GEOTECHNICAL REPORT

APPENDIX A
TRIAL PIT LOGS

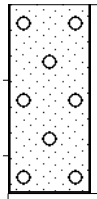
APPENDIX A: TRIAL PIT LOGS

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 01
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, brown,loose, intact, slightly GRAVELLY fine SAND with roots: Colluvium.

0.25

NOTES

1) Excavated by hand auger

2) Refusal at 0.25m

3) No groundwater seepage

4) Hardpan ferricrete at surface in area

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d401'48.4"S
Y-COORD : 30d00'08.4"E

HOLE No: TP 01

D06C D48

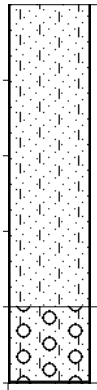
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 02
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist to slightly moist, pale orange brown, loose, intact, slightly gravelly SILTY fine SAND: Colluvium.

0.40 Moist to slightly moist, pale orange brown, loose, intact, slightly gravelly SILTY fine SAND containing dark brown ferricrete GRAVEL nodules: Colluvium.
Transitional to honeycomb ferricrete at base.

0.50

NOTES

1) Excavated by hand auger

2) Refusal at 0.50 m

3) No groundwater seepage

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'48.7"S
Y-COORD : 30d00'04.8"E

HOLE No: TP 02

D06C D48

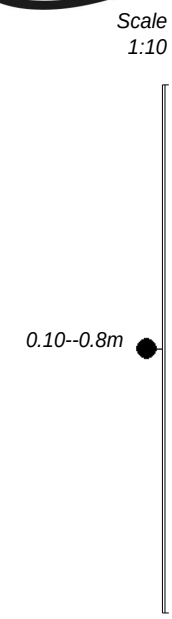
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 03
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, brown,loose, intact, slightly GRAVELLY fine SAND with roots: Colluvium.

0.10

Moist to slightly moist, pale orange brown, loose, intact, slightly gravelly SILTY fine SAND: Colluvium.

0.30

As above with abundant dark brown ferricrete gravel nodules: Colluvium. Transition to honeycomb ferricrete at base of hole.

0.80

NOTES

1) Excavated by hand auger

2) Refusal at 0.80m

3) No groundwater seepage

4) Sample taken between 0.10--0.8m

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'48.5"S
Y-COORD : 30d00'01.3"E

HOLE No: TP 03

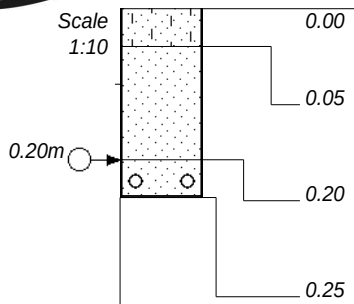
D06C D48

dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 04
Sheet 1 of 1

JOB NUMBER: 2812



Moist, grey brown, loose, intact, SILTY SAND with abundant organic matter: Colluvium.

Moist to wet, greyish brown with pale orange mottles, loose, intact slightly silty SAND: Colluvium.

Wet, greyish brown with pale orange mottles, loose, intact slightly silty GRAVELLY SAND: Colluvium.

NOTES

1) Excavated by hand auger

2) Refusal at 0.25m

3) Ground water seepage below 0.20m

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'48.2"S
Y-COORD : 29d59'56.9"E

HOLE No: TP 04

D06C D48

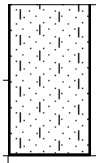
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 05
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, brown, loose, intact, slightly gravelly SILTY SAND: Colluvium.

0.20

NOTES

1) Excavated by hand auger

2) Refusal at 0.20m on cobbles

3) No ground water seepage

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'44.9"S
Y-COORD : 29d59'56.4"E

HOLE No: TP 05

D06C D48

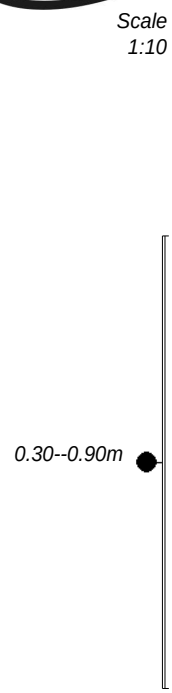
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 06
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Wet, dark grey brown, loose, intact, SILTY SAND with abundant organic matter: Alluvium

0.10

Moist, light grey brown mottled orange, very loose, intact, slightly silty SAND: Alluvium

0.30

Saturated, light grey to beige with depth becoming beige mottled light orange, loose, slightly silty SAND: Alluvium.
Cobbles and at base.

0.90

NOTES

1) Excavated by hand auger

2) Standing ground water at surface

3) Refusal at 0.90m on cobbles

4) Sample taken 0.30--0.90m

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'43.1"S
Y-COORD : 29d59'57.7"E

HOLE No: TP 06

D06C D48

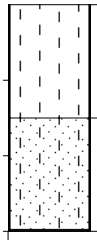
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 07
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, grey brown mottled orange, loose, intact, SILTY fine SAND: Colluvium.

0.15 Moist, pale orange, loose, intact, slightly clayey slightly gravelly SILTY SAND: Colluvium.

0.30

NOTES

1) Excavated by hand auger

2) No groundwater seepage

3) Refusal at 0.30m on gravel

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'44.7"S
Y-COORD : 29d59'59.9"E

HOLE No: TP 07

D06C D48

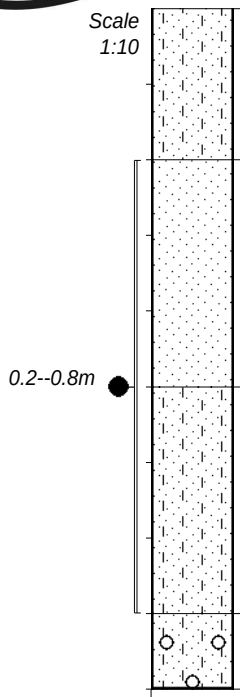
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 08
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Wet, dark grey brown, loose, intact, SILTY SAND with abundant organic matter: Alluvium.

0.20 Wet, light grey occasionally mottled orange, very loose, intact, slightly silty SAND: Alluvium.

0.2--0.8m

0.50 Wet, light grey to beige mottled pale orange, loose, intact, slightly clayey SILTY SAND: Alluvium.
Transitional to clayey sand with depth.

0.80 As above with sub rounded pebbles. Alluvium.

0.90

NOTES

1) Excavated by hand auger

2) Standing water at 0.10m BGL

3) No refusal.

4) Sample taken 0.2--0.8m

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'43.3"S
Y-COORD : 30d00'04.2"E

HOLE No: TP 08

D06C D48

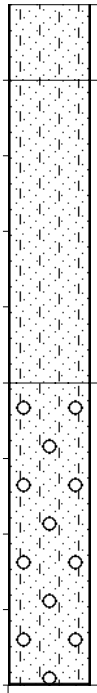
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 09
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Slightly moist, light brown,loose, intact SILTY fine SAND: Colluvium.

0.10 Moist, orange brown, loose, intact, slightly gravelly SILTY SAND: Colluvium.

0.50 As above with abundant ferricrete gravel: Colluvium.

0.90

NOTES

1) Excavated by hand auger

2) Refusal at 0.90m on gravel

3) No ground water seepage

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'50.8"S
Y-COORD : 29d59'59.2"E

HOLE No: TP 09

D06C D48

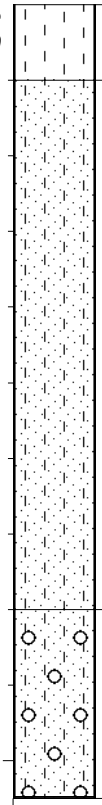
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 10
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00	Slightly moist, light brown,loose, intact SILTY fine SAND: Colluvium.
0.10	Moist to wet with depth, orange brown, loose, intact, slightly gravelly SILTY SAND: Colluvium.
0.80	Wet, orange brown, loose, intact, gravelly SILTY SAND: Colluvium./Abundant ferricrete gravel.
1.05	

NOTES

1) Excavated by hand auger

2) Refusal at 1.05 m on gravel

3) No ground water seepage but soil wet towards base.

CONTRACTOR :
MACHINE : Hand auger
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'51.2"S
Y-COORD : 30d00'03.8"E

HOLE No: TP 10

D06C D48

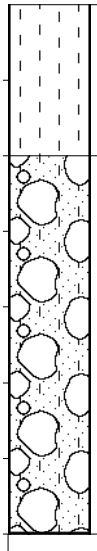
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 11
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00

Moist, light brown, loose, intact, SILTY fine SAND and roots: Colluvium (topsoil).

0.20 *0.20*

Moist, light brown blotched orange and black, loose to medium dense to dense, gravelly SILTY SAND containing sporadic honeycomb to hardpan ferricrete boulders: Colluvium (pedogenic).

0.70 *0.70*

NOTES

1) Refusal at 0.70 m on hardpan Ferricrete

2) No ground water seepage

3) Possibly weathered sandstone with depth.

4) Sample 3 x big bags taken at 0.20 - 0.70 m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'20.1"S
Y-COORD : 29d59'44.9"E

HOLE No: TP 11

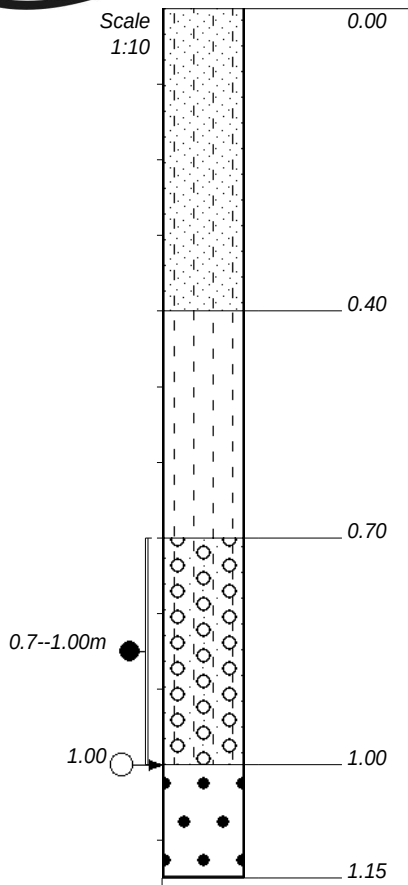
D06C D48

dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 12
Sheet 1 of 1

JOB NUMBER: 2812



0.00 — Moist, light brown, loose, intact, SILTY fine SAND and roots: Colluvium (topsoil).

0.40 — Moist to wet, pale orange brown, very loose, intact, SILTY SAND: Colluvium.

0.70 — Wet, pale orange to beige, loose, intact, SILTY SANDY fine GRAVEL and ferricrete nodules: Colluvium.

1.00 — Wet, orange mottled beige and black, dense, weakly cemented honeycomb to hardpan ferricrete: Pedogenic.

1.15

NOTES

1) Refusal at 1.15 m

2) Slight ground water seepage below 1.00 m

3) Sample taken between 0.7--1.00m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'21.9"S
Y-COORD : 29d59'48.0"E

HOLE No: TP 12

D06C D48

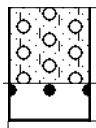
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 13
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00

Slightly moist, light grey brown, loose, intact, angular quartzite and sandstone GRAVEL in a SILTY SAND matrix: Colluvium.

0.10

Slightly moist, dark red brown mottled orange, weakly cemented to cemented honeycomb to hardpan Ferricrete: Pedogenic.

0.15

NOTES

1) Refusal at 0.15 m

2) No ground water seepage.

3) No sample taken

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'22.6"S
Y-COORD : 29d59'53.0"E

HOLE No: TP 13

D06C D48

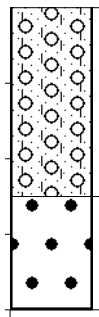
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 14
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, dark brown, loose, intact, SILTY fine SAND, containing quartzite and sandstone GRAVEL, cobbles and roots: Colluvium.

0.25 Moist, pale or mottled orange and black and blotched cream, dense to very dense, nodular ferricrete transitional to highly weathered ferrugised sandstone: Pedogenic (weathered sandstone).

0.40

NOTES

1) Refusal at 0.40 m

2) No ground water seepage

3) No sample taken

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'19.4"S
Y-COORD : 29d59'56.3"E

HOLE No: TP 14

D06C D48

dot.PLOT 5008 J&W

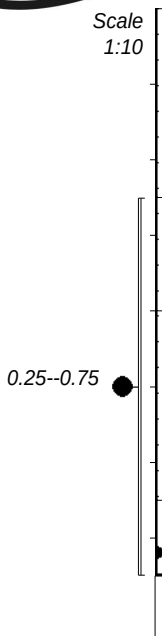
Jeffares & Green
CONSULTING ENGINEERS

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 15
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, brown, loose, intact, slightly gravelly SILTY fine SAND with roots: Colluvium (topsoil).

0.25 Moist, pale orange, very loose, intact, SILTY fine SAND: Colluvium.

0.40 Moist, pale or speckled dark orange, loose to medium dense, intact, SILTY fine SAND containing abundant gravel fragments and ferricrete nodular gravel: Colluvium.

0.65 Moist, dark reddish orange mottled light orange and speckled black, dense to very dense, cemented honeycomb to hardpan ferricrete: Pedogenic.

0.75

NOTES

1) Refusal at 0.75 m

2) No ground water seepage

3) Sample taken between 0.25--0.75 m (mixed)

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'20.4"S
Y-COORD : 29d59'50.8"E

HOLE No: TP 15

D06C D48

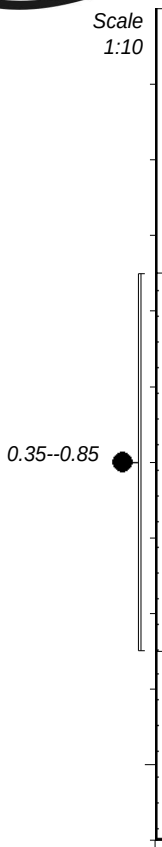
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 16
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, brown, loose, intact, slightly gravelly SILTY fine SAND with roots: Colluvium (topsoil).

0.35 Moist, pale orange, very loose, intact, SILTY fine SAND: Colluvium.

0.85 Moist, orange mottled beige, medium dense, intact, ferrugised silty SAND: Residual sandstone.

1.10

NOTES

1) No refusal but very slow advance at 1.10 m

2) No ground water seepage

3) Sample taken between 0.35--0.85 m (mixed)

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'16.9"S
Y-COORD : 29d59'47.7"E

HOLE No: TP 16

D06C D48

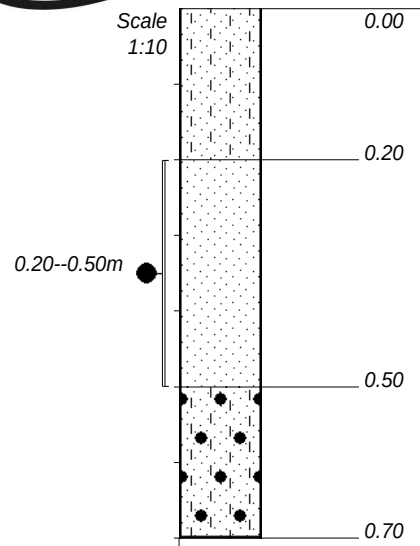
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 17
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00

Dry, light grey brown, loose, intact, SILTY fine SAND with roots: Colluvium.

0.20

Slightly moist, light grey brown to orange brown with depth, loose, intact, slightly gravelly SILTY SAND: Colluvium.

0.50

Slightly moist, orange mottled light grey, medium dense, weakly developed honeycomb ferricrete in a gravelly SILTY SAND matrix: Pedogenic.

0.70

NOTES

1) Refusal at 0.70 m

2) No ground water seepage

3) Sample taken between 0.20--0.50m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'14.3"S
Y-COORD : 29d59'49.2"E

HOLE No: TP 17

D06C D48

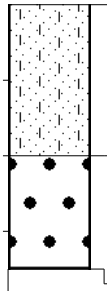
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 18
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00

Moist, dark brown, loose, intact, SILTY fine SAND with roots, containing quartzite and sandstone gravel with scattered cobbles and pebbles: Colluvium.

0.20

Moist, pale or mottled orange and black and blotched cream, dense to very dense nodular ferricrete transitional to highly weathered ferrugised Sandstone: Pedogenic (weathered sandstone).

0.35

NOTES

1) Refusal at 0.35 m

2) No ground water seepage

3) No sample taken

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'16.1"S
Y-COORD : 29d59'52.7"E

HOLE No: TP 18

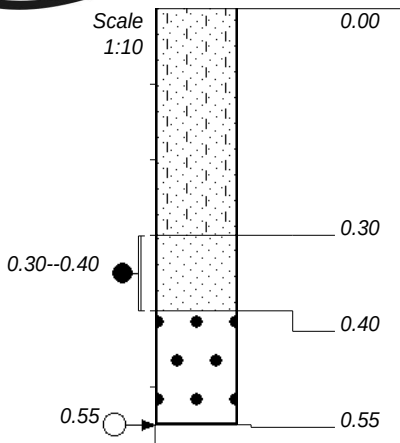
D06C D48

dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 19
Sheet 1 of 1

JOB NUMBER: 2812



Moist to wet, dark brown, very loose, intact, SILTY fine SAND with roots: Colluvium.

Wet, light grey brown mottled darker grey brown, very loose, intact, slightly silty SAND: Colluvium.

Wet, orange mottled dark orange and speckled black, very dense, weakly cemented honeycomb to hardpan ferricrete: Pedogenic.

NOTES

1) Refusal at 0.55 m

2) Slight ground water seepage at 0.55 m

3) Sample taken between 0.30--0.40 m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'19.0"S
Y-COORD : 29d59'49.2"E

HOLE No: TP 19

D06C D48

dot.PLOT 5008 J&W

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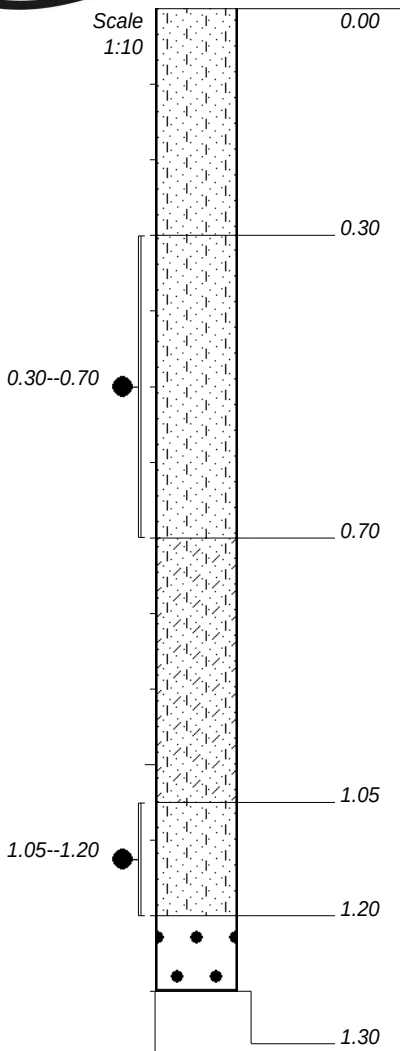
EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 20
Sheet 1 of 1

JOB NUMBER: 2812



0.00 – 0.30: Moist, light brown, loose, intact, SILTY fine SAND: Colluvium (topsoil).

0.30 – 0.70: Moist, pale orange, loose, intact, SILTY fine to medium grained SAND: Colluvium.

0.70 – 1.05: As above but slightly clayey.

1.05 – 1.20: Moist to wet, beige mottled orange, loose, intact, slightly clayey, gravelly SILTY SAND: Colluvium.

1.20 – 1.30: Moist, orange mottled pale orange and beige and occasionally speckled black, dense to very dense, weakly cemented, honeycomb ferricrete: Pedogenic.

NOTES

1) Refusal at 1.30 m

2) No ground water seepage but soil moisture content increases with depth

3) Sample taken between 0.30--0.70 m

4) Sample taken between 1.05--1.20 m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'53.4"S
Y-COORD : 29d58'39.2"E

HOLE No: TP 20

D06C D48

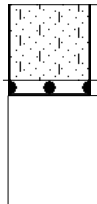
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 21
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Slightly moist, brown, loose, intact, slightly gravelly SILTY fine SAND with roots: Colluvium.

0.10

Dry, dark red brown mottled orange, very dense, cemented, hardpan ferricrete: Pedogenic.

0.12

NOTES

1) Refusal at 0.12 m

2) No ground water seepage

3) No sample taken

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'42.3"S
Y-COORD : 29d58'45.3"E

HOLE No: TP 21

D06C D48

dot.PLOT 5008 J&W

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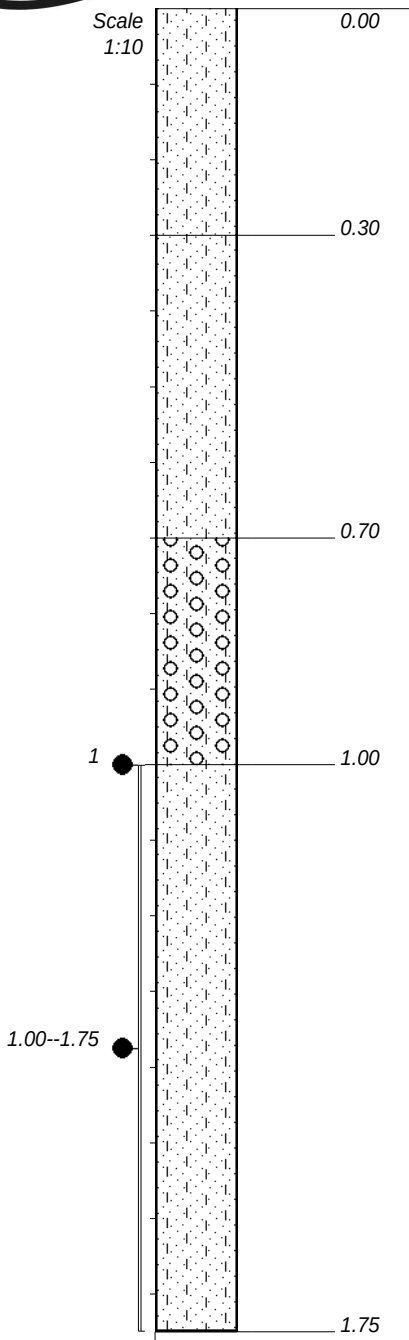
EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 22
Sheet 1 of 1

JOB NUMBER: 2812



0.00 – 0.30: Moist, light brown, loose, intact, SILTY fine SAND: Colluvium (topsoil).

0.30 – 0.70: Moist, light orange brown, loose, intact, slightly gravelly, SILTY fine SAND: Colluvium.

0.70 – 1.00: Moist, light orange brown mottled dark brown, loose, intact, fine rounded ferrugised gravel and rock fragment GRAVEL in a SILTY fine SAND matrix: Colluvium (pebble marker).

1.00 – 1.75: Moist, pale orange mottled orange, medium dense to dense, intact, SILTY fine SAND with minor coarse sand grains: Residual Sandstone.

NOTES

1) No refusal but fairly slow advance

2) No ground water seepage

3) Sample 1 x indicator taken at 1.00--1.75 m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'44.9"S
Y-COORD : 29d58'50.1"E

HOLE No: TP 22

D06C D48

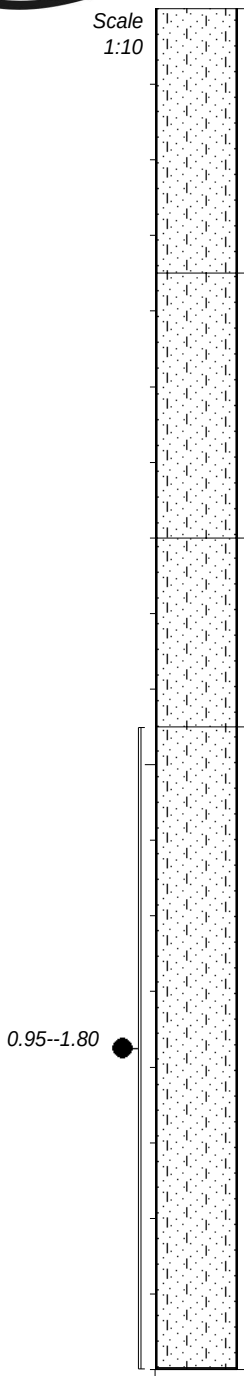
dot.PLOT 5008 J&W

EXXARO RESOURCES
Belfast Mine Leachate Dams

HOLE No: TP 23
Sheet 1 of 1

JOB NUMBER: 2812

Scale 1:10



0.00 Moist, light brown, loose, intact, SILTY fine SAND: Colluvium (topsoil).

0.35 Moist, light orange brown, loose, open-voided, slightly gravelly, SILTY fine SAND: Colluvium.

0.70 Moist, orange brown mottled red brown, loose, intact, gravelly SILTY SAND containing weathered sandstone cobbles: Gravel marker.

0.95 Moist, pale orange mottled orange, medium dense to dense, intact, SILTY fine SAND, with minor coarse sand grains: Residual Sandstone.

1.80

NOTES

1) No refusal

2) No ground water seepage

3) Sample taken between 0.95--1.80 m

CONTRACTOR :
MACHINE : CAT 2x4 TLB
DRILLED BY :
PROFILED BY : S BOK
TYPE SET BY : R WEBB
SETUP FILE : TP-JG-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 3/06/2011
DATE : 27/07/11 11:05
TEXT : ..C:\DOTPLOT\2812BE~1.TXT

ELEVATION :
X-COORD : 25d49'45.1"S
Y-COORD : 29d58'35.1"E

HOLE No: TP 23

D06C D48

dot.PLOT 5008 J&W

GEOTECHNICAL REPORT

APPENDIX B
DCP TESTS

APPENDIX B: DYNAMIC CONE PENETROMETER TESTS

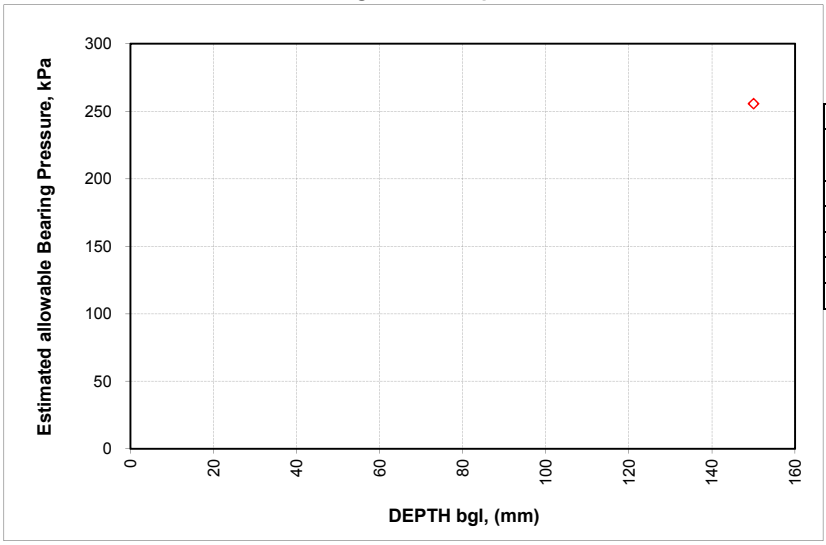
EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

DCP No: 1 Location: TP1

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 150mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	50	150	6	19	44	256

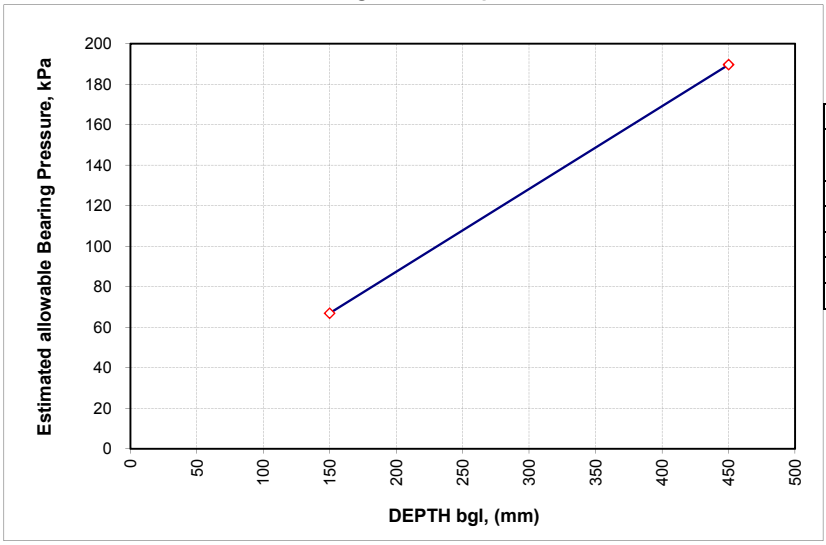
EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

DCP No: 2 Location: TP2

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Very slow advance

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	13	150	23	5	8	67
2	300	600	450	36	450	8	14	29	190

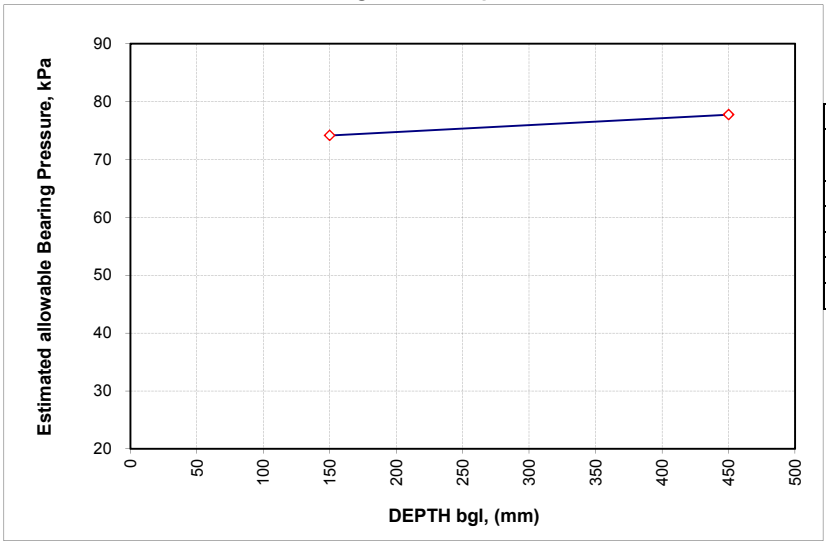
EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

DCP No: 3 Location: TP3

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 650mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	15	150	20	6	9	74
2	300	600	450	16	450	19	6	10	78

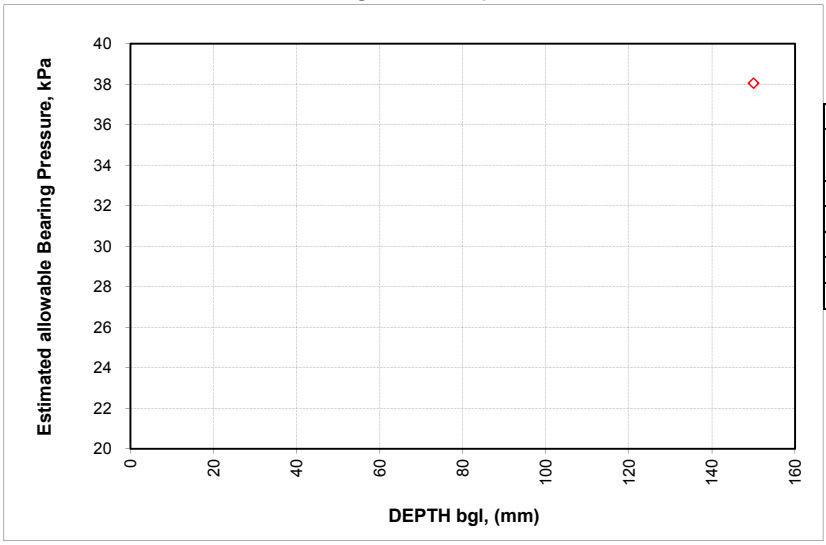
EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

DCP No: 4 Location: TP4

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 500mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	5	150	60	2	2	38

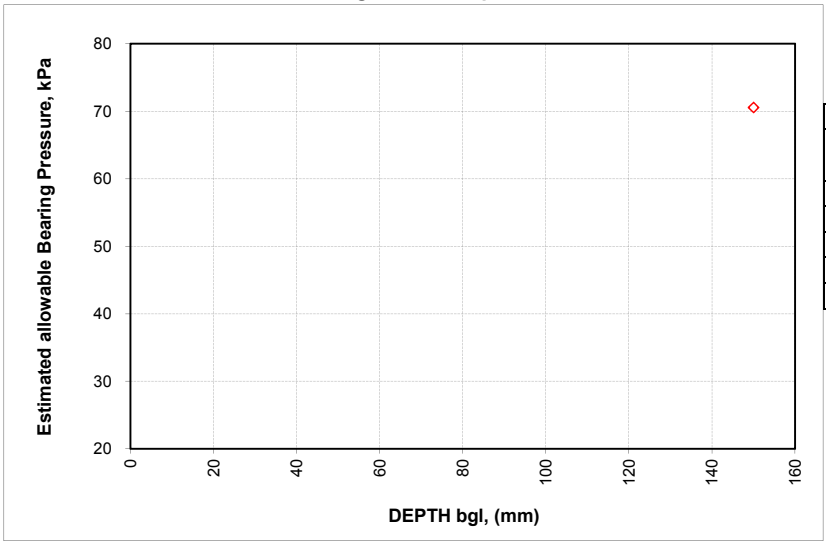
EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

DCP No: 5 Location: TP5

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 280mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	14	150	21	5	8	71

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

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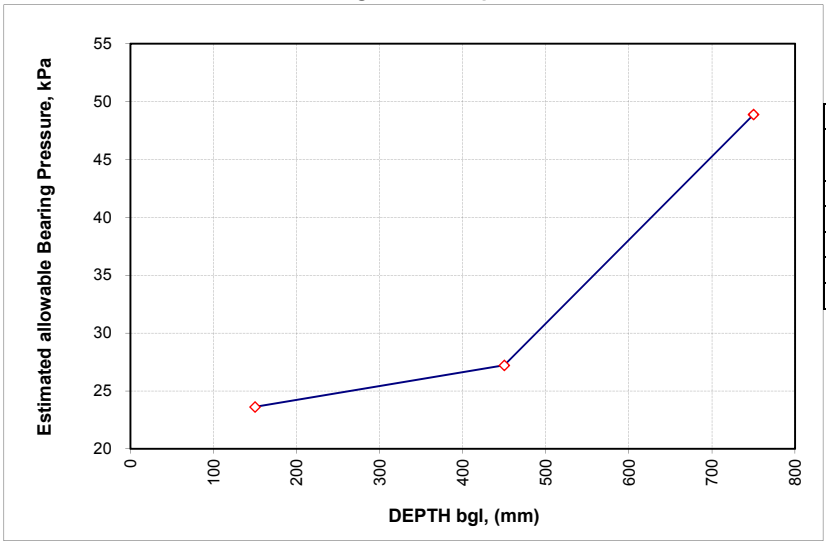
DCP No: 6 Location: TP6

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 900mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	1	150	300	0	0	24
2	300	600	450	2	450	150	1	0	27
3	600	900	750	8	750	38	3	4	49

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

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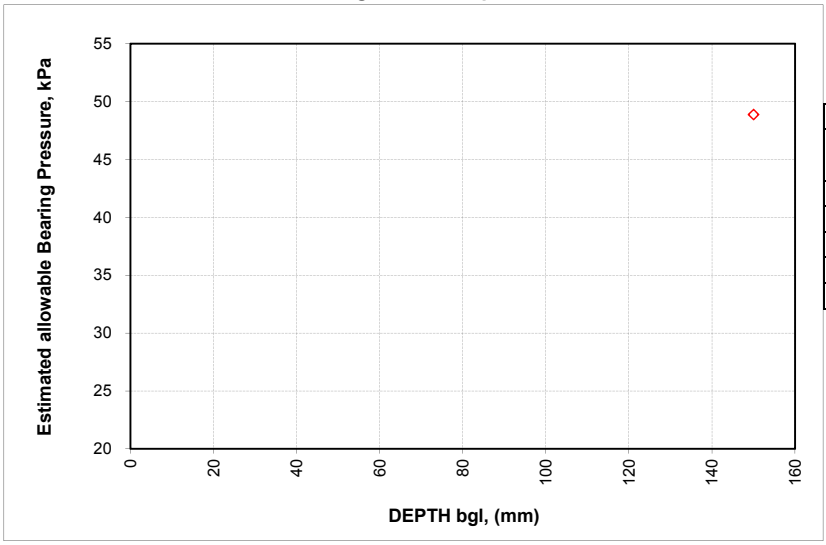
DCP No: 7 Location: TP7

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 350mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	8	150	38	3	4	49

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

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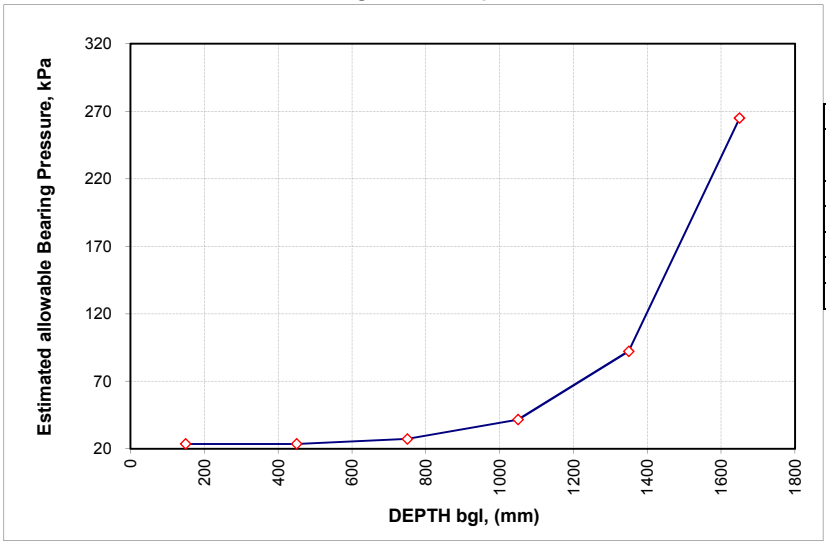
DCP No: 8 Location: TP8

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : No refusal but slow advance

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	1	150	300	0	0	24
2	300	600	450	1	450	300	0	0	24
3	600	900	750	2	750	150	1	0	27
4	900	1200	1050	6	1050	50	2	3	42
5	1200	1500	1350	20	1350	15	8	13	92
6	1500	1800	1650	52	1650	6	20	47	265

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

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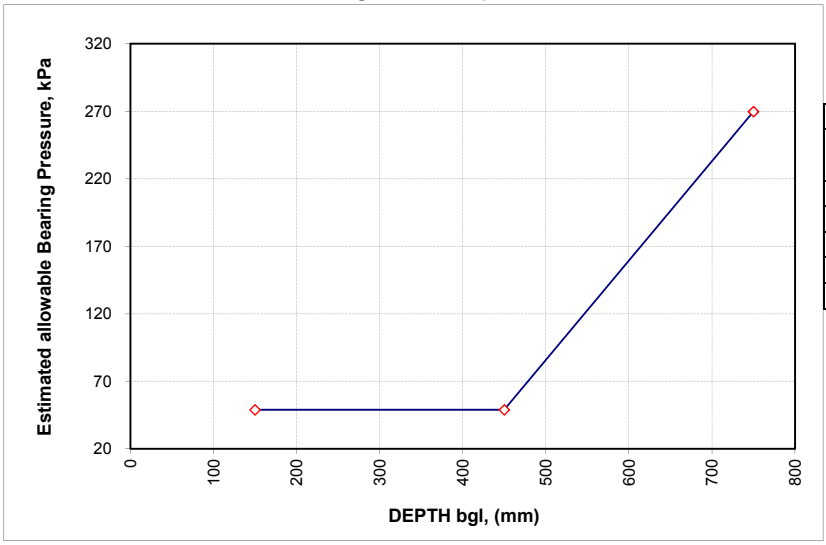
DCP No: 9 Location: TP9

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : No refusal but slow advance

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	8	150	38	3	4	49
2	300	600	450	8	450	38	3	4	49
3	600	900	750	53	750	6	20	48	270

EASBP FROM DCP, sand

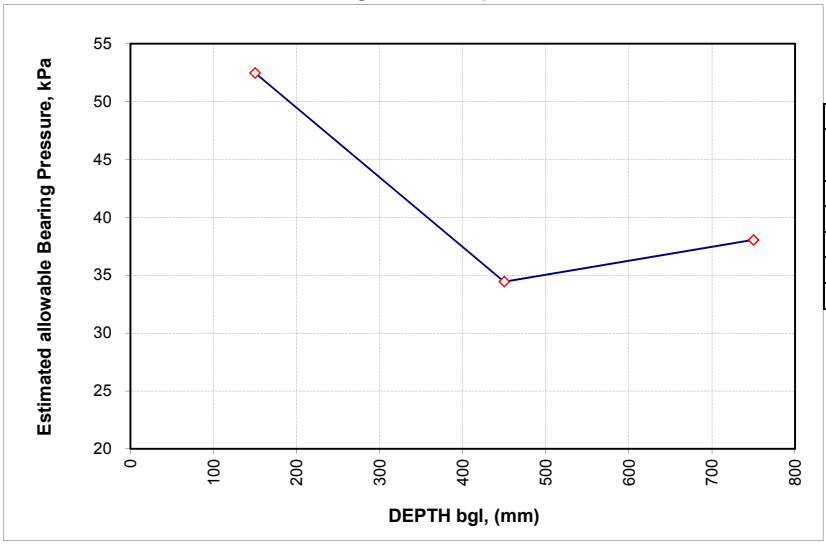
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 3 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 10 Location: TP10

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 1,00m

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	9	150	33	3	5	52
2	300	600	450	4	450	75	2	2	34
3	600	900	750	5	750	60	2	2	38

EASBP FROM DCP, sand

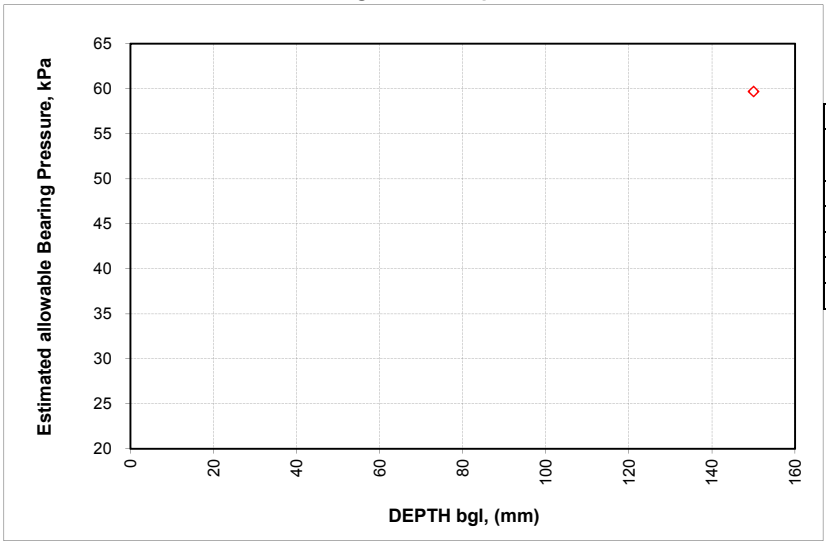
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 11 Location: TP11

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 330mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	11	150	27	4	6	60

EASBP FROM DCP, sand

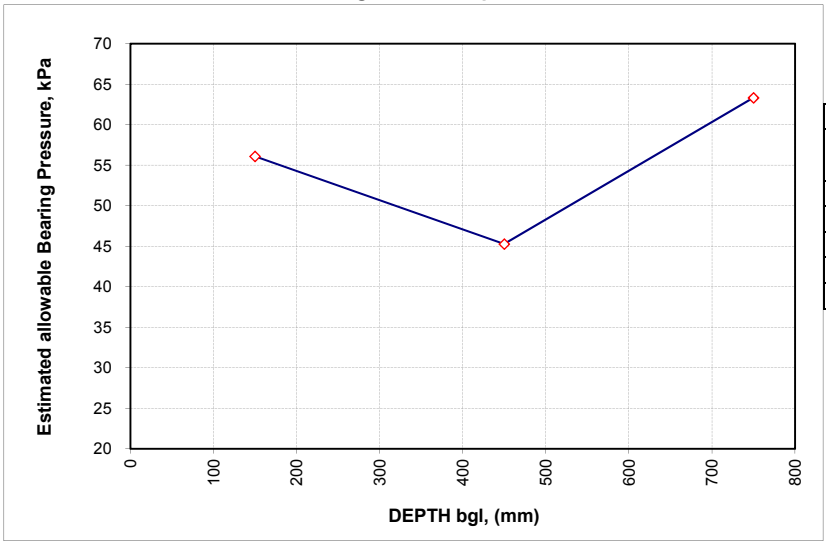
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 12 Location: TP12

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : No refusal but very slow advance

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	10	150	30	4	5	56
2	300	600	450	7	450	43	3	3	45
3	600	900	750	12	750	25	5	7	63

EASBP FROM DCP, sand

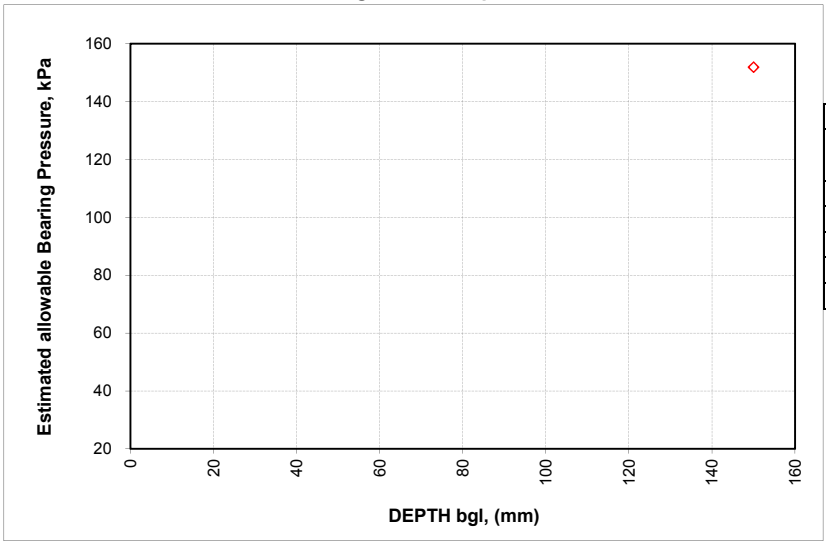
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 13 Location: TP13

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 60mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	28	150	11	11	21	152

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

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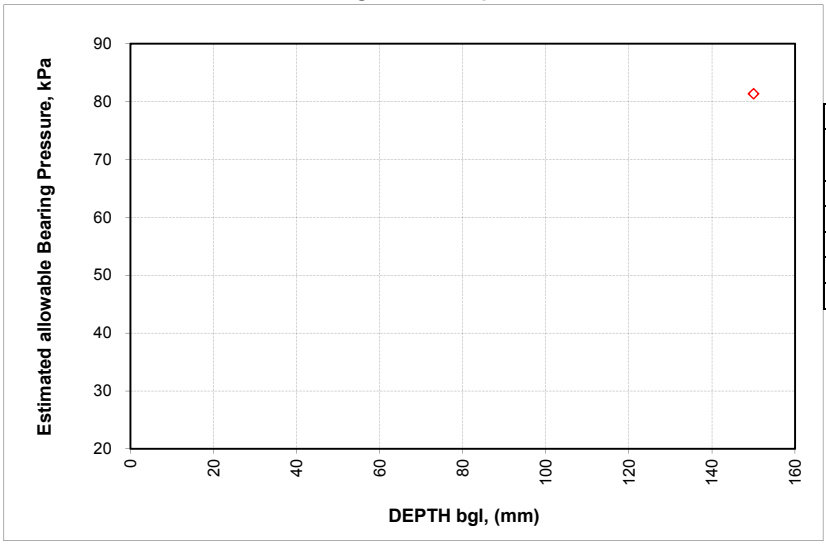
DCP No: 14 Location: TP14

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 230mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	17	150	18	6	11	81

EASBP FROM DCP, sand

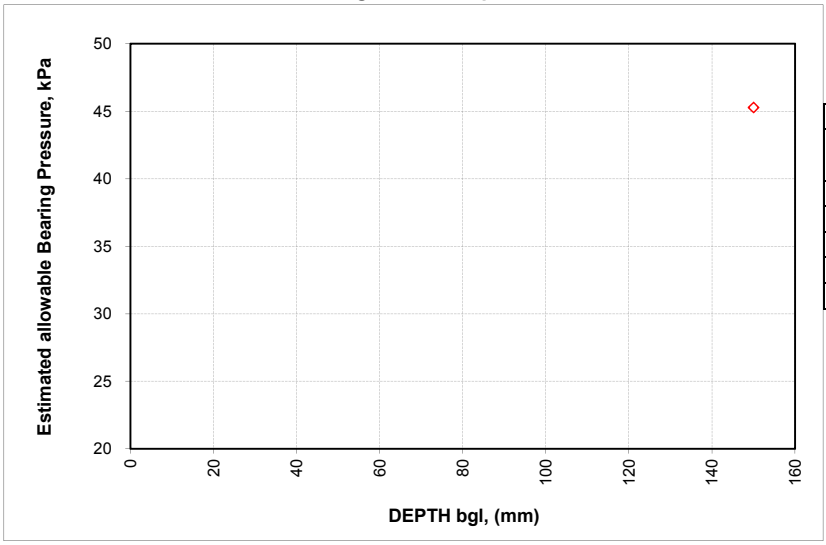
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 15 Location: TP15

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 530mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	7	150	43	3	3	45

EASBP FROM DCP, sand

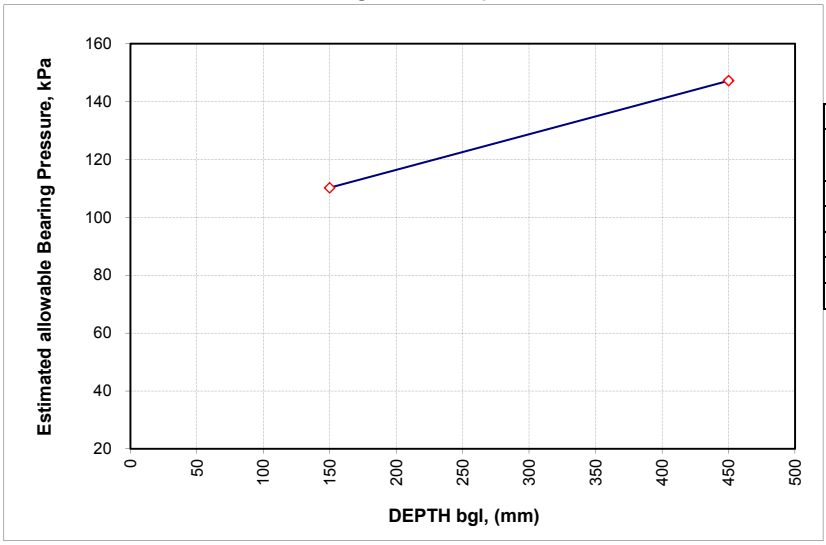
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 17 Location: TP17

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 490mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	25	150	12	10	18	110
2	300	600	450	27	450	11	10	20	147

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

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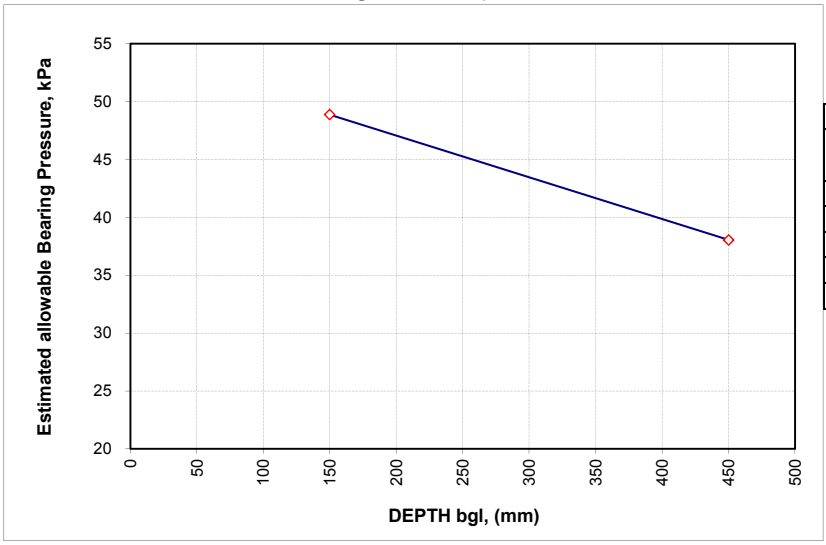
DCP No: 16 Location: TP16

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 870mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	8	150	38	3	4	49
2	300	600	450	5	450	60	2	2	38

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

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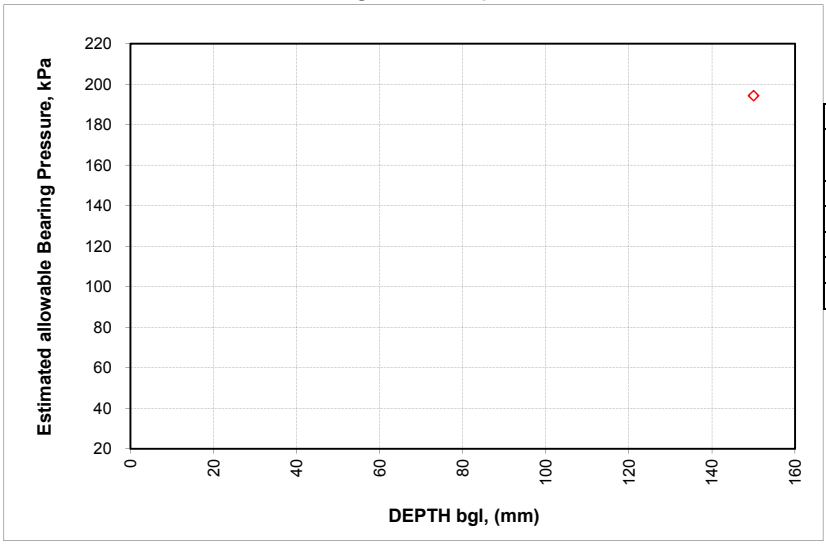
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 18 Location: TP18

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 180mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	37	150	8	14	30	194

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

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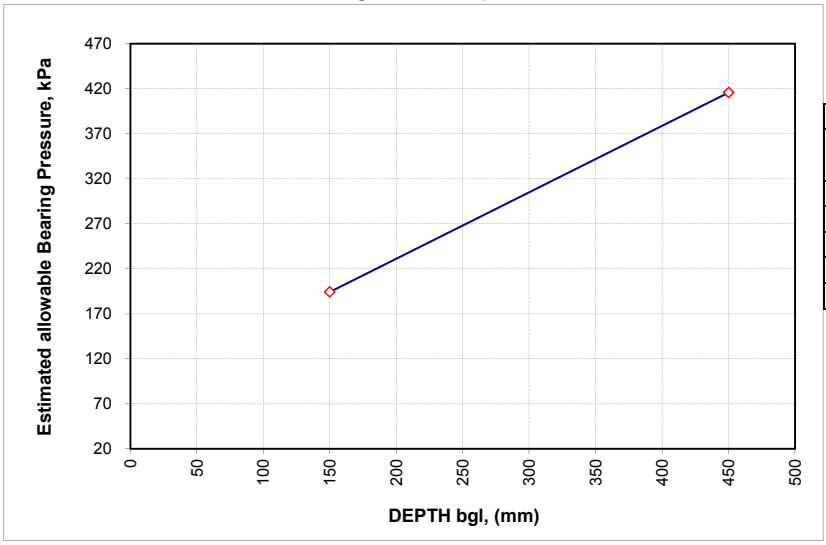
DCP No: 19 Location: TP19

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 450mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	37	150	8	14	30	194
2	300	600	450	84	450	4	32	88	416

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
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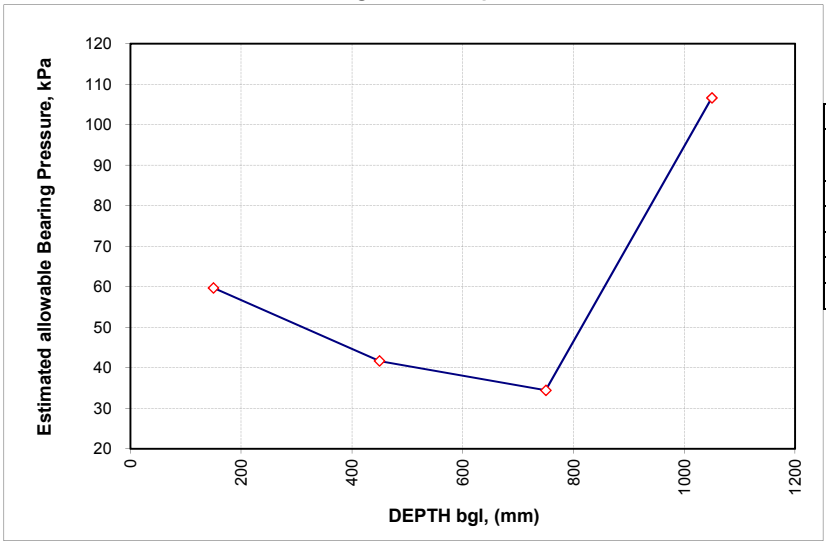
DCP No: 20 Location: TP20

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 1,15m

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	11	150	27	4	6	60
2	300	600	450	6	450	50	2	3	42
3	600	900	750	4	750	75	2	2	34
4	900	1200	1050	24	1050	13	9	17	107

EASBP FROM DCP, sand

Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

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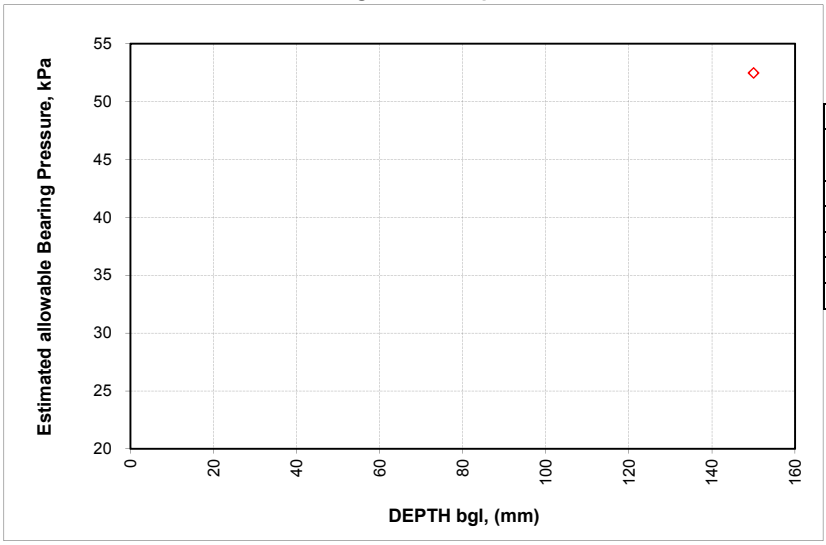
DCP No: 21 Location: TP21

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 0,12mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	9	150	33	3	5	52

EASBP FROM DCP, sand

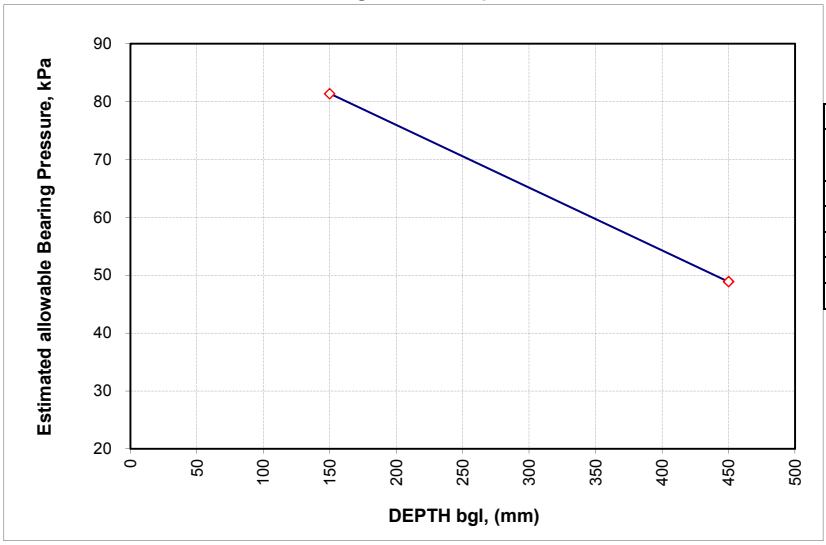
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 22 Location: TP22

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 0,65m

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	17	150	18	6	11	81
2	300	600	450	8	450	38	3	4	49

EASBP FROM DCP, sand

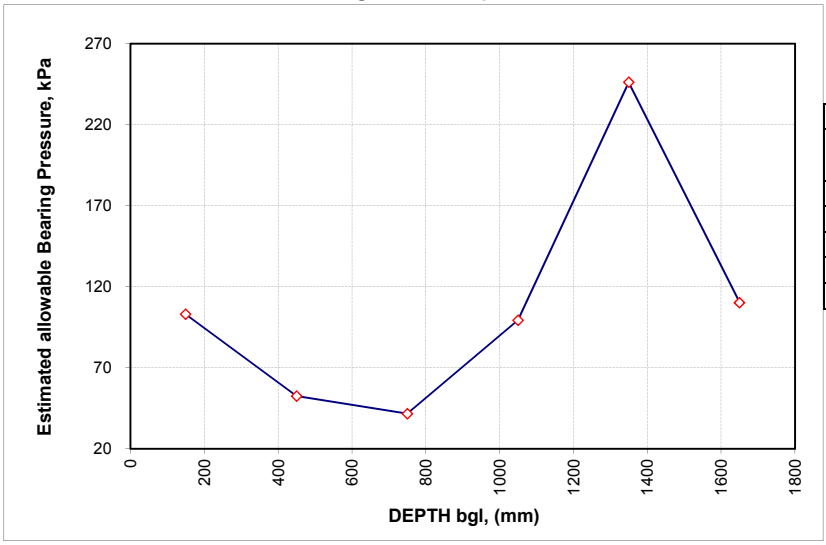
Job Name Belfast mine dams

File No: Job No: 2812 Date of Test: 7 June 2011 SB

Jeffares & Green
ENGINEERING & ENVIRONMENTAL CONSULTING

DCP No: 23 Location: TP23

note: EASBP from Terzaghi & Peck p4 for 25mm settlement



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
< 5	132-210	Very Dense
5 - 10	78-132	Dense
10 - 30	25-78	Med Dense
30 - 75	10 25	Loose
75 -100	<10	Very Loose

NOTE :
Stated consistencies do not apply to cohesive materials. Describe using "stiff or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

Applied Factor : 1 times Terzaghi's value

Remarks : Refusal at 1,90m

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN lows/300mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	300	150	23	150	13	9	16	103
2	300	600	450	9	450	33	3	5	52
3	600	900	750	6	750	50	2	3	42
4	900	1200	1050	22	1050	14	8	15	99
5	1200	1500	1350	48	1350	6	18	42	246
6	1500	1800	1650	25	1650	12	10	18	110

GEOTECHNICAL REPORT

APPENDIX C
TRIAL PIT PHOTOGRAPHS

TP1

TP2

TP4

TP5

TP6

TP7

TP8

TP9

TP10

TP11

TP12

TP13

TP14

TP14

TP15

TP16

TP17

TP17

TP18

TP19

TP20

TP21

TP22

TP23

GEOTECHNICAL REPORT

APPENDIX D
LABORATORY TEST RESULTS

APPENDIX D: LABORATORY TEST RESULTS

D1 Foundation Indicator Test Results

D2 Triaxial Test Results

D3 Moisture Density Relationship Test Results

D4 Permeability Test Results

D5 Chemical Analysis Results

A SANAS accredited testing laboratory No T0062
36/38 Fourth Street, Booysens Reserve, Johannesburg 2091
P O Box 82223, Southdale 2135
Tel: +27 (0)11 835-3117 • Fax: +27 (0)11 835-2503
Email: jhb@civilab.co.za • Website: www.civilab.co.za

Civilab
Civil Engineering Testing Laboratories

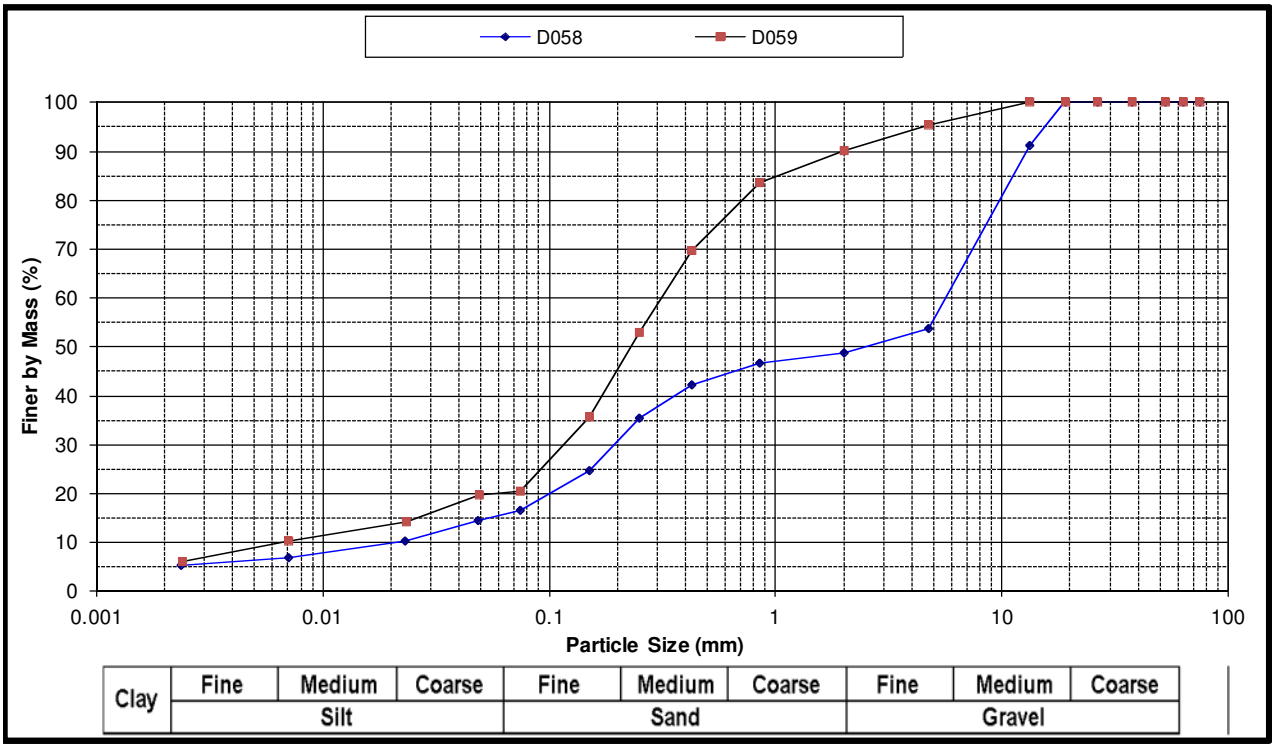
Foundation Indicator Test Data

Project	BELFAST MINE		
Project No.	1039/F19/06/2011	Date	8 July 2011

Sample No.	D058	D059	
Field Ref. No.	TP 1	TP 6	
Depth	0.1 - 0.8	0.3 - 0.9	
Sieve size	%Passing	% Passing	% Passing
75	100	100	
63	100	100	
53	100	100	
37.5	100	100	
26.5	100	100	
19.0	100	100	
13.2	91	100	
4.75	54	95	
2.00	49	90	
0.85	47	84	
0.425	42	70	
0.250	35	53	
0.150	25	36	
0.075	17	21	
0.04	13	18	
0.02	10	14	
0.006	7	10	
0.002	5	6	

Sample No.	D058	D059	
%Gravel	51	10	
%Sand	33	70	
%Silt	10	15	
%Clay	5	6	
NMC %	Not Tested	Not Tested	
Liquid Limit	NP	NP	
Plasticity Index	NP	NP	
Linear Shrink.	0.	0.	
Overall P.I.	NP	NP	
Grading Modulus	1.92	1.20	
H.R.B.	A-1-b (0)	A-2-4 (0)	
Unified	GM	SM	
Weston swell (%) at 1 kPa			

Analysis as per method D422 of ASTM of 1985
The results reported relate only to the samples tested.
Documents may only be reproduced or published in their full context.



Remarks:

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Email: jhb@civilab.co.za • Website: www.civilab.co.za

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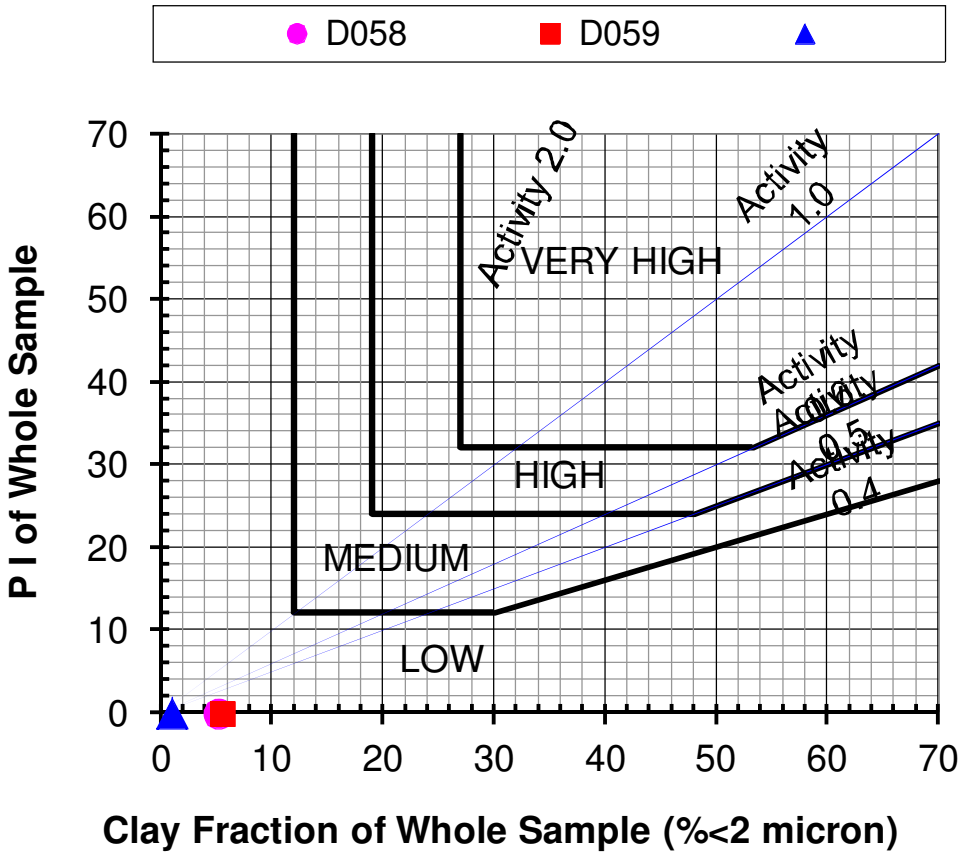
Activity Diagram After D H van der Merwe



Plotted Values:

Sample	Clay Frac	PI
D058	5.2	#VALUE!
D059	5.5	#VALUE!

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36/38 Fourth Street, Booysens Reserve, Johannesburg 2091
P O Box 82223, Southdale 2135
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Email: jhb@civilab.co.za • Website: www.civilab.co.za

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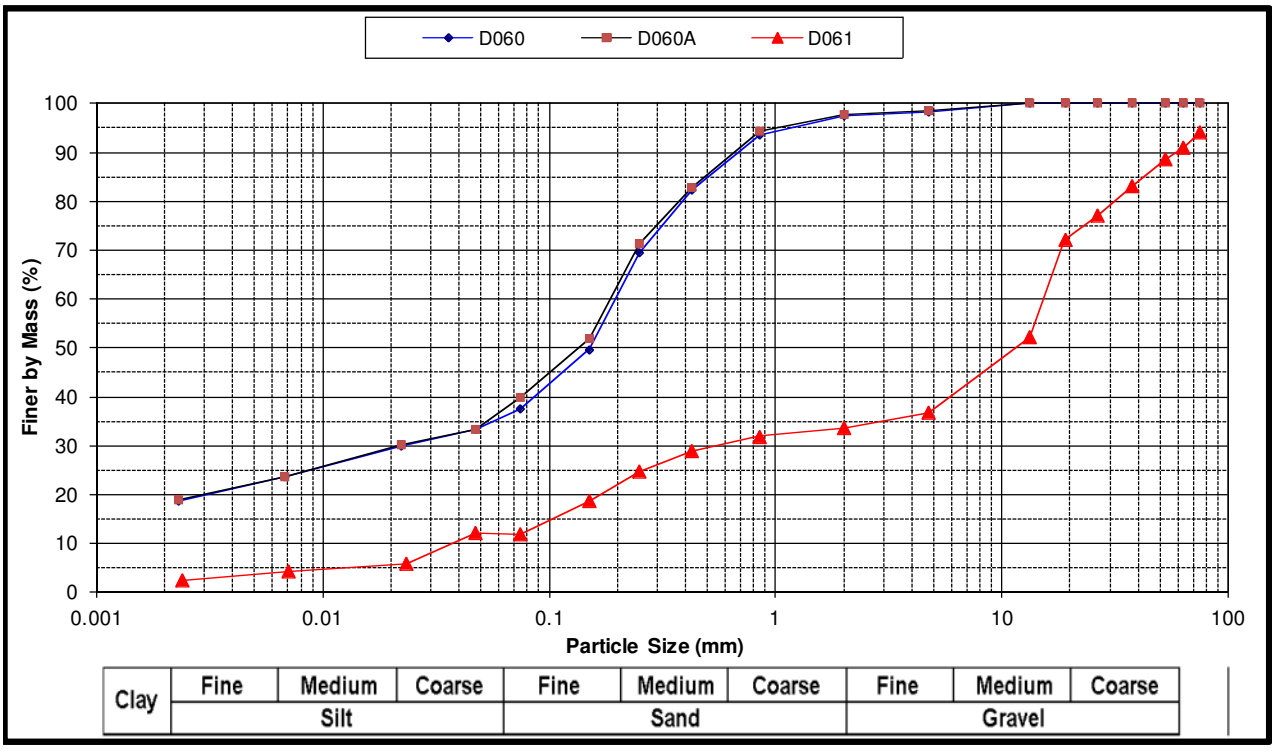
Foundation Indicator Test Data

Project	BELFAST MINE		
Project No.	1039/F19/06/2011	Date	8 July 2011

Sample No.	D060	D060A	D061
Field Ref. No.	TP 8	TP 8	TP 11
Depth	0.2 - 0.8	0.2 - 0.8	0.2 - 0.7
Sieve size	%Passing	% Passing	% Passing
75	100	100	94
63	100	100	91
53	100	100	89
37.5	100	100	83
26.5	100	100	77
19.0	100	100	72
13.2	100	100	52
4.75	98	99	37
2.00	97	98	34
0.85	94	94	32
0.425	82	83	29
0.250	69	71	25
0.150	50	52	19
0.075	38	40	12
0.04	32	33	11
0.02	29	30	6
0.006	23	23	4
0.002	18	18	2

Sample No.	D060	D060A	D061
%Gravel	3	2	66
%Sand	62	61	22
%Silt	17	18	10
%Clay	18	18	2
NMC %	Not Tested	Not Tested	Not Tested
Liquid Limit	25	23	NP
Plasticity Index	12	10	NP
Linear Shrink.	5.	5.	0.
Overall P.I.	10	8	NP
Grading Modulus	0.83	0.80	2.26
H.R.B.	A-6 (1)	A-4 (1)	A-1-a (0)
Unified	SC	SC	GP-GM
Weston swell (%) at 1 kPa			

Analysis as per method D422 of ASTM of 1985
The results reported relate only to the samples tested.
Documents may only be reproduced or published in their full context.



Remarks:

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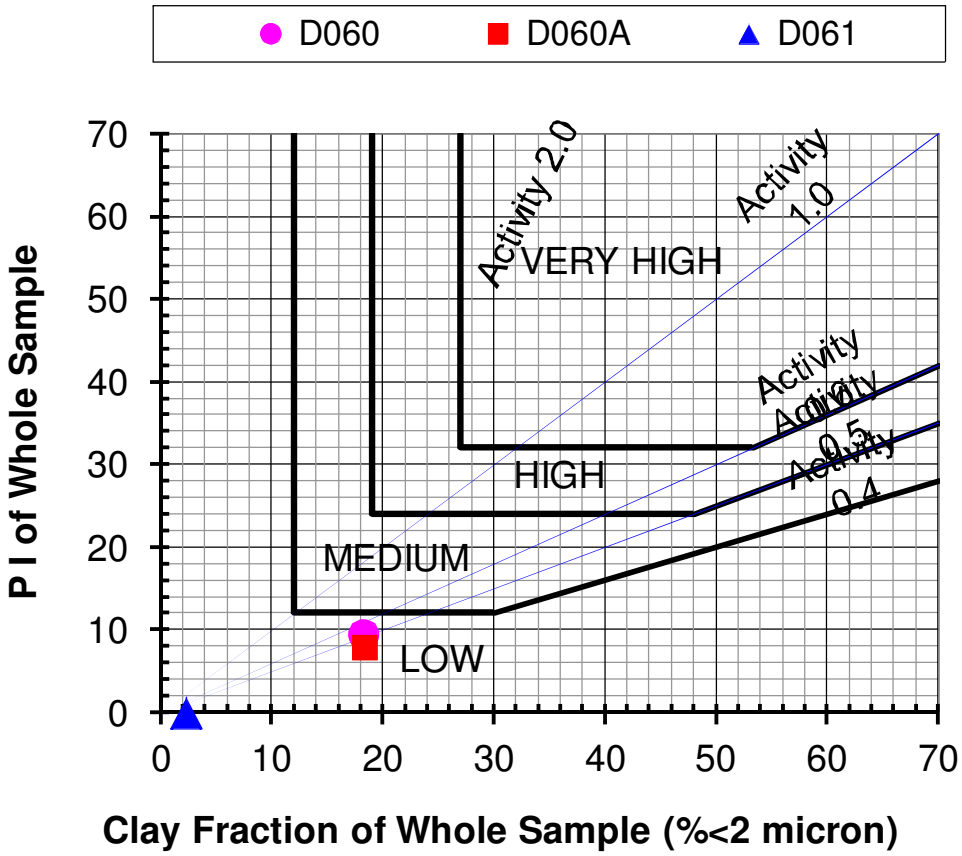
Activity Diagram After D H van der Merwe



Plotted Values:

Sample	Clay Frac	PI
D060	18.2	9.5
D060A	18.3	7.9
D061	2.3	#VALUE!

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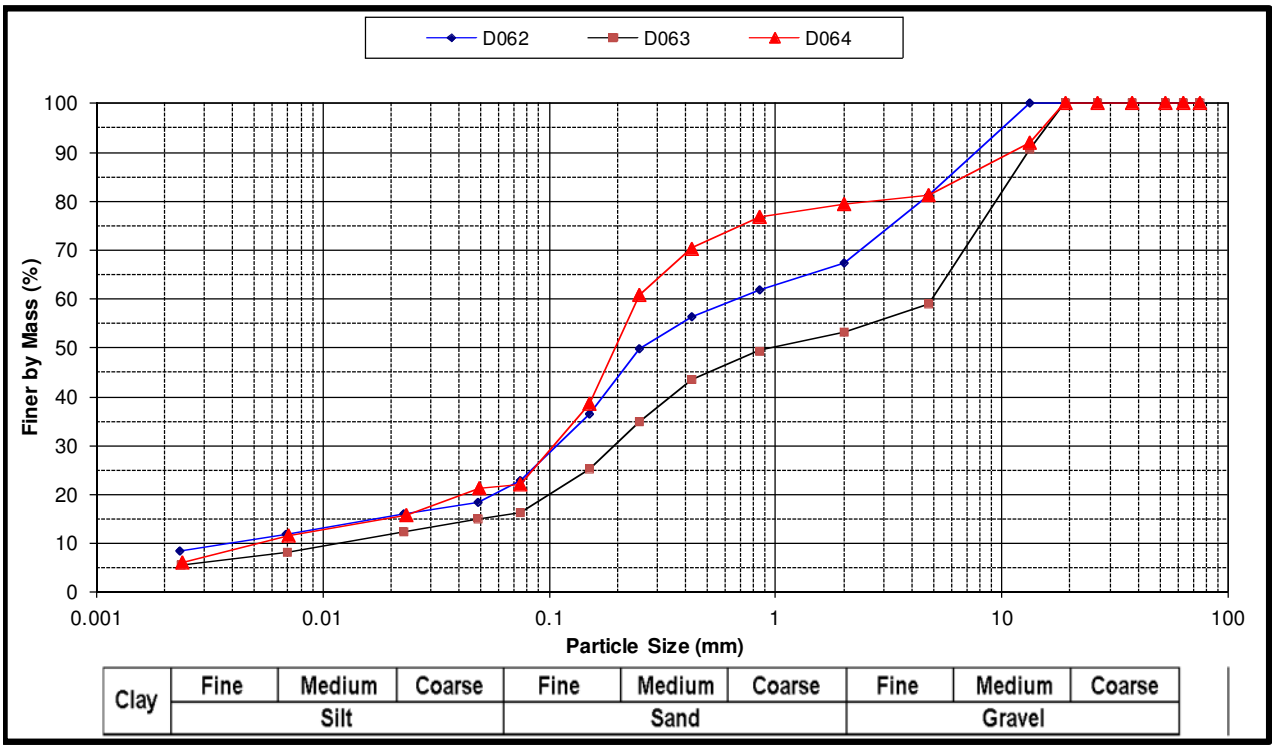
Foundation Indicator Test Data

Project	BELFAST MINE		
Project No.	1039/F19/06/2011	Date	8 July 2011

Sample No.	D062	D063	D064
Field Ref. No.	TP 12	TP 15	TP 16
Depth	0.7 - 1.0	0.25 - 0.75	0.35 - 0.85
Sieve size	%Passing	% Passing	% Passing
75	100	100	100
63	100	100	100
53	100	100	100
37.5	100	100	100
26.5	100	100	100
19.0	100	100	100
13.2	100	91	92
4.75	81	59	81
2.00	67	53	79
0.85	62	49	77
0.425	56	44	70
0.250	50	35	61
0.150	37	25	39
0.075	23	16	22
0.04	18	14	20
0.02	16	12	15
0.006	11	8	11
0.002	8	5	5

Sample No.	D062	D063	D064
%Gravel	33	47	21
%Sand	47	38	58
%Silt	13	10	16
%Clay	8	5	5
NMC %	Not Tested	Not Tested	Not Tested
Liquid Limit	19	20	NP
Plasticity Index	6	8	NP
Linear Shrink.	2.	2.5	0.
Overall P.I.	3	4	NP
Grading Modulus	1.53	1.87	1.28
H.R.B.	A-2-4 (0)	A-2-4 (0)	A-2-4 (0)
Unified	SC-SM	SC	SM
Weston swell (%) at 1 kPa			

Analysis as per method D422 of ASTM of 1985
The results reported relate only to the samples tested.



Remarks:

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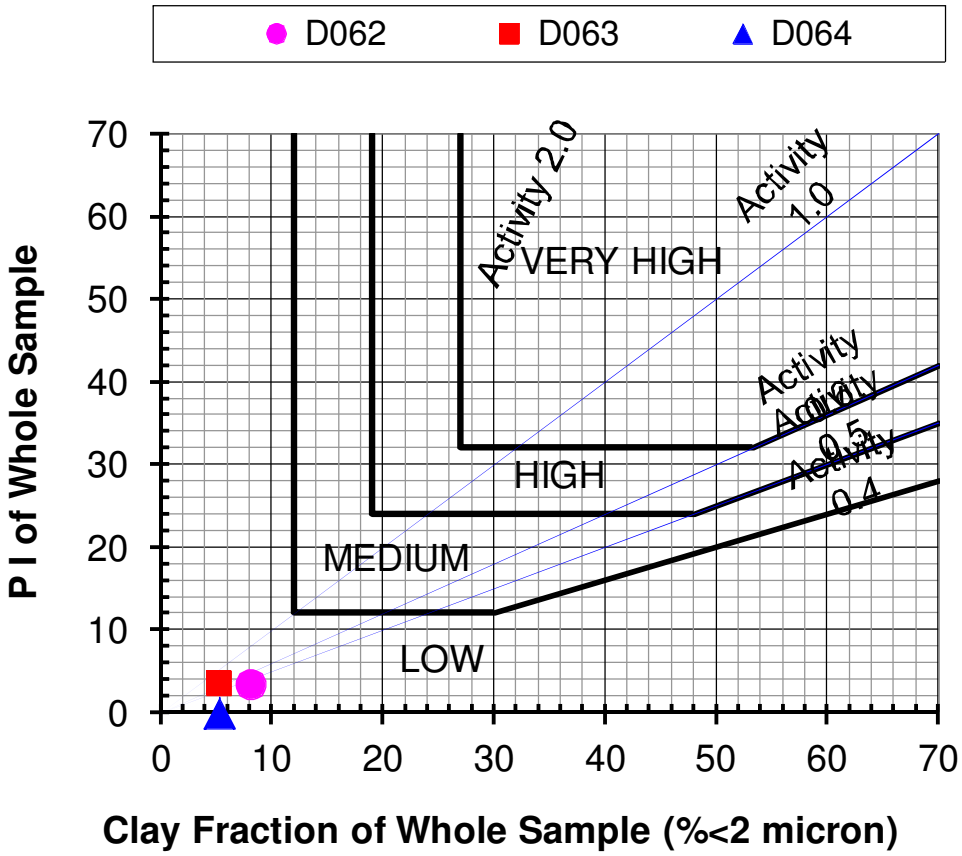

Plotted Values:

Sample	Clay Frac	PI
D062	8.0	3.4
D063	5.2	3.7
D064	5.3	#VALUE!

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Foundation Indicator Test Data

Project	BELFAST MINE		
Project No.	1039/F19/06/2011	Date	8 July 2011

Sample No.	D065	D066	D067
Field Ref. No.	TP 17	TP 20	TP 20
Depth	0.2 - 0.5	0.3 - 0.7	1.05 - 1.2
Sieve size	%Passing	% Passing	% Passing
75	100	100	100
63	100	100	100
53	100	100	100
37.5	100	100	100
26.5	100	100	100
19.0	100	100	100
13.2	100	100	98
4.75	88	99	63
2.00	86	98	57
0.85	82	93	53
0.425	73	80	47
0.250	56	66	39
0.150	33	50	30
0.075	19	35	20
0.04	20	25	17
0.02	14	19	13
0.006	10	12	9
0.002	6	6	5

Sample No.	D065	D066	D067
%Gravel	14	2	43
%Sand	65	67	37
%Silt	15	25	14
%Clay	6	6	5
NMC %	Not Tested	Not Tested	Not Tested
Liquid Limit	NP	NP	20
Plasticity Index	NP	NP	6
Linear Shrink.	0.	0.	2.5
Overall P.I.	NP	NP	3
Grading Modulus	1.22	0.87	1.76
H.R.B.	A-2-4 (0)	A-2-4 (0)	A-1-b (0)
Unified	SM	SM	SC-SM
Weston swell (%) at 1 kPa			

Analysis as per method D422 of ASTM of 1985
The results reported relate only to the samples tested.
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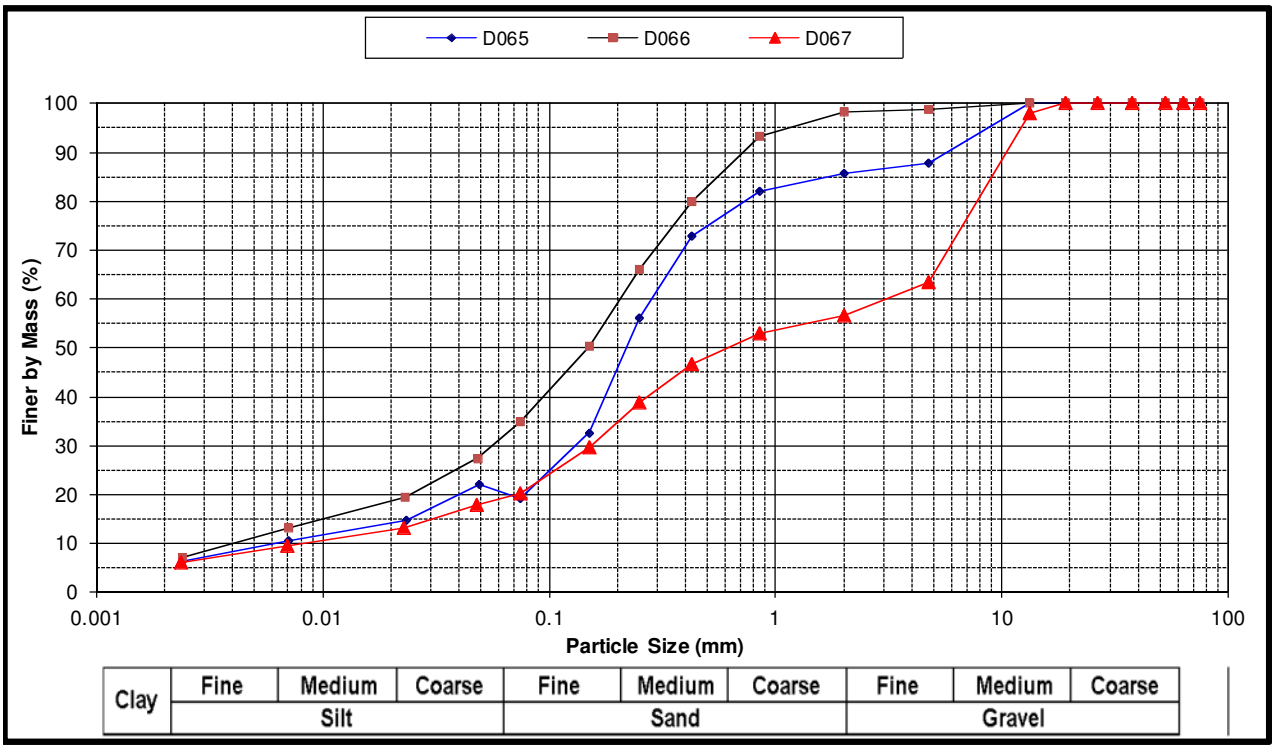

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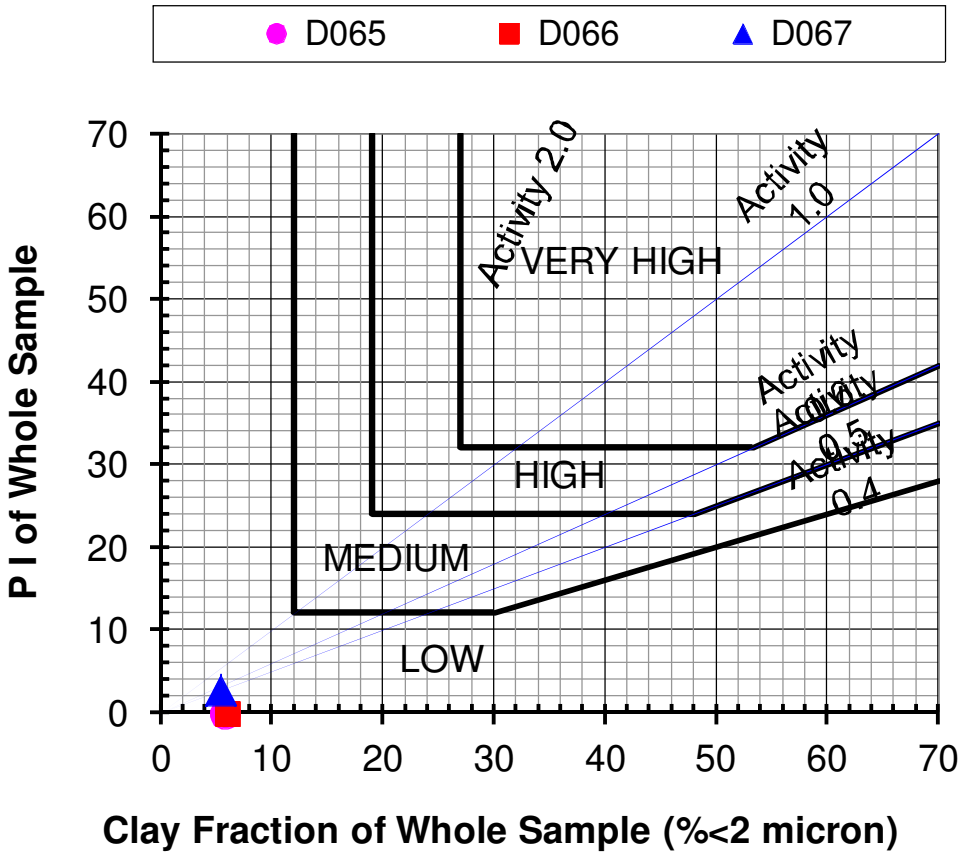
Activity Diagram After D H van der Merwe



Plotted Values:

Sample	Clay Frac	PI
D065	5.7	#VALUE!
D066	6.0	#VALUE!
D067	5.4	2.7

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Foundation Indicator Test Data

Project	BELFAST MINE		
Project No.	1039/F19/06/2011	Date	8 July 2011

Sample No.	D068	D069	
Field Ref. No.	TP 22	TP 23	
Depth	1.0 - 1.75	0.95 - 1.8	
Sieve size	%Passing	% Passing	% Passing
75	100	100	
63	100	100	
53	100	100	
37.5	100	100	
26.5	100	100	
19.0	100	100	
13.2	100	100	
4.75	93	97	
2.00	81	95	
0.85	74	90	
0.425	67	80	
0.250	59	70	
0.150	48	56	
0.075	39	43	
0.04	23	31	
0.02	18	24	
0.006	12	17	
0.002	8	11	

Sample No.	D068	D069	
%Gravel	19	5	
%Sand	49	58	
%Silt	24	27	
%Clay	8	11	
NMC %	Not Tested	Not Tested	
Liquid Limit	27	26	
Plasticity Index	8	10	
Linear Shrink.	4.	4.	
Overall P.I.	5	8	
Grading Modulus	1.13	0.82	
H.R.B.	A-4 (1)	A-6 (2)	
Unified	SC	SC	
Weston swell (%) at 1 kPa			

Analysis as per method D422 of ASTM of 1985
The results reported relate only to the samples tested.
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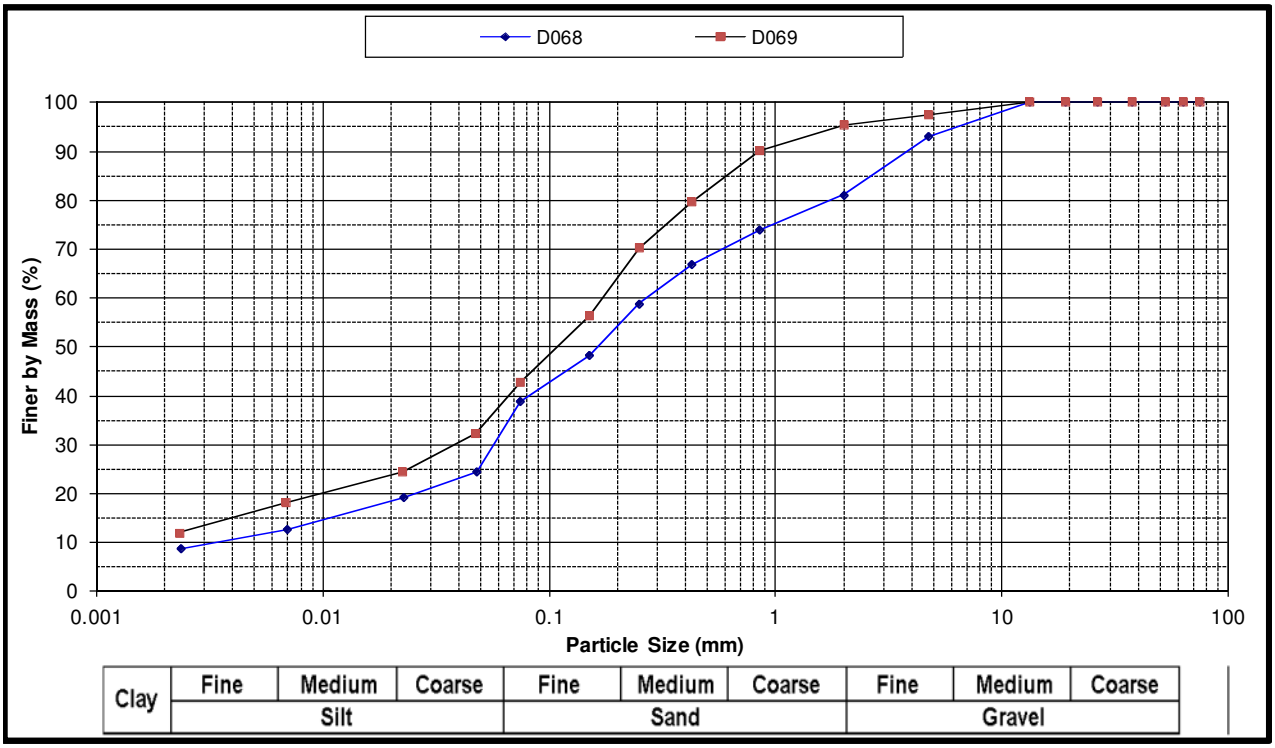

Remarks:

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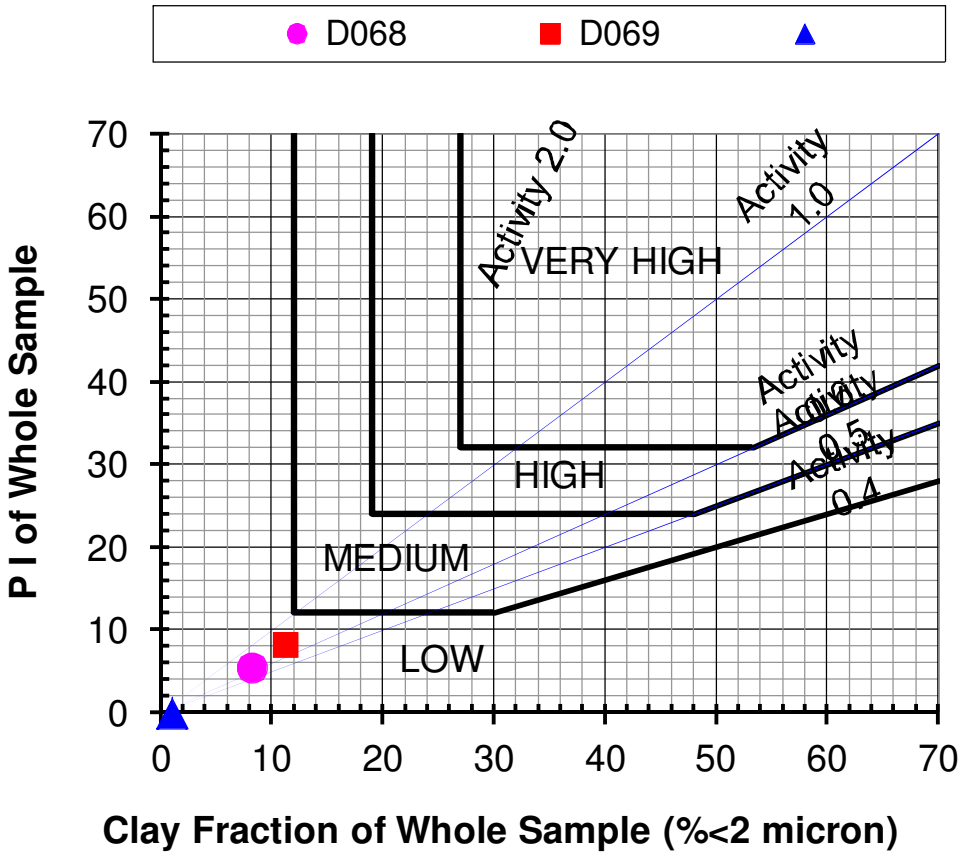
Activity Diagram After D H van der Merwe



Plotted Values:

Sample	Clay Frac	PI
D068	8.2	5.4
D069	11.1	8.3

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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D061
Field Sample Number:	TP 11	Depth (m):	0.2 - 0.7

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 1

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	357.0	Final back pressure (kPa):	347.0	Final B parameter:	0.95

CONSOLIDATION DATA

Effective cons. Stress (kPa): 50.4 t100 (minutes): 0.73 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*103	*50	1963.50	11.1	1910	0.4324	70	2.736 Determined
CONSOLIDATED	102.90	49.95	1959.61	18.5	1916	0.4281	118	
FINAL (After shear)	82.37	55.83	2448.01	18.5	1916	0.4281	118	

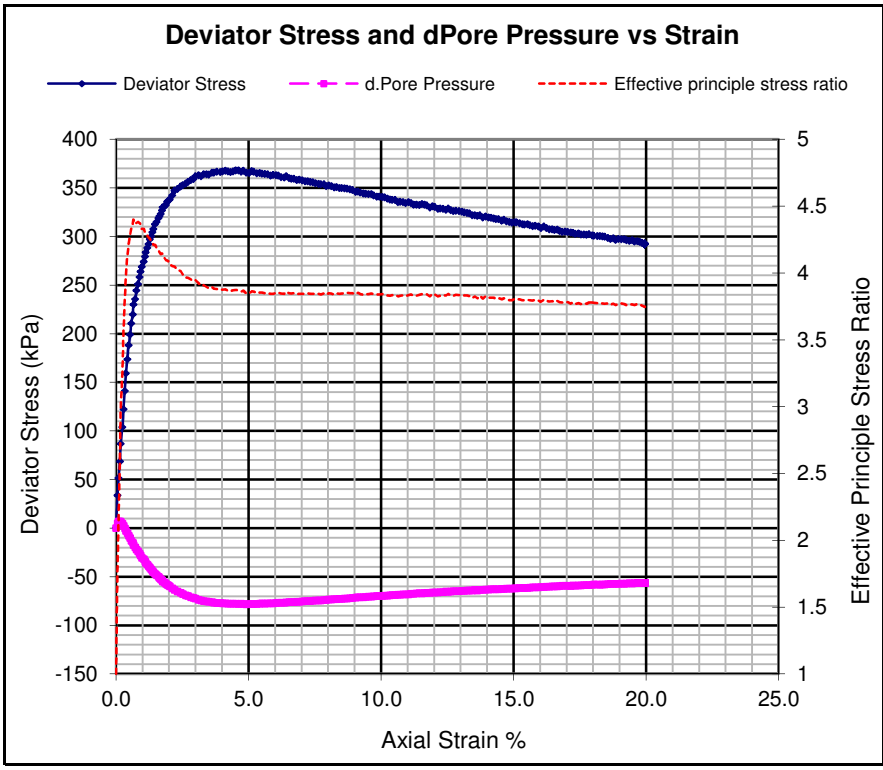
Initial pore pressure (kPa): 385.1 Final pore pressure (kPa): 344.5 Pore pressure dissipation: 90%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	346.6	Initial effective stress (kPa):	50.4		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	0.66				
Deviator stress (kPa):	230.1	Principle Stresses (kPa)			
Excess pore pressure (kPa):	-17.3	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.400	280.5	297.7	50.4	67.7

Deviator stress corrections: Membrane correction: 1.1 kPa



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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D061
Field Sample Number:	TP 11	Depth (m):	0.2 - 0.7

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 2

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	457.0	Final back pressure (kPa):	447.0	Final B parameter:	0.96

CONSOLIDATION DATA

Effective cons. Stress (kPa): 105.9 t100 (minutes): 4 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*103	*50	1963.50	11.1	1920	0.4254	72	2.736 Determined
CONSOLIDATED	102.71	49.86	1952.49	16.7	1936	0.4134	111	
FINAL (After shear)	82.81	55.53	2421.61	16.7	1936	0.4134	111	

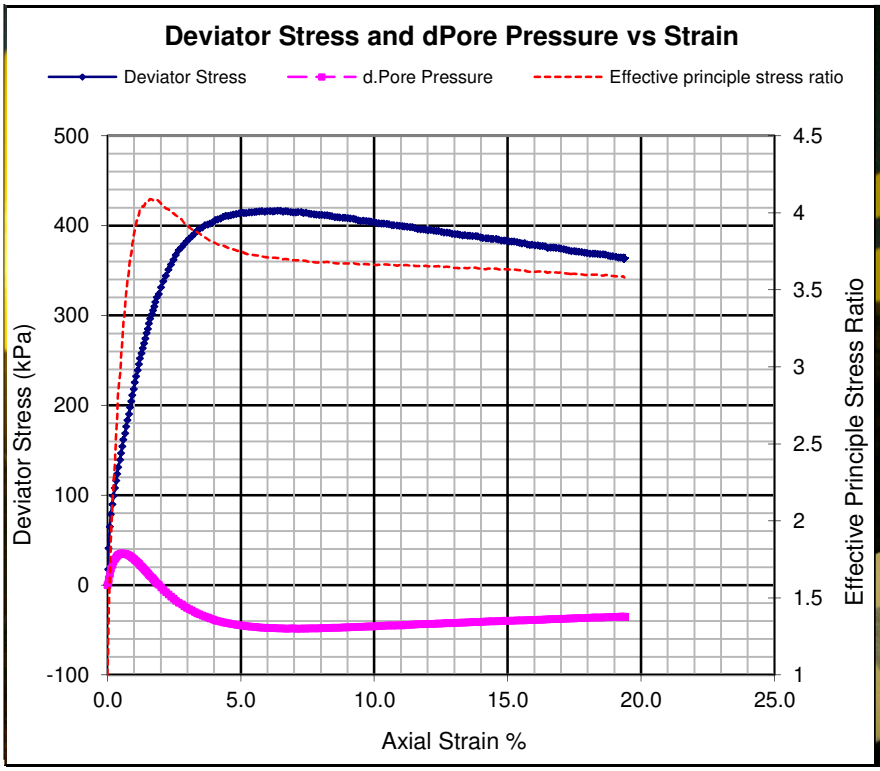
Initial pore pressure (kPa): 530.6 Final pore pressure (kPa): 443.5 Pore pressure dissipation: 96%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	441.1	Initial effective stress (kPa):	105.9		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	1.60				
Deviator stress (kPa):	296.3	Principle Stresses (kPa)			
Excess pore pressure (kPa):	10.0	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.089	402.2	392.2	105.9	95.9

Deviator stress corrections: Membrane correction: 1.1 kPa



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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D061
Field Sample Number:	TP 11	Depth (m):	0.2 - 0.7

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 3

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	357.0	Final back pressure (kPa):	347.0	Final B parameter:	0.99

CONSOLIDATION DATA

Effective cons. Stress (kPa): 200.2 t100 (minutes): 1.21 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*100	*50	1963.50	11.3	1976	0.3849	80	2.736 Determined
CONSOLIDATED	99.51	49.75	1944.16	16.5	2005	0.3645	124	
FINAL (After shear)	78.97	55.85	2449.78	16.5	2005	0.3645	124	

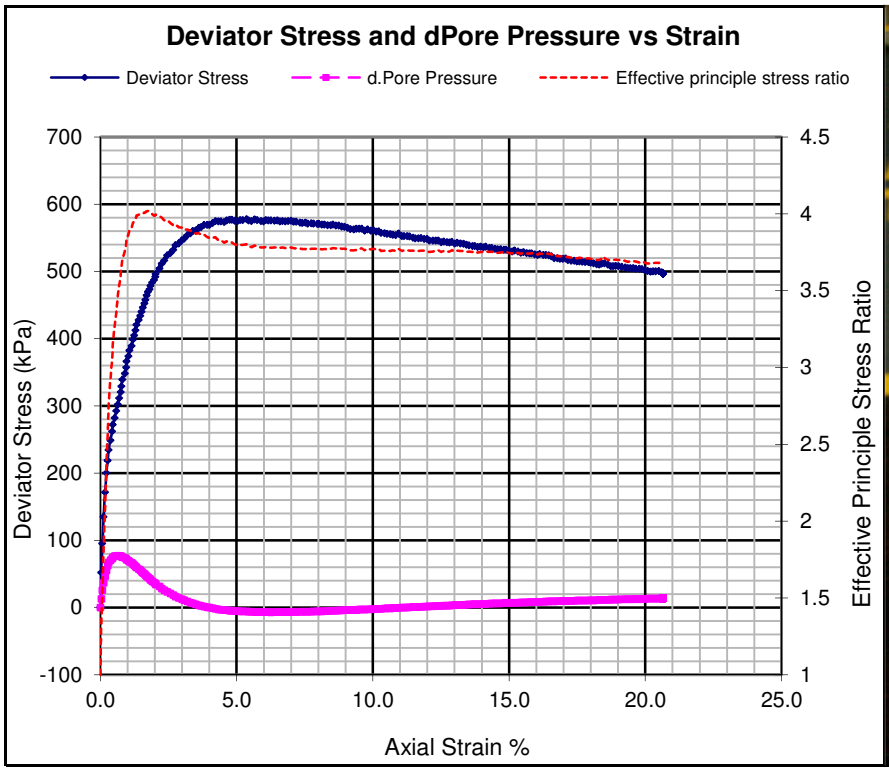
Initial pore pressure (kPa): 536.9 Final pore pressure (kPa): 345.1 Pore pressure dissipation: 97%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	346.8	Initial effective stress (kPa):	200.2		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	1.75				
Deviator stress (kPa):	469.5	Principle Stresses (kPa)			
Excess pore pressure (kPa):	44.6	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.017	669.8	625.2	200.2	155.6

Deviator stress corrections: Membrane correction: 1.1 kPa



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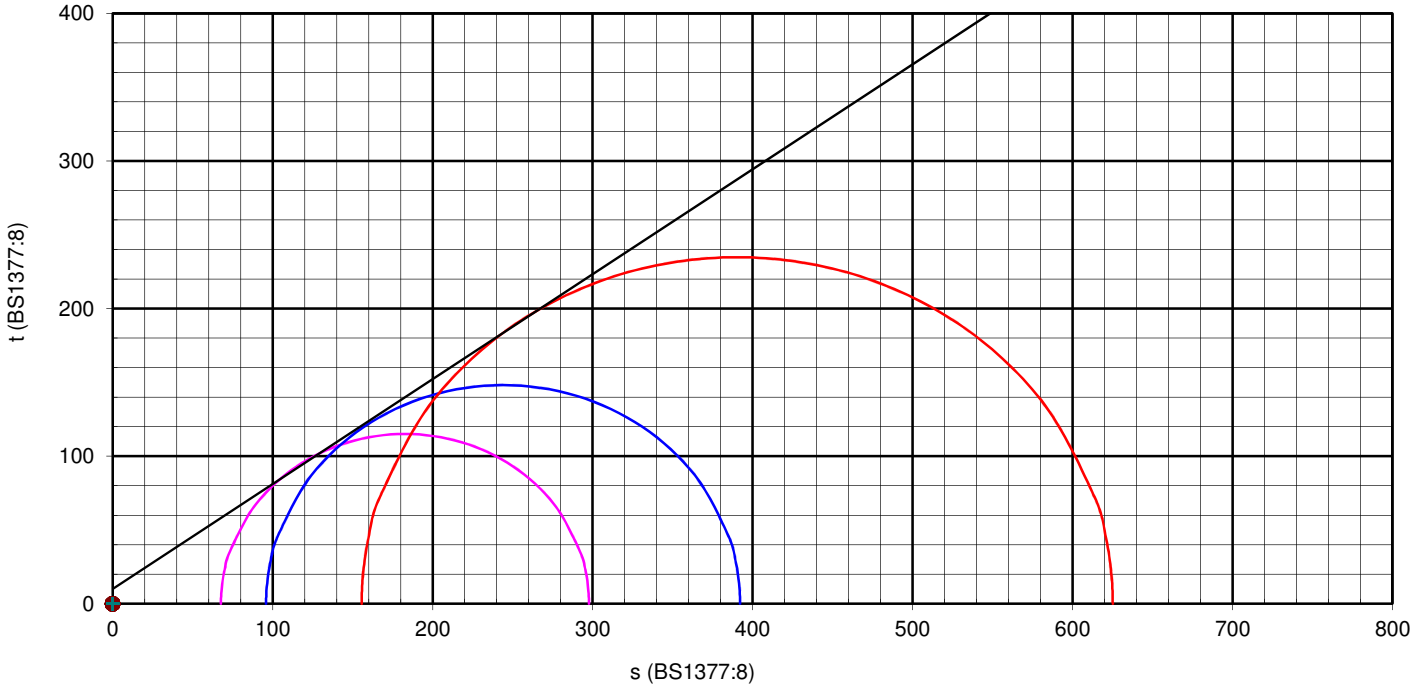
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D061
Field Sample Reference:	TP 11	Depth (m):	0.2 - 0.7

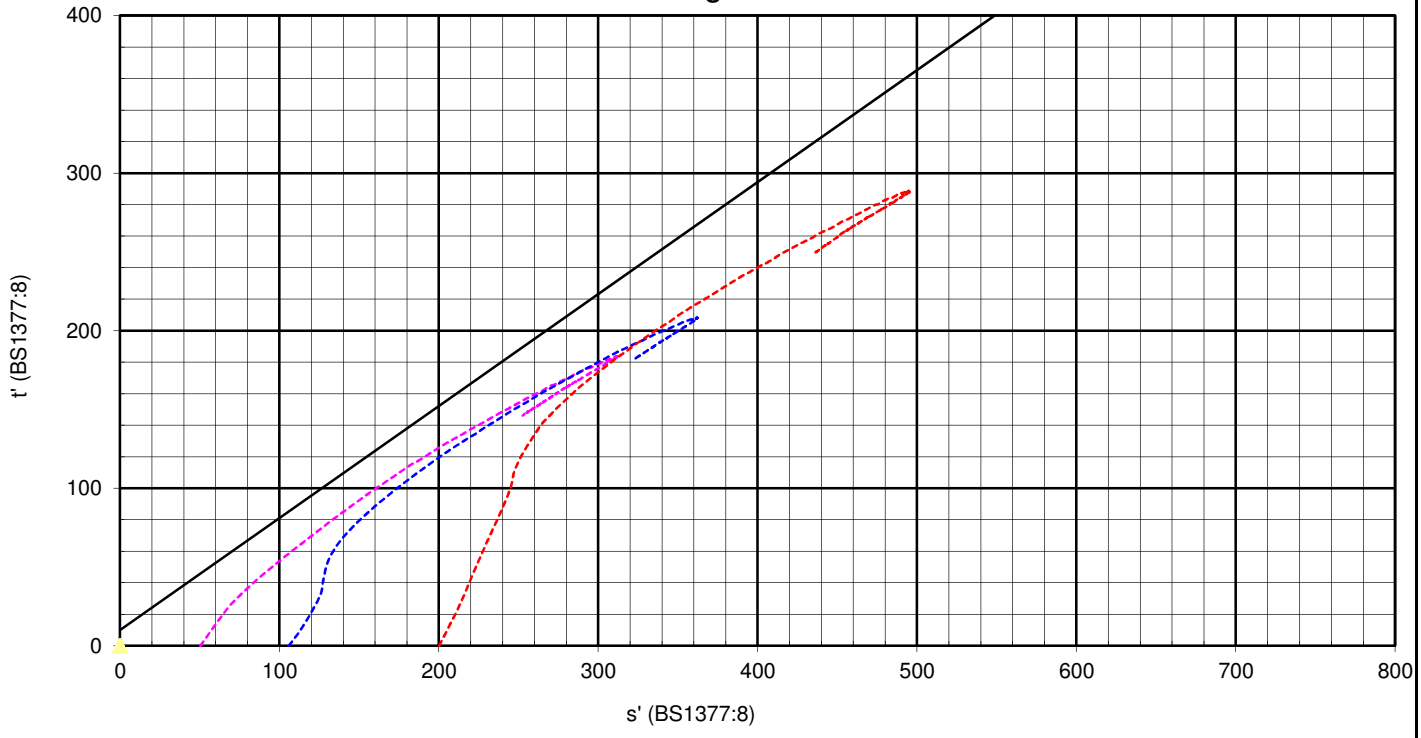
Effective Shear Strength

Stresses	Cohesion (kPa)	Internal friction (Degrees)
Total	42.6	26.7
Effective	10.0	35.4

Effective Shear Strength - Mohr circles at failure



Effective Shear Strength - Stress Paths



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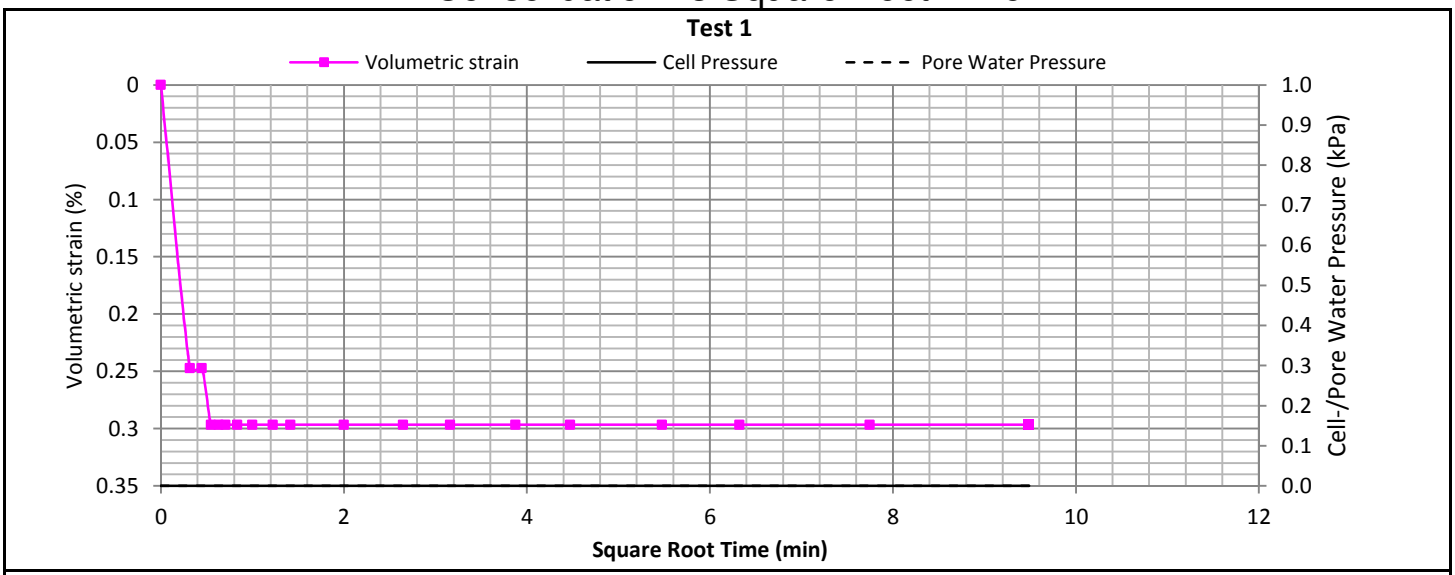
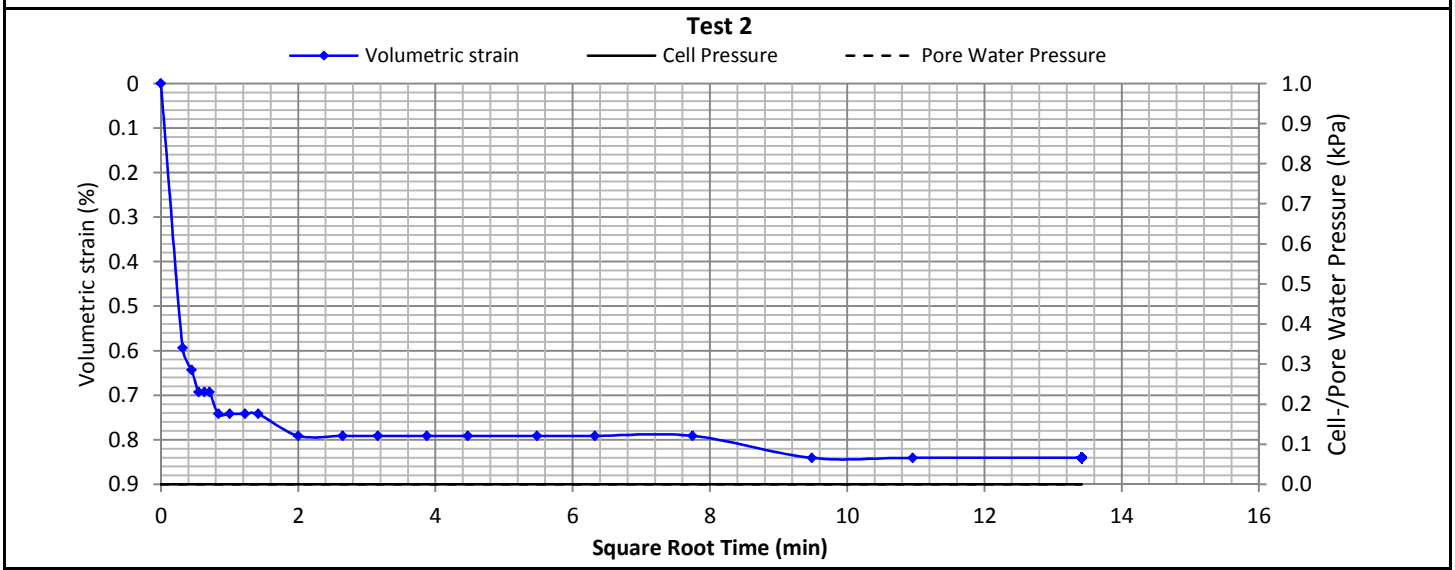
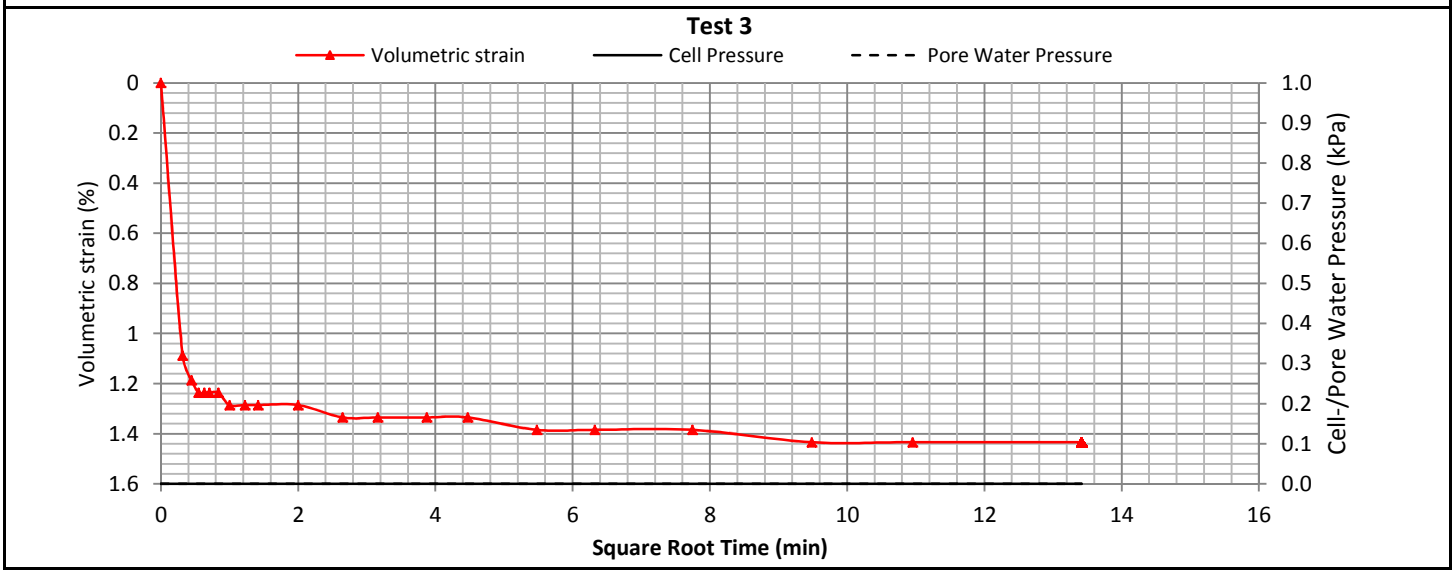
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D061
Field Sample Reference:	TP 11	Depth (m):	0.2 - 0.7

Consolidation vs Square Root Time







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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D063
Field Sample Number:	TP 15	Depth (m):	0.25 - 0.75

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 1

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	457.0	Final back pressure (kPa):	447.0	Final B parameter:	0.95

CONSOLIDATION DATA

Effective cons. Stress (kPa): 51.9 t100 (minutes): 36 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*100	*50	1963.50	12.1	2039	0.3853	89	2.825 Determined
CONSOLIDATED	99.75	49.87	1953.50	12.7	2055	0.3748	96	
FINAL (After shear)	92.76	51.72	2100.58	12.7	2055	0.3748	96	

Initial pore pressure (kPa): 485.4 Final pore pressure (kPa): 445.4 Pore pressure dissipation: 88%

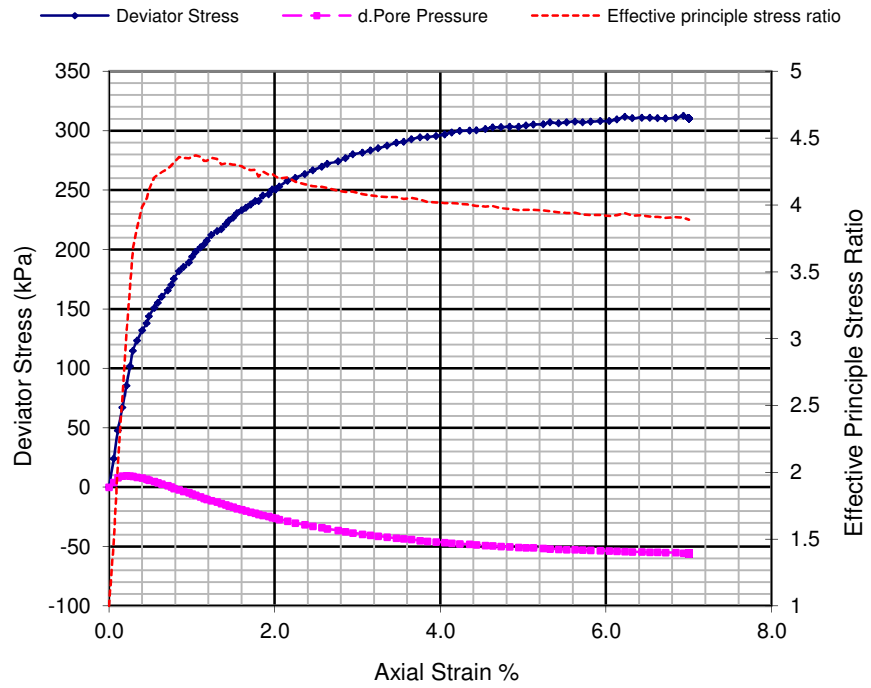
*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	445.1	Initial effective stress (kPa):	51.9		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	1.05				
Deviator stress (kPa):	198.1	Principle Stresses (kPa)			
Excess pore pressure (kPa):	-6.9	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.370	249.9	256.8	51.9	58.8

Deviator stress corrections: Membrane correction: 1.1 kPa

Deviator Stress and dPore Pressure vs Strain



Specimen Failure

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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D063
Field Sample Number:	TP 15	Depth (m):	0.25 - 0.75

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated. Multistage Loading.

Test No. 2

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	457.0	Final back pressure (kPa):	447.0	Final B parameter:	0.95

CONSOLIDATION DATA

Effective cons. Stress (kPa): 93.1 t100 (minutes): 56 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*93.76	*51.72	2100.58	12.1	2033	0.3895	88	2.825 Determined
CONSOLIDATED	93.54	51.60	2090.94	12.7	2047	0.3799	95	
FINAL (After shear)	86.64	53.61	2257.38	12.7	2047	0.3800	95	

Initial pore pressure (kPa): 444.0 Final pore pressure (kPa): 444.0 Pore pressure dissipation: 0%

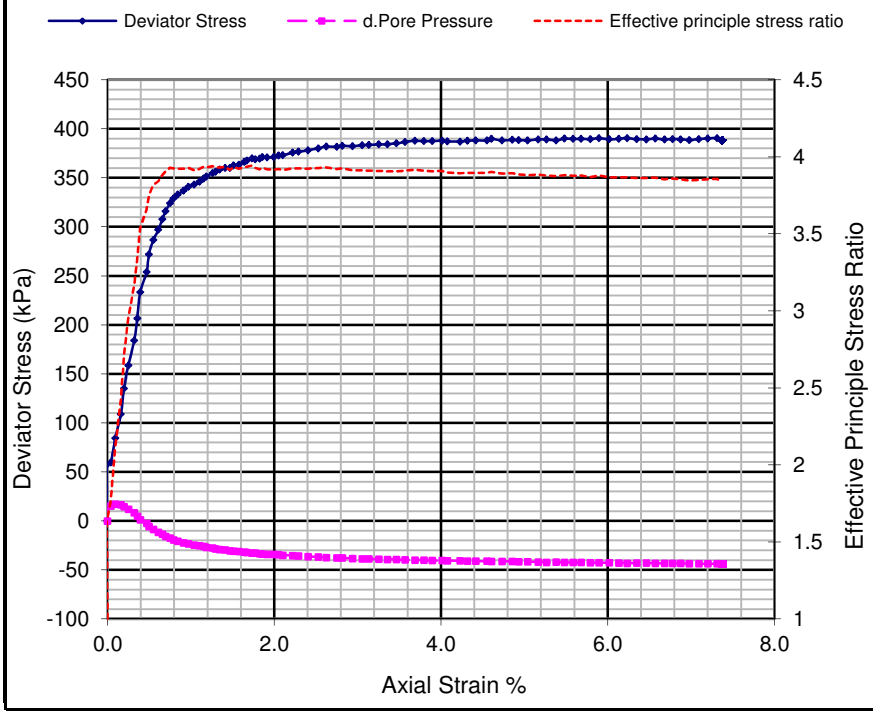
*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	453.9	Initial effective stress (kPa):	93.1		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	1.73				
Deviator stress (kPa):	370.0	Principle Stresses (kPa)			
Excess pore pressure (kPa):	-32.7	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	3.942	463.1	495.7	93.1	125.7

Deviator stress corrections: Membrane correction: 1.1 kPa

Deviator Stress and dPore Pressure vs Strain



Specimen Failure

See Test No.2

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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D063
Field Sample Number:	TP 15	Depth (m):	0.25 - 0.75

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks:	A Consolidated Undrained test on a remoulded sample tested saturated. Multistage Loading.

Test No. 3

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	457.0	Final back pressure (kPa):	447.0	Final B parameter:	0.95

CONSOLIDATION DATA

Effective cons. Stress (kPa): 197.2 t100 (minutes): 120 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*93.54	*53.61	2257.38	12.1	1896	0.4898	70	2.825 Determined
CONSOLIDATED	93.26	53.45	2243.66	12.7	1914	0.4762	75	
FINAL (After shear)	87.38	55.22	2394.56	12.7	1914	0.4762	75	

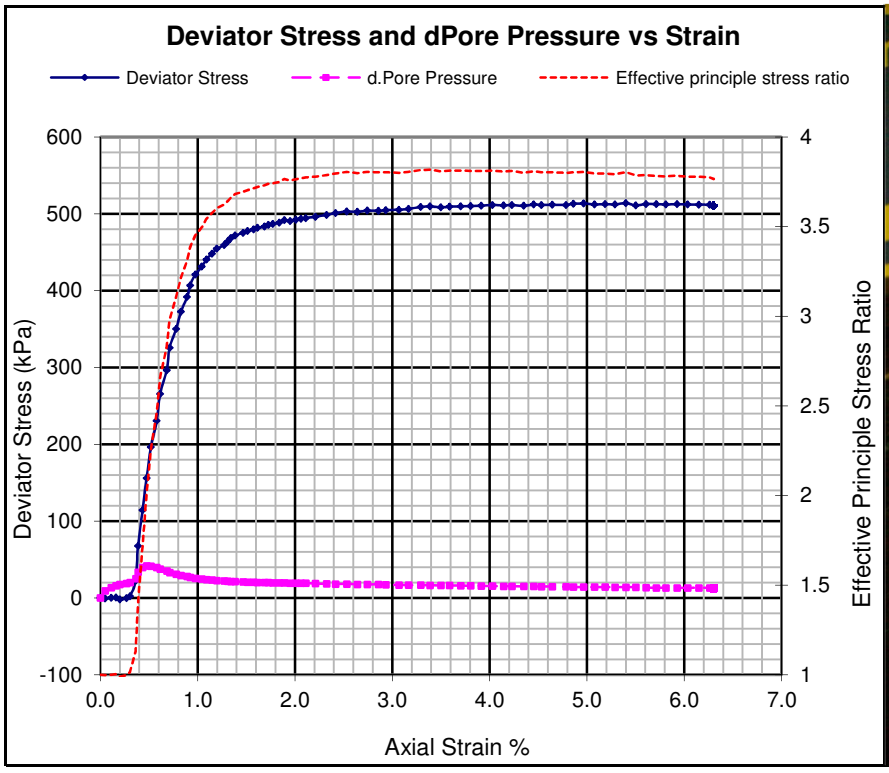
Initial pore pressure (kPa): 444.0 Final pore pressure (kPa): 444.0 Pore pressure dissipation: 0%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	4.8				
Initial pore pressure (kPa):	449.8	Initial effective stress (kPa):	197.2		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	3.39				
Deviator stress (kPa):	509.5	Principle Stresses (kPa)			
Excess pore pressure (kPa):	16.4	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	3.818	706.7	690.3	197.2	180.8

Deviator stress corrections: Membrane correction: 0 kPa



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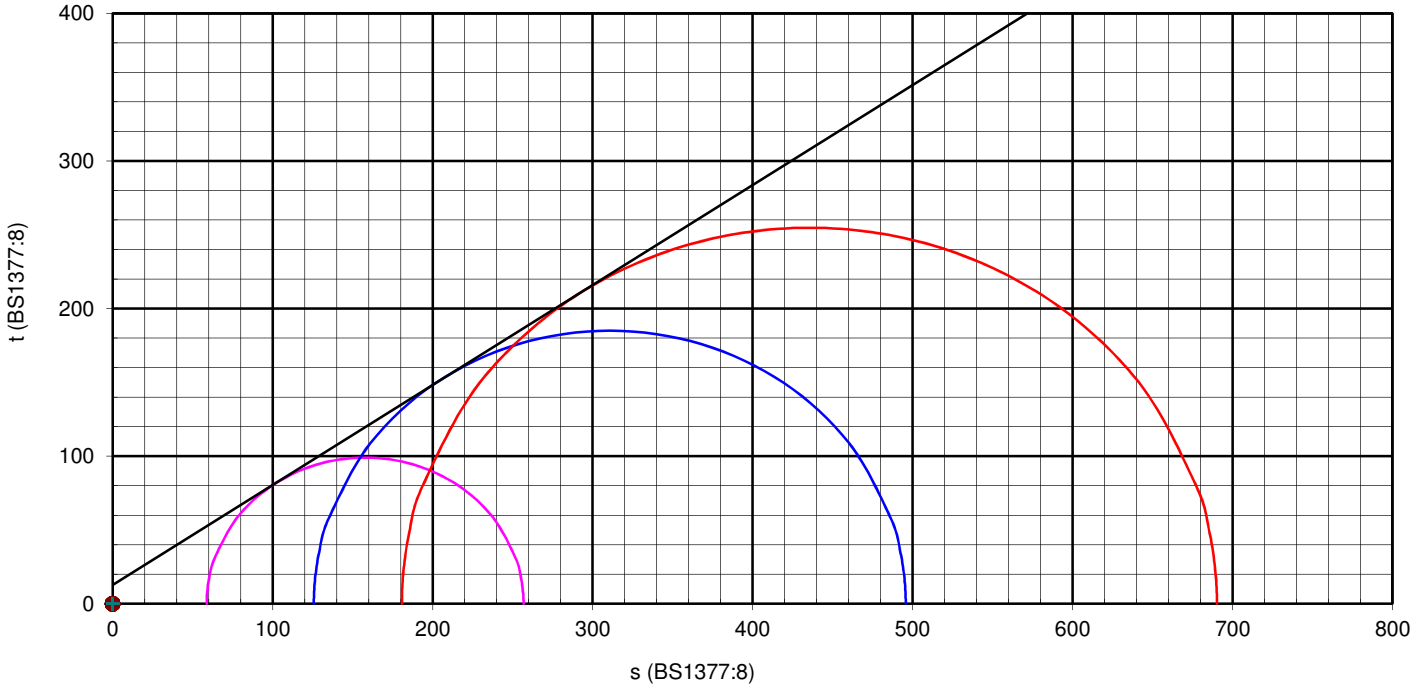
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D063
Field Sample Reference:	TP 15	Depth (m):	0.25 - 0.75

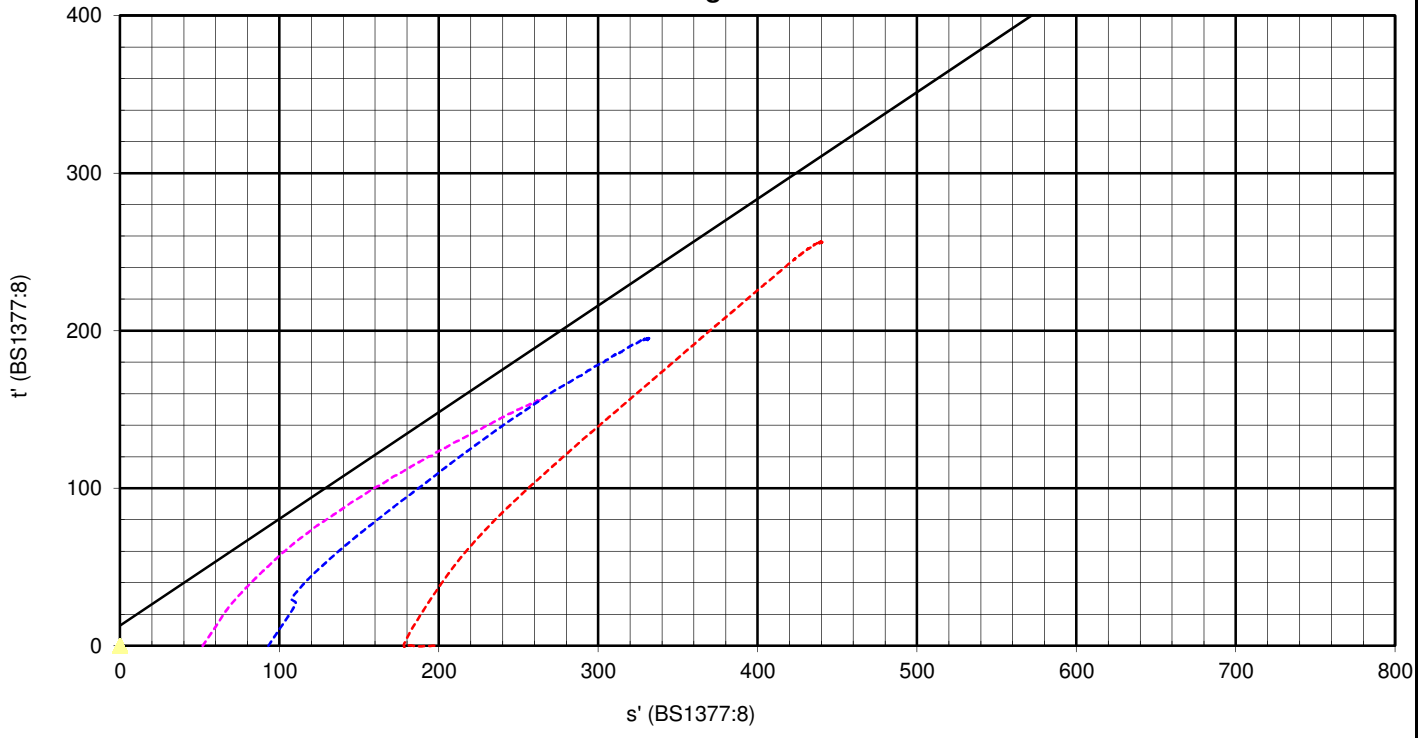
Effective Shear Strength

Stresses	Cohesion (kPa)	Internal friction (Degrees)
Total	34.6	30.7
Effective	12.8	34.1

Effective Shear Strength - Mohr circles at failure



Effective Shear Strength - Stress Paths



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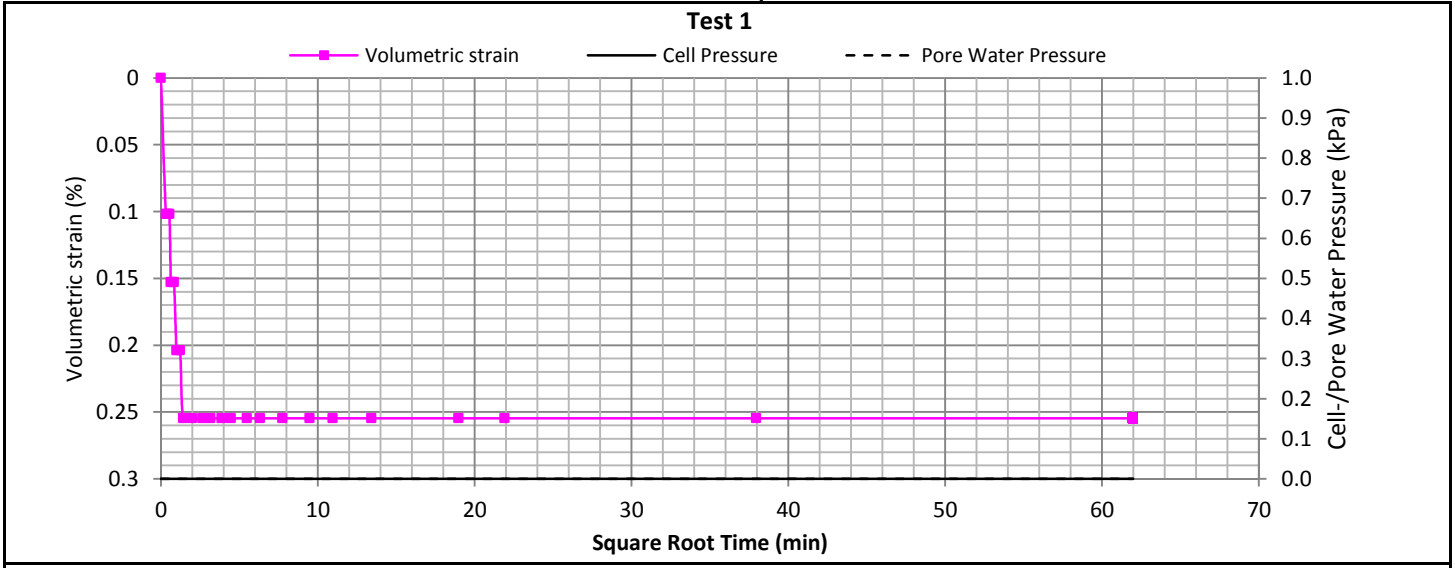
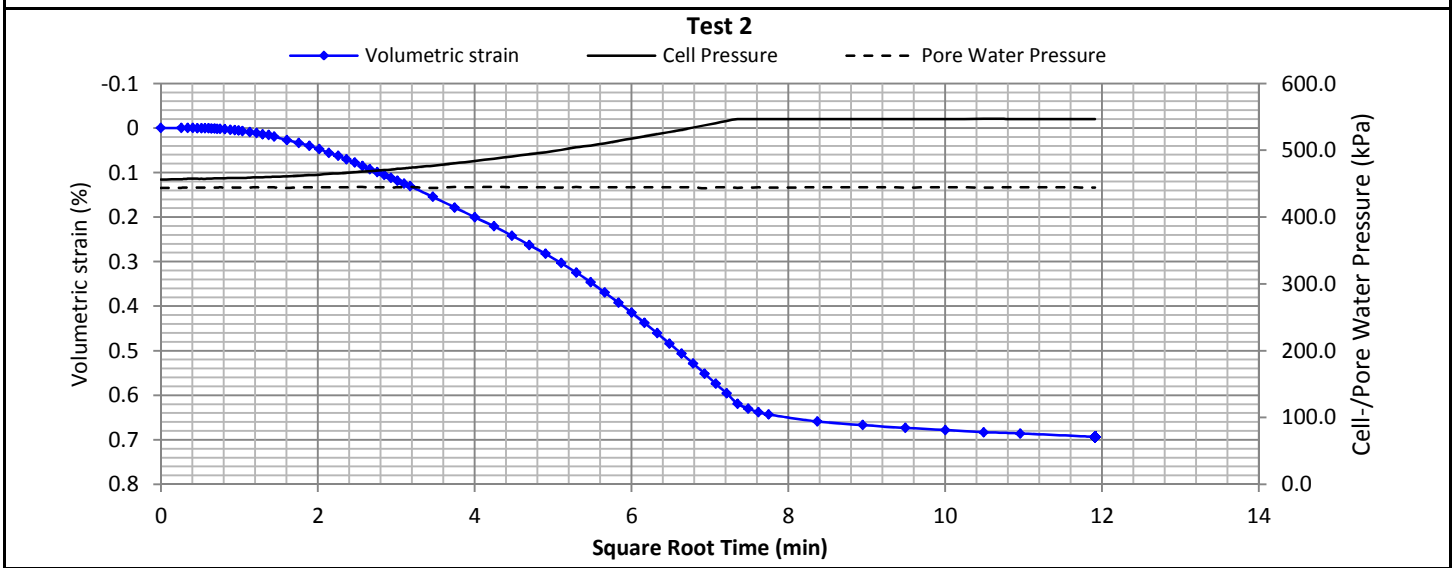
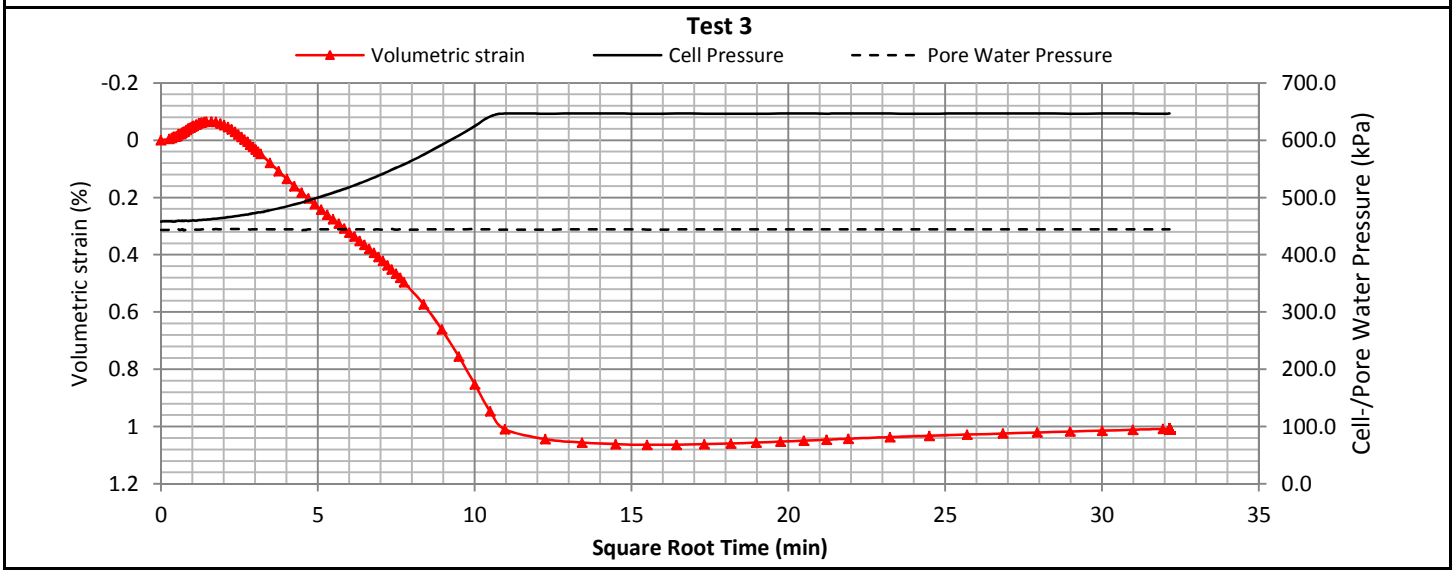
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	19/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D063
Field Sample Reference:	TP 15	Depth (m):	0.25 - 0.75

Consolidation vs Square Root Time







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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	15/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D064
Field Sample Number:	TP 16	Depth (m):	0.35 - 0.85

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 1

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	357.0	Final back pressure (kPa):	347.0	Final B parameter:	0.98

CONSOLIDATION DATA

Effective cons. Stress (kPa): 50.8 t100 (minutes): 0 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*102	*50	1963.50	8.2	1915	0.4805	48	2.835 Determined
CONSOLIDATED	101.88	49.94	1958.92	15.9	1922	0.4754	95	
FINAL (After shear)	81.50	55.84	2448.70	15.9	1922	0.4754	95	

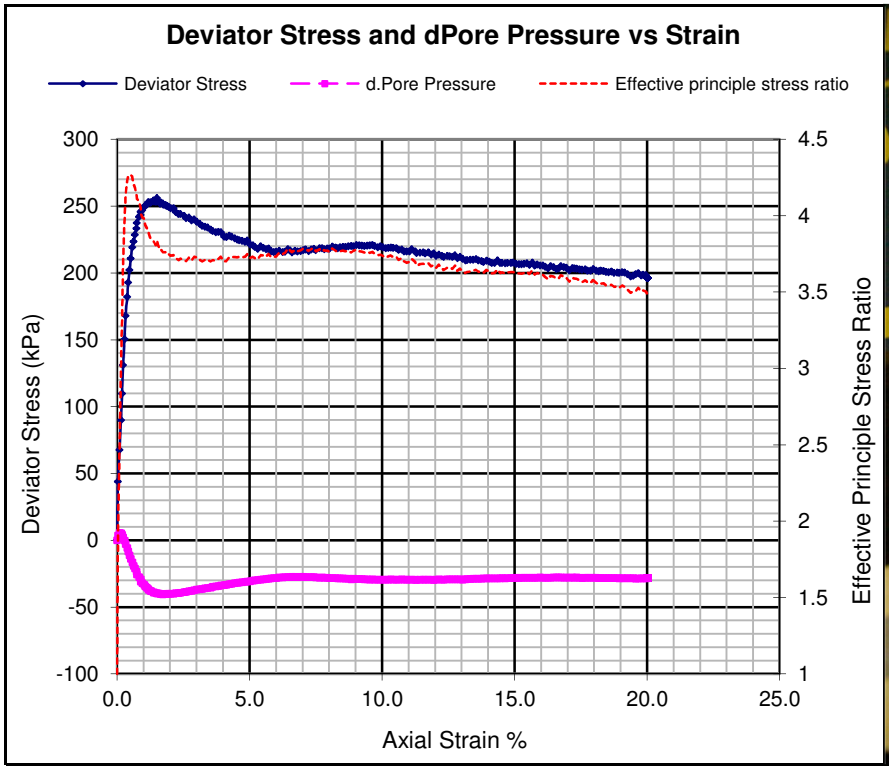
Initial pore pressure (kPa): 386.6 Final pore pressure (kPa): 341.9 Pore pressure dissipation: 96%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	346.2	Initial effective stress (kPa):	50.8		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	0.47				
Deviator stress (kPa):	202.1	Principle Stresses (kPa)			
Excess pore pressure (kPa):	-11.1	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.265	252.9	264.0	50.8	61.9

Deviator stress corrections: Membrane correction: 1.1 kPa



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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	15/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D064
Field Sample Number:	TP 16	Depth (m):	0.35 - 0.85

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 2

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	357.0	Final back pressure (kPa):	347.0	Final B parameter:	0.98

CONSOLIDATION DATA

Effective cons. Stress (kPa): 101.4 t100 (minutes): 0 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*102	*50	1963.50	8.6	1912	0.4825	50	2.835 Determined
CONSOLIDATED	101.81	49.91	1956.31	15.1	1923	0.4743	90	
FINAL (After shear)	88.14	53.64	2259.89	15.1	1923	0.4743	90	

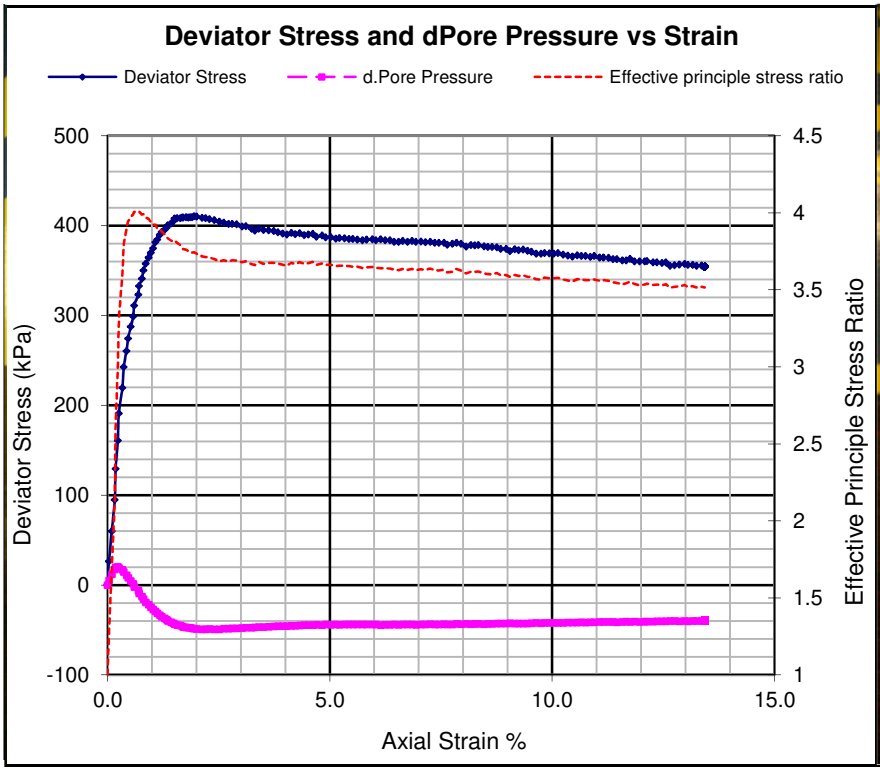
Initial pore pressure (kPa): 435.9 Final pore pressure (kPa): 345.1 Pore pressure dissipation: 95%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	345.6	Initial effective stress (kPa):	101.4		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	0.69				
Deviator stress (kPa):	323.0	Principle Stresses (kPa)			
Excess pore pressure (kPa):	-6.0	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	4.009	424.4	430.4	101.4	107.4

Deviator stress corrections: Membrane correction: 1.1 kPa



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Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	15/07/2011
Batch No.:	1039/F19/06/2011	Laboratory Number:	D064
Field Sample Number:	TP 16	Depth (m):	0.35 - 0.85

This test was carried out in accordance with BS 1377:Part 8:1990 Clause 4,5,6,7

Remarks: A Consolidated Undrained test on a remoulded sample tested saturated.

Test No. 3

SATURATION DATA

Saturation method:	Alternating increments of cell- & back pressure				
Pressure increments applied (kPa):	50,70,100,100,100			Differential pressure (kPa):	10.0
Final cell pressure (kPa):	357.0	Final back pressure (kPa):	347.0	Final B parameter:	0.98

CONSOLIDATION DATA

Effective cons. Stress (kPa): 202.7 t100 (minutes): 0 Side drains fitted: No

	Height mm	Diameter mm	Area mm^2	Moisture Content %	Dry Density kg/m^3	Void Ratio	Saturation %	Specific Gravity
INITIAL (Before saturation)	*101	*50	1963.50	8.2	1937	0.4633	50	2.835 Determined
CONSOLIDATED	100.68	49.84	1950.95	15.0	1956	0.4493	95	
FINAL (After shear)	85.86	53.97	2287.66	15.0	1956	0.4494	95	

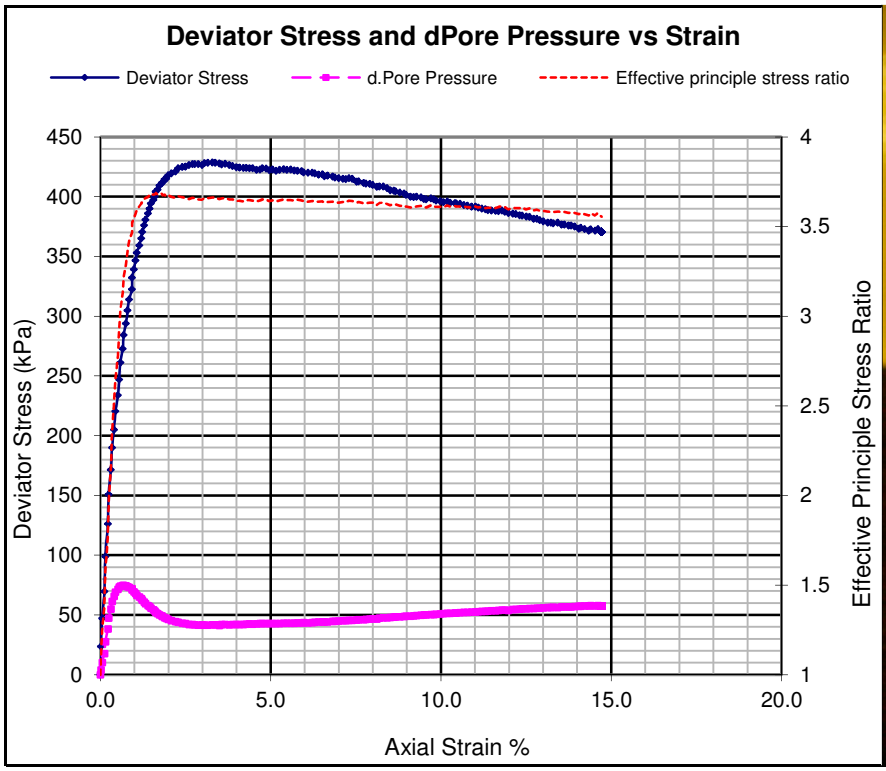
Initial pore pressure (kPa): 534.4 Final pore pressure (kPa): 344.1 Pore pressure dissipation: 98%

*: Measured dimensions; all other dimensions are calculated.

SHEAR DATA

Rate of strain (%/hour):	9				
Initial pore pressure (kPa):	344.3	Initial effective stress (kPa):	202.7		
Parameters at failure:					
Failure Criterion:	Max. Effective Principle Stress Ratio				
Axial strain (%):	1.63				
Deviator stress (kPa):	404.3	Principle Stresses (kPa)			
Excess pore pressure (kPa):	52.2	σ_1	σ_1'	σ_3	σ_3'
Effective principle stress ratio:	3.687	606.9	554.8	202.7	150.5

Deviator stress corrections: Membrane correction: 1.1 kPa



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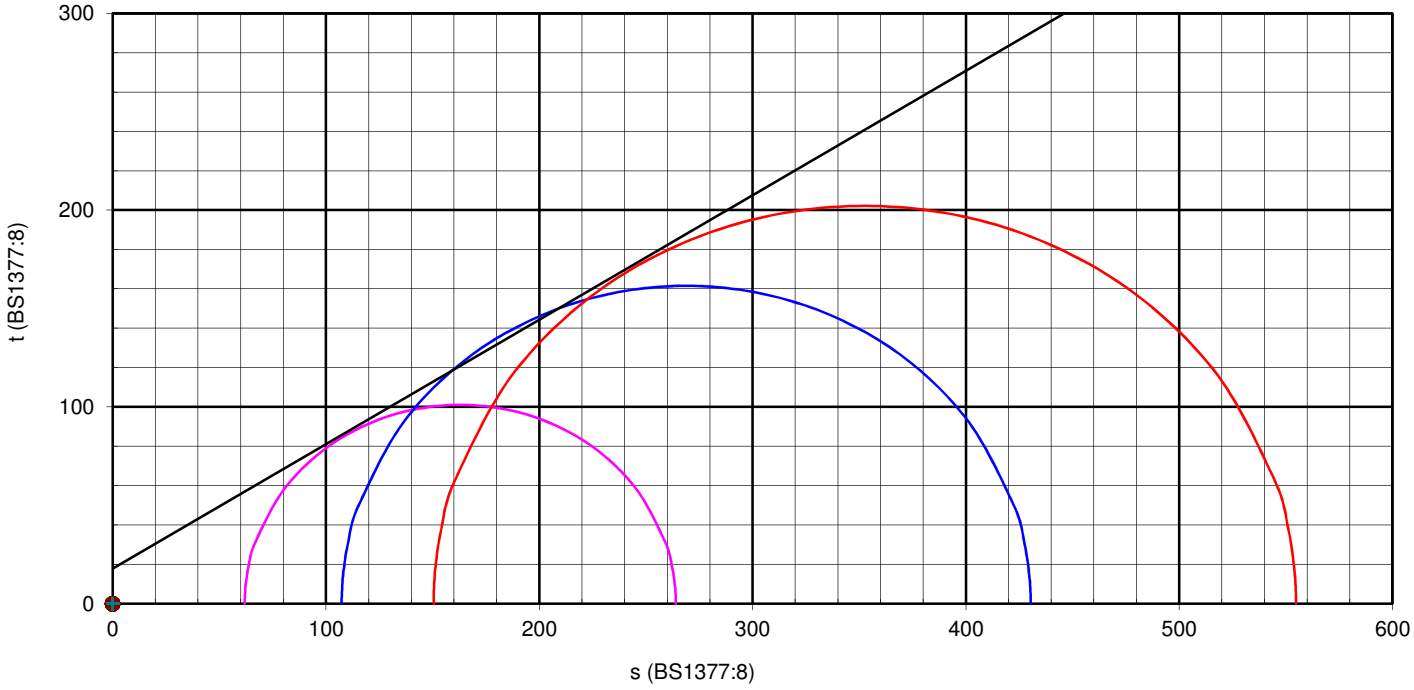
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	15/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D064
Field Sample Reference:	TP 16	Depth (m):	0.35 - 0.85

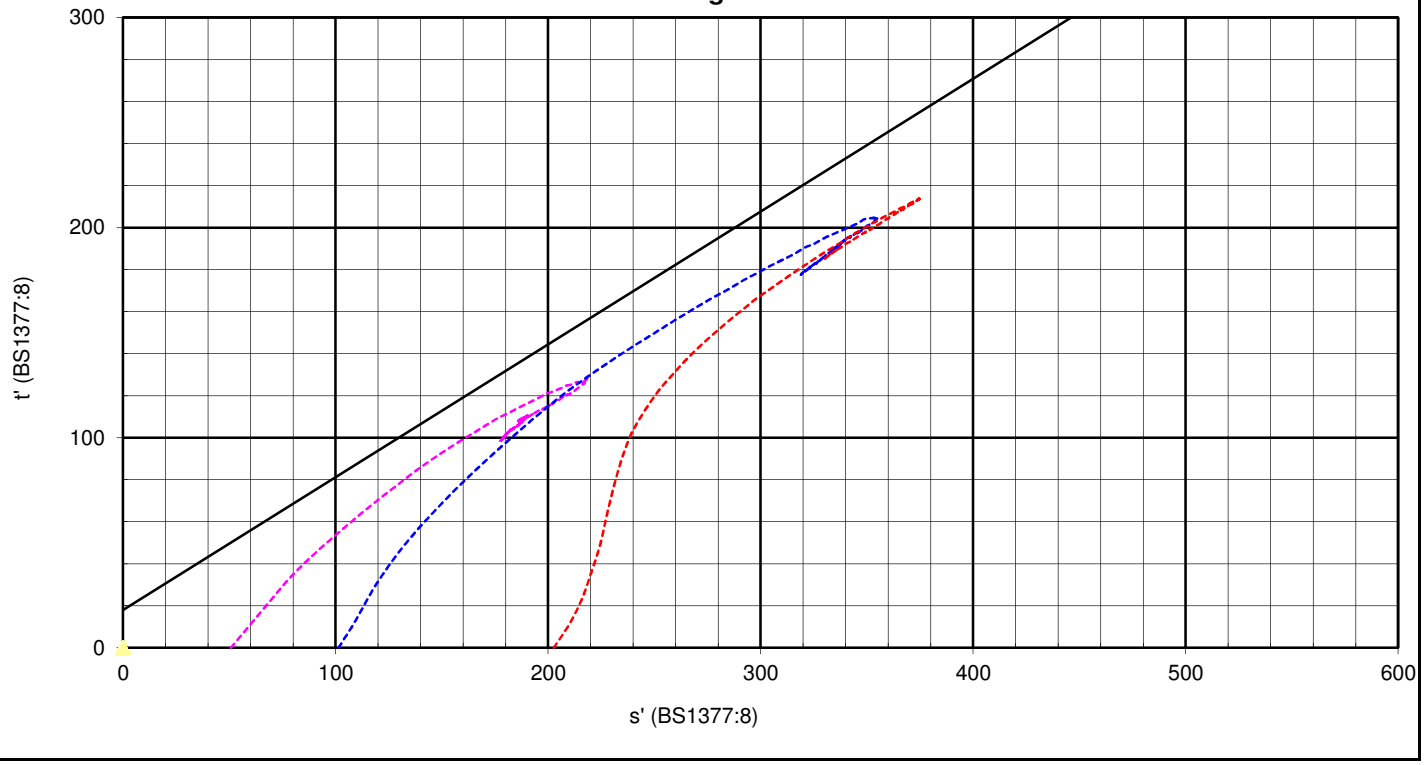
Effective Shear Strength

Stresses	Cohesion (kPa)	Internal friction (Degrees)
Total	51.3	23.2
Effective	17.9	32.3

Effective Shear Strength - Mohr circles at failure



Effective Shear Strength - Stress Paths



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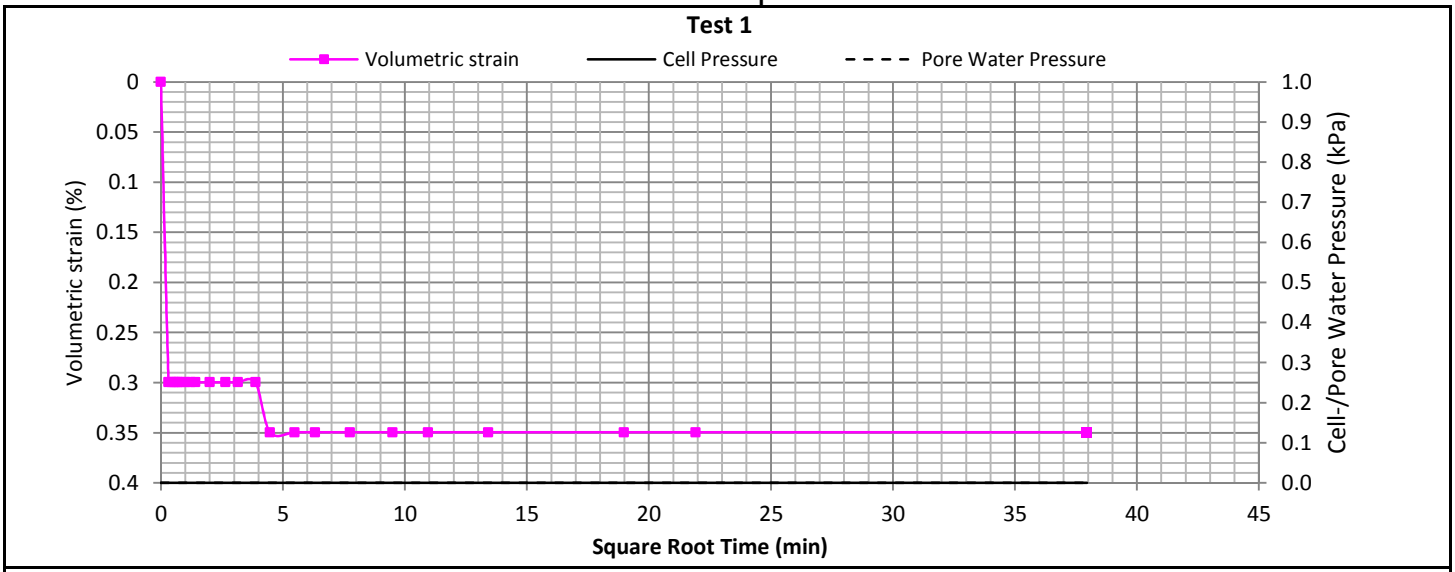
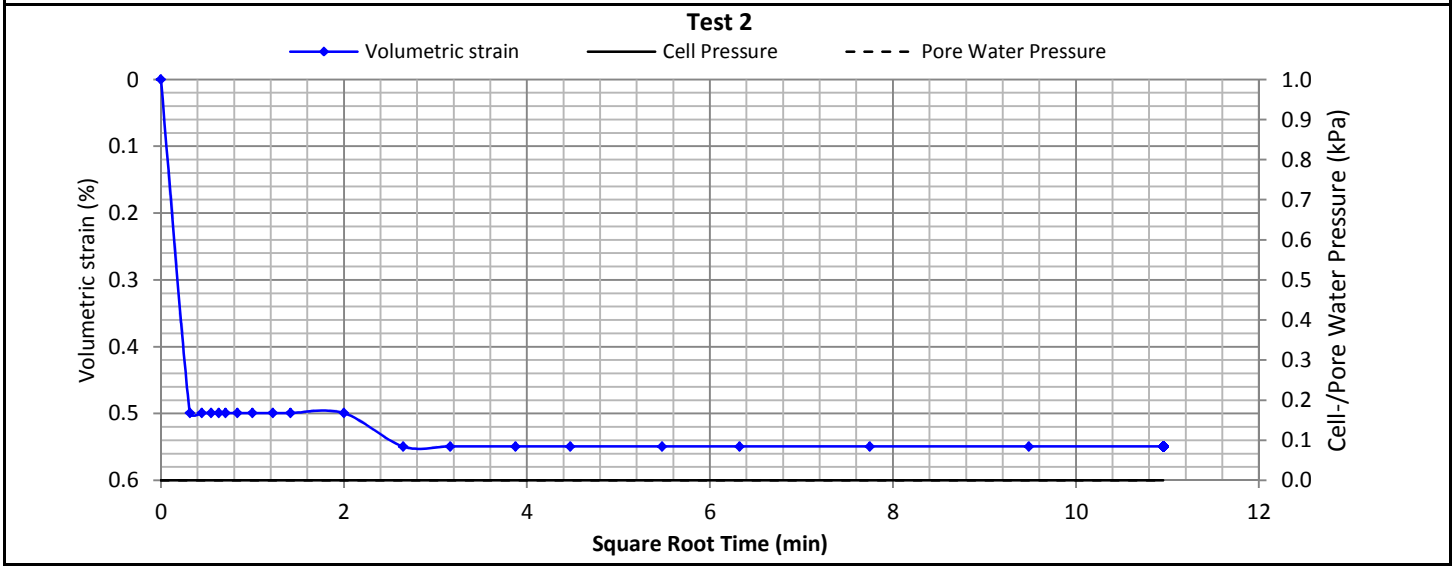
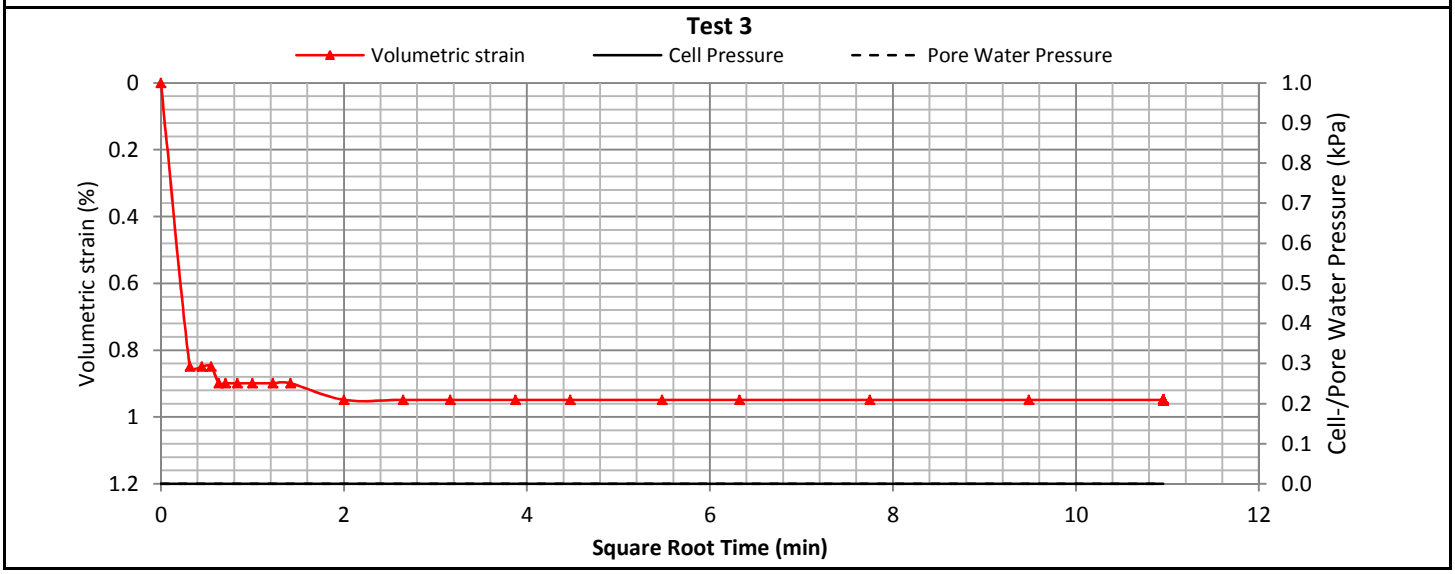
Triaxial Compression Test Results

Project:	BELFAST MINE	Date Tested:	15/07/2011
Proj.No.:	1039/F19/06/2011	Laboratory Number:	D064
Field Sample Reference:	TP 16	Depth (m):	0.35 - 0.85

Consolidation vs Square Root Time







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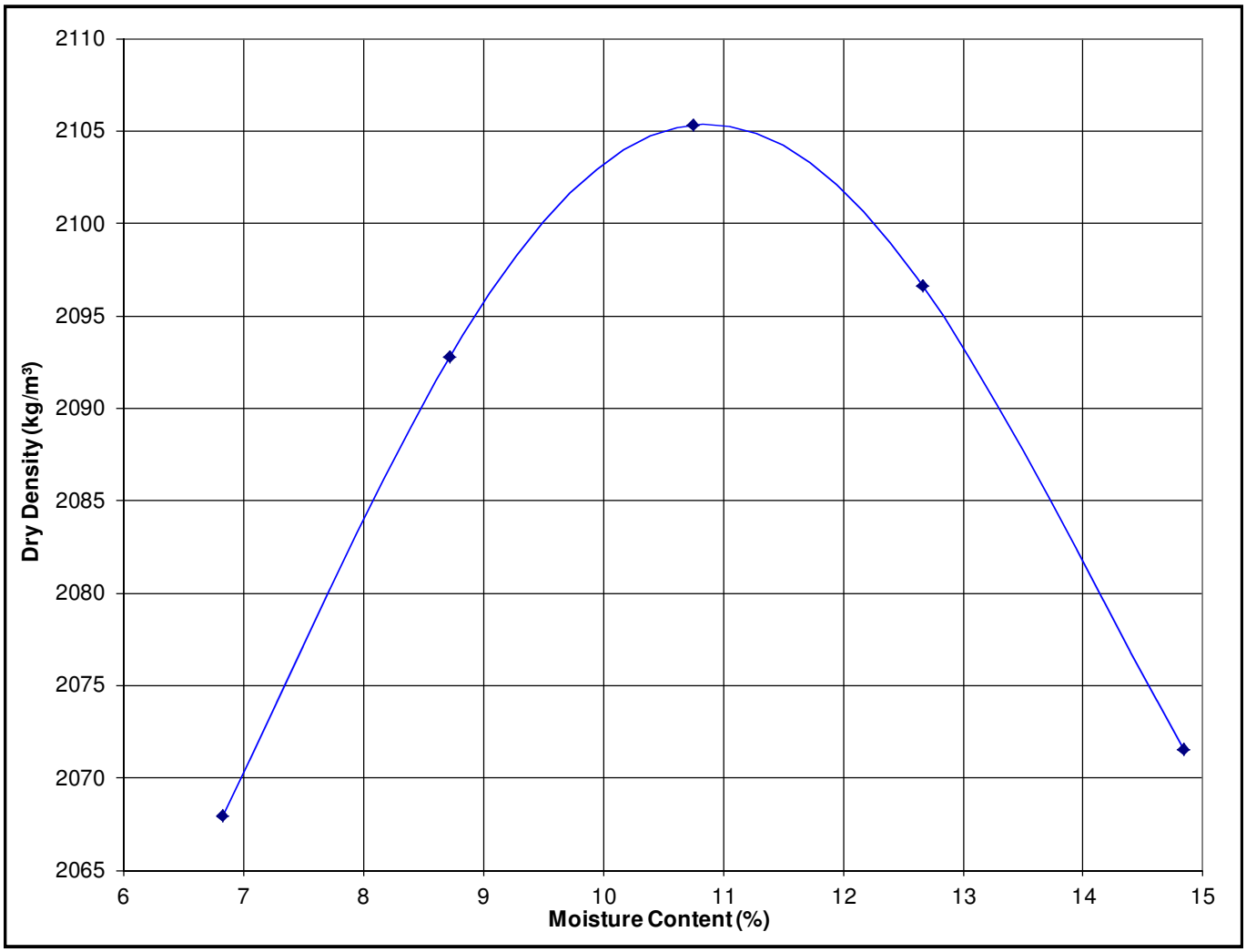
Moisture Density Relationship

Project:	BELFAST MINE		
Project No.:	1039/F19/06/2011	Date:	17 June 2011
Field Reference:	TP 11	Laboratory Ref.:	D061
Depth (m):	0.2 - 0.7	Remarks:	Untreated
Description:	-		

Compactive Effort: **STD PROCTOR**

Percent Water Content (%):	12.7	14.8	10.8	8.7	6.8				
Dry Density (kg/m^3):	2097	2072	2105	2093	2068				

Maximum Dry Density:	**2105 kg/m^3**	**Optimum Moisture Content:**	**10.8 %**



Analysis according to Method A7 of TMH1 of 1986.
The results relate only to the samples tested.
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Remarks:

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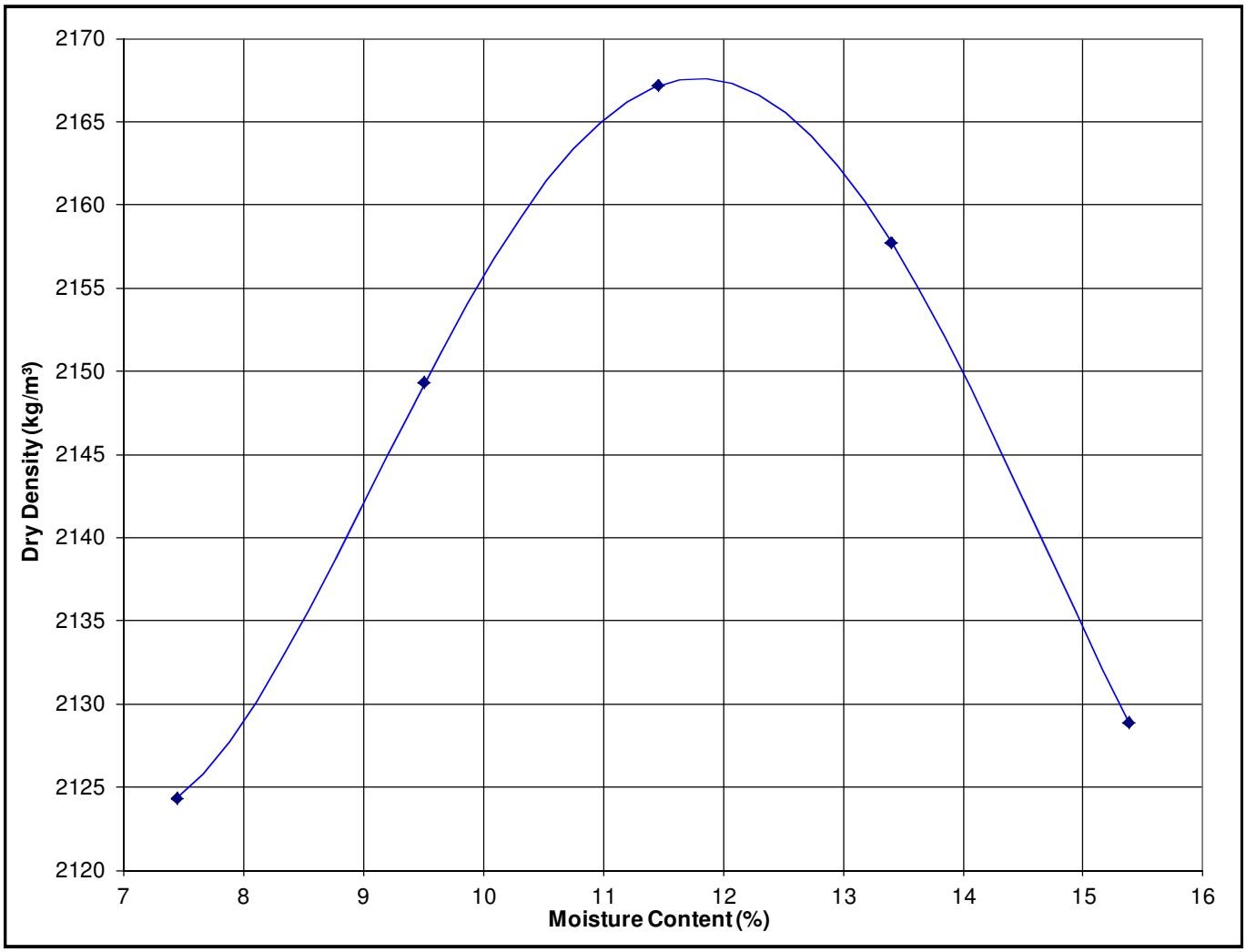
Moisture Density Relationship

Project:	BELFAST MINE		
Project No.:	1039/F19/06/2011	Date:	17 June 2011
Field Reference:	TP 15	Laboratory Ref.:	D063
Depth (m):	0.25 - 0.75	Remarks:	Untreated
Description:	-		

Compactive Effort: **STD PROCTOR**

Percent Water Content (%):	13.4	15.4	11.5	9.5	7.4				
Dry Density (kg/m^3):	2158	2129	2167	2149	2124				

Maximum Dry Density:	**2168 kg/m^3**	**Optimum Moisture Content:**	**11.9 %**



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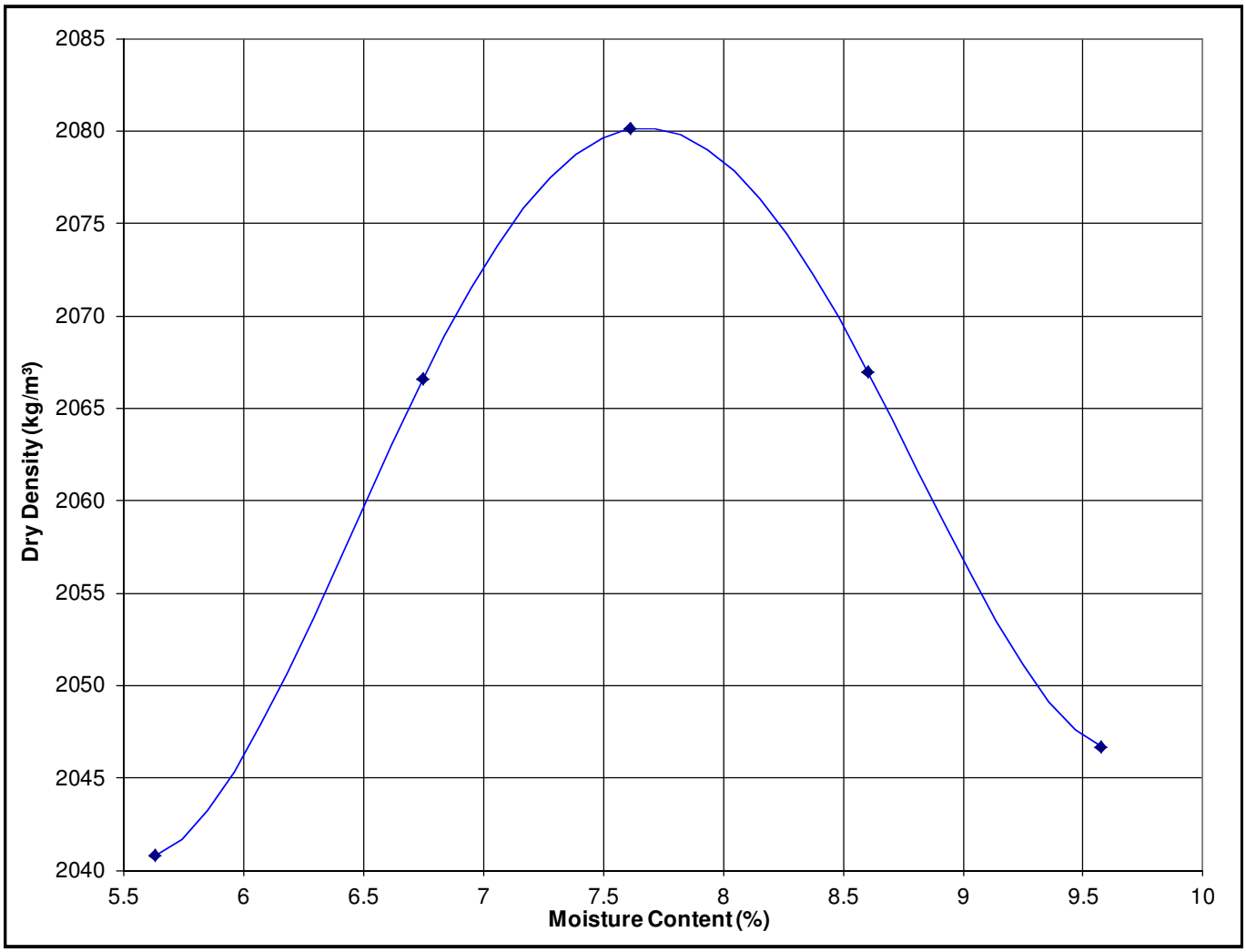
Moisture Density Relationship

Project:	BELFAST MINE		
Project No.:	1039/F19/06/2011	Date:	17 June 2011
Field Reference:	TP 16	Laboratory Ref.:	D064
Depth (m):	0.35 - 0.85	Remarks:	Untreated
Description:	-		

Compactive Effort: **STD PROCTOR**

Percent Water Content (%):	7.6	8.6	6.7	9.6	5.6				
Dry Density (kg/m^3):	2080	2067	2067	2047	2041				

Maximum Dry Density:	**2080 kg/m^3**	**Optimum Moisture Content:**	**7.7 %**



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Falling Head Permeability Test Results

Project:	BELFAST MINE		
Project No:	F19/06/2011	Date:	23/06/2011

Lab. Sample Reference	Field Sample Reference	Depth (m)	Moisture Contents		Dry Density (kg /m^3)	Coefficient of Permeability (m/s)		
			Before Test (%)	After Test (%)		Range		Average
						Minimum	Maximum	
D061	TP 11	0.2 - 0.7	14.6	15.7	1971	1.6E-08	1.8E-08	**1.7E-08**
D063	TP 15	0.25 - 0.75	13.9	13.1	2061	2.2E-08	3.2E-08	**2.6E-08**
D064	TP 16	0.35 - 0.85	10.1	13.8	1969	4.8E-08	6.8E-08	**5.9E-08**

Remarks: Samples remoulded to 95% Proctor.
Saturated and tested under a load of 100kPa.
Densities reported are under a load of 100kPa.

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WATER AND WASTE WATER PROCESS CONSULTANTS

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

LANGELIER SATURATION AND RYZNAR STABILITY INDICES , AGGRESSIVENESS INDEX
AND CHLORIDE + SULPHATE TO ALKALINITY CORROSIVITY RATIO

CLIENT	**JEFFARES & GREEN**
ORDER NO	**2812**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

RHC REF.	**PM 2011-6/21**
DATE RECEIVED	**21 JUNE 2011**

1.1 CHEMICAL ANALYSIS Results are in mg/l unless otherwise stated.		**1.2. CORROSIVITY INDICES**	
DETERMINANT	TP 6 @ 0.30 - 0.90 m	INDEX	VALUE
pH	5.7	Stability pH (pHs) at 20°C	10.6
Conductivity (mS/m)	2	Langelier Index at 20°C	-4.9
Total dissolved solids (Calculated)	13	Ryznar Stability Index at 20°C	15.5
Total Hardness as $CaCO_3$	4	Aggressiveness Index	6.5
Calcium Hardness as $CaCO_3$	2	Cl and SO4 Corrosivity Index	2.4
Calcium as Ca	1	(Corrosivity Ratio)	
Magnesium as Mg	0		
Total Alkalinity as $CaCO_3$	5		
Chloride as Cl	1		
Sulphate as SO_4	10		

2. INTERPRETATION OF CORROSIVITY INDICES

2.1 AGGRESSIVENESS TOWARDS CONCRETE AND FIBRE CEMENT PIPES

INDEX	AGGRESSIVE	NEUTRAL	NON-AGGRESSIVE	COMMENTS
a) STABILITY pH, pHs	< pH	= pH	>pH	According to the corrosivity indices, the soil is very highly corrosive towards concrete and metals. According to the Basson Index, the soil is very highly corrosive towards concrete.
b) LANGELIER INDEX	NEG. VALUE	ZERO	POS. VALUE	
c) RYZNAR INDEX	> 7,5	6 - 7	< 6	
d) AGGRESSIVENESS INDEX, AI	< 10	10 - 12	> 12	

2.2 CORROSIVENESS TOWARDS METALS

	CORROSIVE
CORROSIVITY RATIO	> 0,2

JRH HOFFMANN 24 JUNE 2011

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

REF : PM 2011-6/21

AGGRESSIVENESS TOWARDS CONCRETE : AGGRESSIVENESS INDEX
(PORTLAND CEMENT INSTITUTE - J.J. BASSON PUBLICATION)

CLIENT	**JEFFARES & GREEN**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

DETERMINANT	TP 6 @ 0.30 - 0.90 m	VALUE	CONSTANT	INDEX
pH		5.7	200	760
Calcium Carbonate Saturated pH		10.0	-2000	8600
Calcium Hardness as $CaCO_3$		2	2.2	1096
Total Ammonium as NH_4		0.8	10	8
Magnesium as Mg		0	0.6	0
Sulphates as SO_4		10	0.3	3
Chlorides as Cl		1	0.2	0.2
Total Dissolved Solids		13		
Leaching - corrosion sub-index , LCSI				3485
Spalling - corrosion sub-index , SCSI				4
Final aggressiveness index at 25 Degr. C, corrected for stagnant conditions, Nc				**1746**

GUIDELINES FOR ASSESSING FINAL INDEX

FINAL INDEX	AGGRESSIVENESS	RECOMMENDATION
Under 350	Non to mildly aggressive	Use concrete class as required for structural design
350 - 750	Mildly to fairly aggressive	Good concrete design and construction essential
750 - 1000	Highly aggressive	Identify dominant corrosion sub-index Follow recommendations
Over 1000	Very highly corrosive	Do not use in contact with unprotected concrete

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

LANGELIER SATURATION AND RYZNAR STABILITY INDICES , AGGRESSIVENESS INDEX
AND CHLORIDE + SULPHATE TO ALKALINITY CORROSIVITY RATIO

CLIENT	**JEFFARES & GREEN**
ORDER NO	**2812**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

RHC REF.	**PM 2011-6/21**
DATE RECEIVED	**21 JUNE 2011**

1.1 CHEMICAL ANALYSIS Results are in mg/l unless otherwise stated.		**1.2. CORROSIVITY INDICES**	
DETERMINANT	TP 11 @ 0.20 - 0.70 m	INDEX	VALUE
pH	6.3	Stability pH (pHs) at 20℃	10.5
Conductivity (mS/m)	2	Langelier Index at 20℃	-4.2
Total dissolved solids (Calculated)	13	Ryznar Stability Index at 20℃	14.6
Total Hardness as $CaCO_3$	5	Aggressiveness Index	7.3
Calcium Hardness as $CaCO_3$	2	Cl and SO4 Corrosivity Index	1.9
Calcium as Ca	1	(Corrosivity Ratio)	
Magnesium as Mg	1		
Total Alkalinity as $CaCO_3$	7		
Chloride as Cl	2		
Sulphate as SO_4	10		

2. INTERPRETATION OF CORROSIVITY INDICES

2.1 AGGRESSIVENESS TOWARDS CONCRETE AND FIBRE CEMENT PIPES

INDEX	AGGRESSIVE	NEUTRAL	NON-AGGRESSIVE	COMMENTS
a) STABILITY pH, pHs	< pH	= pH	>pH	According to the corrosivity indices, the soil is very highly corrosive towards concrete and metals. According to the Basson Index, the soil is very highly corrosive towards concrete.
b) LANGELIER INDEX	NEG. VALUE	ZERO	POS. VALUE	
c) RYZNAR INDEX	> 7,5	6 - 7	< 6	
d) AGGRESSIVENESS INDEX, AI	< 10	10 - 12	> 12	

2.2 CORROSIVENESS TOWARDS METALS

	CORROSIVE
CORROSIVITY RATIO	> 0,2

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

REF : PM 2011-6/21

AGGRESSIVENESS TOWARDS CONCRETE : AGGRESSIVENESS INDEX
(PORTLAND CEMENT INSTITUTE - J.J. BASSON PUBLICATION)

CLIENT	**JEFFARES & GREEN**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

DETERMINANT	TP 11 @ 0.20 - 0.70 m	VALUE	CONSTANT	INDEX
pH		6.3	200	640
Calcium Carbonate Saturated pH		10.0	-2000	7400
Calcium Hardness as $CaCO_3$		2	2.2	1096
Total Ammonium as NH_4		0.8	10	8
Magnesium as Mg		1	0.6	0
Sulphates as SO_4		10	0.3	3
Chlorides as Cl		2	0.2	0.4
Total Dissolved Solids		13		
Leaching - corrosion sub-index , LCSI				3045
Spalling - corrosion sub-index , SCSI				4
Final aggressiveness index at 25 Degr. C, corrected for stagnant conditions, Nc				**1526**

GUIDELINES FOR ASSESSING FINAL INDEX

FINAL INDEX	AGGRESSIVENESS	RECOMMENDATION
Under 350	Non to mildly aggressive	Use concrete class as required for structural design
350 - 750	Mildly to fairly aggressive	Good concrete design and construction essential
750 - 1000	Highly aggressive	Identify dominant corrosion sub-index Follow recommendations
Over 1000	Very highly corrosive	Do not use in contact with unprotected concrete

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

LANGELIER SATURATION AND RYZNAR STABILITY INDICES , AGGRESSIVENESS INDEX
AND CHLORIDE + SULPHATE TO ALKALINITY CORROSIVITY RATIO

CLIENT	**JEFFARES & GREEN**
ORDER NO	**2812**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

RHC REF.	**PM 2011-6/21**
DATE RECEIVED	**21 JUNE 2011**

1.1 CHEMICAL ANALYSIS Results are in mg/l unless otherwise stated.		**1.2. CORROSIVITY INDICES**	
DETERMINANT	TP 16 @ 0.35 - 0.85 m	INDEX	VALUE
pH	6.2	Stability pH (pHs) at 20°C	10.7
Conductivity (mS/m)	2	Langelier Index at 20°C	-4.5
Total dissolved solids (Calculated)	13	Ryznar Stability Index at 20°C	15.2
Total Hardness as $CaCO_3$	5	Aggressiveness Index	7.0
Calcium Hardness as $CaCO_3$	2	Cl and SO4 Corrosivity Index	3.8
Calcium as Ca	1.0	(Corrosivity Ratio)	
Magnesium as Mg	1.0		
Total Alkalinity as $CaCO_3$	4		
Chloride as Cl	2		
Sulphate as SO_4	12		

2. INTERPRETATION OF CORROSIVITY INDICES

2.1 AGGRESSIVENESS TOWARDS CONCRETE AND FIBRE CEMENT PIPES

INDEX	AGGRESSIVE	NEUTRAL	NON-AGGRESSIVE	COMMENTS
a) STABILITY pH, pHs	< pH	= pH	>pH	According to the corrosivity indices, the soil is very highly corrosive towards concrete and metals. According to the Basson Index, the soil is very highly corrosive towards concrete.
b) LANGELIER INDEX	NEG. VALUE	ZERO	POS. VALUE	
c) RYZNAR INDEX	> 7,5	6 - 7	< 6	
d) AGGRESSIVENESS INDEX, AI	< 10	10 - 12	> 12	

2.2 CORROSIVENESS TOWARDS METALS

	CORROSIVE
CORROSIVITY RATIO	> 0,2

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DETERMINATION OF CORROSIVITY OF SOIL SAMPLES

REF : PM 2011-6/21

AGGRESSIVENESS TOWARDS CONCRETE : AGGRESSIVENESS INDEX
(PORTLAND CEMENT INSTITUTE - J.J. BASSON PUBLICATION)

CLIENT	**JEFFARES & GREEN**
SAMPLE IDENTIFICATION :	**BELFAST MINE**

DETERMINANT	TP 16 @ 0.35 - 0.85 m	VALUE	CONSTANT	INDEX
pH		6.2	200	660
Calcium Carbonate Saturated pH		10.0	-2000	7600
Calcium Hardness as $CaCO_3$		2	2.2	1096
Total Ammonium as NH_4		0.2	10	2
Magnesium as Mg		1	0.6	0
Sulphates as SO_4		12	0.3	3.6
Chlorides as Cl		2	0.2	0.4
Total Dissolved Solids		13		
Leaching - corrosion sub-index , LCSI				3119
Spalling - corrosion sub-index , SCSI				2
Final aggressiveness index at 25 Degr. C, corrected for stagnant conditions, Nc				**1561**

GUIDELINES FOR ASSESSING FINAL INDEX

FINAL INDEX	AGGRESSIVENESS	RECOMMENDATION
Under 350	Non to mildly aggressive	Use concrete class as required for structural design
350 - 750	Mildly to fairly aggressive	Good concrete design and construction essential
750 - 1000	Highly aggressive	Identify dominant corrosion sub-index Follow recommendations
Over 1000	Very highly corrosive	Do not use in contact with unprotected concrete

Annexure H:
CONCEPT DESIGN DRAWINGS

LIST OF A3 CONCEPT DESIGN DRAWINGS:

Drawing 002802-BP- 1: Drainage Plan

Drawing 002802-BP- 2: Dirty and Clean Water Catchments

Drawing 002802-BP- 3: Plant – Drains and Terrace Areas

Drawing 002802-BP- 4: Typical Drains and Linings

Drawing 002802-BP- 5: Cut-off Drains, Stilling Basins and Road Cross-sections

Drawing 002802-BP- 6: Typical Silt Traps

Drawing 002802-BP- 7: Typical Spillway Details

Drawing 002802-BP- 8: Low Level Structure

Drawing 002802-BP- 9: Dam Linings and Sump Details

Drawing 002802-BP- 10: Stockpile Linings

Drawing 002802-BP- 11: Typical Box Culvert – Normal Loads

Drawing 002802-BP- 12: Typical Culverts – Abnormal Loads

Drawing 002802-BP- 13: Longitudinal Section (C1 to C30, C2-C5b)

Drawing 002802-BP- 14: Longitudinal Section (C29 to D5)

Drawing 002802-BP- 15: Longitudinal Section (P28 to C10)

Drawing 002802-BP- 16: Longitudinal Section (C23 to D5)

Drawing 002802-BP- 17: Return Water Dam Sections (1 of 2)

Drawing 002802-BP- 18: Return Water Dam Sections (2 of 2)