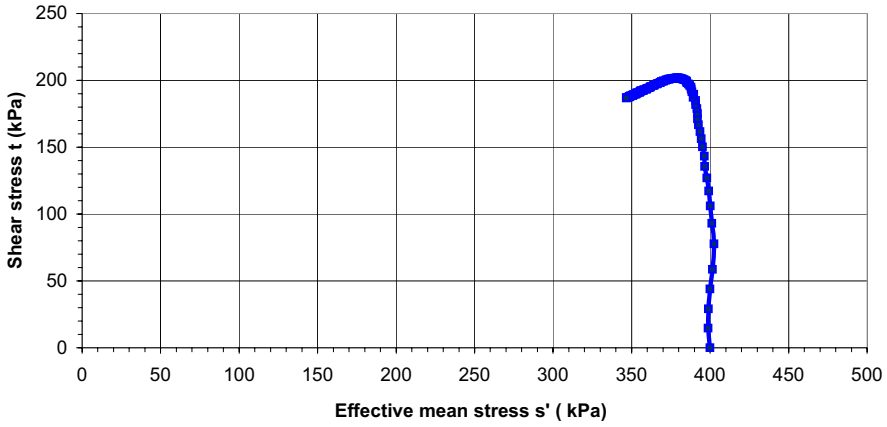




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	29.86-30.05m

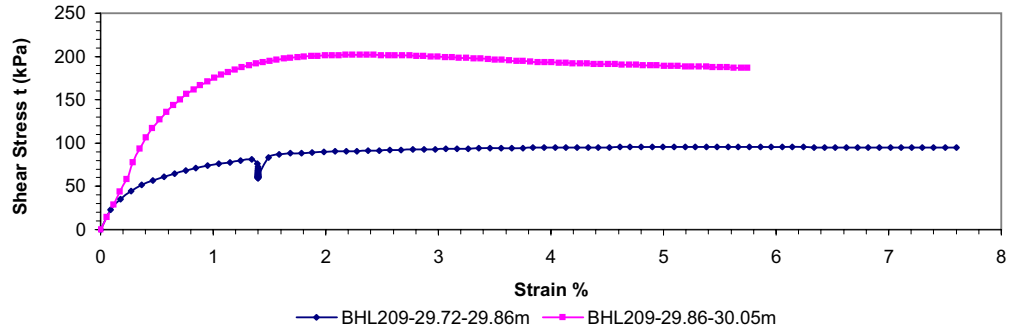


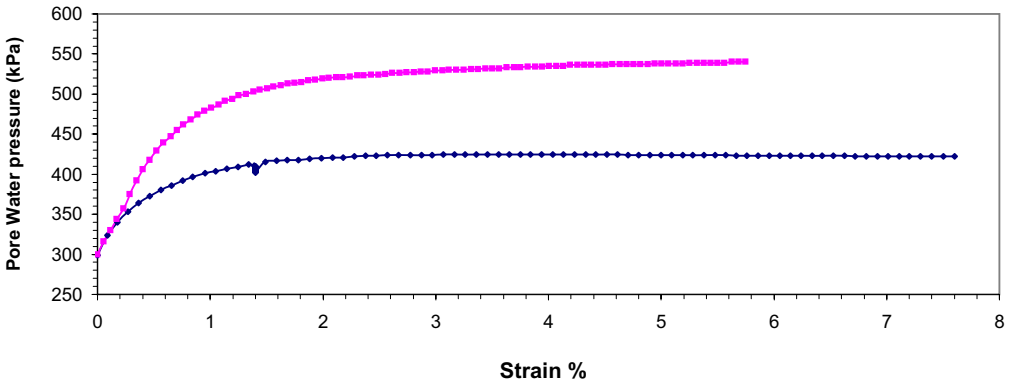


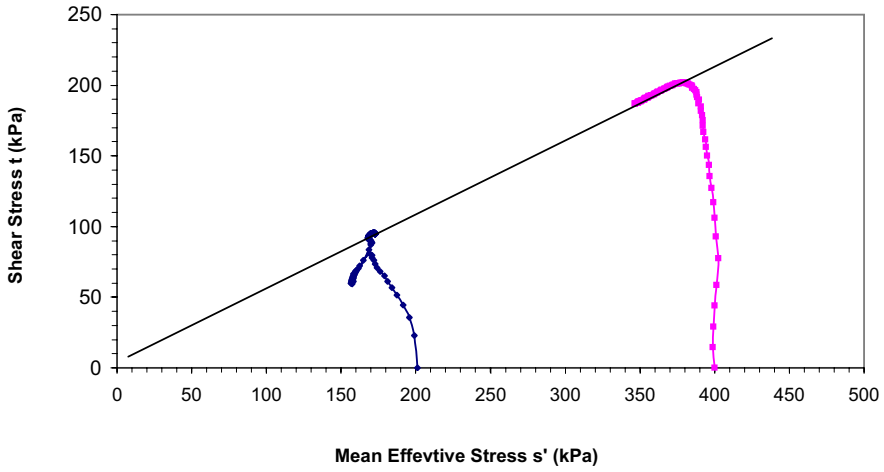


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	29.86-30.05m

Combined Stress Path Plots







c' **10** **kPa**
Φ' **30.7°**

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No. NMTL-523
		Borehole BHL209
	Project: **Durban Harbour Berth Deepening Study**	Sample No. Shelby
		Depth 29.72-30.05m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.72	1.70
Specimen Length	mm	102.80	Dry Density	Mg/m3	1.11	1.10
Specimen Diameter	mm	52.50	Moisture	%	54.51	54.74
Area	mm2	2164.75	Saturation	%	103.28	101.24
Volume	cc	222.54	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.52	0.52
2	100	0.64	0.64
3	200	0.72	0.72
4	300	0.78	0.78
5	350	0.96	0.96

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

At Maximum Deviator stress

Deviator Stress (kPa)	171.9
External Axial Strain (%)	8.84
Shear Stress (kPa)	85.9
Pore Water Pressure (kPa)	-6
Radial Effective Stress (kPa)	56
Axial Effective Stress (kPa)	228
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff dark grey/black CLAY/SILT.

Notes:

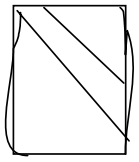
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

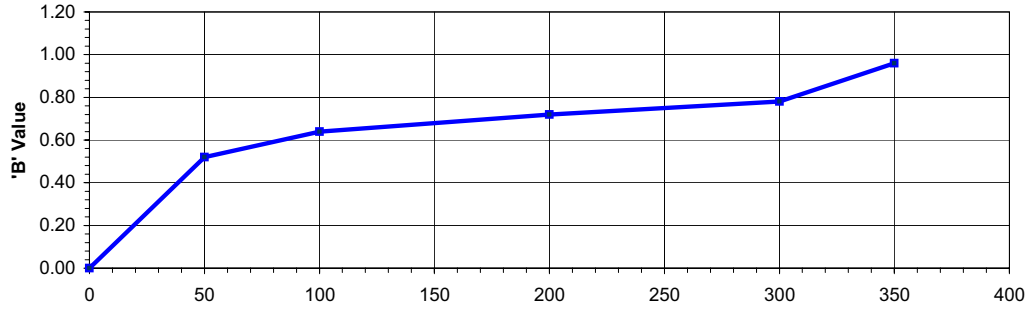
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 21.25-21.45m

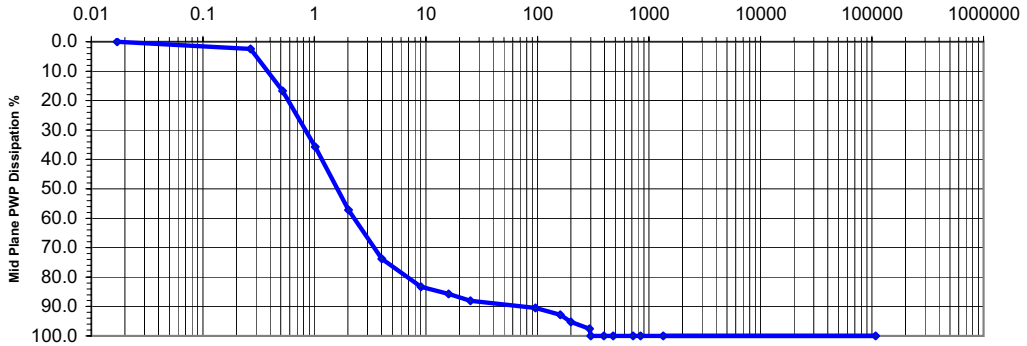
Saturation

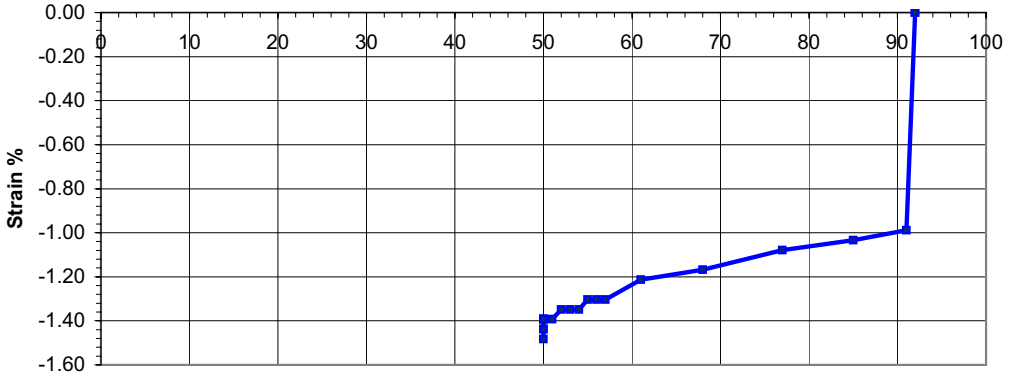


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins



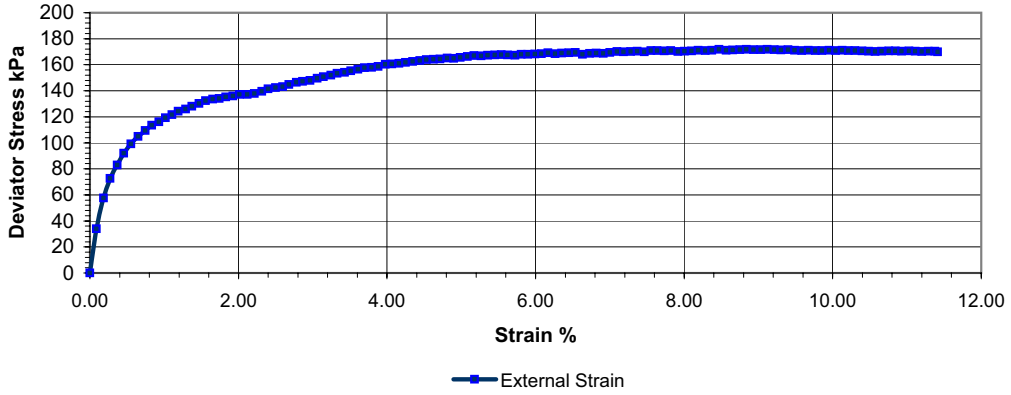


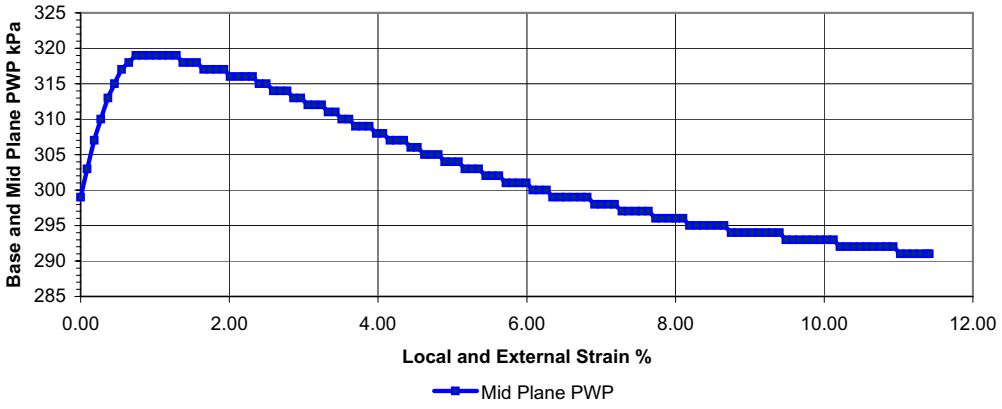
Effect Mean Stress Kpa

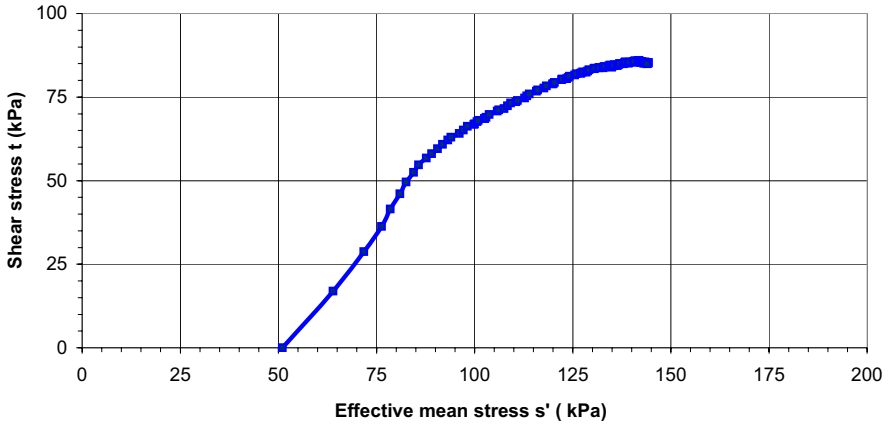
Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	21.25-21.45m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-492
		Borehole No. BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No. U
		Depth. 21.25-21.45m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.67	1.61
Specimen Length	mm	110.20	Dry Density	Mg/m3	0.98	0.95
Specimen Diameter	mm	54.00	Moisture	%	70.59	68.43
Area	mm2	2290.22	Saturation	%	108.27	101.07
Volume	cc	252.38	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.76	0.76
2	100	0.90	0.90
3	200	0.93	0.93
4	300	0.94	0.94
5	400	0.95	0.95

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

At Maximum Deviator stress

Deviator Stress (kPa)	191.6
External Axial Strain (%)	2.31
Shear Stress (kPa)	95.8
Pore Water Pressure (kPa)	48
Radial Effective Stress (kPa)	52
Axial Effective Stress (kPa)	244
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Stiff dark grey/black CLAY/SILT.

Notes:

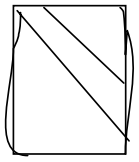
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

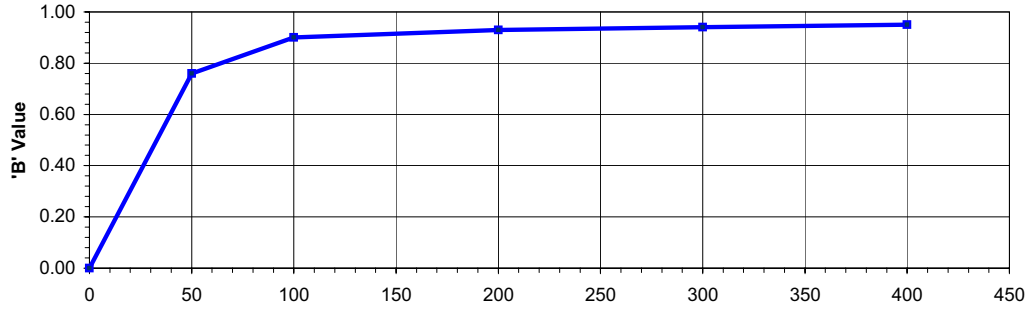
3 Side drain corrections not applied

Specimen After Test



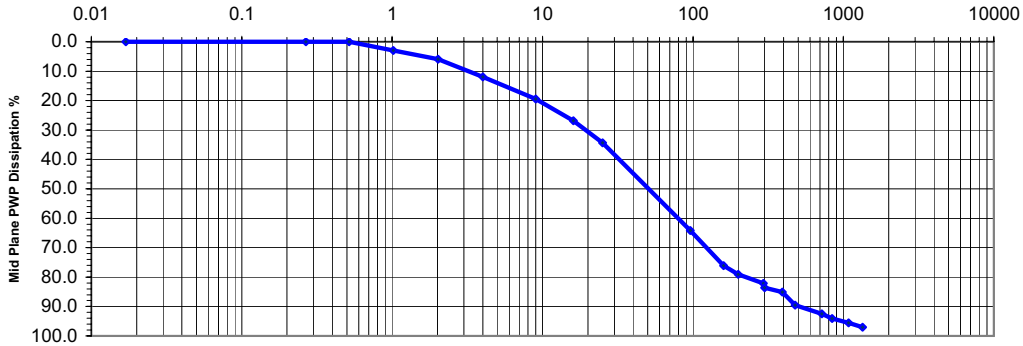
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth. 21.45-21.57m

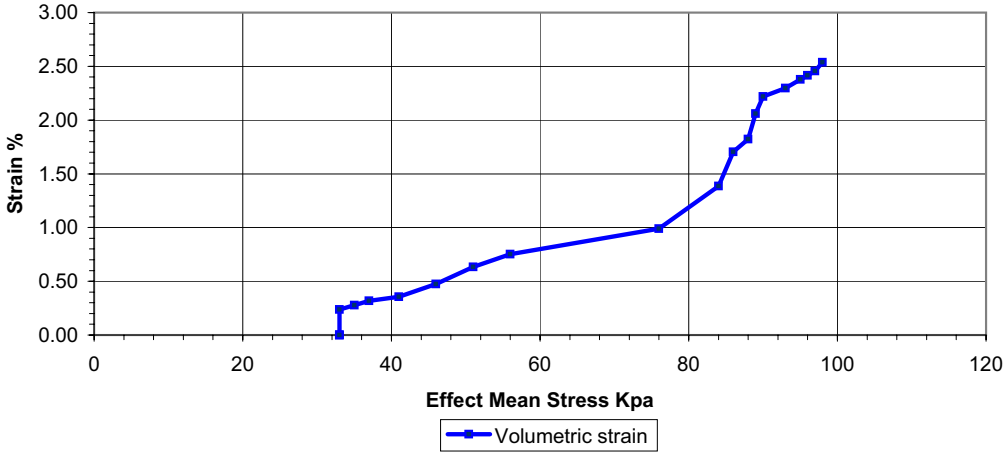
Saturation



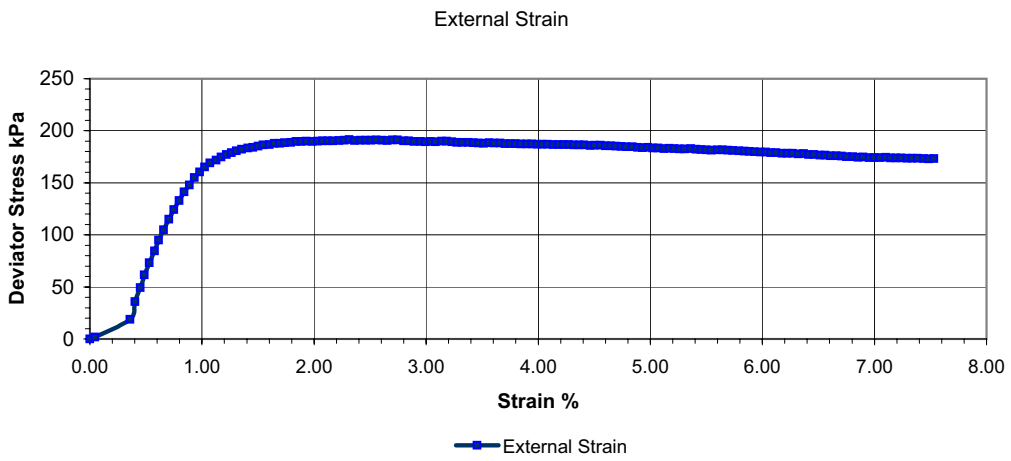
Isotropic Consoliadtion

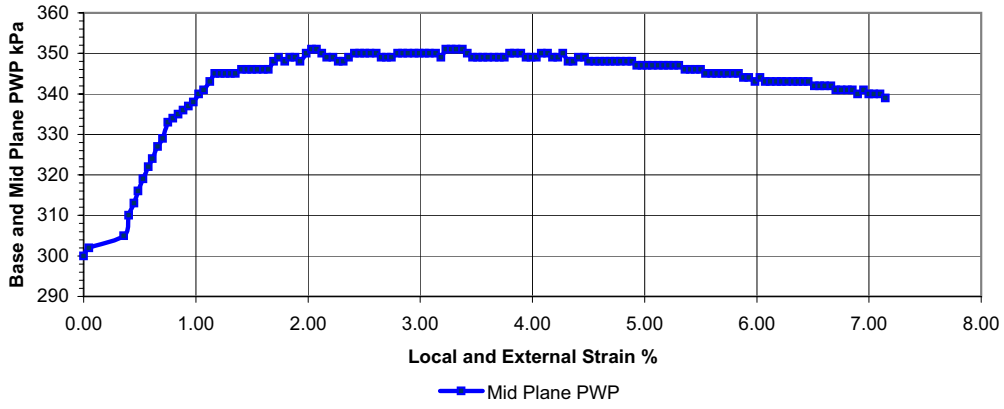
Time Mins

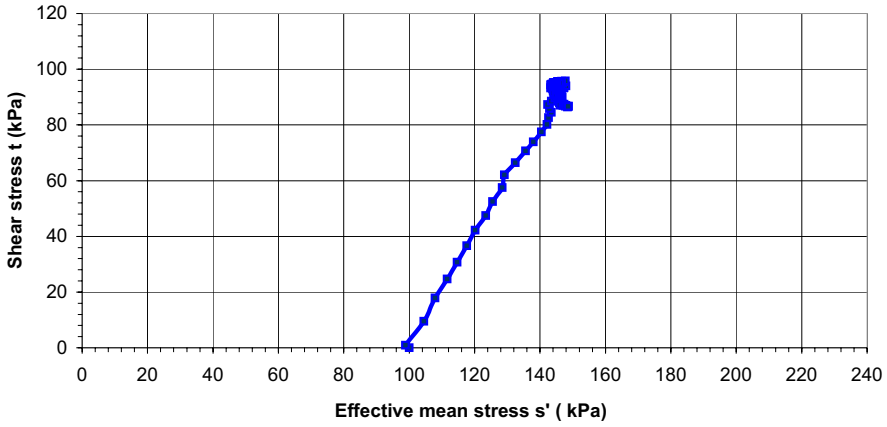




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	21.45-21.57m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	21.45-21.57m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.68	1.57
Specimen Length	mm	101.20	Dry Density	Mg/m3	1.06	1.00
Specimen Diameter	mm	53.50	Moisture	%	59.02	56.00
Area	mm2	2248.01	Saturation	%	102.53	89.52
Volume	cc	227.50	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.54	0.54
2	100	0.68	0.68
3	200	0.72	0.72
4	300	0.80	0.80
5	400	0.85	0.85
6	500	0.93	0.93
7	700	1.00	1.00

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

At Maximum Deviator stress

Deviator Stress (kPa)	380.4
External Axial Strain (%)	2.58
Shear Stress (kPa)	190.2
Pore Water Pressure (kPa)	242
Radial Effective Stress (kPa)	158
Axial Effective Stress (kPa)	538
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm dark grey/black CLAY/SILT.

Notes:

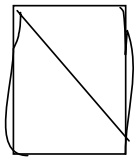
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

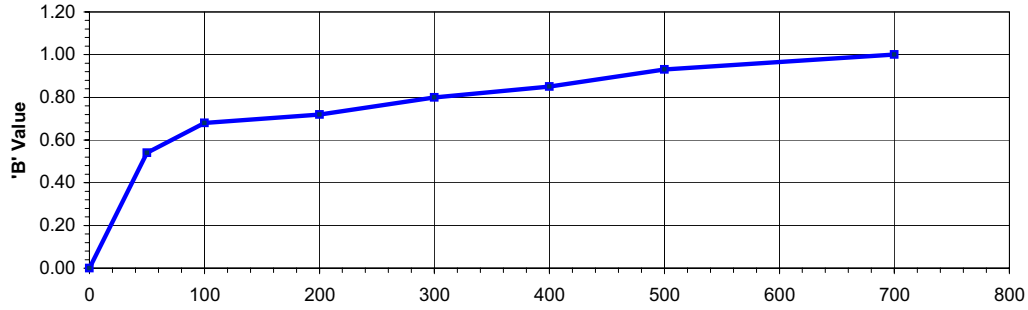
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.09m

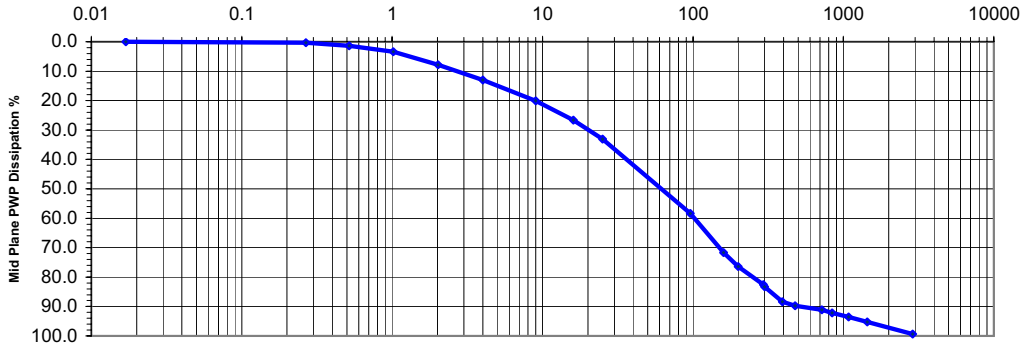
Saturation

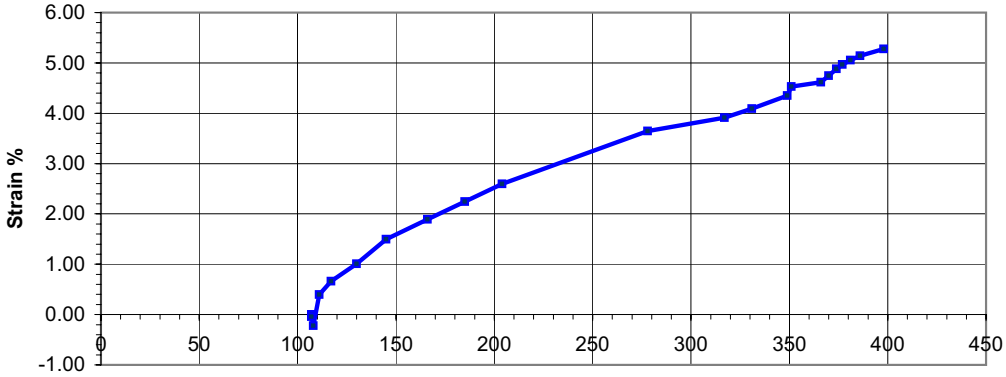


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

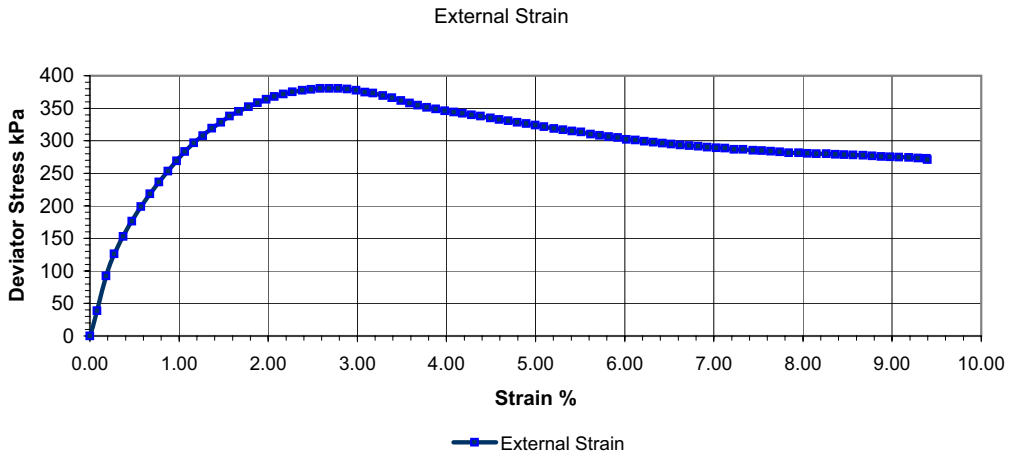


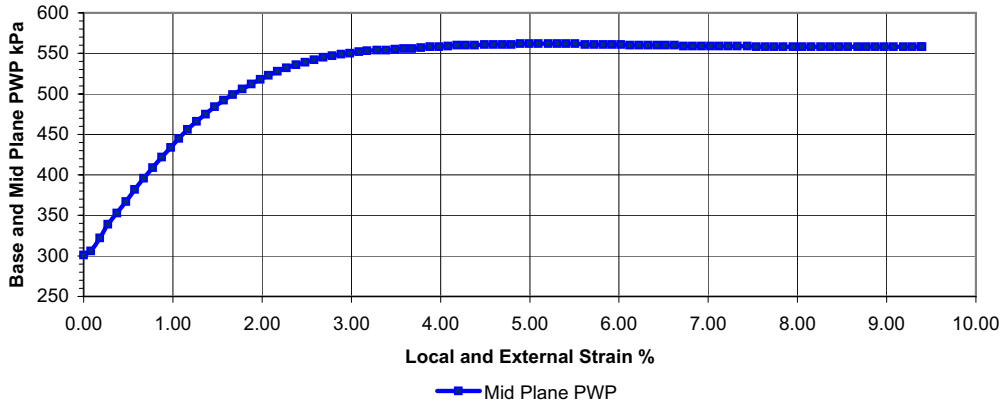


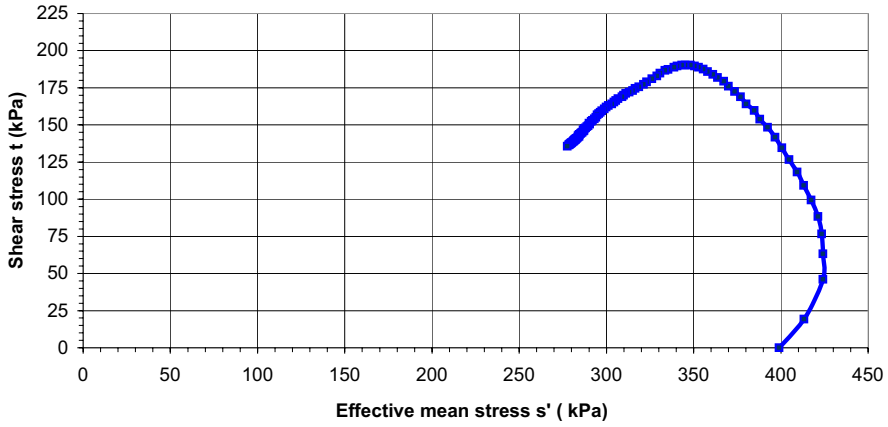
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	22.09m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	22.09m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.62	1.47
Specimen Length	mm	98.70	Dry Density	Mg/m3	0.99	0.93
Specimen Diameter	mm	54.50	Moisture	%	64.17	58.40
Area	mm2	2332.83	Saturation	%	99.55	82.32
Volume	cc	230.25	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.52	0.52
2	100	0.64	0.64
3	200	0.73	0.73
4	300	0.89	0.89
5	400	0.95	0.95
6	800	0.95	0.95

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	800
Back Pressure	kPa	200
Radial Effective stress	kPa	600

At Maximum Deviator stress

Deviator Stress (kPa)	459.1
External Axial Strain (%)	2.98
Shear Stress (kPa)	229.6
Pore Water Pressure (kPa)	324
Radial Effective Stress (kPa)	276
Axial Effective Stress (kPa)	735
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm dark grey/black CLAY/SILT.

Notes:

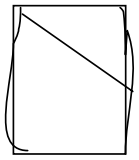
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

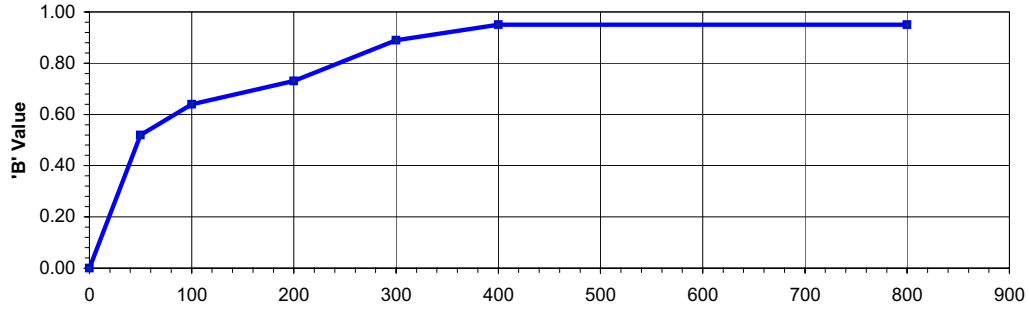
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	22.35m

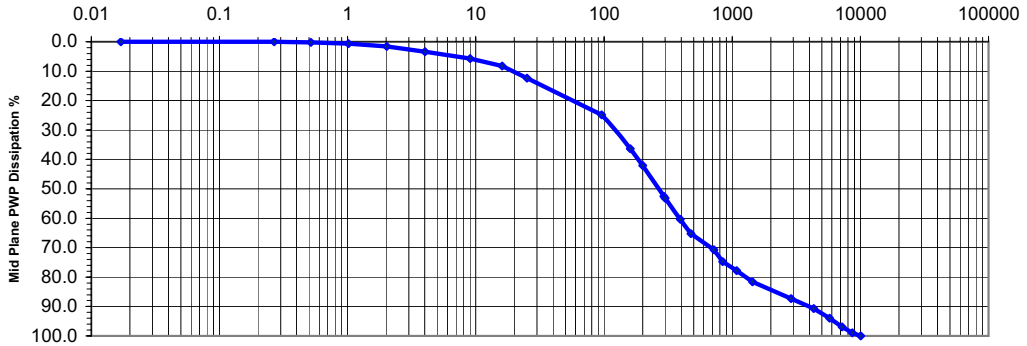
Saturation

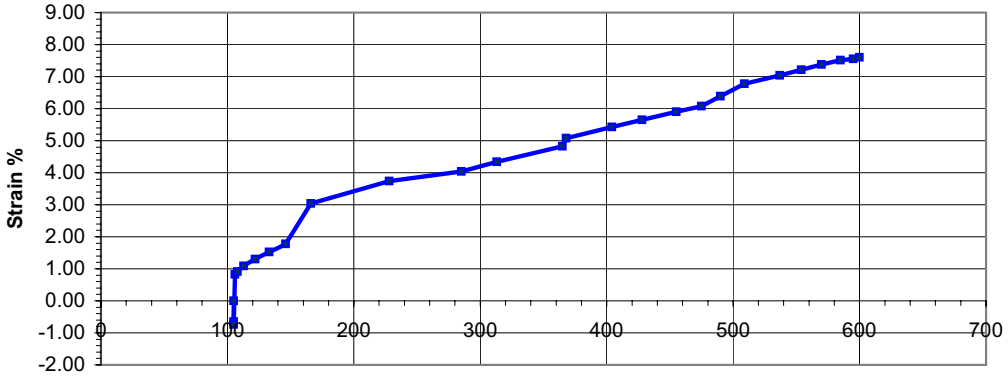


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

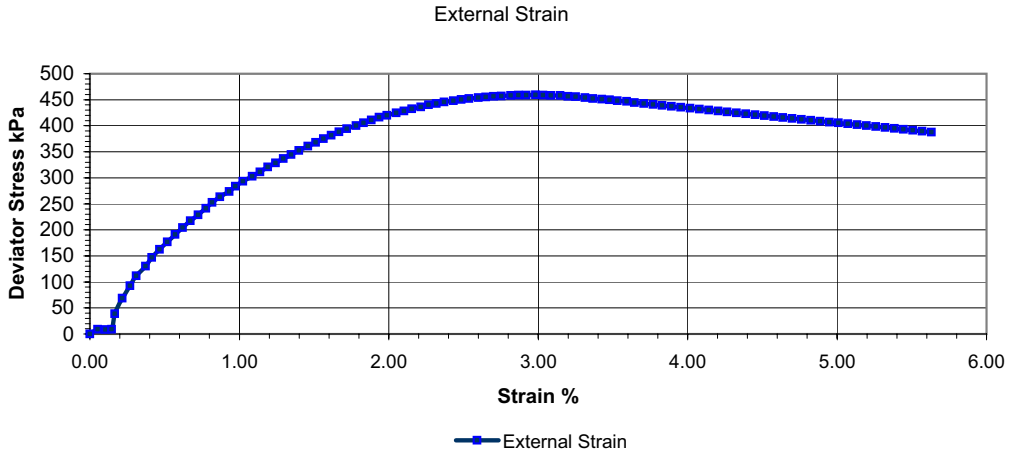


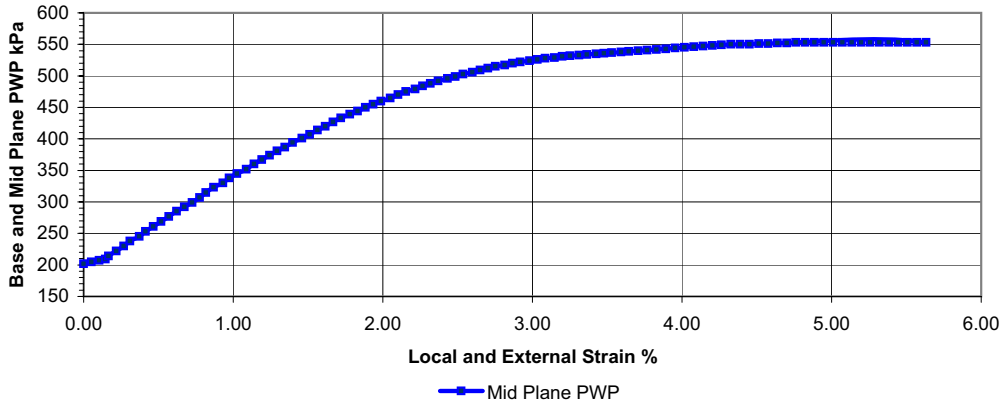


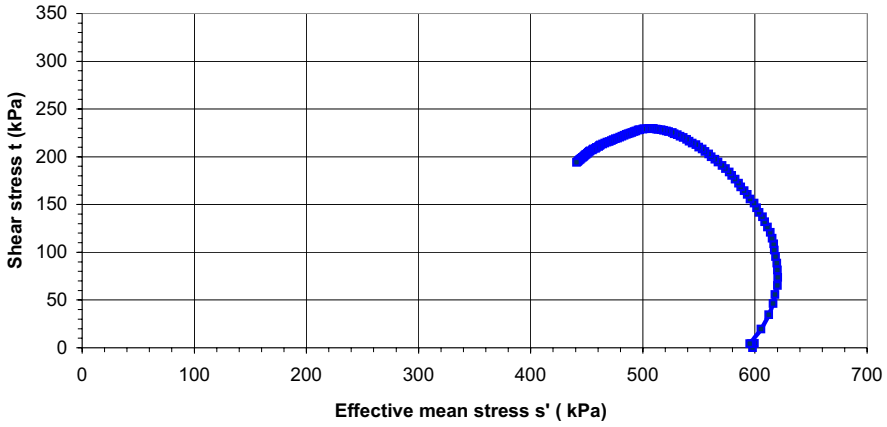
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	22.35m

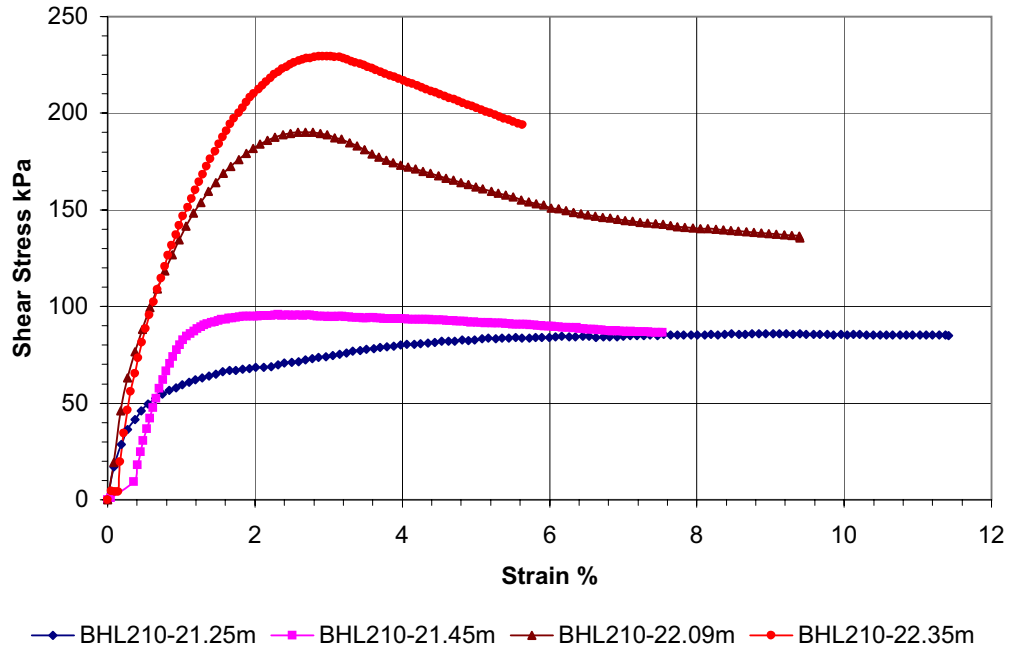


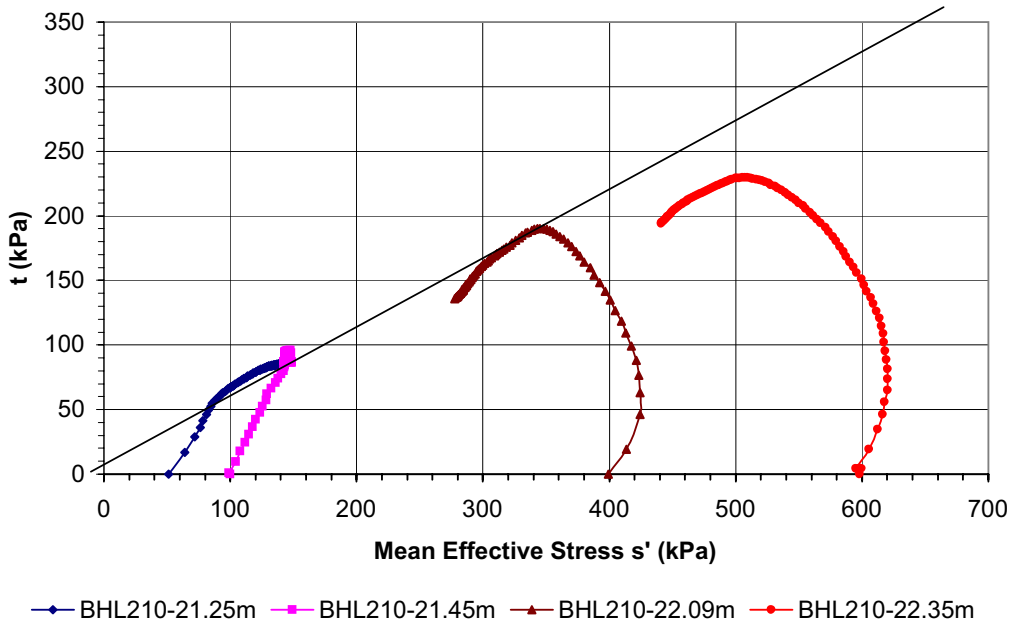




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL210
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	22.35m

Combined Stress Path Plots





c' **10** **kPa**
Φ' **31.7°**

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No. NMTL-523
		Borehole BH210
	Project: Durban Harbour Berth Deepening Study	Sample No. Core
		Depth 21-45-22.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.58	1.59
Specimen Length	mm	130.00	Dry Density	Mg/m3	1.01	1.02
Specimen Diameter	mm	61.00	Moisture	%	56.80	56.87
Area	mm2	2922.47	Saturation	%	91.50	92.55
Volume	cc	379.92	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.48	0.48
2	100	0.58	0.58
3	150	0.66	0.66
4	200	0.72	0.72
5	300	0.82	0.82
6	350	0.96	0.96

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

At Maximum Deviator stress

Deviator Stress (kPa)	119.7
External Axial Strain (%)	9.46
Shear Stress (kPa)	59.8
Pore Water Pressure (kPa)	10
Radial Effective Stress (kPa)	40
Axial Effective Stress (kPa)	160
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm dark grey/black CLAY/SILT.

Notes:

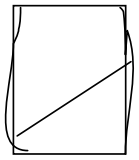
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

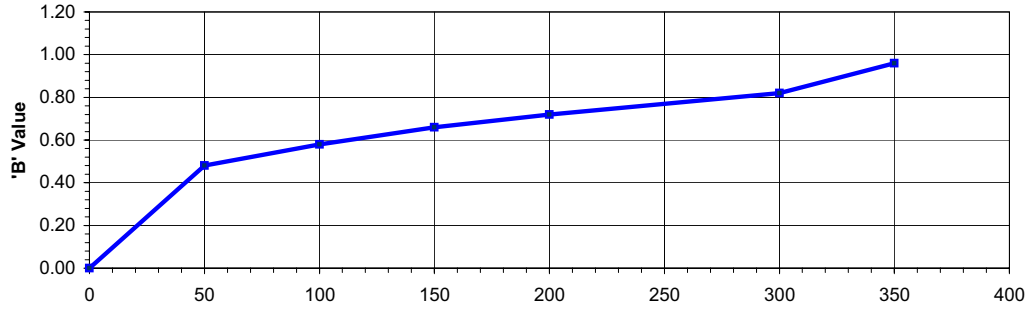
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	4.50m

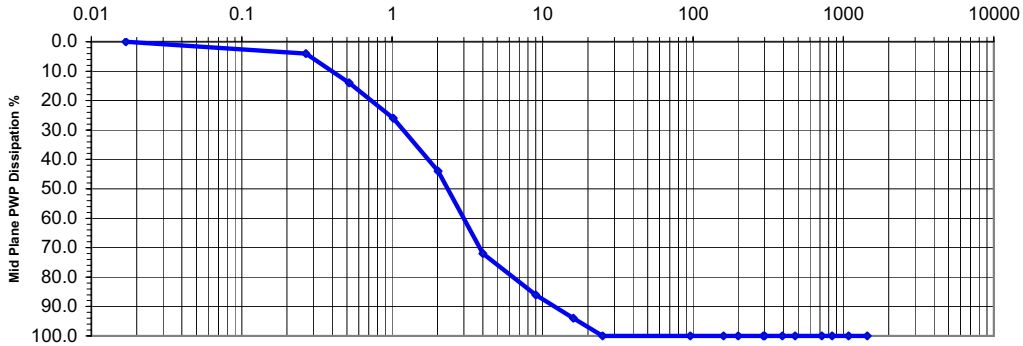
Saturation

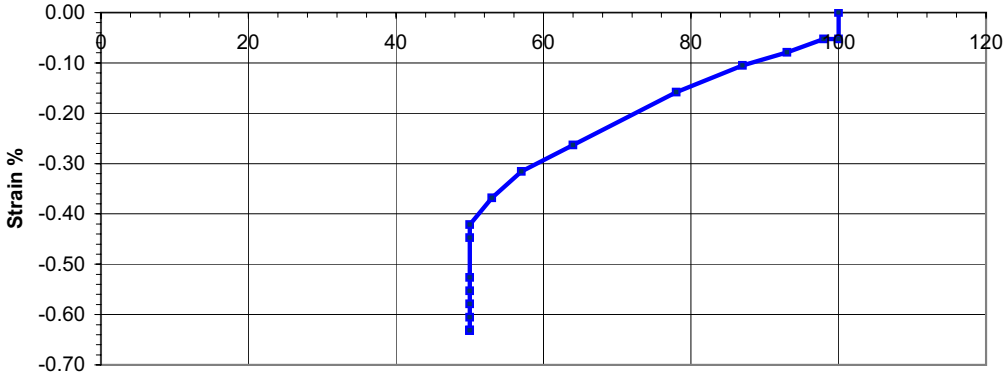


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

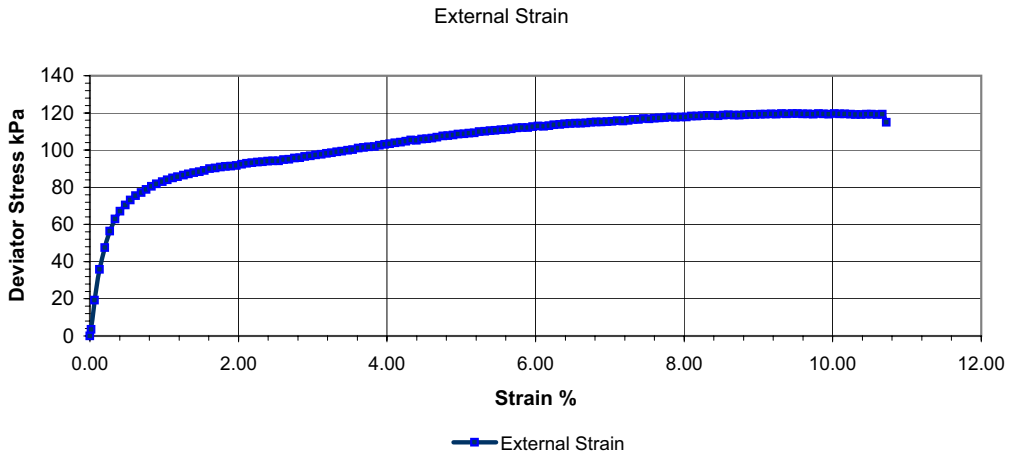


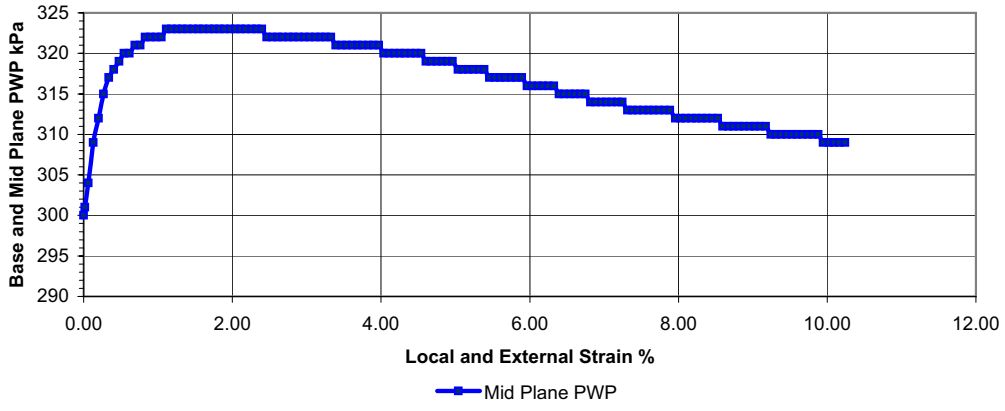


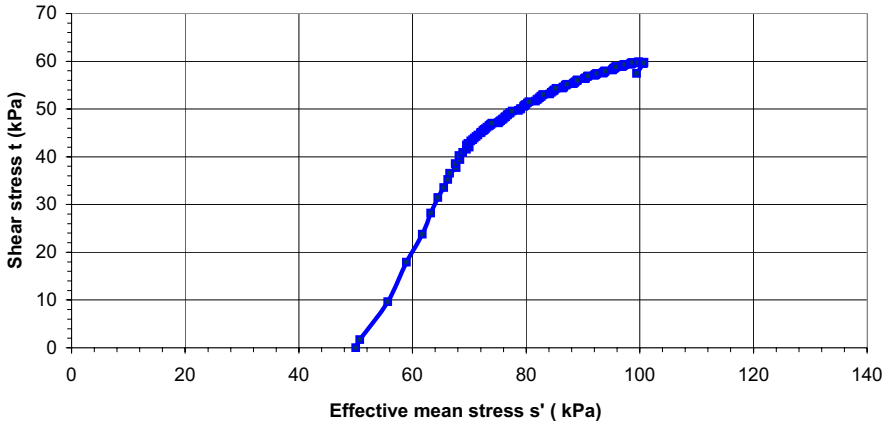
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	4.50m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	4.50m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.65	1.65
Specimen Length	mm	114.50	Dry Density	Mg/m3	1.11	1.10
Specimen Diameter	mm	60.50	Moisture	%	47.77	49.72
Area	mm2	2874.75	Saturation	%	90.70	92.73
Volume	cc	329.16	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.10	0.10
2	100	0.16	0.16
3	150	0.34	0.34
4	200	0.38	0.38
5	300	0.48	0.48
6	400	0.56	0.56

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	550
Back Pressure	kPa	450
Radial Effective stress	kPa	100

At Maximum Deviator stress

Deviator Stress (kPa)	289.8
External Axial Strain (%)	3.13
Shear Stress (kPa)	144.9
Pore Water Pressure (kPa)	33
Radial Effective Stress (kPa)	67
Axial Effective Stress (kPa)	357
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm dark grey/black CLAY/SILT.

Notes:

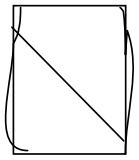
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

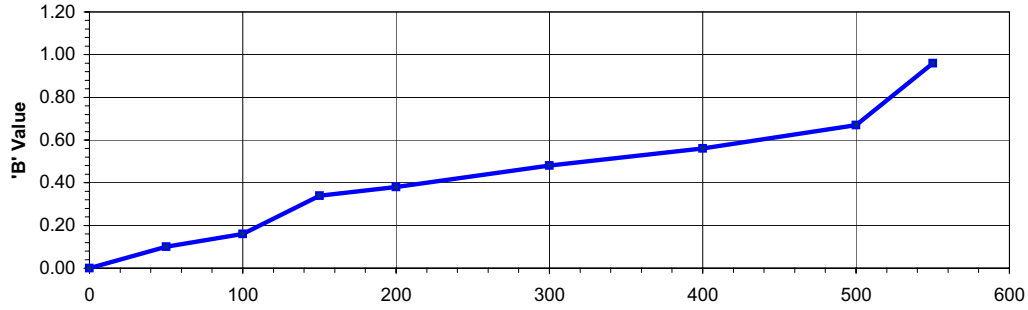
3 Side drain corrections not applied

Specimen After Test



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	4.65m

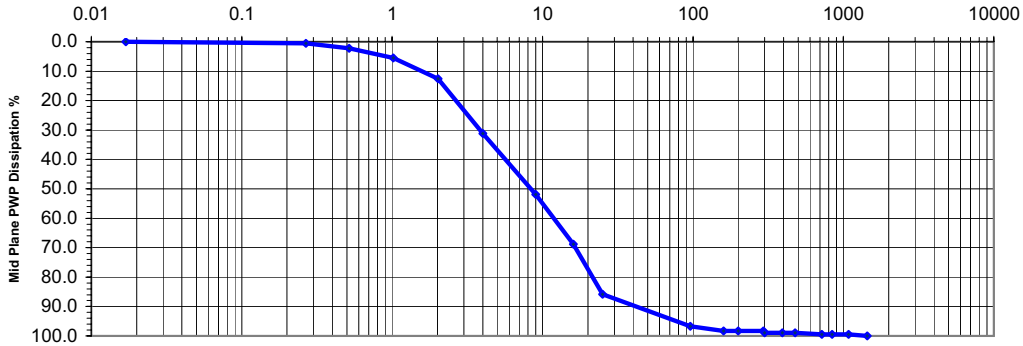
Saturation

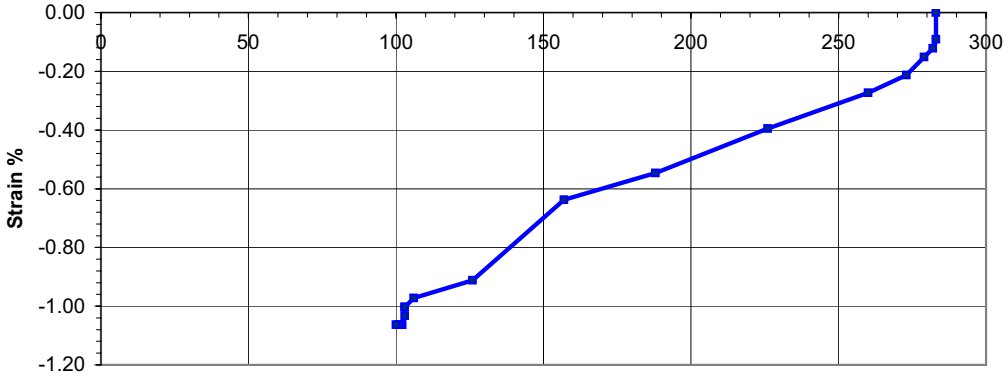


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins



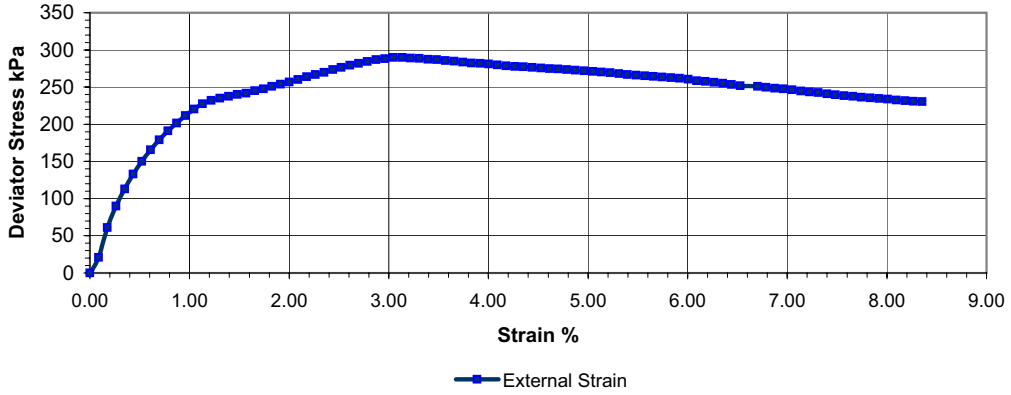


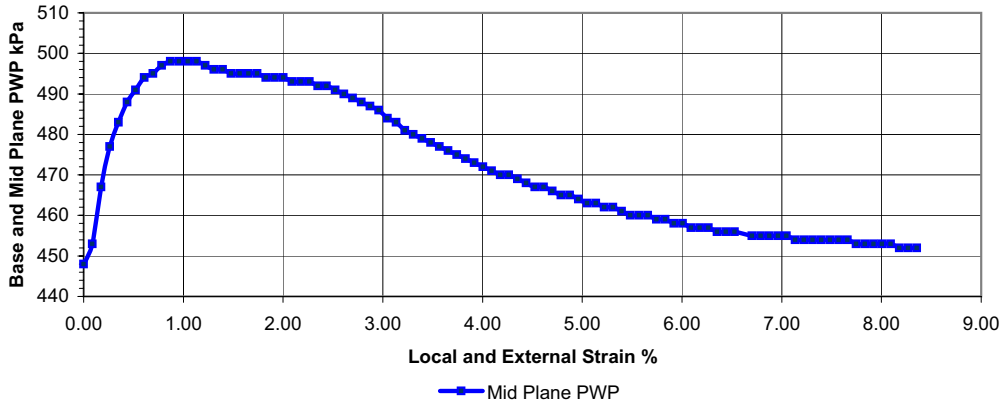
Effect Mean Stress Kpa

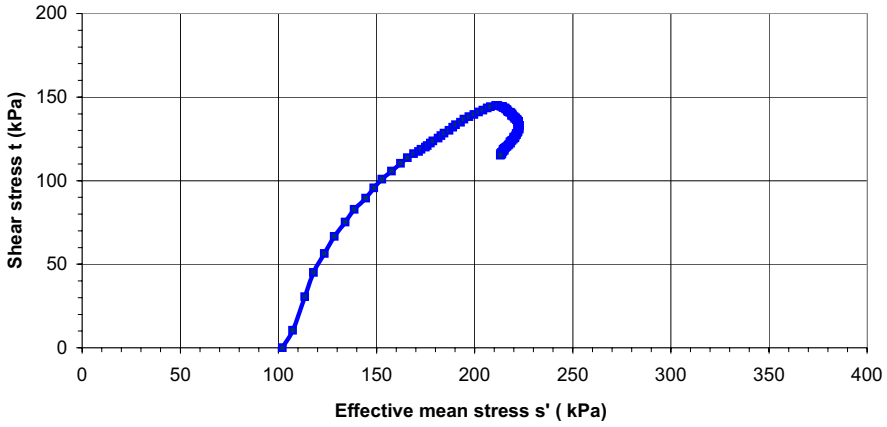
Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	4.65m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	4.65m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.58	1.60
Specimen Length	mm	119.50	Dry Density	Mg/m3	0.98	0.98
Specimen Diameter	mm	60.50	Moisture	%	60.65	63.08
Area	mm2	2874.75	Saturation	%	93.51	97.48
Volume	cc	343.53	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.28	0.28
2	100	0.34	0.34
3	200	0.39	0.39
4	300	0.54	0.54
5	400	0.71	0.71
6	500	0.94	0.94
7	550	0.98	0.98

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	550
Back Pressure	kPa	350
Radial Effective stress	kPa	200

At Maximum Deviator stress

Deviator Stress (kPa)	305.8
External Axial Strain (%)	2.61
Shear Stress (kPa)	152.9
Pore Water Pressure (kPa)	129
Radial Effective Stress (kPa)	71
Axial Effective Stress (kPa)	377
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm dark grey/black CLAY/SILT.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

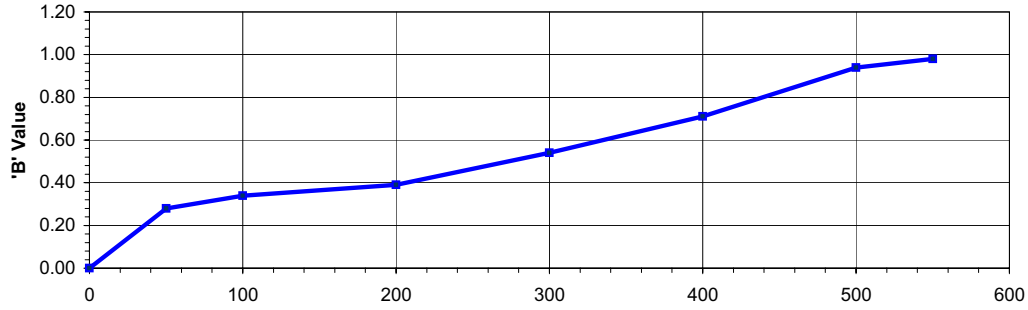
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	4.97m

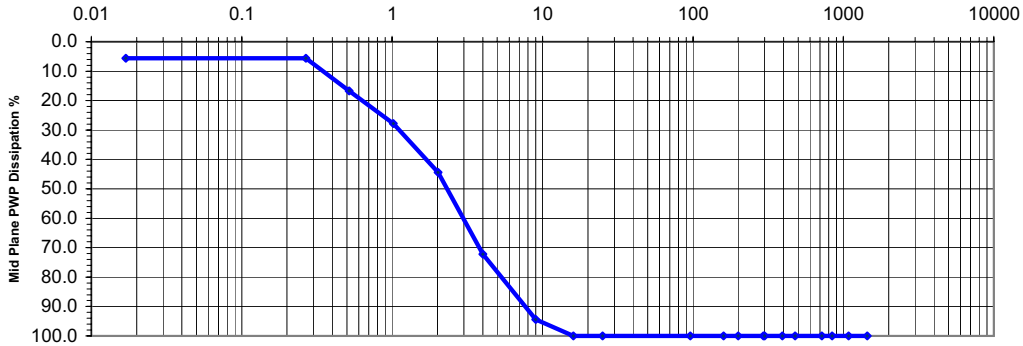
Saturation

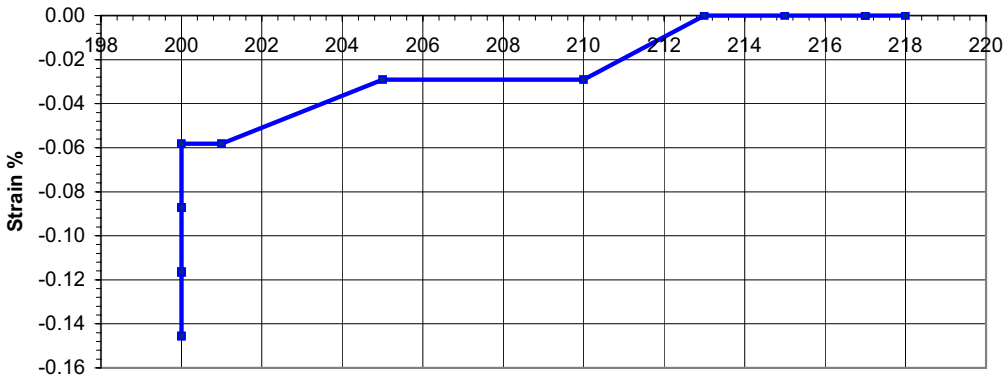


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

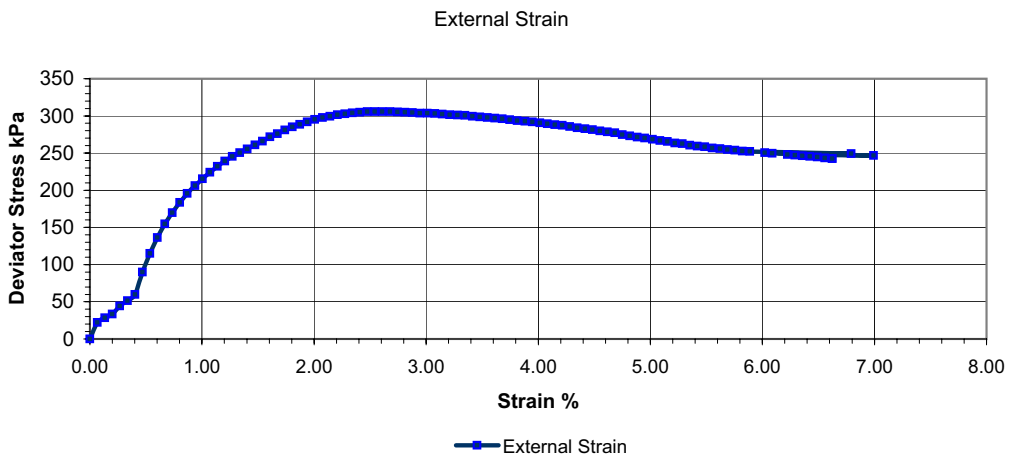


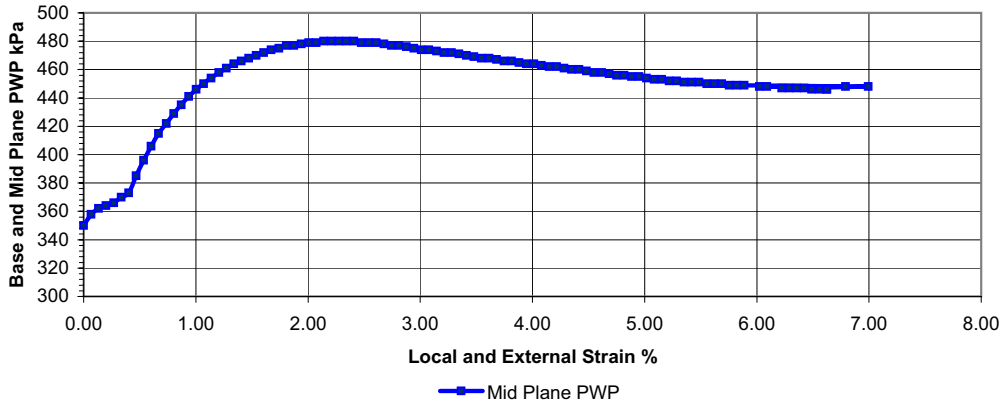


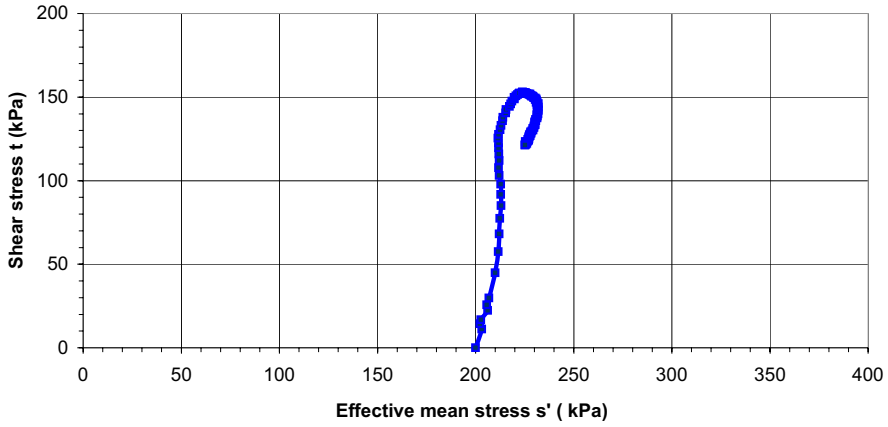
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	4.97m

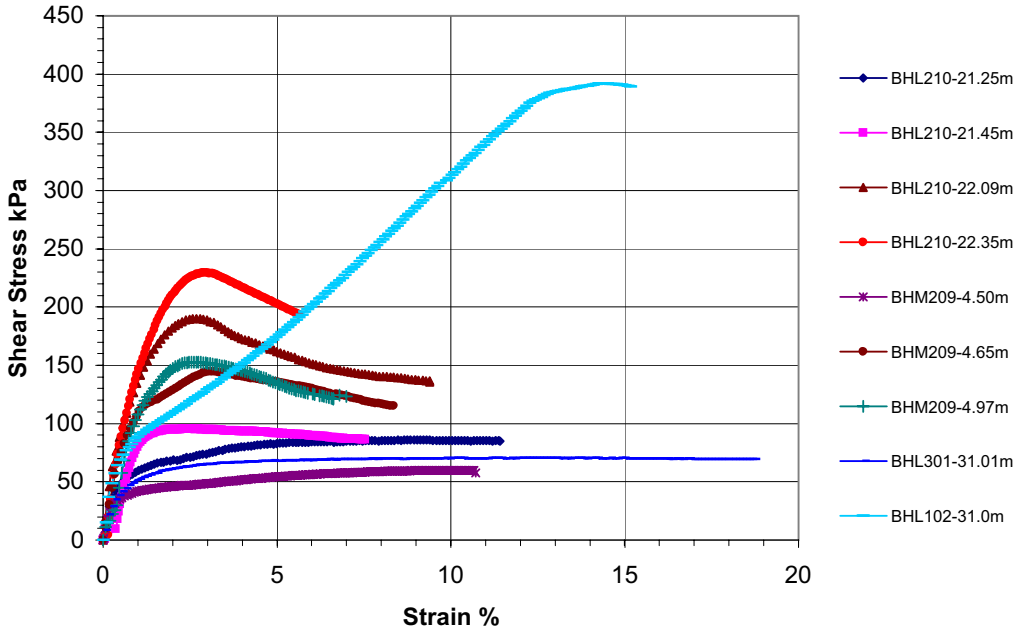


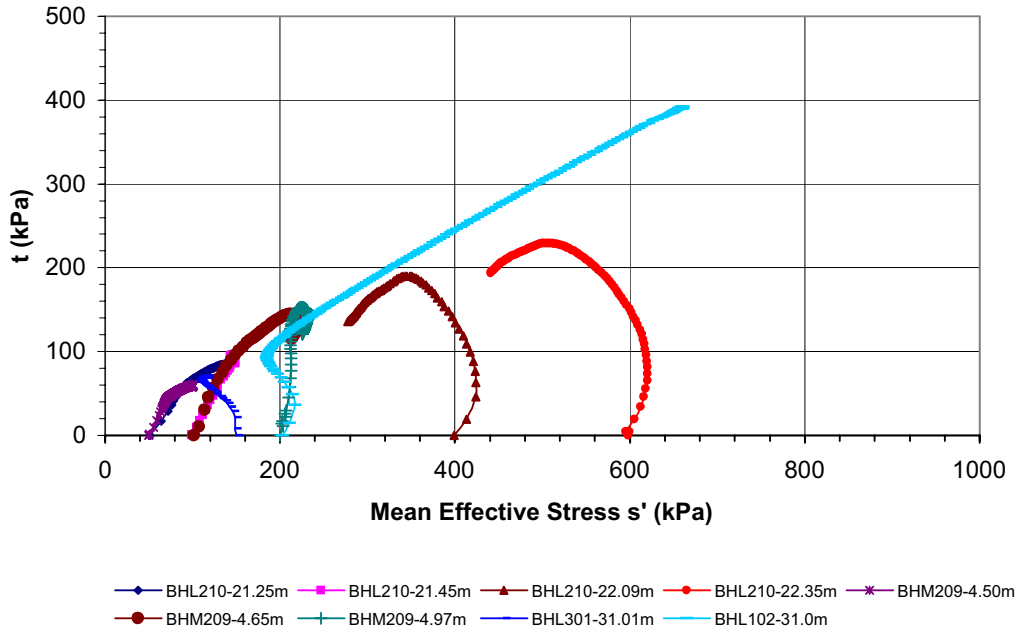




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 209
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	4.97m

Combined Stress Path Plots





c'	1	kPa	c'	1	kPa
Φ'	38.6°		Φ'	29.9°	

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL209-210-102
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth	21-45-22.35m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.66	1.67
Specimen Length	mm	108.20	Dry Density	Mg/m3	1.00	1.04
Specimen Diameter	mm	54.20	Moisture	%	66.87	61.12
Area	mm2	2307.22	Saturation	%	105.44	103.18
Volume	cc	249.64	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.82	0.82
2	100	0.92	0.92
3	200	0.94	0.94
4	300	0.98	0.98
5	350	0.98	0.98

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	350
Back Pressure	kPa	300
Radial Effective stress	kPa	50

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	67.3
External Axial Strain (%)	18.46
Shear Stress (kPa)	33.6
Pore Water Pressure (kPa)	22.0
Radial Effective Stress (kPa)	28.0
Axial Effective Stress (kPa)	95.3
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft to firm dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

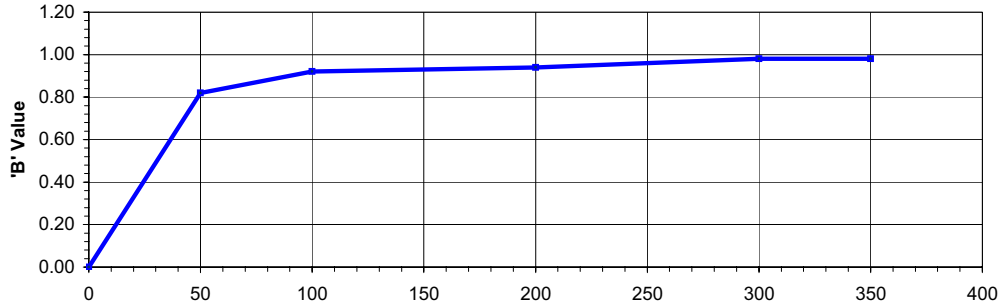
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

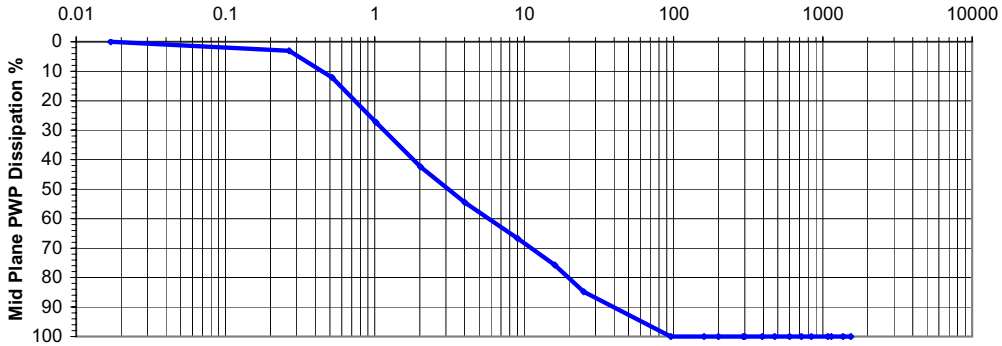
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No. 1
		Depth. 15.08-15.23m

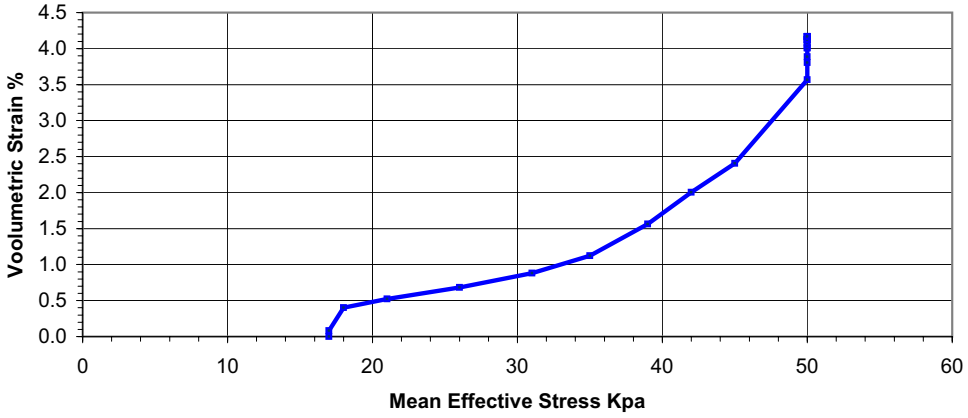
Saturation



Isotropic Consoliadtion

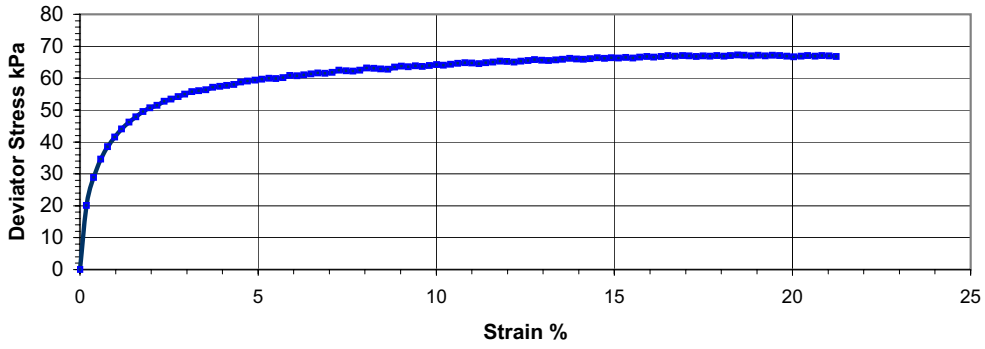
Time Mins

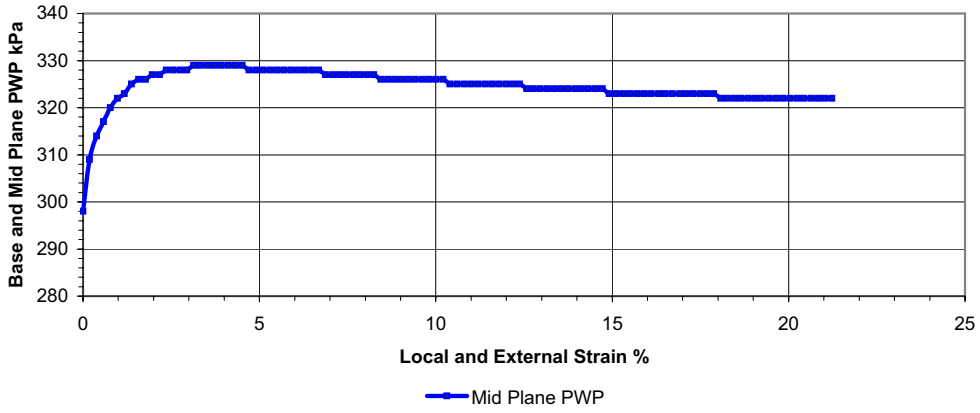


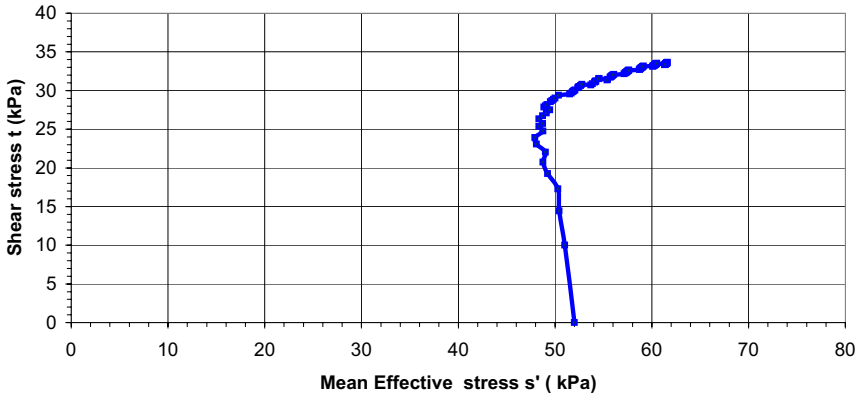


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	15.08-15.23m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	15.08-15.23m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.66	1.70
Specimen Length	mm	112.90	Dry Density	Mg/m3	1.07	1.12
Specimen Diameter	mm	59.50	Moisture	%	55.19	51.00
Area	mm2	2780.51	Saturation	%	97.52	98.02
Volume	cc	313.92	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.92	0.92
2	100	0.92	0.92
3	200	1.00	1.00
4	300	1.00	1.00
5	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	111.9
External Axial Strain (%)	15.90
Shear Stress (kPa)	55.9
Pore Water Pressure (kPa)	63.0
Radial Effective Stress (kPa)	37.0
Axial Effective Stress (kPa)	148.9
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

Sample Description: Soft to firm dark grey sandy SILT/CLAY with shell fragments.

Plastic Failure

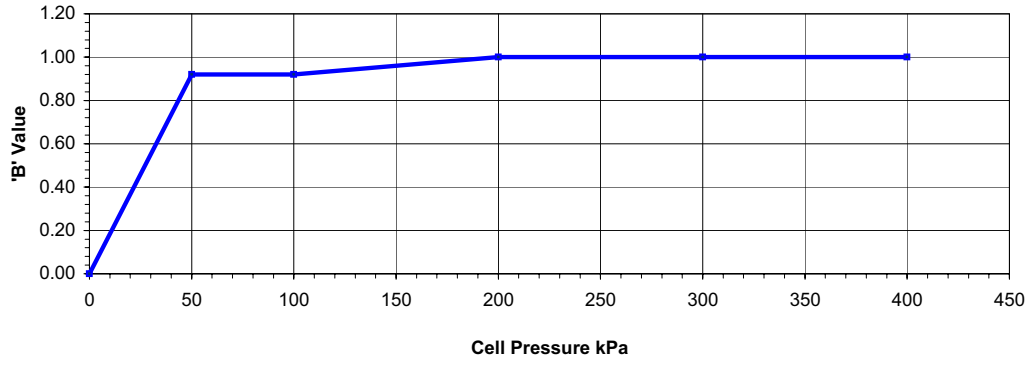
NM TL Ltd

Consolidated undrained triaxial compression test with base and mid plane pore pressure.

Project: Durban Harbour Berth Deepening Study

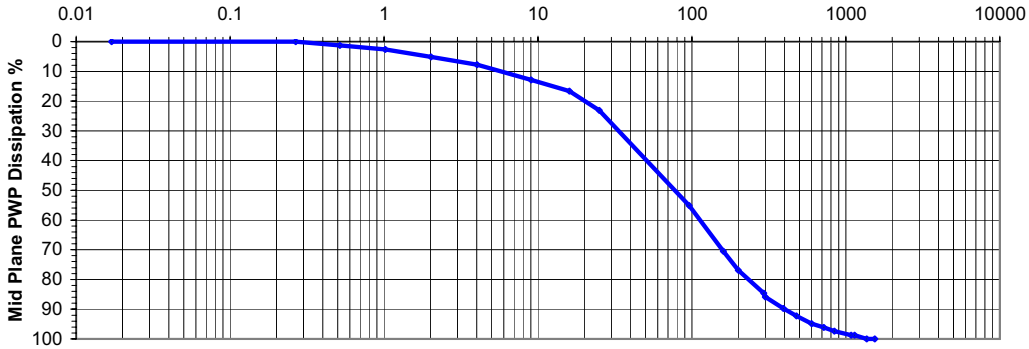
Project No.	NMTL-523
Borehole No.	BHM 211
Sample No.	2
Depth.	15.23-15.42m

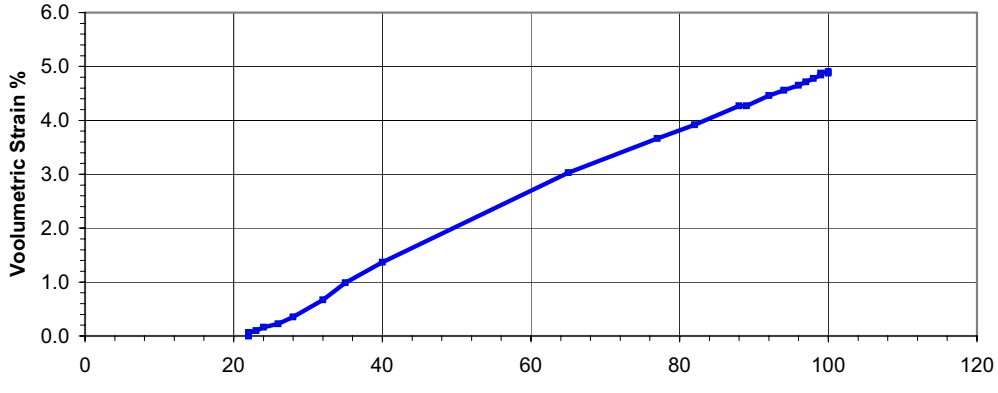
Saturation



Isotropic Consoliadtion

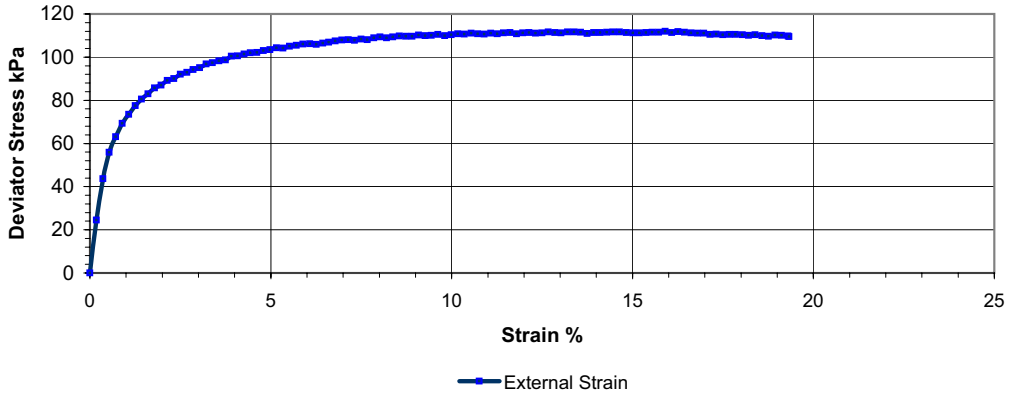
Time Mins

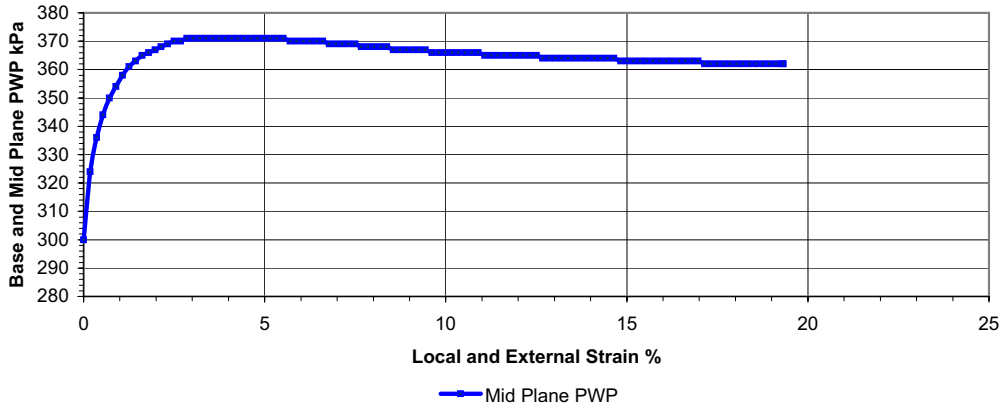


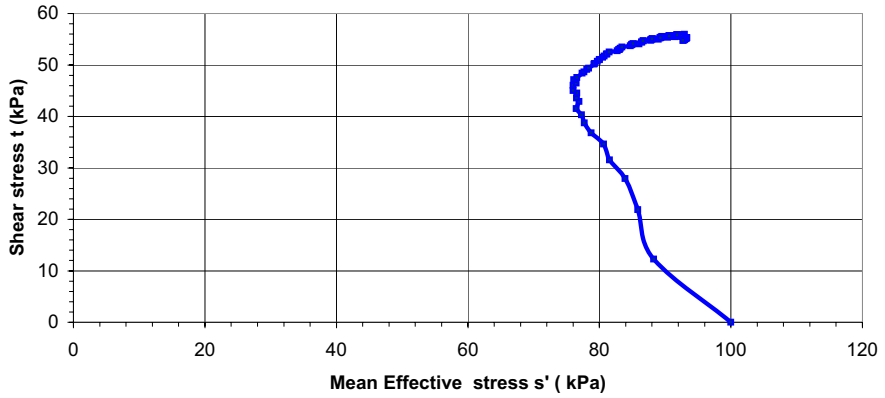


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	15.23-15.42m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	15.23-15.42m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.75	1.82
Specimen Length	mm	108.30	Dry Density	Mg/m3	1.15	1.29
Specimen Diameter	mm	54.20	Moisture	%	52.18	41.67
Area	mm2	2307.22	Saturation	%	104.00	102.18
Volume	cc	249.87	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.92	0.92
2	100	0.92	0.92
3	200	1.00	1.00
4	300	1.00	1.00
5	400	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	188.6
External Axial Strain (%)	5.24
Shear Stress (kPa)	94.3
Pore Water Pressure (kPa)	132.0
Radial Effective Stress (kPa)	68.0
Axial Effective Stress (kPa)	256.6
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft to firm dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

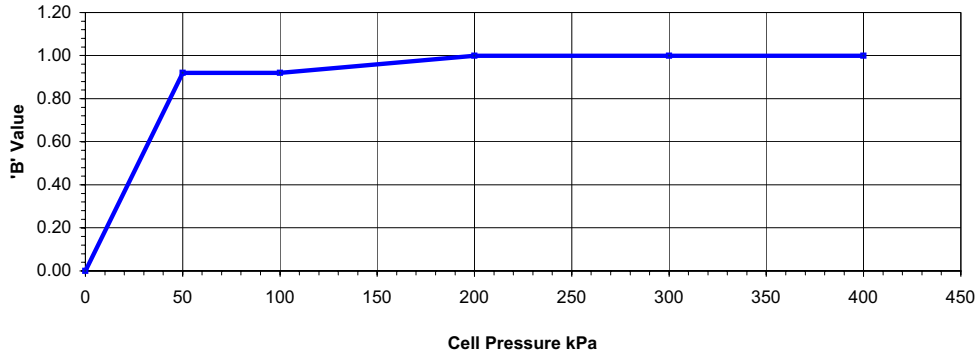
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

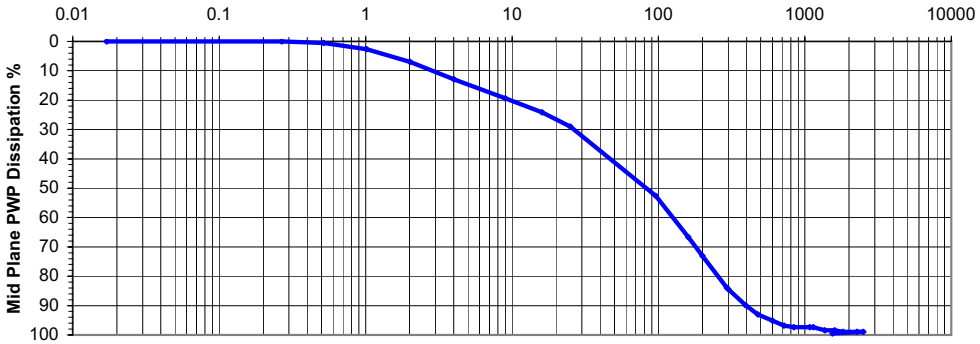
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	15.42-15.56m

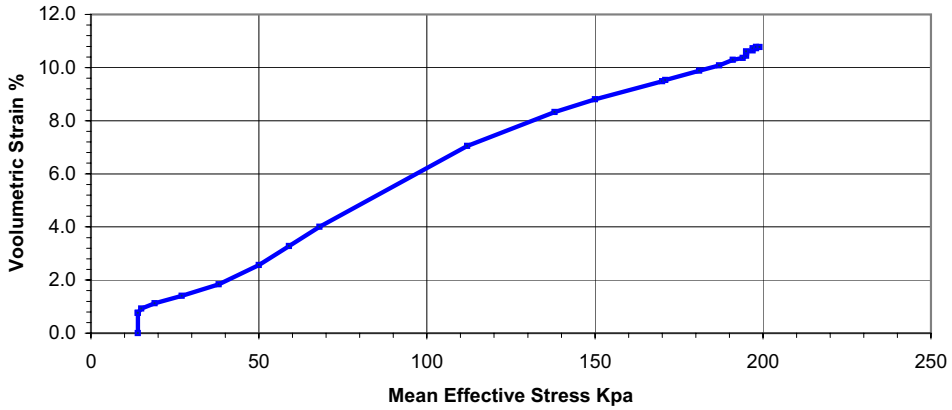
Saturation



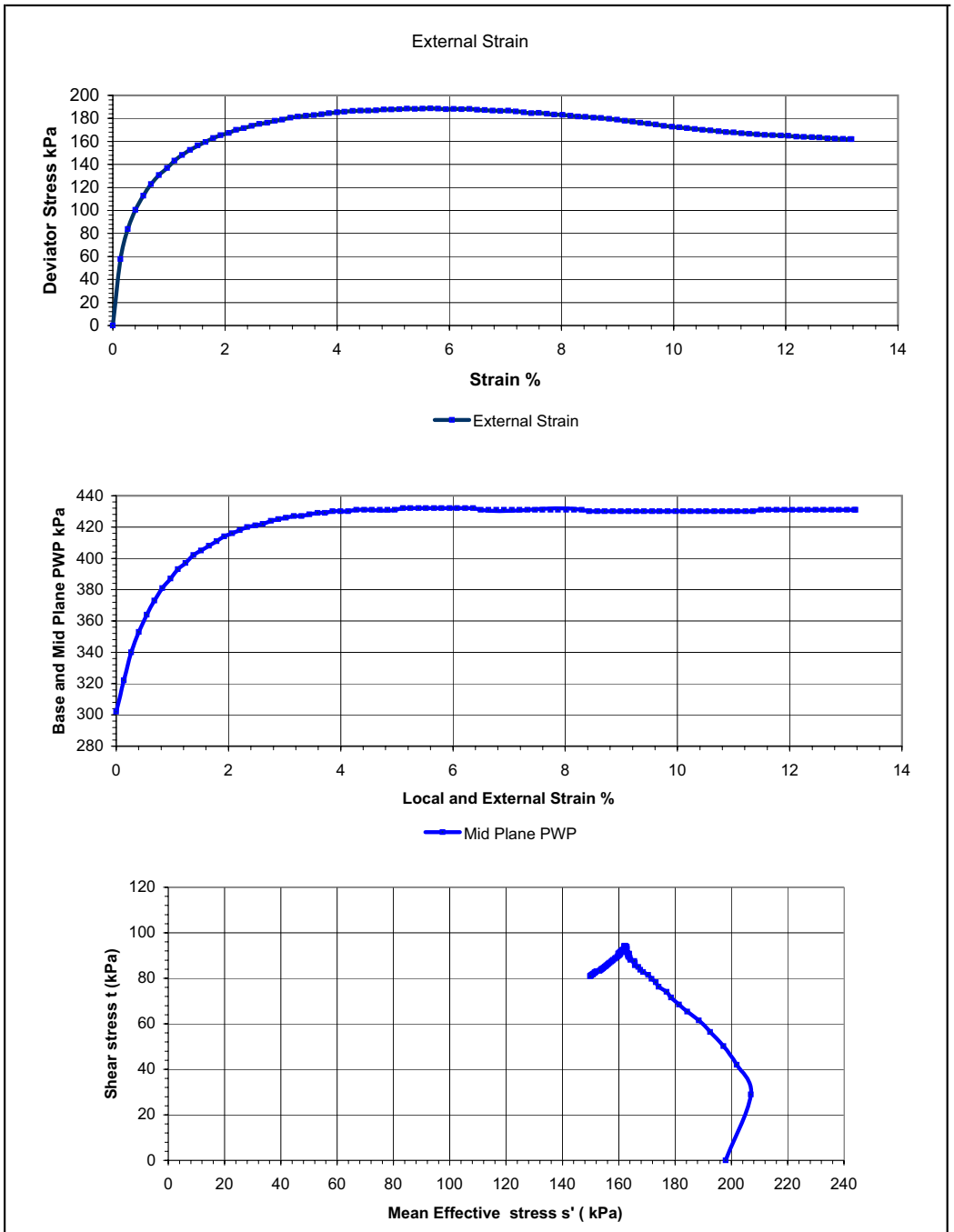
Isotropic Consoliadtion

Time Mins





NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	15.42-15.56m



NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	15.42-15.56m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.76	1.88
Specimen Length	mm	108.20	Dry Density	Mg/m3	1.15	1.35
Specimen Diameter	mm	53.00	Moisture	%	53.42	39.48
Area	mm2	2206.18	Saturation	%	106.35	106.50
Volume	cc	238.71	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.78	0.78
2	100	0.96	0.96
3	200	0.97	0.97
4	300	0.99	0.99
5	500	1.00	1.00
6	700	1.00	1.00

		Consolidation
Isotropic Consolidation Stage		Stage 1
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test.

At Maximum Deviator stress

Deviator Stress (kPa)	338.1
External Axial Strain (%)	4.04
Shear Stress (kPa)	169.0
Pore Water Pressure (kPa)	261.0
Radial Effective Stress (kPa)	139.0
Axial Effective Stress (kPa)	477.1
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.005
Sample Description	Soft to firm dark grey sandy SILT/CLAY with shell fragments.
	Plastic Failure

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

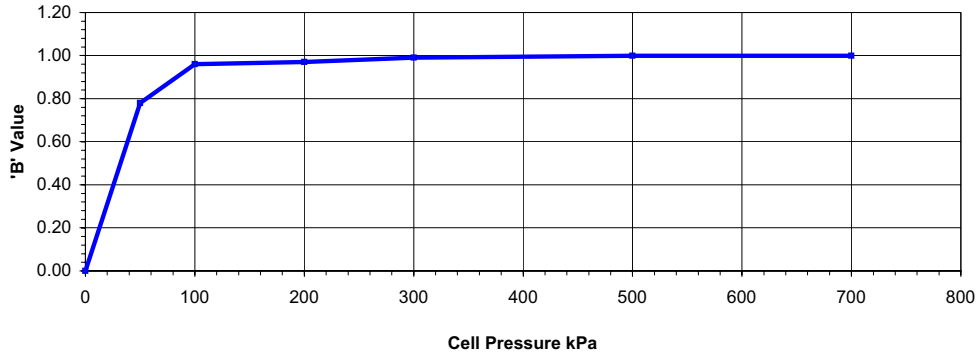
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

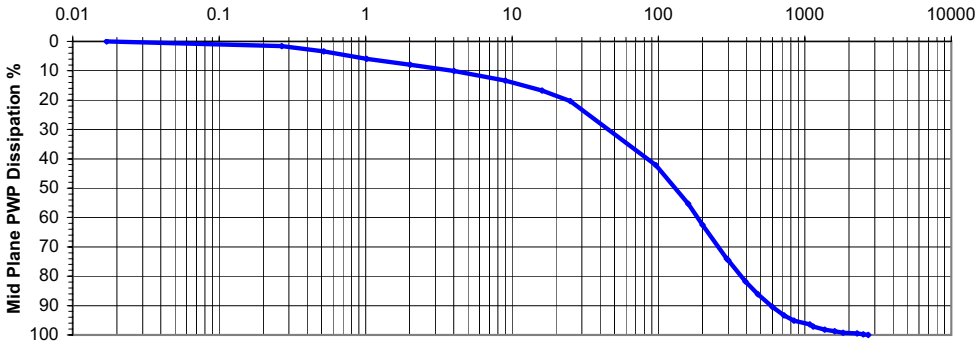
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	4
		Depth.	15.56-15.92m

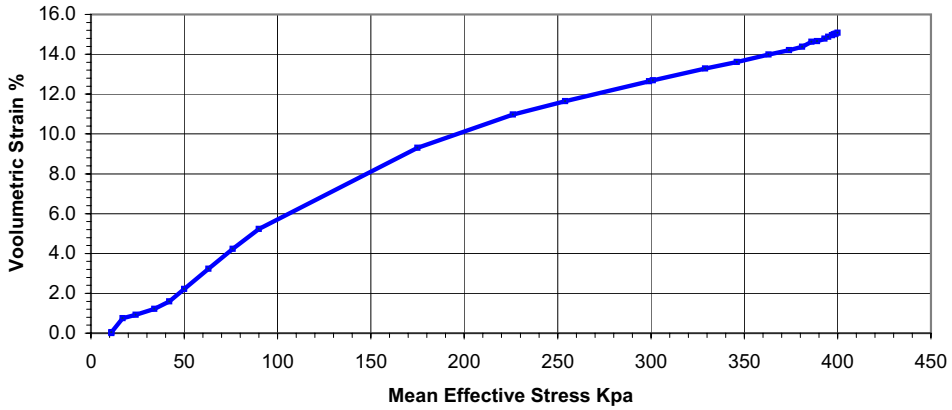
Saturation



Isotropic Consoliadtion

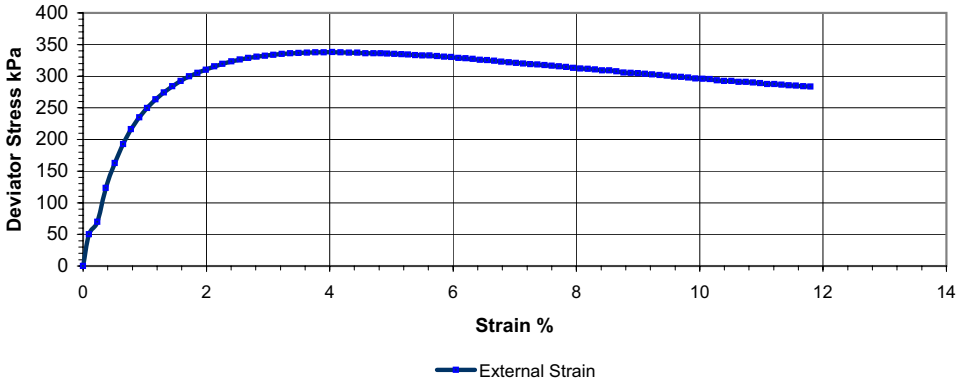
Time Mins

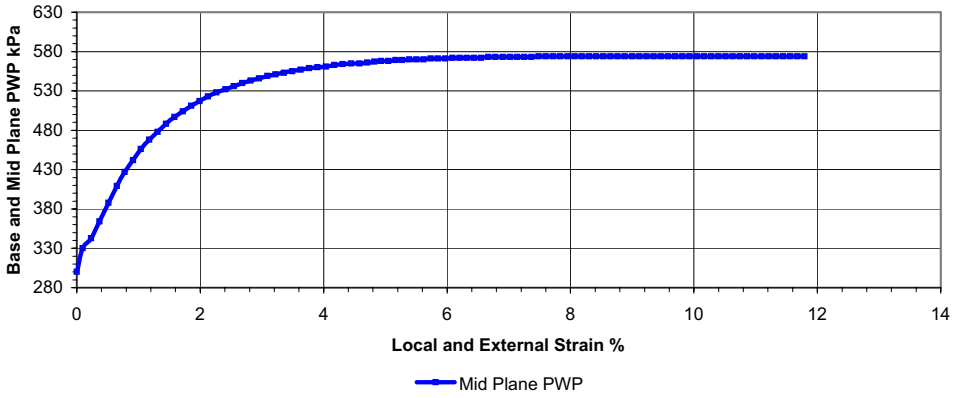


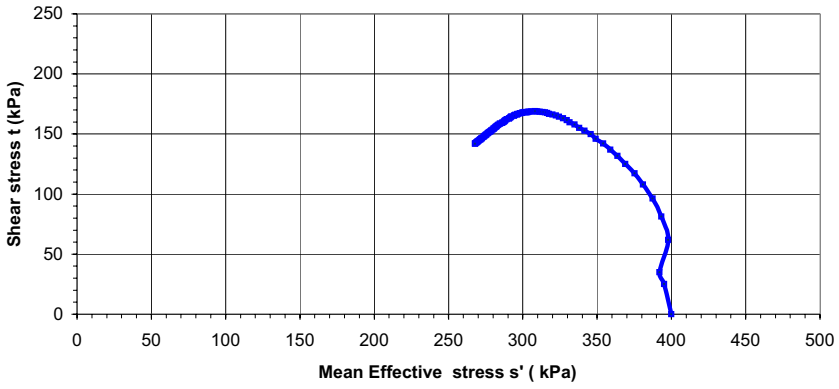


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	4
		Depth.	15.56-15.92m

External Strain

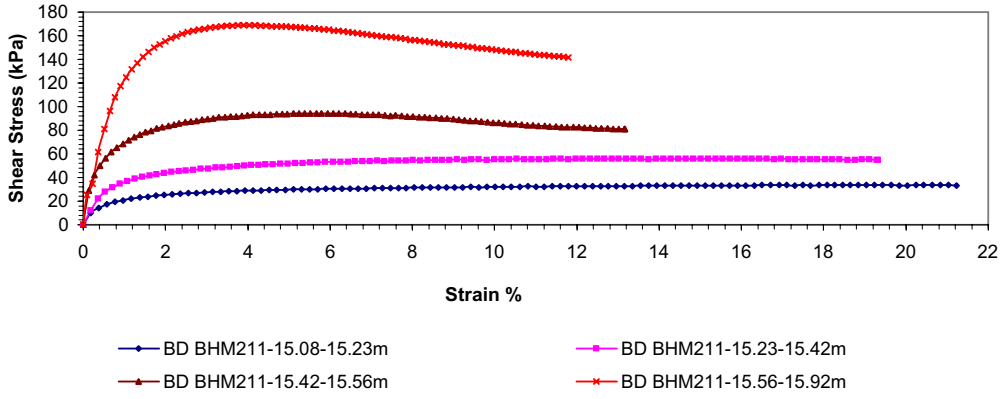




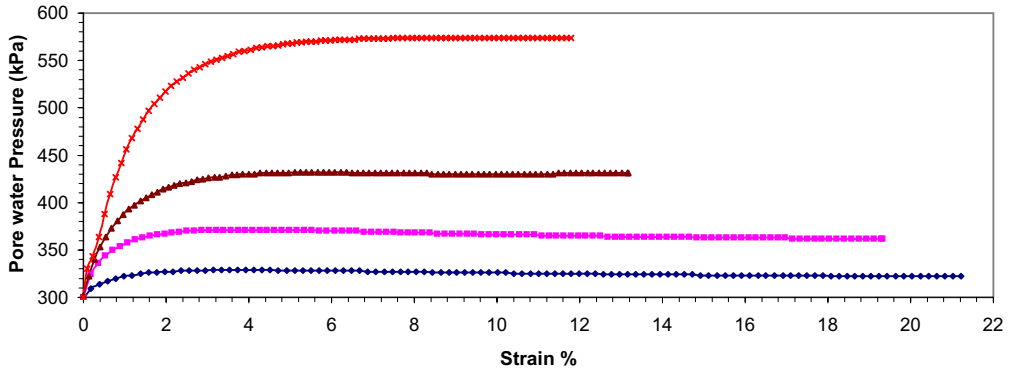


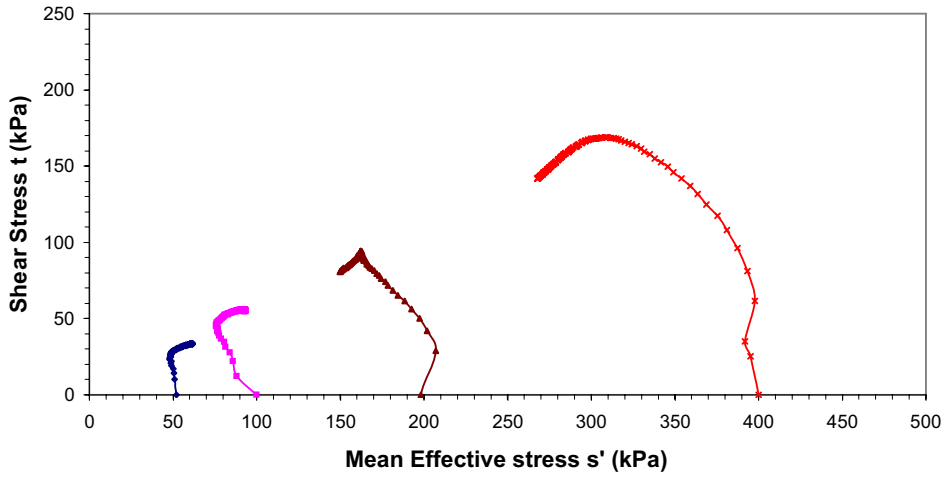
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHM 211
	Project: Durban Harbour Berth Deepening Study	Sample No.	4
		Depth.	15.56-15.92m

Combined Stress Path Plots



BD BHM211-15.08-15.23m
BD BHM211-15.23-15.42m
BD BHM211-15.42-15.56m
BD BHM211-15.56-15.92m





c' **2.5** **kPa**
Φ' **33.2º**

NM	Consolidated undrained triaxial compression test with base	Project No.	NMTL-523
TL	and mid plane pore pressure	Borehole	BHM 211
Ltd	Project:	Sample No.	Core
	Durban Harbour Berth Deepening Study	Depth	15.08-15.92m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.78	1.78
Specimen Length	mm	130.58	Dry Density	Mg/m3	1.26	1.25
Specimen Diameter	mm	73.23	Moisture	%	41.44	42.08
Area	mm2	4212.19	Saturation	%	97.22	98.56
Volume	cc	550.04	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.18	0.18
2	100	0.68	0.68
3	200	0.82	0.82
4	300	0.90	0.90
5	375	0.97	0.97

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	375
Back Pressure	kPa	300
Radial Effective stress	kPa	75

At Maximum Deviator stress

Deviator Stress (kPa)	244.1
External Axial Strain (%)	3.66
Shear Stress (kPa)	122.1
Pore Water Pressure (kPa)	41
Radial Effective Stress (kPa)	34
Axial Effective Stress (kPa)	278
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Stiff to hard dark grey/black SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

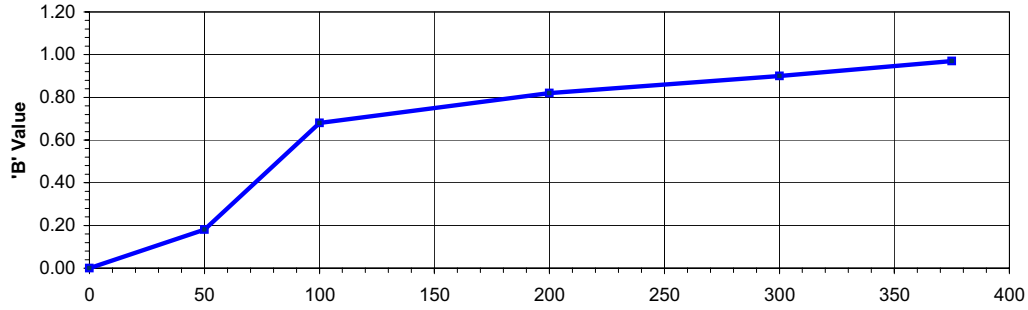
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	29.5-29.82m

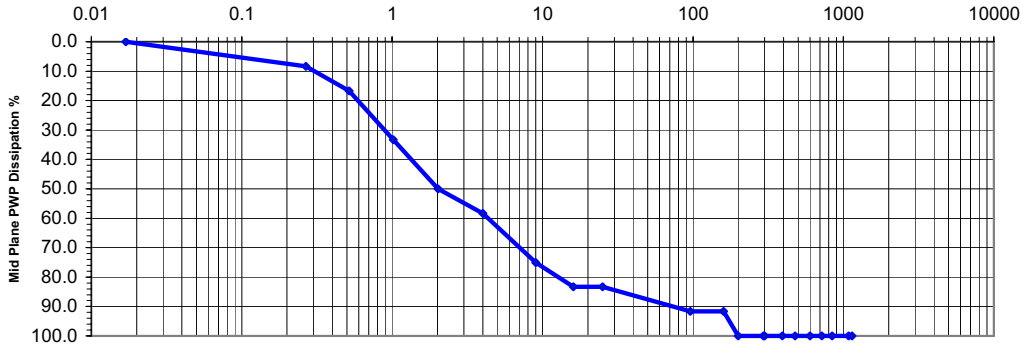
Saturation

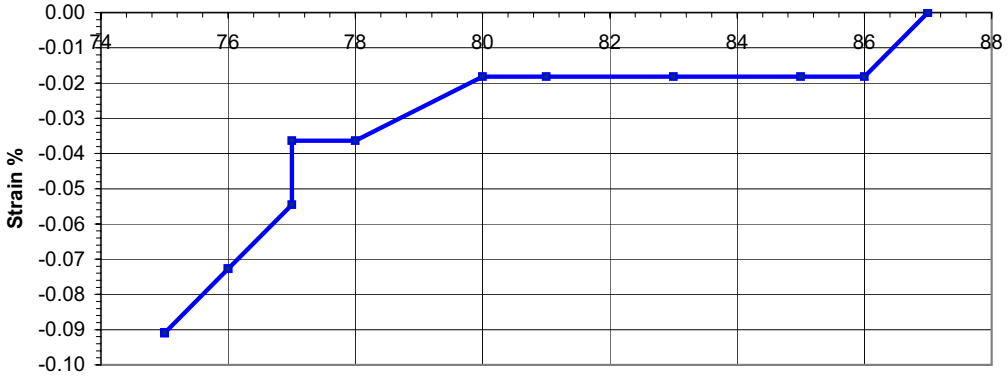


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

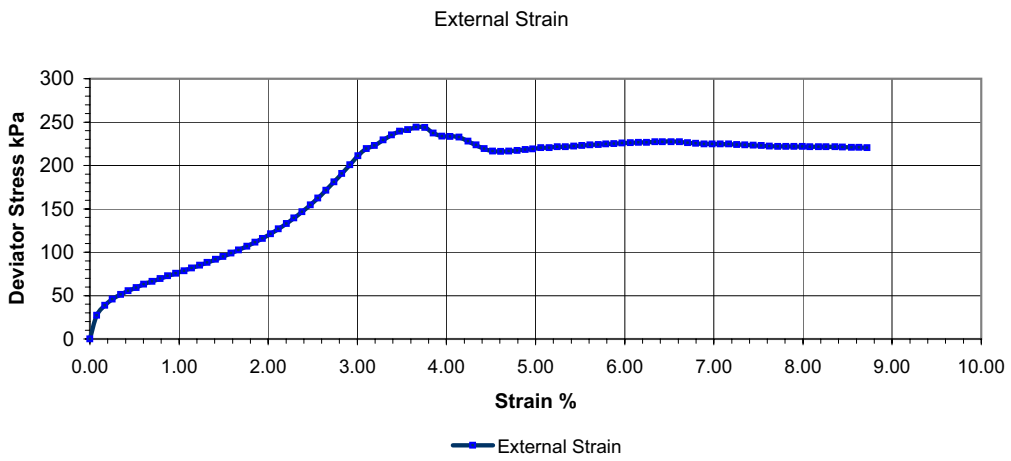


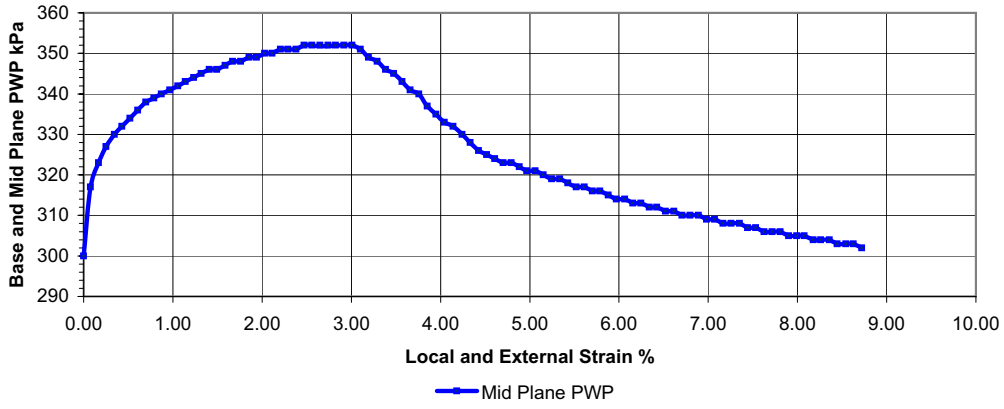


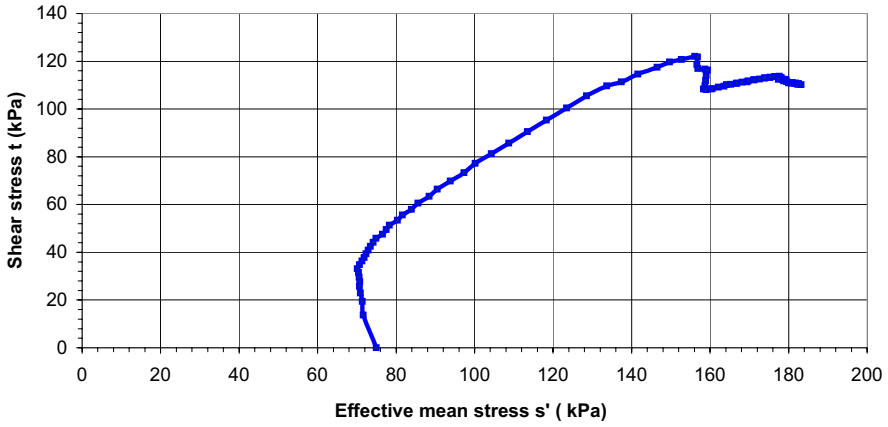
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	29.5-29.82m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	29.5-29.82m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.85	1.81
Specimen Length	mm	140.50	Dry Density	Mg/m3	1.35	1.32
Specimen Diameter	mm	72.90	Moisture	%	36.82	37.04
Area	mm2	4173.93	Saturation	%	99.76	95.57
Volume	cc	586.44	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.70	0.70
2	100	0.84	0.84
3	200	0.94	0.94
4	300	0.96	0.96
5	450	0.99	0.99

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	450
Back Pressure	kPa	300
Radial Effective stress	kPa	150

At Maximum Deviator stress

Deviator Stress (kPa)	334.1
External Axial Strain (%)	2.45
Shear Stress (kPa)	167.0
Pore Water Pressure (kPa)	84
Radial Effective Stress (kPa)	66
Axial Effective Stress (kPa)	400
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Stiff to hard dark grey/black SILT/CLAY.

Notes:

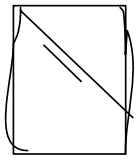
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

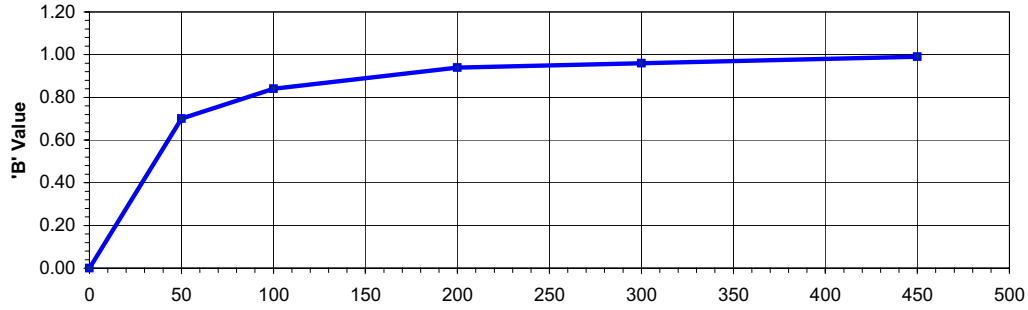
3 Side drain corrections not applied

Specimen After Test

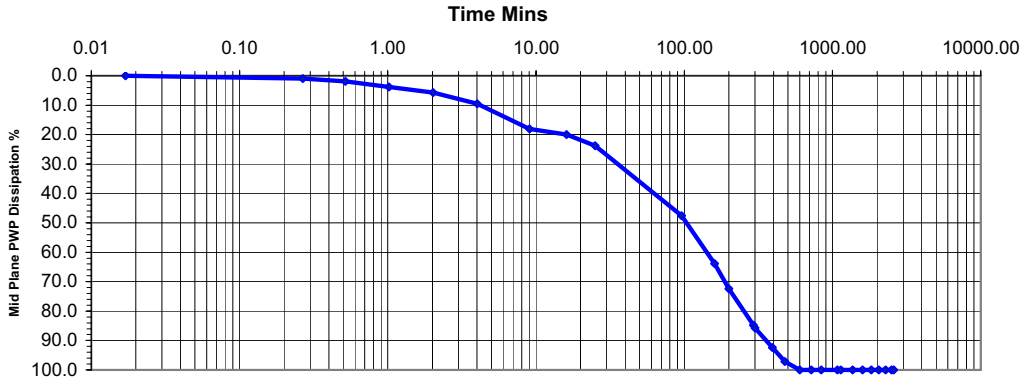


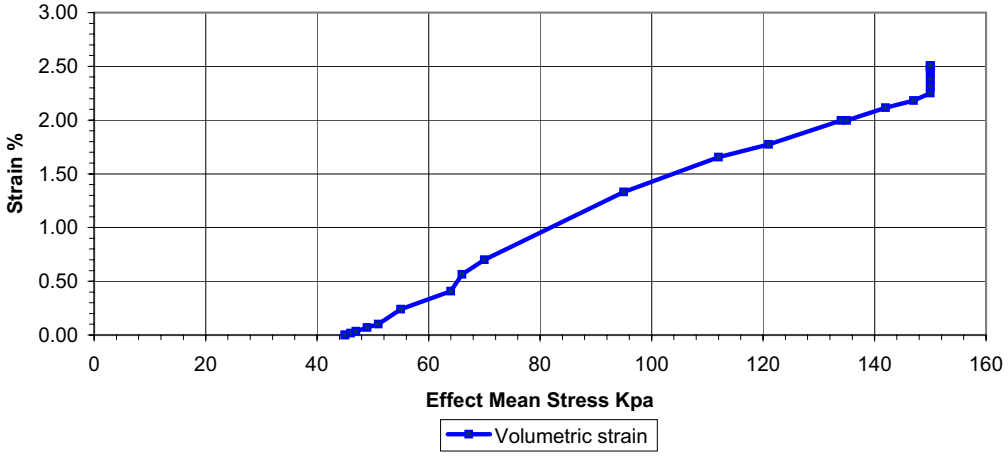
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.82-29.96m

Saturation

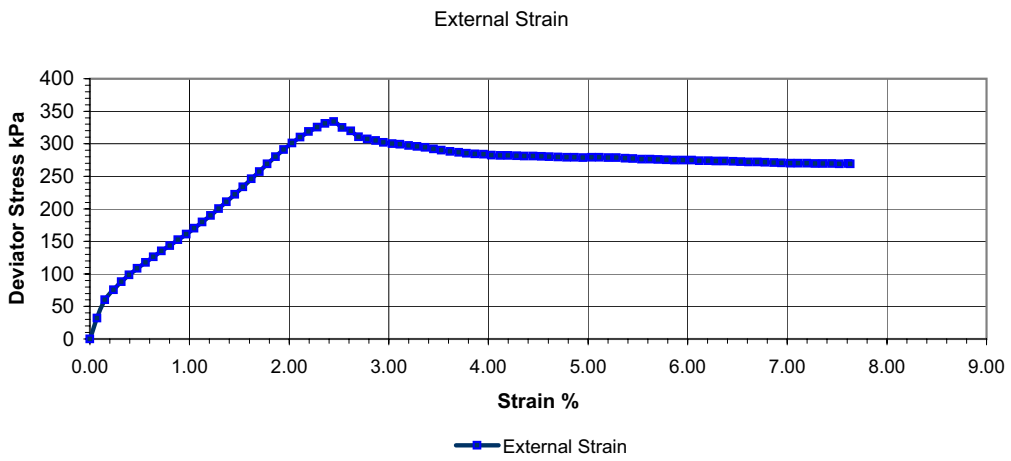


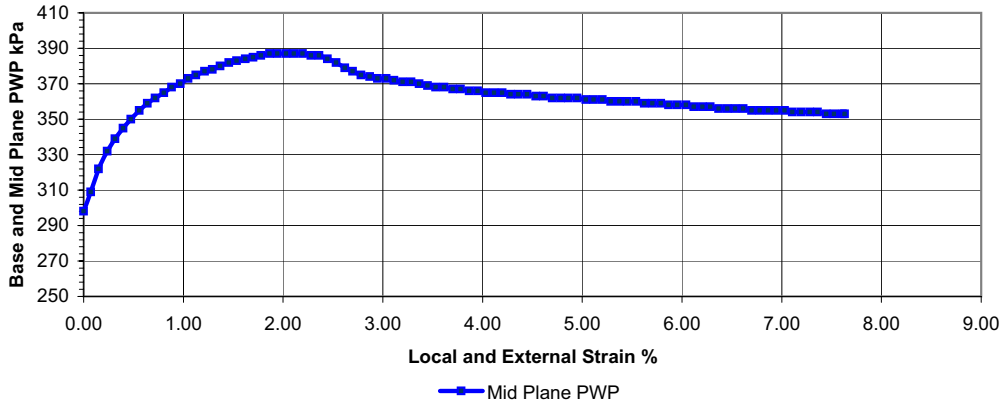
Isotropic Consoliadtion

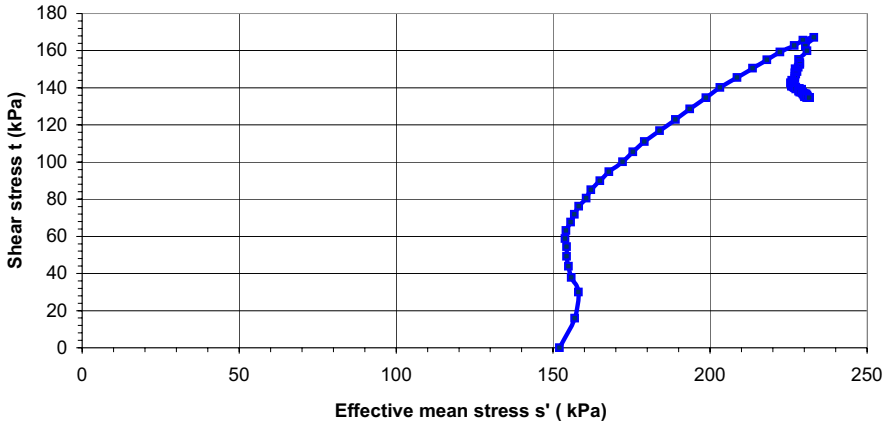




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.82-29.96m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	29.82-29.96m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.87	1.87
Specimen Length	mm	141.00	Dry Density	Mg/m3	1.35	1.36
Specimen Diameter	mm	72.76	Moisture	%	38.07	37.47
Area	mm2	4157.91	Saturation	%	103.22	103.00
Volume	cc	586.27	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.22	0.22
2	100	0.24	0.24
3	200	0.42	0.42
4	300	0.62	0.62
5	400	0.82	0.82
6	500	0.88	0.88
7	600	0.96	0.96

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	600
Back Pressure	kPa	300
Radial Effective stress	kPa	300

At Maximum Deviator stress

Deviator Stress (kPa)	458.8
External Axial Strain (%)	2.76
Shear Stress (kPa)	229.4
Pore Water Pressure (kPa)	177
Radial Effective Stress (kPa)	123
Axial Effective Stress (kPa)	582
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.004
Sample Description	Stiff to hard dark grey/black SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

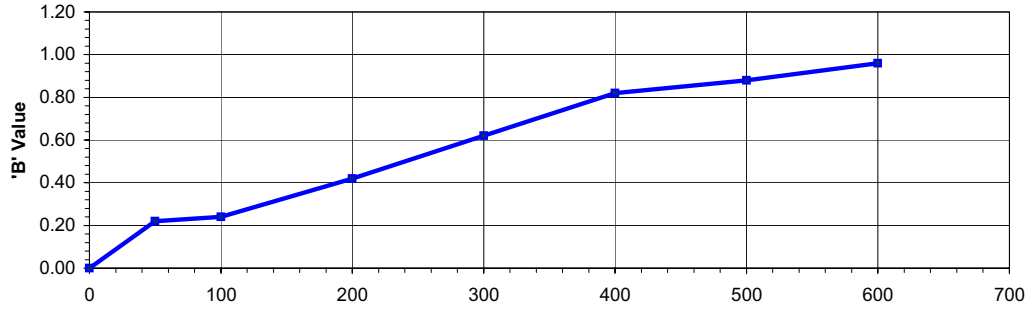
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-523
		Borehole No. BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.96-30.01m

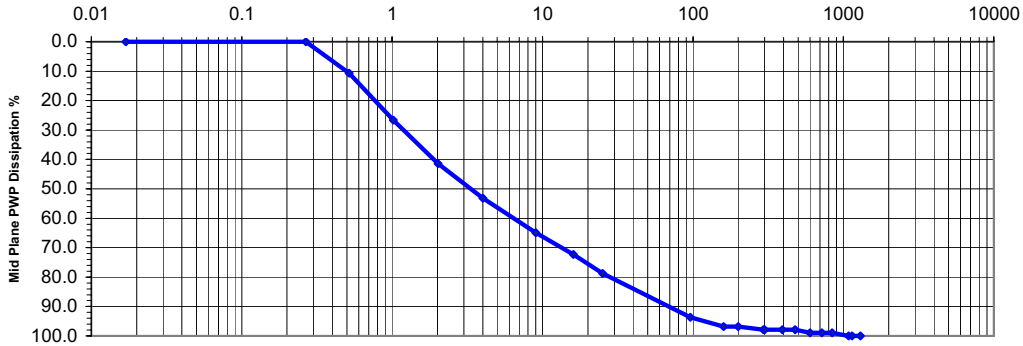
Saturation

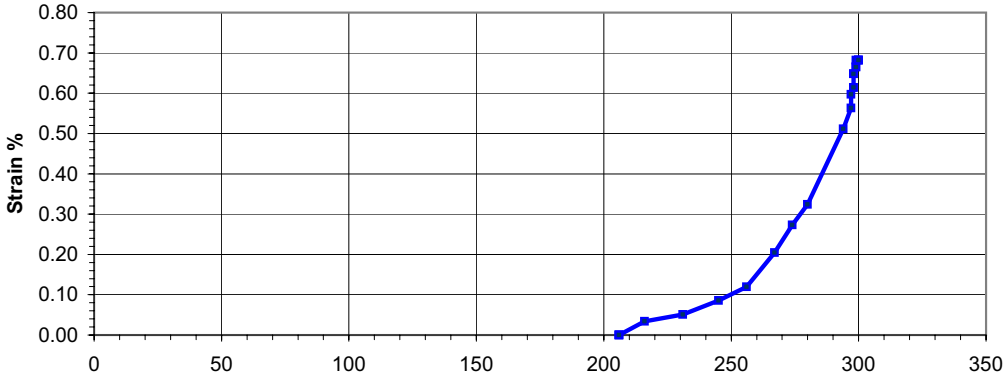


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

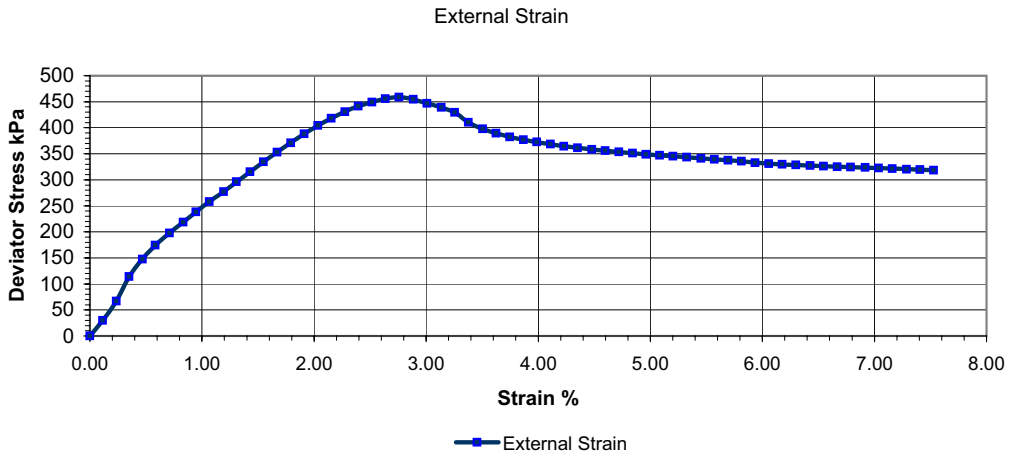


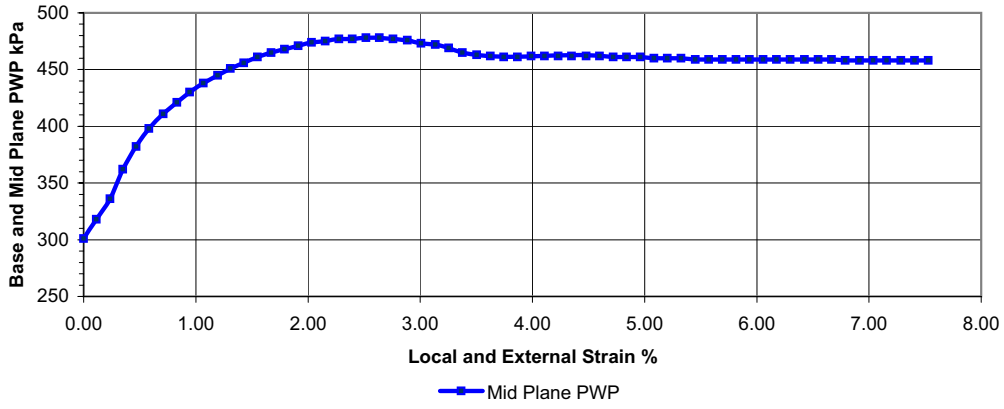


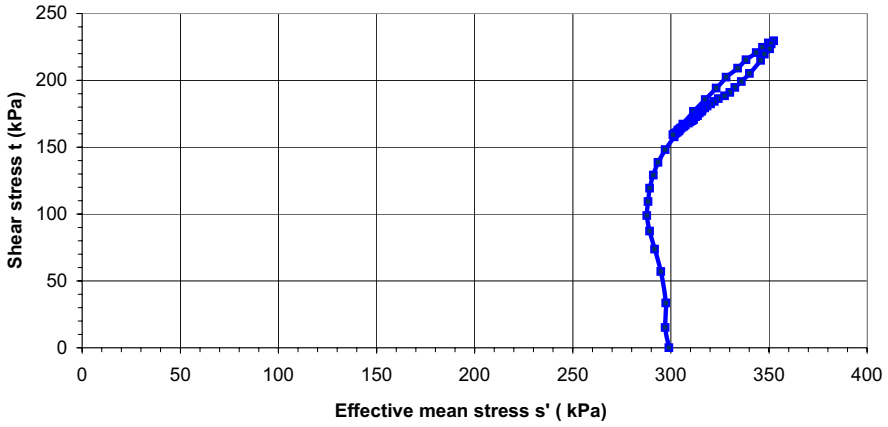
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No. NMTL-492
		Borehole No. BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No. Shelby
		Depth. 29.96-30.1m

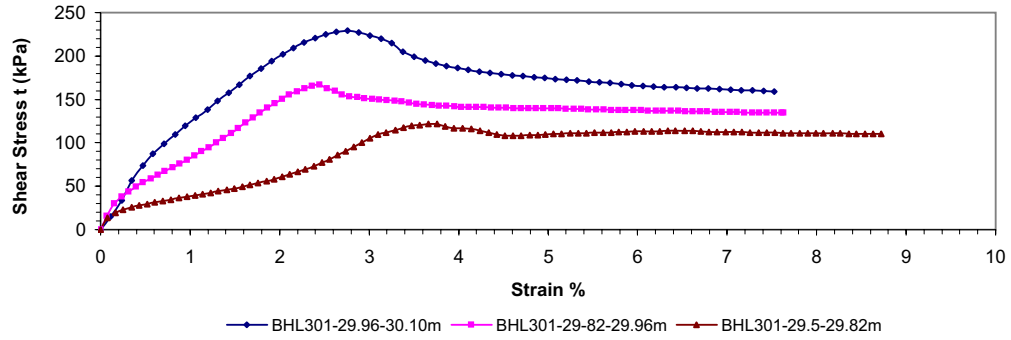


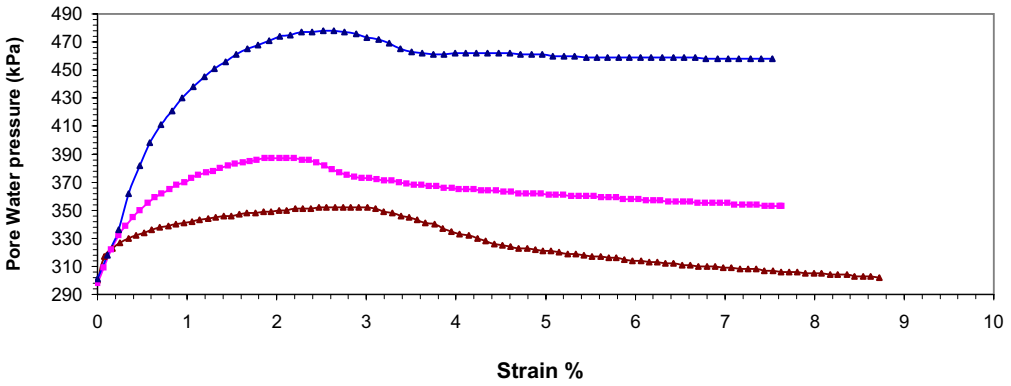


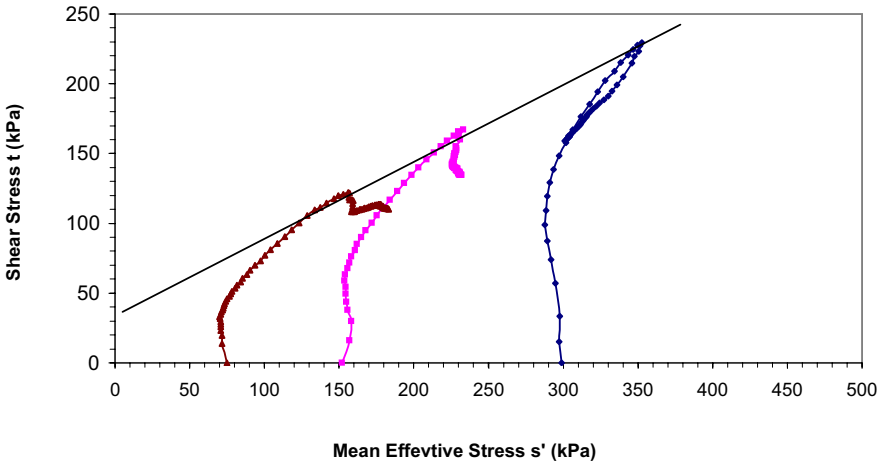


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth.	29.96-30.01m

Combined Stress Path Plots







c' **39** **kPa**

Φ' **32.9°**

NM **TL** **Ltd**	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BHL301
	Project:	Sample No.	Shelby
	Durban Harbour Berth Deepening Study	Depth	29.5-30.10m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.51	1.61
Specimen Length	mm	109.50	Dry Density	Mg/m3	0.88	1.05
Specimen Diameter	mm	54.50	Moisture	%	71.29	53.58
Area	mm2	2332.83	Saturation	%	93.14	92.02
Volume	cc	255.44	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.90	0.90
2	100	1.00	1.00
3	200	1.00	1.00
4	300	1.00	1.00
5	450	1.00	1.00

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	450
Back Pressure	kPa	300
Radial Effective stress	kPa	150

At Maximum Deviator stress

Deviator Stress (kPa)	140.7
External Axial Strain (%)	14.96
Shear Stress (kPa)	70.3
Pore Water Pressure (kPa)	105
Radial Effective Stress (kPa)	45
Axial Effective Stress (kPa)	186
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft dark grey/black CLAY/SILT.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

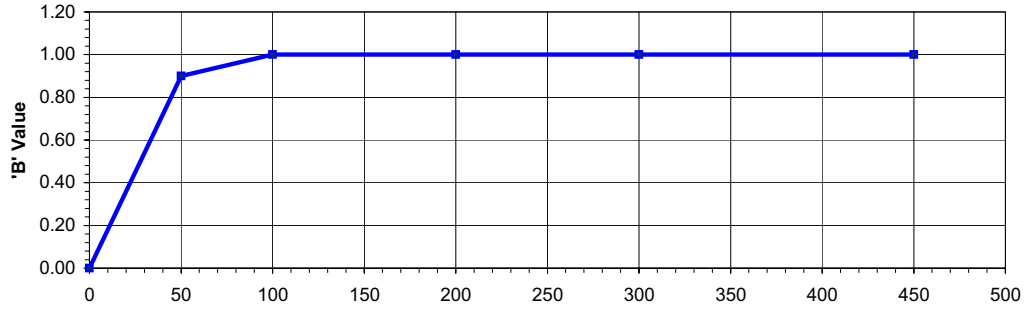
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

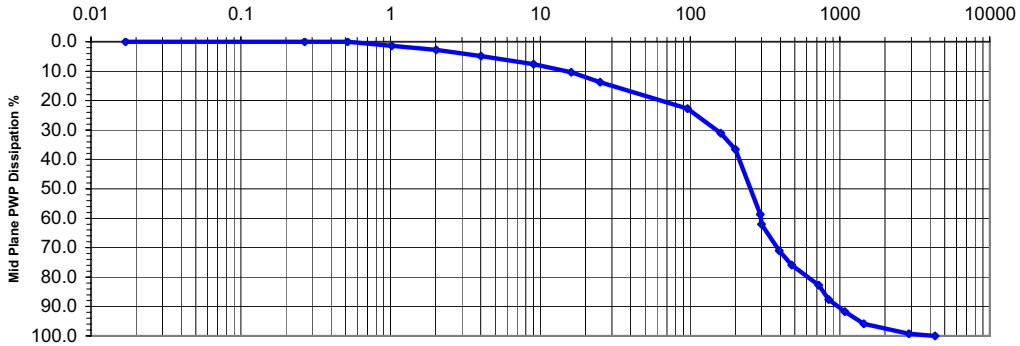
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	30.10m

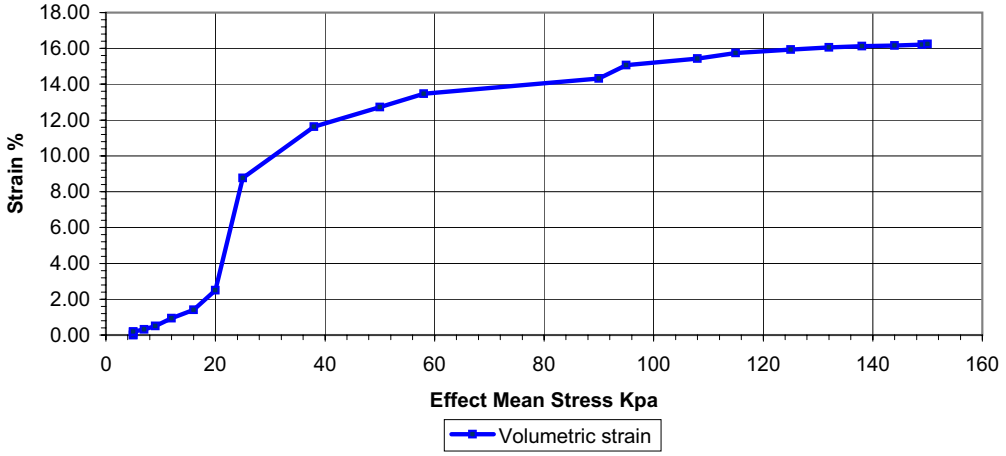
Saturation



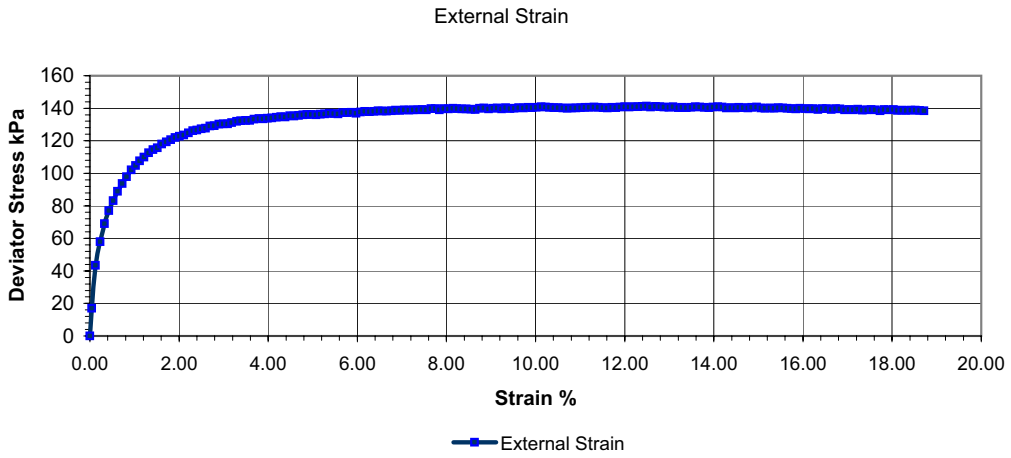
Isotropic Consoliadtion

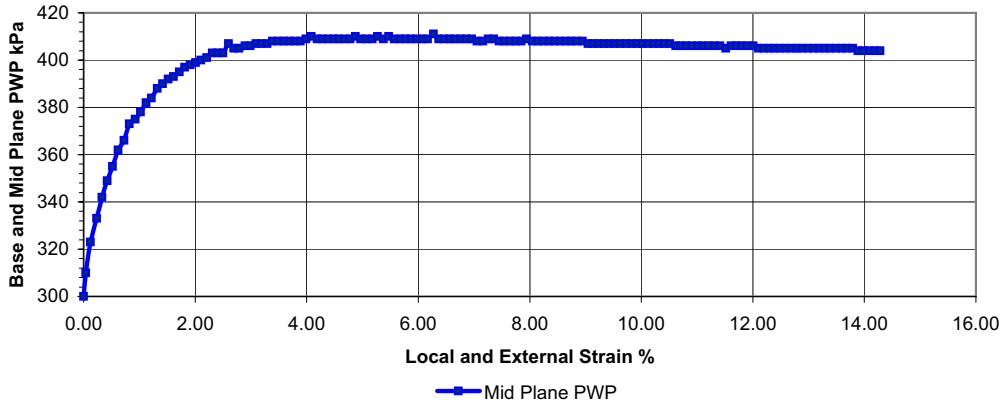
Time Mins

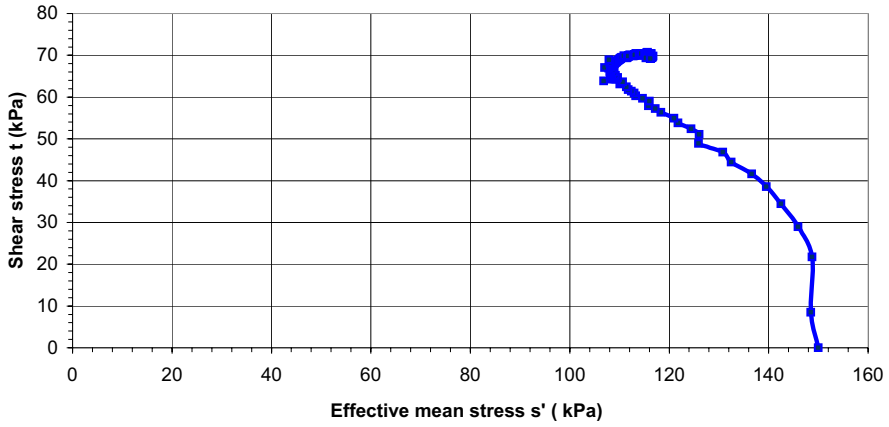




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	30.10m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	30.10m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.81	1.94
Specimen Length	mm	115.80	Dry Density	Mg/m3	1.25	1.44
Specimen Diameter	mm	54.50	Moisture	%	45.40	34.42
Area	mm2	2332.83	Saturation	%	105.28	106.20
Volume	cc	270.14	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.80	0.80
2	100	0.94	0.94
3	200	0.99	0.99
4	300	1.00	1.00
5	600	1.00	1.00

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	600
Back Pressure	kPa	300
Radial Effective stress	kPa	300

At Maximum Deviator stress

Deviator Stress (kPa)	264.3
External Axial Strain (%)	4.25
Shear Stress (kPa)	132.1
Pore Water Pressure (kPa)	188
Radial Effective Stress (kPa)	112
Axial Effective Stress (kPa)	376
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft dark grey/black SILT/CLAY

Notes:

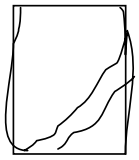
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

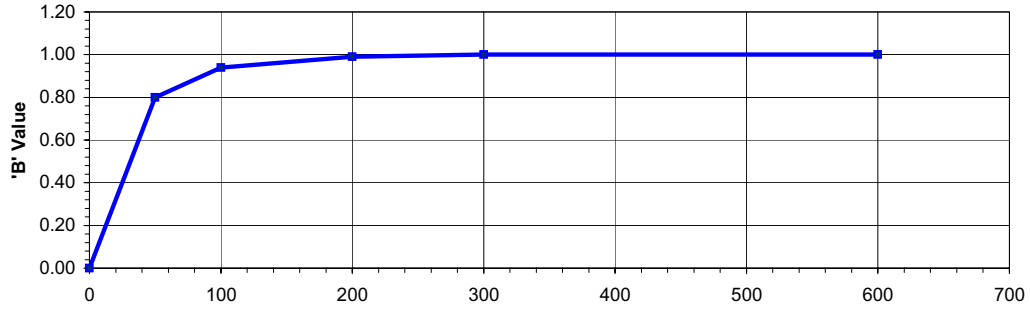
3 Side drain corrections not applied

Specimen After Test



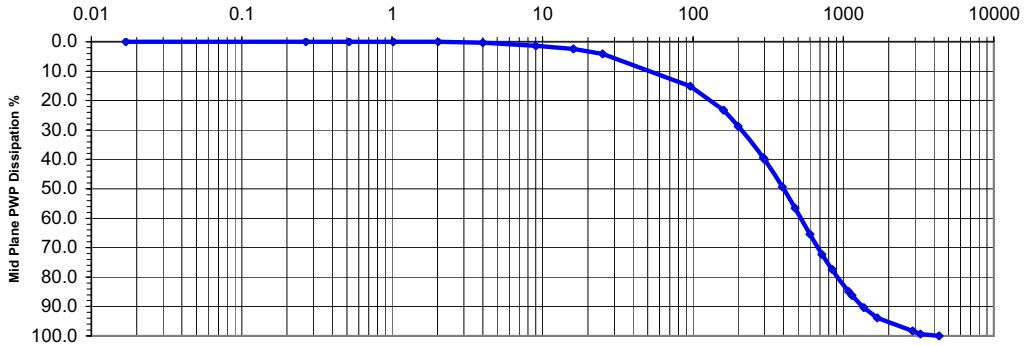
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	30.26m

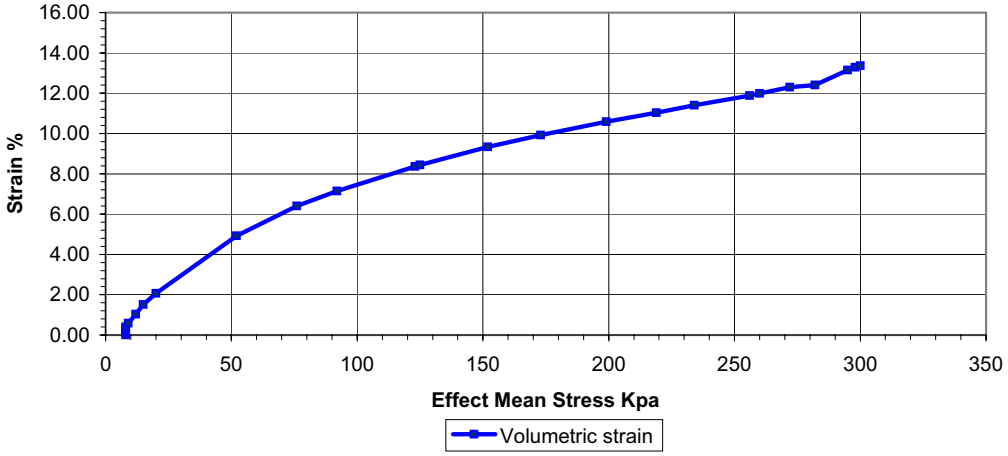
Saturation



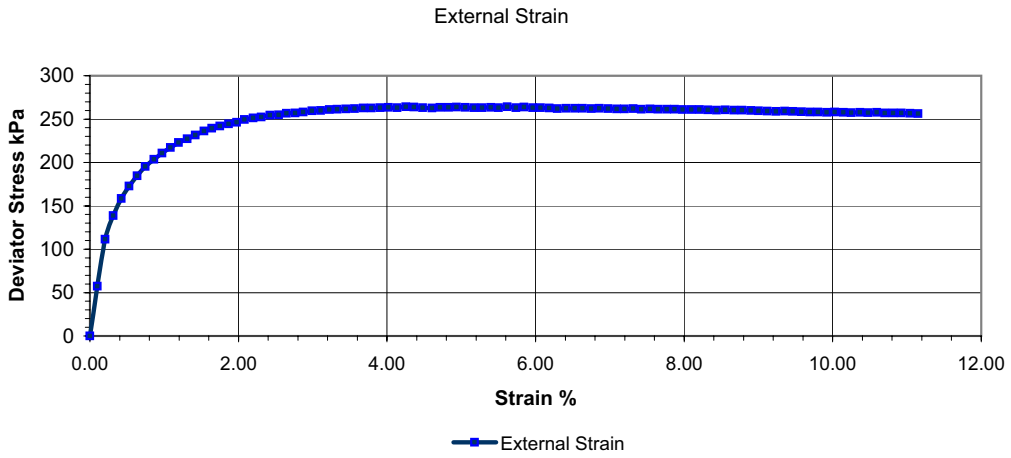
Isotropic Consoliadtion

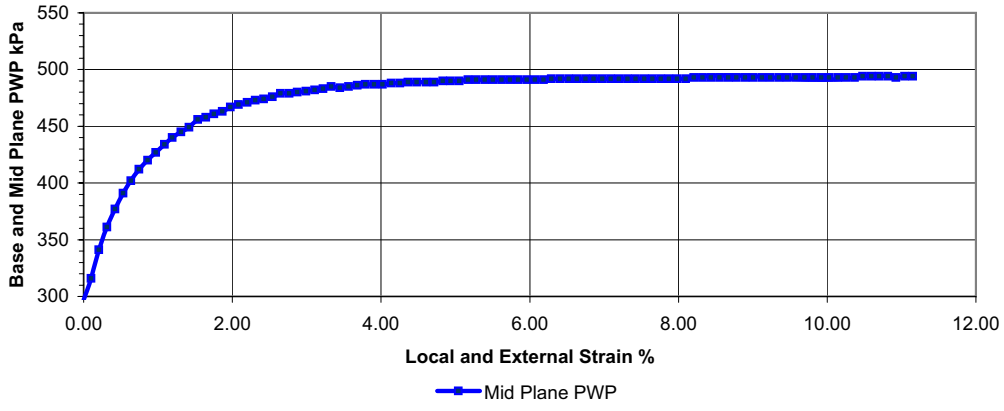
Time Mins

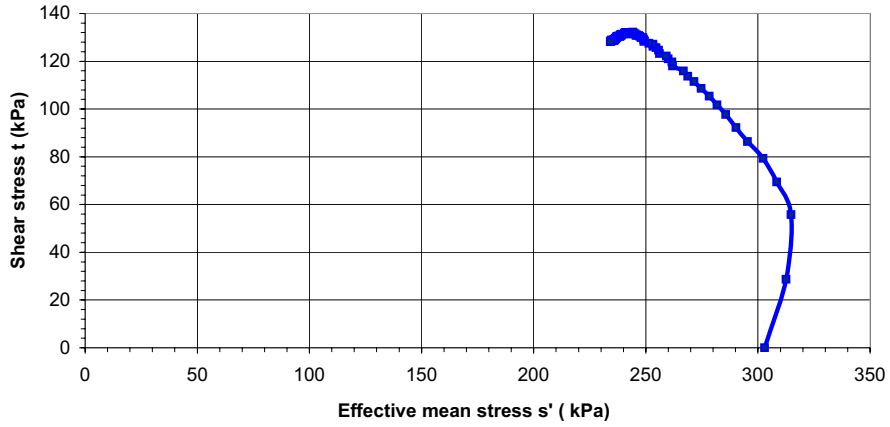




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	30.26m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	30.26m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.75	1.87
Specimen Length	mm	112.50	Dry Density	Mg/m3	1.21	1.38
Specimen Diameter	mm	54.50	Moisture	%	44.45	35.27
Area	mm2	2332.83	Saturation	%	97.72	99.73
Volume	cc	262.44	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.74	0.74
2	100	0.90	0.90
3	200	0.99	0.99
4	300	1.00	1.00
5	800	0.99	0.99

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	800
Back Pressure	kPa	200
Radial Effective stress	kPa	600

At Maximum Deviator stress

Deviator Stress (kPa)	436.2
External Axial Strain (%)	3.61
Shear Stress (kPa)	218.1
Pore Water Pressure (kPa)	322
Radial Effective Stress (kPa)	278
Axial Effective Stress (kPa)	714
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Soft dark grey/black SILT/CLAY

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

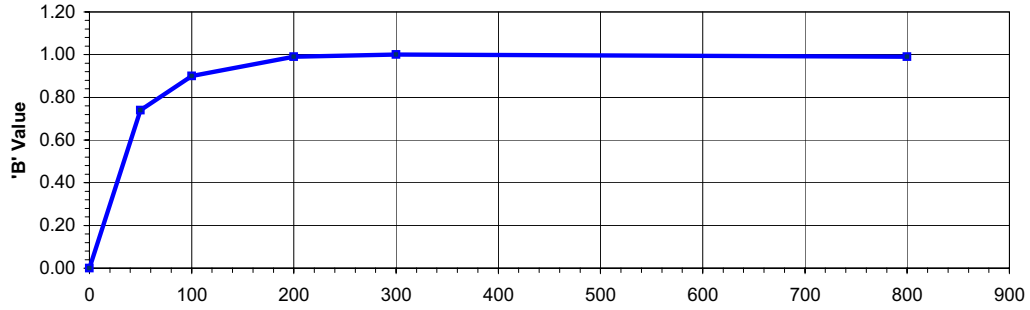
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	31.04m

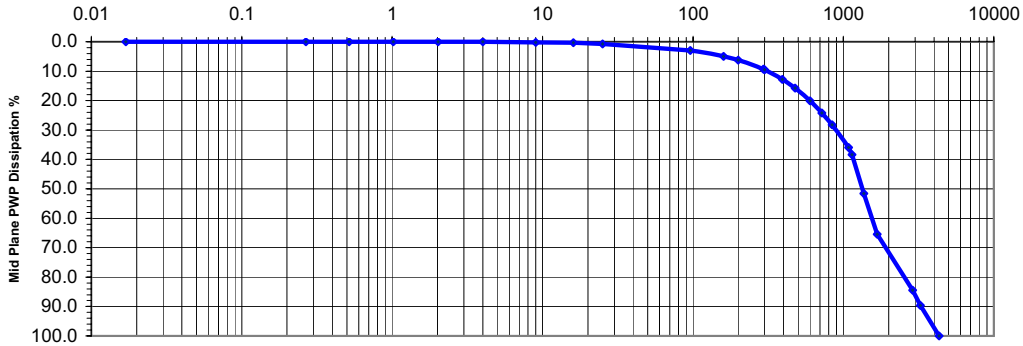
Saturation

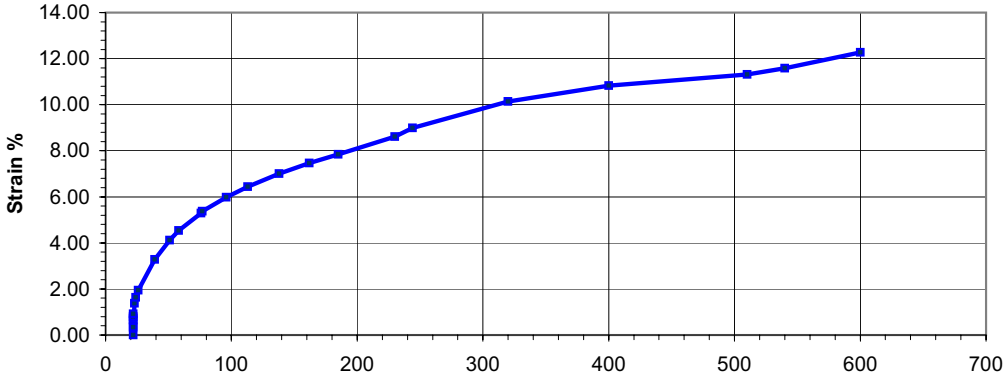


Cell Pressure kPa

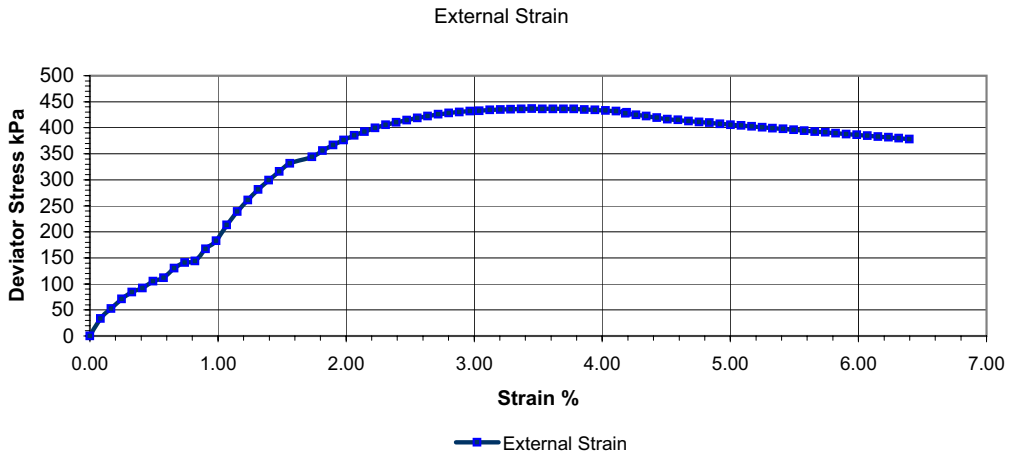
Isotropic Consoliadtion

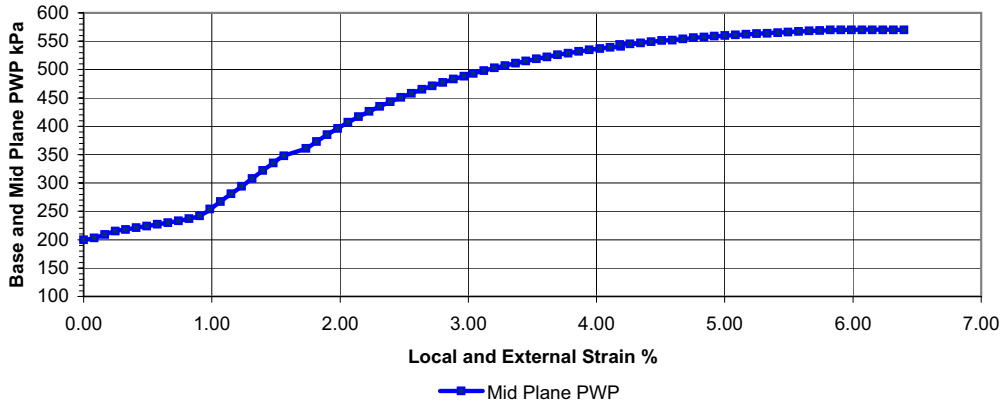
Time Mins

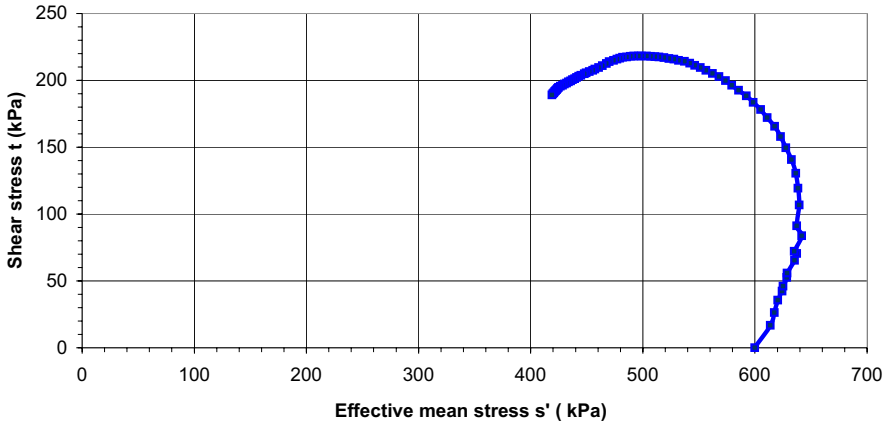




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.04m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.04m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.88	2.00
Specimen Length	mm	112.57	Dry Density	Mg/m3	1.42	1.61
Specimen Diameter	mm	54.50	Moisture	%	31.88	24.45
Area	mm2	2332.83	Saturation	%	96.18	97.52
Volume	cc	262.60	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.68	0.68
2	100	0.74	0.74
3	200	0.96	0.96
4	300	0.97	0.97
5	900	0.99	0.99

Isotropic Consolidation Stage		Consolidation Stage 1
Cell Pressure	kPa	900
Back Pressure	kPa	100
Radial Effective stress	kPa	800

At Maximum Deviator stress

Deviator Stress (kPa)	492.3
External Axial Strain (%)	3.35
Shear Stress (kPa)	246.1
Pore Water Pressure (kPa)	530
Radial Effective Stress (kPa)	270
Axial Effective Stress (kPa)	762
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0035
Sample Description	Soft to Firm dark grey/black SILT/CLAY

Notes:

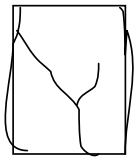
1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

3 Membrane correction not applied

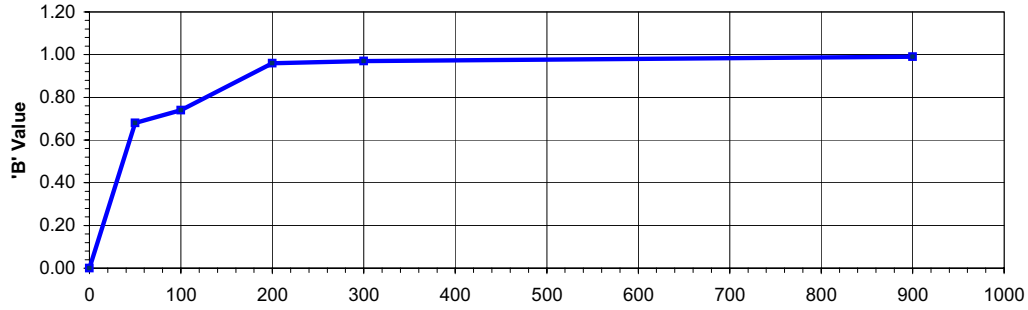
3 Side drain corrections not applied

Specimen After Test



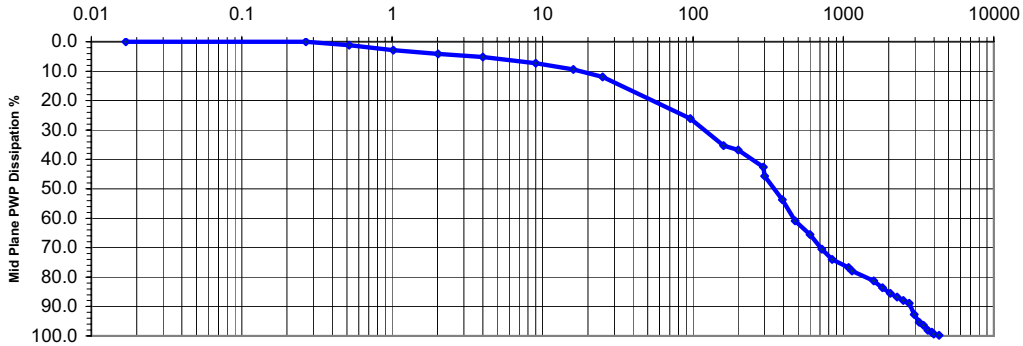
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	Core
		Depth.	31.19m

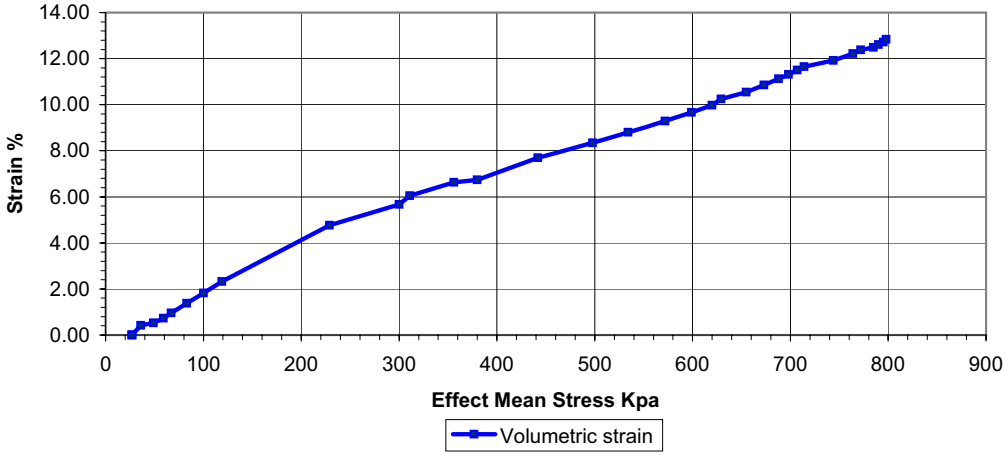
Saturation



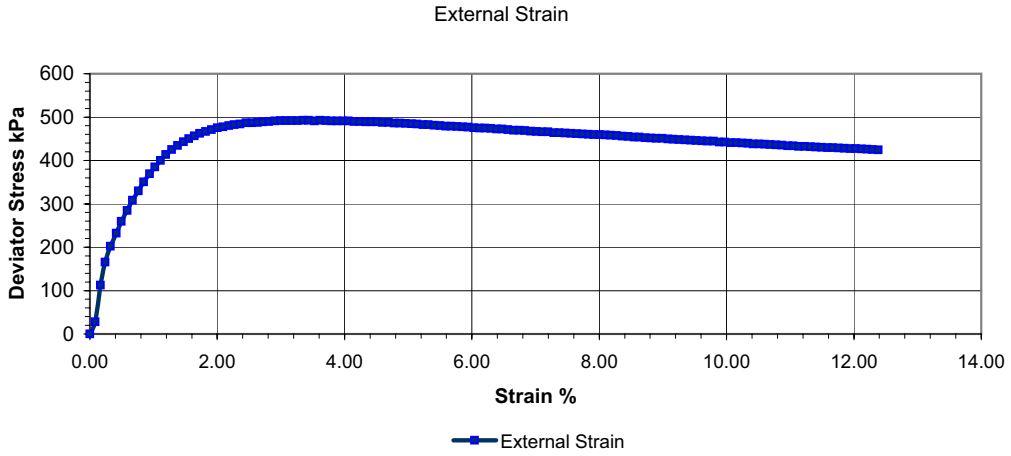
Isotropic Consoliadtion

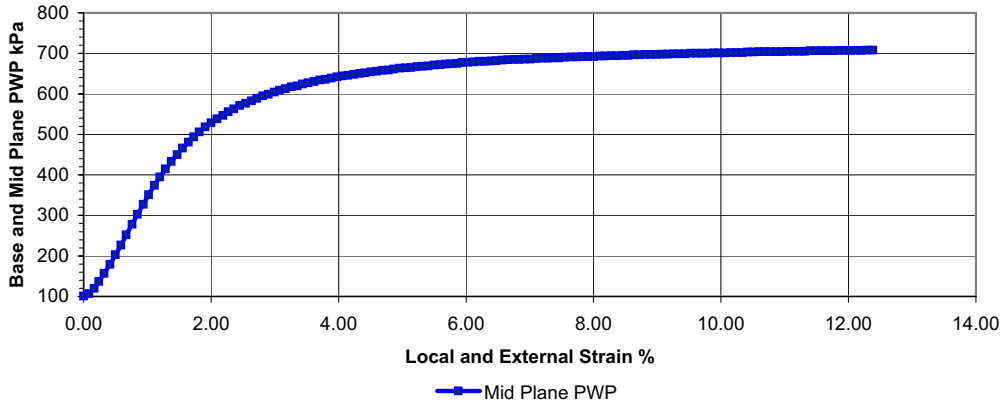
Time Mins

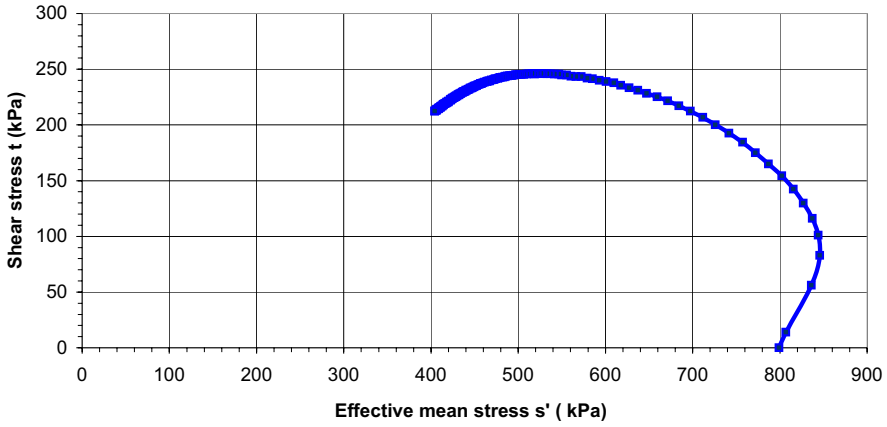




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.19m

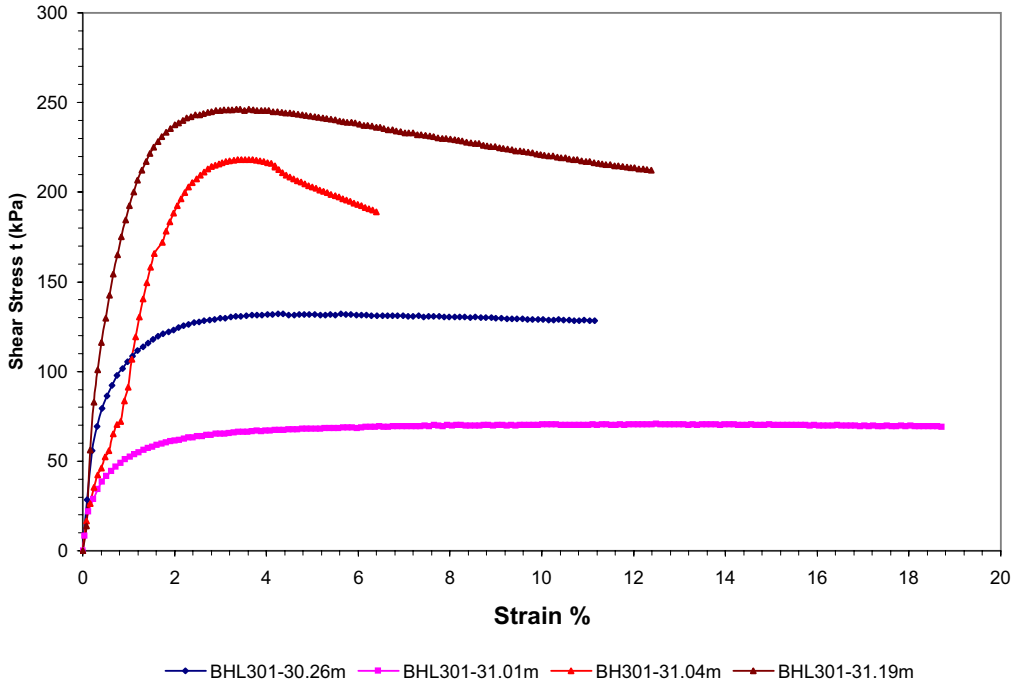


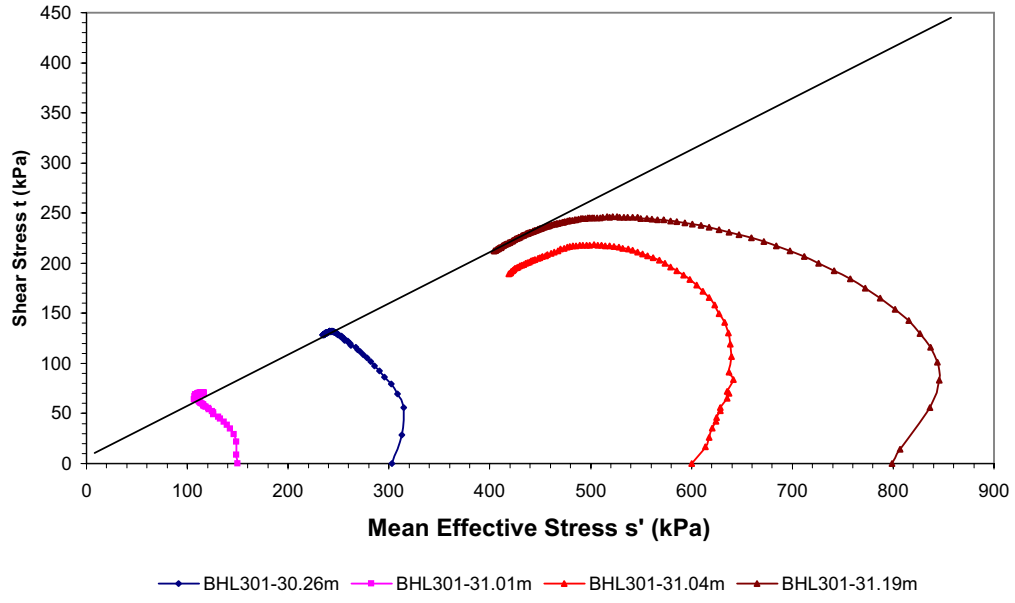




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-492
		Borehole No.	BHL301
	Project: Durban Harbour Berth Deepening Study	Sample No.	U
		Depth.	31.19m

Combined Stress Path Plots





c' **10** **kPa**

Φ' **30.4°**

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No. NMTL-523
		Borehole BHL301
	Project: **Durban Harbour Berth Deepening Study**	Sample No. Core
		Depth 30.26-31.19m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	1.84	1.84
Specimen Length	mm	139.50	Dry Density	Mg/m3	1.50	1.51
Specimen Diameter	mm	70.00	Moisture	%	22.26	21.82
Area	mm2	3848.45	Saturation	%	75.47	74.92
Volume	cc	536.86	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.68	0.68
2	100	0.50	0.50
3	150	0.60	0.60
4	200	0.70	0.70
5	250	0.94	0.94
6	300	0.96	0.96
7	400	0.97	0.97

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	400
Back Pressure	kPa	300
Radial Effective stress	kPa	100

Specimen Split After Test

At Maximum Deviator stress

Deviator Stress (kPa)	908.7
External Axial Strain (%)	22.20
Shear Stress (kPa)	454.3
Pore Water Pressure (kPa)	-302
Radial Effective Stress (kPa)	402
Axial Effective Stress (kPa)	1311
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.01
Sample Description	Light brown occasionally grey silty fine SAND.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

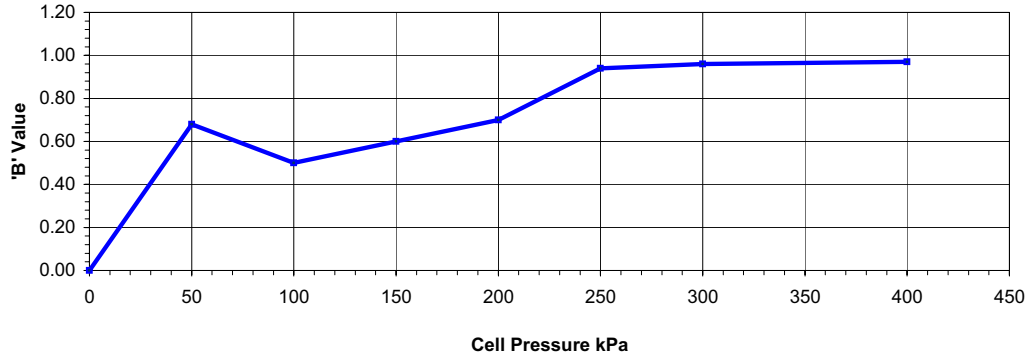
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

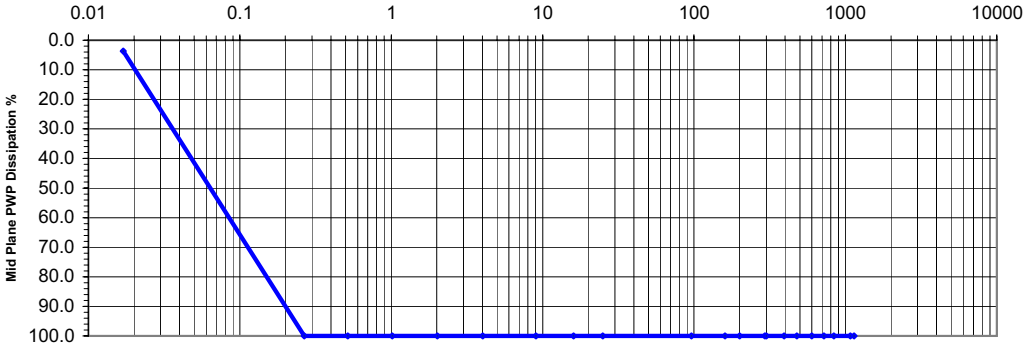
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	24.6-25.15m

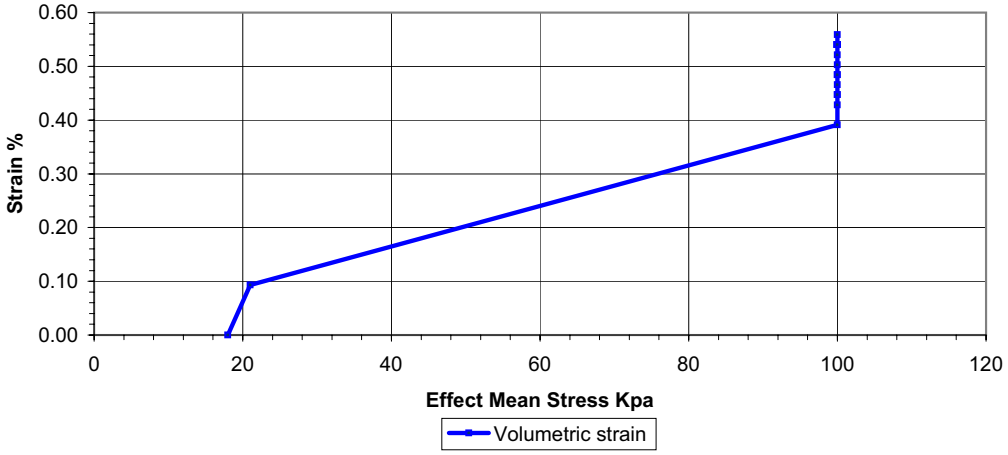
Saturation



Isotropic Consoliadtion

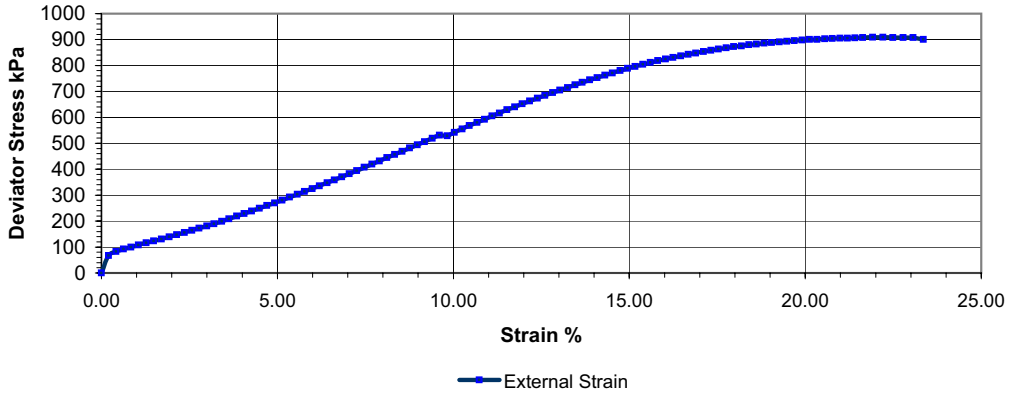
Time Mins

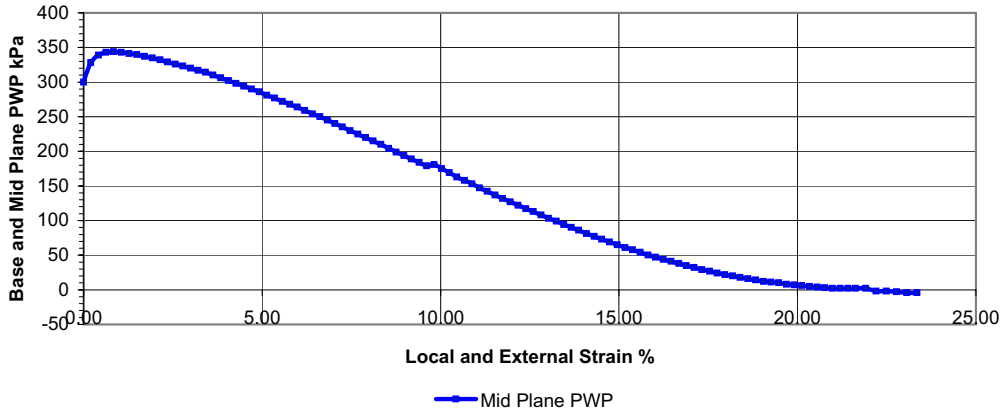


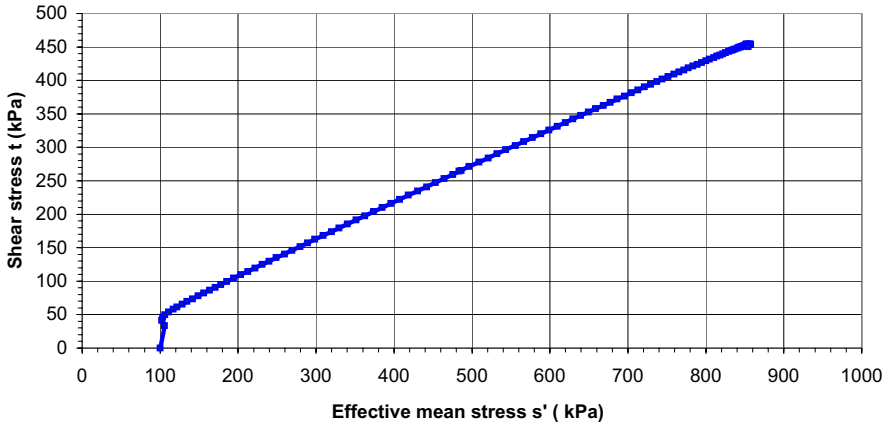


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	24.6-25.15m

External Strain







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	1
		Depth.	24.6-25.15m

SUMMARY OF TEST RESULTS

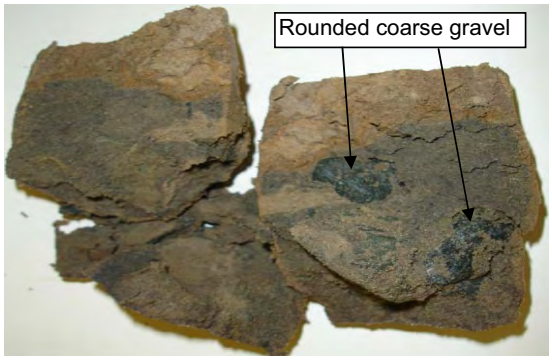
		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	2.05	2.06
Specimen Length	mm	130.00	Dry Density	Mg/m3	1.70	1.72
Specimen Diameter	mm	70.00	Moisture	%	20.74	19.78
Area	mm2	3848.45	Saturation	%	94.50	94.03
Volume	cc	500.30	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.70	0.70
2	100	0.94	0.94
3	200	0.98	0.98
4	300	1.00	1.00
5	500	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	500
Back Pressure	kPa	300
Radial Effective stress	kPa	200

Specimen Split After Test



At Maximum Deviator stress

Deviator Stress (kPa)	911.5
External Axial Strain (%)	21.96
Shear Stress (kPa)	455.8
Pore Water Pressure (kPa)	-156
Radial Effective Stress (kPa)	359
Axial Effective Stress (kPa)	1271
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.01
Sample Description	Light brown occasionally grey silty fine SAND.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

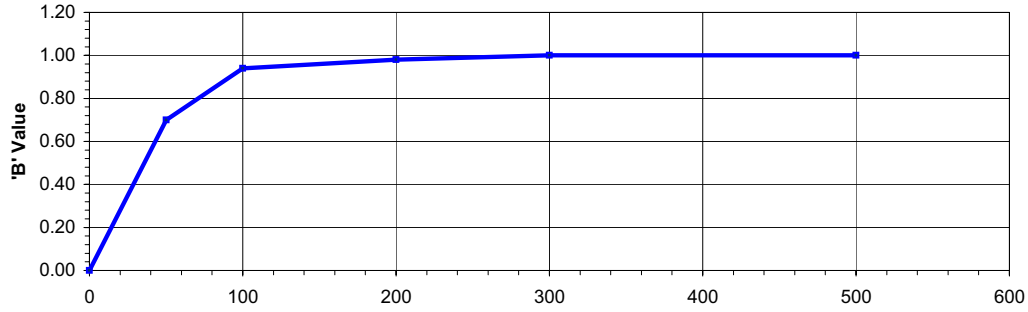
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

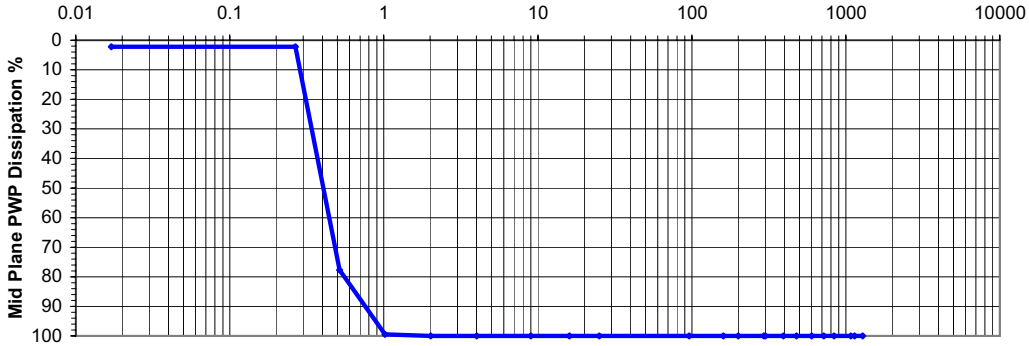
NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	24.6-25.15m

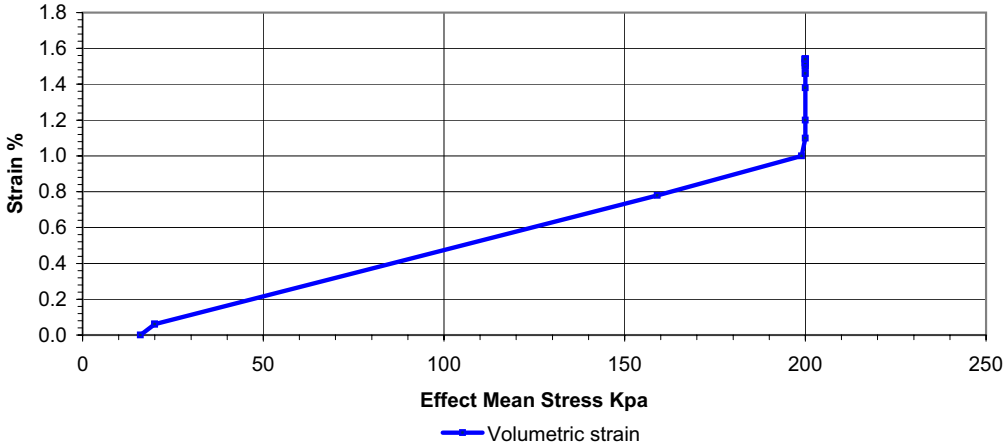
Saturation



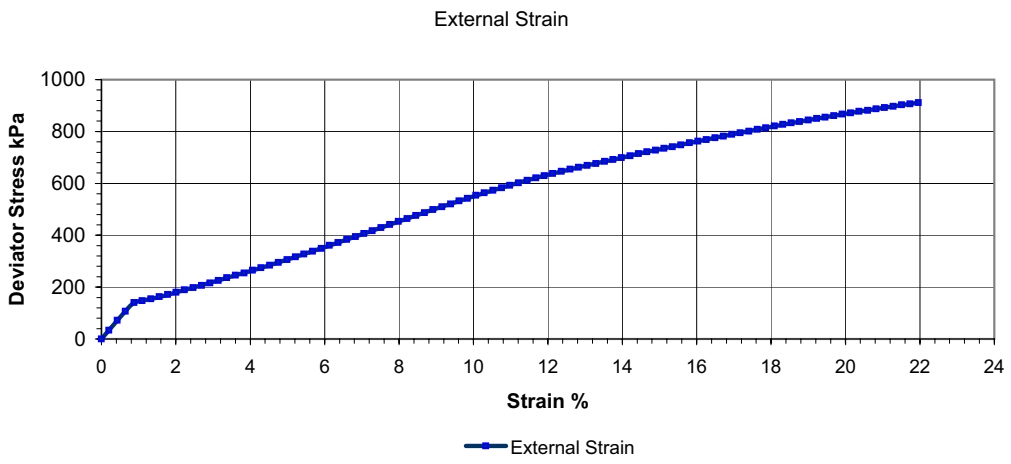
Isotropic Consoliadtion

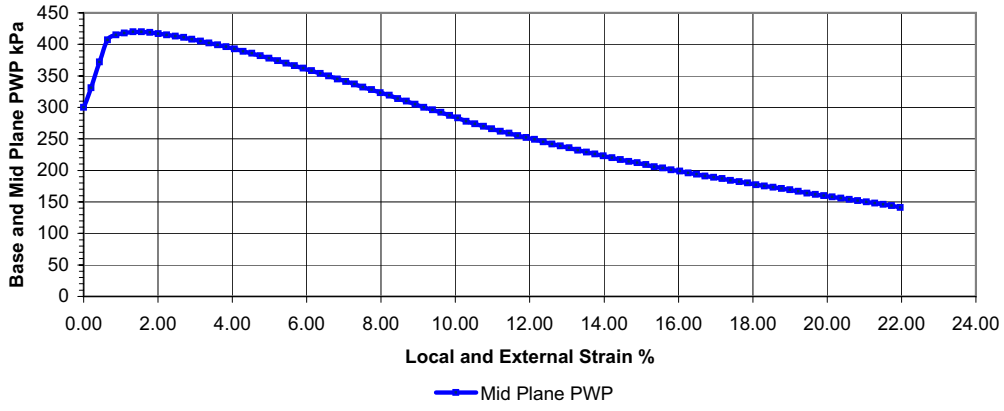
Time Mins

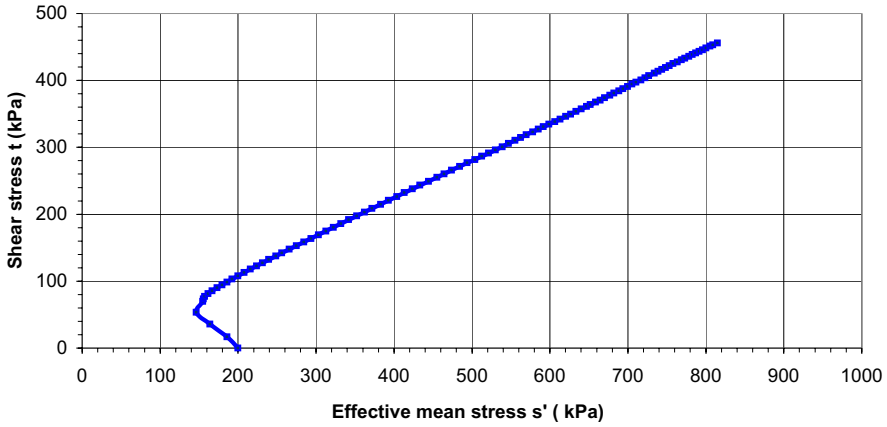




NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	24.6-25.15m







NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	2
		Depth.	24.6-25.15m

SUMMARY OF TEST RESULTS

		Initial			Initial	Final
Hall Effect Gauge length	mm	n/a	Bulk Density	Mg/m3	2.02	2.05
Specimen Length	mm	131.50	Dry Density	Mg/m3	1.58	1.66
Specimen Diameter	mm	71.50	Moisture	%	28.06	23.82
Area	mm2	4015.15	Saturation	%	106.35	102.03
Volume	cc	527.99	Sg(Assumed)	2.70		

Saturation Stage

Test Stage	Cell Pressure (kPa)	Pore Pressure Parameter 'B' Base	Mid Plane
Initial	0	0	0
1	50	0.64	0.64
2	100	0.86	0.86
3	200	0.90	0.90
4	300	0.98	0.98
5	500	0.99	0.99
6	700	1.00	1.00

		Consolidation Stage 1
Isotropic Consolidation Stage		
Cell Pressure	kPa	700
Back Pressure	kPa	300
Radial Effective stress	kPa	400

Specimen Split After Test

At Maximum Deviator stress

Deviator Stress (kPa)	278.8
External Axial Strain (%)	3.40
Shear Stress (kPa)	139.4
Pore Water Pressure (kPa)	169
Radial Effective Stress (kPa)	231
Axial Effective Stress (kPa)	510
Effective angle of friction (Degrees)	See combined data
Cohesion Assumed (kPa)	0
Rate of strain mm/min	0.0067
Sample Description	Firm to stiff grey, becoming brown SILT/CLAY.

Notes:

1 Test performed in accordance with Moors Spence Jones specification.

2 Side drain corrections not applied

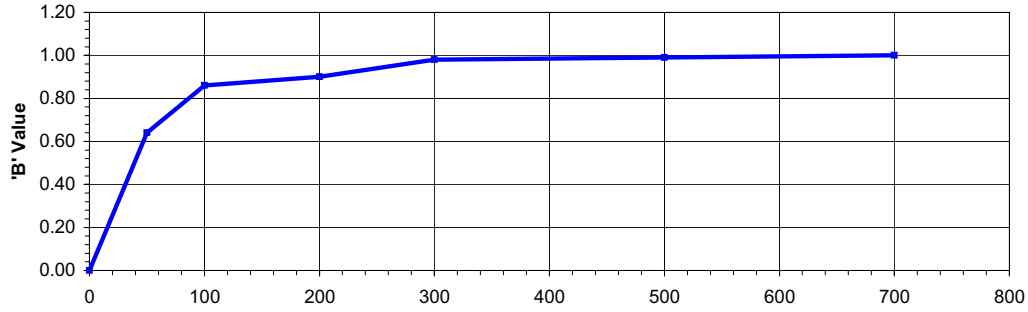
3 Membrane correction not applied

3 Side drain corrections not applied

Specimen After Test

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	24.6-25.15m

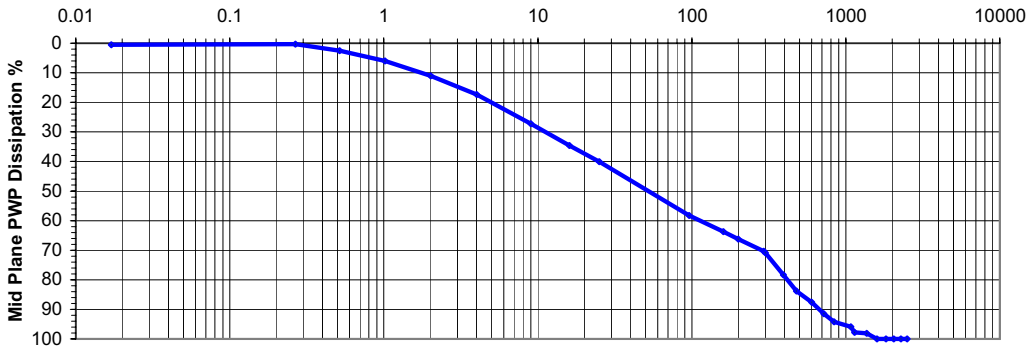
Saturation

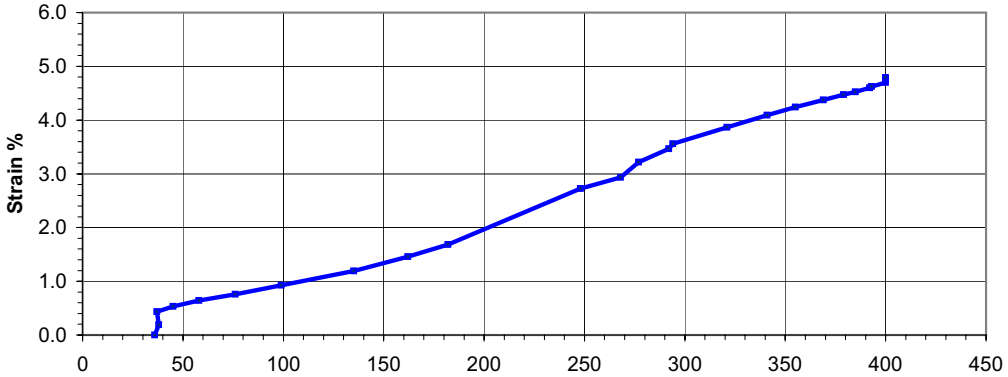


Cell Pressure kPa

Isotropic Consoliadtion

Time Mins

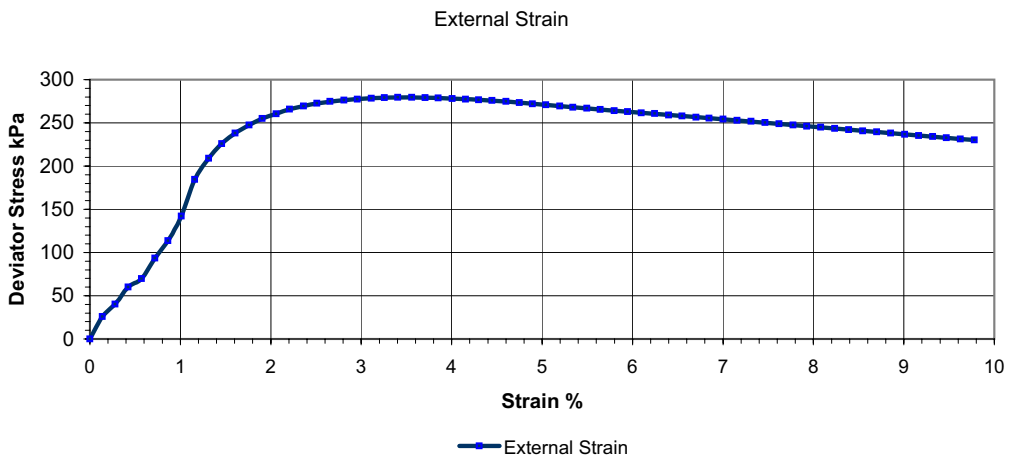


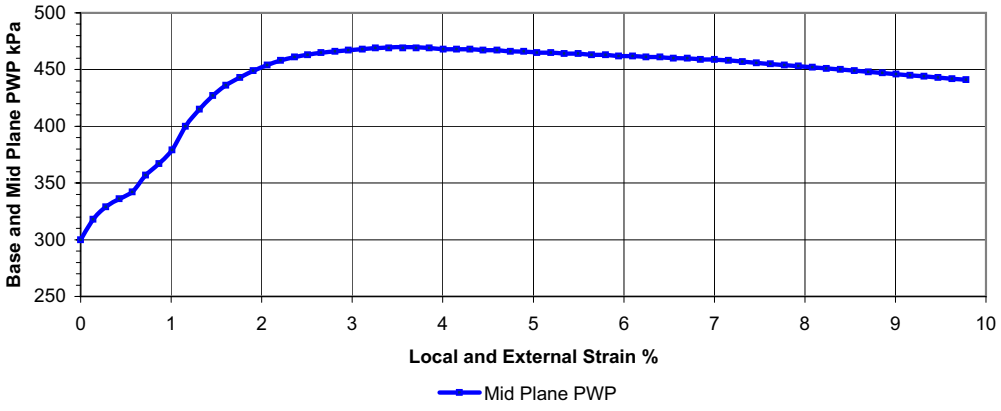


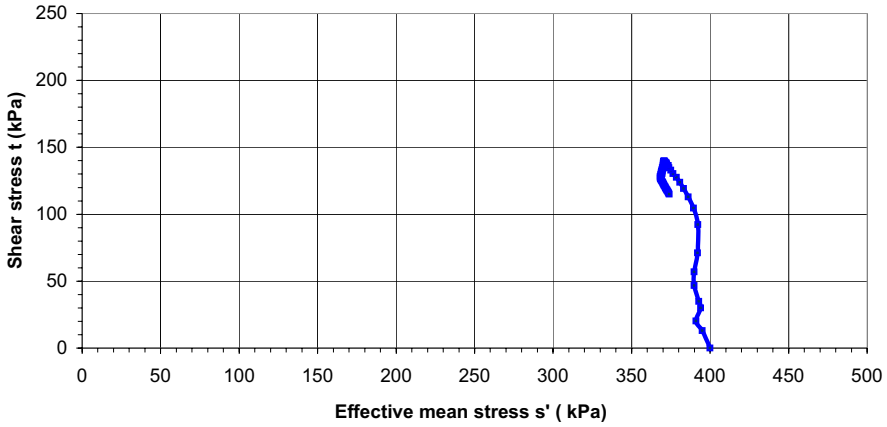
Effect Mean Stress Kpa

Volumetric strain

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	24.6-25.15m

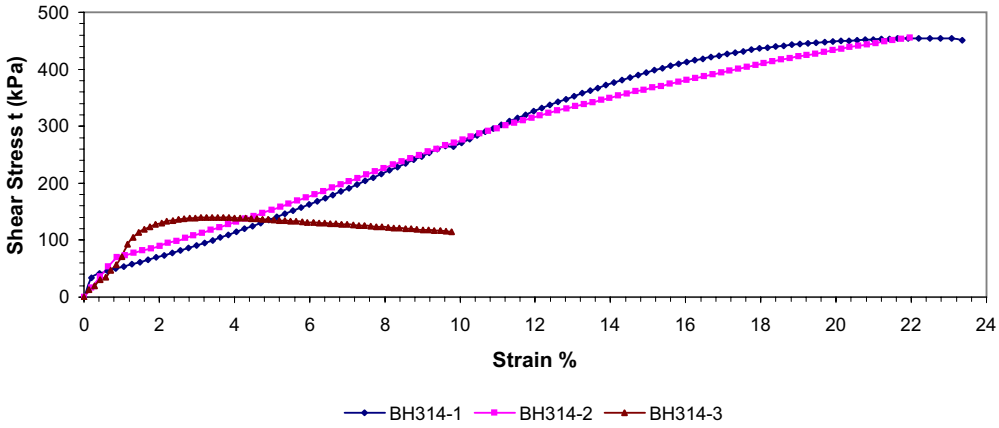


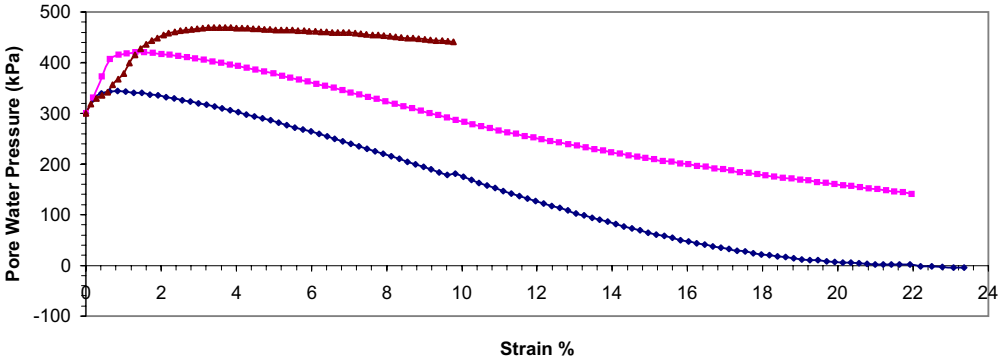


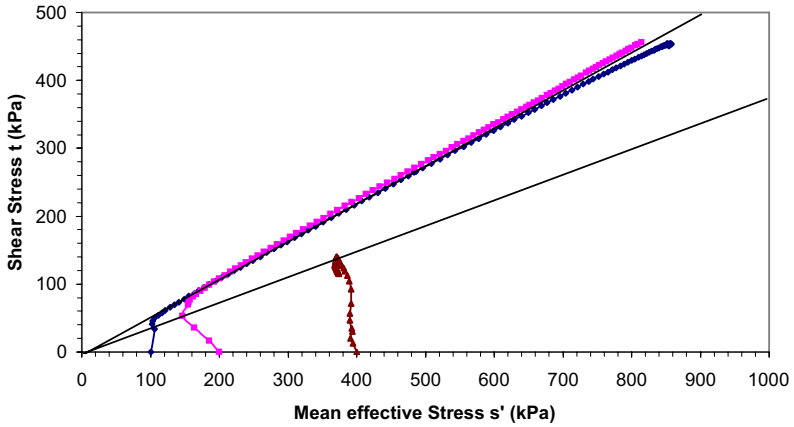


NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure.	Project No.	NMTL-523
		Borehole No.	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	3
		Depth.	24.6-25.15m

Combined Stress Path Plots







c'	0	kPa	0	kPa	
Φ'	33.7º		22.3º		

NM TL Ltd	Consolidated undrained triaxial compression test with base and mid plane pore pressure	Project No.	NMTL-523
		Borehole	BH314
	Project: Durban Harbour Berth Deepening Study	Sample No.	Shelby
		Depth	24.60-25.15m

APPENDIX D

CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10145 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 21.0
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1750.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	16		100.0	0.83	-3.91	33.6
100	25		100.0	1.67	-3.91	52.4
150	29.5		100.0	2.50	-3.91	61.9
200	32.4		100.0	3.33	-3.91	68.0
250	34		100.0	4.17	-3.91	71.3
300	35		100.0	5.00	-3.91	73.4
350	34.9		100.0	5.83	-3.91	73.2
400	33.1		100.0	6.67	-3.91	69.4
450	31.8		100.0	7.50	-3.91	66.7
500	31		100.0	8.33	-3.91	65.0
550	30.8		100.0	9.17	-3.91	64.6
600	30.8		100.0	10.00	-3.91	64.6
650	31		100.0	10.83	-3.91	65.0
700	31.3		100.0	11.67	-3.91	65.6
750	31.5		100.0	12.50	-3.91	66.1
800	31.8		100.0	13.33	-3.91	66.7
850	32		100.0	14.17	-3.91	67.1
900	31.9		100.0	15.00	-3.91	66.9
950	31.8		100.0	15.83	-3.91	66.7
1000	31.4		100.0	16.67	-3.91	65.9
1050	31.4		100.0	17.50	-3.91	65.9
1100	31.3		100.0	18.33	-3.91	65.6
1150	31.4		100.0	19.17	-3.91	65.9
1200	31.1		100.0	20.00	-3.91	65.2
1250	31.1		100.0	20.83	-3.91	65.2

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.0
Prooving Ring Factor 76 Dry Density (kg/m^3) 1750.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25		100.0	0.83	-3.91	52.8
100	38		100.0	1.67	-3.91	80.2
150	48.7		100.0	2.50	-3.91	102.8
200	56.5		100.0	3.33	-3.91	119.3
250	62		100.0	4.17	-3.91	130.9
300	64.6		100.0	5.00	-3.91	136.4
350	65.7		100.0	5.83	-3.91	138.7
400	65.4		100.0	6.67	-3.91	138.1
450	62.3		100.0	7.50	-3.91	131.5
500	59.2		100.0	8.33	-3.91	125.0
550	58		100.0	9.17	-3.91	122.4
600	57.5		100.0	10.00	-3.91	121.4
650	57.2		100.0	10.83	-3.91	120.8
700	57.2		100.0	11.67	-3.91	120.8
750	57.2		100.0	12.50	-3.91	120.8
800	57.4		100.0	13.33	-3.91	121.2
850	57.5		100.0	14.17	-3.91	121.4
900	57.4		100.0	15.00	-3.91	121.2
950	57.4		100.0	15.83	-3.91	121.2
1000	57.5		100.0	16.67	-3.91	121.4
1050	57.4		100.0	17.50	-3.91	121.2
1100	57.4		100.0	18.33	-3.91	121.2
1150	57.5		100.0	19.17	-3.91	121.4
1200	57.5		100.0	20.00	-3.91	121.4
1250	57.5		100.0	20.83	-3.91	121.4

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 21.0
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1750.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	37		100.0	0.83	-3.91	76.3
100	64		100.0	1.67	-3.91	131.9
150	84		100.0	2.50	-3.91	173.1
200	101		100.0	3.33	-3.91	208.2
250	116		100.0	4.17	-3.91	239.1
300	128		100.0	5.00	-3.91	263.8
350	137		100.0	5.83	-3.91	282.4
400	143.8		100.0	6.67	-3.91	296.4
450	146		100.0	7.50	-3.91	300.9
500	146.8		100.0	8.33	-3.91	302.6
550	141		100.0	9.17	-3.91	290.6
600	135.9		100.0	10.00	-3.91	280.1
650	133.2		100.0	10.83	-3.91	274.5
700	132.7		100.0	11.67	-3.91	273.5
750	133		100.0	12.50	-3.91	274.1
800	133.3		100.0	13.33	-3.91	274.7
850	133		100.0	14.17	-3.91	274.1
900	133.3		100.0	15.00	-3.91	274.7
950	133.1		100.0	15.83	-3.91	274.3
1000	132.9		100.0	16.67	-3.91	273.9
1050	132.8		100.0	17.50	-3.91	273.7
1100	132.2		100.0	18.33	-3.91	272.5
1150	132.8		100.0	19.17	-3.91	273.7
1200	132.5		100.0	20.00	-3.91	273.1
1250	132.7		100.0	20.83	-3.91	273.5

CONSOLIDATED DRAINED SHEAR BOX TEST

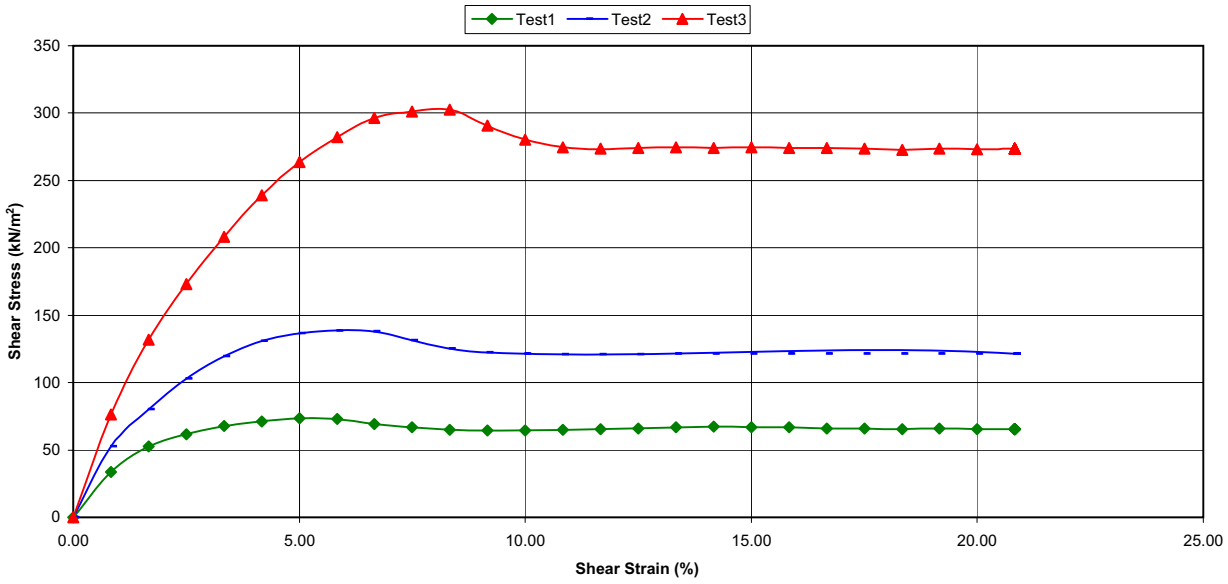
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

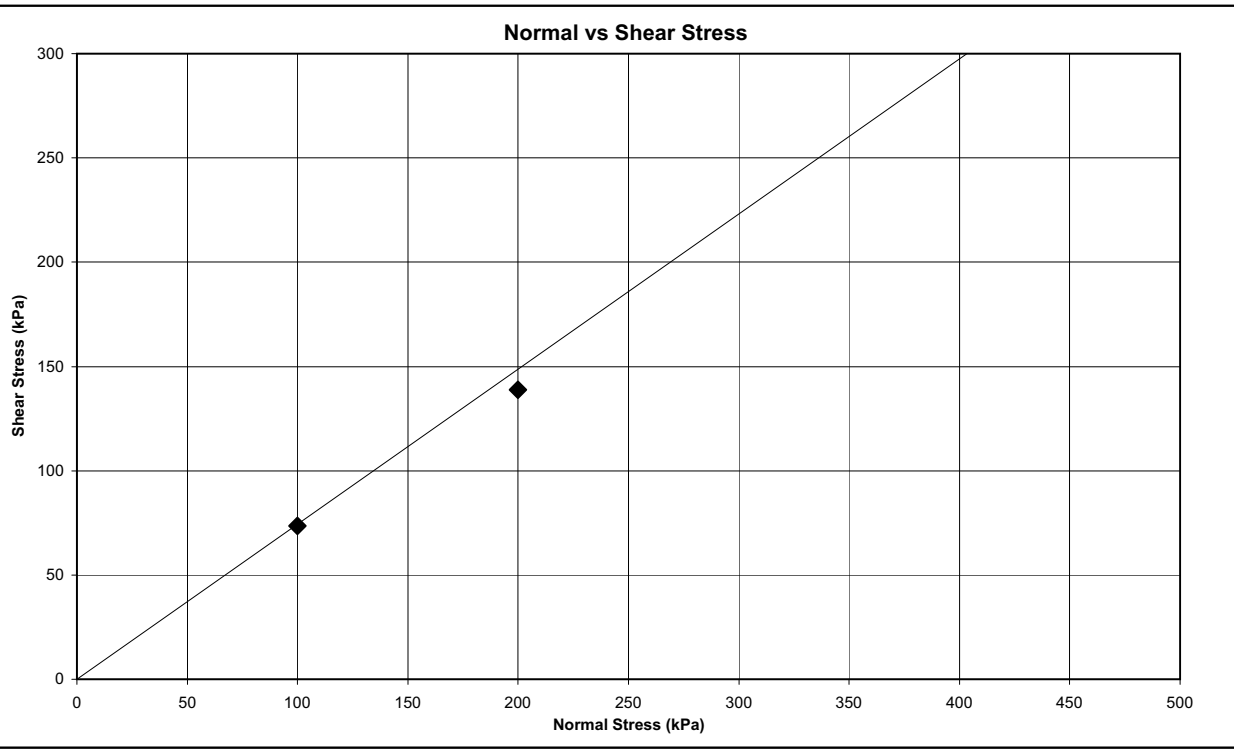
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10145 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 1 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1751	1751	1751
Moisture Content (%)	21.0	21.0	21.0
Shear Strain (%)	5.0	5.8	8.3
Shear Stress (kN/m^2)	73.4	138.7	302.6

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	37
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10145 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 21.0
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1808.85
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	16.8		100.0	0.83	-3.91	35.2
100	25		100.0	1.67	-3.91	52.4
150	29.8		100.0	2.50	-3.91	62.5
200	33		100.0	3.33	-3.91	69.2
250	34.5		100.0	4.17	-3.91	72.4
300	34.5		100.0	5.00	-3.91	72.4
350	34.1		100.0	5.83	-3.91	71.5
400	32.8		100.0	6.67	-3.91	68.8
450	31.8		100.0	7.50	-3.91	66.7
500	31.5		100.0	8.33	-3.91	66.1
550	31.6		100.0	9.17	-3.91	66.3
600	31.8		100.0	10.00	-3.91	66.7
650	31.8		100.0	10.83	-3.91	66.7
700	31.6		100.0	11.67	-3.91	66.3
750	31.4		100.0	12.50	-3.91	65.9
800	31.2		100.0	13.33	-3.91	65.4
850	31.3		100.0	14.17	-3.91	65.6
900	31		100.0	15.00	-3.91	65.0
950	31.3		100.0	15.83	-3.91	65.6
1000	31.2		100.0	16.67	-3.91	65.4
1050	31.2		100.0	17.50	-3.91	65.4
1100	31.2		100.0	18.33	-3.91	65.4
1150	31.2		100.0	19.17	-3.91	65.4
1200	31.1		100.0	20.00	-3.91	65.2
1250	31		100.0	20.83	-3.91	65.0

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.0
Prooving Ring Factor 76 Dry Density (kg/m^3) 1808.85
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	22		100.0	0.83	-3.91	46.4
100	35		100.0	1.67	-3.91	73.9
150	46		100.0	2.50	-3.91	97.1
200	52.2		100.0	3.33	-3.91	110.2
250	55.9		100.0	4.17	-3.91	118.0
300	57.3		100.0	5.00	-3.91	121.0
350	58		100.0	5.83	-3.91	122.4
400	58.2		100.0	6.67	-3.91	122.9
450	58		100.0	7.50	-3.91	122.4
500	57.6		100.0	8.33	-3.91	121.6
550	56.6		100.0	9.17	-3.91	119.5
600	56.3		100.0	10.00	-3.91	118.9
650	56		100.0	10.83	-3.91	118.2
700	55.8		100.0	11.67	-3.91	117.8
750	55.9		100.0	12.50	-3.91	118.0
800	55.9		100.0	13.33	-3.91	118.0
850	56		100.0	14.17	-3.91	118.2
900	56		100.0	15.00	-3.91	118.2
950	56		100.0	15.83	-3.91	118.2
1000	56.1		100.0	16.67	-3.91	118.4
1050	56.1		100.0	17.50	-3.91	118.4
1100	56		100.0	18.33	-3.91	118.2
1150	56		100.0	19.17	-3.91	118.2
1200	55.9		100.0	20.00	-3.91	118.0
1250	55.9		100.0	20.83	-3.91	118.0

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 21.0
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1808.85
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	37		100.0	0.83	-3.91	76.3
100	63		100.0	1.67	-3.91	129.9
150	83		100.0	2.50	-3.91	171.1
200	99.5		100.0	3.33	-3.91	205.1
250	113.5		100.0	4.17	-3.91	233.9
300	125.5		100.0	5.00	-3.91	258.7
350	134		100.0	5.83	-3.91	276.2
400	140		100.0	6.67	-3.91	288.6
450	143.4		100.0	7.50	-3.91	295.6
500	145		100.0	8.33	-3.91	298.9
550	144.4		100.0	9.17	-3.91	297.6
600	139.2		100.0	10.00	-3.91	286.9
650	133.4		100.0	10.83	-3.91	275.0
700	132.1		100.0	11.67	-3.91	272.3
750	131.7		100.0	12.50	-3.91	271.4
800	132.8		100.0	13.33	-3.91	273.7
850	133.7		100.0	14.17	-3.91	275.6
900	133.9		100.0	15.00	-3.91	276.0
950	133.9		100.0	15.83	-3.91	276.0
1000	133.5		100.0	16.67	-3.91	275.2
1050	134		100.0	17.50	-3.91	276.2
1100	134.2		100.0	18.33	-3.91	276.6
1150	132		100.0	19.17	-3.91	272.1
1200	133		100.0	20.00	-3.91	274.1
1250	133.2		100.0	20.83	-3.91	274.5

CONSOLIDATED DRAINED SHEAR BOX TEST

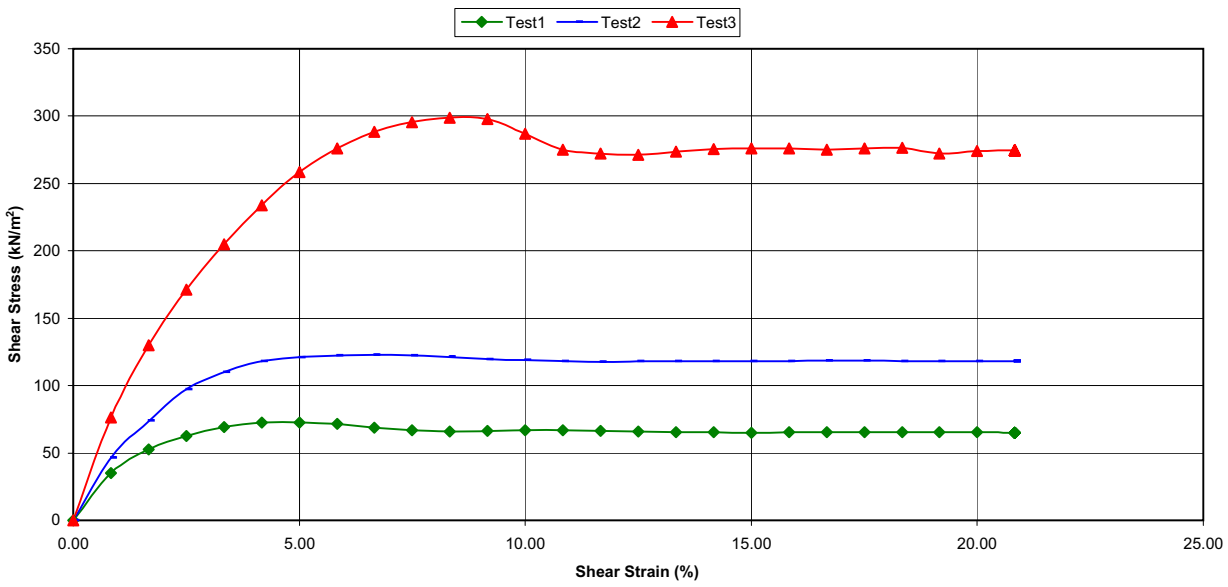
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

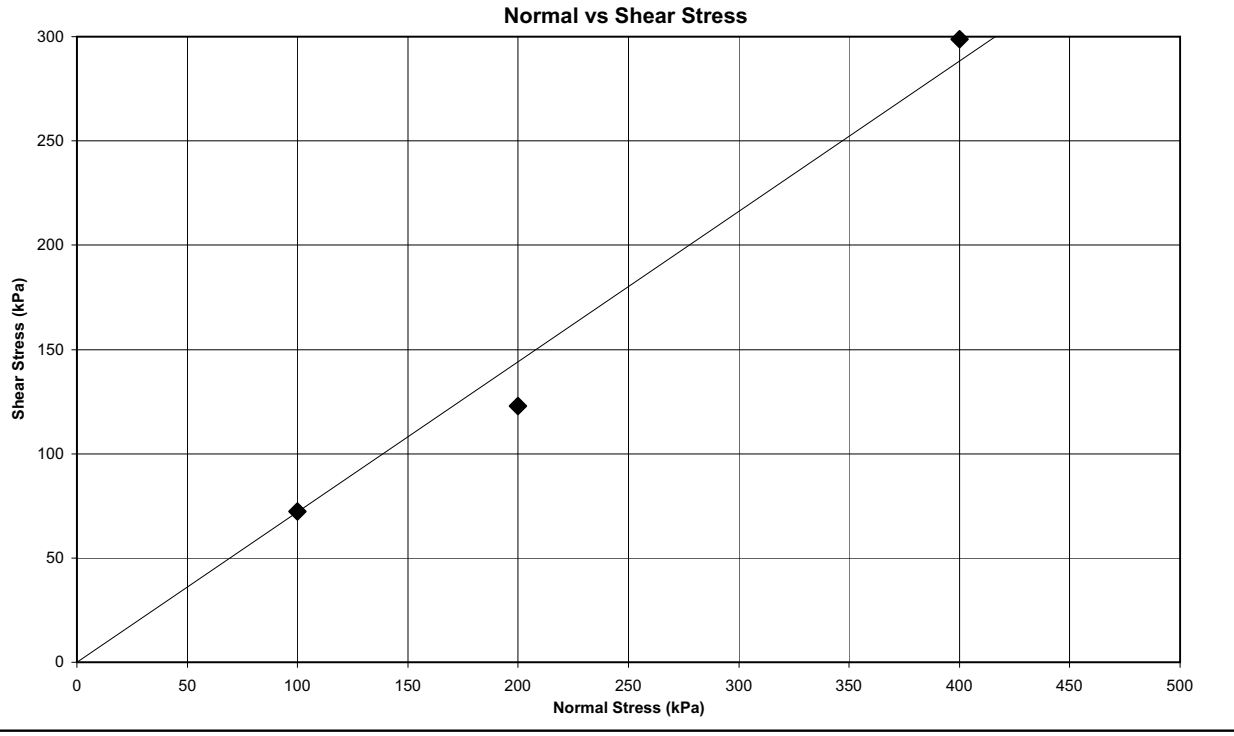
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10145 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 1 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1809	1809	1809
Moisture Content (%)	21.0	21.0	21.0
Shear Strain (%)	4.2	6.7	8.3
Shear Stress (kN/m^2)	72.4	122.9	298.9

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10145 Fill Sand
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 21.0
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1847.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	15		100.0	0.83	-3.91	31.5
100	23.5		100.0	1.67	-3.91	49.3
150	29		100.0	2.50	-3.91	60.8
200	32.2		100.0	3.33	-3.91	67.5
250	33.7		100.0	4.17	-3.91	70.7
300	34		100.0	5.00	-3.91	71.3
350	33.8		100.0	5.83	-3.91	70.9
400	32.5		100.0	6.67	-3.91	68.2
450	32		100.0	7.50	-3.91	67.1
500	31.6		100.0	8.33	-3.91	66.3
550	31.5		100.0	9.17	-3.91	66.1
600	31.4		100.0	10.00	-3.91	65.9
650	31.7		100.0	10.83	-3.91	66.5
700	31.6		100.0	11.67	-3.91	66.3
750	31.9		100.0	12.50	-3.91	66.9
800	31.9		100.0	13.33	-3.91	66.9
850	31.9		100.0	14.17	-3.91	66.9
900	31.6		100.0	15.00	-3.91	66.3
950	31.6		100.0	15.83	-3.91	66.3
1000	31.4		100.0	16.67	-3.91	65.9
1050	31		100.0	17.50	-3.91	65.0
1100	31		100.0	18.33	-3.91	65.0
1150	31		100.0	19.17	-3.91	65.0
1200	30.8		100.0	20.00	-3.91	64.6
1250	30.6		100.0	20.83	-3.91	64.2

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.0
Prooving Ring Factor 76 Dry Density (kg/m^3) 1847.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25		100.0	0.83	-3.91	52.8
100	38.5		100.0	1.67	-3.91	81.3
150	49		100.0	2.50	-3.91	103.4
200	57.7		100.0	3.33	-3.91	121.8
250	62		100.0	4.17	-3.91	130.9
300	64		100.0	5.00	-3.91	135.1
350	65.1		100.0	5.83	-3.91	137.4
400	64.5		100.0	6.67	-3.91	136.2
450	61		100.0	7.50	-3.91	128.8
500	59		100.0	8.33	-3.91	124.6
550	58.2		100.0	9.17	-3.91	122.9
600	58		100.0	10.00	-3.91	122.4
650	58		100.0	10.83	-3.91	122.4
700	58		100.0	11.67	-3.91	122.4
750	57.8		100.0	12.50	-3.91	122.0
800	57.5		100.0	13.33	-3.91	121.4
850	57.2		100.0	14.17	-3.91	120.8
900	57.1		100.0	15.00	-3.91	120.5
950	57		100.0	15.83	-3.91	120.3
1000	56.9		100.0	16.67	-3.91	120.1
1050	56.9		100.0	17.50	-3.91	120.1
1100	56.8		100.0	18.33	-3.91	119.9
1150	56.5		100.0	19.17	-3.91	119.3
1200	56.6		100.0	20.00	-3.91	119.5
1250	56.9		100.0	20.83	-3.91	120.1

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 21.0
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1847.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	30		100.0	0.83	-3.91	61.8
100	59		100.0	1.67	-3.91	121.6
150	79		100.0	2.50	-3.91	162.8
200	96.5		100.0	3.33	-3.91	198.9
250	112		100.0	4.17	-3.91	230.8
300	125		100.0	5.00	-3.91	257.6
350	134.6		100.0	5.83	-3.91	277.4
400	140.7		100.0	6.67	-3.91	290.0
450	143.6		100.0	7.50	-3.91	296.0
500	144.2		100.0	8.33	-3.91	297.2
550	143		100.0	9.17	-3.91	294.7
600	138		100.0	10.00	-3.91	284.4
650	132		100.0	10.83	-3.91	272.1
700	128		100.0	11.67	-3.91	263.8
750	127.3		100.0	12.50	-3.91	262.4
800	127.5		100.0	13.33	-3.91	262.8
850	127.8		100.0	14.17	-3.91	263.4
900	127.5		100.0	15.00	-3.91	262.8
950	127.7		100.0	15.83	-3.91	263.2
1000	128		100.0	16.67	-3.91	263.8
1050	128		100.0	17.50	-3.91	263.8
1100	128.2		100.0	18.33	-3.91	264.2
1150	128.2		100.0	19.17	-3.91	264.2
1200	128.8		100.0	20.00	-3.91	265.5
1250	128.6		100.0	20.83	-3.91	265.1

CONSOLIDATED DRAINED SHEAR BOX TEST

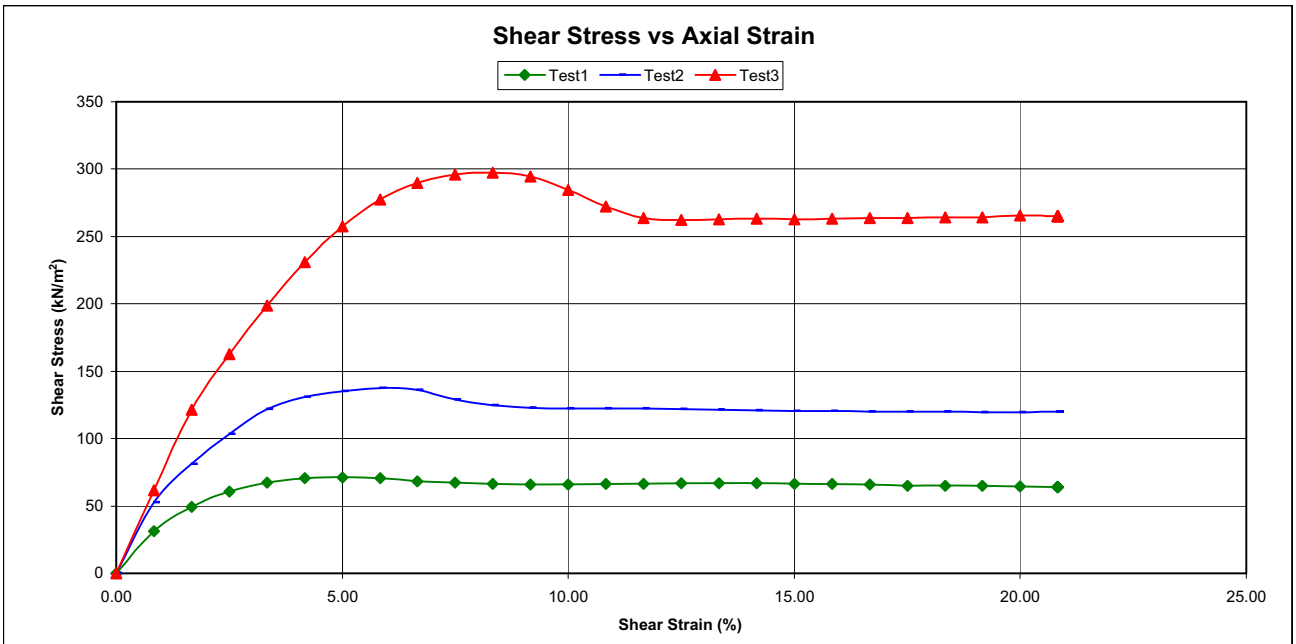
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

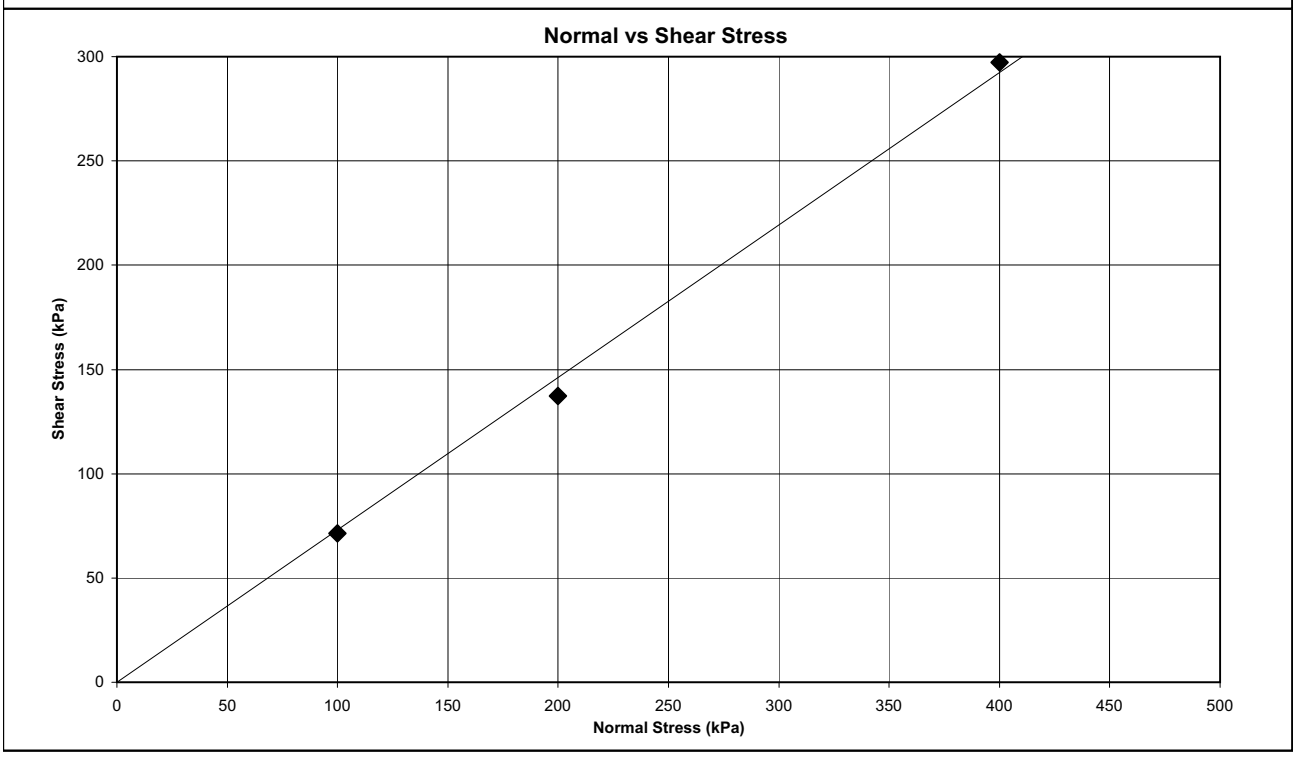
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10145 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 1 **Description:**
Fill Sand

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1848	1848	1848
Moisture Content (%)	21.0	21.0	21.0
Shear Strain (%)	5.0	5.8	8.3
Shear Stress (kN/m^2)	71.3	137.4	297.2

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10146 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.6
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1744.2
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	14		100.0	0.83	-3.91	29.4
100	21.5		100.0	1.67	-3.91	45.1
150	27		100.0	2.50	-3.91	56.6
200	31.8		100.0	3.33	-3.91	66.7
250	32.9		100.0	4.17	-3.91	69.0
300	33.6		100.0	5.00	-3.91	70.5
350	33.7		100.0	5.83	-3.91	70.7
400	32.4		100.0	6.67	-3.91	68.0
450	31		100.0	7.50	-3.91	65.0
500	30.2		100.0	8.33	-3.91	63.3
550	30		100.0	9.17	-3.91	62.9
600	29.9		100.0	10.00	-3.91	62.7
650	29.8		100.0	10.83	-3.91	62.5
700	29.6		100.0	11.67	-3.91	62.1
750	29.6		100.0	12.50	-3.91	62.1
800	29.3		100.0	13.33	-3.91	61.4
850	29.3		100.0	14.17	-3.91	61.4
900	29		100.0	15.00	-3.91	60.8
950	29		100.0	15.83	-3.91	60.8
1000	28.9		100.0	16.67	-3.91	60.6
1050	28.4		100.0	17.50	-3.91	59.6
1100	28.7		100.0	18.33	-3.91	60.2
1150	28.9		100.0	19.17	-3.91	60.6
1200	28.8		100.0	20.00	-3.91	60.4
1250	28.9		100.0	20.83	-3.91	60.6

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.6
Prooving Ring Factor 76 Dry Density (kg/m^3) 1744.2
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	24		100.0	0.83	-3.91	50.7
100	34.5		100.0	1.67	-3.91	72.8
150	43		100.0	2.50	-3.91	90.8
200	49.5		100.0	3.33	-3.91	104.5
250	54		100.0	4.17	-3.91	114.0
300	56.8		100.0	5.00	-3.91	119.9
350	58.1		100.0	5.83	-3.91	122.7
400	58.8		100.0	6.67	-3.91	124.1
450	58.9		100.0	7.50	-3.91	124.3
500	58.2		100.0	8.33	-3.91	122.9
550	58.1		100.0	9.17	-3.91	122.7
600	57.2		100.0	10.00	-3.91	120.8
650	56.8		100.0	10.83	-3.91	119.9
700	56.8		100.0	11.67	-3.91	119.9
750	56.6		100.0	12.50	-3.91	119.5
800	56.5		100.0	13.33	-3.91	119.3
850	56.7		100.0	14.17	-3.91	119.7
900	56.5		100.0	15.00	-3.91	119.3
950	56.9		100.0	15.83	-3.91	120.1
1000	57		100.0	16.67	-3.91	120.3
1050	57		100.0	17.50	-3.91	120.3
1100	56.9		100.0	18.33	-3.91	120.1
1150	56.9		100.0	19.17	-3.91	120.1
1200	57		100.0	20.00	-3.91	120.3
1250	56.8		100.0	20.83	-3.91	119.9

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.6
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1744.2
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	33		100.0	0.83	-3.91	68.0
100	56.5		100.0	1.67	-3.91	116.5
150	76		100.0	2.50	-3.91	156.6
200	92		100.0	3.33	-3.91	189.6
250	104.4		100.0	4.17	-3.91	215.2
300	114		100.0	5.00	-3.91	235.0
350	122.4		100.0	5.83	-3.91	252.3
400	127.7		100.0	6.67	-3.91	263.2
450	131		100.0	7.50	-3.91	270.0
500	131.5		100.0	8.33	-3.91	271.0
550	130		100.0	9.17	-3.91	267.9
600	128.9		100.0	10.00	-3.91	265.7
650	127.9		100.0	10.83	-3.91	263.6
700	127.6		100.0	11.67	-3.91	263.0
750	127.5		100.0	12.50	-3.91	262.8
800	126.8		100.0	13.33	-3.91	261.3
850	128.2		100.0	14.17	-3.91	264.2
900	128.2		100.0	15.00	-3.91	264.2
950	127.3		100.0	15.83	-3.91	262.4
1000	127.1		100.0	16.67	-3.91	262.0
1050	127.3		100.0	17.50	-3.91	262.4
1100	127.6		100.0	18.33	-3.91	263.0
1150	127.8		100.0	19.17	-3.91	263.4
1200	127.3		100.0	20.00	-3.91	262.4
1250	128		100.0	20.83	-3.91	263.8

CONSOLIDATED DRAINED SHEAR BOX TEST

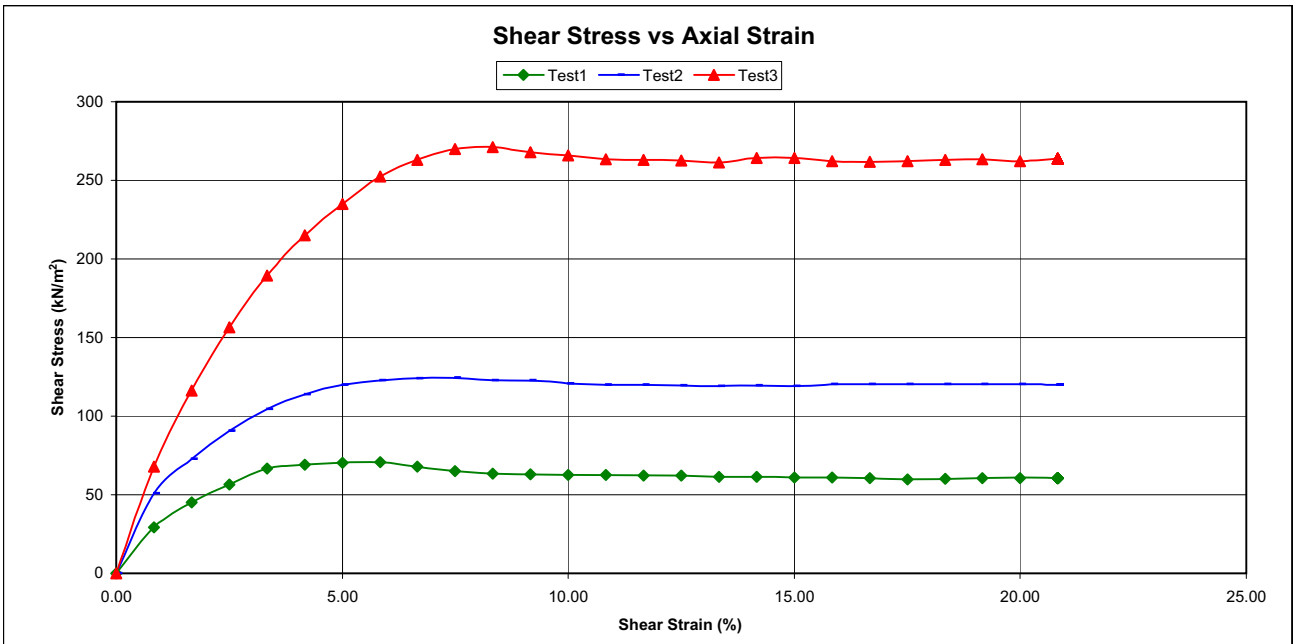
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

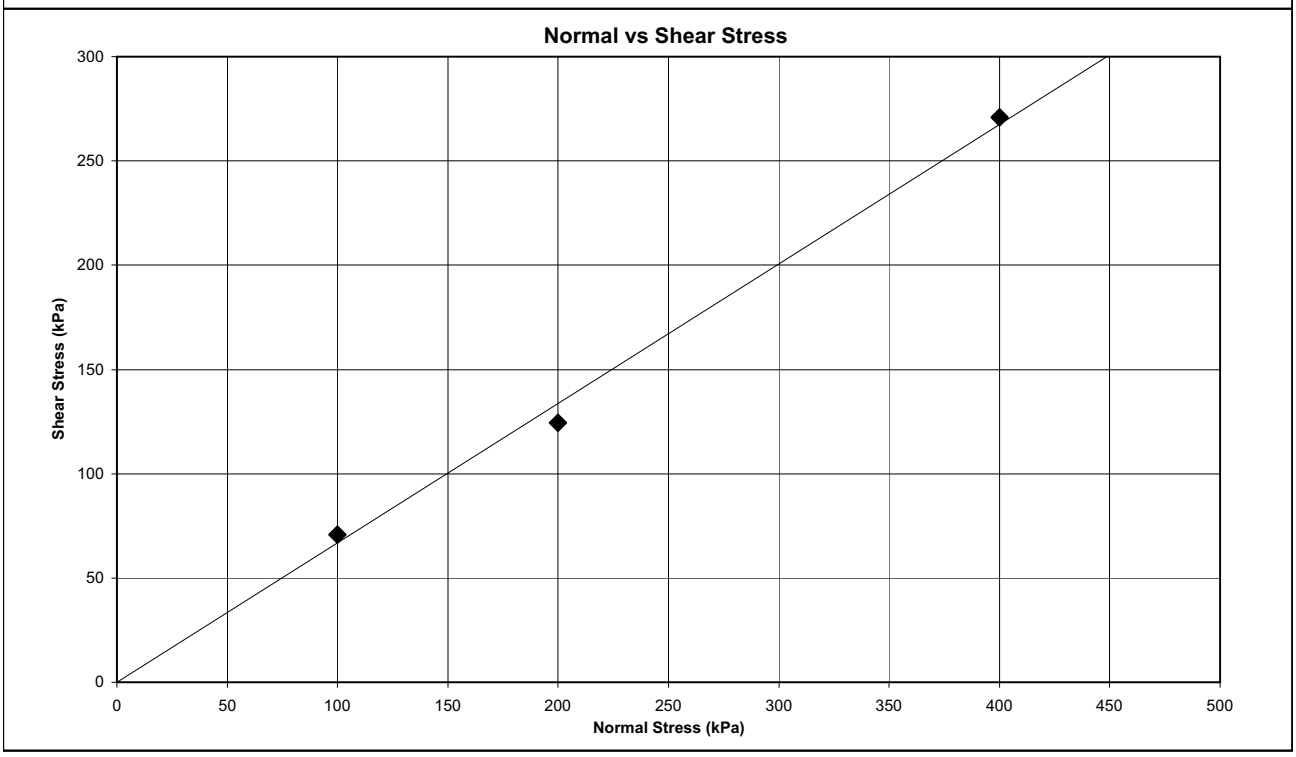
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10146 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 1 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1744	1744	1744
Moisture Content (%)	15.6	15.6	15.6
Shear Strain (%)	5.8	7.5	8.3
Shear Stress (kN/m^2)	70.7	124.3	271.0

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10146 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.6
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1802.34
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	12		100.0	0.83	-3.91	25.2
100	22		100.0	1.67	-3.91	46.1
150	27.3		100.0	2.50	-3.91	57.3
200	30.8		100.0	3.33	-3.91	64.6
250	32		100.0	4.17	-3.91	67.1
300	32.3		100.0	5.00	-3.91	67.7
350	32		100.0	5.83	-3.91	67.1
400	31.1		100.0	6.67	-3.91	65.2
450	30.4		100.0	7.50	-3.91	63.8
500	30.1		100.0	8.33	-3.91	63.1
550	30		100.0	9.17	-3.91	62.9
600	29.9		100.0	10.00	-3.91	62.7
650	30.3		100.0	10.83	-3.91	63.5
700	30.1		100.0	11.67	-3.91	63.1
750	30.1		100.0	12.50	-3.91	63.1
800	30		100.0	13.33	-3.91	62.9
850	30.1		100.0	14.17	-3.91	63.1
900	30.2		100.0	15.00	-3.91	63.3
950	30.3		100.0	15.83	-3.91	63.5
1000	30.1		100.0	16.67	-3.91	63.1
1050	30.1		100.0	17.50	-3.91	63.1
1100	30		100.0	18.33	-3.91	62.9
1150	30.2		100.0	19.17	-3.91	63.3
1200	30.1		100.0	20.00	-3.91	63.1
1250	30		100.0	20.83	-3.91	62.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.6
Prooving Ring Factor 76 Dry Density (kg/m^3) 1802.34
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	28		100.0	0.83	-3.91	59.1
100	41		100.0	1.67	-3.91	86.6
150	50.7		100.0	2.50	-3.91	107.0
200	57.8		100.0	3.33	-3.91	122.0
250	60.7		100.0	4.17	-3.91	128.1
300	61.7		100.0	5.00	-3.91	130.3
350	61.8		100.0	5.83	-3.91	130.5
400	60.3		100.0	6.67	-3.91	127.3
450	58.7		100.0	7.50	-3.91	123.9
500	57.5		100.0	8.33	-3.91	121.4
550	57.2		100.0	9.17	-3.91	120.8
600	57		100.0	10.00	-3.91	120.3
650	57		100.0	10.83	-3.91	120.3
700	56.3		100.0	11.67	-3.91	118.9
750	57.4		100.0	12.50	-3.91	121.2
800	57.4		100.0	13.33	-3.91	121.2
850	57.4		100.0	14.17	-3.91	121.2
900	58		100.0	15.00	-3.91	122.4
950	58.2		100.0	15.83	-3.91	122.9
1000	58.4		100.0	16.67	-3.91	123.3
1050	58.4		100.0	17.50	-3.91	123.3
1100	58.4		100.0	18.33	-3.91	123.3
1150	58.4		100.0	19.17	-3.91	123.3
1200	58.4		100.0	20.00	-3.91	123.3
1250	58.2		100.0	20.83	-3.91	122.9

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.6
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1802.34
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	36		100.0	0.83	-3.91	74.2
100	60		100.0	1.67	-3.91	123.7
150	79.8		100.0	2.50	-3.91	164.5
200	97.3		100.0	3.33	-3.91	200.5
250	112		100.0	4.17	-3.91	230.8
300	124		100.0	5.00	-3.91	255.6
350	133.5		100.0	5.83	-3.91	275.2
400	140.6		100.0	6.67	-3.91	289.8
450	144		100.0	7.50	-3.91	296.8
500	143		100.0	8.33	-3.91	294.7
550	137.7		100.0	9.17	-3.91	283.8
600	133.8		100.0	10.00	-3.91	275.8
650	132		100.0	10.83	-3.91	272.1
700	131.1		100.0	11.67	-3.91	270.2
750	131.7		100.0	12.50	-3.91	271.4
800	131		100.0	13.33	-3.91	270.0
850	132.1		100.0	14.17	-3.91	272.3
900	132.3		100.0	15.00	-3.91	272.7
950	132.1		100.0	15.83	-3.91	272.3
1000	133		100.0	16.67	-3.91	274.1
1050	133.2		100.0	17.50	-3.91	274.5
1100	133.7		100.0	18.33	-3.91	275.6
1150	134.1		100.0	19.17	-3.91	276.4
1200	134		100.0	20.00	-3.91	276.2
1250	133.8		100.0	20.83	-3.91	275.8

CONSOLIDATED DRAINED SHEAR BOX TEST

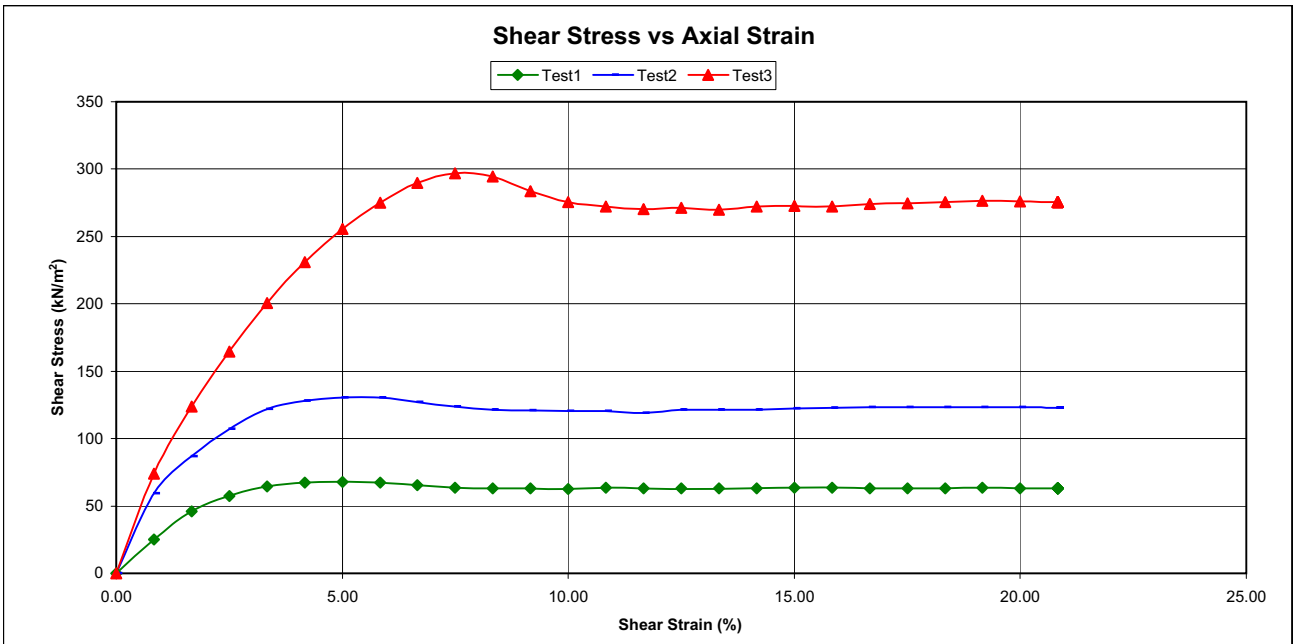
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

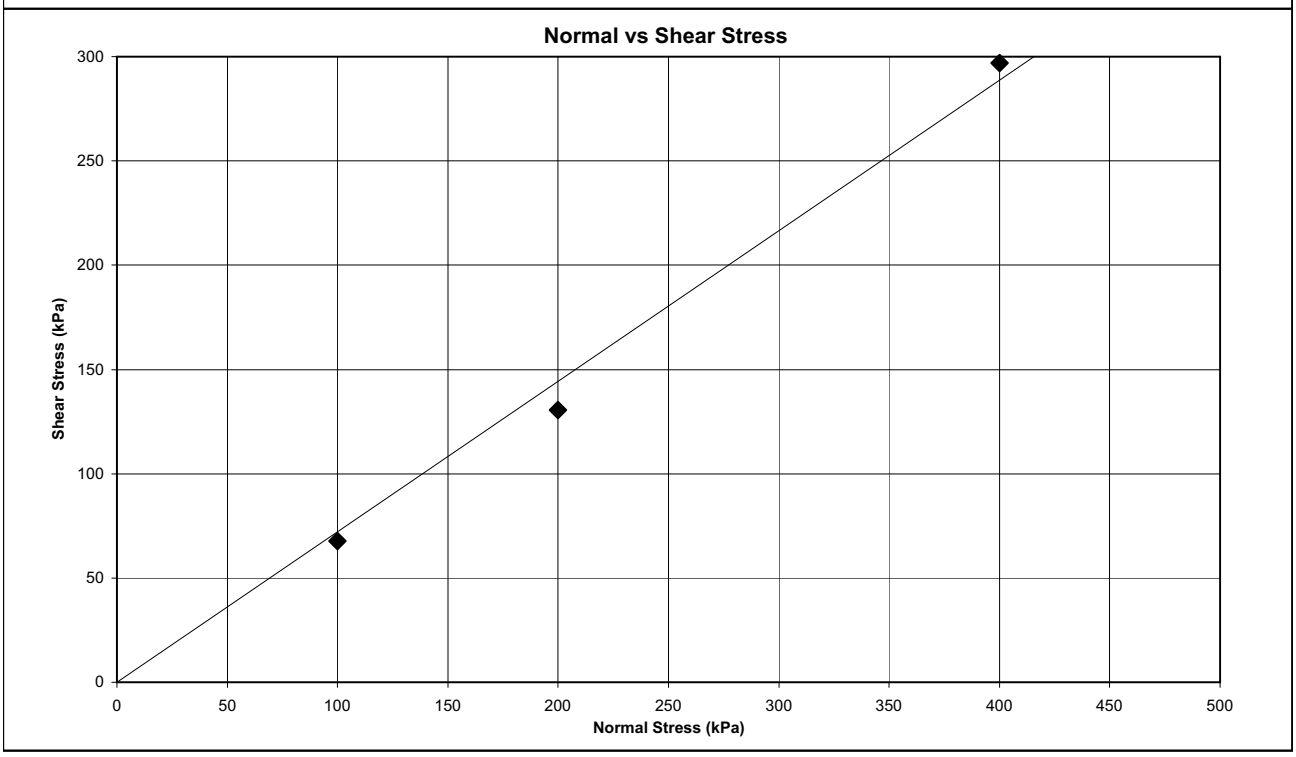
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10146 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 1 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1802	1802	1802
Moisture Content (%)	15.6	15.6	15.6
Shear Strain (%)	5.0	5.8	7.5
Shear Stress (kN/m^2)	67.7	130.5	296.8

Shear Strength Perameters

Angle of Internal Friction (°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
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Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10146 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 1 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.6
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1841.1
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	15		100.0	0.83	-3.91	31.5
100	23		100.0	1.67	-3.91	48.2
150	28.3		100.0	2.50	-3.91	59.4
200	31.2		100.0	3.33	-3.91	65.4
250	32.1		100.0	4.17	-3.91	67.3
300	32.2		100.0	5.00	-3.91	67.5
350	32		100.0	5.83	-3.91	67.1
400	31		100.0	6.67	-3.91	65.0
450	30.1		100.0	7.50	-3.91	63.1
500	29.4		100.0	8.33	-3.91	61.7
550	29		100.0	9.17	-3.91	60.8
600	28.8		100.0	10.00	-3.91	60.4
650	28.5		100.0	10.83	-3.91	59.8
700	28.1		100.0	11.67	-3.91	58.9
750	28.1		100.0	12.50	-3.91	58.9
800	28.4		100.0	13.33	-3.91	59.6
850	28.4		100.0	14.17	-3.91	59.6
900	28.7		100.0	15.00	-3.91	60.2
950	28.7		100.0	15.83	-3.91	60.2
1000	28.8		100.0	16.67	-3.91	60.4
1050	28.8		100.0	17.50	-3.91	60.4
1100	28.6		100.0	18.33	-3.91	60.0
1150	29.3		100.0	19.17	-3.91	61.4
1200	29.1		100.0	20.00	-3.91	61.0
1250	29.3		100.0	20.83	-3.91	61.4

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.6
Prooving Ring Factor 76 Dry Density (kg/m^3) 1841.1
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	27.5		100.0	0.83	-3.91	58.1
100	41		100.0	1.67	-3.91	86.6
150	51		100.0	2.50	-3.91	107.7
200	57.8		100.0	3.33	-3.91	122.0
250	61		100.0	4.17	-3.91	128.8
300	62.8		100.0	5.00	-3.91	132.6
350	62.9		100.0	5.83	-3.91	132.8
400	62		100.0	6.67	-3.91	130.9
450	60		100.0	7.50	-3.91	126.7
500	58.4		100.0	8.33	-3.91	123.3
550	57.4		100.0	9.17	-3.91	121.2
600	56.9		100.0	10.00	-3.91	120.1
650	56.8		100.0	10.83	-3.91	119.9
700	56.8		100.0	11.67	-3.91	119.9
750	57		100.0	12.50	-3.91	120.3
800	57.1		100.0	13.33	-3.91	120.5
850	57.1		100.0	14.17	-3.91	120.5
900	57.1		100.0	15.00	-3.91	120.5
950	57		100.0	15.83	-3.91	120.3
1000	57		100.0	16.67	-3.91	120.3
1050	57.1		100.0	17.50	-3.91	120.5
1100	57.1		100.0	18.33	-3.91	120.5
1150	57.3		100.0	19.17	-3.91	121.0
1200	57.4		100.0	20.00	-3.91	121.2
1250	57.1		100.0	20.83	-3.91	120.5

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.6
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1841.1
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	34		100.0	0.83	-3.91	70.1
100	57		100.0	1.67	-3.91	117.5
150	79		100.0	2.50	-3.91	162.8
200	96.3		100.0	3.33	-3.91	198.5
250	111.2		100.0	4.17	-3.91	229.2
300	124		100.0	5.00	-3.91	255.6
350	133.3		100.0	5.83	-3.91	274.7
400	139.9		100.0	6.67	-3.91	288.3
450	141.8		100.0	7.50	-3.91	292.3
500	140.8		100.0	8.33	-3.91	290.2
550	136.9		100.0	9.17	-3.91	282.2
600	133.5		100.0	10.00	-3.91	275.2
650	131.8		100.0	10.83	-3.91	271.7
700	131.3		100.0	11.67	-3.91	270.6
750	131.4		100.0	12.50	-3.91	270.8
800	131.9		100.0	13.33	-3.91	271.9
850	131		100.0	14.17	-3.91	270.0
900	132.2		100.0	15.00	-3.91	272.5
950	132.8		100.0	15.83	-3.91	273.7
1000	133		100.0	16.67	-3.91	274.1
1050	132.9		100.0	17.50	-3.91	273.9
1100	132.1		100.0	18.33	-3.91	272.3
1150	133.4		100.0	19.17	-3.91	275.0
1200	133		100.0	20.00	-3.91	274.1
1250	133.8		100.0	20.83	-3.91	275.8

CONSOLIDATED DRAINED SHEAR BOX TEST

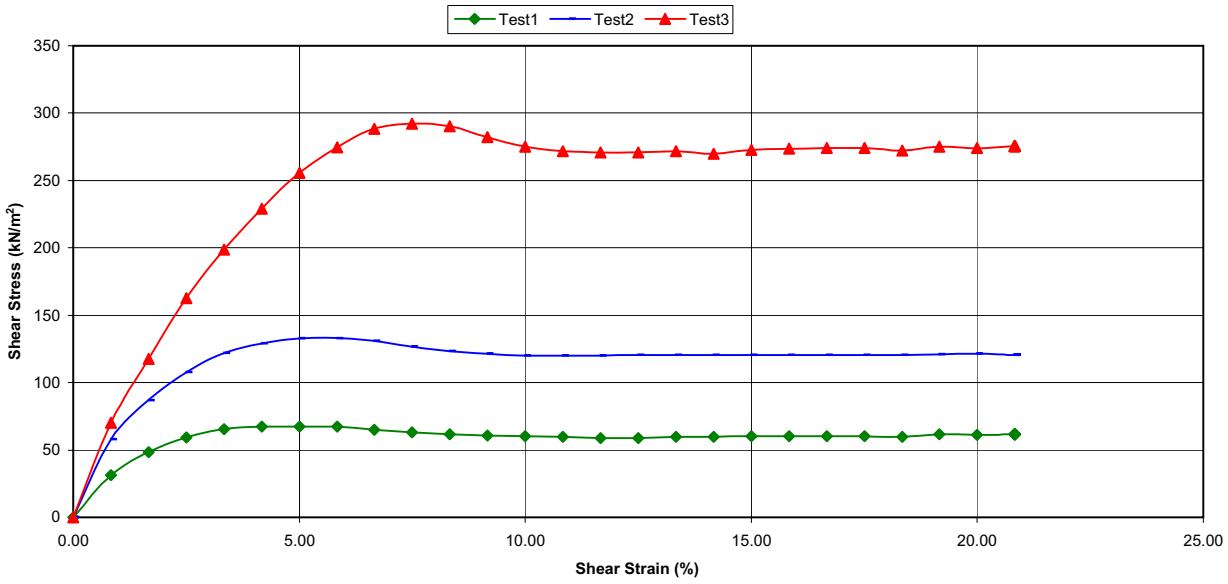
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

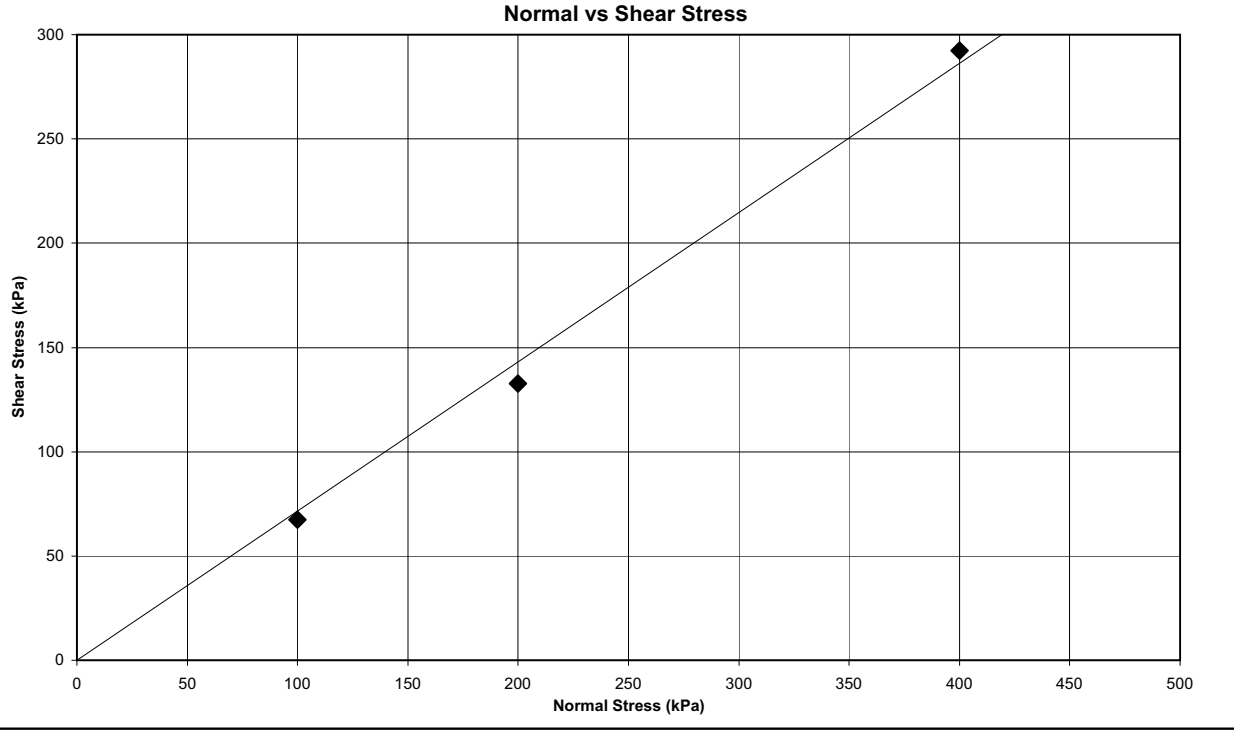
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10146 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 1 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1841	1841	1841
Moisture Content (%)	15.6	15.6	15.6
Shear Strain (%)	5.0	5.8	7.5
Shear Stress (kN/m^2)	67.5	132.8	292.3

Shear Strength Perameters

Angle of Internal Friction (°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10147 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 17.9
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1678.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	13.5		100.0	0.83	-3.91	28.3
100	19.5		100.0	1.67	-3.91	40.9
150	24.3		100.0	2.50	-3.91	51.0
200	27.2		100.0	3.33	-3.91	57.0
250	29.3		100.0	4.17	-3.91	61.4
300	30.1		100.0	5.00	-3.91	63.1
350	30.6		100.0	5.83	-3.91	64.2
400	30.7		100.0	6.67	-3.91	64.4
450	29.9		100.0	7.50	-3.91	62.7
500	29.1		100.0	8.33	-3.91	61.0
550	28.4		100.0	9.17	-3.91	59.6
600	27.7		100.0	10.00	-3.91	58.1
650	27.7		100.0	10.83	-3.91	58.1
700	27.4		100.0	11.67	-3.91	57.5
750	27.6		100.0	12.50	-3.91	57.9
800	27.8		100.0	13.33	-3.91	58.3
850	27.8		100.0	14.17	-3.91	58.3
900	27.5		100.0	15.00	-3.91	57.7
950	27.6		100.0	15.83	-3.91	57.9
1000	28		100.0	16.67	-3.91	58.7
1050	28		100.0	17.50	-3.91	58.7
1100	27.8		100.0	18.33	-3.91	58.3
1150	27.7		100.0	19.17	-3.91	58.1
1200	27.7		100.0	20.00	-3.91	58.1
1250	27.6		100.0	20.83	-3.91	57.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 17.9
Prooving Ring Factor 76 Dry Density (kg/m^3) 1678.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25		100.0	0.83	-3.91	52.8
100	36		100.0	1.67	-3.91	76.0
150	43.2		100.0	2.50	-3.91	91.2
200	48.2		100.0	3.33	-3.91	101.8
250	51.7		100.0	4.17	-3.91	109.1
300	54.2		100.0	5.00	-3.91	114.4
350	55.8		100.0	5.83	-3.91	117.8
400	56.5		100.0	6.67	-3.91	119.3
450	56.8		100.0	7.50	-3.91	119.9
500	57		100.0	8.33	-3.91	120.3
550	56.5		100.0	9.17	-3.91	119.3
600	55.6		100.0	10.00	-3.91	117.4
650	55.1		100.0	10.83	-3.91	116.3
700	55		100.0	11.67	-3.91	116.1
750	55.2		100.0	12.50	-3.91	116.5
800	55.2		100.0	13.33	-3.91	116.5
850	55.2		100.0	14.17	-3.91	116.5
900	55.3		100.0	15.00	-3.91	116.7
950	55.3		100.0	15.83	-3.91	116.7
1000	55.2		100.0	16.67	-3.91	116.5
1050	55.3		100.0	17.50	-3.91	116.7
1100	55.2		100.0	18.33	-3.91	116.5
1150	55.2		100.0	19.17	-3.91	116.5
1200	55.1		100.0	20.00	-3.91	116.3
1250	55.1		100.0	20.83	-3.91	116.3

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 17.9
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1678.5
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	33		100.0	0.83	-3.91	68.0
100	53.5		100.0	1.67	-3.91	110.3
150	69		100.0	2.50	-3.91	142.2
200	81		100.0	3.33	-3.91	167.0
250	91		100.0	4.17	-3.91	187.6
300	100.3		100.0	5.00	-3.91	206.7
350	107.8		100.0	5.83	-3.91	222.2
400	114.9		100.0	6.67	-3.91	236.8
450	120.8		100.0	7.50	-3.91	249.0
500	124.7		100.0	8.33	-3.91	257.0
550	127.8		100.0	9.17	-3.91	263.4
600	130.1		100.0	10.00	-3.91	268.2
650	130.9		100.0	10.83	-3.91	269.8
700	130.1		100.0	11.67	-3.91	268.2
750	128.9		100.0	12.50	-3.91	265.7
800	127.5		100.0	13.33	-3.91	262.8
850	126.7		100.0	14.17	-3.91	261.1
900	125.6		100.0	15.00	-3.91	258.9
950	125		100.0	15.83	-3.91	257.6
1000	123.8		100.0	16.67	-3.91	255.2
1050	123.6		100.0	17.50	-3.91	254.8
1100	123.6		100.0	18.33	-3.91	254.8
1150	122.6		100.0	19.17	-3.91	252.7
1200	122.7		100.0	20.00	-3.91	252.9
1250	122.6		100.0	20.83	-3.91	252.7

CONSOLIDATED DRAINED SHEAR BOX TEST

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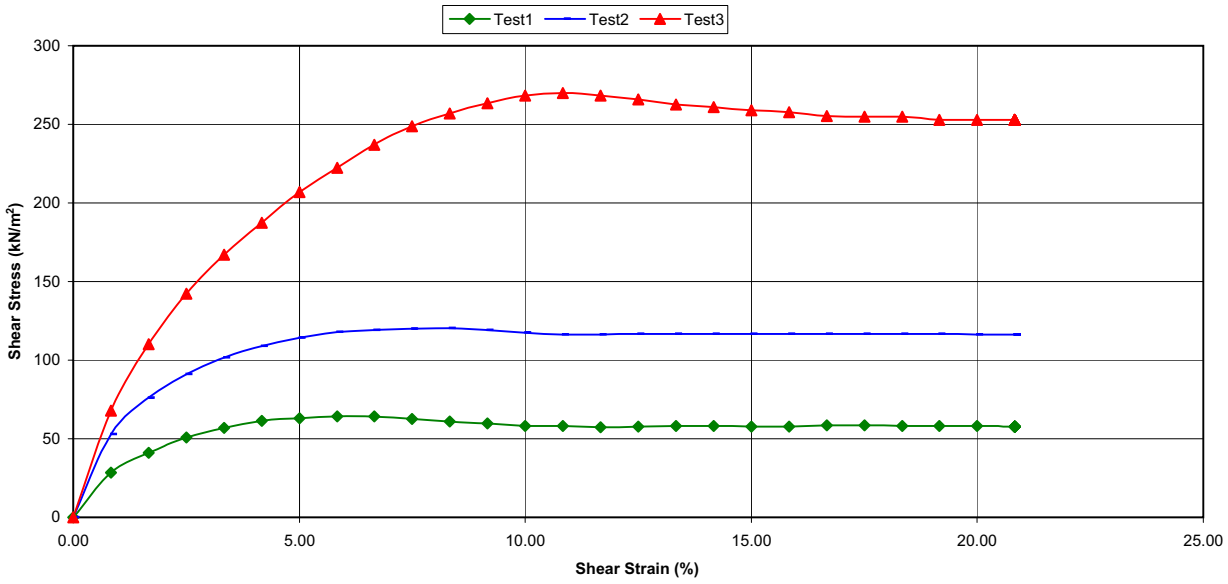
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

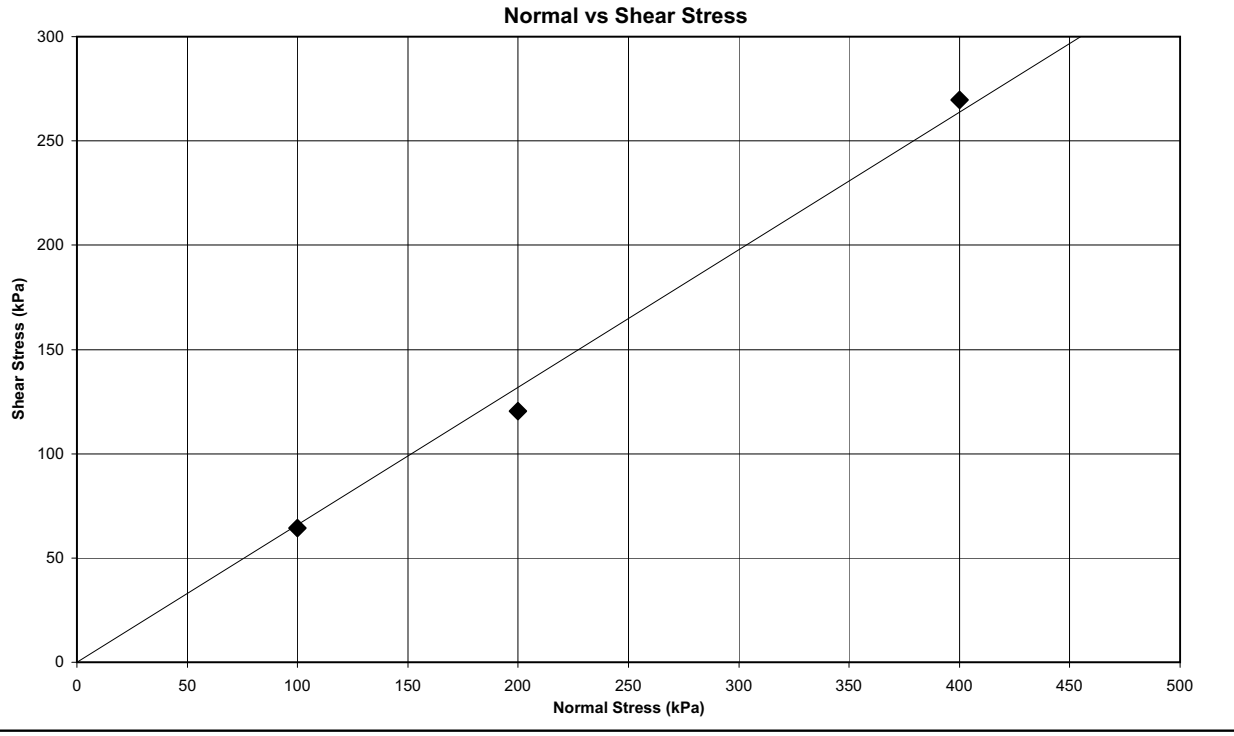
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10147 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 2 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1679	1679	1679
Moisture Content (%)	17.9	17.9	17.9
Shear Strain (%)	6.7	8.3	10.8
Shear Stress (kN/m^2)	64.4	120.3	269.8

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	33
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
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P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10147 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 17.9
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1734.45
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	15		100.0	0.83	-3.91	31.5
100	21.8		100.0	1.67	-3.91	45.7
150	26		100.0	2.50	-3.91	54.5
200	28.7		100.0	3.33	-3.91	60.2
250	30.3		100.0	4.17	-3.91	63.5
300	31.1		100.0	5.00	-3.91	65.2
350	31.3		100.0	5.83	-3.91	65.6
400	31.3		100.0	6.67	-3.91	65.6
450	30.9		100.0	7.50	-3.91	64.8
500	29.9		100.0	8.33	-3.91	62.7
550	28.7		100.0	9.17	-3.91	60.2
600	28		100.0	10.00	-3.91	58.7
650	27.8		100.0	10.83	-3.91	58.3
700	27.4		100.0	11.67	-3.91	57.5
750	27.5		100.0	12.50	-3.91	57.7
800	27.5		100.0	13.33	-3.91	57.7
850	27.6		100.0	14.17	-3.91	57.9
900	27.7		100.0	15.00	-3.91	58.1
950	27.7		100.0	15.83	-3.91	58.1
1000	27.7		100.0	16.67	-3.91	58.1
1050	27.8		100.0	17.50	-3.91	58.3
1100	27.4		100.0	18.33	-3.91	57.5
1150	27.6		100.0	19.17	-3.91	57.9
1200	27.6		100.0	20.00	-3.91	57.9
1250	27.6		100.0	20.83	-3.91	57.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 17.9
Prooving Ring Factor 76 Dry Density (kg/m^3) 1734.45
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26		100.0	0.83	-3.91	54.9
100	36.5		100.0	1.67	-3.91	77.1
150	44		100.0	2.50	-3.91	92.9
200	50		100.0	3.33	-3.91	105.6
250	53		100.0	4.17	-3.91	111.9
300	55		100.0	5.00	-3.91	116.1
350	55.5		100.0	5.83	-3.91	117.2
400	56		100.0	6.67	-3.91	118.2
450	56		100.0	7.50	-3.91	118.2
500	55.9		100.0	8.33	-3.91	118.0
550	55.3		100.0	9.17	-3.91	116.7
600	54.7		100.0	10.00	-3.91	115.5
650	54.1		100.0	10.83	-3.91	114.2
700	53.8		100.0	11.67	-3.91	113.6
750	53.9		100.0	12.50	-3.91	113.8
800	54		100.0	13.33	-3.91	114.0
850	54.2		100.0	14.17	-3.91	114.4
900	54.7		100.0	15.00	-3.91	115.5
950	54.6		100.0	15.83	-3.91	115.3
1000	54		100.0	16.67	-3.91	114.0
1050	54.2		100.0	17.50	-3.91	114.4
1100	54.3		100.0	18.33	-3.91	114.6
1150	54.2		100.0	19.17	-3.91	114.4
1200	54.2		100.0	20.00	-3.91	114.4
1250	54.2		100.0	20.83	-3.91	114.4

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 17.9
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1734.45
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	32.5		100.0	0.83	-3.91	67.0
100	57		100.0	1.67	-3.91	117.5
150	73		100.0	2.50	-3.91	150.5
200	85		100.0	3.33	-3.91	175.2
250	95.4		100.0	4.17	-3.91	196.6
300	105.2		100.0	5.00	-3.91	216.8
350	113		100.0	5.83	-3.91	232.9
400	119.9		100.0	6.67	-3.91	247.1
450	124.9		100.0	7.50	-3.91	257.4
500	128.7		100.0	8.33	-3.91	265.3
550	131.3		100.0	9.17	-3.91	270.6
600	132.7		100.0	10.00	-3.91	273.5
650	133		100.0	10.83	-3.91	274.1
700	133.1		100.0	11.67	-3.91	274.3
750	130.5		100.0	12.50	-3.91	269.0
800	128		100.0	13.33	-3.91	263.8
850	126.4		100.0	14.17	-3.91	260.5
900	125.8		100.0	15.00	-3.91	259.3
950	126.1		100.0	15.83	-3.91	259.9
1000	126.6		100.0	16.67	-3.91	260.9
1050	127.1		100.0	17.50	-3.91	262.0
1100	126.3		100.0	18.33	-3.91	260.3
1150	126.1		100.0	19.17	-3.91	259.9
1200	126.1		100.0	20.00	-3.91	259.9
1250	126.4		100.0	20.83	-3.91	260.5

CONSOLIDATED DRAINED SHEAR BOX TEST

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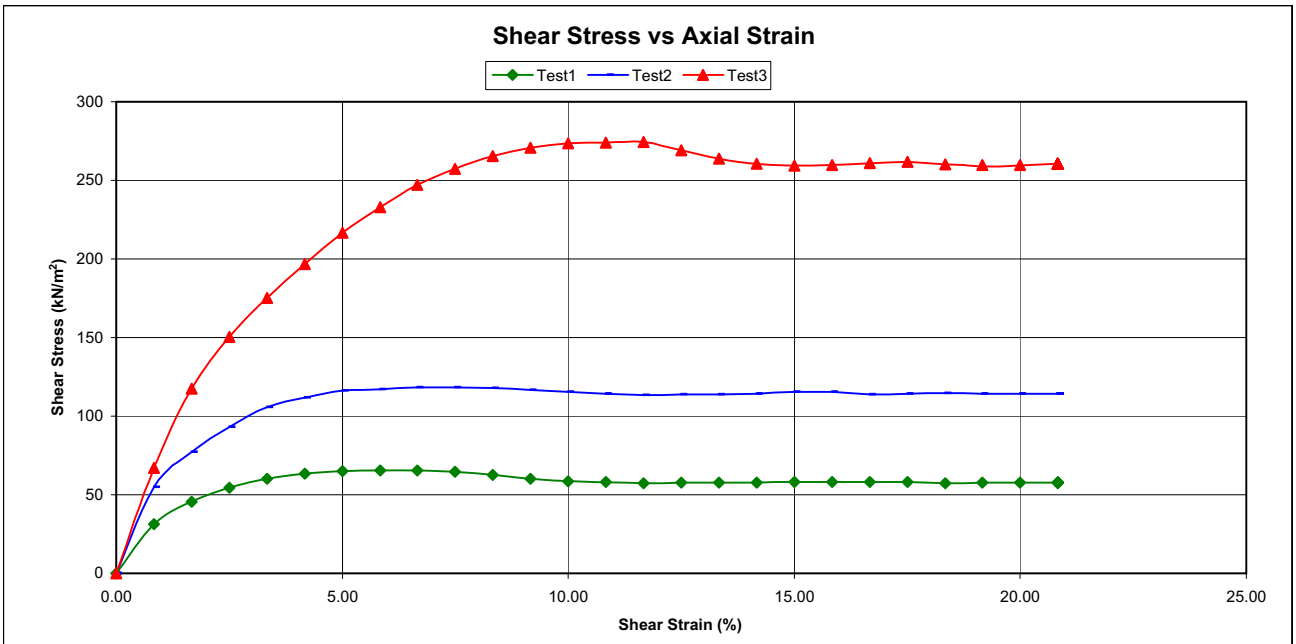
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

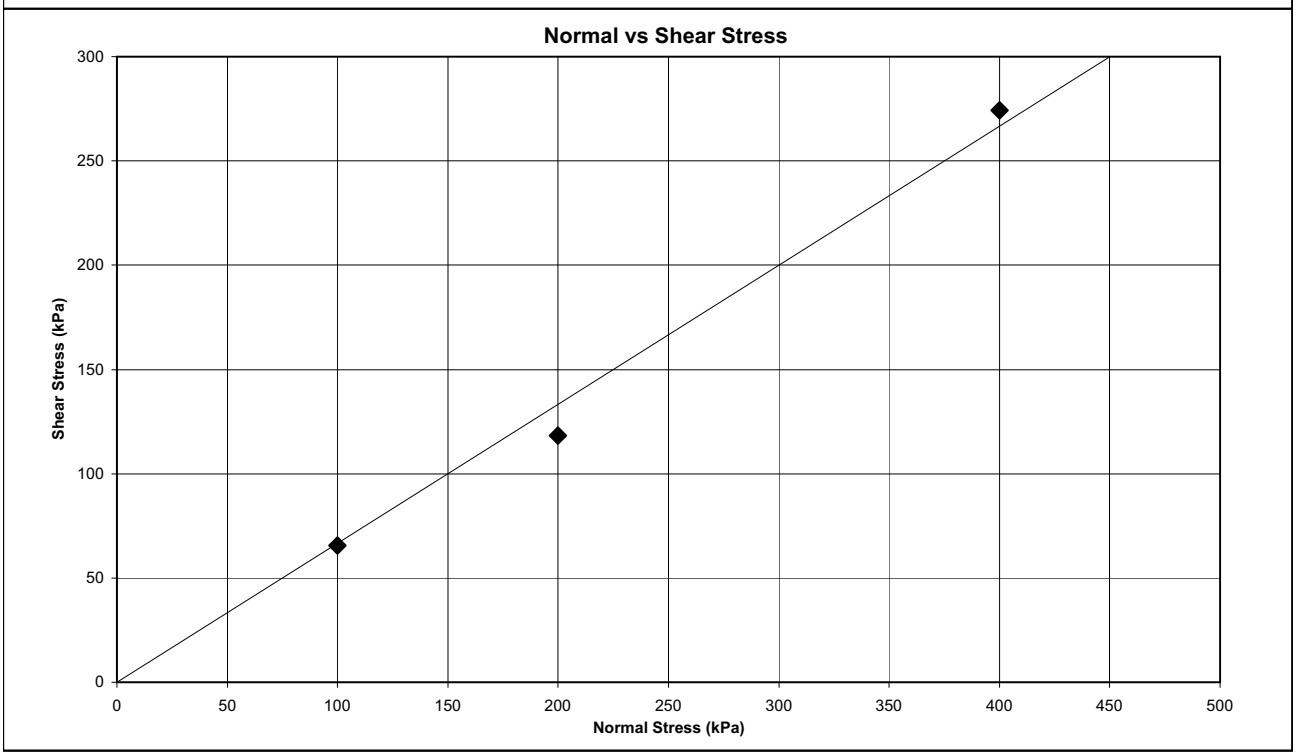
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10147 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 2 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1734	1734	1734
Moisture Content (%)	17.9	17.9	17.9
Shear Strain (%)	5.8	6.7	11.7
Shear Stress (kN/m^2)	65.6	118.2	274.3

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10147 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 17.9
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1771.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	14		100.0	0.83	-3.91	29.4
100	22.5		100.0	1.67	-3.91	47.2
150	27.7		100.0	2.50	-3.91	58.1
200	30.6		100.0	3.33	-3.91	64.2
250	31.8		100.0	4.17	-3.91	66.7
300	32		100.0	5.00	-3.91	67.1
350	31.5		100.0	5.83	-3.91	66.1
400	30.5		100.0	6.67	-3.91	64.0
450	29.1		100.0	7.50	-3.91	61.0
500	28.1		100.0	8.33	-3.91	58.9
550	27.5		100.0	9.17	-3.91	57.7
600	27.5		100.0	10.00	-3.91	57.7
650	27.8		100.0	10.83	-3.91	58.3
700	27.8		100.0	11.67	-3.91	58.3
750	28.2		100.0	12.50	-3.91	59.1
800	28.2		100.0	13.33	-3.91	59.1
850	28.3		100.0	14.17	-3.91	59.4
900	28.3		100.0	15.00	-3.91	59.4
950	28.4		100.0	15.83	-3.91	59.6
1000	28.1		100.0	16.67	-3.91	58.9
1050	28		100.0	17.50	-3.91	58.7
1100	28.1		100.0	18.33	-3.91	58.9
1150	28		100.0	19.17	-3.91	58.7
1200	28		100.0	20.00	-3.91	58.7
1250	28		100.0	20.83	-3.91	58.7

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 17.9
Prooving Ring Factor 76 Dry Density (kg/m^3) 1771.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25		100.0	0.83	-3.91	52.8
100	36.5		100.0	1.67	-3.91	77.1
150	45.2		100.0	2.50	-3.91	95.4
200	52.5		100.0	3.33	-3.91	110.8
250	57.7		100.0	4.17	-3.91	121.8
300	60		100.0	5.00	-3.91	126.7
350	60.7		100.0	5.83	-3.91	128.1
400	60.6		100.0	6.67	-3.91	127.9
450	60.3		100.0	7.50	-3.91	127.3
500	60.1		100.0	8.33	-3.91	126.9
550	58.8		100.0	9.17	-3.91	124.1
600	58		100.0	10.00	-3.91	122.4
650	57.3		100.0	10.83	-3.91	121.0
700	56.7		100.0	11.67	-3.91	119.7
750	56.1		100.0	12.50	-3.91	118.4
800	55.6		100.0	13.33	-3.91	117.4
850	55.2		100.0	14.17	-3.91	116.5
900	55.1		100.0	15.00	-3.91	116.3
950	55		100.0	15.83	-3.91	116.1
1000	55		100.0	16.67	-3.91	116.1
1050	54.9		100.0	17.50	-3.91	115.9
1100	54.9		100.0	18.33	-3.91	115.9
1150	54.9		100.0	19.17	-3.91	115.9
1200	54.9		100.0	20.00	-3.91	115.9
1250	54.8		100.0	20.83	-3.91	115.7

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 17.9
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1771.75
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	35		100.0	0.83	-3.91	72.1
100	62		100.0	1.67	-3.91	127.8
150	78		100.0	2.50	-3.91	160.8
200	90		100.0	3.33	-3.91	185.5
250	100		100.0	4.17	-3.91	206.1
300	109		100.0	5.00	-3.91	224.7
350	116		100.0	5.83	-3.91	239.1
400	121.1		100.0	6.67	-3.91	249.6
450	125.3		100.0	7.50	-3.91	258.3
500	128		100.0	8.33	-3.91	263.8
550	130.1		100.0	9.17	-3.91	268.2
600	131		100.0	10.00	-3.91	270.0
650	129.8		100.0	10.83	-3.91	267.5
700	128.3		100.0	11.67	-3.91	264.4
750	127.1		100.0	12.50	-3.91	262.0
800	126		100.0	13.33	-3.91	259.7
850	125.9		100.0	14.17	-3.91	259.5
900	125.4		100.0	15.00	-3.91	258.5
950	125		100.0	15.83	-3.91	257.6
1000	124.5		100.0	16.67	-3.91	256.6
1050	124		100.0	17.50	-3.91	255.6
1100	124.2		100.0	18.33	-3.91	256.0
1150	123.8		100.0	19.17	-3.91	255.2
1200	124.6		100.0	20.00	-3.91	256.8
1250	125.5		100.0	20.83	-3.91	258.7

CONSOLIDATED DRAINED SHEAR BOX TEST

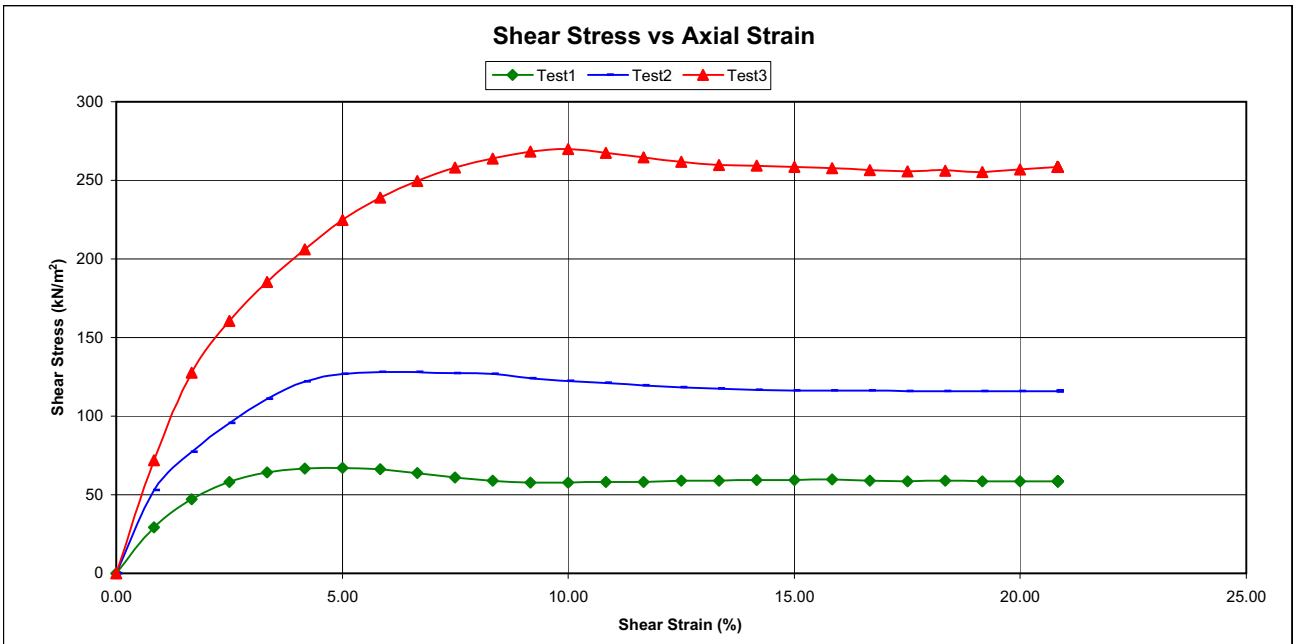
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

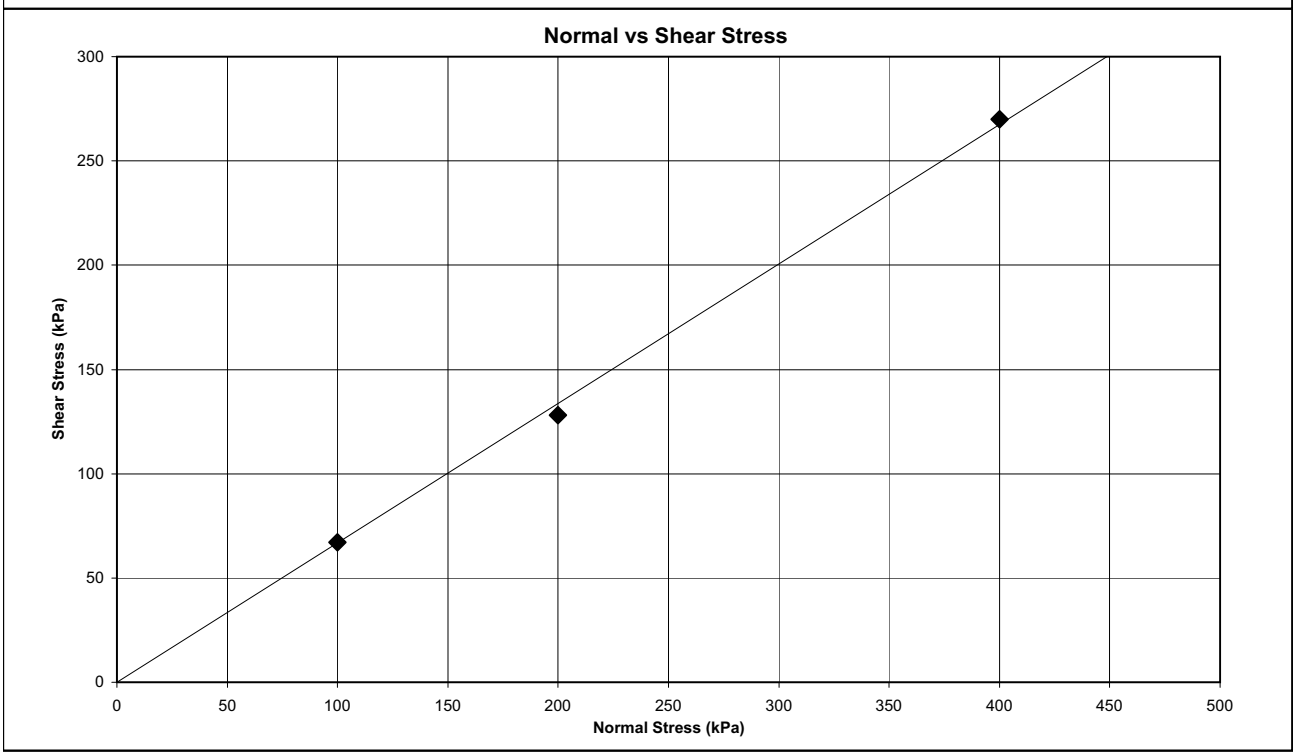
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10147 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 2 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1772	1772	1772
Moisture Content (%)	17.9	17.9	17.9
Shear Strain (%)	5.0	5.8	10.0
Shear Stress (kN/m^2)	67.1	128.1	270.0

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
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Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10148 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.7
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	14		100.0	0.83	-3.91	29.4
100	21.5		100.0	1.67	-3.91	45.1
150	25		100.0	2.50	-3.91	52.4
200	27		100.0	3.33	-3.91	56.6
250	27.5		100.0	4.17	-3.91	57.7
300	28		100.0	5.00	-3.91	58.7
350	28		100.0	5.83	-3.91	58.7
400	28		100.0	6.67	-3.91	58.7
450	28		100.0	7.50	-3.91	58.7
500	28.1		100.0	8.33	-3.91	58.9
550	28.1		100.0	9.17	-3.91	58.9
600	28.1		100.0	10.00	-3.91	58.9
650	27.5		100.0	10.83	-3.91	57.7
700	27.7		100.0	11.67	-3.91	58.1
750	27.3		100.0	12.50	-3.91	57.3
800	27.5		100.0	13.33	-3.91	57.7
850	27.8		100.0	14.17	-3.91	58.3
900	27.8		100.0	15.00	-3.91	58.3
950	27.8		100.0	15.83	-3.91	58.3
1000	27.6		100.0	16.67	-3.91	57.9
1050	27.8		100.0	17.50	-3.91	58.3
1100	27.8		100.0	18.33	-3.91	58.3
1150	27.7		100.0	19.17	-3.91	58.1
1200	27.8		100.0	20.00	-3.91	58.3
1250	27.6		100.0	20.83	-3.91	57.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.7
Prooving Ring Factor 76 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	23		100.0	0.83	-3.91	48.6
100	38		100.0	1.67	-3.91	80.2
150	47.3		100.0	2.50	-3.91	99.9
200	53		100.0	3.33	-3.91	111.9
250	56		100.0	4.17	-3.91	118.2
300	57.1		100.0	5.00	-3.91	120.5
350	57.3		100.0	5.83	-3.91	121.0
400	57.2		100.0	6.67	-3.91	120.8
450	56.9		100.0	7.50	-3.91	120.1
500	56.1		100.0	8.33	-3.91	118.4
550	55.8		100.0	9.17	-3.91	117.8
600	55.4		100.0	10.00	-3.91	117.0
650	55.3		100.0	10.83	-3.91	116.7
700	55.1		100.0	11.67	-3.91	116.3
750	55.1		100.0	12.50	-3.91	116.3
800	55		100.0	13.33	-3.91	116.1
850	55.1		100.0	14.17	-3.91	116.3
900	55.2		100.0	15.00	-3.91	116.5
950	55.4		100.0	15.83	-3.91	117.0
1000	55.3		100.0	16.67	-3.91	116.7
1050	55.4		100.0	17.50	-3.91	117.0
1100	55.6		100.0	18.33	-3.91	117.4
1150	55.6		100.0	19.17	-3.91	117.4
1200	55.7		100.0	20.00	-3.91	117.6
1250	55.7		100.0	20.83	-3.91	117.6

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.7
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	36		100.0	0.83	-3.91	74.2
100	63		100.0	1.67	-3.91	129.9
150	82		100.0	2.50	-3.91	169.0
200	98		100.0	3.33	-3.91	202.0
250	110.2		100.0	4.17	-3.91	227.1
300	119.5		100.0	5.00	-3.91	246.3
350	125.6		100.0	5.83	-3.91	258.9
400	129.8		100.0	6.67	-3.91	267.5
450	131.8		100.0	7.50	-3.91	271.7
500	132.4		100.0	8.33	-3.91	272.9
550	132		100.0	9.17	-3.91	272.1
600	131.6		100.0	10.00	-3.91	271.2
650	130.2		100.0	10.83	-3.91	268.4
700	128		100.0	11.67	-3.91	263.8
750	127.7		100.0	12.50	-3.91	263.2
800	127.9		100.0	13.33	-3.91	263.6
850	127.3		100.0	14.17	-3.91	262.4
900	127.4		100.0	15.00	-3.91	262.6
950	127.4		100.0	15.83	-3.91	262.6
1000	127.1		100.0	16.67	-3.91	262.0
1050	126.4		100.0	17.50	-3.91	260.5
1100	127.1		100.0	18.33	-3.91	262.0
1150	127		100.0	19.17	-3.91	261.8
1200	127.2		100.0	20.00	-3.91	262.2
1250	127.1		100.0	20.83	-3.91	262.0

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
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Tel : (031) 201-8992
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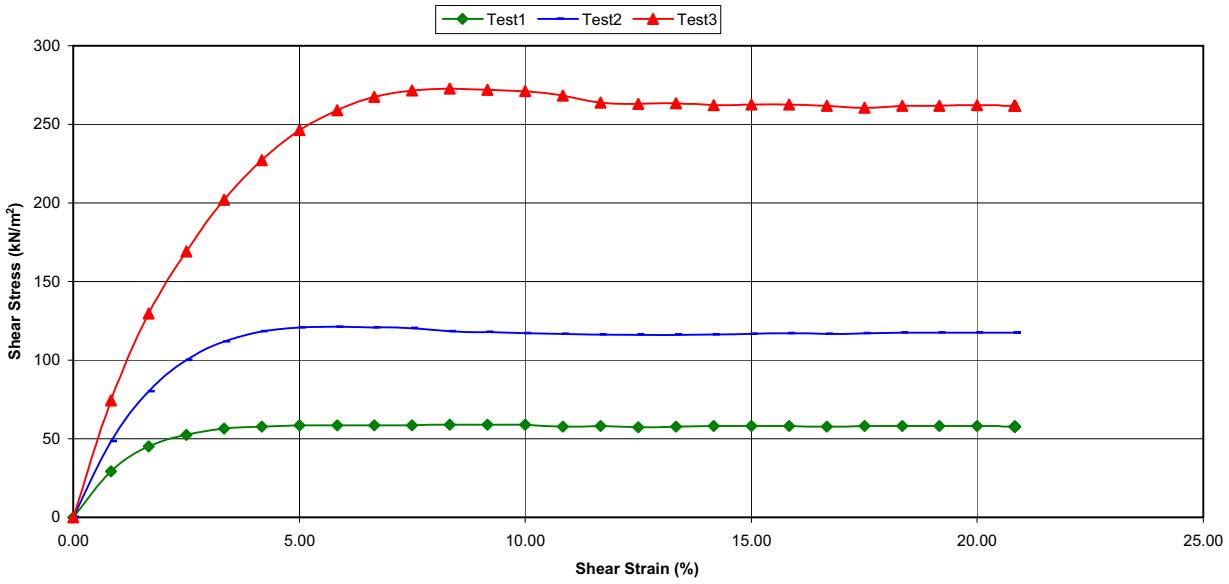
Fax : (031) 201-7920

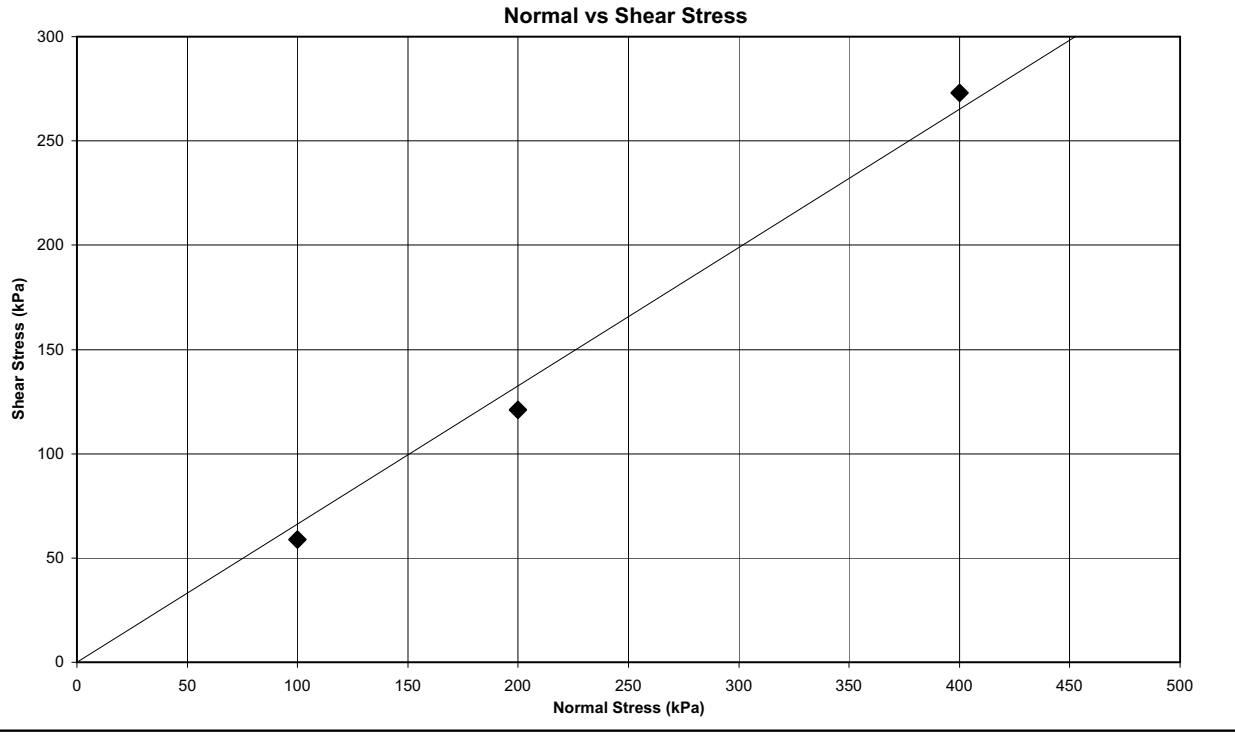
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 2 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1732	1732	1732
Moisture Content (%)	22.7	22.7	22.7
Shear Strain (%)	8.3	5.8	8.3
Shear Stress (kN/m^2)	58.9	121.0	272.9

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
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Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10148 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.7
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	15		100.0	0.83	-3.91	31.5
100	22.5		100.0	1.67	-3.91	47.2
150	26.5		100.0	2.50	-3.91	55.6
200	28.5		100.0	3.33	-3.91	59.8
250	29.8		100.0	4.17	-3.91	62.5
300	30.2		100.0	5.00	-3.91	63.3
350	29		100.0	5.83	-3.91	60.8
400	28.2		100.0	6.67	-3.91	59.1
450	27.6		100.0	7.50	-3.91	57.9
500	27.4		100.0	8.33	-3.91	57.5
550	27.3		100.0	9.17	-3.91	57.3
600	27.2		100.0	10.00	-3.91	57.0
650	27.3		100.0	10.83	-3.91	57.3
700	27.3		100.0	11.67	-3.91	57.3
750	27.4		100.0	12.50	-3.91	57.5
800	27.2		100.0	13.33	-3.91	57.0
850	27.2		100.0	14.17	-3.91	57.0
900	27.3		100.0	15.00	-3.91	57.3
950	27.5		100.0	15.83	-3.91	57.7
1000	27.5		100.0	16.67	-3.91	57.7
1050	27.7		100.0	17.50	-3.91	58.1
1100	27.5		100.0	18.33	-3.91	57.7
1150	27.2		100.0	19.17	-3.91	57.0
1200	27.4		100.0	20.00	-3.91	57.5
1250	27.6		100.0	20.83	-3.91	57.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.7
Prooving Ring Factor 76 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25		100.0	0.83	-3.91	52.8
100	41.5		100.0	1.67	-3.91	87.6
150	51.2		100.0	2.50	-3.91	108.1
200	56.6		100.0	3.33	-3.91	119.5
250	58.9		100.0	4.17	-3.91	124.3
300	59.1		100.0	5.00	-3.91	124.8
350	59		100.0	5.83	-3.91	124.6
400	57.9		100.0	6.67	-3.91	122.2
450	56.5		100.0	7.50	-3.91	119.3
500	55.8		100.0	8.33	-3.91	117.8
550	55.5		100.0	9.17	-3.91	117.2
600	55.1		100.0	10.00	-3.91	116.3
650	55		100.0	10.83	-3.91	116.1
700	55		100.0	11.67	-3.91	116.1
750	55		100.0	12.50	-3.91	116.1
800	55		100.0	13.33	-3.91	116.1
850	54.9		100.0	14.17	-3.91	115.9
900	55.1		100.0	15.00	-3.91	116.3
950	55.2		100.0	15.83	-3.91	116.5
1000	55.4		100.0	16.67	-3.91	117.0
1050	55.5		100.0	17.50	-3.91	117.2
1100	55.3		100.0	18.33	-3.91	116.7
1150	55.3		100.0	19.17	-3.91	116.7
1200	55.2		100.0	20.00	-3.91	116.5
1250	55.3		100.0	20.83	-3.91	116.7

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.7
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	37		100.0	0.83	-3.91	76.3
100	65		100.0	1.67	-3.91	134.0
150	85		100.0	2.50	-3.91	175.2
200	103		100.0	3.33	-3.91	212.3
250	117.5		100.0	4.17	-3.91	242.2
300	129		100.0	5.00	-3.91	265.9
350	137.7		100.0	5.83	-3.91	283.8
400	142.5		100.0	6.67	-3.91	293.7
450	144.3		100.0	7.50	-3.91	297.4
500	143.5		100.0	8.33	-3.91	295.8
550	141.7		100.0	9.17	-3.91	292.1
600	139		100.0	10.00	-3.91	286.5
650	137.2		100.0	10.83	-3.91	282.8
700	135.3		100.0	11.67	-3.91	278.9
750	133.5		100.0	12.50	-3.91	275.2
800	132.7		100.0	13.33	-3.91	273.5
850	132.2		100.0	14.17	-3.91	272.5
900	132.2		100.0	15.00	-3.91	272.5
950	132.3		100.0	15.83	-3.91	272.7
1000	132.2		100.0	16.67	-3.91	272.5
1050	132.3		100.0	17.50	-3.91	272.7
1100	132		100.0	18.33	-3.91	272.1
1150	131.2		100.0	19.17	-3.91	270.4
1200	131		100.0	20.00	-3.91	270.0
1250	131		100.0	20.83	-3.91	270.0

CONSOLIDATED DRAINED SHEAR BOX TEST

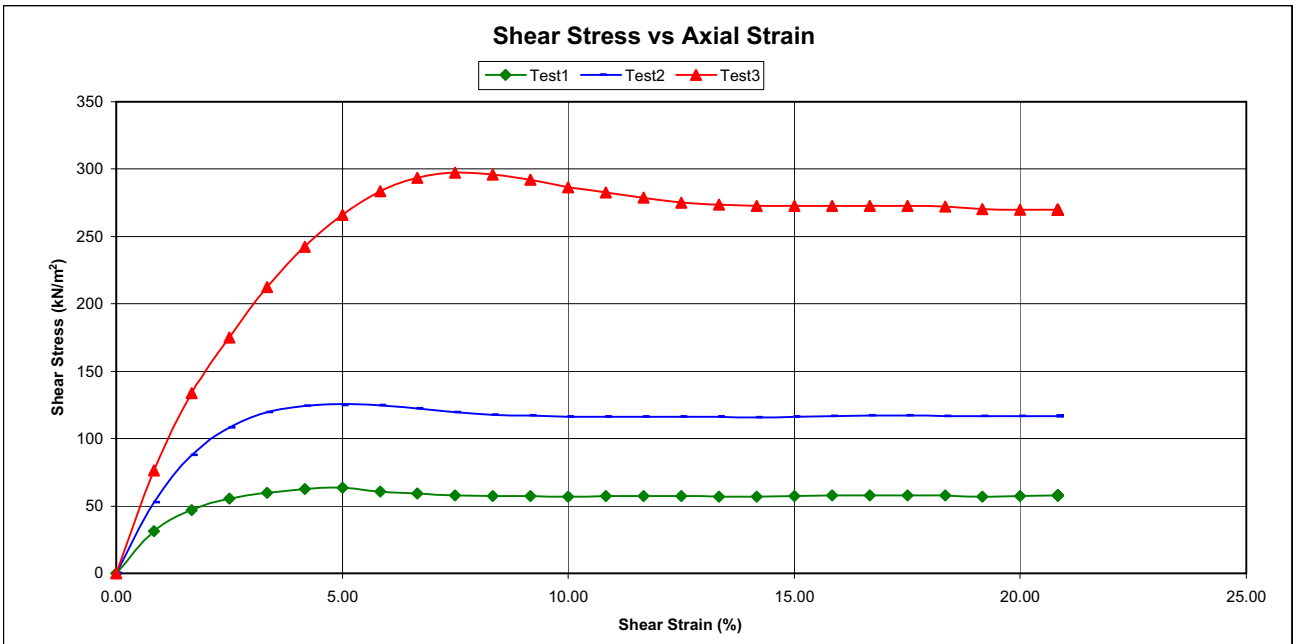
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

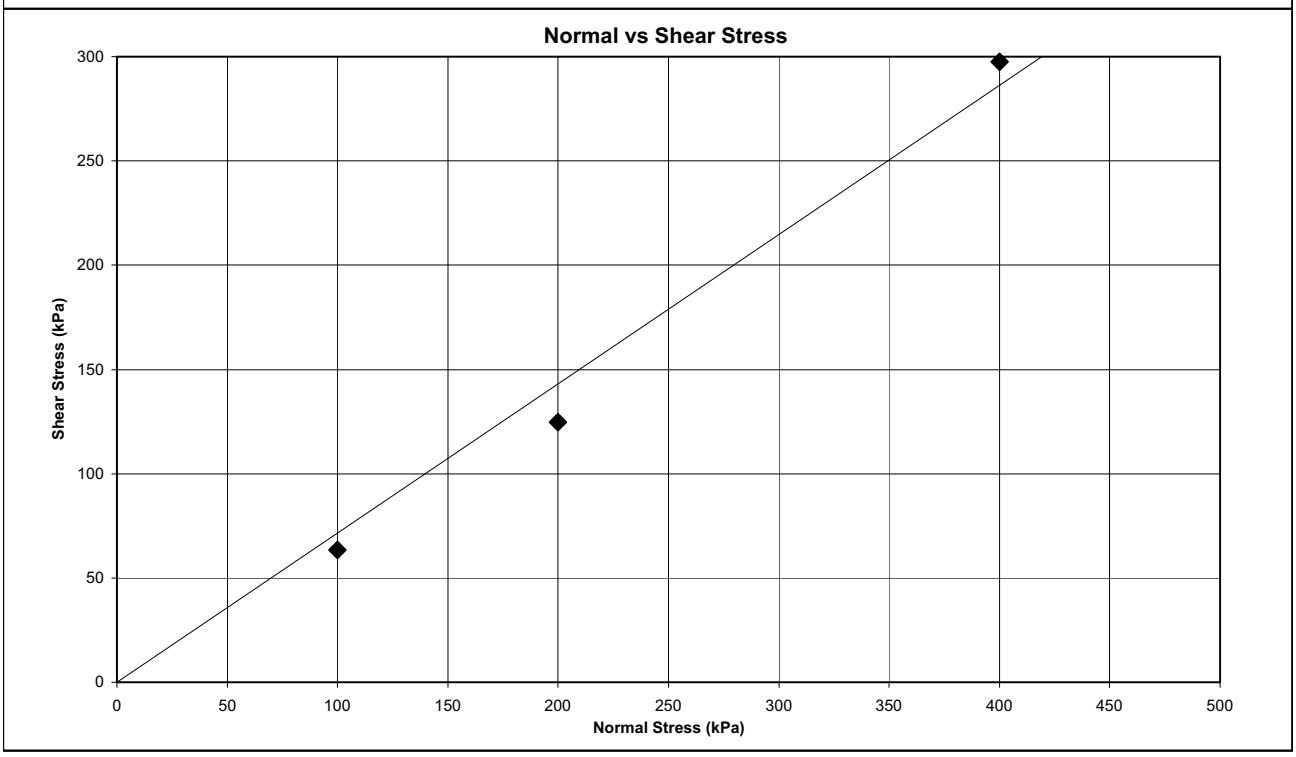
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 2 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1789	1789	1789
Moisture Content (%)	22.7	22.7	22.7
Shear Strain (%)	5.0	5.0	7.5
Shear Stress (kN/m^2)	63.3	124.8	297.4

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
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Tel : (031) 201-8992
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Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10148 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 2 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.7
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	14		100.0	0.83	-3.91	29.4
100	23		100.0	1.67	-3.91	48.2
150	28		100.0	2.50	-3.91	58.7
200	30.7		100.0	3.33	-3.91	64.4
250	31.8		100.0	4.17	-3.91	66.7
300	31.8		100.0	5.00	-3.91	66.7
350	31		100.0	5.83	-3.91	65.0
400	30		100.0	6.67	-3.91	62.9
450	29.1		100.0	7.50	-3.91	61.0
500	28.6		100.0	8.33	-3.91	60.0
550	28		100.0	9.17	-3.91	58.7
600	27.8		100.0	10.00	-3.91	58.3
650	27.7		100.0	10.83	-3.91	58.1
700	27.7		100.0	11.67	-3.91	58.1
750	27.5		100.0	12.50	-3.91	57.7
800	27.4		100.0	13.33	-3.91	57.5
850	27.7		100.0	14.17	-3.91	58.1
900	27.8		100.0	15.00	-3.91	58.3
950	28		100.0	15.83	-3.91	58.7
1000	27.7		100.0	16.67	-3.91	58.1
1050	27.8		100.0	17.50	-3.91	58.3
1100	27.8		100.0	18.33	-3.91	58.3
1150	27.8		100.0	19.17	-3.91	58.3
1200	27.9		100.0	20.00	-3.91	58.5
1250	28		100.0	20.83	-3.91	58.7

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.7
Prooving Ring Factor 76 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26		100.0	0.83	-3.91	54.9
100	40.7		100.0	1.67	-3.91	85.9
150	52		100.0	2.50	-3.91	109.8
200	59.2		100.0	3.33	-3.91	125.0
250	63.2		100.0	4.17	-3.91	133.4
300	65		100.0	5.00	-3.91	137.2
350	65.5		100.0	5.83	-3.91	138.3
400	65.7		100.0	6.67	-3.91	138.7
450	64.6		100.0	7.50	-3.91	136.4
500	61		100.0	8.33	-3.91	128.8
550	59.3		100.0	9.17	-3.91	125.2
600	58.3		100.0	10.00	-3.91	123.1
650	57.8		100.0	10.83	-3.91	122.0
700	57.6		100.0	11.67	-3.91	121.6
750	57.4		100.0	12.50	-3.91	121.2
800	57.2		100.0	13.33	-3.91	120.8
850	57		100.0	14.17	-3.91	120.3
900	57.1		100.0	15.00	-3.91	120.5
950	57.3		100.0	15.83	-3.91	121.0
1000	57.2		100.0	16.67	-3.91	120.8
1050	57.2		100.0	17.50	-3.91	120.8
1100	57.4		100.0	18.33	-3.91	121.2
1150	57.4		100.0	19.17	-3.91	121.2
1200	57.6		100.0	20.00	-3.91	121.6
1250	57.9		100.0	20.83	-3.91	122.2

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.7
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	37		100.0	0.83	-3.91	76.3
100	62		100.0	1.67	-3.91	127.8
150	81		100.0	2.50	-3.91	167.0
200	99		100.0	3.33	-3.91	204.1
250	113		100.0	4.17	-3.91	232.9
300	125.2		100.0	5.00	-3.91	258.1
350	135.4		100.0	5.83	-3.91	279.1
400	141		100.0	6.67	-3.91	290.6
450	141.9		100.0	7.50	-3.91	292.5
500	140.1		100.0	8.33	-3.91	288.8
550	136.8		100.0	9.17	-3.91	282.0
600	133.8		100.0	10.00	-3.91	275.8
650	131.4		100.0	10.83	-3.91	270.8
700	128.3		100.0	11.67	-3.91	264.4
750	126.4		100.0	12.50	-3.91	260.5
800	125.1		100.0	13.33	-3.91	257.8
850	124.6		100.0	14.17	-3.91	256.8
900	125		100.0	15.00	-3.91	257.6
950	124.8		100.0	15.83	-3.91	257.2
1000	124.9		100.0	16.67	-3.91	257.4
1050	125		100.0	17.50	-3.91	257.6
1100	125		100.0	18.33	-3.91	257.6
1150	125.2		100.0	19.17	-3.91	258.1
1200	125.8		100.0	20.00	-3.91	259.3
1250	126		100.0	20.83	-3.91	259.7

CONSOLIDATED DRAINED SHEAR BOX TEST

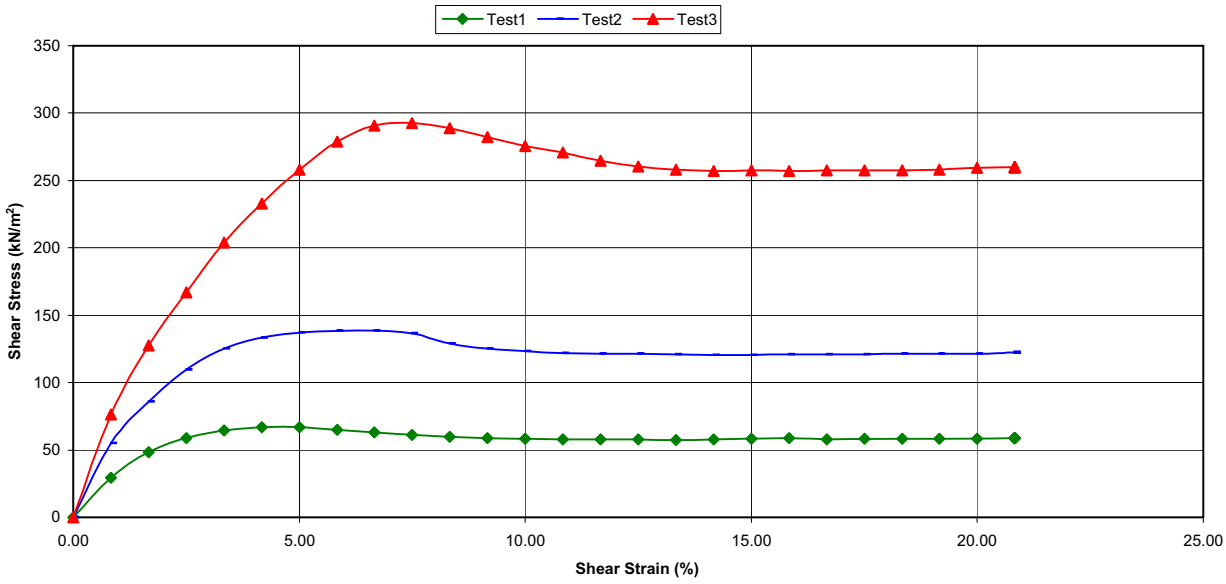
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

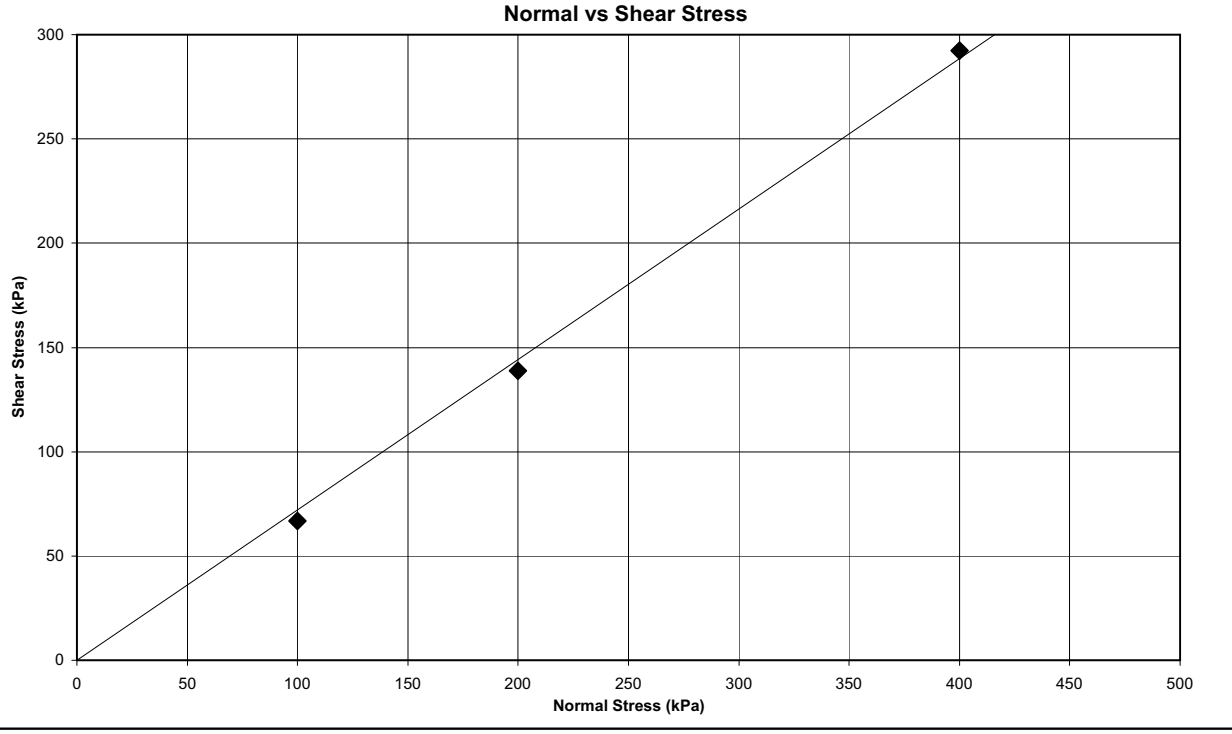
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 2 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1828	1828	1828
Moisture Content (%)	22.7	22.7	22.7
Shear Strain (%)	4.2	6.7	7.5
Shear Stress (kN/m^2)	66.7	138.7	292.5

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10149 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1698.3
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	15.2		100.0	0.83	-3.91	31.9
100	20.3		100.0	1.67	-3.91	42.6
150	22.2		100.0	2.50	-3.91	46.6
200	24.1		100.0	3.33	-3.91	50.5
250	25.1		100.0	4.17	-3.91	52.6
300	25.2		100.0	5.00	-3.91	52.9
350	25.9		100.0	5.83	-3.91	54.3
400	26		100.0	6.67	-3.91	54.5
450	26.5		100.0	7.50	-3.91	55.6
500	26.8		100.0	8.33	-3.91	56.2
550	27		100.0	9.17	-3.91	56.6
600	27		100.0	10.00	-3.91	56.6
650	27.2		100.0	10.83	-3.91	57.0
700	27.9		100.0	11.67	-3.91	58.5
750	27.9		100.0	12.50	-3.91	58.5
800	28.1		100.0	13.33	-3.91	58.9
850	28.3		100.0	14.17	-3.91	59.4
900	28.4		100.0	15.00	-3.91	59.6
950	28.5		100.0	15.83	-3.91	59.8
1000	28.7		100.0	16.67	-3.91	60.2
1050	28.8		100.0	17.50	-3.91	60.4
1100	29		100.0	18.33	-3.91	60.8
1150	29.2		100.0	19.17	-3.91	61.2
1200	29		100.0	20.00	-3.91	60.8
1250	28.9		100.0	20.83	-3.91	60.6

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1698.3
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	24		100.0	0.83	-3.91	50.7
100	34		100.0	1.67	-3.91	71.8
150	39		100.0	2.50	-3.91	82.3
200	44.5		100.0	3.33	-3.91	93.9
250	49		100.0	4.17	-3.91	103.4
300	51.7		100.0	5.00	-3.91	109.1
350	54		100.0	5.83	-3.91	114.0
400	55.6		100.0	6.67	-3.91	117.4
450	56.6		100.0	7.50	-3.91	119.5
500	57		100.0	8.33	-3.91	120.3
550	56.9		100.0	9.17	-3.91	120.1
600	56.6		100.0	10.00	-3.91	119.5
650	56.2		100.0	10.83	-3.91	118.6
700	55.9		100.0	11.67	-3.91	118.0
750	56		100.0	12.50	-3.91	118.2
800	56.1		100.0	13.33	-3.91	118.4
850	56		100.0	14.17	-3.91	118.2
900	56		100.0	15.00	-3.91	118.2
950	56.1		100.0	15.83	-3.91	118.4
1000	54.9		100.0	16.67	-3.91	115.9
1050	54.8		100.0	17.50	-3.91	115.7
1100	54.4		100.0	18.33	-3.91	114.8
1150	54.1		100.0	19.17	-3.91	114.2
1200	54.3		100.0	20.00	-3.91	114.6
1250	53.8		100.0	20.83	-3.91	113.6

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1698.3
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	33		100.0	0.83	-3.91	68.0
100	51.5		100.0	1.67	-3.91	106.1
150	66		100.0	2.50	-3.91	136.0
200	78.5		100.0	3.33	-3.91	161.8
250	87.8		100.0	4.17	-3.91	181.0
300	97		100.0	5.00	-3.91	199.9
350	105.2		100.0	5.83	-3.91	216.8
400	112		100.0	6.67	-3.91	230.8
450	117		100.0	7.50	-3.91	241.2
500	121		100.0	8.33	-3.91	249.4
550	126.2		100.0	9.17	-3.91	260.1
600	129.7		100.0	10.00	-3.91	267.3
650	131		100.0	10.83	-3.91	270.0
700	131		100.0	11.67	-3.91	270.0
750	131.1		100.0	12.50	-3.91	270.2
800	129.8		100.0	13.33	-3.91	267.5
850	129.9		100.0	14.17	-3.91	267.7
900	130		100.0	15.00	-3.91	267.9
950	129.2		100.0	15.83	-3.91	266.3
1000	129.7		100.0	16.67	-3.91	267.3
1050	130.2		100.0	17.50	-3.91	268.4
1100	129.9		100.0	18.33	-3.91	267.7
1150	129.4		100.0	19.17	-3.91	266.7
1200	128.6		100.0	20.00	-3.91	265.1
1250	129.6		100.0	20.83	-3.91	267.1

CONSOLIDATED DRAINED SHEAR BOX TEST

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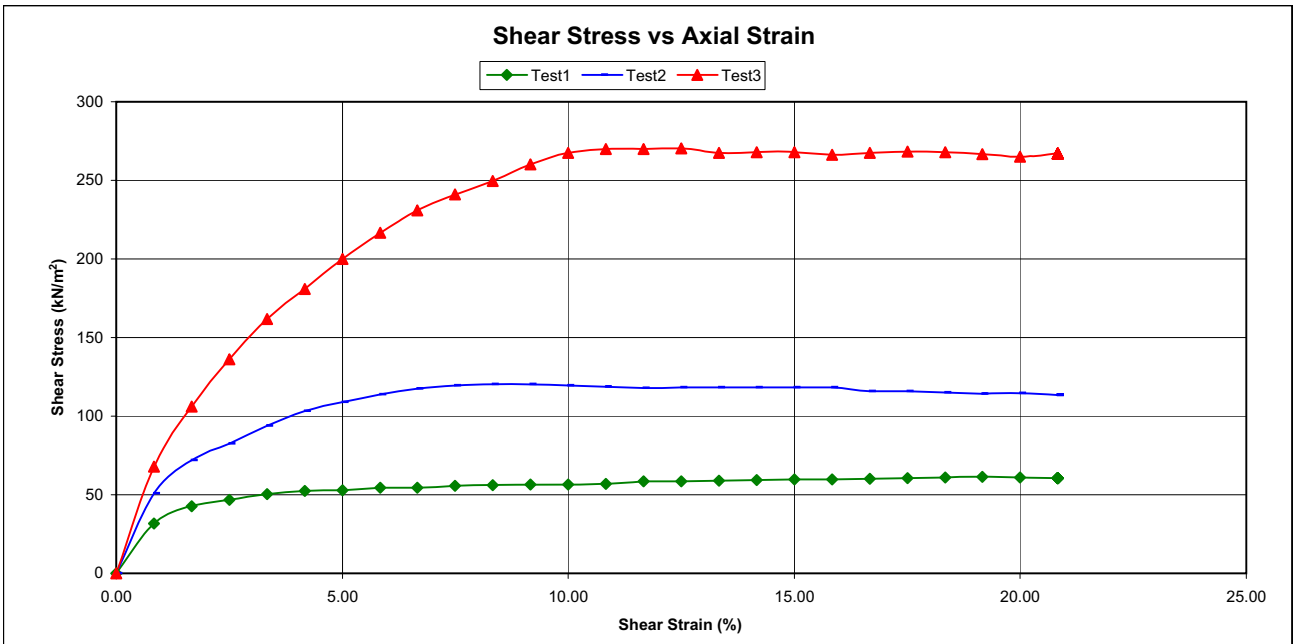
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

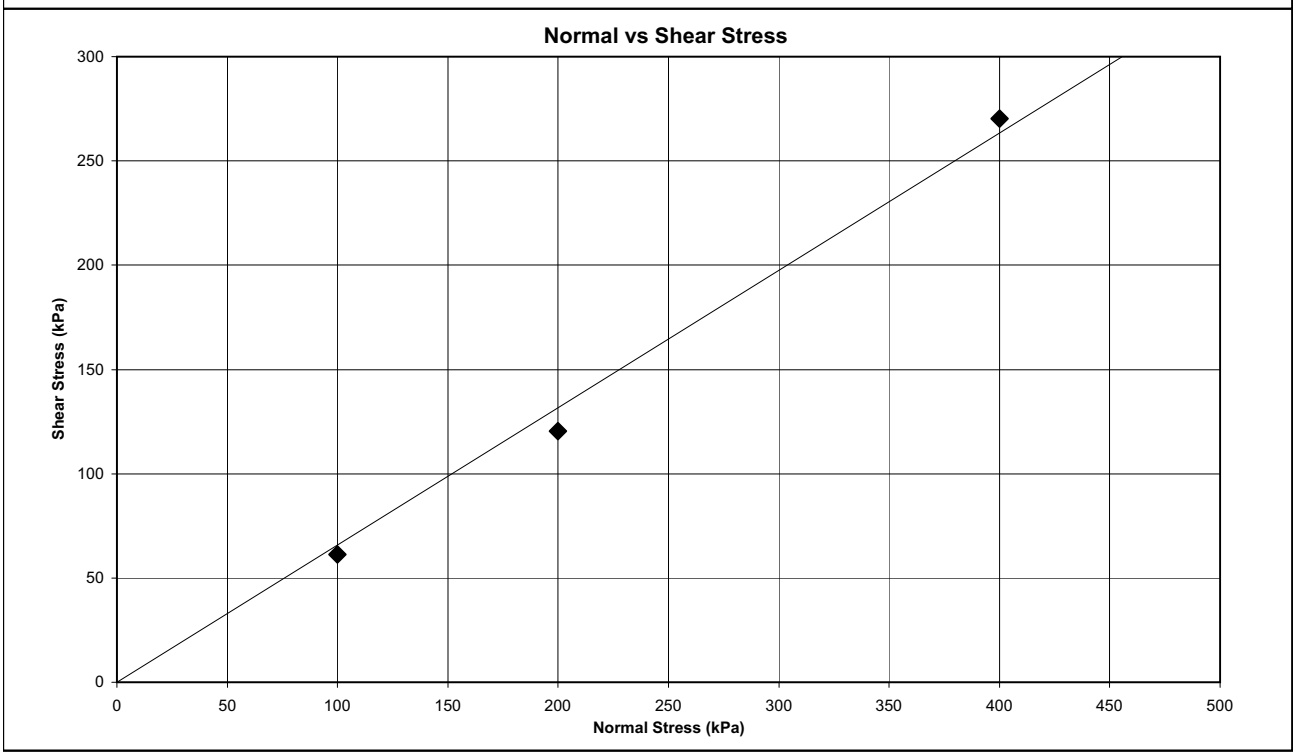
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10149 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 3 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1698	1698	1698
Moisture Content (%)	15.8	15.8	15.8
Shear Strain (%)	19.2	8.3	12.5
Shear Stress (kN/m^2)	61.2	120.3	270.2

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	33
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961
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Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10149 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1754.91
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	13		100.0	0.83	-3.91	27.3
100	20.7		100.0	1.67	-3.91	43.4
150	25.3		100.0	2.50	-3.91	53.1
200	28		100.0	3.33	-3.91	58.7
250	29.5		100.0	4.17	-3.91	61.9
300	30.1		100.0	5.00	-3.91	63.1
350	30.2		100.0	5.83	-3.91	63.3
400	30.2		100.0	6.67	-3.91	63.3
450	29.7		100.0	7.50	-3.91	62.3
500	29.3		100.0	8.33	-3.91	61.4
550	29.1		100.0	9.17	-3.91	61.0
600	29.1		100.0	10.00	-3.91	61.0
650	29		100.0	10.83	-3.91	60.8
700	28.9		100.0	11.67	-3.91	60.6
750	28.9		100.0	12.50	-3.91	60.6
800	28.8		100.0	13.33	-3.91	60.4
850	28.8		100.0	14.17	-3.91	60.4
900	28.7		100.0	15.00	-3.91	60.2
950	28.1		100.0	15.83	-3.91	58.9
1000	28.6		100.0	16.67	-3.91	60.0
1050	28.2		100.0	17.50	-3.91	59.1
1100	28.4		100.0	18.33	-3.91	59.6
1150	28.1		100.0	19.17	-3.91	58.9
1200	27.6		100.0	20.00	-3.91	57.9
1250	28.5		100.0	20.83	-3.91	59.8

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1754.91
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	24		100.0	0.83	-3.91	50.7
100	36		100.0	1.67	-3.91	76.0
150	44		100.0	2.50	-3.91	92.9
200	49		100.0	3.33	-3.91	103.4
250	52		100.0	4.17	-3.91	109.8
300	54		100.0	5.00	-3.91	114.0
350	55		100.0	5.83	-3.91	116.1
400	55.5		100.0	6.67	-3.91	117.2
450	55.5		100.0	7.50	-3.91	117.2
500	55.4		100.0	8.33	-3.91	117.0
550	55.4		100.0	9.17	-3.91	117.0
600	55		100.0	10.00	-3.91	116.1
650	55		100.0	10.83	-3.91	116.1
700	54.9		100.0	11.67	-3.91	115.9
750	54.7		100.0	12.50	-3.91	115.5
800	54.3		100.0	13.33	-3.91	114.6
850	54.3		100.0	14.17	-3.91	114.6
900	54.1		100.0	15.00	-3.91	114.2
950	54.1		100.0	15.83	-3.91	114.2
1000	54		100.0	16.67	-3.91	114.0
1050	53.9		100.0	17.50	-3.91	113.8
1100	53.6		100.0	18.33	-3.91	113.2
1150	53.3		100.0	19.17	-3.91	112.5
1200	53.1		100.0	20.00	-3.91	112.1
1250	53.2		100.0	20.83	-3.91	112.3

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1754.91
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	34		100.0	0.83	-3.91	70.1
100	58		100.0	1.67	-3.91	119.5
150	74		100.0	2.50	-3.91	152.5
200	87		100.0	3.33	-3.91	179.3
250	97.3		100.0	4.17	-3.91	200.5
300	106		100.0	5.00	-3.91	218.5
350	113.4		100.0	5.83	-3.91	233.7
400	119		100.0	6.67	-3.91	245.3
450	123		100.0	7.50	-3.91	253.5
500	125.9		100.0	8.33	-3.91	259.5
550	128		100.0	9.17	-3.91	263.8
600	129.2		100.0	10.00	-3.91	266.3
650	129.9		100.0	10.83	-3.91	267.7
700	129.3		100.0	11.67	-3.91	266.5
750	129.3		100.0	12.50	-3.91	266.5
800	128.5		100.0	13.33	-3.91	264.9
850	127.9		100.0	14.17	-3.91	263.6
900	127.2		100.0	15.00	-3.91	262.2
950	126.7		100.0	15.83	-3.91	261.1
1000	126.3		100.0	16.67	-3.91	260.3
1050	126.4		100.0	17.50	-3.91	260.5
1100	126		100.0	18.33	-3.91	259.7
1150	125.8		100.0	19.17	-3.91	259.3
1200	126.1		100.0	20.00	-3.91	259.9
1250	126.7		100.0	20.83	-3.91	261.1

CONSOLIDATED DRAINED SHEAR BOX TEST

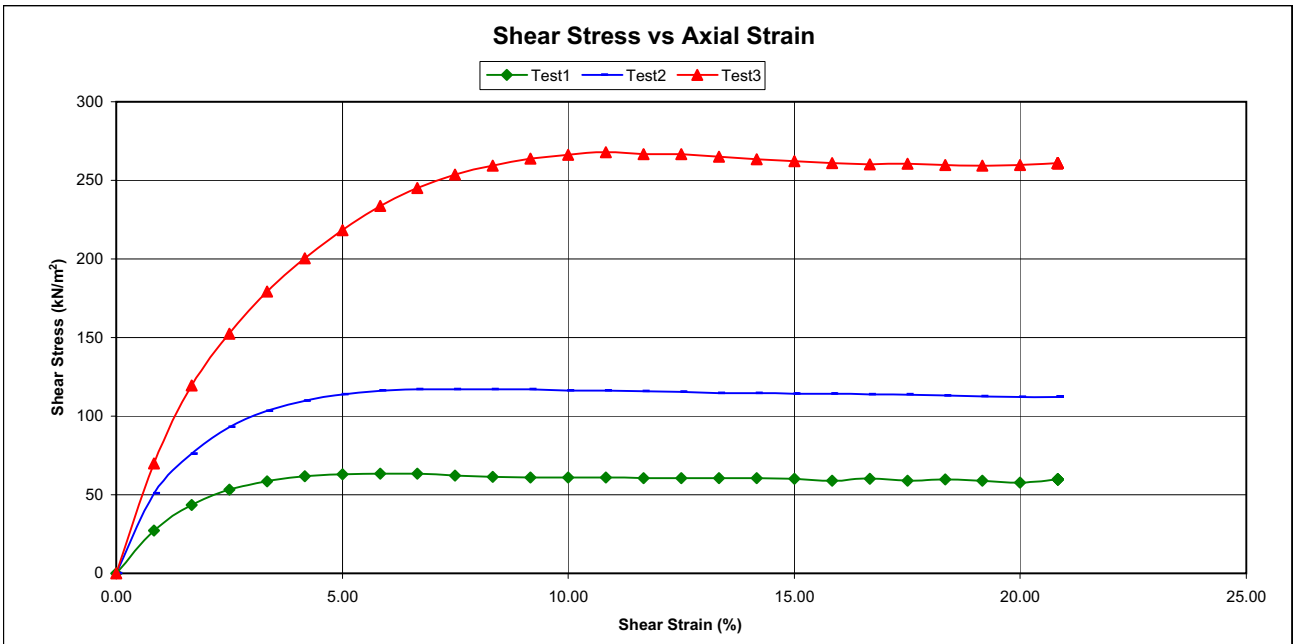
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

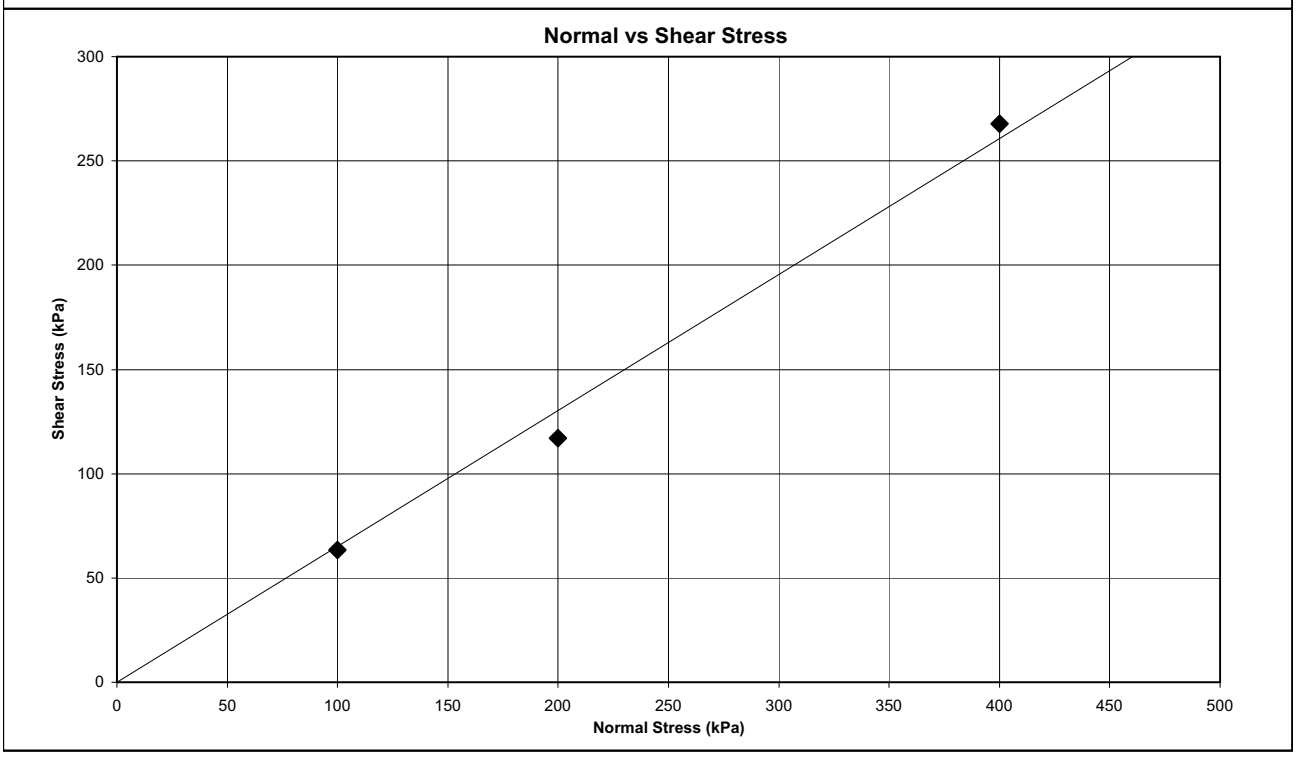
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10149 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 3 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1755	1755	1755
Moisture Content (%)	15.8	15.8	15.8
Shear Strain (%)	5.8	6.7	10.8
Shear Stress (kN/m^2)	63.3	117.2	267.7

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	33
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
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Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10149 Harbour Bed Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 15.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1792.65
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	14		100.0	0.83	-3.91	29.4
100	21		100.0	1.67	-3.91	44.0
150	25		100.0	2.50	-3.91	52.4
200	28.2		100.0	3.33	-3.91	59.1
250	28.6		100.0	4.17	-3.91	60.0
300	29.5		100.0	5.00	-3.91	61.9
350	29.6		100.0	5.83	-3.91	62.1
400	29.6		100.0	6.67	-3.91	62.1
450	29.2		100.0	7.50	-3.91	61.2
500	28.6		100.0	8.33	-3.91	60.0
550	28.1		100.0	9.17	-3.91	58.9
600	27.8		100.0	10.00	-3.91	58.3
650	27.7		100.0	10.83	-3.91	58.1
700	27.4		100.0	11.67	-3.91	57.5
750	27.4		100.0	12.50	-3.91	57.5
800	26.8		100.0	13.33	-3.91	56.2
850	27.1		100.0	14.17	-3.91	56.8
900	27.1		100.0	15.00	-3.91	56.8
950	27.4		100.0	15.83	-3.91	57.5
1000	27.8		100.0	16.67	-3.91	58.3
1050	28.1		100.0	17.50	-3.91	58.9
1100	28.1		100.0	18.33	-3.91	58.9
1150	28.2		100.0	19.17	-3.91	59.1
1200	28.7		100.0	20.00	-3.91	60.2
1250	28.8		100.0	20.83	-3.91	60.4

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 15.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1792.65
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26.7		100.0	0.83	-3.91	56.4
100	38		100.0	1.67	-3.91	80.2
150	45.5		100.0	2.50	-3.91	96.1
200	50.7		100.0	3.33	-3.91	107.0
250	53.5		100.0	4.17	-3.91	112.9
300	55.3		100.0	5.00	-3.91	116.7
350	56.6		100.0	5.83	-3.91	119.5
400	57.1		100.0	6.67	-3.91	120.5
450	57.5		100.0	7.50	-3.91	121.4
500	57.6		100.0	8.33	-3.91	121.6
550	57.8		100.0	9.17	-3.91	122.0
600	57.7		100.0	10.00	-3.91	121.8
650	57.6		100.0	10.83	-3.91	121.6
700	57.4		100.0	11.67	-3.91	121.2
750	57.3		100.0	12.50	-3.91	121.0
800	57.3		100.0	13.33	-3.91	121.0
850	57.3		100.0	14.17	-3.91	121.0
900	57.6		100.0	15.00	-3.91	121.6
950	57.4		100.0	15.83	-3.91	121.2
1000	57.6		100.0	16.67	-3.91	121.6
1050	57.6		100.0	17.50	-3.91	121.6
1100	57.5		100.0	18.33	-3.91	121.4
1150	57.6		100.0	19.17	-3.91	121.6
1200	57.6		100.0	20.00	-3.91	121.6
1250	58		100.0	20.83	-3.91	122.4

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 15.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1792.65
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	36		100.0	0.83	-3.91	74.2
100	63.5		100.0	1.67	-3.91	130.9
150	85		100.0	2.50	-3.91	175.2
200	102.5		100.0	3.33	-3.91	211.3
250	115		100.0	4.17	-3.91	237.0
300	125.3		100.0	5.00	-3.91	258.3
350	134.8		100.0	5.83	-3.91	277.8
400	138		100.0	6.67	-3.91	284.4
450	139.8		100.0	7.50	-3.91	288.1
500	139.2		100.0	8.33	-3.91	286.9
550	138.3		100.0	9.17	-3.91	285.1
600	136.1		100.0	10.00	-3.91	280.5
650	133.2		100.0	10.83	-3.91	274.5
700	130.7		100.0	11.67	-3.91	269.4
750	127.9		100.0	12.50	-3.91	263.6
800	126.7		100.0	13.33	-3.91	261.1
850	127.1		100.0	14.17	-3.91	262.0
900	126.9		100.0	15.00	-3.91	261.6
950	126.3		100.0	15.83	-3.91	260.3
1000	126.9		100.0	16.67	-3.91	261.6
1050	126.9		100.0	17.50	-3.91	261.6
1100	126.1		100.0	18.33	-3.91	259.9
1150	126.1		100.0	19.17	-3.91	259.9
1200	125.8		100.0	20.00	-3.91	259.3
1250	125.7		100.0	20.83	-3.91	259.1

CONSOLIDATED DRAINED SHEAR BOX TEST

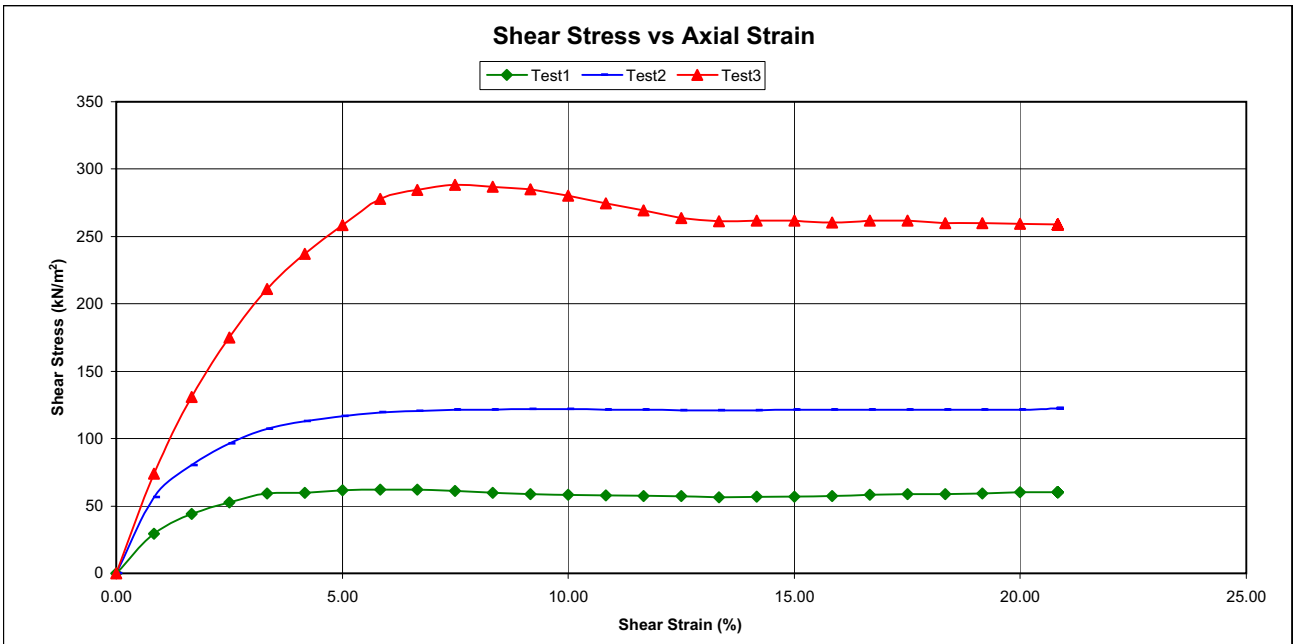
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

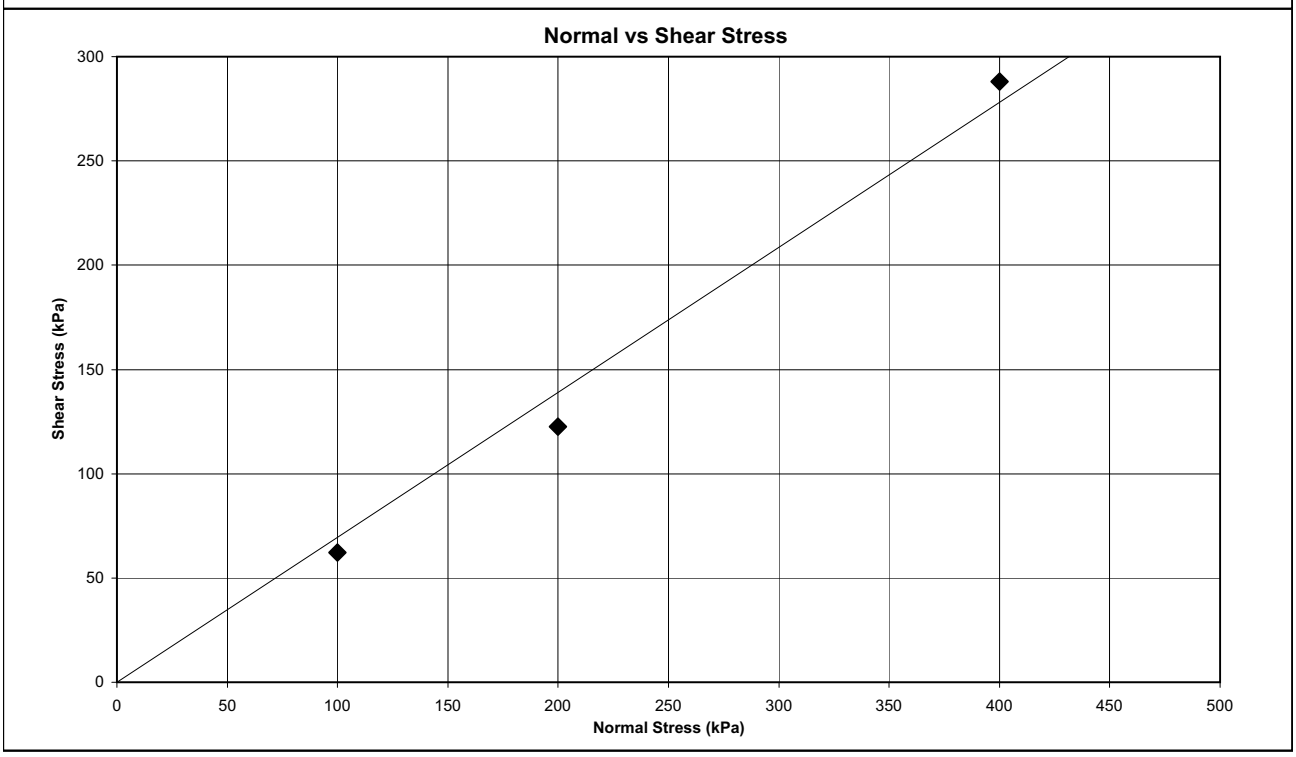
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10149 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 3 **Description:**
Harbour Bed Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1793	1793	1793
Moisture Content (%)	15.8	15.8	15.8
Shear Strain (%)	5.8	20.8	7.5
Shear Stress (kN/m^2)	62.1	122.4	288.1

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	35
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 90% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	16		100.0	0.83	-3.91	33.6
100	23.7		100.0	1.67	-3.91	49.7
150	28		100.0	2.50	-3.91	58.7
200	29.8		100.0	3.33	-3.91	62.5
250	30.7		100.0	4.17	-3.91	64.4
300	30.6		100.0	5.00	-3.91	64.2
350	30		100.0	5.83	-3.91	62.9
400	29.5		100.0	6.67	-3.91	61.9
450	29.1		100.0	7.50	-3.91	61.0
500	28.7		100.0	8.33	-3.91	60.2
550	28.8		100.0	9.17	-3.91	60.4
600	28.9		100.0	10.00	-3.91	60.6
650	29		100.0	10.83	-3.91	60.8
700	29.2		100.0	11.67	-3.91	61.2
750	29		100.0	12.50	-3.91	60.8
800	29		100.0	13.33	-3.91	60.8
850	29.1		100.0	14.17	-3.91	61.0
900	29		100.0	15.00	-3.91	60.8
950	29.2		100.0	15.83	-3.91	61.2
1000	29.2		100.0	16.67	-3.91	61.2
1050	29.3		100.0	17.50	-3.91	61.4
1100	29.3		100.0	18.33	-3.91	61.4
1150	29.7		100.0	19.17	-3.91	62.3
1200	29.6		100.0	20.00	-3.91	62.1
1250	29.4		100.0	20.83	-3.91	61.7

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26		100.0	0.83	-3.91	54.9
100	39		100.0	1.67	-3.91	82.3
150	47.5		100.0	2.50	-3.91	100.3
200	54.3		100.0	3.33	-3.91	114.6
250	58.2		100.0	4.17	-3.91	122.9
300	60.3		100.0	5.00	-3.91	127.3
350	61.2		100.0	5.83	-3.91	129.2
400	61.3		100.0	6.67	-3.91	129.4
450	61.1		100.0	7.50	-3.91	129.0
500	60.1		100.0	8.33	-3.91	126.9
550	59.7		100.0	9.17	-3.91	126.0
600	59.2		100.0	10.00	-3.91	125.0
650	59.2		100.0	10.83	-3.91	125.0
700	59.1		100.0	11.67	-3.91	124.8
750	58		100.0	12.50	-3.91	122.4
800	57.8		100.0	13.33	-3.91	122.0
850	57.5		100.0	14.17	-3.91	121.4
900	57.3		100.0	15.00	-3.91	121.0
950	57		100.0	15.83	-3.91	120.3
1000	57		100.0	16.67	-3.91	120.3
1050	56.9		100.0	17.50	-3.91	120.1
1100	56.7		100.0	18.33	-3.91	119.7
1150	56.5		100.0	19.17	-3.91	119.3
1200	56.5		100.0	20.00	-3.91	119.3
1250	56.5		100.0	20.83	-3.91	119.3

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1731.6
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	35		100.0	0.83	-3.91	72.1
100	64.2		100.0	1.67	-3.91	132.3
150	84		100.0	2.50	-3.91	173.1
200	101		100.0	3.33	-3.91	208.2
250	114.1		100.0	4.17	-3.91	235.2
300	123.5		100.0	5.00	-3.91	254.5
350	130.4		100.0	5.83	-3.91	268.8
400	134.1		100.0	6.67	-3.91	276.4
450	135.3		100.0	7.50	-3.91	278.9
500	135.6		100.0	8.33	-3.91	279.5
550	133.7		100.0	9.17	-3.91	275.6
600	131.1		100.0	10.00	-3.91	270.2
650	130		100.0	10.83	-3.91	267.9
700	128.9		100.0	11.67	-3.91	265.7
750	128.3		100.0	12.50	-3.91	264.4
800	127.8		100.0	13.33	-3.91	263.4
850	127.9		100.0	14.17	-3.91	263.6
900	127.6		100.0	15.00	-3.91	263.0
950	127.8		100.0	15.83	-3.91	263.4
1000	128.2		100.0	16.67	-3.91	264.2
1050	128.1		100.0	17.50	-3.91	264.0
1100	128.2		100.0	18.33	-3.91	264.2
1150	128.1		100.0	19.17	-3.91	264.0
1200	128.1		100.0	20.00	-3.91	264.0
1250	128		100.0	20.83	-3.91	263.8

CONSOLIDATED DRAINED SHEAR BOX TEST

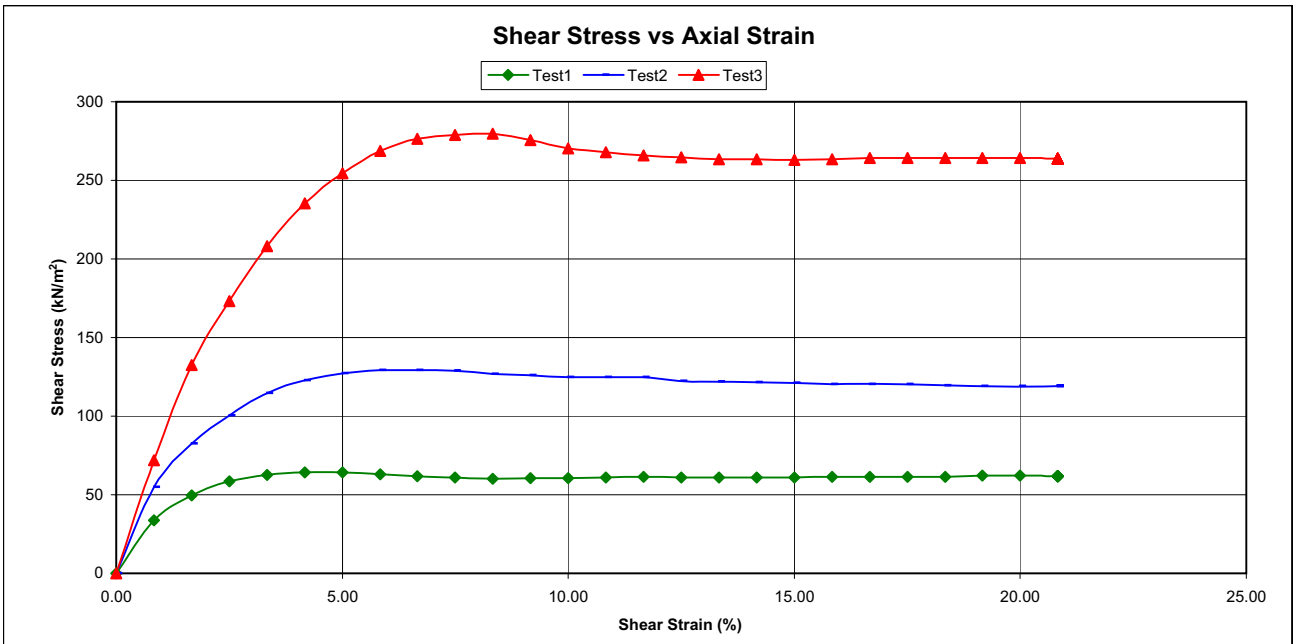
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

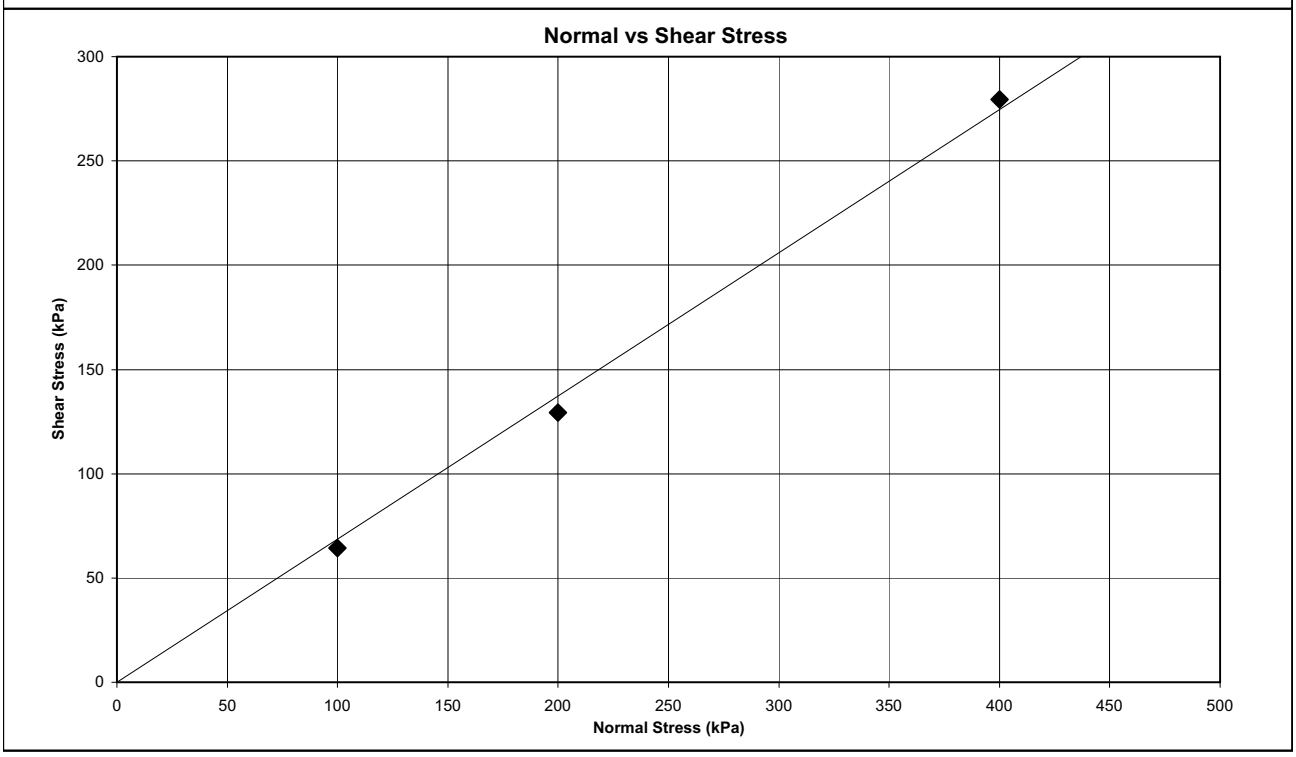
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10150 **Sample Type**
Depth (m): - Recompacted to 90% of MOD
Position: Phase 3 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1732	1732	1732
Moisture Content (%)	22.8	22.8	22.8
Shear Strain (%)	4.2	6.7	8.3
Shear Stress (kN/m^2)	64.4	129.4	279.5

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
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Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	20		100.0	0.83	-3.91	41.9
100	30		100.0	1.67	-3.91	62.9
150	34.1		100.0	2.50	-3.91	71.5
200	35.5		100.0	3.33	-3.91	74.5
250	35.6		100.0	4.17	-3.91	74.7
300	34.5		100.0	5.00	-3.91	72.4
350	33.5		100.0	5.83	-3.91	70.3
400	32.3		100.0	6.67	-3.91	67.7
450	31.6		100.0	7.50	-3.91	66.3
500	31.1		100.0	8.33	-3.91	65.2
550	30.9		100.0	9.17	-3.91	64.8
600	30.9		100.0	10.00	-3.91	64.8
650	30.8		100.0	10.83	-3.91	64.6
700	30.5		100.0	11.67	-3.91	64.0
750	30.7		100.0	12.50	-3.91	64.4
800	30.5		100.0	13.33	-3.91	64.0
850	30.7		100.0	14.17	-3.91	64.4
900	30.5		100.0	15.00	-3.91	64.0
950	30.5		100.0	15.83	-3.91	64.0
1000	30.4		100.0	16.67	-3.91	63.8
1050	30.7		100.0	17.50	-3.91	64.4
1100	30.9		100.0	18.33	-3.91	64.8
1150	30.9		100.0	19.17	-3.91	64.8
1200	31		100.0	20.00	-3.91	65.0
1250	30.9		100.0	20.83	-3.91	64.8

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	24		100.0	0.83	-3.91	50.7
100	39		100.0	1.67	-3.91	82.3
150	50.4		100.0	2.50	-3.91	106.4
200	59.5		100.0	3.33	-3.91	125.6
250	62		100.0	4.17	-3.91	130.9
300	64		100.0	5.00	-3.91	135.1
350	64		100.0	5.83	-3.91	135.1
400	63.3		100.0	6.67	-3.91	133.6
450	61.2		100.0	7.50	-3.91	129.2
500	59		100.0	8.33	-3.91	124.6
550	57.8		100.0	9.17	-3.91	122.0
600	56.6		100.0	10.00	-3.91	119.5
650	56.2		100.0	10.83	-3.91	118.6
700	56.1		100.0	11.67	-3.91	118.4
750	56.4		100.0	12.50	-3.91	119.1
800	56.8		100.0	13.33	-3.91	119.9
850	56.5		100.0	14.17	-3.91	119.3
900	56.2		100.0	15.00	-3.91	118.6
950	56.5		100.0	15.83	-3.91	119.3
1000	57		100.0	16.67	-3.91	120.3
1050	57		100.0	17.50	-3.91	120.3
1100	57		100.0	18.33	-3.91	120.3
1150	57.4		100.0	19.17	-3.91	121.2
1200	57.4		100.0	20.00	-3.91	121.2
1250	57.3		100.0	20.83	-3.91	121.0

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1789.32
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	35		100.0	0.83	-3.91	72.1
100	64		100.0	1.67	-3.91	131.9
150	85.5		100.0	2.50	-3.91	176.2
200	101		100.0	3.33	-3.91	208.2
250	115		100.0	4.17	-3.91	237.0
300	128		100.0	5.00	-3.91	263.8
350	136.5		100.0	5.83	-3.91	281.3
400	142		100.0	6.67	-3.91	292.7
450	144.7		100.0	7.50	-3.91	298.2
500	145.8		100.0	8.33	-3.91	300.5
550	141.5		100.0	9.17	-3.91	291.6
600	135.4		100.0	10.00	-3.91	279.1
650	133.1		100.0	10.83	-3.91	274.3
700	132.9		100.0	11.67	-3.91	273.9
750	134.3		100.0	12.50	-3.91	276.8
800	135		100.0	13.33	-3.91	278.3
850	136.4		100.0	14.17	-3.91	281.1
900	136.9		100.0	15.00	-3.91	282.2
950	137.9		100.0	15.83	-3.91	284.2
1000	138.1		100.0	16.67	-3.91	284.6
1050	137.8		100.0	17.50	-3.91	284.0
1100	137.4		100.0	18.33	-3.91	283.2
1150	138		100.0	19.17	-3.91	284.4
1200	138.3		100.0	20.00	-3.91	285.1
1250	137.9		100.0	20.83	-3.91	284.2

CONSOLIDATED DRAINED SHEAR BOX TEST

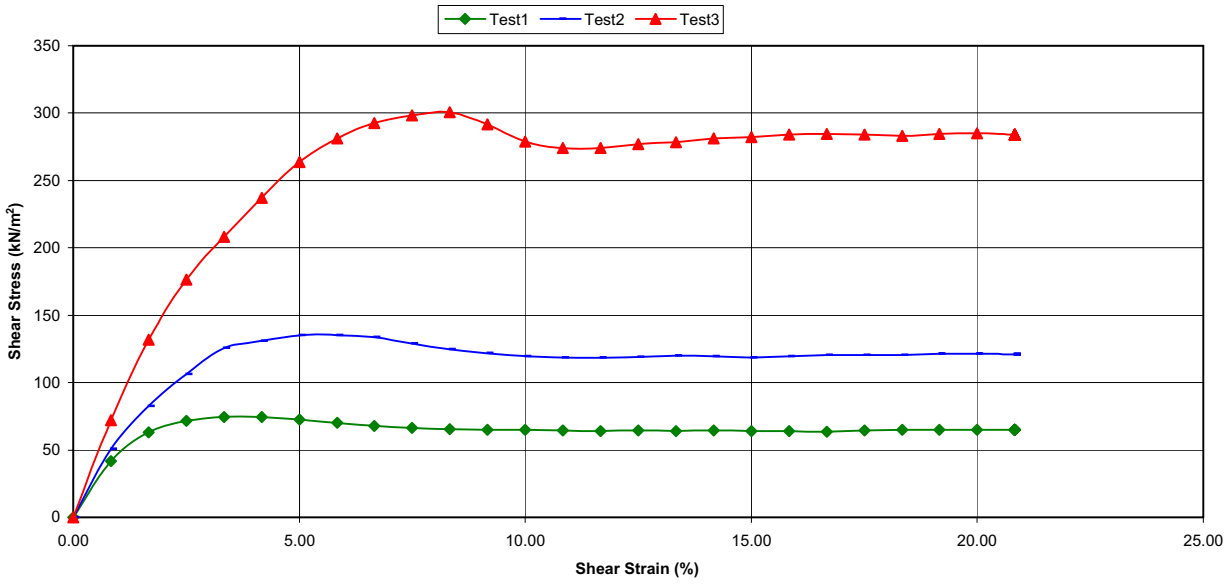
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

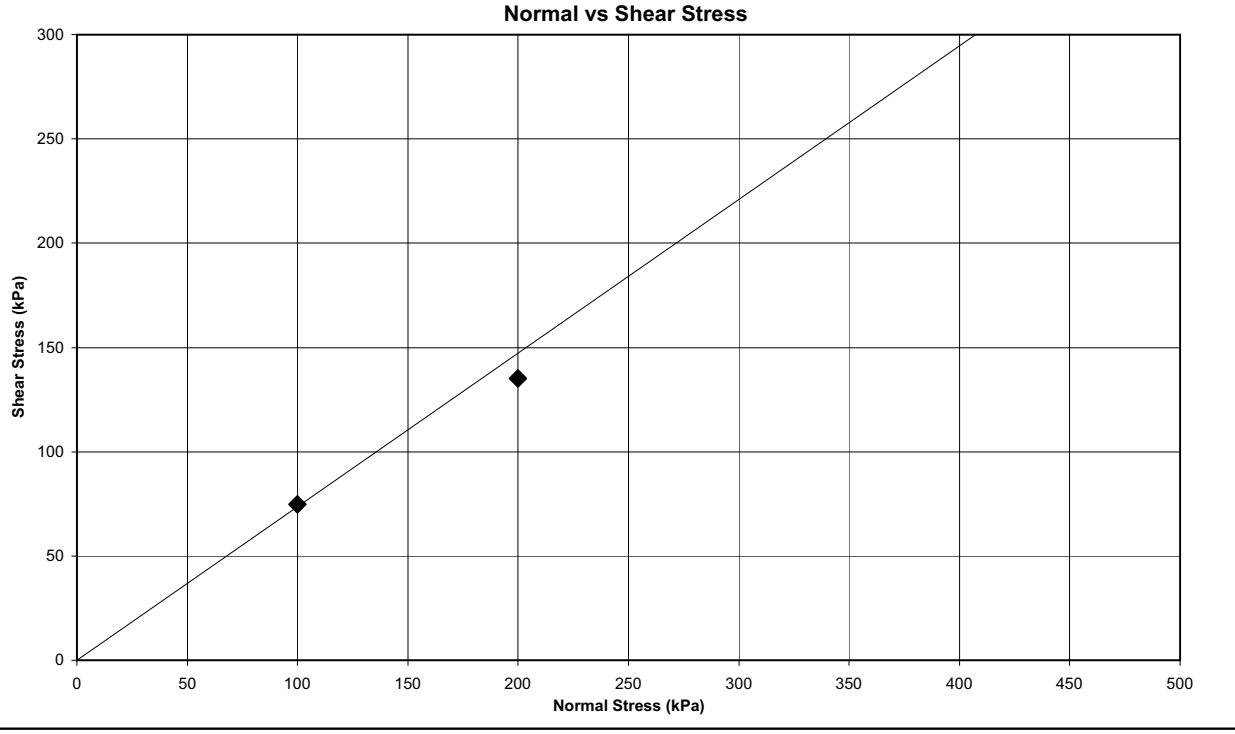
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10150 **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: Phase 3 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1789	1789	1789
Moisture Content (%)	22.8	22.8	22.8
Shear Strain (%)	4.2	5.0	8.3
Shear Stress (kN/m^2)	74.7	135.1	300.5

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	36
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150 Fill Sands
Depth (m): - **Sample Type:**
Position: Phase 3 Recompacted to 95% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.8
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	18		100.0	0.83	-3.91	37.8
100	26		100.0	1.67	-3.91	54.5
150	30.5		100.0	2.50	-3.91	64.0
200	33		100.0	3.33	-3.91	69.2
250	33.8		100.0	4.17	-3.91	70.9
300	33.9		100.0	5.00	-3.91	71.1
350	34		100.0	5.83	-3.91	71.3
400	33.5		100.0	6.67	-3.91	70.3
450	31.8		100.0	7.50	-3.91	66.7
500	30		100.0	8.33	-3.91	62.9
550	29.2		100.0	9.17	-3.91	61.2
600	29		100.0	10.00	-3.91	60.8
650	29.1		100.0	10.83	-3.91	61.0
700	29.1		100.0	11.67	-3.91	61.0
750	29		100.0	12.50	-3.91	60.8
800	29.1		100.0	13.33	-3.91	61.0
850	29.1		100.0	14.17	-3.91	61.0
900	29.3		100.0	15.00	-3.91	61.4
950	29.2		100.0	15.83	-3.91	61.2
1000	29.2		100.0	16.67	-3.91	61.2
1050	29.2		100.0	17.50	-3.91	61.2
1100	29.2		100.0	18.33	-3.91	61.2
1150	29.2		100.0	19.17	-3.91	61.2
1200	29.2		100.0	20.00	-3.91	61.2
1250	29		100.0	20.83	-3.91	60.8

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.8
Prooving Ring Factor 76 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26		100.0	0.83	-3.91	54.9
100	42		100.0	1.67	-3.91	88.7
150	54		100.0	2.50	-3.91	114.0
200	62		100.0	3.33	-3.91	130.9
250	65.8		100.0	4.17	-3.91	138.9
300	67.4		100.0	5.00	-3.91	142.3
350	67		100.0	5.83	-3.91	141.4
400	64.6		100.0	6.67	-3.91	136.4
450	61.5		100.0	7.50	-3.91	129.8
500	58.7		100.0	8.33	-3.91	123.9
550	57		100.0	9.17	-3.91	120.3
600	56.1		100.0	10.00	-3.91	118.4
650	56		100.0	10.83	-3.91	118.2
700	56.1		100.0	11.67	-3.91	118.4
750	56.2		100.0	12.50	-3.91	118.6
800	56.3		100.0	13.33	-3.91	118.9
850	56.5		100.0	14.17	-3.91	119.3
900	56.8		100.0	15.00	-3.91	119.9
950	56.9		100.0	15.83	-3.91	120.1
1000	56.8		100.0	16.67	-3.91	119.9
1050	57		100.0	17.50	-3.91	120.3
1100	57		100.0	18.33	-3.91	120.3
1150	57		100.0	19.17	-3.91	120.3
1200	57		100.0	20.00	-3.91	120.3
1250	57		100.0	20.83	-3.91	120.3

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.8
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1827.8
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	34		100.0	0.83	-3.91	70.1
100	58		100.0	1.67	-3.91	119.5
150	79		100.0	2.50	-3.91	162.8
200	95		100.0	3.33	-3.91	195.8
250	112		100.0	4.17	-3.91	230.8
300	125.8		100.0	5.00	-3.91	259.3
350	136.5		100.0	5.83	-3.91	281.3
400	143.4		100.0	6.67	-3.91	295.6
450	147.2		100.0	7.50	-3.91	303.4
500	146		100.0	8.33	-3.91	300.9
550	142		100.0	9.17	-3.91	292.7
600	138.6		100.0	10.00	-3.91	285.7
650	133.4		100.0	10.83	-3.91	275.0
700	130.7		100.0	11.67	-3.91	269.4
750	128.6		100.0	12.50	-3.91	265.1
800	127.3		100.0	13.33	-3.91	262.4
850	127.2		100.0	14.17	-3.91	262.2
900	127.7		100.0	15.00	-3.91	263.2
950	128.1		100.0	15.83	-3.91	264.0
1000	128		100.0	16.67	-3.91	263.8
1050	127.1		100.0	17.50	-3.91	262.0
1100	127		100.0	18.33	-3.91	261.8
1150	127		100.0	19.17	-3.91	261.8
1200	126.9		100.0	20.00	-3.91	261.6
1250	126.7		100.0	20.83	-3.91	261.1

CONSOLIDATED DRAINED SHEAR BOX TEST

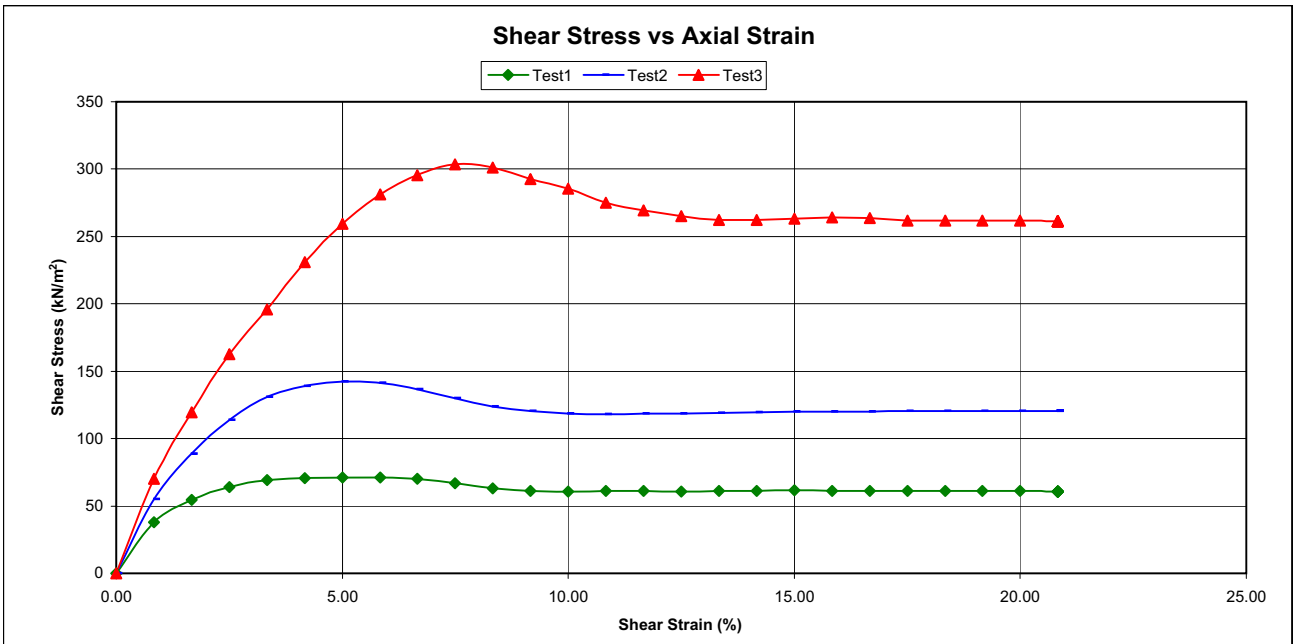
THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

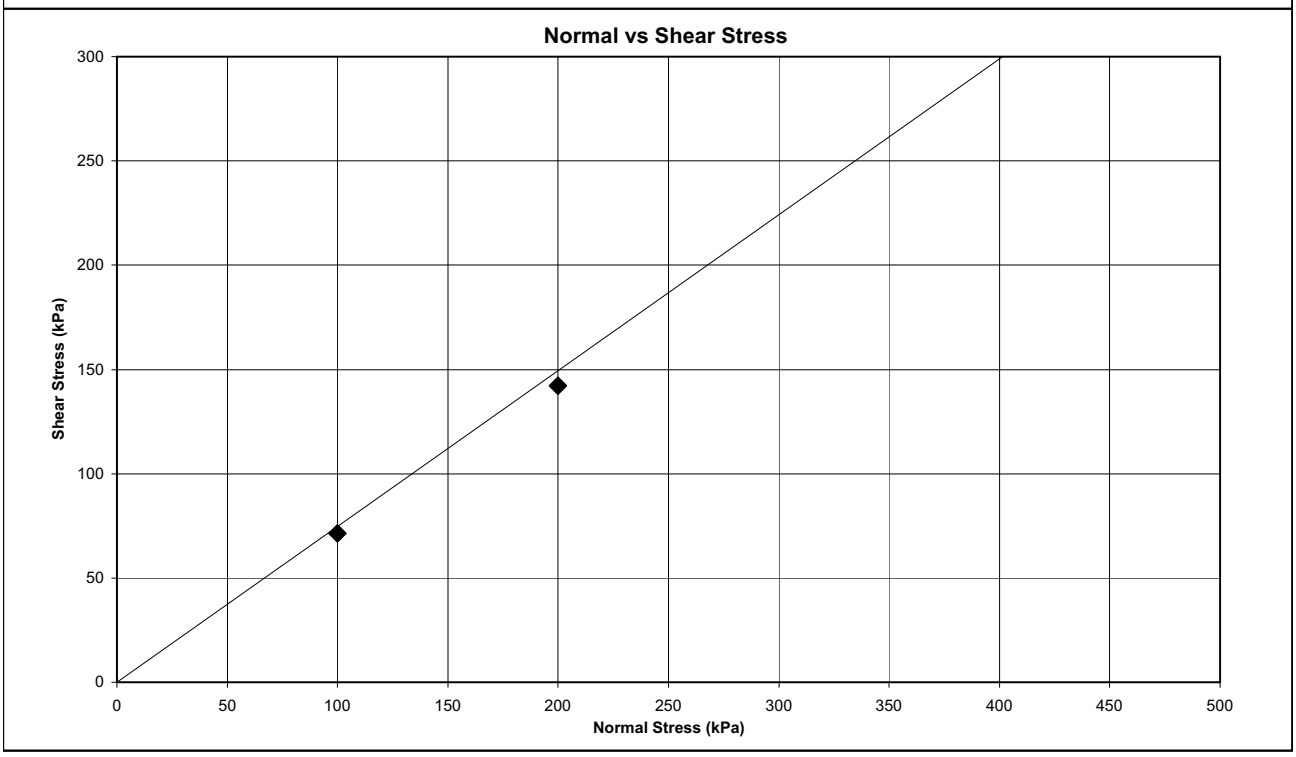
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10150 **Sample Type**
Depth (m): - Recompacted to 95% of MOD
Position: Phase 3 **Description:**
Fill Sands

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1828	1828	1828
Moisture Content (%)	22.8	22.8	22.8
Shear Strain (%)	5.8	5.0	7.5
Shear Stress (kN/m^2)	71.3	142.3	303.4

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	37
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour berth Deepening
Ref no. 5480 **Description:**
Lab no. 10145 -
Depth (m): - **Sample Type:**
Position: Phase 1 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.99
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1582
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	18.5		100.0	0.83	-3.91	38.8
100	23.5		100.0	1.67	-3.91	49.3
150	27.5		100.0	2.50	-3.91	57.7
200	29.5		100.0	3.33	-3.91	61.9
250	30		100.0	4.17	-3.91	62.9
300	31		100.0	5.00	-3.91	65.0
350	30.8		100.0	5.83	-3.91	64.6
400	29		100.0	6.67	-3.91	60.8
450	28.7		100.0	7.50	-3.91	60.2
500	26.5		100.0	8.33	-3.91	55.6
550	26.2		100.0	9.17	-3.91	54.9
600	26.2		100.0	10.00	-3.91	54.9
650	26.2		100.0	10.83	-3.91	54.9
700	26.2		100.0	11.67	-3.91	54.9
750	26.2		100.0	12.50	-3.91	54.9
800	26.2		100.0	13.33	-3.91	54.9
850	25.2		100.0	14.17	-3.91	52.9
900	25.5		100.0	15.00	-3.91	53.5
950	26		100.0	15.83	-3.91	54.5
1000	26		100.0	16.67	-3.91	54.5
1050	26		100.0	17.50	-3.91	54.5
1100	26		100.0	18.33	-3.91	54.5
1150	26		100.0	19.17	-3.91	54.5
1200	26		100.0	20.00	-3.91	54.5
1250	25.8		100.0	20.83	-3.91	54.1

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 24.41
Prooving Ring Factor 76 Dry Density (kg/m^3) 1582
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	24.2		100.0	0.83	-3.91	51.1
100	35		100.0	1.67	-3.91	73.9
150	42.5		100.0	2.50	-3.91	89.7
200	48.2		100.0	3.33	-3.91	101.8
250	53		100.0	4.17	-3.91	111.9
300	55.5		100.0	5.00	-3.91	117.2
350	57.2		100.0	5.83	-3.91	120.8
400	58.2		100.0	6.67	-3.91	122.9
450	59		100.0	7.50	-3.91	124.6
500	59		100.0	8.33	-3.91	124.6
550	58.5		100.0	9.17	-3.91	123.5
600	57.2		100.0	10.00	-3.91	120.8
650	55.8		100.0	10.83	-3.91	117.8
700	53.2		100.0	11.67	-3.91	112.3
750	51.8		100.0	12.50	-3.91	109.4
800	51.5		100.0	13.33	-3.91	108.7
850	51.2		100.0	14.17	-3.91	108.1
900	50		100.0	15.00	-3.91	105.6
950	50.2		100.0	15.83	-3.91	106.0
1000	50.2		100.0	16.67	-3.91	106.0
1050	50.5		100.0	17.50	-3.91	106.6
1100	50.2		100.0	18.33	-3.91	106.0
1150	50.2		100.0	19.17	-3.91	106.0
1200	50.2		100.0	20.00	-3.91	106.0
1250	50.2		100.0	20.83	-3.91	106.0

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 23.08
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1582
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	34		100.0	0.83	-3.91	70.1
100	57.5		100.0	1.67	-3.91	118.5
150	74.5		100.0	2.50	-3.91	153.6
200	87		100.0	3.33	-3.91	179.3
250	98		100.0	4.17	-3.91	202.0
300	105.5		100.0	5.00	-3.91	217.4
350	112.5		100.0	5.83	-3.91	231.9
400	118		100.0	6.67	-3.91	243.2
450	122.8		100.0	7.50	-3.91	253.1
500	126		100.0	8.33	-3.91	259.7
550	128.8		100.0	9.17	-3.91	265.5
600	129.8		100.0	10.00	-3.91	267.5
650	130.2		100.0	10.83	-3.91	268.4
700	129		100.0	11.67	-3.91	265.9
750	125		100.0	12.50	-3.91	257.6
800	122		100.0	13.33	-3.91	251.5
850	119		100.0	14.17	-3.91	245.3
900	118		100.0	15.00	-3.91	243.2
950	116.8		100.0	15.83	-3.91	240.7
1000	116		100.0	16.67	-3.91	239.1
1050	115		100.0	17.50	-3.91	237.0
1100	114.8		100.0	18.33	-3.91	236.6
1150	114.7		100.0	19.17	-3.91	236.4
1200	114		100.0	20.00	-3.91	235.0
1250	114.8		100.0	20.83	-3.91	236.6

CONSOLIDATED DRAINED SHEAR BOX TEST

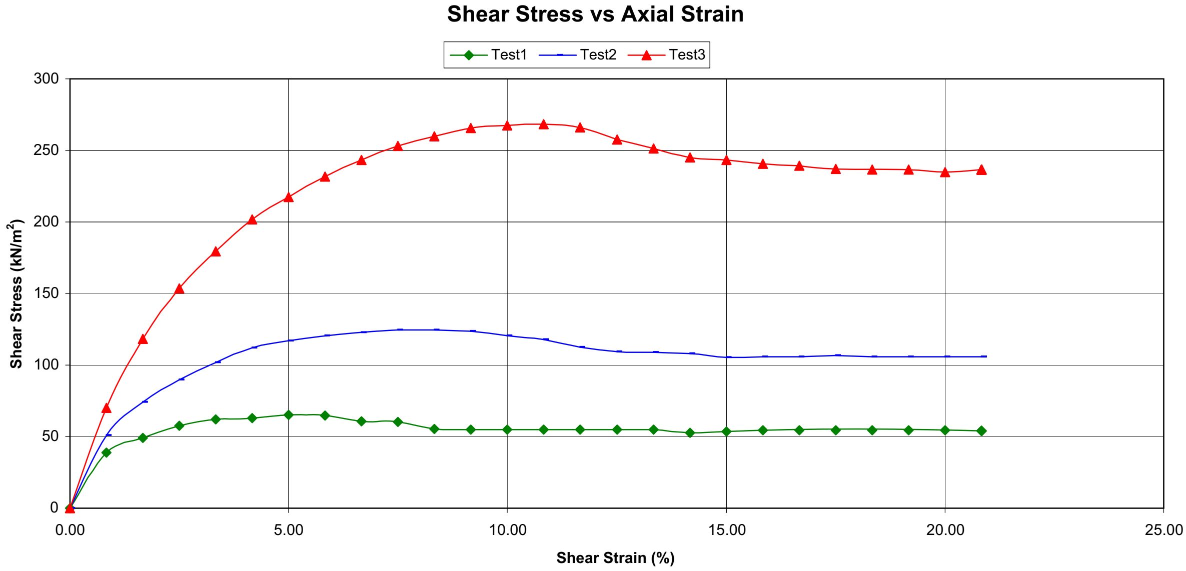
THEKWINI SOILS LAB. CC

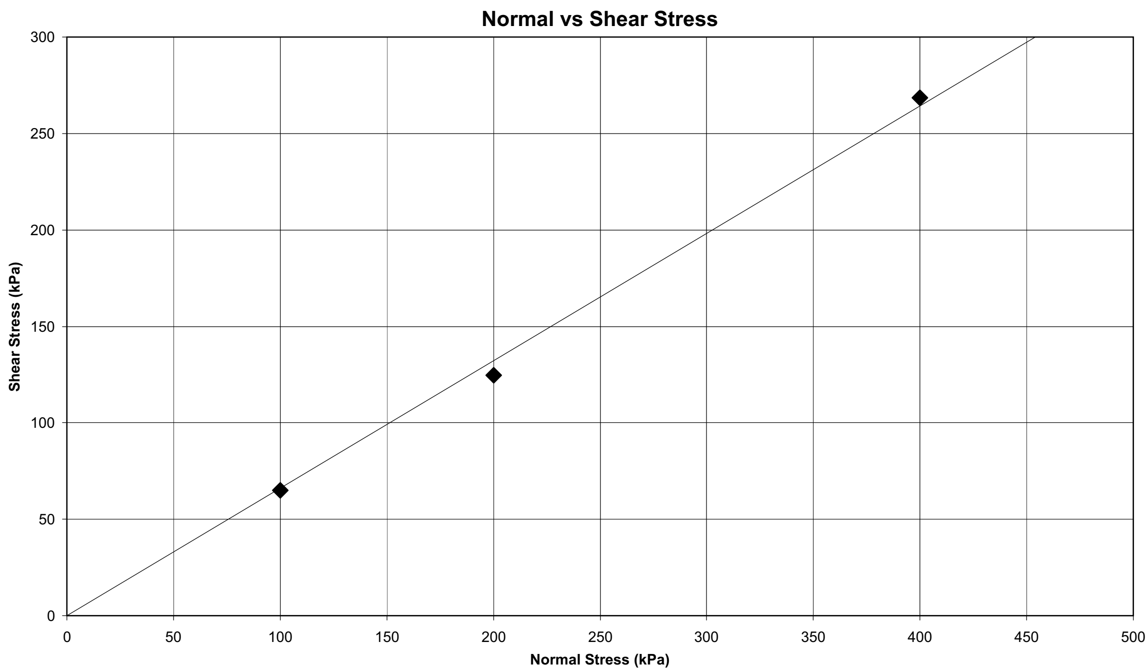
Project Durban Harbour berth Deepening
Ref no. 5480
Lab no. 10145 **Sample Type**
Depth (m): - -
Position: Phase 1 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1582	1582	1582
Moisture Content (%)	23.0	24.4	23.1
Shear Strain (%)	5.0	7.5	10.8
Shear Stress (kN/m^2)	65.0	124.6	268.4

Shear Strength Perameters

Angle of Internal Friction (o^o) 33
Cohesion (kPa) 0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tollgate, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour berth Deepening
Ref no. 5480 **Description:**
Lab no. 10145/B -
Depth (m): - **Sample Type:**
Position: Phase 1 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 22.36
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1627
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	29.2		100.0	0.83	-3.91	61.2
100	25.2		100.0	1.67	-3.91	52.9
150	28.5		100.0	2.50	-3.91	59.8
200	30.5		100.0	3.33	-3.91	64.0
250	30.8		100.0	4.17	-3.91	64.6
300	31.8		100.0	5.00	-3.91	66.7
350	36.2		100.0	5.83	-3.91	75.9
400	30.5		100.0	6.67	-3.91	64.0
450	29.8		100.0	7.50	-3.91	62.5
500	28		100.0	8.33	-3.91	58.7
550	26.5		100.0	9.17	-3.91	55.6
600	26		100.0	10.00	-3.91	54.5
650	25.8		100.0	10.83	-3.91	54.1
700	25.8		100.0	11.67	-3.91	54.1
750	26.2		100.0	12.50	-3.91	54.9
800	26.2		100.0	13.33	-3.91	54.9
850	26		100.0	14.17	-3.91	54.5
900	25.8		100.0	15.00	-3.91	54.1
950	25.8		100.0	15.83	-3.91	54.1
1000	25.5		100.0	16.67	-3.91	53.5
1050	25.2		100.0	17.50	-3.91	52.9
1100	25.2		100.0	18.33	-3.91	52.9
1150	25.2		100.0	19.17	-3.91	52.9
1200	25.5		100.0	20.00	-3.91	53.5
1250	25.5		100.0	20.83	-3.91	53.5

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 22.28
Prooving Ring Factor 76 Dry Density (kg/m^3) 1627
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	27.2		100.0	0.83	-3.91	57.4
100	40.8		100.0	1.67	-3.91	86.1
150	50.2		100.0	2.50	-3.91	106.0
200	57		100.0	3.33	-3.91	120.3
250	60.2		100.0	4.17	-3.91	127.1
300	62		100.0	5.00	-3.91	130.9
350	62.2		100.0	5.83	-3.91	131.3
400	61		100.0	6.67	-3.91	128.8
450	57.8		100.0	7.50	-3.91	122.0
500	55.2		100.0	8.33	-3.91	116.5
550	54		100.0	9.17	-3.91	114.0
600	53.8		100.0	10.00	-3.91	113.6
650	53.8		100.0	10.83	-3.91	113.6
700	53.8		100.0	11.67	-3.91	113.6
750	53.5		100.0	12.50	-3.91	112.9
800	53		100.0	13.33	-3.91	111.9
850	53		100.0	14.17	-3.91	111.9
900	53		100.0	15.00	-3.91	111.9
950	52.8		100.0	15.83	-3.91	111.5
1000	52		100.0	16.67	-3.91	109.8
1050	52		100.0	17.50	-3.91	109.8
1100	52		100.0	18.33	-3.91	109.8
1150	51.2		100.0	19.17	-3.91	108.1
1200	51.2		100.0	20.00	-3.91	108.1
1250	51.2		100.0	20.83	-3.91	108.1

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.76
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1627
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	33.2		100.0	0.83	-3.91	68.4
100	60		100.0	1.67	-3.91	123.7
150	79.5		100.0	2.50	-3.91	163.9
200	96		100.0	3.33	-3.91	197.9
250	109		100.0	4.17	-3.91	224.7
300	121.2		100.0	5.00	-3.91	249.8
350	130		100.0	5.83	-3.91	267.9
400	137.5		100.0	6.67	-3.91	283.4
450	141		100.0	7.50	-3.91	290.6
500	141.8		100.0	8.33	-3.91	292.3
550	140.2		100.0	9.17	-3.91	289.0
600	134		100.0	10.00	-3.91	276.2
650	125		100.0	10.83	-3.91	257.6
700	121.2		100.0	11.67	-3.91	249.8
750	120		100.0	12.50	-3.91	247.3
800	119.3		100.0	13.33	-3.91	245.9
850	119		100.0	14.17	-3.91	245.3
900	119		100.0	15.00	-3.91	245.3
950	119		100.0	15.83	-3.91	245.3
1000	119		100.0	16.67	-3.91	245.3
1050	118.2		100.0	17.50	-3.91	243.6
1100	117.8		100.0	18.33	-3.91	242.8
1150	117		100.0	19.17	-3.91	241.2
1200	117.2		100.0	20.00	-3.91	241.6
1250	117.7		100.0	20.83	-3.91	242.6

CONSOLIDATED DRAINED SHEAR BOX TEST

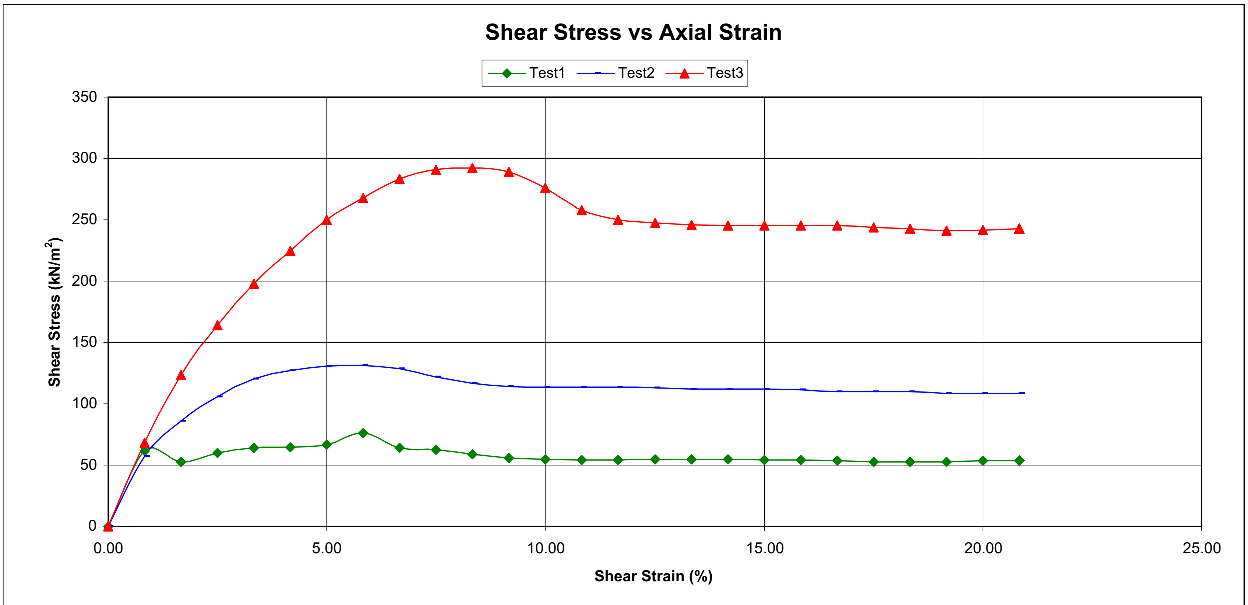
THEKWINI SOILS LAB. CC

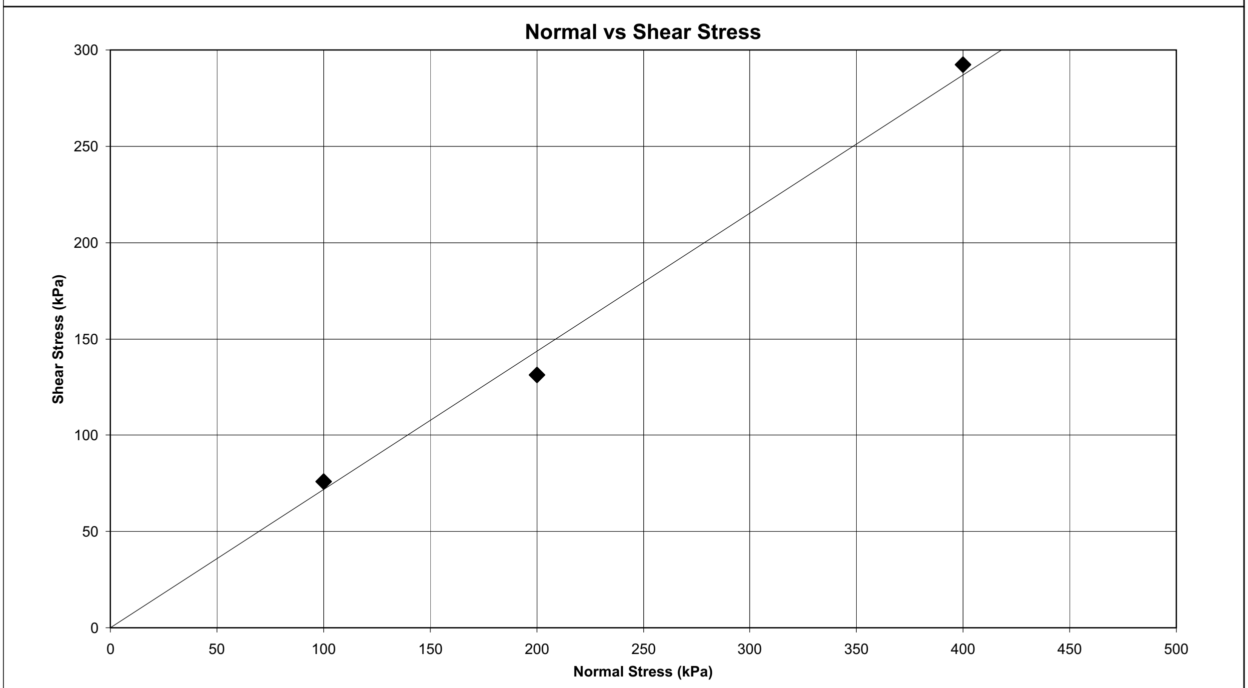
Project Durban Harbour berth Deepening
Ref no. 5480
Lab no. 10145/B **Sample Type**
Depth (m): - -
Position: Phase 1 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1627	1627	1627
Moisture Content (%)	22.4	22.3	22.8
Shear Strain (%)	5.8	5.8	8.3
Shear Stress (kN/m^2)	75.9	131.3	292.3

Shear Strength Perameters

Angle of Internal Friction (o^o) 36
Cohesion (kPa) 0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour berth Deepening
Ref no. 5480 **Description:** -
Lab no. 10145/C
Depth (m): - **Sample Type:** -
Position: Phase 1 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 19.51
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	19.5		100.0	0.83	-3.91	40.9
100	30		100.0	1.67	-3.91	62.9
150	38		100.0	2.50	-3.91	79.7
200	39.8		100.0	3.33	-3.91	83.5
250	37.2		100.0	4.17	-3.91	78.0
300	32.2		100.0	5.00	-3.91	67.5
350	29.2		100.0	5.83	-3.91	61.2
400	28.5		100.0	6.67	-3.91	59.8
450	28.2		100.0	7.50	-3.91	59.1
500	28		100.0	8.33	-3.91	58.7
550	28		100.0	9.17	-3.91	58.7
600	27.8		100.0	10.00	-3.91	58.3
650	27.5		100.0	10.83	-3.91	57.7
700	27.8		100.0	11.67	-3.91	58.3
750	27.5		100.0	12.50	-3.91	57.7
800	27.5		100.0	13.33	-3.91	57.7
850	27.5		100.0	14.17	-3.91	57.7
900	27.5		100.0	15.00	-3.91	57.7
950	27.5		100.0	15.83	-3.91	57.7
1000	27		100.0	16.67	-3.91	56.6
1050	27		100.0	17.50	-3.91	56.6
1100	27		100.0	18.33	-3.91	56.6
1150	27.2		100.0	19.17	-3.91	57.0
1200	27		100.0	20.00	-3.91	56.6
1250	27		100.0	20.83	-3.91	56.6

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.05
Prooving Ring Factor 76 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	27.2		100.0	0.83	-3.91	57.4
100	39.2		100.0	1.67	-3.91	82.8
150	52.2		100.0	2.50	-3.91	110.2
200	63		100.0	3.33	-3.91	133.0
250	67.8		100.0	4.17	-3.91	143.1
300	68.2		100.0	5.00	-3.91	144.0
350	66.8		100.0	5.83	-3.91	141.0
400	61		100.0	6.67	-3.91	128.8
450	56		100.0	7.50	-3.91	118.2
500	55		100.0	8.33	-3.91	116.1
550	54.8		100.0	9.17	-3.91	115.7
600	54.8		100.0	10.00	-3.91	115.7
650	54.2		100.0	10.83	-3.91	114.4
700	54		100.0	11.67	-3.91	114.0
750	54		100.0	12.50	-3.91	114.0
800	54		100.0	13.33	-3.91	114.0
850	53		100.0	14.17	-3.91	111.9
900	53		100.0	15.00	-3.91	111.9
950	53		100.0	15.83	-3.91	111.9
1000	53		100.0	16.67	-3.91	111.9
1050	52.8		100.0	17.50	-3.91	111.5
1100	52.5		100.0	18.33	-3.91	110.8
1150	52.2		100.0	19.17	-3.91	110.2
1200	52		100.0	20.00	-3.91	109.8
1250	52		100.0	20.83	-3.91	109.8

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 21.43
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	36		100.0	0.83	-3.91	74.2
100	65		100.0	1.67	-3.91	134.0
150	87		100.0	2.50	-3.91	179.3
200	105.7		100.0	3.33	-3.91	217.9
250	123		100.0	4.17	-3.91	253.5
300	136		100.0	5.00	-3.91	280.3
350	144		100.0	5.83	-3.91	296.8
400	148.5		100.0	6.67	-3.91	306.1
450	149.8		100.0	7.50	-3.91	308.8
500	148.2		100.0	8.33	-3.91	305.5
550	143		100.0	9.17	-3.91	294.7
600	130		100.0	10.00	-3.91	267.9
650	124		100.0	10.83	-3.91	255.6
700	123		100.0	11.67	-3.91	253.5
750	122.5		100.0	12.50	-3.91	252.5
800	123		100.0	13.33	-3.91	253.5
850	122.2		100.0	14.17	-3.91	251.9
900	122.8		100.0	15.00	-3.91	253.1
950	121.8		100.0	15.83	-3.91	251.0
1000	122		100.0	16.67	-3.91	251.5
1050	121		100.0	17.50	-3.91	249.4
1100	121		100.0	18.33	-3.91	249.4
1150	121.2		100.0	19.17	-3.91	249.8
1200	121.2		100.0	20.00	-3.91	249.8
1250	121		100.0	20.83	-3.91	249.4

CONSOLIDATED DRAINED SHEAR BOX TEST

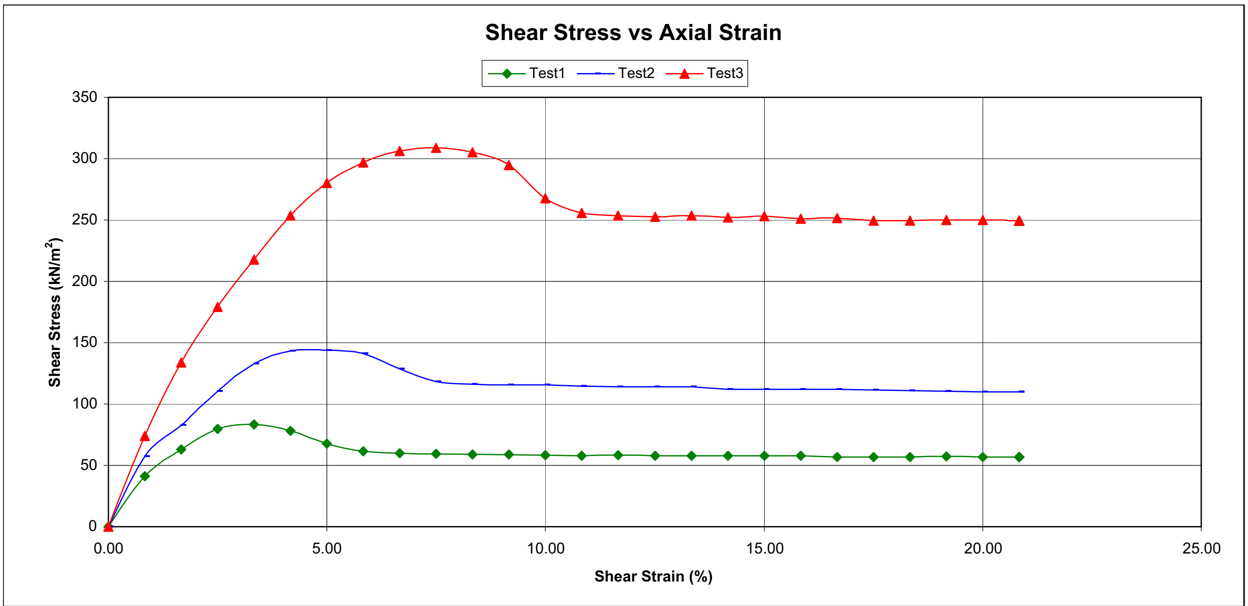
THEKWINI SOILS LAB. CC

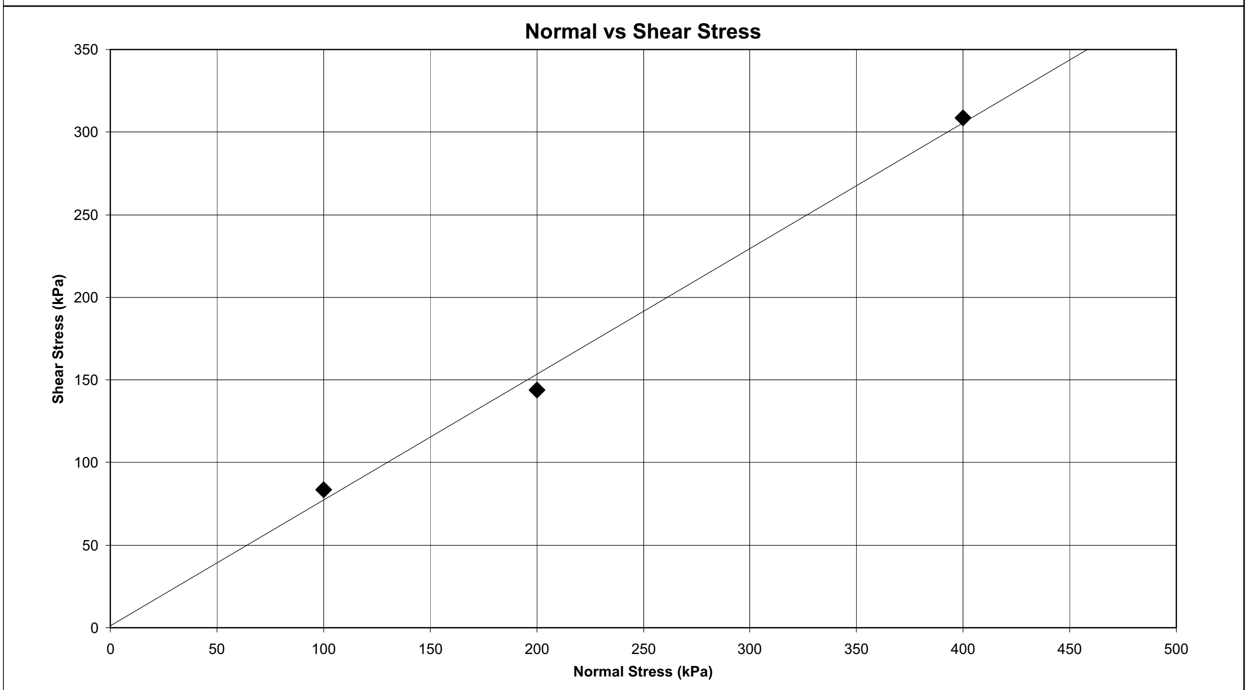
Project Durban Harbour berth Deepening
Ref no. 5480
Lab no. 10145/C **Sample Type**
Depth (m): - -
Position: Phase 1 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1716	1716	1716
Moisture Content (%)	19.5	21.0	21.4
Shear Strain (%)	3.3	5.0	7.5
Shear Stress (kN/m^2)	83.5	144.0	308.8

Shear Strength Perameters

Angle of Internal Friction (o°)	37
Cohesion (kPa)	1





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:** -
Lab no. 10148/A
Depth (m): - **Sample Type:** -
Position: Phase 2 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 27.63
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1431
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	12.2		100.0	0.83	-3.91	25.6
100	16.8		100.0	1.67	-3.91	35.2
150	19.8		100.0	2.50	-3.91	41.5
200	21.5		100.0	3.33	-3.91	45.1
250	22.5		100.0	4.17	-3.91	47.2
300	23.8		100.0	5.00	-3.91	49.9
350	24.5		100.0	5.83	-3.91	51.4
400	24.8		100.0	6.67	-3.91	52.0
450	24.8		100.0	7.50	-3.91	52.0
500	24.2		100.0	8.33	-3.91	50.8
550	23.2		100.0	9.17	-3.91	48.7
600	23		100.0	10.00	-3.91	48.2
650	23		100.0	10.83	-3.91	48.2
700	23.2		100.0	11.67	-3.91	48.7
750	23		100.0	12.50	-3.91	48.2
800	23.5		100.0	13.33	-3.91	49.3
850	23.8		100.0	14.17	-3.91	49.9
900	22.2		100.0	15.00	-3.91	46.6
950	22.2		100.0	15.83	-3.91	46.6
1000	22		100.0	16.67	-3.91	46.1
1050	21.8		100.0	17.50	-3.91	45.7
1100	22.2		100.0	18.33	-3.91	46.6
1150	22.2		100.0	19.17	-3.91	46.6
1200	22.2		100.0	20.00	-3.91	46.6
1250	22.8		100.0	20.83	-3.91	47.8

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 27.45
Prooving Ring Factor 76 Dry Density (kg/m^3) 1431
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	21.2		100.0	0.83	-3.91	44.8
100	30.2		100.0	1.67	-3.91	63.8
150	37		100.0	2.50	-3.91	78.1
200	41.2		100.0	3.33	-3.91	87.0
250	44.8		100.0	4.17	-3.91	94.6
300	48		100.0	5.00	-3.91	101.3
350	50.2		100.0	5.83	-3.91	106.0
400	51.5		100.0	6.67	-3.91	108.7
450	51.8		100.0	7.50	-3.91	109.4
500	51.8		100.0	8.33	-3.91	109.4
550	50.8		100.0	9.17	-3.91	107.2
600	50		100.0	10.00	-3.91	105.6
650	49		100.0	10.83	-3.91	103.4
700	49.2		100.0	11.67	-3.91	103.9
750	49		100.0	12.50	-3.91	103.4
800	48.2		100.0	13.33	-3.91	101.8
850	48.2		100.0	14.17	-3.91	101.8
900	48.2		100.0	15.00	-3.91	101.8
950	48.2		100.0	15.83	-3.91	101.8
1000	48.2		100.0	16.67	-3.91	101.8
1050	48.2		100.0	17.50	-3.91	101.8
1100	48		100.0	18.33	-3.91	101.3
1150	47.5		100.0	19.17	-3.91	100.3
1200	47.5		100.0	20.00	-3.91	100.3
1250	47.8		100.0	20.83	-3.91	100.9

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 27.86
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1433
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	37		100.0	0.83	-3.91	76.3
100	57.8		100.0	1.67	-3.91	119.1
150	74.5		100.0	2.50	-3.91	153.6
200	86.2		100.0	3.33	-3.91	177.7
250	96		100.0	4.17	-3.91	197.9
300	103.1		100.0	5.00	-3.91	212.5
350	108		100.0	5.83	-3.91	222.6
400	113.2		100.0	6.67	-3.91	233.3
450	117.8		100.0	7.50	-3.91	242.8
500	120.5		100.0	8.33	-3.91	248.4
550	124.9		100.0	9.17	-3.91	257.4
600	125.7		100.0	10.00	-3.91	259.1
650	125.1		100.0	10.83	-3.91	257.8
700	125		100.0	11.67	-3.91	257.6
750	125		100.0	12.50	-3.91	257.6
800	122.8		100.0	13.33	-3.91	253.1
850	120.1		100.0	14.17	-3.91	247.5
900	119.2		100.0	15.00	-3.91	245.7
950	118		100.0	15.83	-3.91	243.2
1000	117.1		100.0	16.67	-3.91	241.4
1050	117		100.0	17.50	-3.91	241.2
1100	117		100.0	18.33	-3.91	241.2
1150	117		100.0	19.17	-3.91	241.2
1200	116.8		100.0	20.00	-3.91	240.7
1250	116.9		100.0	20.83	-3.91	240.9

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

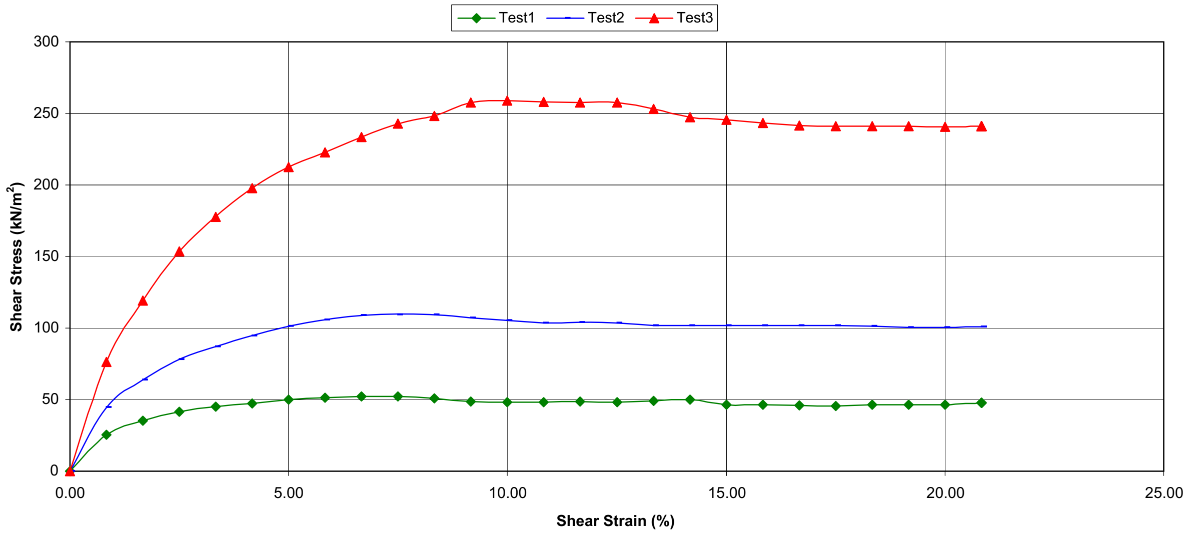
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148/A **Sample Type**
Depth (m): - -
Position: Phase 2 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1431	1431	1433
Moisture Content (%)	27.6	27.4	27.9
Shear Strain (%)	6.7	7.5	10.0
Shear Stress (kN/m^2)	52.0	109.4	259.1

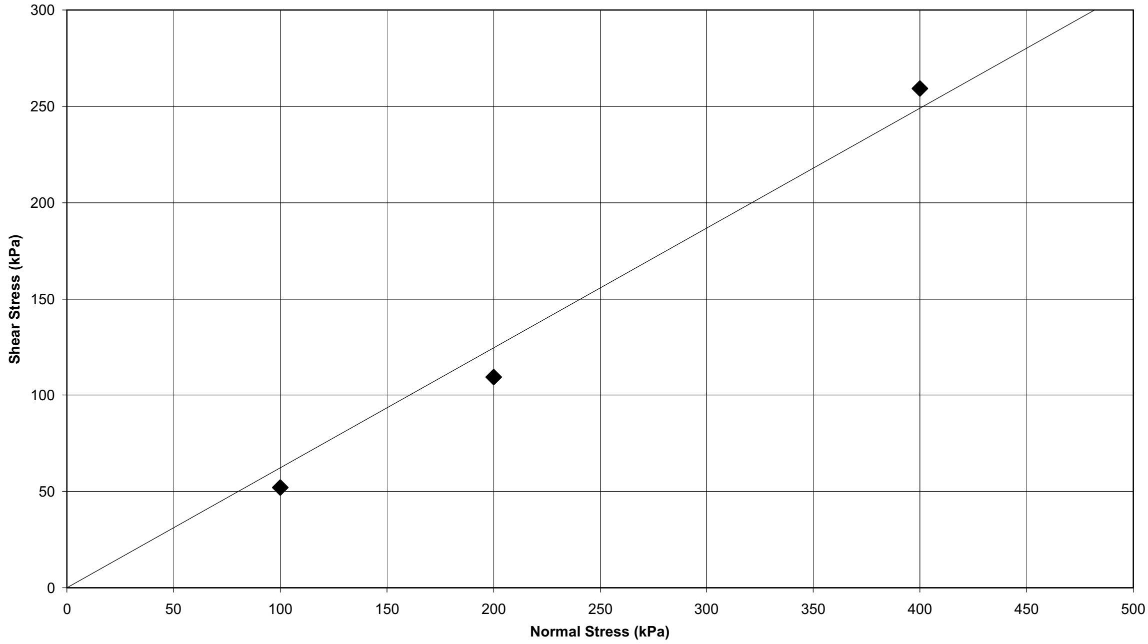
Shear Strength Perameters

Angle of Internal Friction (φ°)	32
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10148/B -
Depth (m): - **Sample Type:**
Position: Phase 2 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 23.43
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1603
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	17.2		100.0	0.83	-3.91	36.1
100	27.2		100.0	1.67	-3.91	57.0
150	32.2		100.0	2.50	-3.91	67.5
200	34.2		100.0	3.33	-3.91	71.7
250	34.5		100.0	4.17	-3.91	72.4
300	33.2		100.0	5.00	-3.91	69.6
350	31		100.0	5.83	-3.91	65.0
400	27.5		100.0	6.67	-3.91	57.7
450	25.5		100.0	7.50	-3.91	53.5
500	25		100.0	8.33	-3.91	52.4
550	24.8		100.0	9.17	-3.91	52.0
600	25		100.0	10.00	-3.91	52.4
650	24.8		100.0	10.83	-3.91	52.0
700	24.8		100.0	11.67	-3.91	52.0
750	24.5		100.0	12.50	-3.91	51.4
800	24		100.0	13.33	-3.91	50.3
850	24		100.0	14.17	-3.91	50.3
900	24		100.0	15.00	-3.91	50.3
950	23.8		100.0	15.83	-3.91	49.9
1000	23.2		100.0	16.67	-3.91	48.7
1050	23.2		100.0	17.50	-3.91	48.7
1100	23.2		100.0	18.33	-3.91	48.7
1150	23.2		100.0	19.17	-3.91	48.7
1200	23.2		100.0	20.00	-3.91	48.7
1250	23		100.0	20.83	-3.91	48.2

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 25.02
Prooving Ring Factor 76 Dry Density (kg/m^3) 1607
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	26.5		100.0	0.83	-3.91	55.9
100	41.2		100.0	1.67	-3.91	87.0
150	52.8		100.0	2.50	-3.91	111.5
200	60.2		100.0	3.33	-3.91	127.1
250	64		100.0	4.17	-3.91	135.1
300	66.8		100.0	5.00	-3.91	141.0
350	66.8		100.0	5.83	-3.91	141.0
400	64.5		100.0	6.67	-3.91	136.2
450	61		100.0	7.50	-3.91	128.8
500	56.5		100.0	8.33	-3.91	119.3
550	54.2		100.0	9.17	-3.91	114.4
600	53.5		100.0	10.00	-3.91	112.9
650	53		100.0	10.83	-3.91	111.9
700	52.8		100.0	11.67	-3.91	111.5
750	53		100.0	12.50	-3.91	111.9
800	52.8		100.0	13.33	-3.91	111.5
850	52.2		100.0	14.17	-3.91	110.2
900	52		100.0	15.00	-3.91	109.8
950	51.2		100.0	15.83	-3.91	108.1
1000	51.2		100.0	16.67	-3.91	108.1
1050	51		100.0	17.50	-3.91	107.7
1100	50.8		100.0	18.33	-3.91	107.2
1150	50.2		100.0	19.17	-3.91	106.0
1200	50.2		100.0	20.00	-3.91	106.0
1250	50.2		100.0	20.83	-3.91	106.0

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 24.65
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1610
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	37		100.0	0.83	-3.91	76.3
100	62		100.0	1.67	-3.91	127.8
150	84.5		100.0	2.50	-3.91	174.2
200	103		100.0	3.33	-3.91	212.3
250	118		100.0	4.17	-3.91	243.2
300	129		100.0	5.00	-3.91	265.9
350	137.7		100.0	5.83	-3.91	283.8
400	144		100.0	6.67	-3.91	296.8
450	144.5		100.0	7.50	-3.91	297.8
500	144.5		100.0	8.33	-3.91	297.8
550	146		100.0	9.17	-3.91	300.9
600	137		100.0	10.00	-3.91	282.4
650	129.2		100.0	10.83	-3.91	266.3
700	126.5		100.0	11.67	-3.91	260.7
750	125.2		100.0	12.50	-3.91	258.1
800	123		100.0	13.33	-3.91	253.5
850	123		100.0	14.17	-3.91	253.5
900	121.8		100.0	15.00	-3.91	251.0
950	121		100.0	15.83	-3.91	249.4
1000	120.5		100.0	16.67	-3.91	248.4
1050	120		100.0	17.50	-3.91	247.3
1100	119.2		100.0	18.33	-3.91	245.7
1150	119.5		100.0	19.17	-3.91	246.3
1200	118.7		100.0	20.00	-3.91	244.7
1250	118.5		100.0	20.83	-3.91	244.2

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

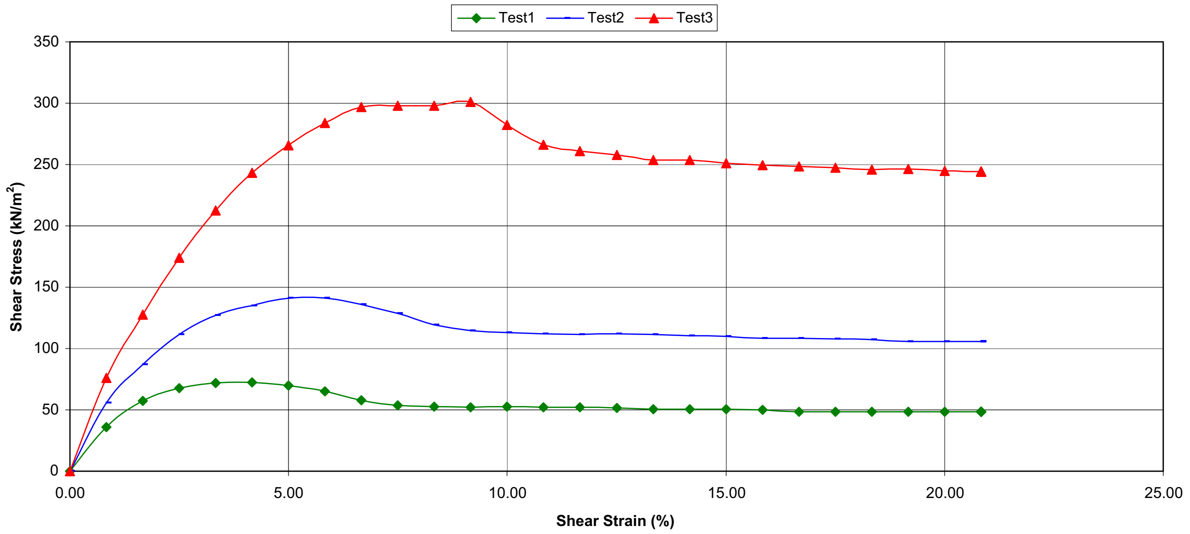
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148/B **Sample Type**
Depth (m): - -
Position: Phase 2 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1603	1607	1610
Moisture Content (%)	23.4	25.0	24.7
Shear Strain (%)	4.2	5.0	9.2
Shear Stress (kN/m^2)	72.4	141.0	300.9

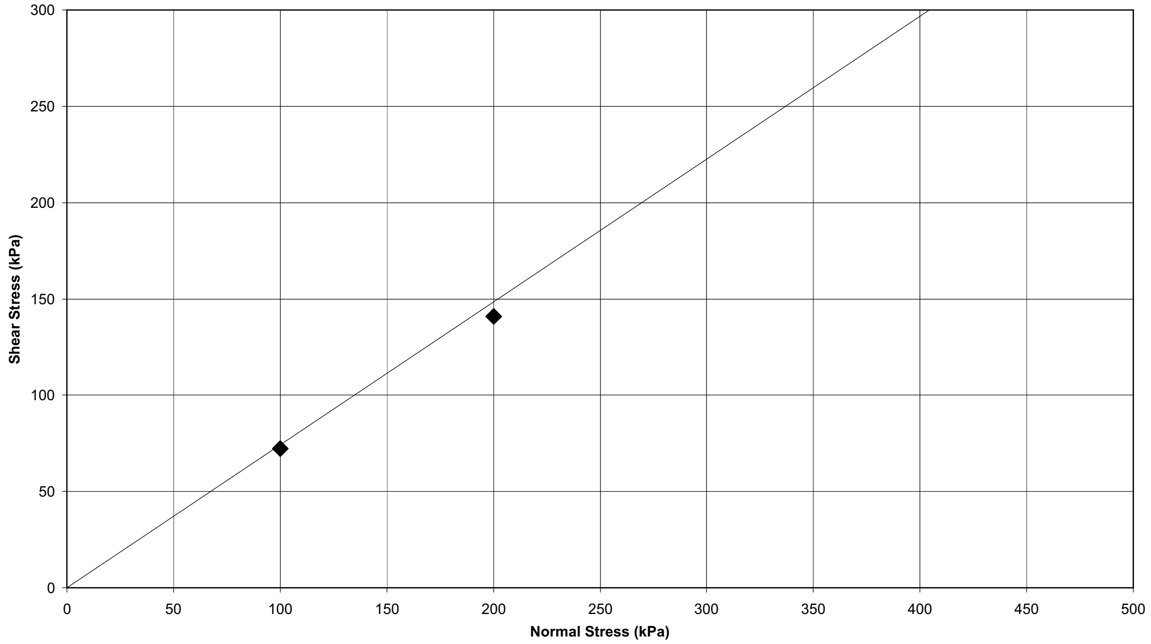
Shear Strength Perameters

Angle of Internal Friction (ø°)	37
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10148/C -
Depth (m): - **Sample Type:**
Position: Phase 2 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 21.13
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	21.5		100.0	0.83	-3.91	45.1
100	32.5		100.0	1.67	-3.91	68.2
150	35		100.0	2.50	-3.91	73.4
200	35		100.0	3.33	-3.91	73.4
250	31		100.0	4.17	-3.91	65.0
300	26.5		100.0	5.00	-3.91	55.6
350	24.2		100.0	5.83	-3.91	50.8
400	23.2		100.0	6.67	-3.91	48.7
450	23		100.0	7.50	-3.91	48.2
500	22.8		100.0	8.33	-3.91	47.8
550	22.5		100.0	9.17	-3.91	47.2
600	22.2		100.0	10.00	-3.91	46.6
650	22		100.0	10.83	-3.91	46.1
700	22		100.0	11.67	-3.91	46.1
750	22		100.0	12.50	-3.91	46.1
800	22		100.0	13.33	-3.91	46.1
850	22		100.0	14.17	-3.91	46.1
900	22		100.0	15.00	-3.91	46.1
950	21.8		100.0	15.83	-3.91	45.7
1000	22		100.0	16.67	-3.91	46.1
1050	22		100.0	17.50	-3.91	46.1
1100	21.8		100.0	18.33	-3.91	45.7
1150	21.8		100.0	19.17	-3.91	45.7
1200	21.8		100.0	20.00	-3.91	45.7
1250	21.5		100.0	20.83	-3.91	45.1

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.67
Prooving Ring Factor 76 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	28		100.0	0.83	-3.91	59.1
100	44.2		100.0	1.67	-3.91	93.3
150	58		100.0	2.50	-3.91	122.4
200	70.8		100.0	3.33	-3.91	149.5
250	74.5		100.0	4.17	-3.91	157.3
300	74.2		100.0	5.00	-3.91	156.6
350	69.8		100.0	5.83	-3.91	147.4
400	63.8		100.0	6.67	-3.91	134.7
450	58.5		100.0	7.50	-3.91	123.5
500	55		100.0	8.33	-3.91	116.1
550	53		100.0	9.17	-3.91	111.9
600	52.8		100.0	10.00	-3.91	111.5
650	52.2		100.0	10.83	-3.91	110.2
700	52.2		100.0	11.67	-3.91	110.2
750	52		100.0	12.50	-3.91	109.8
800	51.5		100.0	13.33	-3.91	108.7
850	51		100.0	14.17	-3.91	107.7
900	50.8		100.0	15.00	-3.91	107.2
950	50.2		100.0	15.83	-3.91	106.0
1000	50		100.0	16.67	-3.91	105.6
1050	50		100.0	17.50	-3.91	105.6
1100	50		100.0	18.33	-3.91	105.6
1150	49.8		100.0	19.17	-3.91	105.1
1200	49.8		100.0	20.00	-3.91	105.1
1250	49.5		100.0	20.83	-3.91	104.5

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 22.51
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1716
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	38.8		100.0	0.83	-3.91	80.0
100	67		100.0	1.67	-3.91	138.1
150	91		100.0	2.50	-3.91	187.6
200	113		100.0	3.33	-3.91	232.9
250	134		100.0	4.17	-3.91	276.2
300	149		100.0	5.00	-3.91	307.1
350	158		100.0	5.83	-3.91	325.7
400	162.5		100.0	6.67	-3.91	334.9
450	161.8		100.0	7.50	-3.91	333.5
500	146		100.0	8.33	-3.91	300.9
550	133		100.0	9.17	-3.91	274.1
600	127		100.0	10.00	-3.91	261.8
650	125.2		100.0	10.83	-3.91	258.1
700	125		100.0	11.67	-3.91	257.6
750	124		100.0	12.50	-3.91	255.6
800	124		100.0	13.33	-3.91	255.6
850	123		100.0	14.17	-3.91	253.5
900	123		100.0	15.00	-3.91	253.5
950	122		100.0	15.83	-3.91	251.5
1000	121.7		100.0	16.67	-3.91	250.8
1050	121		100.0	17.50	-3.91	249.4
1100	120.5		100.0	18.33	-3.91	248.4
1150	120.5		100.0	19.17	-3.91	248.4
1200	120.5		100.0	20.00	-3.91	248.4
1250	120.5		100.0	20.83	-3.91	248.4

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

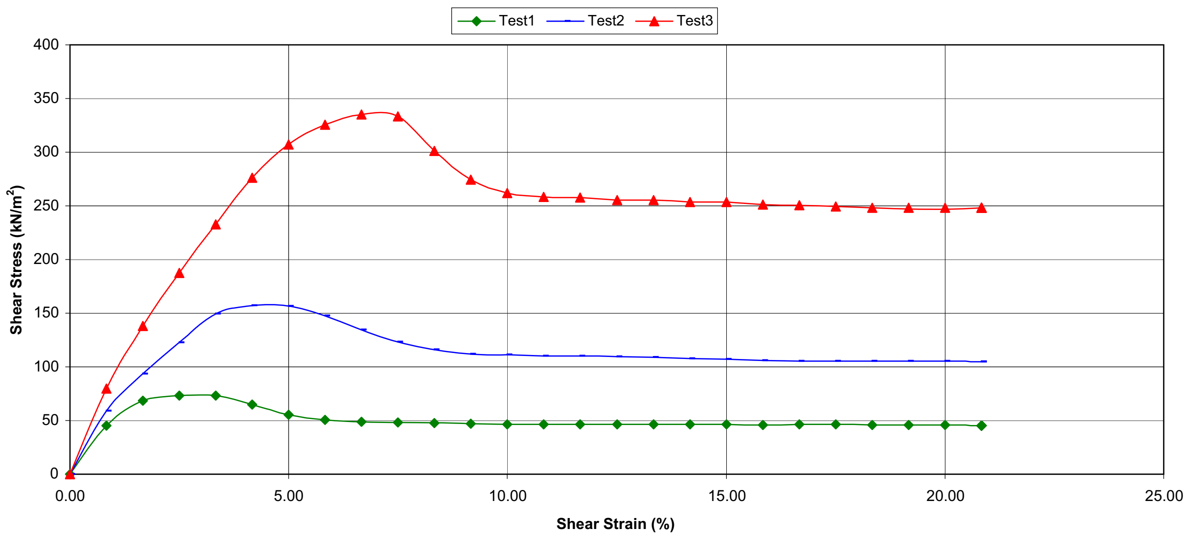
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10148/C **Sample Type**
Depth (m): - -
Position: Phase 2 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m²)	100	200	400
Dry Density (kg/m³)	1716	1716	1716
Moisture Content (%)	21.1	21.7	22.5
Shear Strain (%)	2.5	4.2	6.7
Shear Stress (kN/m²)	73.4	157.3	334.9

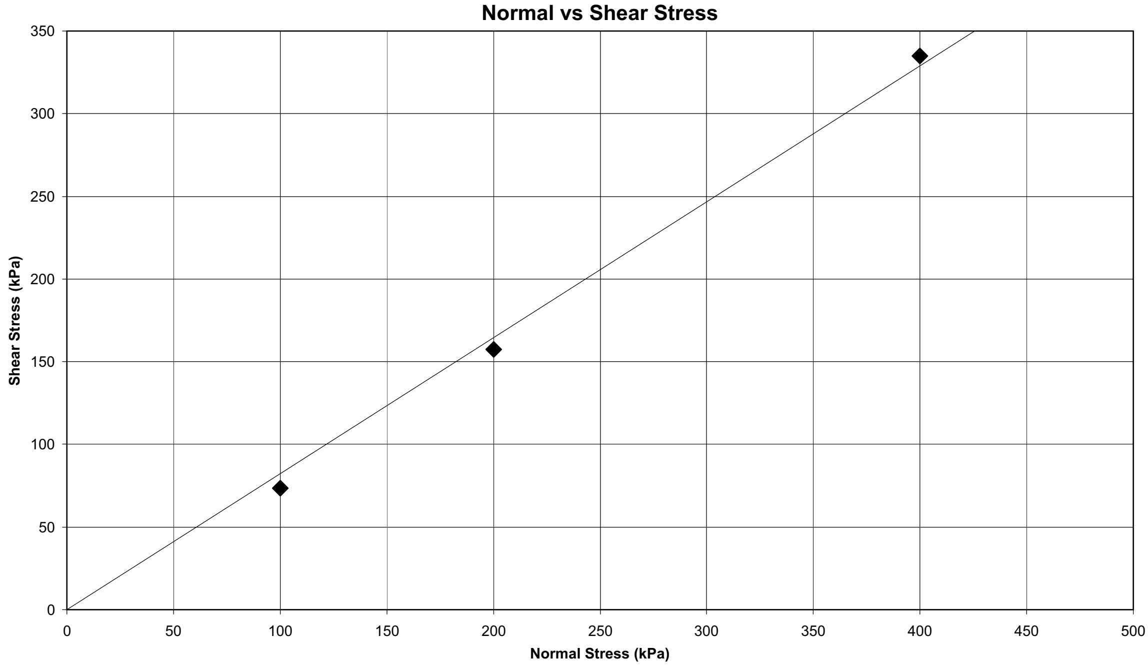
Shear Strength Perameters

Angle of Internal Friction (φ°)	39
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150/a -
Depth (m): - **Sample Type:**
Position: Phase 3 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 25.69
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1303
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	10.2		100.0	0.83	-3.91	21.4
100	13.8		100.0	1.67	-3.91	28.9
150	17.2		100.0	2.50	-3.91	36.1
200	18.2		100.0	3.33	-3.91	38.2
250	18.8		100.0	4.17	-3.91	39.4
300	20.2		100.0	5.00	-3.91	42.4
350	21.8		100.0	5.83	-3.91	45.7
400	22.5		100.0	6.67	-3.91	47.2
450	23.8		100.0	7.50	-3.91	49.9
500	24		100.0	8.33	-3.91	50.3
550	24.2		100.0	9.17	-3.91	50.8
600	24.2		100.0	10.00	-3.91	50.8
650	25		100.0	10.83	-3.91	52.4
700	25		100.0	11.67	-3.91	52.4
750	25		100.0	12.50	-3.91	52.4
800	24.2		100.0	13.33	-3.91	50.8
850	23.5		100.0	14.17	-3.91	49.3
900	23		100.0	15.00	-3.91	48.2
950	23		100.0	15.83	-3.91	48.2
1000	23		100.0	16.67	-3.91	48.2
1050	23		100.0	17.50	-3.91	48.2
1100	22.8		100.0	18.33	-3.91	47.8
1150	22.8		100.0	19.17	-3.91	47.8
1200	22.8		100.0	20.00	-3.91	47.8
1250	22.8		100.0	20.83	-3.91	47.8

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 24.29
Prooving Ring Factor 76 Dry Density (kg/m^3) 1312
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	17.2		100.0	0.83	-3.91	36.3
100	24		100.0	1.67	-3.91	50.7
150	28.2		100.0	2.50	-3.91	59.5
200	32.2		100.0	3.33	-3.91	68.0
250	36		100.0	4.17	-3.91	76.0
300	38.8		100.0	5.00	-3.91	81.9
350	41.2		100.0	5.83	-3.91	87.0
400	42		100.0	6.67	-3.91	88.7
450	45.2		100.0	7.50	-3.91	95.4
500	47		100.0	8.33	-3.91	99.2
550	48.2		100.0	9.17	-3.91	101.8
600	49		100.0	10.00	-3.91	103.4
650	49.8		100.0	10.83	-3.91	105.1
700	49.8		100.0	11.67	-3.91	105.1
750	50		100.0	12.50	-3.91	105.6
800	49.8		100.0	13.33	-3.91	105.1
850	49.2		100.0	14.17	-3.91	103.9
900	49		100.0	15.00	-3.91	103.4
950	48.9		100.0	15.83	-3.91	103.2
1000	48.2		100.0	16.67	-3.91	101.8
1050	48.2		100.0	17.50	-3.91	101.8
1100	48		100.0	18.33	-3.91	101.3
1150	47.5		100.0	19.17	-3.91	100.3
1200	47.5		100.0	20.00	-3.91	100.3
1250	47.2		100.0	20.83	-3.91	99.6

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 25.38
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1313
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	36		100.0	0.83	-3.91	74.2
100	54		100.0	1.67	-3.91	111.3
150	66		100.0	2.50	-3.91	136.0
200	74.2		100.0	3.33	-3.91	152.9
250	82.2		100.0	4.17	-3.91	169.4
300	89.2		100.0	5.00	-3.91	183.9
350	96.5		100.0	5.83	-3.91	198.9
400	101.2		100.0	6.67	-3.91	208.6
450	106		100.0	7.50	-3.91	218.5
500	109.2		100.0	8.33	-3.91	225.1
550	112.8		100.0	9.17	-3.91	232.5
600	116		100.0	10.00	-3.91	239.1
650	117.5		100.0	10.83	-3.91	242.2
700	120		100.0	11.67	-3.91	247.3
750	121		100.0	12.50	-3.91	249.4
800	121.3		100.0	13.33	-3.91	250.0
850	120.3		100.0	14.17	-3.91	248.0
900	120		100.0	15.00	-3.91	247.3
950	117		100.0	15.83	-3.91	241.2
1000	116		100.0	16.67	-3.91	239.1
1050	115.2		100.0	17.50	-3.91	237.4
1100	114.8		100.0	18.33	-3.91	236.6
1150	114		100.0	19.17	-3.91	235.0
1200	114.5		100.0	20.00	-3.91	236.0
1250	114.8		100.0	20.83	-3.91	236.6

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

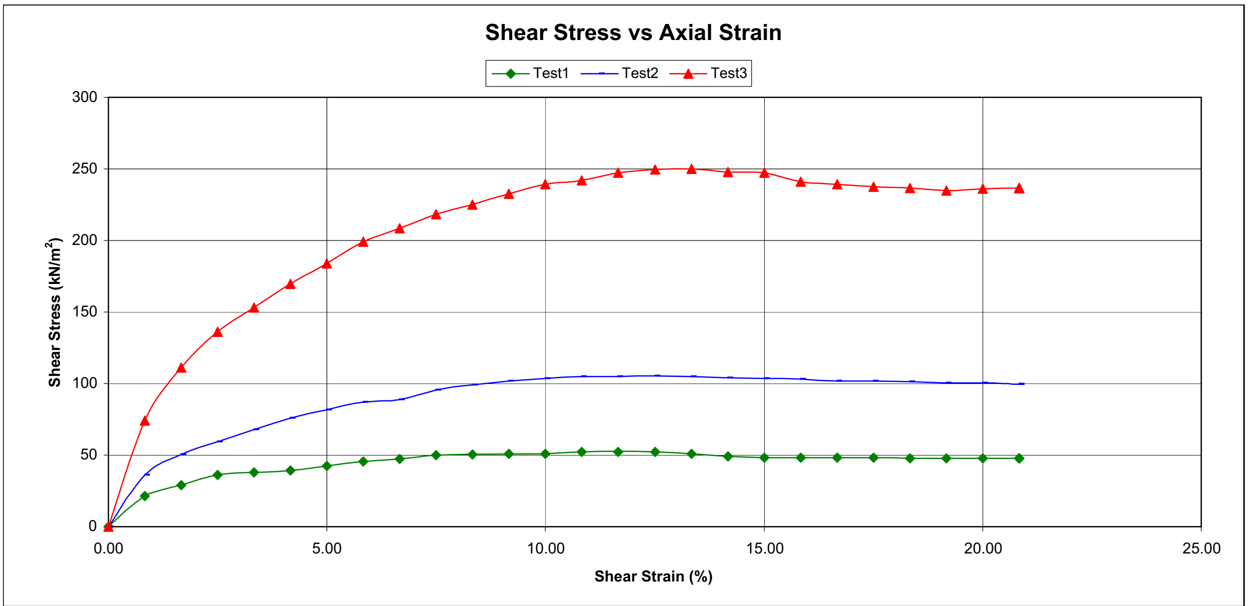
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10150/a
Depth (m): -
Position: Phase 3 Fill

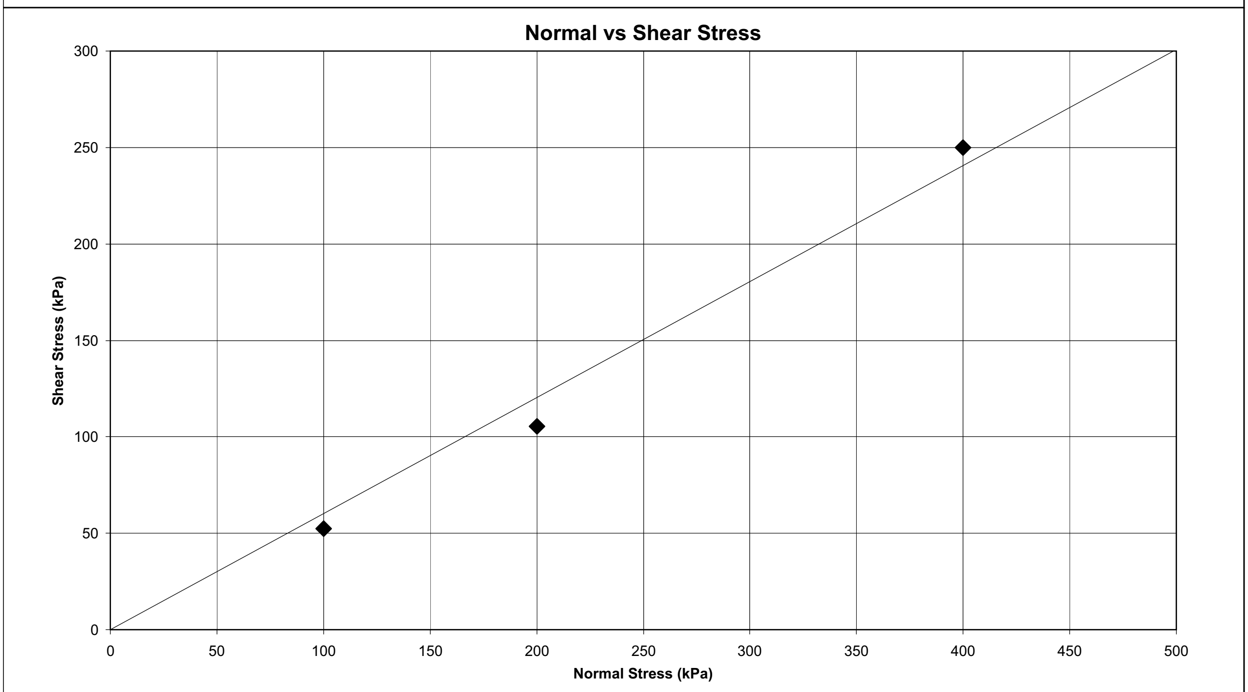
Sample Type
-
Description:
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1303	1312	1313
Moisture Content (%)	25.7	24.3	25.4
Shear Strain (%)	10.8	12.5	13.3
Shear Stress (kN/m^2)	52.4	105.6	250.0

Shear Strength Perameters

Angle of Internal Friction (ø°)	31
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150/B -
Depth (m): - **Sample Type:**
Position: Phase 3 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 24.33
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1474
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	12.8		100.0	0.83	-3.91	26.8
100	17		100.0	1.67	-3.91	35.7
150	20		100.0	2.50	-3.91	41.9
200	22.2		100.0	3.33	-3.91	46.6
250	23.2		100.0	4.17	-3.91	48.7
300	24.5		100.0	5.00	-3.91	51.4
350	25.2		100.0	5.83	-3.91	52.9
400	26		100.0	6.67	-3.91	54.5
450	26		100.0	7.50	-3.91	54.5
500	26		100.0	8.33	-3.91	54.5
550	25.5		100.0	9.17	-3.91	53.5
600	25		100.0	10.00	-3.91	52.4
650	24.2		100.0	10.83	-3.91	50.8
700	25		100.0	11.67	-3.91	52.4
750	25		100.0	12.50	-3.91	52.4
800	24.2		100.0	13.33	-3.91	50.8
850	24		100.0	14.17	-3.91	50.3
900	24		100.0	15.00	-3.91	50.3
950	24		100.0	15.83	-3.91	50.3
1000	23		100.0	16.67	-3.91	48.2
1050	24		100.0	17.50	-3.91	50.3
1100	24		100.0	18.33	-3.91	50.3
1150	23.8		100.0	19.17	-3.91	49.9
1200	24		100.0	20.00	-3.91	50.3
1250	24		100.0	20.83	-3.91	50.3

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 24.82
Prooving Ring Factor 76 Dry Density (kg/m^3) 1487
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	23.2		100.0	0.83	-3.91	49.0
100	32.5		100.0	1.67	-3.91	68.6
150	39		100.0	2.50	-3.91	82.3
200	43.8		100.0	3.33	-3.91	92.5
250	47.5		100.0	4.17	-3.91	100.3
300	50.2		100.0	5.00	-3.91	106.0
350	52		100.0	5.83	-3.91	109.8
400	53.5		100.0	6.67	-3.91	112.9
450	54		100.0	7.50	-3.91	114.0
500	53.5		100.0	8.33	-3.91	112.9
550	51.8		100.0	9.17	-3.91	109.4
600	50.8		100.0	10.00	-3.91	107.2
650	49.5		100.0	10.83	-3.91	104.5
700	49.2		100.0	11.67	-3.91	103.9
750	49.2		100.0	12.50	-3.91	103.9
800	49.2		100.0	13.33	-3.91	103.9
850	49.2		100.0	14.17	-3.91	103.9
900	49.2		100.0	15.00	-3.91	103.9
950	49		100.0	15.83	-3.91	103.4
1000	49		100.0	16.67	-3.91	103.4
1050	48.2		100.0	17.50	-3.91	101.8
1100	49		100.0	18.33	-3.91	103.4
1150	49.2		100.0	19.17	-3.91	103.9
1200	49		100.0	20.00	-3.91	103.4
1250	48.8		100.0	20.83	-3.91	103.0

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 24.78
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1489
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	Δ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	37.2		100.0	0.83	-3.91	76.7
100	57.8		100.0	1.67	-3.91	119.1
150	73		100.0	2.50	-3.91	150.5
200	85.2		100.0	3.33	-3.91	175.6
250	96		100.0	4.17	-3.91	197.9
300	105		100.0	5.00	-3.91	216.4
350	110.5		100.0	5.83	-3.91	227.8
400	116		100.0	6.67	-3.91	239.1
450	120.8		100.0	7.50	-3.91	249.0
500	125		100.0	8.33	-3.91	257.6
550	129		100.0	9.17	-3.91	265.9
600	130.8		100.0	10.00	-3.91	269.6
650	132		100.0	10.83	-3.91	272.1
700	130		100.0	11.67	-3.91	267.9
750	126		100.0	12.50	-3.91	259.7
800	120.8		100.0	13.33	-3.91	249.0
850	119		100.0	14.17	-3.91	245.3
900	119.5		100.0	15.00	-3.91	246.3
950	119		100.0	15.83	-3.91	245.3
1000	119.2		100.0	16.67	-3.91	245.7
1050	118.2		100.0	17.50	-3.91	243.6
1100	117.2		100.0	18.33	-3.91	241.6
1150	117.5		100.0	19.17	-3.91	242.2
1200	117.2		100.0	20.00	-3.91	241.6
1250	117.2		100.0	20.83	-3.91	241.6

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

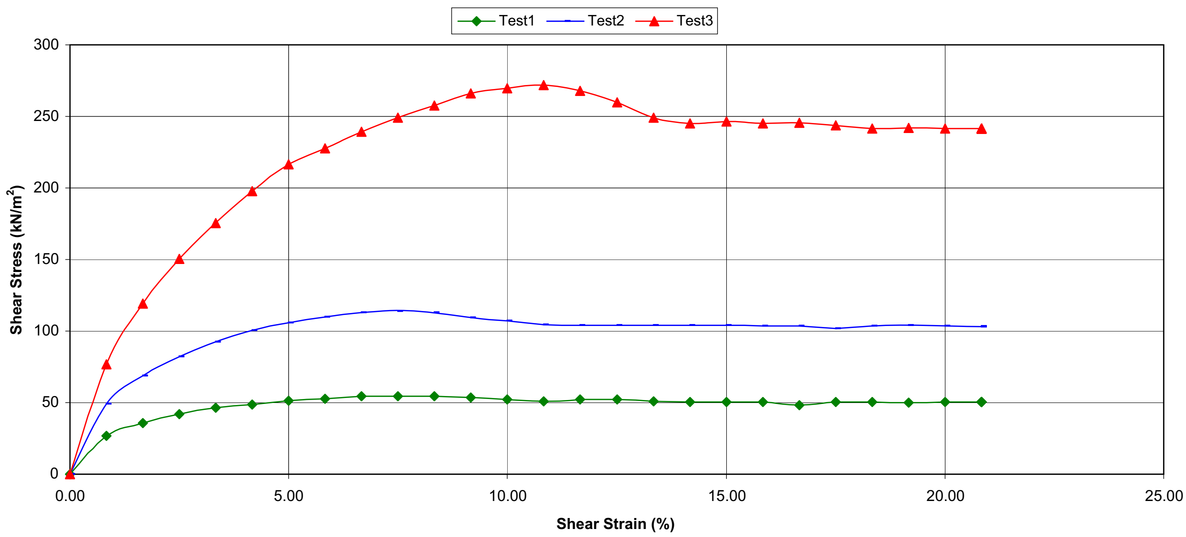
Project Durban Harbour Berth Deepening
Ref no. 5480
Lab no. 10150/B **Sample Type**
Depth (m): - -
Position: Phase 3 Fill **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1474	1487	1489
Moisture Content (%)	24.3	24.8	24.8
Shear Strain (%)	6.7	7.5	10.8
Shear Stress (kN/m^2)	54.5	114.0	272.1

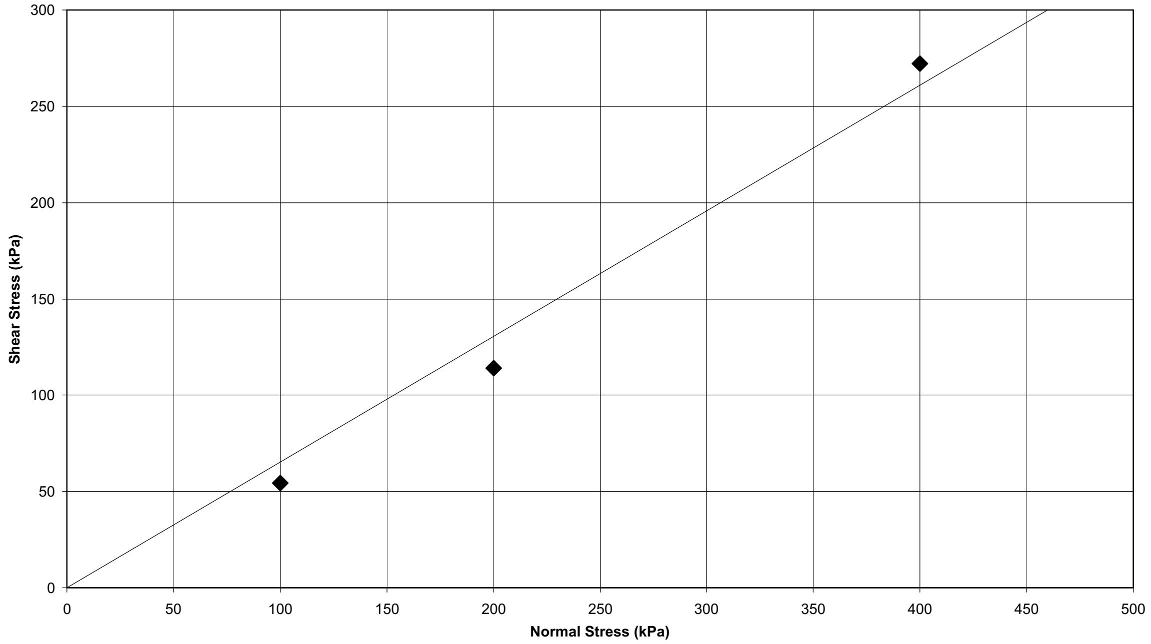
Shear Strength Perameters

Angle of Internal Friction (ø°)	33
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

Project Durban Harbour Berth Deepening
Ref no. 5480 **Description:**
Lab no. 10150/c -
Depth (m): - **Sample Type:**
Position: Phase 3 Fill -

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 21.50
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1673
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	18		100.0	0.83	-3.91	37.8
100	28.2		100.0	1.67	-3.91	59.1
150	32.2		100.0	2.50	-3.91	67.5
200	33		100.0	3.33	-3.91	69.2
250	32.8		100.0	4.17	-3.91	68.8
300	31		100.0	5.00	-3.91	65.0
350	29		100.0	5.83	-3.91	60.8
400	27		100.0	6.67	-3.91	56.6
450	26		100.0	7.50	-3.91	54.5
500	25.8		100.0	8.33	-3.91	54.1
550	25.5		100.0	9.17	-3.91	53.5
600	25.5		100.0	10.00	-3.91	53.5
650	25.8		100.0	10.83	-3.91	54.1
700	25.2		100.0	11.67	-3.91	52.9
750	25.2		100.0	12.50	-3.91	52.9
800	25		100.0	13.33	-3.91	52.4
850	24.5		100.0	14.17	-3.91	51.4
900	24.2		100.0	15.00	-3.91	50.8
950	24.2		100.0	15.83	-3.91	50.8
1000	24		100.0	16.67	-3.91	50.3
1050	23.8		100.0	17.50	-3.91	49.9
1100	23.8		100.0	18.33	-3.91	49.9
1150	23.2		100.0	19.17	-3.91	48.7
1200	23.2		100.0	20.00	-3.91	48.7
1250	23.2		100.0	20.83	-3.91	48.7

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 21.42
Prooving Ring Factor 76 Dry Density (kg/m^3) 1673
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	28.2		100.0	0.83	-3.91	59.5
100	42.2		100.0	1.67	-3.91	89.1
150	55.5		100.0	2.50	-3.91	117.2
200	63.5		100.0	3.33	-3.91	134.1
250	66.2		100.0	4.17	-3.91	139.8
300	66.8		100.0	5.00	-3.91	141.0
350	65		100.0	5.83	-3.91	137.2
400	60.8		100.0	6.67	-3.91	128.4
450	55.5		100.0	7.50	-3.91	117.2
500	54		100.0	8.33	-3.91	114.0
550	52.8		100.0	9.17	-3.91	111.5
600	52		100.0	10.00	-3.91	109.8
650	51		100.0	10.83	-3.91	107.7
700	51		100.0	11.67	-3.91	107.7
750	50.2		100.0	12.50	-3.91	106.0
800	50		100.0	13.33	-3.91	105.6
850	50		100.0	14.17	-3.91	105.6
900	50		100.0	15.00	-3.91	105.6
950	50		100.0	15.83	-3.91	105.6
1000	49.8		100.0	16.67	-3.91	105.1
1050	49		100.0	17.50	-3.91	103.4
1100	48.9		100.0	18.33	-3.91	103.2
1150	48.8		100.0	19.17	-3.91	103.0
1200	48.8		100.0	20.00	-3.91	103.0
1250	48.5		100.0	20.83	-3.91	102.4

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 21.34
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1673
Area (cm^2) 36 Volume at Test (cm^3) 92.16
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000	0	0.00	0	0
50	38		100.0	0.83	-3.91	78.3
100	69.5		100.0	1.67	-3.91	143.2
150	90.85		100.0	2.50	-3.91	187.3
200	113		100.0	3.33	-3.91	232.9
250	131.5		100.0	4.17	-3.91	271.0
300	145		100.0	5.00	-3.91	298.9
350	154.5		100.0	5.83	-3.91	318.4
400	161		100.0	6.67	-3.91	331.8
450	163		100.0	7.50	-3.91	336.0
500	161		100.0	8.33	-3.91	331.8
550	151		100.0	9.17	-3.91	311.2
600	141		100.0	10.00	-3.91	290.6
650	135		100.0	10.83	-3.91	278.3
700	130		100.0	11.67	-3.91	267.9
750	127.5		100.0	12.50	-3.91	262.8
800	126		100.0	13.33	-3.91	259.7
850	125.5		100.0	14.17	-3.91	258.7
900	125.5		100.0	15.00	-3.91	258.7
950	125.5		100.0	15.83	-3.91	258.7
1000	125		100.0	16.67	-3.91	257.6
1050	124.5		100.0	17.50	-3.91	256.6
1100	123.8		100.0	18.33	-3.91	255.2
1150	123		100.0	19.17	-3.91	253.5
1200	122		100.0	20.00	-3.91	251.5
1250	122		100.0	20.83	-3.91	251.5

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

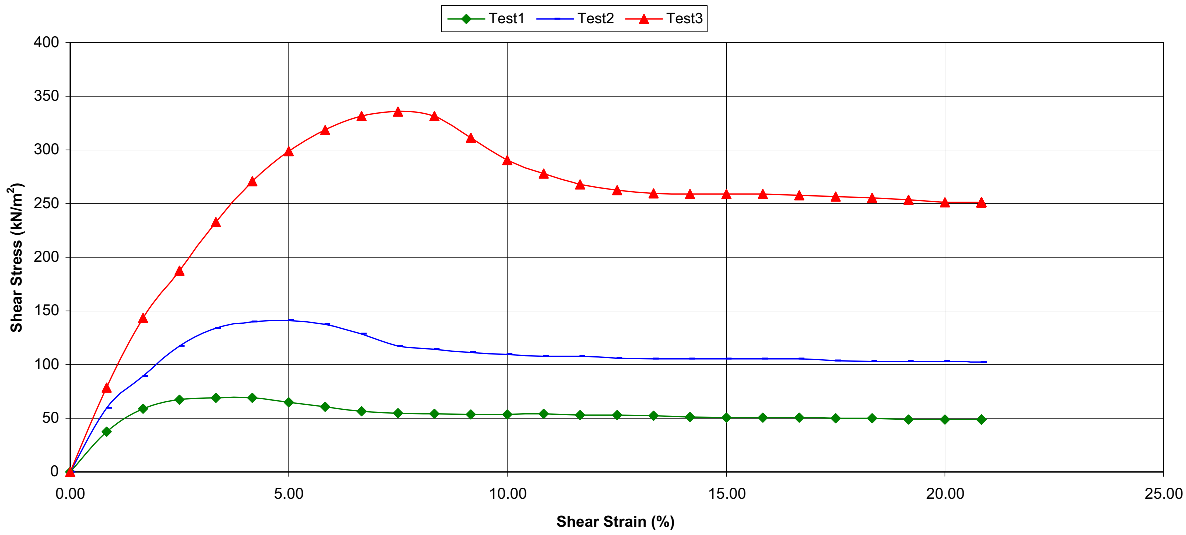
Project	Durban Harbour Berth Deepening		
Ref no.	5480		
Lab no.	10150/c	**Sample Type**	
Depth (m):	-	-	
Position:	Phase 3 Fill	**Description:**	
		-	

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1673	1673	1673
Moisture Content (%)	21.5	21.4	21.3
Shear Strain (%)	3.3	5.0	7.5
Shear Stress (kN/m^2)	69.2	141.0	336.0

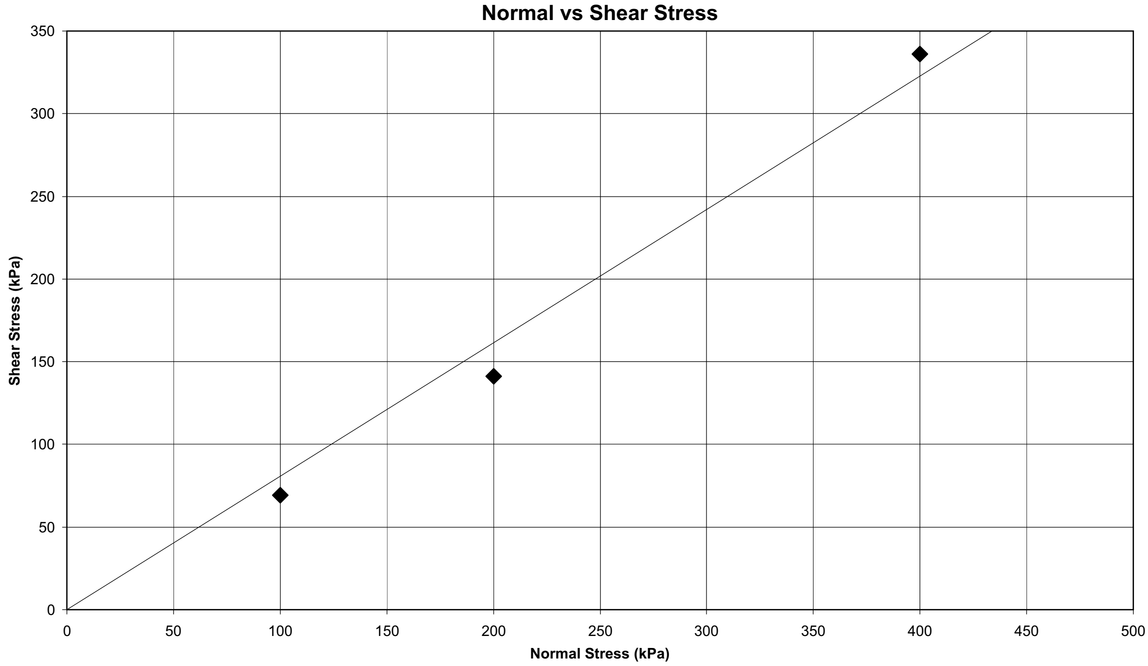
Shear Strength Perameters

Angle of Internal Friction (φ°)	39
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATEDDRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC

Project MSJ Harbour - O/D No. 09822
Ref no. 5364 **Description:**
Lab no. 07089 -
Depth (m): - **Sample Type:**
Position: 4501 Recompated to 90% of MOD.

Test 1

Inputs

Normal Stress (kPa)	100	MC at Test (%)	13.5
Prooving Ring Factor	75.5	Dry Density (kg/m^3)	1538.1
Area (cm^2)	36	Volume at Test (cm^3)	90.504
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	16.8	994	0.6	0.83	-0.02	35.2
100	23.8	993	0.7	1.67	-0.03	49.9
150	26.5	993	0.7	2.50	-0.03	55.6
200	28.2	992	0.8	3.33	-0.03	59.1
250	28.5	982	1.8	4.17	-0.07	59.8
300	28.5	981	1.9	5.00	-0.08	59.8
350	28	980	2.0	5.83	-0.08	58.7
400	27.2	980	2.0	6.67	-0.08	57.0
450	26.8	980	2.0	7.50	-0.08	56.2
500	26.8	980	2.0	8.33	-0.08	56.2
550	26.8	980	2.0	9.17	-0.08	56.2
600	26.8	980	2.0	10.00	-0.08	56.2
650	26.8	980	2.0	10.83	-0.08	56.2
700	26.8	980	2.0	11.67	-0.08	56.2
750	26.5	980	2.0	12.50	-0.08	55.6
800	27	980	2.0	13.33	-0.08	56.6
850	27.2	980	2.0	14.17	-0.08	57.0
900	27.2	980	2.0	15.00	-0.08	57.0
950	27.2	980	2.0	15.83	-0.08	57.0
1000	27.2	978	2.2	16.67	-0.09	57.0
1050	27.8	975	2.5	17.50	-0.10	58.3
1100	27.8	974	2.6	18.33	-0.10	58.3
1150	28	973	2.7	19.17	-0.11	58.7
1200	28	973	2.7	20.00	-0.11	58.7
1250	28	972	2.8	20.83	-0.11	58.7

Test 2

Inputs

Normal Stress (kPa)	200	MC at Test (%)	13.5
Prooving Ring Factor	76	Dry Density (kg/m^3)	1538.1
Area (cm^2)	36	Volume at Test (cm^3)	89.532
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25	995	0.5	0.83	-0.02	52.8
100	37.2	989	1.1	1.67	-0.04	78.5
150	44	986	1.4	2.50	-0.06	92.9
200	50.2	985	1.5	3.33	-0.06	106.0
250	52.2	984	1.6	4.17	-0.06	110.2
300	54.5	980	2.0	5.00	-0.08	115.1
350	55	980	2.0	5.83	-0.08	116.1
400	55	980	2.0	6.67	-0.08	116.1
450	55	980	2.0	7.50	-0.08	116.1
500	54.2	980	2.0	8.33	-0.08	114.4
550	53.5	980	2.0	9.17	-0.08	112.9
600	54.2	980	2.0	10.00	-0.08	114.4
650	53.2	980	2.0	10.83	-0.08	112.3
700	53	979	2.1	11.67	-0.08	111.9
750	53	979	2.1	12.50	-0.08	111.9
800	53	979	2.1	13.33	-0.08	111.9
850	53	978	2.2	14.17	-0.09	111.9
900	53	976	2.4	15.00	-0.10	111.9
950	53	975	2.5	15.83	-0.10	111.9
1000	53	974	2.6	16.67	-0.10	111.9
1050	53	972	2.8	17.50	-0.11	111.9
1100	53	970	3.0	18.33	-0.12	111.9
1150	53	968	3.2	19.17	-0.13	111.9
1200	53	966	3.4	20.00	-0.14	111.9
1250	53	965	3.5	20.83	-0.14	111.9

Test 3

Inputs

Normal Stress (kPa)	400	MC at Test (%)	13.5
Prooving Ring Factor	74.2	Dry Density (kg/m^3)	1538.1
Area (cm^2)	36	Volume at Test (cm^3)	89.28
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	39	998	0.2	0.83	-0.01	80.4
100	67	991	0.9	1.67	-0.04	138.1
150	84.2	986	1.4	2.50	-0.06	173.5
200	101.5	982	1.8	3.33	-0.07	209.2
250	108.5	981	1.9	4.17	-0.08	223.6
300	119.8	978	2.2	5.00	-0.09	246.9
350	126.2	977	2.3	5.83	-0.09	260.1
400	129.5	977	2.3	6.67	-0.09	266.9
450	130.2	976	2.4	7.50	-0.10	268.4
500	127.8	976	2.4	8.33	-0.10	263.4
550	127.2	976	2.4	9.17	-0.10	262.2
600	126.2	976	2.4	10.00	-0.10	260.1
650	122.8	972	2.8	10.83	-0.11	253.1
700	124.8	971	2.9	11.67	-0.12	257.2
750	125.2	970	3.0	12.50	-0.12	258.1
800	124.5	969	3.1	13.33	-0.12	256.6
850	122.2	967	3.3	14.17	-0.13	251.9
900	123.2	965	3.5	15.00	-0.14	253.9
950	123	964	3.6	15.83	-0.14	253.5
1000	123	963	3.7	16.67	-0.15	253.5
1050	121.2	961	3.9	17.50	-0.16	249.8
1100	122	959	4.1	18.33	-0.16	251.5
1150	121	957	4.3	19.17	-0.17	249.4
1200	121.2	956	4.4	20.00	-0.18	249.8
1250	120.5	954	4.6	20.83	-0.18	248.4

CONSOLIDATED DRAINED SHEAR BOX TEST

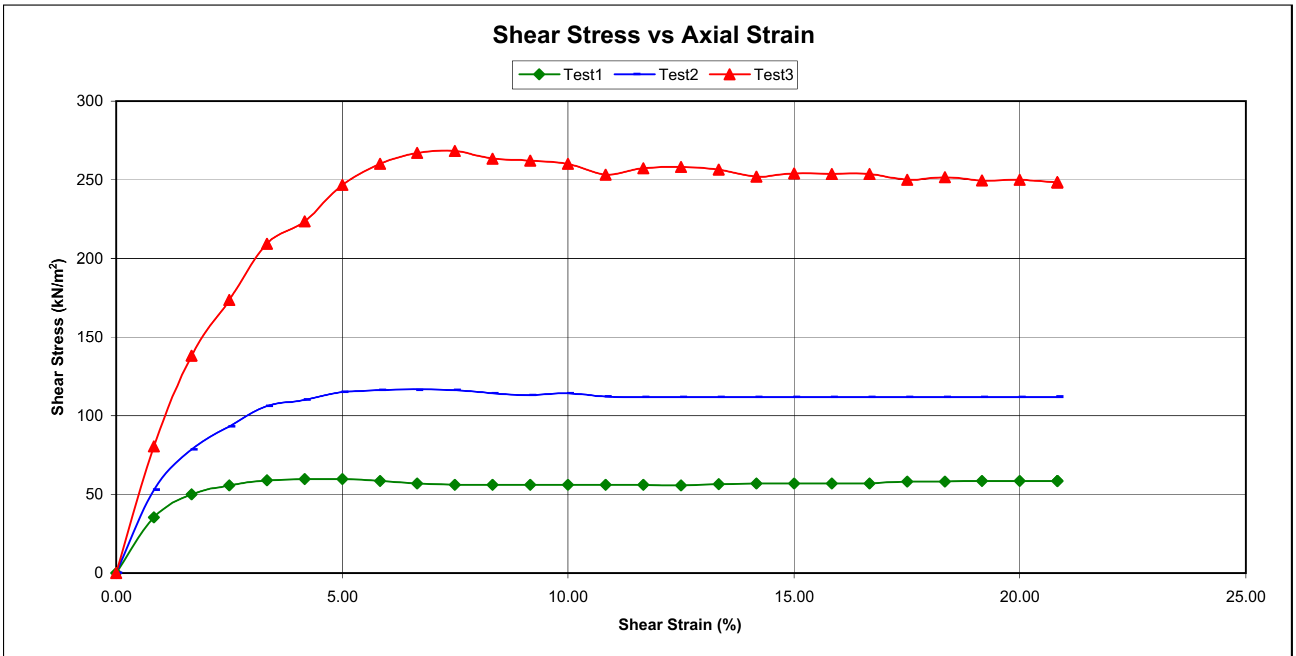
THEKWINI SOILS LAB. CC

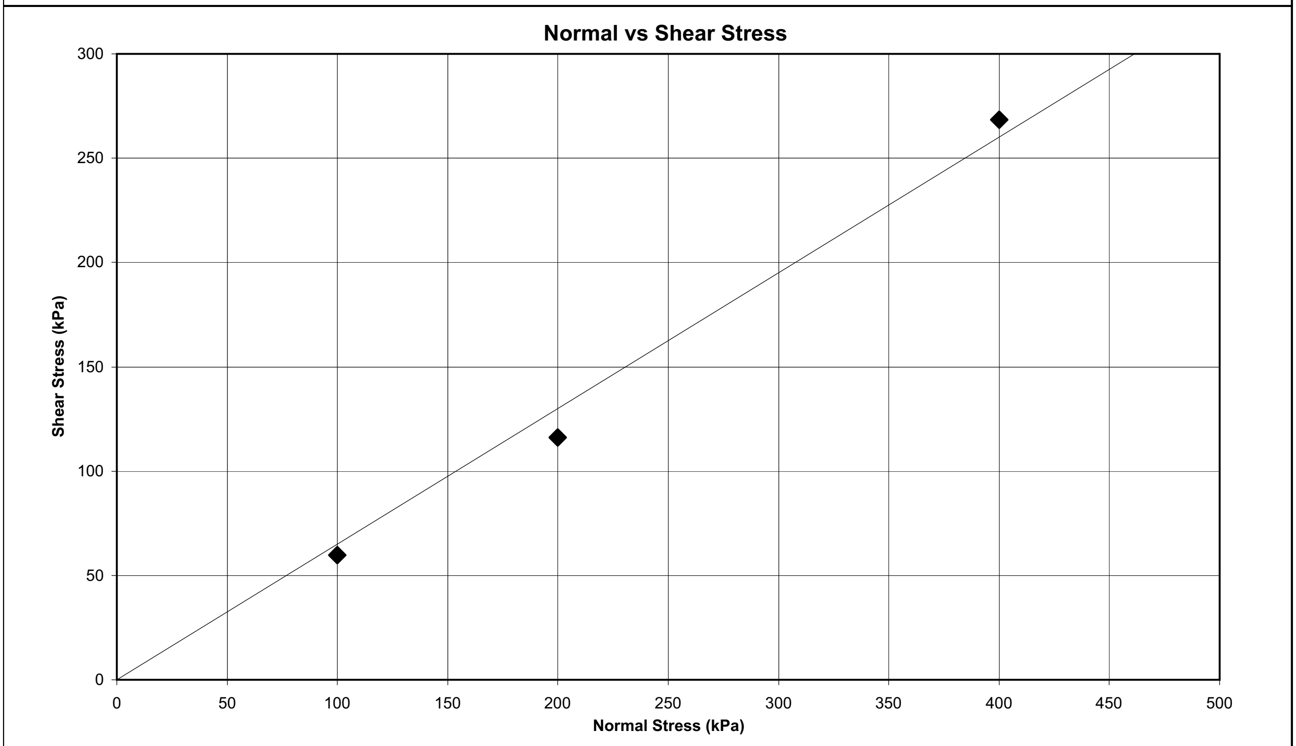
Project	MSJ Harbour - O/D No. 09822		
Ref no.	5364		
Lab no.	07089	**Sample Type**	
Depth (m):	-	Recompated to 90% of MOD.	
Position:	4501	**Description:**	
		-	

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1538	1538	1538
Moisture Content (%)	13.5	13.5	13.5
Shear Strain (%)	4.2	5.8	7.5
Shear Stress (kN/m^2)	59.8	116.1	268.4

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	33
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC

Project MSJ. Harbour - O/D No. 09822
Ref no. 5364 **Description:**
Lab no. 07089 -
Depth (m): - **Sample Type:**
Position: 4501 Recompacted to 93% of MOD.

Test 1

Inputs

Normal Stress (kPa)	100	MC at Test (%)	13.5
Prooving Ring Factor	75.5	Dry Density (kg/m³)	1589.37
Area (cm²)	36	Volume at Test (cm³)	90.252
Volume (cm³)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m²
0	0	1000				
50	16.2	995	0.5	0.83	-0.02	34.0
100	24.2	992	0.8	1.67	-0.03	50.8
150	27.2	992	0.8	2.50	-0.03	57.0
200	30.2	992	0.8	3.33	-0.03	63.3
250	31	991	0.9	4.17	-0.04	65.0
300	30.5	990	1.0	5.00	-0.04	64.0
350	29.5	990	1.0	5.83	-0.04	61.9
400	28.5	990	1.0	6.67	-0.04	59.8
450	27	990	1.0	7.50	-0.04	56.6
500	27	990	1.0	8.33	-0.04	56.6
550	27	990	1.0	9.17	-0.04	56.6
600	27	990	1.0	10.00	-0.04	56.6
650	27.5	990	1.0	10.83	-0.04	57.7
700	27.8	989	1.1	11.67	-0.04	58.3
750	27.2	989	1.1	12.50	-0.04	57.0
800	27.2	988	1.2	13.33	-0.05	57.0
850	27.2	987	1.3	14.17	-0.05	57.0
900	27.5	987	1.3	15.00	-0.05	57.7
950	27.2	986	1.4	15.83	-0.06	57.0
1000	27.2	985	1.5	16.67	-0.06	57.0
1050	27.2	985	1.5	17.50	-0.06	57.0
1100	27	985	1.5	18.33	-0.06	56.6
1150	27.2	985	1.5	19.17	-0.06	57.0
1200	27.2	984	1.6	20.00	-0.06	57.0
1250	27.2	983	1.7	20.83	-0.07	57.0

Test 2

Inputs

Normal Stress (kPa)	200	MC at Test (%)	13.5
Prooving Ring Factor	76	Dry Density (kg/m³)	1589.37
Area (cm²)	36	Volume at Test (cm³)	90.324
Volume (cm³)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m²
0	0	1000				
50	24.2	995	0.5	0.83	-0.02	51.1
100	40.2	990	1.0	1.67	-0.04	84.9
150	47.2	989	1.1	2.50	-0.04	99.6
200	54.2	989	1.1	3.33	-0.04	114.4
250	57	988	1.2	4.17	-0.05	120.3
300	57.5	988	1.2	5.00	-0.05	121.4
350	57.8	985	1.5	5.83	-0.06	122.0
400	57.2	985	1.5	6.67	-0.06	120.8
450	56.8	982	1.8	7.50	-0.07	119.9
500	55.8	982	1.8	8.33	-0.07	117.8
550	55.2	982	1.8	9.17	-0.07	116.5
600	55.2	981	1.9	10.00	-0.08	116.5
650	55.5	980	2.0	10.83	-0.08	117.2
700	56	980	2.0	11.67	-0.08	118.2
750	56.2	980	2.0	12.50	-0.08	118.6
800	56.8	980	2.0	13.33	-0.08	119.9
850	56.8	979	2.1	14.17	-0.08	119.9
900	56.8	978	2.2	15.00	-0.09	119.9
950	56.2	977	2.3	15.83	-0.09	118.6
1000	56.2	975	2.5	16.67	-0.10	118.6
1050	56	973	2.7	17.50	-0.11	118.2
1100	56	973	2.7	18.33	-0.11	118.2
1150	56	972	2.8	19.17	-0.11	118.2
1200	55.5	971	2.9	20.00	-0.12	117.2
1250	55.5	970	3.0	20.83	-0.12	117.2

Test 3

Inputs

Normal Stress (kPa)	400	MC at Test (%)	13.5
Prooving Ring Factor	74.2	Dry Density (kg/m³)	1589.37
Area (cm²)	36	Volume at Test (cm³)	88.56
Volume (cm³)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m²
0	0	1000				
50	48	999	0.1	0.83	0.00	98.9
100	67.8	995	0.5	1.67	-0.02	139.7
150	81.8	992	0.8	2.50	-0.03	168.6
200	106	988	1.2	3.33	-0.05	218.5
250	117	985	1.5	4.17	-0.06	241.2
300	125	985	1.5	5.00	-0.06	257.6
350	132.5	984	1.6	5.83	-0.06	273.1
400	136	983	1.7	6.67	-0.07	280.3
450	137	982	1.8	7.50	-0.07	282.4
500	137	981	1.9	8.33	-0.08	282.4
550	133.2	980	2.0	9.17	-0.08	274.5
600	132.8	978	2.2	10.00	-0.09	273.7
650	131.2	976	2.4	10.83	-0.10	270.4
700	131.2	972	2.8	11.67	-0.11	270.4
750	127	970	3.0	12.50	-0.12	261.8
800	127	968	3.2	13.33	-0.13	261.8
850	128	967	3.3	14.17	-0.13	263.8
900	128	967	3.3	15.00	-0.13	263.8
950	125.2	964	3.6	15.83	-0.14	258.1
1000	124.5	963	3.7	16.67	-0.15	256.6
1050	123.2	959	4.1	17.50	-0.16	253.9
1100	123.2	959	4.1	18.33	-0.16	253.9
1150	122.8	958	4.2	19.17	-0.17	253.1
1200	122.2	958	4.2	20.00	-0.17	251.9
1250	121	953	4.7	20.83	-0.19	249.4

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992

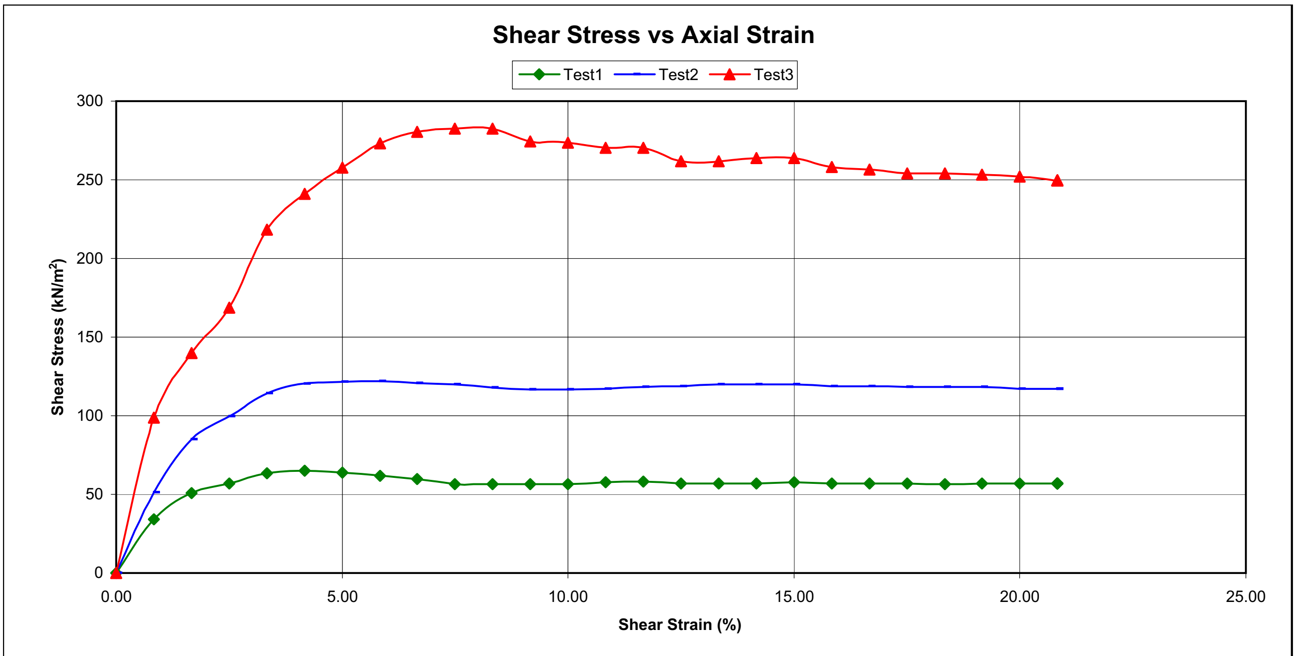
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

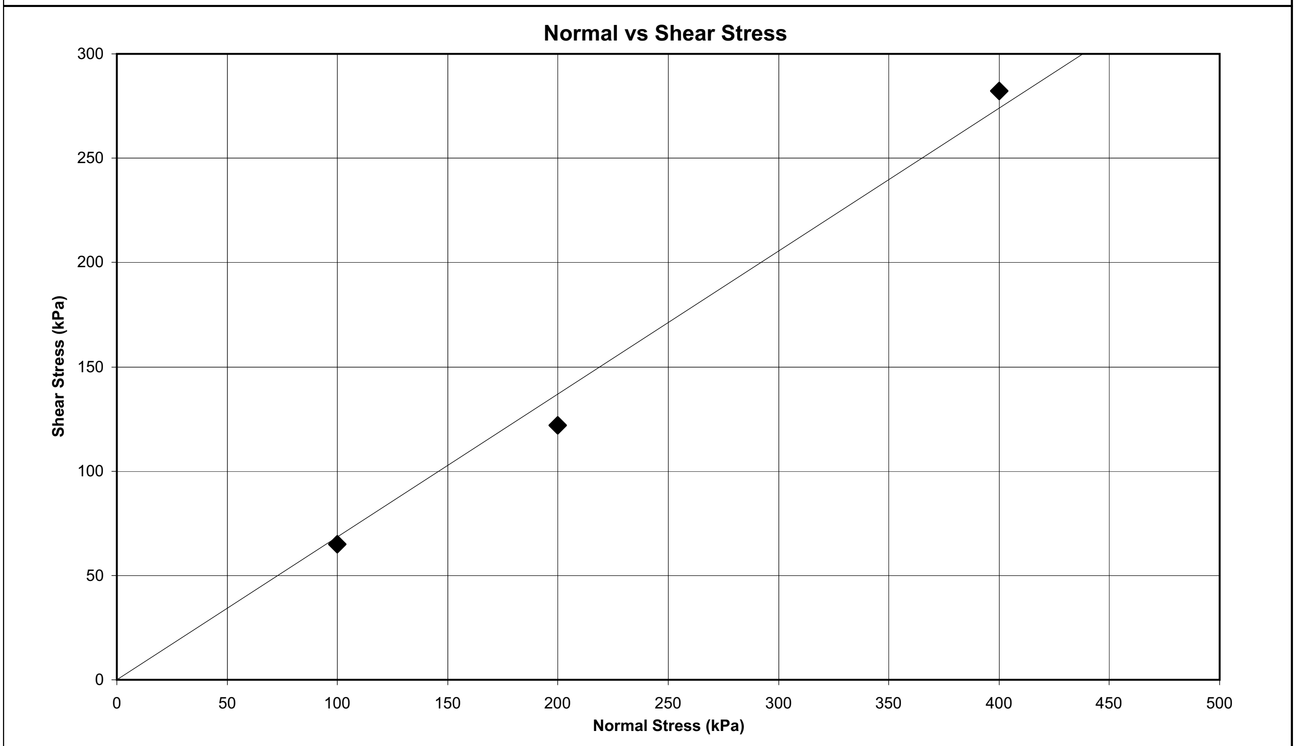
Project MSJ. Harbour - O/D No. 09822
Ref no. 5364
Lab no. 07089 **Sample Type**
Depth (m): - Recompacted to 93% of MOD.
Position: 4501 **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1589	1589	1589
Moisture Content (%)	13.5	13.5	13.5
Shear Strain (%)	4.2	5.8	7.5
Shear Stress (kN/m^2)	65.0	122.0	282.4

Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC

Project	MSJ. Harbour - O/D No. 09822		
Ref no.	5364	**Description:**	
Lab no.	07089	-	
Depth (m):	-	**Sample Type:**	
Position:	4501	Recompacted to 95% of MOD.	

Test 1

Inputs

Normal Stress (kPa)	100	MC at Test (%)	13.5
Prooving Ring Factor	75.5	Dry Density (kg/m^3)	1623.55
Area (cm^2)	36	Volume at Test (cm^3)	90.432
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	16.4	998	0.2	0.83	-0.01	34.4
100	24.1	996	0.4	1.67	-0.02	50.5
150	27.8	999	0.1	2.50	0.00	58.3
200	29	1003	-0.3	3.33	0.01	60.8
250	29.1	1008	-0.8	4.17	0.03	61.0
300	29	1011	-1.1	5.00	0.04	60.8
350	28.9	1011	-1.1	5.83	0.04	60.6
400	28.9	1013	-1.3	6.67	0.05	60.6
450	29.5	1014	-1.4	7.50	0.06	61.9
500	29.5	1014	-1.4	8.33	0.06	61.9
550	29.6	1013	-1.3	9.17	0.05	62.1
600	30	1013	-1.3	10.00	0.05	62.9
700	29.3	1012	-1.2	11.67	0.05	61.4
800	30.2	1011	-1.1	13.33	0.04	63.3
900	30.3	1009	-0.9	15.00	0.04	63.5
1000	30.3	1007	-0.7	16.67	0.03	63.5
1100	30.2	1005	-0.5	18.33	0.02	63.3
1200	30	1005	-0.5	20.00	0.02	62.9

Test 2

Inputs

Normal Stress (kPa)	200	MC at Test (%)	13.5
Prooving Ring Factor	76	Dry Density (kg/m^3)	1623.55
Area (cm^2)	36	Volume at Test (cm^3)	90.36
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	26.8	998	0.2	0.83	-0.01	56.6
100	42.7	993	0.7	1.67	-0.03	90.1
150	53.8	991	0.9	2.50	-0.04	113.6
200	59	993	0.7	3.33	-0.03	124.6
250	61.4	997	0.3	4.17	-0.01	129.6
300	60.2	1003	-0.3	5.00	0.01	127.1
350	58.6	1006	-0.6	5.83	0.02	123.7
400	57.9	1008	-0.8	6.67	0.03	122.2
450	57	1008	-0.8	7.50	0.03	120.3
500	57	1008	-0.8	8.33	0.03	120.3
550	56.9	1008	-0.8	9.17	0.03	120.1
600	57.2	1008	-0.8	10.00	0.03	120.8
700	57.1	1007	-0.7	11.67	0.03	120.5
800	57.1	1005	-0.5	13.33	0.02	120.5
900	56.7	1004	-0.4	15.00	0.02	119.7
1000	56.7	1004	-0.4	16.67	0.02	119.7
1100	56.5	1004	-0.4	18.33	0.02	119.3
1200	56.5	1004	-0.4	20.00	0.02	119.3

Test 3

Inputs

Normal Stress (kPa)	400	MC at Test (%)	13.5
Prooving Ring Factor	74.2	Dry Density (kg/m^3)	1623.55
Area (cm^2)	36	Volume at Test (cm^3)	89.748
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	33.1	1000	0.0	0.83	0.00	68.2
100	57.1	995	0.5	1.67	-0.02	117.7
150	76.6	990	1.0	2.50	-0.04	157.9
200	94.1	984	1.6	3.33	-0.06	194.0
250	108.8	979	2.1	4.17	-0.08	224.2
300	124.1	974	2.6	5.00	-0.10	255.8
350	132	972	2.8	5.83	-0.11	272.1
400	140	969	3.1	6.67	-0.12	288.6
450	143.4	968	3.2	7.50	-0.13	295.6
500	144.1	967	3.3	8.33	-0.13	297.0
550	140	963	3.7	9.17	-0.15	288.6
600	138	965	3.5	10.00	-0.14	284.4
700	130.3	963	3.7	11.67	-0.15	268.6
800	129.9	962	3.8	13.33	-0.15	267.7
900	127.5	957	4.3	15.00	-0.17	262.8
1000	125.7	955	4.5	16.67	-0.18	259.1
1100	124.1	953	4.7	18.33	-0.19	255.8
1200	124	952	4.8	20.00	-0.19	255.6

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC
Tollgate, DURBAN

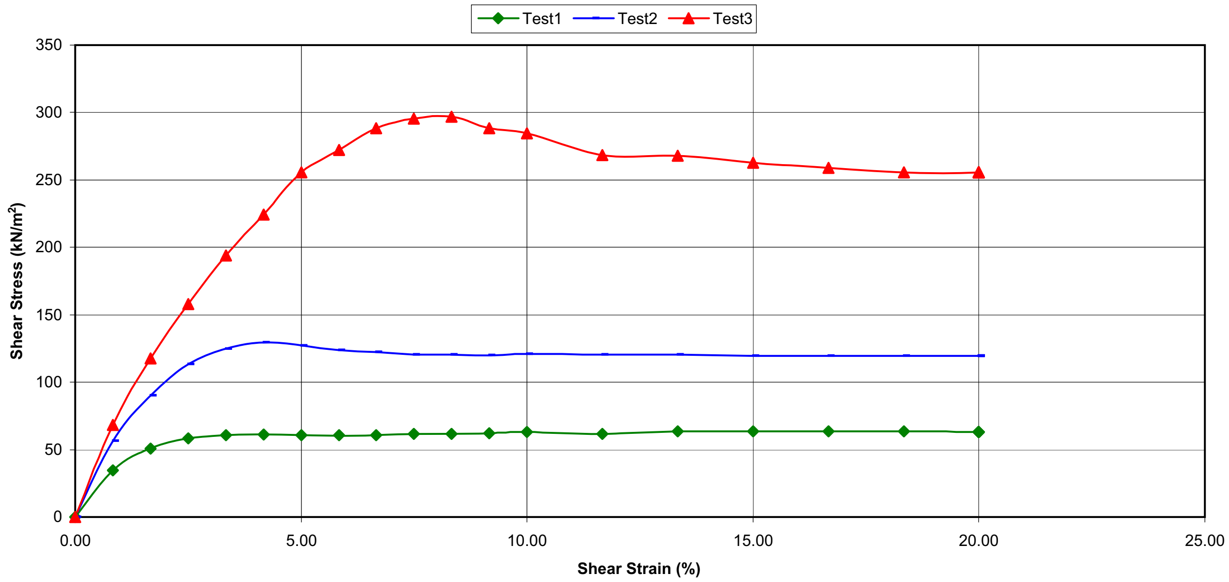
Project MSJ. Harbour - O/D No. 09822
Ref no. 5364
Lab no. 07089 **Sample Type**
Depth (m): - Recompacted to 95% of MOD.
Position: 4501 **Description:**
-

	Test 1	Test 2	Test 3
Normal Stress (kN/m²)	100	200	400
Dry Density (kg/m³)	1624	1624	1624
Moisture Content (%)	13.5	13.5	13.5
Shear Strain (%)	15.0	4.2	8.3
Shear Stress (kN/m²)	63.5	129.6	297.0

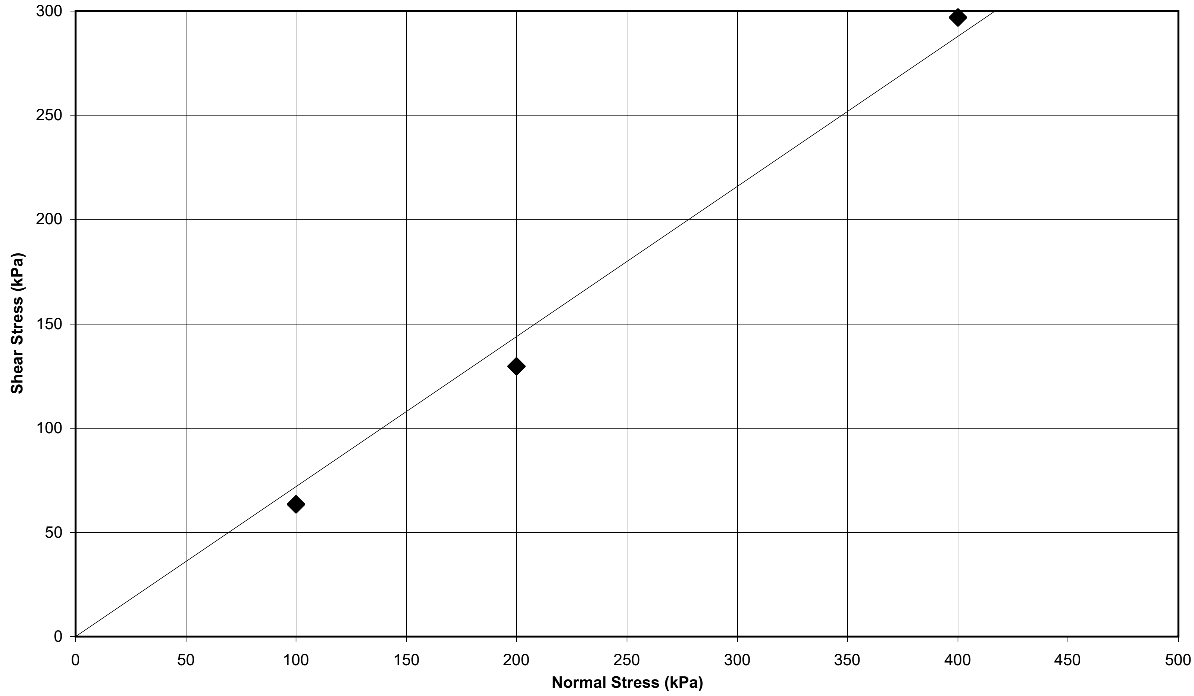
Shear Strength Perameters

Angle of Internal Friction (ø°) 36
Cohesion (kPa) 0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project MSJ. Harbour - O/D No. 09822
Ref no. 5364 **Description:**
Lab no. 07089 -
Depth (m): - **Sample Type:**
Position: 4501 Recompacted to 98% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 13.5
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1674.82
Area (cm^2) 36 Volume at Test (cm^3) 91.224
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	19.3	1001	-0.1	0.83	0.00	40.5
100	29.8	1004	-0.4	1.67	0.02	62.5
200	34.1	1021	-2.1	3.33	0.08	71.5
250	32.7	1029	-2.9	4.17	0.11	68.6
300	30.3	1036	-3.6	5.00	0.14	63.5
370	28.2	1039	-3.9	6.17	0.15	59.1
400	28	1041	-4.1	6.67	0.16	58.7
450	27.7	1042	-4.2	7.50	0.17	58.1
500	28.5	1042	-4.2	8.33	0.17	59.8
550	28.3	1042	-4.2	9.17	0.17	59.4
600	28.1	1042	-4.2	10.00	0.17	58.9
650	28.3	1042	-4.2	10.83	0.17	59.4
800	27.8	1041	-4.1	13.33	0.16	58.3
900	28.2	1040	-4.0	15.00	0.16	59.1
1000	28.4	1040	-4.0	16.67	0.16	59.6
1100	28.1	1039	-3.9	18.33	0.15	58.9
1200	28.1	1038	-3.8	20.00	0.15	58.9

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 13.5
Prooving Ring Factor 76 Dry Density (kg/m^3) 1674.82
Area (cm^2) 36 Volume at Test (cm^3) 90.36
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	25	998	0.2	0.83	-0.01	52.8
100	44.3	997	0.3	1.67	-0.01	93.5
200	66.1	1004	-0.4	3.33	0.02	139.5
250	69.3	1013	-1.3	4.17	0.05	146.3
300	69.7	1022	-2.2	5.00	0.09	147.1
365	66.9	1032	-3.2	6.08	0.13	141.2
400	65	1036	-3.6	6.67	0.14	137.2
450	62.5	1039	-3.9	7.50	0.15	131.9
550	58.2	1042	-4.2	9.17	0.17	122.9
600	56	1042	-4.2	10.00	0.17	118.2
650	54.9	1041	-4.1	10.83	0.16	115.9
800	54.8	1038	-3.8	13.33	0.15	115.7
900	55.1	1037	-3.7	15.00	0.15	116.3
1000	54.9	1034	-3.4	16.67	0.13	115.9
1200	54.9	1030	-3.0	20.00	0.12	115.9

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 13.5
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1674.82
Area (cm^2) 36 Volume at Test (cm^3) 89.064
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	35.4	1000	0.0	0.83	0.00	74.2
100	62.4	996	0.4	1.67	-0.02	130.9
200	109.1	987	1.3	3.33	-0.05	228.8
250	128.7	985	1.5	4.17	-0.06	269.9
300	143	984	1.6	5.00	-0.06	299.9
360	152.9	986	1.4	6.00	-0.06	320.7
400	156.7	987	1.3	6.67	-0.05	328.6
450	158	991	0.9	7.50	-0.04	331.4
500	153	996	0.4	8.33	-0.02	320.9
550	144	998	0.2	9.17	-0.01	302.0
600	137.8	997	0.3	10.00	-0.01	289.0
650	136.8	995	0.5	10.83	-0.02	286.9
800	140.4	989	1.1	13.33	-0.04	294.5
900	142	986	1.4	15.00	-0.06	297.8
1000	142.8	983	1.7	16.67	-0.07	299.5
1100	143.1	981	1.9	18.33	-0.07	300.1
1200	141.4	979	2.1	20.00	-0.08	296.5

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

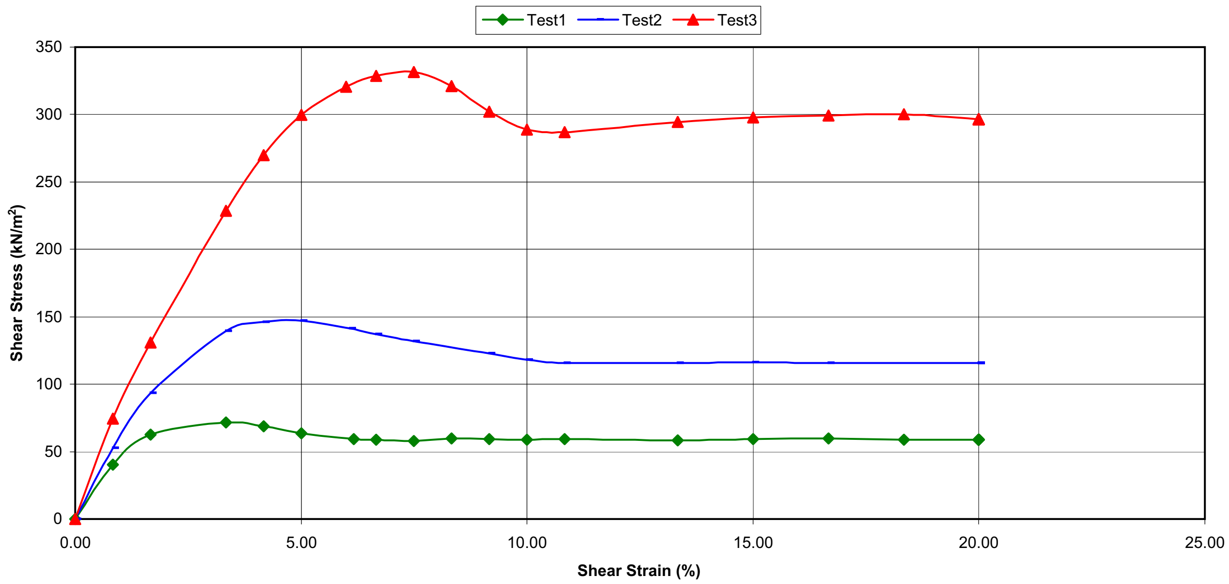
Project	MSJ. Harbour - O/D No. 09822		
Ref no.	5364		
Lab no.	07089	**Sample Type**	
Depth (m):	-	Recompacted to 98% of MOD	
Position:	4501	**Description:**	
		-	

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1675	1675	1675
Moisture Content (%)	13.5	13.5	13.5
Shear Strain (%)	3.3	5.0	7.5
Shear Stress (kN/m^2)	71.5	147.1	331.4

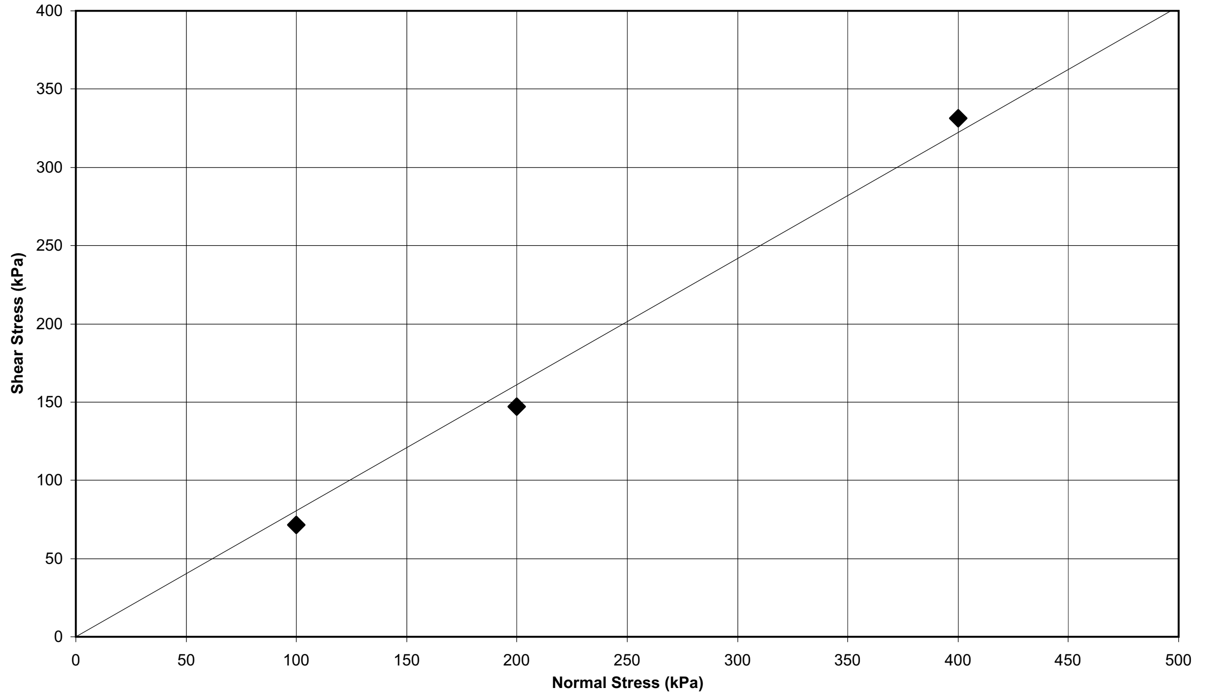
Shear Strength Perameters

Angle of Internal Friction (φ°)	39
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

Project MSJ. Harbour - O/D No. 09822
Ref no. 5364 **Description:**
Lab no. 07089 -
Depth (m): - **Sample Type:**
Position: 4501 Recompacted to 100% of MOD.

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 13.5
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1709
Area (cm^2) 36 Volume at Test (cm^3) 91.116
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	17	1002	-0.2	0.83	0.01	35.7
100	27.8	1004	-0.4	1.67	0.02	58.3
150	35.3	1011	-1.1	2.50	0.04	74.0
200	39.2	1023	-2.3	3.33	0.09	82.2
250	40.1	1037	-3.7	4.17	0.15	84.1
300	37.2	1049	-4.9	5.00	0.19	78.0
350	33.6	1057	-5.7	5.83	0.23	70.5
400	31.8	1060	-6.0	6.67	0.24	66.7
450	29.3	1063	-6.3	7.50	0.25	61.4
500	28.9	1064	-6.4	8.33	0.25	60.6
600	28.6	1064	-6.4	10.00	0.25	60.0
700	28.8	1064	-6.4	11.67	0.25	60.4
800	28.3	1065	-6.5	13.33	0.26	59.4
1000	28.2	1065	-6.5	16.67	0.26	59.1
1100	28.2	1063	-6.3	18.33	0.25	59.1
1200	28.2	1062	-6.2	20.00	0.24	59.1
1250	28.2	1061	-6.1	20.83	0.24	59.1

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 13.5
Prooving Ring Factor 76 Dry Density (kg/m^3) 1709
Area (cm^2) 36 Volume at Test (cm^3) 90.648
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	29.8	999	0.1	0.83	0.00	62.9
100	51.6	999	0.1	1.67	0.00	108.9
150	68	1003	-0.3	2.50	0.01	143.6
200	77.9	1012	-1.2	3.33	0.05	164.5
250	80.5	1024	-2.4	4.17	0.09	169.9
300	79.4	1038	-3.8	5.00	0.15	167.6
350	74.7	1049	-4.9	5.83	0.19	157.7
400	67.8	1056	-5.6	6.67	0.22	143.1
450	65.3	1057	-5.7	7.50	0.23	137.9
500	65.3	1058	-5.8	8.33	0.23	137.9
600	65.9	1059	-5.9	10.00	0.23	139.1
700	66.4	1059	-5.9	11.67	0.23	140.2
800	65.9	1059	-5.9	13.33	0.23	139.1
900	65.1	1058	-5.8	15.00	0.23	137.4
1000	62.8	1056	-5.6	16.67	0.22	132.6
1100	61.2	1054	-5.4	18.33	0.21	129.2
1200	60.8	1049	-4.9	20.00	0.19	128.4
1250	60.5	1049	-4.9	20.83	0.19	127.7

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 13.5
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1709
Area (cm^2) 36 Volume at Test (cm^3) 90
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	36.8	1003	-0.3	0.83	0.01	75.8
100	68.7	1007	-0.7	1.67	0.03	141.6
150	96	1010	-1.0	2.50	0.04	197.9
200	122	1010	-1.0	3.33	0.04	251.5
250	144.8	1012	-1.2	4.17	0.05	298.4
300	161.4	1016	-1.6	5.00	0.06	332.7
350	172.2	1023	-2.3	5.83	0.09	354.9
400	176	1032	-3.2	6.67	0.13	362.8
450	170.8	1044	-4.4	7.50	0.17	352.0
500	162	1052	-5.2	8.33	0.21	333.9
600	142.9	1057	-5.7	10.00	0.23	294.5
700	142.8	1058	-5.8	11.67	0.23	294.3
800	143.9	1058	-5.8	13.33	0.23	296.6
900	143.6	1058	-5.8	15.00	0.23	296.0
1000	144	1060	-6.0	16.67	0.24	296.8
1100	143.5	1058	-5.8	18.33	0.23	295.8
1200	143.5	1054	-5.4	20.00	0.21	295.8
1250	142.5	1054	-5.4	20.83	0.21	293.7

CONSOLIDATED DRAINED SHEAR BOX TEST

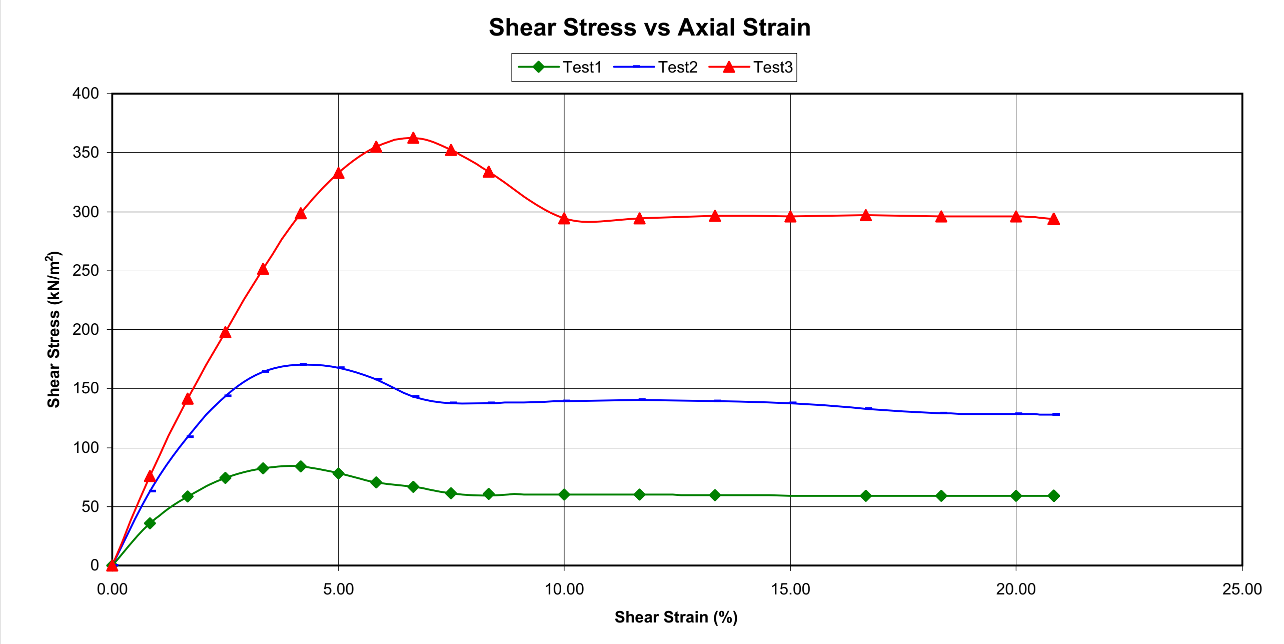
THEKWINI SOILS LAB. CC

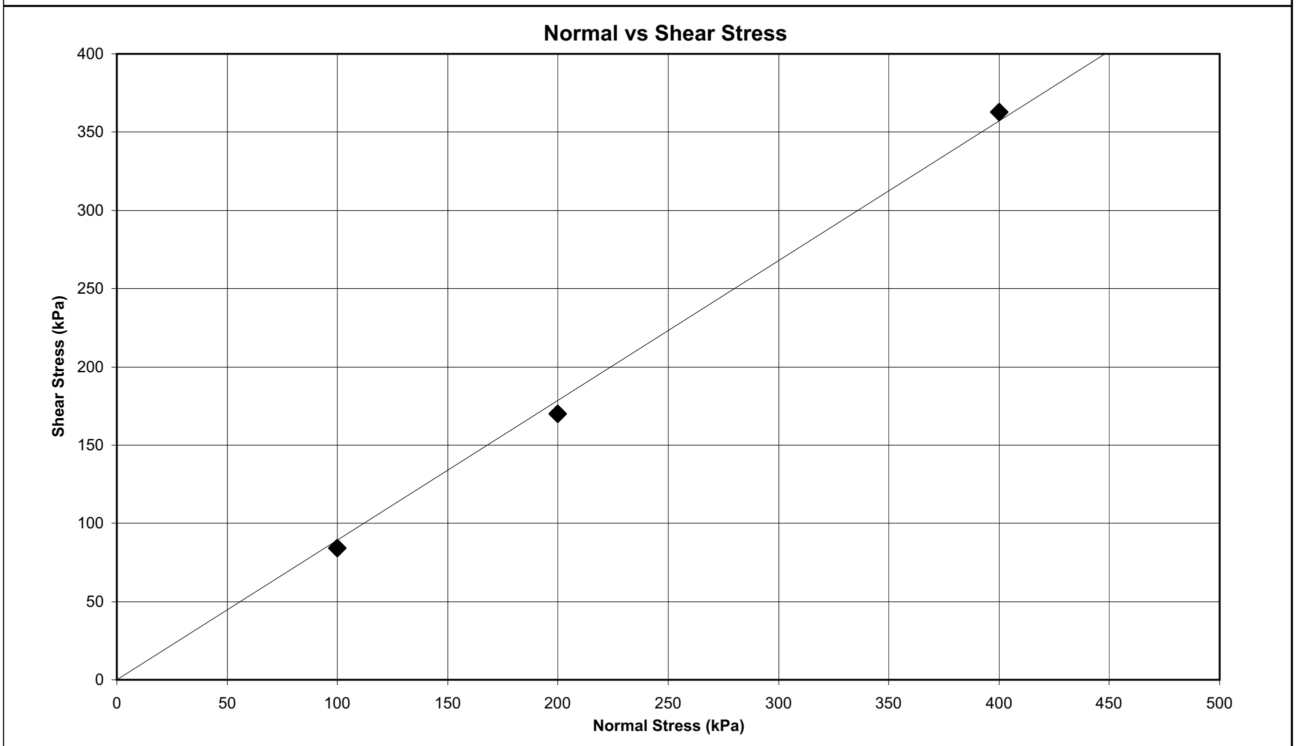
Project	MSJ. Harbour - O/D No. 09822		
Ref no.	5364		
Lab no.	07089	**Sample Type**	
Depth (m):	-	Recompacted to 100% of MOD.	
Position:	4501	**Description:**	
		-	

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1709	1709	1709
Moisture Content (%)	13.5	13.5	13.5
Shear Strain (%)	4.2	4.2	6.7
Shear Stress (kN/m^2)	84.1	169.9	362.8

Shear Strength Perameters

Angle of Internal Friction (φ°)	42
Cohesion (kPa)	0





CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC
66 Ridge Road, Tongaat, DURBAN
P.O. Box 36464, MAYVILLE, 4058
Tel: (031) 201-8592 Fax: (031) 201-7920

Project MSJ - Durban Harbour O/D No. 10219
Ref no. 5449
Lab no. 10013 a Relative Density: 2.732
Depth (m): - **Sample Type:**
Position: 6081 Recompacted to 93% of MOD

Test 1

Inputs
Normal Stress (kPa) 100 MC at Test (%) 14.0
Prooving Ring Factor 75.5 Dry Density (kg/m^3) 1512.18
Area (cm^2) 36 Volume at Test (cm^3) 90.612
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	22.5	996	0.4	0.83	-0.02	47.2
100	29	993	0.7	1.67	-0.03	60.8
150	31.2	992	0.8	2.50	-0.03	65.4
200	32	992	0.8	3.33	-0.03	67.1
250	32	991	0.9	4.17	-0.04	67.1
300	30.5	990	1.0	5.00	-0.04	64.0
350	30	989	1.1	5.83	-0.04	62.9
400	28.2	989	1.1	6.67	-0.04	59.1
450	27.2	989	1.1	7.50	-0.04	57.0
500	26.5	989	1.1	8.33	-0.04	55.6
550	27	988	1.2	9.17	-0.05	56.6
600	27	987	1.3	10.00	-0.05	56.6
650	26.5	987	1.3	10.83	-0.05	55.6
700	27.2	987	1.3	11.67	-0.05	57.0
750	27.2	987	1.3	12.50	-0.05	57.0
800	27	987	1.3	13.33	-0.05	56.6
850	27.2	987	1.3	14.17	-0.05	57.0
900	27	987	1.3	15.00	-0.05	56.6
950	27	983	1.7	15.83	-0.07	56.6
1000	27	982	1.8	16.67	-0.07	56.6
1050	27	982	1.8	17.50	-0.07	56.6
1167	26.8	978	2.2	19.45	-0.09	56.2
1200	27	977	2.3	20.00	-0.09	56.6
1250	27	972	2.8	20.83	-0.11	56.6

Test 2

Inputs
Normal Stress (kPa) 200 MC at Test (%) 14.0
Prooving Ring Factor 76 Dry Density (kg/m^3) 1512.18
Area (cm^2) 36 Volume at Test (cm^3) 90.36
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	28	999	0.1	0.83	0.00	59.1
100	42.5	997	0.3	1.67	-0.01	89.7
150	52.2	997	0.3	2.50	-0.01	110.2
200	57	995	0.5	3.33	-0.02	120.3
250	59.2	994	0.6	4.17	-0.02	125.0
300	60.2	994	0.6	5.00	-0.02	127.1
350	60.2	994	0.6	5.83	-0.02	127.1
400	59.8	993	0.7	6.67	-0.03	126.2
450	58	993	0.7	7.50	-0.03	122.4
500	55.2	993	0.7	8.33	-0.03	116.5
550	54	993	0.7	9.17	-0.03	114.0
600	54	993	0.7	10.00	-0.03	114.0
650	54	993	0.7	10.83	-0.03	114.0
700	54	993	0.7	11.67	-0.03	114.0
750	54	993	0.7	12.50	-0.03	114.0
800	54	993	0.7	13.33	-0.03	114.0
850	53.5	992	0.8	14.17	-0.03	112.9
900	53.2	992	0.8	15.00	-0.03	112.3
950	52.5	990	1.0	15.83	-0.04	110.8
1000	52.2	990	1.0	16.67	-0.04	110.2
1150	51.9	984	1.6	19.17	-0.06	109.6
1200	52	984	1.6	20.00	-0.06	109.8
1250	52	984	1.6	20.83	-0.06	109.8

Test 3

Inputs
Normal Stress (kPa) 400 MC at Test (%) 14.0
Prooving Ring Factor 74.2 Dry Density (kg/m^3) 1512.18
Area (cm^2) 36 Volume at Test (cm^3) 88.56
Volume (cm^3) 92.16

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
50	51.5	998	0.2	0.83	-0.01	106.1
100	79.5	996	0.4	1.67	-0.02	163.9
150	105	996	0.4	2.50	-0.02	216.4
200	120	995	0.5	3.33	-0.02	247.3
250	128.2	992	0.8	4.17	-0.03	264.2
300	134	992	0.8	5.00	-0.03	276.2
350	134	991	0.9	5.83	-0.04	276.2
400	130.2	990	1.0	6.67	-0.04	268.4
450	125	988	1.2	7.50	-0.05	257.6
500	121	985	1.5	8.33	-0.06	249.4
550	117.2	985	1.5	9.17	-0.06	241.6
600	115.2	984	1.6	10.00	-0.06	237.4
650	115	984	1.6	10.83	-0.06	237.0
700	115	984	1.6	11.67	-0.06	237.0
750	114.2	984	1.6	12.50	-0.06	235.4
800	113.8	984	1.6	13.33	-0.06	234.6
850	113.5	984	1.6	14.17	-0.06	233.9
900	113.2	982	1.8	15.00	-0.07	233.3
950	112.8	980	2.0	15.83	-0.08	232.5
1000	112.5	980	2.0	16.67	-0.08	231.9
1050	112	976	2.4	17.50	-0.10	230.8
1180	111.1	971	2.9	19.67	-0.12	229.0
1200	112	971	2.9	20.00	-0.12	230.8
1250	111	970	3.0	20.83	-0.12	228.8

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC

Project MSJ - Durban Harbour O/D No. 10219
Ref no. 5449
Lab no. 10013 a **Sample Type**
Depth (m): - Recompacted to 93% of MOD
Position: 6081

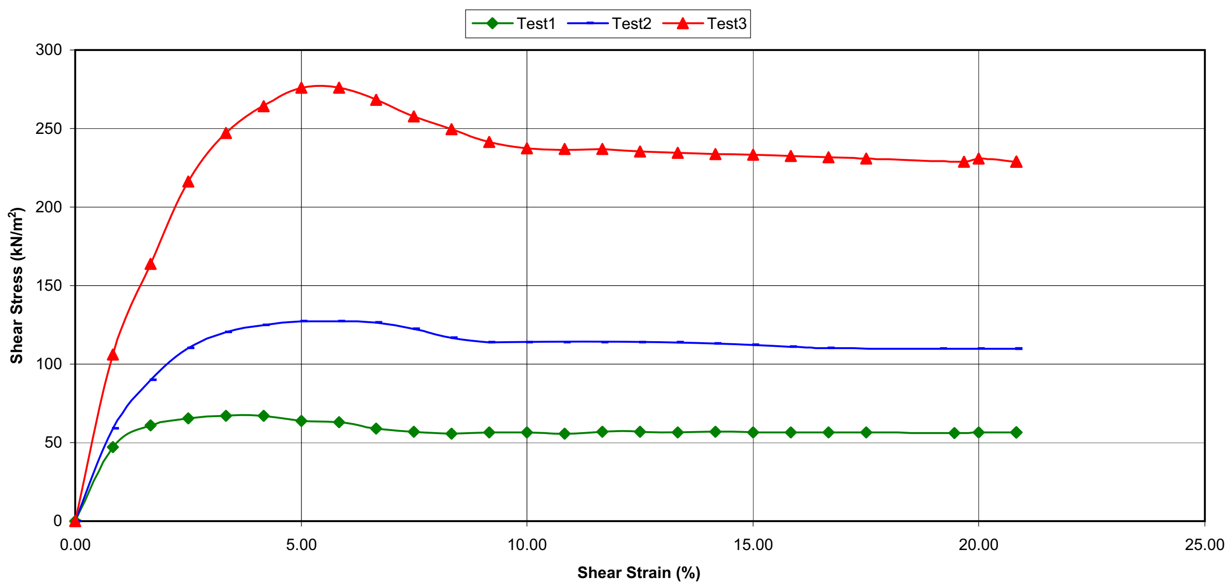
Relative Density: 2.732

	Test 1	Test 2	Test 3
Normal Stress (kN/m²)	100	200	400
Dry Density (kg/m³)	1512	1512	1512
Moisture Content (%)	14.0	14.0	14.0
Shear Strain (%)	3.3	5.0	5.0
Shear Stress (kN/m²)	67.1	127.1	276.2

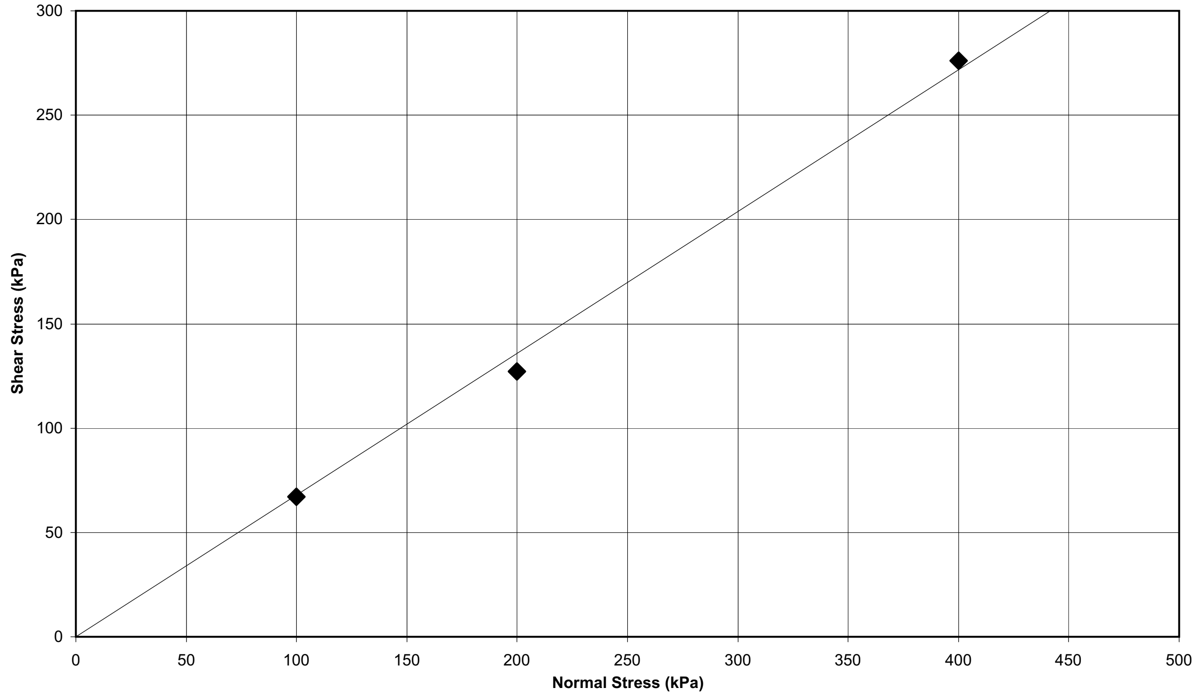
Shear Strength Perameters

Angle of Internal Friction (ϕ°)	34
Cohesion (kPa)	0

Shear Stress vs Axial Strain



Normal vs Shear Stress



CONSOLIDATED DRAINED SHEAR BOX TEST
TEST RESULTS

THEKWINI SOILS LAB. CC

Project MSJ - Durban Harbour O/D No. 10219
Ref no. 5449
Lab no. 10013 b — Relative Density: 2.732
Depth (m): - — **Sample Type:**
Position: 6081 — Recompacred to 95% of MOD

Test 1

Inputs

Normal Stress (kPa)	100	MC at Test (%)	14.0
Prooving Ring Factor	75.5	Dry Density (kg/m^3)	1544.7
Area (cm^2)	36	Volume at Test (cm^3)	90.9
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
70	24.8	995	0.5	1.17	-0.02	52.0
100	28.2	995	0.5	1.67	-0.02	59.1
160	31.2	995	0.5	2.67	-0.02	65.4
200	32.5	993	0.7	3.33	-0.03	68.2
250	32.5	991	0.9	4.17	-0.04	68.2
300	31.2	991	0.9	5.00	-0.04	65.4
350	30	990	1.0	5.83	-0.04	62.9
400	29	990	1.0	6.67	-0.04	60.8
450	29	990	1.0	7.50	-0.04	60.8
500	29	990	1.0	8.33	-0.04	60.8
550	29	990	1.0	9.17	-0.04	60.8
600	29	990	1.0	10.00	-0.04	60.8
650	29.2	989	1.1	10.83	-0.04	61.2
700	29	987	1.3	11.67	-0.05	60.8
750	29	986	1.4	12.50	-0.06	60.8
800	29.2	985	1.5	13.33	-0.06	61.2
850	29.2	984	1.6	14.17	-0.06	61.2
900	29.2	984	1.6	15.00	-0.06	61.2
950	29	981	1.9	15.83	-0.08	60.8
1000	28.5	981	1.9	16.67	-0.08	59.8
1050	28.8	980	2.0	17.50	-0.08	60.4
1100	28.2	979	2.1	18.33	-0.08	59.1
1150	29	977	2.3	19.17	-0.09	60.8
1200	28.5	977	2.3	20.00	-0.09	59.8
1250	29.8	977	2.3	20.83	-0.09	62.5

Test 2

Inputs

Normal Stress (kPa)	200	MC at Test (%)	14.0
Prooving Ring Factor	76	Dry Density (kg/m^3)	1544.7
Area (cm^2)	36	Volume at Test (cm^3)	90.864
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
70	37	999	0.1	1.17	0.00	78.1
100	45.26	998	0.2	1.67	-0.01	95.5
160	62.8	997	0.3	2.67	-0.01	132.6
200	64.2	994	0.6	3.33	-0.02	135.5
250	64	993	0.7	4.17	-0.03	135.1
300	63	992	0.8	5.00	-0.03	133.0
350	61	992	0.8	5.83	-0.03	128.8
400	59	992	0.8	6.67	-0.03	124.6
450	57	991	0.9	7.50	-0.04	120.3
500	56.5	991	0.9	8.33	-0.04	119.3
550	56.2	991	0.9	9.17	-0.04	118.6
600	56.5	990	1.0	10.00	-0.04	119.3
650	56.2	990	1.0	10.83	-0.04	118.6
700	56	990	1.0	11.67	-0.04	118.2
750	56.2	990	1.0	12.50	-0.04	118.6
800	56	990	1.0	13.33	-0.04	118.2
850	56	990	1.0	14.17	-0.04	118.2
900	55.8	990	1.0	15.00	-0.04	117.8
950	55.8	989	1.1	15.83	-0.04	117.8
1000	55.2	985	1.5	16.67	-0.06	116.5
1050	55.2	984	1.6	17.50	-0.06	116.5
1100	55	983	1.7	18.33	-0.07	116.1
1150	54	982	1.8	19.17	-0.07	114.0
1200	54.2	982	1.8	20.00	-0.07	114.4
1250	54.2	982	1.8	20.83	-0.07	114.4

Test 3

Inputs

Normal Stress (kPa)	400	MC at Test (%)	14.0
Prooving Ring Factor	74.2	Dry Density (kg/m^3)	1544.7
Area (cm^2)	36	Volume at Test (cm^3)	88.74
Volume (cm^3)	92.16		

Strain Guage	Prooving Ring	Vertical Gauge	Total Strain (mm)	Total Strain %	△ V/Vo	Shear Stress kN/m^2
0	0	1000				
70	47	999	0.1	1.17	0.00	96.9
100	63	997	0.3	1.67	-0.01	129.9
162	95	995	0.5	2.70	-0.02	195.8
200	106	987	1.3	3.33	-0.05	218.5
250	123	984	1.6	4.17	-0.06	253.5
300	133.2	983	1.7	5.00	-0.07	274.5
350	136.2	983	1.7	5.83	-0.07	280.7
400	135	983	1.7	6.67	-0.07	278.3
500	117	983	1.7	8.33	-0.07	241.2
550	117	983	1.7	9.17	-0.07	241.2
600	118	982	1.8	10.00	-0.07	243.2
650	118	982	1.8	10.83	-0.07	243.2
700	119	982	1.8	11.67	-0.07	245.3
750	120	981	1.9	12.50	-0.08	247.3
800	120.5	980	2.0	13.33	-0.08	248.4
850	120.5	980	2.0	14.17	-0.08	248.4
900	120	980	2.0	15.00	-0.08	247.3
950	121	980	2.0	15.83	-0.08	249.4
1000	120	980	2.0	16.67	-0.08	247.3
1050	118.5	979	2.1	17.50	-0.08	244.2
1100	119.2	977	2.3	18.33	-0.09	245.7
1150	120	976	2.4	19.17	-0.10	247.3
1200	120	974	2.6	20.00	-0.10	247.3
1250	121.2	973	2.7	20.83	-0.11	249.8

CONSOLIDATED DRAINED SHEAR BOX TEST

THEKWINI SOILS LAB. CC
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Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

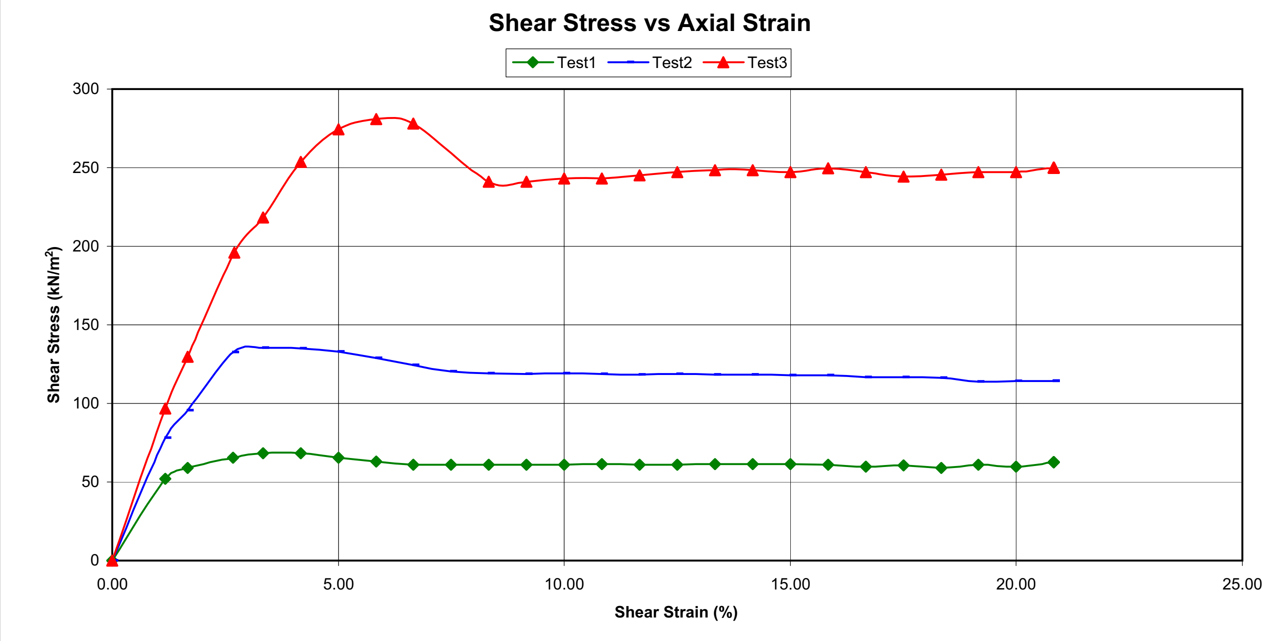
Project MSJ - Durban Harbour O/D No. 10219
Ref no. 5449
Lab no. 10013 b **Sample Type**
Depth (m): - Recompacred to 95% of MOD
Position: 6081

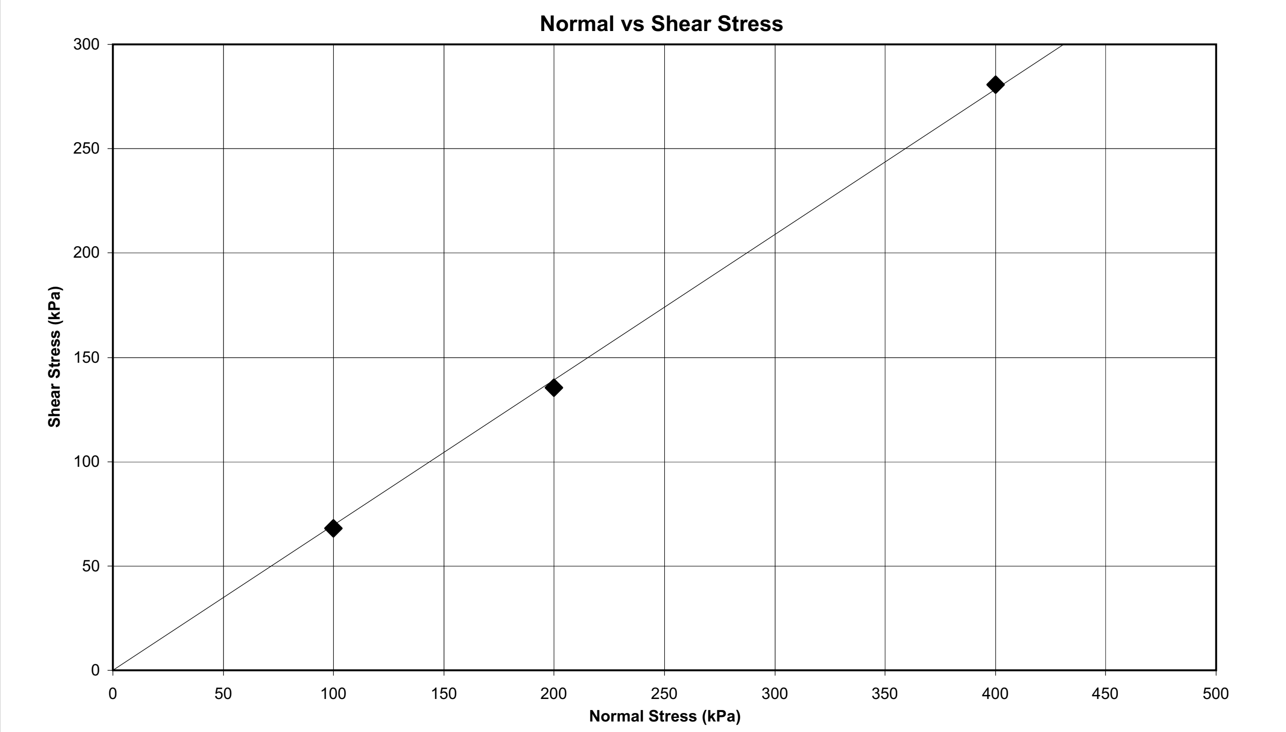
Relative Density: 2.732

	Test 1	Test 2	Test 3
Normal Stress (kN/m^2)	100	200	400
Dry Density (kg/m^3)	1545	1545	1545
Moisture Content (%)	14.0	14.0	14.0
Shear Strain (%)	3.3	3.3	5.8
Shear Stress (kN/m^2)	68.2	135.5	280.7

Shear Strength Perameters

Angle of Internal Friction (Ø°)	35
Cohesion (kPa)	0





SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD - P.O. BOX 15318 - WESTMEAD - 3608 - KWAZULU - NATAL
TELEPHONE : 031 - 7004325 : TELEFAX 031 - 7001909 - email : soilslab@mweb.co.za
a SANAS Accredited Testing Laboratory, No. T0213

SANAS ACCREDITED LABORATORY

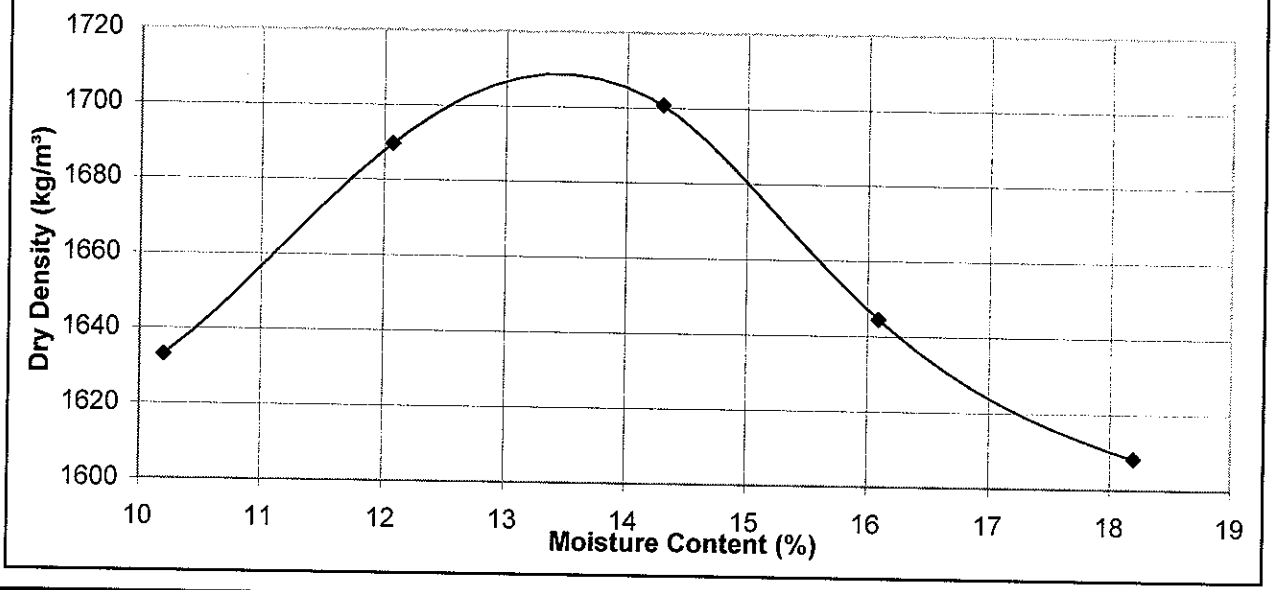
Client Moore Spence Jones
Project Harbour 07-395
Sampled by customer

Job Card No. 128471
Date Received 2008-07-03
Date Tested 2008-07-04
Date Reported 2008-07-24

Laboratory Number 4501
Field Reference No.
Position in field Hydraulic Fill
Depth (mm)
Material Description Br.Coarse Sand

MOISTURE / DENSITY RELATIONSHIP - TMH1-METHOD (A7)

Moisture Content; (%)	10.2	12.1	14.3	16.1	18.2				
Dry Density ; (kg/m^3)	1633	1690	1701	1645	1608				



Maximum Dry Density	1709 kg/m^3
Optimum Moisture Content	13.5 %

For Soilco : _____

APPENDIX E

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones | **Job Card No : 128522**

Project : Berth Deepening 07 - 395 | **Date Received : 2008-07-07**

Date Tested : 2008-07-07

Sample delivered by : - Customer | **Date Reported : 2008-07-25**

AGGREGATE TEST REPORT

Laboratory No.	4538	4539	4540	4541	
Field No.	BD - BHL 102	BD - BHL 105	BD - BHL 107 A	BD - BHL 107 A	
Position in Field					
Depth (m)	40.43 - 40.62	37.25 - 37.50	37.06 - 38.07	38.38 - 38.48	
Material Description	Rock Core Natural	Rock Core Natural	Rock Core Natural	Rock Core Natural	

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture							
	75.0	mm					
	63.0	mm					
	53.0	mm					
	37.5	mm					
	26.5	mm					
	19.0	mm					
	16.0	mm					
	13.2	mm					
	9.5	mm					
	6.7	mm					
	4.75	mm					
	3.35	mm					
	2.36	mm					
	1.18	mm					
	0.600	mm					
	0.425	mm					
	0.300	mm					
	0.150	mm					
	0.075	mm					

Material Characteristics

Fineness Modulus	TMH 1 B13					
Flakiness Index (%)	TMH 1 B3					
Average Least Dimension (mm)	TMH 1 B18(a)					
Aggregate Crushing Value (%)	TMH 1 B1					
10% Fact (kN)	TMH 1 B2					
Water Absorption (%)	TMH B14 or B15					
Presence of Sugar *	SABS 833					
Organic Impurity * *	TMH 1 B6					
Core UCS (Mpa)		2.1	2.0	1.7	22.9	
Apparent Relative Density	Colto - 8100					

* * Denotes that if the colour of the liquid layer is darker than that of the reference solution, further tests should be carried out to determine the presence or quantity of organic impurities present. Results are not accurate and are merely an indication.

Tests marked * in this report are " Not SANAS Accredited " and are not included in the SANAS Schedule of Accreditation for this Laboratory.

Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Berth Deepening 07 - 395

Sample delivered by : - Customer

Job Card No : 128522 A

Date Received : 2008-07-07

Date Tested : 2008-07-07

Date Reported : 2008-07-25

AGGREGATE TEST REPORT

Laboratory No.	4542	4543	4544		
Field No.	BD - BHL 207	BD - BHL 207	BD - BHL 315		
Position in Field					
Depth (m)	33.22 - 33.35	33.35 - 33.55	46.41 - 46.59		
Material Description	Rock	Rock	Rock		
	Core	Core	Core		
	Natural	Natural	Natural		

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture							
75.0	mm						
63.0	mm						
53.0	mm						
37.5	mm						
26.5	mm						
19.0	mm						
16.0	mm						
13.2	mm						
9.5	mm						
6.7	mm						
4.75	mm						
3.35	mm						
2.36	mm						
1.18	mm						
0.600	mm						
0.425	mm						
0.300	mm						
0.150	mm						
0.075	mm						

Material Characteristics

Fineness Modulus	**TMH 1 B13**					
Flakiness Index (%)	**TMH 1 B3**					
Average Least Dimension (mm)	**TMH 1 B18(a)**					
Aggregate Crushing Value (%)	**TMH 1 B1**					
10% Fact (kN)	**TMH 1 B2**					
Water Absorption (%)	**TMH B14 or B15**					
Presence of Sugar *	**SABS 833**					
Organic Impurity **	**TMH 1 B6**					
Core UCS (Mpa)		2.5	2.0	6.6		
Apparent Relative Density	**Colto - 8100**					

The above test results are pertinent only to the samples received and tested at the laboratory. This report shall not be reproduced, except in full, without the prior consent of SOILCO MATERIALS INVESTIGATIONS (Pty) Ltd.

** Denotes that if the colour of the liquid layer is darker than that of the reference solution, further tests should be carried out to determine the presence or quantity of organic impurities present. Results are not accurate and are merely an indication.

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For Soilco : _____

Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08062
Source:	BD BHM 101
Depth:	31.2 - 31.42

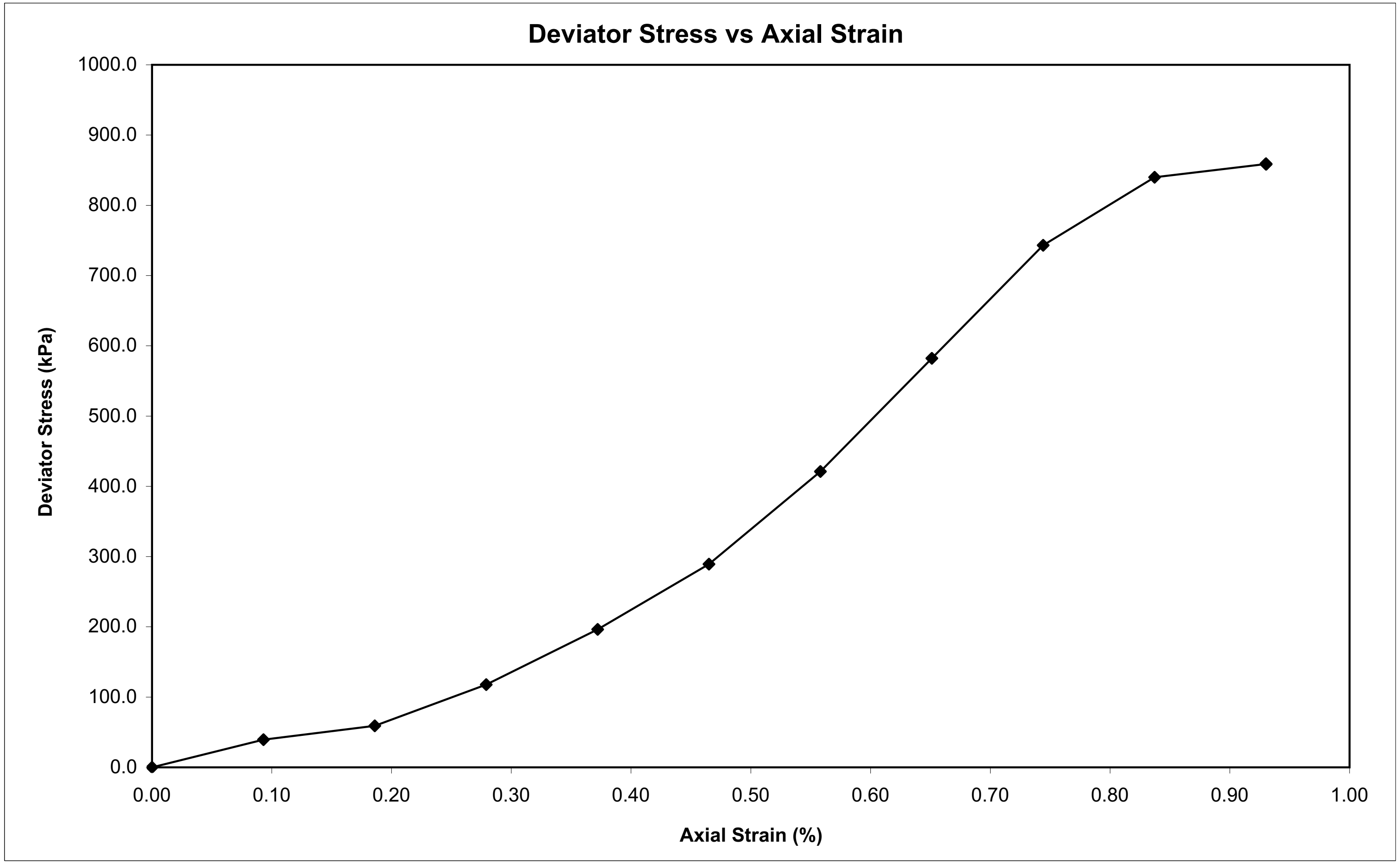
Length (cm)	10.75
Diameter (cm)	5.115
Area (cm2)	20.55
Volume (cm3)	220.90

Mass (g):	439.4
Bulk Density (kg/m3):	1989
Proving Ring Factor:	101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 858.7
Strain at Failure (%): 0.93

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.09	39.4
20	12	0.19	59.0
30	24	0.28	117.9
40	40	0.37	196.3
50	59	0.47	289.2
60	86	0.56	421.2
70	119	0.65	582.2
80	152	0.74	743.0
90	172	0.84	840.0
100	176	0.93	858.7



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
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Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

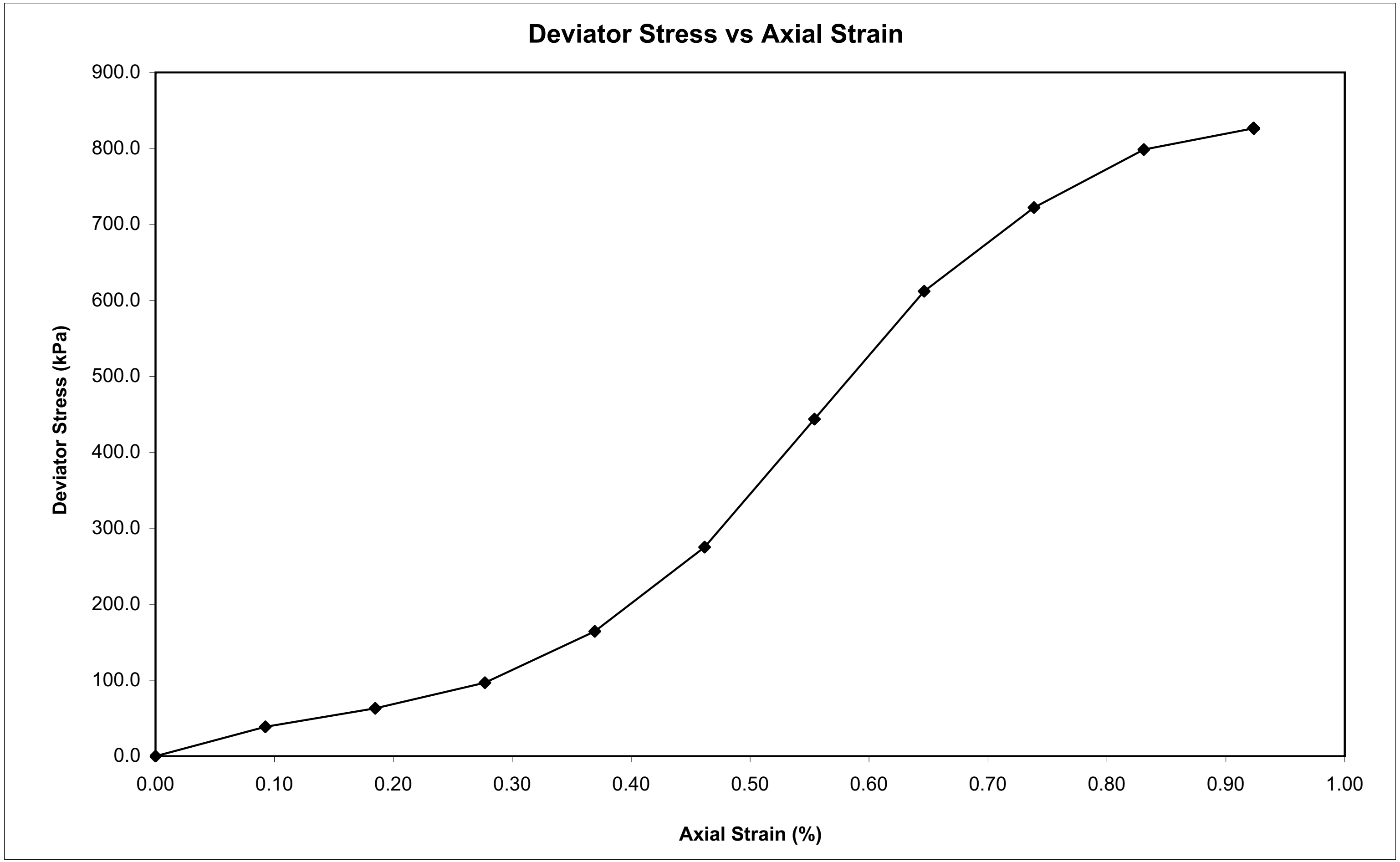
Job no.:	5382
Lab no.:	08063
Source:	BD BHM 101
Depth:	32.82 - 33.02

Length (cm)	10.83
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	225.60
Mass (g):	511
Bulk Density (kg/m3):	2265
Proving Ring Factor:	101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 826.5
Strain at Failure (%): 0.92

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.09	38.8
20	13	0.18	62.9
30	20	0.28	96.7
40	34	0.37	164.3
50	57	0.46	275.2
60	92	0.55	443.7
70	127	0.65	612.0
80	150	0.74	722.1
90	166	0.83	798.4
100	172	0.92	826.5



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO: 4556219901
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8982
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08064
Source:	BD BHM 101
Depth:	34.23 - 34.41

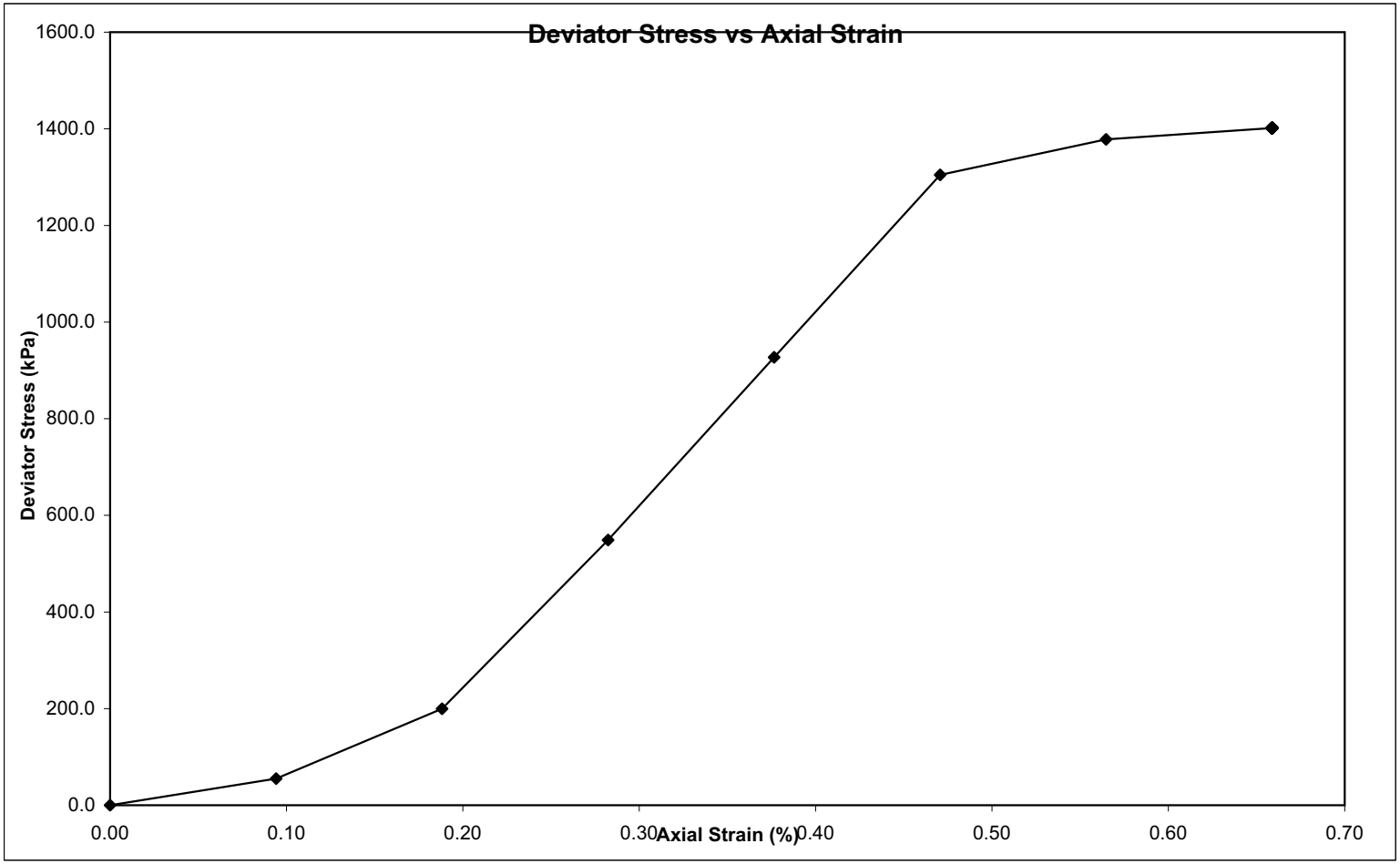
Length (cm)	10.625
Diameter (cm)	5.105
Area (cm2)	20.47
Volume (cm3)	217.48

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.09	55.0
20	40	0.19	199.7
30	110	0.28	548.8
40	186	0.38	927.0
50	262	0.47	1304.6
60	277	0.56	1378.0
70	282	0.66	1401.5

Mass (g):	424.4
Bulk Density (kg/m3):	1969
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1401.5
Strain at Failure (%): 0.66



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO: 4506210801
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8982
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08065
Source:	BD BHM 101
Depth:	38.23 - 38.48

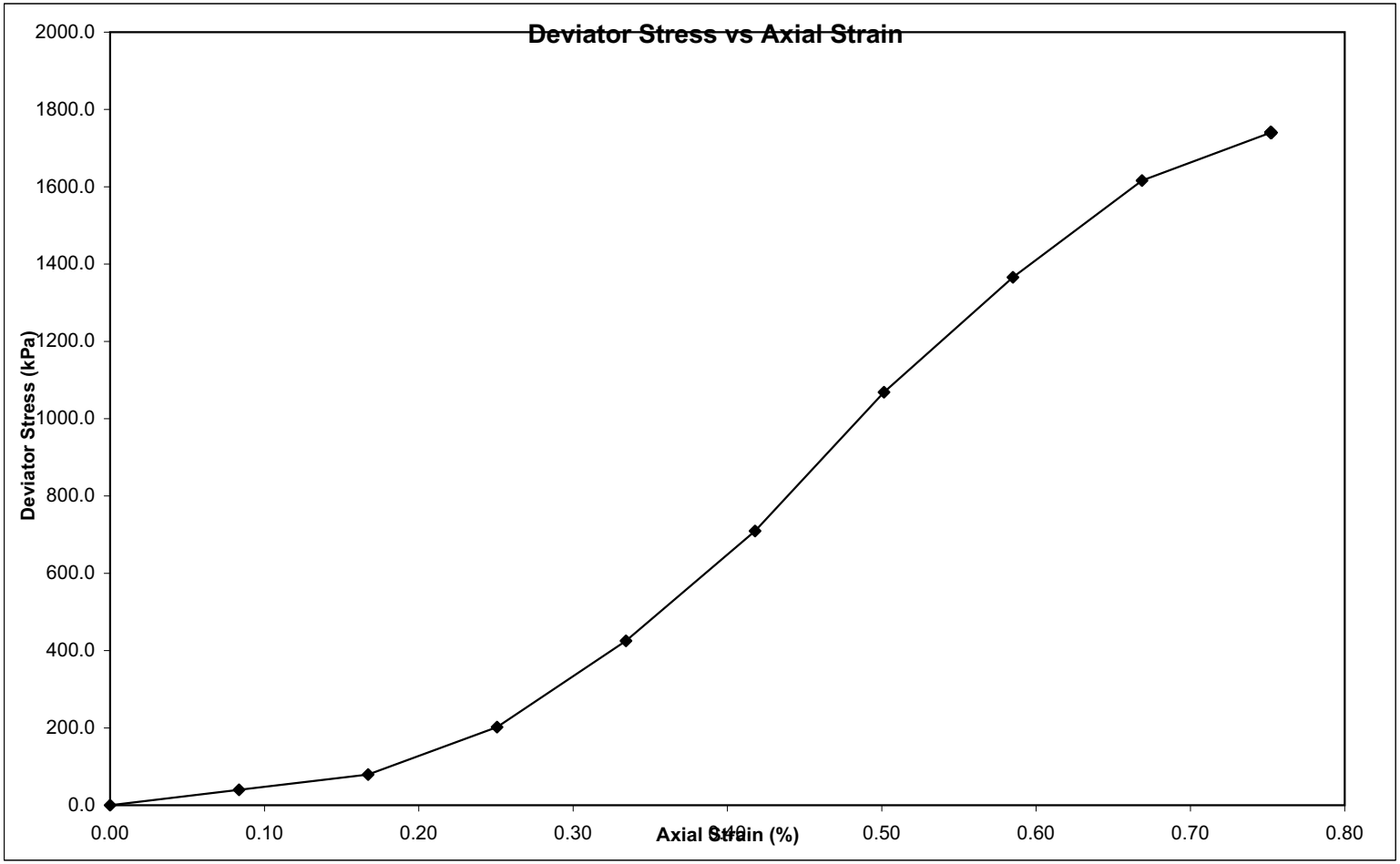
Length (cm)	11.965
Diameter (cm)	5.955
Area (cm2)	27.85
Volume (cm3)	333.25

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.08	39.7
20	22	0.17	79.4
30	56	0.25	202.0
40	118	0.33	425.2
50	197	0.42	709.3
60	297	0.50	1068.4
70	380	0.59	1365.9
80	450	0.67	1616.1
90	485	0.75	1740.4

Mass (g):	645
Bulk Density (kg/m3):	1935
Proving Ring Factor:	101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1740.4
Strain at Failure (%): 0.75



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC

Job no.:	5382	**Length (cm)**	12.04
Lab no.:	08066	**Diameter (cm)**	5.4
Source:	BD BHM 101	**Area (cm2)**	22.90
Depth:	40.97 - 41.21	**Volume (cm3)**	275.74

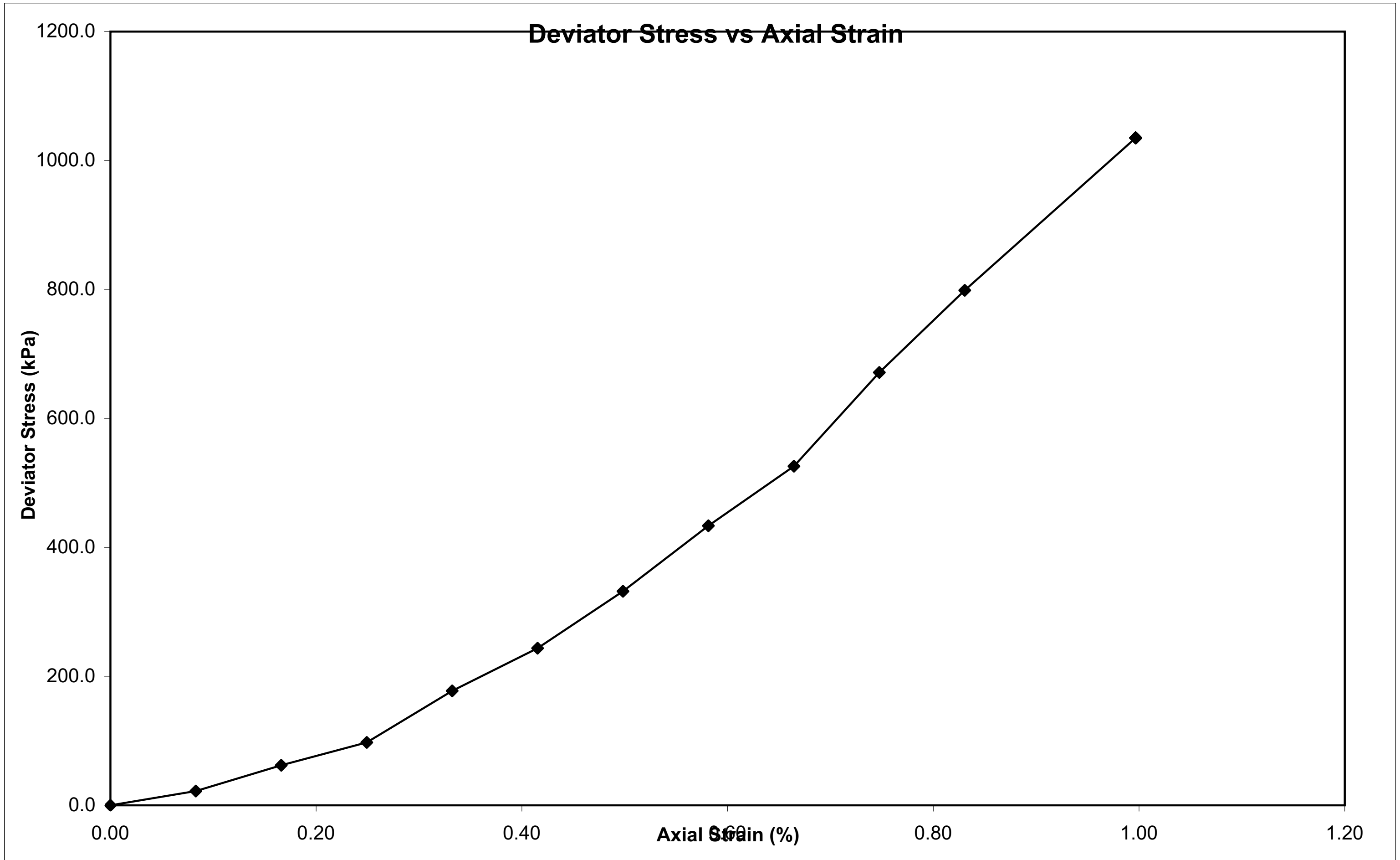
Mass (g): 521.6
Bulk Density (kg/m3): 1892

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1035.2
Strain at Failure (%): 1.00

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	5	0.08	22.2
20	14	0.17	62.2
30	22	0.25	97.6
40	40	0.33	177.4
50	55	0.42	243.7
60	75	0.50	332.0
70	98	0.58	433.5
80	119	0.66	526.0
90	152	0.75	671.2
100	181	0.83	798.6
120	235	1.00	1035.2



Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08067
Source:	BD BHM 101
Depth:	42.59 - 42.78

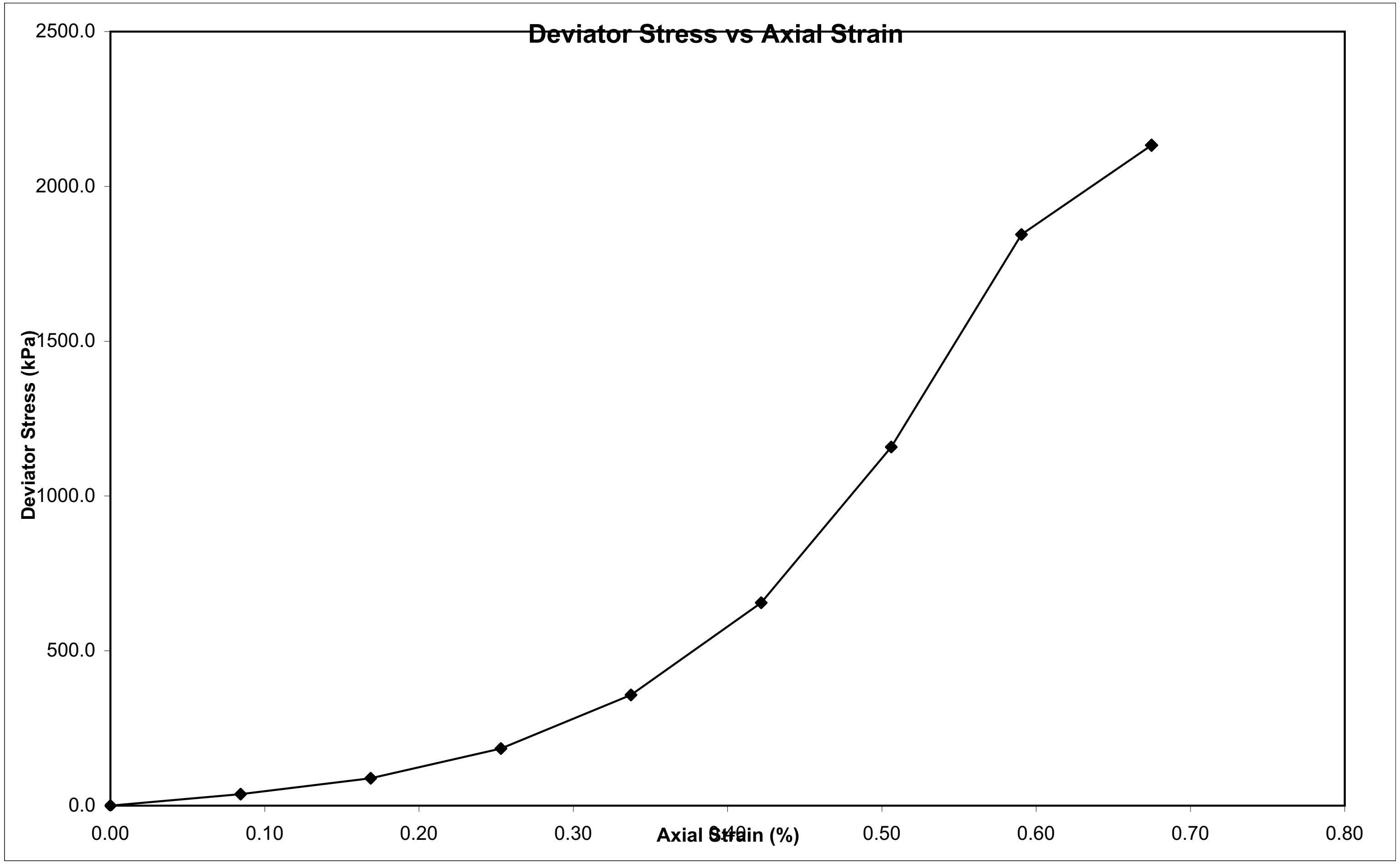
Length (cm)	11.855
Diameter (cm)	5.865
Area (cm2)	27.02
Volume (cm3)	320.28

Mass (g):	635
Bulk Density (kg/m3):	1983
Proving Ring Factor:	100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2133.1
Strain at Failure (%): 0.67

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10	0.08	36.9
20	24	0.17	88.6
30	50	0.25	184.3
40	97	0.34	357.3
50	178	0.42	655.2
60	315	0.51	1158.4
70	502	0.59	1844.6
80	581	0.67	2133.1



RESULTS OF UNCONFINED COMPRESSIVE STRENGTH TESTS ON ROCK CORES

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961.
68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

REF: 5382 **CLIENT:** Moore Spence & Jones **PROJECT:** Durban Harbour Berth Deepening **Date:** 11-08-08

Position	Depth	Bulk Density kg/m^3	Natural Moisture Content %	Axial Strain %	Unconfirmed compressive Strength Mn/m^2	Lab No.
BD BHM 101	45.29 - 45.52	2524	-	0.078	27.967	08068
BD BHM 104	24.80 - 24.93	2510	-	0.056	28.972	08090
BD BHM 104	27.62 - 27.80	2476	-	0.092	20.879	08091

Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
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Fax : (031) 201-7920

Job no.: 5382
Lab no.: 08069
Source: BD BHM 101
Depth: 47.46 - 47.69

Length (cm) 11.815
Diameter (cm) 5.6
Area (cm2) 24.63
Volume (cm3) 291.00

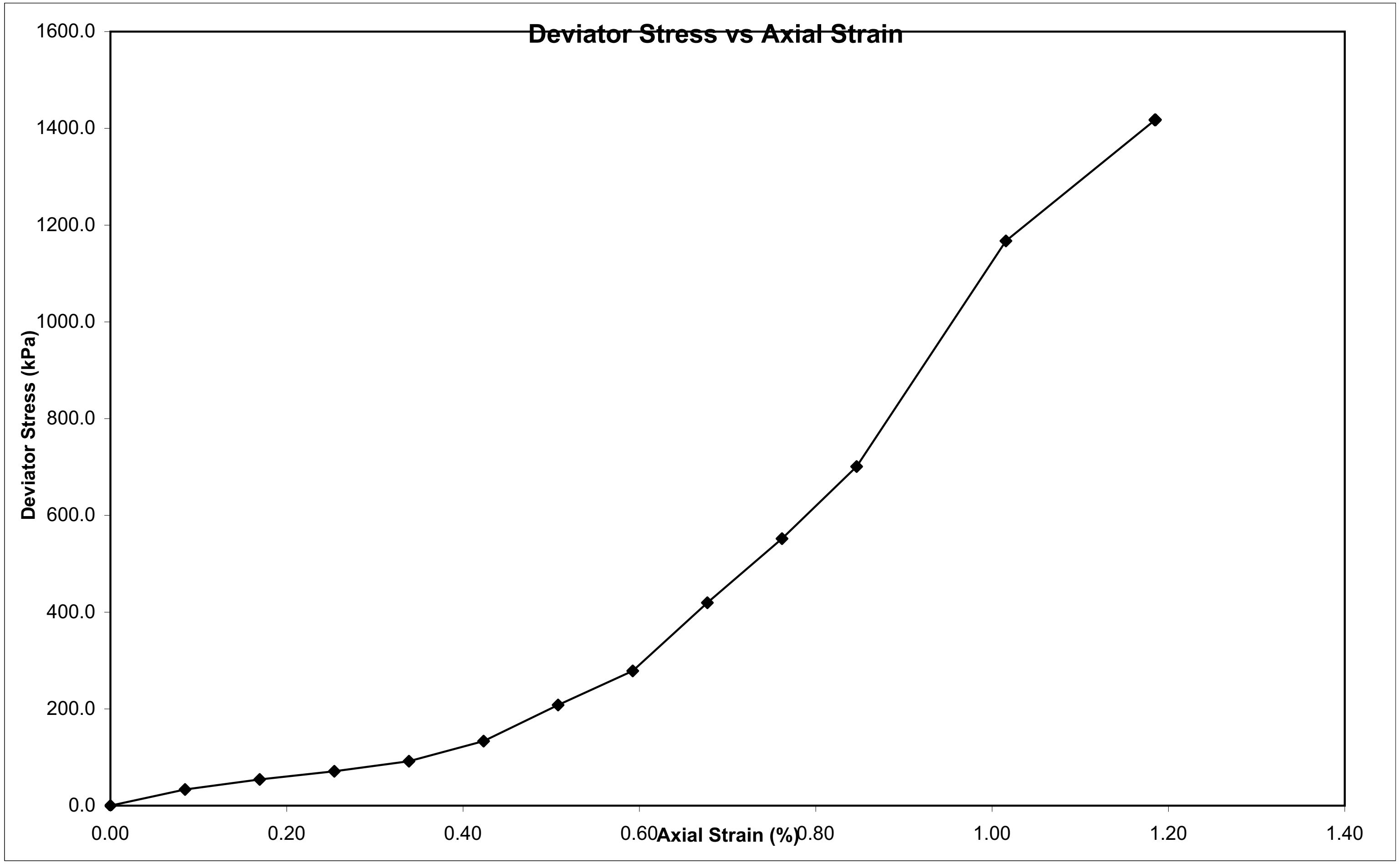
Mass (g): 568.6
Bulk Density (kg/m3): 1954

Proving Ring Factor: 103

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.08	33.4
20	13	0.17	54.3
30	17	0.25	70.9
40	22	0.34	91.7
50	32	0.42	133.3
60	50	0.51	208.1
70	67	0.59	278.6
80	101	0.68	419.6
90	133	0.76	552.0
100	169	0.85	700.8
120	282	1.02	1167.4
140	343	1.18	1417.5

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1417.5
Strain at Failure (%): 1.18



Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08070
Source:	BD BHM 101
Depth:	52.08 - 52.24

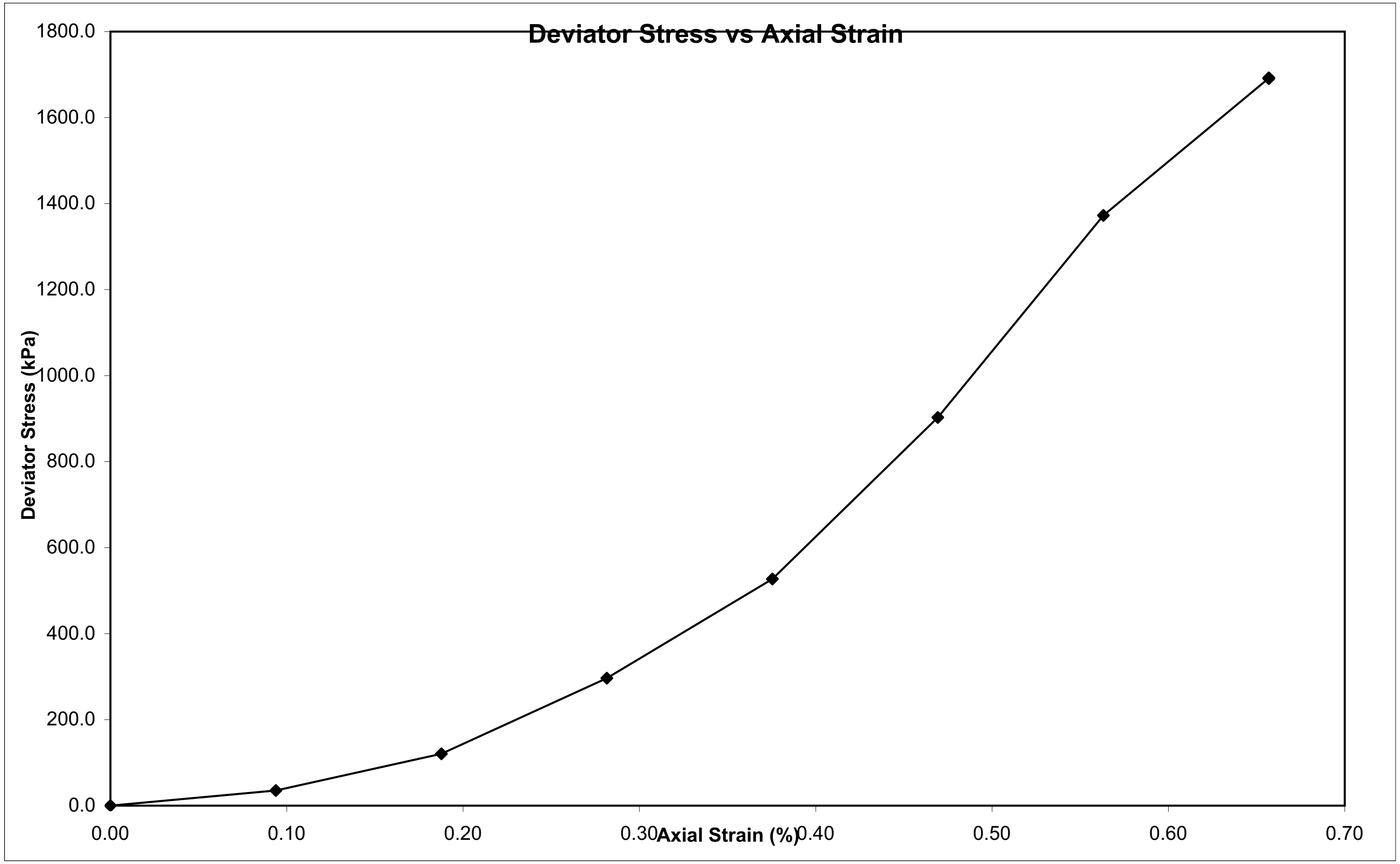
Length (cm)	10.655
Diameter (cm)	5.1
Area (cm2)	20.43
Volume (cm3)	217.66

Mass (g):	427.6
Bulk Density (kg/m3):	1965
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1691.7
Strain at Failure (%): 0.66

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7	0.09	35.2
20	24	0.19	120.7
30	59	0.28	296.4
40	105	0.38	527.0
50	180	0.47	902.6
60	274	0.56	1372.7
70	338	0.66	1691.7



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4550210861
68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.:	5382	**Length (cm)**	10.58
Lab no.:	08071	**Diameter (cm)**	5.165
Source:	BD BHM 101	**Area (cm2)**	20.95
Depth:	53.58 - 53.74	**Volume (cm3)**	221.67

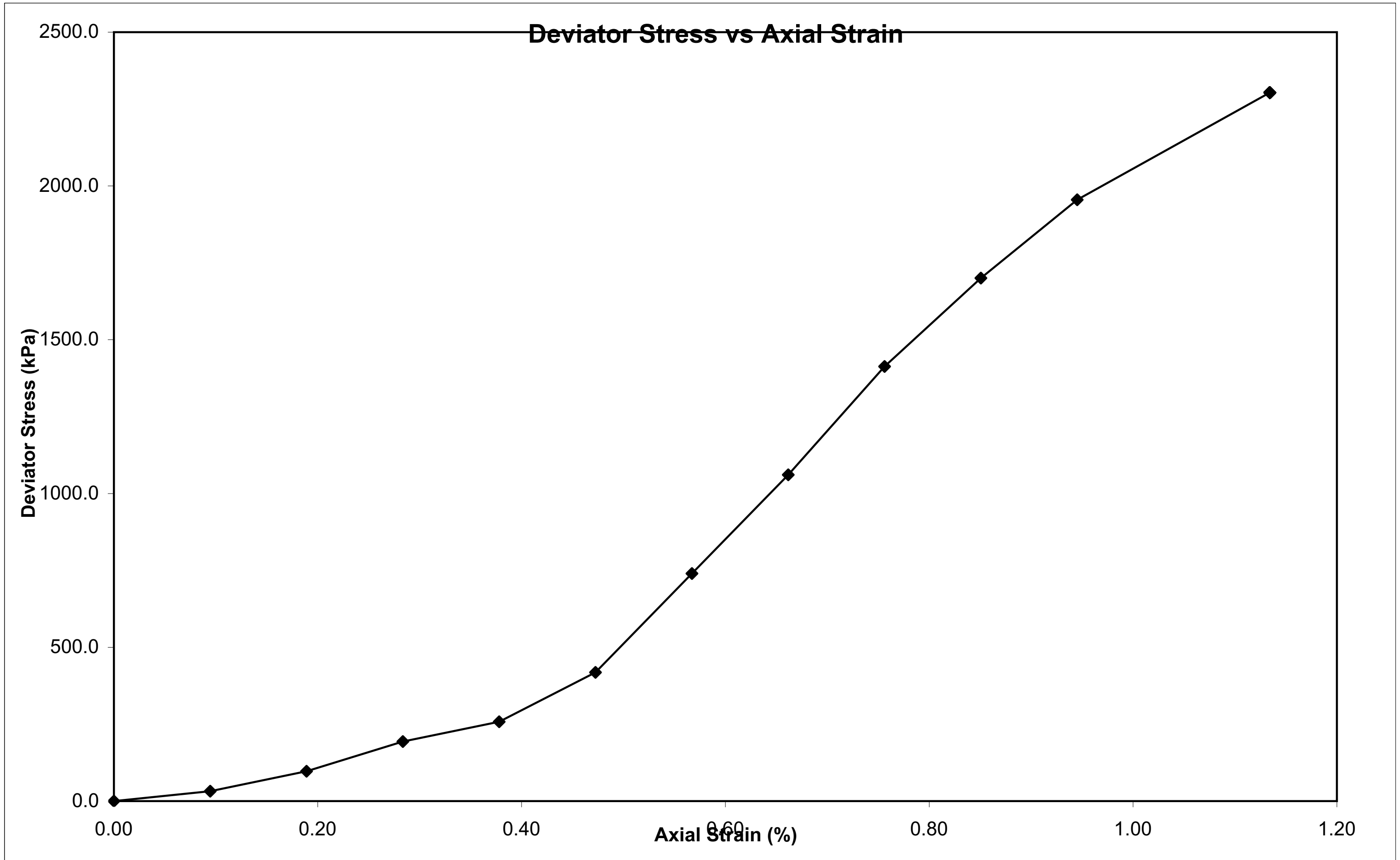
Mass (g): 557.4
Bulk Density (kg/m3): 2515

Proving Ring Factor: 678

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2303.4
Strain at Failure (%): 1.13

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	1	0.09	32.3
20	3	0.19	96.9
30	6	0.28	193.6
40	8	0.38	257.9
50	13	0.47	418.7
60	23	0.57	740.0
70	33	0.66	1060.8
80	44	0.76	1413.0
90	53	0.85	1700.5
100	61	0.95	1955.3
120	72	1.13	2303.4



Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.: 5382
Lab no.: 08072
Source: BD BHM 101
Depth: 56.17 - 56.33

Length (cm) 12.12
Diameter (cm) 5.845
Area (cm2) 26.83
Volume (cm3) 325.21

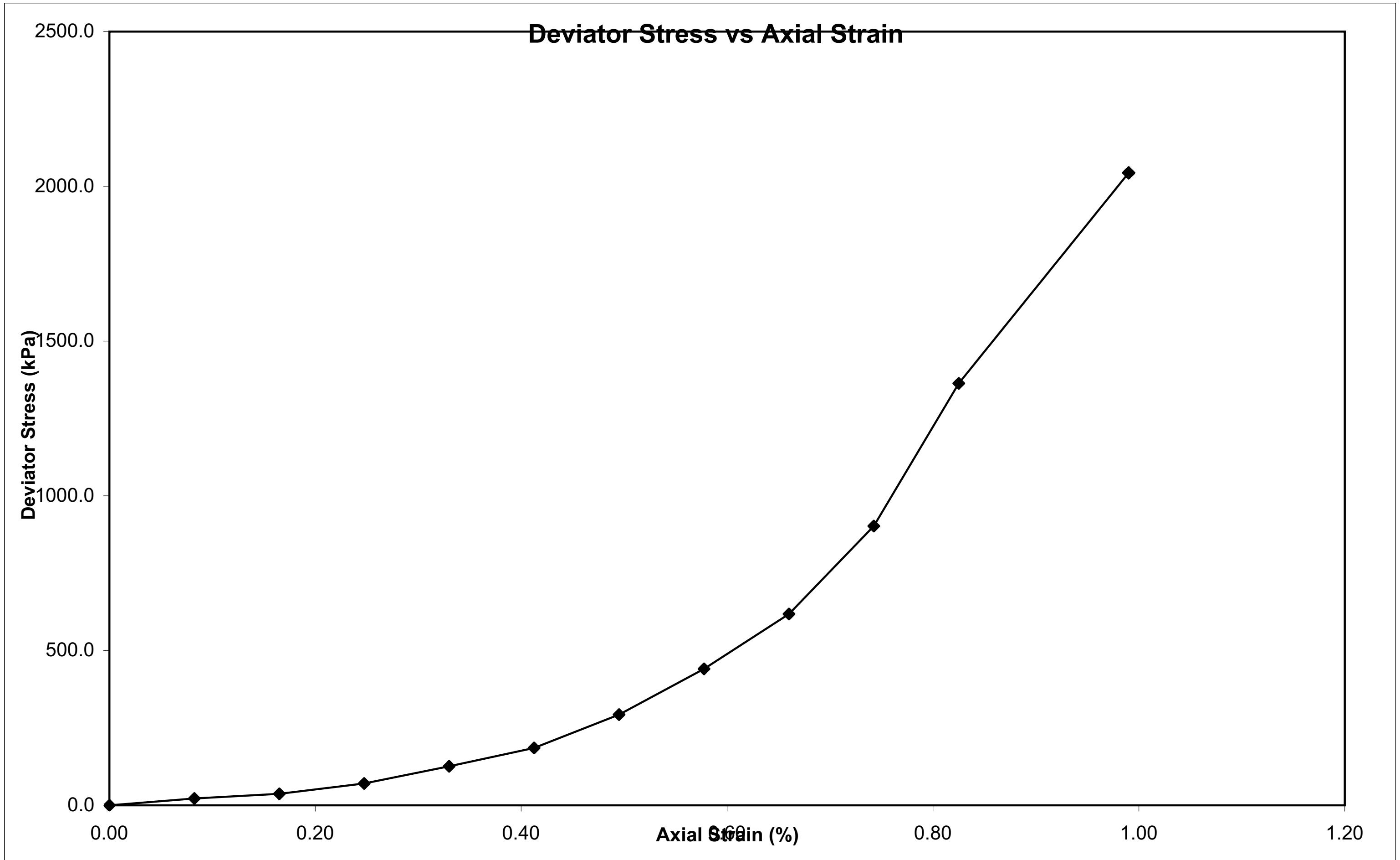
Mass (g): 655
Bulk Density (kg/m3): 21301

Proving Ring Factor: 100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2043.8
Strain at Failure (%): 0.99

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	6	0.08	22.3
20	10	0.17	37.2
30	19	0.25	70.6
40	34	0.33	126.3
50	50	0.41	185.5
60	79	0.50	292.9
70	119	0.58	440.8
80	167	0.66	618.2
90	244	0.74	902.4
100	369	0.83	1363.6
120	554	0.99	2043.8



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08074
Source:	BD BHM 101
Depth:	56.63 - 56.89

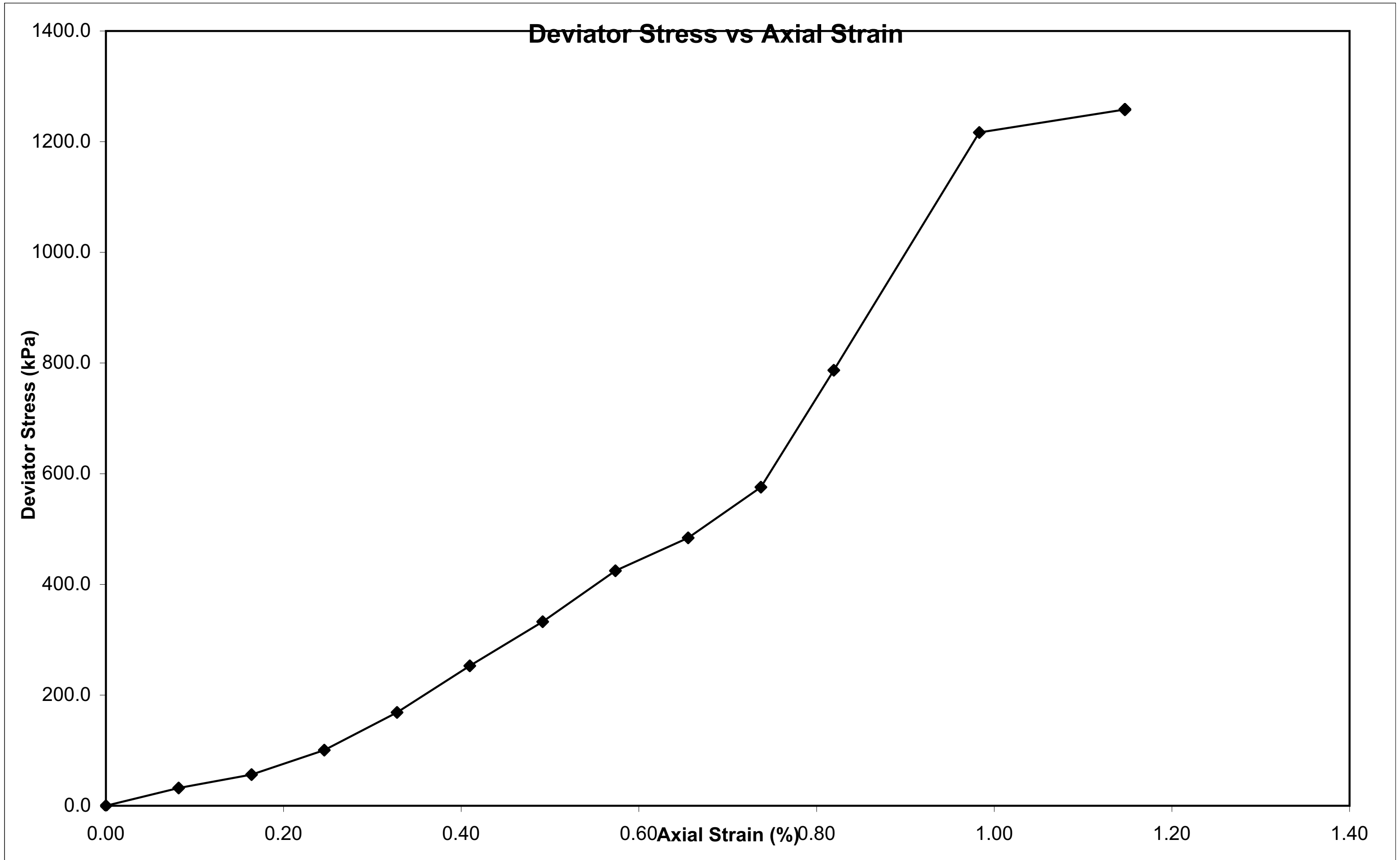
Length (cm)	12.205
Diameter (cm)	5.7
Area (cm2)	25.52
Volume (cm3)	311.44

Mass (g):	610
Bulk Density (kg/m3):	1959
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1258.3
Strain at Failure (%): 1.15

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.08	32.2
20	14	0.16	56.3
30	25	0.25	100.5
40	42	0.33	168.6
50	63	0.41	252.7
60	83	0.49	332.7
70	106	0.57	424.5
80	121	0.66	484.2
90	144	0.74	575.8
100	197	0.82	787.1
120	305	0.98	1216.5
140	316	1.15	1258.3



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08075
Source:	BD BHM 101
Depth:	57.96 - 58.08

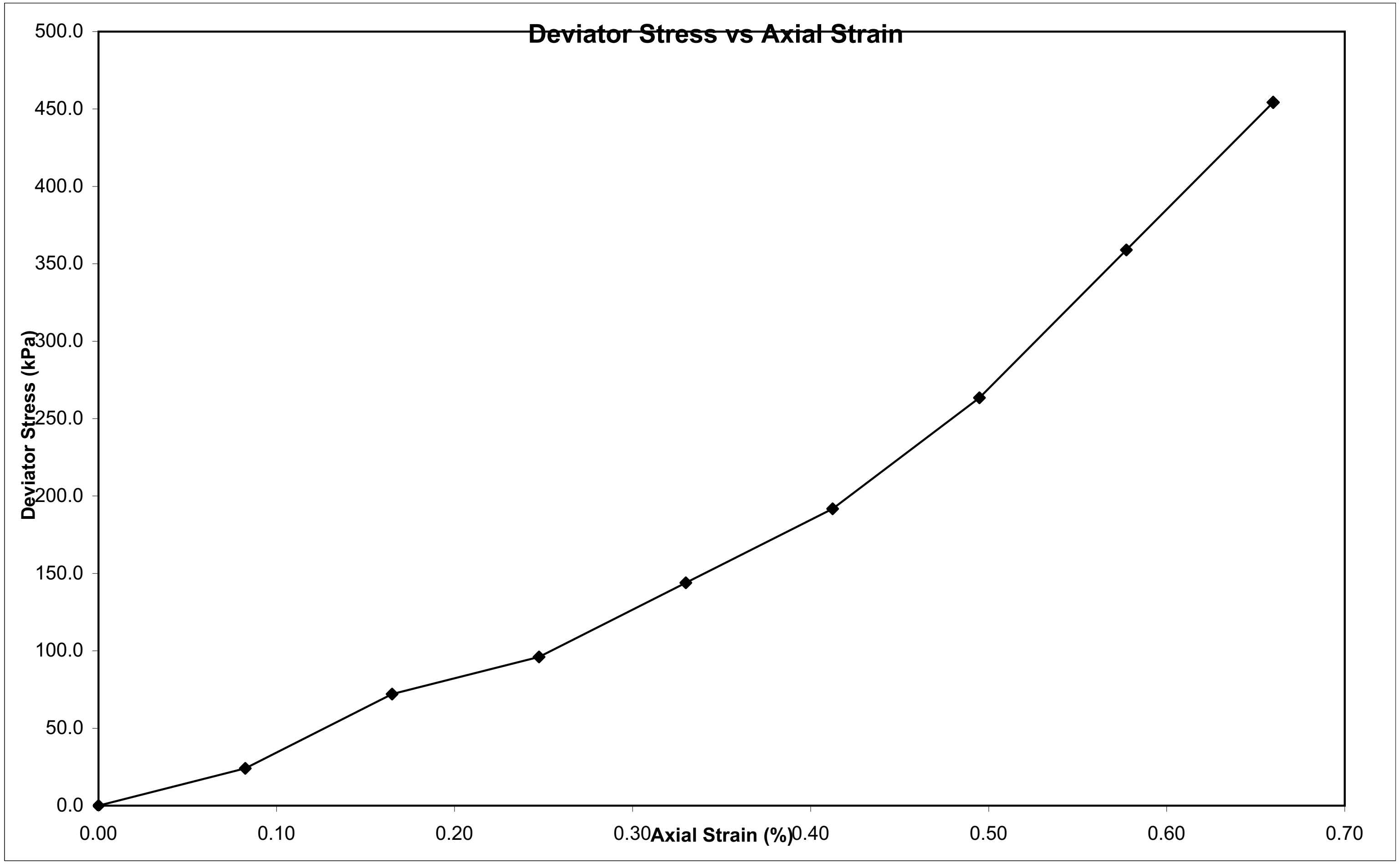
Length (cm)	12.125
Diameter (cm)	5.9
Area (cm2)	27.34
Volume (cm3)	331.49

Mass (g):	665
Bulk Density (kg/m3):	2006
Proving Ring Factor:	658

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 454.3
Strain at Failure (%): 0.66

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	1	0.08	24.0
20	3	0.16	72.1
30	4	0.25	96.0
40	6	0.33	143.9
50	8	0.41	191.7
60	11	0.49	263.4
70	15	0.58	358.9
80	19	0.66	454.3



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08076
Source:	BD BHM 101
Depth:	58.61 - 58.79

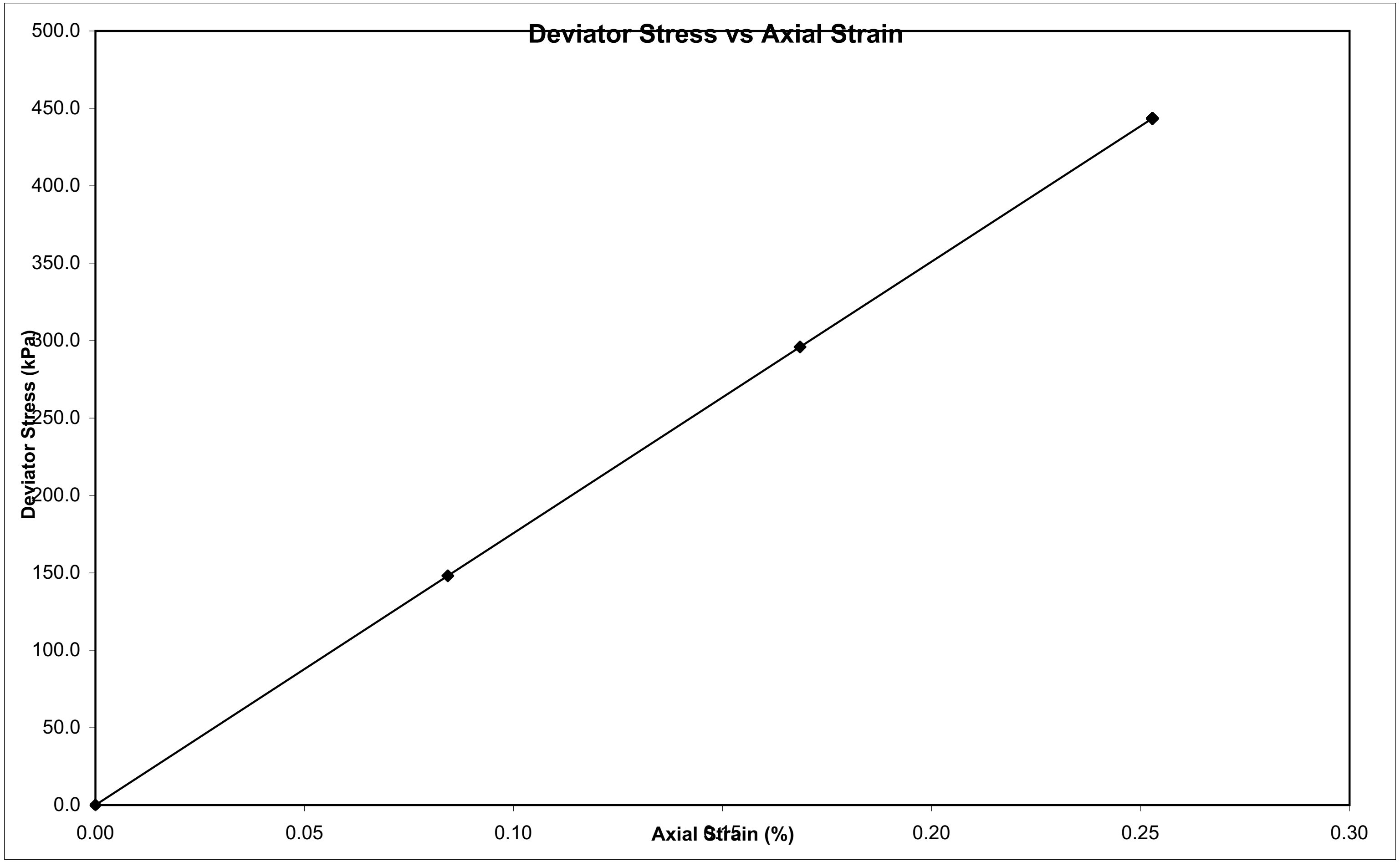
Length (cm)	11.865
Diameter (cm)	5.815
Area (cm2)	26.56
Volume (cm3)	315.11

Mass (g):	630
Bulk Density (kg/m3):	1999
Proving Ring Factor:	656

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 443.5
Strain at Failure (%): 0.25

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	6	0.08	148.1
20	12	0.17	295.9
30	18	0.25	443.5



Job Description: Durban Harbour Berth Deepening

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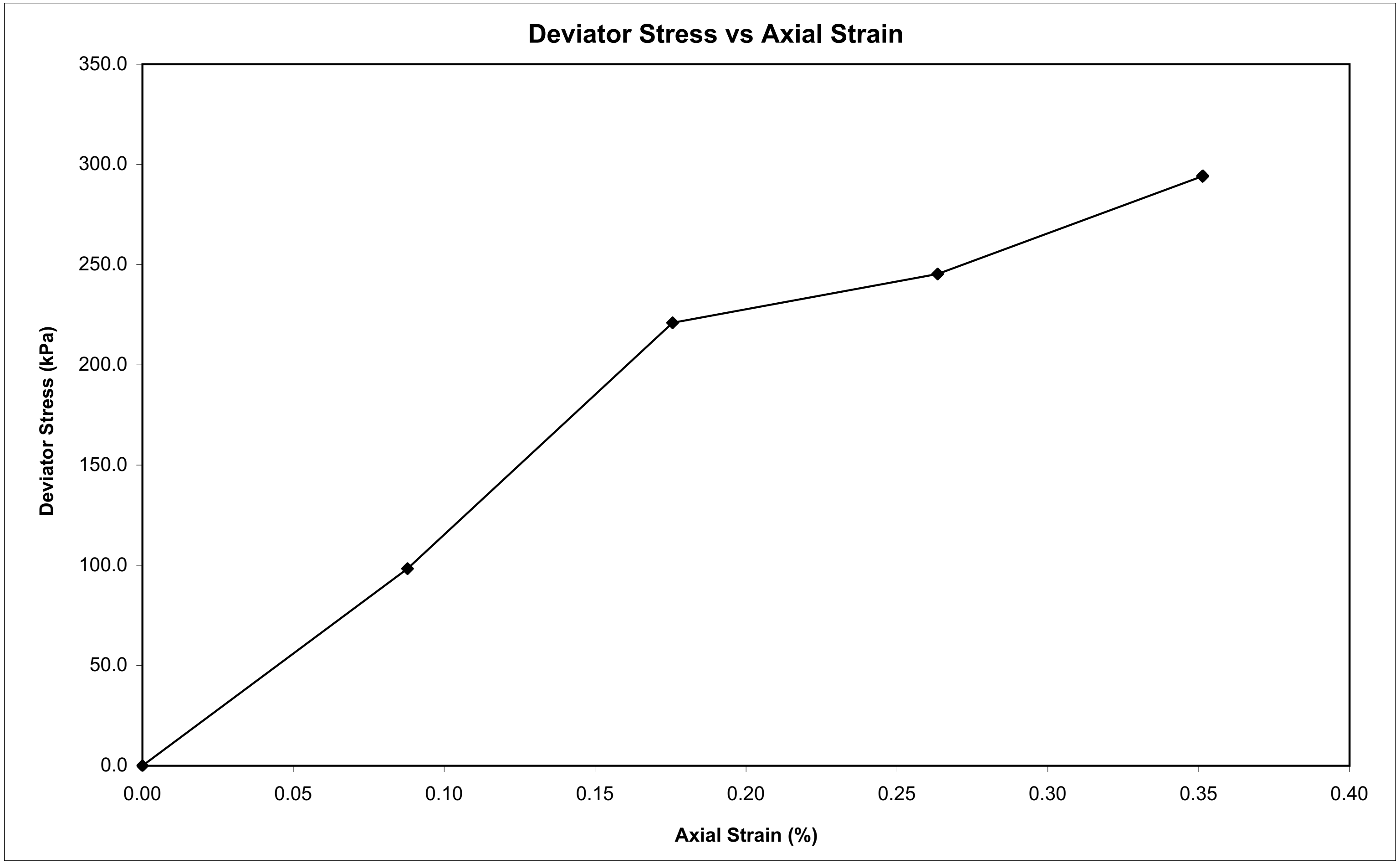
Job no.:	5382
Lab no.:	08077
Source:	BD BHM 101
Depth:	59.58 - 59.74

Length (cm)	11.385
Diameter (cm)	5.8
Area (cm2)	26.42
Volume (cm3)	300.80
Mass (g):	595
Bulk Density (kg/m3):	1978
Proving Ring Factor:	650

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 294.2
Strain at Failure (%): 0.35

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	4	0.09	98.3
20	9	0.18	221.0
30	10	0.26	245.4
40	12	0.35	294.2



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08078
Source:	BD BHM 102
Depth:	31.80 - 31.95

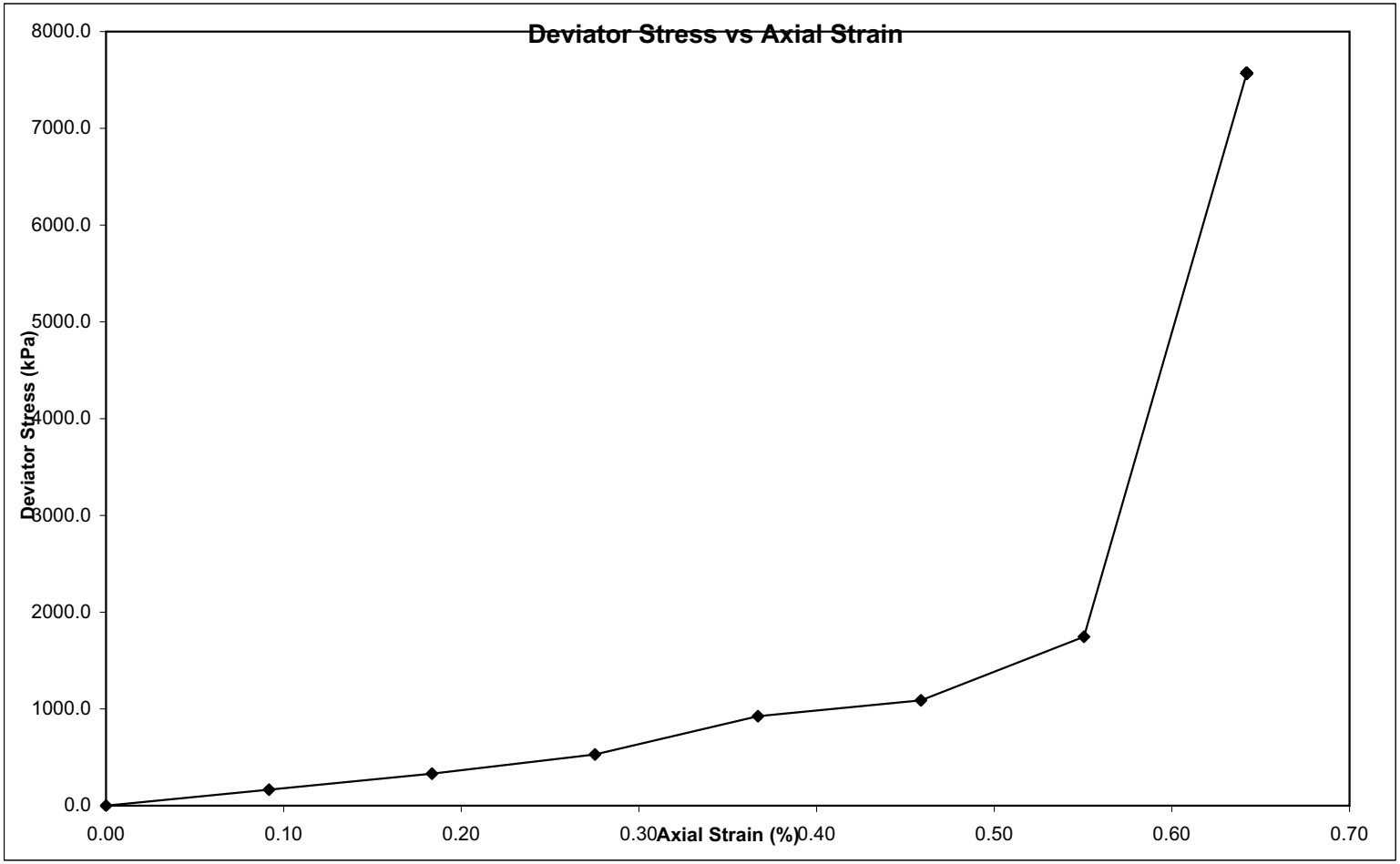
Length (cm)	10.9
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	227.05

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	5	0.09	165.5
20	10	0.18	330.6
30	16	0.28	528.5
40	28	0.37	924.1
50	33	0.46	1088.1
60	53	0.55	1745.9
70	230	0.64	7569.6

Mass (g):	585
Bulk Density (kg/m3):	2577
Proving Ring Factor:	690

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 7569.6
Strain at Failure (%): 0.64



Job Description: Durban Harbour Berth Deepening

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Job no.: 5382
Lab no.: 08079
Source: BD BHM 102
Depth: 41.10 - 41.29

Length (cm) 10.85
Diameter (cm) 5.1
Area (cm2) 20.43
Volume (cm3) 221.65

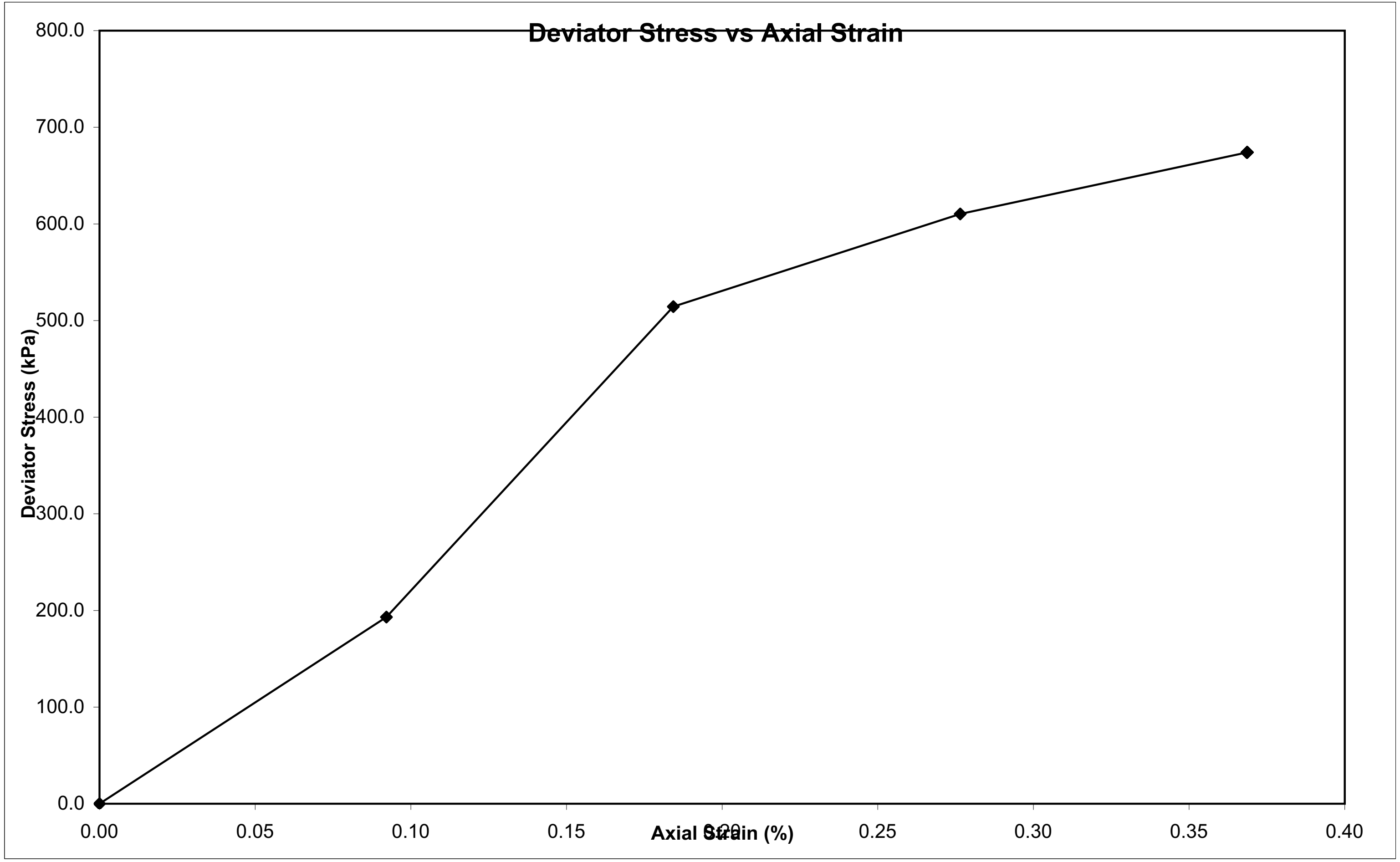
Mass (g): 555
Bulk Density (kg/m3): 2504

Proving Ring Factor: 658

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 673.9
Strain at Failure (%): 0.37

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	6	0.09	193.1
20	16	0.18	514.4
30	19	0.28	610.3
40	21	0.37	673.9



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Job Description: Durban Harbour Berth Deepening

Job no.:	5382
Lab no.:	08080
Source:	BD BHM 102
Depth:	42.45 - 42.58

Length (cm)	9.395
Diameter (cm)	5.77
Area (cm2)	26.15
Volume (cm3)	245.66

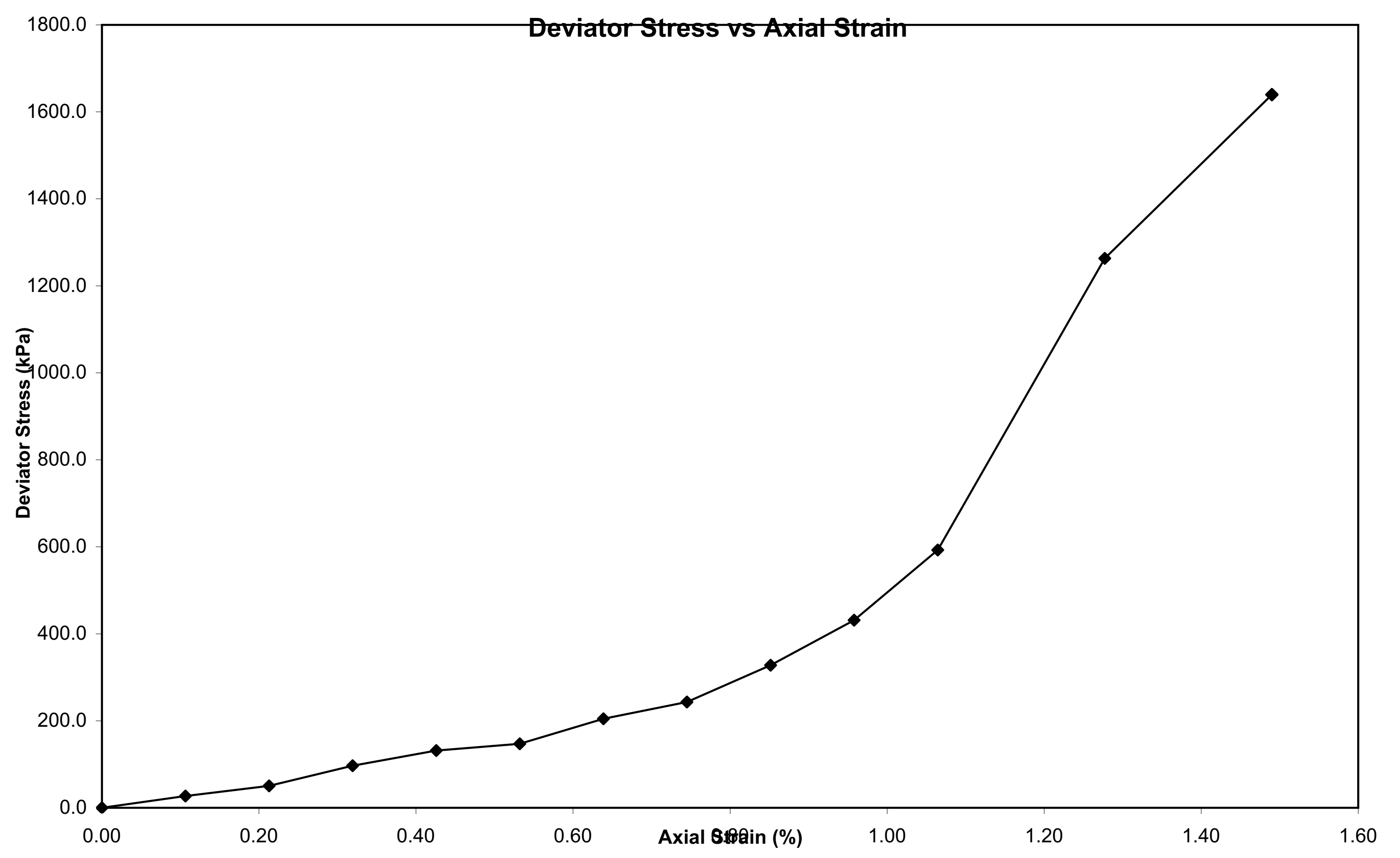
Mass (g):	471.4
Bulk Density (kg/m3):	1919
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1639.7

Strain at Failure (%): 1.49

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7	0.11	27.2
20	13	0.21	50.4
30	25	0.32	96.9
40	34	0.43	131.7
50	38	0.53	147.0
60	53	0.64	204.8
70	63	0.75	243.2
80	85	0.85	327.7
90	112	0.96	431.4
100	154	1.06	592.5
120	329	1.28	1263.1
140	428	1.49	1639.7



Job Description: Durban Harbour Berth Deepening

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Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08081
Source:	BD BHM 102
Depth:	43.54 - 43.66

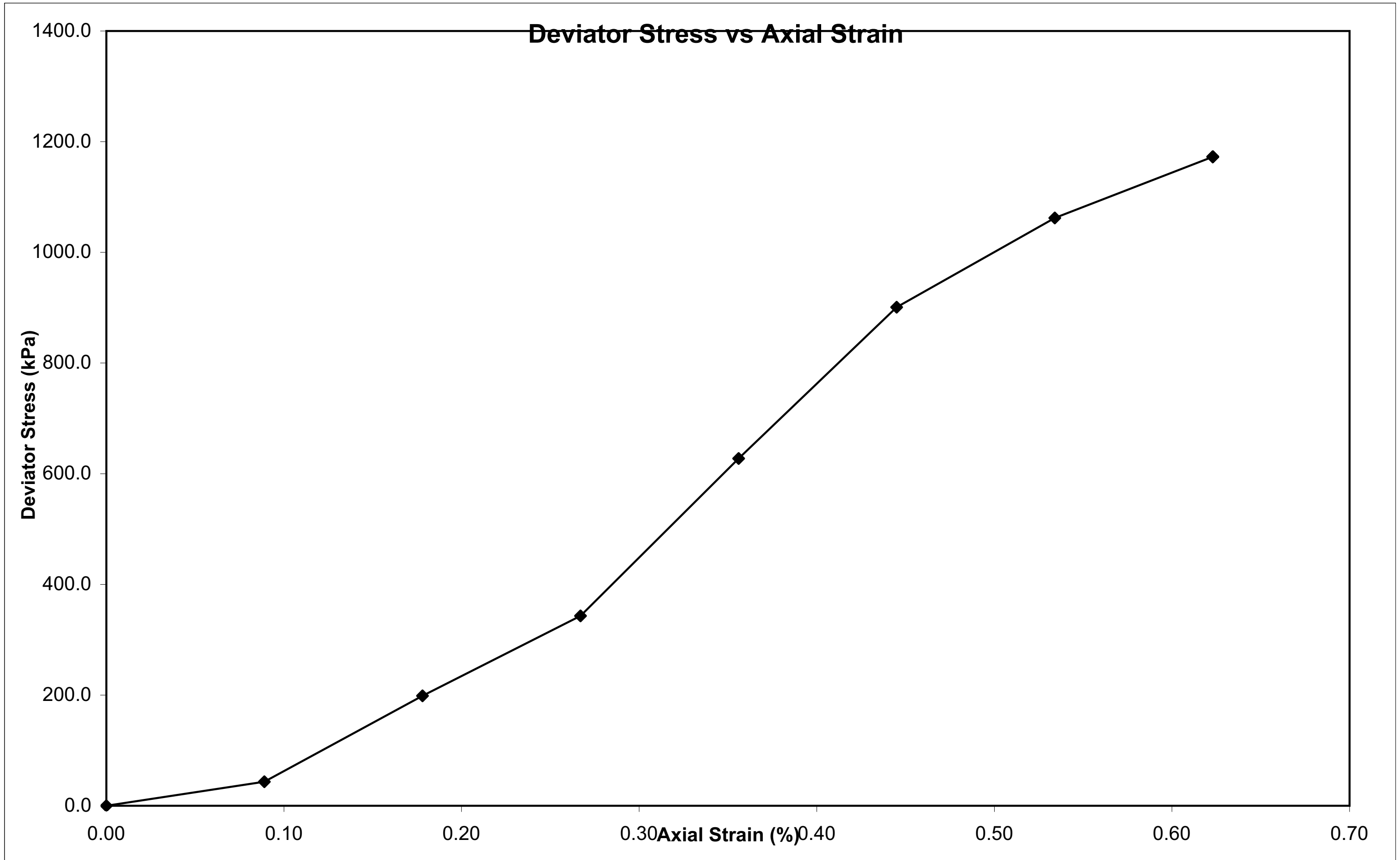
Length (cm)	11.236
Diameter (cm)	6.015
Area (cm2)	28.42
Volume (cm3)	319.28

Mass (g):	635
Bulk Density (kg/m3):	1989
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1172.7
Strain at Failure (%): 0.62

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	12	0.09	43.4
20	55	0.18	198.7
30	95	0.27	343.0
40	174	0.36	627.6
50	250	0.44	900.9
60	295	0.53	1062.1
70	326	0.62	1172.7



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08082
Source:	BD BHM 102
Depth:	46.70 - 46.90

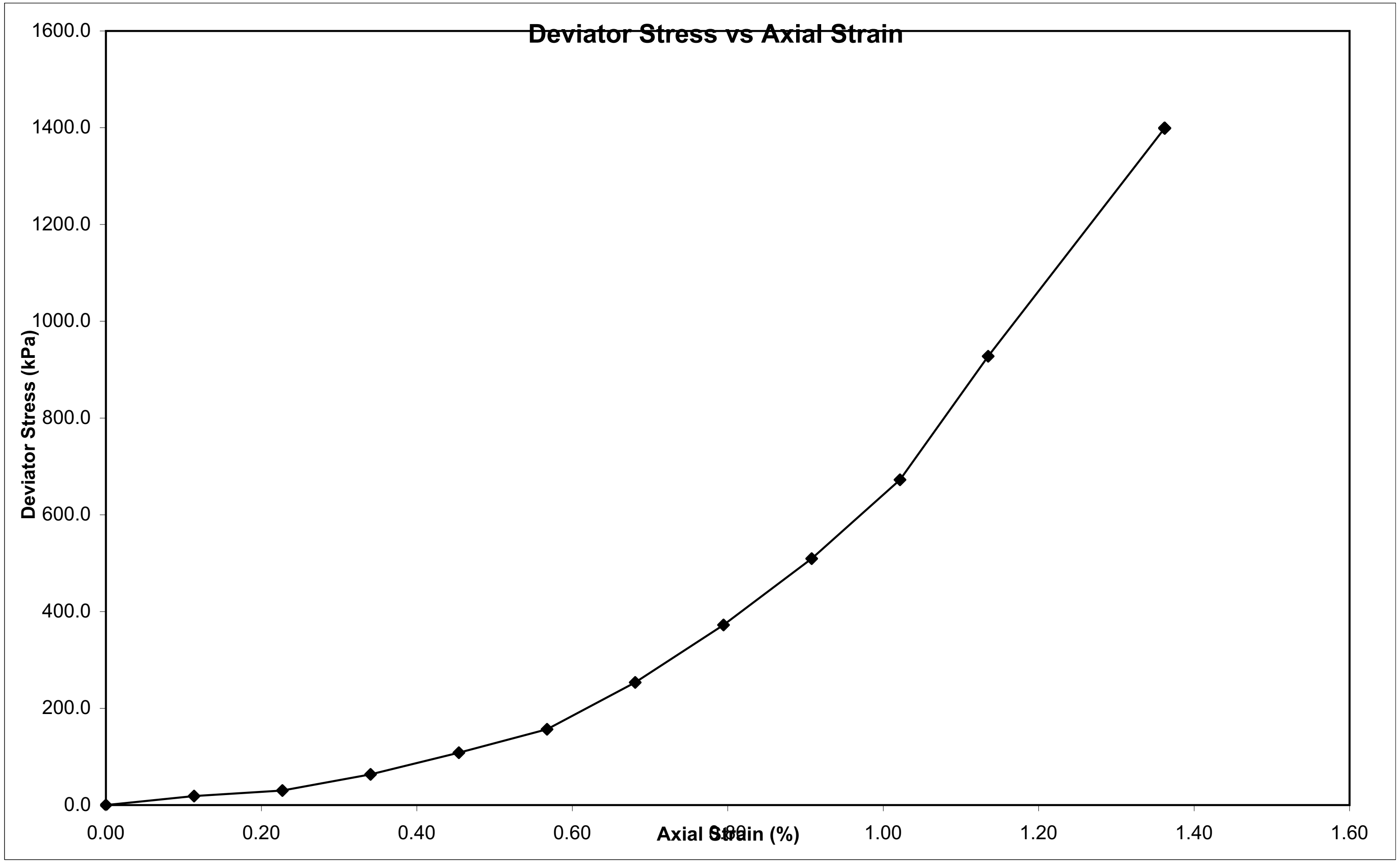
Length (cm)	8.81
Diameter (cm)	5.9
Area (cm2)	27.34
Volume (cm3)	240.86

Mass (g):	475
Bulk Density (kg/m3):	1972
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1399.2
Strain at Failure (%): 1.36

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	5	0.11	18.7
20	8	0.23	30.0
30	17	0.34	63.6
40	29	0.45	108.3
50	42	0.57	156.7
60	68	0.68	253.5
70	100	0.79	372.3
80	137	0.91	509.5
90	181	1.02	672.3
100	250	1.14	927.5
120	378	1.36	1399.2



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08083
Source:	BD BHM 102
Depth:	48.36 - 48.49

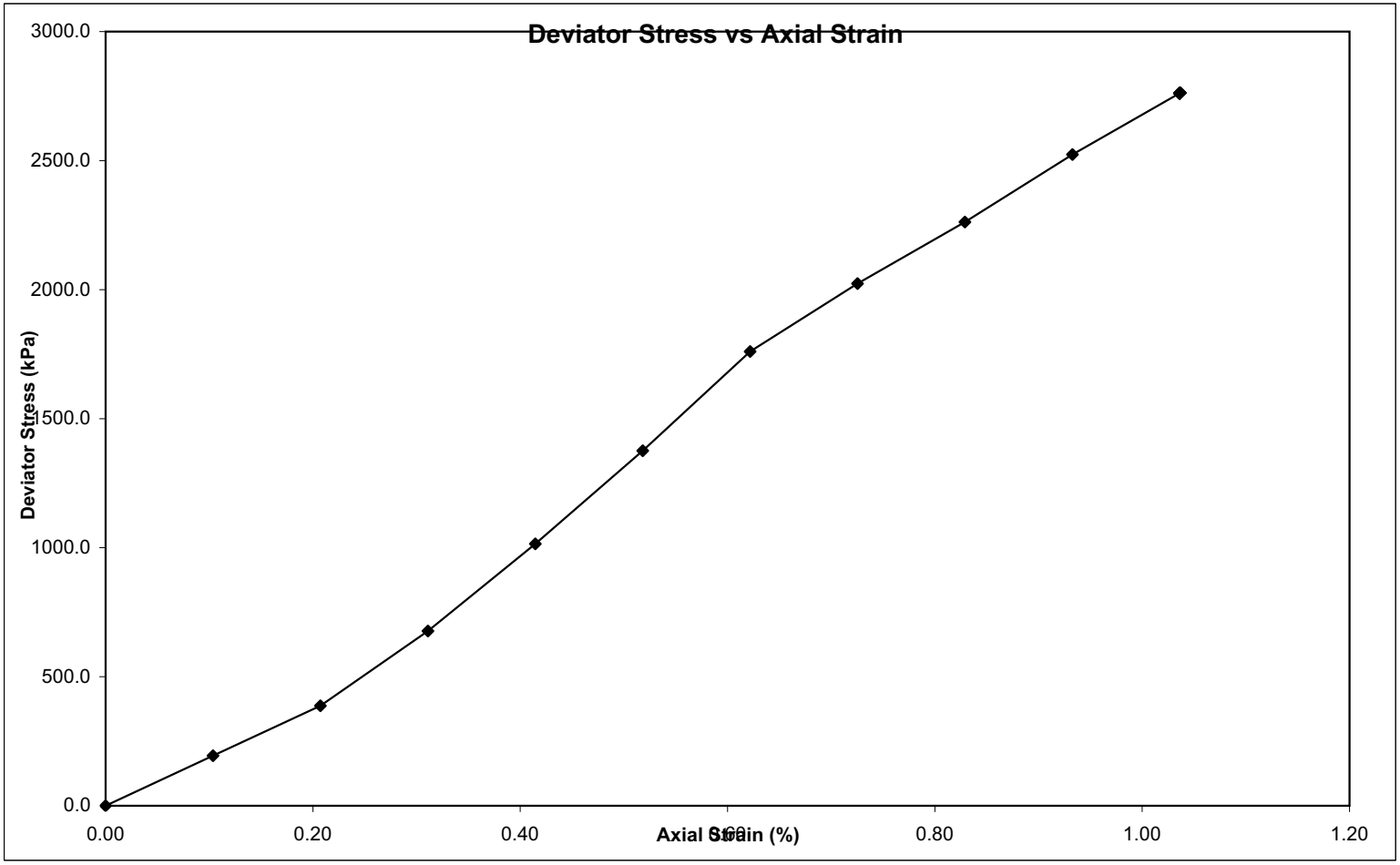
Length (cm)	9.65
Diameter (cm)	6
Area (cm2)	28.27
Volume (cm3)	272.85

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.10	193.9
20	16	0.21	387.4
30	28	0.31	677.2
40	42	0.41	1014.8
50	57	0.52	1375.8
60	73	0.62	1760.1
70	84	0.73	2023.2
80	94	0.83	2261.7
90	105	0.93	2523.8
100	115	1.04	2761.2

Mass (g):	655
Bulk Density (kg/m3):	2401
Proving Ring Factor:	686

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2761.2
Strain at Failure (%): 1.04



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.13
Lab no.:	07161	**Diameter (cm)**	5.2
Source:	BD-BHM 103	**Area (cm2)**	21.24
Depth:	32.13 - 32.29	**Volume (cm3)**	215.13

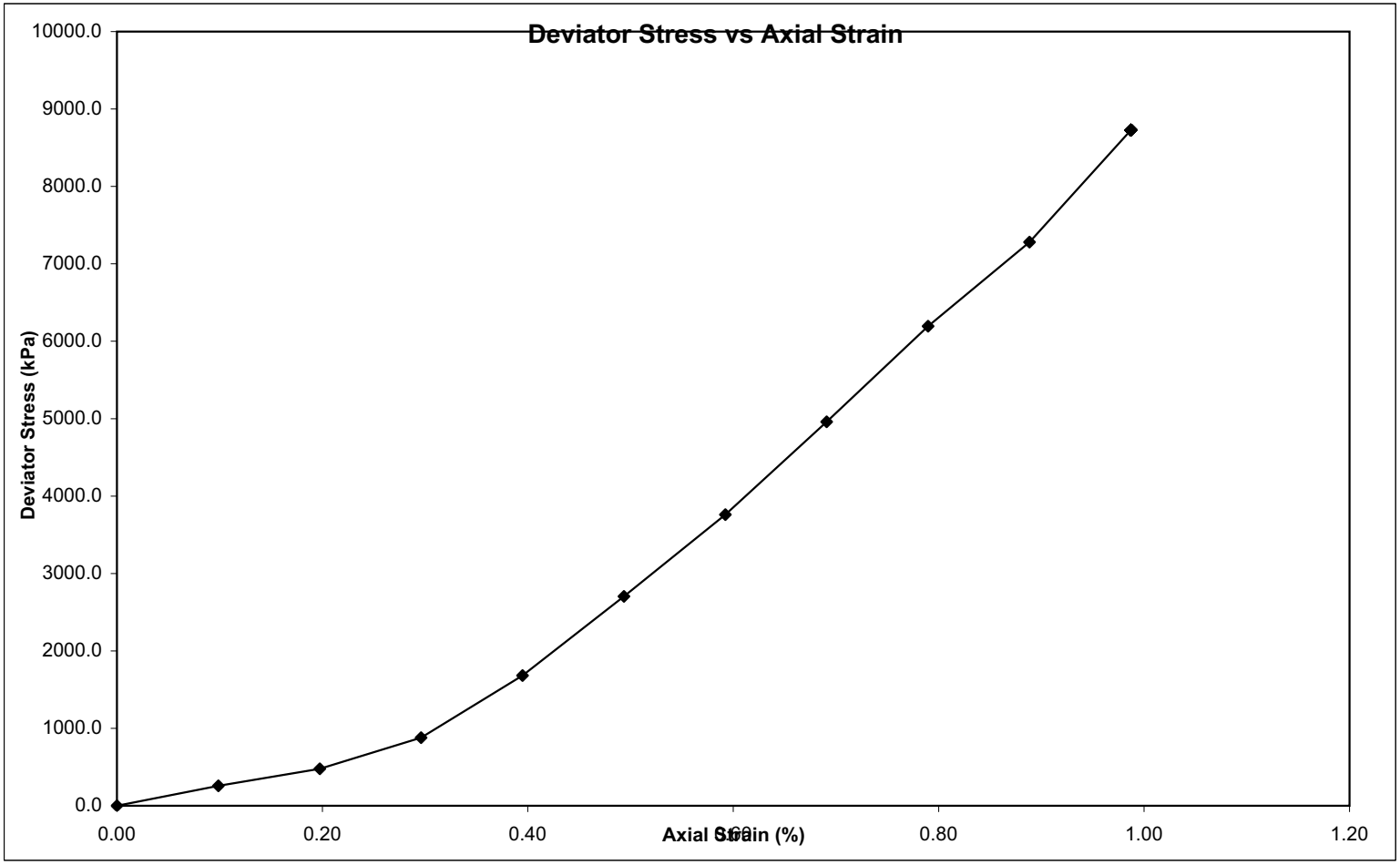
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7	0.10	256.8
20	13	0.20	476.5
30	24	0.30	878.9
40	46	0.39	1682.8
50	74	0.49	2704.5
60	103	0.59	3760.6
70	136	0.69	4960.5
80	170	0.79	6194.5
90	200	0.89	7280.4
100	240	0.99	8727.7

Mass (g): 540
Bulk Density (kg/m3): 2510

Proving Ring Factor: 780

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 8727.7
Strain at Failure (%): 0.99



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.83
Lab no.:	07162	**Diameter (cm)**	5.15
Source:	BD-BHM 103	**Area (cm2)**	20.83
Depth:	34.52 - 34.76	**Volume (cm3)**	204.77

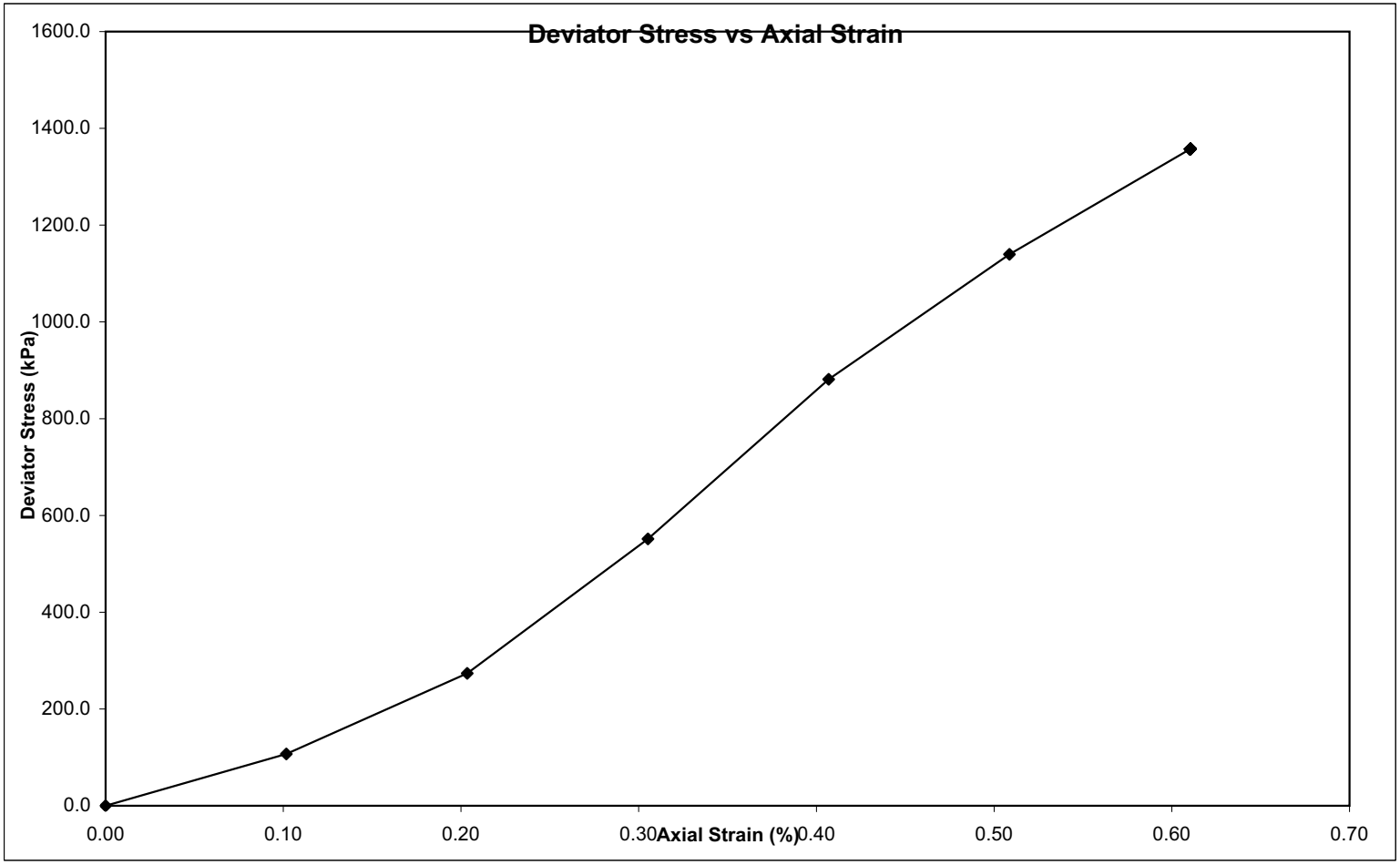
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	21.8	0.10	107.1
20	55.8	0.20	273.7
30	112.5	0.31	551.3
40	180	0.41	881.2
50	233	0.51	1139.6
60	277.8	0.61	1357.3

Mass (g): 400
Bulk Density (kg/m3): 1953

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1357.3
Strain at Failure (%): 0.61



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.855
Lab no.:	07163	**Diameter (cm)**	5.1
Source:	BD-BHM 103	**Area (cm2)**	20.43
Depth:	35.65 - 35.83	**Volume (cm3)**	201.32

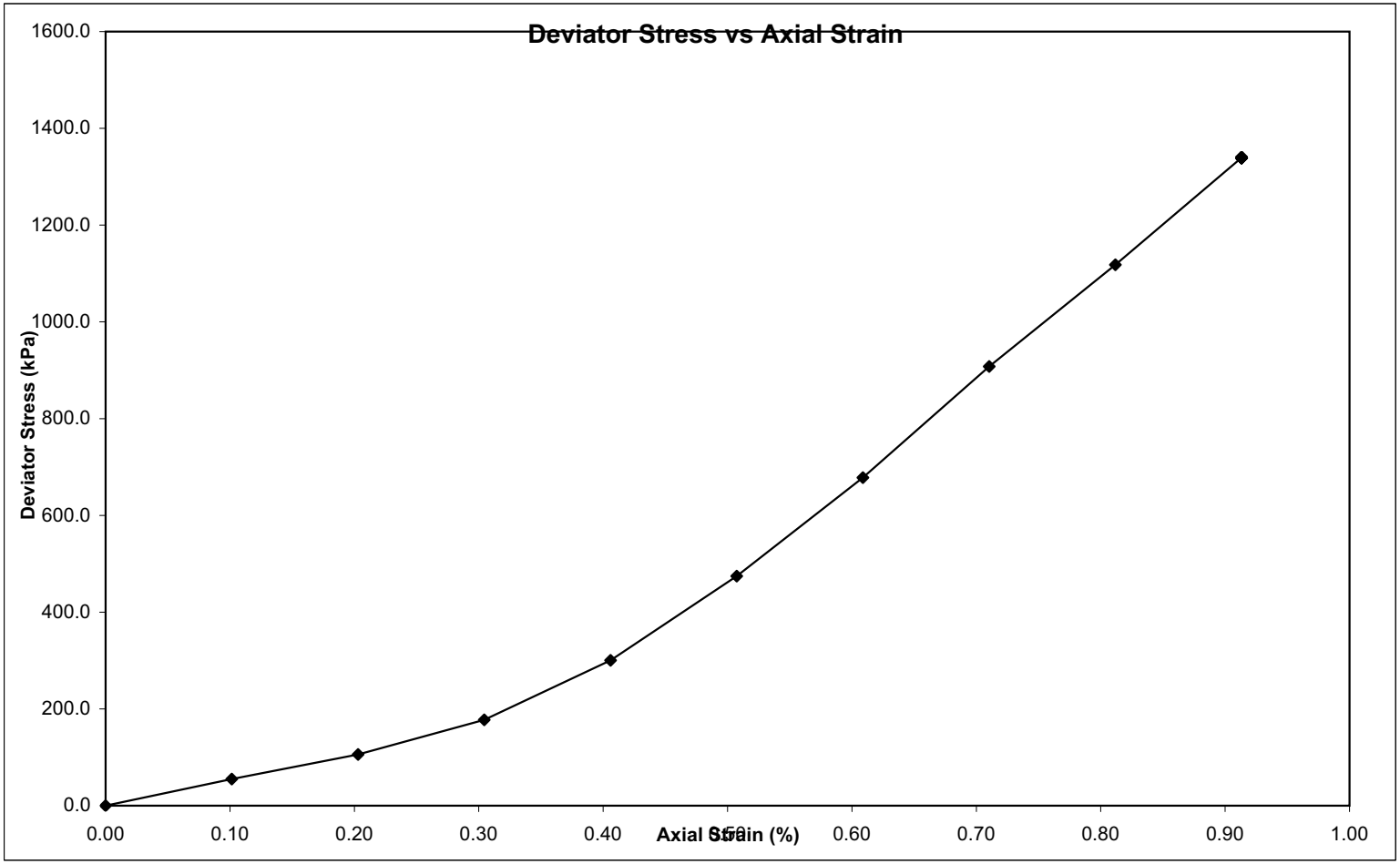
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.10	55.0
20	21.2	0.20	106.0
30	35.5	0.30	177.3
40	60.2	0.41	300.3
50	95.2	0.51	474.5
60	136.2	0.61	678.1
70	182.5	0.71	907.7
80	225	0.81	1117.9
90	269.8	0.91	1339.2

Mass (g): 390
Bulk Density (kg/m3): 1937

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1339.2
Strain at Failure (%): 0.91



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.025
Lab no.:	07164	**Diameter (cm)**	5.15
Source:	BD-BHM 103	**Area (cm2)**	20.83
Depth:	40.38 - 40.55	**Volume (cm3)**	208.83

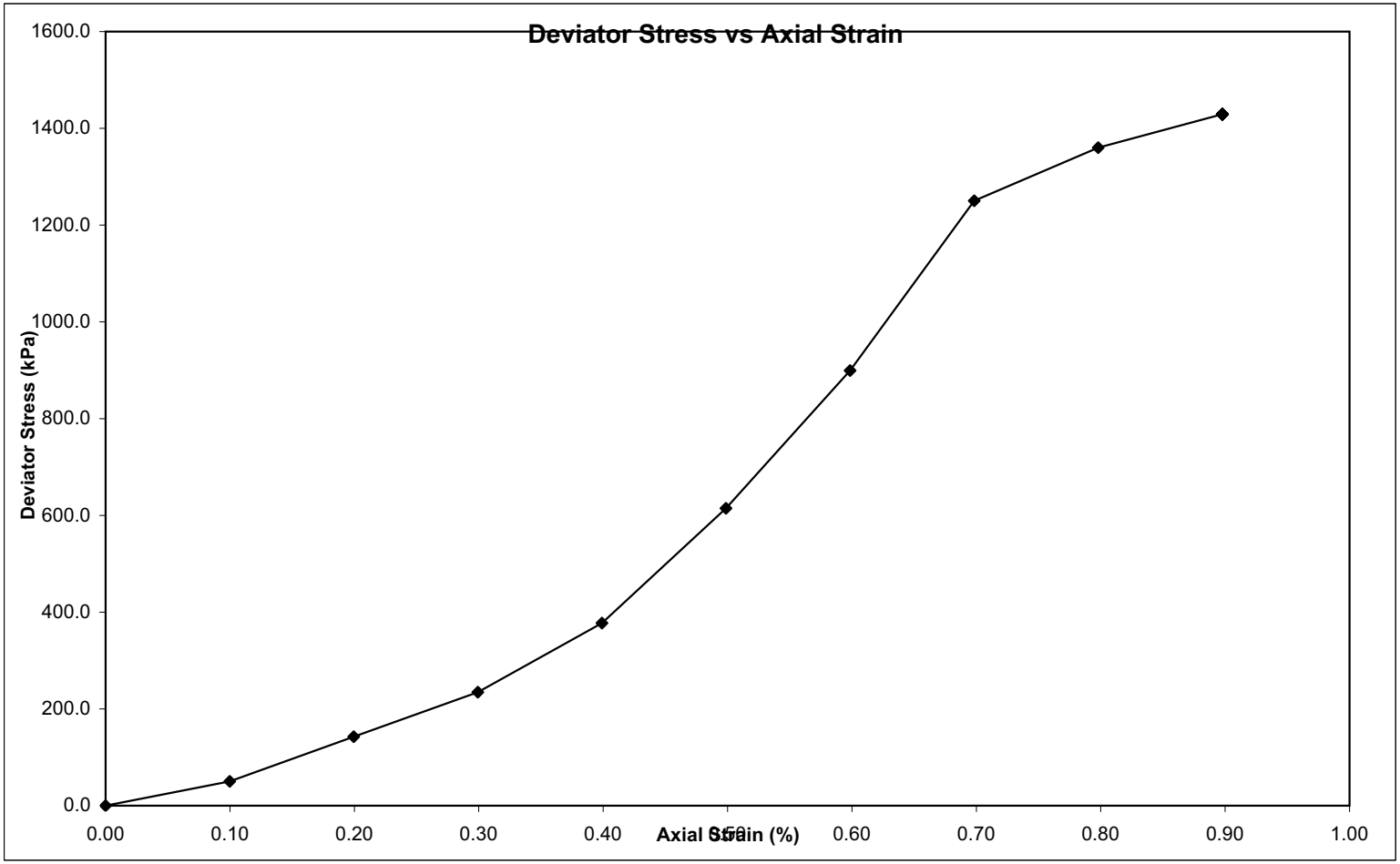
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10.2	0.10	50.2
20	29	0.20	142.5
30	47.8	0.30	234.6
40	77	0.40	377.5
50	125.5	0.50	614.7
60	183.8	0.60	899.3
70	255.8	0.70	1250.4
80	278.5	0.80	1360.0
90	293	0.90	1429.4

Mass (g): 410
Bulk Density (kg/m3): 1963

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1429.4
Strain at Failure (%): 0.90



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.13
Lab no.:	07165	**Diameter (cm)**	5.15
Source:	BD-BHM 103	**Area (cm2)**	20.83
Depth:	4055 - 40.81	**Volume (cm3)**	211.02

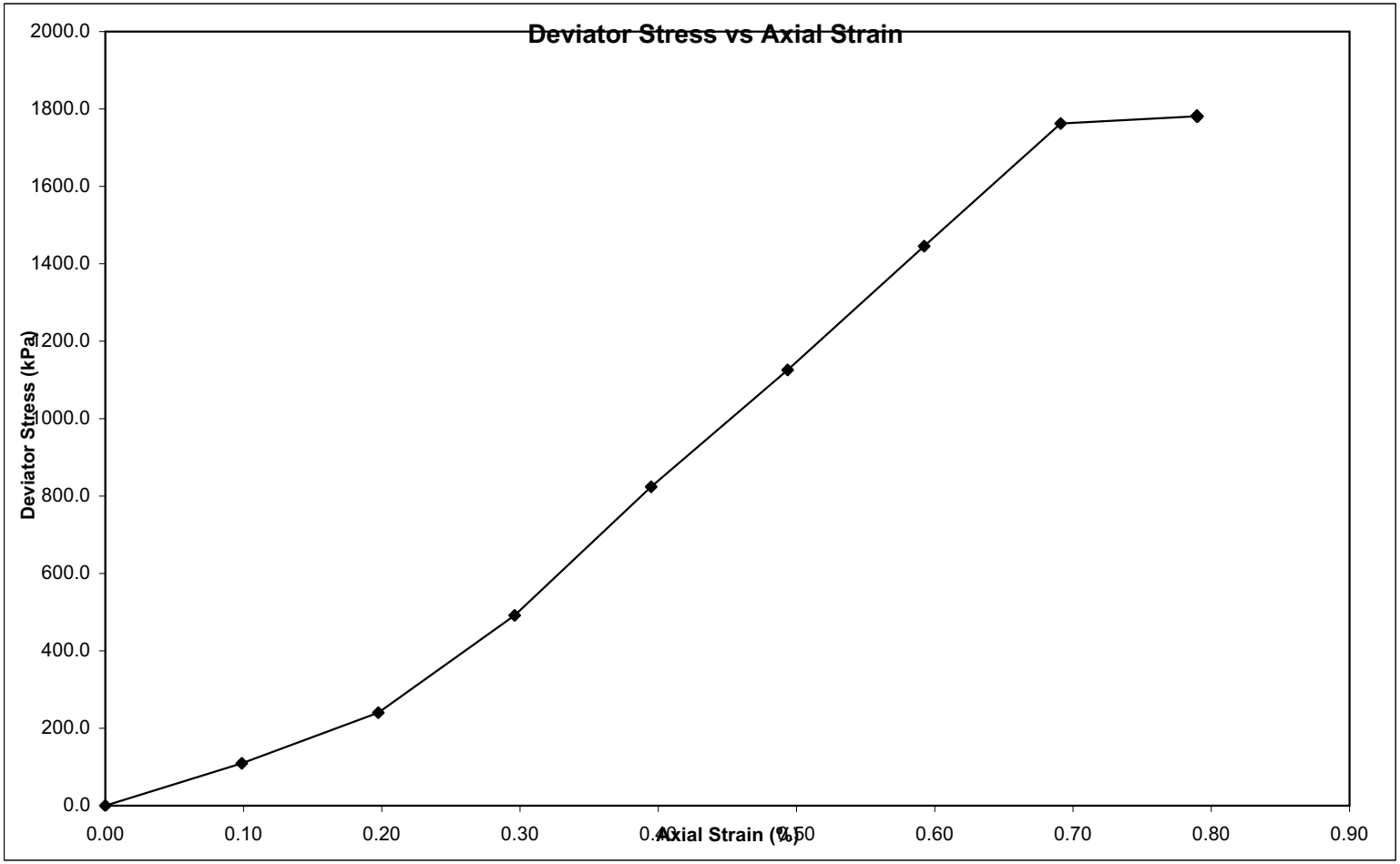
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	22.2	0.10	109.3
20	48.8	0.20	240.1
30	100	0.30	491.5
40	167.8	0.39	823.9
50	229.5	0.49	1125.7
60	295	0.59	1445.5
70	360	0.69	1762.3
80	364.2	0.79	1781.1

Mass (g): 420
Bulk Density (kg/m3): 1990

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1781.1
Strain at Failure (%): 0.79



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.37
Lab no.:	07166	**Diameter (cm)**	5.15
Source:	BD-BHM 103	**Area (cm2)**	20.83
Depth:	42.52 - 42.83	**Volume (cm3)**	216.01

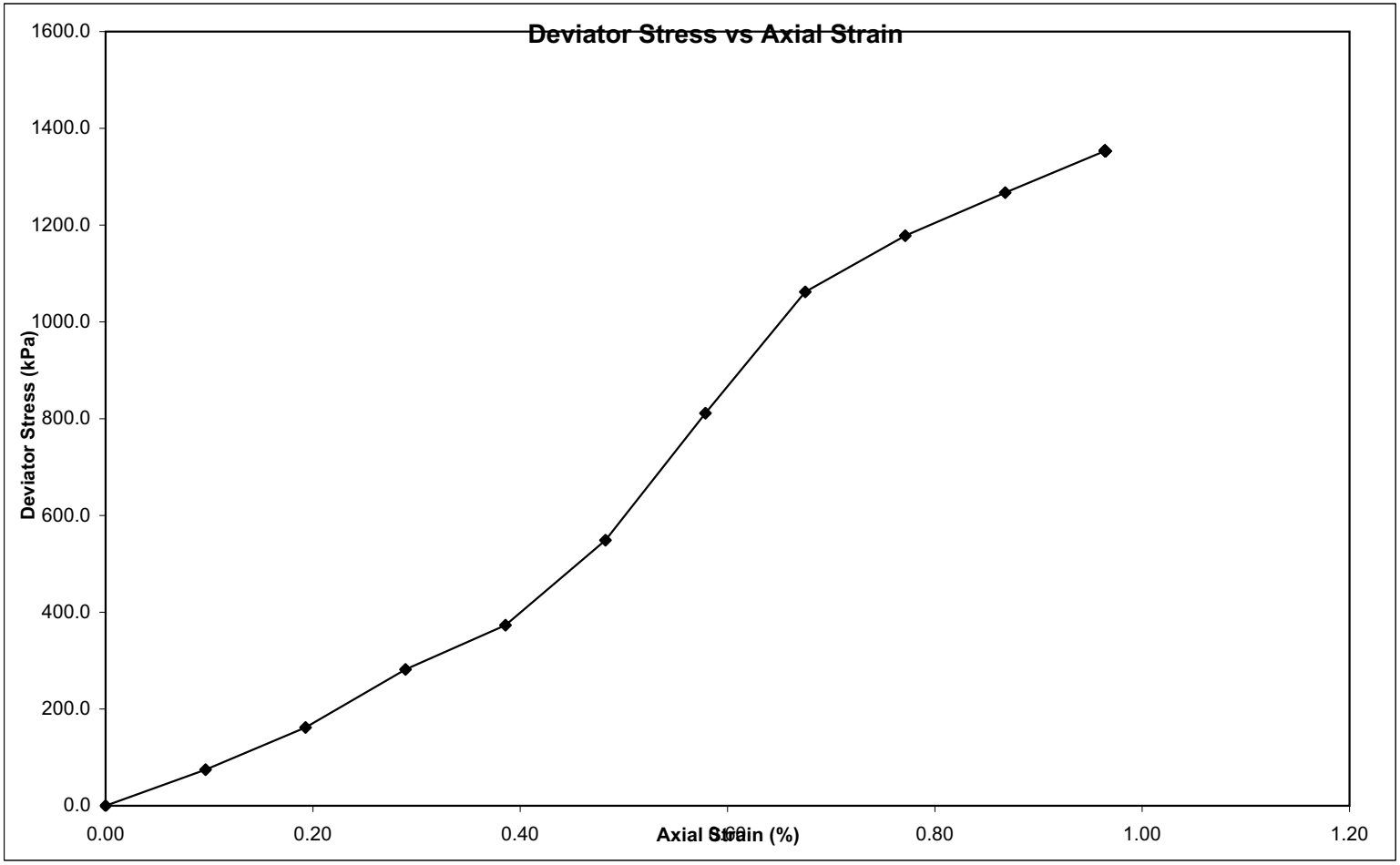
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	15.2	0.10	74.6
20	33	0.19	161.9
30	57.5	0.29	281.8
40	76.2	0.39	373.1
50	112.2	0.48	548.9
60	166	0.58	811.3
70	217.5	0.68	1062.0
80	241.5	0.77	1178.0
90	260	0.87	1267.0
100	278	0.96	1353.4

Mass (g): 420
Bulk Density (kg/m3): 1944

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1353.4
Strain at Failure (%): 0.96



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.06
Lab no.:	07167	**Diameter (cm)**	5.005
Source:	BD-BHM 103	**Area (cm2)**	19.67
Depth:	45.00 - 45.19	**Volume (cm3)**	197.92

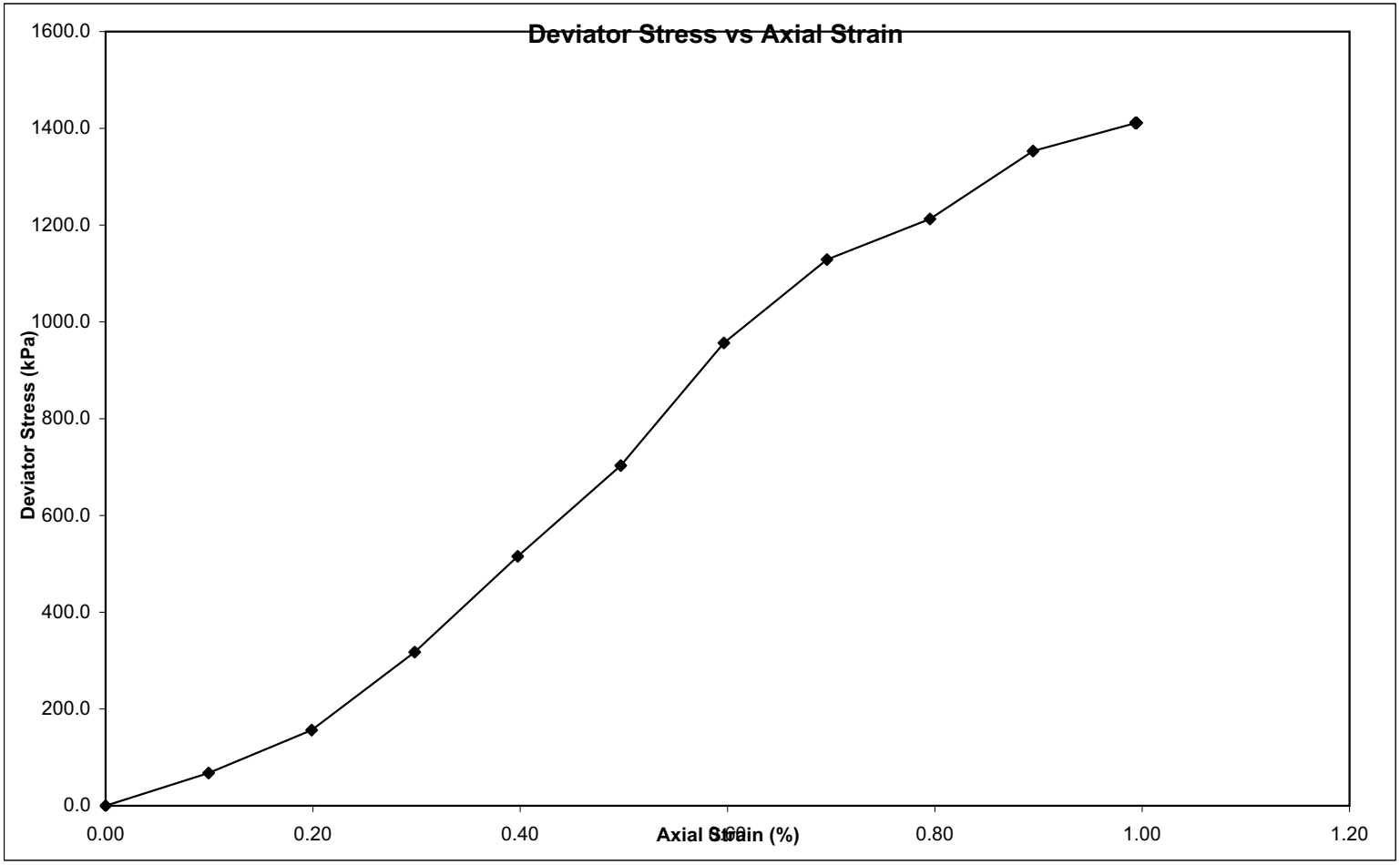
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	13	0.10	67.6
20	30.1	0.20	156.3
30	61.2	0.30	317.4
40	99.5	0.40	515.5
50	135.8	0.50	702.9
60	185	0.60	956.6
70	218.5	0.70	1128.7
80	235	0.80	1212.7
90	262.5	0.89	1353.2
100	274	0.99	1411.1

Mass (g): 395
Bulk Density (kg/m3): 1996

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1411.1
Strain at Failure (%): 0.99



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.945
Lab no.:	07168	**Diameter (cm)**	5.9
Source:	BD-BHM 103	**Area (cm2)**	27.34
Depth:	46.05 - 46.21	**Volume (cm3)**	326.57

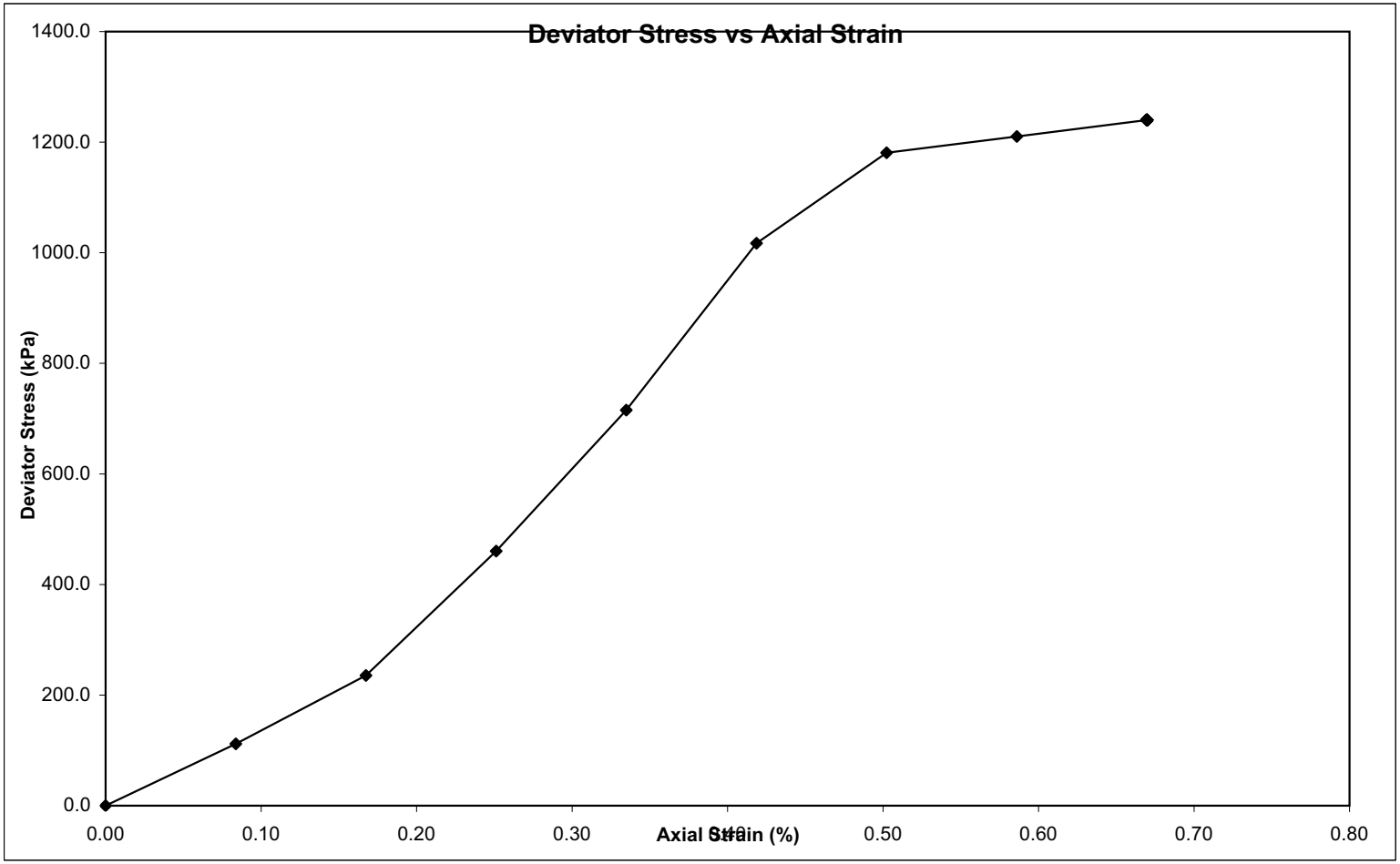
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	29.8	0.08	111.9
20	62.8	0.17	235.6
30	122.8	0.25	460.3
40	191	0.33	715.4
50	271.8	0.42	1017.1
60	315.8	0.50	1180.8
70	324	0.59	1210.4
80	332.2	0.67	1240.0

Mass (g): 725
Bulk Density (kg/m3): 2220

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1240
Strain at Failure (%): 0.67



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.685
Lab no.:	07169	**Diameter (cm)**	5.9
Source:	BD-BHM 103	**Area (cm2)**	27.34
Depth:	48.90 - 49.05	**Volume (cm3)**	319.46

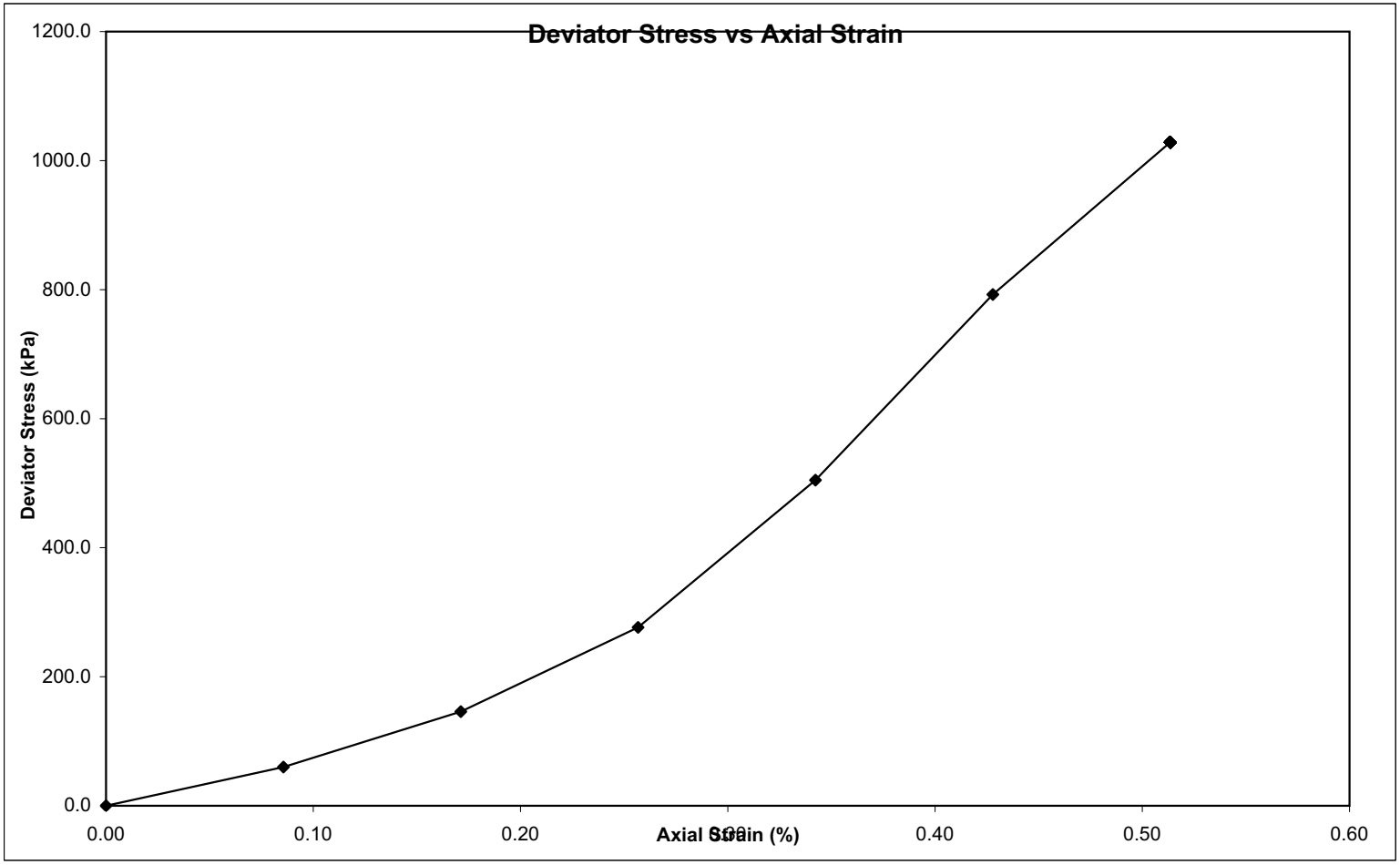
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	16	0.09	59.9
20	39	0.17	145.8
30	74	0.26	276.5
40	135.2	0.34	504.7
50	212.5	0.43	792.5
60	276	0.51	1028.4

Mass (g): 610
Bulk Density (kg/m3): 1909

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1028.4
Strain at Failure (%): 0.51



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.19
Lab no.:	07170	**Diameter (cm)**	6.005
Source:	BD-BHM 103	**Area (cm2)**	28.32
Depth:	49.75 - 49.88	**Volume (cm3)**	316.92

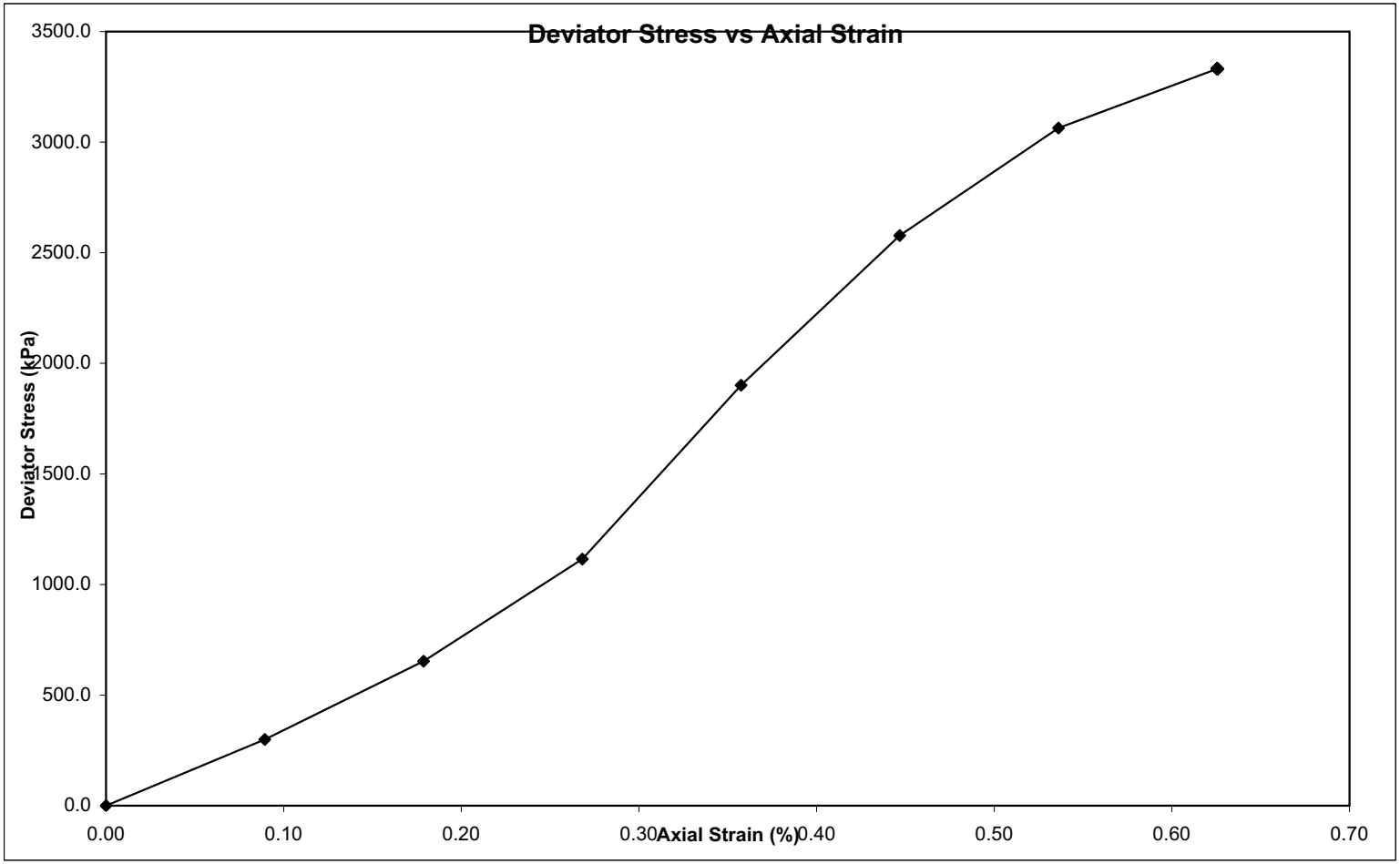
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.09	299.6
20	24	0.18	653.0
30	41	0.27	1114.6
40	70	0.36	1901.3
50	95	0.45	2578.0
60	113	0.54	3063.7
70	123	0.63	3331.8

Mass (g): 795
Bulk Density (kg/m3): 2509

Proving Ring Factor: 772

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 3331.8
Strain at Failure (%): 0.63



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08087
Source:	BD BHM 104
Depth:	22.05 - 22.23

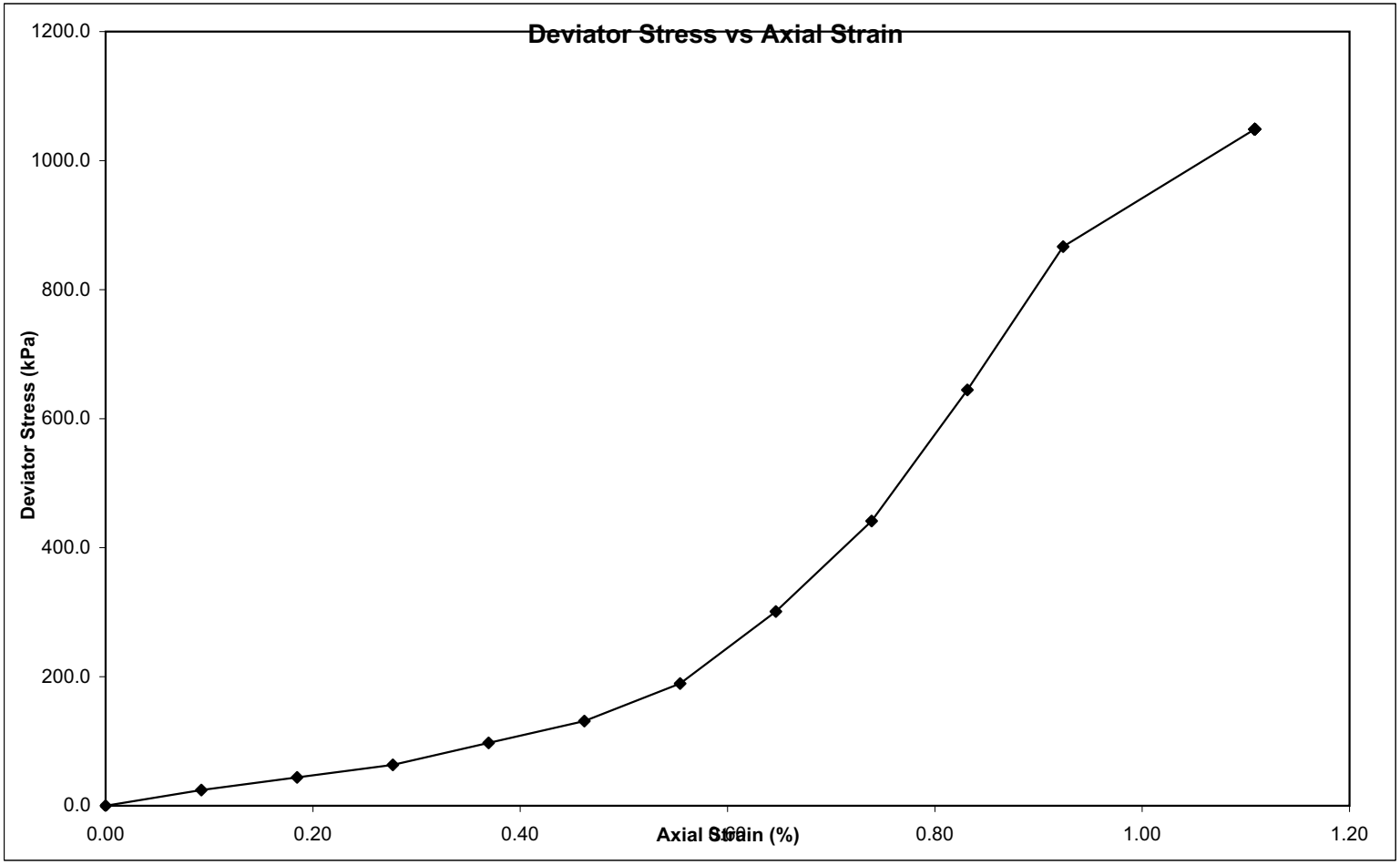
Length (cm)	10.825
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	225.49

Mass (g):	445
Bulk Density (kg/m3):	1973
Proving Ring Factor:	102

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	5	0.09	24.4
20	9	0.18	43.9
30	13	0.28	63.3
40	20	0.37	97.4
50	27	0.46	131.3
60	39	0.55	189.5
70	62	0.65	301.0
80	91	0.74	441.4
90	133	0.83	644.5
100	179	0.92	866.6
120	217	1.11	1048.6

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1048.6
Strain at Failure (%): 1.11



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08088
Source:	BD BHM 104
Depth:	23.90 - 24.03

Length (cm)	11.58
Diameter (cm)	5.85
Area (cm2)	26.88
Volume (cm3)	311.25

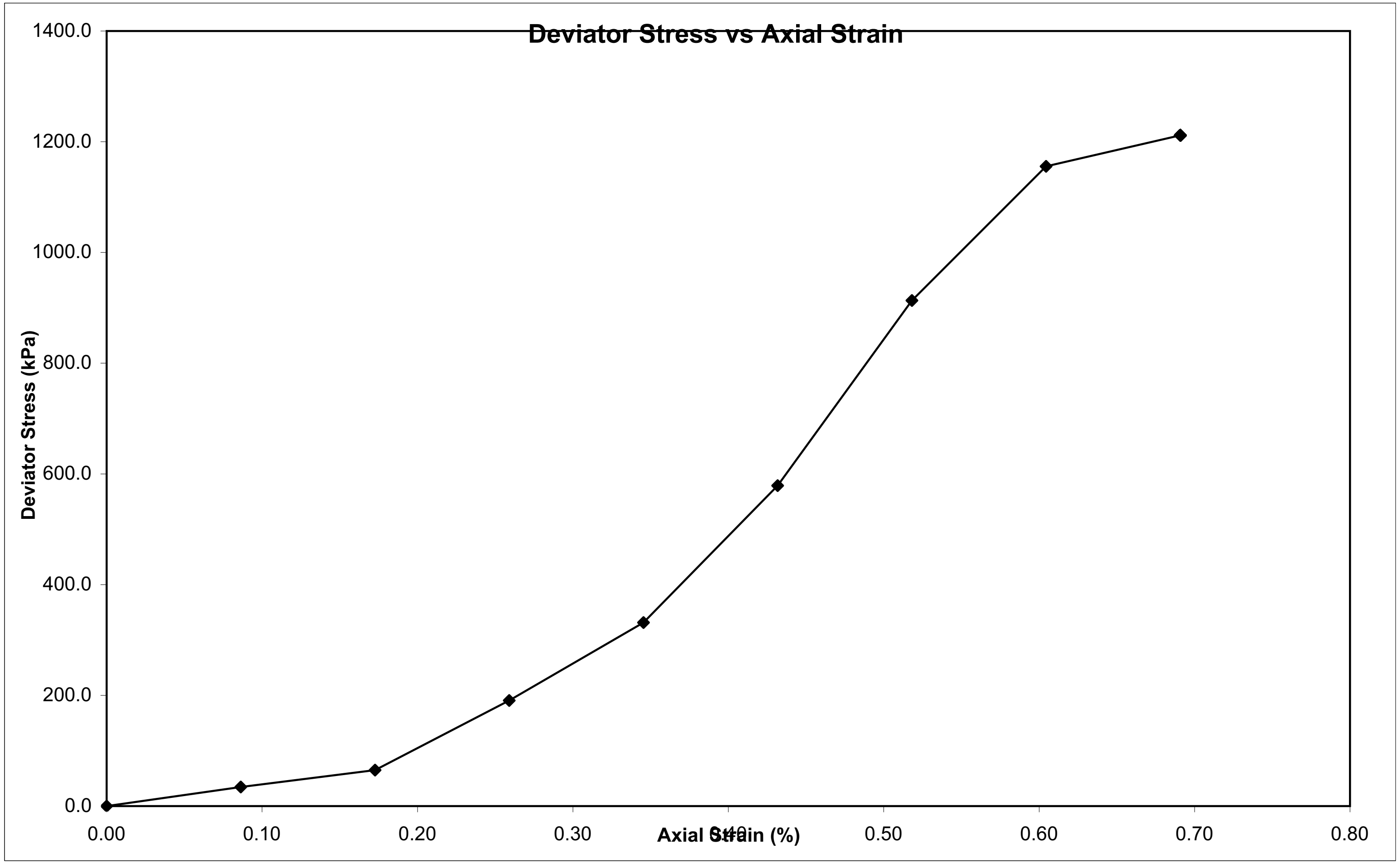
Mass (g):	590
Bulk Density (kg/m3):	1896
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1211.6

Strain at Failure (%): 0.69

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	9	0.09	34.4
20	17	0.17	64.9
30	50	0.26	190.7
40	87	0.35	331.6
50	152	0.43	578.8
60	240	0.52	913.2
70	304	0.60	1155.7
80	319	0.69	1211.6



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08089
Source:	BD BHM 104
Depth:	24.16 - 24.36

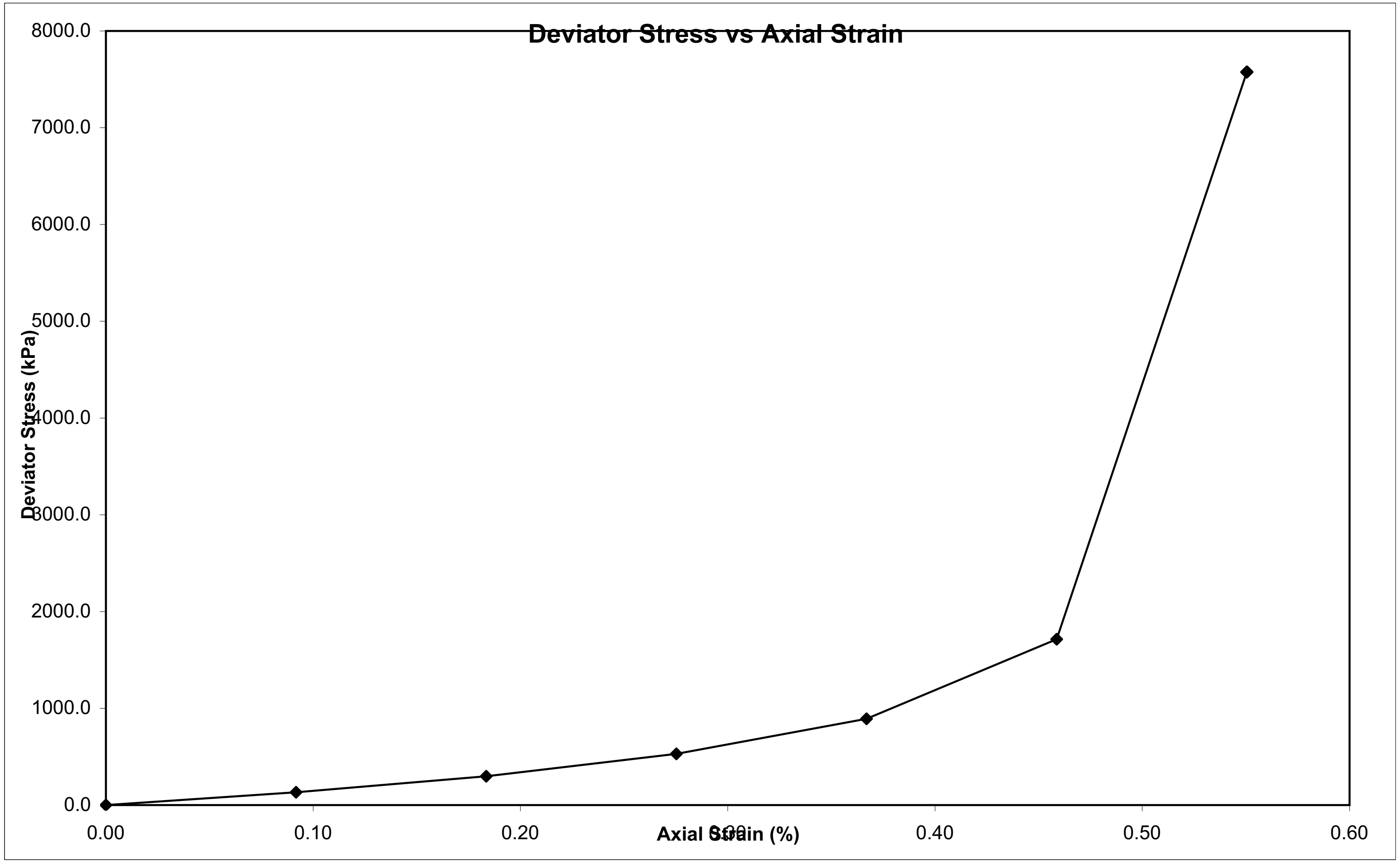
Length (cm)	10.9
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	227.05

Mass (g):	585
Bulk Density (kg/m3):	2577
Proving Ring Factor:	690

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 7576.6
Strain at Failure (%): 0.56

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	4	0.09	132.4
20	9	0.18	297.6
30	16	0.28	528.5
40	27	0.37	891.1
50	52	0.46	1714.6
60	230	0.55	7576.6



RESULTS OF UNCONFINED COMPRESSIVE STRENGTH TESTS ON ROCK CORES

THEKWINI SOILS LAB. CC
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Fax : (031) 201-7920

REF: 5382 **CLIENT:** Moore Spence & Jones **PROJECT:** Durban Harbour Berth Deepening **Date:** 11-08-08

Position	Depth	Bulk Density kg/m^3	Natural Moisture Content %	Axial Strain %	Unconfirmed compressive Strength Mn/m^2	Lab No.
BD BHM 101	45.29 - 45.52	2524	-	0.078	27.967	08068
BD BHM 104	24.80 - 24.93	2510	-	0.056	28.972	08090
BD BHM 104	27.62 - 27.80	2476	-	0.092	20.879	08091

Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08092
Source:	BD BHM 104
Depth:	28.10 - 28.30

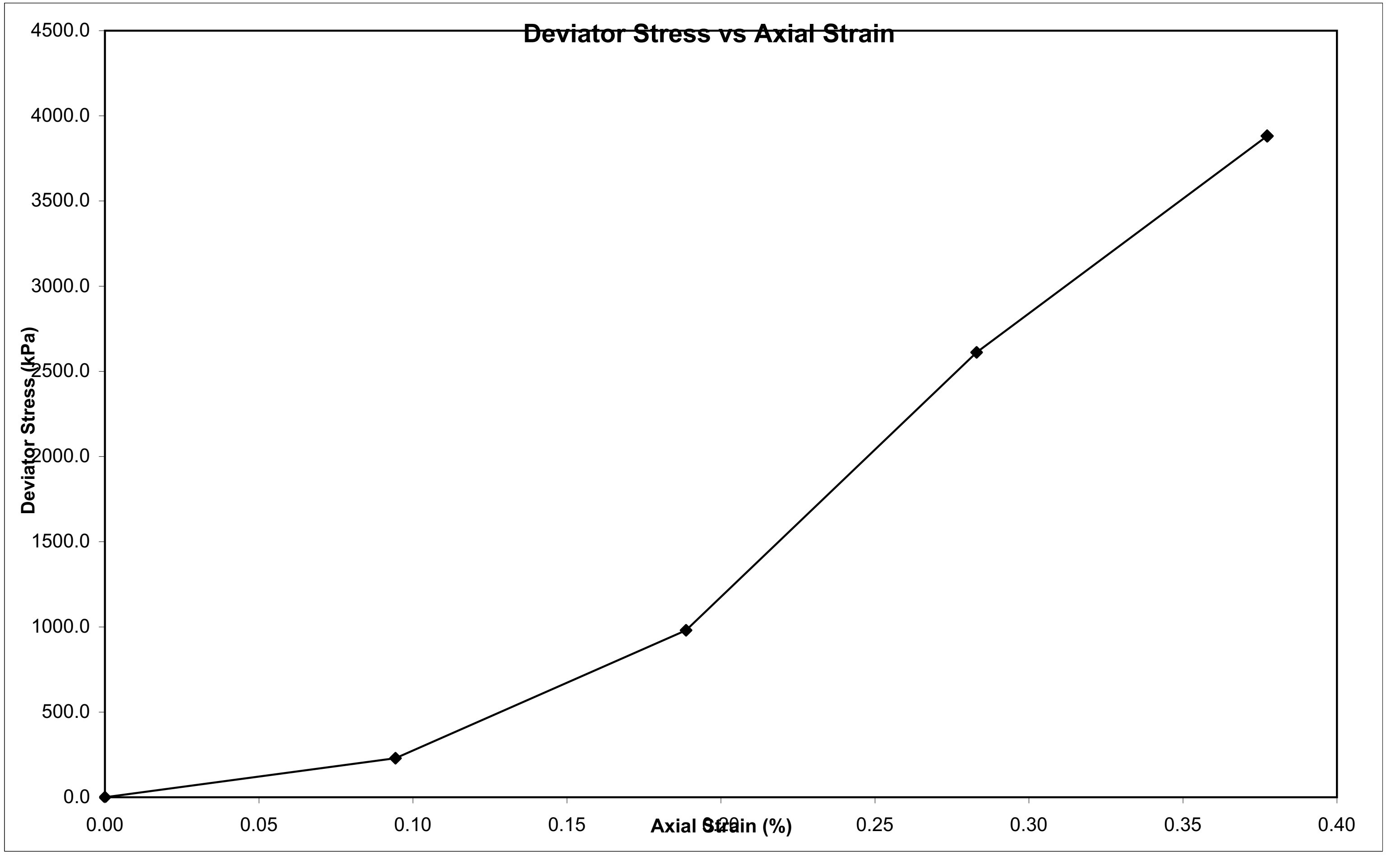
Length (cm)	10.6
Diameter (cm)	5.165
Area (cm2)	20.95
Volume (cm3)	222.09

Mass (g):	550
Bulk Density (kg/m3):	2476
Proving Ring Factor:	686

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7	0.09	229.0
20	30	0.19	980.4
30	80	0.28	2611.9
40	119	0.38	3881.5

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 3881.5
Strain at Failure (%): 0.38



Job Description: Durban Harbour Berth Deepening

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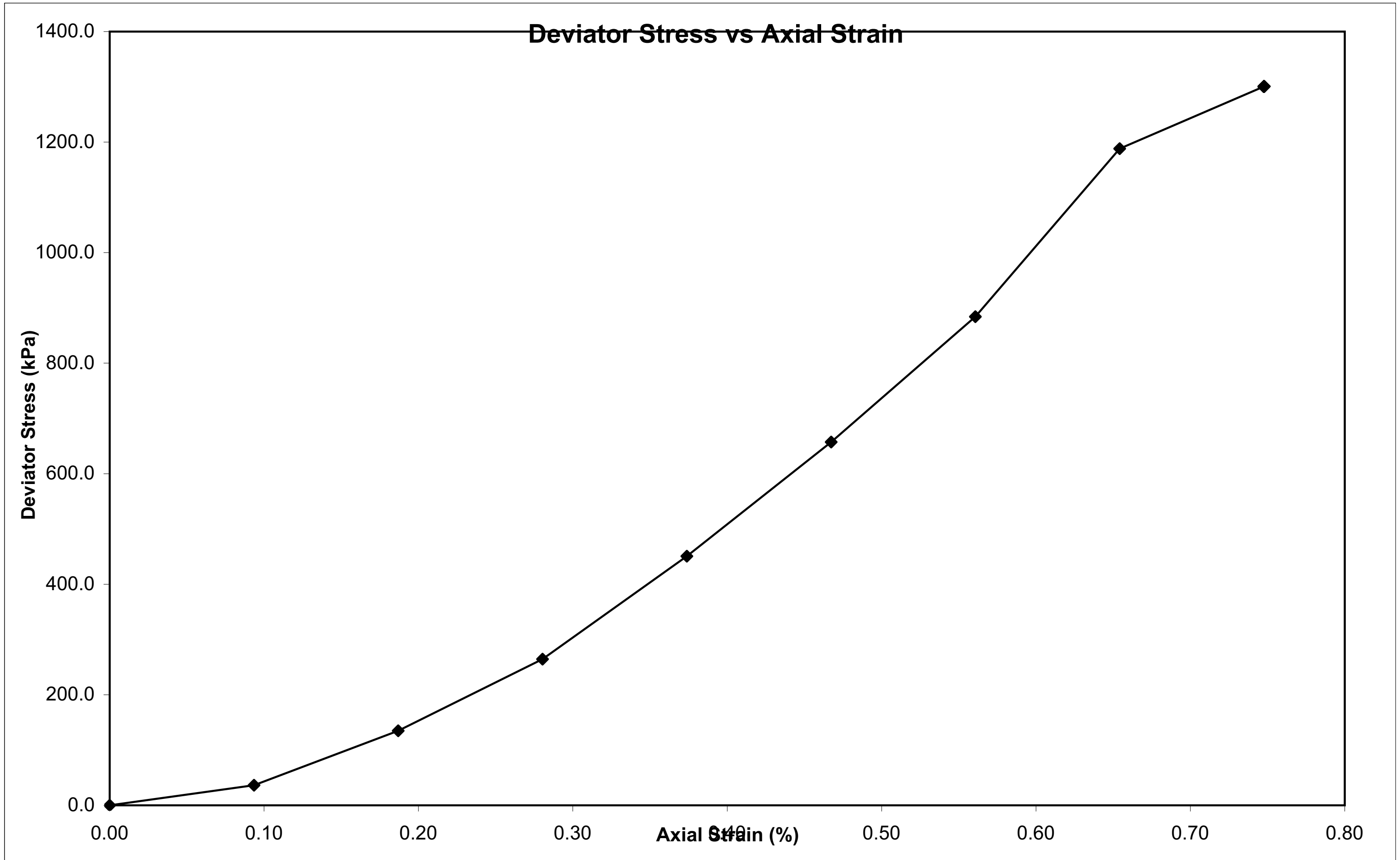
Job no.:	5382
Lab no.:	08093
Source:	BD BHM 104
Depth:	31.30 - 31.54

Length (cm)	10.7
Diameter (cm)	5
Area (cm2)	19.63
Volume (cm3)	210.09
Mass (g):	420.8
Bulk Density (kg/m3):	2003
Proving Ring Factor:	102

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7	0.09	36.4
20	26	0.19	134.9
30	51	0.28	264.5
40	87	0.37	450.7
50	127	0.47	657.3
60	171	0.56	884.2
70	230	0.65	1188.2
80	252	0.75	1300.6

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1300.6
Strain at Failure (%): 0.75



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Fax : (031) 201-7920

Job Description: Durban Harbour Berth Deepening

Job no.: 5382
Lab no.: 08094
Source: BD BHM 104
Depth: 34.33 - 34.55

Length (cm) 12.075
Diameter (cm) 5.915
Area (cm2) 27.48
Volume (cm3) 331.81

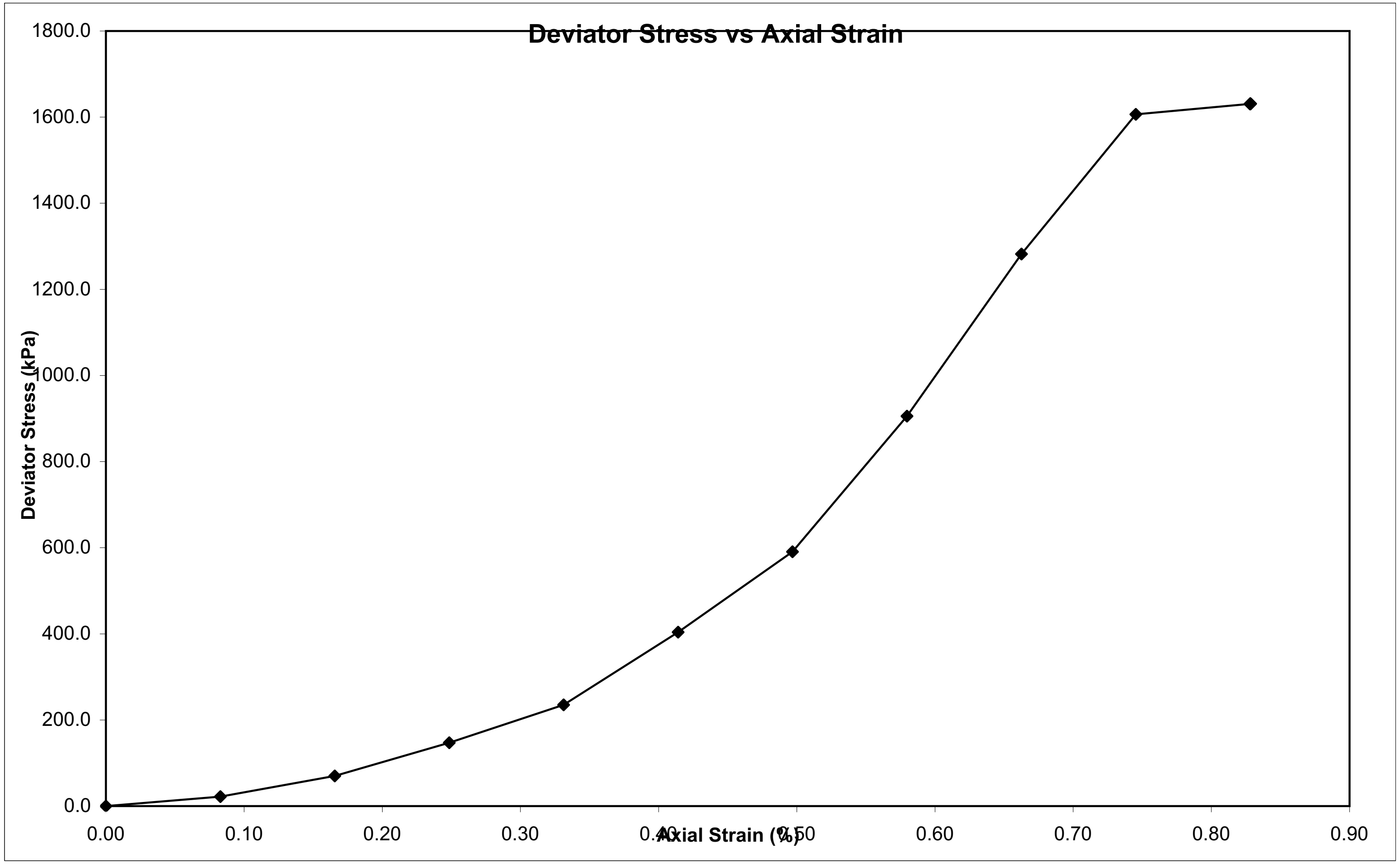
Mass (g): 645
Bulk Density (kg/m3): 1944

Proving Ring Factor: 101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1630.9
Strain at Failure (%): 0.83

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	6	0.08	22.1
20	19	0.17	69.9
30	40	0.25	147.1
40	64	0.33	235.2
50	110	0.41	403.9
60	161	0.50	590.7
70	247	0.58	905.5
80	350	0.66	1282.0
90	439	0.75	1606.6
100	446	0.83	1630.9



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08095
Source:	BD BHM 104
Depth:	45.29 - 45.47

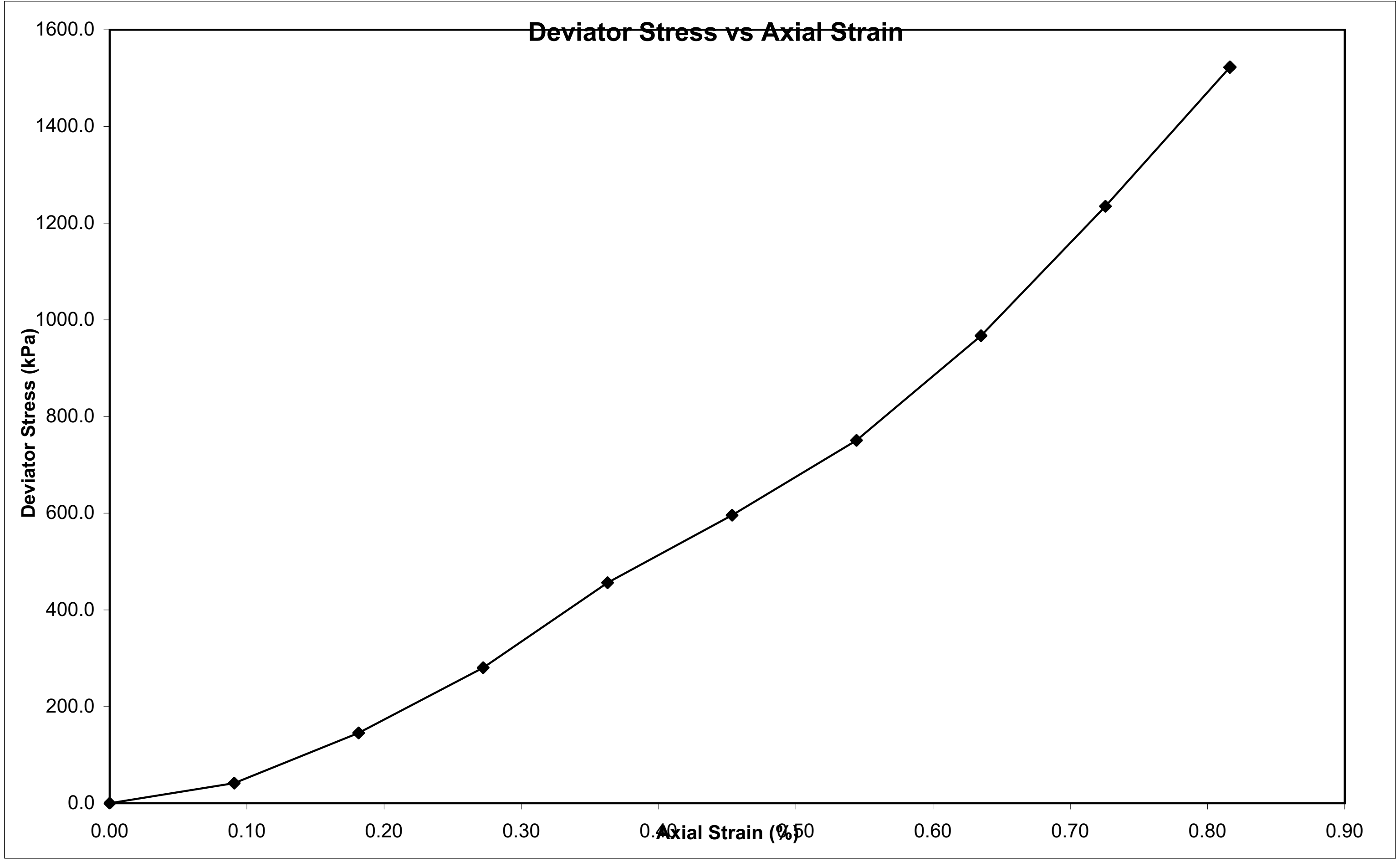
Length (cm)	11.025
Diameter (cm)	5
Area (cm2)	19.63
Volume (cm3)	216.48

Mass (g):	443.2
Bulk Density (kg/m3):	2047
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1522.6
Strain at Failure (%): 0.82

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.09	41.6
20	28	0.18	145.4
30	54	0.27	280.3
40	88	0.36	456.3
50	115	0.45	595.7
60	145	0.54	750.5
70	187	0.63	967.0
80	239	0.73	1234.7
90	295	0.82	1522.6



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08182
Source:	BD BHM 105A
Depth:	25.85 - 26.20

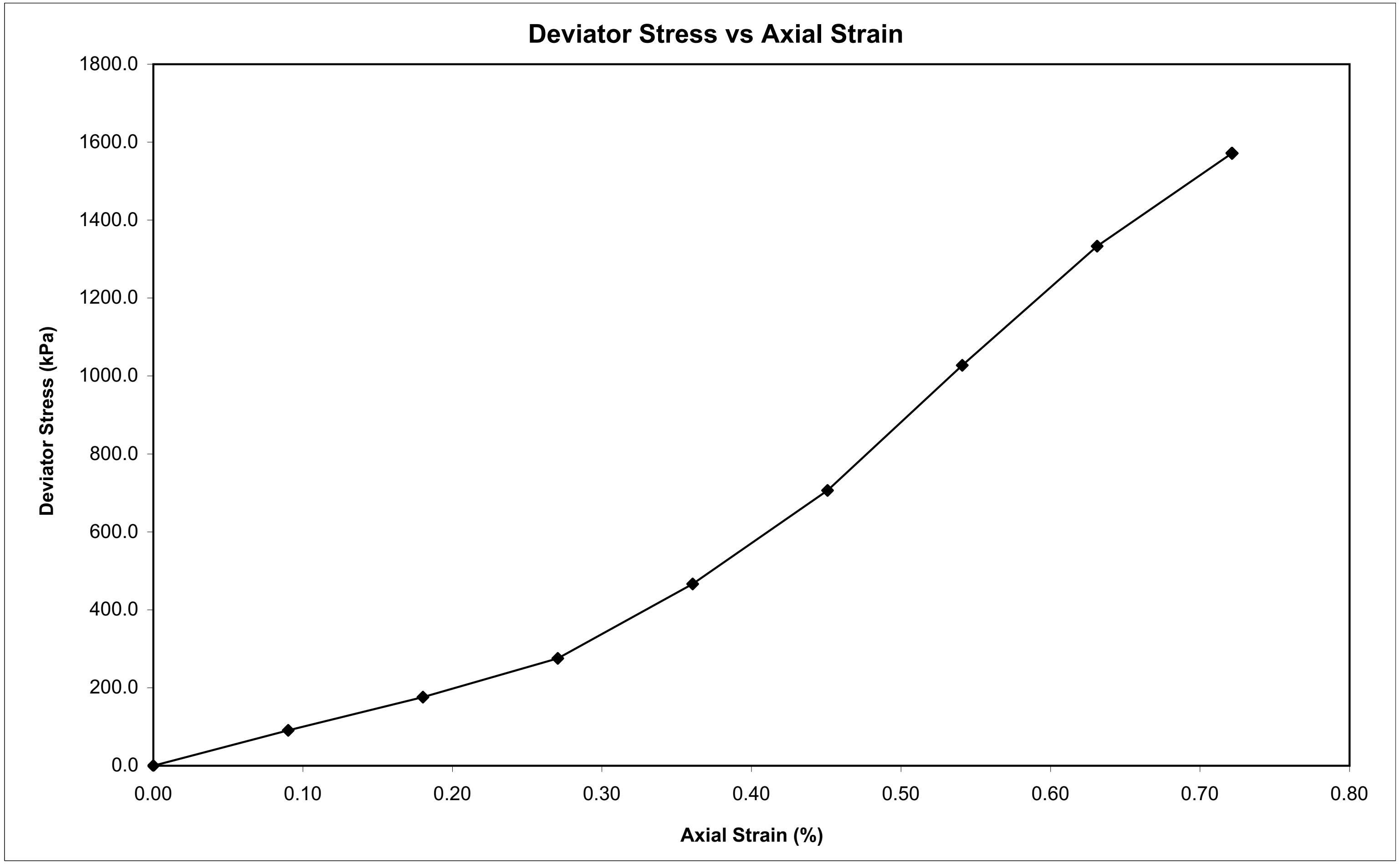
Length (cm)	11.09
Diameter (cm)	5.21
Area (cm2)	21.32
Volume (cm3)	236.43

Mass (g):	543.6
Bulk Density (kg/m3):	2299
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1571.7
Strain (%): 0.72

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	18.8	0.09	90.7
20	36.5	0.18	175.9
30	57.2	0.27	275.3
40	97	0.36	466.5
50	147	0.45	706.3
60	214	0.54	1027.3
70	278	0.63	1333.4
80	328	0.72	1571.7



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08183
Source:	BD BHM 105A
Depth:	36.32 - 36.52

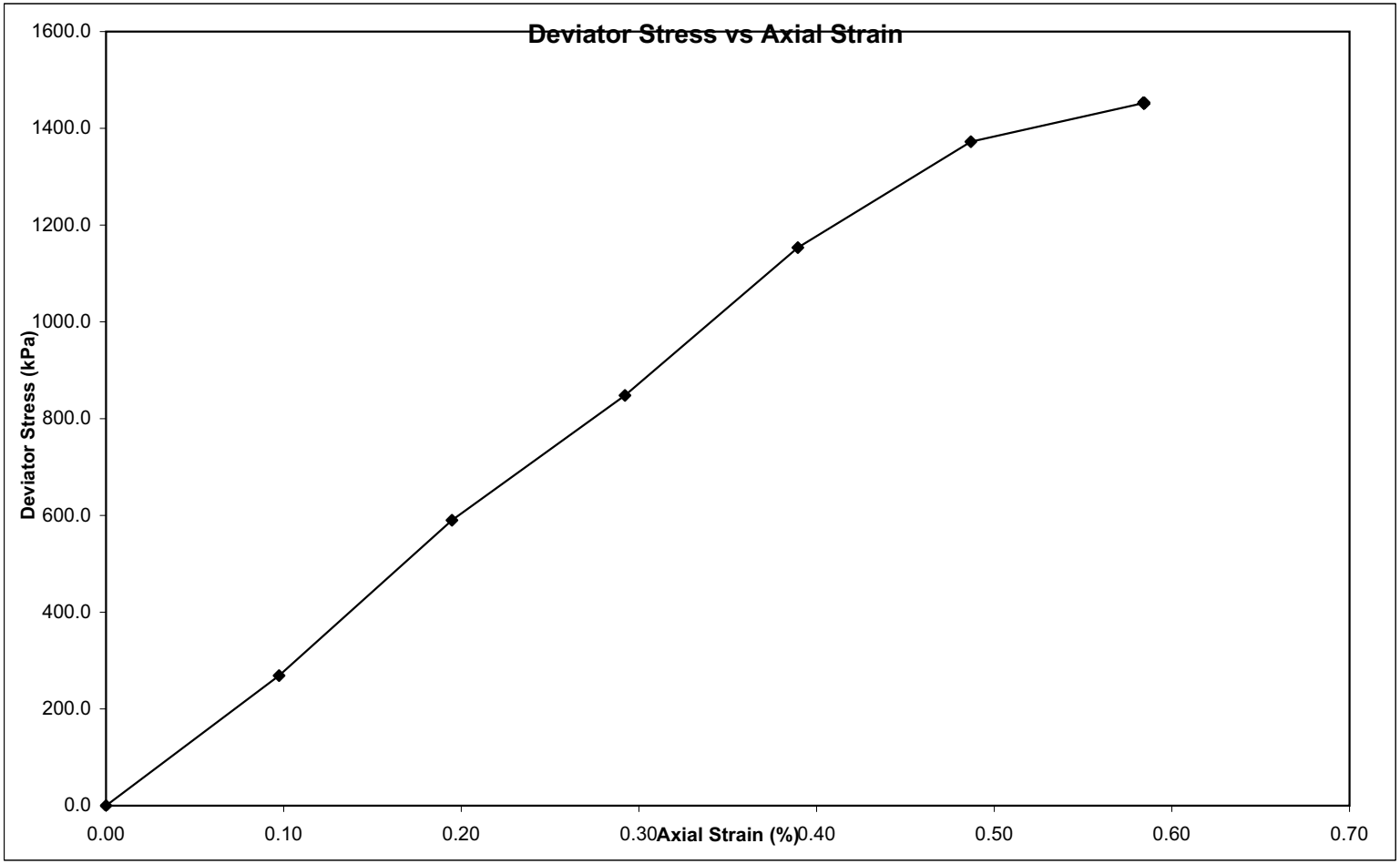
Length (cm)	10.27
Diameter (cm)	5.21
Area (cm2)	21.32
Volume (cm3)	218.95

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	56	0.10	268.8
20	123	0.19	589.9
30	177	0.29	848.0
40	241	0.39	1153.5
50	287	0.49	1372.4
60	304	0.58	1452.2

Mass (g):	436.5
Bulk Density (kg/m3):	1994
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1452.2
Strain (%): 0.58



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08184
Source:	BD BHM 105A
Depth:	38.00 - 38.15

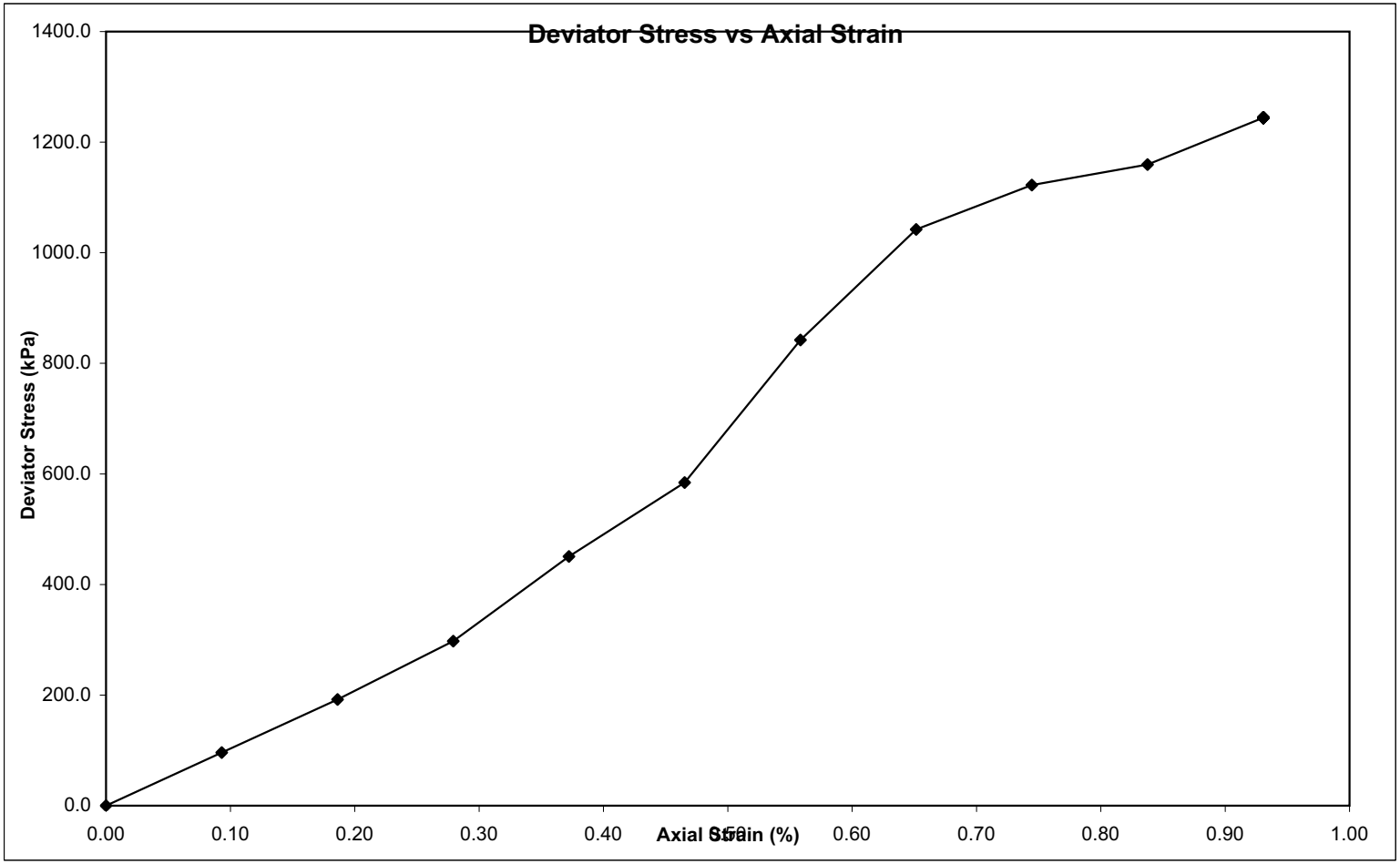
Length (cm)	10.745
Diameter (cm)	5.2
Area (cm2)	21.24
Volume (cm3)	228.19

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	20	0.09	96.2
20	40	0.19	192.1
30	62	0.28	297.5
40	94	0.37	450.7
50	122	0.47	584.4
60	176	0.56	842.2
70	218	0.65	1042.3
80	235	0.74	1122.5
90	243	0.84	1159.6
100	261	0.93	1244.3

Mass (g):	443.6
Bulk Density (kg/m3):	1944
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1244.3
Strain (%): 0.93



Job Description: Durban Harbour Berth Deepening

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Job no.: 5382
Lab no.: 08185
Source: BD BHM 105A
Depth: 39.26 - 39.43

Length (cm) 10.82
Diameter (cm) 5.2
Area (cm2) 21.24
Volume (cm3) 229.79

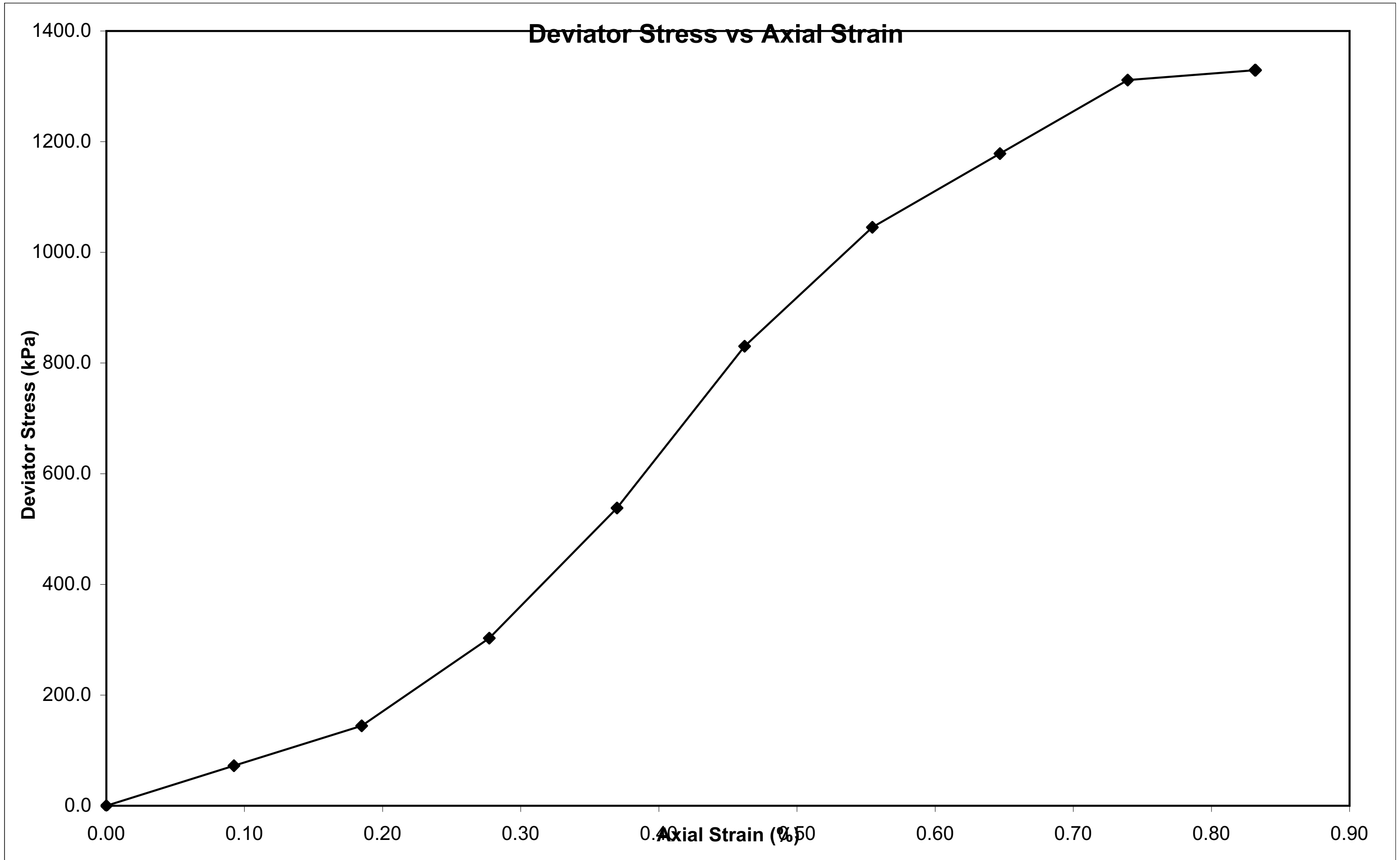
Mass (g): 445.6
Bulk Density (kg/m3): 1939

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1329.3
Strain (%): 0.83

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	15	0.09	72.3
20	30	0.18	144.4
30	63	0.28	302.9
40	112	0.37	538.0
50	173	0.46	830.3
60	218	0.55	1045.3
70	246	0.65	1178.5
80	274	0.74	1311.4
90	278	0.83	1329.3



Job Description: Durban Harbour Berth Deepening

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Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08186
Source:	BD BHM 106
Depth:	21.25 - 21.41

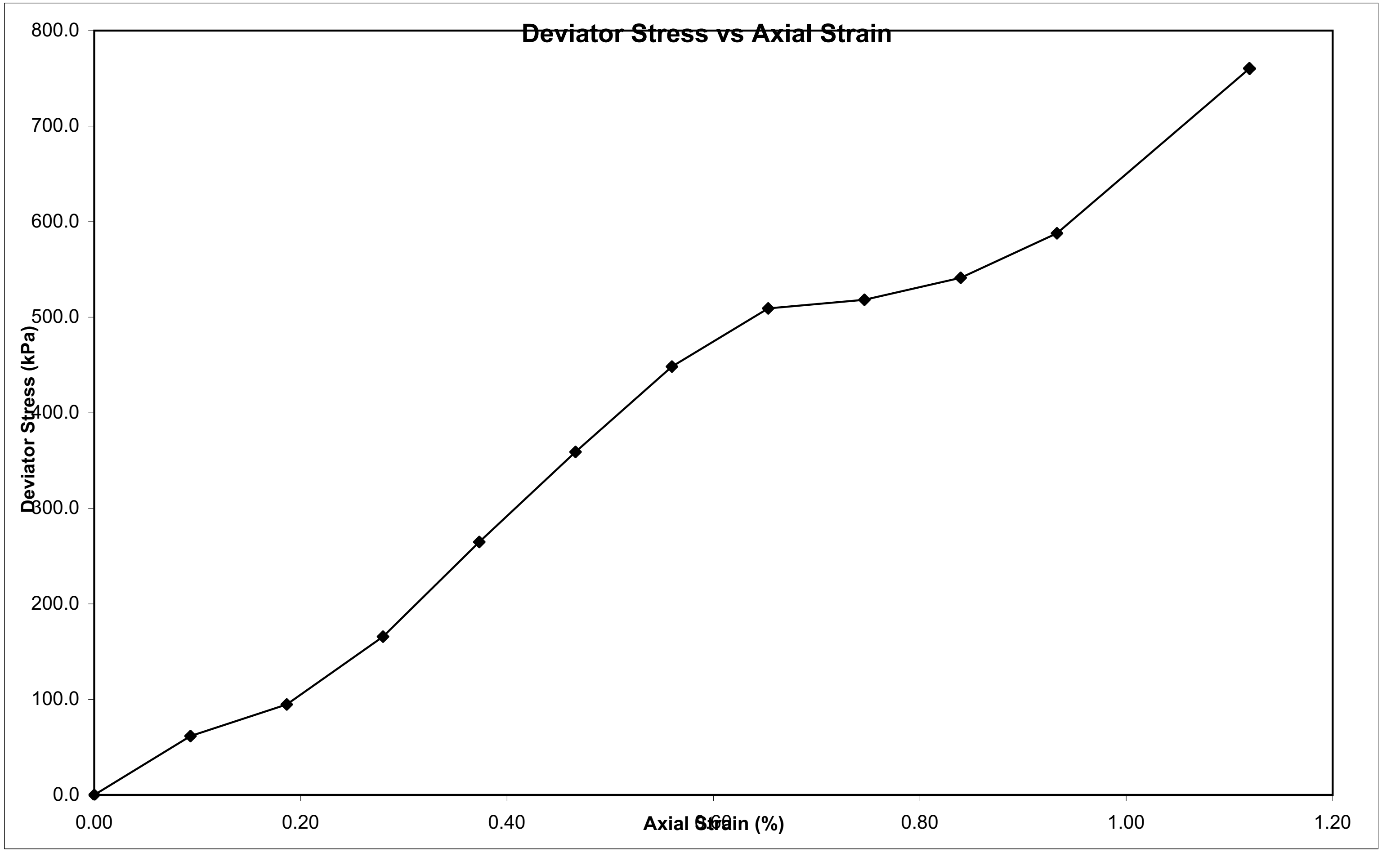
Length (cm)	10.72
Diameter (cm)	5.205
Area (cm2)	21.28
Volume (cm3)	228.10
Mass (g):	440.8
Bulk Density (kg/m3):	1932
Proving Ring Factor:	101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 760.4

Strain (%): 1.12

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	13	0.09	61.6
20	20	0.19	94.8
30	35	0.28	165.7
40	56	0.37	264.8
50	76	0.47	359.1
60	95	0.56	448.4
70	108	0.65	509.3
80	110	0.75	518.2
90	115	0.84	541.3
100	125	0.93	587.8
120	162	1.12	760.4



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08187
Source:	BD BHM 106
Depth:	22.83 - 23.01

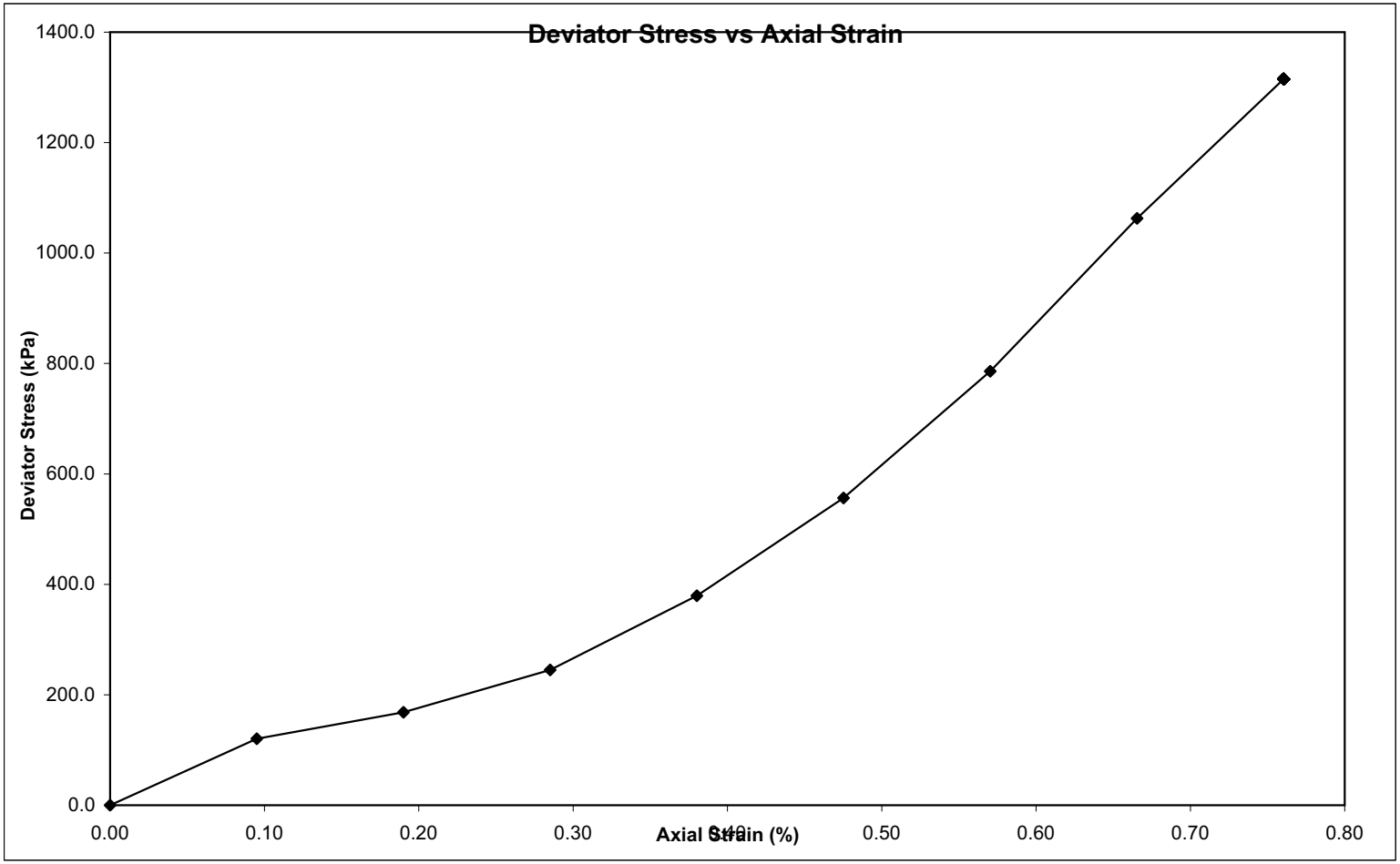
Length (cm)	10.52
Diameter (cm)	5.2
Area (cm2)	21.24
Volume (cm3)	223.41

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	25	0.10	120.4
20	35	0.19	168.3
30	51	0.29	245.1
40	79	0.38	379.2
50	116	0.48	556.3
60	164	0.57	785.8
70	222	0.67	1062.7
80	275	0.76	1315.1

Mass (g):	430.4
Bulk Density (kg/m3):	1927
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1315.1
Strain (%): 0.76



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68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job Description: Durban Harbour Berth Deepening

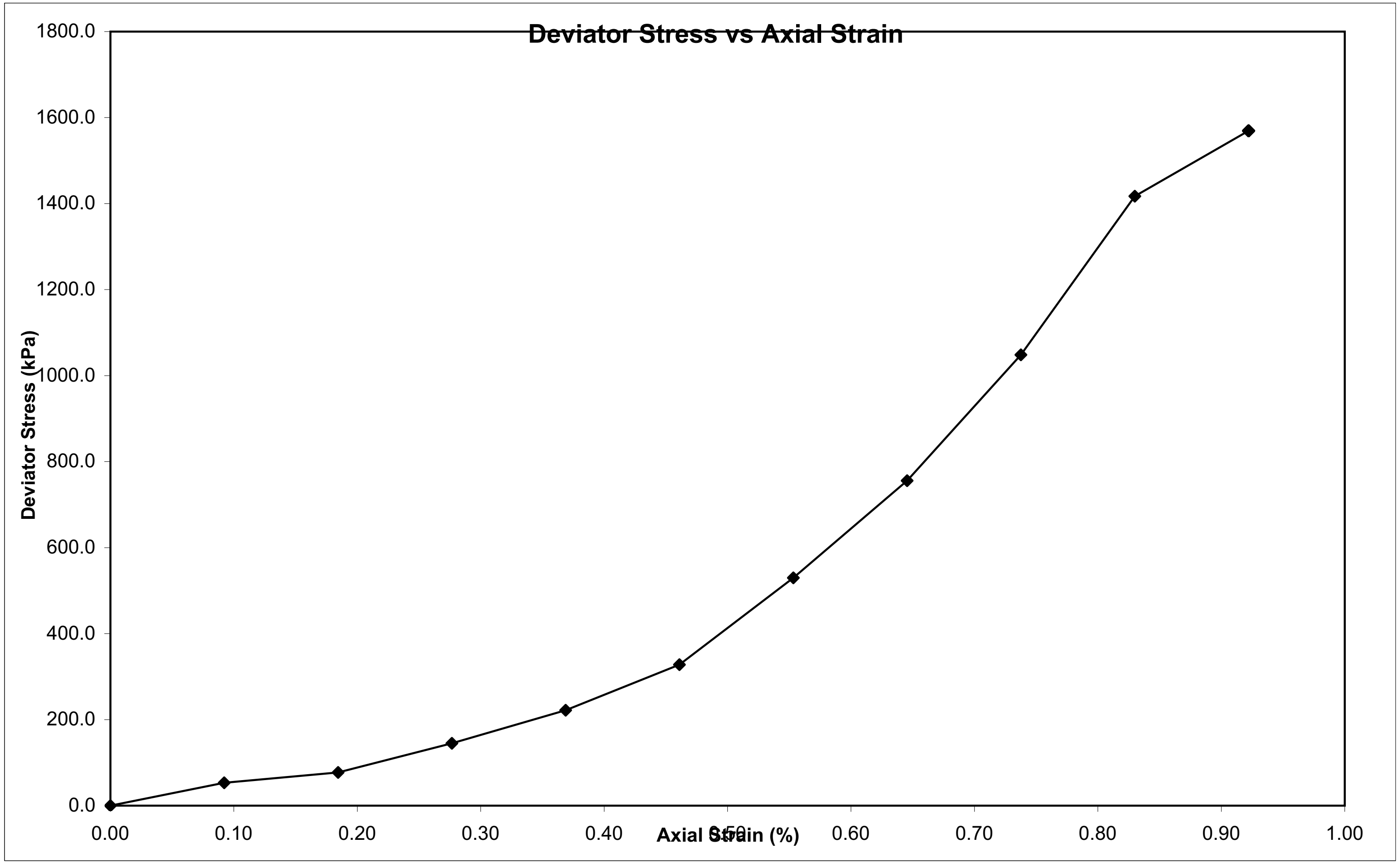
Job no.:	5382
Lab no.:	08188
Source:	BD BHM 106
Depth:	31.43 - 31.61

Length (cm)	10.845
Diameter (cm)	5.2
Area (cm2)	21.24
Volume (cm3)	230.32
Mass (g):	448.8
Bulk Density (kg/m3):	1949
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1569.5
Strain (%): 0.92

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.09	53.2
20	16	0.18	77.4
30	30	0.28	144.9
40	46	0.37	222.0
50	68	0.46	327.9
60	110	0.55	529.9
70	157	0.65	755.7
80	218	0.74	1048.3
90	295	0.83	1417.2
100	327	0.92	1569.5



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08189
Source:	BD BHM 106
Depth:	33.51 - 33.66

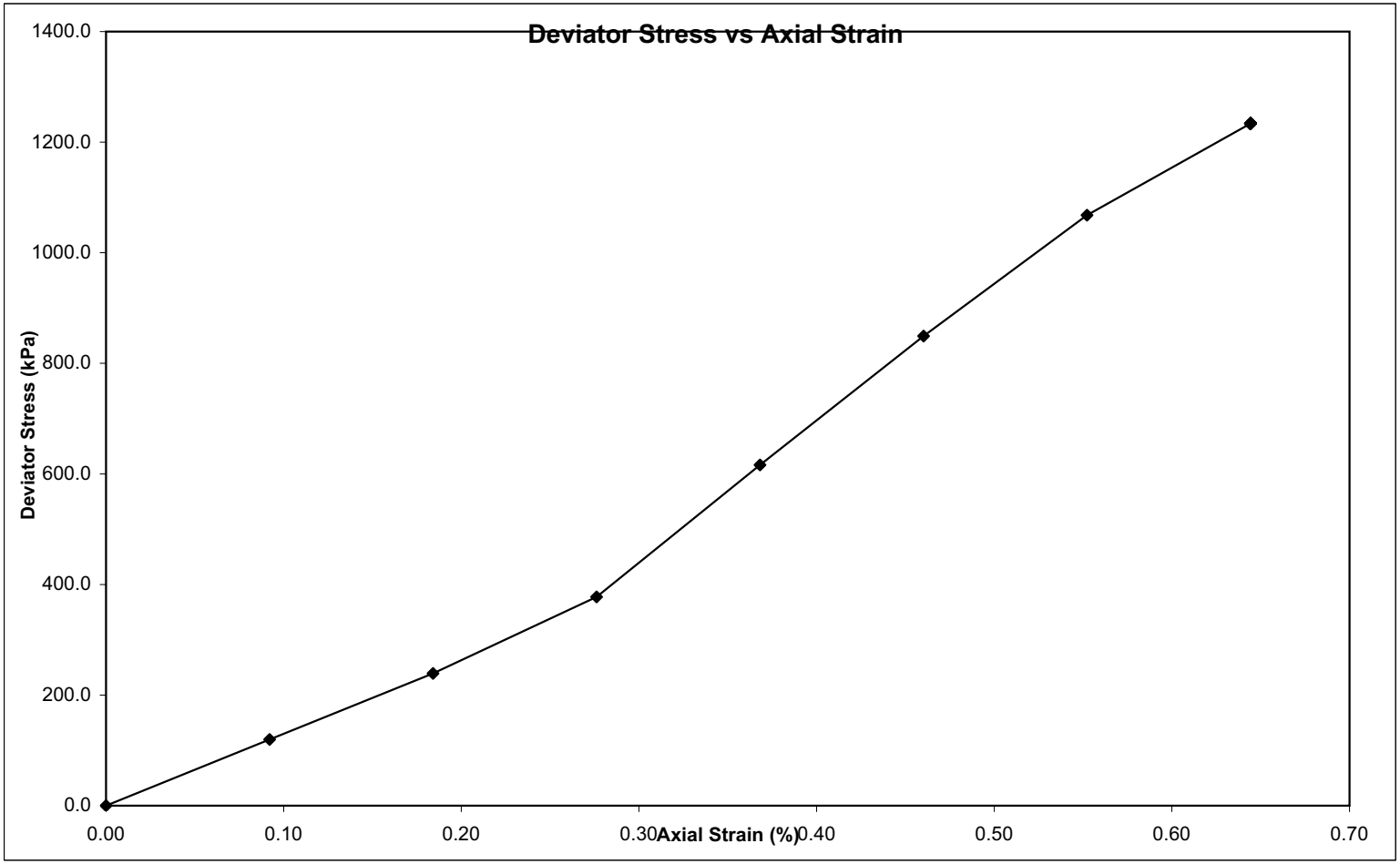
Length (cm)	10.865
Diameter (cm)	5.21
Area (cm2)	21.32
Volume (cm3)	231.63

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	25	0.09	119.7
20	50	0.18	239.3
30	79	0.28	377.7
40	129	0.37	616.1
50	178	0.46	849.4
60	224	0.55	1067.9
70	259	0.64	1233.6

Mass (g):	441.8
Bulk Density (kg/m3):	1907
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1233.6
Strain (%): 0.64



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P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Job Description: Durban Harbour Berth Deepening

Job no.:	5382	**Length (cm)**	10.64
Lab no.:	08194	**Diameter (cm)**	5.22
Source:	BD BHM 107	**Area (cm2)**	21.40
Depth:	29.63 - 29.82	**Volume (cm3)**	227.70

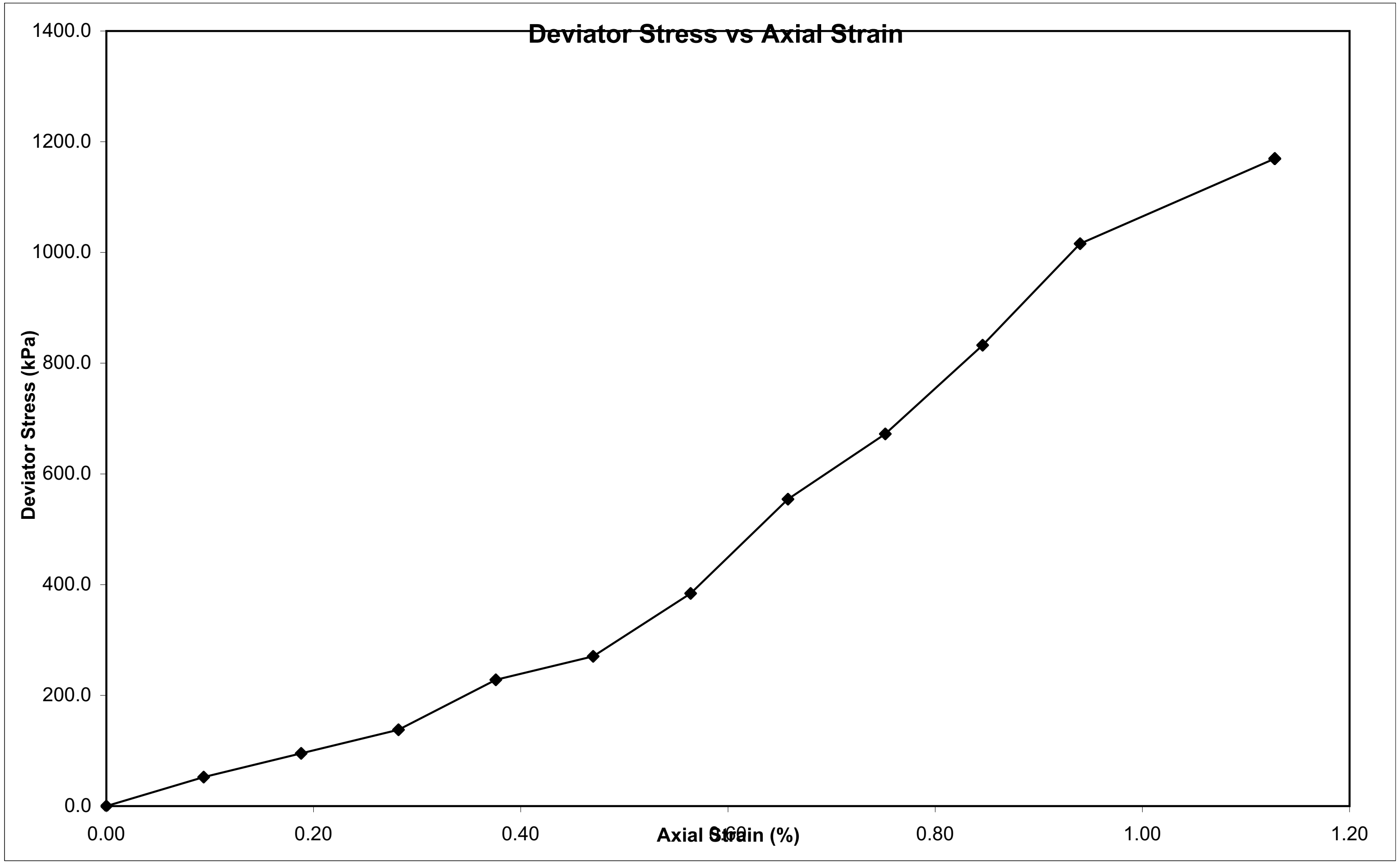
Mass (g): 446.8
Bulk Density (kg/m3): 1960

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1169.6
Strain (%): 1.13

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.09	52.4
20	20	0.19	95.2
30	29	0.28	137.9
40	48	0.38	228.1
50	57	0.47	270.6
60	81	0.56	384.2
70	117	0.66	554.4
80	142	0.75	672.2
90	176	0.85	832.4
100	215	0.94	1015.9
120	248	1.13	1169.6



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08195
Source:	BD BHM 107
Depth:	34.06 - 34.28

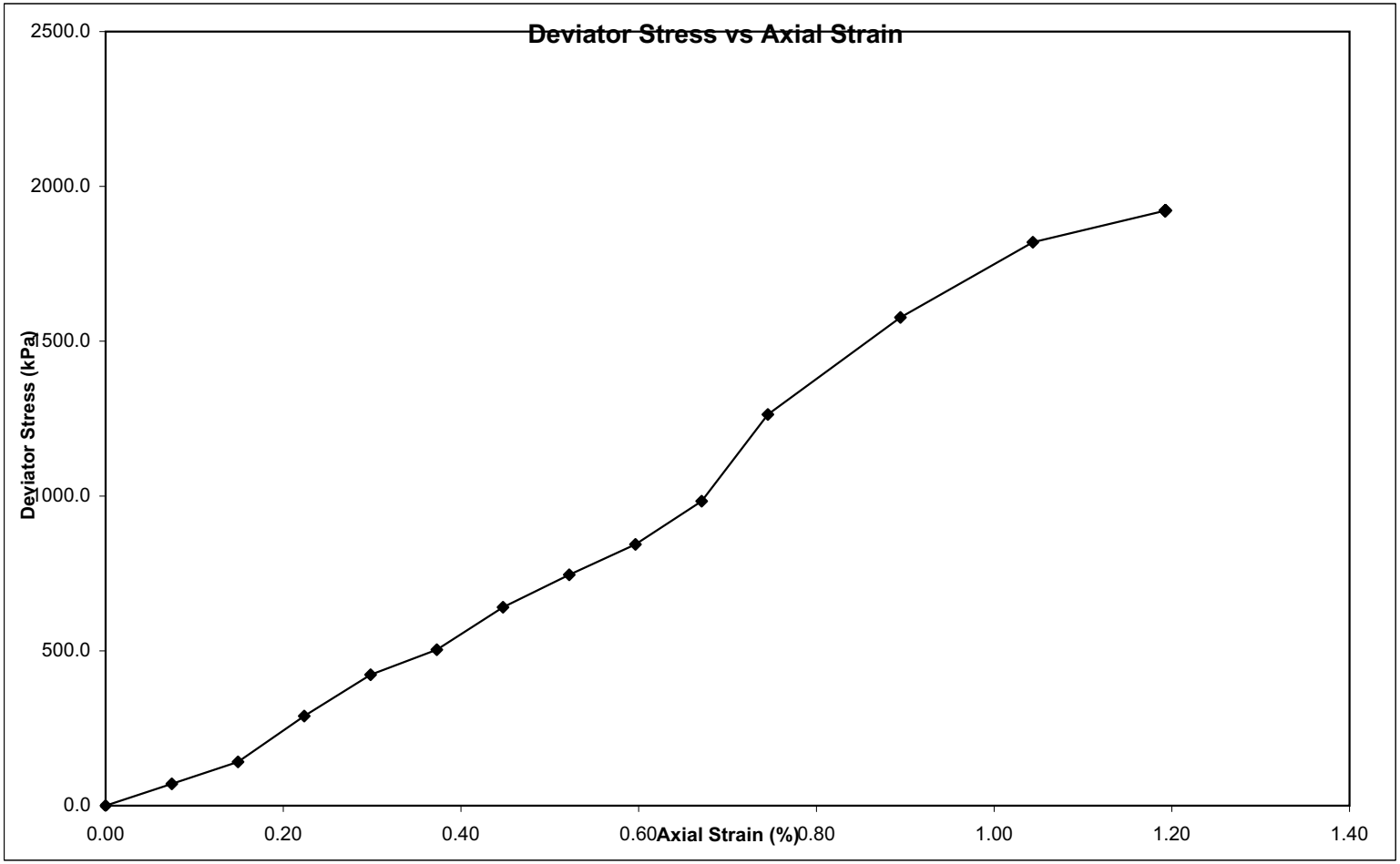
Length (cm)	13.415
Diameter (cm)	6
Area (cm2)	28.27
Volume (cm3)	379.30

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	20	0.07	70.7
20	40	0.15	141.2
30	82	0.22	289.3
40	120	0.30	423.1
50	143	0.37	503.8
60	182	0.45	640.7
70	212	0.52	745.7
80	240	0.60	843.6
90	280	0.67	983.5
100	360	0.75	1263.5
120	450	0.89	1577.0
140	520	1.04	1819.6
160	550	1.19	1921.6

Mass (g):	725
Bulk Density (kg/m3):	1911
Proving Ring Factor:	100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1921.6
Strain (%): 1.19



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08196
Source:	BD BHM 107
Depth:	35.11 - 35.34

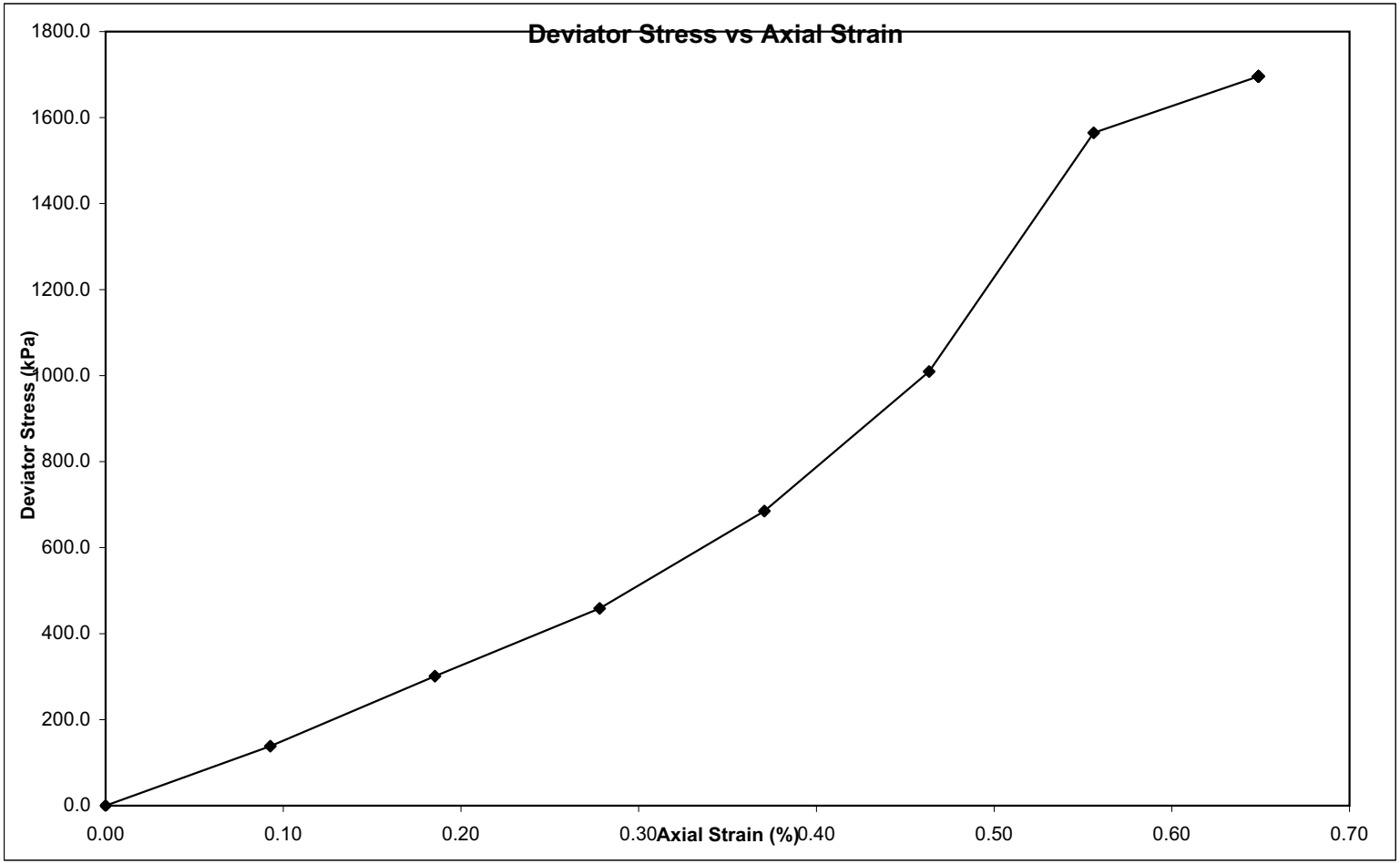
Length (cm)	10.79
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	224.76

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	28	0.09	138.4
20	61	0.19	301.2
30	93	0.28	458.8
40	139	0.37	685.2
50	205	0.46	1009.5
60	318	0.56	1564.6
70	345	0.65	1695.8

Mass (g):	441.6
Bulk Density (kg/m3):	1965
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1695.8
Strain (%): 0.65



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08197
Source:	BD BHM 107
Depth:	37.91 - 38.15

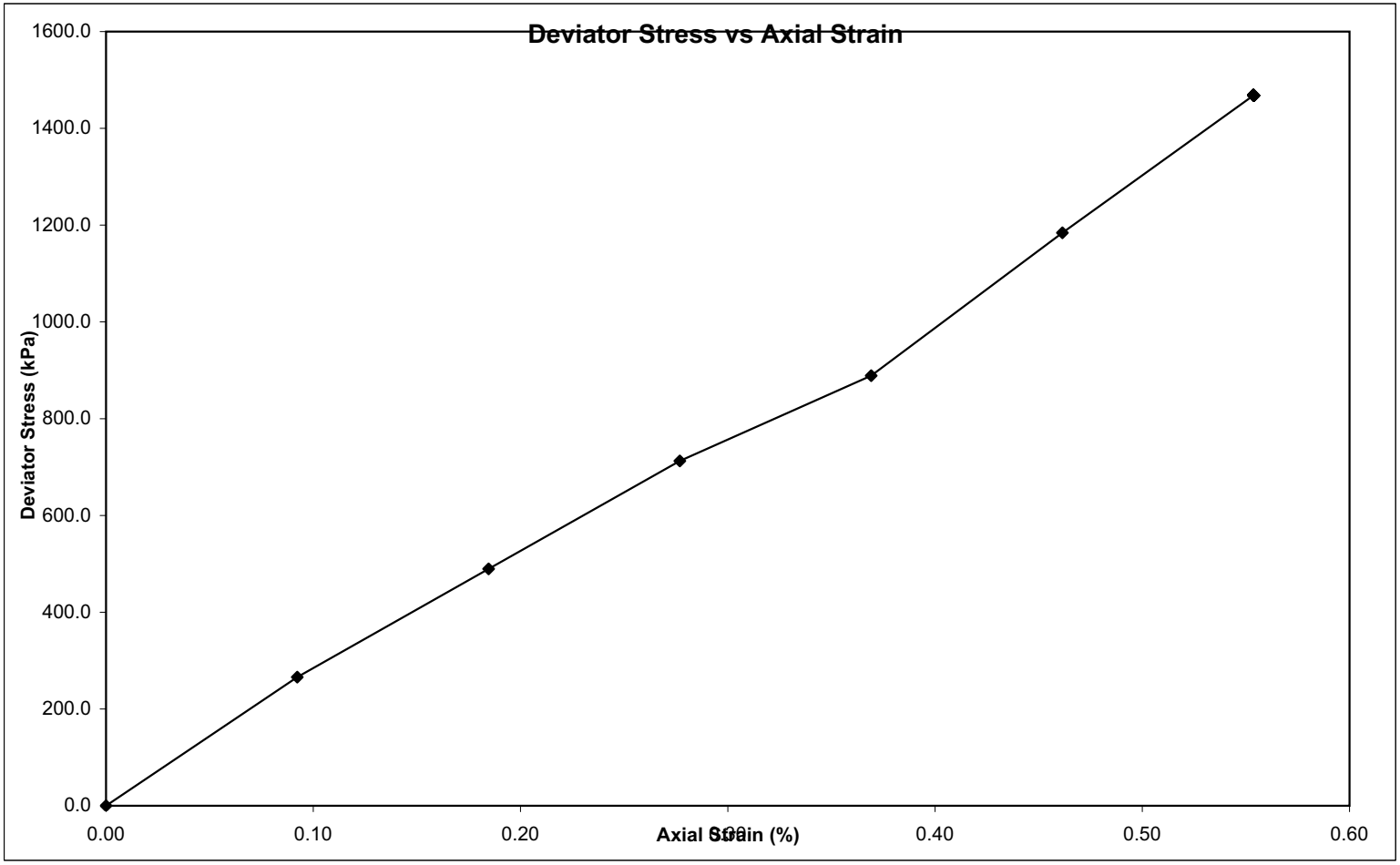
Length (cm)	10.835
Diameter (cm)	5
Area (cm2)	19.63
Volume (cm3)	212.74

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	51	0.09	265.8
20	94	0.18	489.5
30	137	0.28	712.8
40	171	0.37	888.9
50	228	0.46	1184.0
60	283	0.55	1468.3

Mass (g):	408.8
Bulk Density (kg/m3):	1922
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1468.3
Strain (%): 0.55



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

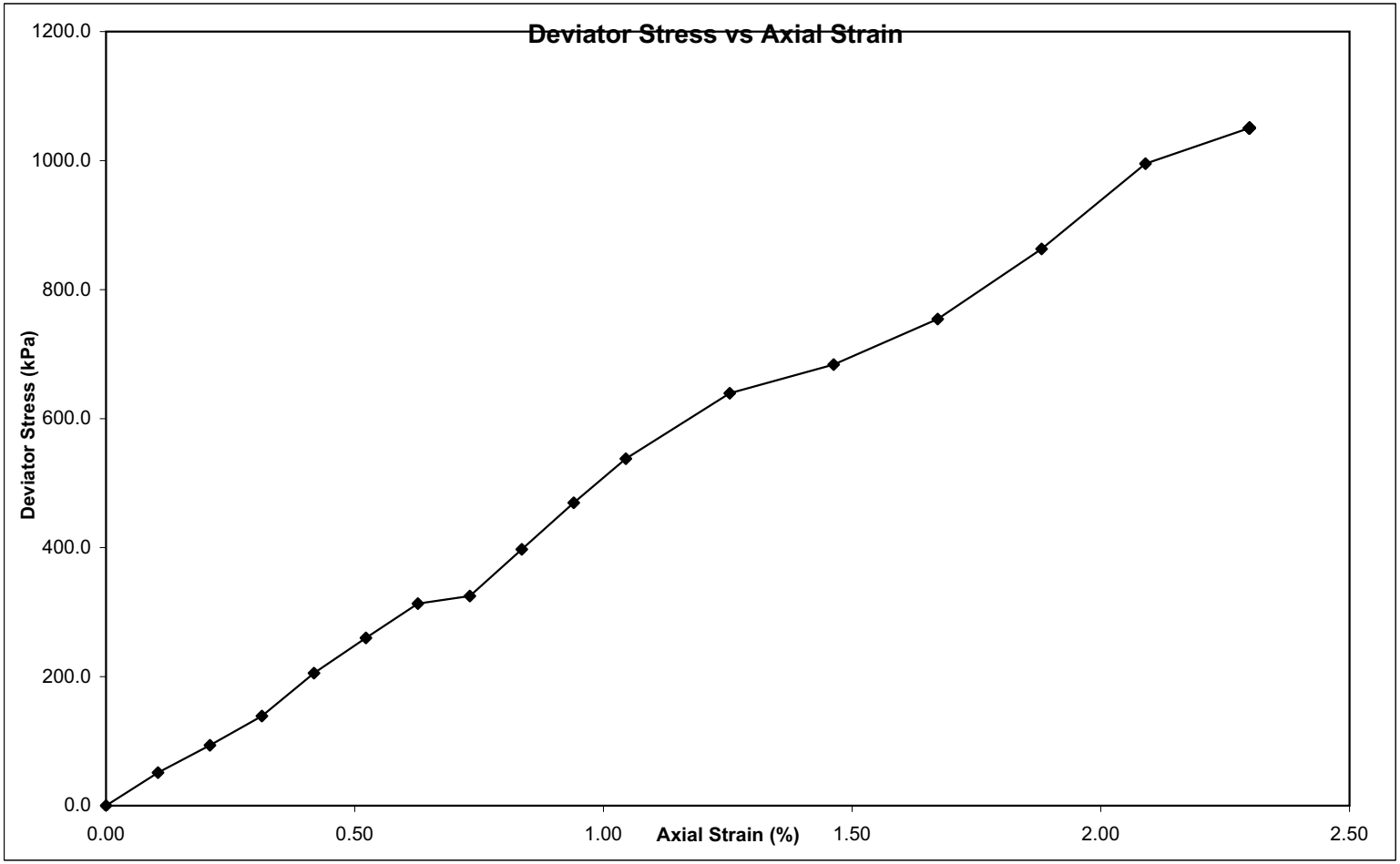
Job no.:	5382	**Length (cm)**	9.57
Lab no.:	07153	**Diameter (cm)**	5.15
Source:	BD-BHL 204	**Area (cm2)**	20.83
Depth:	37.67 - 37.82	**Volume (cm3)**	199.35

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10.5	0.10	51.3
20	19.2	0.21	93.6
30	28.5	0.31	138.8
40	42.2	0.42	205.4
50	53.5	0.52	260.1
60	64.5	0.63	313.2
70	67	0.73	325.0
80	82	0.84	397.4
90	97	0.94	469.6
100	111.2	1.04	537.8
120	132.5	1.25	639.4
140	142	1.46	683.8
160	157	1.67	754.4
180	180	1.88	863.1
200	208	2.09	995.3
220	220	2.30	1050.4

Mass (g):	395
Bulk Density (kg/m3):	1981
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1050.4
Strain at Failure (%): 2.30



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

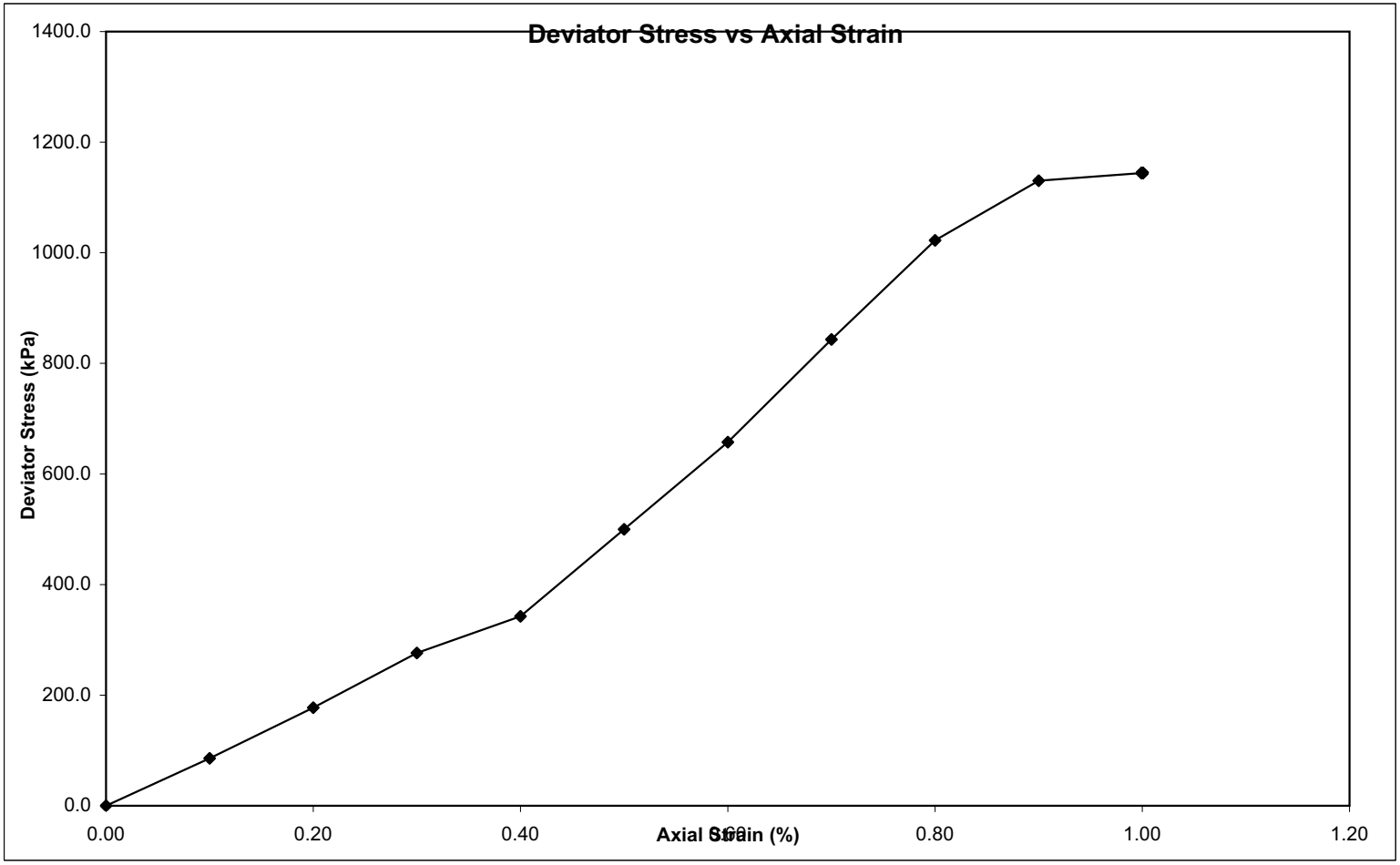
Job no.:	5382	**Length (cm)**	10
Lab no.:	07154	**Diameter (cm)**	5.215
Source:	BD-BHL 204	**Area (cm2)**	21.36
Depth:	39.80 - 40.00	**Volume (cm3)**	213.60

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	18	0.10	85.9
20	37.2	0.20	177.3
30	58	0.30	276.2
40	72	0.40	342.5
50	105.2	0.50	499.9
60	138.5	0.60	657.5
70	177.8	0.70	843.3
80	215.8	0.80	1022.5
90	238.8	0.90	1130.3
100	242	1.00	1144.3

Mass (g):	485
Bulk Density (kg/m3):	2271
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1144.3
Strain at Failure (%): 1.00



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.555
Lab no.:	07155	**Diameter (cm)**	5.15
Source:	BD-BHL 204	**Area (cm2)**	20.83
Depth:	41.24 - 41.38	**Volume (cm3)**	199.04

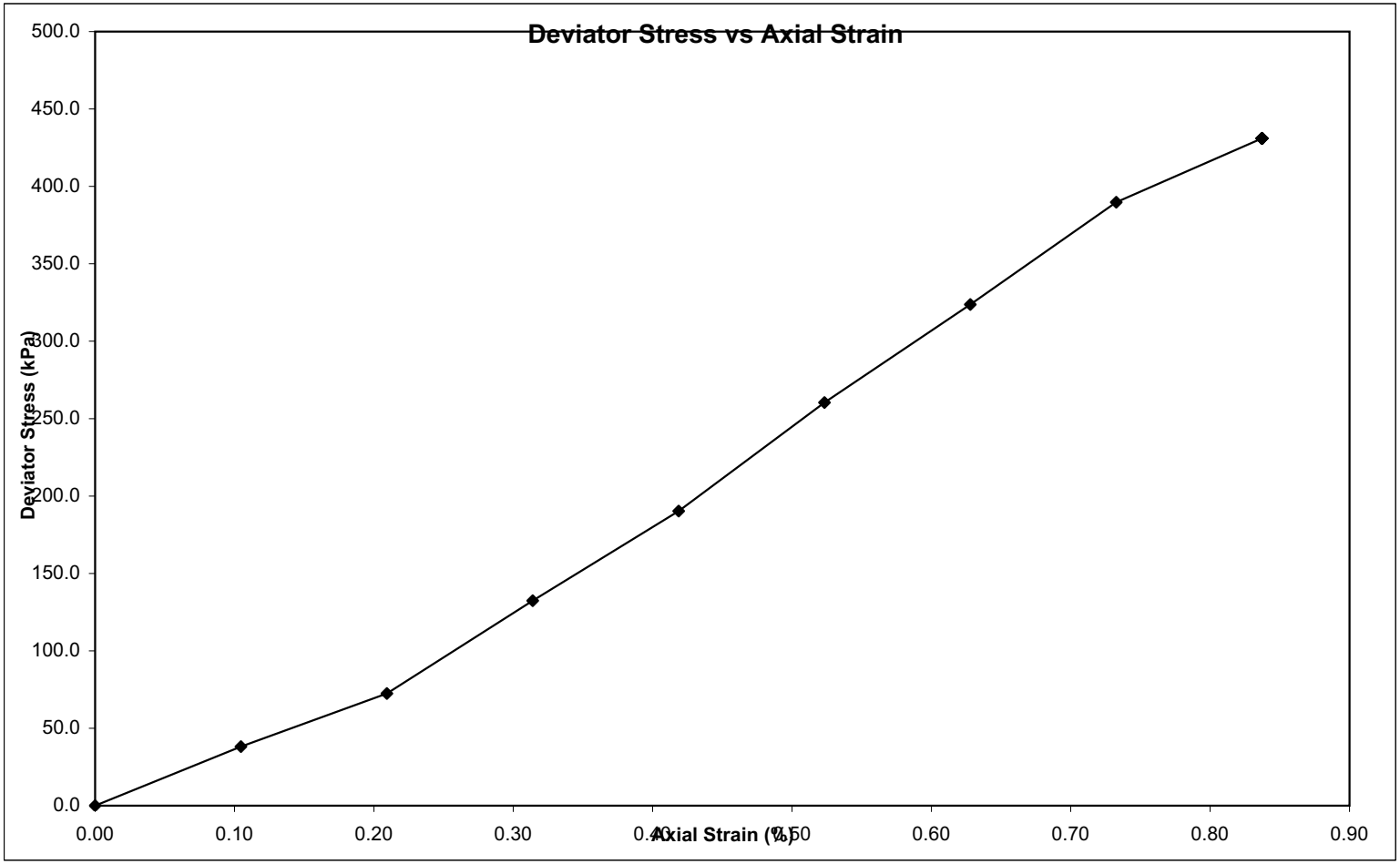
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.10	38.2
20	15.2	0.21	72.5
30	27.8	0.31	132.4
40	40	0.42	190.3
50	54.8	0.52	260.4
60	68.2	0.63	323.7
70	82.2	0.73	389.8
80	91	0.84	431.0

Mass (g): 415
Bulk Density (kg/m3): 2084

Proving Ring Factor: 100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 431
Strain at Failure (%): 0.84



SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Berth Deepening 07 - 395

Sample delivered by : - Customer

Job Card No : 128522 A

Date Received : 2008-07-07

Date Tested : 2008-07-07

Date Reported : 2008-07-25

AGGREGATE TEST REPORT

Laboratory No.	4542	4543	4544		
Field No.	BD - BHL 207	BD - BHL 207	BD - BHL 315		
Position in Field					
Depth (m)	33.22 - 33.35	33.35 - 33.55	46.41 - 46.59		
Material Description	Rock	Rock	Rock		
	Core	Core	Core		
	Natural	Natural	Natural		

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture							
75.0	mm						
63.0	mm						
53.0	mm						
37.5	mm						
26.5	mm						
19.0	mm						
16.0	mm						
13.2	mm						
9.5	mm						
6.7	mm						
4.75	mm						
3.35	mm						
2.36	mm						
1.18	mm						
0.600	mm						
0.425	mm						
0.300	mm						
0.150	mm						
0.075	mm						

Material Characteristics

Fineness Modulus	**TMH 1 B13**					
Flakiness Index (%)	**TMH 1 B3**					
Average Least Dimension (mm)	**TMH 1 B18(a)**					
Aggregate Crushing Value (%)	**TMH 1 B1**					
10% Fact (kN)	**TMH 1 B2**					
Water Absorption (%)	**TMH B14 or B15**					
Presence of Sugar *	**SABS 833**					
Organic Impurity **	**TMH 1 B6**					
Core UCS (Mpa)		2.5	2.0	6.6		
Apparent Relative Density	**Colto - 8100**					

The above test results are pertinent only to the samples received and tested at the laboratory. This report shall not be reproduced, except in full, without the prior consent of SOILCO MATERIALS INVESTIGATIONS (Pty) Ltd.

** Denotes that if the colour of the liquid layer is darker than that of the reference solution, further tests should be carried out to determine the presence or quantity of organic impurities present. Results are not accurate and are merely an indication.

Tests marked * in this report are " Not SANAS Accredited " and are not included in the SANAS Schedule of Accreditation for this Laboratory.

Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

For Soilco : _____

Job Description: Durban Harbour Berth Deepening

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68 Ridge Road, Tollgate, DURBAN
Tel : (031) 201-8992
P.O. Box 30464, MAYVILLE, 4058
Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08190
Source:	BD BHM 206
Depth:	44.53 - 44.68

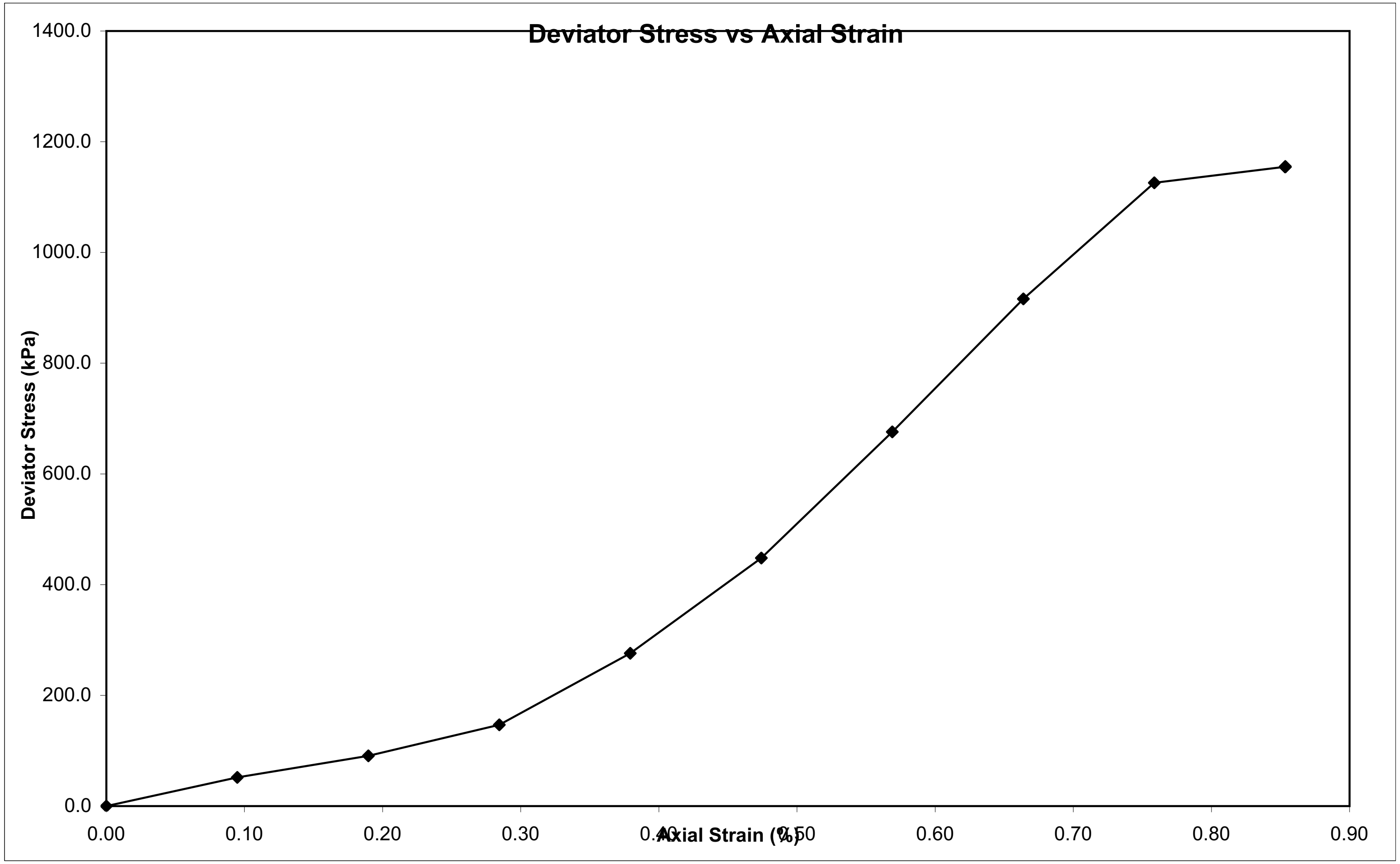
Length (cm)	10.545
Diameter (cm)	5.485
Area (cm2)	23.63
Volume (cm3)	249.17

Mass (g):	517
Bulk Density (kg/m3):	2075
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1154.7
Strain (%): 0.85

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	12	0.09	51.9
20	21	0.19	90.7
30	34	0.28	146.8
40	64	0.38	276.0
50	104	0.47	448.1
60	157	0.57	675.9
70	213	0.66	916.1
80	262	0.76	1125.7
90	269	0.85	1154.7



Job Description: Durban Harbour Berth Deepening

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Tel : (031) 201-8992
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Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08191
Source:	BD BHM 206
Depth:	45.31 - 45.48

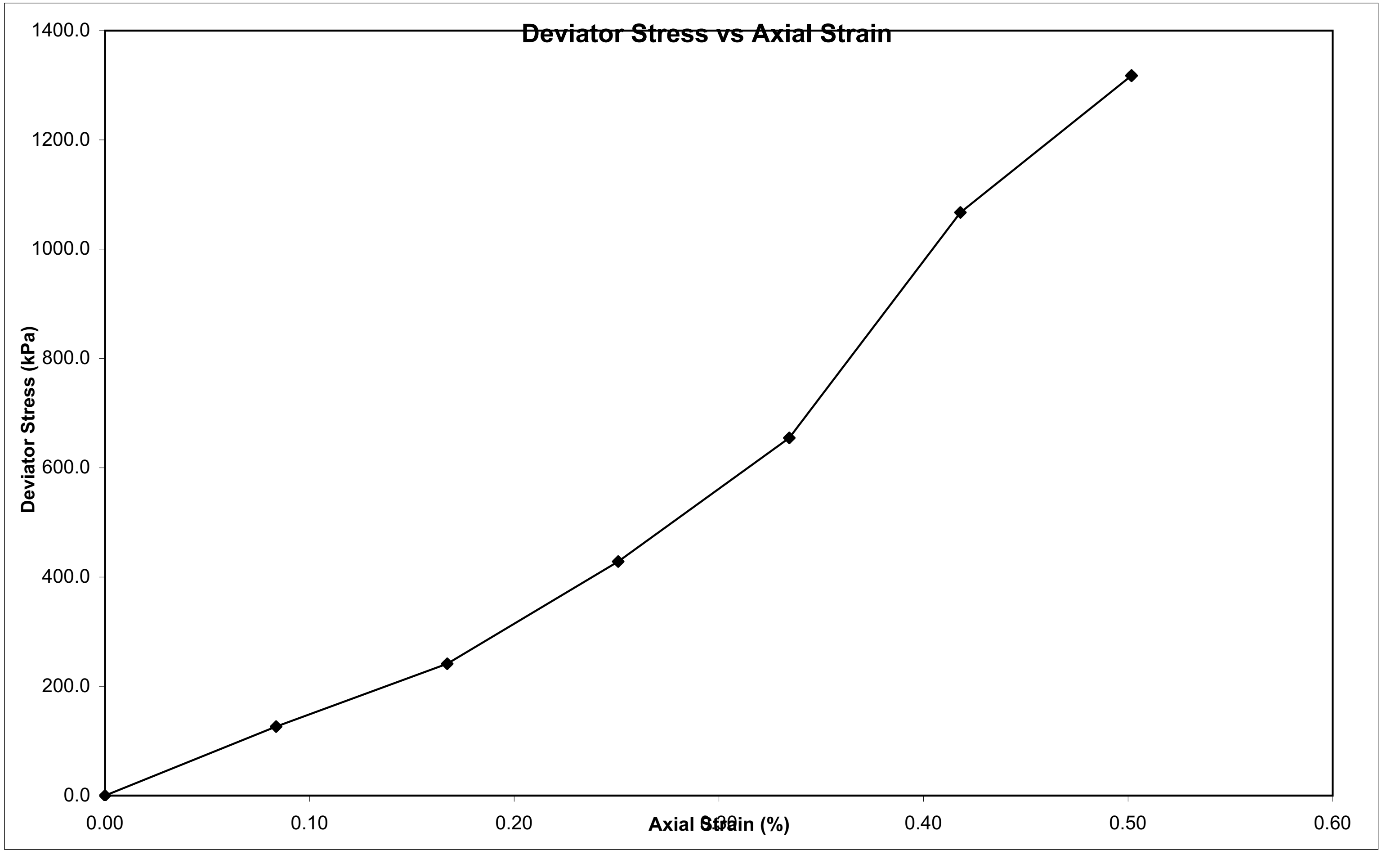
Length (cm)	11.96
Diameter (cm)	6.02
Area (cm2)	28.46
Volume (cm3)	340.42
Mass (g):	680
Bulk Density (kg/m3):	1998
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1317.7

Strain (%): 0.50

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	35	0.08	126.2
20	67	0.17	241.4
30	119	0.25	428.3
40	182	0.33	654.6
50	297	0.42	1067.3
60	367	0.50	1317.7



Job Description: Durban Harbour Berth Deepening

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Job no.:	5382
Lab no.:	08192
Source:	BD BHM 206
Depth:	45.90 - 46.07

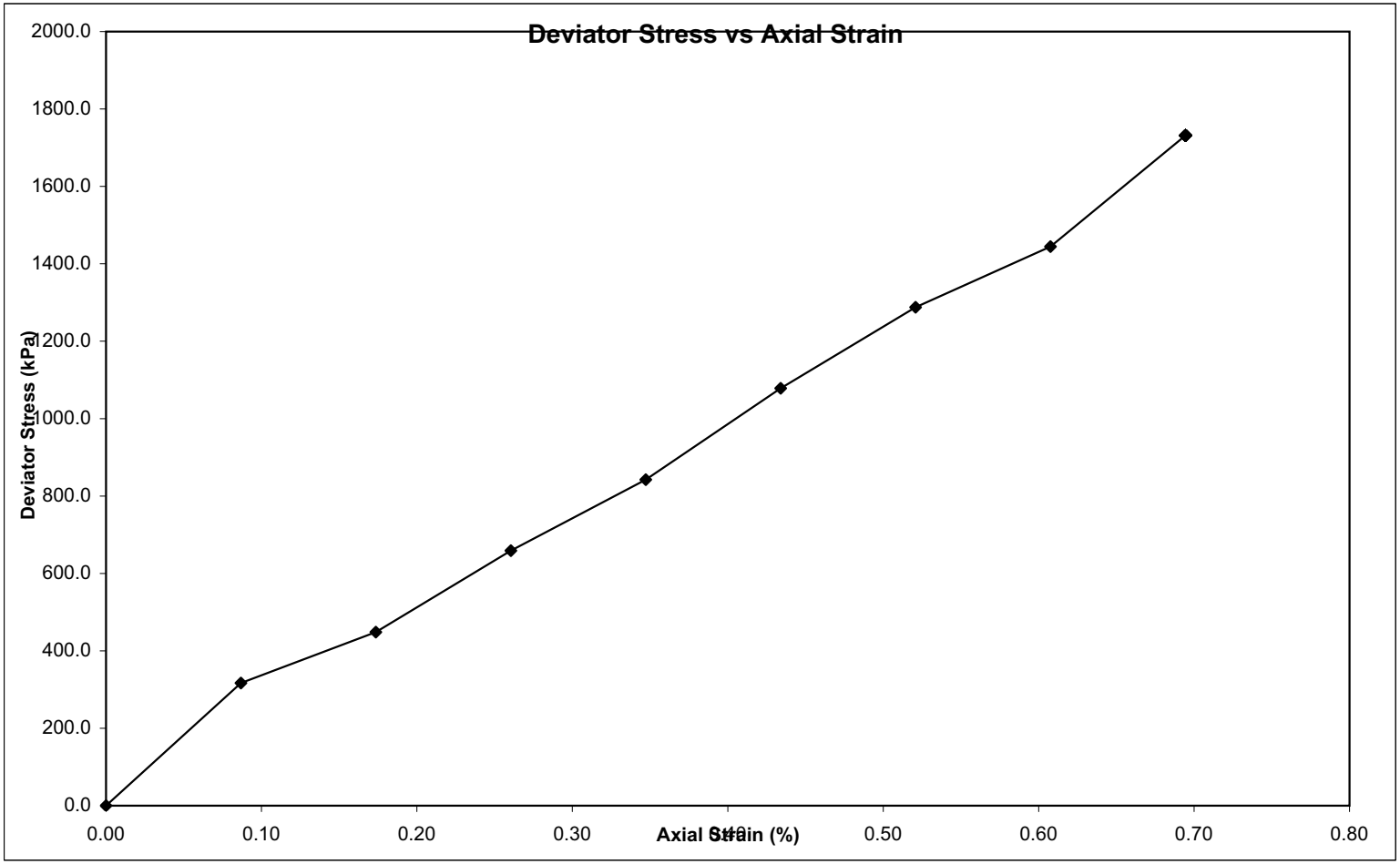
Length (cm)	11.52
Diameter (cm)	6.02
Area (cm2)	28.46
Volume (cm3)	327.90

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	12	0.09	316.8
20	17	0.17	448.4
30	25	0.26	658.8
40	32	0.35	842.5
50	41	0.43	1078.5
60	49	0.52	1287.8
70	55	0.61	1444.3
80	66	0.69	1731.6

Mass (g):	755
Bulk Density (kg/m3):	2303
Proving Ring Factor:	752

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1731.6
Strain (%): 0.69



Job Description: Durban Harbour Berth Deepening

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Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.: 5382
Lab no.: 08193
Source: BD BHM 206
Depth: 46.57 - 46.78

Length (cm) 11.99
Diameter (cm) 6
Area (cm2) 28.27
Volume (cm3) 339.01

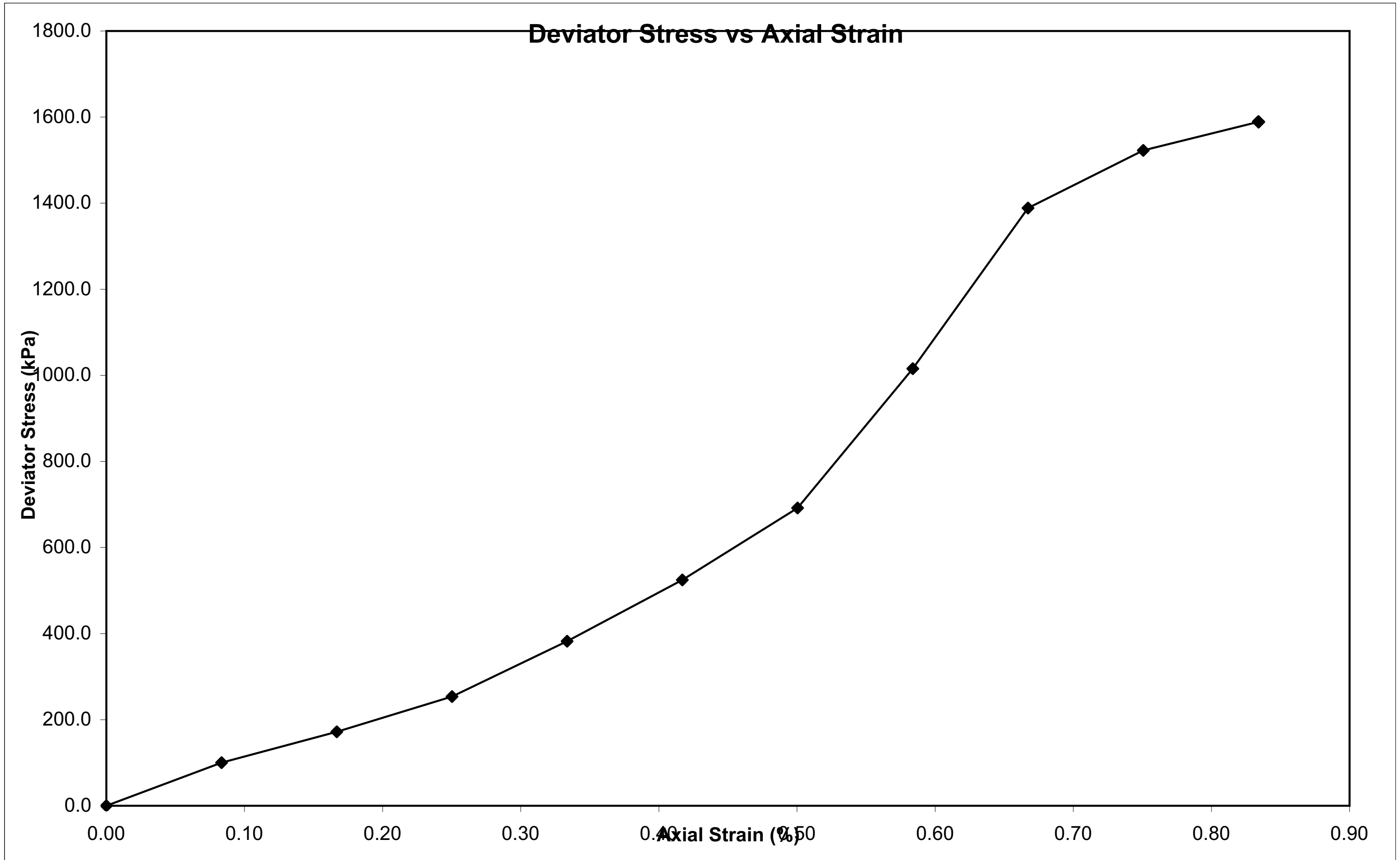
Mass (g): 680
Bulk Density (kg/m3): 2005

Proving Ring Factor: 101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1588.8
Strain (%): 0.83

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	28	0.08	100.3
20	48	0.17	171.8
30	71	0.25	253.8
40	107	0.33	382.2
50	147	0.42	524.7
60	194	0.50	691.8
70	285	0.58	1015.5
80	390	0.67	1388.5
90	428	0.75	1522.5
100	447	0.83	1588.8



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.97
Lab no.:	07171	**Diameter (cm)**	5.15
Source:	BD-BHM 207	**Area (cm2)**	20.83
Depth:	20.45 - 20.58	**Volume (cm3)**	207.68

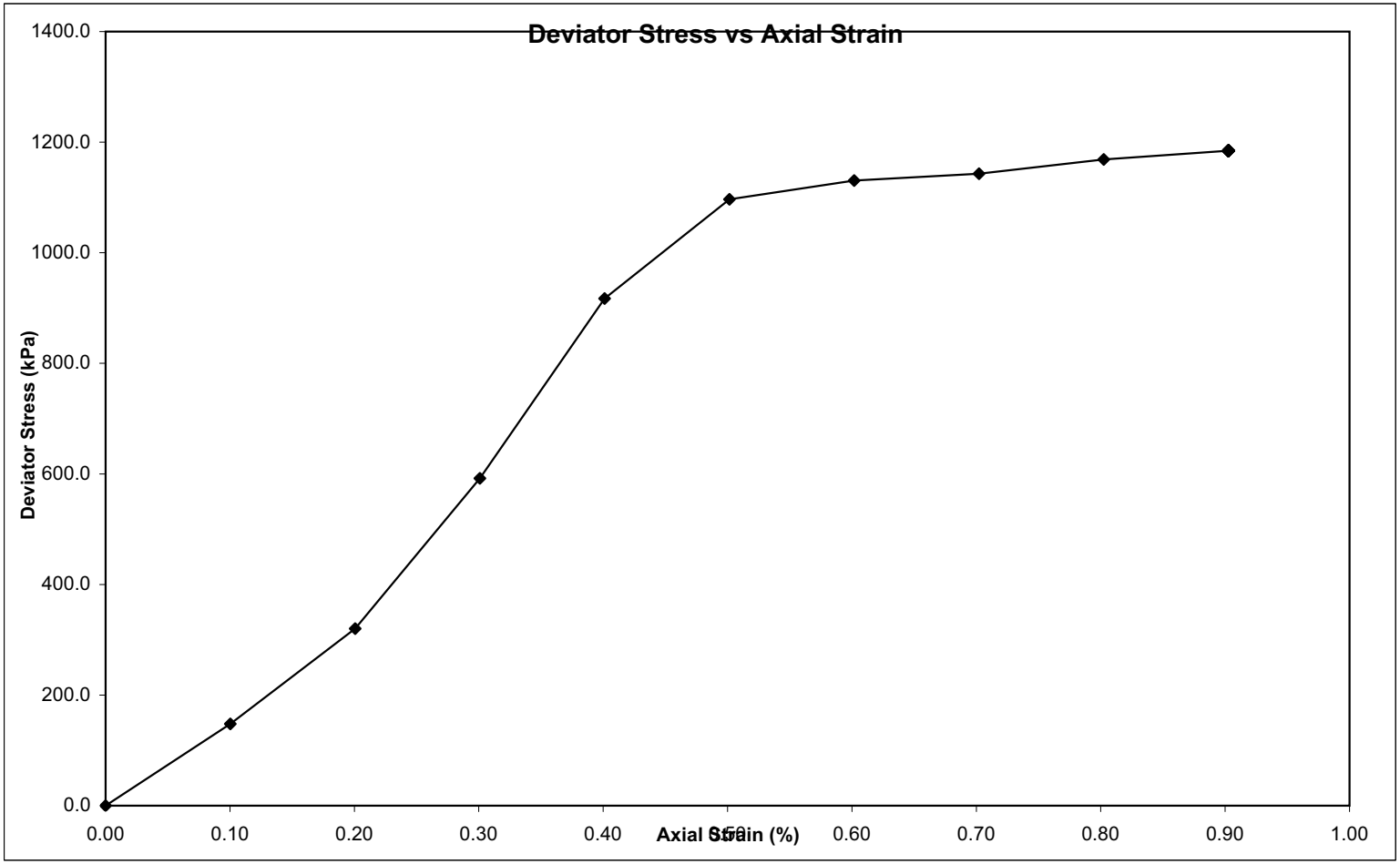
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	30.2	0.10	147.8
20	65.5	0.20	320.2
30	121.2	0.30	591.9
40	188	0.40	917.2
50	225	0.50	1096.6
60	232.2	0.60	1130.6
70	235	0.70	1143.1
80	240.5	0.80	1168.6
90	244	0.90	1184.5

Mass (g): 410
Bulk Density (kg/m3): 1974

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1184.5
Strain at Failure (%): 0.90



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.685
Lab no.:	07172	**Diameter (cm)**	5.1
Source:	BD-BHM 207	**Area (cm2)**	20.43
Depth:	29.71 - 29.87	**Volume (cm3)**	197.85

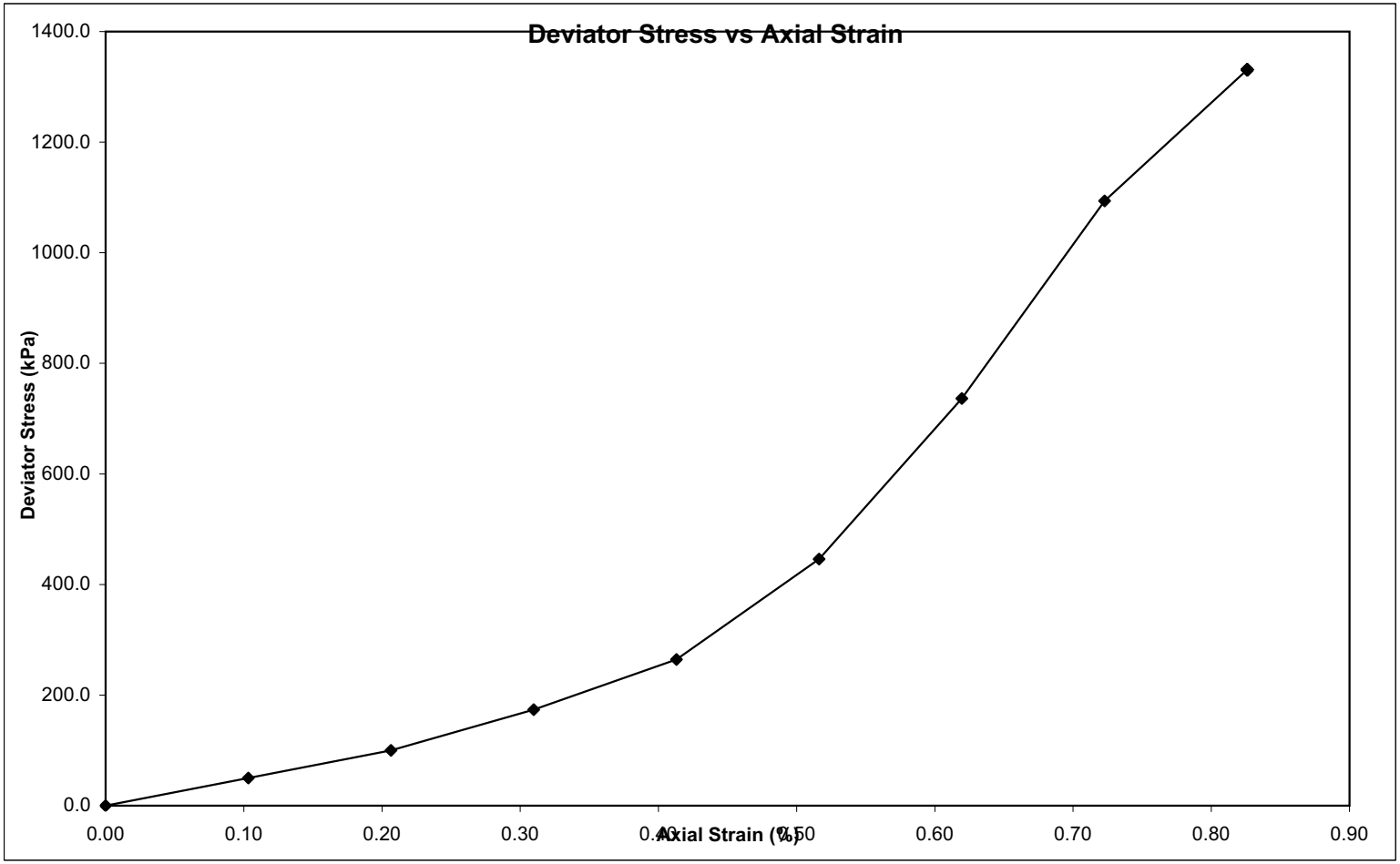
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10	0.10	50.0
20	20	0.21	99.9
30	34.8	0.31	173.7
40	53	0.41	264.3
50	89.5	0.52	445.9
60	148	0.62	736.6
70	220	0.72	1093.7
80	268	0.83	1331.0

Mass (g): 380
Bulk Density (kg/m3): 1921

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1331
Strain at Failure (%): 0.83



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.075
Lab no.:	07173	**Diameter (cm)**	5.1
Source:	BD-BHM 207	**Area (cm2)**	20.43
Depth:	32.23 - 32.38	**Volume (cm3)**	205.81

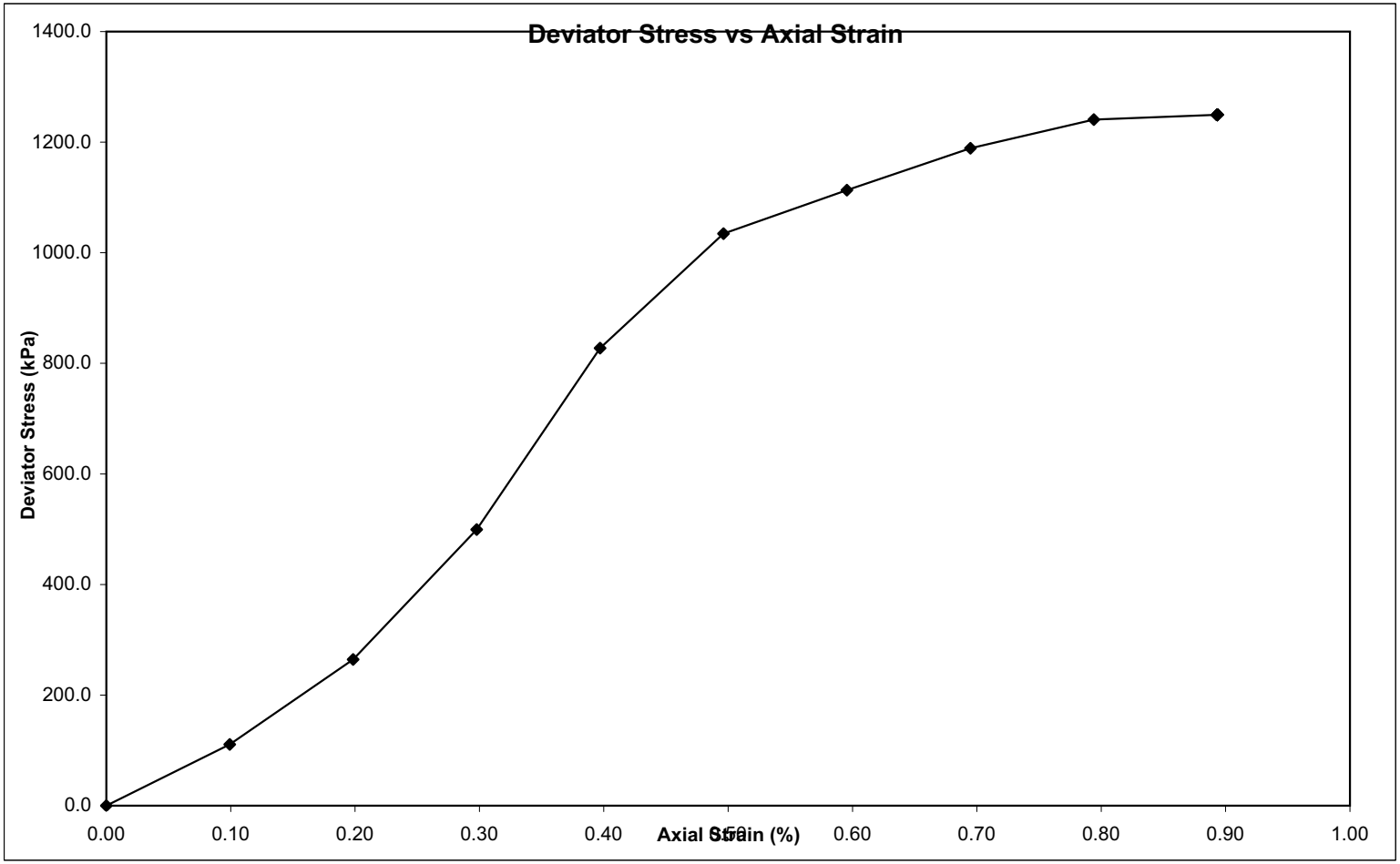
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	22.2	0.10	110.9
20	53	0.20	264.4
30	100.2	0.30	499.4
40	166.2	0.40	827.5
50	208	0.50	1034.6
60	224	0.60	1113.1
70	239.5	0.69	1188.9
80	250.2	0.79	1240.8
90	252.2	0.89	1249.5

Mass (g): 400
Bulk Density (kg/m3): 1943

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1249.5
Strain at Failure (%): 0.89



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.835
Lab no.:	07174	**Diameter (cm)**	6
Source:	BD-BHM 207	**Area (cm2)**	28.27
Depth:	40.85 - 41.05	**Volume (cm3)**	334.63

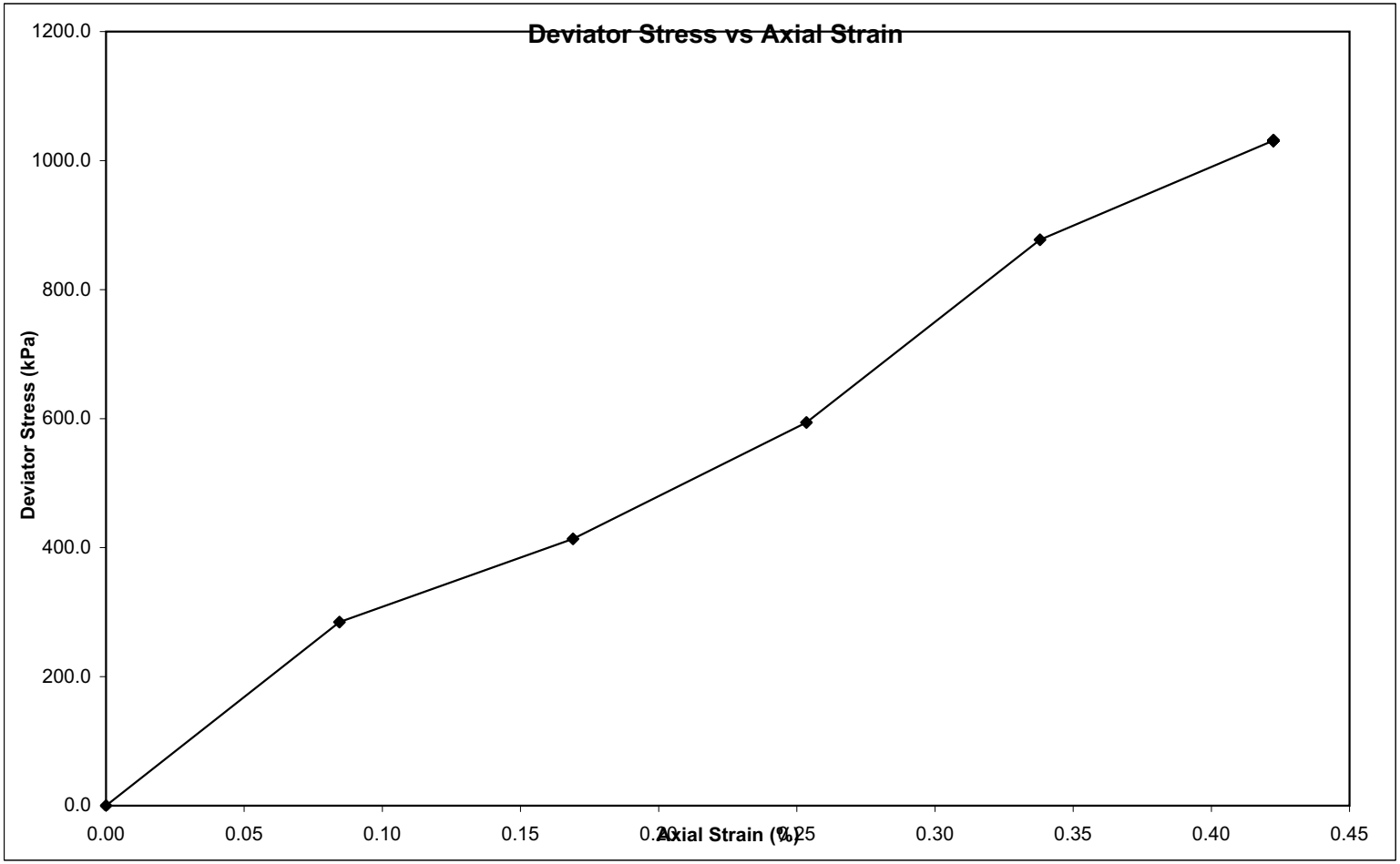
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	11	0.08	284.5
20	16	0.17	413.5
30	23	0.25	593.9
40	34	0.34	877.3
50	40	0.42	1031.2

Mass (g): 845
Bulk Density (kg/m3): 2525

Proving Ring Factor: 732

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1031.2
Strain at Failure (%): 0.42



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.89
Lab no.:	07175	**Diameter (cm)**	5.9
Source:	BD-BHM 207	**Area (cm2)**	27.34
Depth:	42.23 - 42.46	**Volume (cm3)**	325.07

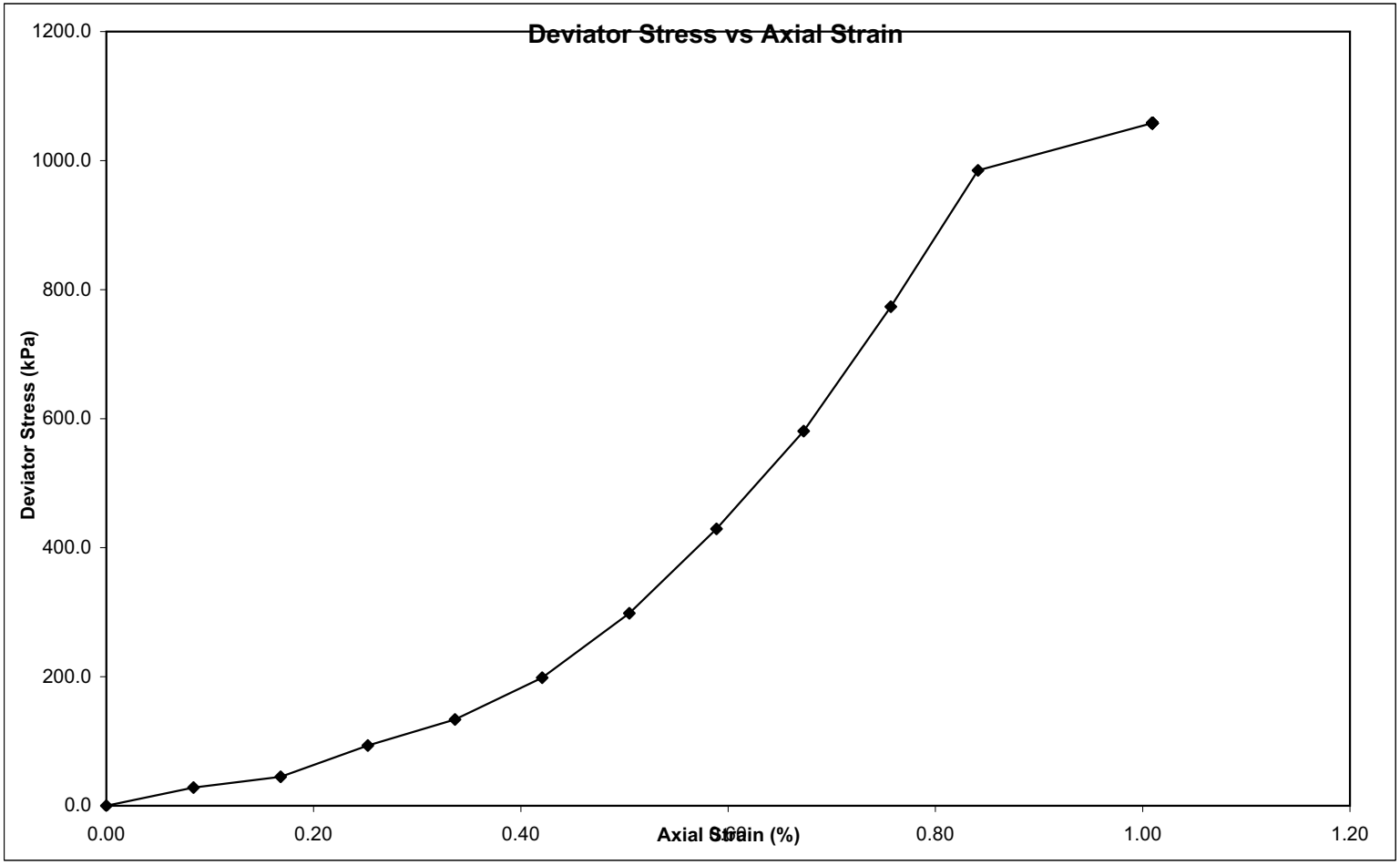
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7.5	0.08	28.1
20	12	0.17	44.9
30	25	0.25	93.5
40	35.8	0.34	133.7
50	53.2	0.42	198.5
60	80	0.50	298.3
70	115.2	0.59	429.2
80	156	0.67	580.7
90	208	0.76	773.6
100	265	0.84	984.8
120	285.2	1.01	1058.0

Mass (g): 670
Bulk Density (kg/m3): 2061

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1058
Strain at Failure (%): 1.01



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.875
Lab no.:	07176	**Diameter (cm)**	6
Source:	BD-BHM 207	**Area (cm2)**	28.27
Depth:	45.09 - 45.27	**Volume (cm3)**	335.76

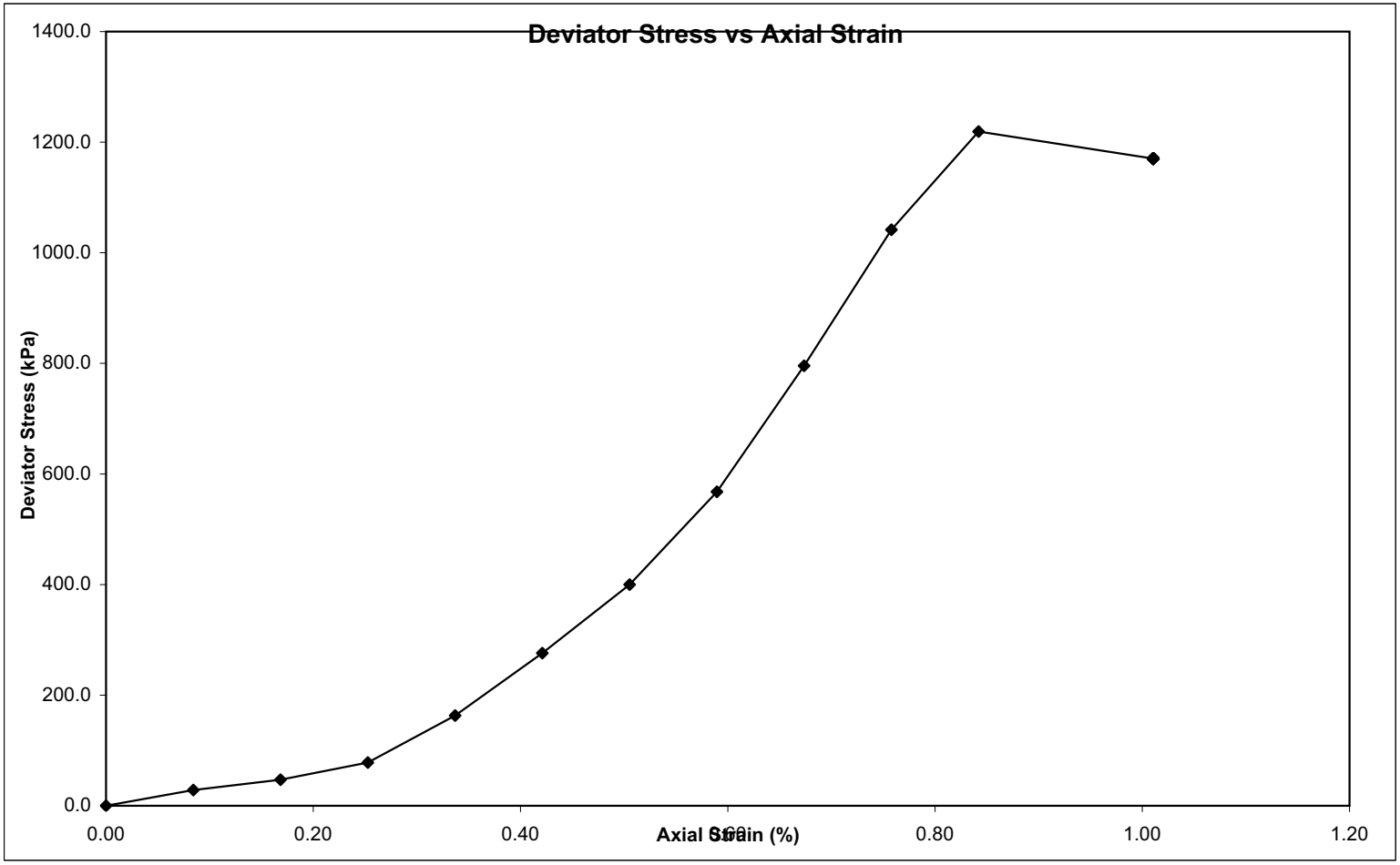
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	7.8	0.08	28.4
20	13	0.17	47.2
30	21.5	0.25	78.0
40	45	0.34	163.2
50	76.2	0.42	276.0
60	110.5	0.51	400.0
70	157	0.59	567.8
80	220.2	0.67	795.7
90	288.5	0.76	1041.6
100	338	0.84	1219.3
120	325	1.01	1170.4

Mass (g): 670
Bulk Density (kg/m3): 1995

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1219.3
Strain at Failure (%): 1.01



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.825
Lab no.:	07177	**Diameter (cm)**	6
Source:	BD-BHM 207	**Area (cm2)**	28.27
Depth:	48.62 - 48.88	**Volume (cm3)**	334.34

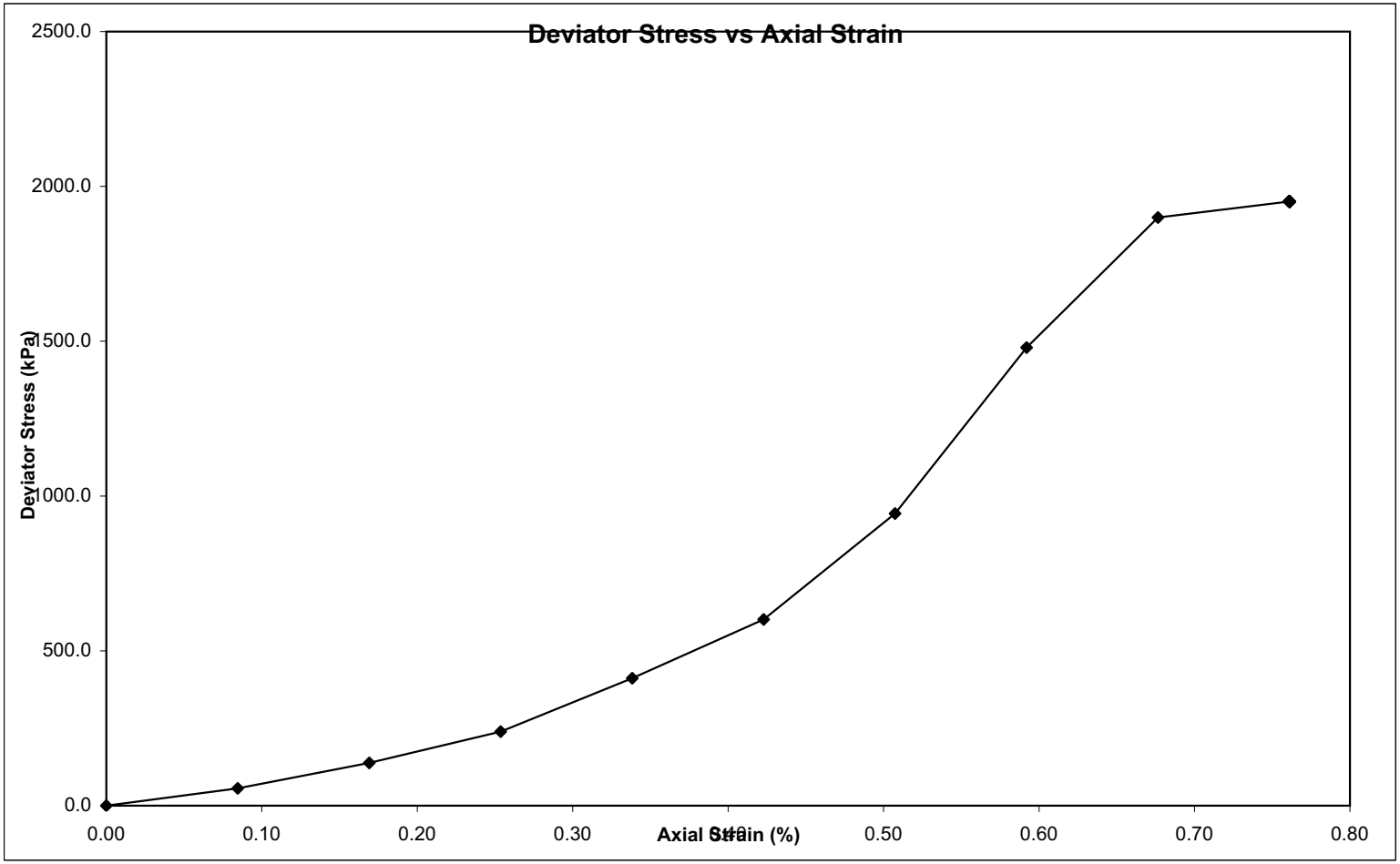
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	15.8	0.08	55.8
20	39.2	0.17	138.4
30	67.8	0.25	239.1
40	116.8	0.34	411.5
50	170.8	0.42	601.3
60	268.2	0.51	943.4
70	421	0.59	1479.6
80	541	0.68	1899.7
90	556.2	0.76	1951.4

Mass (g): 675
Bulk Density (kg/m3): 2019

Proving Ring Factor: 100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1951.4
Strain at Failure (%): 0.76



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.81
Lab no.:	07178	**Diameter (cm)**	6
Source:	BD-BHM 207	**Area (cm2)**	28.27
Depth:	49.70 - 49.88	**Volume (cm3)**	333.92

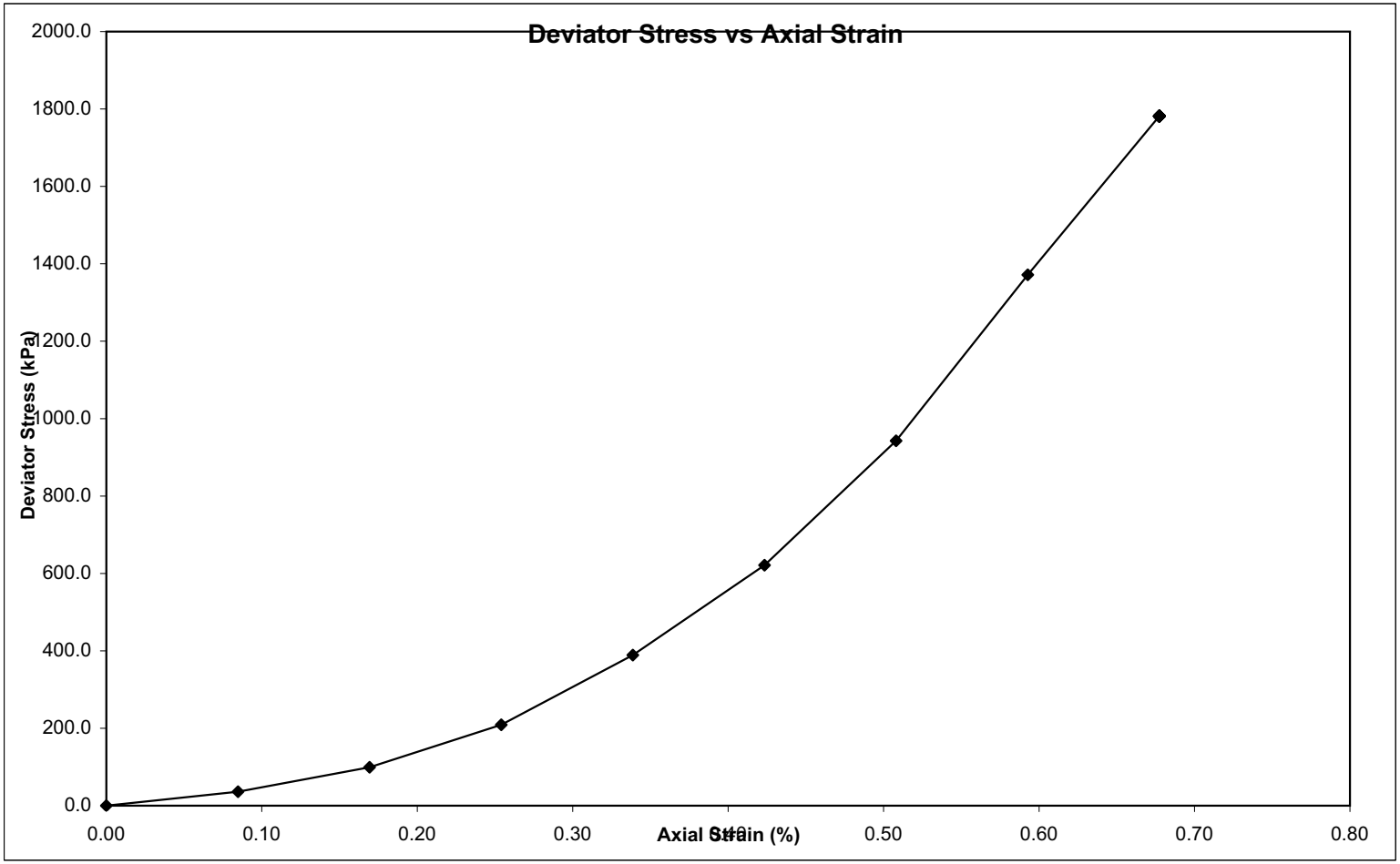
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10.2	0.08	36.2
20	28	0.17	99.2
30	59	0.25	208.8
40	110	0.34	389.0
50	175.8	0.42	621.2
60	267	0.51	942.7
70	388.8	0.59	1371.6
80	505.5	0.68	1781.8

Mass (g): 675
Bulk Density (kg/m3): 2021

Proving Ring Factor: 100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1781.8
Strain at Failure (%): 0.68



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	11.7
Lab no.:	07179	**Diameter (cm)**	6
Source:	BD-BHM 207	**Area (cm2)**	28.27
Depth:	51.80 - 52.03	**Volume (cm3)**	330.81

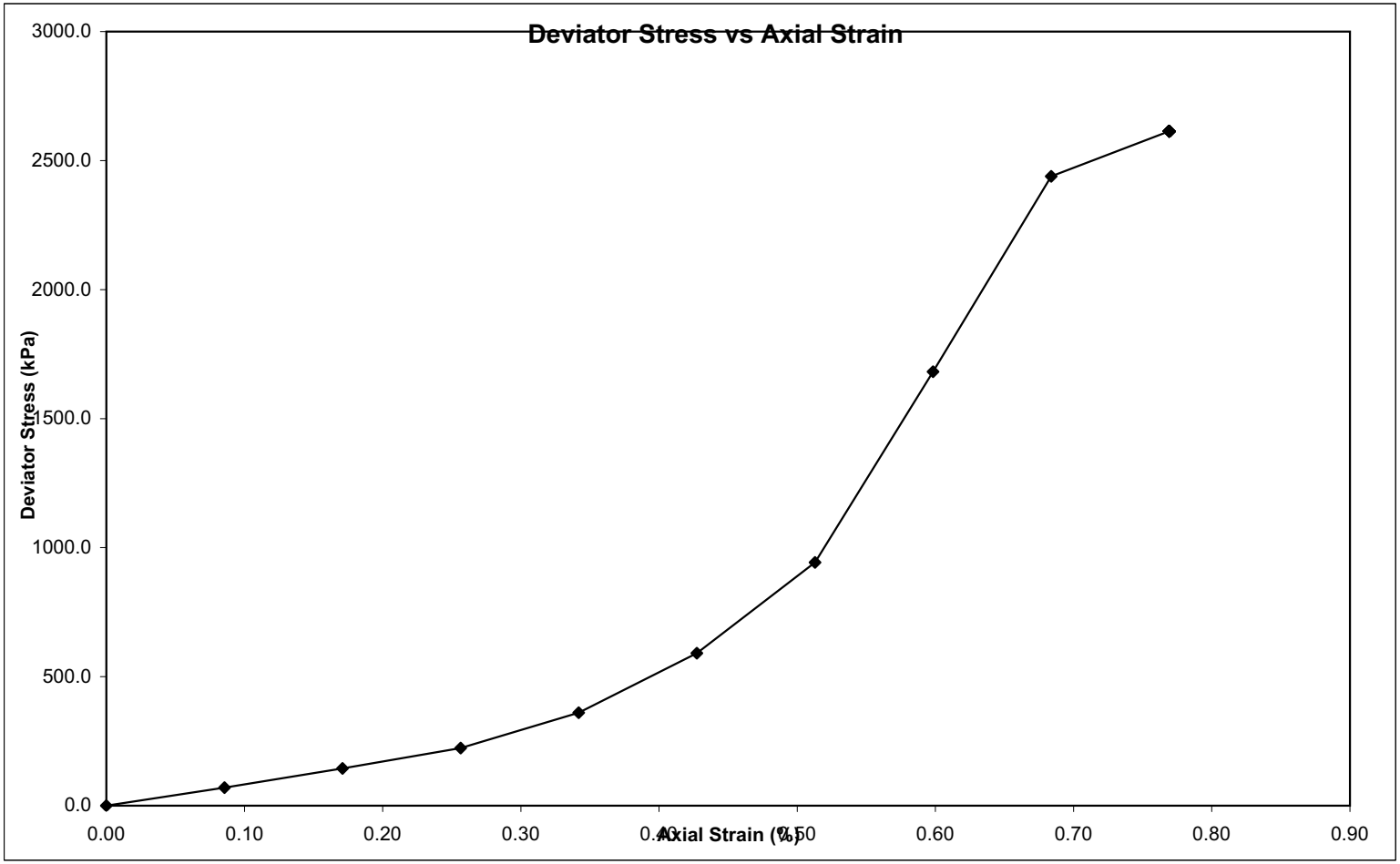
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	20	0.09	70.1
20	41.2	0.17	144.3
30	63.8	0.26	223.3
40	103	0.34	360.1
50	169.2	0.43	591.1
60	270	0.51	942.4
70	482.2	0.60	1681.7
80	700	0.68	2439.1
90	750.8	0.77	2613.9

Mass (g): 680
Bulk Density (kg/m3): 2056

Proving Ring Factor: 99

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2613.9
Strain at Failure (%): 0.77



SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Berth Deepening 07 - 395

Sample delivered by : - Customer

Job Card No : 128468 A

Date Received : 2008-07-03

Date Tested : 2008-07-03/2008-07-04

Date Reported : 2008-07-04

AGGREGATE TEST REPORT

Laboratory No.	4488	4489	4490	4494	
Field No.	BD - BHM 208	BD - BHM 208	BD - BHM 208	BD - BHM 208	
Position in Field					
Depth (m)	15.14 - 15.30	16.20 - 16.36	17.28 - 17.49	20.32 - 20.44	
Material Description	Rock Core Natural	Rock Core Natural	Rock Core Natural	Rock Core Natural	

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**					
	19.0	**mm**					
	16.0	**mm**					
	13.2	**mm**					
	9.5	**mm**					
	6.7	**mm**					
	4.75	**mm**					
	3.35	**mm**					
	2.36	**mm**					
	1.18	**mm**					
	0.600	**mm**					
	0.425	**mm**					
	0.300	**mm**					
	0.150	**mm**					
	0.075	**mm**					

Material Characteristics

Fineness Modulus	**TMH 1 B13**					
Flakiness Index (%)	**TMH 1 B3**					
Average Least Dimension (mm)	**TMH 1 B18(a)**					
Aggregate Crushing Value (%)	**TMH 1 B1**					
10% Fact (kN)	**TMH 1 B2**					
Water Absorption (%)	**TMH B14 or B15**					
Presence of Sugar *	**SABS 833**					
Organic Impurity **	**TMH 1 B6**					
Core UCS (Mpa)		1.9	2.5	2.4	2.2	
Apparent Relative Density	**Colto - 8100**					

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Remarks : This test report relating to job card no. 128468, lab nos. 4488 to 4494 supercedes all previous report with the same lab number.

For Soilco :

Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4550210801
68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.:	5382	**Length (cm)**	10.735
Lab no.:	08084	**Diameter (cm)**	5.16
Source:	BD CPTM 208	**Area (cm2)**	20.91
Depth:	10.20 - 10.34	**Volume (cm3)**	224.49

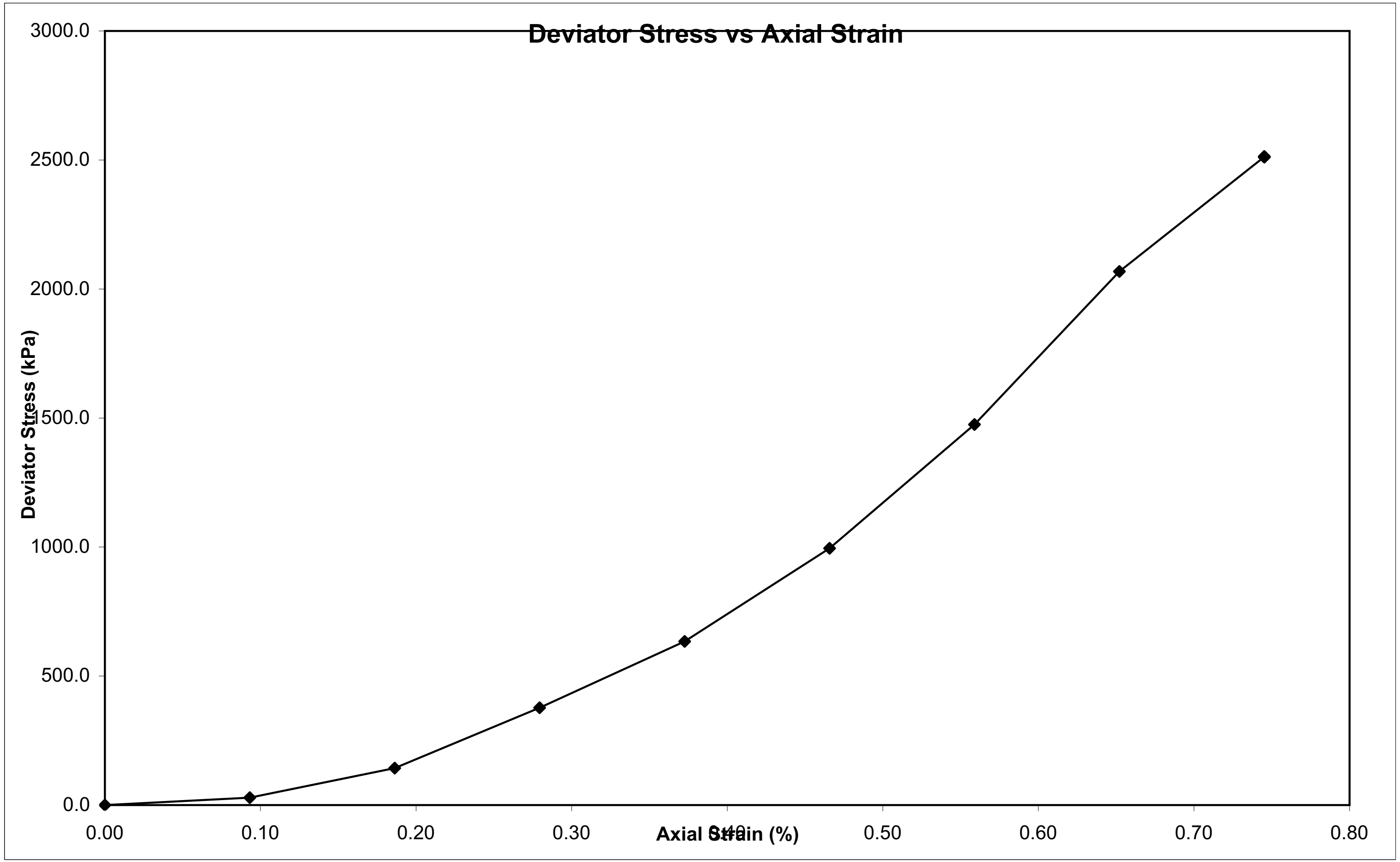
Mass (g): 500
Bulk Density (kg/m3): 2227

Proving Ring Factor: 100

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2512.3
Strain at Failure (%): 0.75

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	6	0.09	28.7
20	30	0.19	143.3
30	79	0.28	376.9
40	133	0.37	634.0
50	209	0.47	995.4
60	310	0.56	1475.0
70	435	0.65	2067.9
80	529	0.75	2512.3



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO: 4506210801
68 Ridge Road, Tollgate, DURBAN Tel : (031) 201-8982
P.O. Box 30464, MAYVILLE, 4058 Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08085
Source:	BD CPTM 208
Depth:	12.93 - 13.15

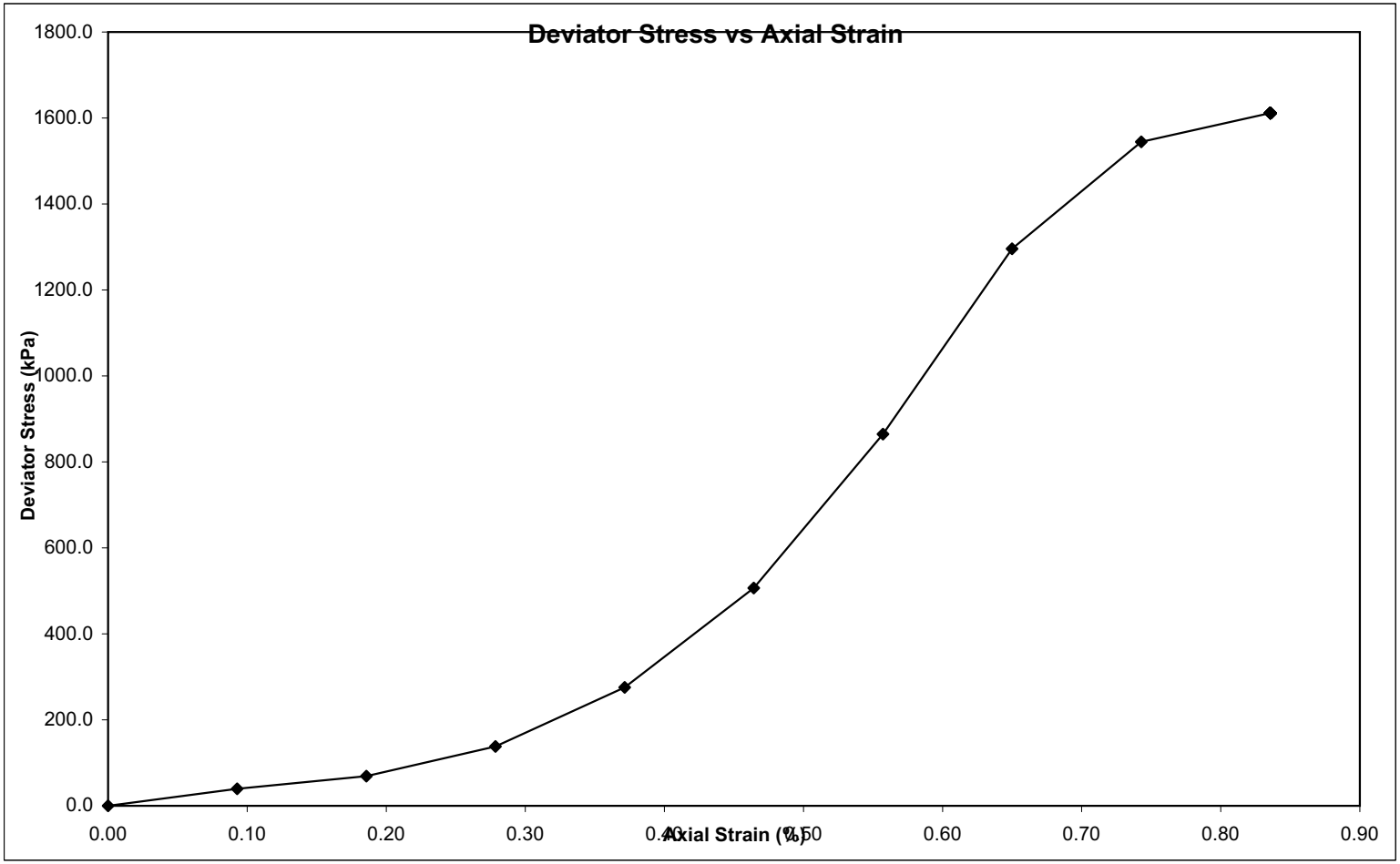
Length (cm)	10.77
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	224.35

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8	0.09	39.5
20	14	0.19	69.0
30	28	0.28	137.9
40	56	0.37	275.6
50	103	0.46	506.4
60	176	0.56	864.6
70	264	0.65	1295.6
80	315	0.74	1544.5
90	329	0.84	1611.6

Mass (g):	436.4
Bulk Density (kg/m3):	1945
Proving Ring Factor:	103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1611.6
Strain at Failure (%): 0.84



Job Description: Durban Harbour Berth Deepening

THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4550210861
68 Ridge Road, Tollgate, DURBAN
P.O. Box 30464, MAYVILLE, 4058
Tel : (031) 201-8992
Fax : (031) 201-7920

Job no.:	5382
Lab no.:	08086
Source:	BD CPTM208
Depth:	13.80 - 13.95

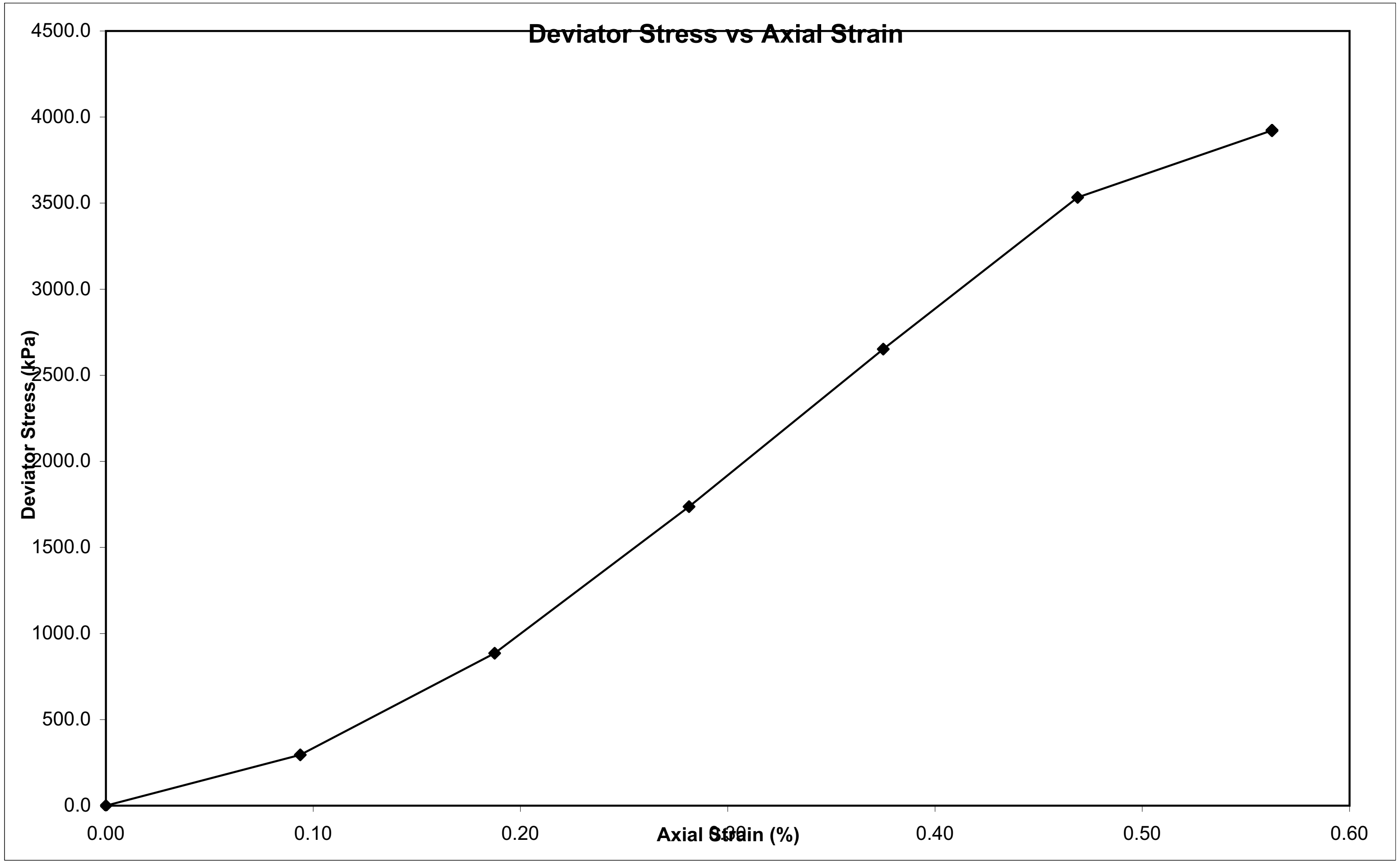
Length (cm)	10.665
Diameter (cm)	5.155
Area (cm2)	20.87
Volume (cm3)	222.59

Mass (g):	565
Bulk Density (kg/m3):	2538
Proving Ring Factor:	686

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 3922
Strain at Failure (%): 0.56

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	9	0.09	295.5
20	27	0.19	885.8
30	53	0.28	1737.1
40	81	0.38	2652.3
50	108	0.47	3533.1
60	120	0.56	3922.0



SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Berth Deepening 07 - 395

Sample delivered by : - **Customer**

Job Card No : 128468 AA

Date Received : 2008-07-03

Date Tested : 2008-07-03/2008-07-04

Date Reported : 2008-07-04

AGGREGATE TEST REPORT

Laboratory No.	4479	4480	4481		
Field No.	BD - BHM 209	BD - BHM 209	BD - BHM 209		
Position in Field					
Depth (m)	40.63 - 40.78	49.32 - 49.50	51.48 - 51.62		
Material Description	Rock	Rock	Rock		
	Core	Core	Core		
	Natural	Natural	Natural		

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture							
	75.0	mm					
	63.0	mm					
	53.0	mm					
	37.5	mm					
	26.5	mm					
	19.0	mm					
	16.0	mm					
	13.2	mm					
	9.5	mm					
	6.7	mm					
	4.75	mm					
	3.35	mm					
	2.36	mm					
	1.18	mm					
	0.600	mm					
	0.425	mm					
	0.300	mm					
	0.150	mm					
	0.075	mm					

Material Characteristics

Fineness Modulus	**TMH 1 B13**					
Flakiness Index (%)	**TMH 1 B3**					
Average Least Dimension (mm)	**TMH 1 B18(a)**					
Aggregate Crushing Value (%)	**TMH 1 B1**					
10% Fact (kN)	**TMH 1 B2**					
Water Absorption (%)	**TMH B14 or B15**					
Presence of Sugar *	**SABS 833**					
Organic Impurity **	**TMH 1 B6**					
Core UCS (Mpa)		2.1	2.9	1.8		
Apparent Relative Density	**Colto - 8100**					

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Remarks : This test report relating to job card no. 128468, lab nos. 4479 to 4481 supercedes all previous reports with the same lab card number.

For Soilco :

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg No. : 1965 / 09585 / 07

25 WESTMEAD ROAD - WESTMEAD P.O. BOX 15318 WESTMEAD 3608 KWA ZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

Client : Moore Spence Jones

Project : Berth Deepening 07 - 395

Sample delivered by : - Customer

Job Card No : 128468 A

Date Received : 2008-07-03

Date Tested : 2008-07-03/2008-07-04

Date Reported : 2008-07-04

AGGREGATE TEST REPORT

Laboratory No.	4482	4483	4484		
Field No.	BD - BHM 209	BD - BHM 209	BD - BHM 209		
Position in Field					
Depth (m)	52.36 - 52.53	56.79 - 56.96	57.31 - 57.47		
Material Description	Rock	Rock	Rock		
	Core	Core	Core		
	Natural	Natural	Natural		

Sieve Analysis (% Passing) TMH 1 - Method B4

Sieve Aperture	**75.0**	**mm**					
	63.0	**mm**					
	53.0	**mm**					
	37.5	**mm**					
	26.5	**mm**					
	19.0	**mm**					
	16.0	**mm**					
	13.2	**mm**					
	9.5	**mm**					
	6.7	**mm**					
	4.75	**mm**					
	3.35	**mm**					
	2.36	**mm**					
	1.18	**mm**					
	0.600	**mm**					
	0.425	**mm**					
	0.300	**mm**					
	0.150	**mm**					
	0.075	**mm**					

Material Characteristics

Fineness Modulus	**TMH 1 B13**					
Flakiness Index (%)	**TMH 1 B3**					
Average Least Dimension (mm)	**TMH 1 B18(a)**					
Aggregate Crushing Value (%)	**TMH 1 B1**					
10% Fact (kN)	**TMH 1 B2**					
Water Absorption (%)	**TMH B14 or B15**					
Presence of Sugar *	**SABS 833**					
Organic Impurity **	**TMH 1 B6**					
Core UCS (Mpa)		2.5	2.4	2.4		
Apparent Relative Density	**Colto - 8100**					

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Remarks : This test report relating to job card no. 128468, lab nos. 4482 to 4484 supercedes all previous reports with the same lab numbers.

For Soilco :

Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382
Lab no.:	07156
Source:	BD-BHM 211
Depth:	44.11 - 44.27

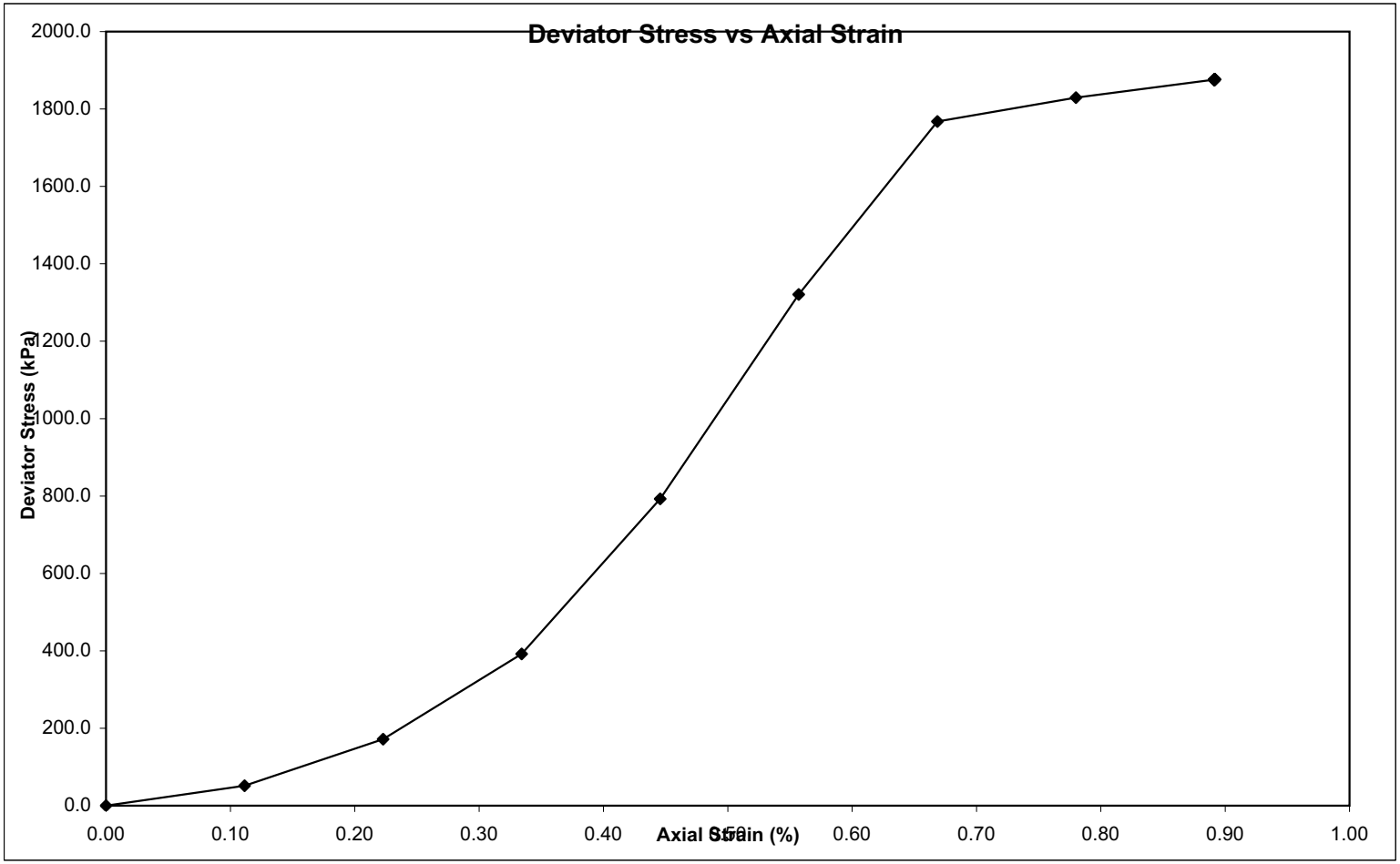
Length (cm)	8.975
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	186.96

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10.5	0.11	51.6
20	35	0.22	171.7
30	80	0.33	392.0
40	162	0.45	792.9
50	270.2	0.56	1321.0
60	362	0.67	1767.8
70	375	0.78	1829.2
80	385	0.89	1875.9

Mass (g):	415
Bulk Density (kg/m3):	2220
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1875.9
Strain at Failure (%): 0.89



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382
Lab no.:	07157
Source:	BD-BHM 211
Depth:	58.20 - 58.42

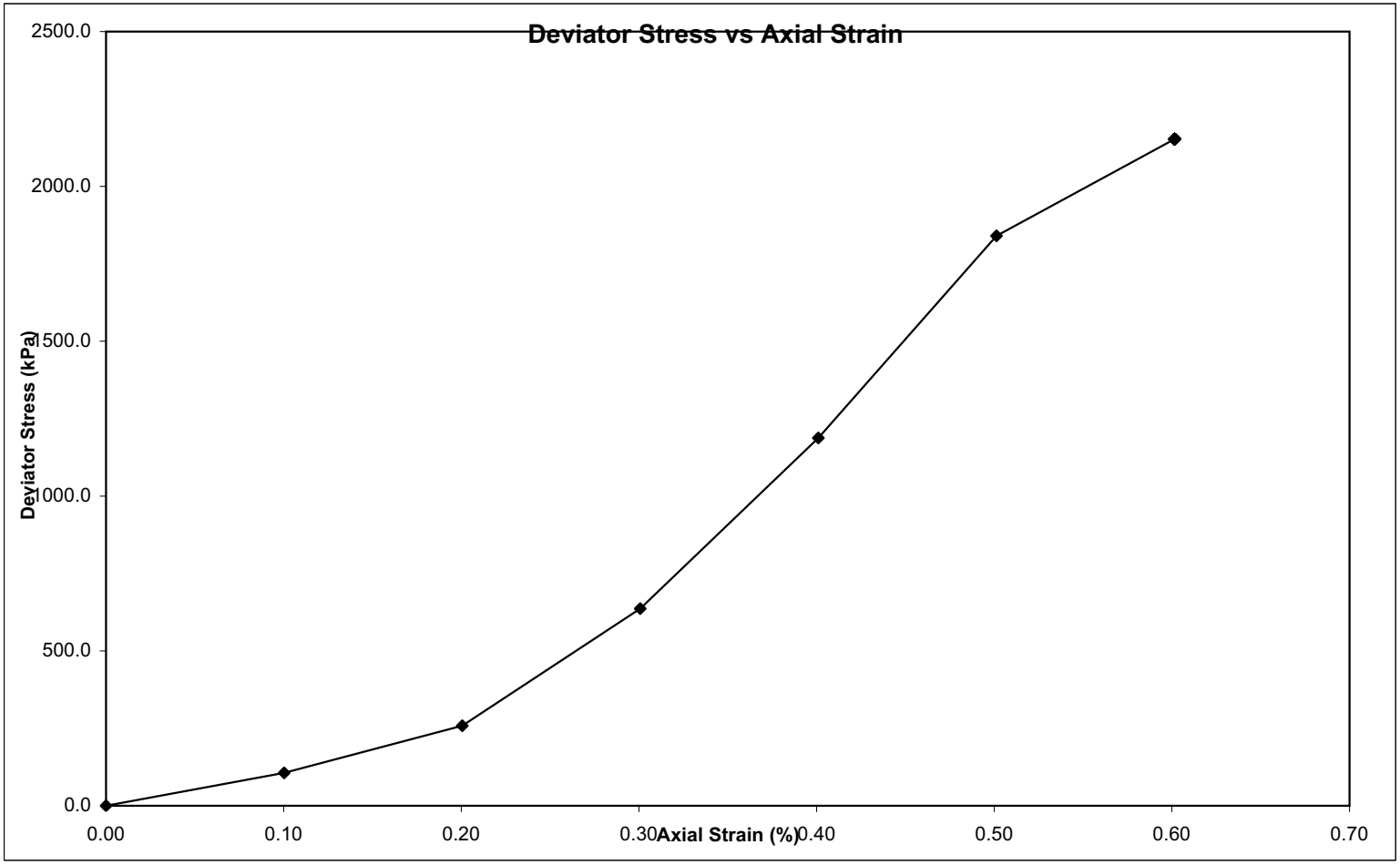
Length (cm)	9.975
Diameter (cm)	5.15
Area (cm2)	20.83
Volume (cm3)	207.79

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	21.8	0.10	106.0
20	53.2	0.20	258.4
30	131.2	0.30	636.6
40	245	0.40	1187.6
50	380	0.50	1840.1
60	445	0.60	2152.7

Mass (g):	435
Bulk Density (kg/m3):	2093
Proving Ring Factor:	101

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2152.7
Strain at Failure (%): 0.60



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.045
Lab no.:	07158	**Diameter (cm)**	5.1
Source:	BD-BHM 211	**Area (cm2)**	20.43
Depth:	59.66 - 59.85	**Volume (cm3)**	205.20

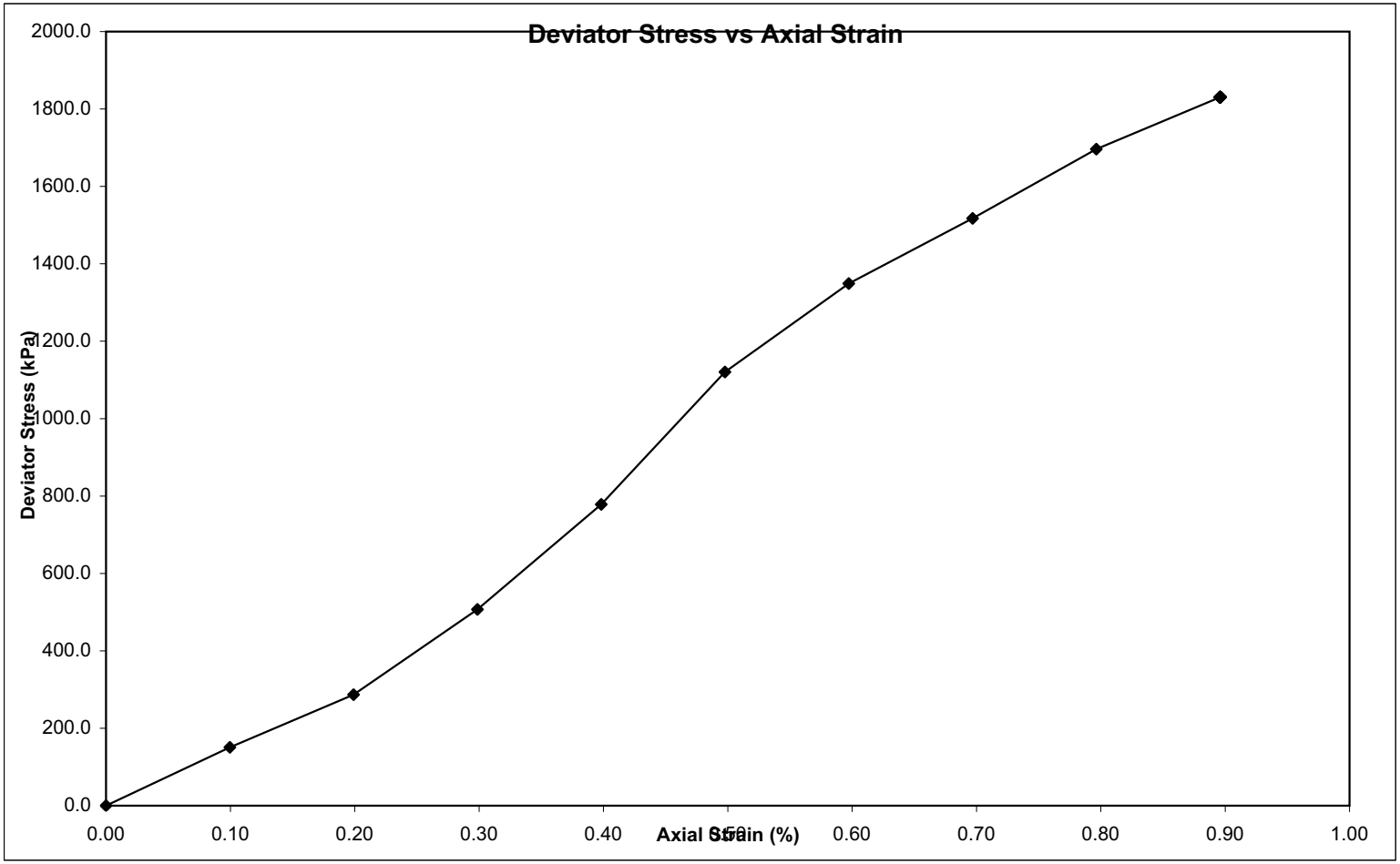
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	30	0.10	150.6
20	57.2	0.20	286.9
30	101.2	0.30	507.2
40	155.5	0.40	778.5
50	224	0.50	1120.3
60	270	0.60	1349.0
70	304	0.70	1517.4
80	340.2	0.80	1696.4
90	367.5	0.90	1830.6

Mass (g): 430
Bulk Density (kg/m3): 2096

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1830.6
Strain at Failure (%): 0.90



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.025
Lab no.:	07159	**Diameter (cm)**	5.15
Source:	BD-BHM 211	**Area (cm2)**	20.83
Depth:	60.55 - 60.74	**Volume (cm3)**	208.83

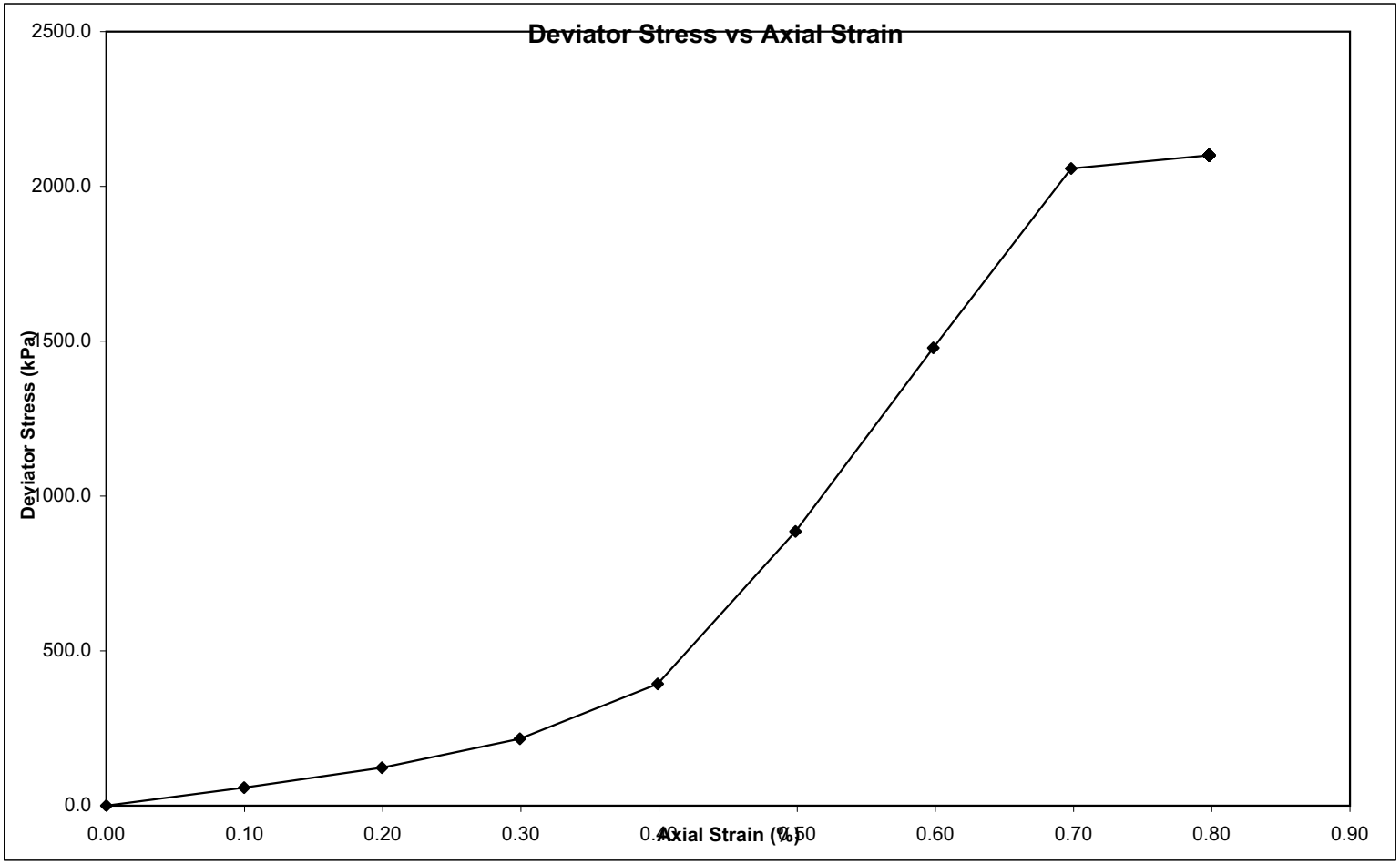
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	12	0.10	58.5
20	25.2	0.20	122.6
30	44.5	0.30	216.4
40	81	0.40	393.4
50	182.5	0.50	885.5
60	305	0.60	1478.4
70	425	0.70	2058.0
80	434.2	0.80	2100.5

Mass (g): 425
Bulk Density (kg/m3): 2035

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 2100.5
Strain at Failure (%): 0.80



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.01
Lab no.:	07160	**Diameter (cm)**	5.1
Source:	BD-BHM 211	**Area (cm2)**	20.43
Depth:	61.02 - 61.18	**Volume (cm3)**	204.49

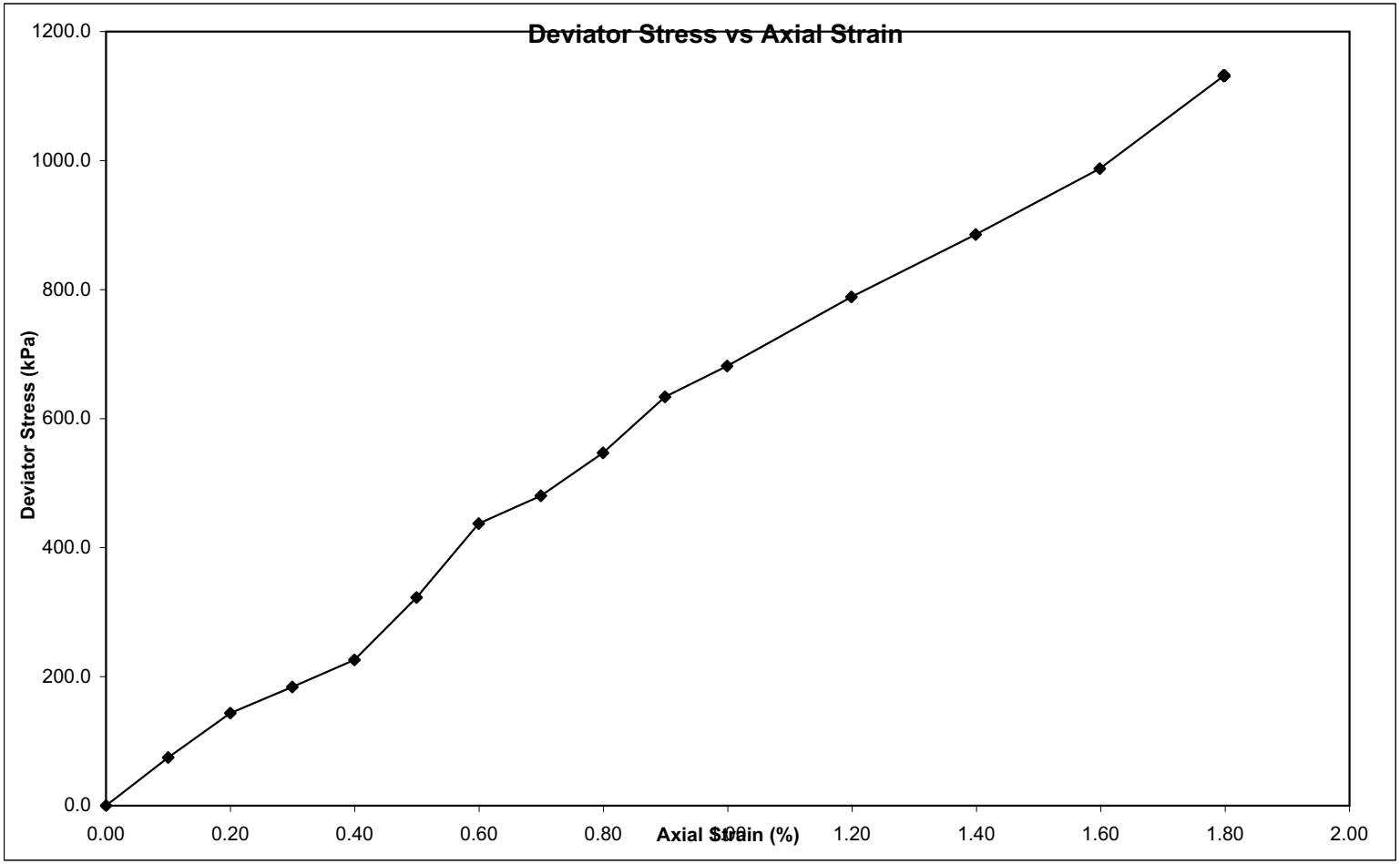
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	15	0.10	74.7
20	28.8	0.20	143.4
30	37	0.30	184.0
40	45.5	0.40	226.1
50	65	0.50	322.6
60	88.2	0.60	437.3
70	97	0.70	480.5
80	110.5	0.80	546.8
90	128.2	0.90	633.7
100	138	1.00	681.5
120	160	1.20	788.5
140	180	1.40	885.3
160	201.2	1.60	987.6
180	231	1.80	1131.6

Mass (g): 420
Bulk Density (kg/m3): 2054

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1131.6
Strain at Failure (%): 1.80



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.935
Lab no.:	07149	**Diameter (cm)**	5.215
Source:	BD-BHL 301	**Area (cm2)**	21.36
Depth:	45.11 - 45.27	**Volume (cm3)**	212.21

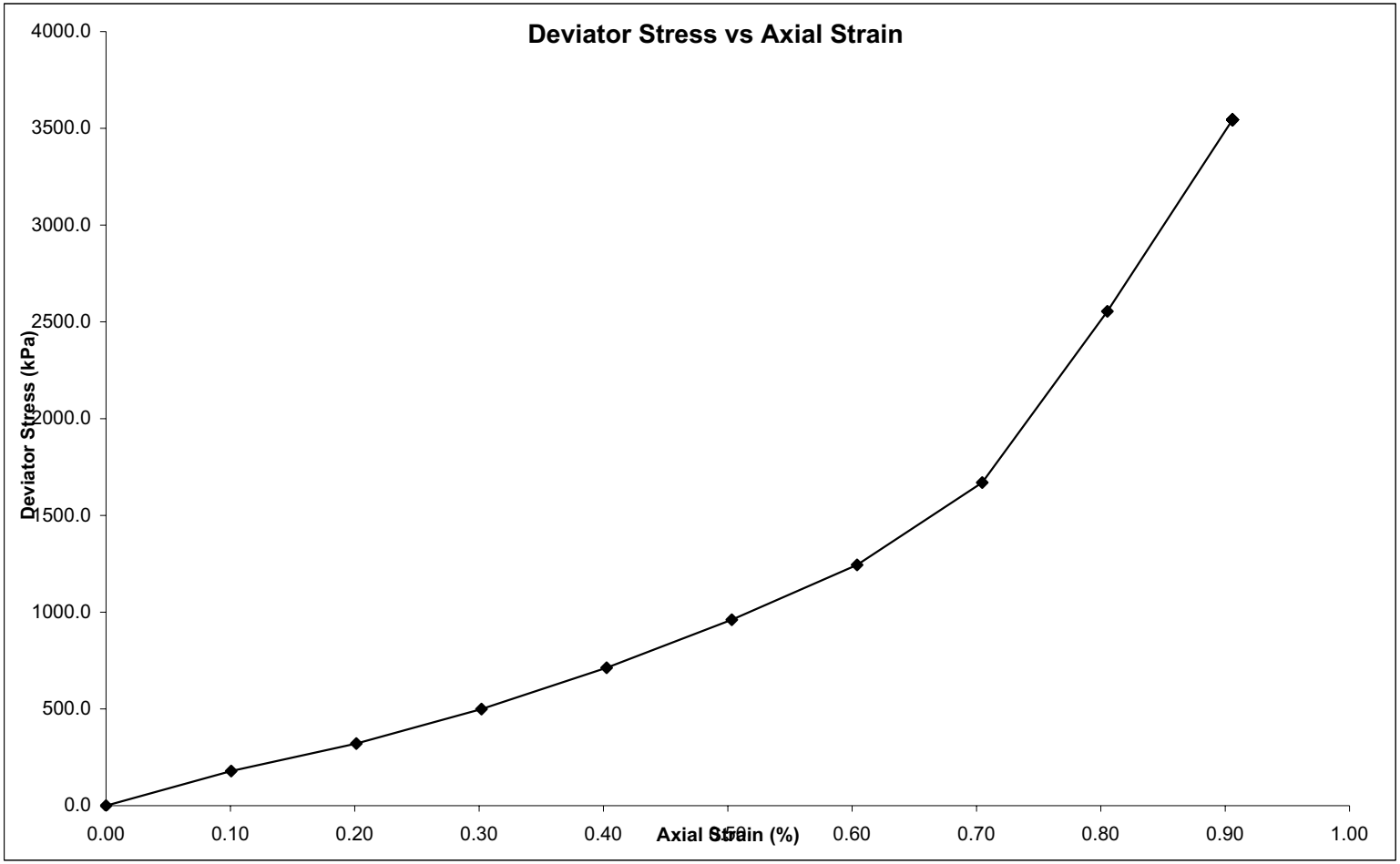
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	5	0.10	178.7
20	9	0.20	321.3
30	14	0.30	499.2
40	20	0.40	712.5
50	27	0.50	960.9
60	35	0.60	1244.3
70	47	0.70	1669.3
80	72	0.81	2554.6
90	100	0.91	3544.4

Mass (g): 535
Bulk Density (kg/m3): 2521

Proving Ring Factor: 764

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 3544.4
Strain at Failure (%): 0.91



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

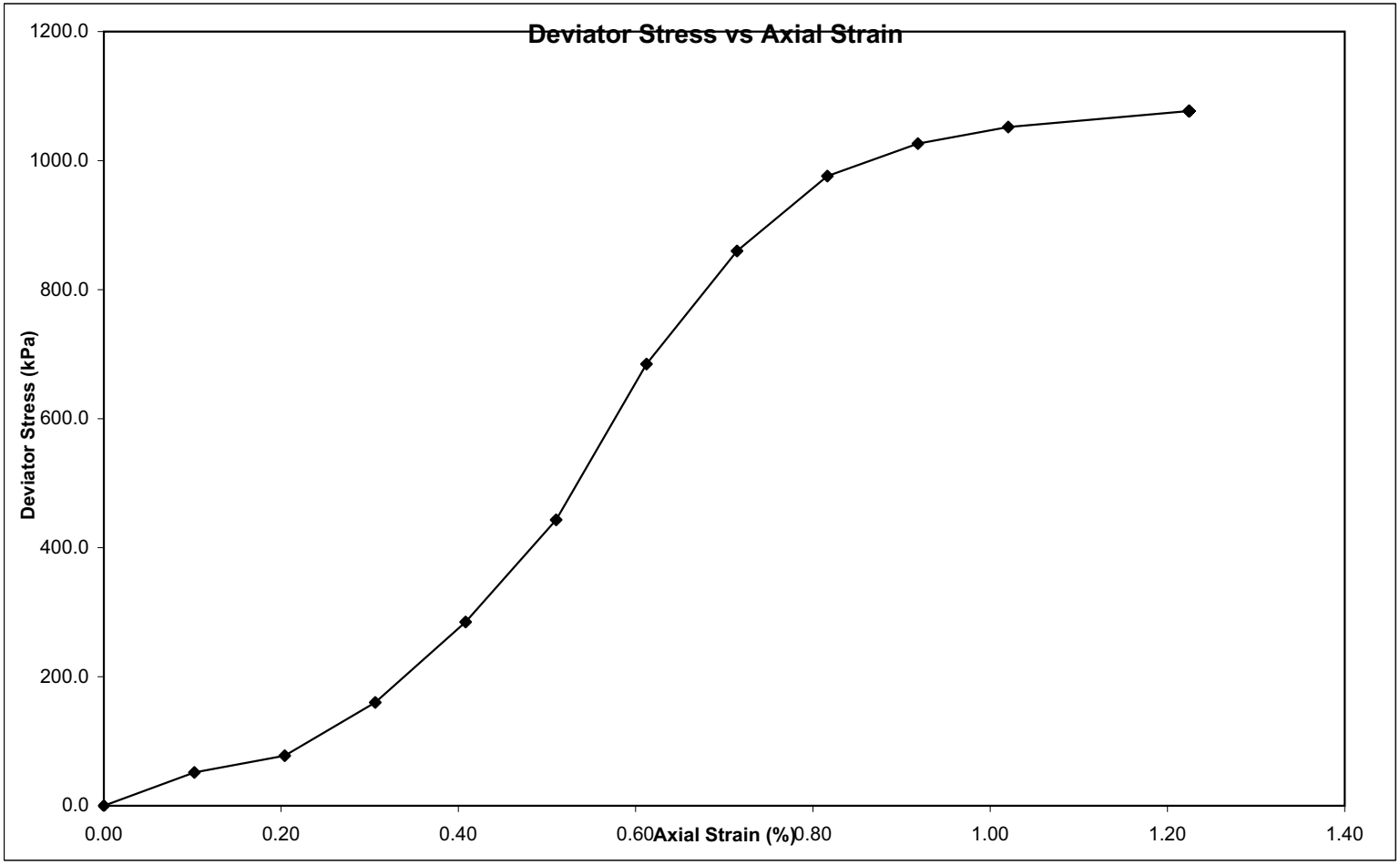
Job no.:	5382	**Length (cm)**	9.8
Lab no.:	07150	**Diameter (cm)**	5
Source:	BD-BHL 301	**Area (cm2)**	19.63
Depth:	46.74 - 46.88	**Volume (cm3)**	192.42

Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	10	0.10	51.7
20	15	0.20	77.5
30	31	0.31	160.1
40	55.2	0.41	284.7
50	86	0.51	443.2
60	133	0.61	684.7
70	167.2	0.71	859.8
80	190	0.82	976.1
90	200	0.92	1026.4
100	205.2	1.02	1052.0
120	210.5	1.22	1076.9

Mass (g):	380
Bulk Density (kg/m3):	1975
Proving Ring Factor:	102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1076.9
Strain at Failure (%): 1.22



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10
Lab no.:	07151	**Diameter (cm)**	5.25
Source:	BD-BHL 301	**Area (cm2)**	21.65
Depth:	47.30 - 47.47	**Volume (cm3)**	216.48

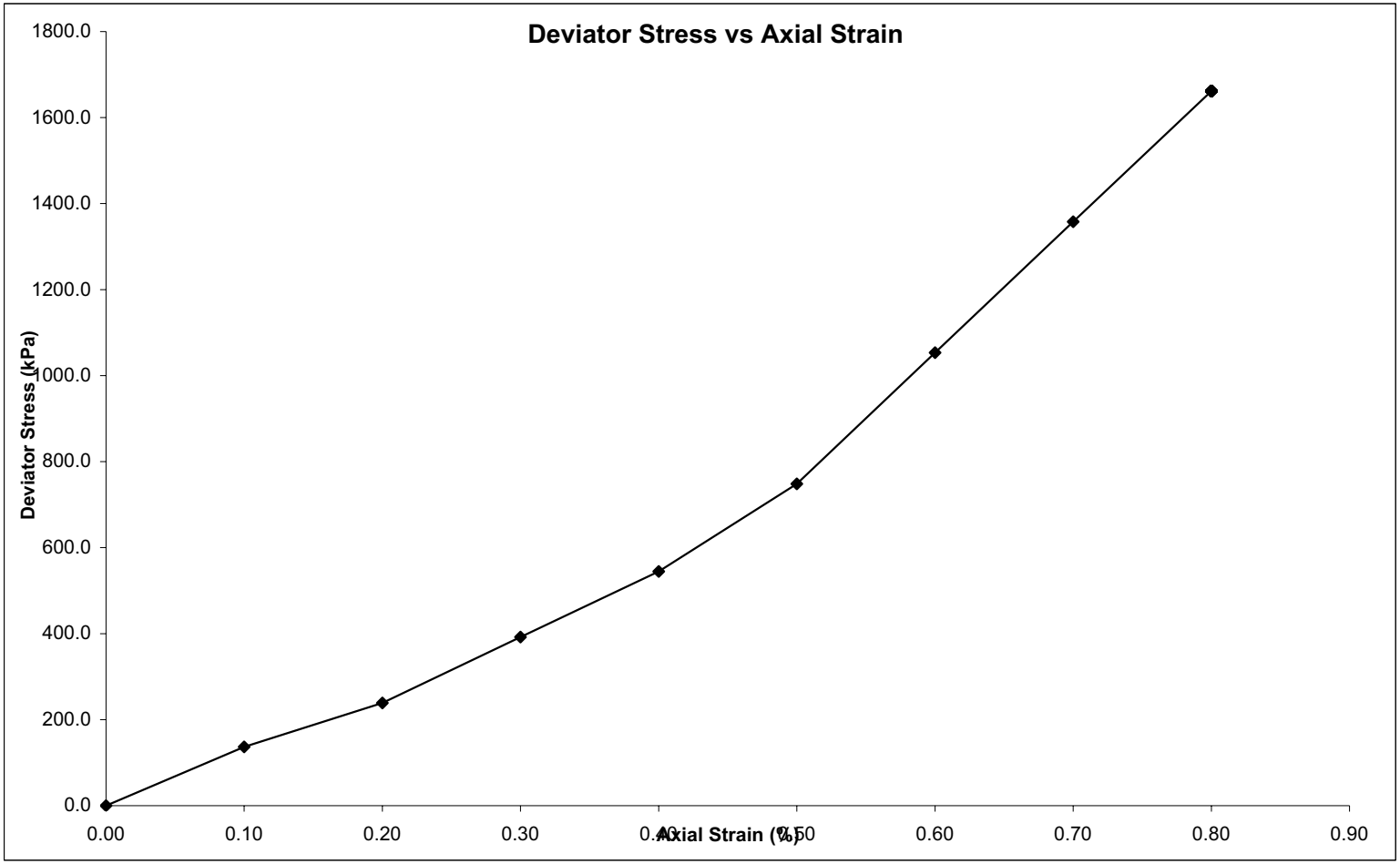
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	4	0.10	136.6
20	7	0.20	238.8
30	11.5	0.30	391.9
40	16	0.40	544.8
50	22	0.50	748.3
60	31	0.60	1053.3
70	40	0.70	1357.8
80	49	0.80	1661.6

Mass (g): 530
Bulk Density (kg/m3): 2448

Proving Ring Factor: 740

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1661.6
Strain at Failure (%): 0.80



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.145
Lab no.:	07152	**Diameter (cm)**	5.135
Source:	BD-BHL 301	**Area (cm2)**	20.71
Depth:	49.74 - 49.90	**Volume (cm3)**	210.10

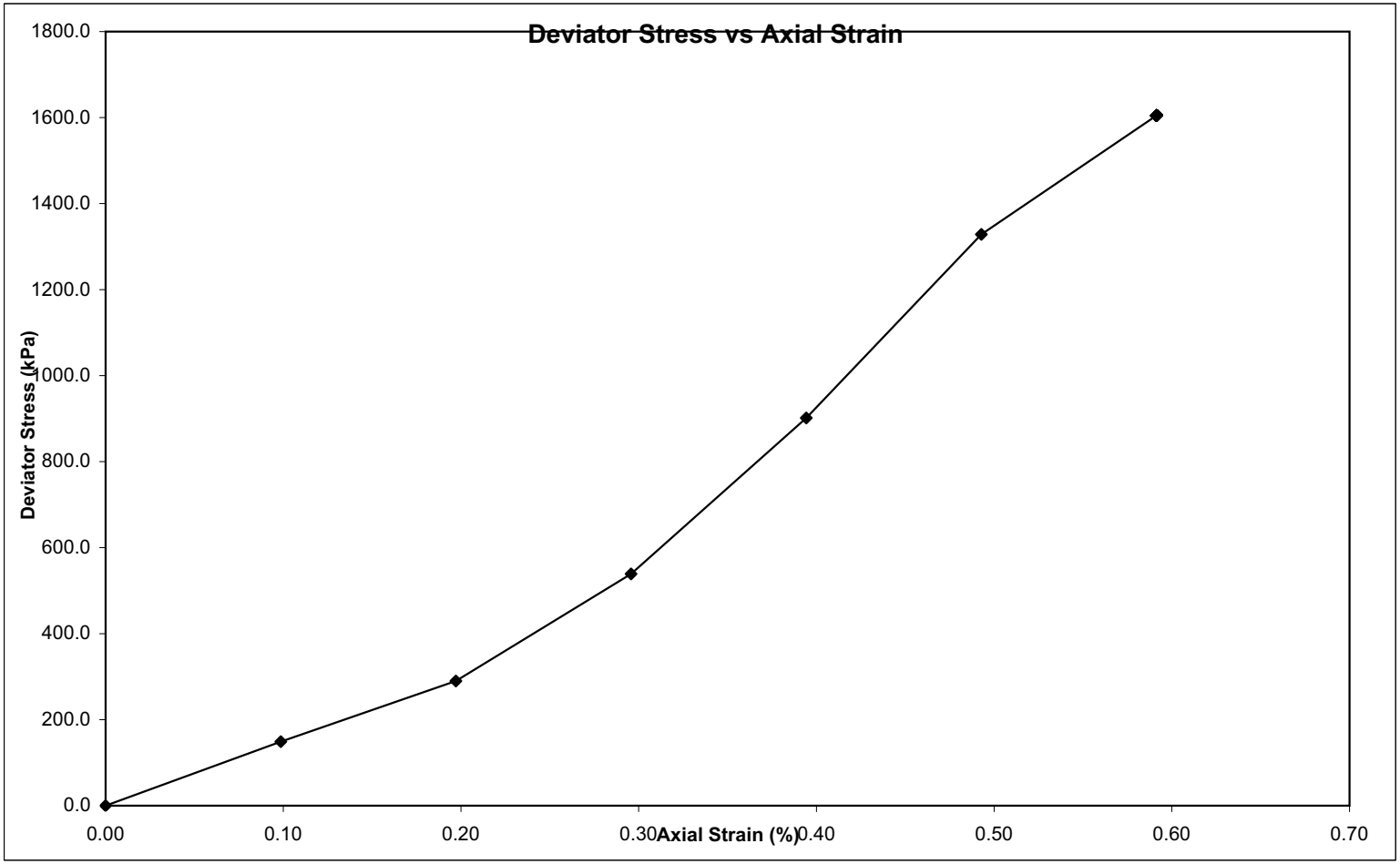
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	30	0.10	148.9
20	58.5	0.20	290.0
30	108.8	0.30	538.8
40	182.2	0.39	901.4
50	268.8	0.49	1328.5
60	325	0.59	1604.7

Mass (g): 420
Bulk Density (kg/m3): 1999

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1604.7
Strain at Failure (%): 0.59



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.99
Lab no.:	07144	**Diameter (cm)**	5.2
Source:	BD-BHL 309	**Area (cm2)**	21.24
Depth:	34.25 - 35.44	**Volume (cm3)**	212.16

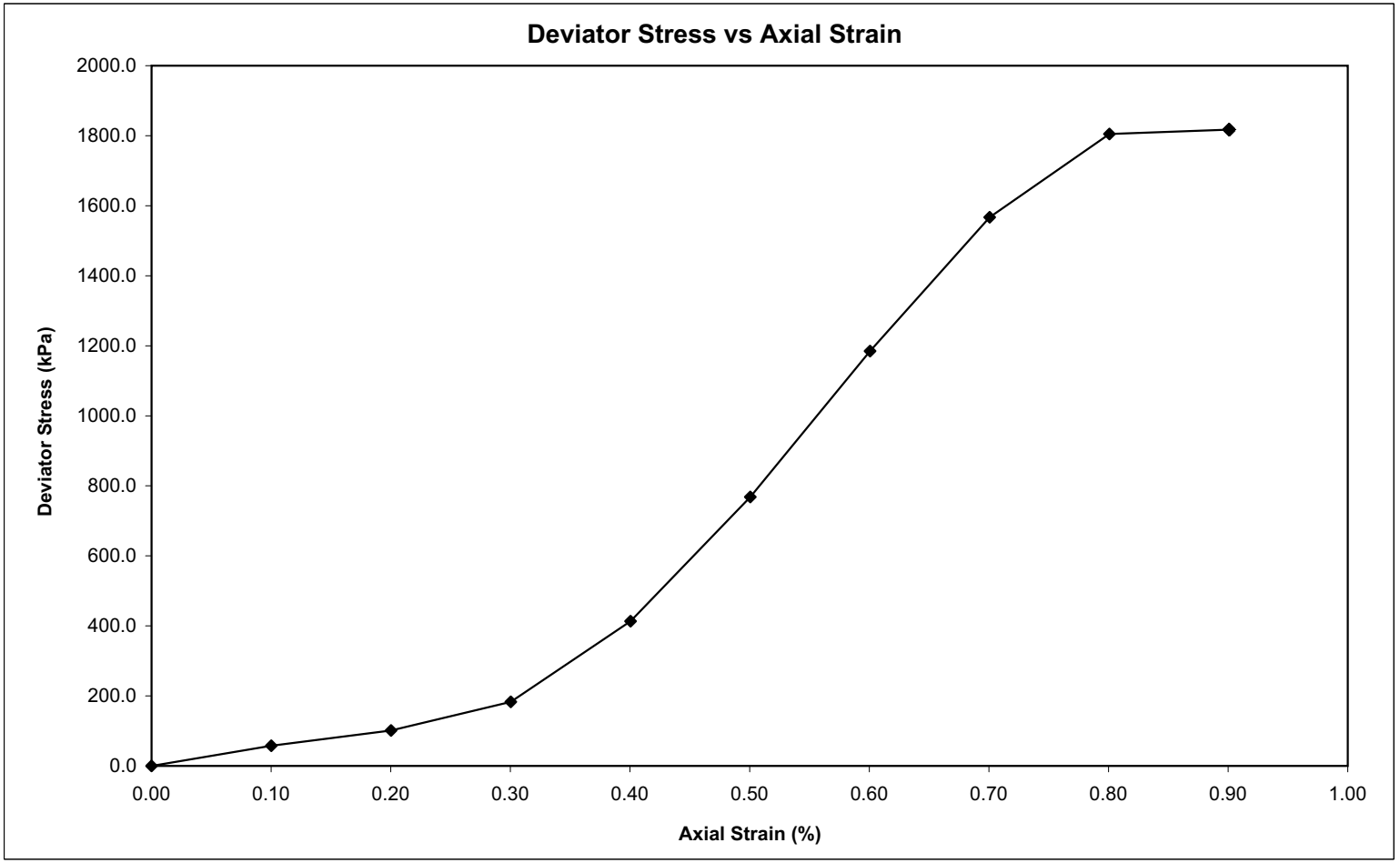
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	12	0.10	57.9
20	21	0.20	101.2
30	38	0.30	182.9
40	86	0.40	413.4
50	160	0.50	768.4
60	247	0.60	1185.0
70	327	0.70	1567.2
80	377	0.80	1805.0
90	380	0.90	1817.5

Mass (g): 425
Bulk Density (kg/m3): 2003

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1817.5
Strain at Failure (%): 0.90



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	9.785
Lab no.:	07145	**Diameter (cm)**	5.115
Source:	BD-BHL 309	**Area (cm2)**	20.55
Depth:	39.40 - 39.61	**Volume (cm3)**	201.07

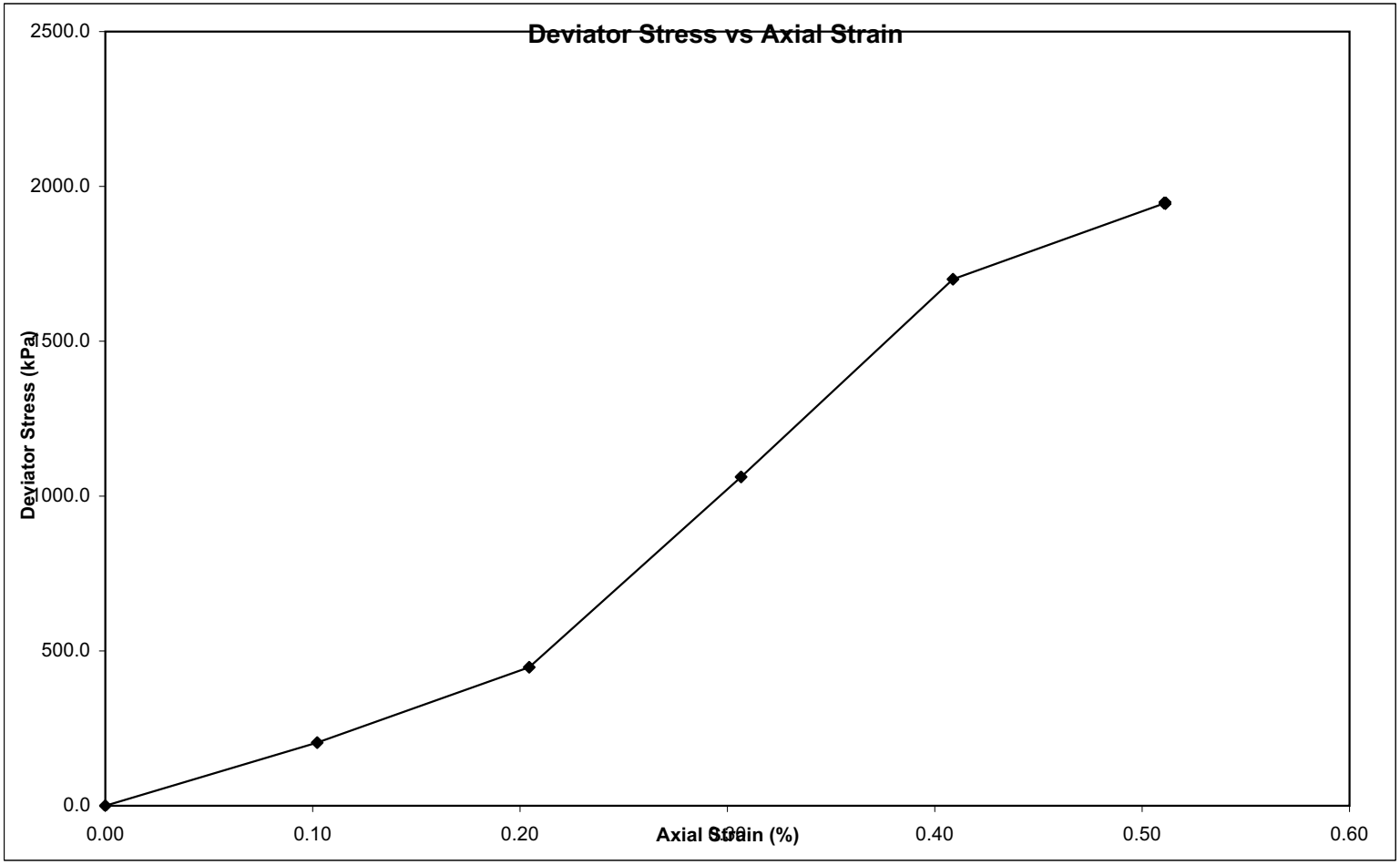
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	41	0.10	203.9
20	90	0.20	447.1
30	214	0.31	1061.9
40	343	0.41	1700.3
50	393	0.51	1946.2

Mass (g): 405
Bulk Density (kg/m3): 2014

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1946.2
Strain at Failure (%): 0.51



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.045
Lab no.:	07146	**Diameter (cm)**	5.15
Source:	BD-BHL 309	**Area (cm2)**	20.83
Depth:	40.84 - 41.02	**Volume (cm3)**	209.24

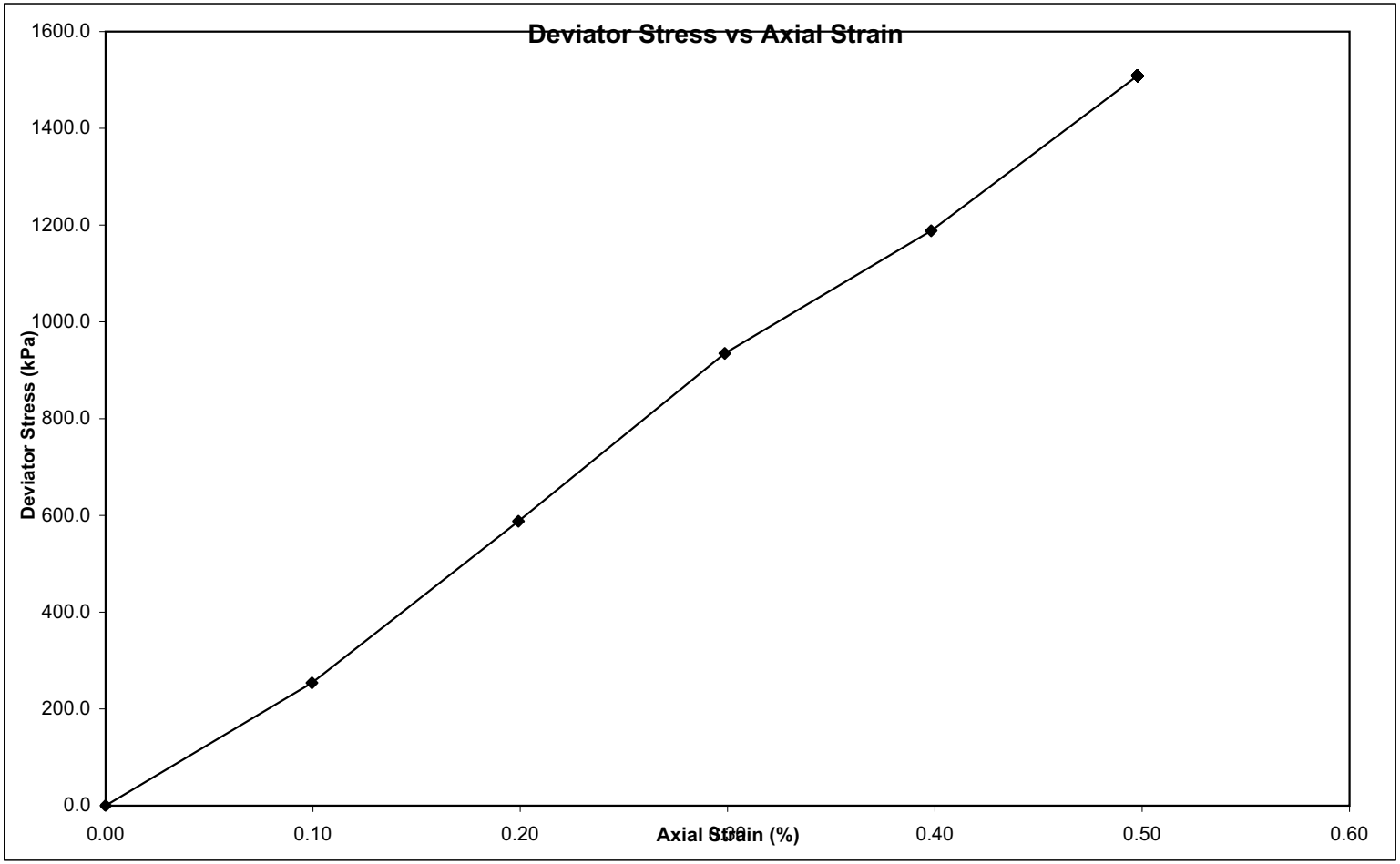
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	51.5	0.10	253.7
20	119.5	0.20	588.0
30	190.2	0.30	934.9
40	242	0.40	1188.4
50	307.5	0.50	1508.5

Mass (g): 415
Bulk Density (kg/m3): 8684

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1508.5
Strain at Failure (%): 0.50



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.145
Lab no.:	07147	**Diameter (cm)**	5.225
Source:	BD-BHL 309	**Area (cm2)**	21.44
Depth:	41.05 - 41.32	**Volume (cm3)**	217.53

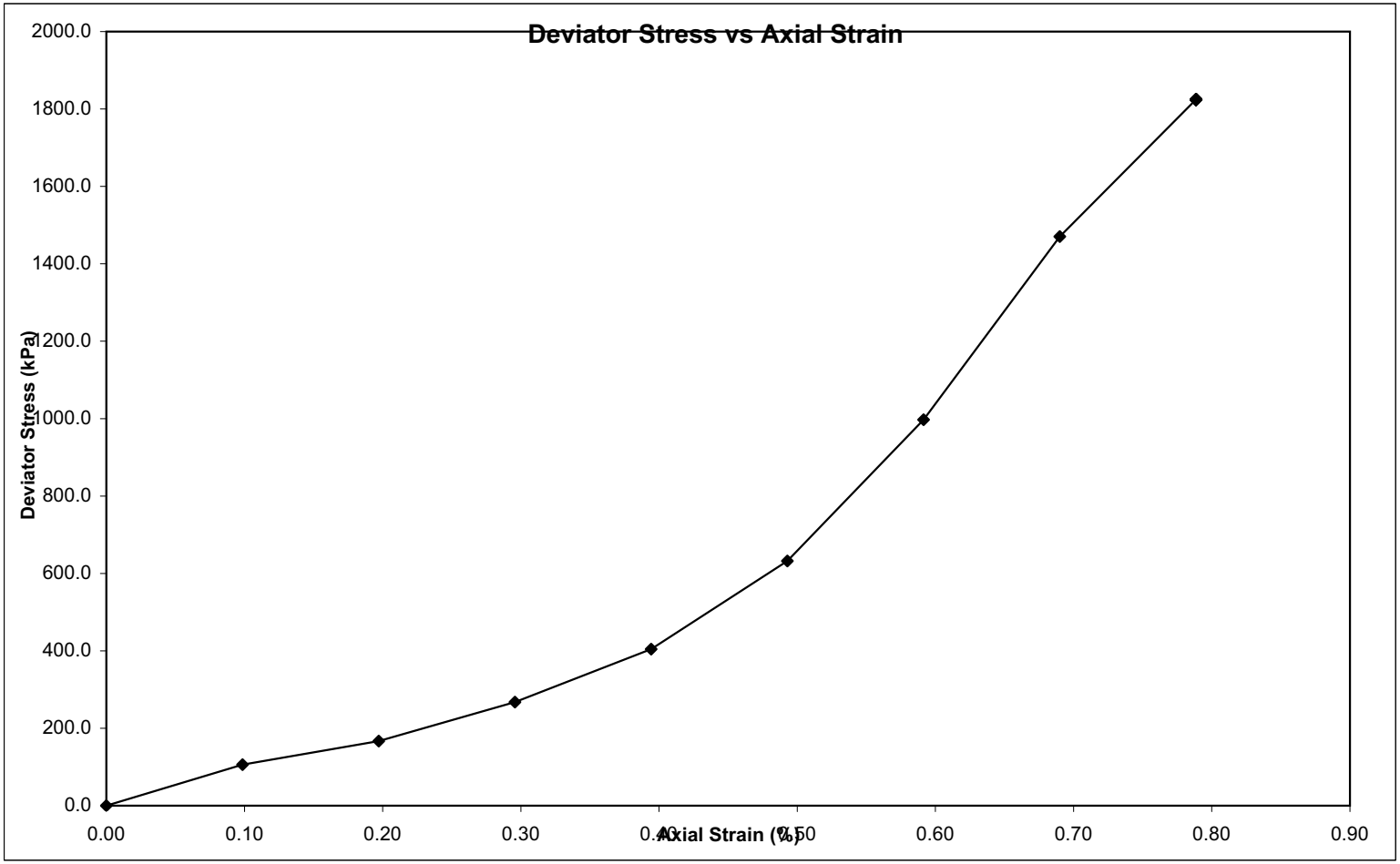
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	22.2	0.10	105.9
20	35	0.20	166.9
30	56.2	0.30	267.7
40	85	0.39	404.4
50	133	0.49	632.2
60	210	0.59	997.2
70	310	0.69	1470.5
80	385	0.79	1824.5

Mass (g): 440
Bulk Density (kg/m3): 2023

Proving Ring Factor: 102

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1824.5
Strain at Failure (%): 0.79



Job Description: Durban Harbour Berth Deepening Project O/D No. 5487

Job no.:	5382	**Length (cm)**	10.055
Lab no.:	07148	**Diameter (cm)**	5.15
Source:	BD-BHL 309	**Area (cm2)**	20.83
Depth:	41.57 - 41.86	**Volume (cm3)**	209.45

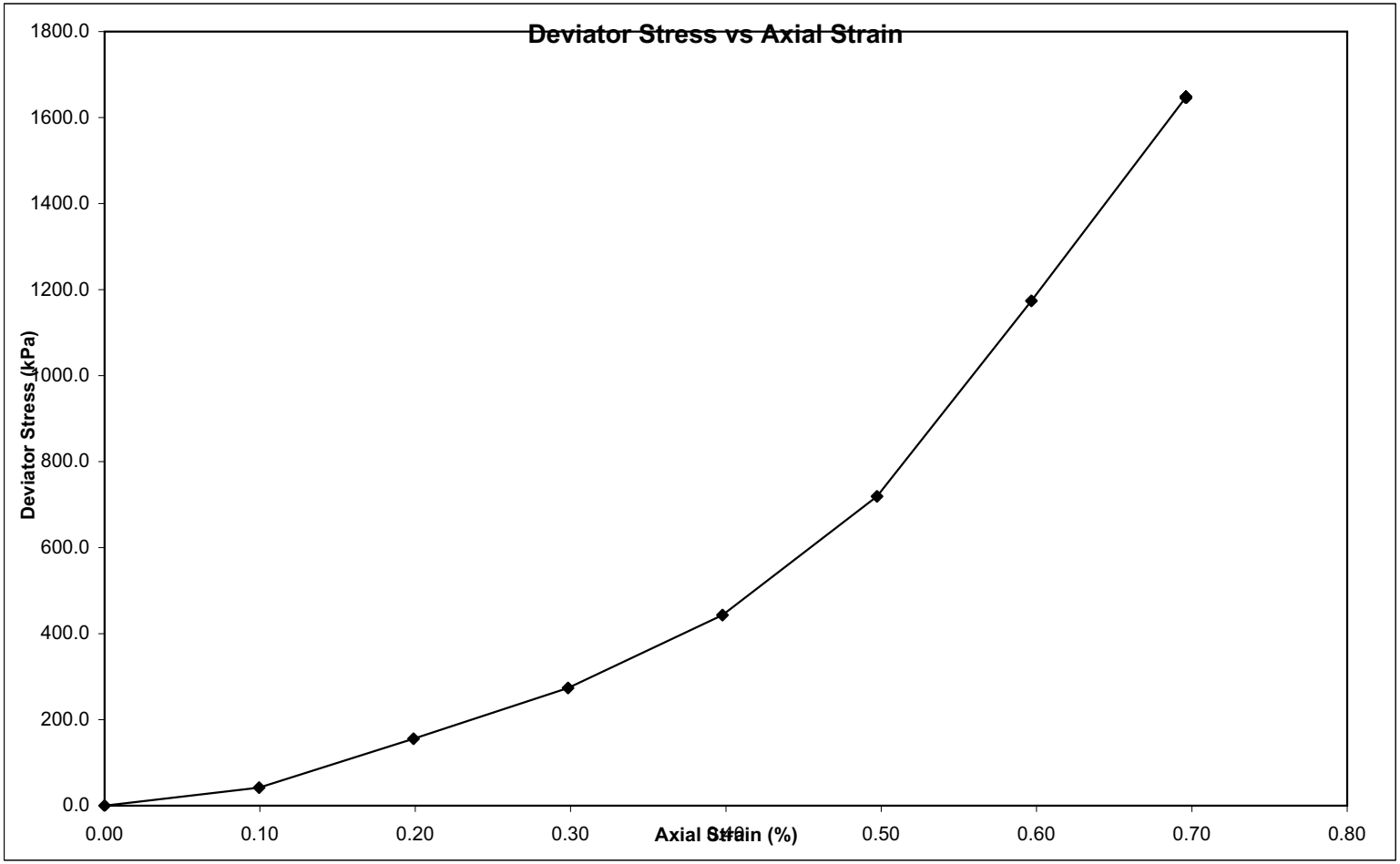
Stain Guage	Prooving Rinng	%Strain	Deviator Stress
0	0	0.00	0.0
10	8.5	0.10	42.0
20	31.5	0.20	155.4
30	55.5	0.30	273.6
40	90	0.40	443.2
50	146.2	0.50	719.3
60	238.8	0.60	1173.7
70	335.5	0.70	1647.4

Mass (g): 415
Bulk Density (kg/m3): 1981

Proving Ring Factor: 103

STRENGTH AND STRAIN PERAMETERS

Stress at Failure (kN/m^2): 1647.4
Strain at Failure (%): 0.70



5.3: Factual Report on Marine Cone Penetration Tests

(Frankie RPT No. Rev.0; June 2009)

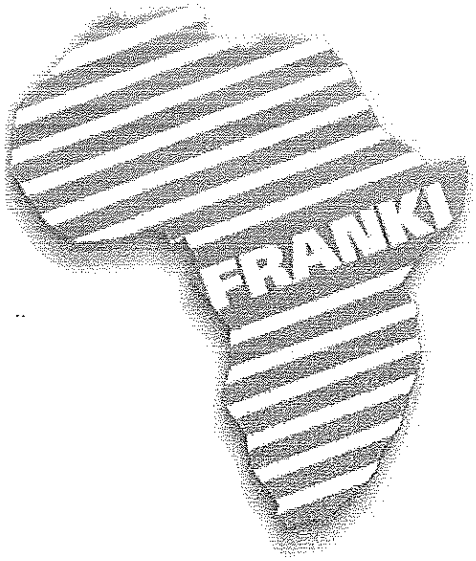
DURBAN HARBOUR BERTH DEEPENING

GEOTECHNICAL INVESTIGATION

FACTUAL REPORT ON MARINE CONE PENETRATION TESTS

JUNE 2009

REV. 0



DURBAN BERTH DEEPENING

GEOTECHNICAL INVESTIGATION

FACTUAL REPORT ON MARINE CONE PENETRATION TESTS

CONTENTS

1. Introduction

Franki Africa were appointed as a sub-contractor to Subtech Marine to undertake marine geotechnical investigation works for the proposed Berth Deepening Pre feasibility Study in October 2008 under Contract H500272-CPC002. The works consisted of marine electronic Cone Penetration Tests (CPTs).

This report contains the results of the marine electronic Cone Penetration Tests carried out for the Berth Deepening project. A series of land based Cone Penetration Tests were carried out by Geopractica as part of the same project but under a separate Contract. These tests are reported separately. In addition, concurrent with the investigation at Piers 1 and 2, a series of marine CPTs were carried out using the same equipment at Maydon Wharf under a separate Contract with PRDW.

2. Description of the Site

The site is located at Piers 1 and 2 in the Port of Durban and CPTs were carried out at Berths 101 and 203 at Pier 1 and Pier 2 respectively. The CPTs were carried out over water approximately 15-25m in front of the existing quay wall. The sea floor at the berths in this area are nominally maintained at a dredged depth of -12.8m CD although recent bathymetric surveys have indicated that sea bed is lower than this in places.

At the time of the marine investigation, Berth 203 was closed to shipping due to the re-engineering works being undertaken on the land side of this berth. The marine works at this berth, therefore, did not interfere with the operation of the port. Berth 101 is a lay by and bunkering berth. The berth was closed to shipping during the CPT operation in consultation with Transnet Port Terminals. As this berth is not a container berth, the affect on Port Operations was manageable.

Originally, a greater number of CPTs were planned to be carried out at Berths 102, 103, 204 and 205. However, due to the difficulties encountered during the CPT operations, the lack of penetration of the CPTs, the excessive time taken to carry out the CPTs and the limited technical data being obtained, further CPTs were cancelled from the investigation in order to minimize disruption to Port activities.

3. Description of the Geology of the site

The geology at sea bed level is composed of the Harbour Beds which are known to compose of layers of sand, silt and clay. The material can vary significantly over short horizontal distances as a result of palaeo channels which were eroded into the material during the last ice age. These channels have subsequently been infilled with younger sediments.

The site is underlain at depth by Cretaceous age siltstone and the boreholes and geophysical surveys have indicated that this lies approximately 20m below sea bed level over much of the site but is significantly deeper at berths 101 and 203 where buried palaeo channels are present. The toe of the quay wall was originally protected with rock fill scour protection extending to between 10m and 20m from the cope line of the quay wall.

4. Description of the Fieldworks carried out

Electronic static cone penetration testing (CPT) was carried out by Franki at 6 locations across the site (BD-CPTM101 to BD-CPTM103 and BD-CPTM207 to BD-CPTM209). Fieldworks were carried out between October 2008 and November 2008. All tests were carried out from the deck of a jack up provided by Subtech and the CPT rig was secured to the platform. The jack up was jacked out of the water at each location in order to provide a stable platform and counterweight for the CPT operation.

Tests were carried out using a lightweight rig with a 10T thrust capacity which was fixed onto position by means of welded cleats. Equipment and testing was in accordance with BS1377 (1990): Part 9 Clause 3.1. Three electrical piezocones manufactured by A P van den Berg of Holland were used on the site. The area of the cone used was $10cm^2$, the apex angle 60° and the area of the friction sleeve was $150cm^2$. The location of the pore water pressure sensor was on the shoulder of the cone in the U2 position.

Prior to the cone penetration test at each location, a standard rotary drilling rig was used to install casing to sea floor level. This was to prevent lateral buckling of the CPT rods in the water between the jack up deck and sea floor. The casing was socketed between 0.75m and 1.5m into the sea floor sediment and the material within the casing was wash bored. The drilling rig was also used to core through any obstructions found on the sea floor. Originally, N size casing (89.1mm mm Outisde Diameter) was used into which smaller diameter B size casing (73.2mm OD) was inserted. However, due to an incident of casing being bent, larger diameter P size casing (139.7mm OD) was subsequently used.

The piezocone was attached to the end of a series of rods. Once the casing was installed, the CPT rods were then lowered down the inside of the casing to the base of the borehole. During the lowering of the rods, depth measurements were not carried out automatically and the depth of the CPT probe was measured manually from the jack up deck. Once the base of the borehole had been reached, zero readings of the system was taken. The result of this is that the water pressure at the base of the casing is not reflected in all the subsequent porewater pressure readings.

The CPT probe was then pushed into the ground at a constant rate of 2cm/s. An umbilical cord transferred the electronic measurements from the cone up through the rods to a laptop computer. Automatic real time measurements were made of depth below sea floor level, resistance to penetration of the cone tip (q_c), frictional resistance on the surface sleeve (f_s), the pore water pressure (u), inclination in two directions, the depth below ground level and the friction ratio (R_f) was carried out by the equipment and stored to disc.

The cone was pushed to the termination depth of the equipment and the tests were generally terminated when the thrust resistance exceeded the capacity of the equipment.

Surveying of the jack up deck was carried out by Subtech at all locations and including precise positioning and leveling of the hole in the deck through which the CPTs were carried out.

The testing that was carried out proved to be very difficult, with problems including:

- Refusal in sand plugged in the bottom of the casing;
- Malfunctioning of the CPT equipment on a number of occasions;
- Obstructions at sea floor level which required all the CPT equipment to be withdrawn and the obstruction to be drilled out;
- Bent casing. The causes of the casing becoming bent are not fully understood and even the large diameter P size casing became bent on two occasions.;
- Shallow refusal on dense Harbour Beds sand at sea floor level.

As a result, only a small number of reliable tests were obtained within the 3 weeks fieldwork period. CPT testing over water is a very specialized operation and does not always prove to be a cost effective method.

5. Results of the Tests

A summary of the tests carried out together with the as built co-ordinates is given in Appendix A

Graphical plots of the CPTs are presented in Appendix B and the following data is presented graphically against depth:

Corrected cone resistance (q_t)

Friction ratio (R_f)

Pore water pressure (u)

The interpreted soil conditions are also shown on the test data sheet. The tests have been interpreted using the guidelines of Dr P K Robertson Et-al 1986 & 1990. It should be noted that the soil interpretation has been carried out automatically and during this process, a minimum strata thickness has been specified in order to maintain clarity on the log. Within each strata there may exist thin layers that are not identified in the soil interpretation (e.g. very thin layers of sand or silt in the clay). These thin layers may have significant geotechnical importance and reference to the raw data should be made to identify these layers.

The raw data for all the tests is also presented in the attached CD-ROM.

M. C. CLACK

500272-CPC002
Durban Berth Deepening
Summary of Marine CPT Testing

Date	Activity
BD-CPTM207	
10/10/2008	Install casing to 19.0m BDL Wash boring from 19.0 to 21.5m BDL Attempted probe from 21.5 - 21.78m BDL but terminated on obstruction Wash boring from 21.0m - 22.0m BDL
11/10/2008	Wash boring 22.0m - 23.5m BDL Attempted probe from 23.1 - 25.48m BDL but terminated on obstruction Rotary coring boulder from 23.1 to 27m BDL
12/10/2008	Casing bent overnight, pulled out and reinstated Install casing to 21m BDL Wash boring from 21.0m - 27.0m BDL Insert probe inside casing. Stopped at 25.40m. Left probe overnight
13/10/2008	Probe jammed inside casing. All rods and casing extracted
14/10/2008	Casing re-installed to 19.0m BDL Wash boring to 19.0m - 23.0m BDL Attempted probe from 23.1m -23.7m BDL but terminated on obstruction
15/10/2008	Rotary coring boulder 23.1m - 24.5m BDL Attempted probe from 24.0m - 25.38m BDL but terminated on obstruction Wash boring from 24.0m - 27m BDL
16/10/2008	Probing from 25.4m - 31.6m BDL - **Probe No. BD-BHM207.** Upper 1.6m of probe probably disturbed by wash boring
17/10/2008	Extract all casing and move jack up

BD-CPTM209	
18/10/2008	Install casing to 19.75m BDL Wash boring 19.75m - 20.5m BDL Probing from 20.5m - 31.74m BDL - **Probe No. BD-BHM209**
19/10/2008	Probe jammed in hole; attempting to extract
20/10/2008	Probe jammed in hole; attempting to extract
21/10/2008	Probe extracted from hole. Casing broke off and large diameter casing bent

BD-CPTM208	
22/10/2008	Install N and P size casing to 19.0m BDL. Wash boring 16.0m - 20.0m BDL Install B size casing to 20.0m BDL Probing from 20.0m - 30.8m BDL. No tip resistance readings due to equipment malfunction. No results.

23/10/2008	Jack up removed from berth 203 due to re-opening of berth to shipping and repeat test at BD-CPTM208 not possible. Jack up moved to Maydon Wharf

BD-CPTM101	
13/11/2008	Install P size casing to 18.80m BDL. Install N size casing to 17.0m BDL Wash boring 17.0m - 20.5m BDL Install BW casing to 20.5m BDL Attempted probe from 20.4m - 21.94m but terminated on obstruction
14/11/2008	Wash boring 20.5m - 22.0m BDL Probing from 21.9 - 35.84m. **Probe No. CPT-BDM101**. However, below 30.74m BDL (8.84m penetration depth), suspected equipment malfunction and unreliable readings. Porewater pressure possibly unreliable throughout test.

BDL: Below jack up deck level

500272-CPC002
Durban Berth Deepening
Summary of Marine CPT Testing

Date	Activity
BD-CPTM102	
17/11/2008	Install P size casing to 18.5m BDL Install N size casing to 17.40 and wash boring 17.4 - 20m BDL Install B size casing to 19.5m BDL Probing 20.1m - 27.94m BDL - **Probe No. BD-CPTM102**. After 7.84m penetration depth signal became corrupted and test abandoned; jack up moved to BD-CPTL102A

BD-CPTM102A	
19/11/2008	Install casing to 17.1m BDL Wash boring 17.1m to 19.0m BDL Attempted probe from 19.0m - 20.26m but terminated on obstruction Wash boring 19.0m - 20.5m BDL
20/11/2008	Casing discovered bent, pulled out and reinstated Install casing to 16.4m BDL Wash boring 16.4m - 18.3m BDL Attempted probe 18.3m - 18.96m BDL but terminated on obstruction Wash boring 18.9m - 22.0m BDL Probing 21.3m - 23.92m BDL - **Probe No. BD-CPTM102A**. At 23.92m BDL (2.62m probe depth), power cut on jack up caused test data to become corrupted
21/11/2008	Extract casing and move position

BD-CPTM103	
22/11/2008	Install casing to 19.5m BDL. Wash boring to 20.1m BDL Attempted probe 20.1m - 20.78m BDL but terminated on obstruction Wash boring 20.0m - 24.0m BDL
23/11/2008	Probing 25.3m - 29.5m BDL - **Probe No. BD-CPTM103**

BDL: Below jack up deck level

Durban Harbour - Berth Deepening CPT Summary

Test No.	Date	WGS84/WG31 Co-ordinates		Jack up deck level	Sea bed level	Sea bed level	Top of test	CPT Penetration	Base of test	Comments
		Y	X	m CD	m BDL	m CD	m BDL	m	m BDL	
BD-CPTM101	14/11/2008	-3023	3306972	4.3	17.45	-13.15	21.90	13.94	35.84	After 8.84m the results are unrelaible with sharp drop in Qc value at rod change, subsequent negative Qc values and very high Friction Ratio. Porewater pressures indicate unstaurated cone for all of the test.
BD-CPTM102	17/11/2008	-3054	3306885	4.1	17.70	-13.60	20.10	7.84	27.94	Approx 7.84m of useful data and then depth signal corrupted and test abandoned
BD-CPTM102A	20/11/2008	-3056	3306886	3.4	16.80	-13.40	21.30	2.62	23.92	Approximately 2.62m of useful data and then power cut leading to aborted test
BD-CPTM103	23/11/2008	-3086	3306826	3.4	18.00	-14.60	25.30	4.20	29.50	Test refused at 4.20m.
BD-CPTM207	16/10/2008	-2023	3306635	3.8	19.00	-15.20	25.40	6.20	31.60	Upper 1.6m of probe possibly disturbed by wash boring
BD-CPTM209	18/10/2008	-2206	3306578	3.95	17.75	-13.80	20.50	11.24	31.74	

mBDL: metres below jack up deck level

L&M

SEA ISLAND CPT POSITIONS

Nr. CIV 08/008

PROJECT: WG31

REF. SYSTEM *As per contract*

DATE 2009/04/08 SURVEYOR C.J. Marx

Employee Work Nr. 2201 Staff

Date	CPT NO.	POSITION Y	X	Z	REMARKS
2008/10/17	BD CPT 207	-2023	3306635	3.8	BTH 55/56#203
2008/10/18	BD CPT 209	-2206	3306578	3.95	Bol 45 30m off quay side # 203
2008/10/22	BD CPT 208	-2101	3306603	3.7	Bol 51 30m off quay side # 203
2008/10/23	CPT-MW12/4	-248	3307224	3.3	Berth 203 Maydon Wharf 12
2008/10/24	CPT-MW12/7	-94	3307244	3.4	Maydon Wharf 12
2008/11/13	BD-BHM-101	-3023	3306972	4.3	Pier 101 # 3&4
2008/11/17	BD-BHM-102	-3054	3306885	4.1	Pier 101 # 8&9
2008/11/19	BD-BHM-102	-3056	3306886	3.4	Pier 101 # 8&9
2008/11/22	BD-BHM-103	-3086	3306826	3.4	Pier 102 # 12
2208/11/25	CPT-MW-12/2	-348	3307204	3.7	Pier 102 # 13
2008/11/26	CPT-MW-12/6	-149	3307237	3.6	M/W 12/6
2008/11/27	CPT-MW-12/5	-198	3307229	3.8	M/W 12/5
2008/12/02	CPT-MW-12/1	-376	3307171	3.1	M/W 12/1
2008/12/03	SPT-MW-12/3	-298	3307216	3.6	M/W 12/3
2008/12/04	SPT-MW-12/2	-346	3307207	3.3	M/W 12/2
2008/12/04	SPT-MW-12/4	-247	3307220	2.9	M/W 12/4
2008/12/08	SPT-MW-12/6	-144	3307237	3	M/W 12/6

Franki Africa
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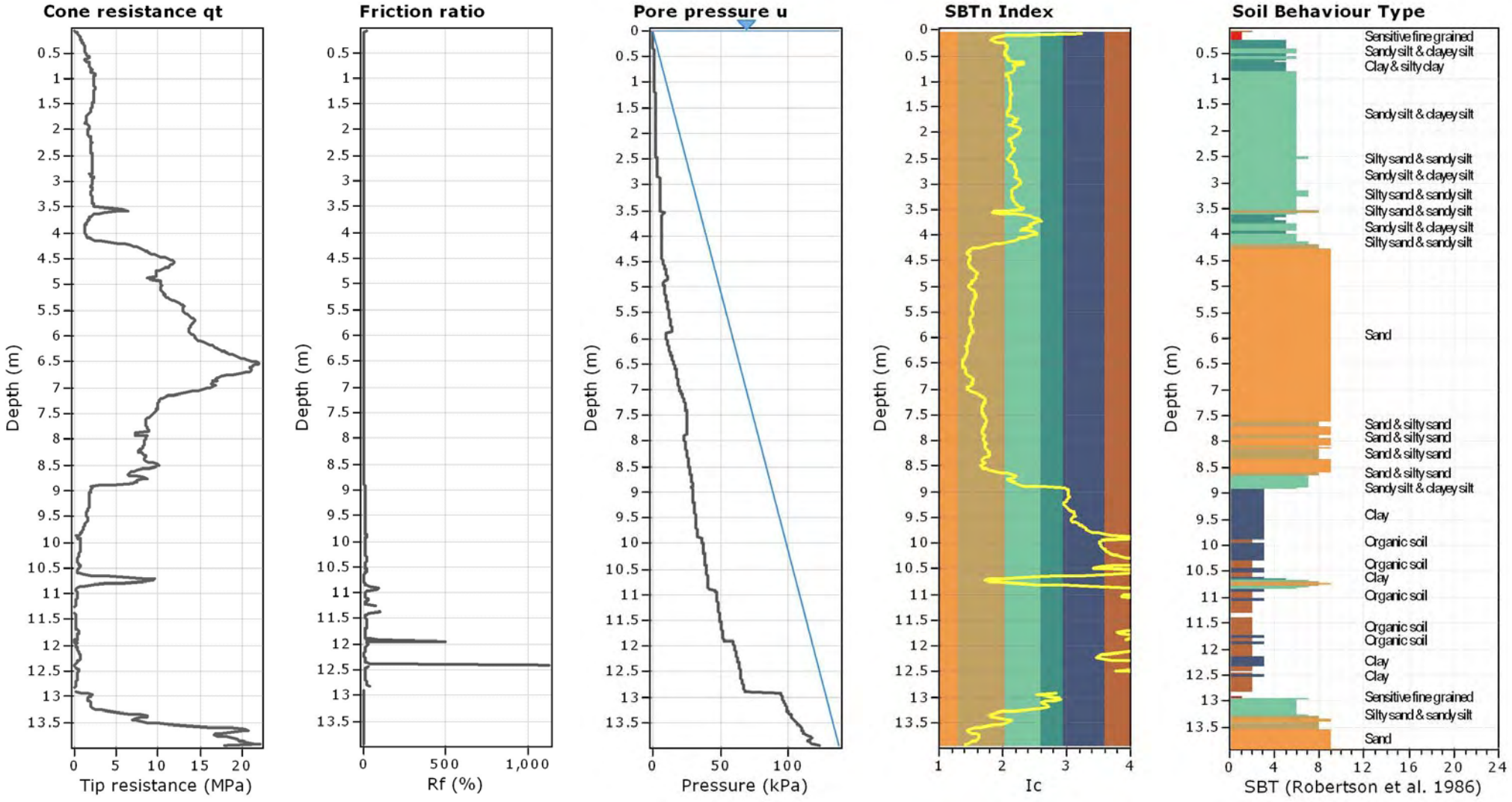
25 Richmond Rd, Durban
http://www.franki.co.za

Project: Durban Harbour CPT's

CPT: BD-CPTM101 - Total depth: 13.94 (m)



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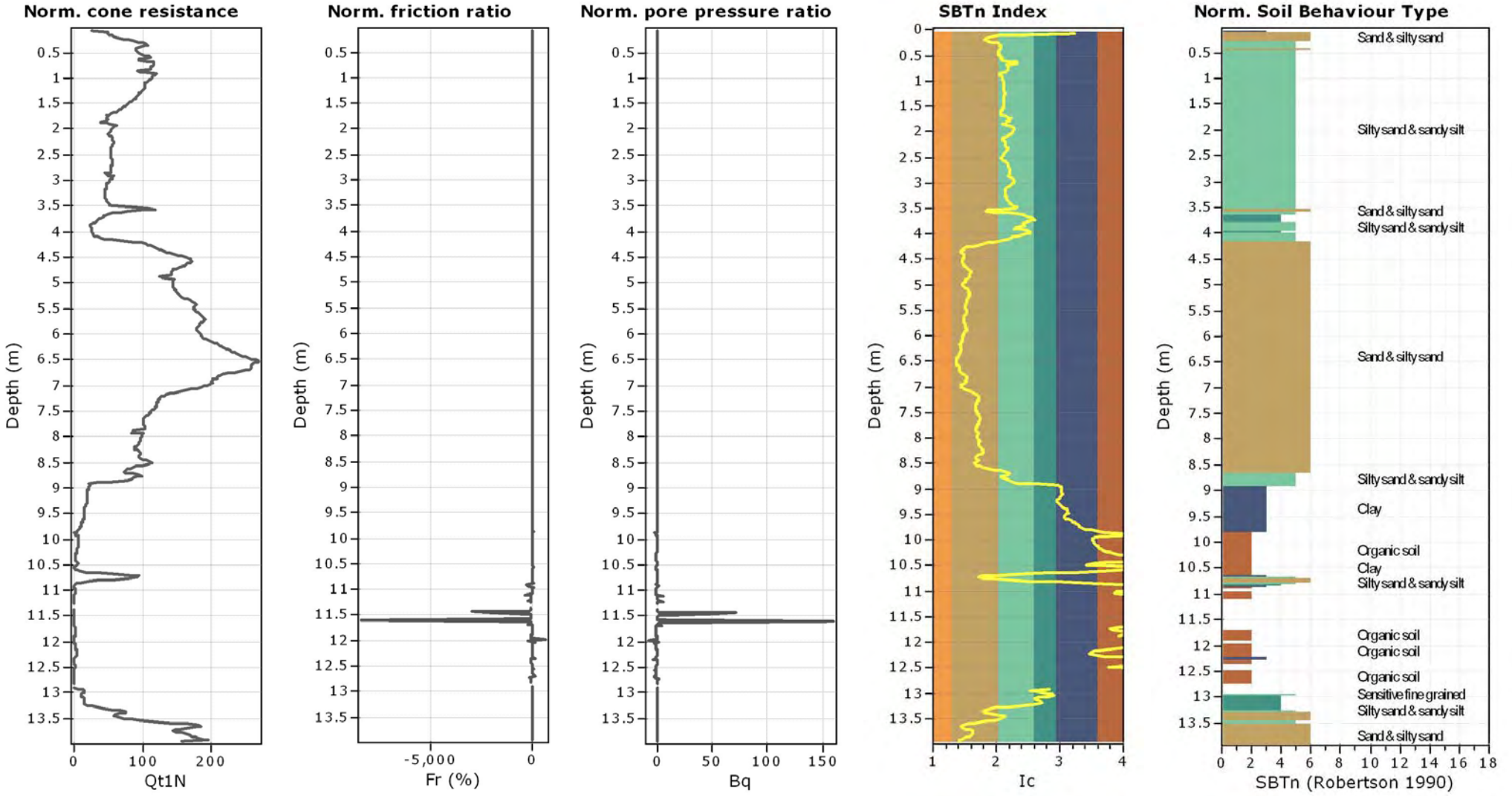
Project: Durban Harbour CPT's

CPT: BD-CPTM101 - Total depth: 13.94 (m)



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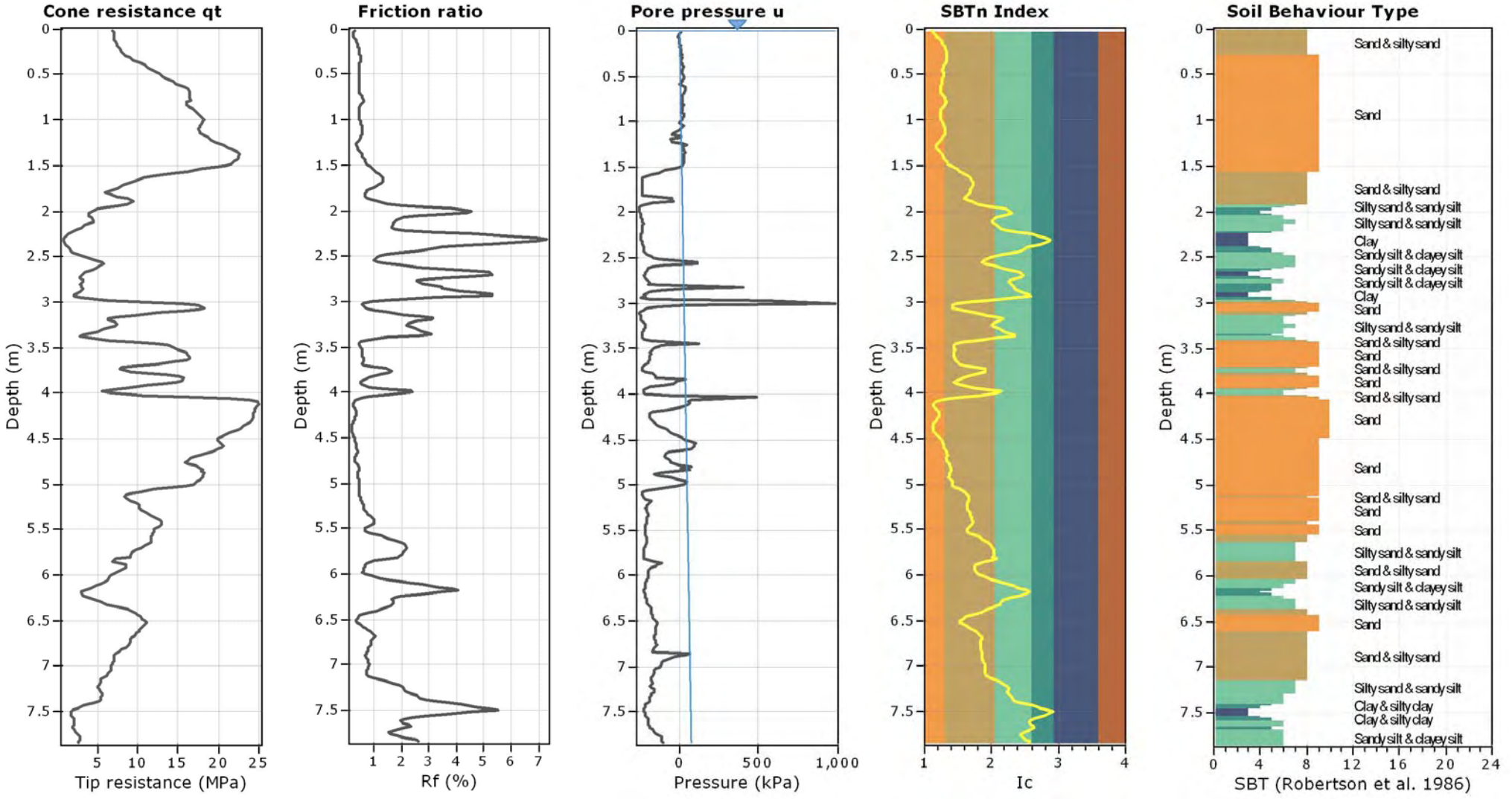
Project: Durban Harbour CPT's

CPT: BD-CPTM102 - Total depth: 7.84 (m)



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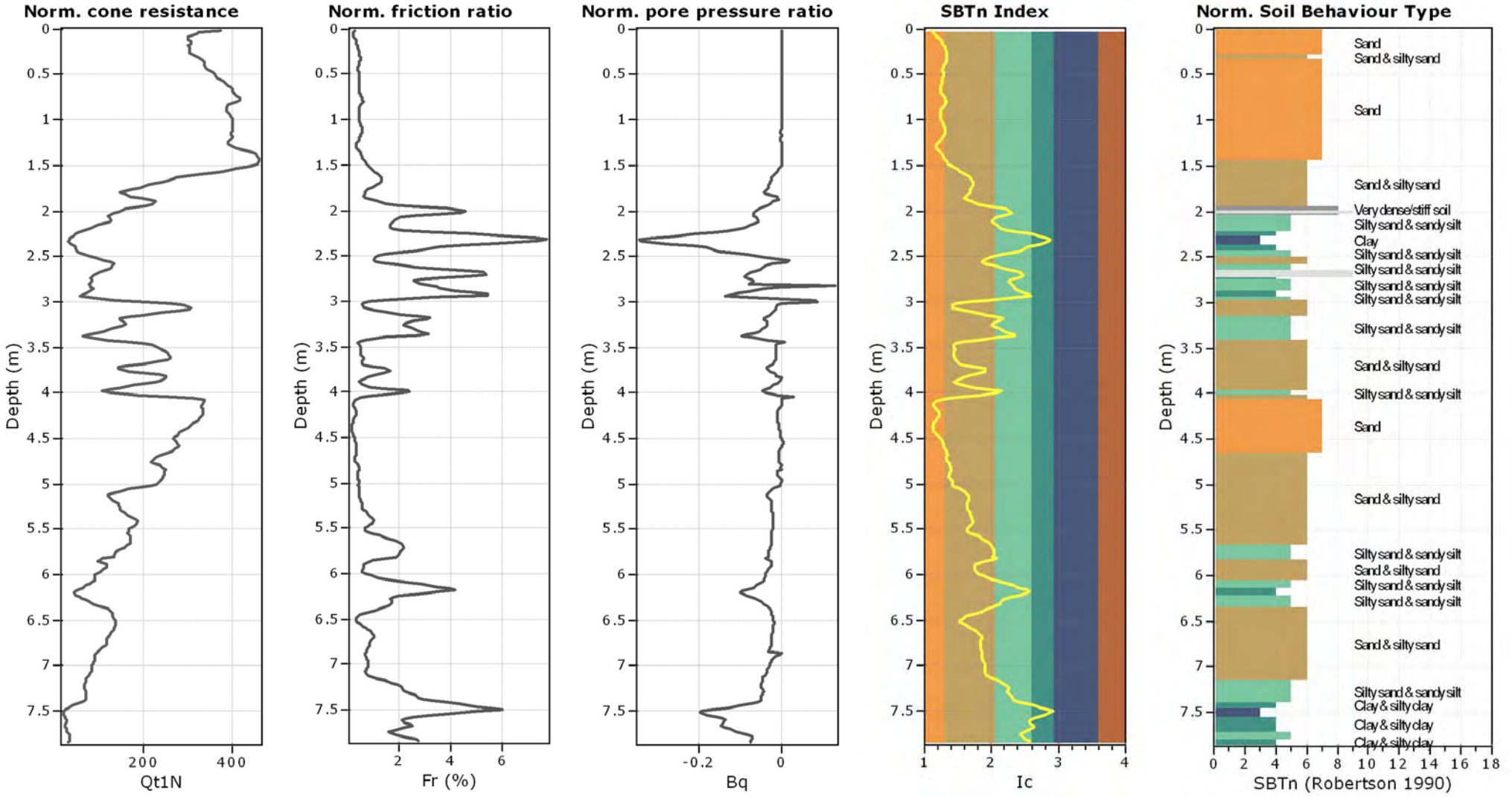
Project: Durban Harbour CPT's

CPT: BD-CPTM102 - Total depth: 7.84 (m)



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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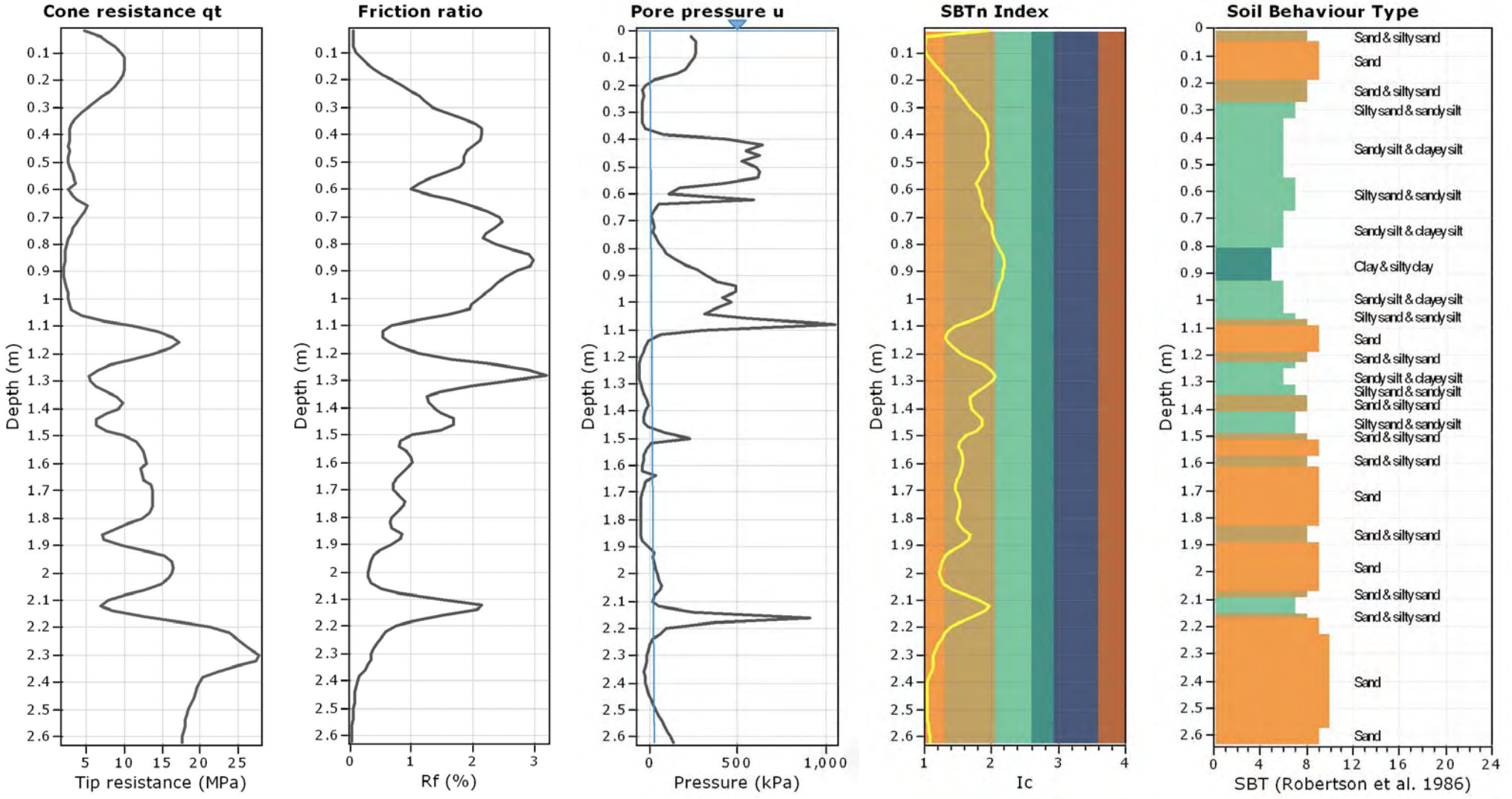
Project: Durban Harbour CPT's

CPT: BD-CPTM102A - Total depth: 2.62 (m)



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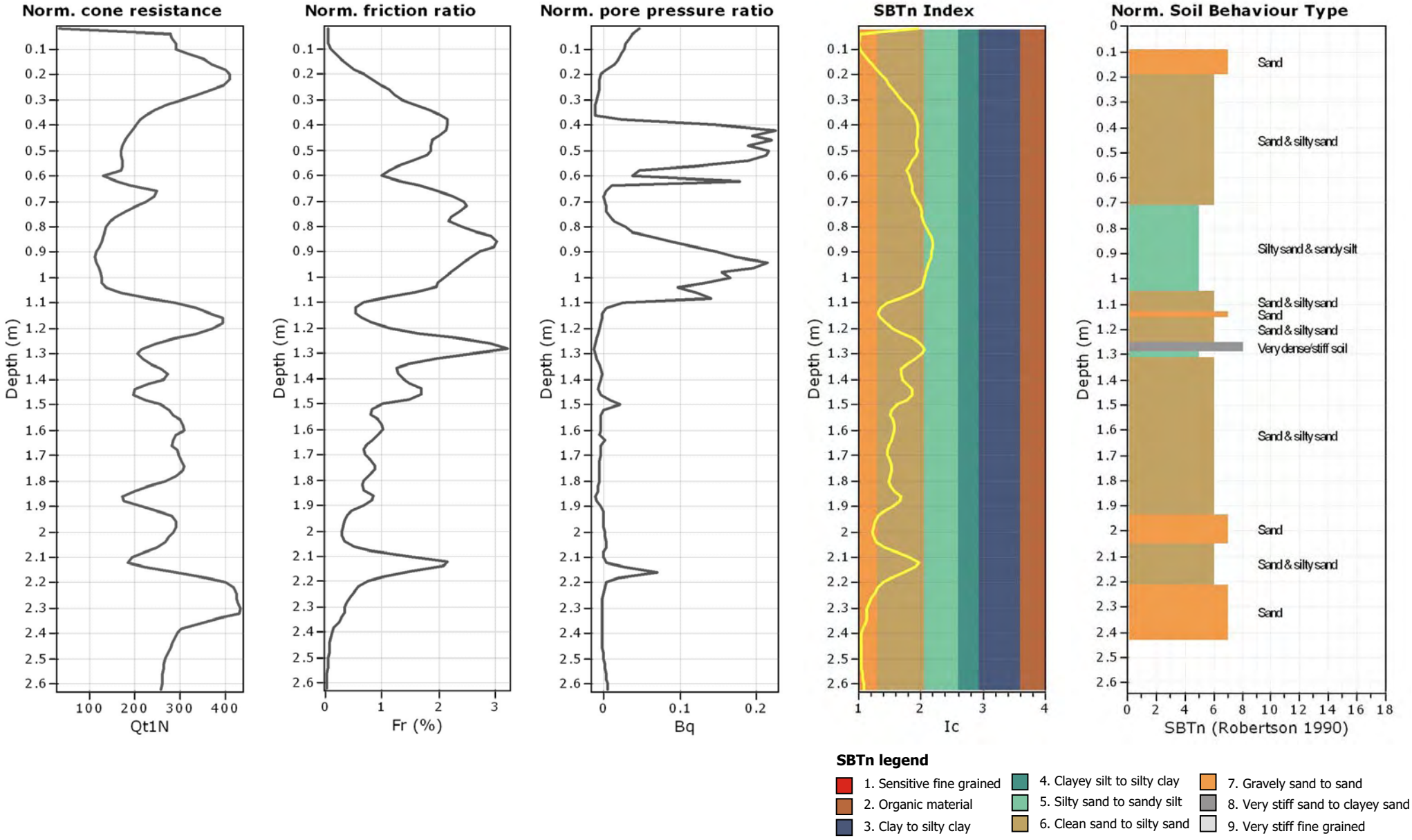
Project: Durban Harbour CPT's

CPT: BD-CPTM102A - Total depth: 2.62 (m)



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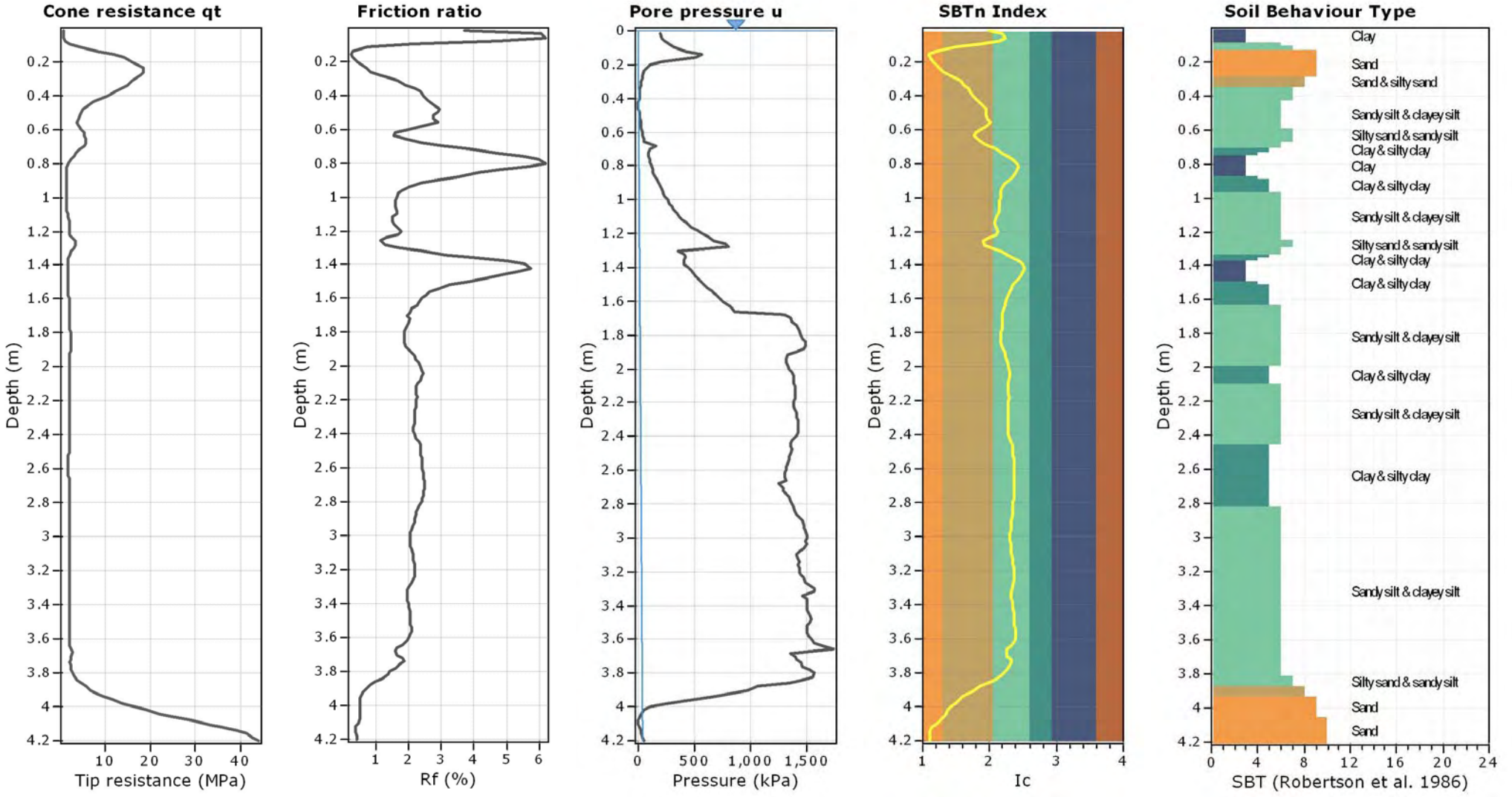
Project: Durban Harbour CPT's

CPT: BD-CPTM103 - Total depth: 4.20 (m)



SBT legend

1. Sensitive fine grained	4. Clay & silty clay	7. Silty sand & sandy silt	10. Sand
2. Organic material	5. Clay & silty clay	8. Sand & silty sand	11. Very dense/stiff soil
3. Clay	6. Sandy silt & clayey silt	9. Sand	12. Very dense/stiff soil

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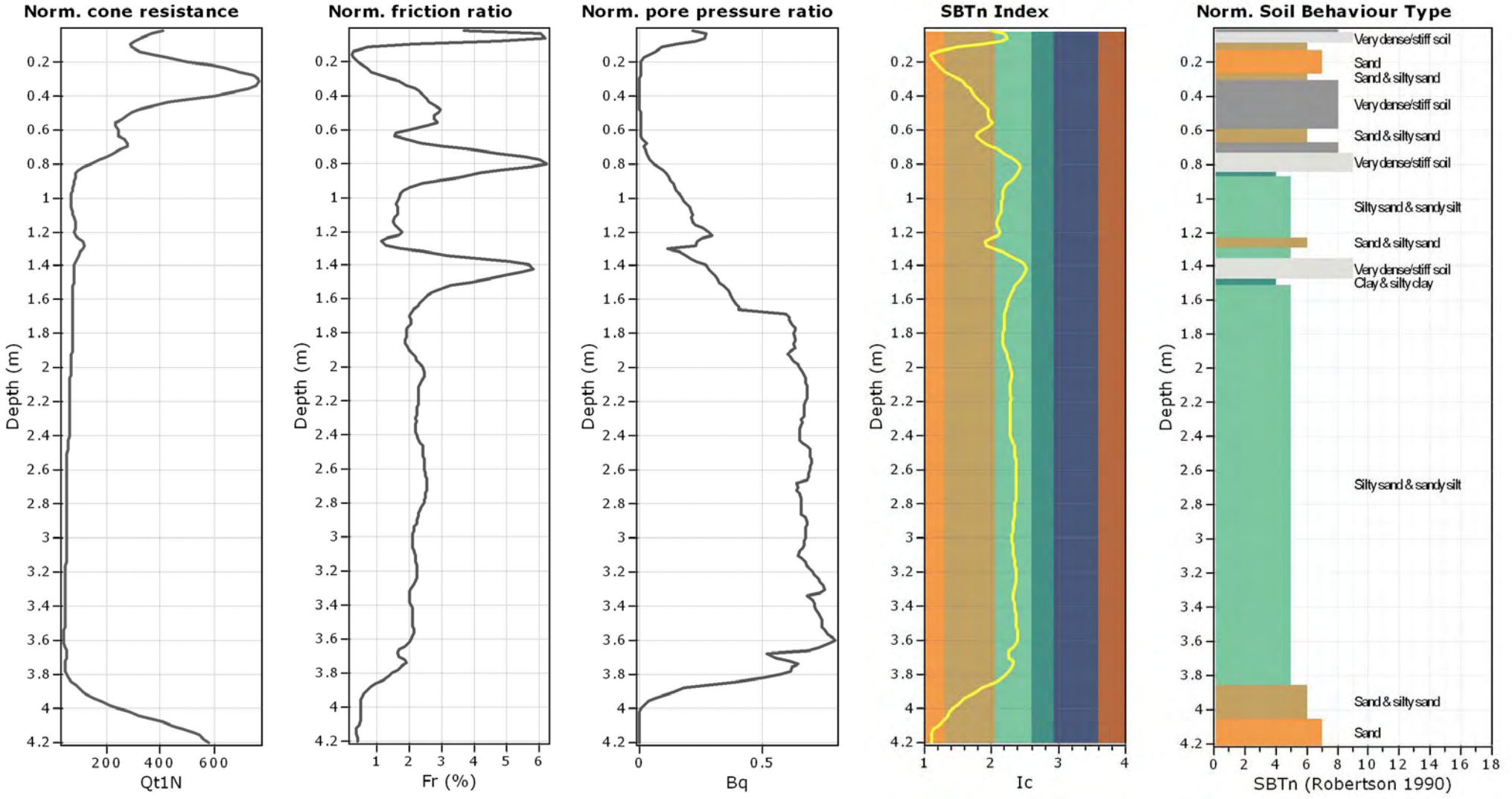
CPT: BD-CPTM103 - Total depth: 4.20 (m)



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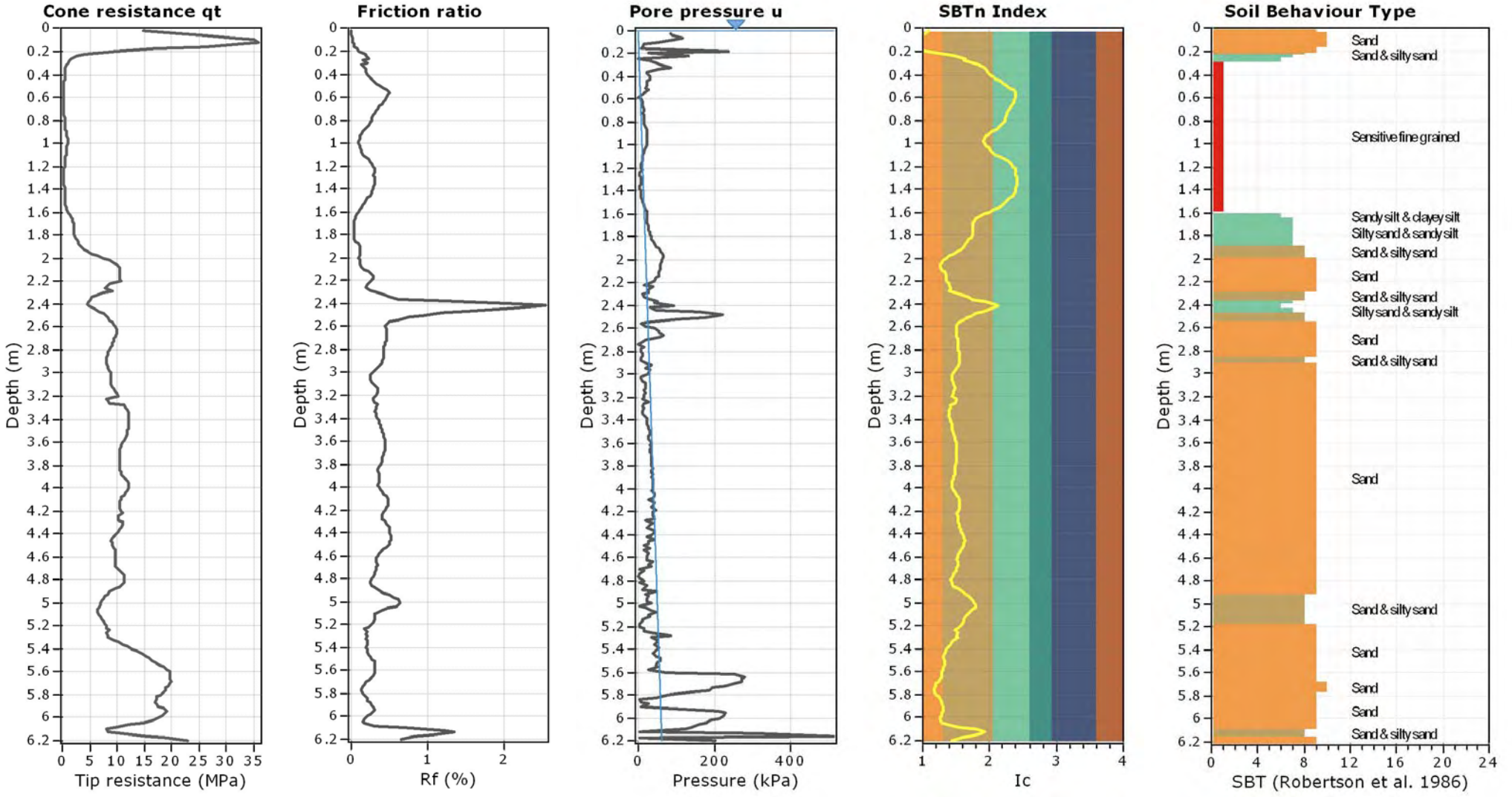
Project: Durban Harbour CPT's

CPT: BD-CPTM207 - Total depth: 6.20 (m)



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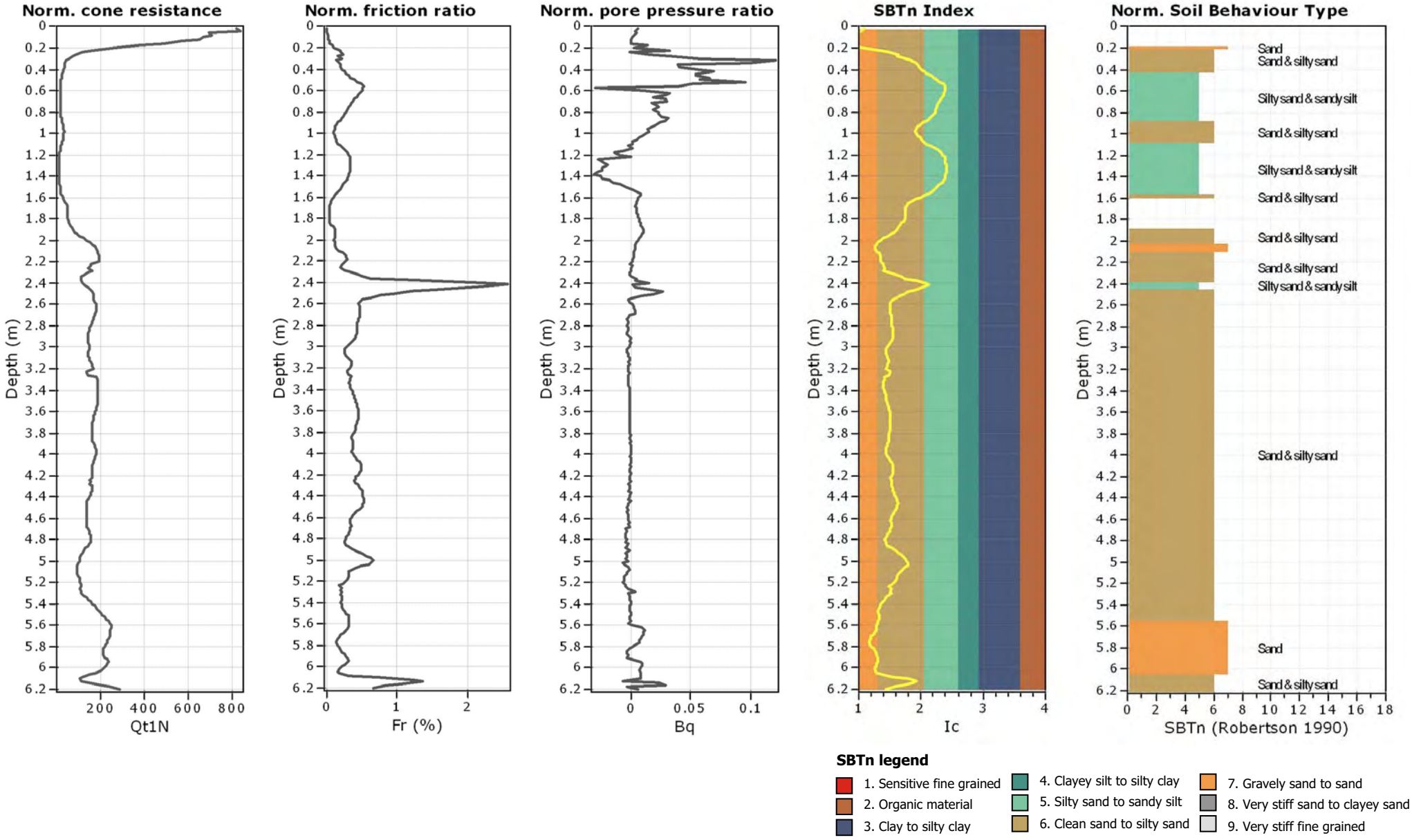
Project: Durban Harbour CPT's

CPT: BD-CPTM207 - Total depth: 6.20 (m)



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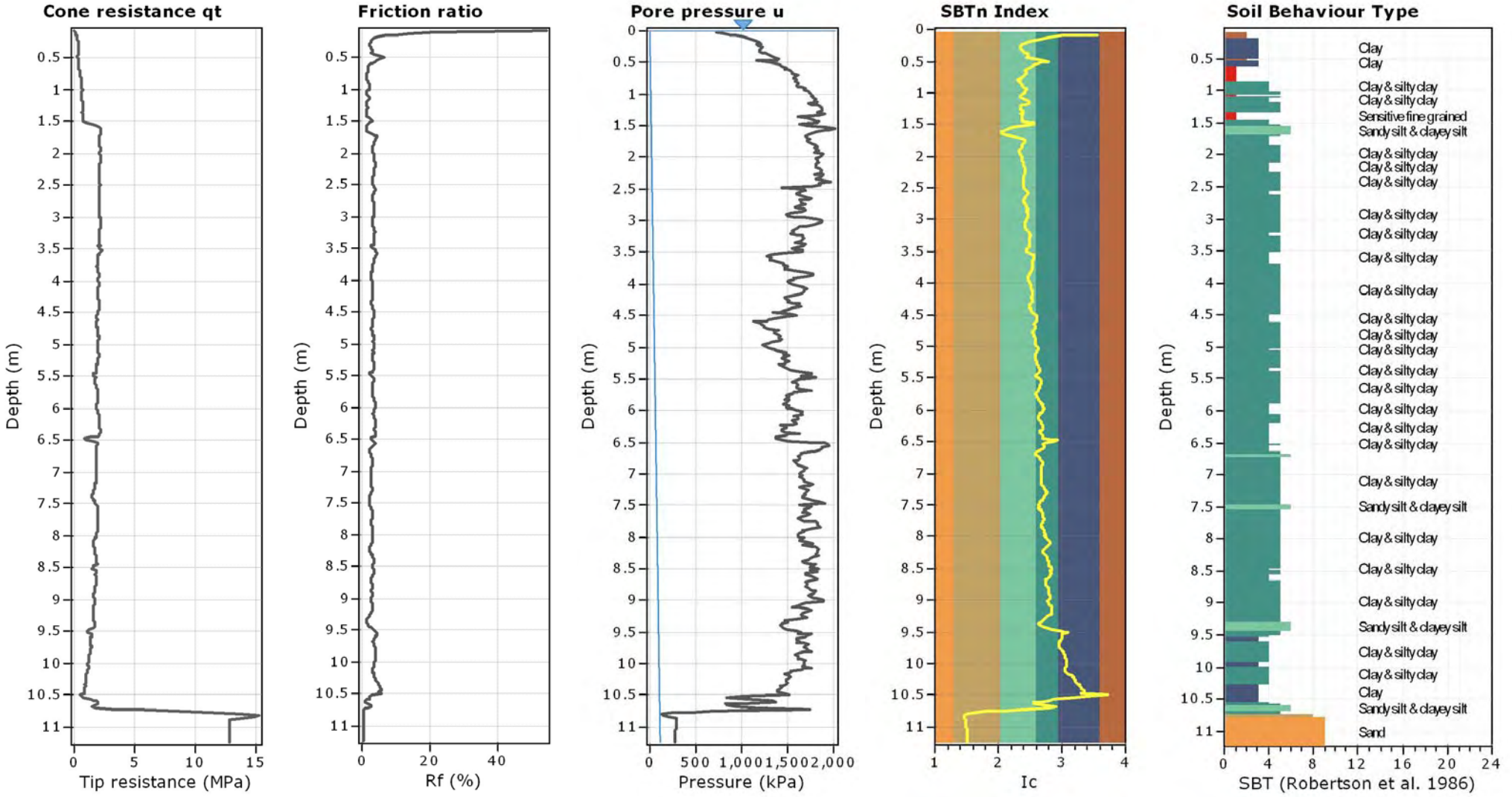
Project: Durban Harbour CPT's

CPT: BD-CPTM209 - Total depth: 11.24 (m)



SBT legend

1. Sensitive fine grained	4. Clay & silty clay	7. Silty sand & sandy silt	10. Sand
2. Organic material	5. Clay & silty clay	8. Sand & silty sand	11. Very dense/stiff soil
3. Clay	6. Sandy silt & clayey silt	9. Sand	12. Very dense/stiff soil

Franki Africa
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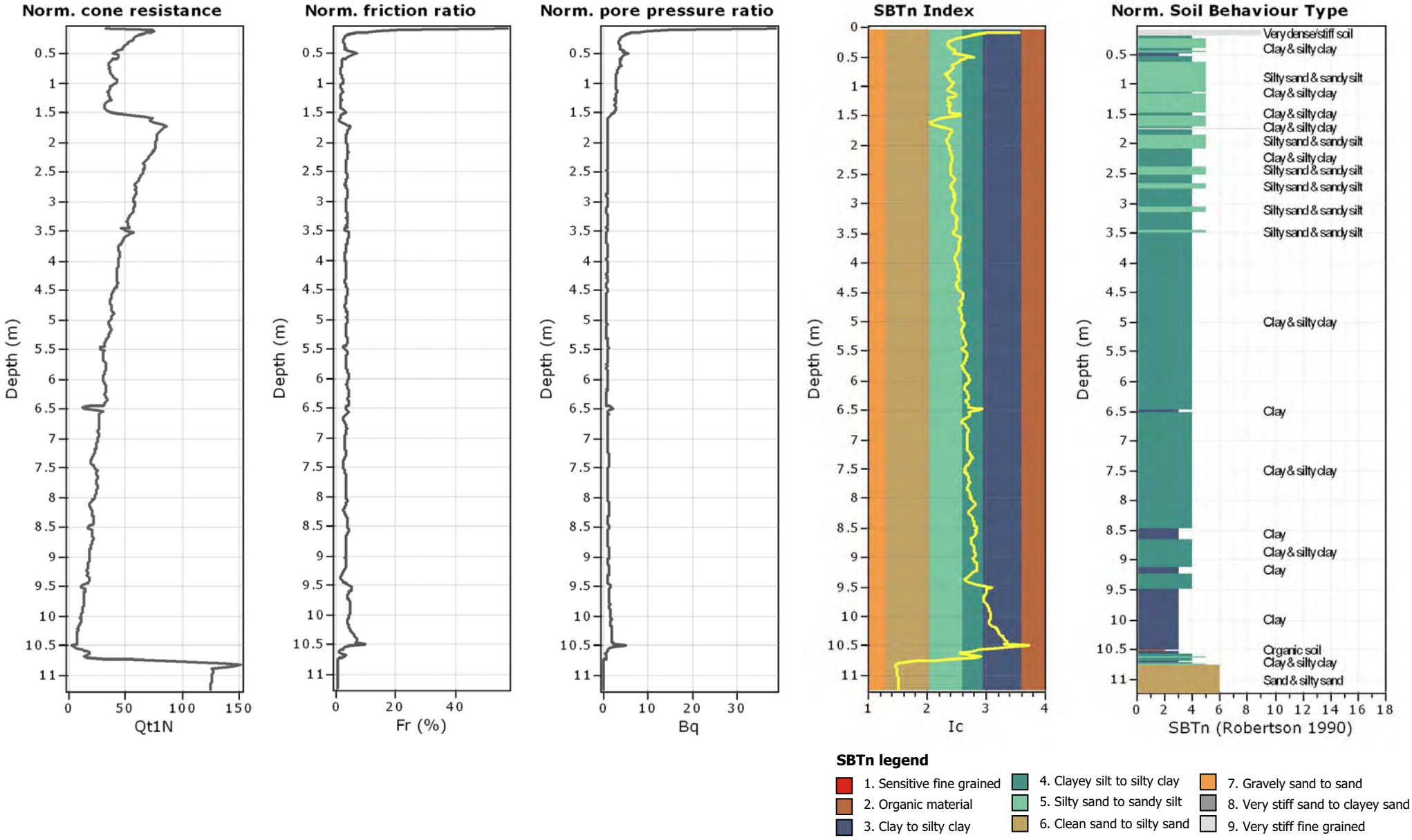
25 Richmond Rd, Durban
http://www.franki.co.za

Project: Durban Harbour CPT's

CPT: BD-CPTM209 - Total depth: 11.24 (m)



5.4: Desk Study Appraisal for the Durban Berth Deepening Feasibility Study

(MSJ RPT No. 07-395; May 2008)

Report to Transnet Projects on a Desk Study Appraisal for the Durban Berth Deepening Feasibility Study

Reference : 07-395

Dated : 12 May 2008

MOORE SPENCE JONES (PTY) LTD
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Report to Transnet Projects on a Desk Study Appraisal for the Durban Berth Deepening Feasibility Study

Reference : 07-395	**Dated : 12 May 2008**

TABLE OF CONTENTS

Report to Transnet Projects on a Desk Study Appraisal for the Durban Berth Deepening Feasibility Study

Reference : 07-395	**Dated : 12 May 2008**

1. INTRODUCTION

Transnet are presently deepening and widening the entrance channel to the port of Durban in order to accommodate post-panamax container vessels in the vessel class of 9 200 TEU. The depth of the existing container terminal quay walls, located at Pier 1 and Pier 2, is too shallow to accommodate this class of ship, and selected berths require to be deepened. The following berths are considered for possible deepening:

- Pier 1 (berths 100 to 104)
- Pier 2 (berths 203 to 205)

Prior to deepening, the berths will be assessed for stability against sliding, overturning, bearing capacity failure and deep foundation failure. The following berths are to be investigated for stability:

- Pier 1 (berths 100 to 109)
- Pier 2 (berths 200 to 205)

The purpose of this desk study report is to collate and assess the functionality of the existing geotechnical information relating to Piers 1 and 2 and their associated berths. The collated information will enable decisions to be made regarding the requirements for further geotechnical investigations for the Durban Berth Deepening Feasibility Study. The existing information has been obtained from numerous reports that have been completed over the years for various phases of redevelopment and augmented development of this part of Durban Harbour.

In particular, a data base of the available information for the areas encompassed by Pier 1 and Pier 2 has been prepared. This data base has been used to indicate the following:

- The quality of the data available for each birth, i.e the relative value in terms of providing geotechnical information pertinent to the project.
- Areas where good quality data occurs.
- Areas where data is sparse and will most likely require further geotechnical investigation.

2. INFORMATION SUPPLIED

The following historical data (including complete reports, as well as borehole logs) was supplied by Hatch Mott McDonald Goba Joint Venture (HMGJV) and Prestedge Retief Dresner Wijnberg (PRDW), consulting port and coastal engineers, and used in compiling the desk study:

- Copy of proposal document titled, *"Transnet Projects – Durban Berth Deepening Feasibility Study*", submitted by Prestedge Retief Dresner Wijnberg (February 2008).
- Seacore – Boreholes for the Bayhead Project (2007).
- Marine Geosolutions – Geophysical Survey for the Eastern Ports Rail Corridor Study (2007).
- Transnet Projects – Design Salisbury Island Redevelopment (2007).
- Protekon – Pier 1 Ground Investigation (2001).
- Protekon – North Terminal Substation Pier 2 (2001).
- Protekon – Extension of berth 206-207 (1999).
- Ove Arup – Report for Berth 200-201 (1976).
- Christian and Nielson – Original boreholes for Pier 1 and Pier 2 (1976).

3. GEOTECHNICAL INVESTIGATION WORK DONE TO DATE

3.1 Fieldwork & Laboratory Testing

A large quantity of fieldwork has been completed in the project area. In summary this investigation works includes the following:

- Boreholes,
- Marine Geophysics, and
- Laboratory Testing.

This information will be discussed with reference to Piers 1 and 2. The detailed summary of all boreholes put down in the project area are included in Appendix A.

3.1.1 Pier 1

Pier 1 extends from Salisbury Island in the south east to Pier 2 in the north-west and incorporates berths 100 to 109. Approximately 67 boreholes have been put down either behind the quay wall or directly in front of the cope of the pier quay wall. The approximate locations of the boreholes are indicated in Figure 1.

A summary of all the information acquired for Pier 1 is tabulated in Table 1. The number of boreholes with information such as test types and final depths are given for each berth.

Table 1
Summary of Existing Borehole Information : Pier 1, Durban Harbour

Berth No.	Total Number of boreholes drilled along extent of berth	In front of Quay Wall Cope			Behind the Quay Wall Cope		
		Borehole reference No.	Type of test	Final Depth	Borehole reference No.	Type of test	Final Depth (m)
100	6	SI-BH101	SPT @ 1.0m intervals	19.00	SI-BH108	SPT	32.95
		S1-BH102	SPT @ 1.0m intervals	33.45	SI-BH109	SPT	32.95
		SI-BH103	SPT @ 1.0m intervals	33.45	-		
		S1-BH104	SPT @ 1.0m intervals	33.45			
101	1	-			9GO203-BH11	-	30.40
102	2	9G0203-BH001	-	37.00	9GO203-D6	-	12.80
103	5	9GO203-DC	-	15.20	9GO203-D4	-	29.70
		DM-G-G1	SPT @ 1.5m intervals	27.00	9GO203-D5	-	14.00
		DM-G-G2	SPT @ 1.5m intervals	23.22			
104	12	P1-BH02	SPT @ 1.0m intervals LL,PI,LS	35.25	9GO203-BH006	-	33.80
		P1-BH01	SPT @ 1.0m intervals LL,PI,LS	35.50	P1-BHWB5	SPT @ 1.0m intervals	20.45
		P1-BH13	SPT @ 1.0m intervals LL,PI,LS	35.45	DM-H-BHC	SPT @ 1.5m intervals	42.90
		P1-BH13	SPT @ 1.0m intervals	35.45	-		
		9GO203-DB	-	16.80			
		9GO203-BH007	-	24.80			
		9GO203-D1	-	13.70			
		9GO203-D2	-	13.70			
		9GO203-BH005	-	21.30			
105	6	P1-BH03	SPT @ 1.0m intervals	35.50	DM-I-RM7	SPT @ 1.5m intervals	49.50
		P1-BH04	SPT @ 1.0m intervals LL,PI,LS	35.45	P1-BHW4	SPT @ 1.0m intervals	20.45
		P1-BH05	SPT @ 1.0m intervals LL,PI,LS	35.45	DM-I-RM6	SPT @ 1.5m intervals	38.55
		P1-BH30	SPT @ 1.0m intervals Triaxial tests				
106	15	P1-BH06	SPT @ 1.0m intervals	35.65	9GO203-BH002	-	33.50
		P1-BH07	SPT @ 1.0m intervals LL,PI,LS	35.45	P1-BHWB3	SPT @ 1.0m intervals	20.45
		P1-BH08	No information supplied		DM-I-RM5	SPT @ 1.5m	39.50

Berth No.	Total Number of boreholes drilled along extent of berth	In front of Quay Wall Cope			Behind the Quay Wall Cope		
		Borehole reference No.	Type of test	Final Depth	Borehole reference No.	Type of test	Final Depth (m)
						intervals	
106	15	P1-BH09	SPT @ 1.0m intervals LL,PI,LS				
		BH-V27	Particle size analysis	3.20	DM-I-RM4	SPT @ 1.5m intervals	45.70
		-			DM-H-BH3	SPT @ 1.5m intervals	44.99
					DM-H-BH4	SPT @ 1.5m intervals	45.31
					9GO203-BH009	-	24.60
		-			DM-H-BHB	SPT @ 1.5m intervals	49.50
					DM-I-RM3	SPT @ 1.5m intervals	43.35
					DM-H-BH2	SPT @ 1.5m intervals	43.00
					DM-H-BH5	SPT @ 1.5m intervals	43.65
107	14	BH-V26	Particle size analysis	3.50	9G0203-BH-107	No information supplied	
		P1-BH11	SPT @ 1.0m intervals	35.45	DM-I-RM2	SPT @ 1.5m intervals	41.50
		P1-BH12	SPT @ 1.0m intervals	35.45	DM-H-BH1	SPT @ 1.5m intervals	40.00
		P1-BH10	SPT @ 1.0m intervals	35.45	DM-H-BH6	SPT @ 1.5m intervals	41.50
		9GO203-BH108	No information supplied		P1-BHWB1	SPT @ 1.0m intervals	20.00
		P1-BH12	No information supplied		DM-I-RM1	SPT @ 1.5m intervals	40.30
		P1-BH14	SPT @ 1.0m intervals		DM-H-BHA	SPT @ 1.5m intervals	48.00
		P1-BH24	SPT @ 1.0m intervals Triaxial tests		9GO203-BH012	-	30.30
108	4	P1-BH15	SPT @ 1.0m intervals	35.45	DM-J-CB1	SPT @ 0.5 to 1.5m intervals	38.59
		P1-BH13	SPT @ 1.0m intervals LL,PI,LS	35.45	DM-J-CB2	SPT @ 0.5 to 1.5m intervals	40.87
		-			9GO203-BH013	-	31.50
109	2	-			DM-J-CB3	SPT @ 0.5 to 1.5m intervals	40.95
					DM-J-CB4	SPT @ 0.5 to 1.5m intervals	39.28

Sources of Information : SI-BH Series – Transnet, Salisbury Island
9G0203 Series – Original Christiani & Nielson drawings, Pier 1
DM Series – Protekon reports
P1-BH01 Series – Murray and Roberts/Franki JV, Pier 1
BH-V26 – MGS Vibrocore, Bayhead

3.1.2 Pier 2

Pier 2 extends from Pier 1 in the south east to the sandbanks in the west, and incorporates Berths 200 to 205. A proposed new berth, Berth 206, is currently under review as part of the overall Feasibility Study. Approximately 83 boreholes have been put down either in front of or directly behind the quay wall. The approximate locations of the boreholes are indicated in Figure 1.

A summary of all the information acquired for the Pier 2 is tabulated in Table 2. The number of boreholes with information such as test types and final depths are given for each berth.

Table 2
Summary of Existing Borehole Information : Pier 2, Durban Harbour

Berth No.	Total Number of boreholes drilled in extent of berth	In front of Quay Wall Cope			Behind the Quay Wall Cope		
		Borehole reference No.	Type of test	Final Depth	Borehole reference No.	Type of test	Final Depth (m)
200	4	9GO200-WB1	SPTs	20.50	-		
		9GO200-V20	-	23.80			
		9GO200-V21	-	21.90			
		9GO200-V22	-	21.90			
201	6	9GO200-WB03	SPTs	21.05	-		
		9GO200-WB02	SPTs	19.51			
		9GO200-V04	Vane tests	21.80			
		9GO200-VO5	-	23.80			
		9GO200-VO6	-	23.50			
		9GO200-VO7	-	22.50			
202	13	9GO200-V14	Vane tests	19.00	-		
		9GO200-V15	Vane tests	20.40			
		9GO200-V17	Vane tests	27.40			
		9GO200-V13	Vane tests	19.50			
		9GO200-WB06	SPTs	20.75			
		9GO200-V08	Vane tests	22.30			
		9GO200-V09	Vane tests	23.60			
		9GO200-V10	Vane tests	23.60			
		9GO200-WB05	SPTs	21.56			
		9GO200-V11	Vane tests	22.30			
		9GO200-V12	Vane tests	21.20			
		9GO200-BHT1		20.73			
		9GO200-WB07	SPTs	21.33			
203	15	9GO200-WB09	SPTs LI,PI,LS	21.64	P2/WB/11	-	21.33
		9GO200-WB10	SPTs LI,PI,LS	21.34	-		
		9GO200-V25	Vane tests	24.80			
		9GO200-V26	Vane tests	24.40			
		9GO200-V26A	-	23.20			
		9GO200-V26B	-	22.50			
		9GO200-V27	Vane tests	20.70			
		9GO200-V32	-	23.80			
		9GO200-V18	Vane tests	25.00			
		9GO200-V31	Vane tests	21.60			
		9GO200-V19	-	18.00			
		9GO200-WB08	SPTs	21.36			
		9GO200-V23	Vane tests	25.90			
		9GO200-V24	Vane tests	24.40			

Berth No.	Total Number of boreholes drilled in extent of berth	In front of Quay Wall Cope			Behind the Quay Wall Cope		
		Borehole reference No.	Type of test	Final Depth	Borehole reference No.	Type of test	Final Depth (m)
204	11	9GO200-WB04	-	21.60	GO200-BH01	-	27.43
		9GO200-V29	Vane tests	23.80	GO200-BH02	-	24.38
		9GO200-V30	Vane tests	23.80	GO200-BH04	-	29.26
		9GO200-V33	Vane tests	24.40	-		
		9GO200-V34	Vane tests	24.40			
		9GO200-V35	Vane tests	24.10			
		9GO200-V36	Vane tests	22.90			
		9GO200-SH4-4	-	25.57			
205	9	9GO200-BH-7U	-	22.60	-		
		9GO200-V40	Vane tests	22.50			
		9GO200-V41	Vane tests	22.90			
		9GO200-V42	Vane tests	23.80			
		9GO200-V37	Vane tests	26.50			
		9GO200-V38	Vane tests	25.30			
		9GO200-V39	Vane tests	25.30			
		9GO200-BH12	-	30.63			
		9GO200-BH06U	-	24.80			
206/207	25	BH-BH108	SPT @ 1.5m intervals	17.00	DM-L-C01	SPT @ 1.5m intervals	40.43
		BH-BH109	SPT @ 1.5m intervals	17.40	DM-L-C02	SPT @ 1.5m intervals	41.63
		BH-BH110	SPT @ 1.5m intervals	15.95	DM-L-C03	SPT @ 1.5m intervals	37.93
		9G0200-BH08	Vane tests	28.80	DM-L-C04	SPT @ 1.5m intervals	35.48
		9G0200-V43	Vane tests	22.90	DM-L-C05A	SPT @ 1.5m intervals	35.72
		9G0200-V44	Vane tests	23.80	DM-L-C05B	SPT @ 1.5m intervals	30.51
		9G0200-V45	Vane tests	22.90	DM-L-C06	SPT @ 1.5m intervals	33.09
		9G0200-V47	Vane tests	22.30	DM-L-C07	SPT @ 1.5m intervals	40.53
		9G0200-V48	Vane tests	24.10	DM-L-C08	SPT @ 1.5m intervals	37.26
		9G0200-V49	Vane tests	24.70	DM-L-C09A	SPT @ 1.5m intervals	33.96
		-			DM-L-C09B	SPT @ 1.5m intervals	30.05
					DM-L-C10	SPT @ 1.5m intervals	21.45
					DM-L-C11	SPT @ 1.5m intervals	21.45
					DM-L-C12	SPT @ 1.5m intervals	21.45
					9G0200-BH07	-	28.04

Sources of Information : 9G0200 Series – Christiani & Nielson original drawings, Pier 2
BH-BH Series – Seacore, Bayhead
DM Series – Protekon reports

3.2 Marine Geophysical Data

Several geophysical surveys have been undertaken in the Durban Harbour by Marine Geo-Solutions (MGS). The majority of the data used is from the EPRCS report. The report includes:

1. Bathymetry and harbour floor topography using single and multi-beam echo sounding, to within 30metres of the quay walls of Piers 1 and 2

2. Identification and distribution of surficial geology based on acoustic properties using side-scan sonar aided by collection of samples at specific sites.

3. Construction of several cross sections (seismic stratigraphy) through the study area based on the interpretation of seismic data ("boomer" and "pinger") and existing borehole data. These are referred to as Pier Sections G1-G2-G3-G4-G5-G6-G7-G8 and Channel Sections HI and MN.

The geological cross-sections inferred from these geophysical surveys, drawn by MGS, along these section lines are given in Figure 2. The inferred geological soil and rock horizons are discussed in greater detail below.

3.2.1 Bathymetry and harbour floor topography (Salisbury Island, Pier 1 and Pier 2)

The bathymetry in the vicinity of Piers 1 and 2, and the rest of the harbour, is controlled to a large degree by the dredging activities operating within the harbour. Surficial outcrops of reef and clay appear to have only a minor control, if any. The bathymetry of the Salisbury Island area, which forms the eastern-most margin of the study area, is typified a gentle sloping gradient, with a well defined rectangular basin just north of the Naval Base. Directly east of this basin, the irregular topography and less well defined nature of the dredge channel suggest the possible accumulation of sediment in this area. A clear dredge channel exists between Pier 1 and the T-Jetty, and extends between Pier 1 and Pier 2 towards Berth 206 (the far western portion of Pier 2) and the central sandbank. This channel is ~80m wide and -14m to -15m Port Chart Datum (CD) in depth.

The bottom topography between Pier 1 and 2 is relatively flat, with a gentle gradient of 0˚ to 2˚ dipping to the north. The depth is on average -12.8m CD, but varies in the range -12m to -14m CD. The quay wall margins between Pier 1 and Pier 2 are marginally deeper (-14m) than the central section between the piers. There is evidence of plough dredging (i.e. perpendicular dredge furrows to quay wall ~10m wide), which terminate in sediment mounds at either end, resulting in a shallower bathymetry (-11m to -12m).

3.2.2 Description and Distribution of Acoustic Facies

Prominent calcarenite reef forms the third largest laterally extensive acoustic facies of the Durban Harbour floor geology. In the study area it is located between Pier 1 and Pier 2. It typically displays a rugged micro-topography but does not exhibit extreme relief above the harbour floor. A sample was collected at this site and described as a light red to light reddish brown, fine grained, ferruginous calcarenite, with subordinate clay clasts. Associated with this facies is scattered reef, which makes up the second largest facies. This facies consists of light olive to light reddish brown, fine to medium grained, weakly cemented sand, which commonly manifests as small, sub-rounded to well rounded pebbles ~20 to 30mm in diameter. The most dominant acoustic facies is fine to medium grained sand and silt which make up more than 90% of the area.

Samples were taken at five sites in order to delineate the composition of certain facies observed on the sonographs. Four of these sites may prove to be important to the geotechnical study to be under taken in the area. Site 1 is located adjacent to Berth 204 and identified a facies consisting of small sub-rounded clasts of firm, silty clay, with evidence of bivalve burrows. The cohesive nature of this

facies could prove problematic to dredge. Site 2 and Site 3 are located between Pier 1 and Pier 2 and identified as comprising dumped angular blocks of Dwyka tillite and Natal Group sandstone. Neither of these has any relation to the geology of the harbour and is likely to have been used as armouring of quay wall (rip-rap), but pose hazards to dredging activity in these areas. Site 4 is located adjacent to the north eastern tip of Pier 1 and indicates the presence of friable weathered calcarenite nodules in a generally sandy matrix.

3.2.3 Seismic Stratigraphy

MGS constructed several cross sectional interpretations using “boomer” and “pinger” seismic data. These cross sections fall within the study area. Cross section G1-G2 lies across Berths 99 and 100; G2 to G3 from Berth 100 to Berth 103; G4 to G5 along Berth 104; G5 to G6 from Berth 105 to Berth 107; G5 to G6 from Berth 108 to Berth 109; G6 to G7 from Berth 200 to Berth 202; G7 to G8 from Berth 203 to Berth 206. The cross sections extend down to the Cretaceous marine sediments, which form the acoustic basement.

The geological cross-sections inferred from these geophysical surveys, drawn by MGS, along these section lines are given in Figure 2. The inferred geological soil and rock horizons are discussed in greater detail below.

4. SUMMARY OF LOCAL GEOLOGY UNDERLYING THE PROJECT AREA

The results of the various borehole logs, sonic and acoustic logs have been used to provide a summary of the localised geological relationships encountered within the Project area. This information is presented in Table 3 below.

Table 3
Summary of geology underlying the project area

Geological Divisions	Units	Description	Depth (below CDP)
Late Pleistocene and Holocene cover sands	Late Pleistocene Aeolian Sediments	Medium dense to dense, light reddish brown to light grey fine grained sand with a coarser basal unit, gravelly SAND.	
	Holocene Lagoonal Sediments	Medium dense to dense, olive to light grey/brown, fine to medium grained SAND with occasional heavy minerals.	
Late Pleistocene Calcarenite		Medium to hard rock, light to dark brown, fine to medium grained, weakly laminated.	-11.4 to -7.5m
Late Pleistocene Channel Sands	Unit 3	Not visible in study area.	
Late Pleistocene Channel Sands (most extensive in field area)	Unit 2 - Upper portions (clay rich unit)	Very soft to stiff, light grey to dark brown mottled occasionally orange, fissured silty or fine to medium grained sandy CLAY.	-12 to -41.7m
	Unit 2 - Lower portions (sandy unit)	Loose to dense, light to dark grey yellowish brown olive or light reddish brown, fine to coarse grained SAND, subordinate layers of firm grey CLAY.	
Late Pleistocene Channel fill Sediments	Unit1- Upper Clay Rich Unit	Stiff to very stiff, light grey to dark brown occasionally black fissured to microshattered, silty to sandy occasionally gravelly CLAY.	-16 to -44m
	Unit1 - Basal Sand Unit	Loose to very dense, olive to dark grey reddish brown occasionally light grey to white, fine to medium grained SAND, occasionally medium to very coarse, with minor conglomerate.	
Late Pleistocene Lagoonal Sediments		Highly variable sediment assemblage. Light olive grey to reddish light brown, dark brown and orange brown loose to dense fine to medium SAND, occasional lenses of fine to coarse and fine to gravelly SAND with occasional shell fragments.	-14 to -34m
Late Pleistocene Aeolianite		Isolated eroded remnants. Pale yellowish brown slightly weathered thinly bedded medium to coarse grained medium hard rock. CALCARENITE	-17 to -28m
Pleistocene Basal Sand Unit		Light reddish orange to brown mottled light grey medium dense to very dense fine to medium grained SAND with small amounts of clayey/silty SAND.	-23 to -29m
Pleistocene Basal Clay Unit		Dark brown and dark grey to black stiff to very stiff dense to very dense organic fine sandy to silty CLAY with minor amounts of clayey fine sandy SILT.	-27 to -33m
Pleistocene Basal Silt Unit		Dark yellowish orange to dark grey mottled with dark orange medium dense to very stiff weathered fine sandy to gravelly SILTS or clayey silty fine SANDS.	-28 to 36m
Cretaceous Sediments		Olive to light grey thickly bedded consolidated SILTSTONE with thin interbedded hard concretionary calcarenite horizons.	-18 to -52m

The most dominant features on the cross sections are numerous incised river channels. These channels result in variable thicknesses of units as well as poor lateral continuity of units. This variability in geology is likely to result in variable geotechnical properties, often over small distances.

5. INFERRED INCISED CHANNELS

As identified by MGS using the seismic data obtained during the surveys, a complex palaeo-drainage pattern exists below Durban Harbour as a result of several episodes of river incision occurring from fluctuations in sea-level during various stages in the geological history. These incisions have a significant control on the geology of the area, the thickness of the units as well as their lack of lateral continuity. Associated with these channels are three units of clay rich channel deposits. The thickness

of these units is related to the depth of the channel. The deeper the channel the thicker these units become. This is clearly evident in the seismic sections constructed through the area.

The incised channels visible in several of the cross sections are of vital importance to the proposed geotechnical study being undertaken in the area as they could (and have been known to) result in quay wall instability and settlement problems. These channels result in variable thicknesses of units as well as poor lateral continuity of units. The occurrence of such inferred incised channels are shown on Figures 1 and 2 but summarised in Table 4 below.

Table 4
Inferred Incised Channels below Piers 1 & 2 into Cretaceous Bedrock

Pier	Berth	Incised Channel Details		
		Width	Depth (CDP)	Anticipated Sediment Infill
1	99/100	>500m	-42m	-12 to -15m : Holocene lagoonal -15 to -33m : Late Pleistocene channel clays -33 to -42m : Late Pleistocene channels sands
	104/105	±150m	-38m	12 to -20m : Late Pleistocene channel clays -20 to -22m : Late Pleistocene channel sands -22 to -38m : Late Pleistocene channel fill sediments
	105/106	±110m	-38m	-12 to -19m : Late Pleistocene channels clays -19 to -21m : Late Pleistocene channel sands. Aeolian sands -21 to -38m : Late Pleistocene channel fill sediments
	107	±180m	-38m	-12 to -25m : Late Pleistocene aeolian sediments -25 to -38m : Late Pleistocene channel fill sediments
	108/109	±275m	-42m	-12 to -18m : Holocene lagoonal sediments -18 to -22m : Late Pleistocene channel clays to late Pleistocene Aeolian sediments -22 to -42m : Late Pleistocene channel fill sediments
2	200	±100m	-41m	-12 to -15m : Holocene lagoonal sediments -15 to -25m : Late Pleistocene channel clays -25 to -41m : Late Pleistocene channel fill sediments
	202/203	±380m	-48m	-13 to -18m : Holocene lagoonal sediments -18 to -38m : Late Pleistocene channel clays -38 to -48m : Late Pleistocene channel sands
	204/205	±220m	-48m	-14 to -16m : Holocene lagoonal sediments -16 to -38m : Late Pleistocene channel clays -38 to -48m : Late Pleistocene channel sands

6. CONSTRUCTION OF EXISTING PIERS

Piers 1 and 2 were constructed over the period 1967 to 1969. Both piers were constructed of blockwork segments which were stacked upon each other to form the current piers. Details of the pier wall construction are shown in Figure 3 (Pier 1) and Figure 4 (Pier 2). The basal block has been placed on a founding mattress of rockfill which ranges between 2 and 4 metres in thickness. The rockfill comprises 38mm to 76mm stone placed in a core trench excavated beneath the structure.

Founding depths of Piers 1 and 2 are shown in some detail in Figure 5. The founding depths can generally be summarised as follows:

- Berths 100 to 103 -14.63m to -17.98m CD
- Berth 104 -14.63m to -17.68m CD
- Berths 105 & 106 -14.63m to -17.63m CD
- Berths 107 to 109 -16.46m to -17.37m CD
- Berths 200 to 202 -14.7m to -17.07m CD
- Berth 203 -14.7m to -18.0m CD
- Berths 204 & 205 -17.0m to -21.0m CD

7. COMMENTS ON QUALITY AND USEFULNESS OF EXISTING GEOTECHNICAL AND GEOPHYSICAL DATA

7.1 Geotechnical Data

A large quantity of boreholes have been drilled in the general vicinity of the two piers and much variability in the quality of the data is evident. In Figure 1 the project area has been demarcated into three separate classes, namely:

- Good quality data (detailed borehole logs with SPT tests),
- Poor to fair data quality (brief borehole logs, poor material descriptions but with insitu and laboratory shear vane test results),
- Poor to fair data (brief borehole logs, poor material descriptions but with laboratory shear vane test results), and
- Very good data (borehole logs with SPT tests and laboratory test results (triaxials)).

Borehole logs giving poor quality information would typically be those which have not been adequately logged using a recognised methodology, such as the generally accepted South African Geoterminology Guidelines (1990)[1] or Association of Engineering Geologists guidelines. The absence of insitu or laboratory test results would also result in borehole information being classified as poor or inadequate.

7.2 Geophysical Data

The geophysical data is generally very useful in providing an indication of the deep or sub harbour bottom geology. While the inferred geological cross-sections given in Figure 2 are generally based on borehole correlations, however, it must be accepted that actual drilling results conducted for the proposed geotechnical investigations for the Harbour Feasibility Study may encounter variations in ground conditions.

The information presented by MGS is applicable from the channel up to a distance of 30m from the pier edge. In that the proposed berth deepening and pier extension will occur within 30m of the pier edge, additional geophysical work inside this 30m wide corridor will need to be considered.

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[1] Geoterminology Workshop (1990) – Guidelines for Soil and Rock Logging SAIEG-AEG-SAICE (Geotech Div) pp47

APPENDIX A

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 1	100	SI-BH101	SPT	0 to 13.5m: To sea bed. 13.5 to 19m: Pale grey brown, dense to medium dense, fine and medium SAND. Harbour Beds		SPT(13.5 to 14m) = 23 SPT(14.5 to 15m) = 27 SPT(15.5 to 16m) = 25 SPT(16.5 to 17m) = 23 SPT(17.5 to 18m) = 17
		SI-BH102	SPT	0 to 13m: To sea bed 13 to 14m: Black, loose,SILTY fine sand. Harbour Beds. 14 to 15m: Grey brown, loose, fine and medium SAND. Harbour Beds. 15 to 19m: Dark grey brown, medium dense and dense, SILTY fine and medium SAND. Harbour beds. 19 to 29m: Grey to dark grey, very stiff becoming stiff below 22.00m, SILTY CLAY. Harbour Beds. 29 to 33.45m: Grey, medium dense becoming dense below 33m, SILTY fine and medium SAND. Harbour Beds.		SPT(13 to 13.5m) = 6 SPT(14 to 14.5m) = 5 SPT(15 to 15.5m) = 35 SPT(16 to 16.5m) = 22 SPT(17 to 17.5m) = 15 SPT(18 to 18.5m) = 14 SPT(19.5 to 20m) = 56 SPT(21 to 21.5m) = 48 SPT(22.5 to 23m) = 13 SPT(24 to 24.5m) = 15 SPT(25.5 to 26m) = 16 SPT(27 to 27.5m) = 12 SPT(28.5 to 29m) = 12 SPT(30 to 30.5m) = 13 SPT(31.5 to 32m) = 14 SPT(33 to 33.5m) = 44
		SI-BH103	SPT	0 to 15m: To sea bed 15 to 16m: Black, loose to medium dense SILTY fine SAND. Harbour Beds 16 to 17m: Dark grey brown, medium dense to dense, SILTY SAND. Harbour Beds. 17 to 22m: Pale brown and dark brown, medium dense overall, fine and medium SAND. Harbour Beds. 22 to 23m: Grey and yello brown, dense, SILTY fine SAND. Harbour Beds. 23 to 26m: Dark brown, medium dense to dense, SILTY fine SAND. Harbour Beds. 26 to 29m: Yellow brown and grey, medium dense CLAYEY fine SAND and fine CLAYEY SAND. Harbour Beds. 29 to 31m: Dark olive, very stiff slighty fine SANDY SILTY CLAY. Harbour Beds. 31 to 32m: Grey, medium dense to dense, SILTY fien and medium SAND. Harbour Beds. 32 to 33.45m: Pale grey, medium dense, fine SAND. Harbour Beds.		SPT(15 to 15.5m) = 12 SPT(16 to 16.5m) = 28 SPT(17 to 17.5m) = 24 SPT(18 to 18.5m) = 21 SPT(19.5 to 20m) = 23 SPT(21 to 21.5m) = 21 SPT(22.5 to 23m) = 21 SPT(24 to 24.5m) = 28 SPT(25.5 to 26m) = 29 SPT(27 to 27.5m) = 24 SPT(28.5 to 29m) = 19 SPT(30 to 30.5m) = 26 SPT(31.5 to 32m) = 29 SPT(33 to 33.5m) = 26
		SI-BH104	SPT	0 to 13.5m: To sea bed 13.5 to 18.5m: Dark grey SILTY SAND as matrix to dark grey, hard rock tillite GRAVEL and BOULDERS. Overall consistency very dense. FILL- scour protection? 18.5 to 22m: Slighty greyish pale brown, dense to very dense, fine and medium SAND. Harbour Beds. 22 to 25m: Off white/very pale brown, very dense, fine and medium SAND. Harbour Beds. 25 to 33.45m Pale brown, very dense overall, medium SAND. Harbour Beds.		SPT(13.5 to 14m) = 78 SPT(16 to 16.5m) = 55 SPT(18.5 to 19m) = 45 SPT(20 to 20.5m) = 44 SPT(21.5 to 22m) = 45 SPT(23 to 23.5m) = 58 SPT(24.5 to 25m) = 54 SPT(26 to 26.5m) = 33 SPT(27.5 to 28m) = 65 SPT(29 to 29.5m) = 62 SPT(30.5 to 31m) = 48 SPT(32m) = Refusal SPT(33 to 33.5m) = 71

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 1	**100**	**SI-BH108**	**SPT**	0 to 2.5m: grey brown, medium dense and dense, gravelly silty sand, underlying 100mm asphalt. FILL. 2.5 to 3.5m: Pale brown, loose fine and medium sand with trace shell fragments. FILL. 3.5 to 6m: Grey, loose becoming dense fine and medium SAND. Harbour Beds. 6 to 14m: Pale brown, medium dense and dense, fine SAND. Harbour Beds. 14 to 15.5m: Dark grey, loose, fine SAND. Harbour Beds. 15.5 to 17m: Brown to dark brown, dense, SILTY fine SAND. Harbour Beds. 17 to 18 m: Greenish grey, stiff SILTY CLAY. Harbour Beds. 18 to 20m: Orange brown and grey, very dense, SILTY CLAY. Harbour Beds. 20 to 22,4m: Pale brown, dense and very dense, medium to coarse SAND. Harbour Beds. 22.4 to 32.95: Dark grey, firm and stiff becoming very stiff below 32.5m, SILTY CLAY. Harbour Beds.		SPT(1 to 1.5m) = 33 SPT(2 to 2.5m) = 22 SPT(3 to 3.5m) = 8 SPT(4 to 4.5m) = 9 SPT(5 to 5.5m) = 33 SPT(6 to 6.5m) = 34 SPT(7 to 7.5m) = 29 SPT(8 to 8.5m) = 25 SPT(9 to 9.5m) = 19 SPT(10 to 10.5m) = 34 SPT(11.5 to 12m) = 50 SPT(13 to 13.5m) = 14 SPT(13 to 13.5m) = 14 SPT(14.5 to 15m) = 8 SPT(16 to 16.5m) = 32 SPT(17.5 to 18m) = 12 SPT(19 to 19.5m) = 70 SPT(20.5 to 21m) = 53 SPT(22 to 22.4m) = 32 SPT(23.5 to 24m) = 6 SPT(25.5 to 26m) = 9 SPT(28 to 28.5m) = 12 SPT(29.5 to 30m) = 15 SPT(31 to 31.5m) = 18 SPT(32.5 to 33m) = 46
			Hand dug 0 to 0.3m			
		SI-BH109	**SPT**	0 to 1.5m: FILL comprising, brown, sandy, fine grit/gravel. 1.5 to 3m: FILL comprising, pale brown, loose, fine and medium sand. 3 to 5m: FILL comprising brown, black and white, medium dense very coarse sand / fine grit / gravel and shell fragments. 5 to 9m: ROCK FILL comprising of hard rock quartzitic sandstone and tillite with a matrix of grey and brown, medium and coarse sand. 9 to 14.5m: Pale brown, medium dense, fine SAND. Harbour Beds. 14.5 to 20.5m: Grey brown becoming pale brown below about 17.5m, medium dense becoming very dense with depth, fine and medium SAND. Harbour Beds. 20.5 to 22m: Brownish grey, loose, fine and coarse SAND with abundant coarse shell fragments. Harbour Beds. 22m to 32.95m: Pale brown, medium dense and dense becoming very dense below 31m, fine SAND. Harbour Beds.		SPT(2 to 2.5m) = 4 SPT(3 to 3.5m) = 8 SPT(4 to 4.5m) = 12 SPT(5m) Refused SPT(10 to 10.5m) = 20 SPT(11.5 to 12m) = 16 SPT(13 to 13.5m) = 25 SPT(14.5 to 15m) = 17 SPT(16 to 16.5m) = 26 SPT(17.5 to 18m) = 42 SPT(19 to 19.5m) = 55 SPT(20.5 to 22m) = 10 SPT(22 to 22.5m) =18 SPT 24m refused SPT(25 to 25.5m) = 25 SPT(26.5 to 27m) = 31 SPT(28 to 28.5m) = 38 SPT(29.5 to 30m) = 43 SPT(31 to 31.5m) = 59 SPT(32.5 to 33m) = 59
			NWD4 6m to 9m (20 to 30% Core recovery)			

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**101**	**9GO203-BH11** **Datum = L.W.O.S.T**		3.5 to 1.2m: Grey brown fine-medium grained SAND. 1.2 to 2.7m: Grey medium grained SAND. 2.7 to 14.2m: Brown fine-medium grained SAND. 14.2 to 14.5m: Hard cemented SAND. 14.5 to 16.5m: Yellow brown fine-medium grained SAND. 16.5 to 16.7m: Hard cememnted SAND. 16.7 to 18.0m: Grey fine-medium grained SAND. 18.0 to 21.3m: Very stiff grey CLAY. 21.3 to 23.5m: Grey brown fine-medium grained SAND. 23.5 to 25.3m: Grey fine-medium slightly silty SAND. 25.3 to 30.4m: Brown fine-medium grained SAND.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**102**	**GO203-B001** **Datum = L.W.O.S.T**		0.0 to 18.2m: Grey fine-medium grained SAND with occasional clay patches. 18.2 to21.8m: Brown medium grained SAND. 21.8 to 24.4m: Grey stiff CLAY. 24.4 to 28.3m: Yellow brown slity silty fine grained SAND. 28.3 to 32.9m: White medium grained SAND. 32.9 to 37.0m: BOULDERS and COBBLES in a matrix of yellow grey firm clay. Residual Dwyka Tillite.		
		9GO203-D6 **Datum = L.W.O.S.T**		0.0 to 7.0m: Water. 0.7 to 12.8m: SILT and SAND with portions of hard sand at depth.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	103	9GO203-DC Datum = L.W.O.S.T		0.0 to 11.3m: Water. 11.3 to 13.7m: SILTand SAND. 13.7 to 15.2m: CLAY.		
		DM-G-G1	SPT	0.0 to 1.0m: Greyish light brown loose silty medium grained SAND contains petrochemicals and shell fragments. 1.0to 4.0m: Olive to grey loose to medium dense silty medium grained SAND. 4.0 to 11.5m: reddish light grey medium dense fine-coarse grained SAND.. 11.5 to 13.0m: Gry medium dense clayey silty fine grained SAND. 13.0 to 16.0m: Olive medium dense to dense silty medium grained SAND. 16.0 to 17.5m: Dark yellowish orange dense clayey fine grained SAND. 17.5 to 19.0m: Yellowish olive very dense clayey fine grained sandy SILT. 19.0 to 21.7m: Dark yellowish orange to olive very dense clayey silty fine grained SAND. 21.7 to 24.2m: Olive vey soft rock fossilferous CONGLOMERATE. Weathered Cretaceous Siltstone. 24.2 to 25.36m: Olive stiff soil to very soft rock clayey silty sand with weathered calcarenite and Cretaceous SANDSTONE. 25.36 to 27.0m: Dark grey very soft rock CRETACEOUS SILTSTONE.		SPT @ 0.5m = 7 SPT @ 1.5m = 10 SPT @ 3.0m = 21 SPT @ 4.5m = 26 SPT @ 6.0m = 29 SPT @ 7.5m = 22 SPT @ 9.0m = 20 SPT @ 10.5m = 29 SPT @ 12.0m = 14 SPT @ 13.5m = 12 SPT @ 15.0m = 34 SPT @ 16.5m = 46 SPT @ 18.0m = 57 SPT @ 19.5m = 16 SPT @ 21.0m = 30 SPT @ 22.0m = 71
		9GO203-BH103				
		9GO203-BH004 Datum = L.W.O.S.T		0.2 to 1.8m: Grey fine grained SAND. 1.8 to 8.5m: Grey medium grained SAND. 8.5 to 17.0m: Grey brown fine-medium grained SAND . 17.0 to 21.0m: Bornw medium grained SAND. 21.0 to 24.6m: Brown medium-coarse grained SAND. 24.6 to 27.5m: Brown coarse grained SAND. 27.5 to 29.7m: Grey frm sandy CLAY.		
		9GO203-D4 Datum = L.W.O.S.T		0.0 to 11.6m: Water. 11.6 to 14.6m: SILT and SAND. 13.6 to 14.0m: CLAY.		
		9GO203-D5 Datum = L.W.O.S.T		0.0 to 11.6m: Water. 11.6 to 13.1m: SILT and SAND. 13.1 to 13.7m: CLAY.		
		DM-G-G2	SPT	0.0 to 1.0m: Light brown loose silty fine-medium grained SAND. Contains Petrochemicals. 1.0 to 2.5m: Reddish light brown medium dense silty medium-coarse grained SAND. Berea Redbeds. 2.5 to 4.0m: Reddish light brown medium dense fine-medium grained SAND. Berea Redbeds. 4.0 to 8.5m: reddish brown medium desne silty gfine-mediumg grained SAND. 8.5 to 11.5m: Reddish light brown medium dense very fine gravelly fine-coarse granied SAND. 11.5 to 14.5m: Reddish light brown to light gree medium desne clayey silty fine-medium grained SAND. 14.5 to 17.5m: Dark brown to oive very dense fine sandy clayey SILT. 17.5 to 18.15m: Olive very stiff micaceous silty CLAY. 18.15 to 18.22m: Dark bornw very dense fine sandy clayey SILT with shell fragments. Weathered Bedrock. 18.22 to 20.0m: Light grey very soft rock. Weathered Creataceous SANDSTONE. 20.0 to 21.40m: Olive stiff soil to very soft rock clayey silty sand with weathered calcarenite and Cretaceous SANDSTONE. 21.4 to 23.22m: Olive to light grey very soft to soft rock. CRETACEOUS SANDSTONE.		SPT @ 0.5m = 6 SPT @ 1.5m = 11 SPT @ 3.0m = 12 SPT @ 4.5m = 20 SPT @ 6.0m = 40 SPT @ 7.5m = 17 SPT @ 9.0m = 25 SPT @ 10.5m = 20 SPT @ 12.0m = 22 SPT @ 13.5m = 28 SPT @ 15.0m = 72 SPT @ 16.5m = 61 SPT @ 18.0m = REF

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	104	P1-BH02	SPT	0.0-19.0m No recovery 19.0-20.5m Light to dark grey medium desne medium grained GRAVELwith a matrix of pinkish brown fine grained SAND. Fill/Harbour Marine 20.5-23.5m Pinkish brown very loose to dense fine-medium grained SAND with shell fragments. Harbour Marine 23.5-25.5m Pinkish to greyish brown denes medium-coarse grained SAND with shell fragments and isolated pockets of grey soft clay. Harbour Marine 25.5-28.5m Light brown pinkish brown dense to very desbe medium-coarse grained SAND with shell fragments. Harbour Marine 28.5-31.5m Light brown to grey brown dense to very dense silty fine grained SAND. Harbour Marine 31.5-32.5m Light grey very stiff to hard fine grained sandy CLAY. Harbour Marine 32.5-34.5m Light grey to pinkish brown dense to very dense medium-coarse grained SAND. Harbour Marine 34.5-35.25m Pinkish brown very desne fien-medium grained SAND. Harbour Marine		SPT @ 19.5m = 14 SPT @ 20.5m = 0 SPT @ 21.5m = 0 SPT @ 22.5m = ? SPT @ 23.5m = 58 SPT @ 24.5m = 46 SPT @ 25.5m = 49 SPT @ 26.5m = 46 SPT @ 27.5m = 48 SPT @ 28.5m = 78 SPT @ 29.5m = 73 SPT @ 30.5m = 52 SPT @ 31.5m = 58 SPT @ 32.5m = 54 SPT @ 33.5m = 55 SPT @ 34.5m = 64 SPT @ 35.5m = 45 (REF)
		9GO203-BH006 Datum = L.W.O.S.T		0.0-3.2m grey fine-medium grained SAND 3.2-5.3m grey medium grained SAND 5.3-9.6m Grey fine-medium grained SAND 9.6-13.6m Grey fine grained SAND 13.6-15.7m Grey brown fine-medium grained SAND 15.7-17.5m Brown medium grained SAND 17.5-19.1m Brown fine grained SAND 19.1-20.6m Brown fine-medium grained SAND 20.6-26.1m Brown medium grained SAND 26.1-27.6m Grey brown fine-medium grained SAND 27.6-33.8m Yellow brown fine-medium grained SAND with occasional pebbles		
		P1-BH01	SPT	0.0-15.0m No recovery 15.0-20.0m Grey to dary grey loose to very dense fine-medium grained GRAVEL with a matrix of silty fine-medium grained sand. Fill/Harbour Marine 20.0-20.5m Brown to dark brown loose to medium dense silty fine grained SAND with gravel and shell fragments. Harbour Marine 20.5-24.5m Light brown to pinish grey medium dense to ense fine-coarse grained SAND with gravel and shell fragments. Harbour Marine 24.5-35.5m Light brown to pinkish grey dense to very dense fine-medium grained SAND with shell fragments. Harbour Marine	At 25m: LL = 16; PI=0; LS=0 At 26m: LL = 16; PI=0; LS=0 At 27m: LL = 14; PI=0; LS=0	SPT @ 15.5m = 10 SPT @ 16.5m = 9 SPT @ 17.5m = 40 SPT @ 18.5m = 43 SPT @ 19.5m = 20 SPT @ 20.5m = 8 SPT @ 21.5m = 31 SPT @ 22.5m = 15 SPT @ 23.5m = 32 SPT @ 24.5m = ? SPT @ 25.5m = 37 SPT @ 26.5m = 48 SPT @ 27.5m = 40 SPT @ 28.5m = 26 SPT @ 29.5m = 41 SPT @ 30.5m = 33 SPT @ 31.5m = 30 SPT @ 32.5m = 29 SPT @ 33.5m = 50 SPT @ 34.5m = 51 SPT @ 35.5m = 59
		P1-BH13	SPT	0.0-19.0m No recovery 19.0-20.7m Light brown to grey brown medium dense gravelly SAND. Harbour Marine 20.7-22.7m Light brown to light orange brown dense SAND. Harbour Marine 22.7-25.7m Light grey very stiff slightly silty fine grained sandy CLAY. Harbour Marine 25.7-27.7m Light brown dense to very desne gravelly SAND. Harbour Marine with gravel fragments (tillite). Harbour Marine 27.7-30.7m Light grey brown very dense slightly silty fine-medium grained SAND with occasional gravel (tillite). Harbour Marine 30.7-31.7m Very dark grey very stiff orangic silty CLAY. Harbour Marine 31.7-32.7m Very dark very dense very clayey SILT. Harbour Marine 32.7-33.7m Light brown to pink brown dense SAND. Harbour Marine 33.7-35.45m Very dark grey very stiff slightly silty CLAY. Harbour Marine	At 21m: LL = 15; PI=0; LS=0 At 22m: LL = 16; PI=SP; LS=0.1	SPT @ 19.5m = 9 SPT @ 20.5m = 22 SPT @ 21.5m = 33 SPT @ 22.5m = 34 SPT @ 23.5m = 41 SPT @ 24.5m = 59 SPT @ 25.5m = 33 SPT @ 26.5m = 43 SPT @ 27.5m = 59 SPT @ 28.5m = 79

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	104	P1-BH13	SPT			SPT @ 29.5m = 81 SPT @ 30.5m = REF SPT @ 31.5m = 37 SPT @ 32.5m = 53 SPT @ 33.5m = 38 SPT @ 34.5m = 46 SPT @ 35.5m = 45
		P1-BHWB5	SPT	0.0-2.7m Light brown to grey brown dense to very dense gravelly fine-medium grained SAND. Harbour Marine 2.7-13.7m Light brown to light grey brown loose to medium dense fine-medium grained SAND with occasional gravel. Harbour Marine 13.7-14.7m Light brown to grey brown medium desne gravelly clayey silty fine grained SAND. Harbour Marine 14.7-15.7m Light brown to grey brown dense silty fine grained SAND. Harbour Marine 15.7-17.7m Dark grey brown medium dense to dense slightly silty fine grained SAND. Harbour Marine 17.7-20.45m Light brown to orange brown loose to medium desne slightly silty fine-medium grained SAND. Harbour Marine		SPT @ 1.5m = 39 SPT @ 2.5m = 67 SPT @ 3.5m = 28 SPT @ 4.5m = 18 SPT @ 5.5m = 10 SPT @ 7.5m = 9 SPT @ 8.5m = 20 SPT @ 9.5m = 21 SPT @ 10.5m = 15 SPT @ 11.5m = 11 SPT @ 12.5m = 17 SPT @ 13.5m = 17 SPT @ 14.5m = 12 SPT @ 15.5m = 39 SPT @ 16.5m = 28 SPT @ 17.5m = 42 SPT @ 18.5m = 19 SPT @ 19.5m = 21 SPT @ 20.5m = 10
		DM-H-BHC	SPT	0.0-1.5m Fill 1.5-4.5m Dry light brown grey loose medium grained SAND. 4.5-10.5m Wet light grey brown medium to very dense fine-medium grained SAND 10.5-15.0m wet light olive green interbedded SILT and fine grained SAND 15.0-19.5m Wet brown yellowish orange dense silty fine grained SAND 19.5-21.0m Wet light grey pink dense well graded mediuM-coarse grained SAND 21.0-25.5m Moist dark grey firm clayey SILT 25.5-30.0Moist light brown dense silty fine grained SAND 30.0-38.5m Moist light olive green very dense silty fine grained SAND 38.5-42.9m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock. UPPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 14 SPT @ 3.0m = 14 SPT @ 4.5m = 37 SPT @ 6.0m = 35.5 SPT @ 7.5m = 20.5 SPT @ 9.0m = 25.5 SPT @ 10.5m = 36 SPT @ 12.0m = REF SPT @ 13.5m = 27.5 SPT @ 15.0m = REF SPT @ 16.5m = 26 SPT @ 18.0m = 31.5 SPT @ 19.5m = 27 SPT @ 21.0m = 12 SPT @ 22.5m = 20 TUBE @ 24.0m SPT @ 25.5m = 29 SPT @ 27.0m = 32.5 SPT @ 28.5m = REF SPT @ 30.0m = REF SPT @ 31.5m = REF SPT @ 33.0m = REF SPT @ 34.5m = REF SPT @ 36.0m = 30
		9GO203-BH104				
		9GO203-DB Datum = L.W.O.S.T		0.0-11.0m Water 11.0-13.1m SILT and SAND 13.1-16.8m Firm CLAY		
		HW-V03				
		9GO203-BH007 Datum = L.W.O.S.T		0.0-1.4m Grey fine-medium grained SAND 1.4-5.3m Grey medium grained SAND 5.3-9.0m Grey fine grained SAND 9.0-10.8m Grey fine-medium grained SAND 10.8-12.0m Grey fine grained SAND 12.0-13.2m Grey fine-medium grained SAND 13.2-14.2m Grey soft sandy CLAY 14.2-20.6m Brown fine-medium SAND 20.6-24.8m Brown fine-medium grained SAND		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	104	9GO203-D1		0.0-9.1m Water 9.1-13.7m SILT and SAND grading into fine grained SAND		
		HW-V02				
		9GO203-D2 Datum = L.W.O.S.T		0.0-13.4m Water 13.4-13.5m SILT and SAND 13.5-13.7m CLAY		
		9GO203-BH005 Datum = L.W.O.S.T		0.0-1.2m Grey fine grained SAND 1.2-4.0m Grey medium grained SAND 4.0-18.9m grey fine-medium grained SAND 18.9-20.6m Grey slightly silty fine grained SAND 20.6-21.3m Grey stiff CLAY		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	105	DM-I-RM7	SPT	0.0-10.0m Light yellowish to greyish brown loose to medium dense fine-medium grained SAND with shell fragments. Fill 10.0-17.5m Greyish to olive brown medium desne silty fine-medium grained SAND with shell fragments. Harbour Beds 17.5-20.5m Pale brown desne fine-medium grained SAND. Harbour Beds 20.5-23.5m Pinkish brown dense fine-coarse grained SAND with silty fine grained sandy lenses. Harbour Marine 23.5-26.5m Dark grey very loose slightly ferruginised silty clayey SAND with friable ferruginsed nodules. Harbour Beds 26.5-29.5m Reddish orange very dense fine-medium grained SAND with silty clay lenses. Harbour Beds 29.5-32.5m Orange yelloe to pinkish brown very dense fine-medium grained SAND. Harbour Beds 32.5-37.0m Dark grey medium dense to stiff clayey SAND/sandy CLAY. Harbour Beds 37.-49.5m Dark greymedium dense to very dense slightly silty fine-medium grained SAND. Harbour Beds		SPT @ 1.5m = 10 SPT @ 3.0m = 10 SPT @ 4.5m = 8 SPT @ 6.0m = 9 SPT @ 7.5m = 19 SPT @ 9.0m = 16 SPT @ 10.5m = 21 SPT @ 12.0m = 14 SPT @ 13.5m = 17 SPT @ 15.0m = 11 SPT @ 16.5m = 24 SPT @ 18.0m = 44 SPT @ 19.5m = 36 SPT @ 21.0m = 33 SPT @ 22.5m = 40 SPT @ 24.0m = 3 SPT @ 25.5m = 4 SPT @ 27.0m = REF SPT @ 28.5m = REF SPT @ 30.0m = REF SPT @ 31.5m = REF SPT @ 33.0m = REF SPT @ 34.5m = 13 SPT @ 36.0m = 25 SPT @ 37.5m = 53 SPT @ 39.0m = 33 SPT @ 40.5m = 31 SPT @ 42.0m = REF SPT @ 43.5m = REF SPT @ 45.0m = 64 SPT @ 46.5m = 35 SPT @ 48.0m = 25 SPT @ 49.5m = 10
		P1-BH03	SPT	0.0-19.0m No recovery 19.0-19.5m Orange brown medium dense to desne mediu-coarse grained SAND with pockets of orange brown firm clay. Fill/Harbour Marine 19.5-22.5m Orange brown medium dense to dense slightly silty medium-coarse grained SAND with shell fragments. Harbour Marine 22.5-25.5m Grey to dark grey very stiff becoming firm to stiff with depth silty CLAY. Harbour Marine 25.5-27.5m Light brown very dense fine grained SAND. Harbour Marine 27.5-30.0m Pink brown very dense very slightly silty fine grained SAND. Harbour Marine 30.0-30.5m Dark gry to dark grey brown stiff CLAY. Habrour Marine 30.5-31.5m Very light pink dense fine-medium grained SAND. Harbour Marine 31.5-32.5m Very light orange brown very dense mediu-coarse grained SAND with shell fragments and pockets of soft light grey clay. Harbour Marine 32.5-34.5m Light grey dense slightl cemented silty fine grained SAND. Harbour Marine 34.5-35.5m Very light grey very dense silty clayey fine grained SAND with occasional gravel. Harbour Marine		SPT @ 19.5m = 31 SPT @ 20.5m = 30 SPT @ 21.5m = 26 SPT @ 22.5m =57 SPT @ 23.5m = 29 SPT @ 24.5m = 12 SPT @ 25.5m = 17 SPT @ 26.5m = 62 SPT @ 27.5m = 62 SPT @ 28.5m = 78 SPT @ 29.5m = 72 SPT @ 30.5m = 19 SPT @ 31.5m = 39 SPT @ 32.5m = 59 SPT @ 33.5m = 34 SPT @ 34.5m = 48 SPT @ 35.5m = 54

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	105	P1-BHWB4	SPT	0.0-0.1m Asphalt 0.1-2.75m Light brown medium dense to dense gravelly fine-medium grained SAND. Harbour Marine/Reclamation Fill 2.75-6.75m Light to dark brown loose to medium dense slightly silty gravelly fine-medium grained SAND. Harbour Marine/Reclamation Fill 6.75-7.75m Grey brown very loose slighty silty fine-medium grained SAND. Harbour Marine 7.75-9.75m Light to dark brown loose fine grained SAND. Harbour Marine/Reclamation Fill 9.75-10.75m Light to dark brown medium dense gravell fine grained SAND. Harbour Marine 10.75-14.75m Light to dark brown meduim dense fine-medium grained SAND. Harbour Marine/Reclamation Fill 14.75-15.75m Light pink dense slightly sandy fine-medium grained GRAVEL. Harbour Marine/Reclamation Fill 15.75-18.75m Light brown medium dense gravelly fine-medium grained SAND. Harbour Marine/Reclamation Fill 18.75-19.75m Light brown medium dense slightly gravelly silty fine grained SAND. Habour Marine/Reclamation Fill 19.75-20.45m Light pink medium dense to dense gravelly medium-coarse grained SAND. Harbour Marine/Reclamation Fill		SPT @ 1.5m = 36 SPT @ 2.5m = 20 SPT @ 3.5m = ? SPT @ 4.5m = 16 SPT @ 5.5m = 14 SPT @ 6.5m = 5 SPT @ 7.5m = 2 SPT @ 8.5m = 7 SPT @ 9.5m = 9 SPT @ 10.5m = 12 SPT @ 11.5m = 17 SPT @ 12.5m = 17 SPT @ 13.5m = 19 SPT @ 14.5m = 10 SPT @ 15.5m = 40 SPT @ 16.5m = 10 SPT @ 17.5m = 11 SPT @ 18.5m = 16 SPT @ 19.5m = 18 SPT @ 20.5m = 30
		P1-BH04	SPT	0.0-19.5m No recovery 19.5-20.2m Gravel and cobbles of tillite and sandstone 20.2-23.7m Grey stiff slightly gravelly and silty CLAY. Harbour Marine 23.7-28.7m Dark grey very stiff slightly gravelly silty CLAY. Harbour Marine 28.7-29.7m Light brown dense medium grained SAND. Harbour Marine 29.7-30.7m Light brown dense gravelly SAND. Harbour Marine 30.7-32.7m Light grey to light grey brown dense to very dense slightly clayey fine grained sandy SILT. Harbour Marine 32.7-35.45m Light brown to light pink brown dense to very dense fine-medium grained SAND. Habour Marine	At 23m: LL = 26; PI=11; LS=5.7 At 25m: LL = 40; PI=18; LS=9.3 At 27m: LL = 42; PI=16; LS=8.3	SPT @ 20.5m = 24 SPT @ 21.5m = 14 SPT @ 22.5m =11 SPT @ 23.5m = 10 SPT @ 24.5m = 24 SPT @ 25.5m = 24 SPT @ 26.5m = 18 SPT @ 27.5m = 25 SPT @ 28.5m = 26 SPT @ 29.5m = 46 SPT @ 30.5m = 36 SPT @ 31.5m = 59 SPT @ 32.5m = 41 SPT @ 33.5m = 50 SPT @ 34.5m = 61 SPT @ 35.5m = 49
		DM-I-RM6	SPT	0.0-10.0m Light yellowish brown to brown medium dense fine-medium grained SAND with shell fragments. Fill 10.0-11.5m Light brown medium dense fine-medium grained SAND. Harbour Beds 11.5-14.5m Light greyish borwn medium dense slightly silty fine-medium grained SAND with shell fragments. Harbour beds 14.5-17.5m Light yellowish and greyish brown medium dense to dense fine-medium grained SAND. Harbour Beds 17.5-19.0m Light brown desne fine-coarse grained SAND. Harbour Beds 19.0-20.5m Dark purple brown very stiff slightly slickensided and shattered silty CLAY. Harbour Beds 20.5-25.0m Pale to dark brown firm to stiff slightly sandy silty CLAY. Harbour Beds 25.0-28.0m Light yellowish orange very dense fine-medium grained SAND with light grey slickendsided silty clayey lenses at depth. Harbour Beds 28.0-29.5m Light brown very dense fine-coarse grained SAND with light greenish grey clayey sandy lenses. Harbour Beds 29.5-31.0m Dark orange brown very dense slightly silty fine-medium grained SAND. Harbour Beds 31.0-34.0m Dark gryish brown very stiff sandy silty CLAY. Harbour Beds 34.0-35.5m Pale yellowish brown dense slightly silty fine grained SAND. Harbour Beds 35.5-37.0m Dark greenish olive very stiff sandy clayey SILT with scatted subangular limestone gravels. Residual Cretaceous Siltstone 37.0-38.55m Dark gryeysih olive medium to slightly weathered fine grained thickly bedded very soft rock CRETACEOUS SILTSTONE		SPT @ 1.5m = 23 SPT @ 3.0m = 21 SPT @ 4.5m = 27 SPT @ 6.0m = 17 SPT @ 7.5m = 18 SPT @ 9.0m = 21 SPT @ 10.5m = 20 SPT @ 12.0m = 25 SPT @ 13.5m = 15 SPT @ 15.0m = 13 SPT @ 16.5m = 34 SPT @ 18.0m = 40 SPT @ 19.5m = 24 SPT @ 21.0m = 6 SPT @ 22.5m = 10 SPT @ 24.0m = 14 SPT @ 25.5m = 62 SPT @ 27.0m = 89 SPT @ 28.5m = 58 SPT @ 30.0m = 58 SPT @ 31.5m = 49 SPT @ 33.0m = 45 SPT @ 34.5m = 33 SPT @ 36.0m = 62

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**105**	**P1-BH05**	**SPT**	0.0-20.0m No recovery 20.0-20.7m Dark grey to dark grey brown medium dense clayey GRAVEL. Harbour Marine 20.7-24.7m Light grey to dark grey stiff slightly gravelly silty CLAY. Harbour Marine 24.7-25.7m Light orange brown medium desne fine-medium grained SADN. Harbour Marine 25.7-33.7m Light orange brown to light gry orange dense to very dense fine-medium grained SAND. Harbour Marine 33.7-35.45m Very dark grey dense clayey SILT. Harbour Marine	At 21m: LL = 30; PI=15; LS=7.7 At 25m: LL = 46; PI=16; LS=8 At 26m: LL = 17; PI=0; LS=0 At 27m: LL = 16; PI=0; LS=0	SPT @ 20.5m = 20 SPT @ 21.5m = 12 SPT @ 22.5m = 9 SPT @ 23.5m = 10 SPT @ 24.5m = 9 SPT @ 25.5m = 27 SPT @ 26.5m = 63 SPT @ 27.5m = 68 SPT @ 28.5m = 65 SPT @ 29.5m = 61 SPT @ 30.5m = 65 SPT @ 31.5m = 67 SPT @ 32.5m = 40 SPT @ 33.5m = 45 SPT @ 34.5m = 38 SPT @ 35.5m = 40
		9GO203-BH003 **Datum = L.W.O.S.T**		0.0-9.6m Grey fine-medium grained SAND 9.6-28.8m Grey stiff CLAY 28.8-34.63m Grey fine-medium grained SAND 34.63-39.92m Grey brown medium grained SAND		
		BH-V06	**Vibrocore**	0.0-0.3m Dark olive to light olive fine-medium grained massive SAND 0.3-2.4m Light yellow to light reddish brown fine-coarse grained laminated SAND. 2.4-2.6m Light grey to dusky blue firm CLAY grading into soft SILT 2.6-3.3m Light yellow to light reddish brown fine-coarse grained laminated SAND 3.3-3.5m Light reddish brown to light olive clayey medium grained SAND	< 0.063mm = 3.43 % > 2.0mm = 1.18 % < 0.063mm = 0.24 to 0.99 % > 2.0mm = 0.00-2.79 % < 0.063mm = 24.53 % > 2.0mm = 0.0 % < 0.063mm = 0.12 % > 2.0mm = 0.0 % < 0.063mm = 1.75 % > 2.0mm = 1.0 %	
		P1-BH30	SPT	0 to 16.5m to seafloor 16.5 to 19m Unweatehred grey to dark grey very hard GRAVEL (fill) comprising tillite fragments. Fine matrix material has been washed out. 19 to 24.5 Moist to very moist, dark grey slightly mottled orange stiff slightly silty CLAY 24.5 to 26.6m Wet light yellow orange brown mottled dark orange very dense fine to medium grained SAND 26.6 to 27.7m Wet orange brown dense medium to coarse grained SAND 27.7 to 30.2m Wet light yellow orange dense fine to medium grained fraction slightly shelly SAND	Triaxial tests	SPT @ 20.5m-23 Shelby sample 20.45 to 24.5m
		9GO203-BH008 **Datum = L.W.O.S.T**	SPT	0.-7.9m Grey fine-medium grained SAND 7.9-14.0m Grey fine grained SAND 14.0-18.6m Brown fine-medium grained SAND 18.6-21.0m Grey brown fine grained SAND 21.0-22.6m Brown medium grained SAND 22.6-24.4m Brownfine-medium grained SAND 24.4-26.8m Brown-medium coarse grained SAND 26.8-28.0m Yellow brown medium grained SAND		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	106	9GO203-BH002 Datum = L.W.O.S.T		0.0-1.2m Grey fine-medium grained SAND 1.2-6.4m Grey medium grained SAND 6.4-9.8m Grey fine grained SAND 9.8-13.1m Light grey slightly silty fine grained SAND 13.1-18.6m Yellow grey stiff sandy CLAY 18.6-18.7m Grey very stiff CLAY 18.7-27.7m Grey clayey fine grained SAND 27.7-32.9m Dark grey firm sandy CLAY 32.9-33.5m Weathered Tillite	
		P1-BH06	SPT	0.0-18.8m No recovery 18.8-19.2m Cobbles of Tilliite and Sandstone 19.2-19.7m Light orange brown stiff gravelly CLAY. Harbour Marine 19.7-20.7m Light grey dense clayey SAND with patches of sandy clay. Harbour Marine 20.70-21.7m Light grey dense SAND. Harbour Marine 21.7-22.7m Light grey hard sandy CLAY. Harbour Marine 22.7-23.7m Light grey dense clayey SAND. Harbour Marine 23.7-25.7m Dark grey to brown medium dense slightly silty clayey medium grained SAND. Harbour Marine 25.7-32.7m Light grey becoming light orange brown dense to very dense slightly silty fine-medium grained SAND. Harbour Marine 32.7-35.65m Very dark grey dense to very dense clayey SILT. Harbour Marine		SPT @ 19.5m = 9 SPT @ 20.5m = 31 SPT @ 21.5m = 41 SPT @ 22.5m = 35 SPT @ 23.5m = 39 SPT @ 24.5m = 28 SPT @ 25.5m = 16 SPT @ 26.5m = 48 SPT @ 27.5m = 31 SPT @ 28.5m = 64 SPT @ 29.5m = 54 SPT @ 30.5m = 63 SPT @ 31.5m = 76 SPT @ 32.5m = 55 SPT @ 33.5m = 50 SPT @ 34.5m = 76 SPT @ 35.5m = ?
		P1-BHWB3	SPT	0.0-0.1m Asphalt 0.1-10.7m Light brown medium dense slightly silty fine-medium grained SAND. Harbour Marine/Reclamation Fill 10.7-13.7m Light grey brown medium dense slightly silty fine grained SAND. Harbour Marine/Reclamation Fill 13.7-16.7m Light brown to light grey brown loose to medium dense clayey sandy GRAVEL. Harbour Marine/Reclamation Fill 16.7-19.7m Dark grey stiff to very stiff slightly silty sandy CLAY with tillite gravel. Harbour Marine/Reclamation Fill 19.7-20.45m Light grey dense silty fine-medium grained SAND. Harbour Marine/Reclamation Fill		SPT @ 1.5m = 19 SPT @ 2.5m = 27 SPT @ 3.5m = 33 SPT @ 4.5m = 19 SPT @ 5.5m = 13 SPT @ 6.5m = 16 SPT @ 7.5m = 16 SPT @ 8.5m = 21 SPT @ 9.5m = 19 SPT @ 10.5m = 20 SPT @ 11.5m = 22 SPT @ 12.5m = 15 SPT @ 13.5m = 20 SPT @ 14.5m = 23 SPT @ 15.5m = 15 SPT @ 16.5m = 9 SPT @ 17.5m = 14 SPT @ 18.5m = 16 SPT @ 19.5m = 13 SPT @ 20.5m = 79
		DM-I-RM5	SPT	0.0-2.5m Light yellowish brown medium dense fien-medium grained SAND with shell fragments. Fill 2.5-10.0m Light brown medium dense fine-medium grained SAND with scattered shell fragments and tillite gravel. Fill 10.0-13.0m Light brownish grey medium dense fine-medium grained SAND with scattered shell fragments. Harbour Beds 13.0-14.5m Light brown to grey medium dense silty fine-medium grained SAND. Harbour Beds 14.5-17.5m Light grey to pinkish brown very stiff slightly sandy silty CLAY. Harbour Beds 17.5-26.5m Light brown to orange brown medium dense becoming very dense with depth slightly silty fine-medium grained SAND. Harbour Beds 26.5-28.0m Dark orange brown very dense slightly silty fine grained SAND. Habour Beds 28.0-29.5m Pale greyish brown very dense slightly silty fine-coarse grained SAND with gravel. Harbour Beds 29.5-31.0 Dark yellowish brown very dense slightly silty fine-medium grained SAND. Harbour Beds 31.0-35.5m Dark yellowish brown to olive grey very stiff andy clayey SILT. Harbour Beds 35.5-36.7m Dark olive very stiff sandy clayey SILT with scatted limestone gravel. Residul Cretaceous Siltstone 36.7-39.5m Dark greyish olive medium to slightly weathered fine grained thickly bedded very soft rock. CRETACEOUS SILTSTONE		SPT @ 1.5m = 24 SPT @ 3.0m = 29 SPT @ 4.5m = 11 SPT @ 6.0m = 13 SPT @ 7.5m = 21 SPT @ 9.0m = 19 SPT @ 10.5m = 26 SPT @ 12.0m = 59 SPT @ 13.5m = 13 SPT @ 15.0m = 19 SPT @ 16.5m = 29 SPT @ 18.0m = 28

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	106	DM-I-RM5	SPT			SPT @ 19.5m = 39 SPT @ 21.0m = 22 SPT @ 22.5m = 68 SPT @ 24.0m = 75 SPT @ 25.5m = 47 SPT @ 27.0m = 83 SPT @ 28.5m = 89 SPT @ 30.0m = 66 SPT @ 31.5m = 33 SPT @ 33.0m = 51 SPT @ 34.5m = 51 SPT @ 36.0m = REF
		P1-BH07	SPT	0.0-18.0m Drilling over water 18.0-19.0m Gravel comprising dark grey to blue grey tillite and dolerite. Harbour Marine 19.0-19.75m Dark grey medium dense to desne medium to coarse grained GRAVEL with a matrix of silty fine sand. Harbour Marine 19.75-23.75m Orange brown medium dense to dense silty fine grained SAND. Harbour Marine 23.75-25.75m Orange brown medium-coarse grained SAND with shell fragments. Harbour Marine 25.75-27.75m Grey to light grey brown dense very fine grained SAND. Harbour Marine 27.75-28.75m Brown to grey brown very stiff slightly silty CLAY. Harbour Marine 28.75-33.75m Dark grey very stioff slightly silty CLAY with occassional lenses of grey very fine grained sand. Harbour Marine 33.75-35.45m Orange brown to light brown very dense slightly silty clayey fine-coarse grained SAND. Harbour Marine	At 28m: LL = 72; PI=34; LS=17 At 29m: LL = 64; PI=31; LS=15.7	SPT @ 19.5m = 30 SPT @ 20.5m = 34 SPT @ 21.5m = 42 SPT @ 22.5m = 24 SPT @ 23.5m = 7 SPT @ 24.5m = 50 SPT @ 25.5m = 42 SPT @ 26.5m = 32 SPT @ 27.5m = 30 SPT @ 28.5m = 18 SPT @ 29.5m = 11 SPT @ 30.5m = 19 SPT @ 31.5m = 23 SPT @ 32.5m = 22 SPT @ 33.5m = 23 SPT @ 34.5m = 81 SPT @ 35.5m = 59
		DM-I-RM4	SPT	0.0-10.0m Light brown medium dense fine-medium grained SAND with scattered shell fragments. Fill 10.0-14.5m Light greyish brown medium dense fine-medium grained SAND with shell fragments. Harbour Beds 14.5-16.0m Light brown medium dense fine-medium grained SAND with silty sandy lenses and shell fragments. Harbour Beds 16.0-17.5m Light orange brown medium dense slightly silty fine-medium grained SAND. Harbour Beds 17.5-22.0m Light orange brown to purple brown dense to very dense fine-medium grained SAND. Harbour Beds 22.0-23.5m Light yellowish brown and darm brown very dense fine-medium SAND with interlayered drk blackish grey silty sandy lenses. Harbour Beds 23.5-25.0m Light orange brown dense fine-coarse grained SAND with silty clay lenses. Harbour Beds 25.0-26.5m Light orange brown very dense fine-coarse grained SAND. Harbour Beds 26.5-28.0m Light yellowis brown dense silty fine grained SAND. Harbour Beds 28.0-34.0m Dark olive to brownish grey very stiff sandy silty CLAY. Harbour Beds 34.0-42.9m Light to dark grey dense to very dense slightyl silty fine-medium grained SAND with silty clay lenses. Harbour Beds 42.9-45.7m Dark greyish/greenish olive slightly to unweathred fine grained thickly bedded very soft rock. CRETACEOUS SILTSTONE		SPT @ 1.5m = 24 SPT @ 3.0m = 22 SPT @ 4.5m = 18 SPT @ 6.0m = 12 SPT @ 7.5m = 18 SPT @ 9.0m = 25 SPT @ 10.5m = 25 SPT @ 12.0m = 25 SPT @ 13.5m = 19 SPT @ 15.0m = 25 SPT @ 16.5m = 21 SPT @ 18.0m = 41 SPT @ 19.5m = 58 SPT @ 21.0m = 40 SPT @ 22.5m = 83 SPT @ 24.0m = 48 SPT @ 25.5m = 68 SPT @ 27.0m =46 SPT @ 28.5m = 18 SPT @ 30.0m = 18 SPT @ 31.5m = 21 SPT @ 33.0m = 19 SPT @ 34.5m = 36 SPT @ 36.0m = 56 SPT @ 37.5m = 59 SPT @ 39.0m = 65 SPT @ 40.5m = 59 SPT @ 42.0m = 50 SPT @ 43.0m = REF
		DM-H-BH3	SPT	0.0-10.5m Wet light brown loose fine-medium grained SAND. 10.5-25.5m Moist interbedded light olive green firm CLAY and yellow orange brown medium dense fine-medium grained SAND. 25.5-27.0m Moist Dark grey mottled brown yellow orange very stiff silty CLAY with minor cemented layers. 27.0-30.09m Moist dark grey firm clayey SILT with shell fragments. 30.09-34.49m Mist dark grey very stiff silty CLAY. 34.49-39.44m Moist dark grey medium to very dense silty clayey fine grained SAND 39.44-44.99m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock. UPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 11 SPT @ 3.0m = 13 SPT @ 4.5m = 9 SPT @ 6.0m = 9 SPT @ 7.5m = 14 SPT @ 9.0m = 8 SPT @ 10.5m = 21.55

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	106	DM-H-BH3	SPT			SPT @ 12.0m = 20 SPT @ 13.5m = 20.5 SPT @ 15.0m = 18 SPT @ 16.5m = 28.5 SPT @ 18.0m = 30 SPT @ 19.5m = 32 SPT @ 21.0m = 20 SPT @ 22.5m = 24 SPT @ 24.0m = 41.5 SPT @ 25.5m = 37.5 TUBE SPT @ 28.0m = 16 TUBE SPT @ 30.0m = 15 SPT @ 31.5m = 18.5 SPT @ 32.5m = 25 SPT @ 33.0m = 37.5 SPT @ 34.5m = 43 SPT @ 36.0m = 15 SPT @ 37.5m = 34.5 SPT @ 39.0m = 43
		DM-H-BH4	SPT	0.0-7.5m Wet light yellowish grey loose to medium dense fine -medium grained SAND with heavy minerals. 7.5-9.0m Wet light grey medium dense medium-coarse grained SAND with heavy minerals and shell fragments 9.0-19.5m Wet yellowish brown very loose to very dense silty fine grained SAND 19.5-24.0m Wet light yellow brown dense to very dense silty fine-coarse grained SAND 24.0-25.5m Moist ligh grey stiff slickensided CLAY 25.5-28.5m Moist dark yellow very dense silty fine grained SAND with cement sandy fragments 28.5-31.76m Moist dark grey stiff clayey SILT 31.76-33.0m Wet dark grey dense silty fine grained SAND 33.0-36.16m wet dark grey firm slightly sandy silty CLAY 36.16-37.66m Moist dark grey medium dense silty fine grained SAND 37.66-42.16m Moist light olive green firm sandy SILT 42.16-45.31m Dark grey very thickly bedded very widely jointed fine gtrained slightly weathered very soft rock UPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 15 SPT @ 3.0m = 12 SPT @ 4.5m = 14 SPT @ 6.0m = 4 SPT @ 7.5m = 14 SPT @ 9.0m = 27 SPT @ 10.5m = 11 SPT @ 12.0m = 18.5 SPT @ 13.5m = 18 SPT @ 15.0m = 13 SPT @ 16.5m = 4 SPT @ 18.0m = 20 SPT @ 19.5m = 24.5 SPT @ 21.0m = 24.5 SPT @ 22.5m = 20 SPT @ 24.0m = 25.5 SPT @ 25.5m = 28.5 SPT @ 27.0m = 32 SPT @ 28.5m = 19 SPT @ 30.0m = 19 TUBE @ 30.5m SPT @ 31.5m = 25 TUBE @ 33.0m SPT @ 34.0m = 18.5 SPT @ 35.0m = 17.5 SPT @ 36.0m = 17 SPT @ 37.5m = 20 SPT @ 39.0m = 16.5 SPT @ 40.5m = 17 SPT @ 42.0m = REF
		9GO203-BH009 Datum = L.W.O.S.T		0.0-3.2m Grey brown medium grained SAND 3.2-9.3m Brown fine-medium grained SAND 9.3-18.1m Yellow brown fine grained SAND with occasional clay patches 18.1-19.1m Grey clayey fine grained SAND 19.1-20.6m Brown medium grained SAND 20.6-22.1m Grey brown clayey fine grained SAND 22.1-24.2m Dark grey stiff CLAY 24.2-24.6m Yellow brown sandy CLAY. Residual Dwyka Tillite		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	106	DM-H-BHB	SPT	0.0-1.5m Fill 1.5-4.5m Moist light briwn very loose fine grained SAND 4.5-9.0m Moist light grey medium dense silty fine grained SAND 9.0-18.0m Wet light briown grey dense to very dense silty fine-medium grained SAND 18.0-21.m Wet light grey very dense clayey fine grained SAND 21.0-22.5m Wet light yellow loose silt fine grained SAND 22.5-24.0m Wet light grey soft SILT 24.0-25.5m Wet light yellow dense silty fine grained SAND 25.5-28.5m Wet light orange medium dense to dense silty fine-medium grained SAND 28.5-30.0m Wet dark orange dense clayey medium grained SAND 30.0-36.0m Wet dark grey firm to stiff slightly sandy SILT/CLAY 36.0-46.5m Wet light to dark grey very dense silty medium-coarse grained SAND 46.5-49.5m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock UPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 4 SPT @ 3.0m = 6 SPT @ 4.5m = 12 SPT @ 6.0m = 18.5 SPT @ 7.5m = 23.5 SPT @ 9.0m = 22.5 SPT @ 10.5m = 32.5 SPT @ 12.0m = 16 SPT @ 13.5m = 18 SPT @ 15.0m = 19 SPT @ 16.5m = 26.5 SPT @ 18.0m = 29 SPT @ 19.5m = 33.5 SPT @ 21.0m = 6 SPT @ 22.5m = 10 TUBE @ 23.0m SPT @ 24.0m = 31 SPT @ 25.5m = 17 SPT @ 27.0m = 21 SPT @ 28.5m = 20 SPT @ 30.0m = 16 SPT @ 31.5m = 24 SPT @ 33.0m = 22 SPT @ 34.5m = 35.5 SPT @ 36.0m = 41 SPT @ 37.5m = 38 SPT @ 39.0m = 40.5 SPT @ 40.5m = 44 SPT @ 42.0m = REF SPT @ 43.5m = 41.5 SPT @ 45.0m = 43 SPT @ 46.5m = REF
		P1-BH09		0 to 18m To seafloor 18 to 19m Angular gravels of Sandstone and tillite, poor recovery (<3%) no fines recovered 19 to 21.7m light grey occasionally mottled yellow brown and pink brown, medium dense to dense, slighlty clayey and gravelly silty, fine to medium SAND. Harbour Marine. 21.7 to 28.7m Grey to grey brown mottled and patched dark orange brown, very stiff, slightly silty CLAY. Harbour Marine 28.7 to 30.7m Dark grey to dark grey brown mottled dark orange brown, very stiff, silty CLAY. Harbour Marine. 30.7 to 35.45m Very dark grey, stiff to very stiff, very silty CLAY. Harbour Marine.	At 19m: LL = 24; PI=3; LS= 1.7 At 20m: LL = 21; PI=SP; LS=0.3 At 22m: LL = 22; PI=SP; LS=0.7 At 23m: LL = 60; PI=30; LS=15 At 25m: LL = 60; PI=28; LS=14	SPT @ 19..5m-26 SPT @ 20.5m-41 SPT @ 21.5m-29 SPT @ 22.5m-30 SPT @ 23.5m = 37 SPT @ 24.5m-16 SPT @ 25.5m-34 SPT @ 26.5m- 22 SPT @ 27.5m-19 SPT @ 28.5m-17 SPT @ 29.5m-17 SPT @ 30.5m-15 SPT @ 31.5m-21 SPT @ 32.5m-14 SPT @ 33.5m-13 SPT @ 34.5m- 20
		DM-I-RM3	SPT	0.0-5.5m Light yellowish brwn medium dense fine-medium grained SAND wit gravel and shell fragments. Fill 5.5-7.0m Light brown medium dense fine-coarse grained SAND with scattered gravel and shell fragments. Fill 7.0-11.5m Light brown medium dense to dense fine-medium grained SAND with scattered gravel and shell fragments. Fill 11.5-16.0m Light greyish to orangey brown medium dense fine-medium grained SAND with shell fragments. Harbour Beds 16.0-19.0m Light olive brown dense becoming loose with depth silty fine-medium grained SAND with calcerous gravel and silty clay lenses. Harbour Beds 19.0-20.5m Dark olive grey firm sandy silty CLAY with shell fragments. Harbour Beds 20.5-23.5m Pale orange brown dense fine-medium grained SAND with shell fragments. Harbour Beds 23.5-25.0m Pale brown dense fine-coarse grained SAND with silty clay lenses. Harbour Beds 25.0-26.5m Light orange brown dense fine-medium grained SAND with slickensided silty clay lenses. Harbour Beds 26.5-29.5m Light to darkolive grey stiff mircoshattered and slickensided silty CLAY with sandy lenses. Harbour Beds 29.5-34.0m Dark brownish grey very stiff sandy silty CLAY with shell fragments. Harbour Beds 34.0-35.5m Dark brownish grey dense clayey silty SAND. Harbour Beds 35.5-38.5m Dark yellowish brown to grey dense to very dense silty fine-medium grained SAND. Harbour Beds 38.5-41.0m Light greyish olive very stiff clayey sandy SILT. Residual Cretaceous Siltstone 41.0-43.35m Dark greyish olive slightly to unweathered fine grained thickly bedded very soft rock CRETACEOUS SILTSTONE		SPT @ 1.5m = 19 SPT @ 3.0m = 20 SPT @ 4.5m = 13 SPT @ 6.0m = 13 SPT @ 7.5m = 17 SPT @ 9.0m = 24 SPT @ 10.5m = 20 SPT @ 12.0m = 25 SPT @ 13.5m = 26 SPT @ 15.0m = 27 SPT @ 16.5m = 40 SPT @ 18.0m = 7 SPT @ 19.5m = 8 SPT @ 21.0m = 44 SPT @ 22.5m = 75

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	106					SPT @ 24.0m = 33 SPT @ 25.5m = 31 SPT @ 27.0m = 19 SPT @ 28.5m = 23 SPT @ 30.0m = 23 SPT @ 31.5m = 21 SPT @ 33.0m = 18 SPT @ 34.5m = 32 SPT @ 36.0m = 41 SPT @ 37.5m = 54 SPT @ 39.0m = 47 SPT @ 41.0m = REF
		DM-H-BH2	SPT	0.0-7.5m Moist light brown medium dense fine grained SAND with heavy minerals 7.5-13.5m Very moist dark olive green very dense fine grained SAND 13.5-19.5m Wet light yellow brown silty fine grained SAND 19.5-23.0m Moist dark grey soft silty CLAY with pebbles 23.0-24.5m Moist light ylloe brown dense silty fine grained SAND 34.5-26.0m Moist interbedded light olive green firm CLAY with yellow orange brown medium dense fine-medium grained SAND 26.0-29.5m Wet light grey dense silty fine grained SAND 29.5-38.5m Moist dark grey firm silty CLAY with shell fragments 38.5-41.5m Wet dark brown very dense silty clayey SAND 41.5-43.0m Dark grey very thickly bedded very widely jointed fine grained slightly weatherd very soft rock UPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 20 SPT @ 3.0m = 21 SPT @ 4.5m = 17 SPT @ 6.0m = 16 SPT @ 7.5m = 44 SPT @ 9.0m = 15.5 SPT @ 10.5m = 28.5 SPT @ 12.0m = 20 SPT @ 13.5m = 18.5 SPT @ 15.0m = 18 SPT @ 16.5m = 32 SPT @ 18.0m = 39 SPT @ 19.5m = 6 SPT@ 20.5m = 18.5 TUBE @ 21.0m SPT @ 23.0m = 38.5 SPT @ 24.5m = 15.5 SPT @ 26.0m = 38.5 SPT @ 27.5m = 18 SPT @ 28.5m = 18 SPT @ 30.0m = 23.5 TUBE @ 31.0m SPT @ 32.0m = 18.5 SPT @ 38.5m = REF SPT @ 40.0m = 29.5 SPT @ 37.5m = 13 SPT @ 43.0m = 26
		DM-H-BH5	SPT	0.0-1.5m Premix and crusher run 1.5-7.5m Moist light brown loose medium grained SAND with pebbles 7.5-16.5m Moist light grey loose to very dense silty fine grained SAND 16.5-19.5m Moist darkgrey firm silty CLAY 19.5-24.0m Moist interbedded light grey firm silty CLAY with brown yellowish orange medium dense silty SAND 24.-25.5m Moist light grey very dense silty fine grained SAND 25.5-28.5m Moist light pink very dense medium-coarse grained SAND 28.8-39.0m Moist dark grey firm silty CLAY with shell fragments 39.0-43.5m Moist olive green firm SILT. Residual Cretaceous Siltstone 43.5-43.65m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very sofy rock UPPER CRETACEOUS SILTSTONE		SPT @ 1.5m = 6 SPT @ 3.0m = 11 SPT @ 4.5m = 12 SPT @ 6.0m = 15 SPT @ 7.5m = 36.5 SPT @ 9.0m = 36.5 SPT @ 10.5m = 15 SPT @ 12.0m = 32 SPT @ 13.5m = 18.5 SPT @ 15.0m = 19 SPT @ 16.5m = 20 SPT @ 18.0m = 5 SPT @ 19.5m = 15 SPT @ 21.0m = 19.5 SPT @ 22.5m = 28 SPT @ 24.0m = 33.5 SPT @ 25.5m = 29.5 SPT @ 27.0m = 35.5 SPT @ 28.5m = 20 SPT @ 30.0m = 20.5 SPT @ 31.5m = 17 SPT @ 33.0m = 20 SPT @ 34.5m = 27.5 SPT @ 36.0m = 16.5 SPT @ 37.5m = 26.5 SPT @ 39.0m = 17.5 SPT @ 40.5m = 21 SPT @ 42.0m = 24.5 SPT @ 43.5m = REF

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**106**	**P1-BH10**	**SPT**	0 to 18m To seafloor 18 to 24m No recovery 24 to 25.7m Light brown, dense, fine to medium grained SAND. Harbour Marine. 25.7 to 26.7 Light brown, dense, fine to medium grained SAND. Harbour Marine. 26.7 to 28.7m Very dark grey, very dense to medium dense, slightly clayey SAND with patches of clayey sand. Harbour Marine. 28.7 to 30.2m light brown mottled and patched light orange brown, very stiff, slightly sandy and silty CLAY. Harbour Marine. 30.2 to 32.2m Very dark grey mottled dark grey brown, very stiff, slightly sandy and silty CLAY with light cream brown shell fragments. Harbour Marine. 32.2 to 35.45m Very dark grey, very stiff to hard, slightly sandy silty CLAY with light cream brown shell fragments. Harbour Beds.		SPT @ 24.5m-39 SPT @ 25.5m-32 SPT @ 26.5m- 44 SPT @ 27.5m-53 SPT @ 28.5m-13 SPT @ 29.5m-24 Shelby tube 30 to 30.5m SPT @ 31.5m-23 Shelby tube 32 to 32.5m SPT @ 33.5m-31 Shelby tube 34 to 34.5m SPT @ 35.5m- 24
		BH-V27	**Vibrocore**	0.0-0.15m Dark brown fine-coarse grained massive normally graded SAND with moderte heavy minerals and shell fragments 0.15-0.25m Dark grey fine-medium grained massive SAND with low instersitial clay content with blocky angular coal clast 0.25-1.8m Dark to light reddish brown fine-coarse grained massive SAND with shell fragments 1.8-2.6m Light olive to light grey fine-coarse grained massive normally graded SAND with clay lenses 2.6-3.0m Light grey with reddish brown mottled firm CLAY 3.0-3.2m Light reddish brown medium grained massive SAND	< 0.063mm = 0.92 % > 2.0mm = 1.17 % < 0.063mm = 2.02 % > 2.0mm = 1.52 % < 0.063mm = 0.67 to 0.97 % > 2.0mm = 0.2 to 2.8 % < 0.063mm = 0.55 % > 2.0mm = 0.24 % < 0.063mm = 74.54 % > 2.0mm = 0.0 % < 0.063mm = 0.78 % > 2.0mm = 0.03 %	

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	107	BH-V26	Vibrocore	0.0-0.5m Dark grey fine grained SILT to very soft CLAY 0.5-2.57m Light grey fine-medium grained SAND 2.57-2.9m Light grey to dark brown soft silty CLAY to CLAY 2.9-3.5m Light reddish brown medium-coarse grained SAND.	< 0.063mm = 30.39% > 2mm = 0.0 % < 0.063mm = 1.69 to 0.00% > 2mm = 0.08 to 0.02 % < 0.063mm = 54.16% > 2mm = 0.00 % < 0.063mm = 0.43% > 2mm = 3.43 %	
		9G0203-BH-107				
		P1-BH11	SPT	0.0-18.0 No recovery 18.0-20.75m Dark grey very loose to medium dense medium-coarse grained GRAVEL of sandstone and tillite. Harbour Beds/Fill 20.75-21.75m Dark grey brown medium clayey sandy SILT. Harbour Marine 21.75-24.75m Light brown dense to very dense fine-medium grained SAND. Harbour Marine 24.75-26.75m Very dark grey firm sandy CLAY. Harbour Marine 26.75-27.75m Light brown loose slightly clayey silty fine grained SAND. Harbour Marine 27.75-29.75m Light brown dense fine-medium grained SAND. Harbour Marine 29.75-31.75m Light brown medium dense to dense silty clayey fine-medium grained SAND. Harbour Marine 31.75-32.75m Light brown very dense fine-medium grained SAND. Harbour Marine 32.75-34.75m Light brown very dense to dense slightly clayey silty fine grained SAND. Harbour Marine 34.75-35.45m Very dark brown hard slightly gravely very sandy CLAY. Harbour Marine * Note: SPT 'N' Values identical to P1-BH12		SPT @ 19.5m = 3 SPT @ 20.5m = 17 SPT @ 21.5m = 16 SPT @ 22.5m = 33 SPT @ 23.5m = 53 SPT @ 24.5m = 51 SPT @ 25.5m = 9 SPT @ 26.5m = 12 SPT @ 27.5m = 5 SPT @ 28.5m = 36 SPT @ 29.5m = 45 SPT @ 30.5m = 19 SPT @ 31.5m = 35 SPT @ 32.5m = 61 SPT @ 33.5m = 63 SPT @ 34.5m = 35 SPT @ 35.5m = 41
		DM-I-RM2	SPT	0.0-10.m Light yellowish brown dense to medium dense fine-medium SAND with shell fragments. Fill 10.0-11.5m Light brown medium dense fine-medium SAND. Harbour Beds 11.5-13.0m Light greyish brown medium dense slightly silty fine-medium grained SAND. Harbour Beds 13.0-16.00m Light olive brown medium dense fine-medium graded SAND. Harbour Beds 16.0-19.0m Light yellowish brown dense slightly silty fine-medium grained SAND. Harbour Beds 19.0-20.5m Dark olive grey stiff slight slickensided silty CLAY. Harbour Beds 20.5-23.5m Dark olive grey stiff Clayey sandy SILT. Harbour Beds 23.5-25.0m Dark olive grey medium dense clayey SAND with scattered shell fragmetnts. Harbour beds 25.0-26.5m Dark greyish brown dense silty fine-medium granined SAND. Harbour Beds 26.5-34.0m Pale greyish to pinkish brown dense to medium dense fine-medium grained SAND. Harbour Beds 34.0-35.5m Light brown very dense fine-coare grained SAND. Harbour Beds 35.5-38.0m Light brown very stiff sandy clayey to clayey sandy SILT. Residual Cretaceous Siltstone 38.0-41.5m Light brown moderately weathered fien grained thickly bedded very soft rock CRETACEOUS SILTSTONE		SPT@ 1.5m-32 SPT@3.0m 36 SPT@4.5m-21 SPT@6.0m-17 SPT@7.5m-22 SPT@9.0m-18 SPT@10.5m-26 SPT@12m-10 SPT@13.5m-32 SPT@15.0m-26 SPT@16.5m-30 SPT@18.0m-38 SPT@19.5m-9 SPT@21.0m-12 SPT@22.5m-10 SPT@24m-10 SPT@25.5m-49 SPT@27m-39 SPT@28.5m-9 SPT@30.0m-67 SPT@31.5m-53 SPT@33.0m-30 SPT@34.5m-73 SPT@36.0m-40 SPT@37.5m-ref
		DM-H-BH1	SPT	0.0-10.5m Moist light grey medium dense medium grained SAND 10.5-12.0m Wet dark yelllow grey medium dense silty SAND 12.0-16.95m Wet dark brown grey dense medium grained SAND 16.95-22.5m Wet dark olive grey very loose to very dense silty fine SAND 22.5-25.5m Moist dark grey firm silty CLAY 25.5-33.0m Wet light olive grey dense to very dense coarse SAND 33.0-36.0m Wet dark yellow orange very dense coarse SAND 36.0-37.5m Interbedded wet dark yellow orange very dense coarse SAND and dark olive brown CLAY 37.5-38.77m Wet dark olive grey very dense silty fine-coarse grained SAND 38.77-40.0m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock. UPPER CRETACEOUS SILTSTONE		SPT@1.5m-14 SPT@3.0m 26 SPT@4.5m-14 SPT@6.0m-16 SPT@7.5m-9 SPT@9.0m-8 SPT@10.5m-16.5 SPT@12m-19.5 SPT@13.5m-22 SPT@15.0m-17

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	107	DM-H-BH1	SPT			SPT@16.5m-23.5 SPT@18.0m-23.5 SPT@19.5m-33 SPT@21.0m-3 SPT@22.5m-15.5 SPT@24m-15.5 SPT@25.5m-23.5 SPT@27m-29 SPT@28.5m-22.5 SPT@30.0m-20 SPT@31.5m-41 SPT@33.0m-REF SPT@34.5m-41 SPT@36.0m-33 SPT@37.5m-28
		DM-H-BH6	SPT	0.0-1.5m Ash 1.5-4.5m Very moist light yellow grey dense coarse grained SAND with clay nodules and shells 4.5-10.5m Wet light grey brown medium to very dense fine-medium grained SAND 10.5-18.0m Wet light brown yellow very dense fine grained SAND 18.0-23.93m Wet light grey brown dense SAND with fragments of cemented sand 23.93-28.0m Moist light grey soft to stiff silty CLAy with shell fragments 28.0-31.27m Moist to wet light grey very dense silty fine-coarse grained SAND 31.27-33.5m Moist dark yellowish brown fimr to stiff silty CLAY 33.5-34.45m Moist to wet light grey very dense clayey fine grained SAND 34.45-37.0m Moist olive green firm SILT. Weathered Cretaceous Siltstone 37.0-41.5m Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock. UPPER CRETACEOUS SILTSTONE		SPT@1.5m-32.5 SPT@3.0m- SPT@4.5m-19 SPT@6.0m-566 SPT@7.5m-43 SPT@9.0m-14 SPT@10.5m-42.5 SPT@12m-0 SPT@13.5m-4 SPT@15.0m-25 SPT@16.5m-15.5 SPT@17.5m-16.5 SPT@18.5m-REF SPT@19.5m-TUBE SPT@21.0m-TUBE SPT@22m-20.5 SPT@22.5m-TUBE SPT@24m-TUBE SPT@25m-13 SPT@26.0m-25.5 SPT@27.0m-28.5 SPT@28.0m-16 SPT@28.0m-32 SPT@30.0m-44 SPT@31.0m-33 SPT@32.5m-32.5 SPT@33.0m-ref SPT@34.5m-23 SPT@37.5m-28
		9G0203-BH-108				
		P1-BH12	SPT	0.0-18.5m No recovery 18.5-21.0m Blue grey and pink brown sub-angular to subrounded GRAVEL/COBBLES of slightly weathered Tillite and Sandstone 21.0-21.7m Light brown stiff to very stiff very sandy silty CLAY. Harbour Marine 21.7-24.7m Light brown medum dense to very dense fine-medium grained SAND. Harbour Marine 24.7-26.7m Very dark grey stiff sandy silty CLAY. Harbour Marine 26.7-27.7m Light to dark brown loose slightly silty clayey SAND. Harbour Marine 27.7-29.7m Light brown dense SAND. Harbour Marine 29.7-31.7m Light red orange medium dense to dense very claeyey fine-medium grained SAND. Harbour Marine 31.7-33.7m Light orange patched light grey very dense slightly silty clayey fine grained SAND (silt and clayey content increasing with depth). Harbour Marine 33.7-34.7m Light orange hard very sandy silty CLAY. Harbour Marine 34.7-35.45m Very dark grey hard slightly gravelly sndy CLAY. Harbour Marine * Note: SPT 'N' Values identical to P1-BH11		SPT @ 19.5m = 3 SPT @ 20.5m = 17 SPT @ 21.5m = 16 SPT @ 22.5m = 33 SPT @ 23.5m = 53 SPT @ 24.5m = 51 SPT @ 25.5m = 9 SPT @ 26.5m = 12 SPT @ 27.5m = 5 SPT @ 28.5m = 36 SPT @ 29.5m = 45 SPT @ 30.5m = 19 SPT @ 31.5m = 35 SPT @ 32.5m = 61 SPT @ 33.5m = 63 SPT @ 34.5m = 35 SPT @ 35.5m = 19

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**107**	**P1-BHWB1**	**SPT**	0.0-0.16m Asphalt with coarse GRAVEL. 0.16-1.0m Grey-pinkish brown aggregate occuring on yellow brown loose fine-medium grained SAND with dark gry ash 1.0-14.5m Light yellow grey and yellow brown loose to medium dense fine-medium grained SAND. Reclamation Fill 14.5-20.0m Light yellow brown and light grey very fine-fine grained SAND with abundant gravel/cobble sized fragments. Fill		SPT @ 1.5m = 31 SPT @ 2.5m = 21 SPT @ 3.5m = 12 SPT @ 4.5m = ? SPT @ 5.5m = 11 SPT @ 6.5m = 9 SPT @ 7.5m = 15 SPT @ 8.5m = 15 SPT @ 9.5m = 13 SPT @ 10.5m = 13 SPT @ 11.5m = 14 SPT @ 12.5m = 19 SPT @ 13.5m = 15 SPT @ 14.5m = 19 SPT @ 15.5m = 9 SPT @ 16.5m = 22 SPT @ 17.5m = 21 SPT @ 18.5m = 23 SPT @ 19.5m = 27
		DM-I-RM1	**SPT**	0.0-2.0m Abundant subangular sandstone, tillite and concrete GRAVEL. Fill 2.0-4.0m Light yellowish brown medium dense fine-medium grained SAND with gravel. Fill 4.0-5.5m Abundant subangular sandstone and tillite GRAVEL in matrix of fine-medium grained sand. Fill 5.5-16.0m Light yellowish brown medium dense fine-medium grained SAND. Habour Beds 16.0-17.5m Light yellowish brown very dense fine-medium grained SAND. Harbour Beds 17.5-19.0m Light greyish olive medum dense silty fine-medium SAND with scattered shell fragments. Harbour Beds 19.0-22.0m Dark greyish olive very stiff to stiff sandy silty CLAY with scattered shell fragments. Harbour Beds 22.0-23.5m Dark greyish brown medium dense fine-medium grained SAND. Harbour Beds 23.5-31.0m Light orange brown very dense to dense fine-medium grained SAND. Harbour Beds 31.0-32.5m Light brown very stiff clayey sandy SILT. Residual Createous Siltstone 32.5-38.0m Dark olive brown to brownish grey very stiff sandy clayey SILT with scattered shell fragments. Residual Cretaceous Siltstone. 38.0-40.3m Dark olive grey slightly to unweathered fine grained thickly bedded very soft rock CRETACEOUS SILTSTONE		SPT@ 1.5m-REF SPT@3.0m 22 SPT@4.5m-33 SPT@6.0m-19 SPT@7.5m-20 SPT@9.0m-25 SPT@10.5m-25 SPT@12m-29 SPT@13.5m-25 SPT@15.0m-19 SPT@16.5m-57 SPT@18.0m-21 SPT@19.5m-19 SPT@21.0m-8 SPT@22.5m-28 SPT@24m-59 SPT@25.5m-46 SPT@27m-51 SPT@28.5m-41 SPT@30.0m-67 SPT@31.5m-41 SPT@33.0m-34 SPT@34.5m-65 SPT@36.0m-19 SPT@37.5m-68
		DM-H-BHA	**SPT**	0.0-3.0m Fill 3.0-4.5m Moist light brown medium dense fine-medium grained SAND with gravel. 4.5-13.5m Wet light olive brown medium dense silty fine SAND 13.5-15.0m Moist dark grey dense silty clayey SAND with shell fragments 15.0-21.0m Wet light grey dense silty fine SAND with thin layers of cemented sand 21.0-28.5m Moist dark grey soft to firm clayey SILT with shell fragments 28.5-31.5m Moist lgiht olive green very dense silty fine SAND 31.5-33.0m Moist light olive green stiff clayey SILT 33.0-34.5m Moist olive greeen very dense silty fine SAND 34.5-39.0m Moist light olive green stiff clayey SILT 39.0-43.5m Moist dark oive green very dense silty SAND 43.5-48.0 Dark grey very thickly bedded very widely jointed fine grained slightly weathered very soft rock UPPER CRETACEOUS SILTSTONE		SPT@1.5m-15 SPT@3.0m- 28 SPT@4.5m-17 SPT@6.0m-12 SPT@7.5m-20.5 SPT@9.0m-26.5 SPT@10.5m-16 SPT@12m-22.5 SPT@13.5m-23 SPT@15.0m-22 SPT@16.5m-18 SPT@18.0m-30

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**107**	**DM-H-BHA**	**SPT**			SPT@19.5m-26.5 SPT@21.0m-18 SPT@22.5m-17 SPT@24m-21 SPT@25.5m-24 SPT@27m-17 SPT@27.5m-tube SPT@28.5m-31.5 SPT@30.0m-33 SPT@31.5m-30.5 SPT@33.0m-30.5 SPT@34.5m-35.5 SPT@35.0m-34.5 SPT@36.0m-37 SPT@42.0m-ref SPT@43.5m-ref
		P1-BH10	SPT	0 to 18m to seafloor 18 to 24m No recovery 24 to 25.7m Light brown dense fine to medium grained SAND 25.7 to 26.7m very dark grey to dark grey brown, dense, SAND 26.7 to 28m Very dark grey very dense slightly clayey SAND with patches of clayey sand. 28 to 28.7m Very dark grey medium dense clayey SAND with patches of slightly clayey sand 28.7 to 30.2m Light brown mottled and patched light orange brown, very stiff slightly sandy and silty CLAY 30.2 to 32.2m very dark grey mottled dark grey brown very stiff slightly sandy and silty CLAY with light cream brown shell fragments 32.2 to 35.45m very dark grey very stiff to hard slightly sandy silty CLAY with light cream brown shell fragments		SPT @ 24.5m-39 SPT @ 25.5m-32 SPT @ 26.5m- 44 SPT @ 27.5m-53 SPT @ 28.5m-13 SPT @ 29.5m-24 Shelby tube 30 to 30.5m SPT @ 31.5m-23 Shelby tube 32 to 32.5m SPT @ 33.5m-31 Shelby tube 34 to 34.5m SPT @ 35.5m = 24
		P1-BH14	SPT	0 to 18m to seafloor 18-19m Sub-angular to sub-rounded gravels and cobbles of Sandstone and Tillite. 19 to 20.7m Dark brown to grey brown, medium dense, slightly silty clayey and sandy GRAVEL (Harbour Marine) 20 to 23.7m Light grey brown, medium dense to dense, slightly silty fine to medium grained SAND (Harbour Marine) 23.7 to 25.7m Dark brown to dark purple brown, very dense, slightly silty fine to medium SAND (Harbour Marine) 25.7 to 27.7m Dark grey brown occasionally mottled orange and light cream brown, medium dense to dense, slightly clayey silty fine to medium SAND, with occasiona clay patches. 27.7 to 28.7m dark grey brown, dense, fine grained SAND (Harbour Marine) 28.7 to 29.7m Light brown to light otrange brown, dense, fine to medium grained SAND (Harbour Marine) 29.7 to 33.7m light orange mottled light cream grey, dense, fine grained sandy clayey SILT/silty CLAY. (Harbour Marine) 33.7 t 35.45m Very dark grey, dense, clayey to slightly clayey SILT. (Harbour Marine)		SPT @ 19..5m-25 SPT @ 20.5m-25 SPT @ 21.5m-22 SPT @ 22.5m-17 SPT @ 23.5m = 40 SPT @ 24.5m-60 SPT @ 25.5m-60 SPT @ 26.5m- 22 SPT @ 27.5m-32 SPT @ 28.5m-40 SPT @ 29.5m-39 SPT @ 30.5m-42 SPT @ 31.5m-40 SPT @ 32.5m-25 SPT @ 33.5m-18 SPT @ 34.5m- 68 SPT @ 35.5m-39
		P1-BH24	SPT	0 to 17m to sea floor 17 to 21.5m Unweathered grey to dark grey very hard GRAVEL (Fill) comprsing tillite fragments. Fine Matrix material has been washed out. 21.5 to 23.5m very moist to wet dark green grey brown soft to firm CLAY 23.5 to 25m Wet dark green brown medium dense fine to medium brained silty clayey SAND 25 to 29.5 Wet green grey madium dense fine to medium grained SAND 29.5 to 30.5 Wet dark grey brown medium dense fine grained slightly clayey SAND.		SPT @ 18.5m = 36 SPT @ 20.5m-21 SPT @ 21.5m-28 SPT @ 23m-15 SPT @ 24m- 25 SPT @ 24.5m-14 SPT @ 25.5m-26 SPT @ 27.5m-29 SPT @ 29m-18 SPT @ 30.4m-16
		9GO203-BH012	SPT	0.0-1.4m Brown medium grained SAND 1.4-4.1m Grey fine-medium grained SAND 4.1-5.9m Brown medium grained SAND 5.9-9.0m Brown fine-medium grained SAND 9.0-12.6m Brown fine grained SAND 12.6-12.8m Hard cemented SAND 12.8-14.0m Brown fine-medium grained SAND 14.0-18.7m Grey stiff sandy CLAY 18.7-25.1m Brown slightly silty fine grained SAND		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**107**			25.1-27.6m Brown medium grained SAND		
		Datum = L.W.O.S.T		27.6-30.3m Brown slightly silty fine grained SAND		
				0.0-3.1m Dark grey slightly silty fine grained SAND		
				3.1-4.9m Grey brown medium grained SAND		
				4.9-10.1m Brown fine-medium grained SAND		
		9GO203-BH010	SPT	10.1-12.2m Yellow grey stiff CLAY		
				12.2-13.3m White slightly silty fine-medium grained SAND		
				13.3-16.5m Yellow brown very stiff CLAY		
				16.5-19.2m Yellow brown slightly silty fine-medium grained SAND		
		Datum = L.W.O.S.T		19.2-23.36m Grey brown slightly silty medium grained SAND		

Location	Berth	Borehole/Probe Information	Borehole Type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	108	P1-BH15	SPT	0.0-18.5m No recovery 18.5-19.0m Gravels and cobbles of sub-rounded unweathered to slightly weathered sandstone and tillite. Fill 19.0-20.7m Light orange brown very stiff slightly silty sandy CLAY with occasional pockets of sand. Harbour Marine 20.7-22.7m Light orange brown to light brown medium dense slightly silty clayey SAND. Harbour Marine 22.7-23.7m Light ornage brown to light brown hard slightly silty sandy CLAY. Harbour Marine 23.7-24.7m Light ornage brown to light brown very dense slightly silty fine-medium grained SAND. Harbour Marine 24.7-25.7m Light cream grey very dense clayey SAND. Harbour Marine 25.7-27.7m Light cream grey very dense clayey SAND. Harbour Marine 27.7-30.7m Light pink to grey brown dense medium-coarse grained SAND with shell fragments. Harbour Marine 30.7-32.7m Light orange to orange brown dense slightly silty clayey fine grained SAND. Harbour Marine 32.7-35.45m Light stiff to very stiff becoming hard fine grained sandy very silty CLAY. Harbour Marine		SPT @ 19.5m = 30 SPT @ 20.5m = 23 SPT @ 21.5m = 24 SPT @ 22.5m = 26 SPT @ 23.5m = 37 SPT @ 24.5m = 54 SPT @ 25.5m = 63 SPT @ 26.5m = 51 SPT @ 27.5m = 57 SPT @ 28.5m = 39 SPT @ 29.5m = 48 SPT @ 30.5m = 43 SPT @ 31.5m = 46 SPT @ 32.5m = 63 SPT @ 33.5m = 14 SPT @ 34.5m = 35 SPT @ 35.5m = 20
		DM-J-CB1	SPT	0.0-1.5m Dark brown and light yellow brown dense fine grained SAND with gravel. Fill 1.5-13.75m Light brown to yellow brown medium dense to very loose fine-medium grained SAND. Hydraulic Fill 13.75-15.75m Pale brown medium dense very slightly silty fine grained SAND with shell fragments. Harbour Beds 15.75-16.75m Pale yellow brown very dense fine-medium grained SAND with cemented gravels. Harbour Beds 16.75-17.25m Pale greenish olive medium dense silty fine grained SANd with shell fragments. Harbour Beds 17.25-18.75m Pale olive grey stiff silty CLAY with shell fragments. Harbour Beds 18.75-19.75m Pale brown loose clayey fine-medium grained SAND with shell fragments. Harbour Beds 19.75-25.0m Pale brown dense to medium dense fine-medium grained SAND. Harbour Beds 25.0-29.5m Pinkish brown very dense to medium dense fine-medium grained SAND with clayey sandy and silty sand lenses. Harbour Beds 29.5-31.0m Light and dark orange brown dense fine-medium grained SAND with gravel. Harbour Beds 31.0-32.5m Dark grey very stiff sandy clayey SILT. Harbour Beds 32.5-34.0m Pale greenish grey very dense silty fine grained SAND with sandy silty clayey lenses. Harbour Beds 34.0-35.5m Pale brown to dark orange brown dense silty fine grained SAND. Harbour Beds 35.5-37.0m Pale greyish brown to orange brown silty fine grained SAND with friable cemented gravels. Harbour Beds 37.0-37.8m Dark olive grey very stiff slightly clayey sandy sSILT with subagular cememnted gravels. Residual Cretaceous Siltstone 37.8-38.59m Dark olive grey slightly to unweatherd fine grained thickly bedded very soft rock. CRETACEOUS SILTSTONE		SPT @ 0.5m = 39 SPT @ 1.0m = 41 SPT @ 1.5m = 26 SPT @ 2.0m = 8 SPT @ 2.5m = 5 SPT @ 3.0m = 3 SPT @ 3.5m = 4 SPT @ 4.0m = 3 SPT @ 4.5m = 4 SPT @ 5.0m = 3 SPT @ 5.5m = 8 SPT @ 6.0m = 8 SPT @ 6.5m = 3 SPT @ 7.0m = 8 SPT @ 7.5m = 15 SPT @ 8.0m = 7 SPT @ 8.5m = 13 SPT @ 9.0m = 6 SPT @ 9.5m = 9 SPT @ 10.0m = 7 SPT @ 11.0m = 12 SPT @ 11.5m = 14 SPT @ 12.0m = 18 SPT @ 13.0m = 12 SPT @ 14.0m = 18 SPT @ 15.0m = 56 SPT @ 16.0m = 80 SPT @ 17.0m = 12 SPT @ 18.0m = 10 SPT @ 19.0m = 7 SPT @ 20.0m = 33 SPT @ 21.0m = 38 SPT @ 22.5m = REF SPT @ 24.0m = 27 SPT @ 25.5m = 61 SPT @ 27.0m = 16 SPT @ 28.5m = 25 SPT @ 30.0m = 41 SPT @ 31.5m = 18 SPT @ 33.0m = 62 SPT @ 34.5m = 34 SPT @ 36.0m = 30

Location	Berth	Borehole/Probe Information	Borehole Type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	108	DM-J-CB2	SPT	0.0-1.0m Pale purple brown very dense fine grained SAND with sandstone gravels. Hydraulic Fill 1.0-13.25m Light yellow brown dense to loose fine-medium grained SAND with shell fragments. Hydraulic Fill 13.25-13.75m Dark grey very stiff silty CLAY. Harbour Beds 13.75-14.75m Pael grey very stiff silty CLAY with sandy lenses and scatted gravel. Harbour Beds 14.75-15.75m Pale brown very stiff slickensided silty CLAY. Harbour Beds 15.75-19.75m Light yellow to grey brown medium dense to dense slightly silty fine-medium grained SAND. Harbour Beds 19.75-22.0m Pale brown medium desne slightly silty fine-coarse grained SAND. Harbour Beds 22.0-23.5m Light brown medium dense clayey fine-coarse grained SAND. Harbour Beds 23.5-25.0m Light brown slightl silty fine-medium grained SAND. Harbour Beds 25.-28.0m Light brown dense fine-coarse grained SAND. Harbour Beds 28.0-29.5m Dark yellow orange medium dense slightly silty fine-coarse grained SAND with clayey sandy lenses. Harbour Beds 29.5-31.0m Light greenish grey medium desne clayey fine-medium grained SAND. Harbour Beds 31.0-34.0m Yellow orange dense to very dense silty fine-medium grained SAND with sandy silt lenses. Harbour Beds 34.0-36.92m Pale brown very dense fine grained SAND. Harbour Beds 36.92-37.88m Abunsdant subagular GRAVEL of mixed origin (sandstone and quartzite) with no matrix 37.88-40.87m Dark olive grey slightly unweathered fine grained thickly bedded very soft rock. CRETACEOUS SILTSTONE		SPT @ 0.5m = 59 SPT @ 1.0m = 36 SPT @ 1.5m = 34 SPT @ 2.0m = 26 SPT @ 2.5m = 18 SPT @ 3.0m = 13 SPT @ 3.5m = 16 SPT @ 4.0m = 11 SPT @ 4.5m = 8 SPT @ 5.0m = 12 SPT @ 5.5m = 12 SPT @ 6.0m = 10 SPT @ 6.5m = 9 SPT @ 7.0m = 8 SPT @ 7.5m = 5 SPT @ 8.0m = 3 SPT @ 8.5m = 6 SPT @ 9.0m = 8 SPT @ 9.5m = 4 SPT @ 10.0m = 12 SPT @ 11.0m = 18 SPT @ 12.0m = 12 SPT @ 13.0m = 22 SPT @ 14.0m = 22 SPT @ 15.0m = 17 SPT @ 16.0m = 34 SPT @ 17.0m = 28 SPT @ 18.0m = 20 SPT @ 19.0m = 37 SPT @ 20.0m = 29 SPT @ 21.0m = 17 SPT @ 22.5m = 23 SPT @ 24.0m = 41 SPT @ 25.5m = 31 SPT @ 27.0m = 50 SPT @ 28.5m = 36 SPT @ 30.0m = 23 SPT @ 31.5m = 41 SPT @ 33.0m = 22 SPT @ 34.5m = 51 SPT @ 36.0m = 71
		BH-V07	Vibrocore	0.0-0.3m Dark brown fine grained massive organic-rich sandy SILT 0.3-0.7m Dark olive to dark brown fine grained massive soft silty CLAY 0.7-1.0m Light reddish orange to light reddish brown fine-coarse grained normally graded massive SAND 1.0-1.9m Light olive to light brown fine-medium grained massive SAND 1.9-3.3m Light olive to black fine-very fine grained normally graded massive soft silty CLAY 3.3-3.4m Dark olive to dark brown fine-medium grained massive SAND with heavy minerals and shell fragments	< 0.063mm = 25.23 % > 2.0mm = 0.0 % < 0.063mm = 36.37 % > 2.0mm = 0.0 % < 0.063mm = 0.92 to 1.59 % > 2.0mm = 0.11 to 14.99 % < 0.063mm = 1.08 to 2.84 % > 2.0mm = 0.84 to 2.97% < 0.063mm = 25.43 to 36.75 % > 2.0mm = 0.0% < 0.063mm = 1.61 % > 2.0mm = 0.0%	
		P1/BH/13	SPT	4.0-1.7m Grey brown fine-medium grained silty SAND with cemented sand cobbles 1.7-0.05m Brown medium grained SAND 0.5-2.9m Grey fine-medium grained SAND 2.9-6.7m Grey medium grained SAND 6.7-9.8m Yellow-brown fine-medium grained SAND 9.8-11.4m Yellow-grey firm CLAY 11.4-16.9m Brown fine-medium grained SAND 16.9-20.6m Brown slightly silty medium grained SAND 20.6-31.5m Brown slightly silty fine-medium grained SAND	At 21m: LL = 15; PI=0; LS=0 At 22m: LL = 16; PI=SP; LS=0.1	

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	109	DM-J-CB3	SPT	0.0-13.75m Pale brown to greyish brown dense to loose fine-medium grained SAND with scattered gravel and shell fragments. Hydraulic Fill 13.75-14.75m Dark olive grey very stiff slightly sandy clayey SILT with clayey sandy lenses. Harbour Beds 14.75-15.75m Dark olive grey very stiff sandy silty CLAY. Harbour beds 15.75-16.75m Light brown dense silty fine-medium grained SAND. Habrour Beds 16.75-18.75m Light brown medium dense to loose clayey fine-medium grained SAND. Harbour Beds 18.75-19.75m Pale orange brown very dense fine-medium grained SAND. Harbour Beds 19.75-23.5m Dark orange brown to olive loose to very dense slightly silty fine-medium grained SAND. Harbour Beds 23.5-28.0m Dark charcoal brown stiff slightly sandy silty CLAY with sandy lenses. Harbour Beds 28.0-32.5m Greyish brown very dense to dense fine-medium grained SAND. Harbour Beds 32.5-37.0m Pae greysih brown very dense slightly silty fine-coarse grained SAND with scatteed gravel. Harbour Beds 37.0-39.5m Pale orange to dark olive very stiff slightly clayey sandy SILT with scattered shell fragments. Residual Cretaceous Siltstone 39.5-40.95m Dark olive grey slightly to unweathered fine grained thickly bedded very soft rock. CRETACEOUS SILTSTONE		SPT @ 0.5m = 36 SPT @ 1.0m = 37 SPT @ 1.5m = 43 SPT @ 2.0m = 26 SPT @ 2.5m = 22 SPT @ 3.0m = 13 SPT @ 3.5m = 3 SPT @ 4.0m = 8 SPT @ 4.5m = 8 SPT @ 5.0m = 6 SPT @ 5.5m = 9 SPT @ 6.0m = 10 SPT @ 6.5m = 5 SPT @ 7.0m = 8 SPT @ 7.5m = 7 SPT @ 8.0m = 12 SPT @ 8.5m = 12 SPT @ 9.0m = 14 SPT @ 9.5m = 15 SPT @ 10.0m = 13 SPT @ 11.0m = 13 SPT @ 12.0m = 26 SPT @ 13.0m = 16 SPT @ 14.0m = 15 SPT @ 15.0m = 49 SPT @ 16.0m = 17 SPT @ 17.0m = 12 SPT @ 18.0m = 9 SPT @ 19.0m = REF SPT @ 20.0m = 34 SPT @ 21.0m = 9 SPT @ 22.5m = 46 SPT @ 24.0m = 43 SPT @ 25.5m = 13 SPT @ 27.0m = 14 SPT @ 28.5m = 72 SPT @ 30.0m = 50 SPT @ 31.5m = 33 SPT @ 33.0m = 73 SPT @ 34.5m = 89 SPT @ 36.0m = REF SPT @ 37.5m = 30 SPT @ 39.0m = 63

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 1	**109**	**DM-J-CH4**	**SPT**	0.0-12.75m Light yellowish to gryish brown medium dense to loose fine-medium grained SAND with scatted gravel. Hydraulic Fill 12.75-13.75m Pale greyish brown loose silty fine grained SAND with scatted gravel. Hydraulic Fill 13.75-17.75m Light greyish brown loose to medium dense silty fine-medium grained SAND. Harbour Beds 17.75-19.75m Light grey very stiff silty CLAY. Harbour Beds 19.75-25.0m Dark yellow orange to pale pinkish brown medium dense to dense slightly silty fine-medium grained SAND. Harbour Beds 25.0-26.5m Pale pinkish brown dense fine-coarse grained SAND. Harbour Beds 26.5-29.5m Pale brown very dense to desne slightly silty fine-medium grained SAND. Harbour Beds 29.5-31.0m Pale brown loose fine-coarse grained SANDl. Harbour Beds. 31.0-35.5m Pale greyish brown very dense to dense fine-medium grained SAND. Harbour Beds 35.5-37.79m Pale grey to dark olive very stiff slightly clayey sandy SILT with shell fragments. Residual Cretaceous Siltstone 37.79-39.28m Dark olive grey slight to unweathered fine grained thickly beded very soft rock. CRETACEOUS SILTSTONE		SPT @ 0.5m = 23 SPT @ 1.0m = 27 SPT @ 1.5m = 26 SPT @ 2.0m = 21 SPT @ 2.5m = 28 SPT @ 3.0m = 24 SPT @ 3.5m = 15 SPT @ 4.0m = 13 SPT @ 4.5m = 12 SPT @ 5.0m = 14 SPT @ 5.5m = 9 SPT @ 6.0m = 7 SPT @ 6.5m = 12 SPT @ 7.0m = 8 SPT @ 7.5m = 8 SPT @ 8.0m = 10 SPT @ 8.5m = 12 SPT @ 9.0m = 13 SPT @ 9.5m = 16 SPT @ 10.0m = 18 SPT @ 11.0m = 6 SPT @ 12.0m = 6 SPT @ 13.0m = 7 SPT @ 14.0m = 8 SPT @ 15.0m = 26 SPT @ 16.0m = 34 SPT @ 17.0m = 17 SPT @ 18.0m = 18 SPT @ 19.0m = 19 SPT @ 20.0m = 36 SPT @ 21.0m = 49 SPT @ 22.5m = 37 SPT @ 24.0m = 37 SPT @ 25.5m = 43 SPT @ 27.0m = 58 SPT @ 28.5m = 48 SPT @ 30.0m = 9 SPT @ 31.5m = 58 SPT @ 33.0m = 67 SPT @ 34.5m = 47 SPT @ 36.0m = REF SPT @ 37.5m = REF SPT @ 39.0m = 63

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	200	9G0200-WB01		7.57 to 13.41m: SILTY SAND. 13.41 to 14.70m: Final dregged level. 14.70 to 15.80m: SILTY SAND. 15.80 to 16.71m: CLAYEY SAND. 16.71 to 20.50m: SILTY SAND.		SPT @ 6.6m: Sampler penetrated 0.48m for 1 blow then 2.4m for 120 blows thereafter no penetration. SPT @ 9m: Sampler penetrated 1m for 70 blows. SPT @ 12m: 1.8m for 26 blows. SPT @ 13.5m: 1.2m for 41 blows.
		9G0200-V20		13.41 to 14.70m: Final dregged level. 14.70 to 17.70m: Fine grey brown SAND. 17.70 to 20.70m: SAND with CLAY. 20.70 to 22.30m: Brown SAND. 22.30 to 23.80m: SAND with CLAY. 23.80 to ??: Brown SAND.		
		9G0200-V21		13.30 to 13.41m: Fine grey brown SAND. 13.41 to 14.70m: Final dregged level. 14.70 to 16.40m: Fine grey brown SAND. 16.40 to 21.90m: Brown SAND. 21.90 to ??: Coarse SAND.		
		9G0200-V22		11.30 to 13.41m: CLAY. 13.41 to 14.70m: Final dregged level. 14.70 to 20.90m: Fine grey brown SAND. 20.90 to 21.90m: Brown SAND.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	201	9G0200-WB02		4.88 to 8.84m: SILTY SAND. 8.84 to 13.41m: CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 19.51m: CLAYEY and SILTY SAND. 19.51 to ??: SILTY SAND.		SPT @ 4.8m = 31 SPT @ 6.6= 40 SPT @ 9.3m = 26 SPT @ 10.5m = 28 SPT @ 11.41m = 35 SPT @ 12.61m = 36 SPT @ 14.50m = 126 SPT @ 15.61m = 7
		9G0200-WB03		3.07 to 10.68m: SILTY SAND. 10.68 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 21.05m: SILTY SAND and CLAY. 21.05 to ??: CLAY.		SPT @ 3.9m = 38 SPT @ 9.00m= 51 SPT @ 9.9m = 40 SPT @ 11.71m = 45 SPT @ 12.91m = 39 SPT @ 15.6m = 39 SPT @ 17.41m = 32
		9G0200-V04		5.50 to 13.41m: SANd with CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 18.20m: SAND with CLAY. 18.20 to 20.40m: Hard CLAY. 20.40 to 21.80m: SAND with CLAY. 21.80 to ??: SAND.		
		9G0200-V05		9.40 to 13.41m: SAND with CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 20.70m: SAND with CLAY. 20.70 to 23.80m: SAND. 23.80 to ??: Coarse SAND.		
		9G0200-V06		9.80 to 13.41m: SAND with CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 19.20m: SANDY CLAY. 19.20 to 20.70m: SILTY CLAY. 20.70 to 23.50m: SANDY CLAY. 23.50 to ??: SAND.		
		9G0200-V07		9.60 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 20.40m: SANDY CLAY. 20.40 to 22.10m: SILTY CLAY. 22.10 to 22.50m: SANDY CLAY.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	**202**	9G0200-V08		10.10 to 13.41m: CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 17.10m: SANDY CLAY. 17.10 to 22.30m: SAND.		Vane test @ 15m=21.1 Vane test @ 15.5m=17.1
		9G0200-V09		9.80 to 13.41m: CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 19.00m: CLAYEY SAND. 19.00 to 23.60m: SAND.		Vane test @ 12m= 19.7 Vane test @ 14m= 15.6 Vane test @ 15.5m= 27.2
		9G0200-V10		9.90 to 13.41m: CLAY. 13.41 to 16.60m: Final dregged level. 16.60 to 20.80m: SILTY CLAY. 20.80 to 23.60m: SAND.		Vane test @ 12m= 21.1 Vane test @ 14m= 22.5 Vane test @ 15.5m= 27.2
		9G0200-V11		8.80 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 18.30m: CLAY. 18.30 to 22.30m: SILTY and CLAY. 22.30 to ??: SAND.		Vane test @ 13.4m= 25.3 Vane test @ 14.5m= 16.5 Vane test @ 16m= 21.1 Vane test @ 18.3m= 30.2 Vane test @ 20.5m= 27.5
		9G0200-V12		9.00 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 21.20m: CLAY with SILT.		Vane test @ 13.4m= 14.4 Vane test @ 14.5m= 16.5 Vane test @ 16m= 26.8
		9G0200-V13		8.70 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 19.50m: CLAY and SILT.		Vane test @ 13.4m= 32.8 Vane test @ 15m= 31.6 Vane test @ 17.4m= 30.7 Vane test @ 18.2m= 25.3
		9G0200-V14		7.20 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 19.00m: CLAY.		Vane test @ 11.2m= 24.8 Vane test @ 16.2m= 21.8 Vane test @ 19m= 30
		9G0200-V15		6.60 to 13.41m: CLAY and SILT. 13.41 to 18.00m: Final dredged level. 18.00 to 20.40m: CLAY and SILT.		Vane test @ 14.8m=37.5 Vane test @ 20.4m= 21.3
		9G0200-V17		6.60 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 21.60m: CLAY. 21.60 to 23.60m: CLAY and SILT. 23.60 to 27.40m: SAND.		Vane test @ 14.8m=38.7 Vane test @ 17.8m= 34.5 Vane test @ 32.6m= 34.5
		9G0200-WB05		0.23 to 7.85m: SILTY SAND. 7.85 to 11.20m: SILTY SAND and CLAY. 11.20 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 20.34m: CLAY. 20.34 to 21.56m: SAND.		SPT @ 6m = 49 SPT @ 9m = 62 SPT @ 12m = 43 SPT @ 13.5m = 44 SPT @ 14.41m = 32 SPT @ 15.6m = 39 SPT @ 17m = 57 SPT @ 18.6m = 43 SPT @ 18.61m = 40
		9G0200-WB06		0.10 to 9.85m: SILTY SAND, some CLAY. 9.85 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 20.75m: CLAY.		SPT @ 12m = 25 SPT @ 13.5m = 32 SPT @ 15m = 48 SPT @ 16.5m = 50 SPT @ 17.41m = 50 SPT @ 18.61m = 40 SPT @ 20.42m = 58

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	**202**	9GO200-WB07		0.00 to 3.65m: Yellow SAND. 3.65 to 8.83m: Yellow SANDY CLAY. 8.83 to 11.58m: Yellow-grey SAND. 11.58 to 21.33m: Grey CLAY. 11.58 to 21.33m: Grey CLAY.		SPT @ 6m = 44 SPT @ 11.71m = 19 SPT @ 12.31m = 30 SPT @ 14.41m = 50 SPT @ 15.9m = 58 SPT @ 17.41m = 52 SPT @ 19.5m = 49 SPT @ 20.42m = 43
		9G0200-BHT1		0.30 to 5.18m: SILTY SAND. 5.18 to 11.28m: SILTY SAND and CLAY. 11.28 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 20.12m: CLAY. 20.12 to 20.73m: SAND.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	203	9G0200-WB08		0.60 to 3.05m: Muddy SAND. 3.05 to 7.62m: SAND. 7.62 to 12.19m: SANDY CLAY. 12.19 to 13.41m: CLAY. 13.41 to 18.00m: Final dredged level. 18.00 to 21.36m: CLAY.		SPT @ 12.31m = 13 SPT @ 14.41m = 43 SPT @ 15.62m = 52 SPT @ 17.42m = 63 SPT @ 19.51m = 54 SPT @ 20.42m = 63
		9G0200-WB09		0.85 to 7.53m: SAND. 7.53 to 13.41m: SANDY CLAY. 14.7m: Final dredged level. 14.7 to 18.55m: SAND. 18.55 to 21.34m: CLAY. 21.34 to 21.64m: SAND.		SPT @ 15m: 1.8m penetration for 31 blows, thereafter no penetration. SPT @ 19.5m: 1.5m penetration for 48 blows, thereafter no penetration.
		9G0200-WB10		0.31 to 7.32m: SAND. 7.32 to 10.67m: SILTY SAND. 10.67 to 13.41m: SANDY CLAY. 14.70m: Final dredged level. 14.70 to 21.34m: Coarser SAND, SANDY CLAY.		SPT @ 13.5m = 31 SPT @ 14.41m = 22 SPT @ 16.52m = 57 SPT @ 18.01m = 61 SPT @ 20.12m = 57
		P2/WB/11		0.00 to 14.63m: Grey yellow grey to brown yellow SAND. 14.63 to 15.54m: Brown CLAYEY SAND. 15.54 to 16.45m: Brown CLAY. 16.45 to 21.33m: Brown SILTY SAND.		SPT @ 13.5m: 1m penetration for 8 blows, thereafter no penetration. SPT @ 15.62m = 89 SPT @ 17.11m = 49 SPT @ 19.51m = 61 SPT @ 21.25m: 1.8m penetration for 82 blows, thereafter no penetration.
		9G0200-V18		6.60 to 13.41m: CLAY with SAND. 18.00m: Final dredged level. 18.00 to 25.00m: CLAY with SILT.		Vane test @ 14.3m= 31.6 Vane test @ 17.0m= 34.0 Vane test @ 19m= 25.3
		9G0200-V19		5.80 to 11.90m: CLAY. 11.90 to 13.41m: CLAY with SILT. 18.00m: Final dredged level. 18.00 to ??: CLAY with SILT.		
		9G0200-V23		4.70 to 13.41m: SAND and CLAY. 18.00m: Final dredged level. 18.00 to 25.90m: Dark grey CLAY. 25.90 to ??: CLAY and SAND.		Vane test @ 14.3m= 22.5 Vane test @ 21m = 26.3
		9G0200-V24		3.60 to 13.41m: Grey brown SAND. 14.70m: Final dredged level. 14.70 to 18.00m: Light brown SAND. 18.00 to 24.40m: Dark grey CLAY. 24.40 to ??: Light brown SAND.		Vane test @ 18m= 17.1 Vane test @ 21m = 11.7
		9G0200-V25		2.70 to 13.41m: light brown SAND with shells. 14.70m: Final dredged level. 14.70 to 17.70m: Coarse brown SAND with shells. 17.70 to 21.80m: Fine brown SAND. 21.80 to 24.80m: fine orange brown SAND. 24.80 to ??: Fine grey brown SAND.		
		9G0200-V26		2.70 to 13.41m: Brown SAND with shells. 14.70m: Final dredged level. 14.70 to 20.70m: Dark brown SAND with little CLAY. 20.70 to 24.40m: Fine brown SAND with little CLAY. 24.40 to ??: Coarse brown SAND with little CLAY.		
		9G0200-V26A		2.3 to 11.30m: SAND. 11.30 to 13.41m: Fine to medium brown SILTY SAND. 14.70m: Final dredged level. 14.70 to 20.30m: Fine to medium brown SILTY SAND. 20.30 to 23.20m: Dark brown medium to coarse SAND.		
		9G0200-V26B		2.4 to 13.41m: Brown fine to medium SILTY SAND. 14.70m: Final dredged level. 14.70 to 20.10m: Brown fine to medium SILTY SAND. 20.10 to 22.50m: Light brown fine to medium SILTY SAND.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of geology	Tests	
					Laboratory	Insitu
Pier 2	203	9G0200-V27		1.80 to 13.41m: Grey brown SAND. 17.10m: Final dregging level. 17.10 to 20.70m: dark grey CLAY. 20.70 to ??: Orange brown SAND.		
		9G0200-V31		5.20 to 10.70m: SAND. 10.70 to 12.20m: CLAY with SAND. 12.20 to 13.41m: Dark grey CLAY. 18.00m: Final dredged level. 18.00 to 21.60m: Dark grey CLAY with shells. 21.60 to ??: Dark grey CLAY with SILT.		Vane test @ 12.2m= 14.4 Vane test @ 14.5m= 22.4 Vane test @ 17.7m= 28.7 Vane test @ 21m= 27.7
		9G0200-V32		11.00 to 13.40m: SAND. 18.00m: Final dredged level. 18.00 to 23.80m: Hard dark grey CLAYEY SILT with shells.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	204	9G0200-WB04		8.63 to 11.98m: SILTY SAND. 11.98 to 13.41m: CLAY. 16.60m: Final dredged level. 16.60 to 19.00m: SAND. 19.00 to 21.60m: SILTY SAND.		
		9G0200-V29		0.60 to 11.30m: SAND. 11.30 to 12.20m: Grey brown SAND. 12.20 to 13.70m: Dark grey CLAY. 17.00m: Final dredged level. 17.00 to 21.30m: Dark grey CLAY. 21.30 to 23.80m: Brown SAND with little CLAY. 23.80 to ??: Coarse brown SAND.		Vane test @ 13.41m= 19.7 Vane test @ 17m = 19.7 Vane test @ 20.4m = 30.2
		9G0200-V30		1.50 to 11.60m: SAND. 11.60 to 13.41m: Grey-brown SAND with little CLAY. 17.00m: Final dredged level. 17.00 to 20.70m: Grey-brown CLAY. 20.70 to 22.50m: Dark grey CLAY. 22.50 to 23.80m: Light brown SAND.		Vane test @ 13.41m= 25.3 Vane test @ 16.8m= 11.7 Vane test @ 20.7m = 39.3
		9G0200-V33		0.10 to 12.80m: Light brown medium SAND. 12.80 to 13.41m: Mottled grey brown CLAYEY SILT or SILTY CLAY. 17.00m: Final dredged level. 17.00 to 22.30m: Mottled grey brown CLAYEY SILT or SILTY CLAY. 22.30 to 24.40m: Light brown medium SAND.		Vane test @ 14.3m= 22.5 Vane test @ 17m = 30.1 Vane test @ 20.5 = 22.5
		9G0200-V34		0.00 to 11.90m: SAND. 11.90 to 13.41m: Grey and brown medium SAND. 18.00m: Final dredged level. 18.00 to 24.10m: Mottled grey-brown CLAYEY SILT or SILTY CLAY. 24.10 to 24.40m: Medium SILTY SAND.		Vane test @ 16.2m= 26.6 Vane test @ 20m = 20.4 Vane test @ 20.8m= 35.2
		9G0200-V35		4.00 to 13.41m: brown and grey SILTY fine to medium SAND. 18.00m: Final dredged level. 14.60 to 17.10m: dark grey firm CLAYEY SILT or SILTY CLAY. 17.10 to 18.60m: Medium brown SAND. 18.60 to 22.30m: grey and brown mottled CLAYEY SILT with SAND. 22.30 to 24.10m: Yellow brown SILTY medium SAND.		Vane test @ 15m= 14.6 Vane test @ 19.5m = 19.6 Vane test @ 21m= 27.2 Vane test @ 22m=27.7
		9G0200-V36		4.30 to 13.41m: Brown and grey fine to medium SAND. 18.00m: Final dredged level. 14.60 to 18.00m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 18.00 to 20.10m: Brown medium SAND. 20.10 to 22.20m: Dark grey quite stiff CLAYEY SILT. 22.20 to 22.90m: Brown medium SAND.		Vane test @ 15m= 11.6 Vane test @ 21m = 11.1
		9G0200-SH4-4		0.00 to 13.41m: SAND. 13.41 to 21.00m: Final dredged layer. 21.00 to 22.25m: CLAY. 22.25 to 25.57m: SILTY SAND.		
		GO200-BH01		0.00 to 3.04m: Grey medium SAND with shells. 3.04 to 12.19m: Light grey medium SAND. 12.19 to 18.59m: Grey black stiff CLAY. 18.59 to 20.42m: Grey SILTY fine SAND. 20.42 to 25.90m: Yellowish grey meidum SAND. 25.90 to 27.43m: Yellow-brown medium-coarse SAND.		
		GO200-BH02		0.00 to 13.72m: Grey medium SAND with shells. 13.72 to 14.33m: Grey CLAYEY SAND. 14.33 to 15.24m: Grey-black soft CLAY with shells. 15.24 to 17.37m: Grey medium SAND with a SILT content. 17.37 to 21.79m: Yellowish grey stiff CLAY. 21.79 to 22.86m: Yellow-grey medium SAND with slight SILT content. 22.86 to 24.38m: Dark grey medium SAND with slight SILT content.		
		GO200-BH04		0.00 to 15.85m: Grey medium SAND with shells. 15.85 to 22.25m: Grey-black medium stiff CLAY with shells. 22.25 to 26.21m: Grey fine medium SAND with some shells and SILT content. 26.21 to 29.26m: Grey medium SAND with slight SILT content.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	205	9G0200-BH07U		0.00 to 10.40m: SAND. 10.40 to 12.00m: CLAYEY SAND. 12.00 to 13.41m: SANDY CLAY. 13.41 to 17.50m: Final dredged layer. 17.50 to 19.60m: SILTY CLAY. 19.60 to 22.60m: SAND.		
		9G0200-V40		2.70 to 13.41m: Grey medium SAND with shells. 13.41 to 19.00m: Final dredged layer. 19.00 to 21.30m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 21.30 to 22.50m: Light brown fine to medium SAND.		Vane test @ 18m= 11.7
		9G0200-V41		0.50 to 13.41m: Grey medium SAND with shells. 13.41 to 17.50m: Final dredged layer. 17.50 to 20.10m: dark grey CLAYEY SILT or SILTY CLAY with shells. 20.10 to 22.90m: Light brown fine to medium SAND.		Vane test @ 17m= 8.7 Vane test @ 24m = 11.9
		9G0200-V42		0.80 to 13.41m: Grey medium SAND with shells. 13.41 to 17.50m: Final dredged layer. 17.50 to 19.20m: Dark grey CLAYEY SILT or SILTY CLAY. 19.20 to 23.80m: Brown medium SAND.		
		9G0200-V37		0.00 to 13.41m: Grey fine to medium SAND with shell fragments. 13.41 to 21.00m: Final dredged layer. 21.00 to 26.50m: Dark grey CLAYEY SILT or SILTY CLAY with shells		Vane test @ 20m= 11.6 Vane test @ 24m = 13.0 Vane test @ 25.5m= 8.7
		9G0200-V38		0.30 to 13.41m: Grey fine to medium SAND. 13.41 to 21.00m: Final dredged layer. 21.00 to 25.30m: Dark grey CLAYEY SILT or SILTY CLAY with shells		Vane test @ 20m= 11.6 Vane test @ 25.2m = 11.0
		9G0200-V39		0.60 to 13.41m: grey medium SAND. 13.41 to 21.00m: Final dredged layer. 21.00 to 25.30m: Dark grey CLAYEY SILT or SILTY CLAY with shells		Vane test @ 21m= 11.0 Vane test @ 23m = 11.6
		9G0200-BH12		0.76 to 13.26m: SAND. 13.26 to 13.41m: SILTY SAND. 13.41 to 21.00m: Final dredged layer. 21.00 to 28.20m: CLAY. 28.20 to 30.63m: SILTY SAND.		
		9G0200-BH06U		0.76 to 10.00m: SAND. 10.00 to 10.80m: CLAY. 10.80 to 12.10m: SAND. 12.10 to 13.41m: CLAYEY SAND. 13.41 to 21.00m: Final dredged layer. 21.00 to 24.80m: SILTY CLAY. 24.80 to ??: SAND.		Vane test @ 10m= 10.8 Vane test @ 17.8m = 14.1 Vane test @ 18.8m= 14.3 Vane test @ 20.8m = 128 Vane test @ 22m= 10.6 Vane test @ 23m = 11.6

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207	DM-L-C01	Wash Bore	0 to 2m: Light brownish grey, very loose, FINE-MEDIUM SAND with occassional well-rounded 10 to 18mm gravel and scattered very small shell fragments. 2 to 3m: Light brownish grey, loose FINE to MEDIUM SAND with scattered rounded +-30mm gravel and abundant small shell fragmenst and small pieces of organic material. 3.5 to 5m: Light brownish grey, MEDIUM SAND abundant small shell fragments. 5 to 6.5m: As above with occassionla small shell fragments. 6.5 to 8m: Light brownish grey, medium dense, FINE to MEDIUM SAND with occasional shell fragments. 8 to 9.5m: As above with occasional sub-rounded gravel, scattered shell fragments and occasional organic material. 9.5 to 11m: Light brownish grey, medium dense, FINE to MEDIUM SAND. 11 to 15.5m: As above with occasional shell fragments and scattered organic material. 15.5m to 17m: Dark Grey, very loose, CLAYEY FINE SANDY SILT with scattered shell fragments. 17m to 20m: Dark grey, very loose, SILTY CLAYEY FINE SAND with scattered shell fragments. 20 to 21.5m: Dark grey, stiff CLAY with occassional shell fragments. 21.5 to 23m: As above with occasional sub-angular 20mm gravel and mnor shell fragments. 23 to 24.5m: Dark grey mottled dark red, dark yellow, black and light grey, stiff, SILTY FINE SANDY CLAY with organic material. 24.5 to 27.5m: Light brownish grey, very to medium dense, CLAYEY to SILTY FINE MEDIUM SAND. 27.5 to 29m: Light brownish grey mottled dark yellow, medium dense, CLAYEY FINE to MEDIUM SAND. 29 to 32m: Light brownish grey mottled dark yellow, very dense, CLAYEY SAND. 32 to 32.4m: Dark grey, very dense, SILTY FINE to MEDIUM SAND with scattered calcareous nodules, and some shell fragments. Reworked Cretaceous 32.4 to 33.23m: Brownish dark grey, slighty weathered, very fine grained, very thickly bedded, very stiff soil to very soft rock. CRETACEOUS SILTY SANDSTONE. 33.23 to 33.60m: Dark grey and white, very slightly weathered, fine grained, thinly laminated, very stiff soil to very soft rock. CRETACEOUS SILTY SANDSTONE. 33.60 to 35.18m: Dark grey speckled white, very slighty weathered, fine grained matrix with medium to coarse grained clasts (clast supported), thickly bedded very stiff soil to soft rock, fossileferous SANDSTONE. Becomes matrix supported with depth. 35.18 to 40.43: Olive-dark brown, unweathered, fine grained, massive, very stiff soil to very soft rock. CRETACEOUS SILTSTONE.	**Results @ 3m** Coarse Sand = 9%; Fine Sand = 80%; Silt/clay = 11% GM = 1.41 **Results @ 7.5m** Coarse Sand = 2%; Fine Sand = 86%; Silt/clay = 12% GM = 0.94 **Results @ 13.5m** Coarse Sand = 4%; Fine Sand = 88%; Silt/clay = 8% GM = 1.11 **Results @ 18m** Sand = 71%; Silt = 13%; Clay = 8% GM = 0.68; LL=22; PI=6; LS=3.5 **Results @ 24m** Sand = 33%; Silt = 24%; Clay = 43% GM = 0.27; LL=35; PI=19; LS=8.0 **Results @ 25.5m** Sand = 79%; Silt = 2%; Clay = 19% GM = 0.79; LL=SP; PI=SP; LS=0.5 **Results @ 28.5m** Sand = 75%; Silt = 6%; Clay = 17% GM = 0.86; LL=SP; PI=SP; LS=0.5 **Results @ 32.5m** Gravel = 13%; Sand = 89%; Silt = 10%; Clay = 8% GM = 1.05; LL=SP; PI=SP; LS=0.5	SPT 1.5m = 4 SPT 3m = 9 SPT 4.5m = 8 SPT 6m = 9 SPT 7.5m = 14 SPT 9m = 20 SPT 10.5m = 23 SPT 12 = 20 SPT 13.5m = 18 SPT 15m = 21 SPT 16.5m = 2 SPT 18m= 1 SPT 19.5m = 1 SPT 21m = 10 SPT 22.5m = 10 SPT 24m = 20 SPT 25m = 74+ SPT 27m = 55+ SPT 28.5m = 29 SPT 30m = 97 SPT 31.5m = 104+ RQD 32m = 59%
		DM-L-C02	Wash bore	0 to 2 m: Light olive, dense, fine to medium SAND, blotched dark red and black ferrous clay. Scattered shell fragments. 2 to 3.5m: Light olive, very dense, fine to medium SAND. Contains lenses of darke brown clay (<7mm). 3.5 to 5m: Light brownish grey, medium dense, fine to medium SAND. Scarce fine laminae of clay. 5 to 6.5m: Dark grey, stiff, fine to medium sandy CLAY. Scarce shell fragments. 6.5 to 8m: Dark grey and light brownish olive, stiff fine to medium sandy CLAY. Scarce shell fragments. 8 to 9.5m: Dark grey, medium dense, fine SAND. 9.5m to 12.5m: Light grey, medium dense, fine SAND. Becoming dense with depth. 12.5 to 14m: Dark grey, very soft, silty CLAY. Scarce shell fragments. 14 to 17m: Light grey, dense silty fine SAND. Becoming slightly clayey with depth. 17 to 21.5m: Dark grey, loose, sandy clayey SILT. Scarce shell fragments. 21.5 to 24.5m: Light brownish grey, medium dense, fine to medium SAND. 24.5 to 26m: Dark grey, stiff, fine to medium sandy silty CLAY. Scarce shell fragments. 26 to 27.5m: Light grey, very stiff, fine to medium sandy CLAY. 27.5 to 29m: Dark yellowish orange, very dense, silty fine SAND. 29 to 30.5m: Light grey, very dense, clayey fine sandy SILT. 30.5 to 32m: Dark yellowish orange, very dense, silty fine SAND. 32 to 33m: Dark yellowish orange, very dense fine SAND. 33 to 33.6m: White and light olive, medium grained, soft rock. CALCARENITE. 33.6 to 36.29m: Light olive speckled white, slighty weathered, fine grained, thickly bedded, very stiff soil to very soft rock. CRETACEOUS SANDSTONE. Pebbly layer at top (20mm) and medium to coarse grained shelly layer (200mm thick) directly below above. 36.29 to 36.52m: Olive light grey, fine grained, soft rock. Cemented fossiliferous. CRETACEOUS SANDSTONE. 36.52 to 41.63m: Olive dark brown, unweathered, fine-grained massive, very stiff soil to soft rock. CRETACEOUS SILTSTONE.	**Results @ 3m** Coarse Sand = 4%; Fine Sand = 79%; Silt/clay = 16% GM = 0.89 **Results @ 9m** Sand = 86%; Silt = 4%; Clay = 10% GM = 0.87 **Results @ 12m** Coarse Sand = 0%; Fine Sand = 91%; Silt/clay = 9% GM = 0.94 **Results @ 16.5m** Sand = 83%; Silt = 5%; Clay = 9% GM = 0.84 **Results @ 21m** Sand = 26%; Silt = 48%; Clay = 26% GM = 0.18; LL= 50; PI = 24; LS = 10 **Results @ 24m** Coarse Sand = 8%; Fine Sand = 81%; Silt/clay = 11% GM = 0.98; **Results @ 25.5m** Sand = %; Silt = 48%; Clay = 26% GM = 0.18; LL= 52; PI = 33; LS = 10 **Results @ 28.5m** Coarse Sand = 1%; Fine Sand = 85%; Silt/clay = 14% GM = 0.88 **Results @ 32.6 m** Coarse Sand = 3%; Fine Sand = 79%; Silt/clay = 17% GM = 1.06	SPT 1.5m = 38 SPT 3m = 53 SPT 4.5m = 18 SPT 6m = 1 SPT 7.5m = 9 SPT 9m = 28 SPT 10.5m = 24 SPT 12 = 38 SPT 13.5m = 1 SPT 15m = 49 SPT 16.5m = 40 SPT 18m = 5 SPT 19.5m = 5 SPT 21m = 4 SPT 22.5m = 24 SPT 24m = 29 SPT 25.5m = 11 SPT 27m = 16 SPT 28.5m = 65+ SPT 30m = 62 SPT 31.5m = 71 SPT 32.6m = 60+ SPT 33m refused. RQD 35m = 0 RQD 36m =25 RQD 36 to 39m = 0 RQD 40m = 84 RQD 40.5m = 100 RQD 41.5m = 95
		DM-L-C03	Wash bore	0 to 2m: Dark brownish grey mottled dark grey, very loose, SILTY FINE SAND with scattered shell fragments. 2 to 3.5m: Brownish light grey, medium dense, MEDIUM SAND with many shell fragments. 3.5 to 5m: As above with abundant shell fragments. 5 to 6.5m: Light brown, medium dense, FINE SAND with occasional shell fragments. 6.5 to 12.5m: Dark grey, very loose, CLAYEY SILTY, 12.5 to 13.5m: Greyish light brown, very loose, FINE SAND. 13.5 to 15.5m Light brown mottled light grey, loose, FINE SAND. 15.5 to 18.5m Light grey mottled light orange yellow, very stiff, CLAYEY SILT.	**Results @ 3m** Gravel = 10%; Sand = 77%; Silt = 4%; Clay = 9% GM = 1.17; LL= NP; PI = NP; LS = 0.0 **Results @ 10.5m** Gravel = 2%; Sand = 63%; Silt = 20%; Clay = 14% GM = 0.68; LL = 23; PI = 7; LS = 3.5 **Results @ 16.5m** Gravel = 0%; Sand = 7%; Silt = 55%; Clay = 38% GM = 0.05; LL = 56; PI = 34; LS = 12	SPT 1.5m = 1 SPT 3m = 22 SPT 4.5m = 2 SPT 6m = 25 SPT 7.5m = 0 SPT 9m = 1 SPT 10.5m = 2 SPT 12 = 2 SPT 13.5m = 4 SPT 15m = 7 SPT 16.5m = 18 SPT 18m = 25

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207			18.5 to 24.5m: Light yellowish orange, medium dense, FINE SAND.	**Results @ 22.5m** Gravel = 0%; Sand = 86%; Silt/Clay = 14% GM = 0.86; LL = NP; PI = NP; LS = 0	SPT 19.5m = 16 SPT 21m = 18 SPT 22.5m = 19 SPT 24m = 30
				24.5 to 26m: Light yellowish orange and light brown, dense, FINE SAND. 26 to 29m: Light brown, dense to very dense FINE SAND. 29 to 30.5m: Yellowish orange brown speckled off white, SILTY SAND with occasional subangular calcrete gravel. 30.5 to 32.73m: As above, light brown with coarser scattered calcrete gravel. 32.73 to 34.03m: Dark olive grey, slightyl weathered, fine grained, very thickly bedded, very stiff to very soft rock. CRETACEOUS SILTSTONE. Contains scattered subangular fossileferous siltstone gravel. 34.03 to 37.93m: Dark grey, unweathered, fine grained, very thickly bedded, very stiff to very soft rock. CRETACEOUS SILTSTONE. Contains thin silified, medium hard, fossileferous siltstone layers and scattered subangular limestone clasts.	**Results @ 25.5m** Gravel = 0%; Sand = 82%; Silt/Clay = 18% GM = 0.82; LL = NP; PI = NP; LS = 0	SPT 30m refused RQD 35m = 60 RQD 37m = 93 RQD 38m = 87
		DM-L-C04	Wash bore	0 to 2m: Greyish light brown mottled dark grey, loose, FINE SAND with scattered shell fragments. 2 to 3.5m: Dark olive mottled light grey and dark yellowish orange, firm, SILTY CLAY. 3.5 to 5m: Light yellowish orange mottled light grey, medium dense, FINE SAND. 5 to 6.5m: Light yellowish brown mottled light grey, loose, CLAYEY FINE TO MEDIUM SAND. 6.5 to 8m: As above with light yellowish brown colour. 8 to 9.5m: Dark orange brown mottled light grey and light yellowish orange, stiff, SANDY SILTY CLAY. 9.5 to 14m: light grey mottled dark orange brown streaked light yellow, very stiff, FINE SANDY CLAYEY SILT. 14 to 15.5m: Light and dark orange yellow mottled light grey, medium dense, FINE TO MEDIUM SAND. 15.5 to 17m: Light yellow mottled light grey, medium dense, slightly CLAYEY FINE to MEDIUM SAND. 17 to 18.5m: As above with a light greyish brown colour. 18.5 to 20m: Light yellowish orange mottled light grey, loose, SILTY FINE TO MEDIUM SAND with occasional ferricrete nodules. 20 to 21.5m: Light brown mottled light grey, medium dense, slighty CLAYEY FINE SAND. 21.5 to 23m: Dark yellowish orange, very dense, FINE TO COARSE SAND. 23 to 24.5m: Dark brown mottled dark grey, very stiff. CLAYEY FINE SAND. 24.5 to 26m: Adrk blackish grey, very stiff, CLAYEY SILTY FINE SAND. 26 to 27.5m: Dark grey, medium dense, CLAYEY SILTY SAND. 27.5 to 29m: Dark greenish olive speckled off white, very dense, SILTY SAND, with scattered ferricrete nodules. 29 to 30.11m: As above with mush subangular calcrete gravel and occassional subrounded ferricrete nodules. 30.11 to 31.04m: Dark olive grey, slighty weathered, fine grained, very thickly bedded, very soft rock. CRETACEOUS SILTSTONE. 31.04 to 33.18m: Dark olive grey, slighty weathered, fine grained, very thickly bedded,very stiff to very soft rock. CRETACEOUS SILTSTONE. 33.18 to 35.48m: Dark olive grey, slighty weathered, fine grained, very thickly bedded, very soft rock. CRETACEOUS SILTSTONE. Thin silicified, medium hard, fossileferous siltstone layers at 33.55 to 33.62m.	**Results @ 3m** Gravel = 0%; Sand = 10%; Silt = 33%; Clay = 56% GM = 0.07; LL= 70; PI = 48; LS = 14.5 **Results @ 7.5m** Gravel = 0%; Sand = 73%; Silt = 2%; Clay = 25% GM = 0.74; LL= 23; PI = 11; LS = 5.5 **Results @ 13.5m** Gravel = 0%; Sand = 15%; Silt = 48%; Clay = 37% GM = 0.32; LL= 34; PI = 15; LS = 6.5 **Results @ 19.5m** Gravel = 4%; Sand = 55%; Silt/Clay = 40% GM = 0.71; LL= NP; PI = NP; LS = 0	SPT 0.5m = 6 SPT 1.5m = 8 SPT 3m = 8 SPT 4.5m = 24 SPT 6m = 7 SPT 7.5m = 8 SPT 9m = 14 SPT 10.5m = 17 SPT 12 = 13 SPT 13.5m = 19 SPT 15m = 28 SPT 16.5m = 21 SPT 18m = 17 SPT 19.5m = 9 SPT 21m = 23 SPT 22.5m = 51 SPT 24m = 29 SPT 25.5m = 27 SPT 27m = 28 SPT 28.5m = 68 RQD 32m = 67 RQD 34m = 69 RQD 35m = 59
		DM-L-C05A	Wash bore	0 to 0.5m: Yellowish brown, medium dense, FINE SAND. 0.5 to 3.5m: Greenish light grey speckled dark olive streaked buff pink, very stiff, SILTY CLAY with dark orange brown sandy and fine gravelly inclusions. 3.5 to 5m: Yellowish brown, dense, FINE TO MEDIUM SAND. 5 to 9.5m: Light grey mottled orange brown and light yellowish orange, very stiff, FINE SANDY SILTY CLAY. 9.5 to 11m: As above with slighty more sand. 11 to 12.5m: Light yellowish brown mottled dark grey, dense, CLAYEY FINE TO MEDIUM SAND. 12.5 to 14m: Yellowish brown, medium dense to very dense, FINE SAND. 14 to 17m: Yellowish brown mottled dark grey, dense, FINE SAND. 17 to 18.5m: Light brown, medium dense, FINE TO MEDIUM SAND. 18.5 to 20m: As above with more silt. 20 to 26m: Light yellowish orange, medium dense to dense, slighty FINE TO COARSE SAND. 26 to 27.8m: Dark blackish grey, very stiff, CLAYEY FINE SANDY SILT. 27.8 to 30m: No core recovered.	**Results @ 3m** Gravel = 8%; Sand = 40%; Silt = 17%; Clay = 35% GM = 0.68; LL= 50; PI = 33; LS = 10 **Results @ 9m** Gravel = 0%; Sand = 20%; Silt = 35%; Clay = 45% GM = 0.14; LL= 52; PI = 36; LS = 12.5 **Results @ 13.5m** Gravel = 1%; Sand = 64%; Silt = 11%; Clay = 25% GM = 0.66; LL= 27; PI = 13; LS = 5.0 **Results @ 19.5m** Gravel = 17%; Sand = 70%; Silt/Clay = 13% GM = 1.03; LL= NP; PI = NP; LS = 0 **Results @ 28.5m** Gravel = 1%; Sand = 28%; Silt = 46%; Clay = 25% GM = 0.22; LL= 40; PI = 20; LS = 8.5	SPT 0.5m = 11 SPT 1.5m = 25 SPT 3m = 23 SPT 4.5m = 33 SPT 6m = 15 SPT 7.5m = 24 SPT 9m = 26 SPT 10.5m = 36 SPT 12 = 32 SPT 13.5m = 34 SPT 15m = 29 SPT 16.5m = 59 SPT 18m = 17 SPT 19.5m = 21 SPT 21m = 21 SPT 22.5m = 32 SPT 24m = 28 SPT 25.5m = 43 SPT 27m = 20
			NXM	30 to 30.51m: Light greenish olive speckled off-white mottled dark blackish grey, very dense, SILTY SAND, Scarce quartzite gravel. 30.51 to 34.25m: Light grey, unweathered, very fine grained, massive very stiff soil and very soft rock, largely silicified. CRETACEOUS SILTSTONE. Contains much fossileferous material leading to pebbly appearance. 34.25 to 35.30m: Light grey, unweathered, very fine-grained, soft rock, highly silicified. CRETACEOUS SILTSTONE with fossileferous material. 35.30 to 35.72m: Very dark brown-black, unweathered, very fine grained, massive, very stiff soil to very soft rock. CRETACEAOUS SILTSTONE with occasional shell fragments and high organic content.		RQD 33m = 92 RQD 35m =61
		DM-L-C05B	Wash bore	0 to 2m: Dark olive, very loose, SILTY FINE TO MEDIUM SAND. Contains abundant 4mm shell fragments. 2 to 4.65m: Light grey (mottled dark brown), medium stiff, microshattered SILTY CLAY. 4.65 to 5m: Light yellowish olive, medium dense, CLAYEY SHELLS and SHELL FRAGMENTS. 5 to 6.5m: Light grey, dense, SILTY MEDIUM SAND. 6.5 to 8m: As above, light grey mottled olive. 8 to 11m: Light grey (mottled orange), very stiff, CLAY. Occasional large shell fragments and ferrugenised pebbles grading into… 11 to 12.5m: Light grey (mottled orange), medium dense, CLAYEY MEDIUM SAND. 12.5 to 15.5m: Light yellow, dense, SILTY FINE to MEDIUM SAND. 15.5 to 17m: Light grey (mottled orange), dense, SILTY FINE to MEDIUM SAND. 17 to 20m: Light yellowish orange, very dense, SILTY MEDIUM to COARSE SAND. 20 to 21.5m: Yellowish orange (mottled light grey and light red), dense, SILTY CLAYEY FINE to MEDIUM SAND. 21.5 to 26m: Orange, dense, CLAYEY SILTY FINE to MEDIUM SAND. Very dense with increase in depth.		SPT 0.5m = 3 SPT 1.5m = 5 SPT 3m = 6 SPT 4.5m = 12 SPT 6m = 50 SPT 7.5m = 52 SPT 9m = 16 SPT 10.5m = 14 SPT 12 = 28 SPT 13.5m = 35 SPT 15m = 36 SPT 16.5m = 33 SPT 18m = 79 SPT 19.5m = 71 SPT 21m = 43 SPT 22.5m = 46 SPT 24m = 60 SPT 25.5m = 44

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207			26m to 27.55: Very dark grey, medium dense, FINE SANDY SILTY CLAY. 27.55 to 27.63m: Dark grey, very soft rock to soft rock, pebbly weathered CRETACEOUS SILTSTONE. 27.63 to 27.73m: Light grey (speckled white), very stiff soil to very soft rock, weathered CALCARENITE. 27.73 to 28m: Yellowish grey, very soft rock, CRETACEOUS SANDSTONE grading into… 28 to 28.89m: Dark grey, very stiff soil to soft rock, CRETACEOUS SILTSTONE. 28.89 to 30.51m: Dark grey, very stiff soil to soft rock, CRETACEOUS SILTSTONE.		SPT 27m = 15 SPT 27.75 refused RQD 28m = 0 RQD 29m = 24 RQD 30.5m = 52
		DM-L-C06	**Wash bore**	0 to 3.5m: Greyish light brown, loose, silty medium to coarse SAND. Shell fragments common. Silt fraction decreases with depth. 3.5 to 5m: Yellowish orange (blotched grey brown), medium dense, fine to medium SAND. 5 to 6.5m:Yellowish orange (blotched grey brown), medium dense, silty fine SAND. 6.5 to 8m: Greyish yellow, dense, silty fine to medium SAND. Minor shell fragments. 8 to 9.5m: Brownish yellow, dense, silty fine SAND. 9.5 to 11m: Dark brown (mottled grey), stiff, shattered, fine to medium sandy silty CLAY. Minor sand lenses and occasional shell fragments. 11 to 14m: dark brown (mottled grey), very stiff, shattered silty CLAY. Abundant shell fragments and occasional sand lenses. 14 to 18.5m: Dark brownish-dark grey, stiff, shattered, fine to medium sandy clayey SILT. Abundant shell fragments. Not shattered below 17.5m. 18.5 to 20m: Brownish grey, stiff, silty CLAY. Containing occasional shell fragments. 20 to 26m: Dark grey, very stiff, fine sandy silty CLAY. High organic content below 22m. 26 to 27.35m: Olive dark grey, hard, fine sandy silty, CLAY. High organic content. 27.35 to 33.09m: Very dark brown/black, very fine grained, massive, very stiff soil to very soft rock. CRETACEOUS SANDY SILTSTONE.	**Results @ 4.5m** Gravel = 3%; Sand = 89%; Silt/Clay = 8% GM = 0.95; LL= NP; PI = NP; LS = 0 **Results @ 10.5m** Gravel = 0%; Sand = 16%; Silt = 45%; Clay = 39% GM = 0.16; LL= 65; PI = 43; LS = 15.5 **Results @ 15m** Gravel = 2%; Sand = 30% Silt = 45%; Clay = 24% GM = 0.27; LL= 44; PI = 26; LS = 10 **Results @ 21m** Gravel = 0%; Sand = 49% Silt = 18%; Clay = 33% GM = 0.48; LL= 26; PI = 15; LS = 5.5	SPT 1.5m = 7 SPT 3m = 6 SPT 4.5m = 5 SPT 6m = 11 SPT 7.5m = 36 SPT 9m = 41 SPT 10.5m = 11 SPT 12 = 22 SPT 13.5m = 21 SPT 15m = 9 SPT 16.5m = 9 SPT 18m = 12 SPT 19.5m = 9 SPT 21m = 18 SPT 22.5m = 16 SPT 24m = 15 SPT 25.5m = 17 SPT 27m refused RQD 27.5m = 79 RQD 29m = 85 RQD 30 = 100 RQD 31 = 99 RQD 32 = 97 RQD 33 = 99
		DM-L-C07	**Wash bore**	0 to 1m: Concrete 1 to 2m: Light and dark brown, medium dense, FINE SAND with minor shell fragments. 2 to 3.5m: Brownish light grey, medium dense, FINE SAND with shell fragments common. 3.5 to 8m: Olive, medium dense, SILTY FINE to MEDIUM SAND. 8 to 11m:Light grey, dense, FINE SAND. 11 to 12.5m: Dark grey, CLAYEY SILTY FINE SAND with very little shell fragments. 12.5 to 17m: Light brownish grey, dense to very dense, FINE SAND with minor shell fragments. 17 to 21.5m: Dark grey, firm, SILTY CLAY with scattered shell fragments. 21.5 to 24.5m: Light brown mottled yellowish brown, medium dense, FINE to MEDIUM SAND. 24.5 to 29m: Yellowish brown, dense to very dense, FINE to MEDIUM SAND. 29 to 30.5m: As above, light brown mottled yellowish brown. 30.5 to 32m: Dark olive grey, dense, slighty SILTY FINE SAND. 32 to 32.94m: Dark grey mottled greyish olive, very stiff, SANDY SILT with scattered calcrete gravel (5 to 30mm). 32.94 to 35.01m: Dark olive speckled off white, SILTY SAND with scattered calcrete gravel (20 to 300mm) and shell fragments.	**Results @ 9m** Gravel = 0%; Sand = 84%; Silt/Clay = 16% GM = 0.84; LL= NP; PI = NP; LS = 0 **Results @ 12m** Gravel = 1%; Sand = 47%; Silt = 34%; Clay = 17% GM = 0.02; LL= 34; PI = 17; LS = 6 **Results @ 16.5m** Gravel = 0%; Sand = 88%; Silt/Clay = 12% GM = 0.89; LL= NP; PI = NP; LS = 0 **Results @ 19.5m** Gravel = 0%; Sand = 11%; Silt = 52%; Clay = 38% GM = 0.02; LL= 67; PI = 40; LS = 13.5 **Results @ 28.5m** Gravel = 6%; Sand = 83%; Silt/Clay = 11% GM = 0.95; LL= NP; PI = NP; LS = 0	SPT 1.5m = 26 SPT 3m = 12 SPT 4.5m = 14 SPT 6m = 11 SPT 7.5m = 11 SPT 9m = 39 SPT 10.5m = 41 SPT 12 = 45 SPT 13.5m = 59 SPT 15m = 58 SPT 16.5m = 43 SPT 18m = 5 SPT 19.5m = 10 SPT 21m = 9 SPT 22.5m = 23 SPT 24m = 21 SPT 25.5m = 40 SPT 27m = 39 SPT 28.5m = 71 SPT 30m = 36 SPT 31.5m = 43 SPT 33m refused.
			NXM	35.01 to 40.53m: Dark grey, unweathered, fine grained, very thickly bedded, very soft rock. CRETACEOUS SILTSTONE. Variation in cosistency from very soft to very stiff. Thin, silicified, medium siltstone layers at 38.58 and 39.5m.		RQD at 36m = 11 RQD at 37m = 96 RQD at 39m = 34 RQD at 40m = 70
		DM-L-C08	**Wash bore**	0 to 2m: Light greyish brown, loose, FINE SAND with abundant shell fragments. 2 to 6.5m: As above, medium dense. 6.5 to 8m: Yellowish brown, medium dense, FINE to MEDIUM SAND. Occasional ferruginised sandstone gravel. 8 to 11m: Light grey mottled orange brown and brown, stiff, SILTY CLAY. 11 to 17m: Yellowish brown mottled light grey, medium dense, FINE SAND. 17 to 20m: Yellowish brown, dense to very dense, FINE to MEDIUM SAND. 20 to 21.5m Yellowish brown, very dense, FINE to COARSE SAND with scattered subangular quartzite gravel (10 to 30mm). 21.5 to 24.5m: Yellowish brown, medium dense, SILTY FINE SAND. 24.5 to 27.5m: Light olive brown, medium dense to very dense, slightyl silty FINE SAND. 27.5 to 29m: Dark blackish grey, stiff, SANDY CLAYEY SILT.	**Results @ 4.5m** Gravel = 12%; Sand = 77%; Silt/Clay = 11% GM = 1.17; LL= NP; PI = NP; LS = 0 **Results @ 7.5m** Gravel = 8%; Sand = 75%; Silt = 4%; Clay = 13% GM = 1.01; LL= NP; PI = NP; LS = 0 **Results @ 9.9m** Gravel = 15%; Sand = 11%; Silt = 42%; Clay = 32% GM = 0.55; LL=62; PI = 40; LS = 14 **Results @ 10.5m** Gravel = 0%; Sand = 10% Silt = 41%; Clay = 49% GM = 0.09; LL= 50; PI = 33; LS = 12 **Results @ 19.5m** Gravel = 4%; Sand = 85%; Silt/Clay = 11% GM = 0.92; LL= NP; PI = NP; LS = 0	SPT 1.5m = 8 SPT 3m = 14 SPT 4.5m = 19 SPT 6m = 17 SPT 7.5m = 22 SPT 9m = 10 SPT 10.5m = 8 SPT 12 = 17 SPT 13.5m = 18 SPT 15m = 32 SPT 16.5m = 28 SPT 18m = 44 SPT 19.5m = 68 SPT 21m = 45 SPT 22.5m = 23 SPT 24m = 39 SPT 25.5m = 22 SPT 27m = 61 SPT 28.5m = 14

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207			29 to 31.20m: Light greenish olive streaked and speckled off white, very stiff, SANDY SILT, scattered calcrete gravel near base (40 to 80mm) 31.2 to 33m: Dark olive grey, slighty weathered, fine grained, very thickly bedded, very stiff to very soft rock. CRETACEOUS SILTSTONE. Contains mush subangular, cemented, medium hard, limestone gravel (20 to 80mm). 33 to 37.26m: Dark brownish grey, slightly weather, fine grained, very thickly bedded, very soft rock. CRETACEOUS SILTSTONE. Several very stiff to very soft rocks of 100 to 200mm thickness and several very thin silicified, medium hard, fossileferous siltstone layers (20 to 40mm thick).	**Results @ 28.5m** Gravel = 1%; Sand = 28%; Silt = 54%; Clay = 18% GM = 0.25; LL=46; PI = 22; LS = 9.5	SPT 30m refused RQD 35m = 71 RQD 35.5m = 48 RQD 36m = 71 RQD 37m = 89
		DM-L-C09	**Wash bore**	0 to 3.5m: Light greyish brown mottled light grey, very loose to loose, FINE SAND with scattered shell fragments becoming abundant and coarser near base. 3.5 to 6.5m: Yellowish brown slightly mottled dark yellowish orange, loose, FINE SAND. 6.5 to 11m: Yellowish brown slightly mottled dark yellowish orange, medium dense to dense, SILTY FINE to MEDIUM SAND. 11 to 14m: Yellowish brown mottled ligt grey and dark yellowish orange, very dense to dense closer to base, slighty silty FINE SAND. Scattered subangular quartzite gravel. 14 to 17m: Yellowish brown, dense, slightly silty fine to medium SAND. 17 to 23m: Light yellowish brown, medium dense, silty fine SAND with minor granite and quartzite gravel. 23 to 26m: Yellowish to orangish brown, dense, slightly silty fine SAND. 26 to 27.9m: Dark olive grey, very stiff, silty fine SAND with scattered friable ferricrete nodules (2 to 10mm).	**Results @ 7.5m** Gravel = 0%; Sand = 86%; Silt/Clay = 14% GM = 0.86; LL= NP; PI = NP; LS = 0 **Results @ 12m** Gravel = 3%; Sand = 76%; Silt/Clay = 21% GM = 0.82; LL= NP; PI = NP; LS = 0 **Results @ 18m** Gravel = 2%; Sand = 86%; Silt/Clay = 16% GM = 0.87; LL= NP; PI = NP; LS = 0 **Results @ 28.5m** Gravel = 0%; Sand = 65%; Silt = 24%; Clay = 11% GM = 0.54; LL=42; PI = 14; LS = 5	SPT 0.5m = 3 SPT 1.5m = 6 SPT 3m = 8 SPT 4.5m = 10 SPT 6m = 7 SPT 7.5m = 20 SPT 9m = 21 SPT 10.5m = 37 SPT 12 = 55 SPT 13.5m = 44 SPT 15m = 36 SPT 16.5m = 38 SPT 18m = 23 SPT 19.5m = 28 SPT 21m = 37 SPT 22.5m = 41 SPT 24m = 32 SPT 25.5m = 33 SPT 27m = 39
			NXM	27.9 to 33.96m: Very dark brown to black, very fine grained, very thickly bedded, very stiff soil to soft rock. CRETACEOUS SILTSTONE, with light grey very fine grained fossileferous soft silicified siltstone layers.		SPT 28m refused RQD 29.5m = 100 RQD 30m = 63 RQD 32m = 59 RQD 33m = 44
		DM-L-C09B	**Wash bore**	0 to 2m: Brown, very loose, silty medium SAND with scattered shell fragments becoming loose with depth. 2 to 3.5m: Yellowish orange, medium dense, silty fine to medium SAND. 3.5 to 6.5m: Dark brown mottled light grey, very stiff microshattered medium sandy clay with higher clay content near base. Grading into… 6.5 to 7.8m: Light grey, stiff, CLAY. Grading into… 7.8 to 8m: Light yellow, clayey medium SAND. 8 to 9.5m: Yellowish orange, medium dense, silty fine to medium SAND. 9.5 to 11m: Light grey (mottled orange), medium dense, clayey medium SAND. 11 to 14m: Light yellow, dense, silty fine to medium SAND. 14 to 15.5m: Light yellowish orange and light yellowish light grey, very dense, clayey fine to medium sand. Scattered sub rounded pebbles of quartzite (150mm average). 15.5 to 20m: Light grey, dense, clayey medium SAND with scattered shell fragments up to 12mm in diameter. Shell content decreases with depth. 20 to 21.5m: Light olive grey, dense, clayey medium to coarse SAND. 21.5 to 23m: Yellowish orange, dense, clayey medium SAND. 23 to 24.5m: Orange, very dense, clayey fine to medium SAND.		SPT 0.5m = 1 SPT 1.5m = 8 SPT 3m = 16 SPT 4.5m = 18 SPT 6m = 20 SPT 7.5m = 12 SPT 9m = 29 SPT 10.5m = 20 SPT 12 = 33 SPT 13.5m = 28 SPT 15m = 85 SPT 16.5m = 37 SPT 18m = 35 SPT 19.5m = 42 SPT 21m = 37 SPT 22.5m = 48 SPT 24m = 59 SPT 25.5m = 28 SPT 27m = 29 SPT 28m refused RQD 29m =18
			NXM	24.5 to 26m: Yellow (mottled orange and grey), medium dense, clayey silty medium to coarse SAND. 26 to 27.5m: Vet dark grey, medium dense, fine sandy clayey SILT. 27.5 to 28.25m: Very dark greyish black, hard, micaceous, fine sandy clayey SILT. Shell fragments common. Weathered Cretaceous SILTSTONE. 28.25 to 28.75m: Dark grey, soft rock, fossileferous. Cretaceous SILTSTONE. 28.75 to 30.05m: Dark grey, stiff soil to soft rock, fossileferous. Cretaceous SILTSTONE.		
		DM-L-C10	**Wash bore**	0 to 2m: Dark grey, loose, fine to medium SAND with abundant shell fragments. 2 to 5m: Light brownish dark grey, dense to very dense, fine to medium SAND with abundant shell fragments. 5 to 6.5m: Brownish light grey, loose, fine to medium SAND. 6.5 to 8m: Light grey mottled light orange, yellow, pink firm, fine sandy silty CLAY. 8 to 9.5m: Light orange mottled light grey, medium dense, clayey fine SAND. 9.5 to 15.5m: Dark orange, loose, fine to medium SAND to fine SAND near base. Scarce light grey thin clay laminations. 15.5 to 18.5m: Reddish dark grey, very stiff, microshattered and slickensided, clayey SILT to fine to medium CLAYEY SILT. Light yellow veins and ferruginous material.	**Results @ 1.5m** Gravel = 1%; Sand = 88%; Silt = 1%; Clay = 10% GM = 0.89; LL=NP; PI = NP; LS = 0 **Results @ 3m** Gravel = 4%; Sand = 87%; Silt = 1%; Clay = 8% GM = 1.04; LL=NP; PI = NP; LS = 0 **Results @ 4.5m** Gravel = 8%; Sand = 87%; Silt = 0%; Clay = 6% GM = 1.21; LL=NP; PI = NP; LS = 0 **Results @ 6m** Gravel = 0%; Sand = 84%; Silt = 2%; Clay = 14% GM = 0.99; LL=NP; PI = NP; LS = 0 **Results @ 7.5m** Gravel = 0%; Sand = 23%; Silt = 34%; Clay = 43% GM = 0.21; LL=43; PI = 27; LS = 10 **Results @ 9m** Gravel = 0%; Sand = 49%; Silt = 22%; Clay = 29% GM = 0.47; LL=24; PI = 10; LS = 4	SPT 1.5m = 6 SPT 3m = 13 SPT 4.5m = 64 SPT 6m = 6 SPT 7.5m = 6 SPT 9m = 13 SPT 10.5m = 9 SPT 12m = 10 SPT 13.5m = 10 SPT 15m = 15 SPT 16.5m = 24 SPT 18m = 30 SPT 19.5m = 18 SPT 21m = 27

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207				**Results @ 10.5m** Gravel = 2%; Sand = 75%; Silt = 2%; Clay = 21% GM = 0.82; LL=NP; PI = NP; LS = 0 **Results @ 12m** Gravel = 0%; Sand = 80%; Silt = 3%; Clay = 17% GM = 0.85; LL=NP; PI = NP; LS = 0 **Results @ 13.5m** Gravel = 0%; Sand = 72%; Silt = 5%; Clay = 23% GM = 0.74; LL=29; PI = 12; LS = 5 **Results @ 15m** Gravel = 0%; Sand = 70%; Silt = 9%; Clay = 21% GM = 0.72; LL=30; PI = 13; LS = 6.5 **Results @ 16.5m** Gravel = 0%; Sand = 19%; Silt = 51%; Clay = 30% GM = 0.15; LL= 51; PI = 29; LS = 12.5 **Results @ 18m** Gravel = 1%; Sand = 31%; Silt = 42%; Clay = 26% GM = 0.30; LL= 48; PI = 25; LS = 12.5 **Results @ 19.5m** Gravel = 1%; Sand = 4%; Silt = 45%; Clay = 51% GM = 0.05; LL= 53; PI = 29; LS = 14 **Results @ 21m** Gravel = 0%; Sand = 7%; Silt = 43%; Clay = 49% GM = 0.04; LL= 49; PI = 26; LS = 13.5	
				18.5 to 21.45m: Black very stiff, organic silty CLAY.		
		DM-L-C11	**Wash bore**	0 to 5m: Greyish olive, loose, fine to medium SAND with prolific shell fragments. Hydraulically placed fill. Grades into medium dense, fine to medium SAND with shell fragments.	**Results @ 1.5m** Gravel = 15%; Sand = 82%; Silt = 0%; Clay = 4% GM = 1.39; LL=NP; PI = NP; LS = 0 **Results @ 3m** Gravel = 16%; Sand = 80%; Silt = 1%; Clay = 6% GM = 1.44; LL=NP; PI = NP; LS = 0 **Results @ 4.5m** Gravel = 10%; Sand = 85%; Silt = 0%; Clay = 5% GM = 1.35; LL=NP; PI = NP; LS = 0 **Results @ 6m** Gravel = 2%; Sand = 89%; Silt = 2%; Clay = 7% GM = 1.02; LL=NP; PI = NP; LS = 0 **Results @ 7.5m** Gravel = 1%; Sand = 87%; Silt = 3%; Clay = 10% GM = 0.21; LL=43; PI = 27; LS = 10 **Results @ 9m** Gravel = 1%; Sand = 91%; Silt = 0%; Clay = 7% GM = 1.00; LL=24; PI = 10; LS = 4 **Results @ 10.5m** Gravel = 0%; Sand = 72%; Silt = 15%; Clay = 13% GM = 0.72; LL=NP; PI = NP; LS = 0.5 **Results @ 12m** Gravel = 0%; Sand = 61%; Silt = 26%; Clay = 13% GM = 0.0.62; LL=25; PI = 10; LS = 4.5 **Results @ 13.5m** Gravel = 0%; Sand = 63%; Silt = 24%; Clay = 13% GM = 0.59; LL=25; PI = 8; LS = 3.5 **Results @ 15m** Gravel = 1%; Sand = 70%; Silt = 11%; Clay = 17% GM = 0.70; LL=SP; PI = SP; LS = 1.5 **Results @ 16.5m** Gravel = 0%; Sand = 17%; Silt = 53%; Clay = 30% GM = 0.03; LL= 60; PI = 30; LS = 10.5	SPT 1.5m = 4 SPT 3m = 12 SPT 4.5m = 11 SPT 6m = 15 SPT 7.5m = 28 SPT 9m = 22 SPT 10.5m = 12 SPT 12m = 7 SPT 13.5m = 3 SPT 15m = 1 SPT 16.5m = 8 SPT 18m = 6 SPT 19.5m = 22 SPT 21m = 14
				5 to 6.5m: Greyish olive, medium dense, medium to very coarse SAND. 6.5 to 11m: grey to dark grey mottled with yellow and pink, medium dense, fine to medium SAND with scattered shell fragments. 11 to 12.5m: Dark grey loose silty fine to medium SAND. 12.5 to 13.5m: Dark grey, clayey silty fine SAND. 13.5 to 14m: Dark grey very loose, fine SAND. 14 to 15.5m: Dark grey, very loose fine SAND. 15.5 to 18.5m: Dark grey, firm, clayey SILT. 18.5 to 20m: Olive dark grey, medium dense, fine to medium SAND.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207				**Results @ 18m** Gravel = 0%; Sand = 11%; Silt = 51%; Clay = 38% GM = 0.02; LL= 58; PI = 29; LS = 12 **Results @ 19.5m** Gravel = 0%; Sand = 81%; Silt = 4%; Clay = 15% GM = 0.81; LL= NP; PI = NP; LS = 0 **Results @ 21m** Gravel = 1%; Sand = 77%; Silt = 13%; Clay = 9% GM = 0.56; LL= 29; PI = 14; LS = 5.5	
				20 to 21.45: Light grey, medium dense, silty fine SAND.		
		DM-L-C12	**Wash bore**	0 to 2m: Light brownish olive, loose, fine to medium SAND with abundant shell fragments. 2 to 11m: Dark grey to black mottled red and pink, medium dense to dense near base, fine to medium SAND. Some shell fragments decreasing towards base. 11 to 12.5m: Dark grey, very loose, clayey fine sandy SILT. 12.5 to 13.5m: Dark grey, medium dense, clayey fine SAND. 13.5 to 14m: Darh grey, medium dense, clayey fine SAND. 14 to 17m: Dark grey mottled black and reddish brown, dense, fine SAND. 17 to 21.45m: Dark grey mottled olive, stiff fine sandy clayey SILT to clayey SILT with shell fragments.	**Results @ 1.5m** Gravel = 2%; Sand = 84%; Silt = 5%; Clay = 9% GM = 1.05; LL=NP; PI = NP; LS = 0 **Results @ 3m** Gravel = 0%; Sand = 84%; Silt = 5%; Clay = 8% GM = 0.92; LL=NP; PI = NP; LS = 0 **Results @ 4.5m** Gravel = 1%; Sand = 90%; Silt = 0%; Clay = 8% GM = 0.98; LL=NP; PI = NP; LS = 0 **Results @ 6m** Gravel = 8%; Sand = 81%; Silt = 3 %; Clay = 8% GM = 1.18; LL=NP; PI = NP; LS = 0 **Results @ 7.5m** Gravel = 1%; Sand = 89%; Silt = 3%; Clay = 8% GM = 1.00; LL=NP; PI = NP; LS = 0 **Results @ 9m** Gravel = 0%; Sand = 87%; Silt = 3%; Clay = 11% GM = 0.87; LL=NP; PI = NP; LS = 0 **Results @ 10.5m** Gravel = 0%; Sand = 87%; Silt = 2%; Clay = 11% GM = 0.89; LL=NP; PI = NP; LS = 0.5 **Results @ 12m** Gravel = 0%; Sand =40%; Silt = 40%; Clay = 20% GM = 0.35; LL= 38; PI = 20; LS = 8.5 **Results @ 13m** Gravel = 0%; Sand = 14%; Silt = 62%; Clay = 24% GM = 0.06; LL= 54; PI = 28; LS = 12.5 **Results @ 13.5m** Gravel = 1%; Sand = 61%; Silt = 14%; Clay = 24% GM = 0.60; LL= 23; PI = 8; LS = 3.5 **Results @ 15m** Gravel = 0%; Sand = 87%; Silt = 1%; Clay = 11% GM = 0.86; LL= NP; PI = NP; LS = 0 **Results @ 19.5m** Gravel = 0%; Sand = 15%; Silt = 53%; Clay = 32% GM = 0.06; LL= 63; PI = 34; LS = 14 **Results @ 21m** Gravel = 1%; Sand = 28%; Silt = 40%; Clay = 31% GM = 0.34; LL= 48; PI = 26; LS = 11.5	SPT 1.5m = 5 SPT 3m = 35 SPT 4.5m = 25 SPT 6m = 28 SPT 7.5m = 35 SPT 9m = 28 SPT 10.5m = 32 SPT 12m = 3 SPT 13.5m = 30 SPT 15m = 50 SPT 16.5m = 49 SPT 18m = 9 SPT 19.5m = 9 SPT 21m = 11
		BH-BH-108 **3.10m to seabed**	**Rotary open hole/coring**	0 to 5.1m: Grey, loose to very loose becoming medium dense, slighty silty SAND, with occasional shell fragments up to 10mm. Harbour Beds. 5.1 to 14m: Light grey mottled grey, very loose to very dense, clayey SAND with occasional shell fragments up to 15mm. Harbour Beds. Below 6.5m becomes silty and dense, at 8m loose, at 9m medium dense, below 11m very dense. 14 to 17m: Dark grey, very soft to soft sandy CLAY, with occasional shell fragments up to 8mm. Harbour Beds. Below 15.5m becomes slightly sandy and fissured. Fissures are closely spaced randomly oriented undulating smooth and tight.		SPT 0.5m = 4 SPT 2m = 2 SPT 3.5m = 18 SPT 6.5m = 40 SPT 8m = 7 SPT 9.5m = 22 SPT 11m = 50/160 SPT 12.5m = 50/140 SPT 14m = 3 SPT 15.5m = 4
		BH-BH-109 **2.07m to seabed**	**Rotary open hole/coring**	0 to 5m: Dark brown to grey, loose becoming medium dense, slighty clayey SAND, with occasional shell fragments up to 10mm. Harbour Beds. Below 3.5m medium dense and no shell fragments. 5m to 6.4m: Brown mottled grey, stiff, fissured, sandy CLAY. Sand fraction is fine to medium. Fissures are randomly oriented and extremely closely spaced smoot and planar 6.4 to 14.25m: Orange mottled grey, loose becoming medium dense, clayey SAND. Harbour Beds. Between 8 and 12m very slighty clayey. At 9.85m rare subangular gravel. Below 12.5m: Very thinly interbedded slightly clayey SAND and clayey SAND.		SPT 0.5m = 4 SPT 2m = 5 SPT 3.5m = 13 SPT 5m = 18 SPT 6.5m = 6 SPT 8m = 15 SPT 9.5m = 24 SPT 11m = 20 SPT 12.5m = 21 SPT 14m = 18

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	206/207			14.25 to 15m: Grey mottled orange, stiff, thinly interbedded clayey SAND with sandy CLAY with occasional brown vertical mottling. Harbour Beds. 15 to 17.4m: Dark brown mottled light brown and orange, stiff, fissured slighty sandy CLAY. Harbour Beds.		SPT 15.5m = 18 SPT 17m = 13
		BH-BH-110 **4.25m to seabed**	**Rotary open hole/coring**	0 to 3.5m: Green to brown mottled blue grey, fissured, slightly sandy to sandy CLAY. Harbour Beds. Sand is fine to medium, fissures are randomly oriented extremely closely spaced smooth and planar. Below 3.10m, very sandy with loses fissuring. 3.5 to 5m: Light brown mottled grey, medium dense, slightly clayey SAND. Harbour Beds. 5 to 7.3m: Green mottled grey, firm, slightly sandy CLAY with occasinal lenses of light grey and orange SAND. Harbour Beds. 7.3 to 9.3m: Dark green mottled dark brown occasionally orange, soft to firm, fissured, sandy CLAY with occassional fibrous and pseudofibrous plant material. Fissures are randomly oriented extremely closey spaced smooth and planar. Below 8m, occcasional lenses of orange, fine to coarse SAND. 9.3 to 11m: Light green to brown mottled grey and orange, medium dense becoming dense, slighty clayey SAND. Harbour Beds. 11 to 15.5m: Light green to brown mottled grey and orange, medium dense becoming dense, slightly clayey SAND. Harbour Beds. At 11m very dense. Below 12.5m becomes very light brown mottled orange, fine to coarse SAND. 15.5 to 15.95m: Very light brown mottled orange, dense, very clayey SAND. Harbour Beds. Rare subangular medium gravel.		SPT 0.5m = 4 SPT 2m = 15 SPT 3.5m = 22 SPT 5m = 10 SPT 6.5m = 8 SPT 8m = 7 SPT 9.5m = 15 SPT 11m = 55 SPT 12.5m = 34 SPT 14m = 45 SPT 15.5m = 36
		GO200-BH07		0.00 to 12.49m: Grey medium SAND with shells. 12.49 to 14.33m: Grey fine medium SAND with slight SILT content. 14.33 to 23.47m: Grey black soft CLAY with shells. 23.47 to 25.30m: Grey medium SAND with SILT content. 25.30 to 26.82m: Grey stiff SILTY CLAY. 26.82 to 28.04m: Grey medium SAND with slight SILT content.		
		9G0200-BH08		1.37 to 13.41m: SAND, slightly SILT content. 13.41 to 17.50m: Final dredged layer. 17.50 to 22.10m: SANDY CLAY. 22.10 to 27.89m: SAND, slightly SILT content. 27.89 to 28.80m: CLAY.		
		9G0200-V43		0.90 to 13.41m: Grey fine to medium (SILTY) SAND. 13.41 to 17.50m: Final dredged layer. 17.50 to 18.90m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 18.90 to 22.90m: Brown fine to medium (SILTY) SAND with shells.		Vane test @ 17.5m= 11.1
		9G0200-V44		2.70 to 13.41m: Grey fine to medium SAND. 13.41 to 17.50m: Final dredged layer. 17.50 to 19.20m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 19.20 to 23.80m: Brown fine to medium (SILTY) SAND with shells.		Vane test @ 17.5m= 7.4
		9G0200-V45		3.00 to 13.41m: Grey fine to medium SAND. 13.41 to 17.50m: Final dredged layer. 17.50 to 19.20m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 19.20 to 22.90m: Brown fine to medium SAND.		Vane test @ 16m= 8.7 Vane test @ 17.6m = 10.2
		9G0200-V47		3.40 to 13.41m: Grey fine to medium SAND with shells. 13.41 to 17.50m: Final dredged layer. 17.50 to 18.30m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 18.30 to 22.30m: Brown fine to medium SAND with shells.		Vane test @ 16m= 11.1 Vane test @ 18.9m = 8.7
		9G0200-V48		3.00 to 13.41m: Grey fine to medium (SILTY) SAND with shells. 13.41 to 20.50m: Final dredged level. 20.50 to 22.90m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 22.90 to 24.10m: Brown fine to medium SAND.		Vane test @ 17.8m= 11.1 Vane test @ 20.5m = 8.7
		9G0200-V49		3.70 to 13.41m: Grey fine to medium (SILTY) SAND with shells. 13.41 to 20.50m: Final dredged level. 20.50 to 22.50m: Dark grey CLAYEY SILT or SILTY CLAY with shells. 22.50 to 24.70m: Brown fine to medium SAND.		Vane test @ 16m= 10.8 Vane test @ 18.9m = 20.4

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2		GO200-BH06		0.00 to 14.63m: grey medium SAND with shells. 14.63 to 15.84m: Grey fine medium SAND with slight SILT content. 15.84 to 25.60m: Grey fine soft CLAY.		
		GO200-BH08		0.00 to 13.41m: Grey brown medium SAND with some shells and slight SILT content. 13.41 to 14.63m: Grey medium SAND with shells. 14.63 to 20.73m: Grey black SANDY CLAY with slight SILT content. 20.73 to 26.52m: Grey medium SAND with some shells and slight SILT content. 26.52 to 27.43m: Grey black CLAY with shells.		
		GO200-BH09		0.00 to 7.62m: Light grey medium SAND with shells. 7.62 to 12.50m: Grey medium SAND with shells. 12.50 to 14.63m: Grey medium SAND. 14.63 to 18.89m: Grey SAND with shells.		
		GO200-BH10		0.00 to 0.91m: Light grey medium SAND with shells. 0.91 to 1.53m: Grey brown medium SAND with shells. 1.53 to 7.92m: Light grey medium SAND with shells. 7.92 to 12.80m: Grey medium SAND with shells. 12.80 to 15.24m: Dark grey medium SAND with slight SILT content. 15.24 to 16.76m: Dark grey SANDY CLAY with shells. 16.76 to 20.42m: Dark grey soft CLAY with shells.		
		GO200-BH11		0.00 to 1.83m: Grey fine medium SAND with shell and slight SILT content. 1.83 to 16.76m: Grey brown medium SAND with some shells and slight SILT content. 16.76 to 18.90m: Dark grey medium SANd with SILT content.		
		9G0200-WBA	Datum + 10"	0 to 2m: Sand some silt, shells. 2 to 13.8m: Sand.		
		9G0200-WBB	Datum - 0.2"	0 to 3.8m: Sand, silt, shells. 3.8 to 6.5m: Sand, silt, some clay 6.5 to 7.5m: Sand, some silt. 7.5 to 9.4m: Sand, silt, some clay 9.4 to 10.4; Sand, some silt. 10.4 to 11m: Sand, silt. 11 to 11.5m: Sandy clay. 11.5 to 11.7m: Sand silt some clay. 11.7 to 14m: Clay		
		9G0200-WBC	?	0 to 2.7m: No recovery. 2.7 to 6.9m: Sand, silt, some clay. 6.9 to 7.5m: Sand, silt. 7.5 to 12.7m: Sand, silt, some clay 12.7 to 14.41m: Sand, silt, clay.		
		9G0200-WBD	Datum + 1'4"	0 to 9.8m: Sand, some silt, shells. 9.8 to 10.66m: Sand, silt, some clay. 10.66 to 12.85m: Sand, some silt.		
		9G0200-WBE	?	0 to 0.7m: No recovery 0.7 to 4.8m: Sand some silt, shells. 4.8 to 10.06m: Sand, some silt. 10.06 to 11.21m: Sand, silt, some soft clay. 11.21 to 12.7m: Sand, silt. 12.7 to 13.24m: Sand,silt, some clay. 13.24 to 13.8m: Sandy clay (soft clay) 13.8 to 15m: Clay		
		9G0200-WBK	Datum +1' 0"	0 to 4.2m: Sand, some silt, shells. 4.2 to 5.7m: Sand, silt. 5.7 to 6.61m: Sand, silt, some clay. 6.61 to 7.2m: Sand, some silt. 7.2 to 14.41m: Sand, silt, some clay.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	Container Terminal (Inland of Berth 200/201)	DM-K-BH1	SPTs	0 to 0.1m: Asphalt premix. FILL. 0.1 to 0.2m: Crusher run. FILL. 0.2m to 0.3m: Concrete. 0.3 to 0.4m: Crusher run. FILL. 0.4 to 0.5m: Grey sand and ash. FILL. 0.5 to 1m: Moist, off white to pale greyish brown, medium dense, fine SAND with traces of fine shell fragments. Fill. 1 to 1.5m: Moist, off white to pale brown, medium dense, fine SAND, with traces of fine shell fragments. Fill. 1.5 to 2m: Moist off white to pale brown, loose to medium dense, fine SAND with traces of fine shell fragments. Fill. 2 to 2.4m: Very moist, off white to pale brown, medium dense, fine SAND, with traces of fine shell fragments. Fill. 2.4 to 3.45m: Reinforced CONCRETE. Quaywall.		SPT 0.3m = 24 SPT 1m = 31 SPT 1.5m = 14 SPT 2m = 24
		DM-K-BH2	SPTs	0 to 6m: Log sheet 1 of 3 missing. 6 to 7m: Pale brown, very loose, wet, fine SAND with traces of fine shell fragments. Fill. 7 to 8m: Pale brown, medium dense, fine SAND with traces of fine shell fragments. Fill. 8 to 9m: Pale greyish brown, very loose to loose, fine SAND with thin lenses of dark grey clayey sand and traces of shell fragments. Fill. 9 to 10m: Pale greyish brown, medium dense, fine SAND with thin lenses of dark grey clayey sand and traces of shell fragments. Fill. 10 to 10.5m: Pale greyish brown, loose to medium dense, fine SAND, with thin lenses of dark grey clayey sand and traces of shell fragments. Fill. 10.5 to 12m: Pale greyish brown, loose to medium dense, fine SAND, with patches of dark grey clayey sand and traces of shell fragments. Fill. 12m to 13.5m: Pale greyish white, medium dense, wet, fine SAND, with occasional thin lenses of dark grey to black, organic rich sand and traces of shell fragments. Fill. 13.5 to 14.9m: Pale brown, medium dense, wet, fine SAND. Fill. 14.9 to 15.63m: Greyish brown, medium dense, wet, fine SAND with dark greeinsh black speckled white, hard rock fine grained igneous? GRAVELS/BOULDERS below 15.63m. Fill associated with quay wall caissons? 15.63 to 16.23m: Pale greyish white, medium dense, wet, fine SAND. Caisson fill?		SPT 6m = 3 SPT 7m = 16 SPT 8m = 6 SPT 9m = 14 SPT 10m = 9 SPT 10.5m = 10 SPT 12m = 22 SPT 13.5m = 20 SPT 15m = 19 SPT 15.63m = 21
		DM-K-BH3	SPTs	0 to 0.10m: Asphalt premix. FILL. 0.1 to 0.25m: Crusher run. Fill. 0.25 to 0.35m: CONCRETE 0.35 to 0.5m: Crusher run and grey sand. Fill. 0.5 to 1m: Dark grey, medium dense to dense, slightly moist, sand and ash. Fill. 1 to 1.5m: Pale reddish brown, slightly moist, sandy GRAVEL and white fine SAND. Overall consistency is dense. Fill. 1.5 to 2m: Pale brown, medium dense to dense, slightly moist, fine SAND, with traces of fine shell fragments. Fill. 2 to 2.5m: Grey brown, loose, moist, fine SAND. Fill. 2.5 to 3m: Pale brown, medium dense, moist to very moist, fine SAND, with traces of shell fragments. Fill. 3 to 4.5m: Pale bronich grey, medium dense, very moist to wet, fine SAND with traces of shell fragments. Fill. 4.5 to 6m: Pale greysih brown, very loose to loose, wet, fine SAND with traces of shell fragments. Fill. 6 to 7.94m: Pale greyish brown, loose to medium dense, wet fine SAND, with traces of shell fragments and mixed gravels. Fill. 7.94 to 8.04m: Hard rock, gravel/boulder fragments of mixed origin. Boulder fill.		 SPT 0.3m = 29 SPT 1m = 36 SPT 1.5m = 28 SPT 2m = 7 SPT 2.5m = 19 SPT 3m = 19 SPT 3.5m = 22 SPT 4m = 10 SPT 4.5m = 5 SPT 5m = 3 SPT 6m = 7 SPT 7m = 7
		DM-M-BH13	SPTs	0 to 1.7m: Light grey, loose, moist, silty fine SAND with shell fragments. 1.7 to 5.7m: Light brown to grey, medim dense, wet, medium and fine grained SAND with occasional shell fragments. 5.7 to 11.2m: Light grey, dense, wet, fine grained SAND. Below 6.7m very dense, and slighty browner in colour.		 SPT 2.7m = 18 SPT 3.7m = 17 SPT 4.7m = 20 SPT 5.7m = 38 SPT 6.7m = 35/150mm SPT 7.7m = 32/150mm SPT 8.7m = 62 SPT 9.7m = 53 SPT 10.7m = 49
		DM-M-BH14	SPTs	0 to 1.5m: Light yellowish brown, medium dense, moist, fine to medium SAND. 1.5 to 10.5m: Light grey dense to medium dense, wet silty SAND.		SPT 1m = 14 SPT 2m = 39 SPT 3m = 19 SPT 4m = 40 SPT 5m = 55 SPT 6m = 27 SPT 7 = 23 SPT 8m = 31 SPT 9m = 33 SPT 10m = 17
	Container Terminal	DM-M-BH15	SPTs	0 to 2m: Light yellowish brown, medium dense, slighly moist, fine grained SILT. 2 to 10m: Light grey, medium dense to dense, moist fine to medium SAND, with shell fragments. 10 to 10.5m: Dark grey to black, medium dense, clayey fine grained SAND, with shell fragments.		SPT 1m = 23 SPT 2m = 19 SPT 3m = 17 SPT 4m = 40 SPT 5m = 31 SPT 6m = 21 SPT 7 = 22 SPT 8m = 42 SPT 9m = 39 SPT 10m = 16

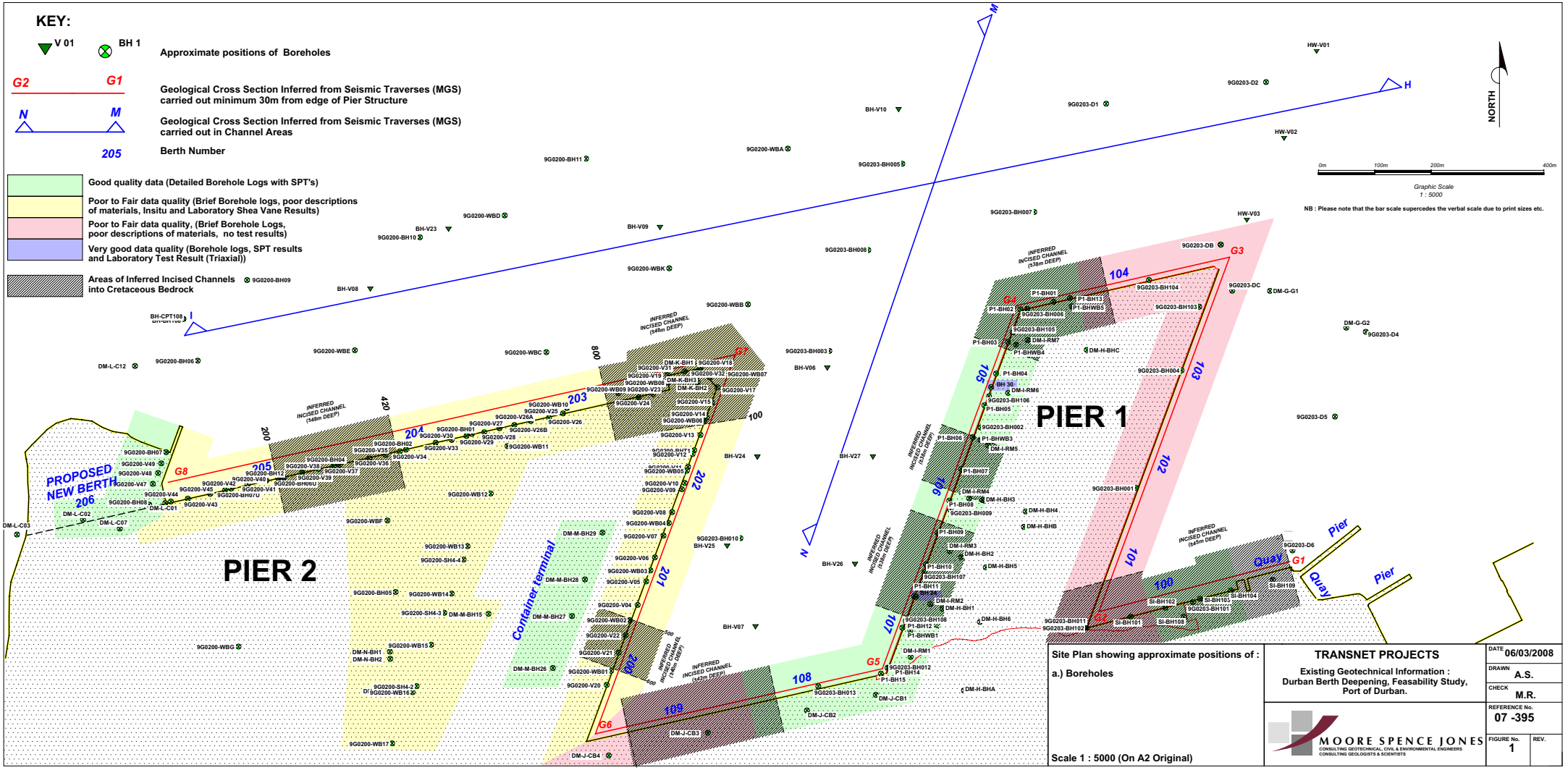
Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	Container Terminal (Inland of Berth 200/201)	DM-M-BH25	SPTs	0 to 2.5m: Light brown, medium dense, moist fine to medium SAND, with shell fragments. 2.5 to 5.5m: Grey, medium dense, wet fine graind SAND. 5.5 to 10.5m: Light grey, dense to very dense, wet, fine to medium SAND, with occasional shell fragments. 10.5 to 13.5m: Light grey, loose, wet, fine to medium SAND with occasional shells 13.5 to 16.5m: Dark grey, stiff, very moist, silty CLAY interbedded with thin beds of reddish brown fine SAND. 16.5 to 20m: Dark grey, stiff, very moist, silty CLAY, with thin layers of reddish brown fine SAND. 20 to 23m: yellowish brown, very dense, wet, fine to medium SAND.		SPT 1m = 24 SPT 2m = 22 SPT 3m = 26 SPT 4m = 25 SPT 5m = 35 SPT 6m = 34 SPT 7 = 43 SPT 8m = 30 SPT 9m = 55 SPT 10m = 56 SPT 12m = 5 SPT 13m = 9 SPT 15m = 14 SPT 16m = 22 SPT 18m = 12 SPT 19m = 13 SPT 21m = 51 SPT 22m = 30 SPT 23m = 33
		DM-M-BH26	SPTs	0 to 1.5m: Dark brown, loose, wet, fine to medium SAND, with shell fragments. 1.5 to 2.5m: Dark grey, medium dense, wet, fine clayey SAND with plant roots and shells. 2.5 to 3.5m: Grey, medium dense, wet, fine to medium grained shelly silty SAND. 3.5 to 7.5m: Light grey, loose, wet, fine grained SAND. 7.5 to 10.5m: Grey, medium dense, wet, fine to medium SAND with occasional shell fragments. 10.5 to 13.5m: Yellowish brown, dense, wet, fine silty SAND. 13.5 to 21m: Off white mottled yellow, medium dense, wet, fine grained clayey SAND. 21 to 23.5m: Yellowish brown, dense, wet, fine silty SAND. 23.5 to 25.5m: Off white, very stiff wet, plastic sandy CLAY, with lenses of medium grained SAND. 25.5 to 30m: Pale yellowish brown, dense to very dense, wet, medium to coarse SAND with layers of off white firm CLAY. 30 to 34.5m: dark grey, very stiff, moist, clayey SILT. Residual Cretaceous. 34.5 to 37m: Dark grey, very stiff, moist, clayey SILT with pebbles of calcareous sandstone. Residual Cretaceous. 37 to 37.5m: Pebbles of calcareous sandstone < 30mm in size. 37.5 to 39.10m: Light grey, soft rock, moist intact siltstone. Cretaceous.		SPT 1m = 6 SPT 2m = 19 SPT 3m = 22 SPT 4m = 51 SPT 5m = 49 SPT 6m = 45 SPT 7m = 38 SPT 8m = 34 SPT 9m = 11 SPT 10m = 56 SPT 12m = 30 SPT 13m = 43 SPT 15m = 7 SPT 16m = 39 SPT 18m = 21 SPT 19m = 11 SPT 21m = 25 SPT 22m = 39 SPT 23m = 31 SPT 24m = 31 SPT 25m = 30 SPT 27m = 36 SPT 28m = 53 SPT 30m = 58 SPT 31m = 23 SPT 33m = 30 SPT 34m = 21 SPT 36m = 36 SPT 37m = 38 RQD 39m = 87%
	Container Terminal	DM-M-BH27	SPTs	0 to 9.5m: Light brownish grey, medium dense to dense, wet, fine to medium grained SAND with minor shell fragments. Shell fragments decrease with depth, absent below 3m. 9.5 to 10.5m: reddish brown, medium dense, wet, silty fine SAND. 10.5 to 13.5m: Light brown firm, very moist, slightly sandy palstic CLAY. 13.5 to 15m: Dark brown, stiff, very moist, plastic CLAY. 15 to 16.5m: Light brown, dense, wet, fine grained clayey SAND. 16.5 to 18m: Yellow, medium dense, wet, clayey, fine grained SAND. 18 to 21m: Dark brown, loose, wet, clayey, fine SAND. 21 to 23.5m: Off white, dense, wet, silty, fine grained SAND.		SPT 1m = 17 SPT 2m = 16 SPT 3m = 16 SPT 4m = 40 SPT 5m = 19 SPT 6m = 22 SPT 7m = 23 SPT 8m = 18 SPT 9m = 13 SPT 10m = 16 SPT 12m = 9 SPT 13m = 12 SPT 15m = 13 SPT 16m = 45 SPT 18m = 23 SPT 19m = 8 SPT 21m = 14 SPT 22m = 29 SPT 23m = 54

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	**Container Terminal (Inland of Berth 200/201)**	**DM-M-BH28**	**SPTs**	0 to 12m: Light brown to grey, medium dense to dense, wet, fine to medium grained silty SAND, with occasional shells. 50mm clay layer at 3m depth. Shells absent from below 2.5m. 12 to 18m: Yellowish brown to grey, medium dense, wet, fine grained clayey SAND. 18 to 21m: Off white, medium dense to dense, wet, fine grained silty SAND. 21 to 24m: Yellowish brown, very dense, wet, fine to medium grained SAND.		SPT 1m = 9 SPT 2m = 13 SPT 3m = 29 SPT 4m = 19 SPT 5m = 19 SPT 6m = 17 SPT 7m = 43 SPT 8m = 21 SPT 9m = 20 SPT 10m = 21 SPT 12m = 6 SPT 13m = 25 SPT 15m = 26 SPT 16m = 28 SPT 18m = 15 SPT 19m = 24 SPT 21m = 42 SPT 22m = 69 SPT 23m = 72
		DM-M-BH29	**SPTs**	0 to 3.5m: Grey, loose, wet, fine to medium grained silty SAND. 3.5 to 6.5m: Dark grey, medium dense, wet, fine to medium grained silty SAND with some thin clay laminae. 6.5 to 8.5m: Light grey, dense, wet, medium to fine grained SAND with occasional shell fragments. 8.5 to 13.5m: Yellowish brown, loose to medium dense, wet, fine grained silty SAND. 13.5 to 15m: Light grey, firm, very moist, silty plastic CLAY. 15 to 16.5m: Pale yellow, dense, wet, fine grained silty SAND. 16.5 to 19.5m: Ligth brownish grey, medium dense, wet, fine grained clayey SAND. 19.5 to 22.5m: Off white, medium dense, wet, fine grained silty SAND. 22.5 to 25.5m: Pale pink to orange brown, very dense, wet, fine grained silty SAND. 25.5 to 30.5m: Offwhite, dense, wet, fine grained silty SAND. 30.5 to 34.5m: Black, very stiff, moist SILT. 34 to 36.5m: Dark grey, very soft rock, intact SILTSTONE. Cretaceous. Layer of calcareous Sandstone pebbles (< 50mm) at 36m		SPT 1m = 7 SPT 2m = 9 SPT 3m = 10 SPT 4m = 14 SPT 5m = 18 SPT 6m = 22 SPT 7m = 35 SPT 8m = 38 SPT 9m = 20 SPT 10m = 9 SPT 12m = 30 SPT 13m = 30 SPT 15m = 7 SPT 16m = 33 SPT 18m = 26 SPT 19m = 27 SPT 21m = 22 SPT 22m = 22 SPT 24m = 58 SPT 25m = 65 SPT 27m = 32 SPT 28m = 37 SPT 30m = 46 SPT 31m = 27 SPT 33m = 34 RQD 34m = 78% RQD 35m = 100% RQD 36m = 100%
		DM-M-BH41	**SPTs**	0 to 3m: Brown and light grey, medium dense, moist becoming wet, fine to medium clean SAND, with occasional thin dark grey silt bands. Hydraulically place sand fill from the ground level to + - 3m. 3 to 10m: Grey to very dark grey, medium dense becoming very dense in places, wet, fine to medium grained SAND. Slighty silty in places Abundant shell fragments from 3 to 4 m, and 7 to 8m. Upper recent estuarine sands.		SPT 1m = 31 SPT 2m = 19 SPT 3m = 20 SPT 4m = 44 SPT 5m = 47 SPT 6m = 51 SPT 7m = 53 SPT 8m = 61 SPT 9m = 26 SPT 10m = 28
		9G0200-SH4-1		3.05 to 12.19m: SAND. 12.19 to 13.70m: CLAY. 13.70 to 17.10m: Final dredged level. 17.10 to 18.58m: CLAY. 18.58 to 20.42m: SILTY SAND. 20.42 to 27.43m: SAND.		
		9G0200-SH4-2		0.00 to 13.11m: SAND. 13.11 to 14.33m: CLAYEY SAND. 13.41 to 17.37: Final dredged level. 14.33 to 15.24m: CLAY. 15.24 to 17.37m: SILTY SAND. 17.37 to 21.80m: CLAY. 21.80 to 24.53m: SILTY SAND.		
	Container Terminal					

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	Container Terminal (Inland of Berth 200/201) Container Terminal	DM-N-BH1	SPTs	0 to 0.46m: Unreinforced concrete. 0.46 to 1m: Crusher base, coarse and gravel. Fill. 1 to 2m: Light brown, dense, fine SAND. 2 to 5m: Grey, medium dense to dense, fine to medium SAND with frequent shell fragments 5 to 6.5m: Brown, dense, fine SAND with occasional shell fragments. 6.5 to 8m: Grey, medium dense to dense, fine grained slightly silty SAND with frquent shell fragments. 8 to 9.95m: Grey, very dense, fine to medium graianed SAND with abundant shell fragments.		SPT 1m = 34 SPT 2m = 34 SPT 3m = 30 SPT 4m = 34 SPT 5m = 43 SPT 7m = 28 SPT 8m = 45 SPT 9.9m = 77
		DM-N-BH2	SPTs	0 to 0.1m: Grass and topsoil. 0.1 to 0.98: Crusher run material. Fill. 0.98 to 4m: Light brown, medium dense, fine grained SAND with occasional organic material. 4 to 5m: Grey, dense, fine to medium SAND, with abundant shell fragments. 5 to 9.95m: Grey, dense to very dense, fine grained SAND with occassional shell fragments, and abundant shell fragments from 9.5m.		SPT 2m = 26 SPT 2.5m = 26 SPT 3.5m = 24 SPT 4.5m = 32 SPT 5.5m = 42 SPT 7m = 26 SPT 8.5m = 50 SPT 10m = 63
		P2/WB/12		0.00 to 2.34m: Grey muddy SAND. 2.34 to 8.83m: Yellow grey SAND. 8.83 to 9.44m: Grey coarse SAND. 9.44 to 15.84m: Grey CLAYEY SAND. 15.84 to 16.45m: Yellow CLAY. 16.45 to 18.59m: Pink-grey SILTY SAND. 18.59 to 19.50m: Yellow-grey CLAYEY SAND.		
		P2/WB/13		0.00 to 14.93m: Grey SAND. 14.93 to 16.45m: Grey SILTY SAND. 16.45 to 18.59m: Yellow brown CLAY. 18.59 to 21.94m: Yellow-grey red SILTY SAND.		
		P2/WB/14		0.00 to 10.66m: Grey SAND. 10.66 to 21.64m: Yellow-grey SILTY SAND. 21.64 to 22.25m: Dark grey CLAYEY SAND. 22.25 to 22.86m: Dark grey CLAY.		
		P2/WB/15		0.00 to 1.52m: Light grey SAND. 1.52 to 7.62m: Dark grey SILTY SAND. 7.62 to 15.54m: Grey to dark grey SAND. 15.54 to 16.15m: CLAYEY SAND. 16.15 to 18.59m: Brown-grey CLAY. 18.59 to 22.55m: Yellow-grey SILTY SAND.		
		P2/WB/16		0.00 to 3.65m: Light grey to grey SAND. 3.65 to 18.59m: Dark grey to dark blue-grey SILTY SAND. 18.59 to 21.94m: Dark blue-grey CLAY.		
		P2/WB/17		0.00 to 11.58m: Grey SAND. 11.58 to 14.93m: Dark grey SILTY SAND. 14.93 to 15.54m: Dark grey CLAY. 15.54 to 19.81m: Dark grey SILTY SAND. 19.81 to 21.94m: Dark brown CLAY. 21.94 to 22.55m: Dark grey CLAYEY SAND.		
		P2/WB/18		0.00 to 13.71m: Light grey SAND. 13.71 to 14.93m: Dark grey SILTY SAND. 14.93 to 15.34m: SAND. 15.34 to 17.98m: Dark blue SANDY CLAY. 17.98 to 19.81m: Dark blue grey SILTY SAND. 19.81 to 22.86m: CLAY.		
		9G0200-WBF		0 to 1.5m: No recovery. 1.5 to 4.8m: Sand silt. 4.8 to 6m: Sand, some silt. 6 to 12.3m: Sand. 12.3m to 13.8m: Sand, some silt and clay.		
		9G0200-WBG	Datum +1'4"	0 to 1.2m: Sand, silt. 1.2 to 4.5m: Sand, some silt. 4.5 to 6m: Sand. 6 to 9.24m: Sand, silt. 9.24 to 9.09m: Sand, silt clay. 9.09 to 13m: Sandy clay. 13 to 13.81m: Clay.		
		9G0200-WBH	Datum +4' 0"	0 to 1.5m: Sand, silt. 1.5 to 2.6m: Sand, some silt. 2.6 to 8.7m: Sand. 8.7 to 12m: Sand, some silt. 12 to 14.7m: Sandy clay. 14.7 to 15m: Soft clay.		

Location	Berth	Borehole/Probe Information	Borehole type	Summary of Geology	Tests	
					Laboratory	Insitu
Pier 2	**Container Terminal (Inland of Berth 200/201) Container Terminal**	**GO200-BH03**		0.00 to 14.33m: Grey medium SANd with shells. 14.33 to 17.06m: grey medium fine SAND with shells and a slight SILT content. 17.06 to 19.50m: Black stiff SANDY CLAY with shells. 19.50 to 21.34m: Grey firm SANDY CLAY. 21.34 to 29.84m: Grey soft CLAY with shells.		
		GO200-BH05		0.00 to 16.46m: Grey medium SAND with shells. 16.46 to 29.56m: Grey black medium stiff CLAY with shells.		

FIGURES


KEY:
V 01
BH 1
Approximate positions of Boreholes
G2
G1
Geological Cross Section Inferred from Seismic Traverses (MGS) carried out minimum 30m from edge of Pier Structure
N
M
Geological Cross Section Inferred from Seismic Traverses (MGS) carried out in Channel Areas
205
Berth Number
Good quality data (Detailed Borehole Logs with SPT's)
Poor to Fair data quality (Brief Borehole logs, poor descriptions of materials, Insitu and Laboratory Shea Vane Results)
Poor to Fair data quality, (Brief Borehole Logs, poor descriptions of materials, no test results)
Very good data quality (Borehole logs, SPT results and Laboratory Test Result (Triaxial))
Areas of Inferred Incised Channels into Cretaceous Bedrock
9G0200-BH09
PIER 1
PIER 2
PROPOSED NEW BERTH
Container terminal
INFERRED INCISED CHANNEL (±48m DEEP)
INFERRED INCISED CHANNEL (±45m DEEP)
Pier
Quay
NORTH
0m 100m 200m 400m
Graphic Scale 1 : 5000
NB : Please note that the bar scale supercedes the verbal scale due to print sizes etc.
Site Plan showing approximate positions of :
a.) Boreholes
Scale 1 : 5000 (On A2 Original)
TRANSNET PROJECTS
Existing Geotechnical Information : Durban Berth Deepening, Feasability Study, Port of Durban.
DATE 06/03/2008
DRAWN A.S.
CHECK M.R.
REFERENCE No. 07 -395
FIGURE No. 1
REV.
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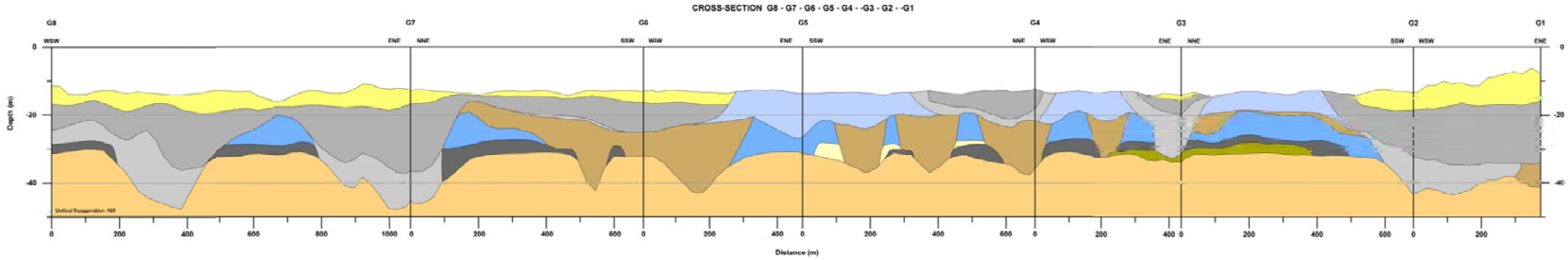
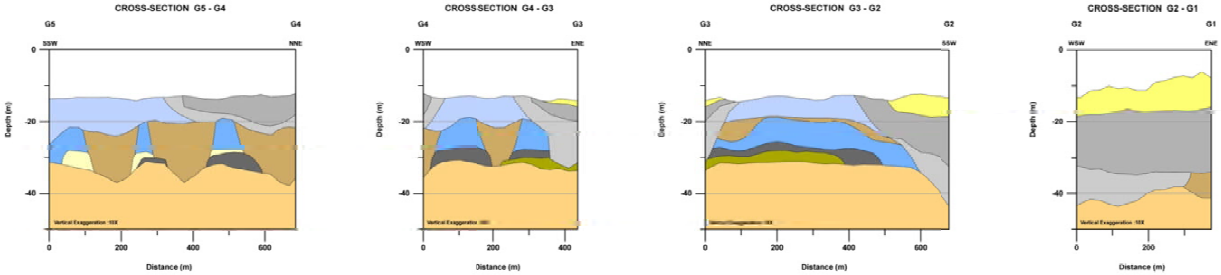
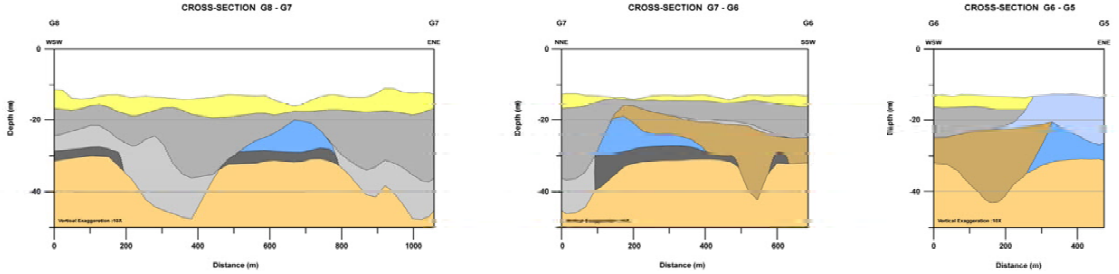
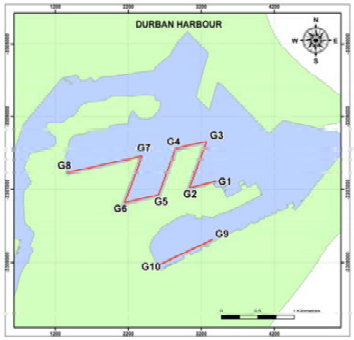
07 - 395 EXISTING BOREHOLE DATA.drg

INTERPRETED SEISMIC SECTIONS - PIER 1, 2 & ISLAND VIEW
All Elevations Reduced to Chart Datum (Port)



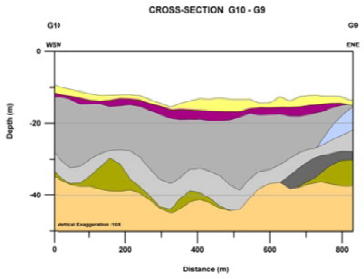






Geological Legend

- Holocene Lagoonal Sediments
- Late Pleistocene Aeolian Sediments
- Late Pleistocene Calcarenite
- Late Pleistocene Channel Clays (Unit 2)
- Late Pleistocene Channel Sands (Unit 2)
- Late Pleistocene Channel Fill Sediments (Unit 1)
- Late Pleistocene Lagoonal Sediments
- Pleistocene Basal Sand Unit
- Pleistocene Basal Clay Unit
- Pleistocene Basal Silt Unit
- Cretaceous



Plan showing Seismic Transverse Locations and Inferred Geological Cross-Sections

(On A3 Original)

TRANSNET PROJECTS

Existing Geotechnical Information: Durban Berth Deepening, Feasability Study, Port of Durban

DATE	May 2008
DRAWN	W.H.
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REFERENCE No.	07 - 395
FIGURE No.	2
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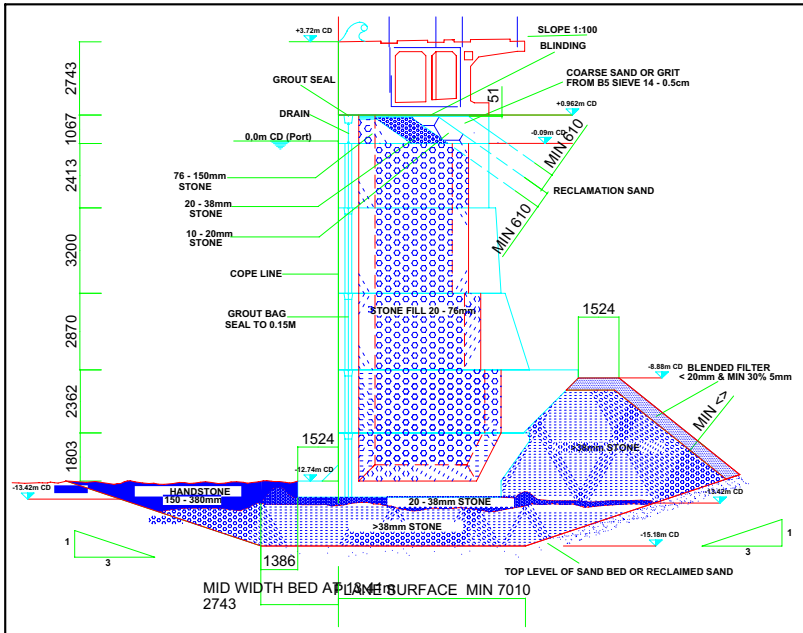
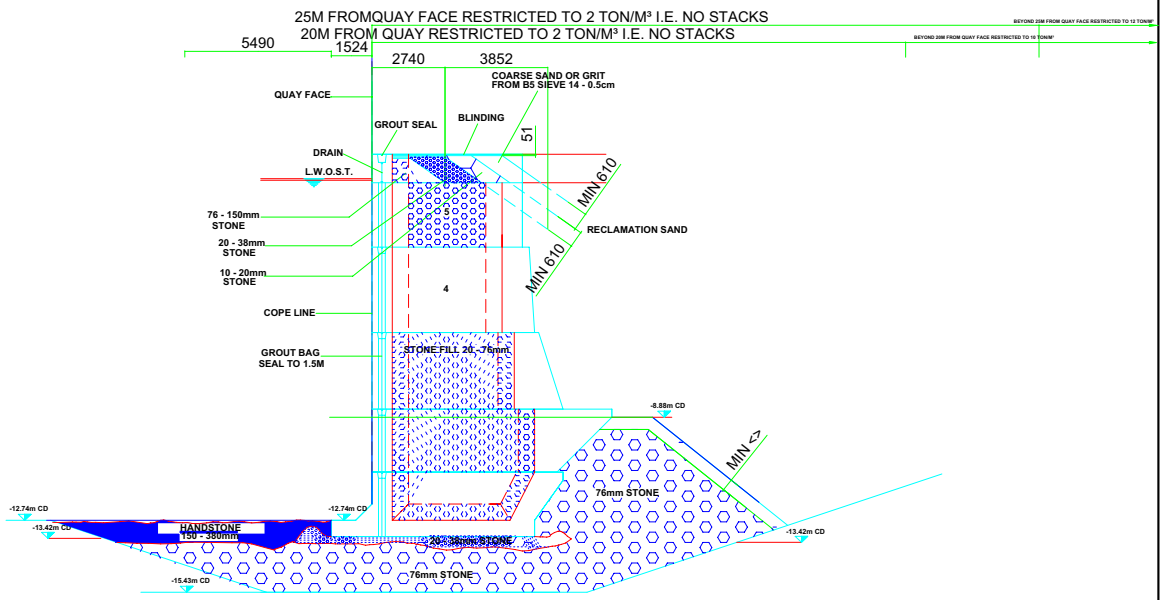
07-395 \ DRAWINGS \ 07-395 FIG2 SEISMIC SECTIONS.DRG



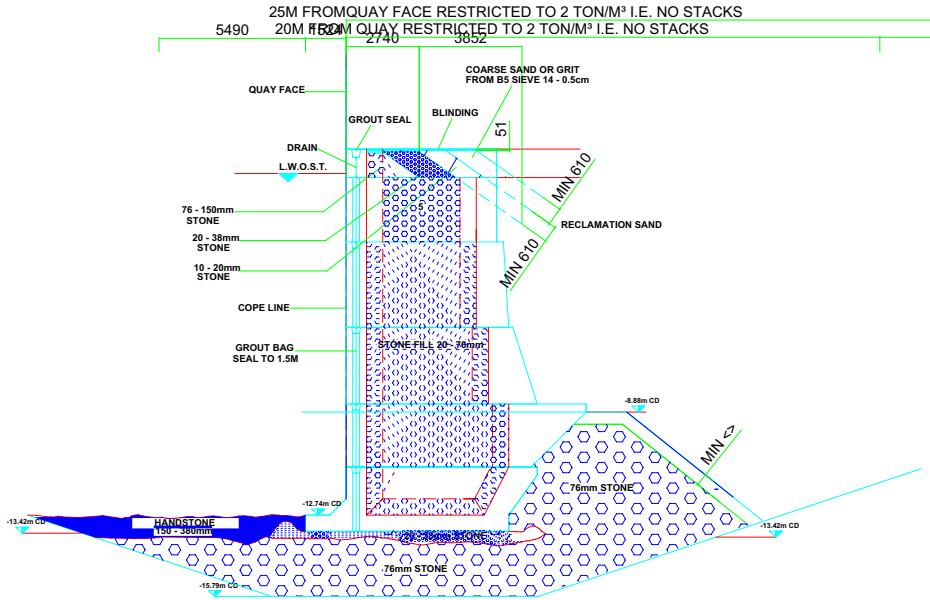
SECTION B - B

SECTION WHERE BED LEVEL AT 15.24m



SECTION B1

SECTION WHERE BED LEVEL AT 15.50m



SECTION B2

SECTION WHERE BED LEVEL AT 15.85m

0m 5m 10m 20m

Graphic Scale
1 : 200

NB : Please note that the bar scale supersedes the verbal scale due to print sizes etc.

Plan showing Asbuilt Details of Pier 1

Scale 1 : 200 (On A3 Original)

TRANSNET PROJECTS

Existing Geotechnical Information: Durban Berth Deepening, Feasability Study, Port of Durban

DATE	May 2008
DRAWN	W.H.
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REFERENCE No.	07 - 395
FIGURE No.	3
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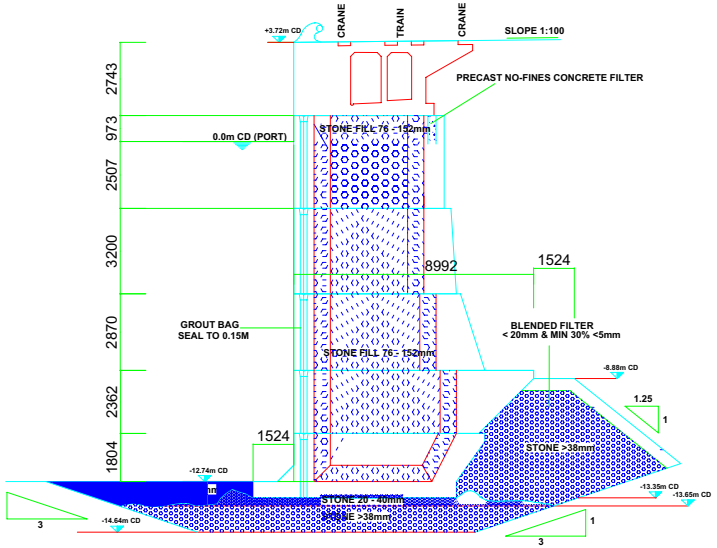
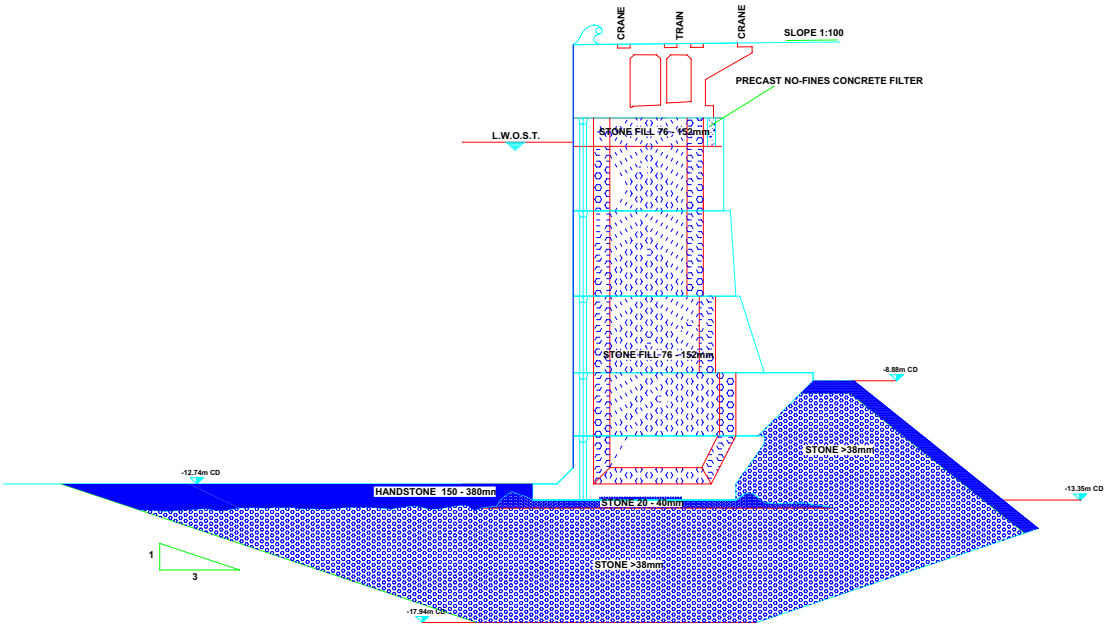
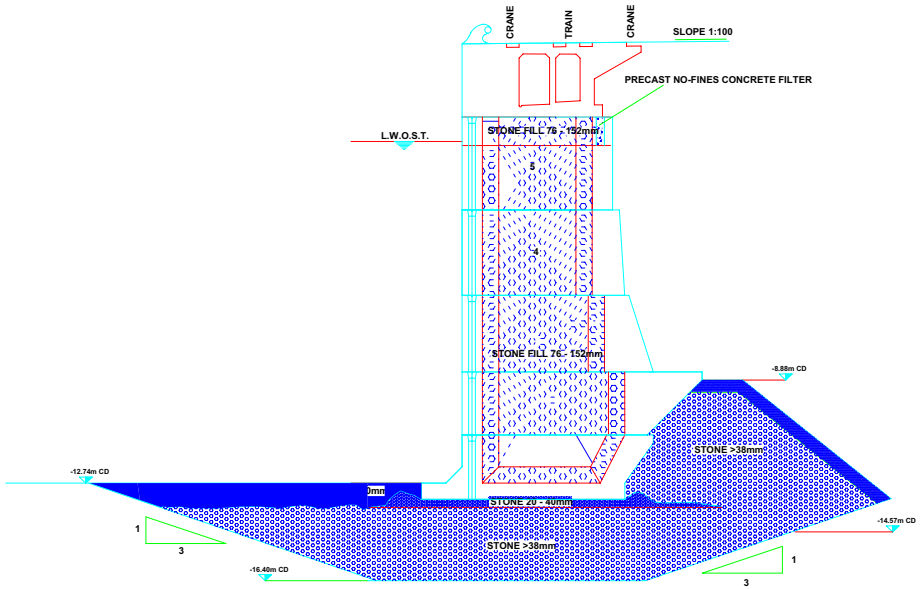
07-395 \ DRAWINGS \ 07-395 FIG 3 PIER1.DRG



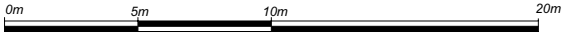
SECTION A



SECTION A1



SECTION A2



Graphic Scale
1 : 200

NB : Please note that the bar scale supersedes the verbal scale due to print sizes etc.

Plan showing Asbuilt Details of Pier 2

Scale 1 : 200 (On A3 Original)

TRANSNET PROJECTS

Existing Geotechnical Information: Durban Berth Deepening, Feasability Study, Port of Durban

DATE	May 2008
DRAWN	W.H.
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REFERENCE No.	07 - 395
FIGURE No.	4
REV.	

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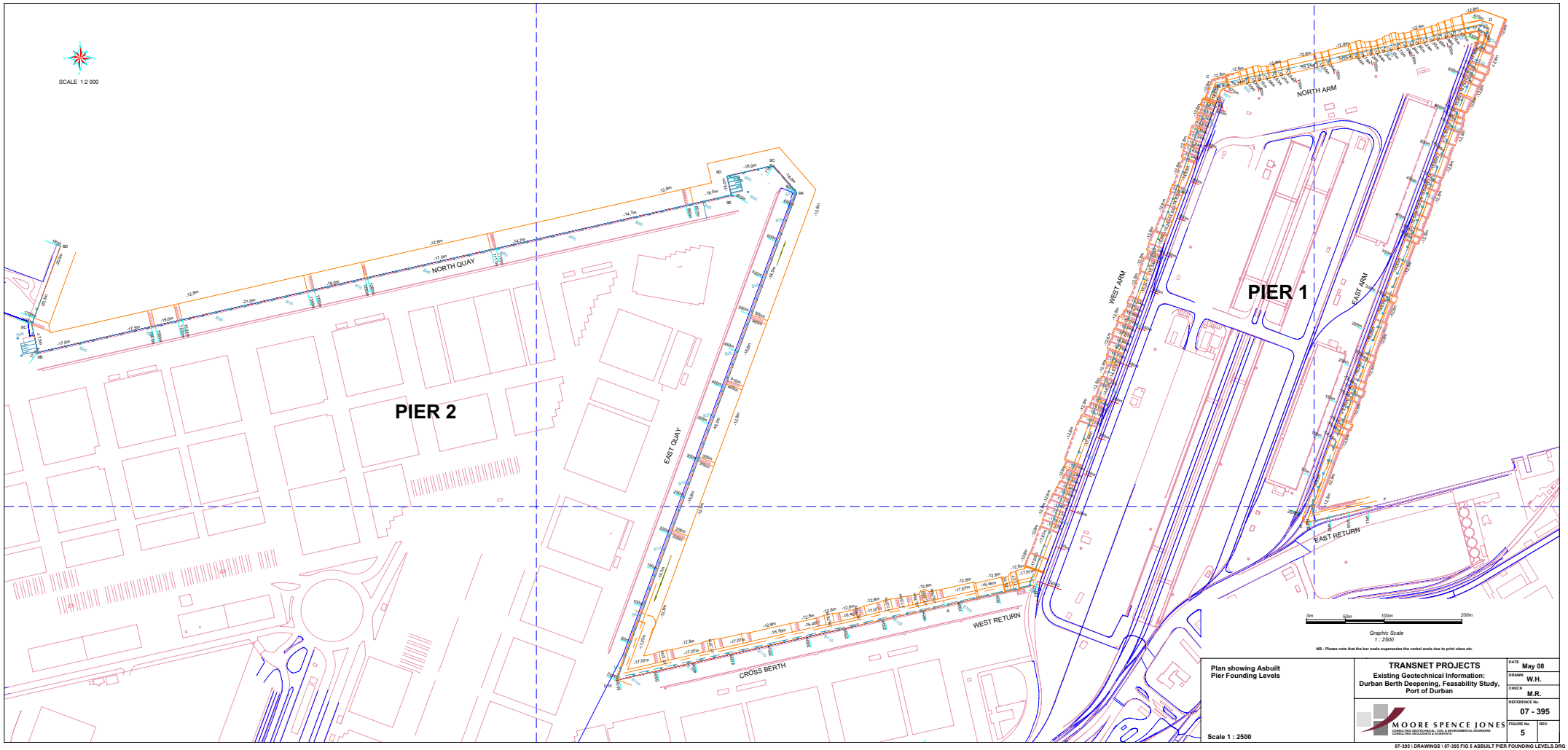
07-375 \ DRAWINGS \ 07-395 FIG 4 PIER2.DRG



NB : Please note that the bar scale supersedes the verbal scale due to print sizes etc.

Plan showing Asbuilt Pier Founding Levels

Scale 1 : 2500

TRANSNET PROJECTS

Existing Geotechnical Information: Durban Berth Deepening, Feasability Study, Port of Durban

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DATE	May 08
DRAWN	W.H.
CHECK	M.R.
REFERENCE No.	07 - 395
FIGURE No.	5
REV.	

07-395 \ DRAWINGS \ 07-395 FIG 5 ASBUILT PIER FOUNDING LEVELS.DRG

5.5: A Geophysical and Sediment Sampling Survey of Two Proposed Sand Winning Areas in the Durban Bight

(CGS RPT No. 2001-0158; 2001)

Council for Geoscience

A GEOPHYSICAL AND SEDIMENT SAMPLING SURVEY OF TWO PROPOSED SAND WINNING AREAS IN THE DURBAN BIGHT

Mr W R Miller (MSc, Pr.Sci.Nat.)
Mr R Leuci (Bsc. Hons.)

Council for Geoscience
Marine Geoscience Unit
Durban

REPORT NO. 2001-0158

CONTENTS

1. INTRODUCTION

The Marine Geoscience Unit was contracted by Portnet to undertake a marine geophysical investigation of two areas identified as potential sites for sand winning. Rather than conducting a new survey, geophysical data from a recent survey in the Durban Bight undertaken in April and May of 1999 was used for the compilation of this report. A standard suite of geophysical instruments including a digital echo-sounder, 3.5 kHz sub-bottom profiler and a side-scan sonar were used for data collection during the survey. A grab sampling and sediment coring programme was conducted in May 2001 to investigate the nature of the sediments and to assess their suitability as backfill.

The aims of the geophysical investigation were to:

- Produce a bathymetric chart of the area encompassing both proposed borrow areas reduced to Mean Sea Level (MSL).
- Produce a side-scan sonar mosaic of the proposed borrow sites to show the nature of the seafloor.
- Assess unconsolidated sediment thickness in the vicinity of the proposed borrow sites.
- Collect grab samples to assess sediment distribution patterns in the area.
- Collect sediment cores at selected sites within the proposed borrow sites to assess sediment variation with depth.
- Make recommendations regarding the suitability of each of the potential borrow areas for sand winning.
- Delineate the most suitable areas for sand winning in each of the borrow sites.

2 GEOPHYSICAL INSTRUMENTATION

2.1 DGPS

A Fugro StarFix DGPS receiver was used for navigation throughout the geophysical survey. This is a 12 channel Trimble system with an update rate of 10 Hz and sub-metre precision. DGPS corrections are RTCM SC-1 04 Ver. 2.0 format, virtual base station solutions with an RTCM update rate of typically less than 5 seconds.

2.2 Odom Echotrac Digital Echosounder

An Odom Echotrac digital echosounder (Model 3100) with a narrow beam (9°) 210kHz transducer was used to collect bathymetric data of the seafloor. This instrument is capable of recording up to 20 data points per second in digital format whilst undertaking shallow water surveys. An event-annotated paper analogue profile is also produced as a backup to the digital data.

2.3 Klein System 2000 Side-scan Sonar

A Klein System 2000 side-scan sonar and model 2260 digital tow-fish were used to collect the sonographs. The Klein System 2000 is a dual frequency (100/500 kHz) side-scan sonar that is capable of collecting high resolution image corrected acoustic data. The Klein System 2000 incorporates a 7 Gigabyte 8 channel Exabyte tape drive which is used for digital data storage, and a 300 dpi, 256 grey shade thermal printer.

2.4 GeoPulse Sub-bottom Profiler

A GeoAcoustics GeoPulse sub-bottom profiling system was used to collect sub-bottom profiles during the geophysical survey. The sub-bottom profiling system consisted of a Model 5430A GeoPulse transmitter, a Model 5210 GeoPulse seismic receiver and an over-the-side mounted transducer array. The Model 5430A transmitter has a maximum output power of 10 kW and a operator selectable operating frequency range of 2 - 15 kHz. The amplifier has a signal to noise ratio of 20 dB at 100 dB gain, 1 kHz centre frequency and 1 kHz bandwidth. The GeoPulse receiver has an operating bandwidth of 50 Hz to 10 kHz and a user selectable sampling frequency of 4 to 24 kHz.

3. METHODOLOGY

3.1 Geophysical Survey

Geophysical data were collected along predetermined coast parallel survey lines located 150 m apart. DGPS coordinates were downloaded in real-time, onto a 486 survey notebook computer via an RS 232 serial cable such that positioning data, survey tracklines and other navigational data were continuously displayed on the computer screen using the *Navlog* software package. Bathymetric data were logged at 1 or 2 second intervals and downloaded into a spreadsheet along with navigation data.

The Klein System 2000 was used to simultaneously acquire 4 channels of digital side-scan sonar data and one auxiliary channel of sub-bottom profiling data and to store the digital data on Exabyte tape. A scan range of 100 metres was used to collect the side-scan sonographs, thereby facilitating a 50 metre overlap of adjacent swaths. The GeoPulse receiver was used to amplify and filter the seismic reflection data while the Klein System 2000 was used to digitally capture the seismic reflection data and produce event annotated analogue seismic profiles.

3.1 Grab Sampling

Twenty eight grab samples were collected using a *Shipek* grab, to ground-truth the side-scan sonar records obtained during April and May 1999, and also to investigate the nature of the sediments on the seafloor. The *Shipek* grab weighs ± 40 kg and takes a 0.15 m^3 sediment sample. Positioning of the grab samples was done with DGPS.

3.2 Core Sampling

Five cores measuring between 4.29 and 4.57 m were collected from the proposed borrow areas (3 from Area 1 and 2 from Area 2) to assess sediment variability with depth. The coring sites were selected by studying the sub-bottom profiling records so as to get representative sediments from both areas.

The extent of the proposed borrow sites along with grab sample and core locations are illustrated in Figure 1.