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REPORT STRUCTURE

VOLUME I: OPERATIONAL REPORT (BS EN ISO 19901)	VOLUME II: GEOTECHNICAL RESULTS REPORT (BS EN ISO 19901)	VOLUME III: DATA INTEGRATION AND ENGINEERING REPORT (BS EN ISO 19901-8)
Executive Summary	Executive Summary	Executive Summary
1. Scope of Project	1. Scope of Project	1. Scope of Project
2. Offshore Activities	2. Soil Description and Profiles	2. Summary of Soil Conditions
3. Drilling Operations	3. Classification Test Results	3. Assessment of Data
4. InSitu testing-CPTU	4. Triaxial Laboratory Results	4. Ground Model
5. InSitu testing-PS Logging	5. Direct Simple Shear Results	5. Representative Basic Soil Parameters
6. Sampling Operations	6. Chemical Results	6. Stress History Parameters
7. Field Laboratory	7. Laboratory Testing Procedures	7. Deformation Parameters
8. Preliminary Geotechnical logs and Soil profiles	8. CPTU Analysis	8. Static Soil Strength Parameters
9. Classification Laboratory results	9. In Situ Testing - PS Logging	9. Cyclic Soil Strength Parameters
10. CPTU Analysis	10. List of Symbols and Abbreviations	10. Recommended Soil Parameters
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EXECUTIVE SUMMARY

This report presents the combined sampling and CPTU borehole log and laboratory test results for the Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area (MD WEA). The site is located in the North Atlantic Ocean, approximately 10km off the coast of Maryland. Detailed locations are shown in Appendix 1.1.

The objective of the investigation was to collect suitable geotechnical data in order to assess and select suitable foundations for the development of the wind farm. Across the site, the boreholes were comprised of combined undisturbed soil sampling, downhole CPTU data acquisition and PS Logging data acquisition.

A total of seven combined sampling and CPTU boreholes were completed during the Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area. A minimum penetration of 64.94m was achieved at BH-MET TOWER and a maximum penetration of 75.24m was reached at BH-G7.

Where operations were halted on a borehole, and the equipment recovered, a new borehole was started adjacent to continue combined sampling and CPTU operations. These new locations are denoted with the suffix A or B respectively and have been presented as a single borehole location.

Table 1 provides a summary of fieldwork; including the number of boreholes completed, fieldwork dates and vessel details. The water depth at the proposed Maryland Wind Energy Area ranged from 12.20m to 42.00m. Section 6 in the Field Operations report provides more detail regarding water depth and tidal measurements.

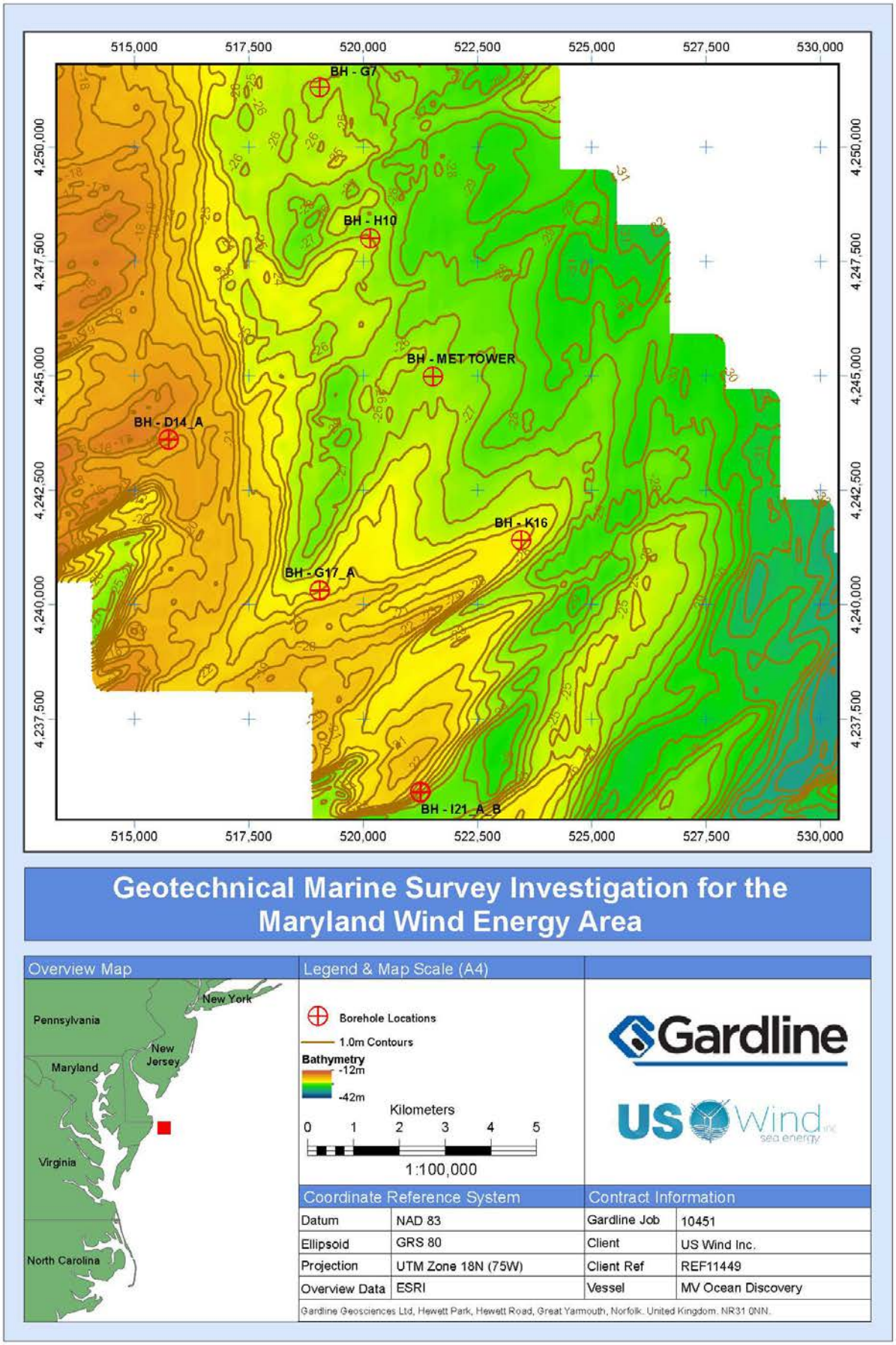
Table 1 Fieldwork Summary

Fieldwork Summary	
Survey Vessel	M.V. Ocean Discovery
Fieldwork dates	22 June 2015 – 07 July 2015
Composite CPTU & sample Borehole	7
PS logging locations	4

This report contains the results from all acquired samples and laboratory testing.

The investigation allowed the soil stratigraphy to 75.24m to be established. The soils encountered are discussed in further detail in Section 2.1.

Figure 1 Location of the Maryland Wind Energy site



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VOLUME II: GEOTECHNICAL RESULTS

1. Scope of Project

1.1 General

This report presents the geotechnical results for the Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area obtained between 22 June 2015 and 07 July 2015 (see Figure 1).

Seven boreholes were drilled at representative locations at the Maryland Wind Farm site. The purpose was to collect suitable geotechnical data in order to assess and select suitable foundations for the development of the wind farm. Boreholes comprised of combined undisturbed soil sampling, downhole CPTU data acquisition and PS Logging data acquisition.

2. Soil Description and Profiles

2.1 General

This section presents the borehole logs with the laboratory test results being discussed in subsequent sections.

A location map for Maryland Wind Energy Area is shown in Appendix 1.1.

2.2 Soil Layering

The borehole logs include the soil logging, laboratory results and interpreted borehole results (Appendix 2.1). Table 2.1 details the parameters presented on the logs.

Table 2.1 Dataset presented on logs

Data Type	Symbol	Data Units
Soil Description	-	-
Undrained Shear Strength	S_u	kPa
Natural Moisture Content	-	%
Atterberg Limits	-	%
Density	-	Mg/m^3
Relative Density	D_r	%
Corrected Cone Resistance	q_t	MPa
Sleeve Friction	f_s	MPa
Pore Pressure	U_2	kPa
Ambient Pore Pressure	-	kPa

Layer boundaries have been chosen based the soil descriptions, classification tests and shear strength measurements from laboratory testing.

Results from samples with CPTU interpretation enabled us to establish distinct soil layers for each location, as presented in Tables 2.2 to 2.8.

Table 2.2 General Description of Soil Layers – BH-D14 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Localised poorly graded SAND locally gravelly. Sand is medium to coarse. Sand is dense to very dense. Light brown becoming dark grey.
	Sandy CLAY with some stratifications of clayey sand. Stiff to very stiff, grey.
Channel Complex	SAND, medium dense to very dense.
	Poorly graded SAND with gravel to Clayey SAND.
Sub-parallel beds	Sandy CLAY. Very stiff.
	Clayey SAND to sandy CLAY.
	Silty SAND. Sand is fine, loose becoming dense, dark grey.
	Sandy CLAY. Very stiff to hard.

Table 2.3 General Description of Soil Layers – BH-G7 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Poorly graded SAND locally with clay and gravel. Sand is medium, medium dense to compact, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly.
Channel Complex	Poorly graded SAND locally with clay and gravel. Sand is medium, medium dense to compact, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly.
	CLAY, Stiff to very stiff, dark grey to dark greyish brown.
Sub-parallel beds	CLAY with sand, locally sandy clay with gravel, very stiff to hard, dark greyish brown. Few lenses and laminations of sand and silt. Few fine to coarse gravel size shell. Few gravel.
	Clayey SAND to poorly graded SAND with silt.
	Sandy CLAY. Sand is fine. Very stiff to hard, grey becoming greyish brown and dry with some fine shell and micaceous. Few to some shell. Stratified with clayey sand. Some laminations of silt and clay.

Table 2.4 General Description of Soil Layers – BH-G17 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Poorly graded SAND with gravel.
Channel Complex	Well graded SAND locally with gravel. Sand is fine to coarse.
	CLAY with sand stratified with sandy clay. Sand is fine. Very stiff to hard, dark grey to dark greyish brown, dry, micaceous. Locally some shell. Trace gravel.
Sub-parallel beds	Silty SAND to Sandy CLAY
	Sandy CLAY. Very stiff to hard with few gravel/shell. Interbedded SAND layers
	SAND, Compact, to Silty SAND.

Table 2.5 General Description of Soil Layers – BH-H10 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Well graded SAND. Fine to coarse, loose becoming dense, olive brown to dark grey. Locally poorly graded sand with gravel. CLAY from 5.10. Firm to stiff.
Channel Complex	Semi graded SAND becoming well graded. Sand is medium to coarse, dense to very dense, olive grey to olive, lenses of gravelly clay.
	Poorly graded SAND with silt. Sand is fine, light olive grey and moist. Trace laminations of clayey sand.
	Sandy CLAY to silty SAND
	Sandy CLAY to Clayey SAND
Sub-parallel beds	Sandy CLAY. Sand is fine, very stiff to hard, olive grey to brownish grey. Laminated with clay with few stratifications of sand.
	Poorly graded SAND with silt. Sand is fine, loose to medium dense, grey with some gravel. Locally some shell.
	Sandy CLAY. Sand is fine to coarse, very stiff to hard, dark grey. Stratified with clayey sand. Sand is fine to coarse, dark grey. Few lenses of clay and trace laminations of coarse sand. Locally some shell
	Clayey SAND, Sand is fine to coarse, dark grey. Little to some shell.
	Silty SAND. Fine to coarse, dark grey, few lenses and few laminations of clay. Few fine gravel and shell.
	CLAY. Very stiff to hard, dark grey and moist. Few weakly cemented lenses of silt. Few black organic staining.
	CLAY with sand. Sand is fine, very stiff to hard, dark grey, moist, mostly laminated with greysilt and fine sand. Little bioturbation infilled with grey silt. Locally mostly shelly.

Table 2.6 General Description of Soil Layers – BH-I21 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Poorly graded SAND. Sand is subangular, medium dense. Sand is light brown becoming dark grey, dry, little shell. Few lenses of black organic staining with mild to strong organic odour.
	Well graded SAND with silt. Sand is fine becoming coarse at 5.90m. Dark grey, with lenses of black organic staining. Sand becomes coarse at 5.90m, with few laminations of clay. Few fine gravel sized shell.
Channel Complex	Well graded SAND. Fine to coarse, dense to compact, dark olive grey, with trace shell fragments. Locally poorly graded. Stratified with poorly graded sand with gravel. Sand is angular and coarse.
	Sandy CLAY. Very stiff, dark greyish brown, few laminations and lenses of silt. Micaceous.
	Silty SAND. Sand is fine. Medium to dense, grey. Stratified with sandy silt.
	Sandy CLAY. Very stiff to hard, firm, grey, dry. Stratified with sandy silt, medium dense. Micaceous.
Sub-parallel beds	Poorly sorted SAND with silt. Sand is coarse and medium dense, grey. Some laminations and stratifications of elastic silt and sandy clay.
	Sandy CLAY. Hard, light grey stratified dark olive grey. Dry, some laminations and lenses of silty sand. Some shell.
	Poorly graded SAND with silt. Sand is fine becoming medium, grey, medium dense to dense, with few shell.
	Sandy CLAY. Very stiff becoming hard. Gravel at base.

Table 2.7 General Description of Soil Layers – BH-K16 location

Identified Geophysical Context	Soil Type
Superficial Sediments	Poorly graded SAND locally with gravel. Sand is angular, medium, medium dense to compact. Light olive grey. Trace organic staining.
Channel Complex	Poorly graded SAND locally with gravel. Sand is angular, medium, medium dense to compact. Light olive grey. Trace organic staining.
	Well graded SAND with gravel. Sand is coarse, very dense to compact.
	CLAY with sand, locally sandy clay. Very stiff to hard, dark olive grey, micacious, few laminations of sandy silt. Few lenses of greyish brown clay.
Sub-parallel beds	CLAY with sand, locally sandy clay. Laminations of SAND with silt to silty SAND.
	CLAY. Hard, dark greenish grey, locally laminated with silt and sandy silt, Micaceous and friable.
	Clayey SAND, sand is fine, loose to medium dense, dark grey, little fine gravel size shell becoming mostly coarse gravel size shell at 66.90m. Trace lenses of clay, trace lenses of coarse sand.
	Sandy CLAY. Very stiff to hard with some laminations of clayey sand.
	Silty SAND becoming poorly graded sand with silt. Sand is coarse, medium dense to dense, grey, with few lenses of sandy clay.

Table 2.8 General Description of Soil Layers – BH-MET TOWER location

Identified Geophysical Context	Soil Type
Superficial Sediments	Poorly graded SAND with silt. Dense to compact. Few stratifications of GRAVEL, Few pockets of clayey SAND. Few laminations of black organic staining. Micaceous.
Channel Complex	Poorly graded SAND. Very dense to compact. Few laminations of black organic staining. Micaceous.
	Sandy SILT. Medium dense to dense locally loose.
	CLAY with sand. Sand is fine. Very stiff to hard, dark olive grey. Dry. Some laminations and lenses of silt. Micaceous.
	Sandy CLAY. Very hard to hard. Some laminations and lenses of sand and silt. Micaceous with trace organics.
Sub-parallel beds	Sandy CLAY. Very hard to hard. Some laminations and lenses of sand and silt. Micaceous with trace organics.
	Poorly graded SAND with silt. Compact.
	Sandy CLAY. Hard.
	Poorly graded SAND with silt. Compact.
	Sandy CLAY. Hard.
	Clayey SAND becoming SAND with silt.

3. Classification Test Results

3.1 General

This section presents the results of the offshore laboratory testing performed. Information on the laboratory testing procedures can be found in Section 9.

Offshore laboratory testing was scheduled by the geotechnical team onboard and conducted alongside drilling operations. Representative samples were extruded offshore and tested according to ASTM D2488-93 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

The geotechnical testing offshore consisted of the following tests:

- Soil description and classification
- Photography of extruded samples
- Moisture content and density determination with the use of cylindrical density rings
- Index shear strength tests: Torvane, Pocket Penetrometer and Motorised Laboratory Vane
- Unconsolidated Undrained Triaxial
- Hydrochloric acid (HCL 10%)

Classification tests were performed within the designated offshore laboratory in order to obtain basic soil characteristics on all recovered samples. All extruded samples were photographed and then visually classified. Sample suitability was then assessed for onshore testing and preserved as either undisturbed samples (referenced as sample type “U” or “Q”), or double bagging as disturbed samples (referenced as sample type “B”).

Further onshore laboratory testing was scheduled by the client and the samples were subjected to further onshore testing at Gardline’s onshore geotechnical testing laboratory.

Geotechnical and chemical testing onshore consisted of the following:

- Soil Description and classification
- Photography of extruded samples
- Index shear strength tests: Fallcones
- Advanced shear strength testing: static and cyclic Consolidated Anisotropic Undrained Compression and Extension Triaxials (CAUC/E) and static Consolidated Anisotropic Drained Compression Triaxials (CADC)
- Static and cyclic Direct Simple Shear (DSS) testing
- Chemical: Carbonate contents

All individual test results are presented in the combined logs in Appendix 2.1. A summary of the laboratory results is presented in Appendix 3.

3.2 Moisture Content

Moisture contents were taken at various depths within each extruded sample. Where soil characteristics changed additional moistures were taken to incorporate this.

The moisture content values presented in this report are measured values and no corrections have been applied.

Moisture content values are consistent throughout the borehole. Results are considered of good quality and repeatability.

Moisture content results are presented in Appendix 3.1 as well as on the borehole log in Appendix 2.1.

3.3 Density

Density tests were generally undertaken at the same depths as moisture contents where a measured volume of undisturbed sample could be taken.

The bulk and dry density values presented in this report are measured values and no corrections have been applied.

Density values are consistent across the site. Results are considered of good quality and repeatability.

Maximum and minimum density tests were attempted on the coarse soil samples at locations BH-H10, BH-D14, BH-I21, BH-G7 and BH-G17A. At locations MET-TOWER and BH-K16 there were no appropriate samples to conduct maximum and minimum density tests. .

Density results are presented in Appendix 3.1 as well as on the borehole logs in Appendix 2.1.

3.4 Particle Density

Particle Density tests were undertaken within core samples. Fifty eight particle density tests were conducted across the site.

Particle Density values are consistent across the site. Results are considered of good quality and repeatability.

Particle density results are presented in Appendix 3.1 as well as on the borehole logs in Appendix 2.1.

3.5 Particle Size Distribution (PSD)

Twenty three PSDs and eight PSD with hydrometer tests were conducted within the borehole.

Eleven Determinations of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve tests were undertaken.

PSD and Amount of Material In Soils Finer Than No. 200 (75µm) Sieve tests are considered to be of good quality and achieved repeatable results. They confirmed the soil type and behavioural characteristics noted during the logging phase.

Particle size distribution plots are presented in Appendix 3.3 and the boundary data is presented in the Classification Summary in 3.2.

Amount of Material In Soils Finer Than No. 200 (75µm) Sieve test results are presented in Appendix 3.4.

3.6 Plasticity

Plasticity tests were undertaken within every suitable identified soil unit where possible. Twenty eight plasticity tests were conducted across the site.

Plasticity tests were consistent within the clay units. Plasticity tests are considered to be of good quality and achieved repeatable results.

The results of the plasticity testing are presented on the Classification Summary in Appendix 3.2, the borehole logs (Appendix 2.1) and on Plasticity Charts in Appendix 3.5.

3.7 Index Shear Strength Testing

Index shear strength tests were conducted using Pocket Penetrometers, Torvane, Fallcone and Motorised Laboratory Vane. The shear strength results were concurrent with consistency tests and CPTU data and were consistent within each soil unit.

Eleven Motorised Lab Vanes (MLV) were conducted and offered good results. The MLV result was slightly higher than other surrounding index shear strength tests in places. The higher value is likely attributed to local variances within the soil unit, including laminations and lenses of sand and silt. All other index shear strengths were performed on identified CLAY units, MLV tests are performed before extrusion and thus sediment composition would not be known.

Index shear strength results are presented in Appendix 3.6 as well as on the borehole logs in Appendix 2.1.

4. Triaxial Laboratory Test Results

4.1 General

This section presents the results of the triaxial laboratory testing. Information on the testing procedures can be found in Section 9. Results were used in conjunction with other shear strength results to run an N_{kt} assessment in order to accurately correlate CPTU and laboratory results.

UUT and CAUC/CADC/CAUE plots are presented in Appendix 3.8 and Appendix 3.9 respectively and summarised in Appendix 3.7, as well as on the borehole logs in Appendix 2.1. Cyclic triaxial results are displayed in Appendix 3.11.

4.2 Undrained Unconsolidated Triaxial (UUT)

In general, shear strength values from UUT tests were consistent within a particular soil layer, and were comparable with the index shear strength testing undertaken. Results are considered of good quality and repeatability and any deviation from the general trend is considered to be as a result of fissures, laminations and shear planes within the sample.

UUT plots are presented in Appendix 3.8 with the results plotted on the borehole logs in Appendix 2.1.

4.3 Consolidated Triaxial Test (CAUC / CADC / CAUE)

In general, consolidated triaxial tests results are considered of good quality and repeatability. The results correlate with other strength testing conducted.

Thirty-seven CAUC (Consolidated Anisotropic Undrained Compression) tests, four CADC/CIDC (Consolidated Anisotropic/Isotropic Drained Compression) and two CAUE (Consolidated Anisotropic Undrained Extension) tests have been scheduled across the site.

Results are presented in Appendix 3.9 with the results plotted on the borehole logs in Appendix 2.1.

4.4 Cyclic Consolidated Triaxial Test (CAUcy)

Twenty-four cyclic Consolidated Anisotropic Undrained triaxial tests (CAUcy) have been scheduled across the site.

CAUcy plots are presented in Appendix 3.10. Interpretation is proposed in Volume 3 of this report.

5. Direct Simple Shear Laboratory Test Results

5.1 Static tests (DSS)

In total twelve static Direct Simple Shear (DSS) laboratory tests have been scheduled across the site. Information on the testing procedures can be found in Section 6.

Direct simple shear plots are presented in Appendix 3.11.

5.2 Cyclic tests (DSScy)

In total thirty-six cyclic Direct Simple Shear (DSScy) laboratory tests have been scheduled across the site.

Direct simple shear plots are presented in Appendix 3.12. Interpretation is proposed in Volume 3 of this report.

6. Chemical Laboratory Test Results

6.1 General

This section presents the results of the chemical laboratory testing. Information on the testing procedures can be found in Section 9.

6.2 Carbonate Content

Carbonate content tests were conducted on a selection of appropriate samples within the borehole.

Carbonate content tests are considered to be of good quality and achieved repeatable results.

Eighty two carbonate tests were conducted within across the site.

Carbonate content results are presented in Appendix 3.13.

7. Laboratory Testing Procedures

7.1 General

The objective of the laboratory test program was to evaluate the pertinent physical and mechanical characteristics of the soils encountered during sampling at the site.

This section of the report discusses the laboratory testing program performed. Tests were performed in accordance with ASTM where possible.

7.2 Soil Description

Descriptive terms are based on ASTM D2488-09A – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

The basic soil types as defined by particle size analysis are as follows:

GRAVEL	Coarse	19.0mm to 75.0mm
	Fine	4.75mm to 19mm
SAND	Coarse	2.00mm to 4.75mm
	Medium	0.425mm to 2.00mm
	Fine	0.075mm to 0.425mm

SILT Soil that is less than 0.075mm that is non plastic or very slightly plastic and that exhibits little or no dry strength when air dry.

CLAY Soil that is less that 0.075mm that can be made to exhibit plasticity within a range of water contents and that exhibits considerable strength when air dry.

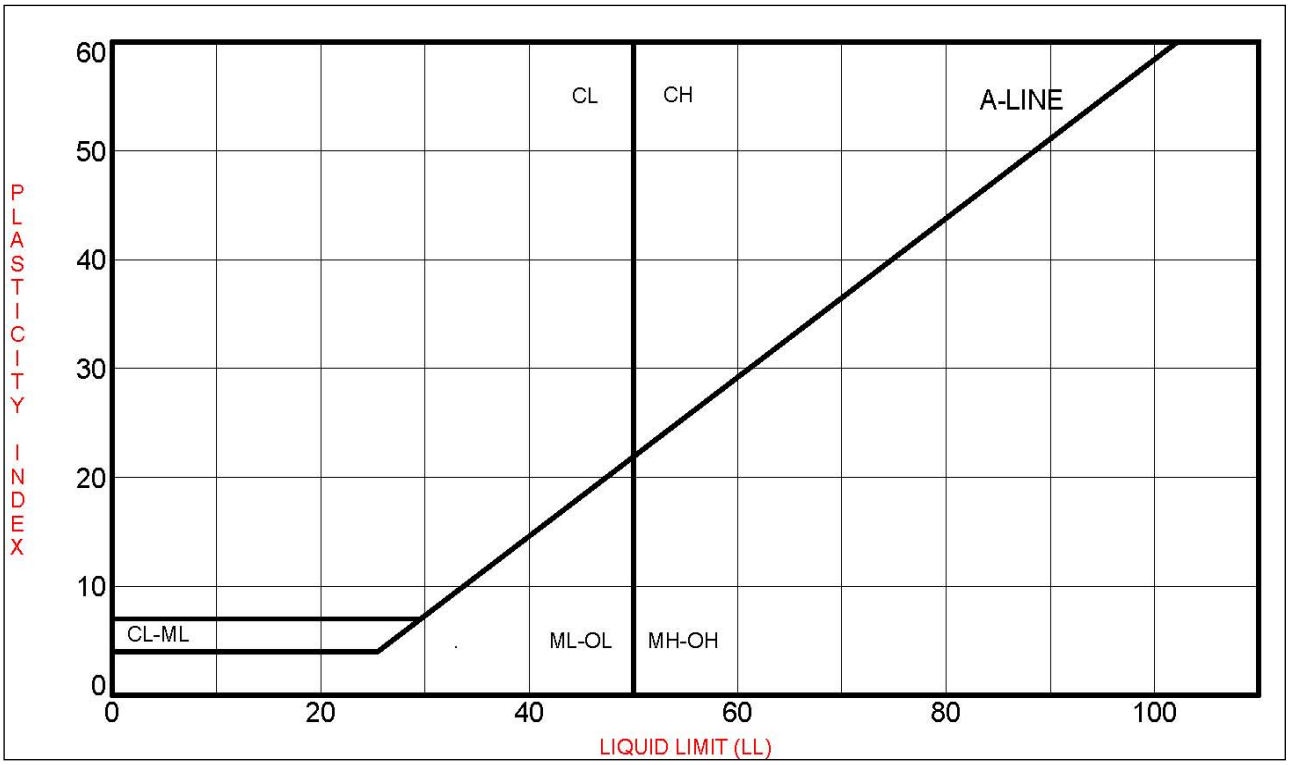
The principal soil type is based on particle size distribution of the coarse fraction and of the fine fraction as determined by a series of specified hand tests supplemented by soil classification tests.

7.2.1 Fine Grained Soils

The identification and description of fine grained soils is based both on a set of hand tests and the measurement of the particle size grading. These hand tests include: dry strength, plasticity and dilatancy.

In general terms, a soil lying above the A-line (Figure 5.1) would be identified as a CLAY and a soil below the A-line as a SILT, however it must be recognized that a soil above the A-line may be comprised of particles of non CLAY minerals (less than 2μm size such as rock flour); equally soils that fall below the A-line may be comprised of the clay minerals halloysite, kaolinite and chlorite.

Figure 7.1 Soil Plasticity Chart



A fine soil is also described according to its consistency shown below in Table 5.1 and shear strength shown in Table 5.2.

Table 7.1 Soil Consistency Classification Parameters

Descriptor	Criteria
Very Soft	Thumb will penetrate soil more than 1 inch (25mm)
Soft	Thumb will penetrate soil about 1 inch (25mm)
Firm	Thumb will indent soil about ¼ inch (6mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumb will not indent soil

Table 7.2 Soil Strength (ASTM D-5578-07 (2007))

Undrained shear strength of clays	Undrained shear strength (kPa)
Very Soft	<12.5
Soft	12.5 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	>200

Table 7.3 Soil Dilatancy Classification Parameters

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing

Table 7.4 Soil Plasticity Classification Parameters

Description	Criteria
Non-plastic	A ⅛ inch (3mm) thread cannot be rolled at any water content
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

Secondary constituents within a fine soil are classified as summarised in Table 5.5.

Table 7.5 Secondary Constituent Classification (Fine Soils)

Group Symbol	Classification Steps			Group Name
CL	< 30% plus 75µm	<15% plus 75µm	% sand > % gravel	Lean clay
		15-25% plus 75µm	%sand < % gravel	Lean clay with sand Lean clay with gravel
	> 30% plus 75µm	% sand > % gravel	< 15% gravel	Sandy lean clay
			> 15% gravel	Sandy lean clay with gravel
		%sand < % gravel	< 15% sand	Gravelly lean clay
			> 15% sand	Gravelly lean clay with sand
ML	< 30% plus 75µm	<15% plus 75µm	% sand > % gravel	Silt
		15-25% plus 75µm	%sand < % gravel	Silt with sand Silt with gravel
	> 30% plus 75µm	% sand > % gravel	< 15% gravel	Sandy silt
			> 15% gravel	Sandy silt with gravel
		%sand < % gravel	< 15% sand	Gravelly silt
			> 15% sand	Gravelly silt with sand
CH	< 30% plus 75µm	<15% plus 75µm	% sand > % gravel	Fat clay
		15-25% plus 75µm	%sand < % gravel	Fat clay with sand Fat clay with gravel
	> 30% plus 75µm	% sand > % gravel	< 15% gravel	Sandy fat clay
			> 15% gravel	Sandy fat clay with gravel
		%sand < % gravel	< 15% sand	Gravelly fat clay
			> 15% sand	Gravelly fat clay with sand
MH	< 30% plus 75µm	<15% plus 75µm	% sand > % gravel	Elastic silt
		15-25% plus 75µm	%sand < % gravel	Elastic silt with sand Elastic silt with gravel
	> 30% plus 75µm	% sand > % gravel	< 15% gravel	Sandy elastic silt
			> 15% gravel	Sandy elastic silt with gravel
		%sand < % gravel	< 15% sand	Gravelly elastic silt
			> 15% sand	Gravelly elastic silt with sand

7.2.2 Coarse Grained Soils

The description of coarse soils (SAND and GRAVELS) is primarily performed by visual observation. There are two problems with the description of coarse soils. First, one must consider the visual differences observed between volume and weight percentages of a sample; and second, is the correct application of the 4.75mm grain size between SAND and GRAVEL. The correct visual description is in accordance with the “weight percentage”, and can be verified by a laboratory particle size distribution test.

Secondary constituents within a coarse soil are classified as summarised in Table 5.6.

Table 7.6 Secondary Constituent Classification (Coarse Soils)

			Group Symbol		Group Name
< 5% fines	Well-graded		GW	< 15% sand	Well-graded gravel
				> 15% sand	Well-graded gravel with sand
	Poorly graded		GP	< 15% sand	Poorly graded gravel
				> 15% sand	Poorly graded gravel with sand
10% fines	Well-graded	Fines = ML or MH	GW-GM	< 15% sand	Well-graded gravel with silt
				> 15% sand	Well-graded gravel with silt and sand
		Fines = CL or CH	GW-GC	< 15% sand	Well-graded gravel with clay
				> 15% sand	Well-graded gravel with clay and sand
	Poorly graded	Fines = ML or MH	GP-GM	< 15% sand	Poorly graded gravel with silt
				> 15% sand	Poorly graded gravel with silt and sand
		Fines = CL or CH	GP-GC	< 15% sand	Poorly graded gravel with clay
				> 15% sand	Poorly graded gravel with clay and sand
> 15% fines		Fines = ML or MH	GM	< 15% sand	Silty gravel
				> 15% sand	Silty gravel with sand
		Fines = CL or CH	GC	< 15% sand	Clayey gravel
				> 15% sand	Clayey gravel with sand
< 5% fines	Well-graded Poorly graded		SW	< 15% gravel	Well-graded sand
				> 15% gravel	Well-graded sand with gravel
			SP	< 15% gravel	Poorly graded sand
				> 15% gravel	Poorly graded sand with gravel
10% fines	Well-graded Poorly graded	Fines = ML or MH	SW-SM	< 15% gravel	Well-graded sand with silt
				> 15% gravel	Well-graded sand with silt and gravel
		Fines = CL or CH	SW-SC	< 15% gravel	Well-graded sand with clay
				> 15% gravel	Well-graded sand with clay and gravel
		Fines = ML or MH	SP-SM	< 15% gravel	Poorly graded sand with silt
				> 15% gravel	Poorly graded sand with silt and gravel
		Fines = CL or CH	SP-SC	< 15% gravel	Poorly graded sand with clay
				> 15% gravel	Poorly graded sand with clay and gravel
> 15% fines		Fines = ML or MH	SM	< 15% gravel	Silty sand
				> 15% gravel	Silty sand with gravel
		Fines = CL or CH	SC	< 15% gravel	Clayey sand
				> 15% gravel	Clayey sand with gravel

All soil types are described in the following order:

- Group Name
- Group Symbol
- Percent of cobbles / boulders by volume
- Particle size range
- Particle angularity
- Particle shape
- Maximum particle size / dimension
- Plasticity of fines
- Dry strength
- Dilations
- Toughness
- Colour
- Odour
- Moisture
- Reaction with HCl
- Consistency
- Structure
- Cementation
- Additional information

7.3 Soil Classification

Classification tests were performed to identify the index properties of the soils encountered at the site. The offshore and onshore laboratories conducted moisture content, wet and dry density, visual identification and consistency tests.

7.3.1 Natural Moisture Content and Bulk and Dry Density

Bulk densities of soil samples were measured by weighing samples of known volume immediately following sample extrusion; the dry density was then calculated from the measured wet density and the associated moisture content value. Testing was carried out in accordance with ASTM D2488

7.3.2 Atterberg Limits

Natural moisture content (w) and the Plastic Limit (P_L) and Liquid Limits (L_L) were determined for cohesive samples to provide classification information. In each case the liquid limit test was performed by Casagrande's method.

Values of the plasticity index (I_P) and the liquidity index (LI) have been calculated for all fine grained soils. The LI is an index property that relates the natural moisture content of a fine grained soil to its respective liquid and plastic limits and is expressed as:

$$LI = \frac{w - P_L}{I_P}$$

Testing was carried out in accordance with ASTM D4318-10.

7.3.3 Particle Size Distribution (PSD)

A soil consists of discrete particles of varying shapes and sizes. The purpose of a particle size analysis is to group these particles into separate size ranges, and so determine the relative proportions, by dry weight, of each size range. Two separate and different procedures are used to assess the range of particle sizes for the sediments encountered along the route and over the mooring area. These are wet sieving, which is used to assess the coarse grained particle sizes of sand, and sedimentation by hydrometer, for the finer silt and clay particle sizes.

During sedimentation by hydrometer, a reagent of sodium hexametaphospate solution is used following the procedure set out in ASTM D421.

For the clays with some sand content encountered in the borehole, composite tests using both sieving and sedimentation by hydrometer were necessary to provide a full particle size distribution.

Testing was carried out in accordance with ASTM D422-63.

7.3.4 Determination of the Amount of Material in Soils Finer Than No.200 (75µm) Sieve

The purpose of the test is to determine the amount of soil that is finer than the No. 200 sieve (75µm). Two methods are used depending on the amount of coarse material within the sample, for sand samples the soil is soaked for at least ten minutes in water and then passed through 0.075mm and 0.425mm sieves. For clay samples, the material is soaked for a minimum of two hours in a deflocculating solution consisting of sodium hexametaphosphate and distilled water. The soil solution is then passed through the sieves mentioned. The percentage passing the 0.075mm sieve is calculated and reported giving an approximate fines content value.

Testing was carried out in accordance with ASTM D1140-14.

7.3.5 Particle Density

The soil particle density is the ratio between the mass of dry mineral particles and the mass of distilled water displaced by the dry mineral particles. The Pyknometer method was used for all particle density tests.

Testing was carried out in accordance with ASTM D854-10.

7.4 Undrained Shear Strength

Undrained shear strength of cohesive samples were obtained from Torvane, Motorised Laboratory Vane, Pocket Penetrometer and triaxial tests offshore. Additional Fallcone, Triaxial, Shearbox and compressibility tests were undertaken in the onshore laboratory.

7.4.1 Pocket Penetrometer

The Pocket Penetrometer is a small hand held device consisting of a flat faced plunger and spring located in a cylindrical housing. The plunger is forced to penetrate the soil sample until a punching-type bearing failure occurs. The compression of the pocket penetrometer spring is directly calibrated to indicate the undrained shear strength of the soil, S_u.

The Pocket Penetrometer has a working limit of 300kPa; if this maximum limit is reached during testing it has been reported as 300+kPa on the summary tables. At higher strengths the most accurate method of measuring the undrained shear strength is the unconsolidated undrained triaxial test.

Testing was carried out in accordance with manufacturer's manual of operation.

7.4.2 Fallcone

The Fall Cone uses a cone with a specified weight and angle (10g and 60g with an angle of 60º and 100g and 400g with an angle of 30º) to measure the penetration into the sample from a controlled height. The weight of the cone is dependent on the strength of the sample. Soft samples require a lighter cone and stiff samples a heavier one. The cone is released from the magnetic cone holder by a release button on the back of the apparatus. The depth of penetration is indicated on the penetration scale which has an optical magnifier for accuracy. The depth of cone penetration is an indicator of the strength of the sample. For remoulded tests the sample is mixed into a homogeneous paste and placed in the remoulding cup for testing.

Testing was carried out in accordance with ISO 17892-6 (2004).

7.4.3 Torvane Test

The Torvane is a small hand-operated device consisting of a plastic disc with thin, radial vanes projecting from one face. The Torvane is pressed against a flat surface of the soil until the vanes are fully embedded and is rotated through a torsion spring until the soil is sheared. The device is calibrated to indicate shear strength of the soil directly from the rotation of the torsion spring.

Testing was carried out in accordance with manufacturer's manual of operation.

7.4.4 Motorised Laboratory Vane

A Motorised Laboratory Vane setup comprises a four bladed cruciform vane mounted on a rod, the assembly being of stainless or plated steel and hard soldered. Typical blade dimensions are 12.7mm wide and 12.7mm long, but larger vanes may be used for measuring very low shear strengths. Rotation of the vane is provided by a motor applying torque via a worm and pinion drive with a suitable scale graduated in 1° intervals for measuring angular rotation of the vane relative to the soil in which it is placed. A calibrated open coil torsion spring is used to increase torque with rotation. Shear is determined by the degree of rotation achieved after sufficient torque has been acquired to shear the vane within the sample.

7.4.5 *Unconsolidated Undrained Triaxial Test (UUT)*

In the unconsolidated undrained triaxial test the test specimen is encapsulated in a latex rubber membrane and subjected to a confining pressure as specified by sample depth. The soil specimen is then loaded axially in a load frame at a constant rate of strain; typically in the order of 1% per minute until the specimen fails. No drainage is allowed at any stage of the test. The undrained shear strength of the soil, S_u is half of the deviator stress at failure:

$$S_u = \frac{\sigma_1-\sigma_3}{2}$$

Where $\sigma_1-\sigma_3$ is the maximum deviator stress (kN/m^2).

Testing was carried out in accordance with ASTM D2850-03a.

7.4.6 *Consolidated Anisotropic Undrained Compression and Extension Triaxial Test (CAUC/E)*

Consolidated Anisotropic Undrained triaxial effective stress testing with the measurement of base pore water pressure was performed to complement and add value to offshore strength testing and provide additional data to be used for design.

Anisotropically consolidated undrained triaxial tests (CAUC/E) were performed on selected samples of cohesive and non-cohesive soil.

Testing was carried out in accordance with ASTM D4767.

7.4.7 *Consolidated Constant Volume Direct Simple Shear (DSS) Test*

Consolidated Constant Volume (CCV) Direct Simple Shear (DSS) tests were performed on selected cohesive and non-cohesive samples. The samples are tested at the in-situ vertical pressure (p_0').

The test procedure followed for the Direct Simple Shear testing program was in accordance with ASTM D 6528-07.

7.5 Chemical Tests

Chemical tests were performed to determine the carbonate, organic and sulphate content within the samples.

7.5.1 Carbonate Content

The test procedure is a gasometric method that utilises a simple portable apparatus. The carbonate content of soil is determined by treating a dried soil specimen with hydrochloric acid (HCl) in an enclosed reaction cylinder (reactor). Carbon dioxide (CO_2) gas is exsolved during the reaction between the acid and carbonate fraction of the specimen. The resulting pressure generated in the closed reactor is proportional to the calcite equivalent of the specimen. This pressure is measured with a suitable pressure gauge, or equivalent pressure-measuring device, that is pre-calibrated with reagent-grade calcium carbonate.

It should be noted that the results of this test are calcite equivalent as different carbonate species will result in percentages greater than 100%. This test does not distinguish between the carbonate species and such determination must be made using quantitative chemical analysis methods such as atomic absorption (ASTM D 4373-02).

The calcium carbonate of all selected test specimens was determined in accordance with the ASTM D 4373-02 standard test method.

8. CPTU Analysis

8.1 General

Downhole CPTU operations were carried out in accordance with ISO 22476-1:2012 Geotechnical Investigation and Testing - Field Testing. Part I. All but two of the CPTUs carried out were within accuracy class 1 or 2 as set out by ISO 22476-1:2012. CPT 3of BH-I21B and CPT 20 of BH-K16 fell into class 3 due to the ground conditions they encountered. In both of these instances the cone was replaced after the test. All testing was completed using 10cm^2 piezocones. The CPTU's were carried out using Wireline downhole CPTU. The data from these CPTU tests were processed using Gardline's TerraFusion software. The measured and derived plots for each test can be seen in Appendix 4.1.

One hundred and eighty eight CPTUs were completed across the seven boreholes; details of these tests can be seen in Appendix 4.1. Corrected cone resistance, sleeve friction, pore pressure, undrained shear strength and relative density are shown on the borehole log in Appendix 2.1.

Following an N_{kt} assessment using preferably CAUC results an N_{kt} range of 15 – 20 was chosen for all CPTU tests.

For information relating to CPTU Presentation and CPTU Interpretation refer to Appendix 4.1.

8.2 Discussion of Results

The majority CPTUs conducted were within accuracy Class 1 or 2 as set out by ISO 22476-1:2012. Two CPTUs fell within Class 3. Any sensory drifts out of class 1 can be attributed to the ground conditions encountered at the borehole. Cone offsets were monitored by Gardline's CPTU operators and Geotechnical Engineers after each test. All cones where assessed for stability during mobilisation and any cones deemed unstable were removed from usage.

The zero reading offsets were consistent before and after testing and there is no evidence of sensor drift effects. In addition, the tip resistance pore pressure and sleeve friction measurements showed excellent responsiveness to layer changes and to the presence of any laminations, stratifications or coarse grained materials within fines. This is an indication of good sensor response and sensitivity. The zero readings of the tests were taken on deck before and after the test and on the seabed before and after each test.

9. PS Logging Analysis

9.1 General

The method is used for the in situ determination of compression (P) and shear (S) wave seismic velocities. The equipment, manufactured by OYO Corporation, comprises a directional seismic source and a pair of directional seismic detectors mounted together with associated power, switching and data transmission electronics, in a 7 m long wireline sonde (Figure 7.1 and 7.2). It is deployed in a fluid filled uncased borehole from a logging winch (Figure 7.3) fitted with depth encoder. Operation is controlled using Robertson Geologging Ltd (RGL) software running a RGL Micrologger 2 logging interface unit.

Figure 9.1 and 9.2 Sonde Component

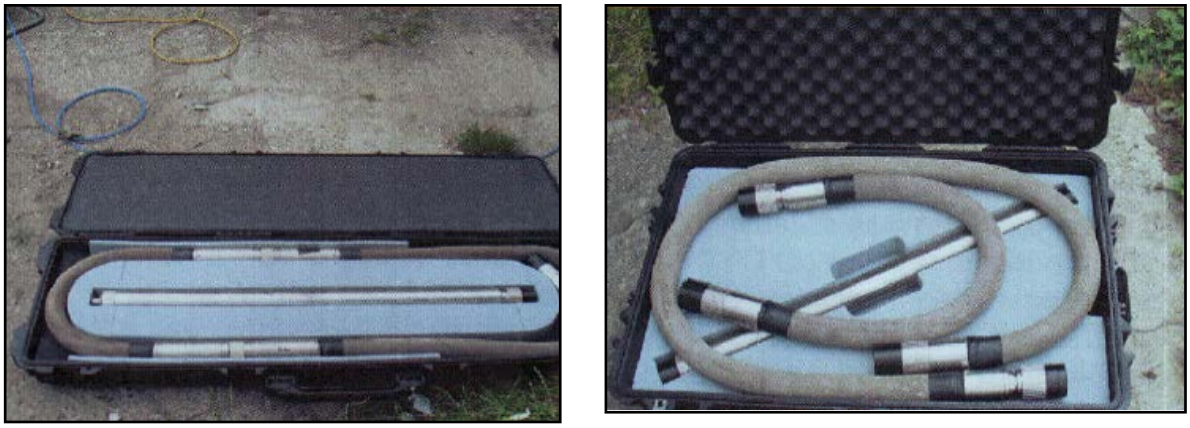
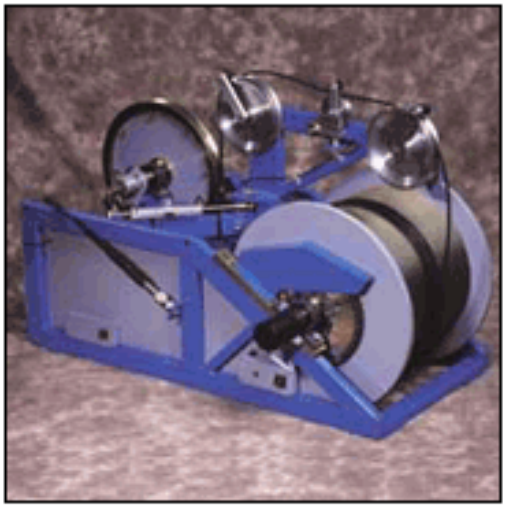


Figure 9.3 PS Logging Winch



9.2 Summary of PS Logging Operations

In operation the seismic source in the sonde is activated to produce a sequence of seismic pulses which excite ‘flexural’ waves. Depending on the direction of impulse the seismic waves which are generated travel at the P- and S-wave velocities of the formation and are detected by the seismic receivers which are 1 m apart. The difference in arrival time at the lower and upper receivers can be measured from the displayed waveforms and the seismic velocities can then be calculated.

It is necessary for the operator to control the system settings to ensure that the data recorded are of sufficient quality for the arrival time measurements to be carried out. Measurements are usually made from the bottom up at 1m intervals and a raw data file is stored for each record.

Once specified depths have been measured the data is then processed. From the resulting wave formation plots, the first arrival times from both the compression (P) and shear (S) wave velocities are picked. The seismic velocities are then determined and used along with other geotechnical data such as densities to aide in characterisation of the basic material properties and determination of G_0.

PS Logging results are presented in Appendix 5.1.

10. List of Symbols and Abbreviations

SYMBOLS

α	Cone area ratio
A_c	Projected area of the cone
A_n	Cross-sectional area of the load cell or shaft
B_q	Pore pressure ratio
D_r	Relative density / Equivalent Relative Density
f_s	Local side friction
K_o	Coefficient of lateral earth pressure
N_{kt}	Cone factor
q_c	Measured cone tip resistance
q_n	Net cone tip resistance
q_t	Corrected cone tip resistance
R_f	Friction ratio
u_2	Pore water pressure measure behind the tip
σ_{vo}	Total overburden stress
e	Voids ratio
σ_1-σ_3	Deviator stress
s_u	Undrained shear strength
$s_{u,rem}$	Remoulded shear strength

ABBREVIATIONS

BPP	Borehole Progression Plan
CPT	Cone penetration test
CPTU	Cone penetration test with pore pressure measurement
SBF	Seabed Frame
UTM	Universal Transverse Mercator
UUT	Undrained Unconsolidated Triaxial
w	Natural Moisture Content

11. References

ASTM International Designation: D 2488-09A: 2009, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D 4186-06: 2006, Standard Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading. *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D 4422-63: 2007, Standard Test Method for Particle-Size Analysis of Soils. *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D4972-13:2013, Standard Test Method for pH of Soils. *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D4373-02:2007, Standard Test Method for Rapid Determination of Carbonate Content of Soils. *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D4318-10:2010, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. *American Society for Testing and Materials,* Pennsylvania.

ASTM International Designation: D 2850–03A: 2007, Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils. *American Society for Testing and Materials,* Pennsylvania.

ASTM-3213-91, ASTM International Designation: D 3213 -97, Standard Practices for Handling, Storing and Preparing Soft Undisturbed Marine Soil

ASTM D6528-07:2013. Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of cohesive Soils. *American Society for Testing and Materials,* Pennsylvania.

BS EN ISO 19901-8, 2013. Petroleum and Natural Gas Industries – Specific requirements for offshore structures, Part 8: Marine Soil Investigations

DD CEN ISO 17892-6: 2004. Geotechnical investigation and testing – Laboratory testing of soils– Part 6 Fall cone test. *British Standards Institute,* London

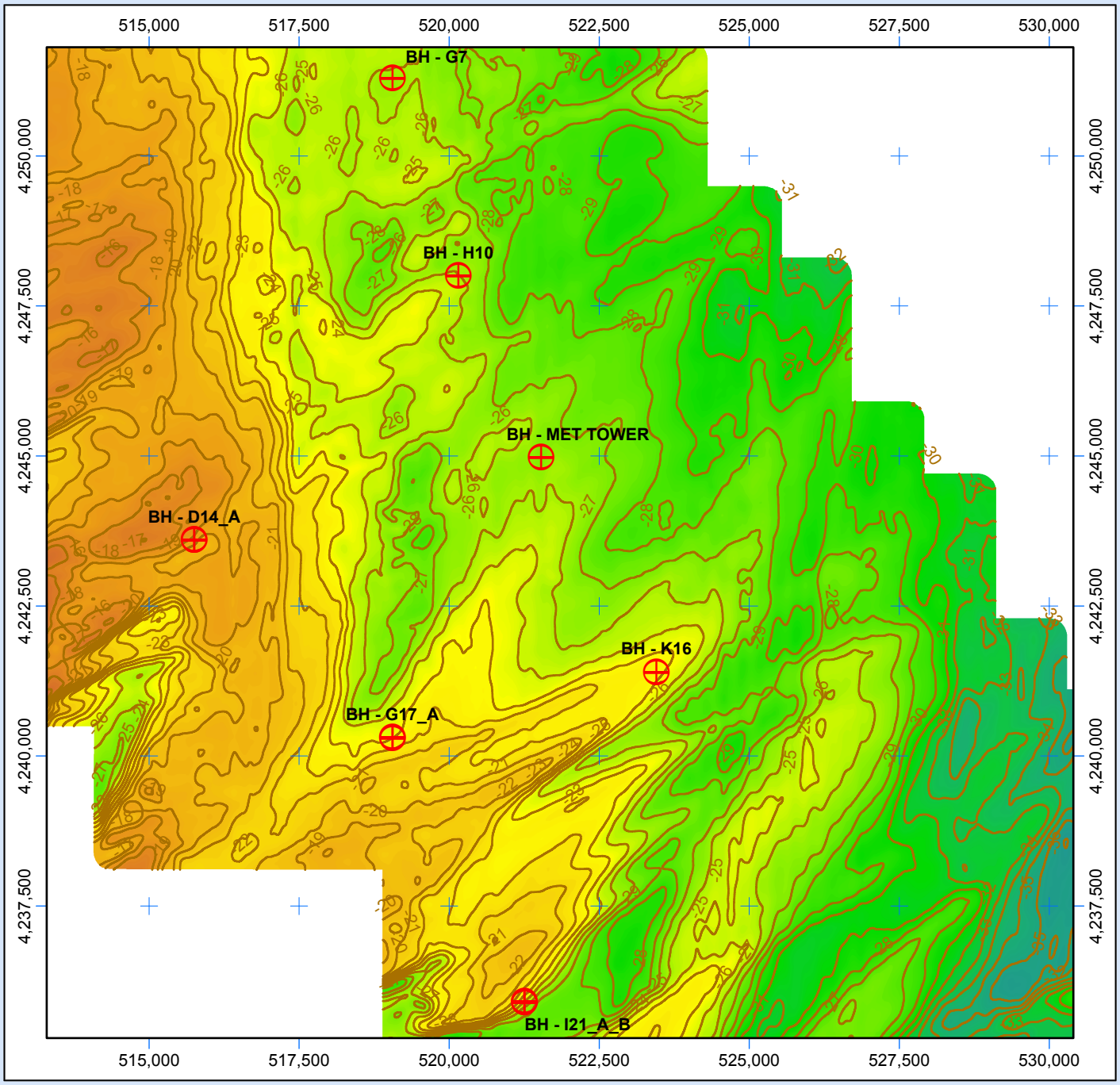
BS1377- 7, 1990 Methods of test for Soils for civil engineering purposes Incorporating Amendment No. 1. *British Standards Institute,* London

APPENDIX 1

1.1 Location Details

1.2 Location Summary

1.1 Location Map



Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

Overview Map

Legend & Map Scale (A4)

Borehole Locations

1.0m Contours

Bathymetry

-12m

-42m

Kilometers

0 1 2 3 4 5

1:100,000

Gardline

US Wind Inc sea energy

Coordinate Reference System

Datum	NAD 83
Ellipsoid	GRS 80
Projection	UTM Zone 18N (75W)
Overview Data	ESRI

Contract Information

Gardline Job	10451
Client	US Wind Inc.
Client Ref	REF11449
Vessel	MV Ocean Discovery

Gardline Geosciences Ltd, Hewett Park, Hewett Road, Great Yarmouth, Norfolk. United Kingdom. NR31 0NN.

1.2 Location Summary

Borehole	Easting (m)	Northing (m)	Water Depth (m)	Penetration (m)	Date of Test	Comments
BH - D14	515755.0	4243606.0	19.0	25.80	28/06/2015	
BH - D14A	515755.1	4243612.0	19.1	71.30	30/06/2015	
BH - G17	519055.0	4240306.0	25.0	41.00	01/07/2015	
BH - G17A	519056.4	4240311.6	24.9	74.00	02/07/2015	BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.
BH - G7	519055.0	4251306.0	25.0	75.20	06/07/2015 - 07/07/2015	
BH - H10	520154.3	4248006.5	26.8	73.80	05/07/2015	
BH - I21	521255.0	4235906.0	20.0	6.50	22/06/2015 - 23/06/2015	
BH - I21A	521255.0	4235906.0	26.0	28.50	23/06/2015	
BH - I21B	521255.0	4235906.0	23.0	73.80	24/06/2015	
BH - K16	523454.4	4241406.3	24.6	73.20	03/07/2015 - 04/07/2015	
BH - MET TOWER	521533.9	4244983.3	27.7	64.90	19/06/2015 - 20/06/2015	

BOREHOLE LOCATION SUMMARY

GRS 80 UTM ZONE 18 N (75 W)

APPENDIX 2

2.1 Interpreted Borehole Logs

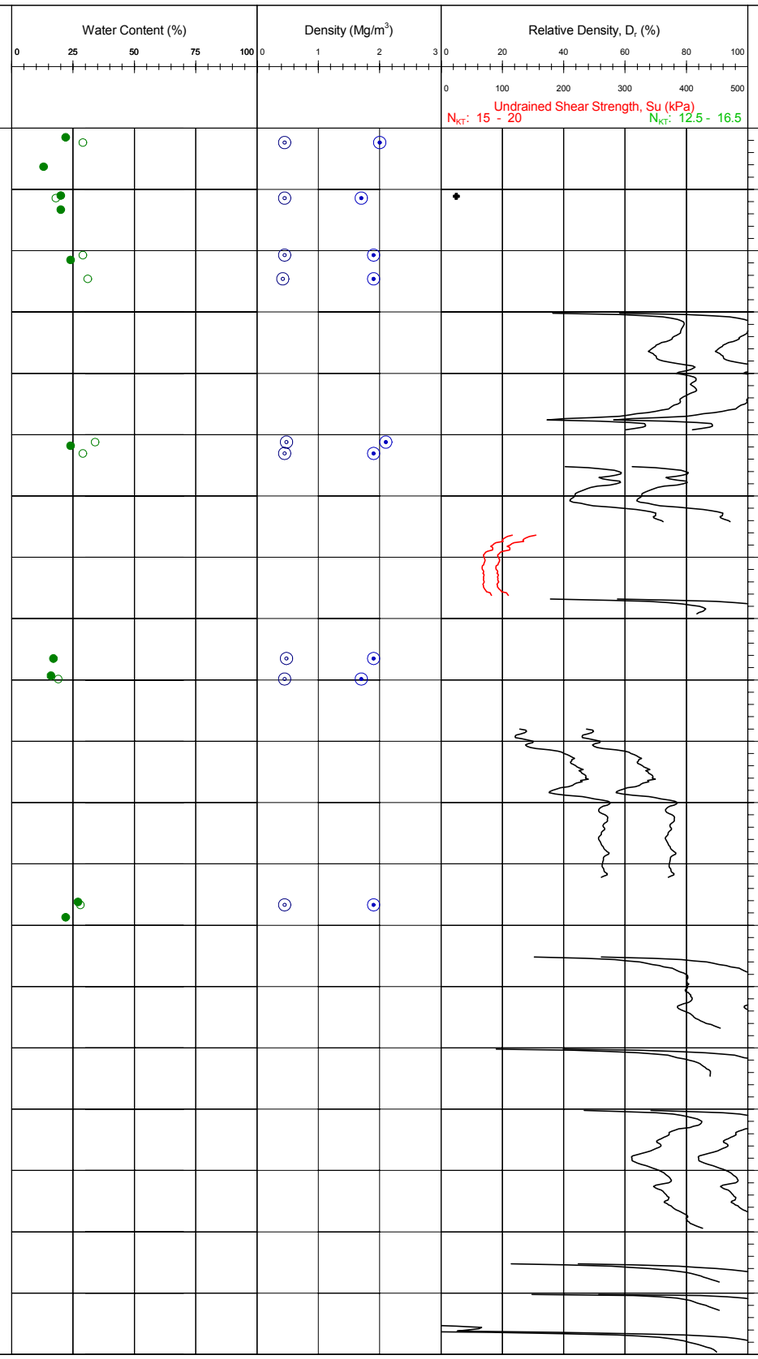
2.2 Sample Photographs

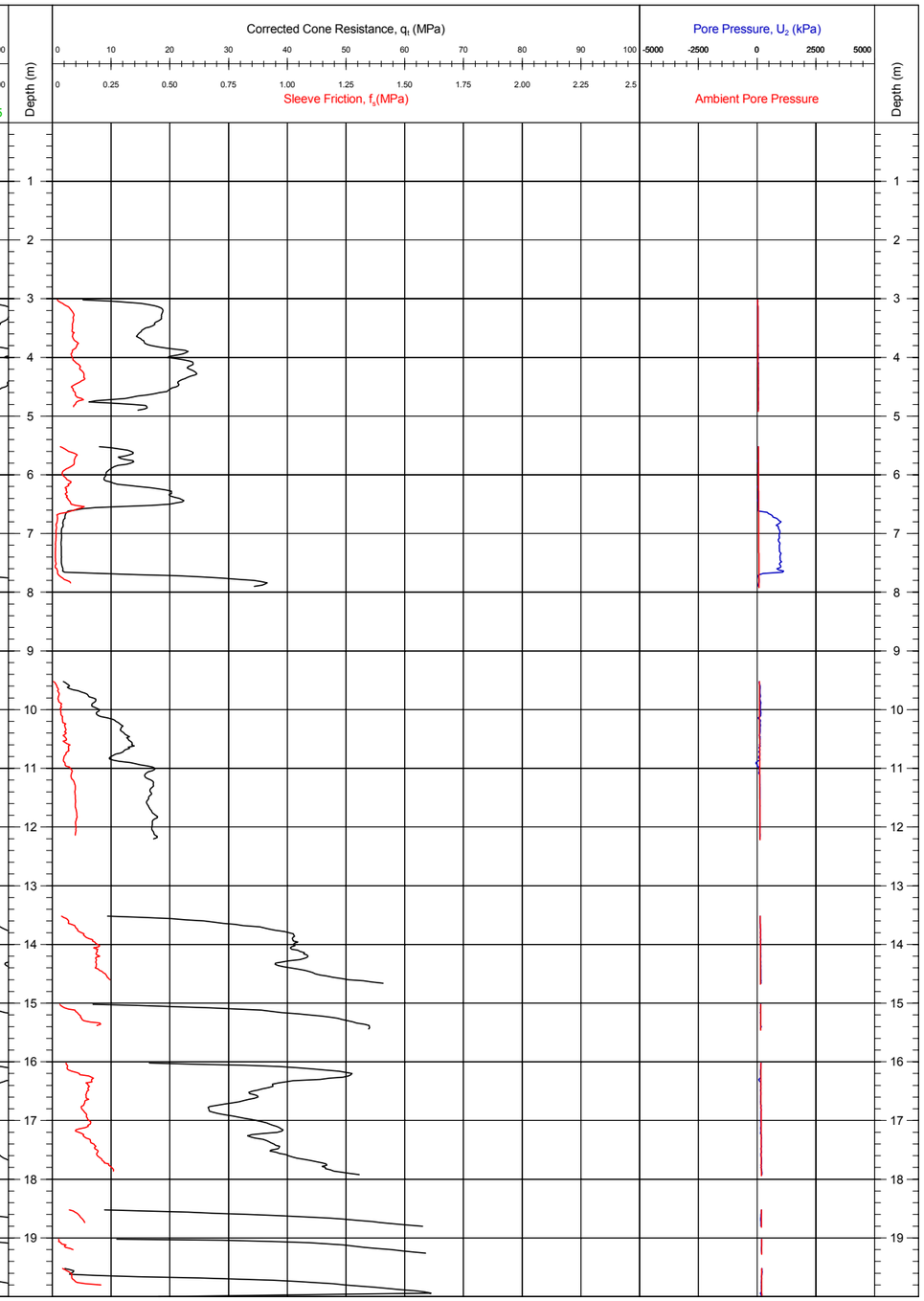
2.1 Interpreted Borehole Logs

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
0					0.10	Poorly graded SAND with gravel. Sand is angular, coarse, light brown with mostly shell. Shell is fine gravel size (15mm). Strong HCL reaction.
1				BH - MET TOWERP1	1.20	Poorly graded SAND with silt. Sand is angular to subangular. Fine to medium grained. Dense to compact. Light grey becoming dark grey. Few stratifications of GRAVEL, gravel is angular and fine. Few pockets of clayey SAND. Few laminations of black organic staining. Micaceous. Strong HCL reaction. *0.10m - 0.30m: CLAY. Very soft, dark grey, wet, no HCL reaction.* *1.00m - 1.15m: Poorly graded GRAVEL with clay. Gravel is angular, coarse (<28mm). Light grey to light brown. Some shell, shell is coarse gravel size (<50mm).* *1.15m - 1.20m: CLAY. Soft, grey, wet. Strong HCL reaction.*
2				BH - MET TOWERP2		
3				BH - MET TOWERP3		
4				003.0 070815G(10cm²) (0.79)		
5				BH - MET TOWERP4		Poorly graded SAND with silt. Sand is angular to subangular. Fine to medium grained. Dense to compact. Light grey becoming dark grey. Few stratifications of GRAVEL, gravel is angular and fine. Few pockets of clayey SAND. Few laminations of black organic staining. Micaceous. Strong HCL reaction.
6						
7				005.5 120911G(10cm²) (0.79)		*6.67m - 7.74m: CLAY with sand. Stiff.*
8						
9				BH - MET TOWERP5		
10						
11				009.5 20911G(10cm²) (0.79)		
12					12.50	Poorly graded SAND. Sand is fine to medium grained, very dense to compact. Light grey and moist. Few laminations of black organic staining. Micaceous. No HCL reaction.
13				BH - MET TOWERP6		
14				013.5 20911G(10cm²) (0.79)		
15				015.0 20911G(10cm²) (0.79)		
16						
17				016.0 20911G(10cm²) (0.79)		
18						
19				018.5 20911G(10cm²) (0.79)		
				019.0 20911G(10cm²) (0.79)		
				019.5 20911G(10cm²)		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

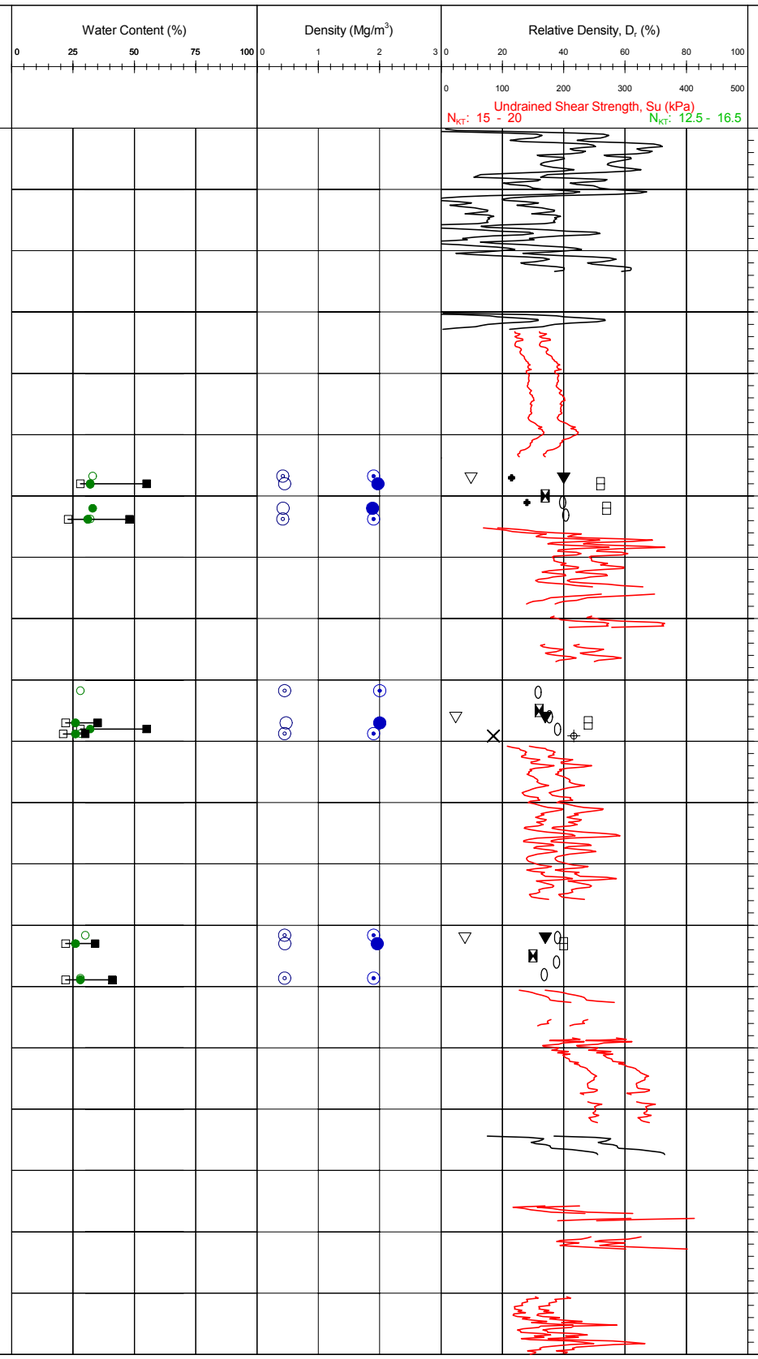
SAND | GRAVEL | COBBLES | Mixed Soil

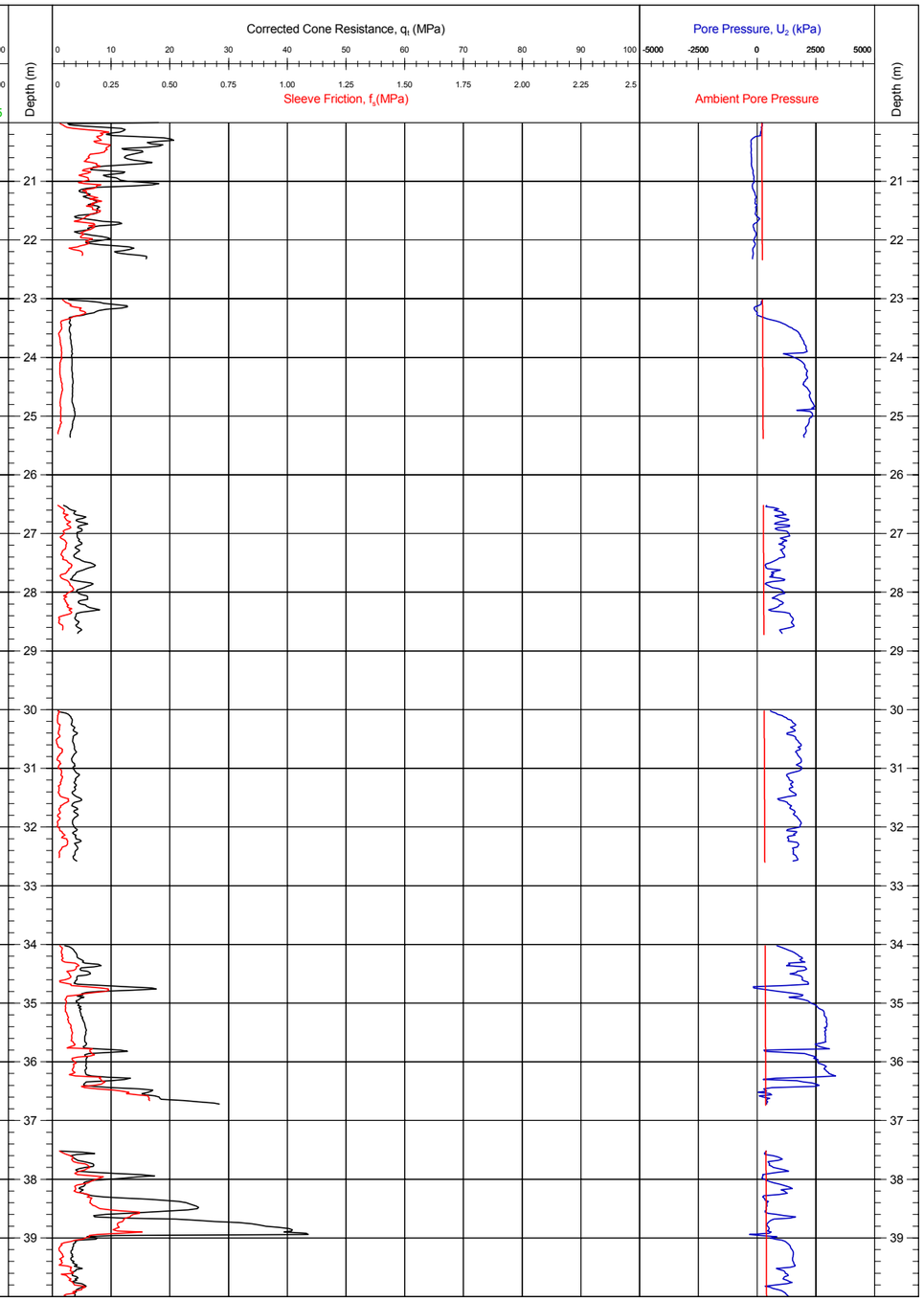
Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status	Sample Name
Contract	**10451**	Latitude/ Longitude		**Comments:**	Preliminary / Draft / Final	**BH - MET TOWER**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**			
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**		X (25/06/2015) / JG (14/12/2014)	
Method	**Wison**	Final Borehole Depth	**64.90m**			Page: 1/4

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
20				(0.79)	20.16	Sandy SILT. Medium dense to dense locally loose.
21				020.0 209113G(10cm² (0.79)		
22						
23					23.30	CLAY with sand. Sand is fine. Very stiff to hard, dark olive grey. Dry. Some laminations and lenses of silt. Micaceous. No HCL reaction.
24				023.0 209113G(10cm² (0.79)		
25						
26				BH - MET TOWERP9	26.50	Sandy CLAY. Sand is fine. Very hard to hard, very dark grey, dry. Little fine to coarse gravel size (<30mm) shell. Some laminations and lenses of sand and silt. Sand is fine grained. Micaceous with trace organics. Weak HCL reaction.
27				026.5 009043G(10cm² (0.75)		
28						
29				BH - MET TOWERP10		
30						
31				030.0 009043G(10cm² (0.75)		
32						
33				BH - MET TOWERP11		
34						
35				034.0 009043G(10cm² (0.75)		*34.91m - 36.25m: CLAY with sand. Hard.*
36						
37				BH - MET OWERP12		*36.44m - 37.00m: Silty SAND. Medium dense.*
38					37.00	Sandy CLAY. Sand is fine. Very hard to hard, very dark grey, dry. Little fine to coarse gravel size (<30mm) shell. Some laminations and lenses of sand and silt. Sand is fine grained. Micaceous with trace organics. Weak HCL reaction. *37.00m - 37.30m: Drillers note: Damaged shelby, possible cobble/gravel.*
39				037.5 009043G(10cm² (0.75)		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

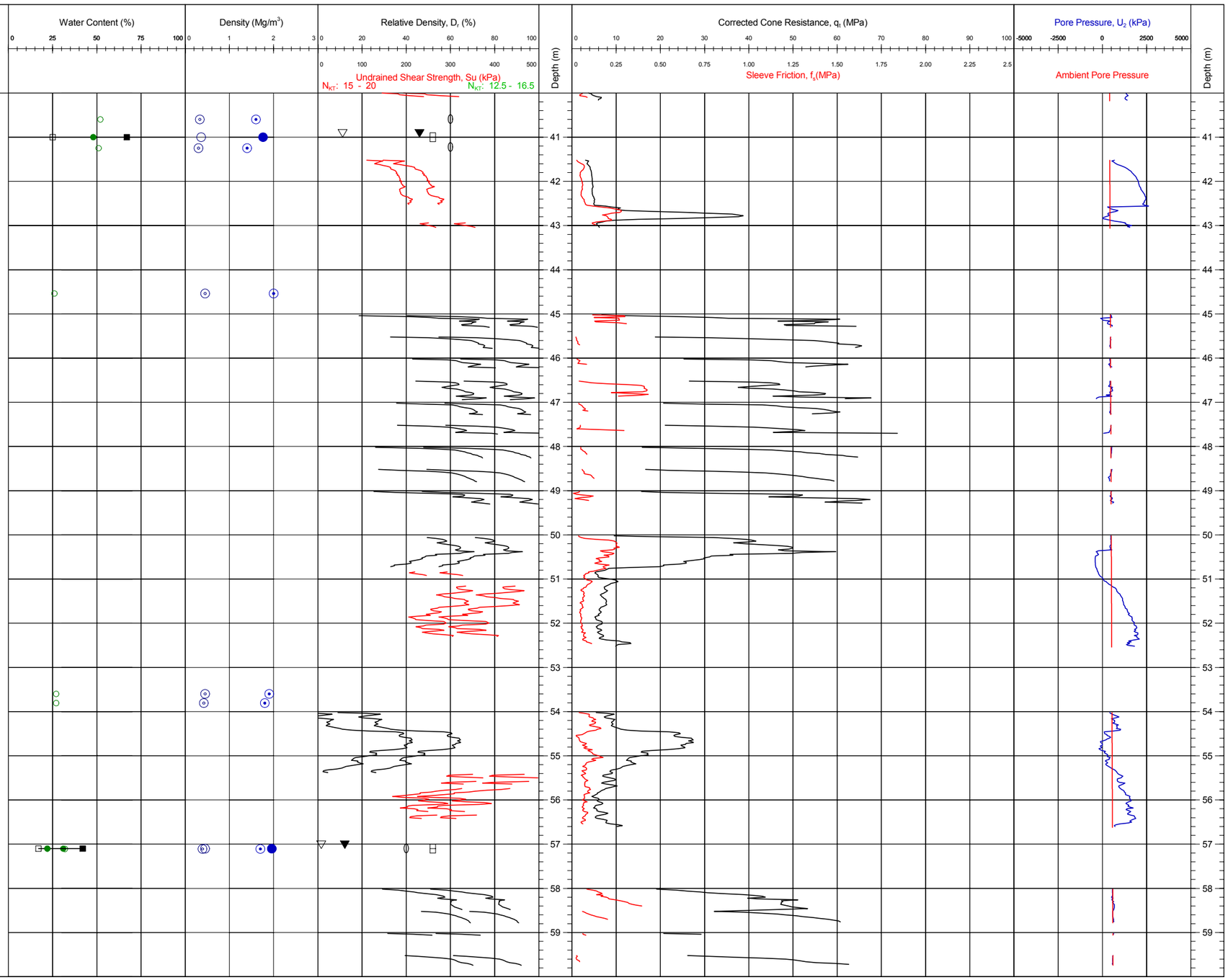
SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - MET TOWER**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**		X (25/06/2015) / JG (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**64.90m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
41				BH - MET TOWERP13		Sandy CLAY. Sand is fine. Very hard to hard, very dark grey, dry. Little fine to coarse gravel size (<30mm) shell. Some laminations and lenses of sand and silt. Sand is fine grained. Micaceous with trace organics. Weak HCL reaction. *40.50m - 41.53m: Elastic SILT. Firm, olive grey, moist, mostly laminated with sandy clay. Sand is fine. No HCL reaction.*
42				041.5 00904G(10cm²) (0.79)		*42.60m - 42.93m: Silty SAND. Dense.*
43						
44					44.01	Poorly graded SAND with silt. Sand is fine grained, grey, compact and wet. No HCL reaction. *44.50m - 44.69m: Drillers note: Damaged shelby, possible cobble/gravel*
45				BH - MET TOWERP14A BH - MET TOWERP14		
46				045.5 00904G(10cm²) (0.79) 046.0 00904G(10cm²) (0.79)		
47				046.5 00904G(10cm²) (0.79) 047.0 00904G(10cm²) (0.79)		
48				047.5 00904G(10cm²) (0.79) 048.0 00904G(10cm²) (0.79)		
49				048.5 20911G(10cm²) (0.79) 049.0 20911G(10cm²) (0.79)		
50				049.5 20911G(10cm²) (0.79)		
51				050.0 20911G(10cm²) (0.79)	50.77	Sandy CLAY. Sand is fine. Hard, grey, moist. No HCL reaction.
52						
53						
54				BH - MET TOWERP16A		*53.50m - 55.30m: Silty SAND. Medium dense to dense.*
55				054.0 20911G(10cm²) (0.79)		
56						
57					57.30	Clayey SAND becoming SAND with silt. Sand is fine to medium grained, grey and moist.
58				BH - MET TOWERP17 058.0 20911G(10cm²) (0.79)		
59				058.5 20911G(10cm²) (0.79) 059.0 20911G(10cm²) (0.79) 059.5 20911G(10cm²) (0.79)		



KEY TO SOIL PROFILE

SILT · CLAY · CHALK · PEAT

SAND · GRAVEL · COBBLES · Mixed Soil

Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**		X (25/06/2015) / JG (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**64.90m**		

Sample Name: **BH - MET TOWER**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
61				061.0 20911G(10cm²) (0.79)		Clayey SAND becoming SAND with silt. Sand is fine to medium grained, grey and moist.
62						
63				062.0 20911G(10cm²) (0.79)		*63.09m - 63.51m: Sandy CLAY. Hard.*
64						
65				064.5 20911G(10cm²) (0.79)		End of borehole at 64.90m
66						
67						
68						
69						
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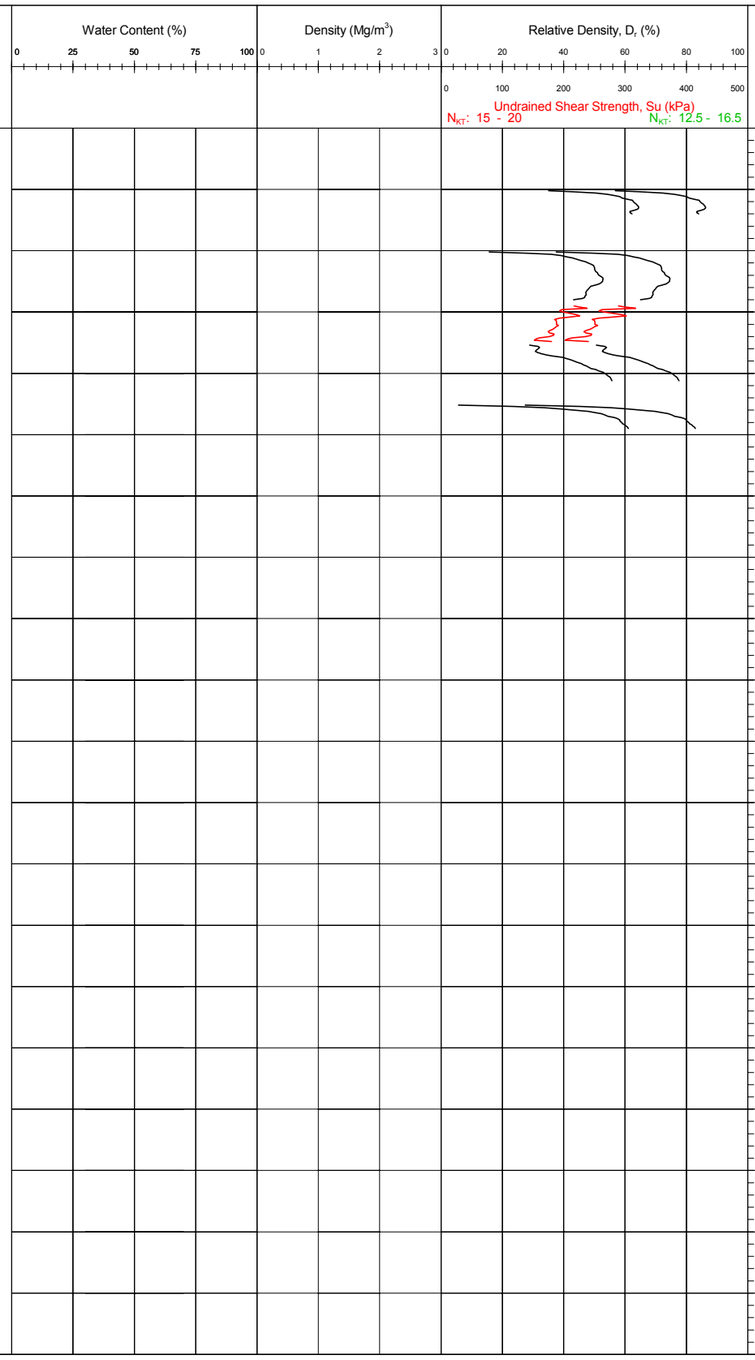
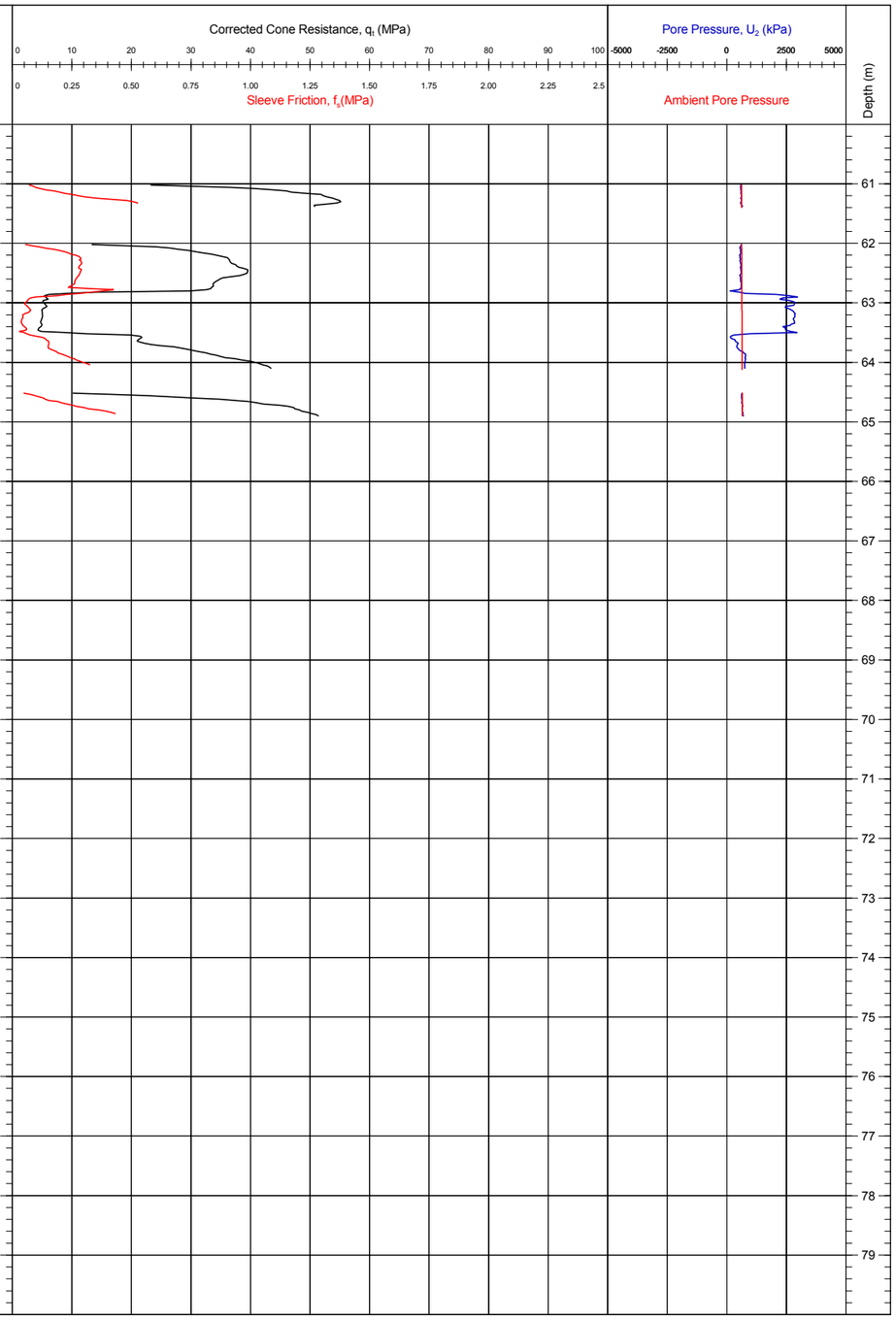
79						





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - MET TOWER**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**		**X** (25/06/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**64.90m**		Page: 4/4

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
0				BH - D14P1		Poorly graded SAND locally gravelly. Sand is subangular to subrounded, medium to coarse. Sand is dense to very dense. Gravel is subrounded and fine (<8mm). Light brown becoming dark grey, dry, with little shell (<30mm). Weak HCL reaction.
1				BH - D14P2		
2						
3				BH - D14P4		
4				BH - D14P5		
5				004.0 081213G(10cm²) (0.83)	4.57	Poorly graded SAND locally gravelly. Sand is subangular to subrounded, medium to coarse. Sand is dense to very dense. Gravel is subrounded and fine (<8mm). Light brown becoming dark grey, dry, with little shell (<30mm). Weak HCL reaction.
6						
7				BH - D14P6		
8					8.50	Sandy CLAY with some stratifications of clayey sand. Stiff to very stiff, grey, moist. No HCL reaction. *9.00m - 9.15m: Sandy SILT* *9.34m - 9.44m: Sandy SILT. Loose* *9.35m - 9.46m: Sandy SILT* *10.00m - 10.98m: CLAY. Firm, dark grey, moist, trace becoming some shell. Shell is fine gravel size (<4mm). Weak HCL reaction.* *11.42m - 12.41m: SAND with silt, loose to dense.*
9				007.5 081213G(10cm²) (0.83)		
10						
11				BH - D14P7		
12				011.0 081213G(10cm²) (0.83)		
13						
14				BH - D14P8		
15					14.53	SAND, medium dense to very dense.
16				014.5 081213G(10cm²) (0.83)	15.11	Sandy CLAY mostly stratified with clayey sand. Clay is stiff to very stiff. *15.25m - 15.40m: Clayey SAND* *15.24m - 15.42m: Clayey SAND. Loose.* *15.97m - 16.16m: Clayey SAND. Loose* *15.96m - 16.17m: Clayey SAND* *16.24m - 16.41m: Clayey SAND. Loose* *16.25m - 16.42m: Clayey SAND*
17					16.52	SAND. Medium dense to very dense. *17.53m - 17.80m: Sandy CLAY with gravel. Clay is firm. grey, moist. Gravel is angular and fine (<12mm). No HCL reaction.*
18				BH - D14P9		
19				018.0 081213G(10cm²) (0.83)		

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**515755.0E**	**4243606.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**
Contract	**10451**	Latitude/ Longitude			**Comments:**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**		
Method	**Wison**	Final Borehole Depth	**25.80m**		

QC Status			Sample Name
Preliminary	Draft	Final	**BH - D14**
SH (28/06/2015)	**JG** (14/12/2014)		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
21						SAND. Medium dense to very dense.
22				BH - D14P10		*21.02m - 21.54m: CLAY laminated with silt, very stiff, dark grey and moist. Some stratifications of sand, sand is fine to medium grained, dark grey and moist. No HCL reaction.*
22					22.00	Poorly graded SAND with gravel and locally silt. Sand is angular to subangular and coarse, medium dense to dense, light grey, and moist. Gravel is fine(<12mm). Weak HCL reaction.
23				022.0 081213G(10cm²) (0.83)		*22.13m - 22.17m: Sandy CLAY*
24						*22.45m - 22.51m: Sandy CLAY*
24						*22.45m - 22.51m: Sandy CLAY*
24						*23.10m - 23.19m: Sandy CLAY*
24						*23.10m - 23.20m: Sandy CLAY*
25				BH - D14P11 025.0 20911G(10cm²) (0.79)		
25				025.5 20911G(10cm²) (0.79)	25.62	End of borehole at 25.80m
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						

Water Content (%): 0, 25, 50, 75, 100

Density (Mg/m^3): 0, 1, 2, 3

Relative Density, D$_r$ (%): 0, 20, 40, 60, 80, 100

Undrained Shear Strength, Su (kPa): 0, 100, 200, 300, 400, 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Sleeve Friction, f_s(MPa): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5

Pore Pressure, U_2 (kPa): -5000, -2500, 0, 2500, 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**515755.0E 4243606.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - D14**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**		**SH** (28/06/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**25.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
				BH - D14AP1		

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

KEY TO SOIL PROFILE

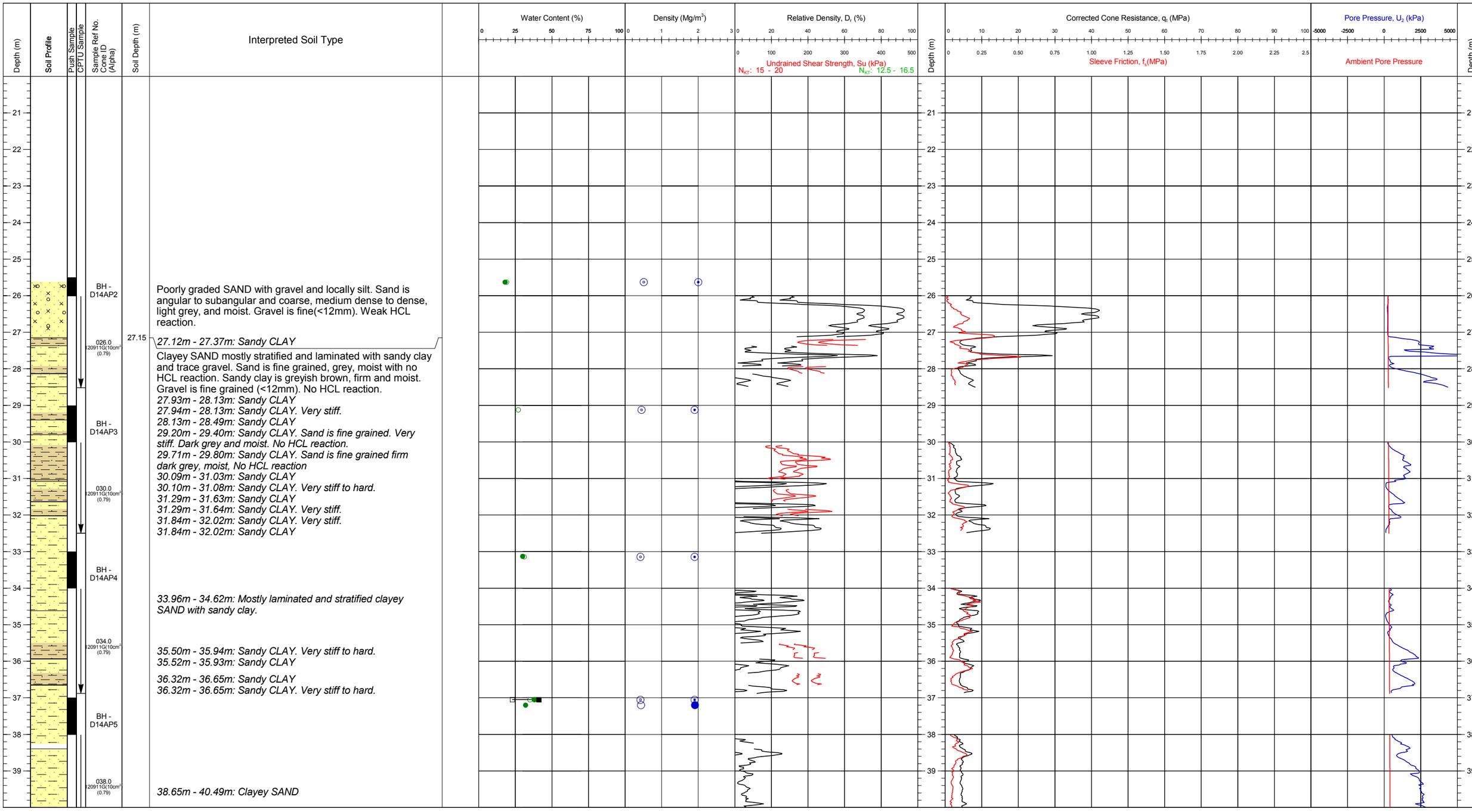
SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		X (30/06/2015) / JG (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**71.30m**		Sample Name: **BH - D14A**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING



KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - D14A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		X (30/06/2015) / JG (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**71.30m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Interpreted Soil Type
41	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine grained, grey, moist with no HCL reaction. Sandy clay is greyish brown, firm and moist. Gravel is fine grained (<12mm). No HCL reaction.
42	*42.03m - 42.38m: Sandy CLAY. Very stiff* *42.09m - 42.39m: Sandy CLAY*
43	
44	*43.31m - 45.00m: Sandy SILT, medium dense.*
45	
46	
47	
48	
48.90	Sandy CLAY. Very stiff to hard, dark grey and moist. Little laminations of clay. Little to mostly shelly, fine to coarse gravel size(<60mm). Sand is fine to medium. Weak HCL reaction.
49	
50	
51	
52	
53	
54	
55	*55.48m - 55.99m: Clayey SAND. Loose*
56	
57	*56.49m - 57.00m: Clayey SAND. Sand is fine to coarse grained, dark grey and moist. Little lenses of clay. Some shell fine to coarse gravel size (<20mm). No HCL reaction.*
58	
59	*59.15m - 59.42m: Clayey SAND* *59.16m - 59.42m: Clayey SAND. Medium dense.*

Soil Profile: Push Sample; CPTU Sample; Sample Ref No. Cone ID (Alpha); Soil Depth (m)

BH - D14AP6
042.0 20911G(10cm² (0.79)
BH - D14AP7
045.5 20911G(10cm² (0.79)
BH - D14AP8
049.5 20911G(10cm² (0.79)
BH - D14AP9
053.5 00912G(10cm² (0.76)
BH - D14AP10
057.5 00912G(10cm² (0.76)

Water Content (%): 0 25 50 75 100

Density (Mg/m^3): 0 1 2 3

Relative Density, D_r (%): 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa): 0 100 200 300 400 500
N_{KT}: 15 - 20
N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa): 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa): -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT; CLAY; CHALK; PEAT; SAND; GRAVEL; COBBLES; Mixed Soil

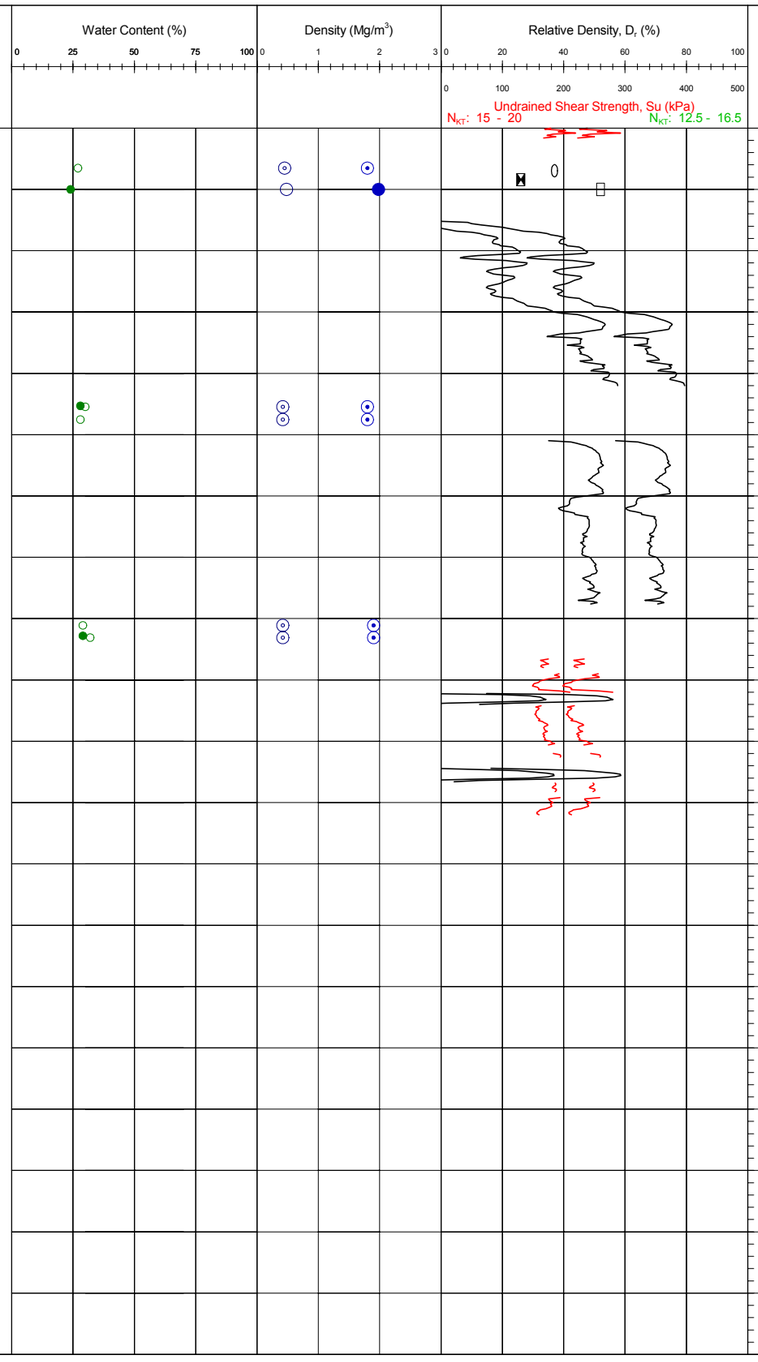
Area	**Maryland USA**	Coordinates	**515755.1E**	**4243612.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**
Contract	**10451**	Latitude/ Longitude			**Comments:**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		
Method	**Wison**	Final Borehole Depth	**71.30m**		

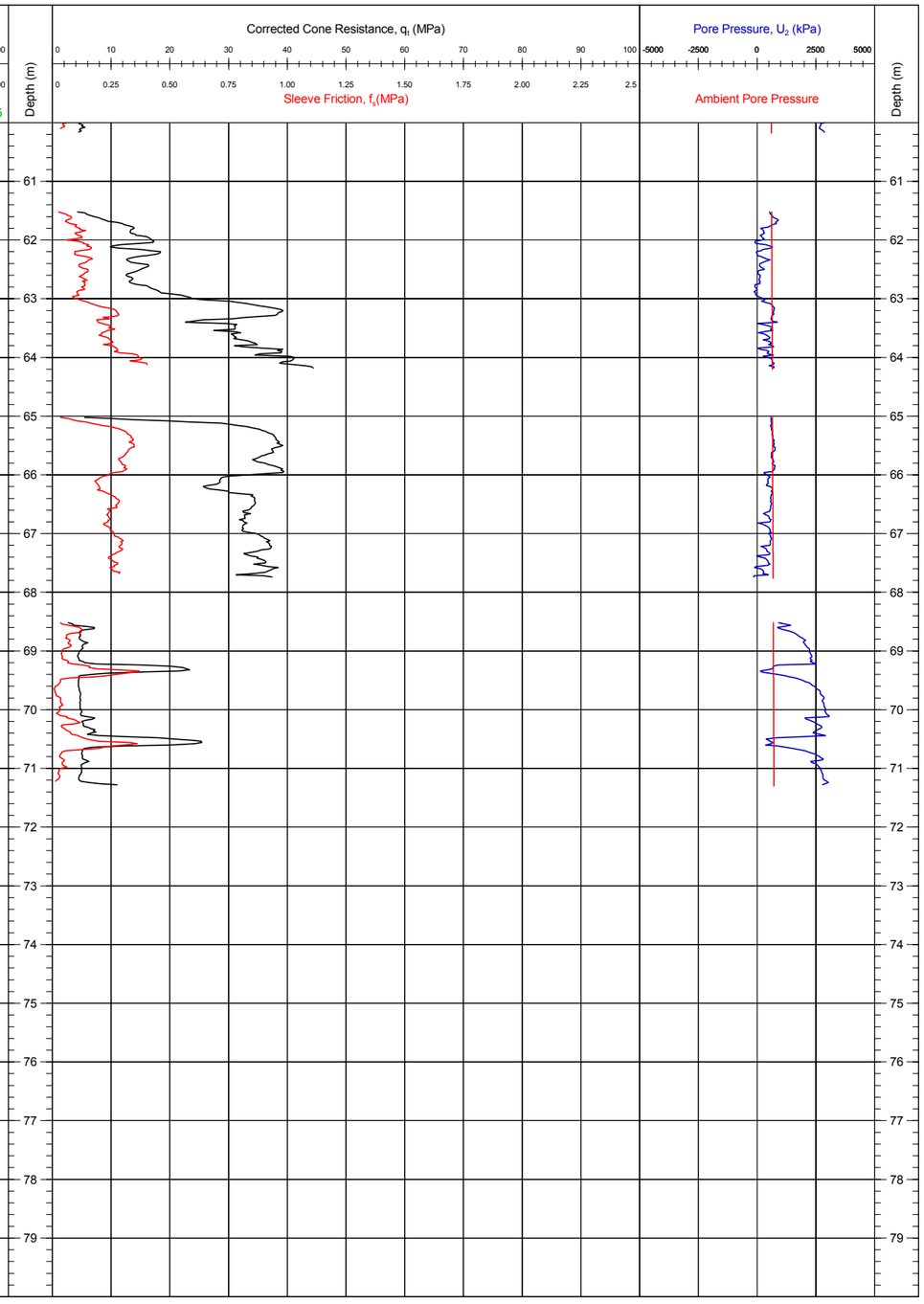
QC Status			Sample Name
Preliminary	Draft	Final	**BH - D14A**
X (30/06/2015)	**JG** (14/12/2014)		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
61				BH - D14AP11	61.50	Sandy CLAY. Very stiff to hard, dark grey and moist. Little laminations of clay. Little to mostly shelly, fine to coarse gravel size(<60mm). Sand is fine to medium. Weak HCL reaction.
62						Silty SAND. Sand is fine, loose becoming dense, dark grey, moist with weak HCL reaction.
63				061.5 00912G(10cm²) (0.76)		*62.99m - 64.04m: SAND with silt. Dense.*
64						
65				BH - D14AP12		*64.72m - 64.92m: Silty SAND with gravel. Sand is fine, dark grey and moist. Gravel is subangular to subrounded and fine (<15mm). Weak HCL reaction.*
66				065.0 00912G(10cm²) (0.76)		
67						
68				BH - D14AP13	68.36	Sandy CLAY. Very stiff to hard.
69						*69.20m - 69.34m: Clayey SAND. Loose to medium dense.* *69.22m - 69.41m: Clayey SAND*
70				068.5 00912G(10cm²) (0.76)		*70.43m - 70.66m: Clayey SAND* *70.46m - 70.66m: Clayey SAND. Loose to medium dense*
71						End of borehole at 71.30m
72						
73						
74						
75						
76						
77						
78						
79						





KEY TO SOIL PROFILE

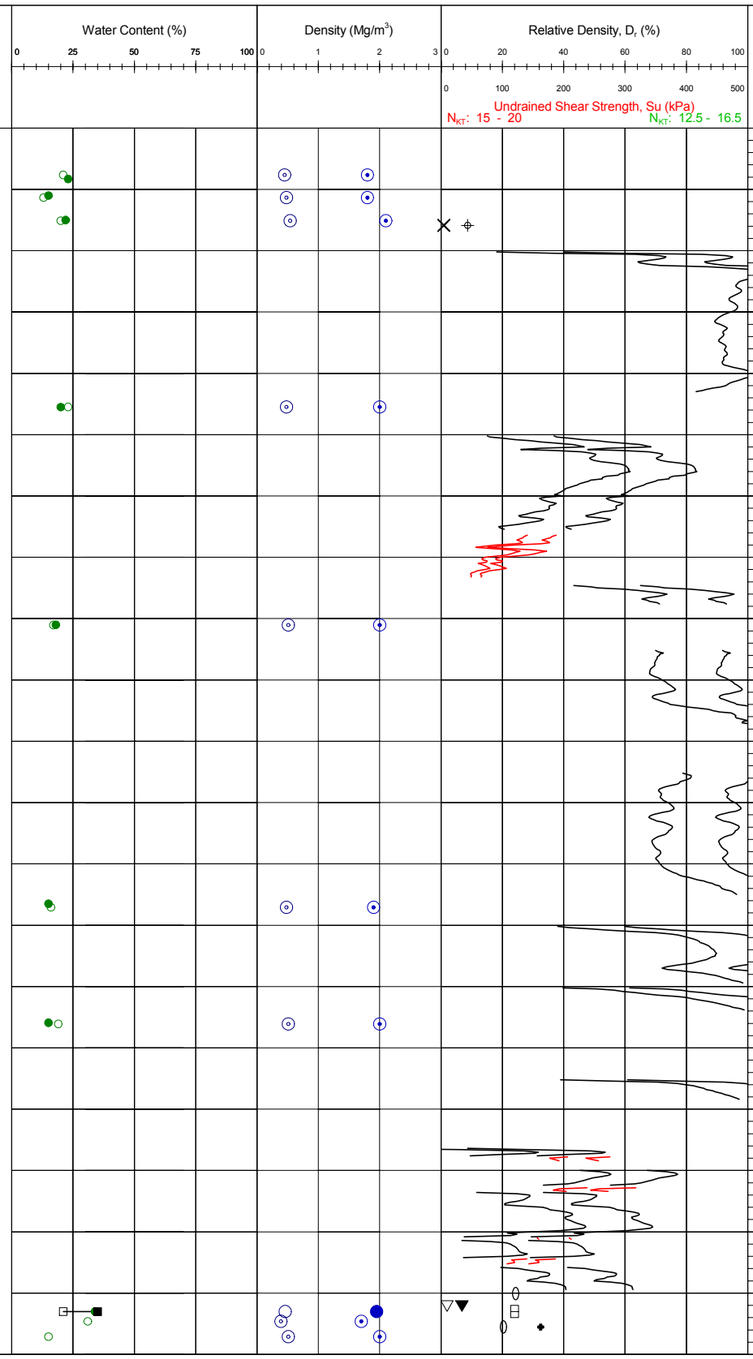
SILT | CLAY | CHALK | PEAT | SAND | GRAVEL | COBBLES | Mixed Soil

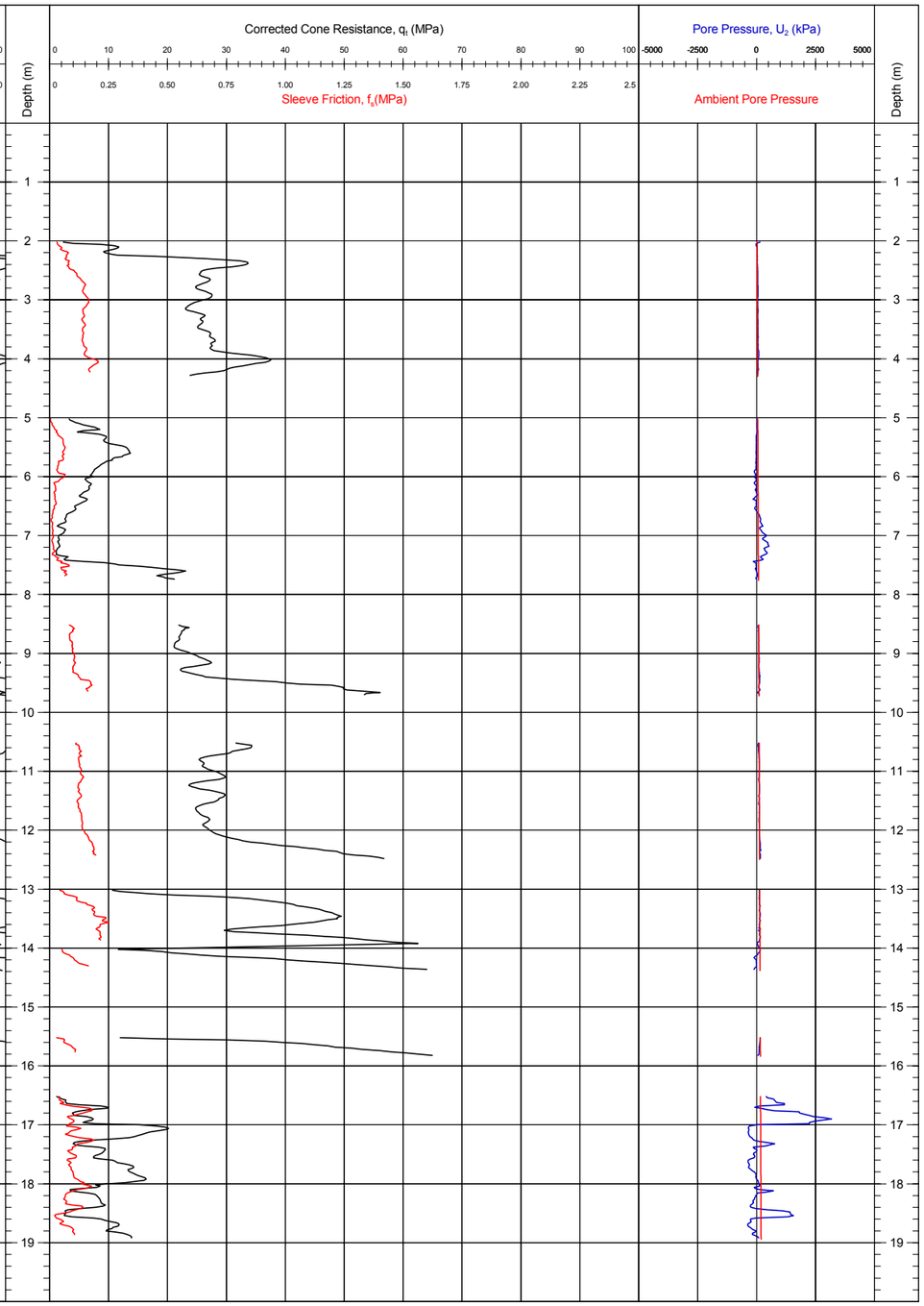
Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		**X** (30/06/2015) / **JG** (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**71.30m**		Sample Name: **BH - D14A**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
0						
1				BH - G7P2		Poorly graded SAND locally with clay and gravel. Sand is medium, medium dense to compact, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly. Gravel subangular to subrounded, fine (<15mm), shell is coarse (30mm). Strong HCL reaction.
2				BH - G7P3	1.50	*1.10m - 1.15m: Sandy CLAY. Soft, grey and wet. No HCL reaction.*
3				002.0 070815G(10cm²) (0.79)		*1.15m - 1.50m: Clayey SAND. Sand is fine, grey and wet with mostly lenses of sandy clay. Weak HCL reaction.*
4						Poorly graded SAND locally with clay and gravel. Sand is medium, medium dense to compact, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly. Gravel subangular to subrounded, fine (<15mm), shell is coarse (30mm). Strong HCL reaction.
5				BH - G7P4		
6				005.0 070815G(10cm²) (0.79)		*6.41m - 7.41m: Sandy CLAY. Very stiff.*
7					7.52	
8				BH - G7P5		Poorly graded SAND. Sand is medium, very dense to compact, light grey, moist with few lenses of sandy CLAY. No HCL reaction.
9				008.5 070815G(10cm²) (0.79)		
10				BH - G7P6A		
11				010.5 070815G(10cm²) (0.79)		
12				BH - G7P7A		*12.50m - 12.79m: Gravelly SAND. Sand is angular and coarse. Gravel is subangular to subrounded, fine to coarse (<30mm). Light grey, moist, No HCL reaction.*
13				013.0 070815G(10cm²) (0.79)		
14				014.0 120911G(10cm²) (0.79)		
15				BH - G7P8		
16				015.5 120911G(10cm²) (0.79)		
17					16.50	CLAY, Stiff to very stiff, dark grey to dark greyish brown and moist. Few coarse shell (<30mm). Stratified with sandy elastic silt, sand is fine dark grey and moist. Stratified with sandy silt, Sand is fine, dark grey, and moist. Stratified with silty sand with gravel. Sand is coarse, gravel is subangular to subrounded, fine (<18mm) dark grey and moist. Stratified with silty sand, sand is fine, dark grey and moist. Micaceous with trace lenses of weakly cemented greyish brown silt. Few laminations of grey silt. No HCL reaction.
18				016.5 120911G(10cm²) (0.79)		*16.78m - 16.95m: CLAY*
19				BH - G7P10		*16.99m - 17.23m: Silty SAND. Dense.*





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G7**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**06/07/2015 - 07/07/2015**		**SH** (07/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**75.20m**		

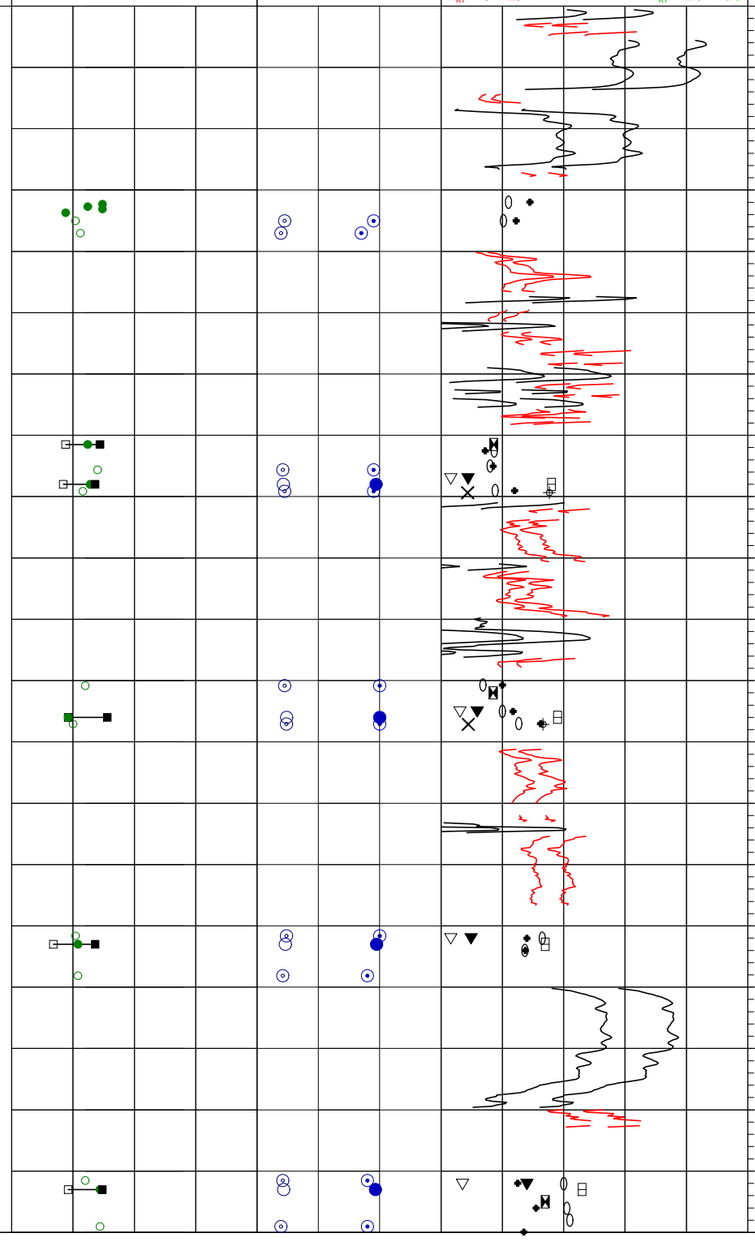
Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

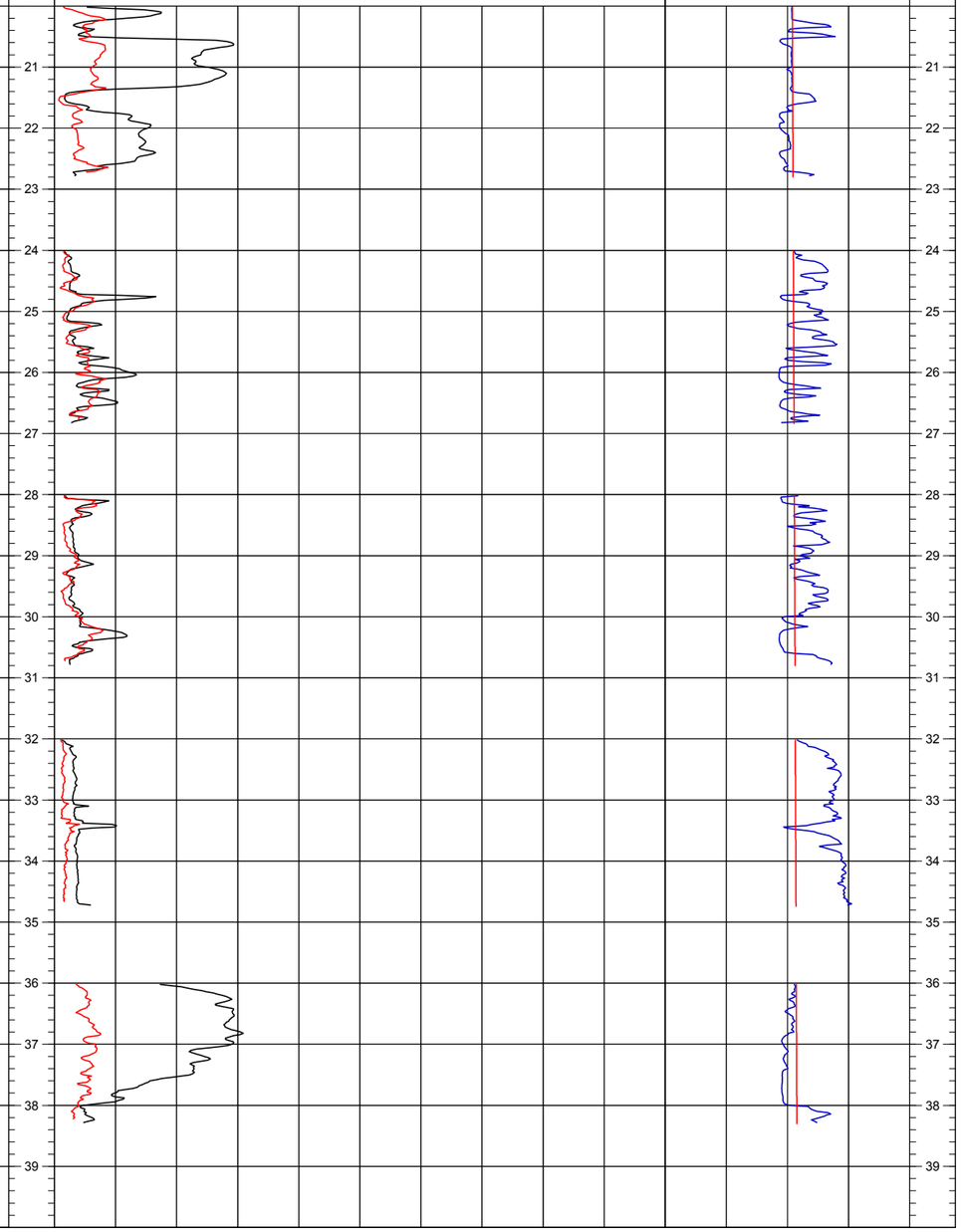
BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Gardline

US Wind Inc. sea energy

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
						17.26m - 17.35m: Sandy CLAY *17.37m - 18.08m: Silty SAND. Medium dense.* *18.08m - 18.13m: Sandy CLAY* *18.14m - 18.41m: Silty SAND. Medium dense.* *18.43m - 18.57m: Sandy CLAY* *18.57m - 18.96m: Silty SAND. Medium dense.* *19.65m - 20.22m: Gravelly SAND. Sand is angular to subrounded, fine to coarse. Gravel is subangular to rounded, fine to coarse (<25mm), dark grey and wet. No HCL reaction*
21				020.0 20911G(10cm² (0.79)		CLAY, Stiff to very stiff, dark grey to dark greyish brown and moist. Few coarse shell (<30mm). Stratified with sandy elastic silt, sand is fine dark grey and moist. Stratified with sandy silt, Sand is fine, dark grey, and moist. Stratified with silty sand with gravel. Sand is coarse, gravel is subangular to subrounded, fine (<18mm) dark grey and moist. Stratified with silty sand, sand is fine, dark grey and moist. Micaceous with trace lenses of weakly cemented greyish brown silt. Few laminations of grey silt. No HCL reaction.
22						
23				BH - G7P11		
24						
25				024.0 20911G(10cm² (0.79)		
26						*20.23m - 20.50m: Sandy CLAY* *20.54m - 21.37m: Silty SAND. Dense.* *21.40m - 21.60m: Sandy CLAY* *21.66m - 22.66m: Silty SAND. Medium dense.* *24.72m - 24.88m: Silty SAND. Medium dense.* *25.15m - 25.30m: Silty SAND. Medium dense.*
27				BH - G7P12		*25.89m - 26.14m: Clayey SAND* *25.89m - 26.15m: Silty SAND. Medium dense.* *26.26m - 26.32m: Silty SAND* *26.26m - 26.33m: Silty SAND. Medium dense.* *26.39m - 26.54m: Silty SAND. Medium dense.* *26.40m - 26.56m: Silty SAND* *28.00m - 28.20m: Silty SAND* *28.02m - 28.18m: Silty SAND. Loose.* *29.07m - 29.20m: Silty SAND. loose.* *29.10m - 29.22m: Silty SAND* *30.00m - 30.60m: Silty SAND. Loose to medium dense.* *29.98m - 30.63m: Silty SAND*
28						
29				028.0 20911G(10cm² (0.79)		
30						
31				BH - G7P13	30.62	CLAY with sand, locally sandy clay with gravel, very stiff to hard, dark greyish brown and moist. Few lenses and laminations of sand and silt. Few fine to coarse gravel size shell (<45mm), Few gravel, gravel is subrounded, fine to coarse (<30mm). No HCL reaction.
32						*31.04m - 31.62m: Sandy CLAY with gravel and sand, sand is fine to coarse, gravel is subangular to subrounded and fine. Very stiff, dark greyish brown, moist to dry with little laminations of silt, few lenses silty coarse sand with subrounded fine gravel, No HCL reaction.*
33				032.0 20911G(10cm² (0.79)		*33.32m - 33.48m: Silty SAND* *33.32m - 33.48m: Silty SAND. Medium dense.*
34						
35				BH - G7P14		
36					36.06	*35.80m - 36.00m: Sandy gravelly CLAY. Sand is fine to medium, gravel is fine to coarse (<45mm) carbonate shell. very stiff, dark grey and dry. Weak HCL reaction.*
37				036.0 20911G(10cm² (0.79)		Silty SAND. Medium dense to dense.
38					37.96	Sandy CLAY. Very stiff to hard, dark grey, dry, few grey silt laminations and few locally some fine to coarse (<70mm) gravel size shell. No HCL reaction.
39				BH - G7P15		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G7**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**06/07/2015 - 07/07/2015**		**SH** (07/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**75.20m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Soil Depth (m)	Interpreted Soil Type
43.92	Sandy CLAY. Very stiff to hard, dark grey, dry, few grey silt laminations and few locally some fine to coarse (<70mm) gravel size shell. No HCL reaction.
51.62	Clayey SAND. Sand is fine to coarse, medium dense, dark grey and moist. Stratified with silty sand. Sand is fine to coarse, dark greenish grey and moist. Trace to locally mostly shelly. Shell is fine to coarse (<70mm). Few lenses of sand, sand is medium to coarse, dark greenish grey sand. Trace lenses of sandy clay. Weak HCL reaction *45.22m - 46.10m: Silty SAND. Medium dense.* *47.05m - 47.50m: SAND with silt. Sand is fine to coarse, dark greenish grey and moist. Mostly shell, shell is fine to coarse gravel size (<70mm). Weak HCL reaction.* *47.62m - 49.52m: Silty SAND. Dense becoming loose.*
58.67	Poorly graded SAND with silt. Sand is medium, very dense to compact, grey, moist, mostly shelly, shell is fine gravel size (12mm). No HCL reaction. *56.52m - 56.55m: Sandy CLAY*

Push Sample / CPTU Sample / Sample Ref No. Cone ID (Alpha):
- 040.0 20911G(10cm² (0.79)
- BH - G7P16
- 044.0 20911G(10cm² (0.79)
- BH - G7P17
- 047.5 20911G(10cm² (0.79)
- BH - G7P18
- 051.0 20911G(10cm² (0.79)
- BH - G7P19
- 053.5 20911G(10cm² (0.79)
- 054.0 20911G(10cm² (0.79)
- 055.0 20911G(10cm² (0.79)
- BH - G7P20
- 058.0 20911G(10cm² (0.79)

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500
N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m) 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT
SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**06/07/2015 - 07/07/2015**		**SH** (07/07/2015) / **JG** (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**75.20m**		Sample Name: **BH - G7**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
61				BH - G7P21		Sandy CLAY. Sand is fine. Very stiff to hard, grey becoming greyish brown and dry with some fine shell and micaceous. Few to some shell. Shell is fine gravel size (<6mm). Stratified with clayey sand. Sand is fine, grey and dry. Some laminations of silt and clay. Weak HCL reaction. *59.65m - 61.38m: Clayey SAND. medium dense to dense.* *59.85m - 61.40m: Clayey SAND*
62				061.0 00912G(10cm² (0.76)		
63						
64				BH - G7P22		*64.33m - 64.53m: Silty SAND, with some laminations of sandy clay. Sand is fine, dry, some fine shell. Weak HCL.* *64.52m - 64.59m: Silty SAND* *64.71m - 64.84m: Silty SAND. Loose.* *64.74m - 64.84m: Silty SAND* *65.39m - 65.51m: Silty SAND. Loose* *65.40m - 65.50m: Silty SAND* *66.07m - 66.16m: Silty SAND* *66.07m - 66.16m: Silty SAND. Loose.*
65						
66				064.5 00912G(10cm² (0.76)		
67						
68				BH - G7P23		*68.01m - 68.15m: Gravelly CLAY. Gravel is carbonate shell, fine gravel size (<10mm), firm, grey and moist. Strong HCL reaction.*
69						
70				068.5 00905G(10cm² (0.82)		
71						*70.45m - 70.66m: Silty SAND* *70.45m - 70.66m: Silty SAND. Medium dense.*
72				BH - G7P24		
73						
74				072.5 00905G(10cm² (0.82)		
75						End of borehole at 75.20m
76						
77						
78						
79						

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G7**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**06/07/2015 - 07/07/2015**		**SH** (07/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**75.20m**		Page: 4/4

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Soil Depth (m)	Interpreted Soil Type
	Poorly graded SAND with gravel. Sand is angular and medium. Gravel is subrounded, fine (<10mm) grey, moist with some shell, Shell is fine gravel size (<8mm). Strong HCL reaction.
1.50	Poorly graded SAND with silt. Sand is fine grained, dense to compact, grey becoming light olive brown and moist. Locally with some gravel, gravel is rounded and fine (<12mm). Strong HCL reaction.
	5.00m - 5.10m: CLAY. Soft, pale brown and moist. Mostly laminated with iron oxide stained sand. Sand is fine. No HCL reaction. *5.40m - 5.50m: Sandy GRAVEL. Gravel is subrounded and fine (<12mm), olive brown and moist. No HCL reaction.*
10.61	Well graded SAND locally with gravel. Sand is subangular to subrounded, fine to coarse. Gravel is subrounded, fine to coarse (<25mm), very dense to compact, light yellowish brown and moist. No HCL reaction.
	19.59m - 19.77m: Clayey SAND. Dense.

Push Sample / CPTU Sample / Sample Ref No. / Cone ID (Alpha):

- BH - G17P1
- BH - G17P2
- BH - G17P3
- 002.5 20911G(10cm² (0.79)
- BH - G17P4
- 006.0 20911G(10cm² (0.79)
- BH - G17P5
- 008.5 20911G(10cm² (0.79)
- BH - G17P7A
- 012.5 20911G(10cm² (0.79)
- 014.0 20911G(10cm² (0.79)
- BH - G17P8
- 015.5 20911G(10cm² (0.79)
- BH - G17P9
- 017.5 20911G(10cm² (0.79)
- BH - G17P10

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G17**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**		
Method	**Wison**	Final Borehole Depth	**41.00m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Interpreted Soil Type	Soil Depth (m)
21	Well graded SAND locally with gravel. Sand is subangular to subrounded, fine to coarse. Gravel is subrounded, fine to coarse (<25mm), very dense to compact, light yellowish brown and moist. No HCL reaction.	
22		
23		
24		
25	*24.50m - 25.50m: Drillers note: Damaged shelby, possible COBBLE/GRAVEL.*	
26		
27		
28		
29		
30		
31	*30.53m - 31.40m: Silty SAND. Loose.*	31.41
32	CLAY with sand stratified with sandy clay. Sand is fine. Very stiff to hard, dark grey to dark greyish brown, dry, micaceous. Locally some shell, shell is fine to coarse gravel size (<30mm). Trace gravel, gravel is subangular and fine (<8mm). No HCL reaction.	
33		
34	*33.50m - 33.90m: Elastic SILT with sand. Sand is fine. Very stiff to hard, very dark grey and moist. Few lenses of weakly cemented, greyish brown silt. No HCL reaction.*	
35		
36		
37		
38		38.50
39	End of borehole at 41.00m	

Soil Profile: Push Sample; CPTU Sample; Sample Ref No. Cone ID (Alpha)

019.0 20911G(10cm²) (0.79)
022.5 20911G(10cm²) (0.79)
023.5 20911G(10cm²) (0.79)
025.5 20911G(10cm²) (0.79)
026.5 20911G(10cm²) (0.79)
028.0 20911G(10cm²) (0.79)
028.5 20911G(10cm²) (0.79)
029.0 20911G(10cm²) (0.79)
BH - G17P11
030.0 20911G(10cm²) (0.79)
030.5 20911G(10cm²) (0.79)
BH - G17P14A
034.5 00917G(10cm²) (0.8)
BH - G17P15
038.5 00904G(10cm²)

Water Content (%) 0 25 50 75 100

Density (Mg/m³) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500
N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s (MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT
SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G17**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**		
Method	**Wison**	Final Borehole Depth	**41.00m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m) | Soil Profile | Push Sample | CPTU Sample | Sample Ref No. Cone ID (Alpha) | Soil Depth (m) | Interpreted Soil Type

Sample Ref No. Cone ID (Alpha): (0.79)

Water Content (%): 0 25 50 75 100

Density (Mg/m^3): 0 1 2 3

Relative Density, D_r (%): 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa): 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa): 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa): -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m): 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - G17**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**		
Method	**Wison**	Final Borehole Depth	**41.00m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**519056.4E**	**4240311.6N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**
Contract	**10451**	Latitude/ Longitude			**Comments:** **BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**		
Method	**Wison**	Final Borehole Depth	**74.00m**		

QC Status			Sample Name
Preliminary	Draft	Final	**BH - G17A**
NV-S (03/07/2015)	**JG** (14/12/2014)		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m) | Soil Profile | Push Sample | CPTU Sample | Sample Ref No. Cone ID (Alpha) | Soil Depth (m) | Interpreted Soil Type

Water Content (%): 0 25 50 75 100

Density (Mg/m^3): 0 1 2 3

Relative Density, D_r (%): 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa): 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa): 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa): -5000 -2500 0 2500 5000

Ambient Pore Pressure

Depth (m): 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

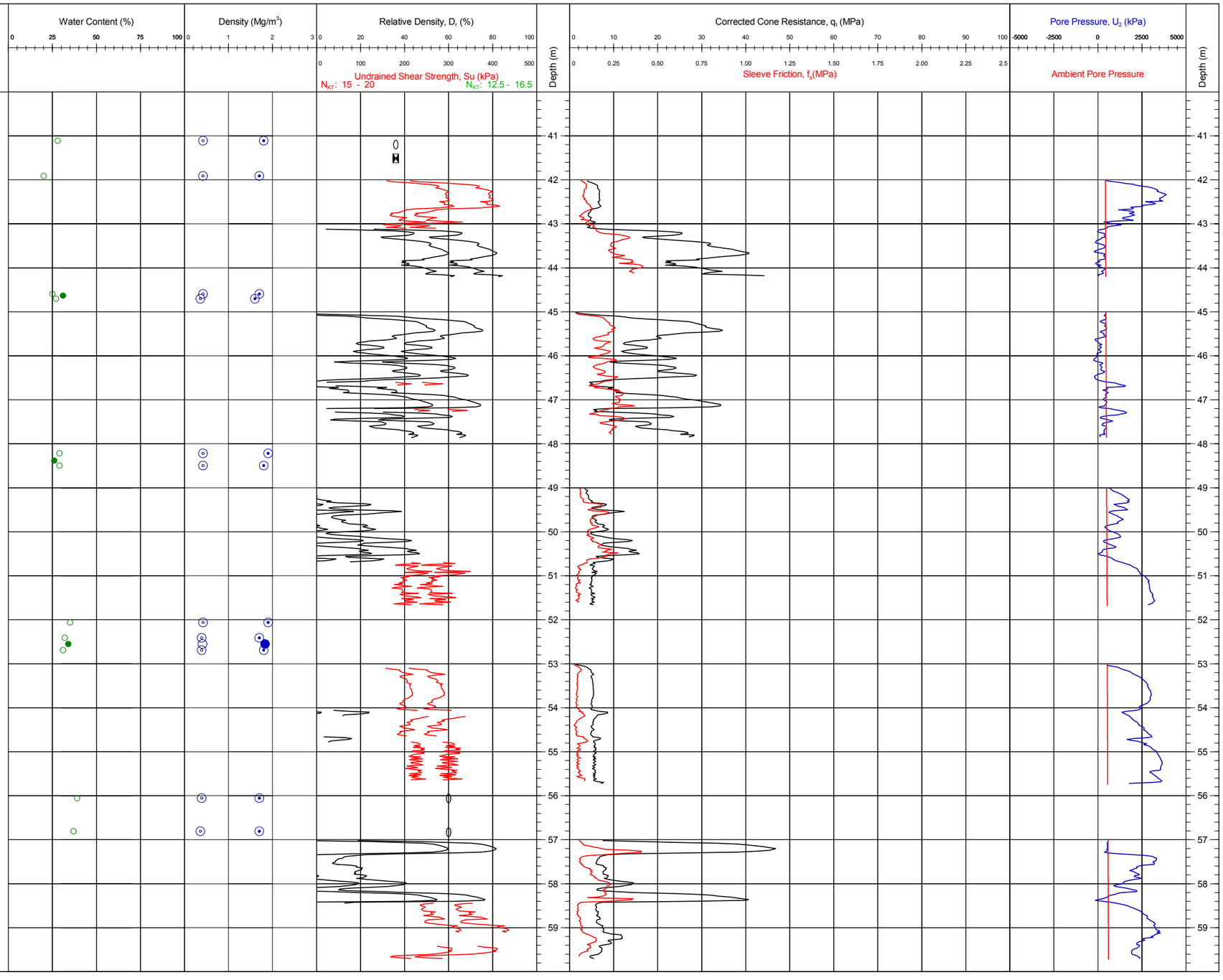
Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:** **BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**		**NV-S** (03/07/2015) / **JG** (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**74.00m**		

Sample Name: **BH - G17A**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
41						CLAY with sand stratified with sandy clay. Sand is fine. Very stiff to hard, dark grey to dark greyish brown, dry, micaceous. Locally some shell, shell is fine to coarse gravel size (<30mm). Trace gravel, gravel is subangular and fine (<8mm). No HCL reaction.
42				BH - G17AP1		
43				042.0 00904G(10cm²) (0.79)	43.11	Silty SAND, sand is fine, loose to medium dense, grey, dry. Locally mostly shelly, shell is fine gravel size (6mm). No HCL reaction.
44						
45				BH - G17AP2		
46						*46.60m - 46.67m: Sandy CLAY*
47				045.0 00904G(10cm²) (0.79)		*47.20m - 47.27m: Sandy CLAY. Hard.* *47.21m - 47.27m: Sandy CLAY*
48						
49				BH - G17AP3	49.00	*48.46m - 49.00m: Elastic SILT with sand, grey, moist, homogenous. Sand is fine with few shell, shell is fine (6mm). No HCL reaction.*
50						Sandy CLAY. Very stiff to hard with few gravel/shell.
51				049.0 00904G(10cm²) (0.79)	50.69	CLAY with sand. Sand is fine. Very stiff to hard, dark grey, dry with few shells, locally some shell. Shell is fine gravel size (<8mm). No HCL reaction.
52				BH - G17AP4		*52.30m - 52.40m: Clayey SAND*
53						
54				053.0 00904G(10cm²) (0.79)		*54.06m - 54.19m: Clayey SAND*
55						*54.65m - 54.78m: Clayey SAND*
56				BH - G17AP5		
57						*57.01m - 58.44m: Clayey SAND*
58				057.0 00904G(10cm²) (0.79)		*57.91m - 58.44m: Clayey SAND. Loose to dense.*
59						



KEY TO SOIL PROFILE

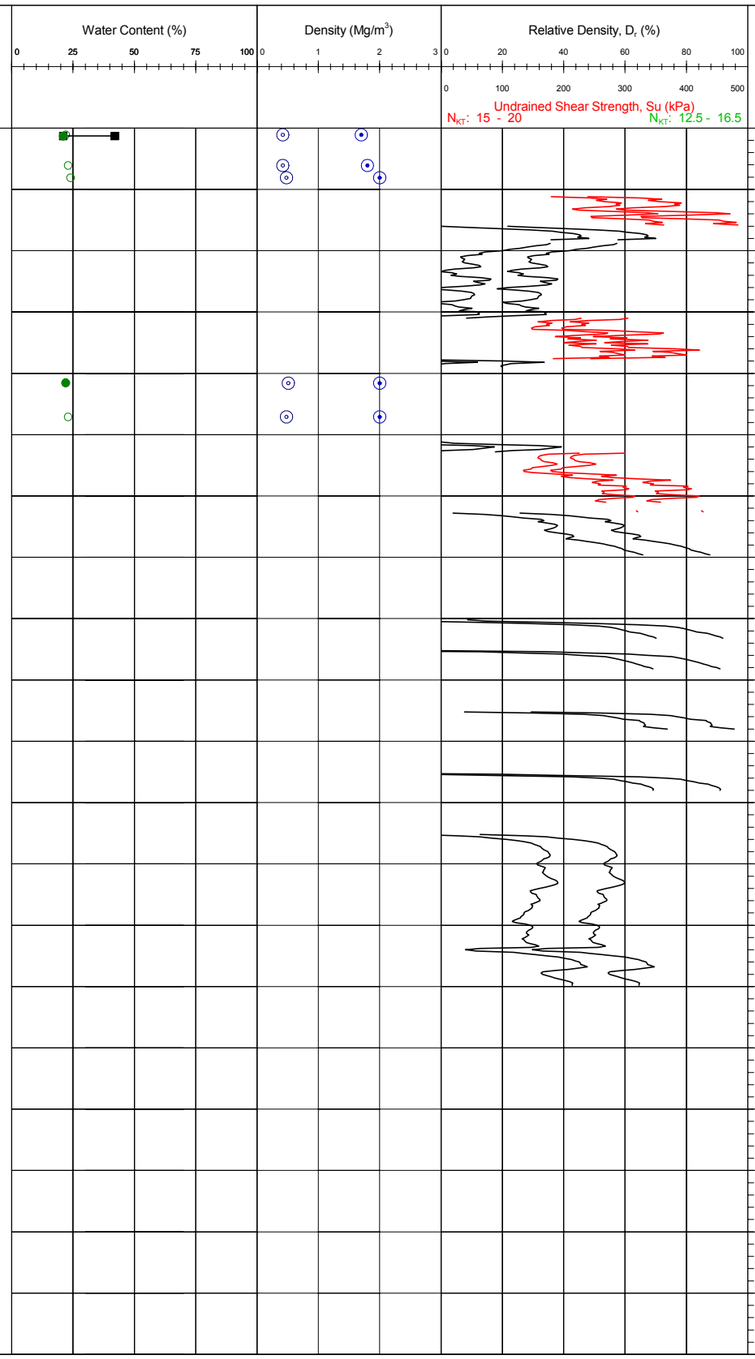
SILT · CLAY · CHALK · PEAT · SAND · GRAVEL · COBBLES · Mixed Soil

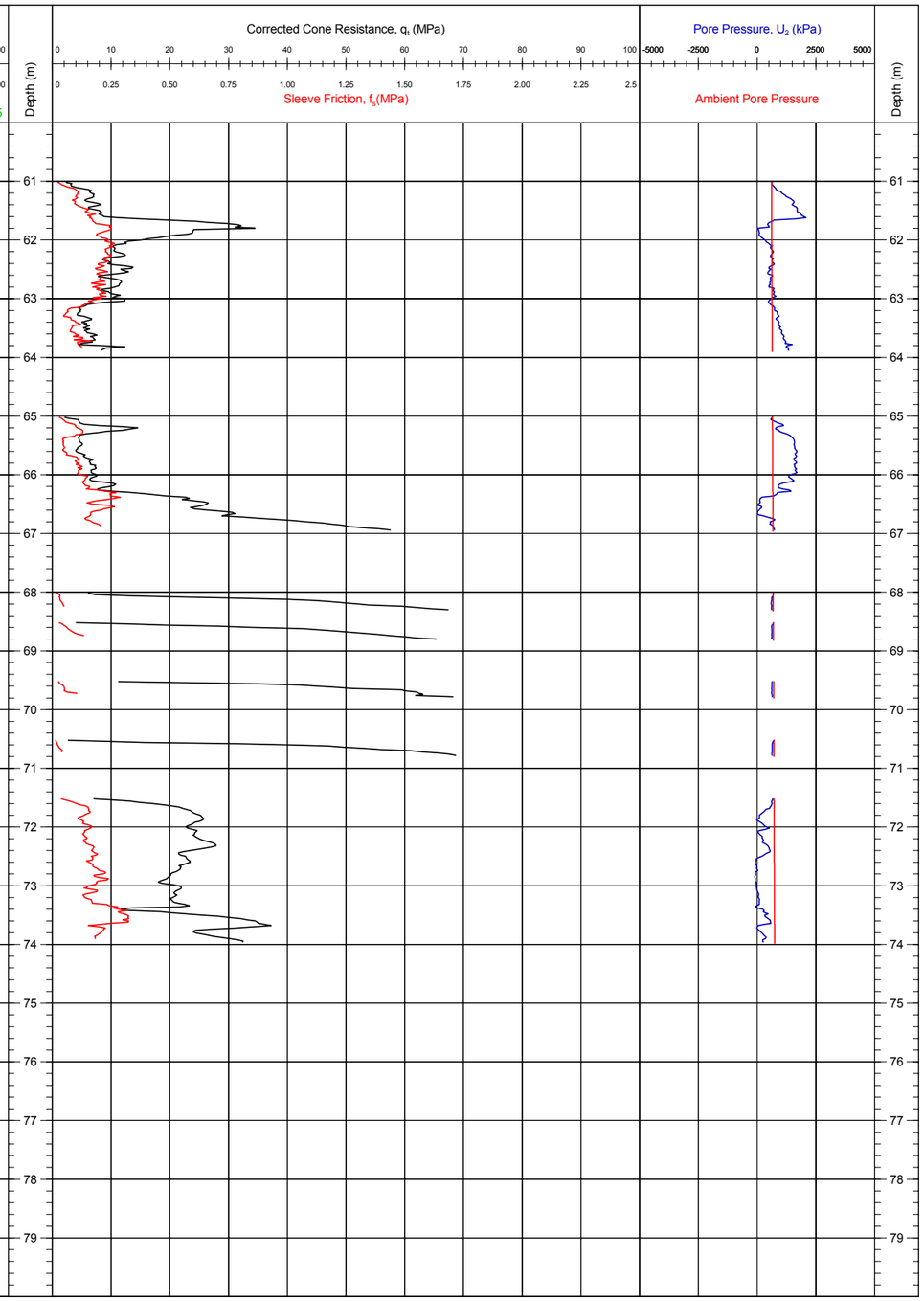
Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:** **BH-G17 abandoned at 41.02m due to weather.** **Location details are taken from BH-G17A.**	Sample Name: **BH - G17A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**		**NV-S** (03/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**74.00m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
60				BH - G17AP6		CLAY with sand. Sand is fine. Very stiff to hard, dark grey, dry with few shells, locally some shell. Shell is fine gravel size (<8mm). No HCL reaction.
61						*60.00m - 60.75m: Clayey GRAVEL with sand. Carbonate gravel (shell) is angular and coarse (<40mm). Sand is fine, dark grey and moist. Strong HCL reaction.*
62				061.0 00904G(10cm²) (0.79)		*61.58m - 63.10m: Clayey SAND*
63						*61.62m - 63.10m: Clayey SAND. Loose to medium dense.*
64				BH - G17AP7		*63.78m - 64.77m: Clayey SAND*
65						*63.90m - 64.77m: Clayey SAND*
66				065.0 00904G(10cm²) (0.79)		*65.04m - 65.29m: Clayey SAND*
67					66.29	SAND. Compact.
68				068.0 00904G(10cm²) (0.79)		*66.31m - 66.79m: Silty SAND. Medium dense to dense.*
69				068.5 00904G(10cm²) (0.79)		
70				069.5 00904G(10cm²) (0.79)		
71				070.5 00904G(10cm²) (0.79)		
72					71.50	Silty SAND. Medium dense.
73				071.5 00904G(10cm²) (0.79)		
74					73.98	End of borehole at 74.00m
75						
76						
77						
78						
79						





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

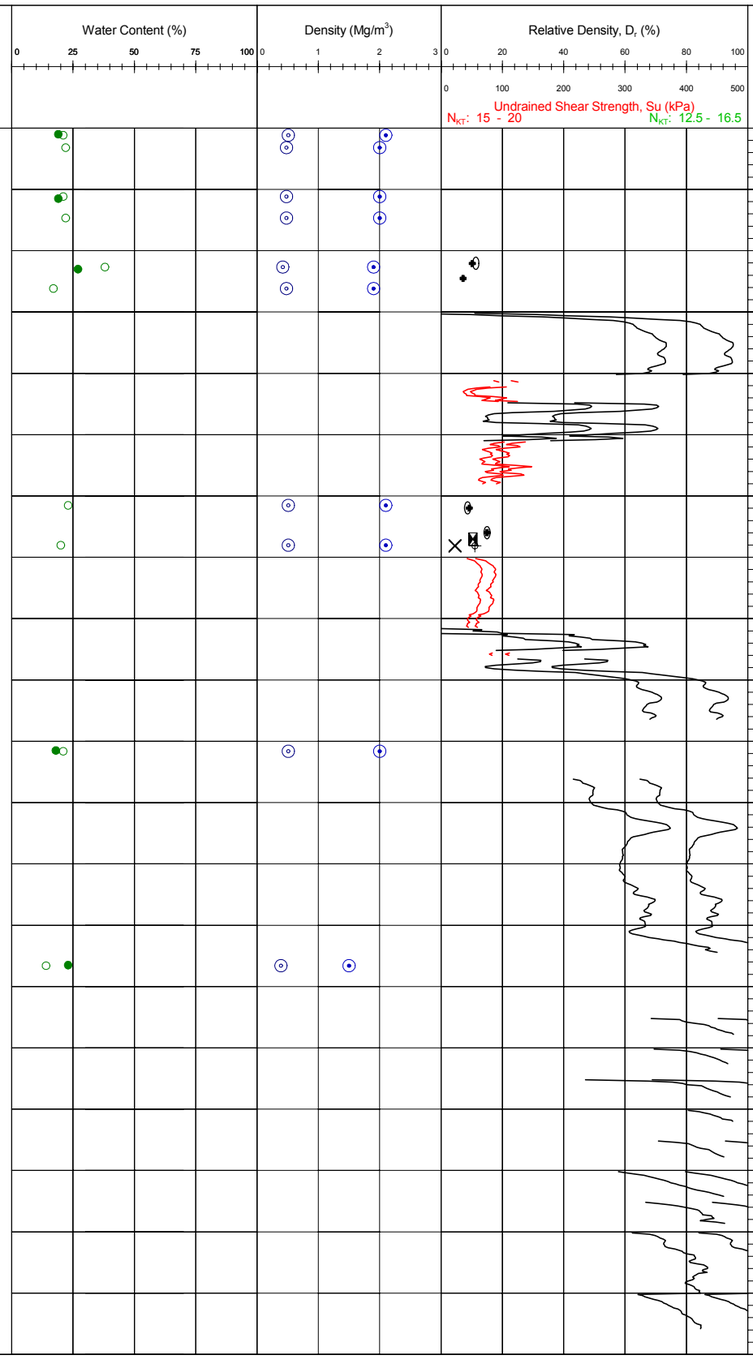
SAND | GRAVEL | COBBLES | Mixed Soil

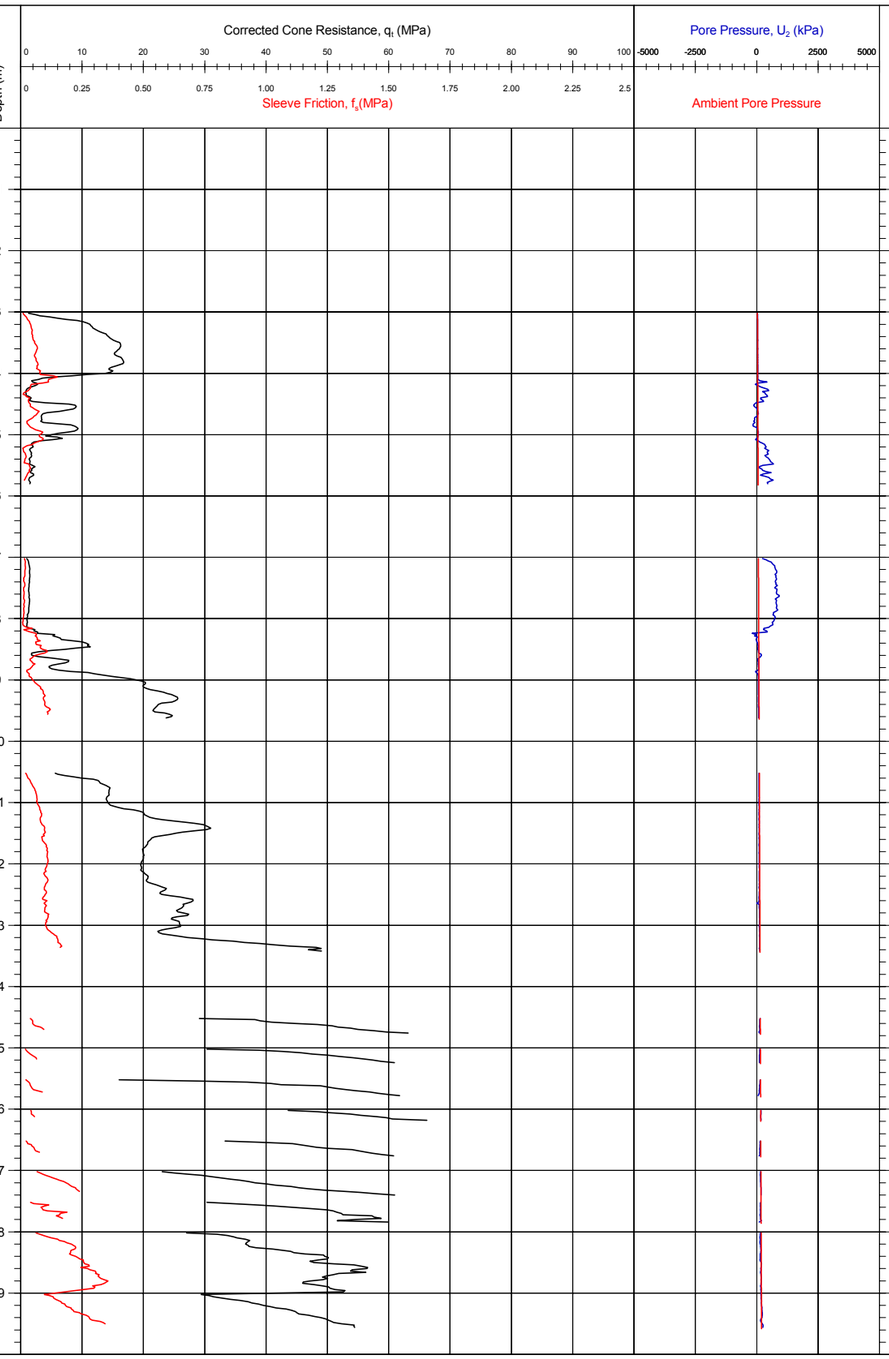
Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:** **BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.**	Sample Name: **BH - G17A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**		**NV-S** (03/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**74.00m**		Page: 4/4

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
			BH - H10P1		
			BH - H10P2	1.20	Well graded SAND. Subangular to subrounded, fine to coarse, loose becoming dense, olive brown to dark grey and moist. Locally poorly graded sand with gravel. Sand is angular to subrounded, mostly coarse. Gravel is fine to coarse (<22mm), dark grey and wet. No HCL reaction.
			BH - H10P3		Well graded SAND. Subangular to subrounded, fine to coarse, loose becoming dense, olive brown to dark grey and moist. Locally poorly graded sand with gravel. Sand is angular to subrounded, mostly coarse. Gravel is fine to coarse (<22mm), dark grey and wet. No HCL reaction. *1.20m - 1.30m: Clayey SAND. Sand is fine, dark grey and wet. No HCL reaction.* *2.00m - 2.30m: CLAY. Firm to stiff, very dark grey and moist. Strong HCL reaction.* *2.30m - 2.40m: Gravelly SAND. Sand is angular to subrounded and coarse. Gravel is subangular to subrounded, fine, dark grey and wet. Little shell, shell is fine gravel size (<15mm). No HCL reaction.* *2.40m - 2.50m: CLAY. Firm to stiff, very dark grey and moist. Strong HCL reaction.* *4.10m - 4.30m: Sandy CLAY. Firm to stiff.*
			003.0 20911G(10cm² (0.79)	5.10	
			BH - H10P4		CLAY. Firm to stiff, dark greyish brown, wet, stratified with clayey sand. Sand is angular to subangular, coarse, dark grey and wet. Strong HCL reaction.
			007.0 20911G(10cm² (0.79)	8.15	Semi graded SAND becoming well graded. Sand is angular to subrounded, medium to coarse, dense to very dense, olive grey to olive, wet, lenses of gravelly clay. Gravel is subrounded to subangular and fine (<15mm). No HCL reaction. *8.52m - 8.66m: Sandy CLAY. Stiff.*
			BH - H10P5		
			010.5 20911G(10cm² (0.79)		
			BH - H10P6A	13.50	Poorly graded SAND with silt. Sand is fine, light olive grey and moist. Trace laminations of clayey sand. Sand is fine, pale brown and wet. No HCL reaction
			014.0 20911G(10cm² (0.79)		
			014.5 20911G(10cm² (0.79)		
			015.0 20911G(10cm² (0.79)		
			015.5 20911G(10cm² (0.79)		
			016.0 20911G(10cm² (0.79)		
			016.5 20911G(10cm² (0.79)		
			017.0 20911G(10cm² (0.79)		
			017.5 20911G(10cm² (0.79)		
			018.0 20911G(10cm² (0.79)		
			019.0 20911G(10cm² (0.79)		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - H10**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**		
Method	**Wison**	Final Borehole Depth	**73.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
21						Poorly graded SAND with silt. Sand is fine, light olive grey and moist. Trace laminations of clayey sand. Sand is fine, pale brown and wet. No HCL reaction
					21.26	
22				020.5 20911G(10cm² (0.79)		Sandy CLAY. Very stiff to hard.
					22.35	
23						Silty SAND. Sand is fine, medium dense to dense, grey, wet and micaceous. No HCL reaction.
24				BH - H10P8		
25				024.0 00905G(10cm² (0.82)	24.80	Sandy CLAY. Sand is fine, very stiff, dark grey and moist. No HCL reaction.
					25.65	
26						Sandy CLAY. Sand is fine, very stiff, dark grey and moist. No HCL reaction.
27				BH - H10P9		
28				027.0 00905G(10cm² (0.82)	28.42	Clayey SAND. Sand is fine, medium dense to dense, grey, moist, stratified with sandy clay. Sand is fine, very stiff to hard, dark olive grey and moist. Few laminations of grey silt. No HCL reaction. *28.66m - 28.82m: Sandy CLAY. Very stiff to hard.* *29.15m - 29.31m: Sandy CLAY. Very stiff to hard.* *29.48m - 29.61m: Sandy CLAY. Very stiff to hard.*
29						
30				BH - H10P10		
31					31.02	Sandy CLAY. Sand is fine, very stiff to hard, olive grey to brownish grey and dry. Laminated with clay with fewstratifications of sand. Sand is medium to coarse, grey and moist. Micaceous. No HCL reaction.
32				031.0 00905G(10cm² (0.82)		
33						
34				BH - H10P11		
35						
36				035.0 00905G(10cm² (0.82)		
37						
38				BH - H10P12	37.80	Poorly graded SAND with silt. Sand is fine, loose to medium dense, grey and moist with some gravel. Gravel is fine (<15mm). Locally some shell, shell is fine to coarse gravel size (<35mm). Weak HCL reaction.
39						

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

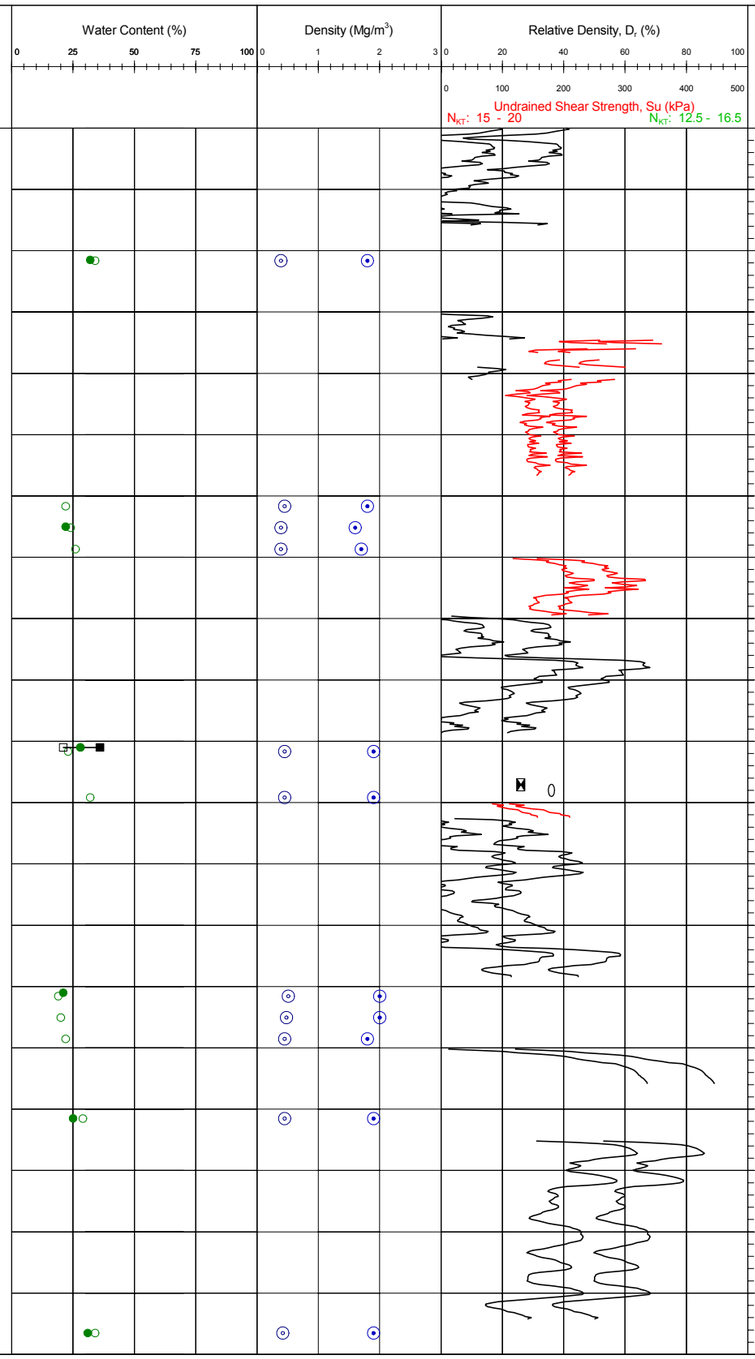
SAND GRAVEL COBBLES Mixed Soil

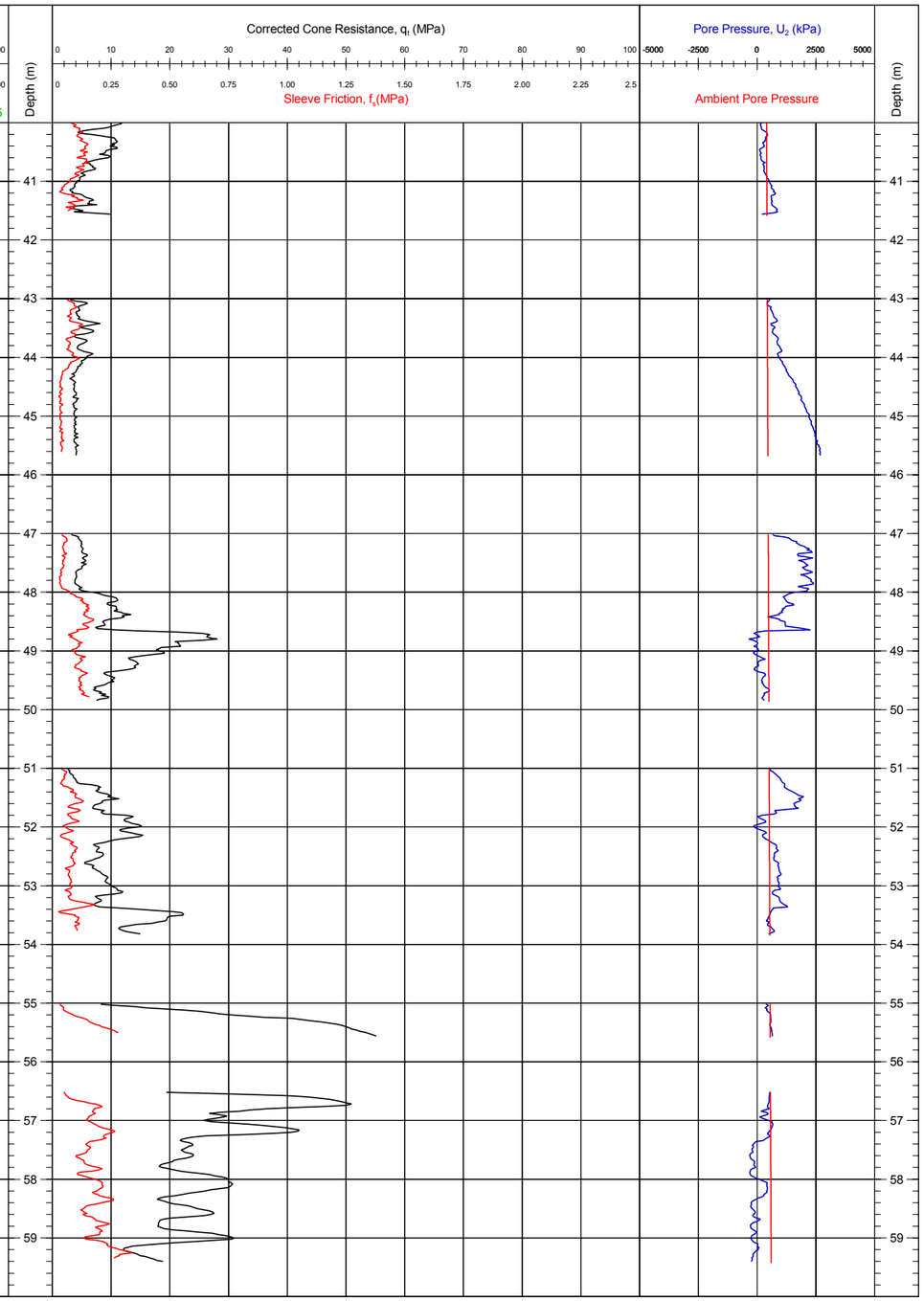
Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - H10**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**		
Method	**Wison**	Final Borehole Depth	**73.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
41				039.0 100905G(10cm² (0.82)		Poorly graded SAND with silt. Sand is fine, loose to medium dense, grey and moist with some gravel. Gravel is fine (<15mm). Locally some shell, shell is fine to coarse gravel size (<35mm). Weak HCL reaction. *40.94m - 41.23m: Sandy CLAY. Very stiff to hard.* *41.41m - 41.50m: Sandy CLAY. Very stiff to hard.*
42				BH - H10P13		
43					43.00	Sandy CLAY. Sand is fine to coarse, very stiff to hard, dark grey and moist. Stratified with clayey sand. Sand is fine to coarse, dark grey moist. Few lenses of clay and trace laminations of coarse sand. Locally some shell, fine to coarse gravel size (<65mm). No HCL reacton.
44				043.0 100905G(10cm² (0.82)		
45						
46					45.93	Clayey SAND, Sand is fine to coarse, dark grey and moist. Little to some shell. Shell is fine to coarse gravel size (<65mm). No HCL reaction.
47				BH - H10P14	46.97	Sandy CLAY. firm to stiff.
48					47.97	Clayey SAND. Sand is medium to coarse, dark grey, moist with few lenses of clay. Some laminations of coarse grey sand. Trace shell, shell is fine to coarse gravel size(<20mm). No HCL reaction.
49				047.0 100912G(10cm² (0.76)	48.69	Silty SAND. Fine to coarse, dark grey, moist, few lenses and few laminations of clay. Few fine gravel (<6mm) and shell. Shell is fine to coarse gravel size (<20mm). No HCL reaction.
50						
51				BH - H10P15		*50.58m - 51.28m: Sandy CLAY. Stiff to very stiff, grey and moist. Sand is fine to coarse.Few laminations of silt, grey coarse sand and clay. No HCL reaction.*
52				051.0 100912G(10cm² (0.76)		
53						
54				BH - H10P16		
55					55.10	Silty SAND. Fine to coarse, mostly coarse, loose to medium dense, dark grey, moist and micacious. Few lenses and few laminations of clay. With few fine gravel and shell. Gravel and shell are fine to coarse (<20mm). No HCL reaction.
56				055.0 100912G(10cm² (0.76)		
57				BH - H10P17		
58						
59				056.5 100912G(10cm² (0.76)		
				BH -		





KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT
SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - H10**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**		
Method	**Wison**	Final Borehole Depth	**73.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
60				H10P18		Silty SAND. Fine to coarse, mostly coarse, loose to medium dense, dark grey, moist and micacious. Few lenses and few laminations of clay. With few fine gravel and shell. Gravel and shell are fine to coarse (<20mm). No HCL reaction.
61				060.0 00912G(10cm² (0.76)		
62						
63				BH - H10P19		
64					64.07	CLAY. Very stiff to hard, dark grey and moist. Few weakly cemented lenses of silt. Few black organic staining. No HCL reaction.
65				063.5 00912G(10cm² (0.76)		
66						
67				BH - H10P20	67.00	CLAY with sand. Sand is fine, very stiff to hard, dark grey, moist, mostly laminated with greysilt and fine sand. Little bioturbation infilled with grey silt. Locally mostly shelly, shell is fine to coarse gravel size (<20mm). Micaceous. No HCL reaction.
68				067.0 00912G(10cm² (0.76)		
69						
70				BH - H10P21		
71				071.0 00912G(10cm² (0.76)		
72						End of borehole at 73.80m
73						
74						
75						
76						
77						
78						
79						

Water Content (%): 0, 25, 50, 75, 100

Density (Mg/m^3): 0, 1, 2, 3

Relative Density, D_r (%): 0, 20, 40, 60, 80, 100

Undrained Shear Strength, Su (kPa): 0, 100, 200, 300, 400, 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Sleeve Friction, f_s(MPa): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5

Pore Pressure, U_2 (kPa): -5000, -2500, 0, 2500, 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**520154.3E**	**4248006.5N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude			**Comments:**	Sample Name: **BH - H10**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**			
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**			
Method	**Wison**	Final Borehole Depth	**73.80m**			Page: 4/4

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
0						
1				BH - I21P1		Poorly graded SAND. Sand is subangular, medium dense. Sand is light brown becoming dark grey, dry, little shell, shell is flat and fine to coarse gravel size (<60mm). Few lenses of black organic staining with mild to strong organic odour. Weak HCL reaction.
2				BH - I21P2		*2.00m - 2.05m: Well graded GRAVEL with sand. Gravel is angular to sub rounded, fine (<18mm). Sand is medium, dark grey. Little shell, shell is fine gravel size (15mm).*
3				BH - I21P3		*3.16m - 3.45m: Sandy CLAY. Stiff to very stiff.*
4						*3.74m - 3.91m: Sandy CLAY. Stiff.*
5					4.00	Well graded SAND with silt. Sand is subangular, fine becoming coarse at 5.90m. Dark grey, moist with lenses of black organic staining. Sand becomes coarse at 5.90m, with few laminations of clay. Few fine gravel sized (<15mm) shell. Strong HCL reaction
6				BH - I21P4		
7						End of borehole at 6.50m
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						

Water Content (%): 0, 25, 50, 75, 100

Density (Mg/m^3): 0, 1, 2, 3

Relative Density, D_r (%): 0, 20, 40, 60, 80, 100

Undrained Shear Strength, Su (kPa): 0, 100, 200, 300, 400, 500

N_{KT}: 15 - 20

Corrected Cone Resistance, q_t (MPa): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Sleeve Friction, f_s(MPa): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5

Pore Pressure, U_2 (kPa): -5000, -2500, 0, 2500, 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - I21**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**20.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**22/06/2015 - 23/06/2015**		X (21/06/2015) / JG (14/12/2014)
Method		Final Borehole Depth	**6.50m**		Page: 1/1

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
3.50 - 3.73						*3.50m - 3.73m: Silty SAND. Medium dense.*
4.01 - 4.35						*4.01m - 4.35m: Silty SAND. Medium dense.*
0.0 - 18.0				002.5 081213G(10cm² (0.75)		Well graded SAND. Fine to coarse, subrounded to subangular, dense to compact, dark olive grey, moist with trace shell fragments. Locally poorly graded. Stratified with poorly graded sand with gravel. Sand is angular and coarse. Gravel is subangular to subrounded and fine. Light brownish grey. No HCL reaction.
				006.5 081213G(10cm² (0.75)		
				BH - I21AP1		
				010.5 081213G(10cm² (0.75)		
				011.0 081213G(10cm² (0.75)		
				BH - I21AP2 BH - I21AP3		
				015.0 081213G(10cm² (0.75)		
				BH - I21AP4A		
				018.0 081213G(10cm² (0.75)		

Water Content (%) 0 25 50 75 100

Density (Mg/m^3) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status		Sample Name
Contract	**10451**	Latitude/ Longitude		**Comments:**	Preliminary	Draft / Final	**BH - I21A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**				
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**				
Method	**Wison**	Final Borehole Depth	**28.50m**				Page: 1/2

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
21				BH - I21AP5		Well graded SAND. Fine to coarse, subrounded to subangular, dense to compact, dark olive grey, moist with trace shell fragments. Locally poorly graded. Stratified with poorly graded sand with gravel. Sand is angular and coarse. Gravel is subangular to subrounded and fine. Light brownish grey. No HCL reaction.
22						*20.81m - 22.00m: SAND with silt. Sand is fine, dense to compact, dark olive grey and moist. No HCL reaction.*
23						
24				022.0 209115G(10cm²) (0.75)		
25				BH - I21AP6		*23.80m - 25.25m: Well graded SAND with silt. Sand is fine to coarse, subangular to subrounded. Dense to compact. Olive grey, moist with few lenses of clay. Trace gravel, gravel is subangular and fine (<25mm). No HCL reaction.*
26				025.5 070815G(10cm²) (0.75) 026.0 070815G(10cm²) (0.75)	26.80	
27				026.5 070815G(10cm²) (0.75)		End of borehole at 28.50m
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						

Water Content (%): 0, 25, 50, 75, 100

Density (Mg/m^3): 0, 1, 2, 3

Relative Density, D_r (%): 0, 20, 40, 60, 80, 100

Undrained Shear Strength, Su (kPa): 0, 100, 200, 300, 400, 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Sleeve Friction, f_s(MPa): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5

Pore Pressure, U_2 (kPa): -5000, -2500, 0, 2500, 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

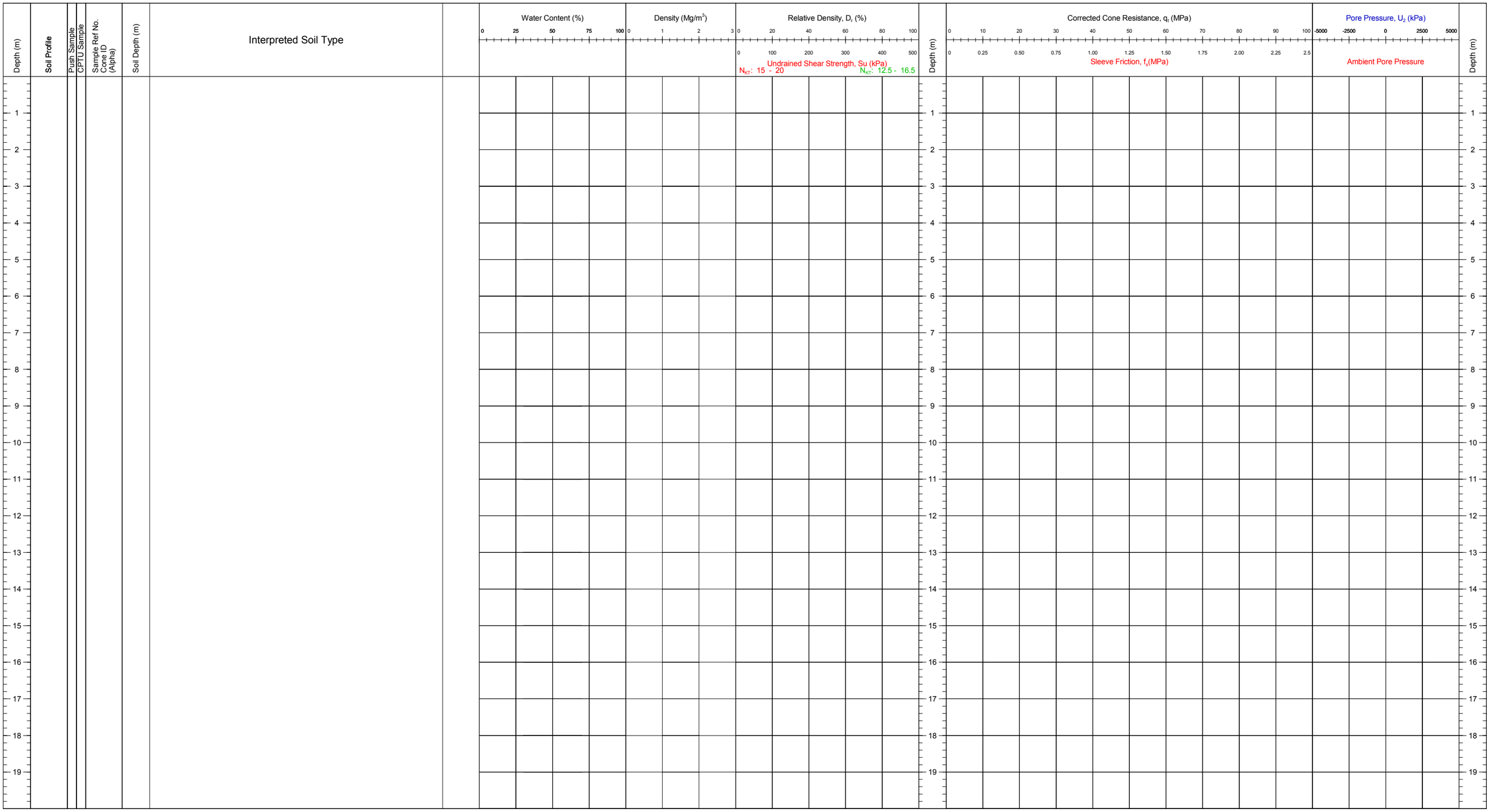
SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - I21A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**		
Method	**Wison**	Final Borehole Depth	**28.50m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING



KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - I21B**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		X (24/06/2015) / JG (14/12/2014)
Method	**Wison**	Final Borehole Depth	**73.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
21						
22						
23						
24						
25						
26						
27						Sandy CLAY. Sand is fine. Very stiff, dark greyish brown, moist, few laminations and lenses of silt. Micaceous. No HCL reaction.
28				BH - I21BP1		
29				BH - I21BP2		*29.80m - 30.00m: Elastic SILT with sand. Sand is fine. Very stiff, dark greyish brown, moist. Stratified with clay with sand. Sand is fine. No HCL reaction.*
30						
31				030.0 100981(10cm²) (0.75)		*31.45m - 31.70m: Silty SAND. Medium dense.* *31.44m - 31.71m: Silty SAND*
32						
33				BH - I21BP3		
34					33.68	Silty SAND. Sand is fine. Medium to dense, grey. Stratified with sandy silt. Sand is fine, medium dense, grey, moist. Micaceous. No HCL reactions *33.67m - 34.21m: Silty SAND*
35				033.5 100981(10cm²) (0.75)		
36						*36.07m - 36.95m: Sandy SILT, sand is fine, medium dense, grey, moist. homogenous, micaceous. No HCL reaction. .*
37				BH - I21BP4		
38				037.0 100981(10cm²) (0.75)		*38.60m - 38.80m: Sandy SILT* *38.62m - 38.95m: Sandy SILT. Medium dense.* *38.98m - 39.09m: Sandy CLAY. Hard.* *38.97m - 39.16m: Sandy CLAY*
39						

Water Content (%): 0 25 50 75 100

Density (Mg/m³): 0 1 2 3

Relative Density, D_r (%): 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa): 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s (MPa): 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa): -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E**	**4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**
Contract	**10451**	Latitude/ Longitude			**Comments:**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		
Method	**Wison**	Final Borehole Depth	**73.80m**		

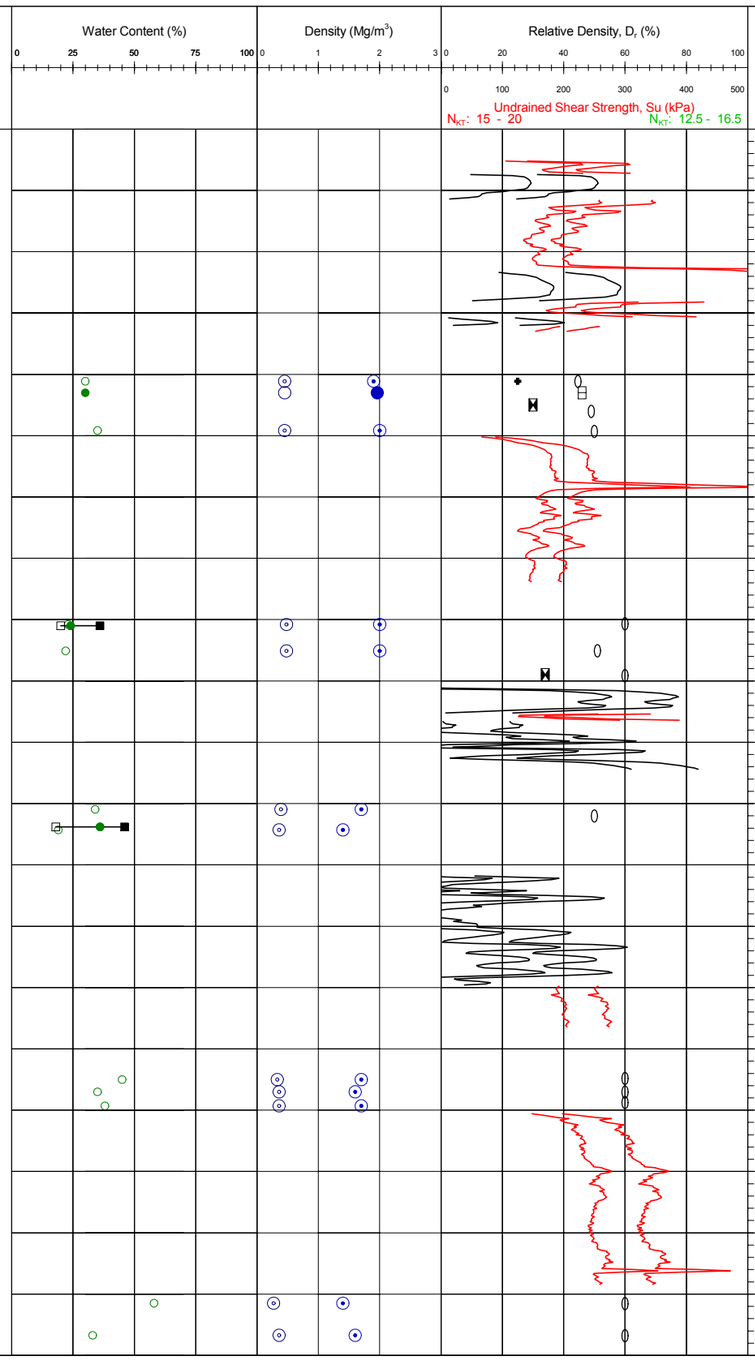
QC Status		
Preliminary	Draft	Final
X (24/06/2015)	**JG** (14/12/2014)	

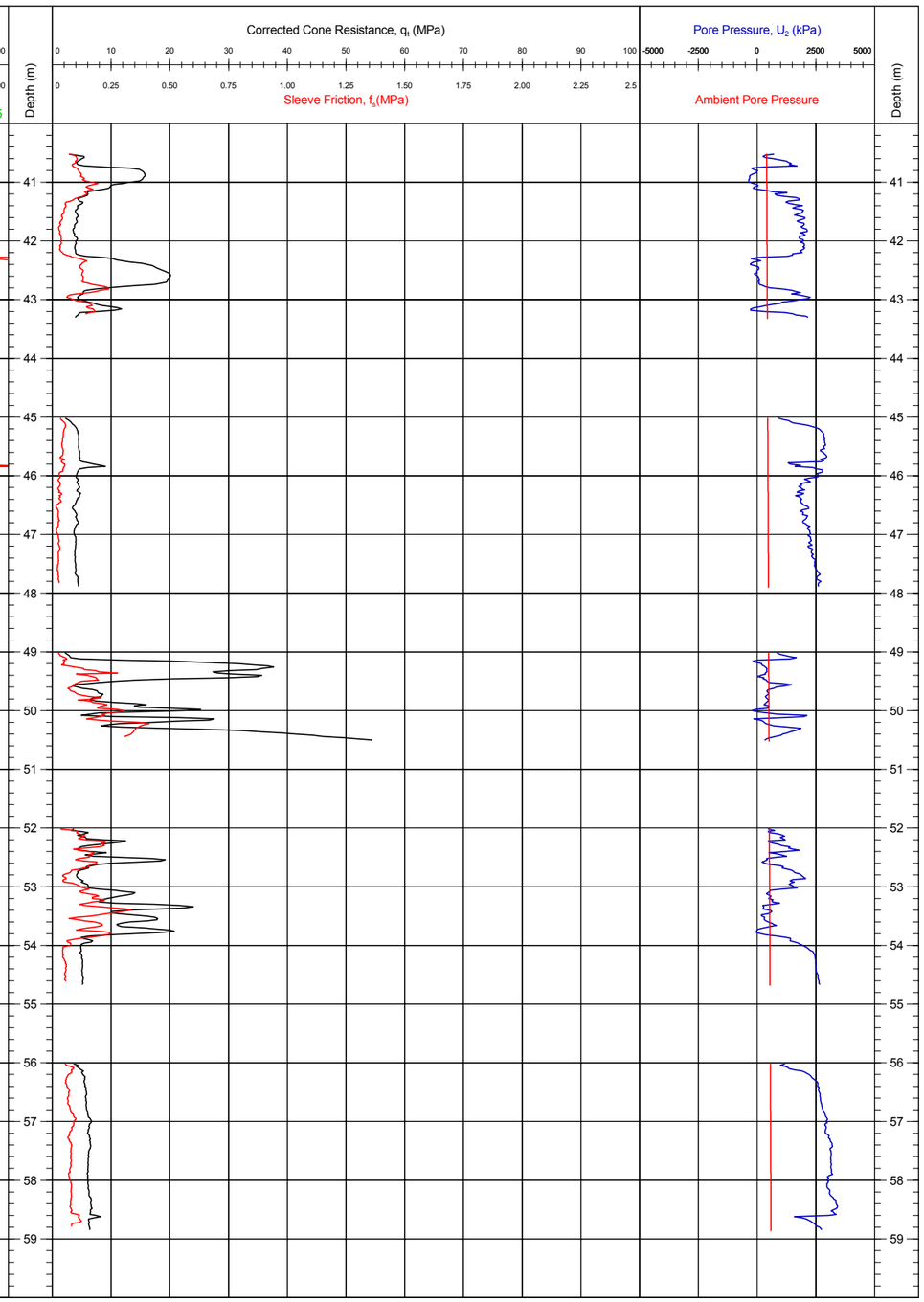
Sample Name: **BH - I21B**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
40				BH - I21BP5	40.53	*39.50m - 40.10m: SILT with sand. Sand is fine, dark grey, moist. Micaceous. No HCL reaction.*
41						Sandy CLAY. Very stiff to hard, firm, grey, dry. Stratified with sandy silt, medium dense. Micaceous. No reaction to HCL. *40.76m - 41.15m: Sandy SILT. Medium dense.*
42				040.5 (0.0090400(10cm²) (0.75)		*42.23m - 42.81m: Sandy SILT. Medium dense*
43						*43.08m - 43.16m: Sandy SILT. Loose to medium dense*
44						
45				BH - I21BP6A		*44.04m - 45.72m: CLAY. Hard, grey, dry. No HCL reaction.*
46						
47				045.0 (0.0090400(10cm²) (0.75)	47.02	Sandy CLAY. Very stiff to hard, firm, grey, dry. Stratified with sandy silt, medium dense. Micaceous. No reaction to HCL.
48					48.01	Elastic SILT with sand and some shell. Silt is firm, dark grey, dry, homogenous. Shell is fine to coarse gravel size (<60mm), and light brown. No HCL reaction
49				BH - I21BP7	49.00	Poorly sorted SAND with silt. Sand is coarse and medium dense, grey and moist.Some laminations and stratifications of elastic silt and sandy clay. *49.52m - 49.62m: Sandy CLAY. Very stiff to hard.* *49.53m - 49.65m: Sandy CLAY* *50.03m - 50.15m: Sandy CLAY. Hard.*
50				049.0 (0.0090400(10cm²) (0.75)		
51				BH - I21BP8		
52						*52.67m - 53.05m: Sandy CLAY. Hard.*
53				052.0 (0.0090400(10cm²) (0.75)		*53.55m - 53.75m: Sandy SILT. Medium dense.*
54					53.85	Sandy CLAY. Hard, light grey stratified (<40mm) dark olive grey. Dry, some laminations and lenses of silty sand. Some shell, shell is fine to coarse gravel size (<30mm). Mostly platy. No reaction to HCL
55						
56				BH - I21BP9		
57						
58				056.0 (0.0090400(10cm²) (0.75)		
59						
				BH - I21BP10		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT

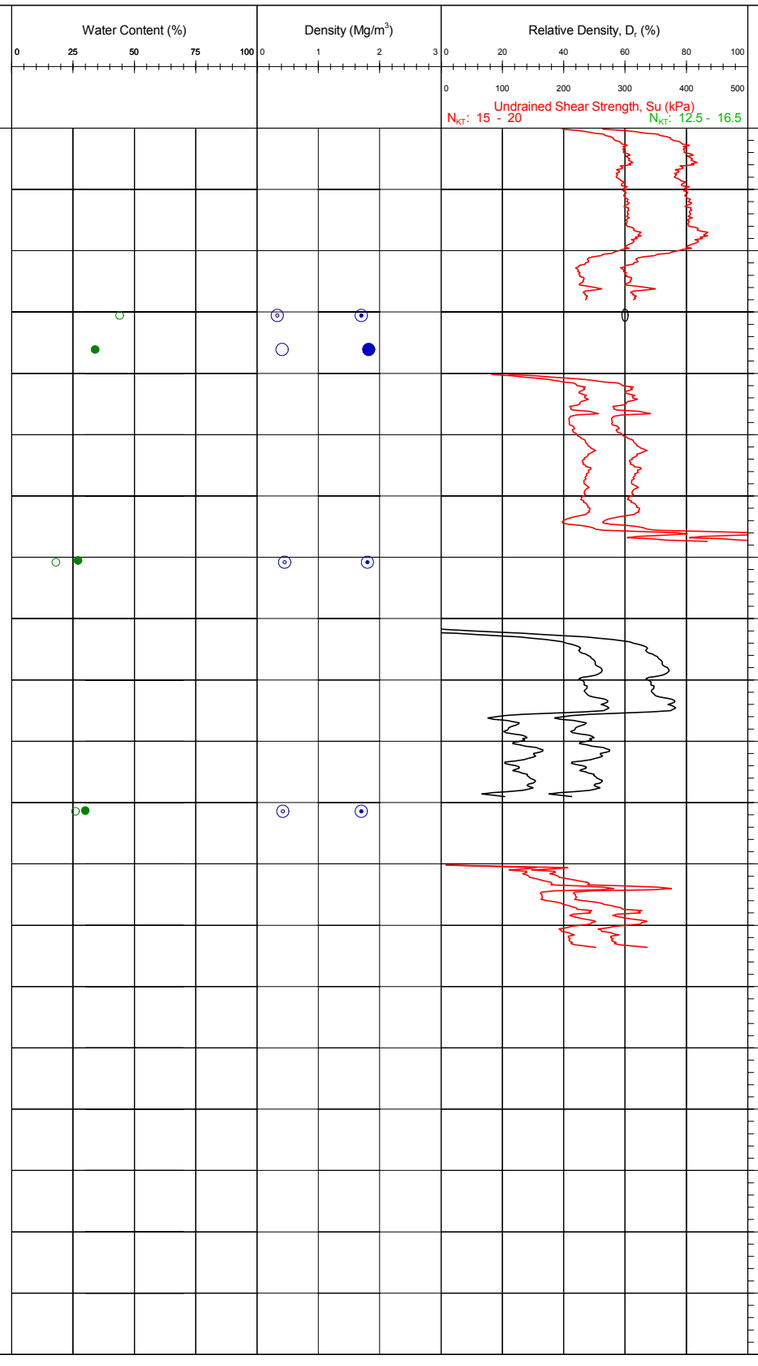
SAND | GRAVEL | COBBLES | Mixed Soil

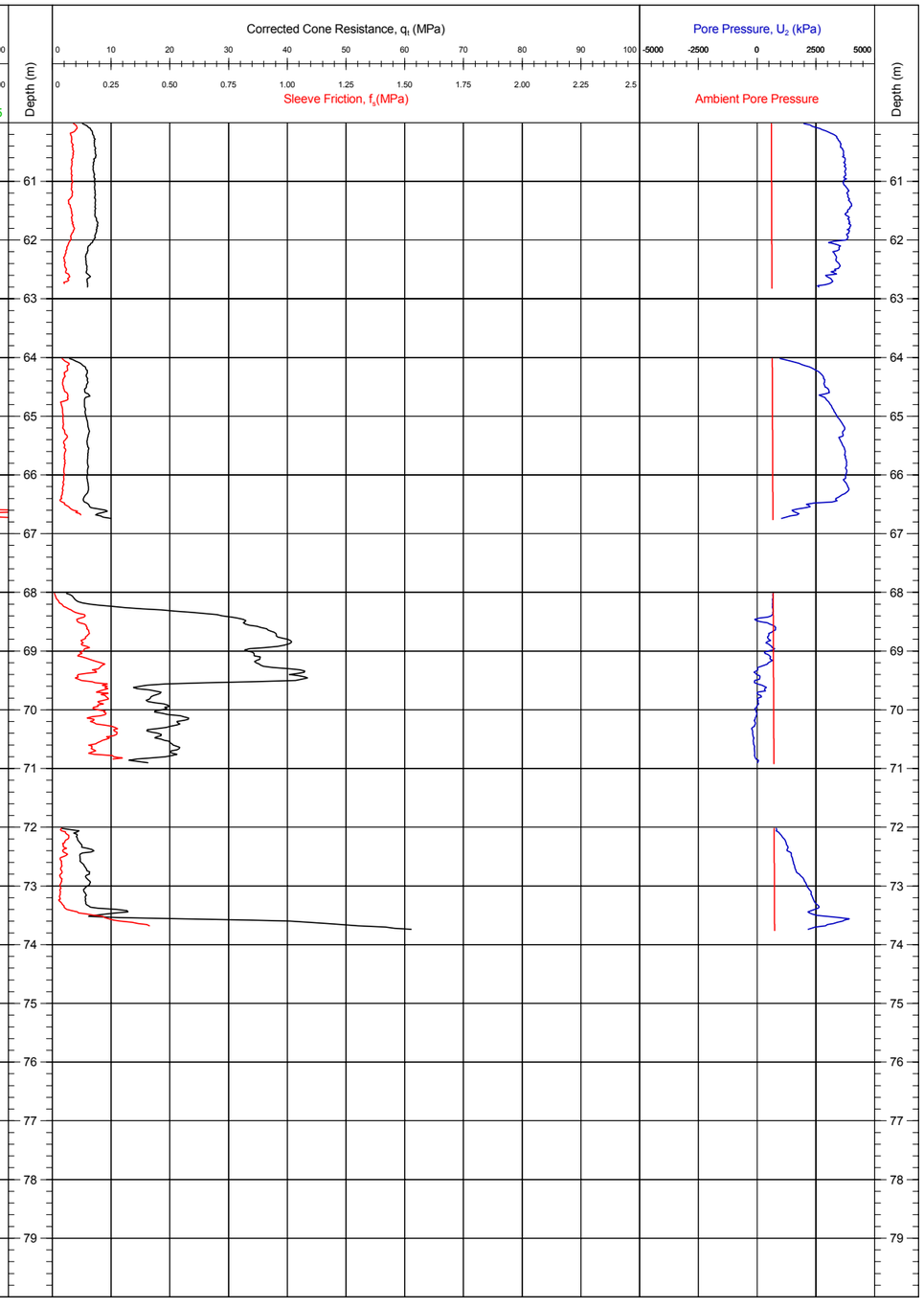
Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - I21B**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		**X** (24/06/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**73.80m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
60						
61				060.0 I00904G(10cm²) (0.75)		Sandy CLAY. Hard, light grey stratified (<40mm) dark olive grey. Dry, some laminations and lenses of silty sand. Some shell, shell is fine to coarse gravel size (<30mm). Mostly platy. No reaction to HCL
62						
63				BH - I21BP11		
64				064.0 I00904G(10cm²) (0.75)		
65						
66						
67				BH - I21BP12	66.42	Poorly graded SAND with silt. Sand is fine becoming medium, grey, medium dense to dense, moist with few shell. No HCL reaction.
68				068.0 I00904G(10cm²) (0.75)		*69.61m - 70.94m: Sandy SILT. Medium dense.*
69						
70						
71				BH - I21BP13		
72					72.00	Sandy CLAY. Very stiff becoming hard. Gravel at base.
73				072.0 I00904G(10cm²) (0.75)		
74					73.76	End of borehole at 73.80m
75						
76						
77						
78						
79						





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT | SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		X (24/06/2015) / JG (14/12/2014) /
Method	**Wison**	Final Borehole Depth	**73.80m**		

Sample Name: **BH - I21B**

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
0				BH - K16P1A		Poorly graded SAND locally with gravel. Sand is angular, medium, medium dense to compact. Gravel is subrounded, mostly fine with few coarse (25mm). Light olive grey and moist. Trace organic staining. No HCL reaction.
1						
2				001.0 20911G(10cm² (0.79)		
3						
4				BH - K16P3	4.05	*3.85m - 4.05m: Clayey SAND*
5						Poorly graded SAND locally with gravel. Sand is angular, medium, medium dense to compact. Gravel is subrounded, mostly fine with few coarse (25mm). Light olive grey and moist. Trace organic staining. No HCL reaction.
6				004.5 20911G(10cm² (0.79)		*5.83m - 5.91m: Silty SAND*
7						
8				BH - K16P4A		
9						
10				008.0 20911G(10cm² (0.79)		
11						
12				011.0 20911G(10cm² (0.79)		*11.62m - 12.62m: Sandy CLAY*
13				BH - K16P6		
14						*13.88m - 14.06m: Silty SAND* *13.97m - 14.07m: Silty SAND. Medium dense.*
15				013.5 20911G(10cm² (0.79)		
16						*16.02m - 16.56m: Silty SAND. Medium dense.*
17				016.0 20911G(10cm² (0.79)		
18						
19						*19.61m - 19.90m: Silty SAND. Medium dense.*

Water Content (%) 0 25 50 75 100

Density (Mg/m³) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - K16**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**03/07/2015 - 04/07/2015**		**SH** (04/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**73.20m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
21				019.0 20911G(10cm²) (0.79)		Poorly graded SAND locally with gravel. Sand is angular, medium, medium dense to compact. Gravel is subrounded, mostly fine with few coarse (25mm). Light olive grey and moist. Trace organic staining. No HCL reaction.
22				BH - K16P10		
23				022.5 20911G(10cm²) (0.79)		
24						
25						
26				025.0 20911G(10cm²) (0.79)		*26.26m - 26.89m: Silty SAND. Medium dense to dense.*
27					27.00	Well graded SAND with gravel. Sand is angular to subrounded, coarse, very dense to compact. Gravel is subrounded to rounded and fine (<18mm). Greyish brown and moist. No HCL reaction.
28				BH - K16P12		
29				028.5 20911G(10cm²) (0.79)		
30						
31				BH - K16P13		
32				032.0 20911G(10cm²) (0.79)		
33				033.5 20911G(10cm²) (0.79)		
34				034.0 20911G(10cm²) (0.79)		
35				035.0 20911G(10cm²) (0.79)		
36				035.5 20911G(10cm²) (0.79)		
37				036.5 81213G(10cm²) (0.83)	37.00	CLAY with sand, locally sandy clay. Very stiff to hard, dark olive grey, dry, micacious, few laminations of sandy silt. Few lenses of greyish brown clay. No HCL reaction.
38						
39				037.0 81213G(10cm²) (0.83)		*39.57m - 39.92m: SILT*

Water Content (%) 0 25 50 75 100

Density (Mg/m³) 0 1 2 3

Relative Density, D_r (%) 0 20 40 60 80 100

Undrained Shear Strength, Su (kPa) 0 100 200 300 400 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 50 60 70 80 90 100

Sleeve Friction, f_s(MPa) 0 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.5

Pore Pressure, U_2 (kPa) -5000 -2500 0 2500 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

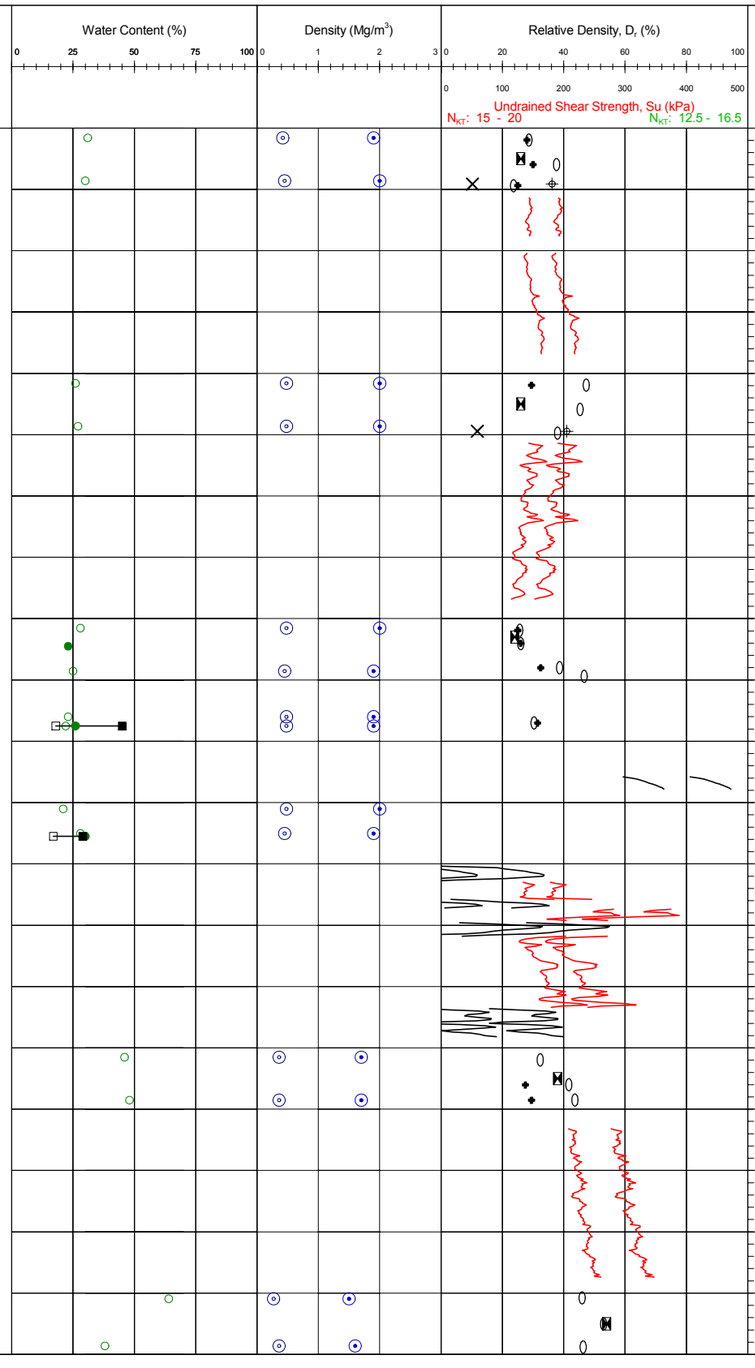
SAND GRAVEL COBBLES Mixed Soil

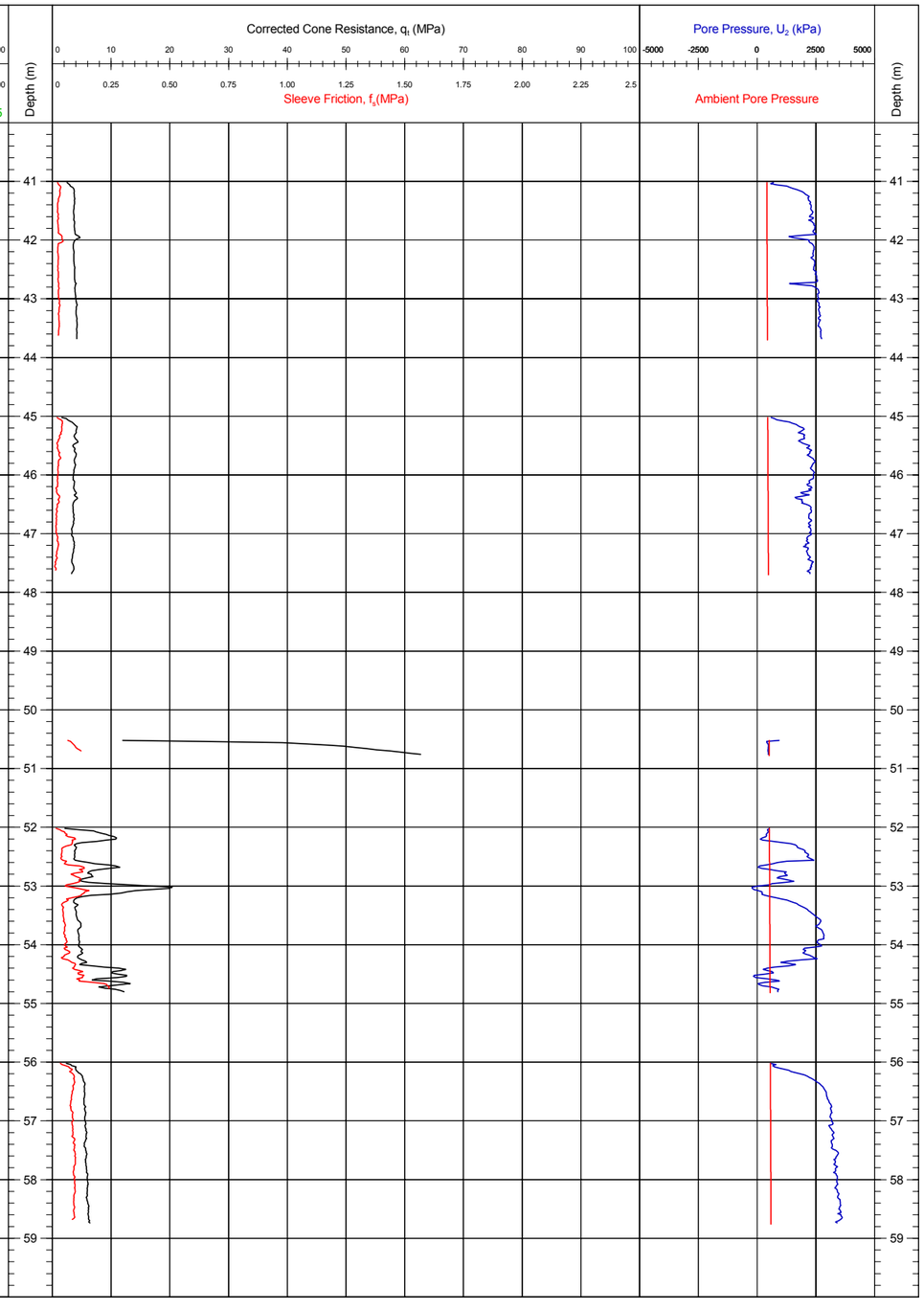
Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - K16**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**03/07/2015 - 04/07/2015**		**SH** (04/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**73.20m**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
41				BH - K16P15		CLAY with sand, locally sandy clay. Very stiff to hard, dark olive grey, dry, micacious, few laminations of sandy silt. Few lenses of greyish brown clay. No HCL reaction. *40.01m - 40.39m: Elastic SILT with sand. Sand is fine, very stiff, dark grey, dry, micaceous, with few lenses of greyish brown weakly cemented SILT. Weak HCL reaction.*
42				041.0 0812136(10cm² (0.83)		
43						
44				BH - K16P16		
45						
46				045.0 0090406(10cm² (0.79)		
47						
48				BH - K16P17		
49						*48.53m - 48.73m: Sandy CLAY with gravel. Gravel is subrounded to subangular, fine to coarse (<20mm). Sand is fine to coarse. Clay is very stiff, dark olive grey, dry, with few shell, shell is fine to coarse gravel size (<40mm), micaceous, No HCL reaction.* *49.38m - 49.69m: Silty SAND* *49.50m - 49.69m: SAND. Sand is fine to medium, dark grey and moist. No HCL reaction.*
50				BH - K16P18	49.69	
51				050.5 0712166(10cm² (0.74)		CLAY with sand, locally sandy clay. Very stiff to hard, dark olive grey, dry, micacious, few laminations of sandy silt. Few lenses of greyish brown clay. No HCL reaction. *50.56m - 51.58m: Silty SAND* *50.98m - 51.58m: SAND with silt. Sand is fine to medium, dark grey, moist, laminated with clay. No HCL reaction.* *52.05m - 52.24m: Silty SAND. Loose to medium dense.* *52.02m - 52.28m: Silty SAND* *52.56m - 52.73m: Silty SAND. Loose to medium dense.* *52.58m - 52.74m: Silty SAND* *52.95m - 53.18m: Silty SAND* *52.98m - 53.18m: Silty SAND. Loose to medium dense.* *54.36m - 54.83m: Silty SAND* *54.43m - 54.83m: Silty SAND. Loose to medium dense.*
52				BH - K16P19		
53						
54				052.0 0712166(10cm² (0.74)		
55					54.99	CLAY. Hard, dark greenish grey, dry, locally laminated with silt and sandy silt, Micaceous and friable. No HCL reaction.
56				BH - K16P20		
57						
58				056.0 0712166(10cm² (0.74)		
59						
				BH - K16P21		





KEY TO SOIL PROFILE

SILT | CLAY | CHALK | PEAT | SAND | GRAVEL | COBBLES | Mixed Soil

Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - K16**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**03/07/2015 - 04/07/2015**		
Method	**Wison**	Final Borehole Depth	**73.20m**		

QC Status: **SH** (04/07/2015) / **JG** (14/12/2014) / Final

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

BOREHOLE LOG, LABORATORY TEST RESULTS AND IN SITU CPTU TESTING

Depth (m)	Soil Profile	Push Sample	CPTU Sample	Sample Ref No. Cone ID (Alpha)	Soil Depth (m)	Interpreted Soil Type
61						CLAY. Hard, dark greenish grey, dry, locally laminated with silt and sandy silt, Micaceous and friable. No HCL reaction.
62				060.0 071216G(10cm²) (0.74)		
63						*62.98m - 63.99m: Becoming mostly shelly. Shell is fine to coarse (<30mm).*
64				BH - K16P22	64.00	Clayey SAND, sand is fine, loose to medium dense, dark grey, moist, little fine gravel size shell becoming mostly coarse gravel size shell (<45mm) at 66.90m. Trace lenses of clay, trace lenses of coarse sand. Weak becoming strong HCL reaction.
65				064.0 071216G(10cm²) (0.74)		
66						
67				BH - K16P23		
68				067.5 071216G(10cm²) (0.74)	68.03	Sandy CLAY. Very stiff to hard with some laminations of clayey sand. *68.83m - 68.98m: Silty SAND* *68.86m - 68.96m: Clayey SAND. Very loose.* *69.20m - 69.38m: Silty SAND*
69				068.0 071216G(10cm²) (0.74)	69.84	Silty SAND becoming poorly graded sand with silt. Sand is coarse, medium dense to dense, grey, moist, with few lenses of sandy clay. Weak HCL reaction.
70						
71				BH - K16P24		
72				071.5 071216G(10cm²) (0.74)		End of borehole at 73.20m
73						
74						
75						
76						
77						
78						
79						

Water Content (%): 0, 25, 50, 75, 100

Density (Mg/m^3): 0, 1, 2, 3

Relative Density, D_r (%): 0, 20, 40, 60, 80, 100

Undrained Shear Strength, Su (kPa): 0, 100, 200, 300, 400, 500

N_{KT}: 15 - 20 N_{KT}: 12.5 - 16.5

Corrected Cone Resistance, q_t (MPa): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Sleeve Friction, f_s(MPa): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5

Pore Pressure, U_2 (kPa): -5000, -2500, 0, 2500, 5000

Ambient Pore Pressure

KEY TO SOIL PROFILE

SILT CLAY CHALK PEAT

SAND GRAVEL COBBLES Mixed Soil

Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CRS: **GRS 80 UTM ZONE 18 N (75 W)**	QC Status: Preliminary / Draft / Final
Contract	**10451**	Latitude/ Longitude		**Comments:**	Sample Name: **BH - K16**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start-End)	**03/07/2015 - 04/07/2015**		**SH** (04/07/2015) / **JG** (14/12/2014)
Method	**Wison**	Final Borehole Depth	**73.20m**		

2.2 Sample Photographs

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 — PUSH SAMPLE NO: P03

DEPTH (M): 2.00 - 3.00 — RECOVERY (M): 0.30

DATE: 22/06/2015

US Wind inc sea energy

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Hewett Road,
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Norfolk,
NR31 0NN.

Tel: +44(0)1493 845600
www.gardlinemarinesciences.com

0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21

PUSH SAMPLE NO: P02

DEPTH (M): 1.00 - 2.00

RECOVERY (M): 0.55

DATE: 22/06/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 PUSH SAMPLE NO: P03

DEPTH (M): 2.00 - 2.50 RECOVERY (M): 0.30

DATE: 22/06/2015

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Tel: +44(0)1493 845600
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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 PUSH SAMPLE NO: P 0 4

DEPTH (M): 5.50 - 6.50 RECOVERY (M): 0.6 5

DATE: 22/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

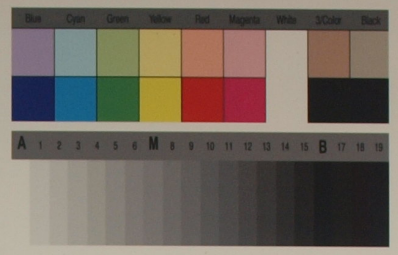
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 A — PUSH SAMPLE NO: P01

DEPTH (M): 9.50 - 10.15 — RECOVERY (M): 0.35

DATE: 23/06/2015



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0.0m — 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 A PUSH SAMPLE NO: P 0 3

DEPTH (M): 14. 50 - 14. 9 0 RECOVERY (M): 0. 3 5

DATE: 23/06/2015

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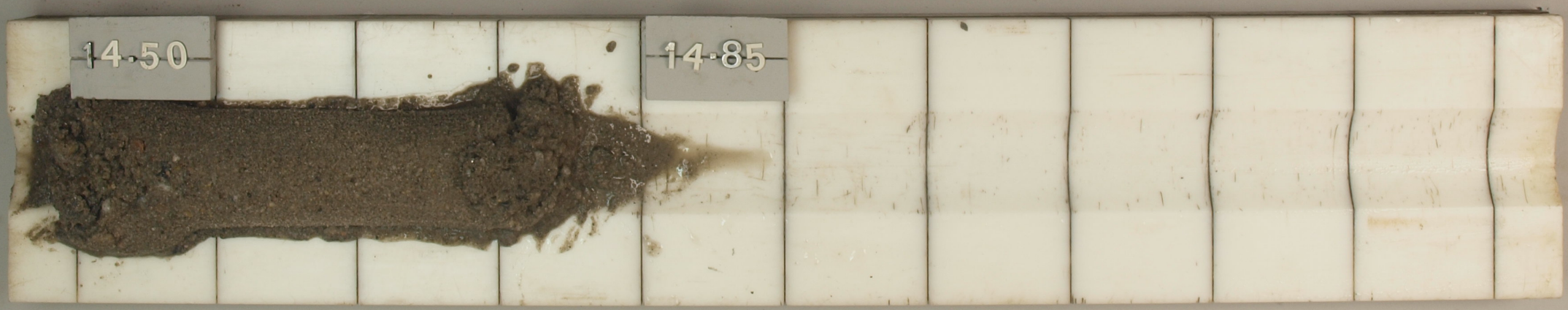
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 A

PUSH SAMPLE NO: P04A

DEPTH (M): 17.50 - 18.20

RECOVERY (M): 0.15

DATE: 23/06/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 A

PUSH SAMPLE NO: P 0 5

DEPTH (M): 21.00 - 21.70

RECOVERY (M): 0.50

DATE: 23/06/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 A

PUSH SAMPLE NO: P 0 6

DEPTH (M): 25.00 - 25.50

RECOVERY (M): 0.25

DATE: 23/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 01

DEPTH (M): 28.00 - 29.00 RECOVERY (M): 1.00

DATE: 24/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 0 2

DEPTH (M): 2 9. 00 - 3 0. 00 RECOVERY (M): 0. 9 5

DATE: 24/06/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

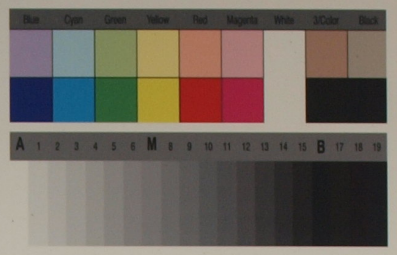
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 0 5

DEPTH (M): 3 9.50 - 4 0. 50 RECOVERY (M): 0. 6 0

DATE: 24/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 0 6 A

DEPTH (M): 4 4. 00 - 4 5. 00 RECOVERY (M): 1. 00

DATE: 24/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 0 7

DEPTH (M): 4 8. 00 - 4 9. 00 RECOVERY (M): 1. 00

DATE: 24/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

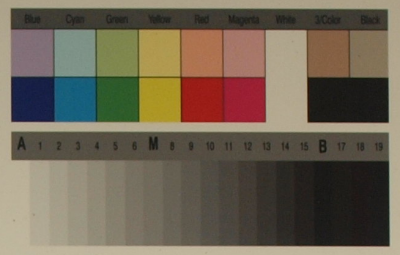
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 0 8

DEPTH (M): 5 1. 00 - 5 1. 7 0 RECOVERY (M): 0. 50

DATE: 24/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B

PUSH SAMPLE NO: P 0 9

DEPTH (M): 5 5. 00 - 5 6. 00

RECOVERY (M): 1. 00

DATE: 24/06/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

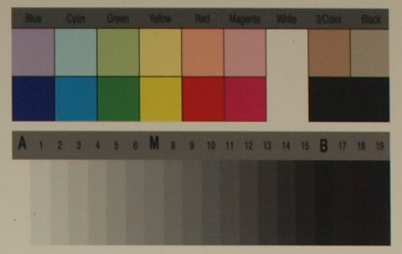
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 1 0

DEPTH (M): 5 9. 00 - 6 0. 00 RECOVERY (M): 1. 00

DATE: 24/06/2015



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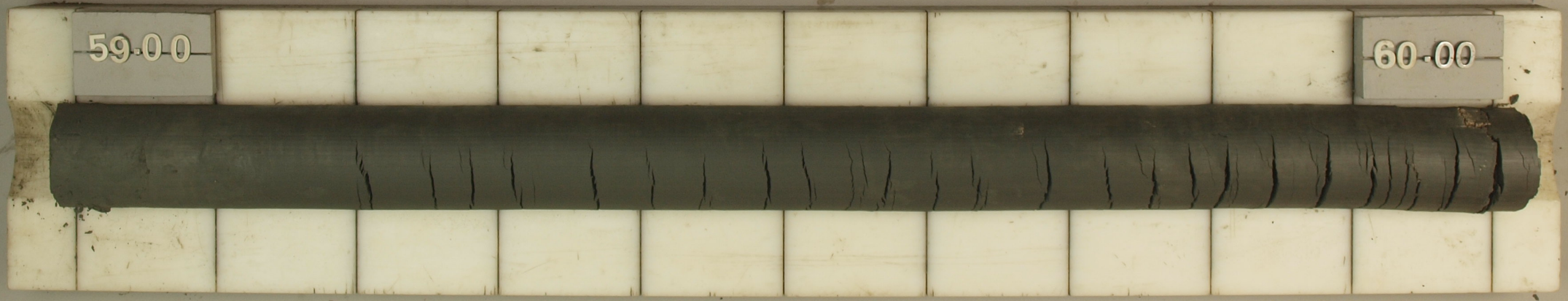
0.0m 1.0m



CLIENT: US Wind Inc.

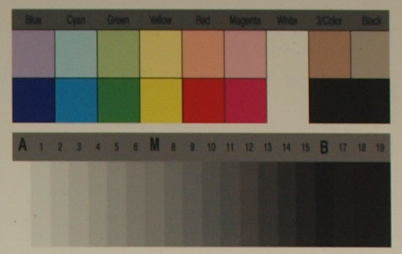
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 11

DEPTH (M): 63.00 - 64.00 RECOVERY (M): 1.00

DATE: 24/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 12

DEPTH (M): 67.00 - 68.00 RECOVERY (M): 1.00

DATE: 24/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH – I21 B PUSH SAMPLE NO: P 1 3

DEPTH (M): 7 1. 00 - 7 2. 00 RECOVERY (M): 0.5 5

DATE: 24/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

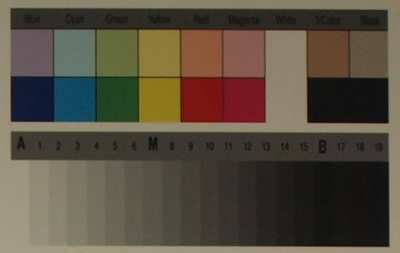
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P01

DEPTH (M): 0.00 - 1.00 RECOVERY (M): 0.75

DATE: 25/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

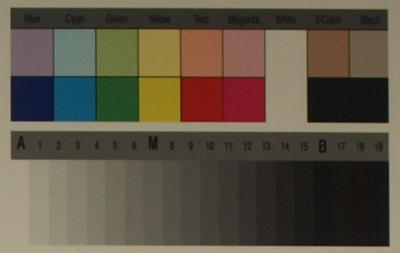
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P02

DEPTH (M): 1.00 - 2.00 RECOVERY (M): 0.45

DATE: 25/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

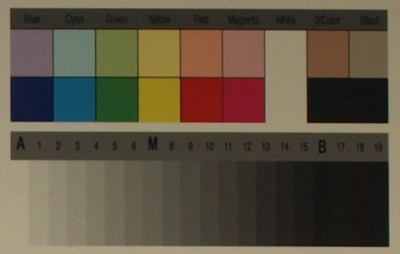
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P03

DEPTH (M): 2.00 - 3.00 RECOVERY (M): 0.60

DATE: 25/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P04

DEPTH (M): 5.00 - 5.70 RECOVERY (M): 0.35

DATE: 25/06/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P05

DEPTH (M): 8.50 - 9.20 RECOVERY (M): 0.55

DATE: 25/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

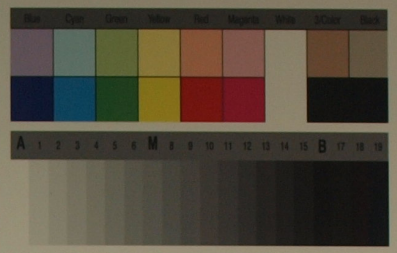
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P06

DEPTH (M): 12.50 - 13.30 RECOVERY (M): 0.50

DATE: 25/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P09

DEPTH (M): 25.50 - 26.50 RECOVERY (M): 0.95

DATE: 26/06/2015

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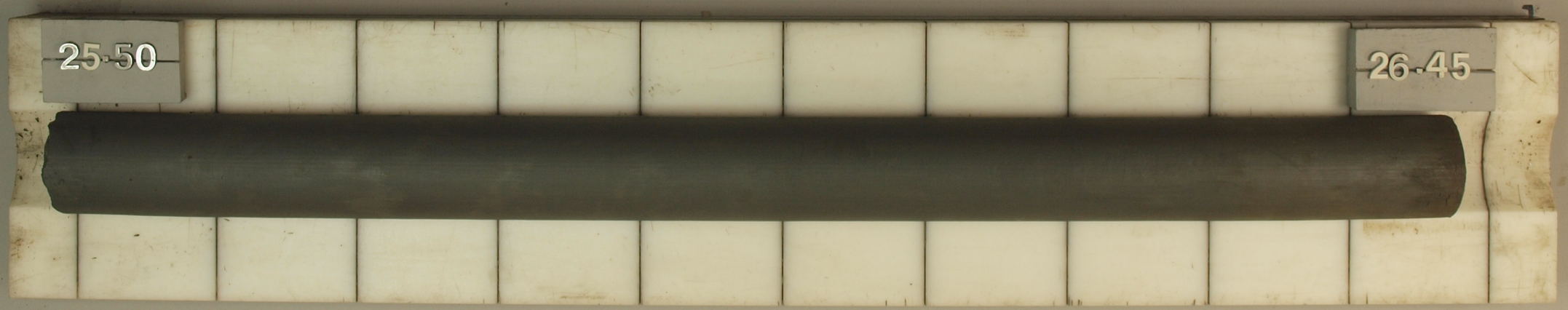
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 0

DEPTH (M): 2 9.00 - 3 0.00 RECOVERY (M): 0.9 5

DATE: 26/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 1

DEPTH (M): 3 3.00 - 3 4.00 RECOVERY (M): 0.9 8

DATE: 26/06/2015

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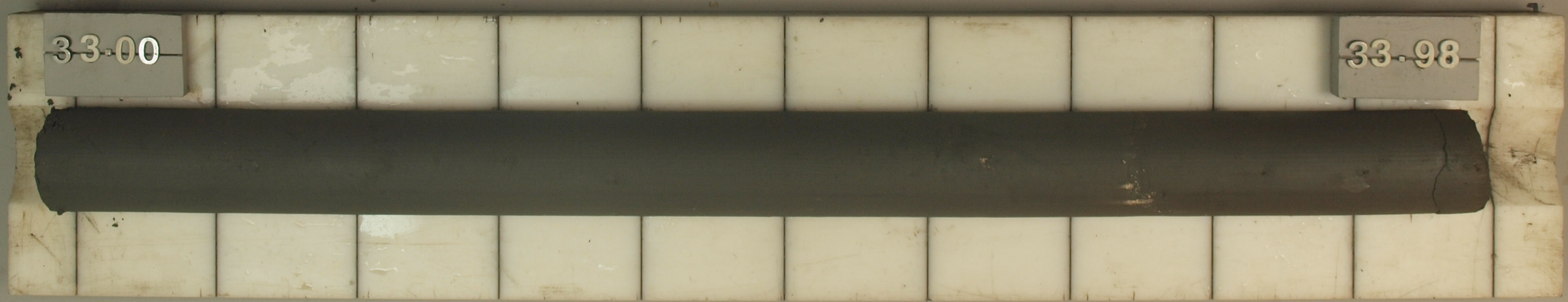
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 2

DEPTH (M): 3 7. 00 - 3 7. 4 0 RECOVERY (M): 0. 3 0

DATE: 26/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 3

DEPTH (M): 4 0. 50 - 4 1. 5 0 RECOVERY (M): 0. 9 0

DATE: 26/06/2015

US Wind inc sea energy

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Norfolk,
NR31 0NN.

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 4

DEPTH (M): 4 4. 50 - 4 5. 5 0 RECOVERY (M): 0. 1 0

DATE: 26/06/2015

US Wind inc sea energy

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 4 A

DEPTH (M): 4 4. 50 - 4 5.00 RECOVERY (M): 0. 3 0

DATE: 26/06/2015

US Wind inc sea energy

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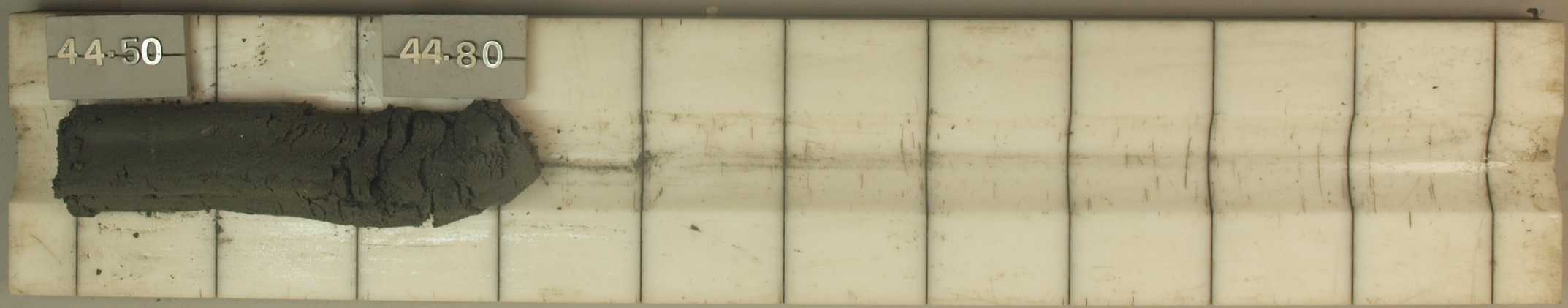

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 6 A

DEPTH (M): 5 3. 50 - 5 4. 50 RECOVERY (M): 0. 4 0

DATE: 26/06/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - MET TOWER PUSH SAMPLE NO: P 1 7

DEPTH (M): 5 7. 00 - 5 7. 7 5 RECOVERY (M): 0. 7 5

DATE: 26/06/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P 0 1

DEPTH (M): 0. 00 - 0. 7 0 RECOVERY (M): 0. 3 0

DATE: 29/06/2015

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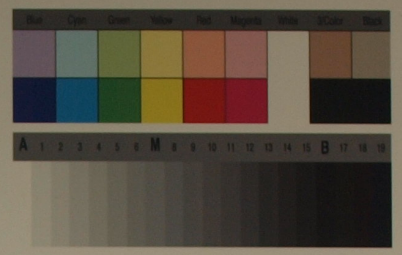

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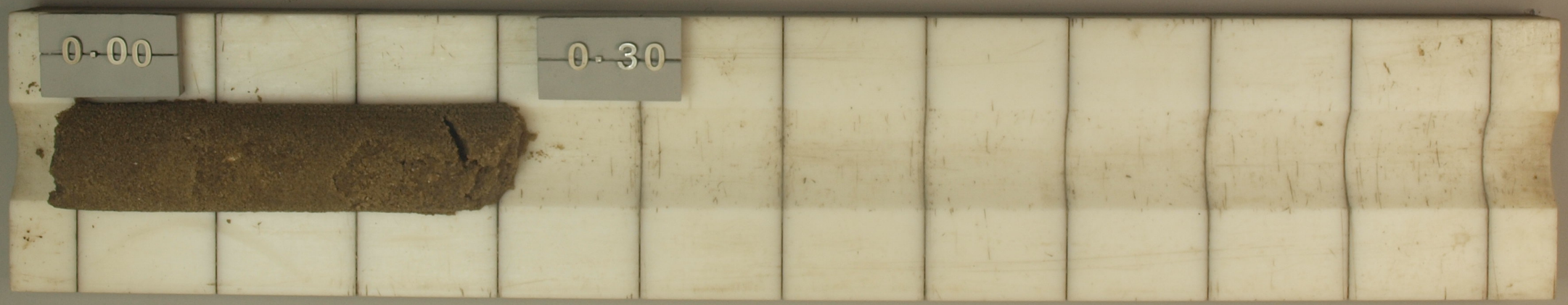

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P 0 4

DEPTH (M): 2. 00 - 3. 00 RECOVERY (M): 0. 5 0

DATE: 29/06/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P05

DEPTH (M): 3.00 - 4.00 RECOVERY (M): 0.80

DATE: 29/06/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14

PUSH SAMPLE NO: P06

DEPTH (M): 7.00 - 7.70

RECOVERY (M): 0.30

DATE: 29/06/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

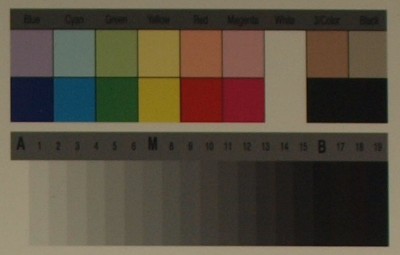
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P07

DEPTH (M): 10.00 - 11.00 RECOVERY (M): 0.75

DATE: 29/06/2015



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

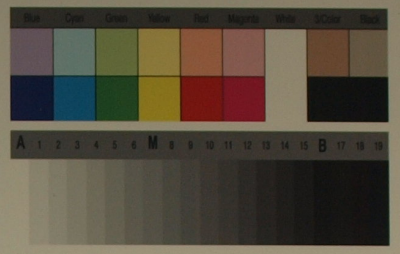
BOREHOLE NO: BH - D14

PUSH SAMPLE NO: P 0 8

DEPTH (M): 1 3. 50 - 1 4. 50

RECOVERY (M): 0. 8 0

DATE: 29/06/2015



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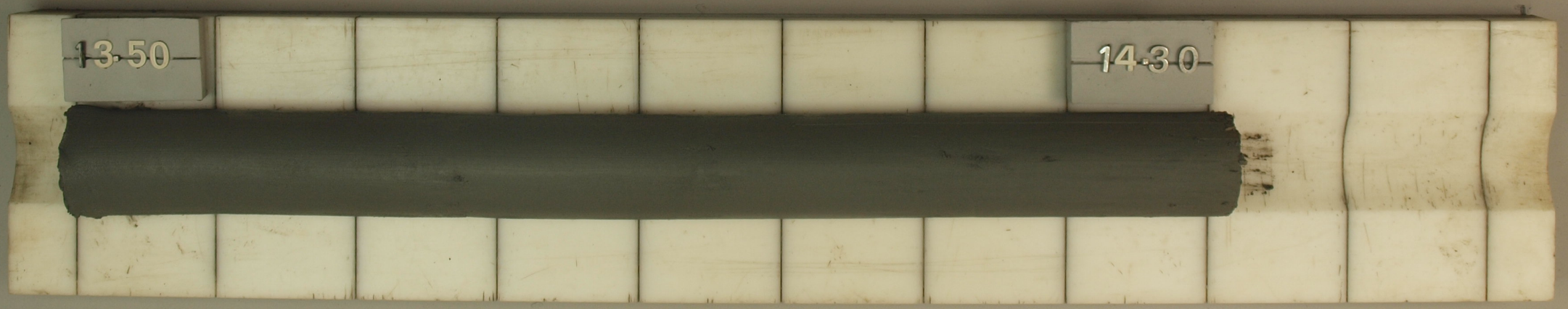


CLIENT: US Wind Inc.

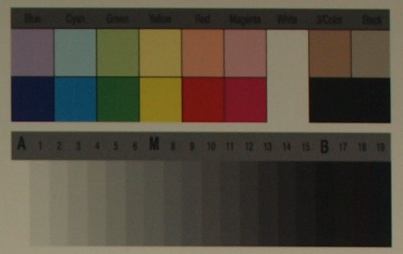
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P09

DEPTH (M): 17.50 - 17.90 RECOVERY (M): 0.30

DATE: 29/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

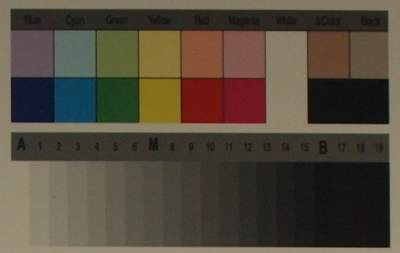
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 PUSH SAMPLE NO: P10

DEPTH (M): 21.00 - 22.00 RECOVERY (M): 0.55

DATE: 29/06/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14

PUSH SAMPLE NO: P 11

DEPTH (M): 24.50 - 25.20

RECOVERY (M): 0.35

DATE: 29/06/2015

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CLIENT: US Wind Inc.

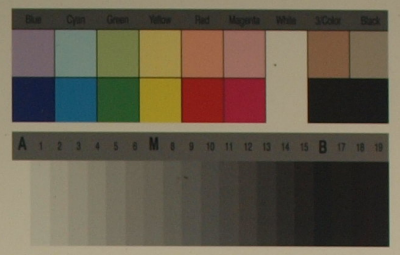
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 A — PUSH SAMPLE NO: P 1 0

DEPTH (M): 5 6.5 0 - 5 7.5 0 — RECOVERY (M): 0.5 5

DATE: 01/07/2015



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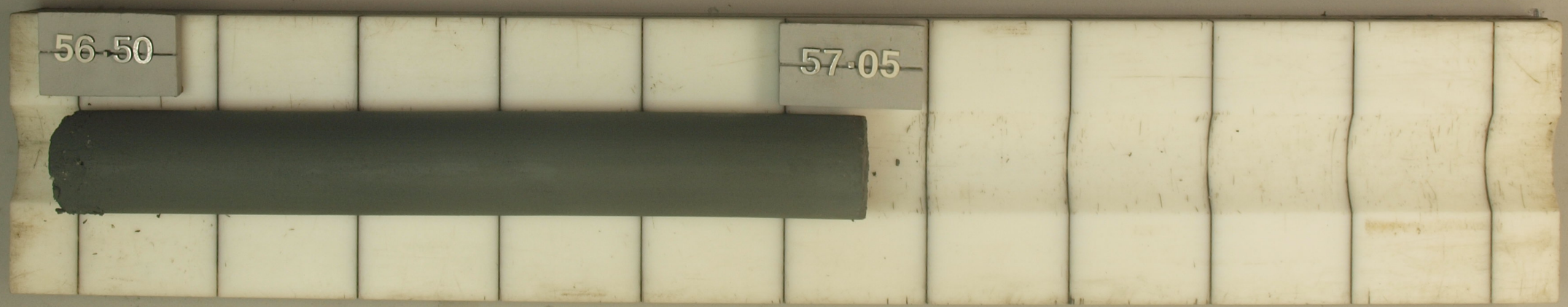


CLIENT: US Wind Inc.

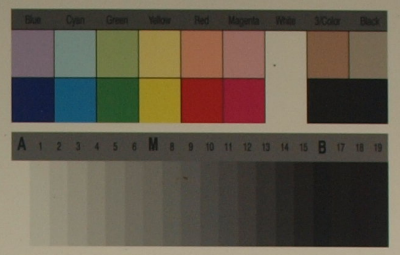
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - D14 A — PUSH SAMPLE NO: P 1 1

DEPTH (M): 6 0.5 0 - 6 1.5 0 — RECOVERY (M): 1.00

DATE: 01/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P01

DEPTH (M): 0.00 - 0.76 RECOVERY (M): 0.40

DATE: 01/07/2015

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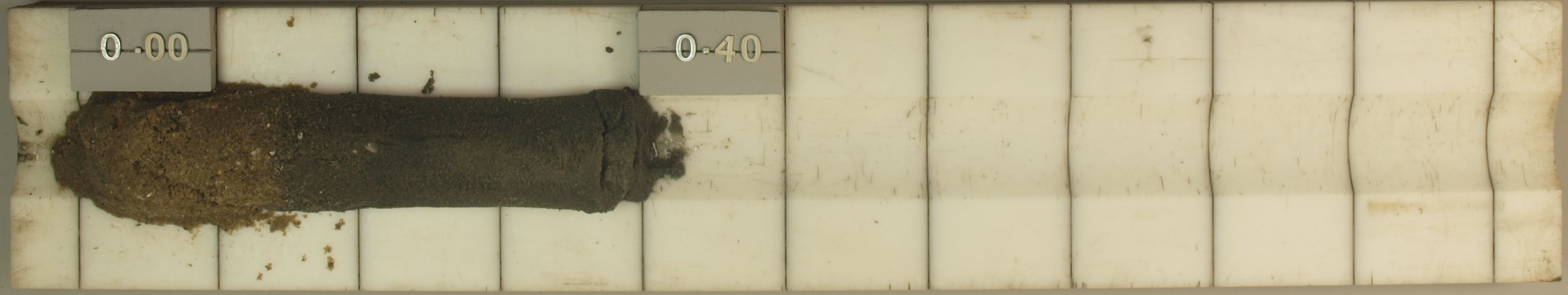
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P02

DEPTH (M): 0.50 - 1.40 RECOVERY (M): 0.70

DATE: 01/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P03

DEPTH (M): 1.50 - 2.26 RECOVERY (M): 0.50

DATE: 01/07/2015

US Wind inc sea energy

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

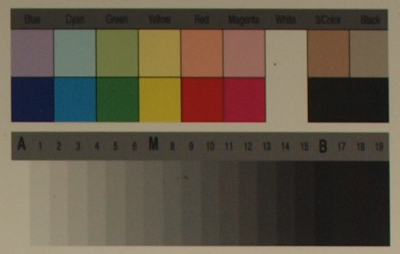
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 0 4

DEPTH (M): 5. 00 - 6. 00 RECOVERY (M): 0. 50

DATE: 01/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P05

DEPTH (M): 8.00 - 8.80 RECOVERY (M): 0.25

DATE: 01/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17

PUSH SAMPLE NO: P07A

DEPTH (M): 12.00 - 12.50

RECOVERY (M): 0.10

DATE: 01/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

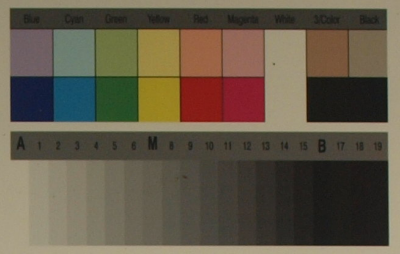
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 0 9

DEPTH (M): 17.00 - 17.50 RECOVERY (M): 0.20

DATE: 02/07/2015



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

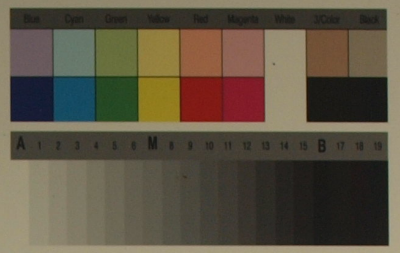
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 1 0

DEPTH (M): 1 8. 5 0 - 1 8. 9 5 RECOVERY (M): 0. 2 5

DATE: 02/07/2015



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 1 3

DEPTH (M): 2 9. 50 - 3 0. 00 RECOVERY (M): 0. 2 5

DATE: 02/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 1 4 A

DEPTH (M): 3 3. 50 - 3 4. 50 RECOVERY (M): 0. 7 7

DATE: 02/07/2015

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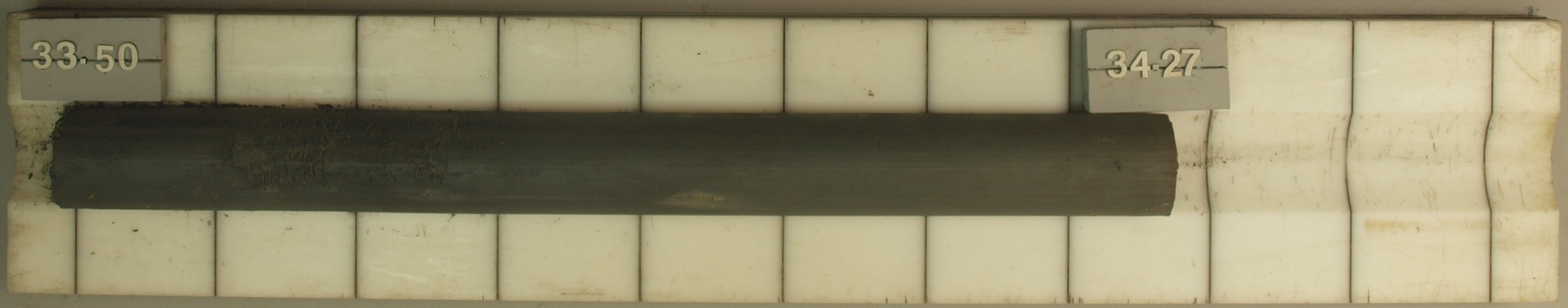

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P 1 5

DEPTH (M): 3 7. 50 - 3 8. 50 RECOVERY (M): 0. 94

DATE: 02/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 PUSH SAMPLE NO: P01

DEPTH (M): 0.00 - 0.76 RECOVERY (M): 0.40

DATE: 01/07/2015

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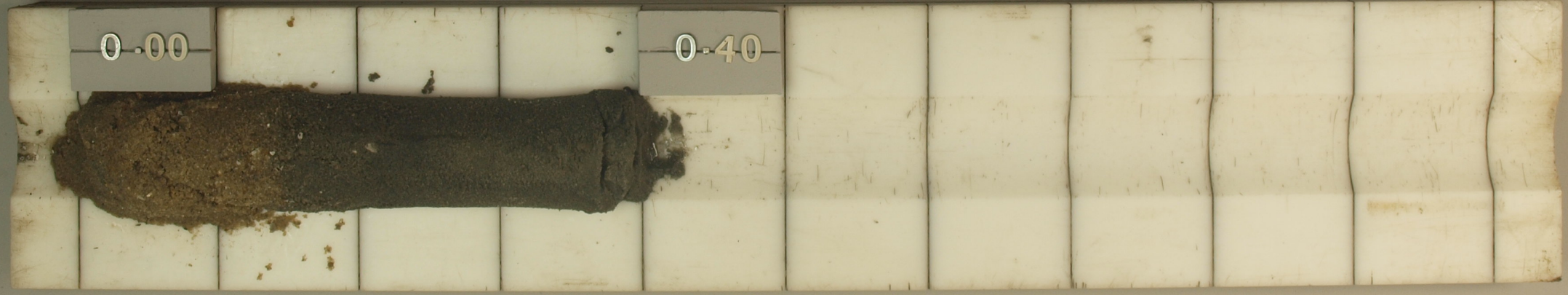

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A

PUSH SAMPLE NO: P 02

DEPTH (M): 44.50 - 45.25

RECOVERY (M): 0.25

DATE: 02/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A

PUSH SAMPLE NO: P 0 3

DEPTH (M): 4 8.00 - 4 8.9 0

RECOVERY (M): 0.7 0

DATE: 02/07/2015

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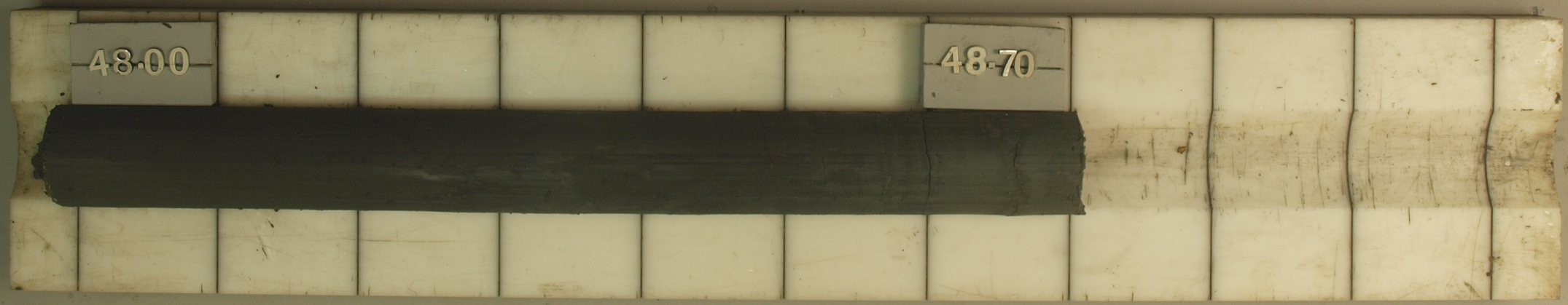

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A

PUSH SAMPLE NO: P 0 4

DEPTH (M): 5 2. 00 - 52. 80

RECOVERY (M): 0. 7 5

DATE: 02/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A — PUSH SAMPLE NO: P 05

DEPTH (M): 56.00 - 57.00 — RECOVERY (M): 0.90

DATE: 02/07/2015

US Wind inc sea energy

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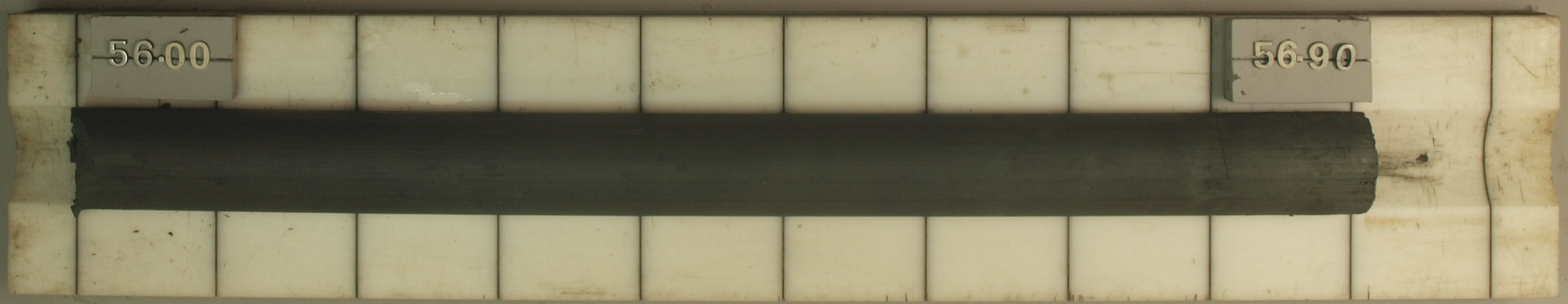
0.0m — 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A PUSH SAMPLE NO: P 0 6

DEPTH (M): 6 0. 00 - 6 1. 00 RECOVERY (M): 1. 00

DATE: 02/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G17 A PUSH SAMPLE NO: P 0 7

DEPTH (M): 6 4.00 - 6 5.00 RECOVERY (M): 0.8 0

DATE: 02/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16

PUSH SAMPLE NO: P01A

DEPTH (M): 0.00 - 1.00

RECOVERY (M): 0.15

DATE: 03/07/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

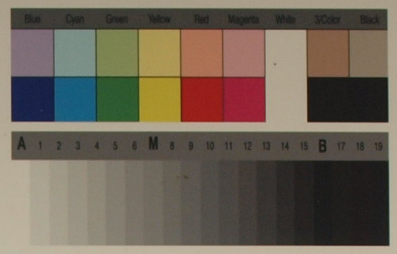
BOREHOLE NO: BH - K16

PUSH SAMPLE NO: P 03

DEPTH (M): 3.50 - 4.50

RECOVERY (M): 0.55

DATE: 03/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

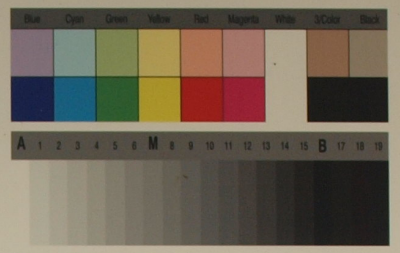
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 0 4 A

DEPTH (M): 7. 50 - 8.3 0 RECOVERY (M): 0. 2 0

DATE: 03/07/2015



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CLIENT: US Wind Inc.

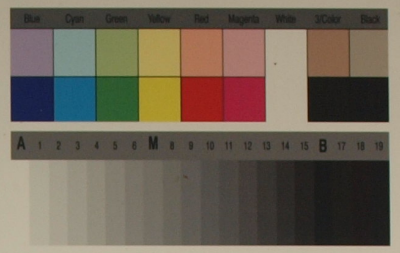
CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 0 6

DEPTH (M): 1 3. 00 - 1 3. 7 0 RECOVERY (M): 0. 1 5

DATE: 03/07/2015



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0.0m 1.0m

13.00 13.15

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 0

DEPTH (M): 2 2.00 - 2 2.7 0 RECOVERY (M): 0.2 5

DATE: 03/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P12

DEPTH (M): 28.00 - 28.70 RECOVERY (M): 0.40

DATE: 03/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

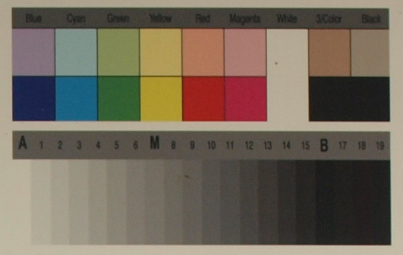
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P13

DEPTH (M): 31.00 - 31.75 RECOVERY (M): 0.30

DATE: 04/07/2015



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

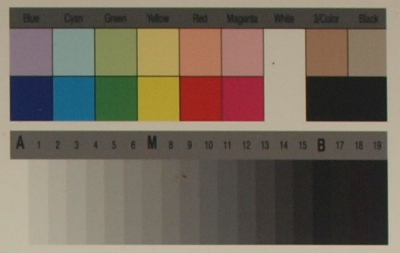
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 5

DEPTH (M): 4 0. 00 - 4 1. 00 RECOVERY (M): 0. 9 5

DATE: 04/07/2015



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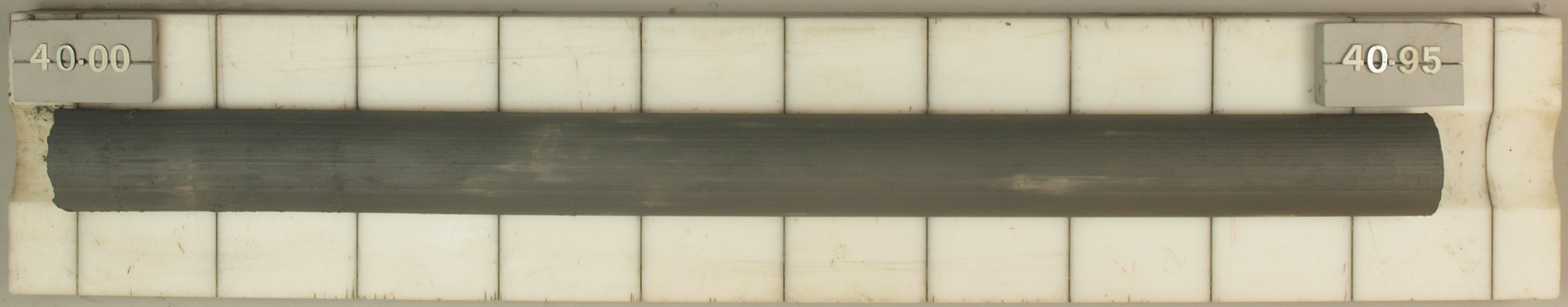
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451

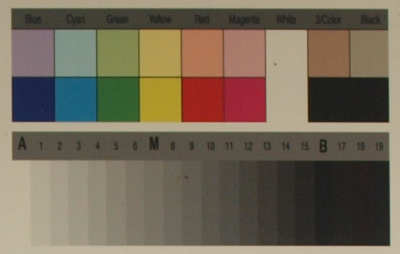
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 6

DEPTH (M): 4 4. 00 - 4 5. 00 RECOVERY (M): 0. 9 8

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

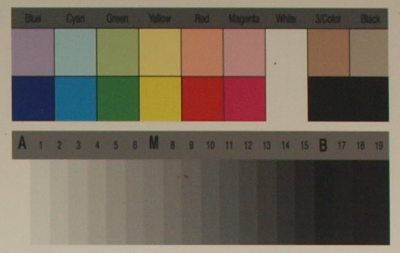
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 7

DEPTH (M): 4 8. 00 - 4 9. 00 RECOVERY (M): 0. 9 5

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

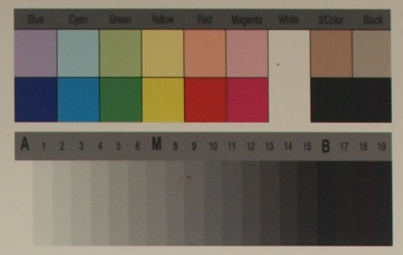
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 8

DEPTH (M): 4 9. 50 - 5 0. 3 0 RECOVERY (M): 0. 3 0

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

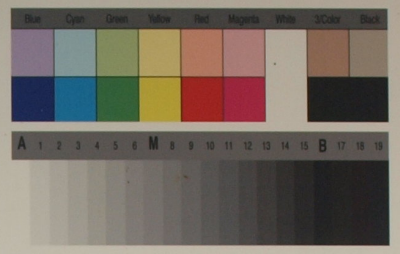
Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 1 9

DEPTH (M): 5 1. 00 - 5 2.00 RECOVERY (M): 0. 7 0

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 20

DEPTH (M): 55.00 - 56.00 RECOVERY (M): 1.00

DATE: 04/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

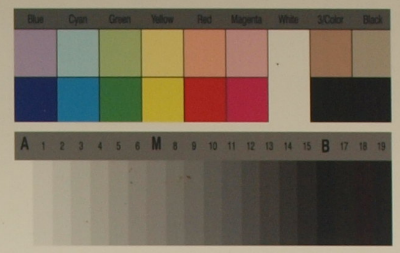
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 2 1

DEPTH (M): 5 9. 00 - 6 0. 00 RECOVERY (M): 1. 00

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16

PUSH SAMPLE NO: P 2 2

DEPTH (M): 6 3. 00 - 6 4. 00

RECOVERY (M): 1. 00

DATE: 04/07/2015

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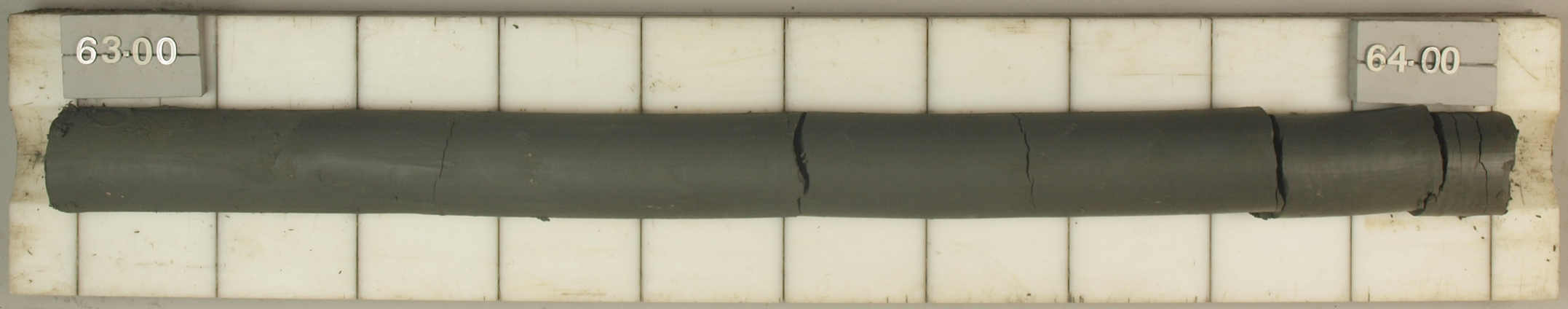
0.0m 1.0m



CLIENT: US Wind Inc.

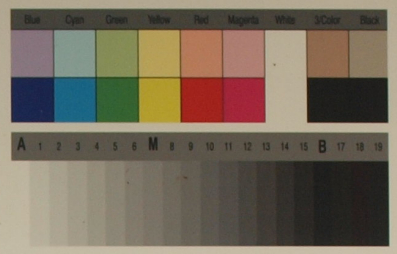
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 2 3

DEPTH (M): 6 6. 50 - 6 7. 50 RECOVERY (M): 0. 7 0

DATE: 04/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - K16 PUSH SAMPLE NO: P 2 4

DEPTH (M): 7 1. 00 - 7 1. 7 0 RECOVERY (M): 0. 4 0

DATE: 04/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 0 1

DEPTH (M): 0.00 - 1.00 RECOVERY (M): 0.40

DATE: 05/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

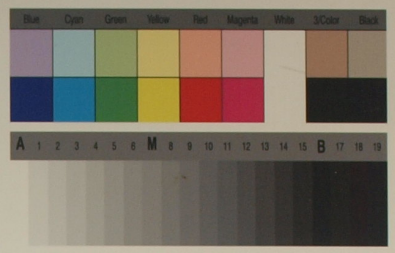
LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P02

DEPTH (M): 1.00 - 2.00 RECOVERY (M): 0.55

DATE: 05/07/2015

0.0m 1.0m



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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

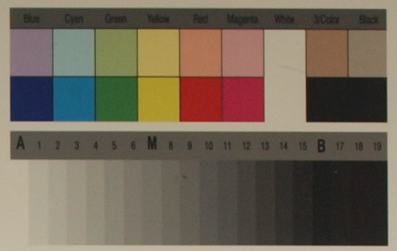
LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 0 3

DEPTH (M): 2. 00 - 3. 00 RECOVERY (M): 0. 7 0

DATE: 05/07/2015

0.0m 1.0m



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10

PUSH SAMPLE NO: P 0 4

DEPTH (M): 6.00 - 7.00

RECOVERY (M): 0. 8 4

DATE: 05/07/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P05

DEPTH (M): 10.00 - 10.50 RECOVERY (M): 0.30

DATE: 05/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 0 6 A

DEPTH (M): 1 3. 50 - 1 4. 0 0 RECOVERY (M): 0. 3 0

DATE: 05/07/2015

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10

PUSH SAMPLE NO: P 0 8

DEPTH (M): 2 3. 50 - 2 4. 50

RECOVERY (M): 0. 4 5

DATE: 05/07/2015

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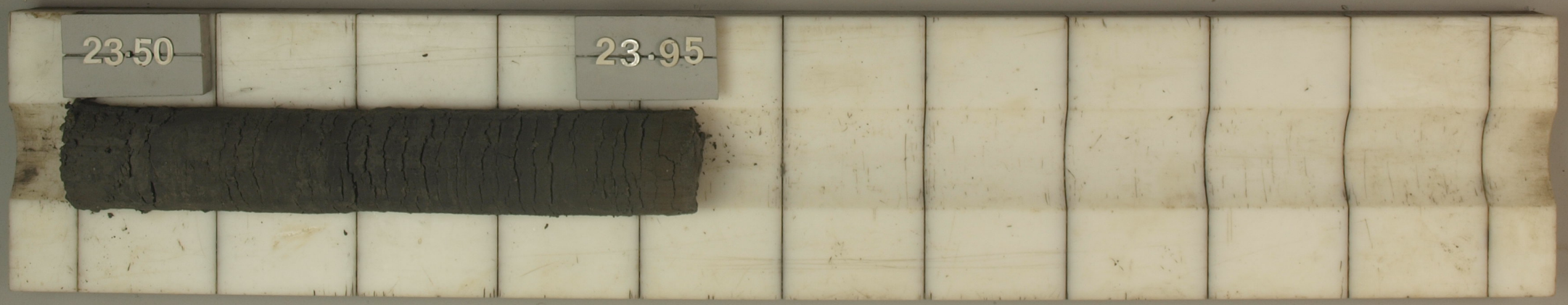

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10

PUSH SAMPLE NO: P 0 8

DEPTH (M): 2 3. 50 - 2 4. 50

RECOVERY (M): 0. 4 5

DATE: 05/07/2015

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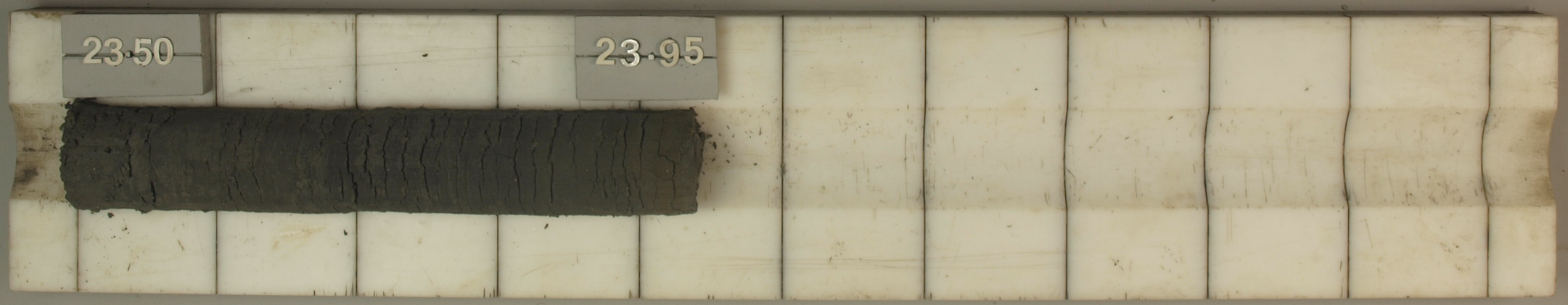
0.0m 1.0m



CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 0 9

DEPTH (M): 2 6. 0 0 - 2 7. 0 0 RECOVERY (M): 0. 9 0

DATE: 05/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P10

DEPTH (M): 30.00 - 30.85 RECOVERY (M): 0.80

DATE: 05/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 1 1

DEPTH (M): 3 4. 0 0 - 3 4. 9 0 RECOVERY (M): 0. 8 0

DATE: 05/07/2015

0.0m 1.0m

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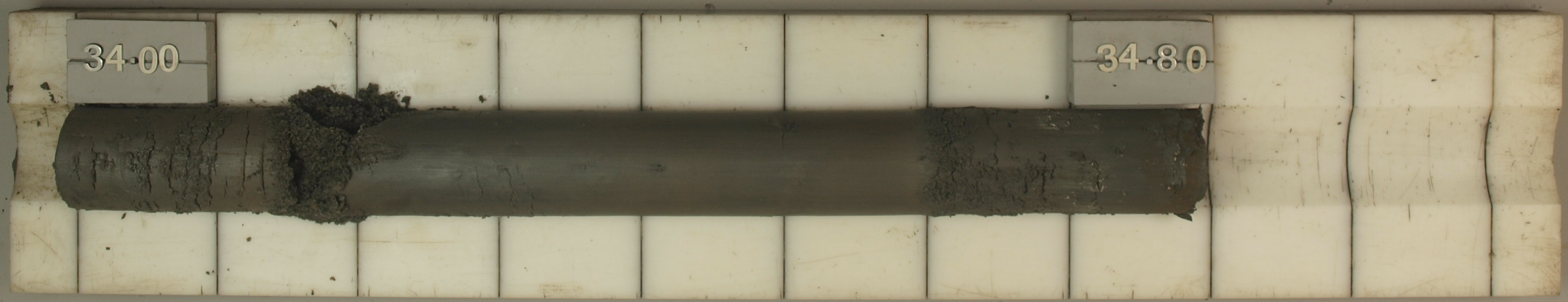

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P12

DEPTH (M): 38.00 - 38.90 RECOVERY (M): 0.65

DATE: 05/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 1 3

DEPTH (M): 4 2. 0 0 - 4 3. 0 0 RECOVERY (M): 0. 8 5

DATE: 05/07/2015

0.0m 1.0m

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42.00

42.85

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P15

DEPTH (M): 50.00 - 51.00 RECOVERY (M): 1.00

DATE: 06/07/2015

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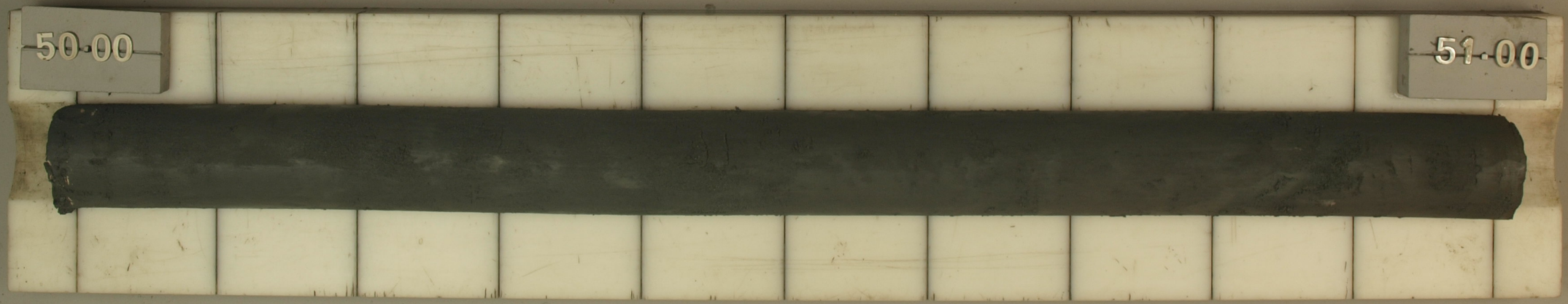

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 1 6

DEPTH (M): 5 4.00 - 5 5.00 RECOVERY (M): 0. 9 6

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

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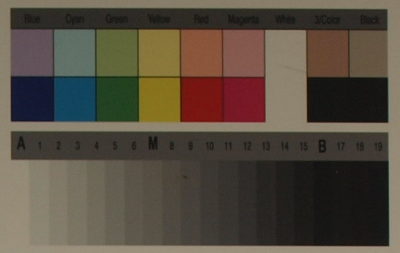
LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P17

DEPTH (M): 56.00 - 56.50 RECOVERY (M): 0.30

DATE: 06/07/2015

0.0m 1.0m



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CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 1 8

DEPTH (M): 5 9. 50 - 6 0. 00 RECOVERY (M): 0. 3 0

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P19

DEPTH (M): 63.00 - 63.50 RECOVERY (M): 0.30

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 2 0

DEPTH (M): 6 6.00 - 6 7. 00 RECOVERY (M): 1. 0 0

DATE: 06/07/2015

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0.0m 1.0m

66.00

67.00

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 2 1

DEPTH (M): 7 0.00 - 7 1.00 RECOVERY (M): 1.00

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 2 1

DEPTH (M): 7 0.00 - 7 1.00 RECOVERY (M): 1.00

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 2 2

DEPTH (M): 74.00 - 75.00 RECOVERY (M): 0.90

DATE: 06/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - H10 PUSH SAMPLE NO: P 2 2

DEPTH (M): 74.00 - 75.00 RECOVERY (M): 0.90

DATE: 06/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 0 2

DEPTH (M): 0. 50 - 1. 50 RECOVERY (M): 0. 4 5

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 0 3

DEPTH (M): 1. 00 - 2. 00 RECOVERY (M): 0. 6 0

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7

PUSH SAMPLE NO: P 0 4

DEPTH (M): 4. 50 - 4. 9 0

RECOVERY (M): 0. 1 0

DATE: 06/07/2015

0.0m

1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P05

DEPTH (M): 8.00 - 8.20 RECOVERY (M): 0.20

DATE: 06/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P06A

DEPTH (M): 10.00 - 10.40 RECOVERY (M): 0.05

DATE: 06/07/2015

0.0m 1.0m

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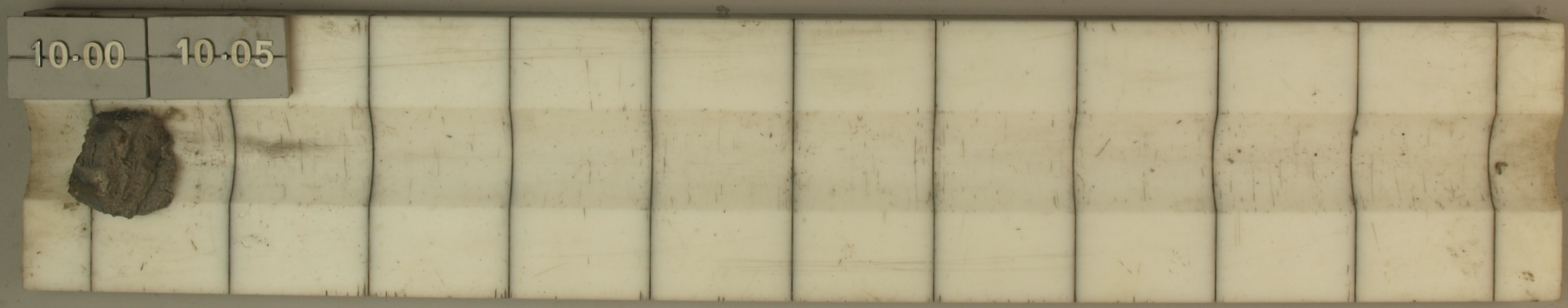

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P07A

DEPTH (M): 12.50 - 12.90 RECOVERY (M): 0.30

DATE: 06/07/2015

0.0m 1.0m

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US Wind inc sea energy

12.50 12.80

CLIENT: US Wind Inc.

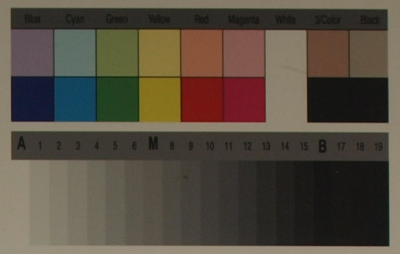
CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P08

DEPTH (M): 14.50 - 15.14 RECOVERY (M): 0.18

DATE: 07/07/2015



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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - G7

PUSH SAMPLE NO: P10

DEPTH (M): 19.00 - 20.00

RECOVERY (M): 0.78

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 1

DEPTH (M): 2 3. 00 - 2 4. 00 RECOVERY (M): 0. 8 0

DATE: 07/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 2

DEPTH (M): 2 7. 00 - 2 8. 00 RECOVERY (M): 0. 9 5

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 3

DEPTH (M): 3 1. 00 - 3 2. 00 RECOVERY (M): 0. 7 4

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 4

DEPTH (M): 3 5. 00 - 3 6. 00 RECOVERY (M): 1. 00

DATE: 07/07/2015

0.0m 1.0m

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CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 5

DEPTH (M): 3 9. 00 - 4 0. 00 RECOVERY (M): 1. 00

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 6

DEPTH (M): 4 3. 00 - 4 4. 00 RECOVERY (M): 1. 00

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P17

DEPTH (M): 46.50 - 47.50 RECOVERY (M): 0.80

DATE: 07/07/2015

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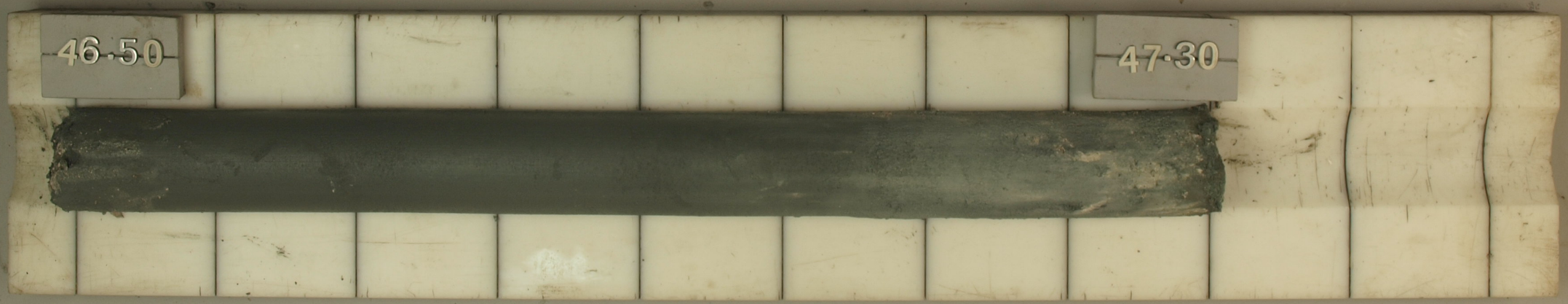

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 8

DEPTH (M): 5 0. 00 - 5 1. 00 RECOVERY (M): 1. 0 0

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

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LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 1 9

DEPTH (M): 5 3. 0 0 - 5 3. 8 0 RECOVERY (M): 0. 2 0

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 2 0

DEPTH (M): 5 7. 00 - 5 7. 5 5 RECOVERY (M): 0.3 0

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

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LOCATION: Maryland USA

BOREHOLE NO: BH - G7

PUSH SAMPLE NO: P 2 1

DEPTH (M): 60.50 - 61.00

RECOVERY (M): 0.40

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 2 2

DEPTH (M): 6 4. 00 - 6 4. 50 RECOVERY (M): 0. 50

DATE: 07/07/2015

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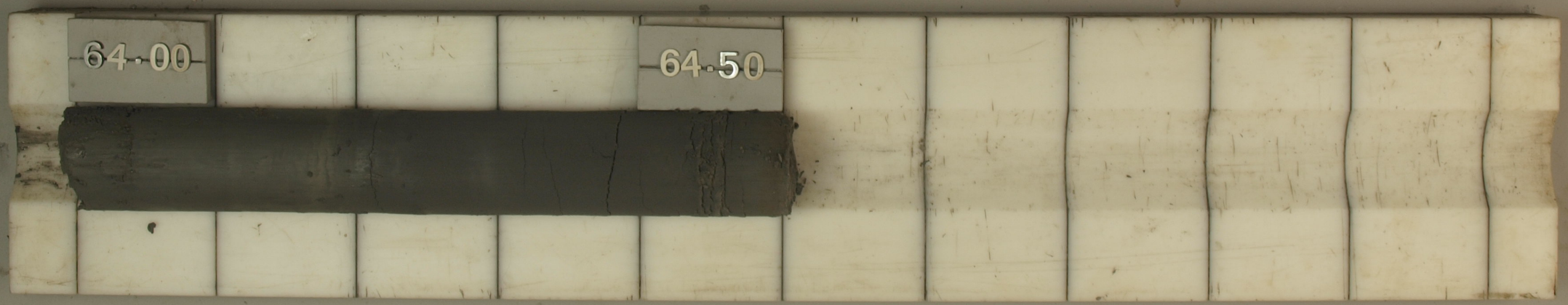

CLIENT: US Wind Inc.

CONTRACT NO: 10451 — Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 2 3

DEPTH (M): 6 7. 50 - 6 8. 2 5 RECOVERY (M): 0. 7 5

DATE: 07/07/2015

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0.0m 1.0m

CLIENT: US Wind Inc.

CONTRACT NO: 10451

Geotechnical Marine Survey for the Maryland Wind Energy Area

LOCATION: Maryland USA

BOREHOLE NO: BH - G7 PUSH SAMPLE NO: P 2 4

DEPTH (M): 71. 50 - 72. 50 RECOVERY (M): 1. 00

DATE: 07/07/2015

0.0m 1.0m

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APPENDIX 3

3.1 Moisture Content and Density Results

3.2 Classification Summary

3.3 Particle Size Distribution Results

3.4 Finer than 75µm Report Summary

3.5 Plasticity Results

3.6 Shear Strength Summary

3.7 Triaxial Summary

3.8 Undrained Unconsolidated Triaxial (UU) Results

3.9 Consolidated Anisotropic Undrained Compression Triaxial (CAUC)

3.10 Chemical Laboratory Results

3.1 Moisture Content and Density Results

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14/D14A

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1B1	0.15	19											
P1B1	0.16	18	1.6	1.8								17.66	
P4B1	2.08	18						2.66					
P4B1	2.11	21	1.7	2.0								19.62	
P4B2	2.35	23	1.70	2.09								20.49	
P5B1	3.05					1.45	1.78						
P5B2	3.21	22	1.4	1.7								16.68	
P5B2	3.25	17											
P5B3	3.41	24	1.4	1.8								17.66	
P5B3	3.50	19											
P5B4	3.70	16											
P5B4	3.72	16											
P5B4	3.74	16											
P5B4	3.76	16											
P6B1	7.15	22											
P6B1	7.16	24	1.6	2.0								19.62	
P7B1	10.05	49											
P7B1	10.09	38	1.1	1.6								15.70	
P7U1	10.40	50						2.80					
P7Q2	10.60	47	1.25	1.83				2.78		1.31	0.57	18.00	
P7B2	10.74	33	1.4	1.8								17.66	
P8B1	13.62	33	1.4	1.9								18.64	
P8B2	14.21	43	1.3	1.8								17.66	
P9B1	17.65	14											

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14/D14A

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P10B1	21.15	29											
P10B1	21.15	29	1.5	1.9								18.64	
P10B2	21.42	25	1.5	1.9								18.64	
P11B1	24.68	16											
P11B1	24.71	20	1.6	1.9								18.64	
P1B1	1.13	16											
P2B1	25.63	19	1.7	2.0								19.62	
P2B1	25.63	18						2.65					
P3B1	29.12	27	1.5	1.9								18.64	
P4B1	33.13	30											
P4B1	33.14	31	1.4	1.9								18.64	
P5B1	37.05	38											
P5B1	37.06	35	1.4	1.9								18.64	
P5Q1	37.20	32	1.45	1.91				2.72		0.87	0.47	18.74	
P6B1	41.08	30	1.5	1.9								18.64	
P6B1	41.10	33											
P6B2	41.34	33	1.2	1.6								15.70	
P6B3	41.70	40											
P6B3	41.72	33	1.4	1.9								18.64	
P7B1	45.07	28	1.5	1.9								18.64	
P7B2	45.38	25											
P7B2	45.41	25	1.4	1.8								17.66	
P8B1	48.60	29											
P8B1	48.61	30	1.4	1.8								17.66	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14/D14A

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P8B2	49.41	35	1.3	1.7								16.68	
P9B1	52.60	38											
P9B1	52.60	40	1.3	1.8								17.66	
P9Q1	53.20	38	1.33	1.84				2.72		1.03	0.51	18.05	
P9B4	53.32	37	1.3	1.8								17.66	
P10B1	56.55	23											
P10B1	56.55	24	1.4	1.8								17.66	
P10B2	57.00	26	1.5	1.9								18.64	
P11B1	60.65	27	1.5	1.8								17.66	
P11Q1	61.00	24	1.60	1.98				2.73		0.66	0.40	19.43	
P12B1	64.53	28											
P12B1	64.55	30	1.4	1.8								17.66	
P12B2	64.75	28	1.4	1.8								17.66	
P13B1	68.11	29	1.4	1.9								18.64	
P13B2	68.28	29											
P13B2	68.31	32	1.4	1.9								18.64	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P2B2	0.76	21	1.5	1.8								17.66	
P2B2	0.80	15	1.50	1.72								16.85	
P2B2	0.83	23	1.50	1.72				2.73		0.41	0.29	16.87	
P3B1	1.10	15						2.67					
P3B1	1.13	13	1.6	1.8								17.66	
P3B2	1.30	20											
P3B2	1.32	20											
P3B2	1.34	20											
P3B2	1.36	20											
P3B3	1.50	22											
P3B3	1.51	20	1.8	2.1								20.60	
P4B1	4.55	23	1.6	2.0								19.62	
P4B1	4.55	20											
P5B1	8.10	18											
P5B1	8.10	17	1.7	2.0								19.62	
P7AB1	12.65	15											
P7AB1	12.71	16	1.6	1.9								18.64	
P8B1	14.59	15											
P8B1	14.61	19	1.7	2.0								19.62	
P10Q2	19.30	34	1.53	1.95				2.73		0.76	0.43	19.13	
P10B1	19.46	31	1.3	1.7								16.68	
P10B2	19.71	15	1.7	2.0								19.62	
P11Q2	23.23	37											
P11Q2	23.27	31											

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P11Q2	23.31	37											
P11Q2	23.37	22											
P11B1	23.50	26	1.5	1.9								18.64	
P11B2	23.70	28	1.3	1.7								16.68	
P12U1	27.15	31											
P12B3	27.56	35	1.4	1.9								18.64	
P12Q2	27.80	32	1.43	1.94				2.75		0.99	0.50	19.03	
P12B4	27.91	29	1.5	1.9								18.64	
P13B1	31.08	30	1.5	2.0								19.62	
P13Q2	31.60	23	1.61	2.00				2.70		0.65	0.39	19.62	
P13B2	31.71	25	1.6	2.0								19.62	
P14B1	35.16	26	1.6	2.0								19.62	
P14Q1	35.30	27	1.54	1.95				2.76		0.72	0.42	19.13	
P14B2	35.81	27	1.4	1.8								17.66	
P15B1	39.15	30	1.4	1.8								17.66	
P15Q1	39.30	36	1.45	1.93				2.76		0.91	0.48	18.93	
P15B2	39.90	36	1.3	1.8								17.66	
P16B1	43.10	26	1.5	1.9								18.64	
P16Q1	43.30	27	1.60	2.00				2.69		0.67	0.40	19.62	
P16B2	43.90	37	1.4	1.9								18.64	
P17B1	46.55	20											
P17B1	46.56	22	1.6	1.9								18.64	
P17Q2	46.90	23	1.66	2.04				2.71		0.62	0.38	20.04	
P17B2	47.15					1.25	1.54						

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

Gardline

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

US Wind inc sea energy

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P17B2	47.21	17	1.6	1.9								18.64	
P18B1	50.11	26	1.5	2.0								19.62	
P18B2	50.50	25						2.69					
P18B2	50.51	22	1.6	1.9								18.64	
P18B3	50.91	25	1.6	2.0								19.62	
P19B1	53.10	21											
P19B1	53.11	25	1.5	1.9								18.64	
P20B1	57.15	27											
P20B1	57.15	29	1.4	1.8								17.66	
P21B1	60.63	30	1.4	1.8								17.66	
P21B1	60.70	25											
P21B1	60.82	25	1.6	2.0								19.62	
P22B1	64.12	34	1.3	1.7								16.68	
P22B1	64.13	39											
P22B2	64.37	29	1.5	1.9								18.64	
P23B1	67.56	36	1.4	1.9								18.64	
P23Q1	67.70	31	1.42	1.86				2.78		0.86	0.46	18.25	
P24B1	71.55	32											
P24B1	71.58	25	1.6	2.0								19.62	
P24B2	72.12	27	1.6	2.0								19.62	
P24Q2	72.30	30	1.49	1.93				2.78		0.83	0.45	18.93	
P24B3	72.42	29	1.6	2.1								20.60	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17/G17A

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1B1	0.17	17	1.6	1.9								18.64	
P1B1	0.20	12											
P1B1	0.35	23	1.5	1.9								18.64	
P2B1	0.64	30	1.6	2.0								19.62	
P2B1	0.68	21						2.66					
P3B1	1.64	25	1.7	2.1								20.60	
P3B2	1.88	21											
P3B2	1.90	23	1.5	1.8								17.66	
P4B1	5.06	29	1.5	1.9								18.64	
P4B1	5.13	22											
P4B2	5.44	9.8	1.7	1.8								17.66	
P5B1	8.13	22											
P5B1	8.14	24	1.6	2.0								19.62	
P9B1	17.10	19						2.65					
P9B1	17.12	20	1.6	1.9								18.64	
P10B1	18.53	12	1.76	1.96								19.26	
P10B1	18.53	17	1.68	1.97				2.67		0.45	0.31	19.33	
P10Q1	18.56	17											
P10Q1	18.60	16											
P10Q1	18.63	16											
P10Q1	18.66	16											
P10B2	18.72	19	1.7	2.0								19.62	
P10B2	18.73	19											
P11B1	29.62	18	1.6	1.8								17.66	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

Gardline

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17/G17A

US Wind Inc sea energy

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P11B1	29.63	17											
P11B1	29.72	17	1.6	1.9								18.64	
P14AB1	33.67	31	1.5	1.9								18.64	
P14AU1	34.00	30											
P14AB2	34.17	31	1.5	1.9								18.64	
P15B1	37.67	27	1.6	2.0								19.62	
P15Q1	37.80	27	1.58	2.00				2.74		0.74	0.43	19.59	
P15B2	38.37	29	1.5	1.9								18.64	
P1B1	41.11	28	1.4	1.8								17.66	
P1Q2	41.63	26											
P1Q2	41.64	29											
P1Q2	41.66	36											
P1Q2	41.68	42											
P1B2	41.91	20	1.4	1.7								16.68	
P2B1	44.59	25	1.4	1.7								16.68	
P2B1	44.63	31											
P2B1	44.70	27	1.2	1.6								15.70	
P3B1	48.13					1.15	1.49						
P3B1	48.22	29	1.4	1.9								18.64	
P3B2	48.38	26											
P3B2	48.49	29	1.4	1.8								17.66	
P4B1	52.06	35	1.4	1.9								18.64	
P4B2	52.41	32	1.3	1.7								16.68	
P4Q2	52.55	34	1.36	1.83				2.72		0.92	0.48	17.95	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17/G17A

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P4B3	52.69	31	1.3	1.8								17.66	
P5B1	56.05	39	1.3	1.7								16.68	
P5Q2	56.60	32	1.41	1.86				2.75		0.88	0.47	18.25	
P5B2	56.81	37	1.2	1.7								16.68	
P6B1	60.11	22	1.4	1.7								16.68	
P6B1	60.13	21											
P6B3	60.61	23	1.4	1.8								17.66	
P6B4	60.81	24	1.6	2.0								19.62	
P7B1	64.15	22											
P7B1	64.16	22	1.7	2.0								19.62	
P7B3	64.71	23	1.6	2.0								19.62	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1B1	0.10	19											
P1B1	0.12	21	1.7	2.1								20.60	
P1B2	0.30					1.41	1.77						
P1B2	0.32	22	1.6	2.0								19.62	
P2B1	1.12	21	1.6	2.0								19.62	
P2B1	1.15	19						2.67					
P2B2	1.47	22	1.6	2.0								19.62	
P3Q1	2.10	32	1.53	2.02				2.69		0.86	0.46	19.82	
P3B1	2.27	38	1.4	1.9								18.64	
P3B1	2.30	27											
P3B2	2.62	17	1.6	1.9								18.64	
P4B1	6.15	23	1.7	2.1								20.60	
P4Q1	6.30	20	1.68	2.02				2.76		0.55	0.36	19.82	
P4B2	6.80	20	1.7	2.1								20.60	
P5B1	10.15	18						2.65					
P5B1	10.16	21	1.7	2.0								19.62	
P6AB1	13.65	23						2.67					
P6AB1	13.66	14	1.3	1.5								14.72	
P8B1	23.63	37											
P8B1	23.68	19	1.6	1.9								18.64	
P8B2	23.91	21	1.6	1.9								18.64	
P9B1	26.16	19	1.6	1.9								18.64	
P9Q1	26.40	31	1.47	1.92				2.77		0.86	0.46	18.88	
P9Q2	26.53	33											

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P9Q2	26.55	32											
P9Q2	26.57	32											
P9Q2	26.64	31											
P9B2	26.80	30											
P9B2	26.81	19	1.6	1.9								18.64	
P10B1	30.12	18	1.5	1.8								17.66	
P10B1	30.15	36											
P11B1	34.12	34	1.4	1.9								18.64	
P11Q1	34.40	33	1.36	1.81				2.74		0.90	0.47	17.76	
P12B1	38.18	22	1.4	1.7								16.68	
P12B2	38.48	26											
P13B1	42.15	32											
P13B1	42.16	34	1.3	1.8								17.66	
P14B1	46.17	22	1.5	1.8								17.66	
P14B2	46.50	22											
P14B2	46.52	24	1.3	1.6								15.70	
P14B3	46.87	26	1.3	1.7								16.68	
P15B1	50.10	28											
P15B1	50.17	23	1.5	1.9								18.64	
P15B2	50.92	32	1.5	1.9								18.64	
P16B1	54.10	21						2.67					
P16B1	54.16	19	1.7	2.0								19.62	
P16Q1	54.30	18	1.78	2.09				2.69		0.48	0.33	20.52	
P16B2	54.51	20	1.6	2.0								19.62	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P16Q2	54.63	20											
P16Q2	54.65	19											
P16Q2	54.67	20											
P16Q2	54.74	20											
P16Q2	54.63	20											
P16Q2	54.65	19											
P16Q2	54.67	20											
P16Q2	54.74	20											
P16B3	54.85	22	1.5	1.8								17.66	
P16B3	54.88					1.18	1.56						
P17B1	56.15	25											
P17B1	56.15	29	1.5	1.9								18.64	
P18B1	59.65	31											
P18B1	59.65	34	1.4	1.9								18.64	
P19B1	63.25	29											
P19B1	63.25	30	1.5	1.9								18.64	
P20B1	66.15	32	1.5	2.0								19.62	
P20Q1	66.30	36	1.39	1.89								18.54	
P20B2	66.90	34	1.4	1.9								18.64	
P21B1	70.11	27	1.4	1.8								17.66	
P21Q1	70.30	23	1.52	1.87				2.82		0.65	0.39	18.34	
P21B2	70.61	29	1.4	1.8								17.66	
P21B3	70.96	36	1.3	1.7								16.68	
P22Q1	74.30	28	1.52	1.95				2.79		0.78	0.44	19.13	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

Gardline

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

US Wind Inc sea energy

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P22B1	74.51	40	1.5	2.1								20.60	
P22B2	74.81	39	1.5	2.0								19.62	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

Gardline

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-I21/I21A/I21B

US Wind Inc sea energy

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1B1	0.10	18											
P1B1	0.19	21	1.7	2.0								19.62	
P1B2	0.38	15											
P1B2	0.41	21	1.6	1.9								18.64	
P2B1	1.10	18						2.67					
P2B1	1.19	22	1.6	1.9								18.64	
P2B2	1.41	20	1.6	1.9								18.64	
P3B1	2.08	29	1.5	1.9								18.64	
P3B1	2.15	19											
P3B1	2.26	23	1.6	2.0								19.62	
P4B1	5.69	18	1.8	2.2								21.58	
P4B2	5.80					1.43	1.81						
P4B2	5.81	20	1.8	2.2								21.58	
P4B3	6.03	15											
P4B3	6.11	16	1.6	1.9								18.64	
P1B1	9.60	25						2.68					
P1B1	9.61	27	1.5	2.0								19.62	
P1B2	9.76	25	1.6	2.0								19.62	
P1B2	9.78	22											
P1B2	9.78	22	1.61	1.97				2.72		0.60	0.37	19.33	
P1B2	9.79	22											
P1B2	9.80	22											
P1B2	9.81	22											
P3B1	14.60	20											

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21/I21A/I21B

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P3B1	14.61	20	1.7	2.0								19.62	
P3B2	14.78	20											
P3B2	14.80	18	1.5	1.8								17.66	
P4AB1	17.58	16											
P4AB1	17.59	20	1.6	1.9								18.64	
P5B1	21.13	22	1.60	1.94								19.05	
P5B1	21.13	22	3.25	3.95				2.71		0.60	0.37	38.75	
P5B1	21.21	28	1.5	1.9								18.64	
P5B2	21.38	25											
P5B2	21.41	28	1.5	2.0								19.62	
P6B1	25.11	29	1.5	2.0								19.62	
P6B1	25.13	27											
P1B1	28.16	29	1.5	2.0								19.62	
P1Q1	28.30	27	1.58	2.00				2.76		0.75	0.43	19.62	
P1B2	28.86	25	1.7	2.1								20.60	
P2B1	29.15	21	1.6	1.9								18.64	
P2Q1	29.30	26	1.59	2.00				2.78		0.72	0.42	19.61	
P2B2	29.85	29	1.5	1.9								18.64	
P3B1	32.63	23	1.7	2.1								20.60	
P3Q1	32.80	22	1.70	2.07				2.77		0.61	0.38	20.32	
P3B2	33.39	23	1.7	2.0								19.62	
P4B1	36.60	27	1.5	1.9								18.64	
P4B1	36.61	29											
P4B1	36.71	32	1.4	1.8								17.66	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-I21/I21A/I21B

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P5B1	39.62	32	1.3	1.8								17.66	
P5B1	39.77	33	1.3	1.7								16.68	
P5B2	39.95	32											
P5B2	40.00	28	1.5	1.9								18.64	
P6AB1	44.11	30	1.5	1.9								18.64	
P6AQ1	44.30	30	1.50	1.96				2.74		0.82	0.45	19.24	
P6AB2	44.92	35	1.5	2.0								19.62	
P7B1	48.08	23	1.6	2.0								19.62	
P7B1	48.10	24											
P7B2	48.51	22	1.6	2.0								19.62	
P8B1	51.09	34	1.3	1.7								16.68	
P8B2	51.38	36											
P8B2	51.43	19	1.2	1.4								13.73	
P9B1	55.50	45	1.1	1.7								16.68	
P9B2	55.70	35	1.2	1.6								15.70	
P9B3	55.93	38	1.2	1.7								16.68	
P10B1	59.15	58	0.9	1.4								13.73	
P10Q1	59.23	48											
P10Q1	59.27	55											
P10Q1	59.32	52											
P10Q1	59.37	48											
P10B2	59.67	33	1.2	1.6								15.70	
P11B1	63.06	44	1.1	1.7								16.68	
P11Q2	63.60	34	1.36	1.82								17.89	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

Gardline

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-I21/I21A/I21B

US Wind Inc sea energy

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P12B1	67.05	27											
P12B1	67.08	18	1.5	1.8								17.66	
P13B1	71.13	30											
P13B1	71.14	26	1.4	1.7								16.68	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1AB1	0.08	16	1.5	1.8								17.66	
P1AB1	0.08	16											
P3B1	3.63	16						2.66					
P3B1	3.63	19	1.6	1.8								17.66	
P3B2	3.91	27	1.7	2.1								20.60	
P4AB1	7.60	18	1.6	1.9								18.64	
P4AB1	7.60	15											
P10B1	22.11	25	1.5	1.9								18.64	
P10B1	22.13	20											
P12B1	28.13	18	1.4	1.7								16.68	
P12B1	28.20	13						2.65					
P12B1	28.30	20	1.6	1.9								18.64	
P13B1	31.15	15											
P13B1	31.16	16	1.6	1.9								18.64	
P15B1	40.16	31	1.4	1.9								18.64	
P15Q2	40.70	28	1.52	1.96				2.77		0.78	0.44	19.20	
P15B2	40.86	30	1.5	2.0								19.62	
P16B1	44.16	26	1.6	2.0								19.62	
P16B2	44.86	27	1.6	2.0								19.62	
P17B1	48.16	28	1.6	2.0								19.62	
P17Q1	48.43	25											
P17Q1	48.45	23											
P17Q1	48.48	27											
P17Q1	48.53	26											

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P17B2	48.86	25	1.5	1.9								18.64	
P18B1	49.60	23	1.6	1.9								18.64	
P18B2	49.75	26											
P18B2	49.75	22	1.6	1.9								18.64	
P19B1	51.10	21	1.6	2.0								19.62	
P19B3	51.50	28	1.5	1.9								18.64	
P19B3	51.55	30											
P20B1	55.15	46	1.2	1.7								16.68	
P20Q2	55.70	45	1.22	1.77				2.79		1.26	0.56	17.34	
P20B2	55.85	48	1.2	1.7								16.68	
P21B1	59.09	64	0.9	1.5								14.72	
P21B2	59.86	38	1.2	1.6								15.70	
P22B1	63.22	49	1.1	1.7								16.68	
P22Q1	63.33	42											
P22Q1	63.35	42											
P22Q1	63.37	43											
P22Q1	63.45	40											
P22B2	63.72	67	1.1	1.9								18.64	
P23B1	66.61	23	1.6	2.0								19.62	
P23B3	67.10	23											
P23B3	67.11	24	1.3	1.6								15.70	
P24B1	71.09	20	1.5	1.8								17.66	
P24B1	71.20	19											
P24B1	71.27	19	1.6	1.9								18.64	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P1B1	0.15	22											
P1B1	0.24	29	1.5	2.0								19.62	
P1B3	0.63	13						2.65					
P2B1	1.10	20											
P2B1	1.14	18	1.5	1.7								16.68	
P2B2	1.33	20											
P3B1	2.07	29	1.5	1.9								18.64	
P3B1	2.15	24											
P3B2	2.46	31	1.4	1.9								18.64	
P4B1	5.12	34	1.6	2.1								20.60	
P4B1	5.18	24						2.66					
P4B1	5.31	29	1.5	1.9								18.64	
P5B1	8.65	17	1.6	1.9								18.64	
P5B2	8.93	16											
P5B2	8.99	19	1.5	1.7								16.68	
P6B1	12.62	27						2.66					
P6B1	12.67	28	1.5	1.9								18.64	
P6B2	12.87	22											
P9B1	25.68	33	1.4	1.9								18.64	
P9Q1	25.80	32	1.50	1.97								19.33	
P9Q1	25.81	32											
P9Q2	26.20	33	1.41	1.88								18.47	
P9B2	26.38	32	1.4	1.9								18.64	
P9B2	26.38	31						2.77					

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER

Push Number	Level in core (m)	Natural Moisture Content (%)	Dry Density (Mg/m^3)	Bulk Density (Mg/m^3)	Density of Intact Core (Mg/m^3)	Minimum Dry Density (Mg/m^3)	Maximum Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Saturated Moisture Content	Void Ratio	Porosity	Unit Weight (kN/m^3)	Remarks
P10B1	29.18	28	1.5	2.0								19.62	
P10Q1	29.30	28											
P10Q2	29.70	26	1.58	2.00								19.62	
P10B2	29.88	28	1.5	1.9								18.64	
P10B2	29.88	26											
P11B1	33.16	30	1.5	1.9								18.64	
P11Q1	33.30	26	1.51	1.96				2.72		0.79	0.44	19.23	
P11Q2	33.63	28											
P11Q2	33.65	28											
P11Q2	33.67	27											
P11Q2	33.72	27											
P11B2	33.86	28	1.5	1.9								18.64	
P11B2	33.89	28											
P13B1	40.60	52	1.1	1.6								15.70	
P13Q2	41.00	48	1.20	1.76								17.27	
P13B2	41.25	51	1.0	1.4								13.73	
P14AB1	44.65							2.69					
P14B1	44.54	26	1.5	2.0								19.62	
P16AB1	53.60	27	1.5	1.9								18.64	
P16AB2	53.80							2.69					
P16AB2	53.81	27	1.4	1.8								17.66	
P17Q1	57.10	22	1.50	1.96								19.21	
P17Q1	57.10	31	1.50	1.96								19.21	
P17Q1	57.11	32	1.3	1.7								16.68	

DETERMINATION OF MOISTURE CONTENT AND DENSITY

ASTM D2216-05

3.2 Classification Summary

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14_A

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P4B1	2.08	2	97	1									
P5B3	3.50	0	98	2									
P6B1	7.15	0	96	4									
P7B1	10.05						53	24	29	85.0	49		
P7U1	10.40						59	26	33	72.0	50		
P9B1	17.65						31	15	16	-5.9	14		
P10B1	21.15						43	20	23	39.0	29		
P11B1	24.68	0	96	4									
P5B1	37.05						41	23	18	84.0	38		
P6B1	41.10						46	23	23	43.0	33		
P6B3	41.70						45	21	24	81.0	40		
P8B1	48.60						46	NP	NP		29		
P9B1	52.60						67	27	40	28.0	38		
P13B2	68.28	0	83	17	9	8							

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P10Q2	19.30						35	21	14	95.0	34		
P12U1	27.15						36	22	14	61.0	31		
P12Q2	27.80						34	21	13	85.0	32		
P13Q2	31.60						39	23	16	2.7	23		
P14Q1	35.30						34	17	17	60.0	27		
P15Q1	39.30						37	23	14	90.0	36		
P16Q1	43.30						38	19	19	40.0	27		
P22B1	64.13						53	23	30	54.0	39		
P24B1	71.55						43	22	21	49.0	32		

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17_A

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P1B1	0.20	3	95	2									
P4B1	5.13						21	15	6	120.0	22		
P5B1	8.13	5	88	7									
P9B1	17.10	14	82	4									
P14AU1	34.00						47	26	21	9.0	28		
P6B1	60.13						42	21	21	-1.3	21		

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P2B1	1.15	2	95	3									
P5B1	10.15	2	96	2									
P6AB1	13.65	2	88	10	4	6							
P9B2	26.80						38	25	13	38.0	30		
P12B2	38.48	0	86	14	5	9							
P14B2	46.50	0	68	32	12	20							
P15B1	50.10						36	21	15	44.0	28		

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-I21_A_B

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P2B1	1.10	1	97	2									
P1B1	9.60	3	91	6	2	4							
P4AB1	17.58	14	81	5									
P5B2	21.38	0	92	8									
P7B1	48.10						36	20	16	27.0	24		
P8B2	51.38						46	18	28	64.0	36		

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P3B1	3.63	4	94	2									
P10B1	22.13	0	95	5									
P13B1	31.15	2	92	6									
P18B2	49.75						45	18	27	30.0	26		
P19B3	51.55						29	17	12	110.0	30		

CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-MET TOWER

Push Name	Specimen Depth (m)	Particle Size Distribution (%)					Atterberg Limits						Principal Soil Type
		GRAVEL 2mm 63mm	SAND 60µm-2mm	FINES <63µm	SILT 2µm-63µm	CLAY <2µm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (I_P)	Liquidity Index (I_L)	Moisture Content (%)	Activity	
P1B1	0.15	0	62	38	18	20							
P1B3	0.63	0	89	11	6	5							
P2B1	1.10	0	42	58	28	30							
P2B2	1.33	0	63	37	22	15							
P9Q1	25.80						55	28	27	14.0	32		
P9Q1	29.80						55	28	27	14.0	32		
P9B2	26.38						48	23	25	32.0	31		
P10Q2	29.70						35	22	13	34.0	26		
P10B2	29.88						30	21	9	55.0	26		
P11Q1	33.30						34	22	12	34.0	26		
P11B2	33.89						41	22	19	33.0	28		
P13Q2	41.00						67	25	42	54.0	48		
P14AB1	44.65	11	68	21	13	8							
P17Q1	57.10						42	17	25	20.0	22		

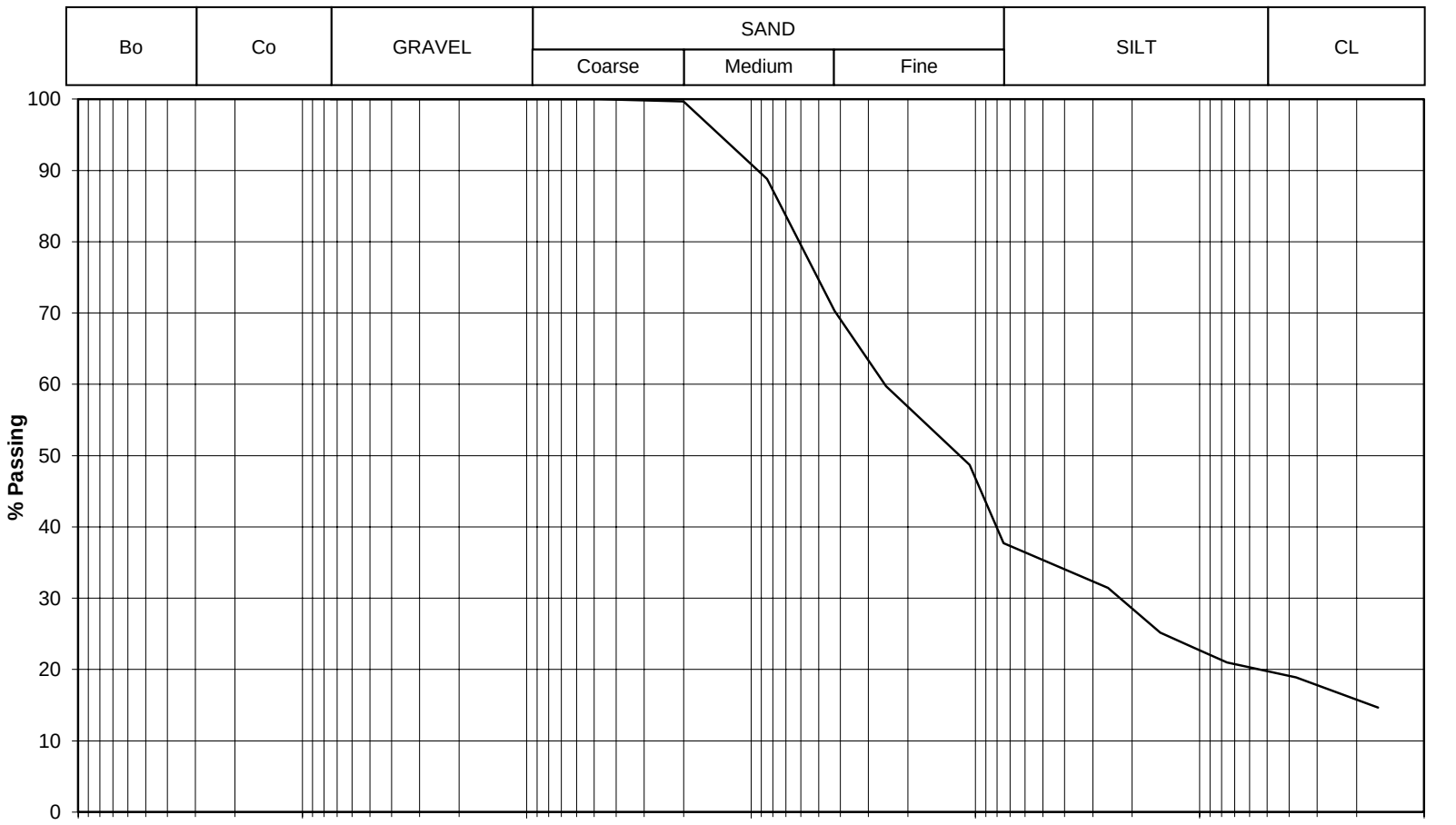
CLASSIFICATION SUMMARY TABLE

ASTM D422-63 (2007) & D4318

3.3 Particle Size Distribution Results

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - MET TOWER
Soil Description	Clayey silty SAND. Sand is fine to medium, light brown, wet.	**Sample Ref.**	P1B1
		Depth (m)	0.00 - 0.30



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	89
0.425	70
0.250	60
0.106	49
0.075	38

Sedimentation	
Particle Size (µm)	% Finer
25.6	31
15.0	25
10.7	23
7.6	21
3.7	19
1.6	15

Particle Density (ρs) Mg/m3	
2.65	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	62
Silt / Clay	38
Silt	18
Clay	20

Grading Analysis	
D60 (mm)	0.253
D30 (mm)	0.0226
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

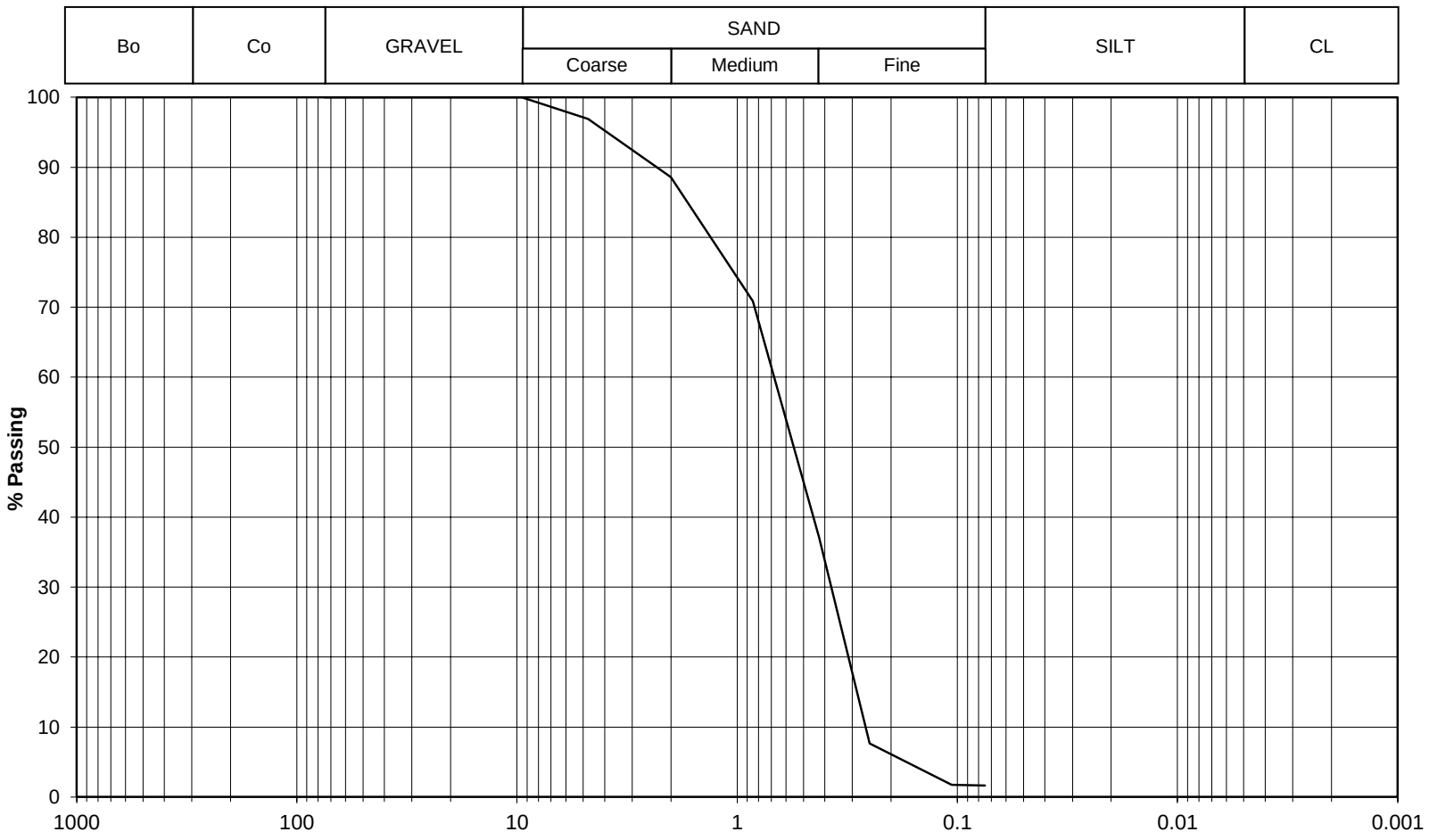
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - G17
Soil Description		**Sample Ref.**	P1B1
		Depth (m)	0.00 - 0.40



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	97
2.000	89
0.850	71
0.425	37
0.250	8
0.106	2
0.075	2

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	3
Sand	95
Silt / Clay	2
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.68
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

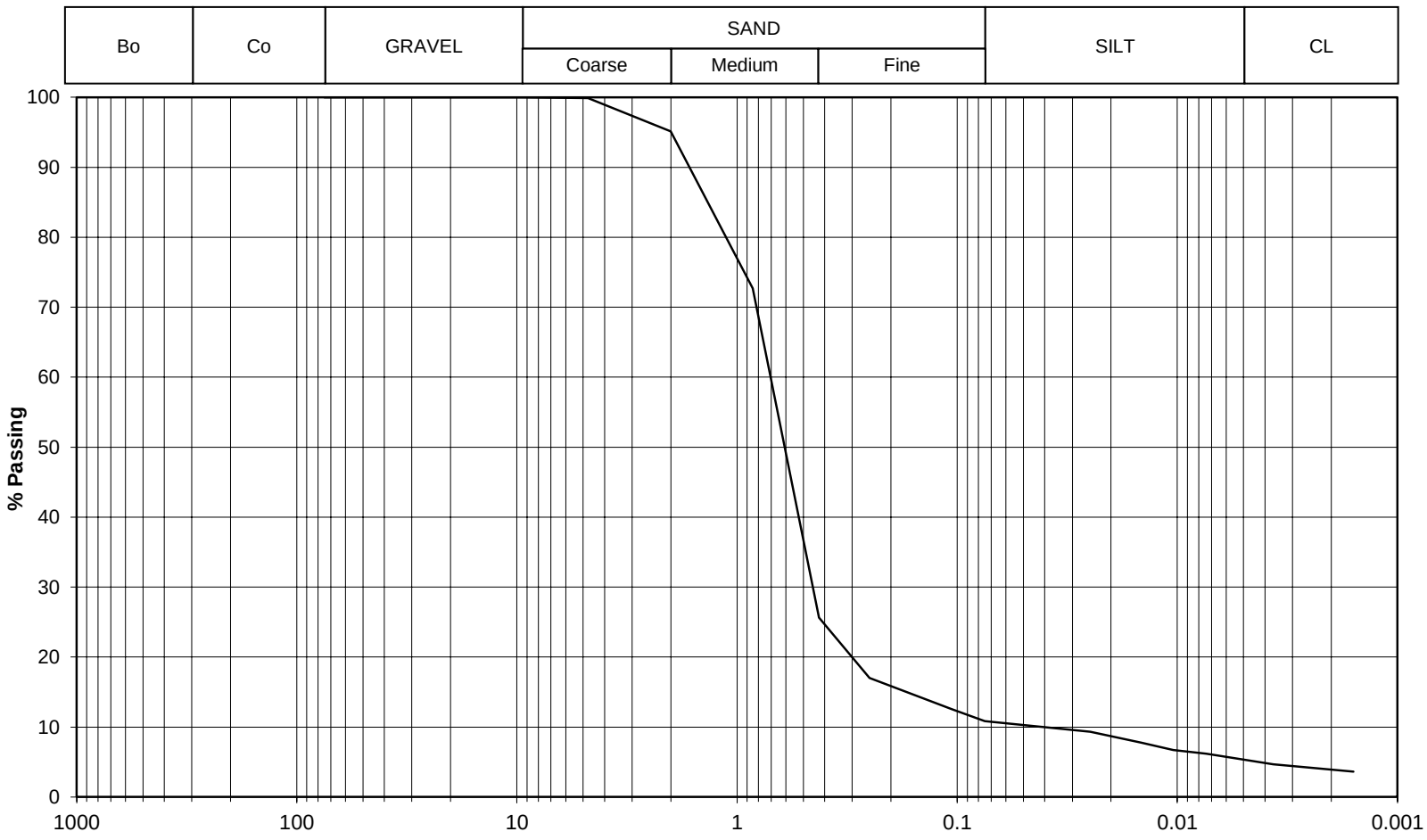
Testing in accordance with
ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - MET TOWER
Soil Description	SAND with silt and clay. Sand is medium to coarse, light grey becoming dark grey, moist.	**Sample Ref.**	P1B3
		Depth (m)	0.50 - 0.75



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	95
0.850	73
0.425	26
0.250	17
0.106	13
0.075	11

Sedimentation	
Particle Size (µm)	% Finer
24.9	9
14.6	8
10.4	7
7.4	6
3.7	5
1.6	4

Particle Density (ρs) Mg/m3	
2.65	measured

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	89
Silt / Clay	11
Silt	6
Clay	5

Grading Analysis	
D60 (mm)	0.705
D30 (mm)	0.453
D10 (mm)	0.0303
Uniformity Coefficient	23
Curvature Coefficient	9.6

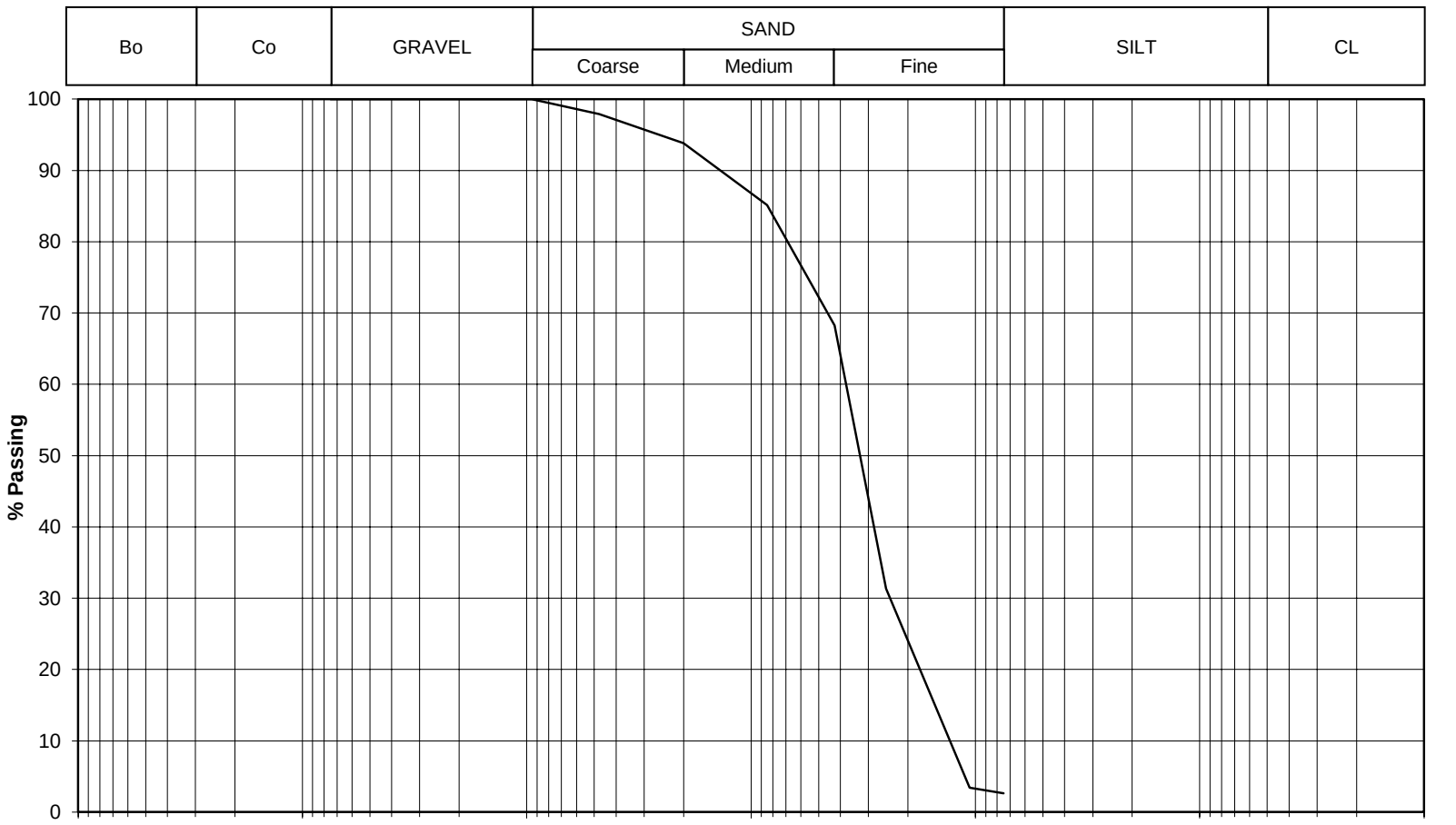
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - H10
Soil Description	SAND. Sand is fine to coarse, olive brown to dark grey, moist. Trace gravel. Gravel is fine.	**Sample Ref.**	P2B1
		Depth (m)	1.00 - 1.30



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	98
2.000	94
0.850	85
0.425	68
0.250	31
0.106	3
0.075	3

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	2
Sand	95
Silt / Clay	3
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.377
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

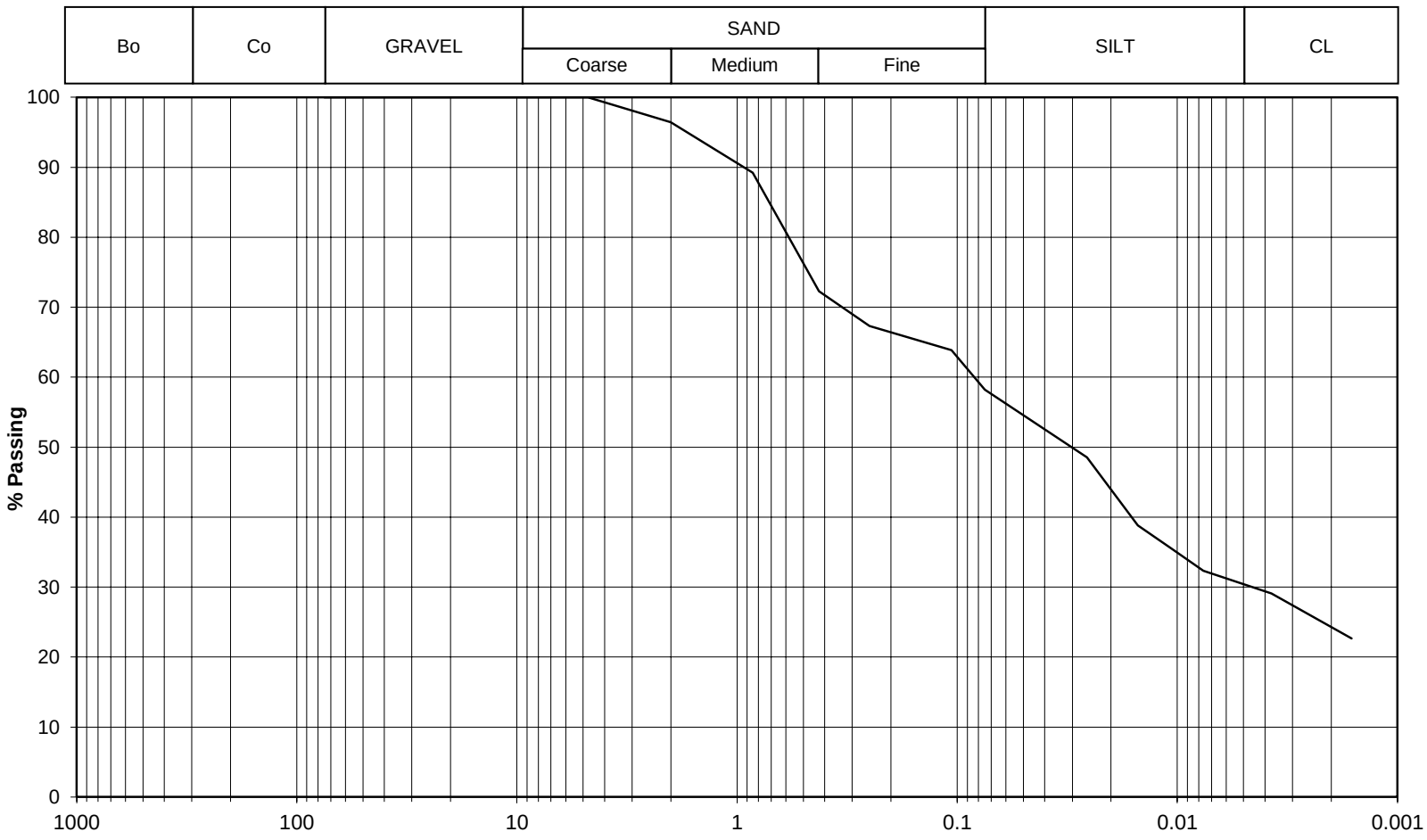
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - MET TOWER
Soil Description	Sandy Silty CLAY, light grey to light brown. Sand is medium.	**Sample Ref.**	P2B1
		Depth (m)	1.00 - 1.20



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	96
0.850	89
0.425	72
0.250	67
0.106	64
0.075	58

Sedimentation	
Particle Size (µm)	% Finer
25.7	49
15.1	39
10.7	36
7.6	32
3.7	29
1.6	23

Particle Density (ρs) Mg/m3	
2.65	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	42
Silt / Clay	58
Silt	28
Clay	30

Grading Analysis	
D60 (mm)	0.0837
D30 (mm)	0.00455
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

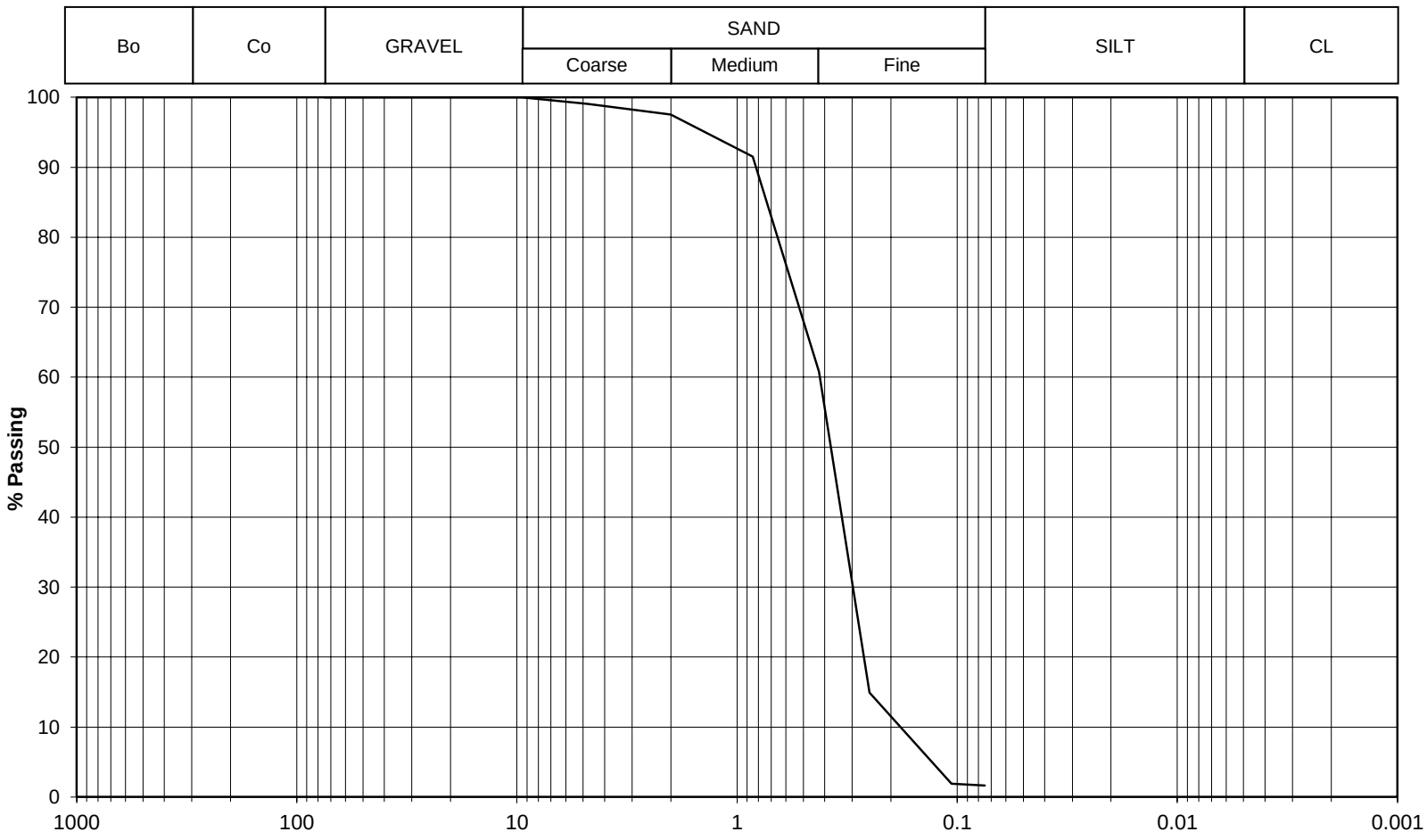
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - I21
Soil Description	SAND. Sand is medium, light brown becoming dark grey, dry. Trace gravel. Gravel is fine.	**Sample Ref.**	P2B1
		Depth (m)	1.00 - 1.20



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	99
2.000	98
0.850	92
0.425	61
0.250	15
0.106	2
0.075	2

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	1
Sand	97
Silt / Clay	2
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.421
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

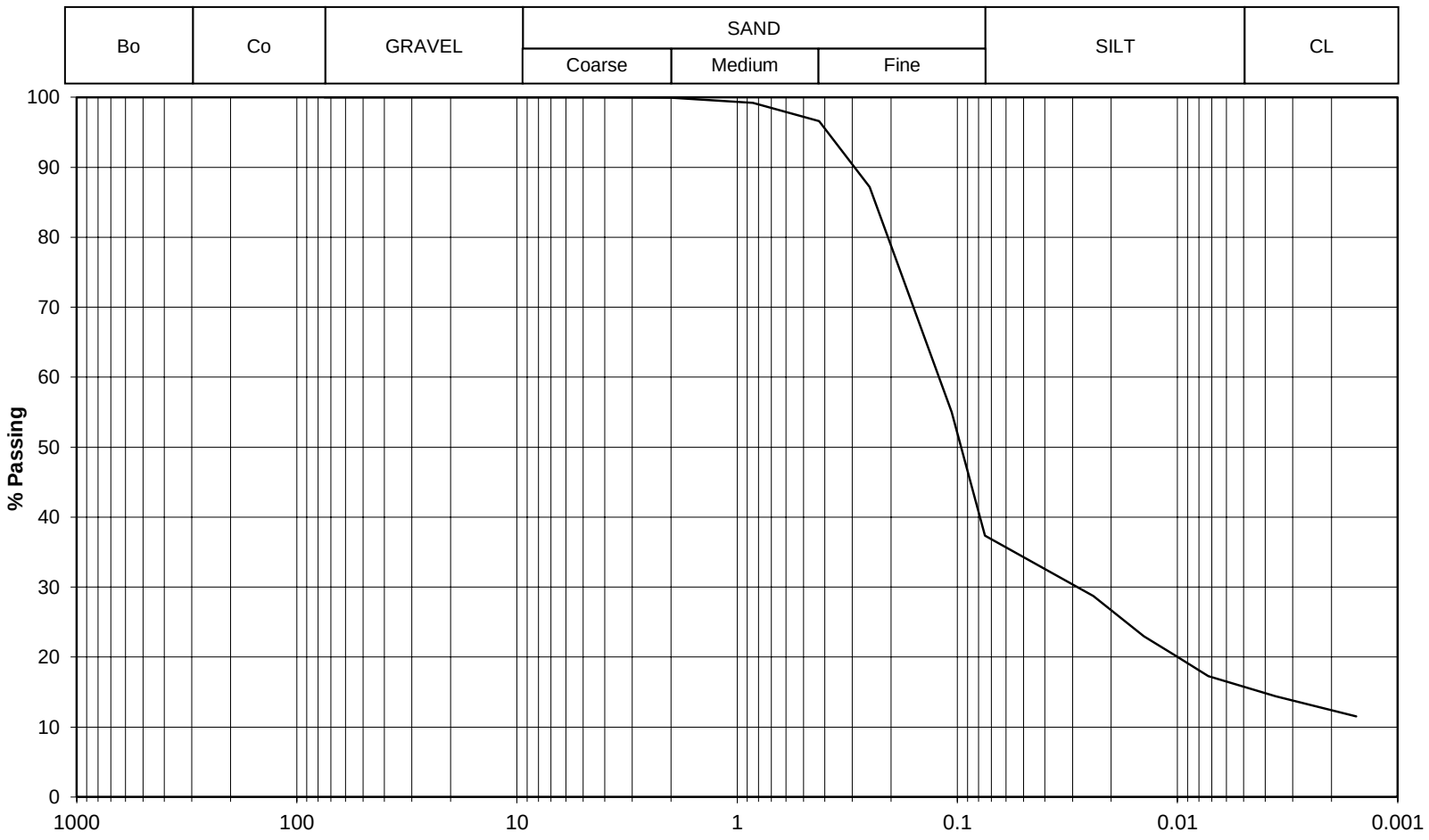
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - MET TOWER
Soil Description	Silty clayey SAND. Sand is fine, light grey becoming dark grey, moist.	**Sample Ref.**	P2B2
		Depth (m)	1.20 - 1.45



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	99
0.425	97
0.250	87
0.106	55
0.075	37

Sedimentation	
Particle Size (µm)	% Finer
24.1	29
14.2	23
10.2	20
7.2	17
3.6	14
1.5	11

Particle Density (ρs) Mg/m3	
2.65	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	63
Silt / Clay	37
Silt	22
Clay	15

Grading Analysis	
D60 (mm)	0.121
D30 (mm)	0.0257
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

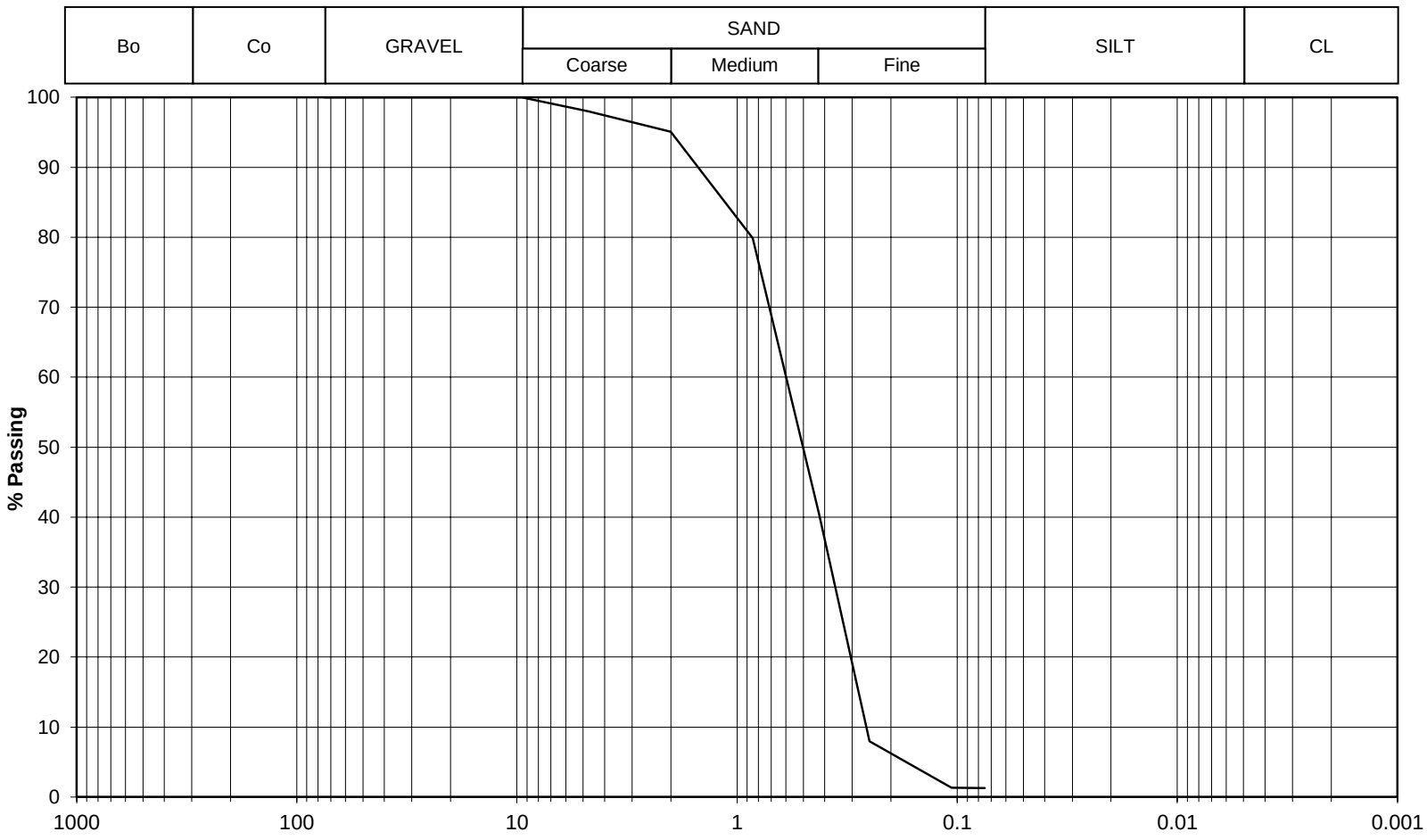
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - D14
Soil Description	SAND. Sand is medium to coarse, light brown becoming dark grey, dry. Trace gravel. Gravel is fine.	**Sample Ref.**	P4B1
		Depth (m)	2.00 - 2.15



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	98
2.000	95
0.850	80
0.425	40
0.250	8
0.106	1
0.075	1

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	2
Sand	97
Silt / Clay	1
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.599
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

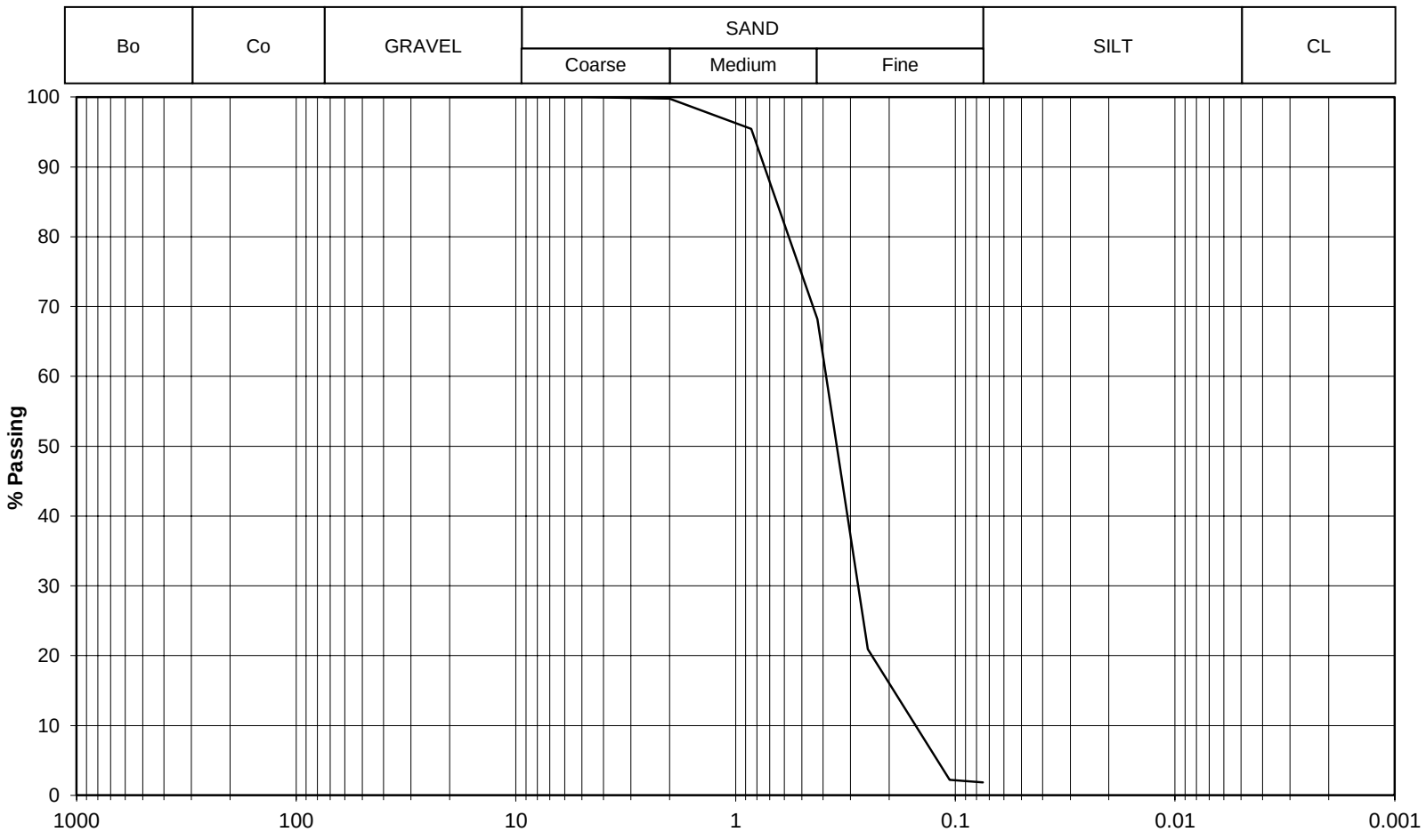
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - D14
Soil Description	SAND. Sand is medium, light brown becoming dark grey, dry.	**Sample Ref.**	P5B3
		Depth (m)	3.40 - 3.60



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	95
0.425	68
0.250	21
0.106	2
0.075	2

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	98
Silt / Clay	2
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.388
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

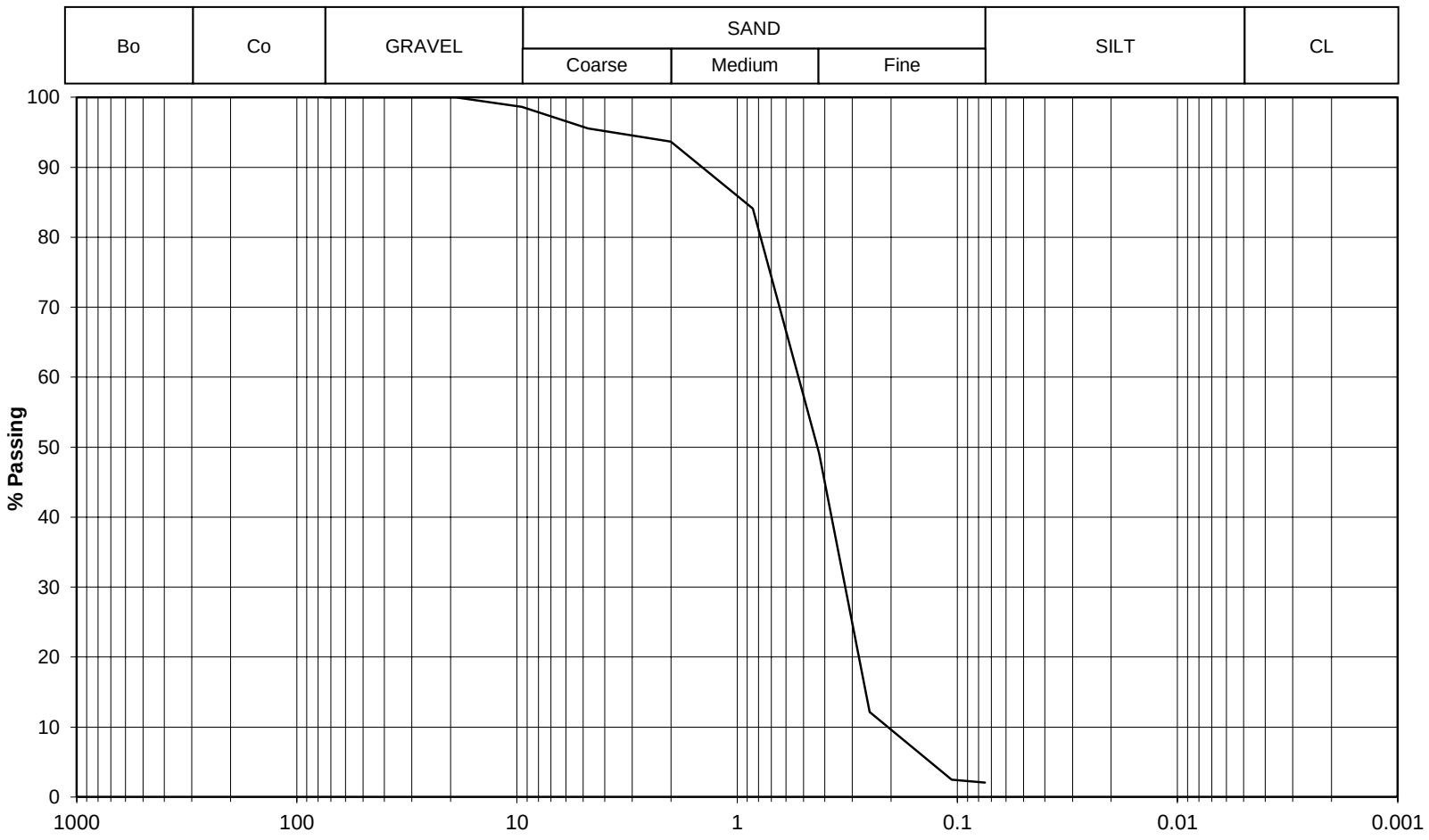
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - K16
Soil Description	SAND with gravel. Sand is medium to coarse, light olive grey, moist. Gravel is fine to medium.	**Sample Ref.**	P3B1
		Depth (m)	3.50 - 3.75



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	99
4.750	96
2.000	94
0.850	84
0.425	49
0.250	12
0.106	2
0.075	2

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	4
Sand	94
Silt / Clay	2
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.527
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

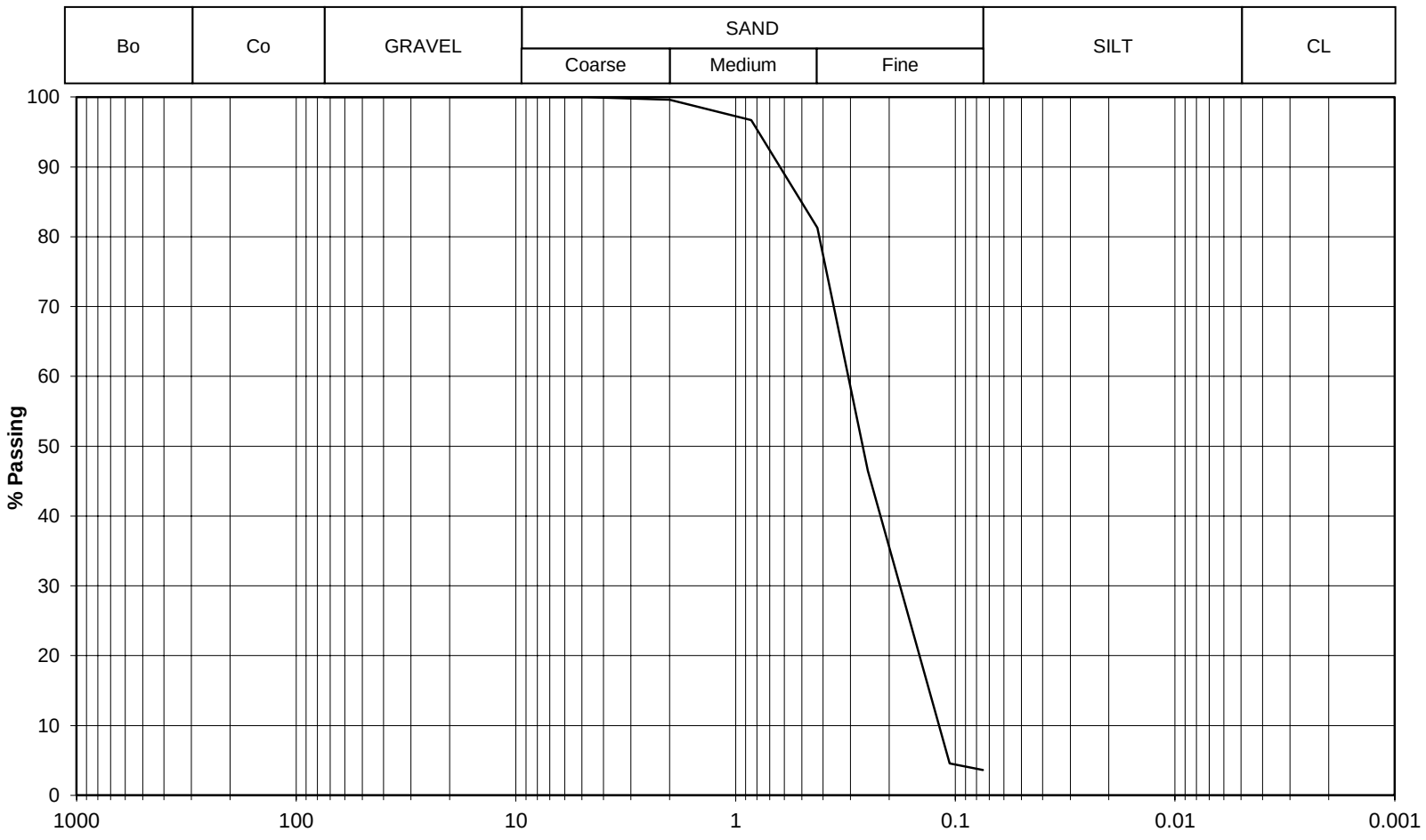
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - D14
Soil Description	SAND. Sand is fine to medium, light brown becoming dark grey, dry.	**Sample Ref.**	P6B1
		Depth (m)	7.00 - 7.30



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	97
0.425	81
0.250	46
0.106	5
0.075	4

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	96
Silt / Clay	4
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.307
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

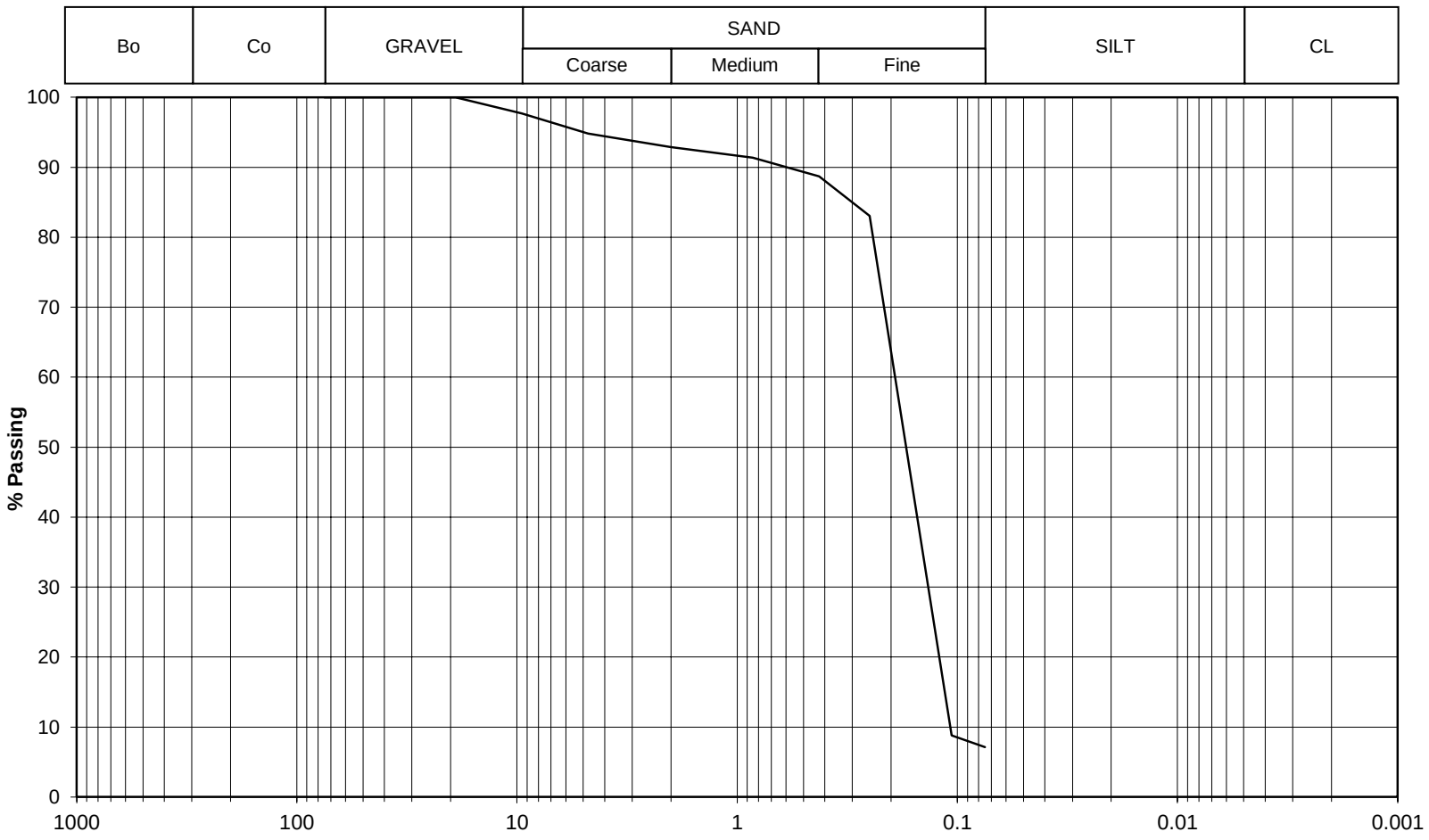
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - G17
Soil Description	SAND with silt and gravel. Sand is fine, grey becoming light olive brown, moist. Gravel is fine to medium.	**Sample Ref.**	P5B1
		Depth (m)	8.00 - 8.25



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	98
4.750	95
2.000	93
0.850	91
0.425	89
0.250	83
0.106	9
0.075	7

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	5
Sand	88
Silt / Clay	7
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.192
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

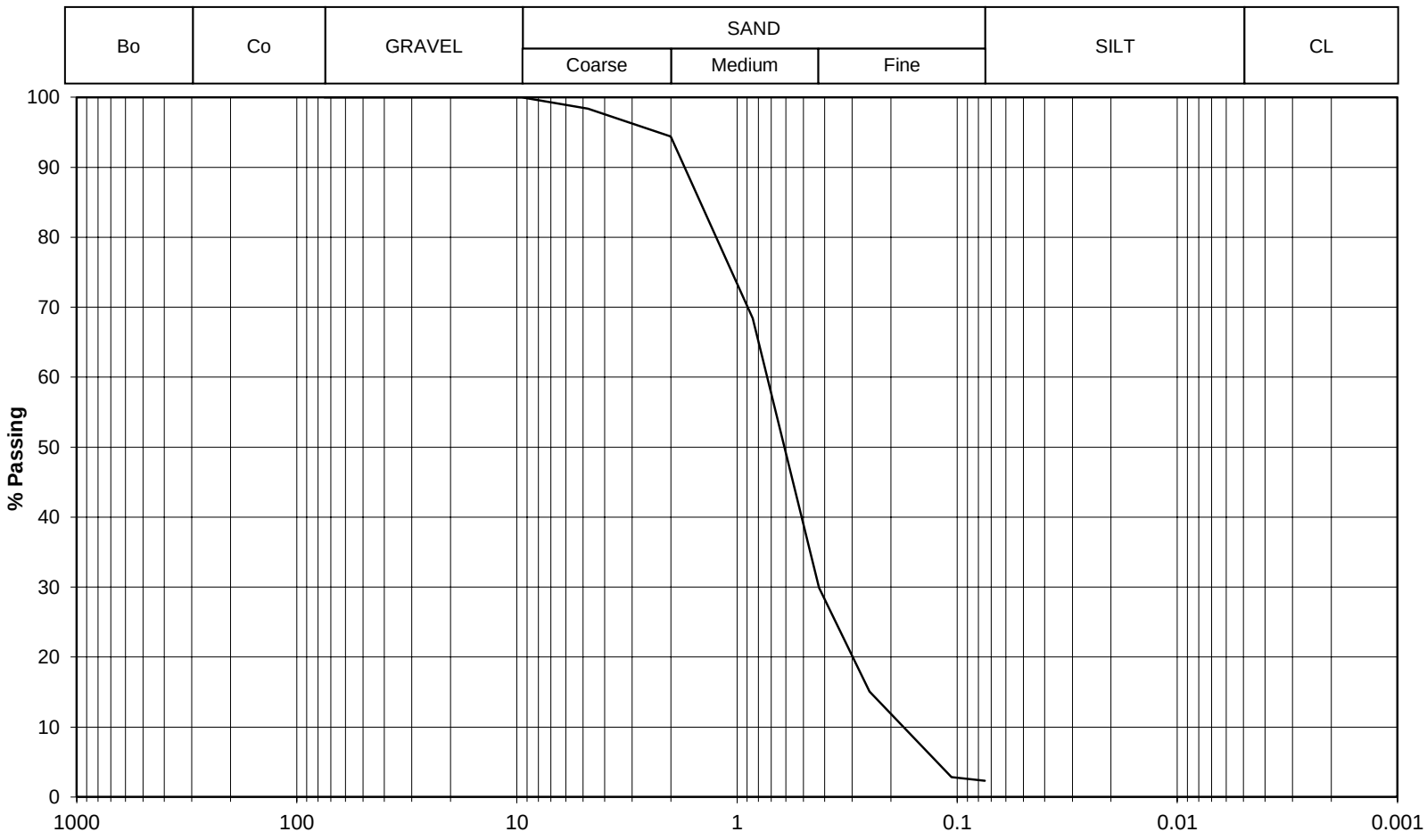
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - H10
Soil Description	SAND. Sand is medium to coarse, olive grey to olive, wet. Trace gravel. Gravel is fine.	**Sample Ref.**	P5B1
		Depth (m)	10.00 - 10.30



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	98
2.000	94
0.850	68
0.425	30
0.250	15
0.106	3
0.075	2

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	2
Sand	96
Silt / Clay	2
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.73
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

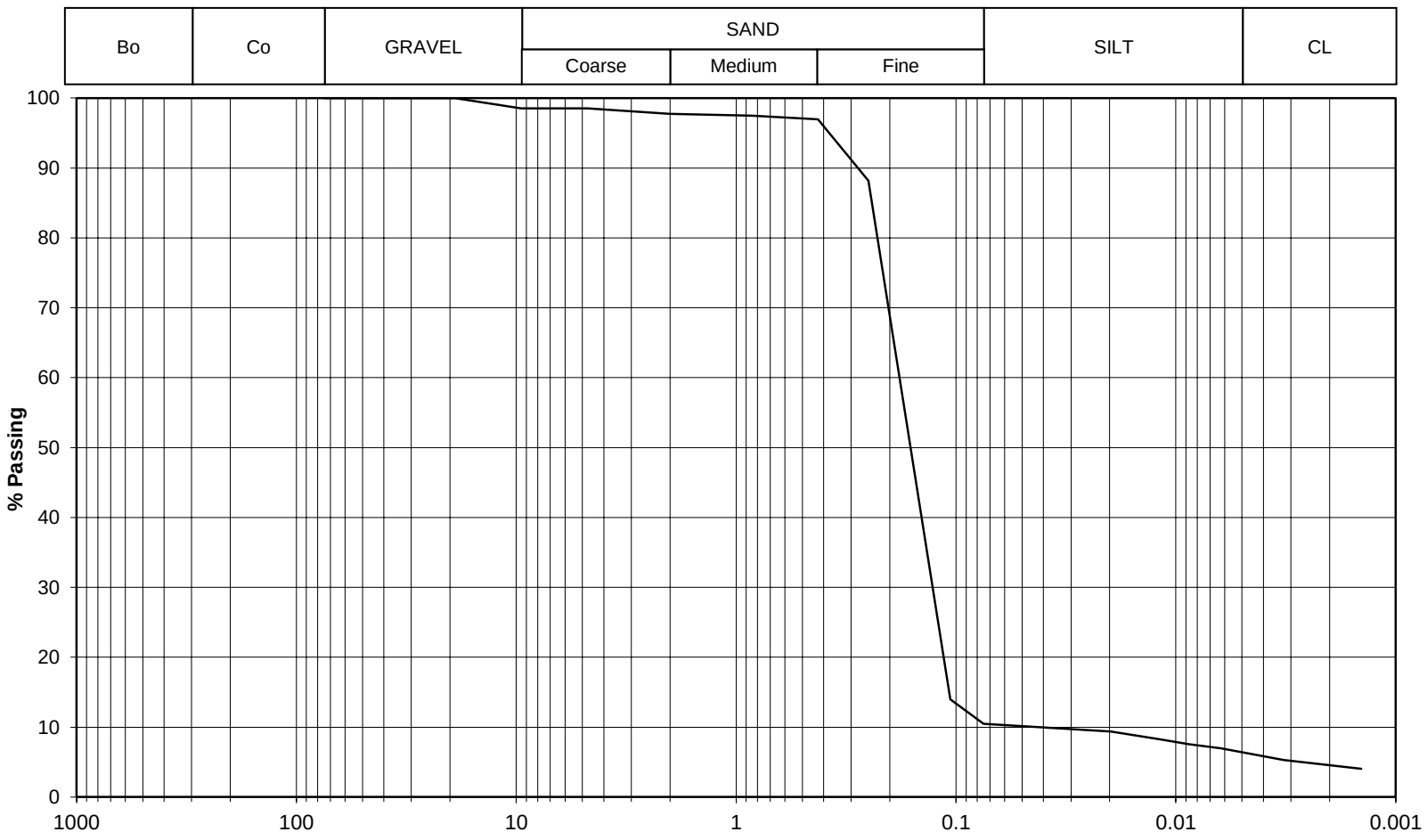
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - H10
Soil Description	SAND with clay and trace gravel. Sand is fine, light olive grey, moist. Gravel is fine to medium.	**Sample Ref.**	P6AB1
		Depth (m)	13.50 - 13.80



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	99
4.750	99
2.000	98
0.850	97
0.425	97
0.250	88
0.106	14
0.075	10

Sedimentation	
Particle Size (µm)	% Finer
19.7	9
11.9	8
8.7	8
6.3	7
3.2	5
1.4	4

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	2
Sand	88
Silt / Clay	10
Silt	4
Clay	6

Grading Analysis	
D60 (mm)	0.18
D30 (mm)	0.128
D10 (mm)	0.0251
Uniformity Coefficient	7.2
Curvature Coefficient	3.6

Particle Density (ρs) Mg/m3	
2.67	measured

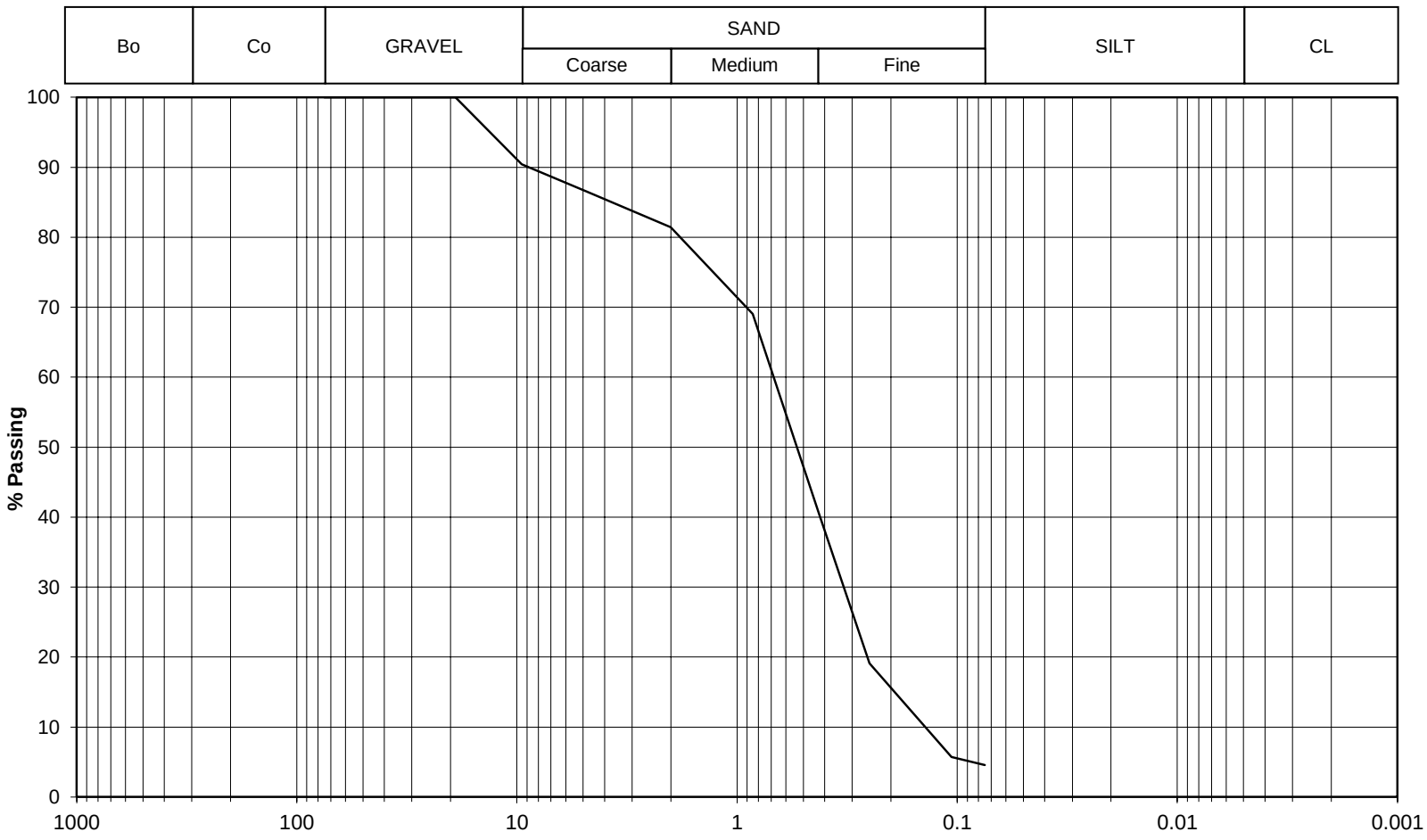
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - G17
Soil Description	Gravelly SAND with silt. Sand is medium to coarse, light yellowish brown, moist. Gravel is fine to medium.	**Sample Ref.**	P9B1
		Depth (m)	17.00 - 17.20



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	90
4.750	86
2.000	81
0.850	69
0.425	40
0.250	19
0.106	6
0.075	5

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	14
Sand	82
Silt / Clay	4
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.682
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

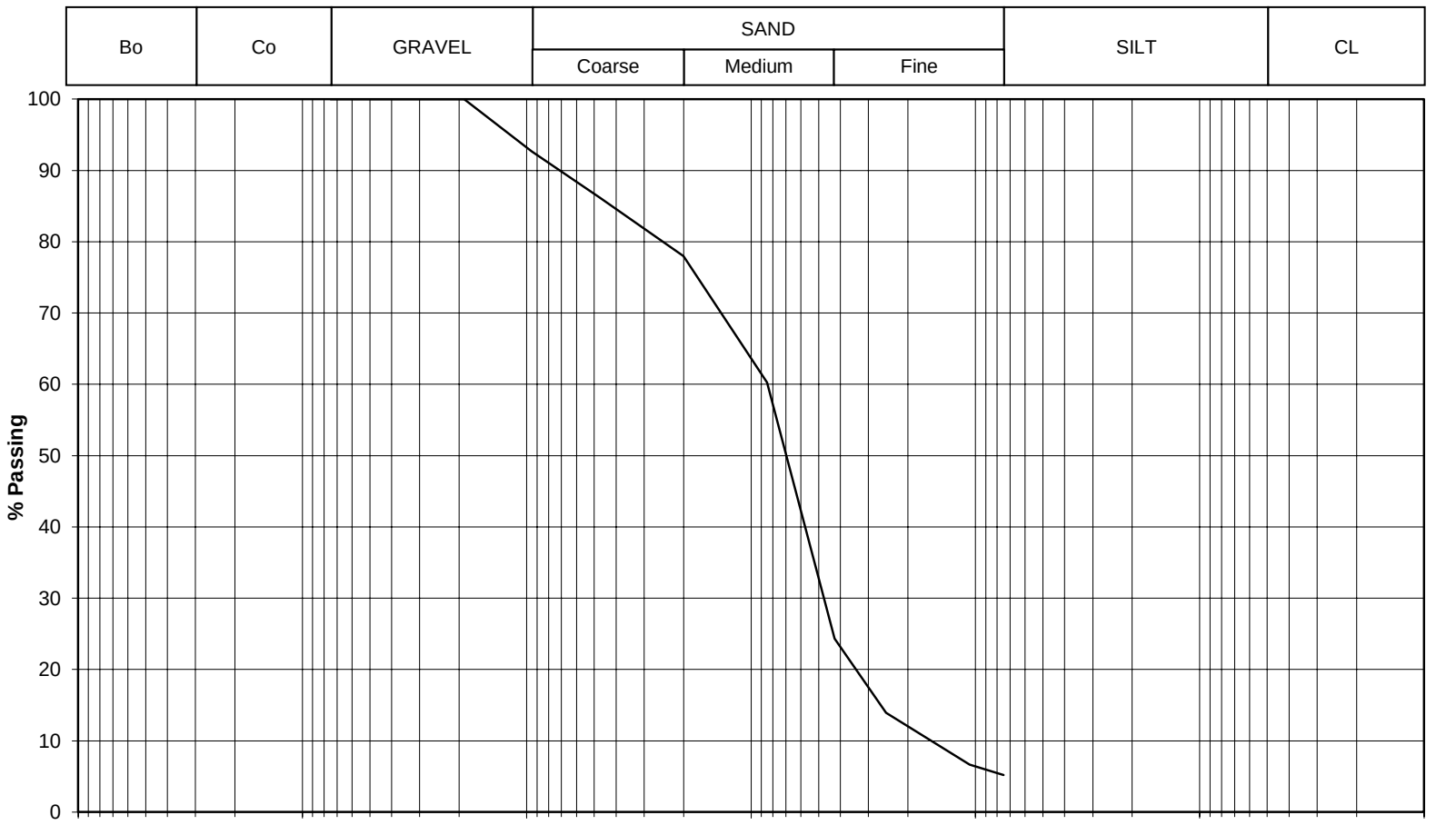
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - I21A
Soil Description	Gravelly SAND with silt. Sand is medium to coarse, dark olive grey, moist. Gravel is fine to medium.	**Sample Ref.**	P4AB1
		Depth (m)	17.50 - 17.65



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	93
4.750	86
2.000	78
0.850	60
0.425	24
0.250	14
0.106	7
0.075	5

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	14
Sand	81
Silt / Clay	5
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.846
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

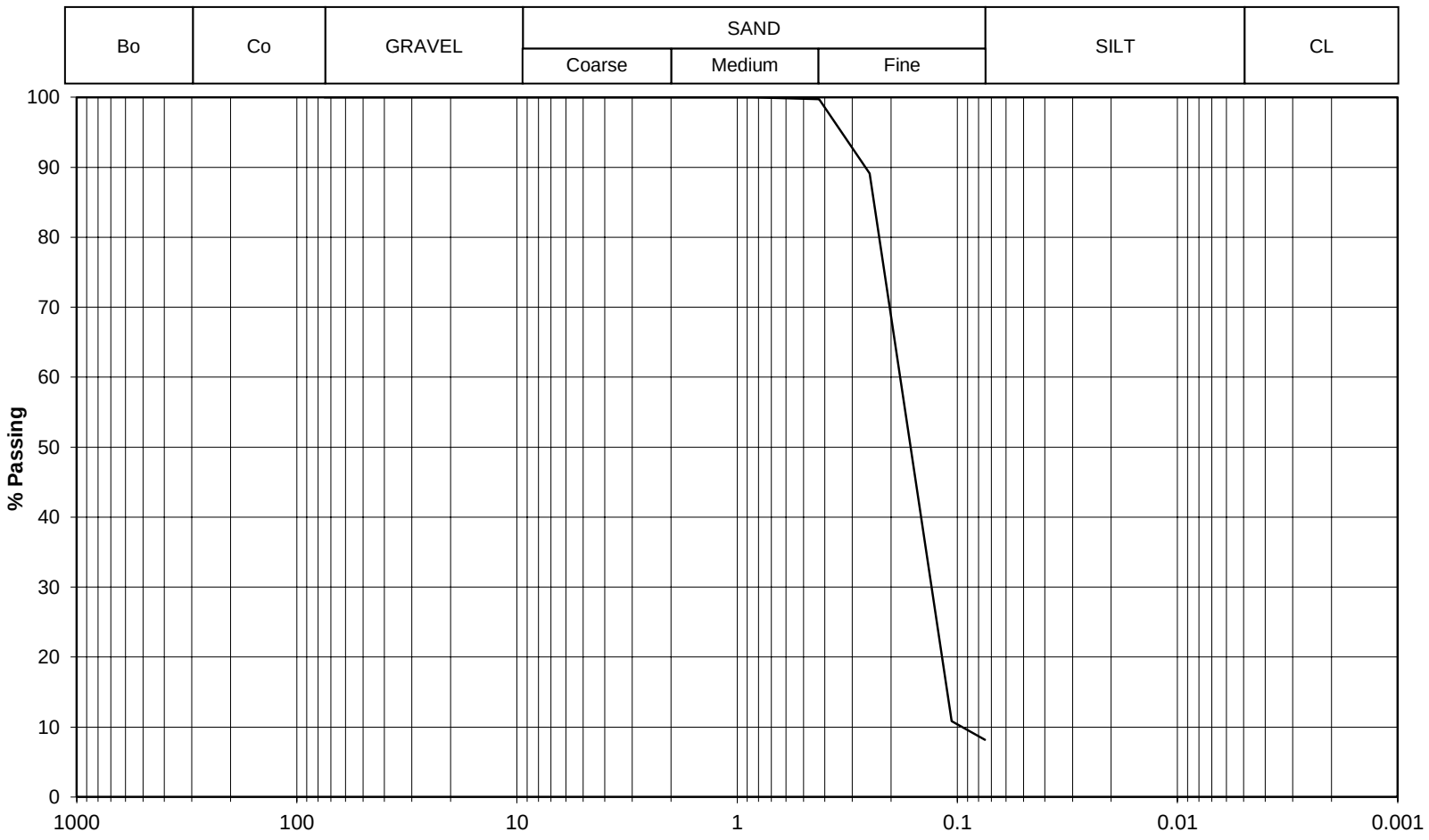
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - I21A
Soil Description	SAND with silt. Sand is fine, dark olive grey, moist.	**Sample Ref.**	P5B2
		Depth (m)	21.25 - 21.50



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	100
0.425	100
0.250	89
0.106	11
0.075	8

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	92
Silt / Clay	8
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.182
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

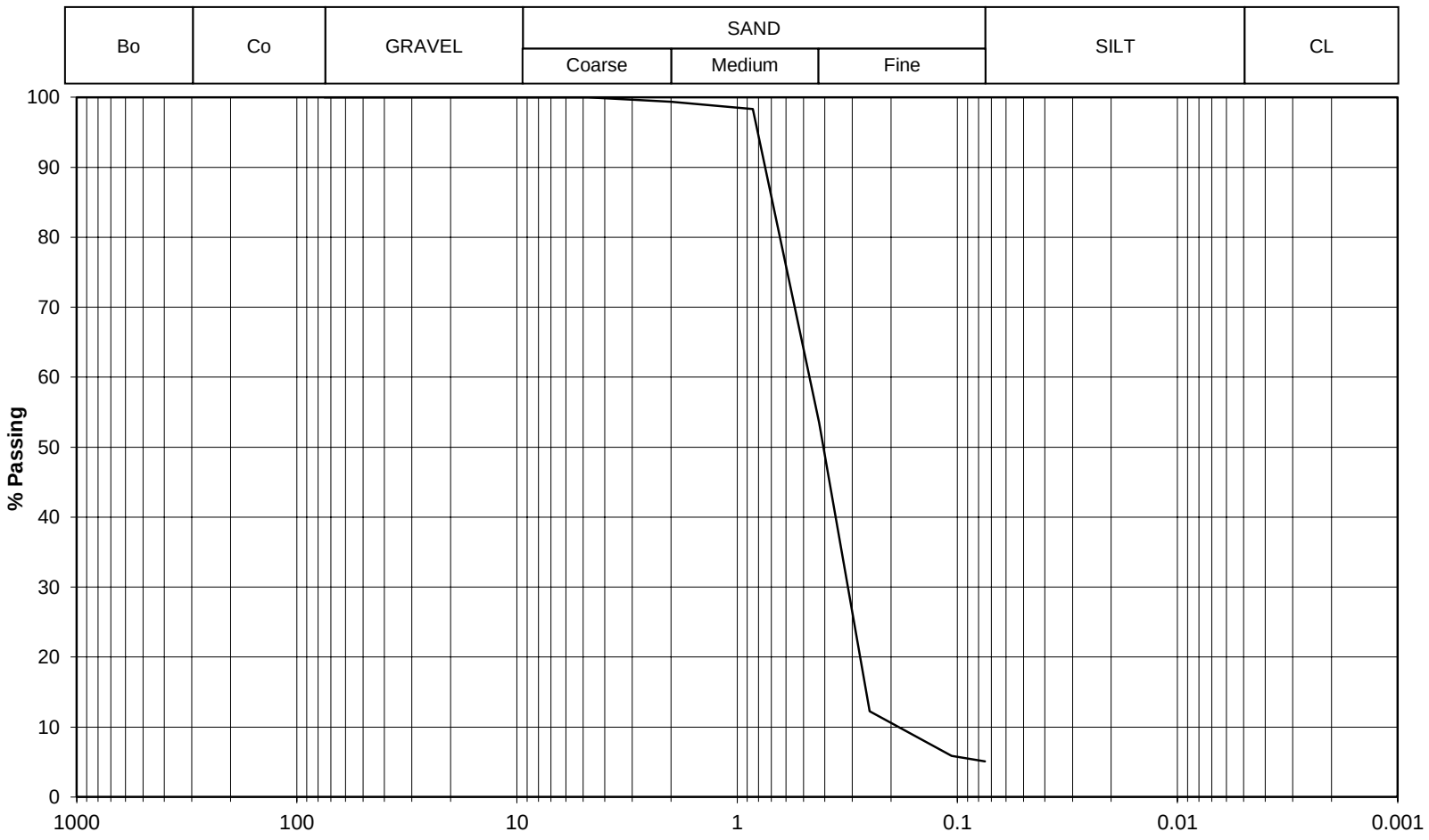
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - K16
Soil Description	SAND with silt. Sand is medium, light olive grey, moist.	**Sample Ref.**	P10B1
		Depth (m)	22.00 - 22.25



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	99
0.850	98
0.425	53
0.250	12
0.106	6
0.075	5

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	95
Silt / Clay	5
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.47
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

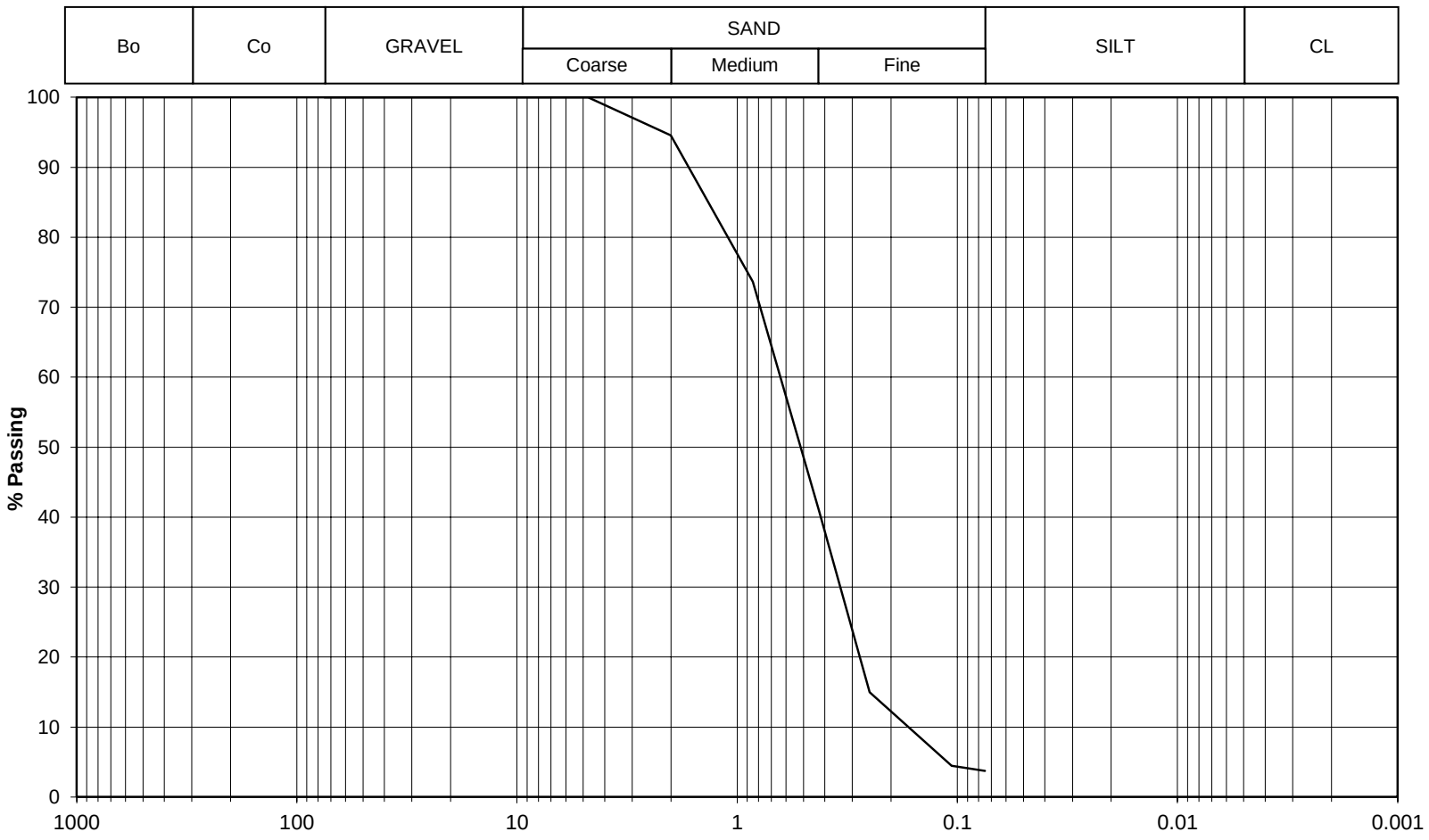
Testing in accordance with
ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - D14
Soil Description	SAND. Sand is medium to coarse, light grey, moist.	**Sample Ref.**	P11B1
		Depth (m)	24.50 - 24.85



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	95
0.850	74
0.425	41
0.250	15
0.106	4
0.075	4

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	96
Silt / Clay	4
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.637
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

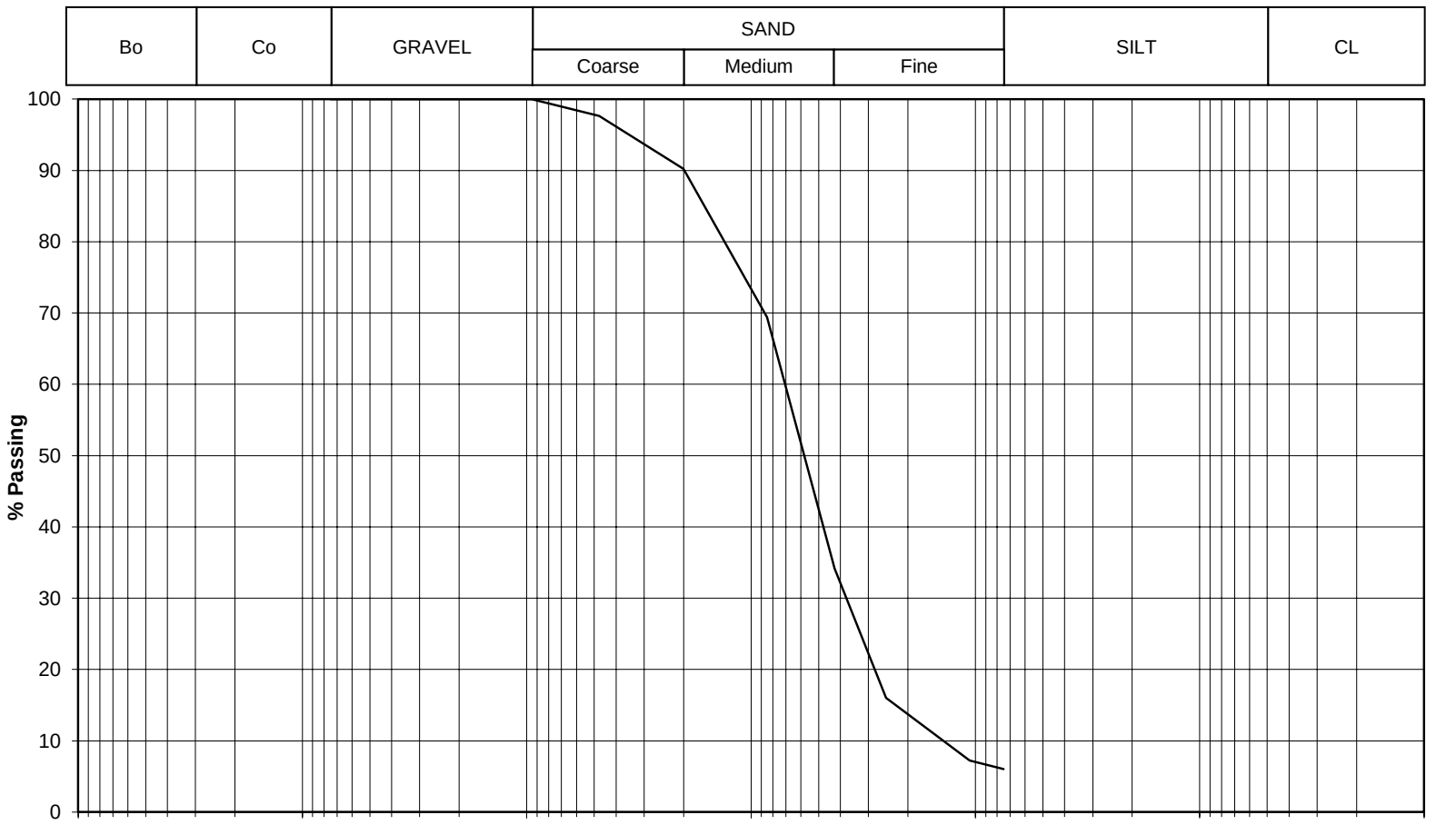
Testing in accordance with
ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - K16
Soil Description		**Sample Ref.**	P13B1
		Depth (m)	31.00 - 31.30



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	98
2.000	90
0.850	69
0.425	34
0.250	16
0.106	7
0.075	6

Sedimentation	
Particle Size (µm)	% Finer

Particle Density (ρs) Mg/m3	
	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	2
Sand	92
Silt / Clay	6
Silt	
Clay	

Grading Analysis	
D60 (mm)	0.707
D30 (mm)	
D10 (mm)	
Uniformity Coefficient	
Curvature Coefficient	

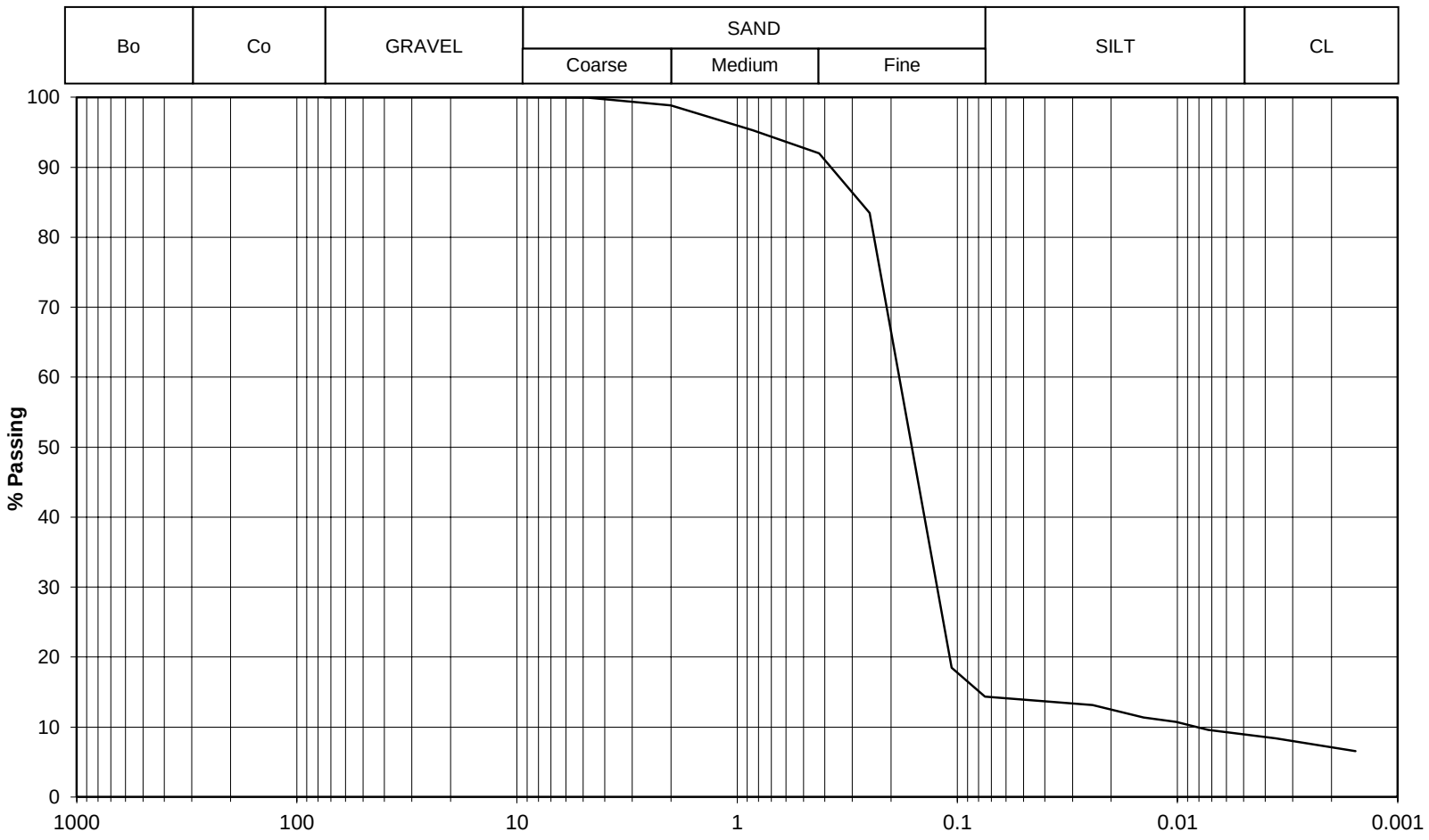
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - H10
Soil Description	SAND with silt and clay. Sand isfine, grey, moist.	**Sample Ref.**	P12B2
		Depth (m)	38.30 - 38.65



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	99
0.850	95
0.425	92
0.250	83
0.106	18
0.075	14

Sedimentation	
Particle Size (µm)	% Finer
24.3	13
14.3	11
10.1	11
7.2	10
3.6	8
1.6	7

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	86
Silt / Clay	14
Silt	5
Clay	9

Grading Analysis	
D60 (mm)	0.183
D30 (mm)	0.123
D10 (mm)	0.0082
Uniformity Coefficient	22
Curvature Coefficient	10

Particle Density (ρs) Mg/m3	
2.65	assumed

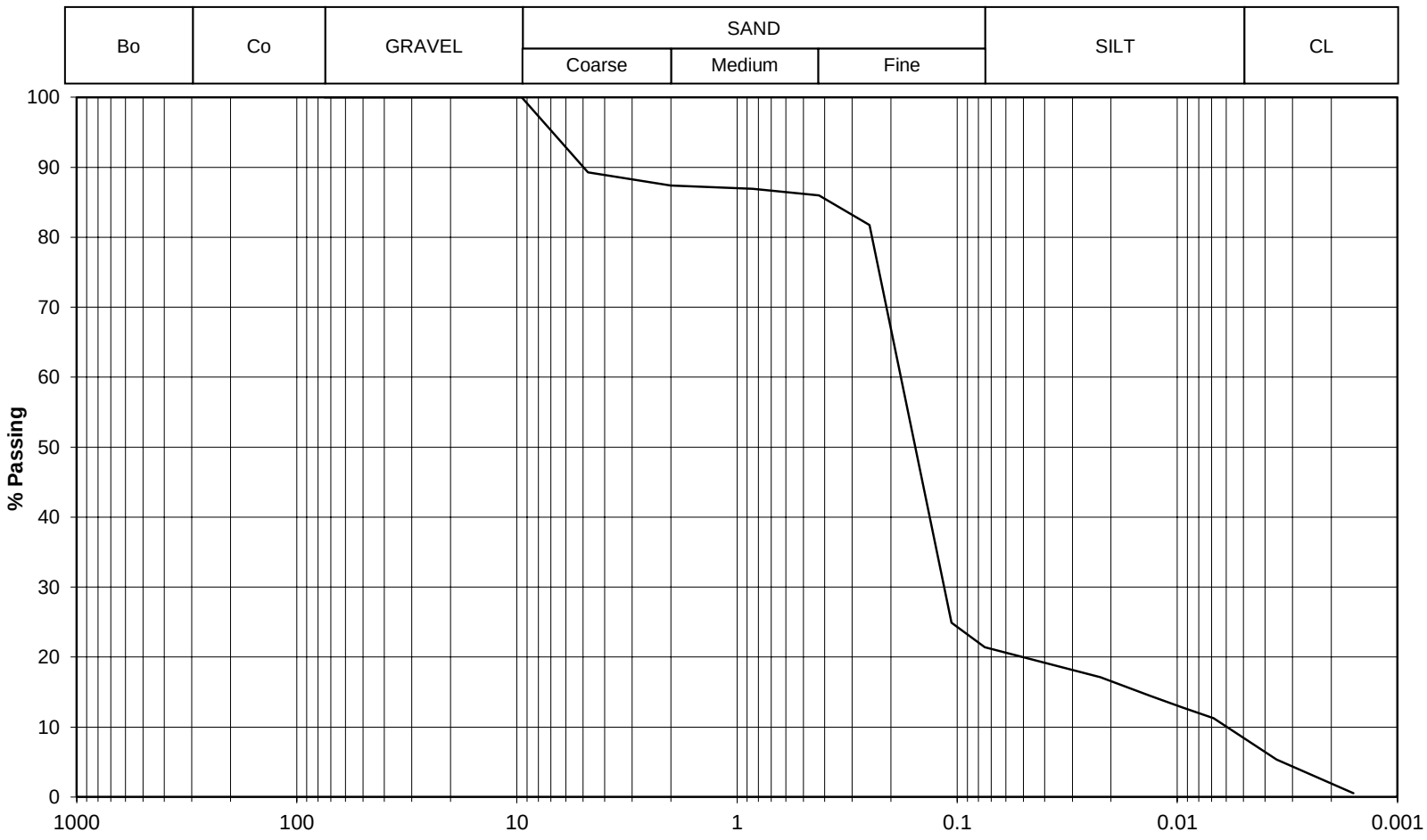
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - MET TOWER
Soil Description	SAND with gravel, silt and clay. Sand is fine, grey, wet. Gravel is fine to medium.	**Sample Ref.**	P14AB1
		Depth (m)	44.50 - 44.80



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	89
2.000	87
0.850	87
0.425	86
0.250	82
0.106	25
0.075	21

Sedimentation	
Particle Size (µm)	% Finer
22.4	17
13.3	14
9.5	13
6.9	11
3.5	5
1.6	1

Particle Density (ρs) Mg/m3	
2.69	measured

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	11
Sand	68
Silt / Clay	21
Silt	13
Clay	8

Grading Analysis	
D60 (mm)	0.18
D30 (mm)	0.114
D10 (mm)	0.00597
Uniformity Coefficient	30
Curvature Coefficient	12

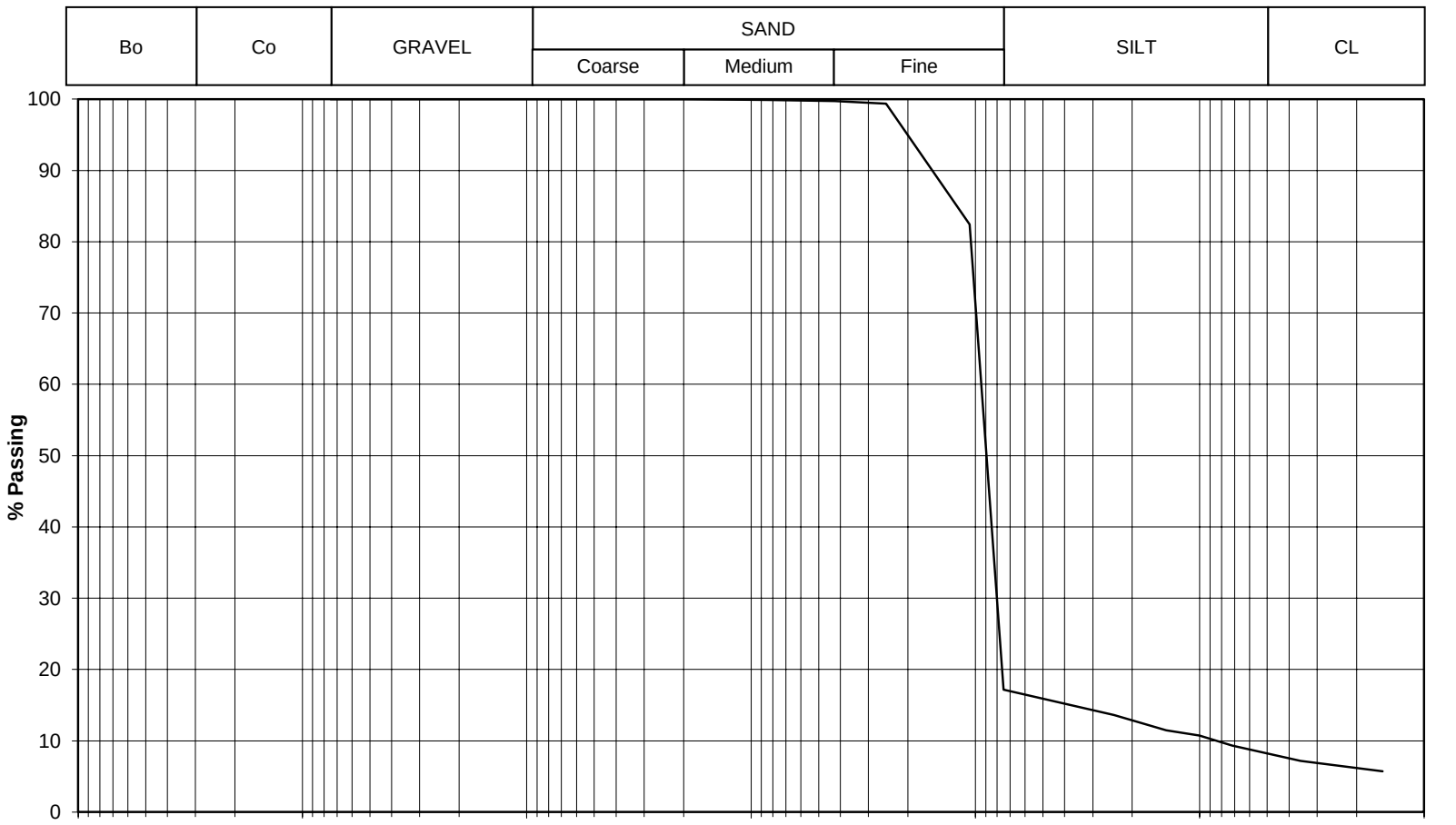
Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

Particle Size Distribution Analysis

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH No.	BH - D14A
Soil Description	SAND with silt and clay. Sand is fine, moist.	**Sample Ref.**	P13B2
		Depth (m)	68.20 - 68.35



Sieving	
Particle Size (mm)	% Passing
75.0	100
50.0	100
37.5	100
25.0	100
19.0	100
9.5	100
4.750	100
2.000	100
0.850	100
0.425	100
0.250	99
0.106	82
0.075	17

Sedimentation	
Particle Size (µm)	% Finer
24.1	14
14.1	11
10.0	11
7.2	9
3.6	7
1.5	6

Particle Density (ρs) Mg/m3	
2.70	assumed

Soil Categories	
Type	%
Cobbles / Boulders	0
Gravel	0
Sand	83
Silt / Clay	17
Silt	9
Clay	8

Grading Analysis	
D60 (mm)	0.0941
D30 (mm)	0.0803
D10 (mm)	0.00845
Uniformity Coefficient	11
Curvature Coefficient	8.1

Testing in accordance with ASTM D422-63 (2007)

Remarks

Checked by	DR
Approved by	AA

3.4 Finer than 75µm Report Summary

Gardline

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

US Wind inc. sea energy

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - D14	P1B1	0.00-0.30	Poorly graded SAND locally gravelly. Sand is medium to coarse, light brown becoming dark grey, dry. Gravel is fine.	Direct	A	Soaked	10 minutes	148.39	1.6
BH - D14	P5B2	3.10-3.40	Poorly graded SAND locally gravelly. Sand is medium to coarse, light brown becoming dark grey, dry. Gravel is fine.	Direct	A	Soaked	10 minutes	112.80	2.5
BH - D14	P7B1	10.00-10.10	CLAY. Firm, dark grey, moist, trace becoming some shell.	Direct	B	Soaked	2 hours	85.14	96.9
BH - D14	P7U1			Direct					
BH - D14	P8Q2			Direct					
BH - D14	P9B1	17.50-17.80	SAND. Sand is medium, grey, moist.	Direct	A	Soaked	10 minutes	158.25	8.5
BH - D14	P10B1	21.00-21.30	CLAY laminated with silt. Very stiff, dark grey, moist.	Direct	A	Soaked	10 minutes	88.42	78.4
BH - D14A	P1B1	1.00-1.25	Poorly graded SAND locally gravelly. Sand is medium to coarse, light brown becoming dark grey, dry. Gravel is fine.	Direct	A	Soaked	10 minutes	142.37	1.8
BH - D14A	P2B1	25.50-25.75	Poorly graded SAND with gravel and locally silt. Sand is coarse, light grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	192.43	2.8
BH - D14A	P3Q2			Direct					
BH - D14A	P4B1	33.00-33.25	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	106.63	22.6
BH - D14A	P5B1	37.00-37.10	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	83.4	58.5
BH - D14A	P6B1	41.00-41.20	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	110.35	54.2
BH - D14A	P6Q1			Direct					
BH - D14A	P6B3	41.6	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	96.1	69.0

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - D14A	P7B2	45.30-45.45	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	92.24	17.0
BH - D14A	P8B1	48.50-48.70	Clayey SAND mostly stratified and laminated with sandy clay and trace gravel. Sand is fine, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	136.48	23.9
BH - D14A	P8Q2			Direct					
BH - D14A	P9B1	52.50-52.70	Sandy CLAY. Very stiff to hard, dark grey, moist. Little to mostly shelly. Shell if fine to coarse gravel size.	Direct	A	Soaked	10 minutes	83.60	60.3
BH - D14A	P10B1	56.50-56.60	Clayey SAND. Sand is fine to coarse, dark grey, moist. Little lenses of clay.	Direct	A	Soaked	10 minutes	114.13	19.0
BH - D14A	P11Q1			Direct					
BH - D14A	P12B1	64.50-64.55	Silty SAND. Sand is fine, dark grey, moist.	Direct	A	Soaked	10 minutes	71.72	8.2

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	AA

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - G7	P2B2	0.70-0.95	Poorly graded SAND locally with clay and gravel. Sand is medium, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly.	Direct	A	Soaked	10 minutes	80.02	12.6
BH - G7	P3B3	1.40-1.60	Clayey SAND. Sand is fine, grey and wet with mostly lenses of sandy clay.	Direct	A	Soaked	10 minutes	54.46	22.8
BH - G7	P4B1	4.50-4.60	Poorly graded SAND locally with clay and gravel. Sand is medium, dark grey, wet with black organic staining and lenses of sandy clay. Mostly shelly.	Direct	A	Soaked	10 minutes	58.20	2.6
BH - G7	P5B1	8.00-8.20	Poorly graded SAND. Sand is medium, light grey, moist with few lenses of sandy CLAY.	Direct	A	Soaked	10 minutes	53.12	11.0
BH - G7	P7AB1	12.50-12.80	Gravelly SAND. Sand is coarse. Gravel is fine to coarse. Light grey, moist.	Direct	A	Soaked	10 minutes	73.10	2.9
BH - G7	P8B1	14.50-14.68	Poorly graded SAND. Sand is medium, light grey, moist with few lenses of sandy CLAY.	Direct	A	Soaked	10 minutes	65.24	6.0
BH - G7	P10Q2	19.20-19.40	CLAY. Stiff to very stiff, dark grey to dark greyish brown, moist. Few coarse shell. Stratified with sandy elastic silt. Sand is fine, dark grey, moist. Stratified with sandy silt. Sand is fine, dark grey, moist. Stratified with silty sand with gravel. Sand is coarse	Direct	B	Soaked	2 hours	36.66	57.2
BH - G7	P11Q2			Direct					
BH - G7	P12U1	27.05-27.25	CLAY. Stiff to very stiff. Dark grey to dark greyish brown, moist. Few coarse shell. Stratified with sandy elastic silt.	Direct	B	Soaked	2 hours	58.24	89.9
BH - G7	P12Q2	27.20-27.90	CLAY. Stiff to very stiff, dark grey to dark greyish brown, moist. Few coarse shell. Stratified with sandy silt. Sand is fine, dark grey, moist.	Direct	B	Soaked	2 hours	19.92	85.2
BH - G7	P13Q2	31.50-31.70	Sandy CLAY with gravel and sand. Very stiff, dark greyish brown, moist to dry. Sand is fine to coarse, gravel is fine.	Direct	B	Soaked	2 hours	53.95	52.0
BH - G7	P14Q1	35.20-35.40	CLAY with sand, locally sandy clay with gravel. Very stiff to ahrd, dark greyish brown, moist. Few lenses and laminations of sand and silt. Few fine to coarse gravel size shell. Few gravel. Gravel is fine to coarse.	Direct	B	Soaked	2 hours	21.94	61.5
BH - G7	P15Q1	39.20-39.40	CLAY with sand, locally sandy clay with gravel. Very stiff to hard, dark greyish brown, moist. Few lenses and laminations of sand and silt. Few fine to coarse gravel size shell. Few gravel, gravel is fine to coarse.	Direct	B	Soaked	2 hours	45.00	36.3
BH - G7	P16Q1	43.20-43.40	Sandy CLAY. Very stiff to hard, dark grey, dry. Few grey silt laminations and few fine to coarse gravel size shell.	Direct	B	Soaked	2 hours	41.18	30.0
BH - G7	P17B1	46.50-46.60	Clayey SAND. Sand is fine to coarse, dark grey, moist. Stratified with silty sand.	Direct	A	Soaked	10 minutes	63.09	18.8

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	AA

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - G7	P18B2	50.40-50.60	Clayey SAND. Sand is fine to coarse, dark grey, moist. Stratified with silty sand.	Direct	A	Soaked	10 minutes	46.48	16.6
BH - G7	P19B1	53.00-53.20	Poorly graded SAND with silt. Sand is medium, grey, moist, mostly shelly.	Direct	A	Soaked	10 minutes	75.98	4.0
BH - G7	P20B1	57.00-57.30	Poorly graded SAND with silt. Sand is medium, grey, moist, mostly shelly.	Direct	A	Soaked	10 minutes	56.53	11.9
BH - G7	P21B1	60.50-60.90	Sandy CLAY. Sand is fine. Very stiff to hard, grey becoming greyish brown, dry, some fine shell. Stratified with clayey sand.	Direct	A	Soaked	10 minutes	58.29	29.5
BH - G7	P22B1	64.00-64.25	Sandy CLAY. Sand is fine. Very stiff to hard, grey becoming greyish brown, dry, some fine shell. Stratified with clayey sand.	Direct	A	Soaked	10 minutes	53.21	82.3
BH - G7	P23Q1			Direct					
BH - G7	P24B1	71.50-71.60	Sandy CLAY. Sand is fine. Very stiff to hard, grey becoming greyish brown, dry, some fine shell. Stratified with clayey sand.	Direct	B	Soaked	2 hours	61.44	99.5
BH - G7	P24Q2			Direct					

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Gardline

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

US Wind inc. sea energy

Contract: Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - G17	P2B1	0.50-0.85	Poorly graded SAND with gravel. Sand is medium, grey, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	119.45	2.9
BH - G17	P3B2	1.75-2.00	Poorly graded SAND with silt. Sand is fine, grey becoming light olive brown, moist. Locally with some gravel. Gravel is fine.	Direct	A	Soaked	10 minutes	89.73	3.5
BH - G17	P4B1	5.00-5.25	CLAY. Soft, pale brown and moist. Laminated with sand. Sand is fine. Becoming poorly graded SAND with silt. Sand is fine, grey becoming light olive brown, moist. Locally with some gravel. Gravel is fine at 5.10m.	Direct	A	Soaked	10 minutes	118.29	8.5
BH - G17	P10B2	18.70-18.75	Well graded SAND locally with gravel. Sand is fine to coarse, light yellowish brown, moist. Gravel is fine to coarse.	Direct	A	Soaked	10 minutes	66.45	3.8
BH - G17	P11B1	29.50-29.75	Well graded SAND locally with gravel. Sand is fine to coarse, light yellowish brown, moist. Gravel is fine to coarse.	Direct	A	Soaked	10 minutes	93.43	4.2
BH - G17	P14AU1			Direct					
BH - G17	P15Q1			Direct					
BH - G17A	P1Q2			Direct					
BH - G17A	P2B1	44.50-44.75	Silty SAND. Sand is fine, grey, dry.	Direct	A	Soaked	10 minutes	82.70	21.1
BH - G17A	P3B2	48.25-48.50	Silty SAND. Sand is fine, grey, dry.	Direct	A	Soaked	10 minutes	113.10	26.3
BH - G17A	P4Q1			Direct					
BH - G17A	P5Q2			Direct					
BH - G17A	P6B1	60.00-60.25	Clayey GRAVEL with sand. Gravel is coarse, dark grey, moist. Sand is fine.	Direct	A	Soaked	10 minutes	81.73	17.3
BH - G17A	P7B1	64.00-64.30	Clayey SAND. Sand is fine, dark grey, moist.	Direct	A	Soaked	10 minutes	105.38	17.9

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Gardline

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

US Wind inc sea energy

Contract: Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - H10	P1B1	0.00-0.20	Well graded SAND. Sand is fine to coarse, olive brown to dark grey, moist. Locally poorly graded sand with gravel. Gravel is fine to coarse, dark grey, wet.	Direct	A	Soaked	10 minutes	70.41	2.1
BH - H10	P3B1	2.20-2.40	CLAY. Firm to stiff, very dark grey, moist. Becoming gravelly SAND. Sand is coarse, grey, wet. Gravel is fine, dark grey, wet at 2.30m.	Direct	A	Soaked	10 minutes	77.33	52.4
BH - H10	P4Q2			Direct					
BH - H10	P8B1	23.50-23.75	Silty SAND. Sand is fine, grey, wet.	Direct	A	Soaked	10 minutes	52.23	47.6
BH - H10	P9Q2			Direct					
BH - H10	P10B1	30.00-30.30	Clayey SAND. Sand is fine, grey, moist. Stratified with sandy clay. Sand is fine, very stiff to hard, dark olive grey, moist.	Direct	A	Soaked	10 minutes	56.98	51.3
BH - H10	P11Q1			Direct					
BH - H10	P13B1	42.00-42.30	Poorly graded SAND with silt. Sand is fine, grey, moist, some gravel. Gravel is fine.	Direct	A	Soaked	10 minutes	68.12	26.2
BH - H10	P15B1	50.00-50.20	Silty SAND. Sand is fine to coarse, dark grey, moist, few lenses and dew laminations of clay. Few fine gravel.	Direct	A	Soaked	10 minutes	138.52	26.2
BH - H10	P16B1	54.00-54.20	Silty SAND. Sand is fine to coarse, dark grey, moist, few lenses and dew laminations of clay. Few fine gravel.	Direct	A	Soaked	10 minutes	67.58	12.6
BH - H10	P17B1	56.00-56.30	Silty SAND. Sand is fine to coarse, dark grey, moist. Few lenses and few laminations of clay. Few fine to coarse gravel.	Direct	A	Soaked	10 minutes	110.96	4.0
BH - H10	P18B1	59.50-59.80	Silty SAND. Sand is fine to coarse, dark grey, moist. Few lenses and few laminations of clay. Few fine to coarse gravel.	Direct	A	Soaked	10 minutes	86.38	10.1
BH - H10	P19B1	63.20-63.30	Silty SAND. Sand is fine to coarse, dark grey, moist. Few lenses and few laminations of clay. Few fine to coarse gravel.	Direct	A	Soaked	10 minutes	92.03	12.1
BH - H10	P20Q1			Direct					
BH - H10	P21Q1			Direct					

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - I21	P1B1	0.00-0.20	Poorly graded SAND. Sand is fine, light brown becoming dark grey, dry. Little shell. Shell is fine to coarse gravel size.	Direct	A	Soaked	10 minutes	86.11	1.2
BH - I21	P1B2	0.20-0.55	Poorly graded SAND. Sand is fine, light brown becoming dark grey, dry. Little shell. Shell is fine to coarse gravel size.	Direct	A	Soaked	10 minutes	100.93	1.9
BH - I21	P3B1	2.00-2.30	Well graded GRAVEL with sand. Gravel is fine. Sand is medium, dark grey. Becoming poorly graded SAND. Sand is fine, light brown becoming dark grey, dry. Little shell. Shell is fine to coarse gravel size at 2.05m	Direct	A	Soaked	10 minutes	141.45	3.4
BH - I21	P4B3	5.90-6.15	Well graded SAND with silt. Sand is coarse, dark grey, moist. Lenses of black organic staining.	Direct	A	Soaked	10 minutes	118.53	35.3
BH - I21A	P3B1	14.50-14.70	Well graded SAND. Fine to coarse, dark olive grey, moist with trace shell fragments. Stratified with poorly graded sand with gravel. Sand coarse. Gravel is fine. Light brownish grey.	Direct	A	Soaked	10 minutes	90.46	1.6
BH - I21A	P6B1	25.00-25.25	Well graded SAND with silt. Sand is fine to coarse. Olive grey, moist with few lenses of clay. Trace gravel. Gravel is fine.	Direct	A	Soaked	10 minutes	156.61	4.7
BH - I21B	P1Q2			Direct					
BH - I21B	P2Q1			Direct					
BH - I21B	P3Q1			Direct					
BH - I21B	P4B1	36.50-36.72	Sandy SILT. Sand is fine, grey, moist.	Direct	A	Soaked	10 minutes	83.40	30.0
BH - I21B	P5B2	39.80-40.10	SILT with sand. Sand is fine, dark grey, moist.	Direct	A	Soaked	10 minutes	87.53	47.5
BH - I21B	P6AQ1			Direct					
BH - I21B	P7B1	48.00-48.20	Elastic SILT with sand and some shell. Silt is firm, dark grey, dry.	Direct	B	Soaked	2 hours	97.45	66.3
BH - I21B	P8B2	51.25-51.50	Poorly sorted SAND with silt. Sand is coarse, grey, moist. Some laminations and stratifications of elastic silt and sandy clay.	Direct	A	Soaked	10 minutes	88.87	58.9
BH - I21B	P9Q2			Direct					

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract:

Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - I21B	P10Q1			Direct					
BH - I21B	P11Q1			Direct					
BH - I21B	P12B1	67.00-67.10	Poorly graded SAND with silt. Sand is fine becoming medium, grey, moist.	Direct	A	Soaked	10 minutes	87.67	6.4
BH - I21B	P13B1	71.00-71.25	Poorly graded SAND with silt. Sand is fine becoming medium, grey, moist.	Direct	A	Soaked	10 minutes	84.27	19.0

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: | Site:

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - K16	P1AB1	0.00-0.15	Poorly graded SAND locally with gravel. Sand is medium, light olive grey, moist. Gravel is mostly fine with few coarse shell.	Direct	A	Soaked	10 minutes	124.64	2.0
BH - K16	P4AB1	7.50-7.70	Poorly graded SAND locally with gravel. Sand is medium, light olive grey, moist. Gravel is mostly fine with few coarse shell.	Direct	A	Soaked	10 minutes	143.12	3.2
BH - K16	P12B1	28.00-28.40	Well graded SAND with gravel. Sand is coarse, greyish brown, moist. Gravel is fine.	Direct	A	Soaked	10 minutes	142.51	3.9
BH - K16	P15Q2			Direct					
BH - K16	P16Q2			Direct					
BH - K16	P17Q2			Direct					
BH - K16	P18B2	49.69-49.80	CLAY with sand, locally sandy clay. Very stiff to hard, dark olive grey, dry, few laminations of sandy silt. Sand is fine.	Direct	A	Soaked	10 minutes	116.61	41.8
BH - K16	P19B3	51.40-51.70	SAND with silt. Sand is fine to medium, dark grey, moist, laminated with clay.	Direct	A	Soaked	10 minutes	116.06	24.6
BH - K16	P20Q1			Direct					
BH - K16	P21Q2			Direct					
BH - K16	P22Q1			Direct					
BH - K16	P23B3	67.00-67.20	Clayey SAND. Sand is fine, dark grey, moist, little fine gravel size shell.	Direct	A	Soaked	10 minutes	77.26	21.2
BH - K16	P24B1	71.00-71.40	Silty SAND becoming poorly graded sand with silt. Sand is coarse, grey, moist with few lenses of sandy clay.	Direct	A	Soaked	10 minutes	116.71	8.3

Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

Checked by:	Approved by:
DR	

Determination of the Amount of Material In Soils Finer Than No. 200 (75µm) Sieve

Contract: 10451 Location: Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

Borehole I.D.	Sample Reference	Sample Depth (m)	Description	Dry Mass Determination	Test Method A/B	Soaked/Unsoaked	Amount of Time Soaked	Initial Dry Mass Used	Percentage Finer than 75µm
BH - MET TOWER	P3B1	2.00-2.30	Poorly graded SAND with silt. Sand is angular to subangular. Fine to medium grained, dense to compact, light grey becoming dark grey. Few stratifications of GRAVEL, gravel is angular and fine. Few pockets of clayey SAND. Few laminations of black organic staining.	Direct	A	Soaked	10 minutes	186.91	12.2
BH - MET TOWER	P4B1	5.00-5.35	Poorly graded SAND with silt. Sand is angular to subangular. Fine to medium grained, dense to compact, light grey becoming dark grey. Few stratifications of GRAVEL, gravel is angular and fine. Few pockets of clayey SAND. Few laminations of black organic staining.	Direct	A	Soaked	10 minutes	198	12.1
BH - MET TOWER	P5B1	8.50-8.80	Poorly graded SAND with silt. Sand is angular to subangular. Fine to medium grained, dense to compact, light grey becoming dark grey. Few stratifications of GRAVEL, gravel is angular and fine. Few pockets of clayey SAND. Few laminations of black organic staining.	Direct	A	Soaked	10 minutes	211.83	13.5
BH - MET TOWER	P9Q1	25.70-25.90	CLAY with sand. Very stiff to hard, dark olive grey, dry. Sand is fine. Some laminations and lenses of silt.	Direct	A	Soaked	10 minutes	39.2	91.6
BH - MET TOWER	P9B2	26.30-26.45	CLAY with sand. Sand is fine. Very stiff to hard, dark olive grey. Dry. Some laminations and lenses of silt.	Direct	B	Soaked	2 hours	178.39	61.7
BH - MET TOWER	P10Q2	29.60-29.80	Sandy CLAY. Very hard to hard, very dark grey, dry, Some laminations and lenses of sand and silt. Sand is fine.	Direct	A	Soaked	10 minutes	36.82	52
BH - MET TOWER	P11Q1	33.20-33.40	Sandy CLAY. Very hard to hard, very dark grey, dry. Sand is fine. Little fine to coarse gravel size shell. Lenses of sand and silt.	Direct	A	Soaked	10 minutes	33.24	62.8
BH - MET TOWER	P11B2	33.80-33.98	Sandy CLAY. Sand is fine. Very hard to hard, very dark grey, dry. Little fine to coarse gravel size shell. Some laminations and lenses of sand and silt. Sand is fine grained. Trace organics.	Direct	B	Soaked	2 hours	181.67	60.1
BH - MET TOWER	P13Q2	40.90-41.10	Elastic SILT. Firm, olive grey, moist. Mostly laminated with sandy clay. Sand is fine.	Direct	B	Soaked	2 hours	38.52	82.63
BH - MET TOWER	P16AB2	53.70-53.90	Poorly graded SAND with silt. Sand is fine grained, grey, compact and wet.	Direct	A	Soaked	10 minutes	215.39	20.6
BH - MET TOWER	P17Q1	57.00-57.20	Sandy CLAY. Hard, grey, moist. Sand is fine.	Direct	B	Soaked	2 hours	67.49	43.55

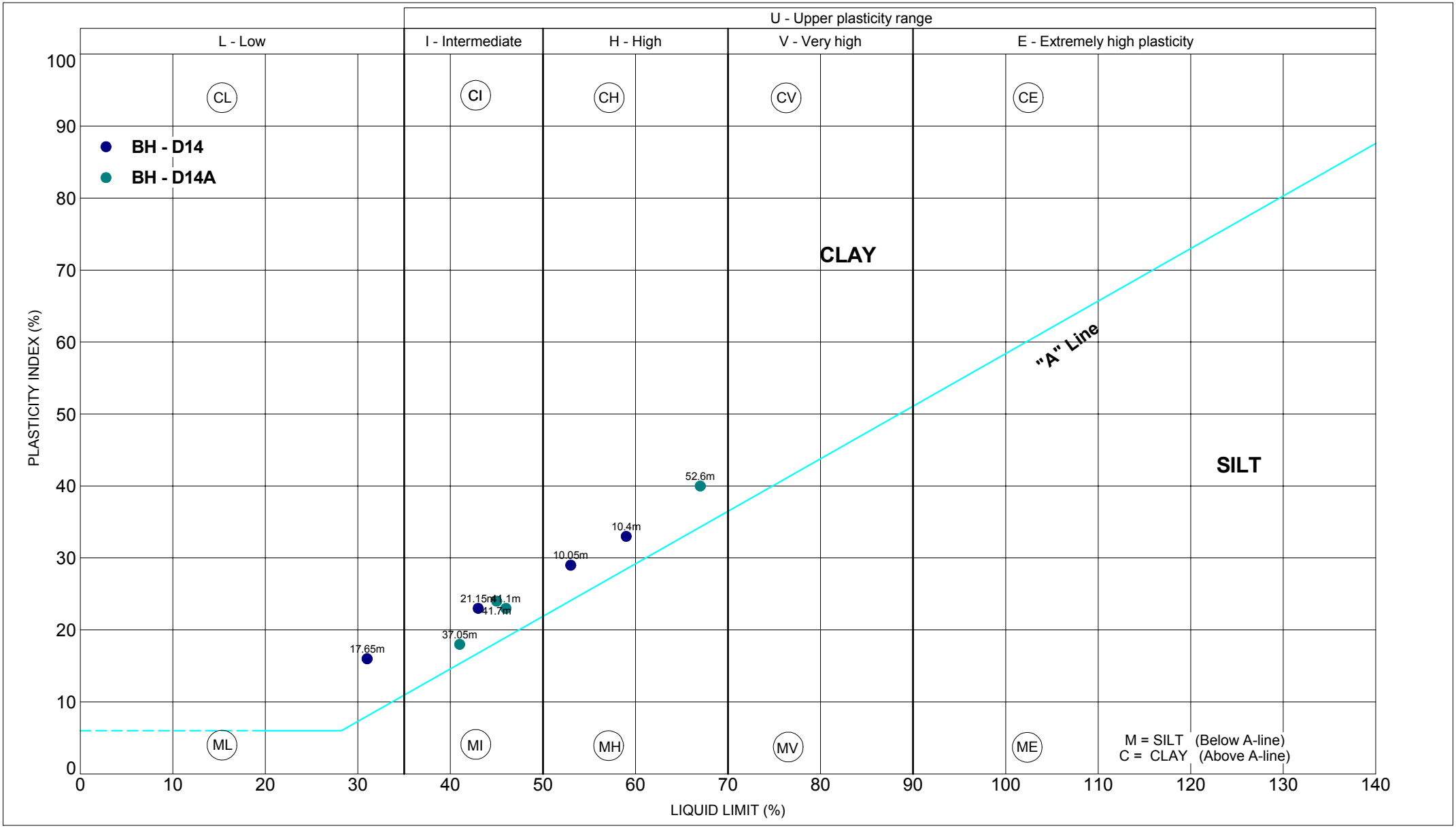
Remarks:

Prepared and Tested in accordance with ASTM D1140-14.

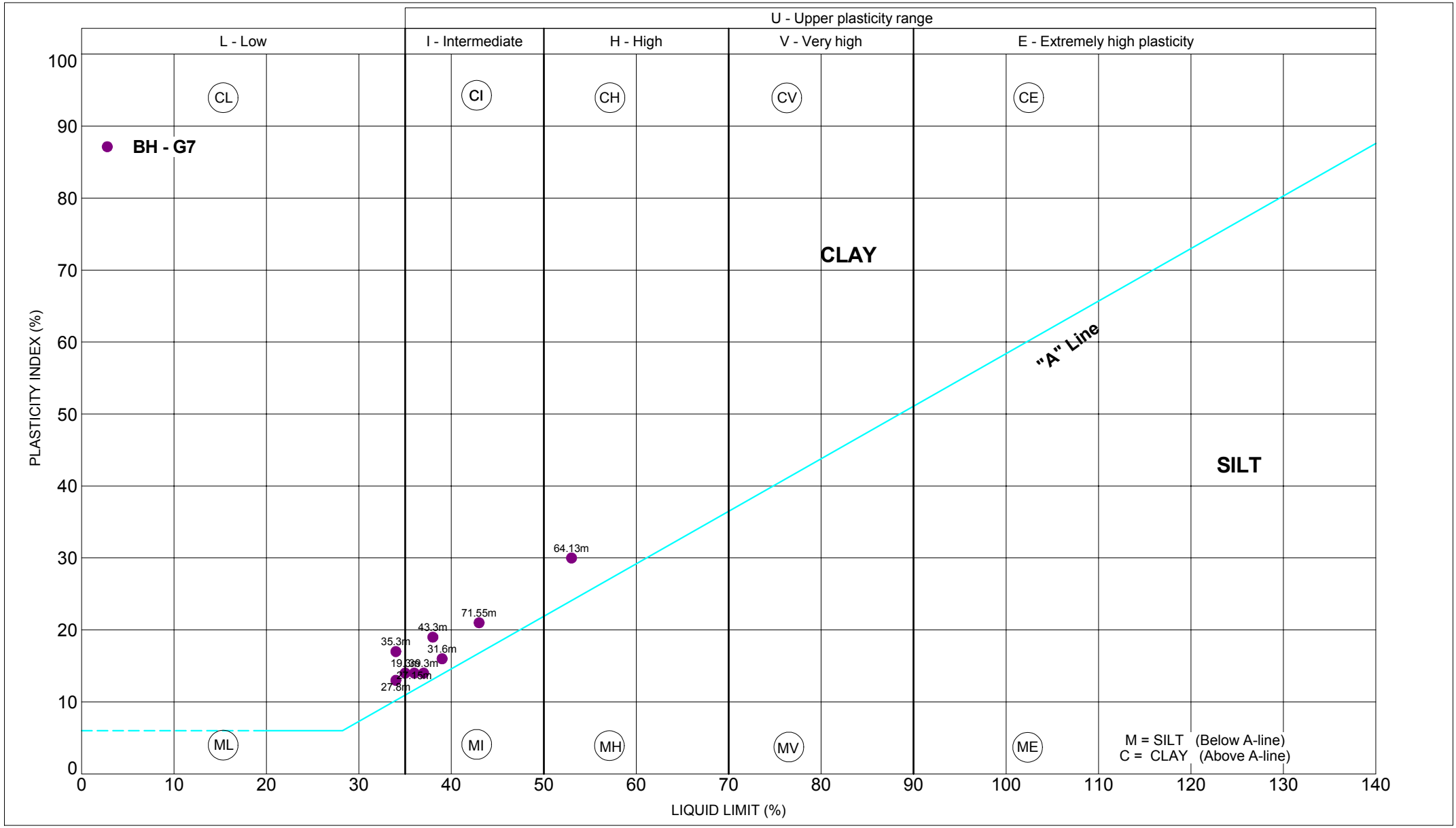
Checked by:	Approved by:
DR	AA

3.5 Plasticity Results

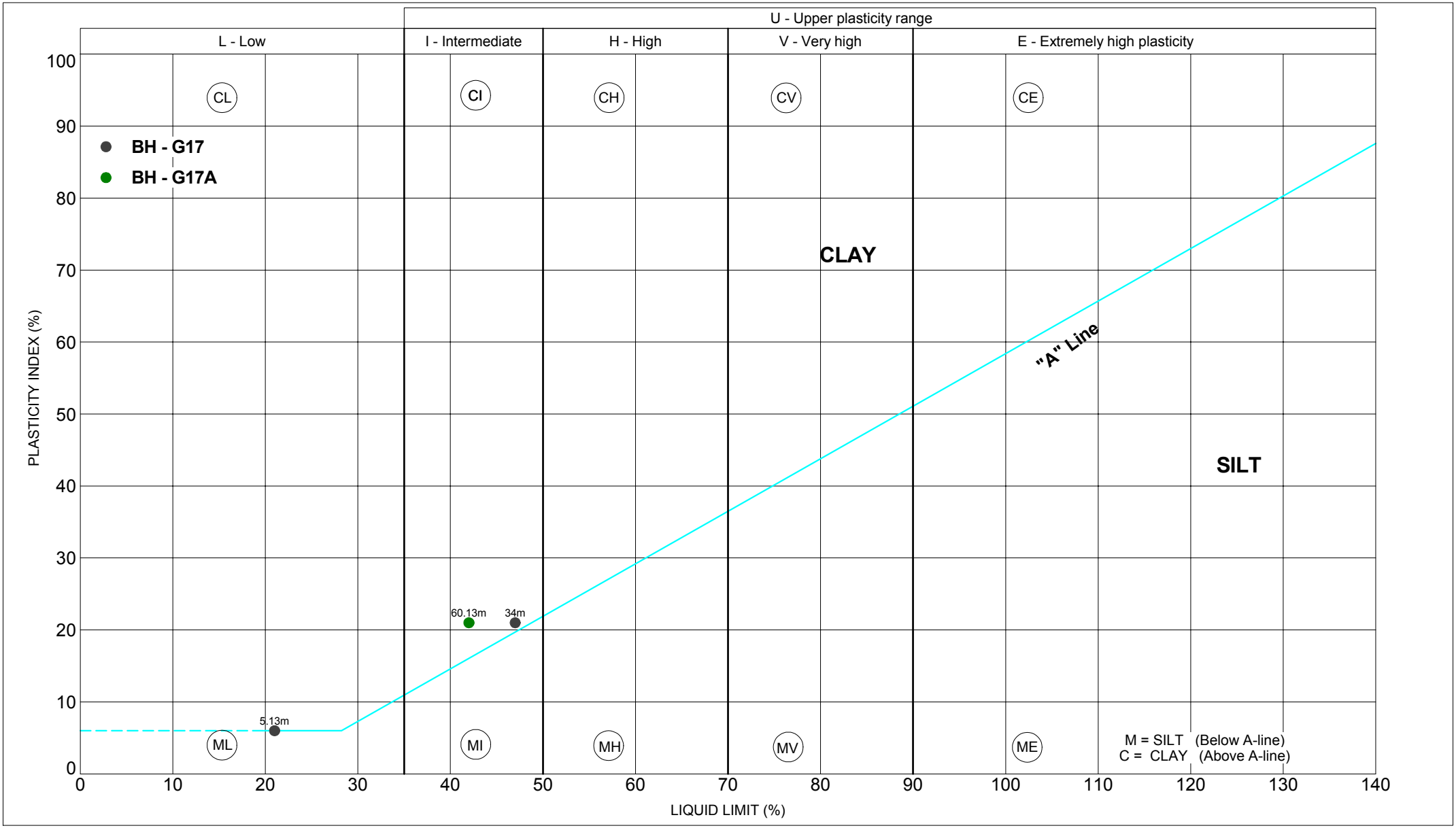
Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14_A



Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7



Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17_A



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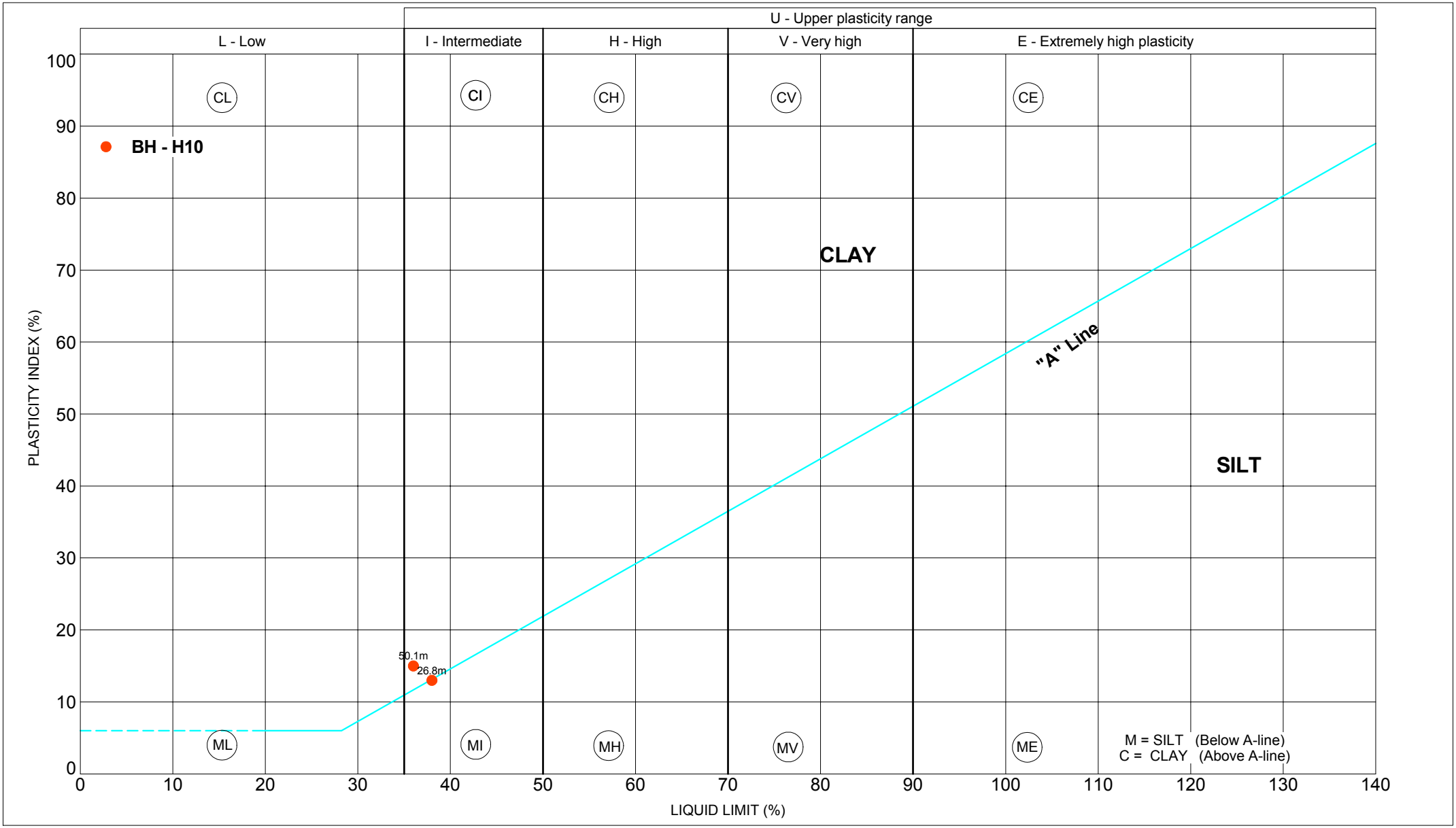
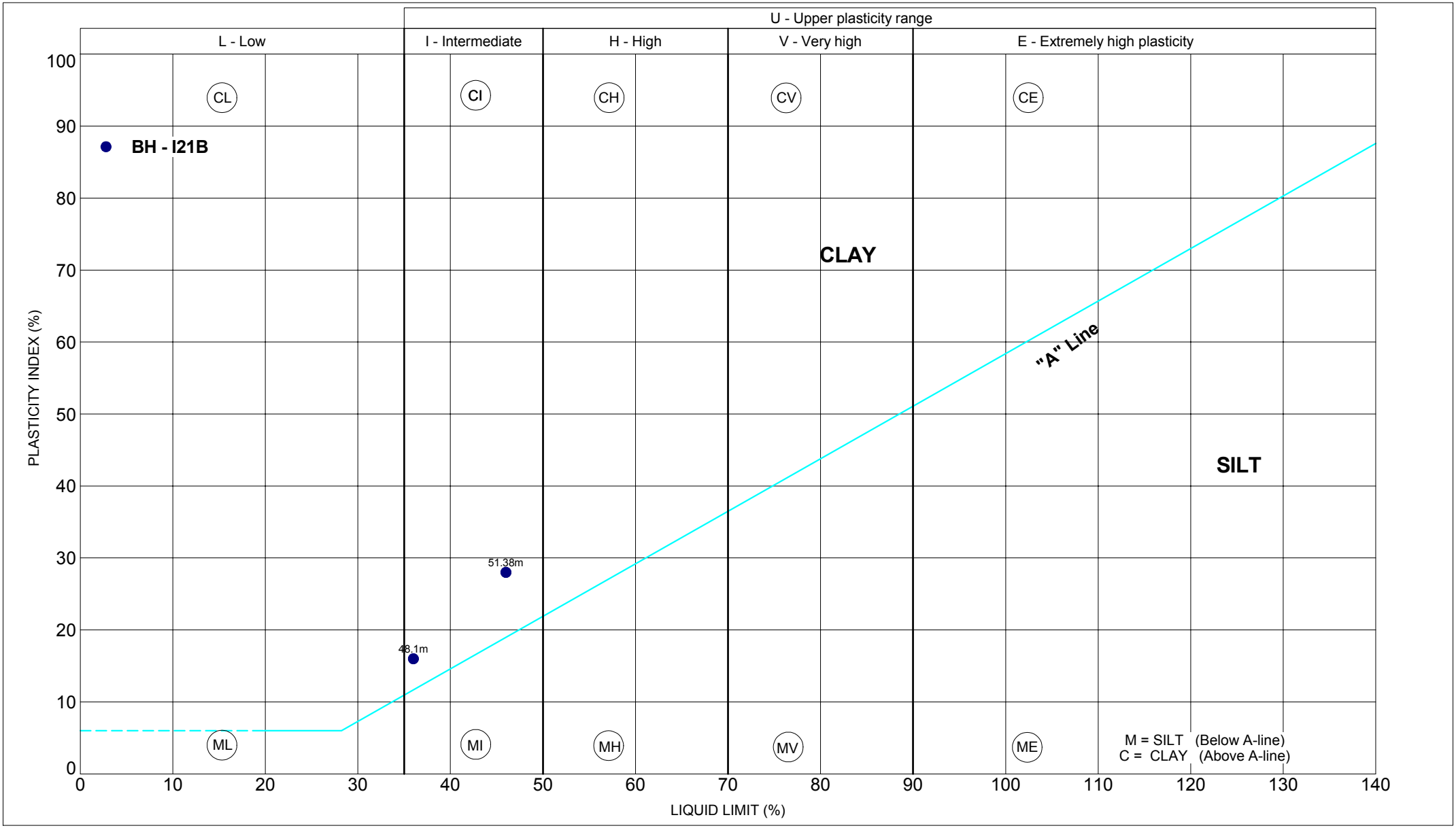
BH-H10



Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21_B



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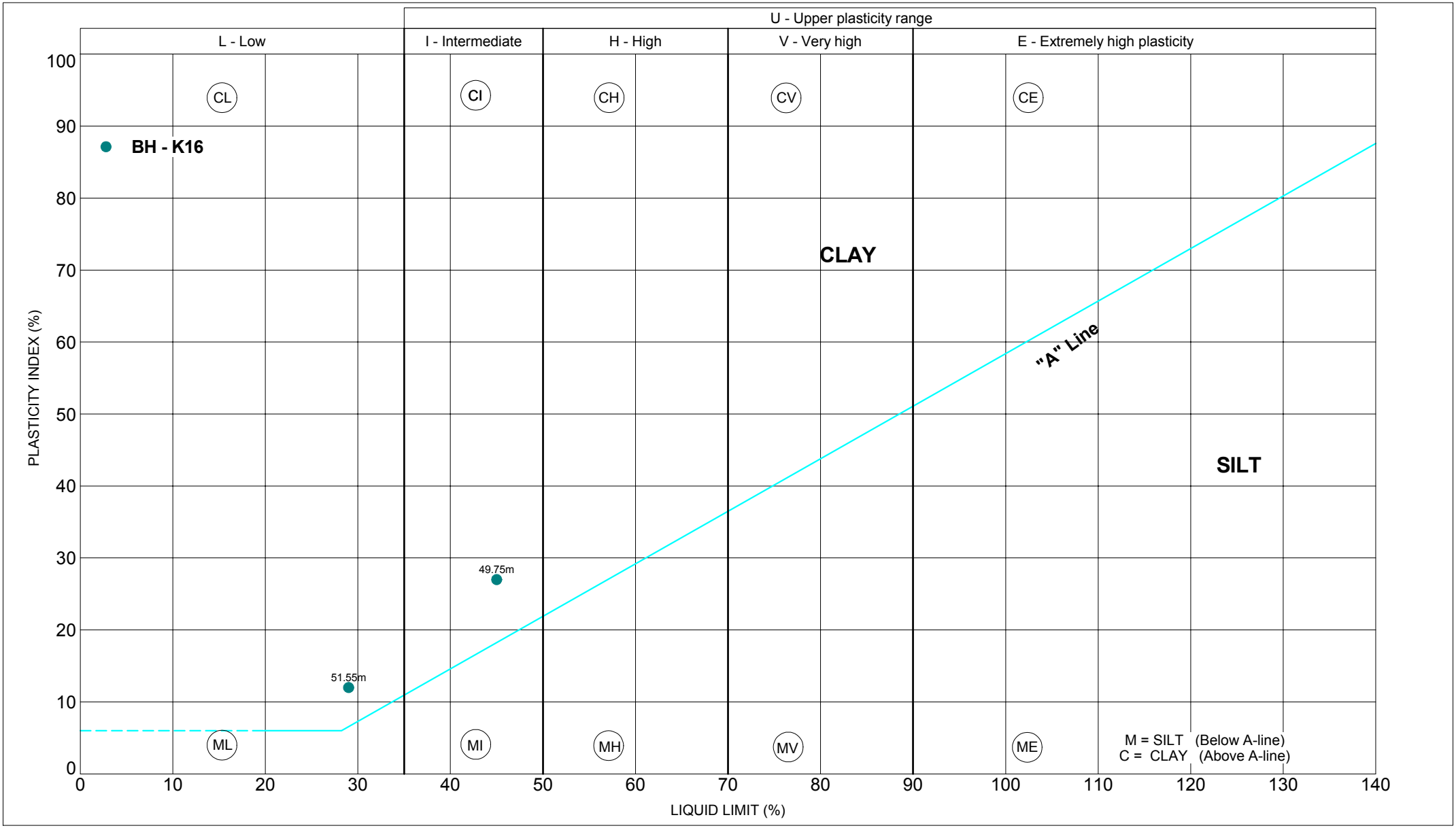
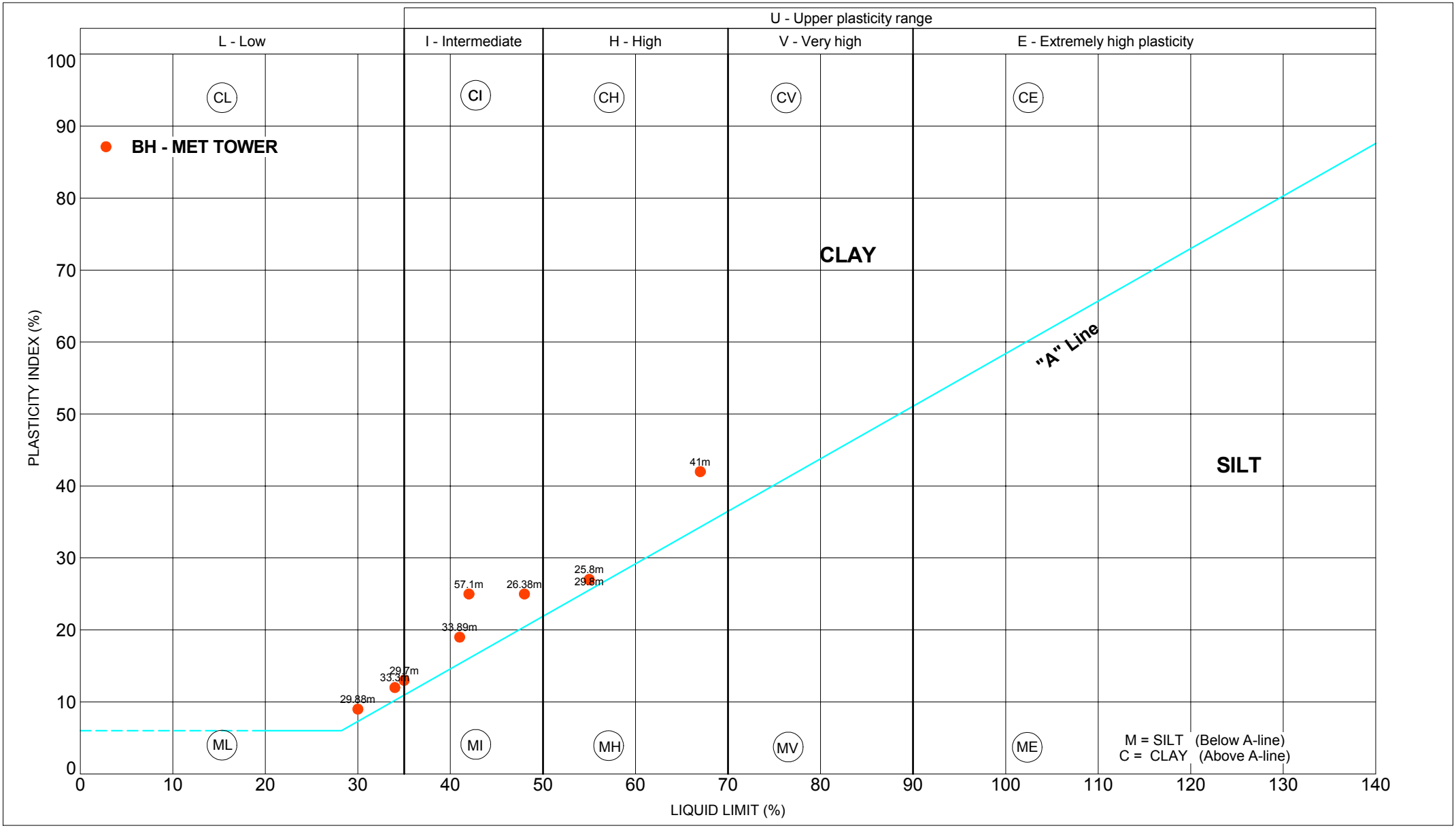


Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER



3.6 Shear Strength Summary

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-D14/D14A

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P4B2	2.35																
P5B4	3.70																
P5B4	3.72																
P5B4	3.74																
P5B4	3.76																
P7B1	10.10		40.0														
P7B1	10.10	75.0															
P7U1	10.37									40.0							
P7Q2	10.60			29.0	4.6							107.5					
P7B2	10.70	90.0															
P7B2	10.74					60.4	12.5										
P7B2	10.75		45.0														
P7B2	10.75	90.0															
P8B1	13.61		45.0														
P8B1	13.61	85.0															
P8Q2	13.90		50.0														
P8B2	14.21		40.0														
P8B2	14.22	70.0															
P8B2	14.26					63.8	10.3										
P10B1	21.30	128.3															
P10B2	21.40	80.0															
P5Q1	37.20			93.0	24.0							440.9					
P8U1	49.01									190.0							
P8B2	49.40	188.3															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area BH-D14/D14A

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P9B1	52.70		120.0														
P9B2	52.70	196.7															
P9U1	52.96									170.0							
P9B3	53.05	208.3															
P9Q1	53.20			170.0	74.0							523.2					
P9B4	53.30	225.0															
P9B4	53.30		137.5														
P11B1	60.70	185.0															
P11U1	60.84									130.0							
P11Q1	61.00			87.0	31.0							524.6					

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P2B2	0.80																
P3B2	1.30													17.5			
P3B2	1.32																
P3B2	1.34																
P3B2	1.36																
P3B3	1.59					43.3	4.6										
P10Q1	19.01	121.7															
P10Q2	19.23			34.0	9.7												
P10Q2	19.30											250.0					
P10B1	19.55	101.7															
P10B1	19.55		162.5														
P11Q1	23.20		145.0														
P11Q1	23.20	110.0															
P11Q2	23.23													79.3			
P11Q2	23.27																
P11Q2	23.31																
P11Q2	23.37																
P11B1	23.50	101.7															
P11B1	23.50		122.5														
P12U1	27.15									86.0							
P12B2	27.25		72.0														
P12B2	27.26	86.7															
P12B3	27.50	80.0															
P12B3	27.50		85.0														

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P12Q2	27.73			44.0	16.0												
P12Q2	27.80											354.0					
P12B4	27.90	88.3															
P12B4	27.90		120.0														
P12B4	27.94					176.6	43.3										
P13B1	31.07	68.3															
P13B1	31.07		100.0														
P13U1	31.20									85.0							
P13Q2	31.50	100.0															
P13Q2	31.50		117.5														
P13Q2	31.53			59.0	31.0												
P13Q2	31.60											380.1					
P13B2	31.70	126.7															
P13B2	31.70		162.5														
P13B2	31.71					166.3	44.4										
P14Q1	35.20	165.0															
P14Q1	35.20		140.0														
P14Q1	35.23			49.0	16.0												
P14Q1	35.30											336.2					
P14U1	35.40	136.7															
P14U1	35.40		137.5														
P15B1	39.20		125.0														
P15Q1	39.21	200.0															
P15Q1	39.23			140.0	35.0												

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P15Q1	39.30											463.8					
P15U1	39.50									170.0							
P15Q2	39.60		155.0														
P15Q2	39.61	205.0															
P15B2	39.80	210.0															
P15B2	39.99		135.0														
P16B1	43.19	211.7															
P16Q1	43.23			120.0	64.0												
P16Q1	43.30											605.9					
P16U1	43.50									180.0							
P16Q2	43.60	210.0															
P16B2	44.00	276.7															
P17Q2	46.90			74.0	19.0							678.7					
P22B1	64.08	170.0															
P23B1	67.57	175.0															
P23Q1	67.70											614.5					
P24B1	71.55	125.0															
P24U1	71.90									140.0							
P24B2	72.10	125.0															
P24Q2	72.30											508.1					
P24B3	72.40	125.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17/G17A

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P10B1	18.53																
P10Q1	18.56																
P10Q1	18.60																
P10Q1	18.63																
P10Q1	18.66																
P14AQ1	33.70	206.7															
P14AB2	34.10		155.0														
P14AB2	34.11	193.3															
P14AB2	34.26	210.0															
P15Q1	37.70	178.3															
P15Q1	37.80			170.0	28.0							370.9					
P15Q2	38.10	190.0	125.0														
P15B2	38.31	176.7	125.0														
P15B2	38.40					199.4	66.1										
P1B1	41.20	180.0															
P1U1	41.51									180.0							
P1Q2	41.63													103.4			
P1Q2	41.64																
P1Q2	41.66																
P1Q2	41.68																
P4Q2	52.55			200.0	74.0							728.9					
P5B1	56.06	300.0															
P5Q2	56.60											616.3					
P5B2	56.83	300.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

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10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P3Q1	2.10											137.1					
P3B1	2.21	56.7															
P3B1	2.21		51.0														
P3B2	2.45		36.0														
P4B1	6.19	43.3															
P4B1	6.20		46.0														
P4Q1	6.30											113.2					
P4Q2	6.60	75.0	75.0														
P4U1	6.70									52.0							
P4B2	6.81					55.3	22.8										
P9B1	26.15	151.7															
P9Q1	26.40			97.0	16.0							345.6					
P9Q2	26.53													97.0			
P9Q2	26.55																
P9Q2	26.57																
P9Q2	26.64																
P9B2	26.80	165.0															
P11B1	34.07	98.3															
P11Q1	34.40			93.0	35.0							405.9					
P15U1	50.71									130.0							
P15B2	50.80	180.0															
P16Q1	54.30											961.1					
P16Q2	54.63													189.8			
P16Q2	54.65																

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P16Q2	54.67																
P16Q2	54.74																
P20B1	66.20	150.0															
P20B1	66.20		162.5														
P20Q1	66.30											504.0					
P20U1	66.51									180.0							
P20U1	66.60	163.3															
P20U1	66.60		180.0														
P20B2	66.81	163.3															
P20B2	66.81		180.0														
P20B2	66.99	225.0															
P20B2	66.99		200.0														
P21B1	70.20		115.0														
P21B1	70.20	120.0															
P21Q1	70.30											570.8					
P21B2	70.61	165.0															
P21B2	70.61		150.0														
P21B3	70.95	210.0															
P21B3	70.95		197.5														
P22U1	74.10									170.0							
P22U1	74.20	200.0															
P22U1	74.20		170.0														
P22Q1	74.30											681.1					
P22B1	74.50	215.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P22B1	74.50		165.0														
P22B2	74.81	161.7															
P22B2	74.81		205.0														

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21A/I21B

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P1B2	9.78																
P1B2	9.79																
P1B2	9.80																
P1B2	9.81																
P3B2	14.78												- 770.6				
P5B1	21.13																
P1Q1	28.20	65.0															
P1Q1	28.20		85.0														
P1Q1	28.30			61.0	17.0							354.4					
P1Q2	28.40	130.0															
P1U1	28.60	135.0															
P1U1	28.60		100.0														
P1U1	28.70									120.0							
P1B2	28.80	150.0															
P1B2	28.80		125.0														
P1B2	28.99		187.5														
P2B1	29.19		85.0														
P2B1	29.20	100.0															
P2Q1	29.30			150.0	16.0							343.2					
P2Q1	29.39	140.0															
P2U1	29.51									95.0							
P2Q2	29.60	130.0															
P2Q2	29.60		87.5														
P2B2	29.80	140.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21A/I21B

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P2B2	29.80		100.0														
P2B2	29.91					79.8	19.4										
P3B1	32.63		100.0														
P3B1	32.64	125.0															
P3Q1	32.80			93.0	24.0							418.5					
P3Q1	32.90		120.0														
P3U1	32.91	120.0															
P3U1	32.99									110.0							
P3B2	33.38		115.0														
P3B2	33.40	120.0															
P3B2	33.48		100.0														
P6AB1	44.11		125.0														
P6AB1	44.12	223.3															
P6AQ1	44.30			140.0	31.0							456.7					
P6AU1	44.50									150.0							
P6AQ2	44.60	245.0															
P6AB2	44.93	250.0															
P7B1	48.07	300.0															
P7B2	48.51	255.0															
P7U1	48.90									170.0							
P7U1	48.91	300.0															
P8B1	51.20	250.0															
P9B1	55.48	300.0															
P9B2	55.71	300.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21A/I21B

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P9B3	55.88	300.0															
P10B1	59.16	300.0															
P10Q1	59.23													206.3			
P10Q1	59.27																
P10Q1	59.32																
P10Q1	59.37																
P10B2	59.68	300.0															
P11B1	63.05	300.0															
P11Q2	63.60											613.1					

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P15B1	40.20	143.3	140.0														
P15U1	40.50									130.0							
P15U1	40.60	188.3	150.0														
P15Q2	40.70			150.0	49.0							572.3					
P15B2	40.91					181.1	51.3										
P15B2	40.94		125.0														
P15B2	40.94	118.3															
P16B1	44.19	236.7															
P16B1	44.20		147.5														
P16U1	44.50									130.0							
P16U1	44.59	226.7															
P16B2	44.94					205.1	59.2										
P16B2	44.98	190.0															
P17B1	48.19	128.3															
P17B1	48.19		125.0														
P17U1	48.30									120.0							
P17Q1	48.40		130.0														
P17Q1	48.41	130.0															
P17Q1	48.43																
P17Q1	48.45													137.7			
P17Q1	48.48																
P17Q1	48.53																
P17B2	48.80	193.3															
P17B2	48.80		162.5														

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P17B2	48.94	233.3															
P18B2	49.70	151.7															
P18B2	49.70		157.5														
P20B1	55.20	161.7															
P20U1	55.50									190.0							
P20Q2	55.60	208.3															
P20Q2	55.60		137.5														
P20Q2	55.70			220.0	100.0							588.7					
P20B2	55.85	218.3															
P20B2	55.85		147.5														
P21B1	59.08	230.0															
P21U1	59.50									270.0							
P21U1	59.50	265.0															
P21B2	59.88	231.7															
P22B1	63.10	246.7															
P22Q1	63.33													179.2			
P22Q1	63.35																
P22Q1	63.37																
P22Q1	63.45																
P22B2	63.62	226.7															
P22B3	63.90	245.0															

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P2B1	1.11		25.0														
P9Q1	25.70		115.0														
P9Q1	25.73			200.0	49.0												
P9Q1	25.80											510.8					
P9U1	26.00									170.0							
P9Q2	26.11	198.3															
P9Q2	26.11		140.0														
P9Q2	26.20			170.0	49.0							549.4					
P9B2	26.31	203.3															
P10Q1	29.20	158.3															
P10Q1	29.30												- 283.1				
P10U1	29.50									160.0							
P10Q2	29.60	176.7															
P10Q2	29.63			170.0	24.0												
P10Q2	29.70											484.2					
P10B2	29.81	190.0															
P10B2	29.91					216.5	85.4										
P11Q1	33.20	190.0															
P11Q1	33.23			170.0	39.0												
P11Q1	33.30											392.4					
P11U1	33.50									150.0							
P11Q2	33.60	188.3															
P11Q2	33.63													115.6			
P11Q2	33.65																

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER

Push Number	Level in core (m)	INDEX STRENGTH TESTS								TRIAXIAL				DSS	SENSITIVITY		
		PPT	Torvane	Fall Cone		Laboratory Vane		Hand Shear Vane		UU		CAUC	CAUE				
		S_u (kPa)	S_u (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_r (kPa)	S_u (kPa)	S_u (kPa)	S_u (kPa)	S_t (Triaxial)	S_t (Fall Cone)	S_t (Lab Vane)
P11Q2	33.67																
P11Q2	33.72																
P11B2	33.81	168.3															
P13B1	40.59	300.0															
P13Q2	40.93			230.0	56.0												
P13Q2	41.00											520.4					
P13B2	41.22	300.0															
P17Q1	57.03			61.0	7.8												
P17Q1	57.10	200.0															
P17Q1	57.10											524.7					
P17Q1	57.10											524.7					

DETERMINATION OF UNDRAINED SHEAR STRENGTHS

ISO/TS 17892-6:2003

3.7 UUT Summary

Gardline

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

US Wind sea energy

Core Number	Level in core (m)	Undrained Shear Strength (kPa)		Specimen Diameter	Total Cell Pressure	Initial Moisture	Dev. Stress at Failure	Sample Length	Bulk Density	Dry Density	Strain at Failure	Mode of Failure
		C_u	C_r	mm	kN/m²	%	kN/m²	mm	Mg/m³	Mg/m³	%	
BH - D14	10.37	40			373	54	81	0.137	1.72	1.12	5.9	Intermediate
BH - D14A	49.01	190			1129	28	370	0.187	1.93	1.51	15.0	Barreling
BH - D14A	52.96	170			798	35	348	0.187	1.87	1.39	8.6	Intermediate
BH - D14A	60.84	130			1375	27	250	0.118	1.99	1.57	14.8	Barrelling
BH - G17A	41.51	180			1013	30	446	0.178	1.89	1.45	11.7	Intermediate
BH - G7	27.15	86			688	29	172	0.2	1.91	1.48	14.3	Intermediate
BH - G7	31.20	85			895	22	170	0.2	2.03	1.67	15.1	Intermediate
BH - G7	39.50	170			1002	32	337	0.2	1.88	1.43	12.0	Shear
BH - G7	43.50	180			1111	29	359	0.2	1.98	1.53	15.4	Intermediate
BH - G7	71.90	140			1666	27	277	0.2	1.98	1.55	12.8	Intermediate
BH - H10	6.70	52			401	17	104	0.195	2.08	1.83	15.5	Barrelling
BH - H10	50.71	130			1216	32	158	0.183	1.91	1.45	12.1	Intermediate
BH - H10	66.51	180			1498	35	367	0.187	1.89	1.39	10.1	Shear
BH - H10	74.10	170			1705	29	332	0.192	1.98	1.53	12.8	Intermediate
BH - I21B	28.70	120			833	26	243	0.2	2.04	1.63	12.5	Intermediate
BH - I21B	29.51	95			894	24	189	0.182	2.02	1.64	12.3	Intermediate
BH - I21B	32.99	110			993	22	226	0.173	2.06	1.68	13.0	Barrelling
BH - I21B	44.50	150			1156	34	297	0.2	1.90	1.42	12.7	Intermediate
BH - I21B	48.90	170			1282	29	334	0.2	1.98	1.54	10.3	Intermediate
BH - K16	40.50	130			1011	32	266	0.2	1.96	1.49	15.3	Barrelling
BH - K16	44.50	130			1095	28	256	0.2	1.97	1.54	15.4	Barrelling
BH - K16	48.30	120			1177	26	237	0.2	1.97	1.57	15.3	Intermediate
BH - K16	55.50	190			1194	47	386	0.2	1.75	1.19	8.3	Shear
BH - K16	59.50	270			1269	48	534	0.2	1.77	1.19	9.4	Shear

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377:1990 - Part 7 : Section 8

Gardline

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

US Wind Inc sea energy

Core Number	Level in core (m)	Undrained Shear Strength (kPa)		Specimen Diameter	Total Cell Pressure	Initial Moisture	Dev. Stress at Failure	Sample Length	Bulk Density	Dry Density	Strain at Failure	Mode of Failure
		C_u	C_r	mm	kN/m²	%	kN/m²	mm	Mg/m³	Mg/m³	%	
BH - MET TOWER	26.00	170			798	42	331	0.2	1.88	1.33	10.3	Shear
BH - MET TOWER	29.50	160			901	27	321	0.2	1.98	1.56	15.1	Barrelling
BH - MET TOWER	33.50	150			965	28	289	0.2	1.94	1.52	9.7	Shear

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

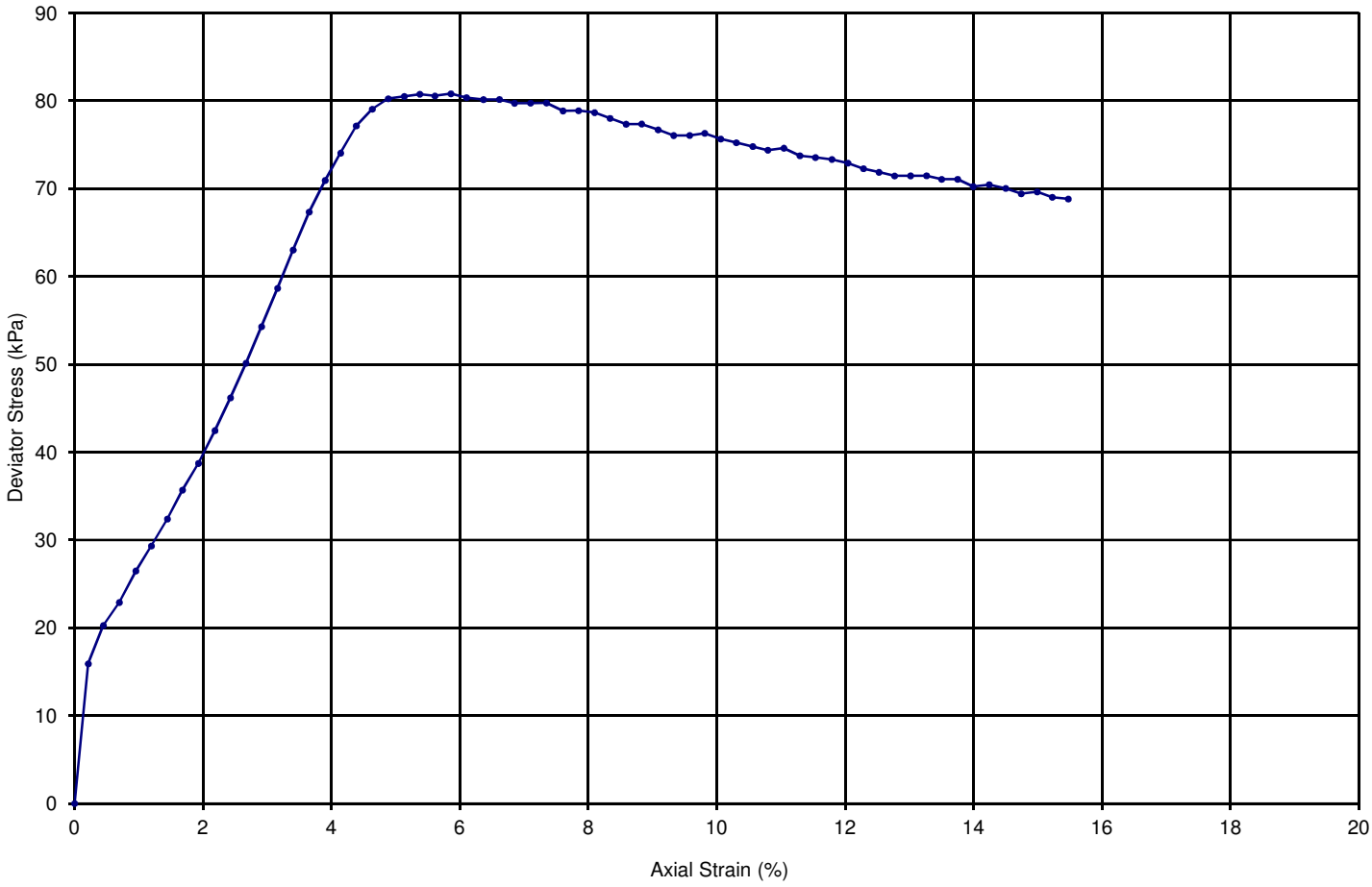
BS1377:1990 - Part 7 : Section 8

3.8 Undrained Unconsolidated Triaxial (UU) Test Results

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH-D14
Soil description	**CLAY**	Sample No./Type	P07 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	10.30 - 10.50m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	54
Bulk Density ρ	Mg/m3	1.72
Dry Density $\rho\delta$	Mg/m3	1.12
Initial Height of the Specimen	mm	136.4
Initial Diameter of the Specimen	mm	72.1
Cell Pressure σ_3	kPa	373
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	81
Failure Strain e	%	5.9
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	40

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

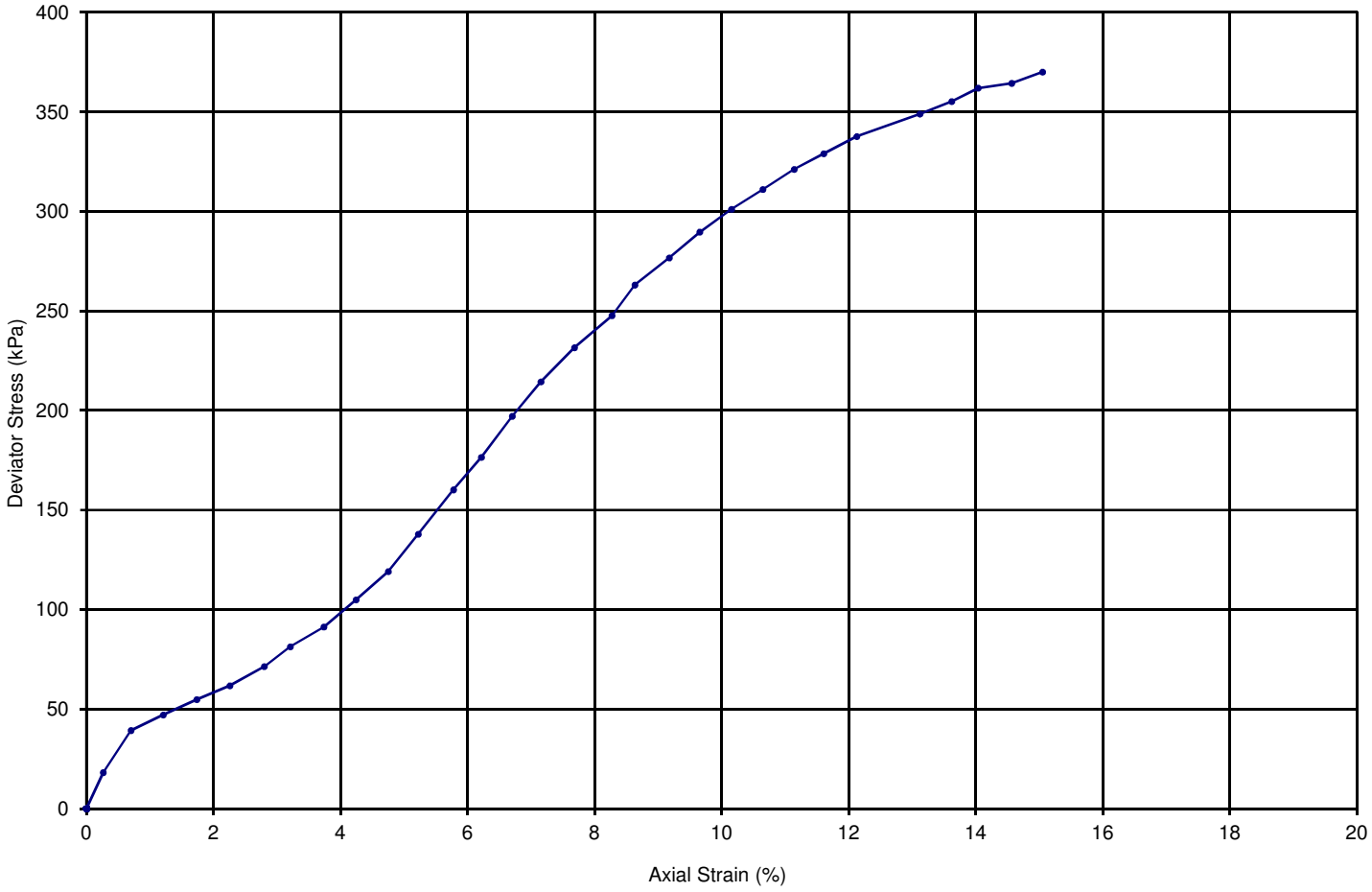
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - D14A
Soil description	**0**	Sample No./Type	P08 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	48.8-49.1m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	28
Bulk Density ρ	Mg/m3	1.93
Dry Density ρδ	Mg/m3	1.51
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1129
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	370
Failure Strain e	%	15.0
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	185

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

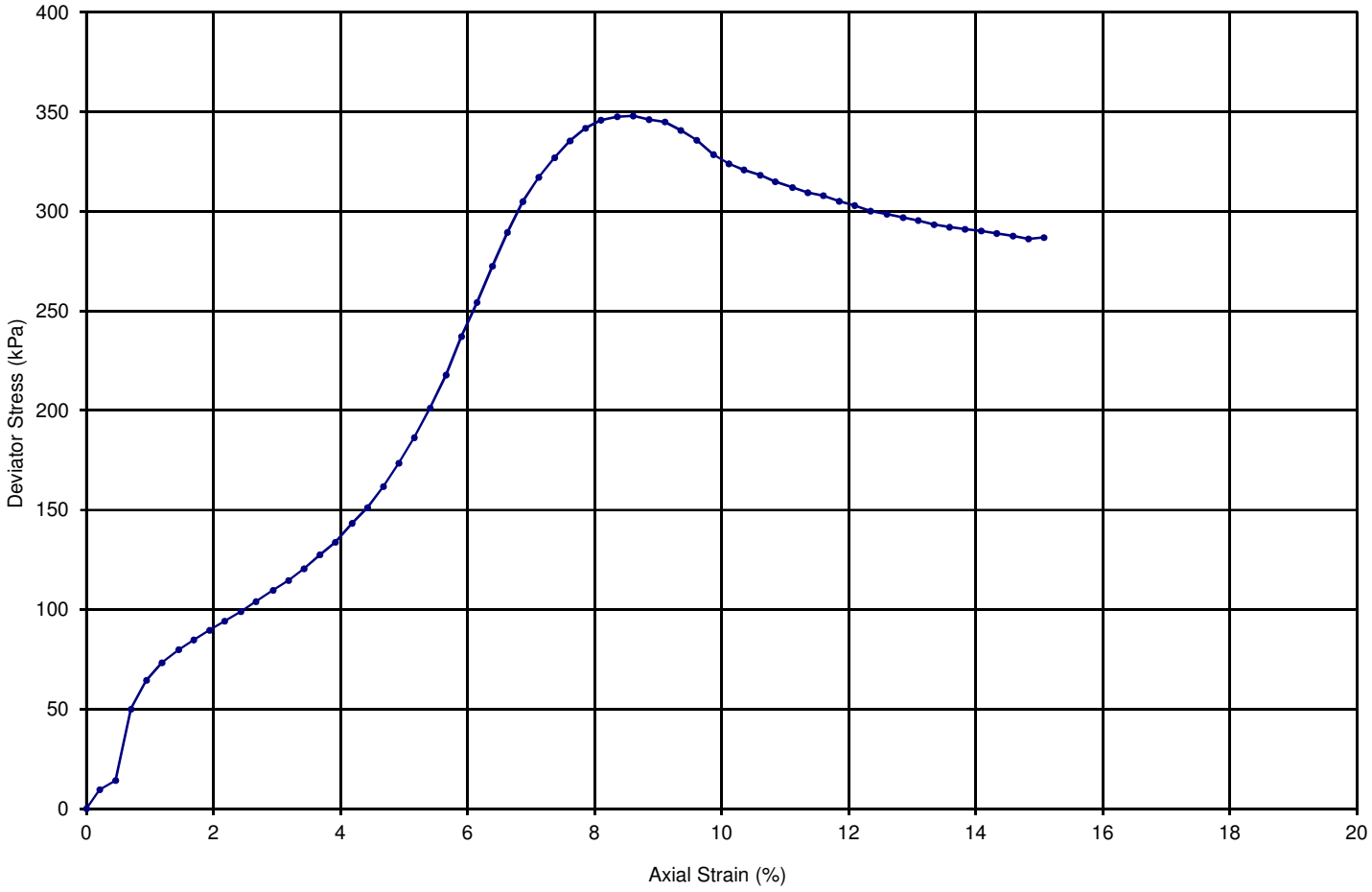
Tested by:	Checked by:	Approved by:
JA	**NH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - D14A
Soil description	**0**	Sample No./Type	P09 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	52.85-53.05

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	35
Bulk Density ρ	Mg/m3	1.87
Dry Density ρδ	Mg/m3	1.39
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1158
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	348
Failure Strain e	%	8.6
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	174

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

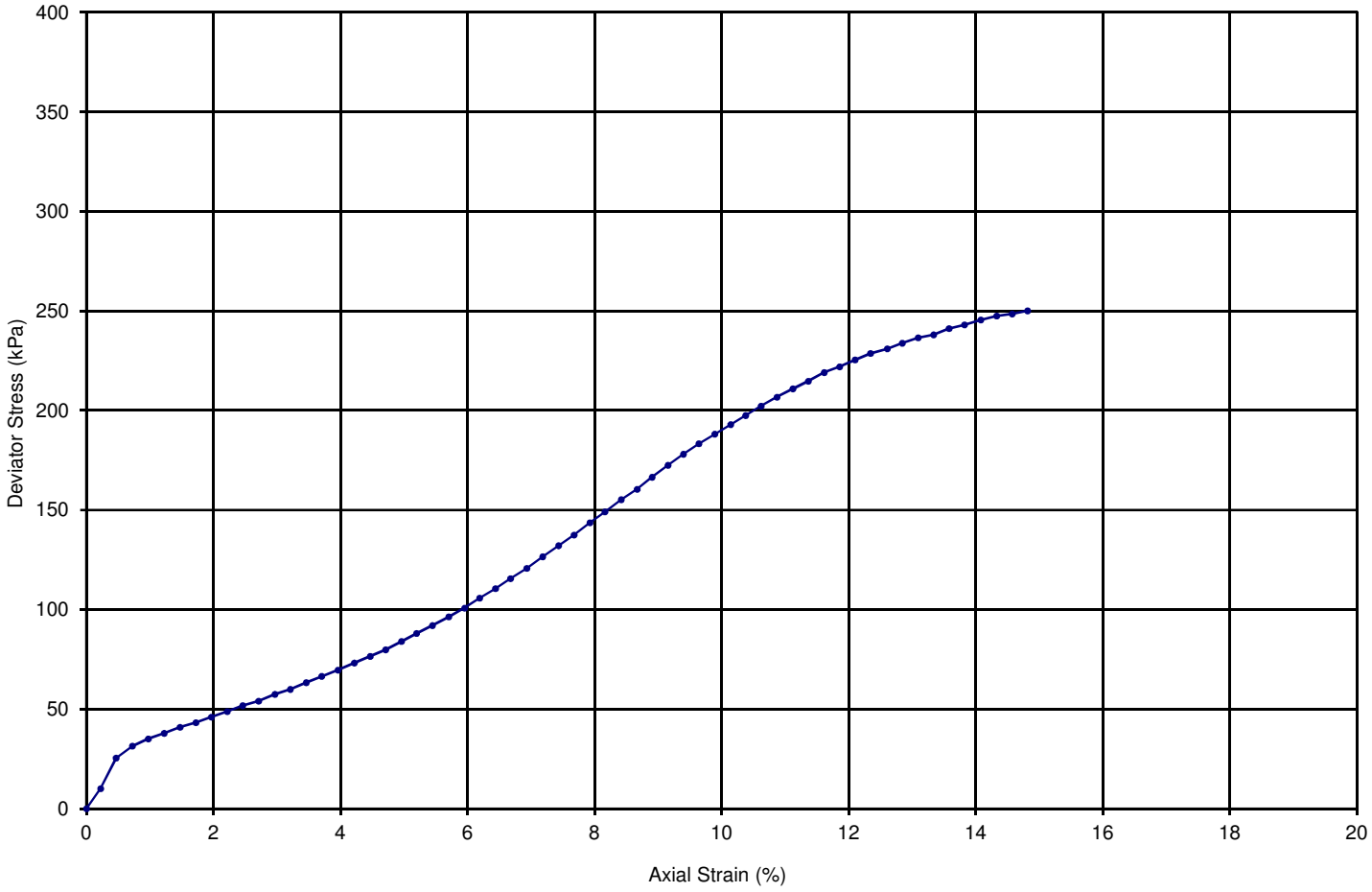
Tested by:	Checked by:	Approved by:
JA	**NH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - D14A
Soil description	**0**	Sample No./Type	P11 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	60.7-60.9m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	27
Bulk Density ρ	Mg/m3	1.99
Dry Density $\rho\delta$	Mg/m3	1.57
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1375
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	250
Failure Strain e	%	14.8
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	125

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

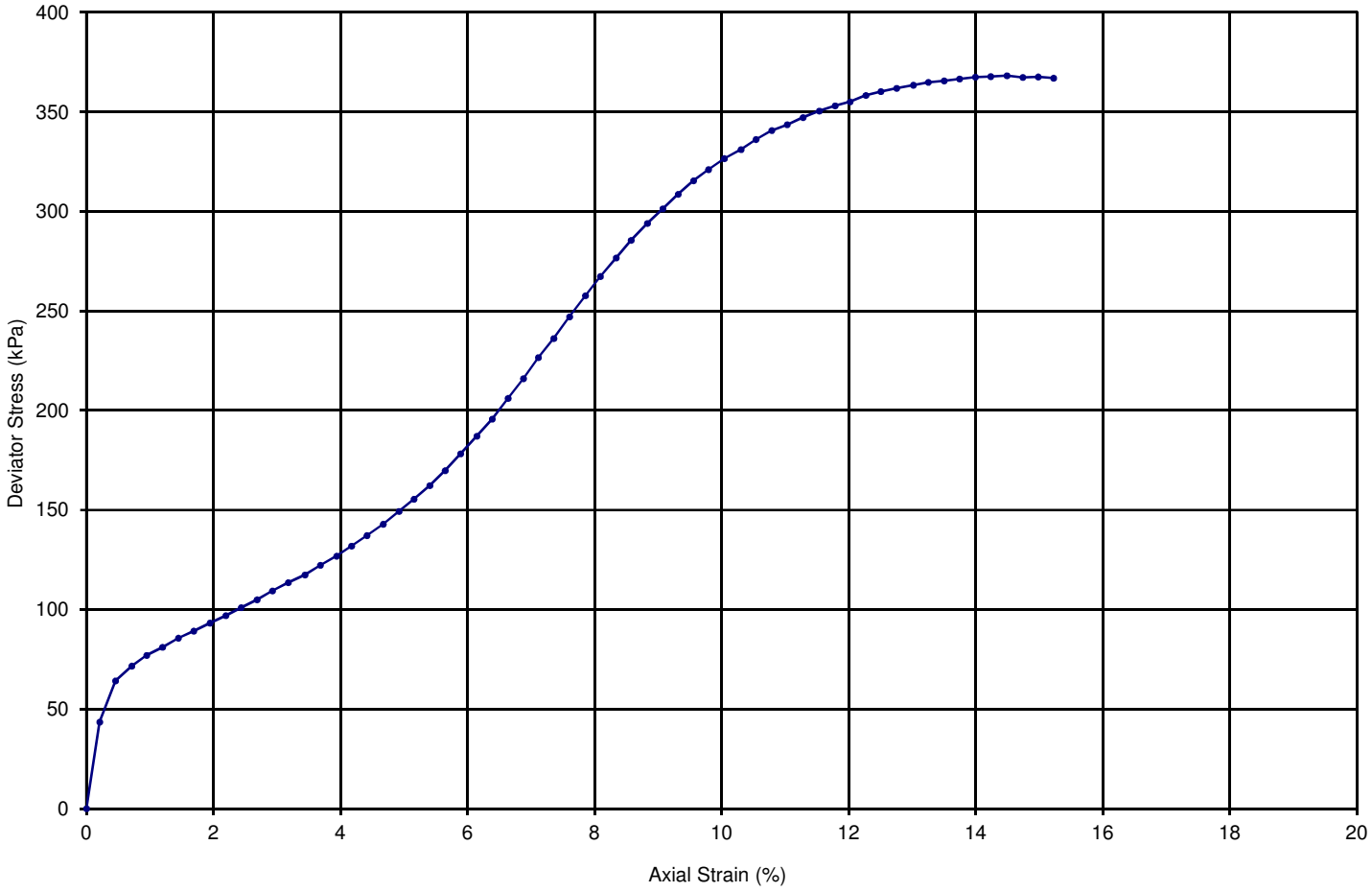
Tested by:	Checked by:	Approved by:
JA	**NH**	

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G17
Soil description	**CLAY**	Sample No./Type	P14A _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	33.90-34.10

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	-7340
Bulk Density ρ	Mg/m3	1.93
Dry Density $\rho\delta$	Mg/m3	-0.03
Initial Height of the Specimen	mm	144.5
Initial Diameter of the Specimen	mm	70.7
Cell Pressure σ_3	kPa	889
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	368
Failure Strain e	%	14.5
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	184

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

Intermediate

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

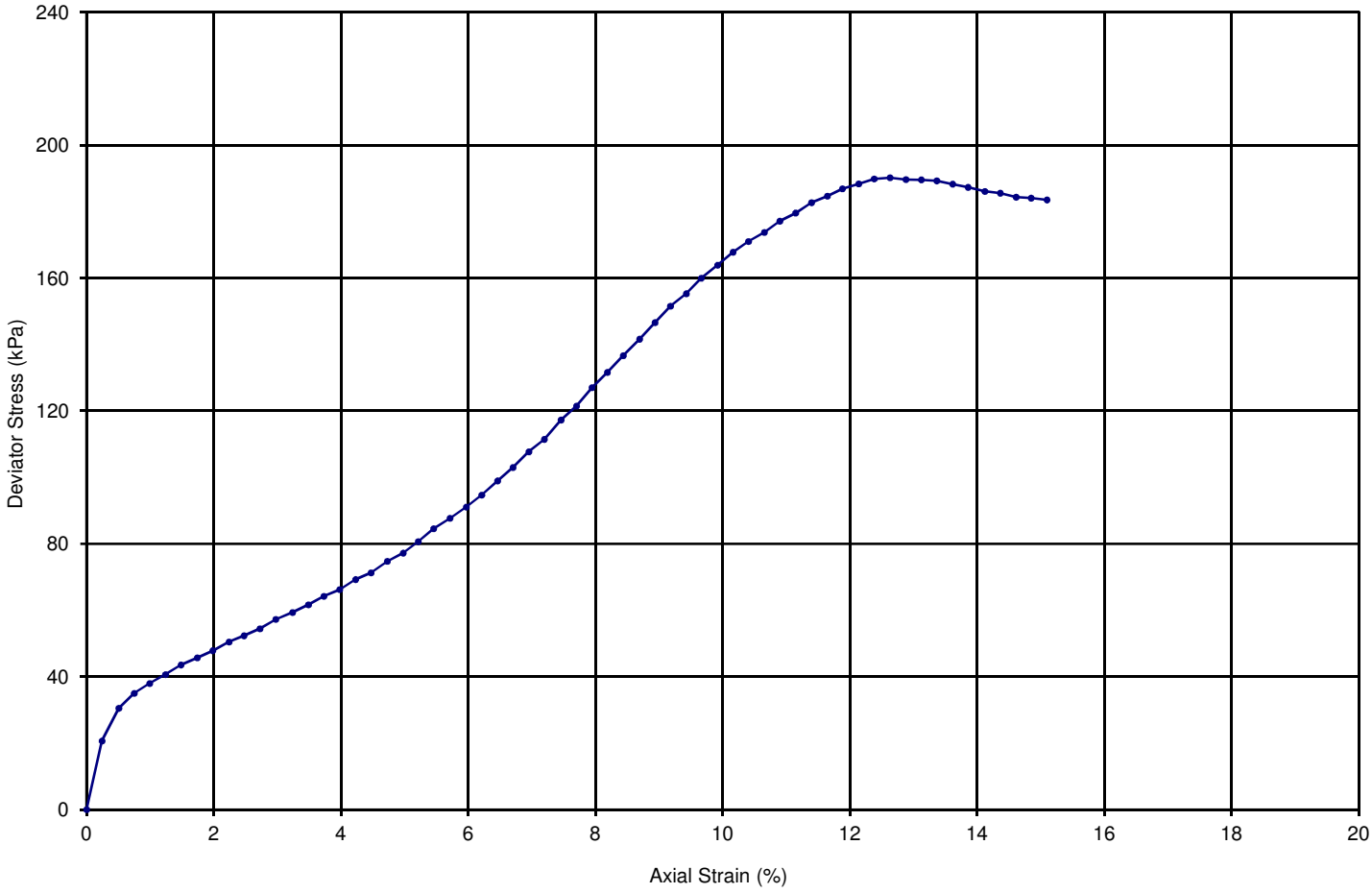
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G17
Soil description	**CLAY**	Sample No./Type	P15 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	37.90-38.10

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	-8630
Bulk Density ρ	Mg/m3	1.97
Dry Density $\rho\delta$	Mg/m3	-0.02
Initial Height of the Specimen	mm	144.3
Initial Diameter of the Specimen	mm	70.6
Cell Pressure σ_3	kPa	982
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	190
Failure Strain e	%	12.6
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	95

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

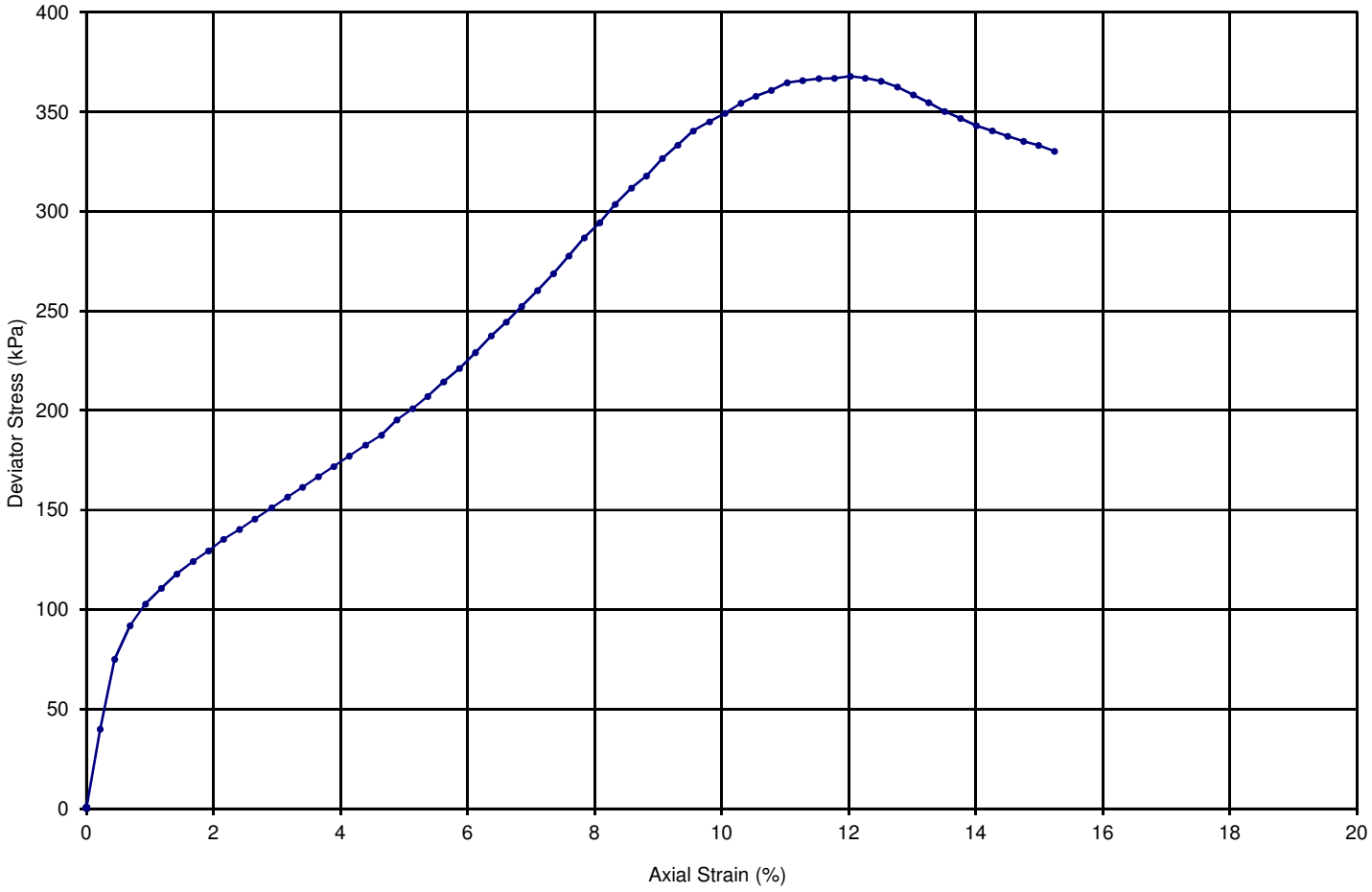
Remarks:	Tested by:	Checked by:	Approved by:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm Sample sheared at a strain rate of 1 %min	**NH**	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G17A
Soil description	**CLAY**	Sample No./Type	P01 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	41.40-41.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	29
Bulk Density ρ	Mg/m3	1.88
Dry Density ρδ	Mg/m3	1.45
Initial Height of the Specimen	mm	140.0
Initial Diameter of the Specimen	mm	70.0
Cell Pressure σ_3	kPa	1013
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	368
Failure Strain e	%	12.0
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	184

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

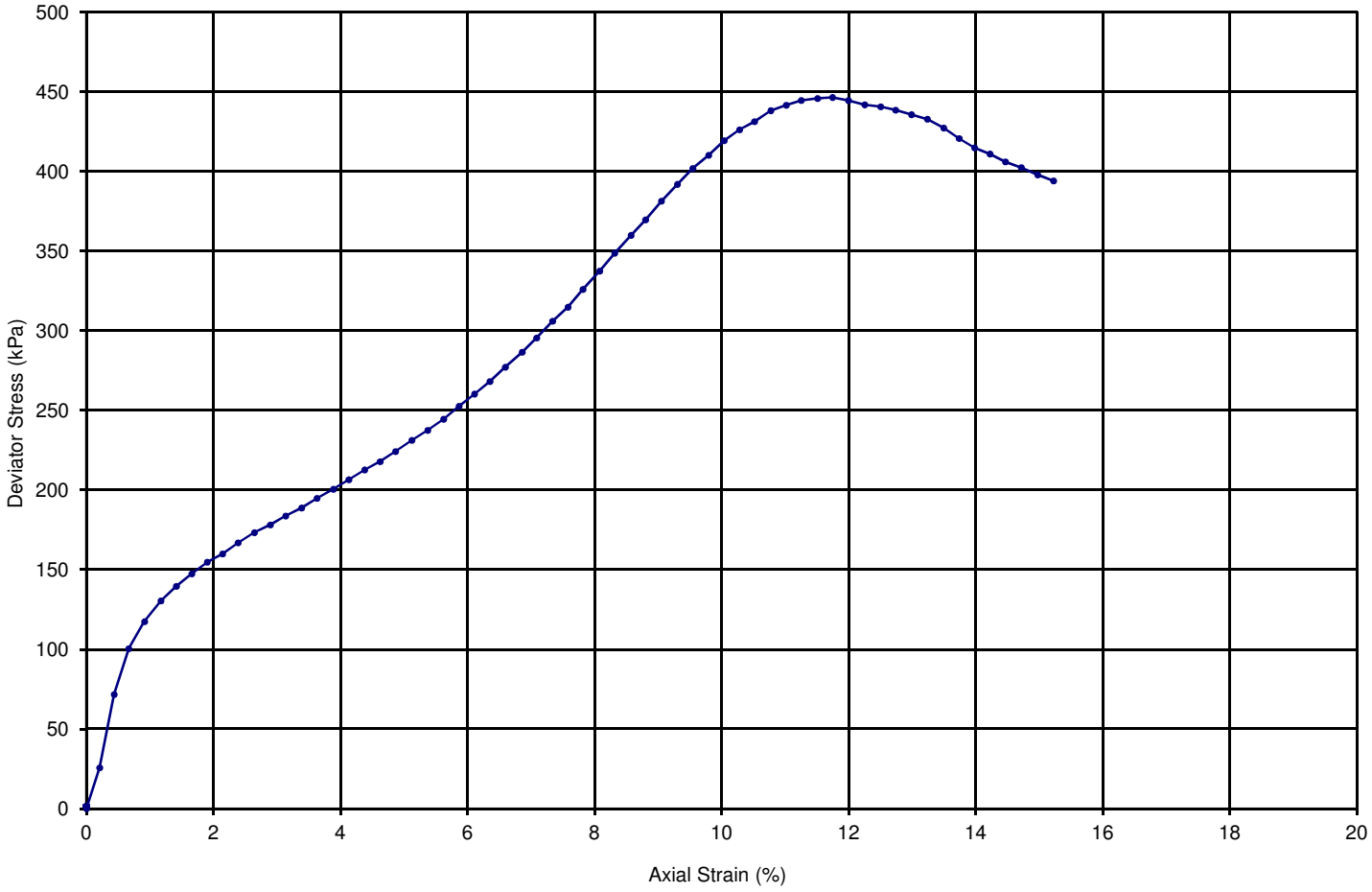
Tested by:	Checked by:	Approved by:
JA	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G17A
Soil description	**CLAY**	Sample No./Type	P05_ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	56.30-56.50

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	30
Bulk Density ρ	Mg/m3	1.89
Dry Density ρδ	Mg/m3	1.45
Initial Height of the Specimen	mm	140.0
Initial Diameter of the Specimen	mm	70.0
Cell Pressure σ_3	kPa	1293
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	446
Failure Strain e	%	11.7
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	223

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

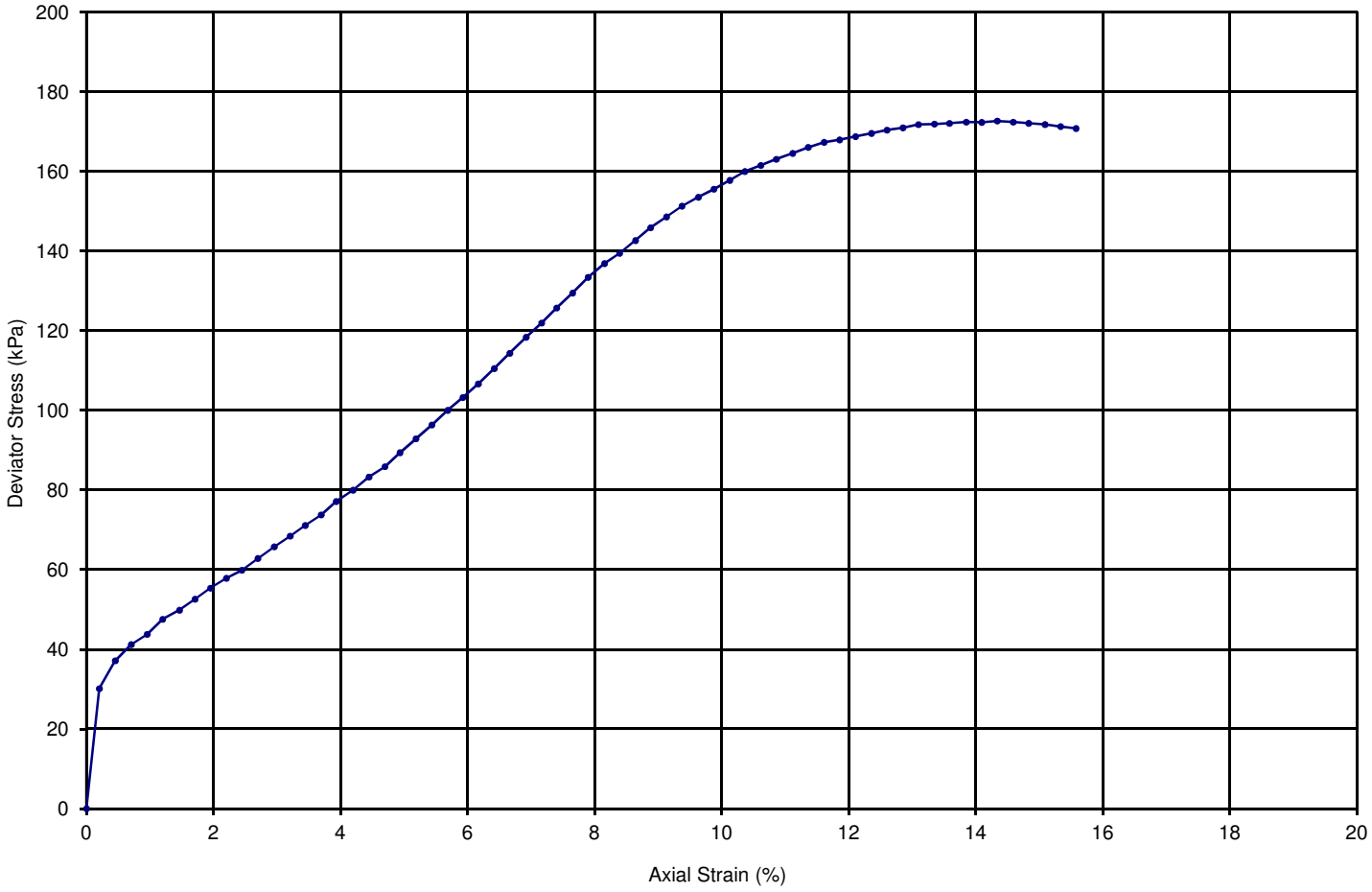
Tested by:	Checked by:	Approved by:
JA	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G7
Soil description	**CLAY**	Sample No./Type	P12 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	27.05 - 27.25

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	29
Bulk Density ρ	Mg/m3	1.91
Dry Density ρδ	Mg/m3	1.48
Initial Height of the Specimen	mm	143.5
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	688
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	172
Failure Strain e	%	14.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	86

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

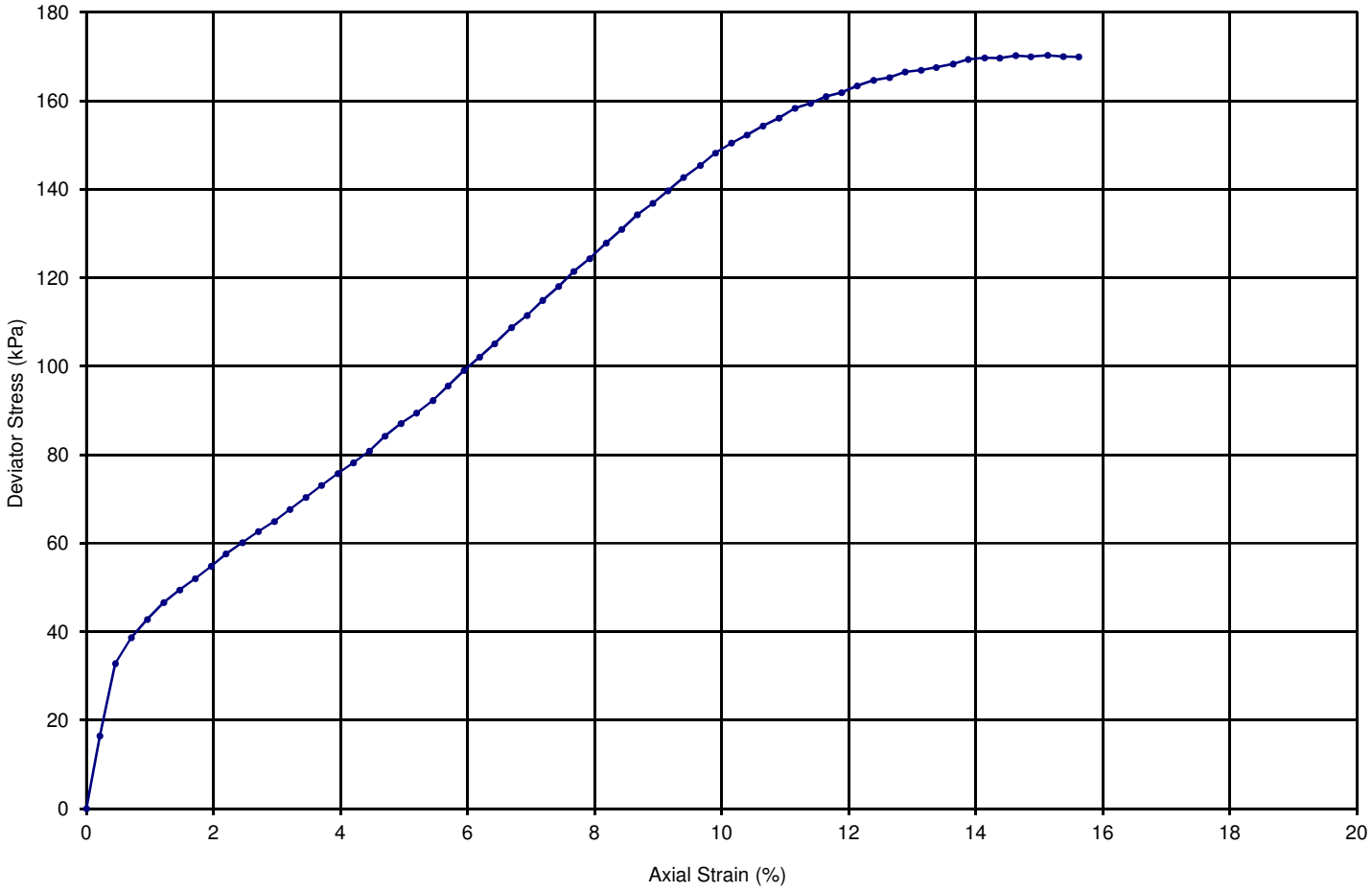
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G7
Soil description	**CLAY**	Sample No./Type	P13 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	31.10 - 31.30

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	22
Bulk Density ρ	Mg/m3	2.03
Dry Density $\rho\delta$	Mg/m3	1.67
Initial Height of the Specimen	mm	143.0
Initial Diameter of the Specimen	mm	71.4
Cell Pressure σ_3	kPa	895
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	170
Failure Strain e	%	15.1
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	85

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

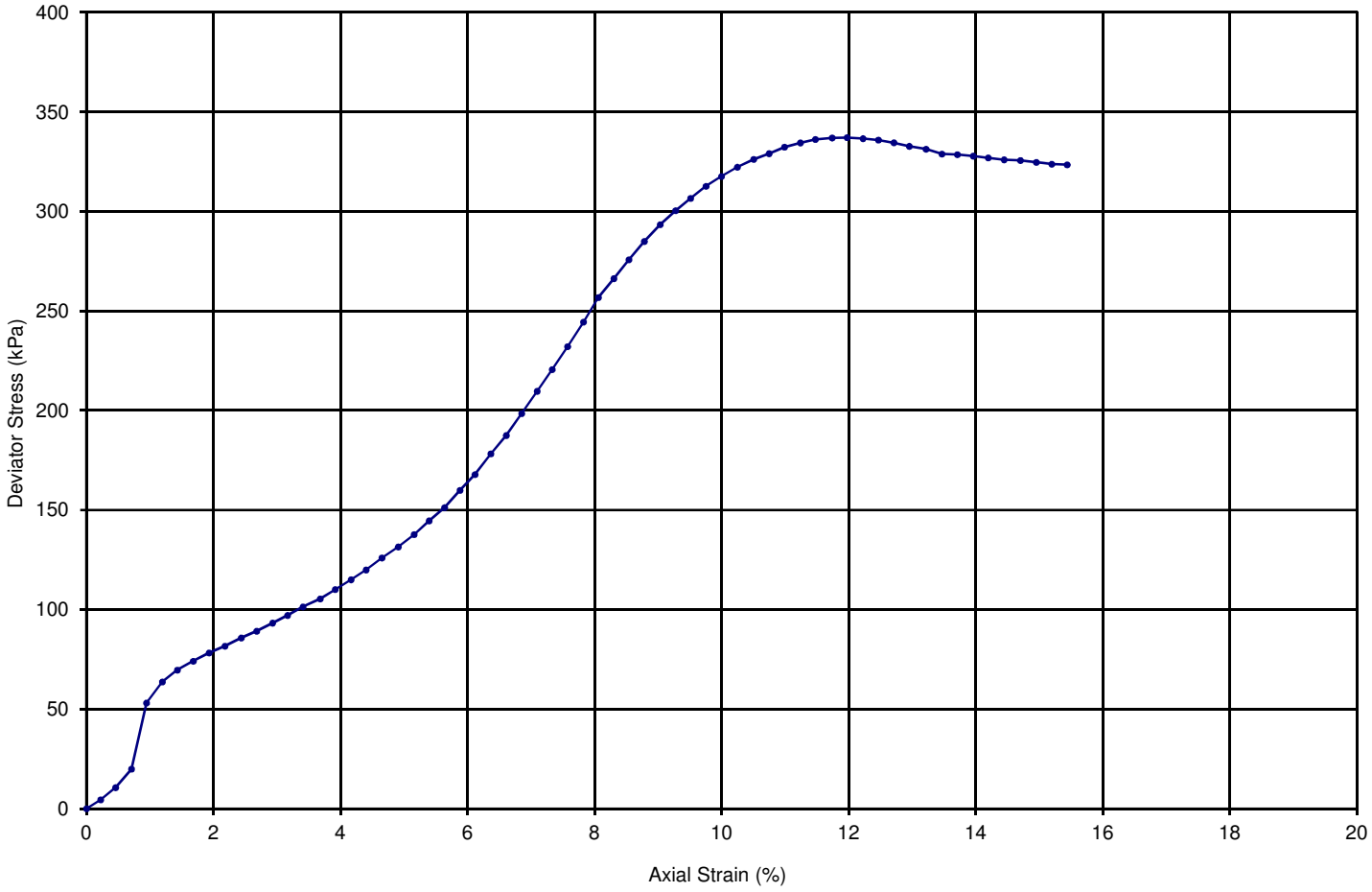
Remarks:	Tested by:	Checked by:	Approved by:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm Sample sheared at a strain rate of 1 %min	**NH**	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G7
Soil description	**sandy CLAY**	Sample No./Type	P15 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	39.40-39.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	32
Bulk Density ρ	Mg/m3	1.88
Dry Density ρδ	Mg/m3	1.43
Initial Height of the Specimen	mm	144.1
Initial Diameter of the Specimen	mm	71.8
Cell Pressure σ_3	kPa	1002
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	337
Failure Strain e	%	12.0
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	168

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

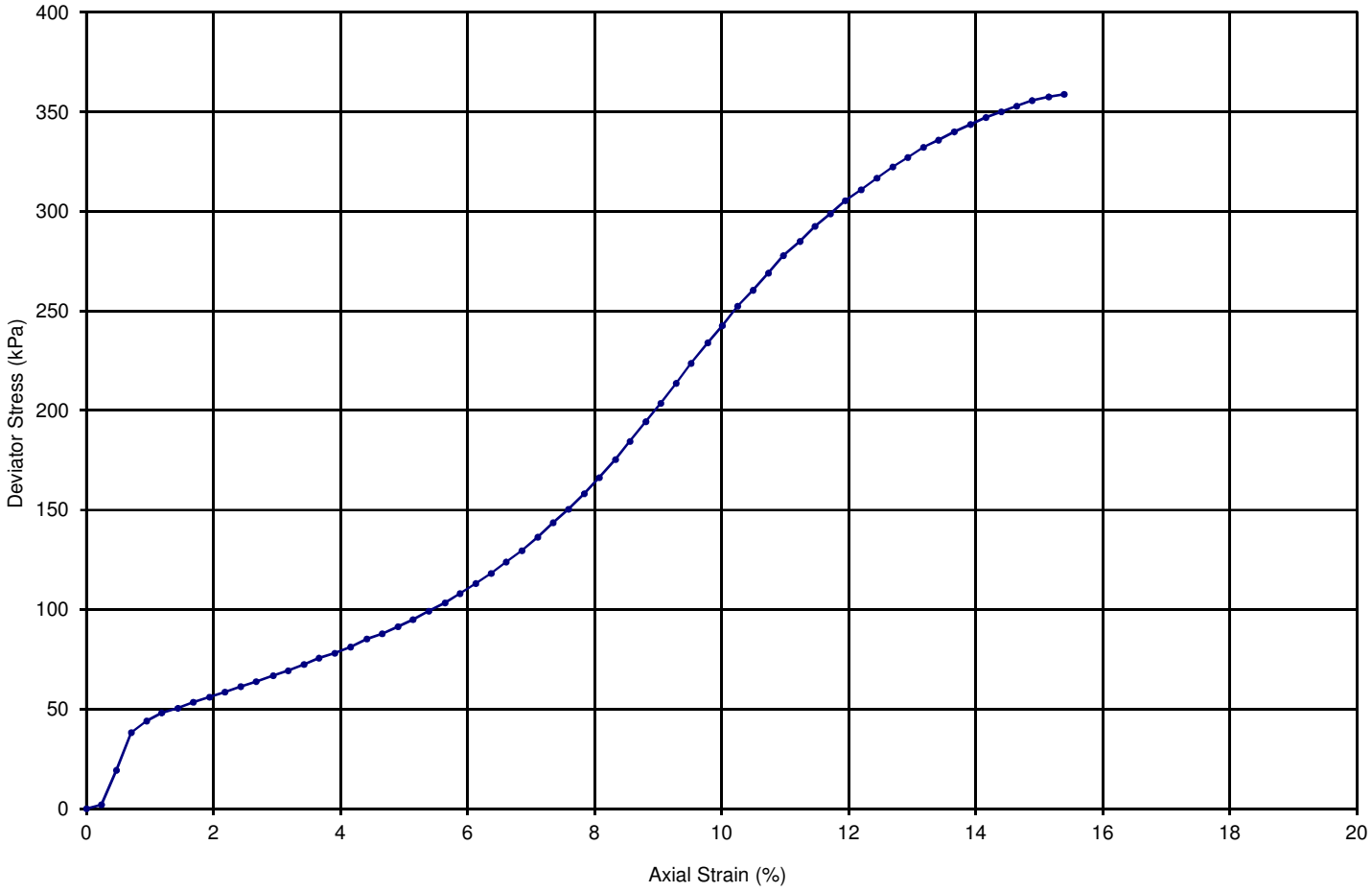
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G7
Soil description	**CLAY/SAND**	Sample No./Type	P16 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	43.40 - 43.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	29
Bulk Density ρ	Mg/m3	1.98
Dry Density $\rho\delta$	Mg/m3	1.53
Initial Height of the Specimen	mm	144.6
Initial Diameter of the Specimen	mm	71.6
Cell Pressure σ_3	kPa	1111
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	359
Failure Strain e	%	15.4
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	179

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

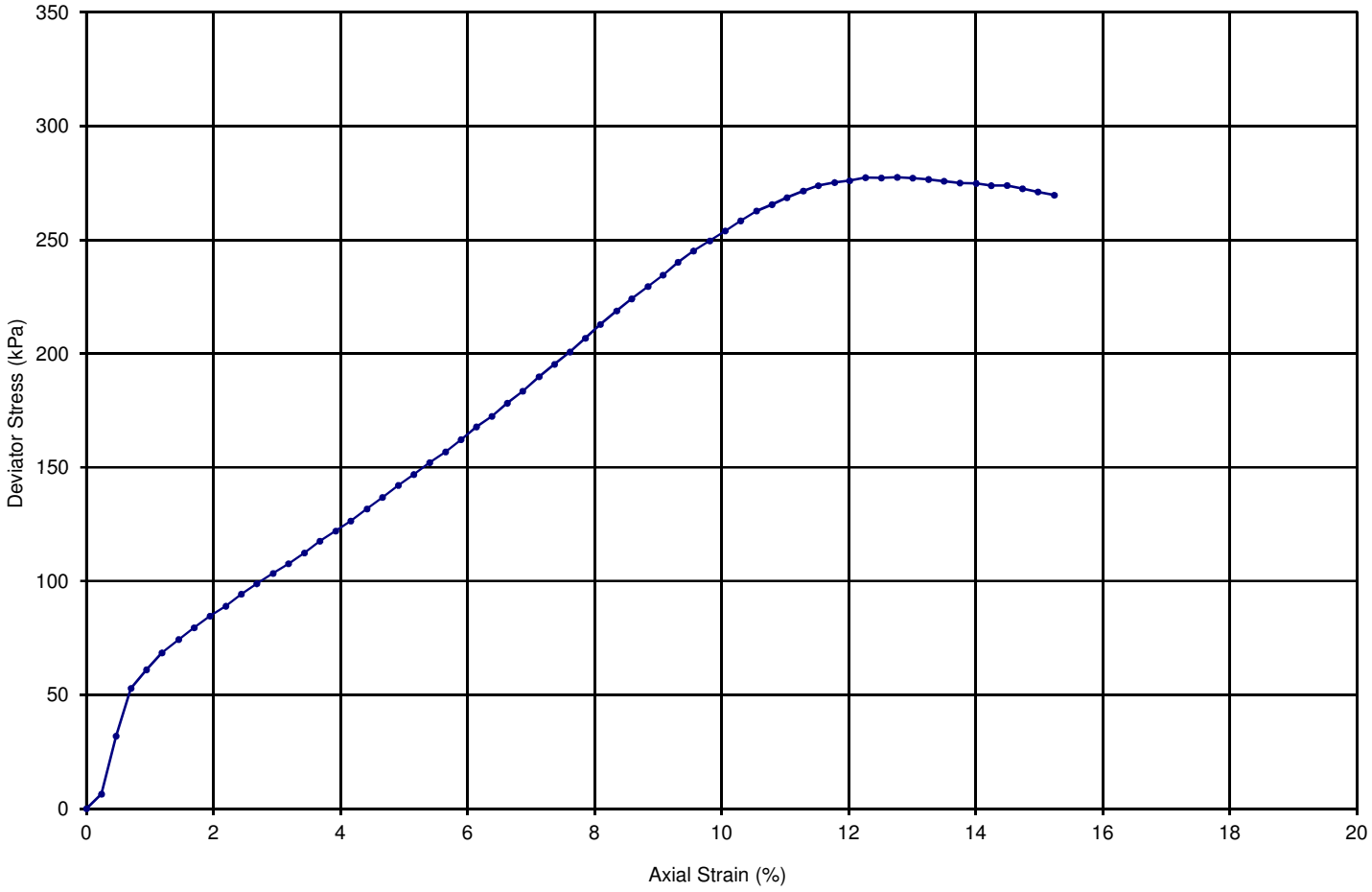
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - G7
Soil description	**CLAY**	Sample No./Type	P24 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	71.80 - 72.00m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	27
Bulk Density ρ	Mg/m3	1.98
Dry Density ρδ	Mg/m3	1.55
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	71.9
Cell Pressure σ_3	kPa	1666
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	277
Failure Strain e	%	12.8
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	139

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

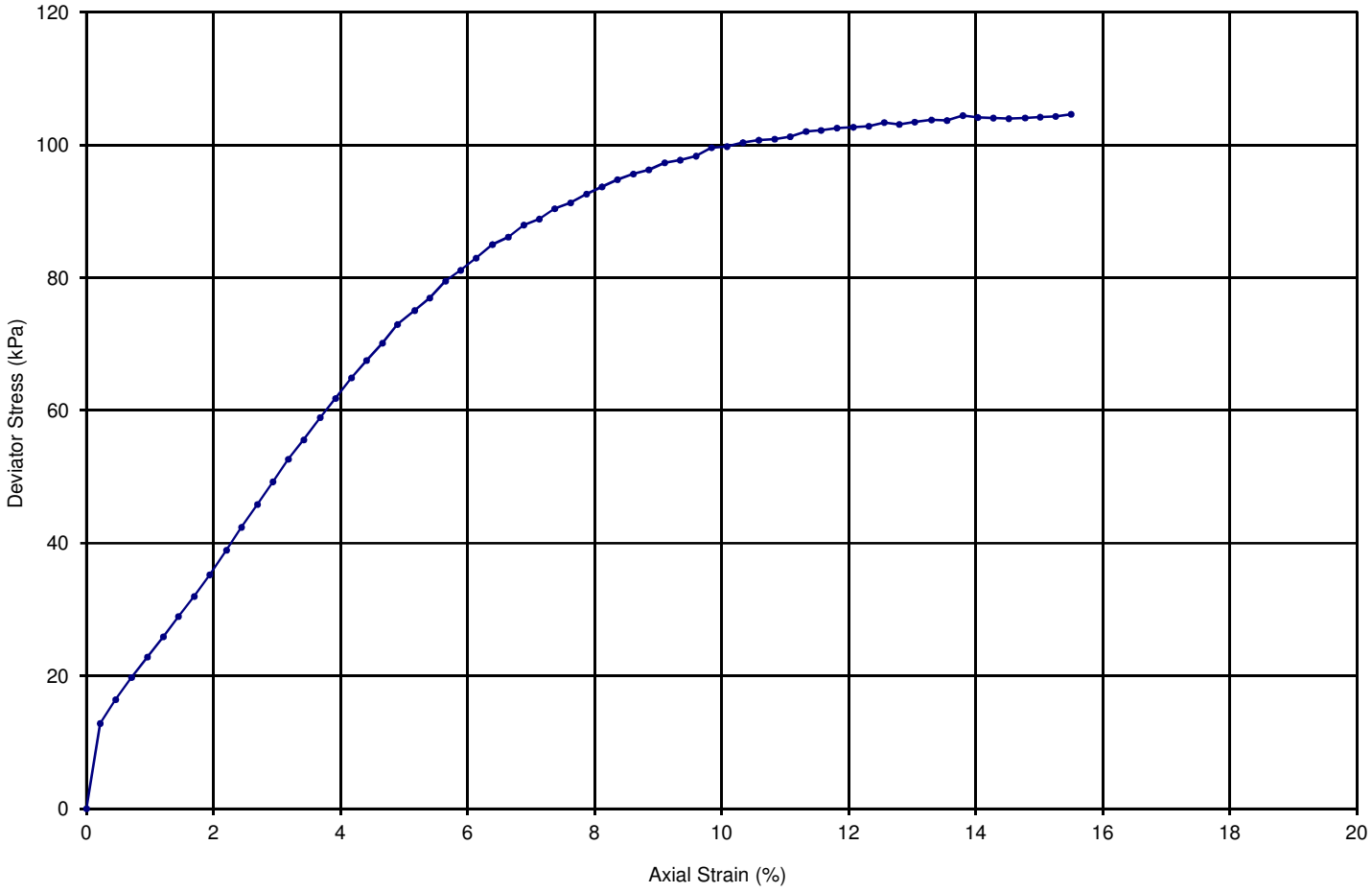
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - H10
Soil description	**CLAY**	Sample No./Type	P04 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	6.60 - 6.80

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	14
Bulk Density ρ	Mg/m3	2.08
Dry Density ρδ	Mg/m3	1.83
Initial Height of the Specimen	mm	143.8
Initial Diameter of the Specimen	mm	72.4
Cell Pressure σ_3	kPa	401
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	104
Failure Strain e	%	15.5
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	52

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

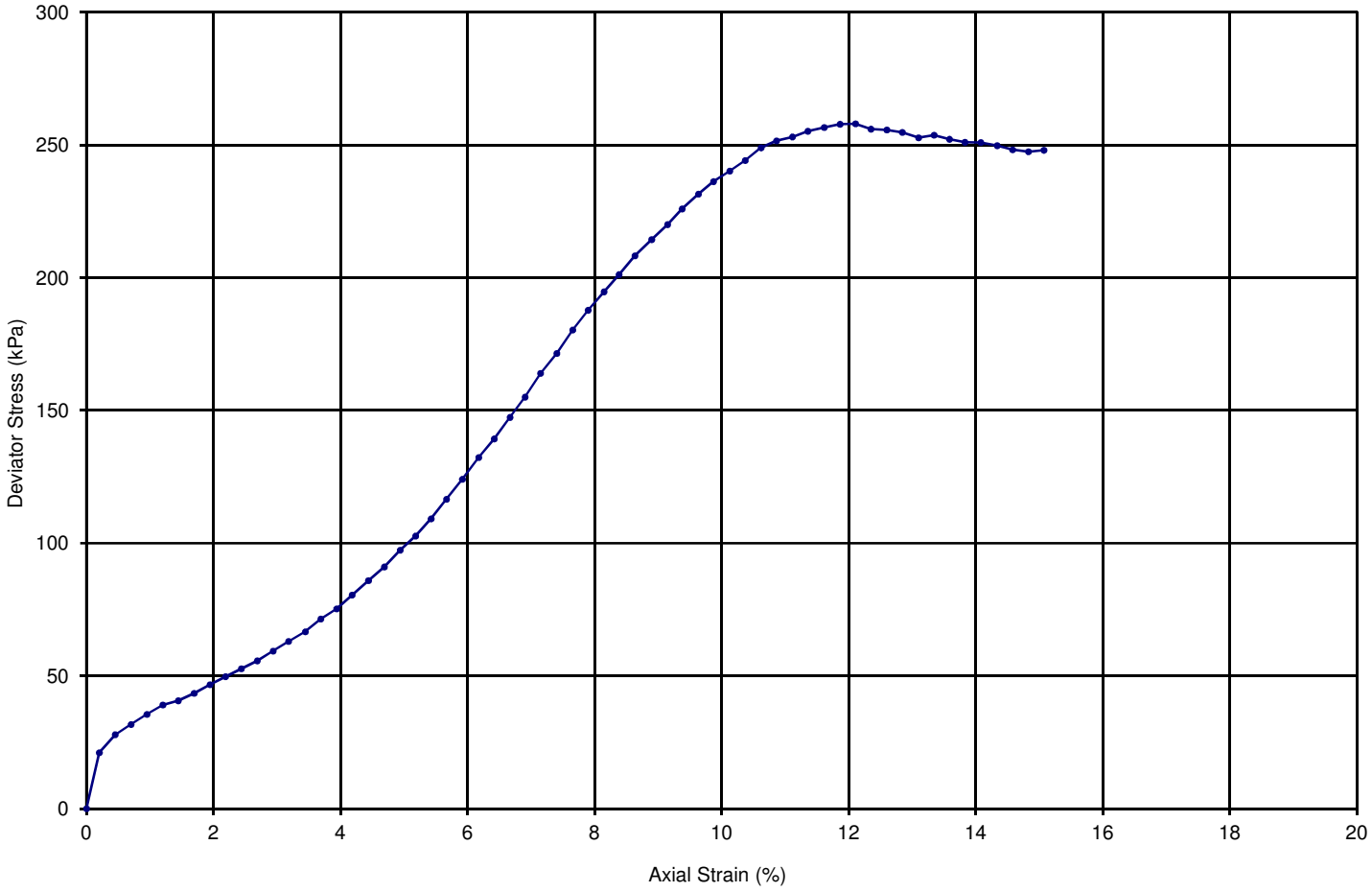
Tested by:	Checked by:	Approved by:
NH/XY	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - H10
Soil description	**sandy CLAY**	Sample No./Type	P15 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	50.60 - 50.80

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	32
Bulk Density ρ	Mg/m3	1.91
Dry Density ρδ	Mg/m3	1.45
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1216
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	258
Failure Strain e	%	12.1
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	129

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

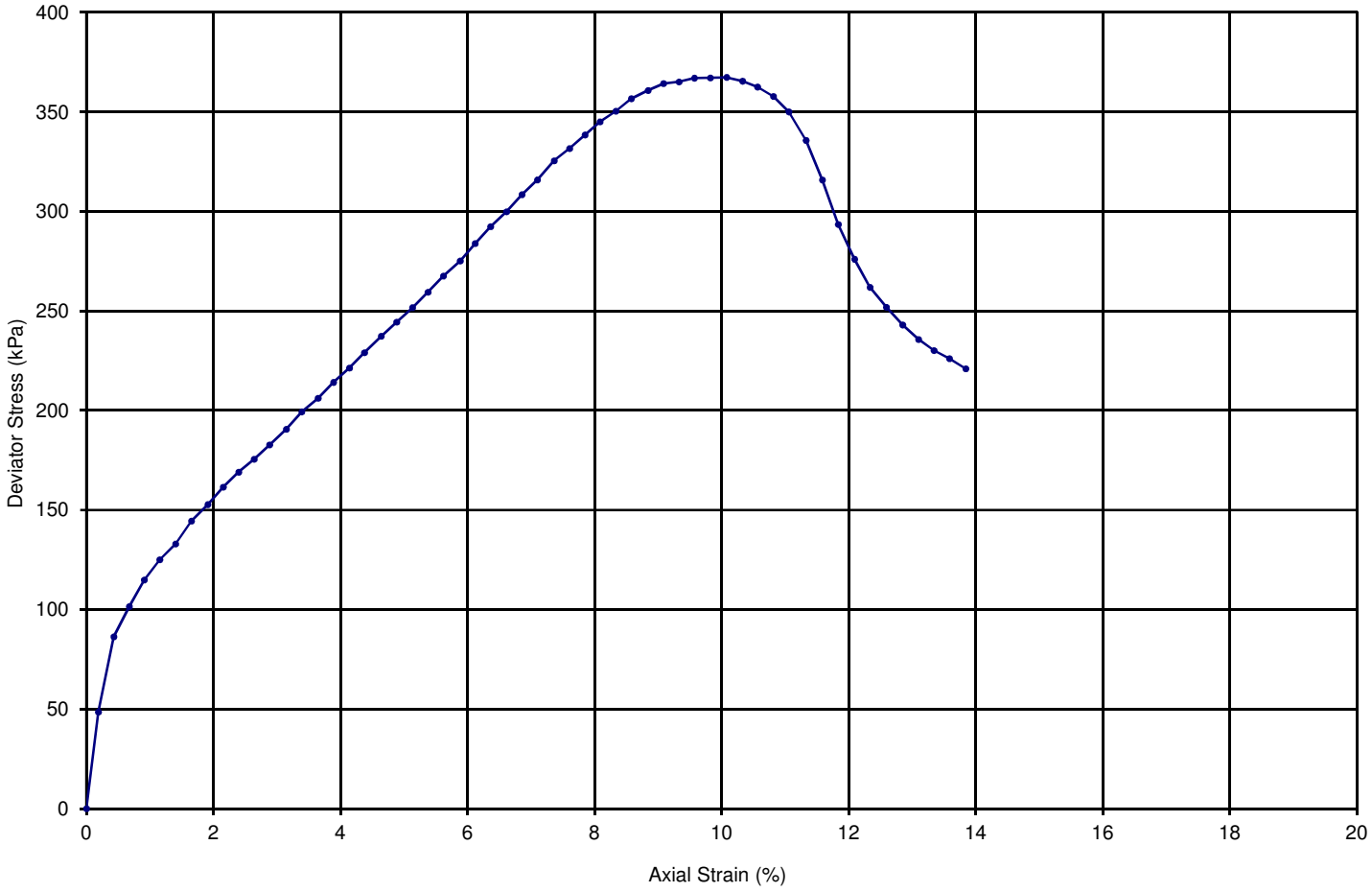
Tested by:	Checked by:	Approved by:
JA	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - H10
Soil description	**CLAY**	Sample No./Type	P20 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	66.40-66.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	35
Bulk Density ρ	Mg/m3	1.89
Dry Density ρδ	Mg/m3	1.39
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1498
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	367
Failure Strain e	%	10.1
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	184

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

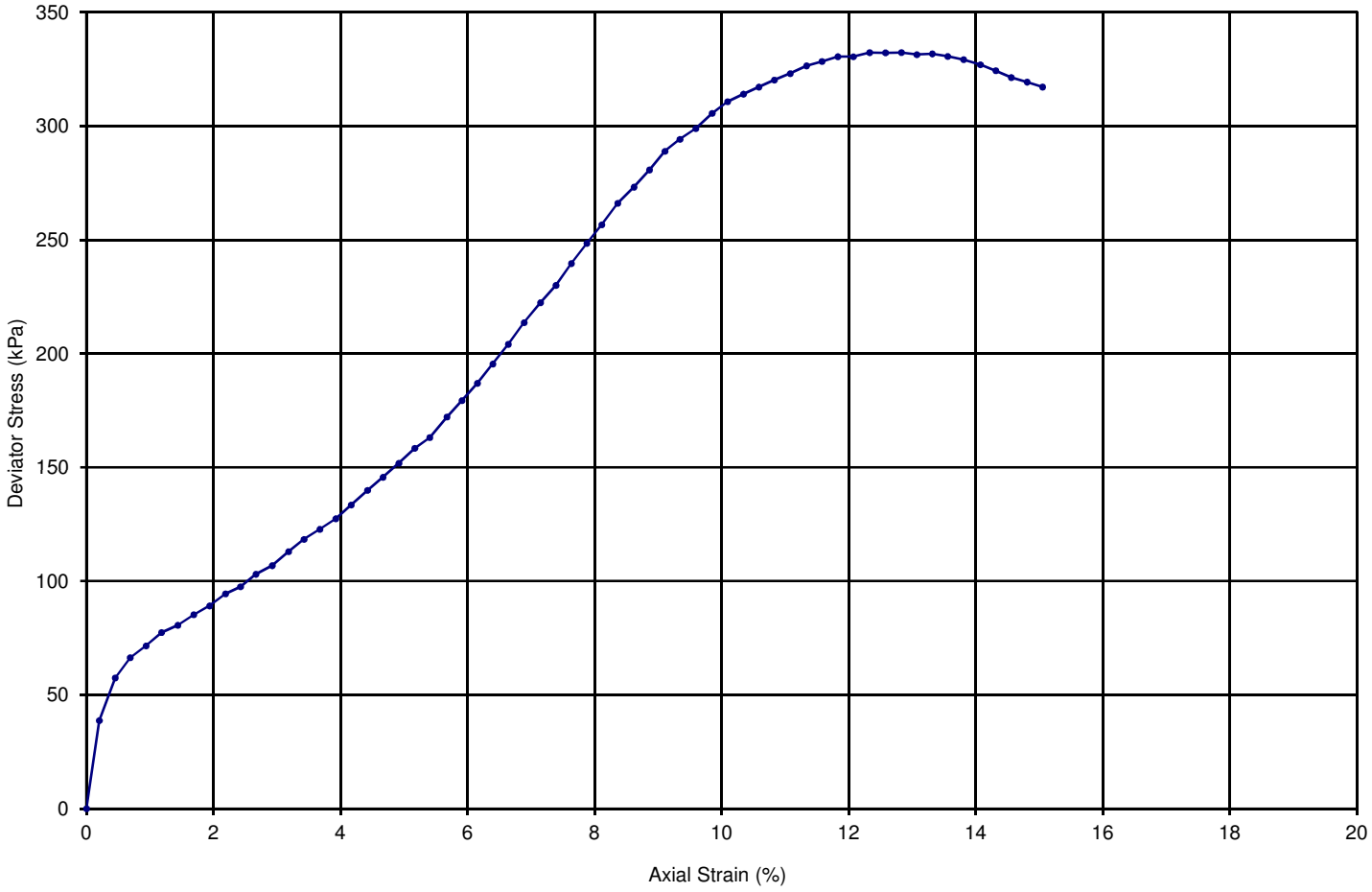
Tested by:	Checked by:	Approved by:
JA	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - H10
Soil description	**CLAY**	Sample No./Type	P22 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	74.00 - 74.20

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	29
Bulk Density ρ	Mg/m3	1.98
Dry Density ρδ	Mg/m3	1.53
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1705
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	332
Failure Strain e	%	12.8
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	166

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

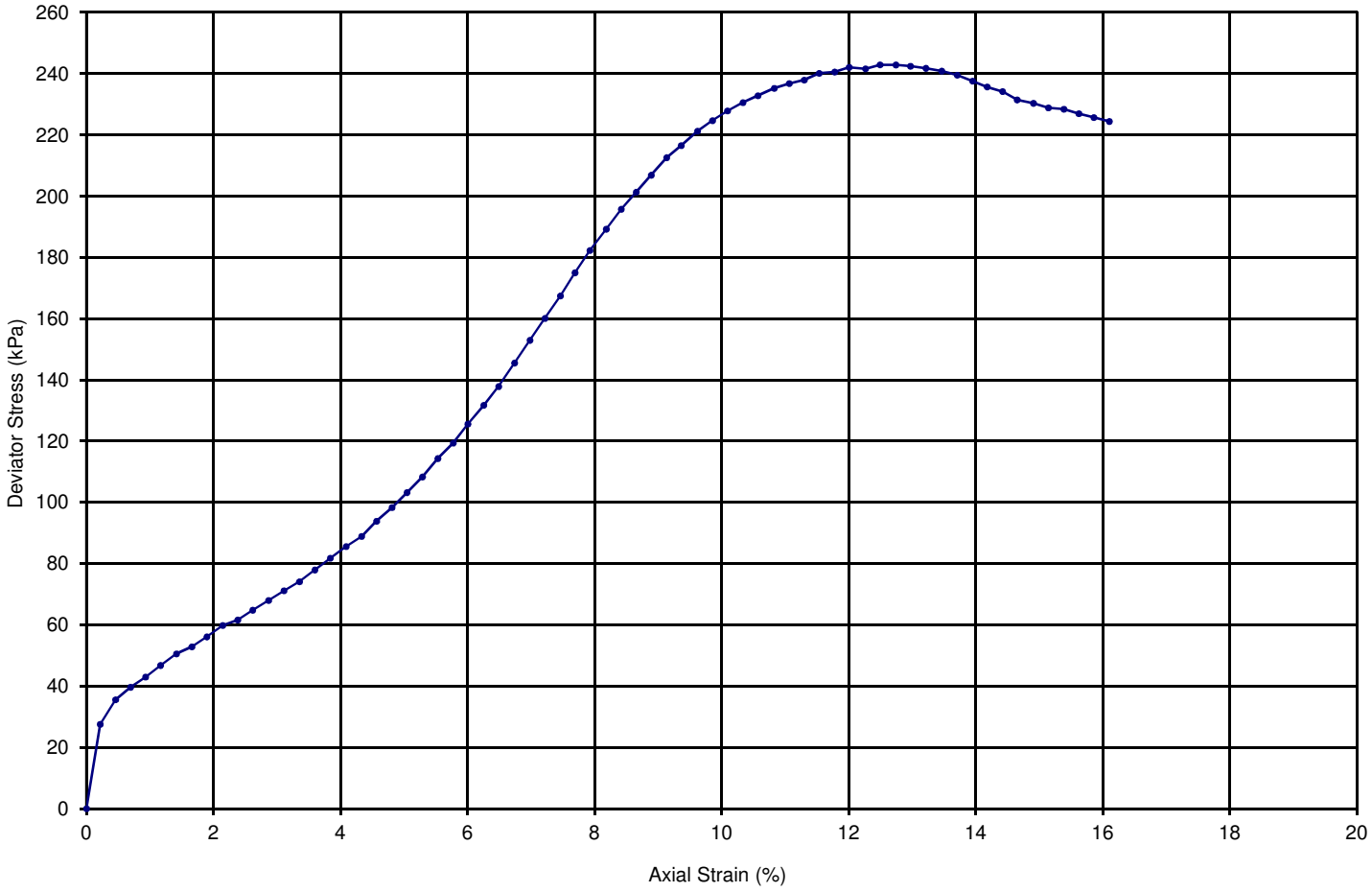
Tested by:	Checked by:	Approved by:
JA	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind Inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - I21B
Soil description	**CLAY**	Sample No./Type	P 01_U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	28.60 - 28.80

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	26
Bulk Density ρ	Mg/m3	2.04
Dry Density $\rho\delta$	Mg/m3	1.63
Initial Height of the Specimen	mm	144.1
Initial Diameter of the Specimen	mm	71.9
Cell Pressure σ_3	kPa	883
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	243
Failure Strain e	%	12.5
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	121

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

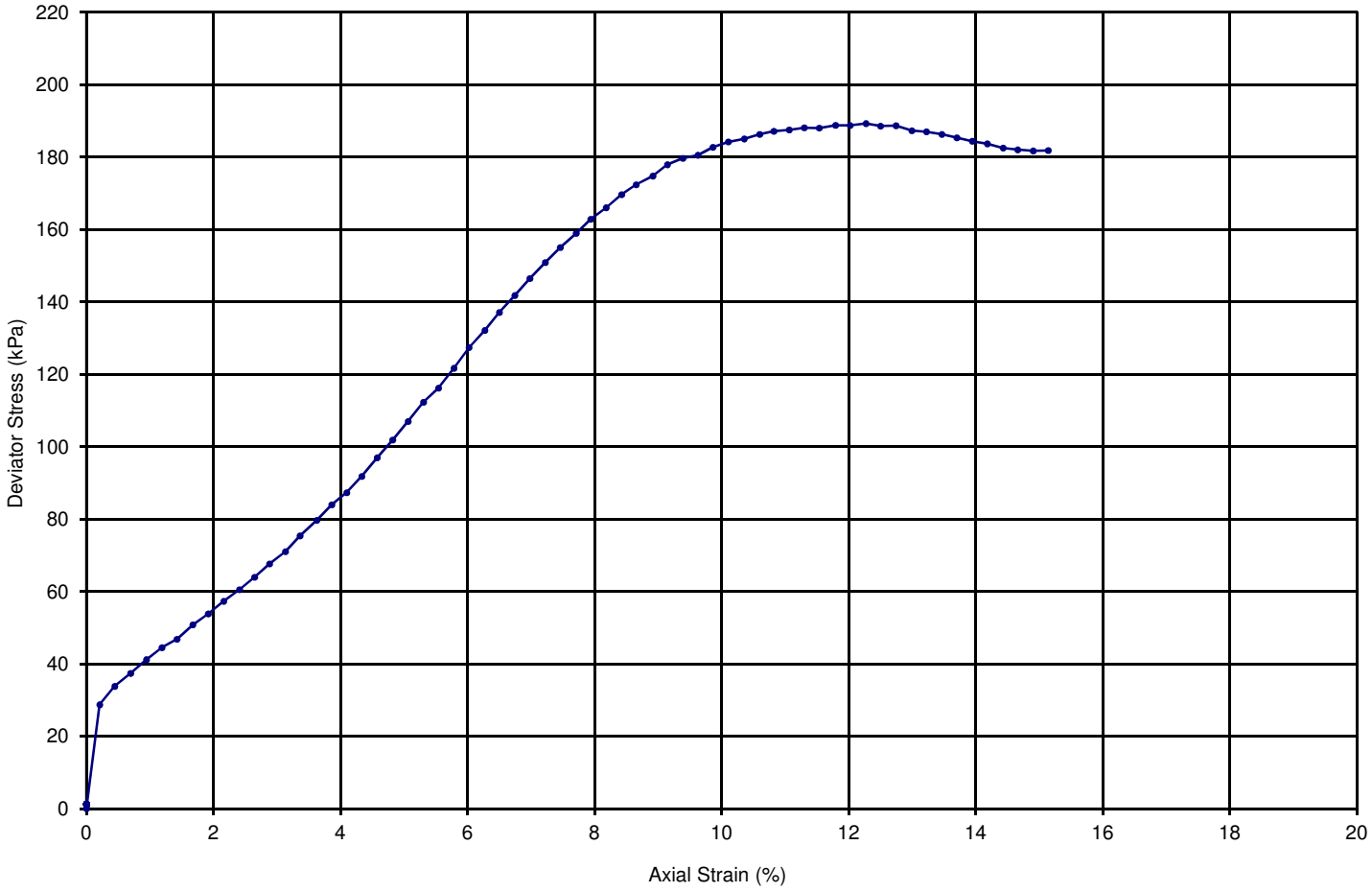
Tested by:	Checked by:	Approved by:
NH	**SH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - I21B
Soil description	**CLAY**	Sample No./Type	P02_U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	29.40 - 29.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	24
Bulk Density ρ	Mg/m3	2.02
Dry Density $\rho\delta$	Mg/m3	1.64
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	71.9
Cell Pressure σ_3	kPa	894
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	189
Failure Strain e	%	12.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	95

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

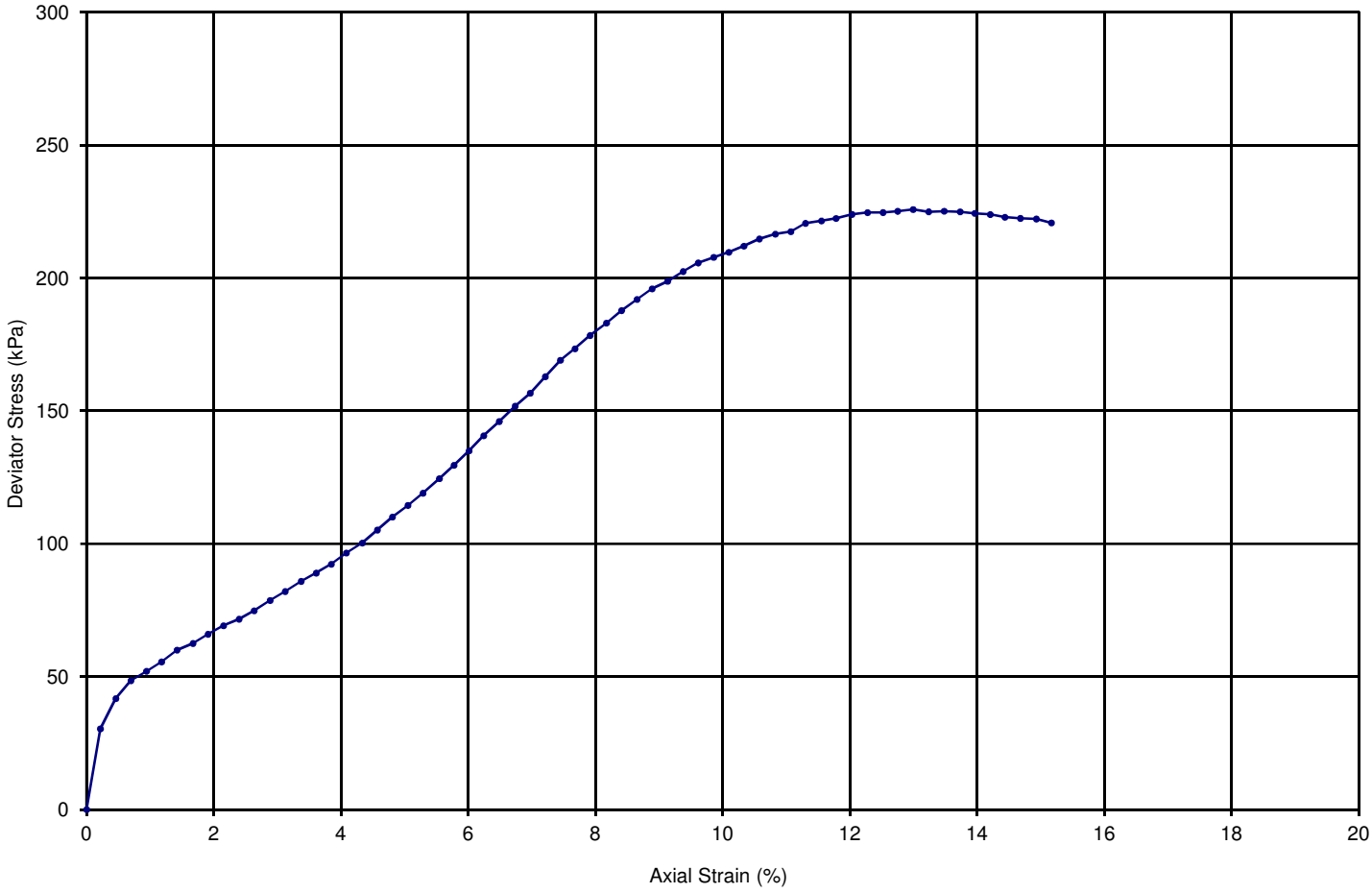
Tested by:	Checked by:	Approved by:
NH	**SH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - I21B
Soil description	**CLAY**	Sample No./Type	P03_U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	32.90 - 33.10

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	22
Bulk Density ρ	Mg/m3	2.06
Dry Density $\rho\delta$	Mg/m3	1.68
Initial Height of the Specimen	mm	143.6
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	993
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	226
Failure Strain e	%	13.0
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	113

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

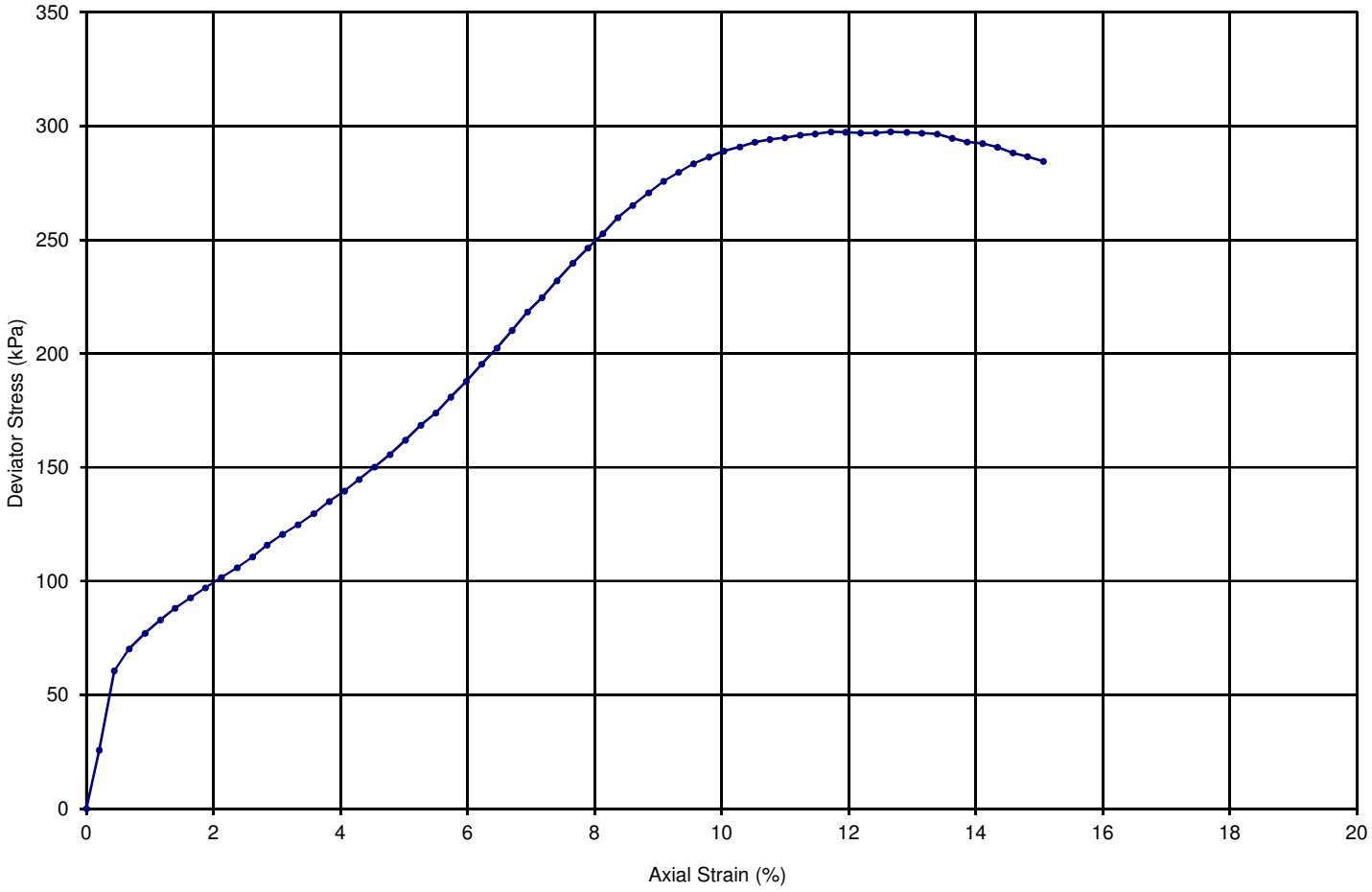
Tested by:	Checked by:	Approved by:
NH	**SH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - I21B
Soil description	**CLAY**	Sample No./Type	P06A_U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	44.40 - 44.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	34
Bulk Density ρ	Mg/m3	1.90
Dry Density ρδ	Mg/m3	1.42
Initial Height of the Specimen	mm	144.2
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	1156
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	297
Failure Strain e	%	12.7
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	149

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

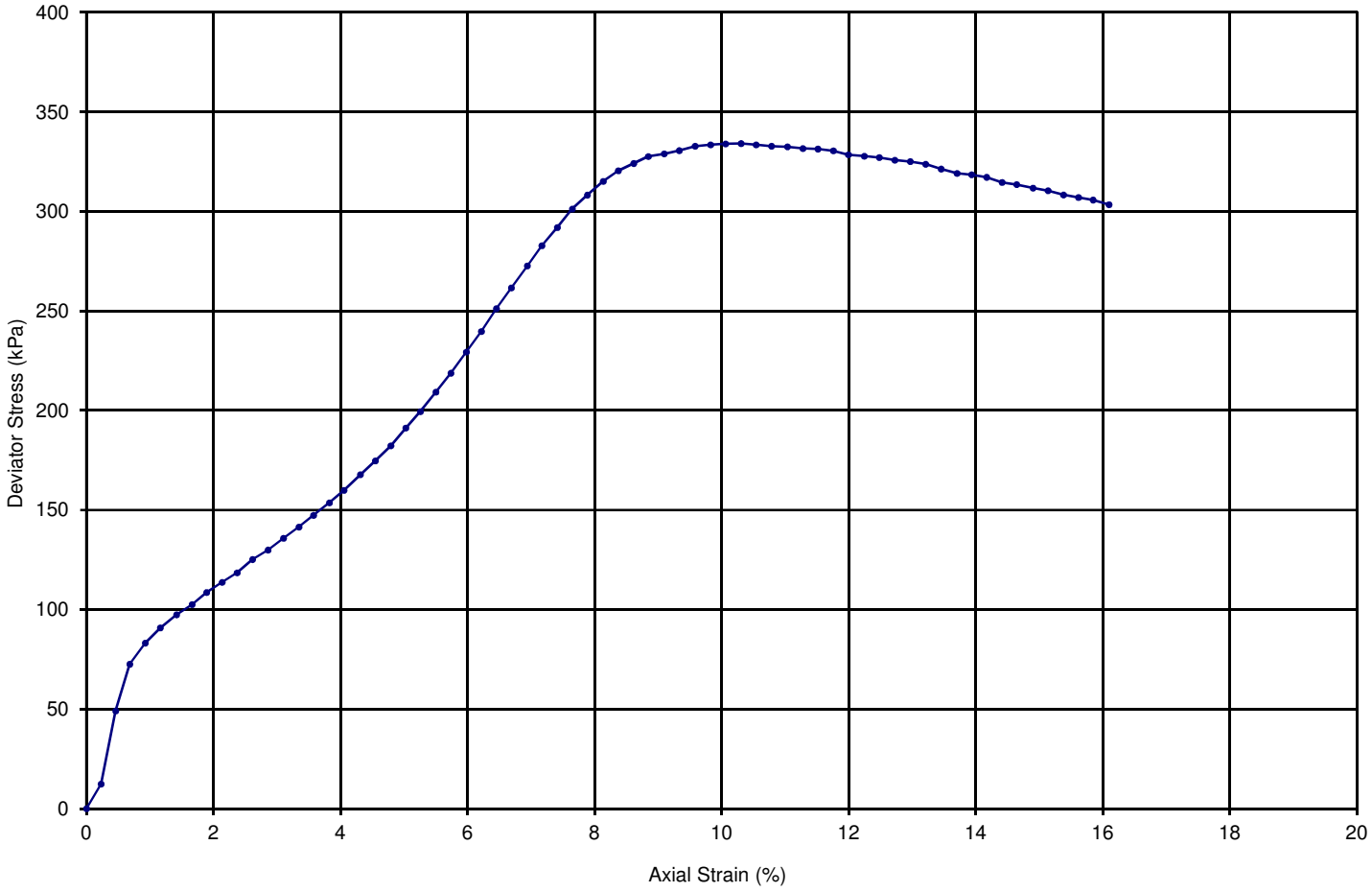
Tested by:	Checked by:	Approved by:
NH	**SH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH-I21B
Soil description	**CLAY**	Sample No./Type	P07_U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	48.80 - 49.00

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	29
Bulk Density ρ	Mg/m3	1.98
Dry Density ρδ	Mg/m3	1.54
Initial Height of the Specimen	mm	143.8
Initial Diameter of the Specimen	mm	71.7
Cell Pressure σ_3	kPa	1282
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	334
Failure Strain e	%	10.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	167

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

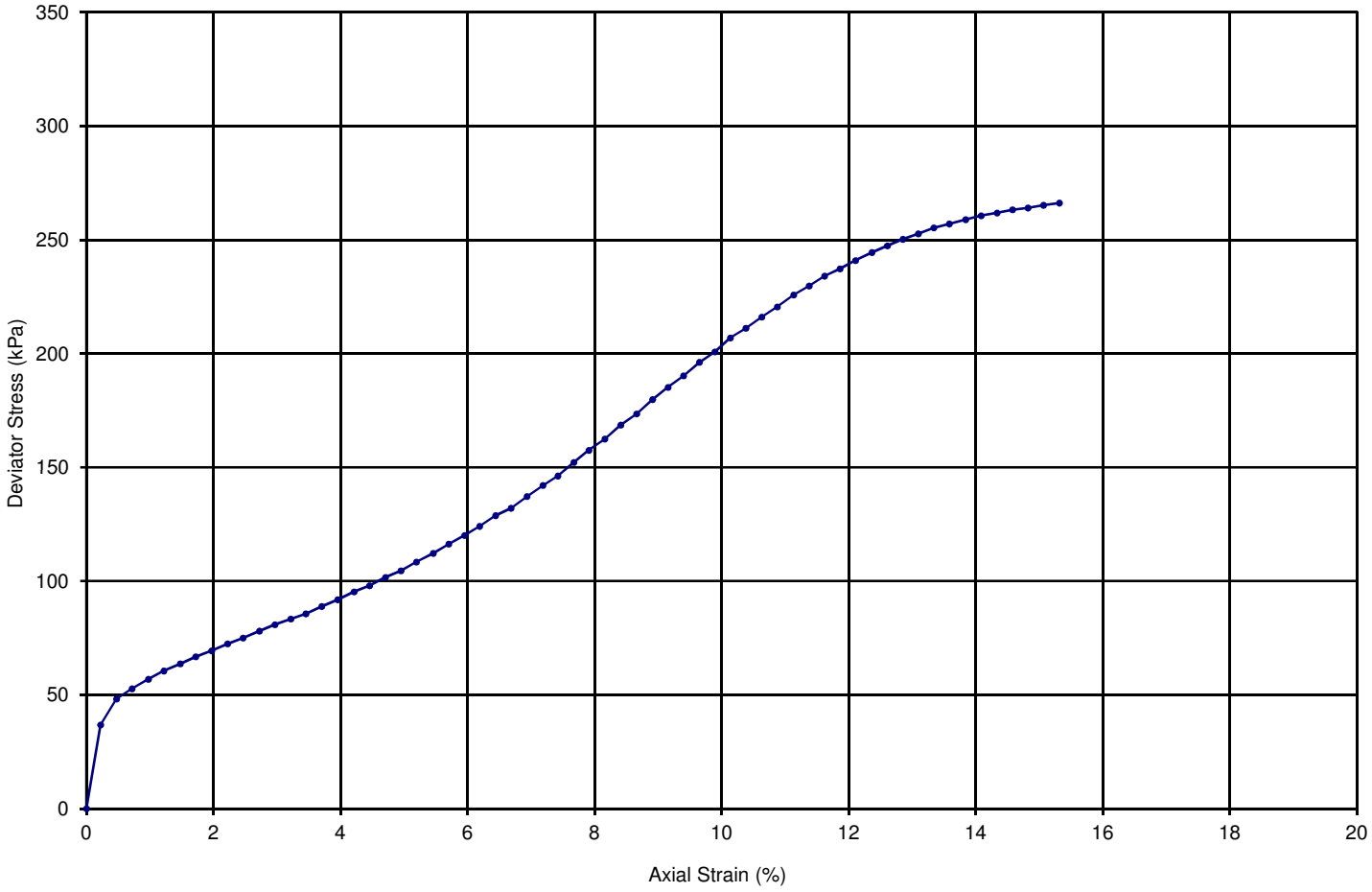
Tested by:	Checked by:	Approved by:
NH	**SH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - K16
Soil description	**CLAY**	Sample No./Type	P15 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	40.40 - 40.60

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	32
Bulk Density ρ	Mg/m3	1.96
Dry Density ρδ	Mg/m3	1.49
Initial Height of the Specimen	mm	139.6
Initial Diameter of the Specimen	mm	70.5
Cell Pressure σ_3	kPa	1011
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	266
Failure Strain e	%	15.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	133

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

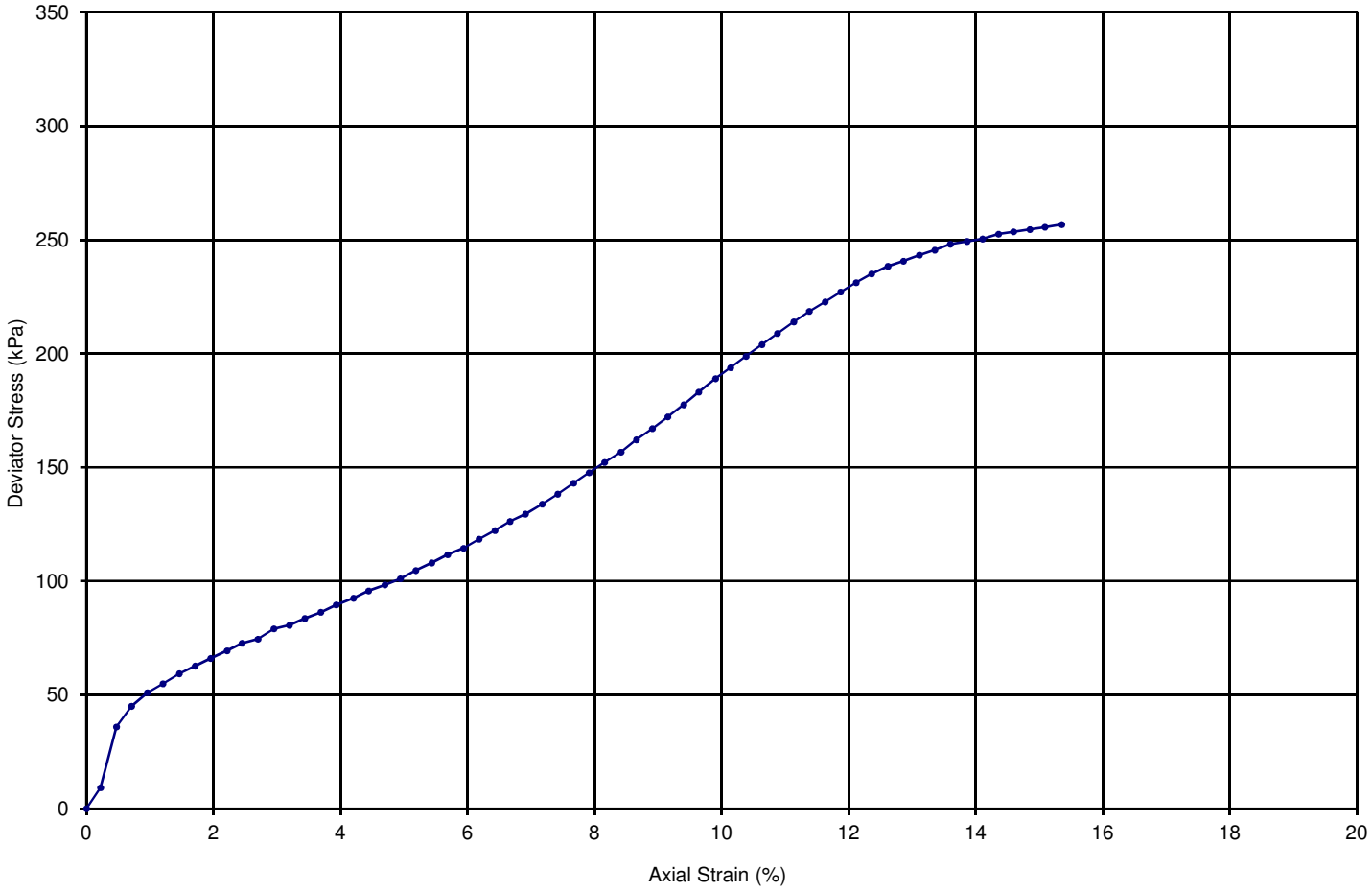
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - K16
Soil description	**CLAY**	Sample No./Type	P16 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	44.40 - 44.60m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	28
Bulk Density ρ	Mg/m3	1.97
Dry Density ρδ	Mg/m3	1.54
Initial Height of the Specimen	mm	139.7
Initial Diameter of the Specimen	mm	70.5
Cell Pressure σ_3	kPa	1095
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	256
Failure Strain e	%	15.4
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	128

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:

Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm

Sample sheared at a strain rate of 1 %min

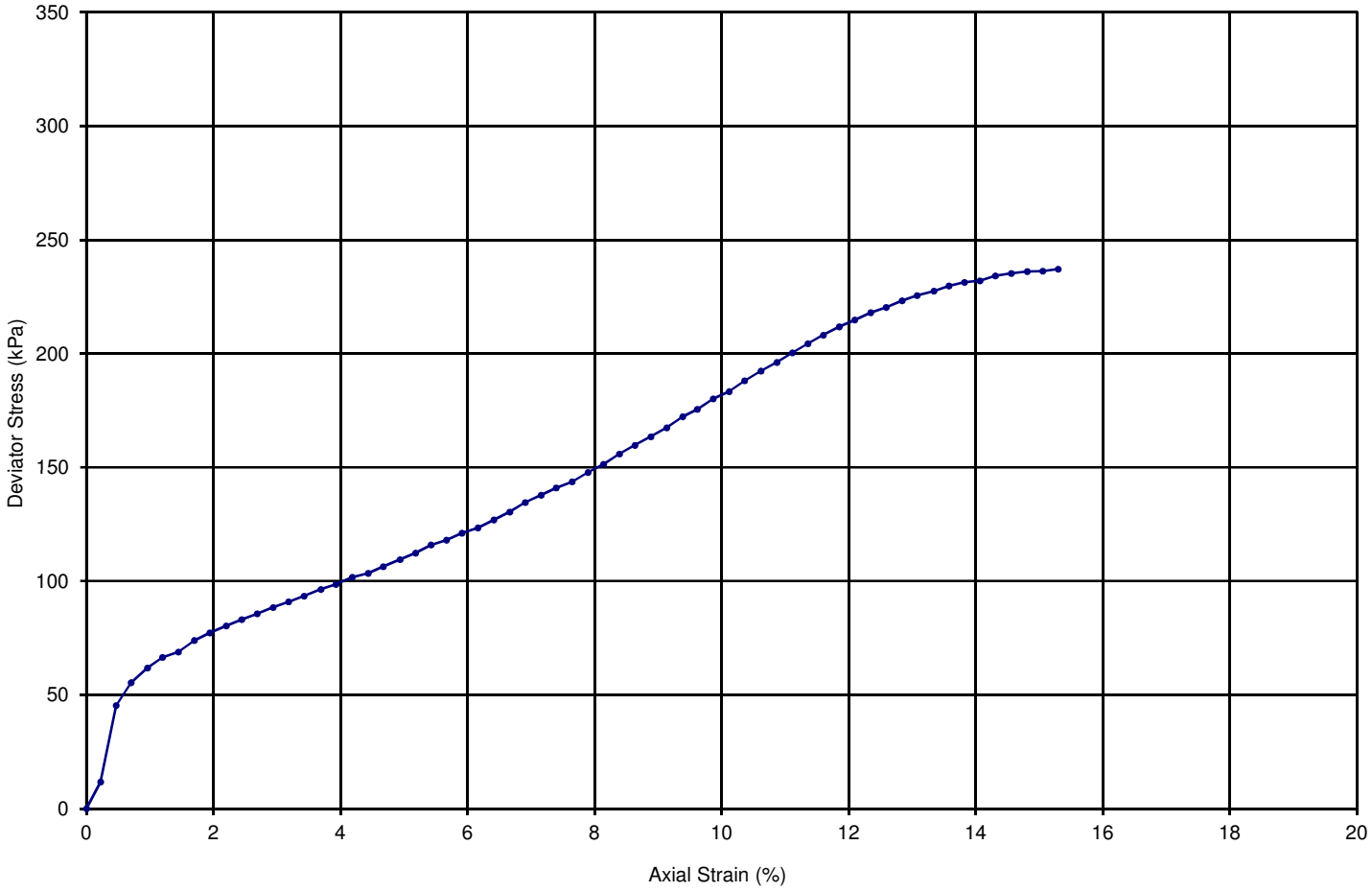
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	K16
Soil description	**CLAY**	Sample No./Type	P17 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	48.2-48.4m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	26
Bulk Density ρ	Mg/m3	1.97
Dry Density ρδ	Mg/m3	1.57
Initial Height of the Specimen	mm	139.6
Initial Diameter of the Specimen	mm	70.5
Cell Pressure σ_3	kPa	1177
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	237
Failure Strain e	%	15.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	118

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Intermediate

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

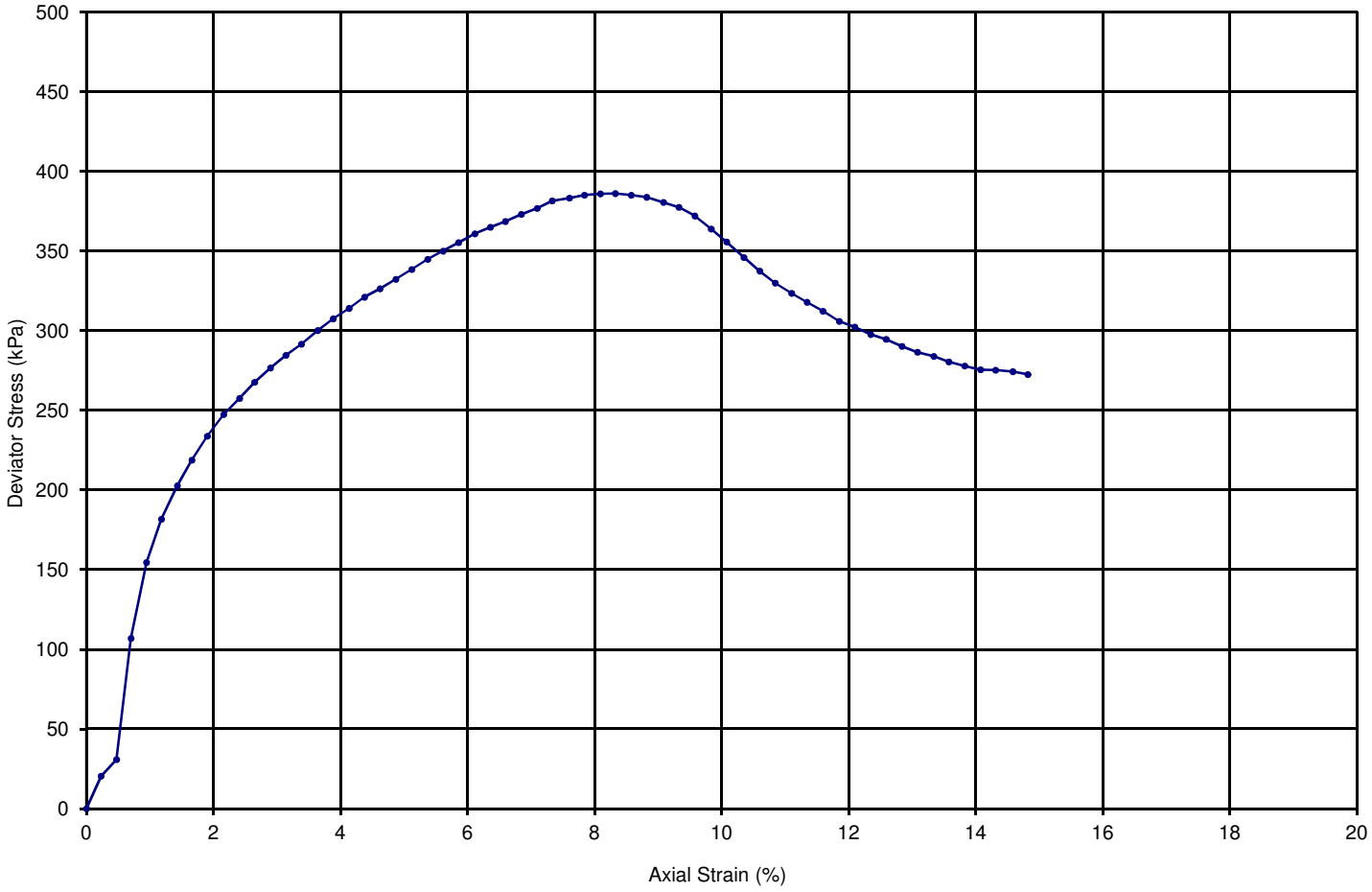
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - K16
Soil description	**CLAY**	Sample No./Type	P20 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	55.40 - 55.60m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	47
Bulk Density ρ	Mg/m3	1.75
Dry Density ρδ	Mg/m3	1.19
Initial Height of the Specimen	mm	139.8
Initial Diameter of the Specimen	mm	70.6
Cell Pressure σ_3	kPa	1194
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	386
Failure Strain e	%	8.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	193

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

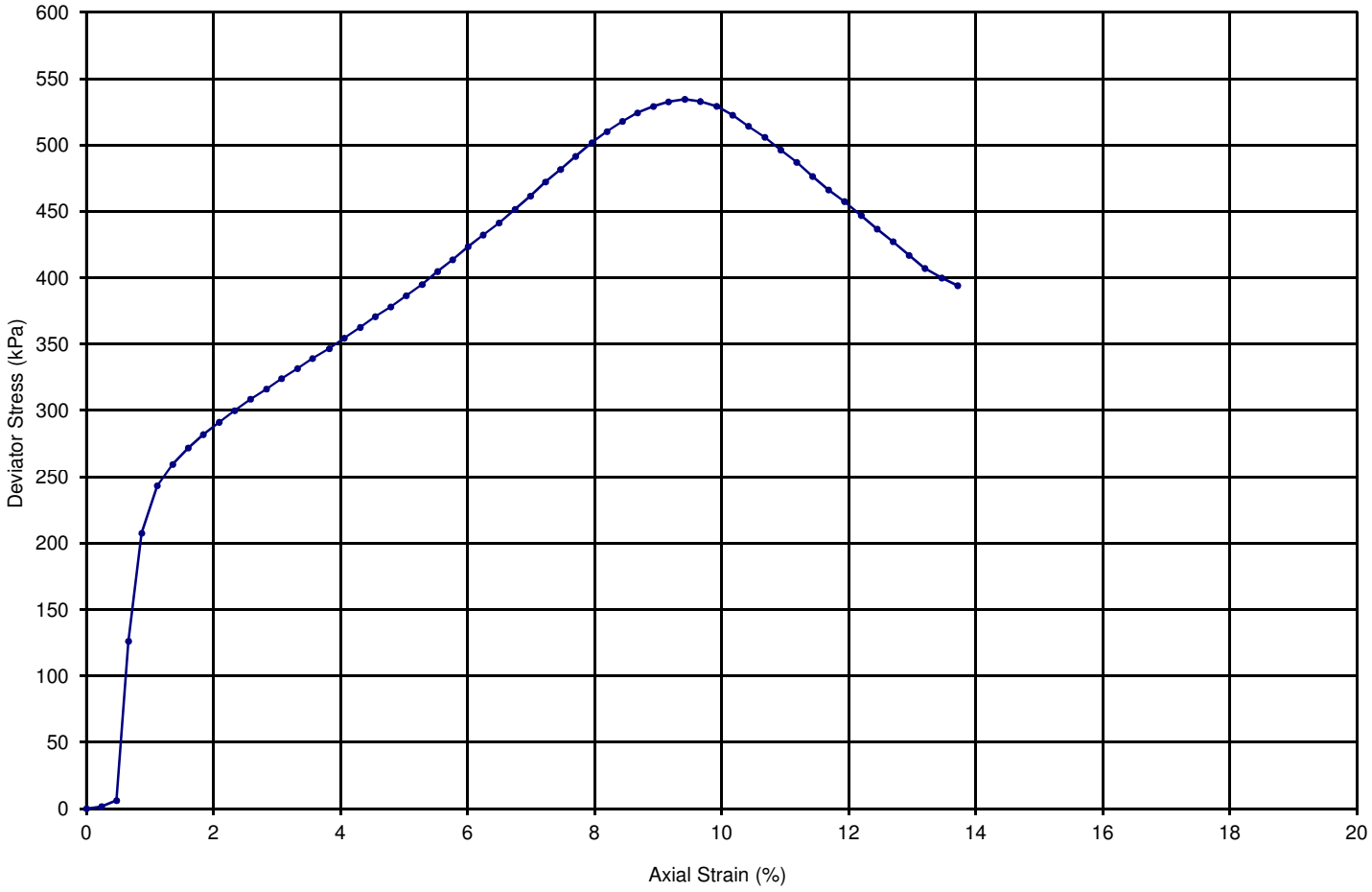
Remarks:	Tested by:	Checked by:	Approved by:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm Sample sheared at a strain rate of 1 %min	**NH**	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	BH - K16
Soil description	**CLAY**	Sample No./Type	P21 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	59.40 - 59.60m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	48
Bulk Density ρ	Mg/m3	1.77
Dry Density $\rho\delta$	Mg/m3	1.19
Initial Height of the Specimen	mm	143.7
Initial Diameter of the Specimen	mm	70.7
Cell Pressure σ_3	kPa	1269
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	534
Failure Strain e	%	9.4
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	267

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

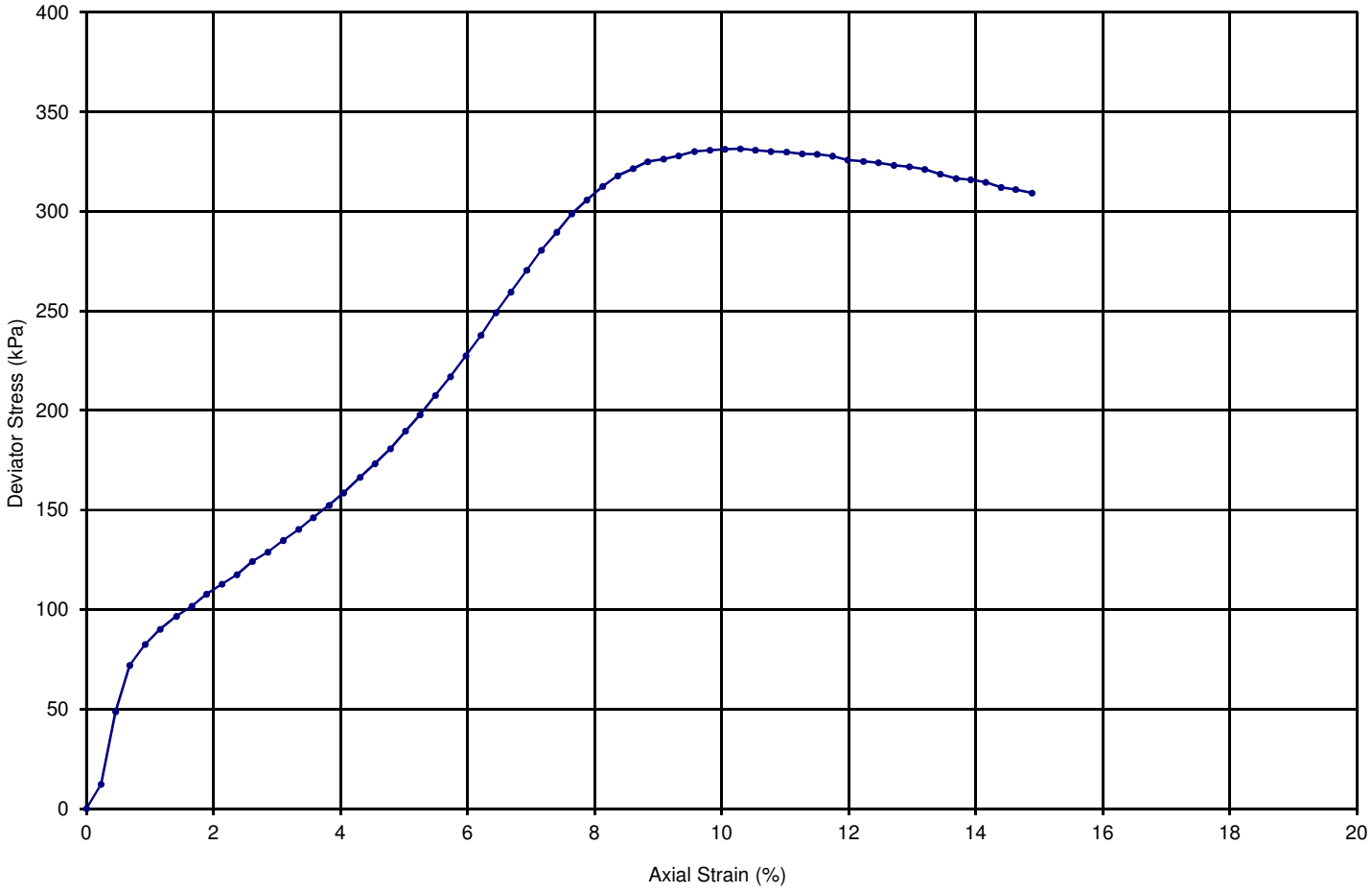
Remarks:	Tested by:	Checked by:	Approved by:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm Sample sheared at a strain rate of 1 %min	**NH**	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	Met Tower
Soil description	**CLAY**	Sample No./Type	P09 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	25.9-26.1m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	42
Bulk Density ρ	Mg/m3	1.88
Dry Density ρδ	Mg/m3	1.33
Initial Height of the Specimen	mm	144.0
Initial Diameter of the Specimen	mm	72.0
Cell Pressure σ_3	kPa	798
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	331
Failure Strain e	%	10.3
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	166

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

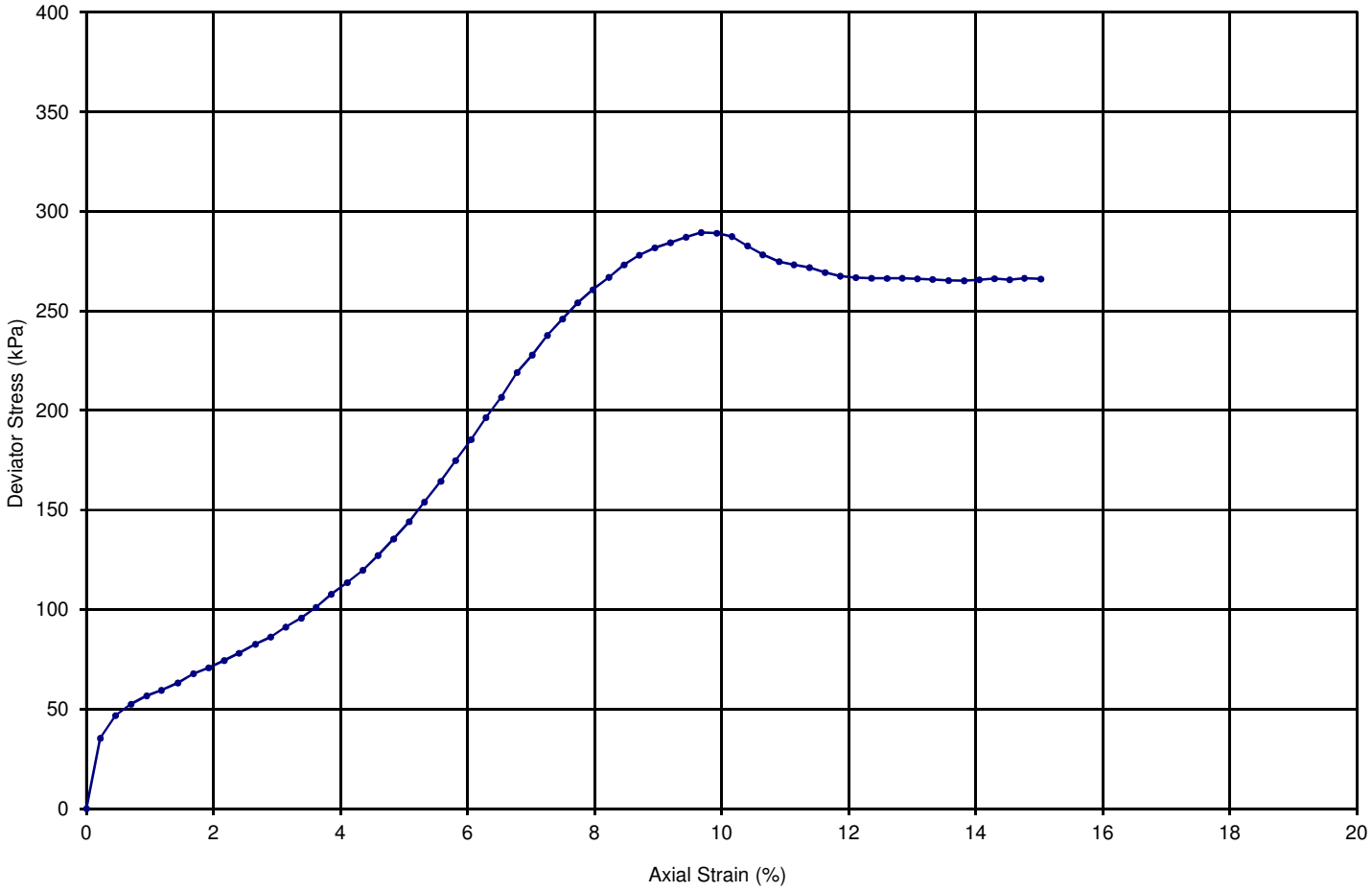
Tested by:	Checked by:	Approved by:
JA	**NH**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	Met Tower
Soil description	**CLAY**	Sample No./Type	P11 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	33.4-33.6m

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	28
Bulk Density ρ	Mg/m3	1.94
Dry Density ρδ	Mg/m3	1.52
Initial Height of the Specimen	mm	142.5
Initial Diameter of the Specimen	mm	72.2
Cell Pressure σ_3	kPa	965
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	289
Failure Strain e	%	9.7
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	145

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Shear (brittle)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

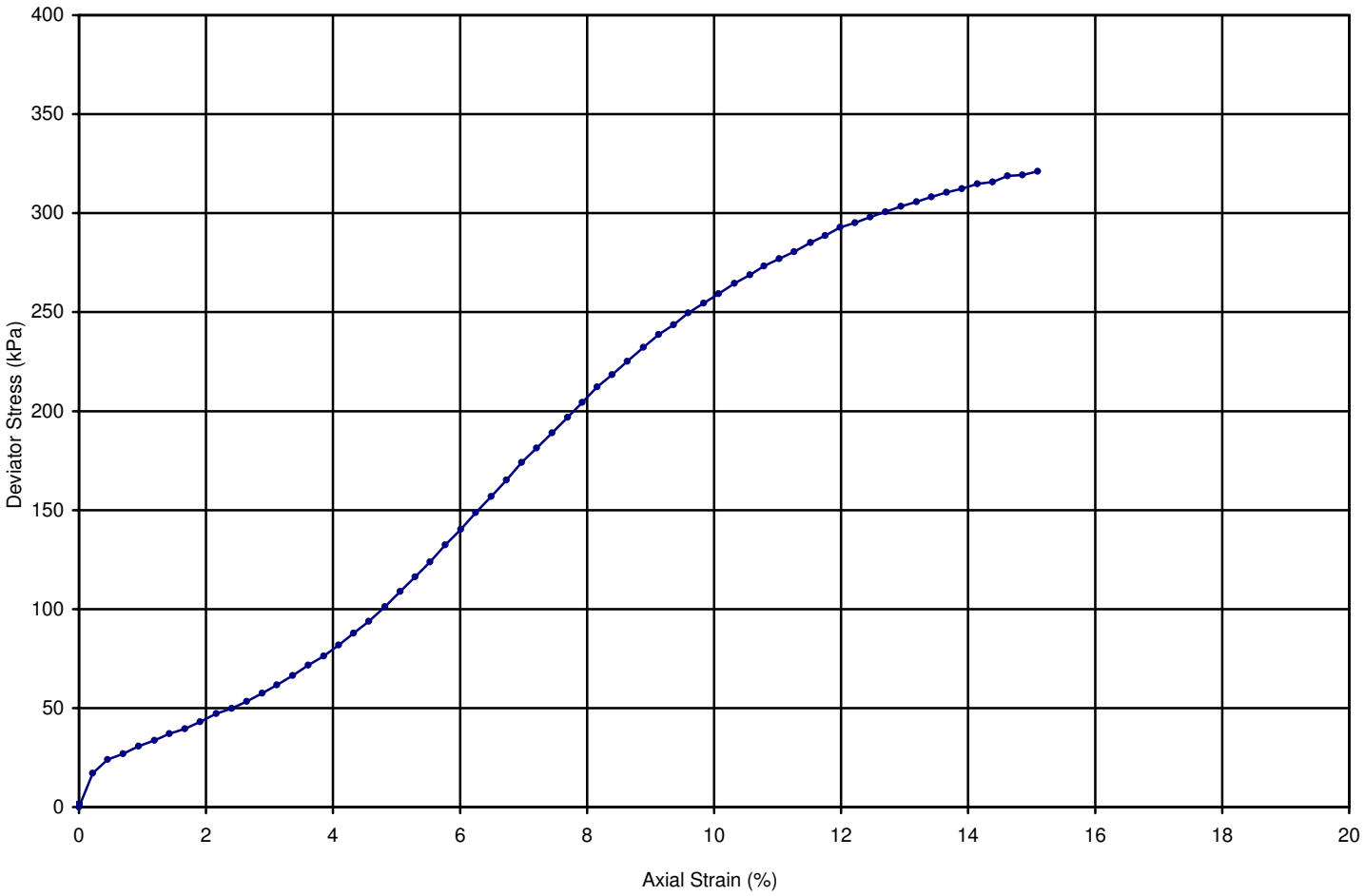
Tested by:	Checked by:	Approved by:
NH	**NV-S**	**SMc**

Revision: 1.0

Gardline	Determination of the Undrained Shear Strength in Triaxial Compression	US Wind inc sea energy

Location	**Geotechnical Marine Survey For the Maryland Wind Energy Area**	Contract No.	10451
		Borehole/Pit No.	Met Tower
Soil description	**CLAY**	Sample No./Type	P10 _ U1
Tested and prepared in accordance with	**ASTM D 2850 - 03a**	Depth (m)	29.4-29.6

STRESS / STRAIN CURVE



RESULTS

Moisture Content	%	27
Bulk Density ρ	Mg/m3	1.98
Dry Density $\rho\delta$	Mg/m3	1.56
Initial Height of the Specimen	mm	143.8
Initial Diameter of the Specimen	mm	72.2
Cell Pressure σ_3	kPa	901
Corrected Deviator Stress $(\sigma_1 - \sigma_3)_f$	kPa	321
Failure Strain e	%	15.1
Undrained Cohesion c_u $^1/_2(\sigma_1 - \sigma_3)_f$	kPa	160

PREPARATION DETAILS

Sample Type Undisturbed

FAILURE MODE

Barrelling (plastic)

Remarks:
Membrane thickness: 38-50mm 0.2mm, 70-100mm 0.4mm
Sample sheared at a strain rate of 1 %min

Tested by:	Checked by:	Approved by:
NH	**NV-S**	

Revision: 1.0

3.9 Consolidated Triaxial (CAUC / CADC / CAUE) Results

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P5Q1
		Depth	37.1-37.3
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	32
	Bulk Density (Mg/m3)	1.91
	Dry Density (Mg/m^3)	1.45
Saturation	Initial PWP (kPa)	-2
	Saturated PWP (kPa)	299
	Final Cell Pressure (kPa)	300
	B Value	0.98
Consolidation	Cell Pressure (kPa)	603
	Back Pressure (kPa)	299
	Initial PWP (kPa)	299
	Final PWP (kPa)	298
	cv (m^2/yr)	0.37
	mv (m^2/MN)	85.694
	k (calculated value) (m/s)	9.7E-09
Compression	Cell Pressure (kPa)	603
	Back Pressure (kPa)	299
	s3' (kPa)	304
	Rate of Strain (%/hr)	0

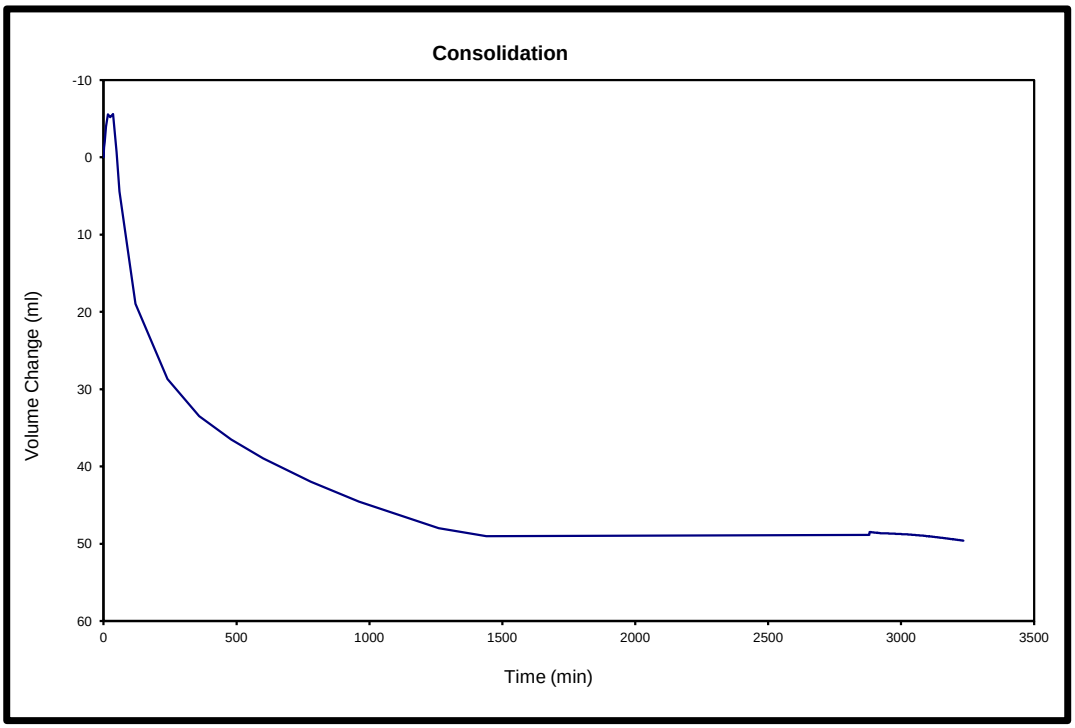
Sample Quality	SQ Index $\Delta e/e_0$	0.184242238	
	Sample Quality Category	4	Very poor

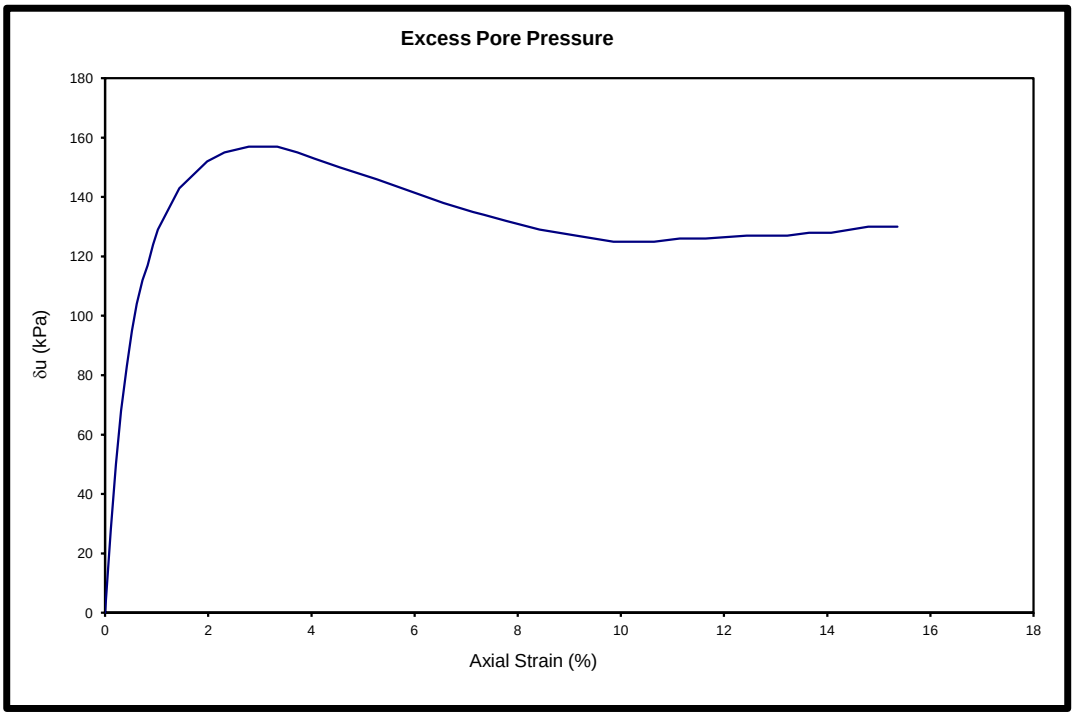
Final Conditions	Moisture Content (%)	33
	Bulk Density (Mg/m3)	2.07
	Dry Density (Mg/m^3)	1.56
Failure Conditions	Strain (e) (%)	8.4
	δu (kPa)	129
	σ_3'f (kPa)	175
	$(\sigma_1' - \sigma_3')f$ (kPa)	441

Failure Mode: Shear

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

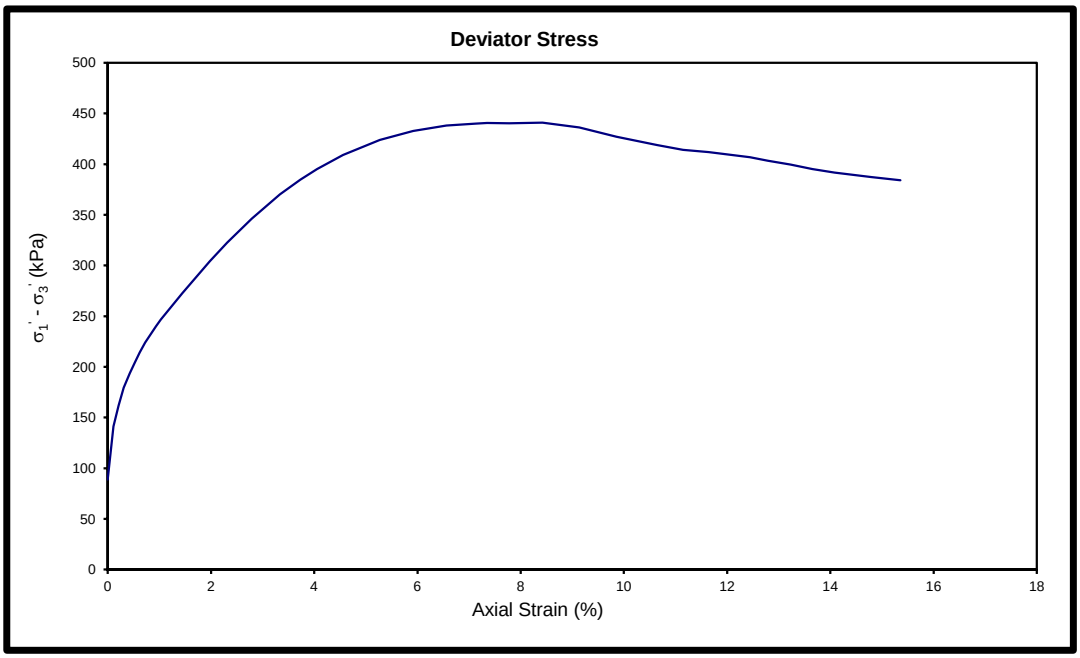
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P5Q1
		Depth	37.1-37.3
Prepared and tested in accordance with ASTM D4767 and In House method			

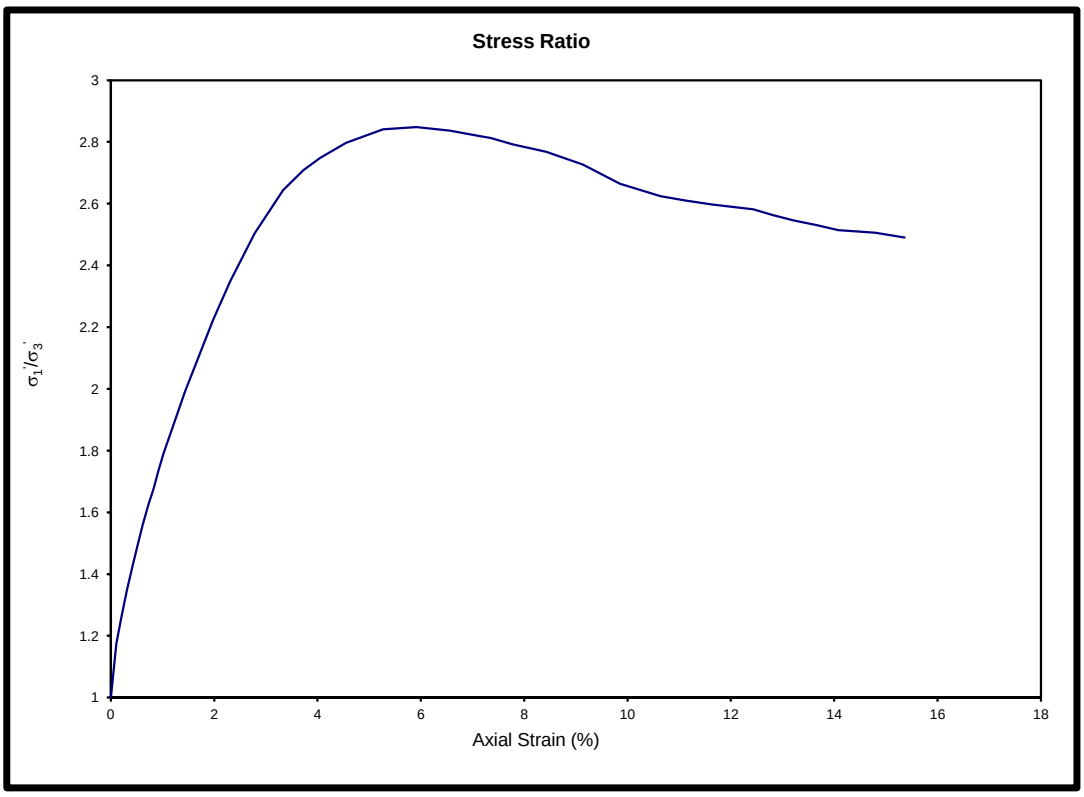




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

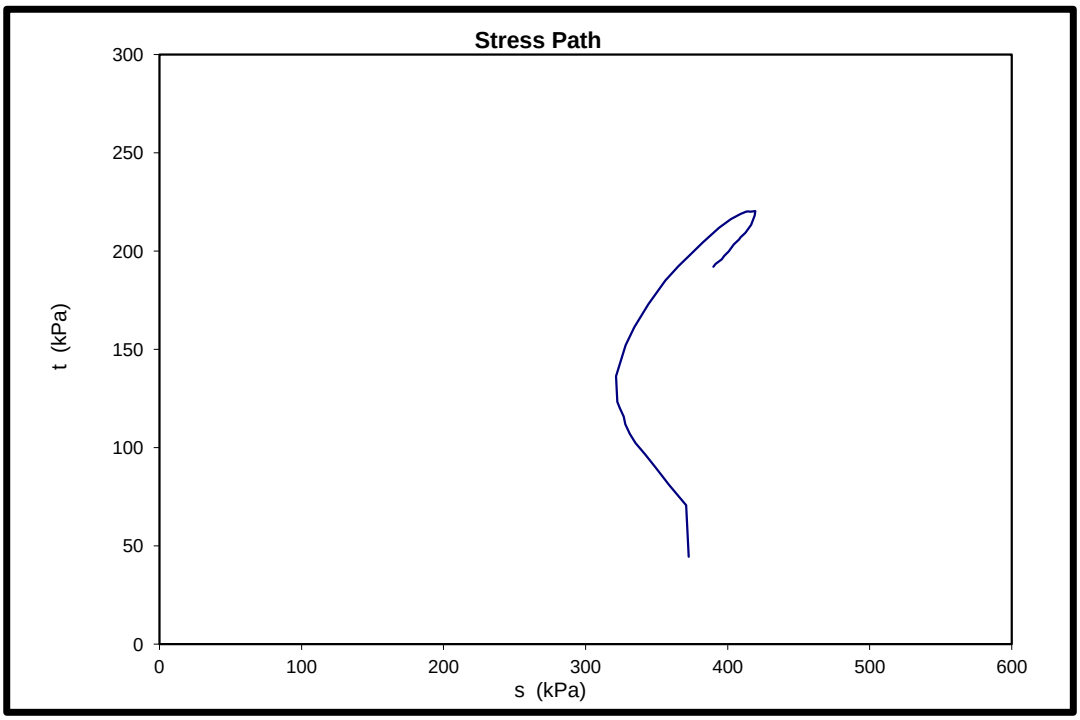
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P5Q1
		Depth	37.1-37.3
Prepared and tested in accordance with ASTM D4767 and In House method			

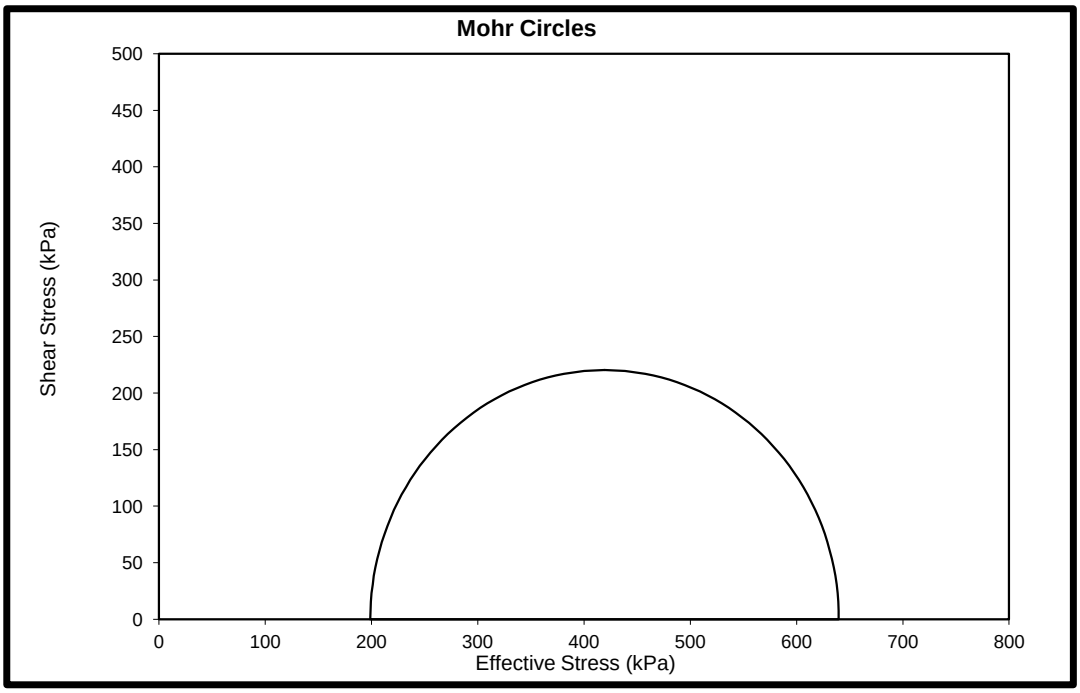




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P5Q1
		Depth	37.1-37.3
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P9Q1
		Depth	53.1-53.3
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	110
	Diameter (mm)	72
	Moisture Content %	38
	Bulk Density (Mg/m3)	1.84
	Dry Density (Mg/m^3)	1.33
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	433
	Final Cell Pressure (kPa)	450
	B Value	0.96
Consolidation	Cell Pressure (kPa)	847
	Back Pressure (kPa)	433
	Initial PWP (kPa)	433
	Final PWP (kPa)	432
	cv (m^2/yr)	0.07
	mv (m^2/MN)	42.313
	k (calculated value) (m/s)	9.0E-10
Compression	Cell Pressure (kPa)	847
	Back Pressure (kPa)	433
	s3' (kPa)	414
	Rate of Strain (%/hr)	0.8

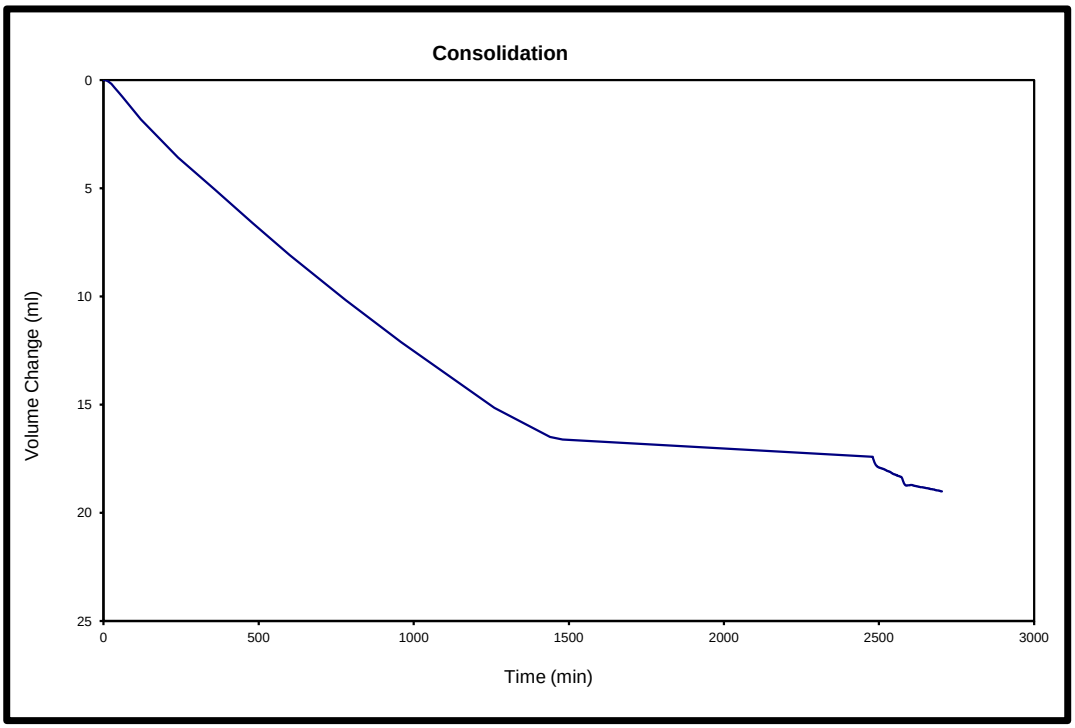
Final Conditions	Moisture Content (%)	35
	Bulk Density (Mg/m3)	1.89
	Dry Density (Mg/m^3)	1.40
Failure Conditions	Strain (e) (%)	3.2
	δu (kPa)	232
	σ_3'f (kPa)	182
	$(\sigma_1' - \sigma_3')f$ (kPa)	523

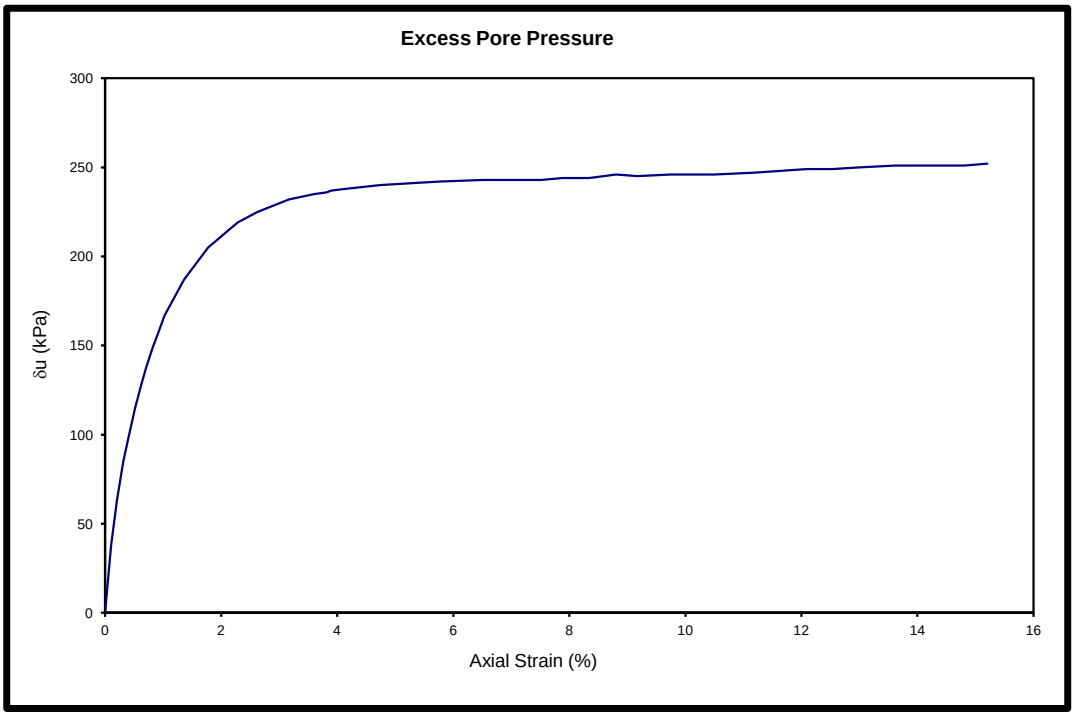
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.08228157	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

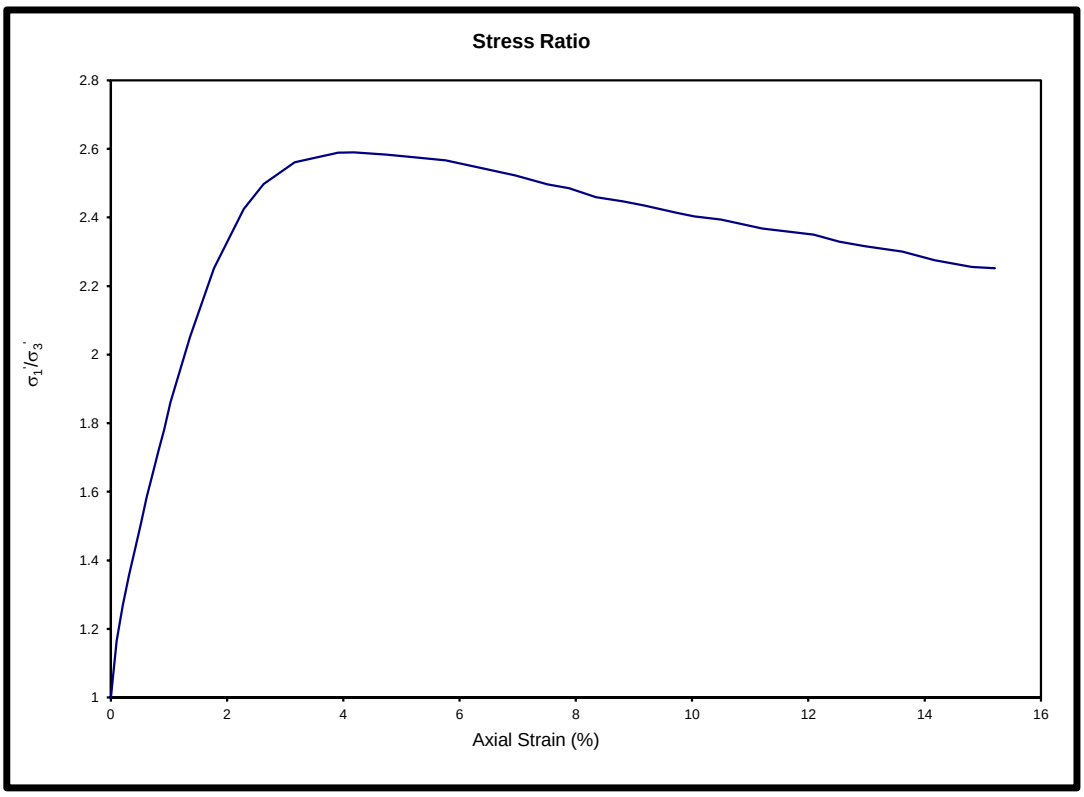
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P9Q1
		Depth	53.1-53.3
Prepared and tested in accordance with ASTM D4767 and In House method			





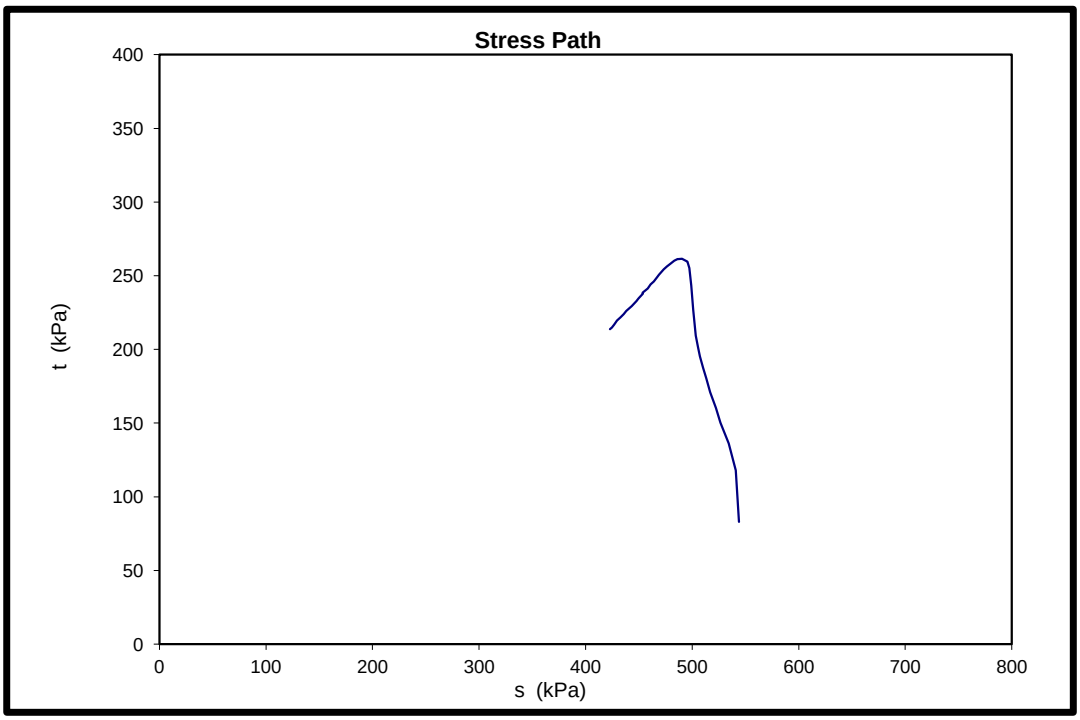
Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

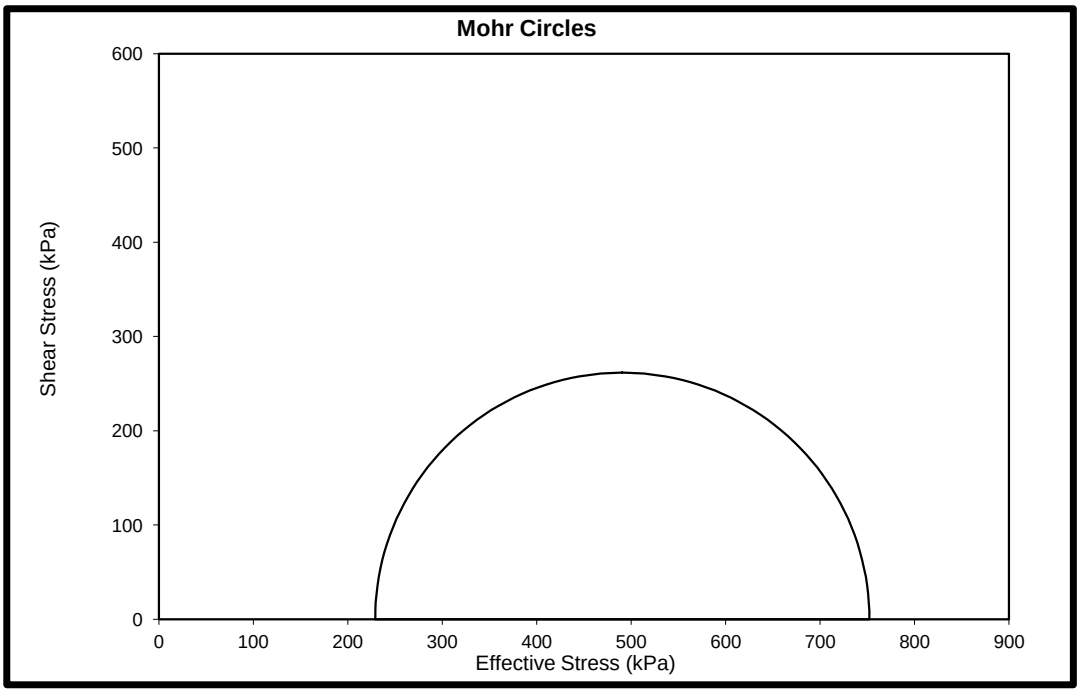
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P9Q1
		Depth	53.1-53.3
Prepared and tested in accordance with ASTM D4767 and In House method			



Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAY with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P9Q1
		Depth	53.1-53.3
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAy with sand. Sand is fine to medium, greenish grey, moist, fine to medium shell fragments, rare pockets of coarse sand	**Sample Type/No.**	P11Q1
		Depth	60.9-61.1
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	24
	Bulk Density (Mg/m3)	1.98
	Dry Density (Mg/m^3)	1.60
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	316
	Final Cell Pressure (kPa)	350
	B Value	0.98
Consolidation	Cell Pressure (kPa)	772
	Back Pressure (kPa)	316
	Initial PWP (kPa)	315
	Final PWP (kPa)	314
	cv (m^2/yr)	0.04
	mv (m^2/MN)	63.101
	k (calculated value) (m/s)	7.1E-10
Compression	Cell Pressure (kPa)	772
	Back Pressure (kPa)	316
	s3' (kPa)	456
	Rate of Strain (%/hr)	0.8

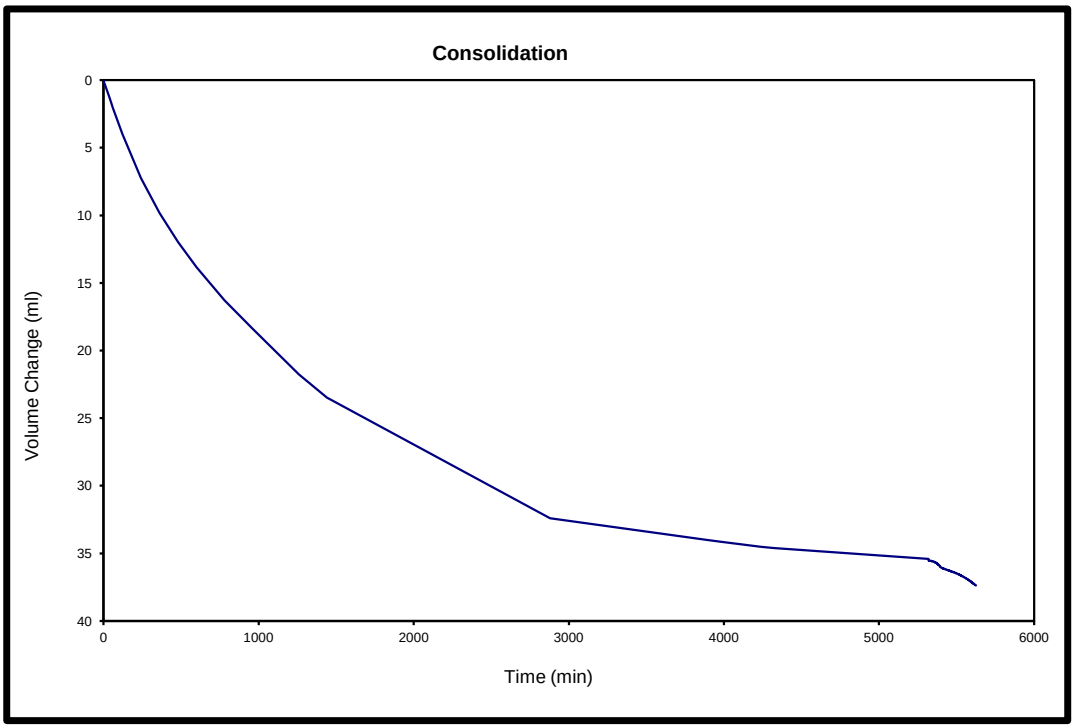
Final Conditions	Moisture Content (%)	25
	Bulk Density (Mg/m3)	2.06
	Dry Density (Mg/m^3)	1.65
Failure Conditions	Strain (e) (%)	10.3
	δu (kPa)	262
	σ_3'f (kPa)	194
	$(\sigma_1' - \sigma_3')f$ (kPa)	525

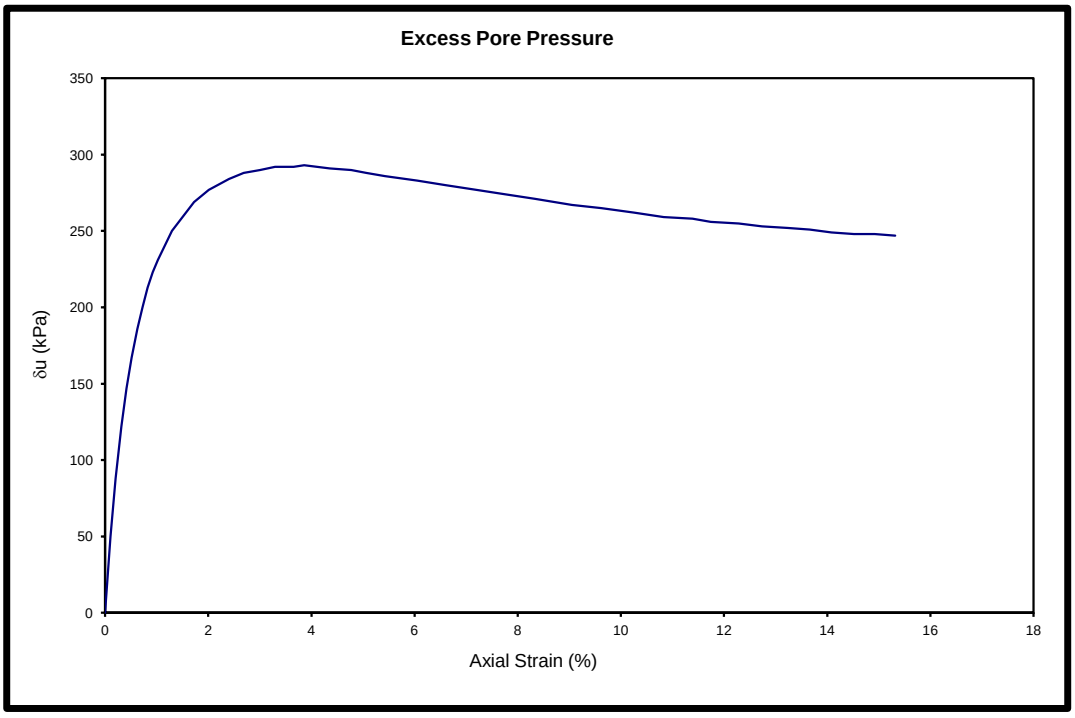
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.160	
	Sample Quality Category	4	Very poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

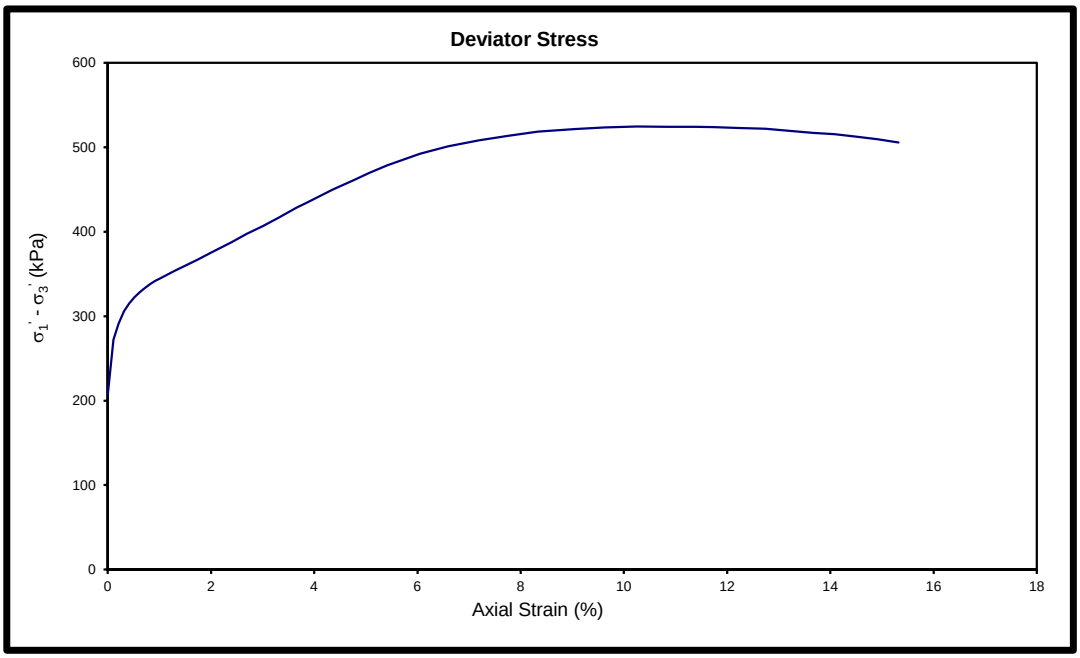
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAy with sand. Sand is fine to medium, greenish grey, moist, fine to medium shell fragments, rare pockets of coarse sand	**Sample Type/No.**	P11Q1
		Depth	60.9-61.1
Prepared and tested in accordance with ASTM D4767 and In House method			

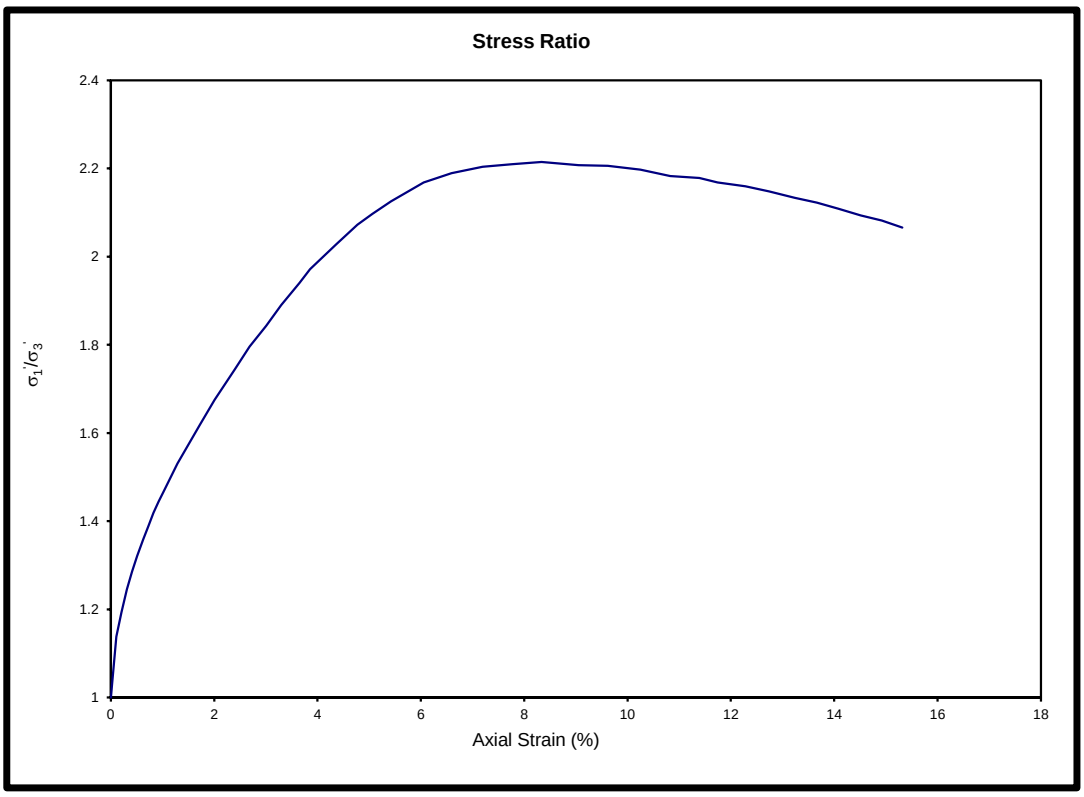




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

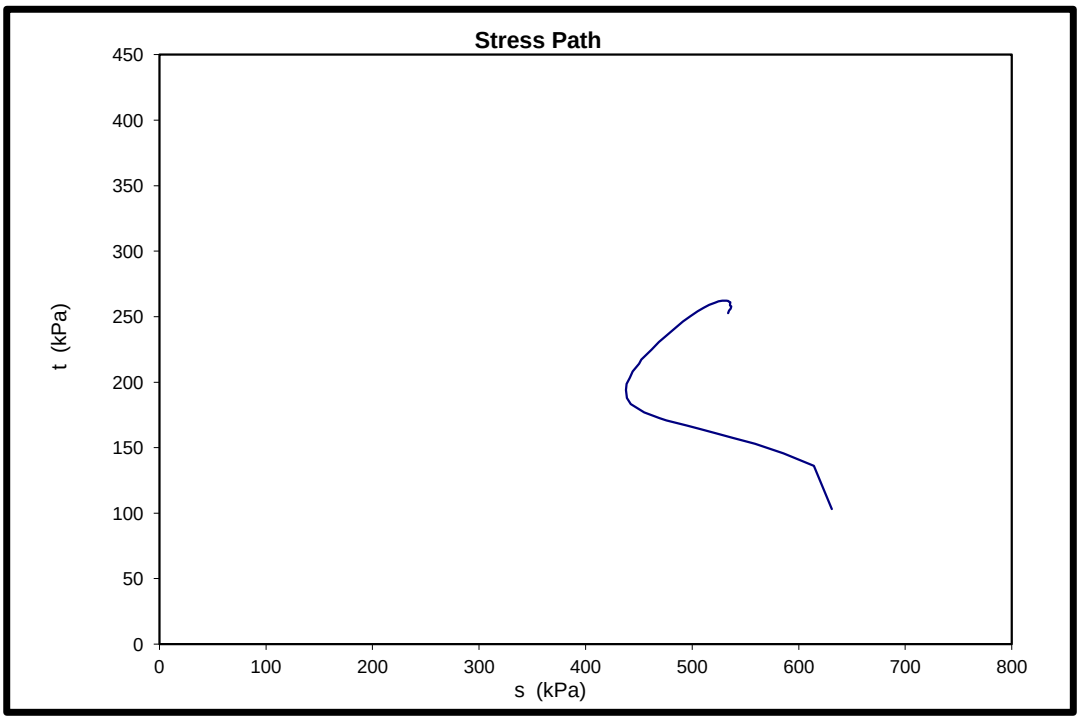
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAy with sand. Sand is fine to medium, greenish grey, moist, fine to medium shell fragments, rare pockets of coarse sand	**Sample Type/No.**	P11Q1
		Depth	60.9-61.1
Prepared and tested in accordance with ASTM D4767 and In House method			

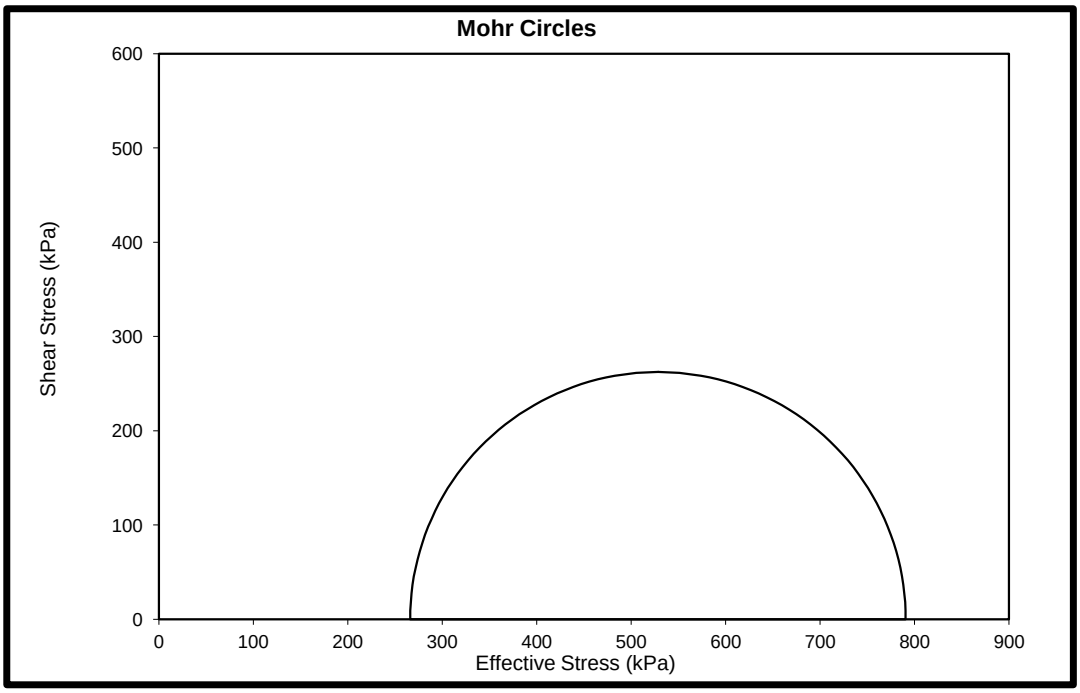




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - D14A
Description	CLAy with sand. Sand is fine to medium, greenish grey, moist, fine to medium shell fragments, rare pockets of coarse sand	**Sample Type/No.**	P11Q1
		Depth	60.9-61.1
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, moist, with thinly laminated fine to medium silty sand	**Sample Type/No.**	P10 Q2
		Depth	19.20-19.40
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	28
	Bulk Density (Mg/m3)	1.95
	Dry Density (Mg/m^3)	1.53
Saturation	Initial PWP (kPa)	2
	Saturated PWP (kPa)	465
	Final Cell Pressure (kPa)	500
	B Value	0.98
Consolidation	Cell Pressure (kPa)	639
	Back Pressure (kPa)	466
	Initial PWP (kPa)	465
	Final PWP (kPa)	472
	cv (m^2/yr)	0.12
	mv (m^2/MN)	-3.582
	k (calculated value) (m/s)	-1.3E-10
Compression	Cell Pressure (kPa)	639
	Back Pressure (kPa)	466
	s3' (kPa)	173
	Rate of Strain (%/hr)	0.8

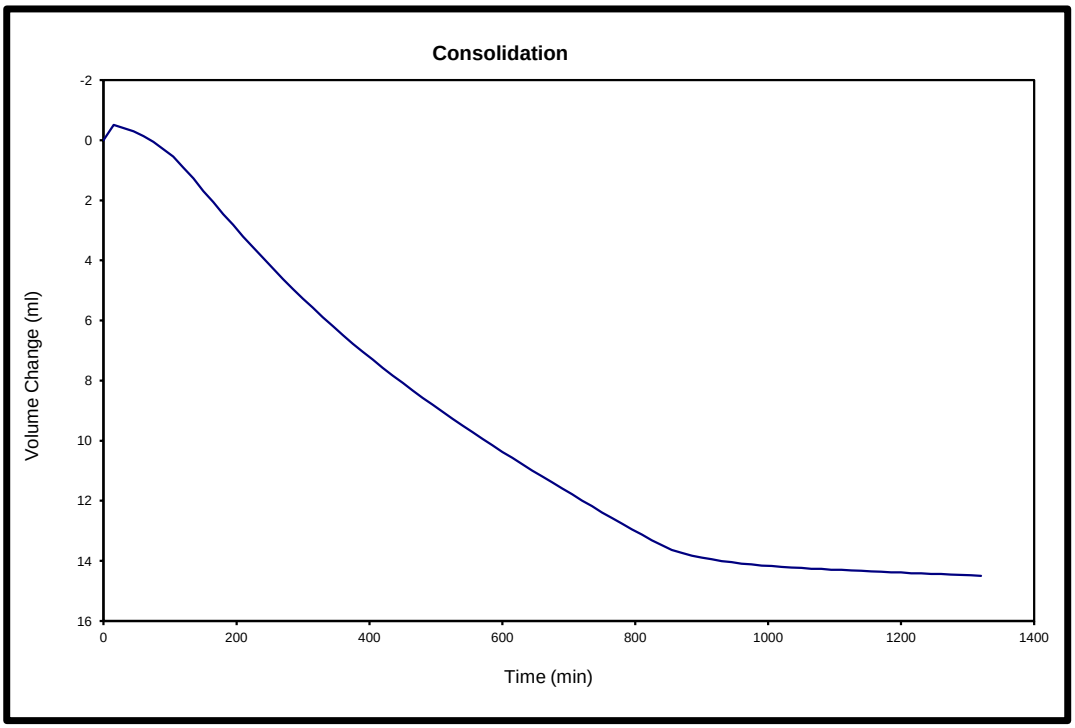
Final Conditions	Moisture Content (%)	35
	Bulk Density (Mg/m3)	1.97
	Dry Density (Mg/m^3)	1.46
Failure Conditions	Strain (e) (%)	8.7
	δu (kPa)	60
	σ_3'f (kPa)	113
	$(\sigma_1' - \sigma_3')f$ (kPa)	250

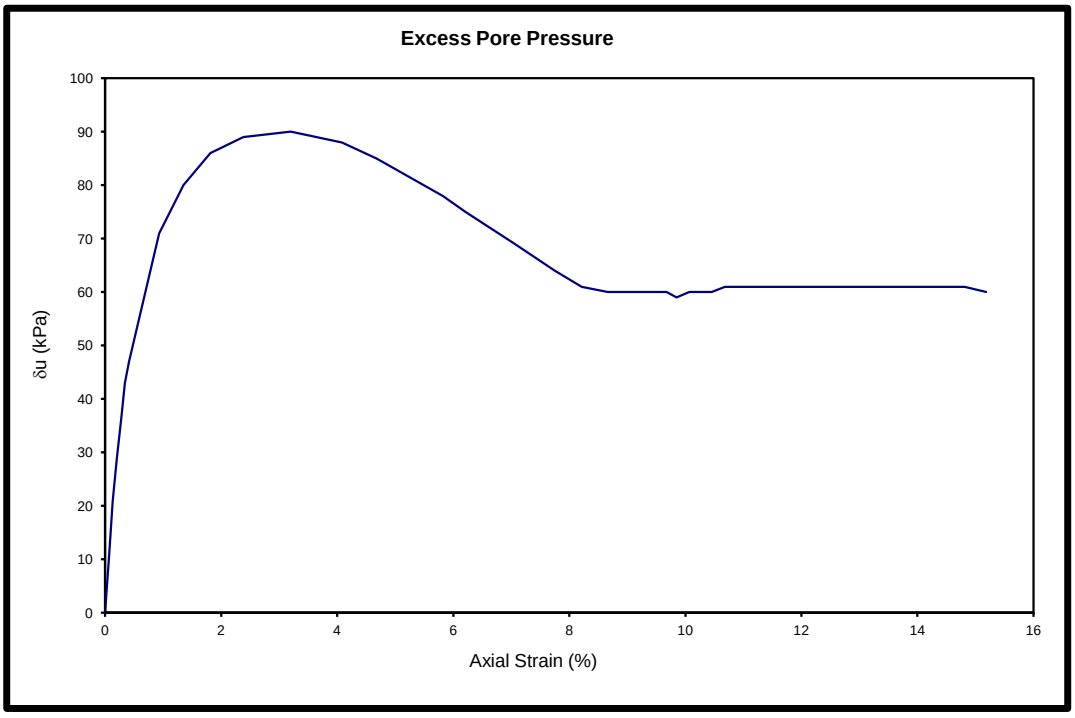
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.058	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

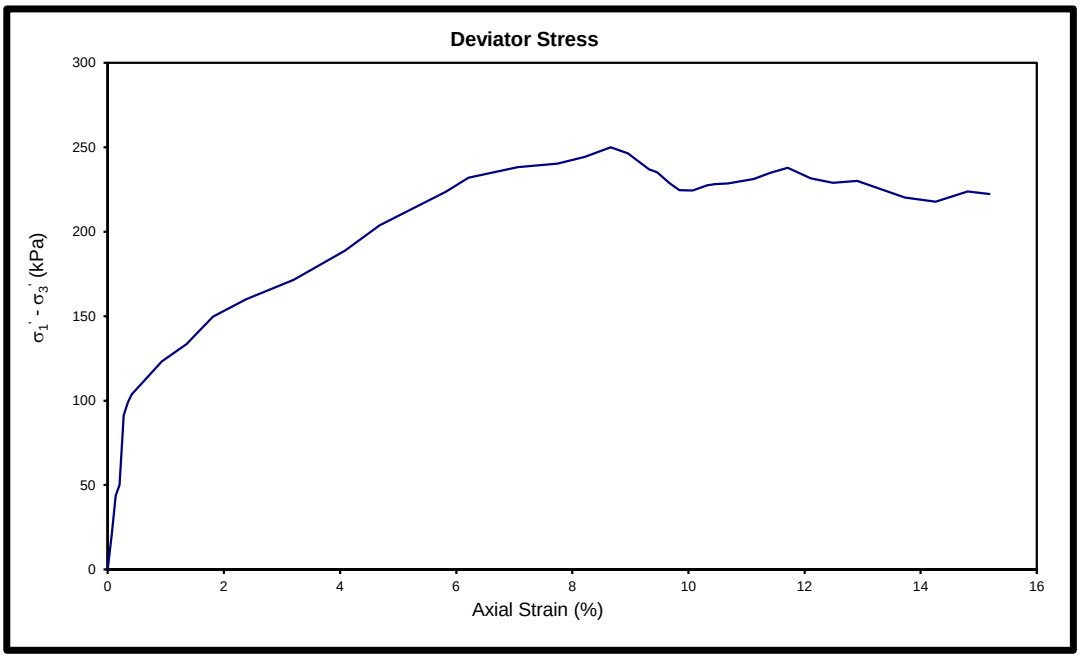
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, moist, with thinly laminated fine to medium silty sand	**Sample Type/No.**	P10 Q2
		Depth	19.20-19.40
Prepared and tested in accordance with ASTM D4767 and In House method			

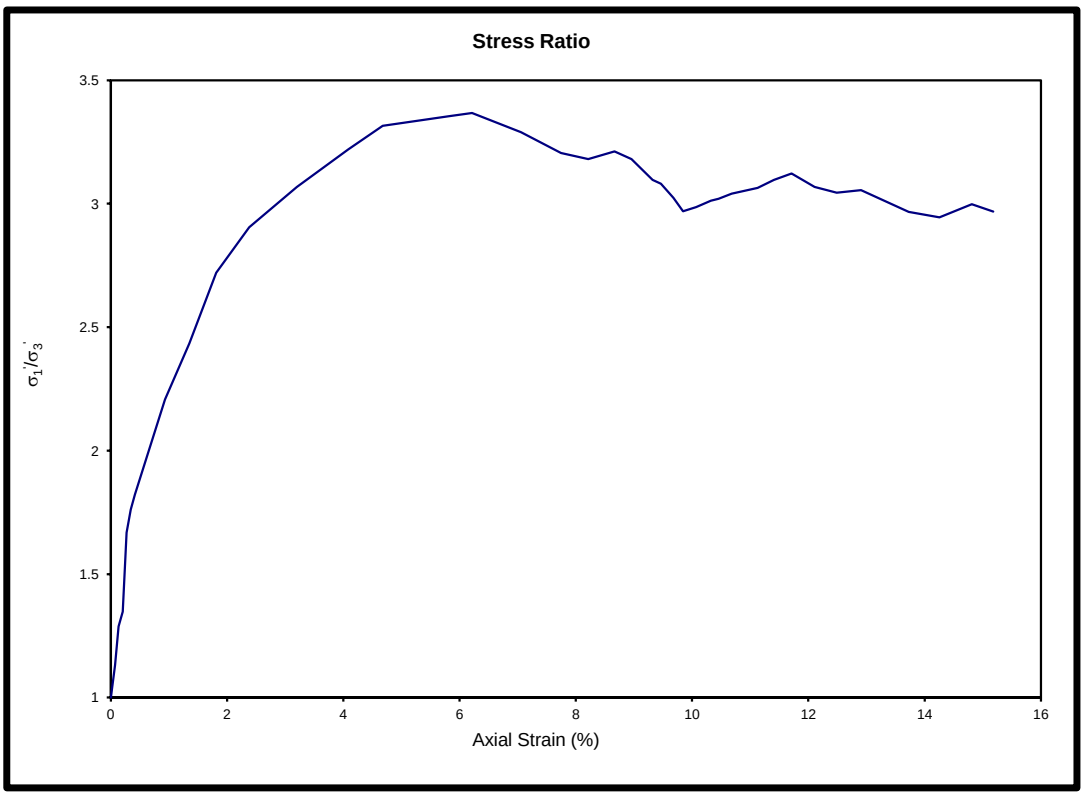




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

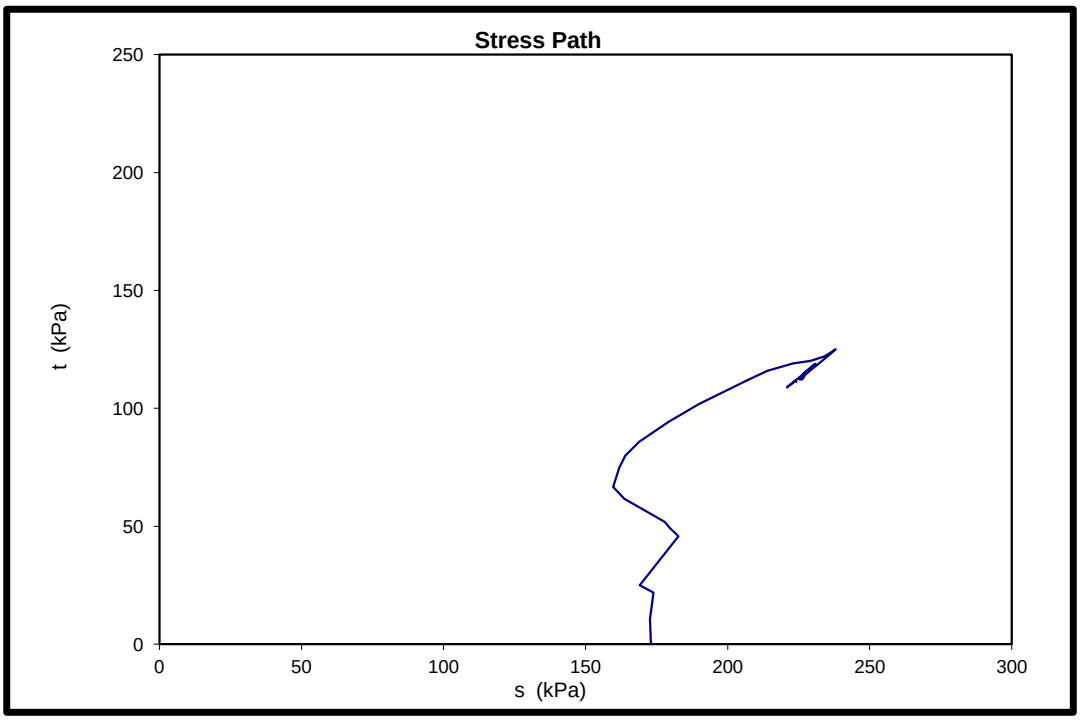
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, moist, with thinly laminated fine to medium silty sand	**Sample Type/No.**	P10 Q2
		Depth	19.20-19.40
Prepared and tested in accordance with ASTM D4767 and In House method			

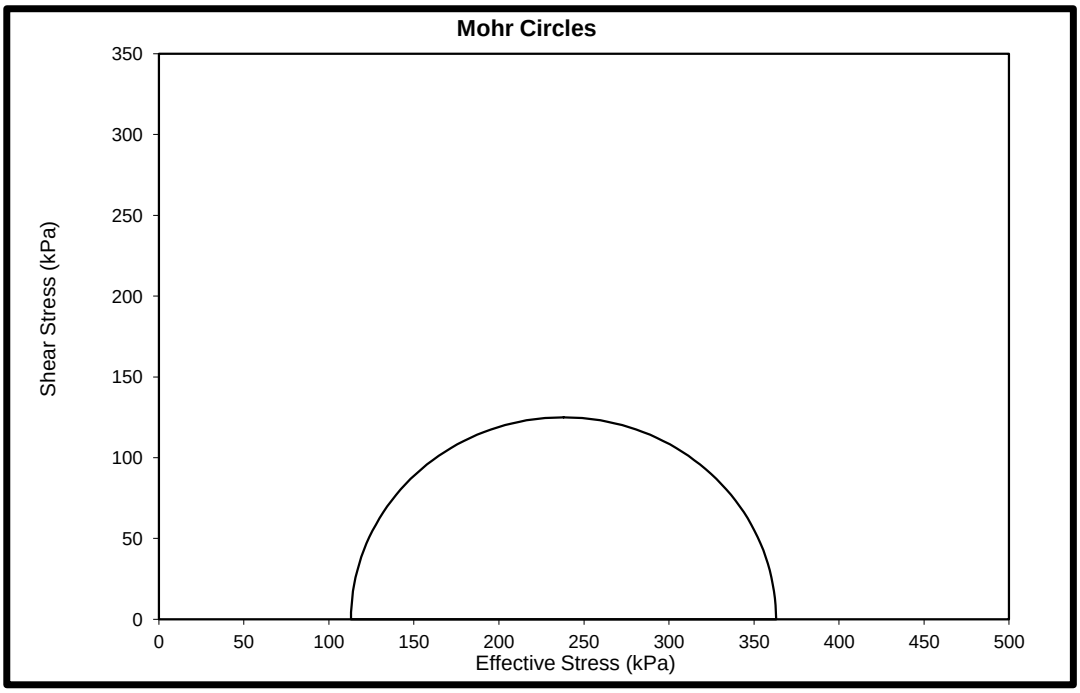




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, moist, with thinly laminated fine to medium silty sand	**Sample Type/No.**	P10 Q2
		Depth	19.20-19.40
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, grey with very dark grey, moist, laminations of fine silty sand	**Sample Type/No.**	P12 Q2
		Depth	27.70-27.90
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	117
	Diameter (mm)	72
	Moisture Content %	36
	Bulk Density (Mg/m3)	1.93
	Dry Density (Mg/m^3)	1.42
Saturation	Initial PWP (kPa)	2
	Saturated PWP (kPa)	497
	Final Cell Pressure (kPa)	500
	B Value	0.98
Consolidation	Cell Pressure (kPa)	737
	Back Pressure (kPa)	497
	Initial PWP (kPa)	497
	Final PWP (kPa)	492
	cv (m^2/yr)	0.06
	mv (m^2/MN)	2.671
	k (calculated value) (m/s)	4.9E-11
Compression	Cell Pressure (kPa)	737
	Back Pressure (kPa)	497
	s3' (kPa)	240
	Rate of Strain (%/hr)	1.0

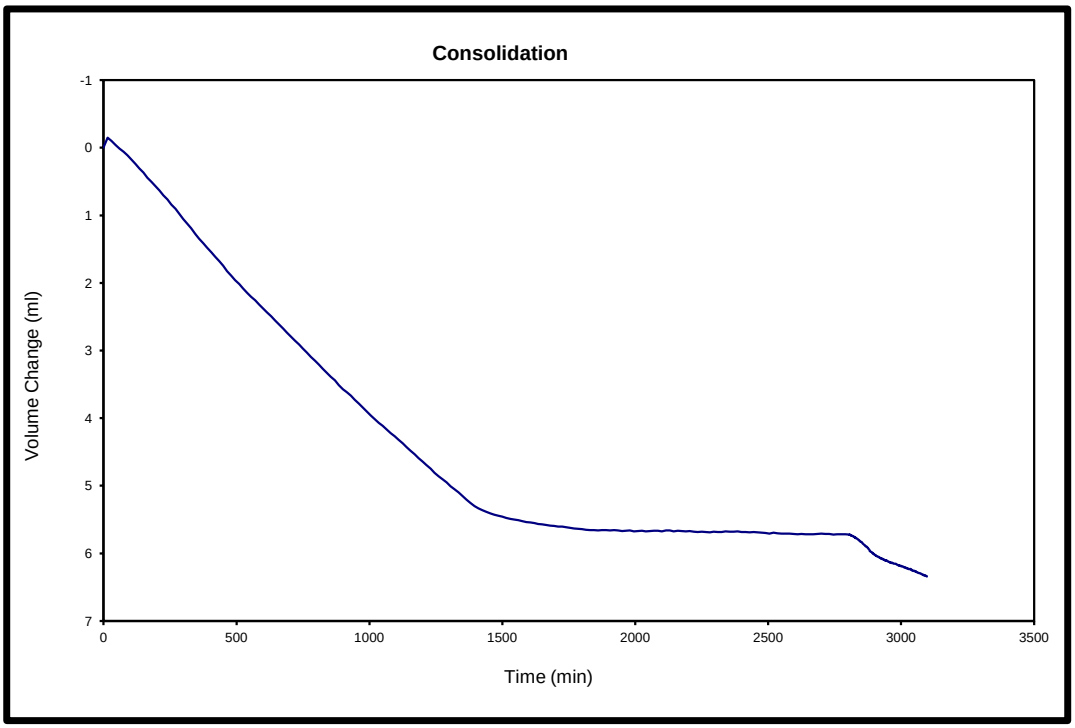
Final Conditions	Moisture Content (%)	28
	Bulk Density (Mg/m3)	1.94
	Dry Density (Mg/m^3)	1.51
Failure Conditions	Strain (e) (%)	10.6
	δu (kPa)	67
	σ_3'f (kPa)	173
	$(\sigma_1' - \sigma_3')f$ (kPa)	354

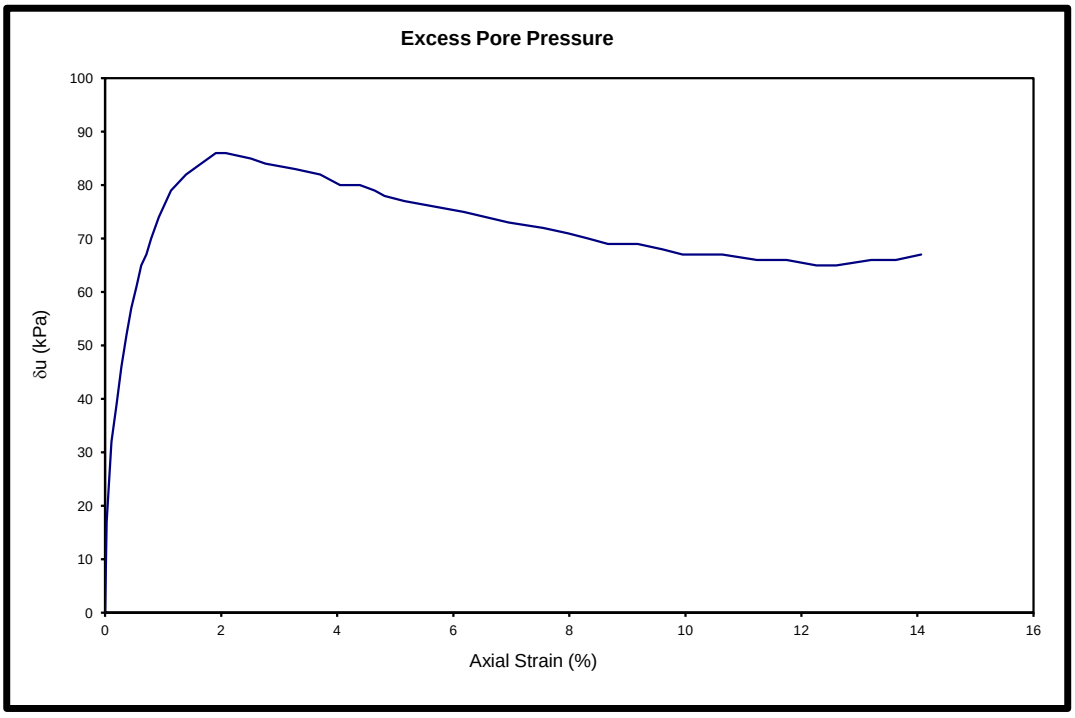
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.027	
	Sample Quality Category	1	Very good to Excellent

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

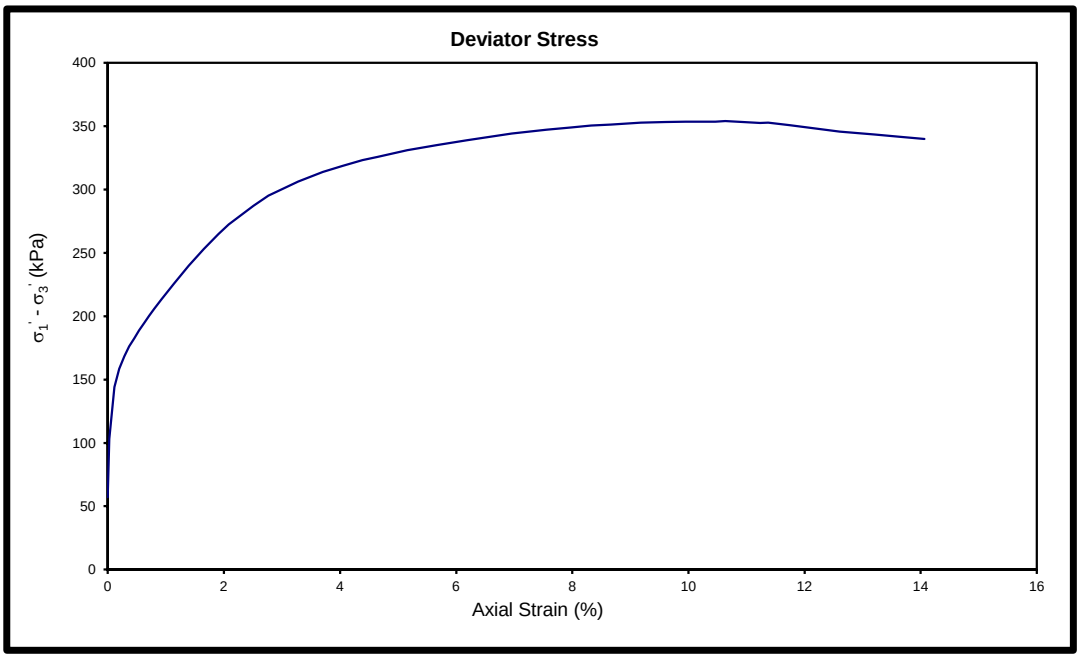
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, grey with very dark grey, moist, laminations of fine silty sand	**Sample Type/No.**	P12 Q2
		Depth	27.70-27.90
Prepared and tested in accordance with ASTM D4767 and In House method			

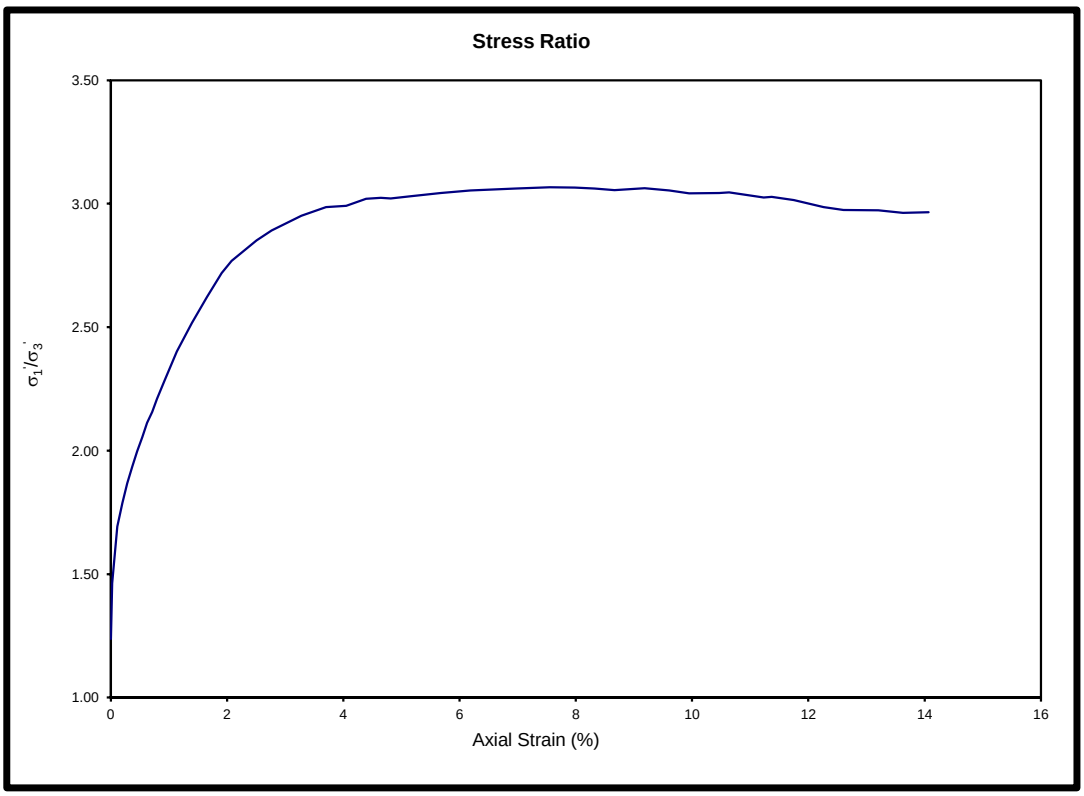




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

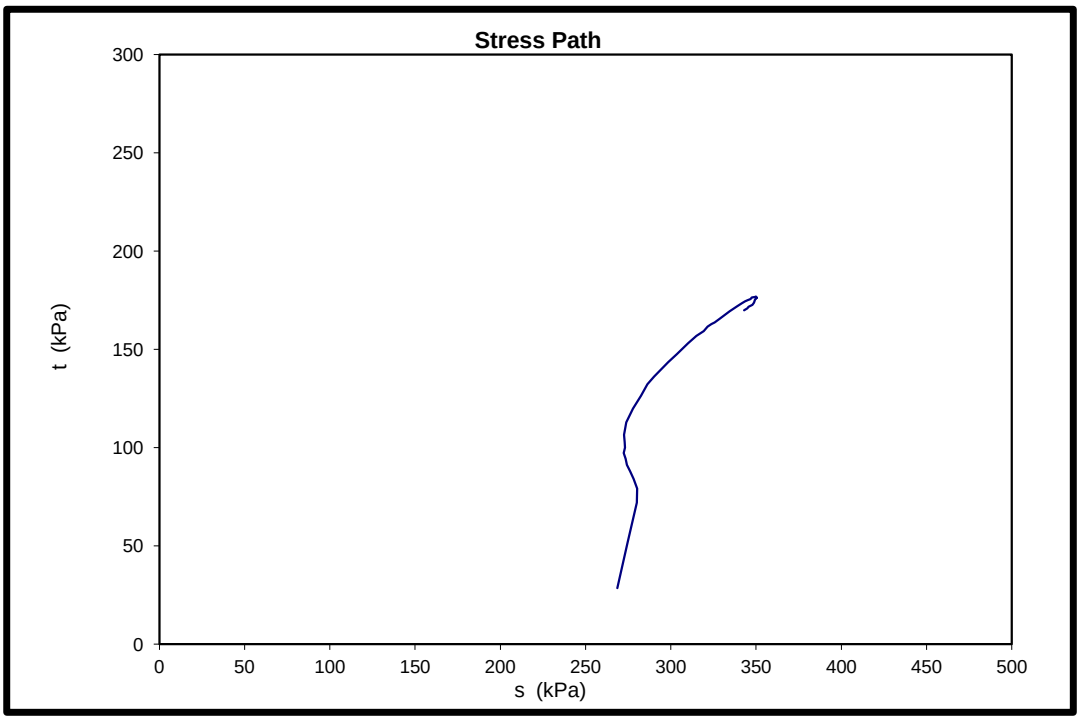
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, grey with very dark grey, moist, laminations of fine silty sand	**Sample Type/No.**	P12 Q2
		Depth	27.70-27.90
Prepared and tested in accordance with ASTM D4767 and In House method			

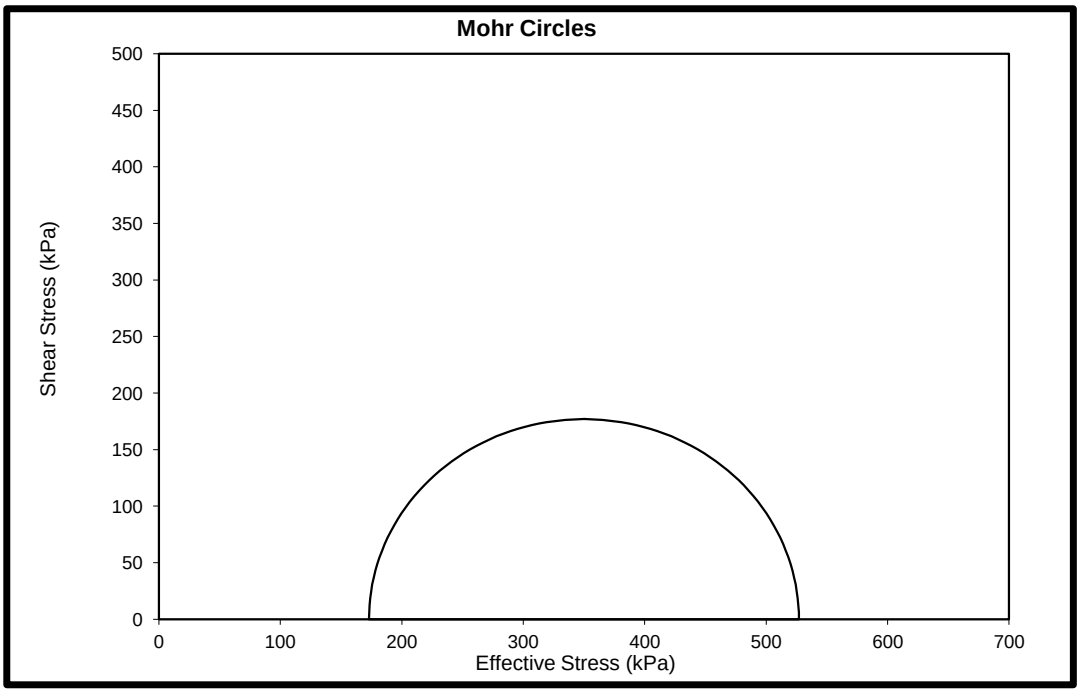




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, grey with very dark grey, moist, laminations of fine silty sand	**Sample Type/No.**	P12 Q2
		Depth	27.70-27.90
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, rare fine gravel, moist.	**Sample Type/No.**	P13 Q2
		Depth	31.50-31.70
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	24
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.61
Saturation	Initial PWP (kPa)	-12
	Saturated PWP (kPa)	427
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	701
	Back Pressure (kPa)	427
	Initial PWP (kPa)	424
	Final PWP (kPa)	423
	cv (m^2/yr)	0.44
	mv (m^2/MN)	27.161
	k (calculated value) (m/s)	3.7E-09
Compression	Cell Pressure (kPa)	701
	Back Pressure (kPa)	427
	s3' (kPa)	274
	Rate of Strain (%/hr)	0.8

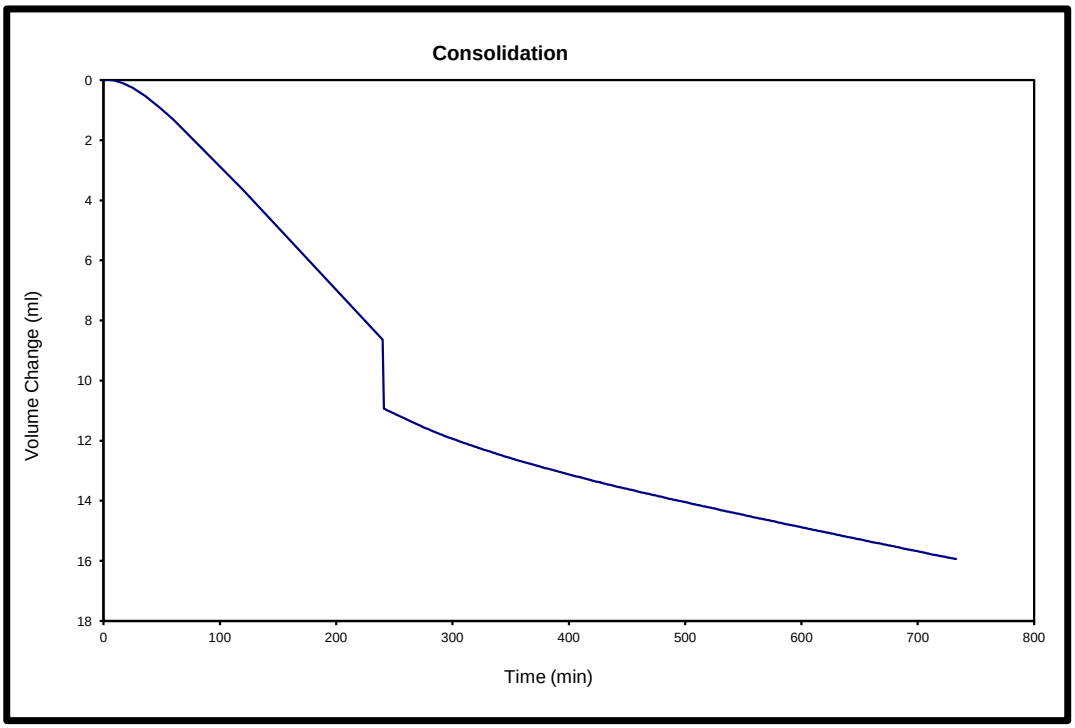
Final Conditions	Moisture Content (%)	26
	Bulk Density (Mg/m3)	2.03
	Dry Density (Mg/m^3)	1.61
Failure Conditions	Strain (e) (%)	11.2
	δu (kPa)	125
	σ_3'f (kPa)	149
	$(\sigma_1' - \sigma_3')f$ (kPa)	380

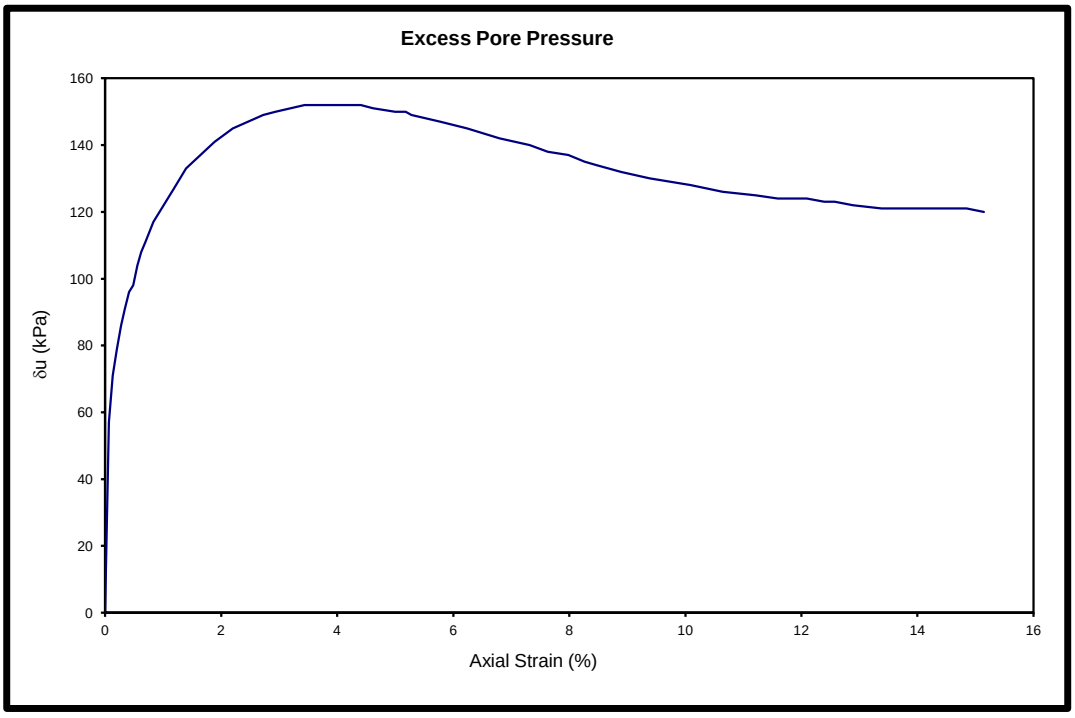
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.068	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

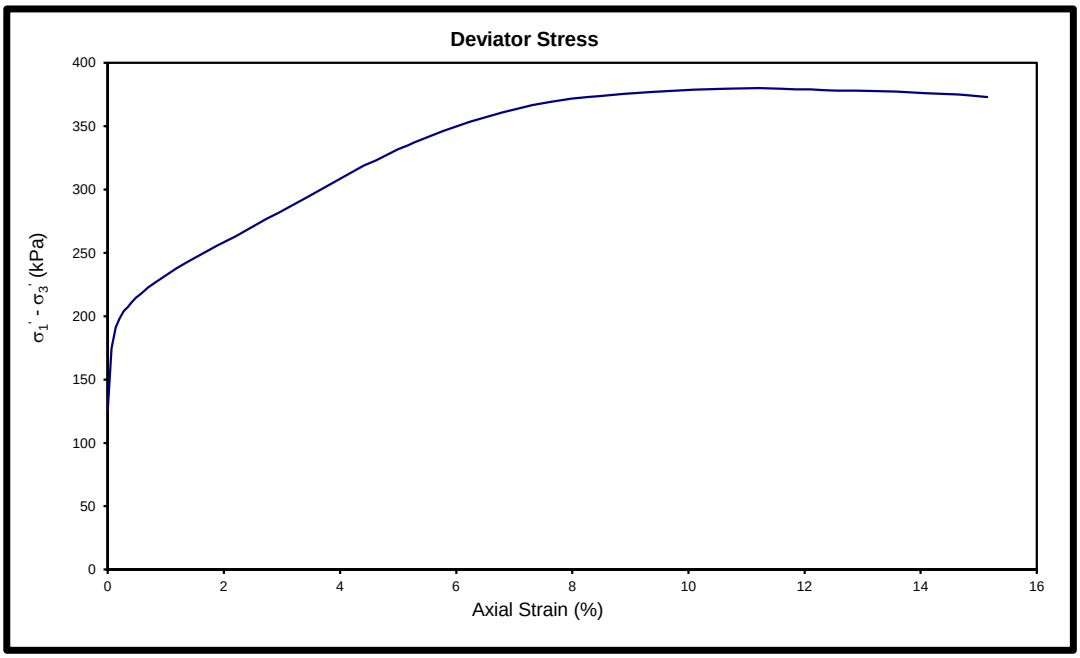
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, rare fine gravel, moist.	**Sample Type/No.**	P13 Q2
		Depth	31.50-31.70
Prepared and tested in accordance with ASTM D4767 and In House method			

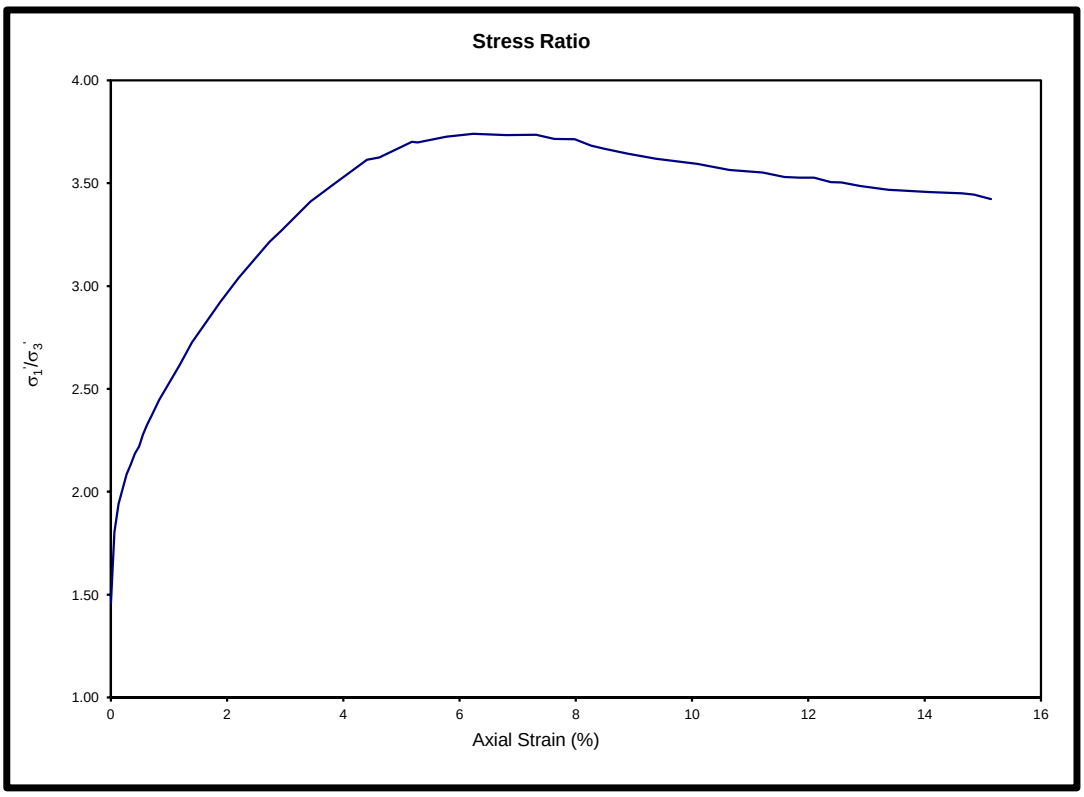




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

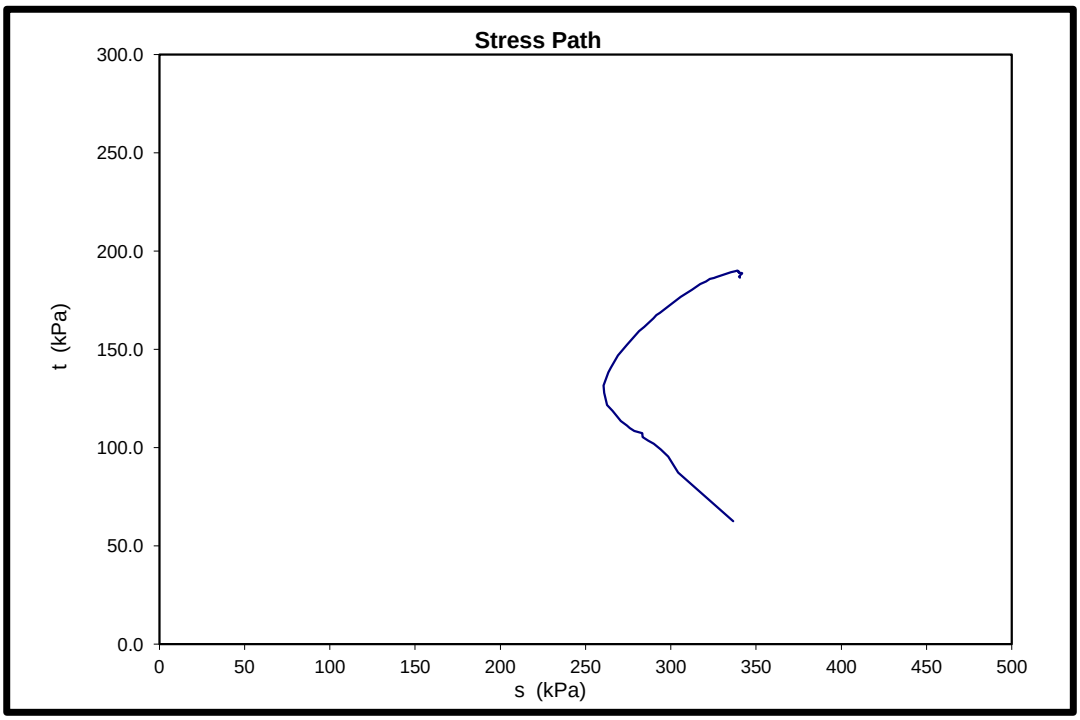
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, rare fine gravel, moist.	**Sample Type/No.**	P13 Q2
		Depth	31.50-31.70
Prepared and tested in accordance with ASTM D4767 and In House method			

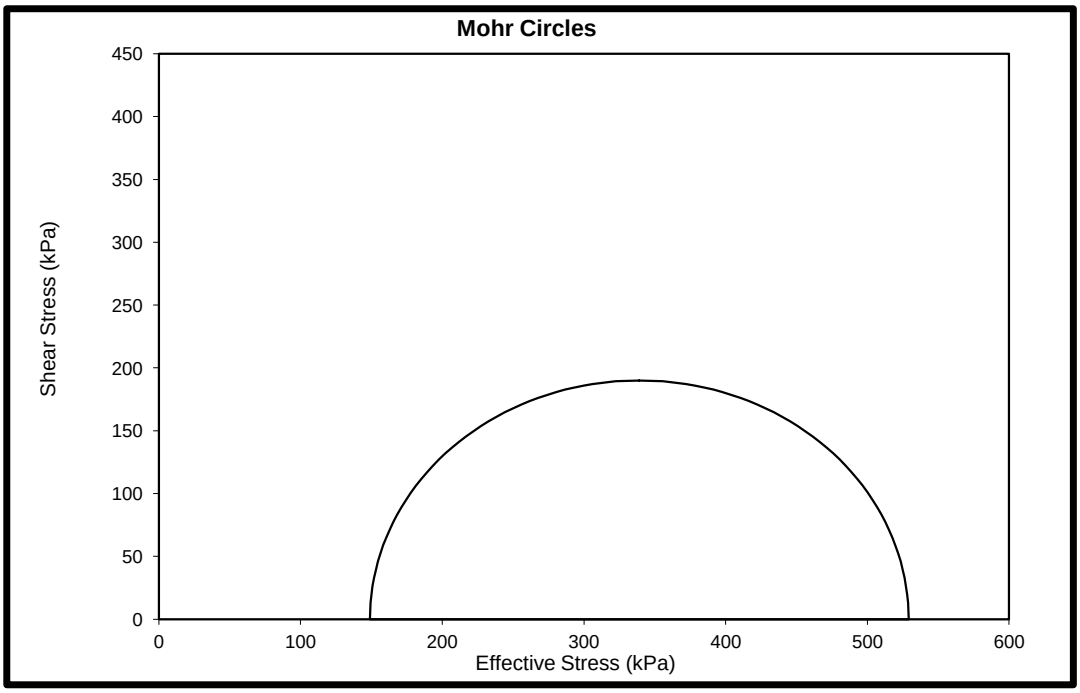




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine, dark grey, rare fine gravel, moist.	**Sample Type/No.**	P13 Q2
		Depth	31.50-31.70
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	Olive grey slightly sandy CLAY. Sand is fine with laminations of m/c sand with shell fragments	**Sample Type/No.**	P14 Q1
		Depth	35.20-35.40
Prepared and tested in accordance with ASTM D4767 and In House Method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	115
	Diameter (mm)	72
	Moisture Content %	26
	Bulk Density (Mg/m3)	1.95
	Dry Density (Mg/m^3)	1.54
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	469
	Final Cell Pressure (kPa)	500
	B Value	0.98
Consolidation	Cell Pressure (kPa)	780
	Back Pressure (kPa)	469
	Initial PWP (kPa)	462
	Final PWP (kPa)	469
	cv (m^2/yr)	0.058
	mv (m^2/MN)	-5.59
	k (calculated value) (m/s)	-1.0E-10
Compression	Cell Pressure (kPa)	780
	Back Pressure (kPa)	469
	s3' (kPa)	311
	Rate of Strain (%/hr)	1.04

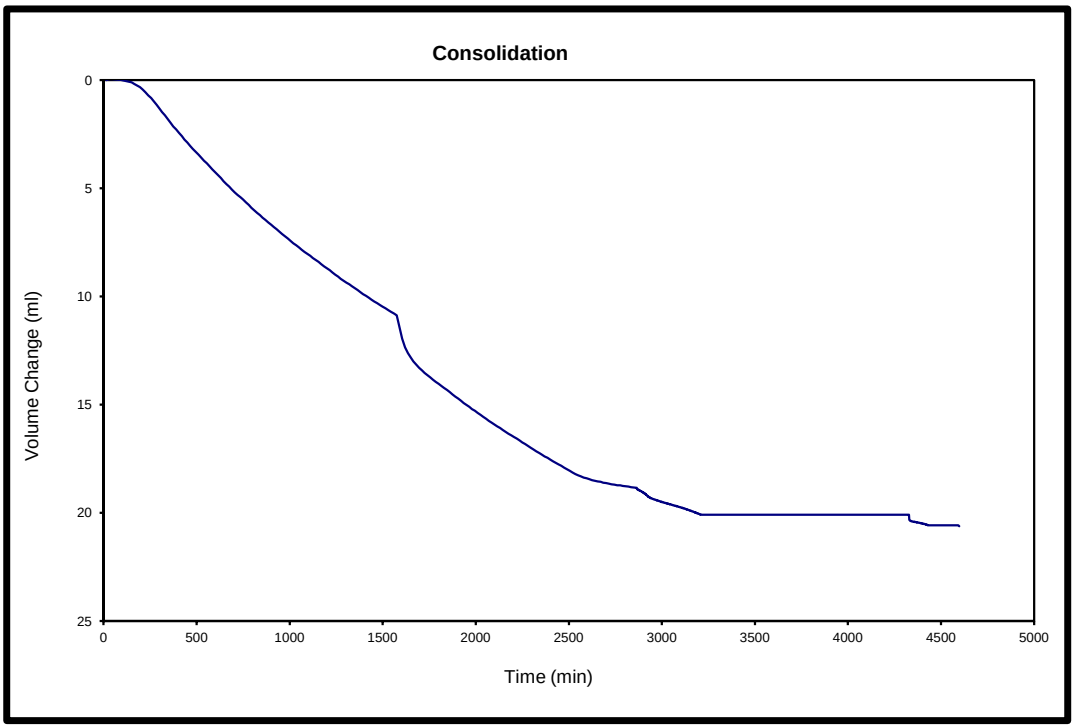
Final Conditions	Moisture Content (%)	24
	Bulk Density (Mg/m3)	2.01
	Dry Density (Mg/m^3)	1.61
Failure Conditions	Strain (e) (%)	6.1
	δu (kPa)	154
	σ_3'f (kPa)	157
	$(\sigma_1' - \sigma_3')f$ (kPa)	336

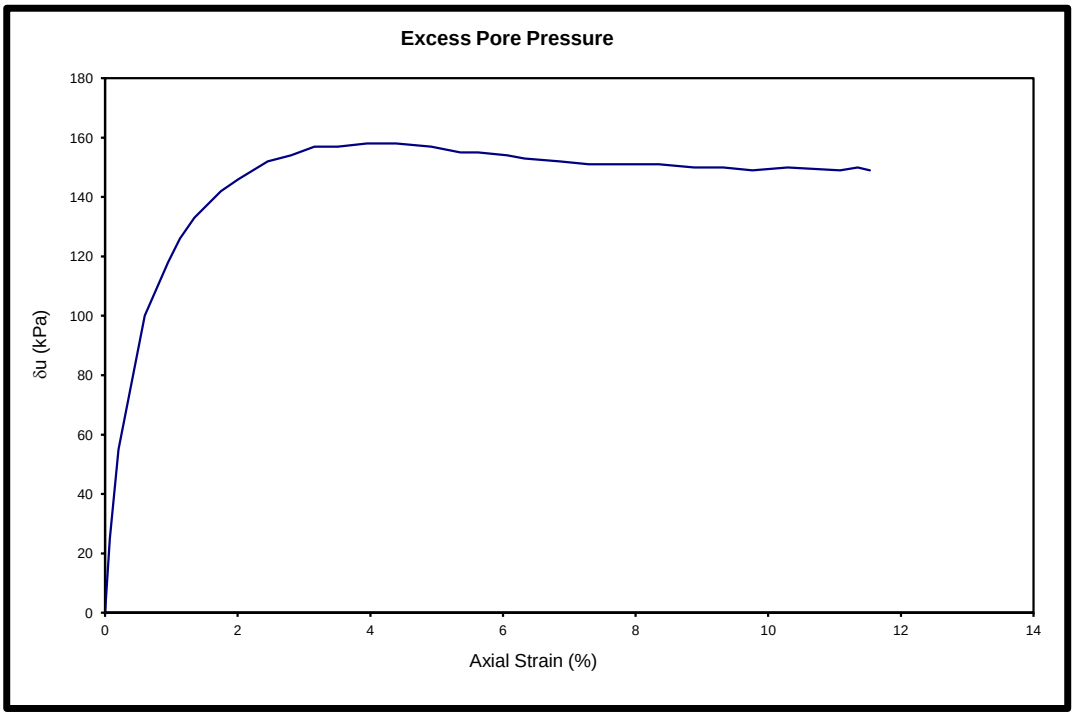
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.093	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

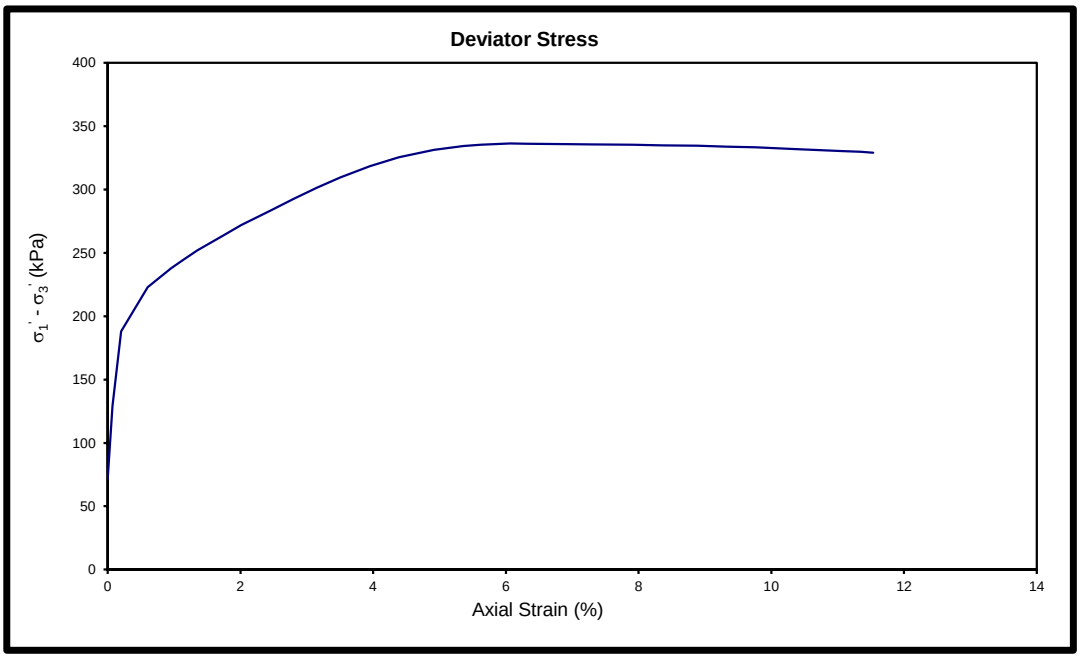
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	Olive grey slightly sandy CLAY. Sand is fine with laminations of m/c sand with shell fragments	**Sample Type/No.**	P14 Q1
		Depth	35.20-35.40
Prepared and tested in accordance with ASTM D4767 and In House Method			

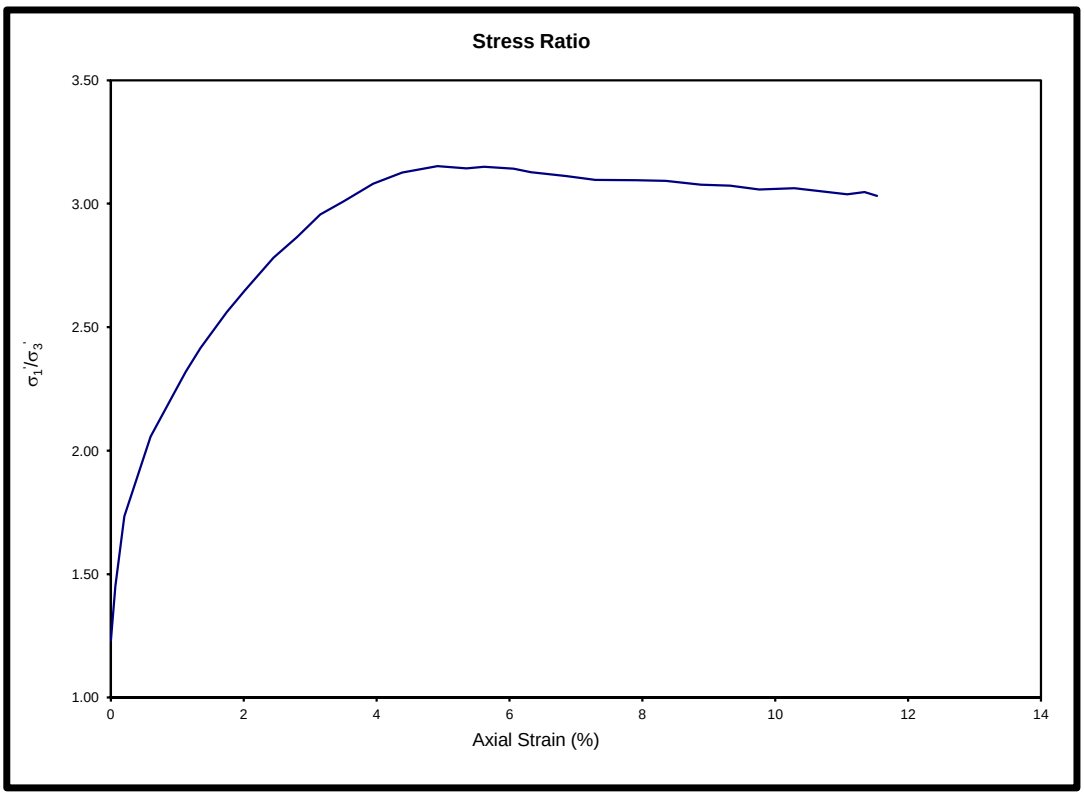




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

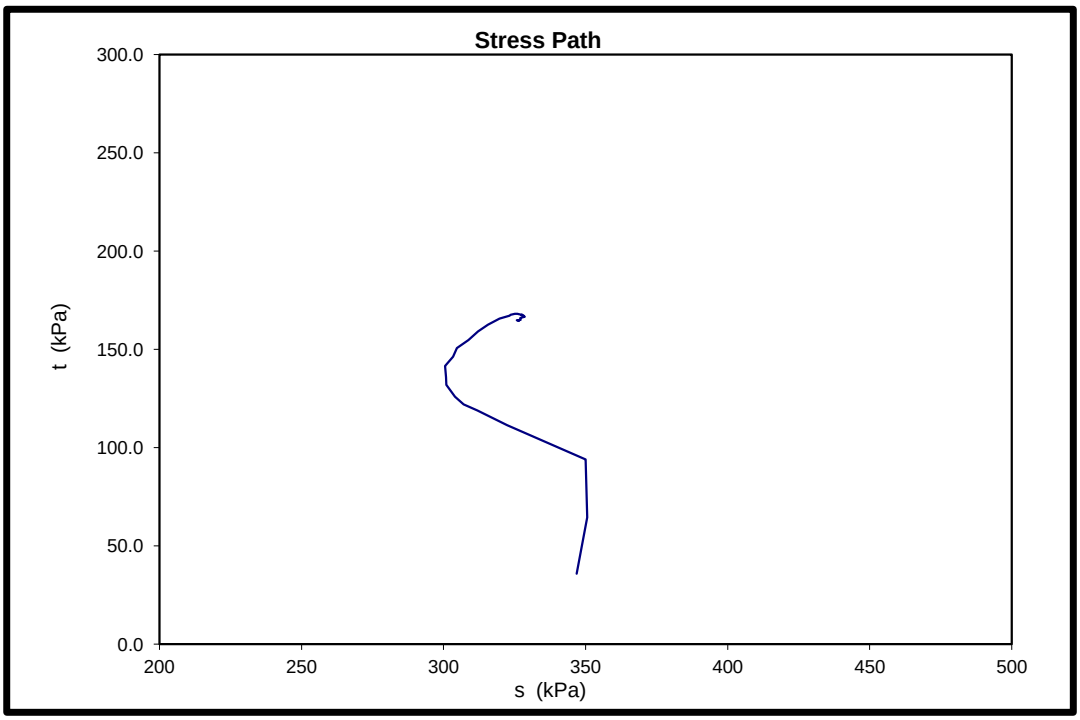
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	Olive grey slightly sandy CLAY. Sand is fine with laminations of m/c sand with shell fragments	**Sample Type/No.**	P14 Q1
		Depth	35.20-35.40
Prepared and tested in accordance with ASTM D4767 and In House Method			

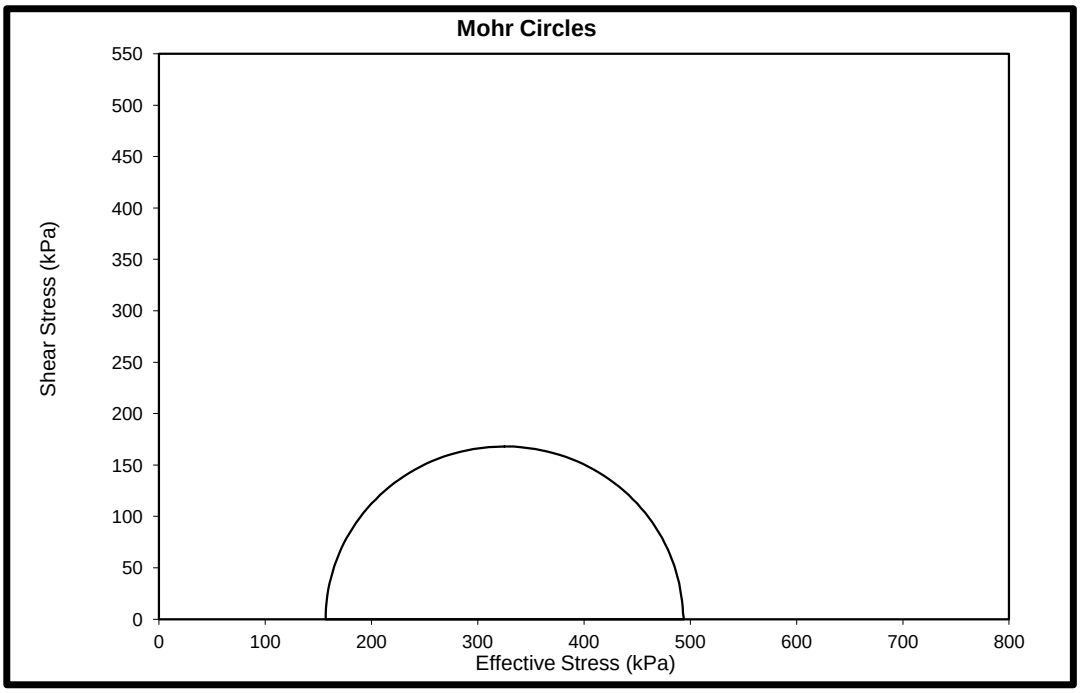




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	Olive grey slightly sandy CLAY. Sand is fine with laminations of m/c sand with shell fragments	**Sample Type/No.**	P14 Q1
		Depth	35.20-35.40
Prepared and tested in accordance with ASTM D4767 and In House Method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY sandy. Sand is fine, dark olive grey, laminations of fine to medium shell fragments, moist.	**Sample Type/No.**	P15 Q1
		Depth	39.20-39.40
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	33
	Bulk Density (Mg/m3)	1.93
	Dry Density (Mg/m^3)	1.45
Saturation	Initial PWP (kPa)	1
	Saturated PWP (kPa)	345
	Final Cell Pressure (kPa)	500
	B Value	0.95
Consolidation	Cell Pressure (kPa)	679
	Back Pressure (kPa)	338
	Initial PWP (kPa)	345
	Final PWP (kPa)	346
	cv (m^2/yr)	0.37
	mv (m^2/MN)	-12.015
	k (calculated value) (m/s)	-1.4E-09
Compression	Cell Pressure (kPa)	679
	Back Pressure (kPa)	338
	s3' (kPa)	341
	Rate of Strain (%/hr)	0.8

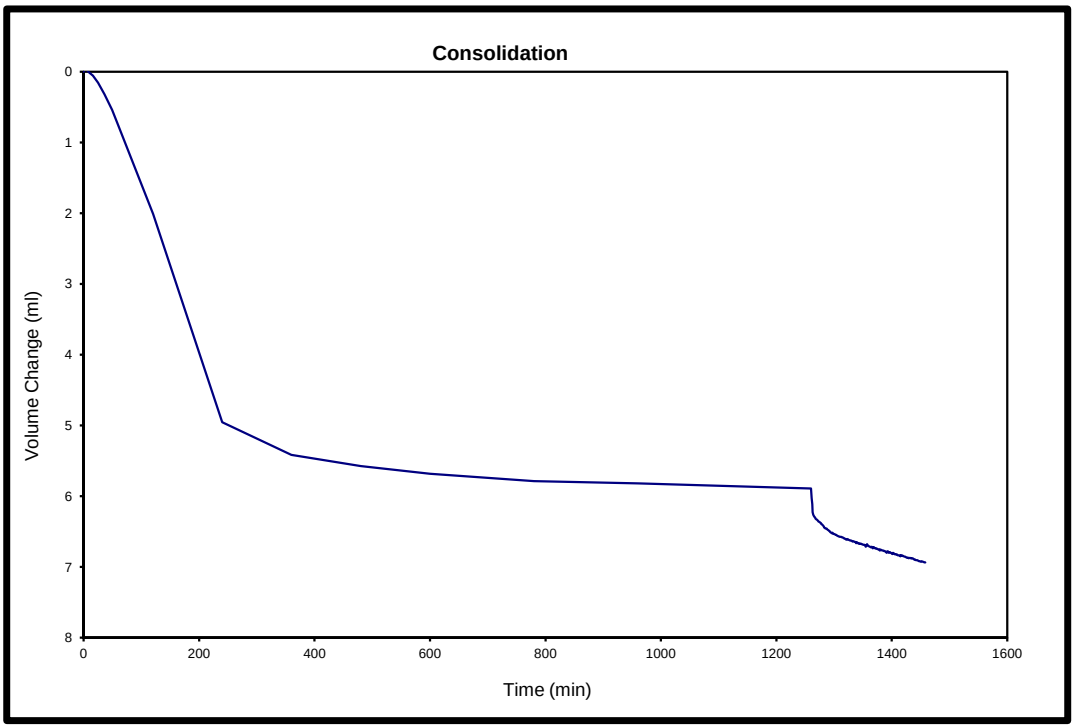
Final Conditions	Moisture Content (%)	31
	Bulk Density (Mg/m3)	1.92
	Dry Density (Mg/m^3)	1.47
Failure Conditions	Strain (e) (%)	10.9
	δu (kPa)	171
	σ_3'f (kPa)	170
	$(\sigma_1' - \sigma_3')f$ (kPa)	464

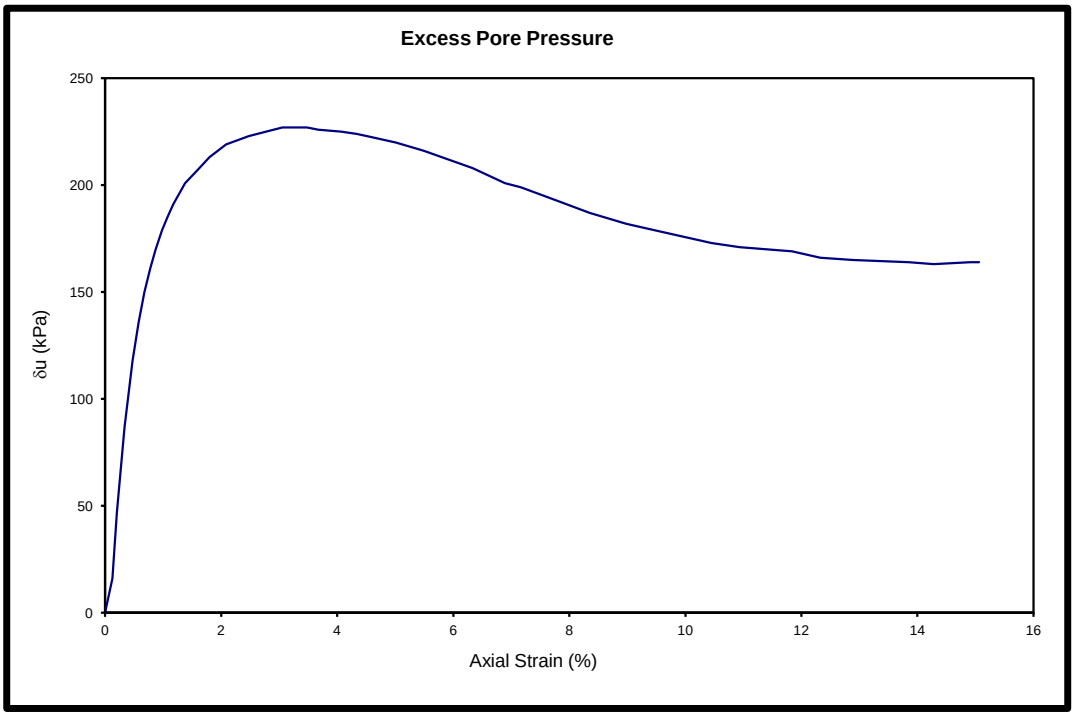
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.025	
	Sample Quality Category	1	Very good to Excellent

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

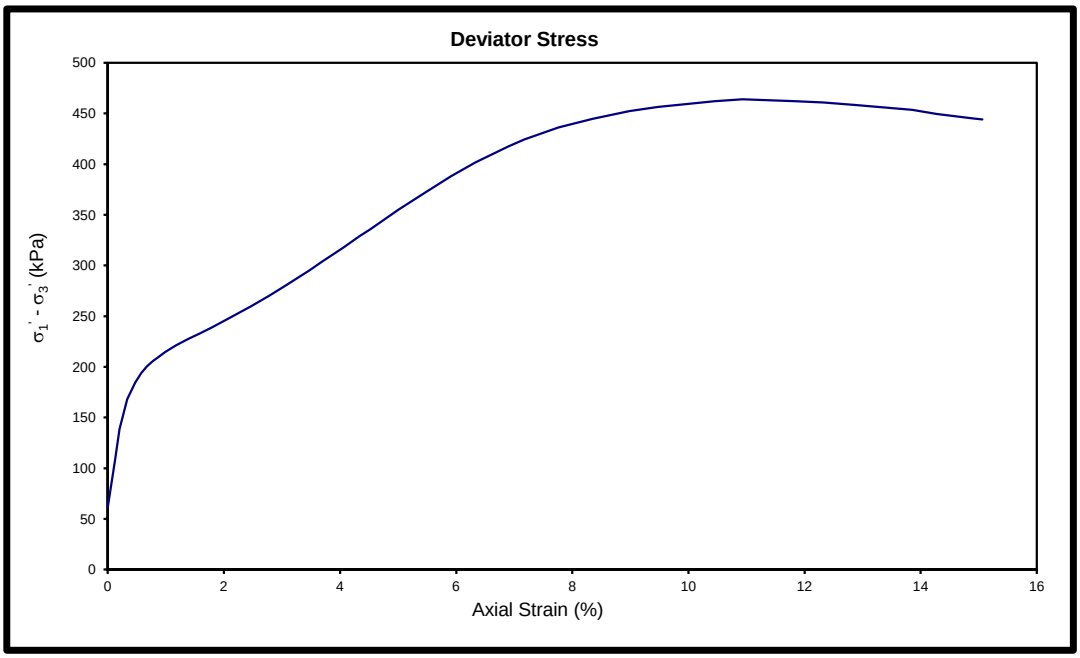
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY sandy. Sand is fine, dark olive grey, laminations of fine to medium shell fragments, moist.	**Sample Type/No.**	P15 Q1
		Depth	39.20-39.40
Prepared and tested in accordance with ASTM D4767 and In House method			

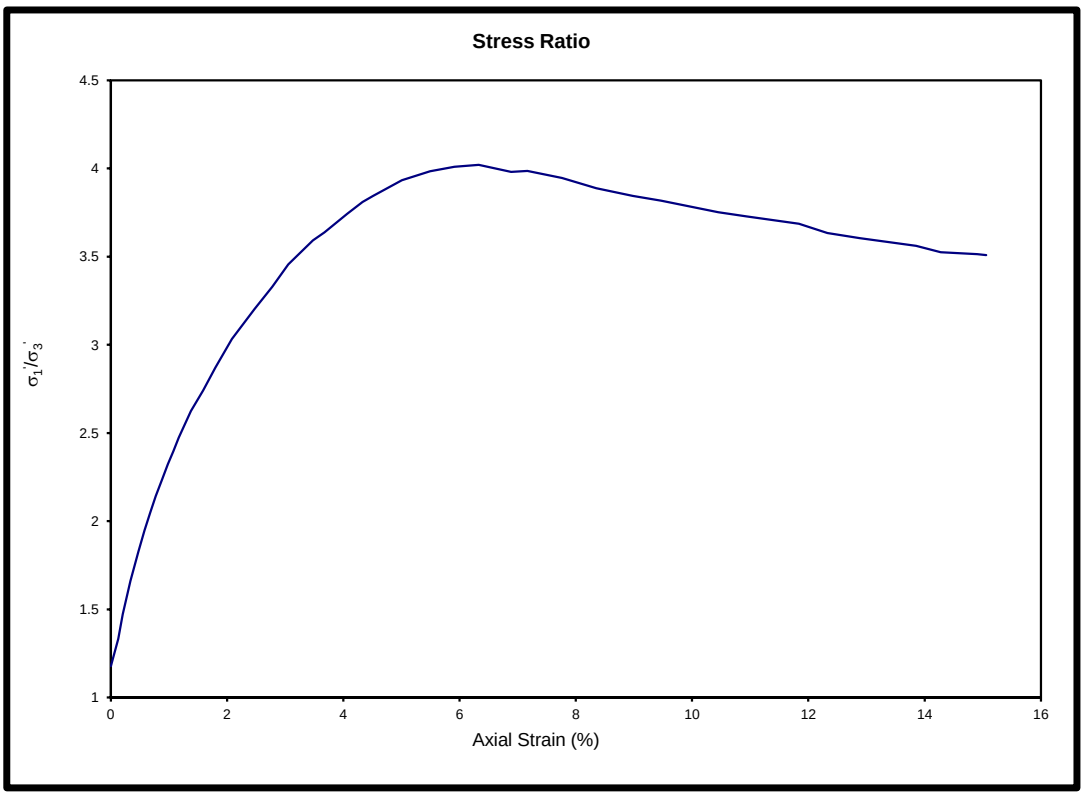




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

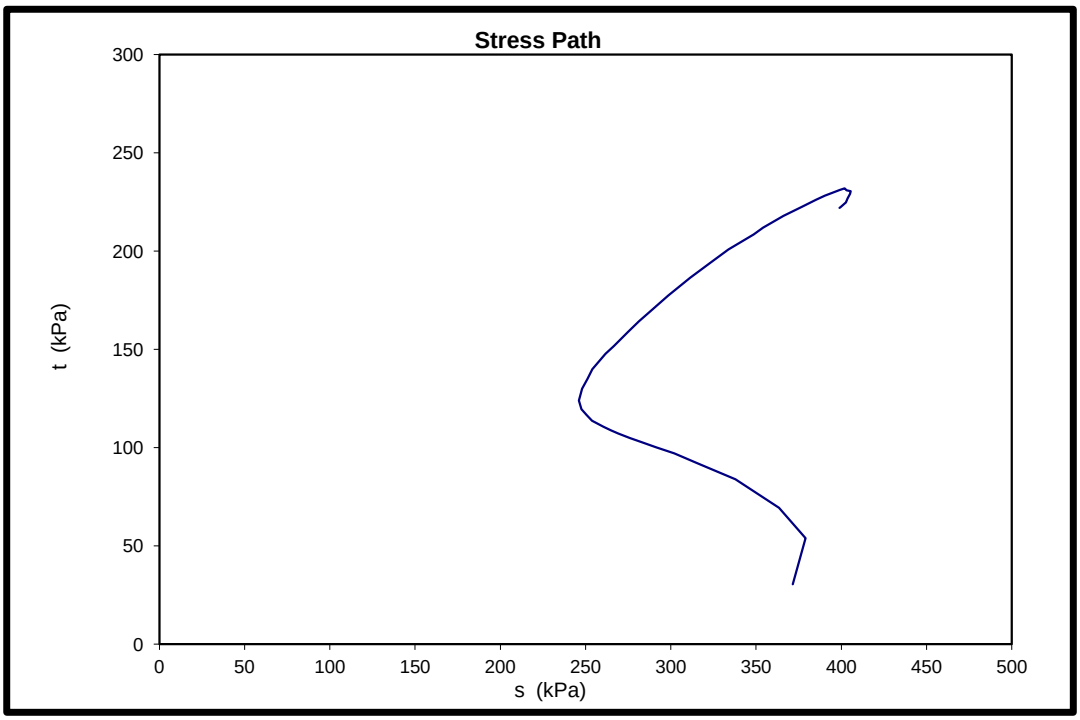
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY sandy. Sand is fine, dark olive grey, laminations of fine to medium shell fragments, moist.	**Sample Type/No.**	P15 Q1
		Depth	39.20-39.40
Prepared and tested in accordance with ASTM D4767 and In House method			

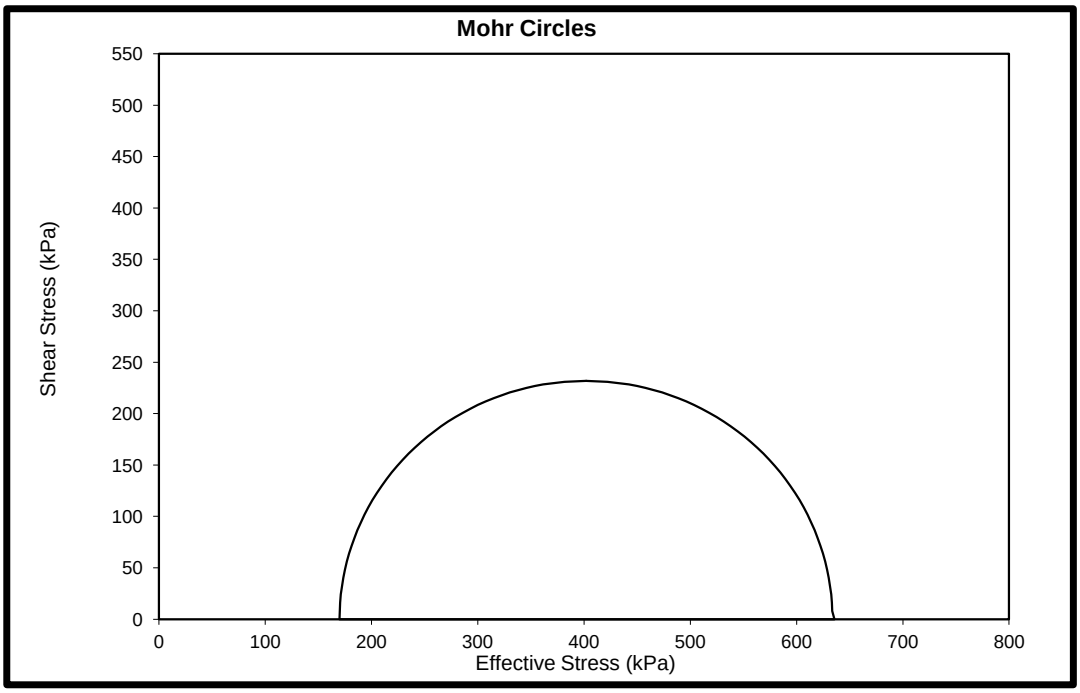




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY sandy. Sand is fine, dark olive grey, laminations of fine to medium shell fragments, moist.	**Sample Type/No.**	P15 Q1
		Depth	39.20-39.40
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine to medium and thinly laminated with fine to medium sand, dark greenish grey, with fine to medium shell fragments, moist	**Sample Type/No.**	P16 Q1
		Depth	43.20-43.40
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	25
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.60
Saturation	Initial PWP (kPa)	5
	Saturated PWP (kPa)	424
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	798
	Back Pressure (kPa)	423
	Initial PWP (kPa)	428
	Final PWP (kPa)	435
	cv (m^2/yr)	NA
	mv (m^2/MN)	-4.350
	k (calculated value) (m/s)	NA
Compression	Cell Pressure (kPa)	798
	Back Pressure (kPa)	423
	s3' (kPa)	375
	Rate of Strain (%/hr)	0.8

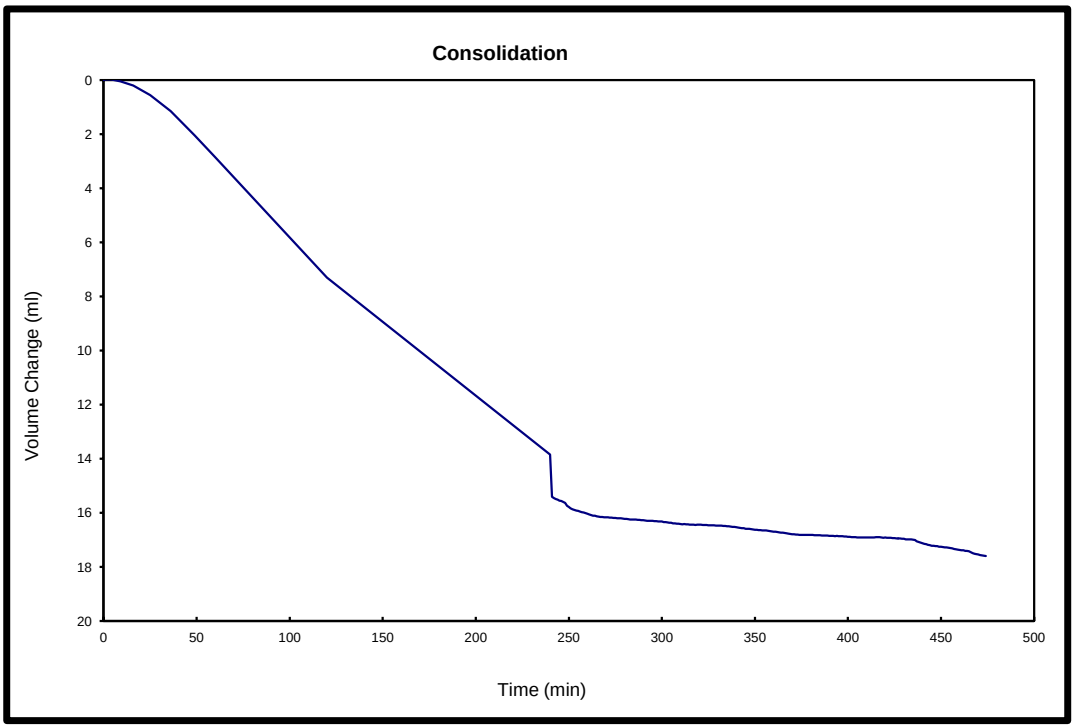
Final Conditions	Moisture Content (%)	24
	Bulk Density (Mg/m3)	2.03
	Dry Density (Mg/m^3)	1.64
Failure Conditions	Strain (e) (%)	10.1
	δu (kPa)	201
	σ_3'f (kPa)	174
	$(\sigma_1' - \sigma_3')f$ (kPa)	606

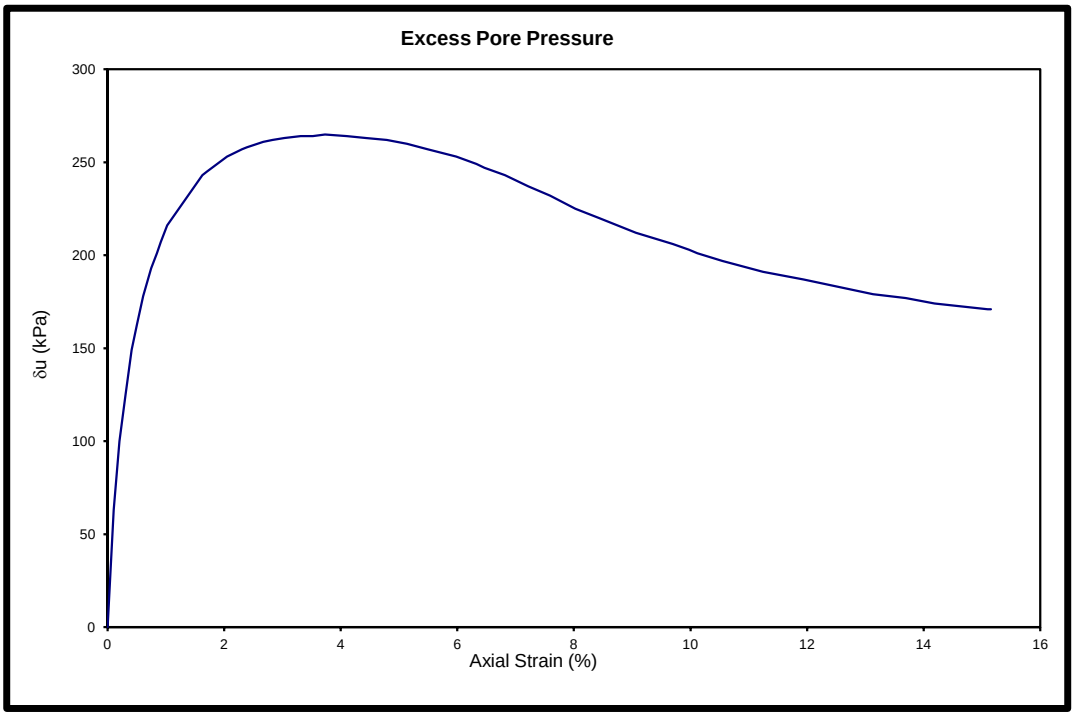
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.075	
	Sample Quality Category	3	Poor

Remarks:	Unable to calculate cv and k (calculated value) due to software error.	Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

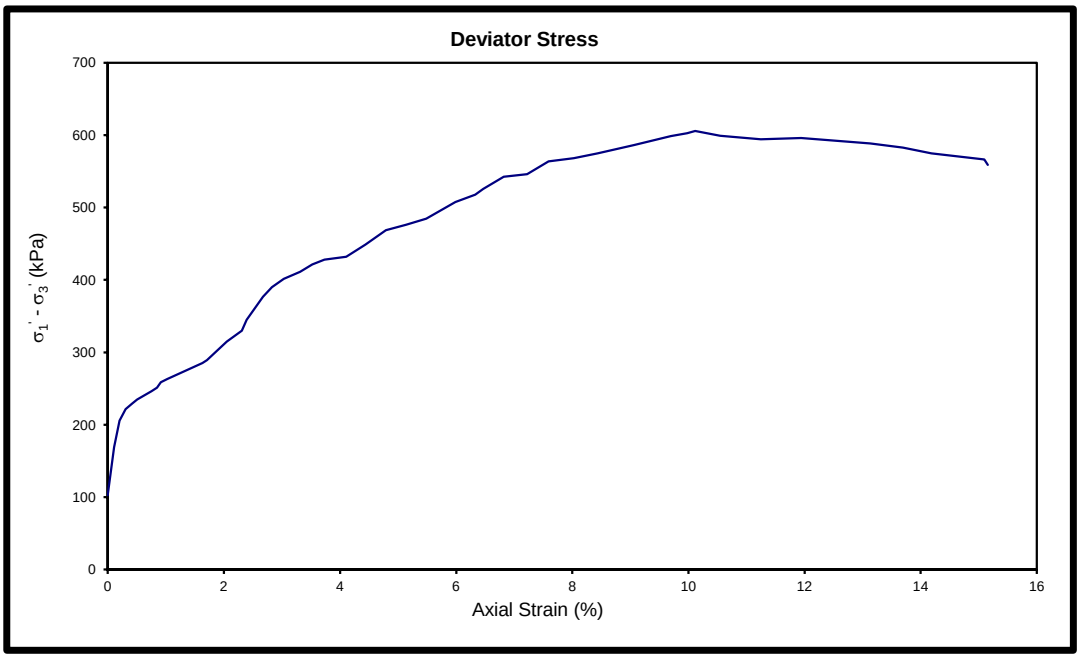
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine to medium and thinly laminated with fine to medium sand, dark greenish grey, with fine to medium shell fragments, moist	**Sample Type/No.**	P16 Q1
		Depth	43.20-43.40
Prepared and tested in accordance with ASTM D4767 and In House method			

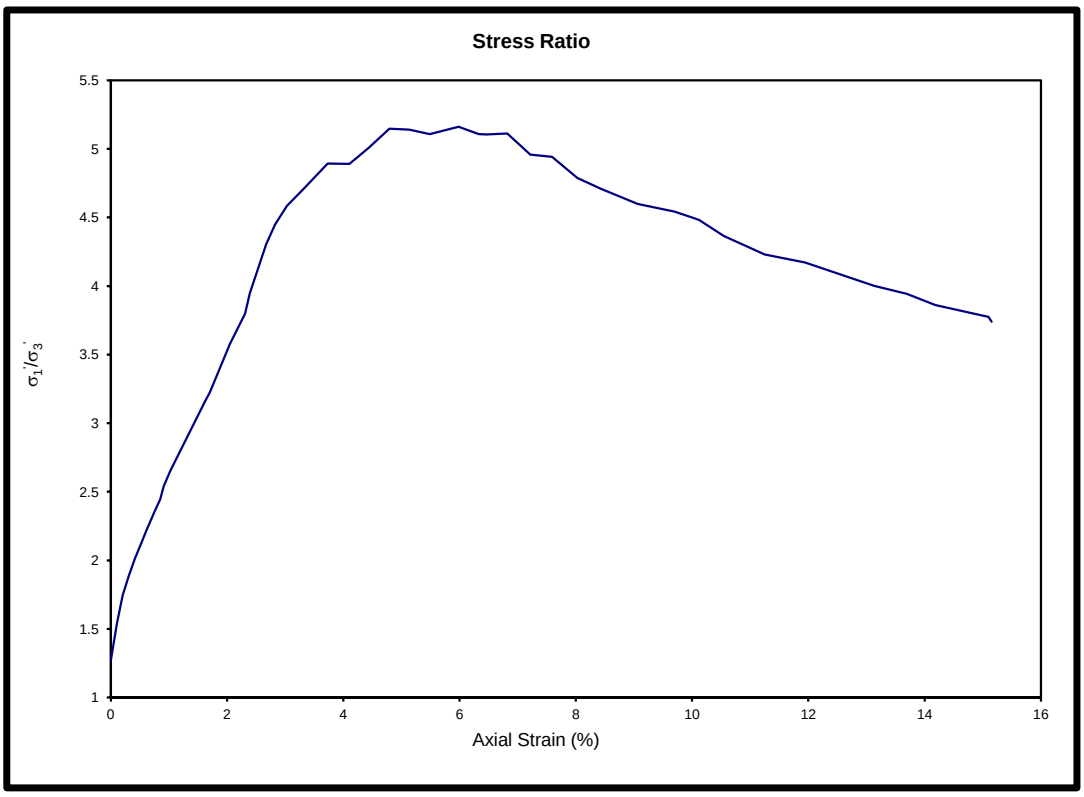




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

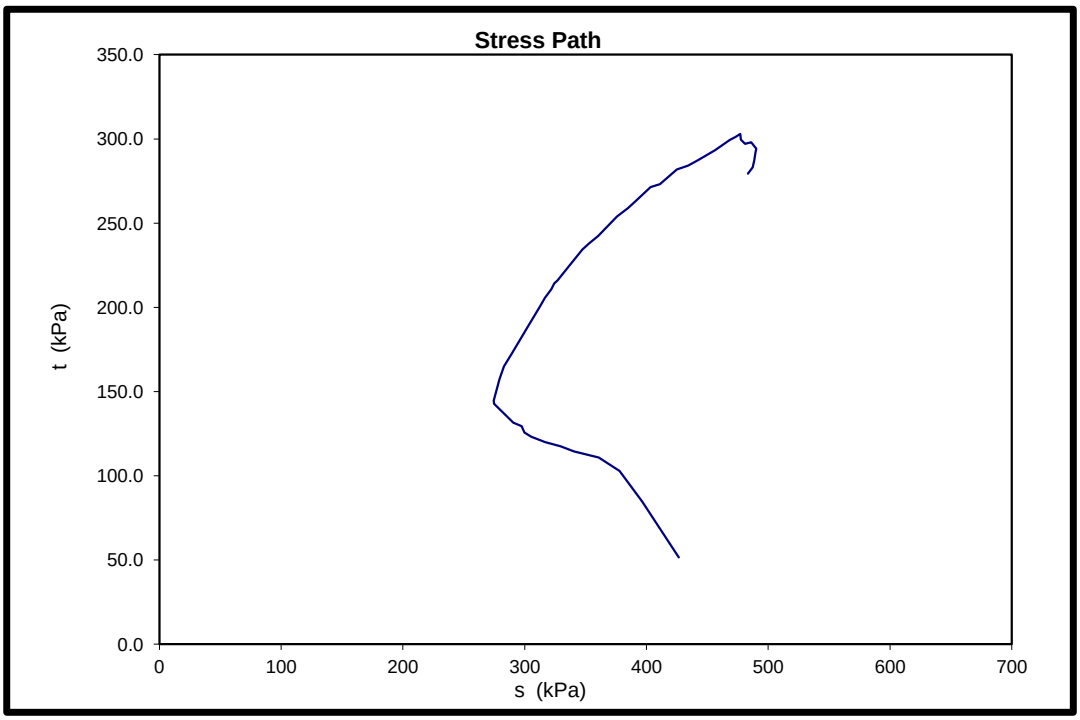
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine to medium and thinly laminated with fine to medium sand, dark greenish grey, with fine to medium shell fragments, moist	**Sample Type/No.**	P16 Q1
		Depth	43.20-43.40
Prepared and tested in accordance with ASTM D4767 and In House method			

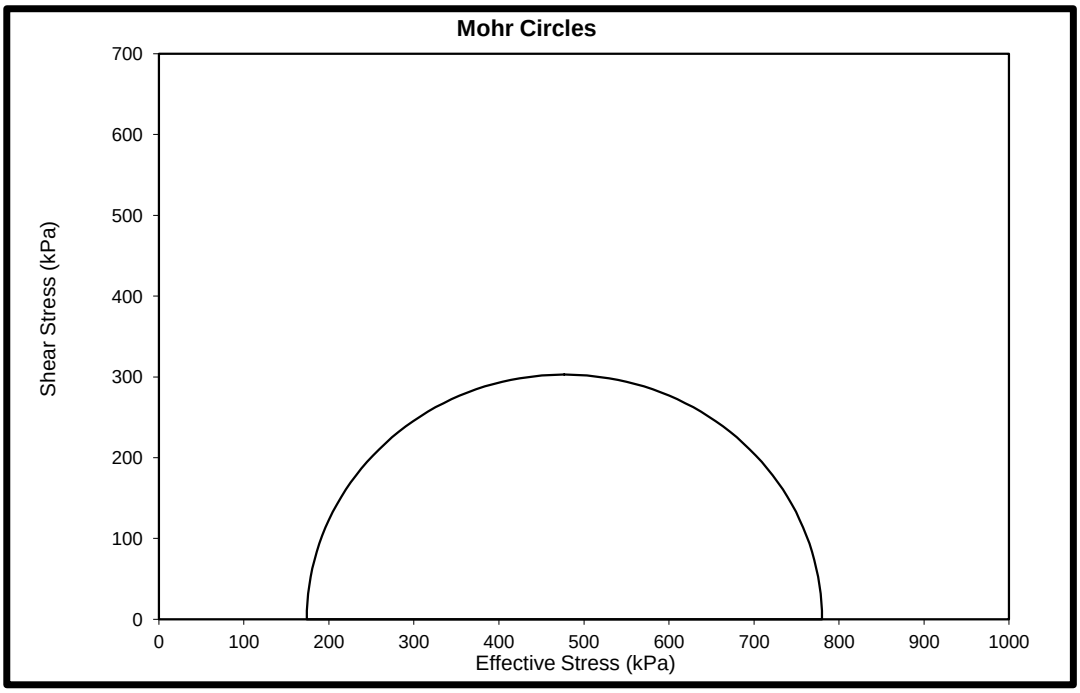




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-G7
Description	CLAY with sand. Sand is fine to medium and thinly laminated with fine to medium sand, dark greenish grey, with fine to medium shell fragments, moist	**Sample Type/No.**	P16 Q1
		Depth	43.20-43.40
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G7
Description	SAND with clay. Sand is fine to medium, dark greenish grey, moist, with fine to medium shell fragments	**Sample Type/No.**	P17Q2
		Depth	46.8-47
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	23
	Bulk Density (Mg/m3)	2.04
	Dry Density (Mg/m^3)	1.66
Saturation	Initial PWP (kPa)	11
	Saturated PWP (kPa)	399
	Final Cell Pressure (kPa)	400
	B Value	0.98
Consolidation	Cell Pressure (kPa)	804
	Back Pressure (kPa)	399
	Initial PWP (kPa)	400
	Final PWP (kPa)	399
	cv (m^2/yr)	0.41
	mv (m^2/MN)	52.281
	k (calculated value) (m/s)	6.6E-09
Compression	Cell Pressure (kPa)	804
	Back Pressure (kPa)	399
	s3' (kPa)	405
	Rate of Strain (%/hr)	0.8

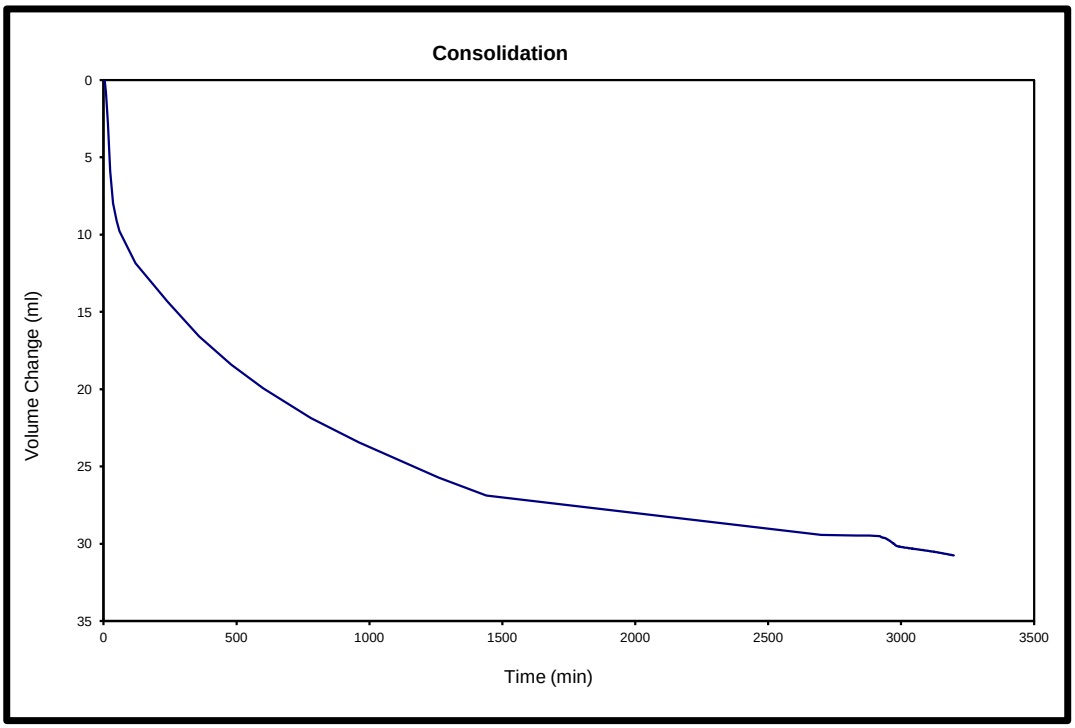
Final Conditions	Moisture Content (%)	22
	Bulk Density (Mg/m3)	2.12
	Dry Density (Mg/m^3)	1.74
Failure Conditions	Strain (e) (%)	15.3
	δu (kPa)	149
	σ_3'f (kPa)	256
	$(\sigma_1' - \sigma_3')f$ (kPa)	679

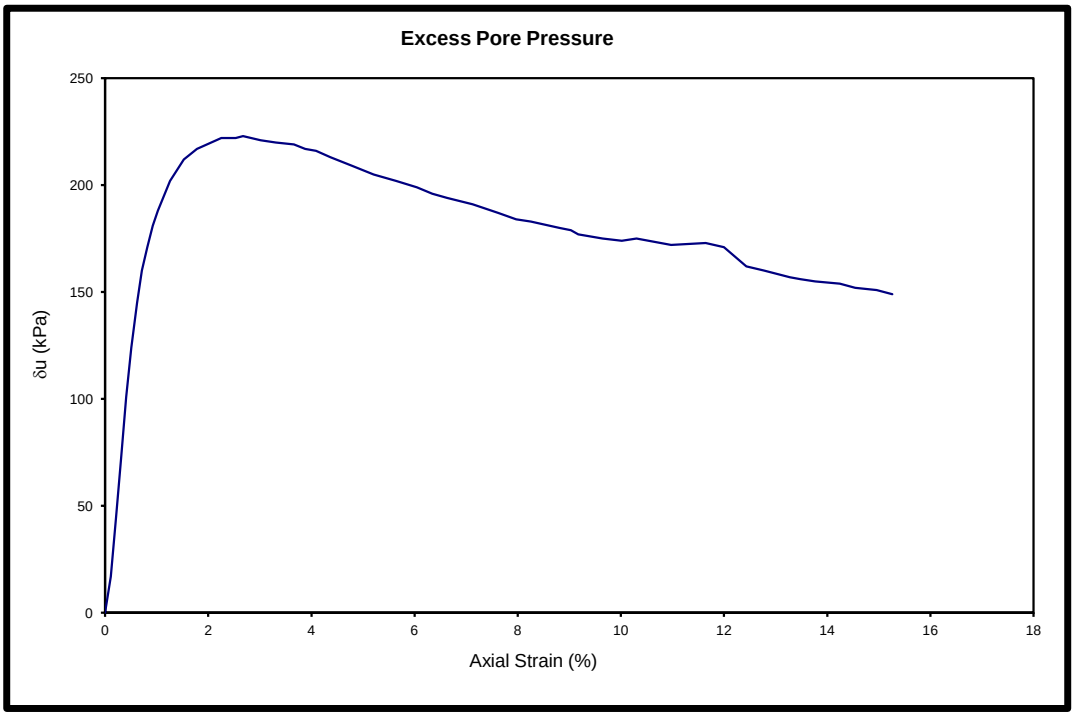
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.135582455	
	Sample Quality Category	4	Very poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

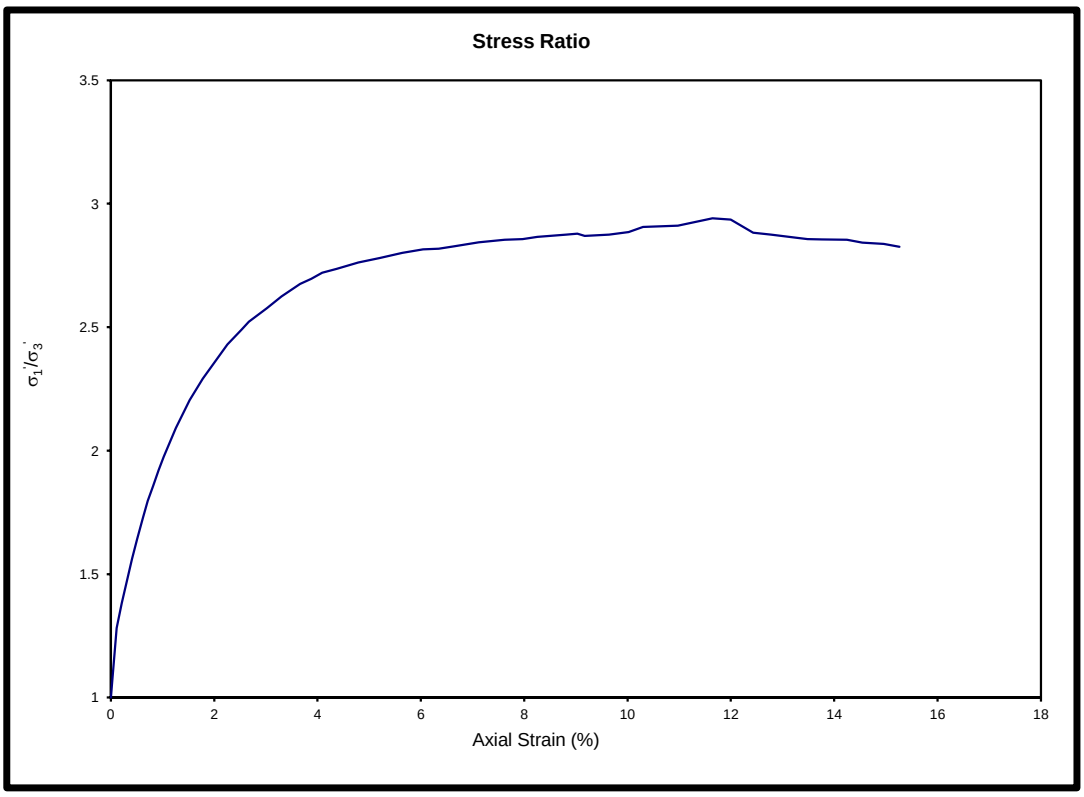
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G7
Description	SAND with clay. Sand is fine to medium, dark greenish grey, moist, with fine to medium shell fragments	**Sample Type/No.**	P17Q2
		Depth	46.8-47
Prepared and tested in accordance with ASTM D4767 and In House method			





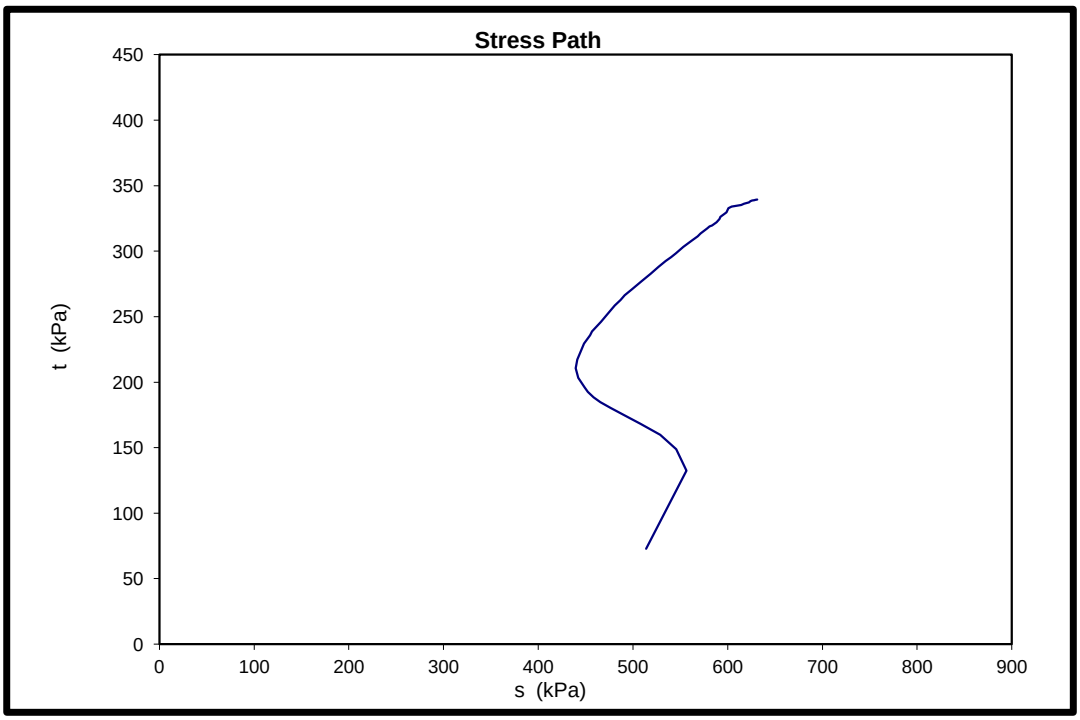
Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

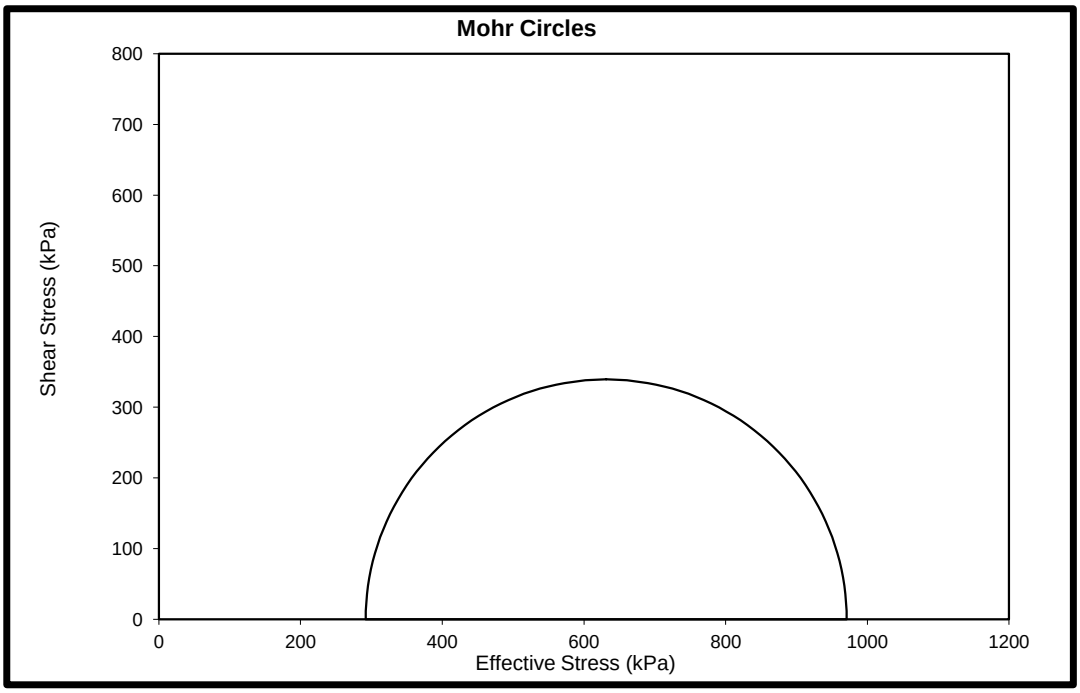
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G7
Description	SAND with clay. Sand is fine to medium, dark greenish grey, moist, with fine to medium shell fragments	**Sample Type/No.**	P17Q2
		Depth	46.8-47
Prepared and tested in accordance with ASTM D4767 and In House method			



Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G7
Description	SAND with clay. Sand is fine to medium, dark greenish grey, moist, with fine to medium shell fragments	**Sample Type/No.**	P17Q2
		Depth	46.8-47
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline

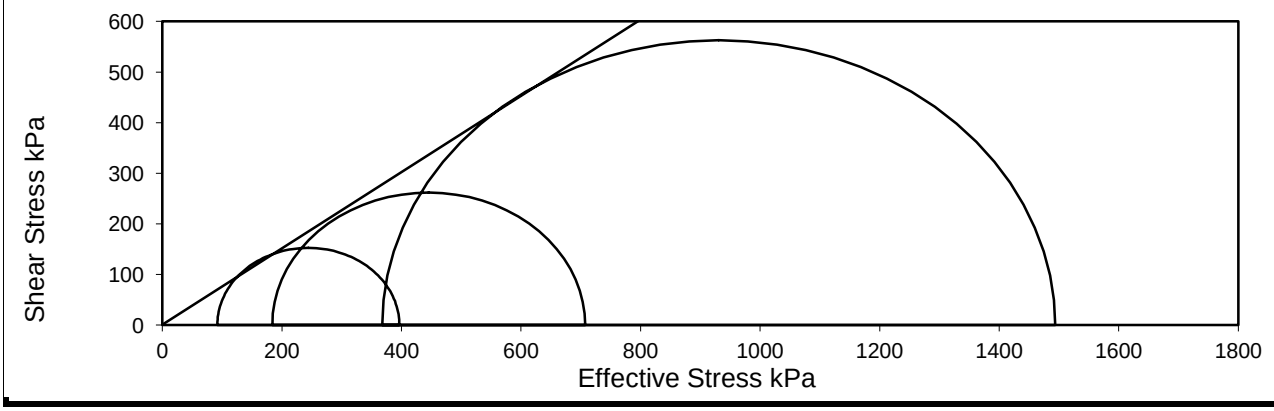
Consolidated Drained Triaxial Compression with measurement of volume change

US Wind inc sea energy

Prepared and tested in accordance with ASTM D 7181

Contract No.	10451	Location.	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area		
BH/TP No.	BH-G17	Sample Type/No.	P10 B1	Depth.	18.5-18.55
Type of Specimen	Disturbed / Compacted	Type of Test	Multi-Specimen	Side Drains Fitted	No
Description	SAND. Sand is medium to coarse, moist, light olive brown, ocassional fine gravel		Drainage Conditions	One end	

			Specimen 1	Specimen 2	Specimen 3
Intial Specimen Conditions ASTM 7181	Moisture Content	%	15.7	11.8	15.7
	Bulk Density	Mg/m^3	1.85	1.96	1.91
	Dry Density	Mg/m^3	1.60	1.76	1.65
	Height	mm	137	133	137
	Diameter	mm	70	70	70
	Particle Density - Assumed	Mg/m^3	2.65	2.65	2.65
	Degree of Saturation	%	61.75	60.06	67.27
	Void Ratio	e_0	0.65786	0.50995	0.60382
Compression Stage	Cell Pressure	kPa	950	877	950
	Back Pressure	kPa	858	693	582
	σ3	kPa	92	184	368
	Failure Criteron: Maximum Deviator Stress				
	Rate of Axial Displacement	mm/min	0.570	0.044	0.045
	Axial Strain	%/min	0.417	0.033	0.033
	Membrane/Side Drain Correction Applied		0.12	0.12	0.12
	σ^1-σ^3 (Corrected)	kPa	305	523	1125
	Pore Water Pressure (o_u)	kPa	858	699	582
	Major Principle Stress	kPa	397	707	1493
	Minor Principle Stress	kPa	92	184	368
	Volumetric Strain	%	-0.64	-0.36	-0.24
Final Specimen Condition s ASTM 7181	Moisture Content	%	18.0	18.0	17.9
	Bulk Density	Mg/m^3	1.91	1.97	1.98
	Dry Density	Mg/m^3	1.62	1.67	1.68
Sample Quality	SQ Index ($\Delta e/e_0$)		#N/A	#N/A	#N/A
	Sample Quality Category		#N/A	#N/A	#N/A
			#N/A	#N/A	#N/A
	G_{max}	m/s	#N/A	361.7	#N/A



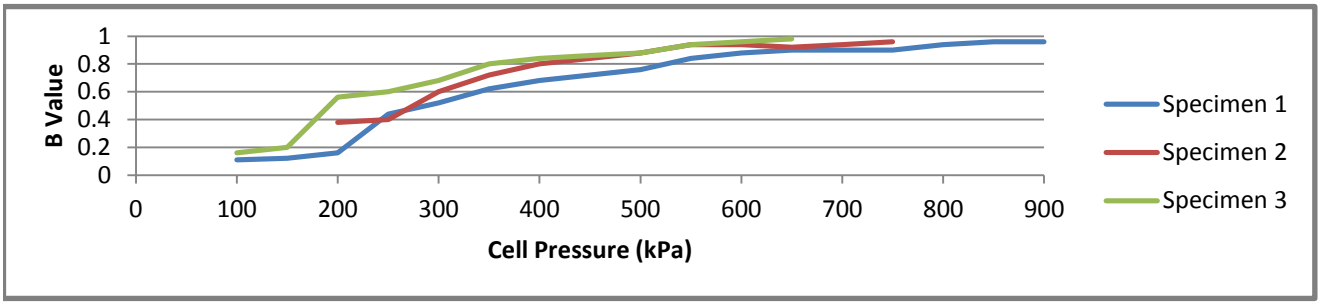
Effective Stress Parameters	c_d kPa	0.3	φ_d deg	37.0
Remarks:		Tested By	Checked By	Approved By
		LR	LR	JG

Gardline	Consolidated Drained Triaxial Compression with measurement of volume change	US Wind inc sea energy

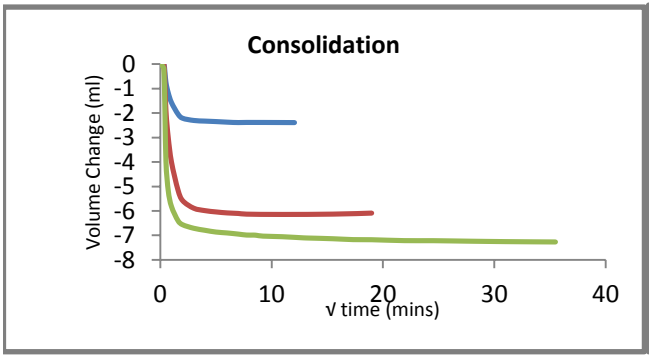
Prepared and tested in accordance with ASTM D 7181

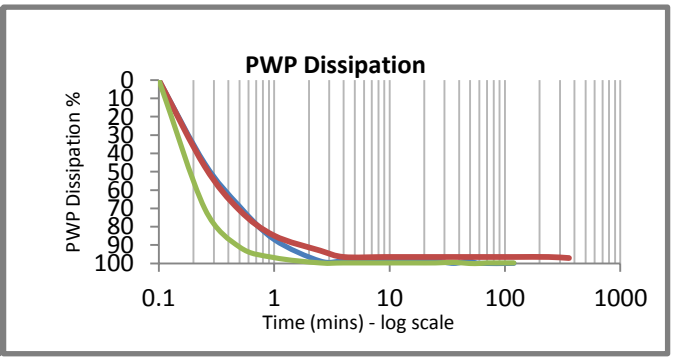
BH/TP No.	BH-G17	Sample Type/No.	P10 B1	Depth.	18.5-18.55

Saturation Stage ASTM 7181	Method:	Incremental Back Pressure		Specimen 1	Specimen 2	Specimen 3
	Initial PWP		kPa	6	7	10
	Saturated PWP		kPa	888	693	639
	Final Cell Pressure		kPa	900	700	650
	B - Value			0.96	0.96	0.98



Consolidation Stage ASTM 7181			Specimen 1	Specimen 2	Specimen 3
	Cell Pressure	kPa	950	877	950
	Back Pressure	kPa	858	693	582
	σ3	kPa	92	184	368
	Initial o_u	kPa	935	865	927
	Final o_u	kPa	858	698	582
	Dissipation of o_u	%	100.00	97.09	100.00
	Volumetric Strain (ε_{vc})	%	0.454	1.195	1.375
	$c_{v\ (isotropic)}$	m2/yr	6.4	5.3	7.7
	$m_{v\ (isotropic)}$	m2/MN	0.059	0.072	0.040
	k (Calculated value)	m/s	3.55062E-08	3.6014E-08	2.87673E-08
	Void Ratio	e	0.65033	0.49191	0.58177
	t100	mins	4.15	4.94	3.44
	Moisture Content	%	25.2	19.0	22.5
	Dry Density	Mg/m^3	1.57	1.76	1.65
	Degree of Saturation	%	100.0	100.0	100.0
	Cross Sectional Area (A_c)	mm^3	42.13	41.62	40.70
	(Method Used)		A	A	A





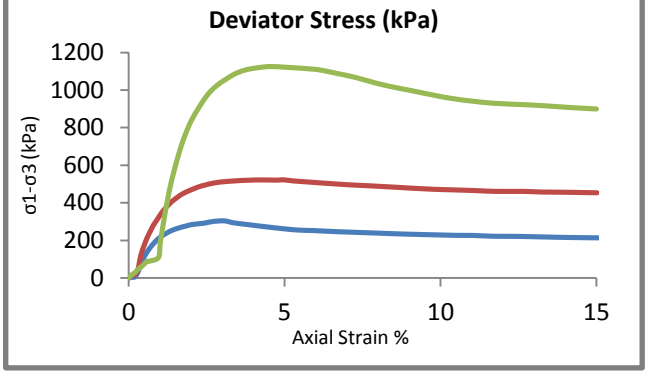
Remarks:	Tested By	Checked By	Approved By
	LR	LR	JG

Gardline	Consolidated Drained Triaxial Compression with measurement of volume change	US Wind inc sea energy

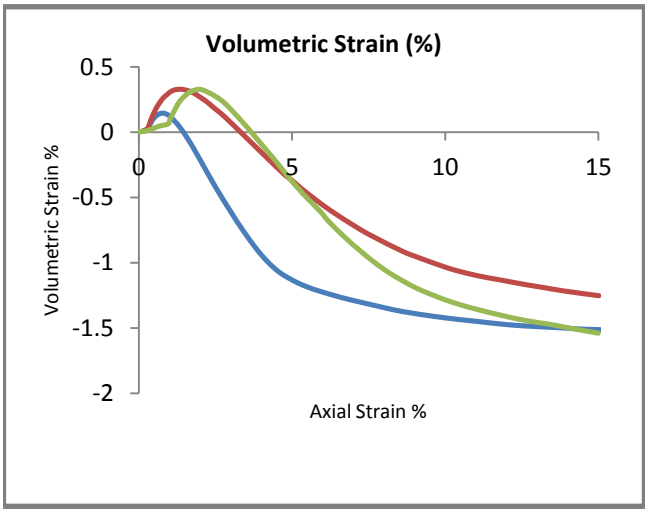
Prepared and tested in accordance with ASTM D 7181

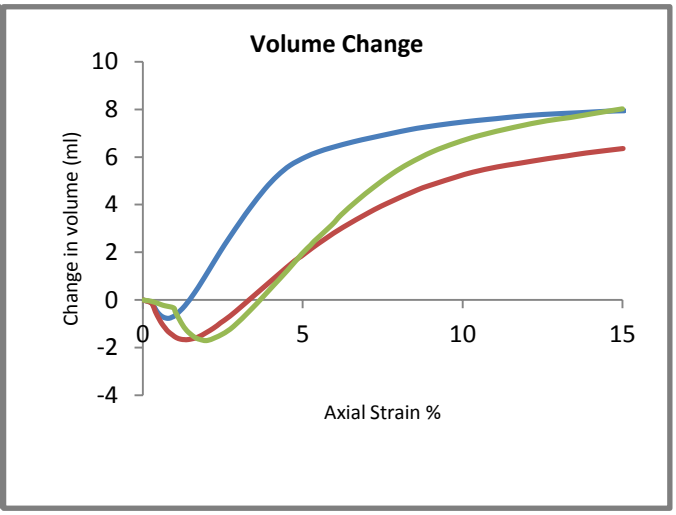
BH/TP No.	BH-G17	Sample Type/No.	P10 B1	Depth.	18.5-18.55

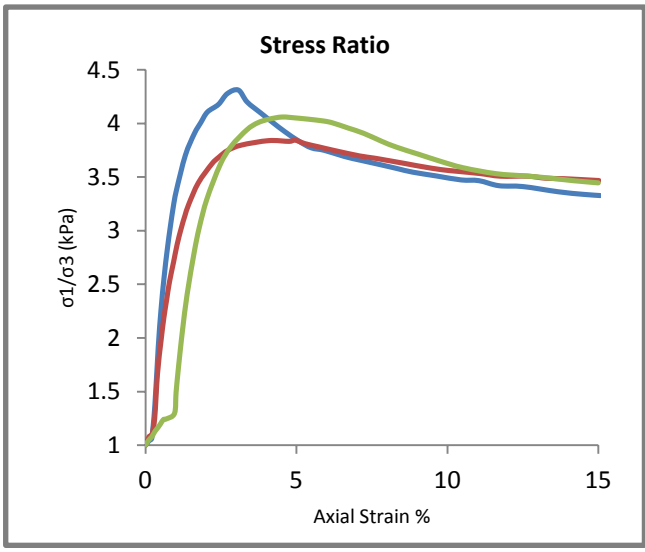
Compression Stage:

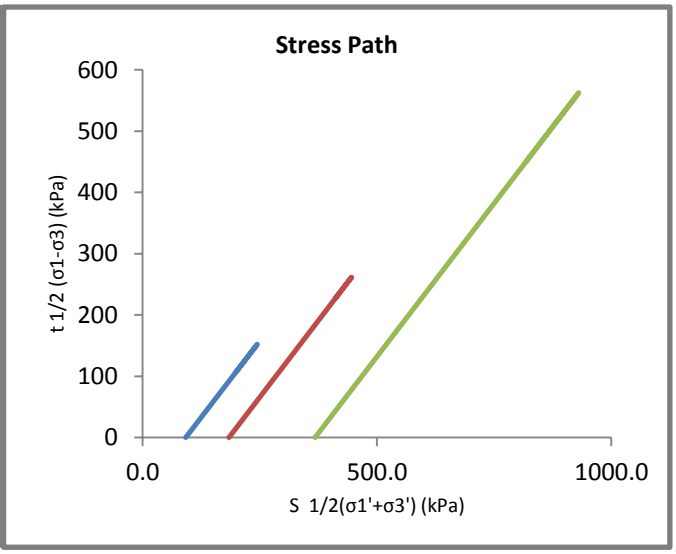


Specimen 1	Specimen 2	Specimen 3
Failure:	Failure:	Failure:
Shear	Shear	Shear









Remarks:	Tested By	Checked By	Approved By
	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G17A
Description	CLAY with sand. Sand is fine, greenish grey, moist, fine shell fragments	**Sample Type/No.**	P4Q2
		Depth	52.45-52.65
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	140
	Diameter (mm)	71
	Moisture Content %	33
	Bulk Density (Mg/m3)	1.83
	Dry Density (Mg/m^3)	1.38
Saturation	Initial PWP (kPa)	1
	Saturated PWP (kPa)	382
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	894
	Back Pressure (kPa)	382
	Initial PWP (kPa)	390
	Final PWP (kPa)	388
	cv (m^2/yr)	0.06
	mv (m^2/MN)	18.066
	k (calculated value) (m/s)	3.3E-10
Compression	Cell Pressure (kPa)	894
	Back Pressure (kPa)	382
	s3' (kPa)	512
	Rate of Strain (%/hr)	0.8

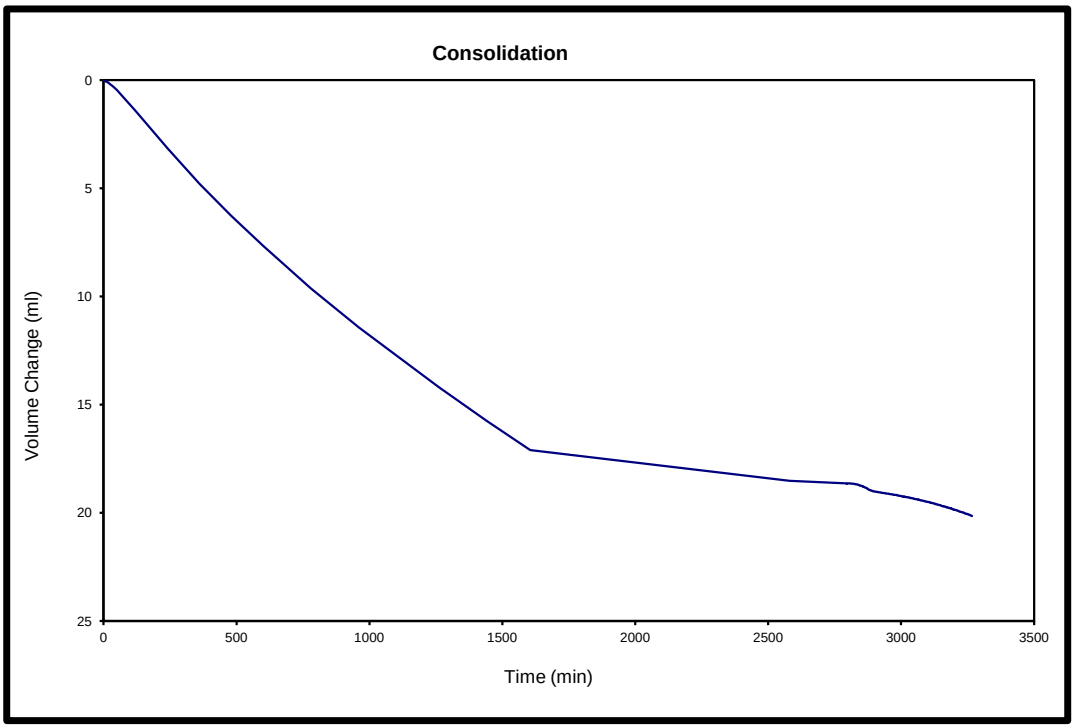
Final Conditions	Moisture Content (%)	35
	Bulk Density (Mg/m3)	1.87
	Dry Density (Mg/m^3)	1.39
Failure Conditions	Strain (e) (%)	9.3
	δu (kPa)	251
	σ_3'f (kPa)	261
	$(\sigma_1' - \sigma_3')f$ (kPa)	729

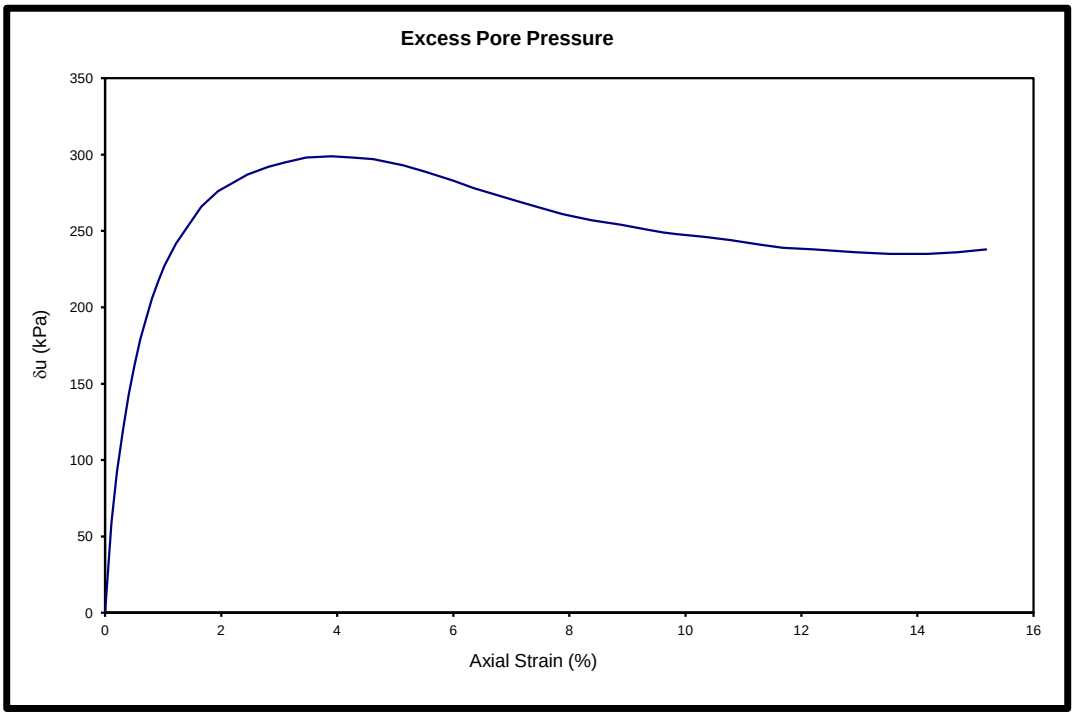
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.077	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

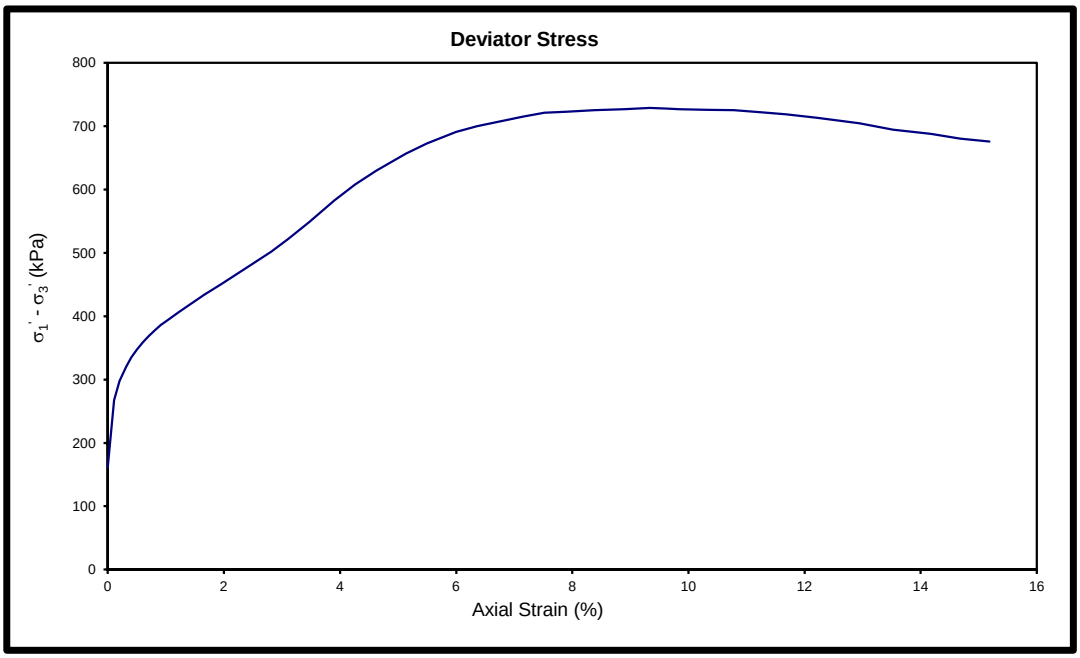
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G17A
Description	CLAY with sand. Sand is fine, greenish grey, moist, fine shell fragments	**Sample Type/No.**	P4Q2
		Depth	52.45-52.65
Prepared and tested in accordance with ASTM D4767 and In House method			

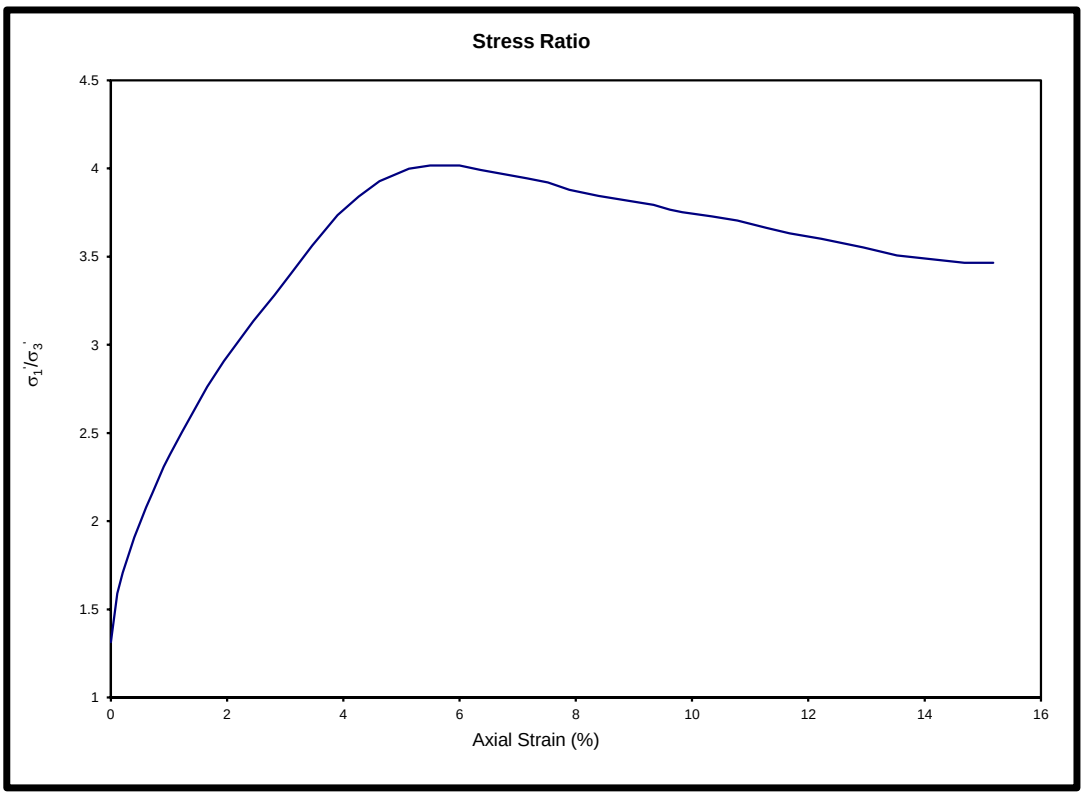




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

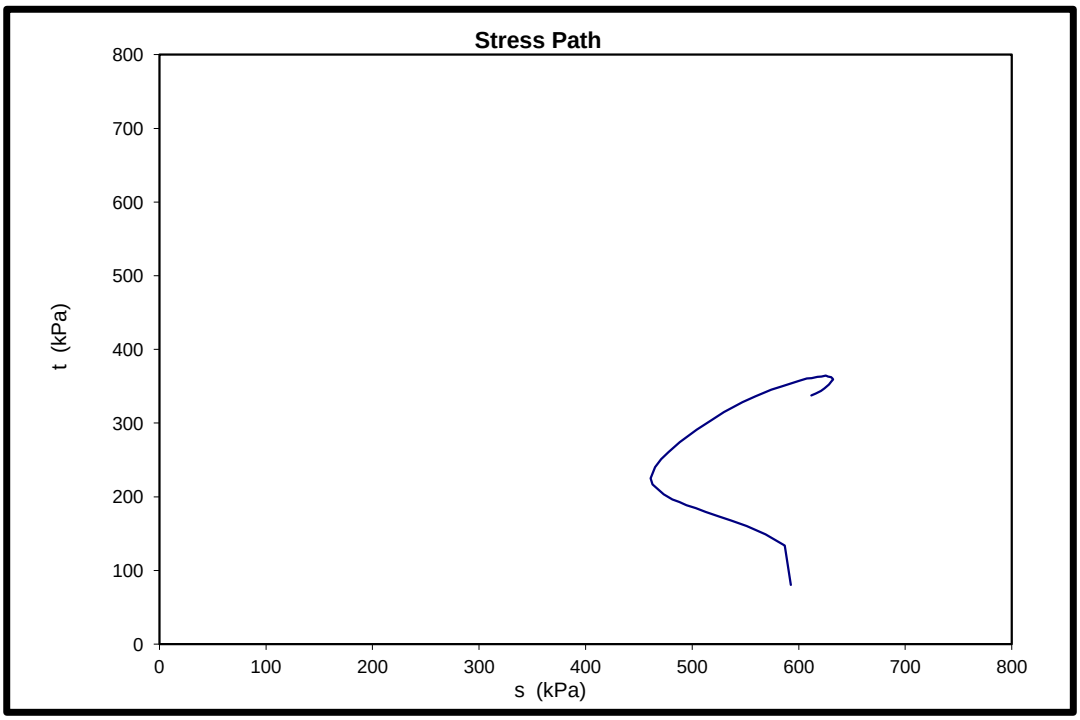
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G17A
Description	CLAY with sand. Sand is fine, greenish grey, moist, fine shell fragments	**Sample Type/No.**	P4Q2
		Depth	52.45-52.65
Prepared and tested in accordance with ASTM D4767 and In House method			

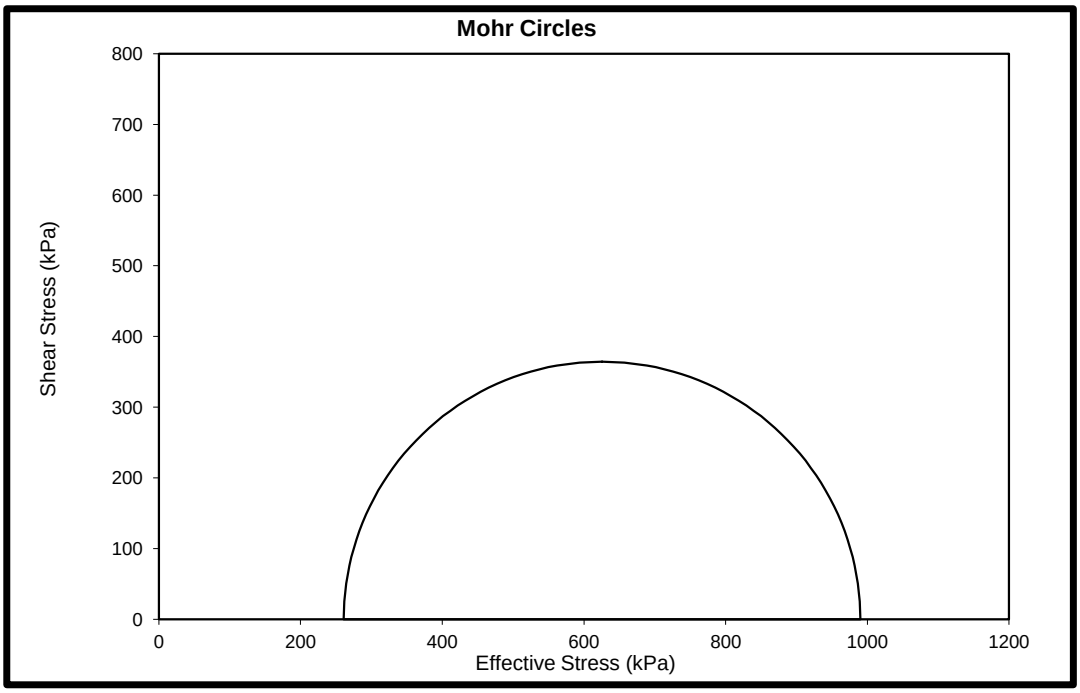




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - G17A
Description	CLAY with sand. Sand is fine, greenish grey, moist, fine shell fragments	**Sample Type/No.**	P4Q2
		Depth	52.45-52.65
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, rare fine shell fragments	**Sample Type/No.**	P9Q1
		Depth	26.3-26.5
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	31
	Bulk Density (Mg/m3)	1.92
	Dry Density (Mg/m^3)	1.47
Saturation	Initial PWP (kPa)	2
	Saturated PWP (kPa)	522
	Final Cell Pressure (kPa)	600
	B Value	0.98
Consolidation	Cell Pressure (kPa)	788
	Back Pressure (kPa)	522
	Initial PWP (kPa)	522
	Final PWP (kPa)	521
	cv (m^2/yr)	0.13
	mv (m^2/MN)	23.544
	k (calculated value) (m/s)	9.7E-10
Compression	Cell Pressure (kPa)	788
	Back Pressure (kPa)	522
	s3' (kPa)	266
	Rate of Strain (%/hr)	0.8

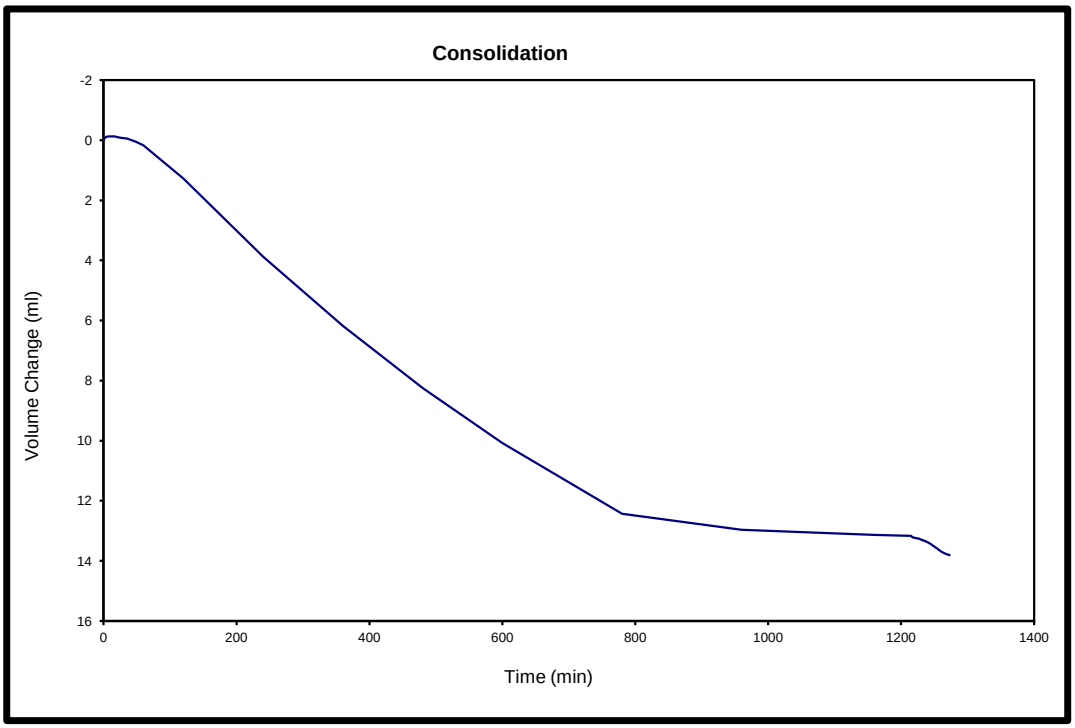
Final Conditions	Moisture Content (%)	31
	Bulk Density (Mg/m3)	1.94
	Dry Density (Mg/m^3)	1.48
Failure Conditions	Strain (e) (%)	10.2
	δu (kPa)	127
	σ_3'f (kPa)	139
	$(\sigma_1' - \sigma_3')f$ (kPa)	346

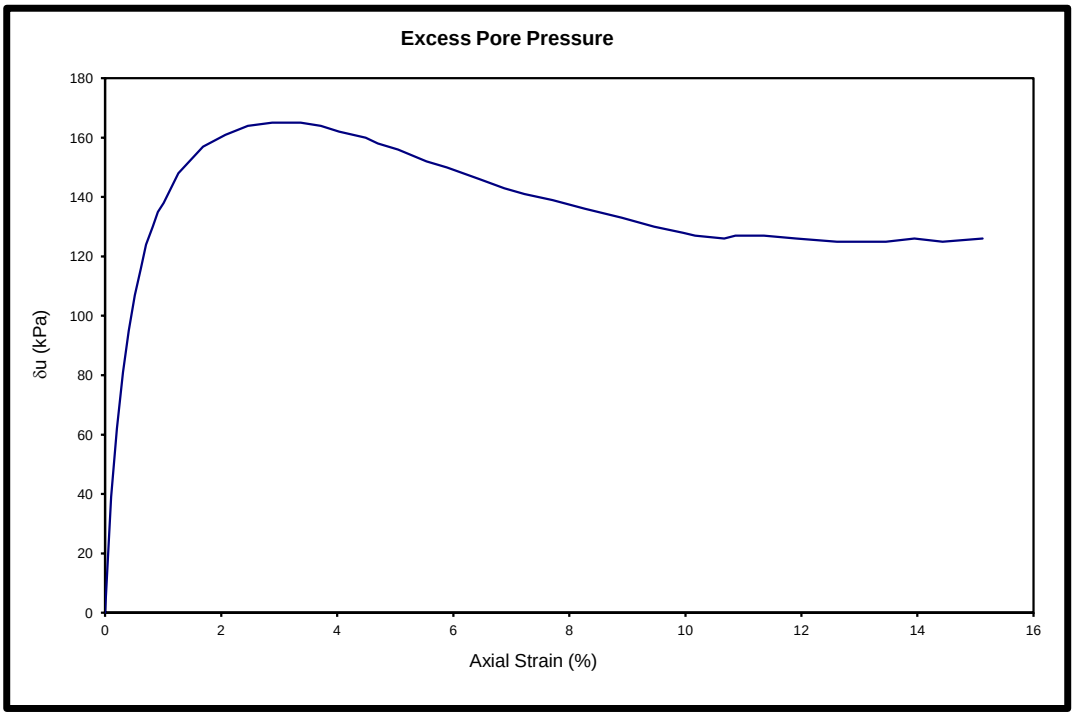
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.051	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

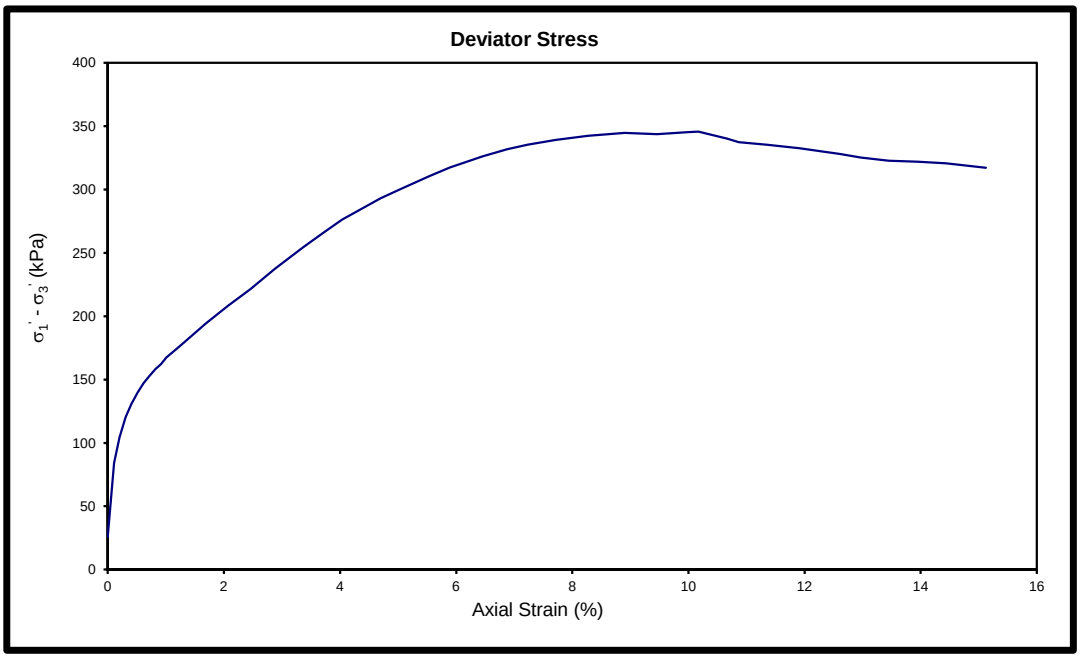
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, rare fine shell fragments	**Sample Type/No.**	P9Q1
		Depth	26.3-26.5
Prepared and tested in accordance with ASTM D4767 and In House method			

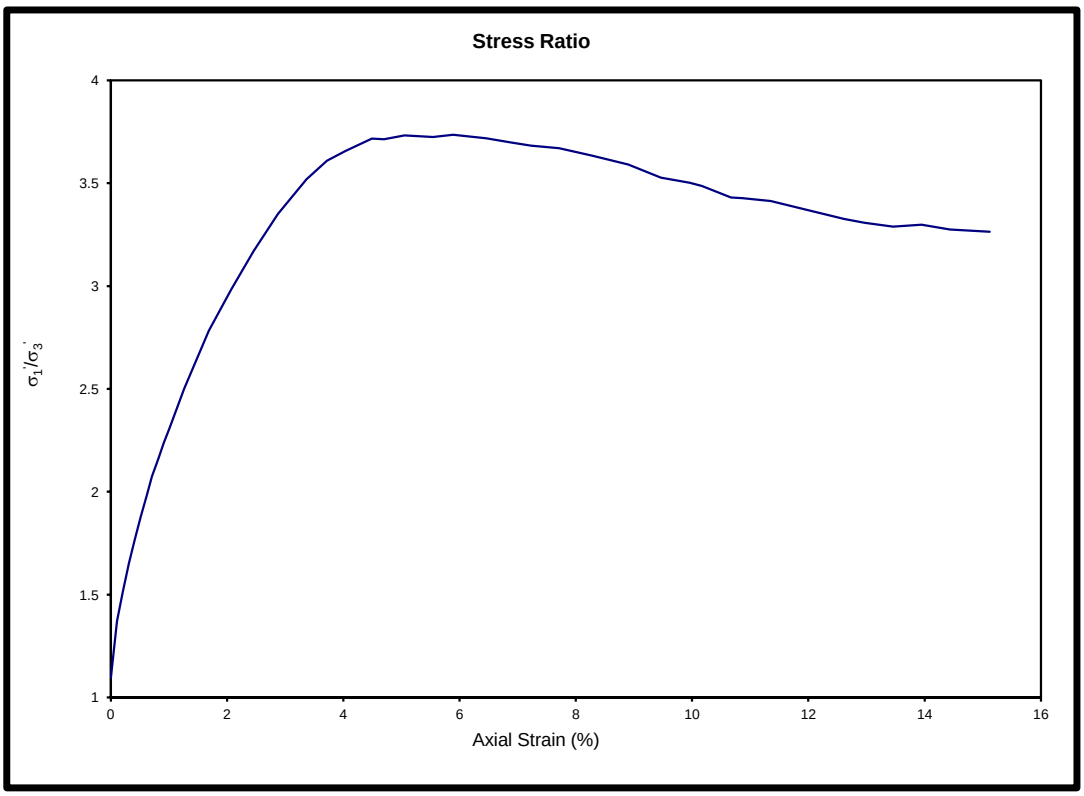




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

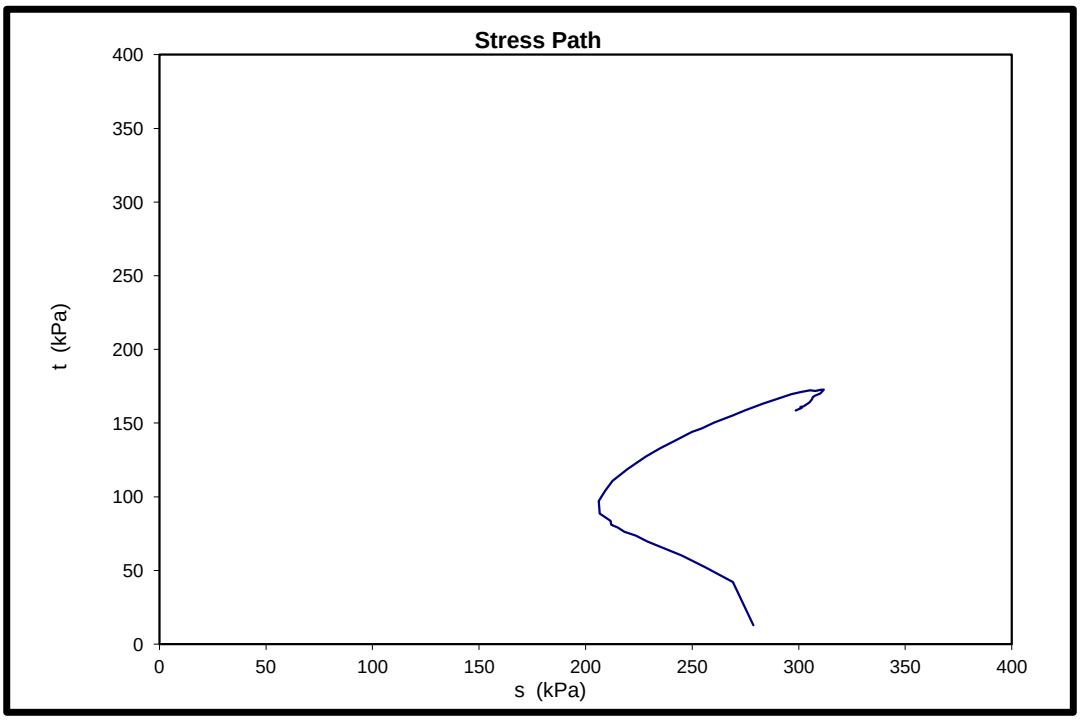
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, rare fine shell fragments	**Sample Type/No.**	P9Q1
		Depth	26.3-26.5
Prepared and tested in accordance with ASTM D4767 and In House method			

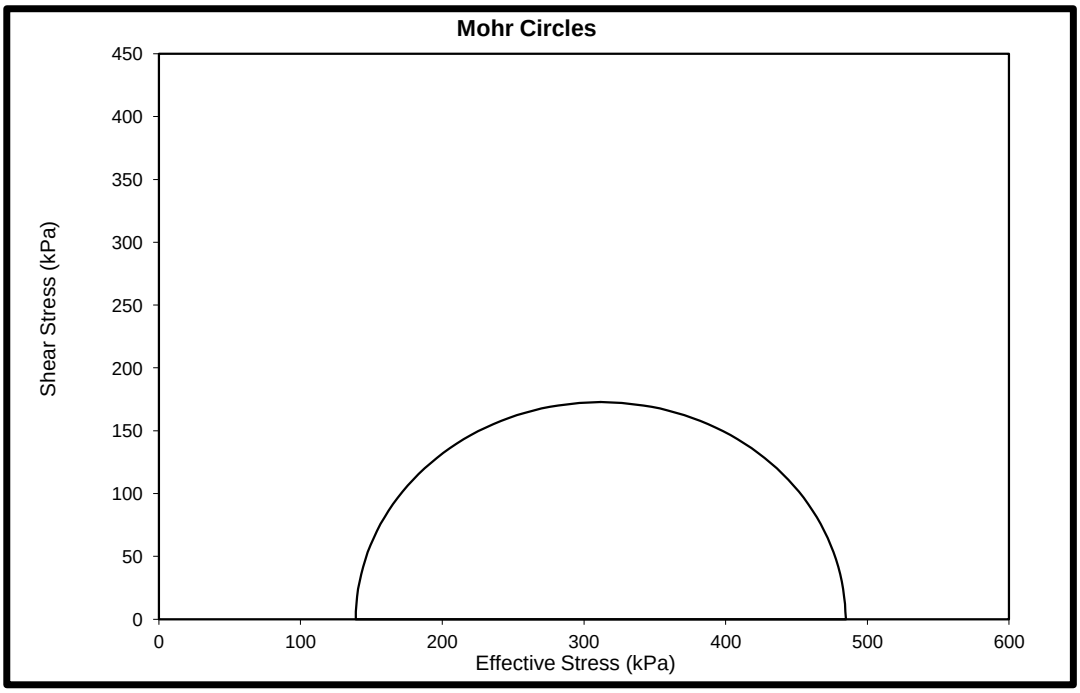




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, rare fine shell fragments	**Sample Type/No.**	P9Q1
		Depth	26.3-26.5
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, laminations of silty fine sand	**Sample Type/No.**	P11Q1
		Depth	34.301-34.503
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	122
	Diameter (mm)	73
	Moisture Content %	33
	Bulk Density (Mg/m3)	1.81
	Dry Density (Mg/m^3)	1.36
Saturation	Initial PWP (kPa)	4
	Saturated PWP (kPa)	407
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	734
	Back Pressure (kPa)	407
	Initial PWP (kPa)	413
	Final PWP (kPa)	411
	cv (m^2/yr)	0.12
	mv (m^2/MN)	19.272
	k (calculated value) (m/s)	6.9E-10
Compression	Cell Pressure (kPa)	734
	Back Pressure (kPa)	407
	s3' (kPa)	343
	Rate of Strain (%/hr)	0.8

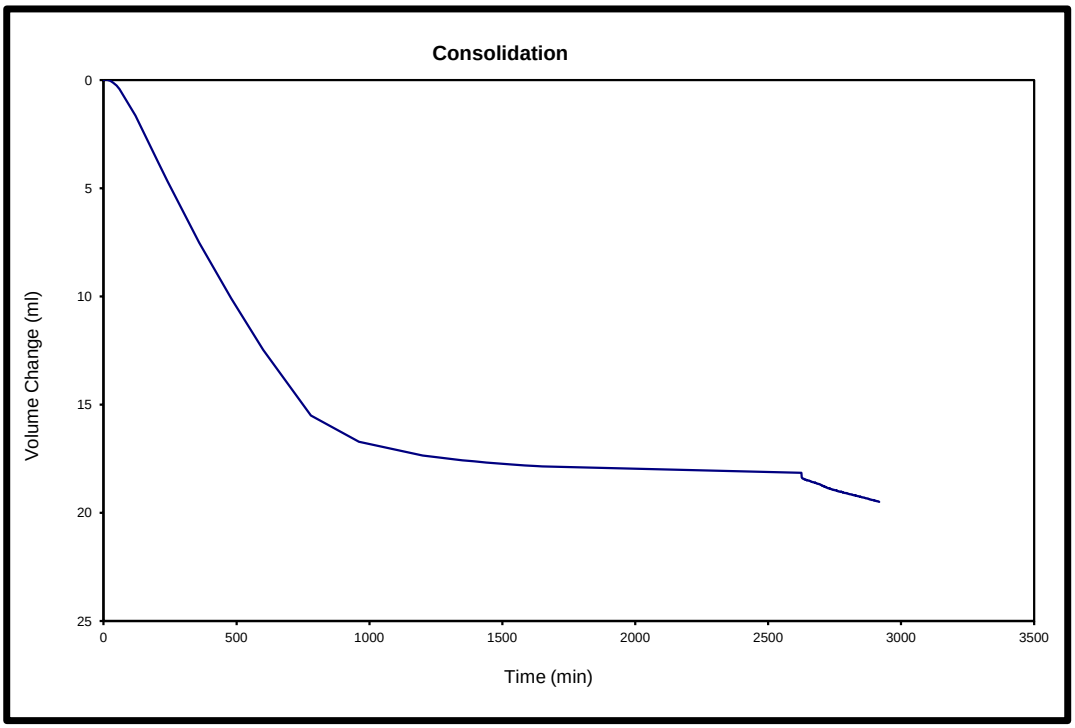
Final Conditions	Moisture Content (%)	37
	Bulk Density (Mg/m3)	1.86
	Dry Density (Mg/m^3)	1.36
Failure Conditions	Strain (e) (%)	9.4
	δu (kPa)	141
	σ_3'f (kPa)	202
	$(\sigma_1' - \sigma_3')f$ (kPa)	406

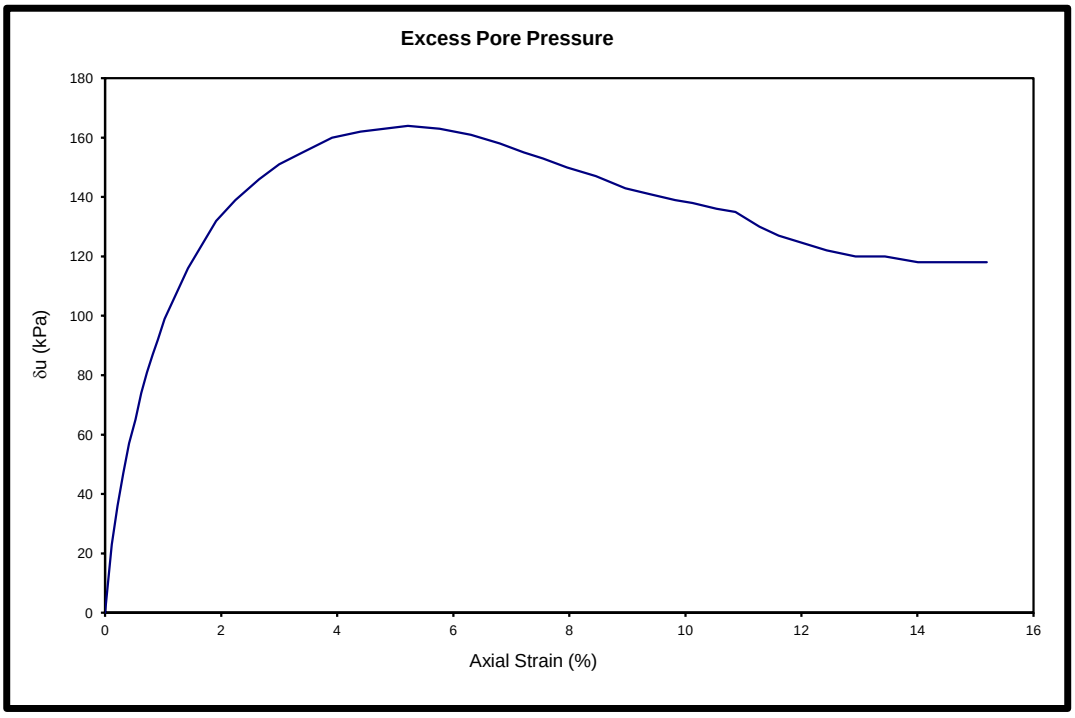
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.080	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

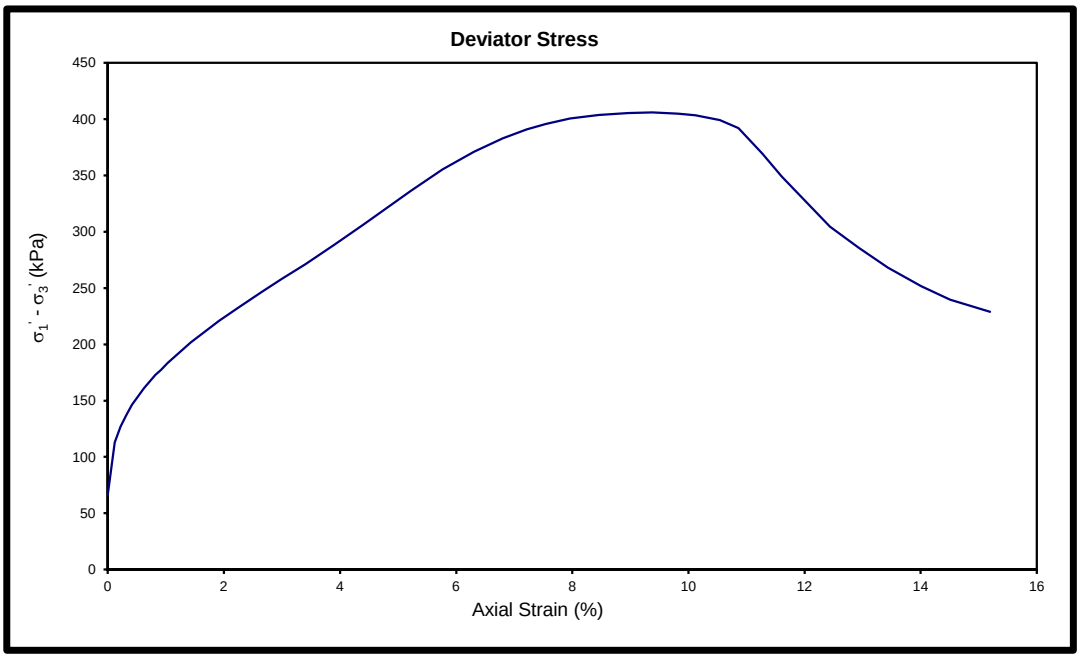
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, laminations of silty fine sand	**Sample Type/No.**	P11Q1
		Depth	34.301-34.503
Prepared and tested in accordance with ASTM D4767 and In House method			

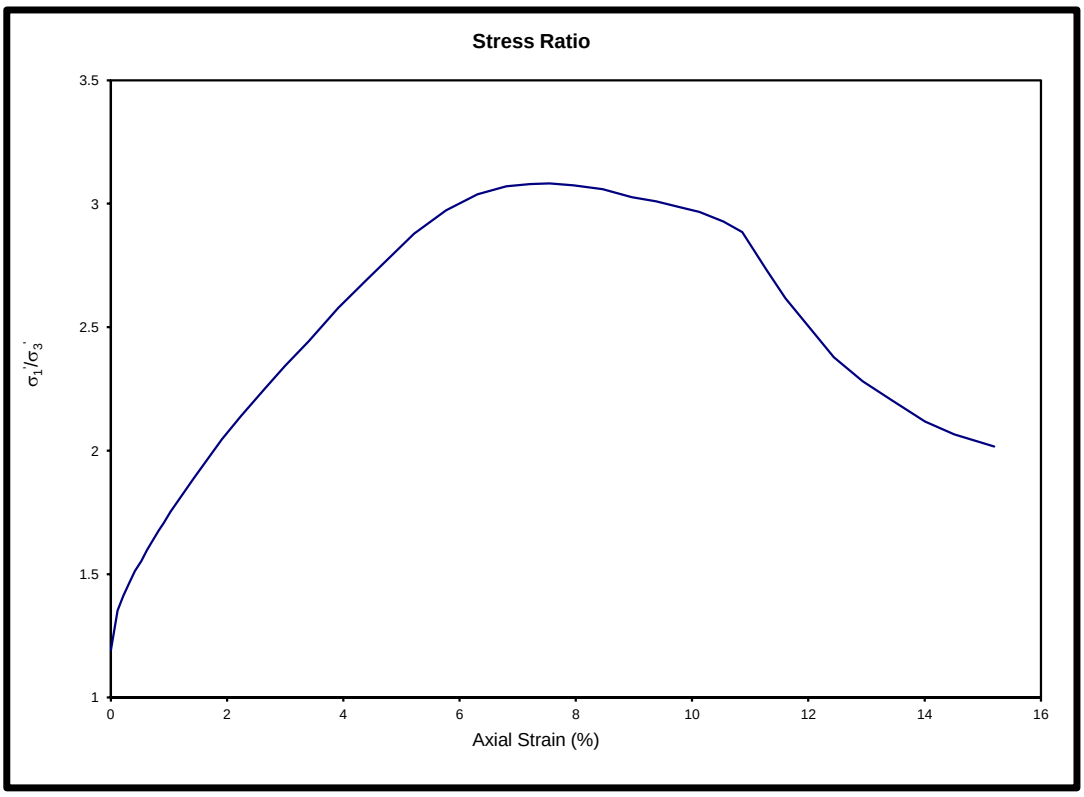




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

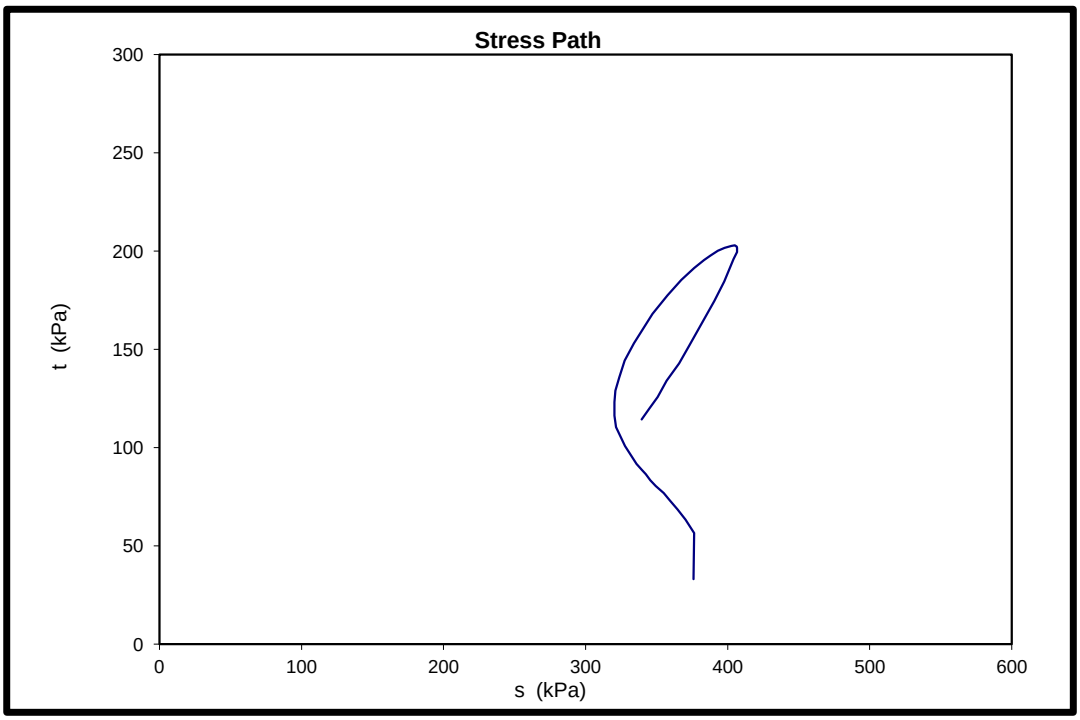
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, laminations of silty fine sand	**Sample Type/No.**	P11Q1
		Depth	34.301-34.503
Prepared and tested in accordance with ASTM D4767 and In House method			

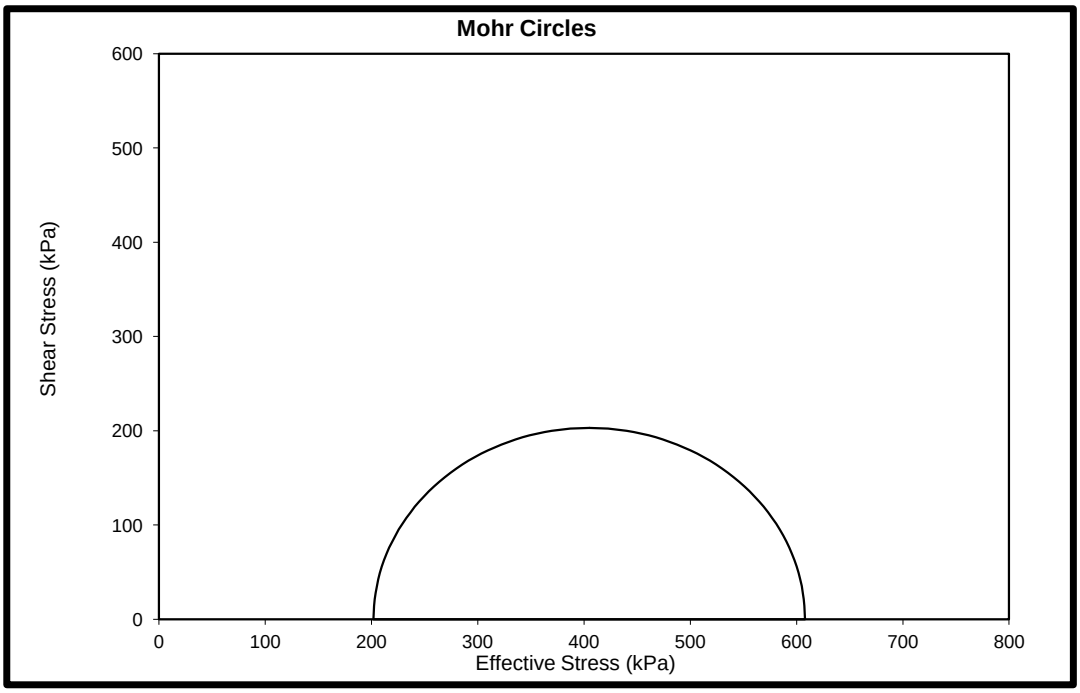




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	CLAY with sand and silt. Sand is fine, dark grey, moist, laminations of silty fine sand	**Sample Type/No.**	P11Q1
		Depth	34.301-34.503
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	SAND with clay. Sand is fine to coarse, dark greenish grey, moist	**Sample Type/No.**	P16Q1
		Depth	54.2-54.4
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	18
	Bulk Density (Mg/m3)	2.09
	Dry Density (Mg/m^3)	1.78
Saturation	Initial PWP (kPa)	7
	Saturated PWP (kPa)	236
	Final Cell Pressure (kPa)	250
	B Value	0.96
Consolidation	Cell Pressure (kPa)	710
	Back Pressure (kPa)	236
	Initial PWP (kPa)	241
	Final PWP (kPa)	240
	cv (m^2/yr)	0.10
	mv (m^2/MN)	39.012
	k (calculated value) (m/s)	1.2E-09
Compression	Cell Pressure (kPa)	710
	Back Pressure (kPa)	236
	s3' (kPa)	526
	Rate of Strain (%/hr)	0.8

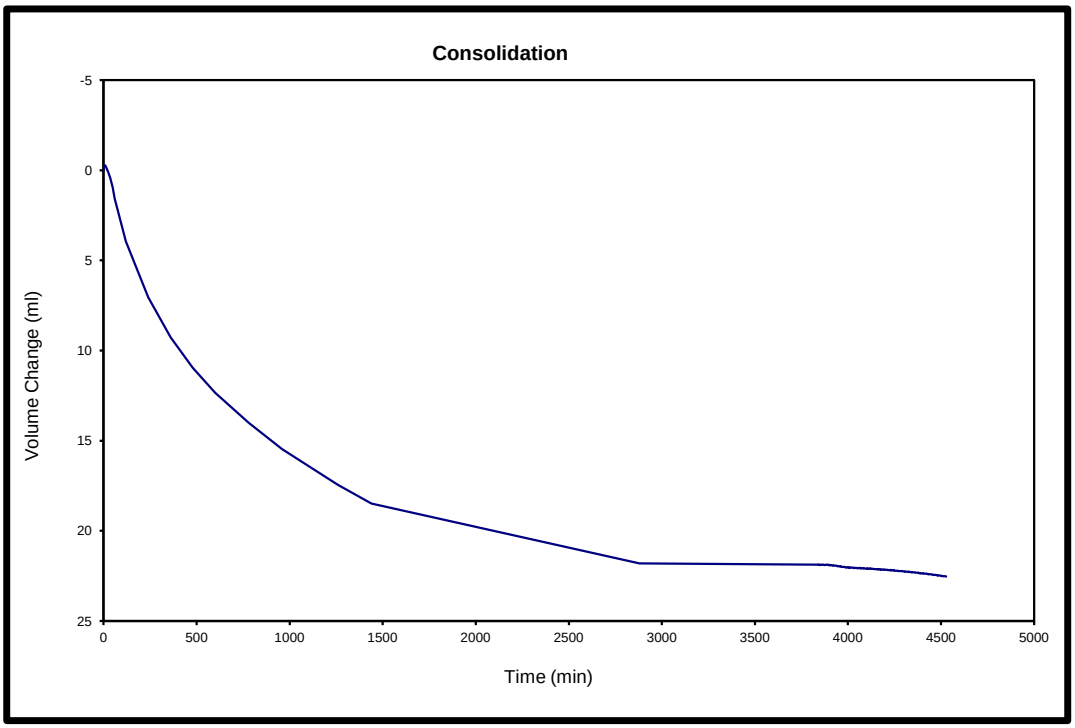
Final Conditions	Moisture Content (%)	20
	Bulk Density (Mg/m3)	2.14
	Dry Density (Mg/m^3)	1.79
Failure Conditions	Strain (e) (%)	12.9
	δu (kPa)	75
	σ_3'f (kPa)	451
	$(\sigma_1' - \sigma_3')f$ (kPa)	961

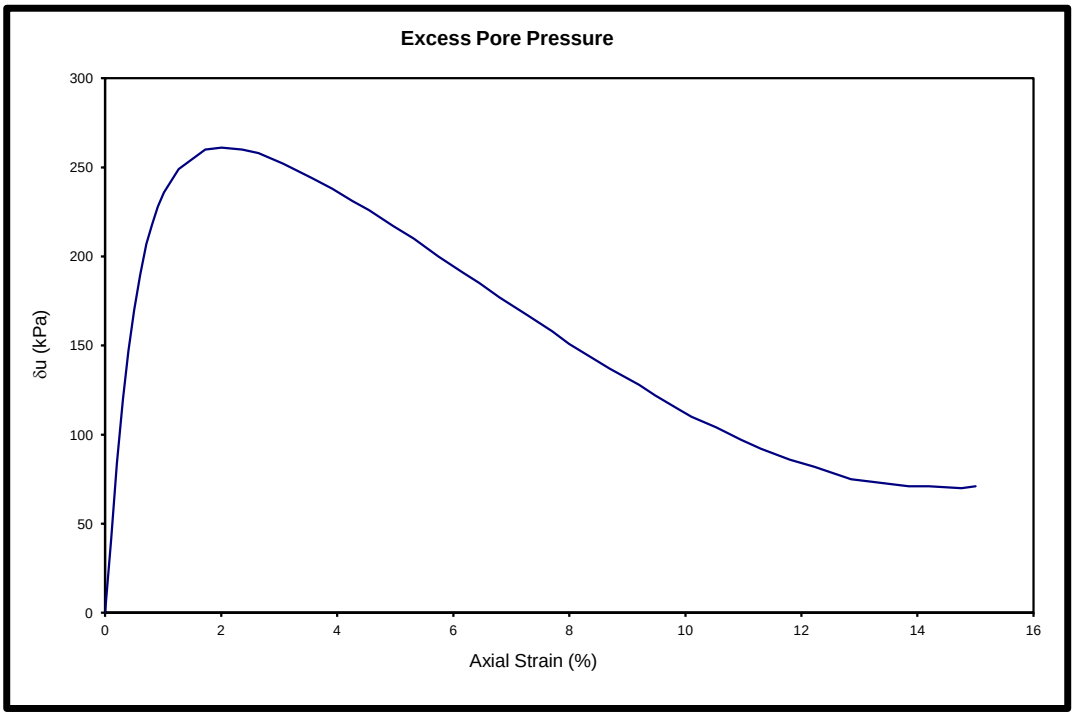
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.119	
	Sample Quality Category	4	Very poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

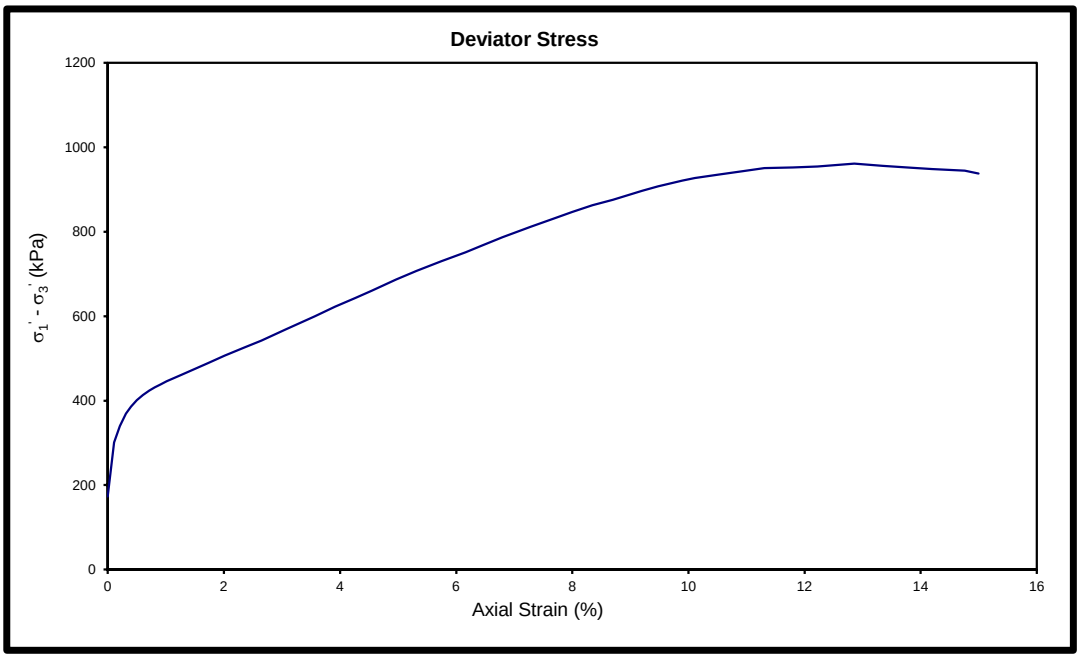
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	SAND with clay. Sand is fine to coarse, dark greenish grey, moist	**Sample Type/No.**	P16Q1
		Depth	54.2-54.4
Prepared and tested in accordance with ASTM D4767 and In House method			

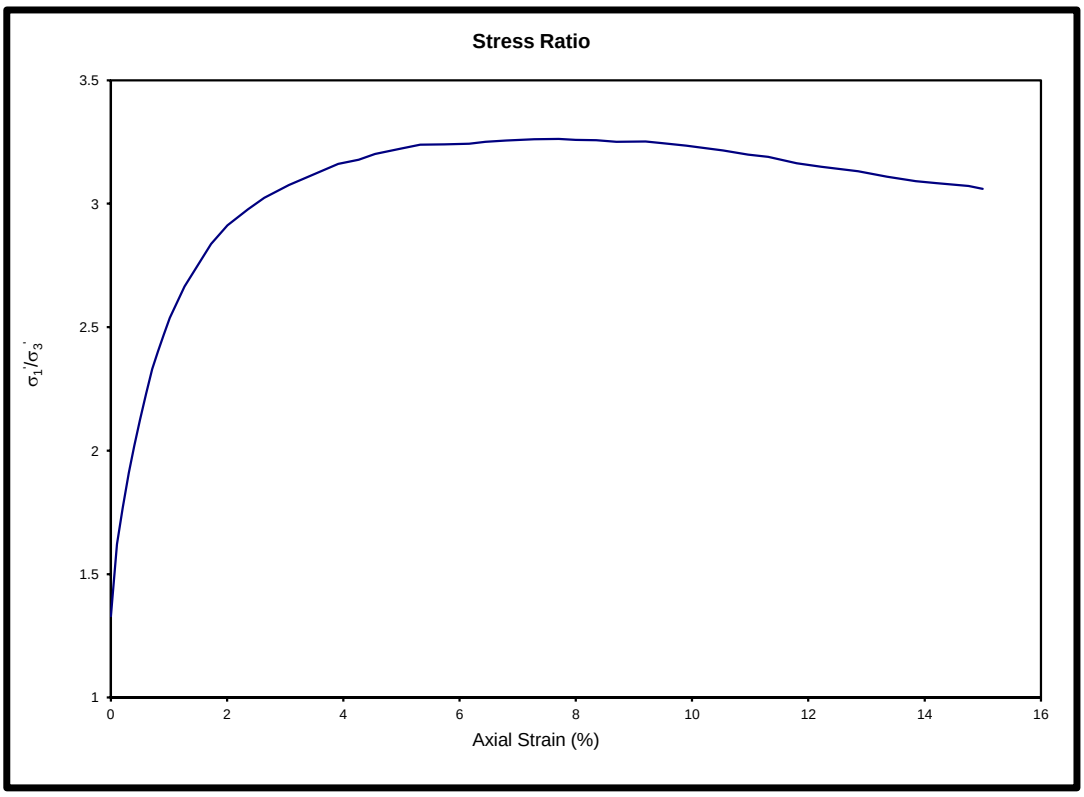




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

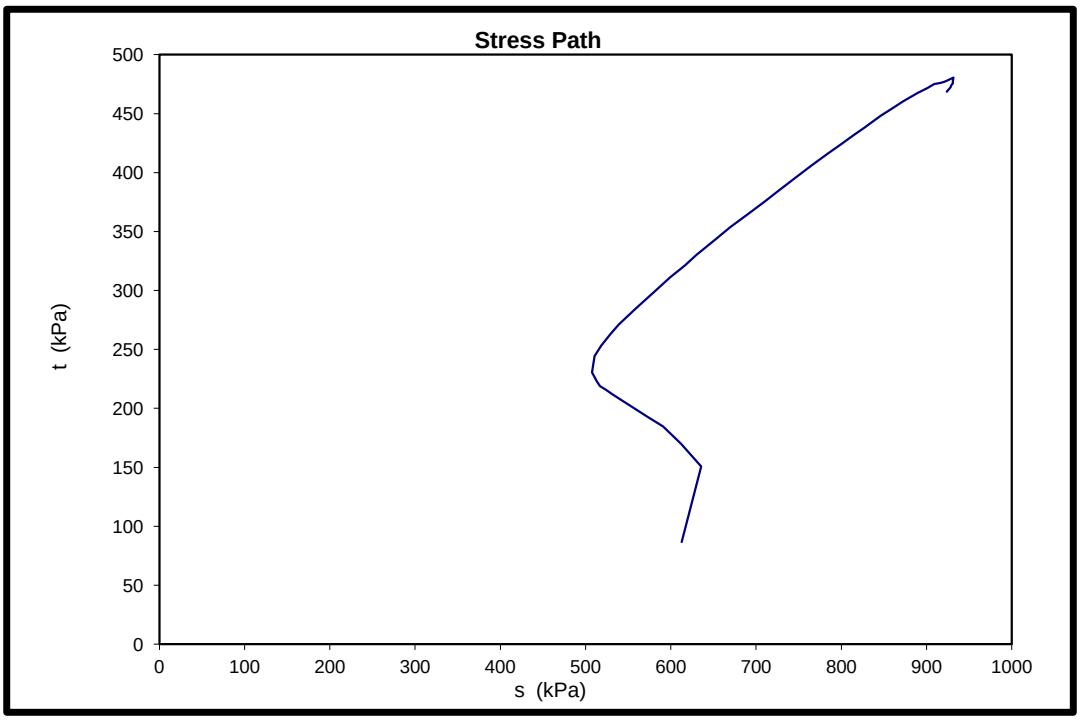
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	SAND with clay. Sand is fine to coarse, dark greenish grey, moist	**Sample Type/No.**	P16Q1
		Depth	54.2-54.4
Prepared and tested in accordance with ASTM D4767 and In House method			

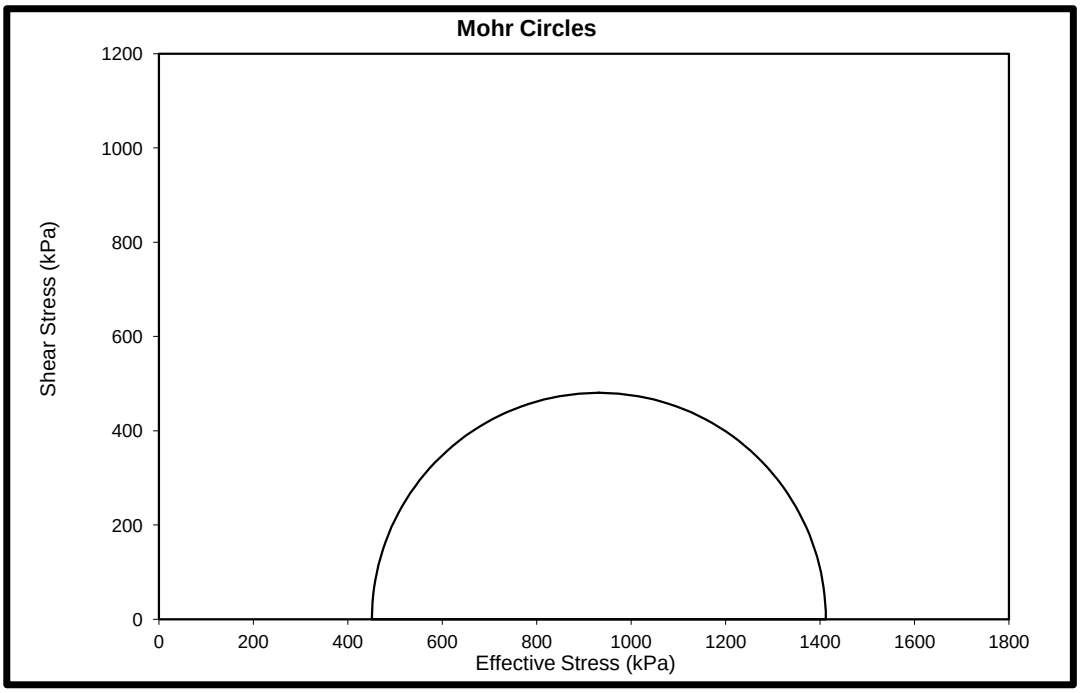




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - H10
Description	SAND with clay. Sand is fine to coarse, dark greenish grey, moist	**Sample Type/No.**	P16Q1
		Depth	54.2-54.4
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline

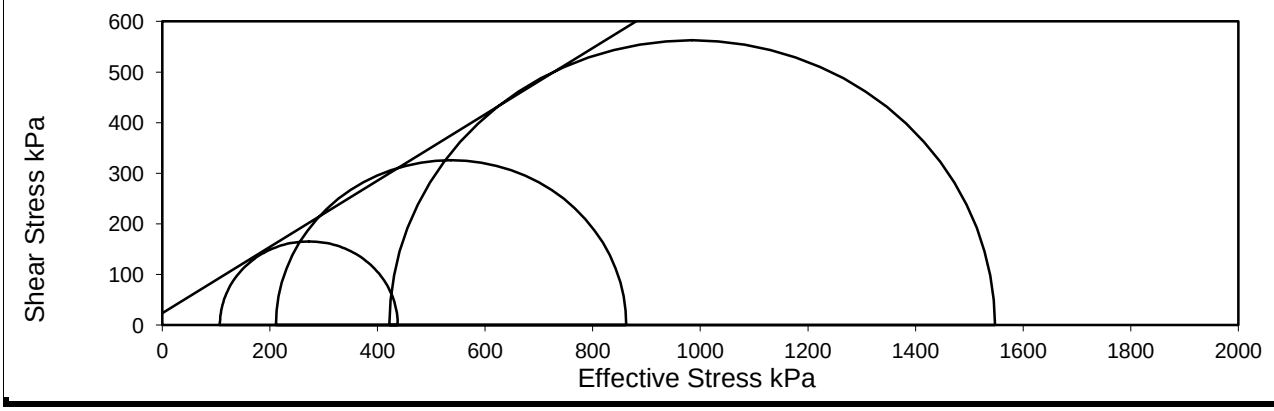
Consolidated Drained Triaxial Compression with measurement of volume change

US Wind inc sea energy

Prepared and tested in accordance with ASTM D 7181

Contract No.	10451	Location.	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area		
BH/TP No.	BH_I21A	Sample Type/No.	P05 B1	Depth.	21.00-21.25
Type of Specimen	Disturbed / Compacted	Type of Test	Multi-Specimen	Side Drains Fitted	No
Description	SAND. Sand is fine to medium, moist, light olive brown, slightly silty		Drainage Conditions	One end	

			Specimen 1	Specimen 2	Specimen 3
Intial Specimen Conditions ASTM 7181	Moisture Content	%	23.7	21.6	25.3
	Bulk Density	Mg/m^3	1.89	1.94	1.90
	Dry Density	Mg/m^3	1.53	1.60	1.52
	Height	mm	136	140	137
	Diameter	mm	70	70	70
	Particle Density - Assumed	Mg/m^3	2.65	2.65	2.65
	Degree of Saturation	%	83.92	84.61	87.66
	Void Ratio	e_0	0.72976	0.65856	0.74646
Compression Stage	Cell Pressure	kPa	599	805	950
	Back Pressure	kPa	493	594	528
	σ3	kPa	106	211	422
	Failure Criteron: Maximum Deviator Stress				
	Rate of Axial Displacement	mm/min	0.057	0.17	0.046
	Axial Strain	%/min	0.042	0.122	0.034
	Membrane/Side Drain Correction Applied		0.12	0.14	0.12
	σ^1-σ^3 (Corrected)	kPa	331	651	1126
	Pore Water Pressure (o_u)	kPa	500	600	534
	Major Principle Stress	kPa	437	862	1548
	Minor Principle Stress	kPa	106	211	422
	Volumetric Strain	%	-0.60	-0.34	0.10
Final Specimen Condition s ASTM 7181	Moisture Content	%	25.0	25.3	25.2
	Bulk Density	Mg/m^3	1.91	2.00	1.93
	Dry Density	Mg/m^3	1.53	1.60	1.54
Sample Quality	SQ Index ($\Delta e/e_0$)		#N/A	#N/A	#N/A
	Sample Quality Category		#N/A	#N/A	#N/A
			#N/A	#N/A	#N/A
	G_{max}	m/s	N/A	332.1	N/A



Effective Stress Parameters	**c_d kPa**	23.4	**φ_d deg**	33.7	
Remarks:		Tested By	Checked By	Approved By	
		LR	LR	JG	

Gardline

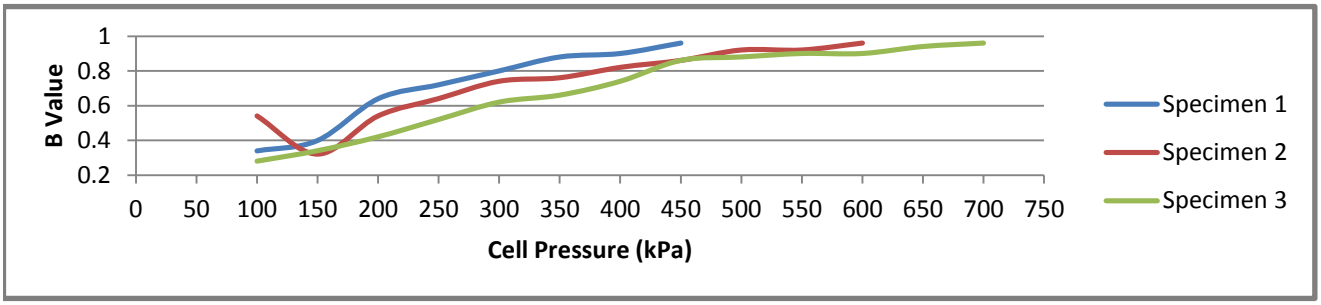
Consolidated Drained Triaxial Compression with measurement of volume change

US Wind inc sea energy

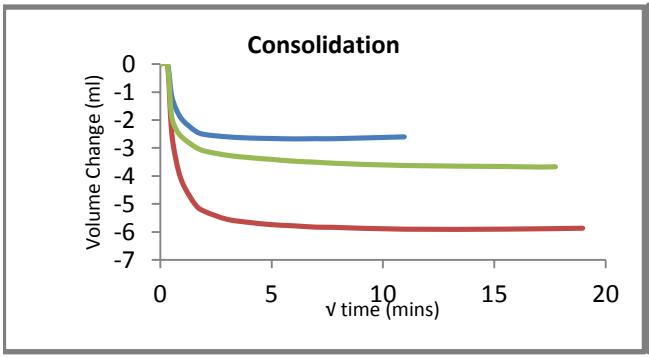
Prepared and tested in accordance with ASTM D 7181

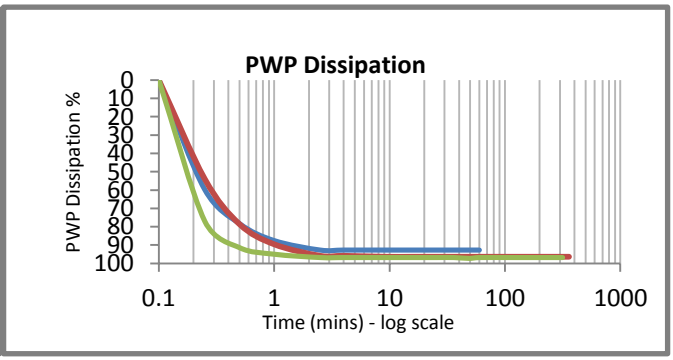
BH/TP No.	BH_I21A	Sample Type/No.	P05 B1	Depth.	21.00-21.25

Saturation Stage ASTM 7181	Method:	Incremental Back Pressure		Specimen 1	Specimen 2	Specimen 3
	Initial PWP		kPa	9	4	9
	Saturated PWP		kPa	494	594	695
	Final Cell Pressure		kPa	500	600	700
	B - Value			0.96	0.96	0.96



Consolidation Stage ASTM 7181			Specimen 1	Specimen 2	Specimen 3
	Cell Pressure	kPa	599	805	950
	Back Pressure	kPa	493	594	528
	σ3	kPa	106	211	422
	Initial o_u	kPa	590	785	750
	Final o_u	kPa	497	601	535
	Dissipation of o_u	%	95.88	96.34	96.85
	Volumetric Strain (ε_{vc})	%	0.512	1.095	0.699
	$c_{v\ (isotropic)}$	m2/yr	5.6	8.1	5.9
	$m_{v\ (isotropic)}$	m2/MN	0.055	0.059	0.033
	k (Calculated value)	m/s	2.8942E-08	4.5267E-08	1.79865E-08
	Void Ratio	e	0.72091	0.64040	0.73425
	t100	mins	4.75	3.27	4.51
	Moisture Content	%	27.9	24.8	28.4
	Dry Density	Mg/m^3	1.58	1.68	1.58
	Degree of Saturation	%	100.00	100.00	100.00
	Cross Sectional Area (A_c)	mm^3	40.20	40.66	40.29
	(Method Used)		A	A	A





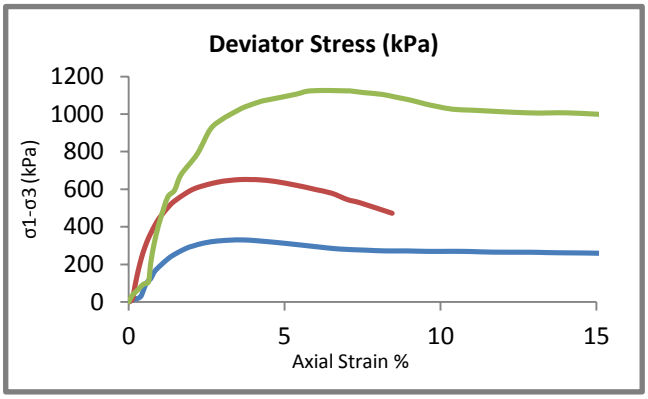
Remarks:	Tested By	Checked By	Approved By
	LR	LR	JG

Gardline	Consolidated Drained Triaxial Compression with measurement of volume change	US Wind inc sea energy

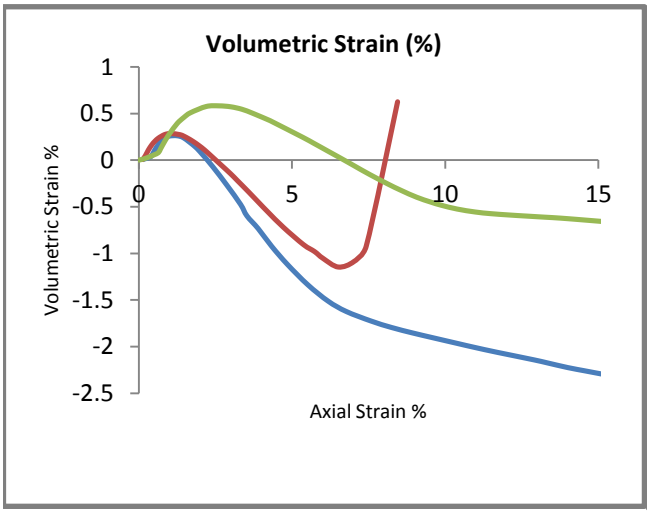
Prepared and tested in accordance with ASTM D 7181

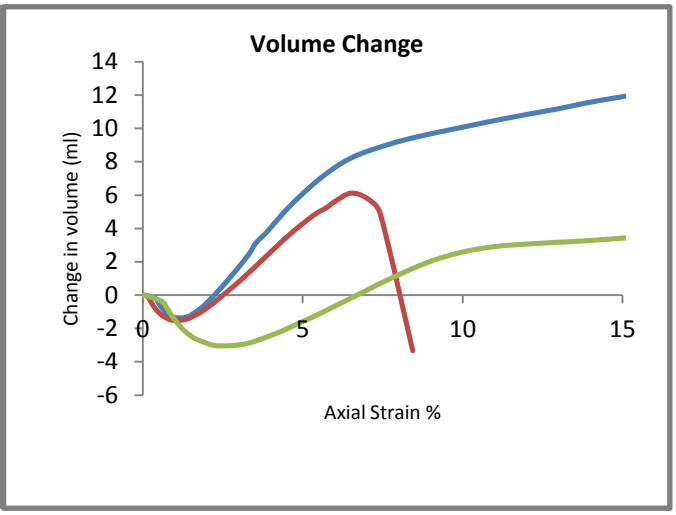
BH/TP No.	BH_I21A	Sample Type/No.	P05 B1	Depth.	21.00-21.25

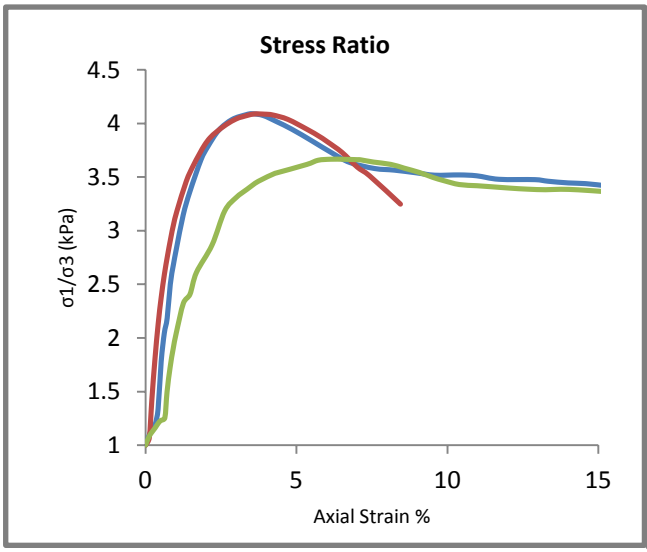
Compression Stage:

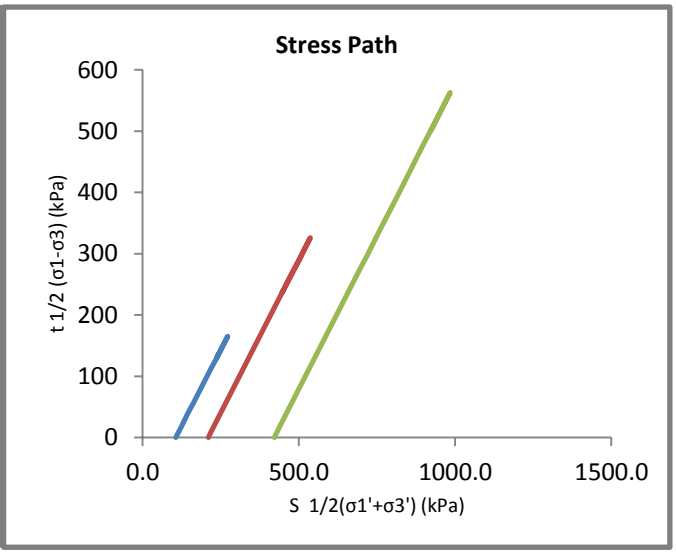


Specimen 1	Specimen 2	Specimen 3
Failure:	Failure:	Failure:
Shear	Shear	Shear









Remarks:	Tested By	Checked By	Approved By
	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand and silt. Sand is fine, greyish brown, moist, laminations of silty fine sand	**Sample Type/No.**	P1Q1
		Depth	28.2-28.4
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	143
	Diameter (mm)	72
	Moisture Content %	27
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.58
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	231
	Final Cell Pressure (kPa)	250
	B Value	0.96
Consolidation	Cell Pressure (kPa)	492
	Back Pressure (kPa)	231
	Initial PWP (kPa)	227
	Final PWP (kPa)	226
	cv (m^2/yr)	0.10
	mv (m^2/MN)	37.584
	k (calculated value) (m/s)	1.2E-09
Compression	Cell Pressure (kPa)	492
	Back Pressure (kPa)	231
	s3' (kPa)	261
	Rate of Strain (%/hr)	0.8

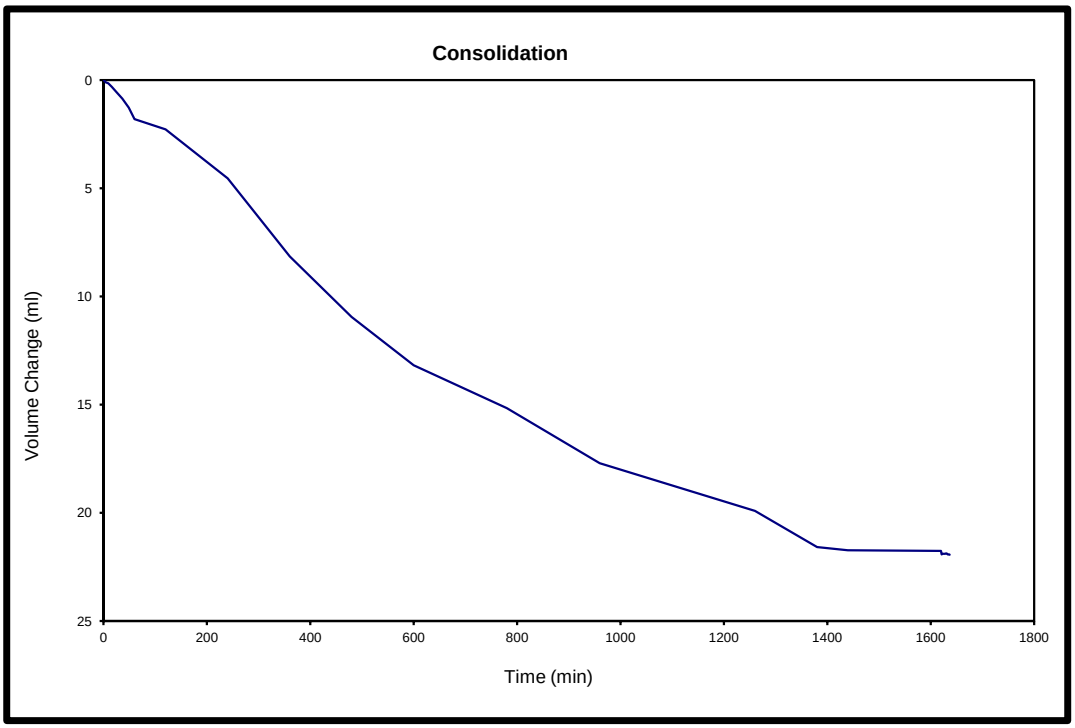
Final Conditions	Moisture Content (%)	27
	Bulk Density (Mg/m3)	2.04
	Dry Density (Mg/m^3)	1.61
Failure Conditions	Strain (e) (%)	7.9
	δu (kPa)	115
	σ_3'f (kPa)	146
	$(\sigma_1' - \sigma_3')f$ (kPa)	354

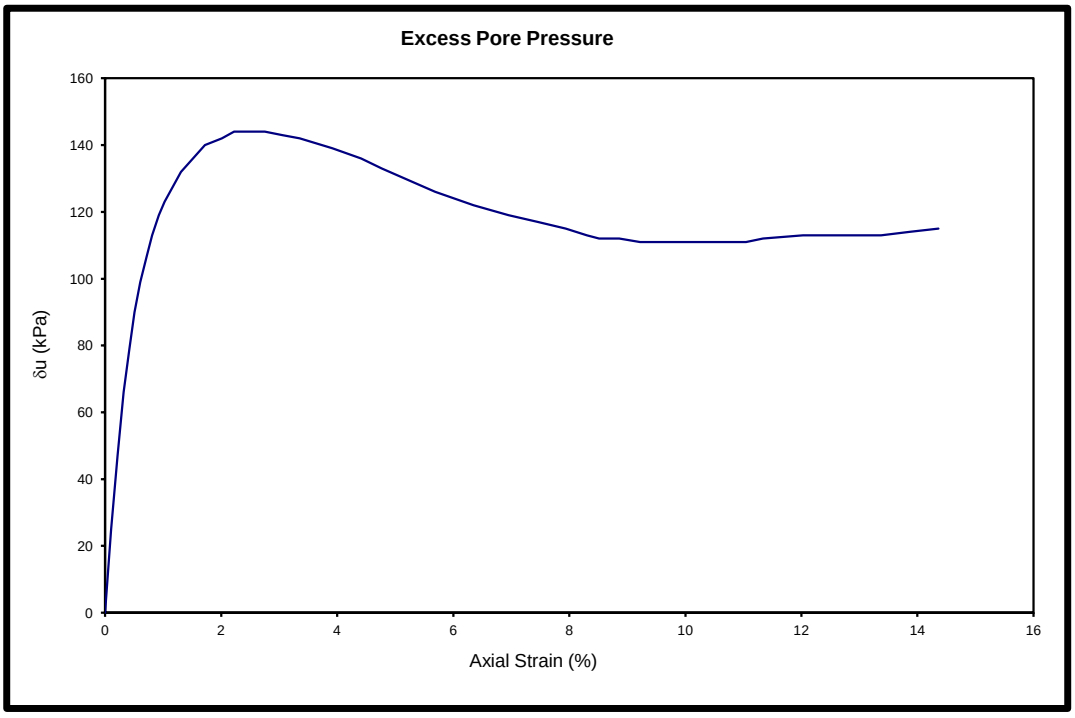
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.089	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

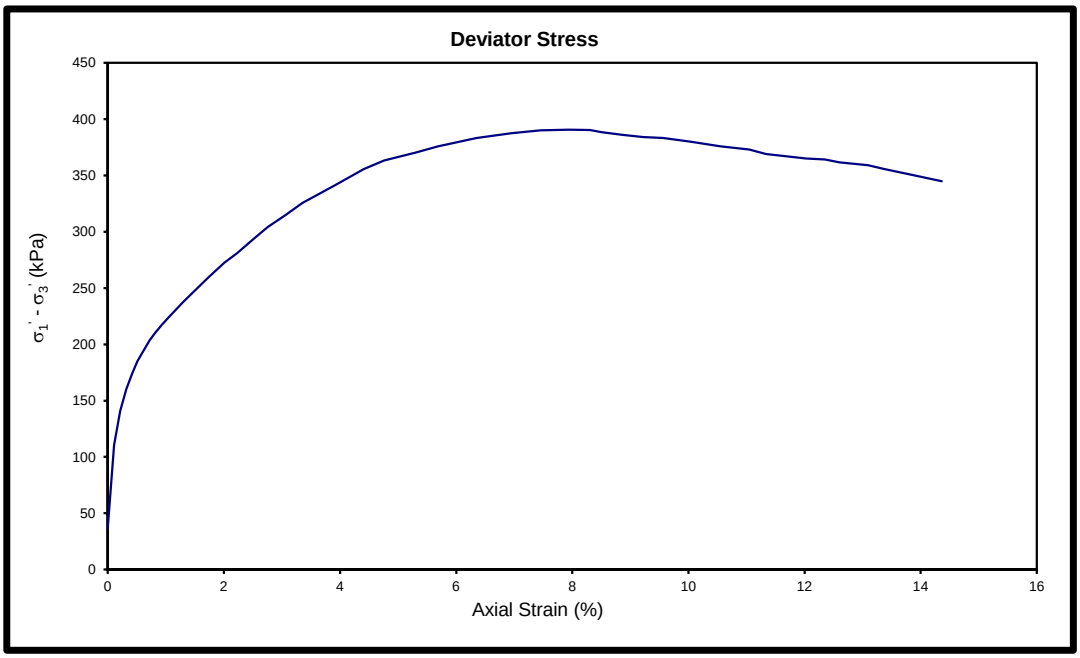
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand and silt. Sand is fine, greyish brown, moist, laminations of silty fine sand	**Sample Type/No.**	P1Q1
		Depth	28.2-28.4
Prepared and tested in accordance with ASTM D4767 and In House method			

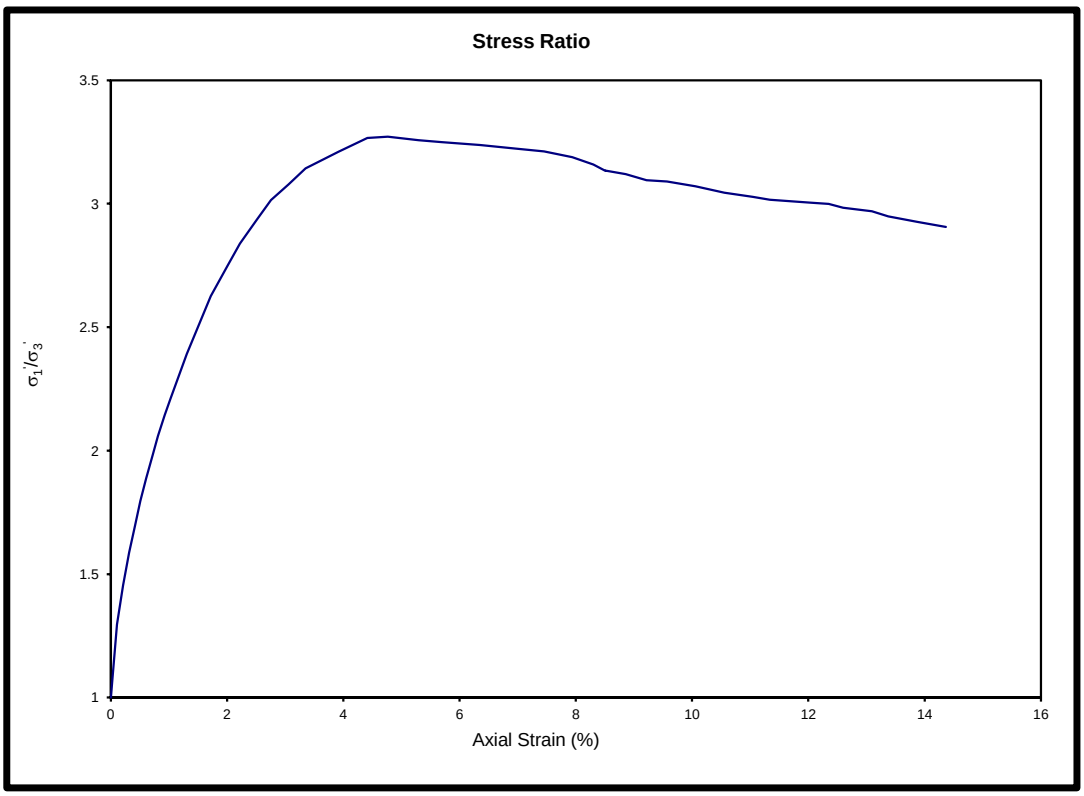




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

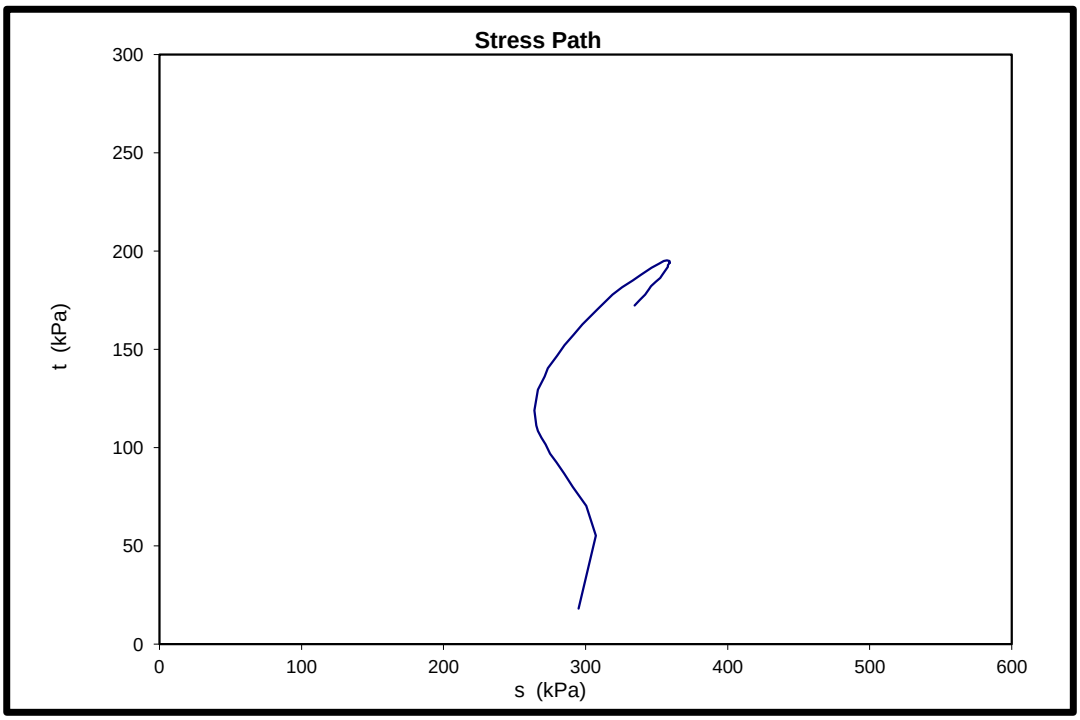
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand and silt. Sand is fine, greyish brown, moist, laminations of silty fine sand	**Sample Type/No.**	P1Q1
		Depth	28.2-28.4
Prepared and tested in accordance with ASTM D4767 and In House method			

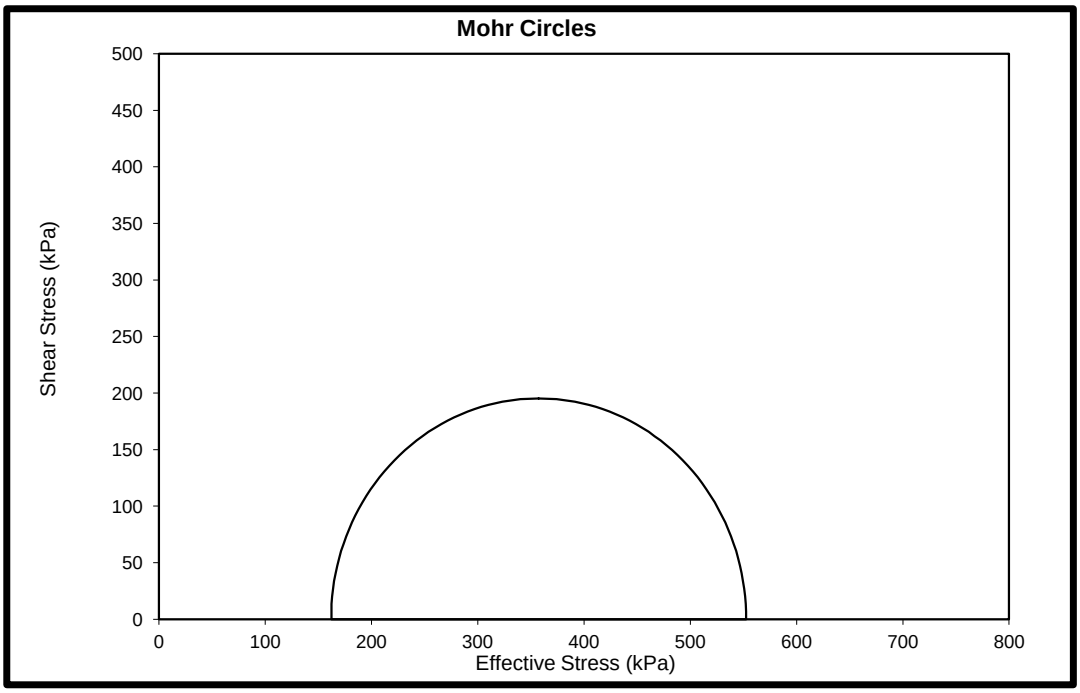




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand and silt. Sand is fine, greyish brown, moist, laminations of silty fine sand	**Sample Type/No.**	P1Q1
		Depth	28.2-28.4
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, grey, moist	**Sample Type/No.**	P2Q1
		Depth	29.2-29.4
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	73
	Moisture Content %	26
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.59
Saturation	Initial PWP (kPa)	3
	Saturated PWP (kPa)	398
	Final Cell Pressure (kPa)	400
	B Value	0.98
Consolidation	Cell Pressure (kPa)	678
	Back Pressure (kPa)	398
	Initial PWP (kPa)	398
	Final PWP (kPa)	393
	cv (m^2/yr)	0.44
	mv (m^2/MN)	20.499
	k (calculated value) (m/s)	2.8E-09
Compression	Cell Pressure (kPa)	678
	Back Pressure (kPa)	398
	s3' (kPa)	280
	Rate of Strain (%/hr)	0.8

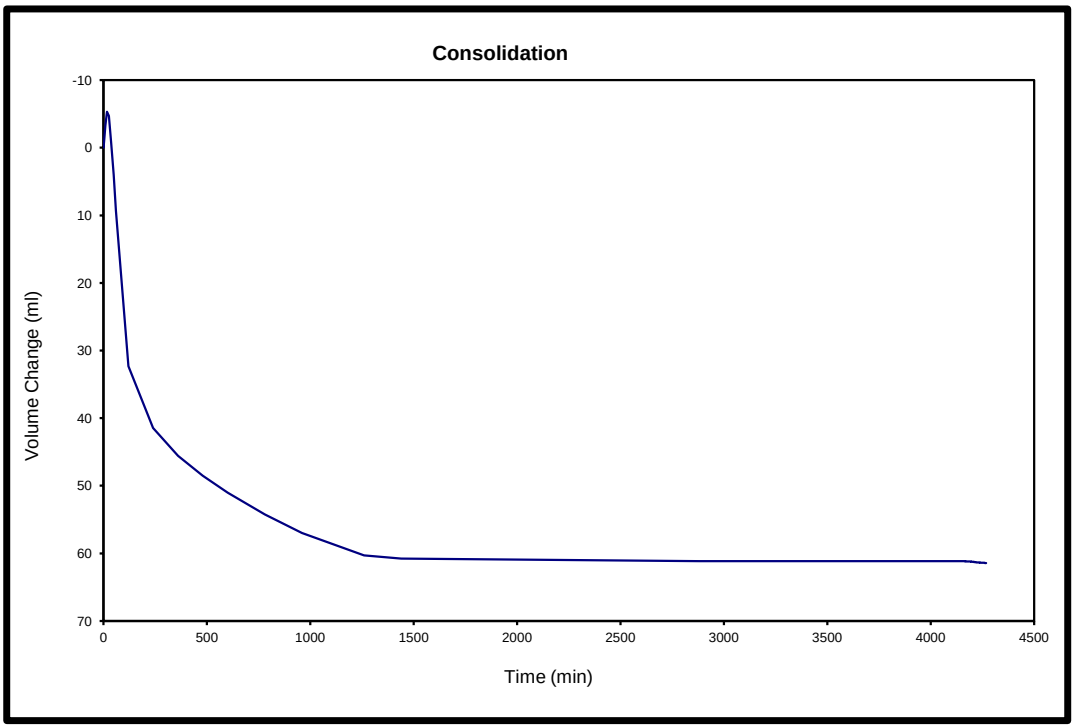
Final Conditions	Moisture Content (%)	24
	Bulk Density (Mg/m3)	2.19
	Dry Density (Mg/m^3)	1.77
Failure Conditions	Strain (e) (%)	7.9
	δu (kPa)	130
	σ_3'f (kPa)	150
	$(\sigma_1' - \sigma_3')f$ (kPa)	343

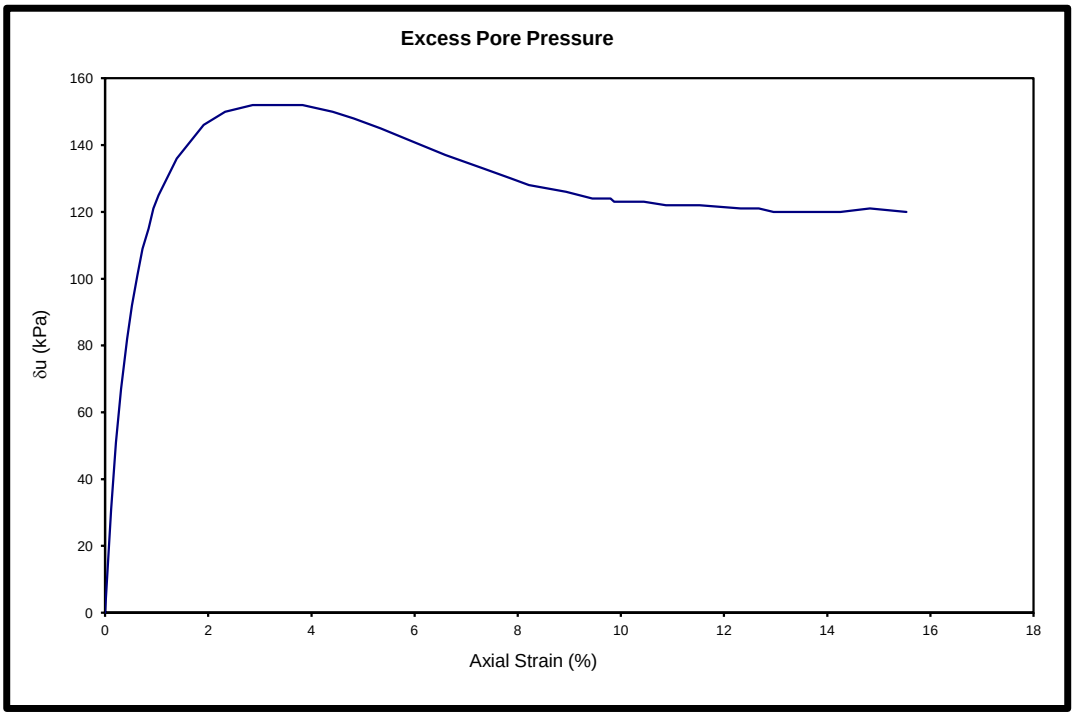
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.246	
	Sample Quality Category	4	Very poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

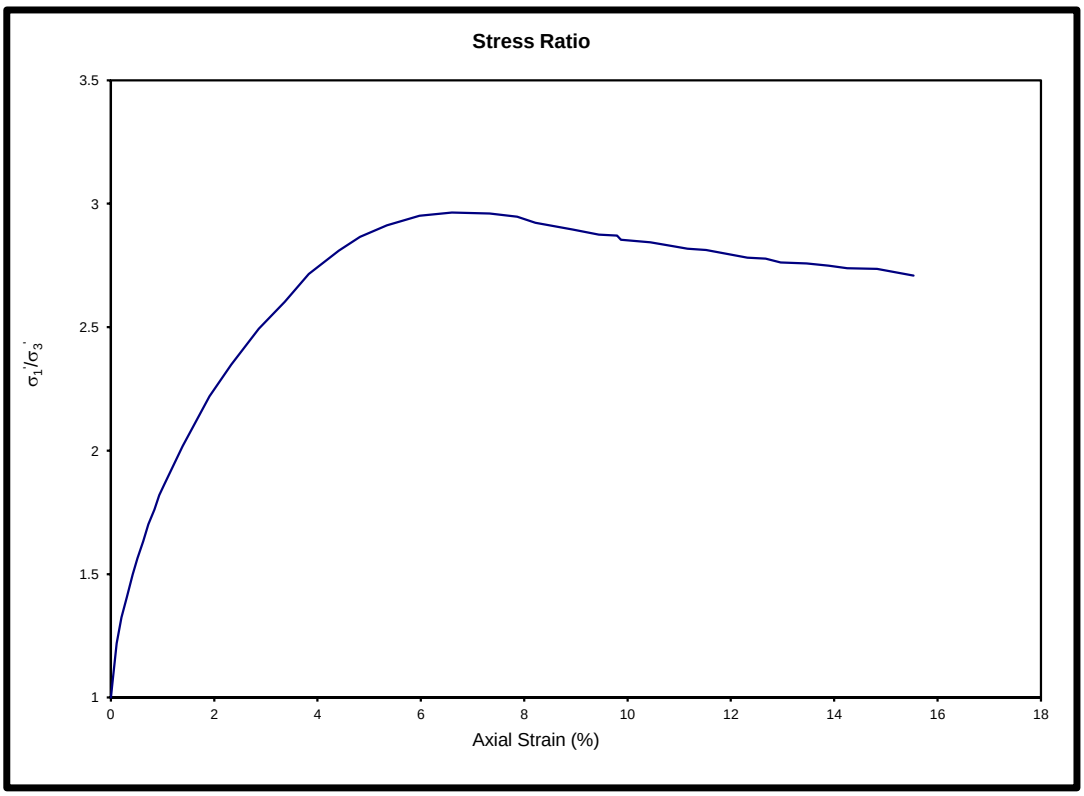
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, grey, moist	**Sample Type/No.**	P2Q1
		Depth	29.2-29.4
Prepared and tested in accordance with ASTM D4767 and In House method			





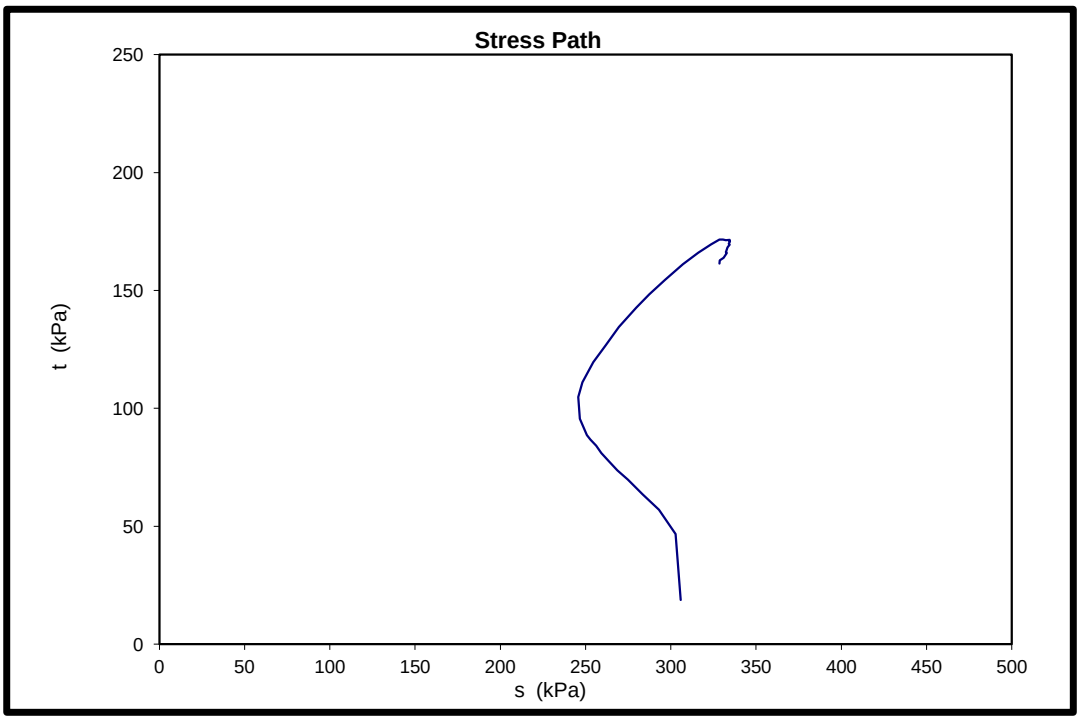
Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

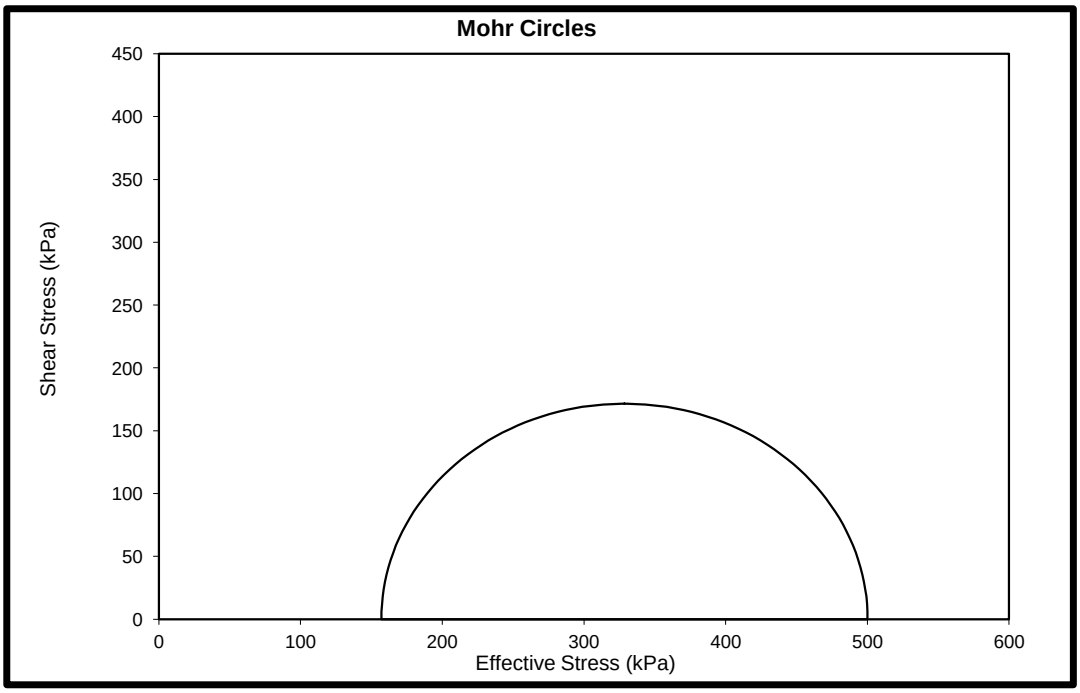
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, grey, moist	**Sample Type/No.**	P2Q1
		Depth	29.2-29.4
Prepared and tested in accordance with ASTM D4767 and In House method			



Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, grey, moist	**Sample Type/No.**	P2Q1
		Depth	29.2-29.4
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, greyish brown, moist	**Sample Type/No.**	P3Q1
		Depth	32.7-32.9
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	22
	Bulk Density (Mg/m3)	2.07
	Dry Density (Mg/m^3)	1.70
Saturation	Initial PWP (kPa)	7
	Saturated PWP (kPa)	293
	Final Cell Pressure (kPa)	350
	B Value	0.96
Consolidation	Cell Pressure (kPa)	606
	Back Pressure (kPa)	293
	Initial PWP (kPa)	293
	Final PWP (kPa)	295
	cv (m^2/yr)	0.09
	mv (m^2/MN)	-13.921
	k (calculated value) (m/s)	-4.0E-10
Compression	Cell Pressure (kPa)	606
	Back Pressure (kPa)	293
	s3' (kPa)	313
	Rate of Strain (%/hr)	0.8

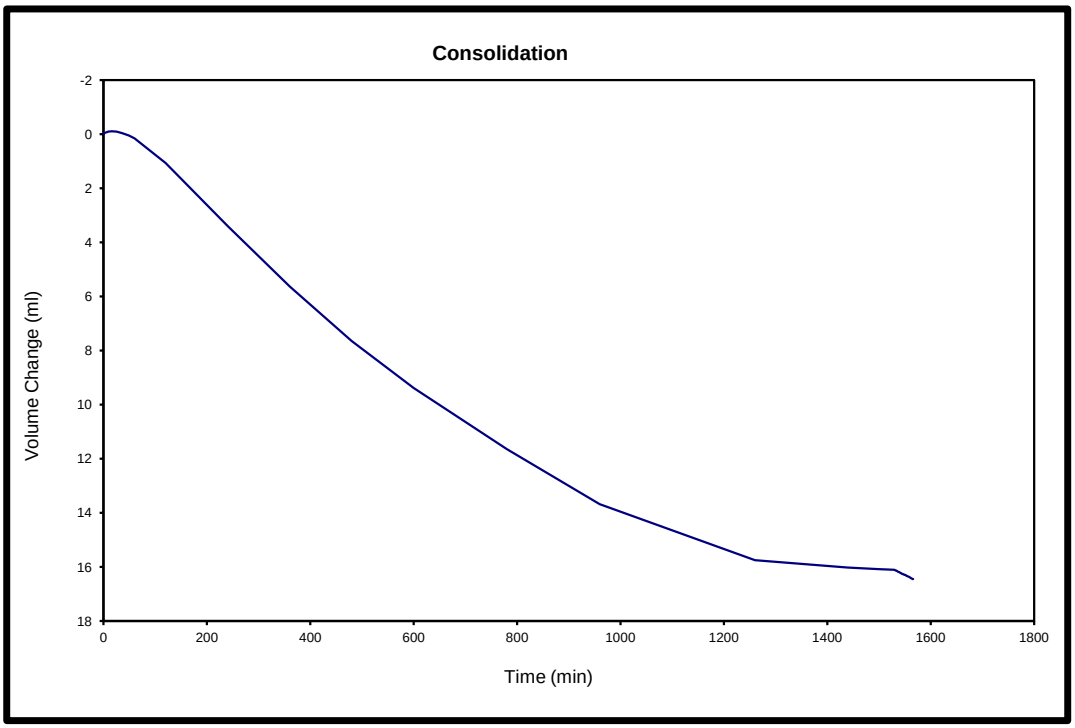
Final Conditions	Moisture Content (%)	22
	Bulk Density (Mg/m3)	2.10
	Dry Density (Mg/m^3)	1.73
Failure Conditions	Strain (e) (%)	10.6
	δu (kPa)	122
	σ_3'f (kPa)	191
	$(\sigma_1' - \sigma_3')f$ (kPa)	418

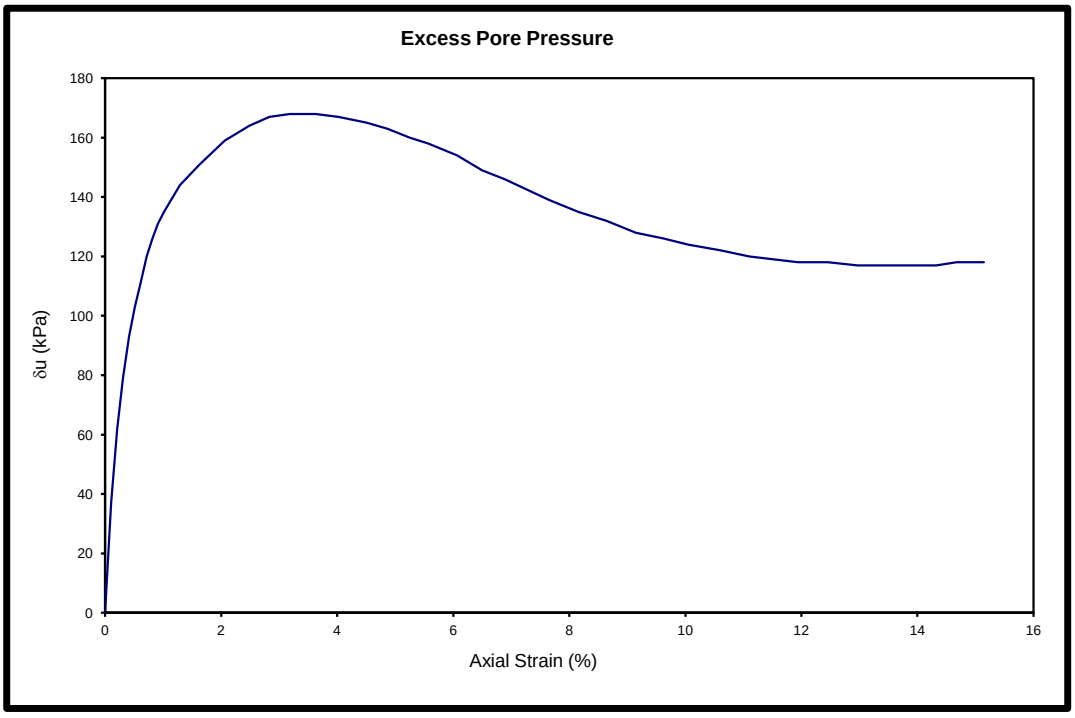
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.073566104	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

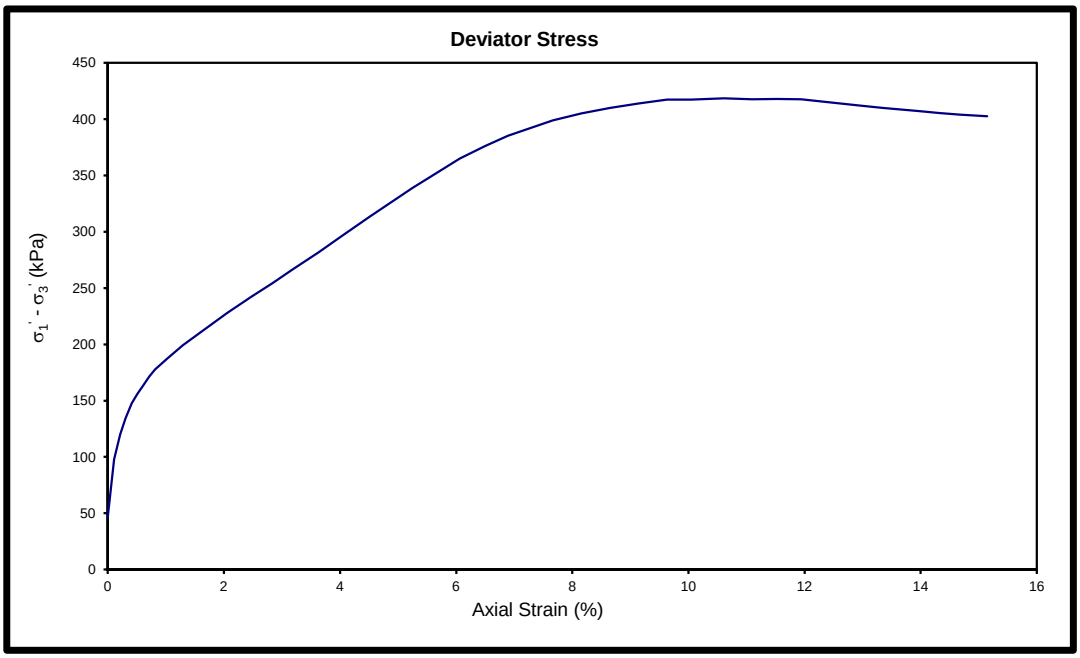
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, greyish brown, moist	**Sample Type/No.**	P3Q1
		Depth	32.7-32.9
Prepared and tested in accordance with ASTM D4767 and In House method			

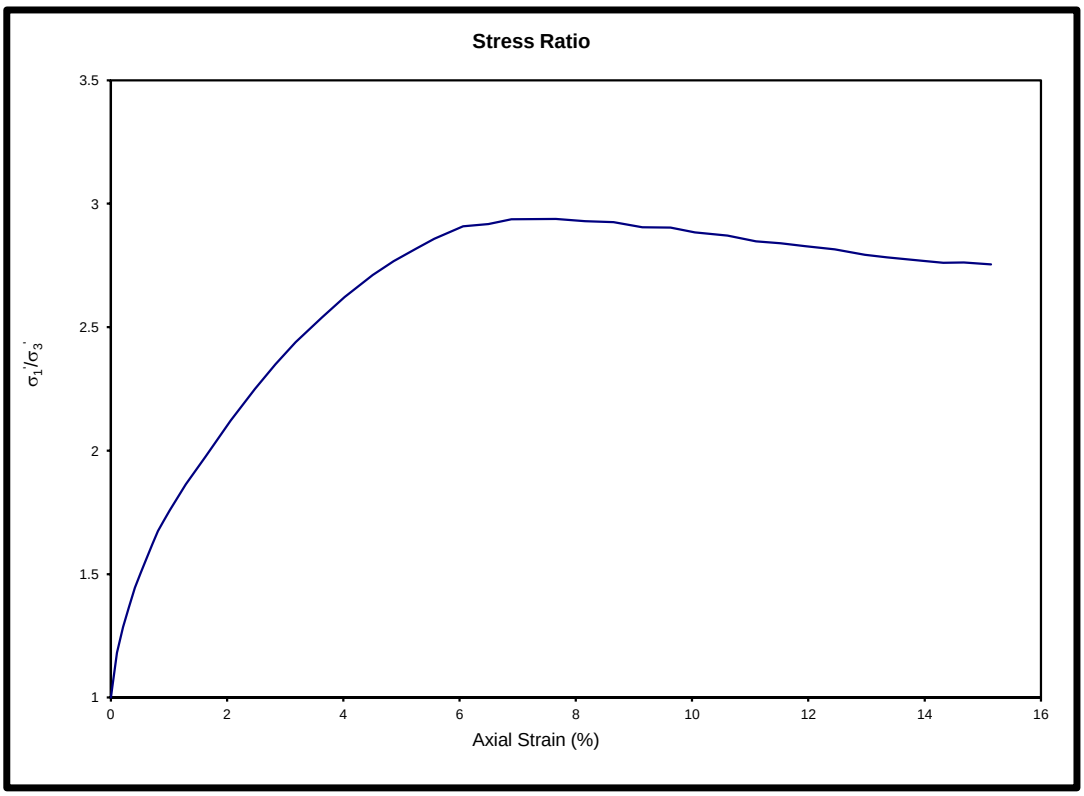




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

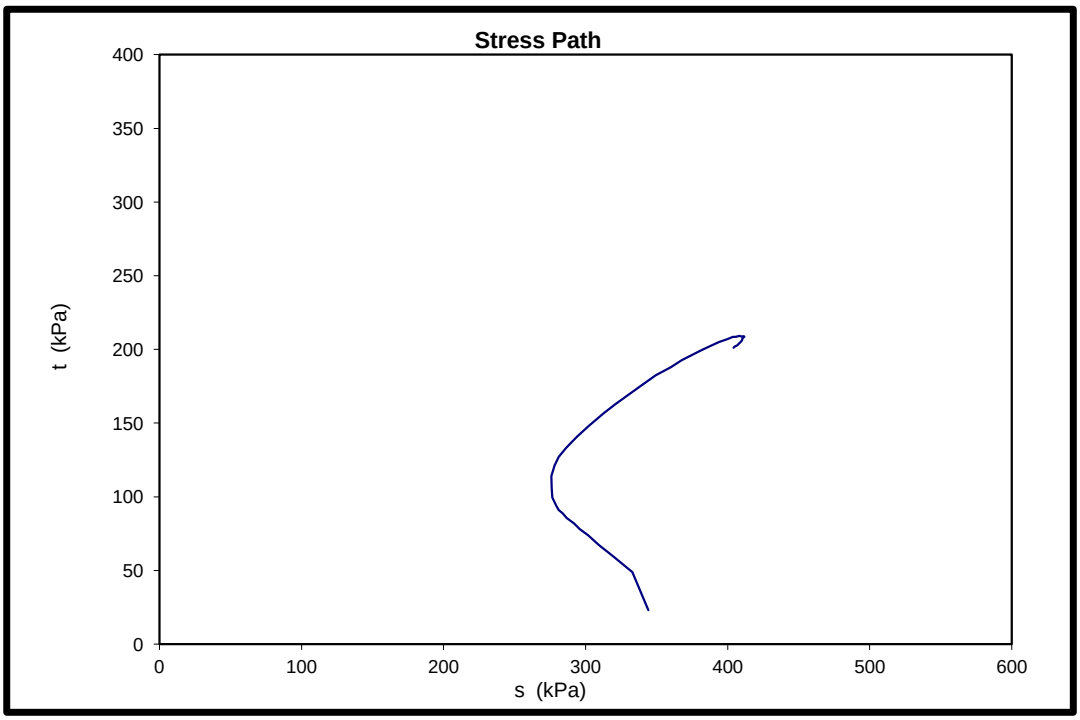
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, greyish brown, moist	**Sample Type/No.**	P3Q1
		Depth	32.7-32.9
Prepared and tested in accordance with ASTM D4767 and In House method			

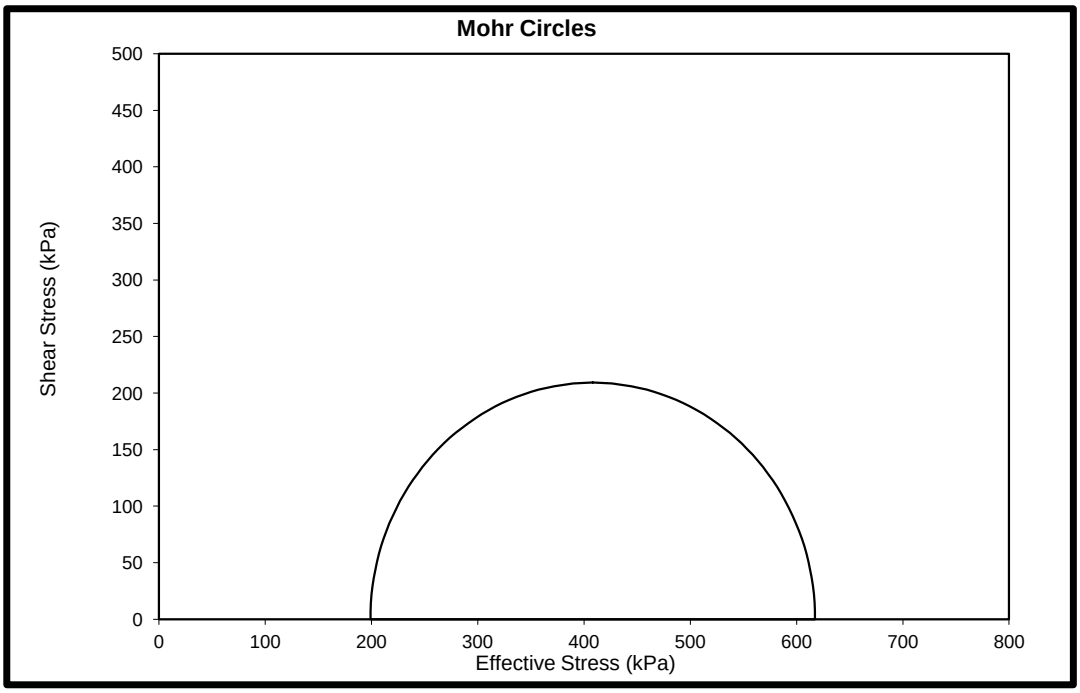




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, greyish brown, moist	**Sample Type/No.**	P3Q1
		Depth	32.7-32.9
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P6AQ1
		Depth	44.2-44.4
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144.0
	Diameter (mm)	72.1
	Moisture Content %	30
	Bulk Density (Mg/m3)	1.96
	Dry Density (Mg/m^3)	1.50
Saturation	Initial PWP (kPa)	2
	Saturated PWP (kPa)	320
	Final Cell Pressure (kPa)	400
	B Value	0.96
Consolidation	Cell Pressure (kPa)	721
	Back Pressure (kPa)	320
	Initial PWP (kPa)	320
	Final PWP (kPa)	319
	cv (m^2/yr)	0.06
	mv (m^2/MN)	43.127
	k (calculated value) (m/s)	8.3E-10
Compression	Cell Pressure (kPa)	721
	Back Pressure (kPa)	320
	s3' (kPa)	401
	Rate of Strain (%/hr)	0.8

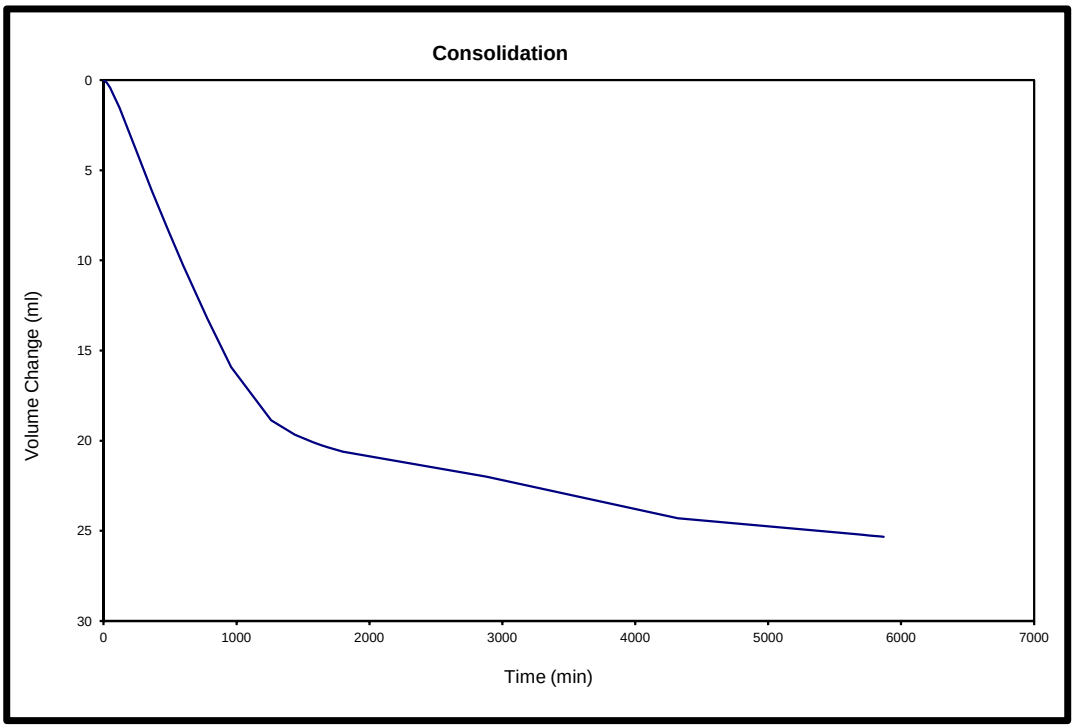
Final Conditions	Moisture Content (%)	29
	Bulk Density (Mg/m3)	2.02
	Dry Density (Mg/m^3)	1.56
Failure Conditions	Strain (e) (%)	11.2
	δu (kPa)	203
	σ_3'f (kPa)	198
	$(\sigma_1' - \sigma_3')f$ (kPa)	457

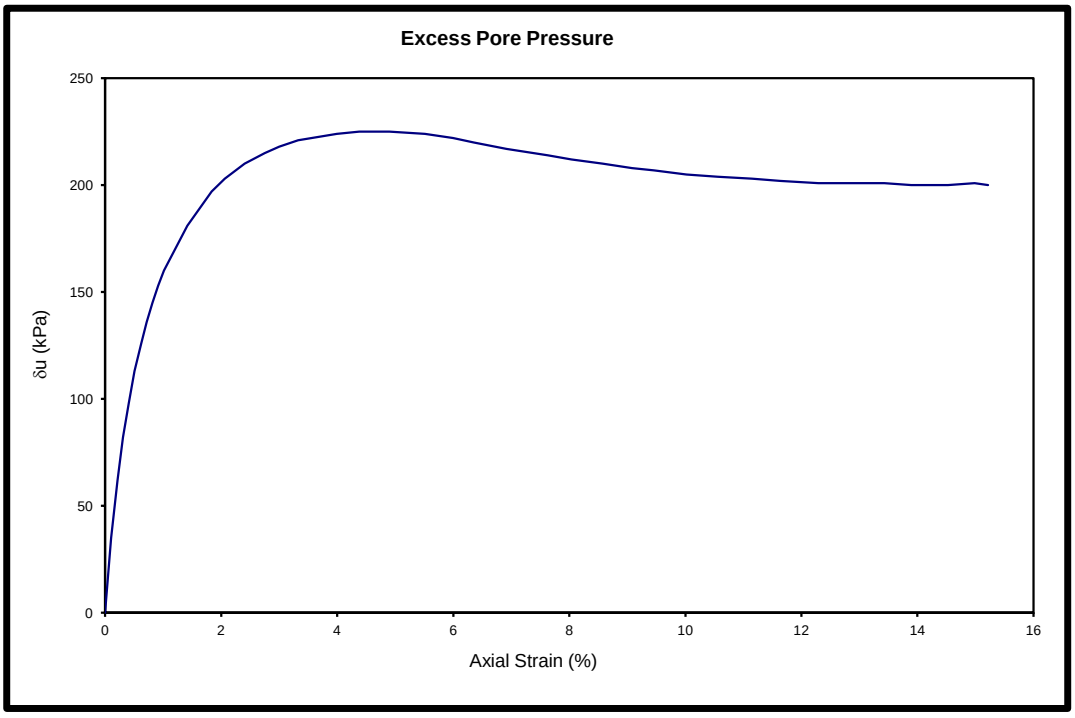
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.094852763	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

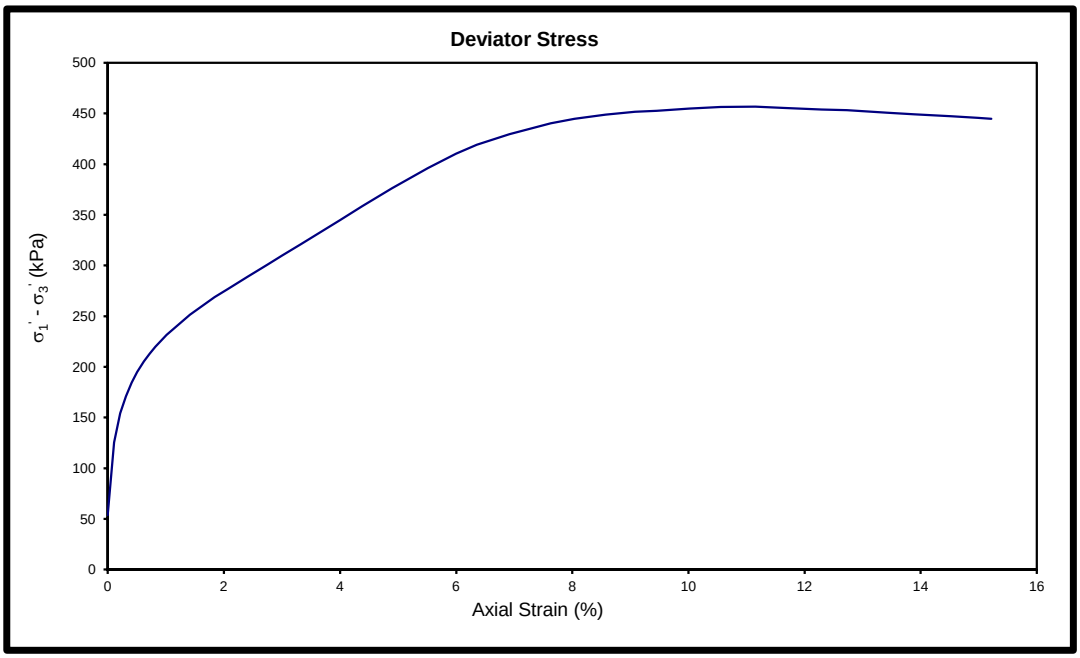
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P6AQ1
		Depth	44.2-44.4
Prepared and tested in accordance with ASTM D4767 and In House method			

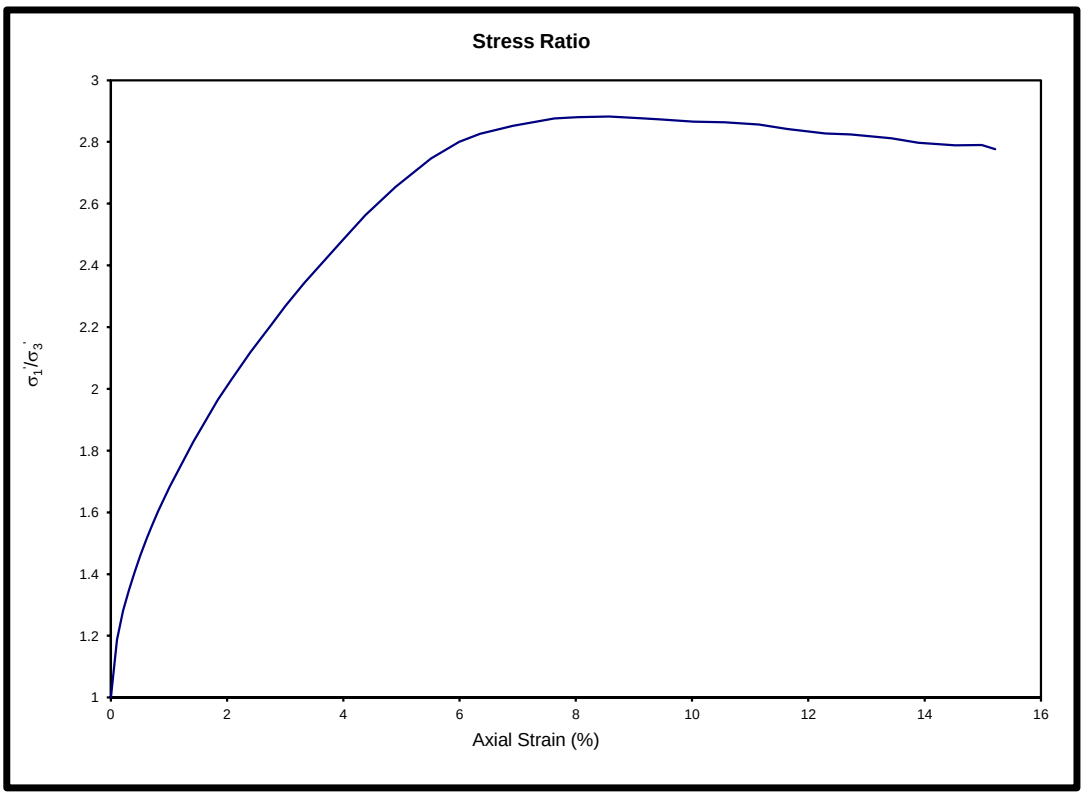




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

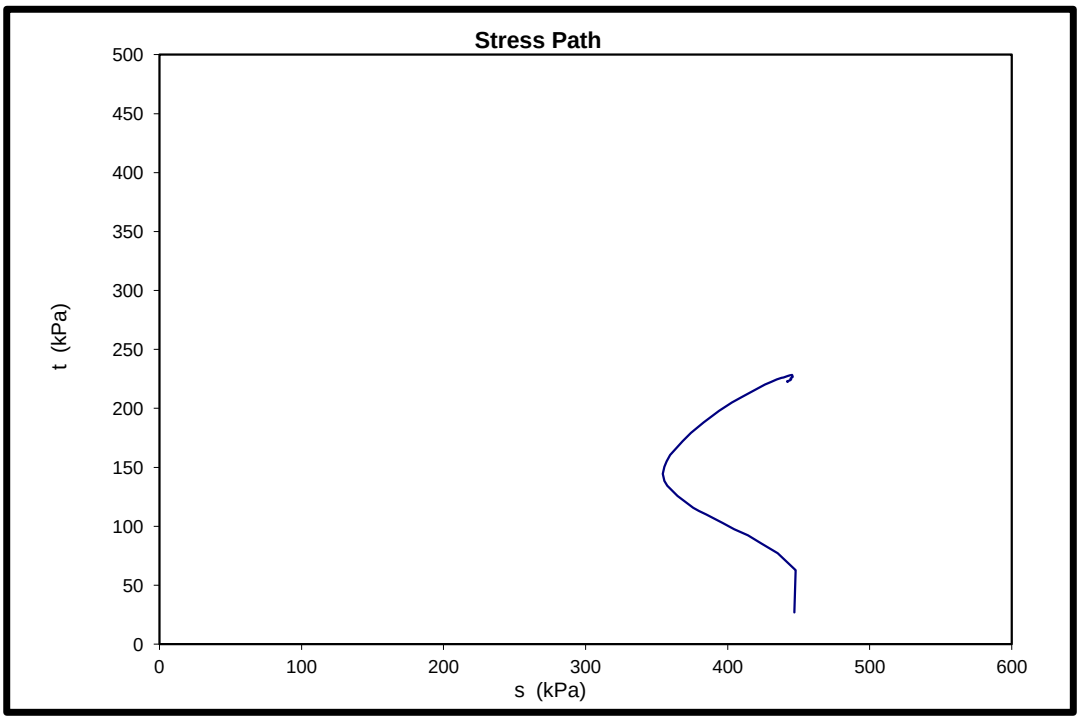
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P6AQ1
		Depth	44.2-44.4
Prepared and tested in accordance with ASTM D4767 and In House method			

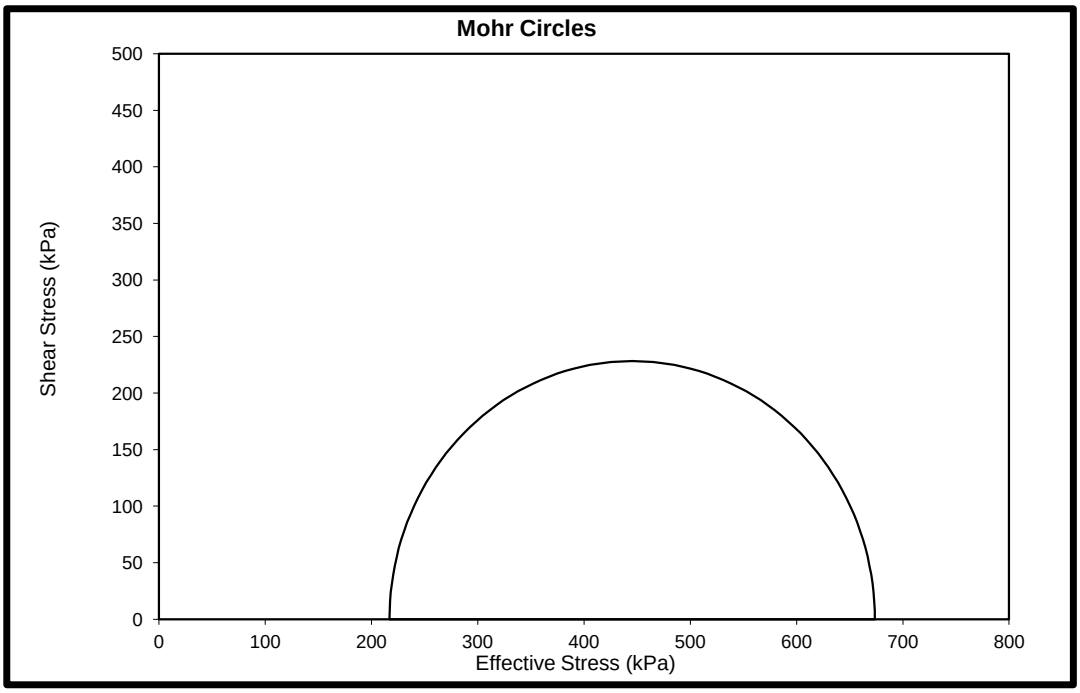




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	CLAY with sand. Sand is fine, dark grey, moist	**Sample Type/No.**	P6AQ1
		Depth	44.2-44.4
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	Clay with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P11Q2
		Depth	63.5-63.7
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	129
	Diameter (mm)	72
	Moisture Content %	34
	Bulk Density (Mg/m3)	1.82
	Dry Density (Mg/m^3)	1.36
Saturation	Initial PWP (kPa)	-14
	Saturated PWP (kPa)	350
	Final Cell Pressure (kPa)	350
	B Value	0.98
Consolidation	Cell Pressure (kPa)	878
	Back Pressure (kPa)	350
	Initial PWP (kPa)	356
	Final PWP (kPa)	354
	cv (m^2/yr)	0.13
	mv (m^2/MN)	42.664
	k (calculated value) (m/s)	1.8E-09
Compression	Cell Pressure (kPa)	878
	Back Pressure (kPa)	350
	s3' (kPa)	545
	Rate of Strain (%/hr)	0.8

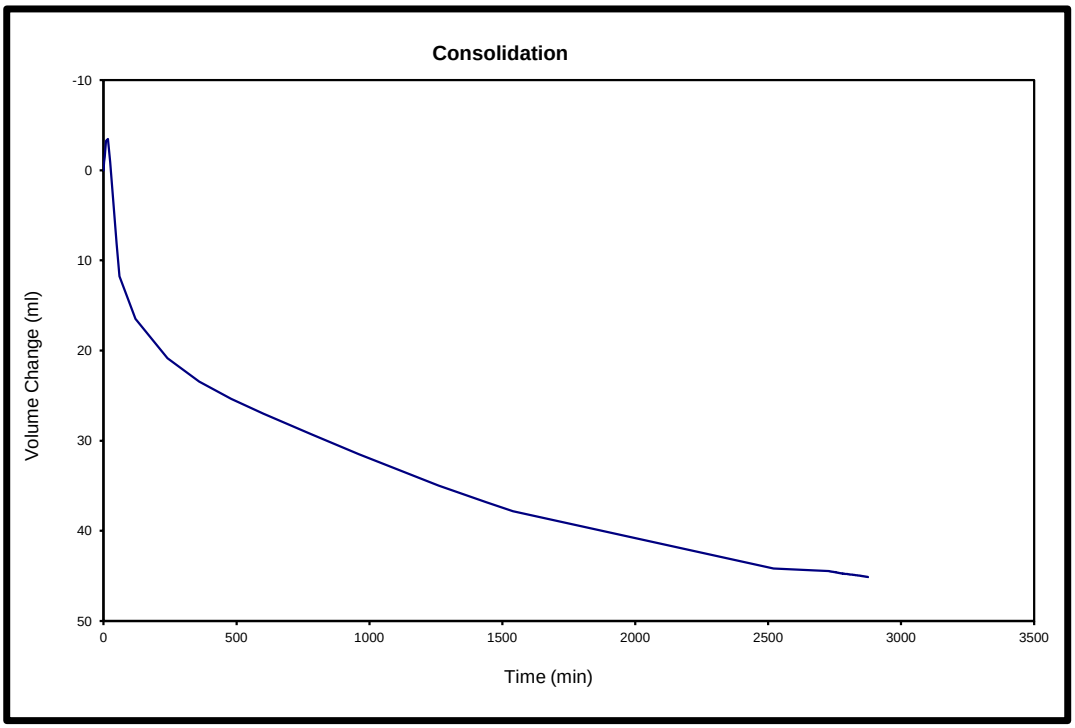
Sample Quality	SQ Index $\Delta e/e_0$	0.176	
	Sample Quality Category	4	Very poor

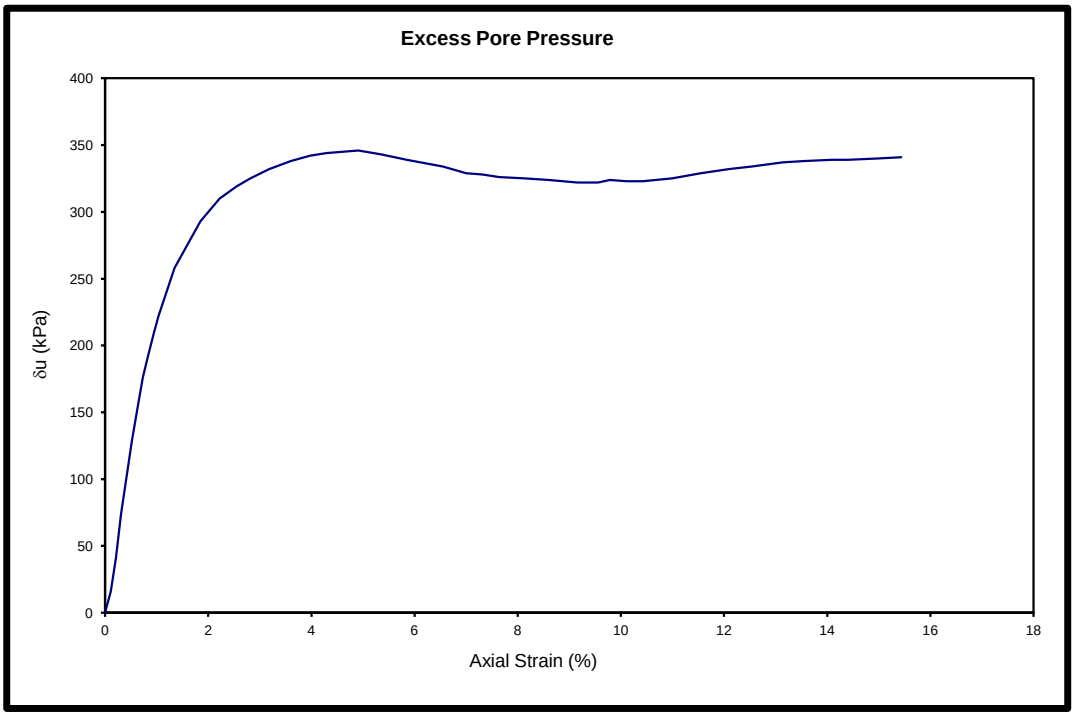
Final Conditions	Moisture Content (%)	33
	Bulk Density (Mg/m3)	1.97
	Dry Density (Mg/m^3)	1.49
Failure Conditions	Strain (e) (%)	6.5
	δu (kPa)	334
	σ_3'f (kPa)	211
	$(\sigma_1' - \sigma_3')f$ (kPa)	613

Failure Mode: Shear

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

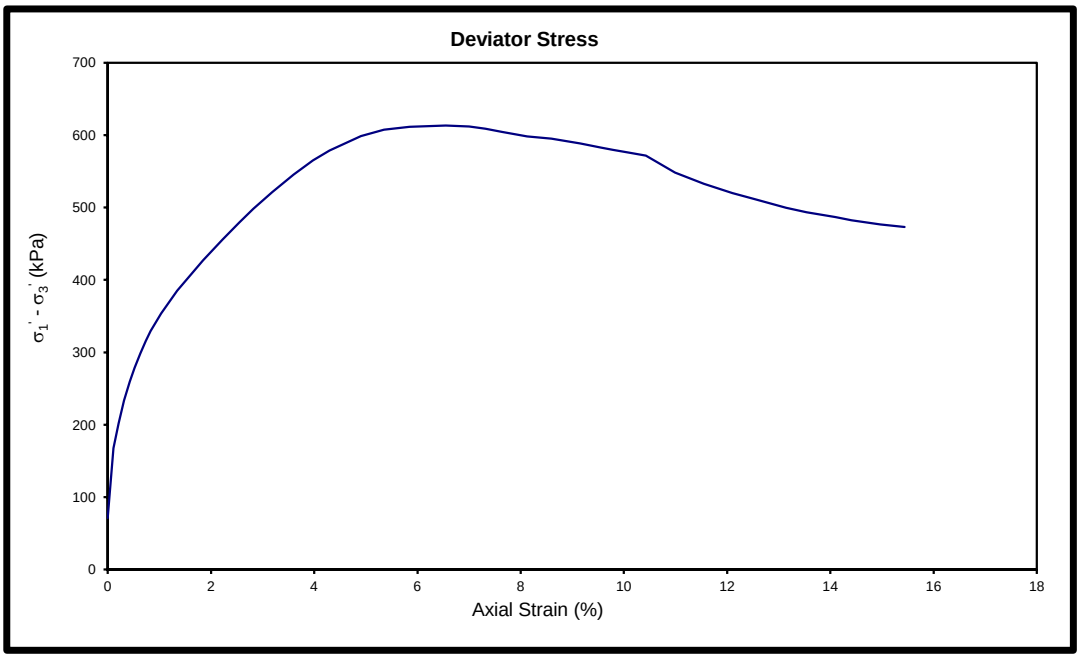
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	Clay with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P11Q2
		Depth	63.5-63.7
Prepared and tested in accordance with ASTM D4767 and In House method			

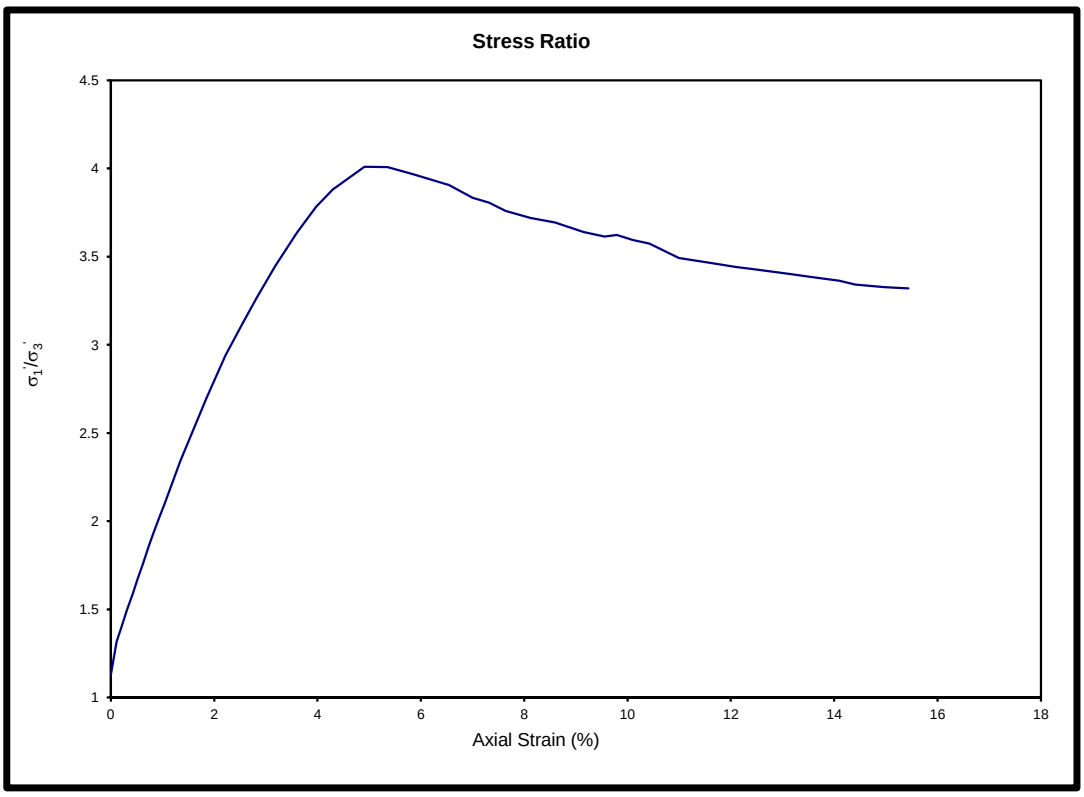




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

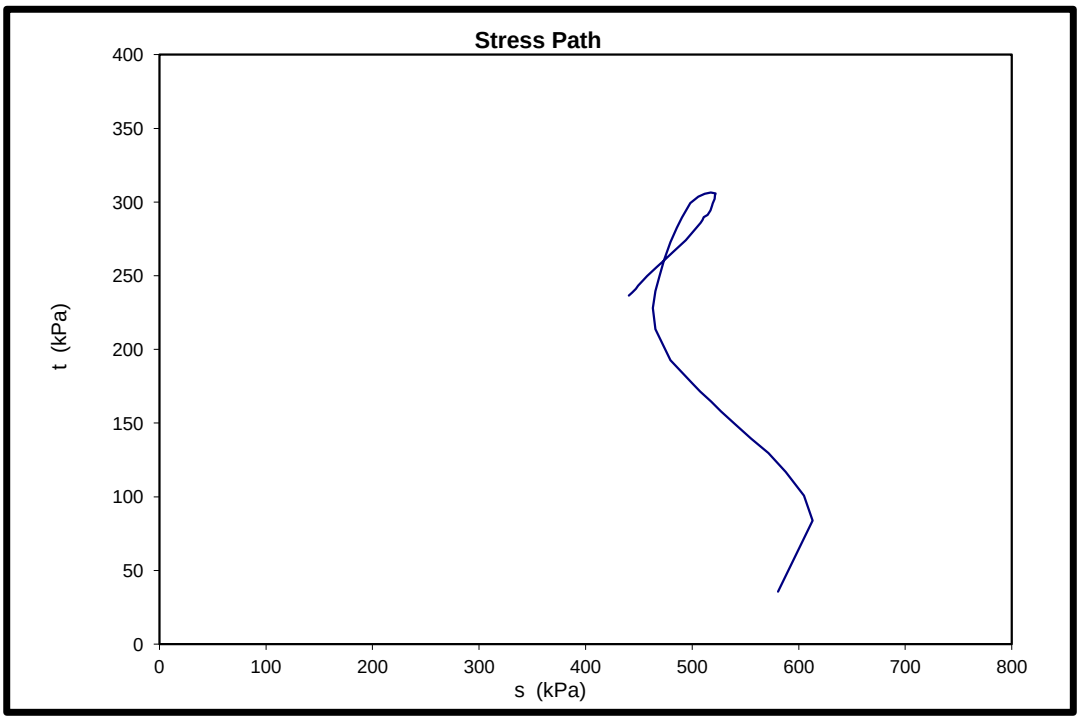
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	Clay with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P11Q2
		Depth	63.5-63.7
Prepared and tested in accordance with ASTM D4767 and In House method			

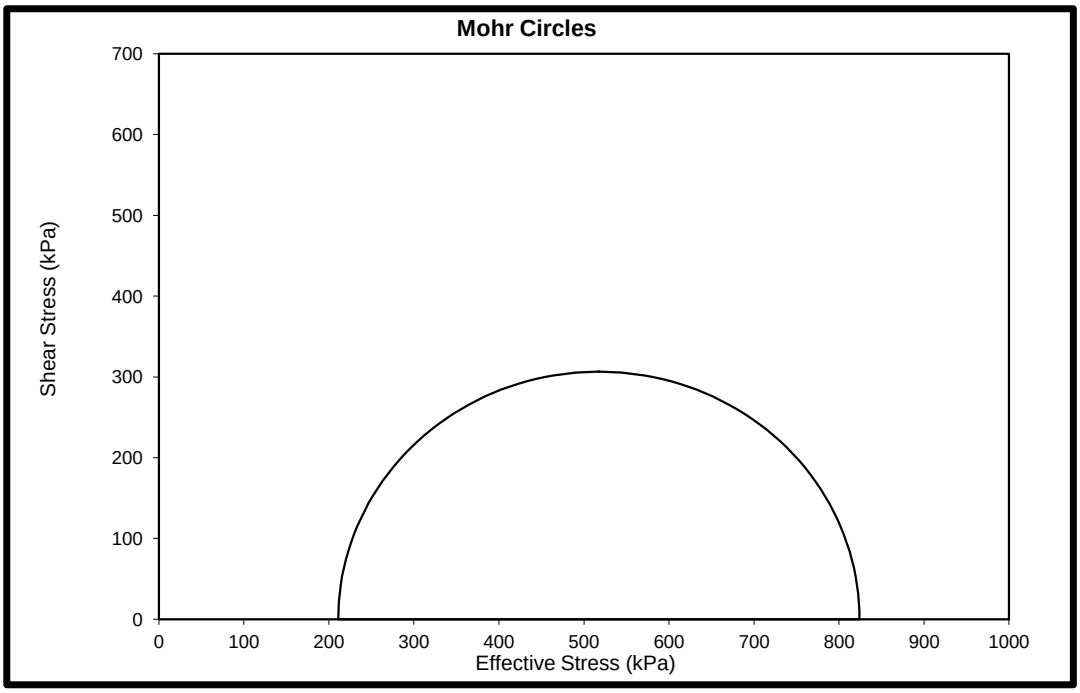




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - I21B
Description	Clay with sand. Sand is fine, dark greenish grey, moist, fine to medium shell fragments	**Sample Type/No.**	P11Q2
		Depth	63.5-63.7
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY with sand. Sand is fine, dark grey, moist with laminations of silt	**Sample Type/No.**	P15Q2
		Depth	40.6-40.8
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	71
	Moisture Content %	28
	Bulk Density (Mg/m3)	1.96
	Dry Density (Mg/m^3)	1.52
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	413
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	796
	Back Pressure (kPa)	413
	Initial PWP (kPa)	418
	Final PWP (kPa)	419
	cv (m^2/yr)	0.07
	mv (m^2/MN)	35.896
	k (calculated value) (m/s)	7.5E-10
Compression	Cell Pressure (kPa)	796
	Back Pressure (kPa)	413
	s3' (kPa)	411
	Rate of Strain (%/hr)	0.8

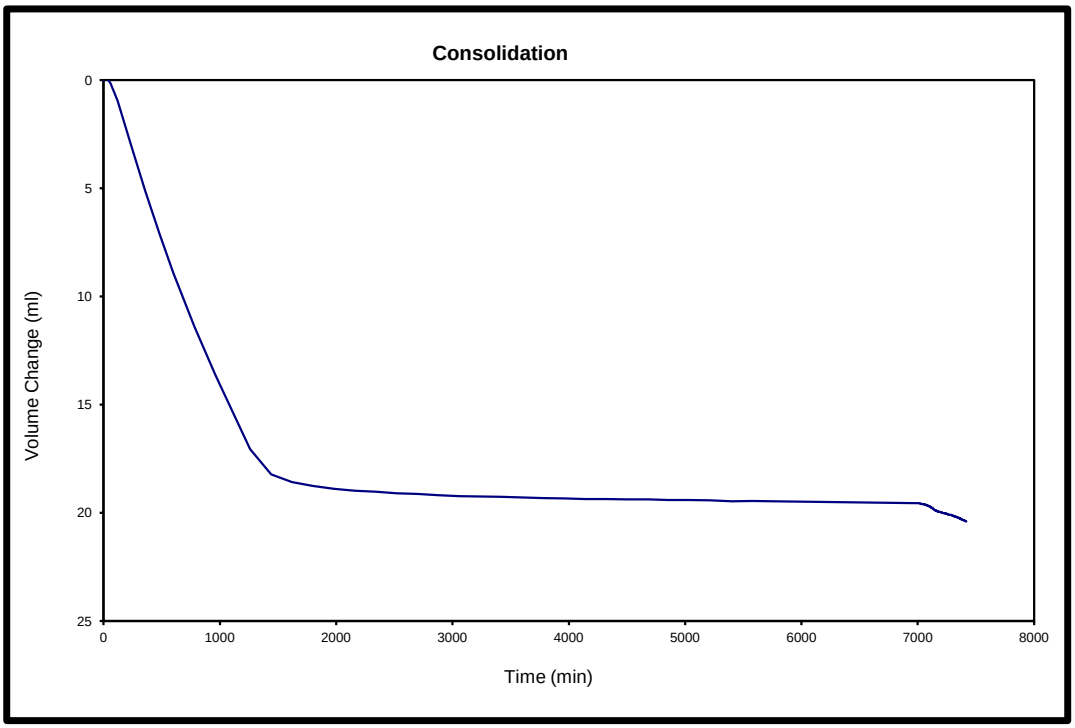
Final Conditions	Moisture Content (%)	27
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.57
Failure Conditions	Strain (e) (%)	15.2
	δu (kPa)	157
	σ_3'f (kPa)	254
	$(\sigma_1' - \sigma_3')f$ (kPa)	572

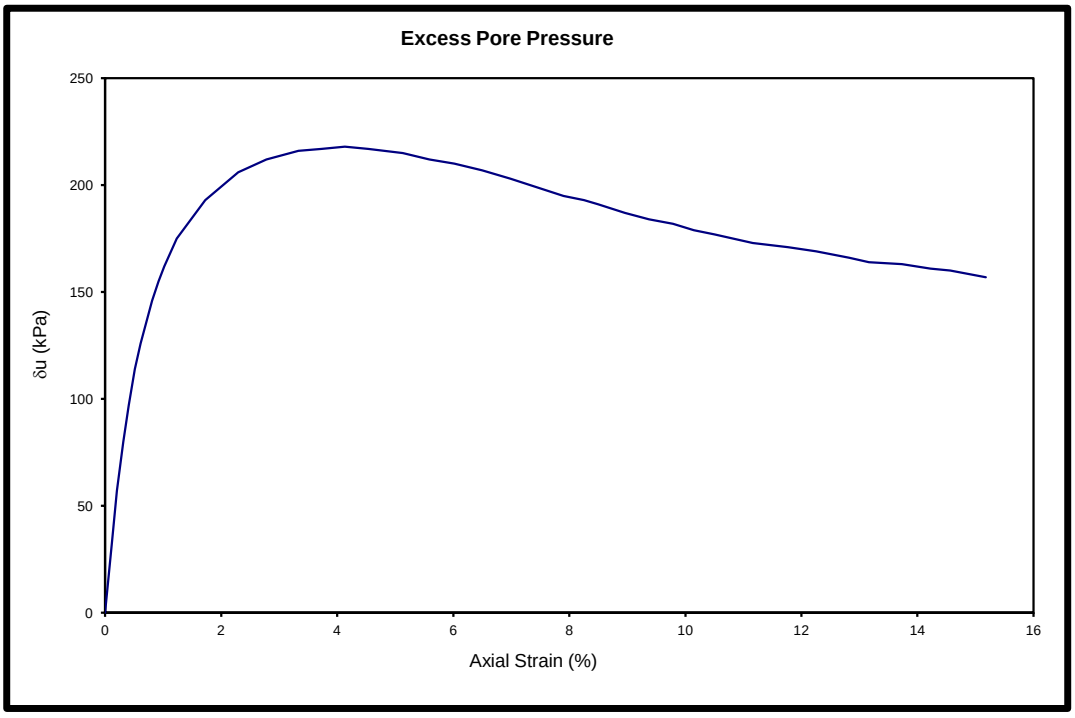
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.082	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

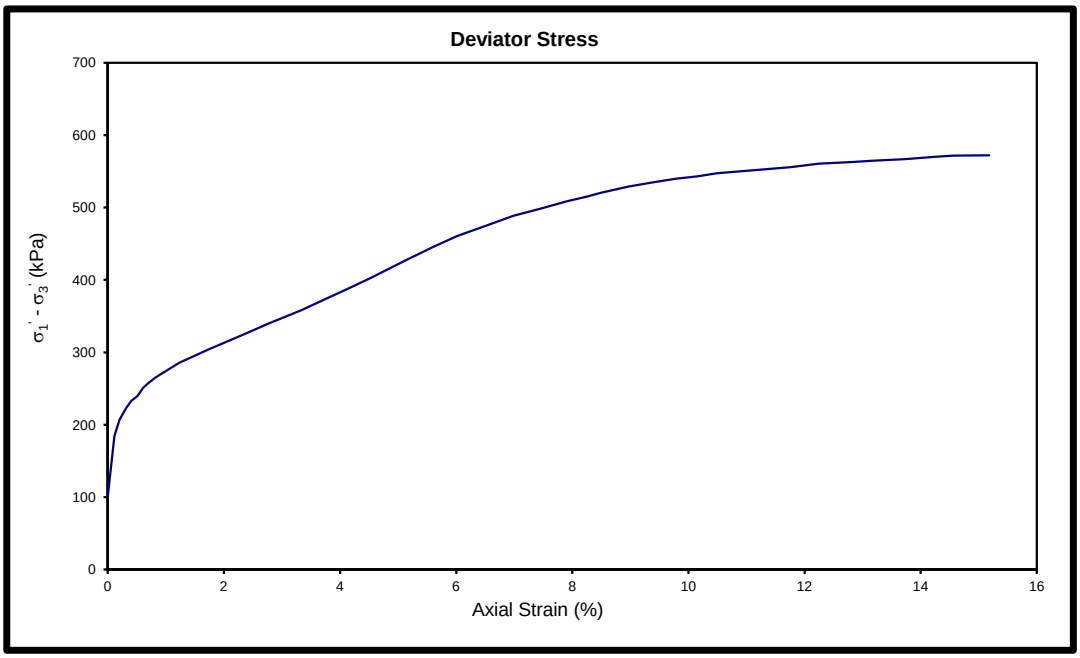
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY with sand. Sand is fine, dark grey, moist with laminations of silt	**Sample Type/No.**	P15Q2
		Depth	40.6-40.8
Prepared and tested in accordance with ASTM D4767 and In House method			

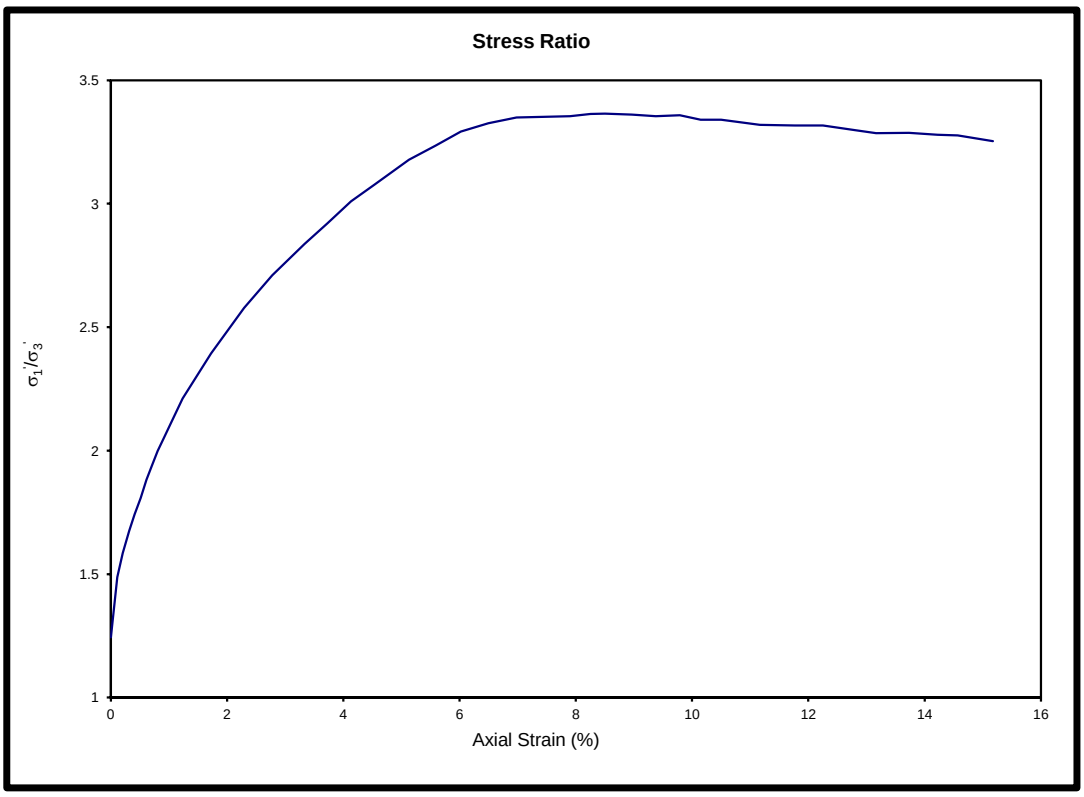




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

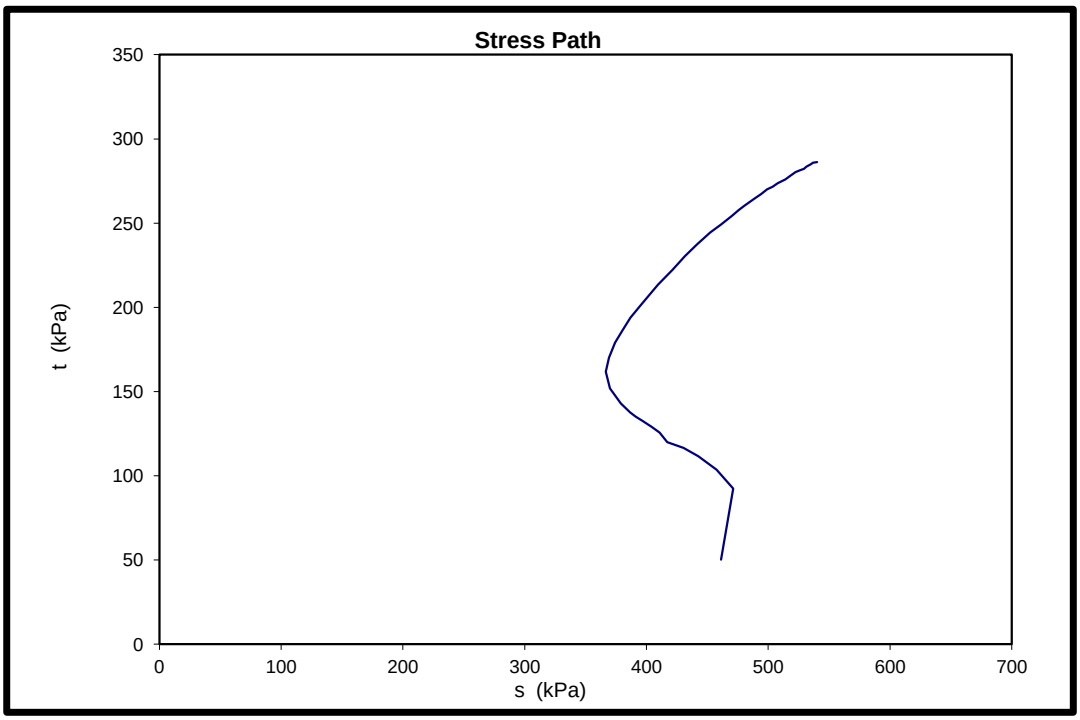
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY with sand. Sand is fine, dark grey, moist with laminations of silt	**Sample Type/No.**	P15Q2
		Depth	40.6-40.8
Prepared and tested in accordance with ASTM D4767 and In House method			

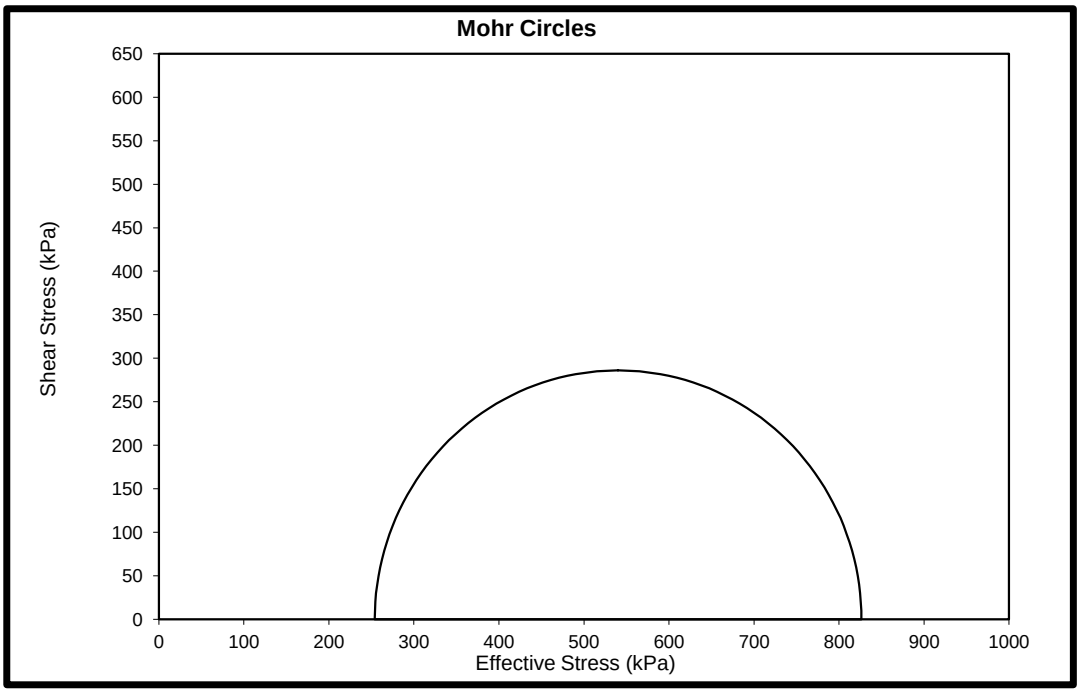




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY with sand. Sand is fine, dark grey, moist with laminations of silt	**Sample Type/No.**	P15Q2
		Depth	40.6-40.8
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY. Greenish grey, moist	**Sample Type/No.**	P20Q2
		Depth	55.6-55.8
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	71
	Moisture Content %	45
	Bulk Density (Mg/m3)	1.77
	Dry Density (Mg/m^3)	1.22
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	404
	Final Cell Pressure (kPa)	450
	B Value	0.96
Consolidation	Cell Pressure (kPa)	899
	Back Pressure (kPa)	404
	Initial PWP (kPa)	410
	Final PWP (kPa)	407
	cv (m^2/yr)	0.04
	mv (m^2/MN)	16.945
	k (calculated value) (m/s)	2.2E-10
Compression	Cell Pressure (kPa)	899
	Back Pressure (kPa)	404
	s3' (kPa)	549
	Rate of Strain (%/hr)	0.8

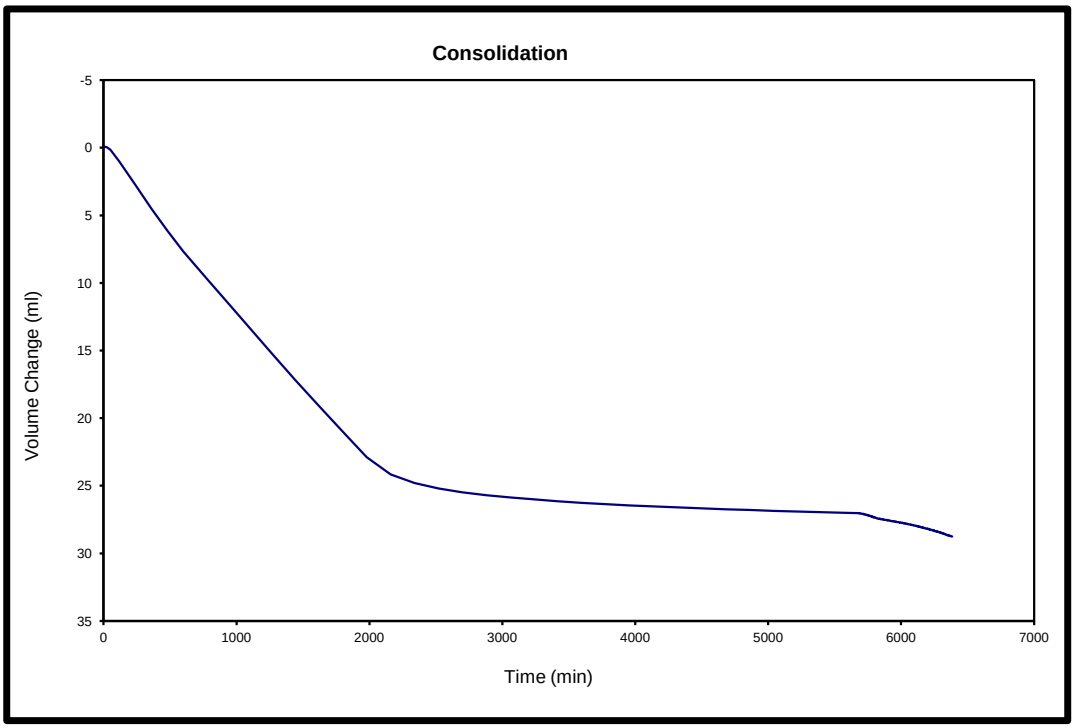
Final Conditions	Moisture Content (%)	39
	Bulk Density (Mg/m3)	1.85
	Dry Density (Mg/m^3)	1.33
Failure Conditions	Strain (e) (%)	4.0
	δu (kPa)	266
	σ_3'f (kPa)	283
	(σ_1' - σ_3')f (kPa)	589

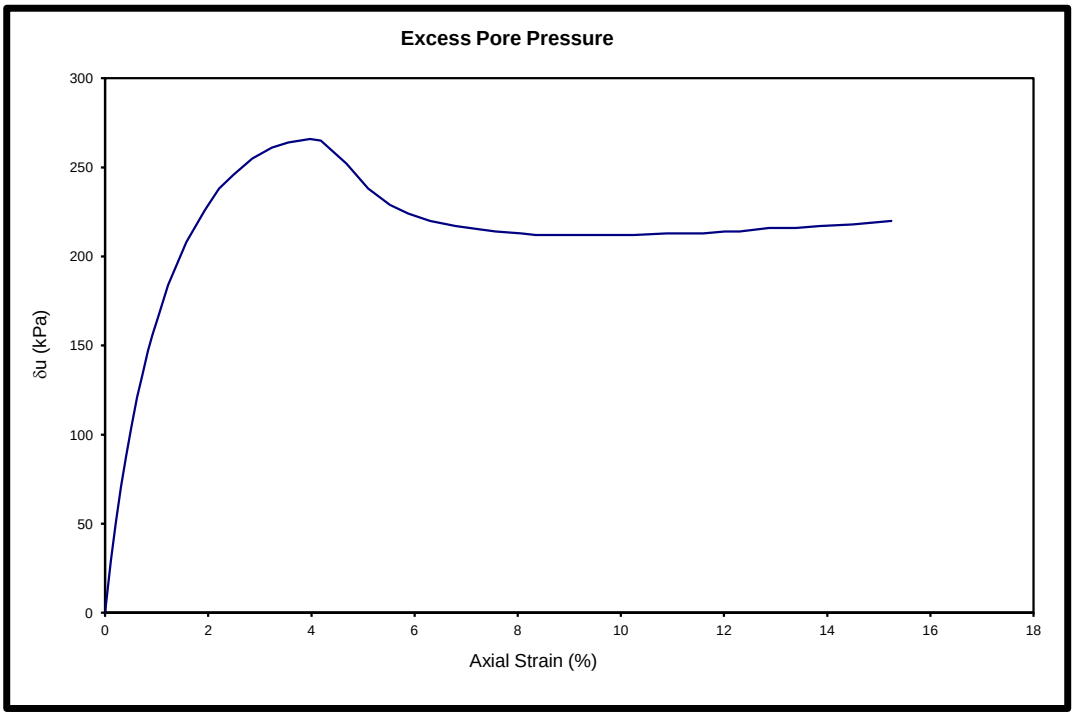
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.092	
	Sample Quality Category	3	Poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

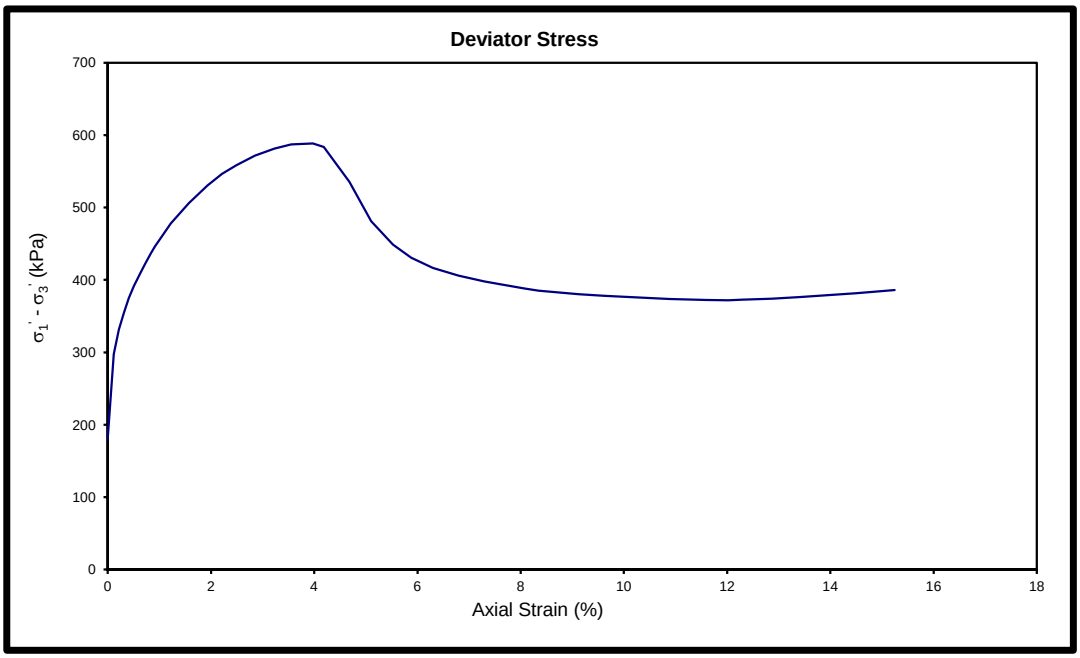
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY. Greenish grey, moist	**Sample Type/No.**	P20Q2
		Depth	55.6-55.8
Prepared and tested in accordance with ASTM D4767 and In House method			

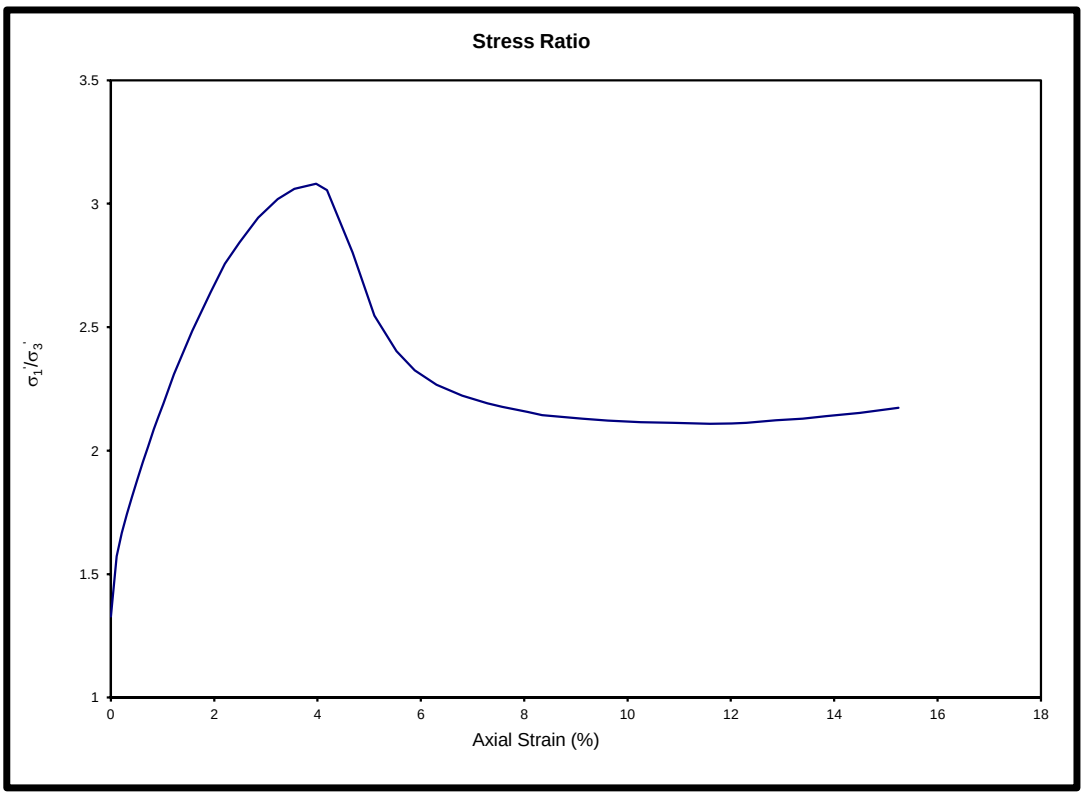




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

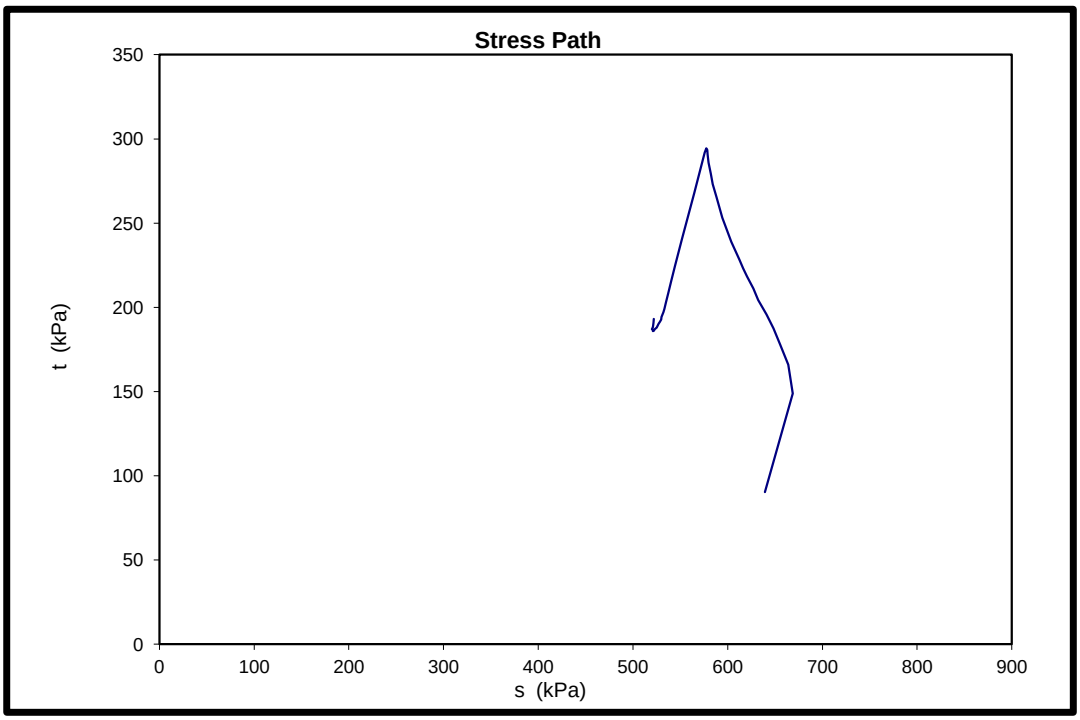
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY. Greenish grey, moist	**Sample Type/No.**	P20Q2
		Depth	55.6-55.8
Prepared and tested in accordance with ASTM D4767 and In House method			

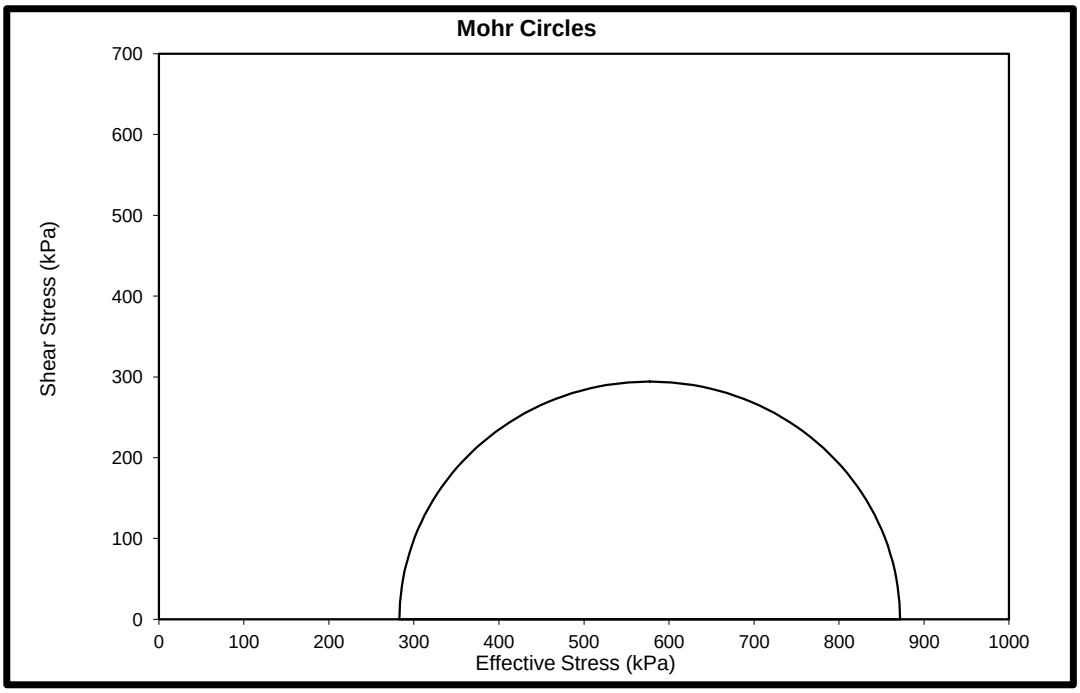




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - K16
Description	CLAY. Greenish grey, moist	**Sample Type/No.**	P20Q2
		Depth	55.6-55.8
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	JG

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Dark olive grey, dry. Sand is fine. Some laminations and lenses of silt.	**Sample Type/No.**	P09 Q1
		Depth	25.70-25.90
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	138
	Diameter (mm)	72
	Moisture Content %	32
	Bulk Density (Mg/m3)	1.97
	Dry Density (Mg/m^3)	1.49
Saturation	Initial PWP (kPa)	1
	Saturated PWP (kPa)	426
	Final Cell Pressure (kPa)	500
	B Value	0.96
Consolidation	Cell Pressure (kPa)	645
	Back Pressure (kPa)	426
	Initial PWP (kPa)	426
	Final PWP (kPa)	422
	cv (m^2/yr)	0.41
	mv (m^2/MN)	2.162
	k (calculated value) (m/s)	2.7E-10
Compression	Cell Pressure (kPa)	645
	Back Pressure (kPa)	426
	s3' (kPa)	219
	Rate of Strain (%/hr)	0.9

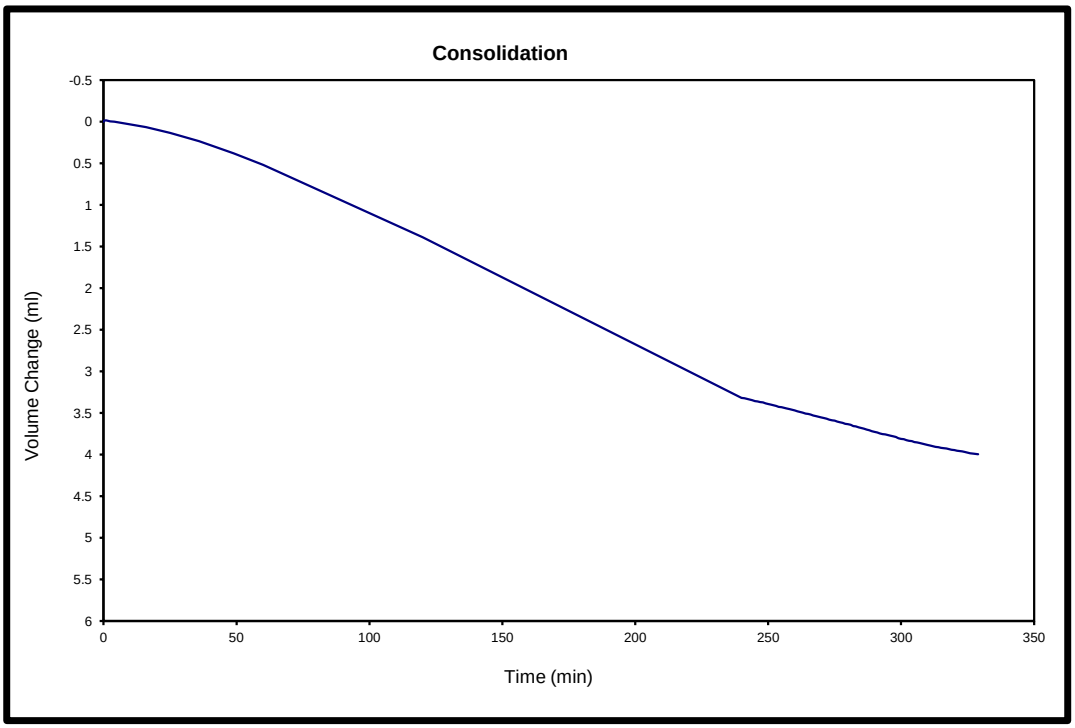
Final Conditions	Moisture Content (%)	33
	Bulk Density (Mg/m3)	1.98
	Dry Density (Mg/m^3)	1.49
Failure Conditions	Strain (e) (%)	5.9
	δu (kPa)	36
	σ_3'f (kPa)	183
	$(\sigma_1' - \sigma_3')f$ (kPa)	511

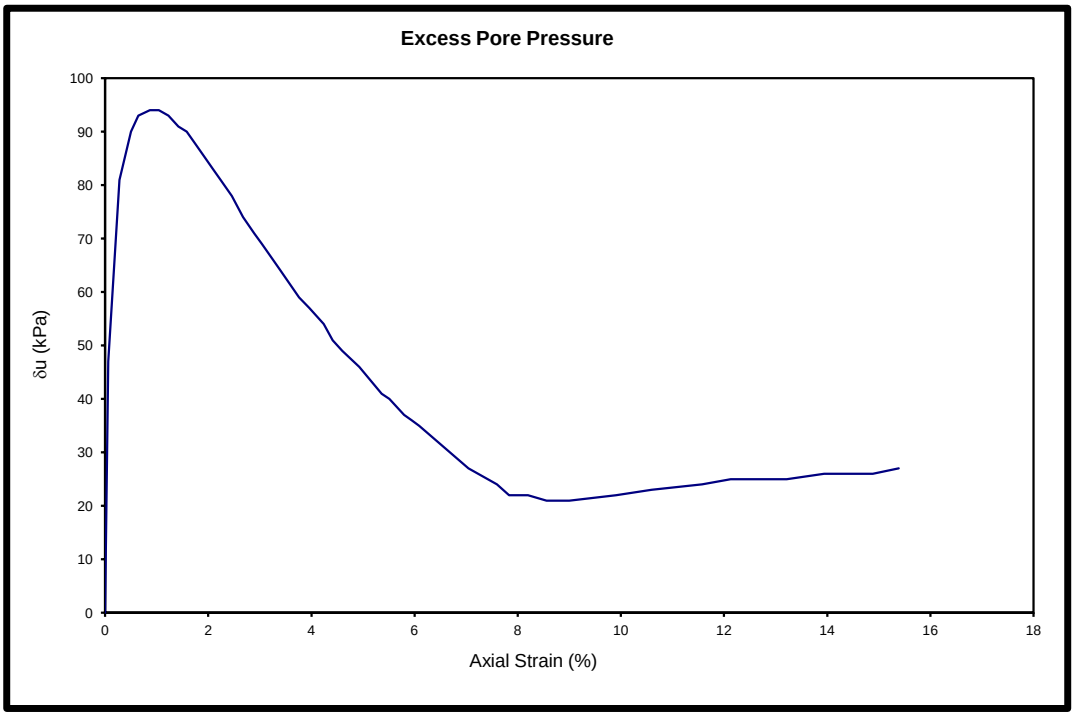
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.019	
	Sample Quality Category	1	Very good to Excellent

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

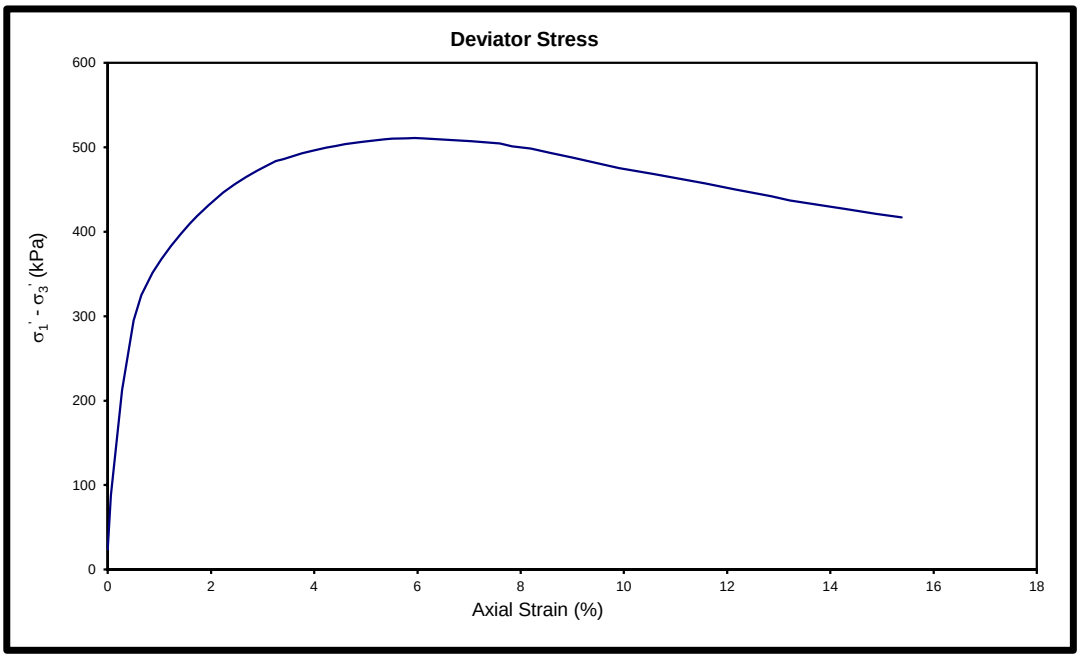
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Dark olive grey, dry. Sand is fine. Some laminations and lenses of silt.	**Sample Type/No.**	P09 Q1
		Depth	25.70-25.90
Prepared and tested in accordance with ASTM D4767 and In House method			

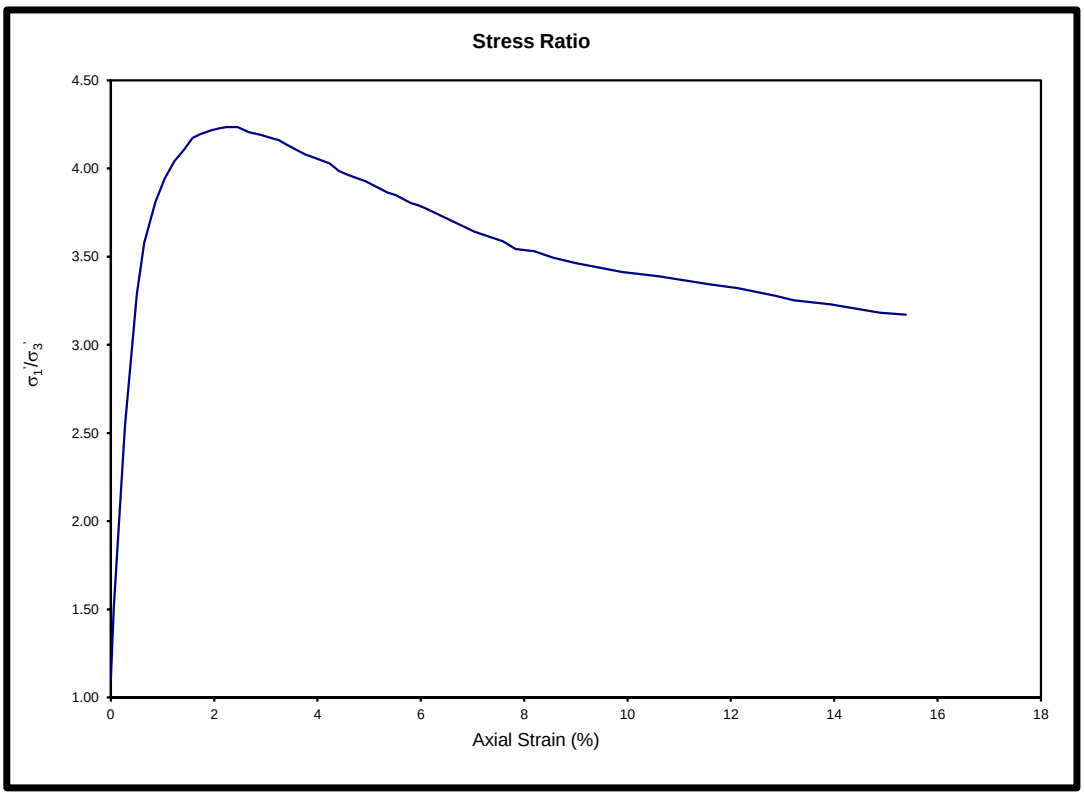




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

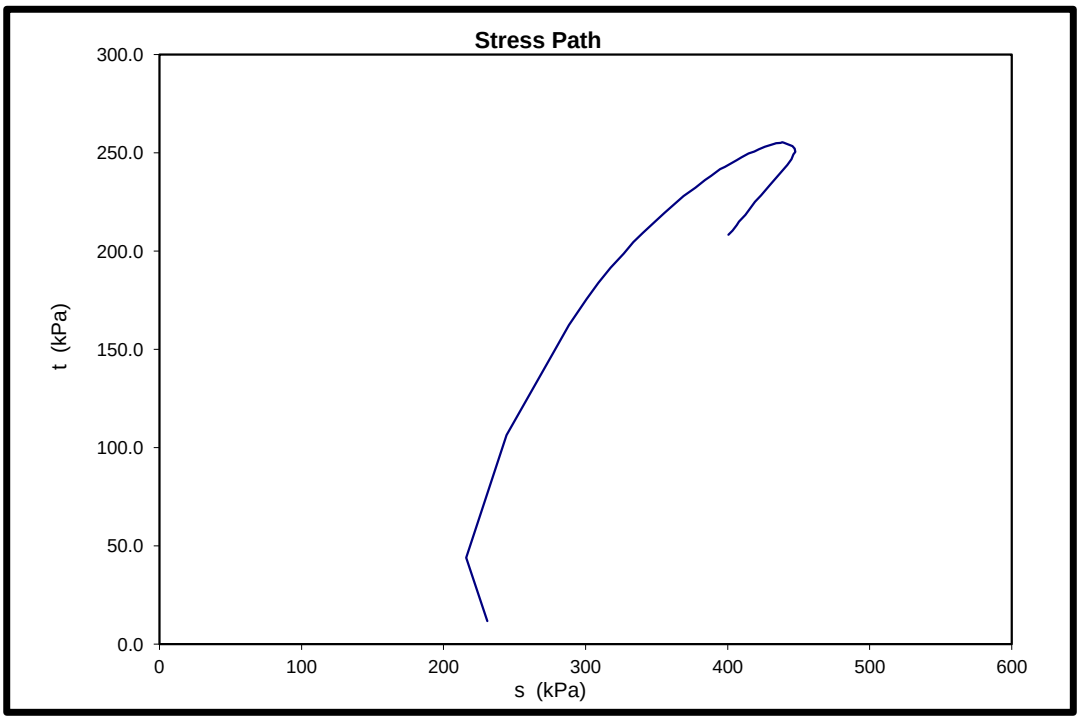
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Dark olive grey, dry. Sand is fine. Some laminations and lenses of silt.	**Sample Type/No.**	P09 Q1
		Depth	25.70-25.90
Prepared and tested in accordance with ASTM D4767 and In House method			

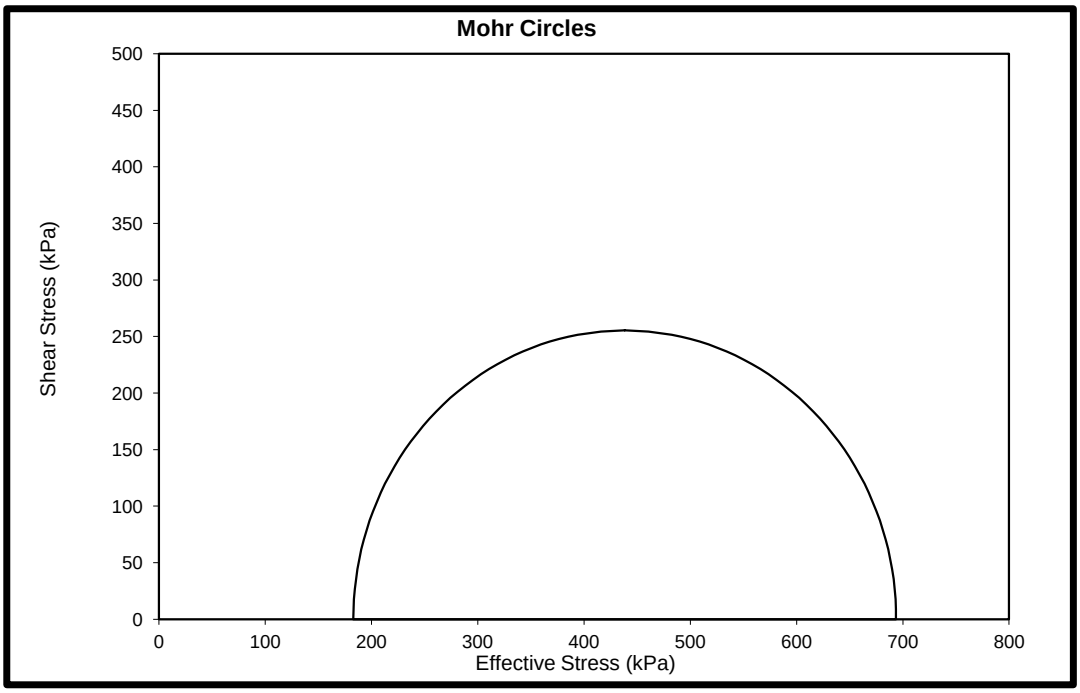




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Dark olive grey, dry. Sand is fine. Some laminations and lenses of silt.	**Sample Type/No.**	P09 Q1
		Depth	25.70-25.90
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - MET TOWER
Description	CLAY with sand. Sand is fine, dark grey, rare laminations of silty fine sand	**Sample Type/No.**	P9Q2
		Depth	26.1-26.3
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	33
	Bulk Density (Mg/m3)	1.88
	Dry Density (Mg/m^3)	1.41
Saturation	Initial PWP (kPa)	0
	Saturated PWP (kPa)	449
	Final Cell Pressure (kPa)	450
	B Value	0.96
Consolidation	Cell Pressure (kPa)	581
	Back Pressure (kPa)	349
	Initial PWP (kPa)	349
	Final PWP (kPa)	348
	cv (m^2/yr)	0.06
	mv (m^2/MN)	32.344
	k (calculated value) (m/s)	6.3E-10
Compression	Cell Pressure (kPa)	581
	Back Pressure (kPa)	349
	s3' (kPa)	232
	Rate of Strain (%/hr)	0.8

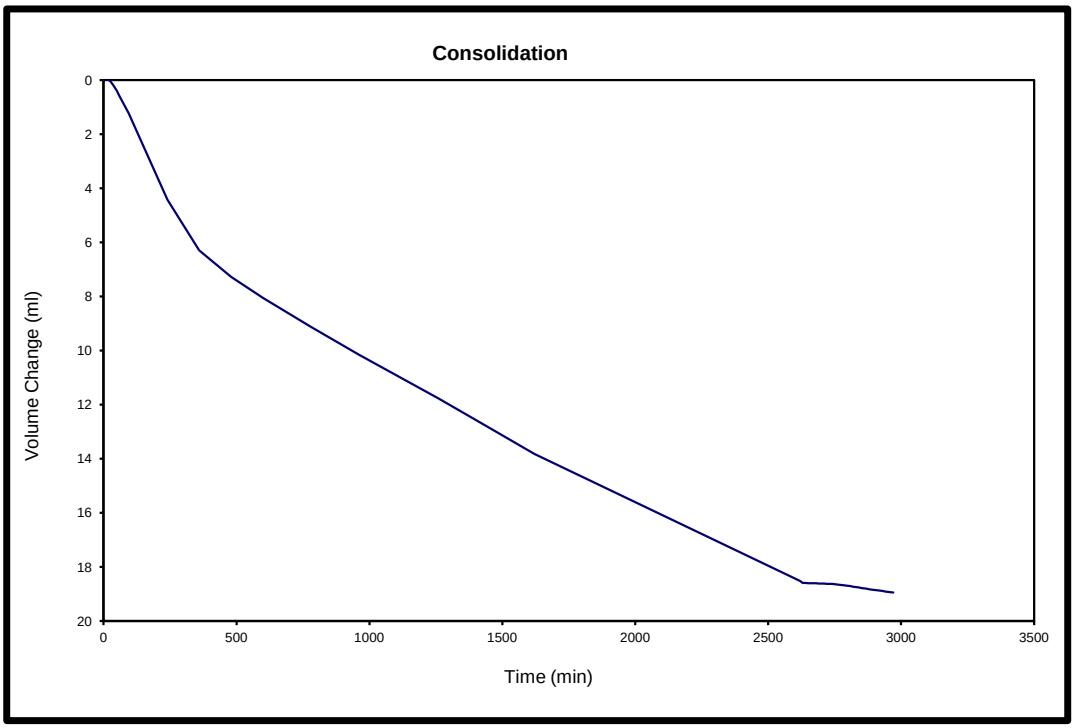
Sample Quality	SQ Index $\Delta e/e_0$	0.068	
	Sample Quality Category	3	Poor

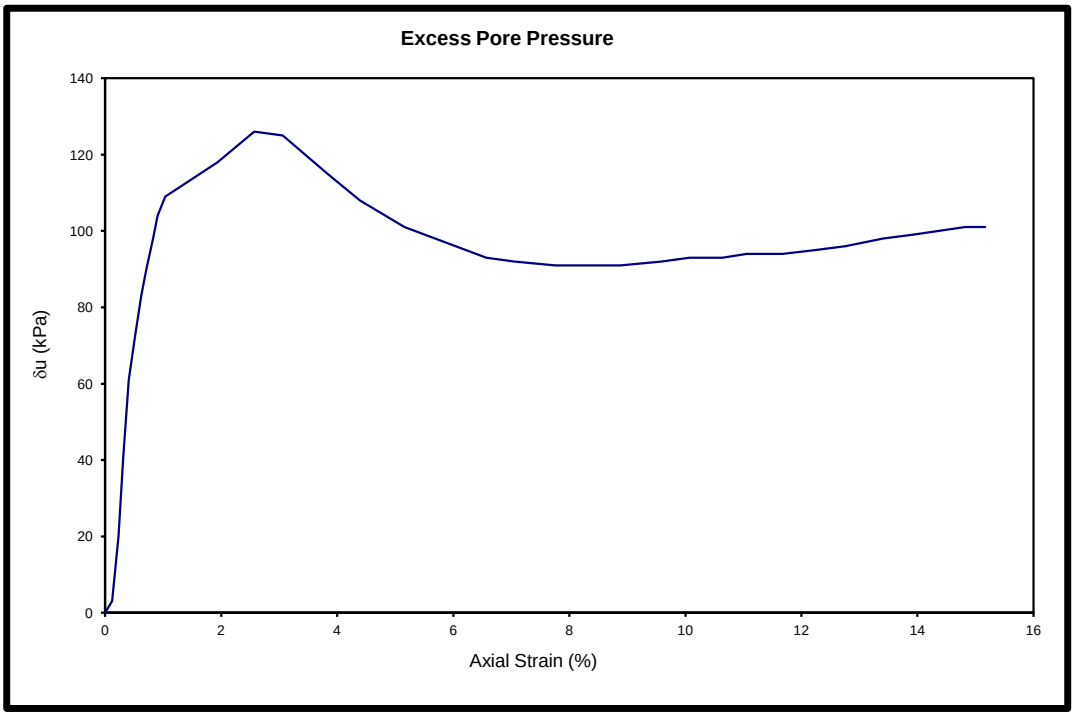
Final Conditions	Moisture Content (%)	36
	Bulk Density (Mg/m3)	1.94
	Dry Density (Mg/m^3)	1.42
Failure Conditions	Strain (e) (%)	5.9
	δu (kPa)	97
	σ_3'f (kPa)	135
	$(\sigma_1' - \sigma_3')f$ (kPa)	549

Failure Mode: Shear

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

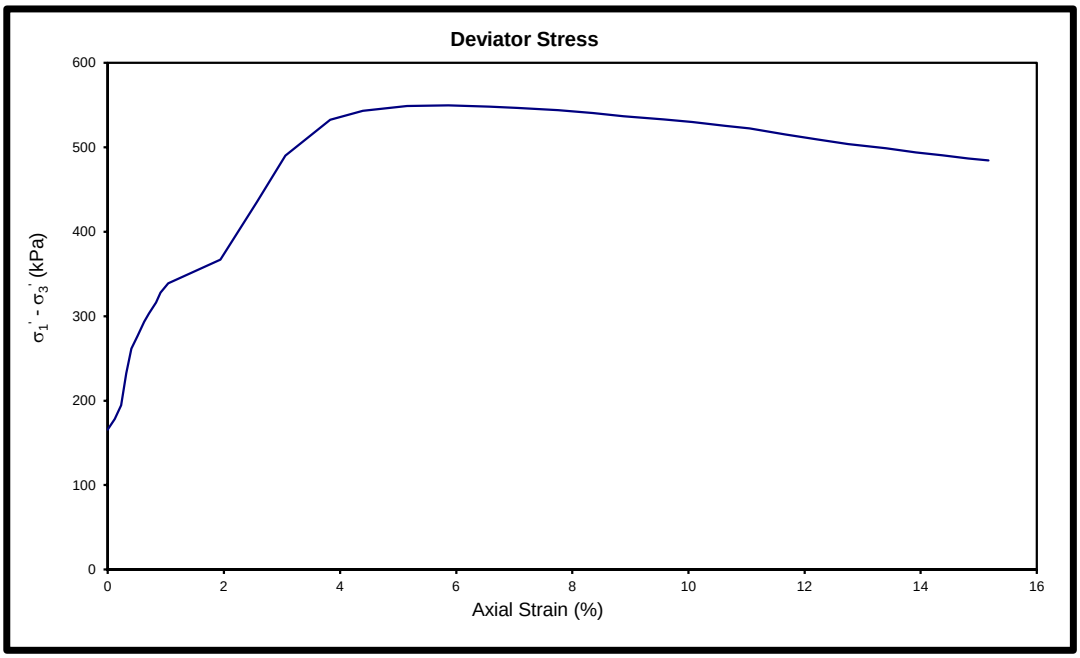
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - MET TOWER
Description	CLAY with sand. Sand is fine, dark grey, rare laminations of silty fine sand	**Sample Type/No.**	P9Q2
		Depth	26.1-26.3
Prepared and tested in accordance with ASTM D4767 and In House method			

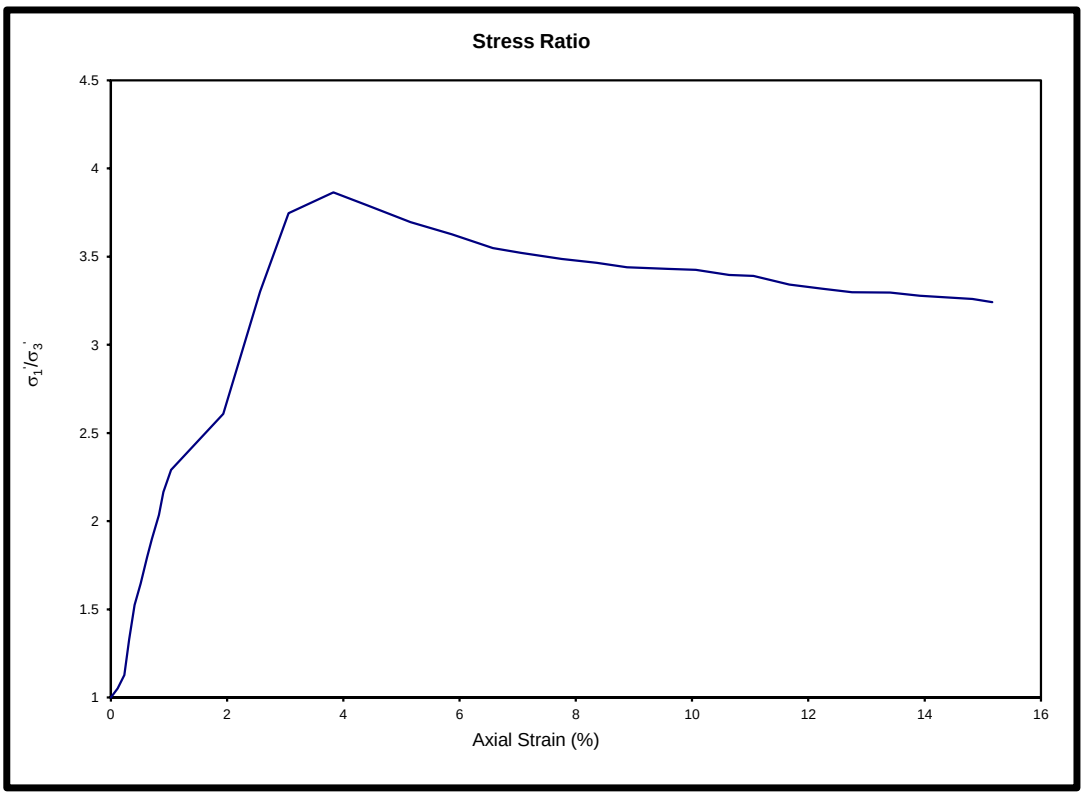




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

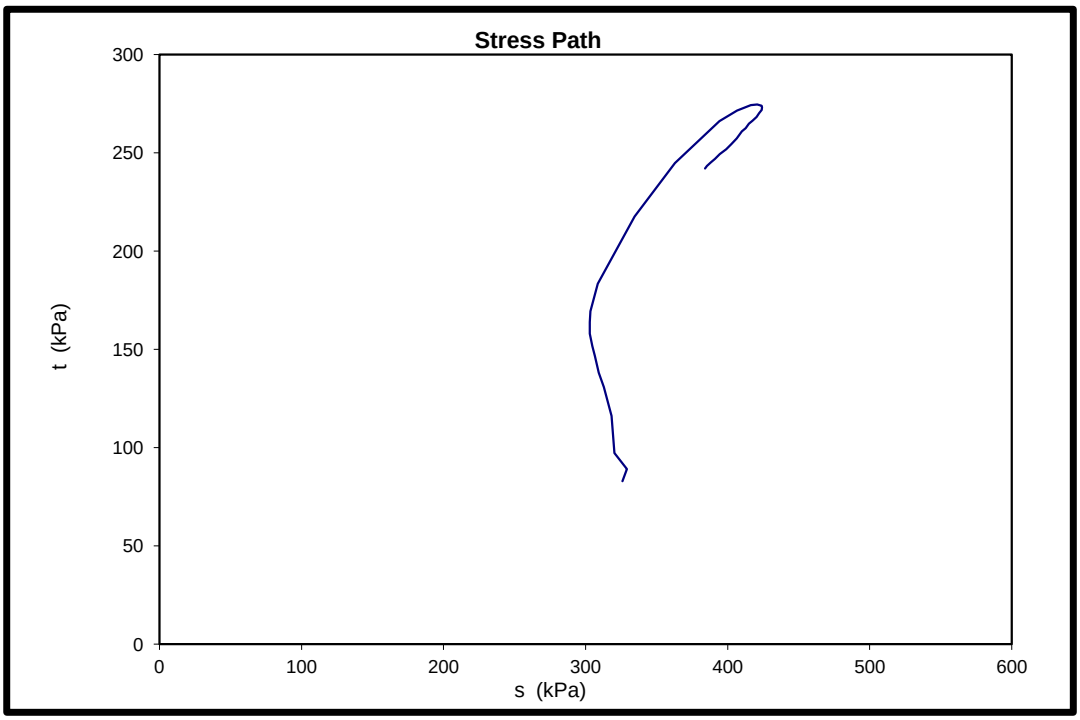
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - MET TOWER
Description	CLAY with sand. Sand is fine, dark grey, rare laminations of silty fine sand	**Sample Type/No.**	P9Q2
		Depth	26.1-26.3
Prepared and tested in accordance with ASTM D4767 and In House method			

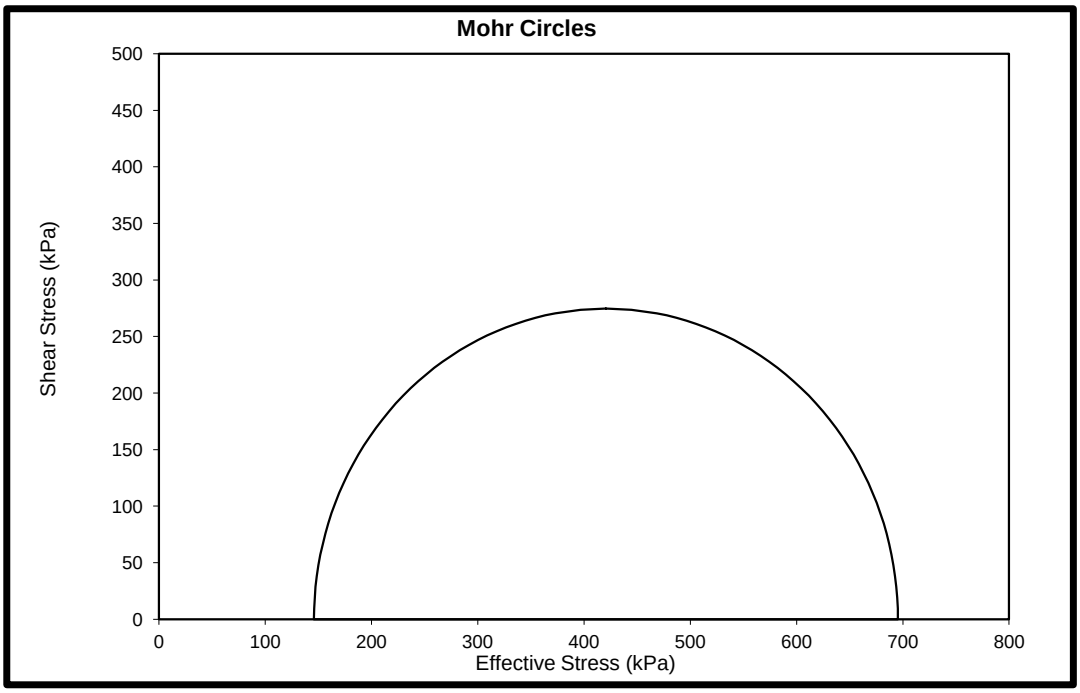




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH - MET TOWER
Description	CLAY with sand. Sand is fine, dark grey, rare laminations of silty fine sand	**Sample Type/No.**	P9Q2
		Depth	26.1-26.3
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	RS

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry, some laminations and lenses of sand and silt. Sand is fine.	**Sample Type/No.**	P10 Q2
		Depth	29.60-29.80
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	27
	Bulk Density (Mg/m3)	2.00
	Dry Density (Mg/m^3)	1.58
Saturation	Initial PWP (kPa)	4
	Saturated PWP (kPa)	499
	Final Cell Pressure (kPa)	500
	B Value	0.99
Consolidation	Cell Pressure (kPa)	751
	Back Pressure (kPa)	499
	Initial PWP (kPa)	500
	Final PWP (kPa)	505
	cv (m^2/yr)	0.57
	mv (m^2/MN)	-9.453
	k (calculated value) (m/s)	-1.7E-09
Compression	Cell Pressure (kPa)	751
	Back Pressure (kPa)	499
	s3' (kPa)	252
	Rate of Strain (%/hr)	0.8

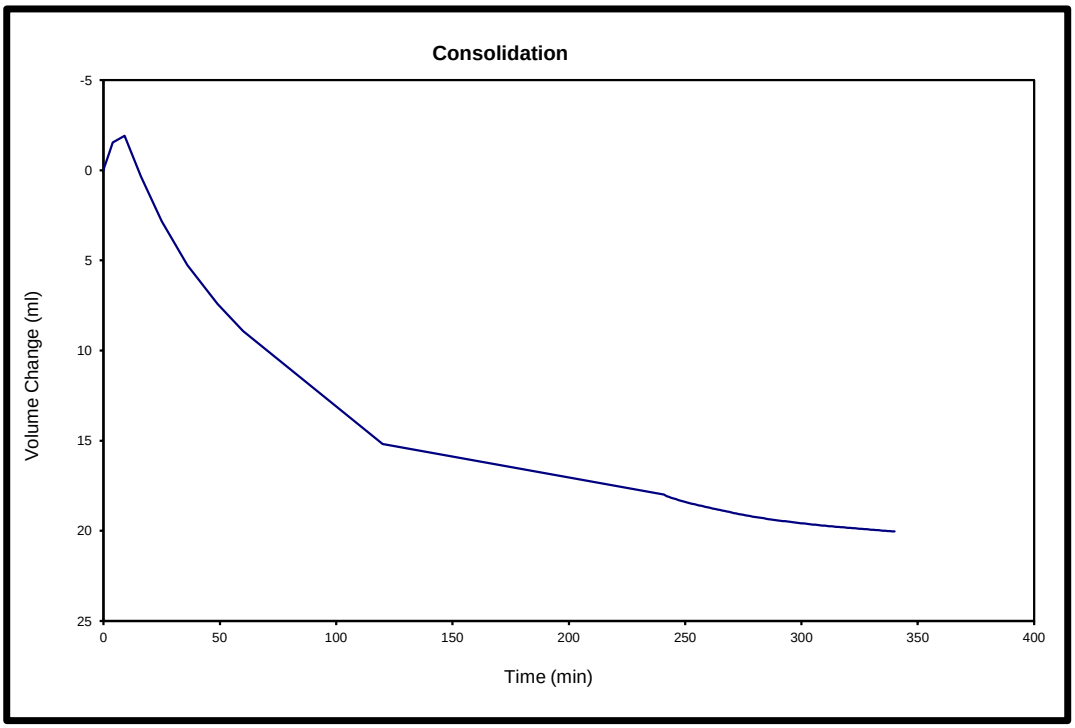
Final Conditions	Moisture Content (%)	28
	Bulk Density (Mg/m3)	2.08
	Dry Density (Mg/m^3)	1.63
Failure Conditions	Strain (e) (%)	13.0
	δu (kPa)	65
	σ_3'f (kPa)	187
	$(\sigma_1' - \sigma_3')f$ (kPa)	484

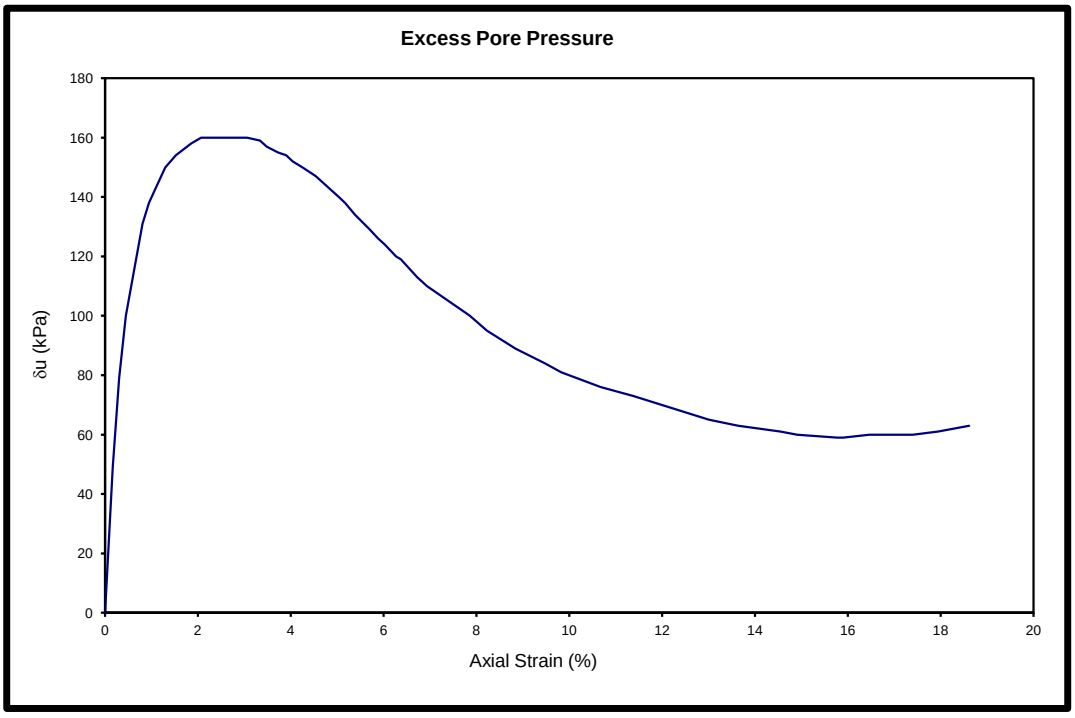
Failure Mode: Intermediate

Sample Quality	SQ Index $\Delta e/e_0$	0.112	
	Sample Quality Category	4	Very poor

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

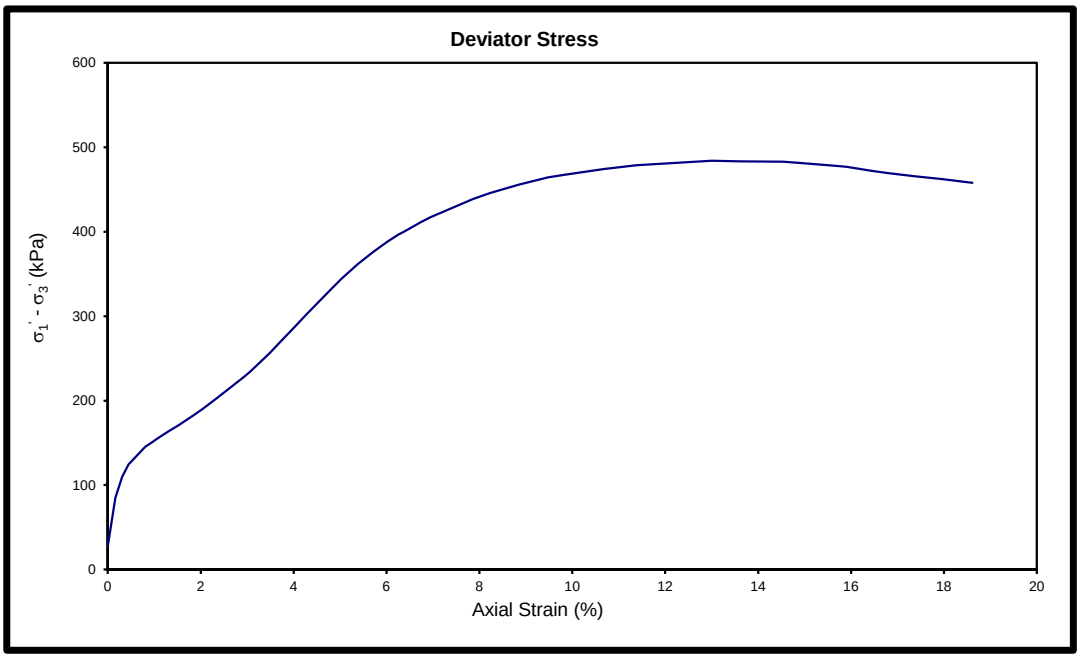
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry, some laminations and lenses of sand and silt. Sand is fine.	**Sample Type/No.**	P10 Q2
		Depth	29.60-29.80
Prepared and tested in accordance with ASTM D4767 and In House method			

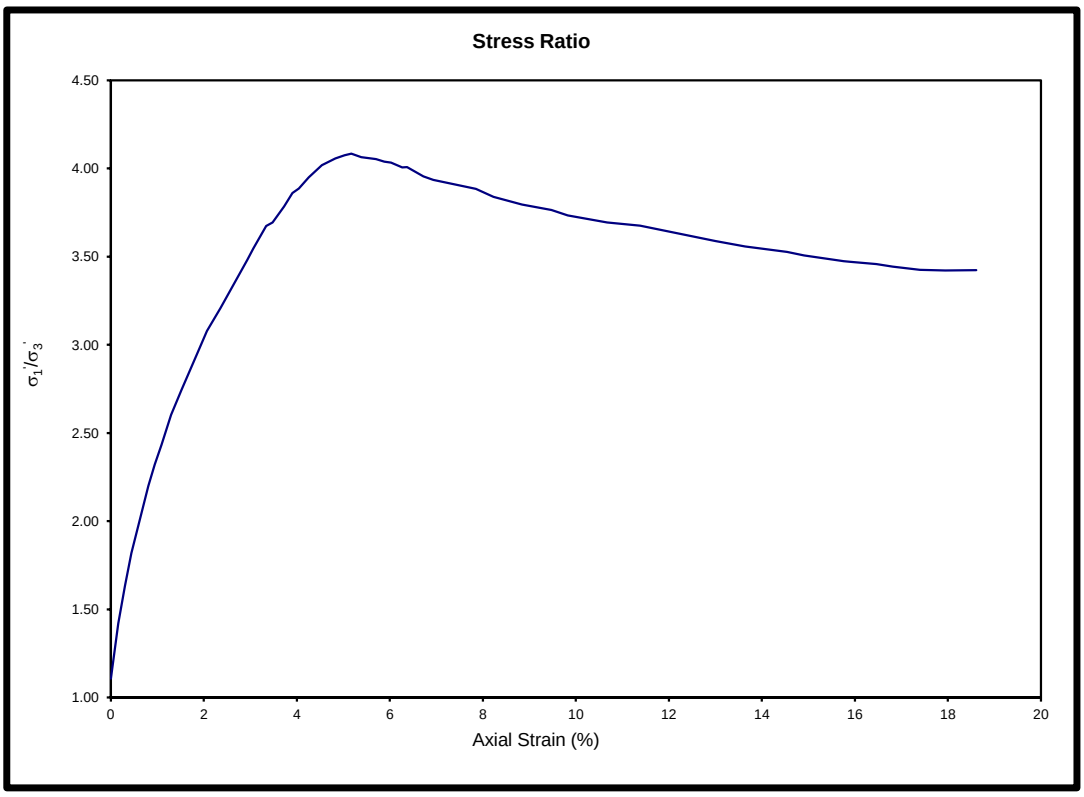




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

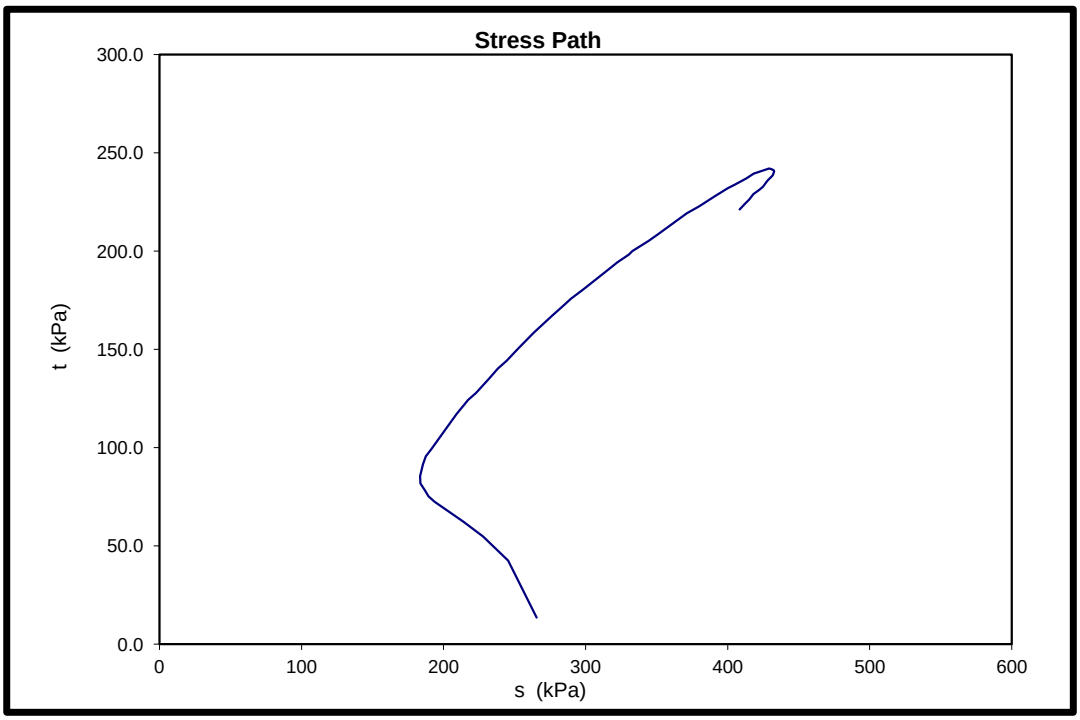
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry, some laminations and lenses of sand and silt. Sand is fine.	**Sample Type/No.**	P10 Q2
		Depth	29.60-29.80
Prepared and tested in accordance with ASTM D4767 and In House method			

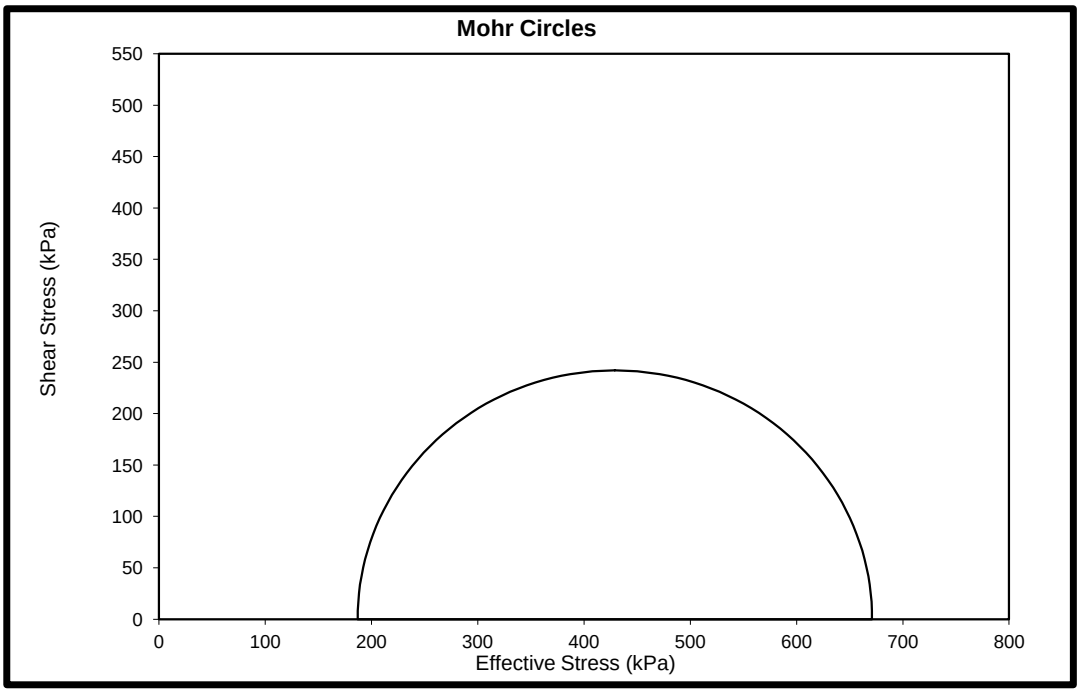




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry, some laminations and lenses of sand and silt. Sand is fine.	**Sample Type/No.**	P10 Q2
		Depth	29.60-29.80
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry. Sand is fine. Little fine to coarse gravel size shell. Lenses of sand and silt.	**Sample Type/No.**	P11 Q1
		Depth	33.20-33.40
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	29
	Bulk Density (Mg/m3)	1.96
	Dry Density (Mg/m^3)	1.51
Saturation	Initial PWP (kPa)	5
	Saturated PWP (kPa)	511
	Final Cell Pressure (kPa)	550
	B Value	0.98
Consolidation	Cell Pressure (kPa)	799
	Back Pressure (kPa)	516
	Initial PWP (kPa)	523
	Final PWP (kPa)	522
	cv (m^2/yr)	1.53
	mv (m^2/MN)	12.905
	k (calculated value) (m/s)	6.1E-09
Compression	Cell Pressure (kPa)	799
	Back Pressure (kPa)	516
	s3' (kPa)	283
	Rate of Strain (%/hr)	0.8

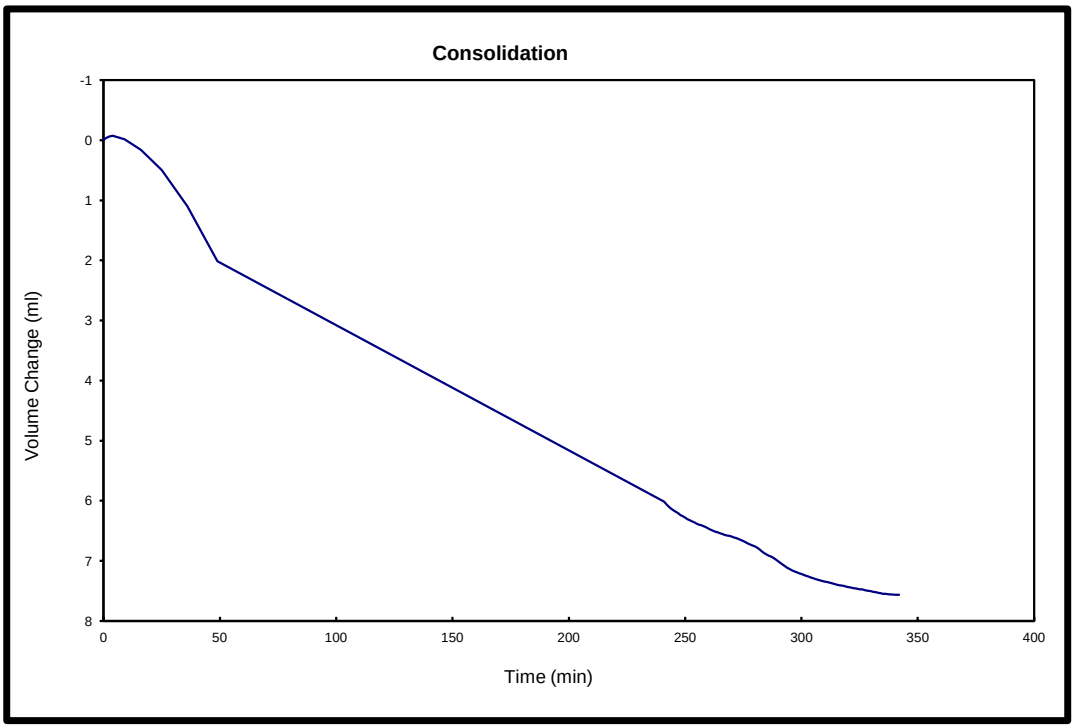
Final Conditions	Moisture Content (%)	29
	Bulk Density (Mg/m3)	1.96
	Dry Density (Mg/m^3)	1.52
Failure Conditions	Strain (e) (%)	10.7
	δu (kPa)	122
	σ_3'f (kPa)	161
	$(\sigma_1' - \sigma_3')f$ (kPa)	392

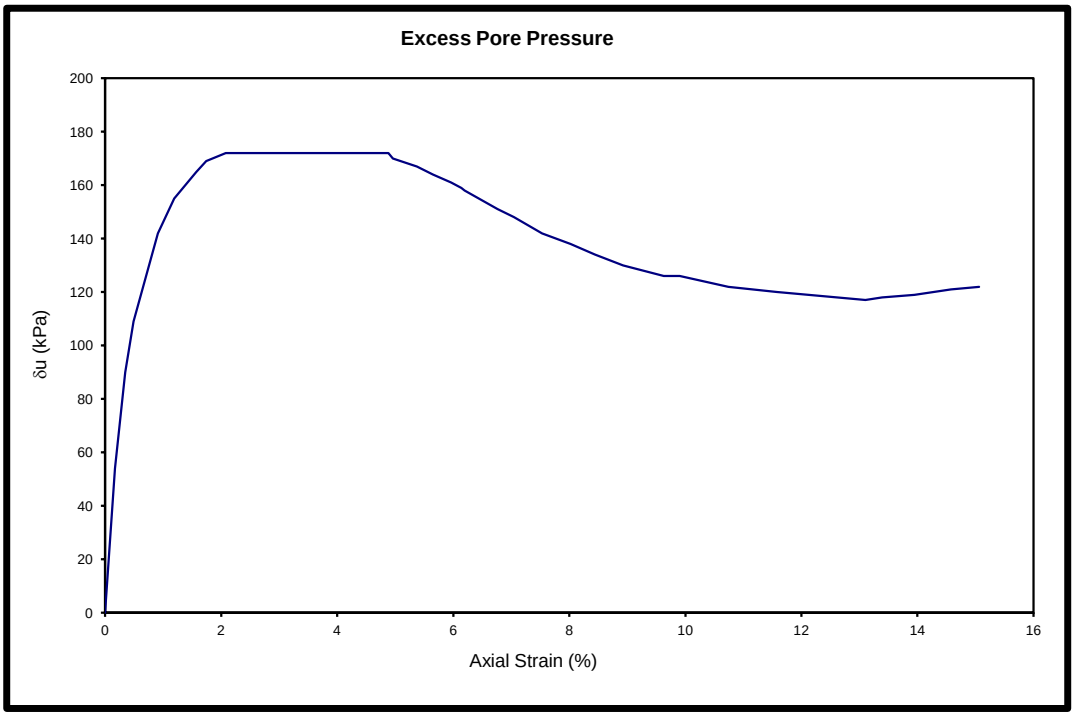
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.029	
	Sample Quality Category	1	Very good to Excellent

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

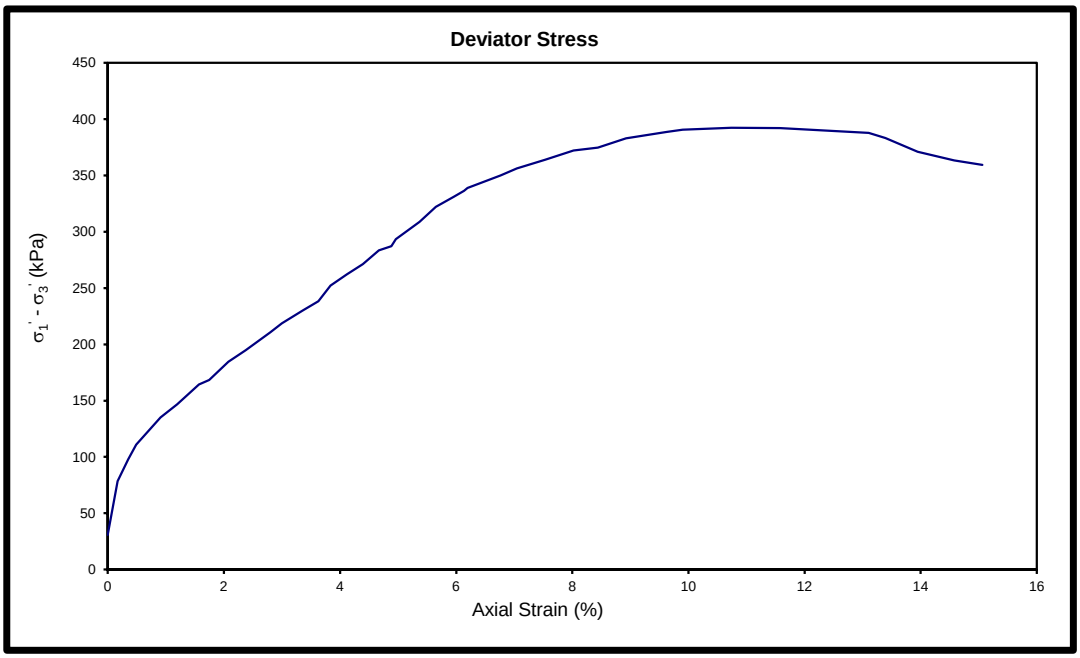
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry. Sand is fine. Little fine to coarse gravel size shell. Lenses of sand and silt.	**Sample Type/No.**	P11 Q1
		Depth	33.20-33.40
Prepared and tested in accordance with ASTM D4767 and In House method			

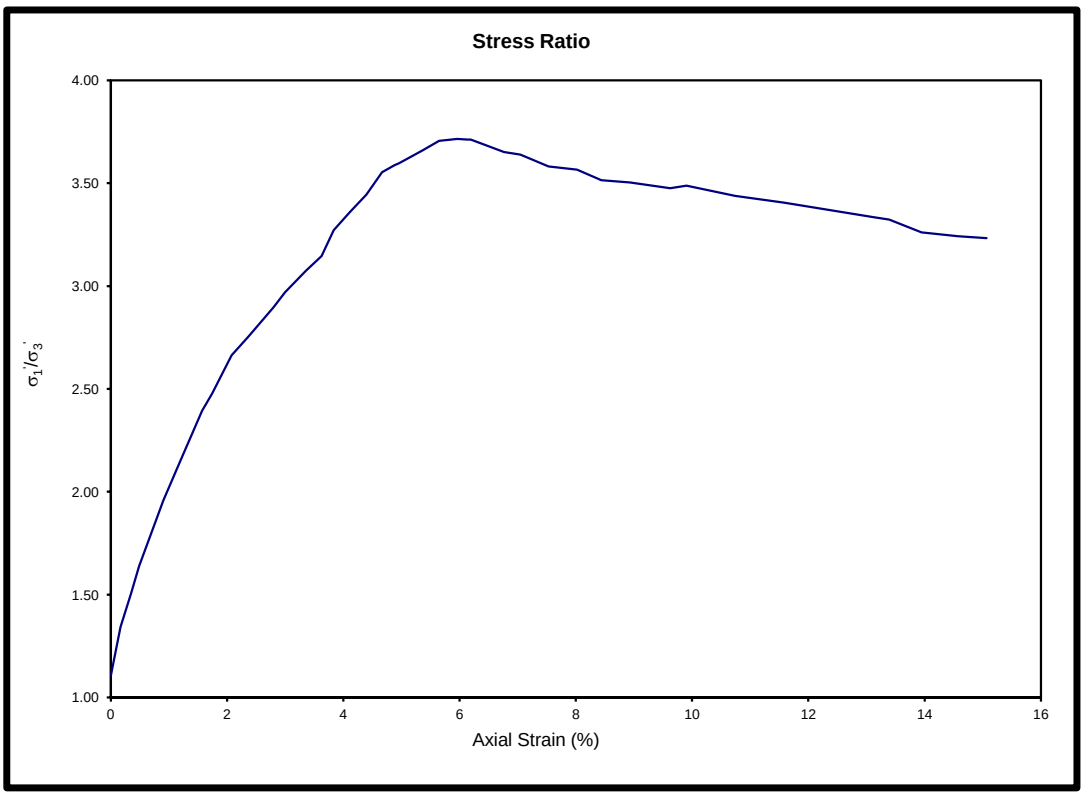




Remarks:	Pore pressure transducer out of calibrated range between 2.08-4.88% axial strain	Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

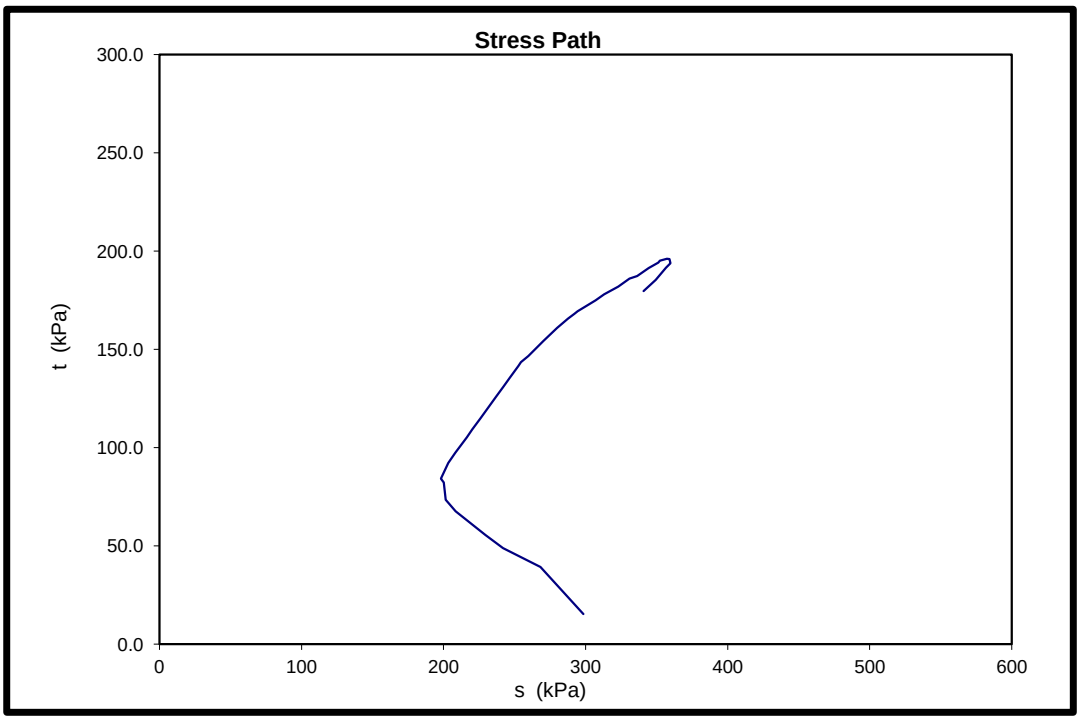
Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry. Sand is fine. Little fine to coarse gravel size shell. Lenses of sand and silt.	**Sample Type/No.**	P11 Q1
		Depth	33.20-33.40
Prepared and tested in accordance with ASTM D4767 and In House method			

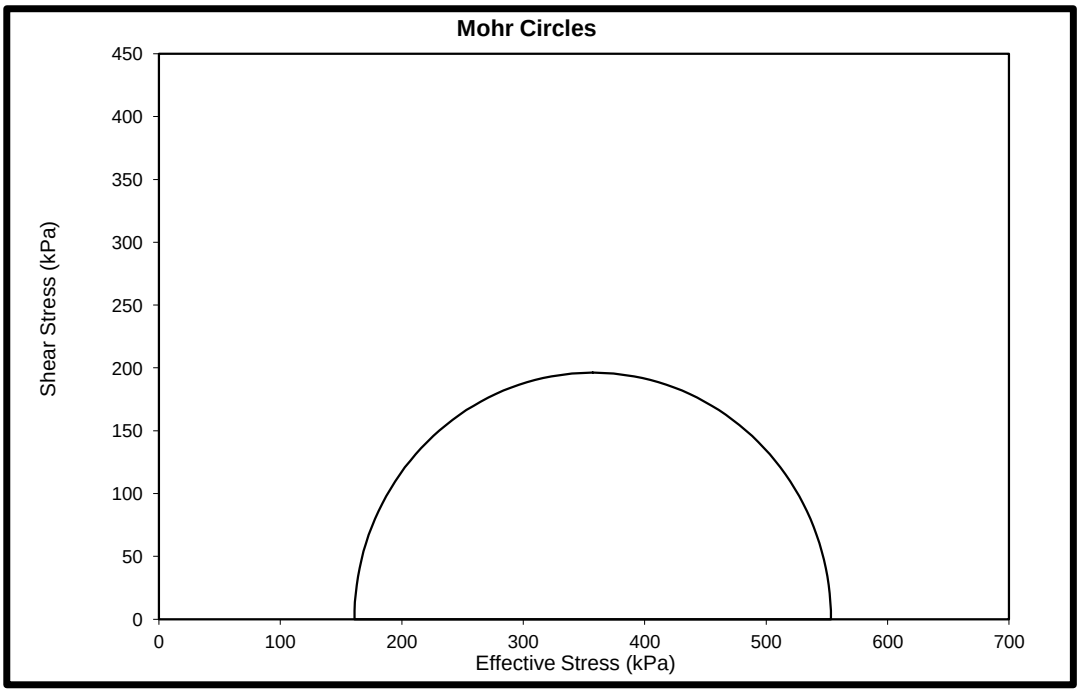




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	CLAY with sand. Very dark grey, dry. Sand is fine. Little fine to coarse gravel size shell. Lenses of sand and silt.	**Sample Type/No.**	P11 Q1
		Depth	33.20-33.40
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	Clayey silty SAND. Olive grey, dry. Sand is fine. Little fine to medium size shell.	**Sample Type/No.**	P13 Q2
		Depth	40.90-41.10
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	140
	Diameter (mm)	72
	Moisture Content %	48
	Bulk Density (Mg/m3)	1.76
	Dry Density (Mg/m^3)	1.20
Saturation	Initial PWP (kPa)	9
	Saturated PWP (kPa)	423
	Final Cell Pressure (kPa)	550
	B Value	0.96
Consolidation	Cell Pressure (kPa)	773
	Back Pressure (kPa)	424
	Initial PWP (kPa)	420
	Final PWP (kPa)	421
	cv (m^2/yr)	0.43
	mv (m^2/MN)	-21.498
	k (calculated value) (m/s)	-2.9E-09
Compression	Cell Pressure (kPa)	773
	Back Pressure (kPa)	424
	s3' (kPa)	349
	Rate of Strain (%/hr)	0.9

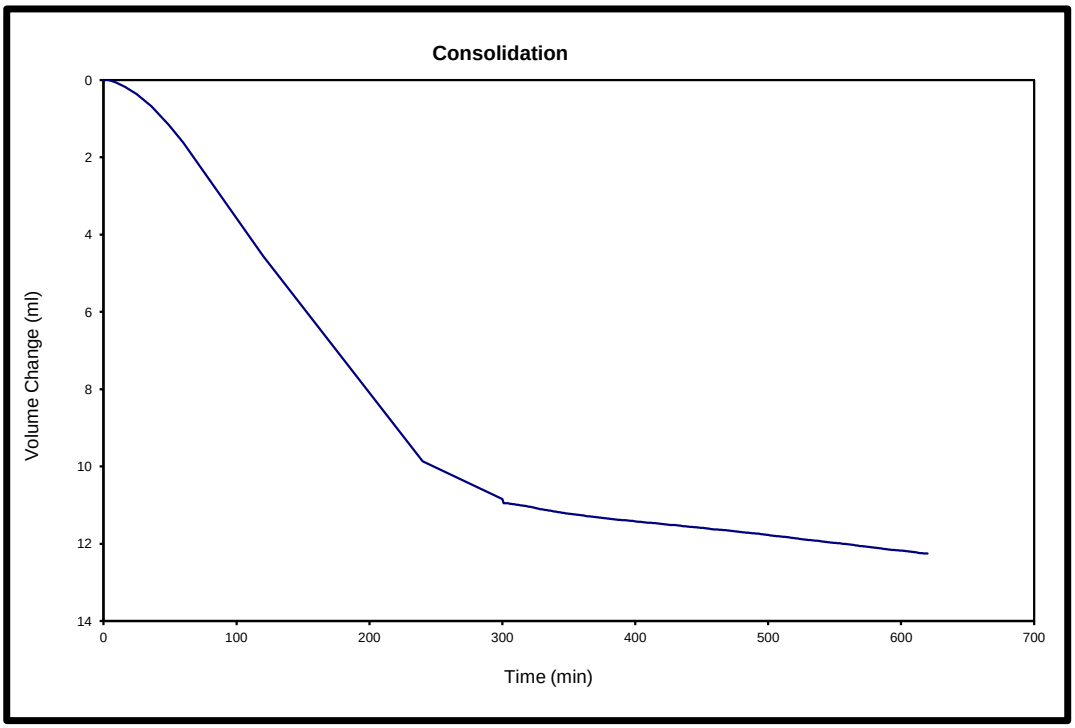
Final Conditions	Moisture Content (%)	44
	Bulk Density (Mg/m3)	1.78
	Dry Density (Mg/m^3)	1.24
Failure Conditions	Strain (e) (%)	7.1
	δu (kPa)	228
	σ_3'f (kPa)	121
	(σ_1' - σ_3')f (kPa)	520

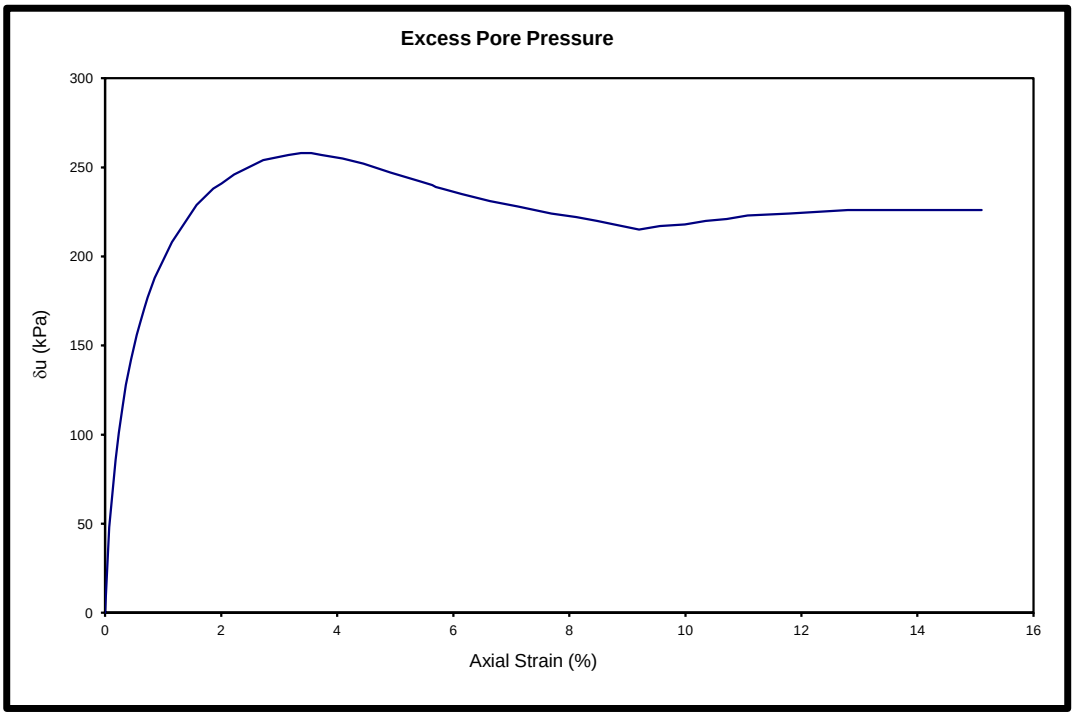
Failure Mode: Shear

Sample Quality	SQ Index $\Delta e/e_0$	0.038	
	Sample Quality Category	2	Good to fair

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

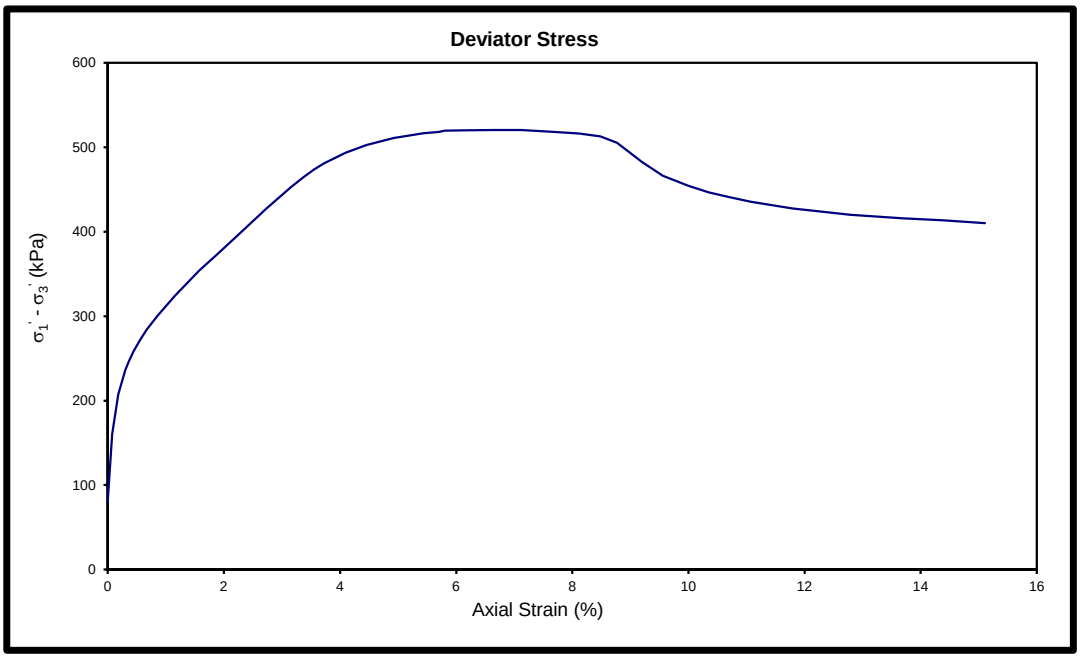
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	Clayey silty SAND. Olive grey, dry. Sand is fine. Little fine to medium size shell.	**Sample Type/No.**	P13 Q2
		Depth	40.90-41.10
Prepared and tested in accordance with ASTM D4767 and In House method			

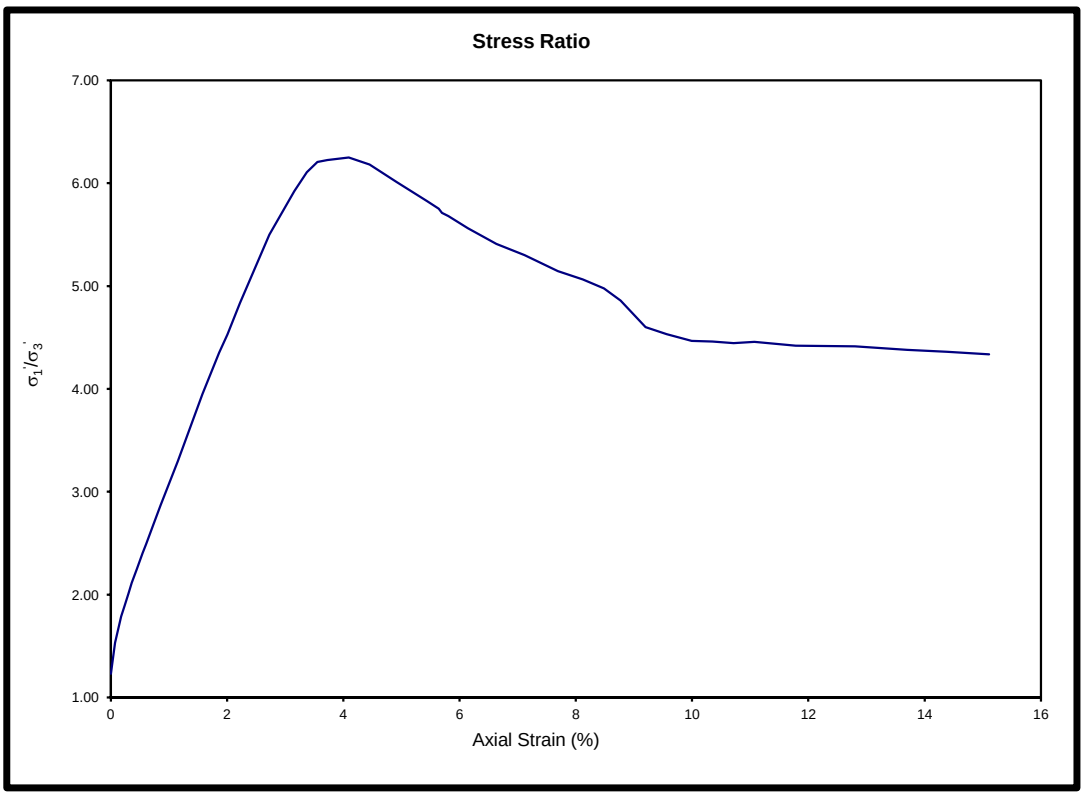




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

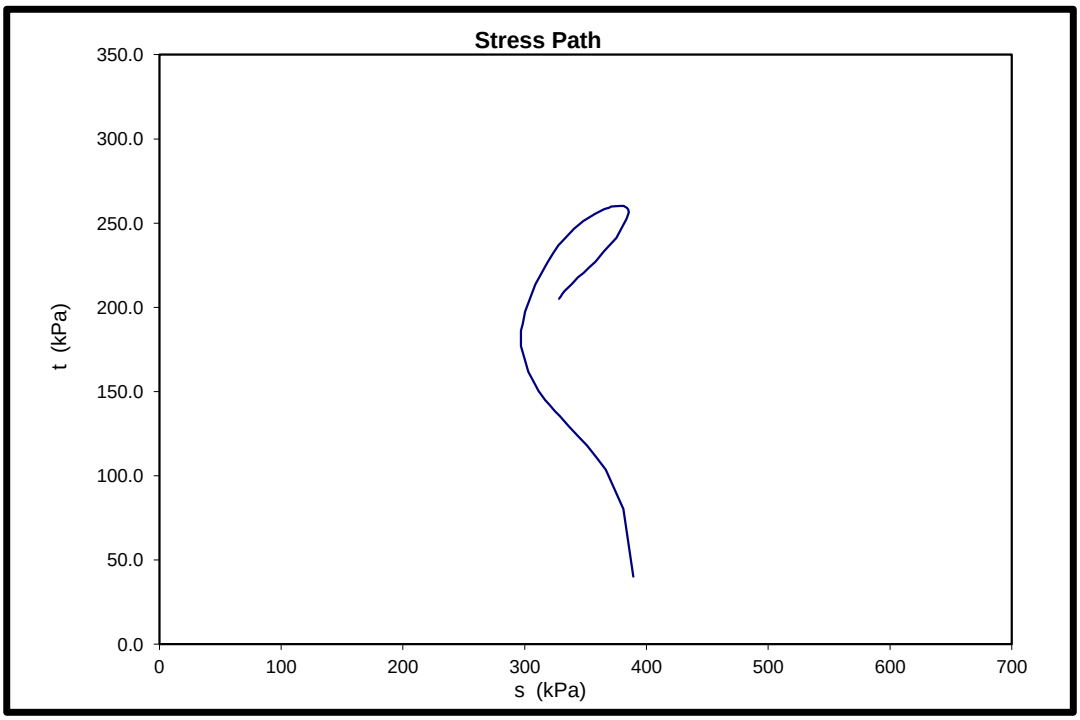
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	Clayey silty SAND. Olive grey, dry. Sand is fine. Little fine to medium size shell.	**Sample Type/No.**	P13 Q2
		Depth	40.90-41.10
Prepared and tested in accordance with ASTM D4767 and In House method			

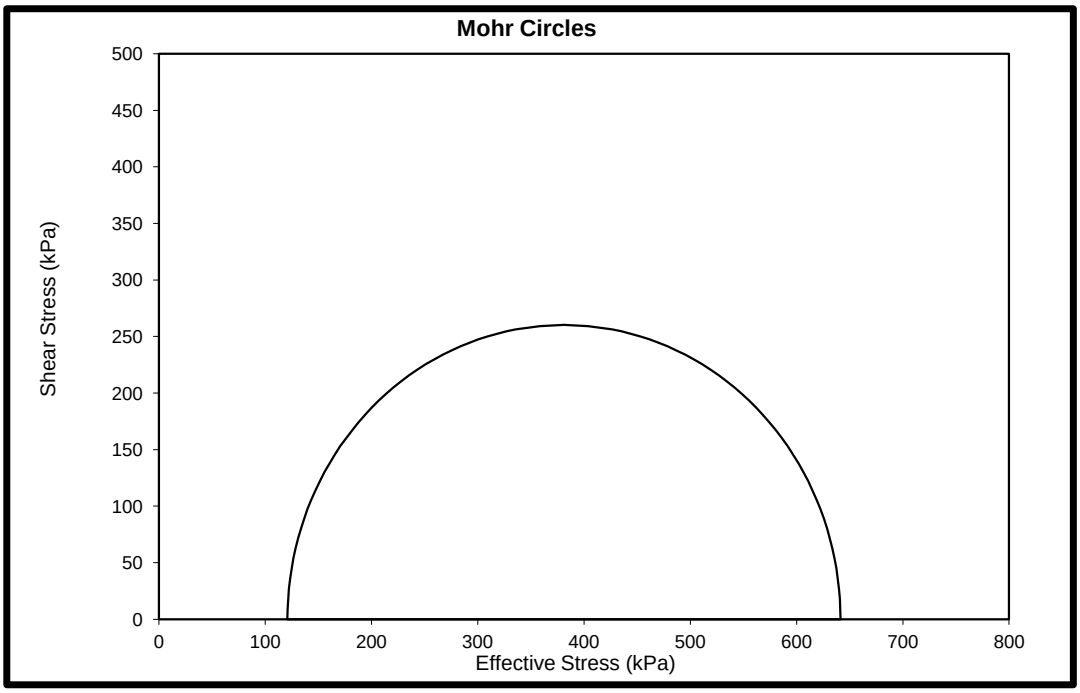




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	Clayey silty SAND. Olive grey, dry. Sand is fine. Little fine to medium size shell.	**Sample Type/No.**	P13 Q2
		Depth	40.90-41.10
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	SAND with clay. Very dark greenish grey, moist. Sand is fine to medium.	**Sample Type/No.**	P17 Q1
		Depth	57.00-57.20
Prepared and tested in accordance with ASTM D4767 and In House method			

Type of Specimen	Undisturbed / Vertical	**Type of test**	Single Stage	**Side Drains Fitted**	Yes	**Drainage Conditions**	One end & radial boundary

Initial Conditions	Length (mm)	144
	Diameter (mm)	72
	Moisture Content %	31
	Bulk Density (Mg/m3)	1.96
	Dry Density (Mg/m^3)	1.50
Saturation	Initial PWP (kPa)	15
	Saturated PWP (kPa)	547
	Final Cell Pressure (kPa)	550
	B Value	0.97
Consolidation	Cell Pressure (kPa)	1032
	Back Pressure (kPa)	547
	Initial PWP (kPa)	550
	Final PWP (kPa)	555
	cv (m^2/yr)	0.19
	mv (m^2/MN)	-10.495
	k (calculated value) (m/s)	-6.3E-10
Compression	Cell Pressure (kPa)	1032
	Back Pressure (kPa)	547
	s3' (kPa)	485
	Rate of Strain (%/hr)	0.8

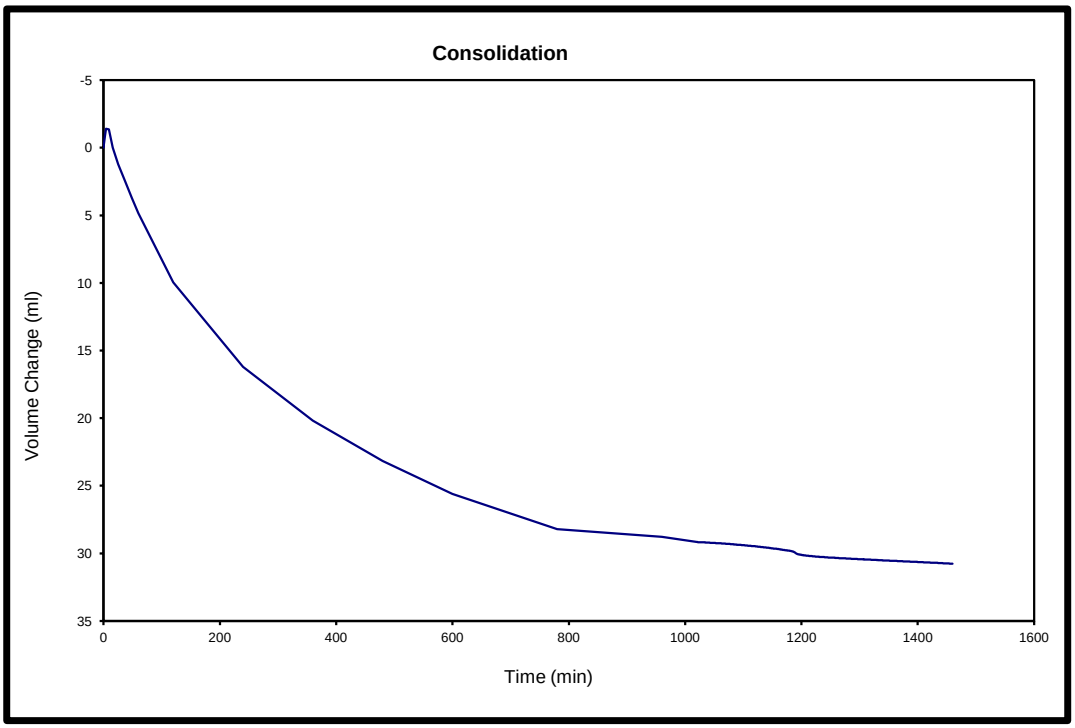
Sample Quality	SQ Index $\Delta e/e_0$	0.114	
	Sample Quality Category	4	Very poor

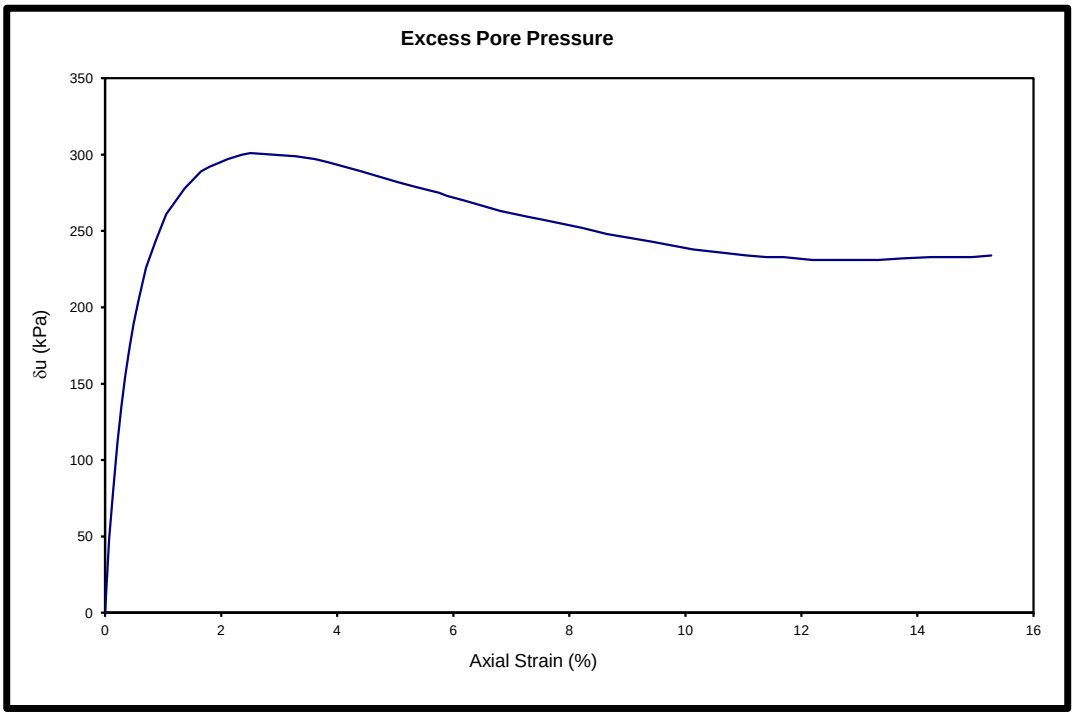
Final Conditions	Moisture Content (%)	24
	Bulk Density (Mg/m3)	2.03
	Dry Density (Mg/m^3)	1.64
Failure Conditions	Strain (e) (%)	10.1
	δu (kPa)	238
	σ_3'f (kPa)	247
	$(\sigma_1' - \sigma_3')f$ (kPa)	525

Failure Mode: Shear

Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

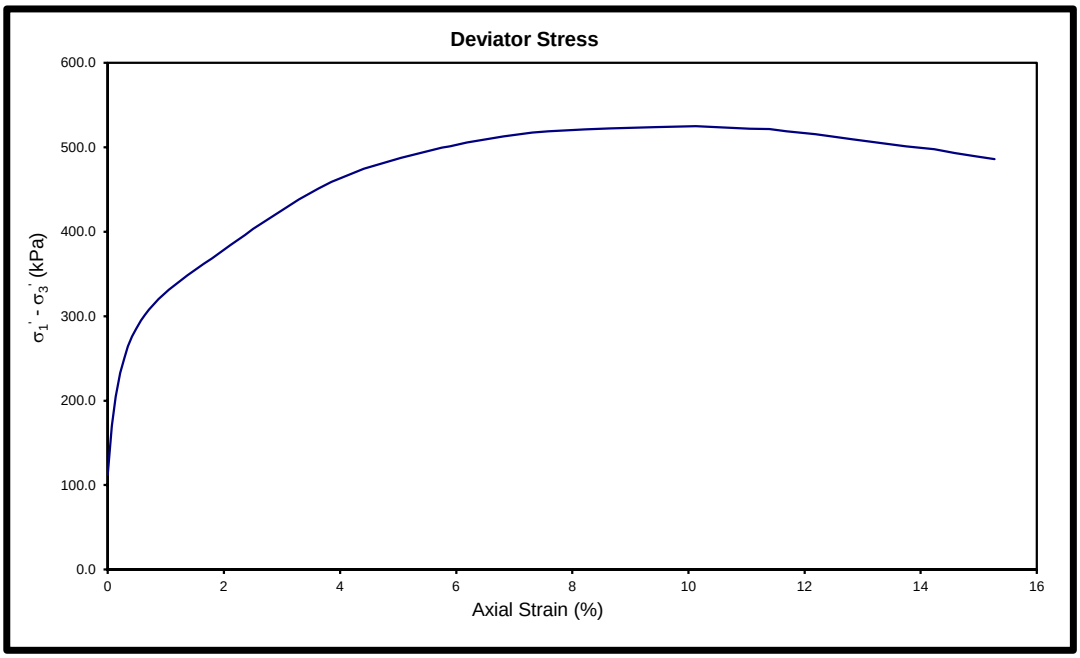
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	SAND with clay. Very dark greenish grey, moist. Sand is fine to medium.	**Sample Type/No.**	P17 Q1
		Depth	57.00-57.20
Prepared and tested in accordance with ASTM D4767 and In House method			

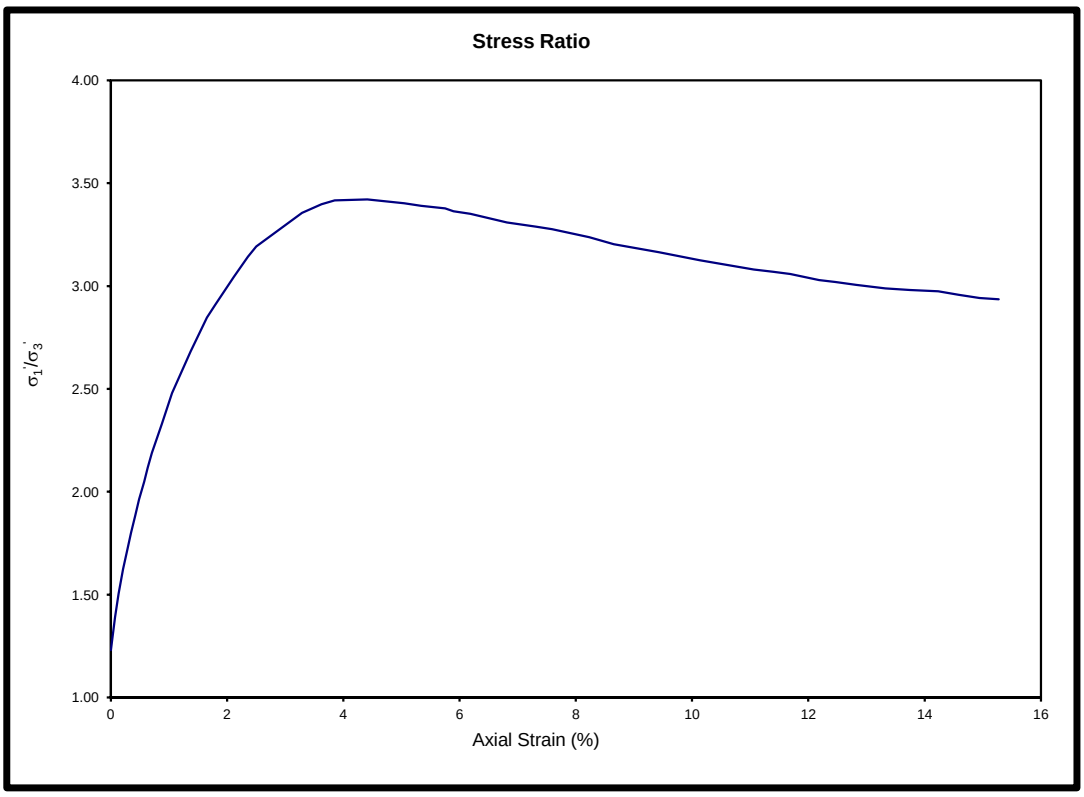




Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

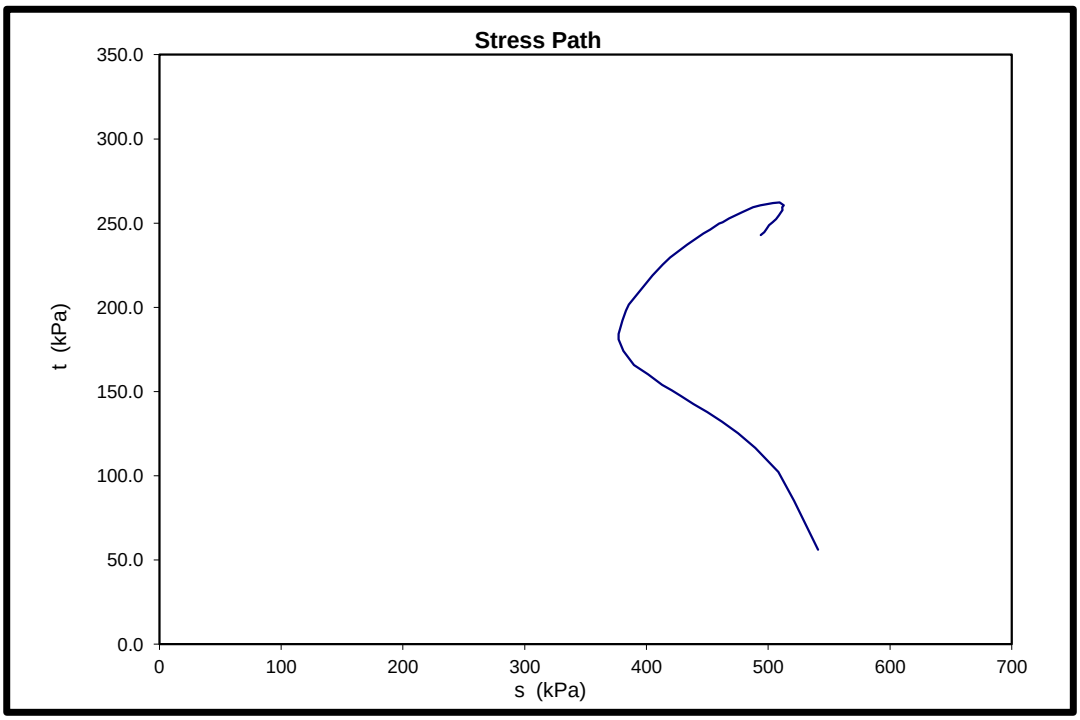
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	SAND with clay. Very dark greenish grey, moist. Sand is fine to medium.	**Sample Type/No.**	P17 Q1
		Depth	57.00-57.20
Prepared and tested in accordance with ASTM D4767 and In House method			

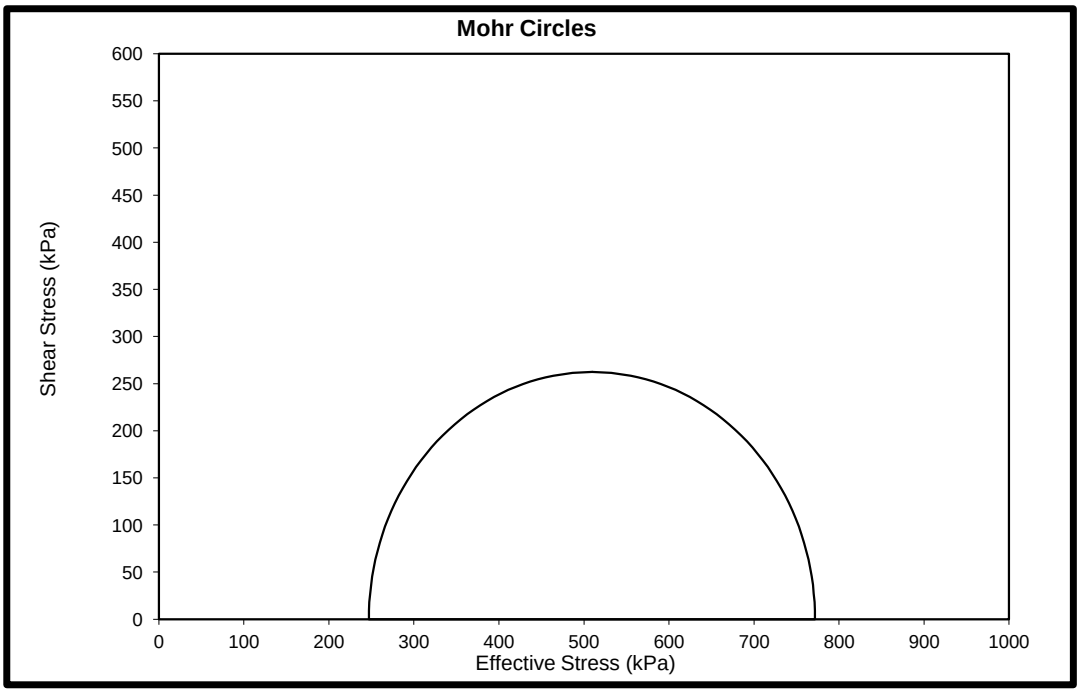




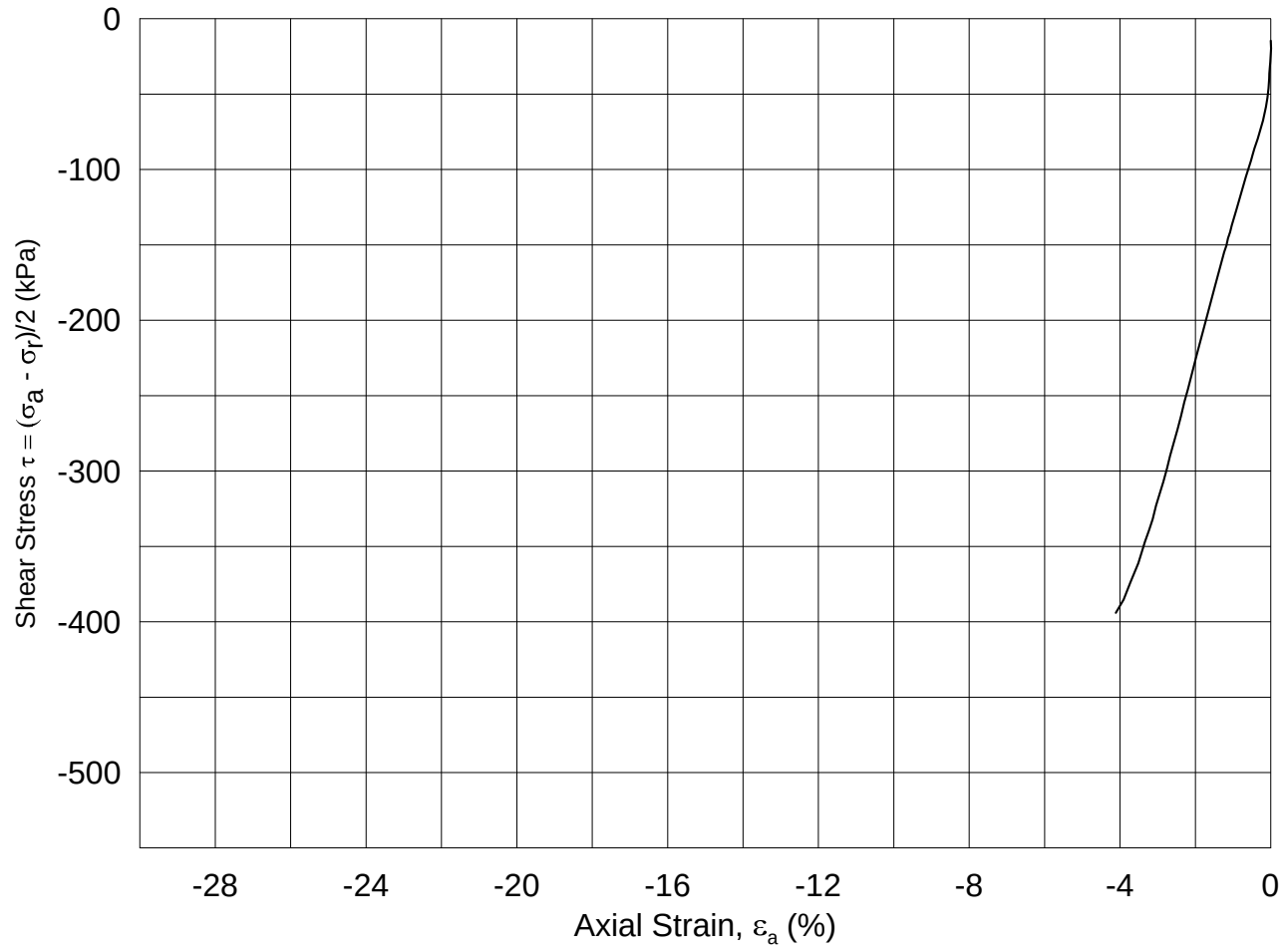
Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA

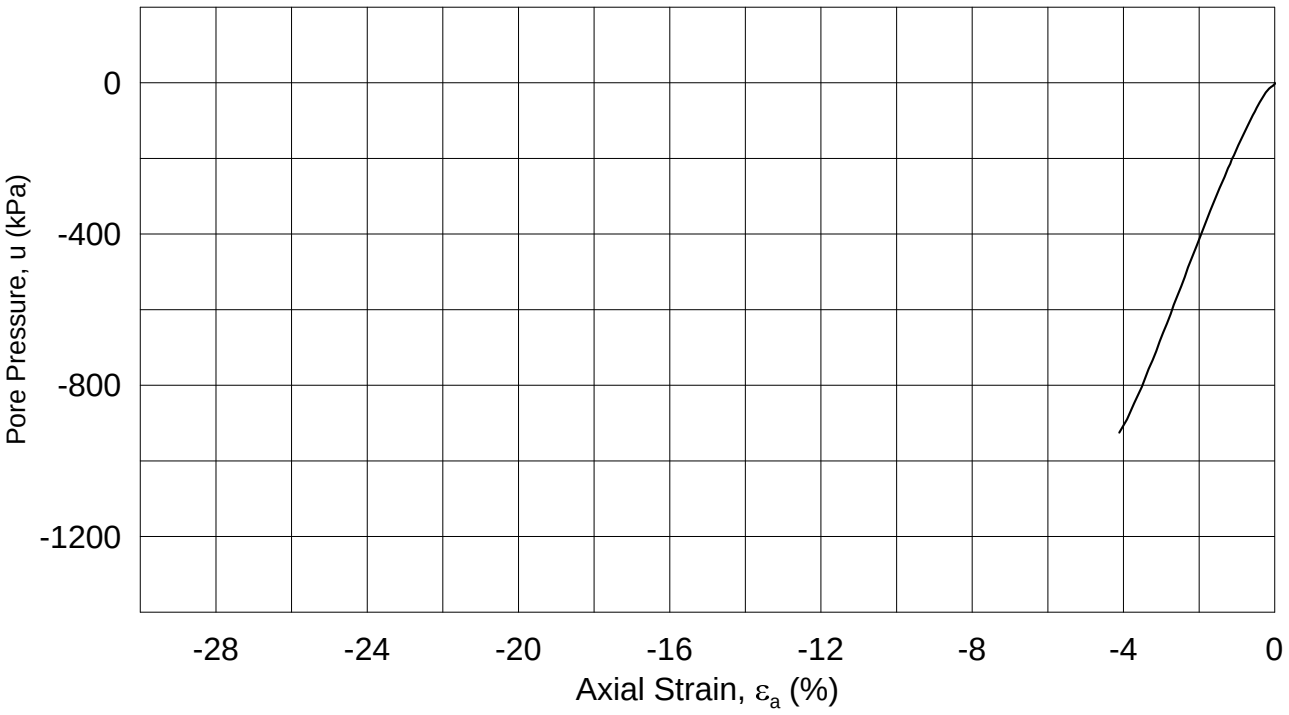
Gardline	Consolidated Anisotropic Undrained Triaxial Test with the Measurement of Pore Water Pressure	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	**Contract No.**	10451
		BH/TP No.	BH-MET TOWER
Description	SAND with clay. Very dark greenish grey, moist. Sand is fine to medium.	**Sample Type/No.**	P17 Q1
		Depth	57.00-57.20
Prepared and tested in accordance with ASTM D4767 and In House method			





Remarks:		Prepared by	Tested by	Processed by	Approved by
		LR	LR	LR	AA





Dato/rev.: 2014-12-23/01

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Triaxial test: **CAUE**

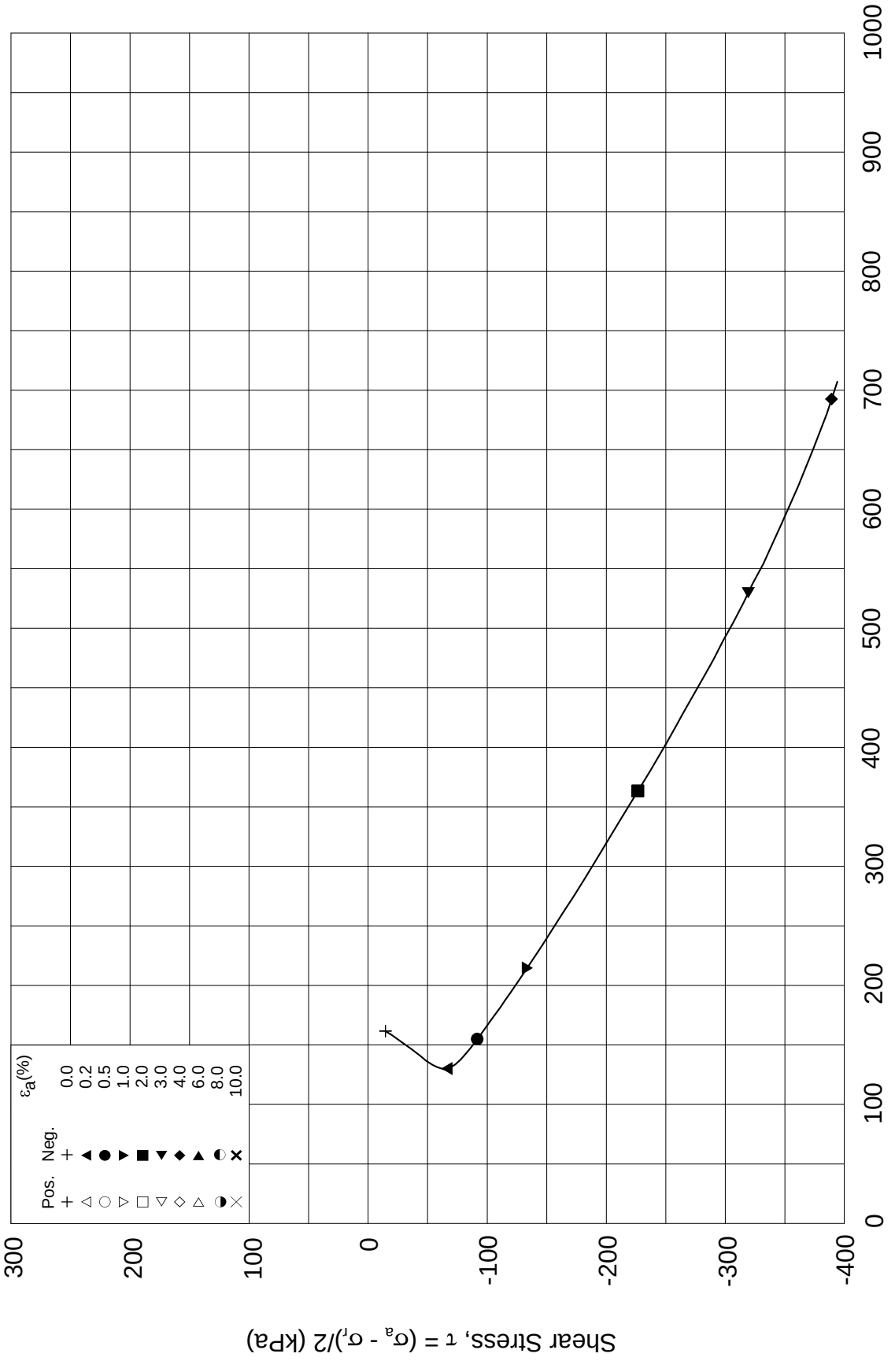
Figure No.: XX

Boring:	**121A**	Depth =	**14.80**	m	Consolidation stresses			
Tube:	**P3B2**	p_O' =	**148.0**	kPa	(kPa)	max.	min.	final
Part:	**1**	w_i =	**19.6**	%	σ_{ac}' =	-	-	**147.8**
Test:	**CAUE**	w_c =	**19.3**	%	σ_{rc}' =	-	-	**176.1**

Date: 2016-01-25

Drawn by/checked: MAS / GS

121A-P3B2-1-CAUE.Plot1.grf



Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUE**

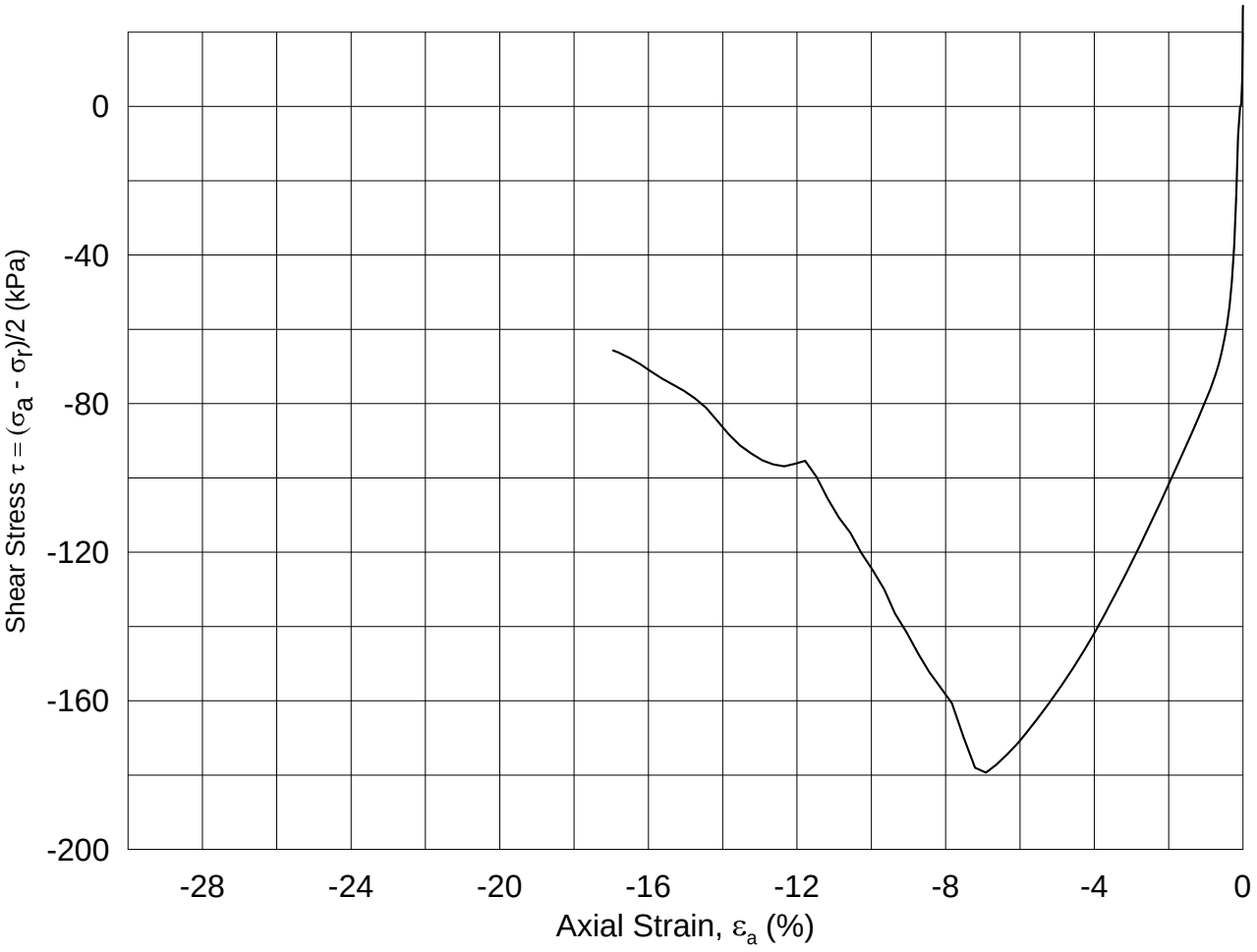
Figure No.: XX

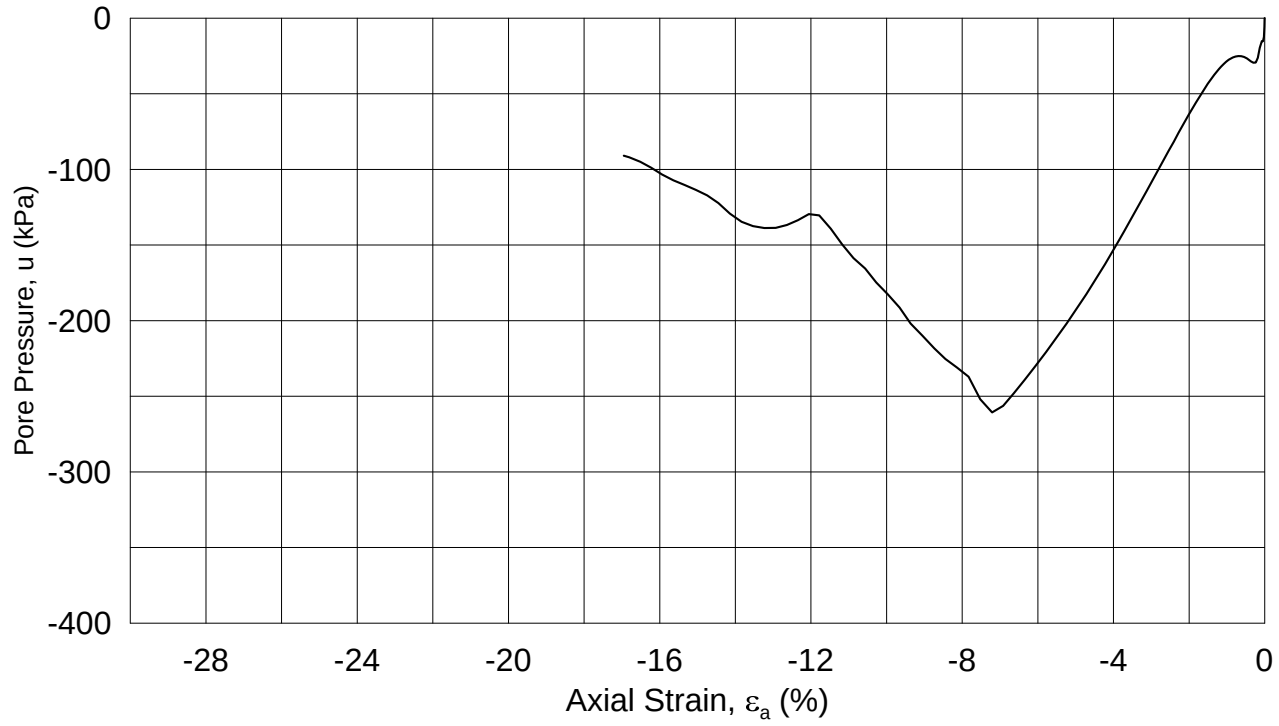
Boring:	**121A**	Depth =	**14.80**	m	Consolidation stresses			
Tube:	**P3B2**	p_O' =	**148.0**	kPa	(kPa)	max.	min.	final
Part:	**1**	w_i =	**19.6**	%	σ_{ac}' =	-	-	**147.8**
Test:	**CAUE**	w_c =	**19.3**	%	σ_{rc}' =	-	-	**176.1**

Date: 2016-01-25

Drawn by/checked: MAS / GS

121A-P3B2-1-CAUE.Plot2.grf





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Triaxial test: **CAUE**

Figure No.: xx

Boring: **MetTower**
Tube: **P10Q1**
Part: **1**
Test: **CAUE**

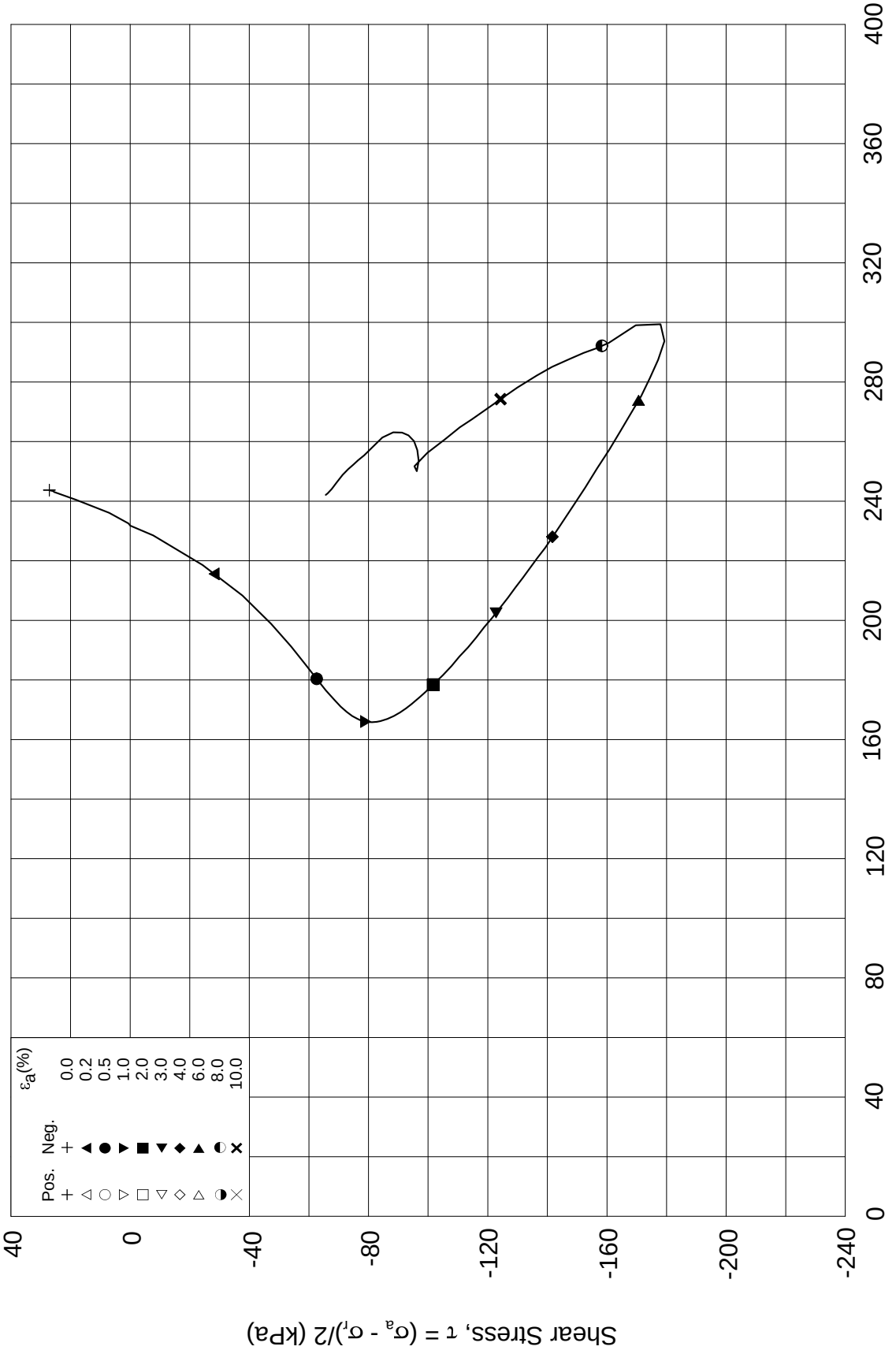
Depth	=	**29.30**	m
p_O'	=	**271.0**	kPa
w_i	=	**27.5**	%
w_c	=	**25.7**	%

Consolidation stresses (kPa)	max.	min.	final
σ_{ac}' =	-	-	**270.8**
σ_{rc}' =	-	-	**216.7**

Date: 2016-01-14

Drawn by/checked: MAS / GS

MetTower-P10Q1-1-CAUE.Plot1.grf



Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

Figure No.: xx

Triaxial test: **CAUE**

Boring:	**MetTower**	Depth =	**29.30**	m	Consolidation stresses			
Tube:	**P10Q1**	p_0' =	**271.0**	kPa	(kPa)	max.	min.	final
Part:	**1**	w_i =	**27.5**	%	σ_{ac}' =	-	-	**270.8**
Test:	**CAUE**	w_c =	**25.7**	%	σ_{rc}' =	-	-	**216.7**

Date: 2016-01-14

Drawn by/checked: MAS / GS

MetTower-P10Q1-1-CAUE.Plot2.grf

Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement (CADC)

Borehole Number:	D14	Description (visual) :	
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells	
Sample Depth (m):	2.20-2.50		

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	143.0	mm		
Diameter :	69.4	mm		
Moisture content :	22.73	%	22.68	%
Bulk density :	2.09	Mg/m³		
Dry density :	1.70	Mg/m³		
Particle density (assumed)	2.66	Mg/m³		
Initial voids ratio (e_o)	0.5628			
Test Duration:			8	Days

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell/Back pressure ramp (#2 Undrained))

Stage	#1	#2	
Cell pressure (kPa):	700	750	
Base pwp (kPa):	691.0	740.8	
Base B values :	1.01	1.00	
Initial effective stress (mid-plane) :		9.1	kPa

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	23.4	(kPa)
$\Delta e/e_o$	0.0117	

Note: shell debris mobilised during drained shear stage.

At failure:

External axial strain	3.21	(%)
Peak deviator stress	81	(kPa)
Drained shear strength	41	(kPa)
Base pore pressure	739	(kPa)
Horizontal effective stress	29	(kPa)
Vertical effective stress	110	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.13	(%)
Deviator stress	34	(kPa)
Base pore pressure	741	(kPa)
Horizontal effective stress	28	(kPa)
Vertical effective stress	61	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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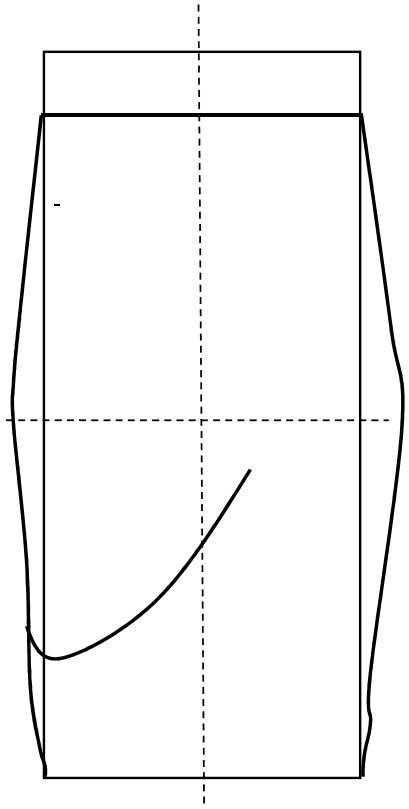
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	

SPECIMEN DETAILS

Initial Height:	143.0	mm
Initial Diameter:	69.4	mm

Elevation



Failure Sketch

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Date:	15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	750	768
Base pwp (kPa)	740.9	740.0
s' (kPa)	9.1	21.0
t (kPa)	0.0	-7.0
Voids ratio (e)	0.5628	0.5562

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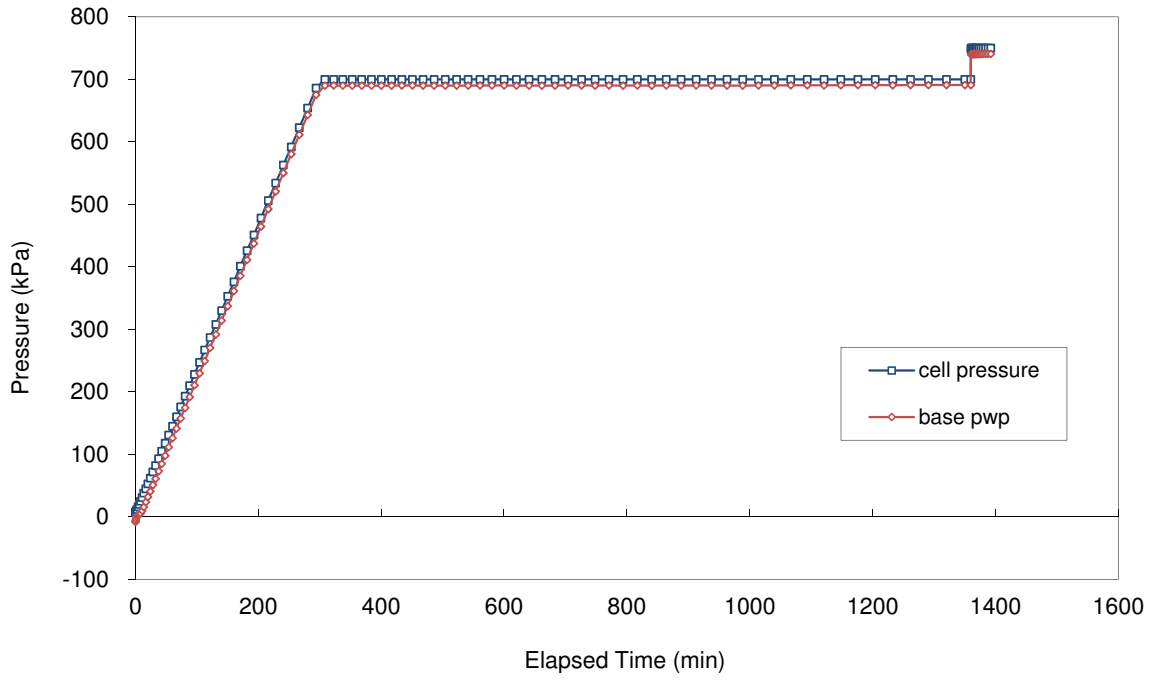
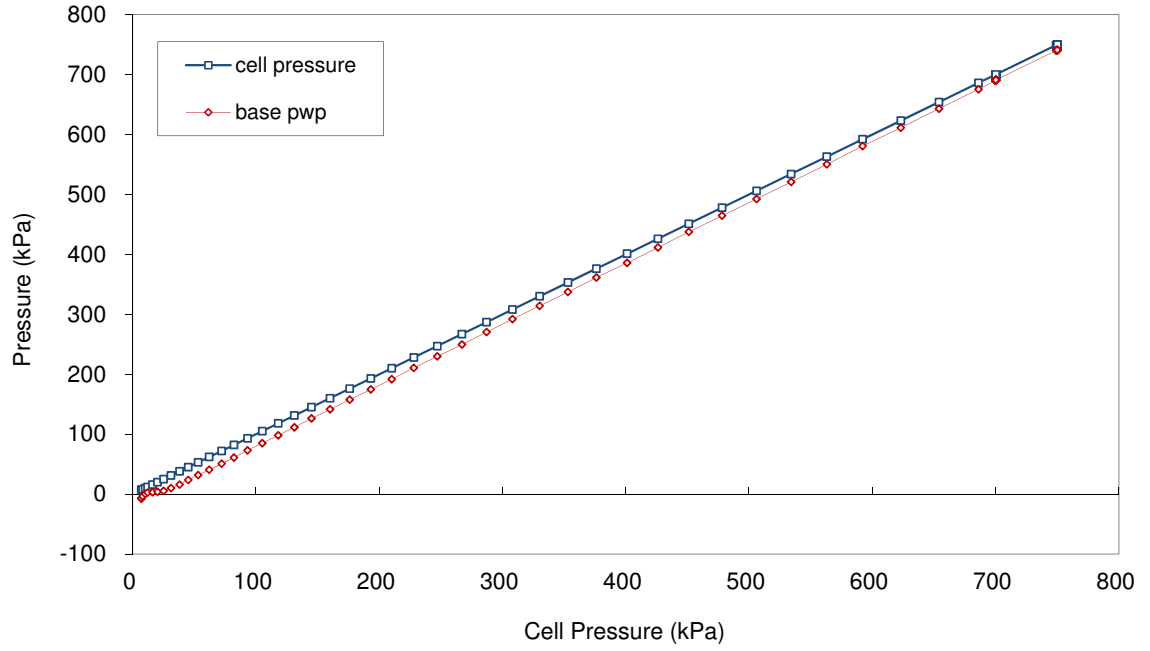
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	





Determination of Initial Effective Stress

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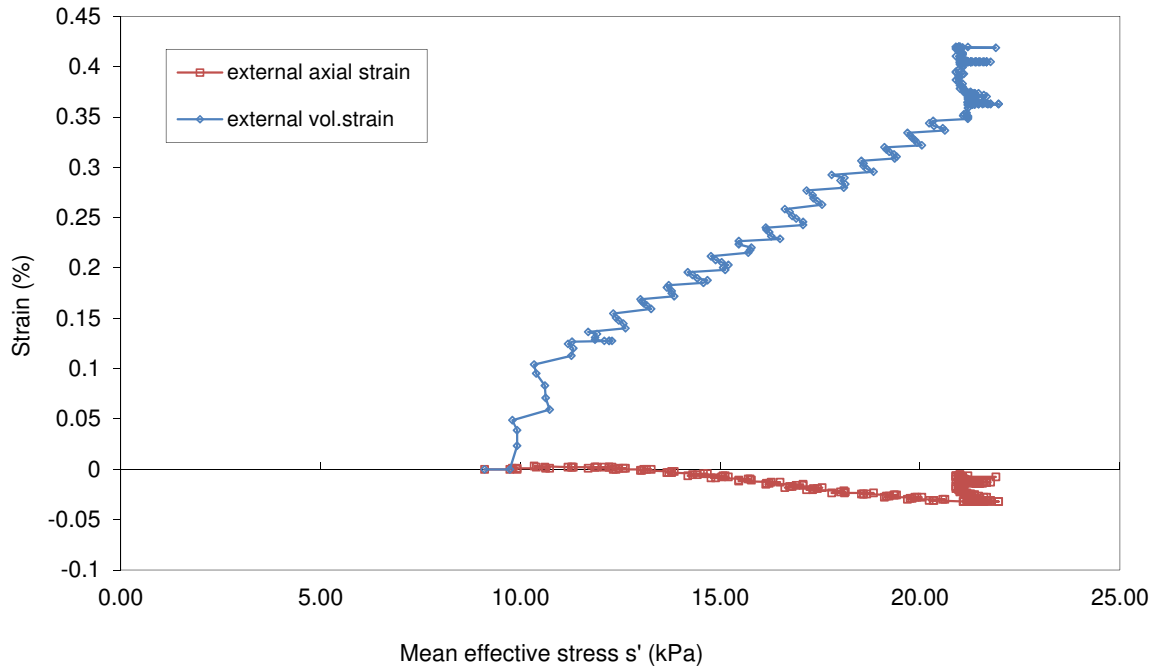
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	



Anisotropic Consolidation/Swelling Stage #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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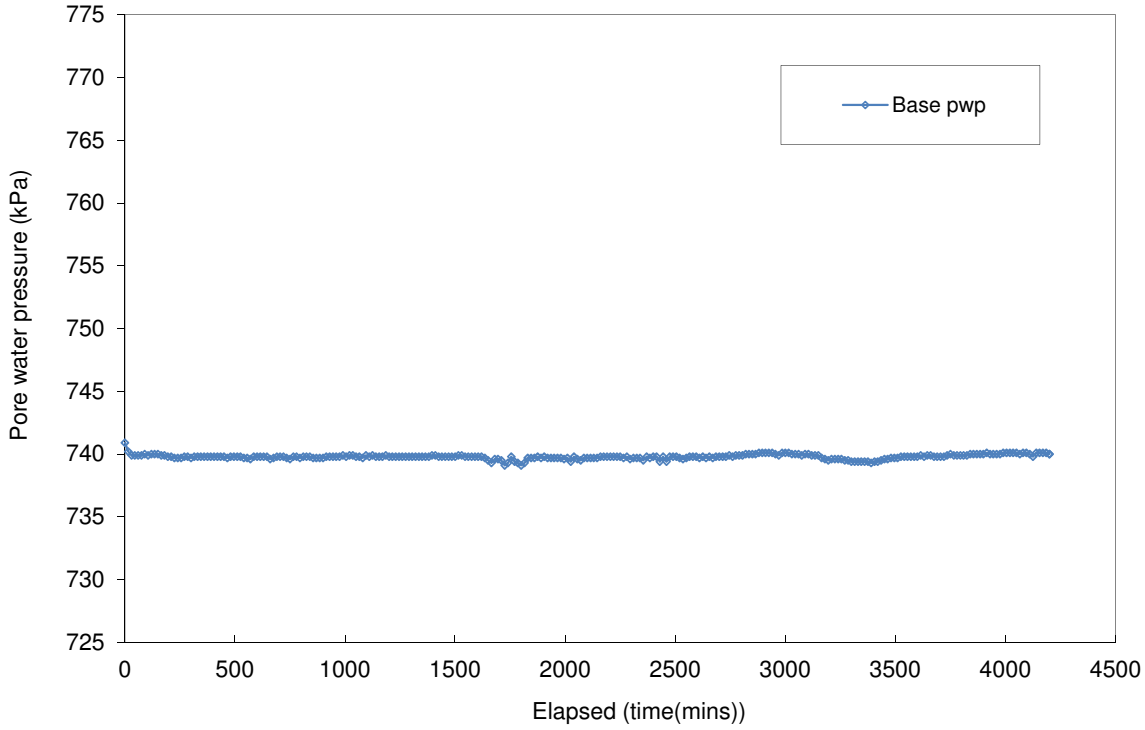
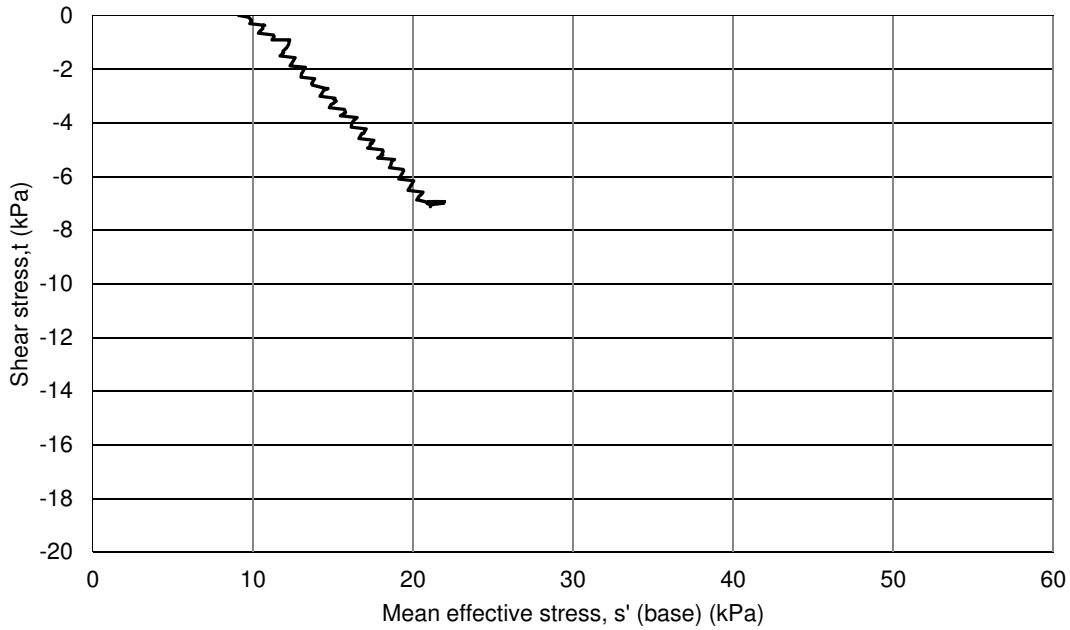
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	





Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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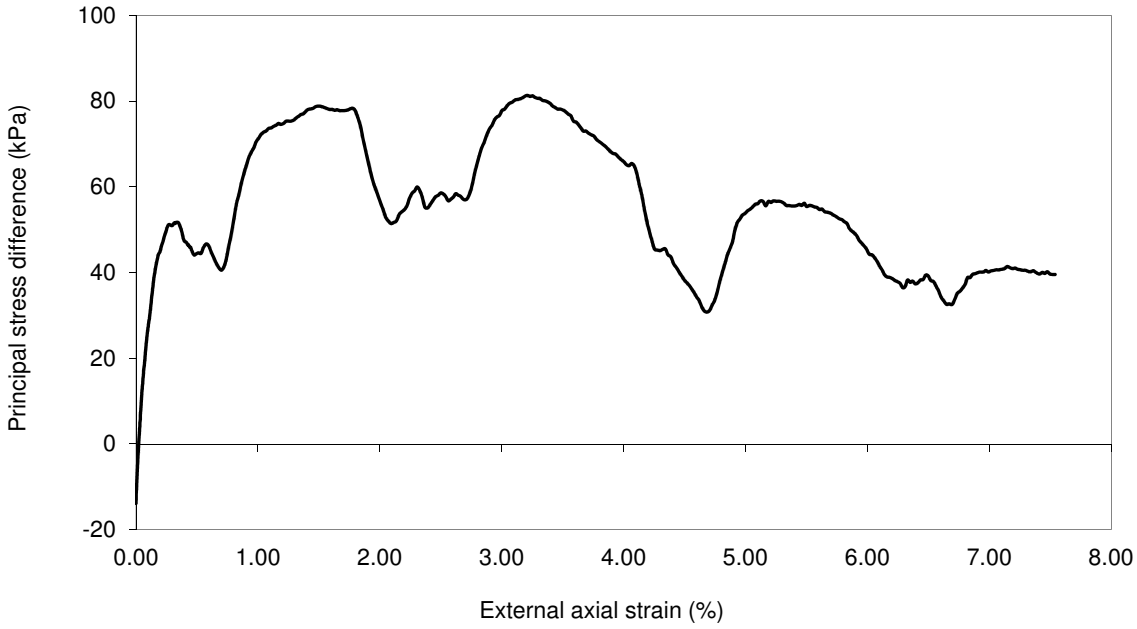
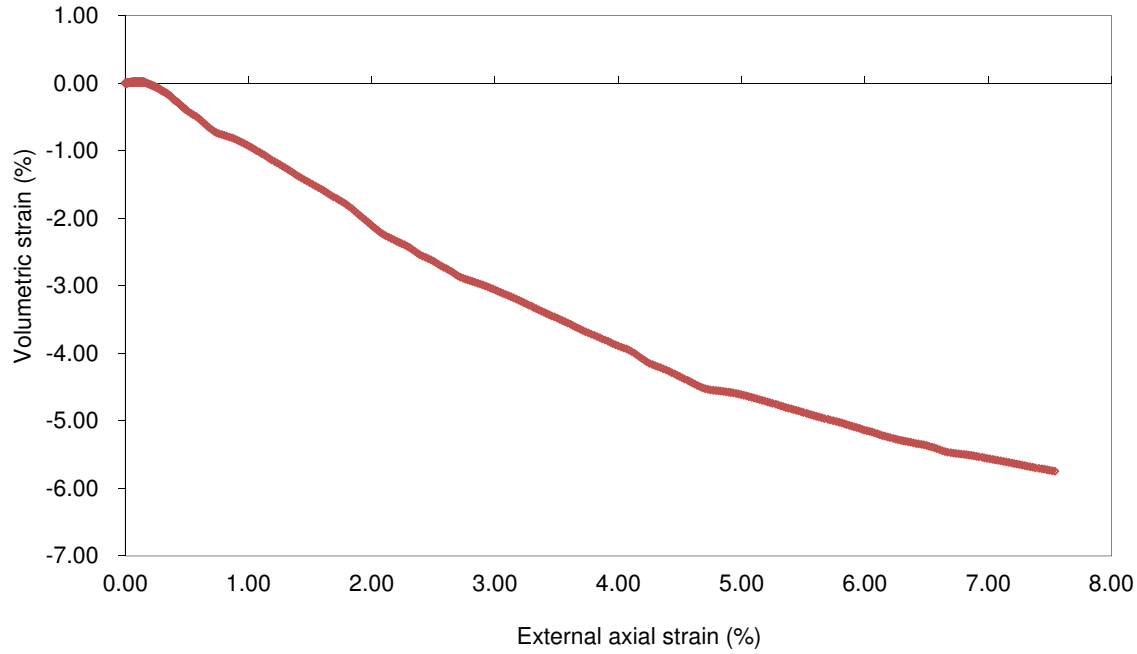
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	





Undrained Shear Stage

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Date: 15/02/2016		

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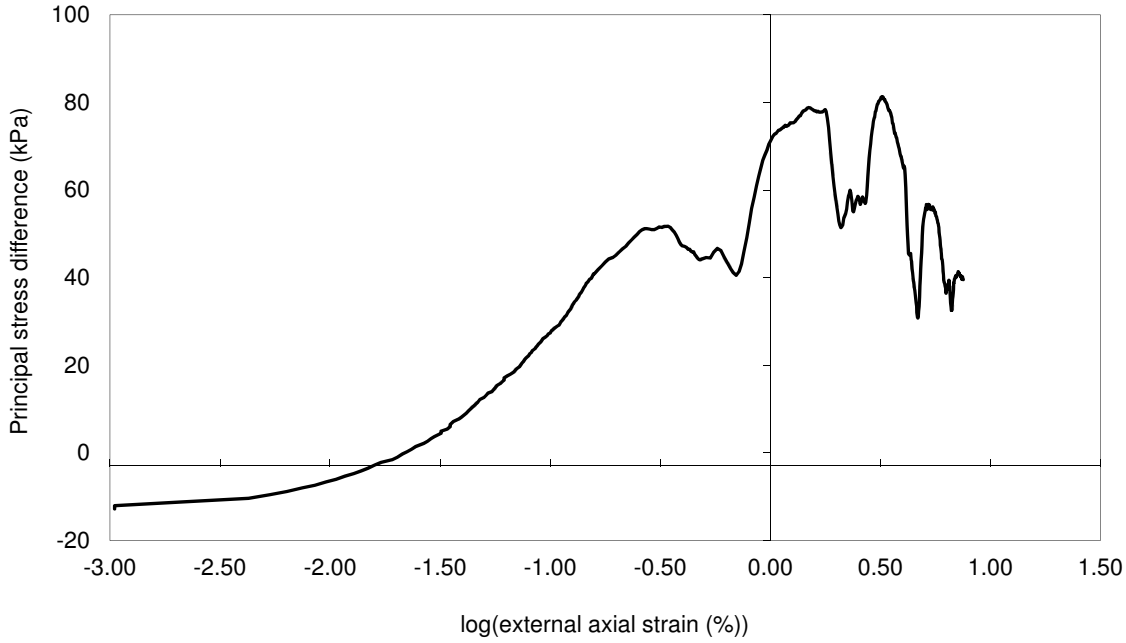
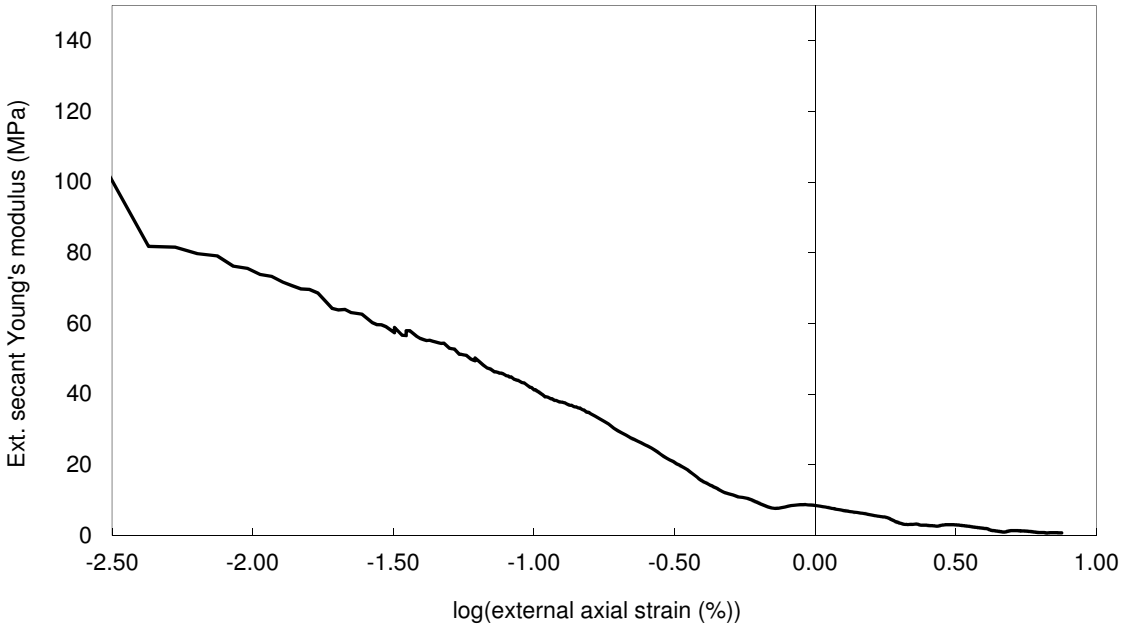
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	





Undrained Shear Stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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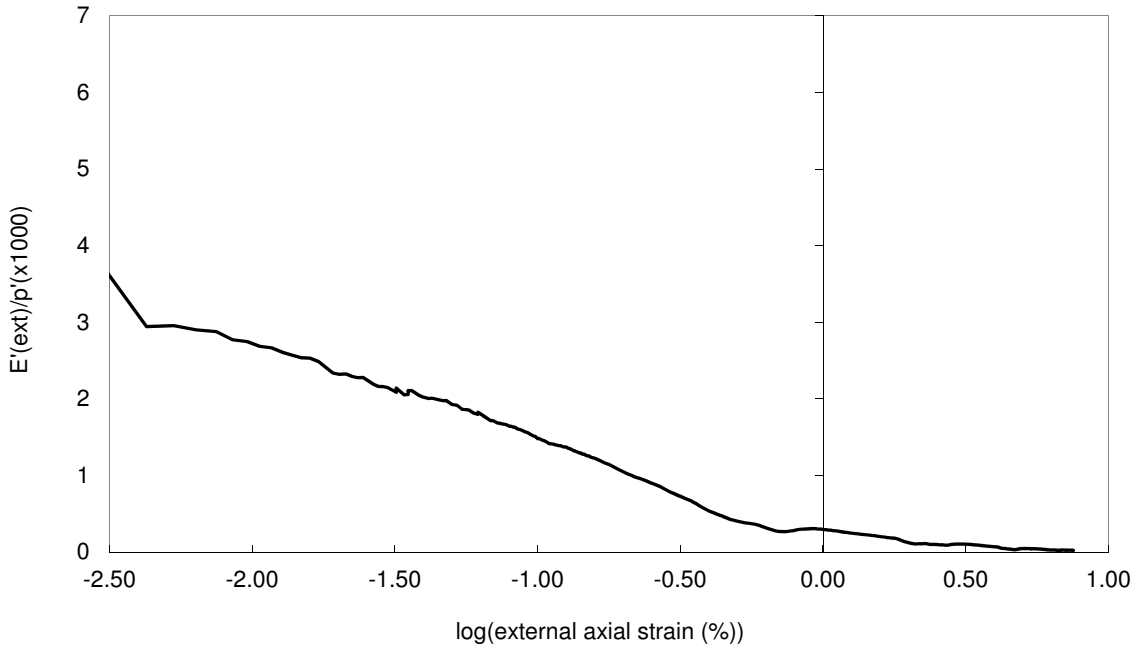
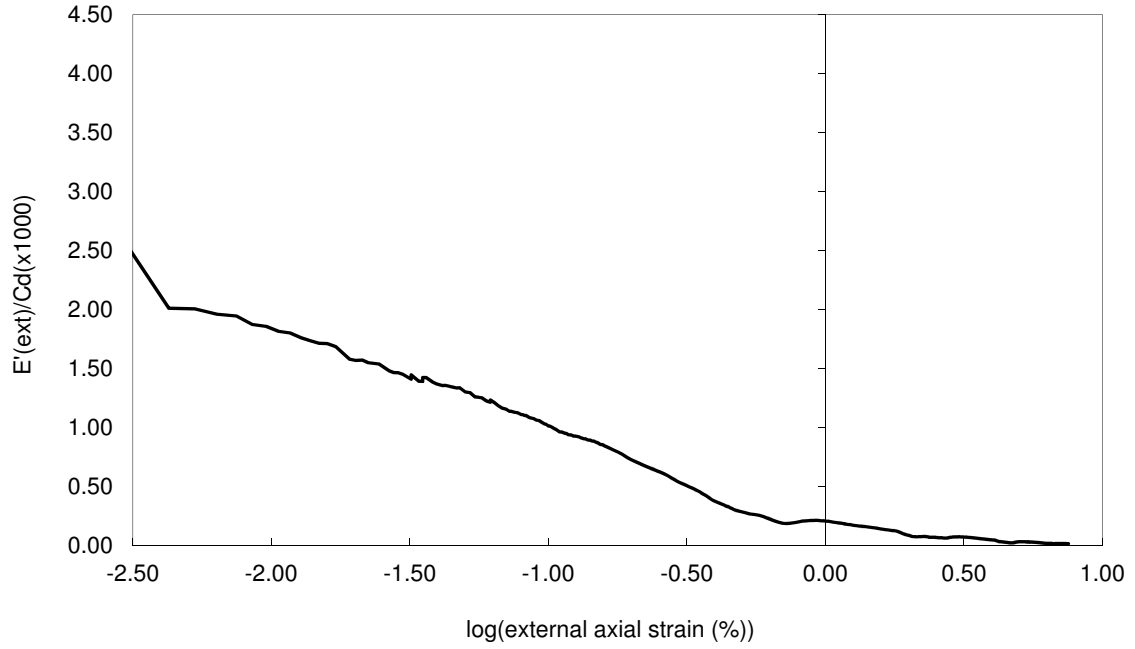
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	





Undrained Shear Stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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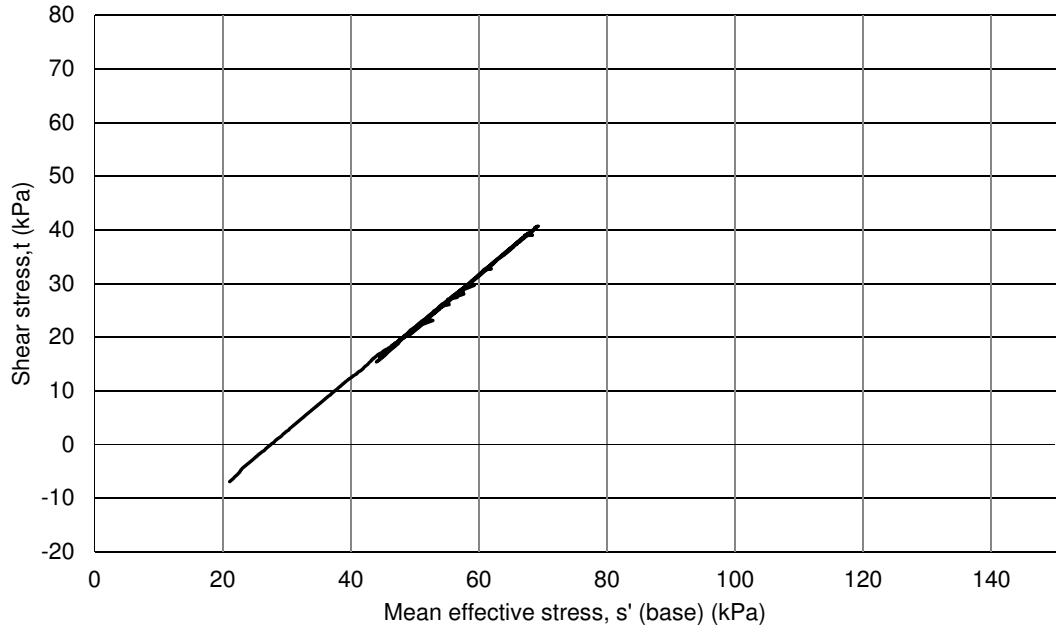
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	D14	Description :
Sample Number:	P4-B2	Brown medium/coarse SAND with some shells
Sample Depth (m):	2.20-2.50	



Undrained Shear Stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement (CADC)

Borehole Number:	G7	Description (visual) :	
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells	
Sample Depth (m):	0.70-0.90		

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	150.0	mm		
Diameter :	69.4	mm		
Moisture content :	14.66	%	16.66	%
Bulk density :	1.72	Mg/m³		
Dry density :	1.50	Mg/m³		
Particle density (assumed)	2.66	Mg/m³		
Initial voids ratio (e_o)	0.7760			
Test Duration:			12 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell/Back pressure ramp (#2 Undrained))

Stage	#1	#2	
Cell pressure (kPa):	700	750	
Base pwp (kPa):	696.4	746.2	
Base B values :	1.00	1.00	
Initial effective stress (mid-plane) :		4.1	kPa

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	7.9	(kPa)
$\Delta e/e_o$	0.0000	

At failure:

External axial strain	14.98	(%)
Peak deviator stress	22	(kPa)
Drained shear strength	11	(kPa)
Base pore pressure	745	(kPa)
Horizontal effective stress	9	(kPa)
Vertical effective stress	31	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.96	(%)
Deviator stress	8	(kPa)
Base pore pressure	745	(kPa)
Horizontal effective stress	9	(kPa)
Vertical effective stress	17	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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Date:	15/02/2016		

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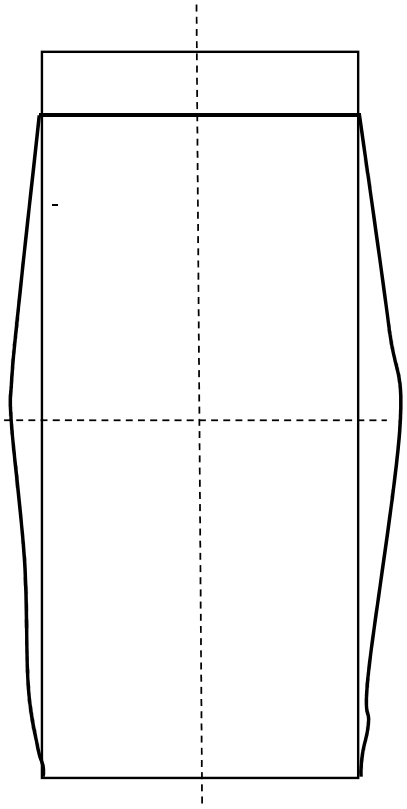
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

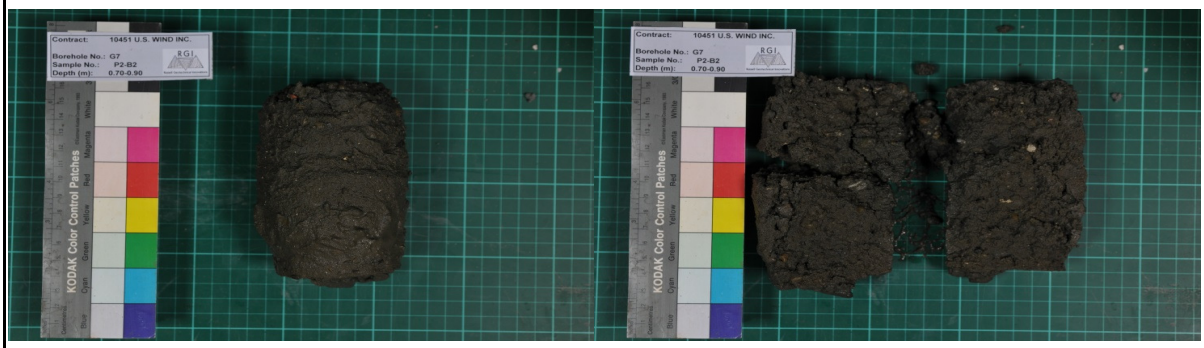
Borehole Number:	G7	Description :
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells
Sample Depth (m):	0.70-0.90	

SPECIMEN DETAILS

Initial Height:	150.0	mm
Initial Diameter:	69.4	mm

Elevation





Failure Sketch

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Date: 15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	G7	Description :
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells
Sample Depth (m):	0.70-0.90	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	750	754
Base pwp (kPa)	745.9	742.9
s' (kPa)	4.1	7.7
t (kPa)	0.0	-2.9
Voids ratio (e)	0.7760	0.7760

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Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
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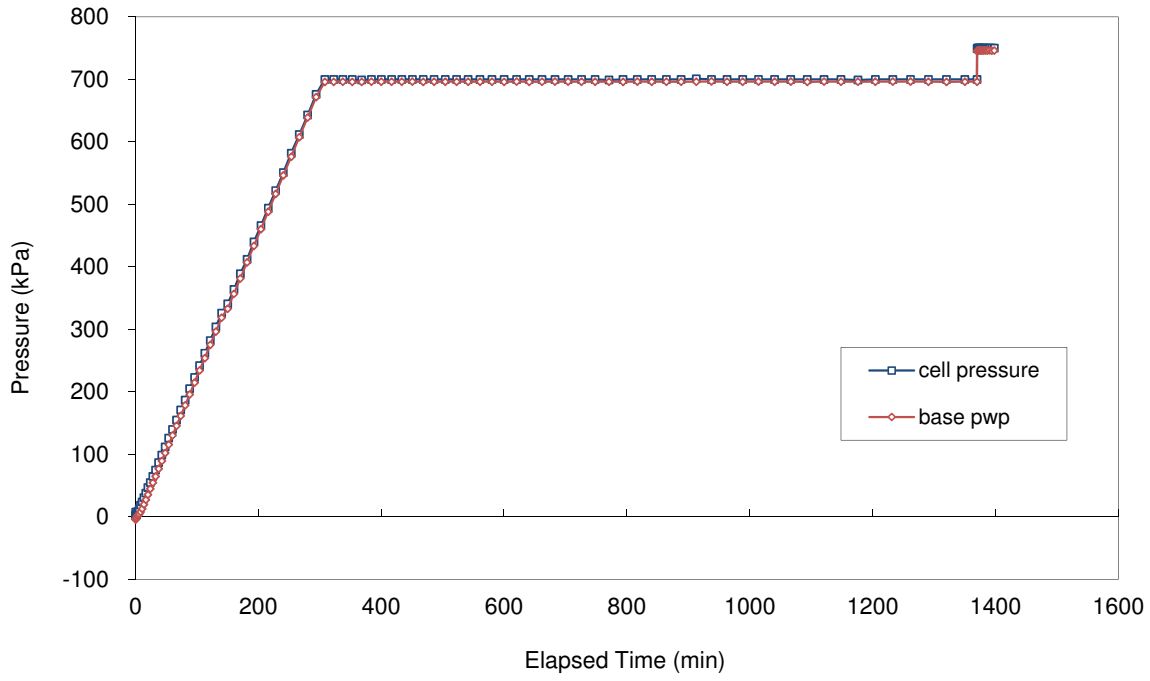

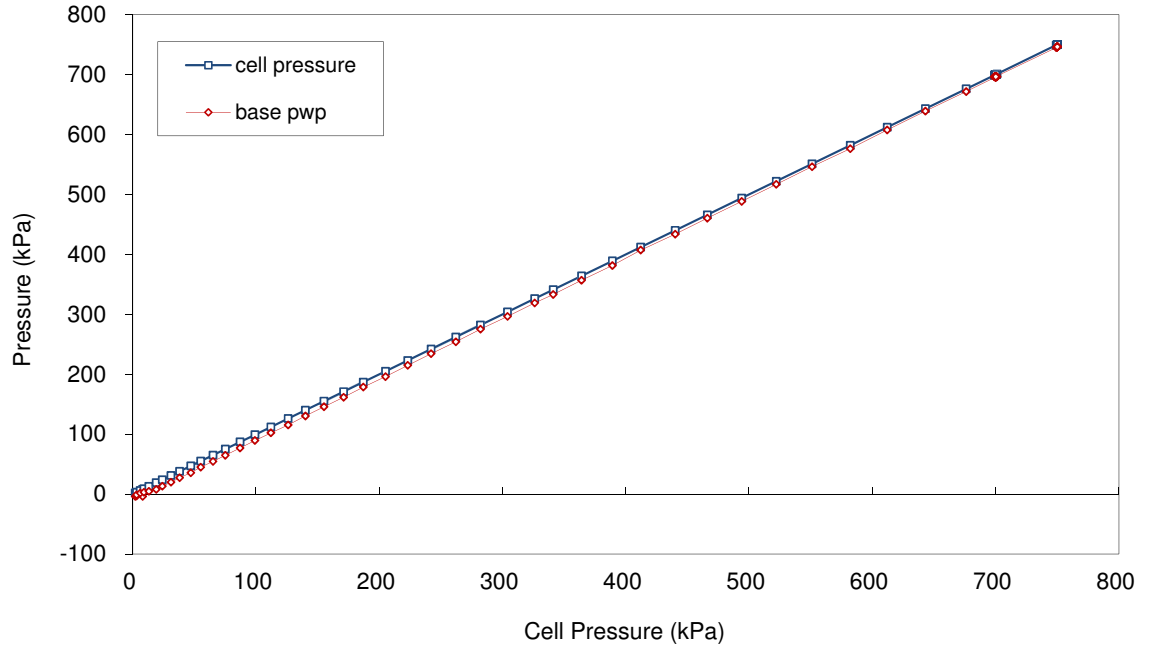

Determination of Initial Effective Stress

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	G7	Description :
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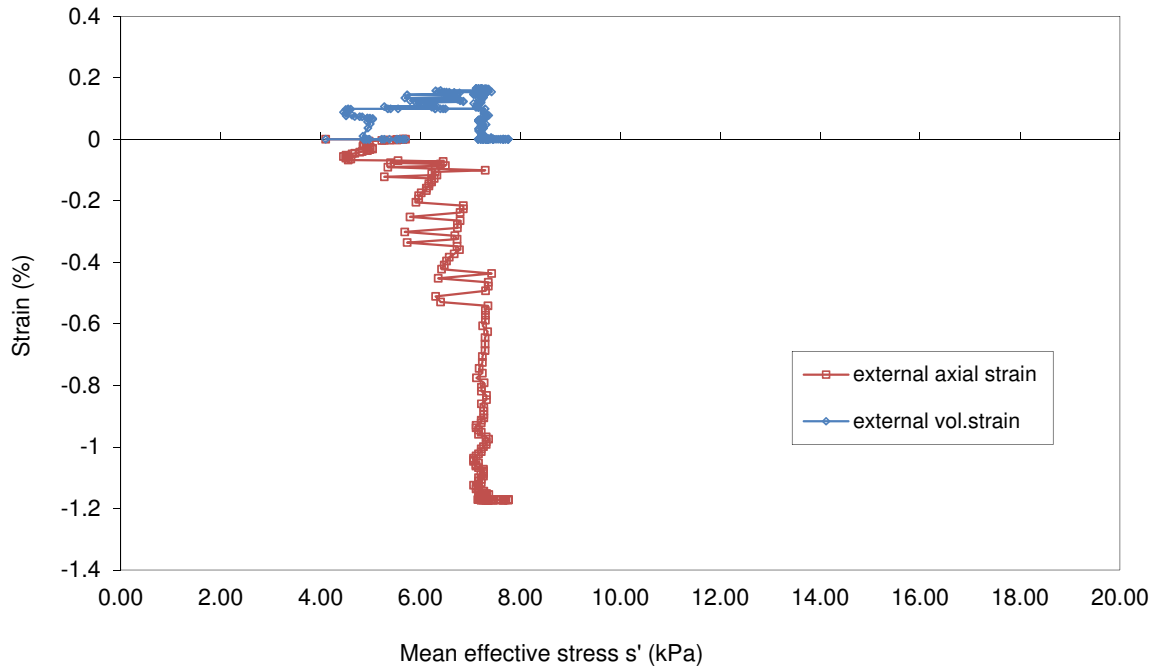
Sample Depth (m):	0.70-0.90	



Anisotropic Consolidation/Swelling Stage #1

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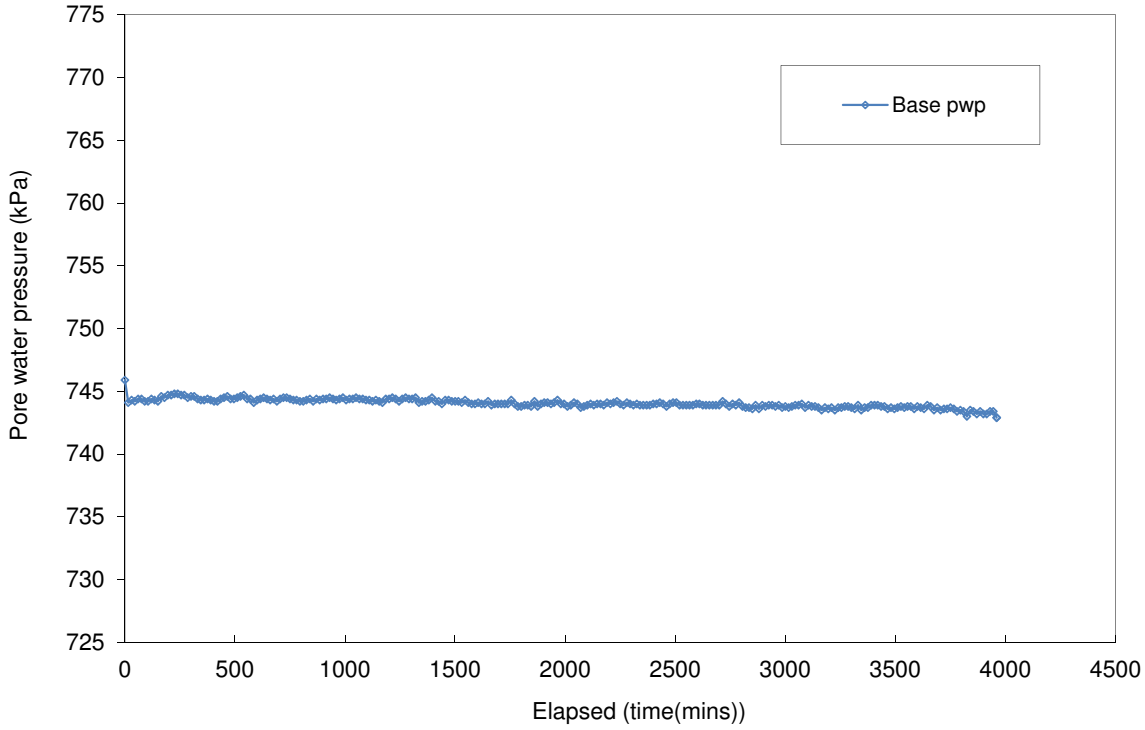

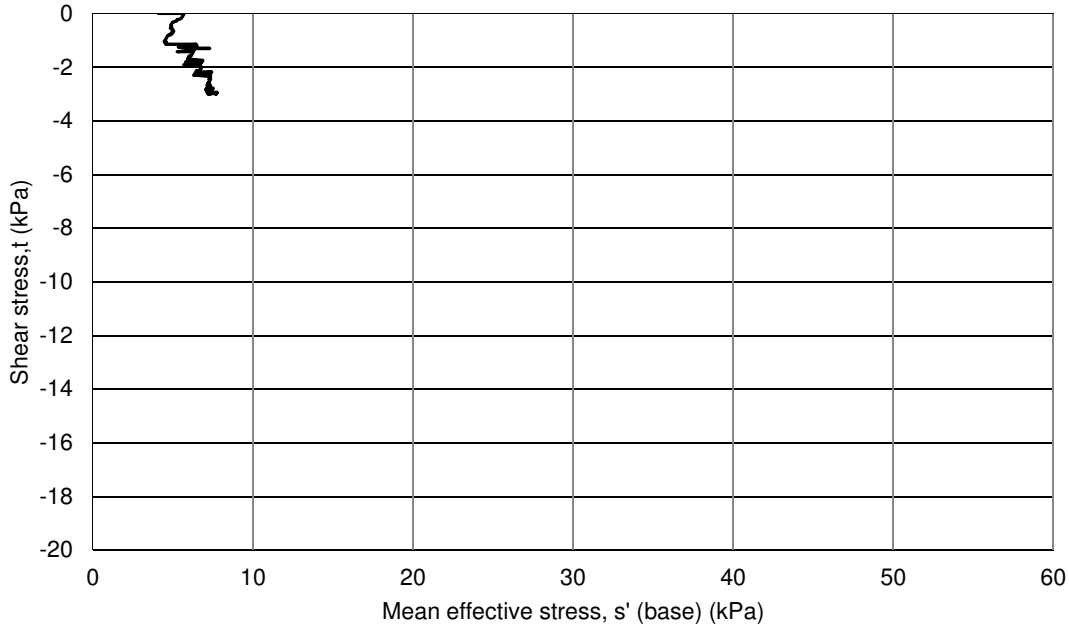

Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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Borehole Number:	G7	Description :
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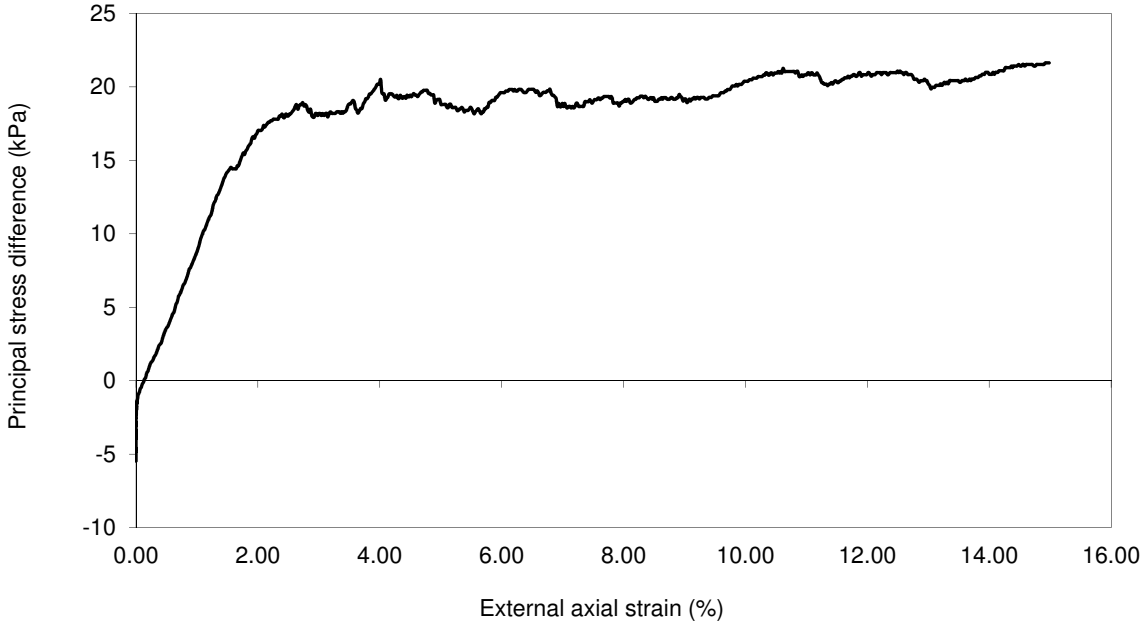

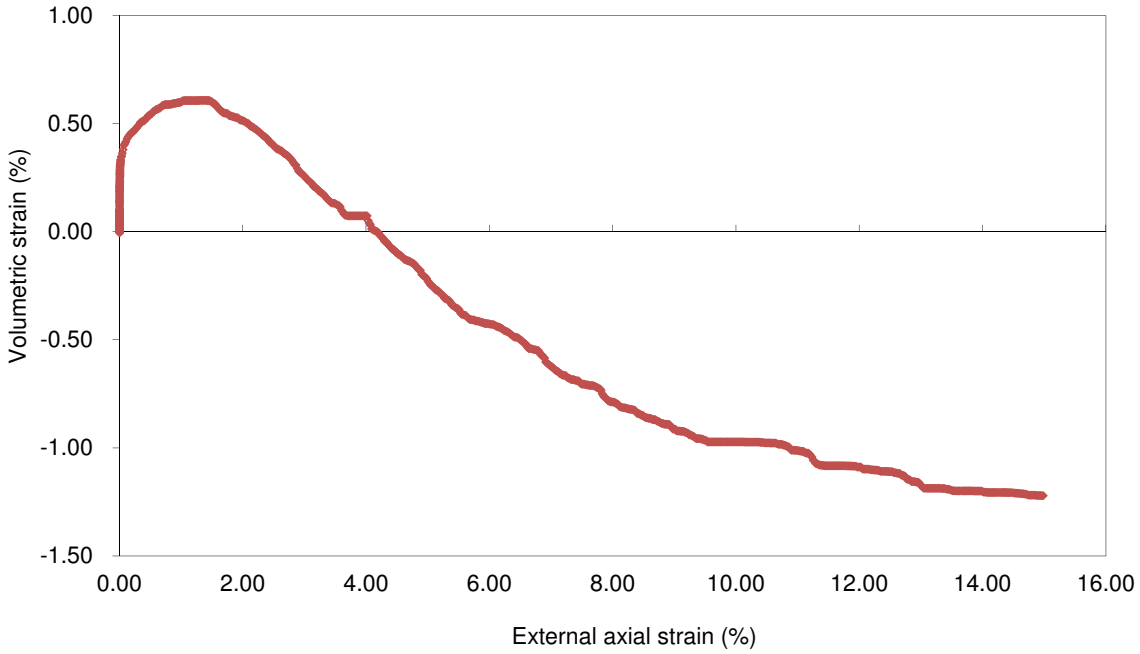

Undrained Shear Stage

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Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

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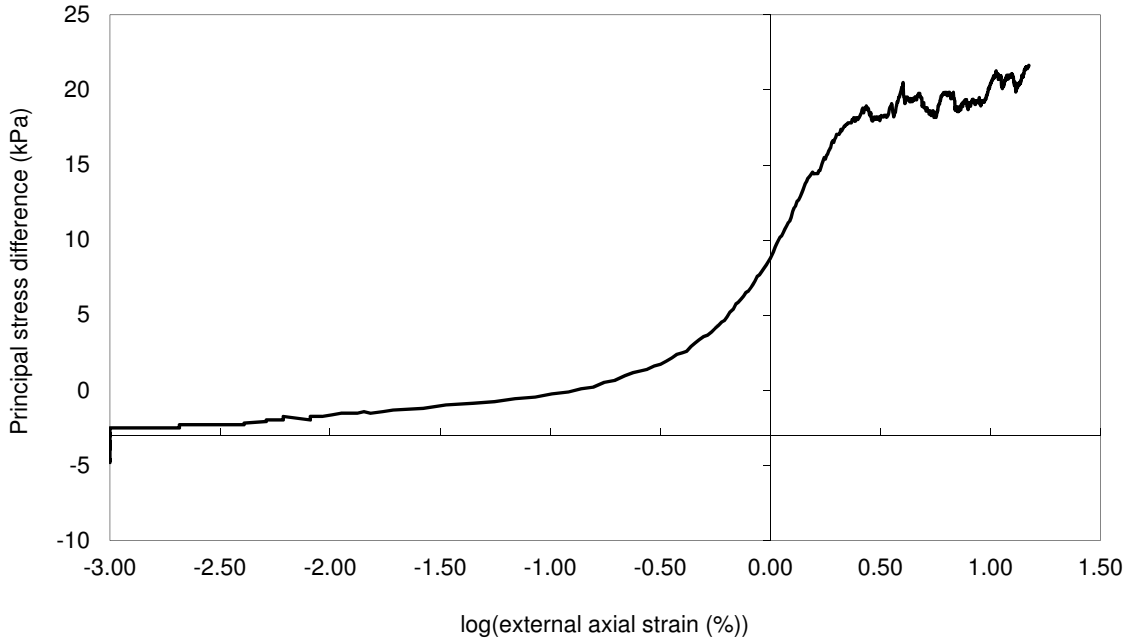
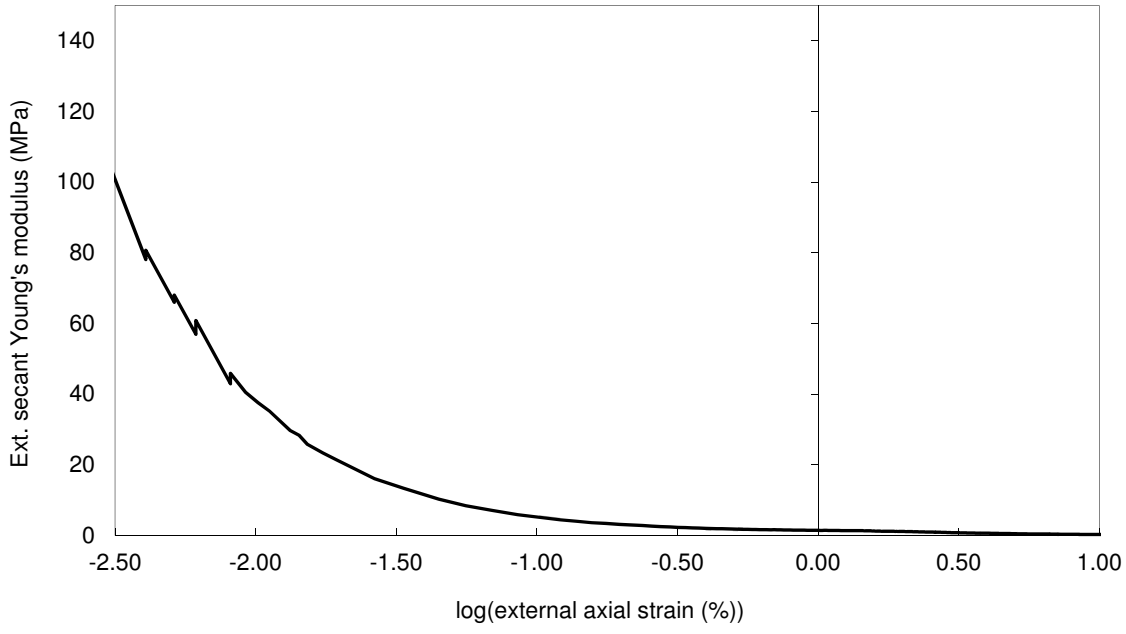
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells
Sample Depth (m):	0.70-0.90	





Undrained Shear Stage

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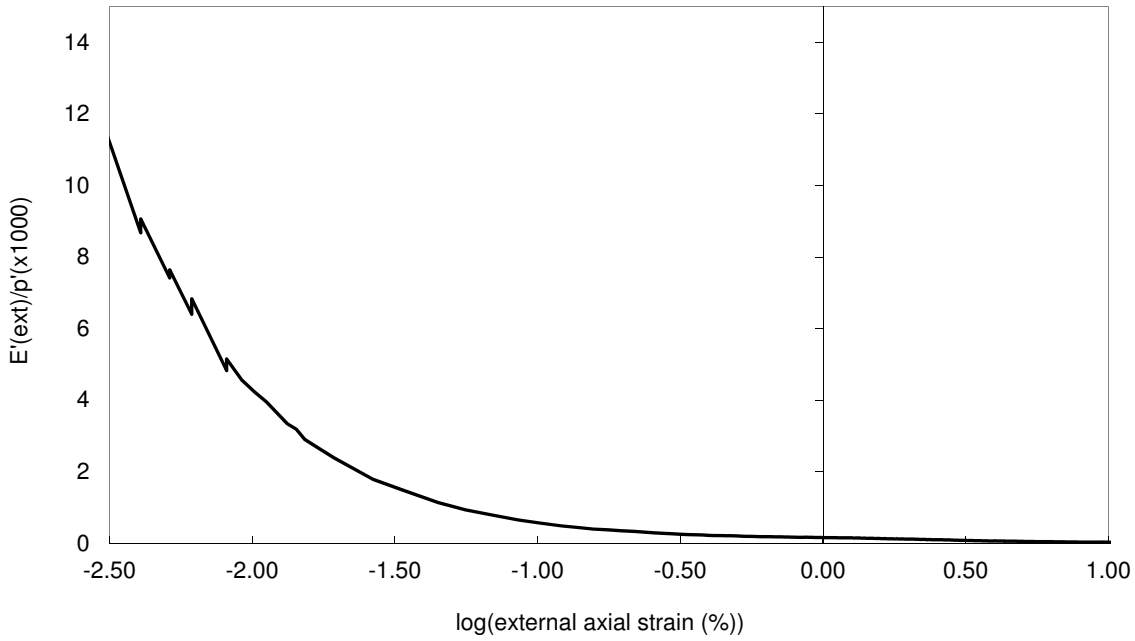
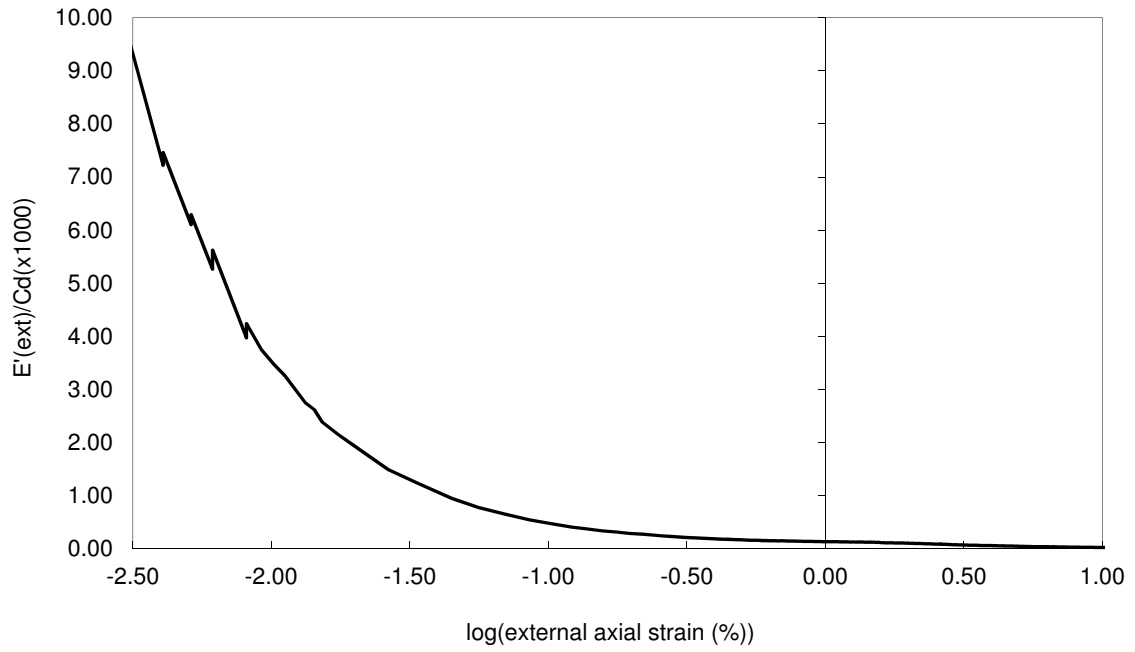
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	G7	Description :
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells
Sample Depth (m):	0.70-0.90	





Undrained Shear Stage

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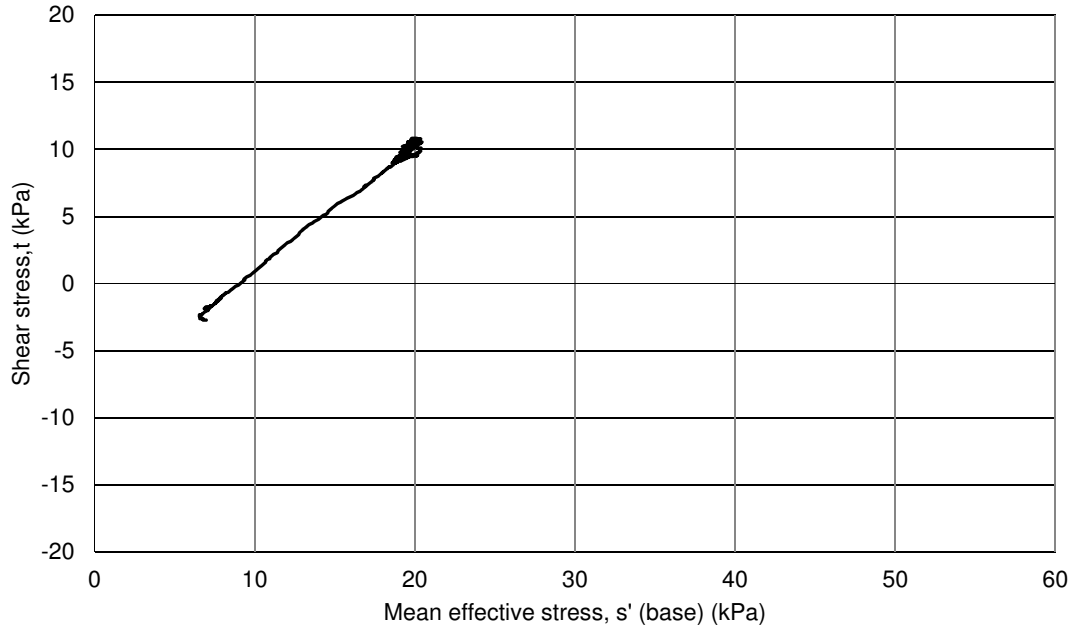
Anisotropically Consolidated Drained Triaxial Test with Base Pore Water Pressure and Volume Measurement

Borehole Number:	G7	Description :
Sample Number:	P2-B2	Grey fine/medium silty SAND with shells
Sample Depth (m):	0.70-0.90	



Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	G7	Description (visual) :	
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay	
Sample Depth (m):	67.60-67.80		

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	141.8	mm		
Diameter :	71.6	mm		
Moisture content :	31.42	%	27.97	%
Bulk density :	1.86	Mg/m³		
Dry density :	1.42	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.9195			
Test Duration:			14 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell pressure increments at NMC)

Stage	#1	#2	#3	
Cell pressure (kPa):	800	1000	1200	
Base pwp (kPa):	787.2	993.7	1193.6	
Mid-plane pwp (kPa):	786.4	998.2	1192.7	
Base B values :	0.99	1.03	1.00	
Mid-plane B values :	0.99	1.06	0.97	
Initial effective stress (mid-plane) :		8.239	kPa	

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	628.3	(kPa)
$\Delta e/e_o$	0.1245	

At failure:

External axial strain	16.54	(%)
Peak deviator stress	615	(kPa)
Undrained shear strength	307	(kPa)
Mid plane pore pressure	1487	(kPa)
Base pore pressure	1487	(kPa)
Horizontal effective stress	249	(kPa)
Vertical effective stress	863	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.36	(%)
Deviator stress	435	(kPa)
Mid plane pore pressure	1360	(kPa)
Base pore pressure	1360	(kPa)
Horizontal effective stress	376	(kPa)
Vertical effective stress	811	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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Date:	15/02/2016		

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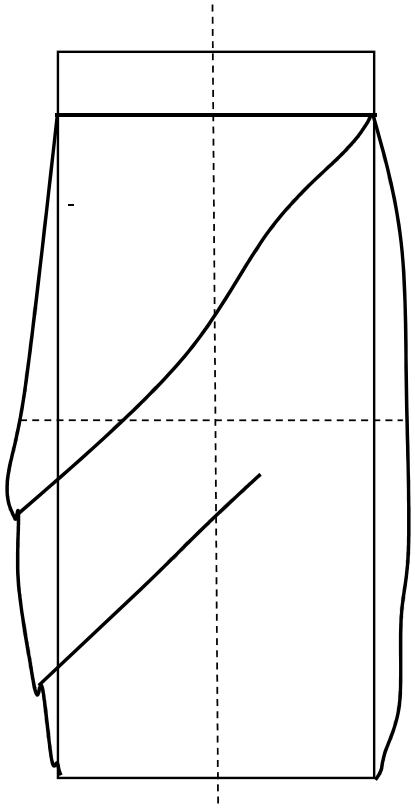
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	

SPECIMEN DETAILS

Initial Height:	141.8	mm
Initial Diameter:	71.6	mm

Elevation



Failure Sketch

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	1201	1736
Mid pwp (kPa)	1192.761	1192.786
Base pwp (kPa)	1194.044	1192.8
s' (kPa)	8.2	670.8
t (kPa)	0.0	127.6
Voids ratio (e)	0.9195	0.8050

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
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Date: 15/02/2016		

Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
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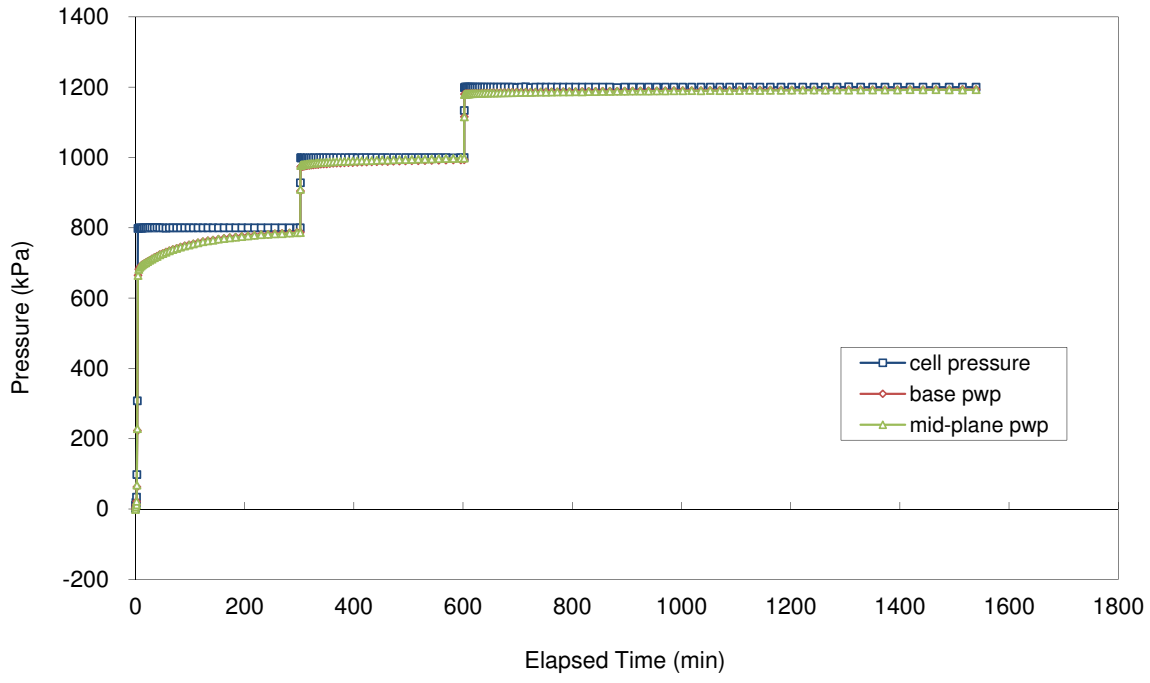

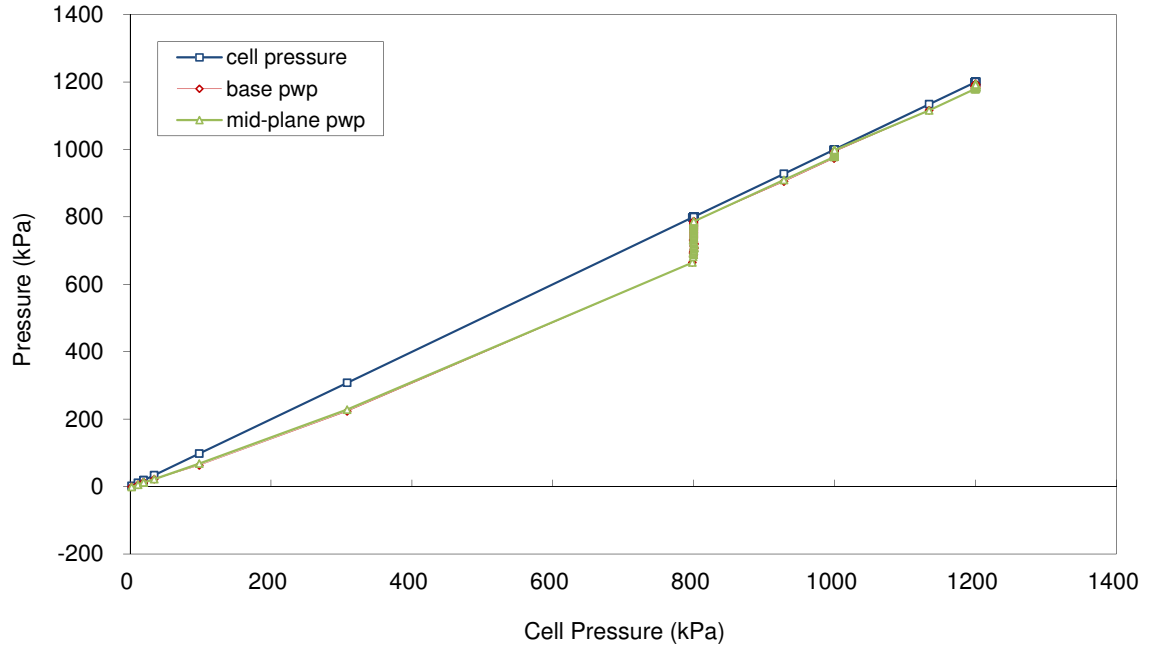

Determination of Initial Effective Stress

Checked and approved	Project Number:	**RGI/1130**
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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
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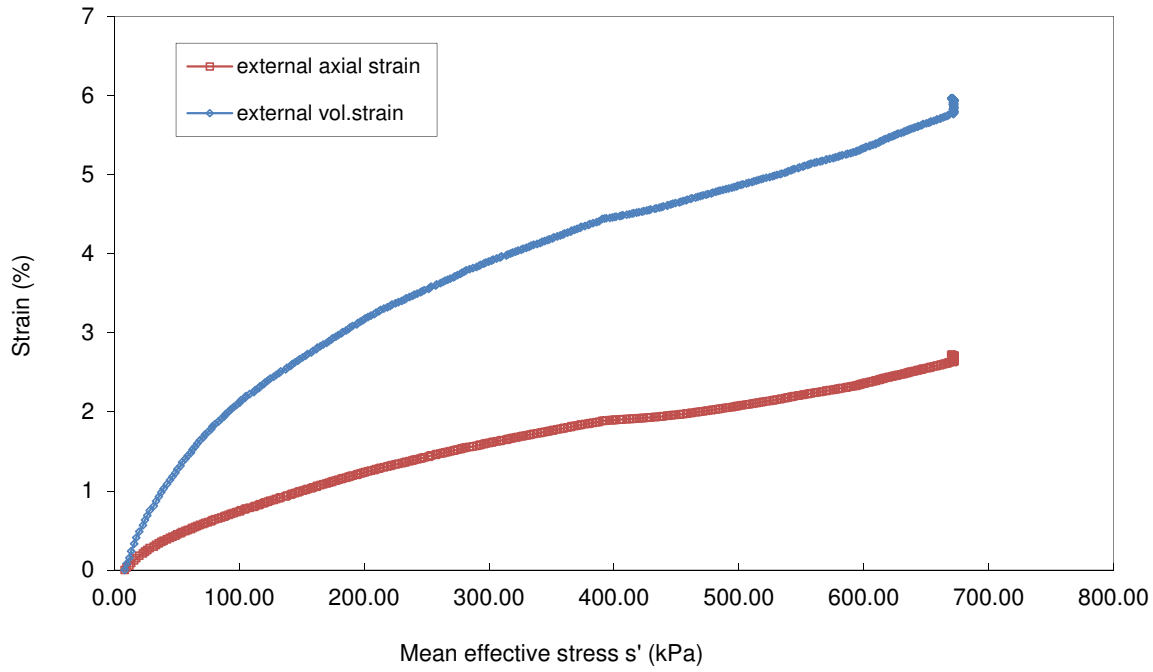

Anisotropic Consolidation/Swelling Stage #1

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
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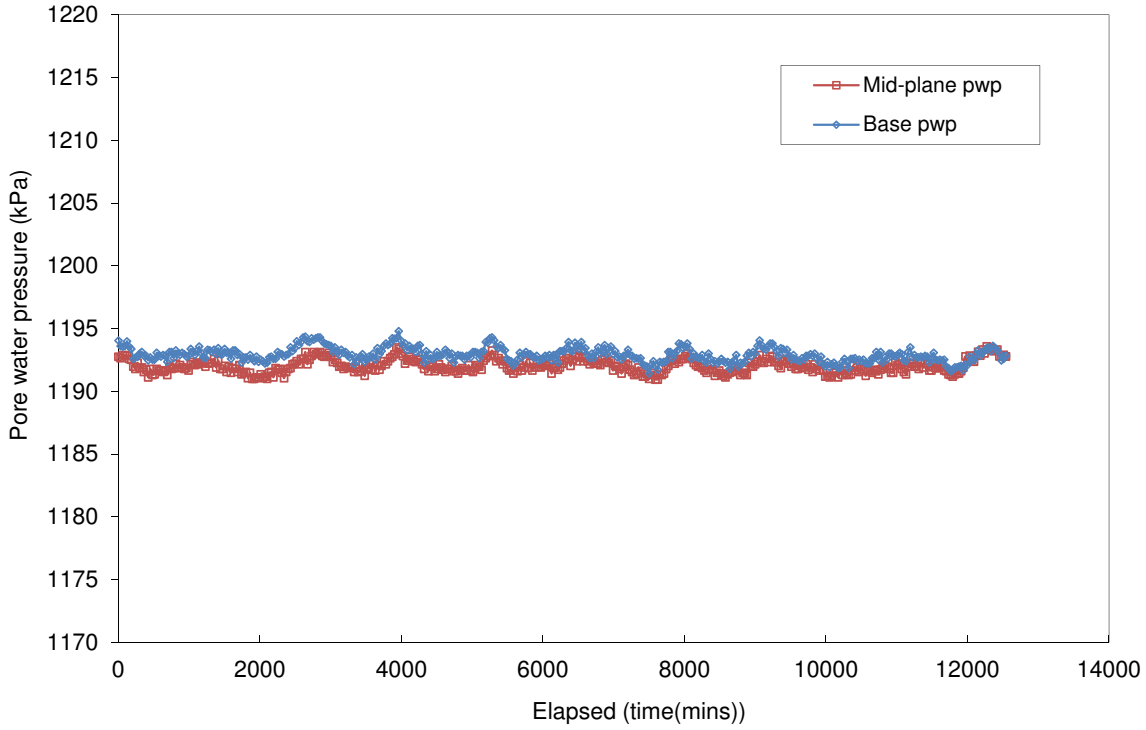

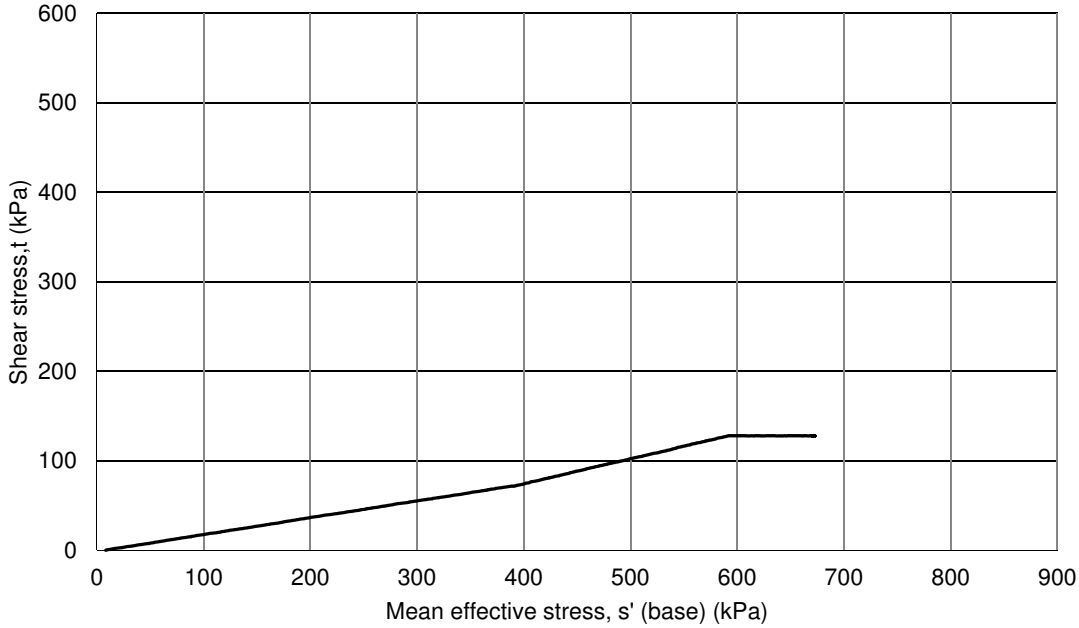

Anisotropic Consolidation/Swelling Stage #1

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Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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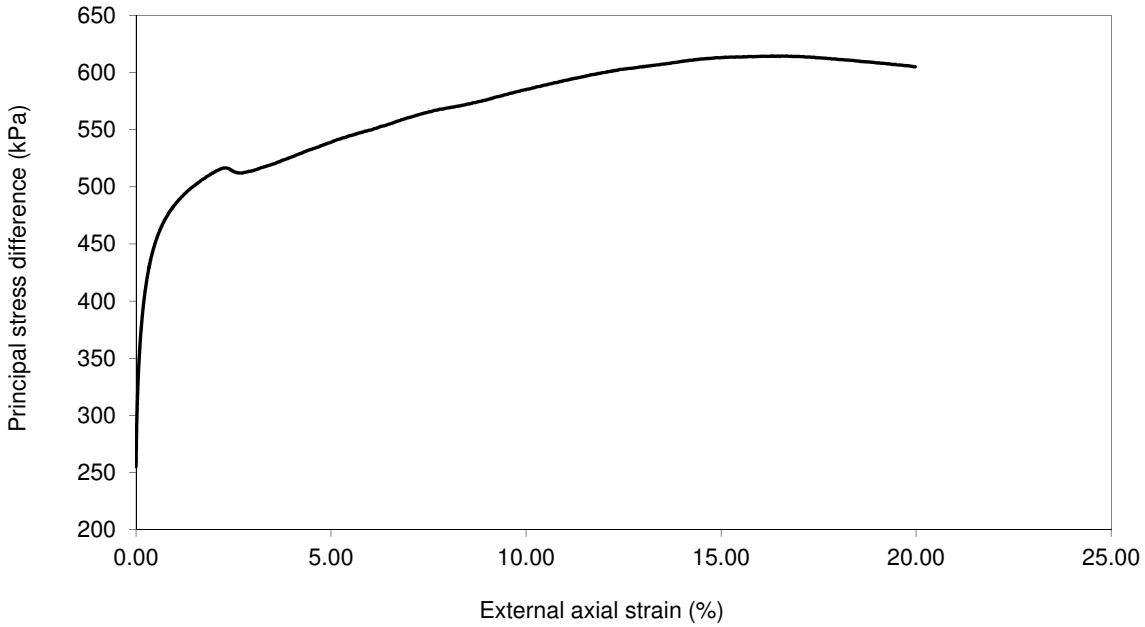
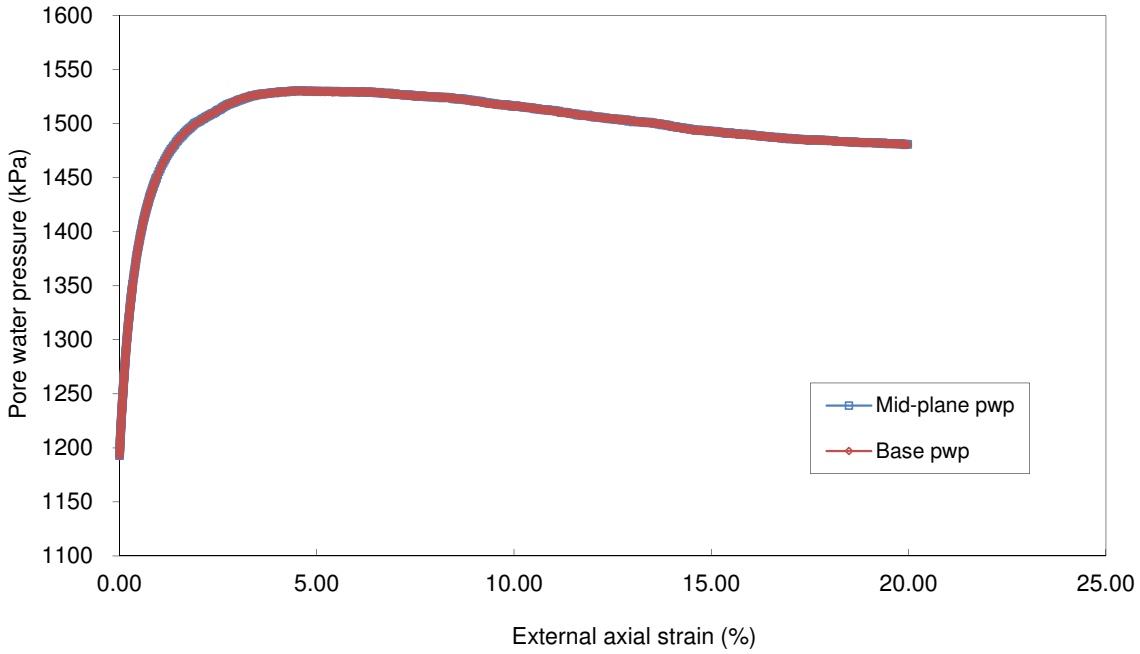
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	





Undrained Shear Stage

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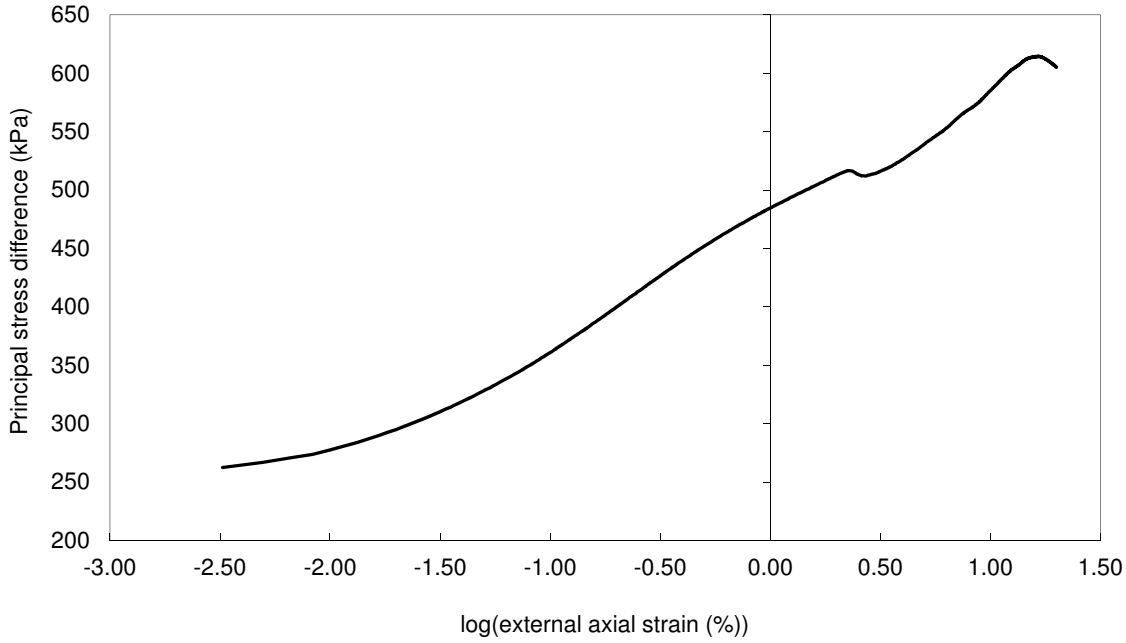
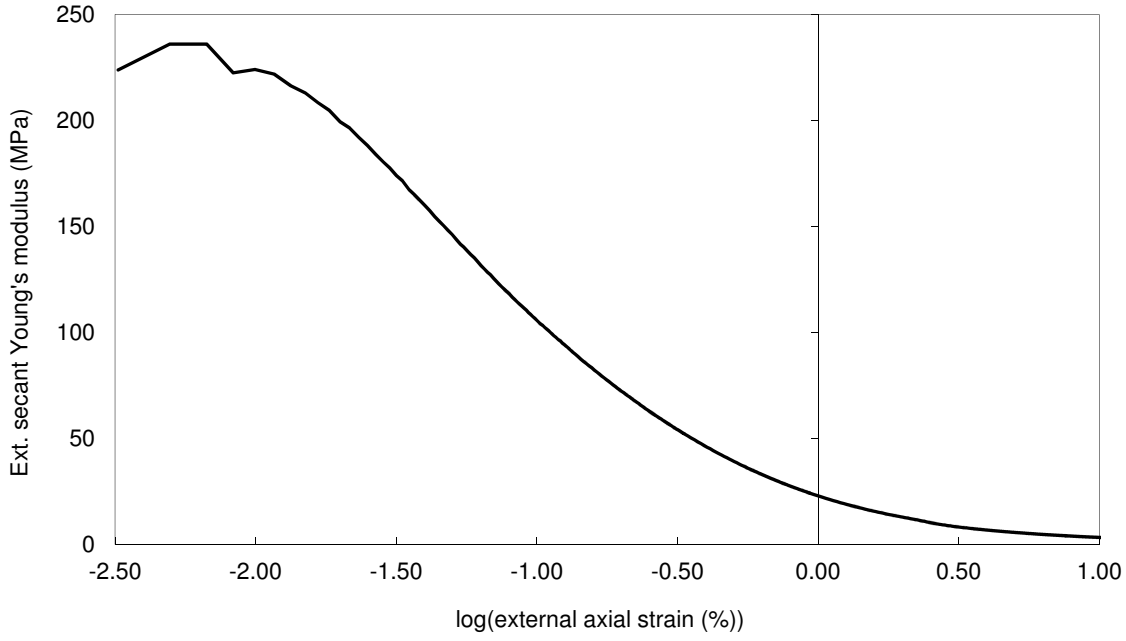
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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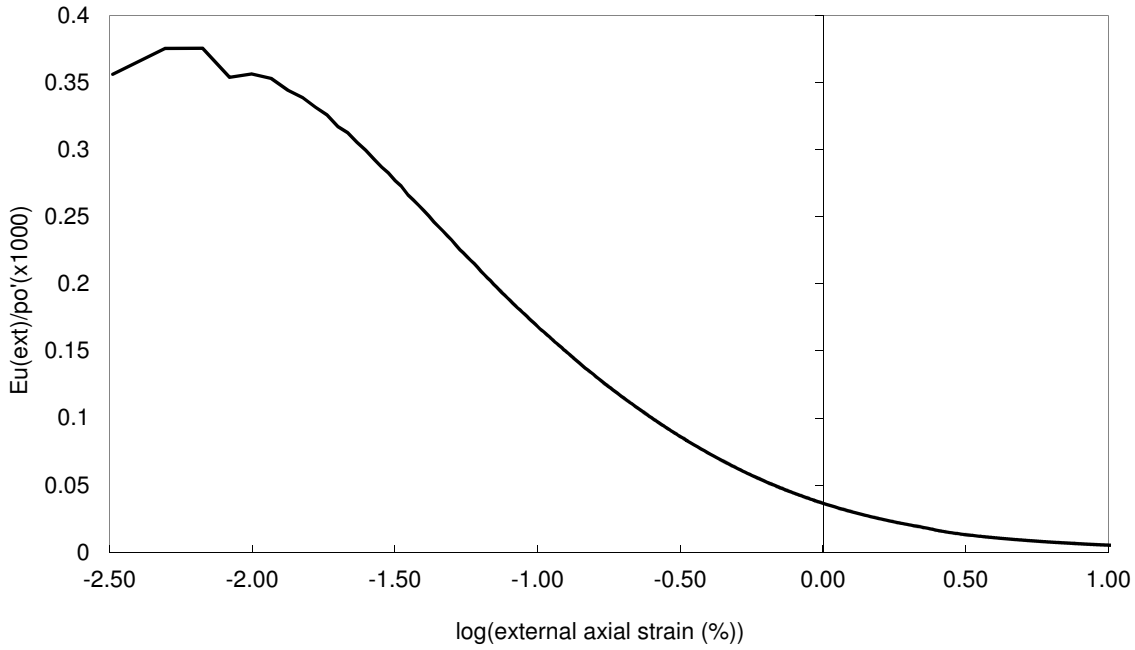
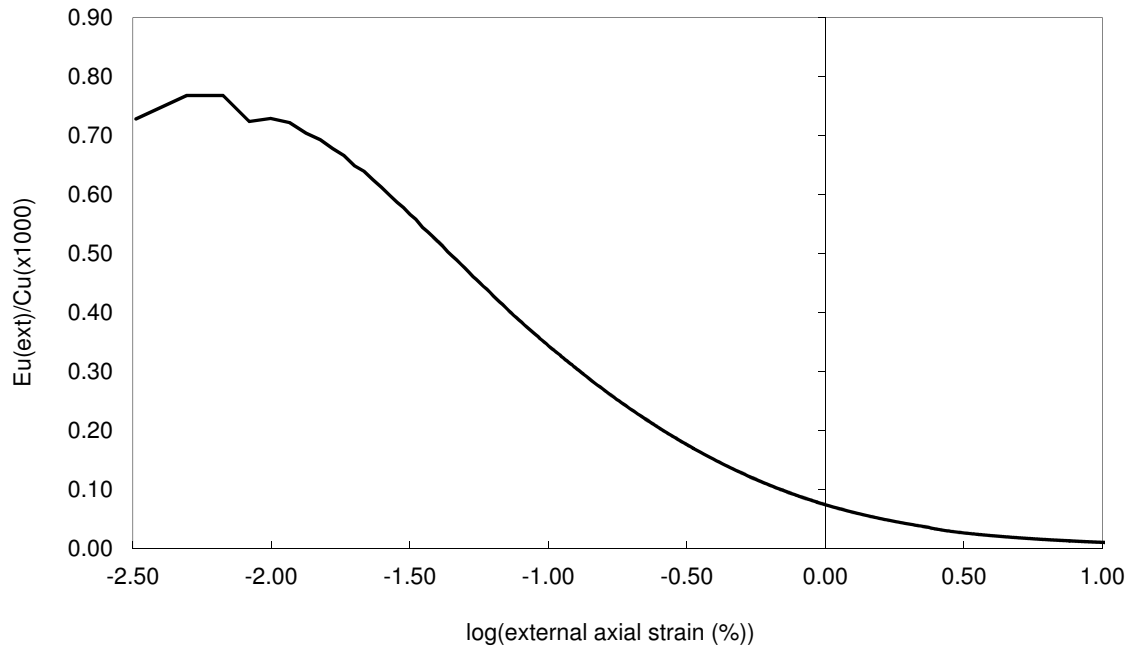
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
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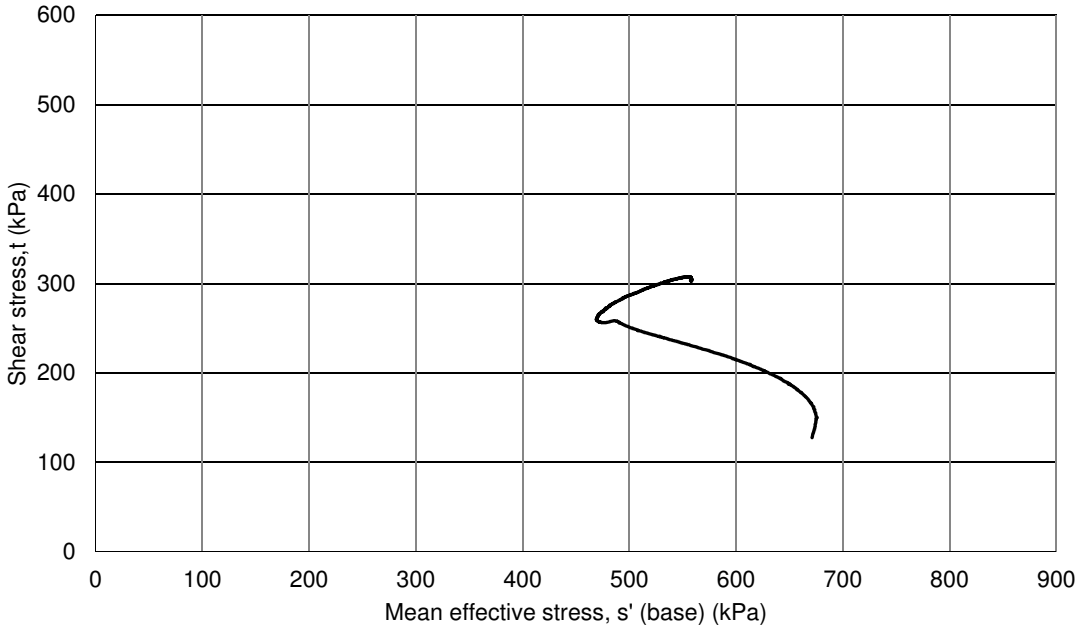
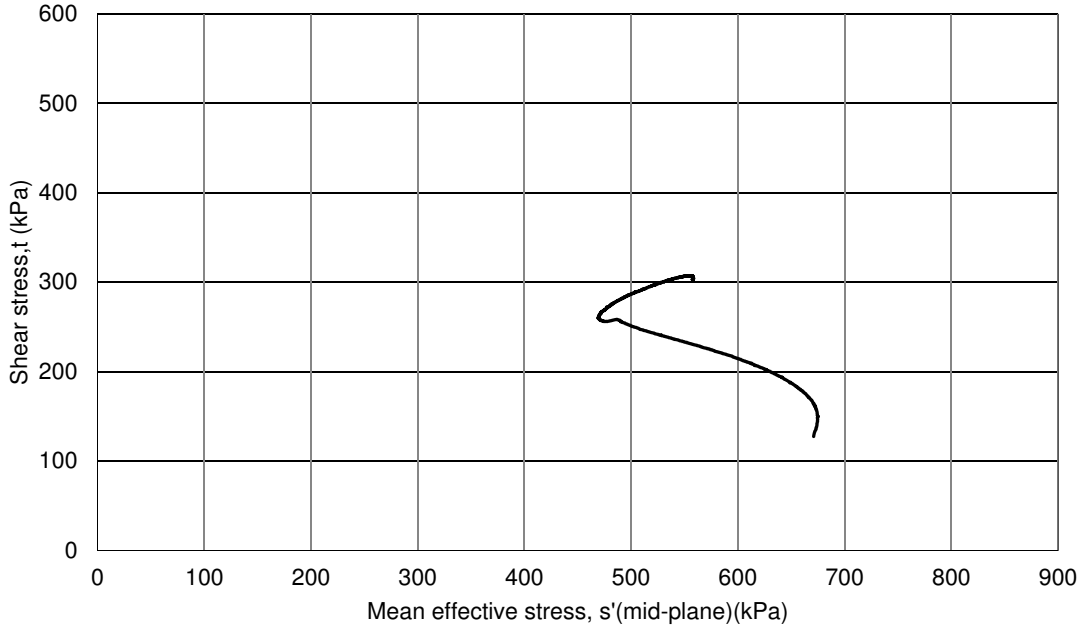
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P23-Q1	Compact brown micaceous SILT with some clay
Sample Depth (m):	67.60-67.80	





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	G7	Description (visual) :	
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches	
Sample Depth (m):	72.20-72.40		

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	142.1	mm		
Diameter :	72.4	mm		
Moisture content :	29.46	%	28.87	%
Bulk density :	1.93	Mg/m³		
Dry density :	1.49	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.8200			
Test Duration:			14 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell pressure increments at NMC)

Stage	#1	#2	#3
Cell pressure (kPa):	800	1000	1200
Base pwp (kPa):	769.4	965.1	1162.3
Mid-plane pwp (kPa):	767.5	963.8	1161.7
Base B values :	0.96	0.98	0.99
Mid-plane B values :	1.05	0.98	0.99

Initial effective stress (mid-plane) : 38.672 kPa

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	667.0	(kPa)
$\Delta e/e_o$	0.1816	

At failure:

External axial strain	5.44	(%)
Peak deviator stress	508	(kPa)
Undrained shear strength	254	(kPa)
Mid plane pore pressure	1397	(kPa)
Base pore pressure	1400	(kPa)
Horizontal effective stress	343	(kPa)
Vertical effective stress	851	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.36	(%)
Deviator stress	388	(kPa)
Mid plane pore pressure	1246	(kPa)
Base pore pressure	1244	(kPa)
Horizontal effective stress	494	(kPa)
Vertical effective stress	882	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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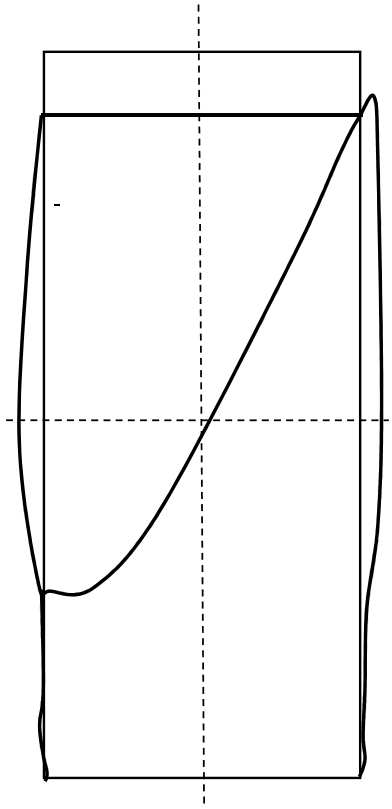
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	

SPECIMEN DETAILS

Initial Height:	142.1	mm
Initial Diameter:	72.4	mm

Elevation



Failure Sketch

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	1200	1740
Mid pwp (kPa)	1161.328	1162.808
Base pwp (kPa)	1162.245	1162.5
s' (kPa)	38.7	711.7
t (kPa)	0.0	134.6
Voids ratio (e)	0.8200	0.6711

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Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
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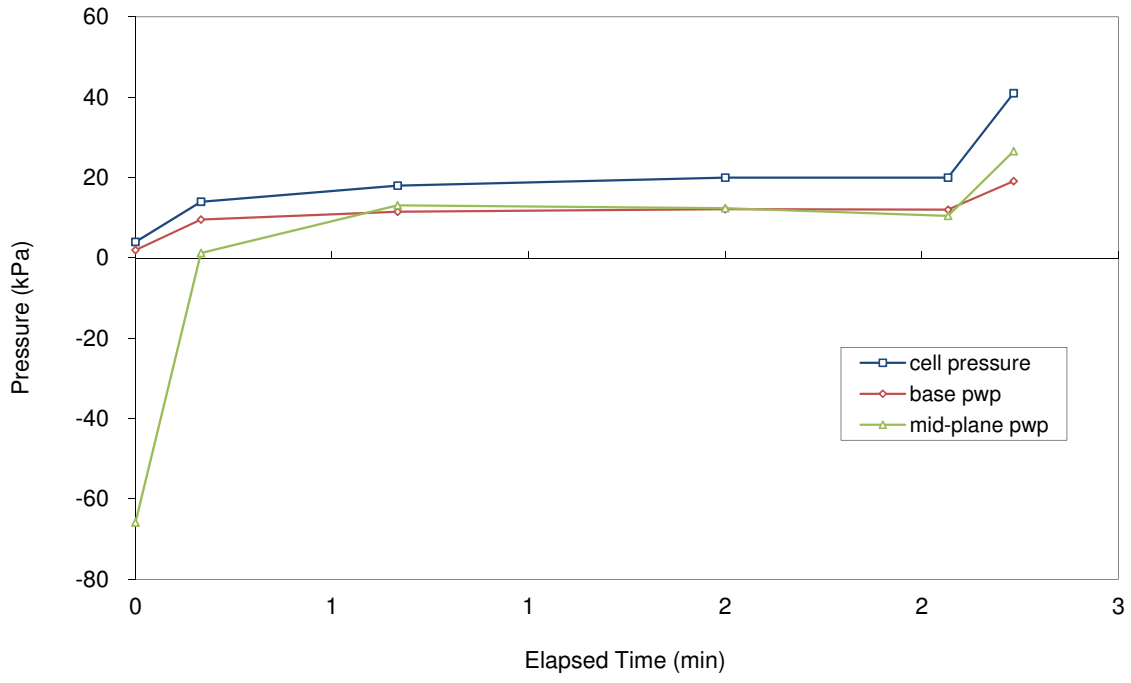
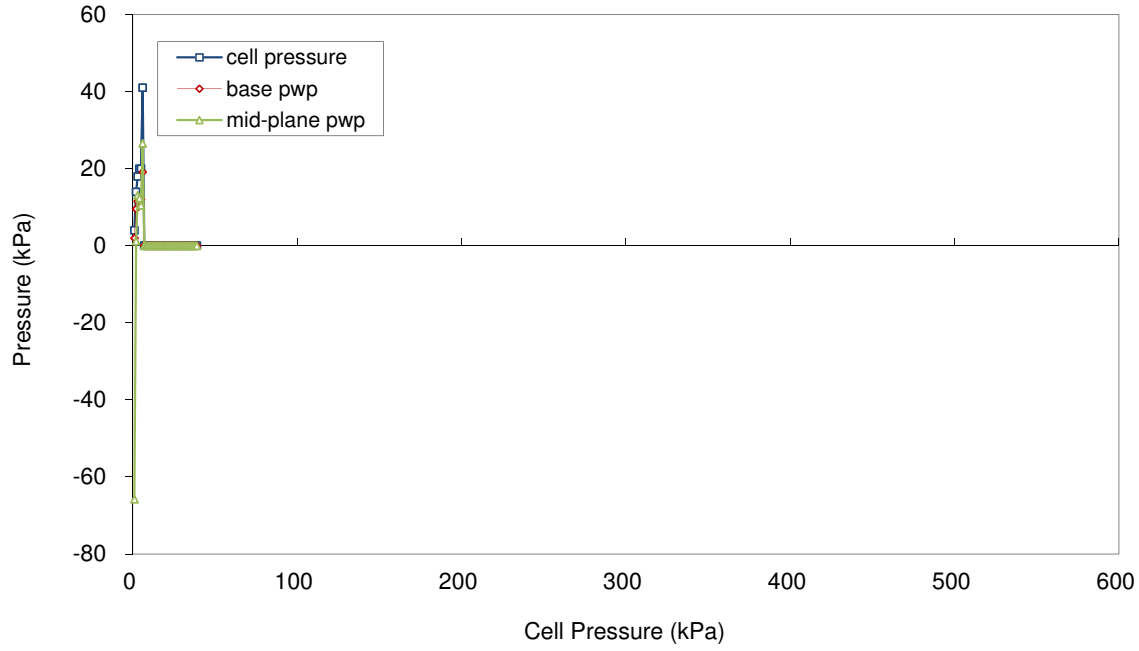
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Determination of Initial Effective Stress

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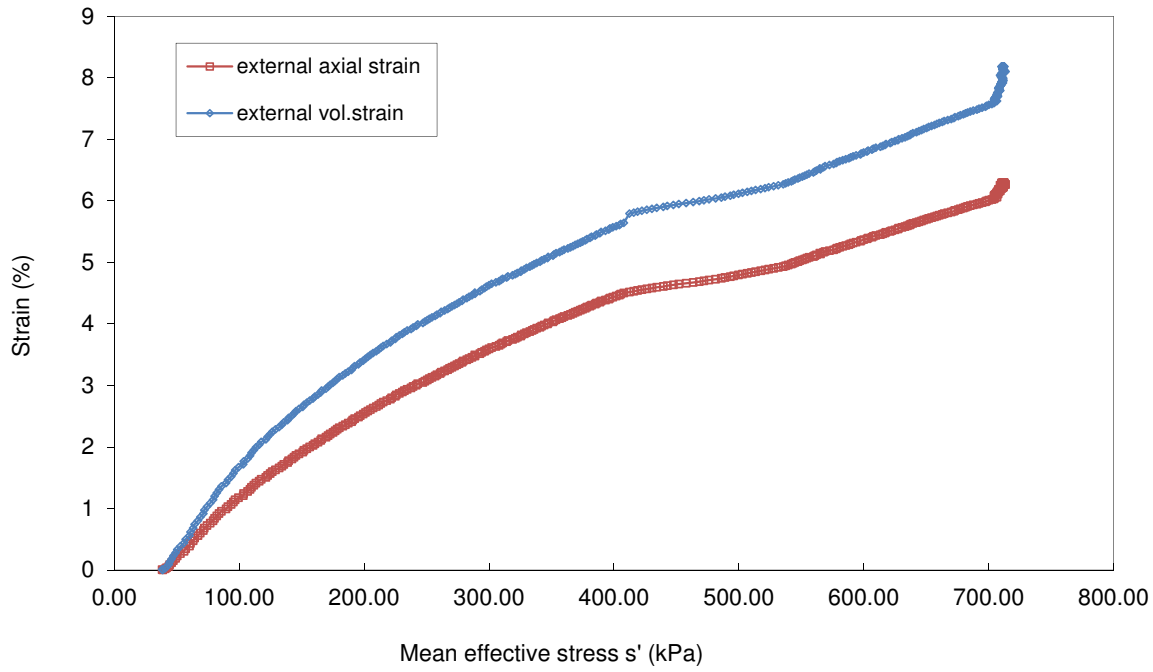
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	



Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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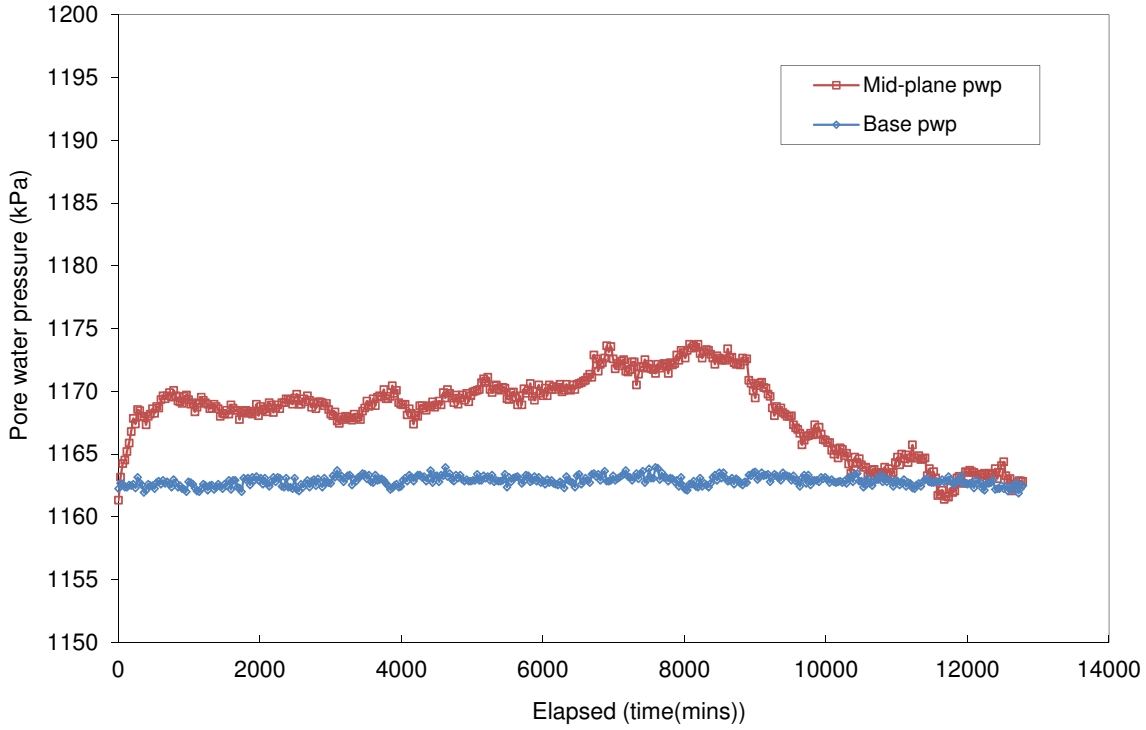
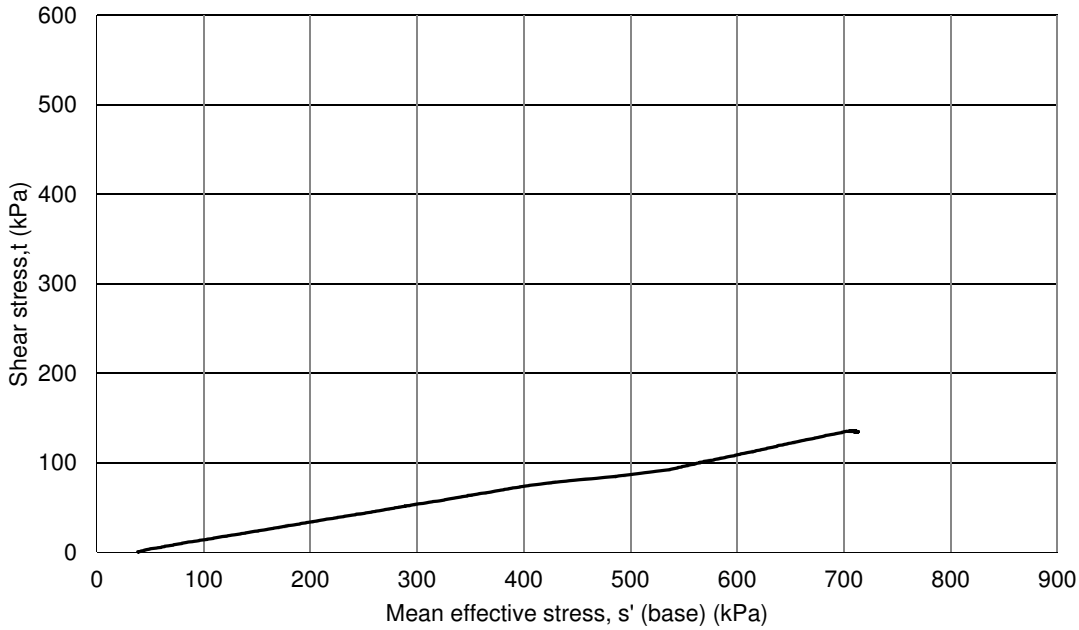
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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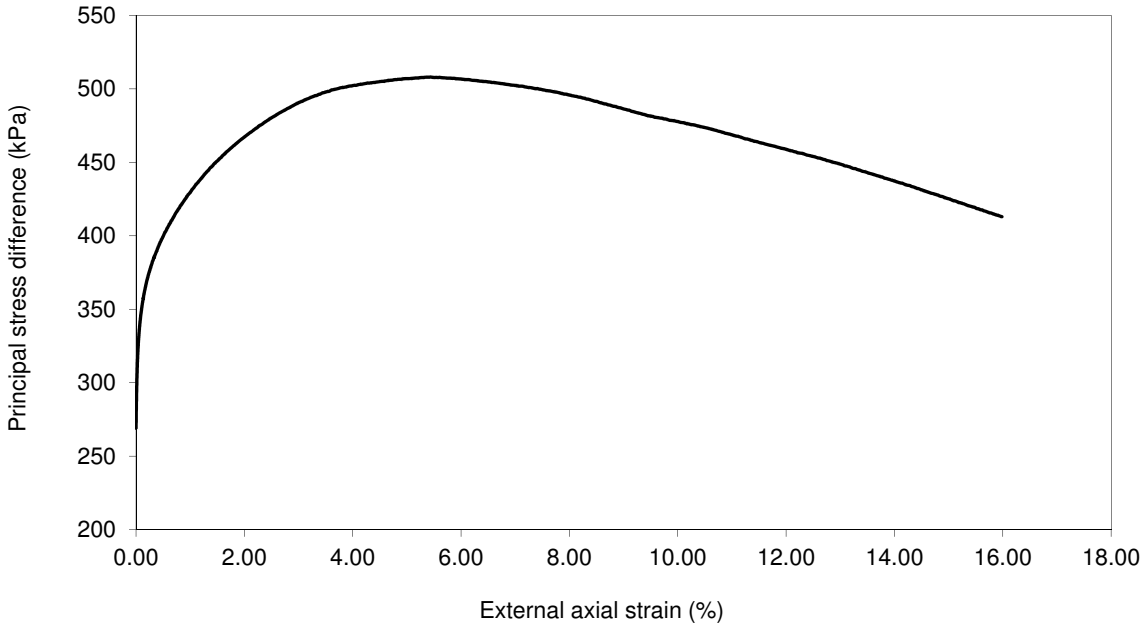
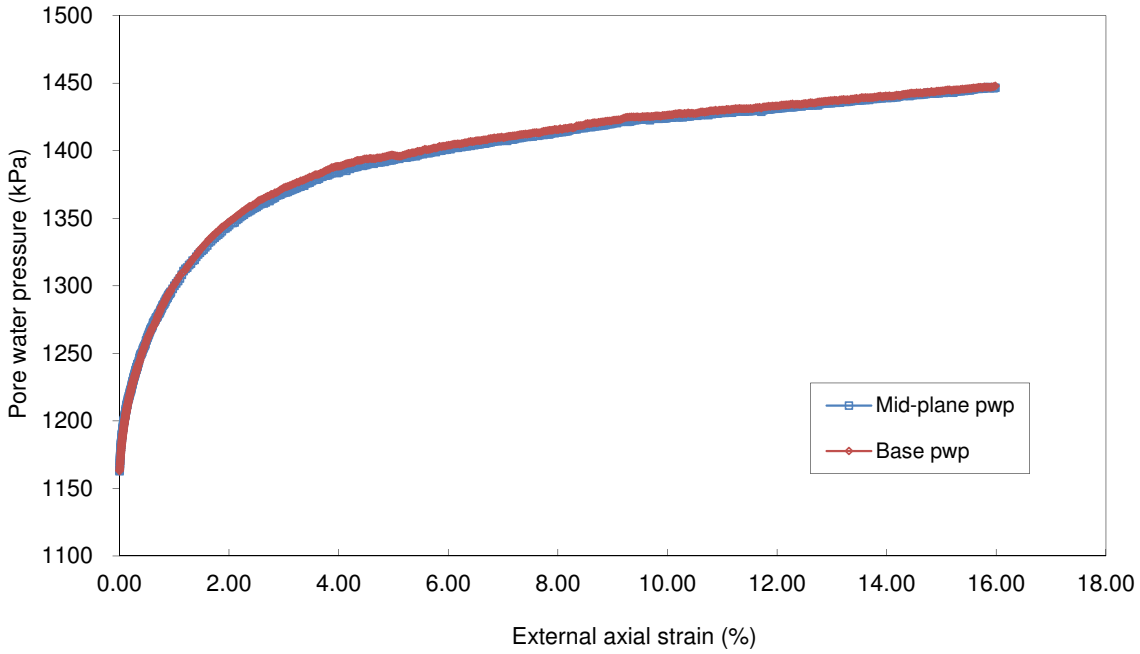
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
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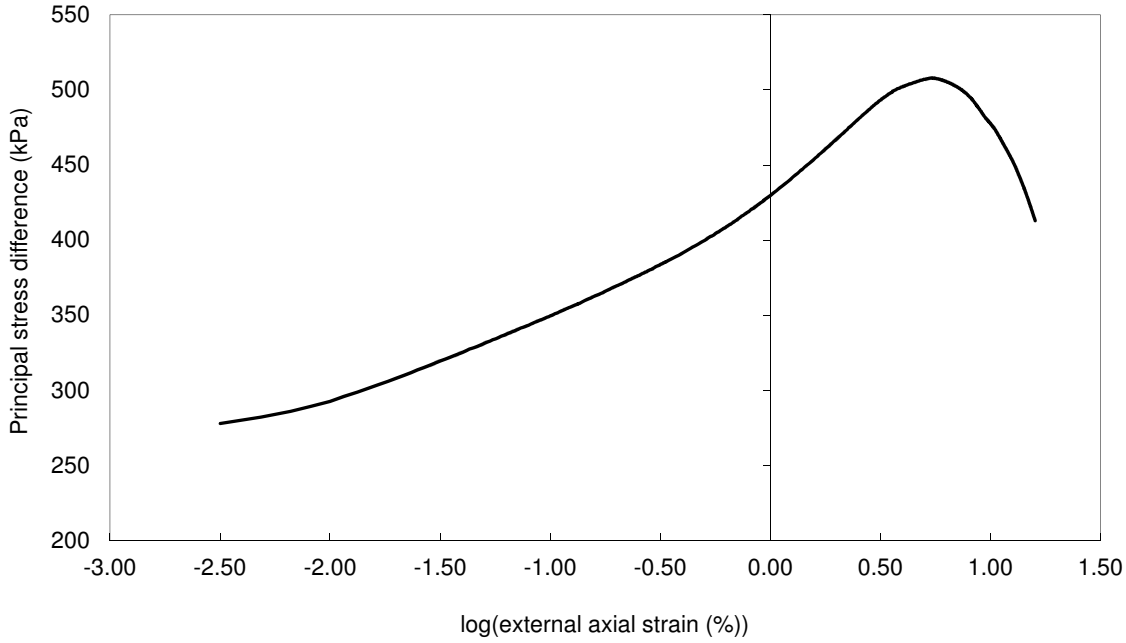
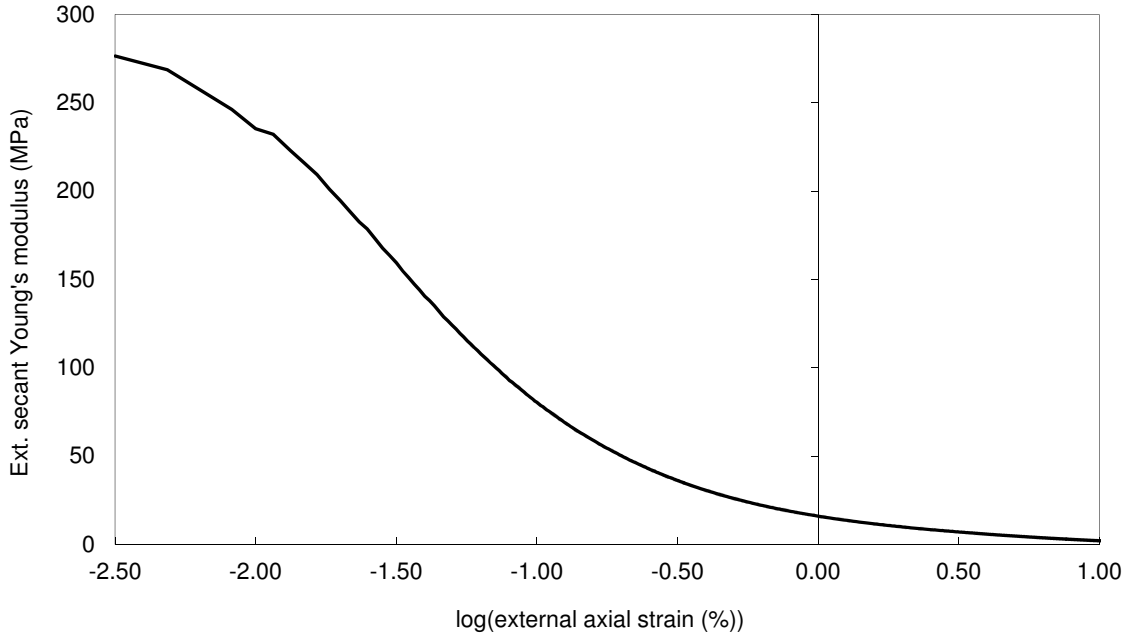
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Undrained Shear Stage

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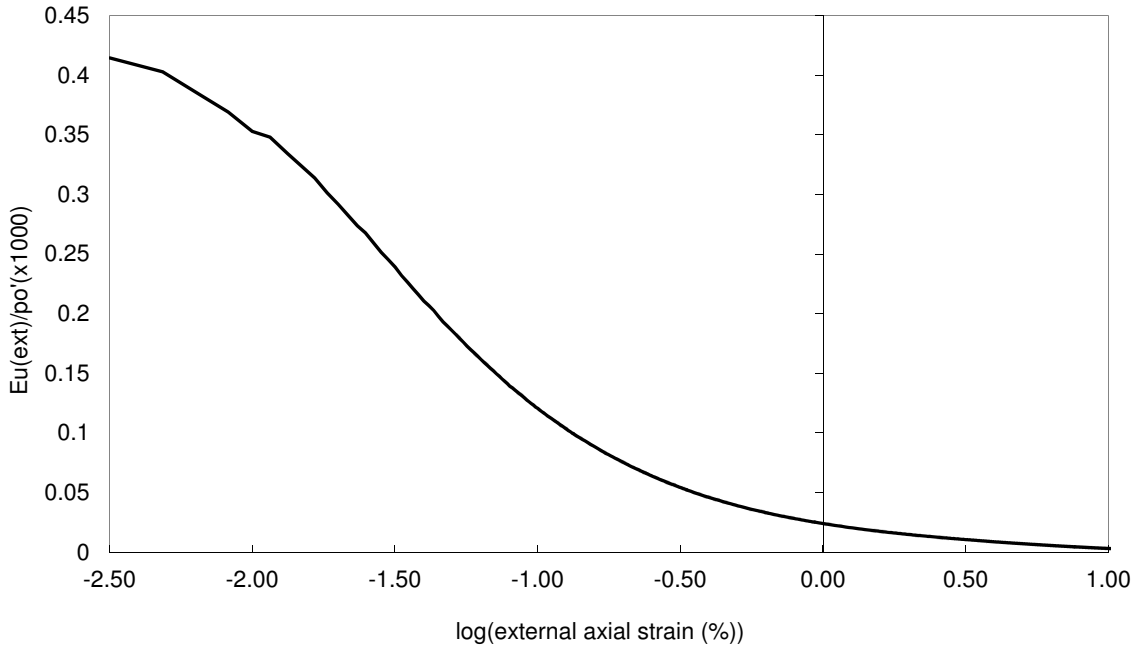
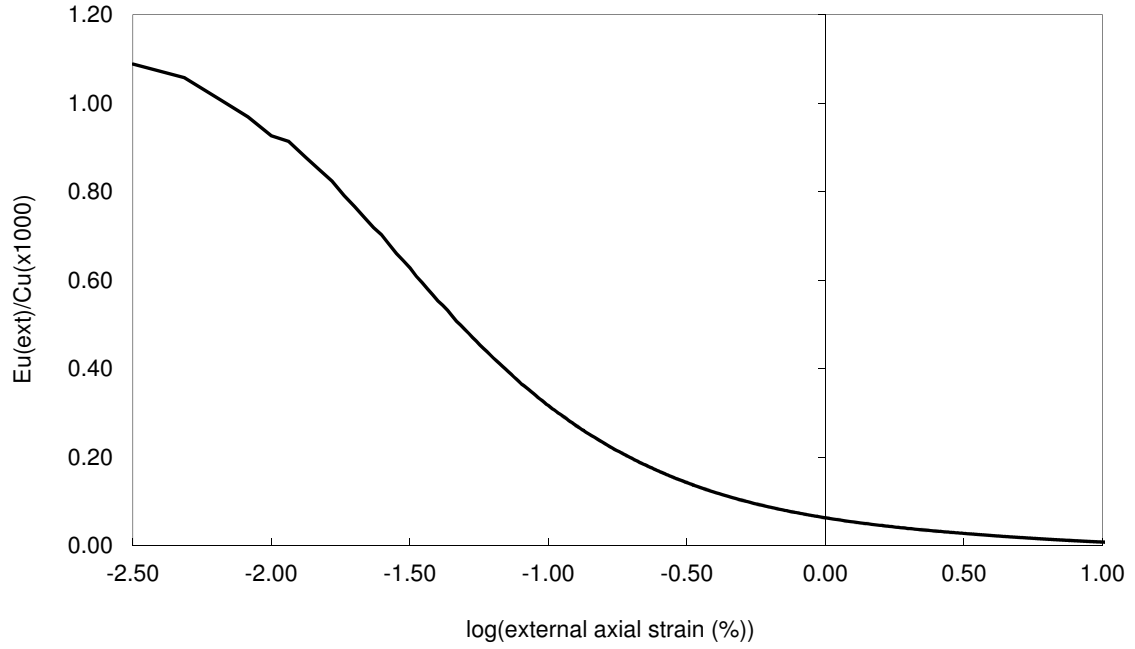
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Undrained Shear Stage

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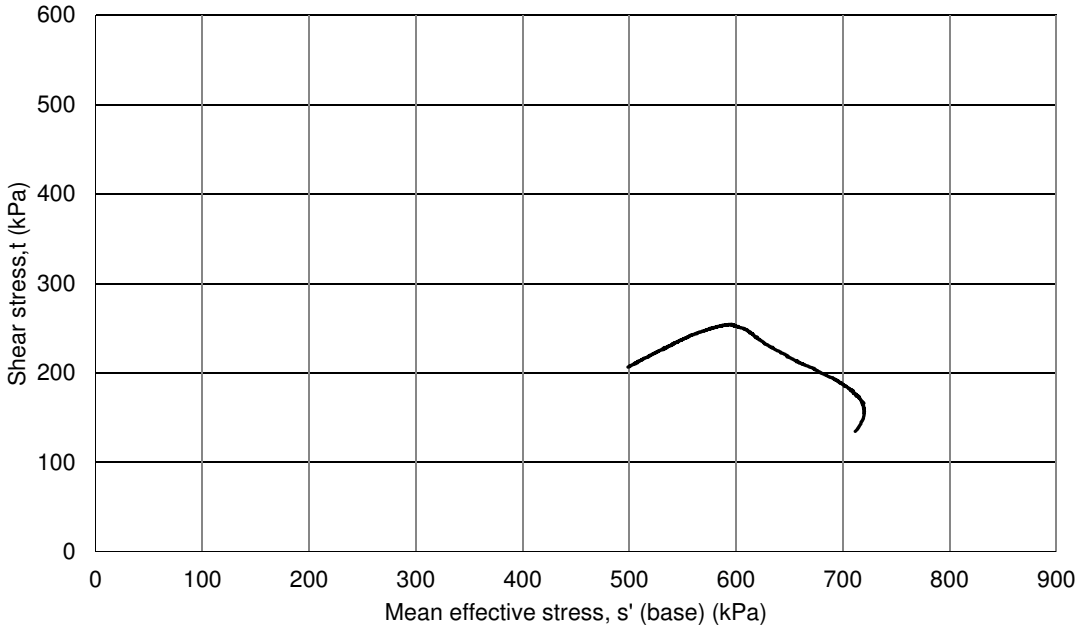
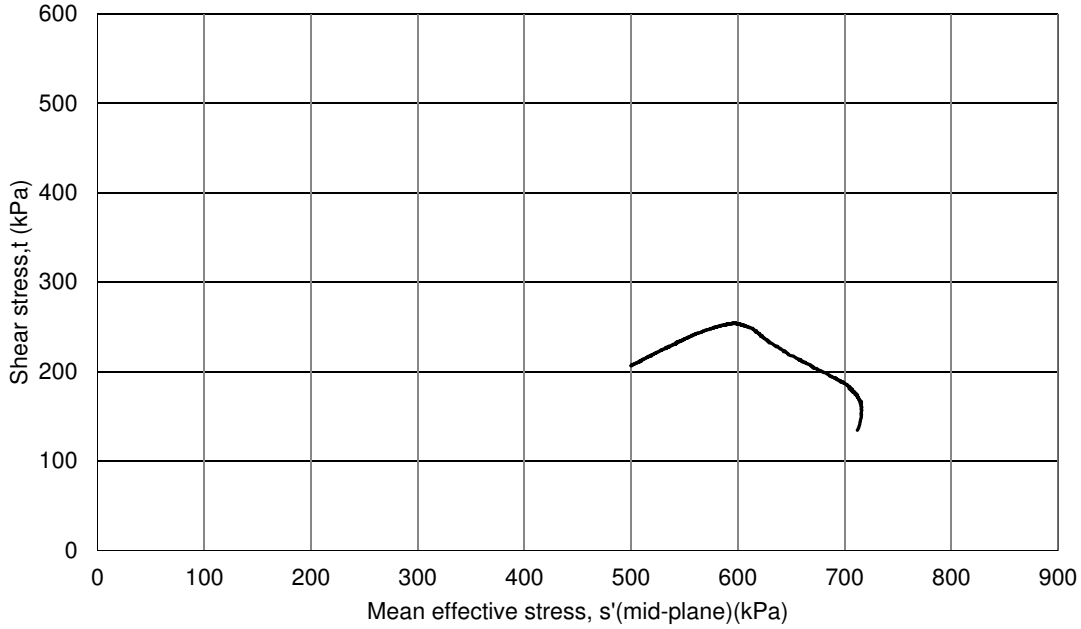
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G7	Description :
Sample Number:	P24-Q2	Stiff grey CLAY with organic black patches
Sample Depth (m):	72.20-72.40	





Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	G17-A	Description (visual) :	
Sample Number:	P05-Q2	Stiff/very stiff grey sandy CLAY	
Sample Depth (m):	56.50-56.70		

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	141.6	mm		
Diameter :	71.1	mm		
Moisture content :	31.70	%	32.64	%
Bulk density :	1.86	Mg/m³		
Dry density :	1.41	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.9285			
Test Duration:			11 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell pressure increments at NMC)

Stage	#1	#2	#3	
Cell pressure (kPa):	800	1000	1200	
Base pwp (kPa):	617.3	804.4	996.6	
Mid-plane pwp (kPa):	616.3	803.9	996.4	
Base B values :	0.78	0.94	0.96	
Mid-plane B values :	0.78	0.94	0.96	
Initial effective stress (mid-plane) :		203.7145	kPa	

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	547.6	(kPa)
$\Delta e/e_o$	0.0595	

At failure:

External axial strain	5.67	(%)
Peak deviator stress	616	(kPa)
Undrained shear strength	308	(kPa)
Mid plane pore pressure	1279	(kPa)
Base pore pressure	1279	(kPa)
Horizontal effective stress	202	(kPa)
Vertical effective stress	819	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.92	(%)
Deviator stress	402	(kPa)
Mid plane pore pressure	1196	(kPa)
Base pore pressure	1196	(kPa)
Horizontal effective stress	285	(kPa)
Vertical effective stress	687	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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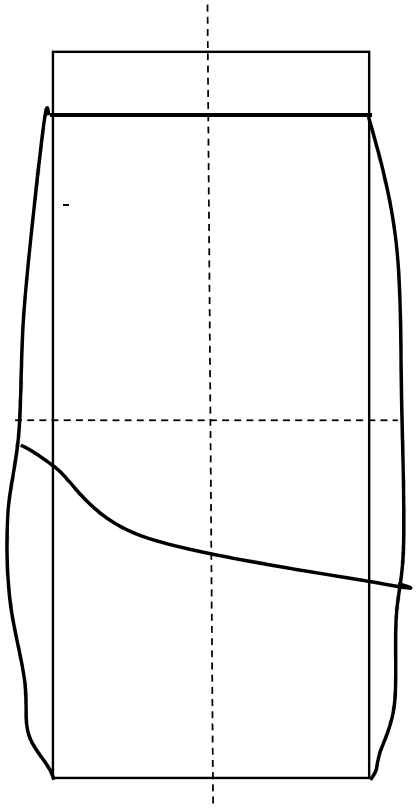
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

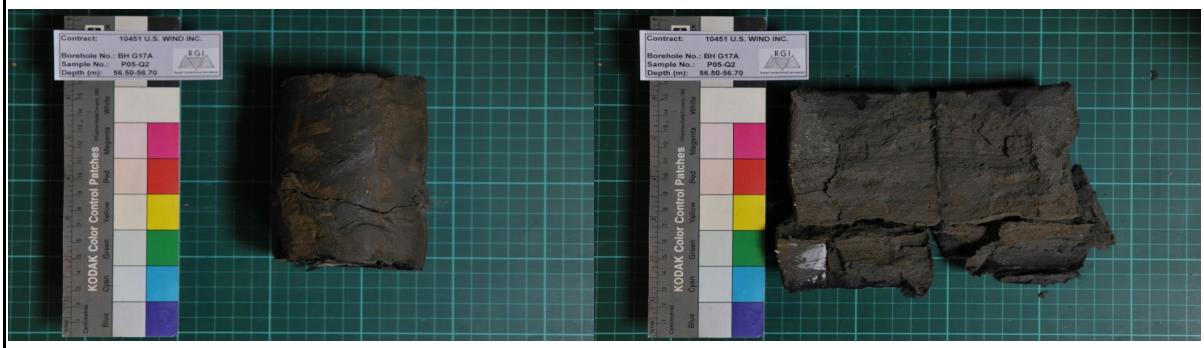
Borehole Number:	G17-A	Description :
Sample Number:	P05-Q2	Stiff/very stiff grey sandy CLAY
Sample Depth (m):	56.50-56.70	

SPECIMEN DETAILS

Initial Height:	141.6	mm
Initial Diameter:	71.1	mm

Elevation





Failure Sketch

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Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G17-A	Description :
Sample Number:	P05-Q2	Stiff/very stiff grey sandy CLAY
Sample Depth (m):	56.50-56.70	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	1200	1481
Mid pwp (kPa)	996.2855	996.1114
Base pwp (kPa)	996.1069	995.9
s' (kPa)	203.7	579.0
t (kPa)	0.0	94.1
Voids ratio (e)	0.9285	0.8732

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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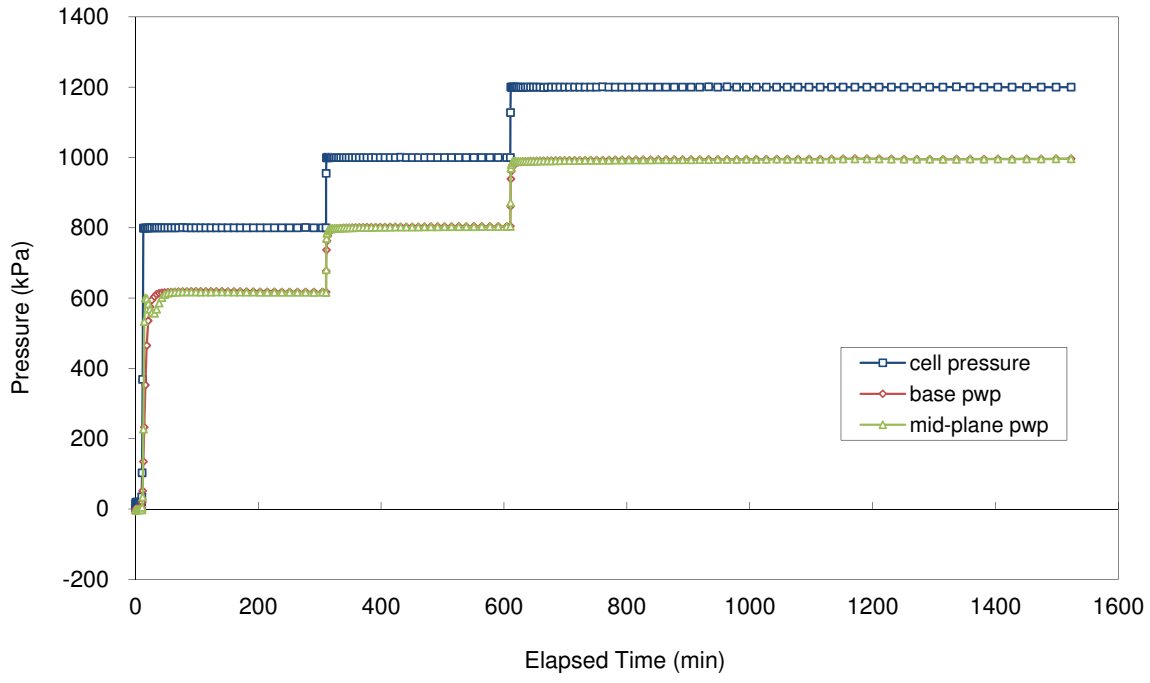
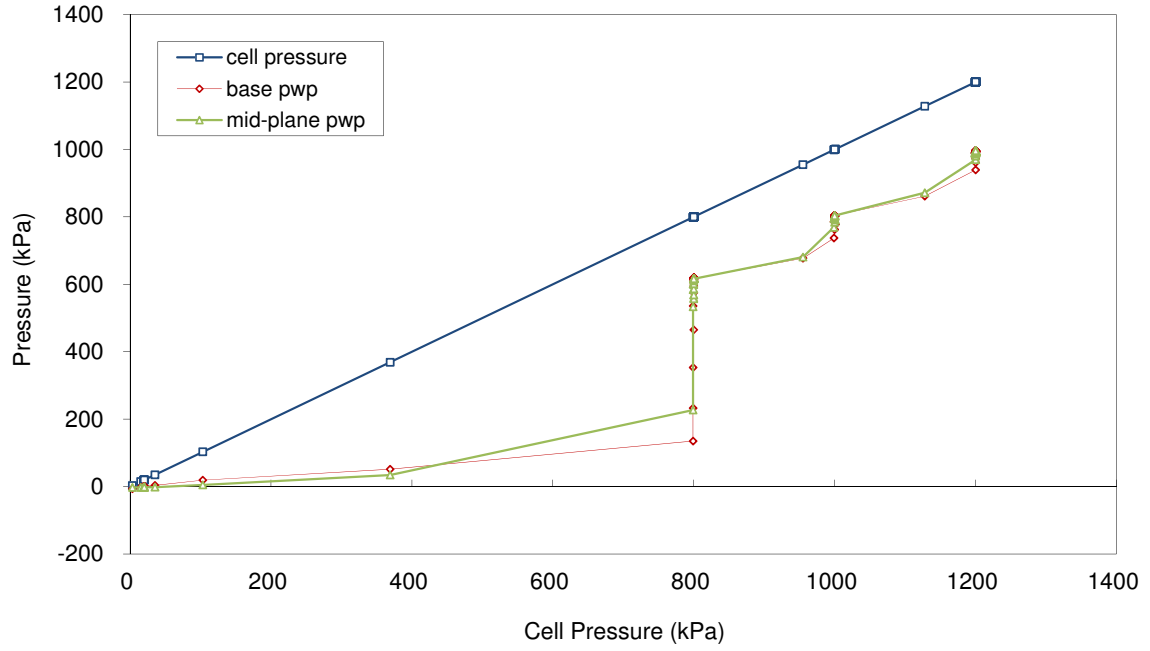
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	G17-A	Description :
Sample Number:	P05-Q2	Stiff/very stiff grey sandy CLAY
Sample Depth (m):	56.50-56.70	





Determination of Initial Effective Stress

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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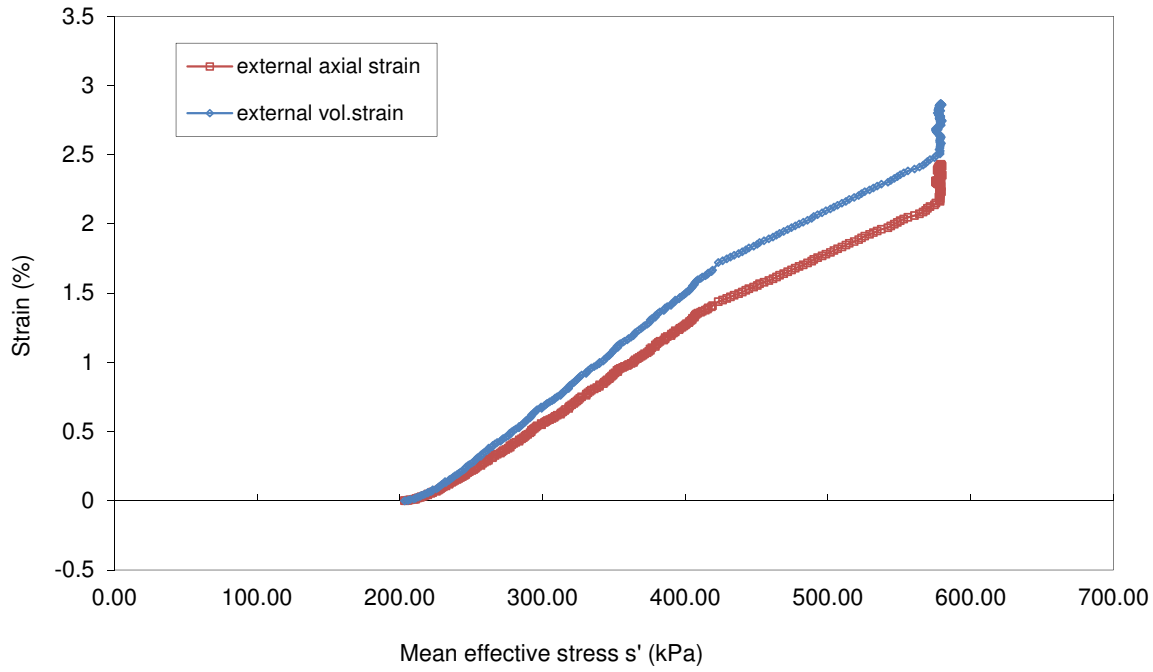

Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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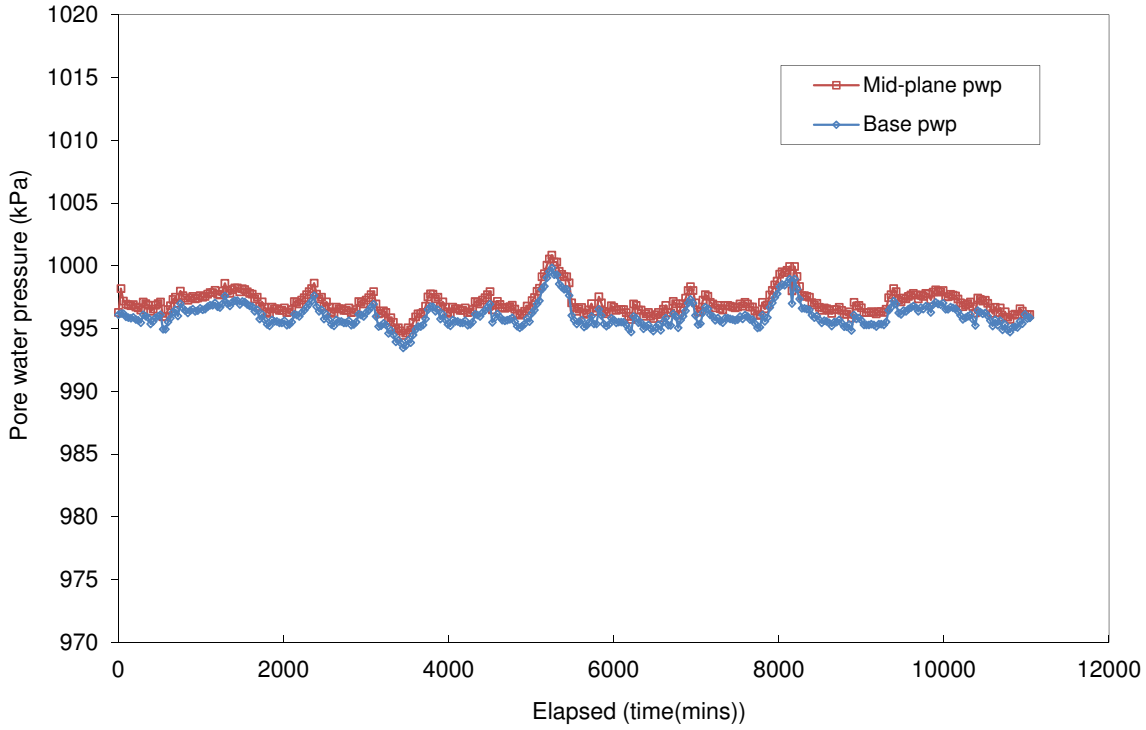

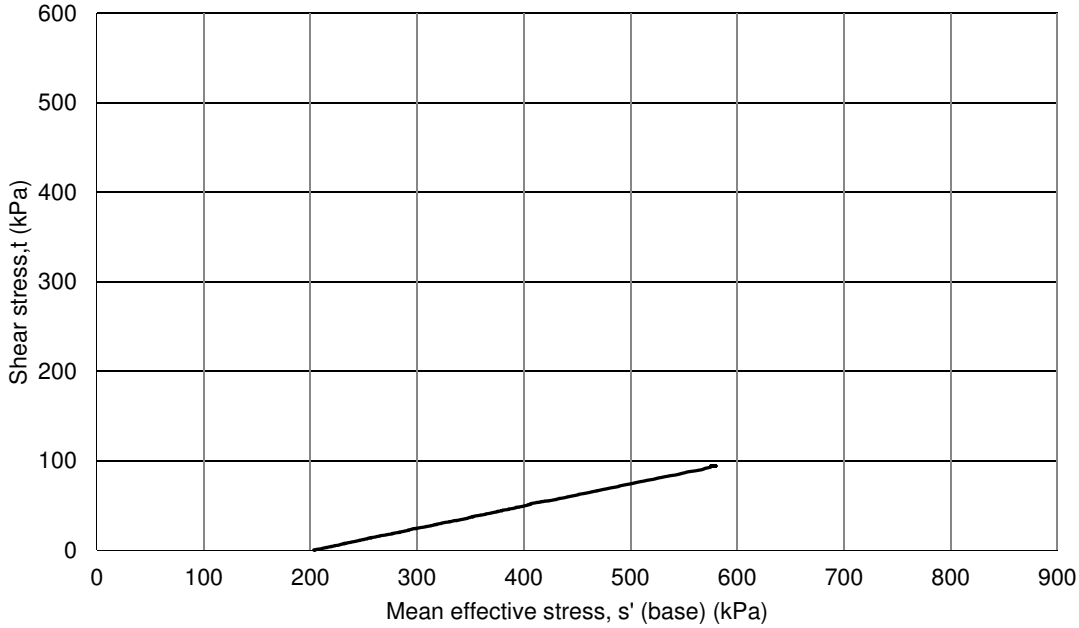

Anisotropic Consolidation/Swelling Stage #1

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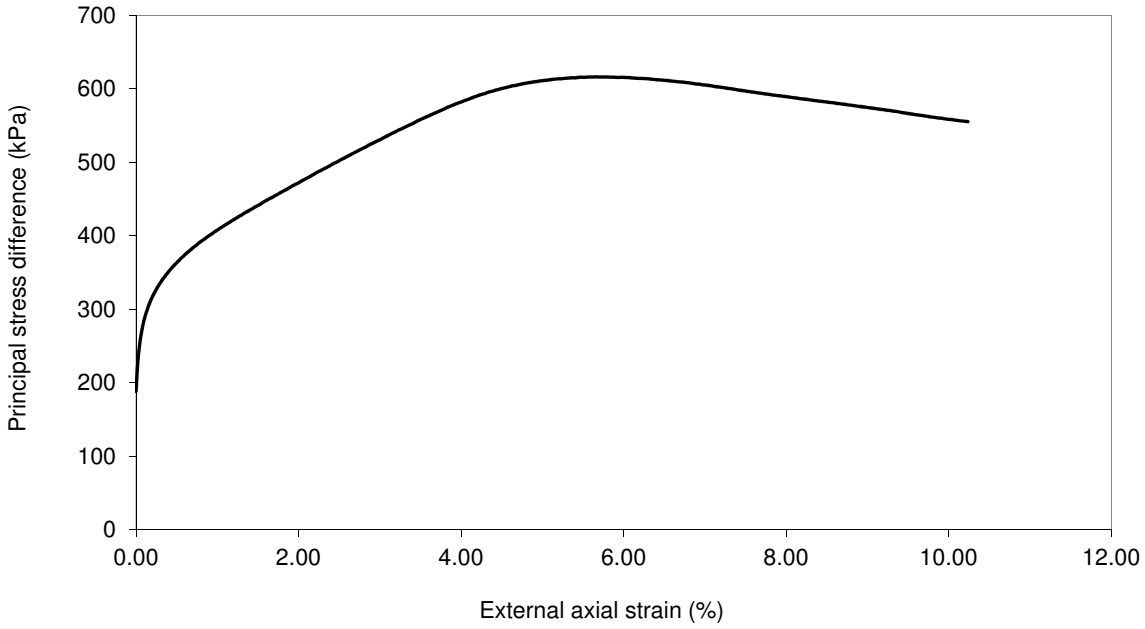

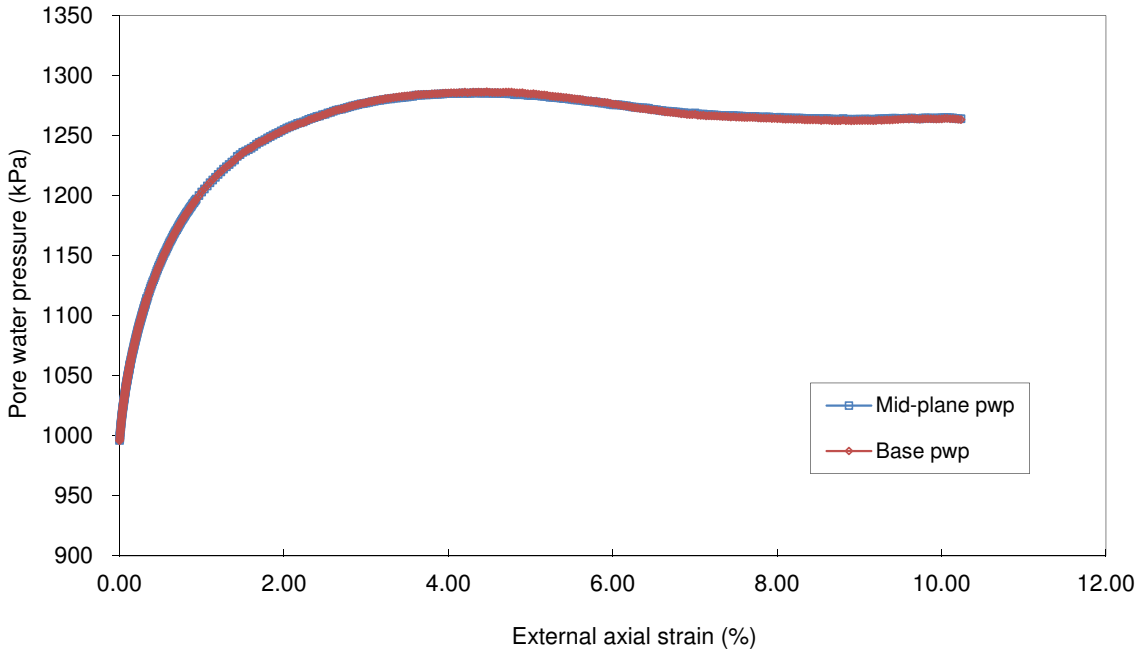

Undrained Shear Stage

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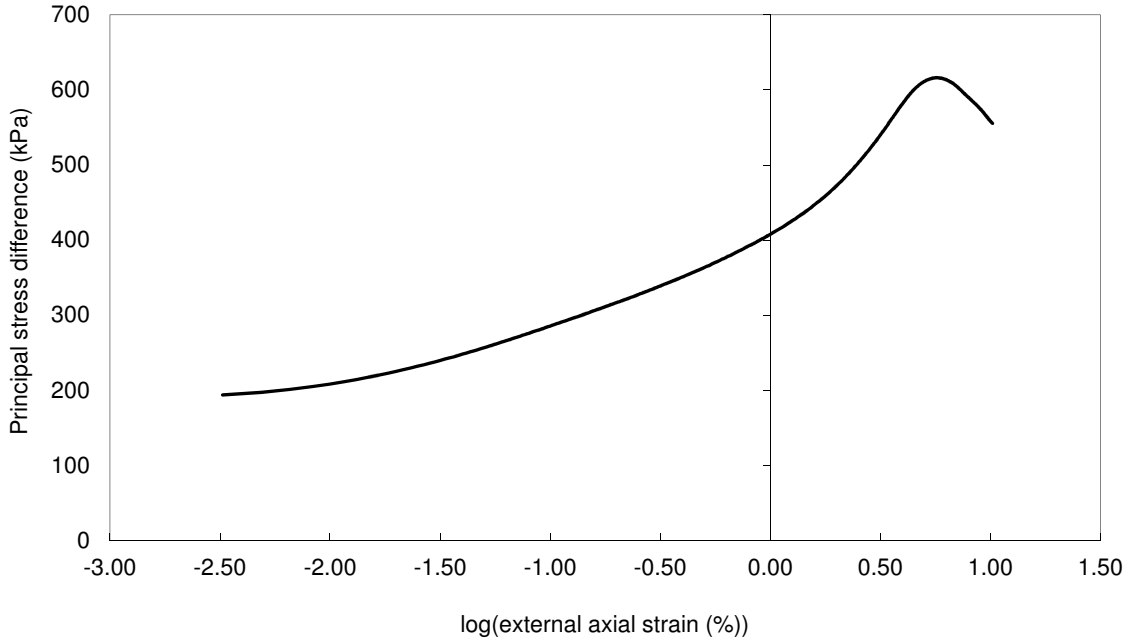

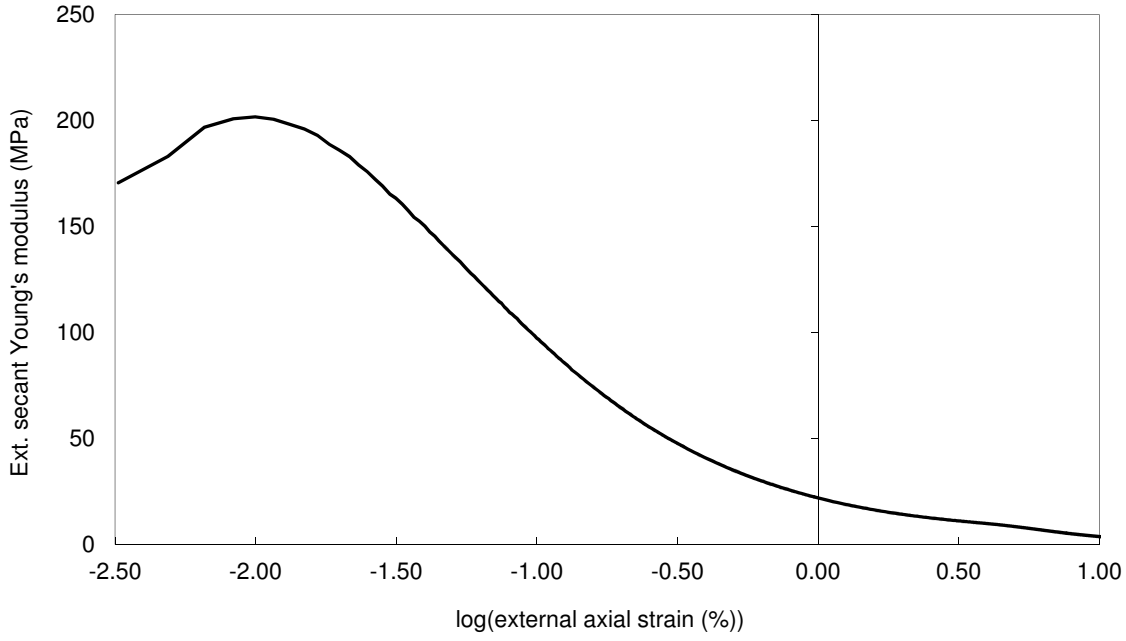

Undrained Shear Stage

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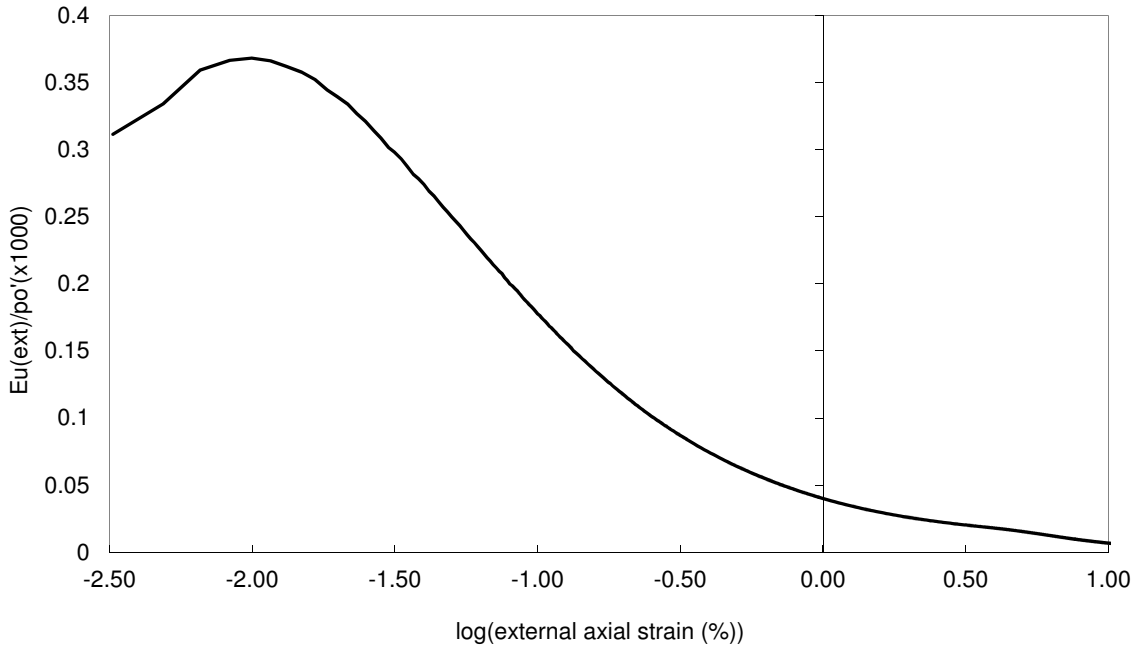

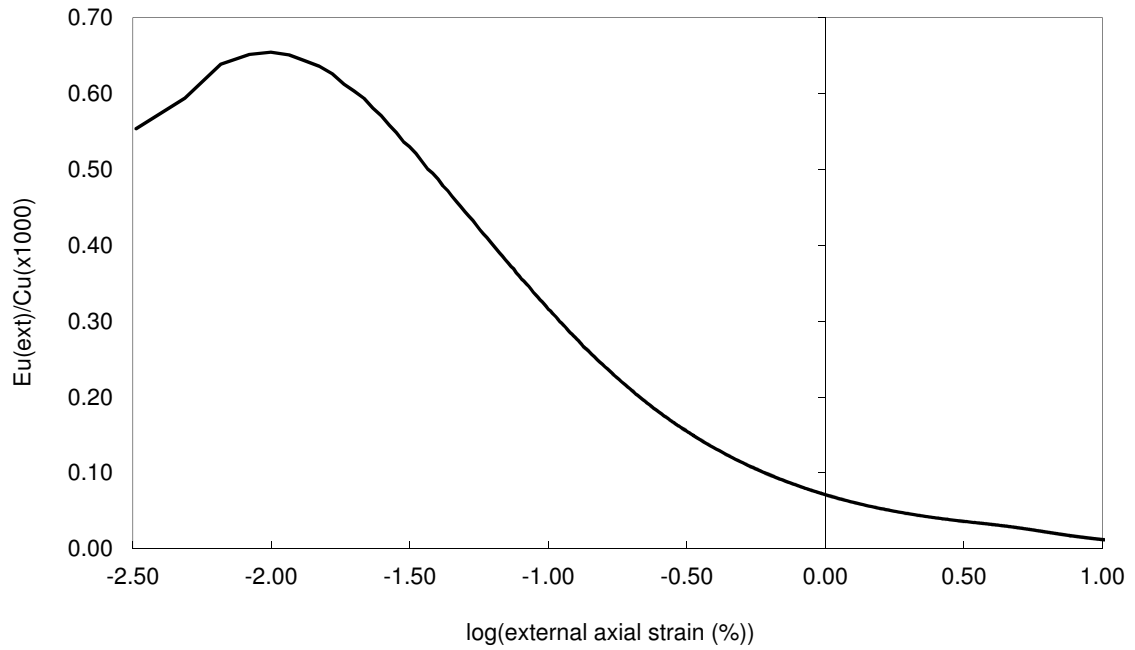

Undrained Shear Stage

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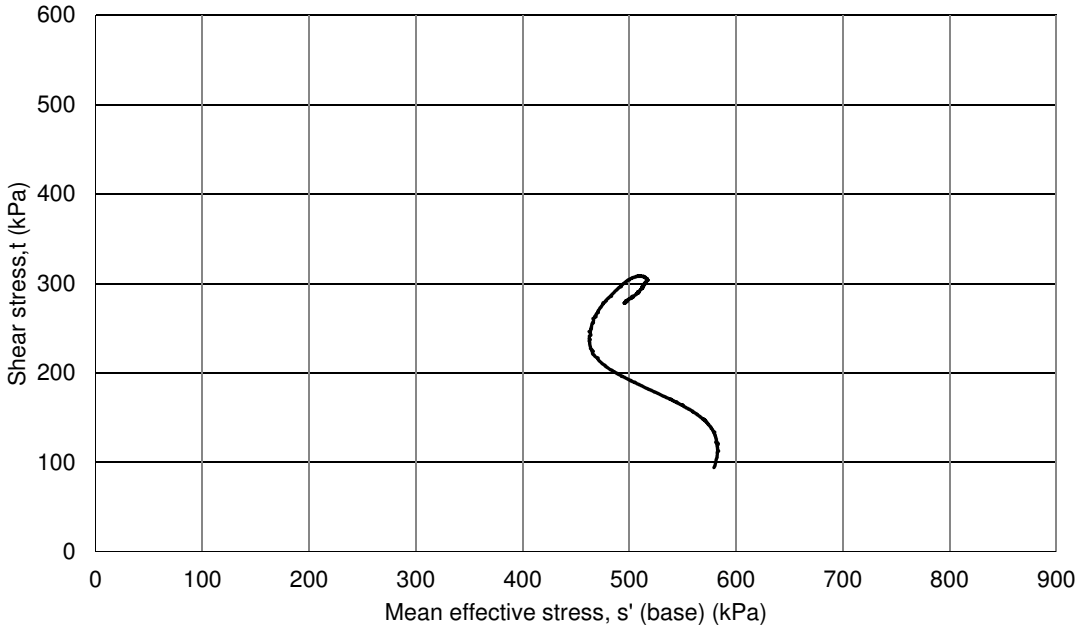

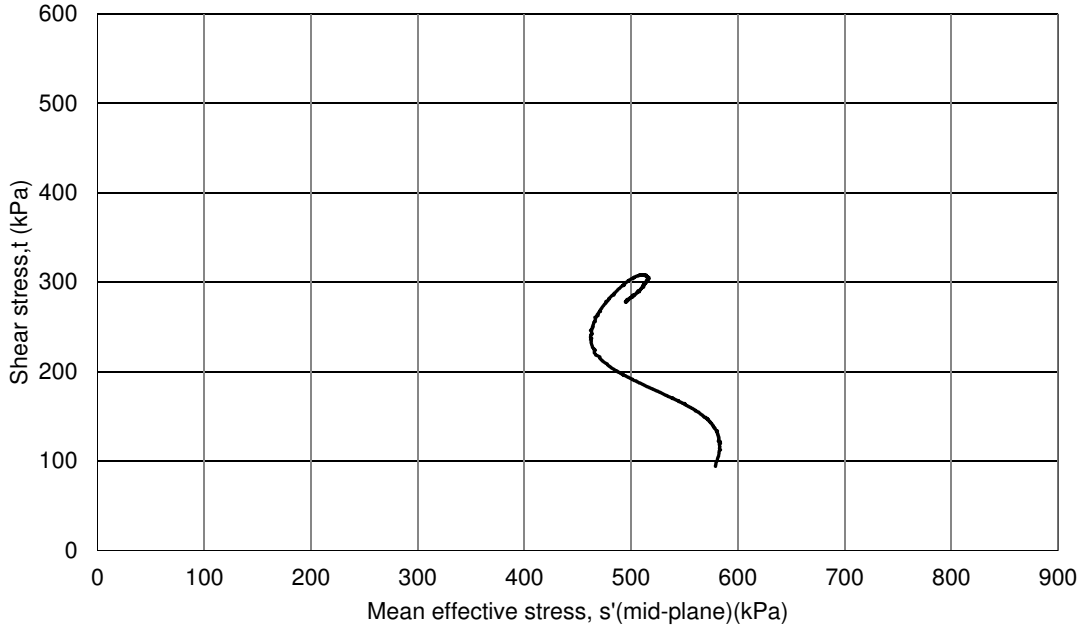

Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	H10	Description (visual) :	
Sample Number:	P3-Q1	Firm grey slightly organic grey CLAY with lenses	
Sample Depth (m):	2.00-2.20	of medium sand and shells	

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	142.7	mm		
Diameter :	72.6	mm		
Moisture content :	32.78	%	31.56	%
Bulk density :	2.02	Mg/m³		
Dry density :	1.52	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.7860			
Test Duration:			10 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell/Back pressure ramp (#2 Undrained))

Stage	#1	#2	
Cell pressure (kPa):	600	700	
Base pwp (kPa):	590	690	
Mid-plane pwp (kPa):	589	687.7	
Base B values :	0.99	1.00	
Mid-plane B values :	0.99	0.99	
Initial effective stress (mid-plane) :		12.2	kPa

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	63.0	(kPa)
$\Delta e/e_o$	0.0591	

At failure:

External axial strain	8.41	(%)
Peak deviator stress	137	(kPa)
Undrained shear strength	69	(kPa)
Mid plane pore pressure	713	(kPa)
Base pore pressure	718	(kPa)
Horizontal effective stress	44	(kPa)
Vertical effective stress	181	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	1.24	(%)
Deviator stress	69	(kPa)
Mid plane pore pressure	731	(kPa)
Base pore pressure	734	(kPa)
Horizontal effective stress	26	(kPa)
Vertical effective stress	95	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
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Date: 15/02/2016		

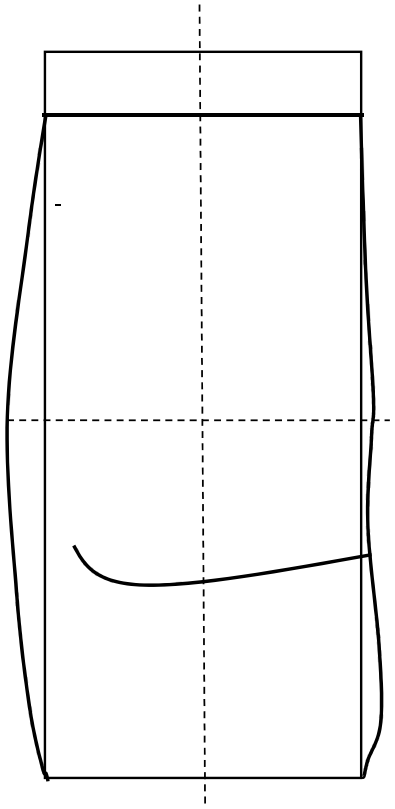
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P3-Q1	Firm grey slightly organic grey CLAY with lenses
Sample Depth (m):	2.00-2.20	of medium sand and shells

SPECIMEN DETAILS

Initial Height:	142.7	mm
Initial Diameter:	72.6	mm

Elevation



Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P3-Q1	Firm grey slightly organic grey CLAY with lenses
Sample Depth (m):	2.00-2.20	of medium sand and shells

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	700	757
Mid pwp (kPa)	687.8	688.7
Base pwp (kPa)	687.9	690.2
s' (kPa)	12.2	60.4
t (kPa)	0.0	-7.9
Voids ratio (e)	0.7860	0.7396

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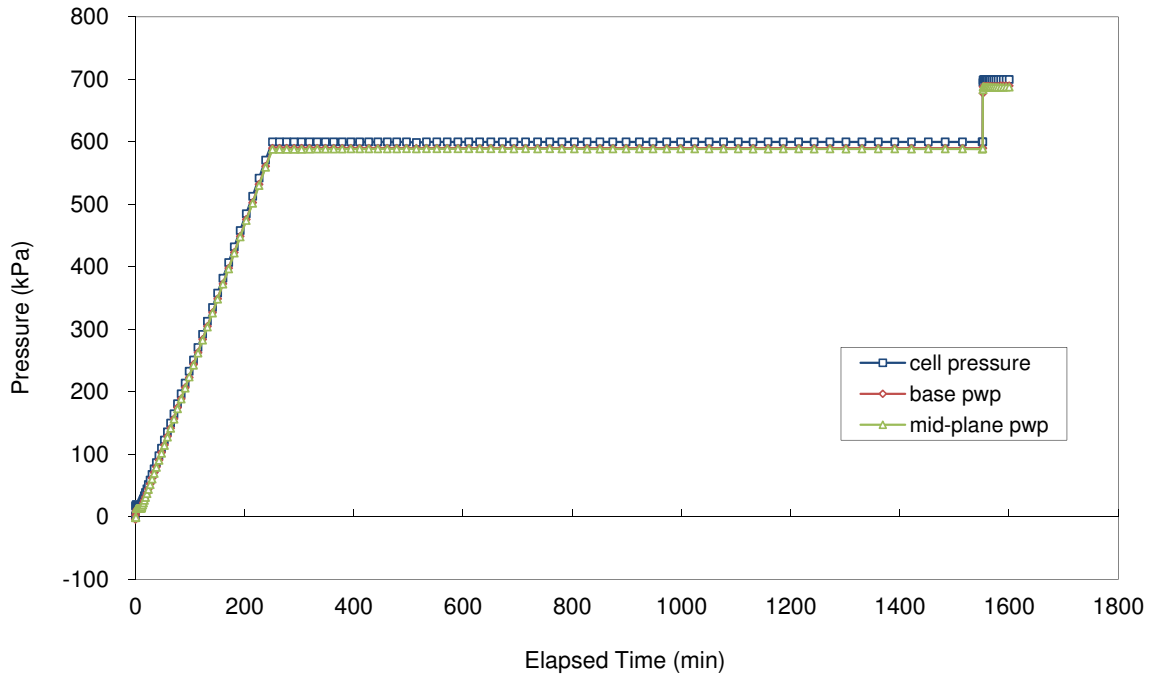

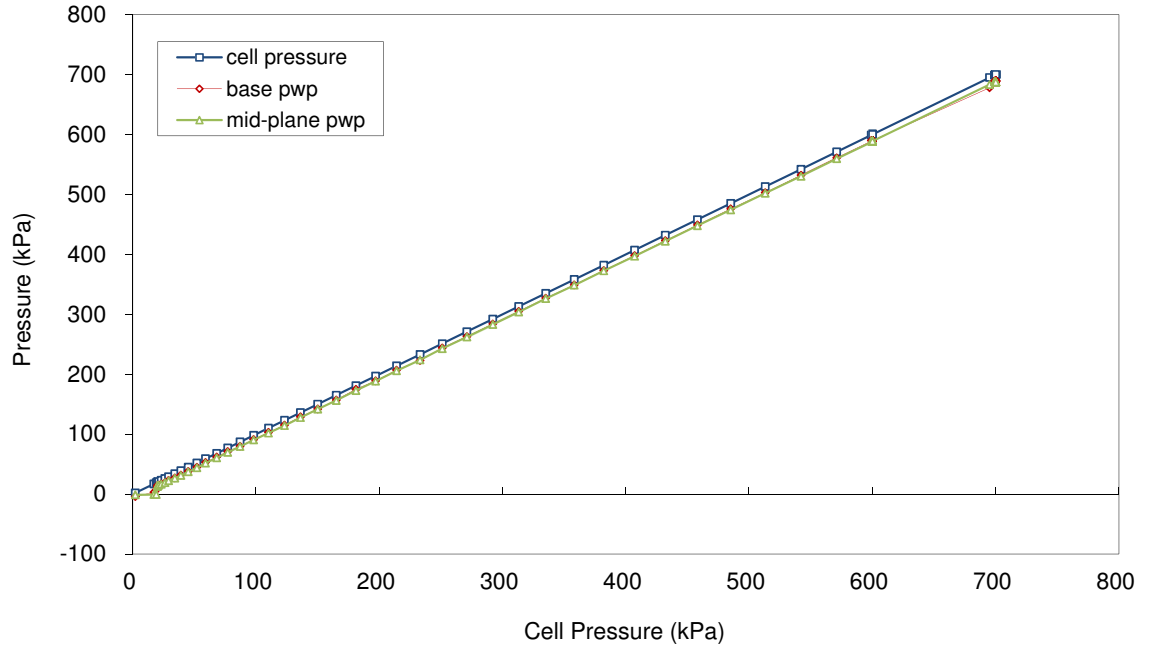

Determination of Initial Effective Stress

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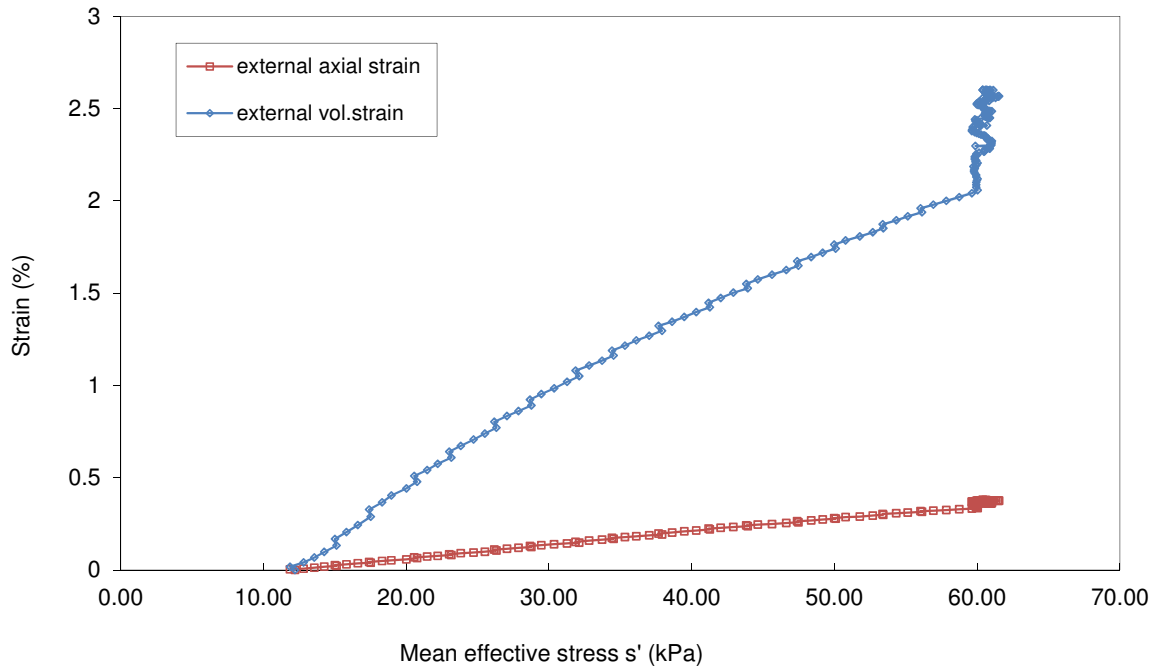

Anisotropic Consolidation/Swelling Stage #1

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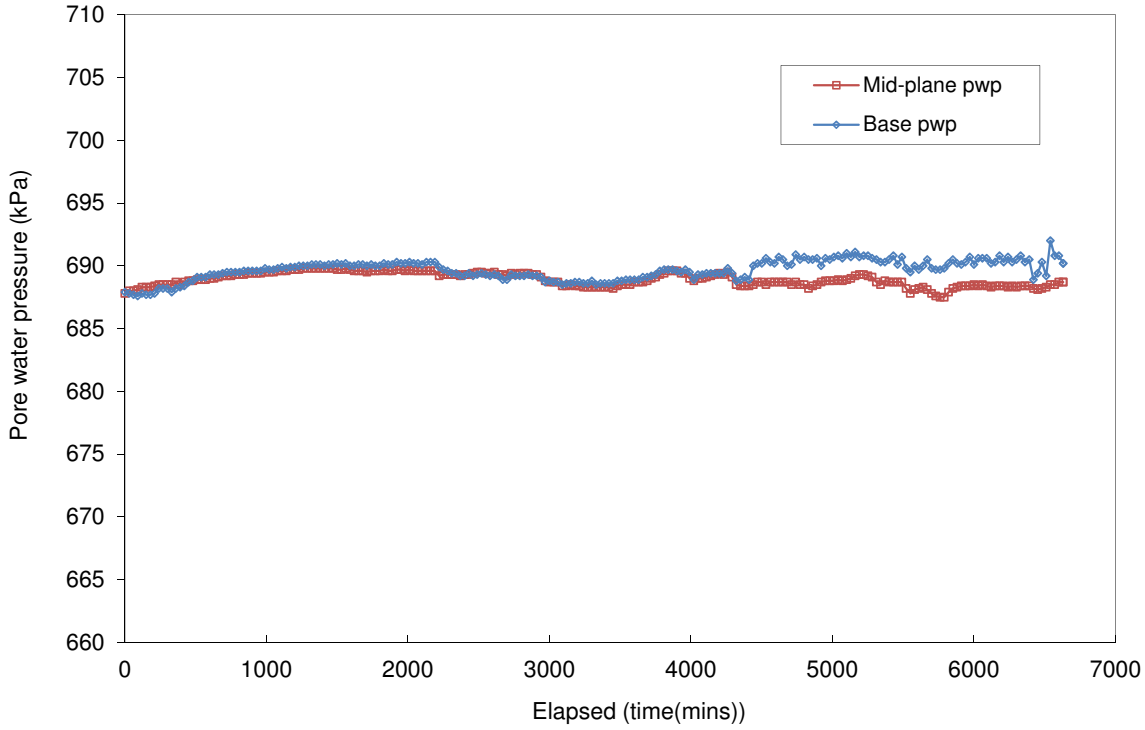

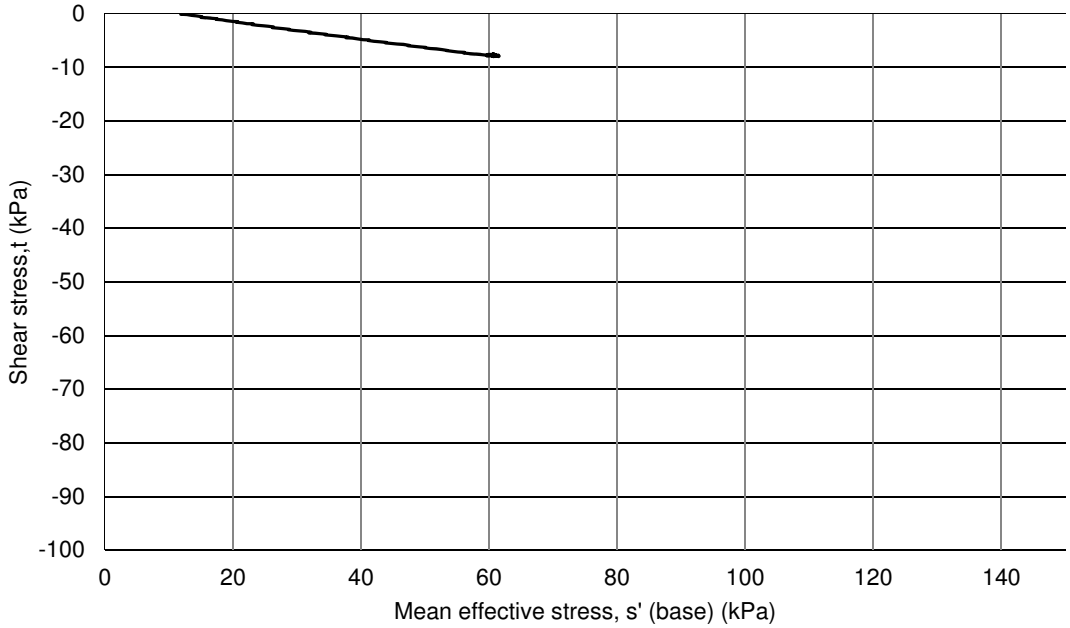

Anisotropic Consolidation/Swelling Stage #1

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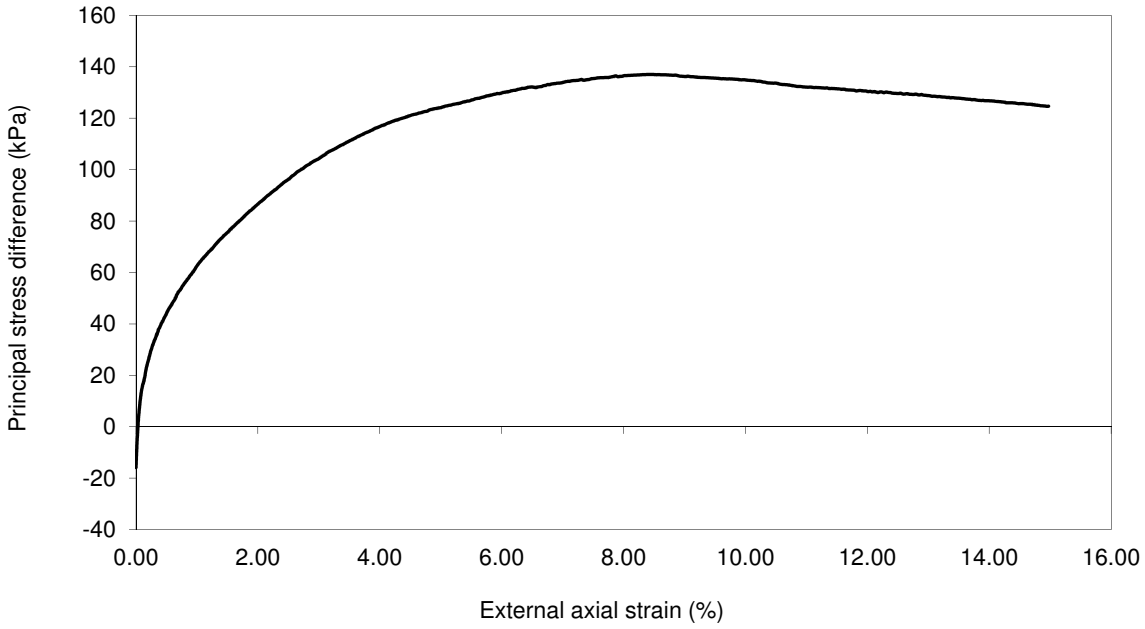

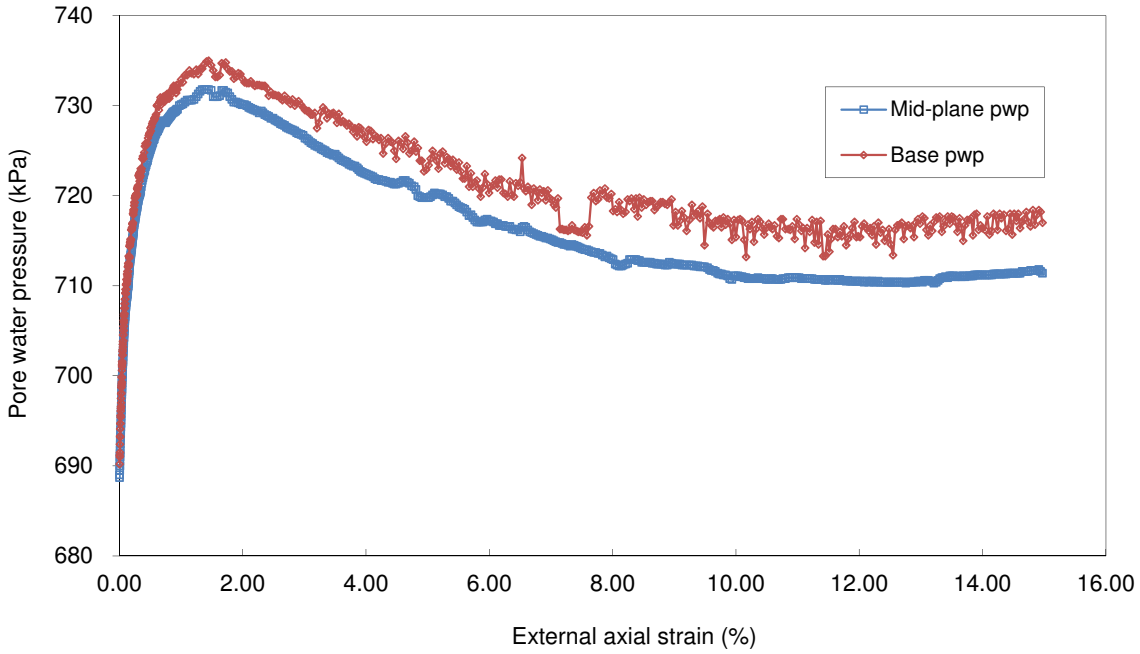

Undrained Shear Stage

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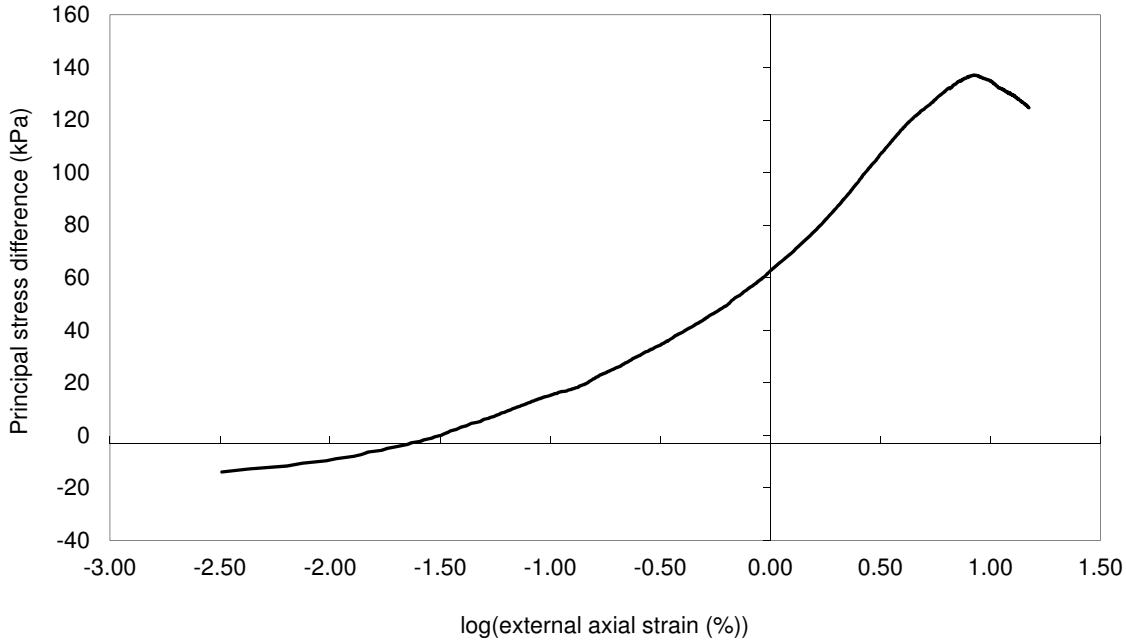

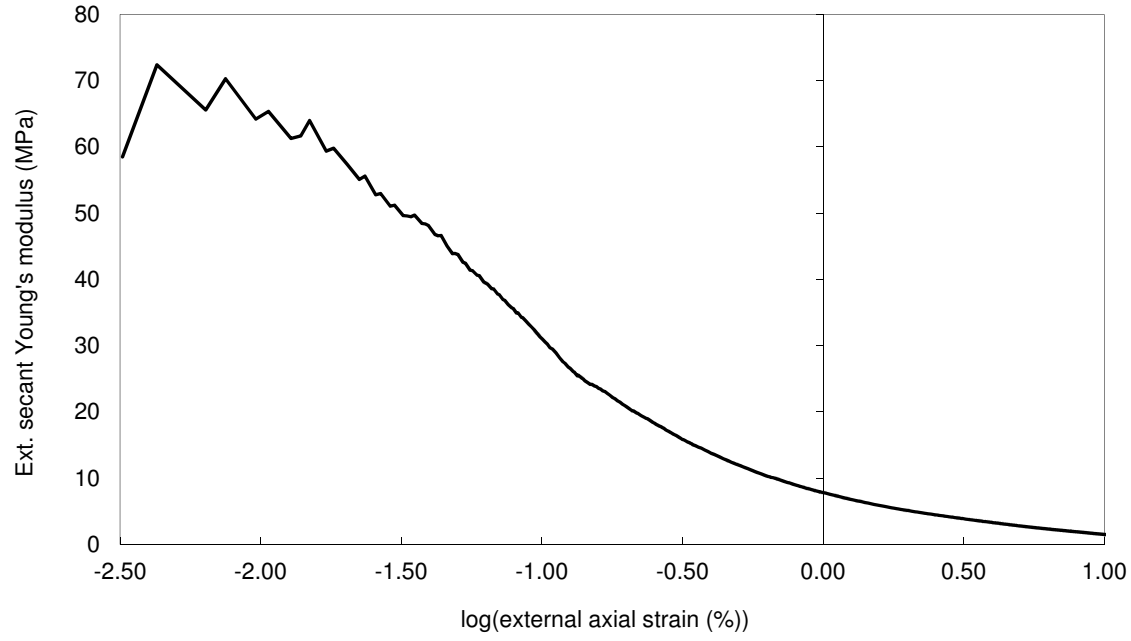

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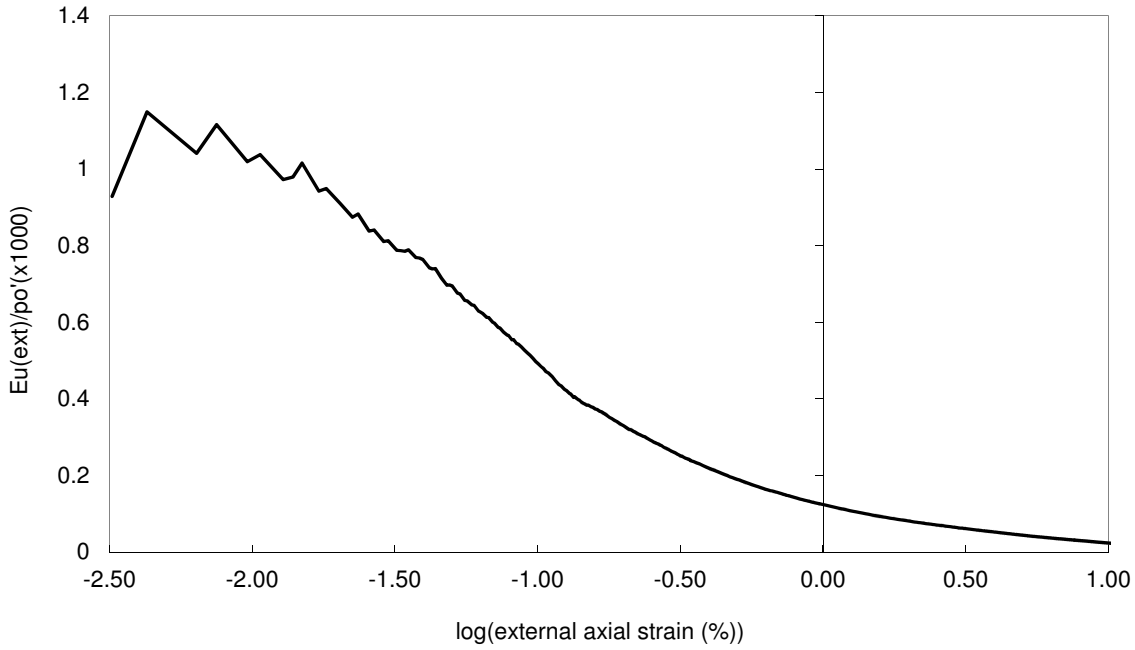

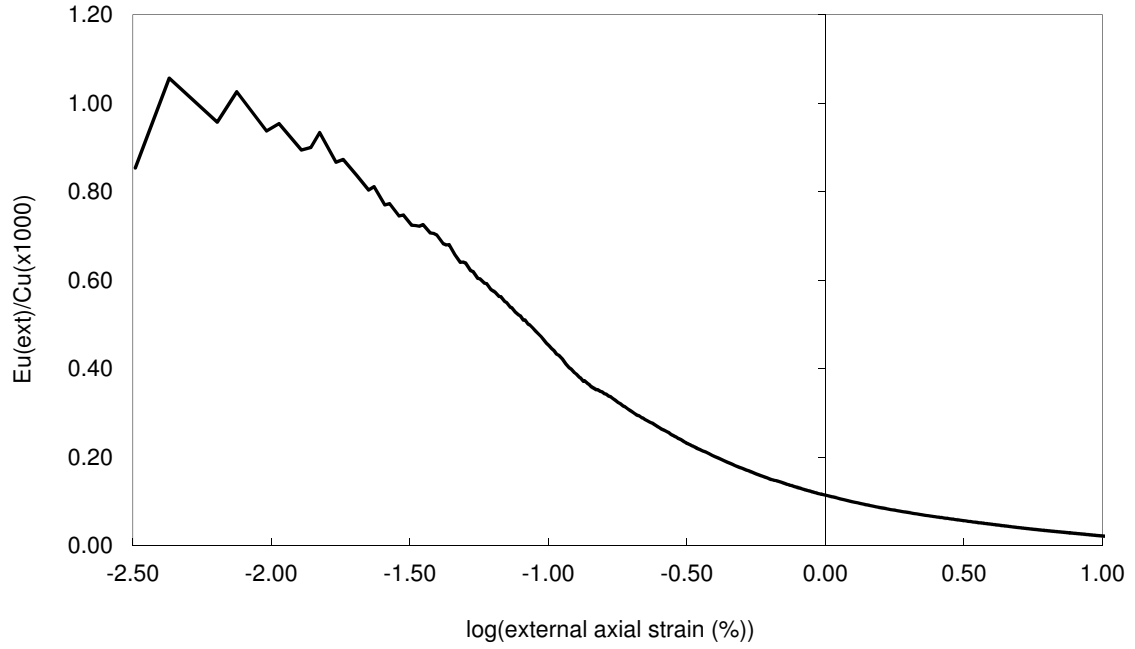

Undrained Shear Stage

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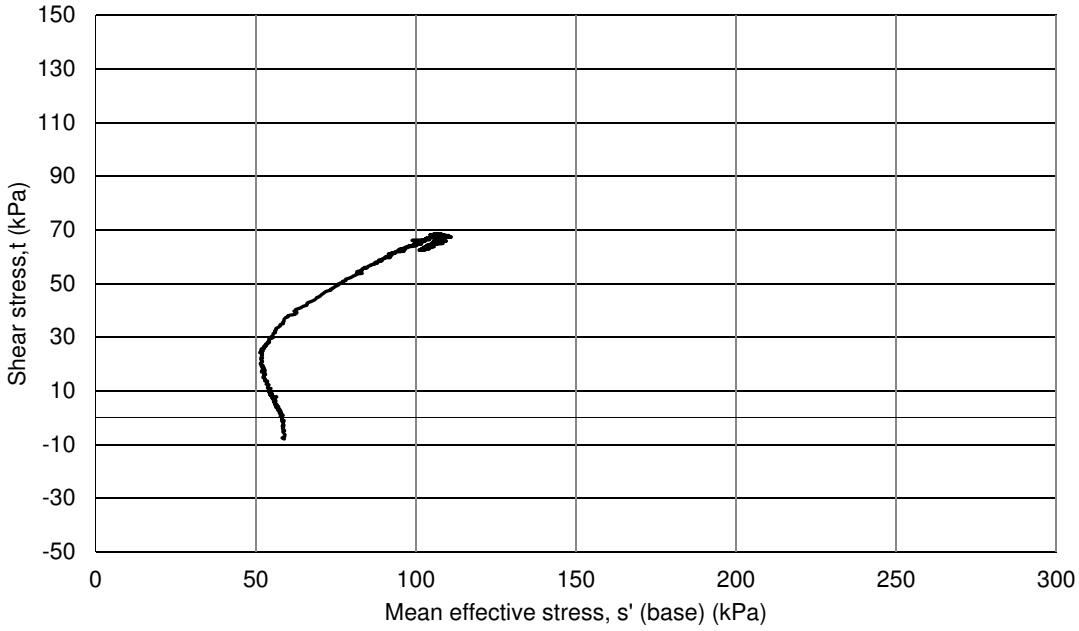
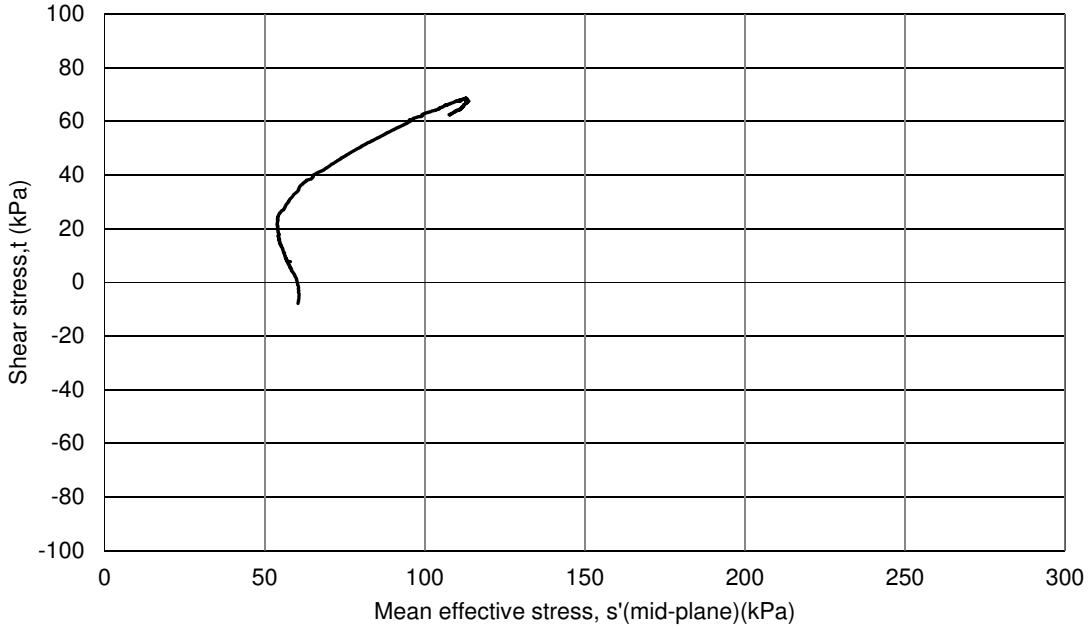
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P3-Q1	Firm grey slightly organic grey CLAY with lenses
Sample Depth (m):	2.00-2.20	of medium sand and shells





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	H10	Description (visual) :	
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand	
Sample Depth (m):	6.20-6.40	with shells	

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	141.7	mm		
Diameter :	74.0	mm		
Moisture content :	20.38	%	18.73	%
Bulk density :	2.02	Mg/m³		
Dry density :	1.68	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.6213			
Test Duration:			20 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell/Back pressure ramp (#2 Undrained))

Stage	#1	#2	
Cell pressure (kPa):	600	700	
Base pwp (kPa):	587.6	688	
Mid-plane pwp (kPa):	590.1	689.7	
Base B values :	0.98	1.00	
Mid-plane B values :	0.99	1.00	
Initial effective stress (mid-plane) :		10.3	kPa

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	62.6	(kPa)
$\Delta e/e_o$	0.0559	

At failure:

External axial strain	18.15	(%)
Peak deviator stress	113	(kPa)
Undrained shear strength	57	(kPa)
Mid plane pore pressure	709	(kPa)
Base pore pressure	709	(kPa)
Horizontal effective stress	47	(kPa)
Vertical effective stress	160	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	4.13	(%)
Deviator stress	48	(kPa)
Mid plane pore pressure	744	(kPa)
Base pore pressure	745	(kPa)
Horizontal effective stress	12	(kPa)
Vertical effective stress	60	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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Date:	15/02/2016		

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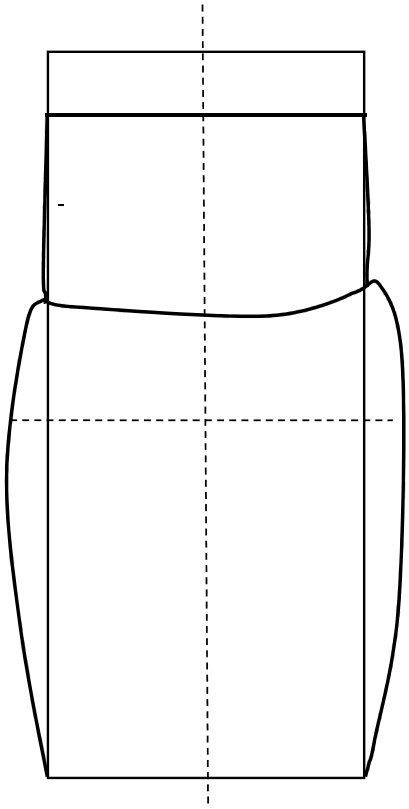
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells

SPECIMEN DETAILS

Initial Height:	141.7	mm
Initial Diameter:	74.0	mm

Elevation



Failure Sketch

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Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	700	756
Mid pwp (kPa)	689.7	688
Base pwp (kPa)	688	688.2
s' (kPa)	10.3	59.8
t (kPa)	0.0	-8.2
Voids ratio (e)	0.6213	0.5865

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Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
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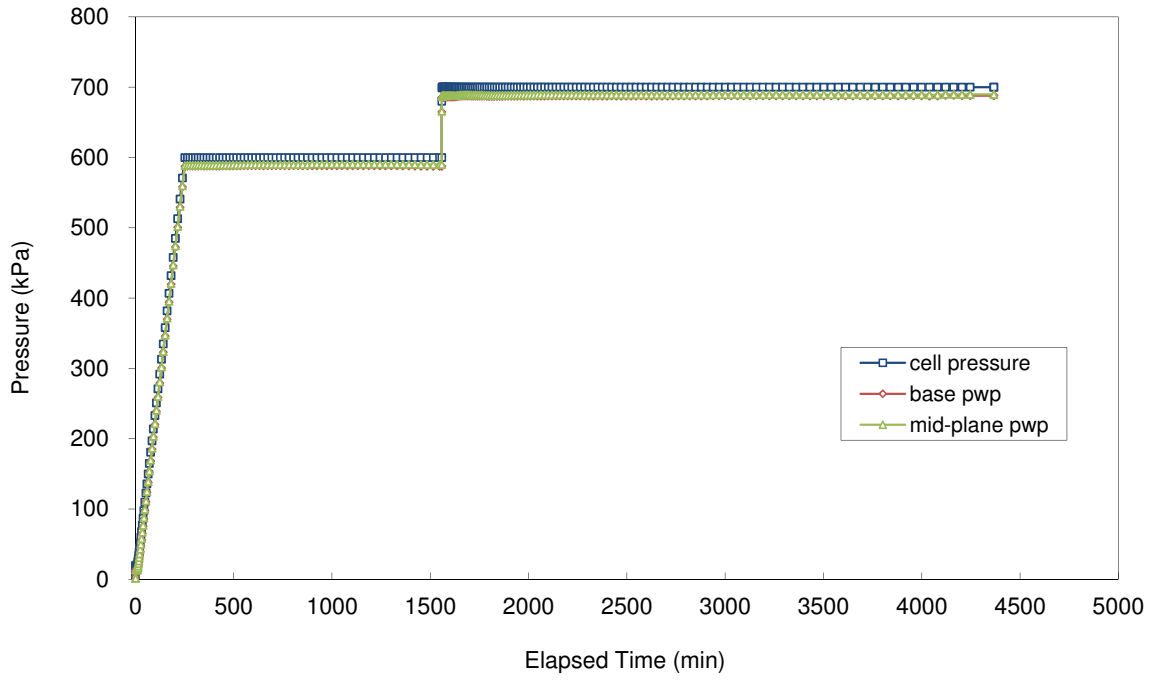
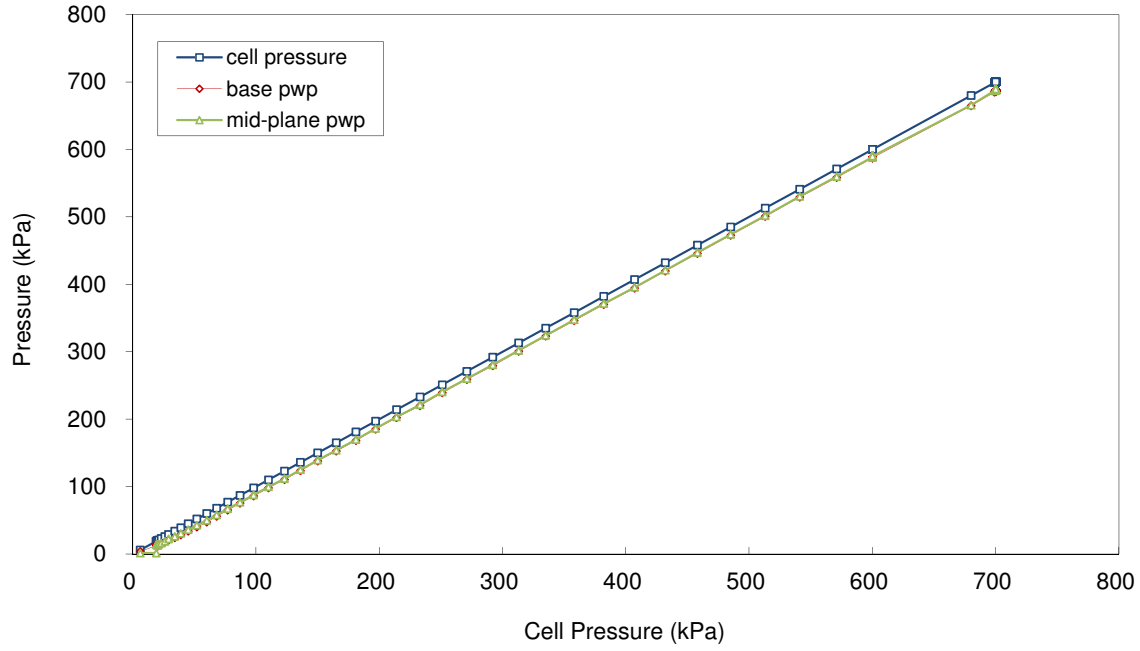
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Determination of Initial Effective Stress

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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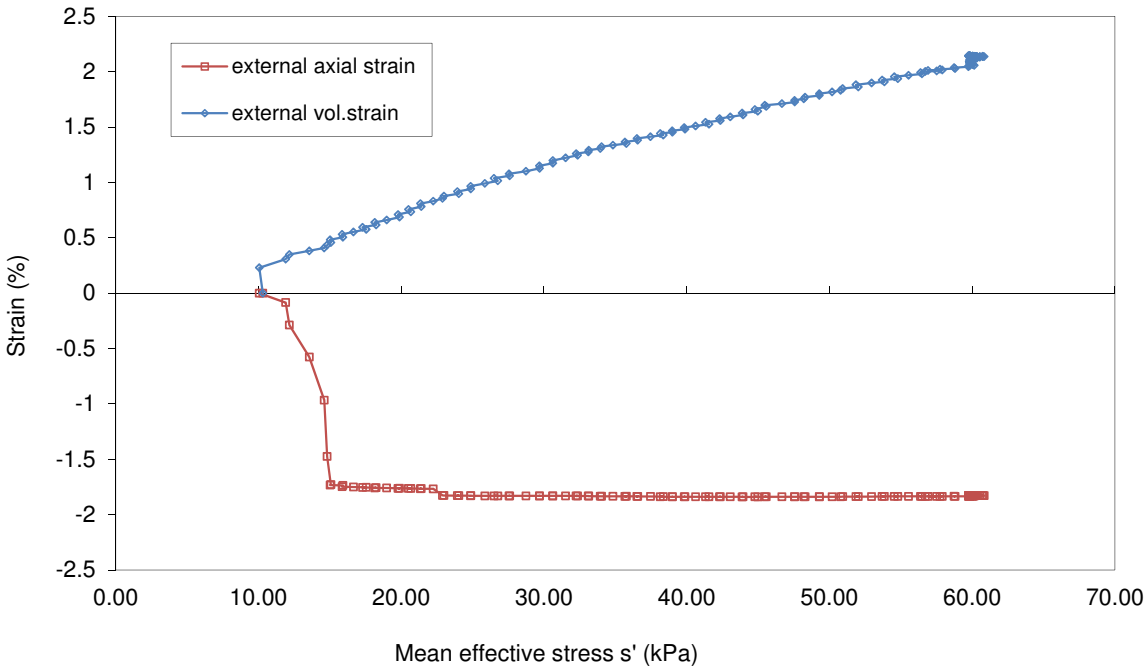
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells



Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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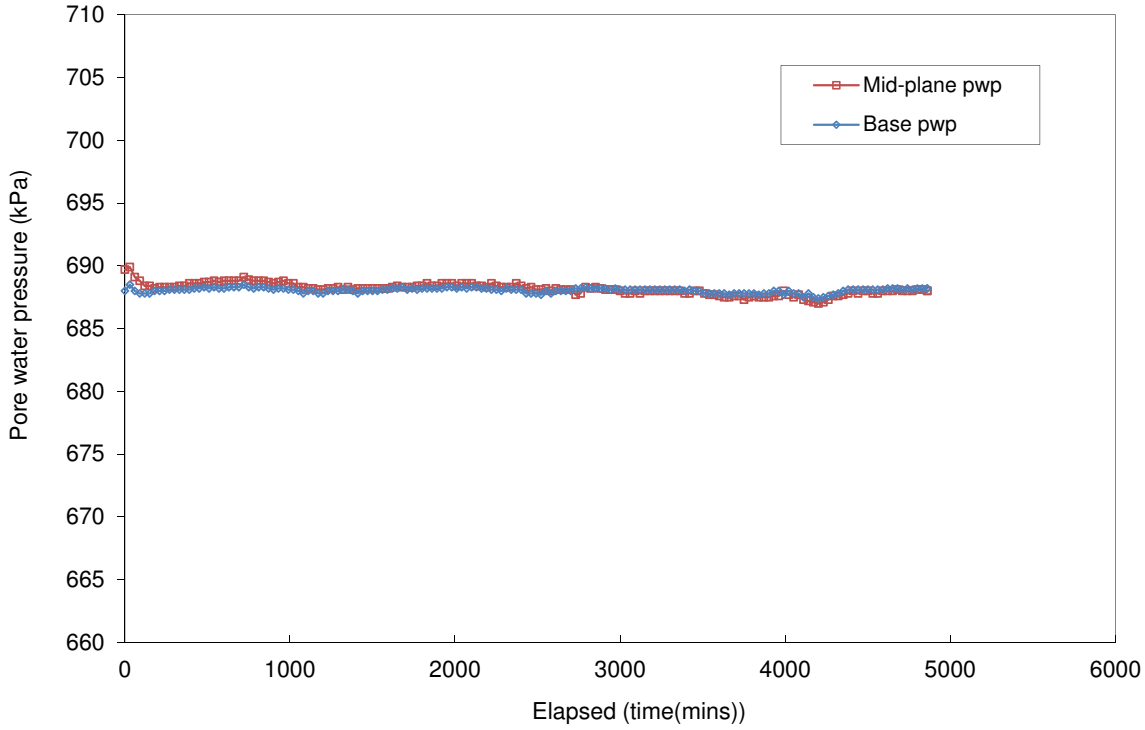
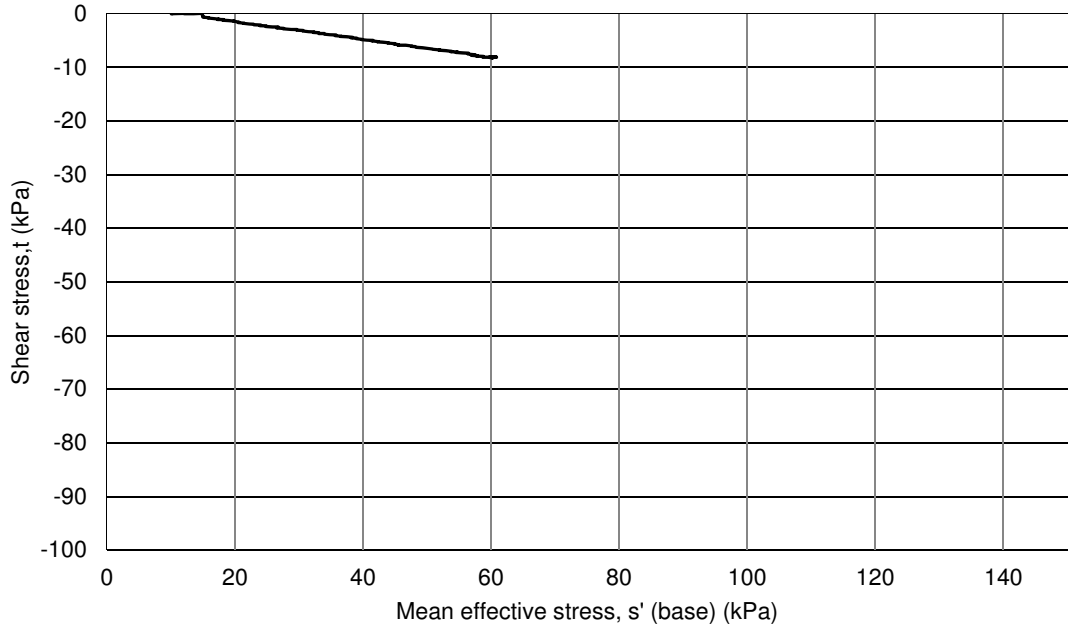
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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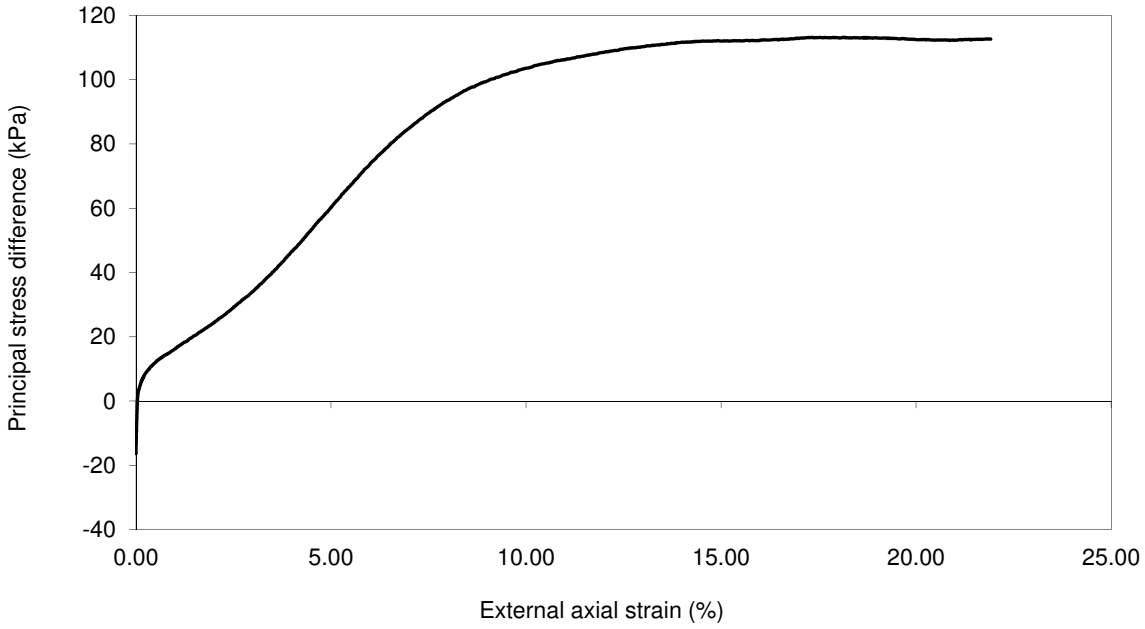
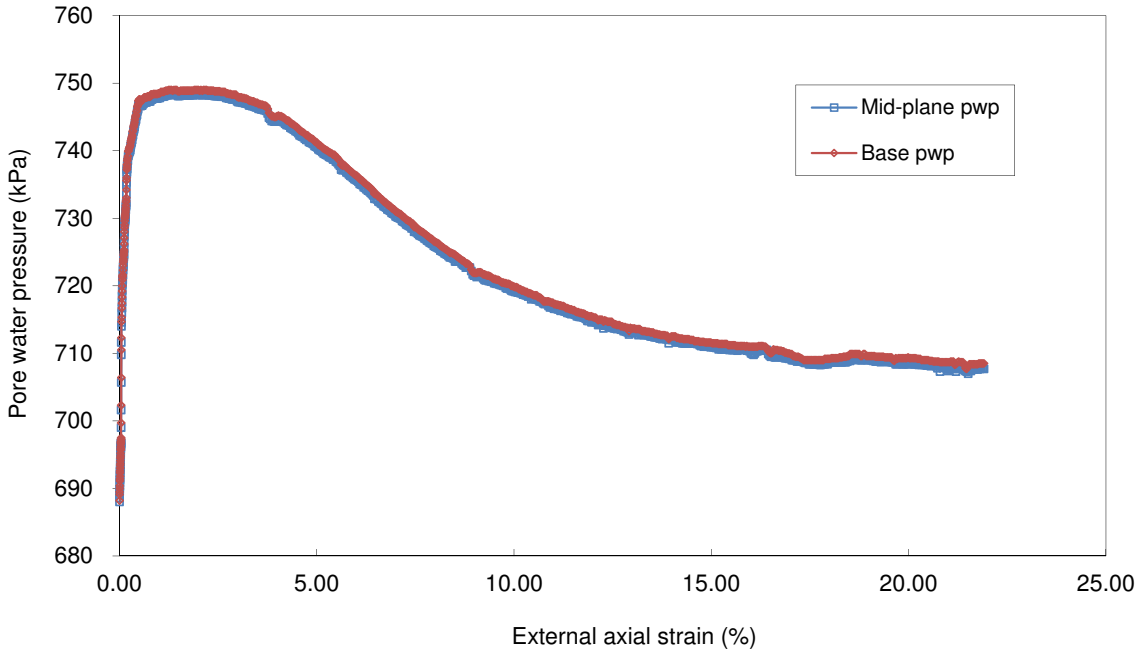
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
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Date: 15/02/2016		

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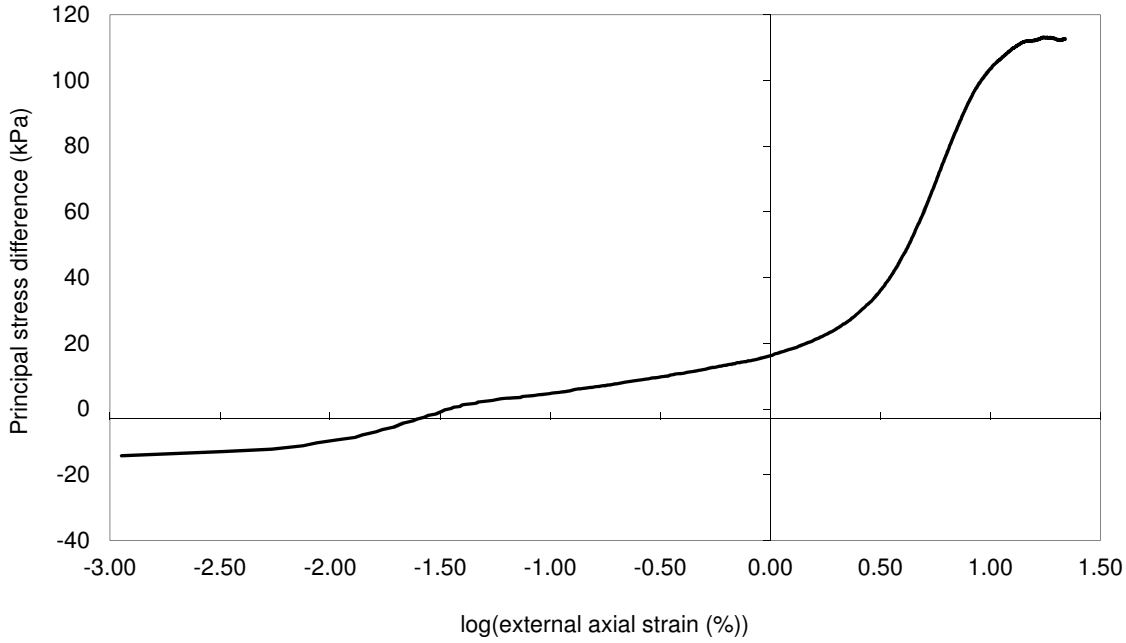
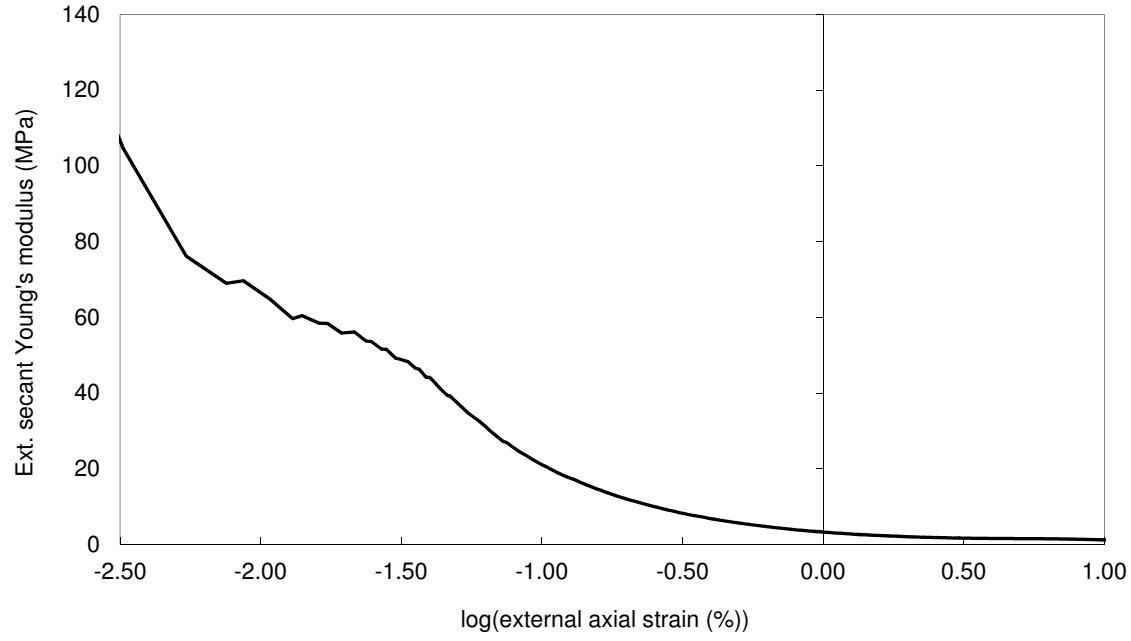
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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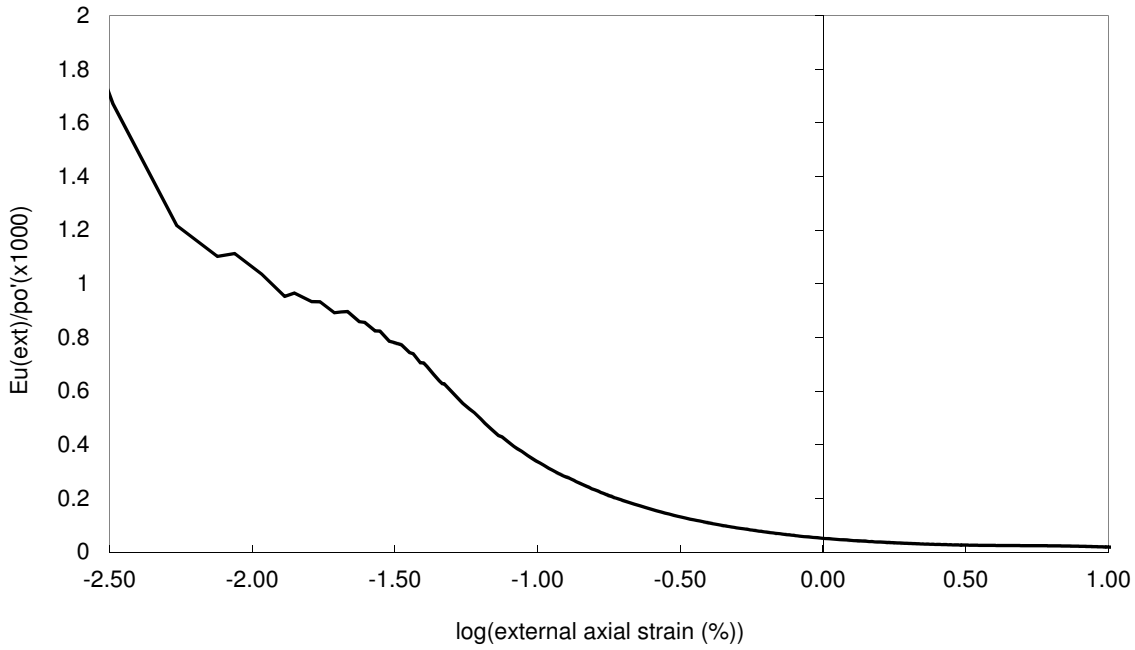
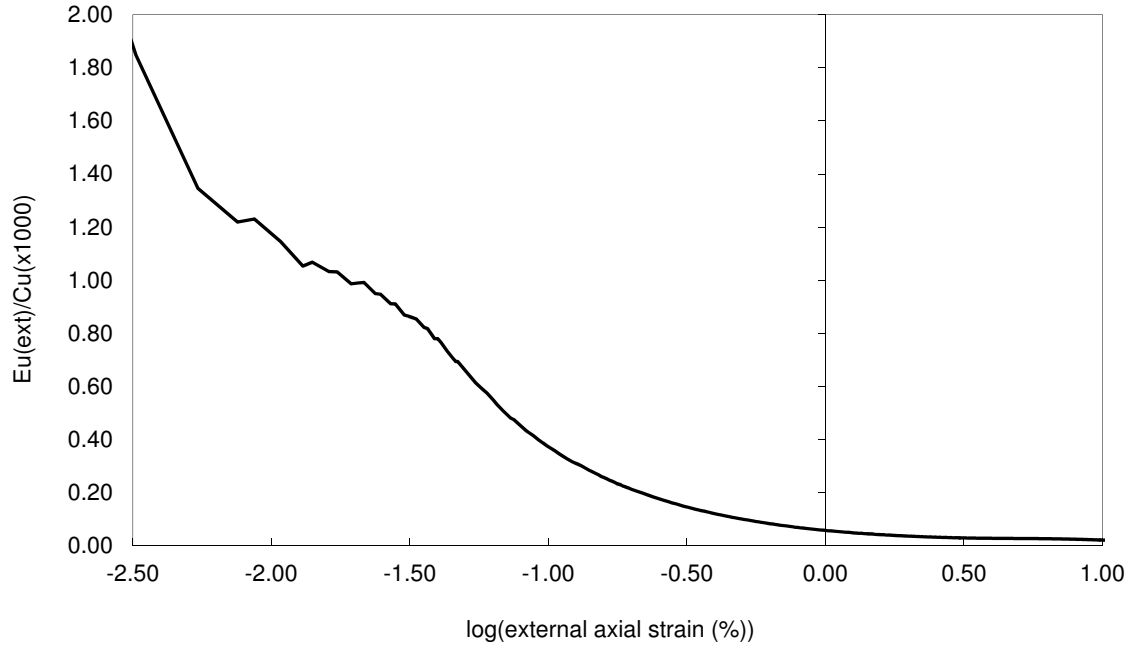
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Undrained Shear Stage

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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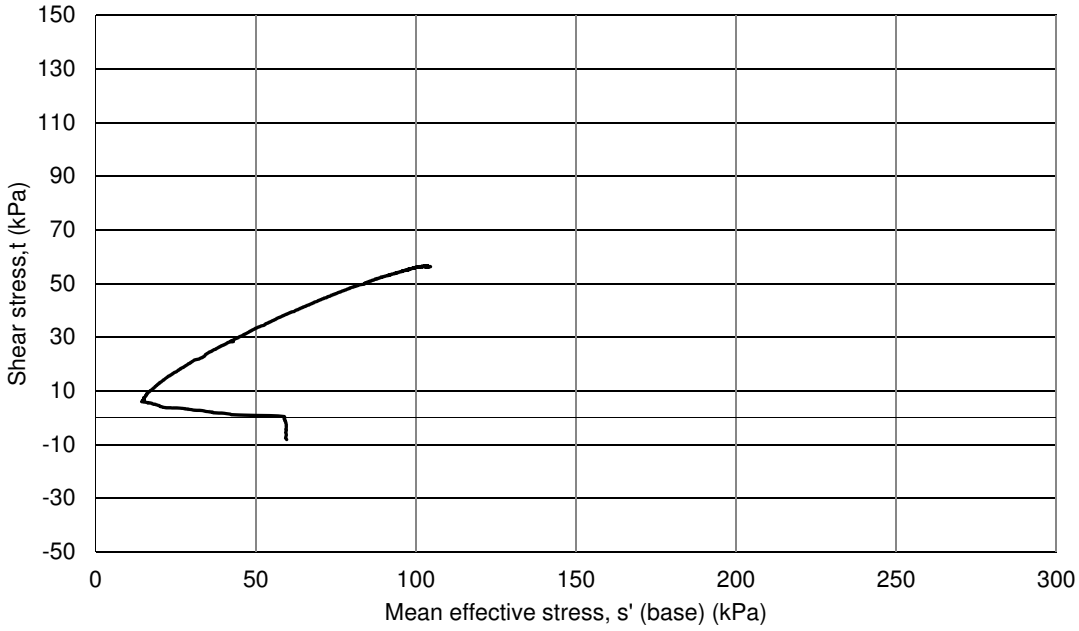
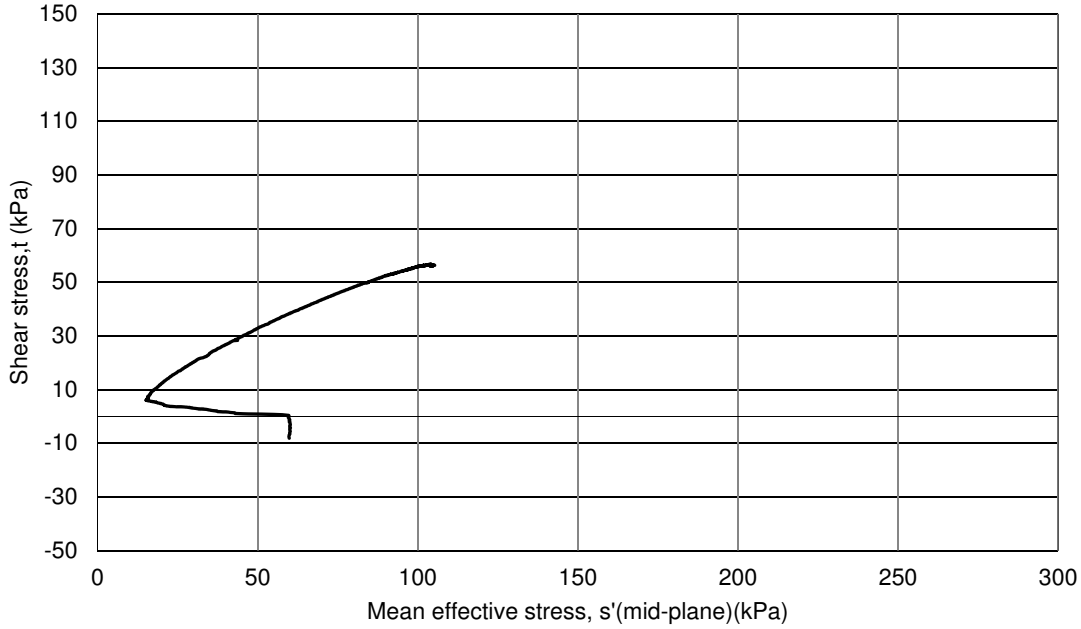
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P4-Q1	Soft grey sandy CLAY with lenses of sand
Sample Depth (m):	6.20-6.40	with shells





Undrained Shear Stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	H10	Description (visual) :	
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional	
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand	

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	140.9	mm		
Diameter :	72.1	mm		
Moisture content :	35.84	%	34.73	%
Bulk density :	1.89	Mg/m³		
Dry density :	1.39	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.9558			
Test Duration:			15	Days

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Increments of cell pressure at NMC)

Stage	#1	#2	#3	
Cell pressure (kPa):	800	1000	1200	
Base pwp (kPa):	611.4	797.3	994.9	
Mid-plane pwp (kPa):	614.7	801.8	994.5	
Base B values :	0.77	0.93	0.99	
Mid-plane B values :	0.78	0.94	0.96	
Initial effective stress (mid-plane) :		205.5	kPa	

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	629.7	(kPa)
$\Delta e/e_o$	0.0816	

At failure:

External axial strain	5.86	(%)
Peak deviator stress	504	(kPa)
Undrained shear strength	252	(kPa)
Mid plane pore pressure	1187	(kPa)
Base pore pressure	1188	(kPa)
Horizontal effective stress	359	(kPa)
Vertical effective stress	863	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.79	(%)
Deviator stress	371	(kPa)
Mid plane pore pressure	1090	(kPa)
Base pore pressure	1090	(kPa)
Horizontal effective stress	456	(kPa)
Vertical effective stress	827	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

Checked and approved		Project Number:	**RGI/1130**
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Date:	15/02/2016		

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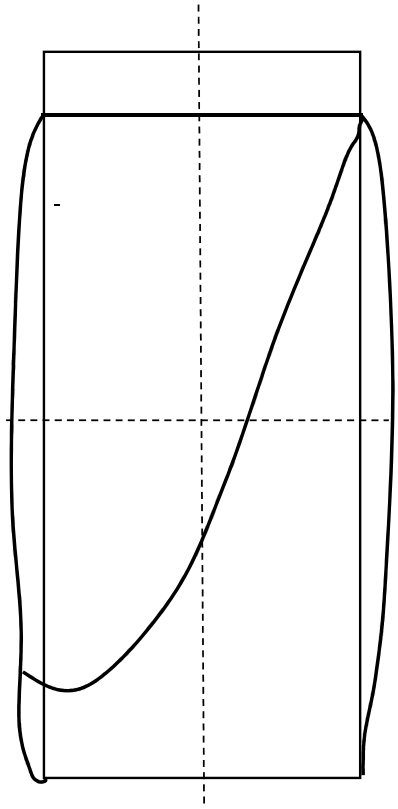
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

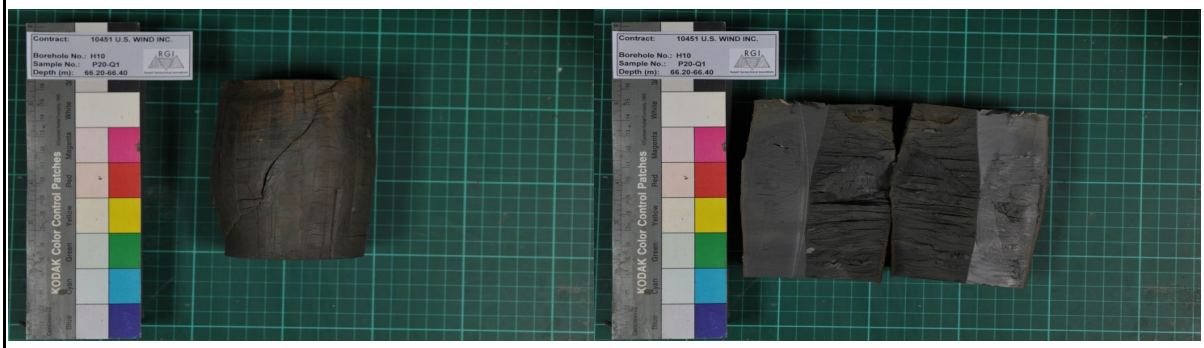
Borehole Number:	H10	Description :
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand

SPECIMEN DETAILS

Initial Height:	140.9	mm
Initial Diameter:	72.1	mm

Elevation





Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand

STRESS PATH STAGES

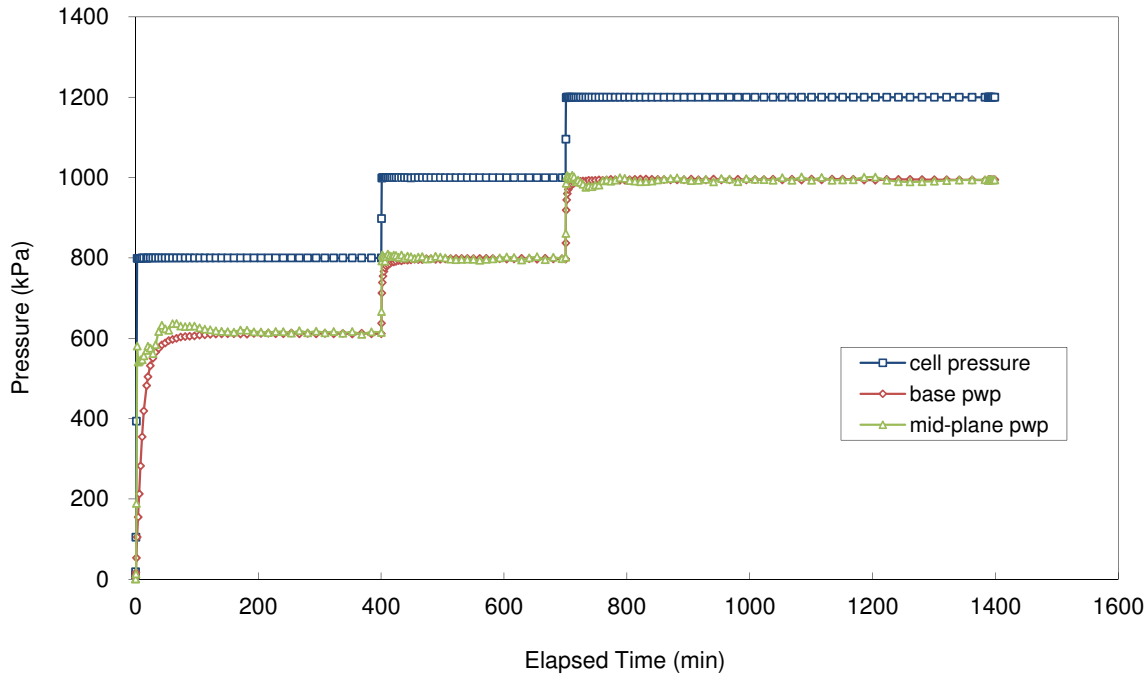
ANISOTROPIC CONSOLIDATION/SWELLING #1

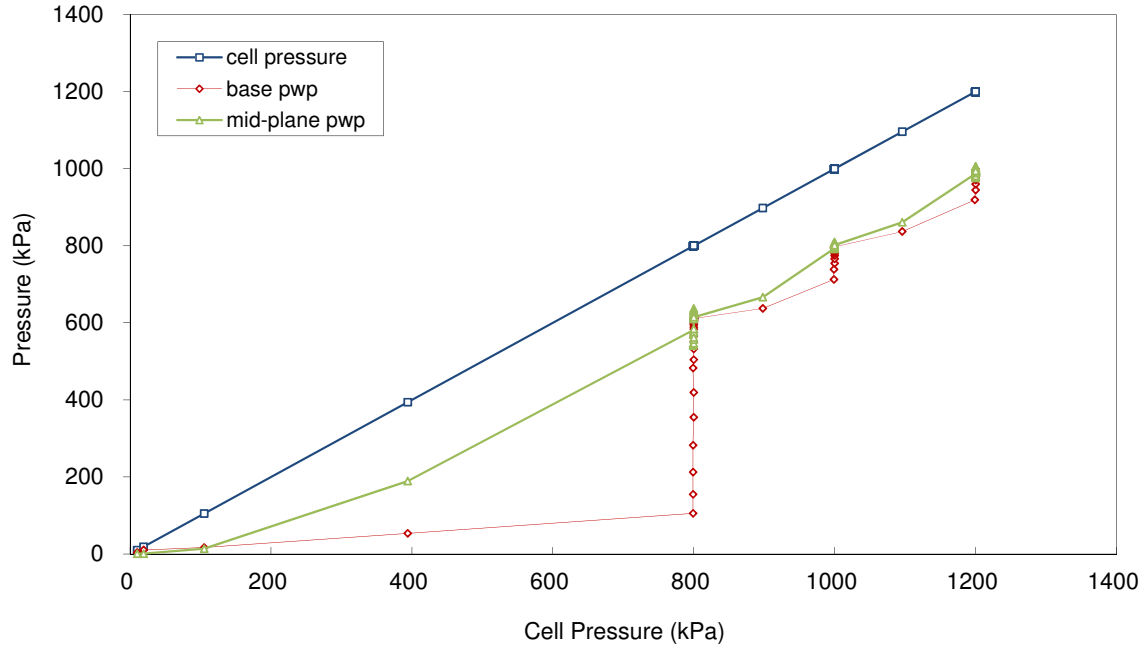
	Initial Values	Final Values
Cell Press. (kPa)	1200	1546
Mid pwp (kPa)	994.5	995.2
Base pwp (kPa)	994.9	995.2
s' (kPa)	205.5	669.3
t (kPa)	0.0	118.5
Voids ratio (e)	0.9558	0.8778

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 15/02/2016		

Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand





Determination of Initial Effective Stress

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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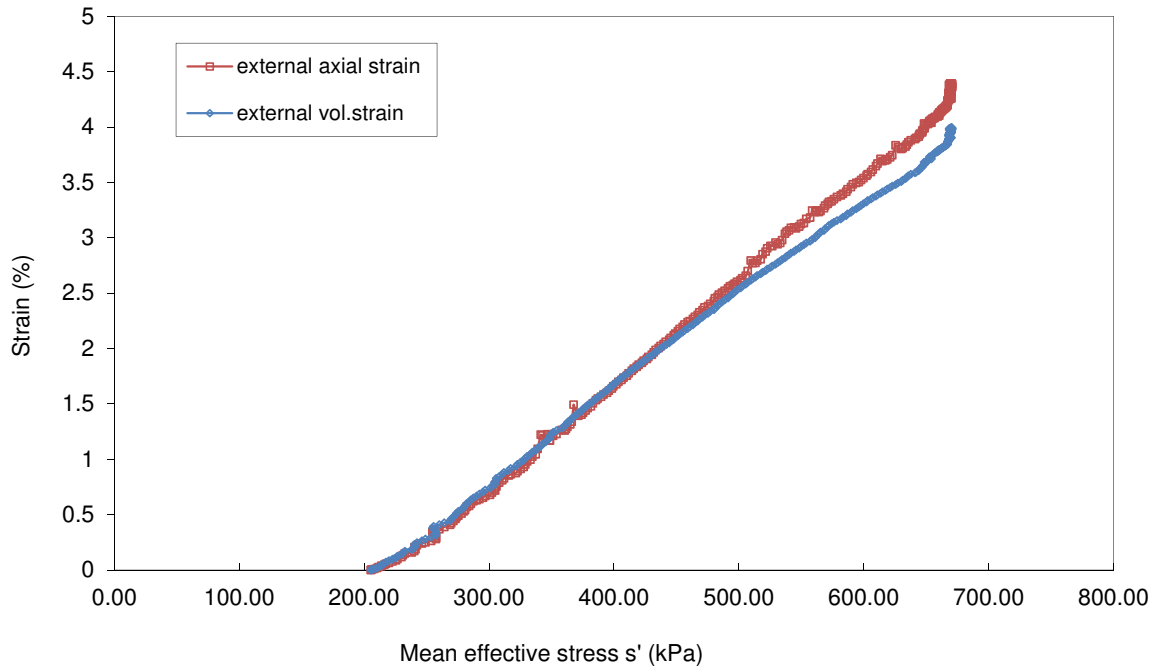
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand



Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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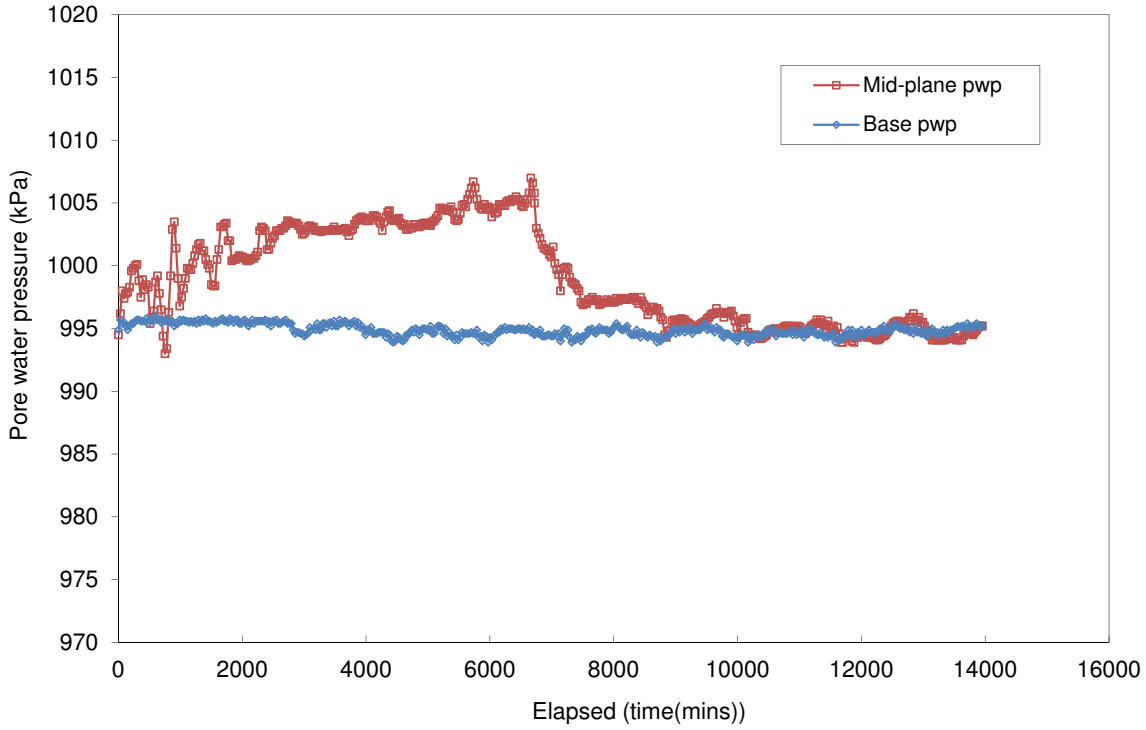
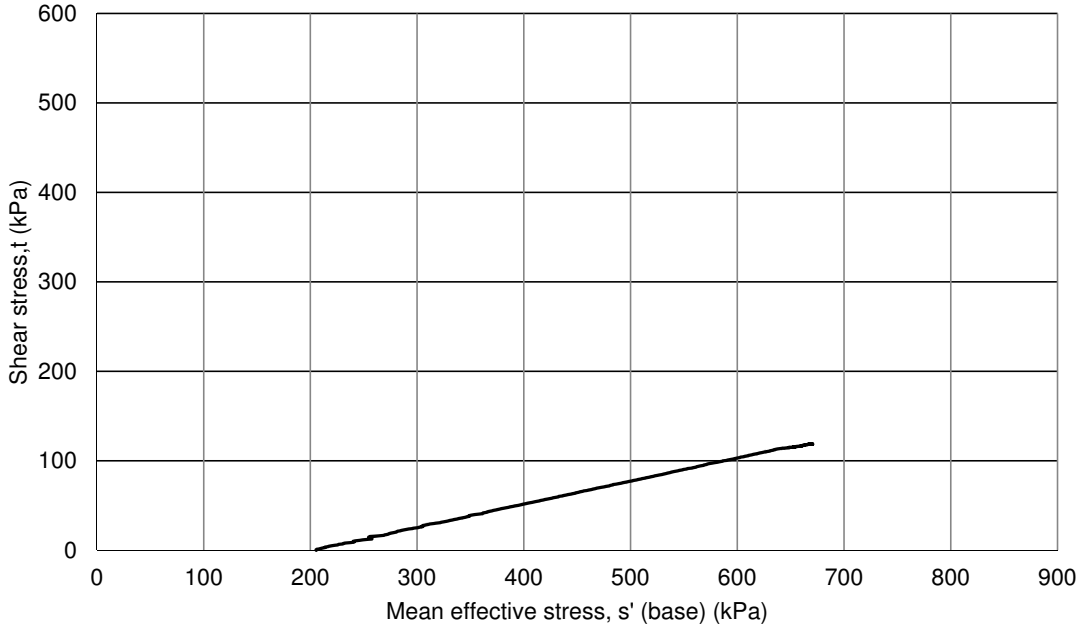
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P20-Q1	Stiff grey (oxidising to brown) CLAY with occasional
Sample Depth (m):	66.20-66.40	shells and pockets of black organic medium sand





Anisotropic Consolidation/Swelling Stage #1

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

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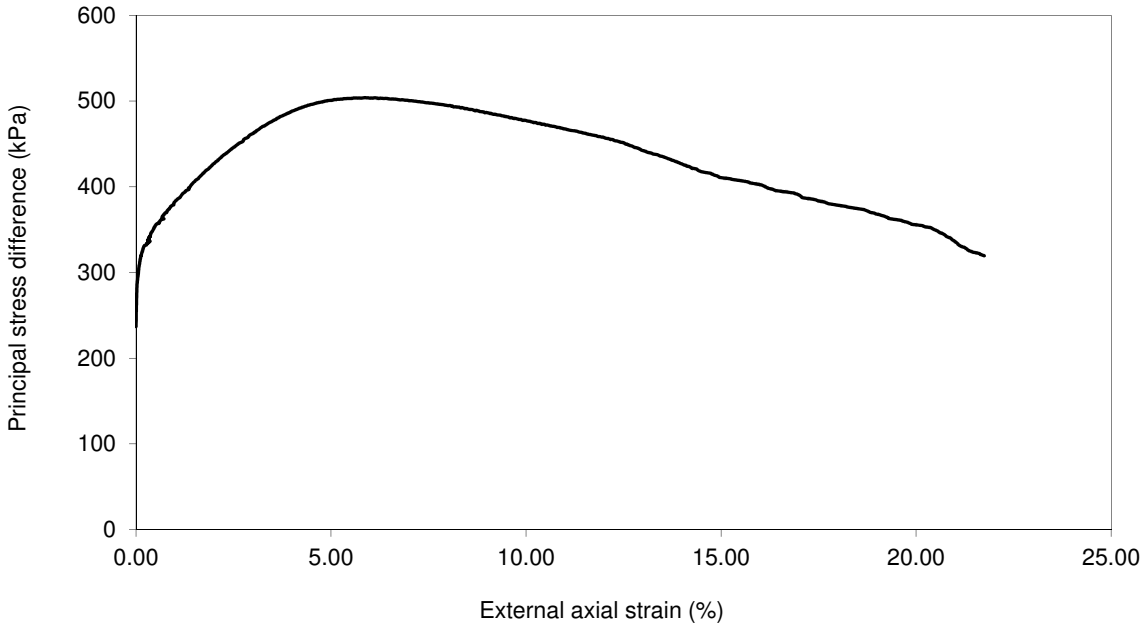

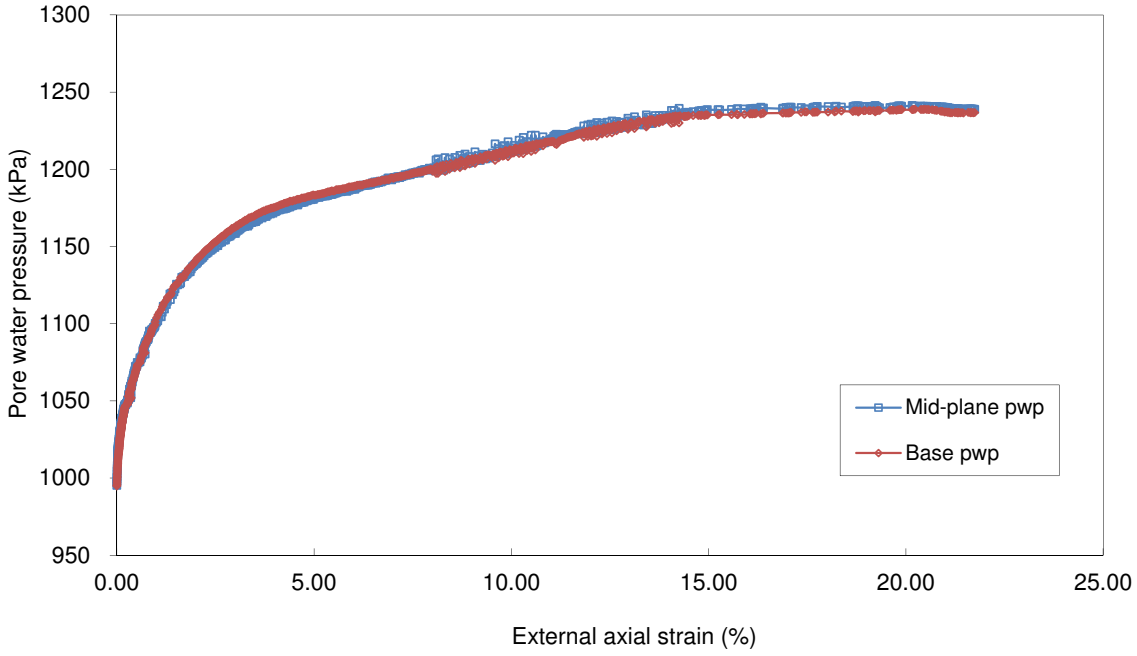

Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

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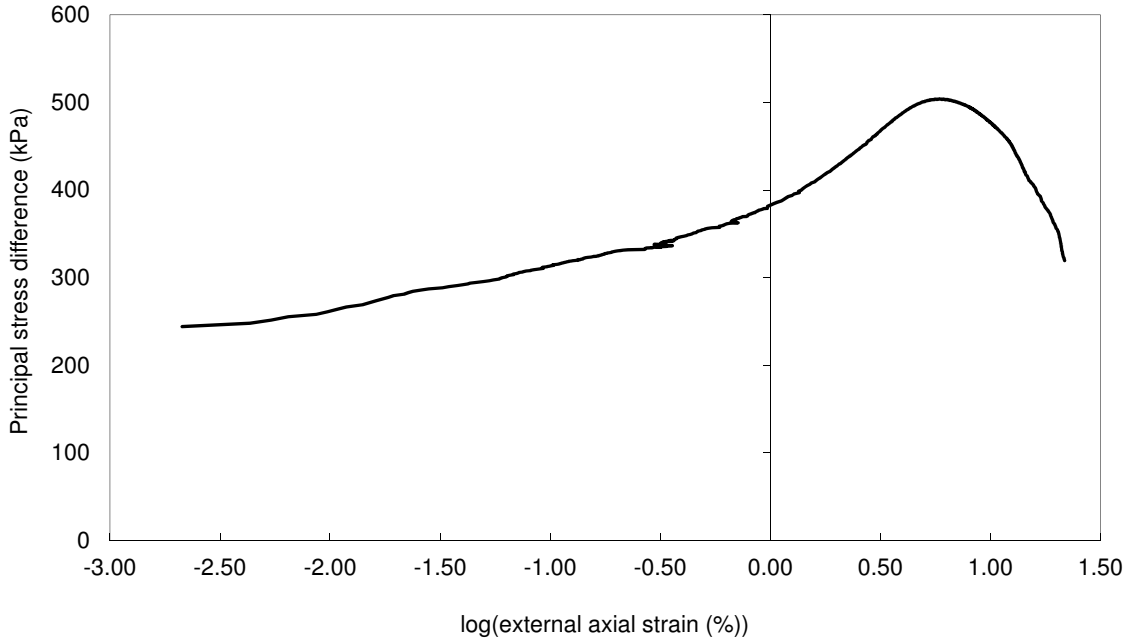

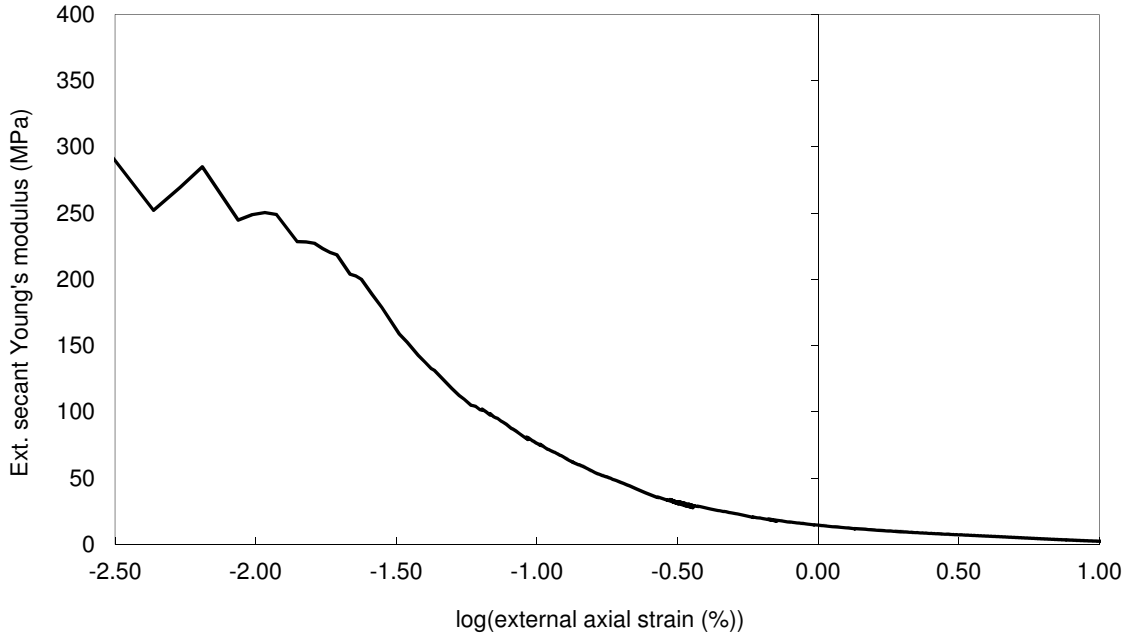

Undrained Shear Stage

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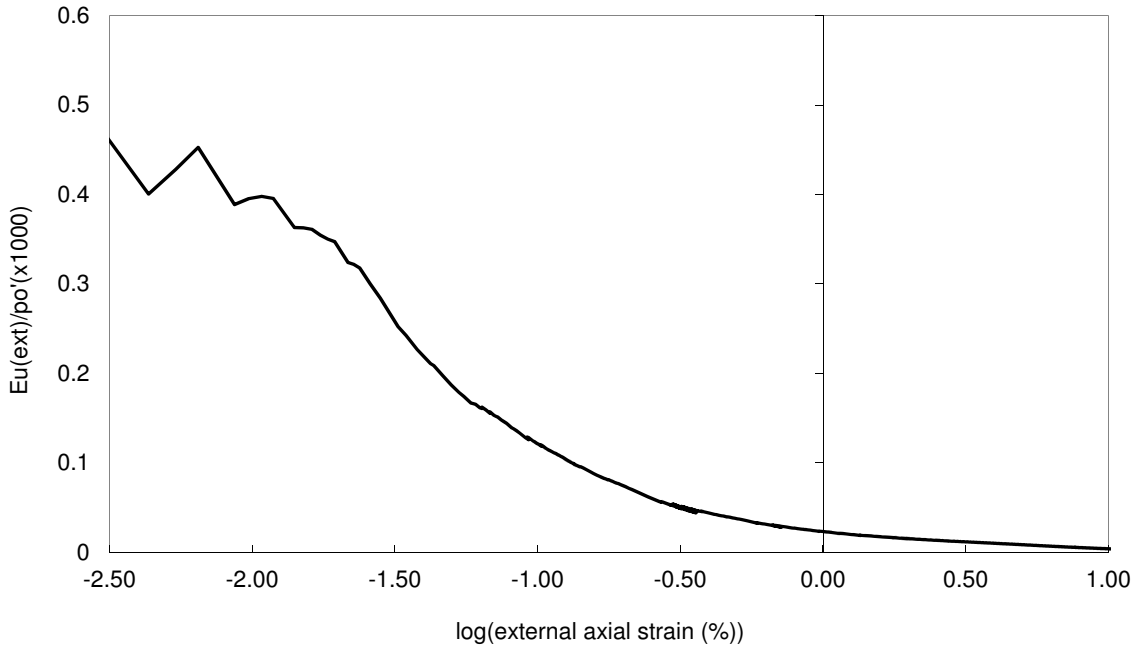

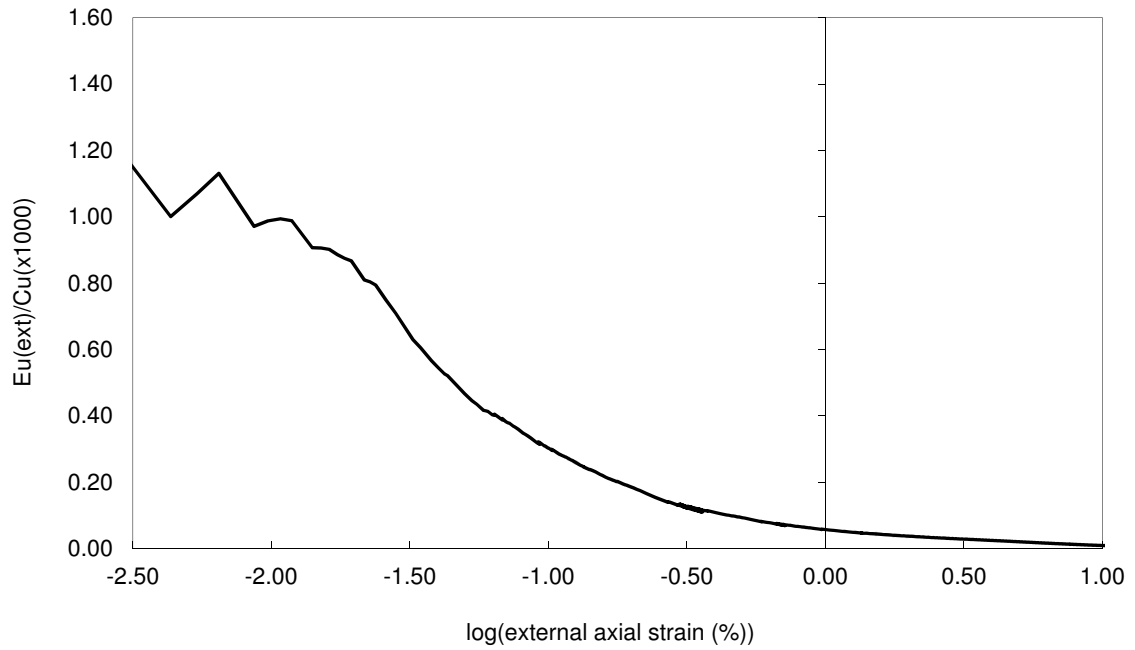

Undrained Shear Stage

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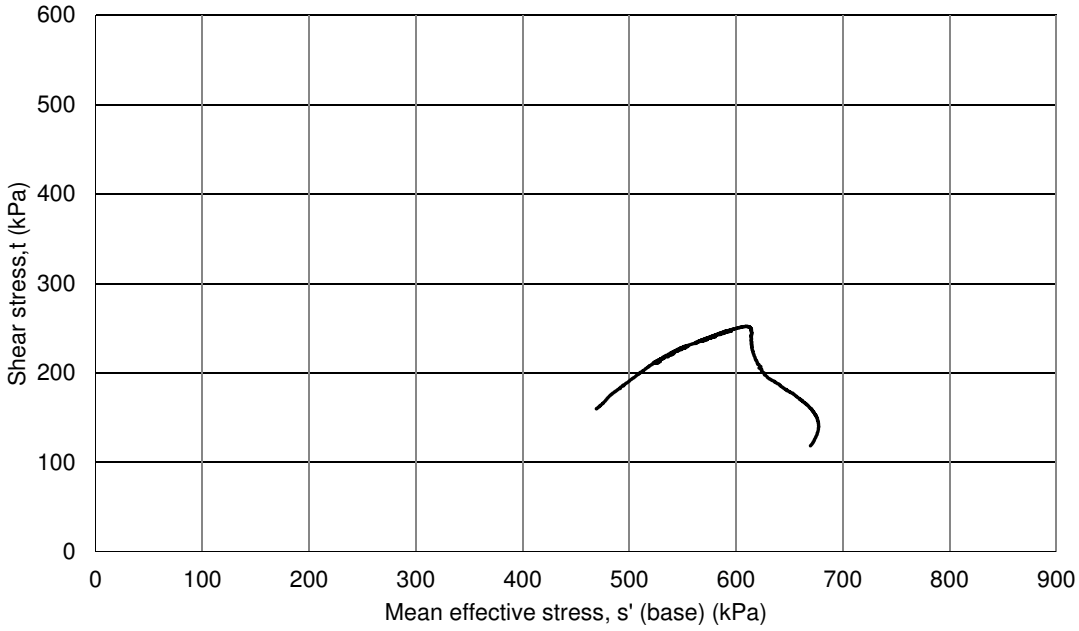

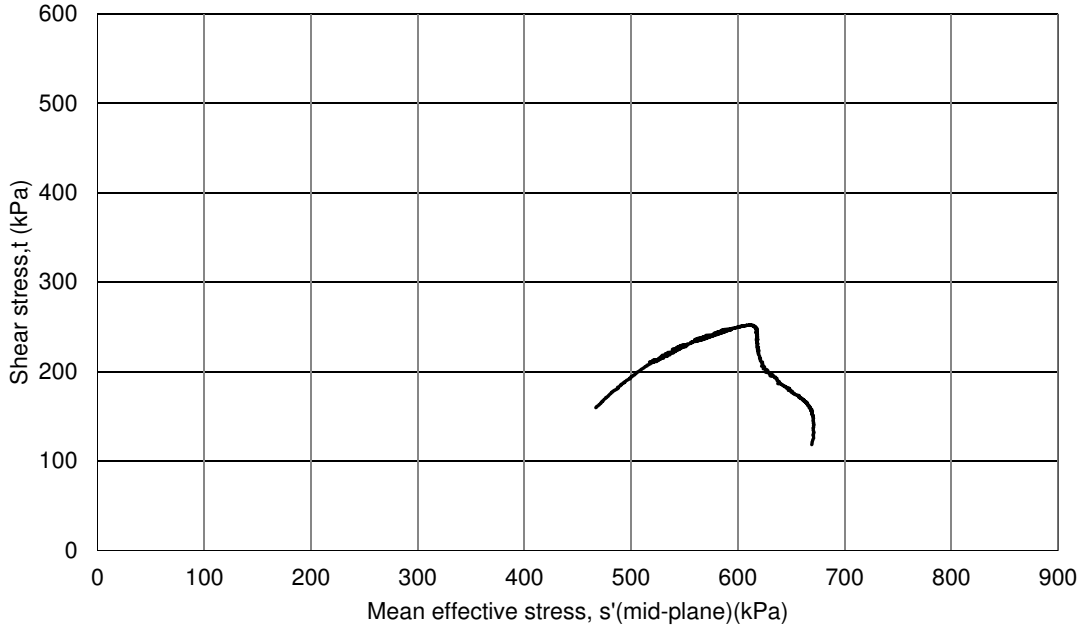

Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	H10	Description (visual) :	
Sample Number:	P21-Q1	Stiff grey sandy CLAY with lenses of brown	
Sample Depth (m):	70.20-70.40	medium sand with shells	

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	142.3	mm		
Diameter :	73.3	mm		
Moisture content :	22.82	%	19.65	%
Bulk density :	1.87	Mg/m³		
Dry density :	1.52	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.7884			
Test Duration:			13 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Increments of Cell pressure at NMC)

Stage	#1	#2	#3	
Cell pressure (kPa):	800	1000	1200	
Base pwp (kPa):	663.9	857.1	1049.3	
Mid-plane pwp (kPa):	663.3	856.4	1049.2	
Base B values :	0.84	0.97	0.96	
Mid-plane B values :	0.85	0.97	0.96	
Initial effective stress (mid-plane) :		150.8	kPa	

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	663.2	(kPa)
$\Delta e/e_o$	0.0994	

At failure:

External axial strain	9.10	(%)
Peak deviator stress	571	(kPa)
Undrained shear strength	285	(kPa)
Mid plane pore pressure	1353	(kPa)
Base pore pressure	1354	(kPa)
Horizontal effective stress	274	(kPa)
Vertical effective stress	845	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.50	(%)
Deviator stress	415	(kPa)
Mid plane pore pressure	1211	(kPa)
Base pore pressure	1212	(kPa)
Horizontal effective stress	416	(kPa)
Vertical effective stress	831	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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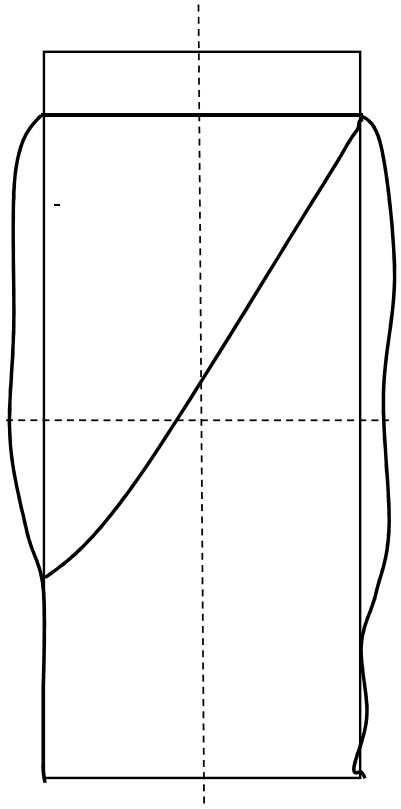
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

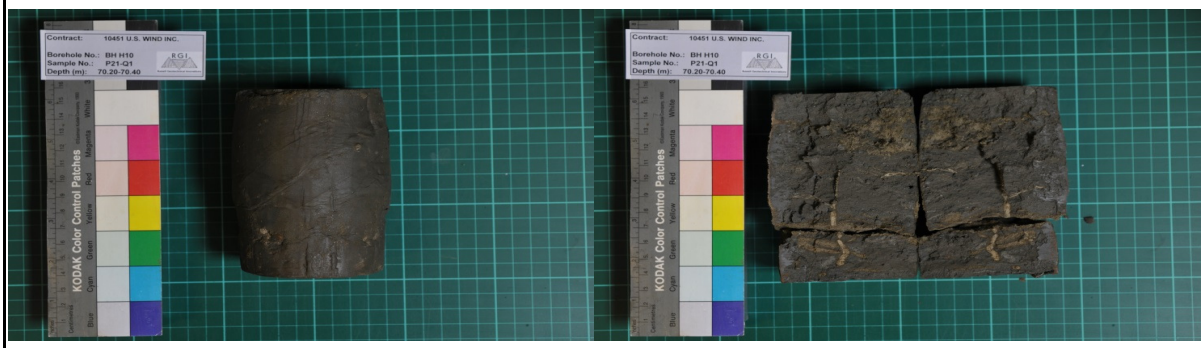
Borehole Number:	H10	Description :
Sample Number:	P21-Q1	Stiff grey sandy CLAY with lenses of brown
Sample Depth (m):	70.20-70.40	medium sand with shells

SPECIMEN DETAILS

Initial Height:	142.3	mm
Initial Diameter:	73.3	mm

Elevation





Failure Sketch

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Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P21-Q1	Stiff grey sandy CLAY with lenses of brown
Sample Depth (m):	70.20-70.40	medium sand with shells

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values	Final Values
Cell Press. (kPa)	1200	1627
Mid pwp (kPa)	1049.2	1050
Base pwp (kPa)	1049.3	1050.3
s' (kPa)	150.8	706.3
t (kPa)	0.0	129.3
Voids ratio (e)	0.7884	0.7101

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Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
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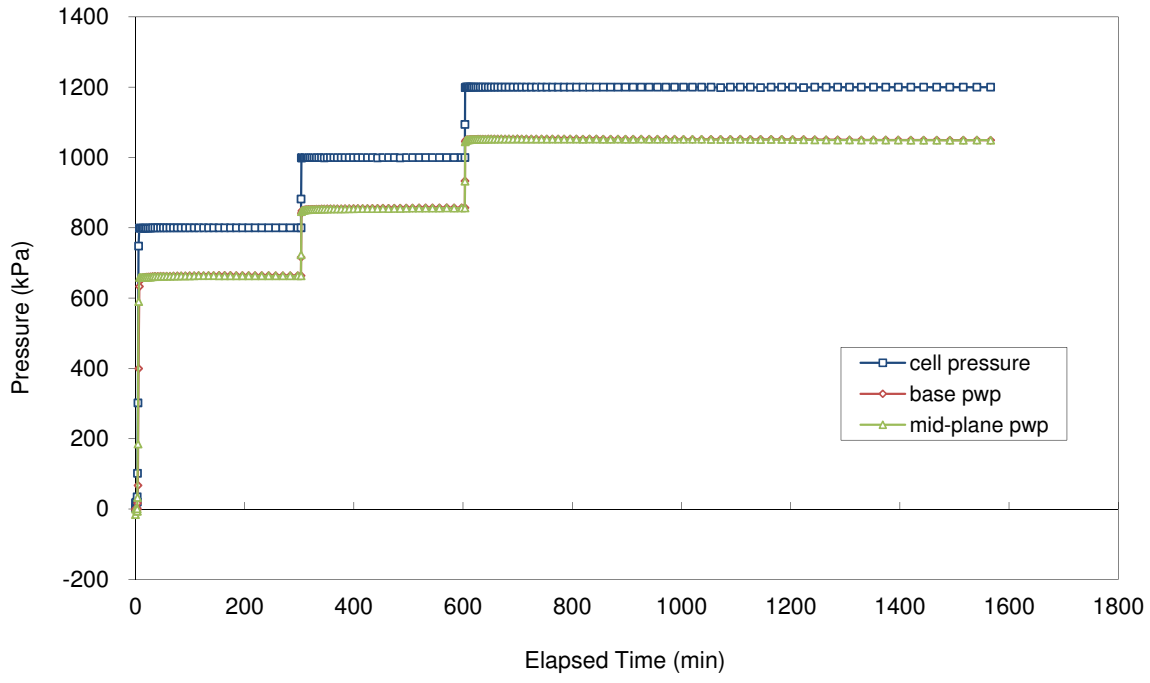

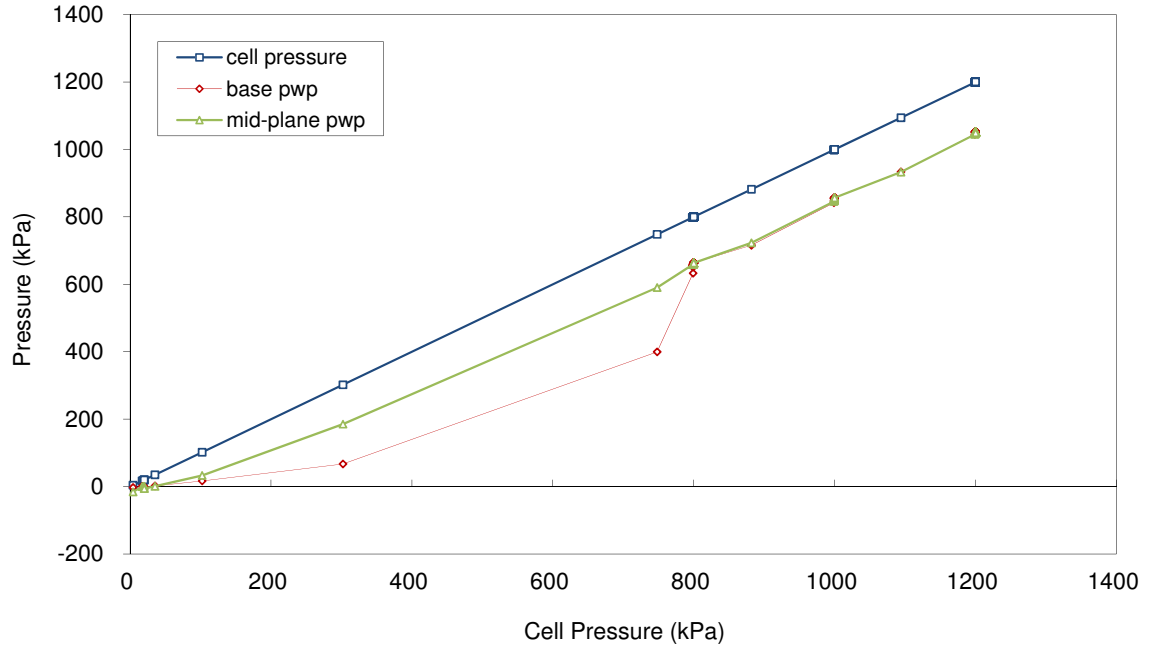

Determination of Initial Effective Stress

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

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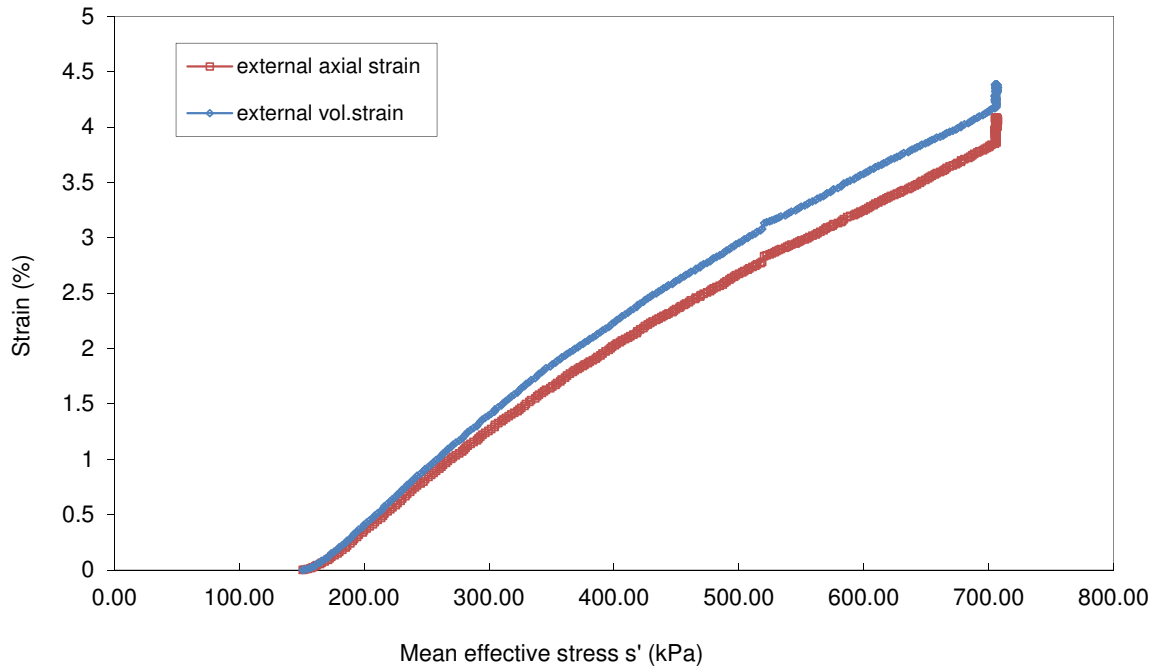

Anisotropic Consolidation/Swelling Stage #1

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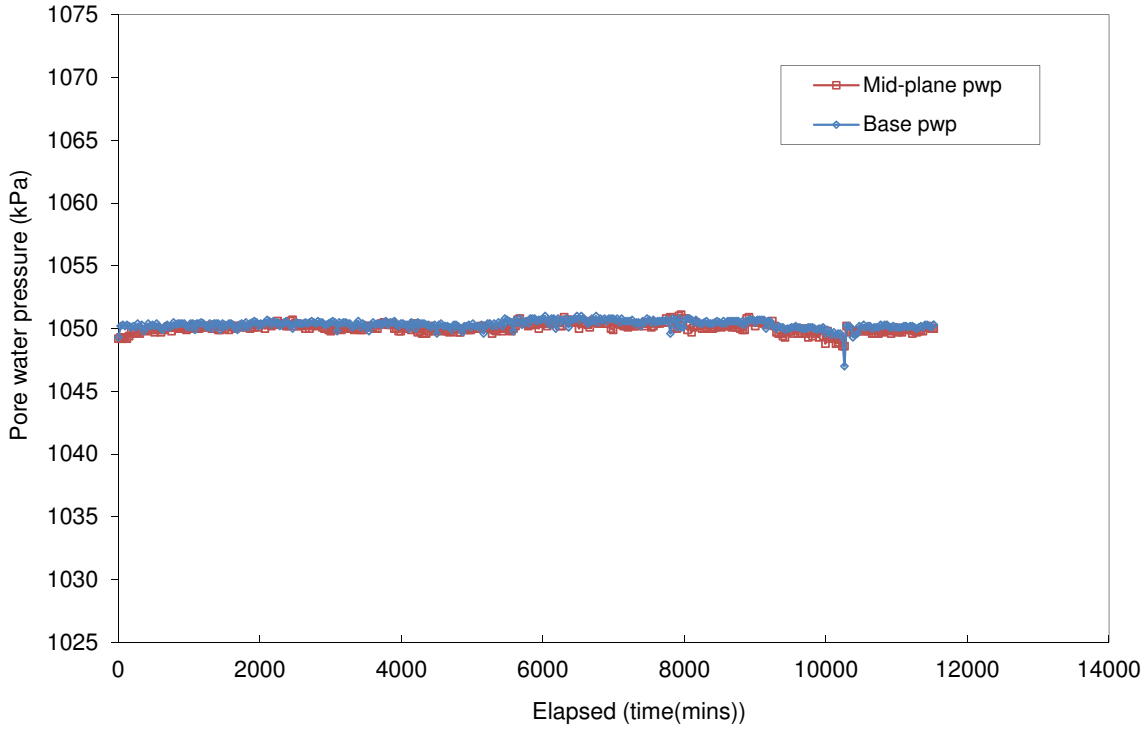

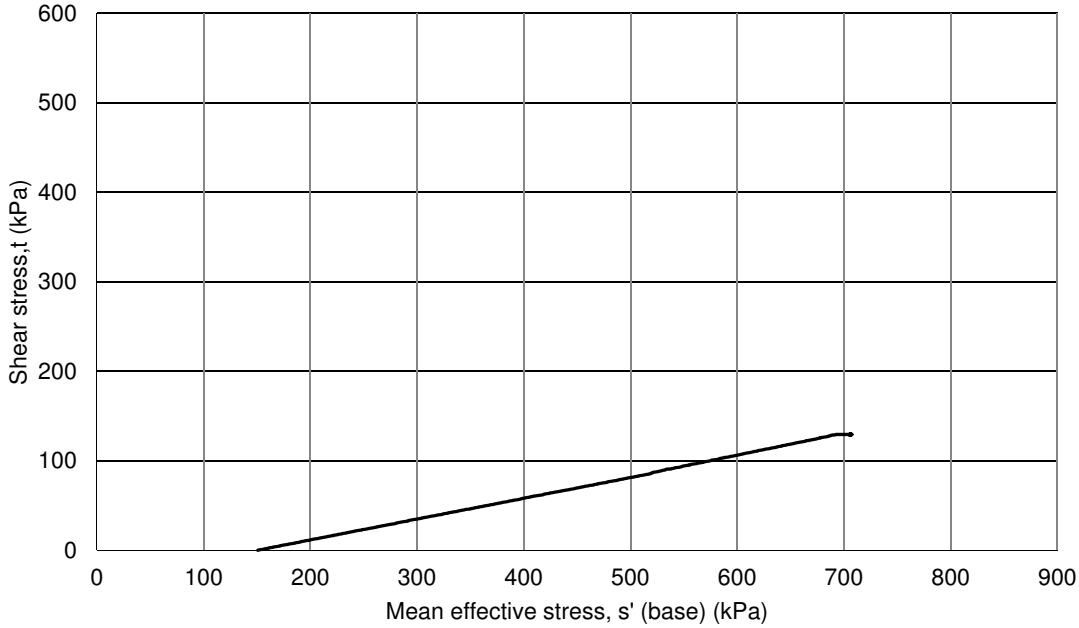

Anisotropic Consolidation/Swelling Stage #1

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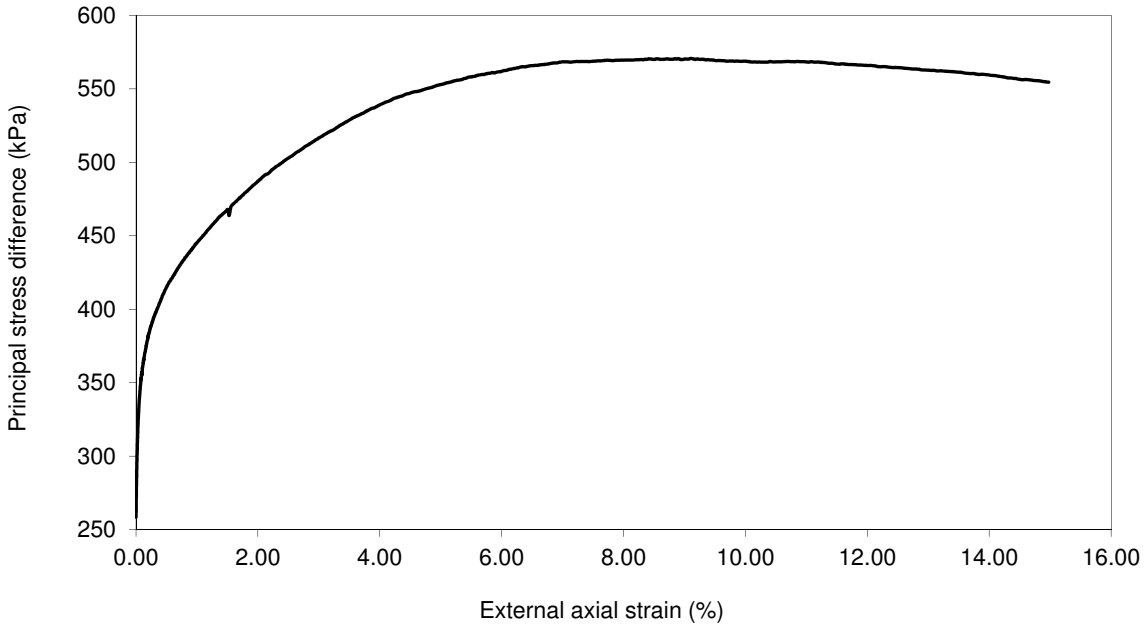

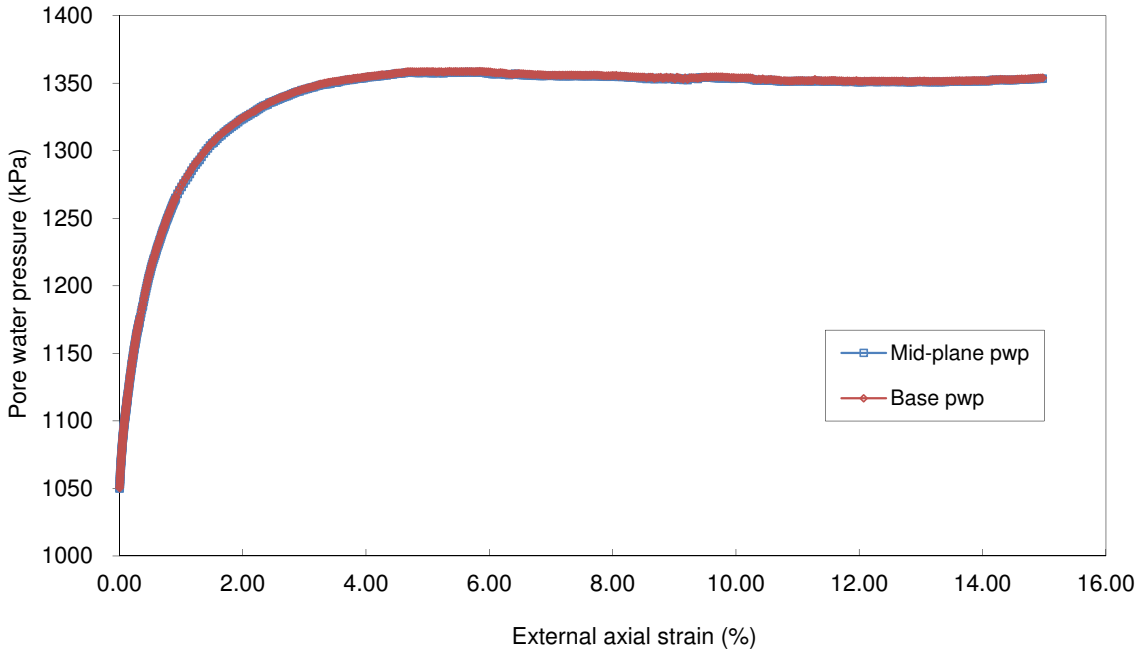

Undrained Shear Stage

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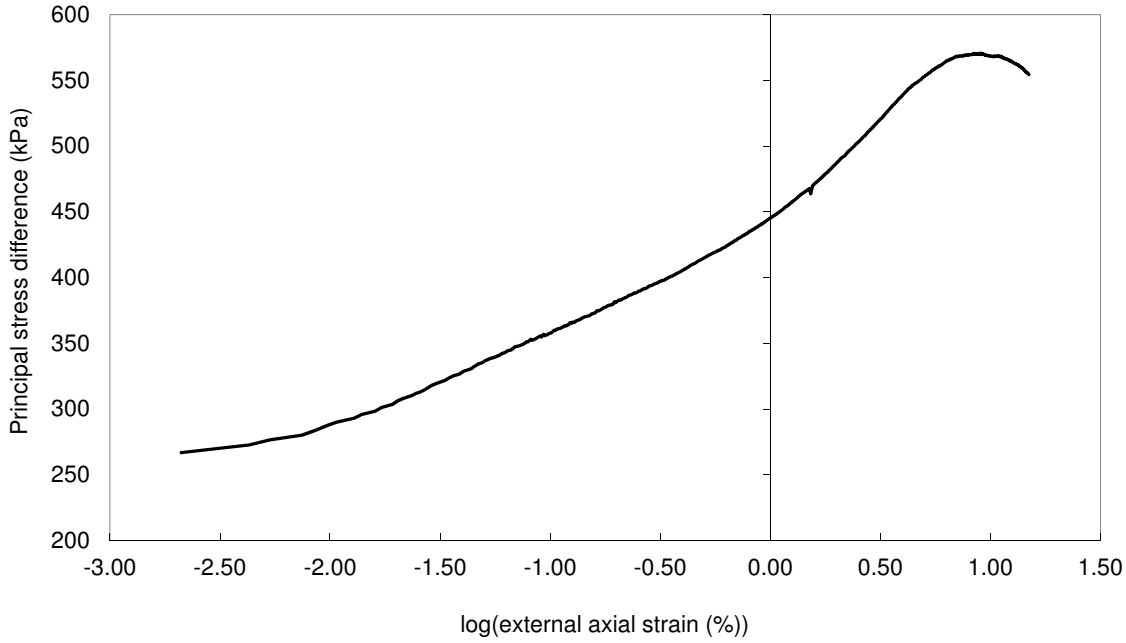

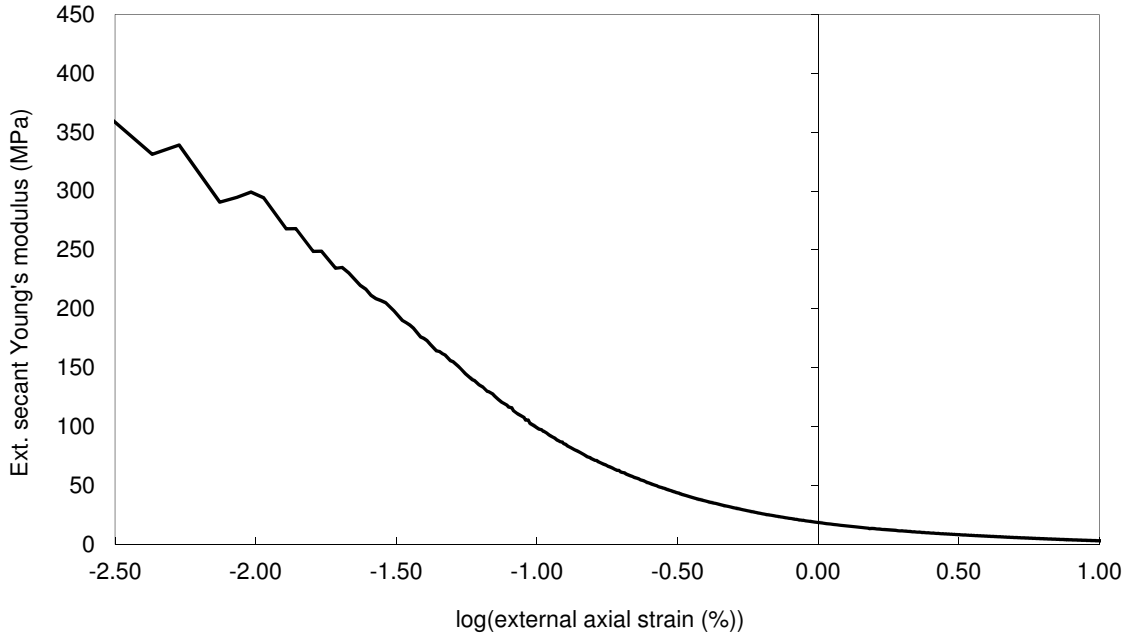

Undrained Shear Stage

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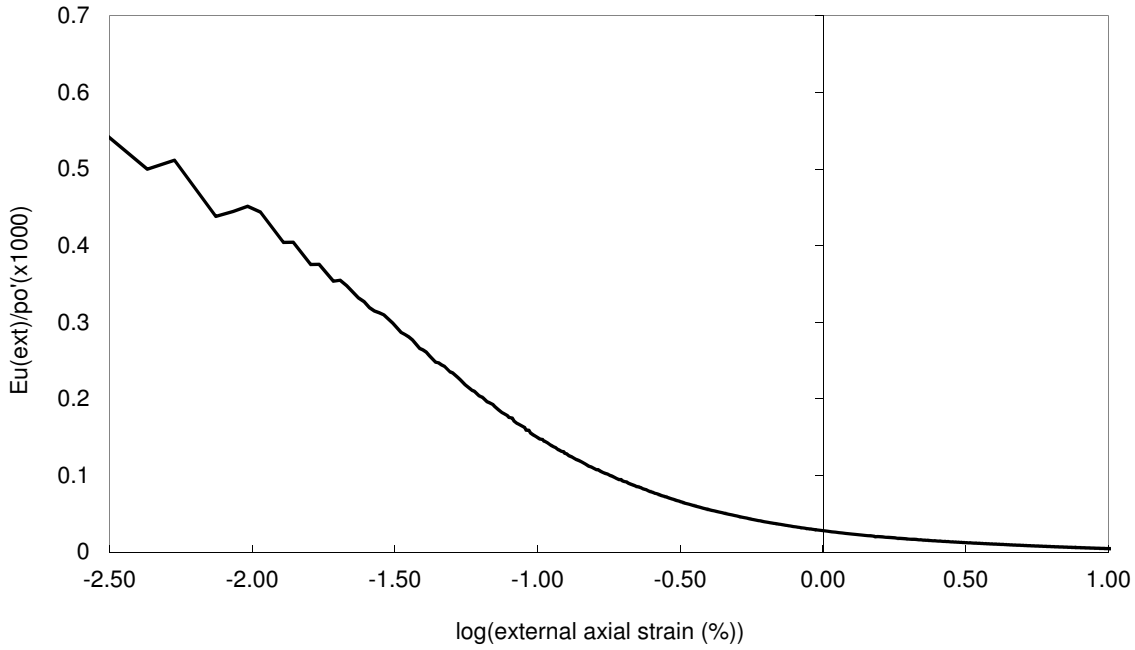

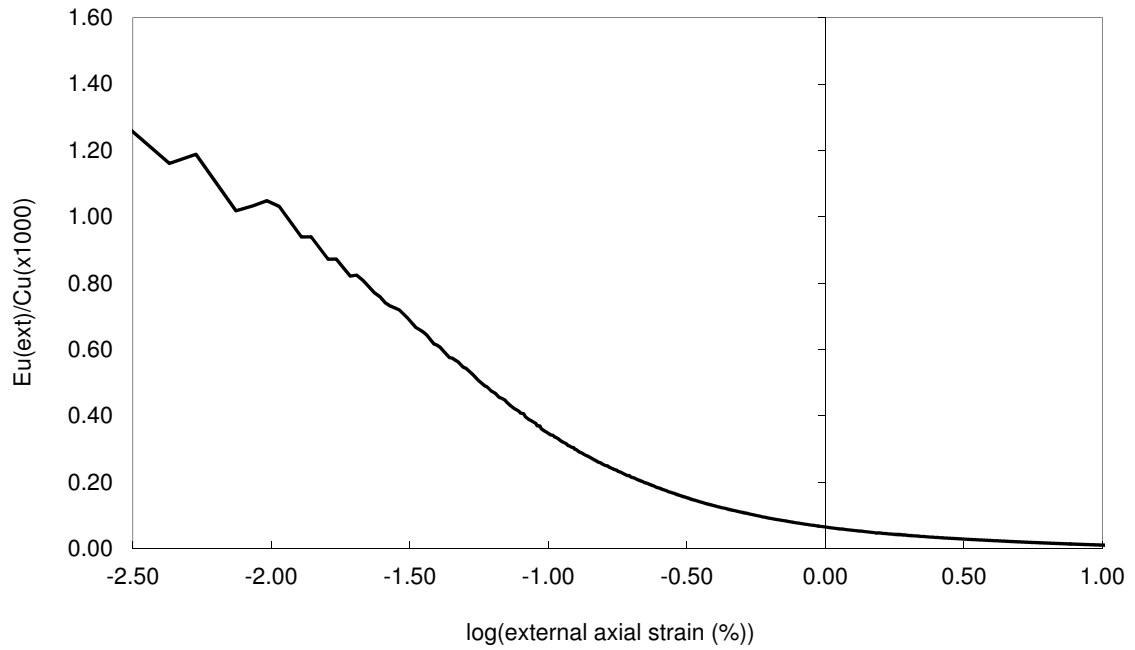

Undrained Shear Stage

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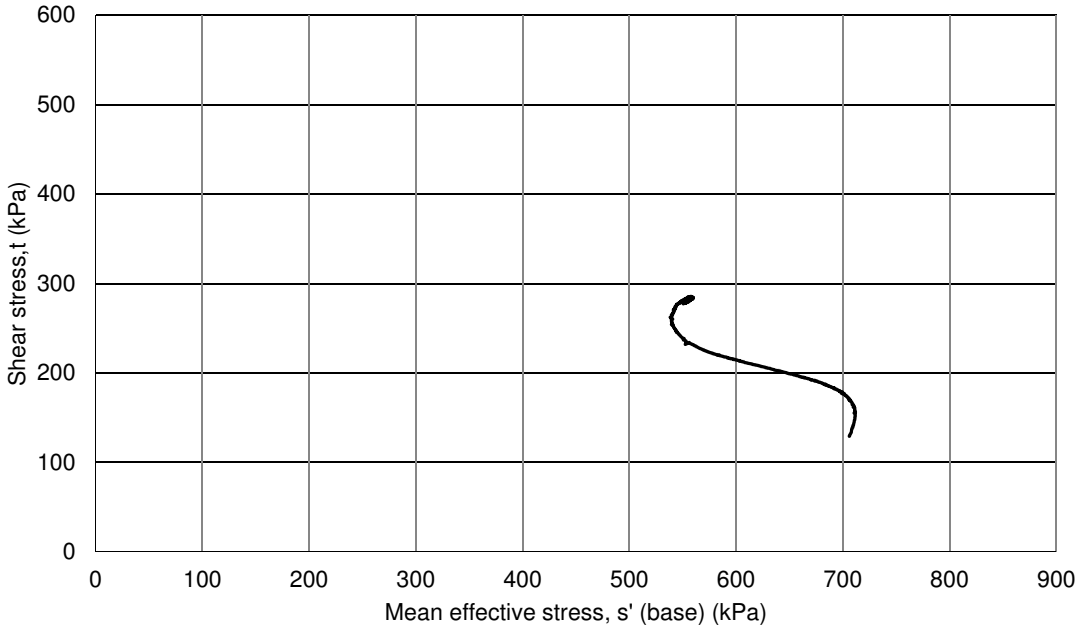

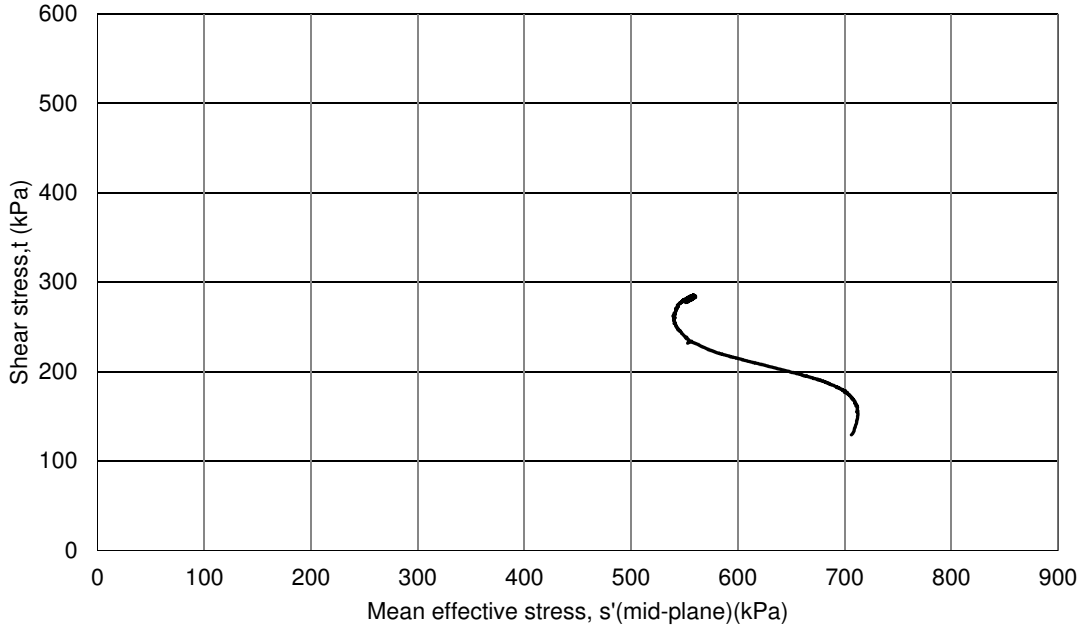

Undrained Shear Stage

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement (CAUC)

Borehole Number:	H10	Description (visual) :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	

SPECIMEN DETAILS	Initial Values		Final Values	
Height :	140.8	mm		
Diameter :	72.4	mm		
Moisture content :	28.36	%	25.96	%
Bulk density :	1.95	Mg/m³		
Dry density :	1.52	Mg/m³		
Particle density (assumed)	2.72	Mg/m³		
Initial voids ratio (e_o)	0.7928			
Test Duration:			17 Days	

INITIAL MEASUREMENT OF EFFECTIVE STRESS (Cell pressure increments at NMC)

Stage	#1	#2	#3	
Cell pressure (kPa):	800	1000	1200	
Base pwp (kPa):	779.9	984.4	1179.6	
Mid-plane pwp (kPa):	780.8	985.3	1180.5	
Base B values :	0.98	1.02	0.98	
Mid-plane B values :	0.98	1.02	0.98	
Initial effective stress (mid-plane) :		19.3	kPa	

ISOTROPIC CONSOLIDATION/SWELLING STAGE

Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #1
Final cell pressure (kPa):	#NA	Final back Pressure (kPa):	#NA	Stage #2

SHEAR STAGE

Effective stress, po', at start	697.2	(kPa)
$\Delta e/e_o$	0.1059	

At failure:

External axial strain	9.29	(%)
Peak deviator stress	681	(kPa)
Undrained shear strength	341	(kPa)
Mid plane pore pressure	1500	(kPa)
Base pore pressure	1503	(kPa)
Horizontal effective stress	284	(kPa)
Vertical effective stress	965	(kPa)

At 50% of maximum deviator stress change during stage:

External axial strain	0.45	(%)
Deviator stress	476	(kPa)
Mid plane pore pressure	1377	(kPa)
Base pore pressure	1379	(kPa)
Horizontal effective stress	407	(kPa)
Vertical effective stress	883	(kPa)

Note: In all notation po' is mean effective stress: p'= (σa'+(2σr'))/3

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Initials: CSR	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 15/02/2016		

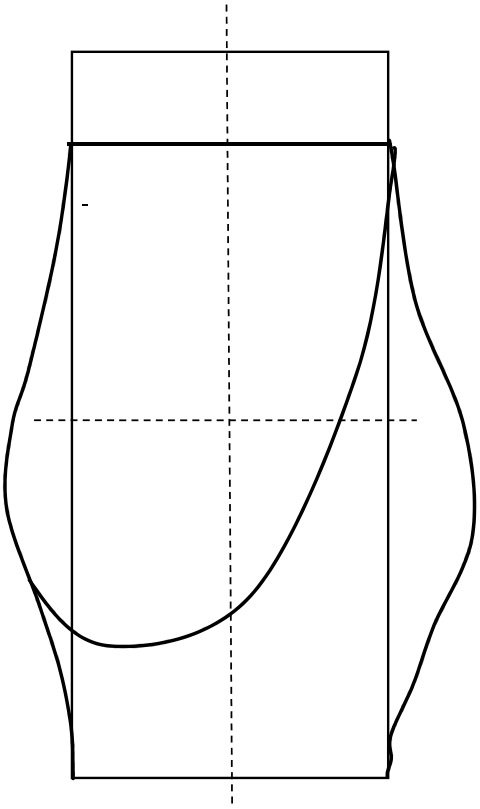
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	

SPECIMEN DETAILS

Initial Height:	140.8	mm
Initial Diameter:	72.4	mm

Elevation



Failure Sketch

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Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	15/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	

STRESS PATH STAGES

ANISOTROPIC CONSOLIDATION/SWELLING #1

	Initial Values		Final Values
Cell Press. (kPa)	1200		1784
Mid pwp (kPa)	1180.7		1176.9
Base pwp (kPa)	1179.8		1177.4
s' (kPa)	19.3		742.9
t (kPa)	0.0		135.8
Voids ratio (e)	0.7928		0.7088

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Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
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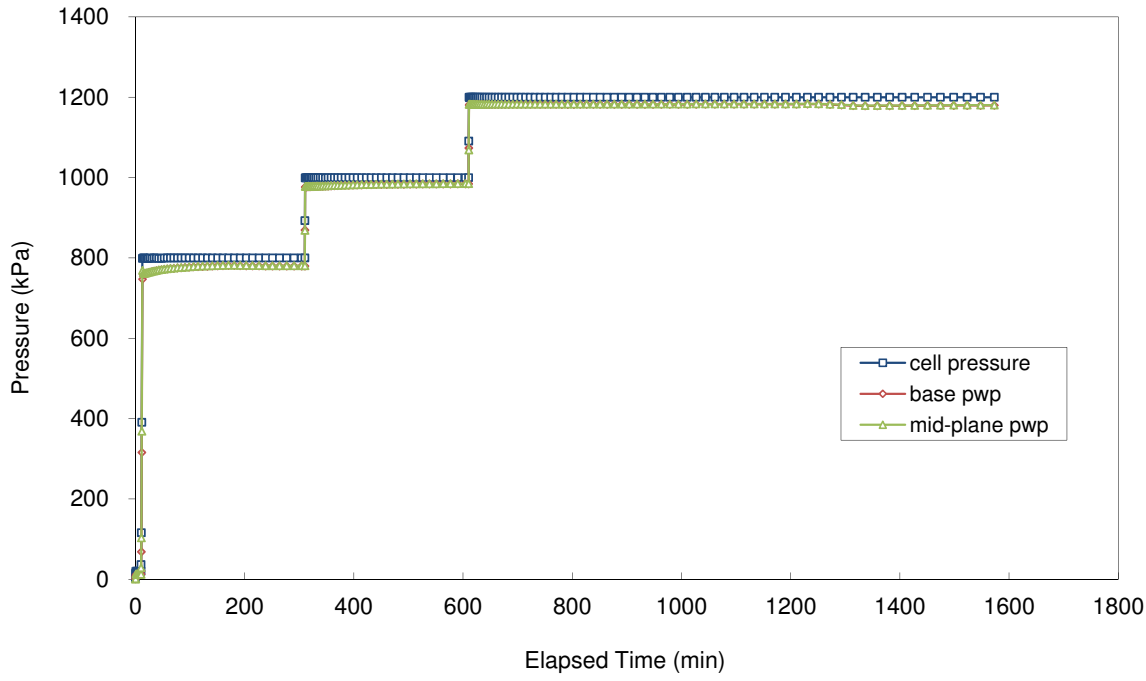
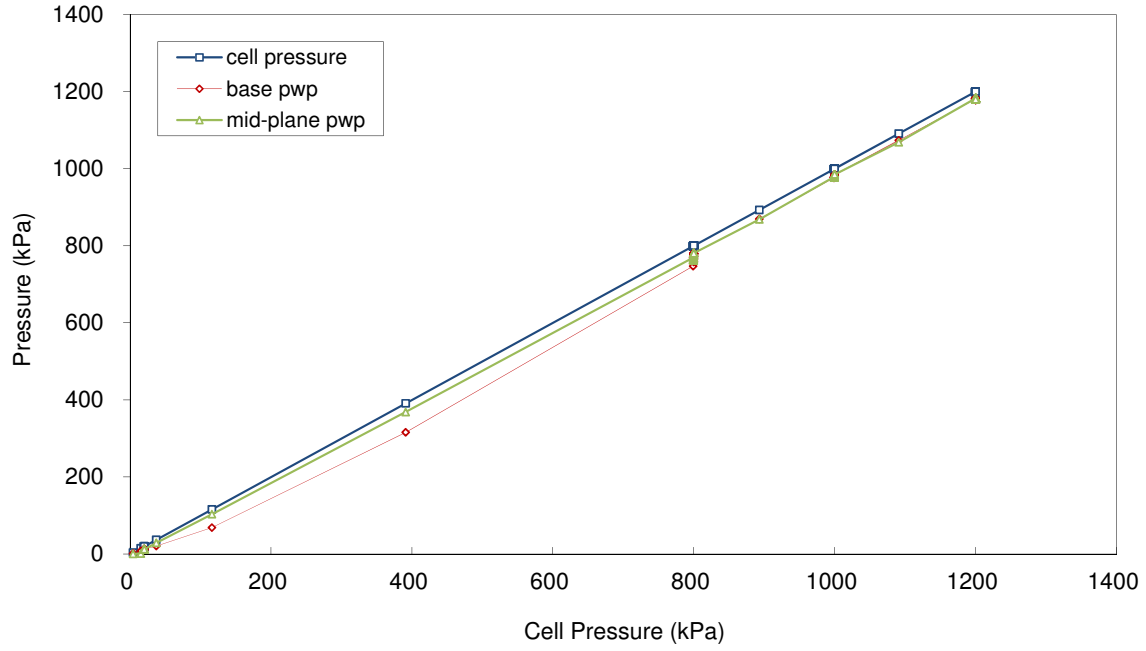
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	





Determination of Initial Effective Stress

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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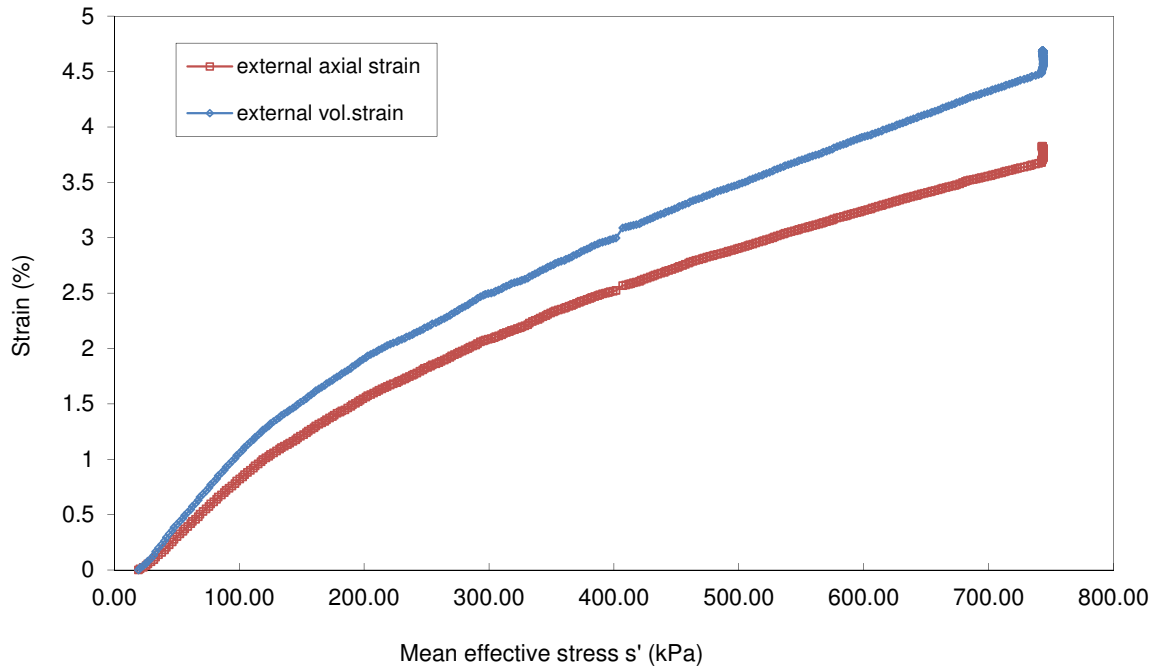
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	



Anisotropic Consolidation/Swelling Stage #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

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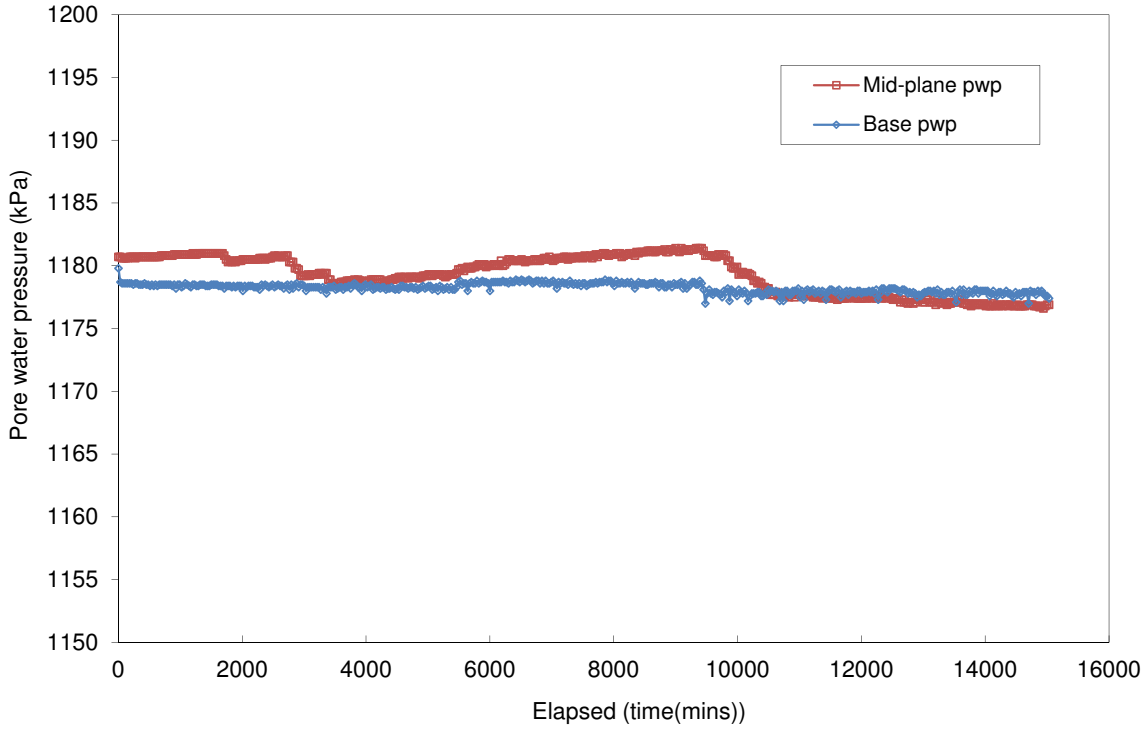
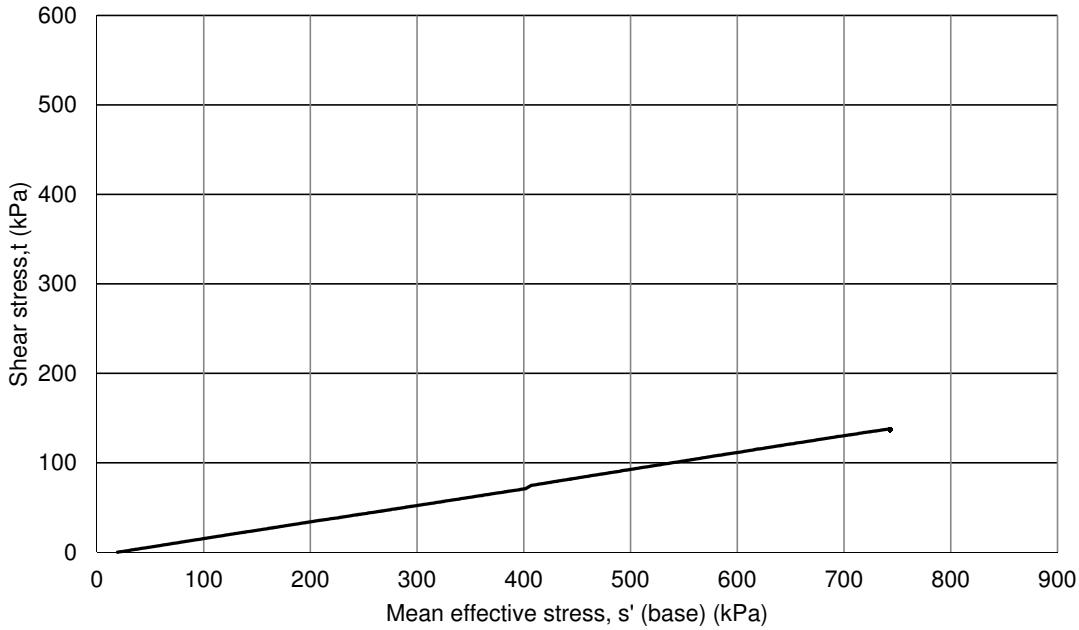
Sample Depth (m):	74.20-74.40	





Anisotropic Consolidation/Swelling Stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
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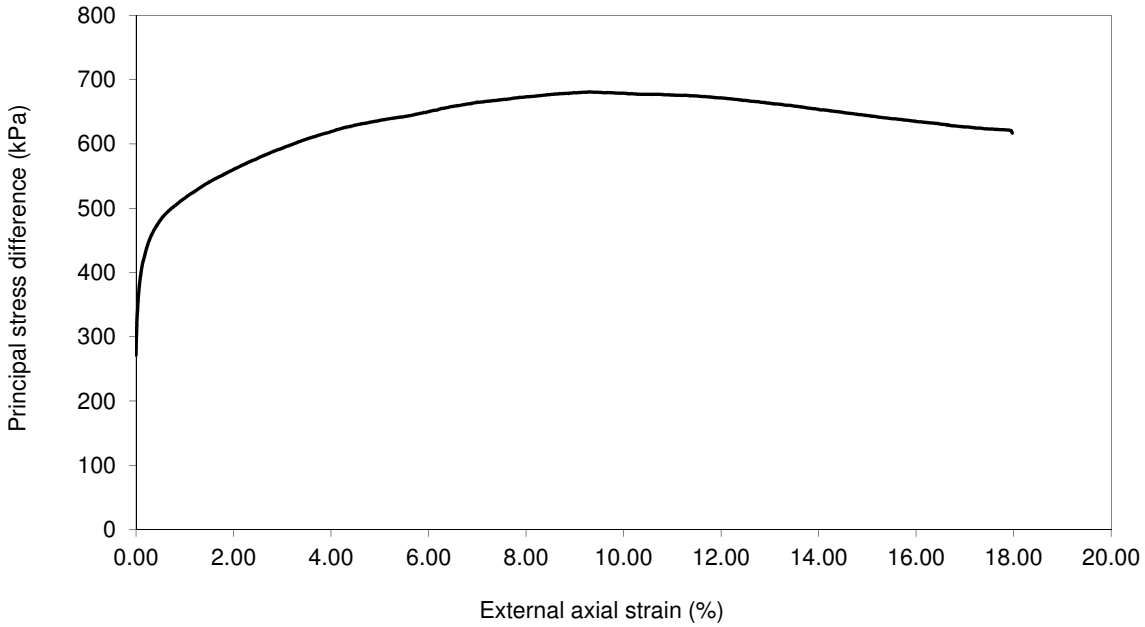

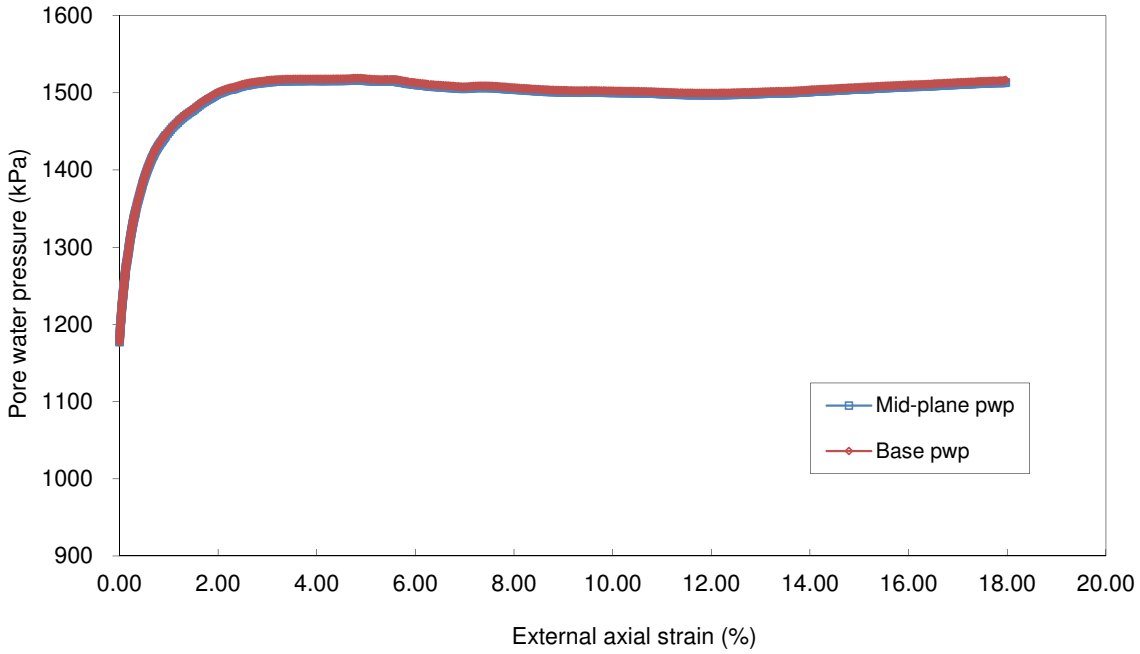

Undrained Shear Stage

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Date: 15/02/2016		

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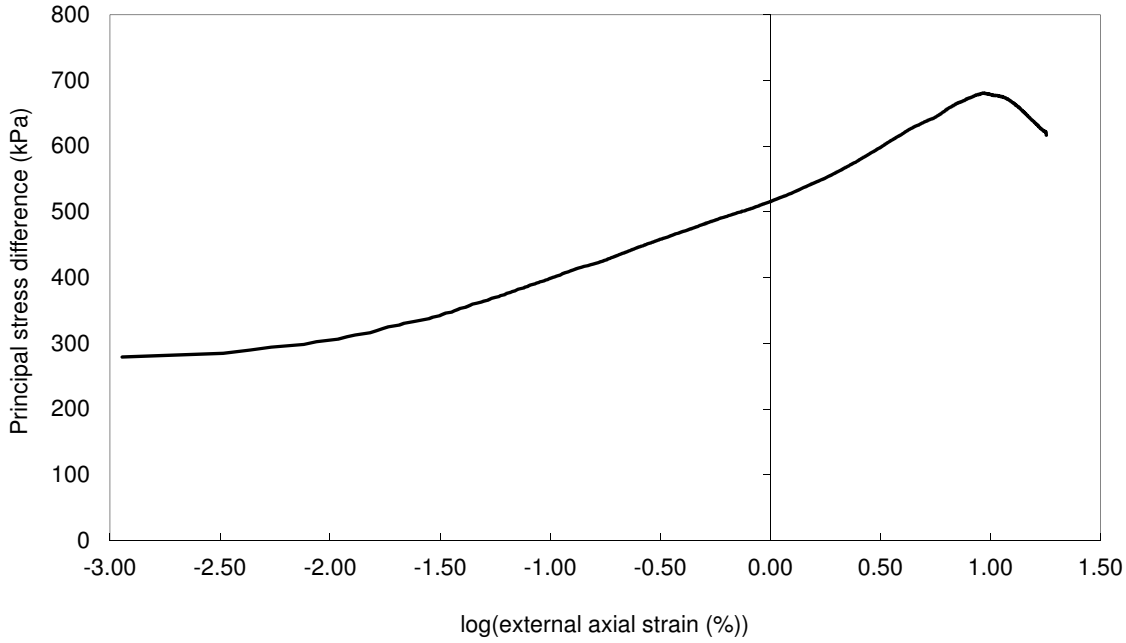
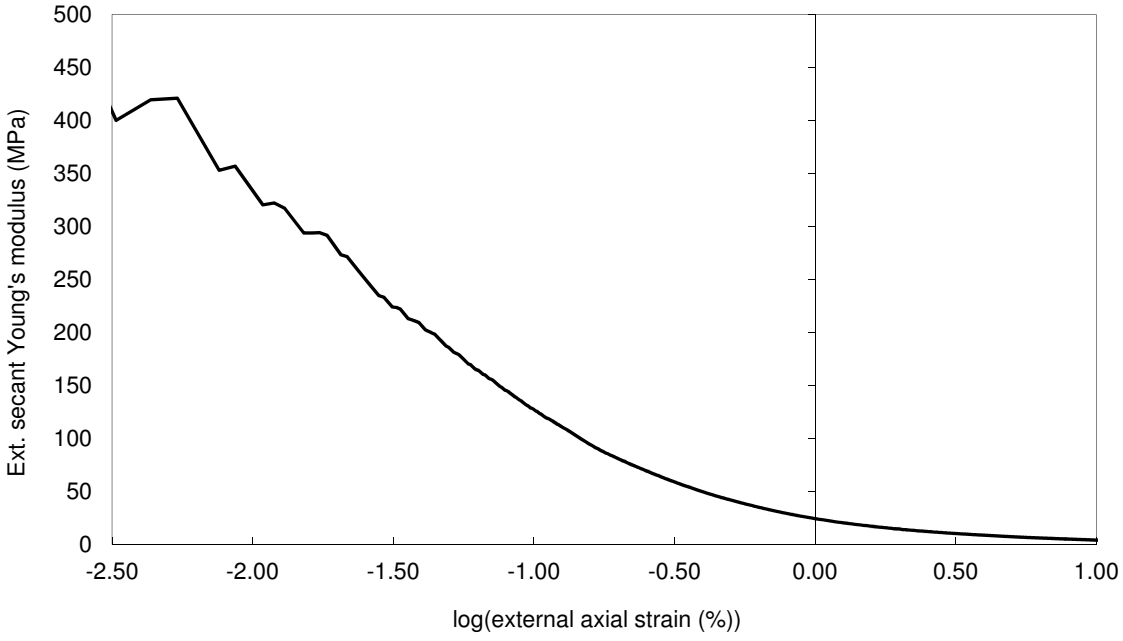
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	





Undrained Shear Stage

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Date: 15/02/2016		

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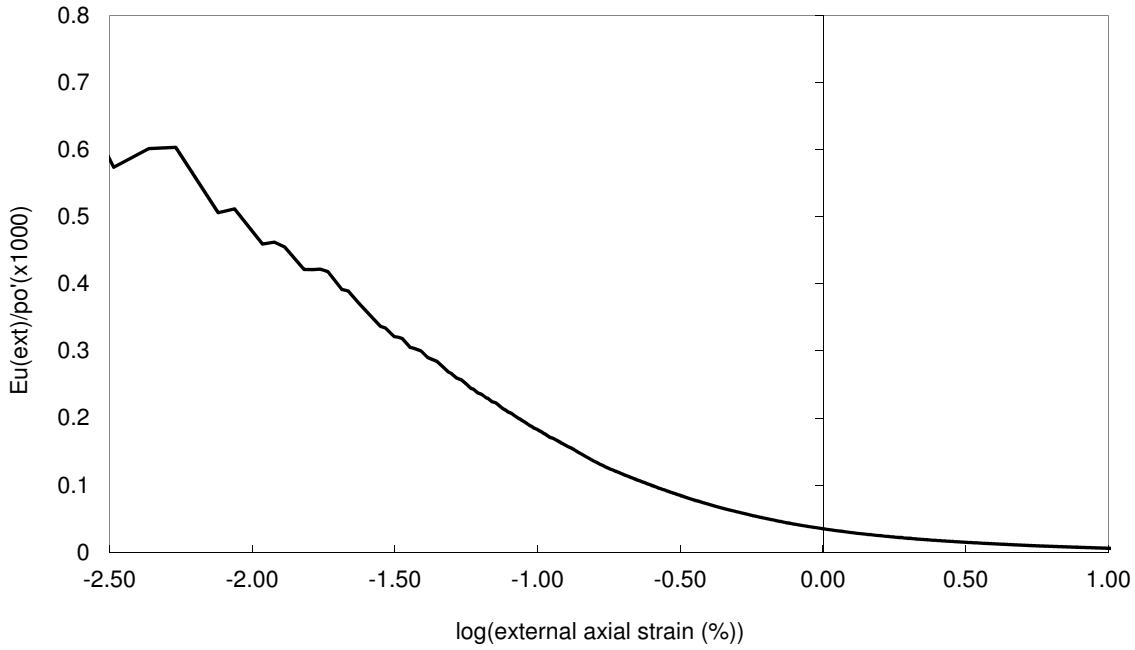
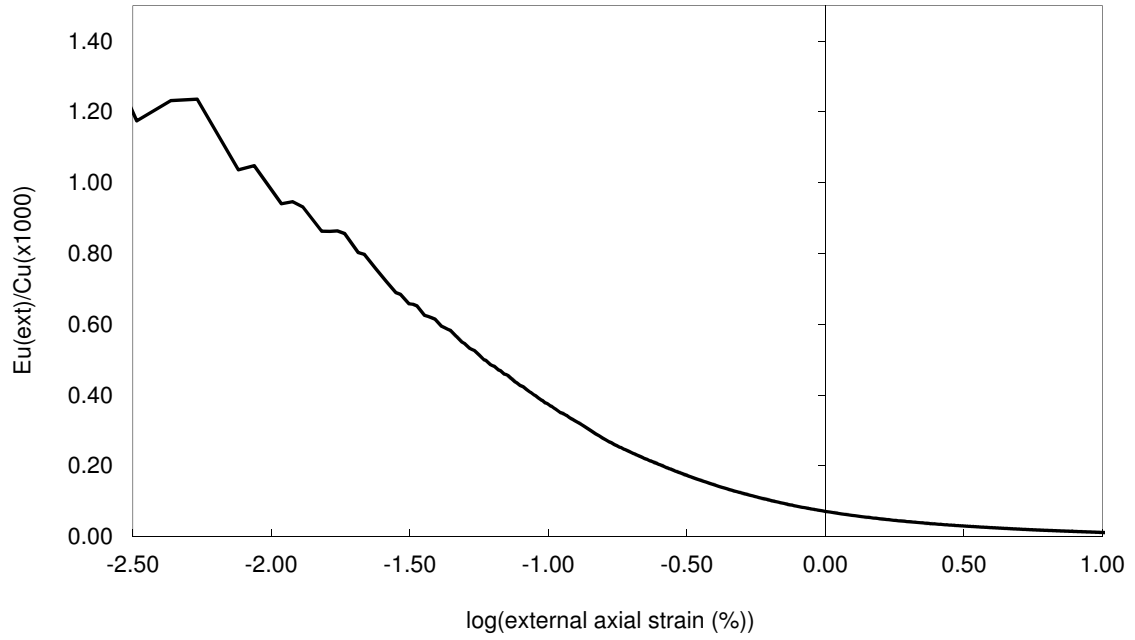
Anisotropically Consolidated Undrained Triaxial Test with Base/Mid-plane Pore Water Pressure Measurement

Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	





Undrained Shear Stage

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Date: 15/02/2016		

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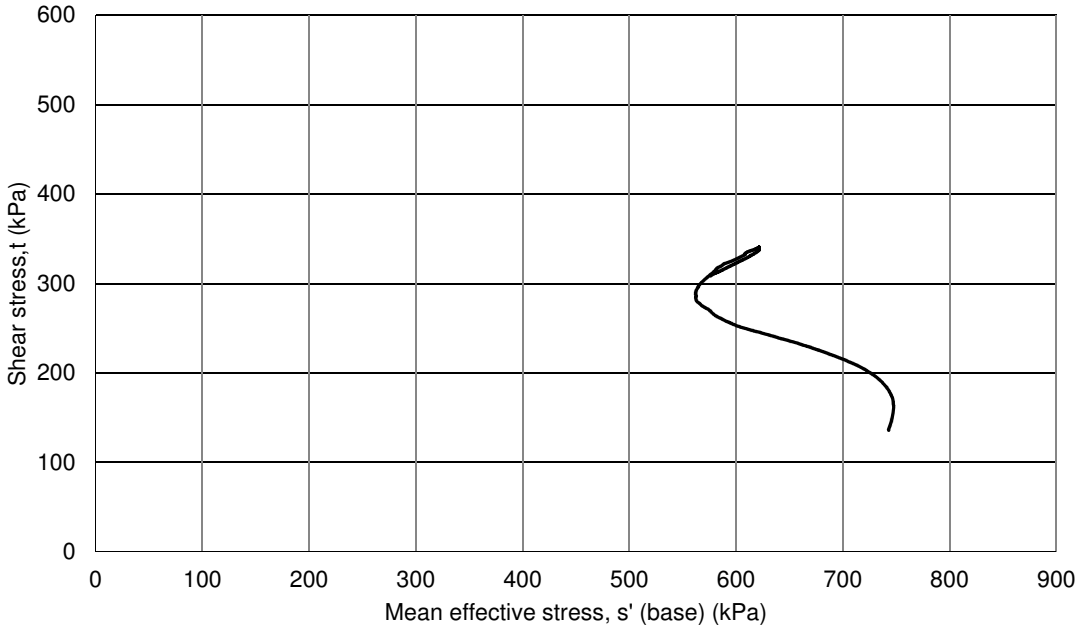
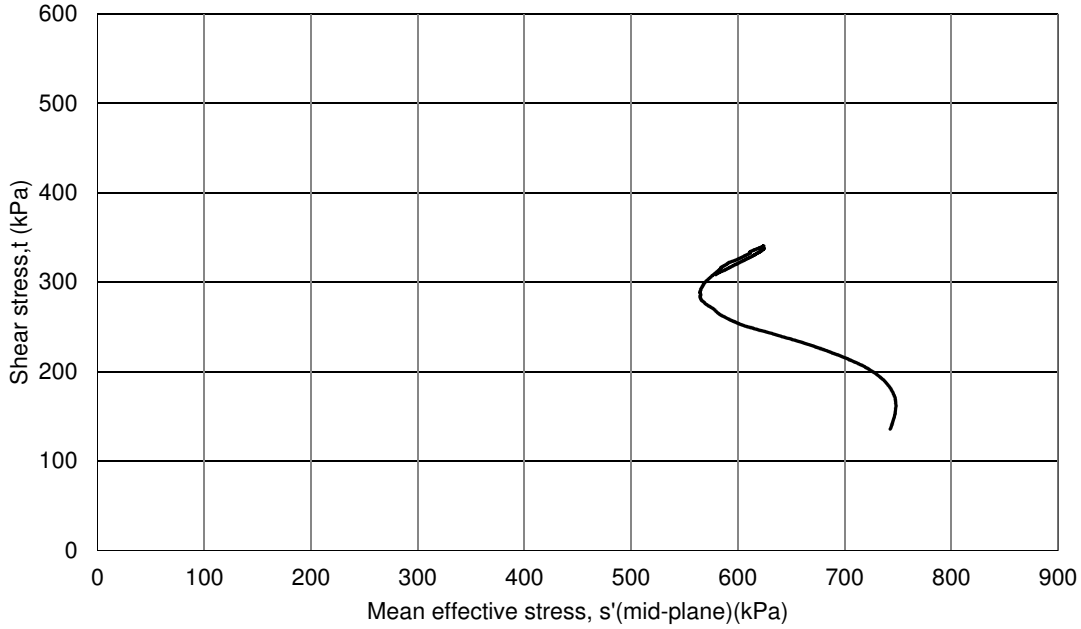
Borehole Number:	H10	Description :
Sample Number:	P22-Q1	Firm/stiff grey clayey fine SAND/SILT with some mica
Sample Depth (m):	74.20-74.40	





Undrained Shear Stage

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Date: 15/02/2016		

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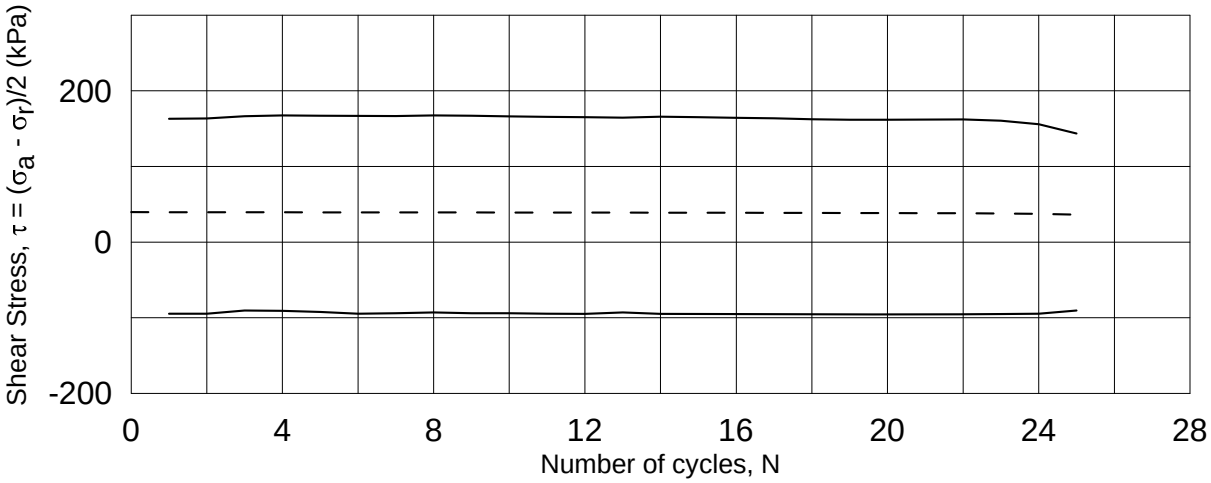
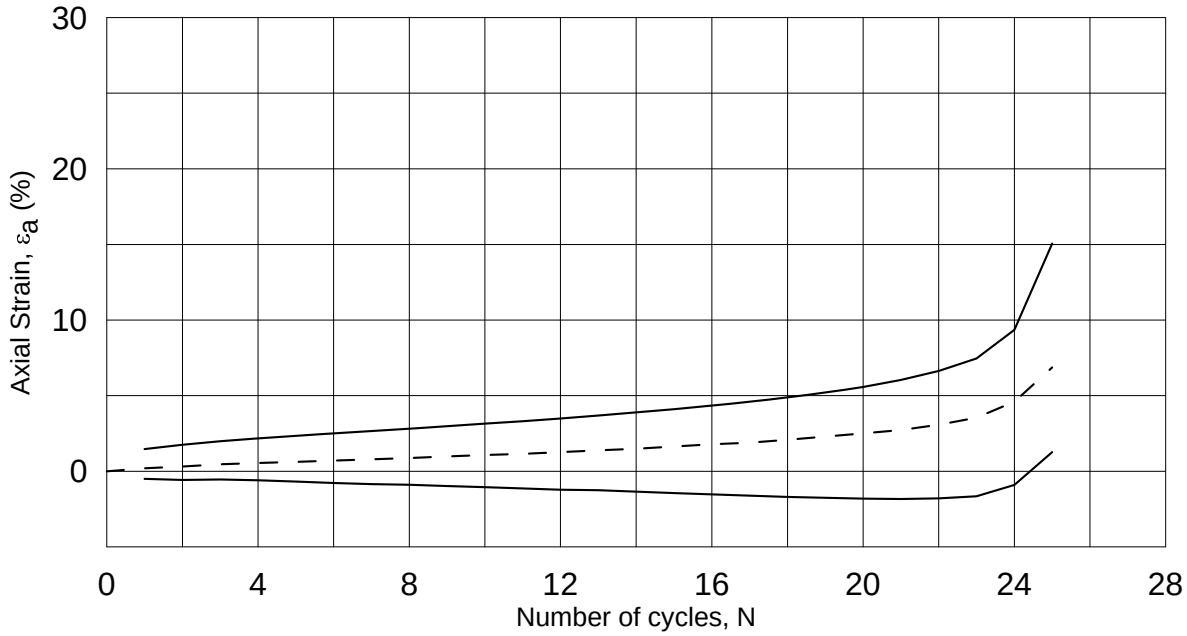
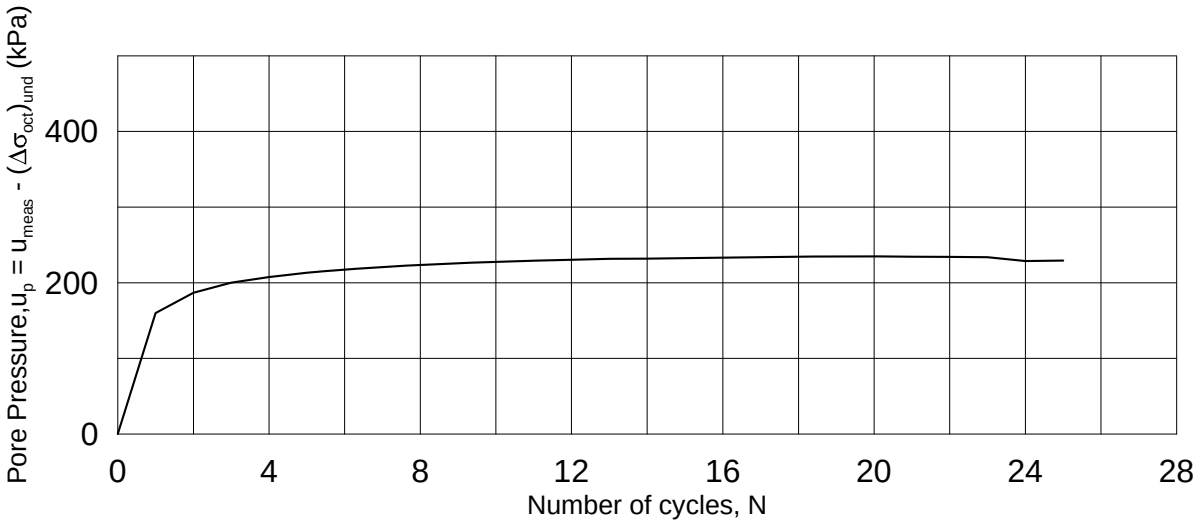
3.10 Cyclic Consolidated Triaxial (CAUcy) Results







Dato/rev.: 2014-12-23/01

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Triaxial test: **CAUcy**

Figure No.: XX

Boring: **D14A**
Tube: **P5Q2**
Part: **UnitB**
Test: **1**

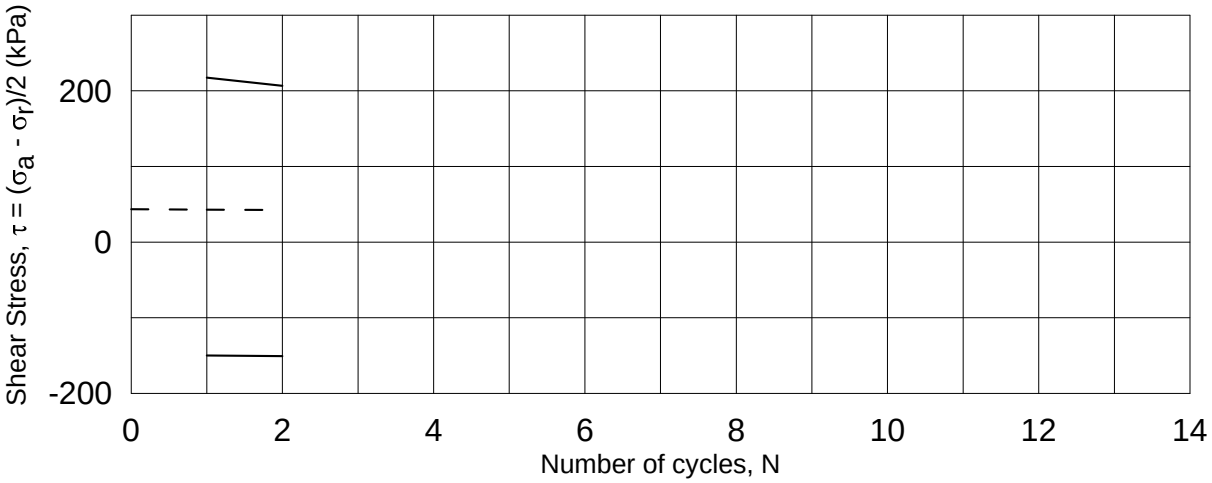
Depth	=	**37.60**	m
p_0'	=	**331.0**	kPa
w_i	=	**33.5**	%
w_c	=	**31.6**	%

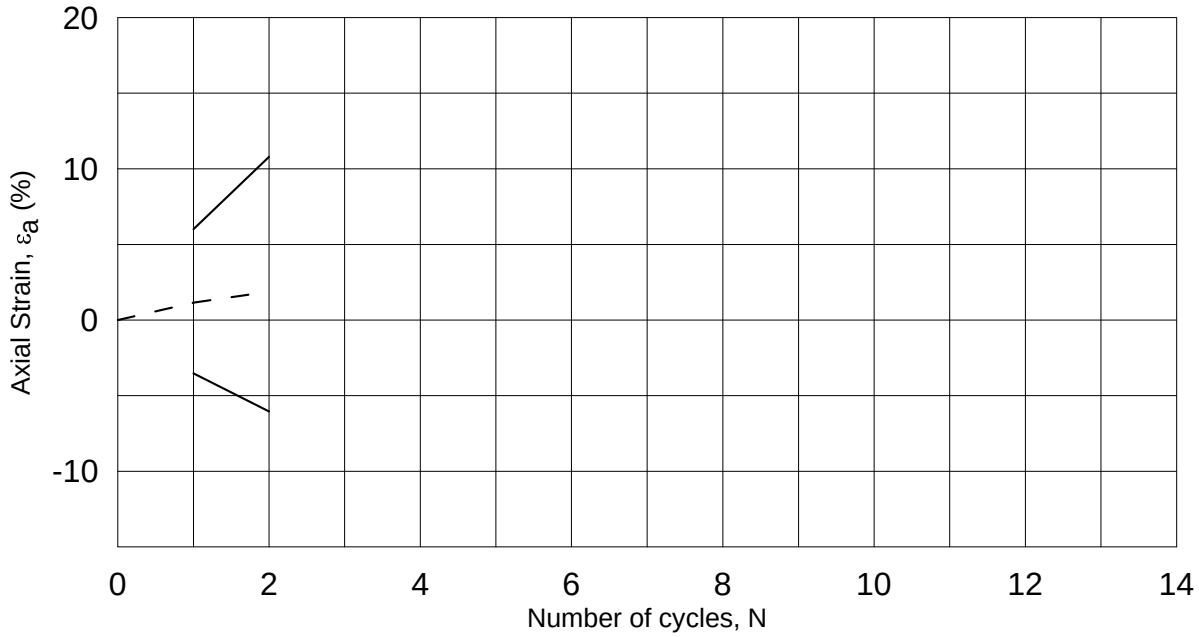
Consolidation stresses (kPa)	max.	min.	final
σ_{ac}' =	-	-	**331.0**
σ_{rc}' =	-	-	**251.6**

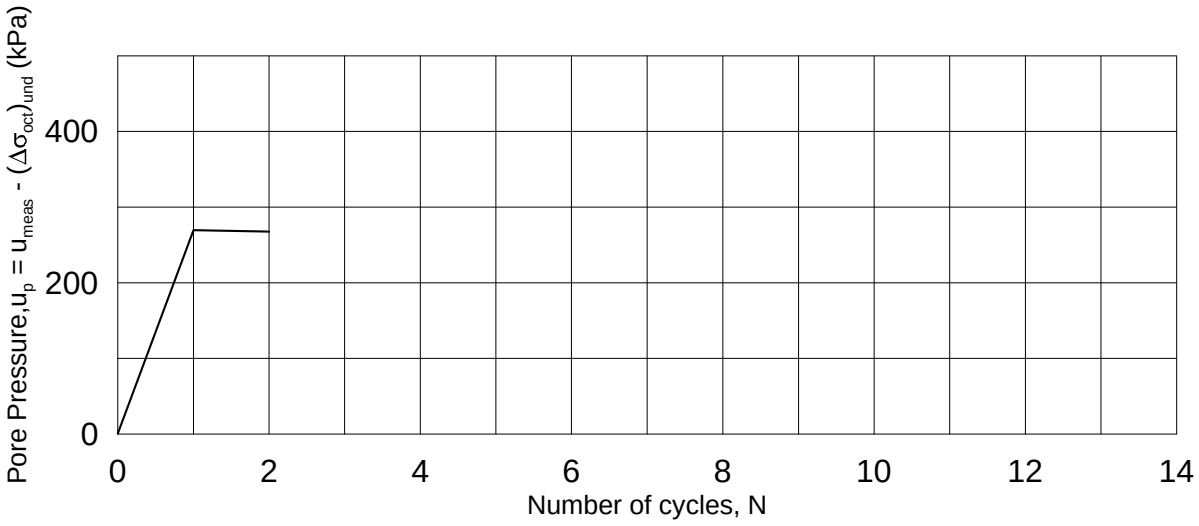
Date: 2016-02-19

Drawn by/checked: MAS / GS

D14A-P5Q2-UnitB-1.Plot1.grf







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Triaxial test: **CAUcy**

Figure No.: XX

Boring: **D14A**
Tube: **P6Q1**
Part: **UnitB**
Test: **2**

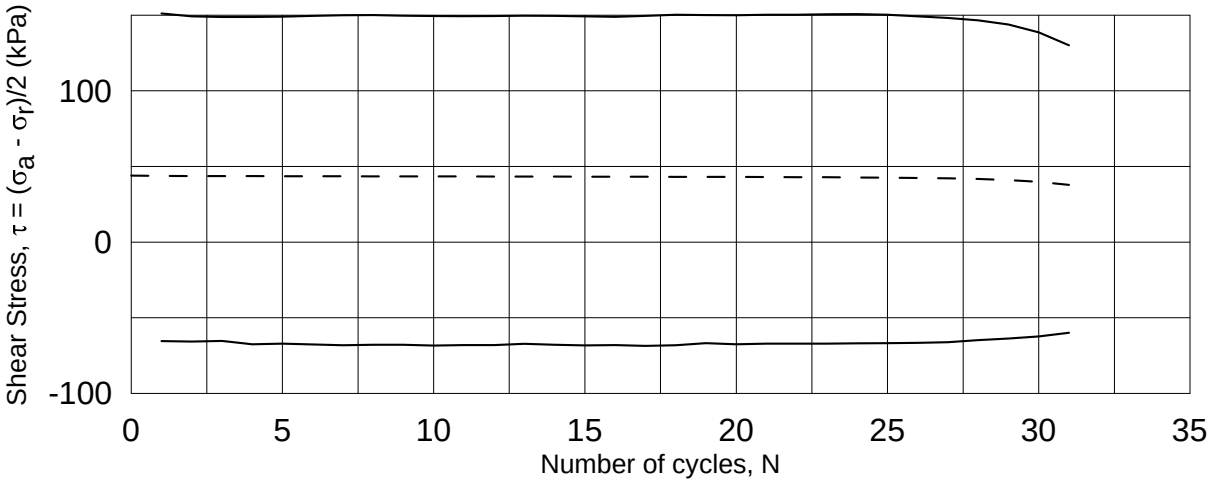
Depth	=	**41.50**	m
p_O'	=	**363.0**	kPa
w_i	=	**35.4**	%
w_c	=	**32.5**	%

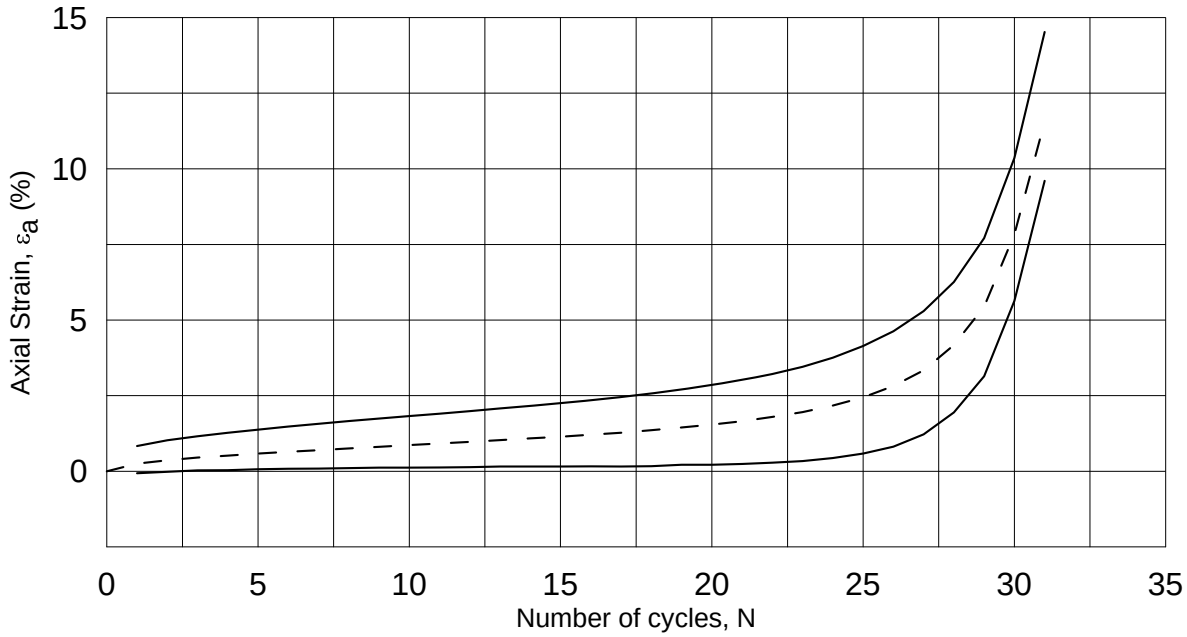
Consolidation stresses (kPa)	max.	min.	final
σ_{ac}' =	-	-	**362.9**
σ_{rc}' =	-	-	**275.9**

Date: 2016-02-22

Drawn by/checked: MAS / GS

D14A-P6Q1-UnitB-2.Plot1.grf





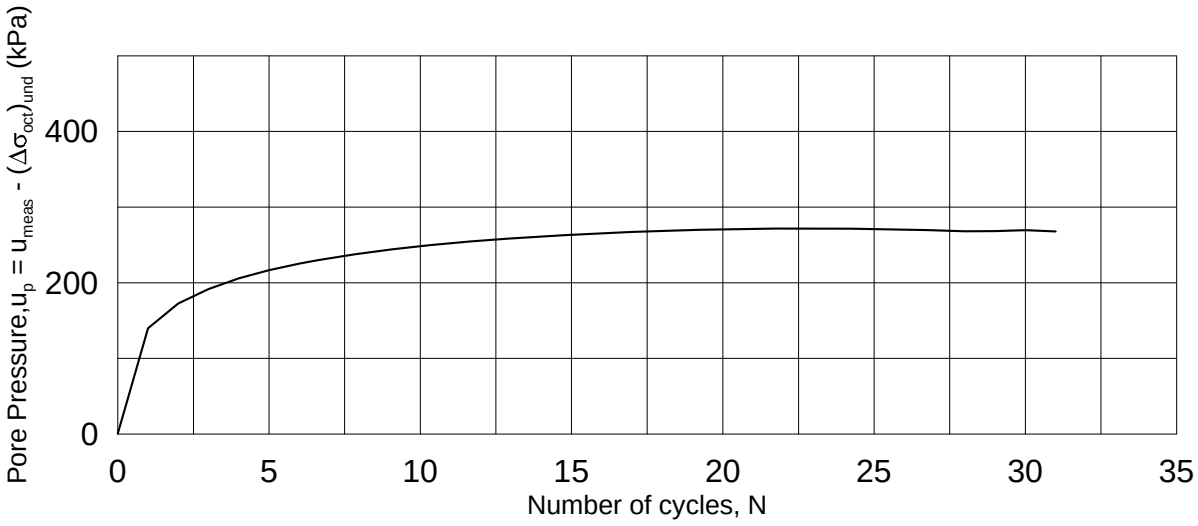


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Figure No.:

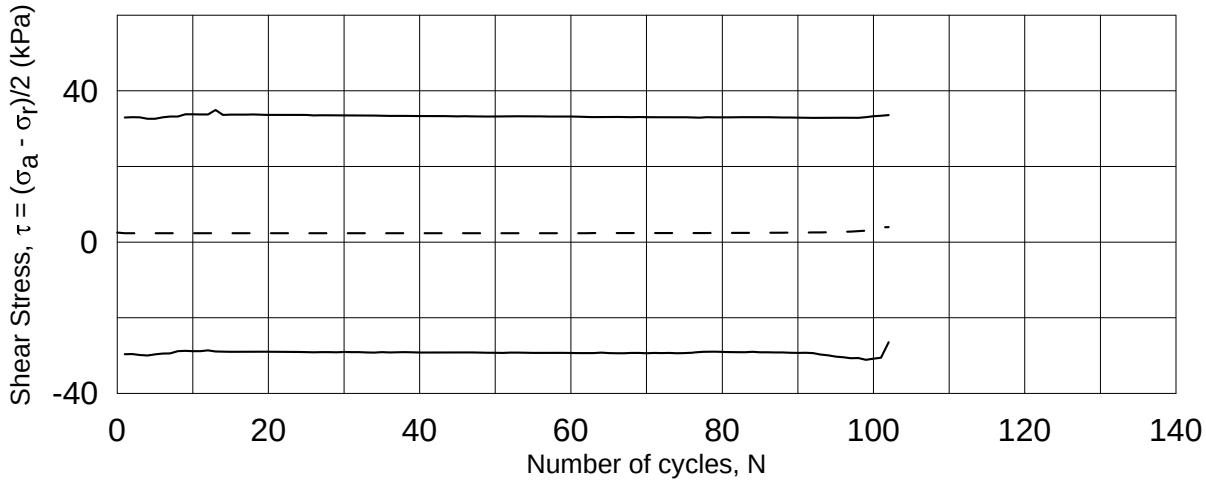
Triaxial test: **CAUcy**

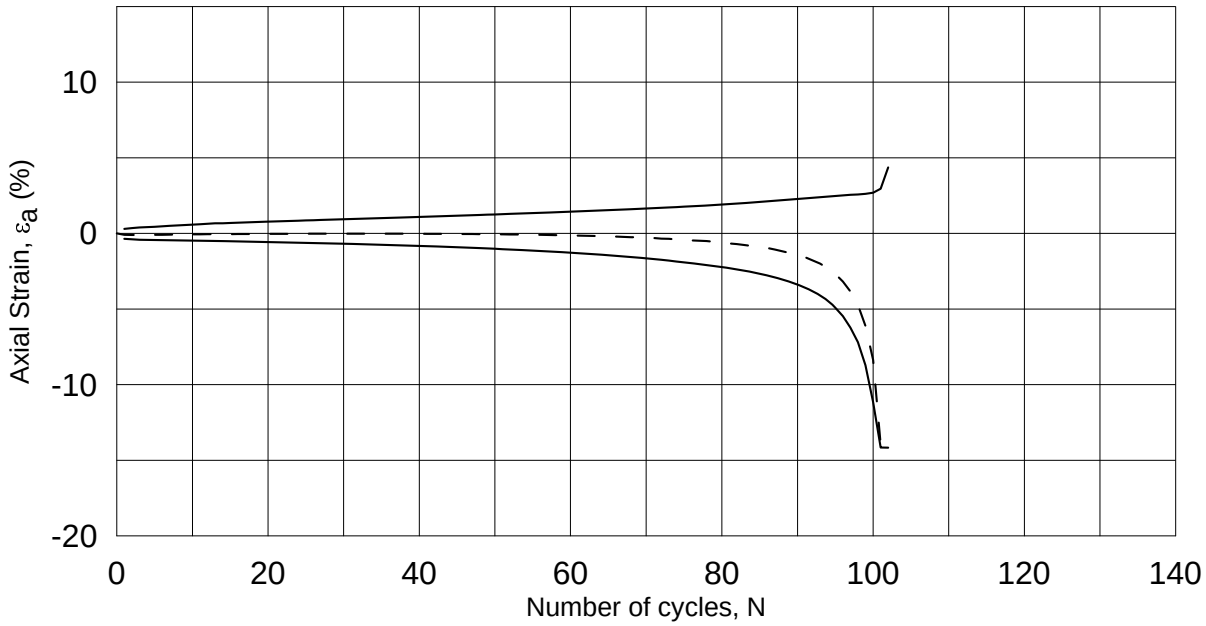
Boring:	**D14A**	Depth =	**41.90**	m	Consolidation stresses			
Tube:	**P6Q2**	p_O' =	**366.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitB**	w_i =	**39.9**	%	σ_{ac}' =	-	-	**365.9**
Test:	**3**	w_c =	**37.1**	%	σ_{rc}' =	-	-	**278.2**

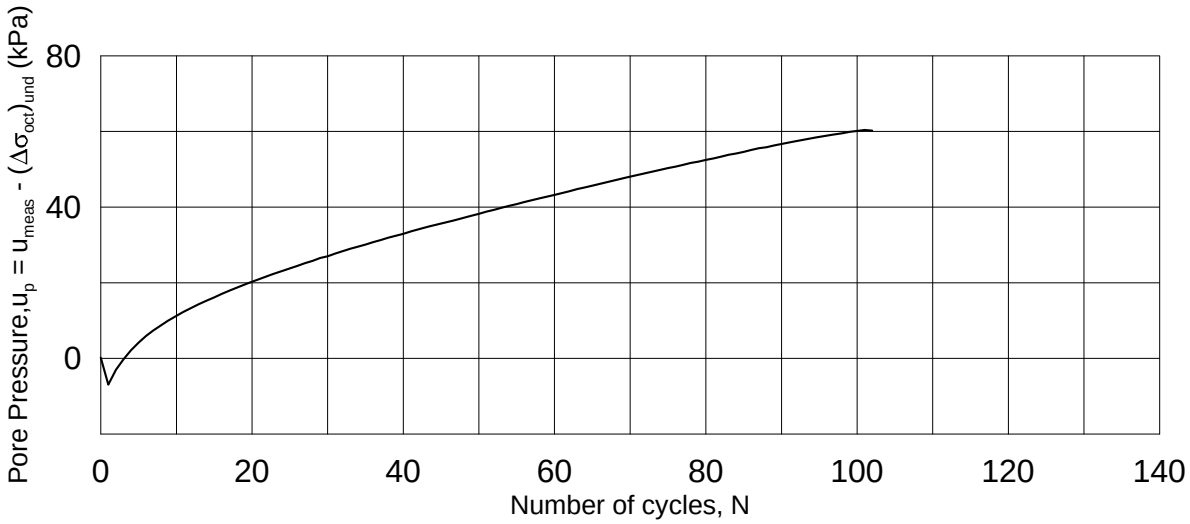
Date: 2016-03-04

Drawn by/checked: MAS / GS

D14A-P6Q2-UnitB-3.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Figure No.:

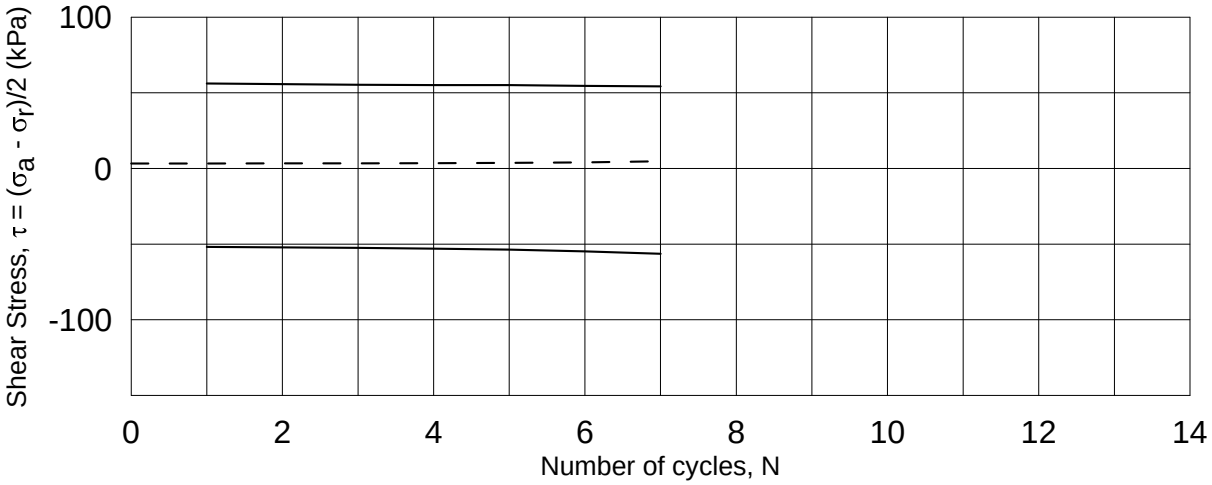
Triaxial test: **CAUcy**

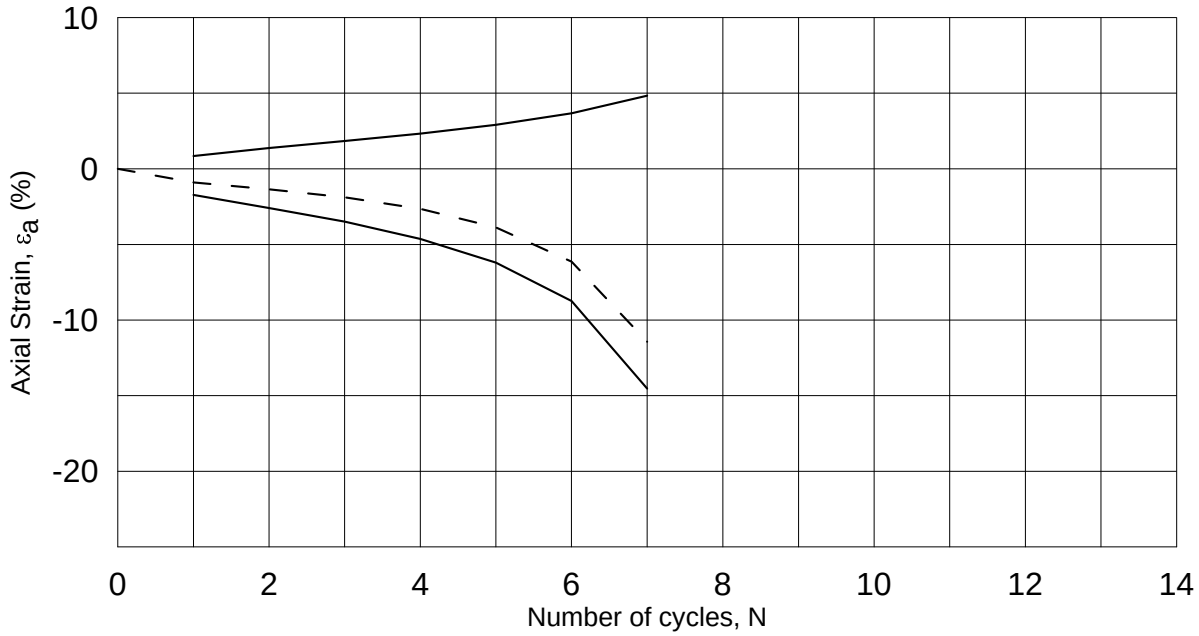
Boring:	**D14**	Depth =	**10.20**	m	Consolidation stresses			
Tube:	**P7Q1**	p_O' =	**96.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitA**	w_i =	**53.0**	%	σ_{ac}' =	-	-	**95.9**
Test:	**1**	w_c =	**50.4**	%	σ_{rc}' =	-	-	**91.2**

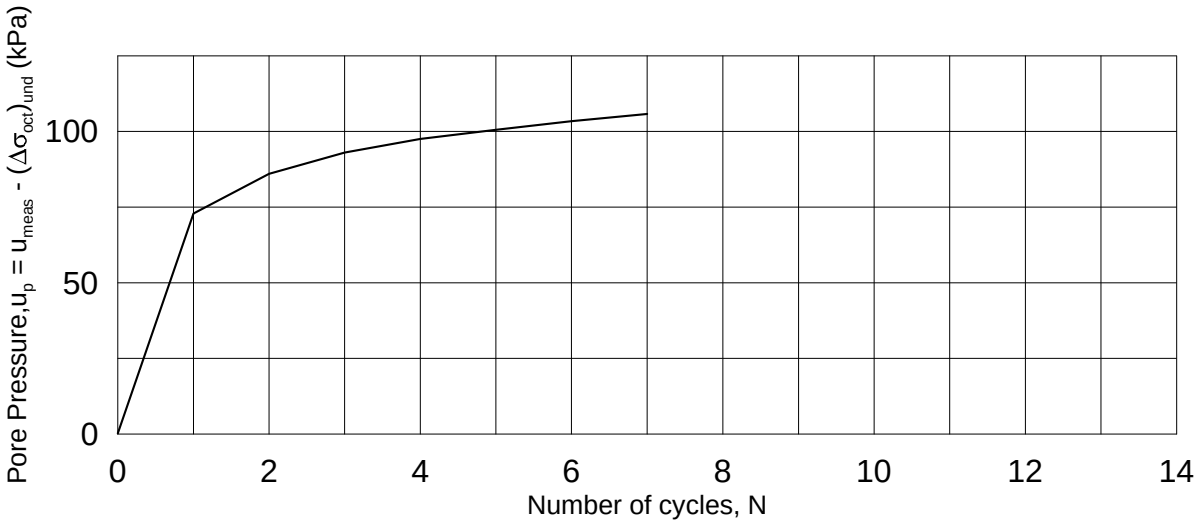
Date: 2016-01-25

Drawn by/checked: MAS / GS

D14-P7Q1-UnitA-1.Plot1.grf







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Triaxial test: **CAUcy**

Figure No.: XX

Boring: **D14**
Tube: **P8Q1**
Part: **UnitA**
Test: **2**

Depth	=	**13.80**	m
p_O'	=	**125.0**	kPa
w_i	=	**36.8**	%
w_c	=	**34.2**	%

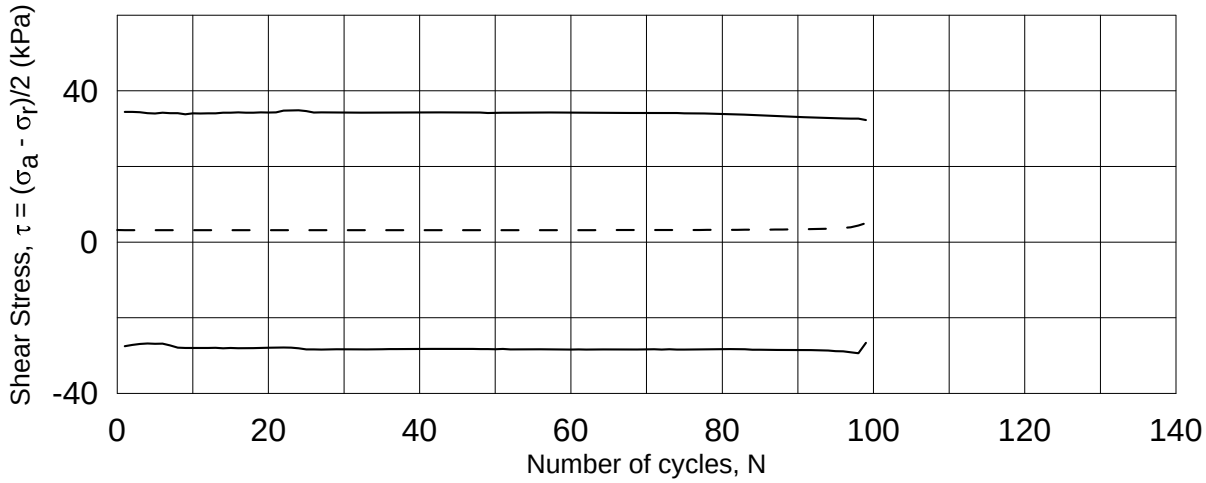
Consolidation stresses

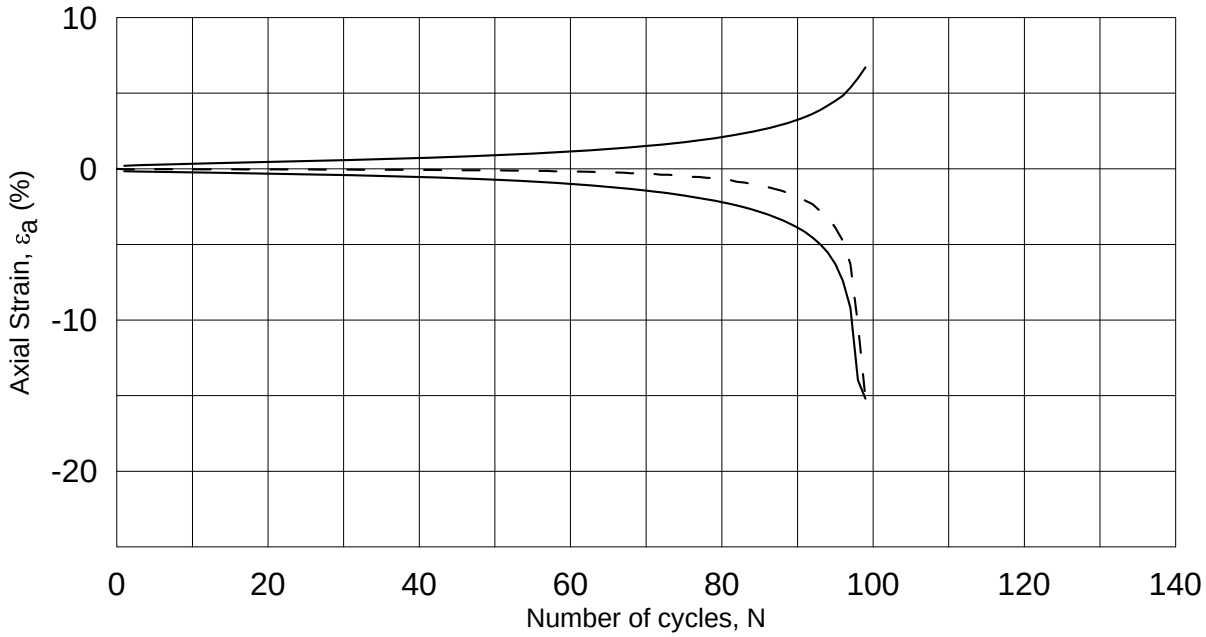
(kPa)	max.	min.	final
σ_{ac}' =	-	-	**125.1**
σ_{rc}' =	-	-	**118.8**

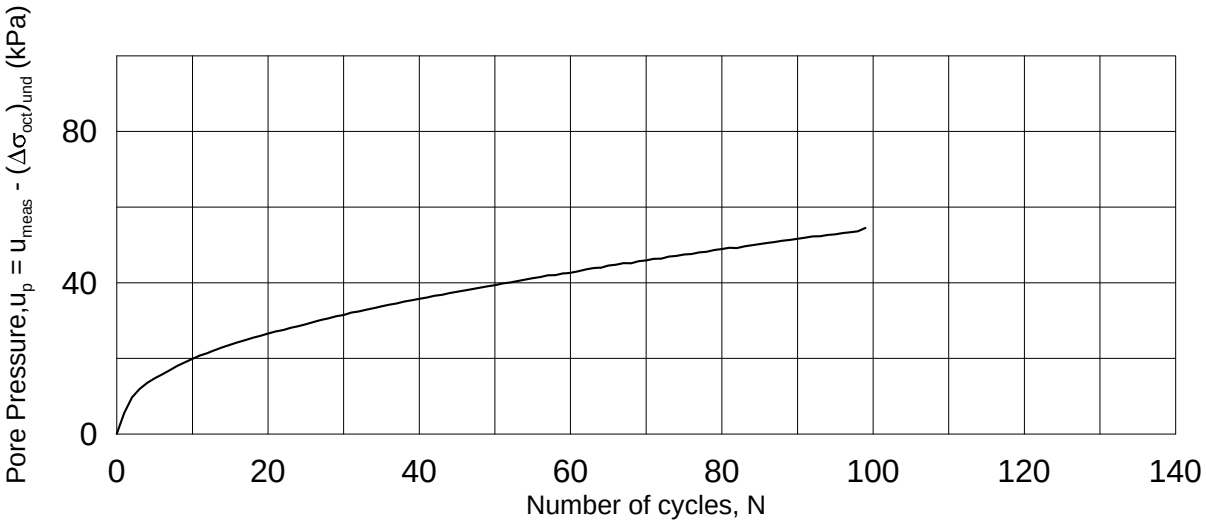
Date: 2016-02-01

Drawn by/checked: MAS / GS

D14-P8Q1-UnitA-2.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

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Triaxial test: **CAUcy**

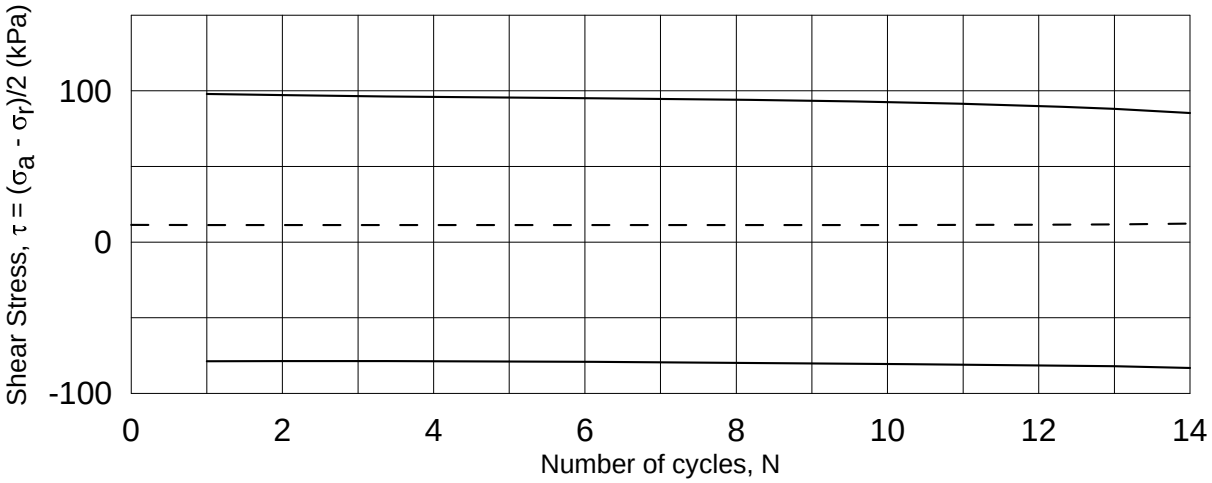
Figure No.: XX

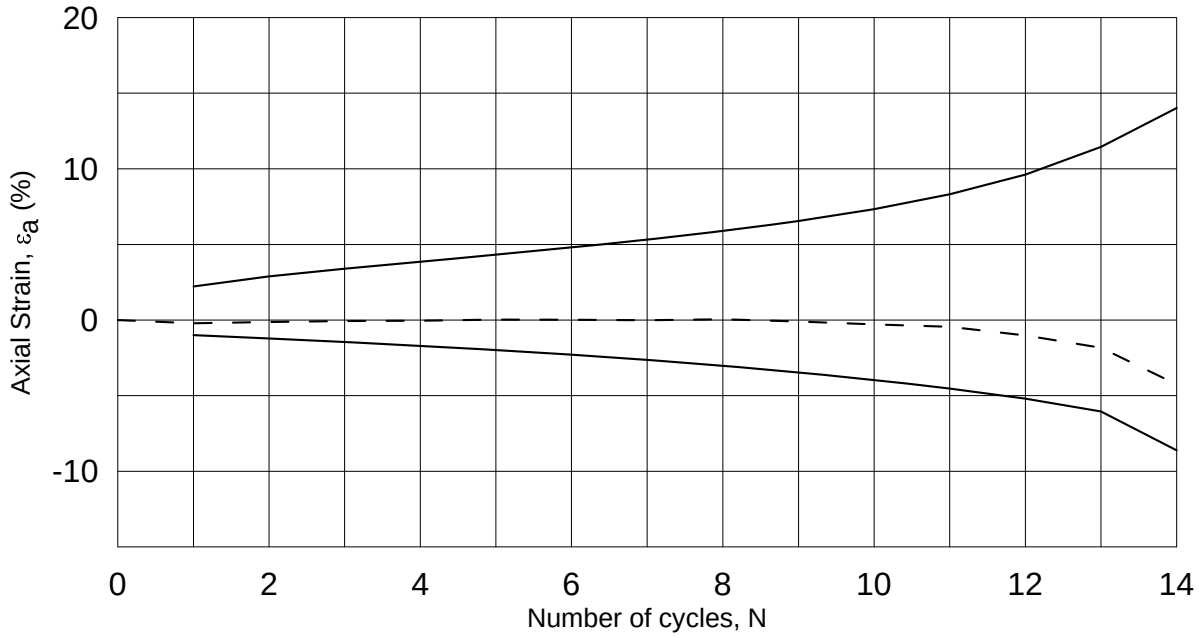
Boring:	**D14**	Depth =	**14.00**	m	Consolidation stresses			
Tube:	**P8Q2**	p_o' =	**126.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitA**	w_i =	**39.1**	%	σ_{ac}' =	-	-	**126.0**
Test:	**3**	w_c =	**36.0**	%	σ_{rc}' =	-	-	**119.7**

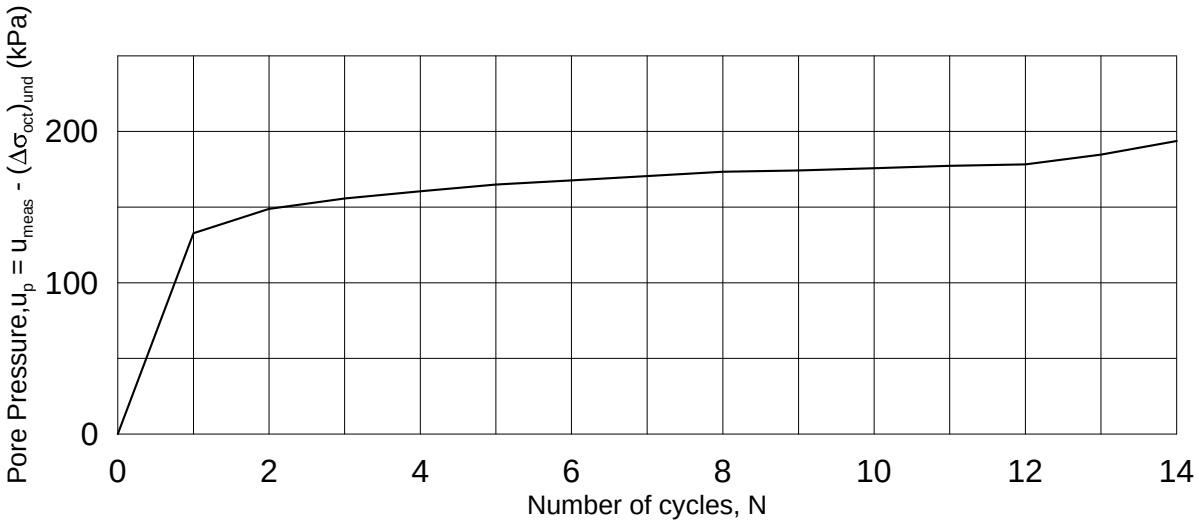
Date: 2016-01-29

Drawn by/checked: MAS / GS

D14-P8Q2-UnitA-3.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUcy**

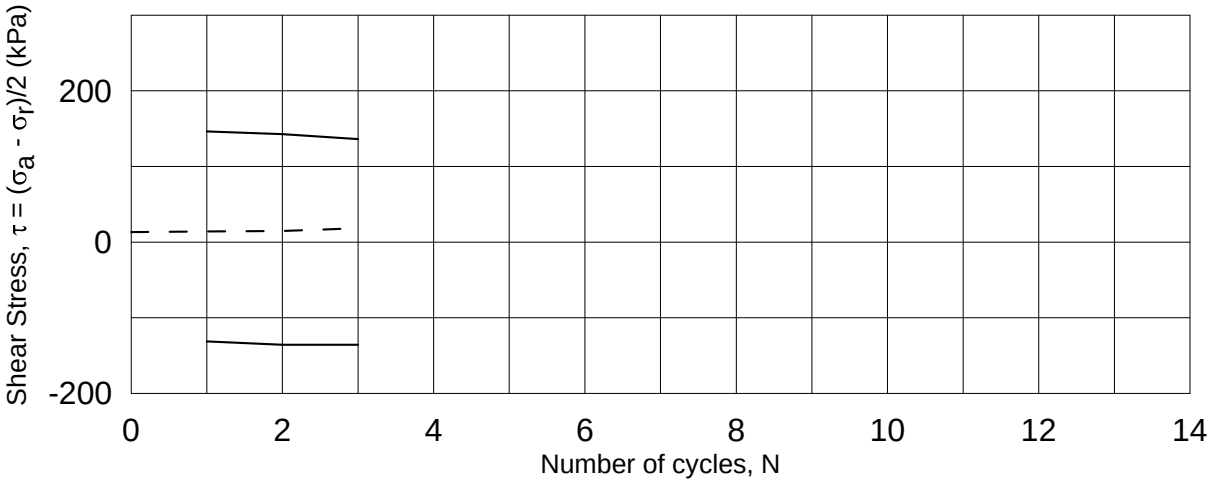
Figure No.: XX

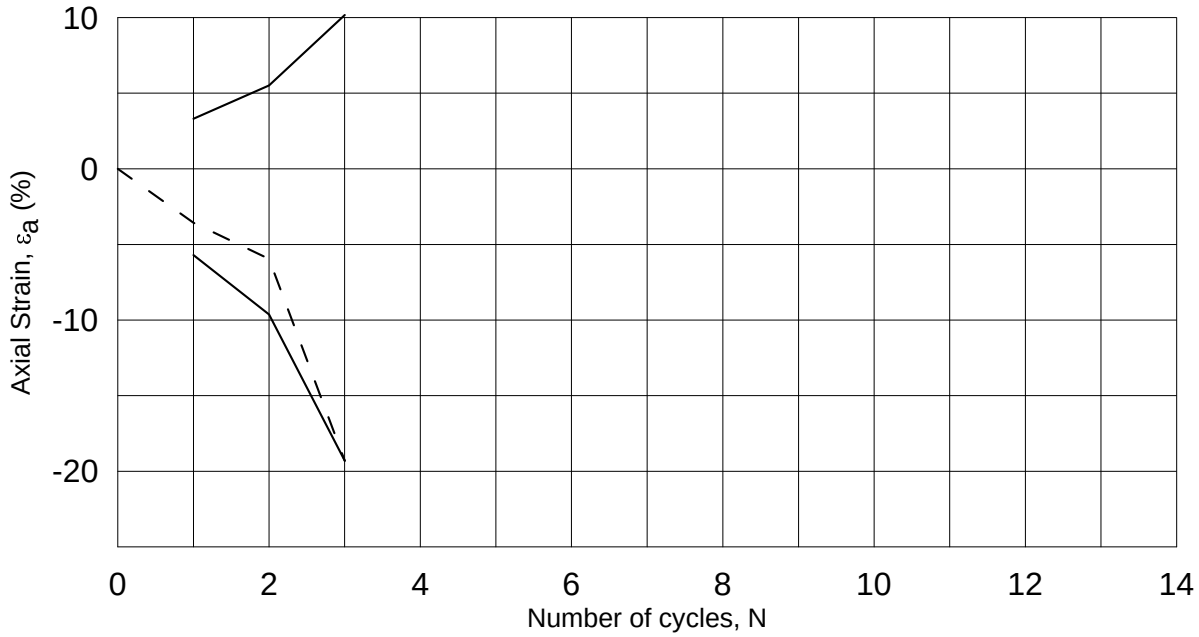
Boring:	**G7**	Depth =	**23.10**	m	Consolidation stresses			
Tube:	**P11Q1**	p_o' =	**226.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**32.1**	%	σ_{ac}' =	-	-	**225.9**
Test:	**1**	w_c =	**29.9**	%	σ_{rc}' =	-	-	**203.4**

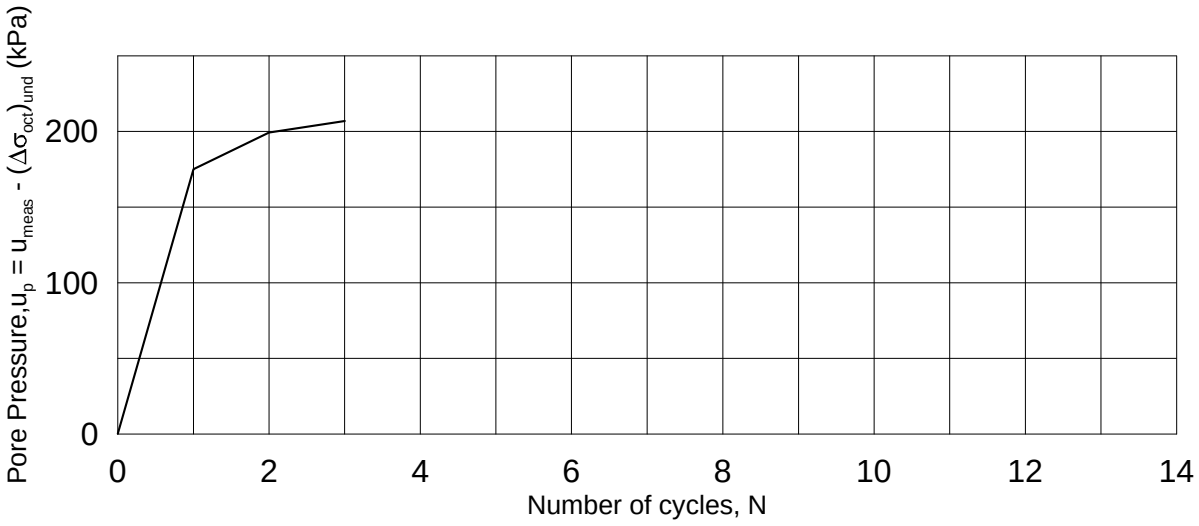
Date: 2016-02-01

Drawn by/checked: MAS / GS

G7-P11Q1-UnitC-1.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUcy**

Figure No.: XX

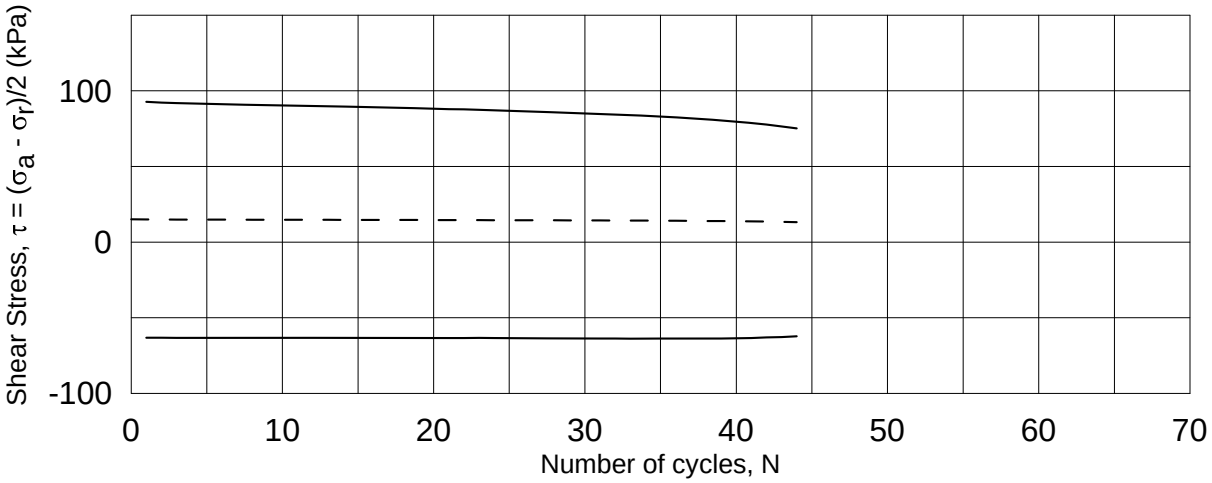
Boring:	**G7**	Depth =	**27.40**	m	Consolidation stresses			
Tube:	**P12Q1**	p_o' =	**265.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**35.2**	%	σ_{ac}' =	-	-	**264.9**
Test:	**2**	w_c =	**31.5**	%	σ_{rc}' =	-	-	**238.5**

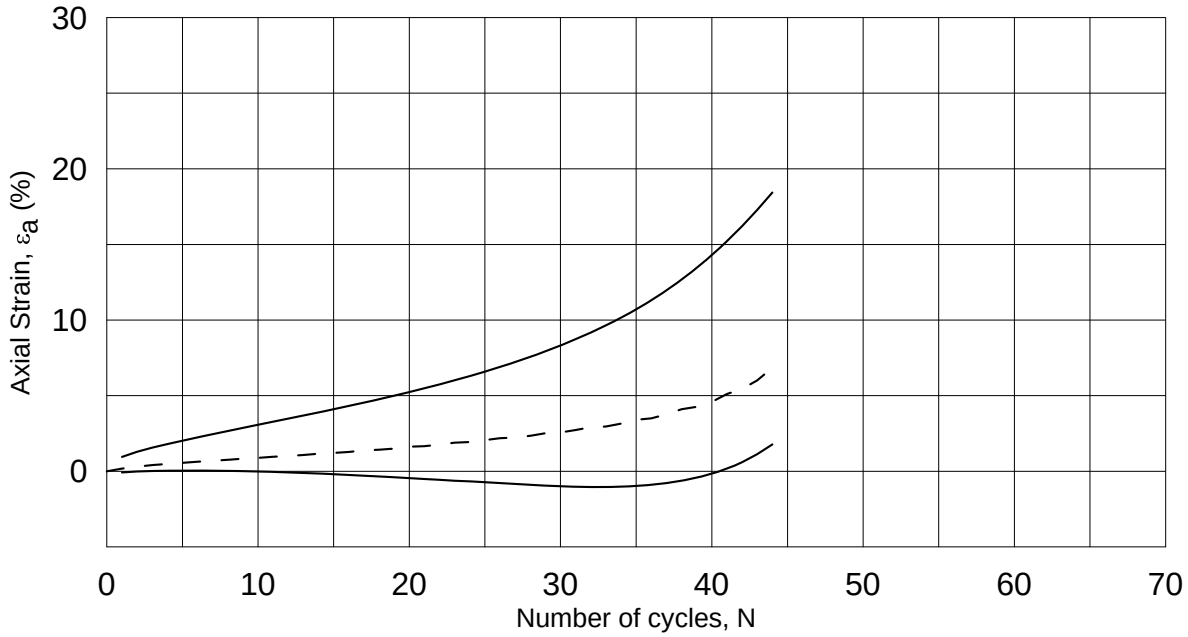
Date: 2016-02-03

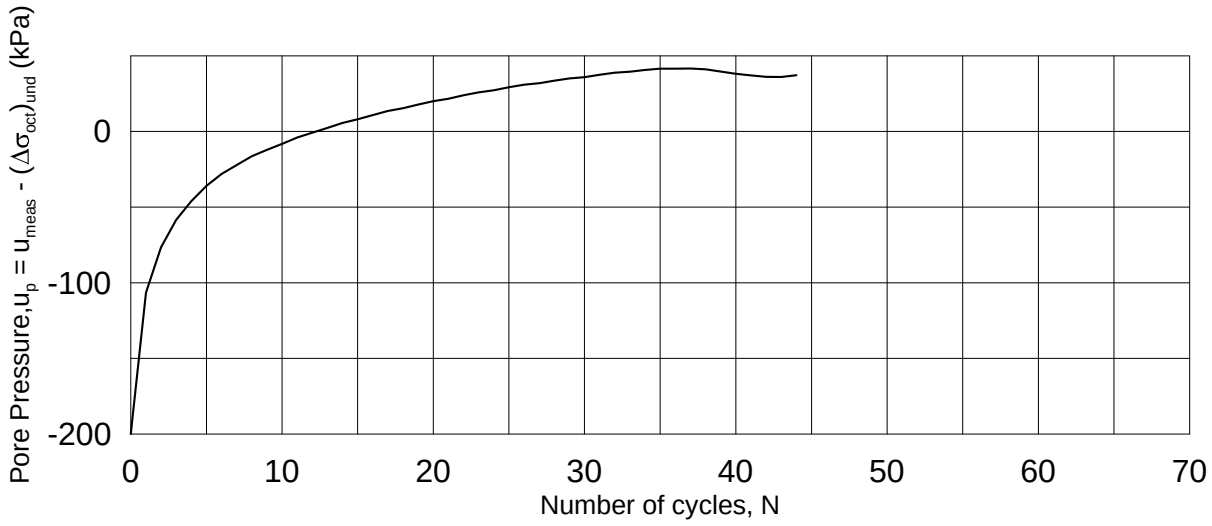
Drawn by/checked: MAS / GS

NGI

G7-P12Q1-UnitC-2.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

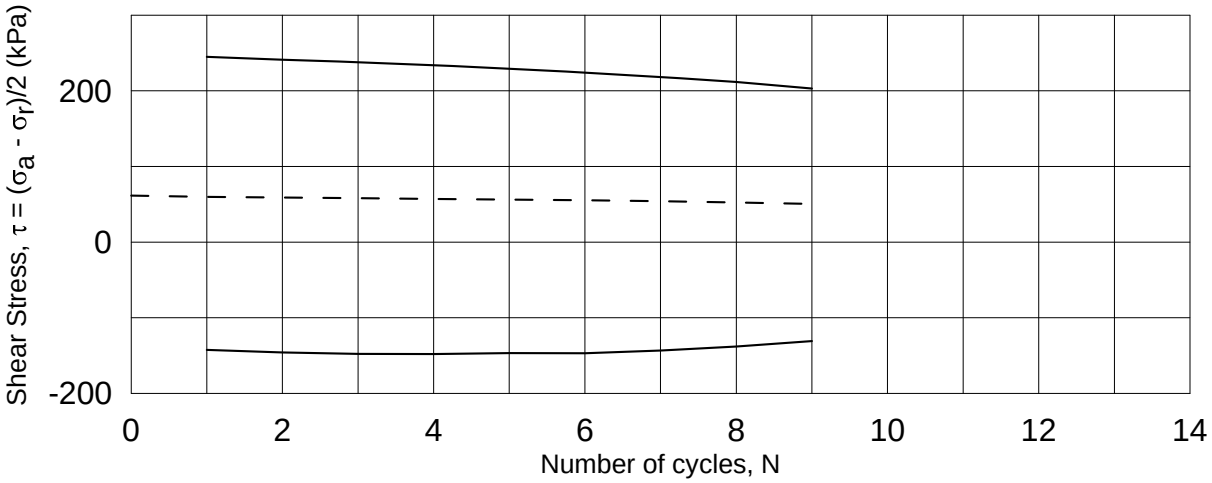
Triaxial test: **CAUcy**

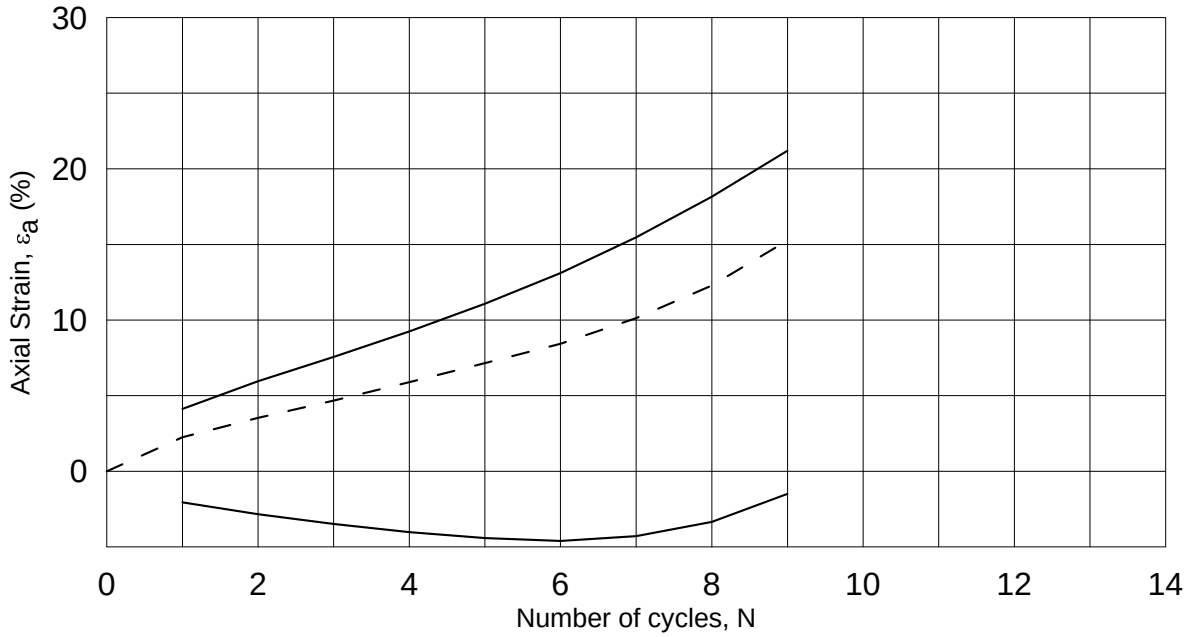
Figure No.: XX

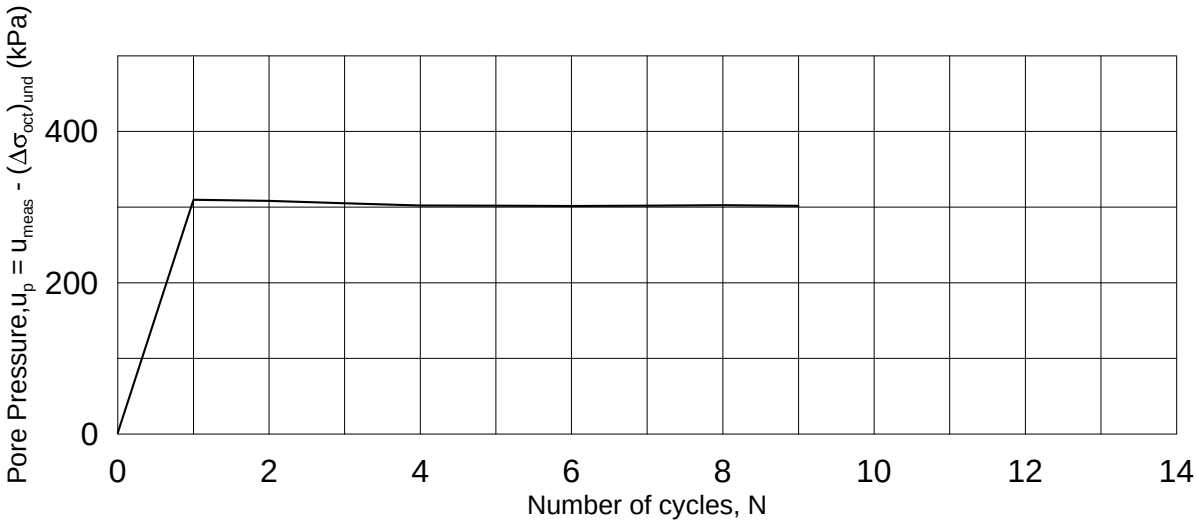
Boring:	**G7**	Depth =	**31.40**	m	Consolidation stresses			
Tube:	**P13Q1**	p_o' =	**301.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**24.1**	%	σ_{ac}' =	-	-	**300.9**
Test:	**3**	w_c =	**21.6**	%	σ_{rc}' =	-	-	**270.9**

Date: 2016-02-03 | Drawn by/checked: MAS / GS

G7-P13Q1-UnitC-3.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUcy**

Figure No.: XX

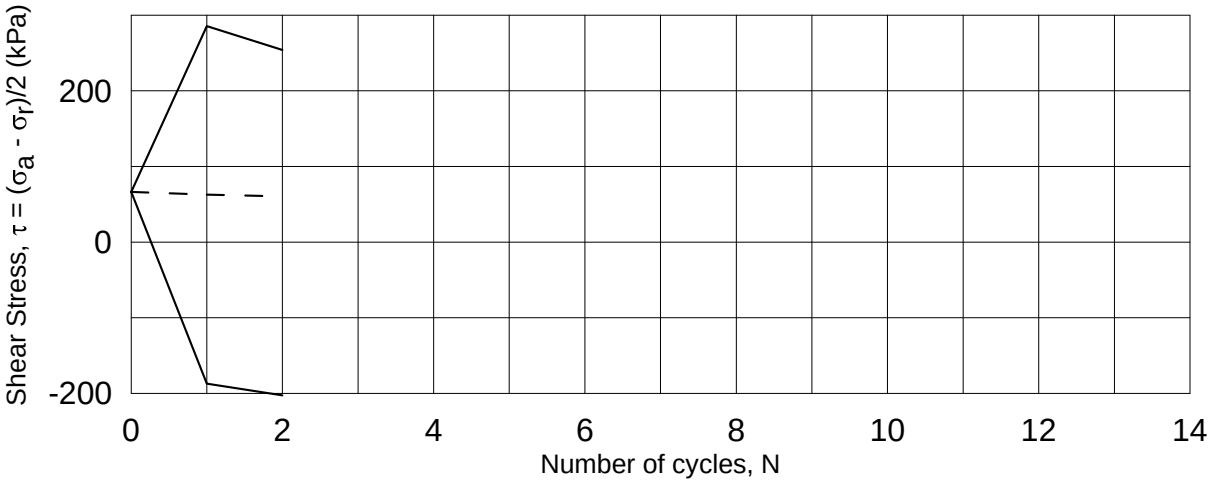
Boring:	**G7**	Depth =	**46.70**	m	Consolidation stresses			
Tube:	**P17Q1**	p_o' =	**439.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitD**	w_i =	**22.1**	%	σ_{ac}' =	-	-	**438.9**
Test:	**1**	w_c =	**20.5**	%	σ_{rc}' =	-	-	**316.1**

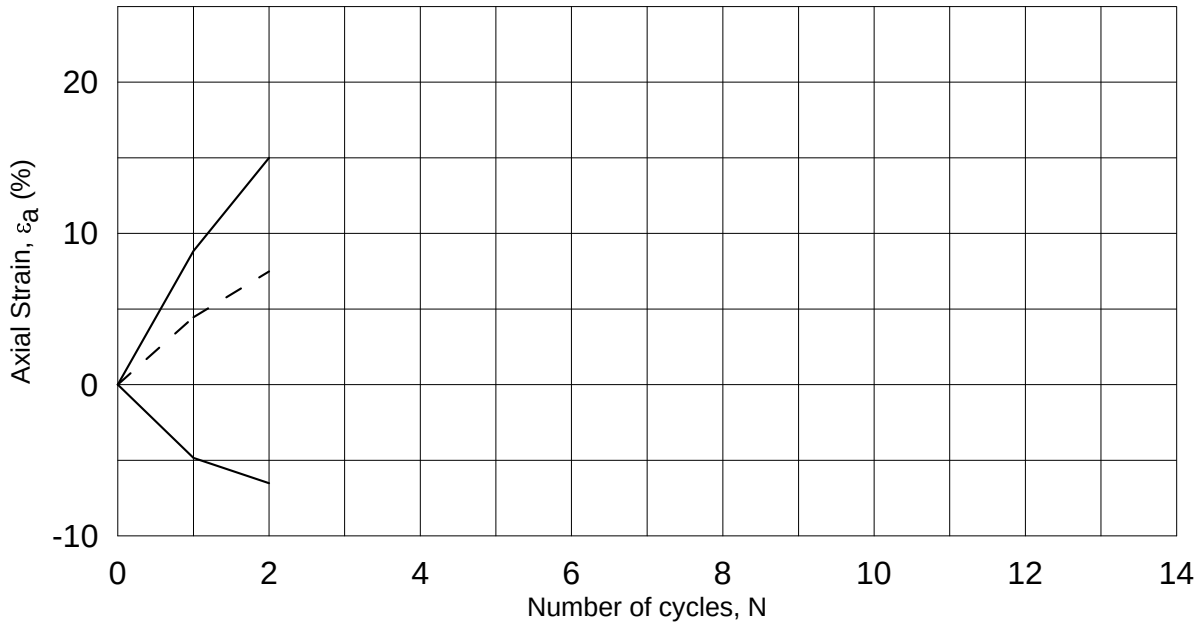
Date: 2016-02-15

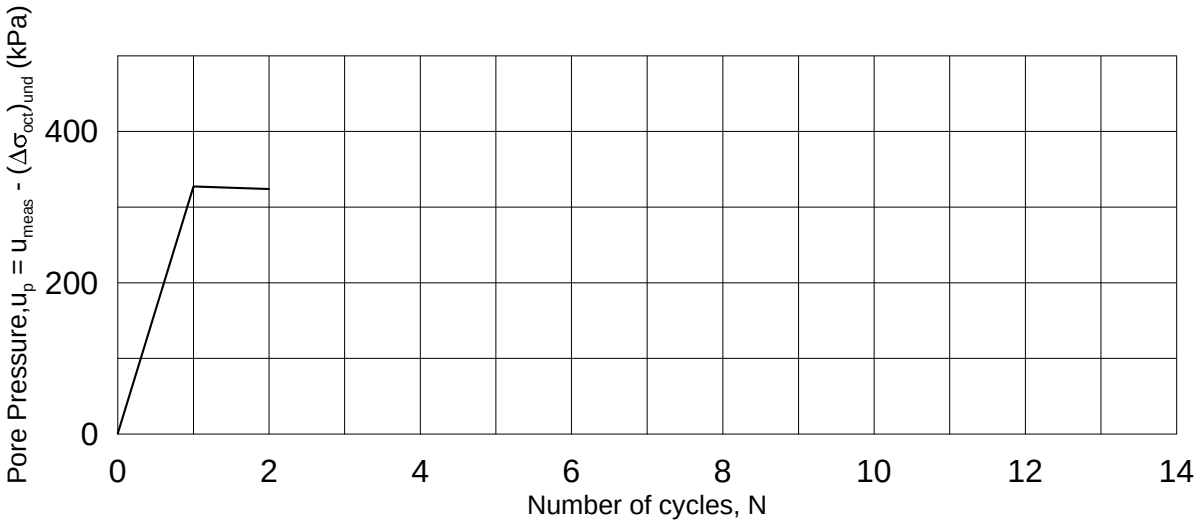
Drawn by/checked: MAS / GS

NGI

G7-P17Q1-UnitD-1.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Figure No.:

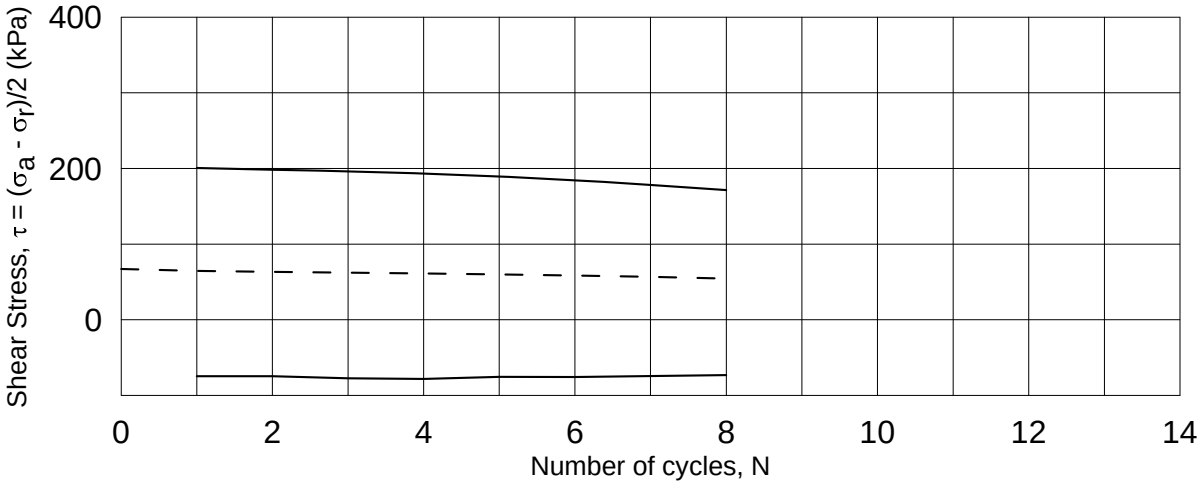
Triaxial test: **CAUcy**

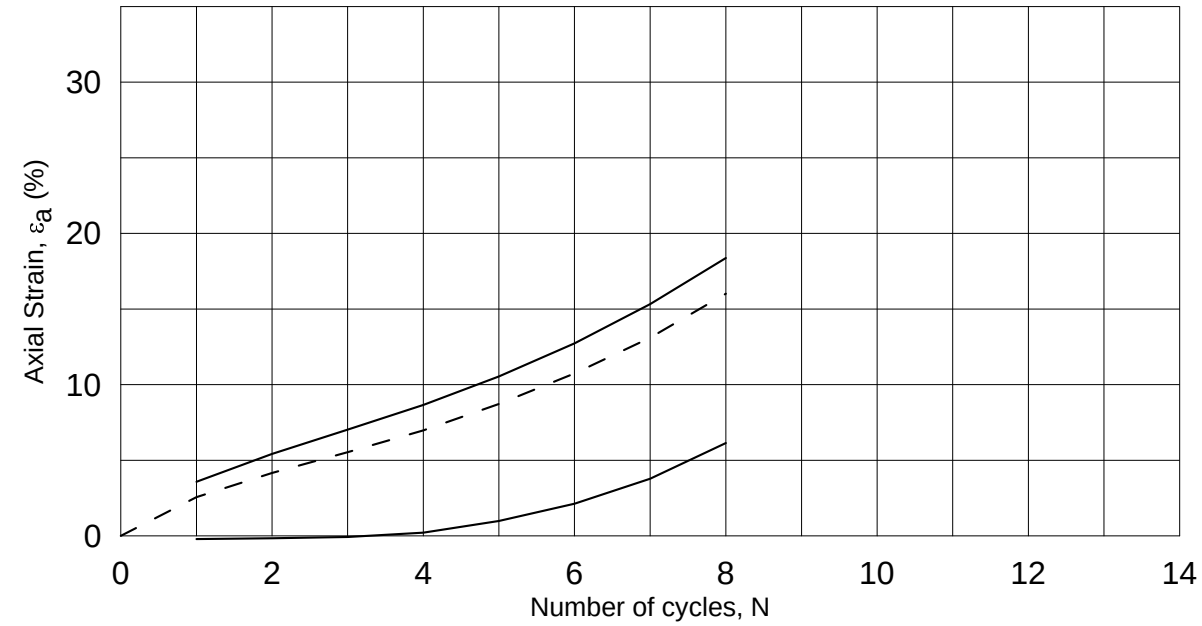
Boring:	**G7**	Depth =	**50.30**	m	Consolidation stresses			
Tube:	**P18Q1**	p_o' =	**471.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitD**	w_i =	**25.1**	%	σ_{ac}' =	-	-	**471.0**
Test:	**2**	w_c =	**23.1**	%	σ_{rc}' =	-	-	**339.1**

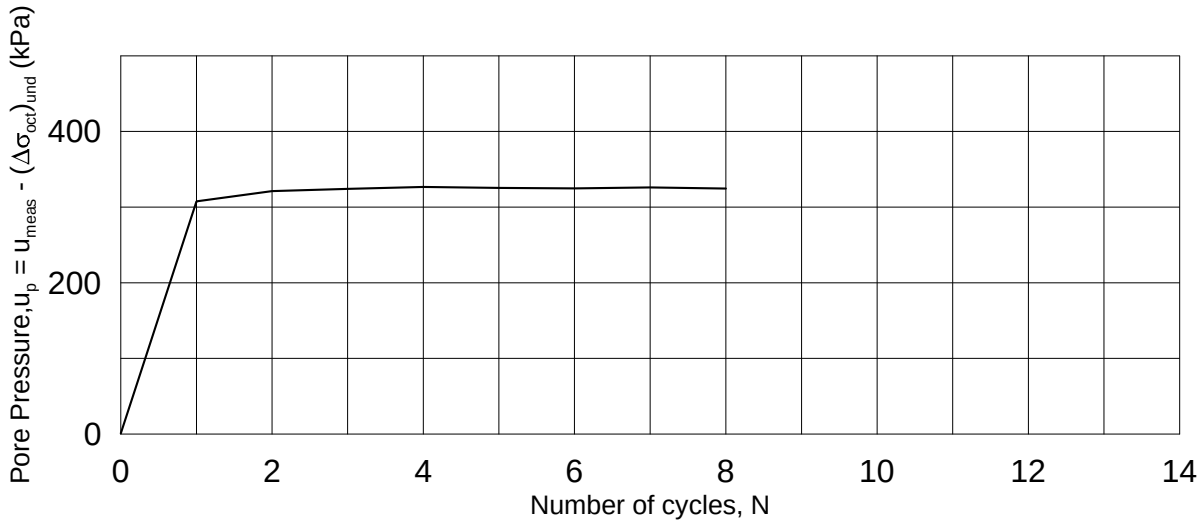
Date: 2016-02-25

Drawn by/checked: PCa / GS

G7-P18Q1-UnitD-2.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

Figure No.:

Triaxial test: **CAUcy**

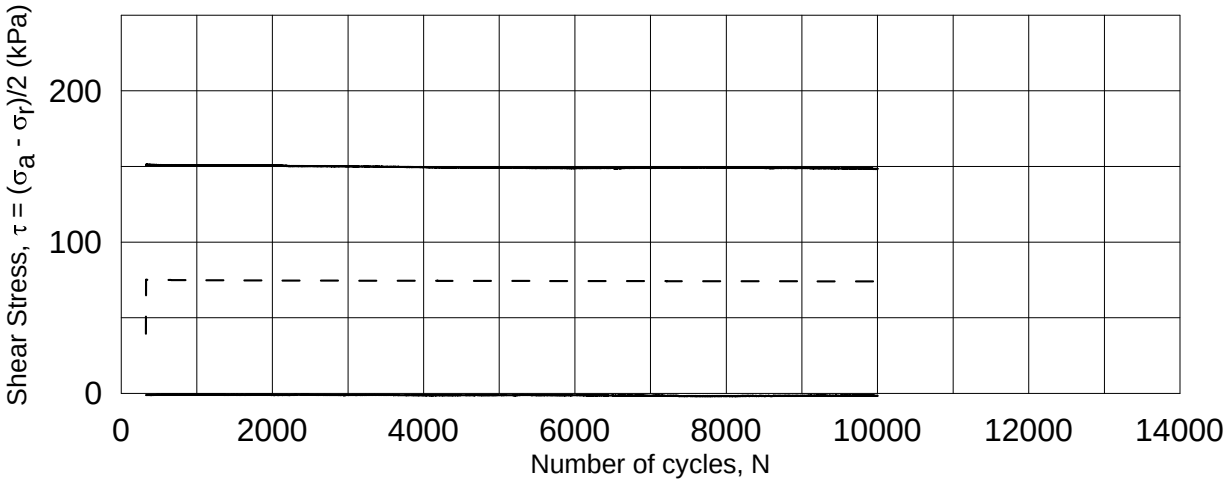
Boring:	**G7**	Depth =	**50.70**	m	Consolidation stresses			
Tube:	**P18Q2**	p_o' =	**475.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitD**	w_i =	**26.7**	%	σ_{ac}' =	-	-	**474.8**
Test:	**3**	w_c =	**24.3**	%	σ_{rc}' =	-	-	**342.0**

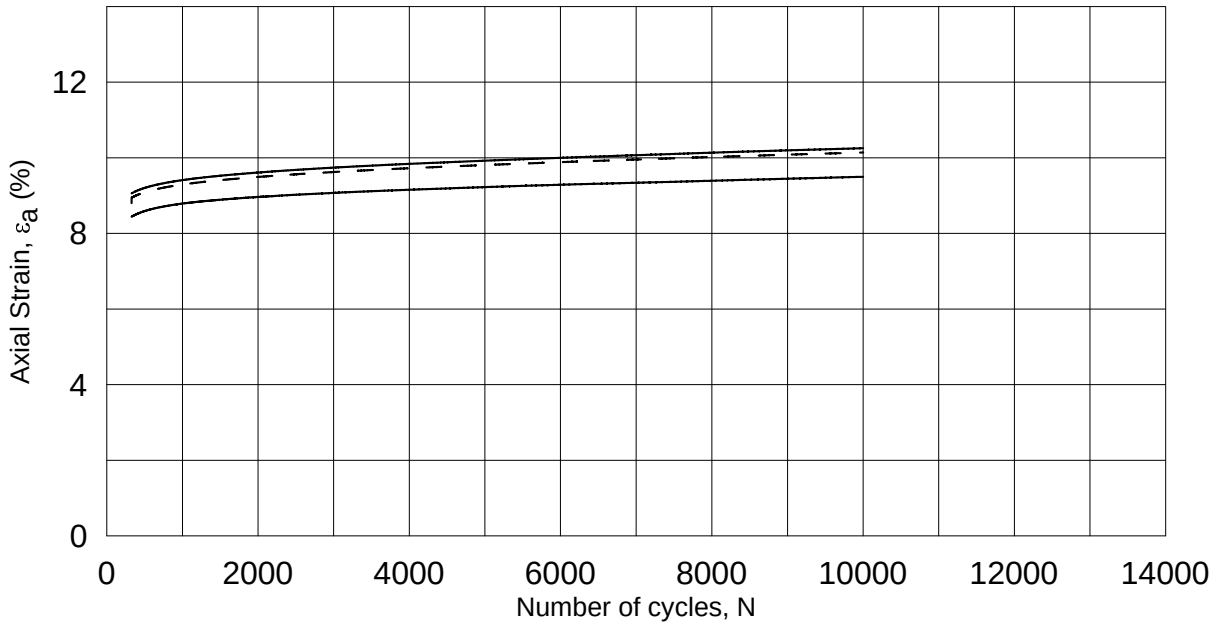
Date: 2016-02-25

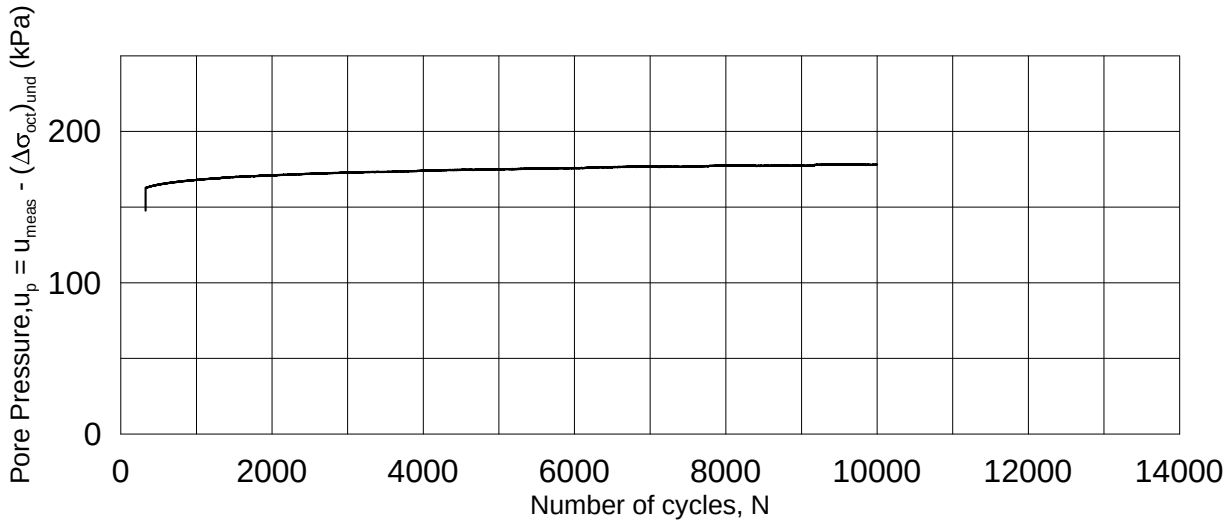
Drawn by/checked: PCa / GS

NGI

G7-P18Q2-UnitD-3.Plot1.grf







The first 327 cycles were not recorded.

Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

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Triaxial test: **CAUcy**

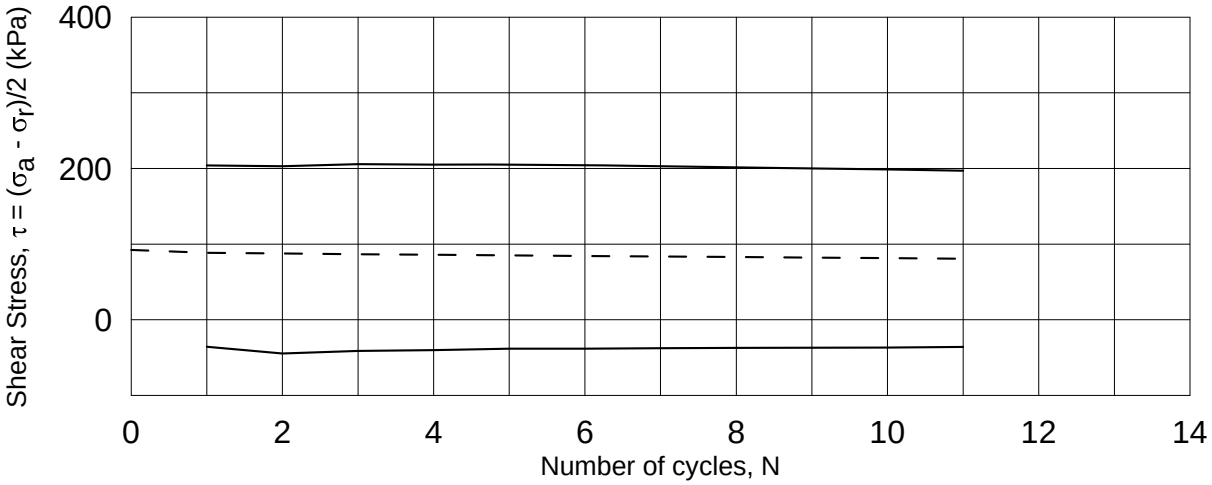
Figure No. XX

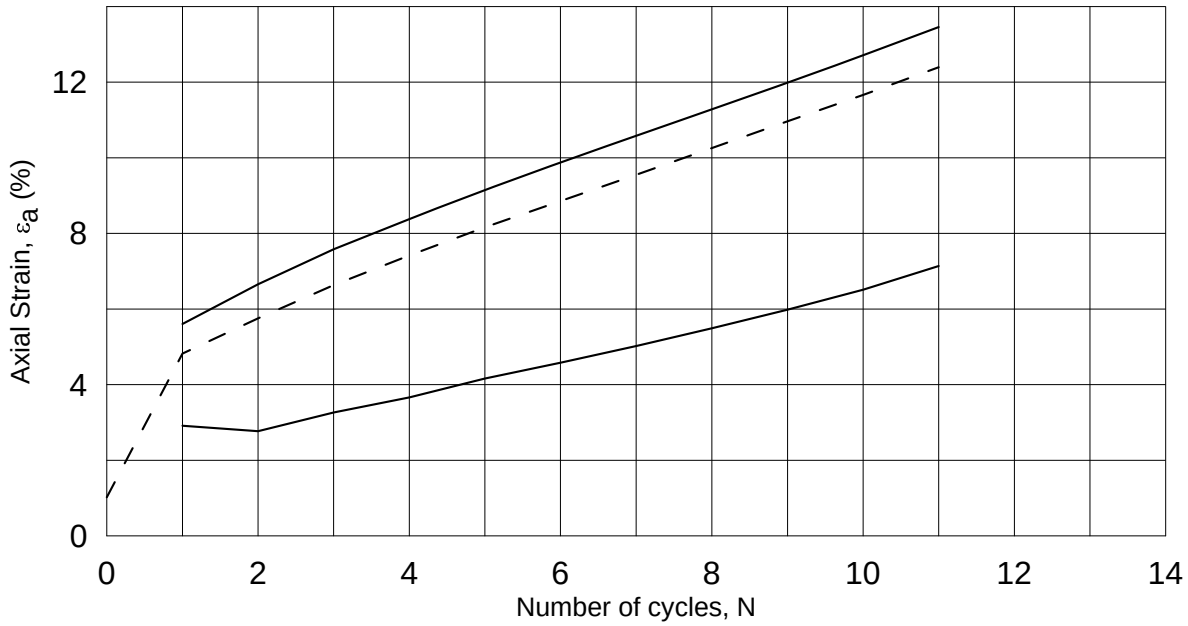
Boring:	**G17**	Depth =	**33.80**	m	Consolidation stresses		
Tube:	**P14Q1**	p_0' =	**341.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**31.5**	%	σ_{ac}' =	-	-	**340.9**
Test:	**4**	w_c =	**28.7**	%	σ_{rc}' =	-	-	**272.8**

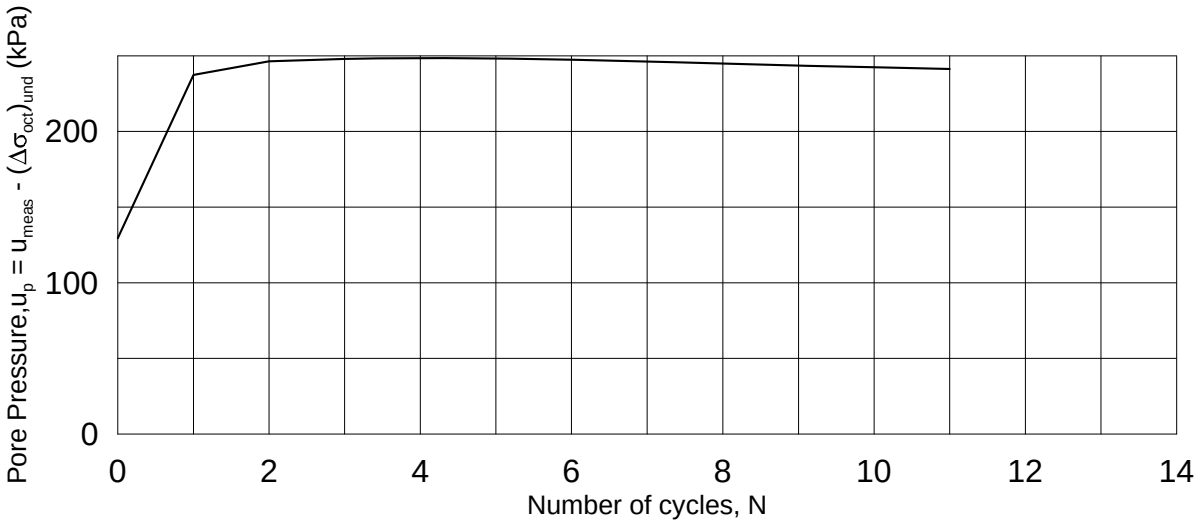
Date: 2016-03-04

Drawn by/checked: MAS / GS

G17-P14Q1-UnitC-4.Plot1.grf







Dato/rev.: 2014-12-23/01

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Triaxial test: **CAUcy**

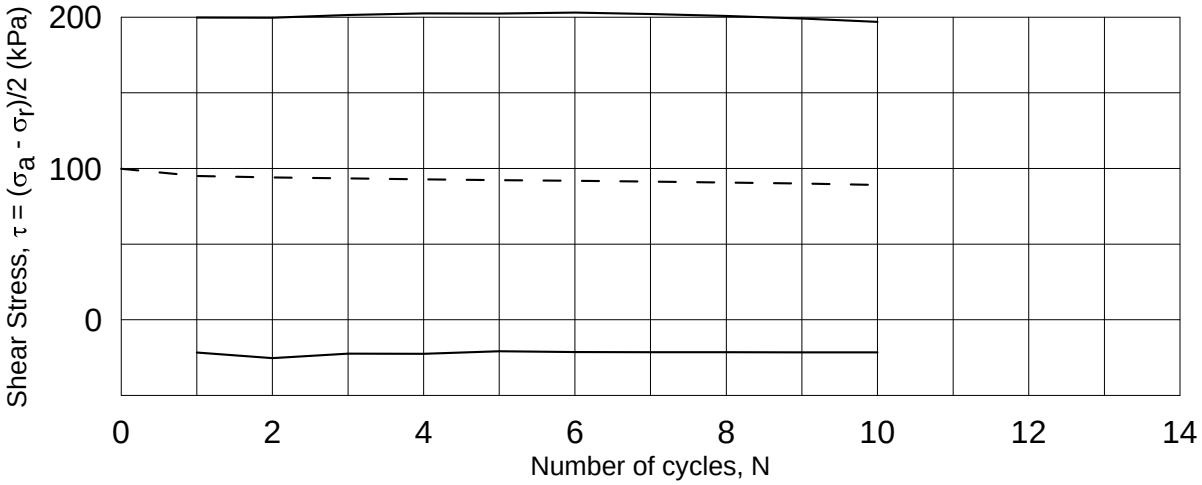
Figure No.: XX

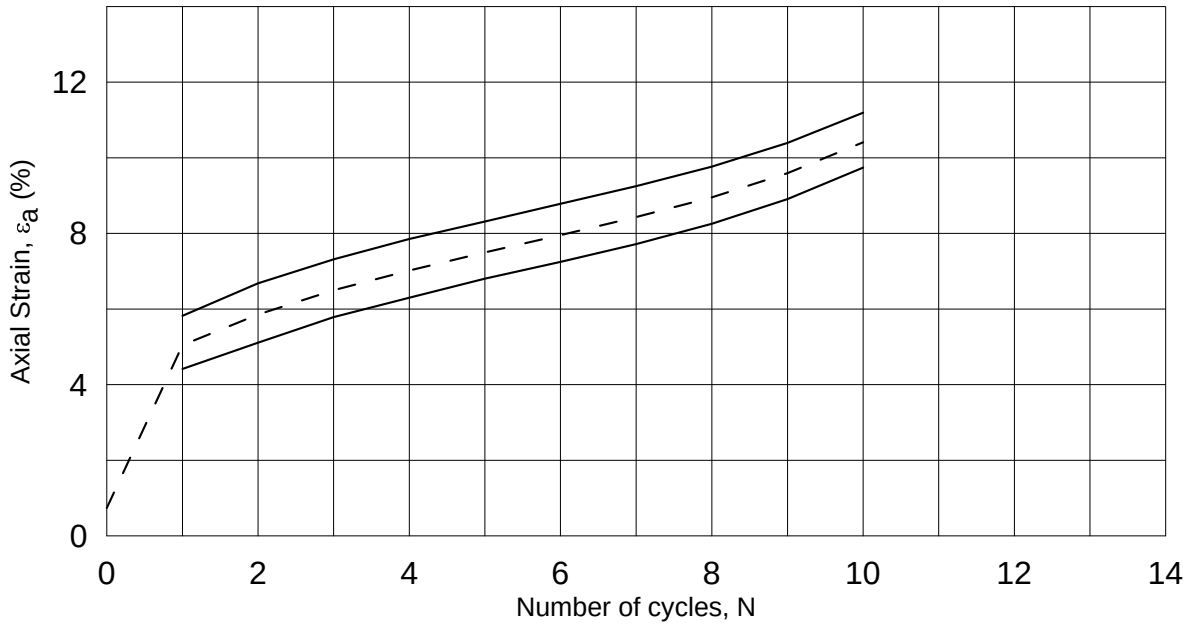
Boring:	**G17**	Depth =	**38.20**	m	Consolidation stresses		
Tube:	**P15Q2**	p_O' =	**380.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**28.4**	%	σ_{ac}' =	-	-	**380.0**
Test:	**5**	w_c =	**26.0**	%	σ_{rc}' =	-	-	**304.0**

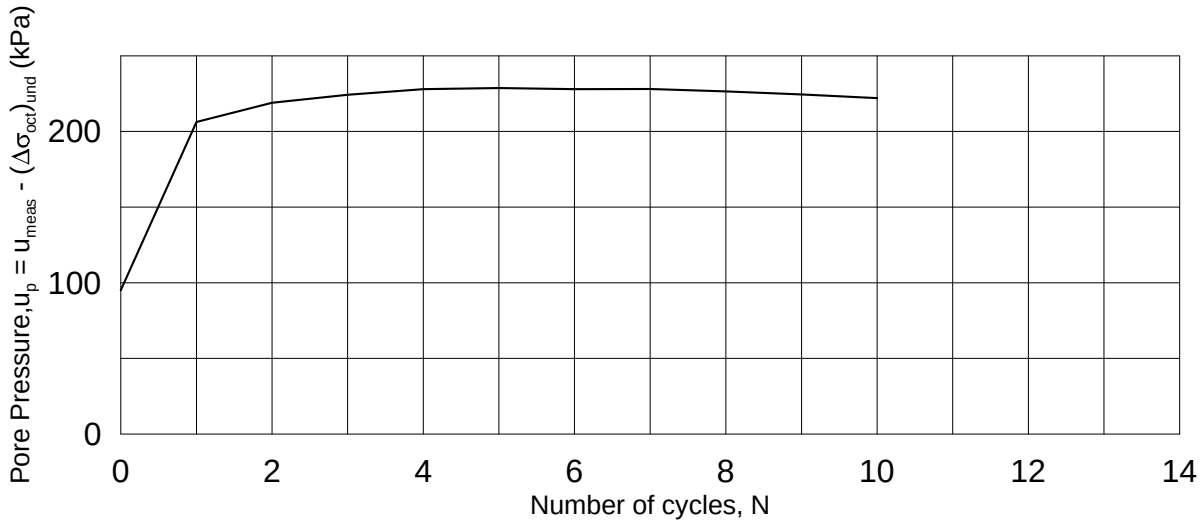
Date: 2016-02-11

Drawn by/checked: MAS / GS

G17-P15Q2-UnitC-5.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUcy**

Figure No.: XX

Boring: **G17A**
Tube: **P1Q1**
Part: **UnitC**
Test: **6**

Depth =	**41.30**	m	
p_O' =	**410.0**	kPa	
w_i =	**36.2**	%	
w_c =	**33.7**	%	

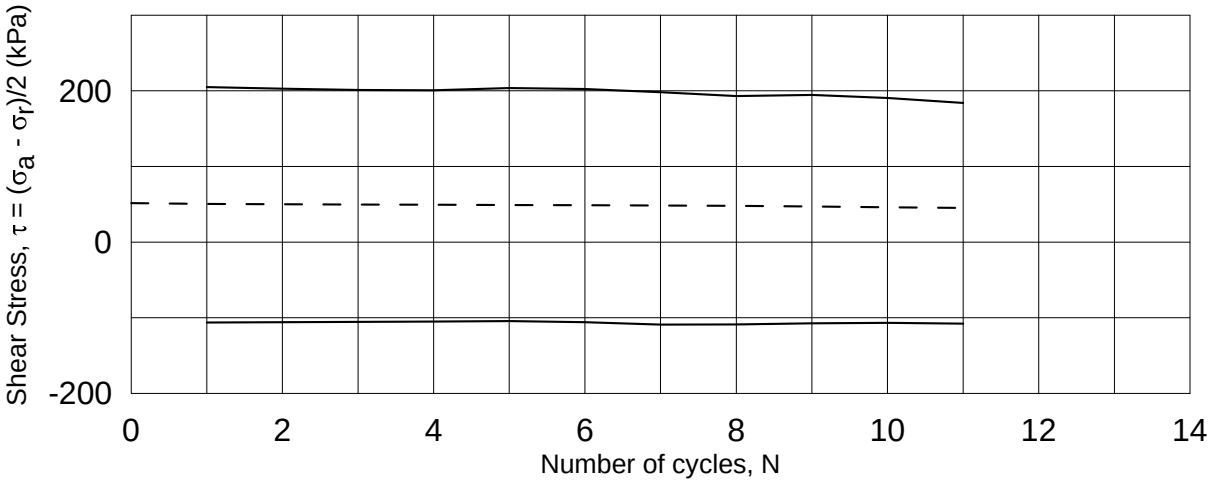
Consolidation stresses

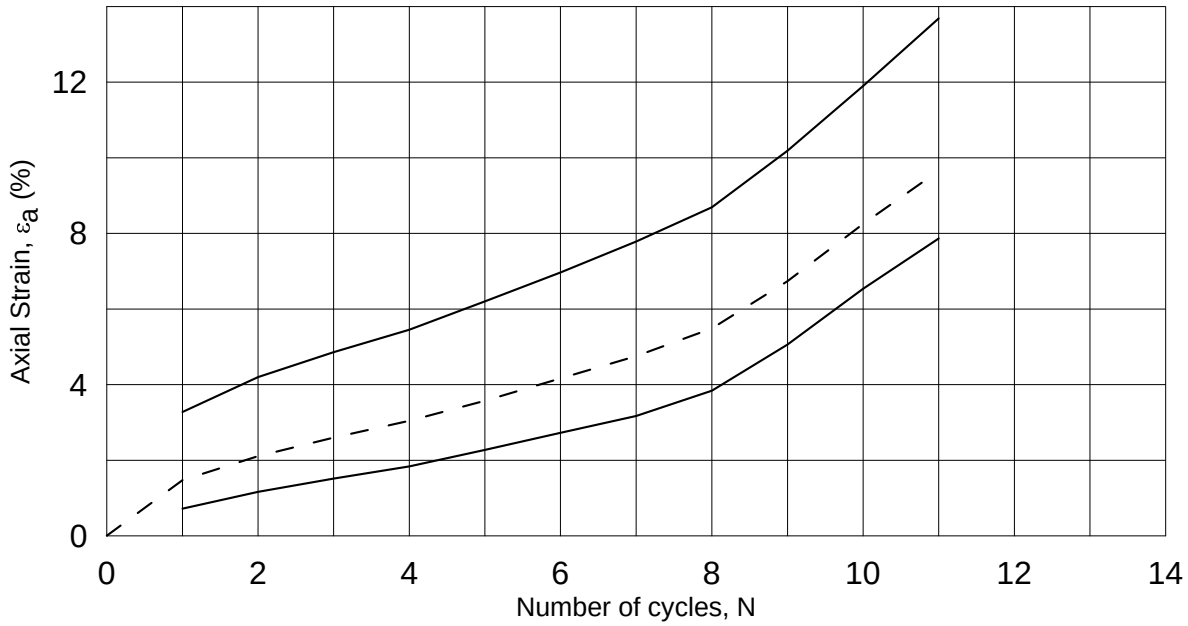
(kPa)	max.	min.	final
σ_{ac}' =	-	-	**409.9**
σ_{rc}' =	-	-	**328.0**

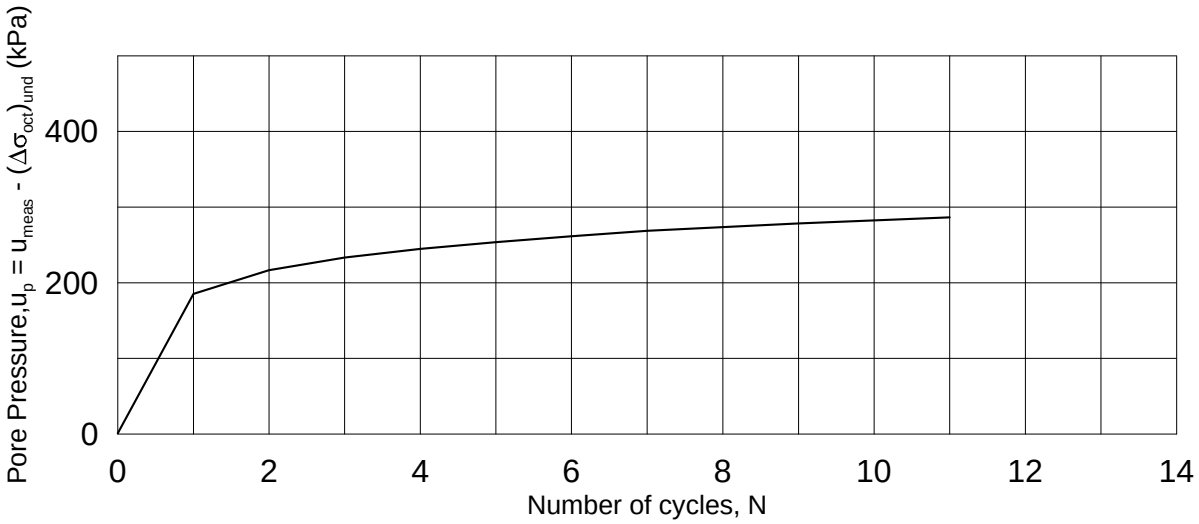
Date: 2016-02-12

Drawn by/checked: MAS / GS

G17A-P1Q1-UnitC-6.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

Triaxial test: **CAUcy**

Figure No.: XX

Boring: **I21B**
Tube: **P9Q1**
Part: **UnitF**
Test: **1**

Depth	=	**55.10**	m
p_O'	=	**514.0**	kPa
w_i	=	**35.1**	%
w_c	=	**31.5**	%

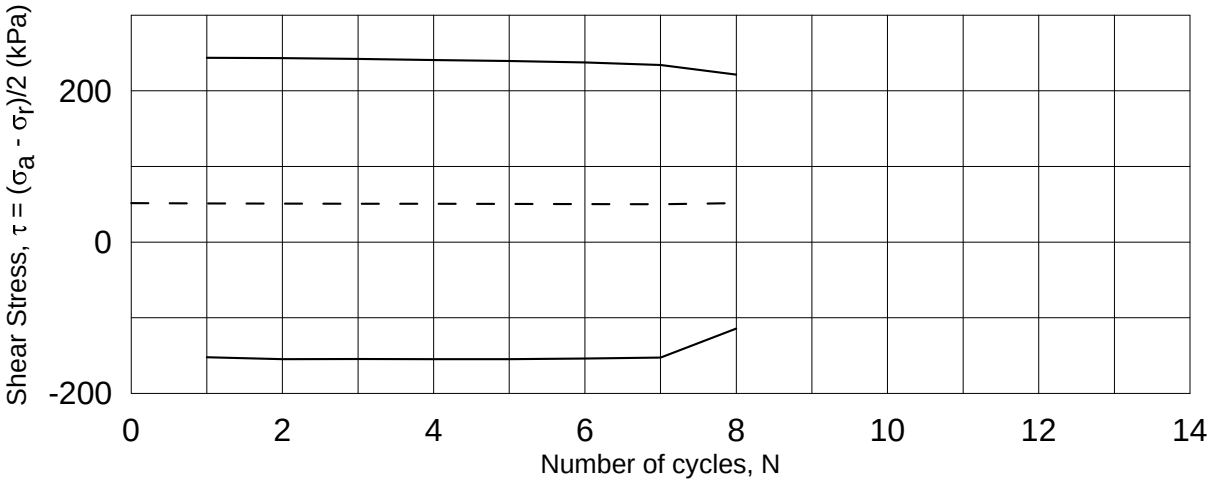
Consolidation stresses

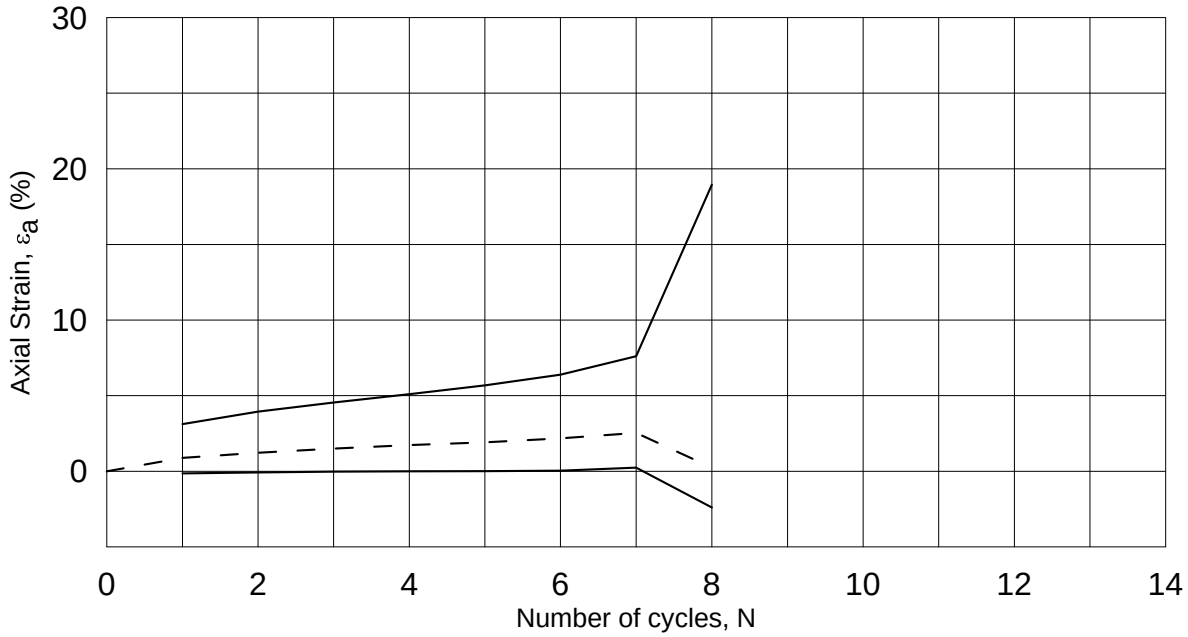
(kPa)	max.	min.	final
σ_{ac}' =	-	-	**513.8**
σ_{rc}' =	-	-	**411.2**

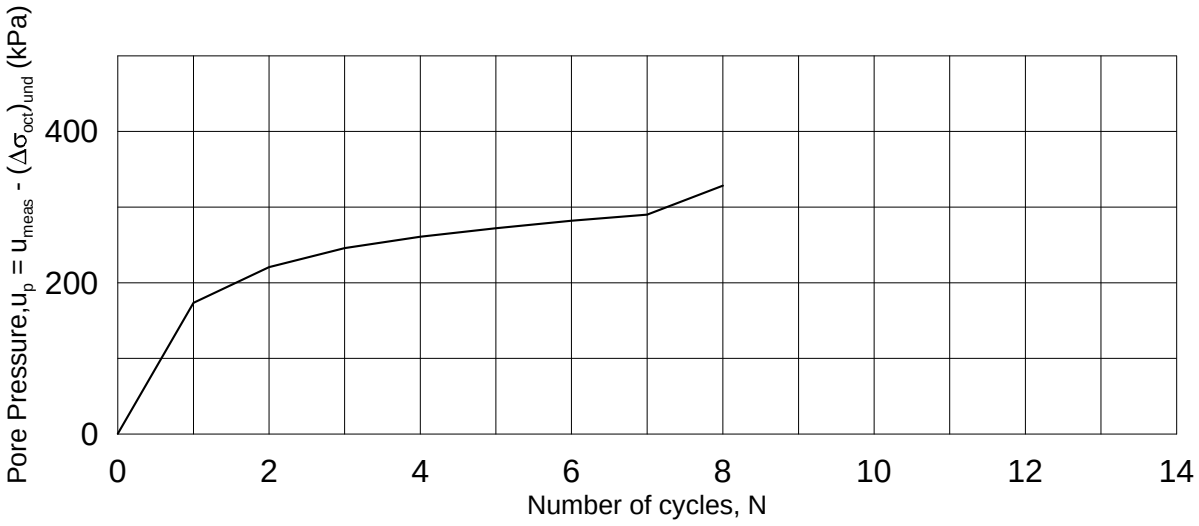
Date: 2016-02-03

Drawn by/checked: MAS / GS

I21B-P9Q1-UnitF-1.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

Triaxial test: **CAUcy**

Figure No.: XX

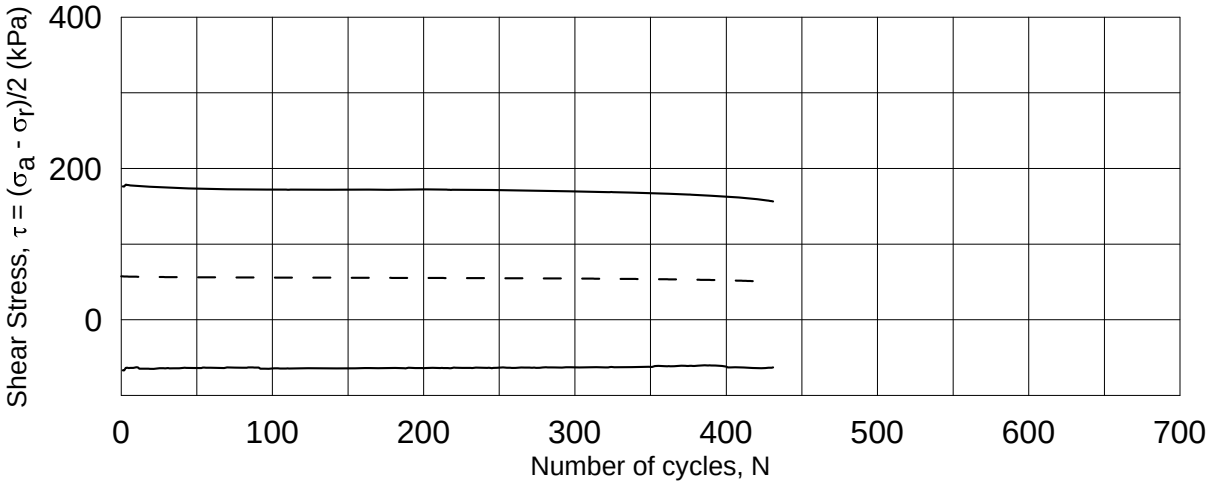
Boring:	**I21B**	Depth =	**55.30**	m	Consolidation stresses			
Tube:	**P9Q2**	p_O' =	**516.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitF**	w_i =	**42.1**	%	σ_{ac}' =	-	-	**516.0**
Test:	**2**	w_c =	**39.8**	%	σ_{rc}' =	-	-	**412.7**

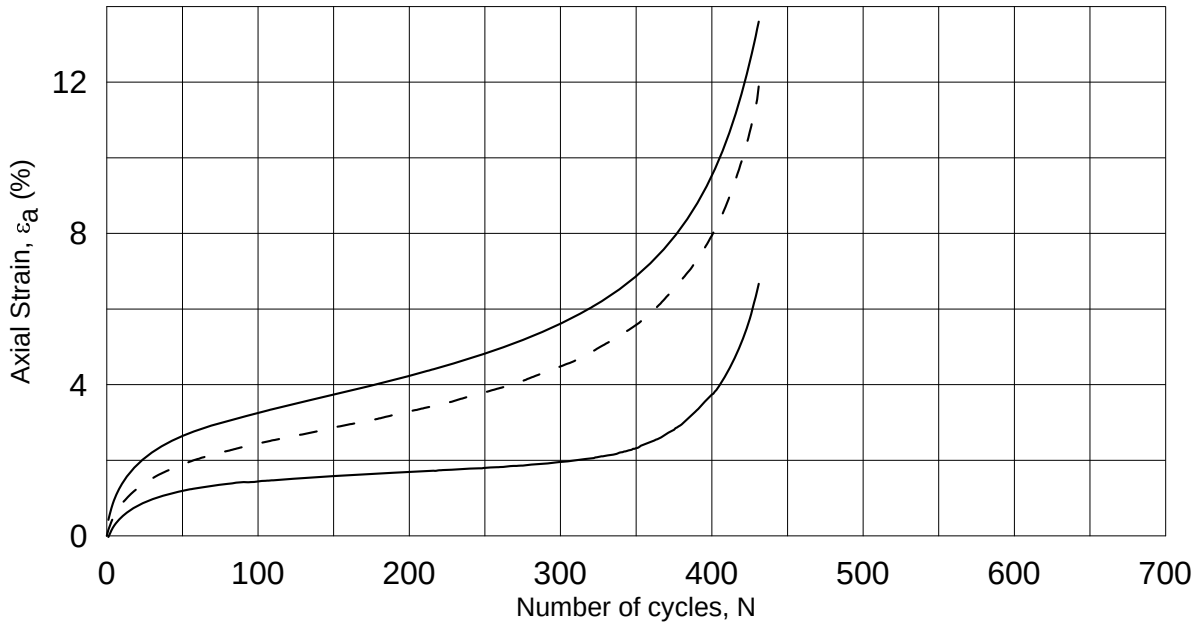
Date: 2016-02-08

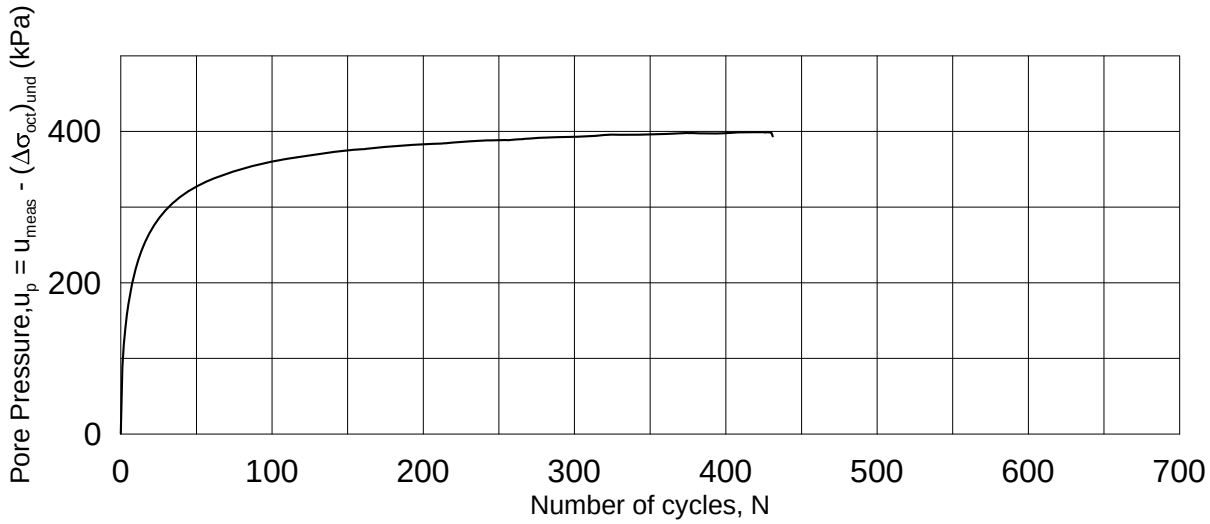
Drawn by/checked: MAS / GS

NGI

I21B-P9Q2-UnitF-2.Plot1.grf







Dato/rev.: 2014-12-23/01

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Triaxial test: **CAUcy**

Figure No.: XX

Boring: **I21B**
Tube: **P11Q1**
Part: **UnitF**
Test: **3**

Depth	=	**63.20**	m
p_0'	=	**574.0**	kPa
w_i	=	**35.2**	%
w_c	=	**31.0**	%

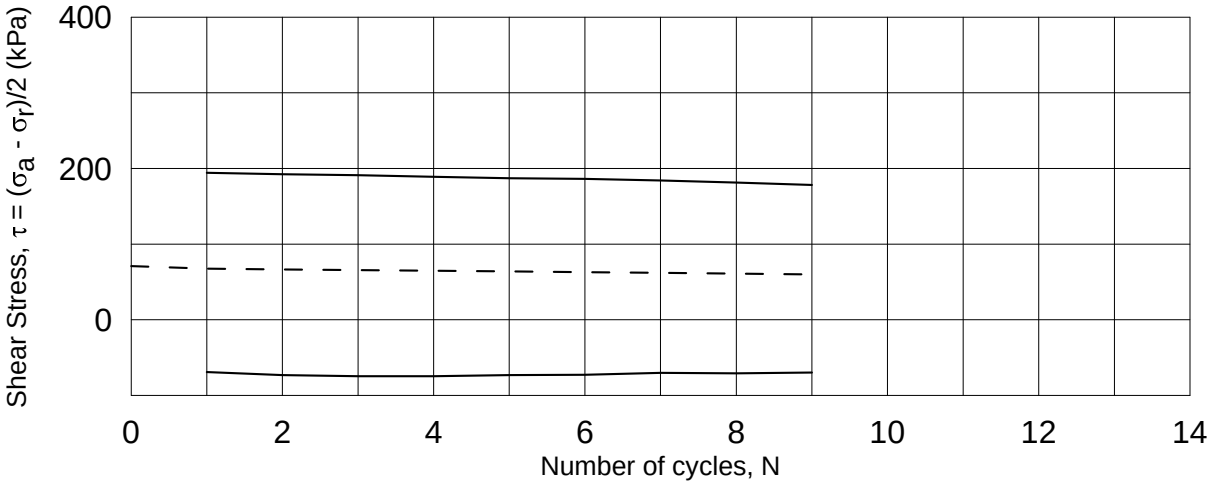
Consolidation stresses

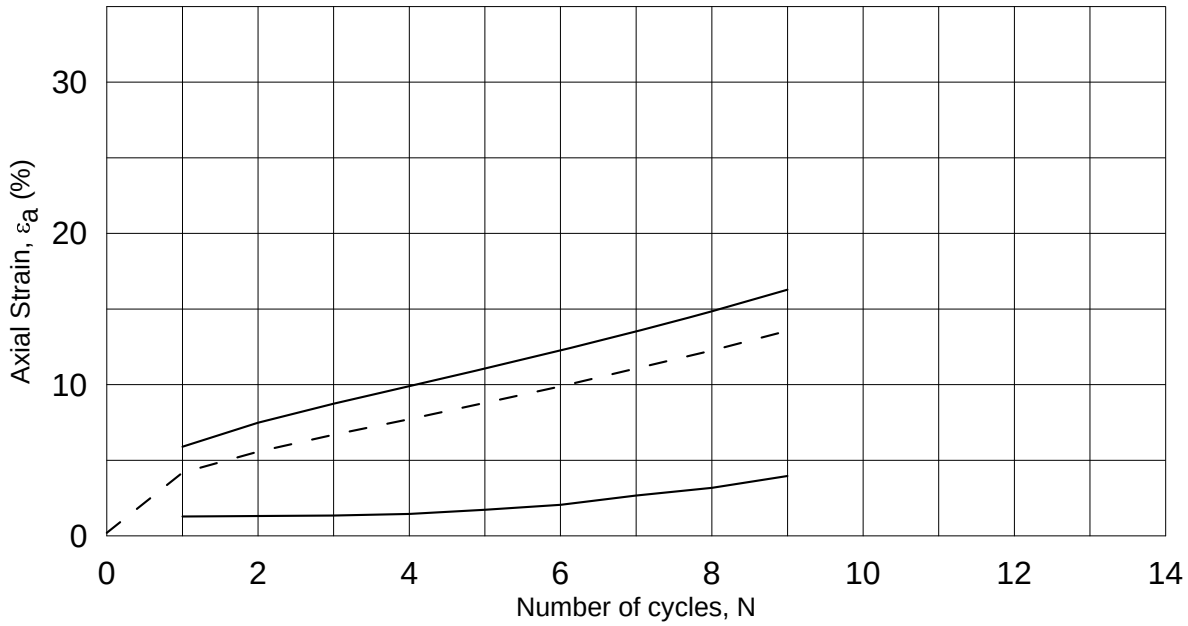
(kPa)	max.	min.	final
σ_{ac}' =	-	-	**573.9**
σ_{rc}' =	-	-	**459.1**

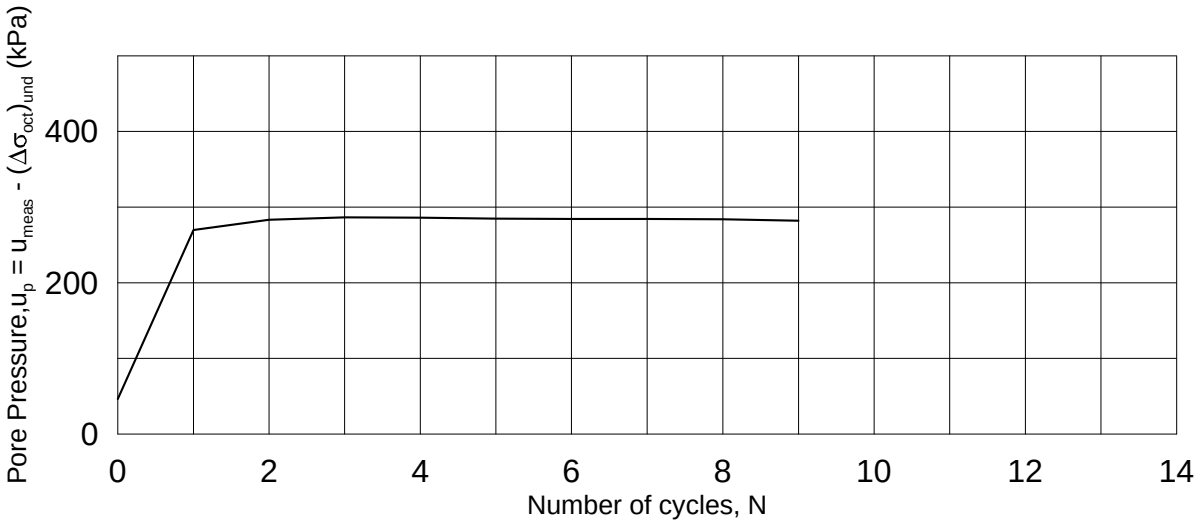
Date: 2016-02-08

Drawn by/checked: MAS / GS

I21B-P11Q1-UnitF-3.Plot1.grf







Dato/rev.: 2014-12-23/01

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Triaxial test: **CAUcy**

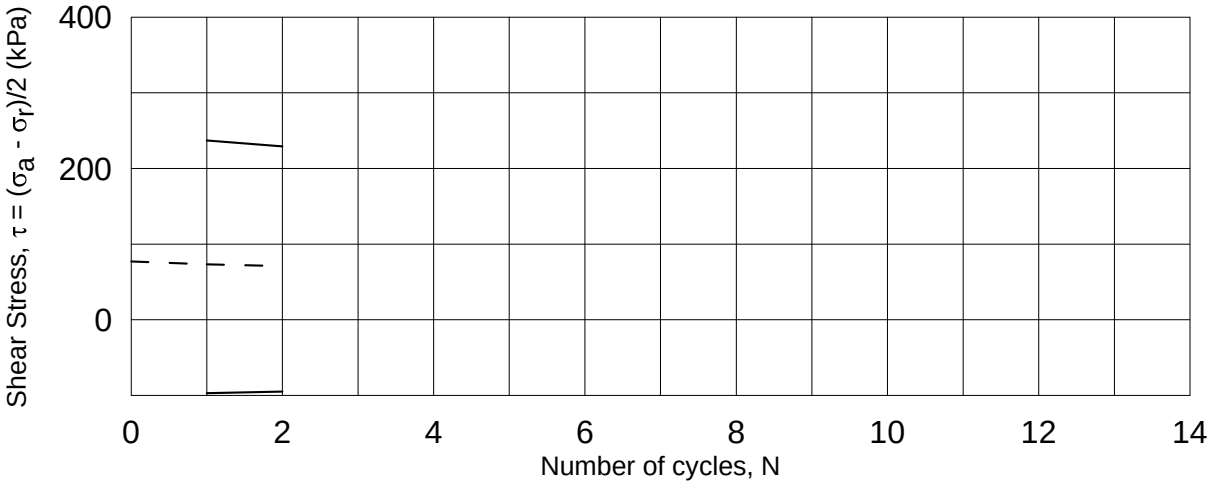
Figure No.: XX

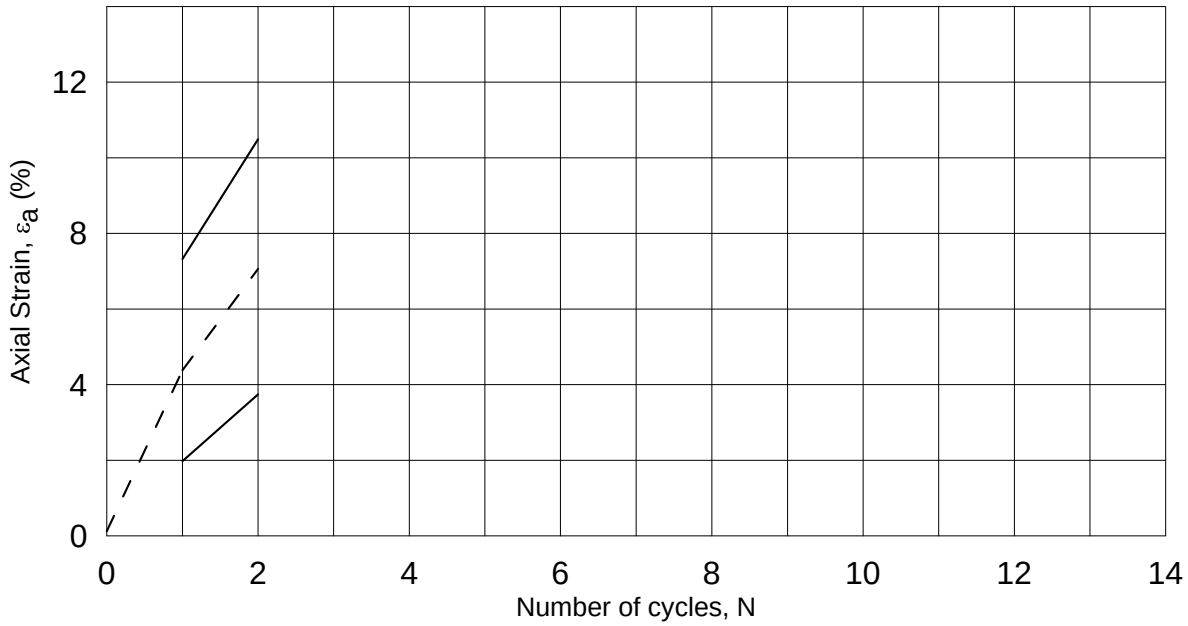
Boring:	**K16**	Depth =	**40.30**	m	Consolidation stresses		
Tube:	**P15Q1**	p_o' =	**407.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**31.1**	%	σ_{ac}' =	-	-	**407.0**
Test:	**7**	w_c =	**27.9**	%	σ_{rc}' =	-	-	**325.6**

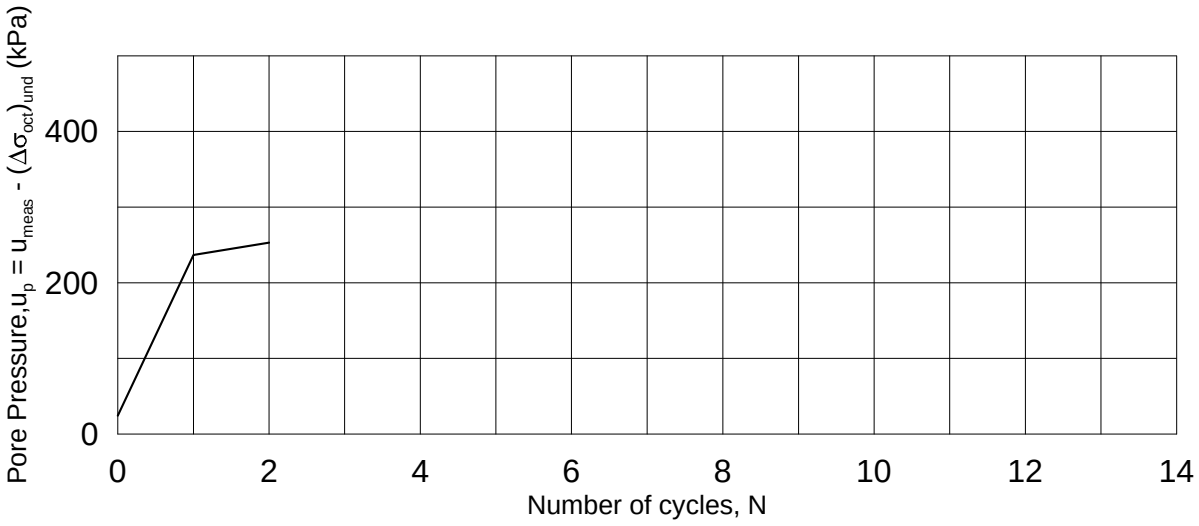
Date: 2016-02-11

Drawn by/checked: MAS / GS

K16-P15Q1-UnitC-7.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Figure No.: XX

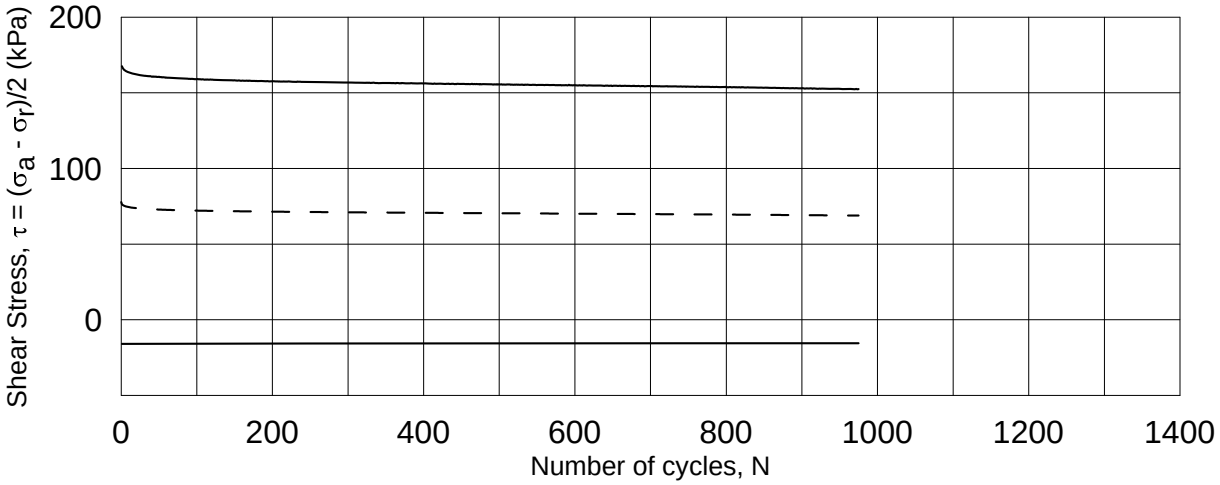
Triaxial test: **CAUCy**

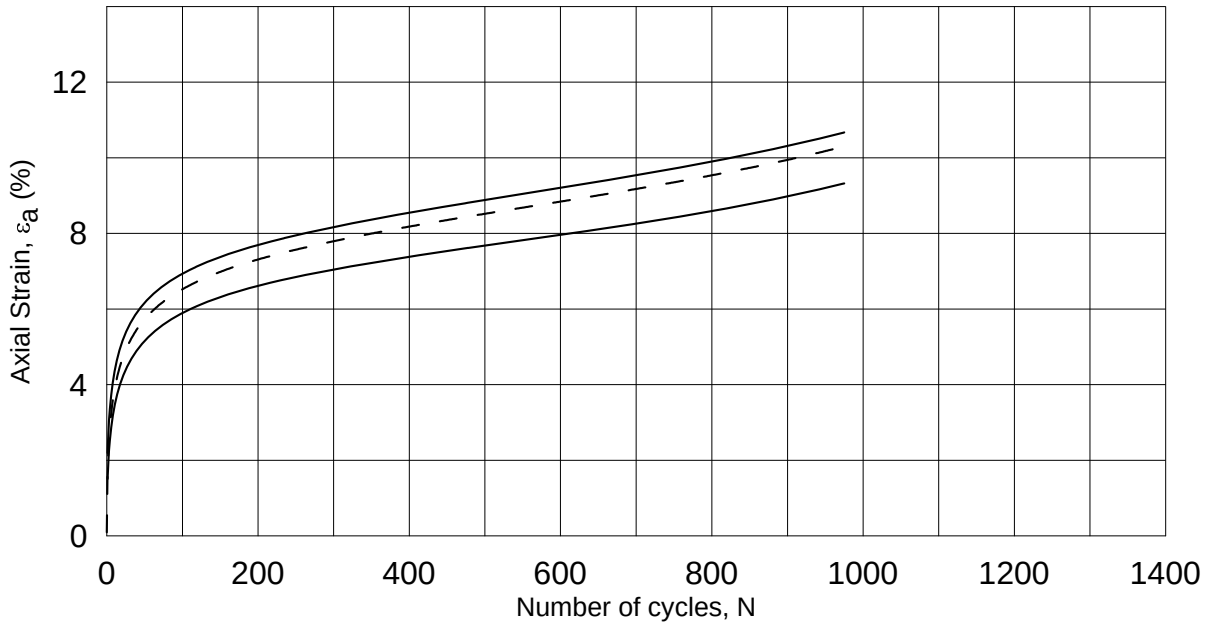
Boring:	**K16**	Depth =	**44.30**	m	Consolidation stresses		
Tube:	**P16Q1**	p_o' =	**442.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitC**	w_i =	**30.8**	%	σ_{ac}' =	-	-	**442.0**
Test:	**8**	w_c =	**27.7**	%	σ_{rc}' =	-	-	**353.7**

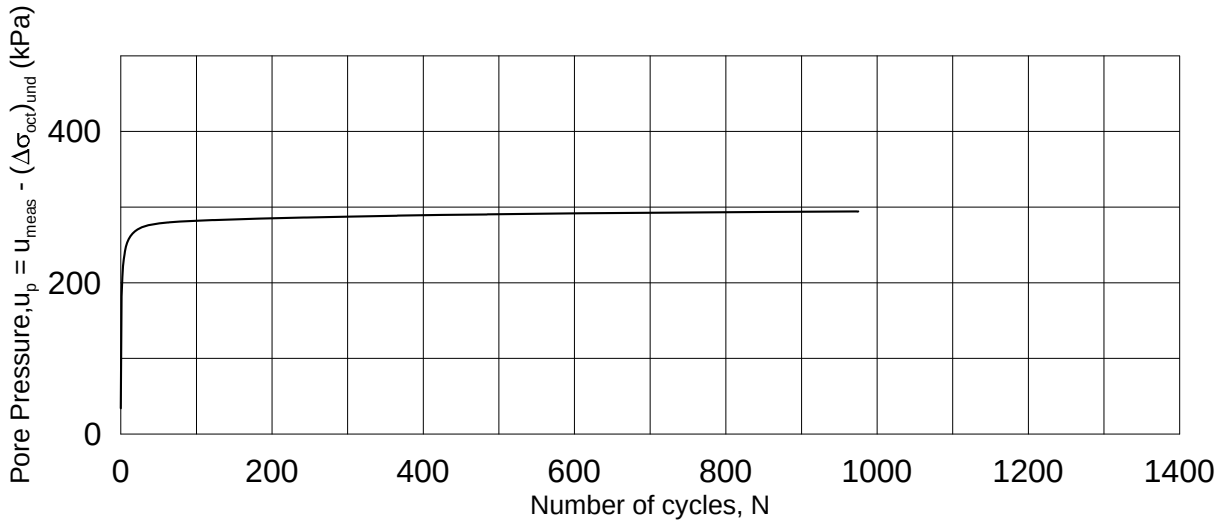
Date: 2016-02-15

Drawn by/checked: MAS / GS

K16-P16Q1-UnitC-8.Plot1.grf







Dato/rev.: 2014-12-23/01

Maryland Laboratory Testing and assistance on cyclic lab program

Document No.: 20150637-01-R

Triaxial test: **CAUCy**

Figure No.: XX

Boring: **K16**
Tube: **P16Q2**
Part: **UnitC**
Test: **9**

Depth	=	**44.70**	m
p_O'	=	**446.0**	kPa
w_i	=	**27.2**	%
w_c	=	**24.3**	%

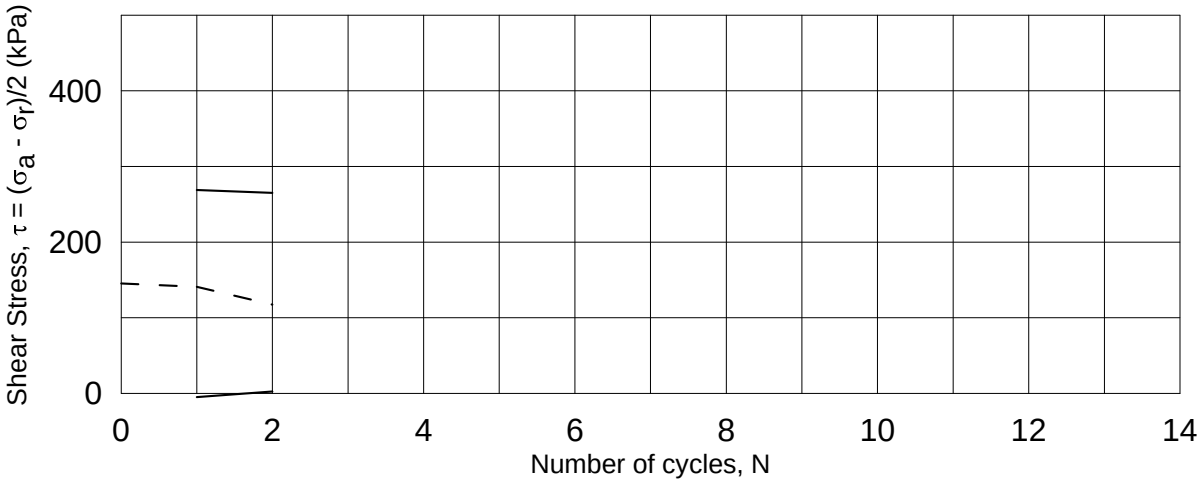
Consolidation stresses

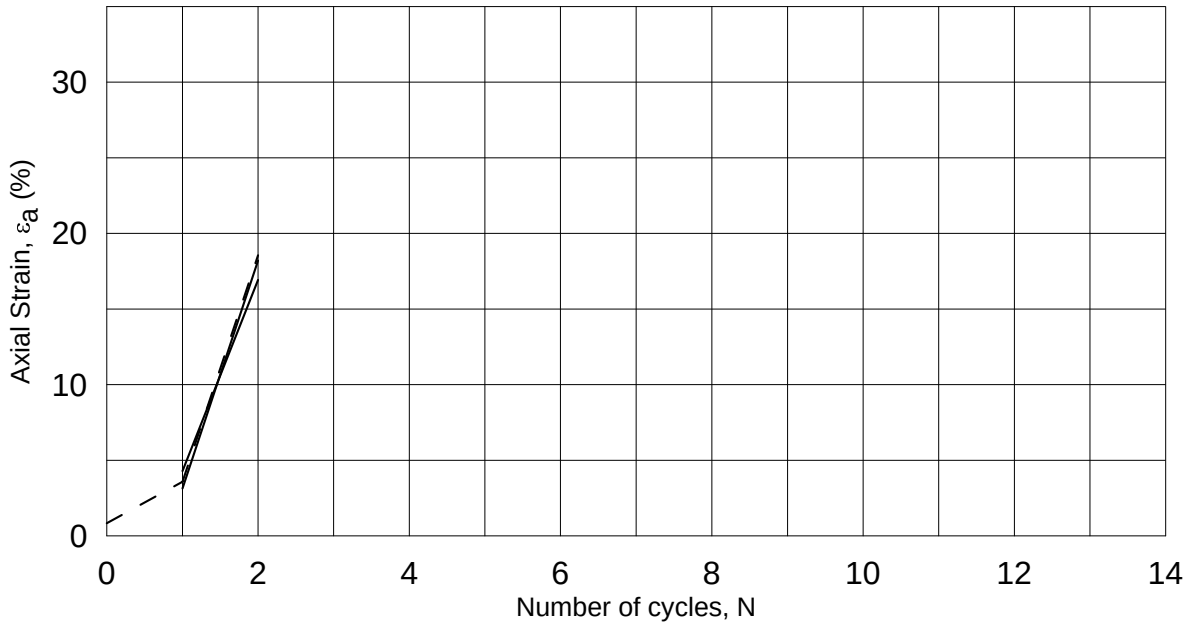
(kPa)	max.	min.	final
σ_{ac}' =	-	-	**445.9**
σ_{rc}' =	-	-	**356.8**

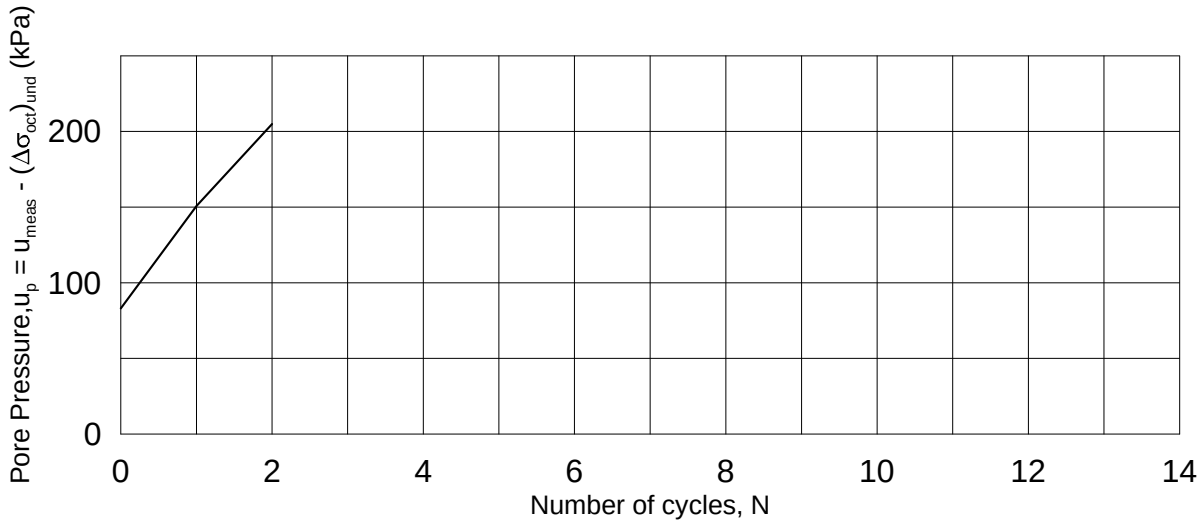
Date: 2016-02-15

Drawn by/checked: MAS / GS

K16-P16Q2-UnitC-9.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUCy**

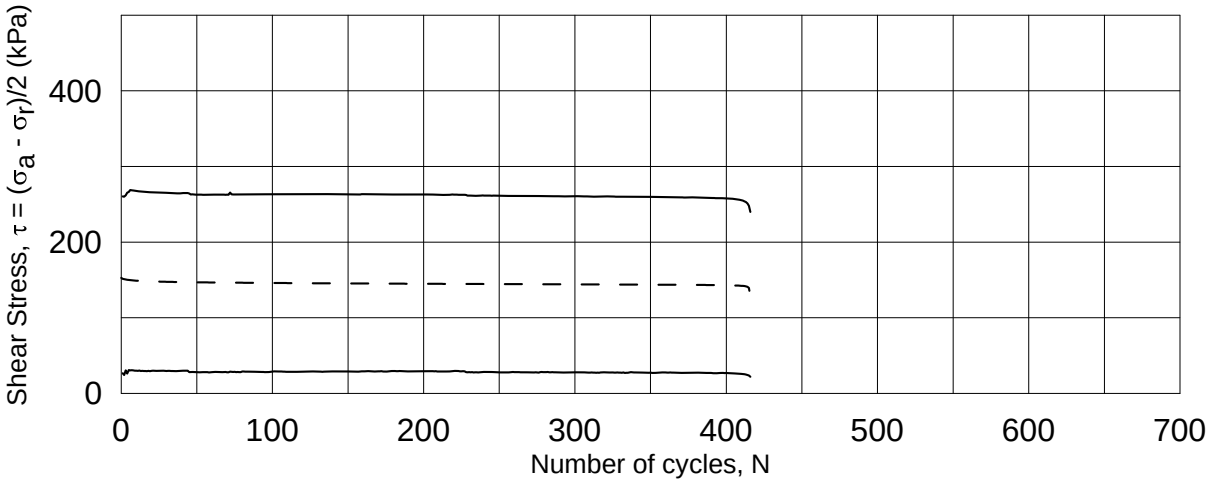
Figure No.: XX

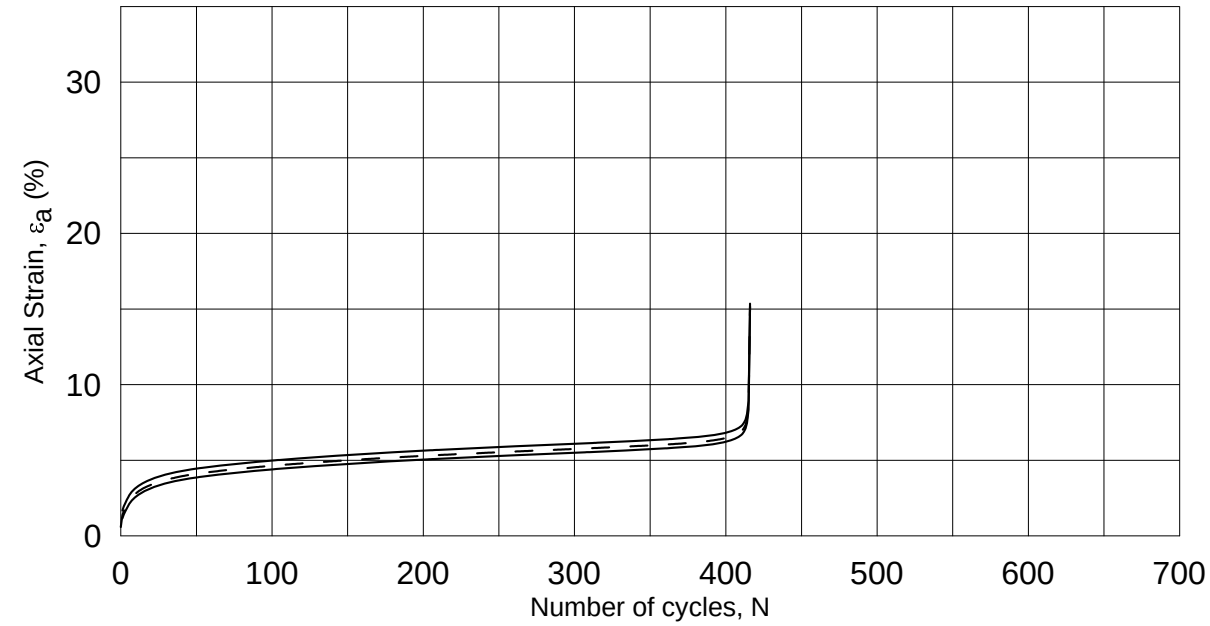
Boring:	**K16**	Depth =	**55.30**	m	Consolidation stresses			
Tube:	**P20Q1**	p_O' =	**546.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitH**	w_i =	**49.3**	%	σ_{ac}' =	-	-	**545.9**
Test:	**1**	w_c =	**46.6**	%	σ_{rc}' =	-	-	**436.8**

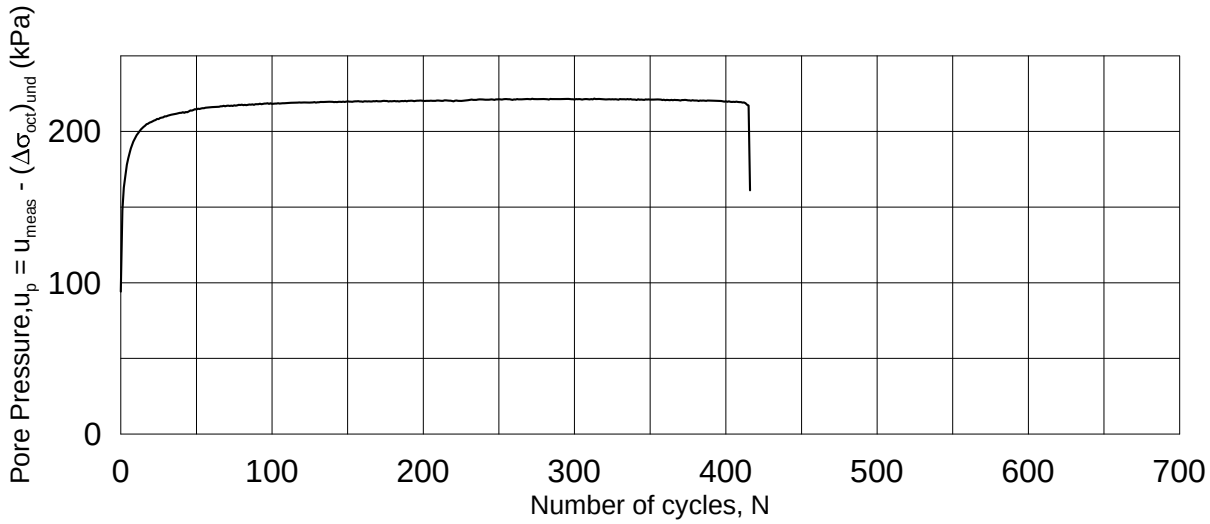
Date: 2016-02-15

Drawn by/checked: MAS / GS

K16-P20Q1-UnitH-1.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Triaxial test: **CAUcy**

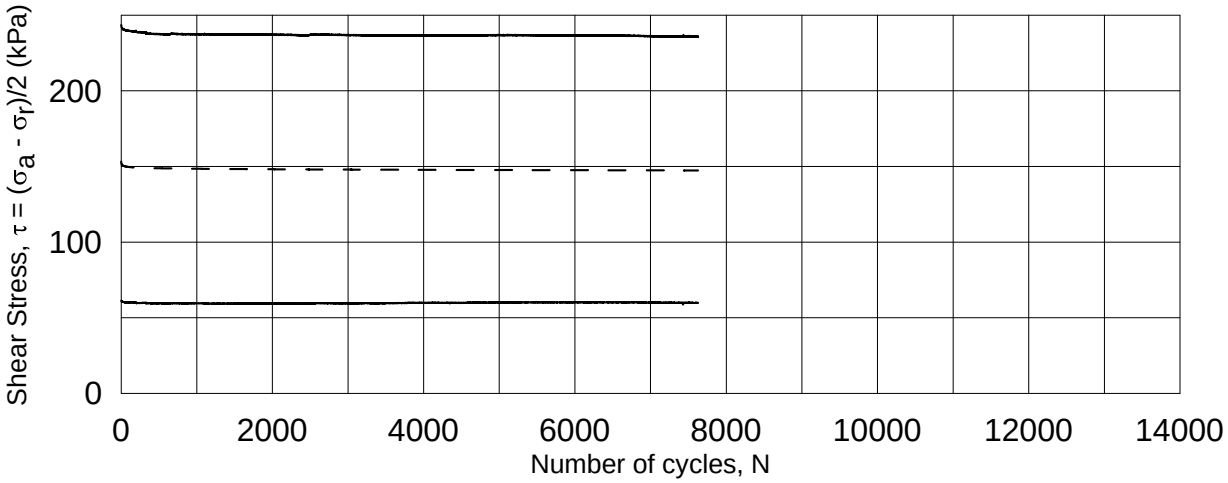
Figure No.: XX

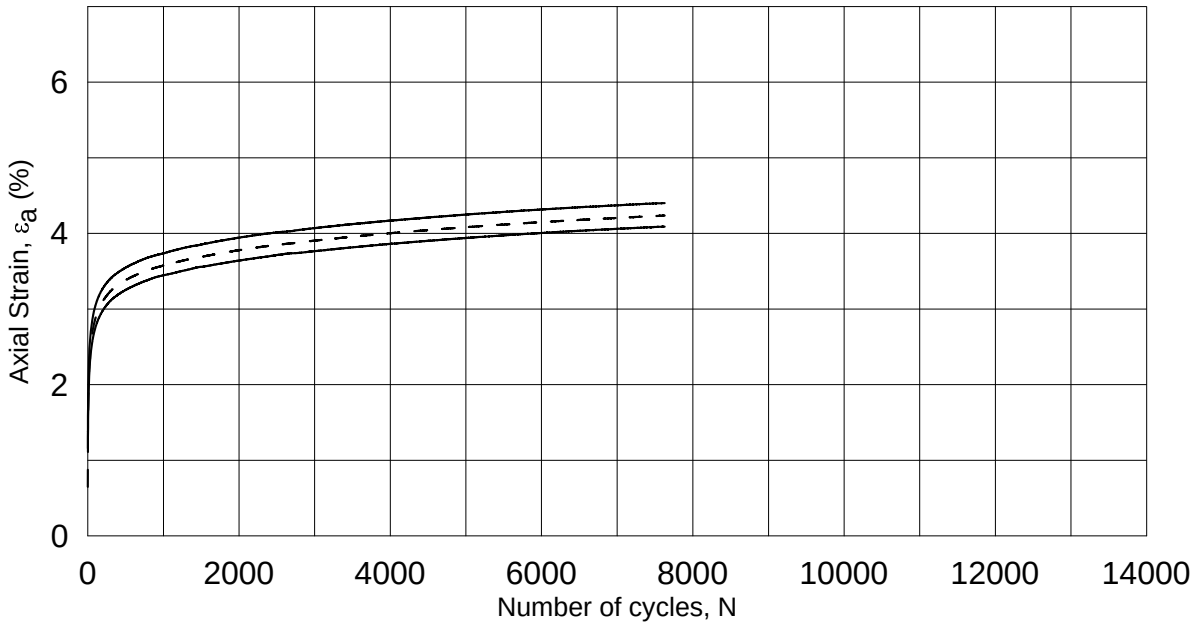
Boring:	**K16**	Depth =	**59.30**	m	Consolidation stresses		
Tube:	**P21Q1**	p_O' =	**573.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitH**	w_i =	**53.2**	%	σ_{ac}' =	-	-	**573.0**
Test:	**2**	w_c =	**50.6**	%	σ_{rc}' =	-	-	**458.4**

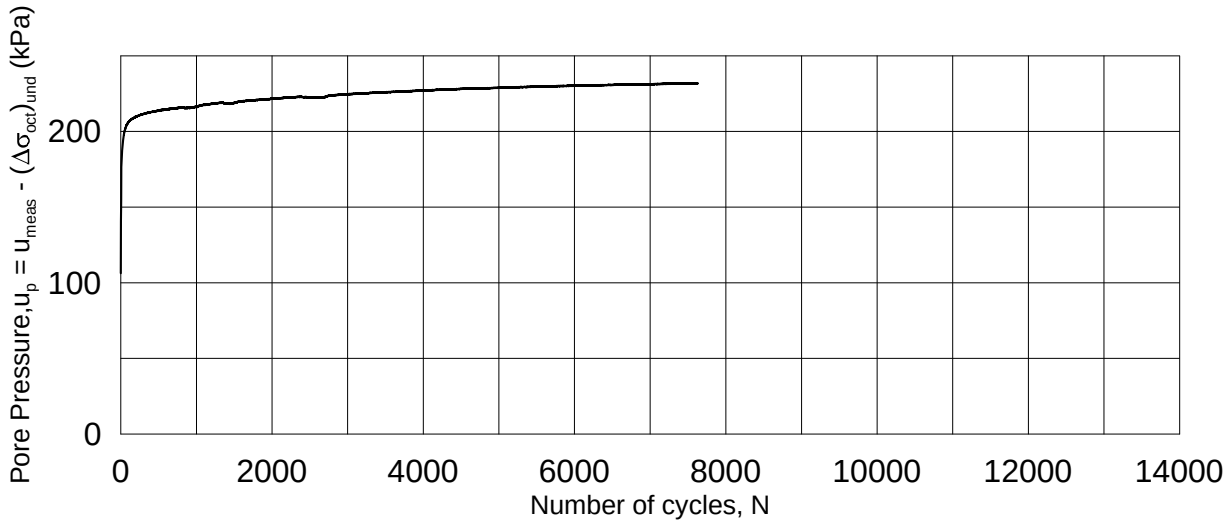
Date: 2016-02-25

Drawn by/checked: PCa / GS

K16-P21Q1-UnitH-2.Plot1.grf







Dato/rev.: 2014-12-23/01

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Document No.: 20150637-01-R

Figure No.:

Triaxial test: **CAUcy**

Boring:	**K16**	Depth =	**59.70**	m	Consolidation stresses		
Tube:	**P21Q2**	p_O' =	**576.0**	kPa	(kPa)	max.	min.	final
Part:	**UnitH**	w_i =	**42.7**	%	σ_{ac}' =	-	-	**575.9**
Test:	**3**	w_c =	**40.5**	%	σ_{rc}' =	-	-	**460.8**

Date: 2016-02-19

Drawn by/checked: MAS / GS

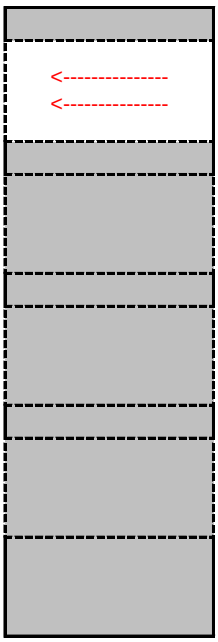
K16-P21Q2-UnitH-3.Plot1.grf

3.11 Direct Simple Shear (DSS) Test Results

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.22-23.24

Initial specimen position, orientation and shear direction

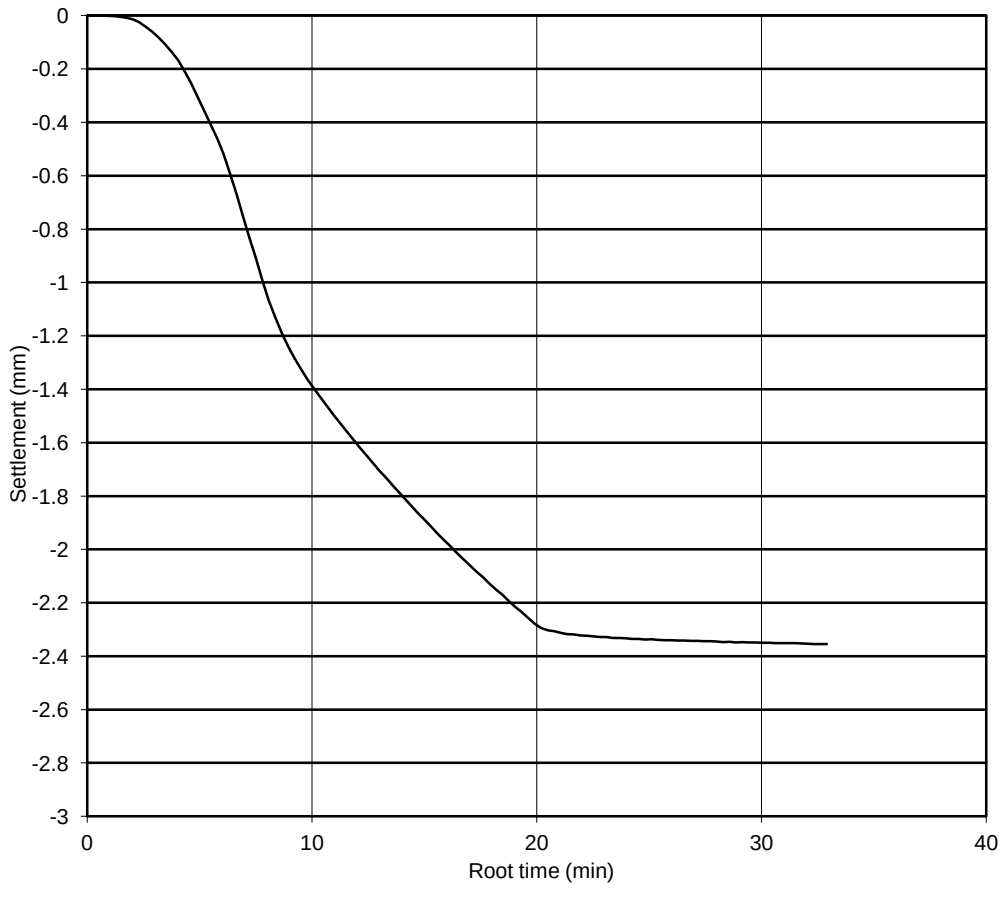


Position in sample
Top
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
DSS-CCV

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.96		
Sample Weight		g
73.06		
Moisture Content		%
36.8		
Bulk Density	P	Mg/m^3
1.864		
Dry Density	P_d	Mg/m^3
1.363		
Particle Density	P_s	Mg/m^3
2.77		
Voids Ratio	e_o	
1.033		
Degree of Saturation	S_o	
98.68		
Seating Pressure		kPa
5		

Consolidation Stage



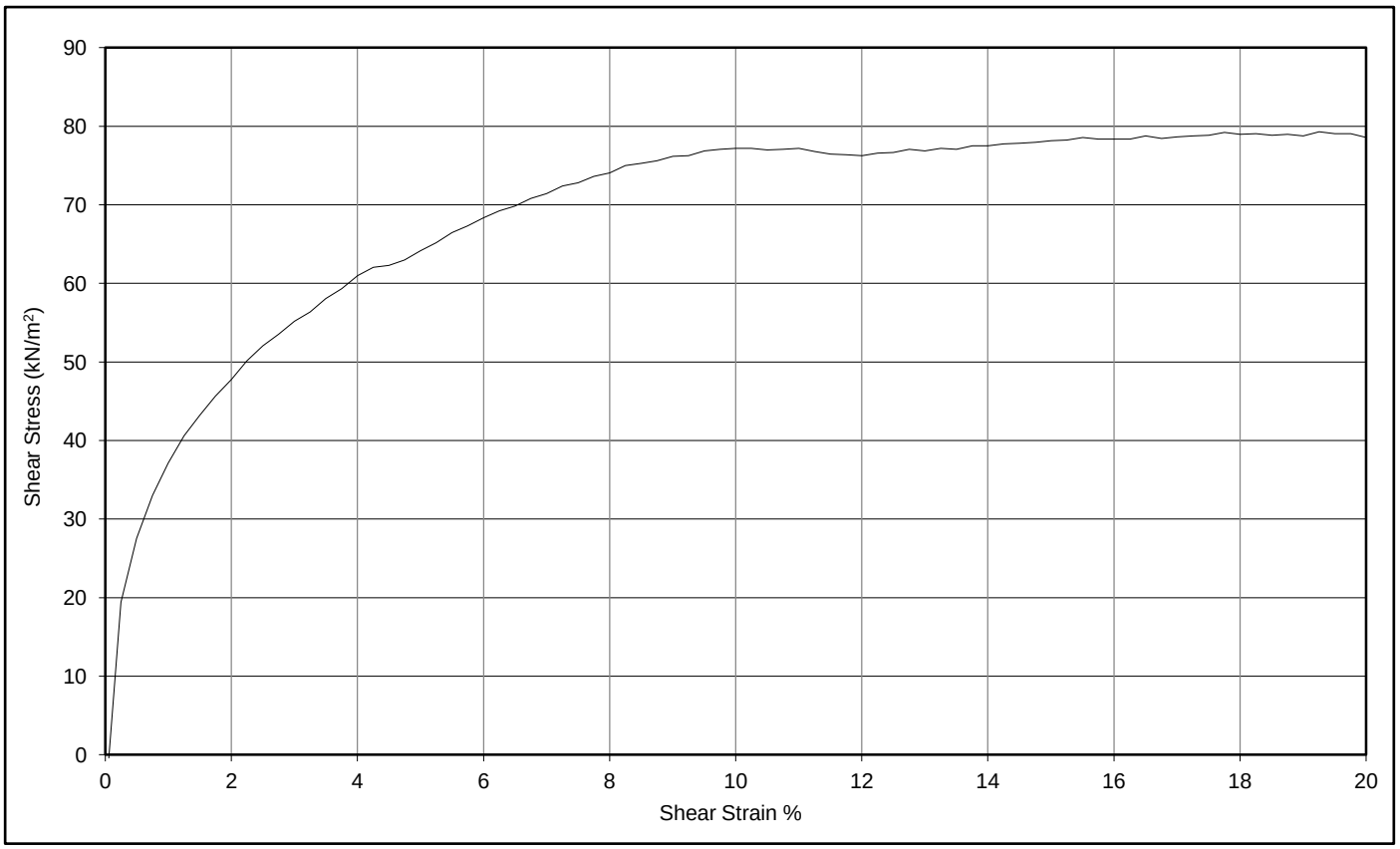
Specimen Consolidation Results

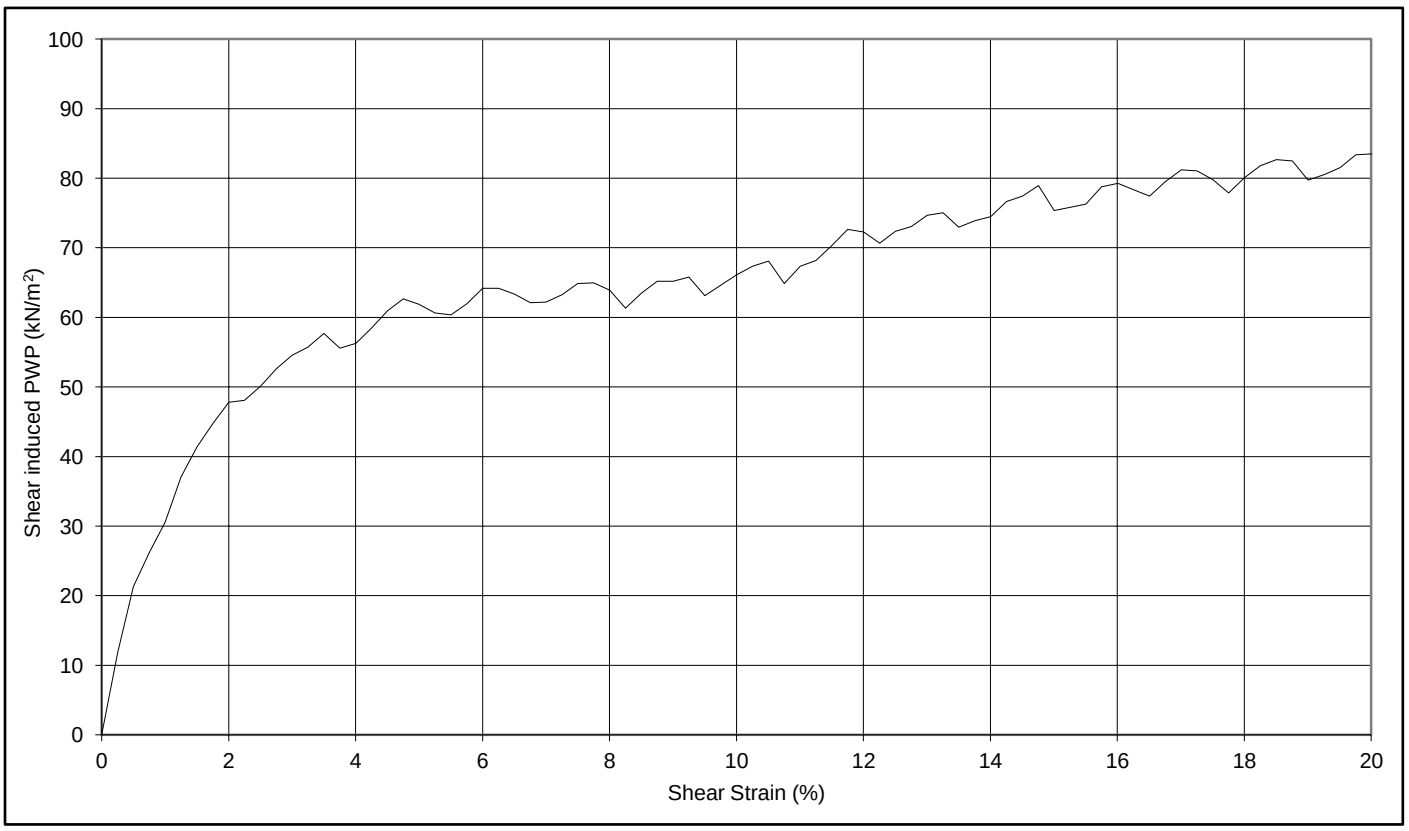
Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	228
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	11.78
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	228
Vertical strain at end of consolidation	
ε_{vc} (%)	11.78
Rate of strain for Shear Stage	
%hr	5.00

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.22-23.24

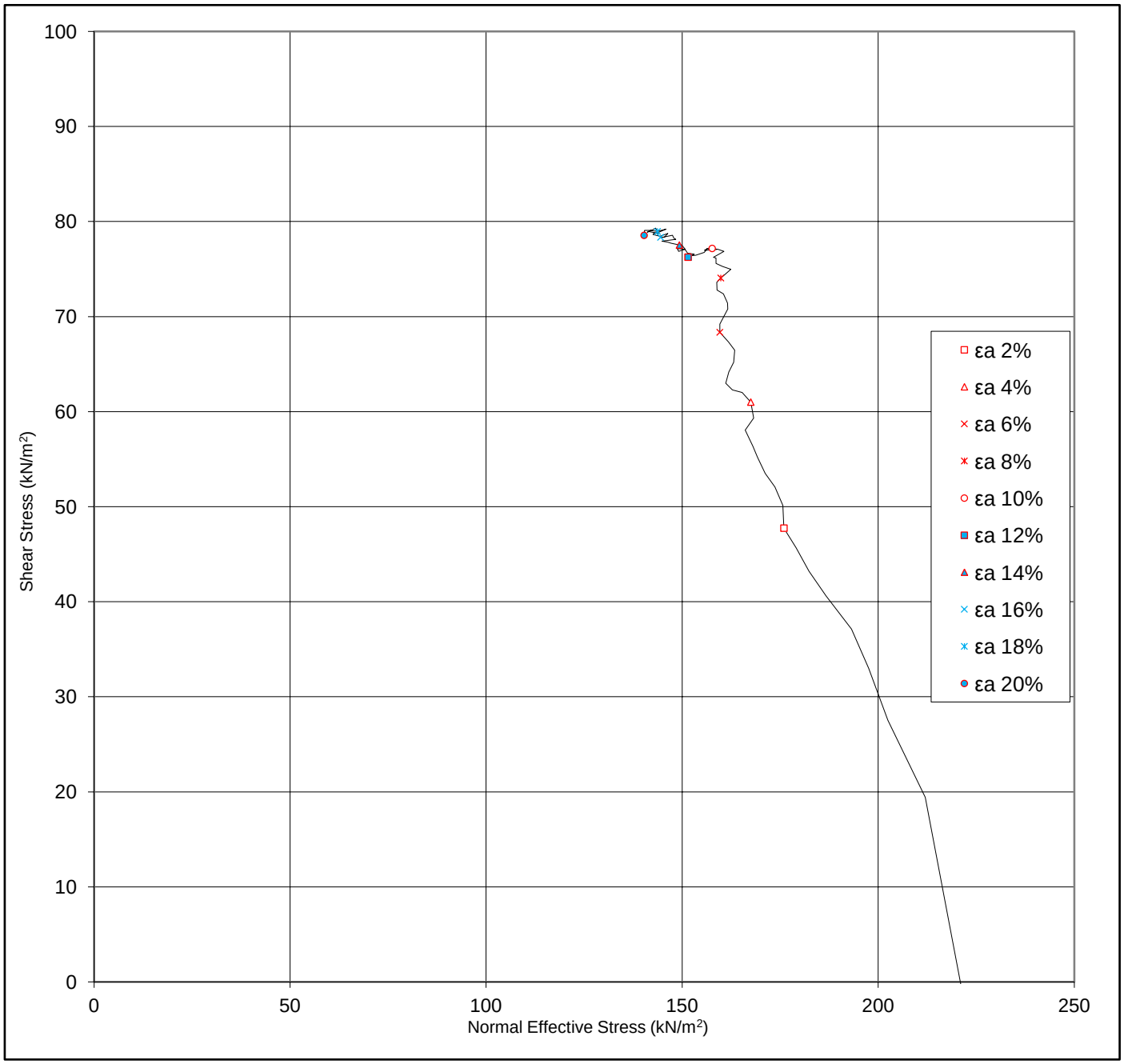
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

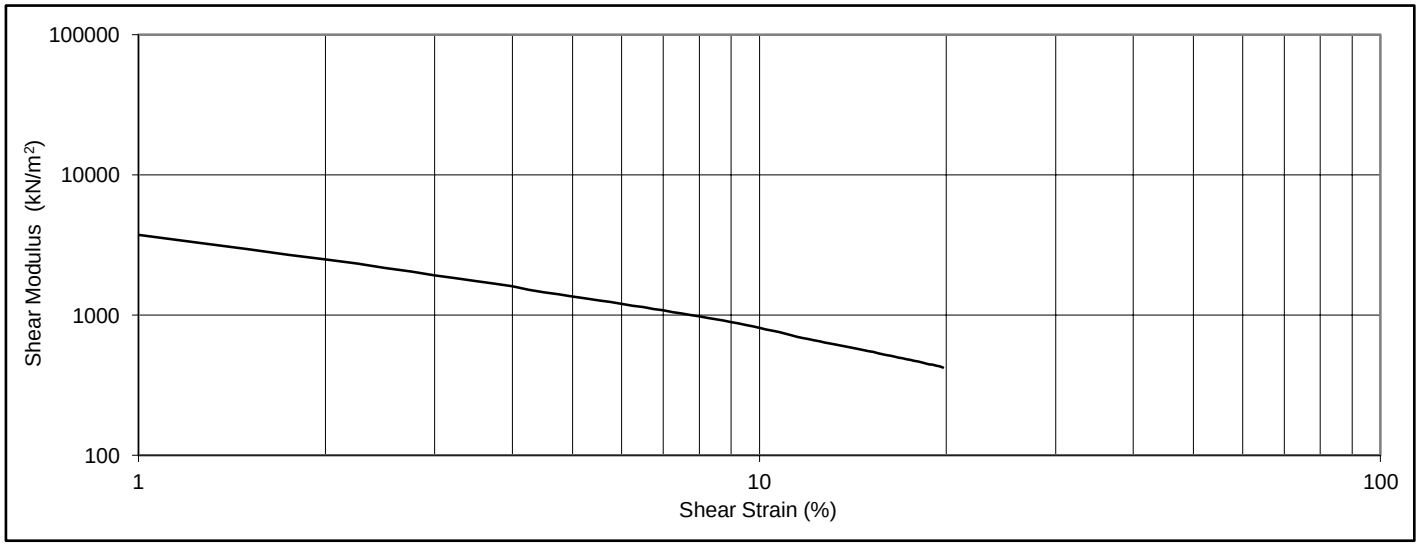
Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.22-23.24

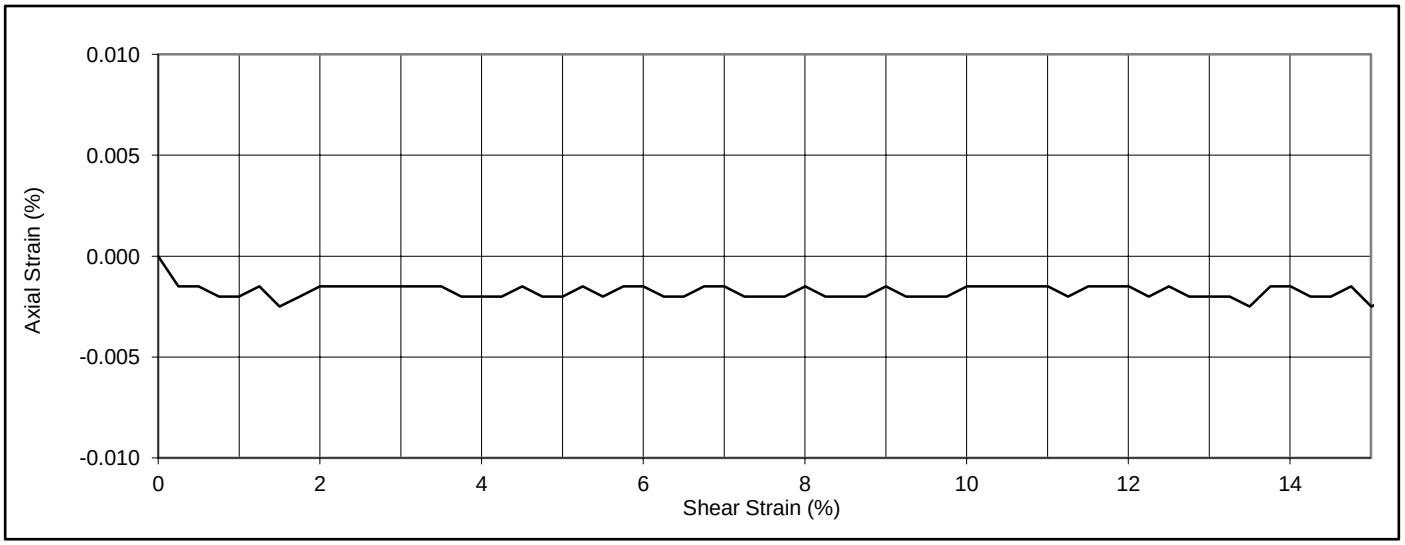


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.22-23.24





Final Specimen Details

Sample Height		
17.63		
Sample Diameter		
49.96		
Sample Weight		
70.95		
Moisture Content		
37.1		
Bulk Density	P	Mg/m^3
2.051		
Dry Density	P_d	Mg/m^3
1.497		
Voids Ratio	e_o	
0.851		
Degree of Saturation	S_o	
120.66		

Specimen Shear Results

Undrained shear strength	
S_u (kPa)	79
Shear Strain	
γ (%)	19.25
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.003
Pore pressure at failure	
Uf (kPa)	80.5

Picture Key

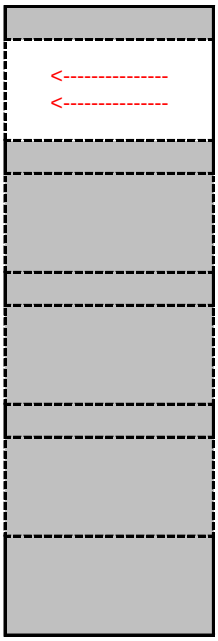
Top Picture
Side view of failure
Bottom Picture
Split along failure line

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Direct Simple Shear (DSS) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, slightly slightly with occassional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.55-18.57

Initial specimen position, orientation and shear direction

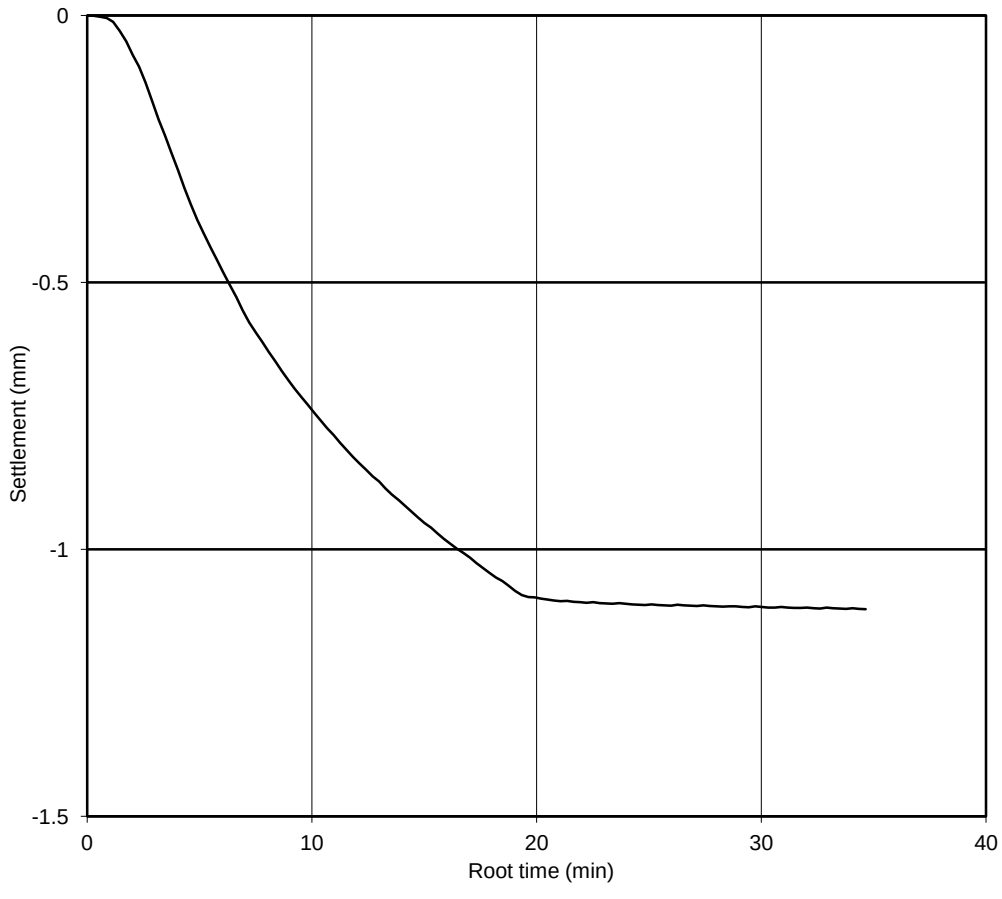


Position in sample
Bottom
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
DSS-CCS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
78.73		
Moisture Content		%
16.6		
Bulk Density	P	Mg/m^3
2.005		
Dry Density	P_d	Mg/m^3
1.720		
Particle Density	P_s	Mg/m^3
2.77		
Voids Ratio	e_o	
0.611		
Degree of Saturation	S_o	
75.34		
Seating Pressure		kPa
2.5		

Consolidation Stage



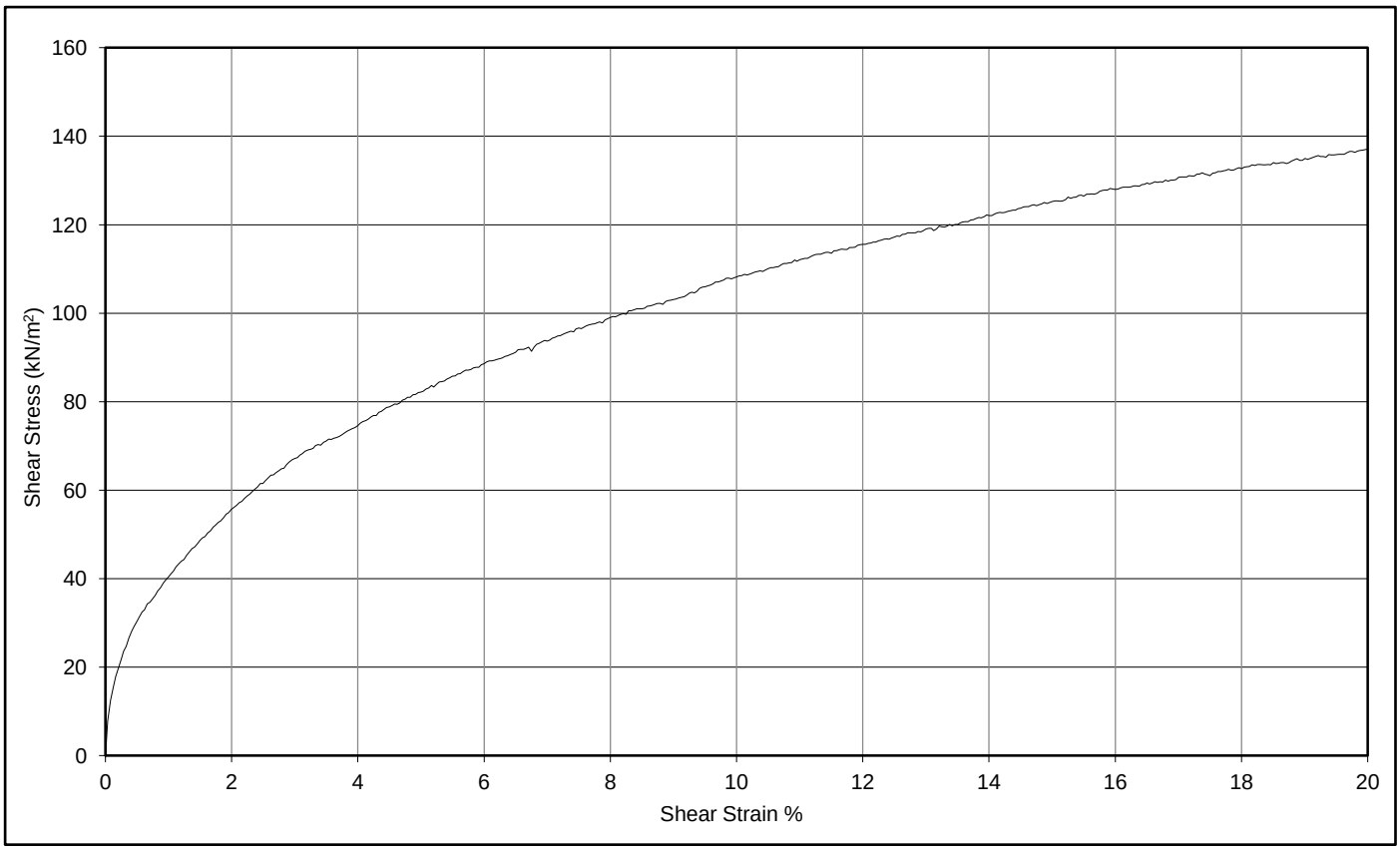
Specimen Consolidation Results

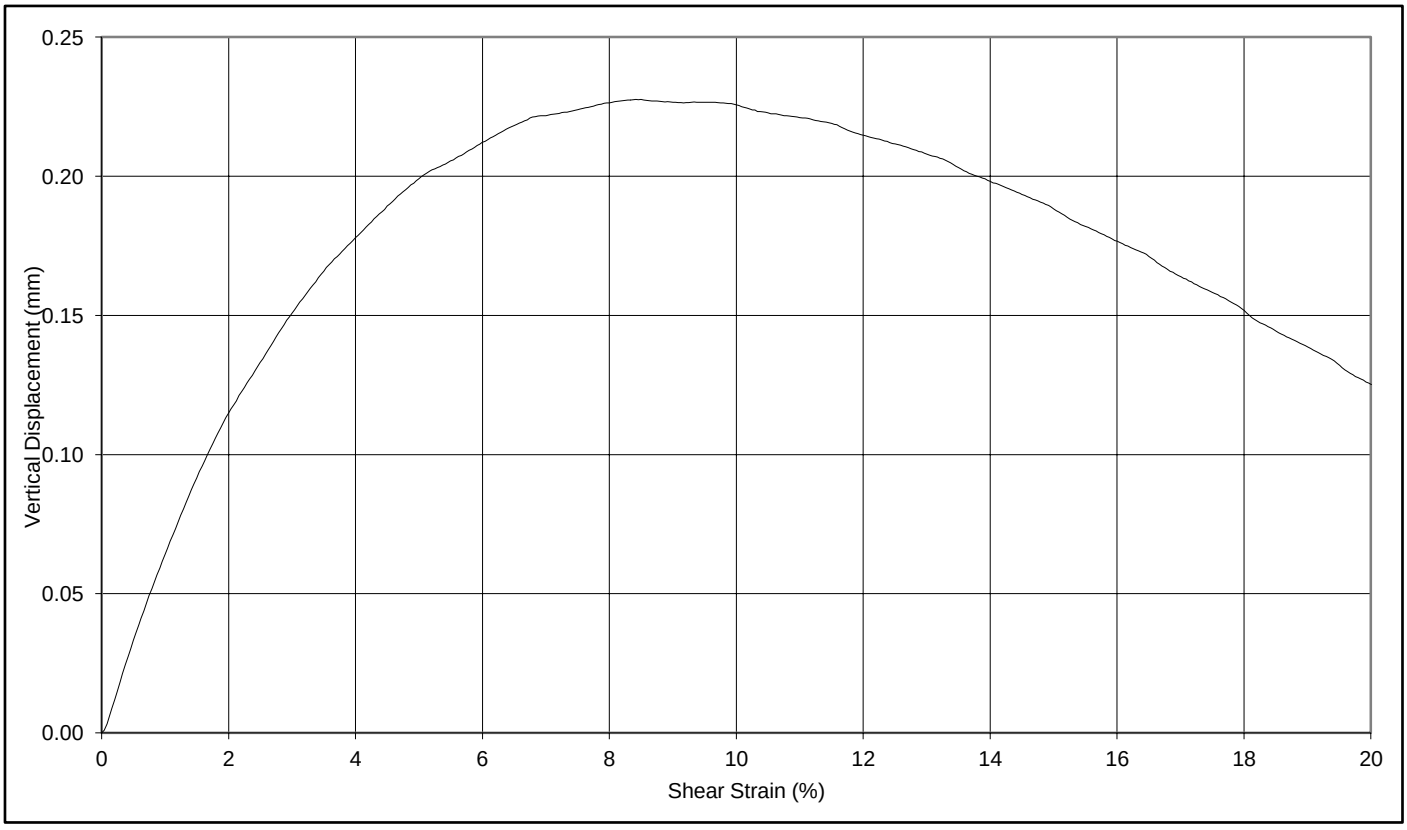
Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	185
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	5.56
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	185
Vertical strain at end of consolidation	
ε_{vc} (%)	5.56
Rate of strain for Shear Stage	
%hr	5.00

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Direct Simple Shear (DSS) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, slightly slightly with occassional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.55-18.57

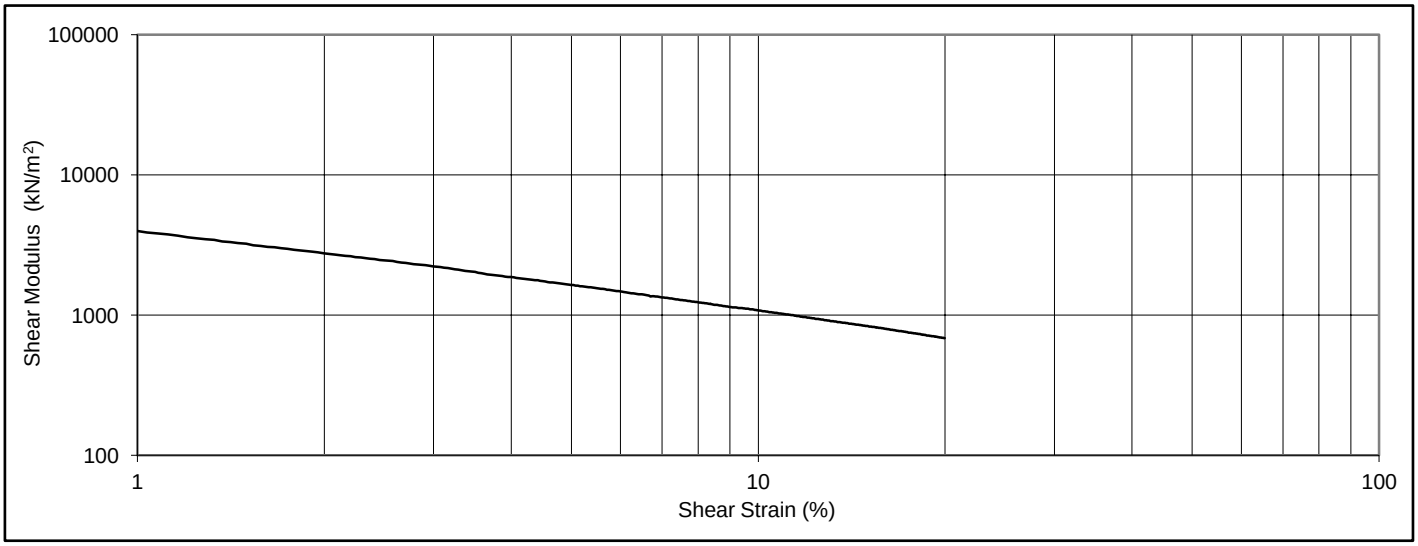
Shear Stage

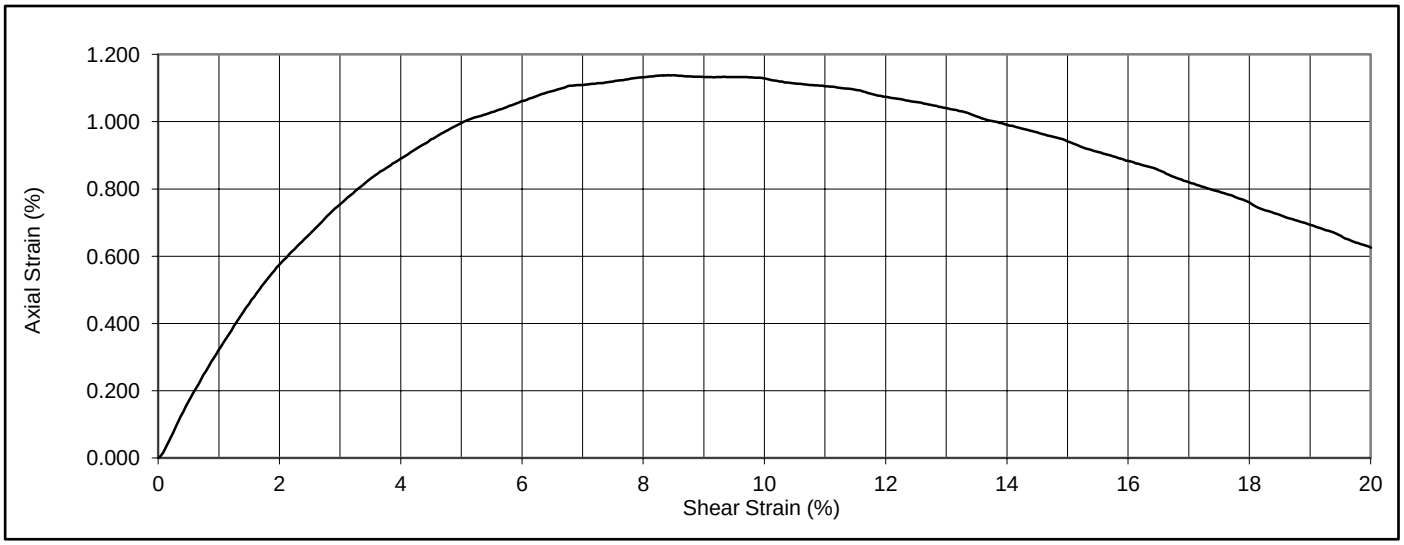




Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Direct Simple Shear (DSS) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, slightly slightly with occassional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.55-18.57





Final Specimen Details

Sample Height		
18.62		
Sample Diameter		
50.00		
Sample Weight		
77.84		
Moisture Content		
16.5		
Bulk Density	P	Mg/m^3
2.129		
Dry Density	P_d	Mg/m^3
1.827		
Voids Ratio	e_o	
0.516		
Degree of Saturation	S_o	
88.54		

Specimen Shear Results

Drained shear stress at failure	
tau' (kPa)	137
Shear Strain	
γ (%)	20.01
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	62.56
Angle of failure line	
alpha' (°)	36.5

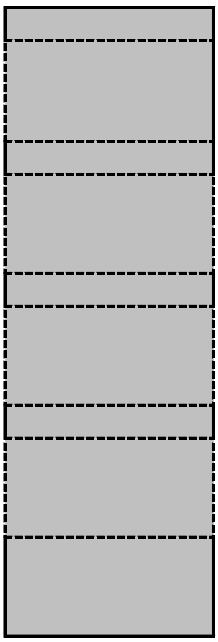
Picture Key
Top Picture
Side view of specimen post shear
Bottom Picture
Specimen opened perdendicular to shear

	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Direct Simple Shear (DSS) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, with rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.7-9.85

Initial specimen position, orientation and shear direction

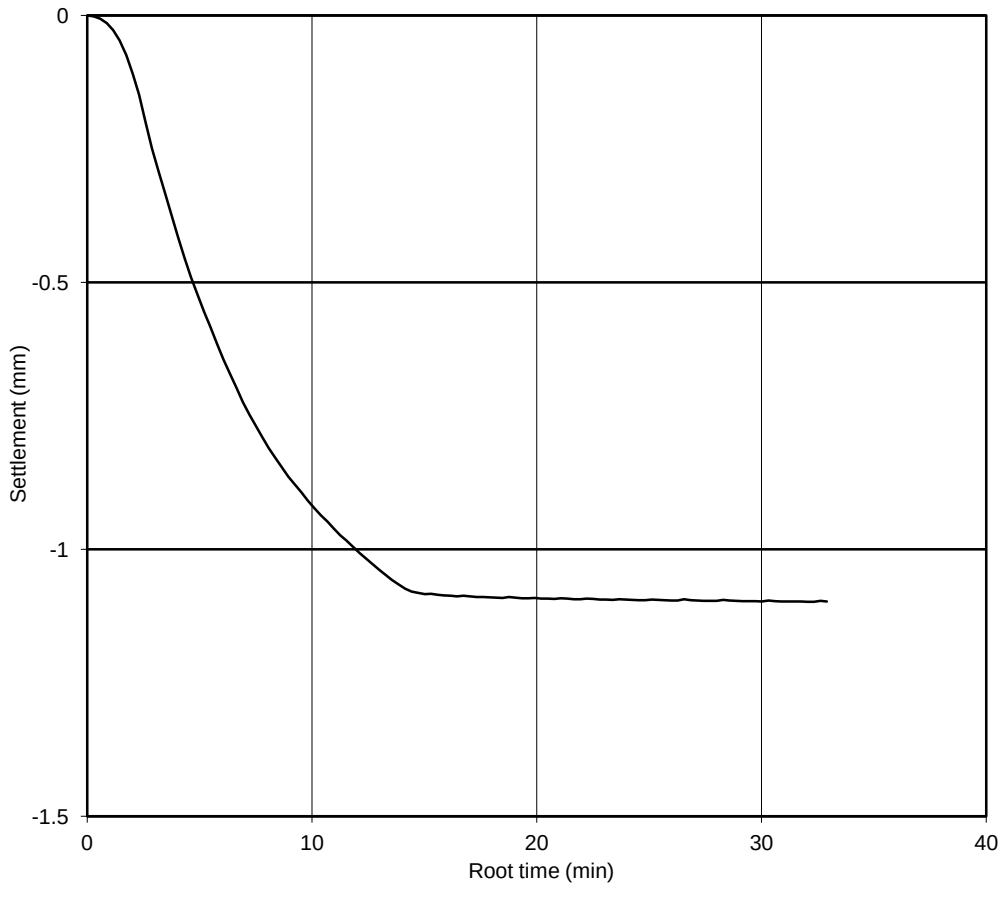


Position in sample
Bag Sample
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
DSS-CCS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
77.14		
Moisture Content		%
22.1		
Bulk Density	P	Mg/m^3
1.965		
Dry Density	P_d	Mg/m^3
1.609		
Particle Density	P_s	Mg/m^3
2.77		
Voids Ratio	e_o	
0.721		
Degree of Saturation	S_o	
84.90		
Seating Pressure		kPa
2.5		

Consolidation Stage



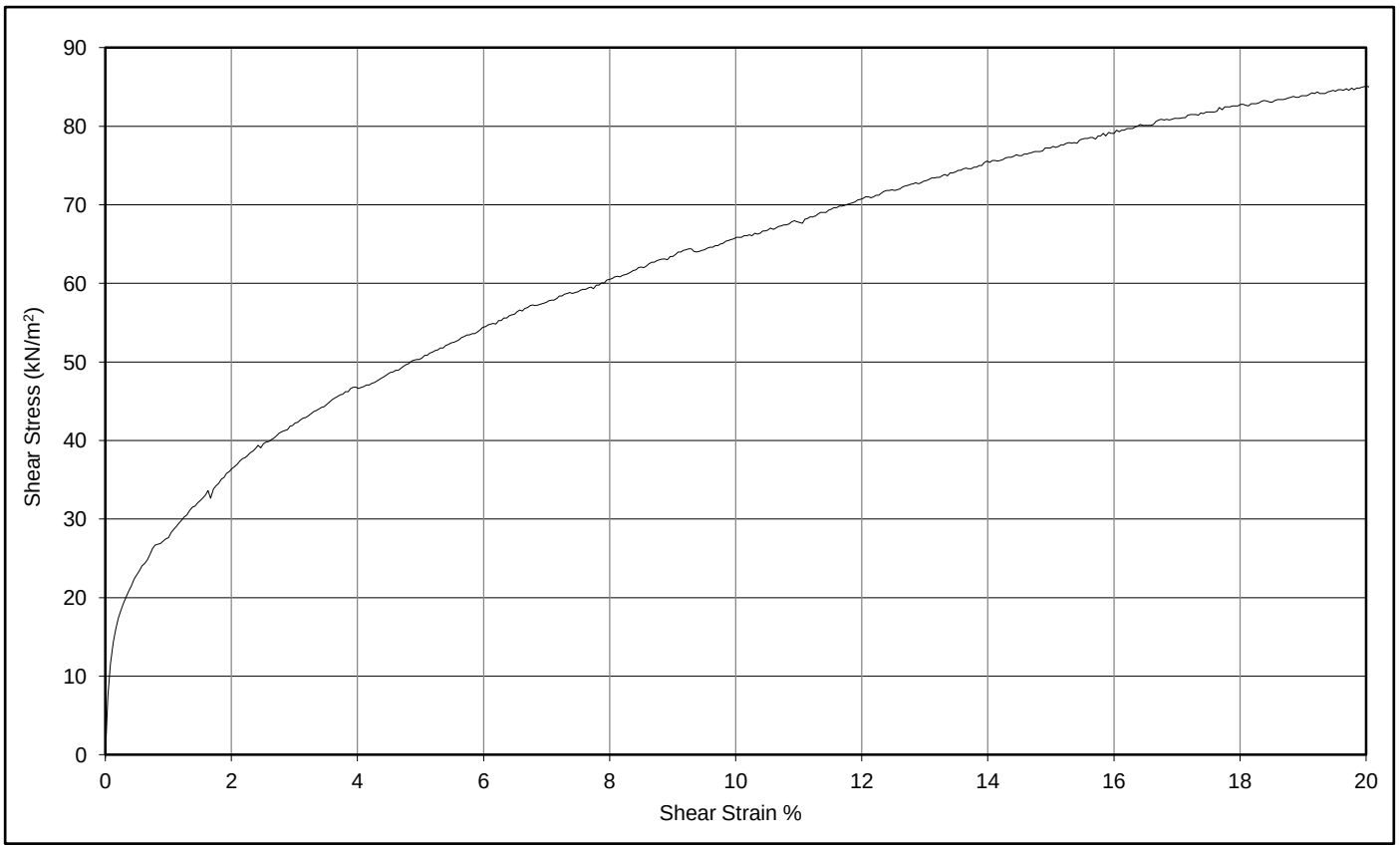
Specimen Consolidation Results

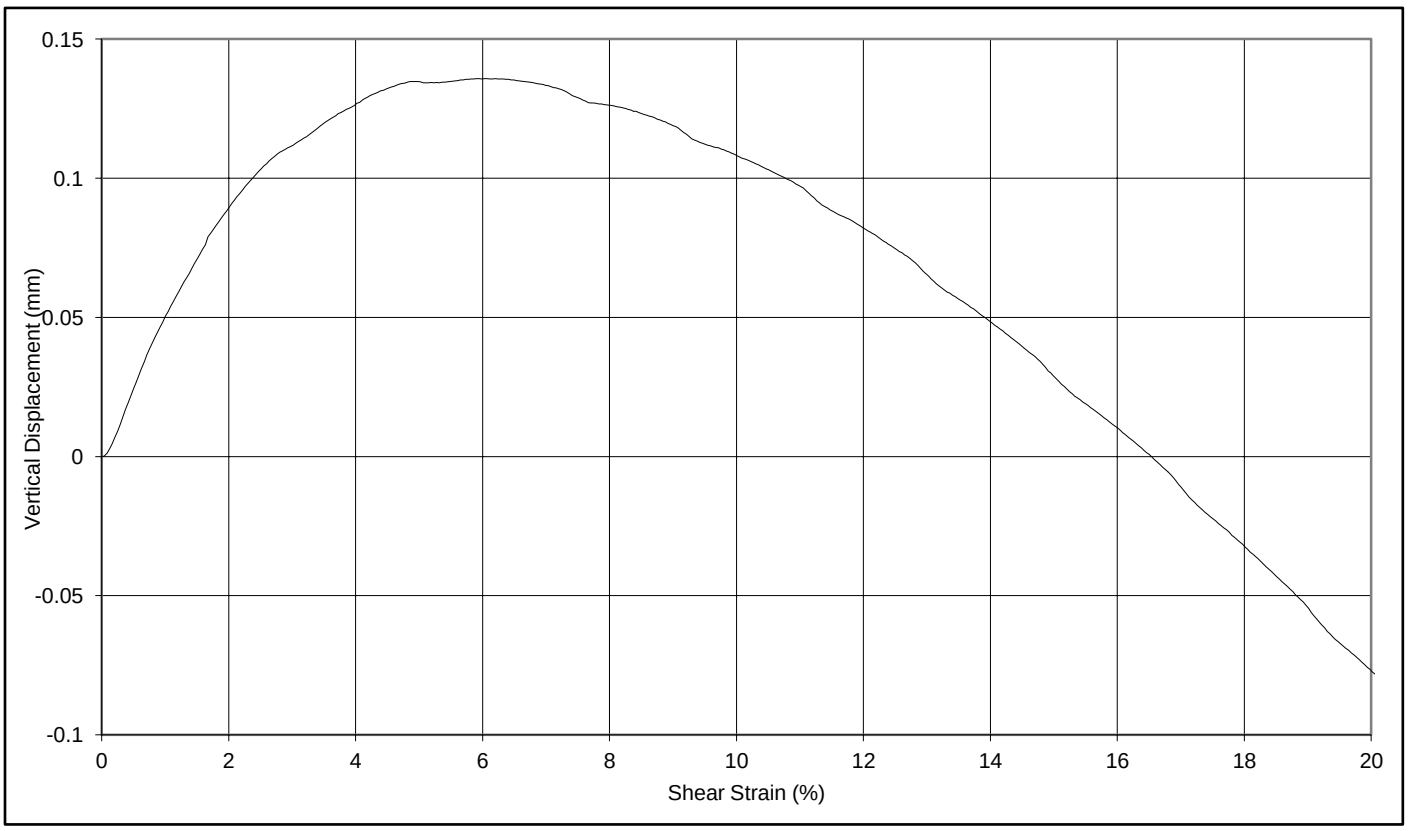
Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	98
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	5.49
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	98
Vertical strain at end of consolidation	
ε_{vc} (%)	5.49
Rate of strain for Shear Stage	
%hr	5.00

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Direct Simple Shear (DSS) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, with rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.7-9.85

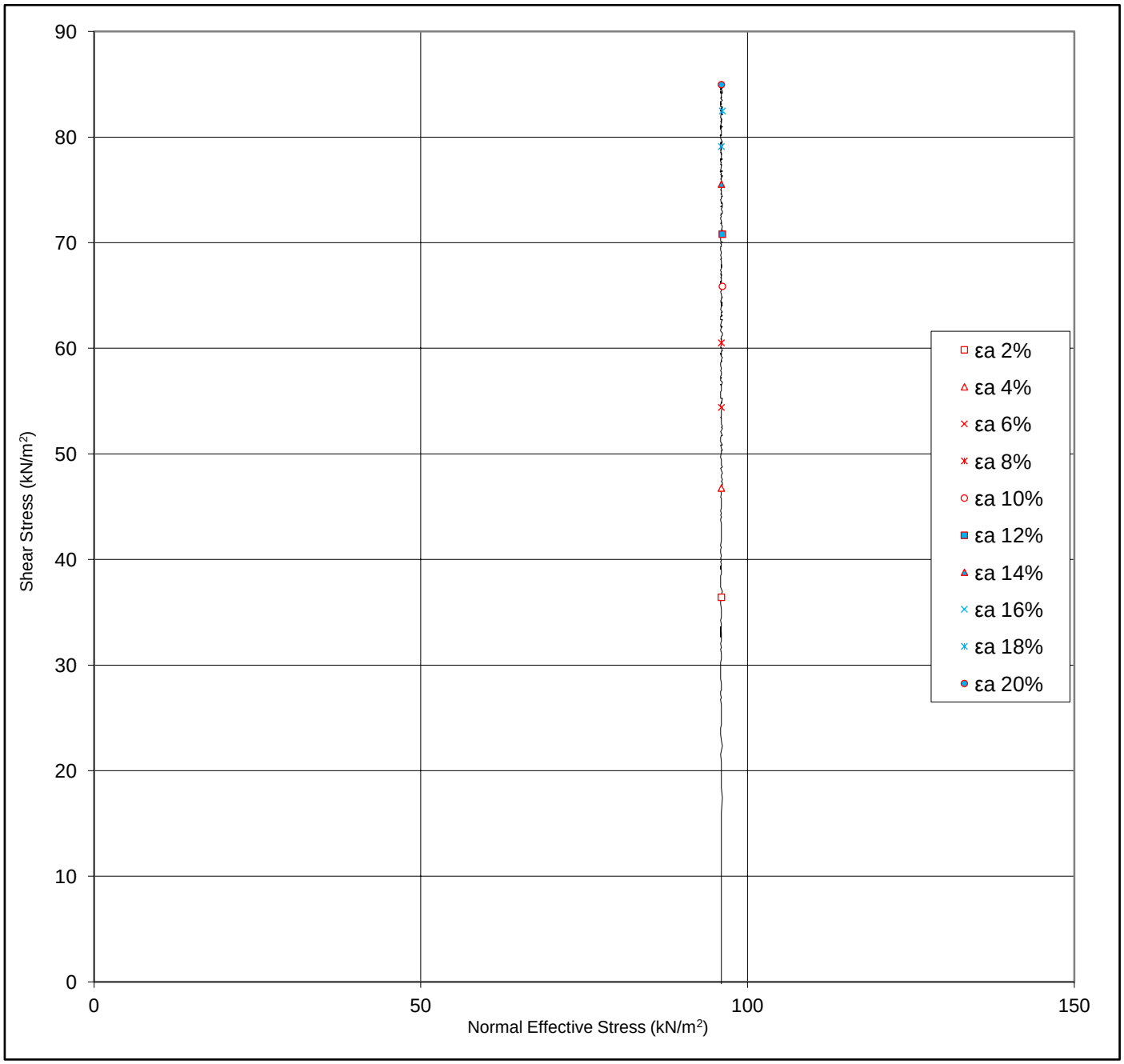
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

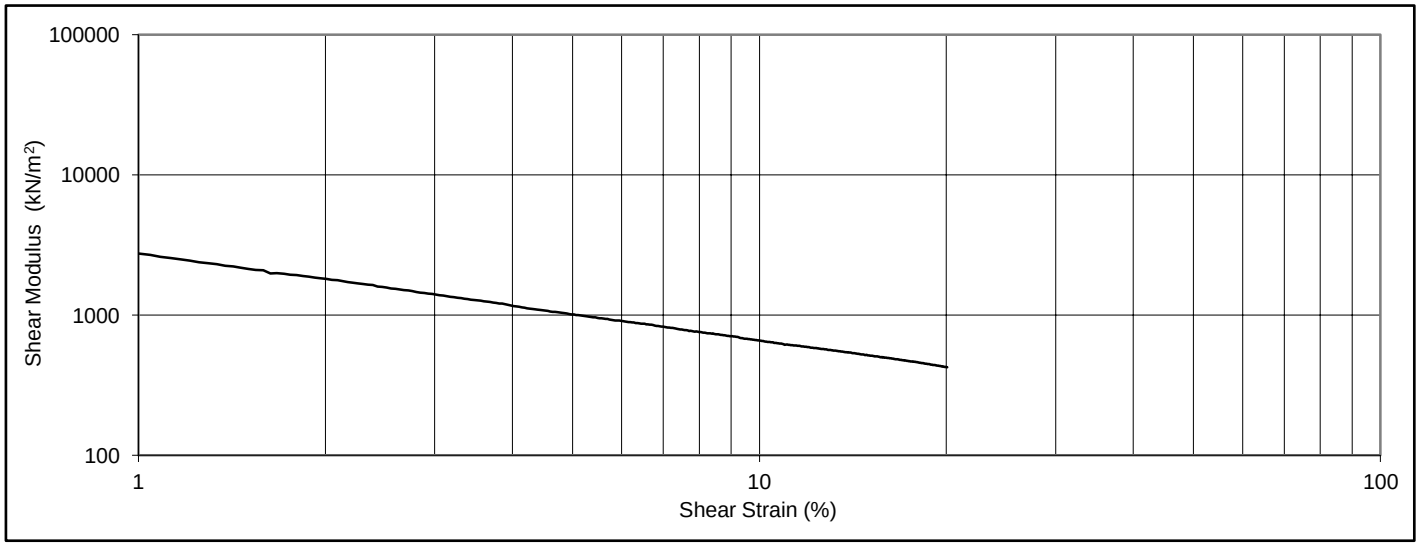
Gardline	Direct Simple Shear (DSS) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, with rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.7-9.85

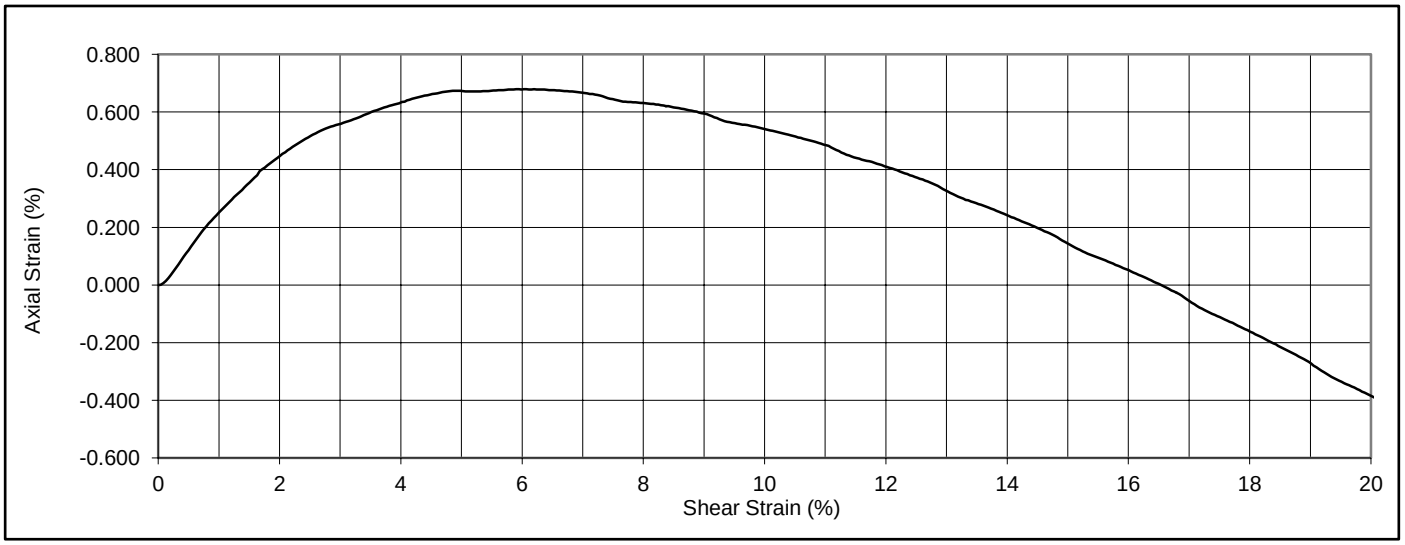


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Direct Simple Shear (DSS) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, with rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.7-9.85





Final Specimen Details

Sample Height		
18.73		
Sample Diameter		
50.00		
Sample Weight		
74.8		
Moisture Content		
21.0		
Bulk Density	P	Mg/m^3
2.034		
Dry Density	P_d	Mg/m^3
1.681		
Voids Ratio	e_o	
0.648		
Degree of Saturation	S_o	
89.82		

Specimen Shear Results

Drained shear stress at failure	
tau' (kPa)	85
Shear Strain	
γ (%)	19.98
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	-0.38
Angle of failure line	
alpha' (°)	41.0

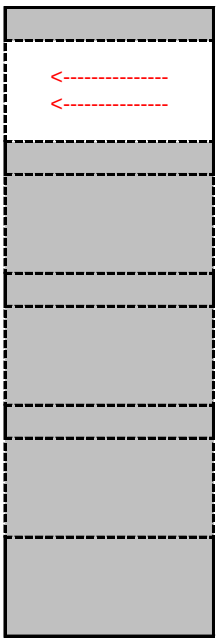
Picture Key
Top Picture
Side view of specimen post shear
Bottom Picture
Specimen opened perpendicular to shear

	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.22-59.24

Initial specimen position, orientation and shear direction

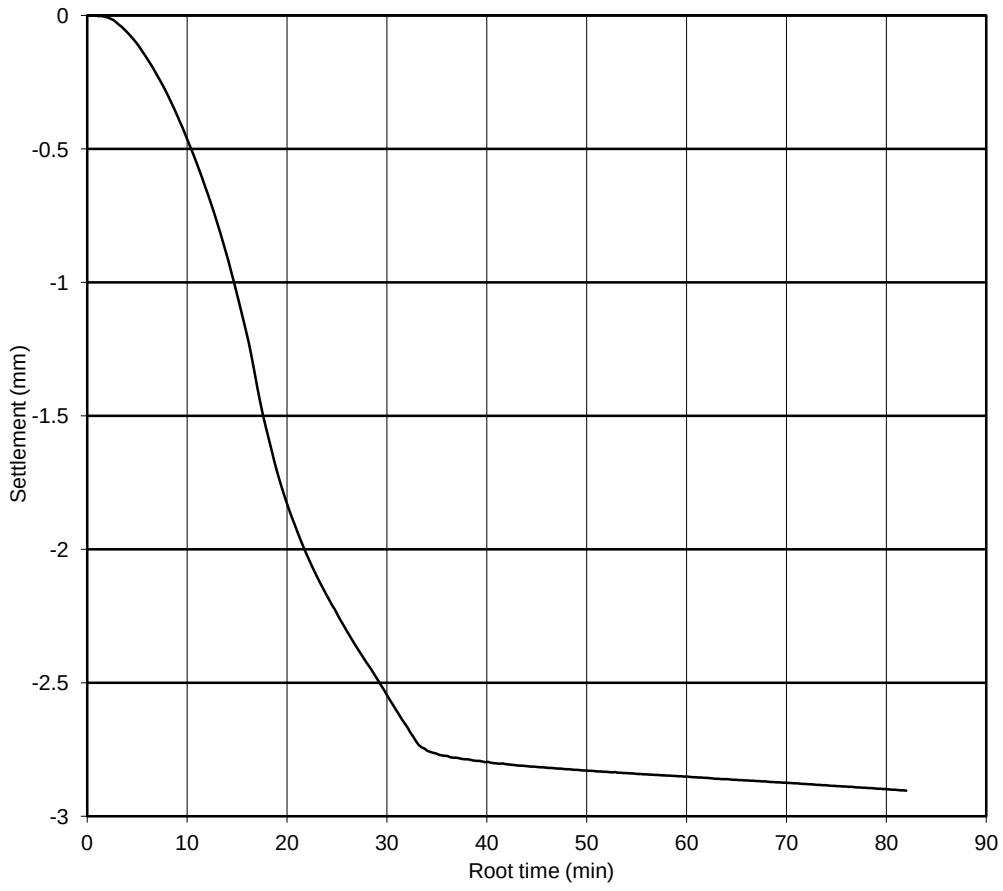


Position in sample
Top
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
DSS-CCV

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.92		
Sample Weight		g
62.7		
Moisture Content		%
48.3		
Bulk Density	P	Mg/m^3
1.602		
Dry Density	P_d	Mg/m^3
1.081		
Particle Density	P_s	Mg/m^3
2.77		#
Voids Ratio	e_o	
1.563		
Degree of Saturation	S_o	
85.52		
Seating Pressure		kPa
2.5		

Consolidation Stage



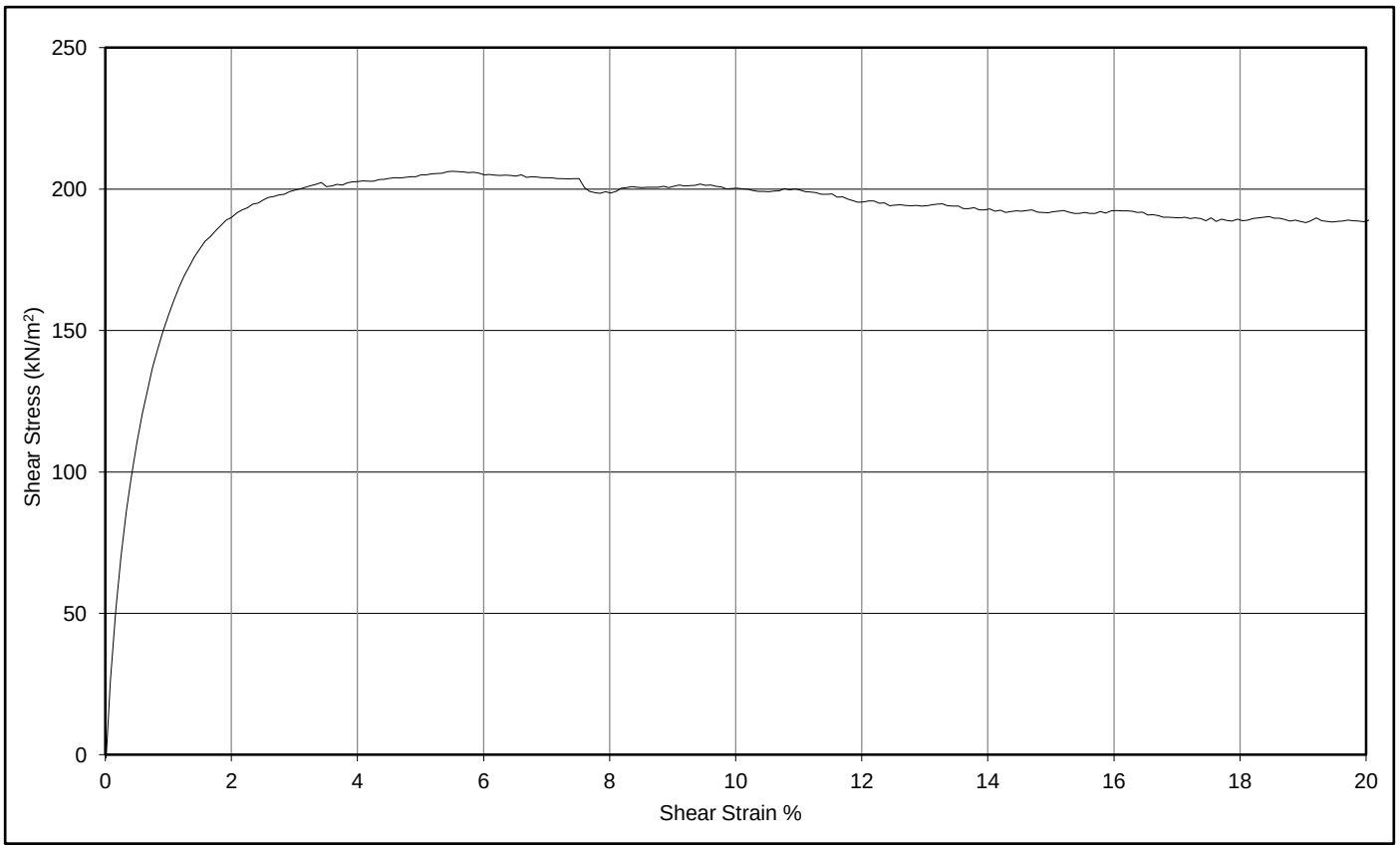
Specimen Consolidation Results

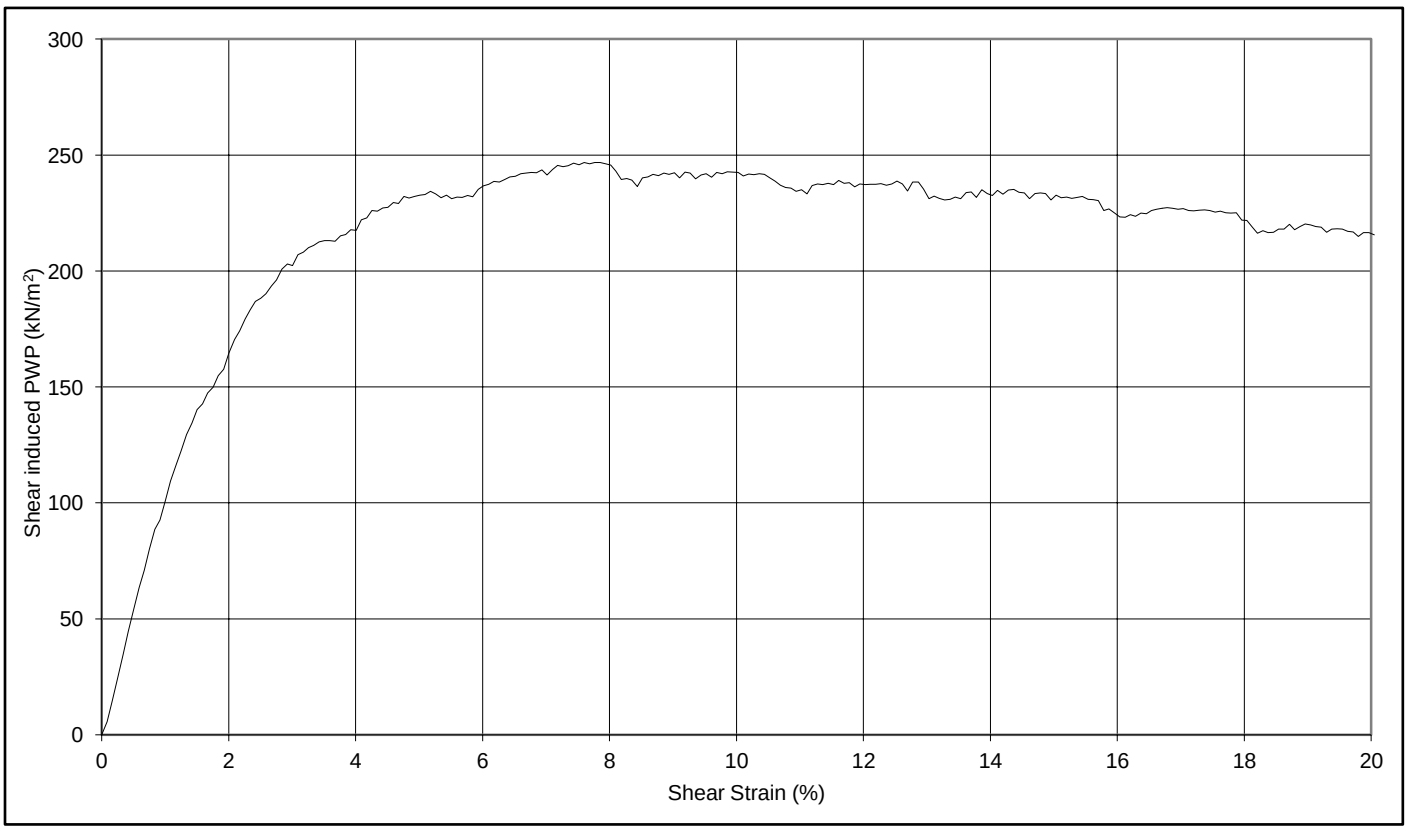
Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	545
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	14.52
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	545
Vertical strain at end of consolidation	
ε_{vc} (%)	14.52
Rate of strain for Shear Stage	
%hr	5.00

Remarks: # denotes estimated value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.22-59.24

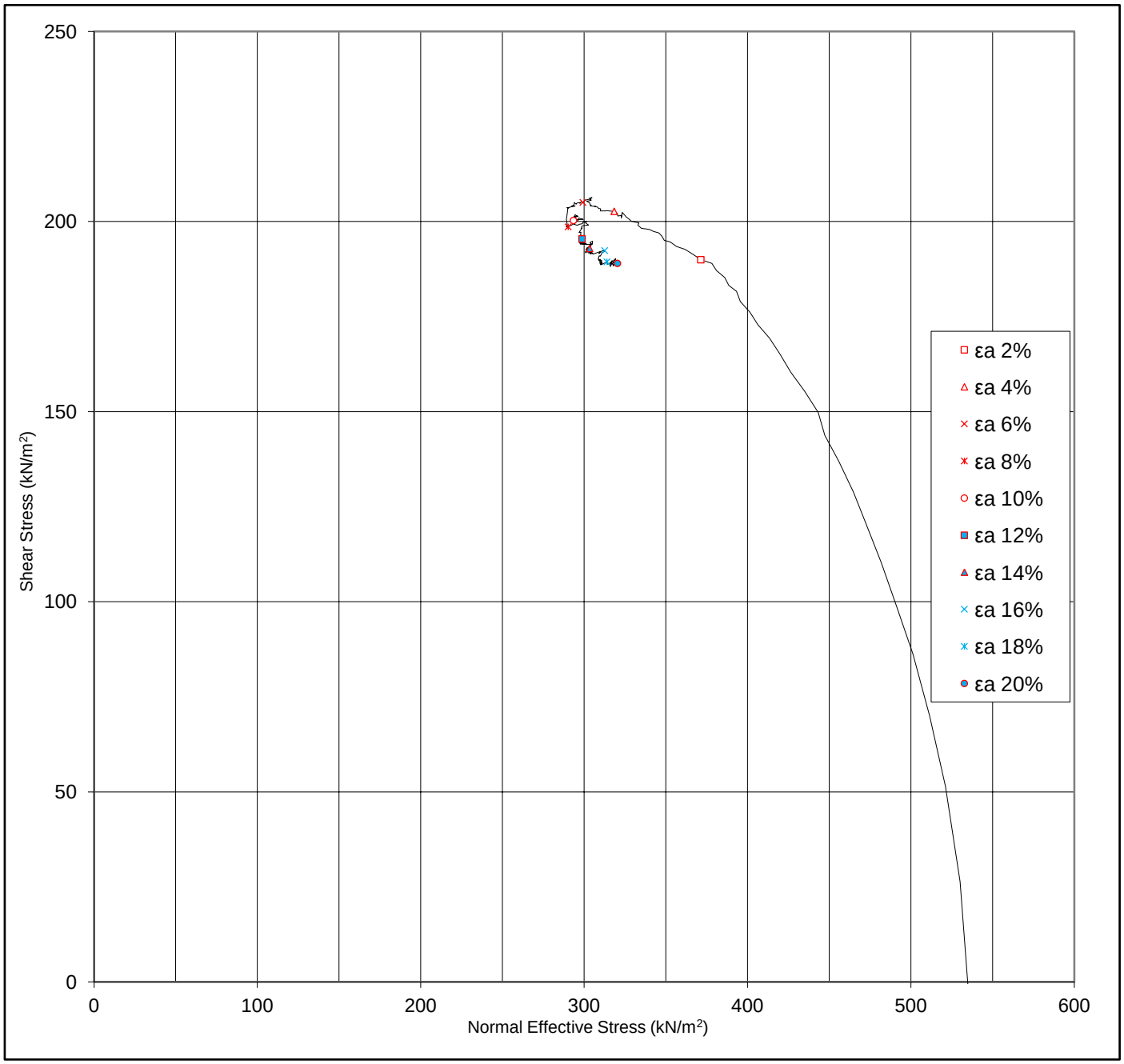
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

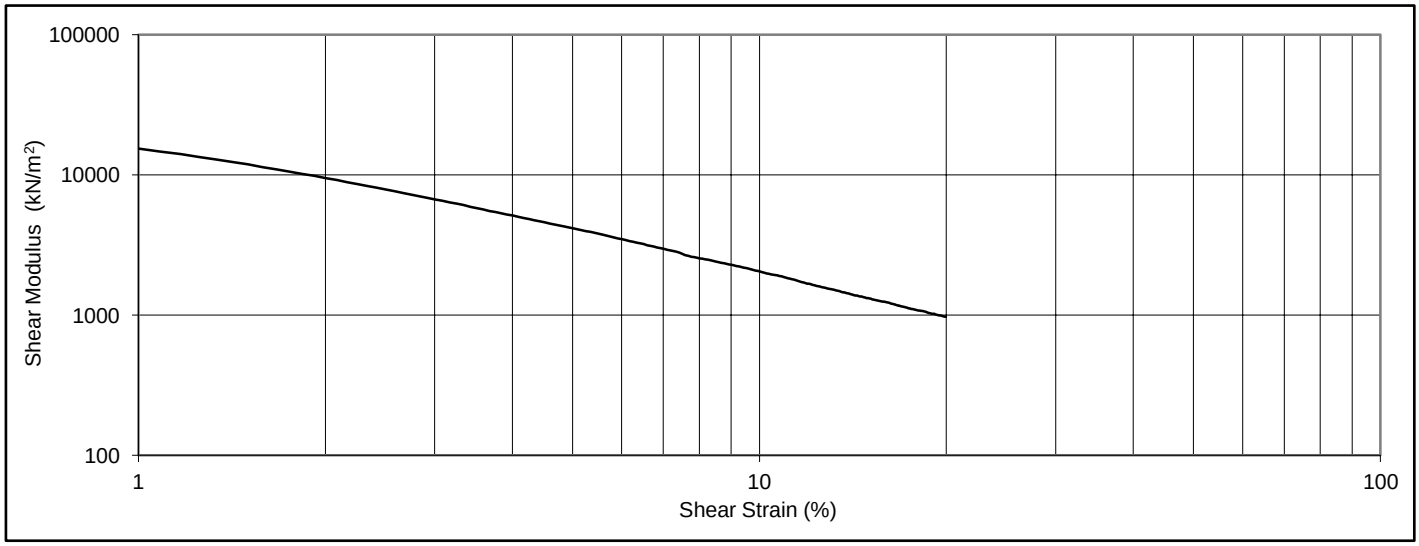
Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.22-59.24

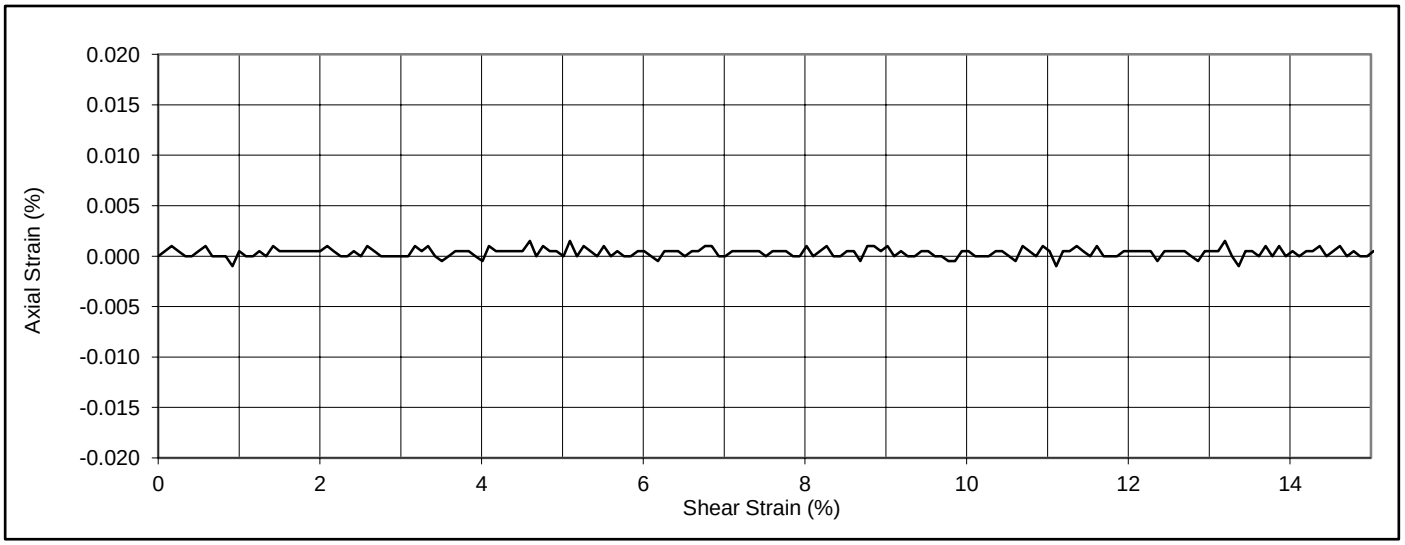


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.22-59.24





Final Specimen Details

Sample Height		
17.09		
Sample Diameter		
49.92		
Sample Weight		
61.66		
Moisture Content		
46.8		
Bulk Density	P	Mg/m^3
1.842		
Dry Density	P_d	Mg/m^3
1.255		
Voids Ratio	e_o	
1.207		
Degree of Saturation	S_o	
107.40		

Specimen Shear Results

Undrained shear strength	
s_u (kPa)	206
Shear Strain	
γ (%)	5.51
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.10
Pore pressure at failure	
Uf (kPa)	231.1

Picture Key

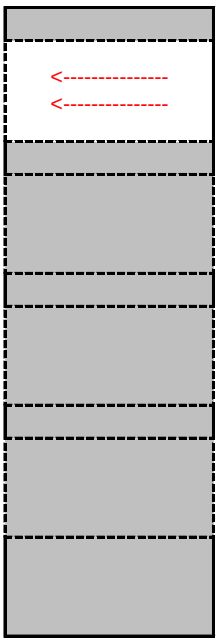
Top Picture
Side view of failure
Bottom Picture
Specimen lifted from failure

Remarks: Failure occured along silty micaceous lamination	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - K16
Description	Clay with sand. Sand is fine to medium, dark grey, moist, fine to medium shell fragments and gravel	Sample No./Type	P17Q1
Tested in accordance with ASTM D6528-07		Depth (m)	48.44-48.46

Initial specimen position, orientation and shear direction

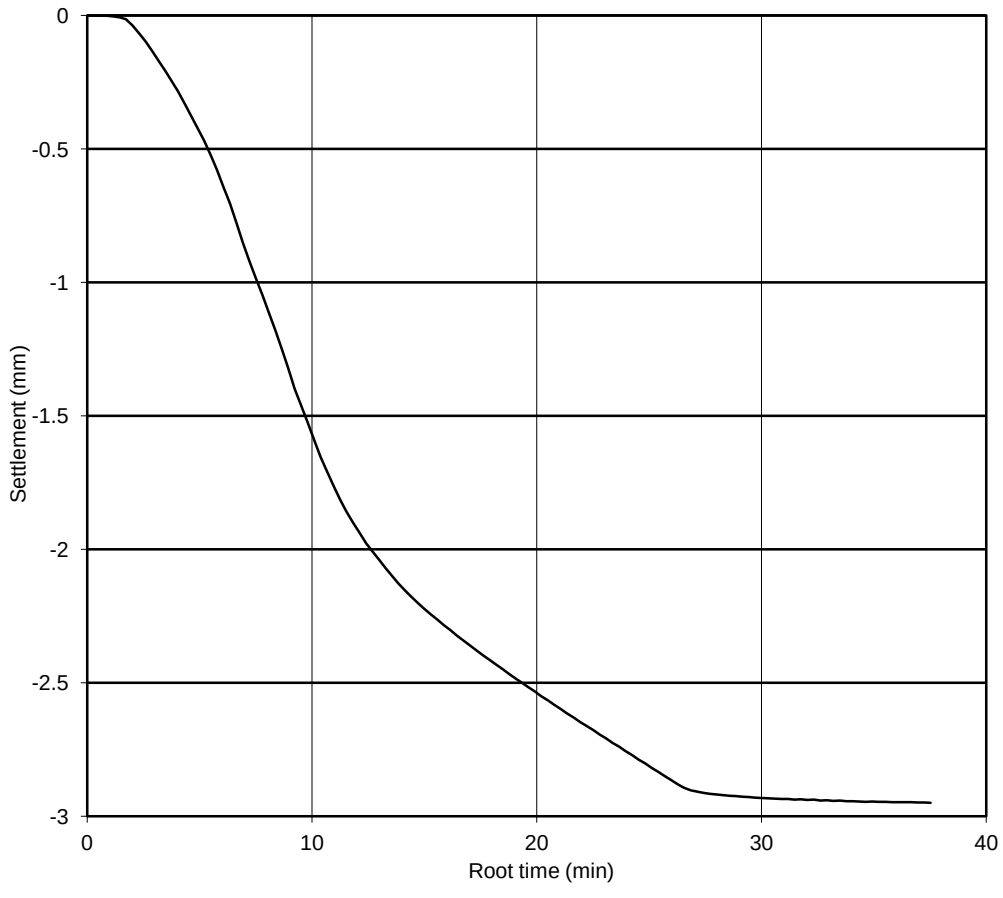


Position in sample
Top
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
DSS-CCV

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.79		
Sample Weight		g
74.78		
Moisture Content		%
23.5		
Bulk Density	P	Mg/m^3
1.921		
Dry Density	P_d	Mg/m^3
1.556		
Particle Density	P_s	Mg/m^3
2.77		
Voids Ratio	e_o	
0.781		
Degree of Saturation	S_o	
83.33		
Seating Pressure		kPa
5		

Consolidation Stage



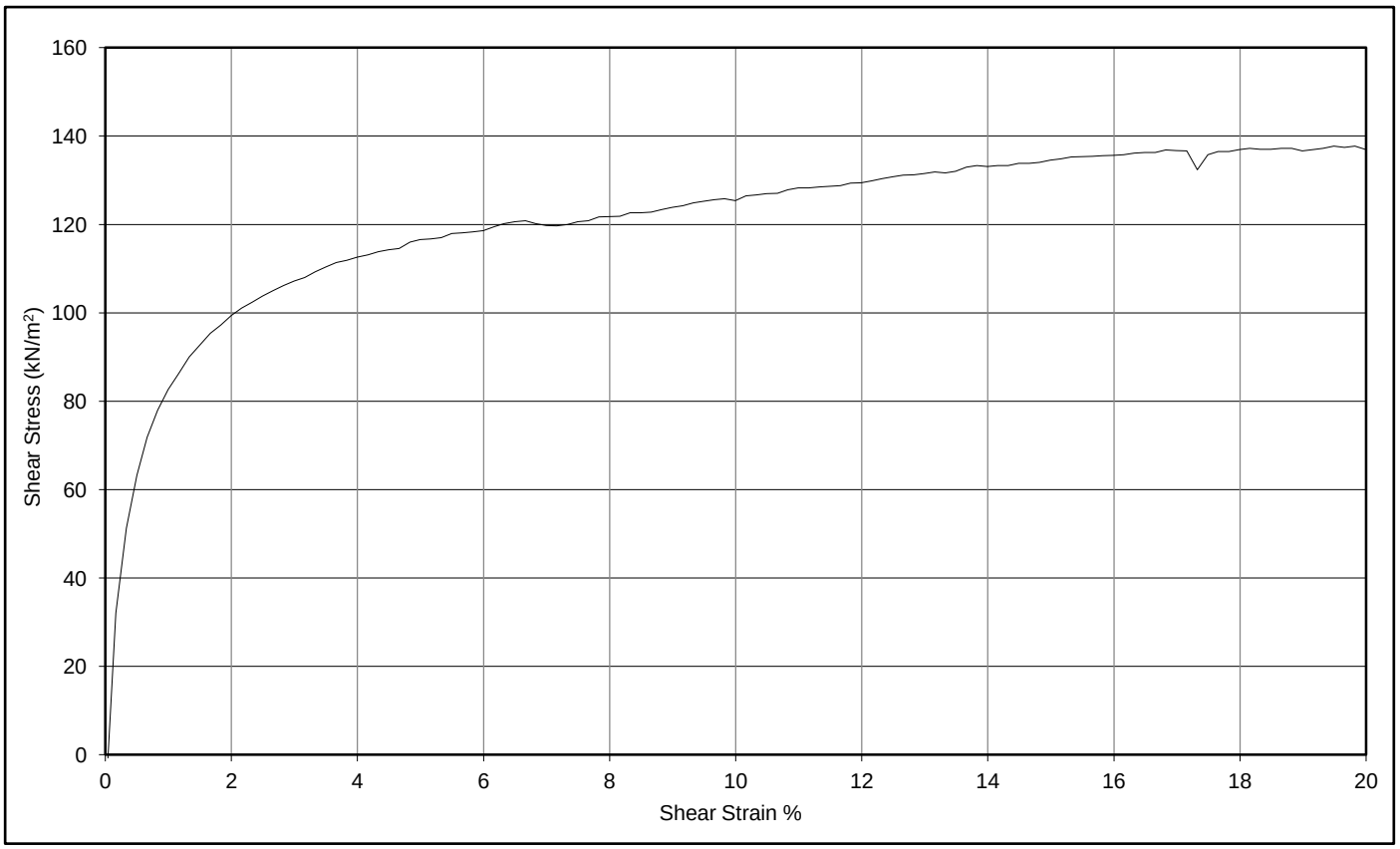
Specimen Consolidation Results

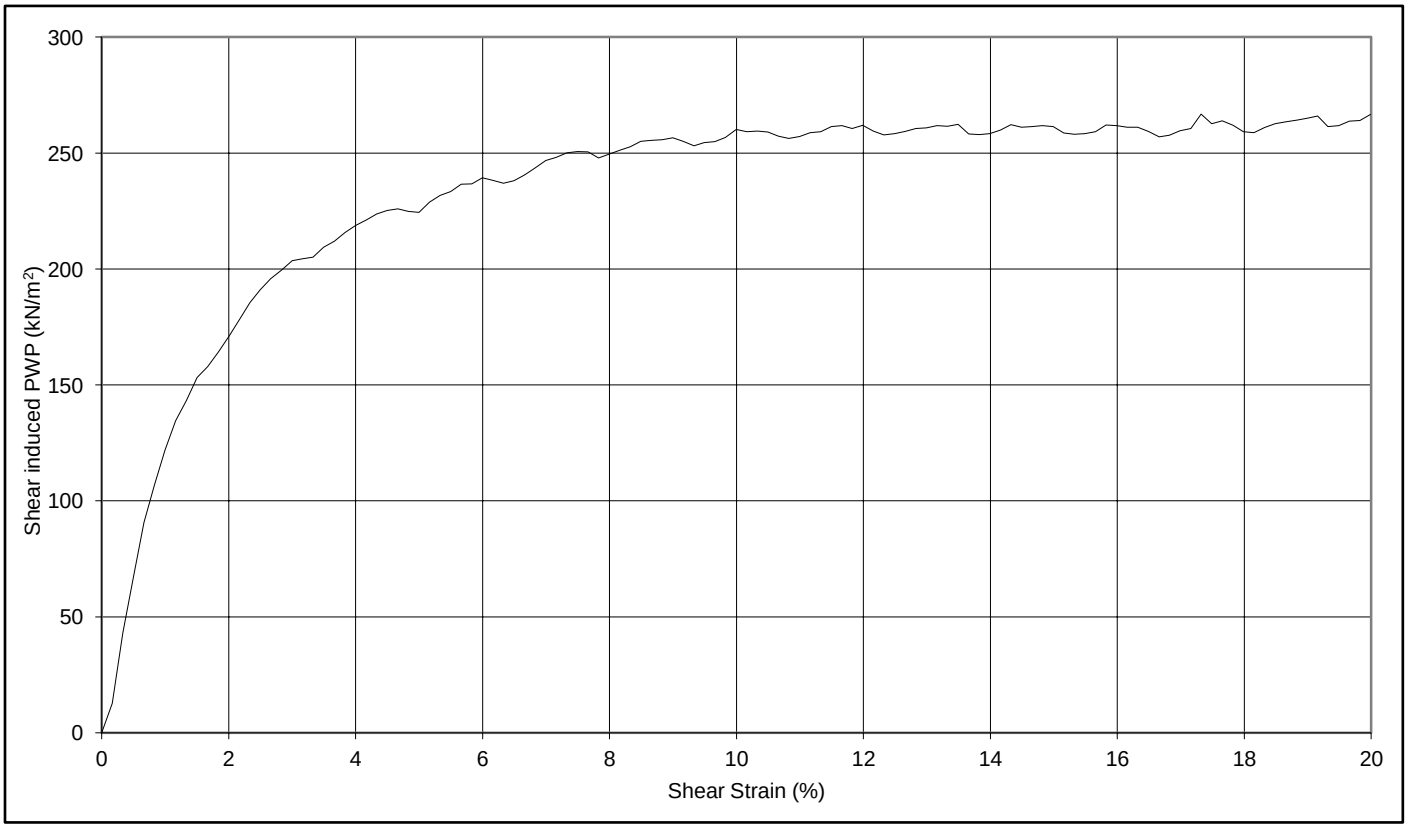
Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	482
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	14.75
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	482
Vertical strain at end of consolidation	
ε_{vc} (%)	14.75
Rate of strain for Shear Stage	
%hr	0.00

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - K16
Description	Clay with sand. Sand is fine to medium, dark grey, moist, fine to medium shell fragments and gravel	Sample No./Type	P17Q1
Tested in accordance with ASTM D6528-07		Depth (m)	48.44-48.46

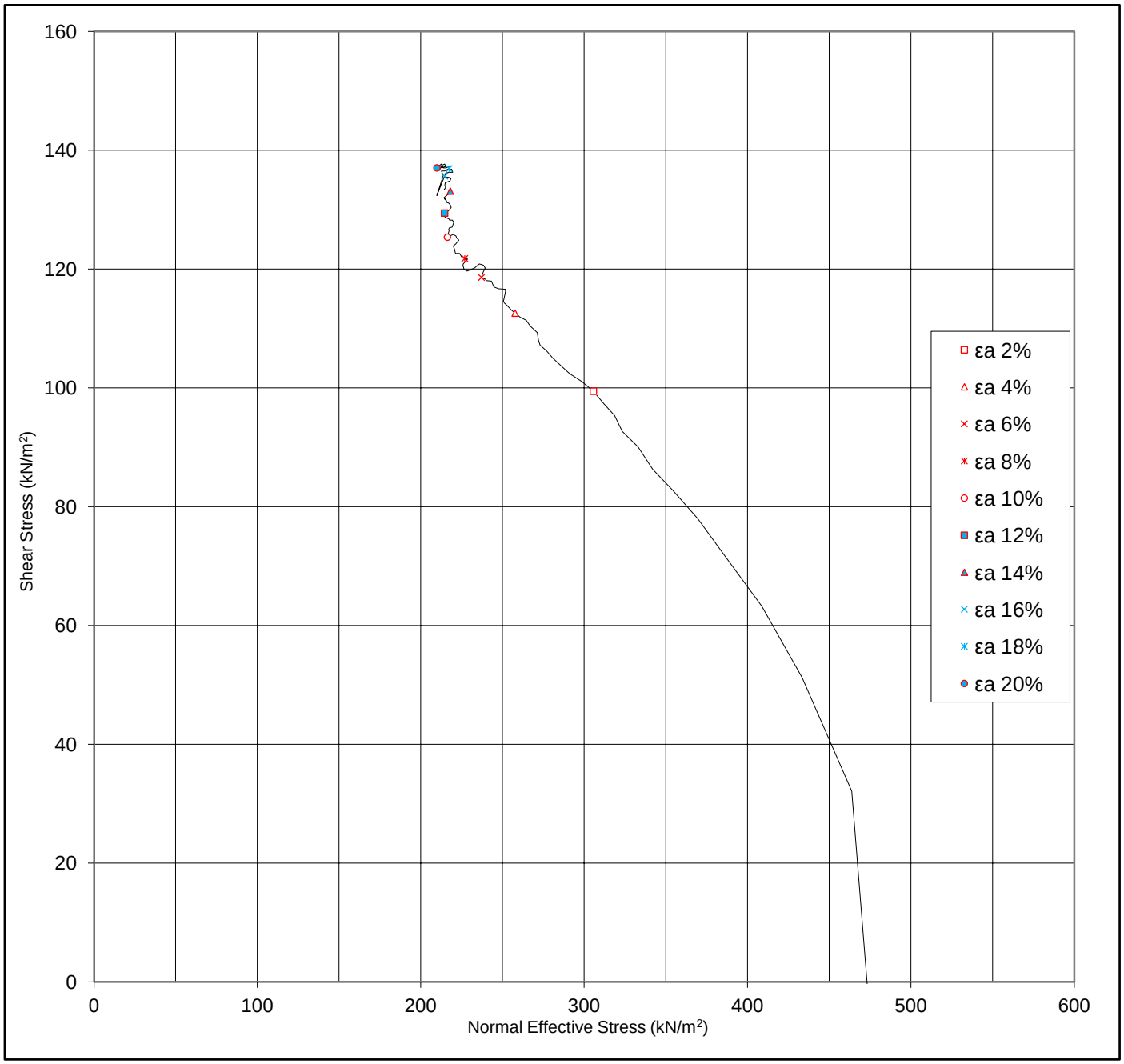
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

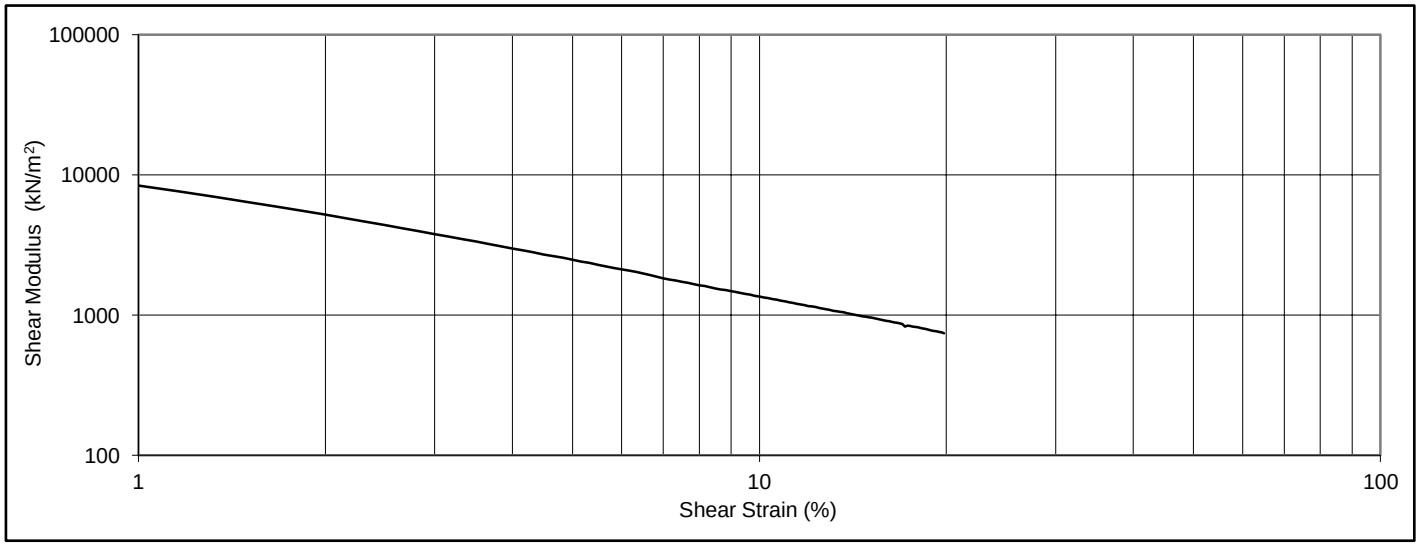
Gardline	Direct Simple Shear (DSS) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - K16
Description	Clay with sand. Sand is fine to medium, dark grey, moist, fine to medium shell fragments and gravel	Sample No./Type	P17Q1
Tested in accordance with ASTM D6528-07		Depth (m)	48.44-48.46

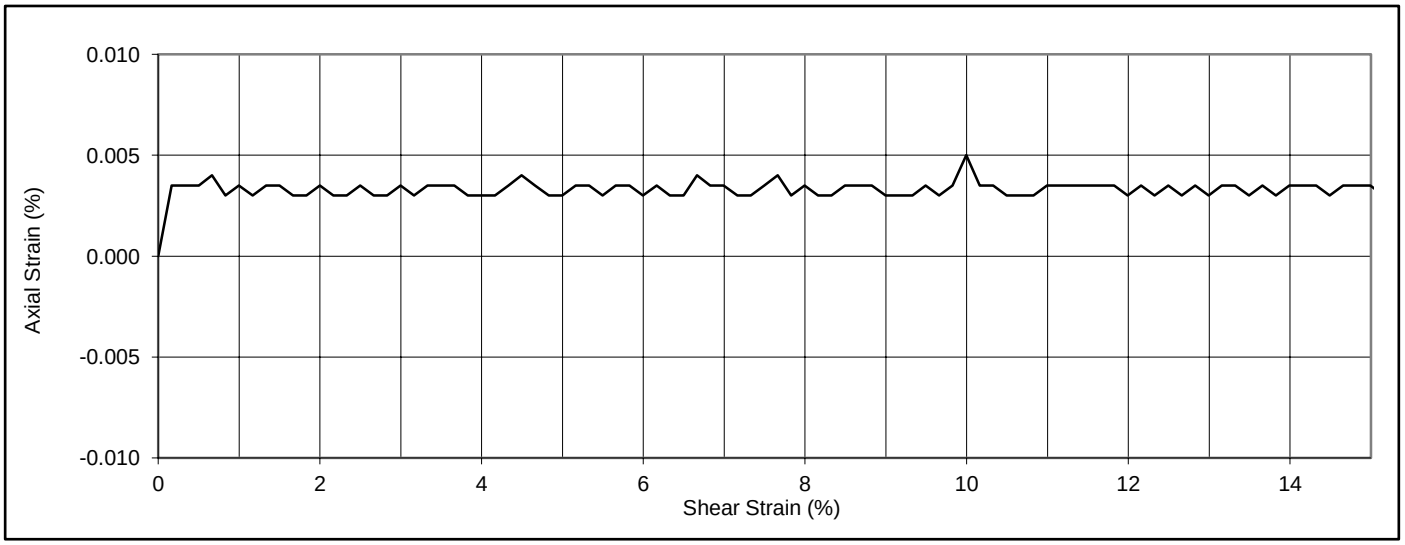


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Direct Simple Shear (DSS) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - K16
Description	Clay with sand. Sand is fine to medium, dark grey, moist, fine to medium shell fragments and gravel	Sample No./Type	P17Q1
Tested in accordance with ASTM D6528-07		Depth (m)	48.44-48.46





Final Specimen Details

Sample Height		
17.04		
Sample Diameter		
49.79		
Sample Weight		
73.18		
Moisture Content		
25.6		
Bulk Density	P	Mg/m^3
2.204		
Dry Density	P_d	Mg/m^3
1.755		
Voids Ratio	e_o	
0.578		
Degree of Saturation	S_o	
122.62		

Specimen Shear Results

Undrained shear strength	
s_u (kPa)	138
Shear Strain	
γ (%)	19.49
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.35
Pore pressure at failure	
Uf (kPa)	261.8

Picture Key

Top Picture
Side view of failure zone
Bottom Picture
Specimen cut along failure zone

Failure zone runs across fine gravel inside the specimen.	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**RS**

Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DDSScyc)

Borehole Number:	D14	Description (visual) :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	18.54	%	17.87	%	
Bulk density :	1.66	Mg/m^3			
Dry density :	1.40	Mg/m^3			
Particle density (assumed)	2.68	Mg/m^3			
Initial voids ratio (e_o)	0.9144				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.25	% (for stage)
Normal stress:	35.9	kPa
Voids ratio (e_o):	0.9096	
Max. Consolidation stress:	35.9	kPa
Max. Consolidation strain:	0.25	% (for stage)
Duration:	817	Min.

PRIOR TO DRAINED PRE-CYCLING		
Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	35.9	kPa
Voids ratio (e_o):	0.9096	
Max. Consolidation stress:	35.9	kPa
Max. Consolidation strain:	0.00	% (for stage)
Duration	0	Min.

DRAINED PRE-CYCLING STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	1.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	400	(sinusoidal wave form)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.006	-0.011	1.4	-1.4	0.1	-0.1
5	0.006	-0.011	1.4	-1.4	0.0	-0.1
10	0.006	-0.011	1.4	-1.4	0.0	-0.1
50	0.005	-0.011	1.4	-1.4	0.1	-0.1
100	0.006	-0.013	1.4	-1.4	0.1	-0.1
200	0.006	-0.013	1.4	-1.4	0.1	-0.1
300	0.005	-0.013	1.4	-1.4	0.1	-0.1
400	0.006	-0.014	1.4	-1.4	0.1	-0.2

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

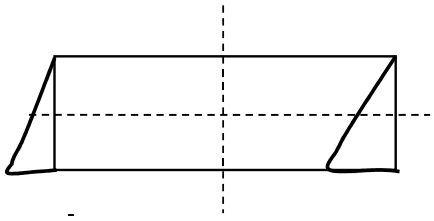
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHD14 P05B4 0360 DDSSMono.xlsx]Sheet1

Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

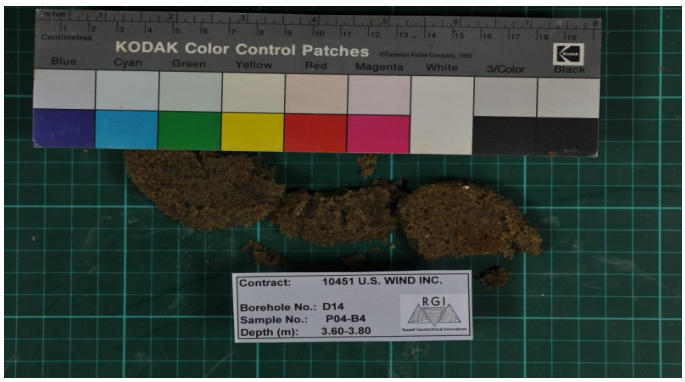
Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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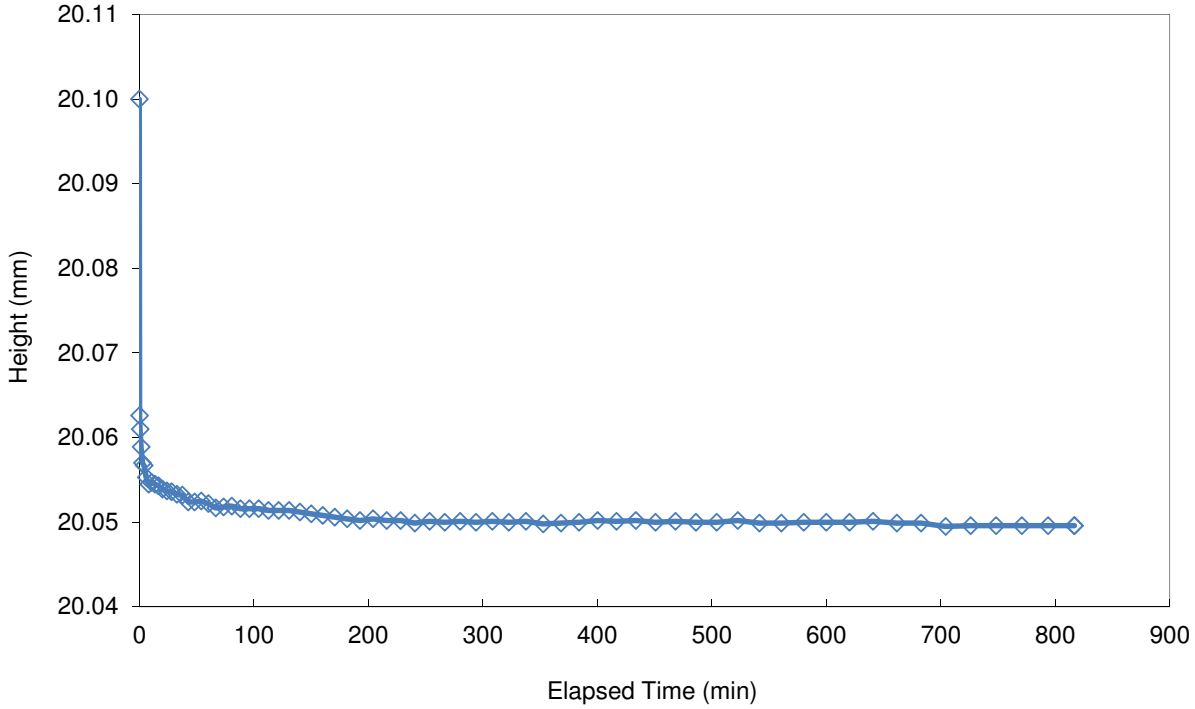
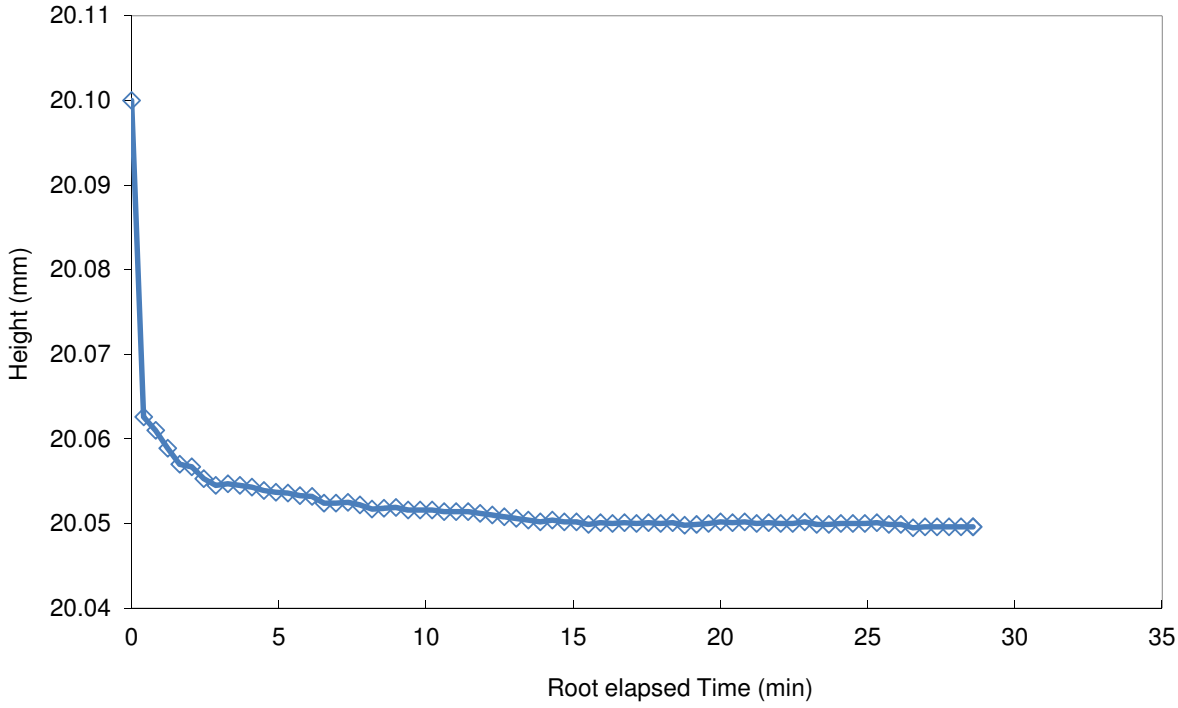
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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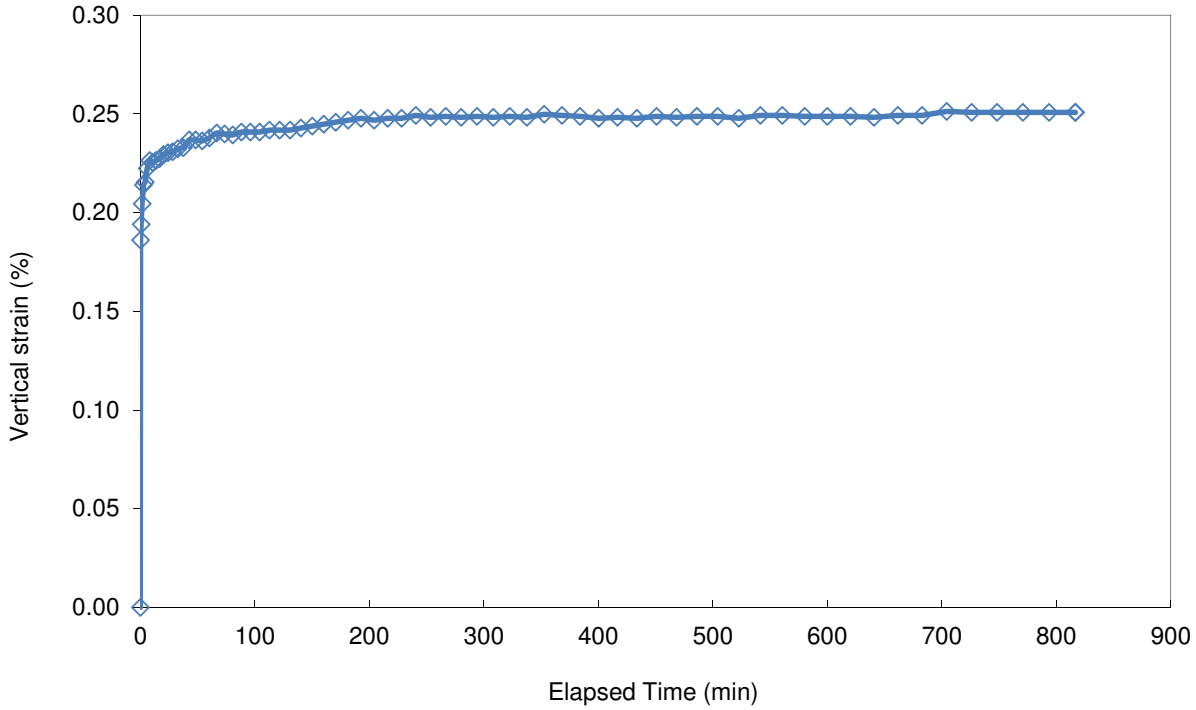

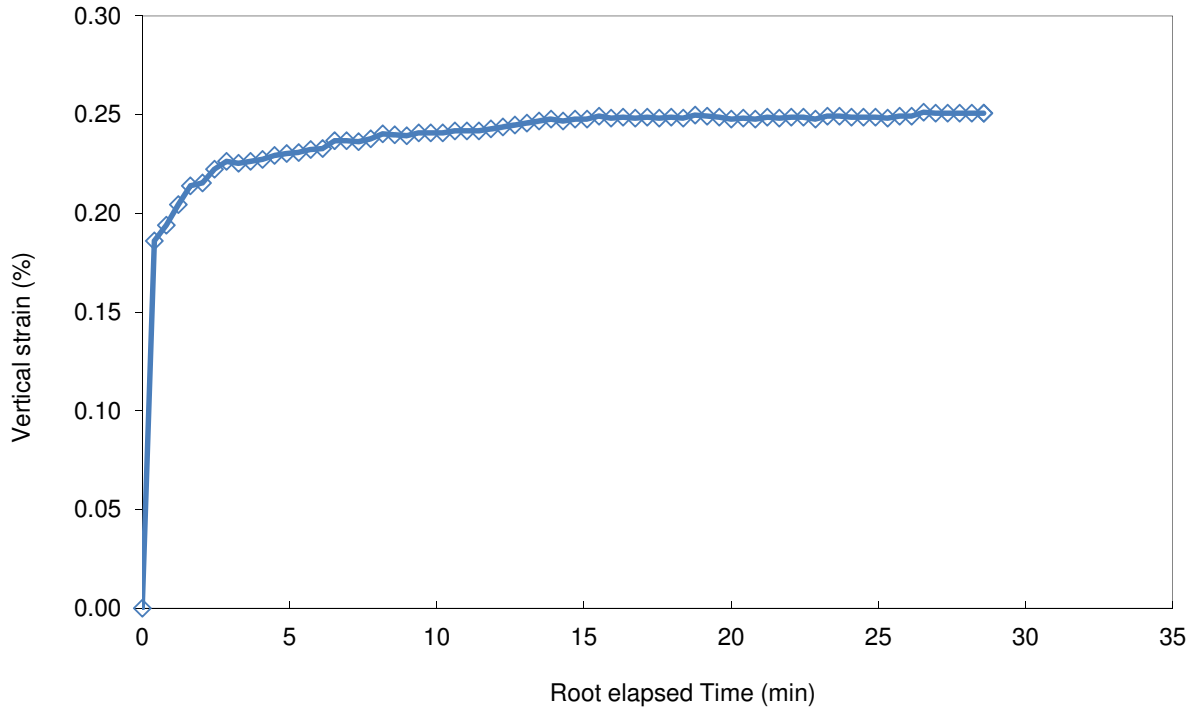

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

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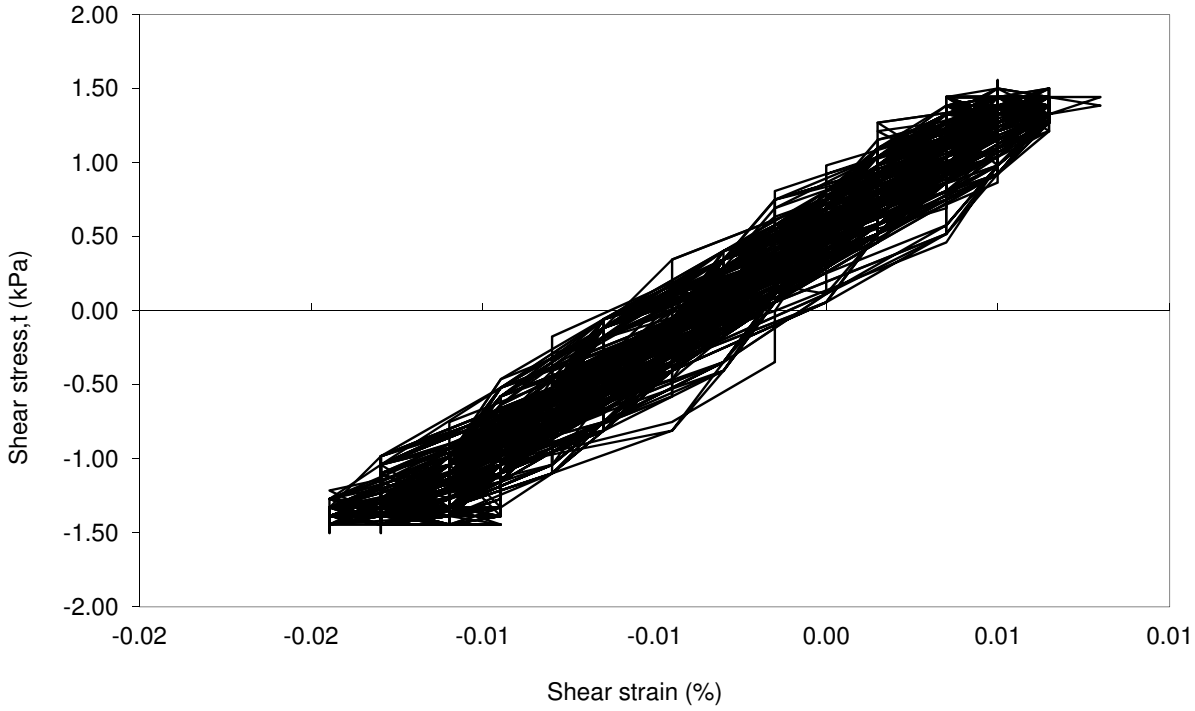
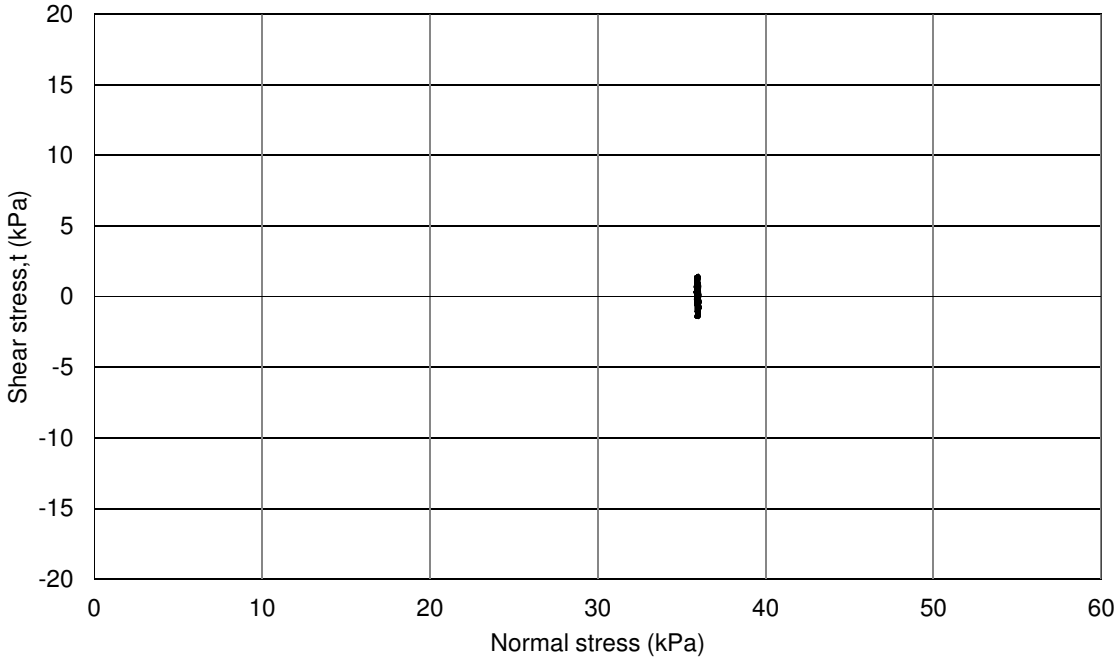
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Drained cyclic pre-shear stage

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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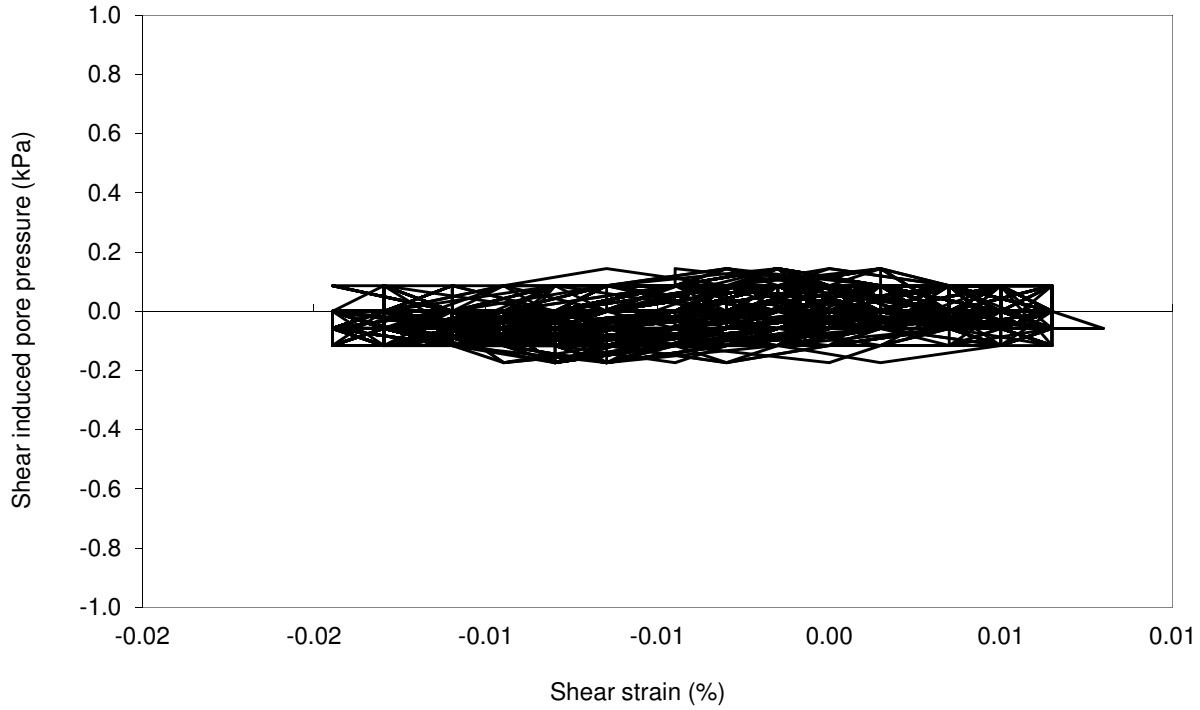
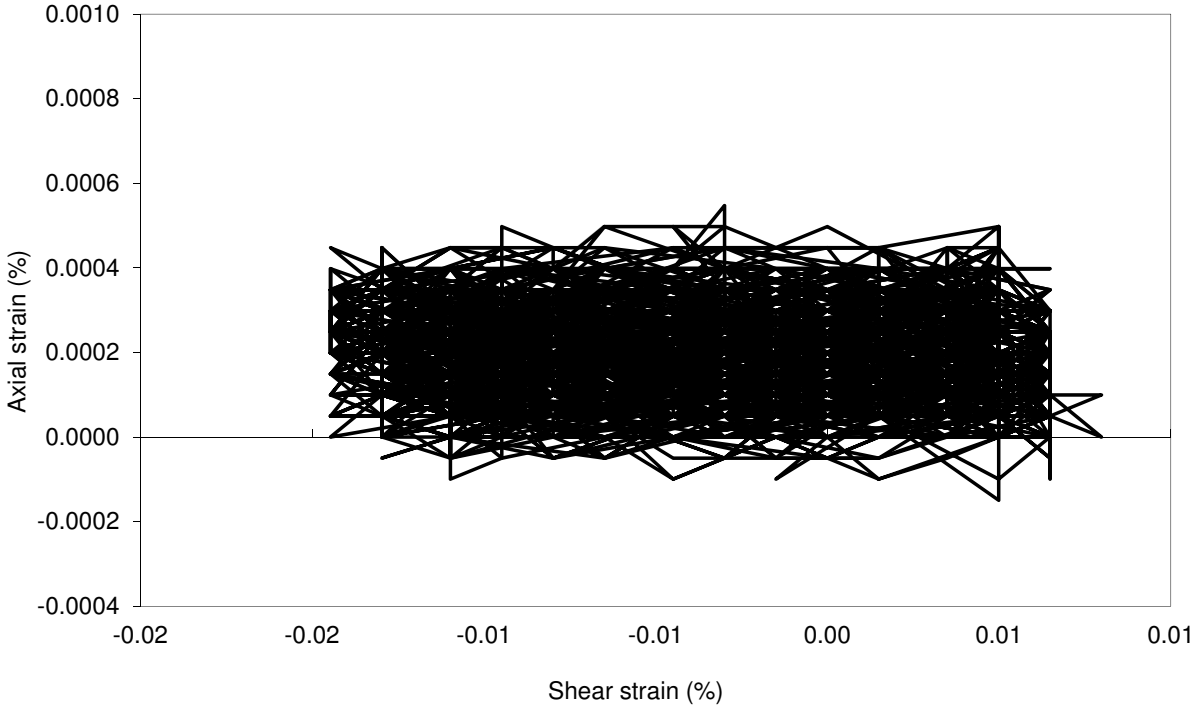
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

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Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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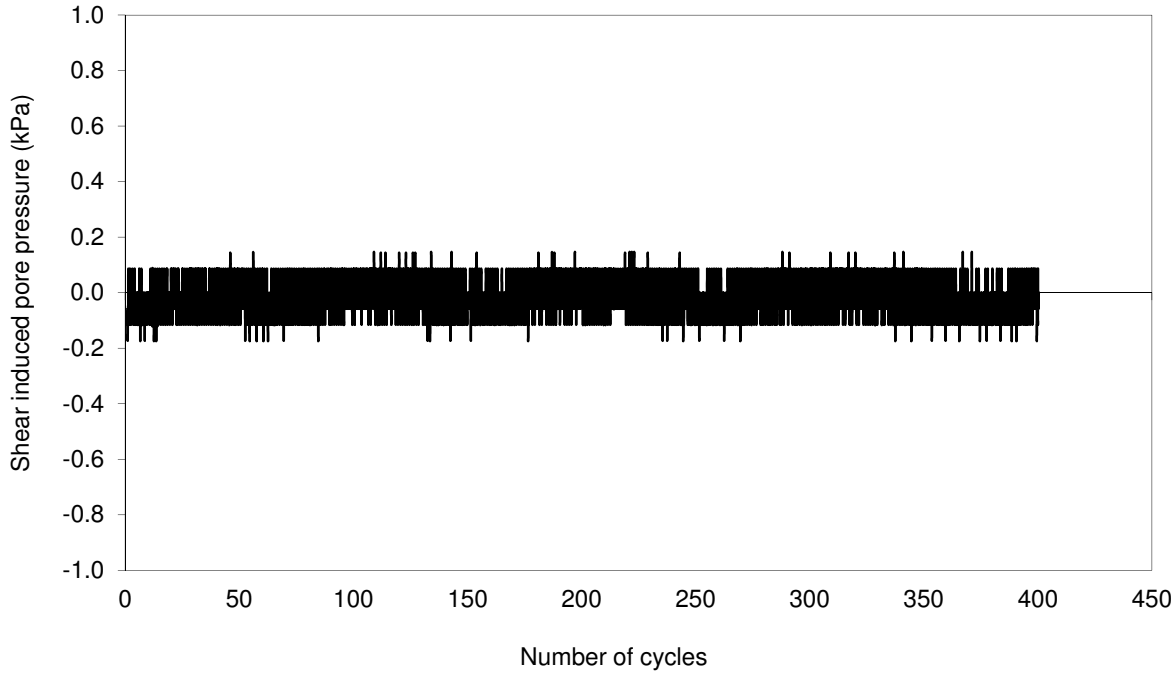

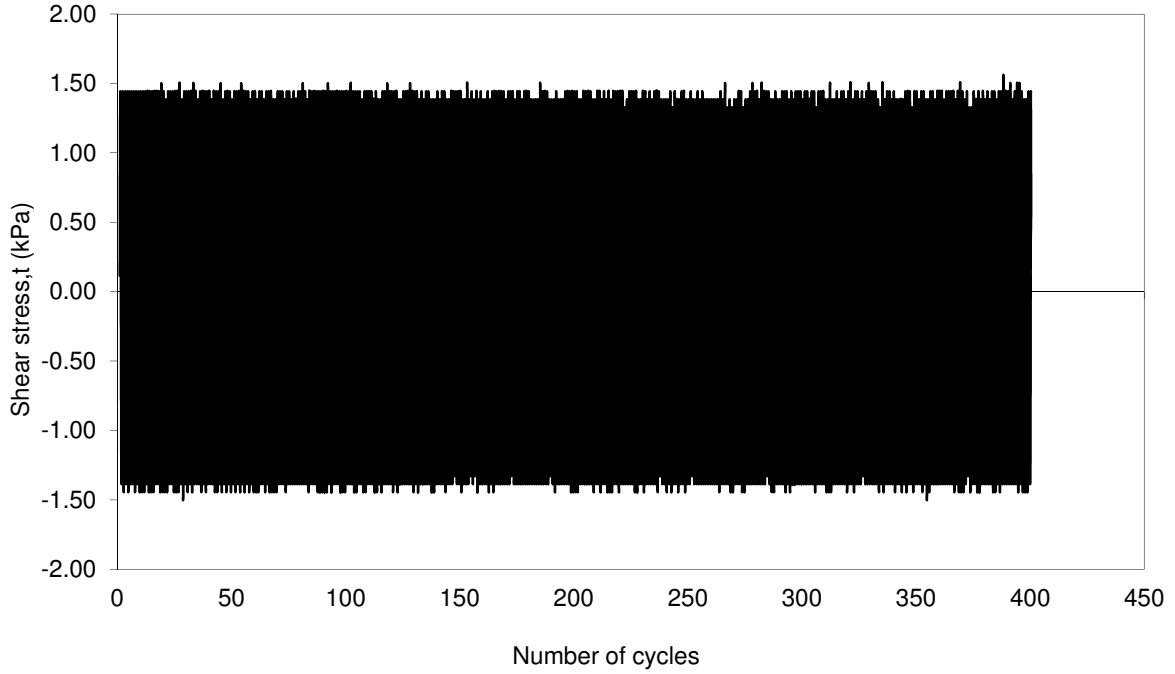

Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

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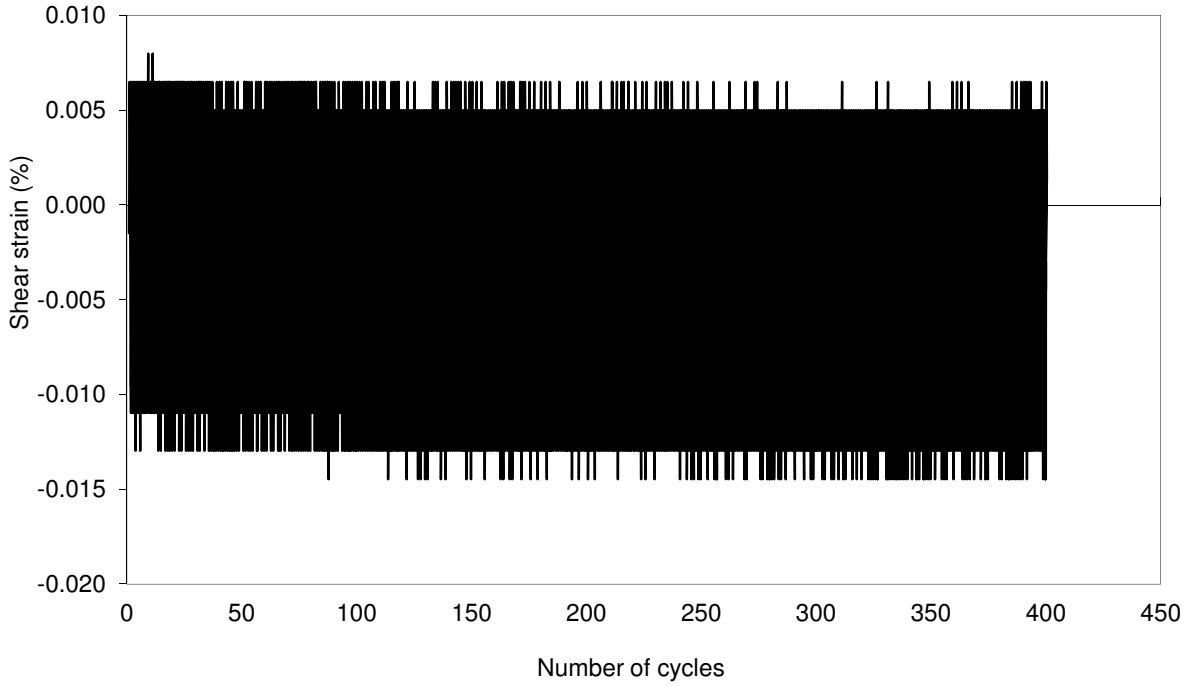
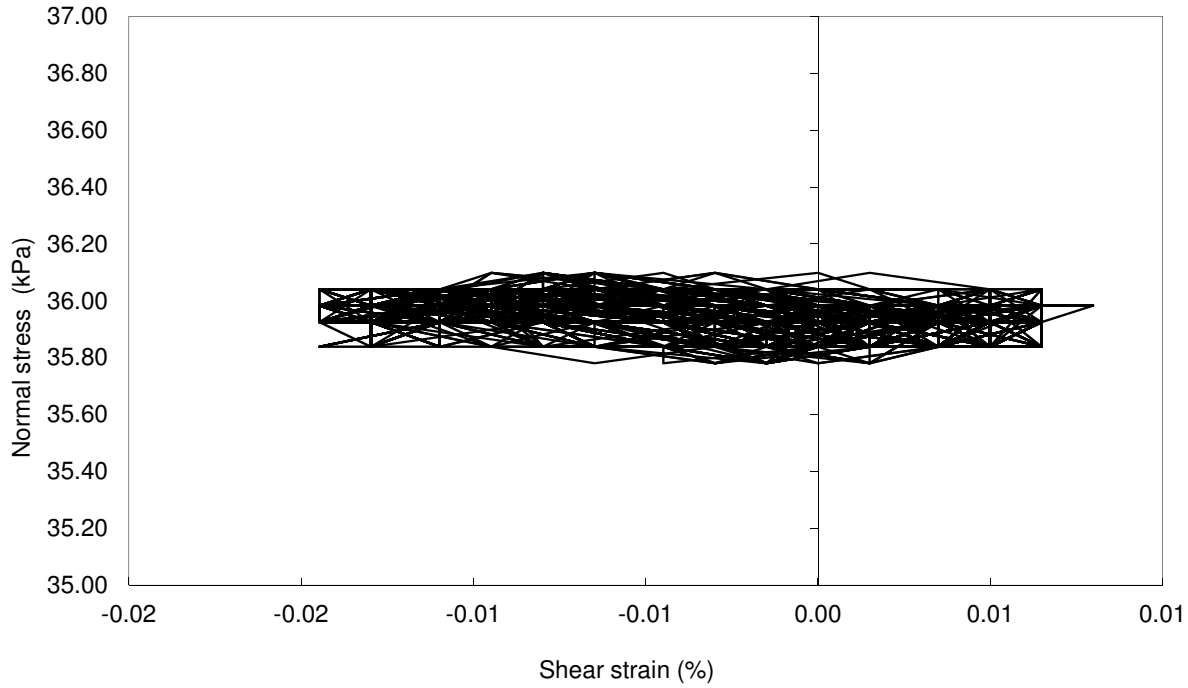
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

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Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments

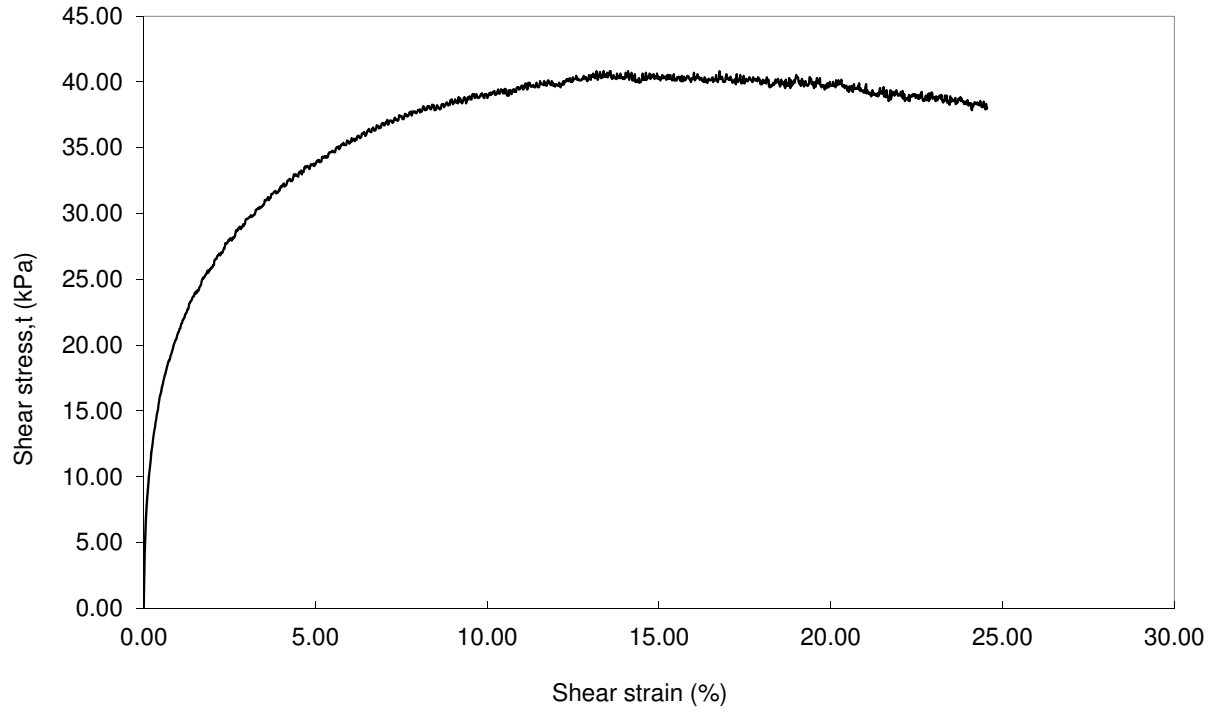
END OF CYCLIC PRE-SHEARING STAGE

Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.0004	% (for stage)
Normal stress:	35.9	kPa
Shear stress:	0.1	kPa

MONOTONIC DRAINED SHEAR STAGE

At maximum shear stress:

Shear strain	16.76	%
Shear stress	40.8	kPa
Normal stress	36.4	kPa
Pore pressure	-0.5	kPa
Axial strain	-0.16	%
Shear modulus	0.31	Mpa
Duration	245	Min.



Monotonic (drained) simple shear to failure

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

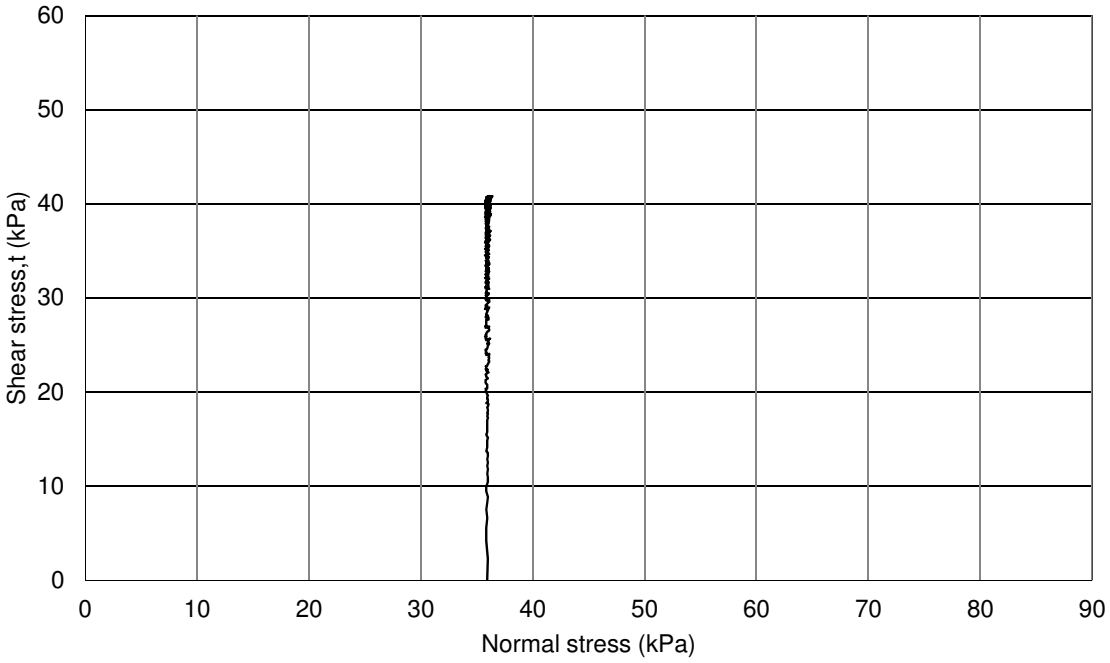
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

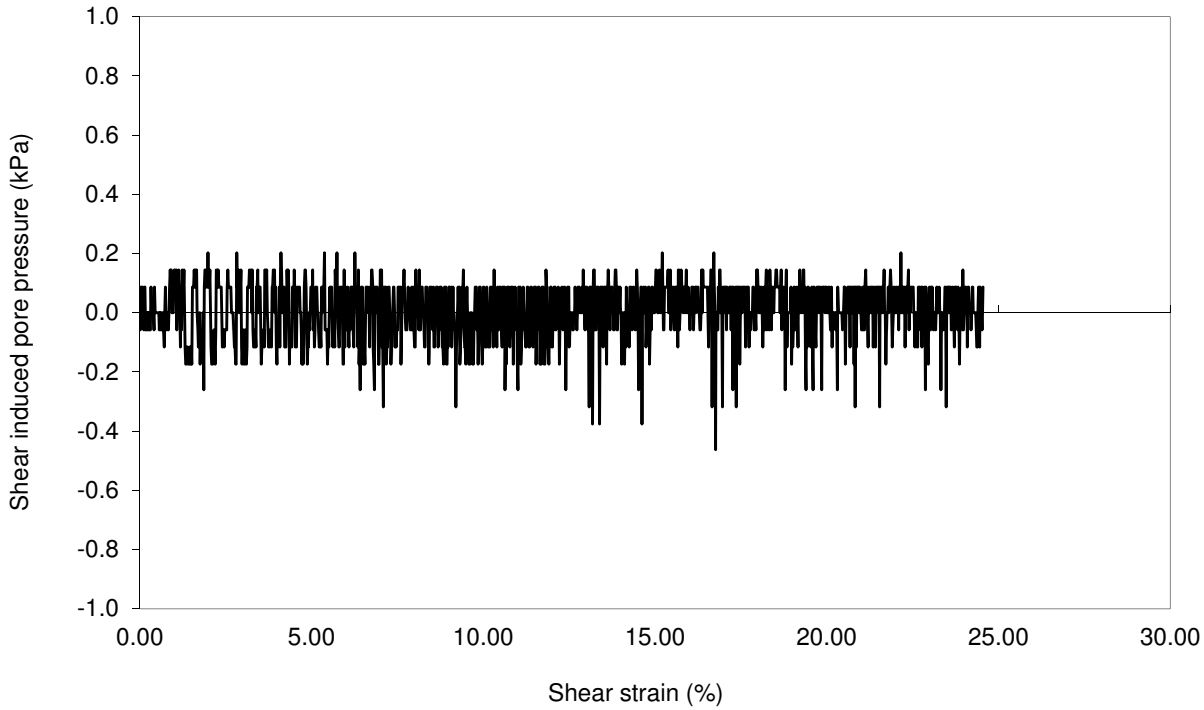
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHD14 P05B4 0360 DDSSMono.xlsx]Sheet1

Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Monotonic (drained) simple shear to failure

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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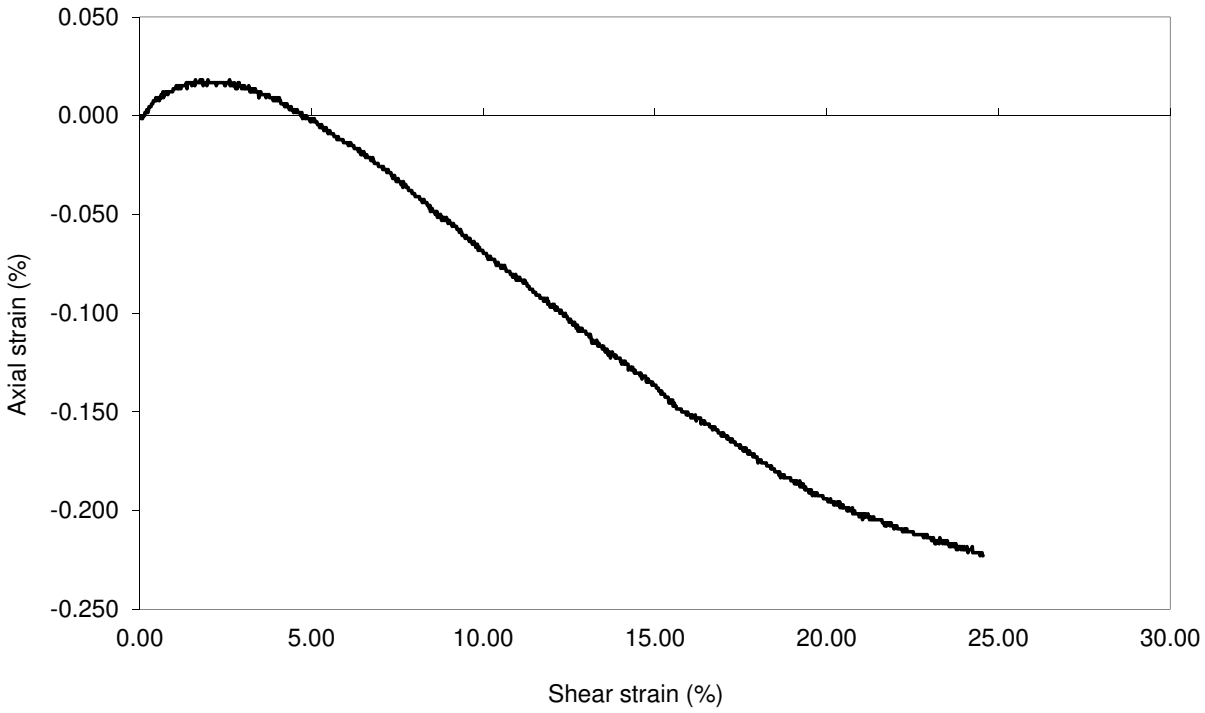
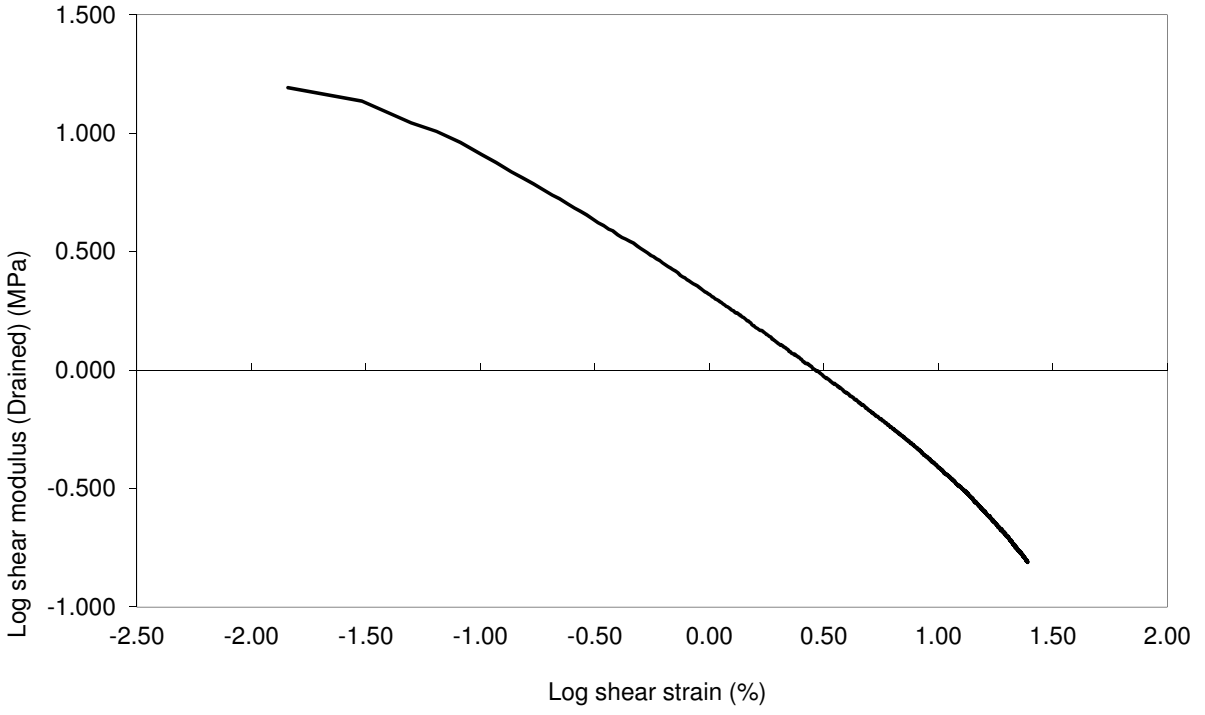
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments





Monotonic (drained) simple shear to failure

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DDSScyc)

Borehole Number:	G7	Description (visual) :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.30	%	13.69	%	
Bulk density :	2.04	Mg/m^3			
Dry density :	1.70	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.5744				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.7	mm
Diameter :	66.4	mm
Axial strain:	2.22	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5394	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	2.22	% (for stage)
Duration:	771	Min.

PRIOR TO DRAINED PRE-CYCLING		
Height :	19.7	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5394	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	0.00	% (for stage)
Duration	0	Min.

DRAINED PRE-CYCLING STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	1.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	400	(sinusoidal wave form)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.000	-0.010	0.6	-0.4	0.1	0.1
5	-0.005	-0.010	0.6	-0.5	0.3	0.1
10	0.000	-0.015	0.5	-0.5	0.3	0.2
50	-0.005	-0.015	0.7	-0.5	0.3	0.1
100	-0.005	-0.020	0.5	-0.5	0.3	0.1
200	-0.005	-0.020	0.6	-0.4	0.2	0.1
300	-0.010	-0.020	0.6	-0.4	0.2	0.1
400	-0.010	-0.025	0.6	-0.5	0.3	-0.1

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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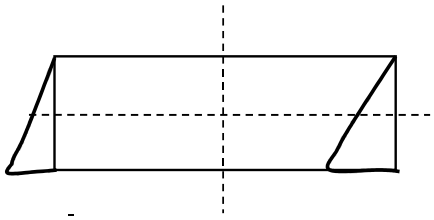
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

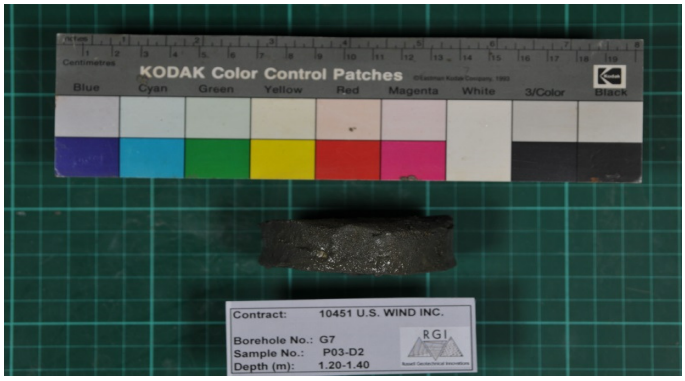
Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements

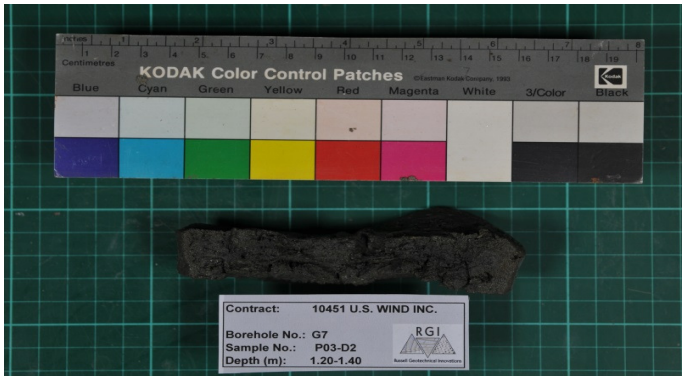
SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation





Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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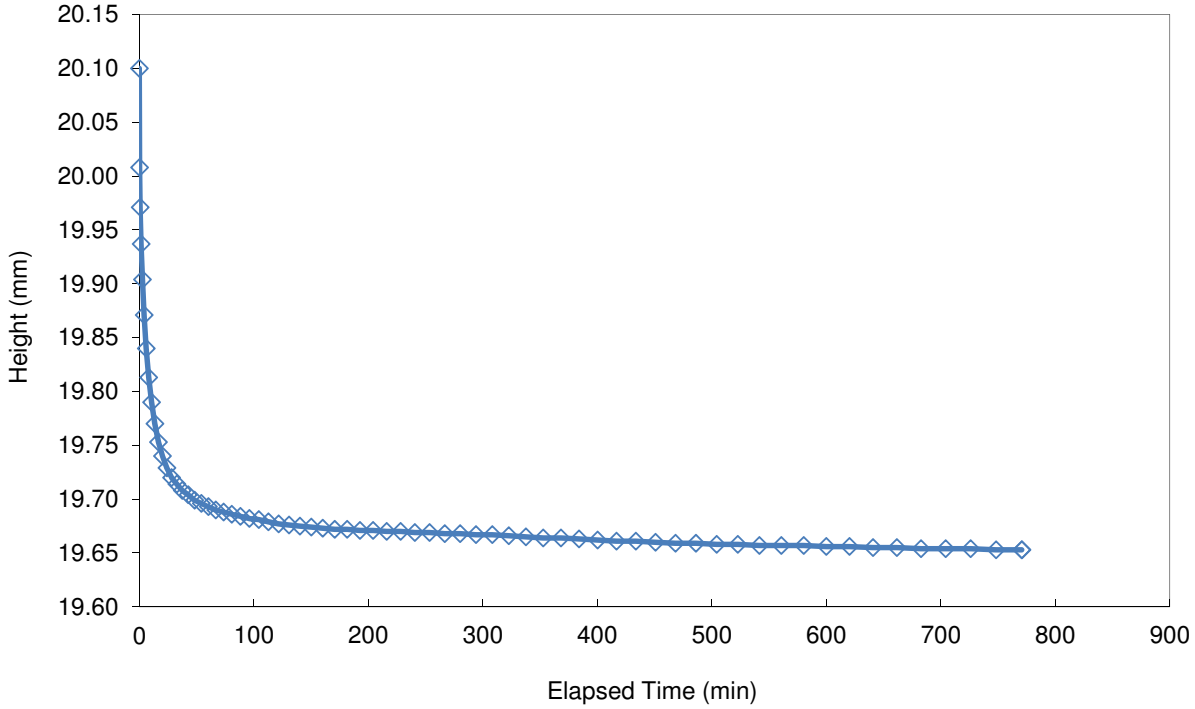
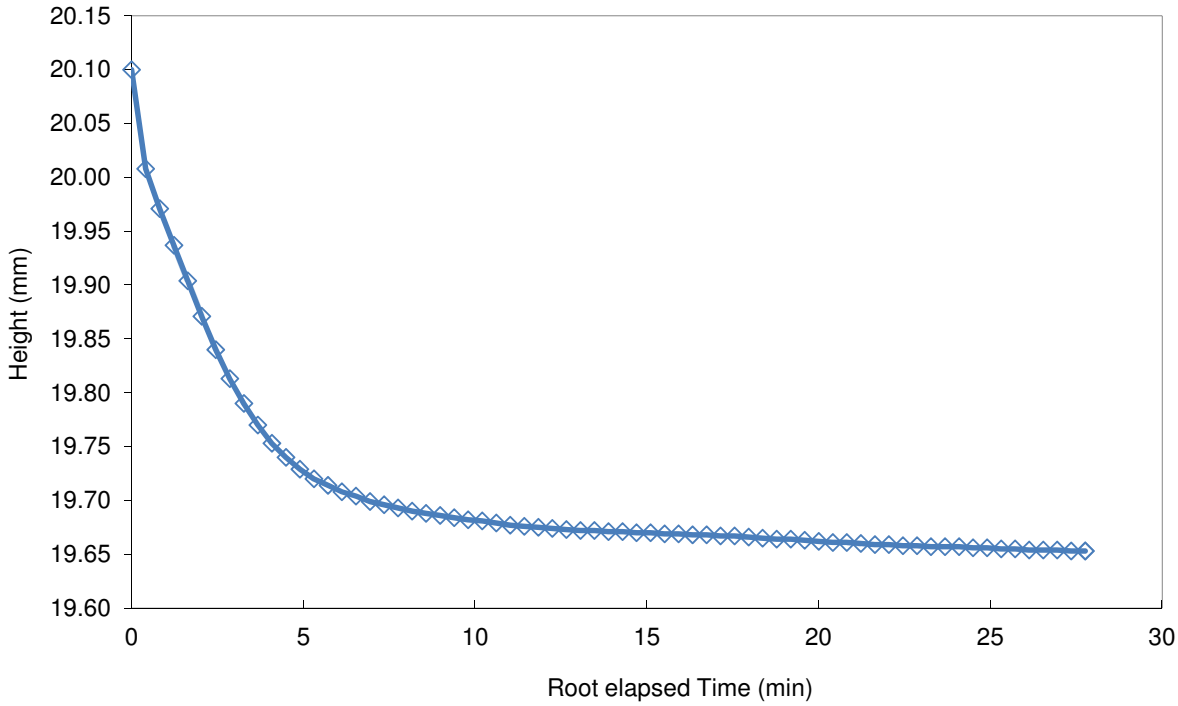
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

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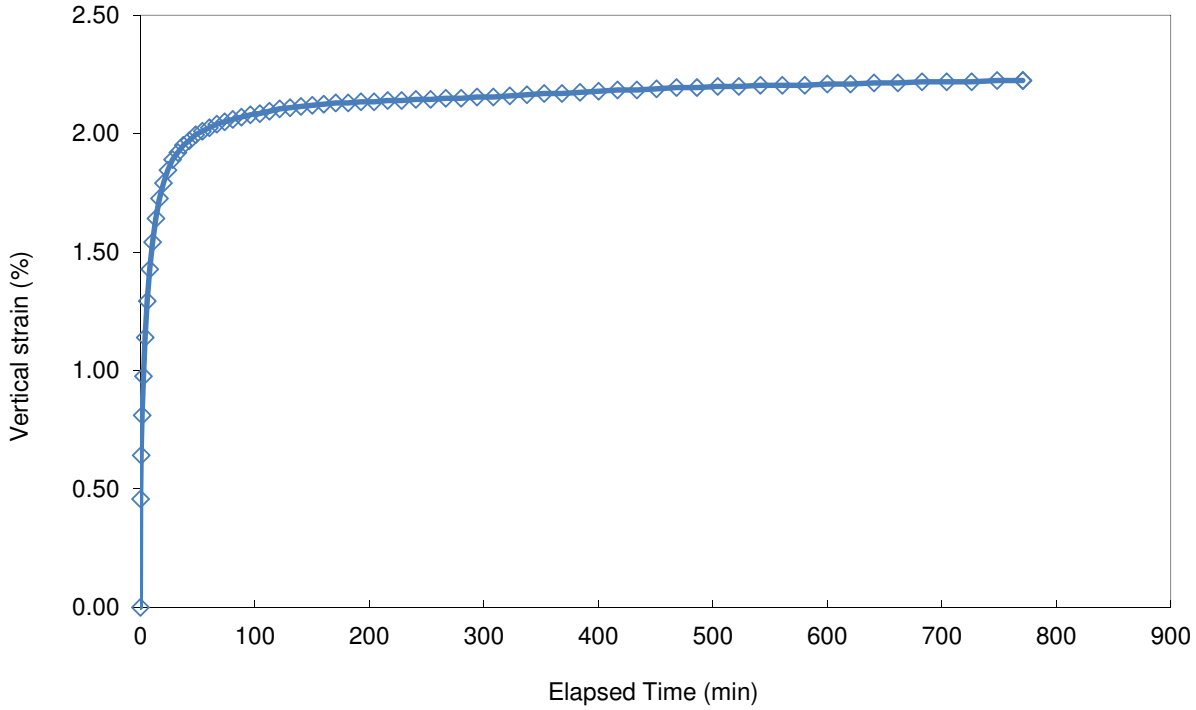
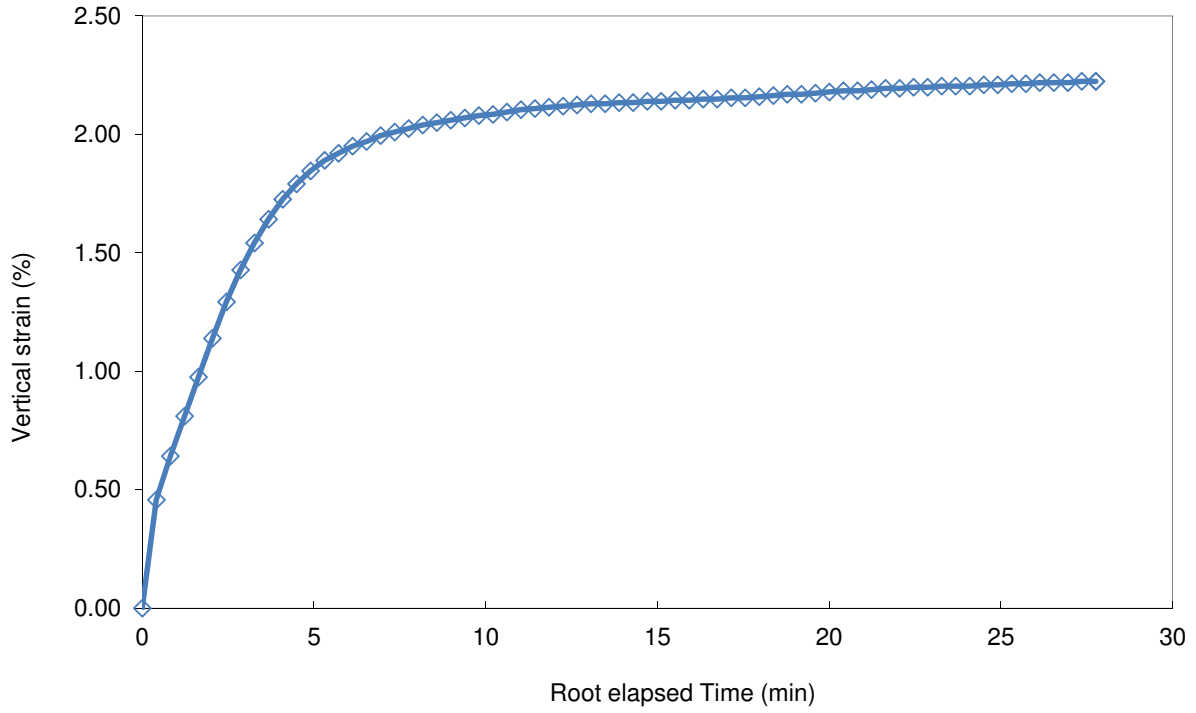
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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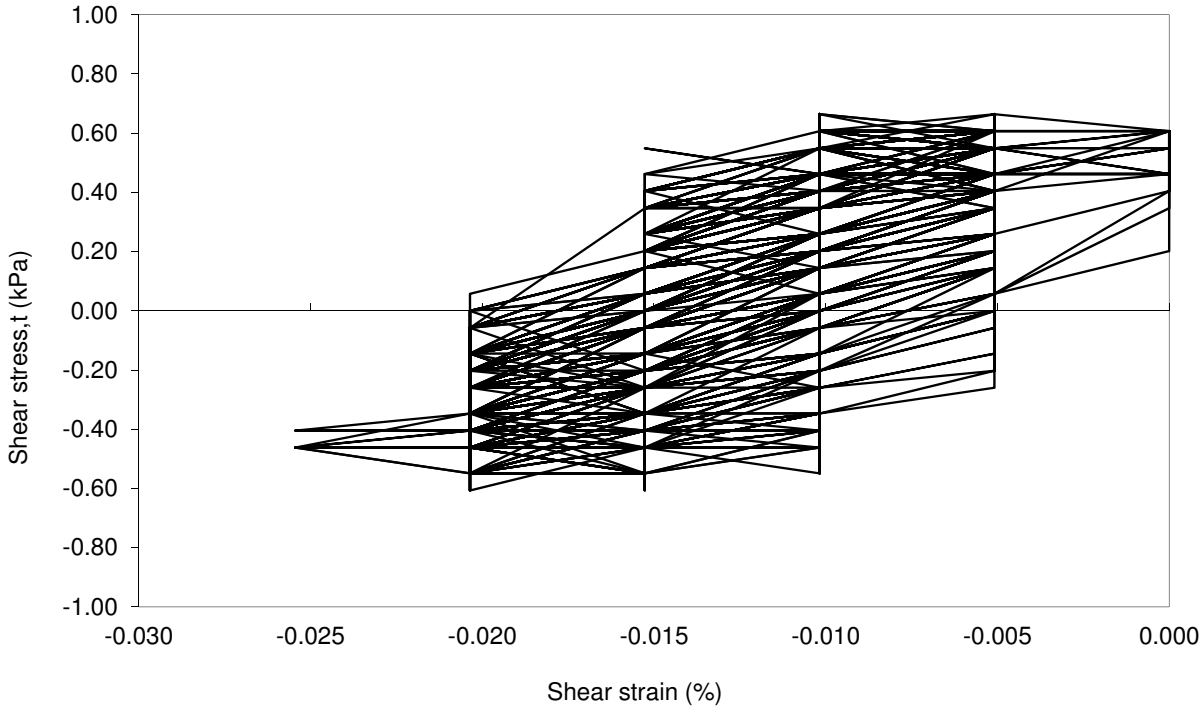
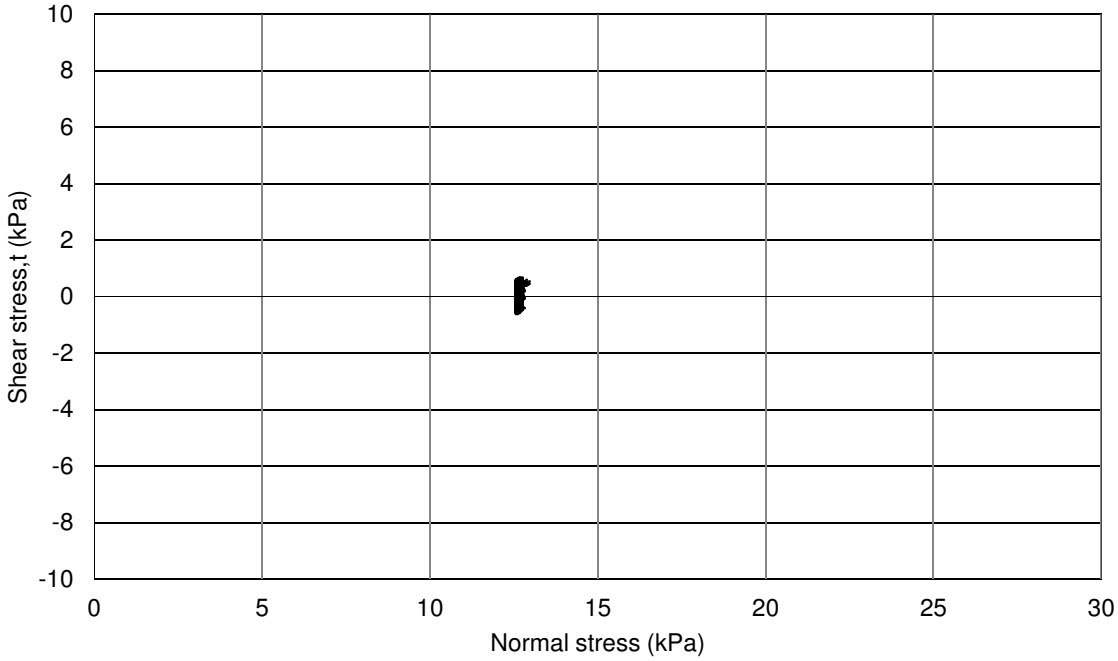
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

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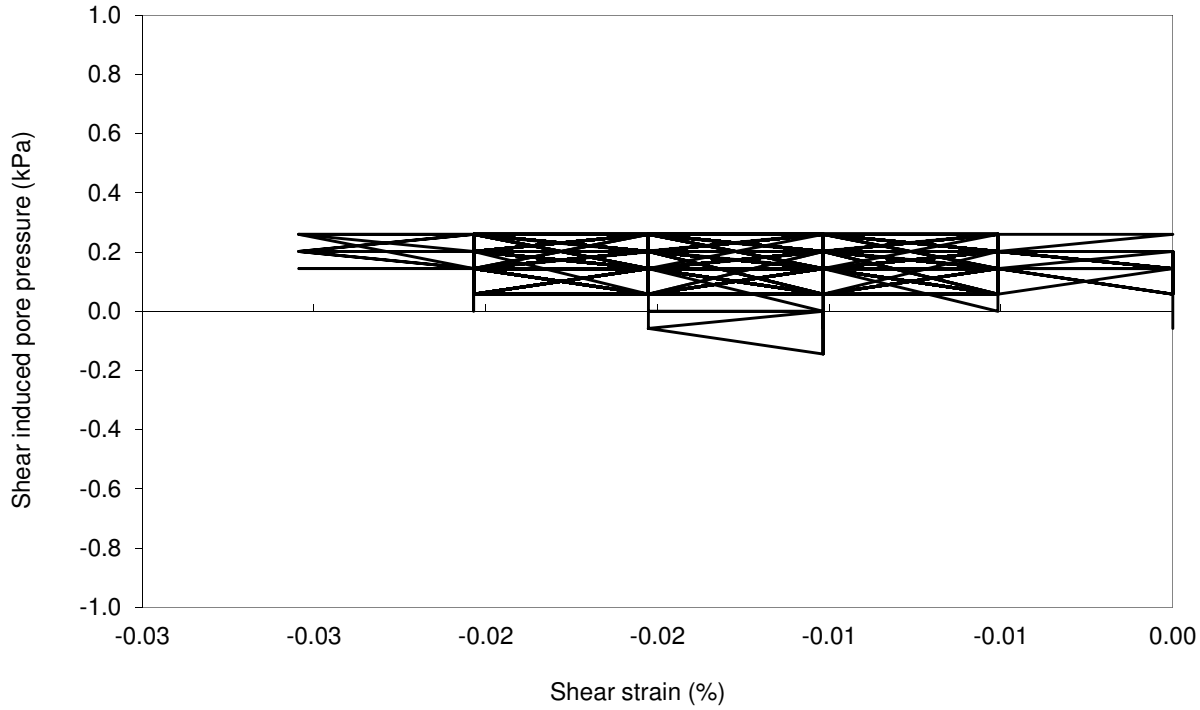
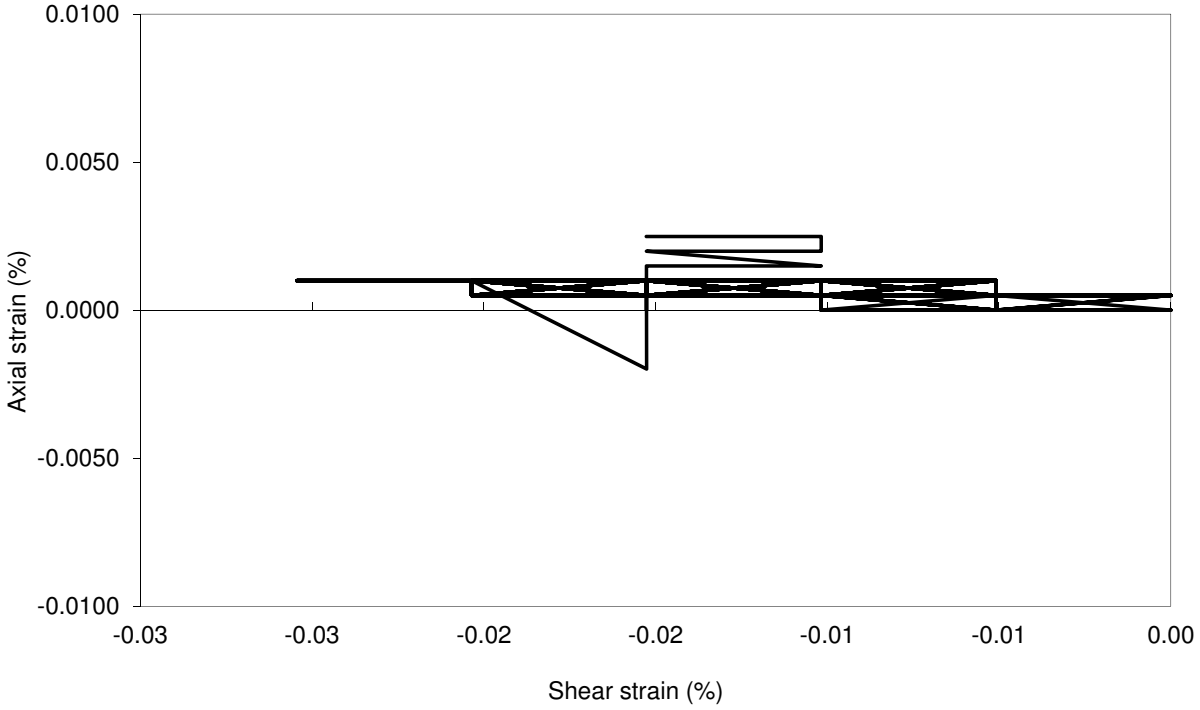
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
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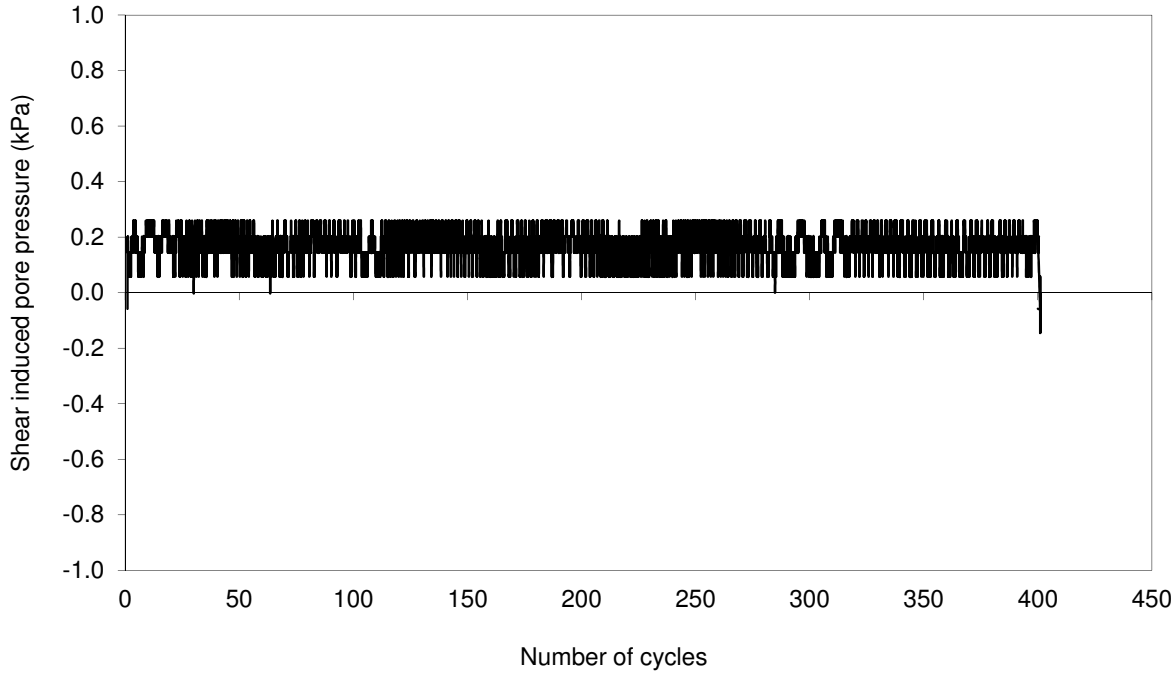
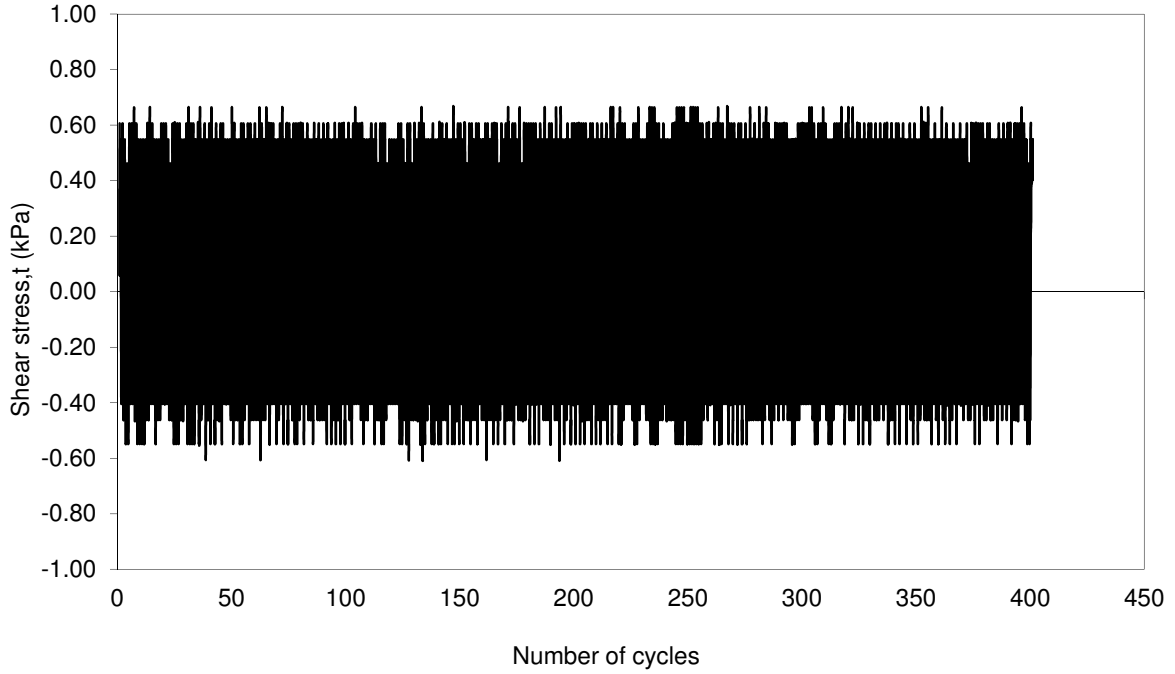
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Drained cyclic pre-shear stage

Checked and approved	Project Number:	**RGI/1130**
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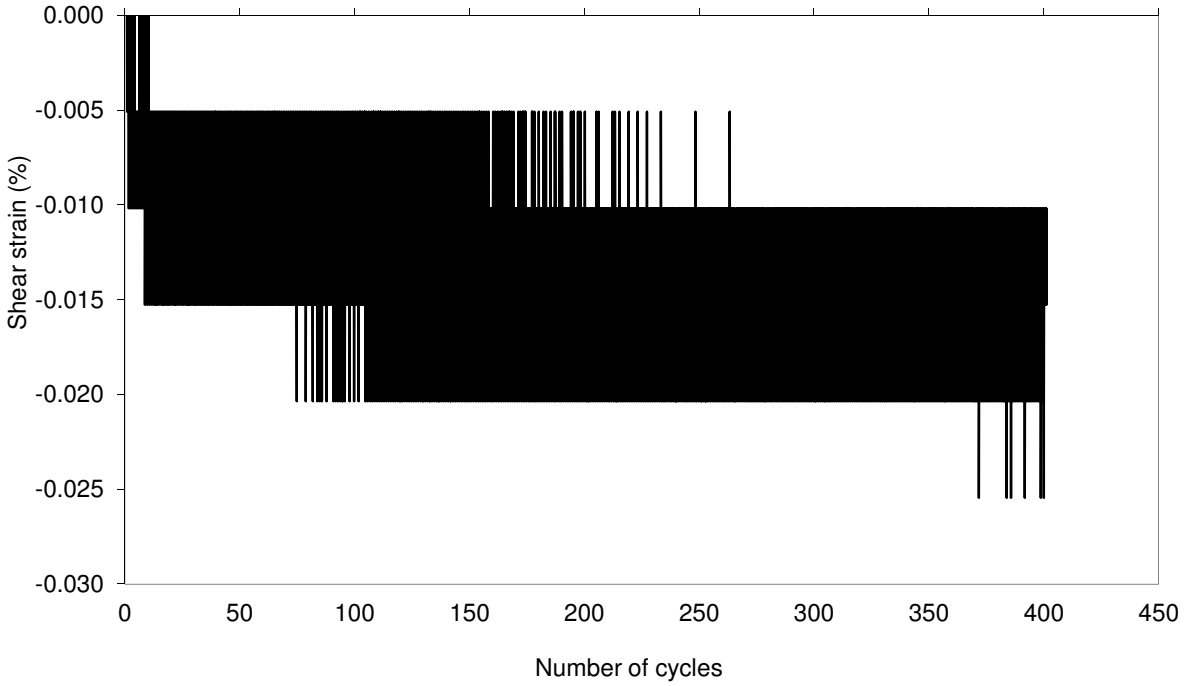
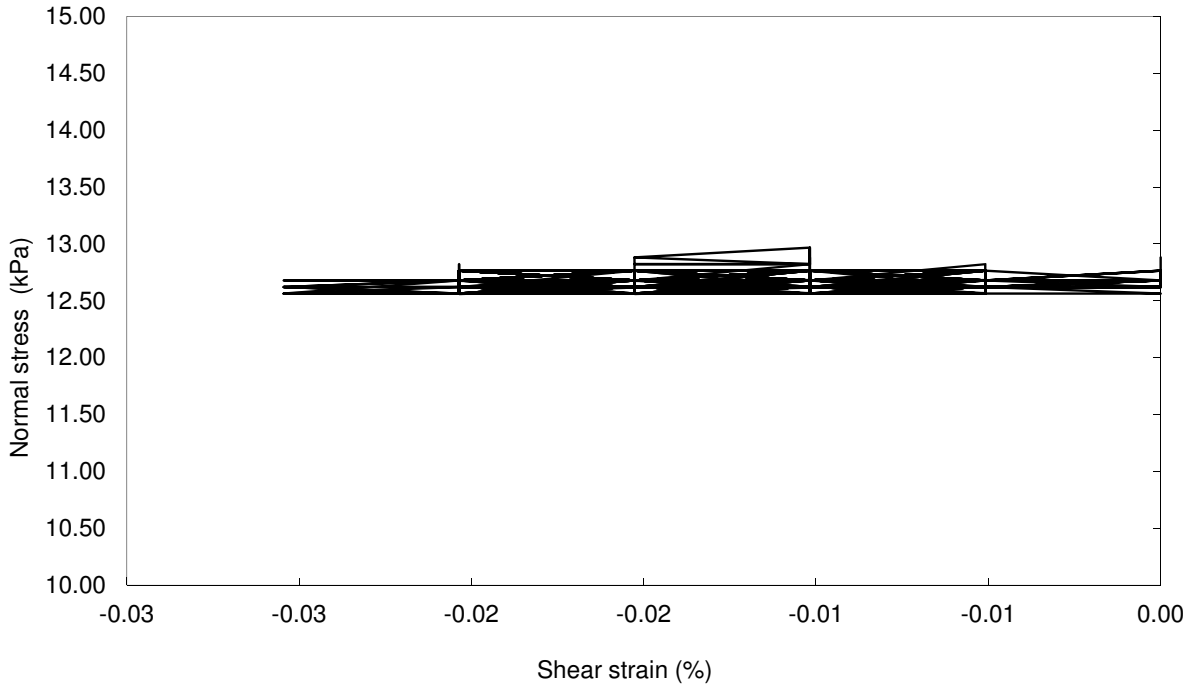
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Drained cyclic pre-shear stage

Checked and approved	Project Number: **RGI/1130**	Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

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Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements

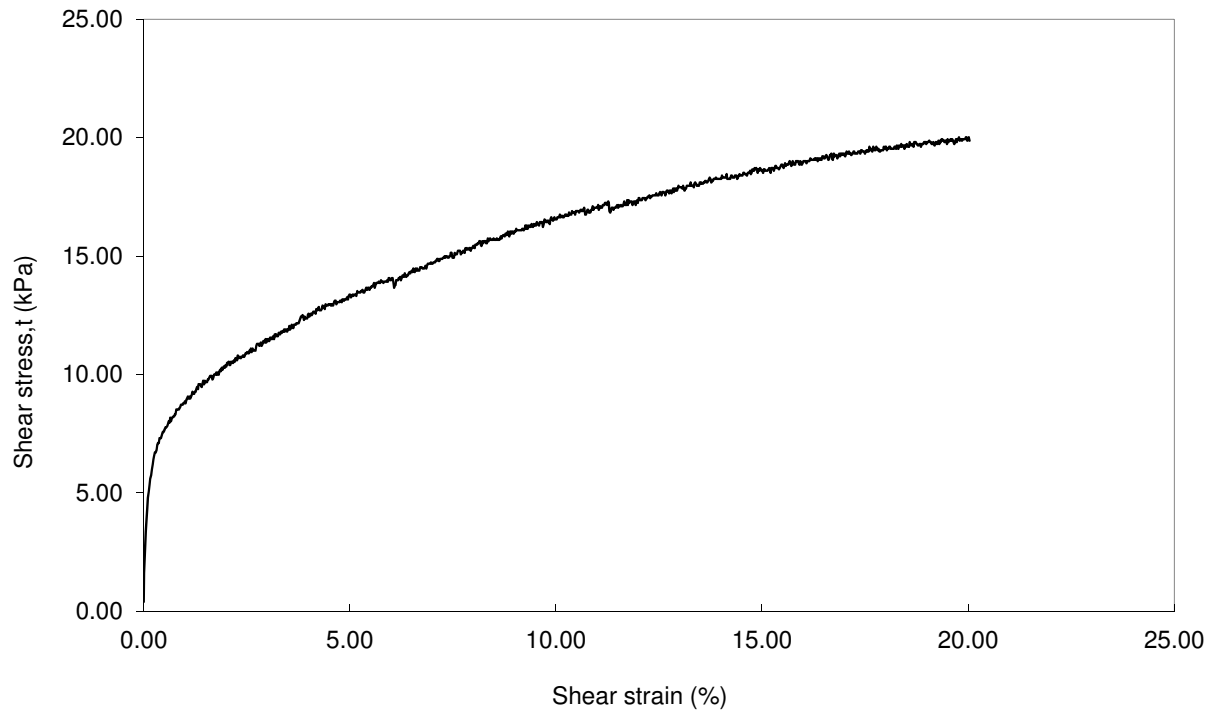
END OF CYCLIC PRE-SHEARING STAGE

Height :	19.7	mm
Diameter :	66.4	mm
Axial strain:	0.0010	% (for stage)
Normal stress:	12.8	kPa
Shear stress:	0.4	kPa

MONOTONIC DRAINED SHEAR STAGE

At maximum shear stress:

Shear strain	20.02	%
Shear stress	20.0	kPa
Normal stress	12.9	kPa
Pore pressure	-0.1	kPa
Axial strain	0.00	%
Shear modulus	0.10	Mpa
Duration	180	Min.



Monotonic (drained) simple shear to failure

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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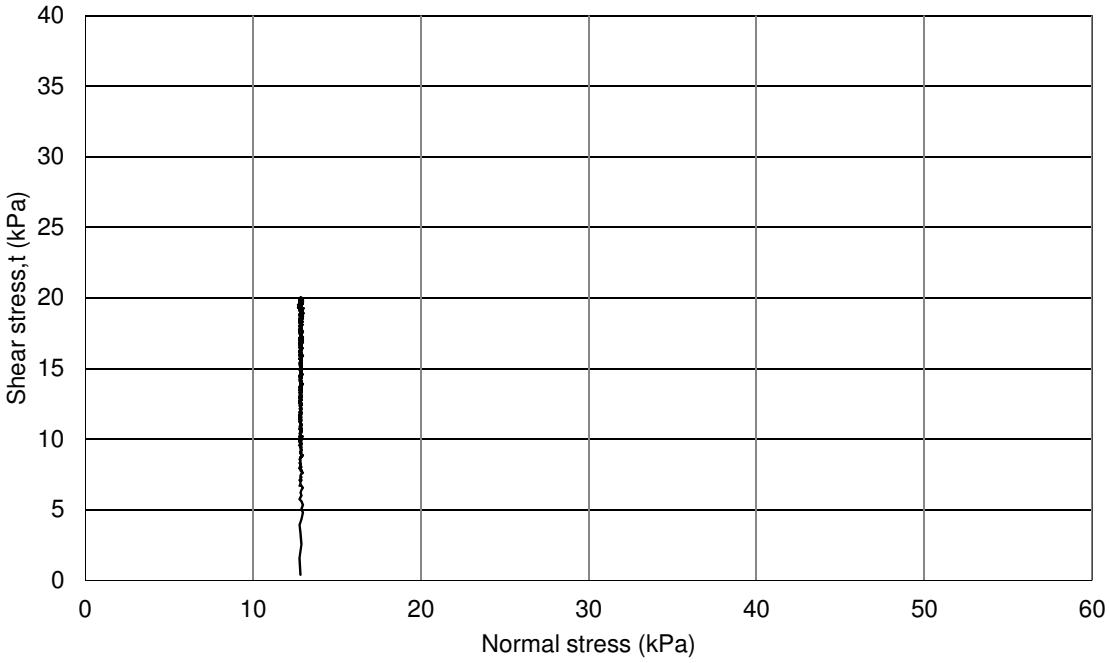
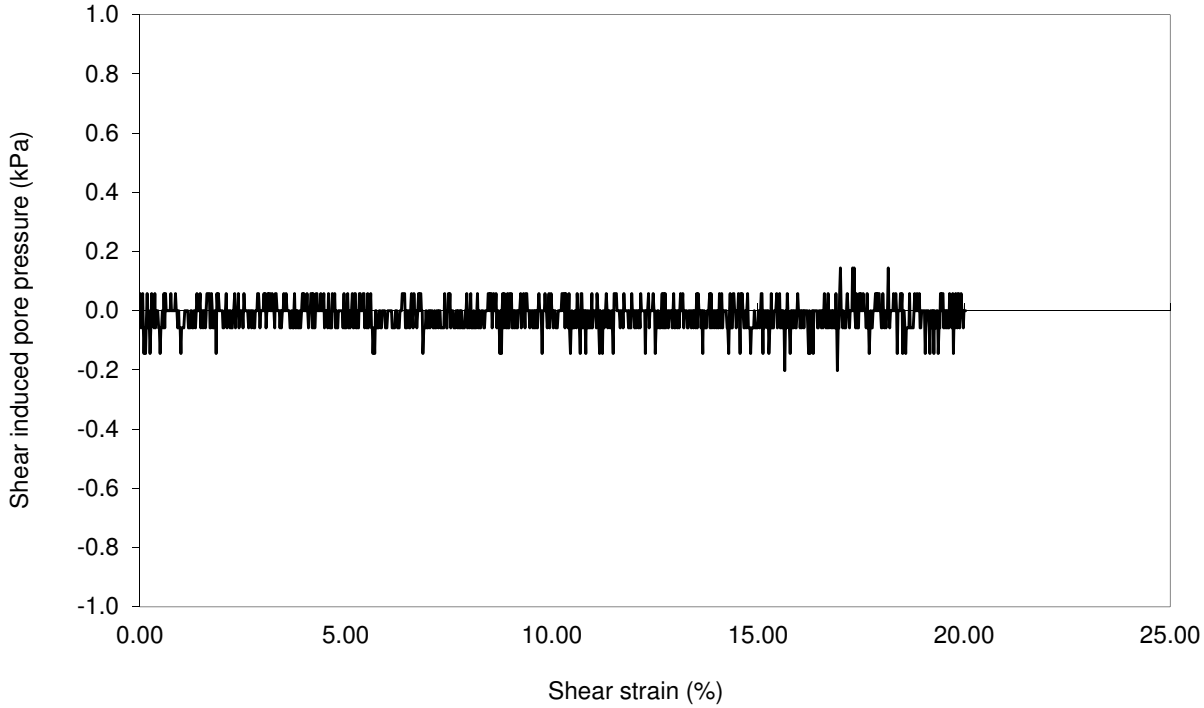
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Monotonic (drained) simple shear to failure

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 10/02/2016		

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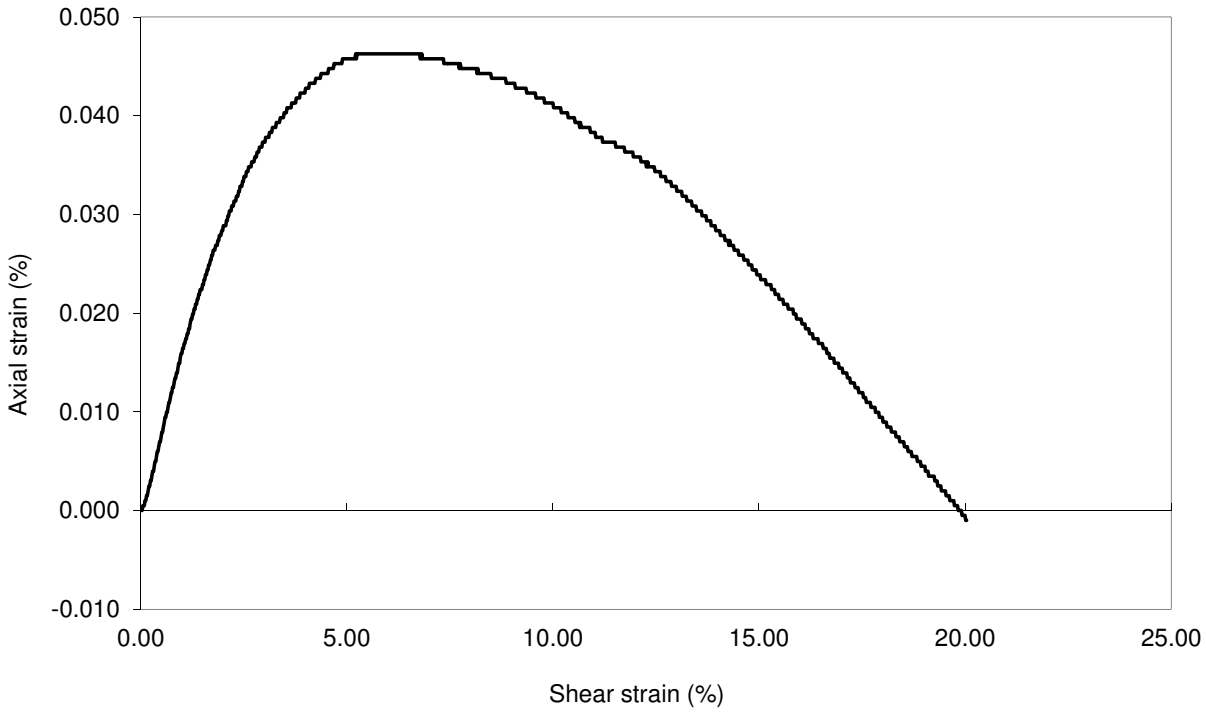
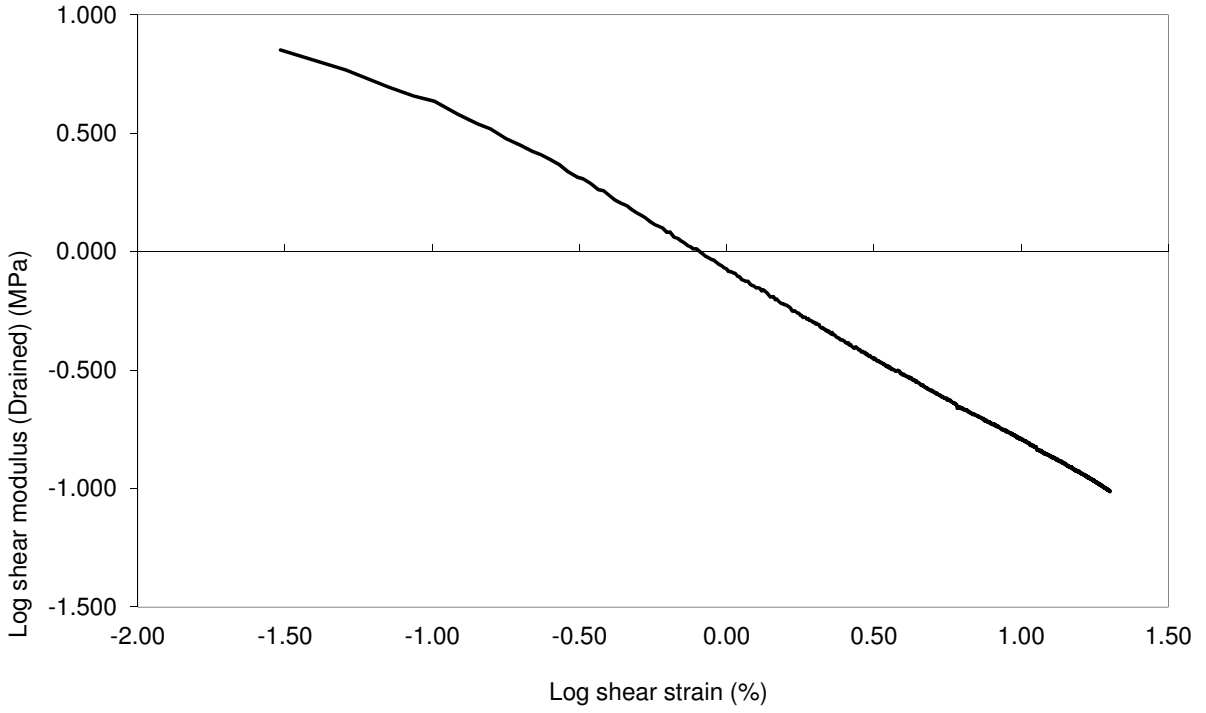
Consolidated Drained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Monotonic (drained) simple shear to failure

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 10/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	G7	Description (visual) :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements

SPECIMEN DETAILS

Sample type:	Disturbed			
Trimming Procedure:	Recompacted			
	Initial Values		Final Values	
Height :	20.1	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	20.30	%	17.03	%
Bulk density :	2.04	Mg/m^3		
Dry density :	1.70	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.5744			
Test Duration:			2 Days	

END OF CONSOLIDATION #1

Height :	19.6	mm
Diameter :	66.4	mm
Axial strain	2.25	%
Normal stress	12.8	kPa
Voids ratio (e_o)	0.5389	
Max. Consolidation stress	12.8	kPa
Max. Consolidation strain	2.25	%
Duration	683	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	20.31	%
Shear stress	17.59	kPa
Normal stress	16.00	kPa
Pore pressure	-3.12	kPa
Axial strain	0.00	%
Shear modulus	0.09	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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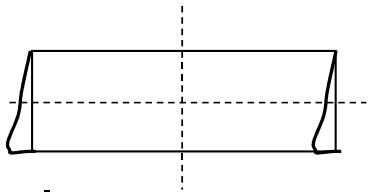
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm

Elevation



Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	12/02/2016		

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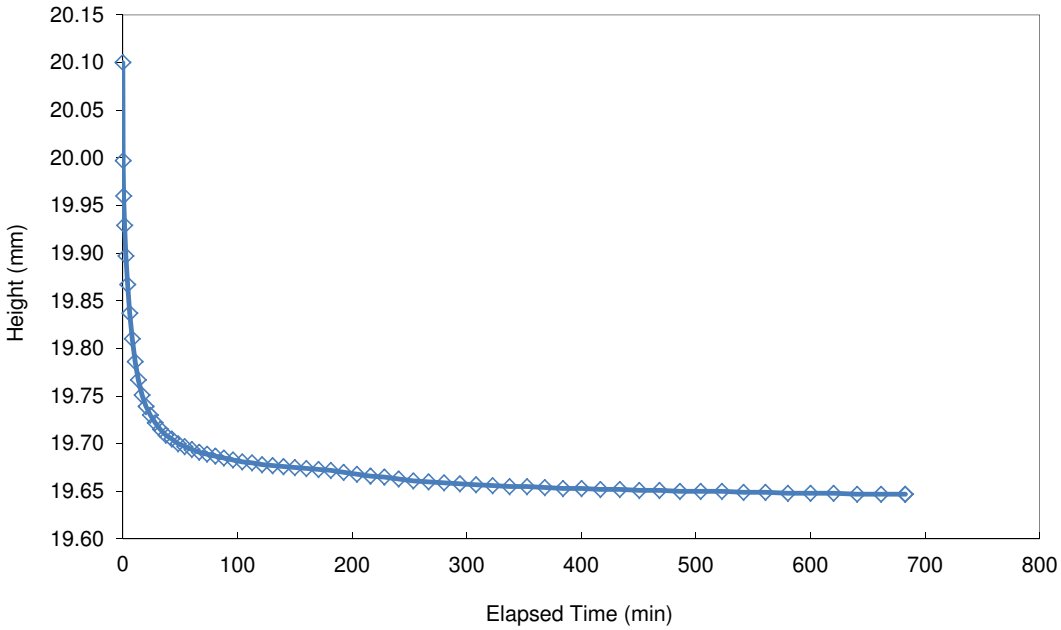
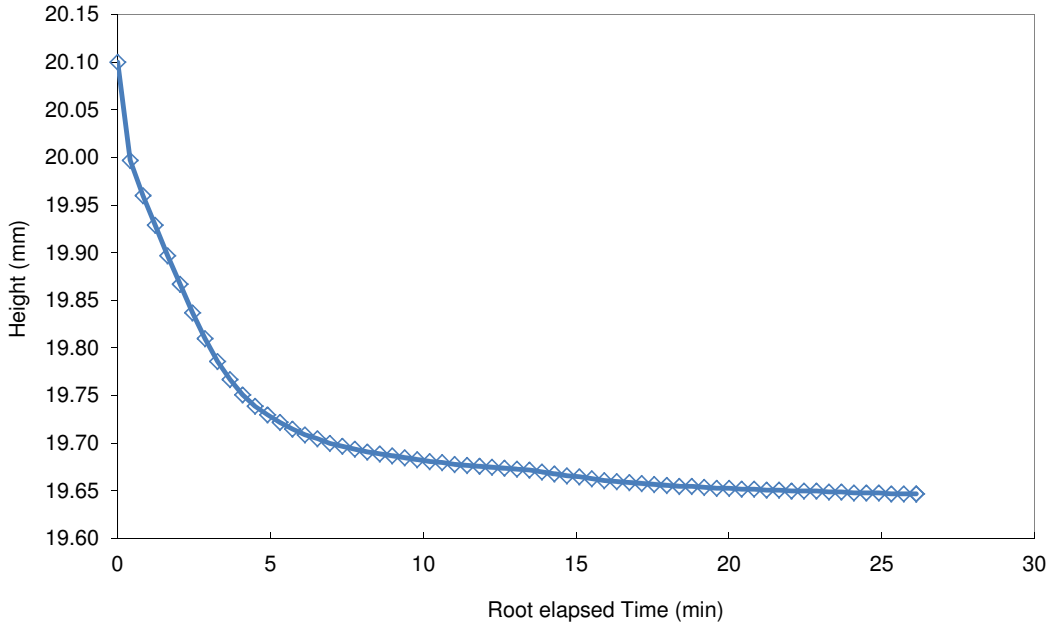
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	12/02/2016		

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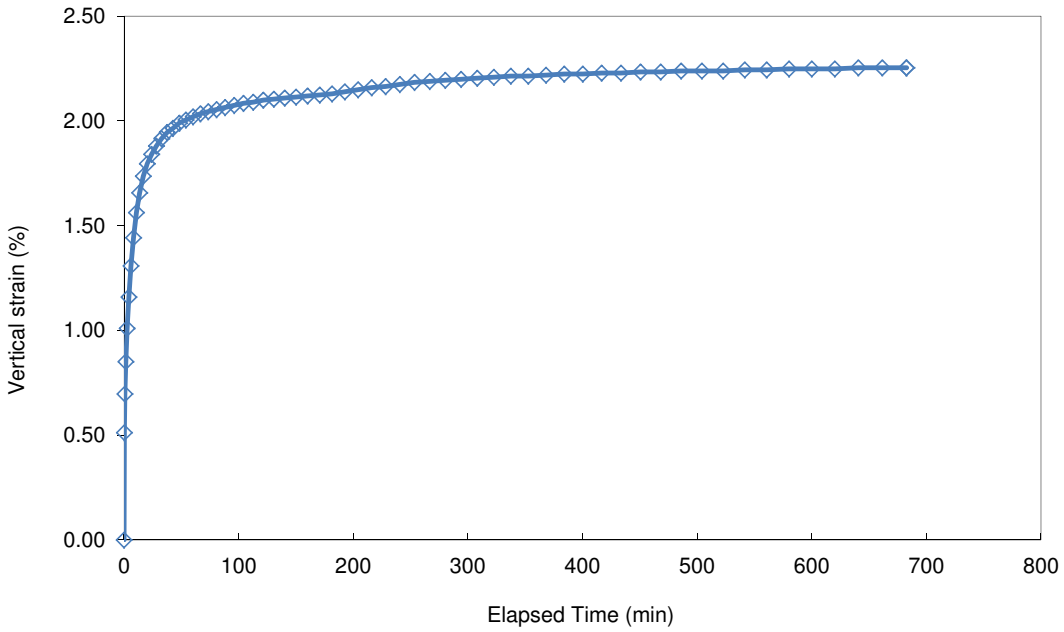
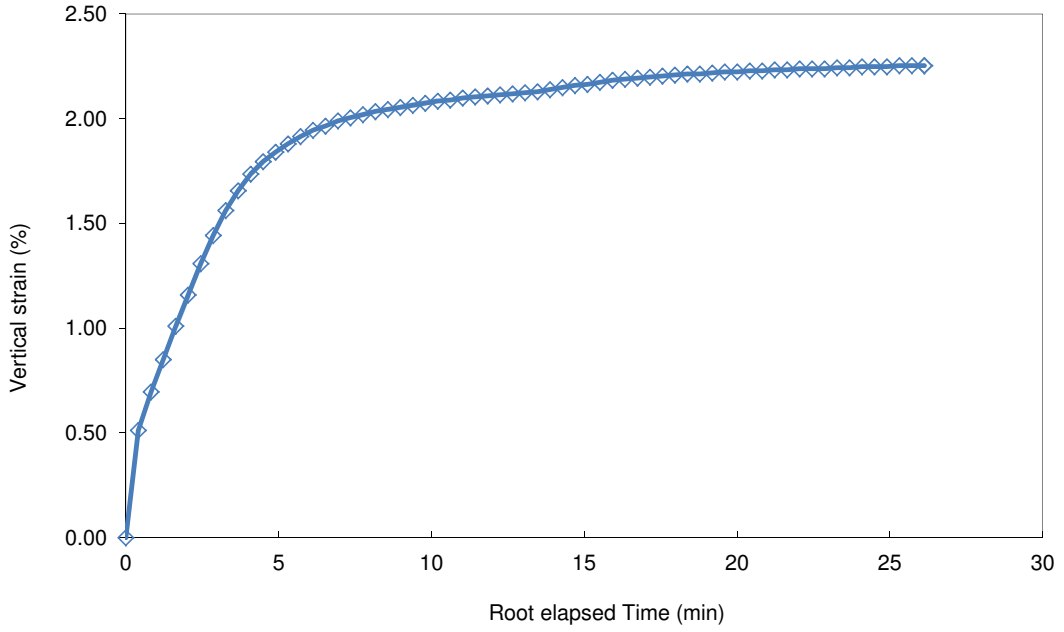
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
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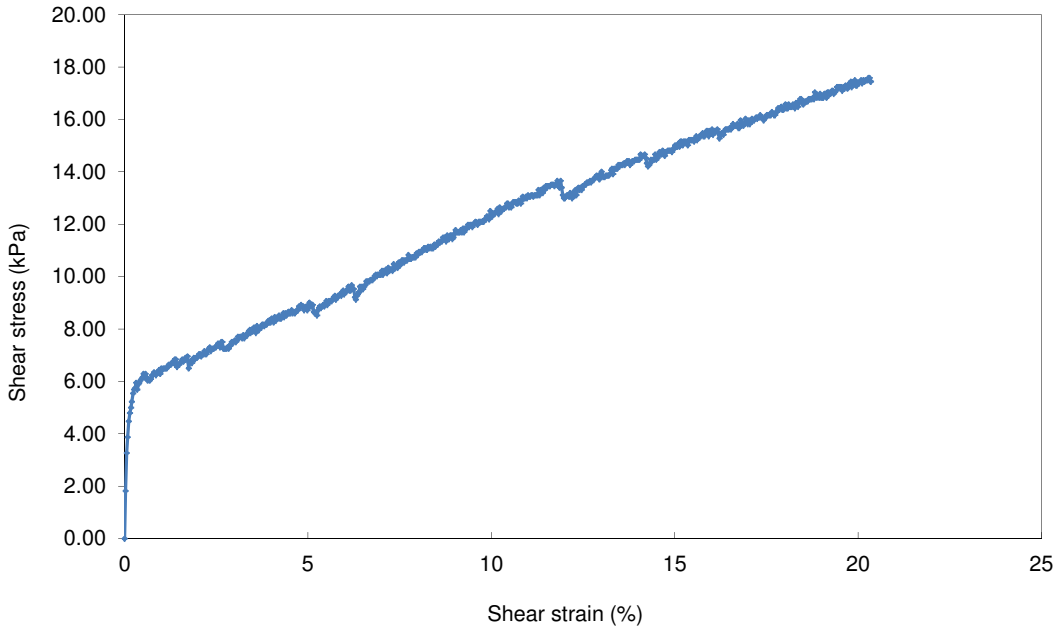
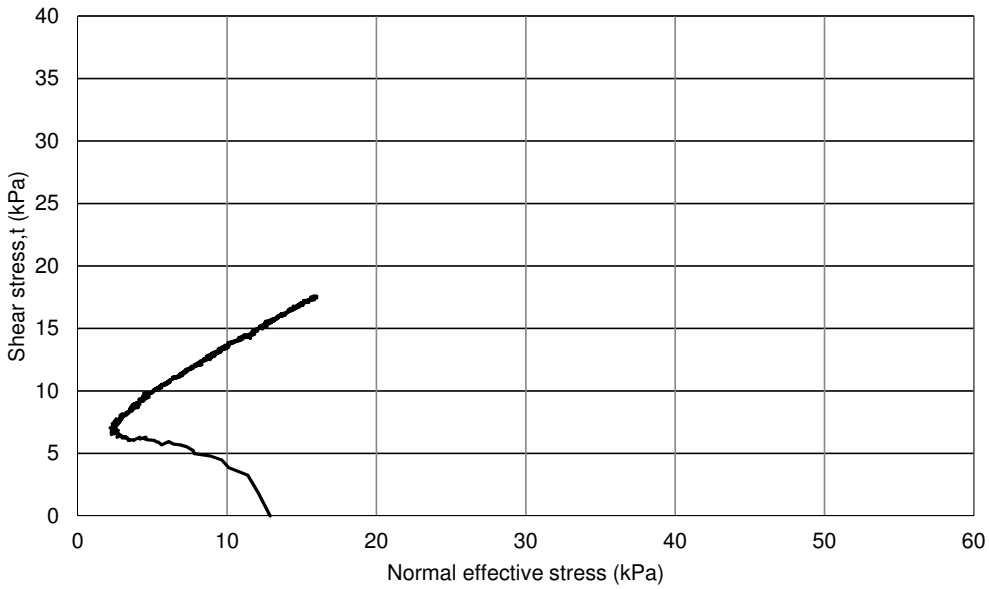
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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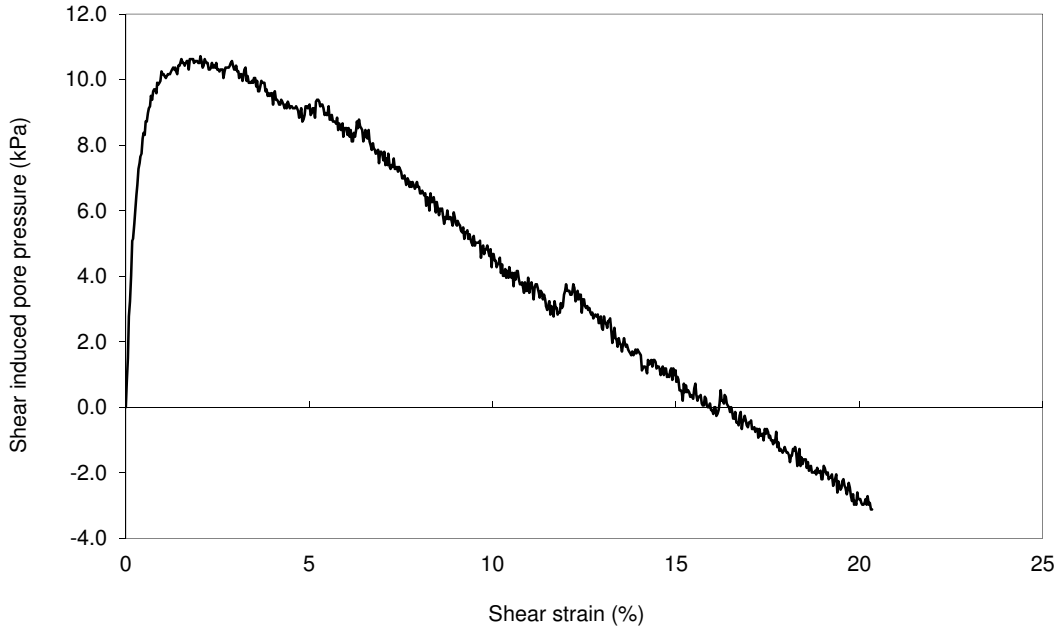
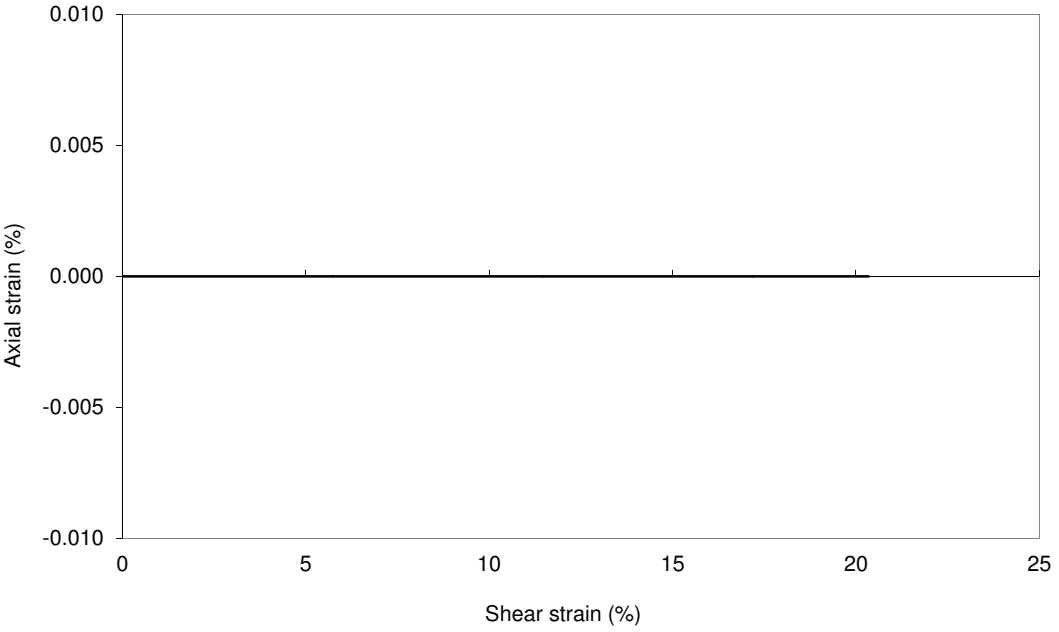
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements





Monotonic simple shear

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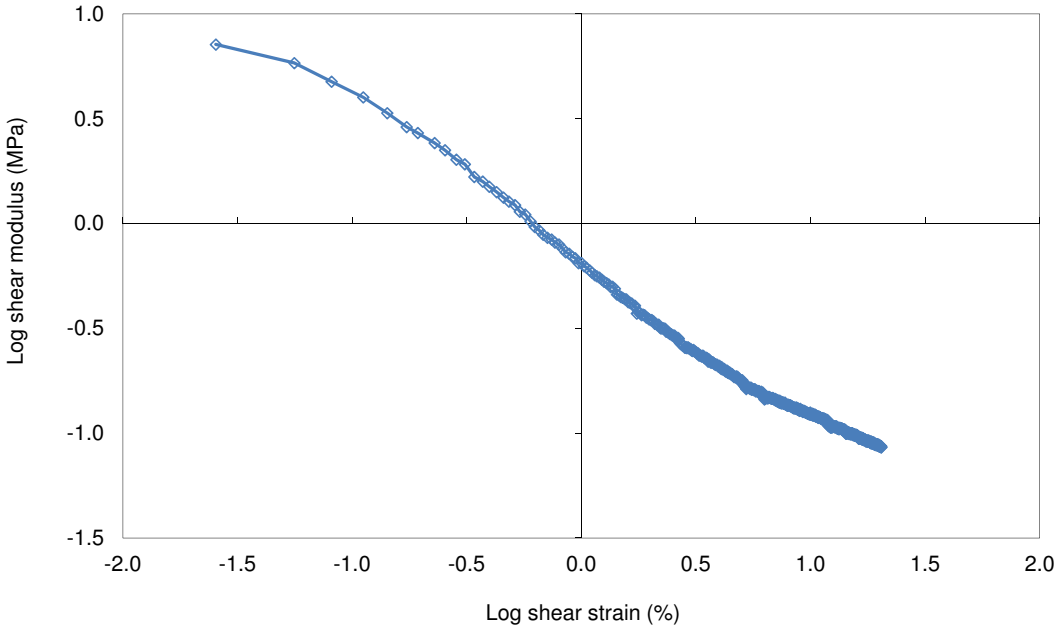
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements



Monotonic simple shear

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	G17A	Description (visual) :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand

SPECIMEN DETAILS

Sample type:	Undisturbed			
Trimming Procedure:	Cutting Ring			
	Initial Values		Final Values	
Height :	21.7	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	25.58	%	29.90	%
Bulk density :	1.80	Mg/m^3		
Dry density :	1.44	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.8601			
Test Duration:			2 Days	

END OF CONSOLIDATION #1

Height :	19.9	mm
Diameter :	66.4	mm
Axial strain	8.20	%
Normal stress	481.9	kPa
Voids ratio (e_o)	0.7076	
Max. Consolidation stress	481.9	kPa
Max. Consolidation strain	8.20	%
Duration	1148	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	3.29	%
Shear stress	103.41	kPa
Normal stress	262.04	kPa
Pore pressure	219.79	kPa
Axial strain	0.00	%
Shear modulus	3.14	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/216		

RGI
Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

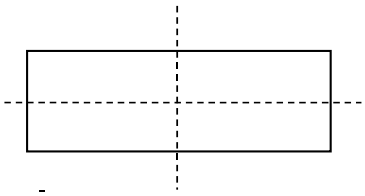
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHG17A P01Q2 4160 DSSmonotonic.xlsx]Sheet1

Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand

SPECIMEN DETAILS

Initial Height:	21.7	mm
Initial Diameter:	66.4	mm



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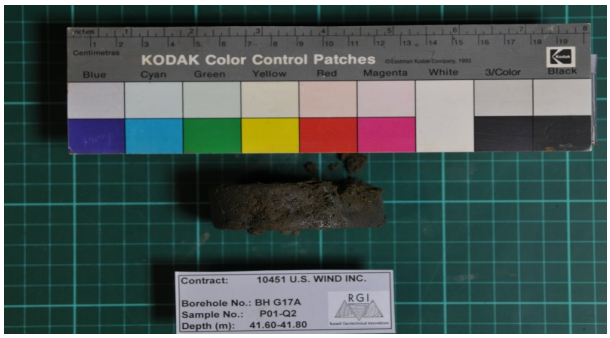

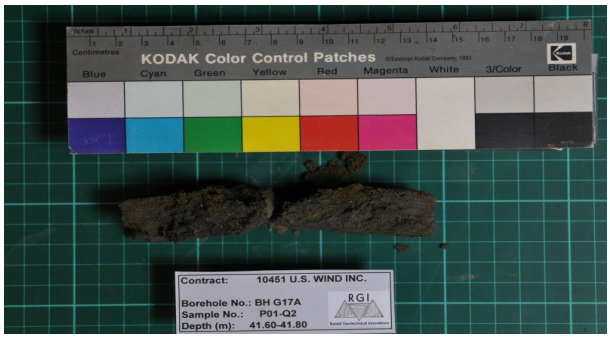

Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/216		

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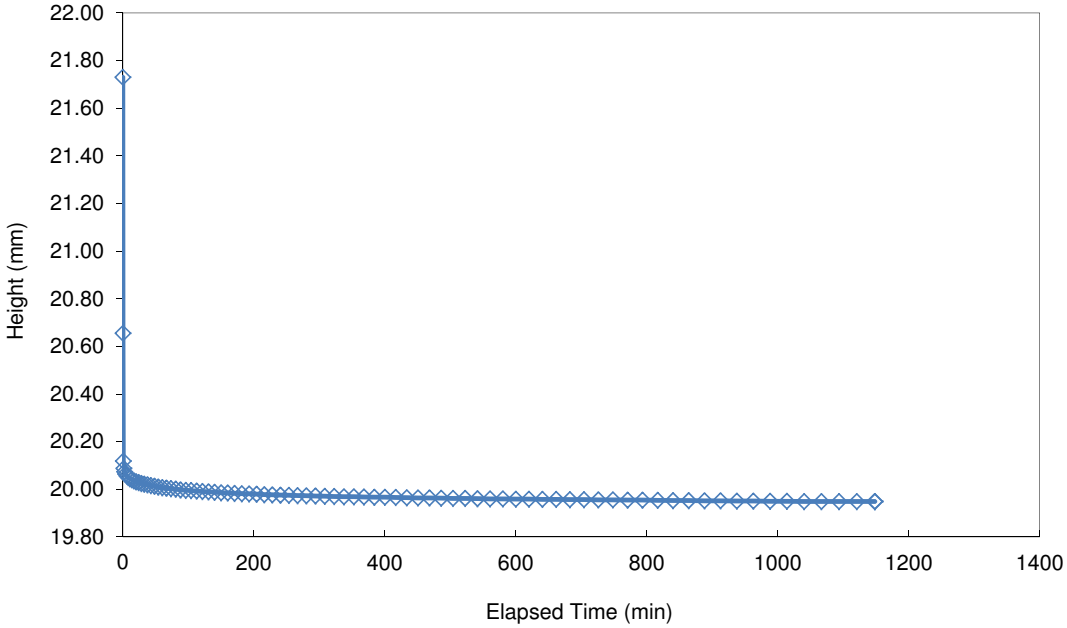
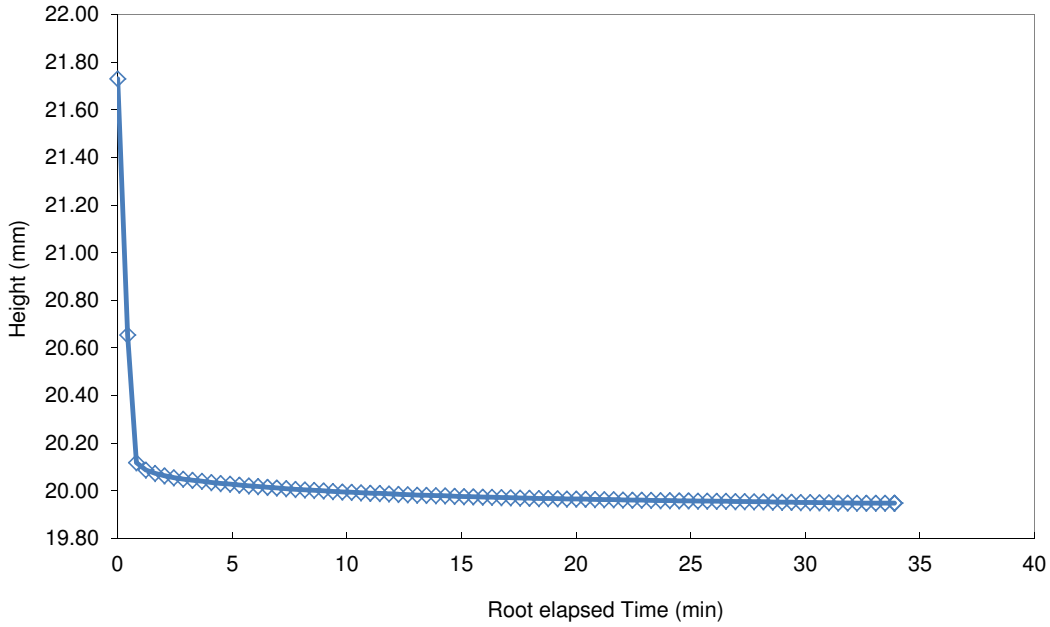
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/216		

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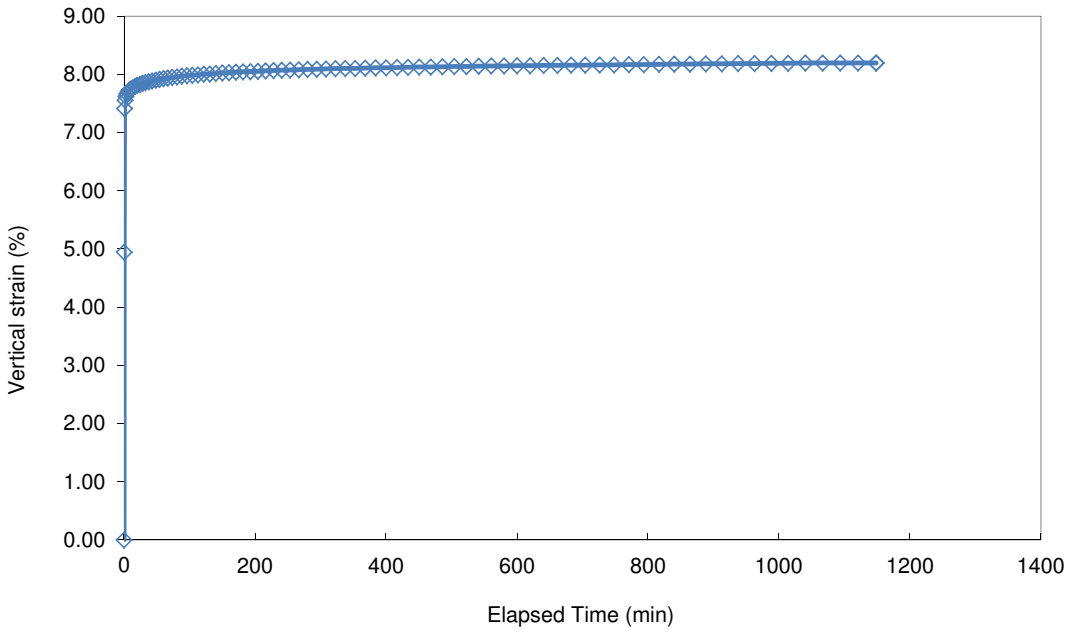
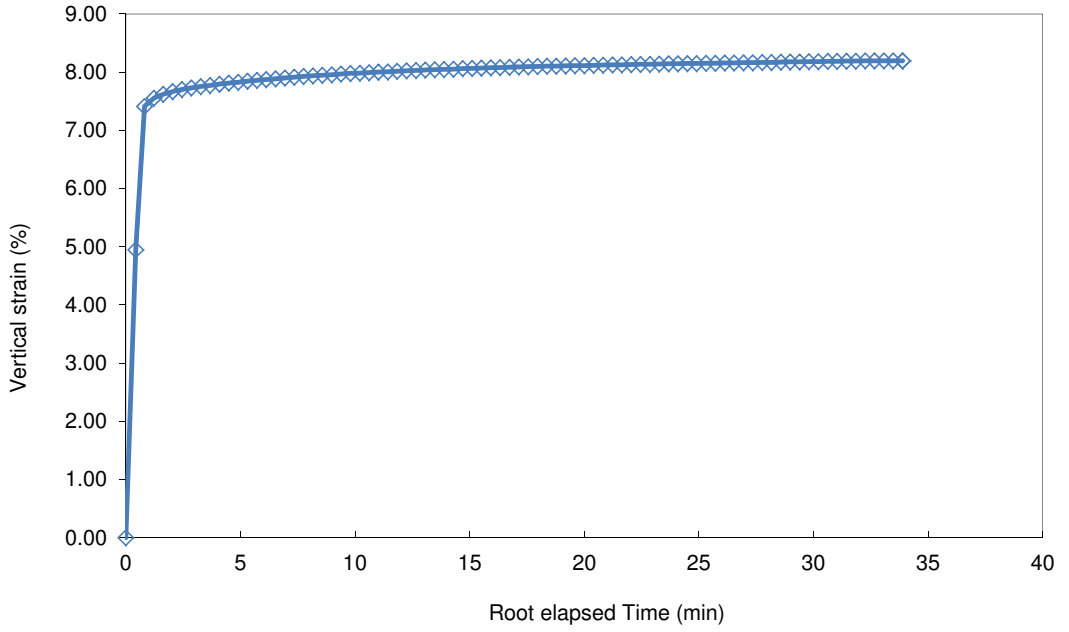
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/216		

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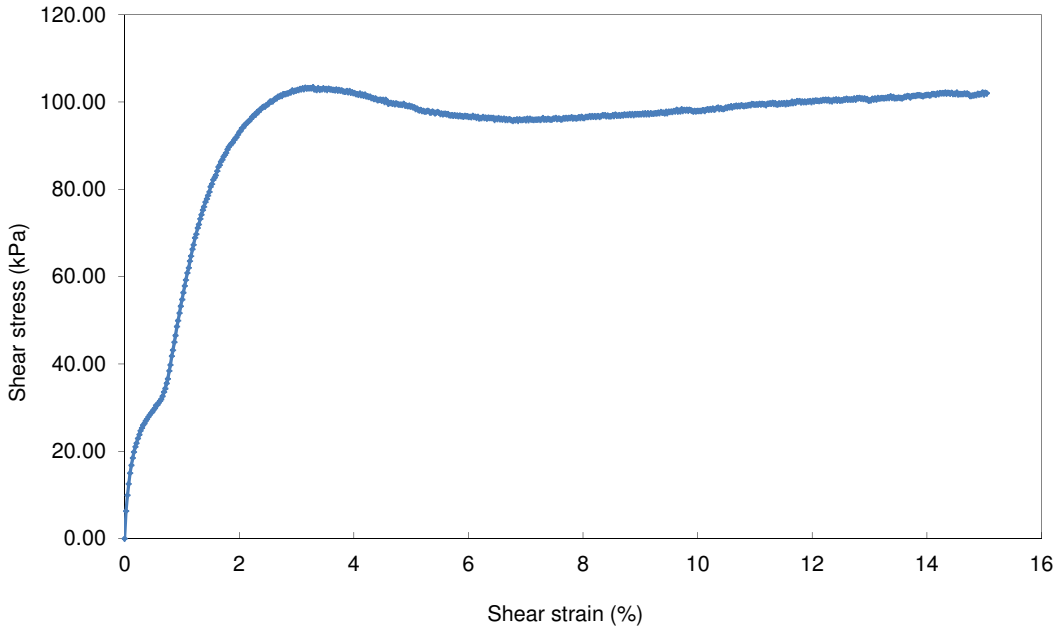
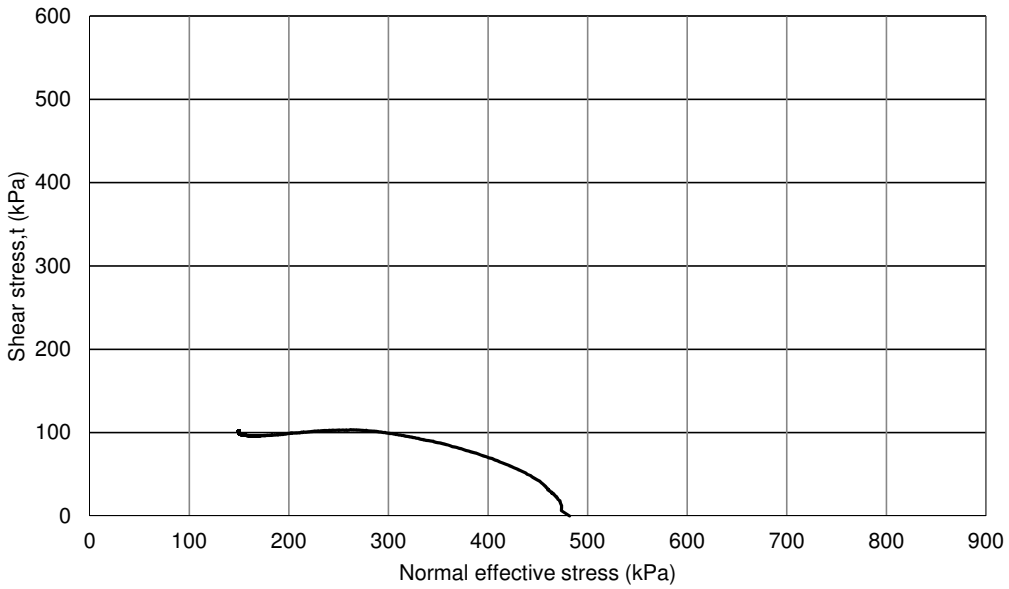
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand





Monotonic simple shear

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Date:	08/01/216		

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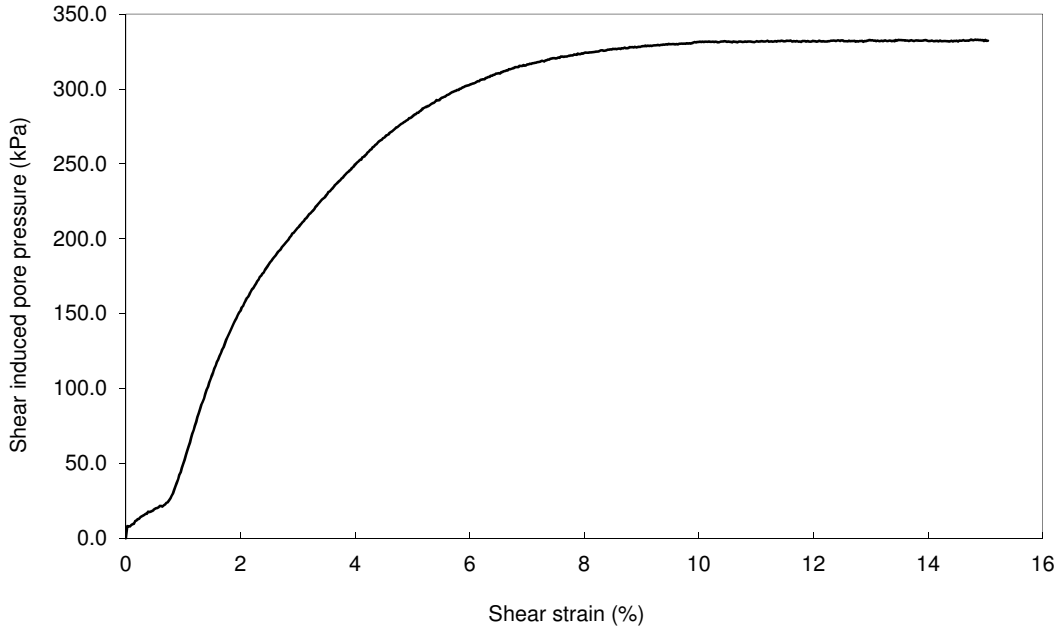
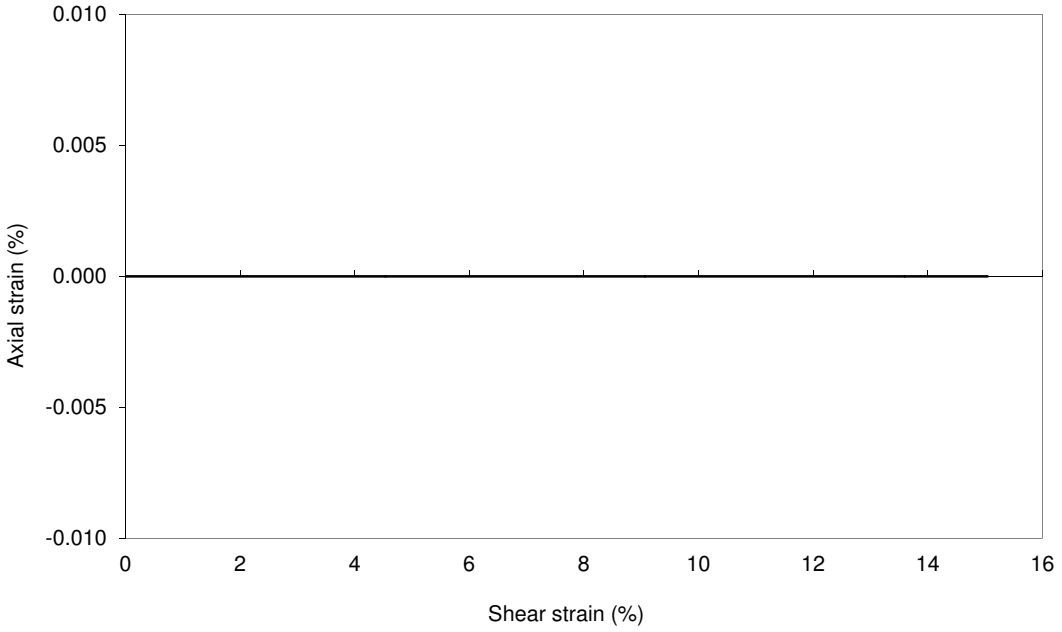
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/216		

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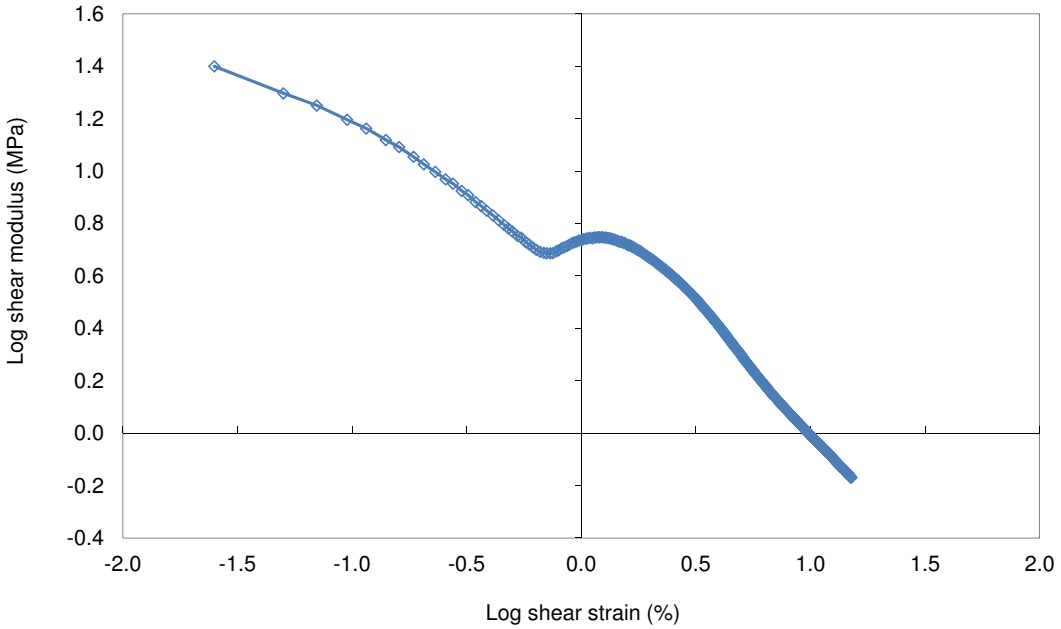
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey sandy CLAY with lenses of
Sample Depth (m):	41.60-41.65	coarse brown sand



Monotonic simple shear

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/216		

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	H10	Description (visual) :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)

SPECIMEN DETAILS

Sample type:	Undisturbed			
Trimming Procedure:	Cutting Ring			
	Initial Values		Final Values	
Height :	21.2	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	32.77	%	31.56	%
Bulk density :	1.86	Mg/m^3		
Dry density :	1.40	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.9024			
Test Duration:			3	Days

END OF CONSOLIDATION #1

Height :	19.9	mm
Diameter :	66.4	mm
Axial strain	5.90	%
Normal stress	267.8	kPa
Voids ratio (e_o)	0.7902	
Max. Consolidation stress	267.8	kPa
Max. Consolidation strain	5.90	%
Duration	1411	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	16.75	%
Shear stress	96.97	kPa
Normal stress	147.08	kPa
Pore pressure	120.65	kPa
Axial strain	0.00	%
Shear modulus	0.58	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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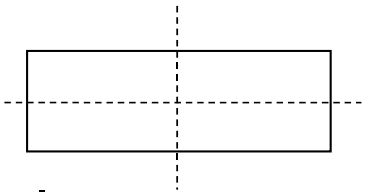
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

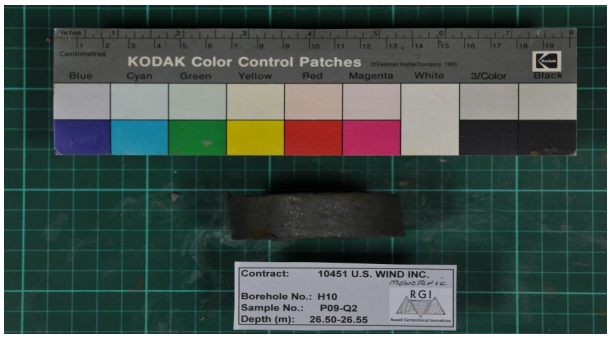
Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)

SPECIMEN DETAILS

Initial Height:	21.2	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	04/02/2016		

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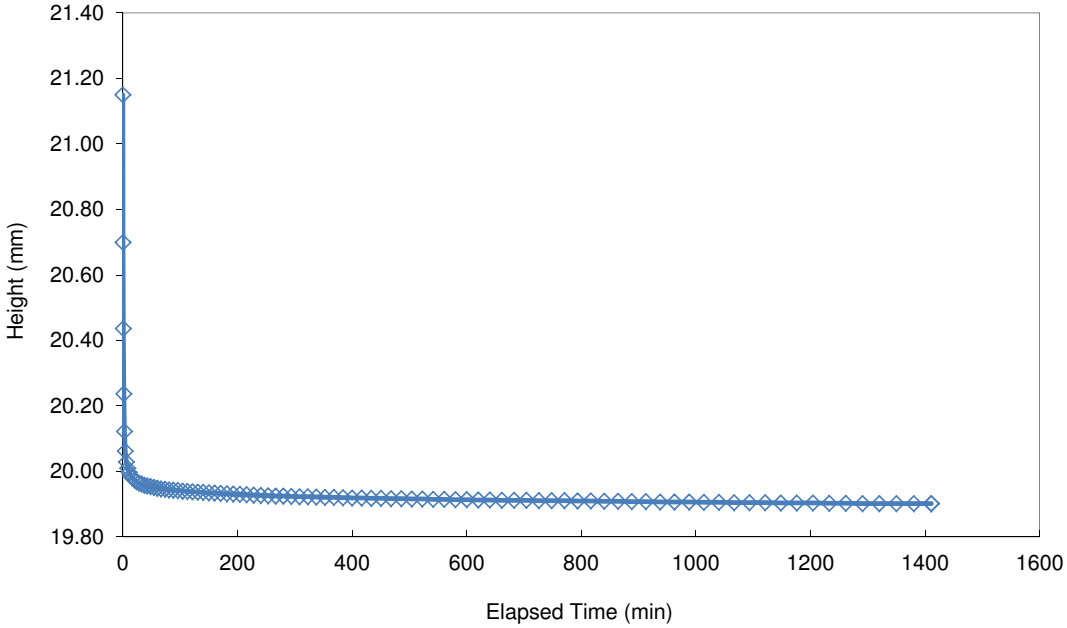
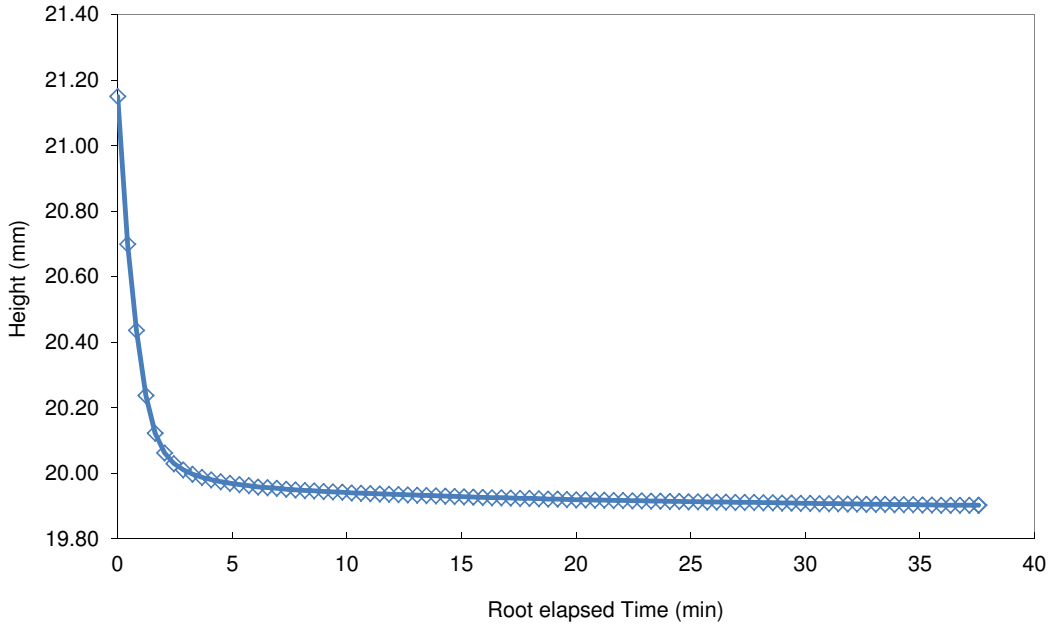
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
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Date:	04/02/2016		

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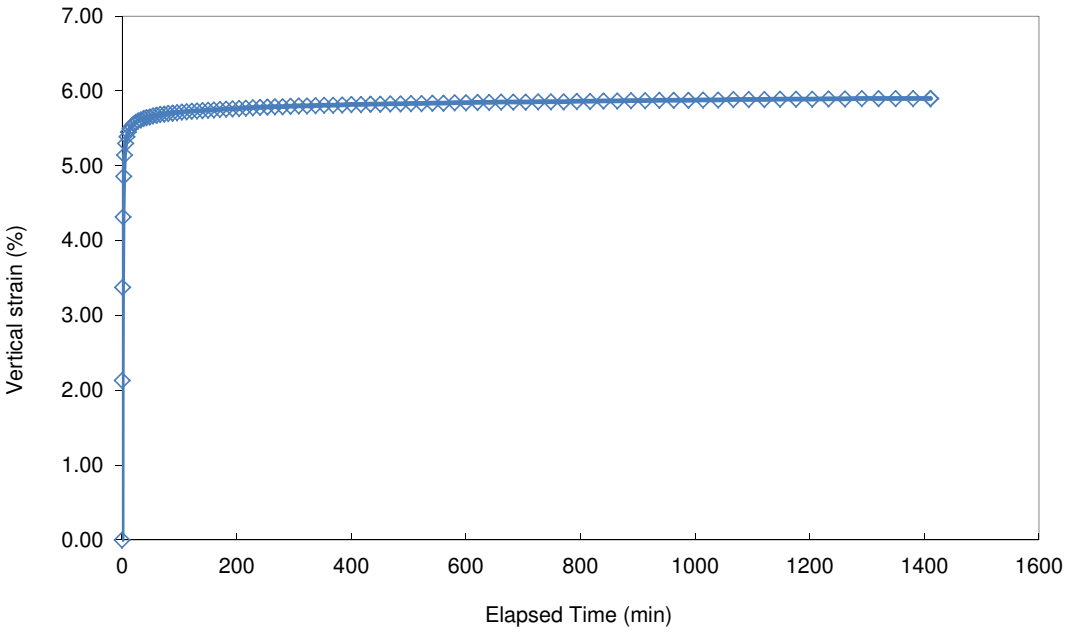
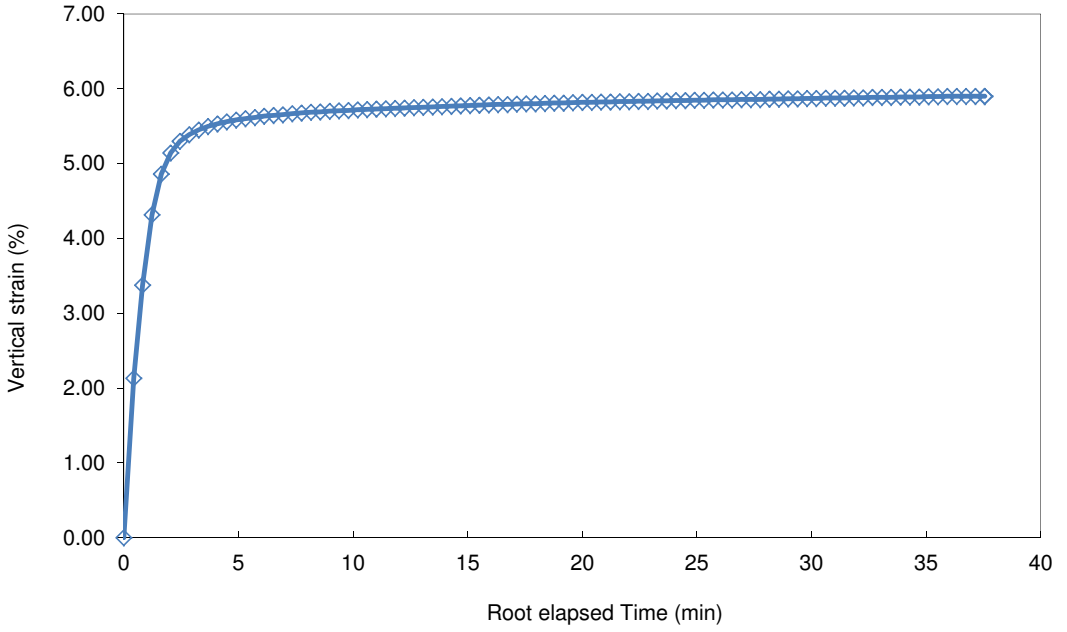
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
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Date:	04/02/2016		

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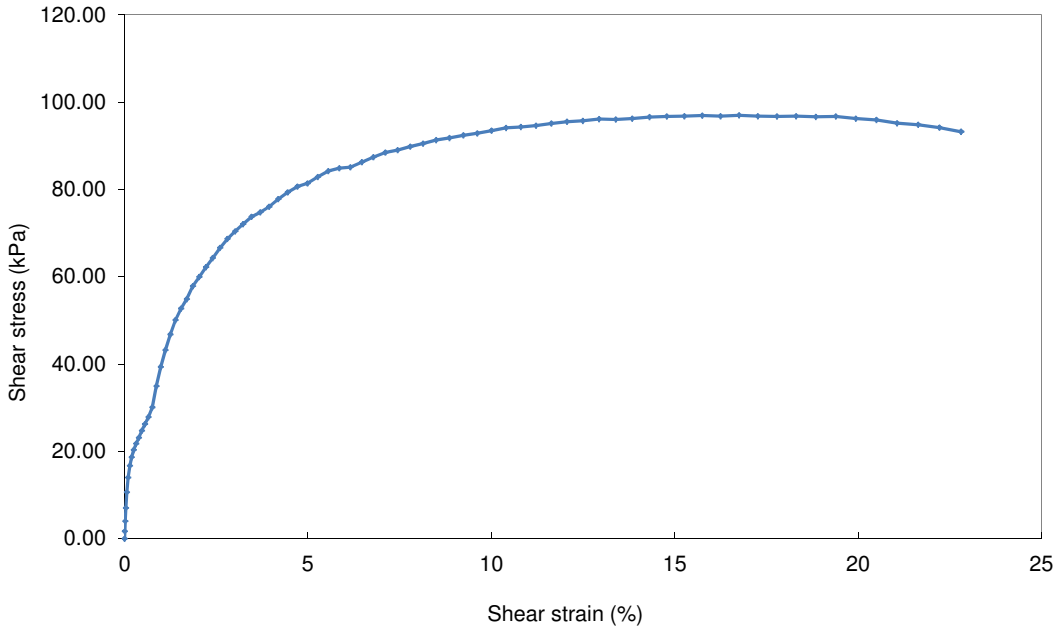
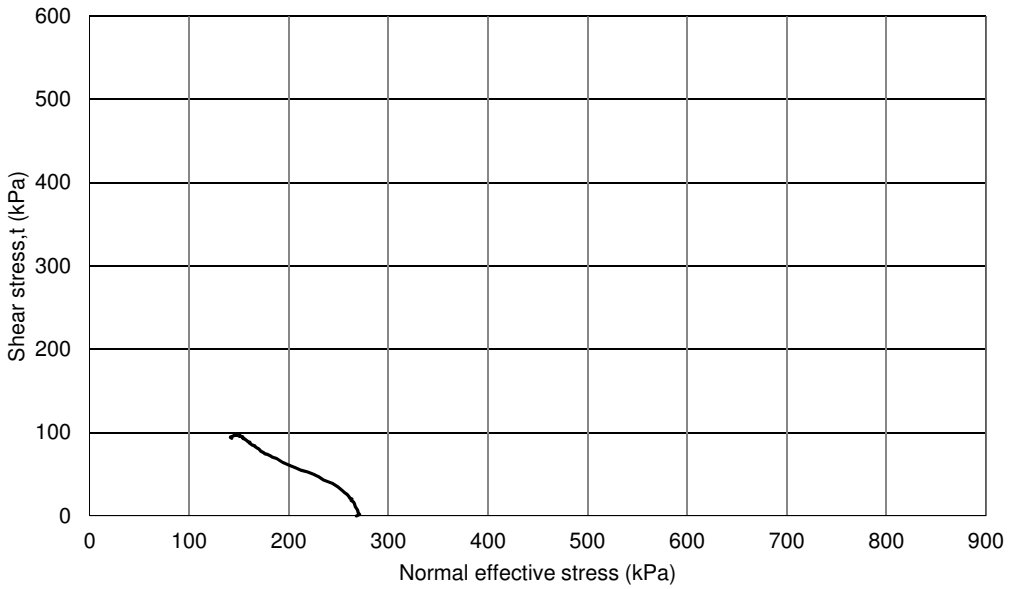
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)





Monotonic simple shear

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	04/02/2016		

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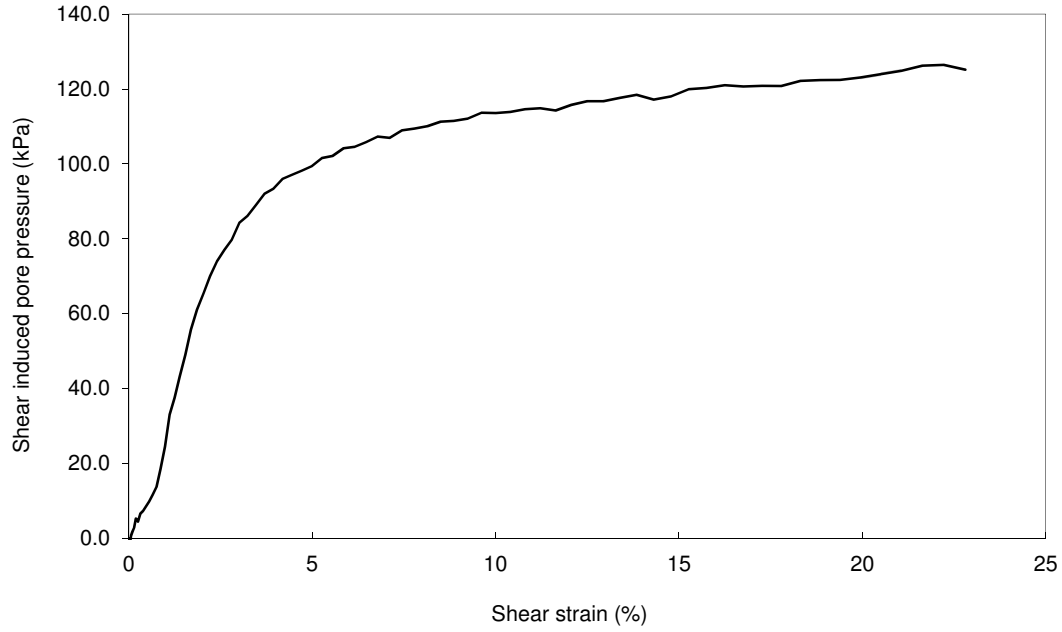
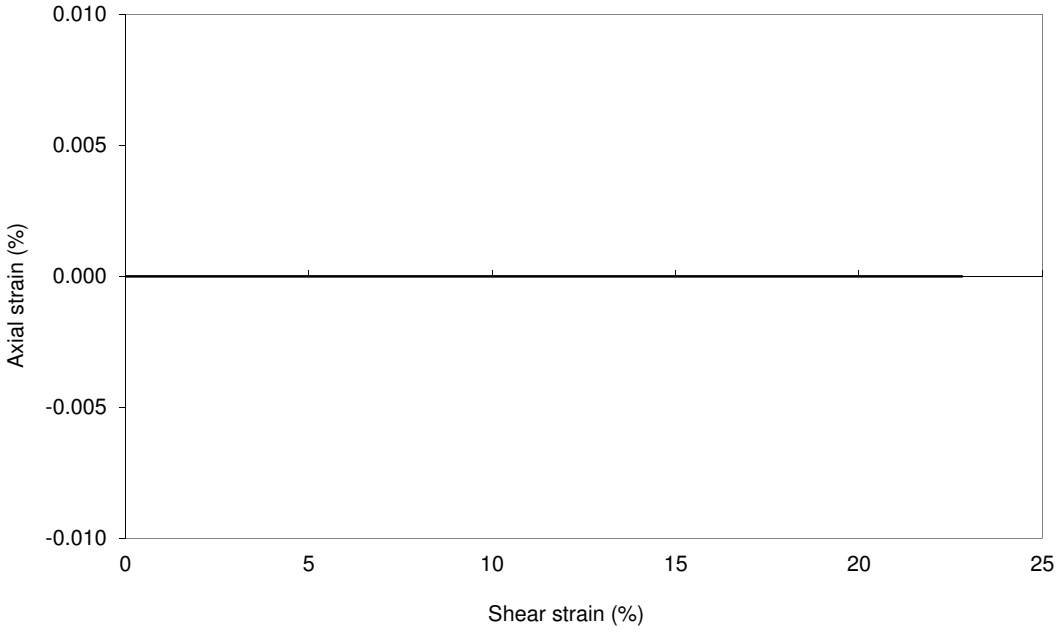
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)





Monotonic simple shear

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

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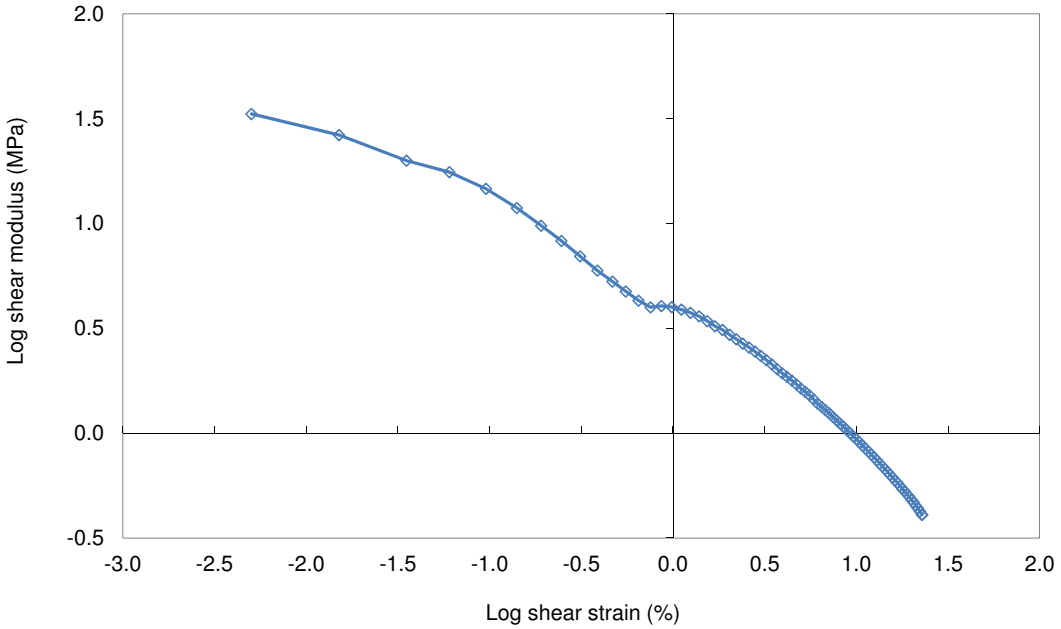
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey silty CLAY with lenses of silt/fine sand
Sample Depth (m):	26.50-26.55	(slightly micaceous)



Monotonic simple shear

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Date: 04/02/2016		

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	H10	Description (visual) :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells

SPECIMEN DETAILS

Sample type:	Undisturbed			
Trimming Procedure:	Cutting Ring			
	Initial Values		Final Values	
Height :	21.6	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	19.98	%	20.85	%
Bulk density :	1.98	Mg/m^3		
Dry density :	1.65	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.6209			
Test Duration:			3	Days

END OF CONSOLIDATION #1

Height :	20.8	mm
Diameter :	66.4	mm
Axial strain	3.33	%
Normal stress	530.9	kPa
Voids ratio (e_o)	0.5670	
Max. Consolidation stress	530.9	kPa
Max. Consolidation strain	3.33	%
Duration	1320	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	23.40	%
Shear stress	203.02	kPa
Normal stress	344.78	kPa
Pore pressure	186.06	kPa
Axial strain	0.00	%
Shear modulus	0.87	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

RGI
Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

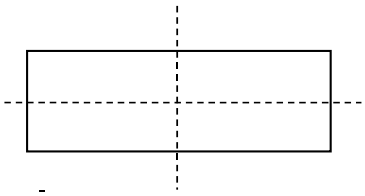
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHH10 P16Q2 5460 DSSmonotonic.xlsx]Sheet1

Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells

SPECIMEN DETAILS

Initial Height:	21.6	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	04/02/2016		

Russell Geotechnical Innovations

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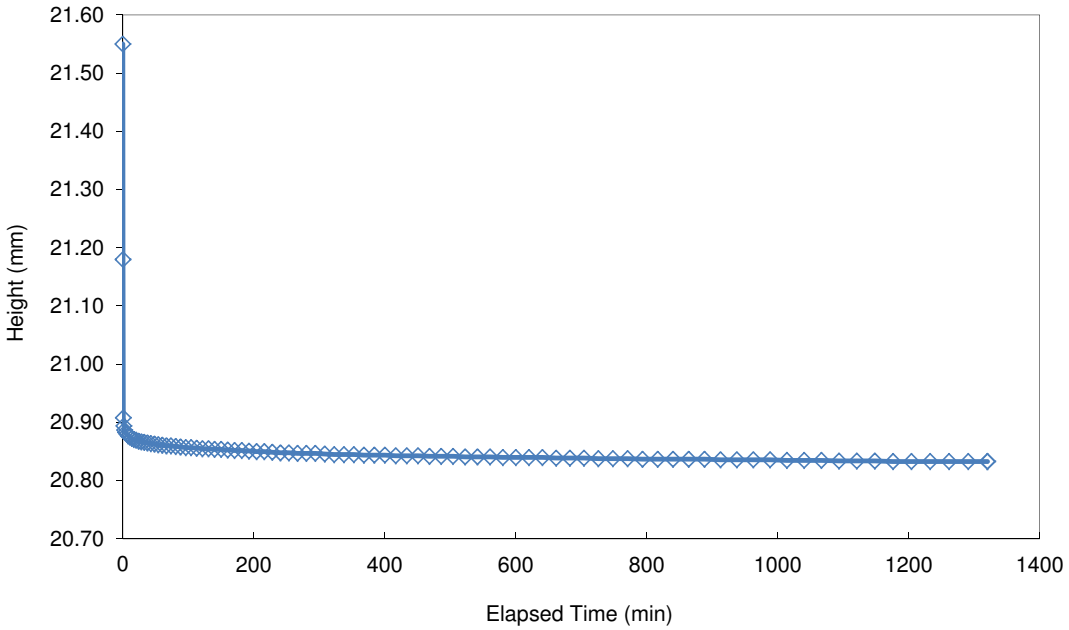
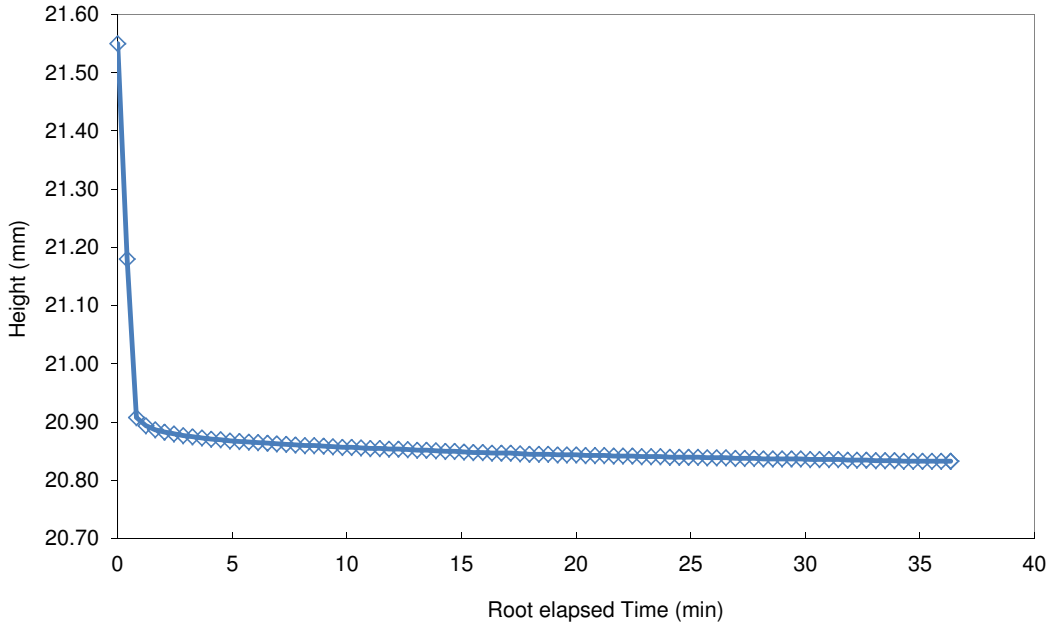
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	04/02/2016		

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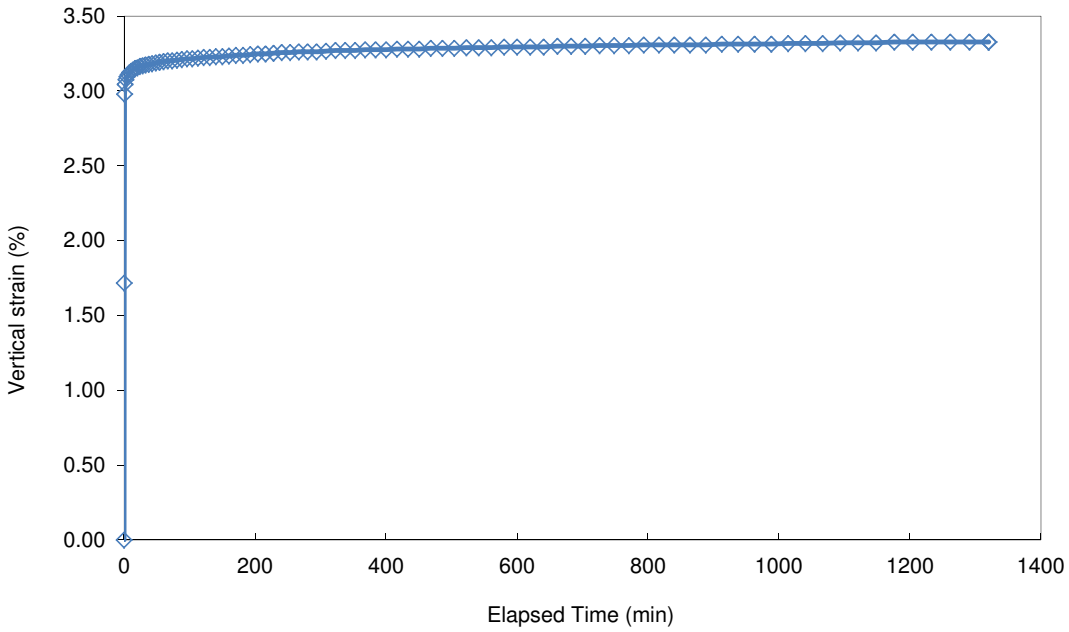
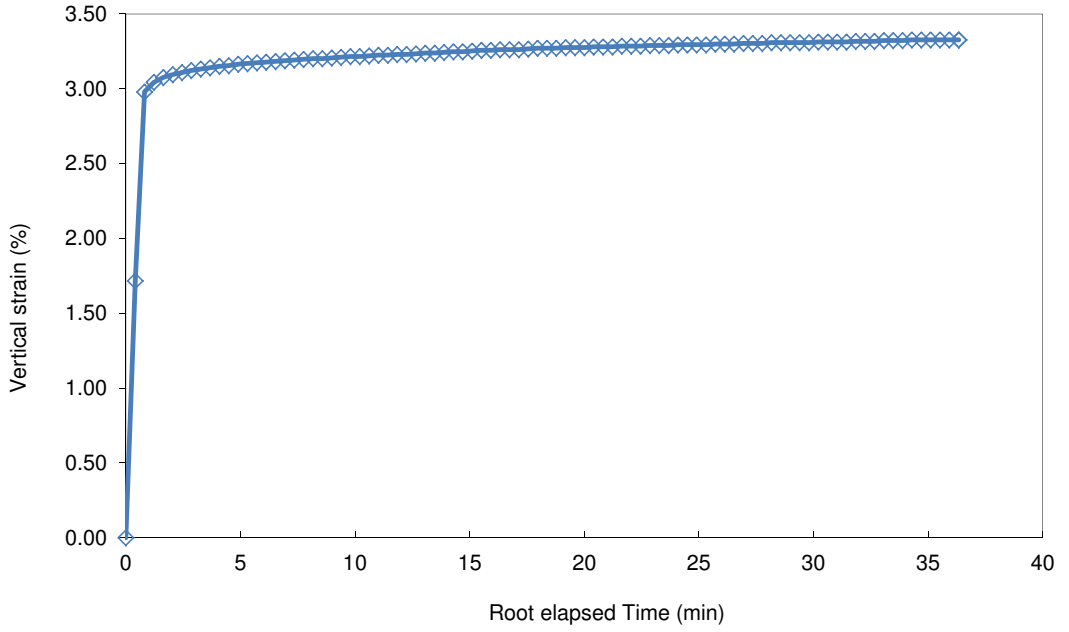
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	04/02/2016		

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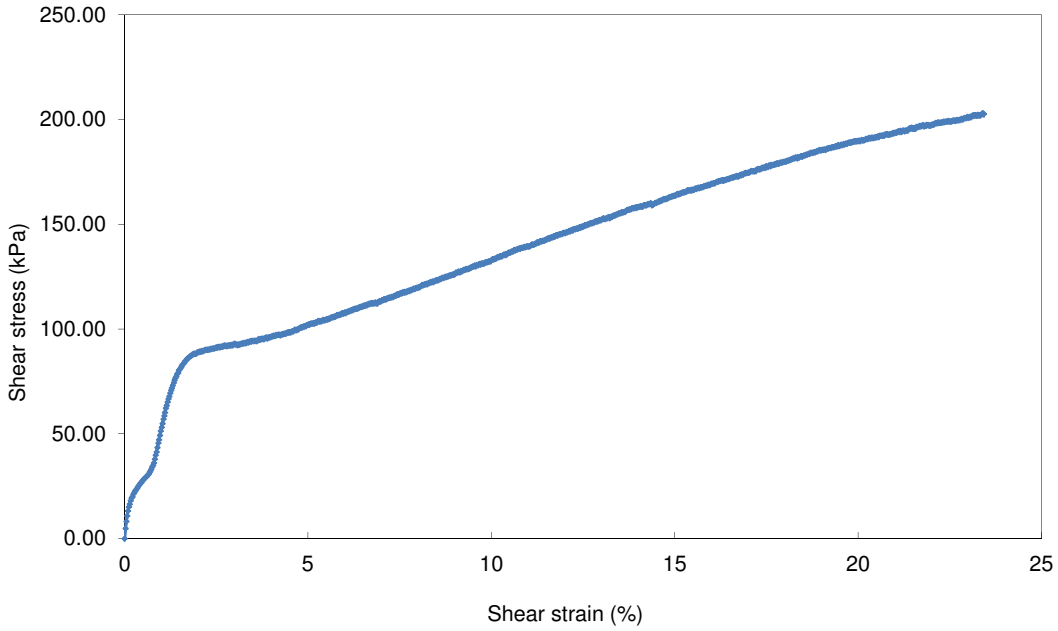
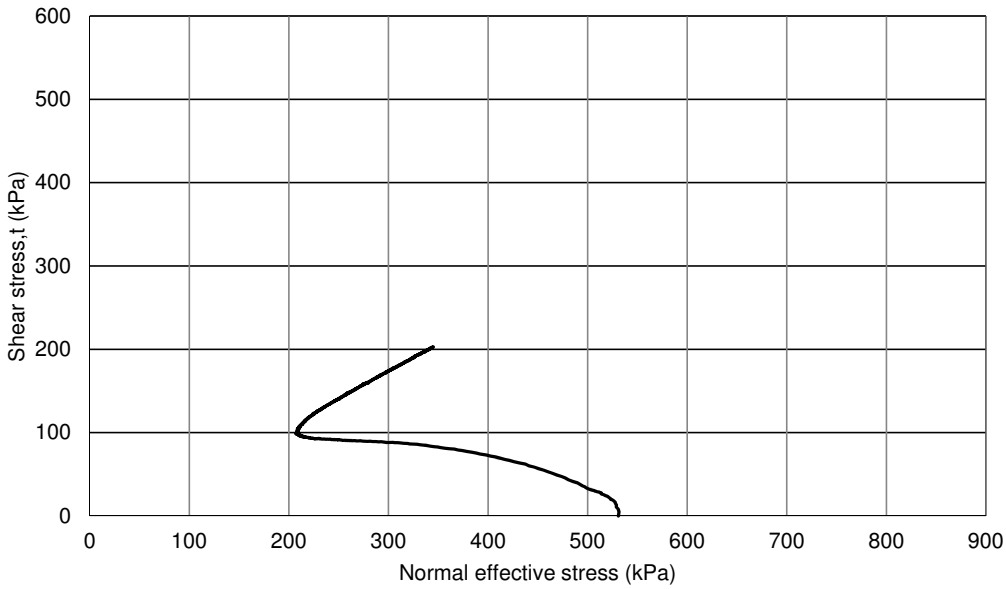
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

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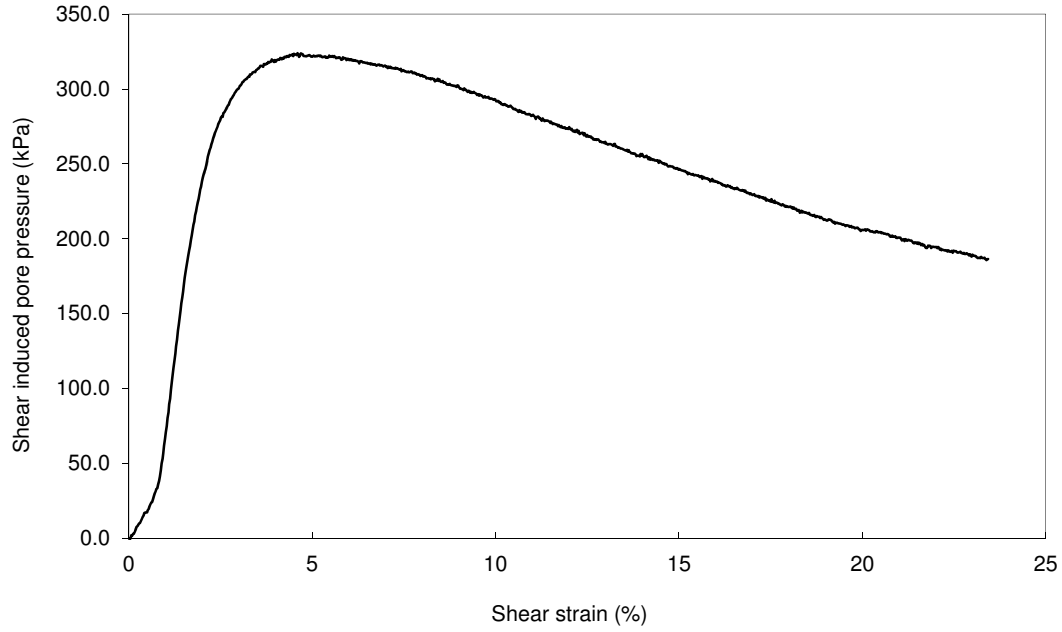
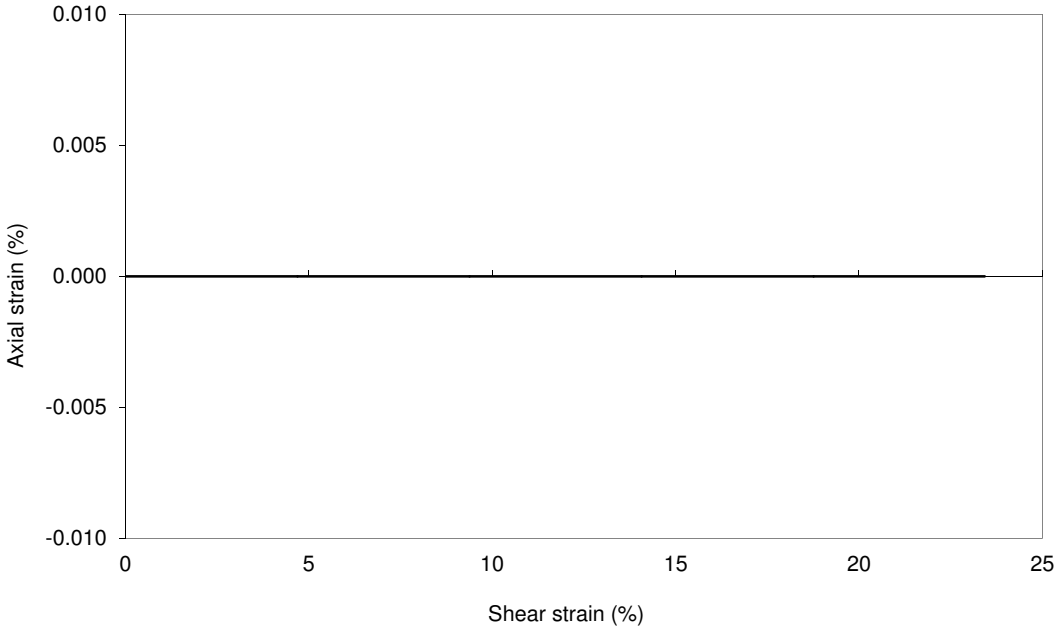
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

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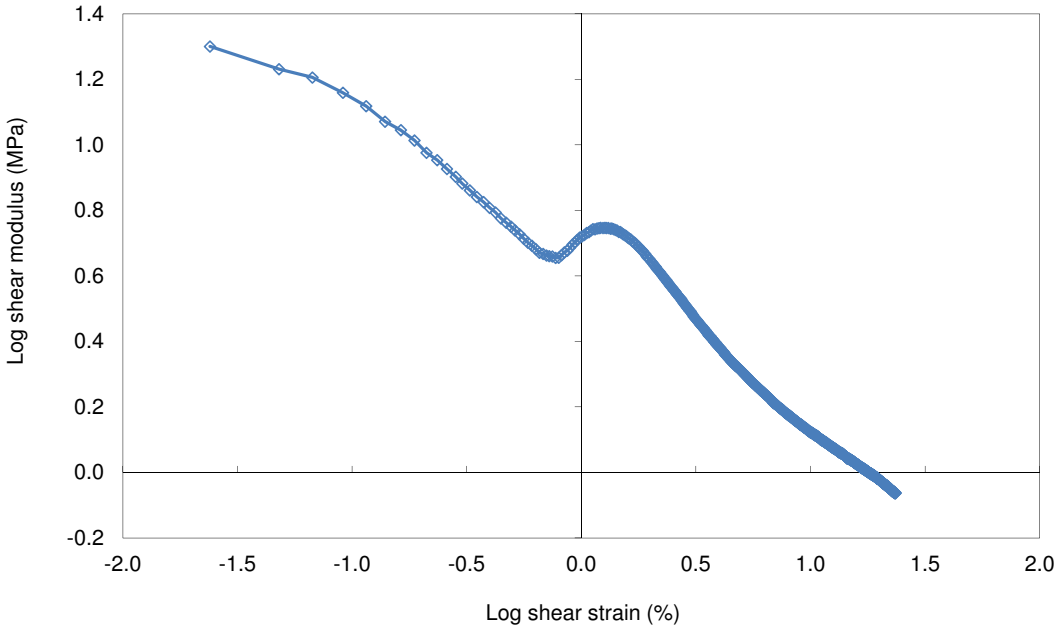
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey clayey FINE SAND
Sample Depth (m):	54.60-54.65	with occasional shells



Monotonic simple shear

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 04/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	K16	Description (visual) :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand

SPECIMEN DETAILS

Sample type:	Undisturbed			
Trimming Procedure:	Cutting Ring			
	Initial Values		Final Values	
Height :	21.7	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	42.08	%	46.94	%
Bulk density :	1.68	Mg/m^3		
Dry density :	1.18	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	1.2537			
Test Duration:			3	Days

END OF CONSOLIDATION #1

Height :	20.0	mm
Diameter :	66.4	mm
Axial strain	7.94	%
Normal stress	600.8	kPa
Voids ratio (e_o)	1.0747	
Max. Consolidation stress	600.8	kPa
Max. Consolidation strain	7.94	%
Duration	2904	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	7.39	%
Shear stress	179.19	kPa
Normal stress	308.28	kPa
Pore pressure	292.57	kPa
Axial strain	0.00	%
Shear modulus	2.43	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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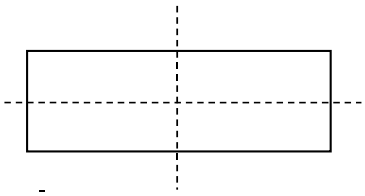
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

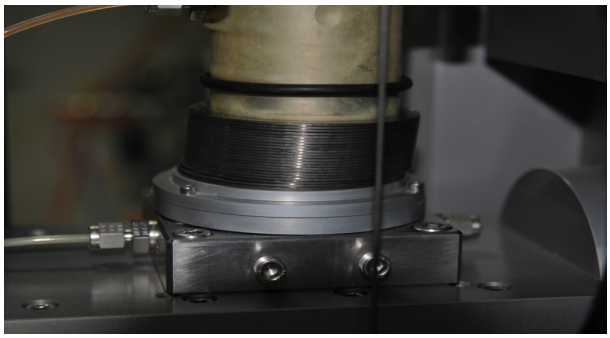
Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand

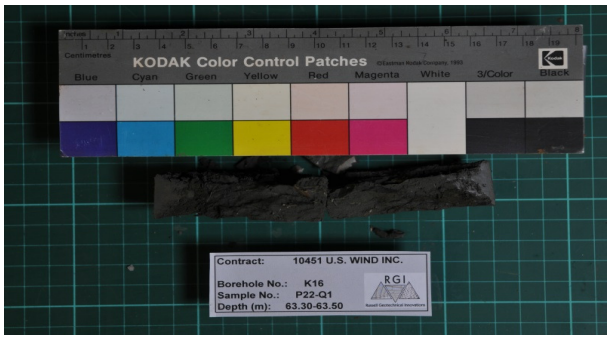
SPECIMEN DETAILS

Initial Height:	21.7	mm
Initial Diameter:	66.4	mm



Elevation





Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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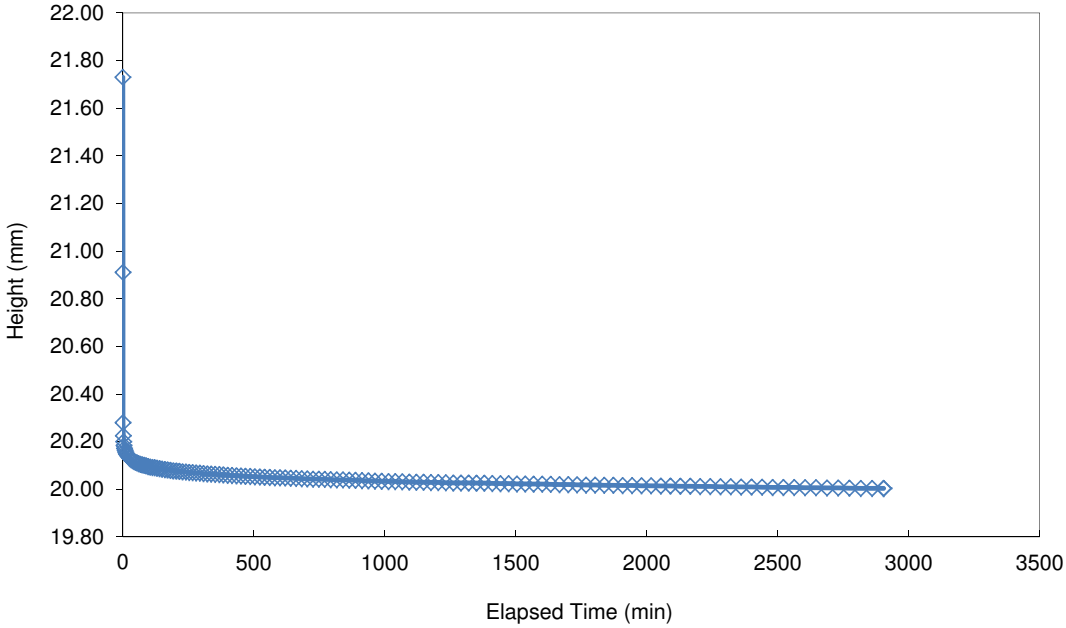
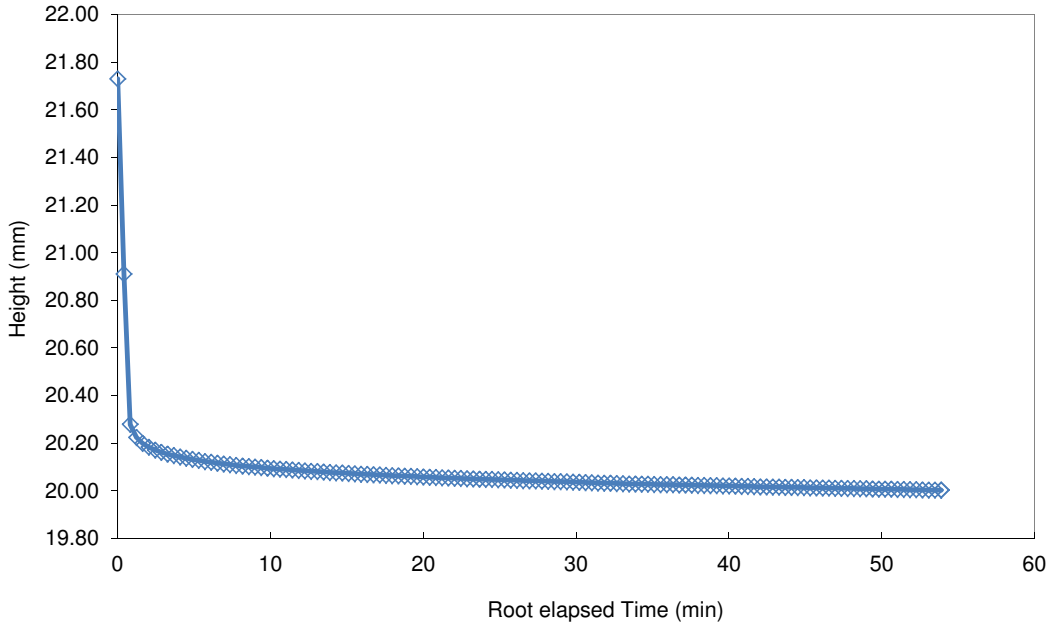
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

Russell Geotechnical Innovations

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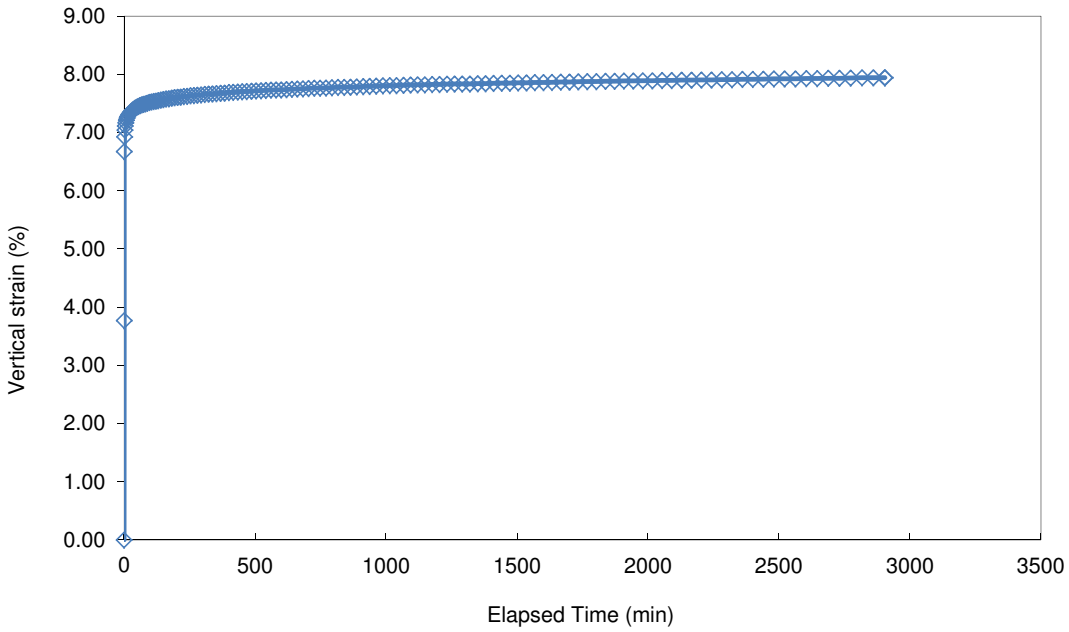
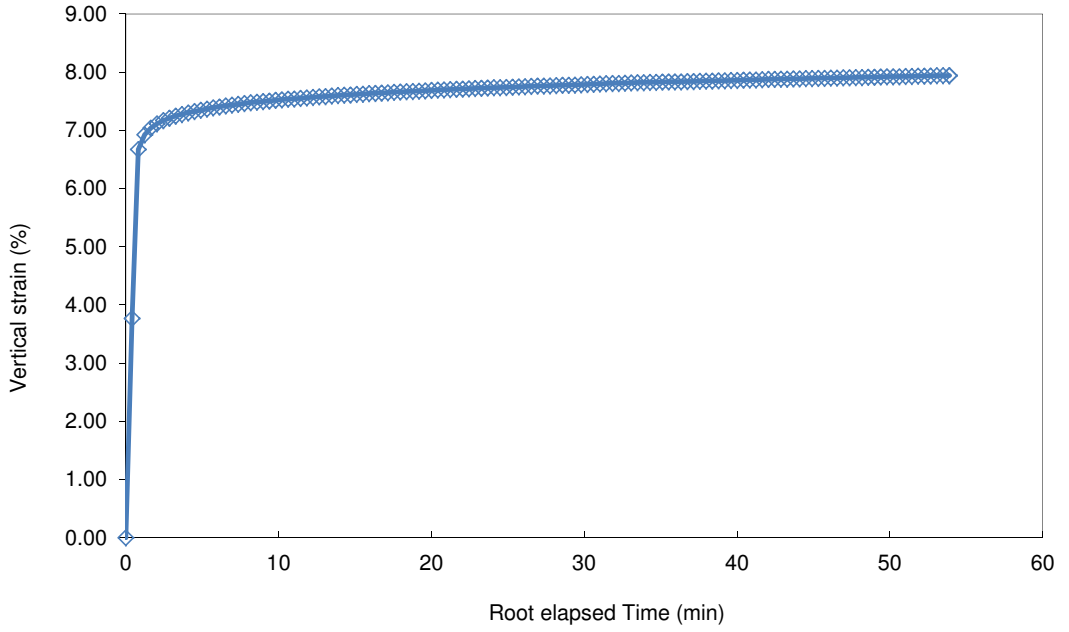
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

RGI
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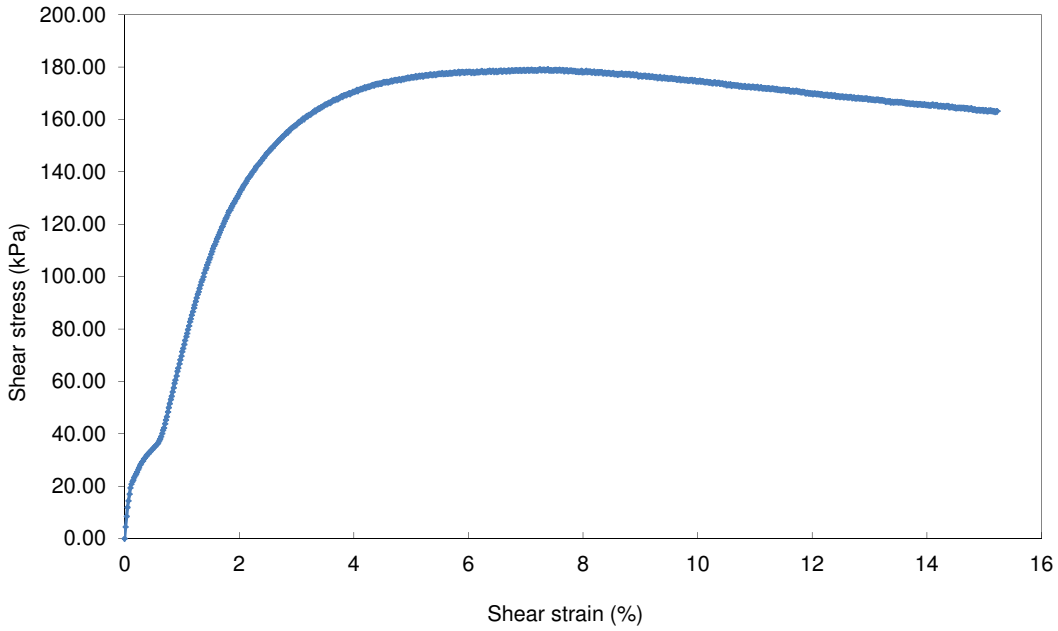
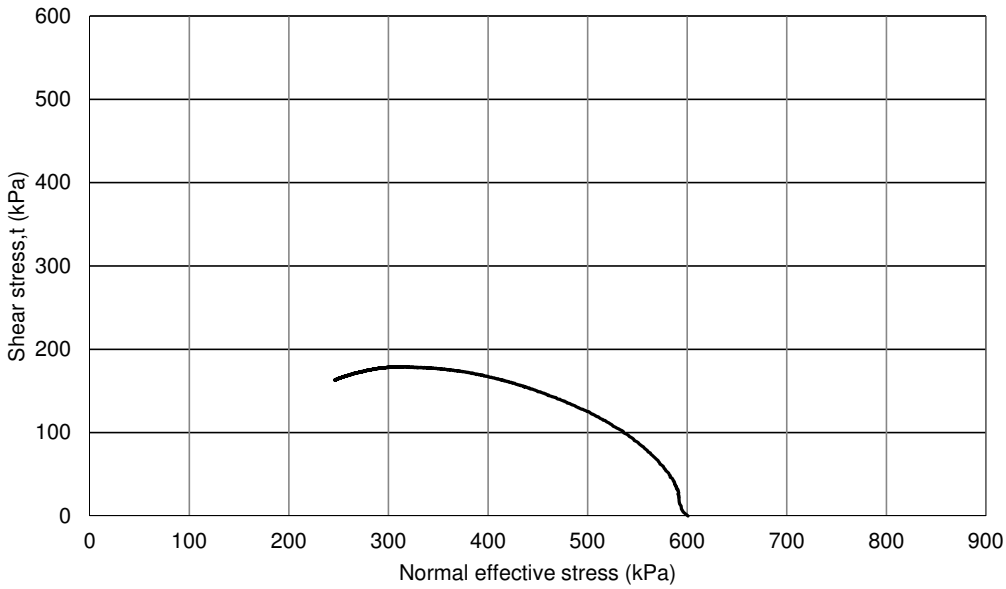
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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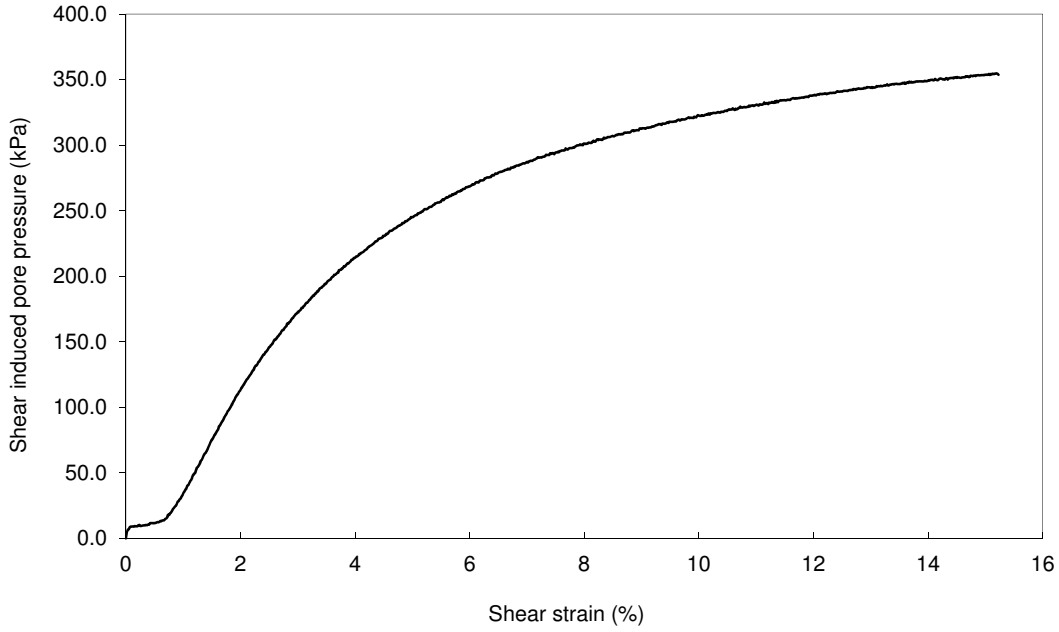
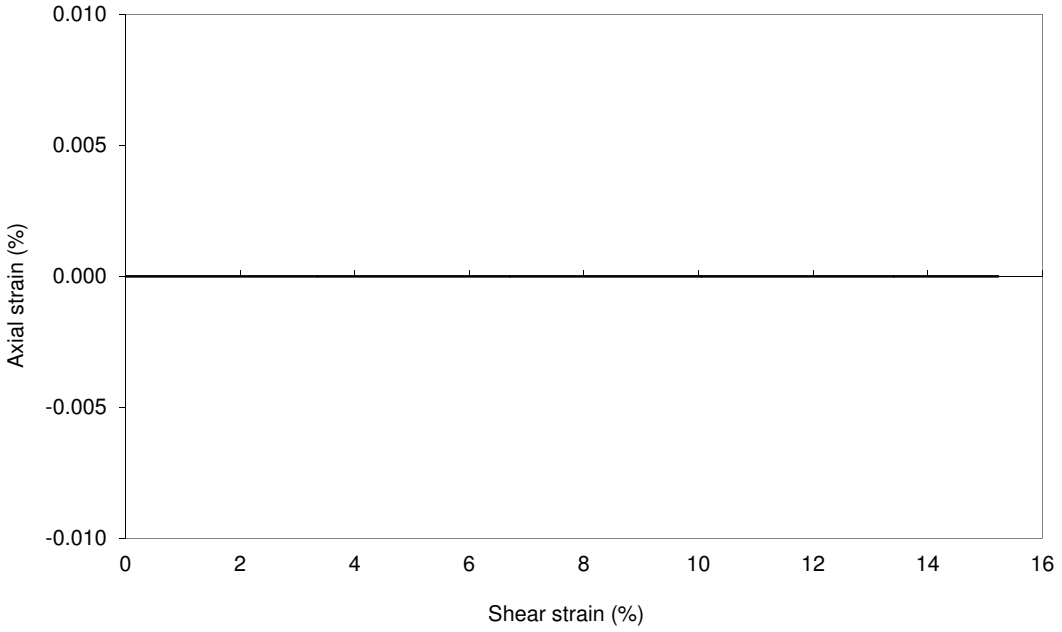
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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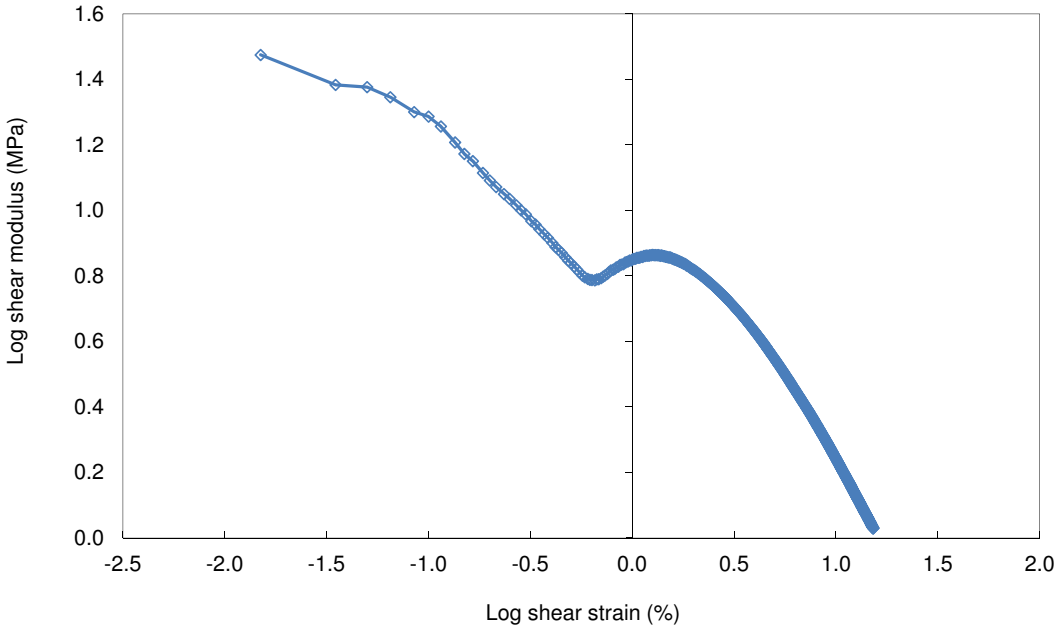
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey sandy CLAY with many lenses of
Sample Depth (m):	63.30-63.35	fine brown sand



Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSS)

Borehole Number:	MET TOWER	Description (visual) :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel

SPECIMEN DETAILS

Sample type:	Undisturbed			
Trimming Procedure:	Cutting Ring			
	Initial Values		Final Values	
Height :	21.4	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	28.09	%	28.58	%
Bulk density :	1.90	Mg/m^3		
Dry density :	1.48	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.8003			
Test Duration:			3	Days

END OF CONSOLIDATION #1

Height :	20.4	mm
Diameter :	66.4	mm
Axial strain	4.44	%
Normal stress	309.9	kPa
Voids ratio (e_o)	0.7203	
Max. Consolidation stress	309.9	kPa
Max. Consolidation strain	4.44	%
Duration	1291	Min.

END OF SWELLING STAGE #1

Height :	NA	mm
Diameter :	NA	mm
Axial strain	NA	%
Normal stress	NA	kPa
Voids ratio (e_o)	NA	
Max. Consolidation stress	NA	kPa
Max. Consolidation strain	NA	%
Duration	NA	Min.

SHEAR STAGE

At maximum shear stress:

Shear strain	18.43	%
Shear stress	115.57	kPa
Normal stress	172.46	kPa
Pore pressure	137.40	kPa
Axial strain	0.00	%
Shear modulus	0.63	Mpa

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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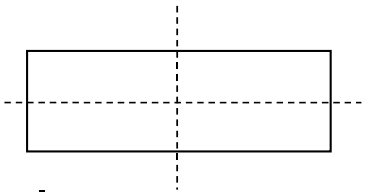
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel

SPECIMEN DETAILS

Initial Height:	21.4	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

Russell Geotechnical Innovations

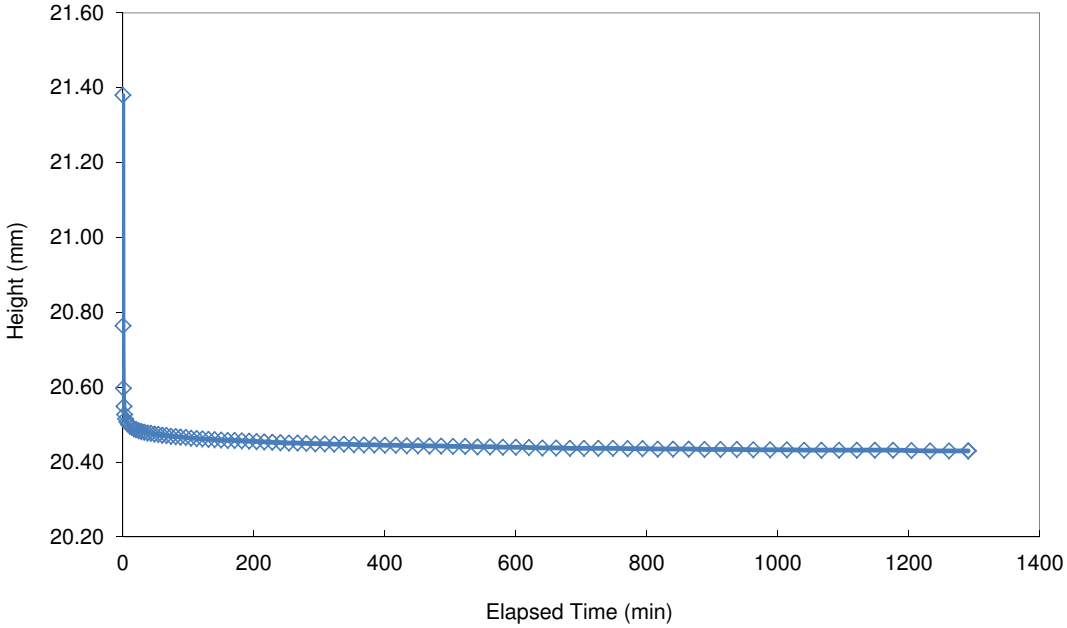
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

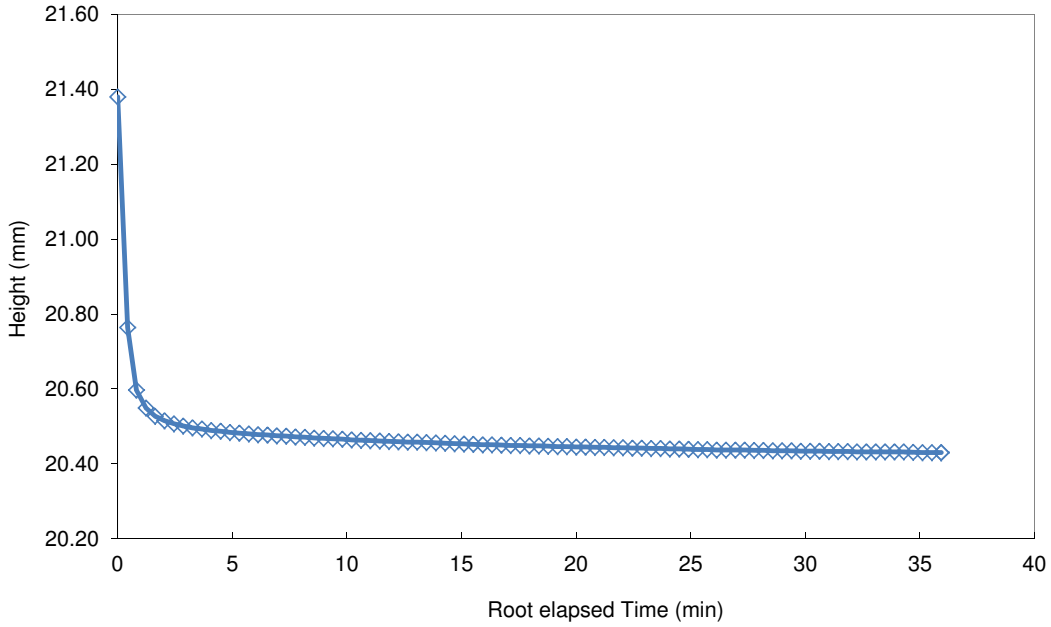
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSSmonotonic.xlsx]Sheet1

Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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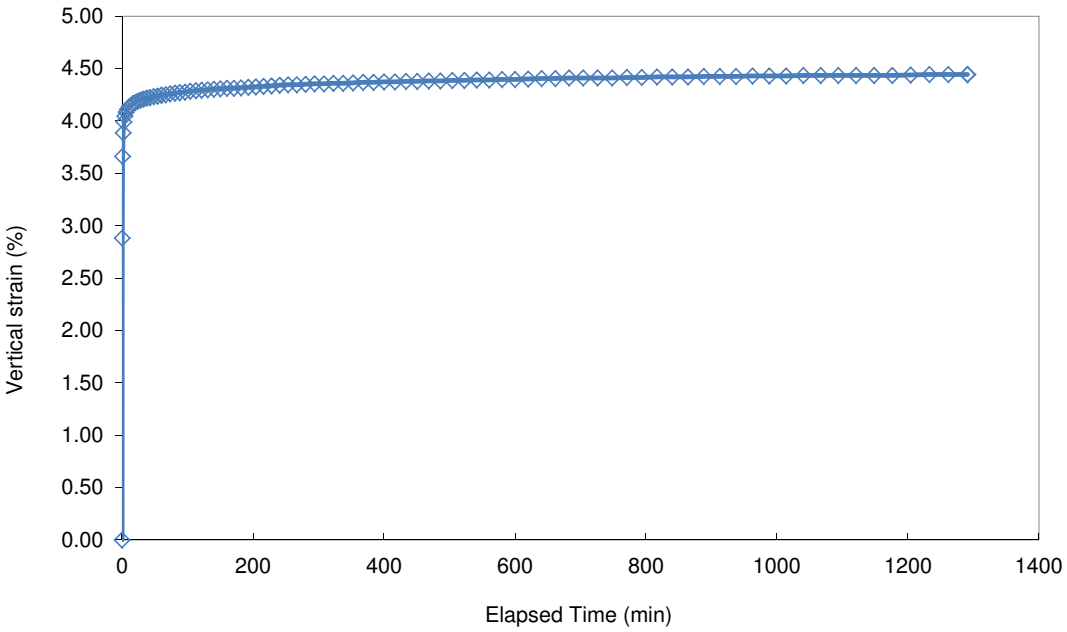
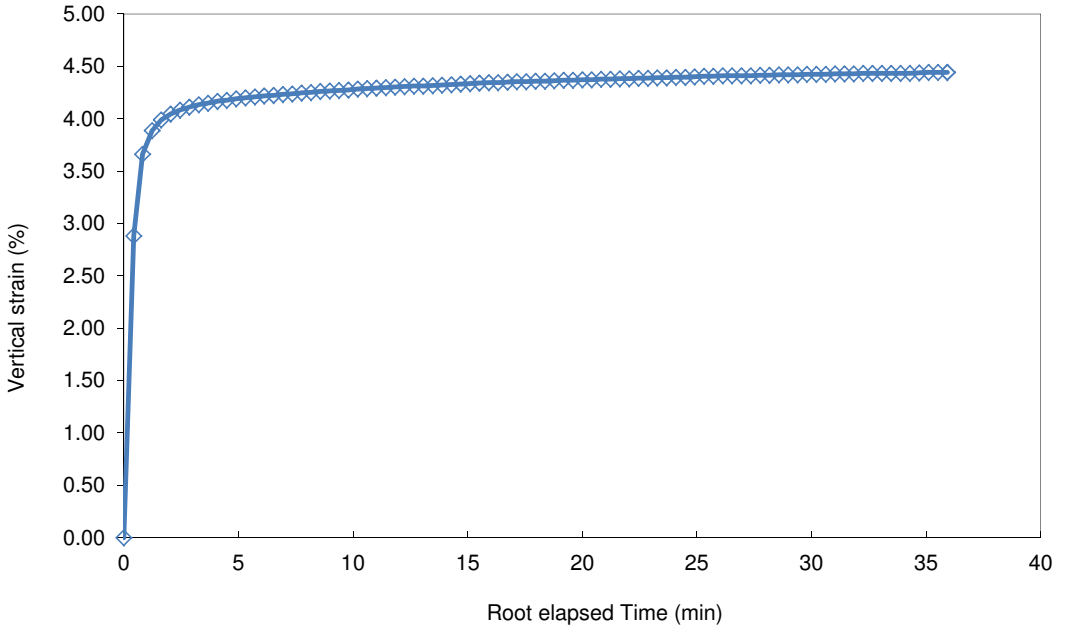
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel





Consolidation stage

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

RGI
Russell Geotechnical Innovations

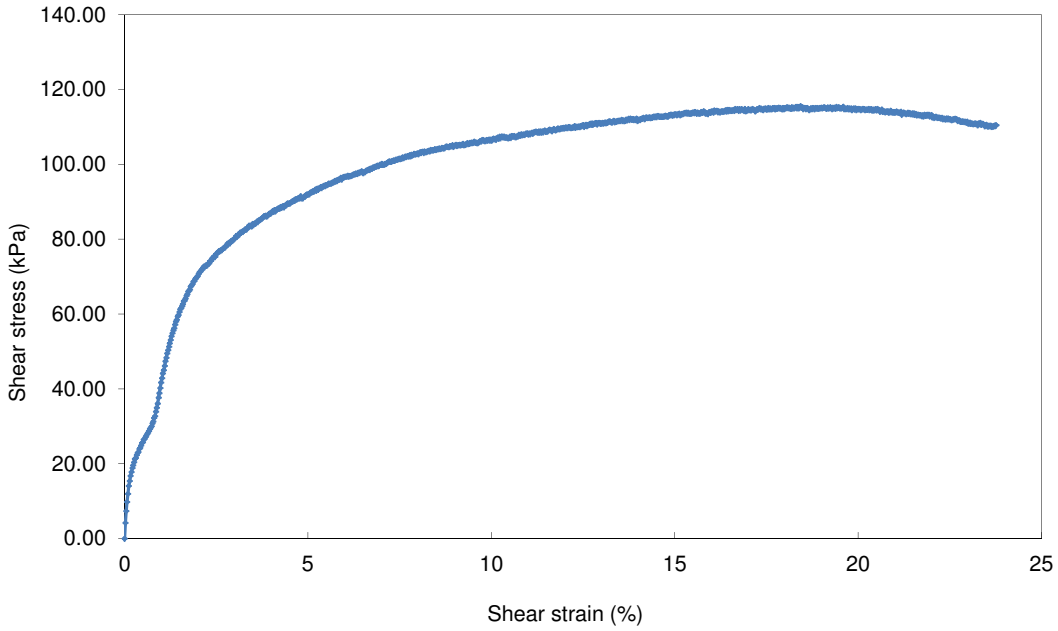
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

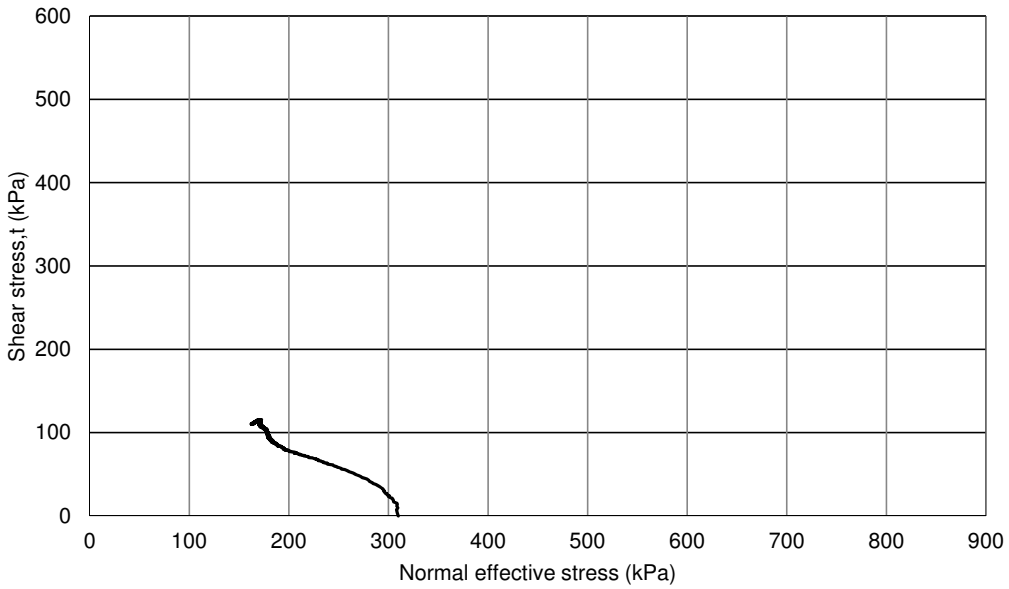
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSSmonotonic.xlsx]Sheet1

Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel





Monotonic simple shear

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

Russell Geotechnical Innovations

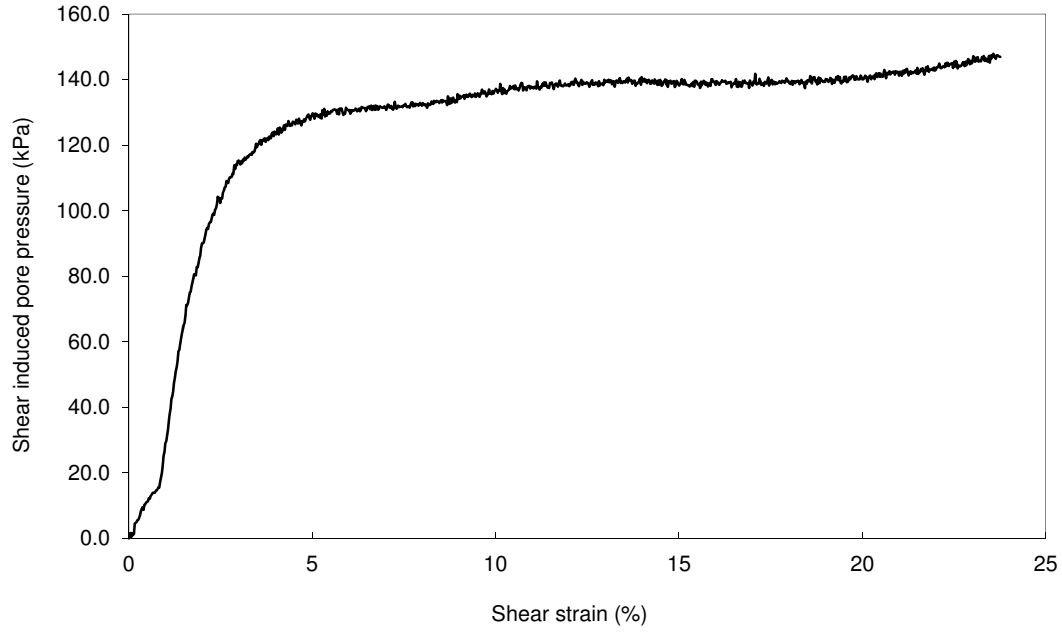
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

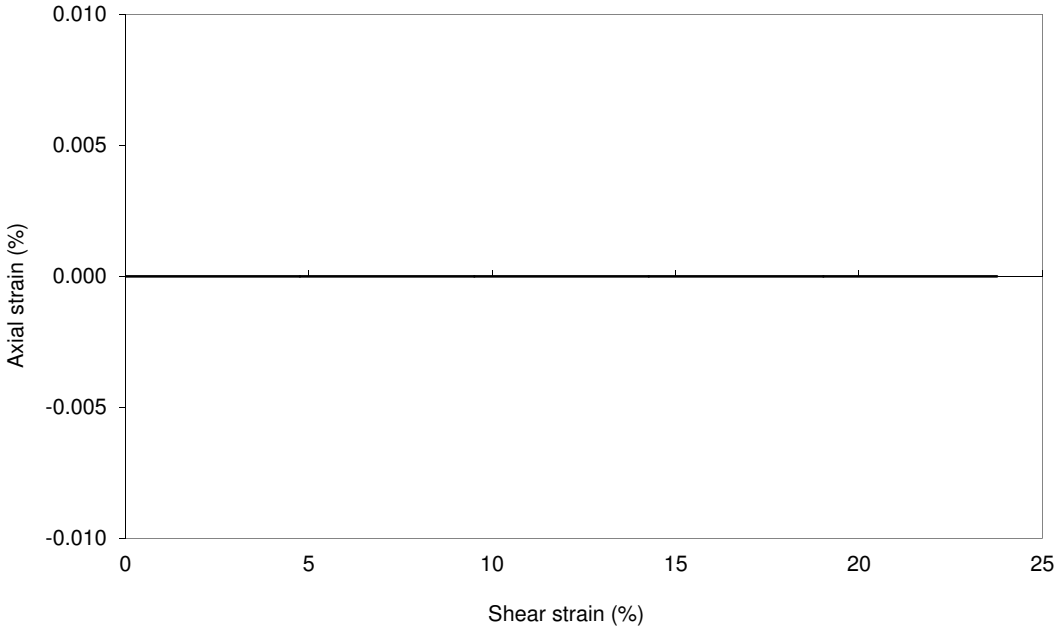
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSSmonotonic.xlsx]Sheet1

Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel





Monotonic simple shear

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

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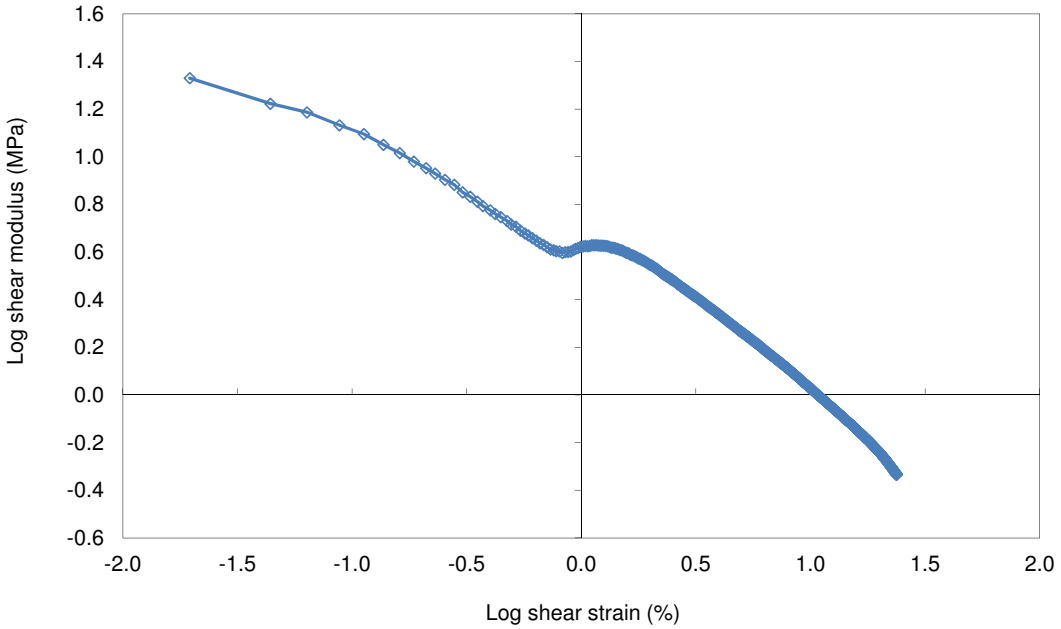
Consolidated Undrained Direct Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey silty clayey FINE SAND with shells
Sample Depth (m):	33.60-33.65	and occasional fine gravel



Monotonic simple shear

Checked and approved		Project Number:	**RGI/1130**
Initials:	*CSR*	Project Name:	**10451 U.S. WIND INC.**
Date:	08/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

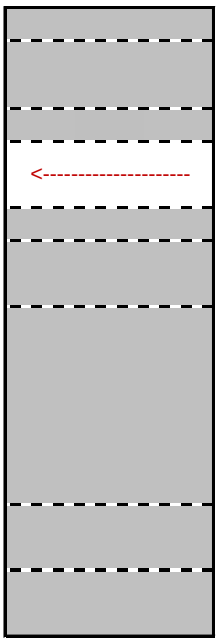
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSSmonotonic.xlsx]Sheet1

3.12 Cyclic DSS Test Results

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28

Initial specimen position, orientation and shear direction

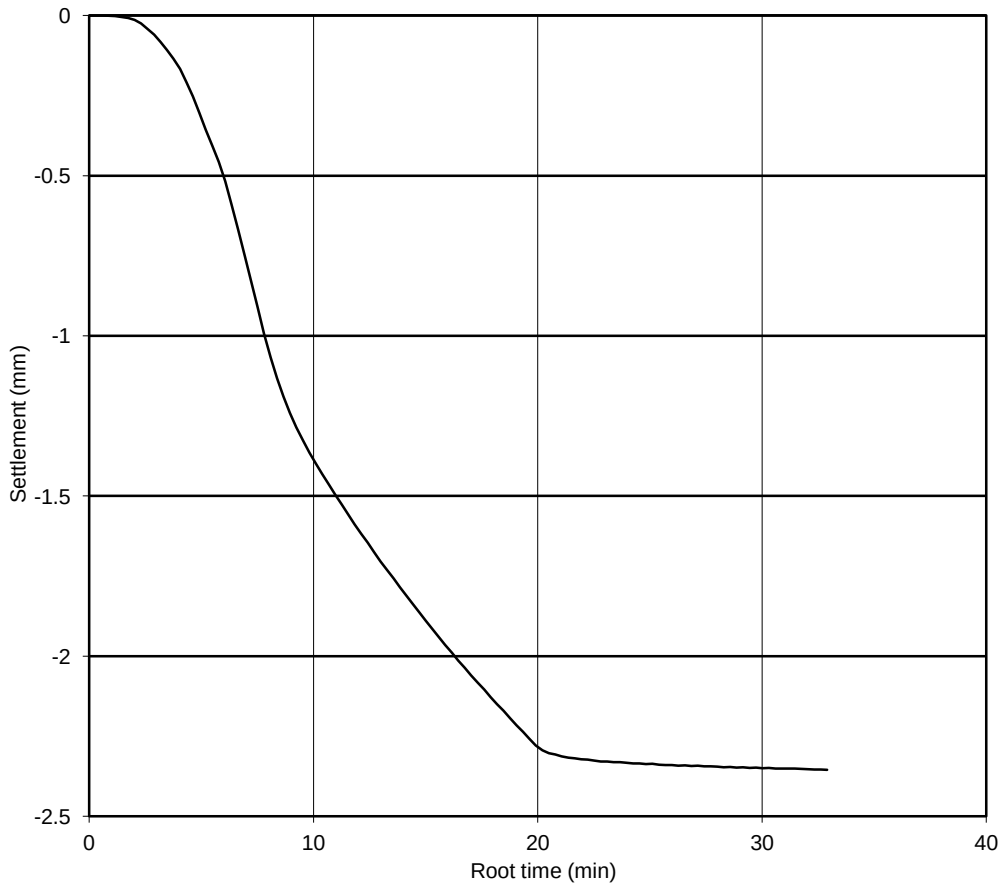


Position in sample
Middle
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.96		
Sample Weight		g
72.3		
Moisture Content		%
31.0		
Bulk Density	P	Mg/m^3
1.845		
Dry Density	P_d	Mg/m^3
1.409		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.917		
Degree of Saturation	S_o	
91.18		
Seating Pressure		kPa
2.5		

Consolidation Stage



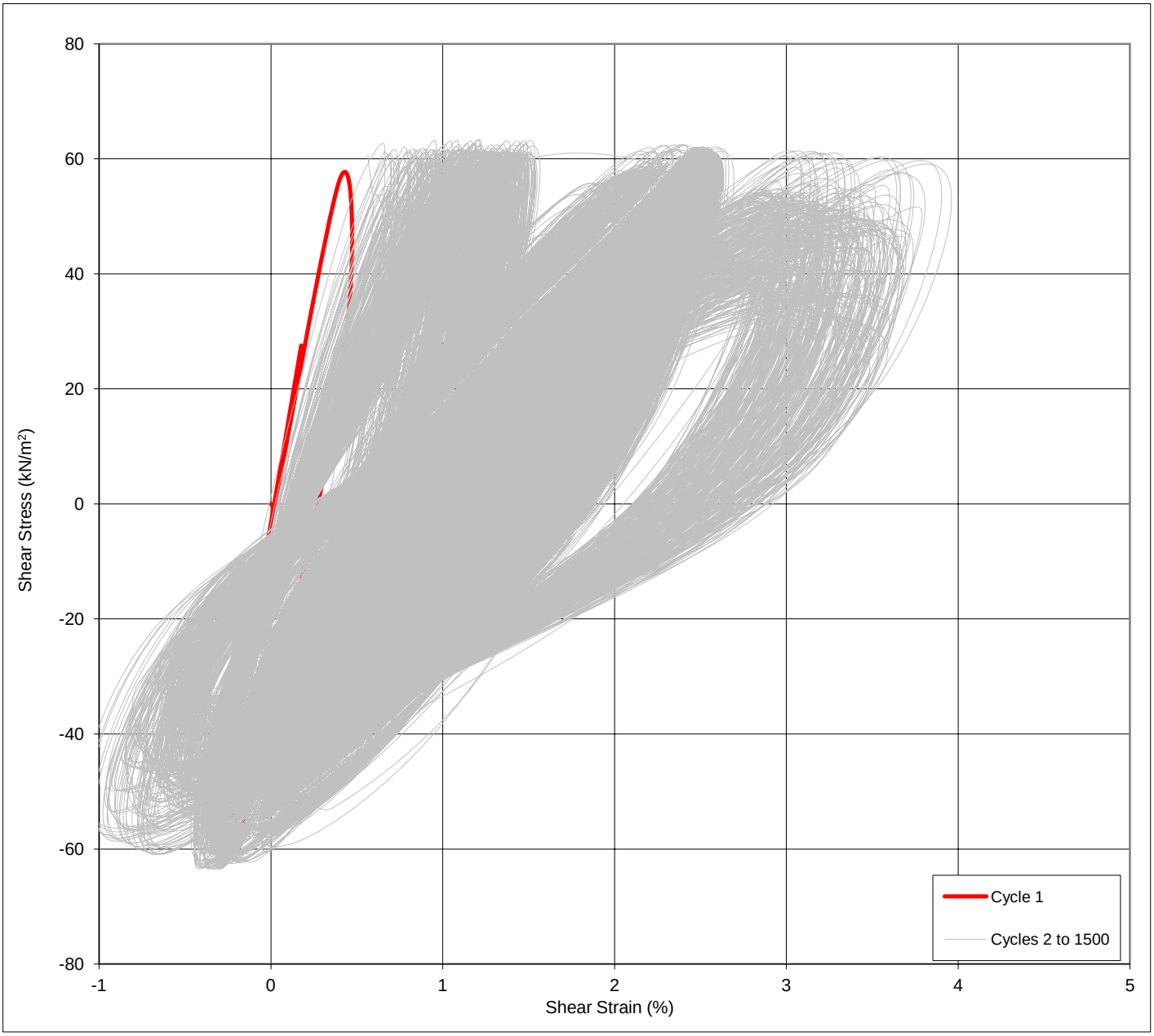
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	228
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	11.78
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	228
Vertical strain at end of consolidation	
ε_{vc} (%)	11.78

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	228
τ_{ref}	
kN/m^2	79
Frequency	
Hz	0.1

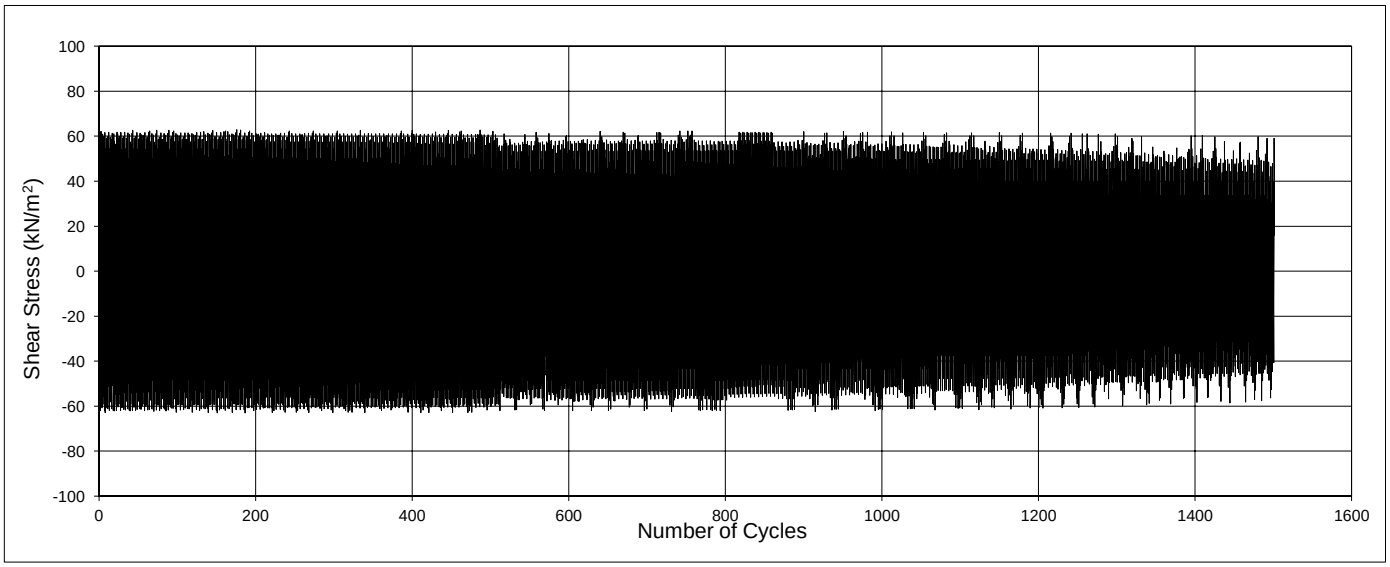
τ_{ave} / σ_{ref}	
	0
τ_{ave}	
kN/m^2	0
τ_{cy} / σ_{ref}	
	0.8
τ_{cyc}	
kN/m^2	63

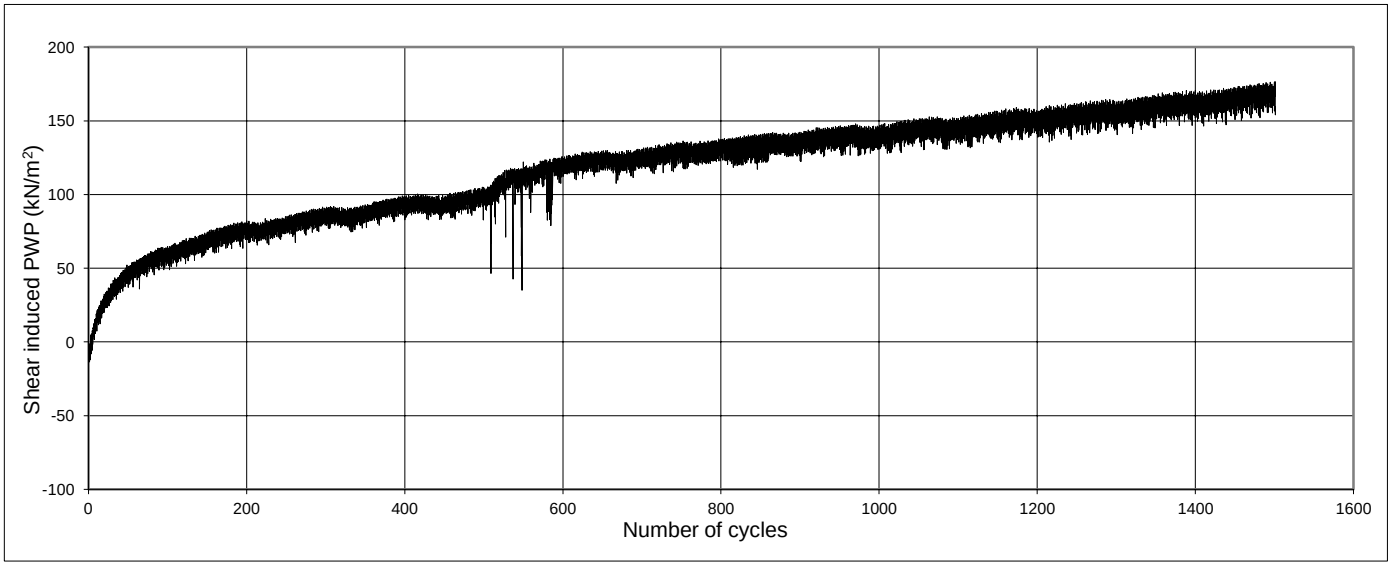
Cyclic Results

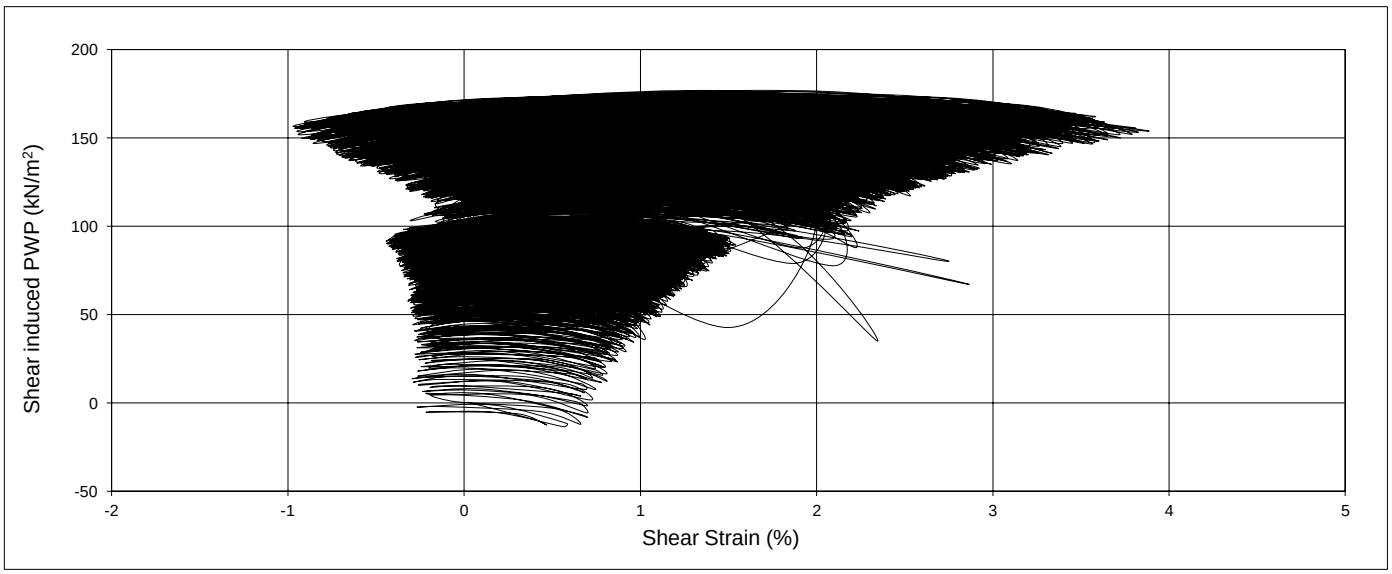
Number of Cycles at Failure	
N_f	1500
Change in PWP at failure	
Δu at N_f (kPa)	157
Average strain at failure	
γ_a at N_f (%)	1.29
Permanent strain at failure	
γ_p at N_f (%)	2.06
Cyclic strain at failure	
γ_{cy} at N_f (%)	1.87

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28

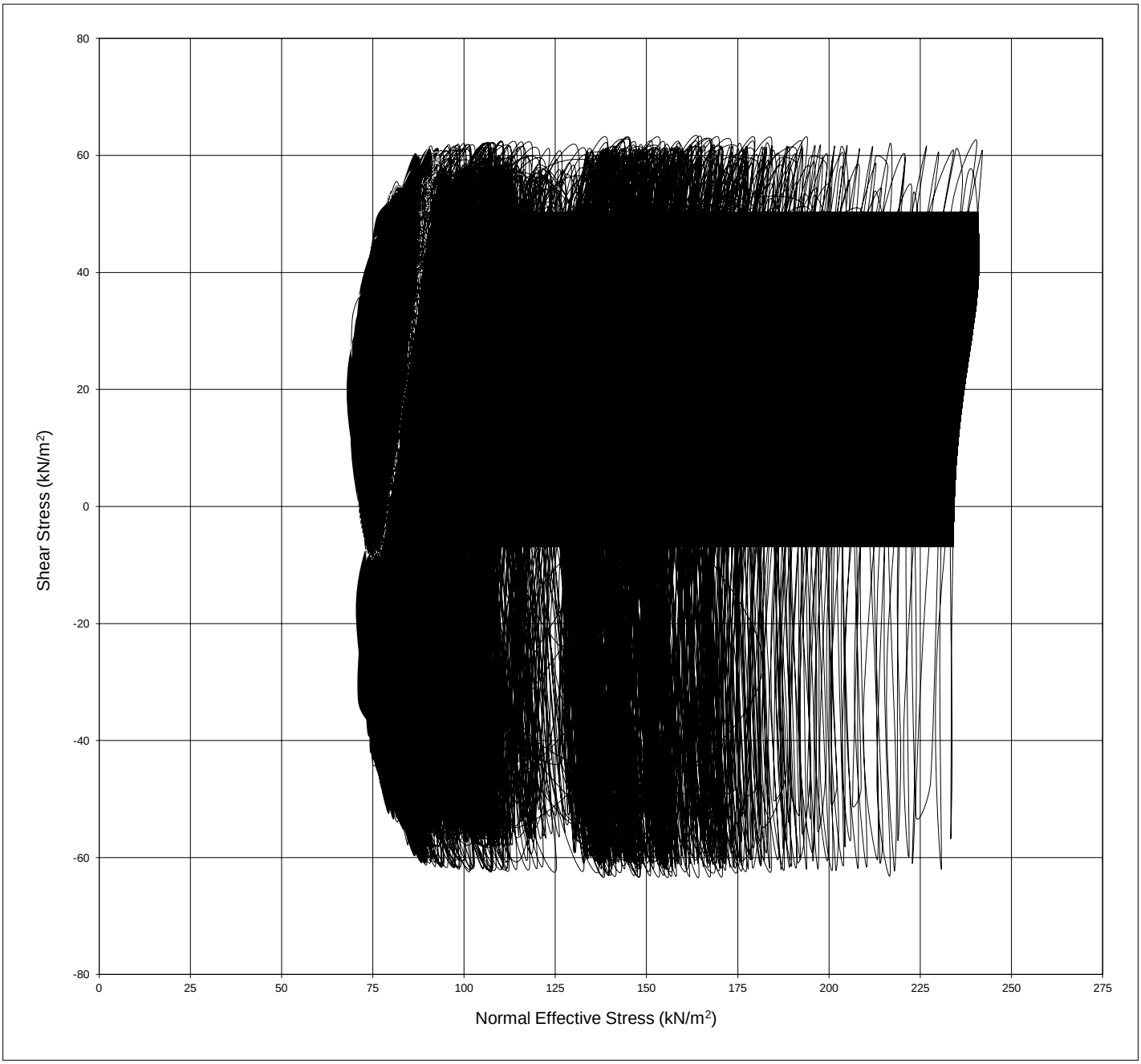






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

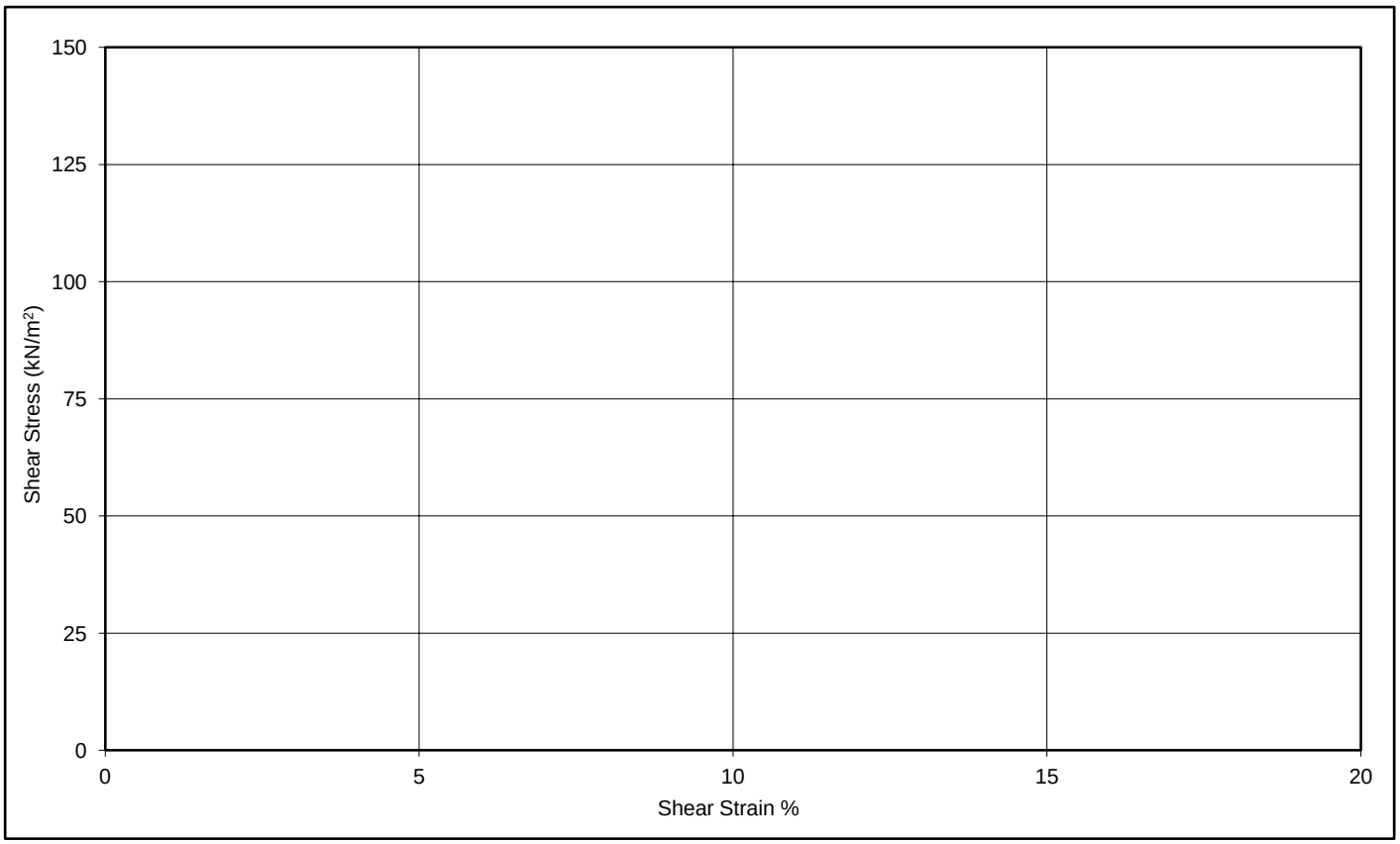
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28

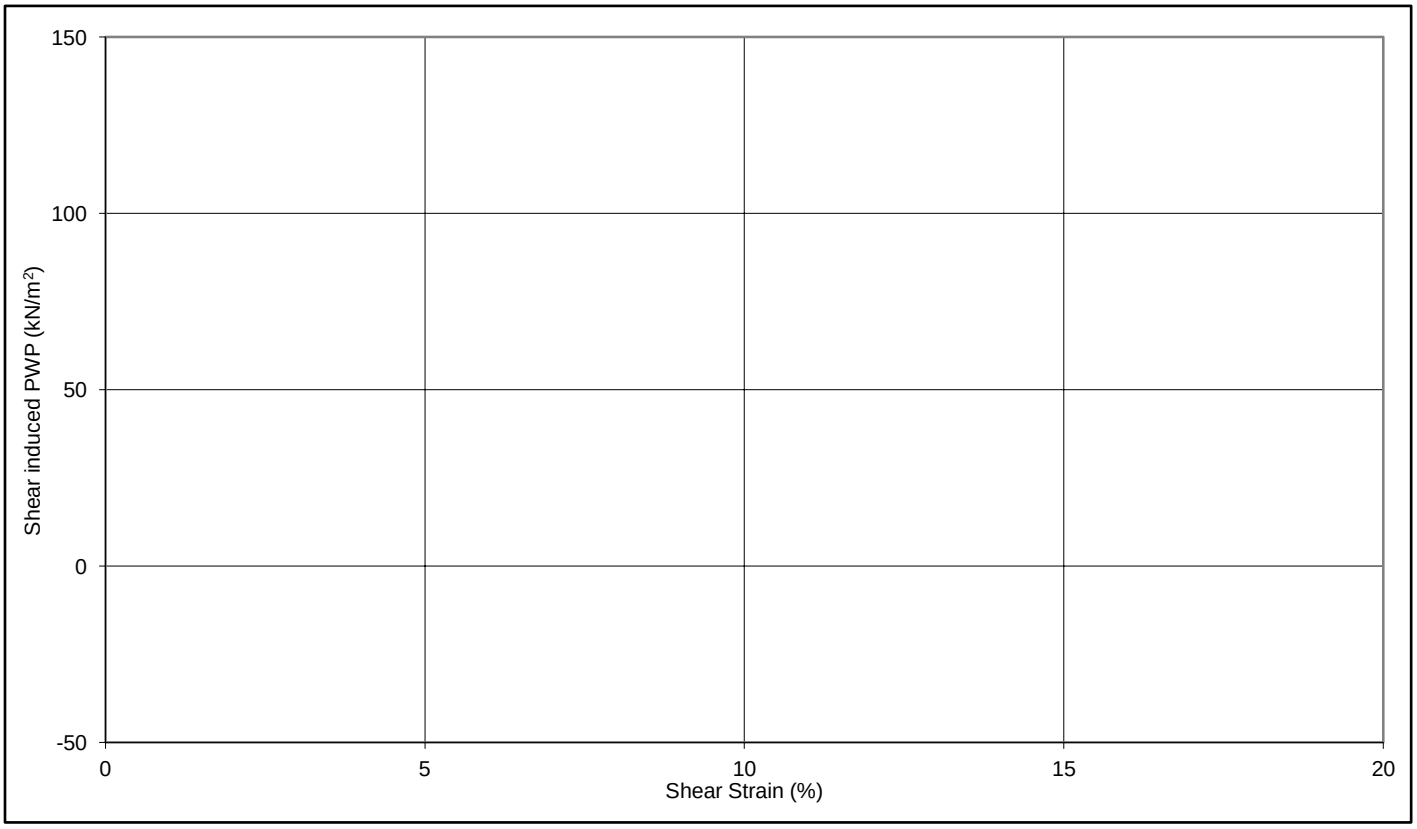


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28

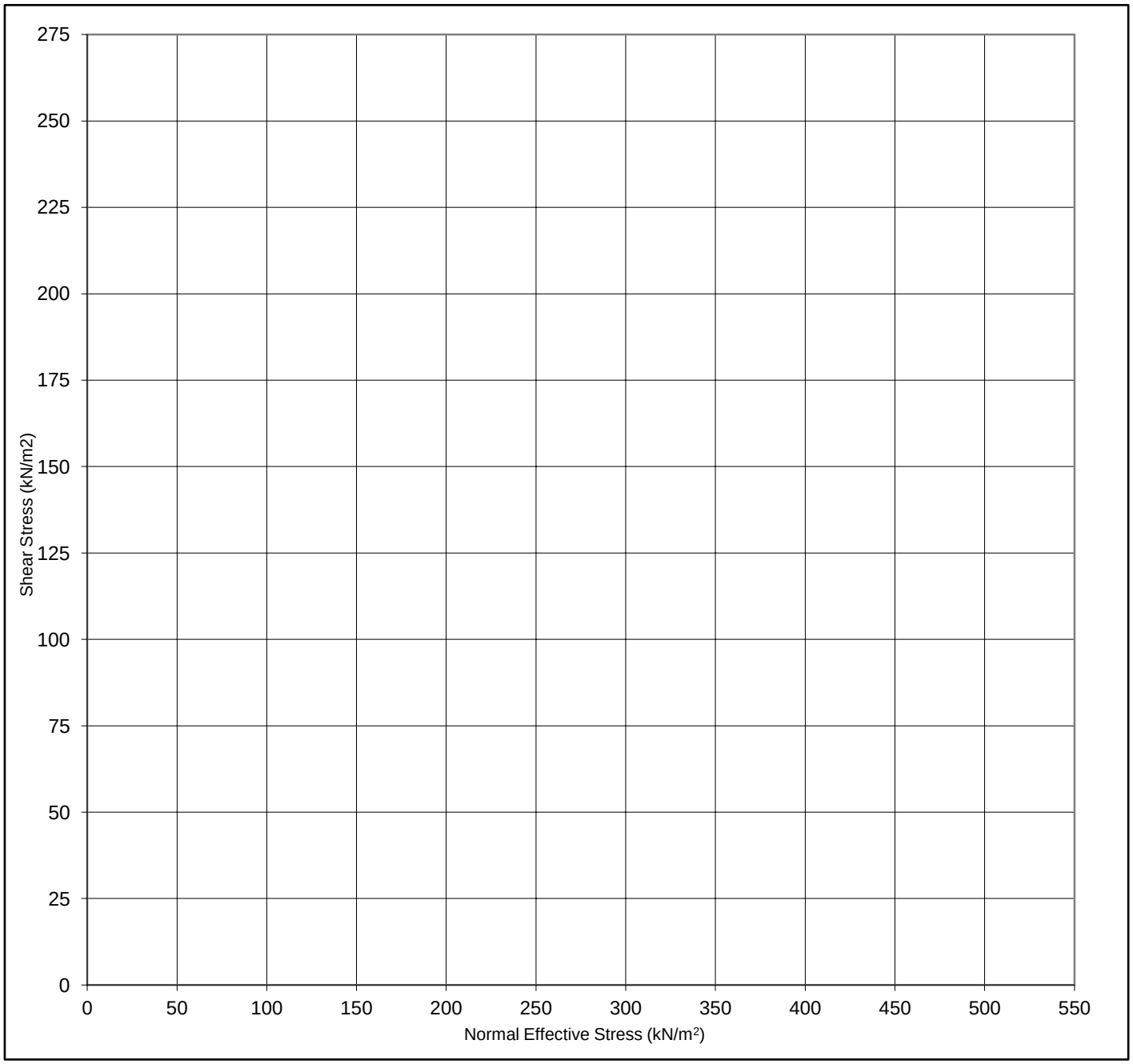
Shear Stage





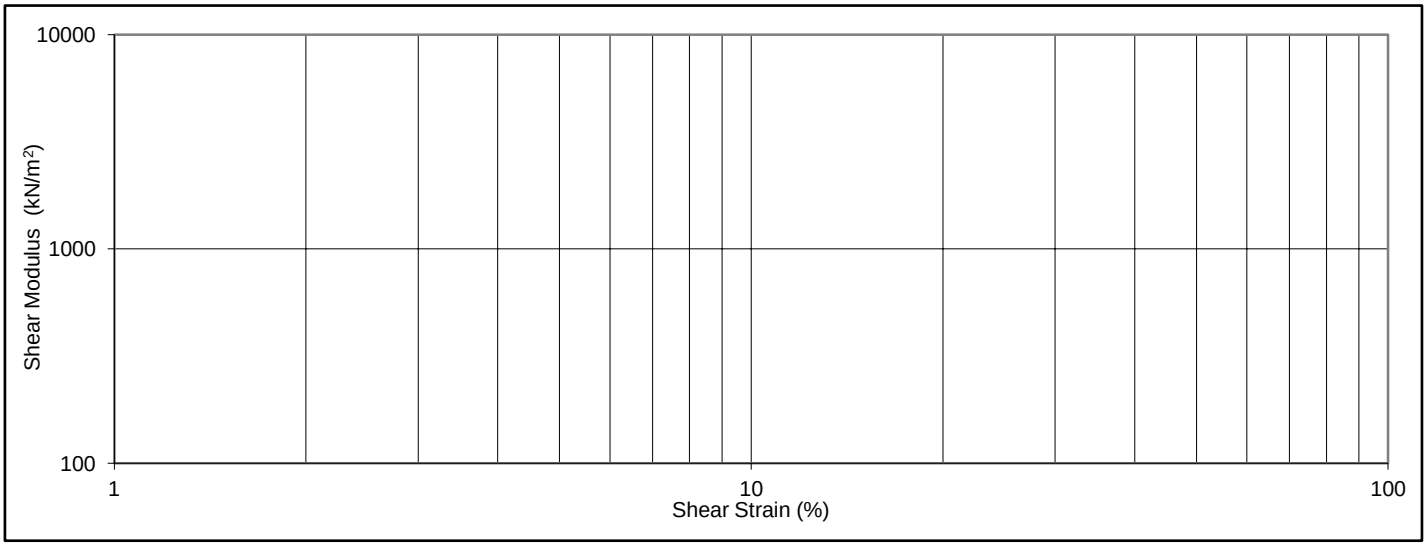
Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

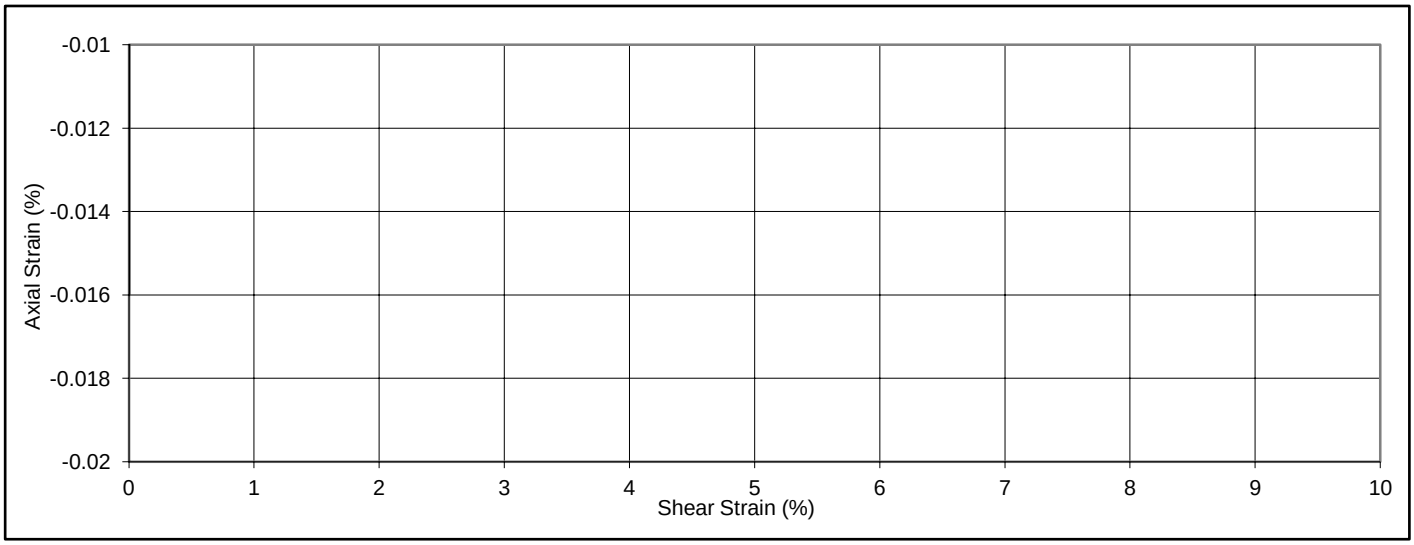
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28



Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, dark grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.26-23.28





Final Specimen Details

Sample Height	mm
17.64	
Sample Diameter	mm
49.96	
Sample Weight	g
72.78	
Moisture Content	%
28.8	
Bulk Density	Mg/m^3
1.856	
Dry Density P_d	Mg/m^3
1.441	
Voids Ratio e_o	
0.874	
Degree of Saturation S_o	
89.02	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

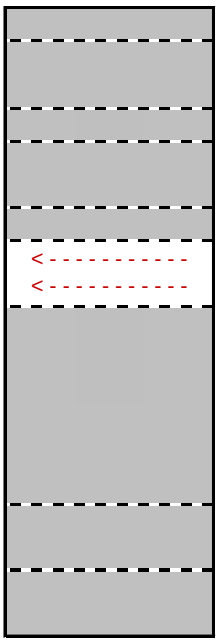
Picture Key
Top Picture
Side photo of failure along sample
Bottom Picture
Failure of sample pulled along natural line.

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

Initial specimen position, orientation and shear direction

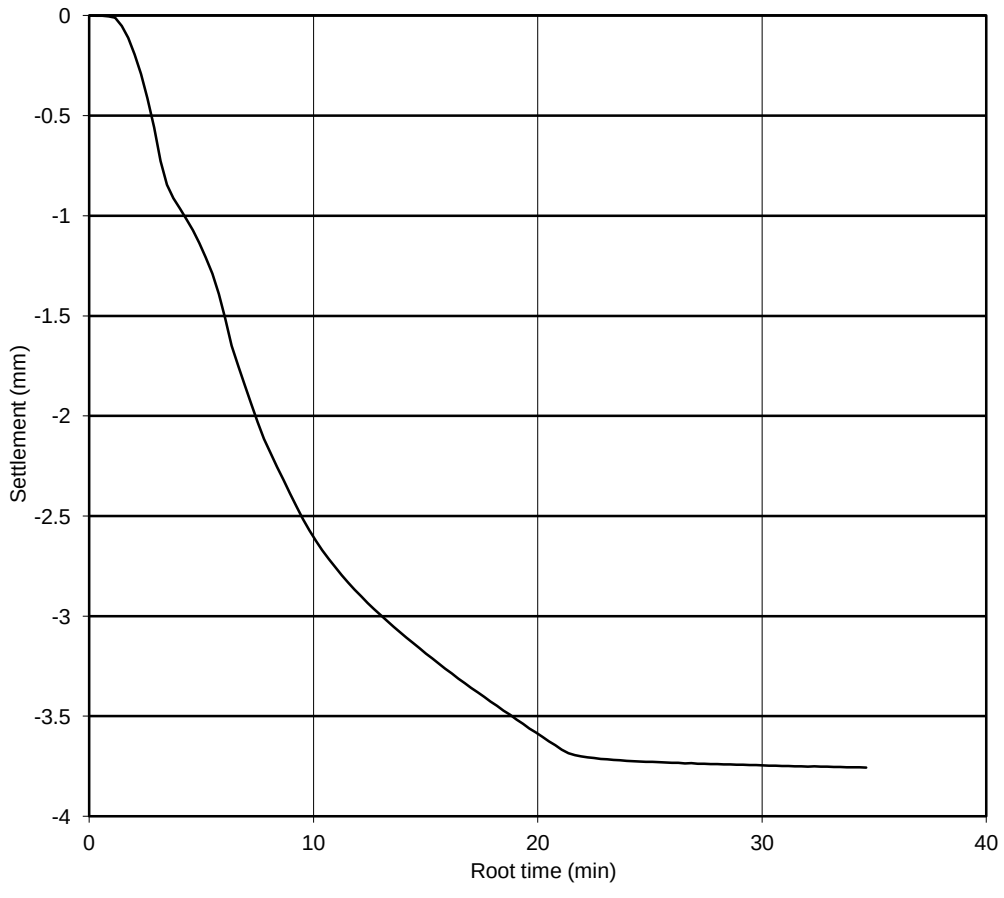


Position in sample
Middle
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.97		
Sample Weight		g
72.32		
Moisture Content		%
36.6		
Bulk Density	P	Mg/m^3
1.845		
Dry Density	P_d	Mg/m^3
1.351		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.998		
Degree of Saturation	S_o	
98.92		
Seating Pressure		kPa
2.5		

Consolidation Stage



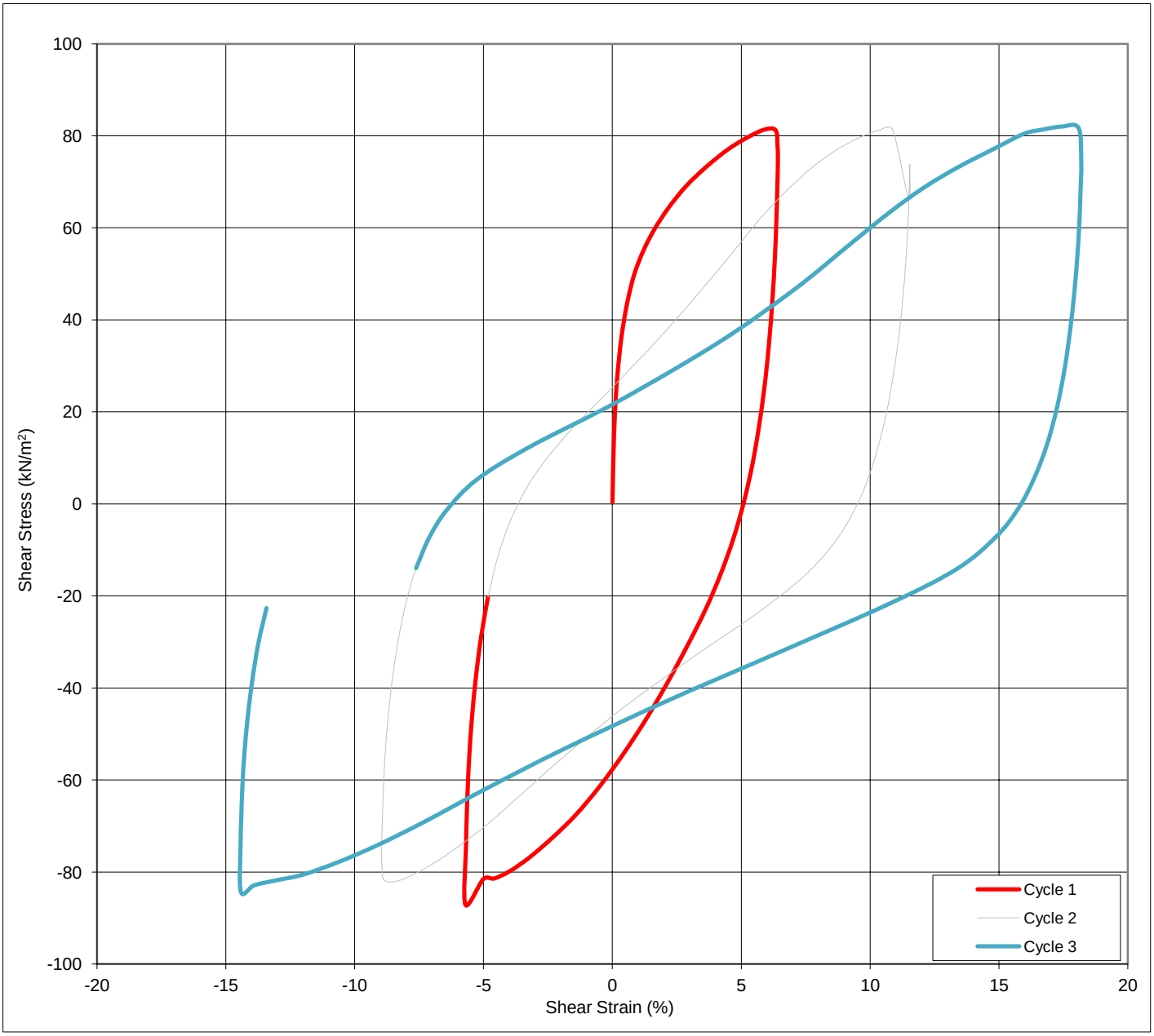
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	228
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	18.79
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	228
Vertical strain at end of consolidation	
ε_{vc} (%)	18.79

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	228
τ_{ref}	
kN/m^2	79
Frequency	
Hz	0.1

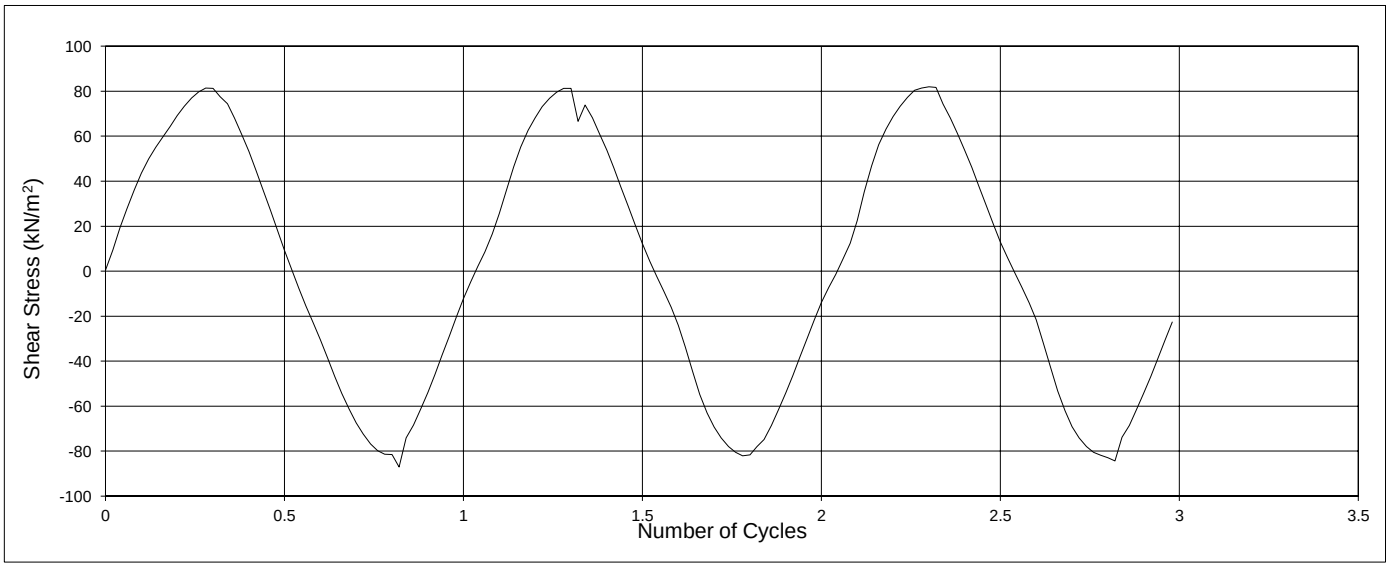
τ_{ave} / σ_{ref}	
	0
τ_{ave}	
kN/m^2	0
τ_{cy} / σ_{ref}	
	1.1
τ_{cyc}	
kN/m^2	87

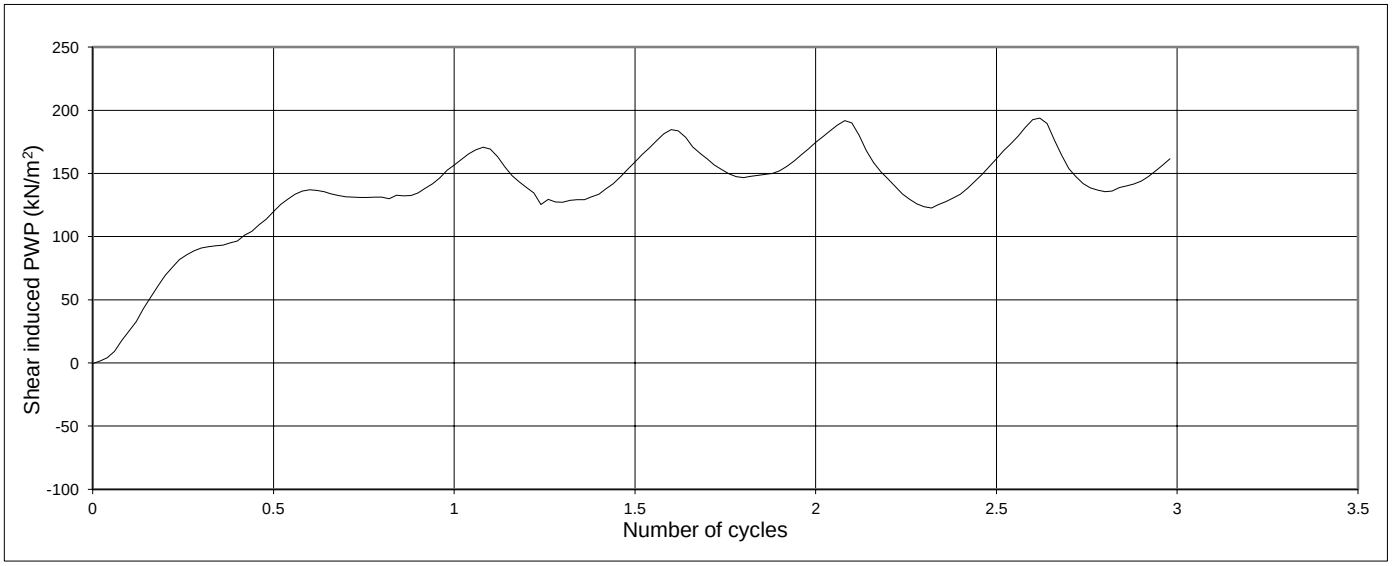
Cyclic Results

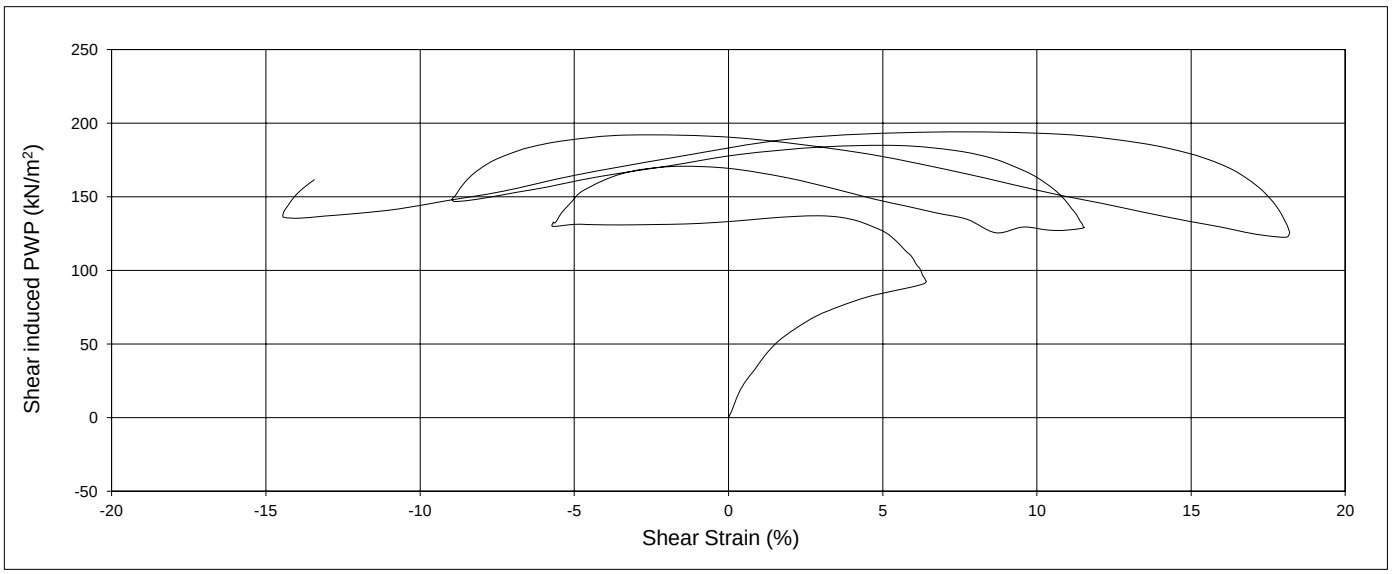
Number of Cycles at Failure	
N_f	3
Change in PWP at failure	
Δu at N_f (kPa)	162
Average strain at failure	
γ_a at N_f (%)	1.88
Permanent strain at failure	
γ_p at N_f (%)	-5.27
Cyclic strain at failure	
γ_{cy} at N_f (%)	16.31

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

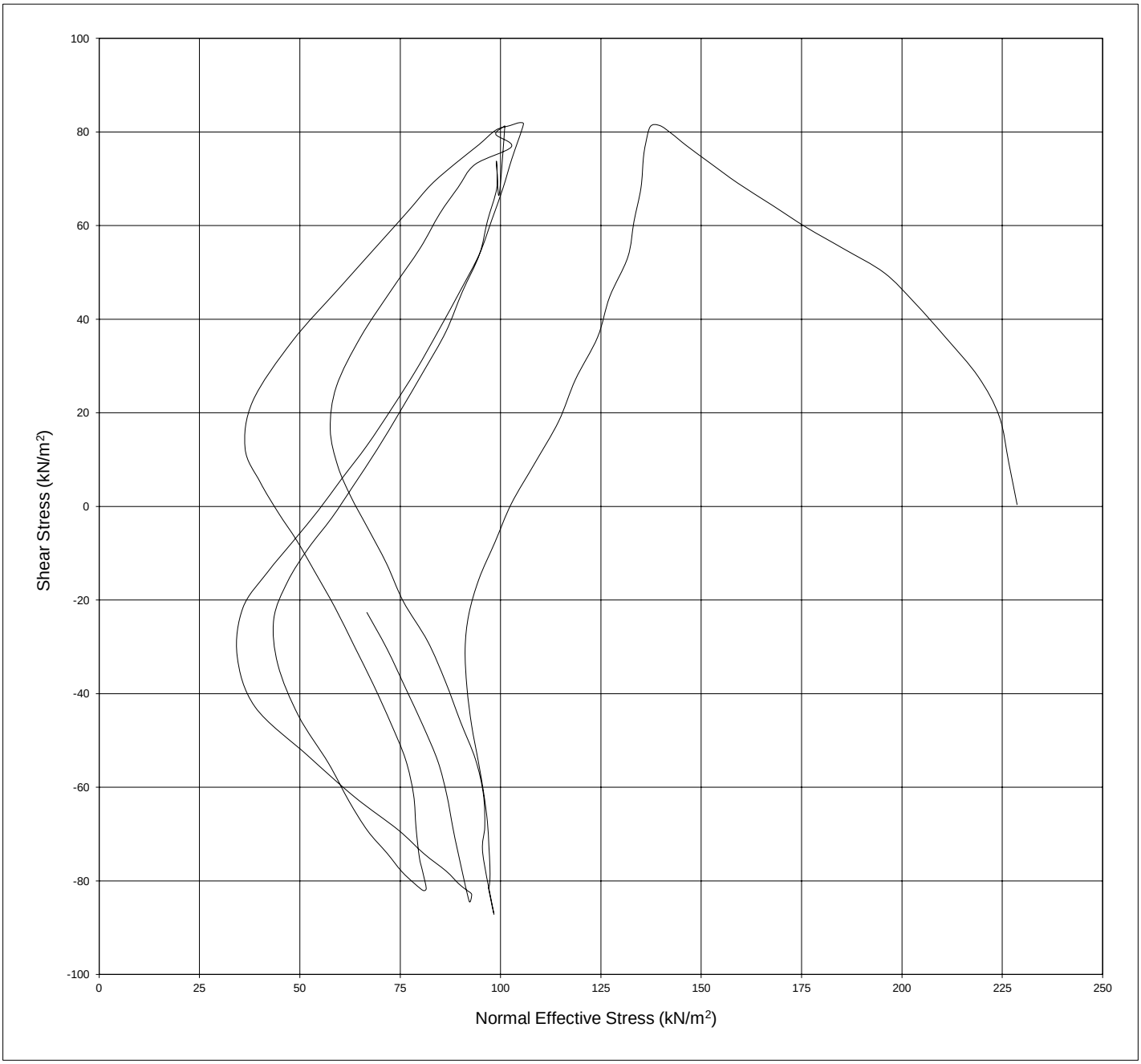






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

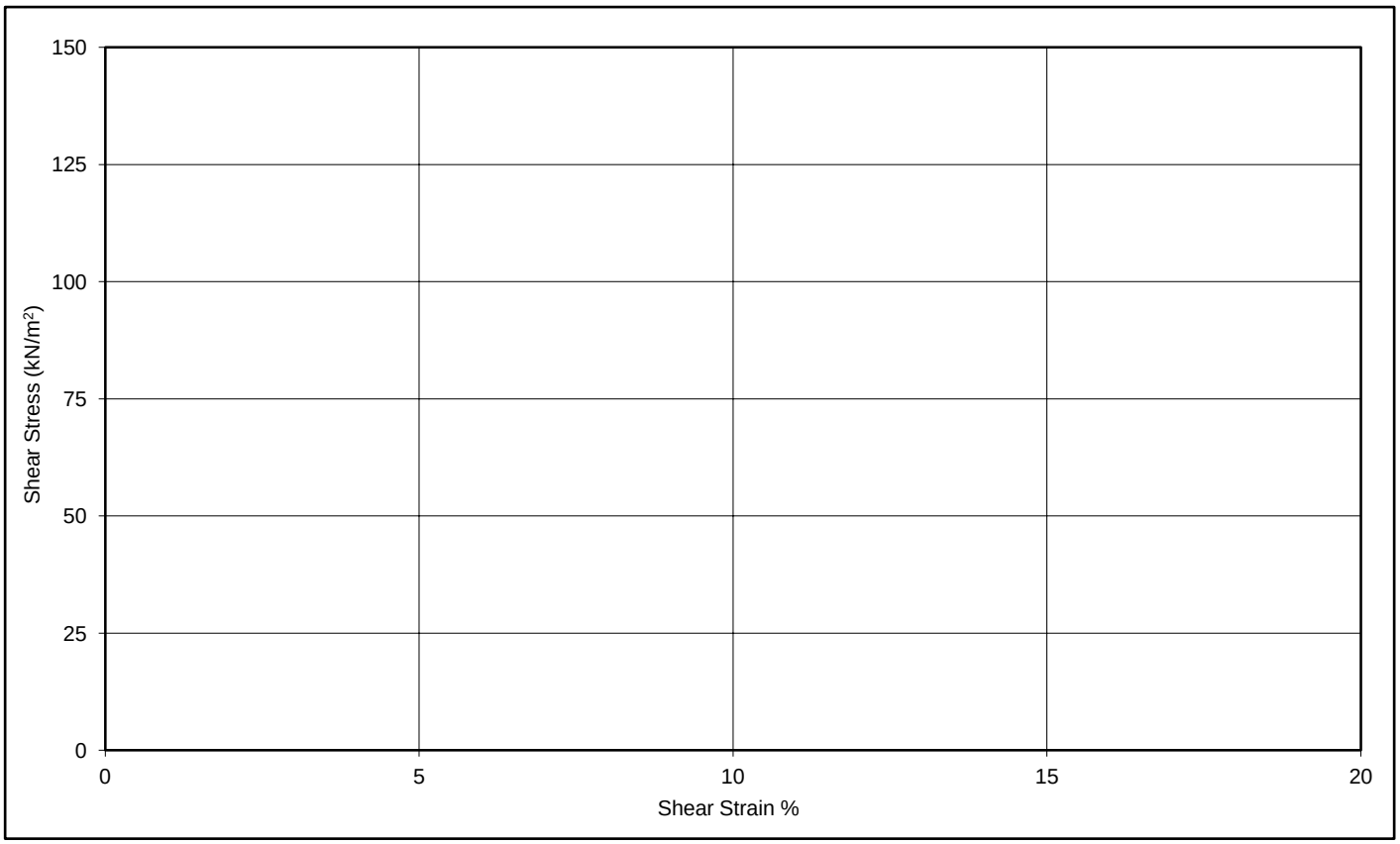
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

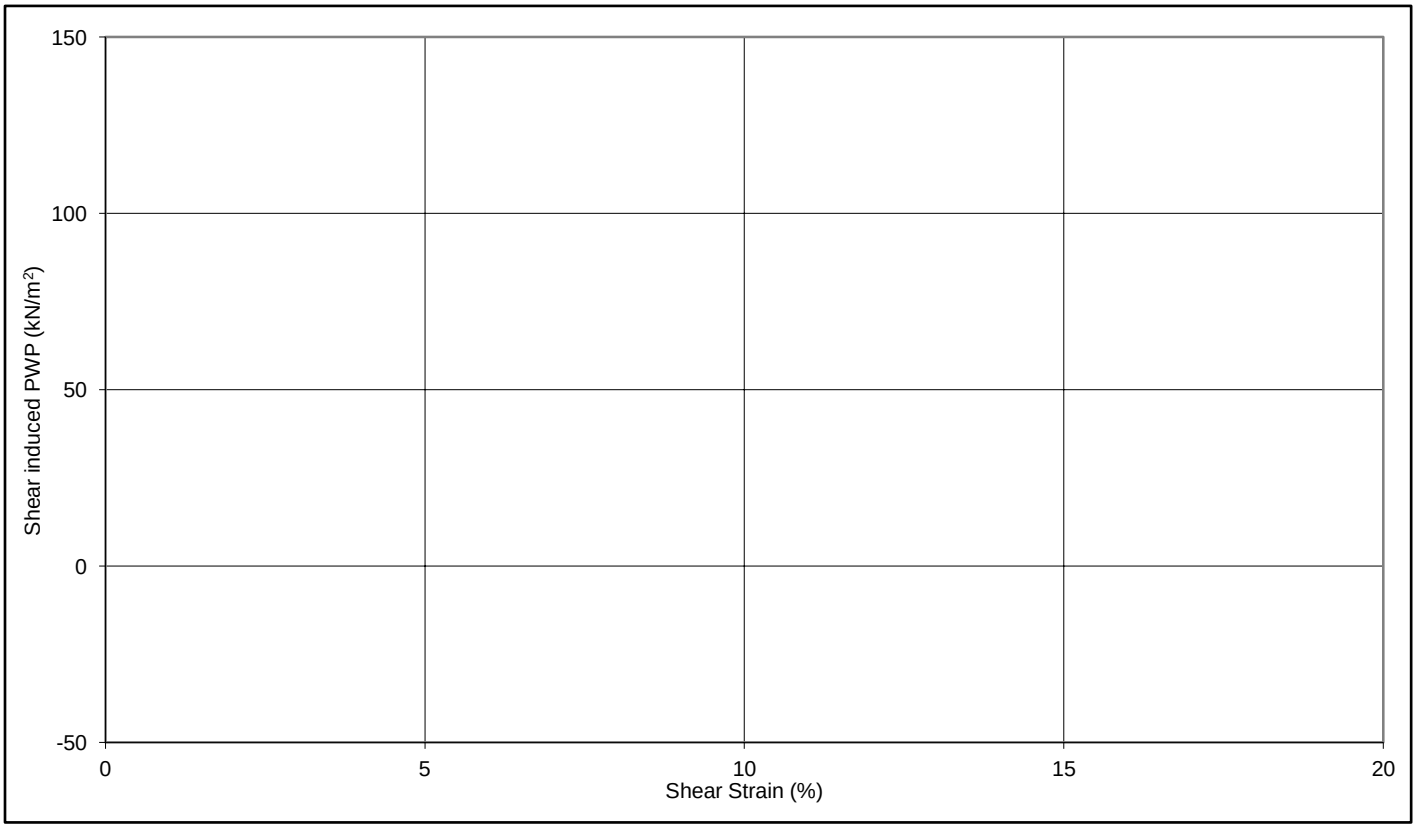


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

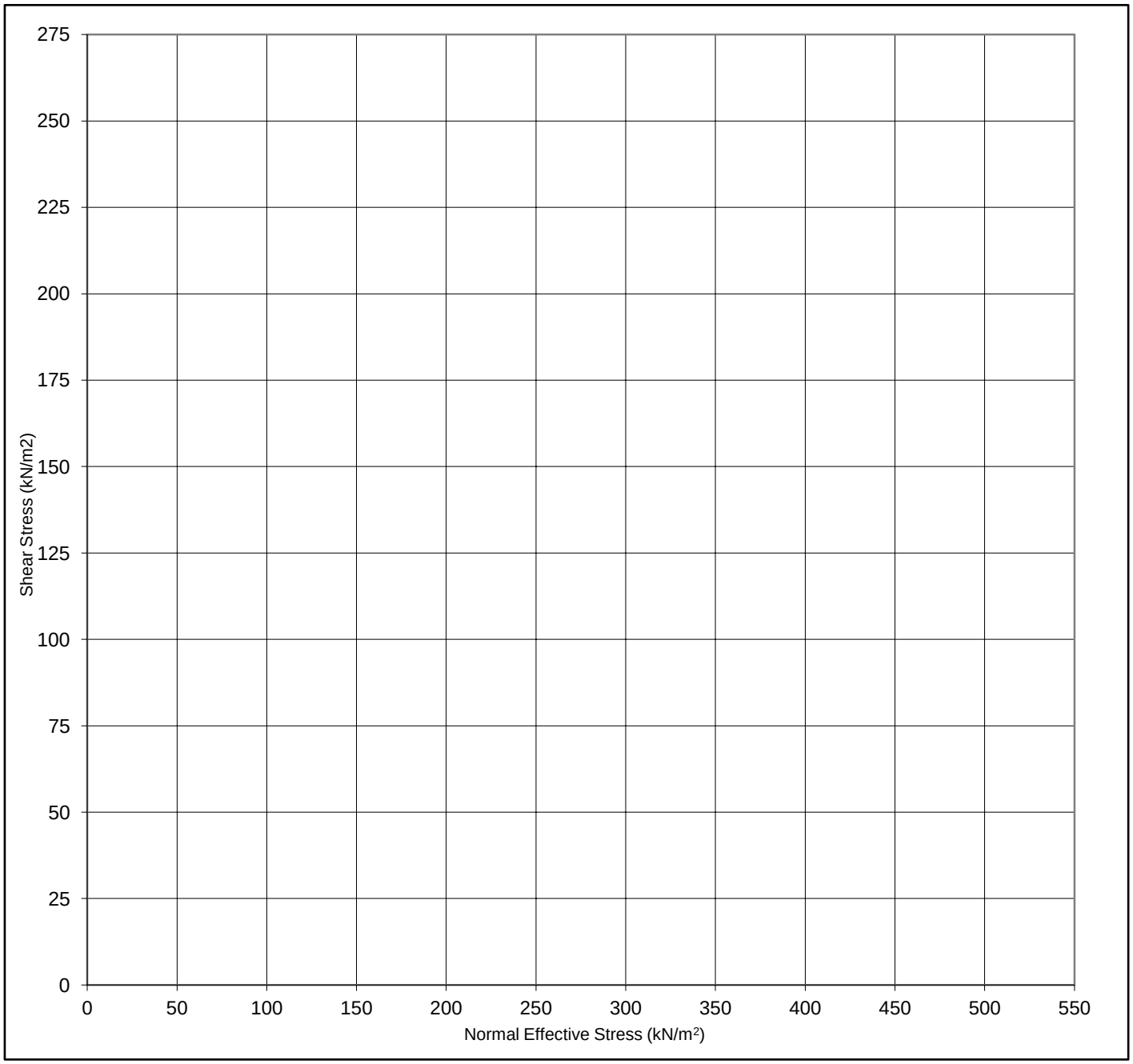
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

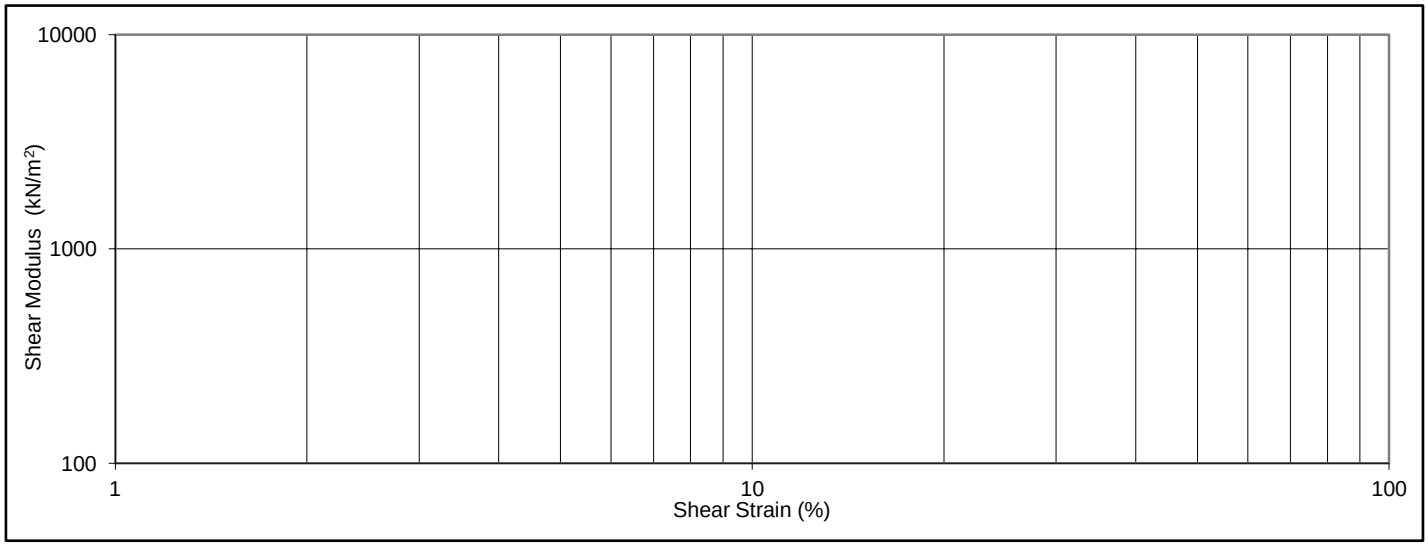
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32

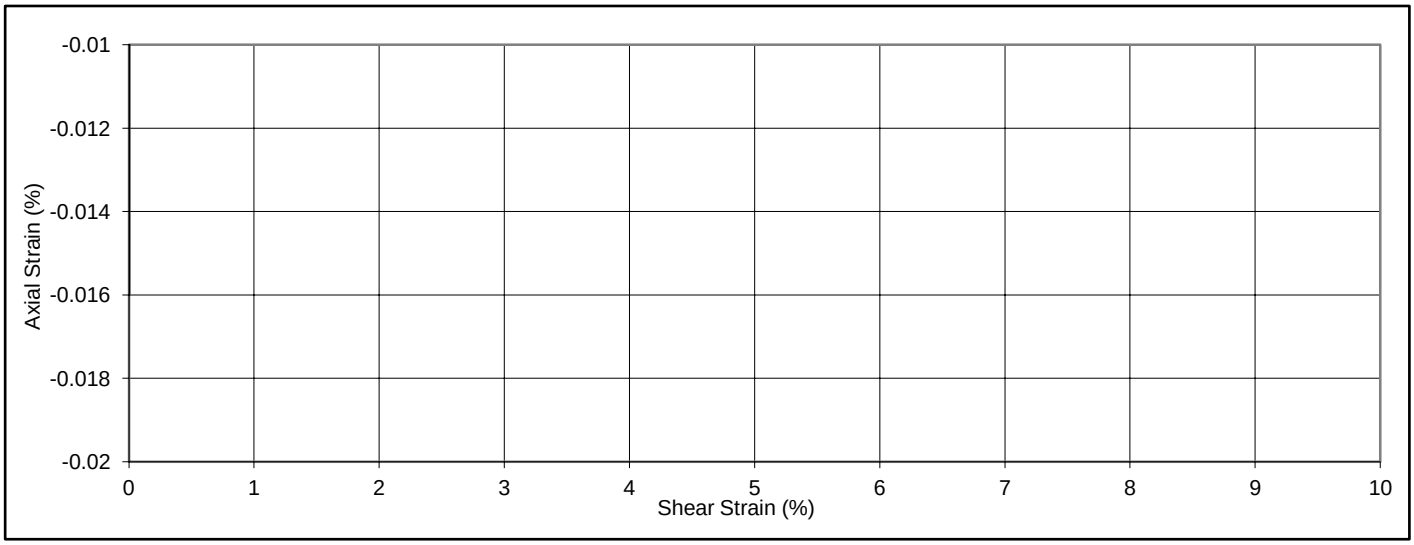


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	Clay with sand, grey, moist, laminations of fine sand	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.3-23.32





Final Specimen Details

Sample Height	mm
16.23	
Sample Diameter	mm
49.97	
Sample Weight	g
70.77	
Moisture Content	%
33.6	
Bulk Density	Mg/m^3
1.805	
Dry Density P_d	Mg/m^3
1.351	
Voids Ratio e_o	
0.999	
Degree of Saturation S_o	
90.80	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

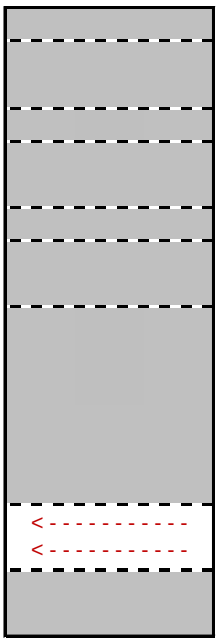
Top Picture
Side view of failure
Bottom Picture
Specimen pulled along failure zone

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38

Initial specimen position, orientation and shear direction

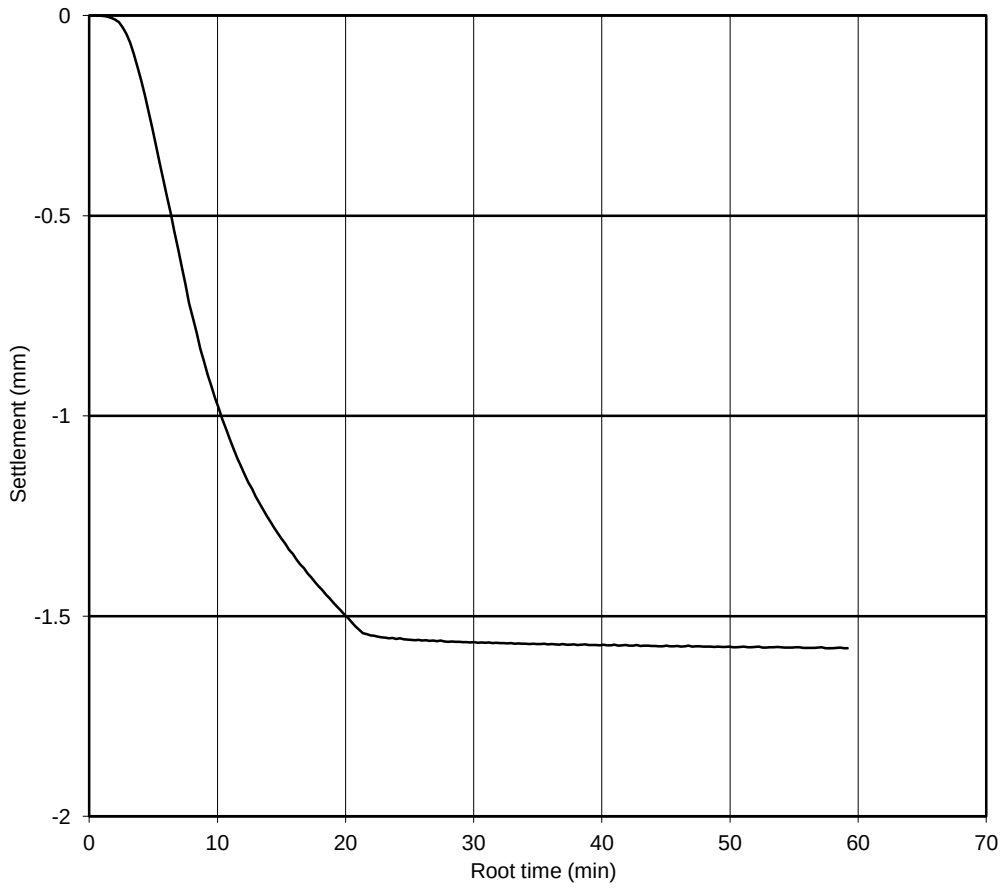


Position in sample
Bottom
Specimen alignment
Normal
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
49.88		
Sample Weight		g
75.26		
Moisture Content		%
21.6		
Bulk Density	P	Mg/m^3
1.926		
Dry Density	P_d	Mg/m^3
1.584		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.704		
Degree of Saturation	S_o	
82.74		
Seating Pressure		kPa
5		

Consolidation Stage



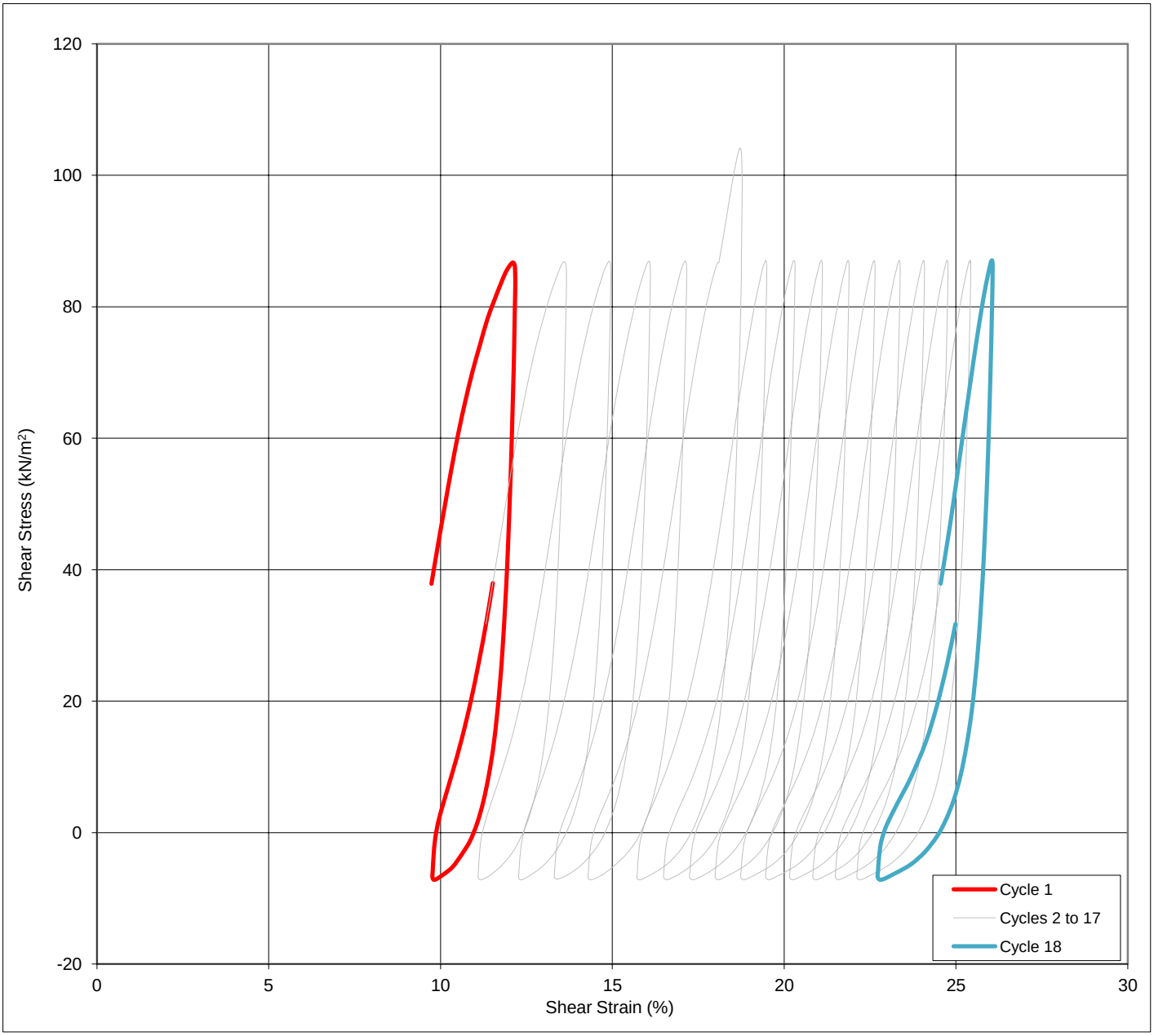
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	228
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	7.92
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	228
Vertical strain at end of consolidation	
ε_{vc} (%)	7.92

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	228
τ_{ref}	
kN/m^2	79
Frequency	
Hz	0.1

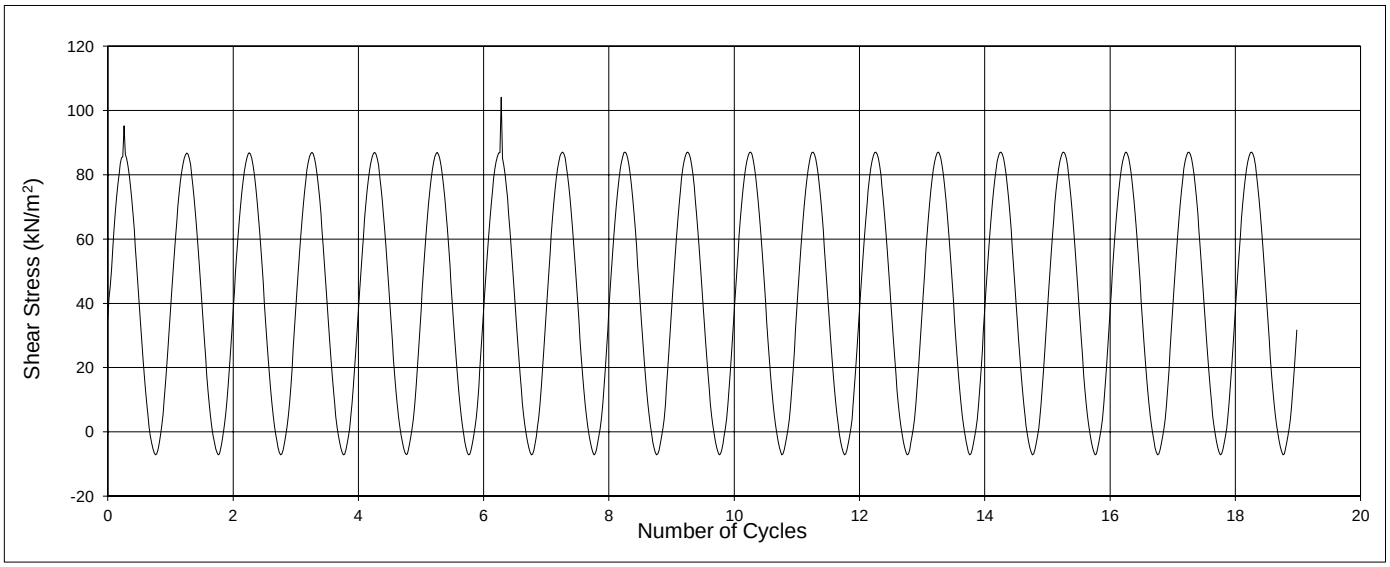
τ_{ave} / σ_{ref}	
	0.5
τ_{ave}	
kN/m^2	40
τ_{cy} / σ_{ref}	
	0.6
τ_{cyc}	
kN/m^2	47

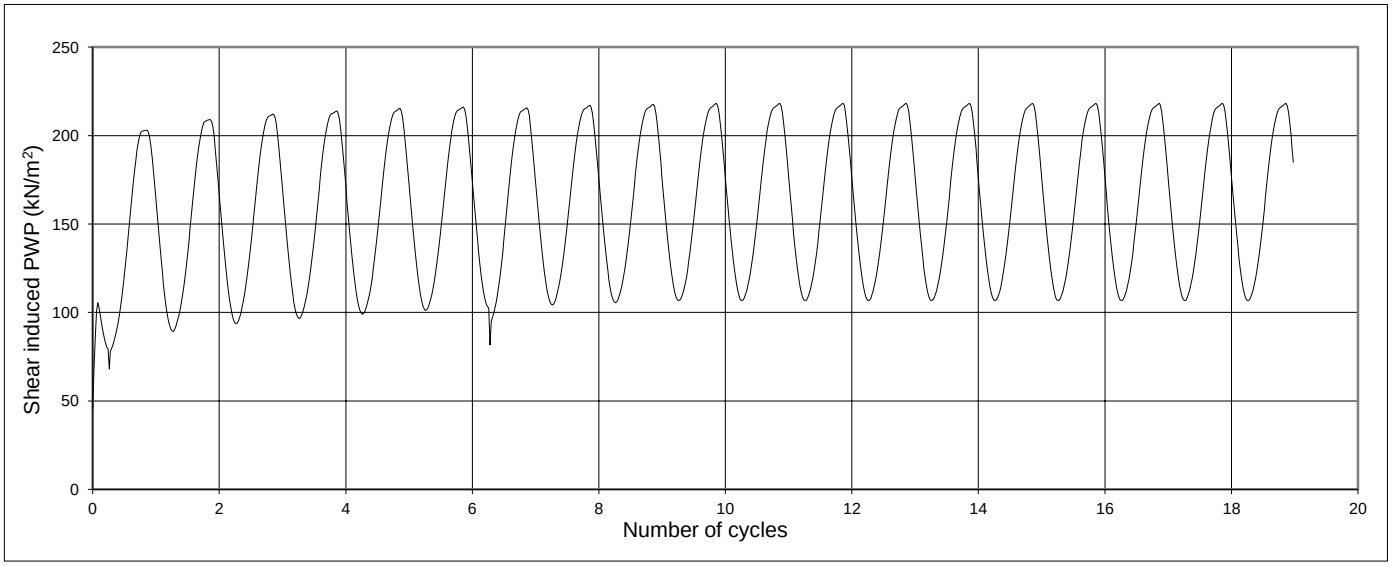
Cyclic Results

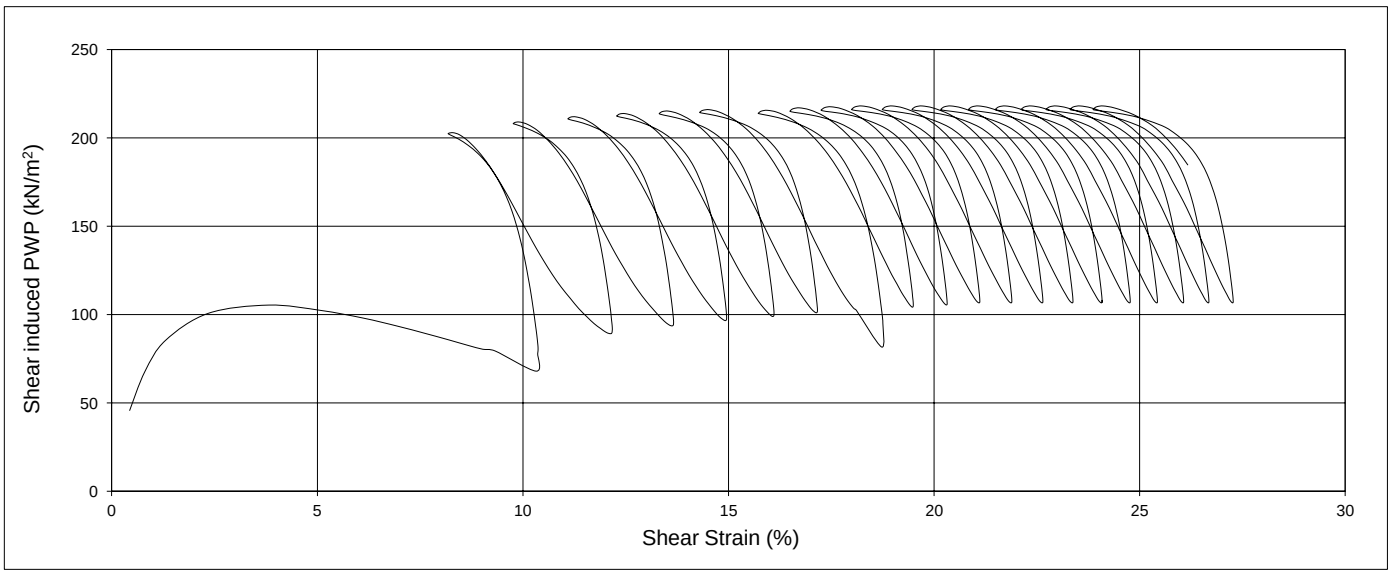
Number of Cycles at Failure	
N_f	18
Change in PWP at failure	
Δu at N_f (kPa)	176
Average strain at failure	
γ_a at N_f (%)	15.27
Permanent strain at failure	
γ_p at N_f (%)	15.64
Cyclic strain at failure	
γ_{cy} at N_f (%)	1.69

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38

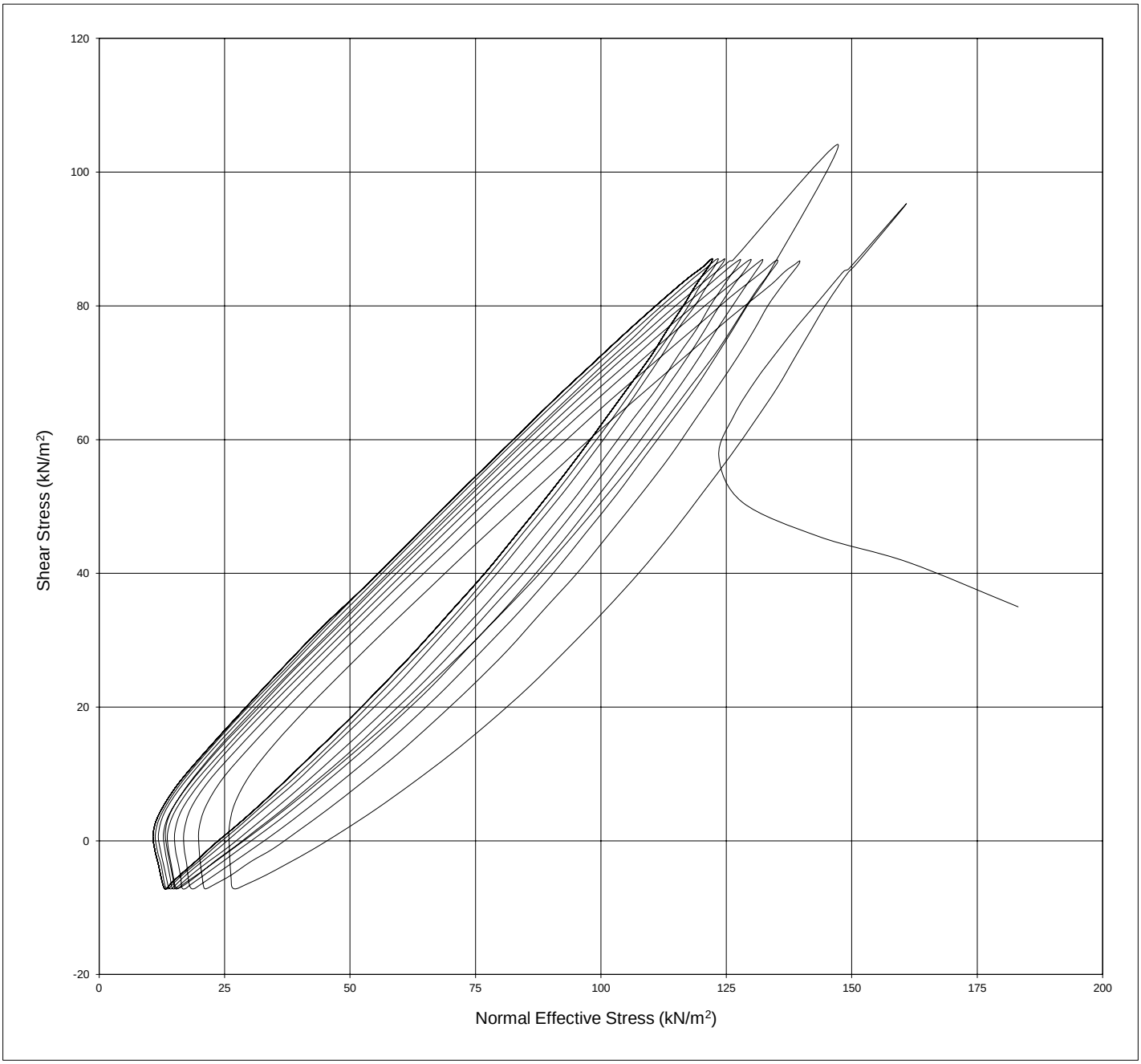






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

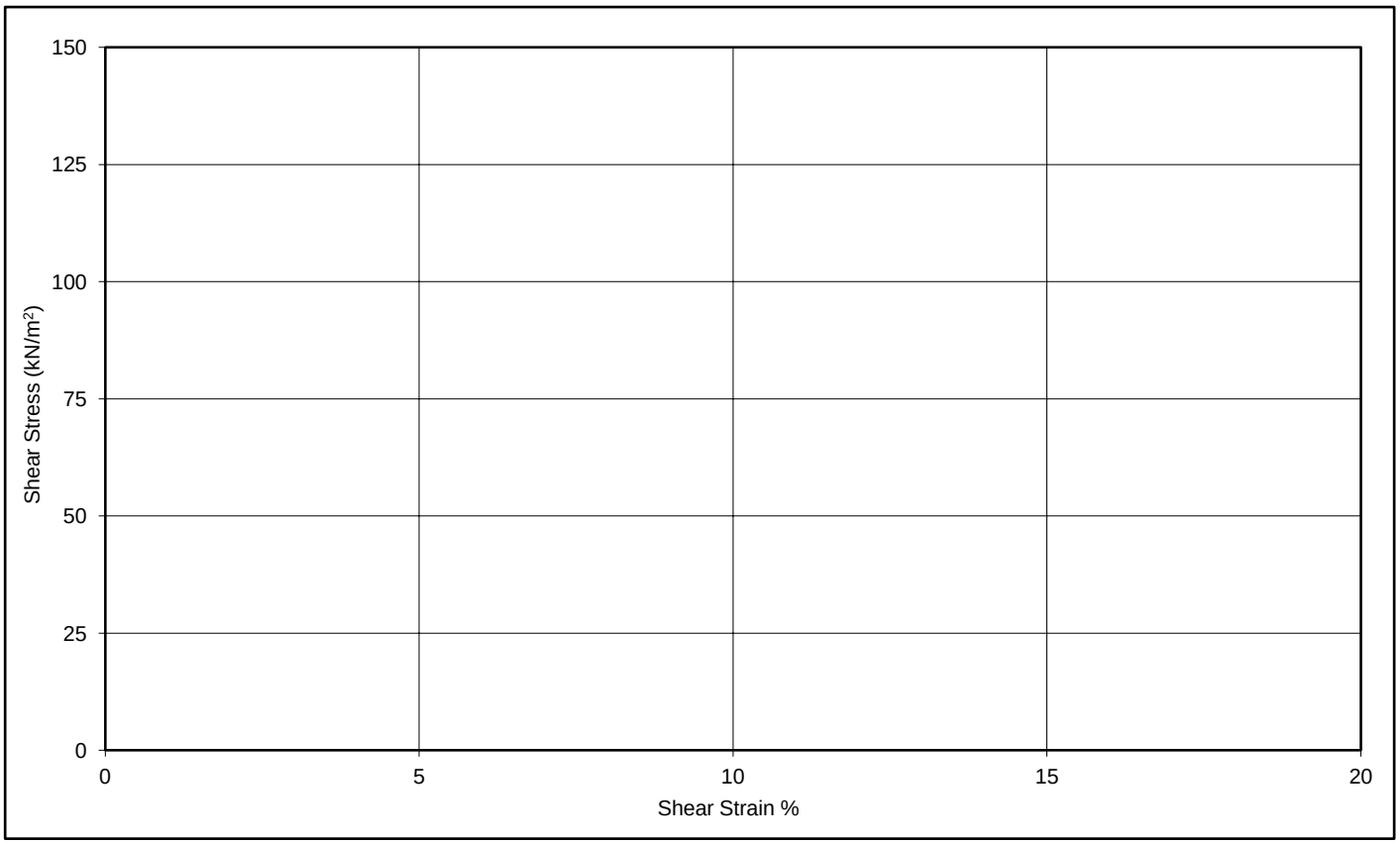
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38

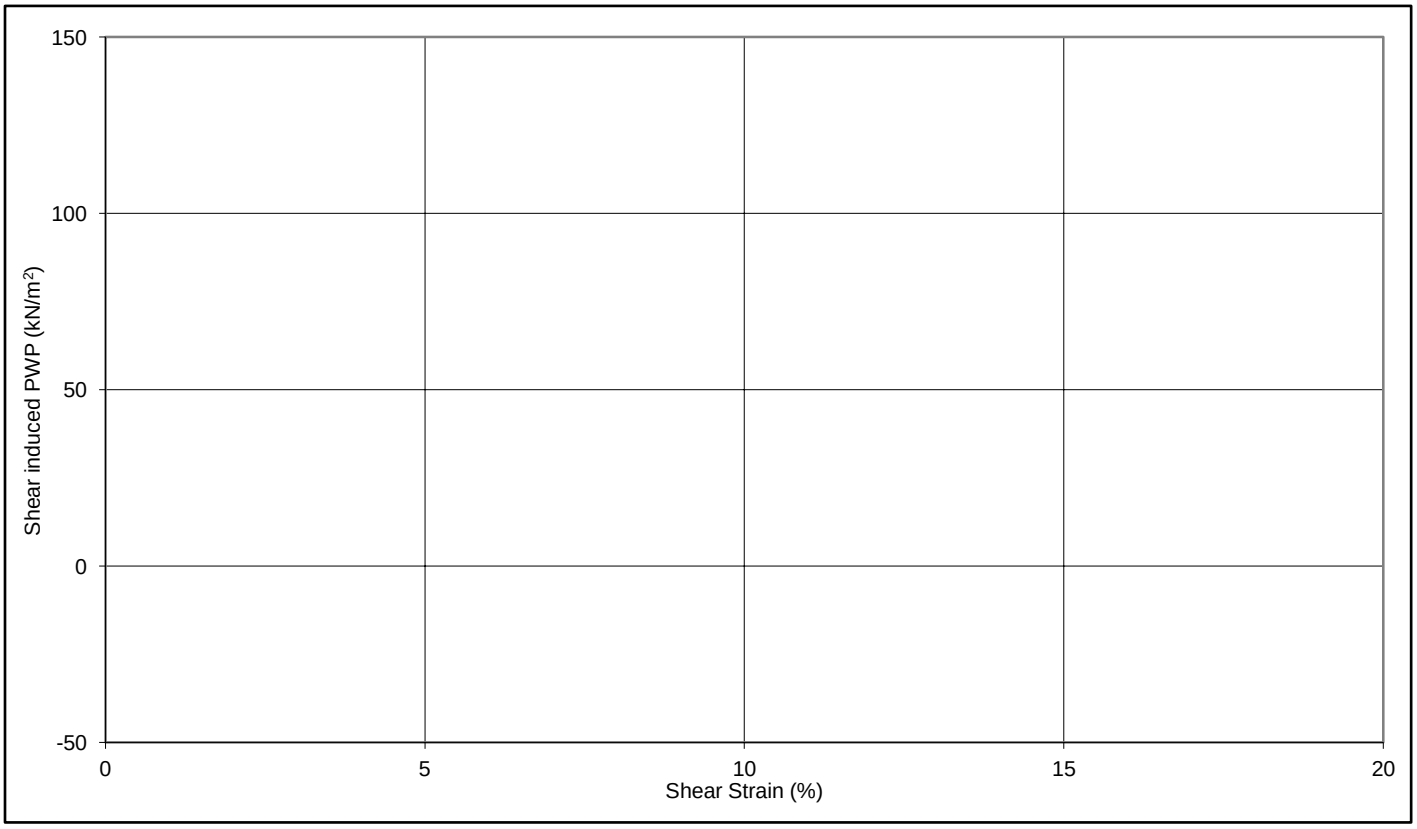


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38

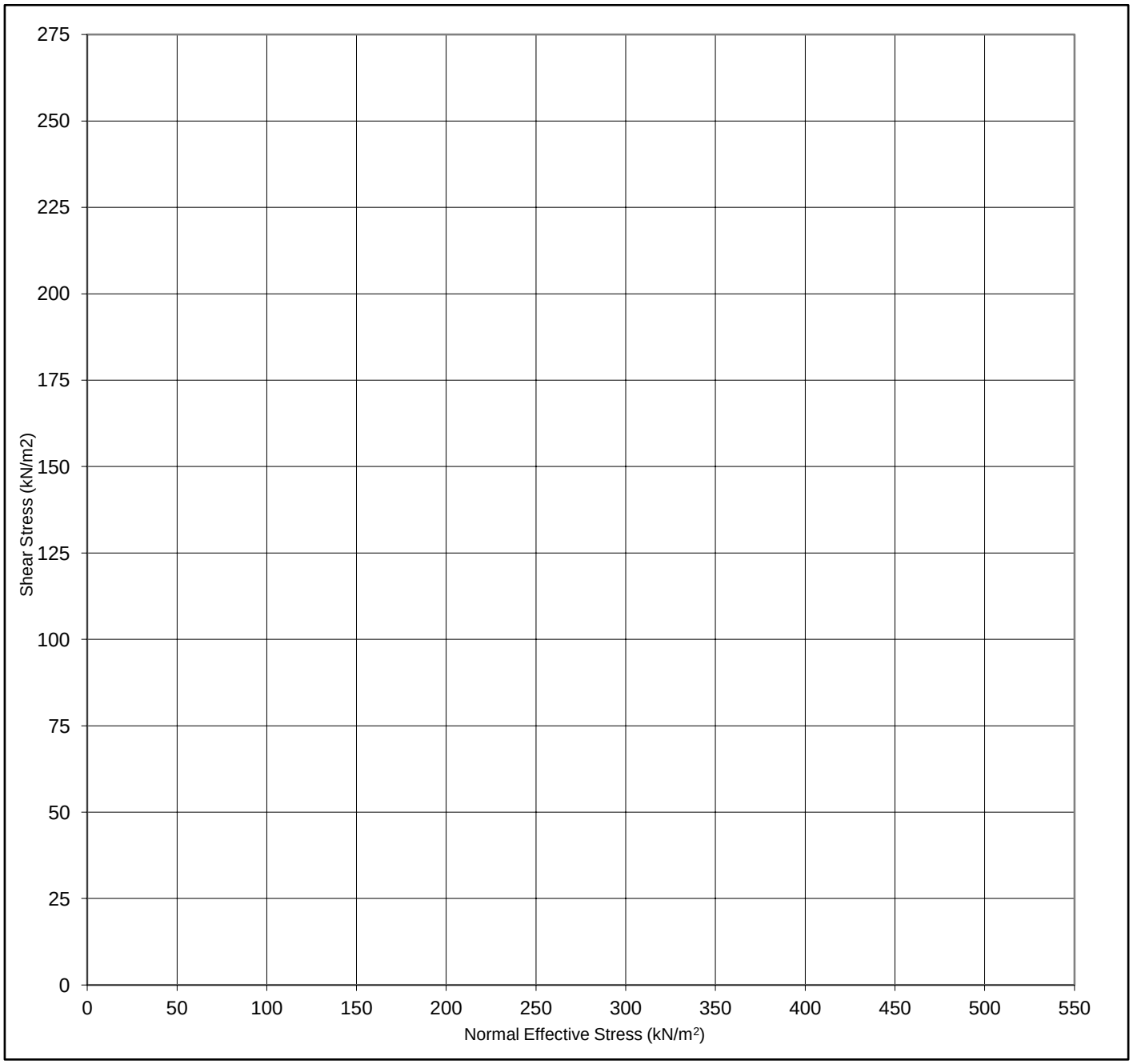
Shear Stage





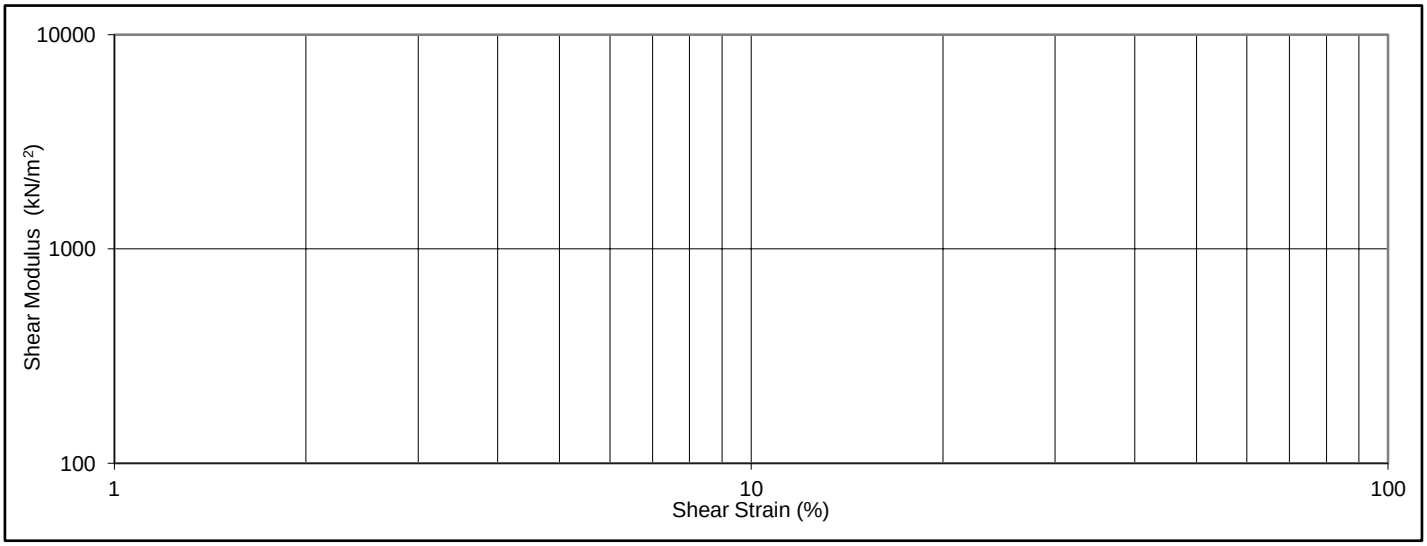
Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

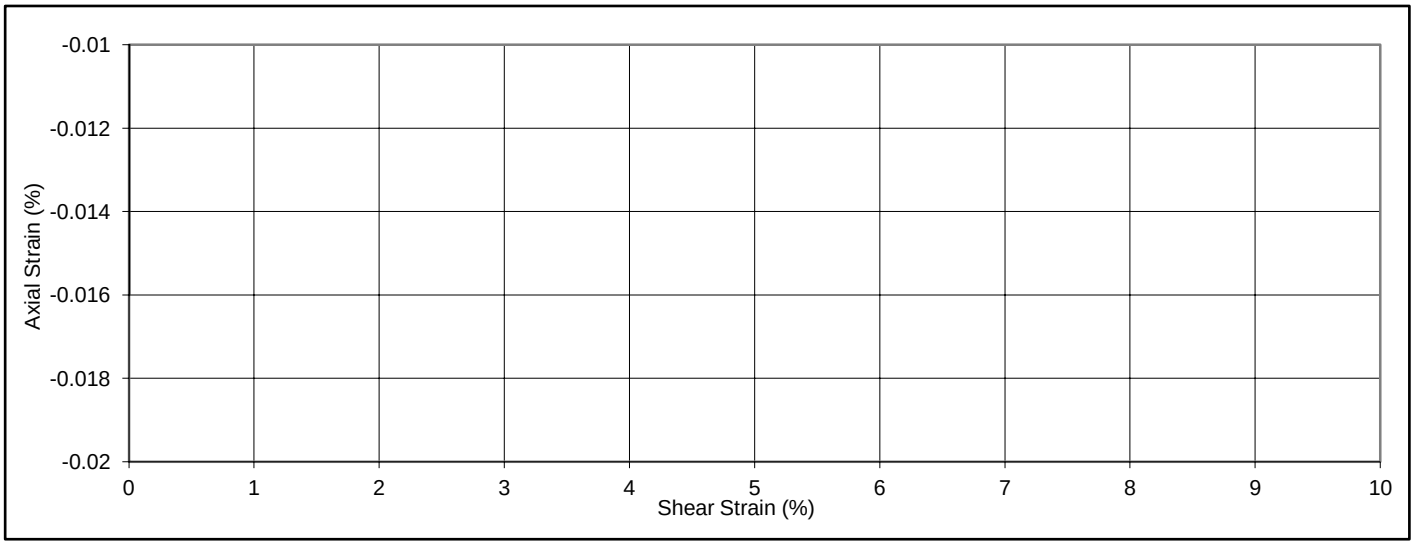
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38



Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G7
Description	CLAY with sand. Sand is fine, greenish grey, moist	Sample No./Type	P11Q2
Tested in accordance with ASTM D6528-07		Depth (m)	23.36-23.38





Final Specimen Details

Sample Height	mm
18.41	
Sample Diameter	mm
49.88	
Sample Weight	g
74	
Moisture Content	%
25.9	
Bulk Density	Mg/m³
1.893	
Dry Density P_d	Mg/m³
1.504	
Voids Ratio e_o	
0.795	
Degree of Saturation S_o	
87.85	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m²)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

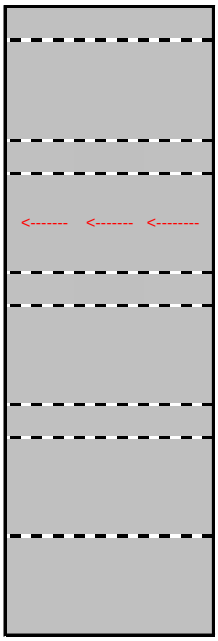
Top Picture
Side view of failure
Bottom Picture
Specimen pulled along failure zone

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61

Initial specimen position, orientation and shear direction

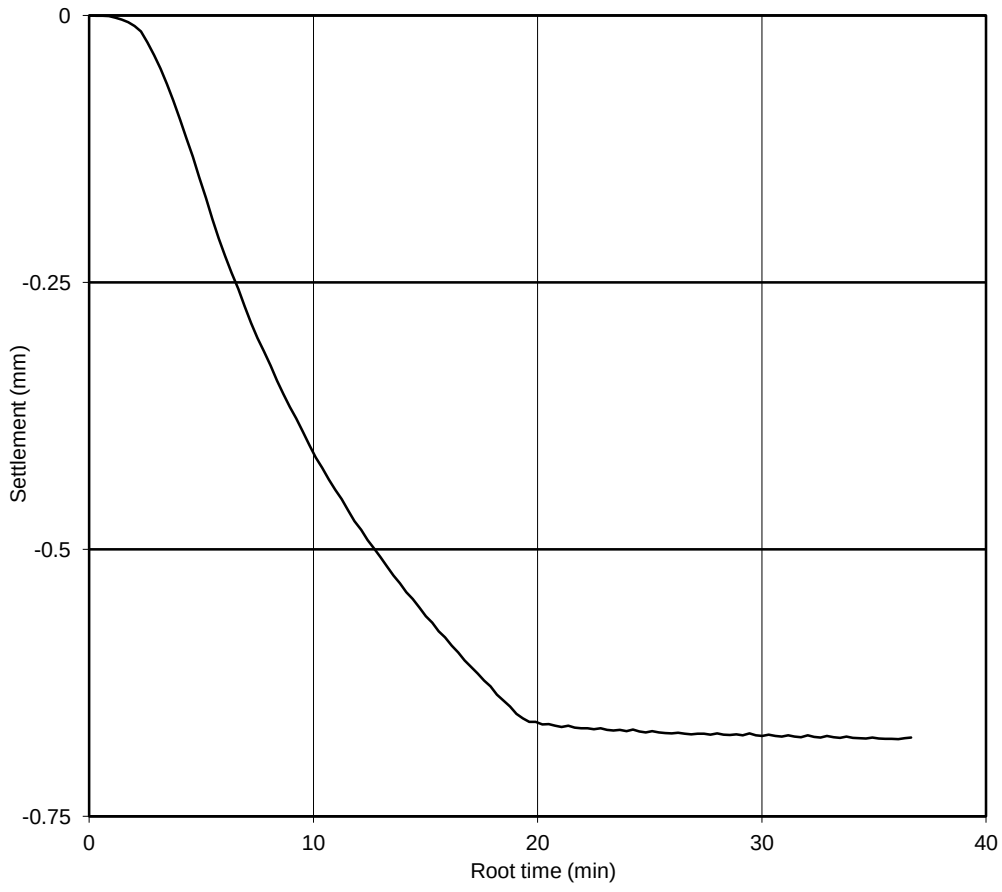


Position in sample
Middle
Specimen alignment
Cut from sample vertical axis
Shear alignment
Rotated
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CCS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
79.25		
Moisture Content		%
16.1		
Bulk Density	P	Mg/m^3
2.019		
Dry Density	P_d	Mg/m^3
1.739		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.553		
Degree of Saturation	S_o	
78.65		
Seating Pressure		kPa
2.5		

Consolidation Stage



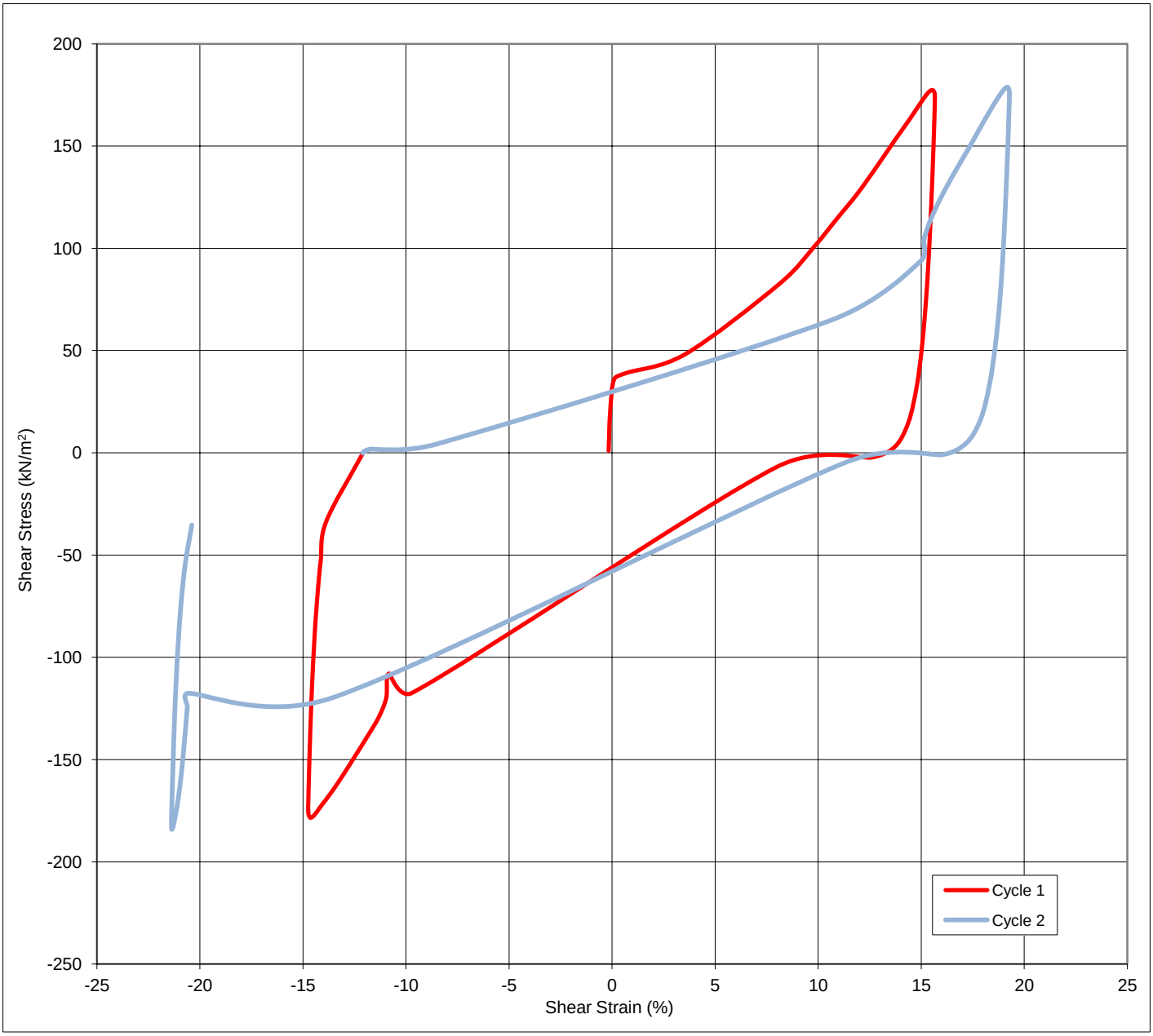
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	185
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	3.39
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	185
Vertical strain at end of consolidation	
ε_{vc} (%)	3.39

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	185
τ_{ref}	
kN/m^2	174
Frequency	
Hz	0.1

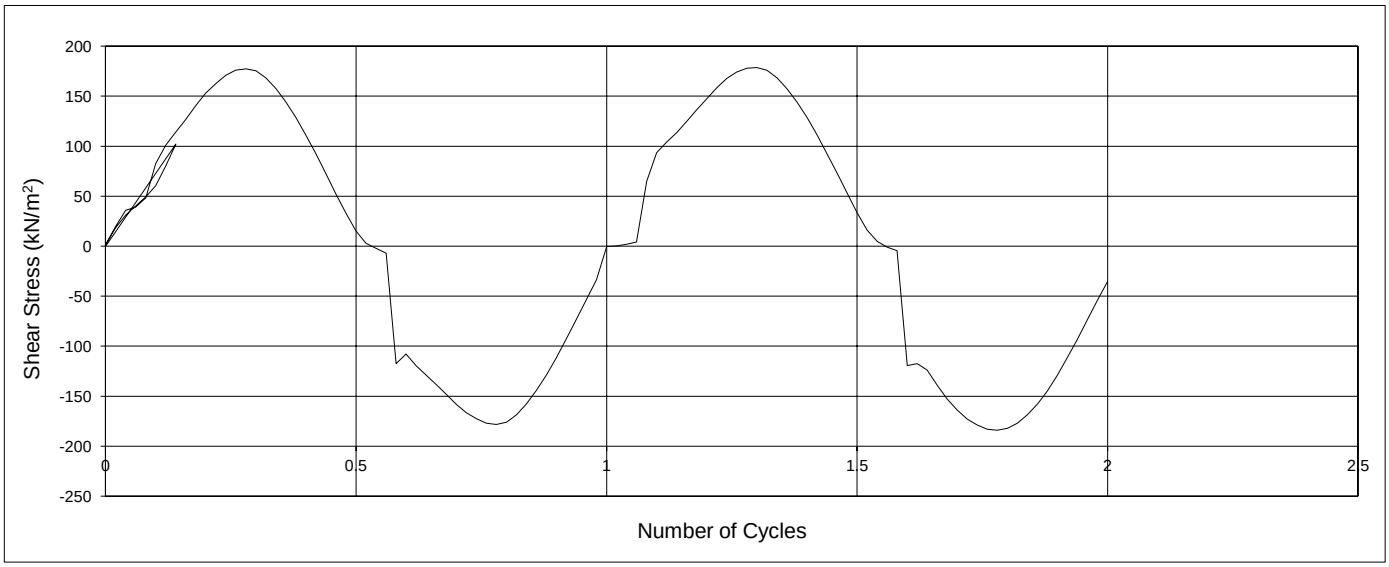
τ_{ave} / σ_{ref}	
	0
τ_{ave}	
kN/m^2	0
τ_{cy} / σ_{ref}	
	1.0635
τ_{cyc}	
kN/m^2	185

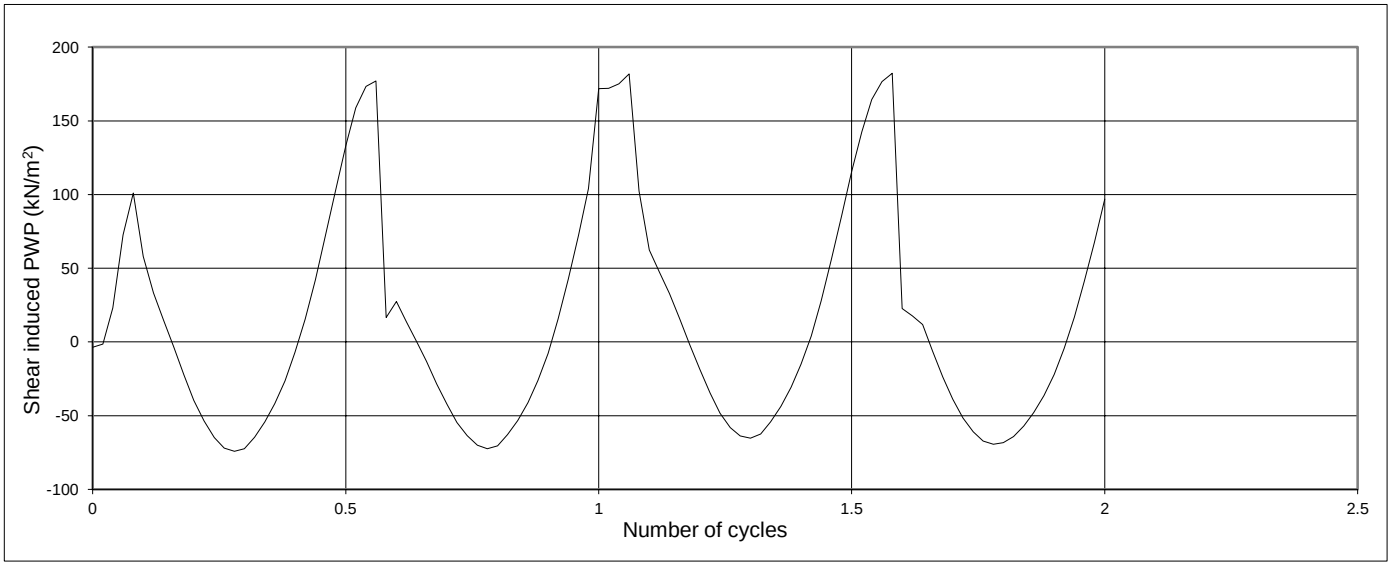
Cyclic Results

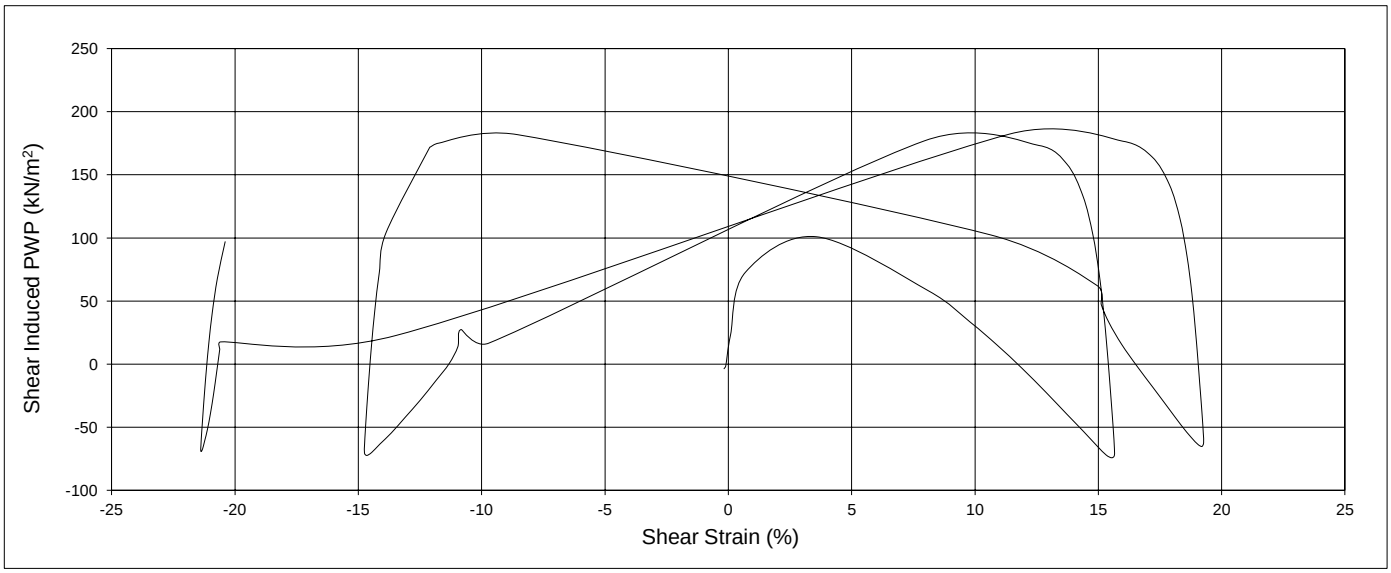
Number of Cycles at Failure	
N_f	1
Change in PWP at failure	
Δu at N_f (kPa)	172
Average strain at failure	
γ_a at N_f (%)	0.45
Permanent strain at failure	
γ_p at N_f (%)	-0.17
Cyclic strain at failure	
γ_{cy} at N_f (%)	15.20

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61

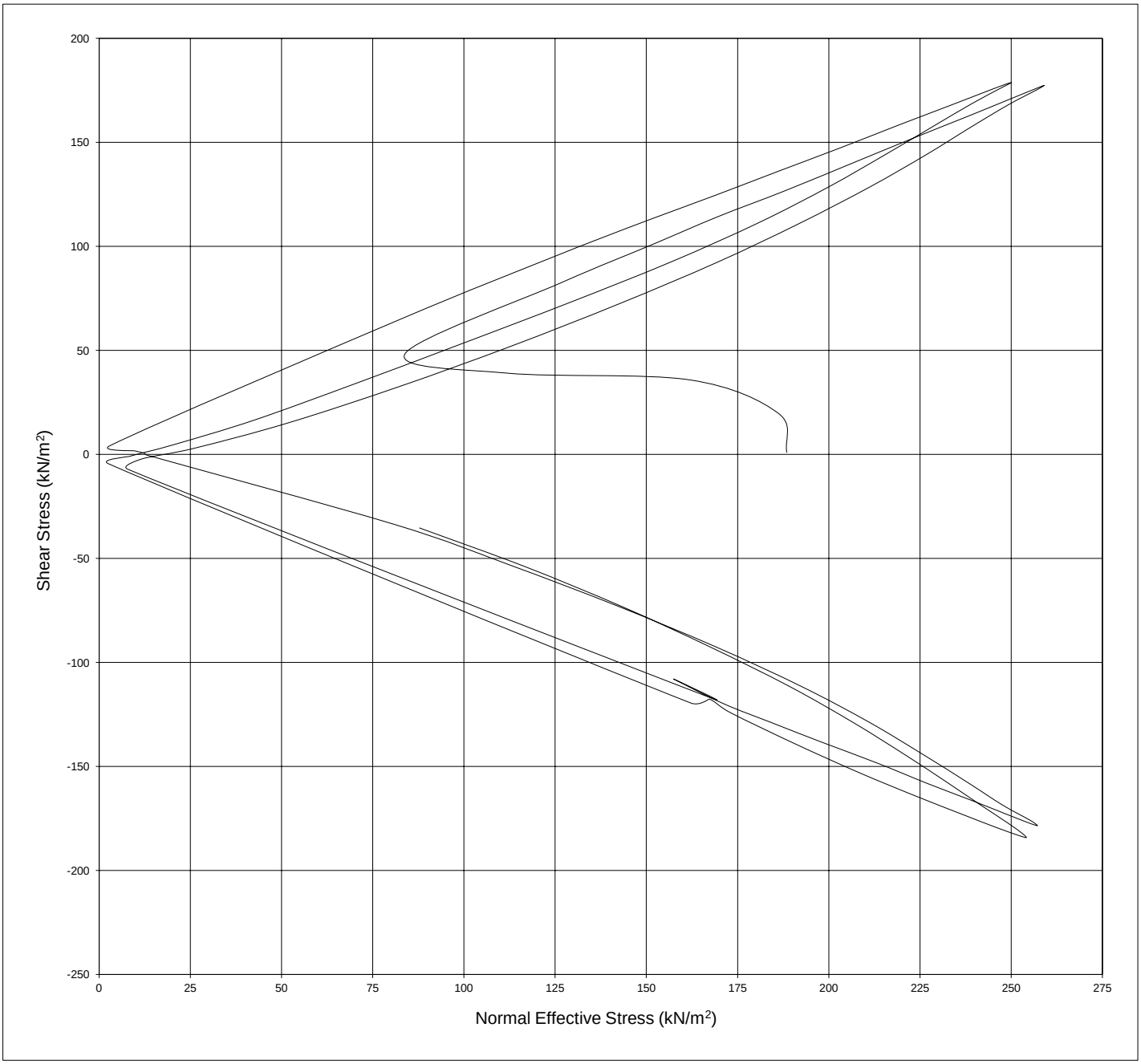






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

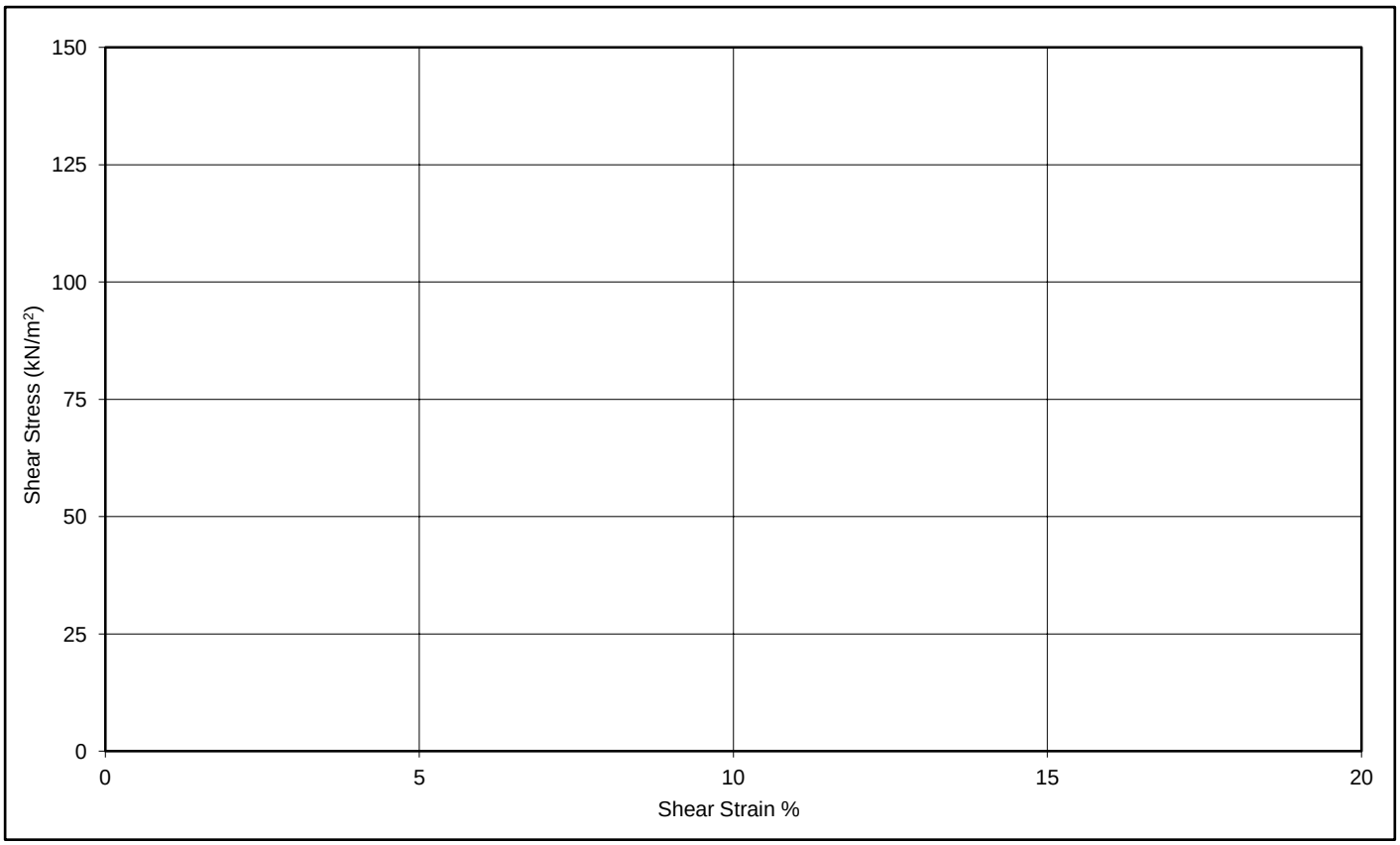
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61

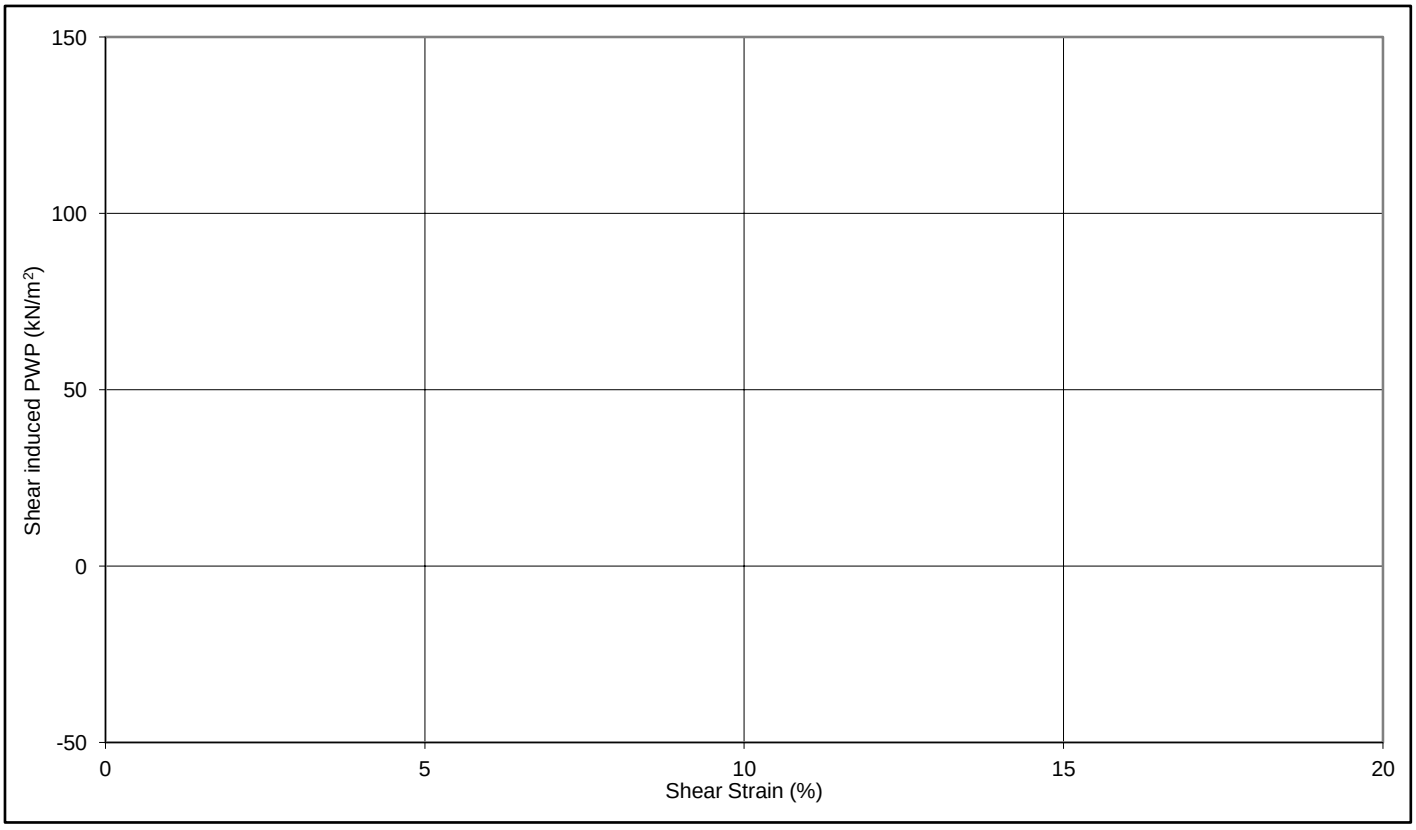


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61

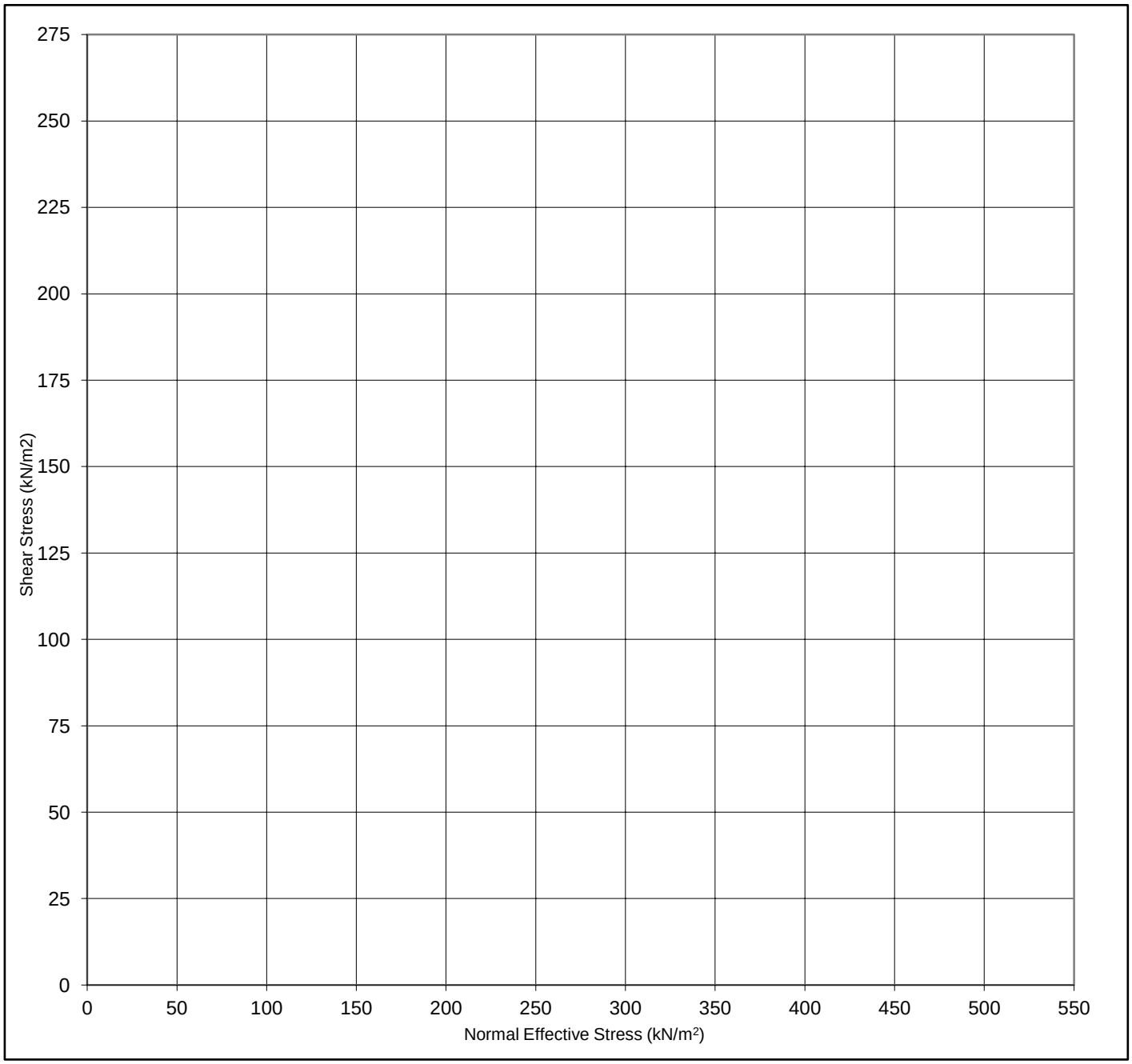
Shear Stage





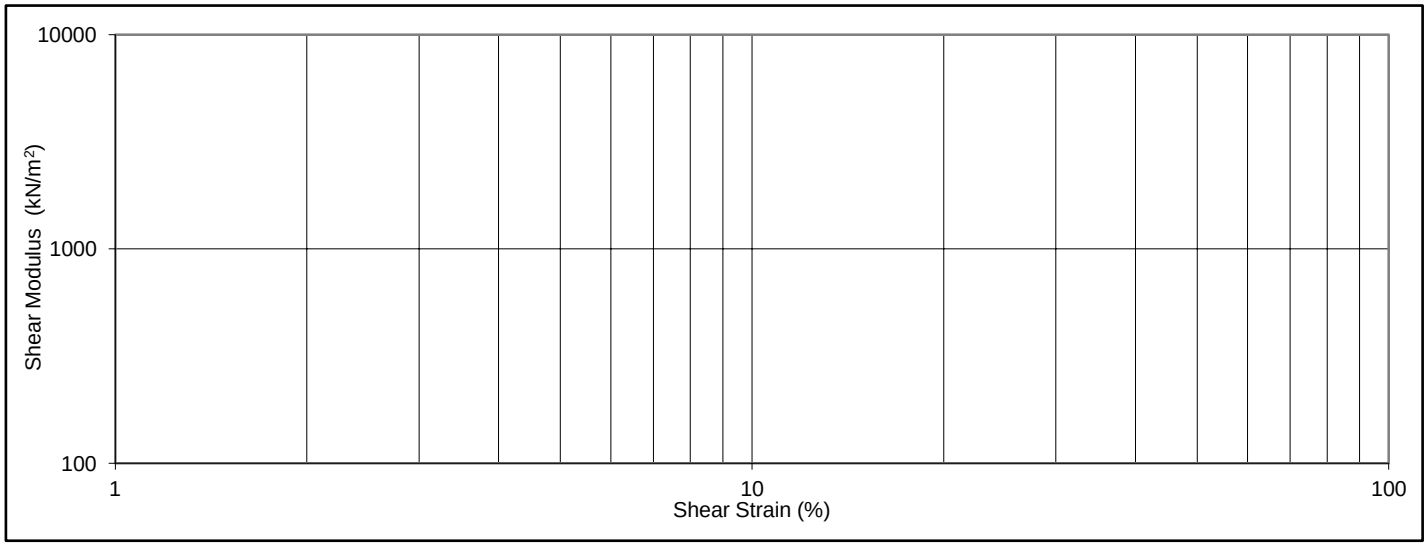
Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

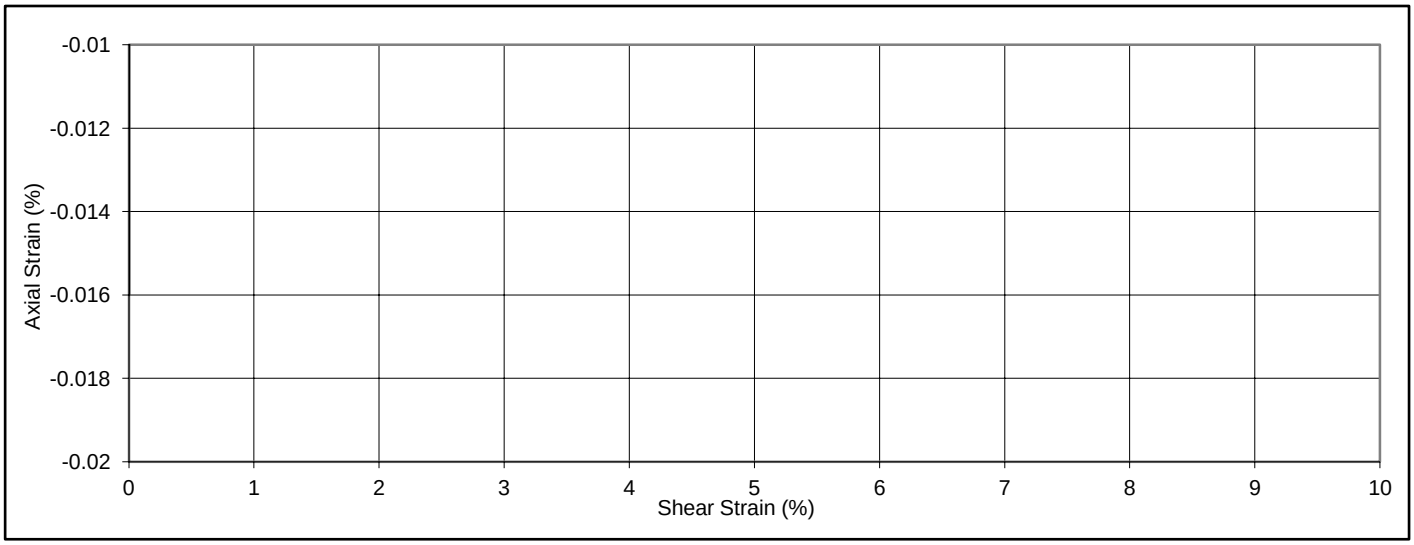
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61



Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, moist, slightly silty, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.59-18.61





Final Specimen Details

Sample Height	mm
20.00	
Sample Diameter	mm
50.00	
Sample Weight	g
77.46	
Moisture Content	%
16.0	
Bulk Density	Mg/m³
1.973	
Dry Density P_d	Mg/m³
1.701	
Voids Ratio e_o	
0.587	
Degree of Saturation S_o	
73.44	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m²)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

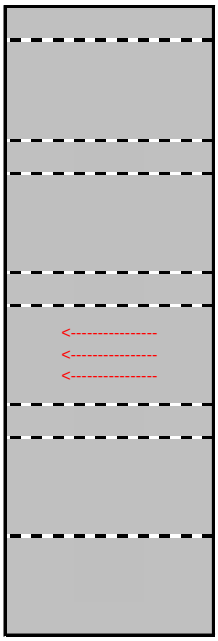
Top Picture
Side View of sample post cyclic test
Bottom Picture
Sample opened perpendicular to direction of shear

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64

Initial specimen position, orientation and shear direction

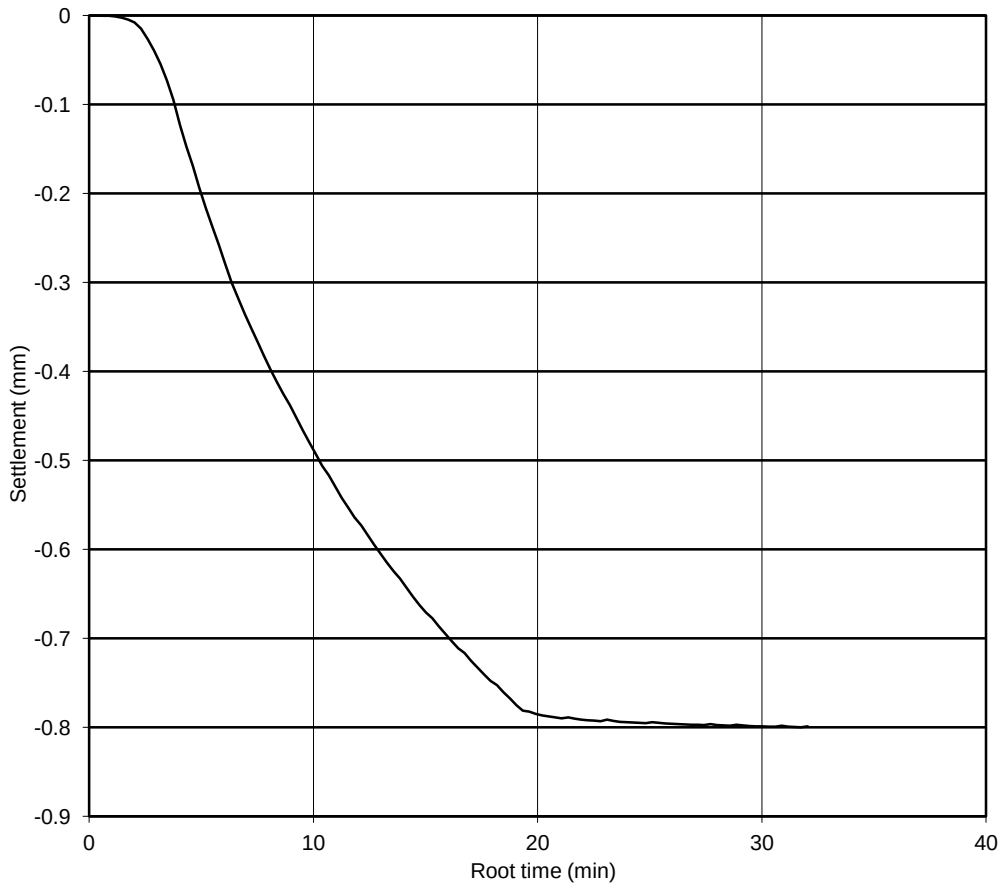


Position in sample
Middle
Specimen alignment
Cut from sample vertical axis
Shear alignment
Rotated
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
77.43		
Moisture Content		%
16.1		
Bulk Density	P	Mg/m^3
1.972		
Dry Density	P_d	Mg/m^3
1.699		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.589		
Degree of Saturation	S_o	
73.78		
Seating Pressure		kPa
2.5		

Consolidation Stage



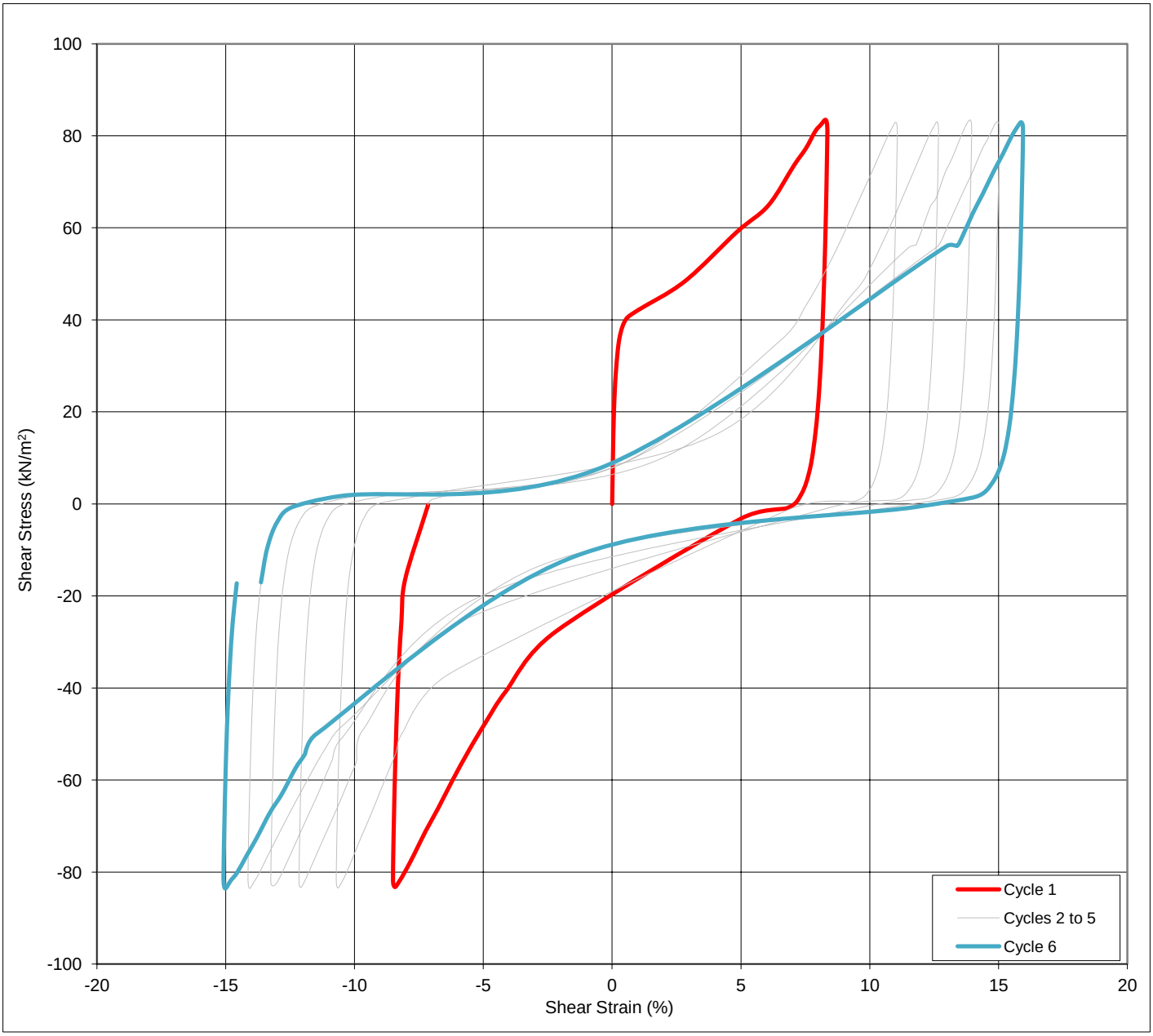
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	185
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	4.00
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	185
Vertical strain at end of consolidation	
ε_{vc} (%)	4.00

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	185
τ_{ref}	
kN/m^2	174
Frequency	
Hz	0.1

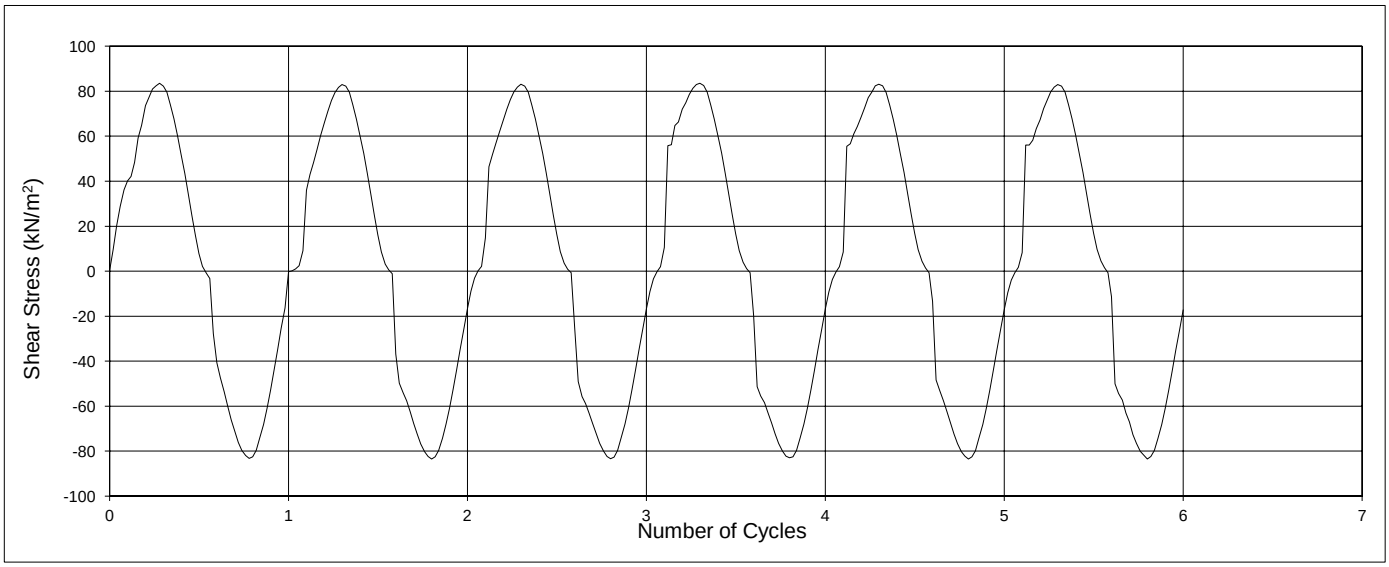
τ_{ave} / σ_{ref}	
	0
τ_{ave}	
kN/m^2	0
τ_{cy} / σ_{ref}	
	0.5
τ_{cyc}	
kN/m^2	87

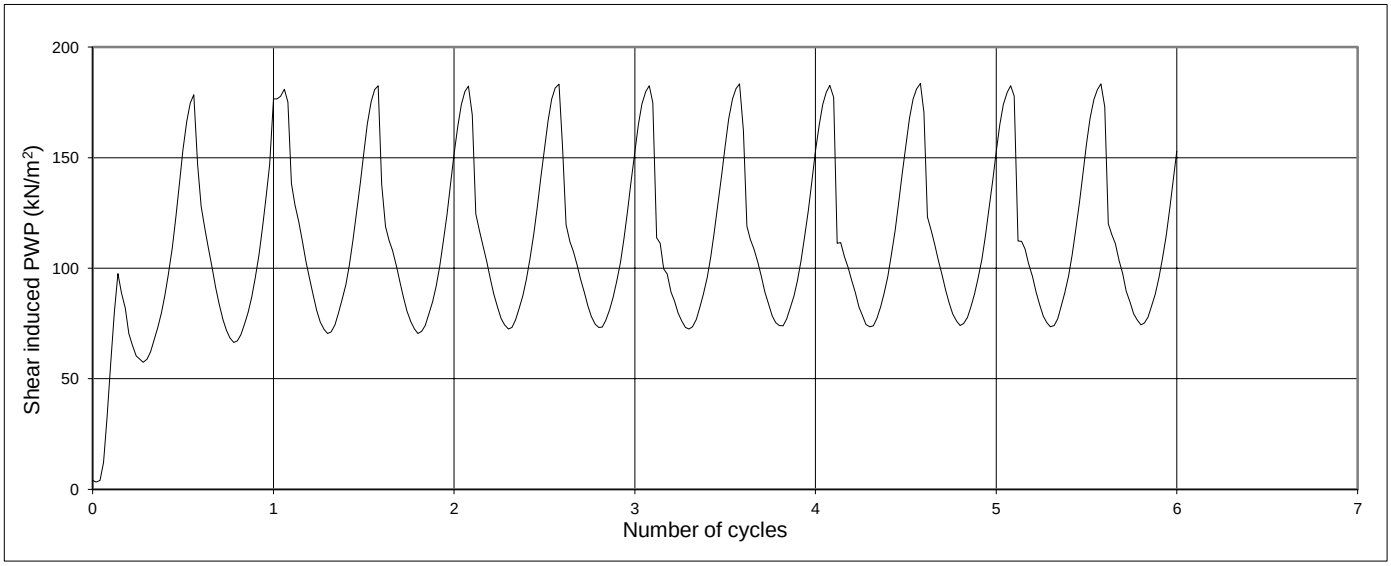
Cyclic Results

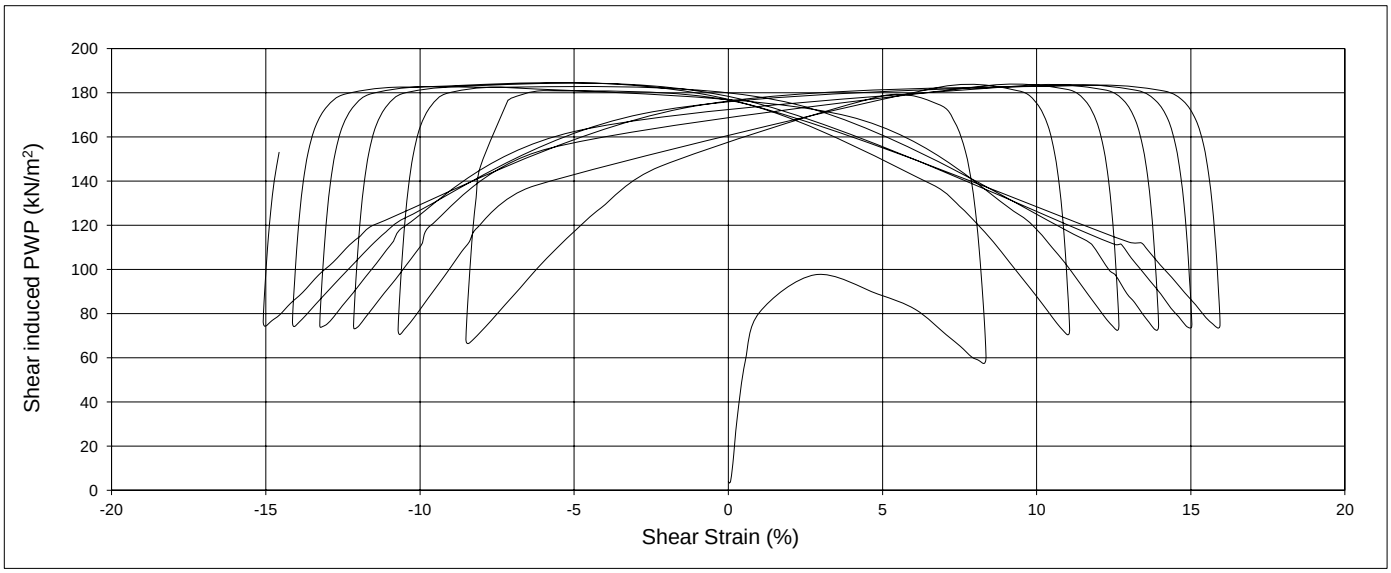
Number of Cycles at Failure	
N_f	6
Change in PWP at failure	
Δu at N_f (kPa)	140
Average strain at failure	
γ_a at N_f (%)	0.431
Permanent strain at failure	
γ_p at N_f (%)	-10.48
Cyclic strain at failure	
γ_{cy} at N_f (%)	15.52

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64

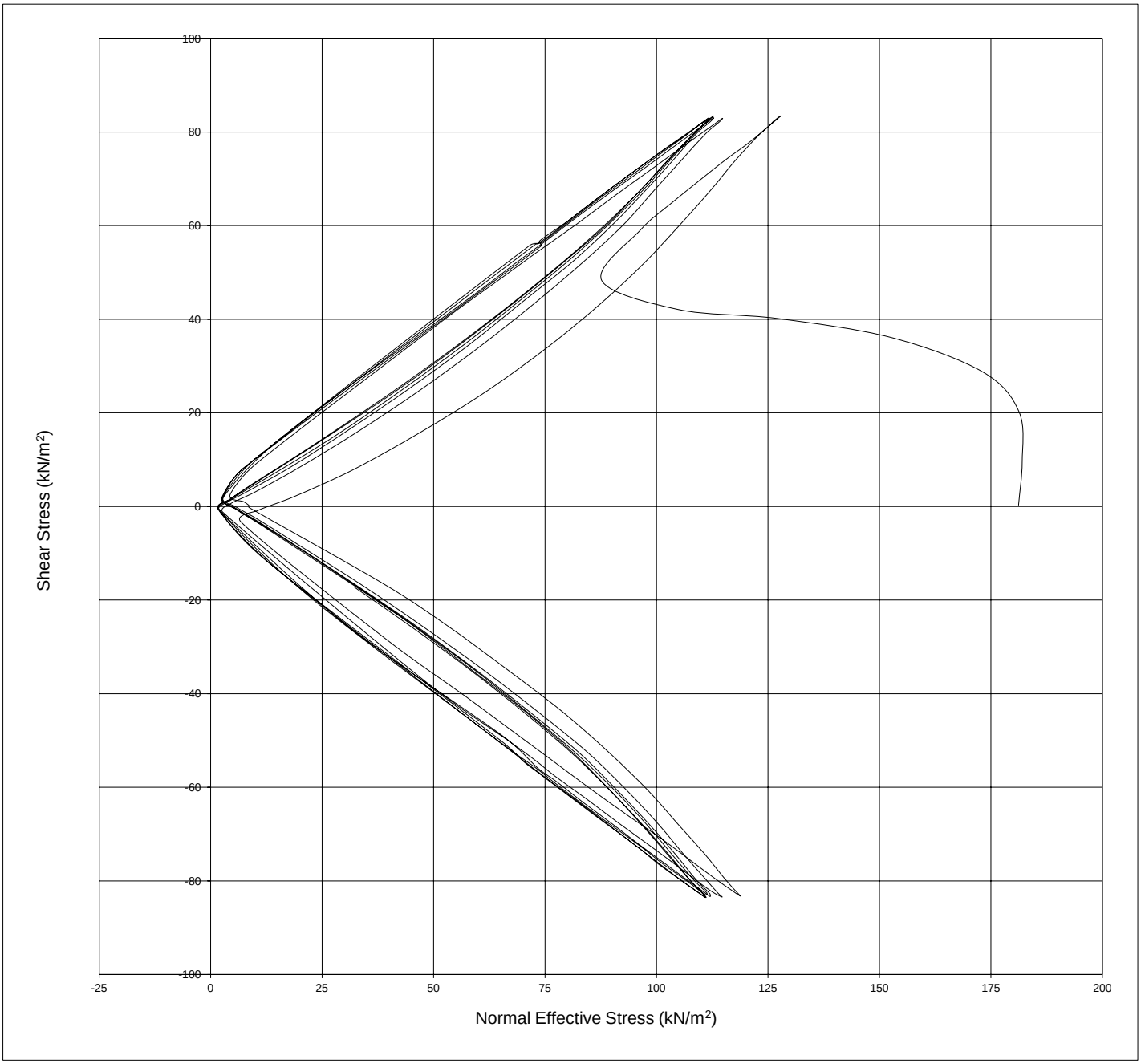






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

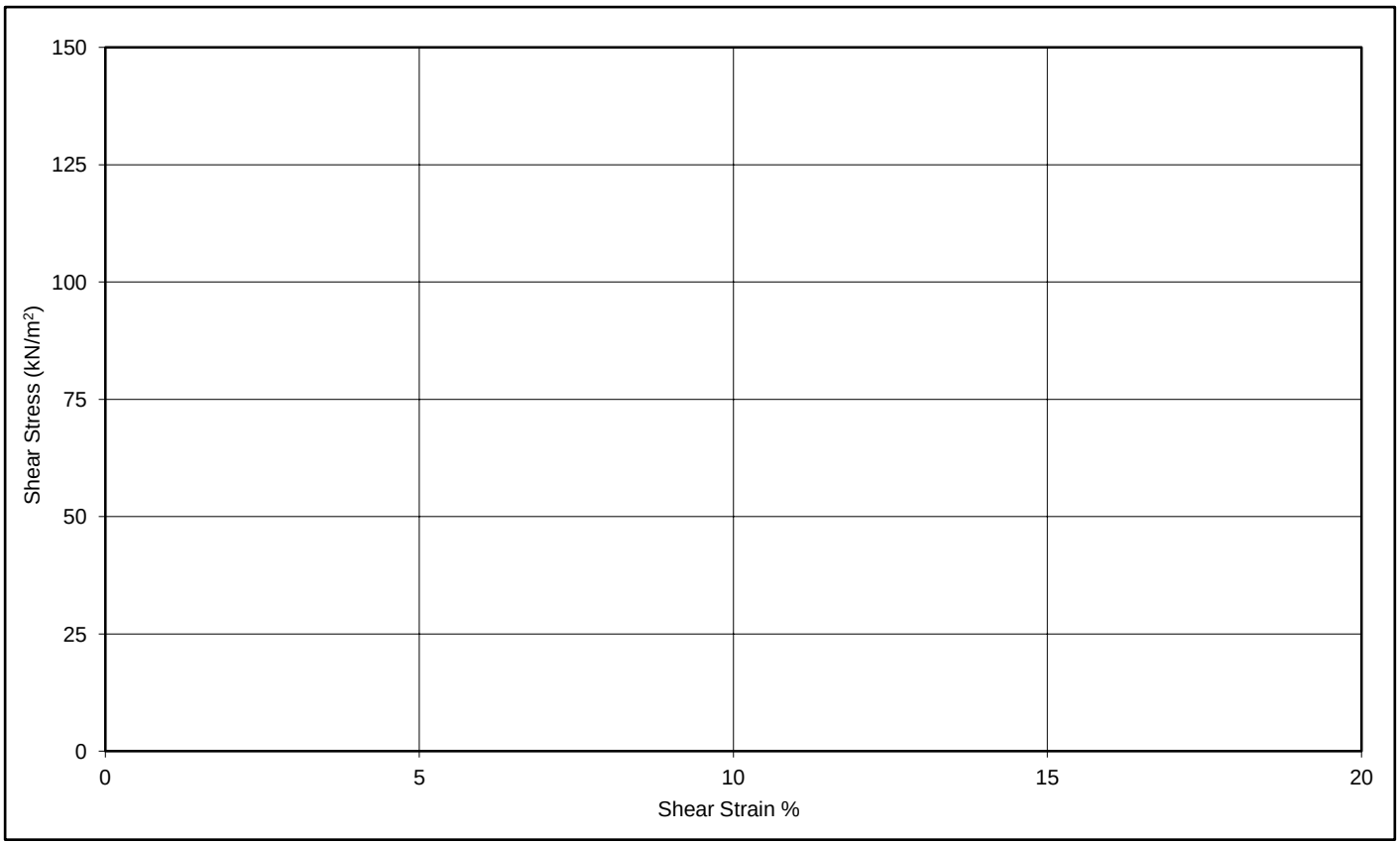
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64

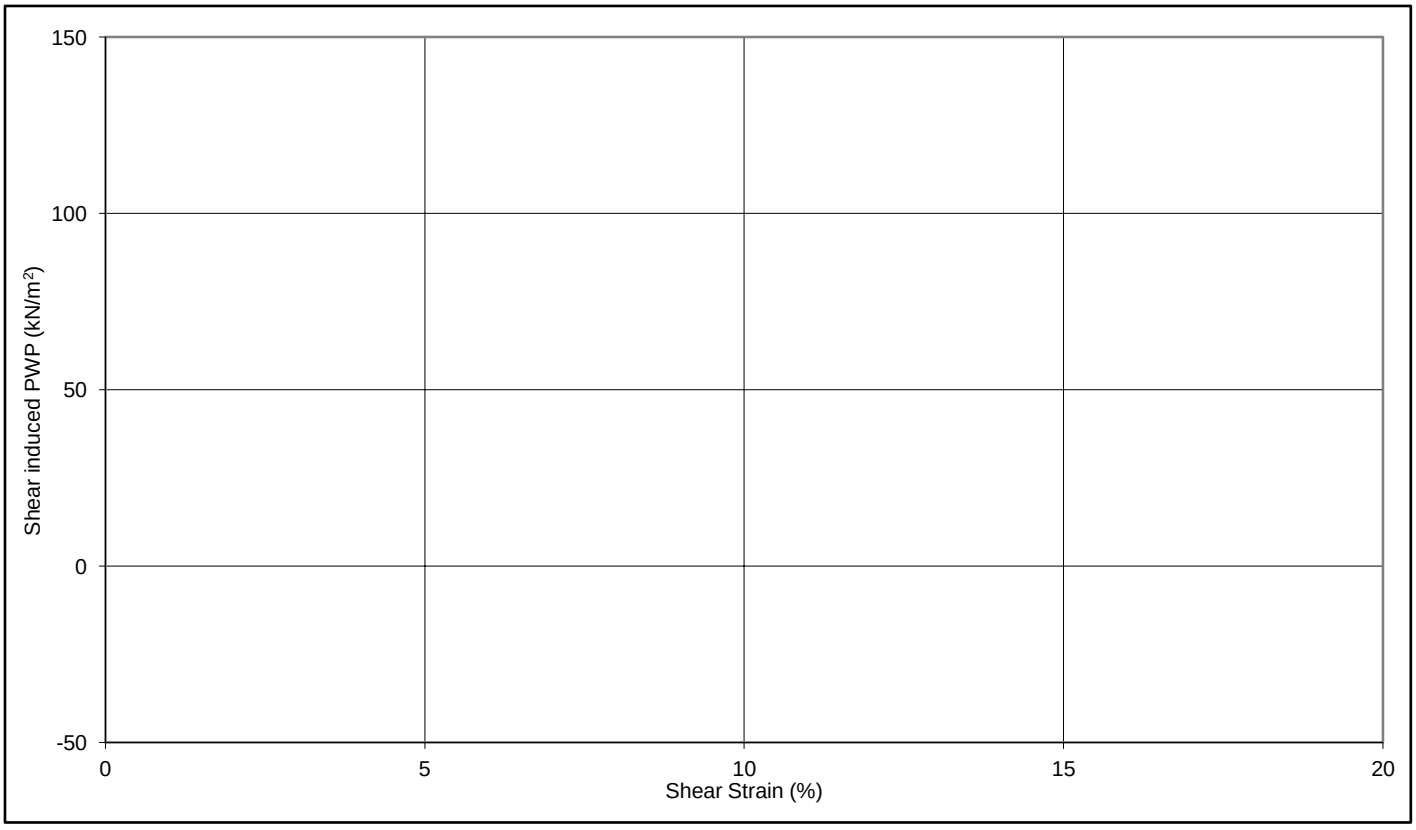


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64

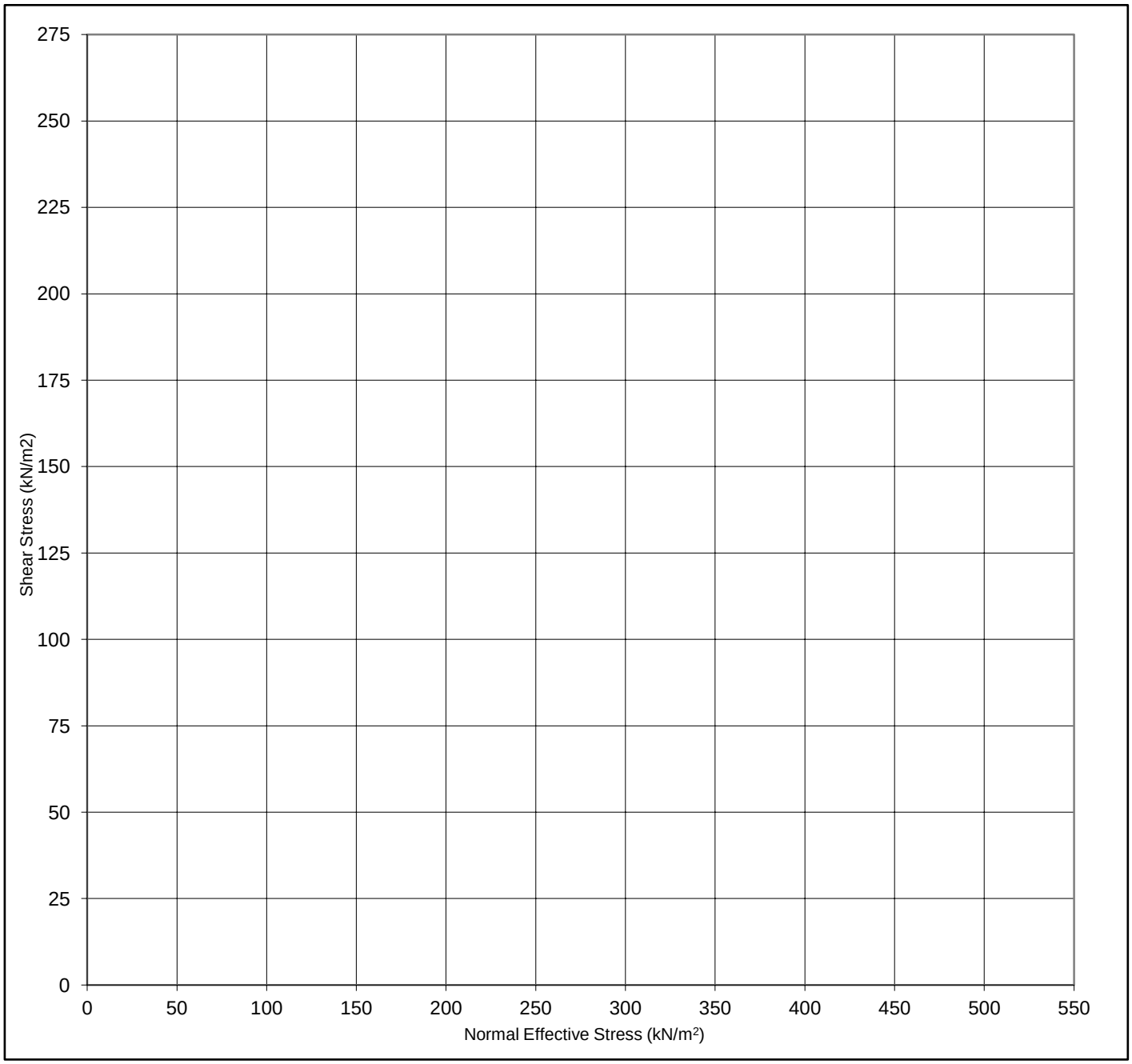
Shear Stage





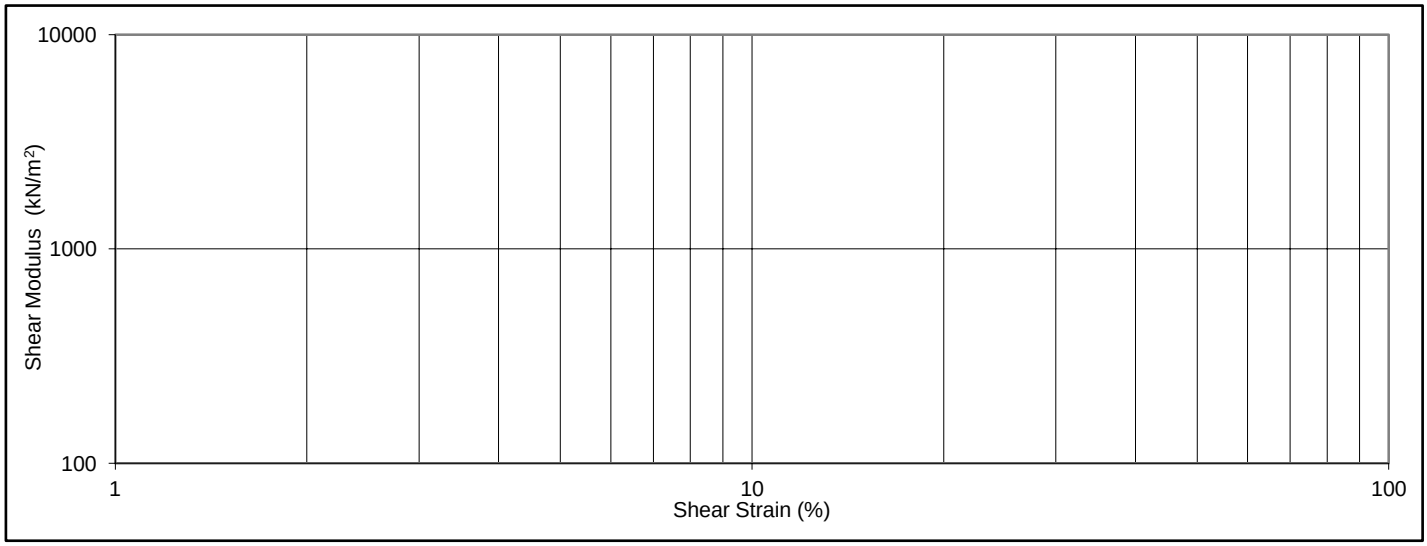
Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

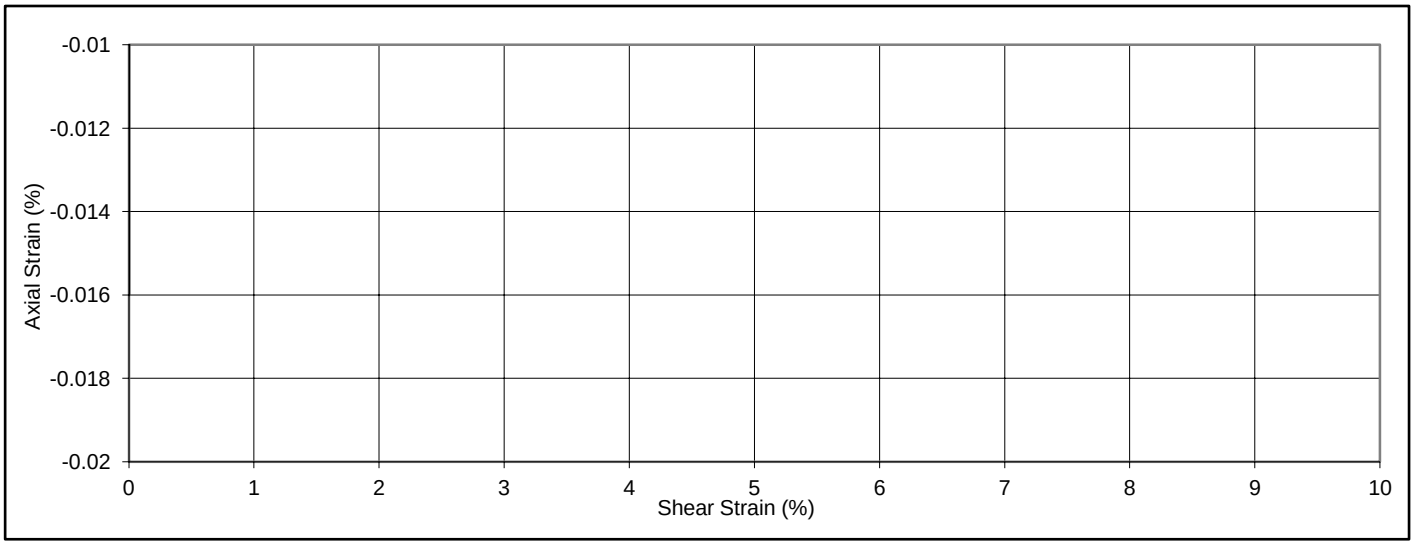
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64



Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey, occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.62-18.64





Final Specimen Details

Sample Height	mm
20.00	
Sample Diameter	mm
50.00	
Sample Weight	g
76.32	
Moisture Content	%
16.0	
Bulk Density	Mg/m^3
1.944	
Dry Density P_d	Mg/m^3
1.676	
Voids Ratio e_o	
0.611	
Degree of Saturation S_o	
70.59	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

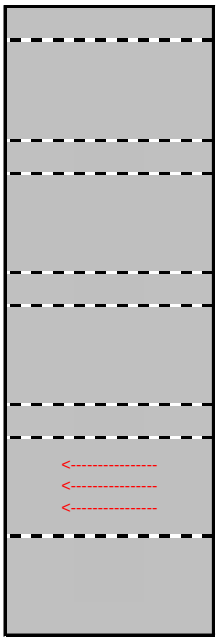
Picture Key
Top Picture
Side view of specimen post cyclic
Bottom Picture
Specimen opened perpendicular to direction of

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

Initial specimen position, orientation and shear direction

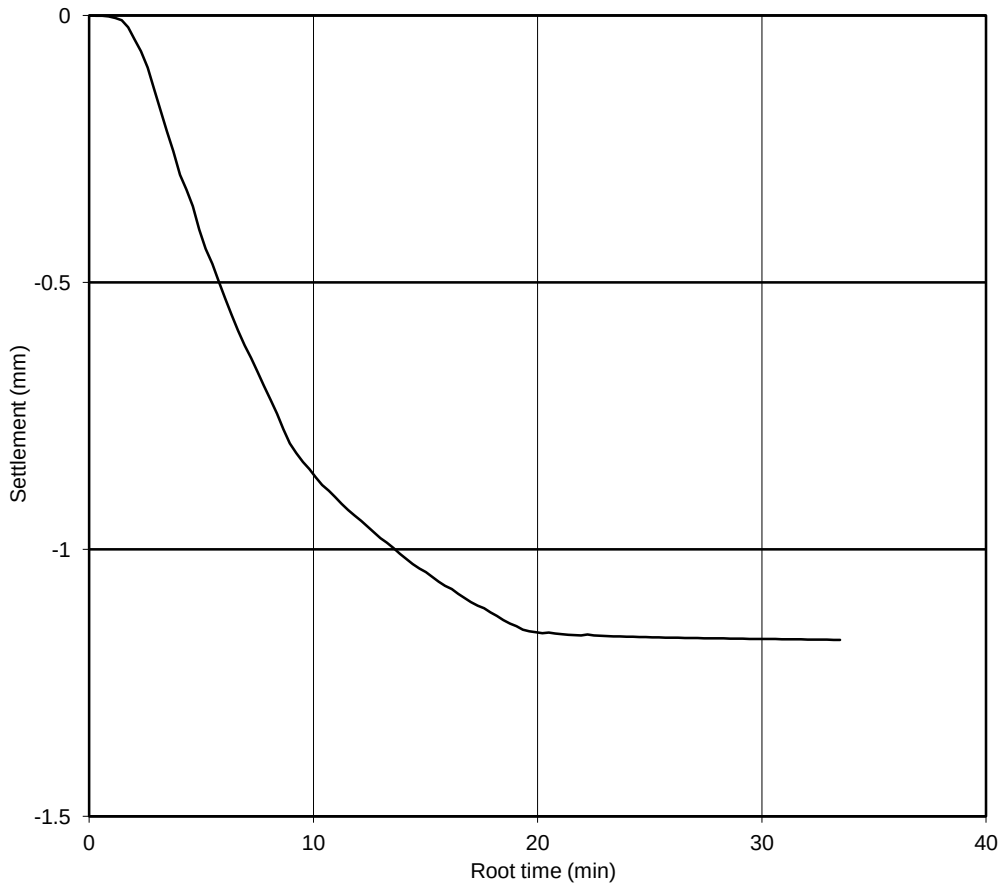


Position in sample
Bottom
Specimen alignment
Cut from sample vertical axis
Shear alignment
Horizontal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
77.79		
Moisture Content		%
16.1		
Bulk Density	P	Mg/m^3
1.982		
Dry Density	P_d	Mg/m^3
1.707		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.582		
Degree of Saturation	S_o	
74.71		
Seating Pressure		kPa
2.5		

Consolidation Stage



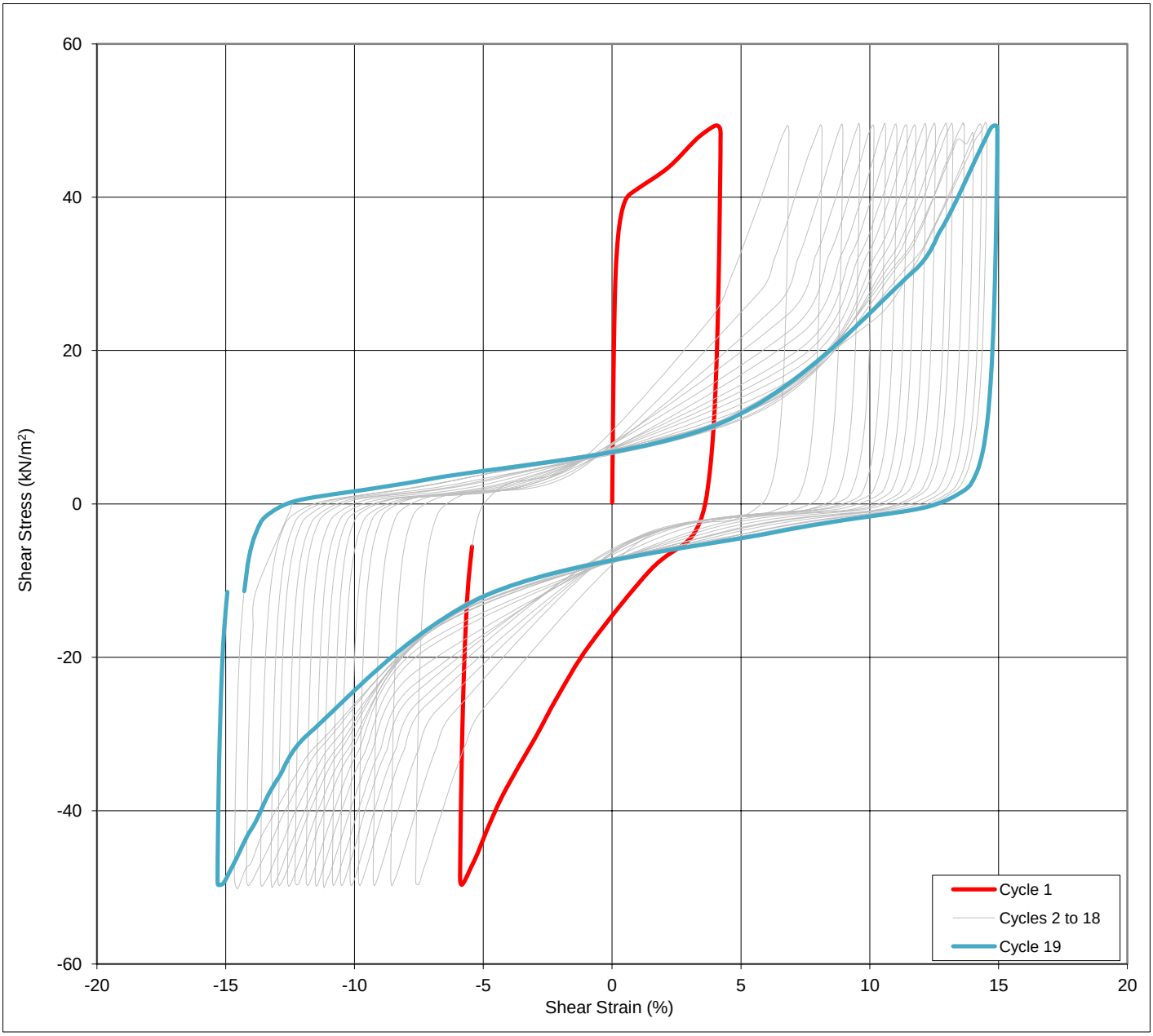
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	185
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	5.85
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	185
Vertical strain at end of consolidation	
ε_{vc} (%)	5.85

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	185
τ_{ref}	
kN/m^2	174
Frequency	
Hz	0.1

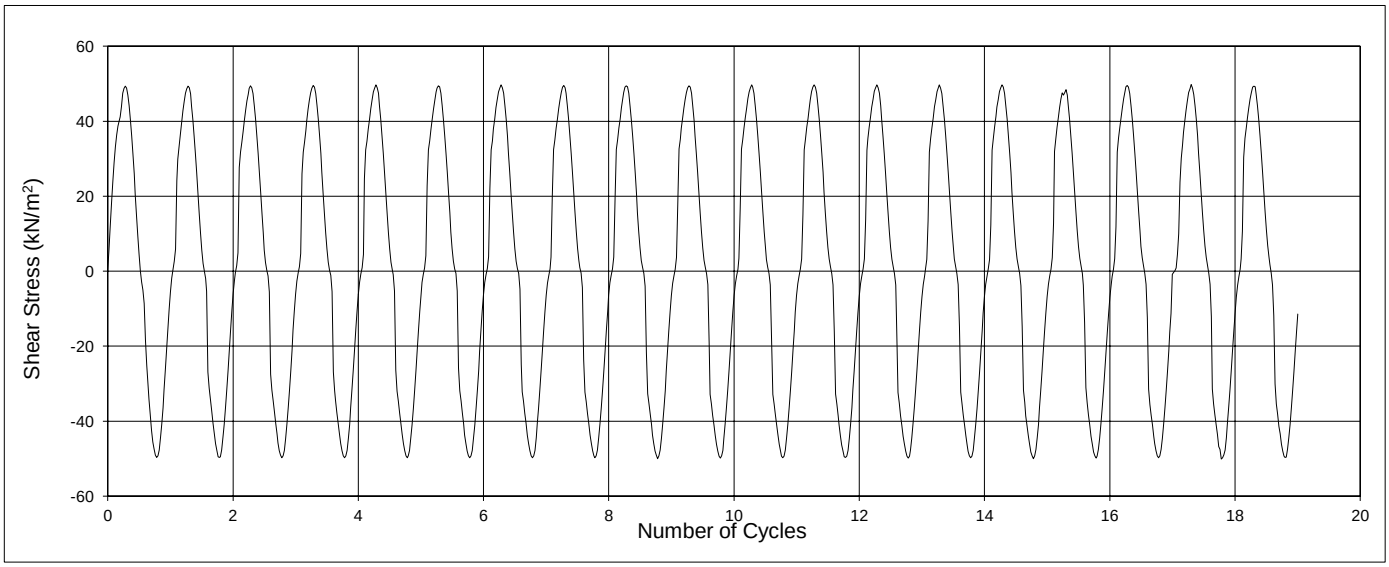
τ_{ave} / σ_{ref}	
	0
τ_{ave}	
kN/m^2	0
τ_{cy} / σ_{ref}	
	0.3
τ_{cyc}	
kN/m^2	52

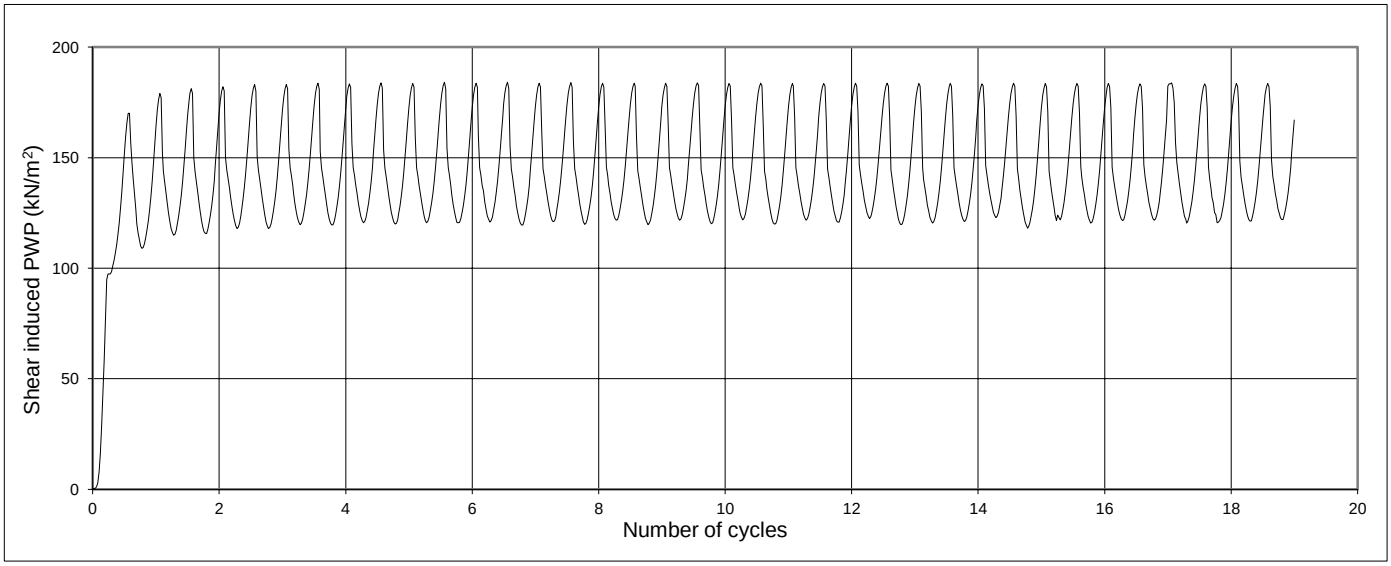
Cyclic Results

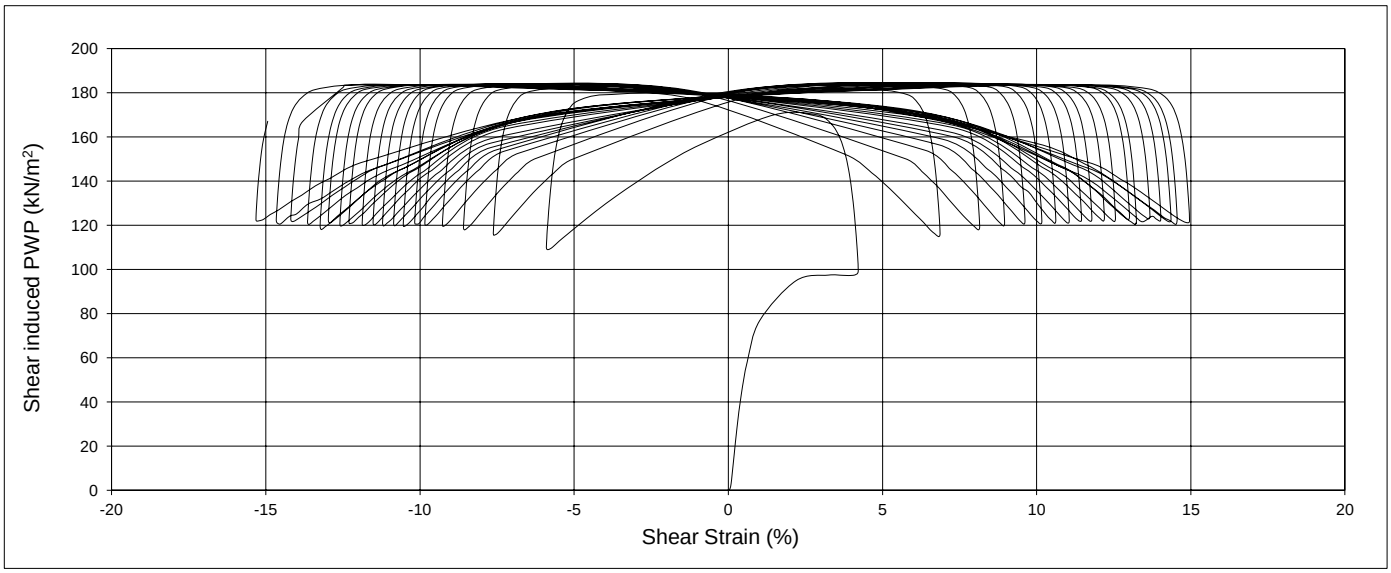
Number of Cycles at Failure	
N_f	19
Change in PWP at failure	
Δu at N_f (kPa)	160
Average strain at failure	
γ_a at N_f (%)	-0.18
Permanent strain at failure	
γ_p at N_f (%)	-12.16
Cyclic strain at failure	
γ_{cy} at N_f (%)	15.13

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

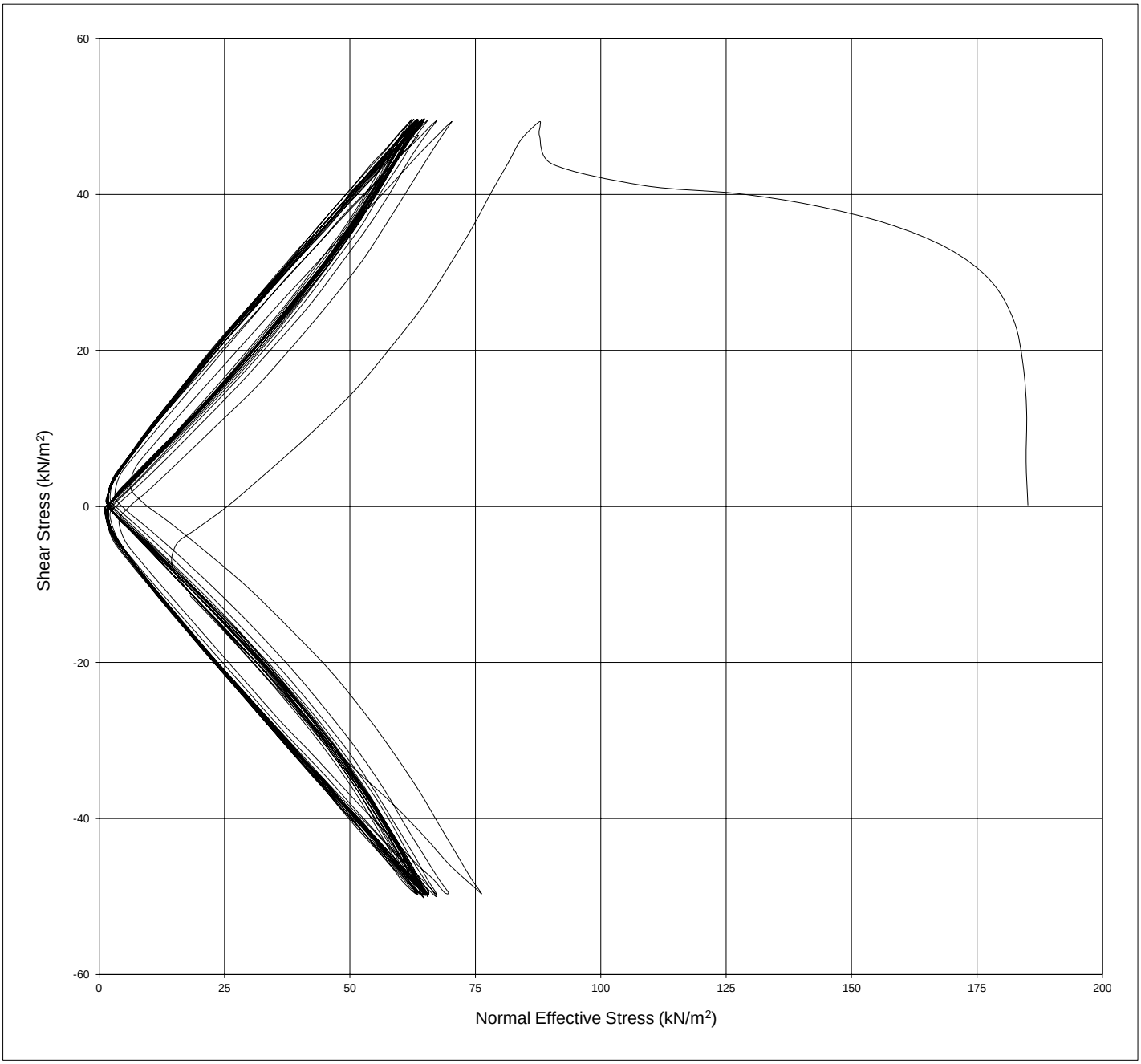






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

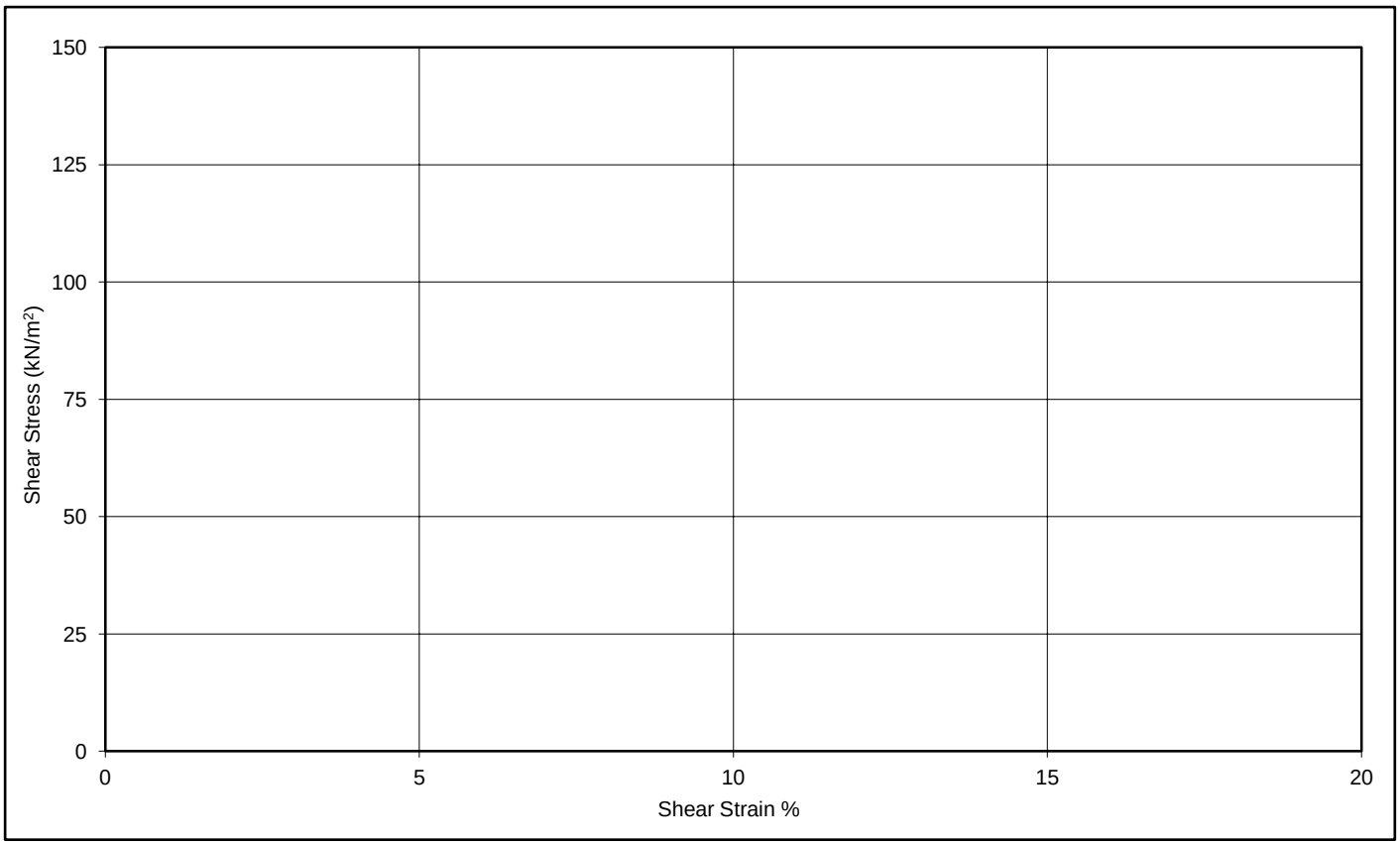
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

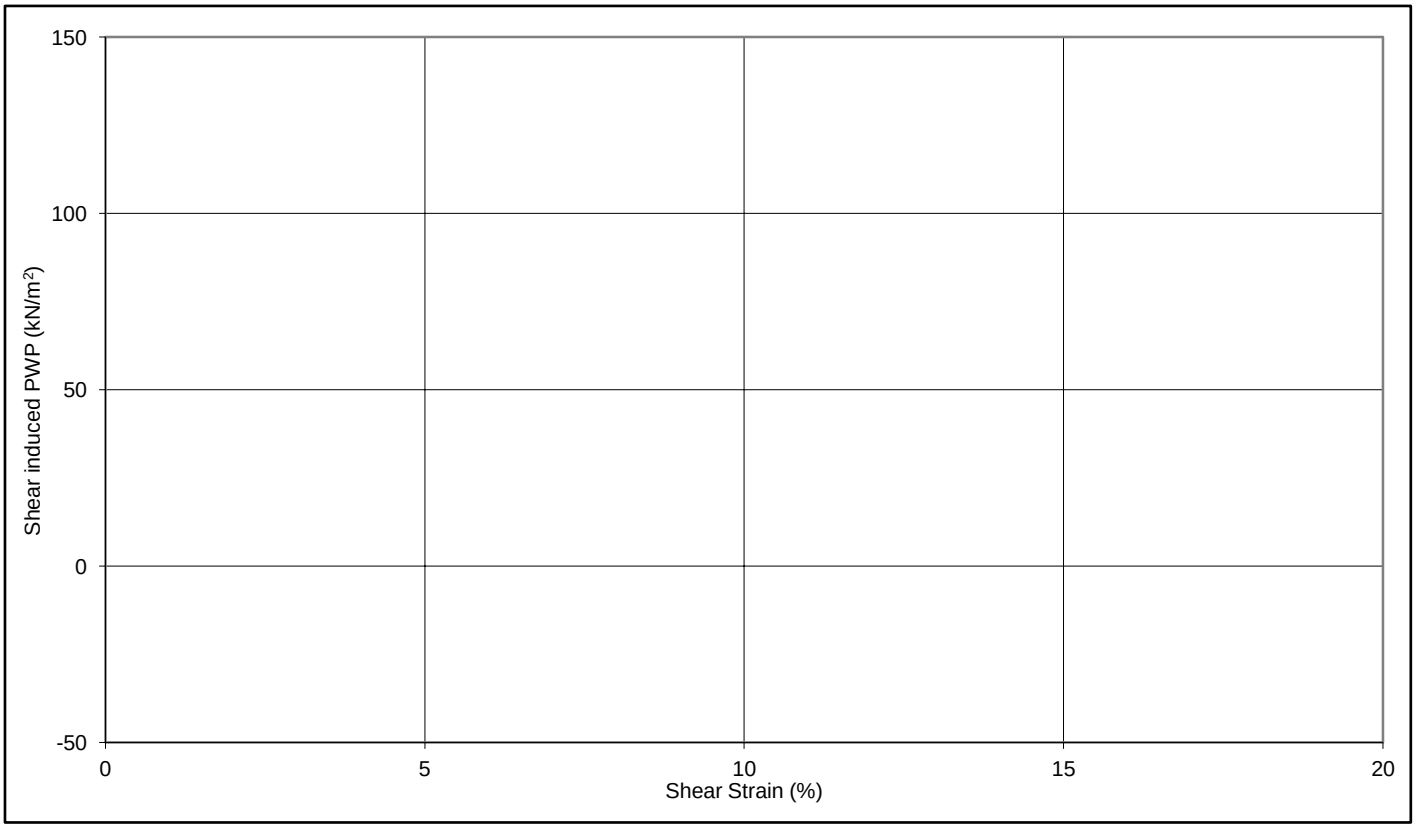


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

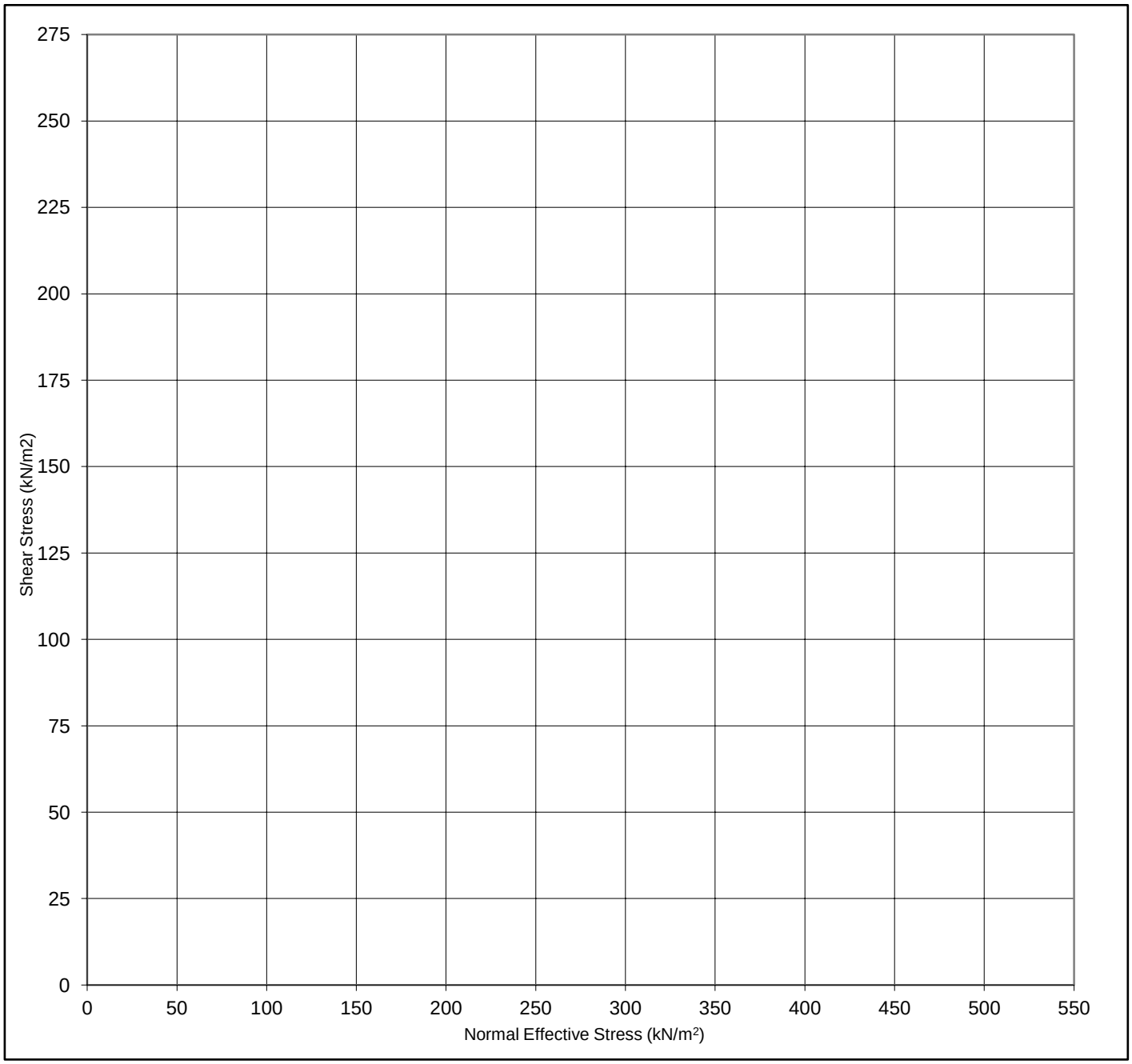
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

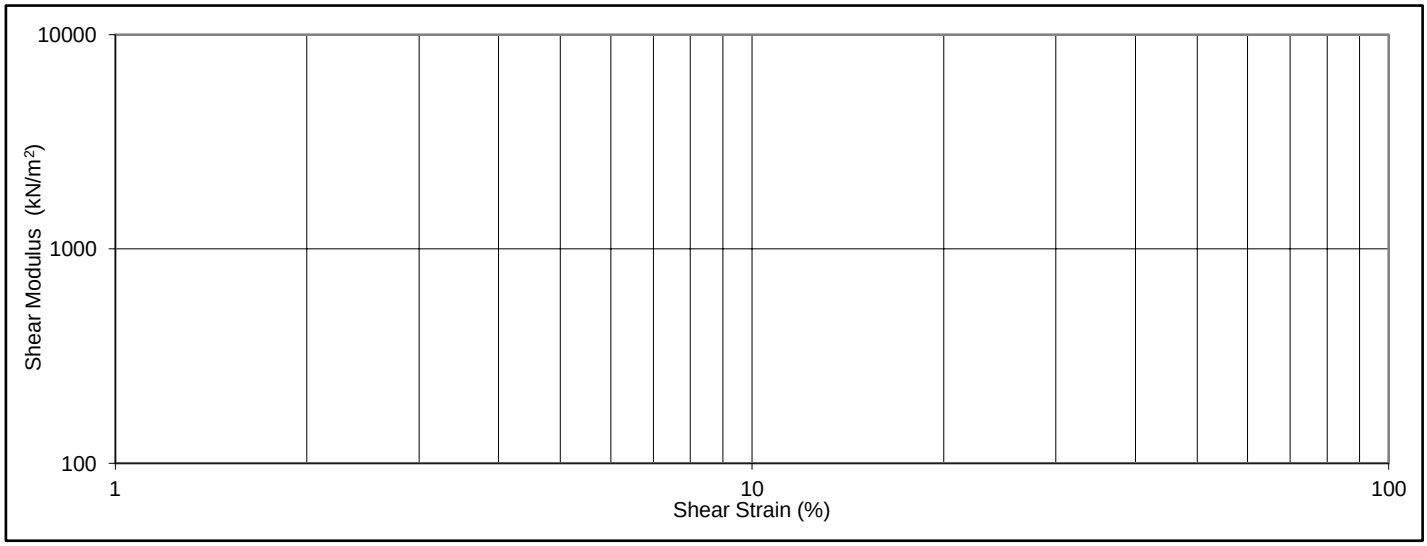
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67

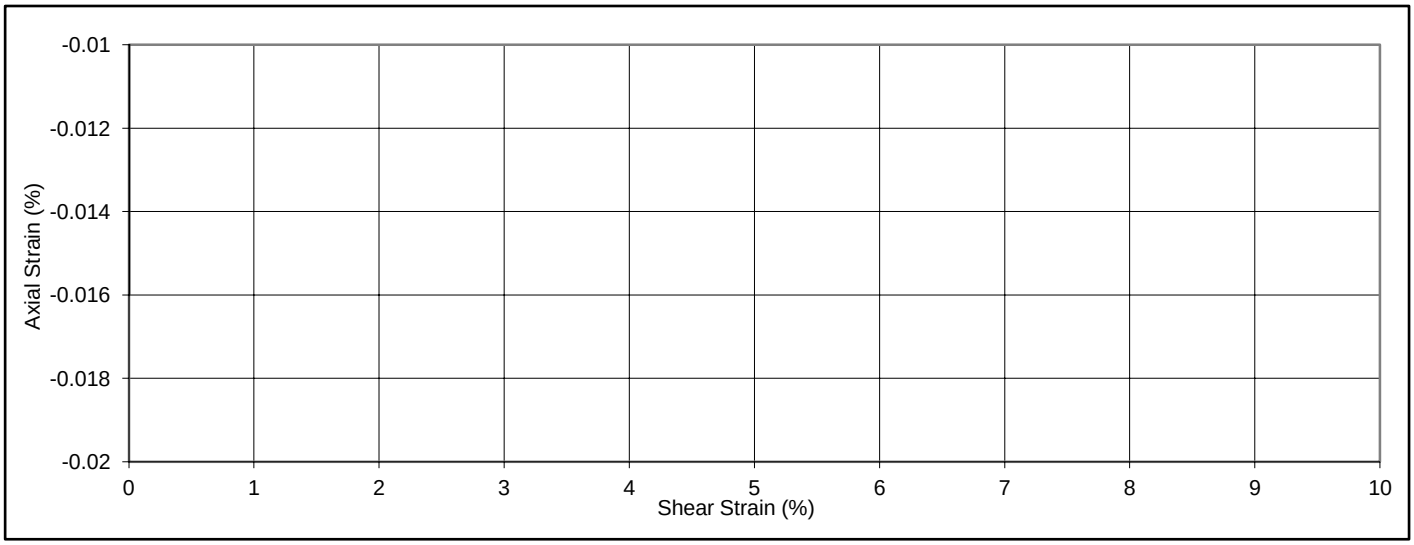


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - G17
Description	SAND. Sand is fine to medium, light olive grey,occasional fine gravel	Sample No./Type	P10Q1
Tested in general accordance with ASTM D6528-07		Depth (m)	18.65-18.67





Final Specimen Details

Sample Height	mm
20.00	
Sample Diameter	mm
50.00	
Sample Weight	g
76.58	
Moisture Content	%
16.0	
Bulk Density	Mg/m^3
1.950	
Dry Density P_d	Mg/m^3
1.682	
Voids Ratio e_o	
0.606	
Degree of Saturation S_o	
71.23	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

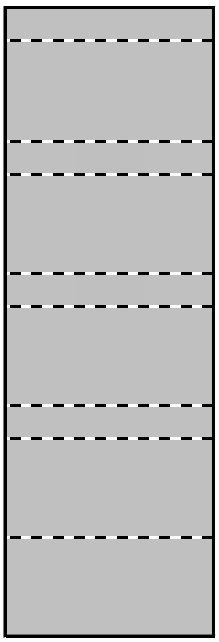
Top Picture
Side view of specimen post shear
Bottom Picture
Specimen opened perpendicular to shear

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Borehole	BH - I21A
		Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

Initial specimen position, orientation and shear direction

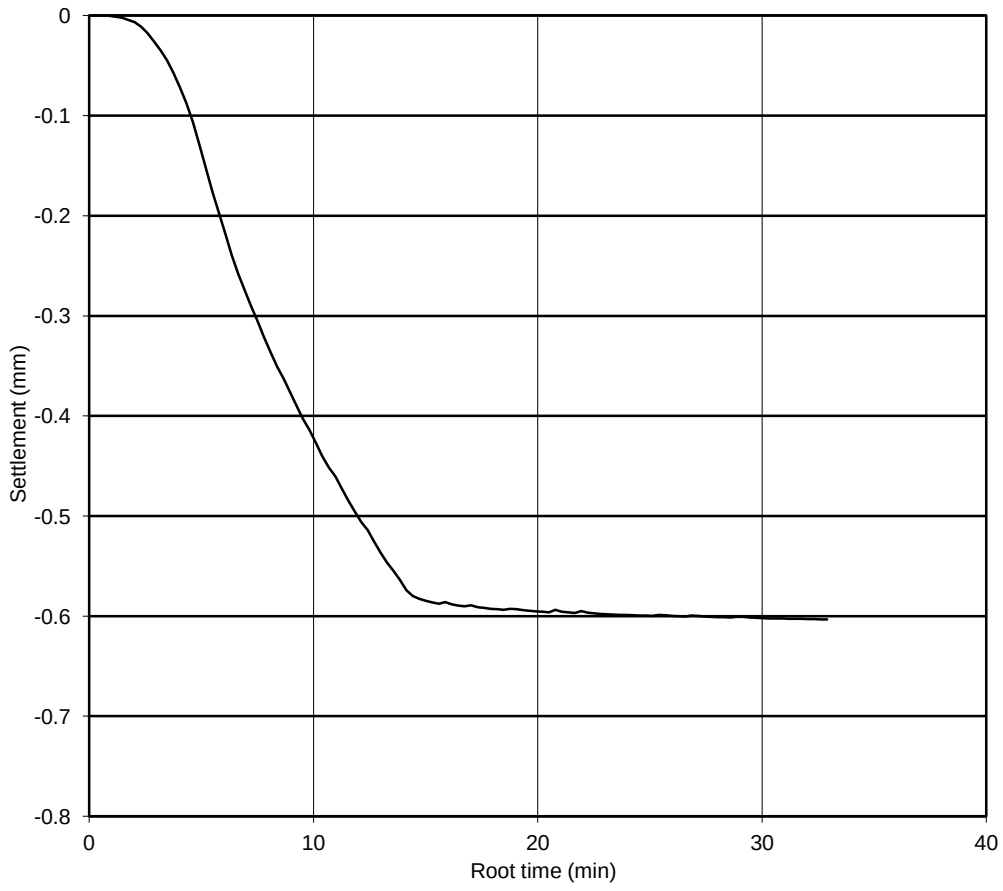


Position in sample
Bag Sample
Specimen alignment
Cut from sample vertical axis
Shear alignment
Normal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
77.73		
Moisture Content		%
22.0		
Bulk Density	P	Mg/m^3
1.980		
Dry Density	P_d	Mg/m^3
1.623		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.664		
Degree of Saturation	S_o	
89.50		
Seating Pressure		kPa
2.5		

Consolidation Stage



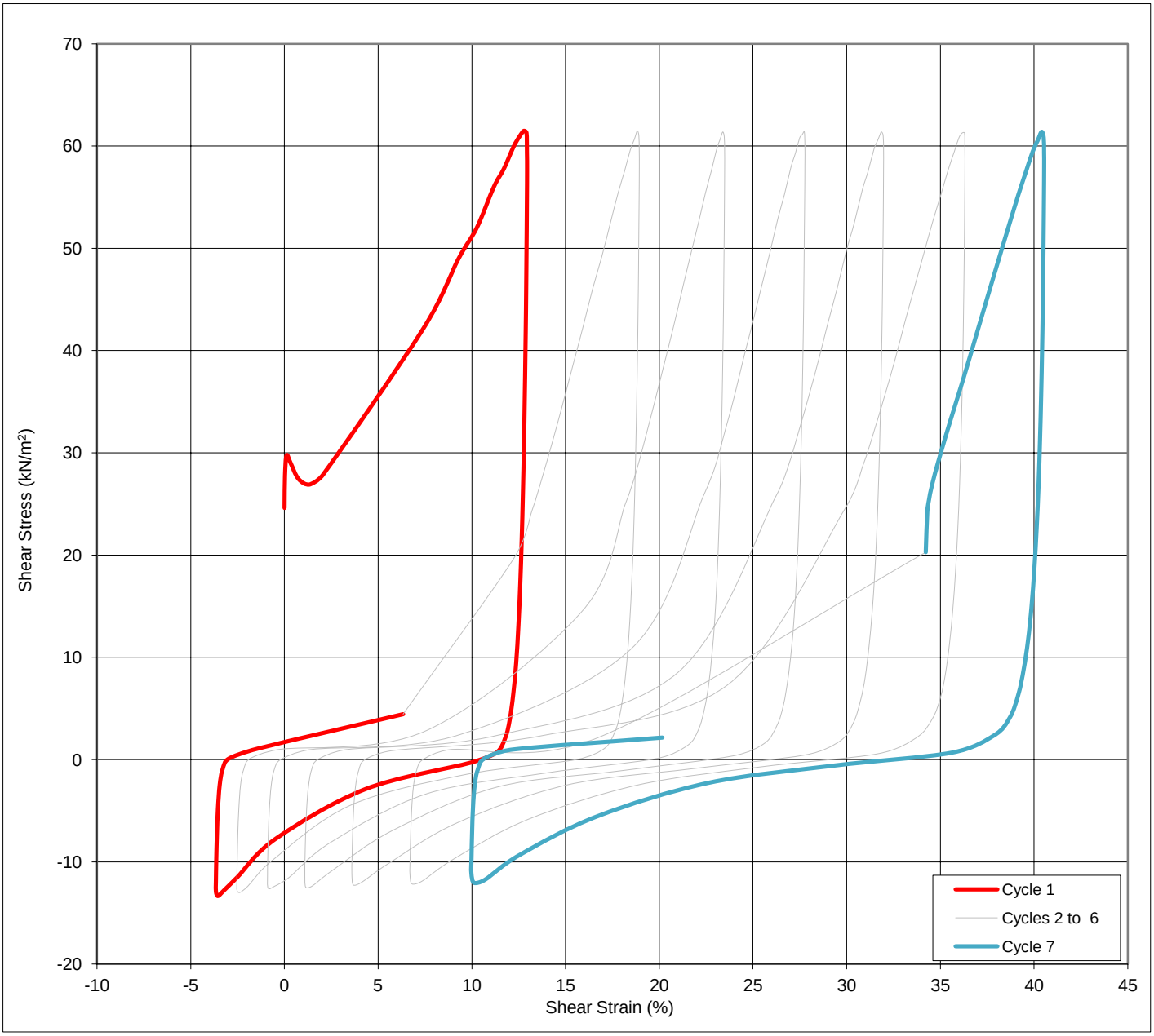
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	98
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	3.02
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	98
Vertical strain at end of consolidation	
ε_{vc} (%)	3.02

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	98
τ_{ref}	
kN/m^2	98
Frequency	
Hz	0.1

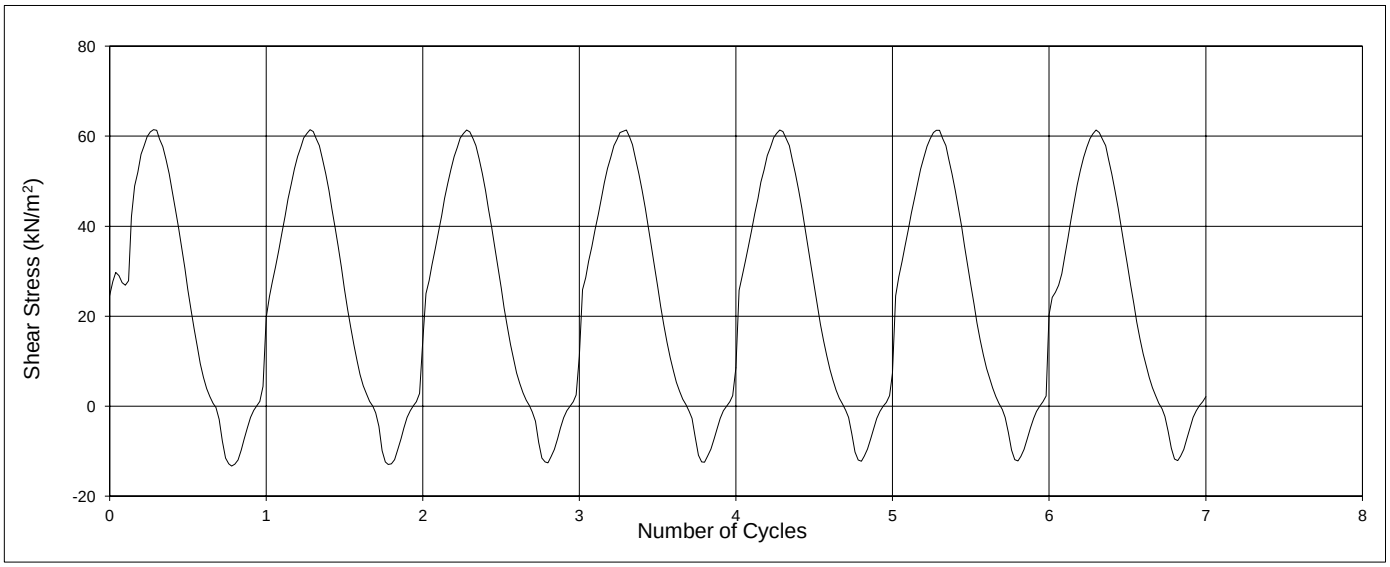
τ_{ave} / σ_{ref}	
	0.25
τ_{ave}	
kN/m^2	24.5
τ_{cy} / σ_{ref}	
	0.4
τ_{cyc}	
kN/m^2	39.3

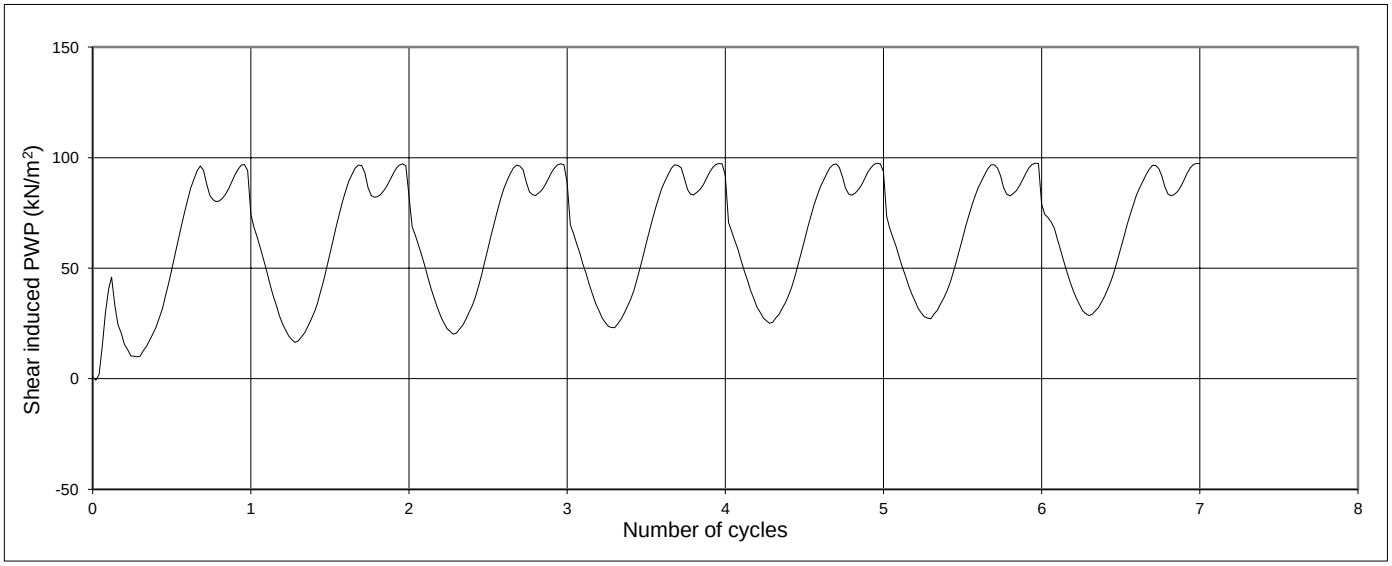
Cyclic Results

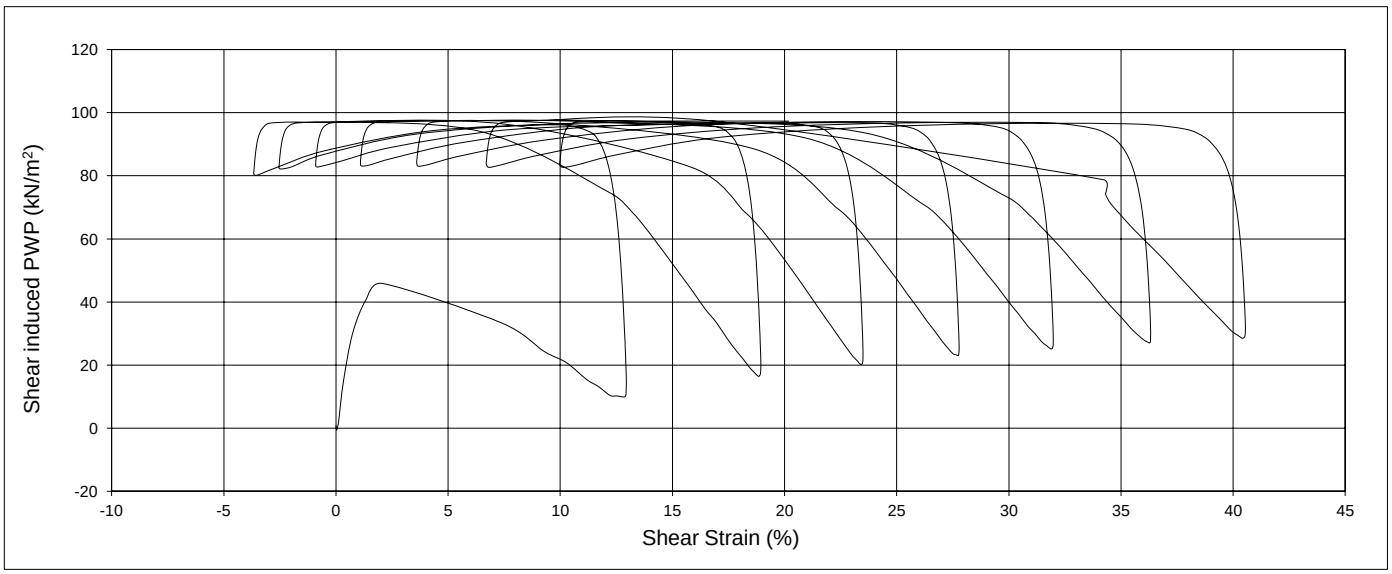
Number of Cycles at Failure	
N_f	7
Change in PWP at failure	
Δu at N_f (kPa)	97
Average strain at failure	
γ_a at N_f (%)	13.26
Permanent strain at failure	
γ_p at N_f (%)	22.39
Cyclic strain at failure	
γ_{cy} at N_f (%)	15.28

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

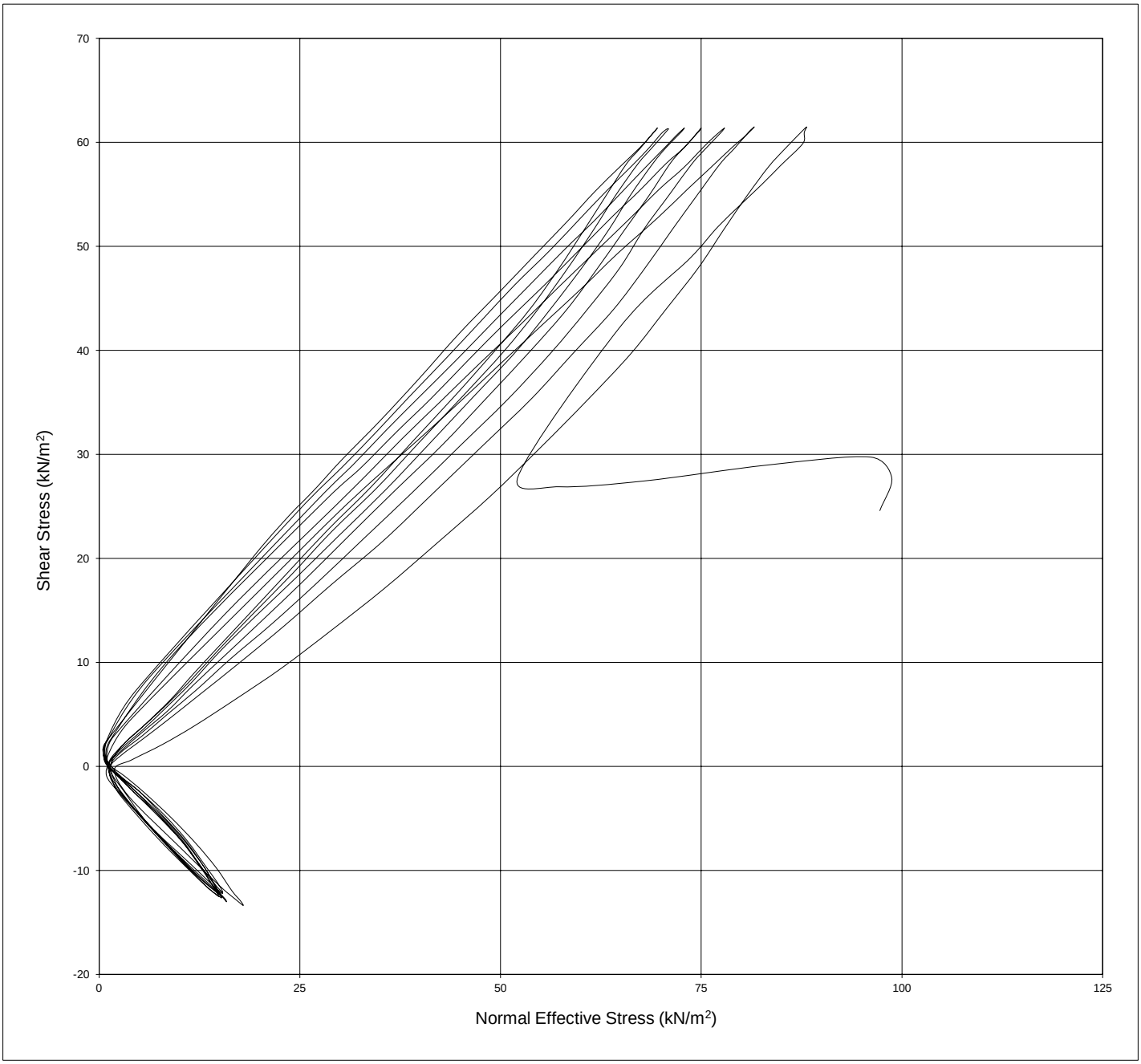






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

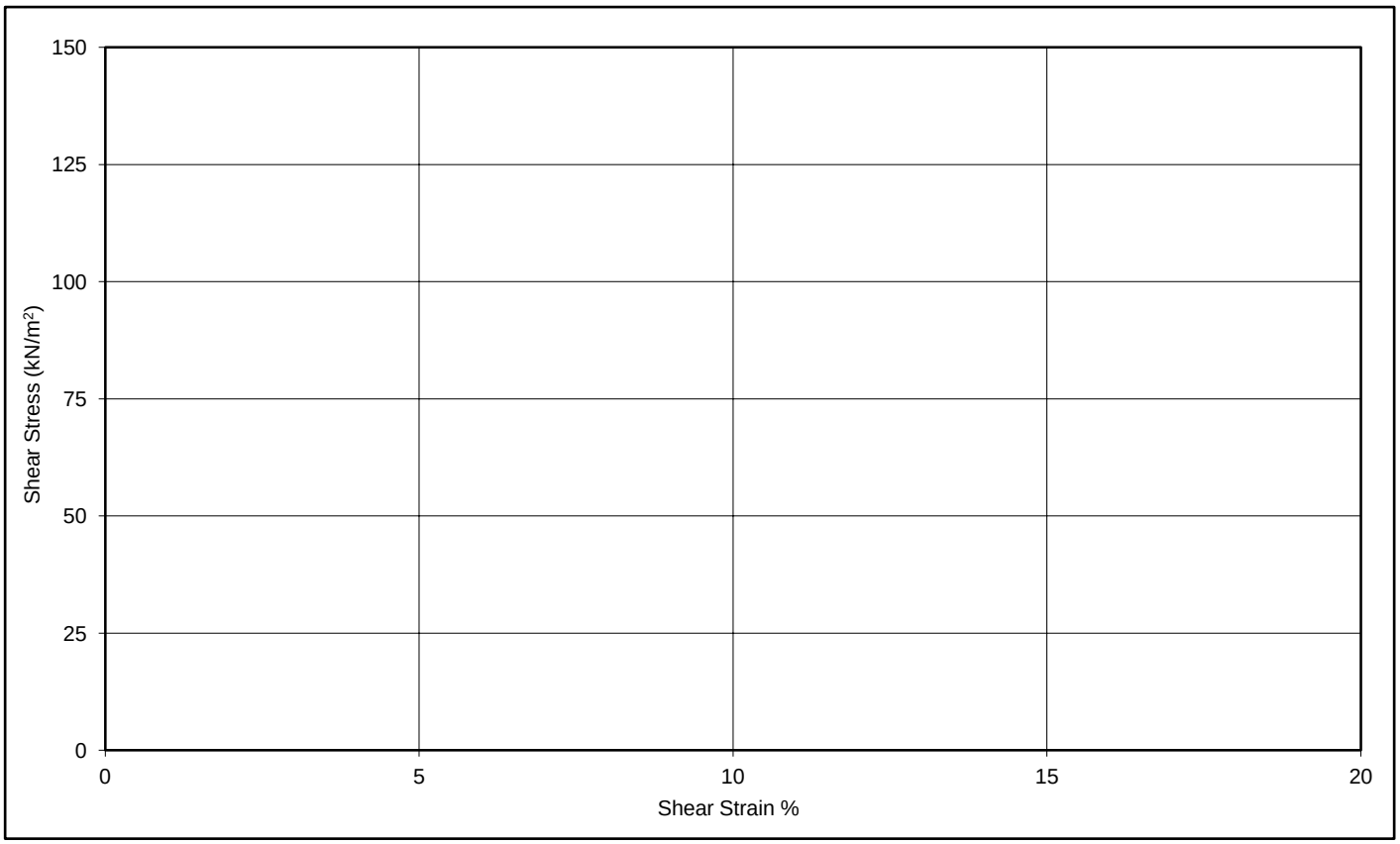
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

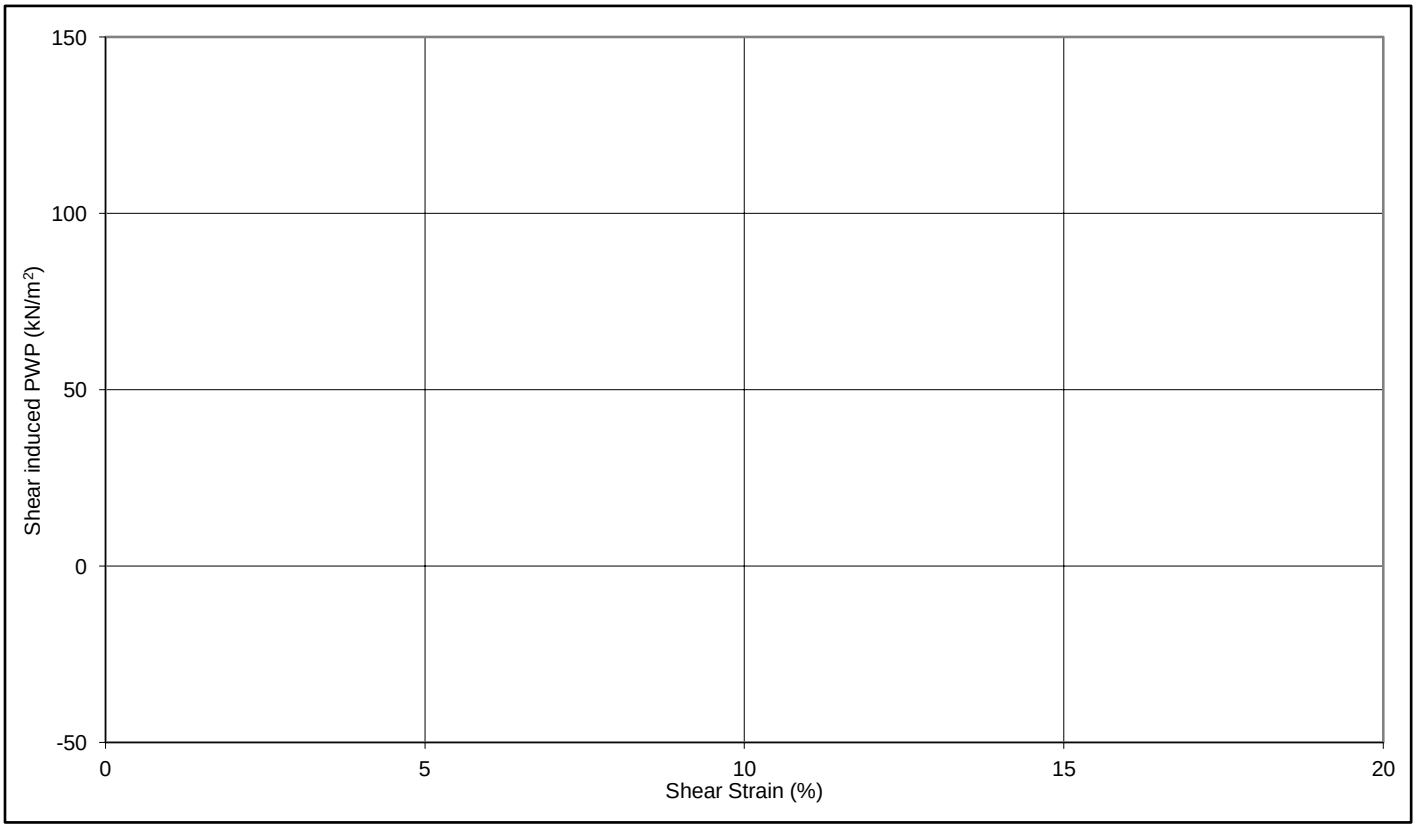


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

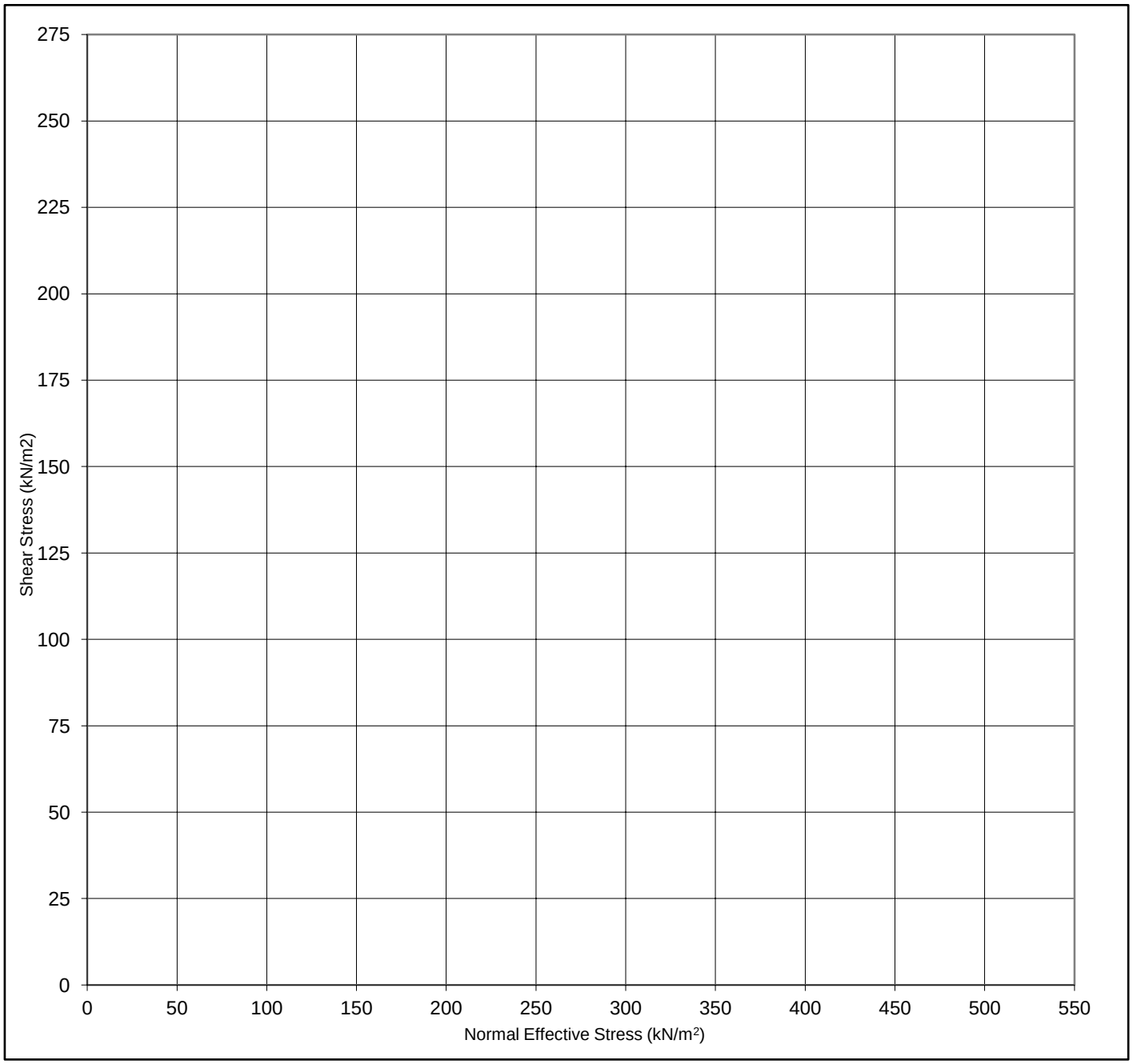
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

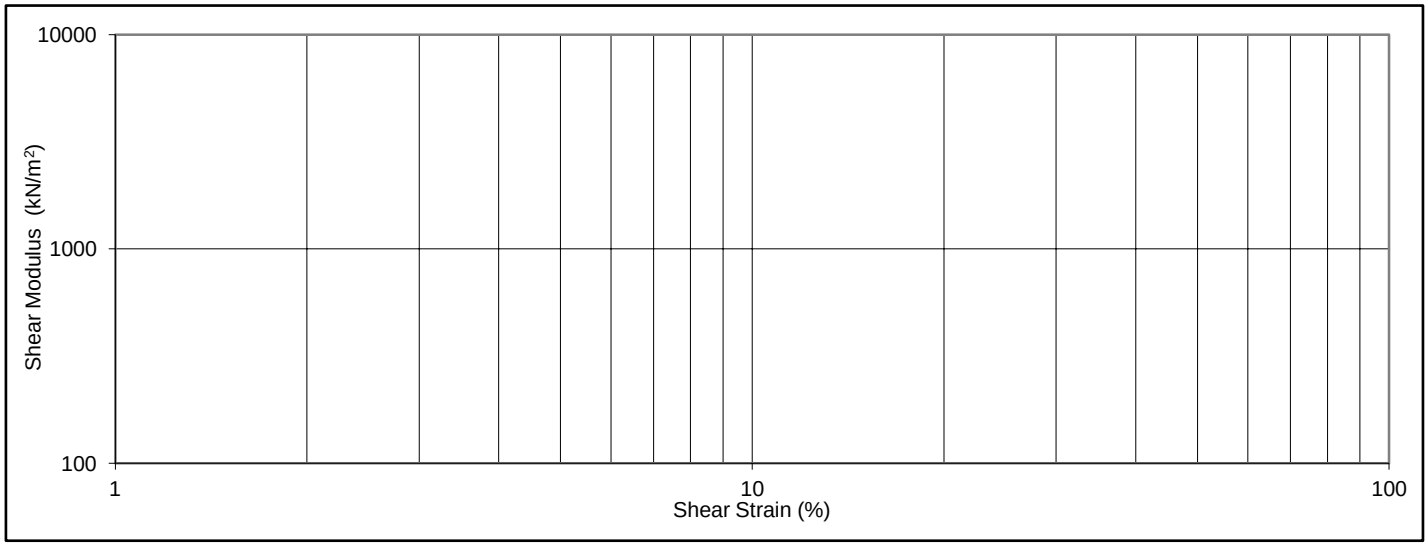
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85

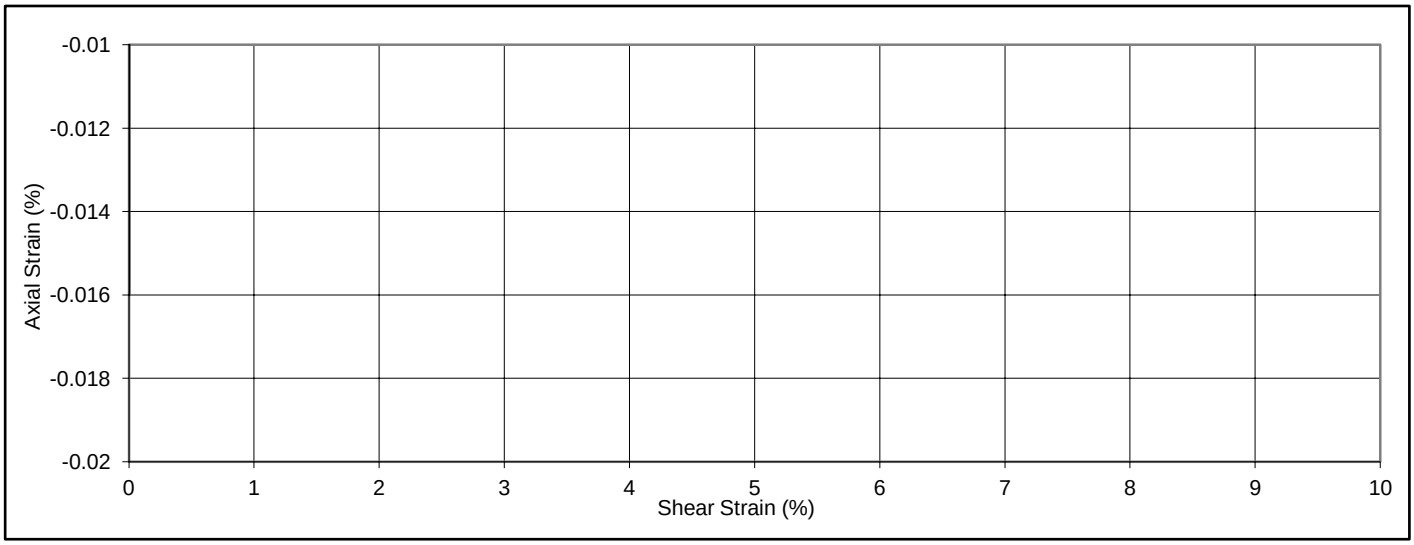


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.72-9.85





Final Specimen Details

Sample Height	mm
20.00	
Sample Diameter	mm
50.00	
Sample Weight	g
74.14	
Moisture Content	%
19.3	
Bulk Density	Mg/m³
1.888	
Dry Density P_d	Mg/m³
1.582	
Voids Ratio e_o	
0.706	
Degree of Saturation S_o	
73.88	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m²)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

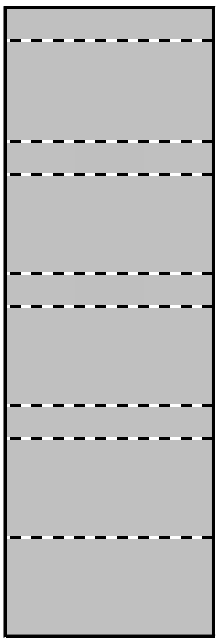
Picture Key
Top Picture
Side view of specimen post cyclic shear
Bottom Picture
Specimen opened perpendicular to shear

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Borehole	BH - I21A
		Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

Initial specimen position, orientation and shear direction

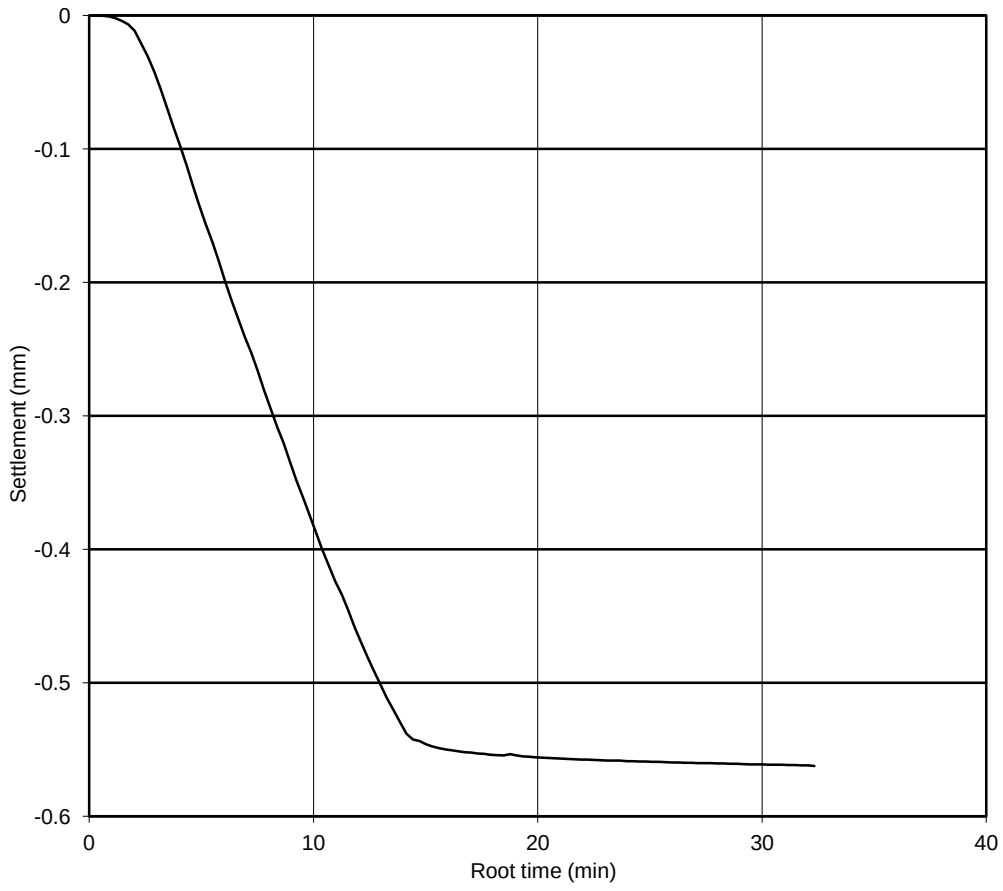


Position in sample
Bag Sample
Specimen alignment
Cut from sample vertical axis
Shear alignment
Normal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
50.00		
Sample Weight		g
77.39		
Moisture Content		%
22.0		
Bulk Density	P	Mg/m^3
1.971		
Dry Density	P_d	Mg/m^3
1.616		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.671		
Degree of Saturation	S_o	
88.52		
Seating Pressure		kPa
2.5		

Consolidation Stage



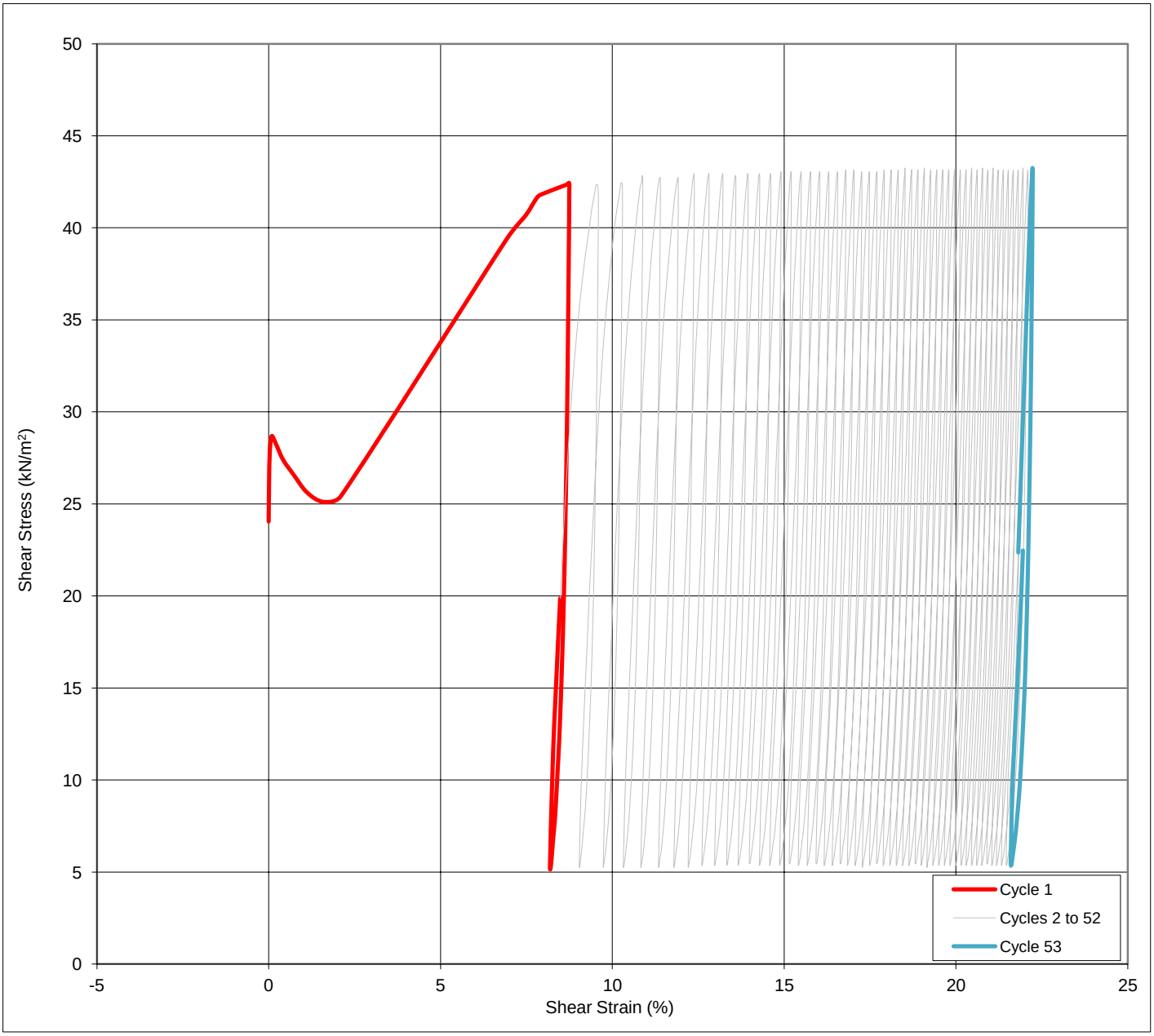
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	98
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	2.81
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	98
Vertical strain at end of consolidation	
ε_{vc} (%)	2.81

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	98
τ_{ref}	
kN/m^2	98
Frequency	
Hz	0.1

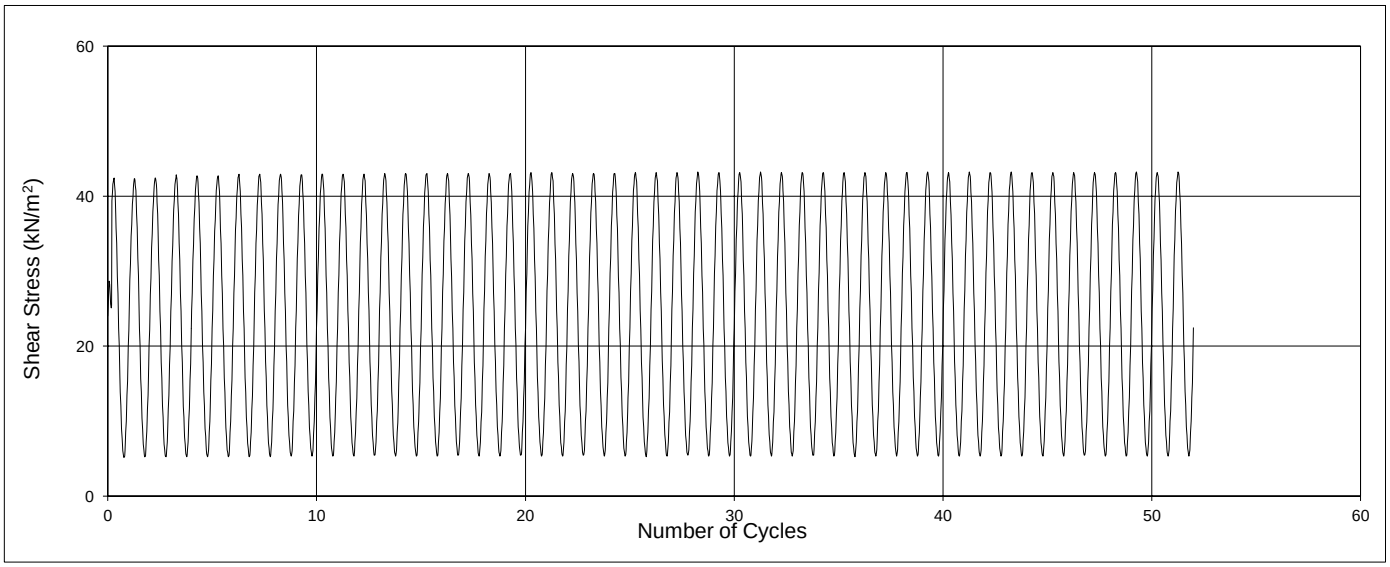
τ_{ave} / σ_{ref}	
	0.25
τ_{ave}	
kN/m^2	25
τ_{cy} / σ_{ref}	
	0.2
τ_{cyc}	
kN/m^2	20

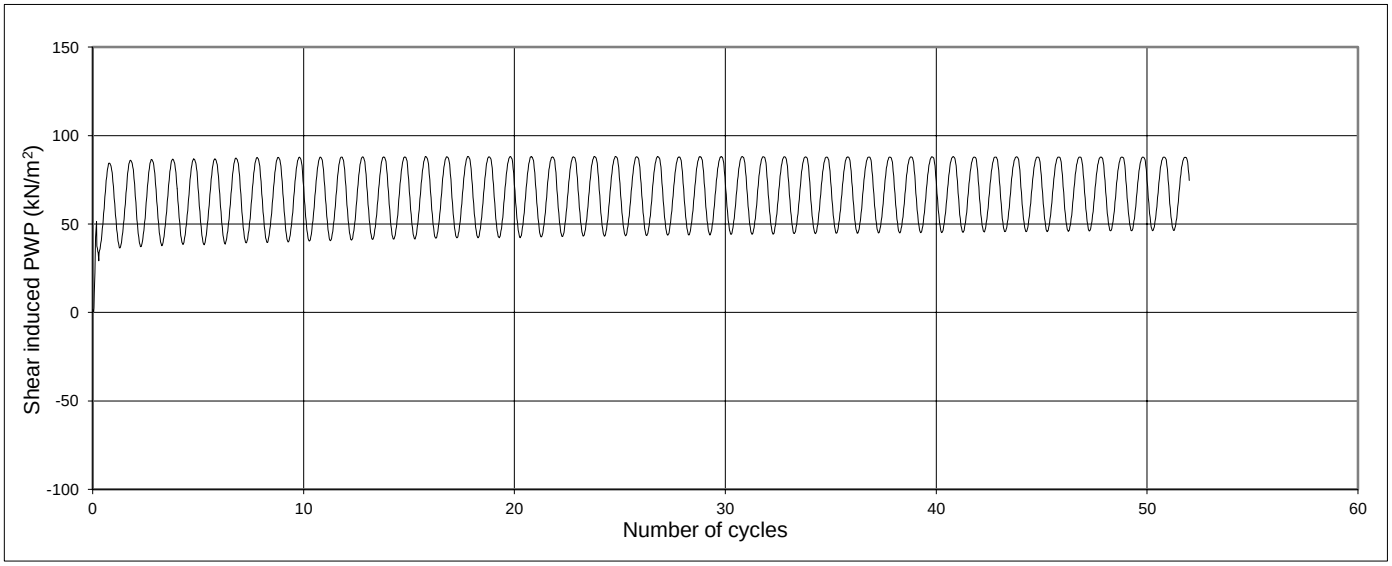
Cyclic Results

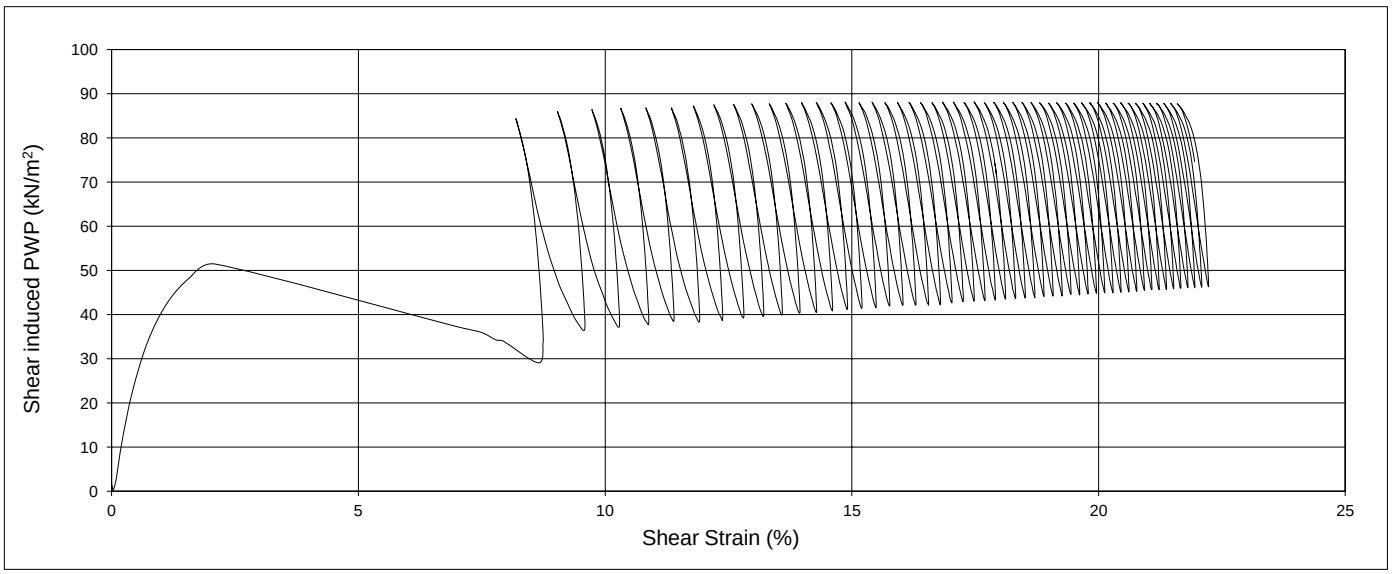
Number of Cycles at Failure	
N_f	53
Change in PWP at failure	
Δu at N_f (kPa)	75
Average strain at failure	
γ_a at N_f (%)	15.05
Permanent strain at failure	
γ_p at N_f (%)	15.00
Cyclic strain at failure	
γ_{cy} at N_f (%)	0.32

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

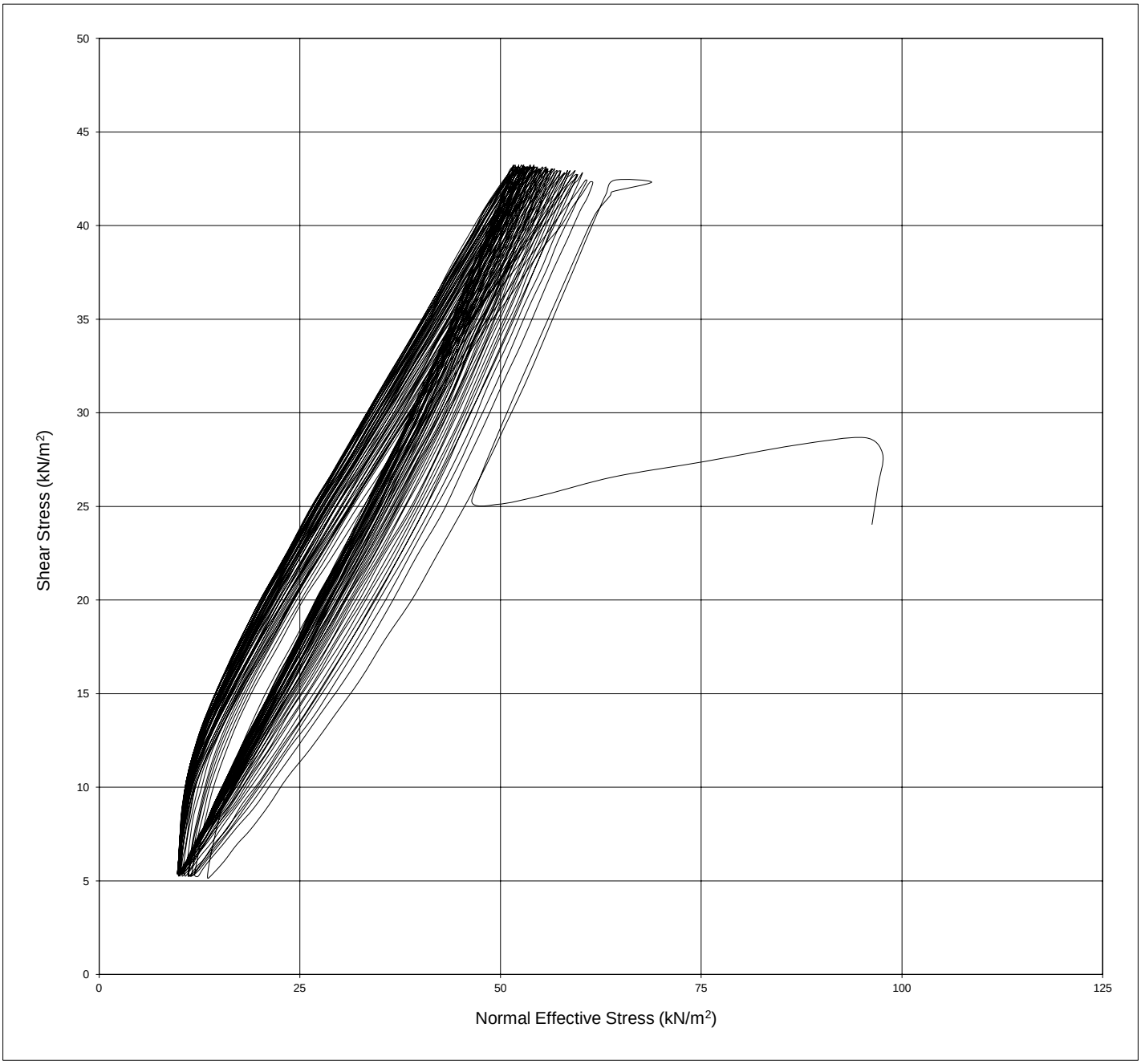






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

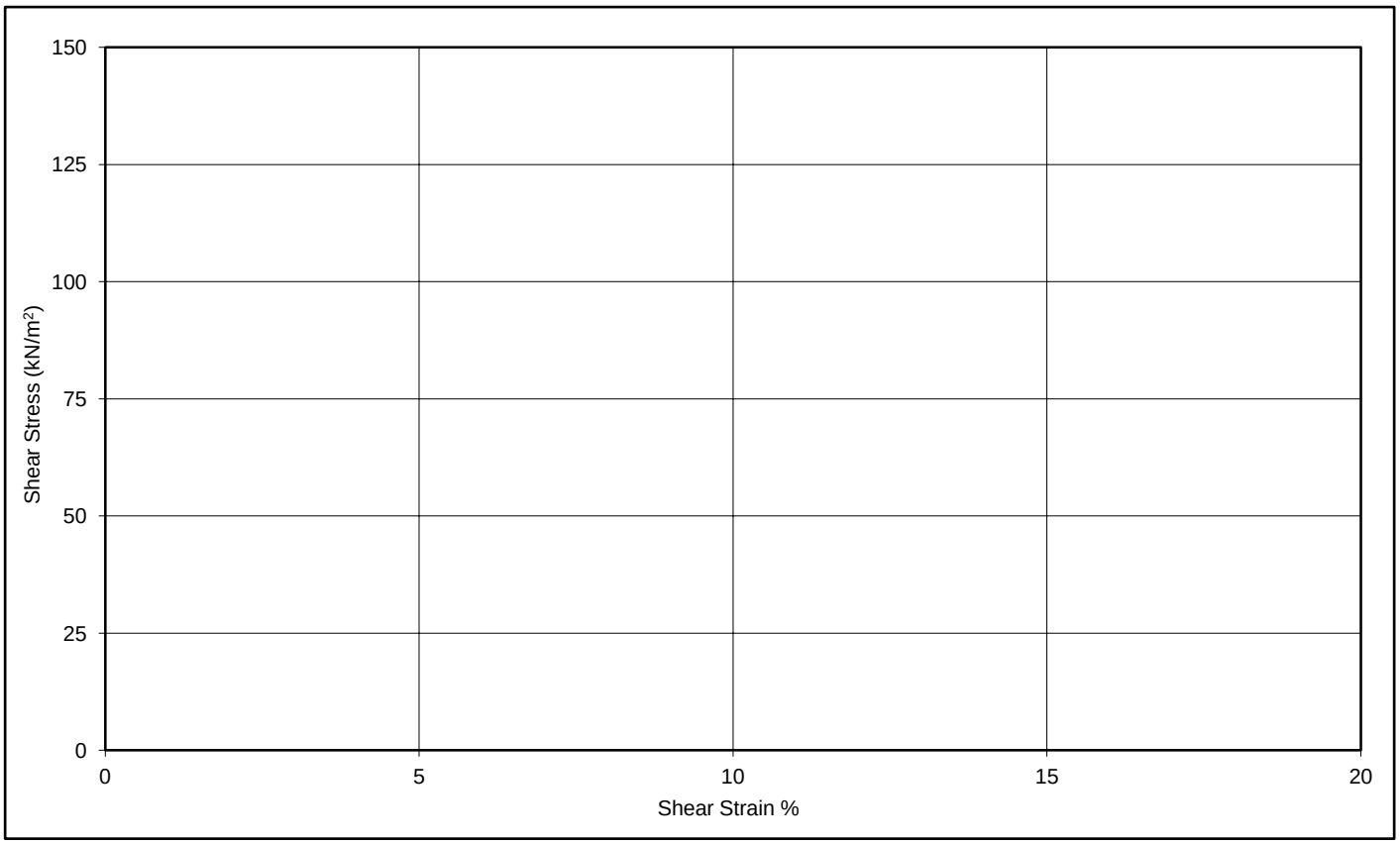
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

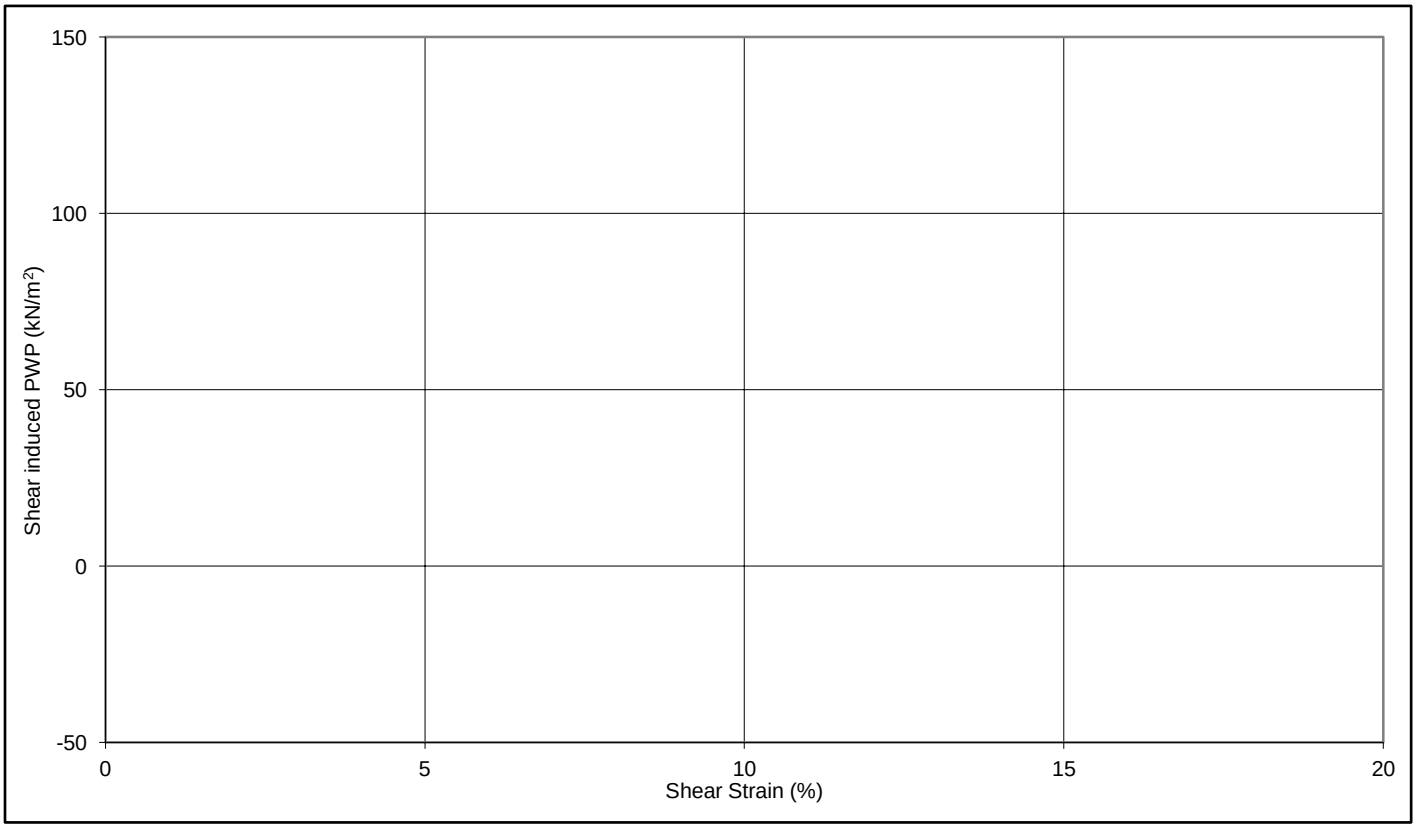


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

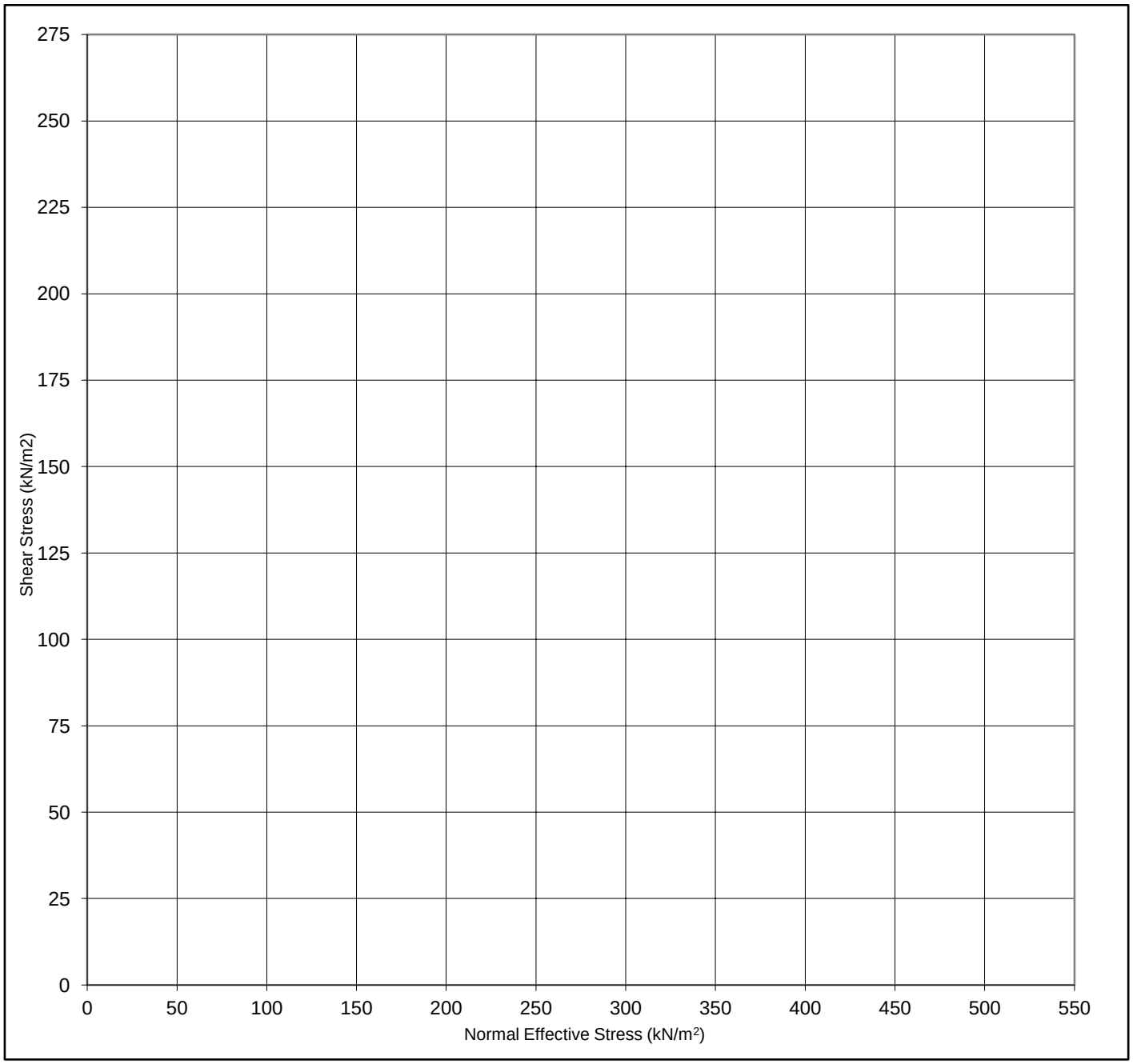
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

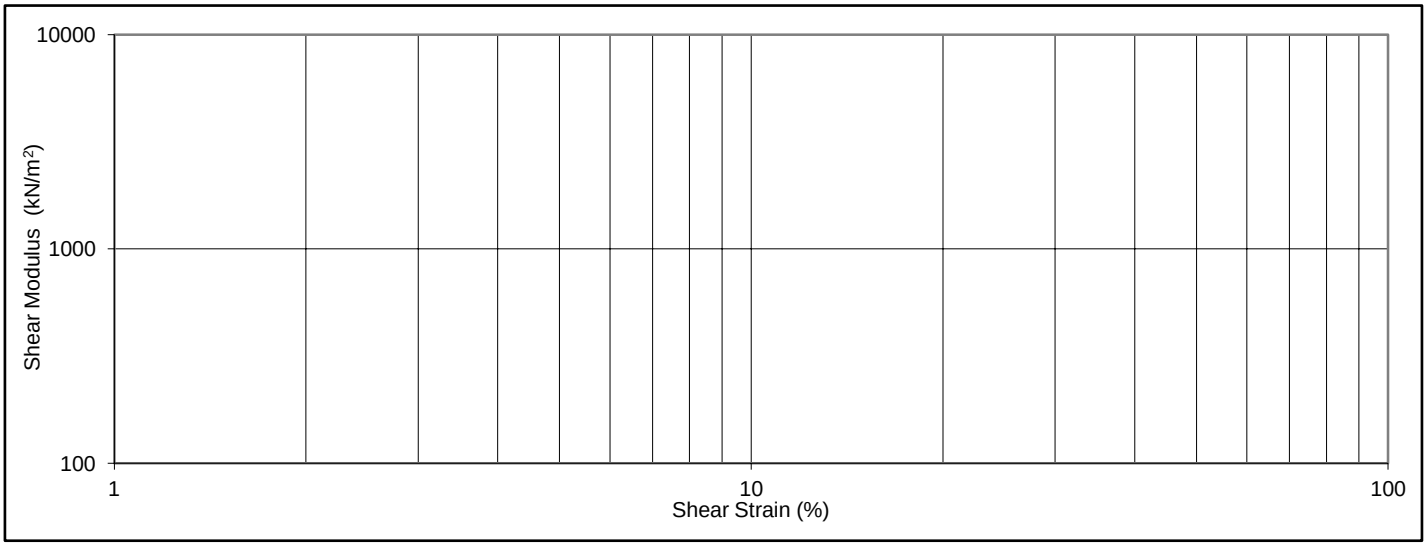
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85

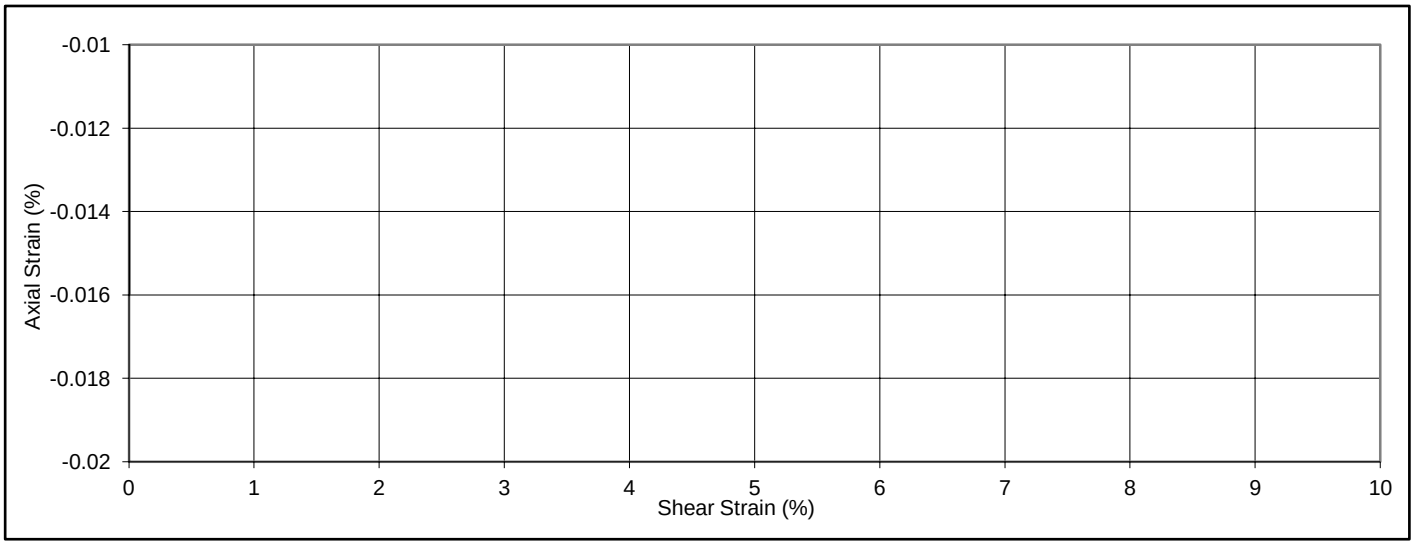


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.74-9.85





Final Specimen Details

Sample Height	mm
20.00	
Sample Diameter	mm
50.00	
Sample Weight	g
74.39	
Moisture Content	%
18.0	
Bulk Density	Mg/m³
1.895	
Dry Density P_d	Mg/m³
1.606	
Voids Ratio e_o	
0.681	
Degree of Saturation S_o	
71.26	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m²)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

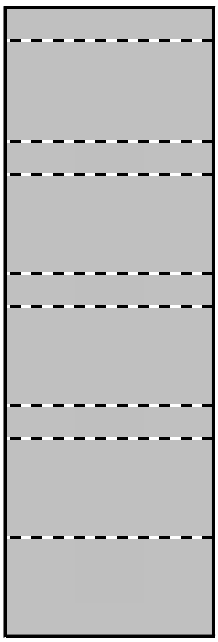
Picture Key
Top Picture
Side view of specimen post shear
Bottom Picture
Specimen opened perpendicular to shear

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Borehole	BH - I21A
		Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

Initial specimen position, orientation and shear direction

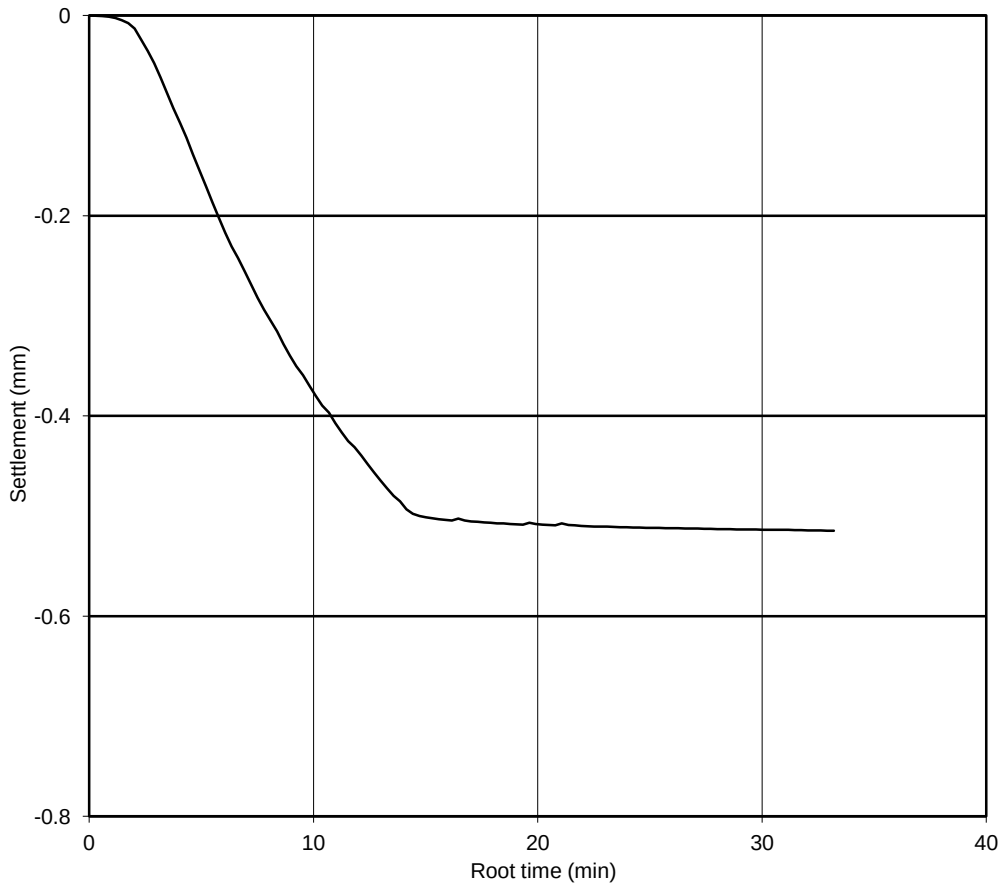


Position in sample
Bag
Specimen alignment
Cut from sample vertical axis
Shear alignment
Rotated
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
50.00		
Sample Weight		g
76.4		
Moisture Content		%
21.5		
Bulk Density	P	Mg/m^3
1.946		
Dry Density	P_d	Mg/m^3
1.602		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
0.685		
Degree of Saturation	S_o	
84.71		
Seating Pressure		kPa
2.5		

Consolidation Stage



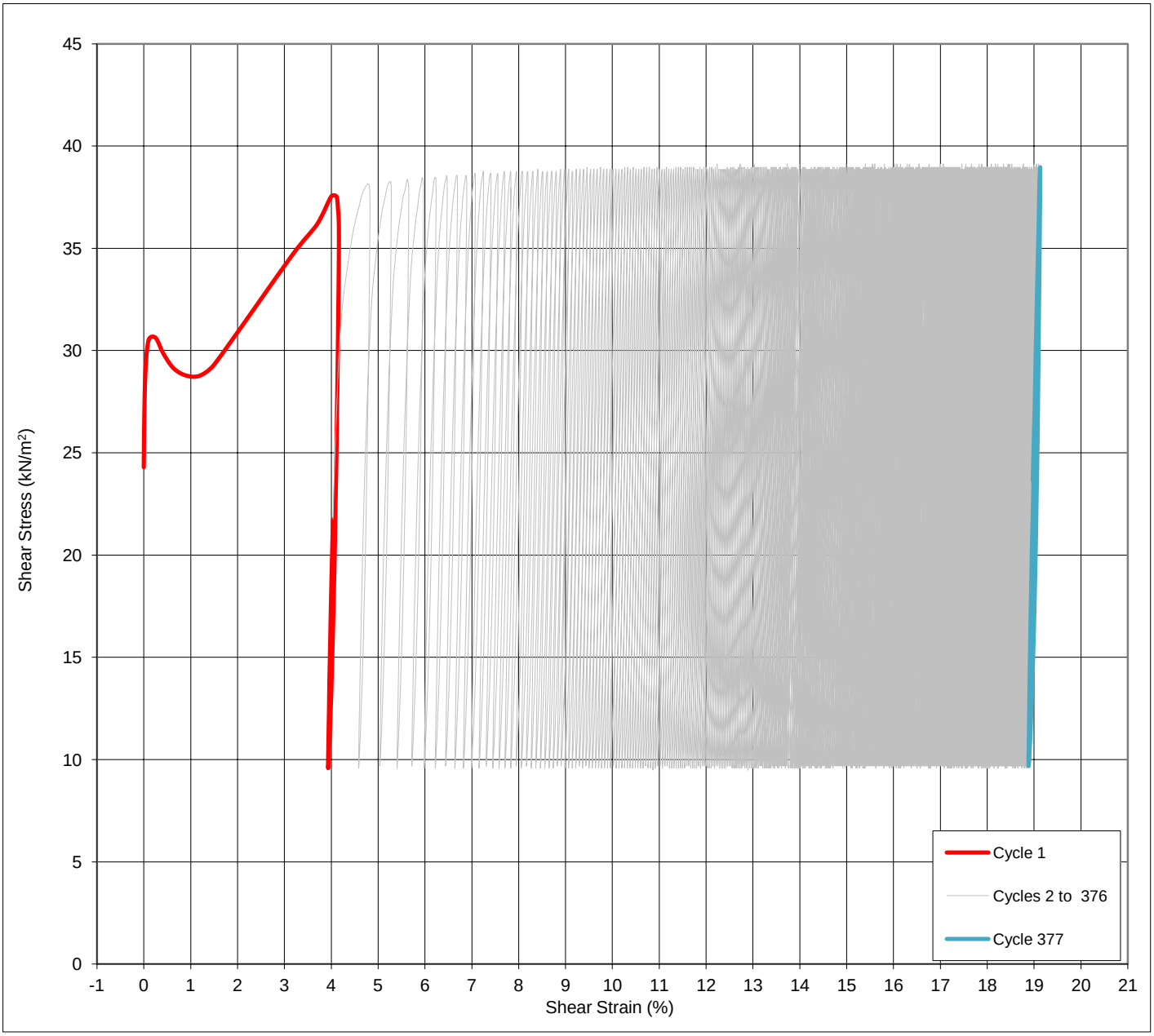
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	98
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	2.57
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	98
Vertical strain at end of consolidation	
ε_{vc} (%)	2.57

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m²	98
τ_{ref}	
kN/m²	98
Frequency	
Hz	0.1

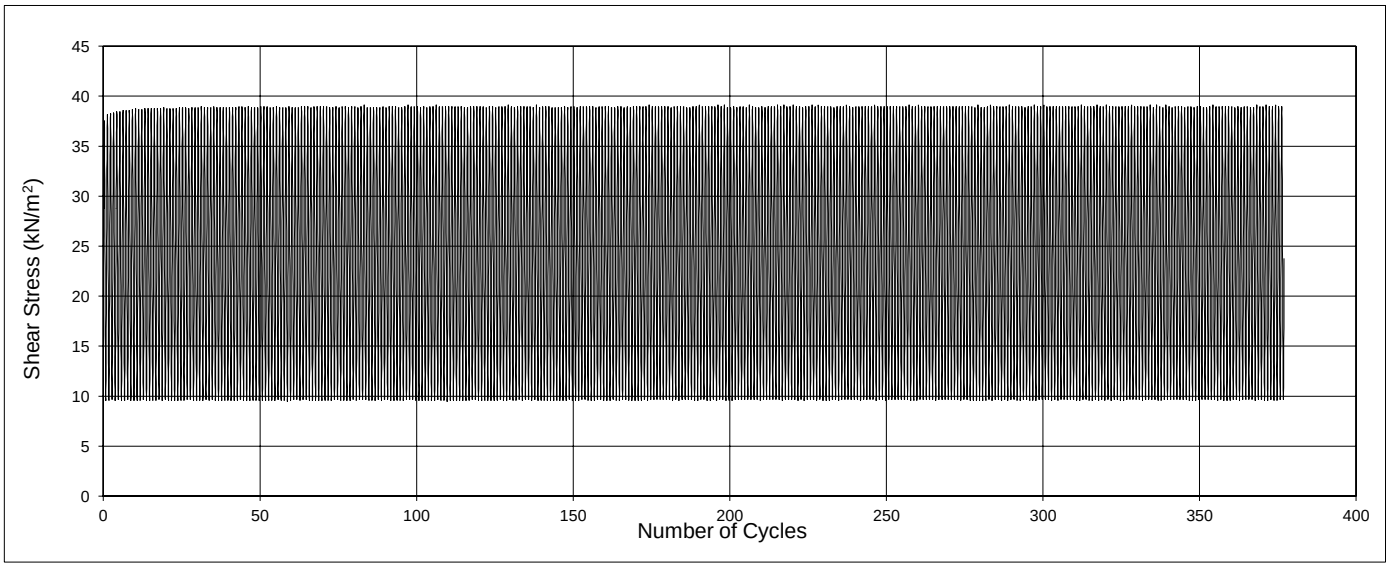
τ_{ave} / σ_{ref}	
	0.25
τ_{ave}	
kN/m²	25
τ_{cy} / σ_{ref}	
	0.15
τ_{cyc}	
kN/m²	15

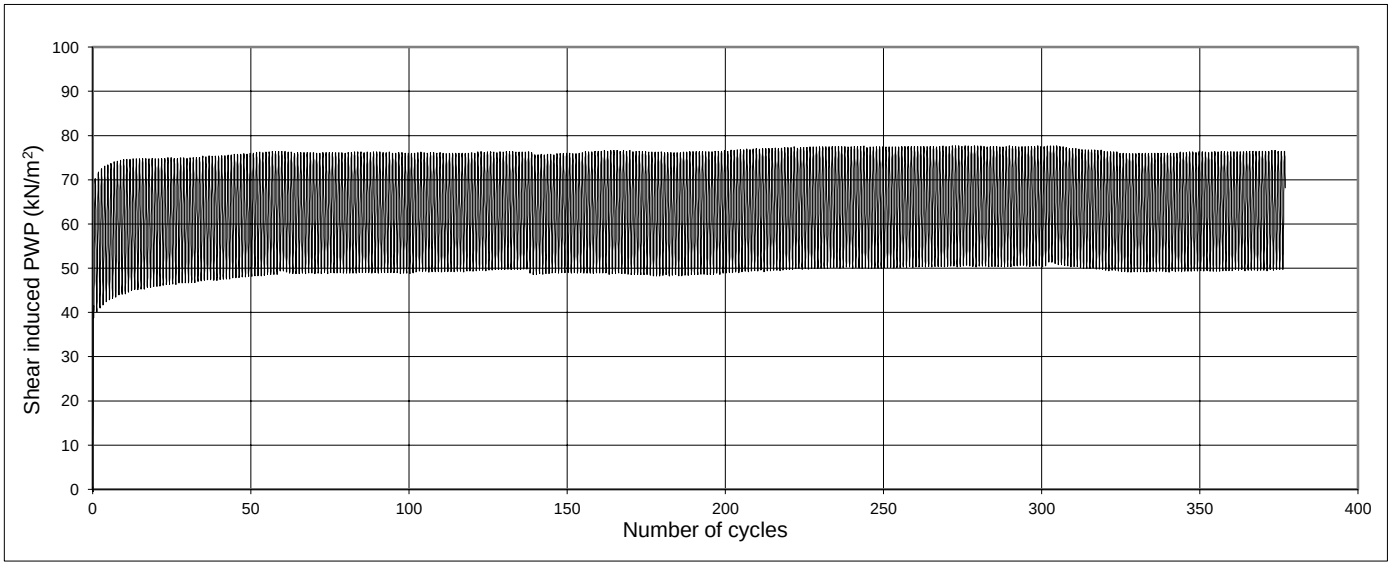
Cyclic Results

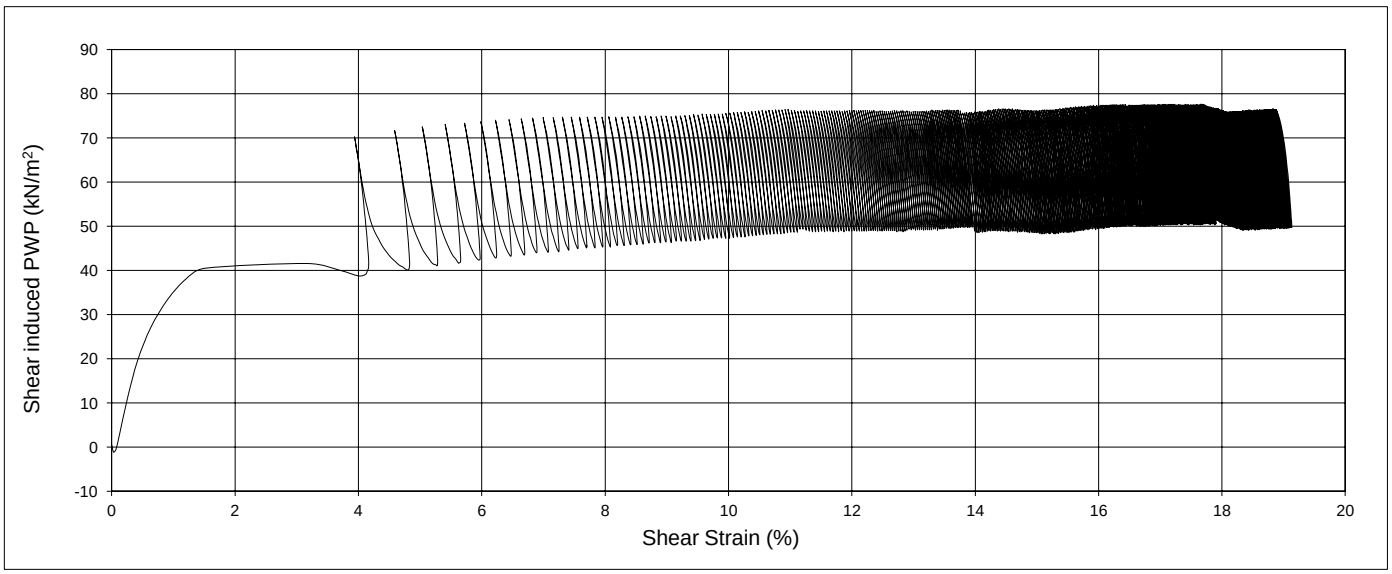
Number of Cycles at Failure	
N_f	377
Change in PWP at failure	
Δu at N_f (kPa)	68
Average strain at failure	
γ_a at N_f (%)	15.01
Permanent strain at failure	
γ_p at N_f (%)	14.99
Cyclic strain at failure	
γ_{cy} at N_f (%)	0.13

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

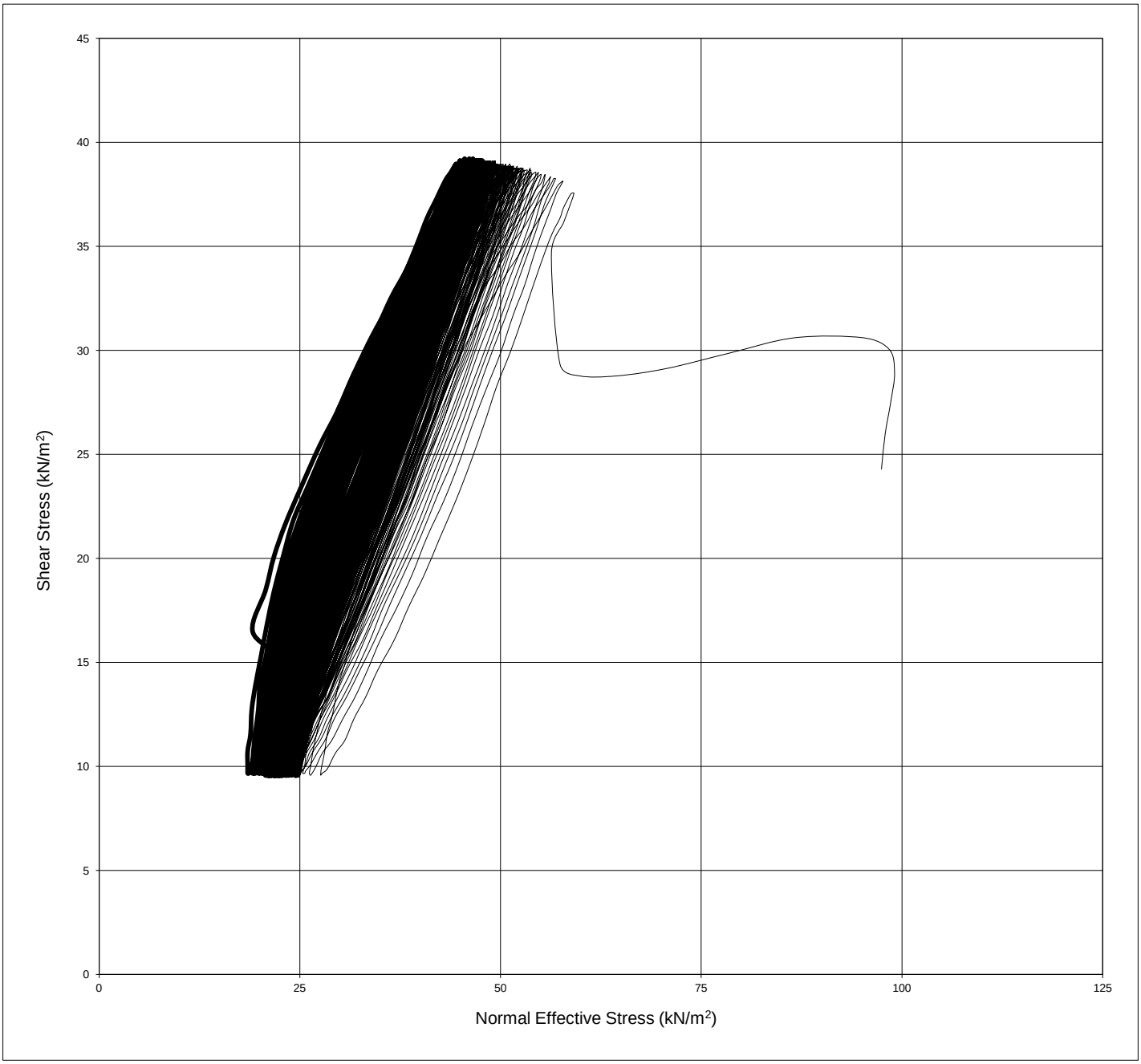






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

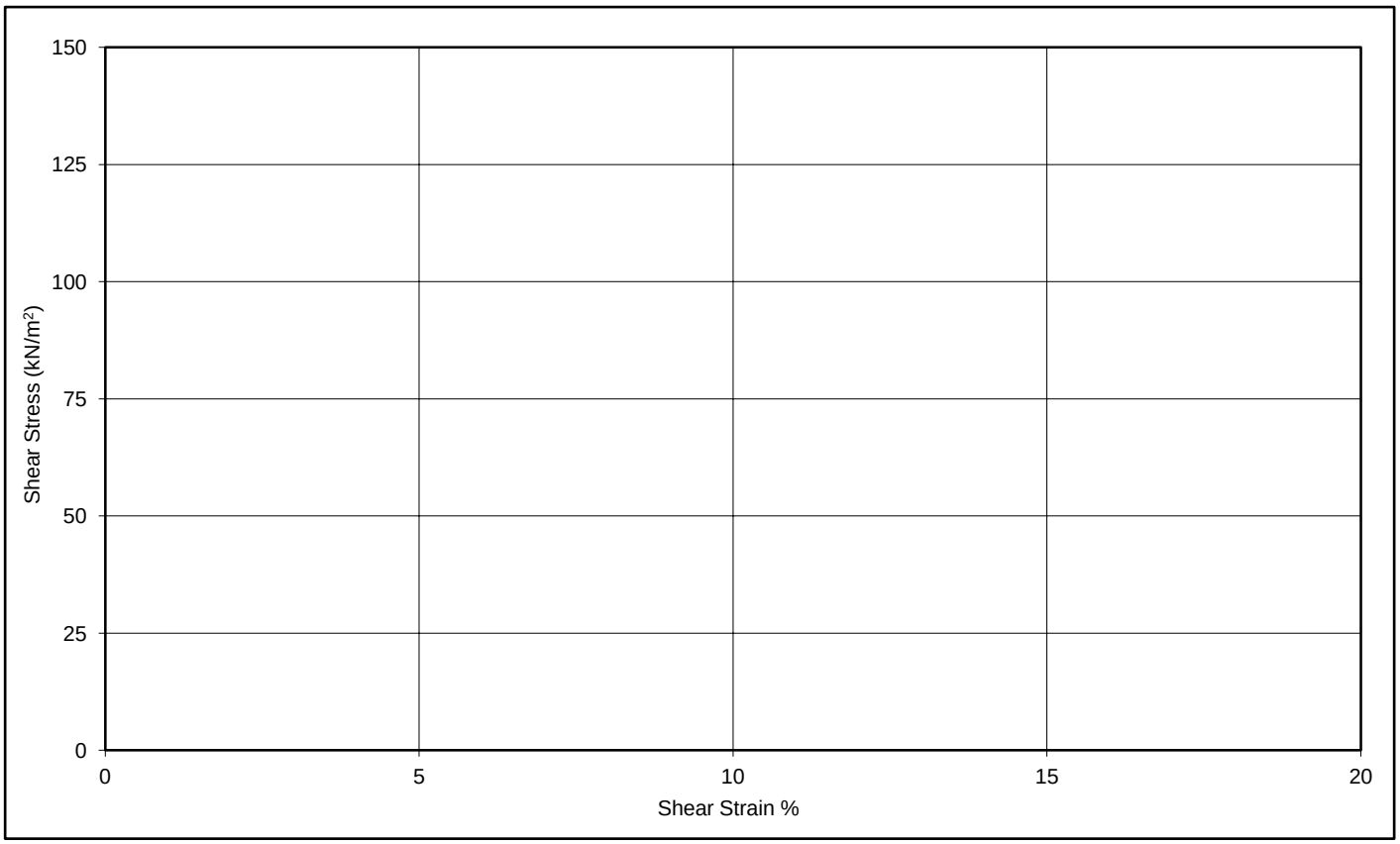
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

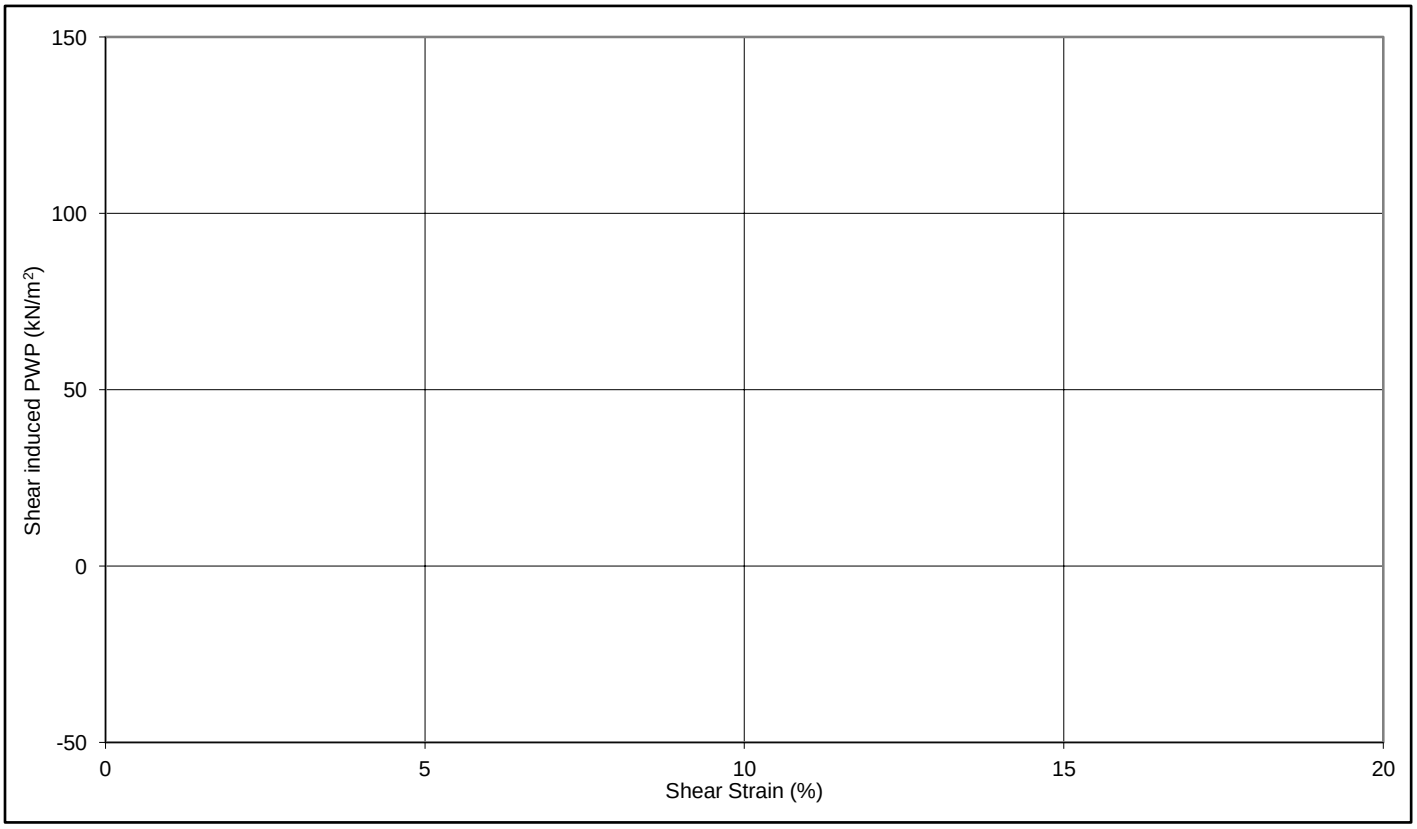


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

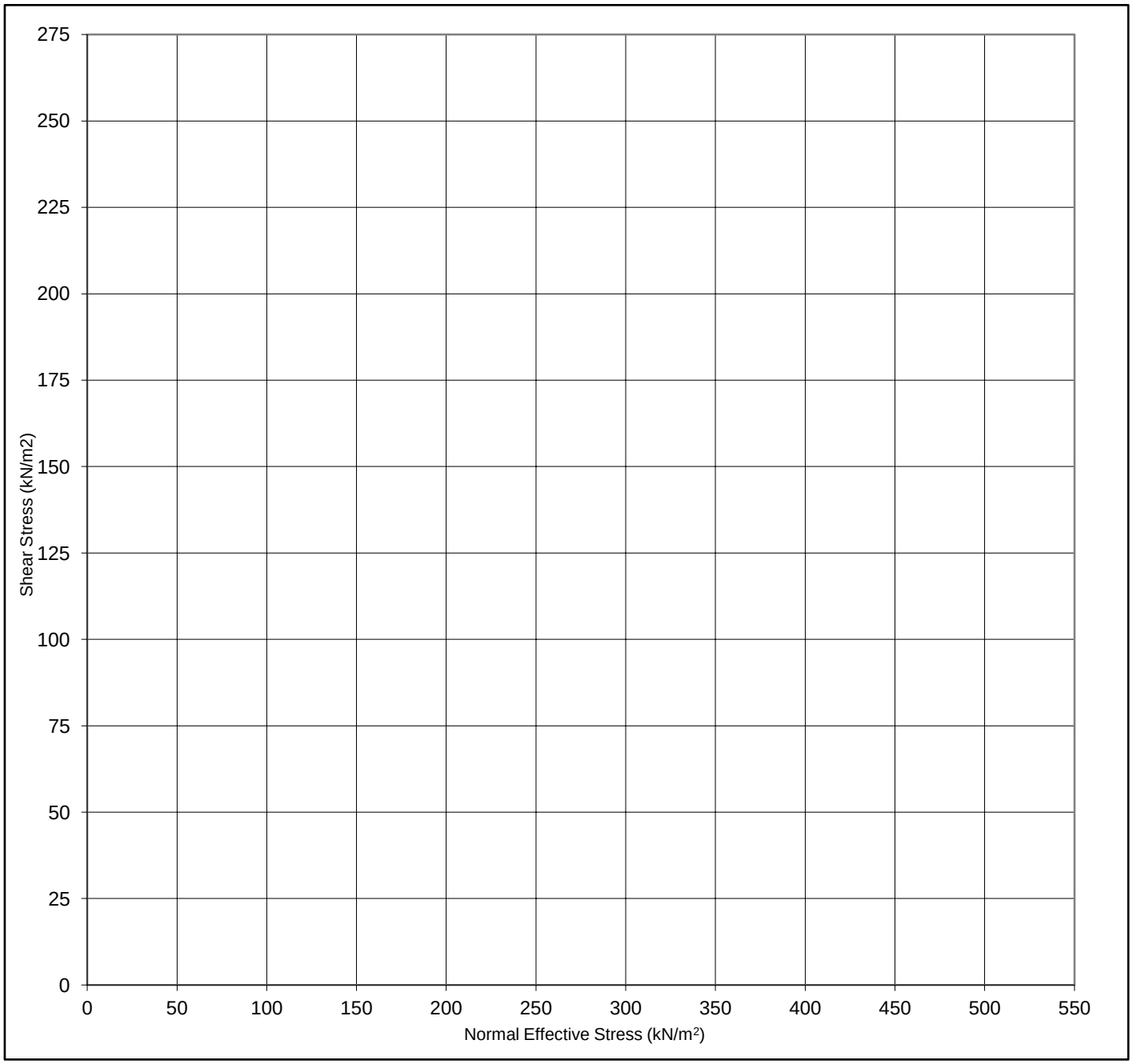
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

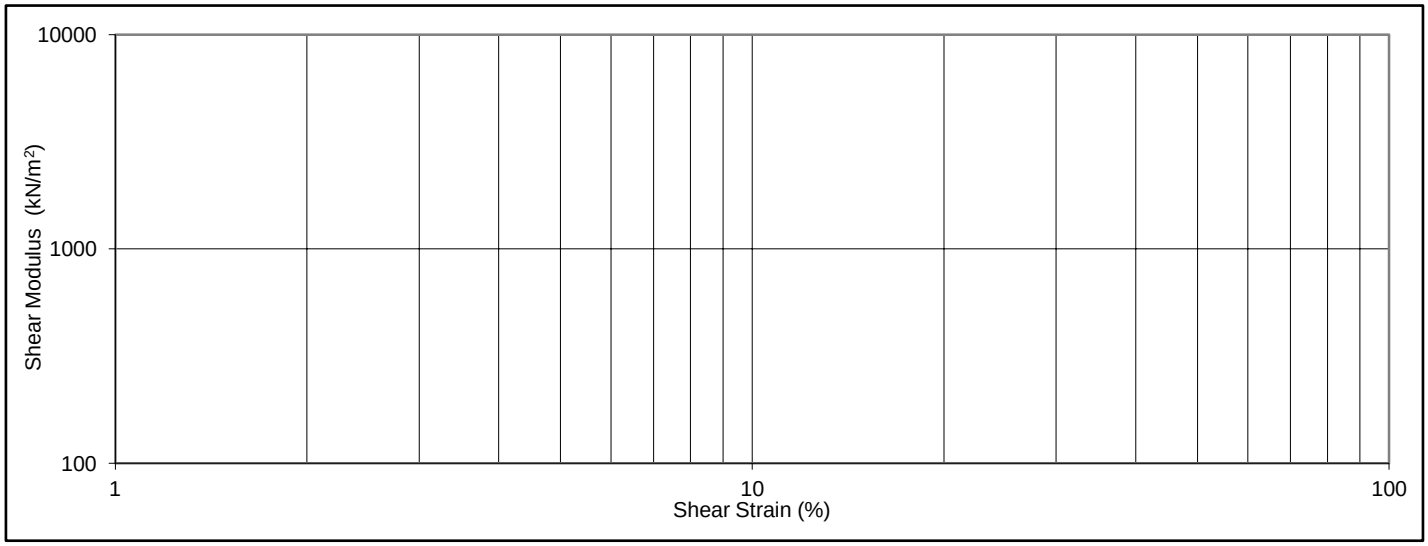
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85

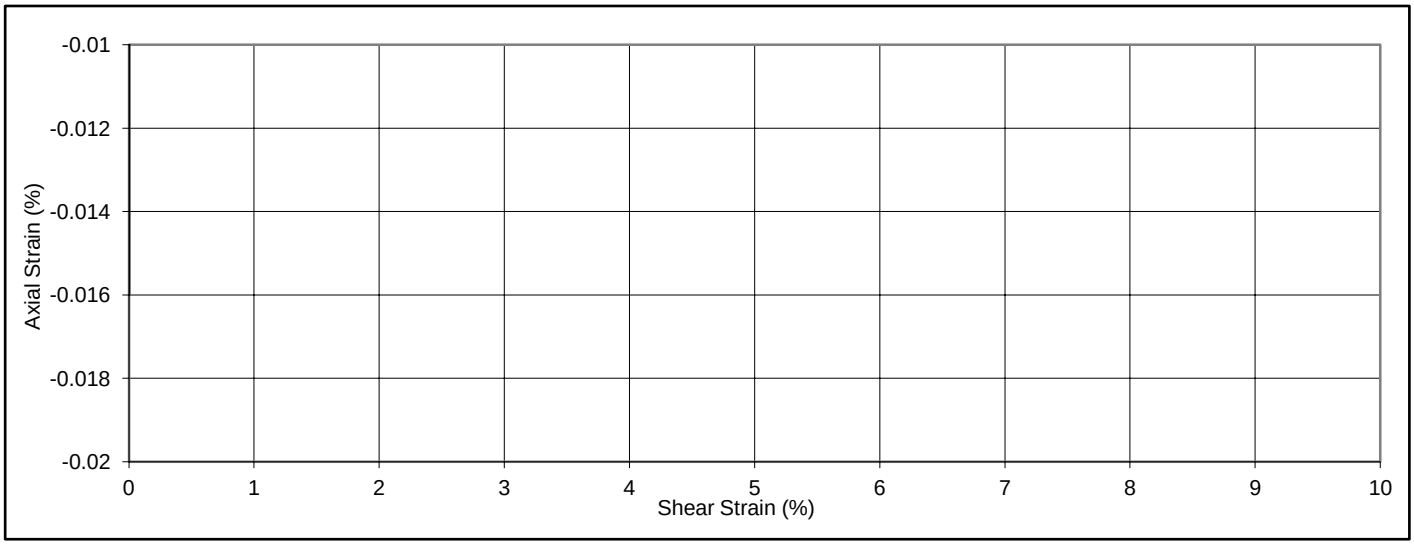


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Drained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21A
Description	SAND. Sand is fine to medium, moist, dark grey, rare pockets of clayey sand	Sample No./Type	P1B2
Tested in general accordance with ASTM D6528-07		Depth (m)	9.76-9.85





Final Specimen Details

Sample Height	mm
19.99	
Sample Diameter	mm
50.00	
Sample Weight	g
73.86	
Moisture Content	%
17.4	
Bulk Density	Mg/m^3
1.881	
Dry Density P_d	Mg/m^3
1.603	
Voids Ratio e_o	
0.685	
Degree of Saturation S_o	
68.51	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

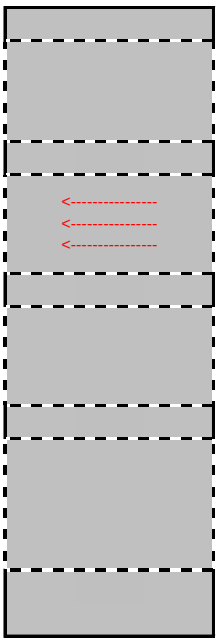
Picture Key
Top Picture
Side view of specimen post cyclic shear
Bottom Picture
Specimen opened perpenduicular to cyclic shear

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28

Initial specimen position, orientation and shear direction

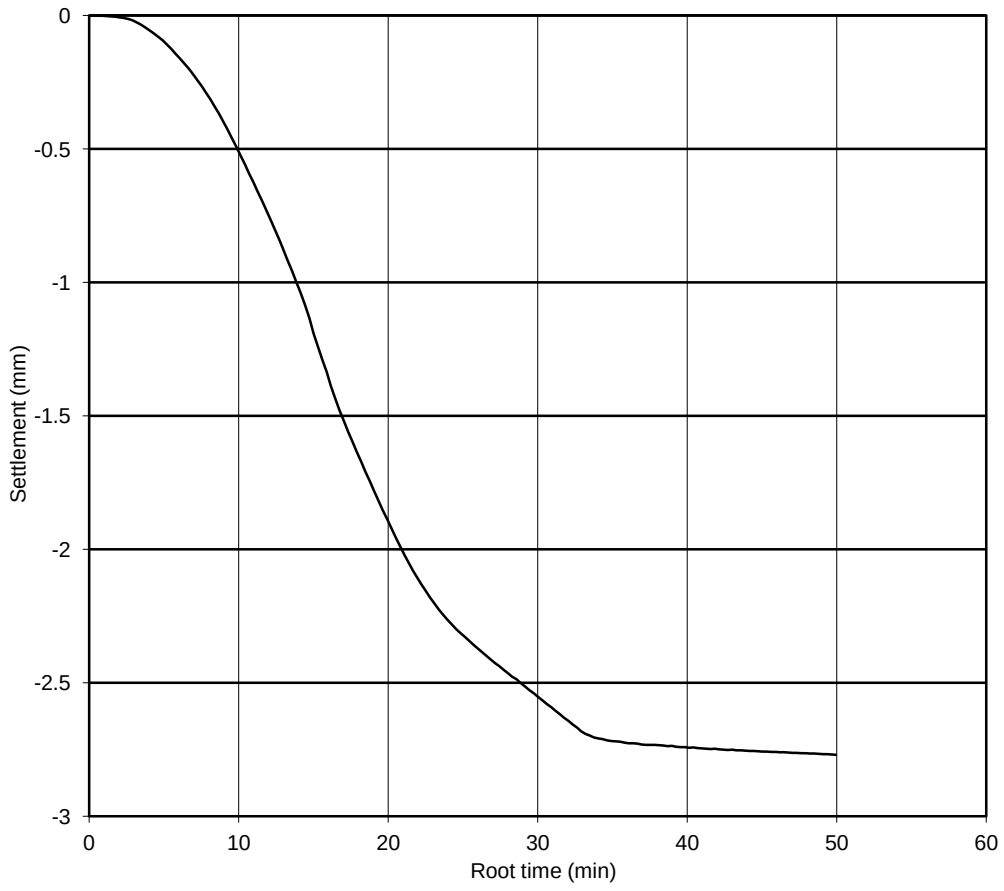


Position in sample
Middle
Specimen alignment
Horizontal
Shear alignment
Normal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
49.96		
Sample Weight		g
62.47		
Moisture Content		%
55.0		
Bulk Density	P	Mg/m^3
1.593		
Dry Density	P_d	Mg/m^3
1.028		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
1.627		
Degree of Saturation	S_o	
91.29		
Seating Pressure		kPa
2.5		

Consolidation Stage



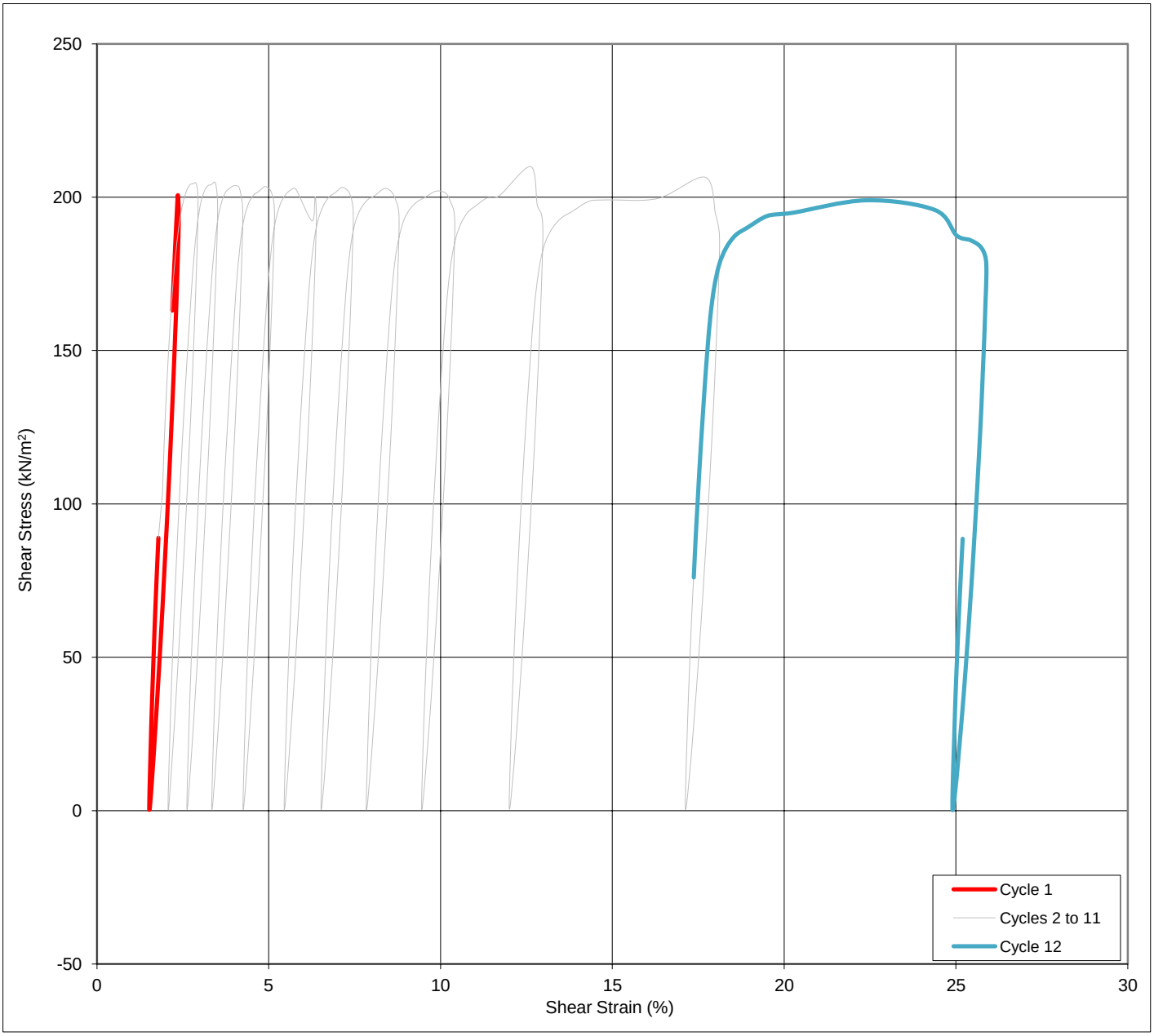
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	545
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	13.84
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	545
Vertical strain at end of consolidation	
ε_{vc} (%)	13.84

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	545
τ_{ref}	
kN/m^2	206
Frequency	
Hz	0.1

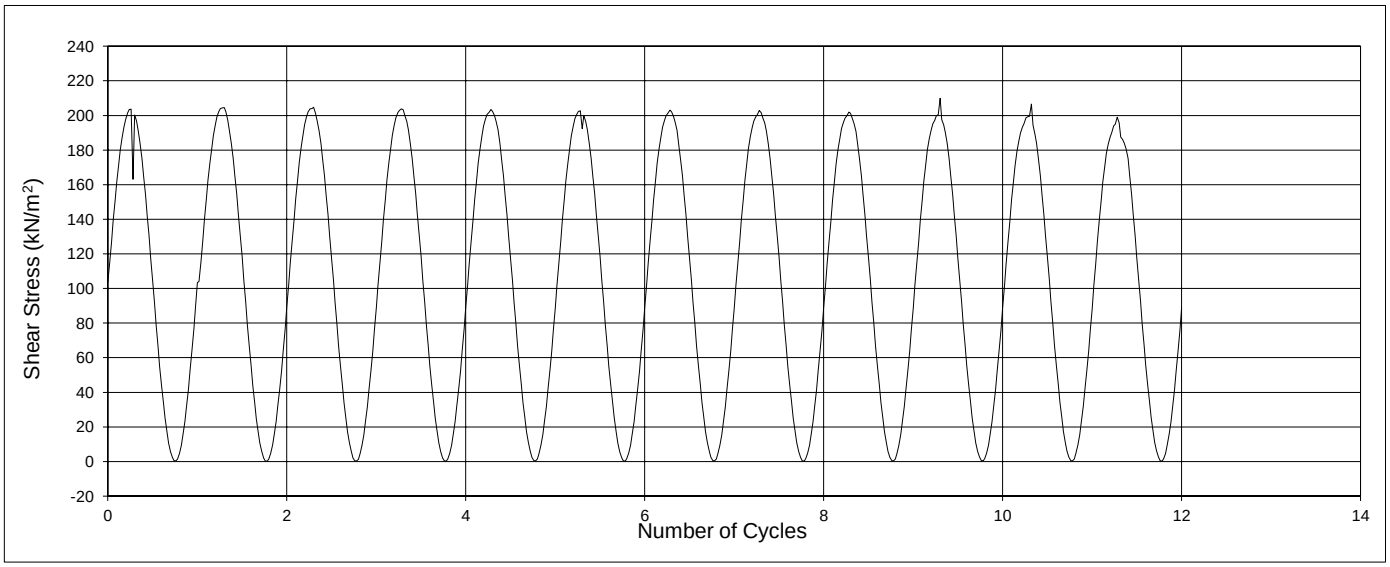
τ_{ave} / σ_{ref}	
	0.5
τ_{ave}	
kN/m^2	103
τ_{cy} / σ_{ref}	
	0.5
τ_{cyc}	
kN/m^2	103

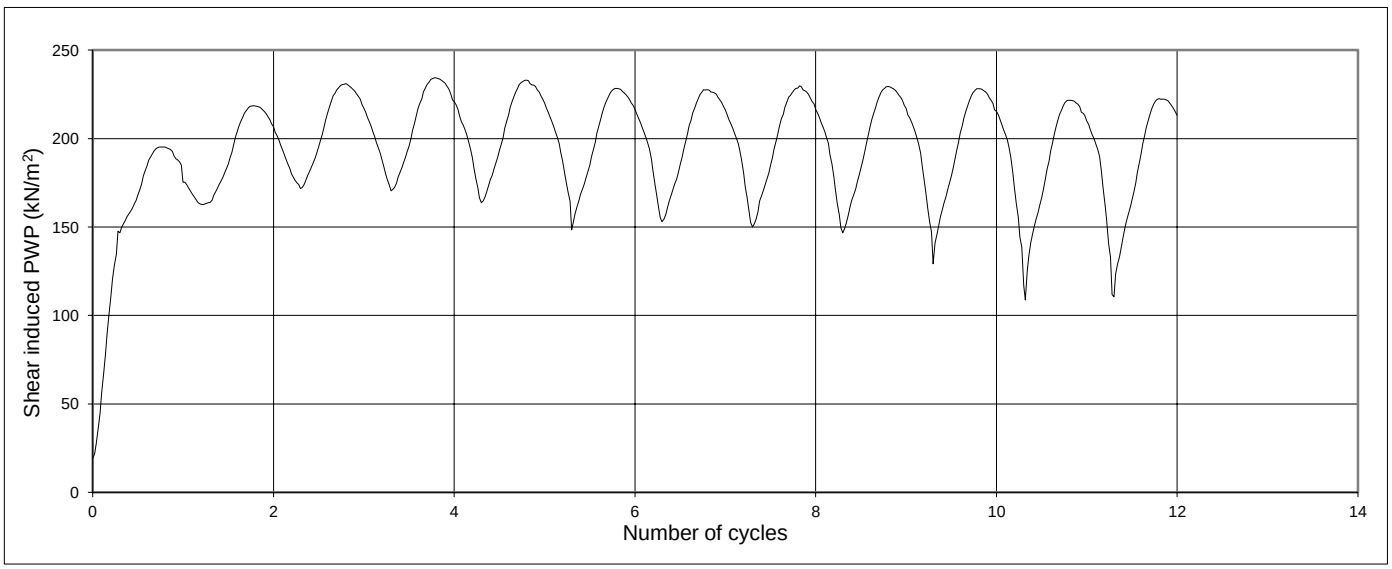
Cyclic Results

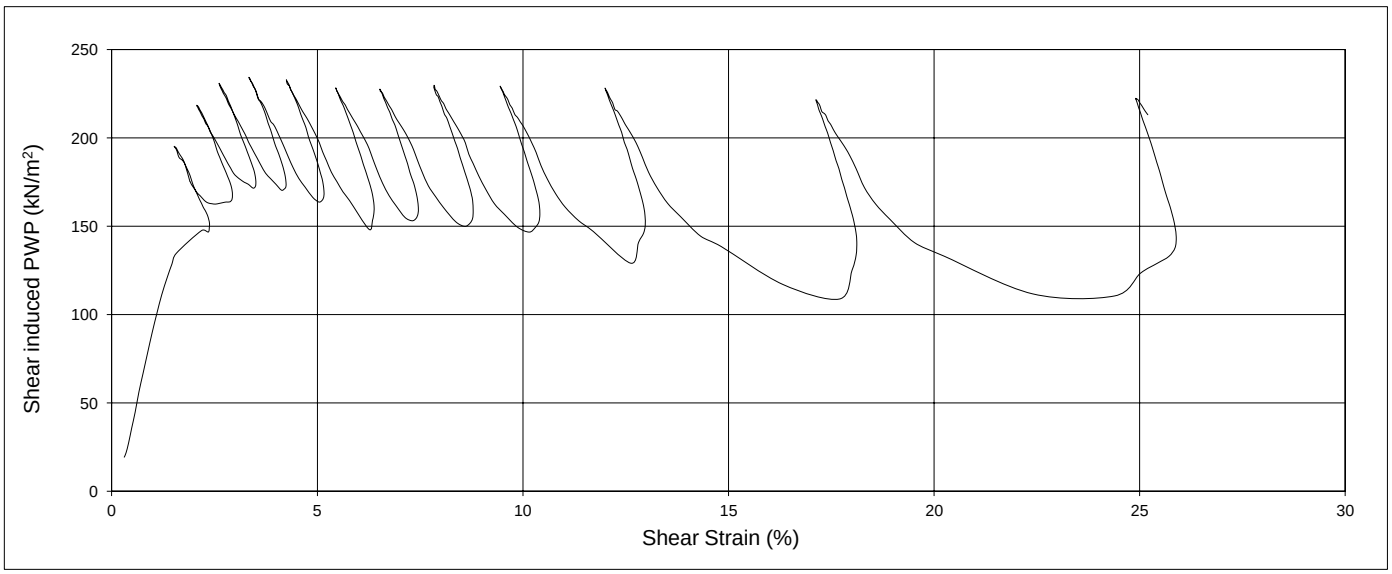
Number of Cycles at Failure	
N_f	12
Change in PWP at failure	
Δu at N_f (kPa)	215
Average strain at failure	
γ_a at N_f (%)	19.65
Permanent strain at failure	
γ_p at N_f (%)	15.55
Cyclic strain at failure	
γ_{cy} at N_f (%)	4.23

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28

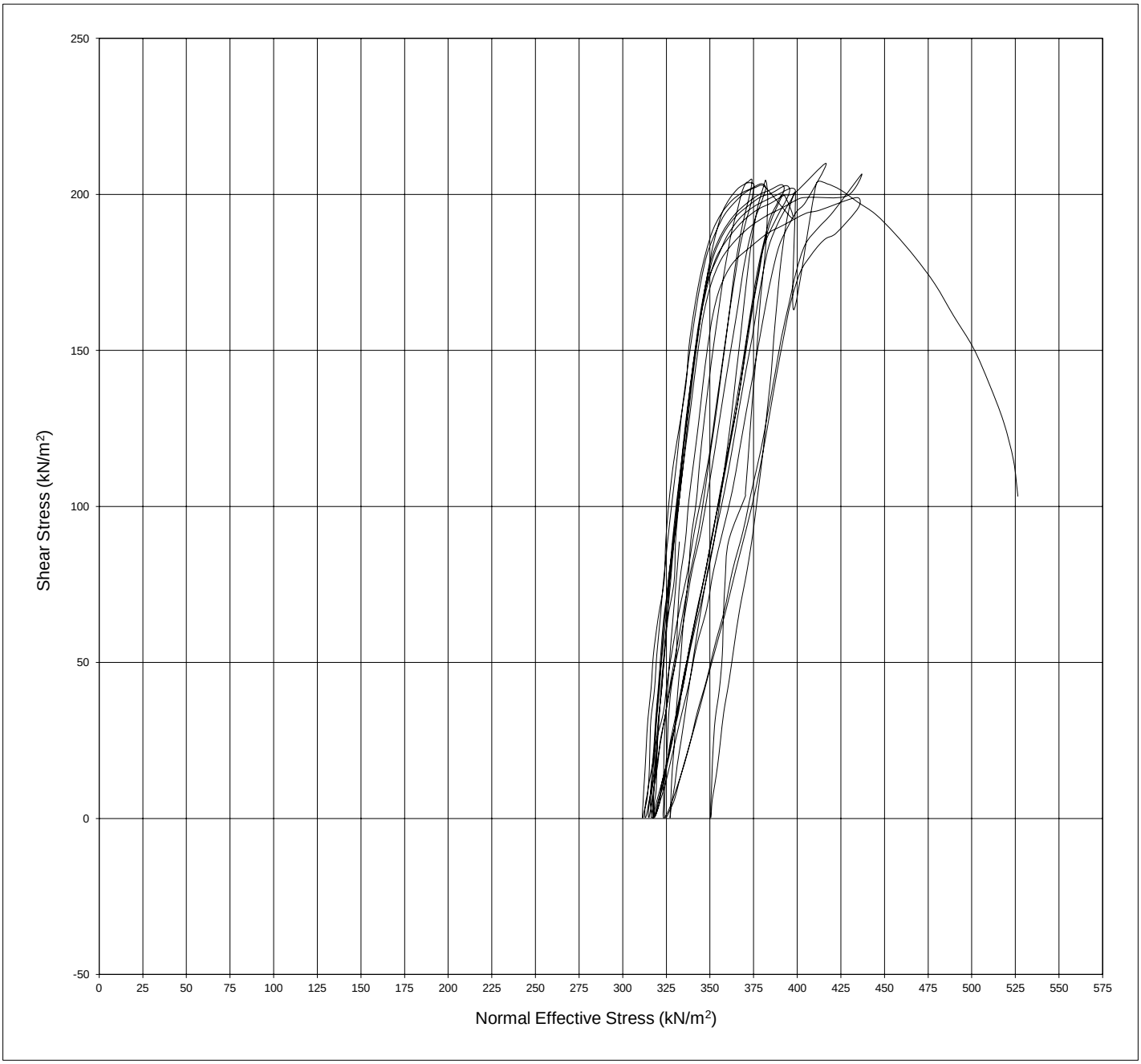






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

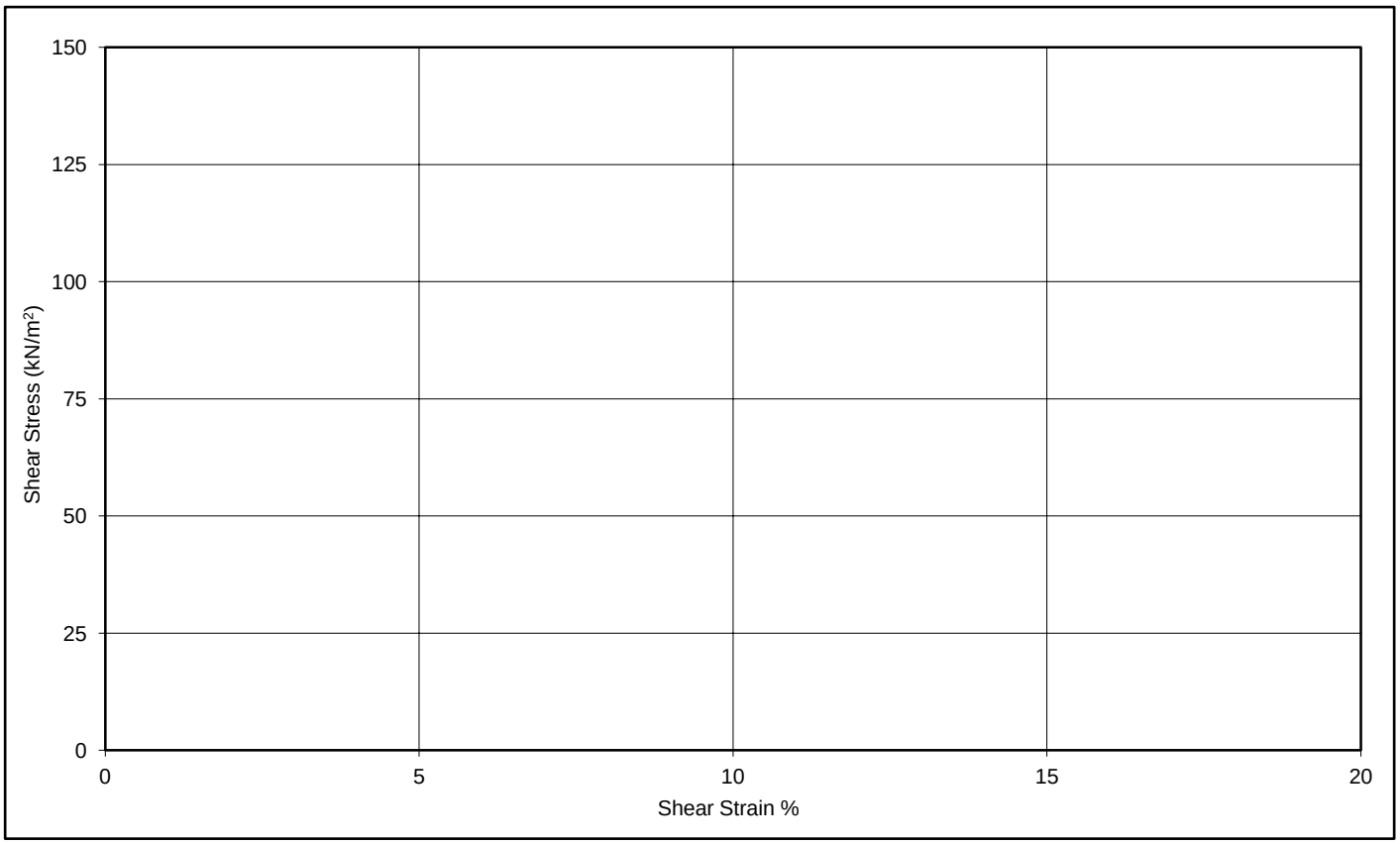
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28

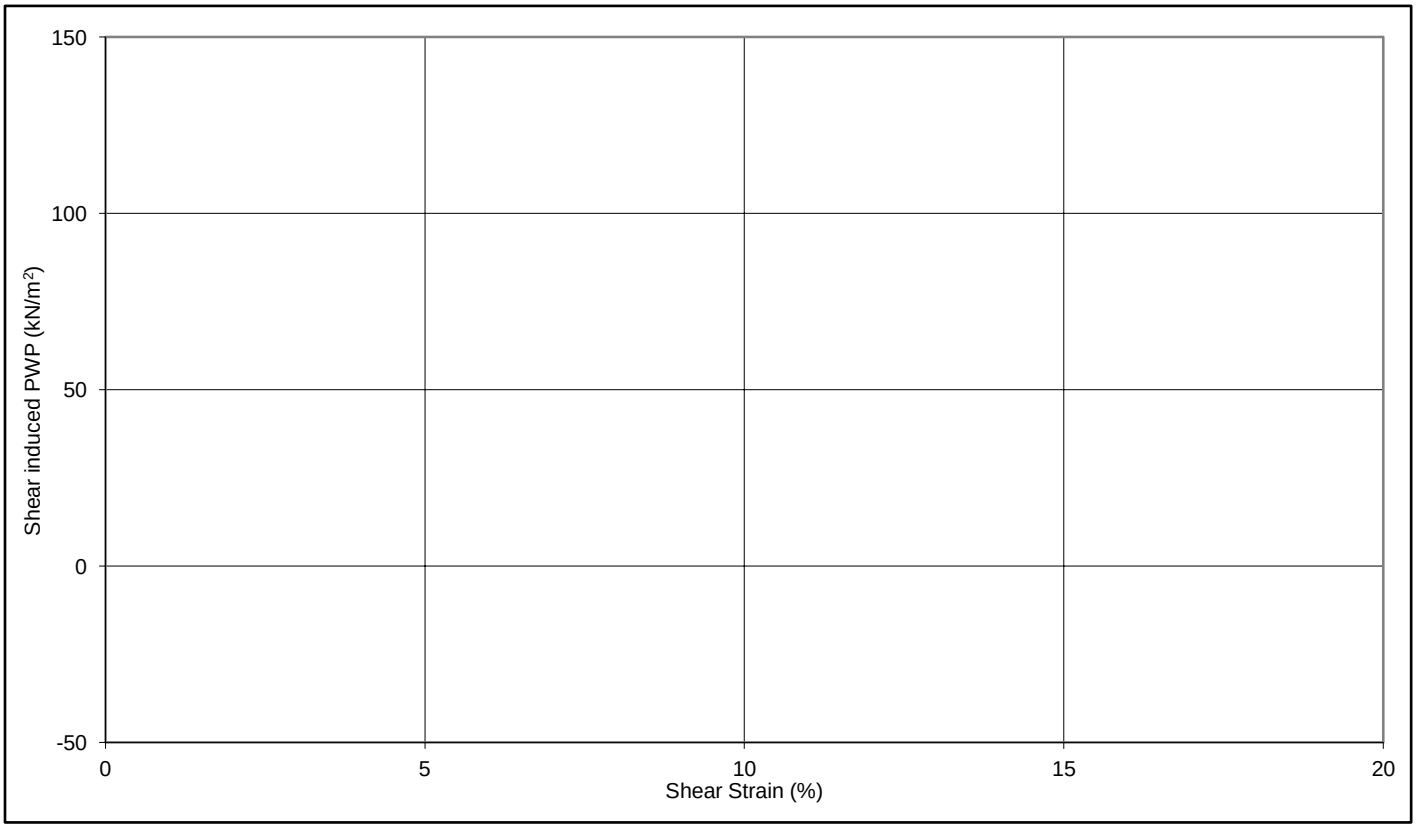


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28

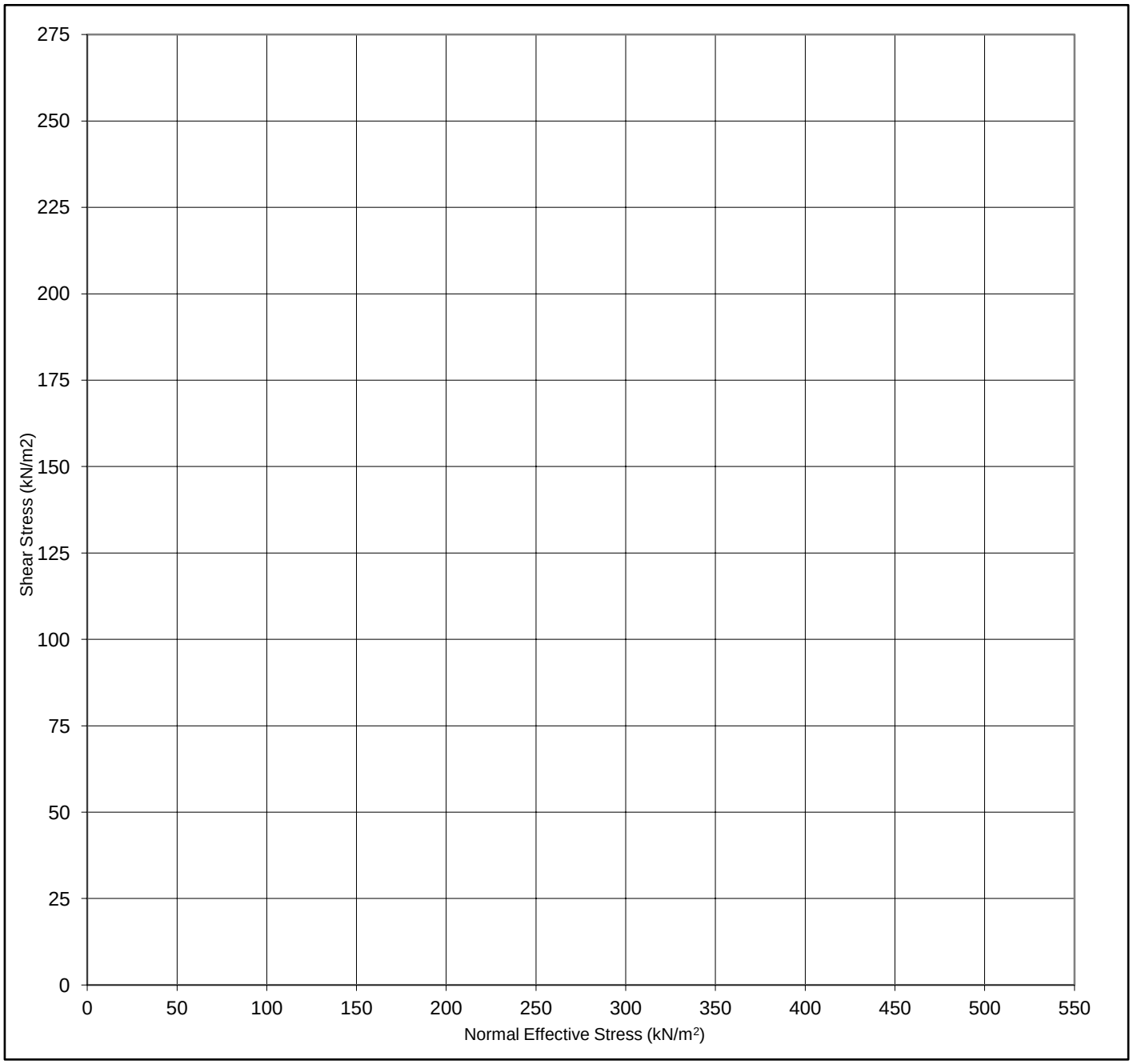
Shear Stage





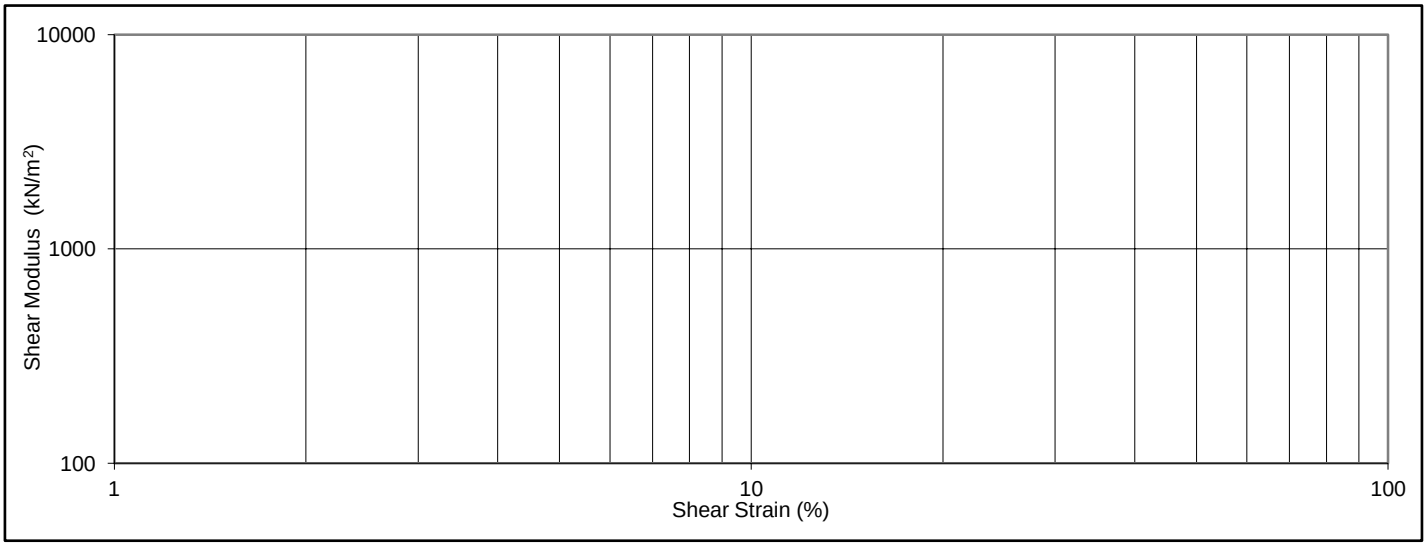
Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

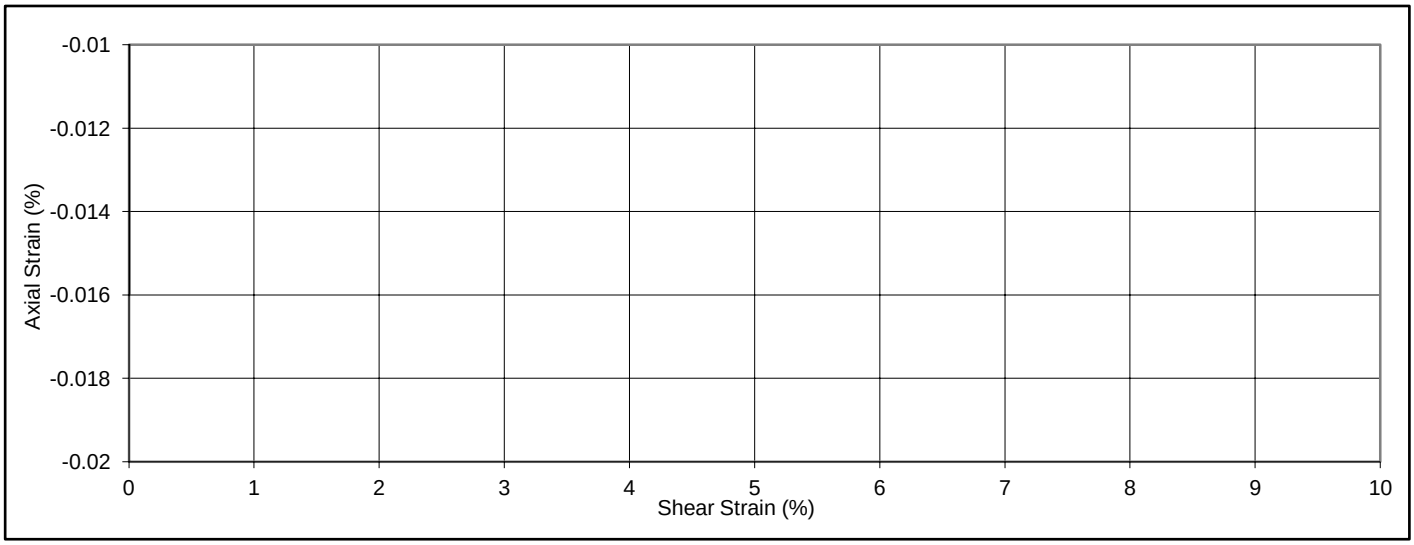
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28



Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.26-59.28





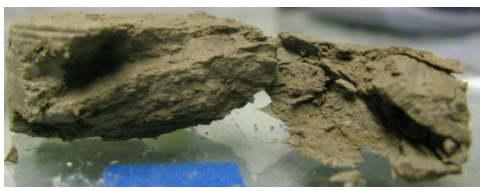
Final Specimen Details

Sample Height	mm
17.23	
Sample Diameter	mm
49.96	
Sample Weight	g
60.99	
Moisture Content	%
55.9	
Bulk Density	Mg/m^3
1.366	
Dry Density P_d	Mg/m^3
0.876	
Voids Ratio e_o	
2.081	
Degree of Saturation S_o	
72.54	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key
Top Picture
Side View of failure zone
Bottom Picture
Specimen split to show internal failure

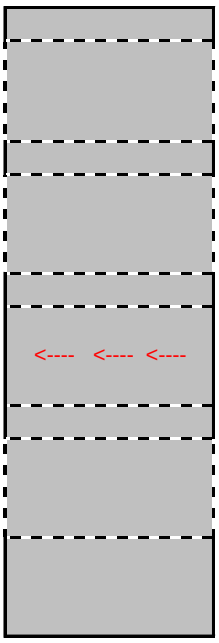


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	LR	LR	JG

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

Initial specimen position, orientation and shear direction

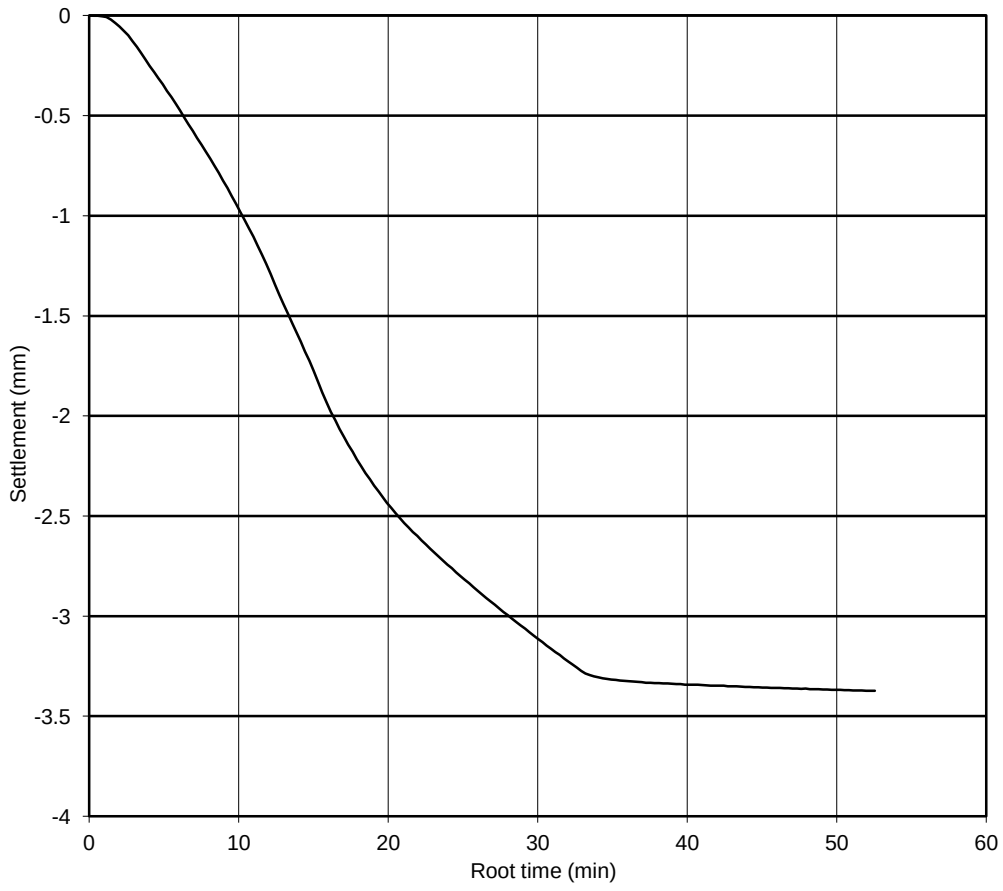


Position in sample
Middle
Specimen alignment
Horizontal
Shear alignment
Normal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
19.99		
Sample Diameter		mm
50.00		
Sample Weight		g
64.09		
Moisture Content		%
52.4		
Bulk Density	P	Mg/m^3
1.633		
Dry Density	P_d	Mg/m^3
1.071		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
1.520		
Degree of Saturation	S_o	
93.11		
Seating Pressure		kPa
2.5		

Consolidation Stage



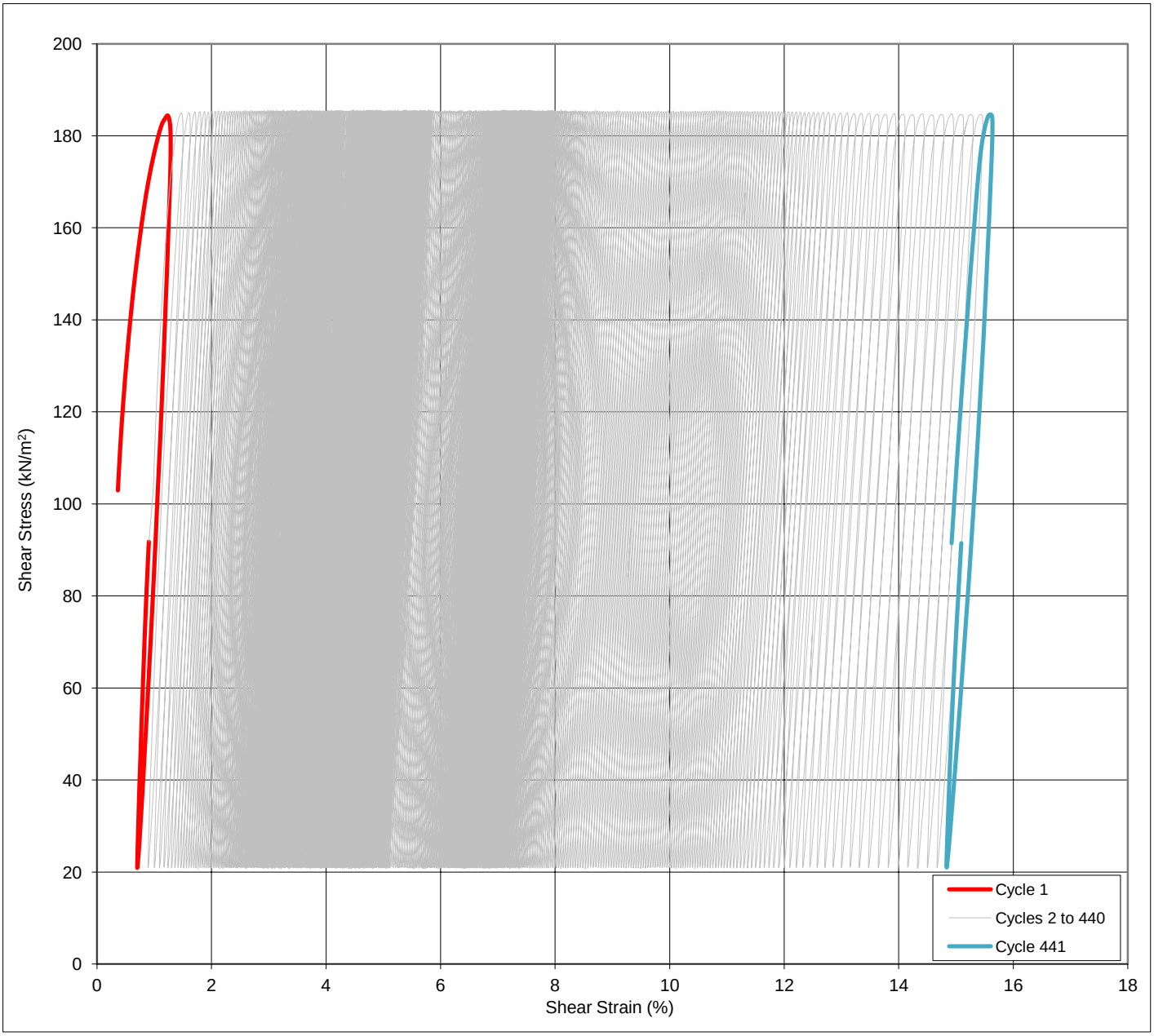
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	545
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	16.88
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	545
Vertical strain at end of consolidation	
ε_{vc} (%)	16.88

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	545
τ_{ref}	
kN/m^2	206
Frequency	
Hz	0.1

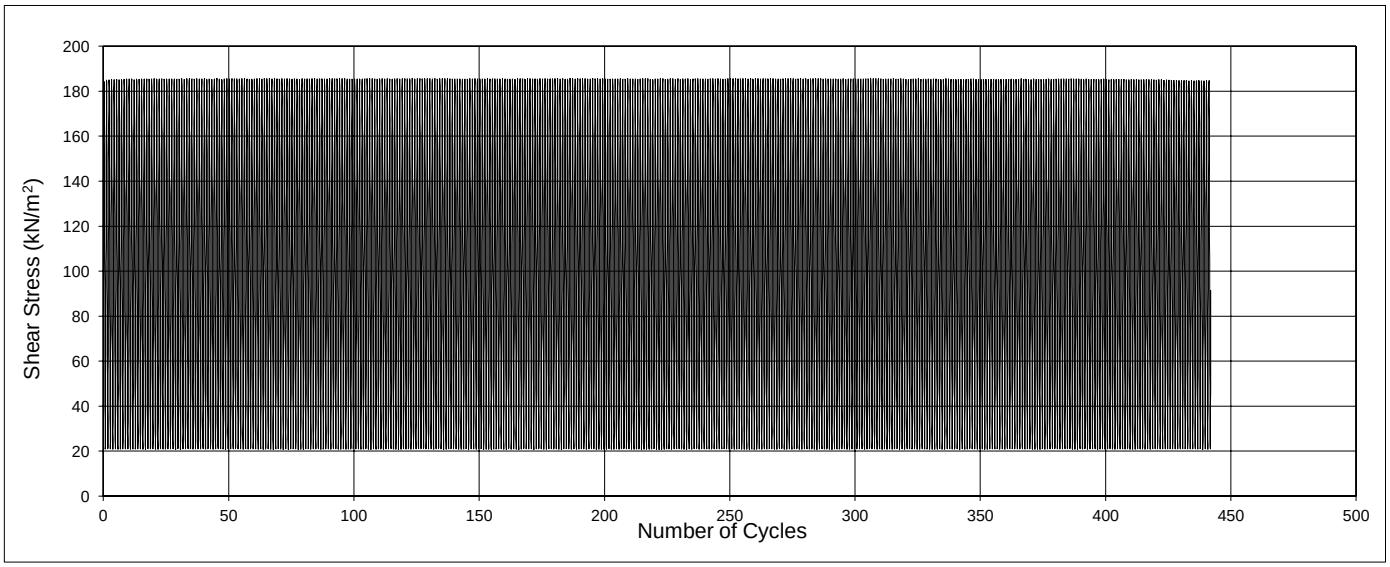
τ_{ave} / σ_{ref}	
	0.5
τ_{ave}	
kN/m^2	103
τ_{cy} / σ_{ref}	
	0.4
τ_{cyc}	
kN/m^2	82

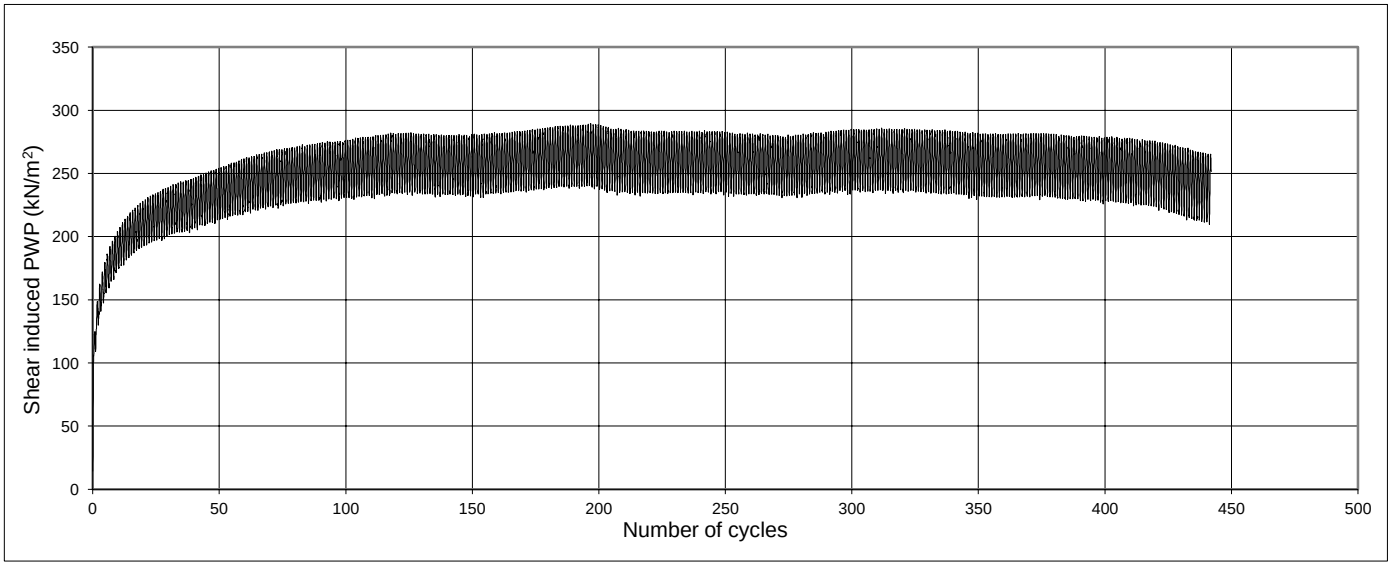
Cyclic Results

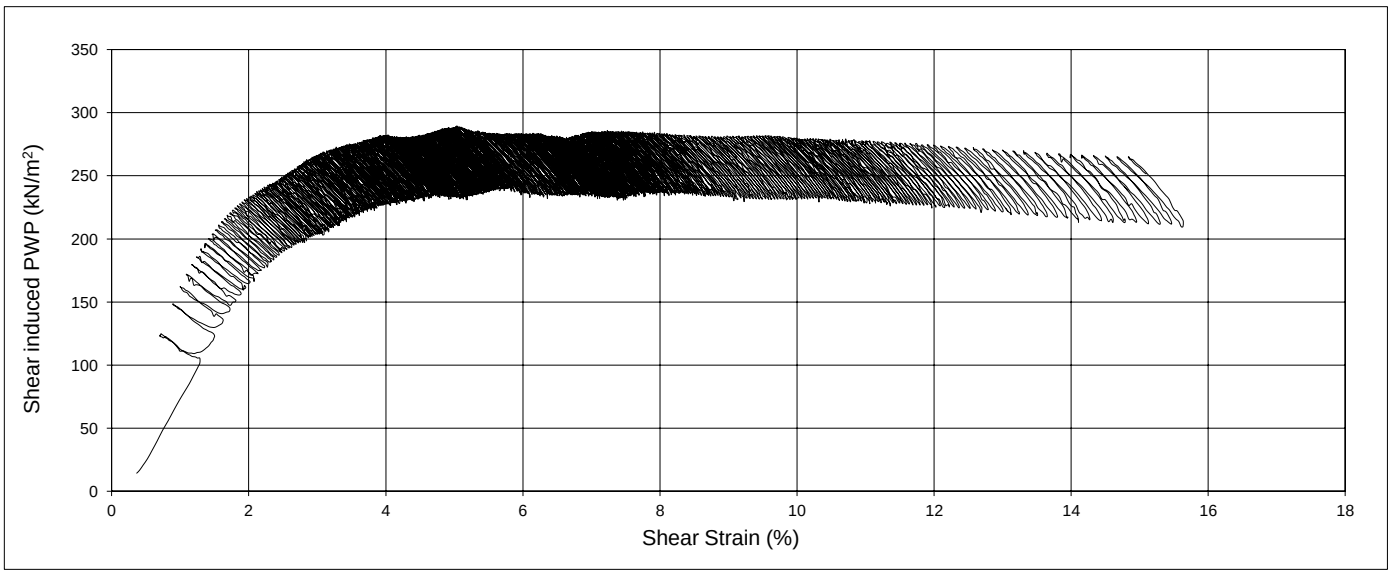
Number of Cycles at Failure	
N_f	441
Change in PWP at failure	
Δu at N_f (kPa)	254
Average strain at failure	
γ_a at N_f (%)	15.07
Permanent strain at failure	
γ_p at N_f (%)	14.86
Cyclic strain at failure	
γ_{cy} at N_f (%)	0.40

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

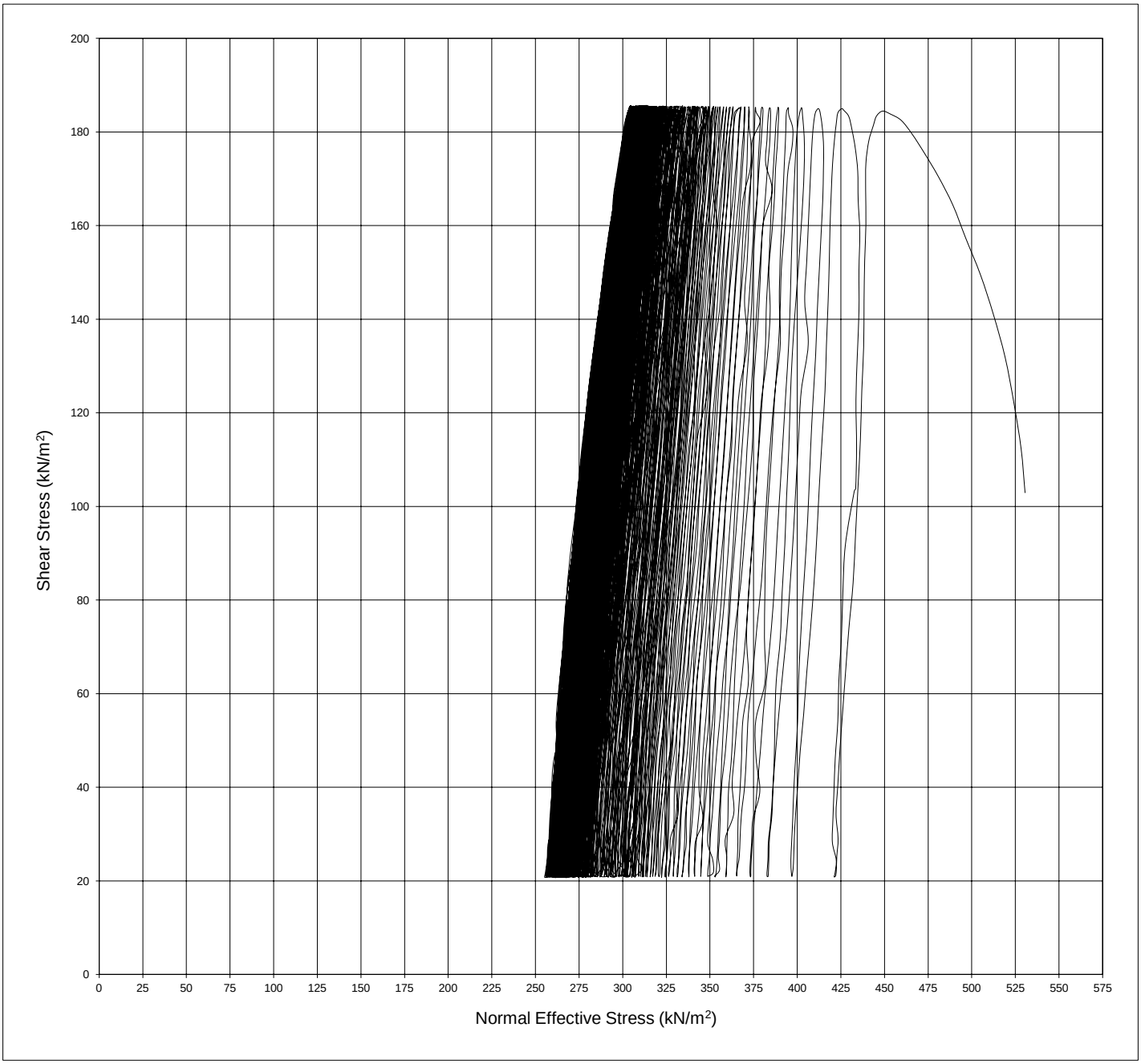






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

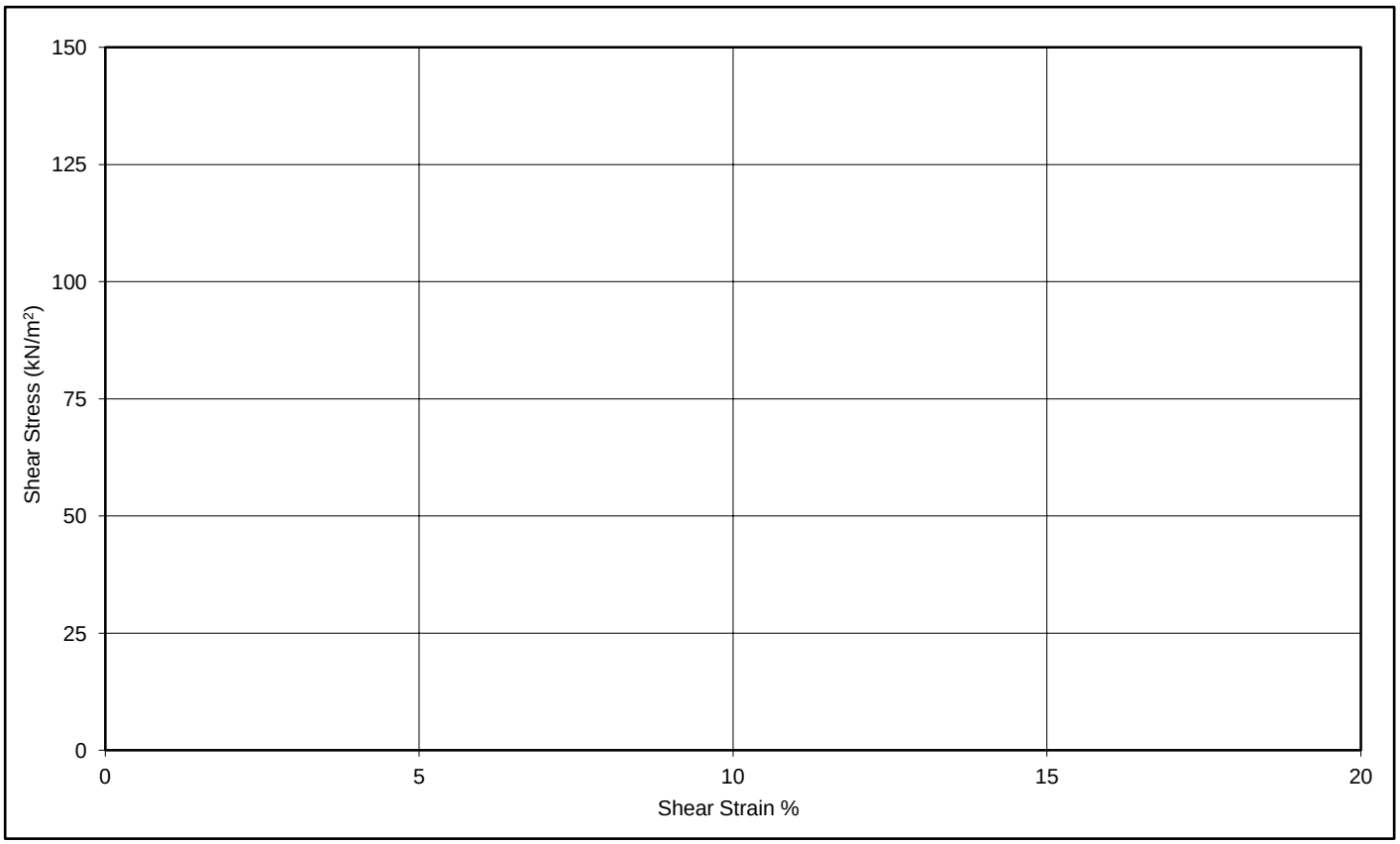
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

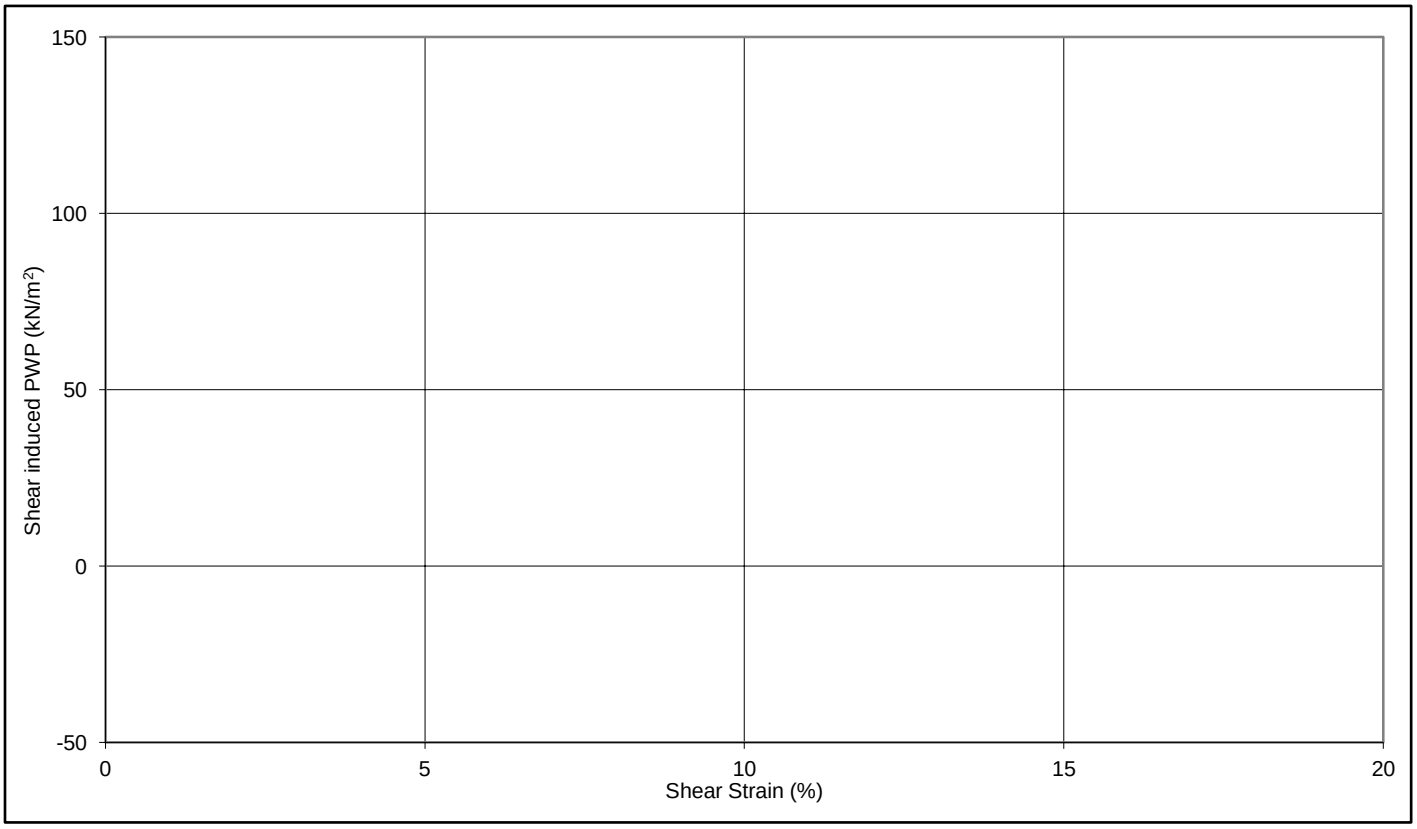


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

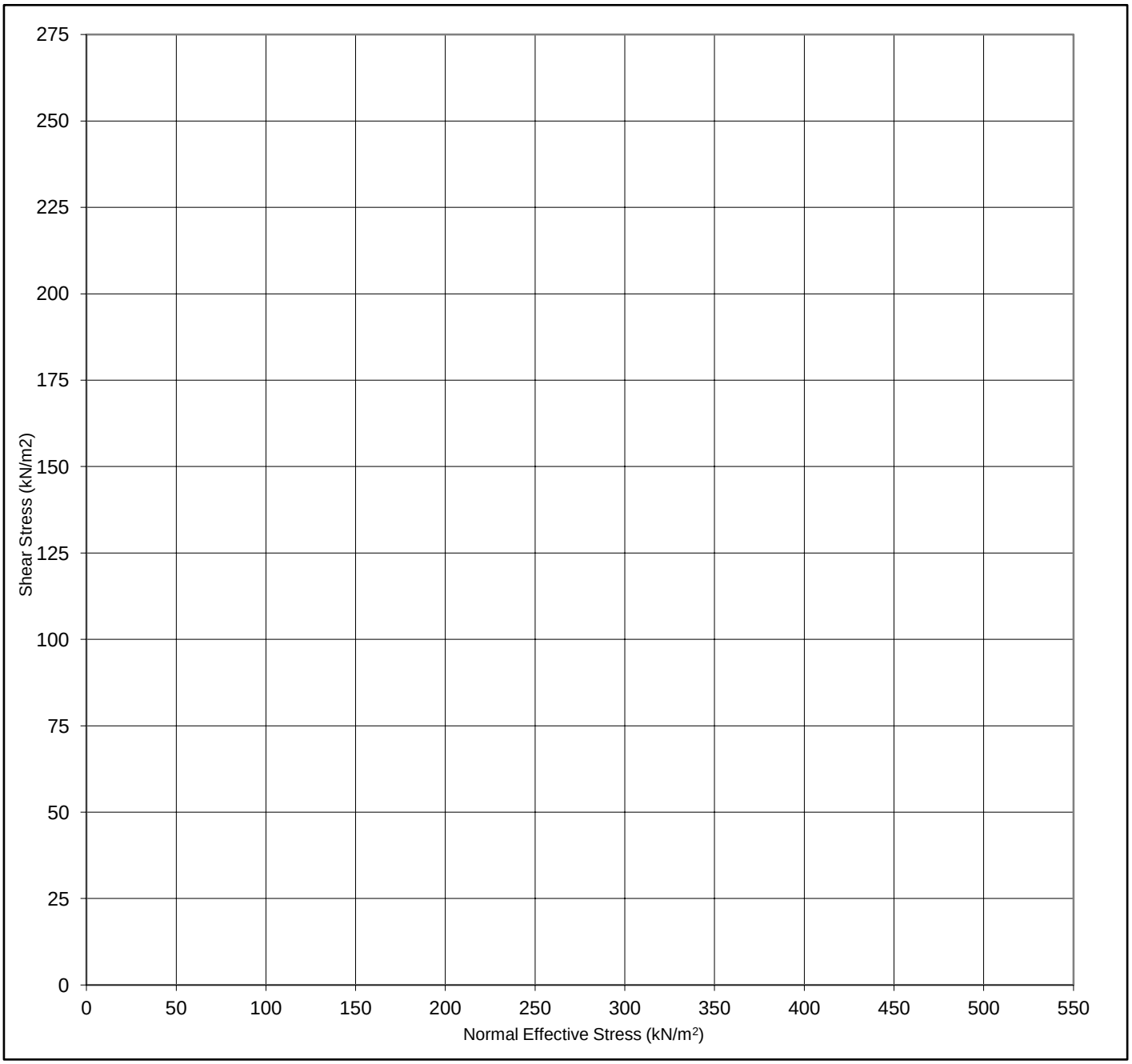
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

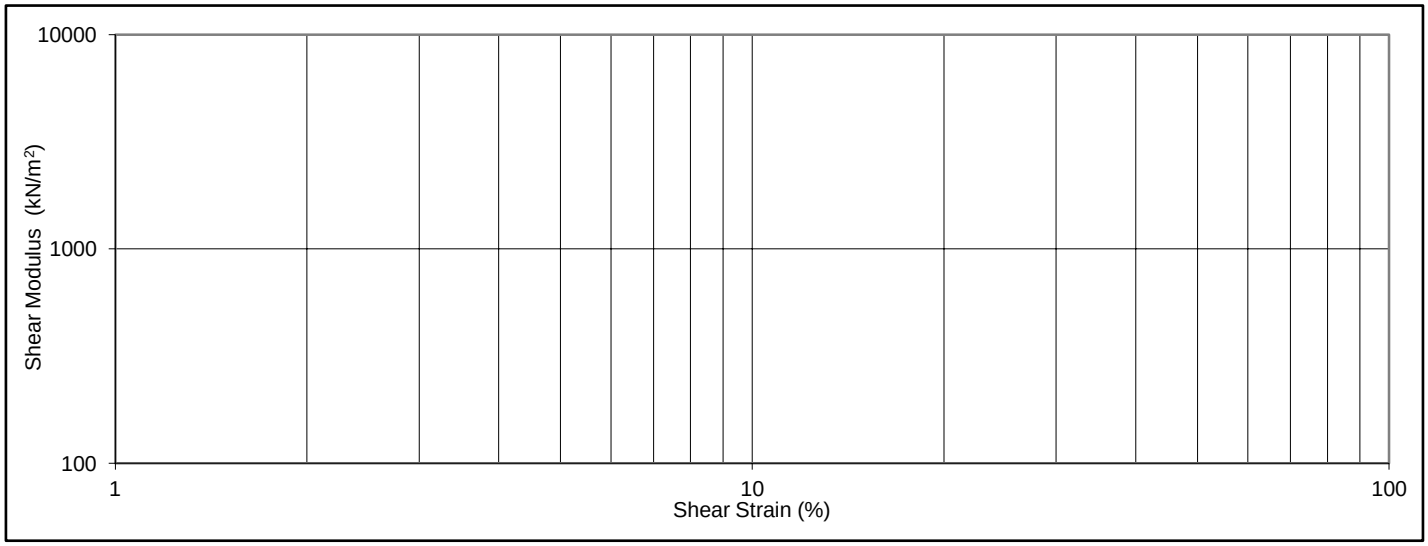
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33

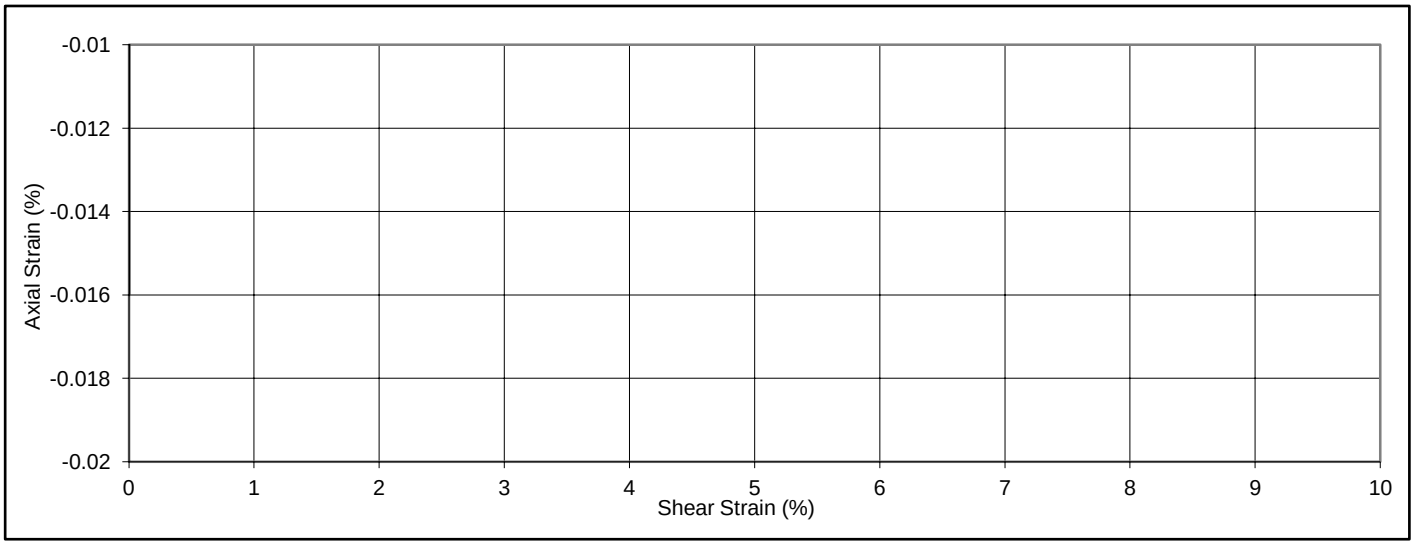


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, micaceous with silty laminations	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.31-59.33





Final Specimen Details

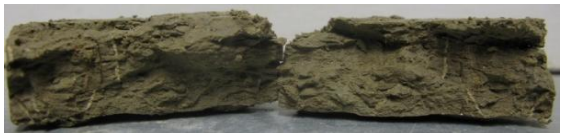
Sample Height		mm
16.62		
Sample Diameter		mm
50.00		
Sample Weight		g
63.42		
Moisture Content		%
52.0		
Bulk Density		Mg/m^3
1.382		
Dry Density	P_d	Mg/m^3
0.910		
Voids Ratio	e_o	
1.969		
Degree of Saturation	S_o	
71.26		

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

Top Picture
Side view of failure zone
Bottom Picture
Specimen split to show internal failure zone

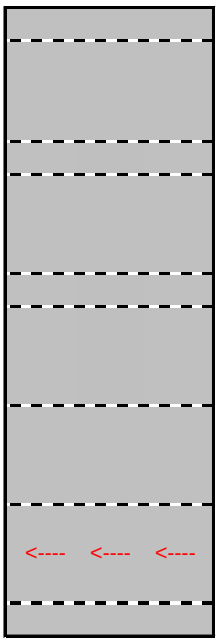


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

Initial specimen position, orientation and shear direction

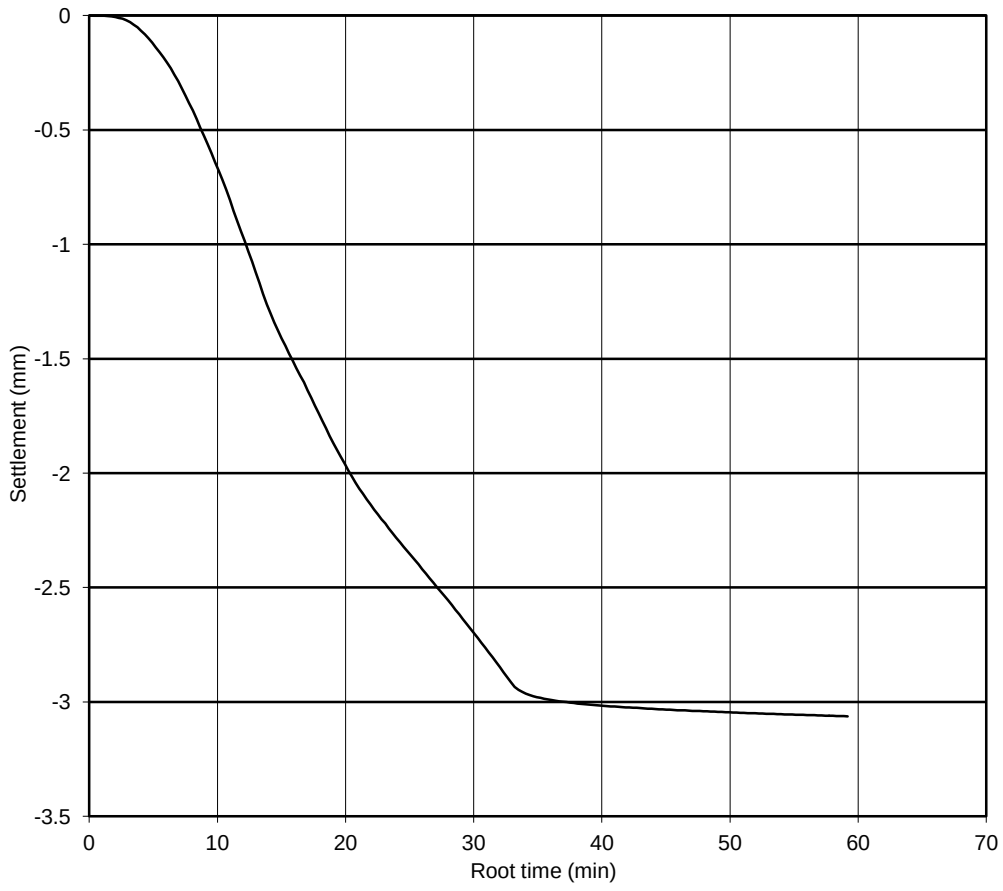


Position in sample
Bottom
Specimen alignment
Horizontal
Shear alignment
Normal
Direction of shear relative to sample orientation
see <------ in diagram
Test Type
CSS

Initial Specimen Details

Sample Height		mm
20.00		
Sample Diameter		mm
49.98		
Sample Weight		g
62.75		
Moisture Content		%
48.1		
Bulk Density	P	Mg/m^3
1.600		
Dry Density	P_d	Mg/m^3
1.080		
Particle Density	P_s	Mg/m^3
2.70 #		
Voids Ratio	e_o	
1.499		
Degree of Saturation	S_o	
86.56		
Seating Pressure		kPa
2.5		

Consolidation Stage



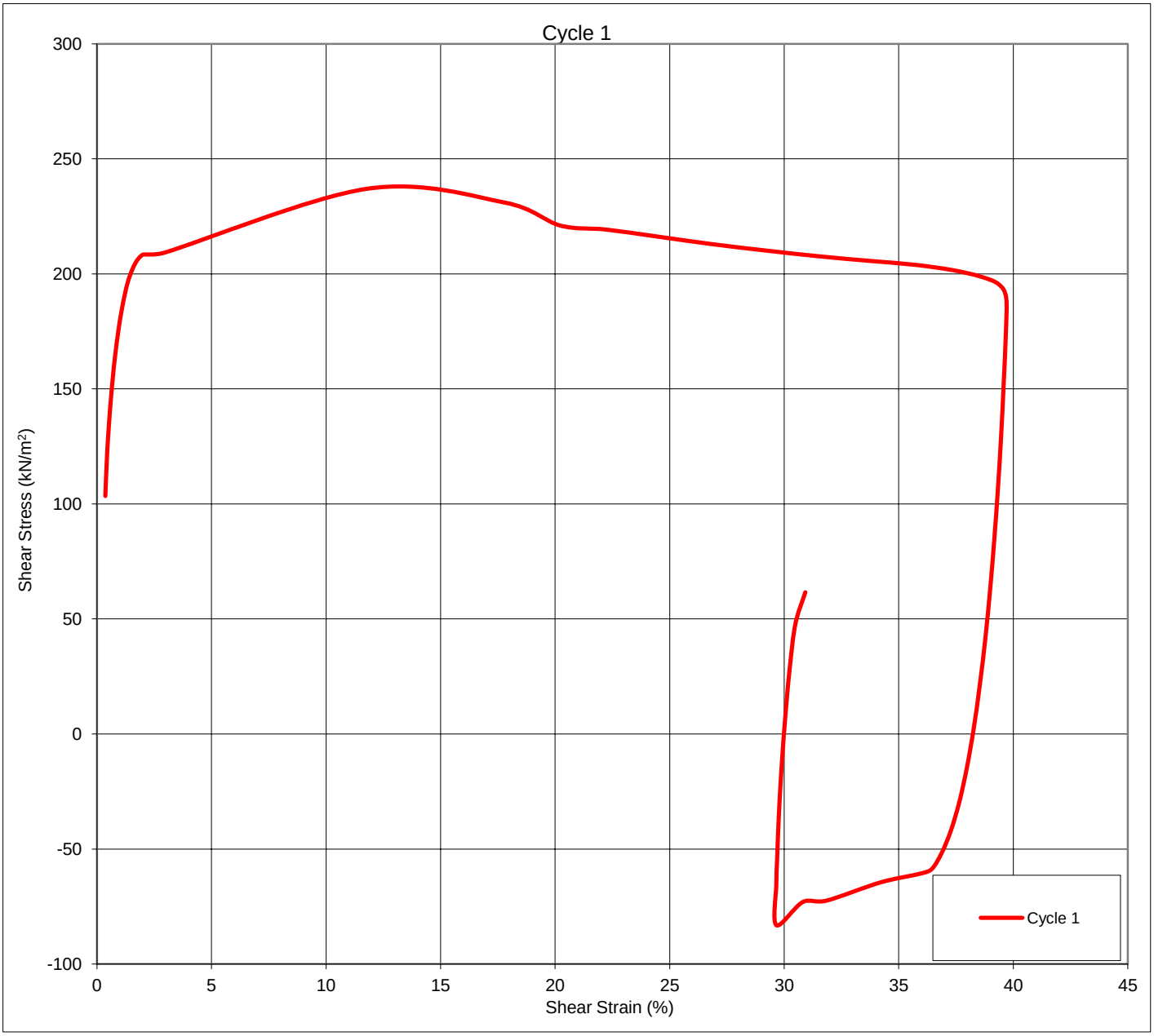
Specimen Consolidation Results

Maximum vertical consolidation stress	
$\sigma'_{vc\ max}$ (kN/m^2)	545
Vertical strain at max vertical stress	
$\varepsilon_{vc\ max}$ (%)	15.36
Vertical effective stress at end of consolidation	
σ'_{vc} (kN/m^2)	545
Vertical strain at end of consolidation	
ε_{vc} (%)	15.36

Remarks: # = assumed value	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

Cyclic Stage



Cyclic Test Parameters

Control Method	
Stress	
σ_{vc}' Max	
kN/m^2	545
τ_{ref}	
kN/m^2	206
Frequency	
Hz	0.1

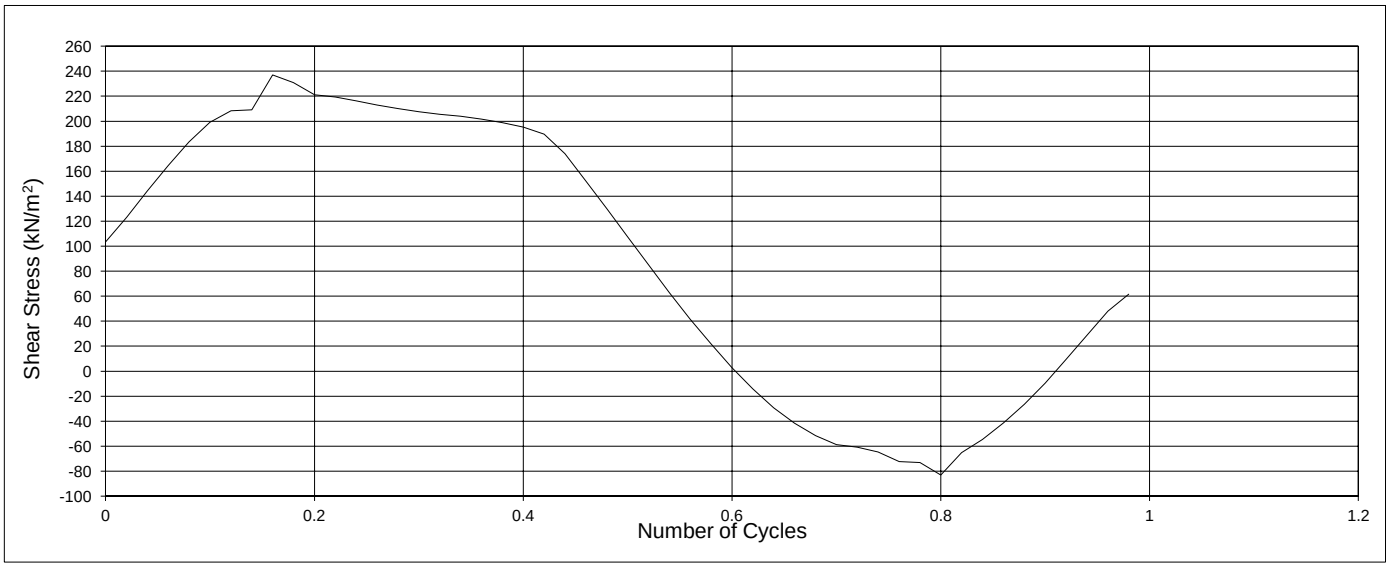
τ_{ave} / σ_{ref}	
	0.5
τ_{ave}	
kN/m^2	103
τ_{cy} / σ_{ref}	
	0.9
τ_{cyc}	
kN/m^2	185

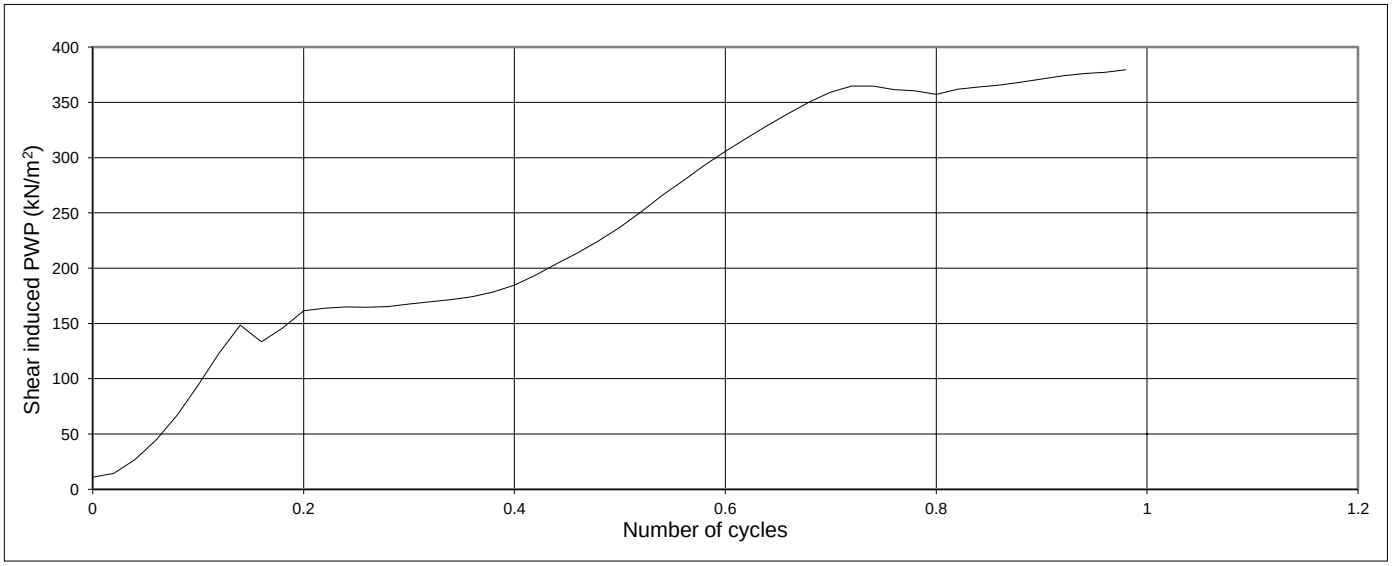
Cyclic Results

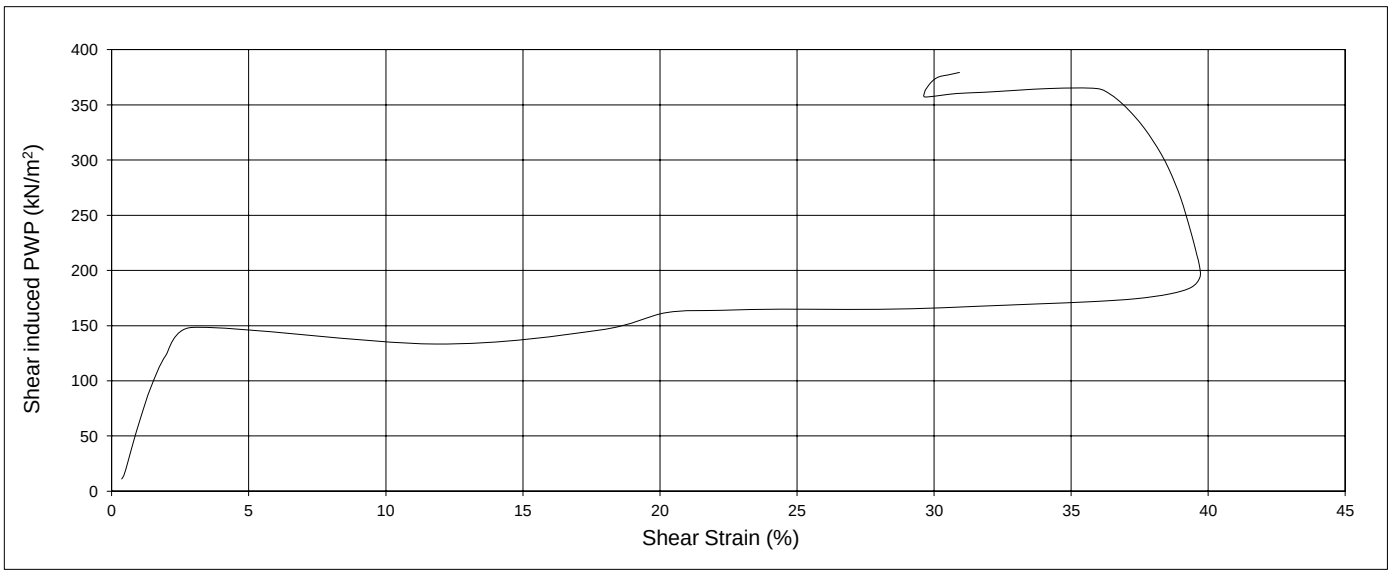
Number of Cycles at Failure	
N_f	1
Change in PWP at failure	
Δu at N_f (kPa)	379
Average strain at failure	
γ_a at N_f (%)	20.028
Permanent strain at failure	
γ_p at N_f (%)	0.37
Cyclic strain at failure	
γ_{cy} at N_f (%)	19.66

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

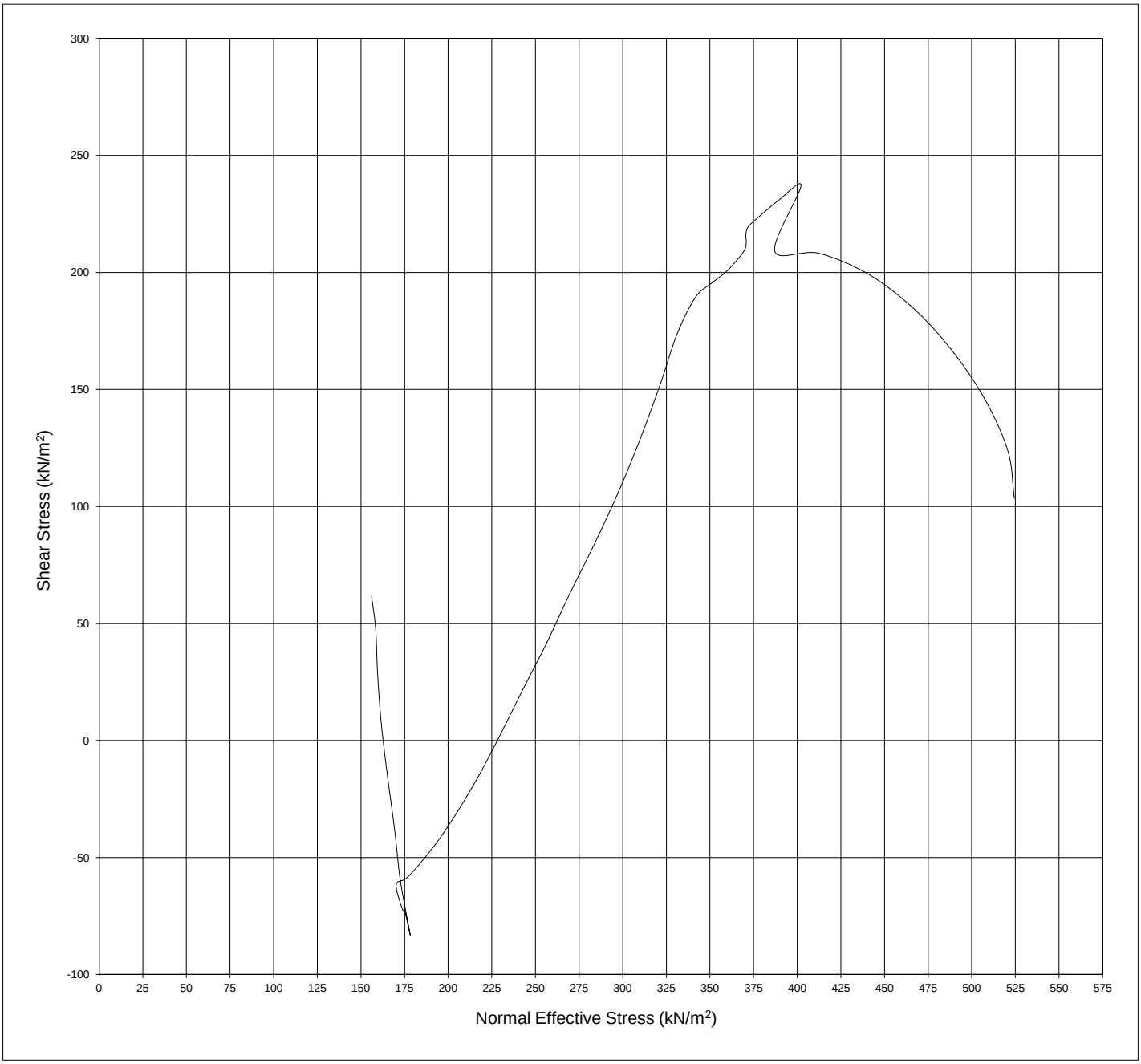






Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

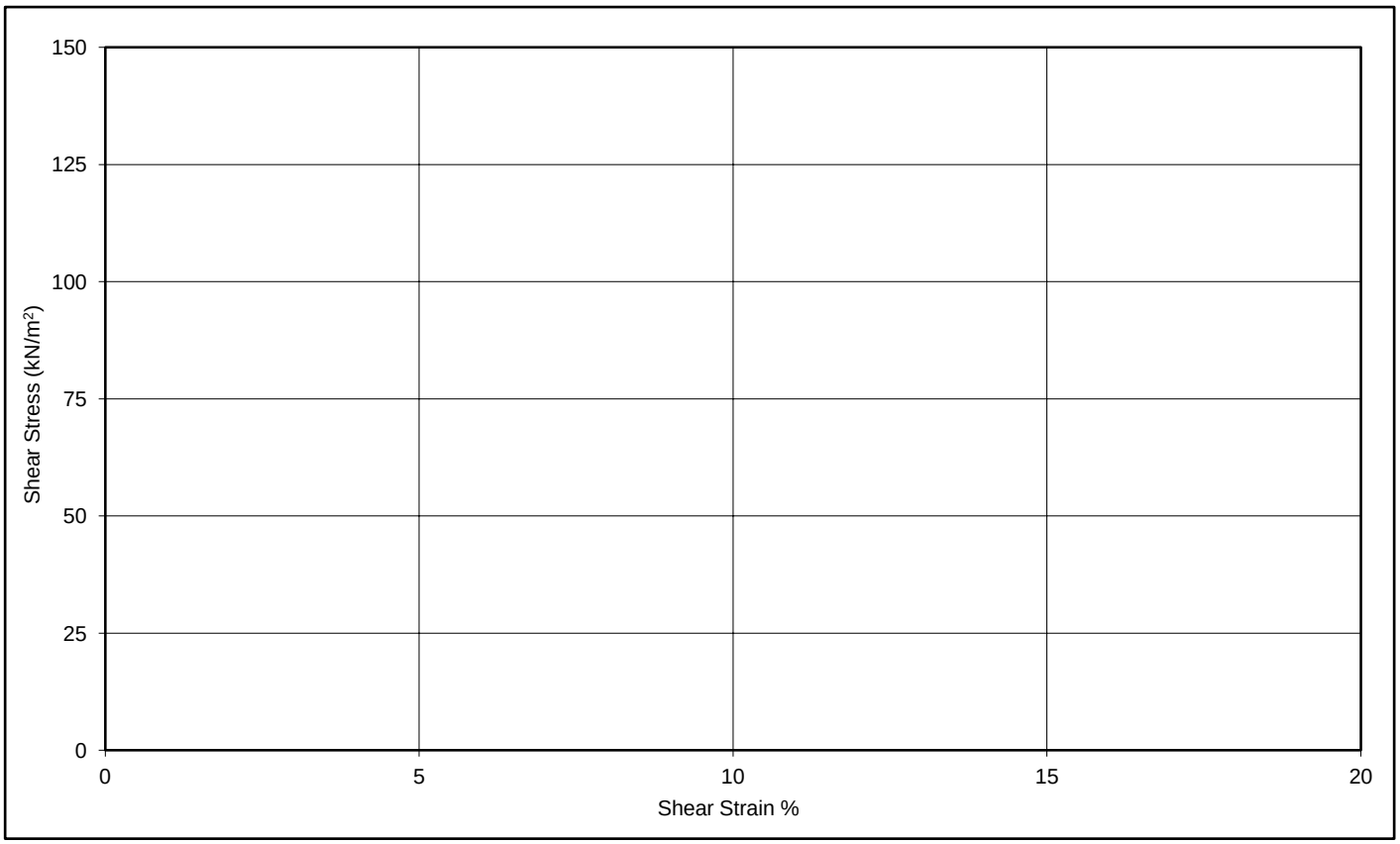
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

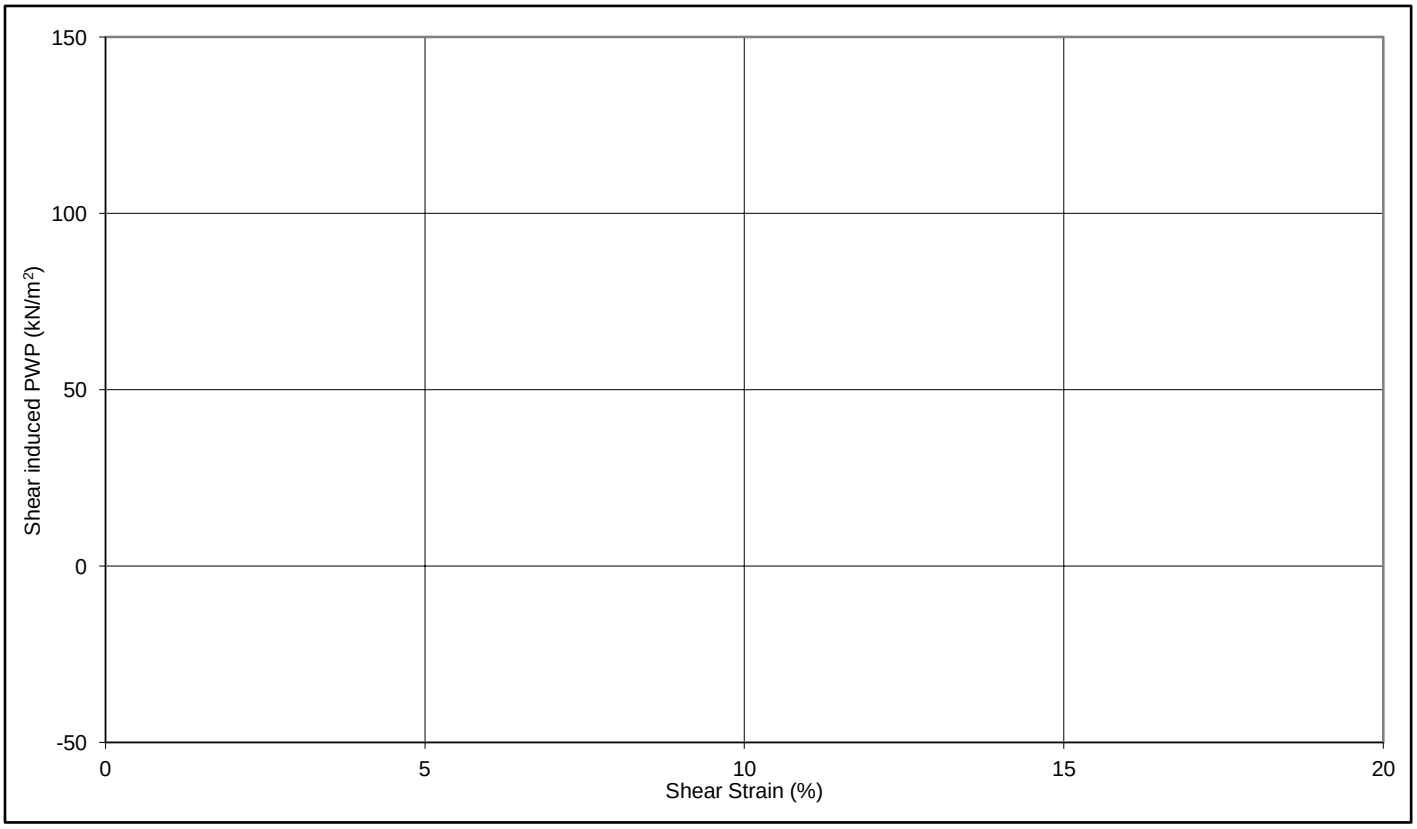


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

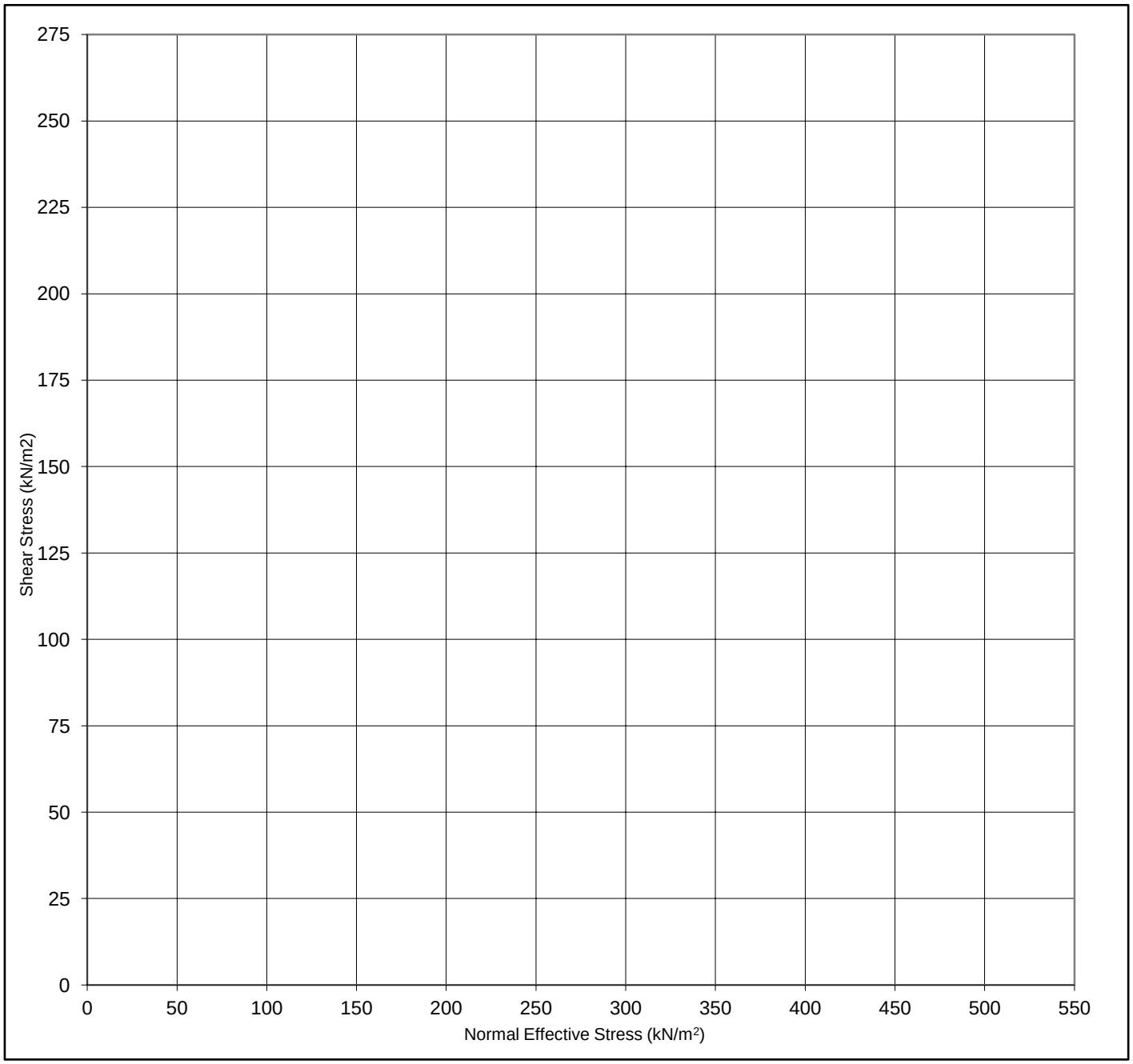
Shear Stage





Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

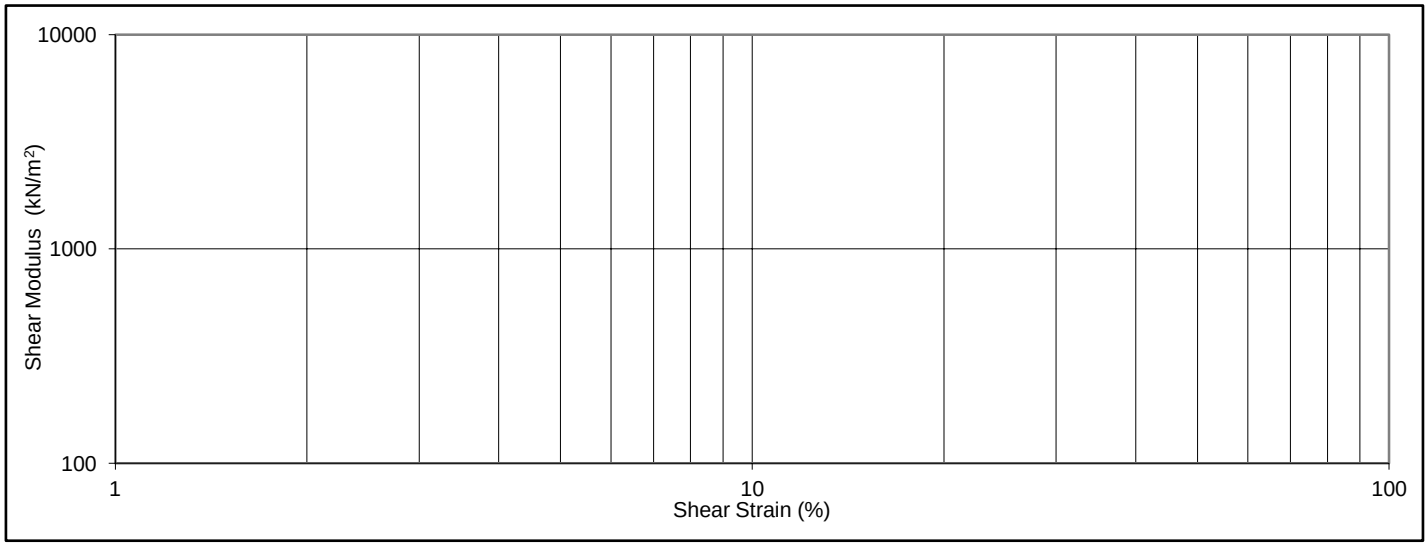
Gardline	Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)	US Wind inc sea energy	
Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38

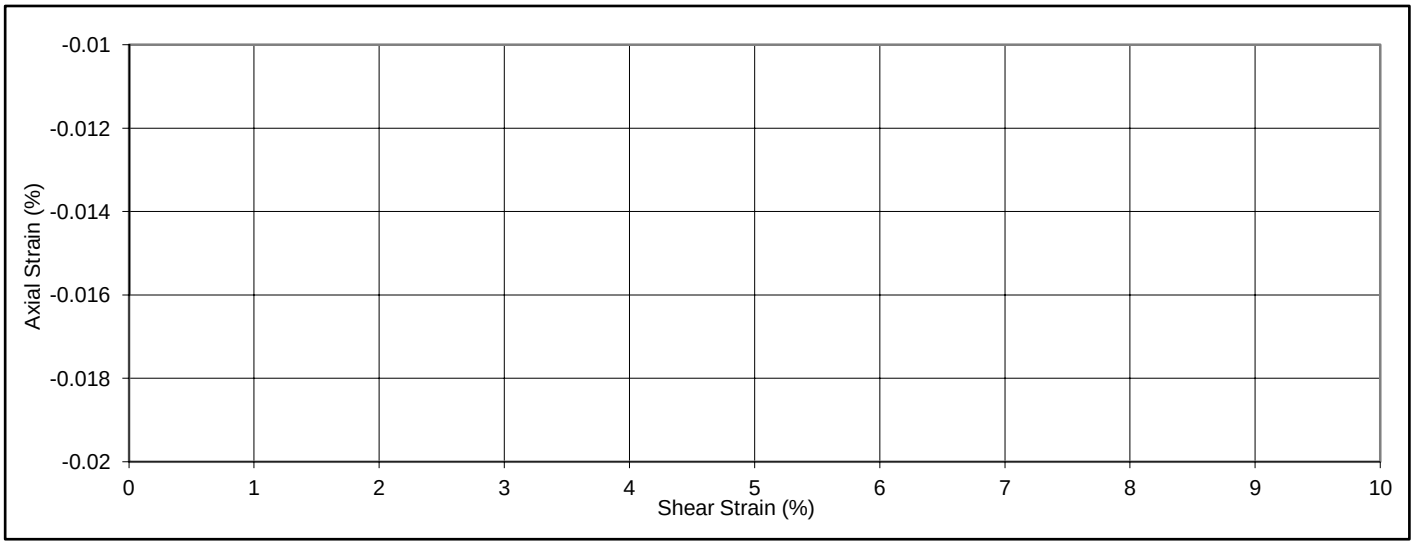


Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Cyclic Direct Simple Shear (DSScy) (Consolidated Undrained)

Location	Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area	Contract No	10451
		Borehole	BH - I21B
Description	CLAY with silt. Olive grey, moist, silt laminations and rare fine shell fragments	Sample No./Type	P10Q1
Tested in accordance with ASTM D6528-07		Depth (m)	59.36-59.38





Final Specimen Details

Sample Height	mm
16.93	
Sample Diameter	mm
49.98	
Sample Weight	g
62.1	
Moisture Content	%
46.5	
Bulk Density	Mg/m^3
1.372	
Dry Density P_d	Mg/m^3
0.937	
Voids Ratio e_o	
1.883	
Degree of Saturation S_o	
66.68	

Specimen Shear Results

Undrained shear strength	
S_u (kN/m^2)	0
Shear Strain	
γ (%)	0.00
Change in Vertical Strain	
$\Delta\varepsilon_v$ (%)	0.00
Pore pressure at failure	
Uf (kPa)	0

Picture Key

Top Picture
Side view of failure zone
Bottom Picture
Specimen lifted from failure zone

Remarks:	Tested by	Processed by	Checked by	Approved by
	LR	**LR**	**LR**	**JG**

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	D14	Description (visual) :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	18.54	%	14.94	%	
Bulk density :	1.66	Mg/m³			
Dry density :	1.40	Mg/m³			
Particle density (assumed)	2.66	Mg/m³			
Initial voids ratio (e_o)	0.9001				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.9	mm
Diameter :	66.4	mm
Axial strain:	0.95	% (for stage)
Normal stress:	35.9	kPa
Voids ratio (e_o):	0.8821	
Max. Consolidation stress:	35.9	kPa
Max. Consolidation strain:	0.95	% (for stage)
Duration:	662	Min.

PRIOR TO CYCLIC DRAINED PRE-CONDITIONING		
Height :	19.9	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	35.9	kPa
Voids ratio (e_o):	0.8821	
Max. Consolidation stress:	35.9	kPa
Max. Consolidation strain:	0.00	% (for stage)
Duration	0	Min.

CYCLIC DRAINED PRE-CONDITIONING STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	1.44	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	400	(sinusoidal wave form)
Failure:	NA	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.010	-0.013	1.4	-1.4	0.2	-0.1
5	0.008	-0.013	1.4	-1.4	0.1	-0.1
10	0.008	-0.013	1.4	-1.4	0.1	-0.1
50	0.007	-0.013	1.4	-1.4	0.2	-0.1
100	0.007	-0.015	1.4	-1.4	0.2	-0.1
400	0.005	-0.020	1.5	-1.4	0.1	-0.1

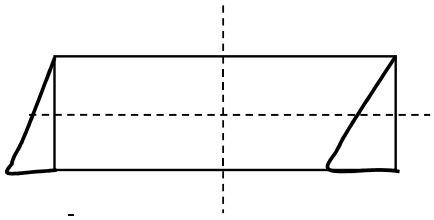
Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 11/02/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

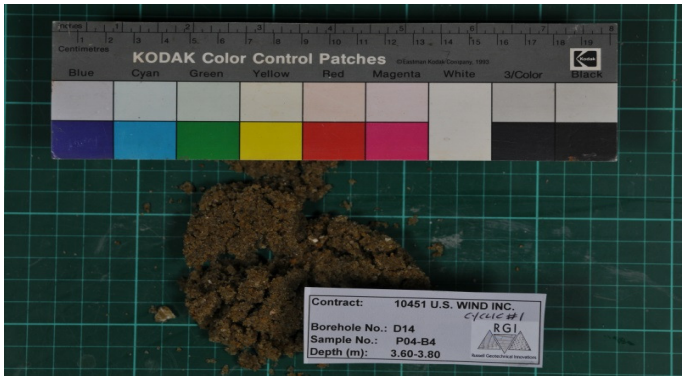
Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

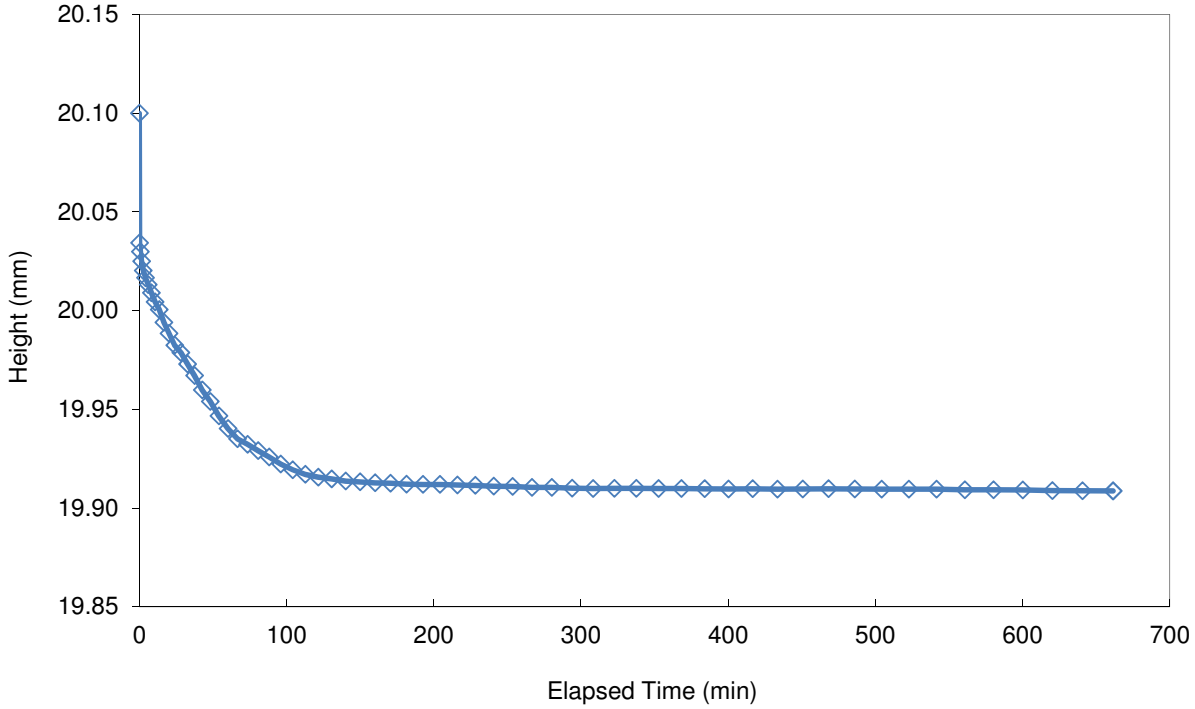
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

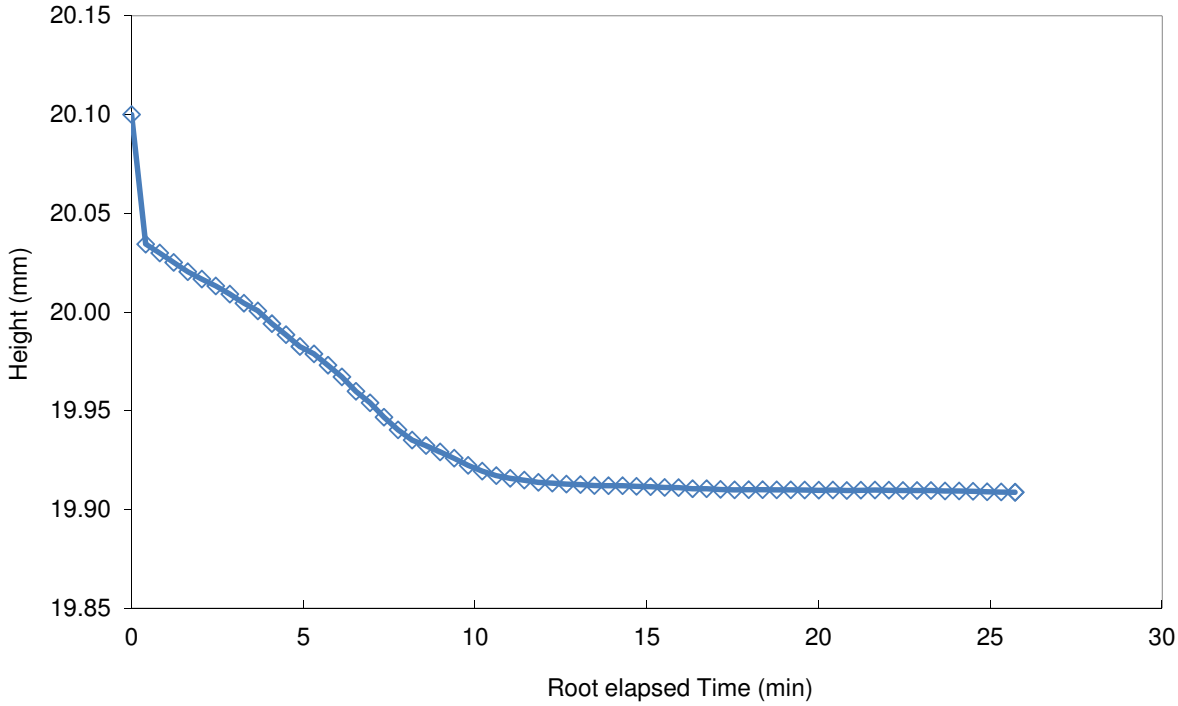
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHD14 P05B4 0360 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

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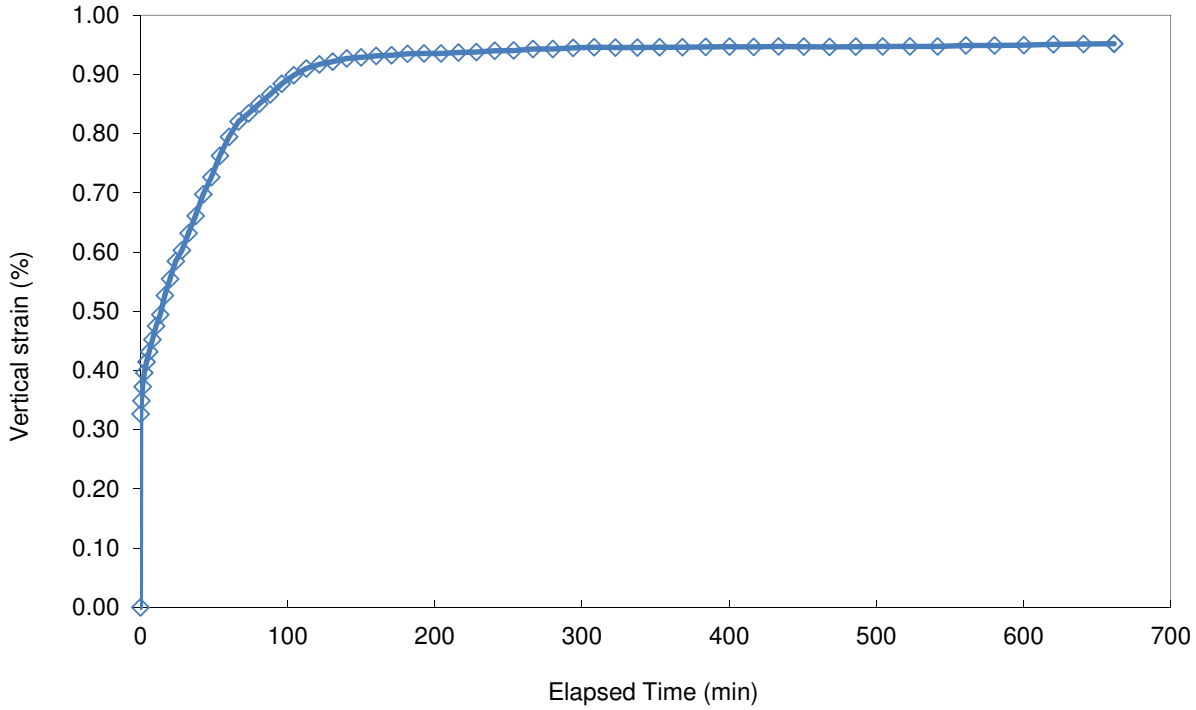

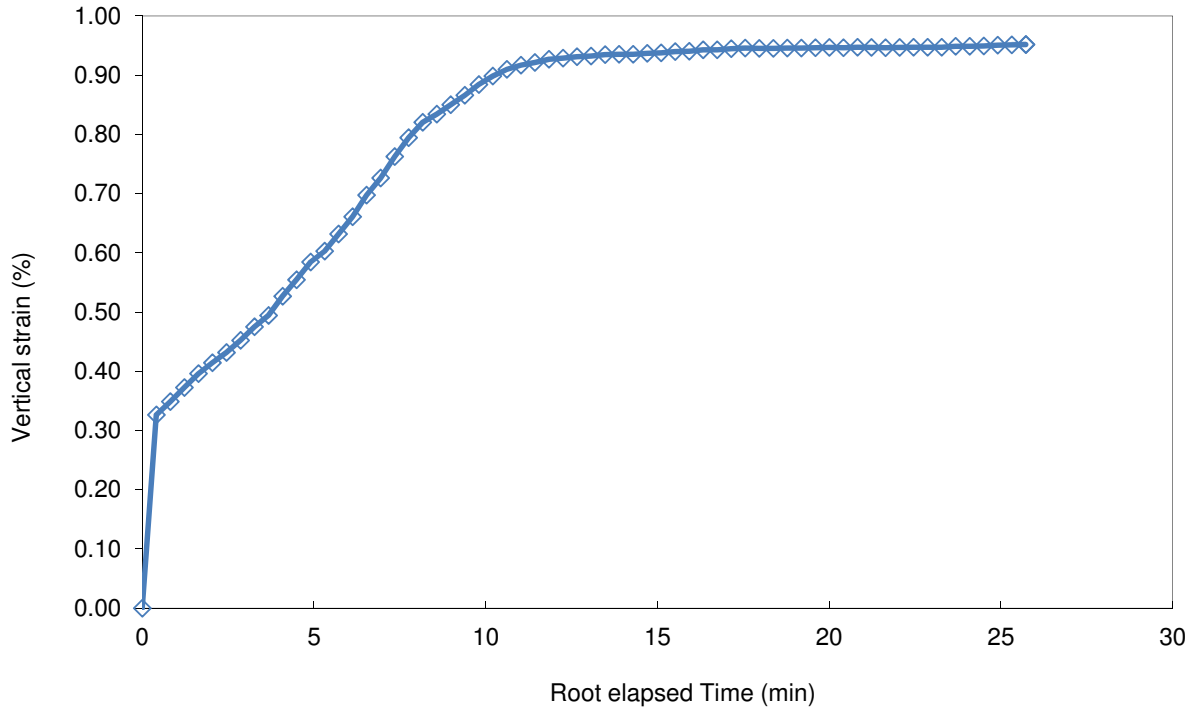

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

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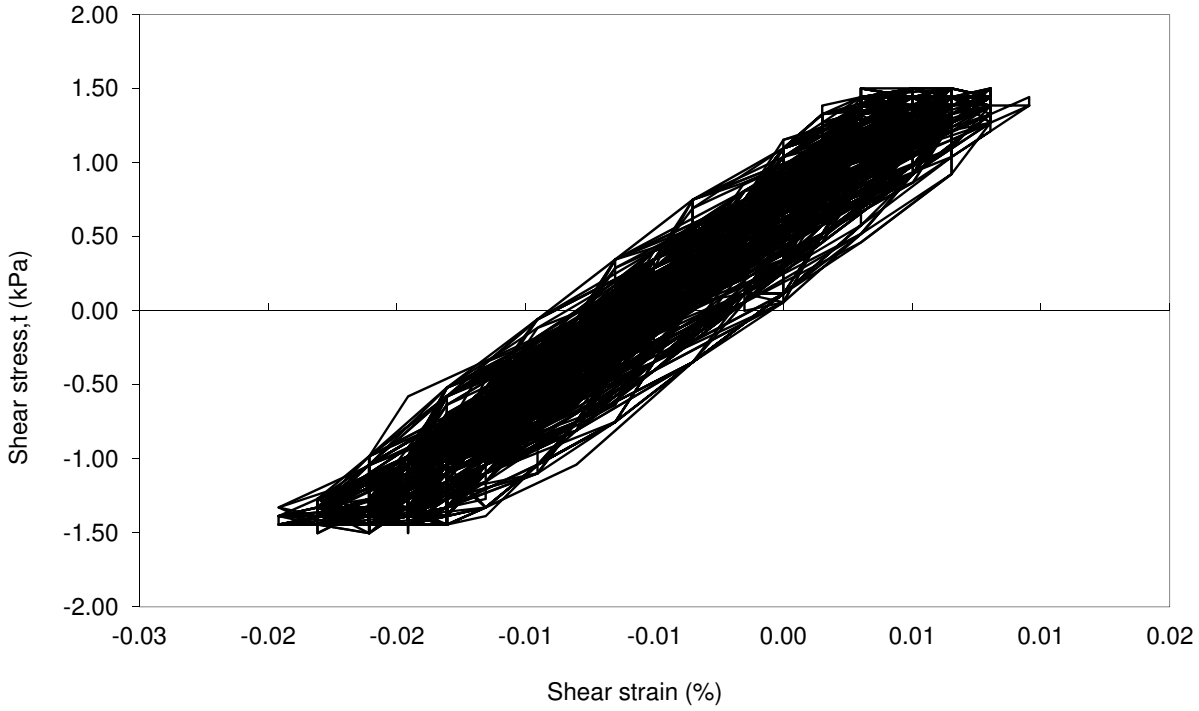

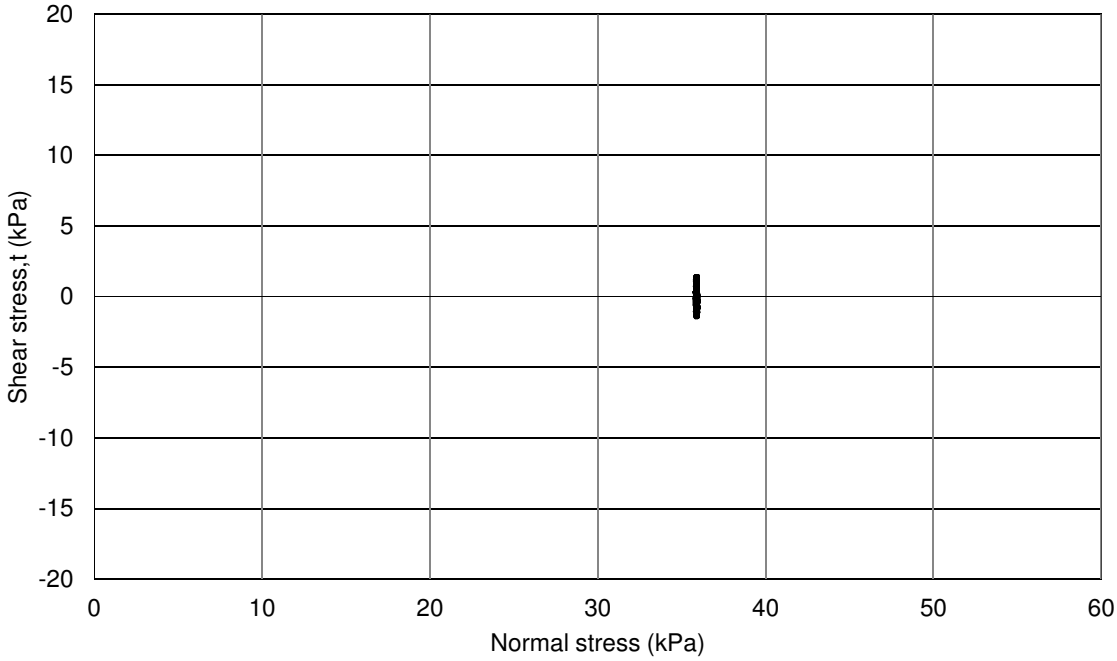

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 11/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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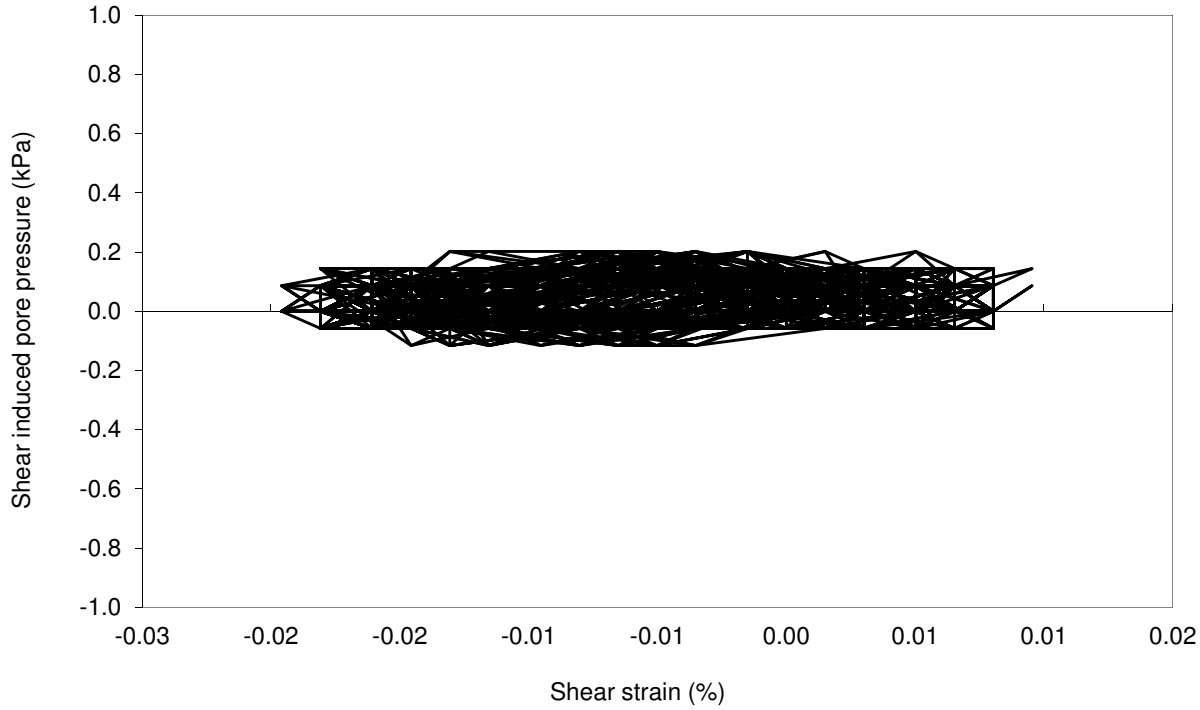

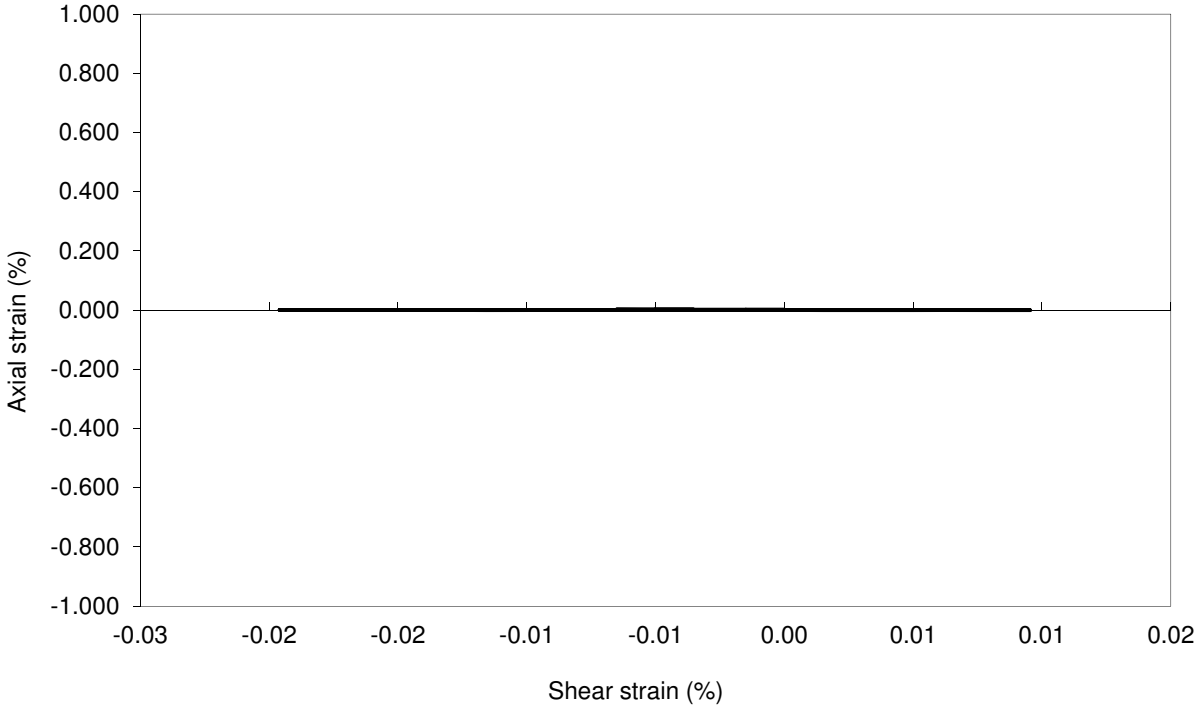

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 11/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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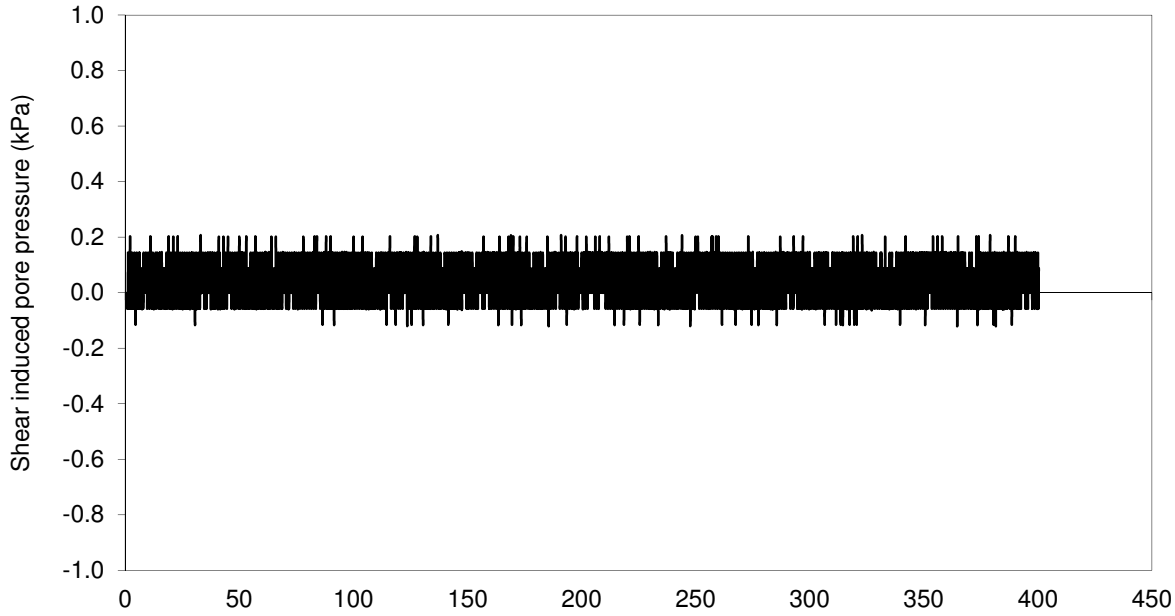

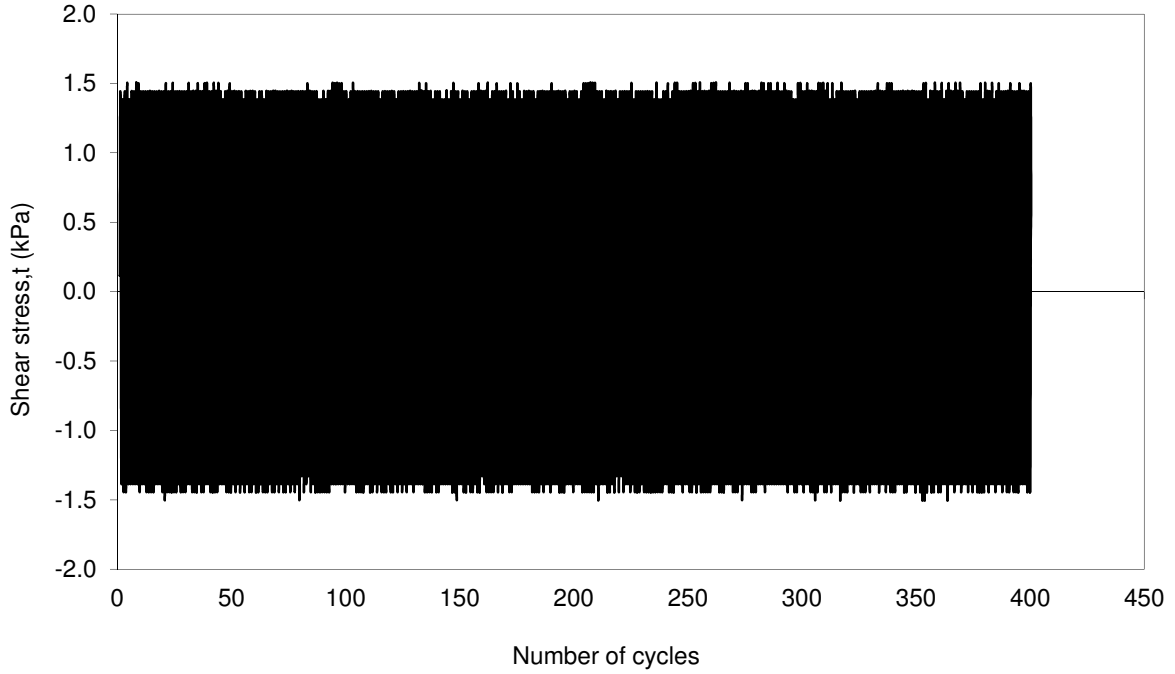

Drained cyclic Pre-shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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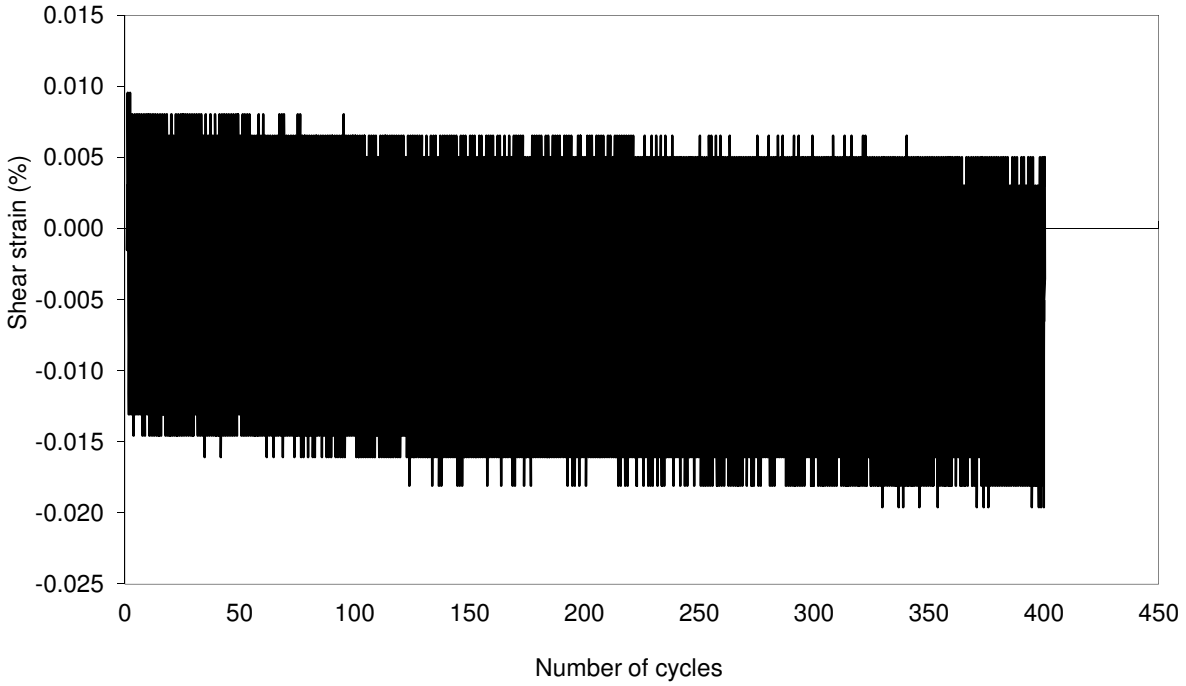

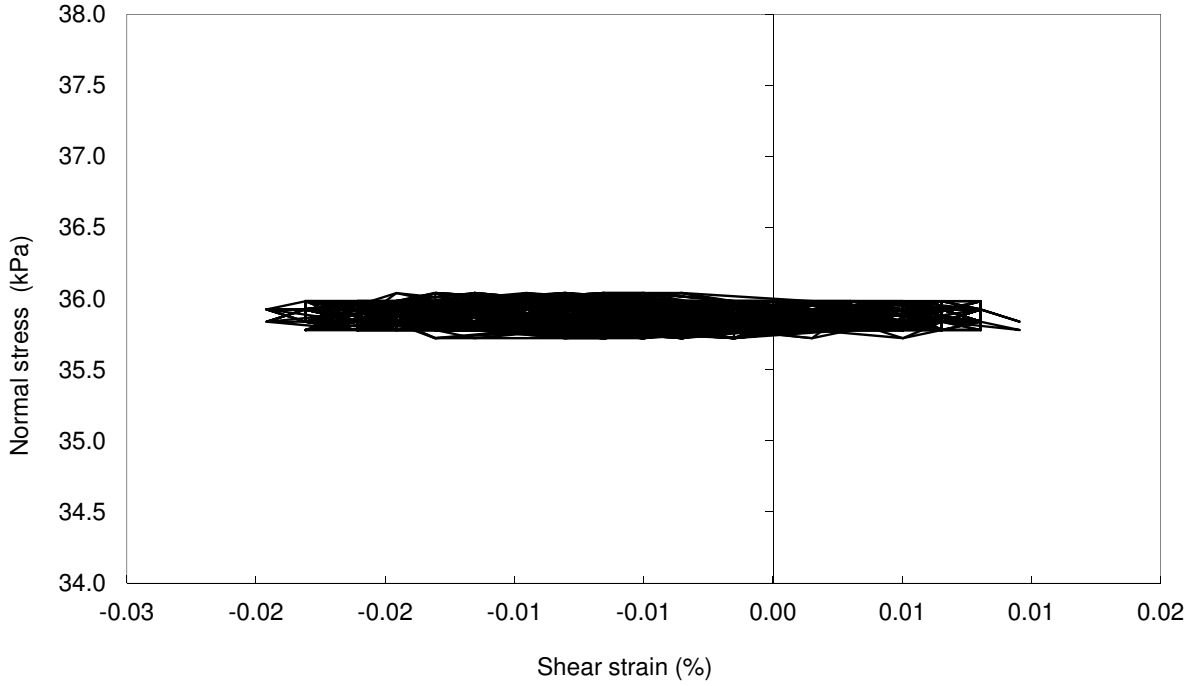

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: CSR	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 11/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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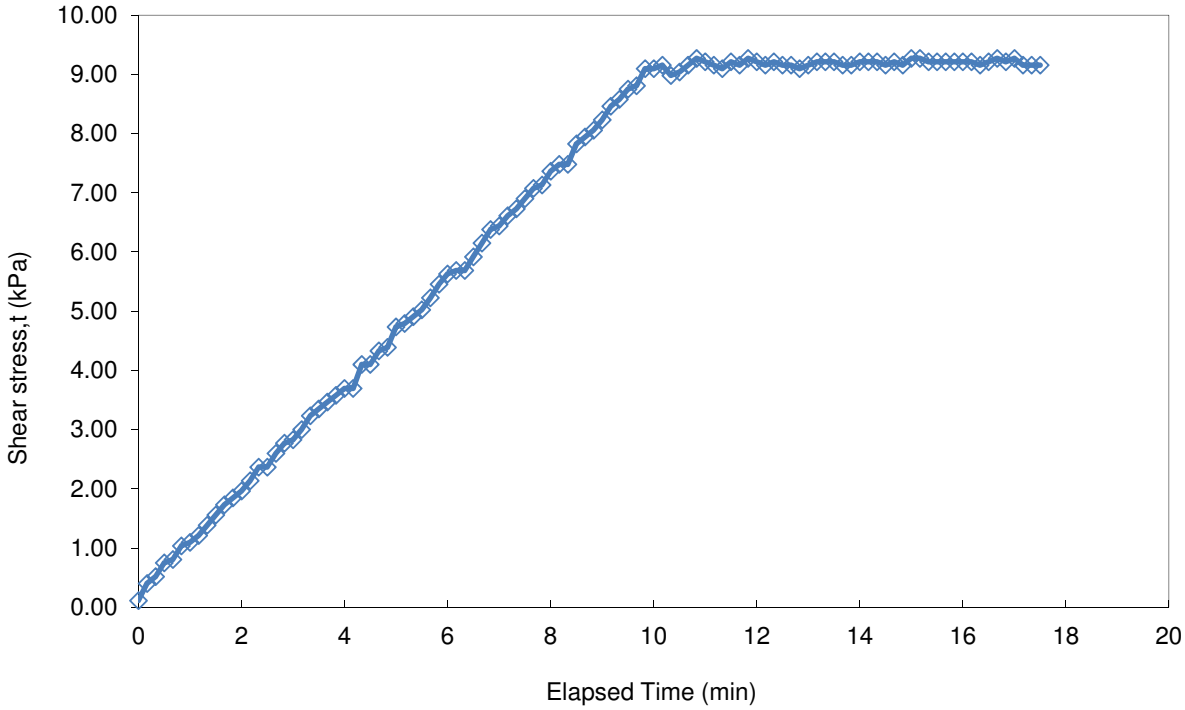

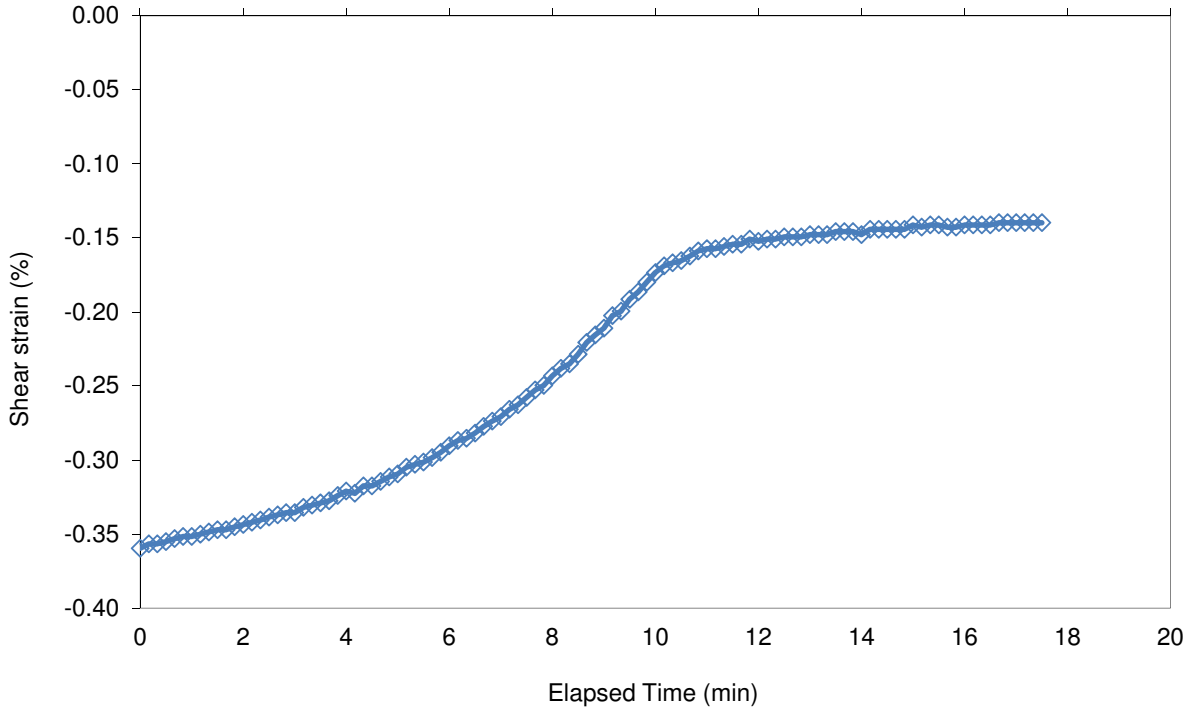

Drained loading to average shear stress #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)

END OF DRAINED CYCLIC PRE-SHEARING STAGE #1

Height :	19.9	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	36.0	kPa
Shear stress:	0.1	kPa
Duration:	627	Min.

END OF DRAINED LOADING TO AVERAGE SHEAR STRESS #2 (PRIOR TO CYCLIC SHEAR #2)

Height :	19.9	mm
Diameter :	66.4	mm
Normal stress:	35.98	kPa
Shear stress :	9.2	kPa
Duration	133	Min.

UNDRAINED CYCLIC SHEAR STAGE

Average shear stress:	9.10	(kPa)
Cyclic shear stress (+/-):	17.5	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	8	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	6.169	-2.005	26.1	-8.8	44.1	9.3
5	10.377	-3.547	26.1	-9.0	44.0	11.7
6	11.597	-3.993	26.1	-8.9	43.9	12.0
7	13.759	-4.521	26.3	-9.1	43.9	11.1
8	16.157	-5.467	26.3	-9.0	43.9	11.6
9	18.548	-6.304	26.4	-8.9	43.7	11.1
10	21.582	-6.949	26.3	-9.0	43.8	11.5
11	25.632	-5.033	26.3	-8.9	43.7	12.3
12	27.960	-4.839	26.8	-8.5	43.8	12.3
13	33.744	-5.268	26.3	-8.3	43.7	12.4

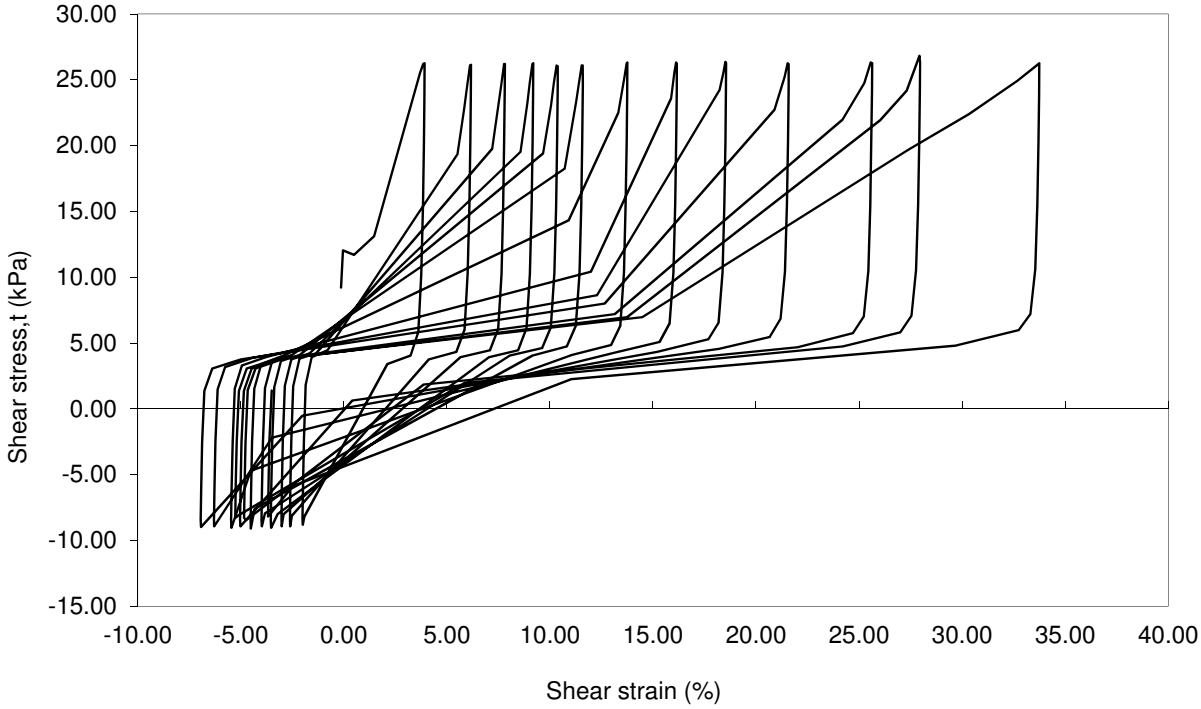
Cyclic simple shear #2

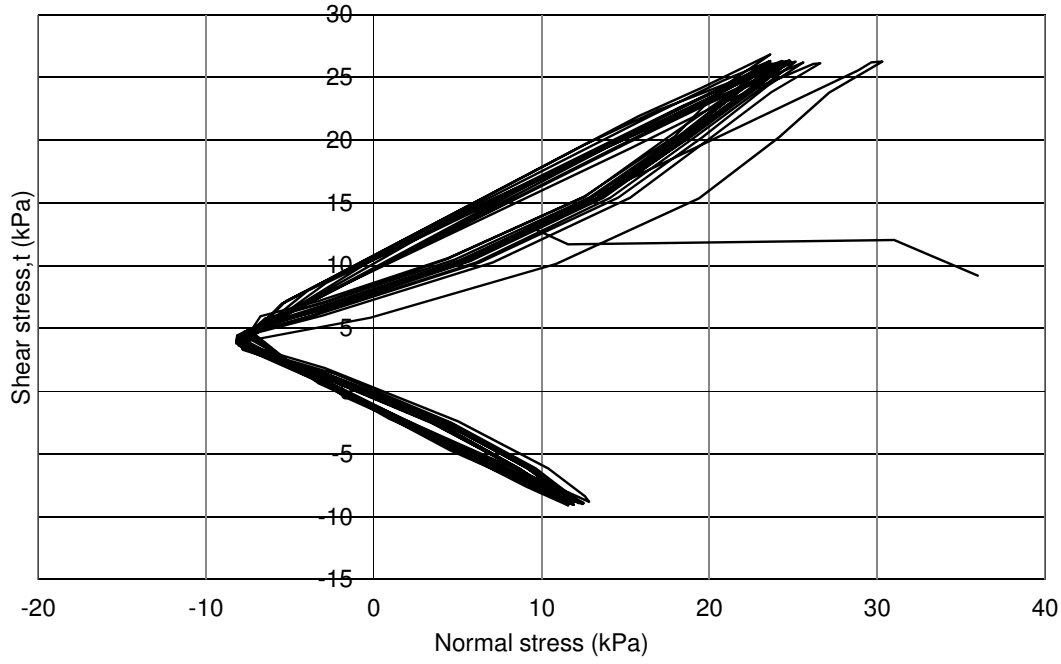
Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)





Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: CSR	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 11/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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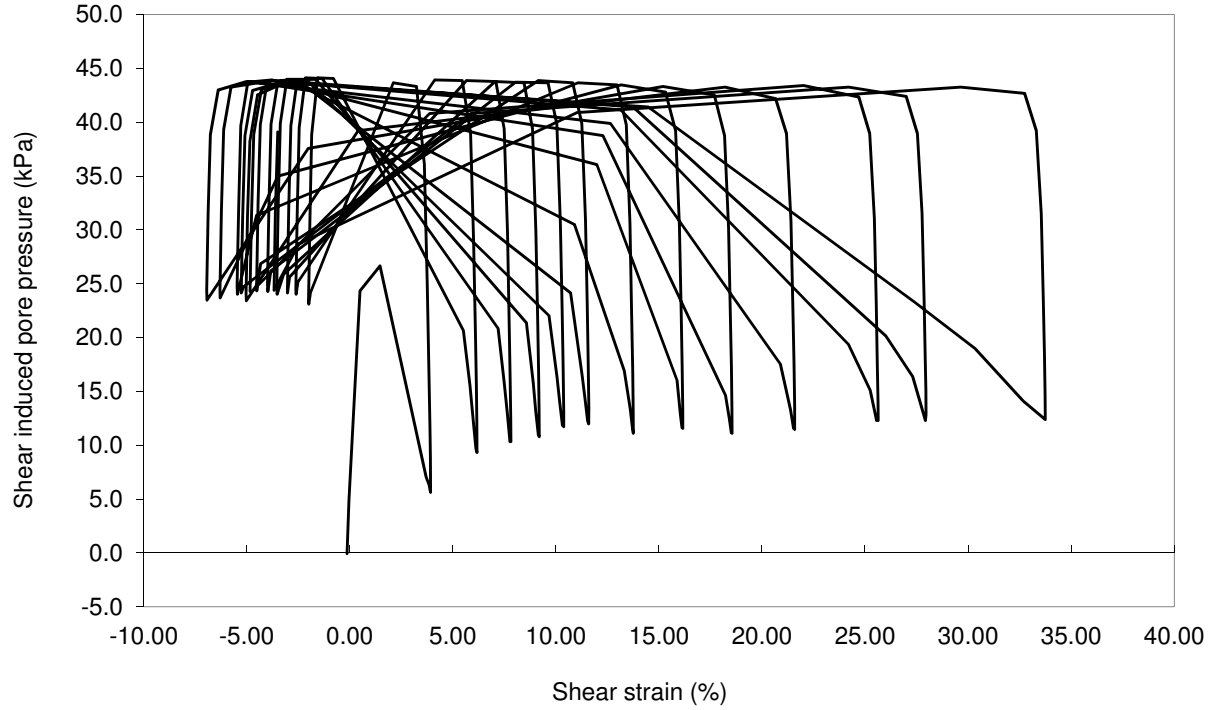
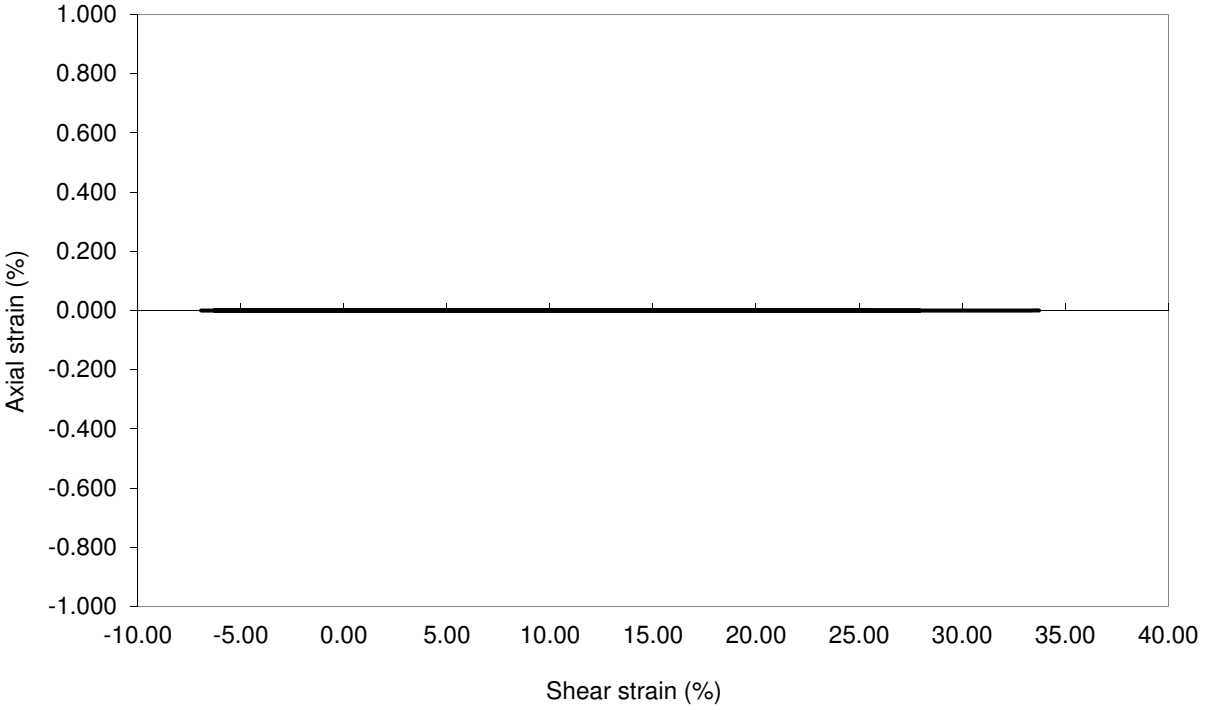
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)





Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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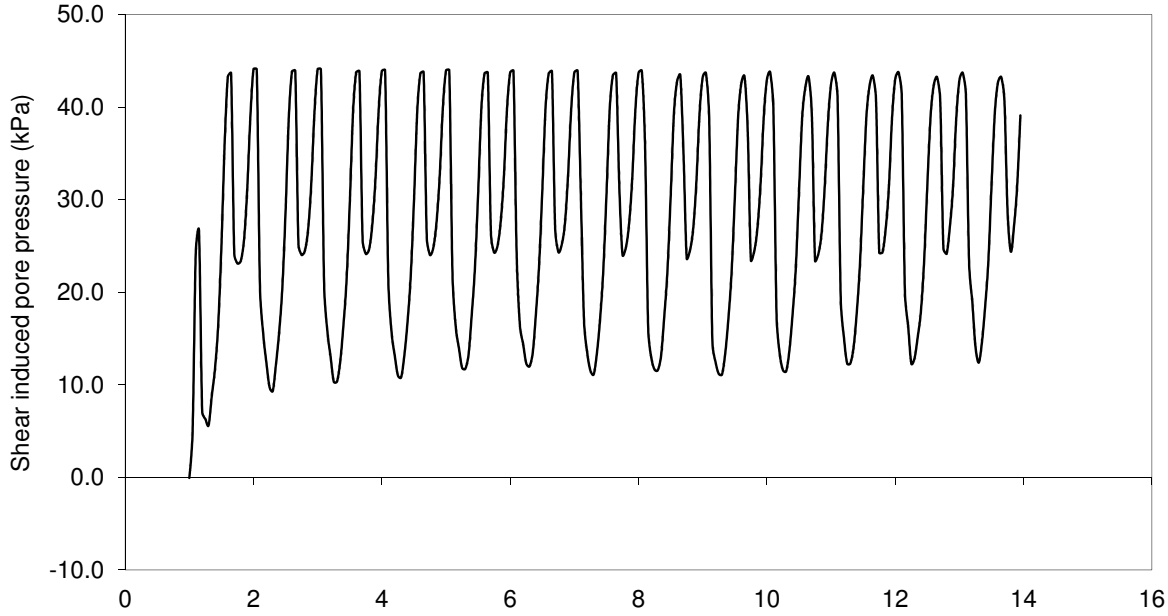
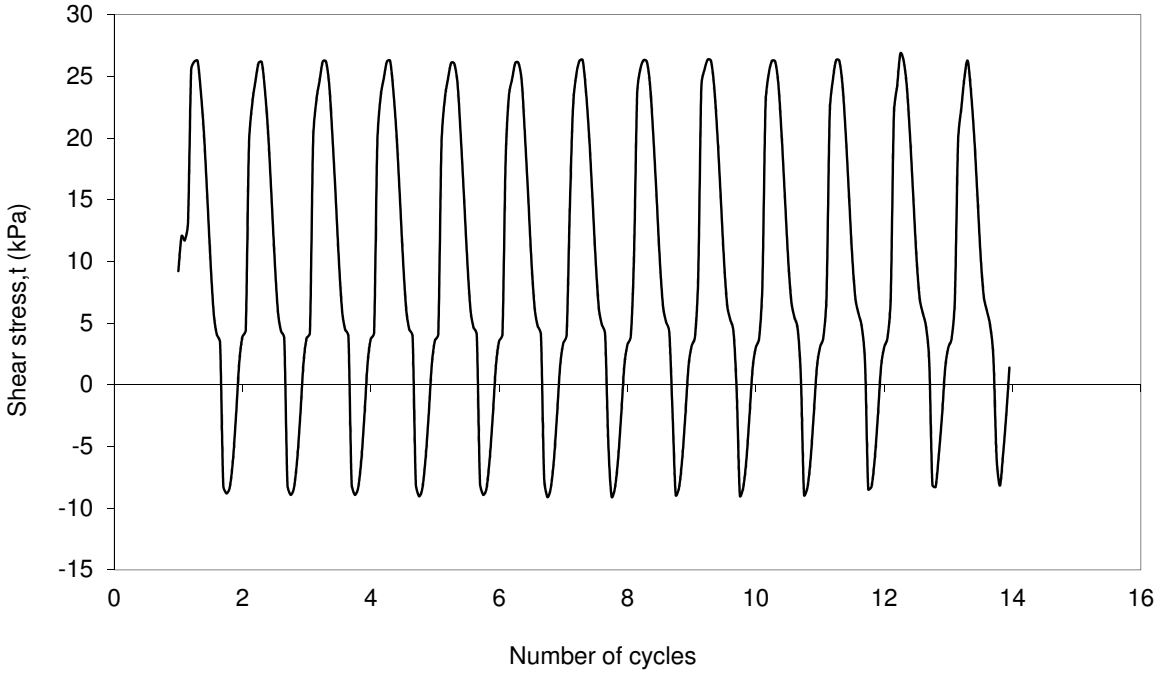
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)





Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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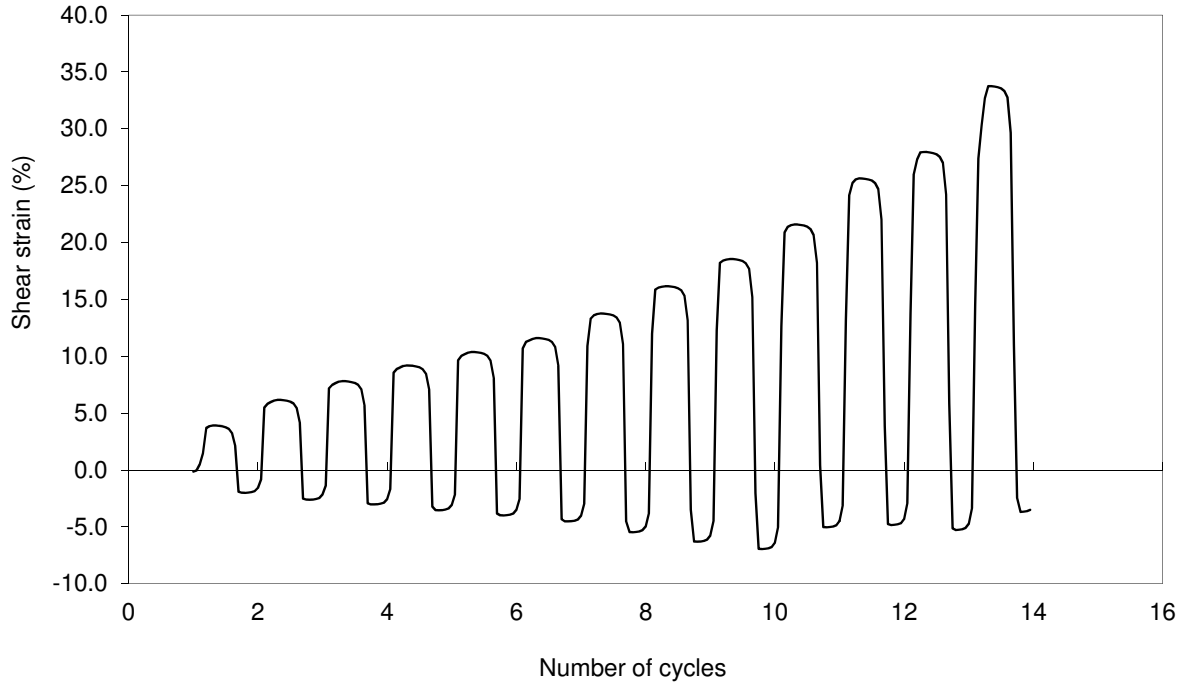
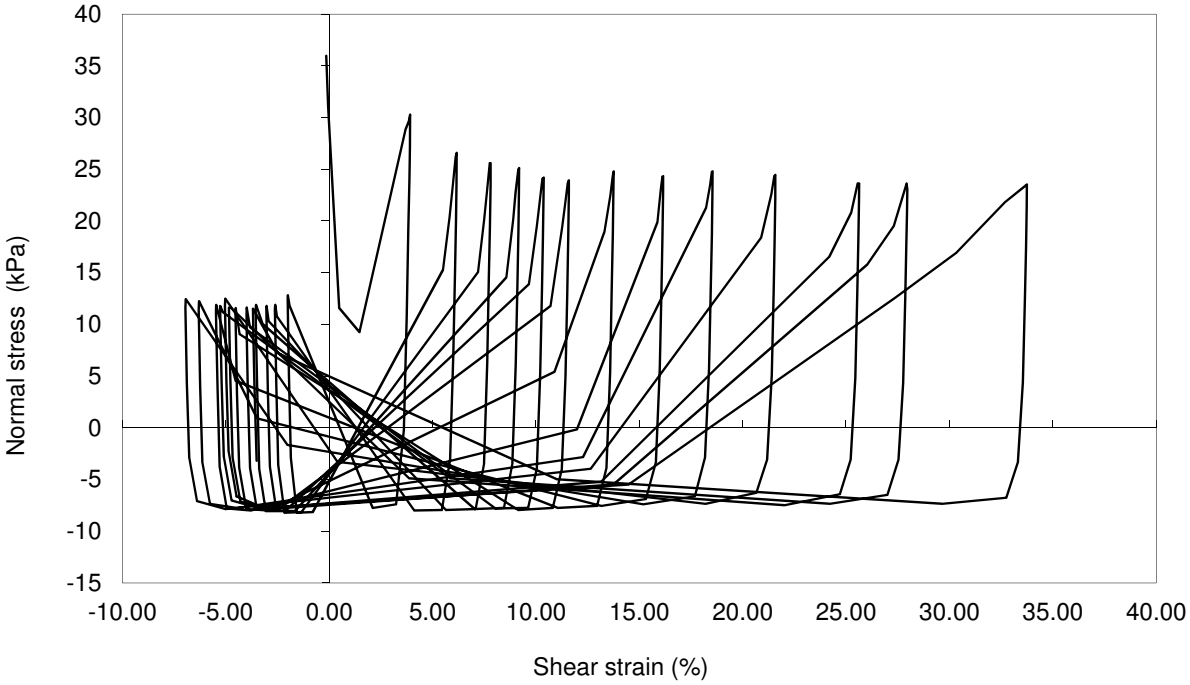
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#1)





Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	D14	Description (visual) :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	18.54	%	18.46	%	
Bulk density :	1.66	Mg/m^3			
Dry density :	1.40	Mg/m^3			
Particle density (assumed)	2.66	Mg/m^3			
Initial voids ratio (e_o)	0.9001				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.6	mm
Diameter :	66.4	mm
Axial strain:	2.60	% (for stage)
Normal stress:	35.8	kPa
Voids ratio (e_o):	0.8506	
Max. Consolidation stress:	35.8	kPa
Max. Consolidation strain:	2.60	% (for stage)
Duration:	771	Min.

PRIOR TO CYCLIC DRAINED PRE-CONDITIONING		
Height :	19.6	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	35.8	kPa
Voids ratio (e_o):	0.8506	
Max. Consolidation stress:	35.8	kPa
Max. Consolidation strain:	0.00	% (for stage)
Duration	0	Min.

CYCLIC DRAINED PRE-CONDITIONING STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	1.44	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	400	(sinusoidal wave form)
Failure:	NA	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.012	-0.015	1.4	-1.4	0.1	-0.1
5	0.012	-0.016	1.4	-1.4	0.1	-0.1
10	0.010	-0.016	1.4	-1.3	0.1	-0.1
50	0.003	-0.023	1.4	-1.3	0.1	-0.1
100	0.000	-0.027	1.4	-1.4	0.1	-0.1
400	-0.010	-0.035	1.5	-1.4	0.1	-0.2

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 12/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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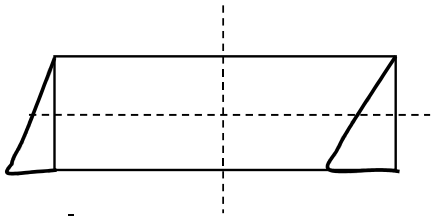
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

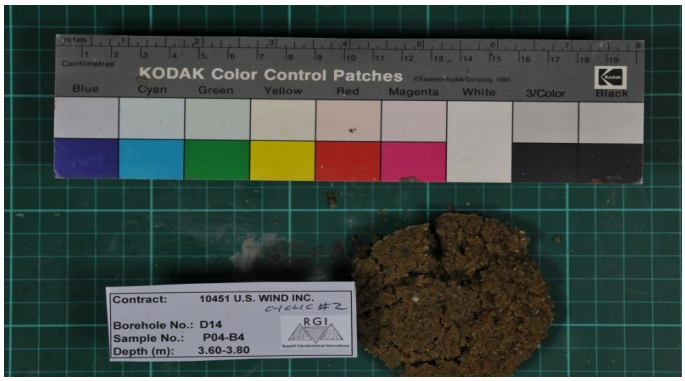
Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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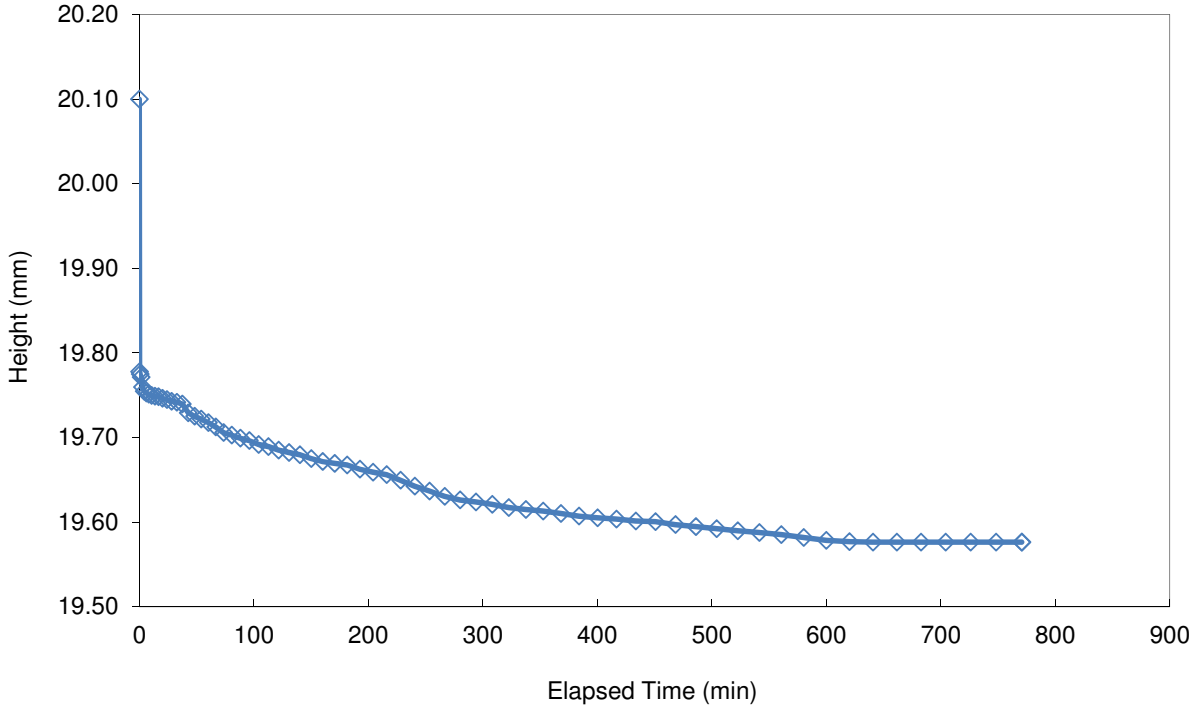
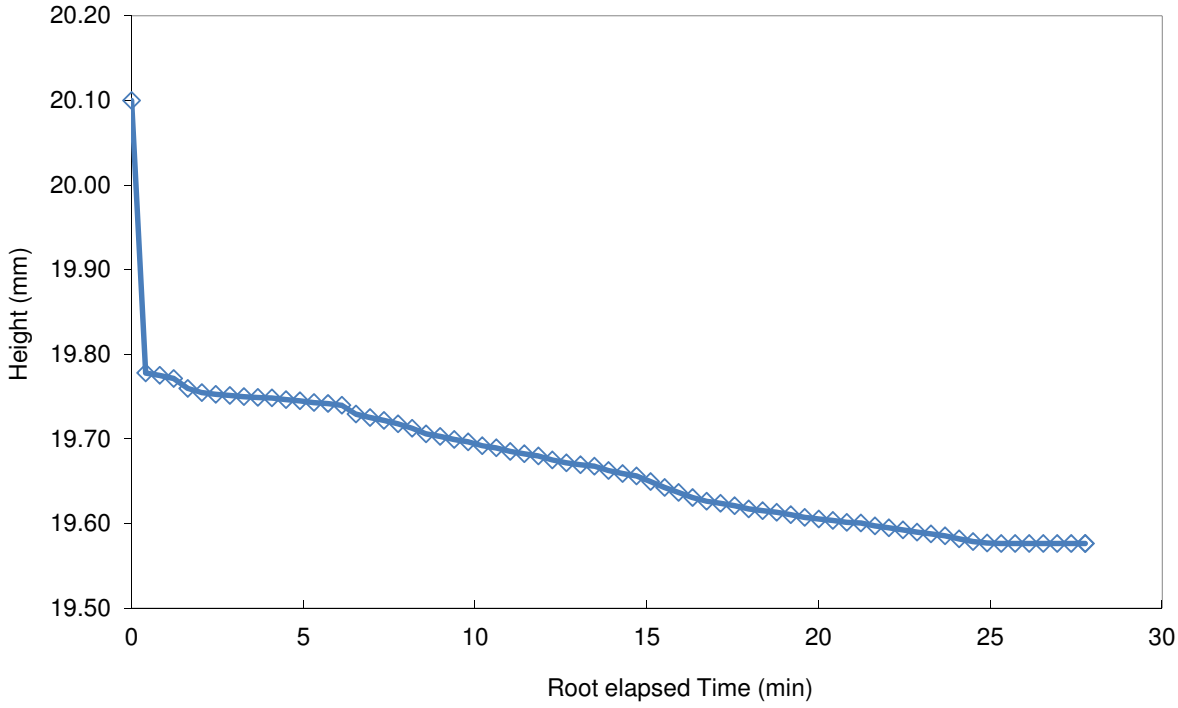
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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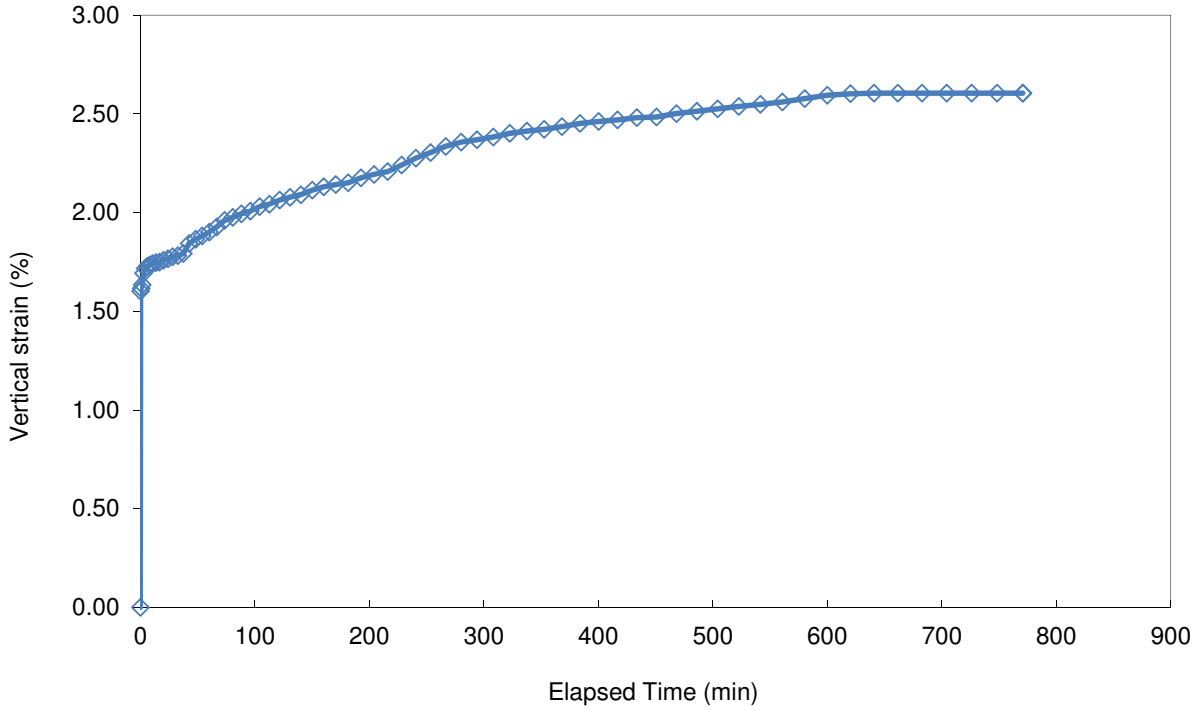

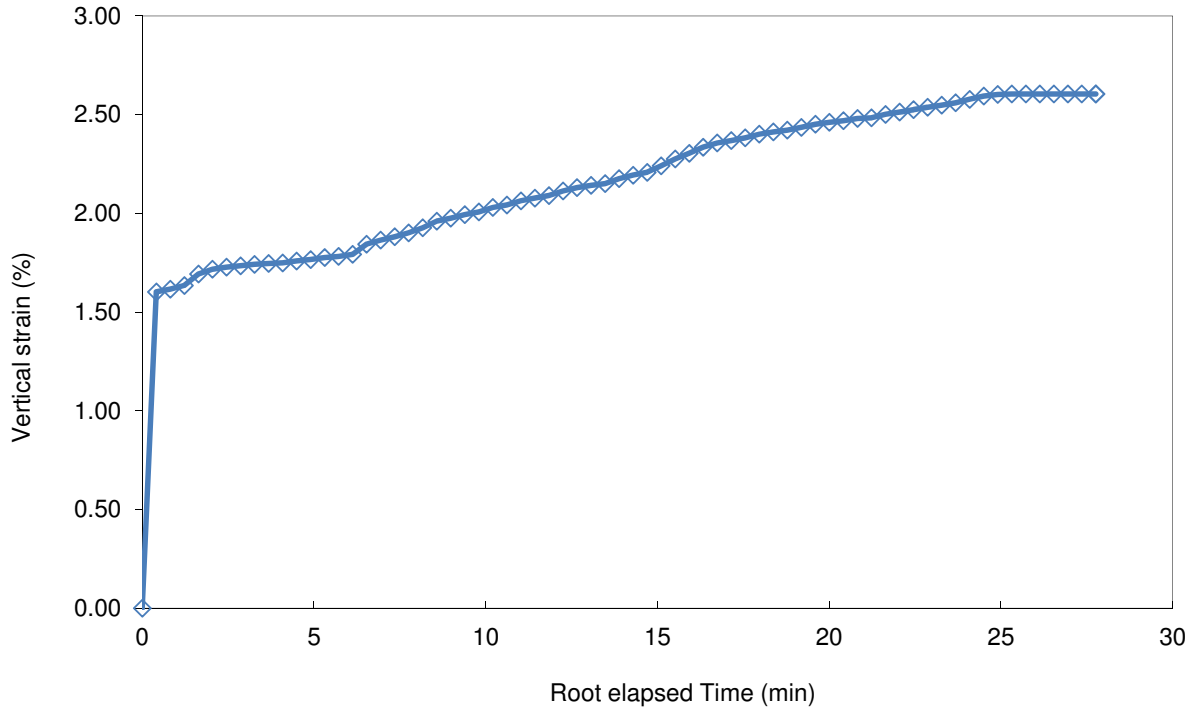

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

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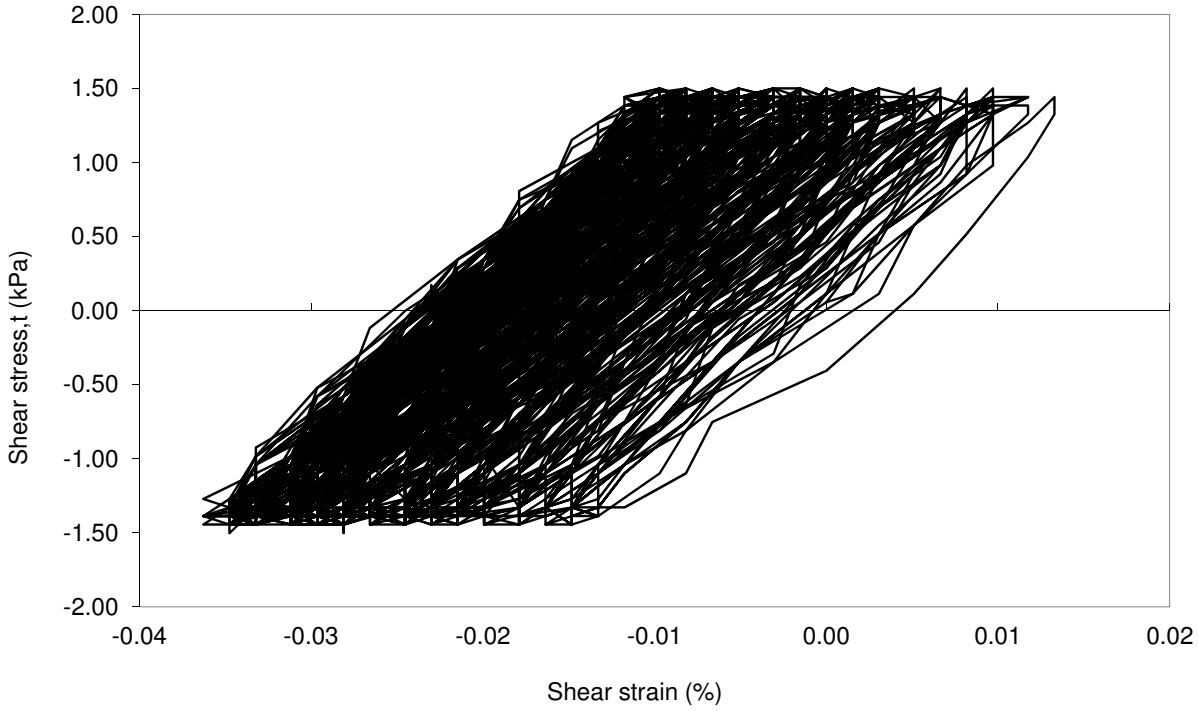

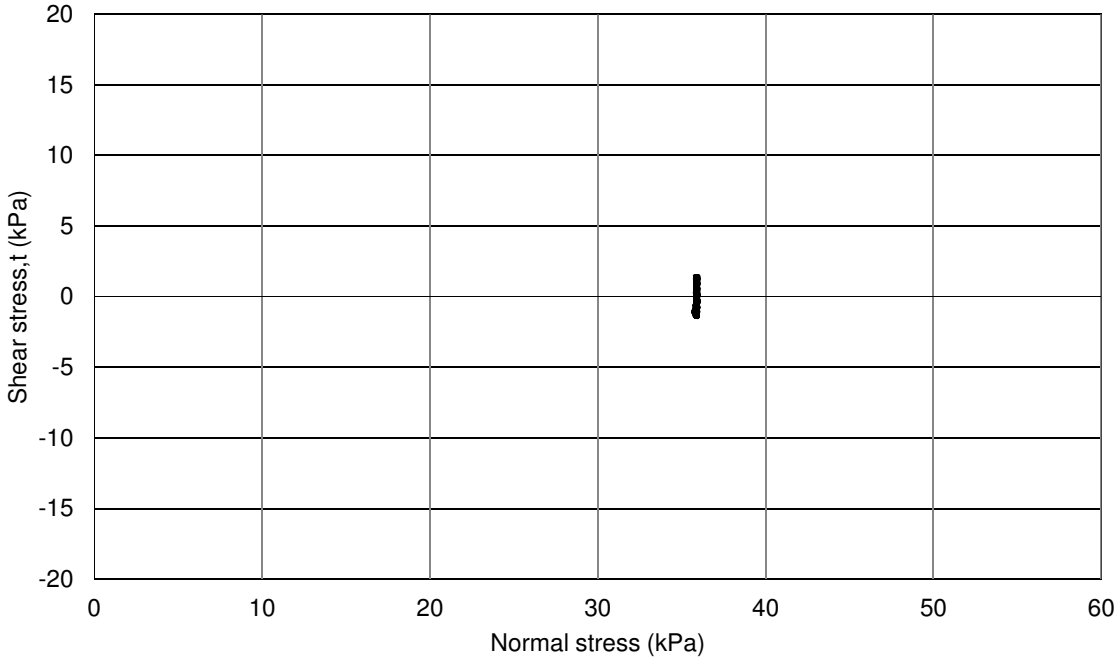

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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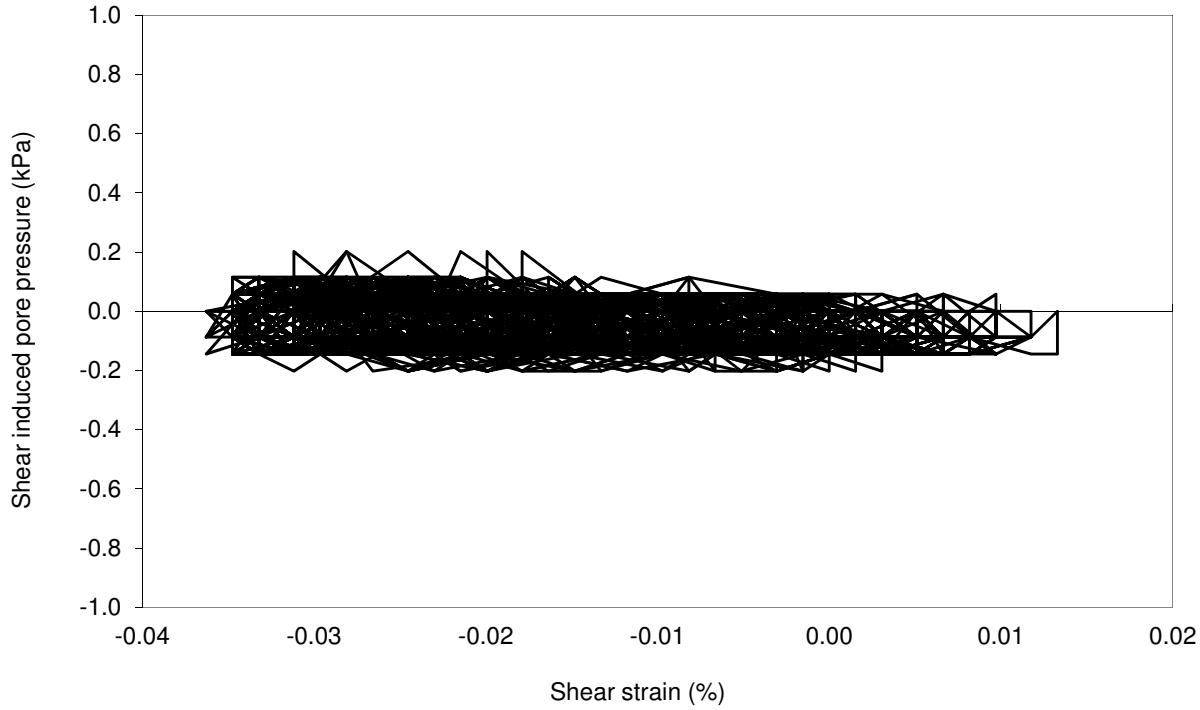

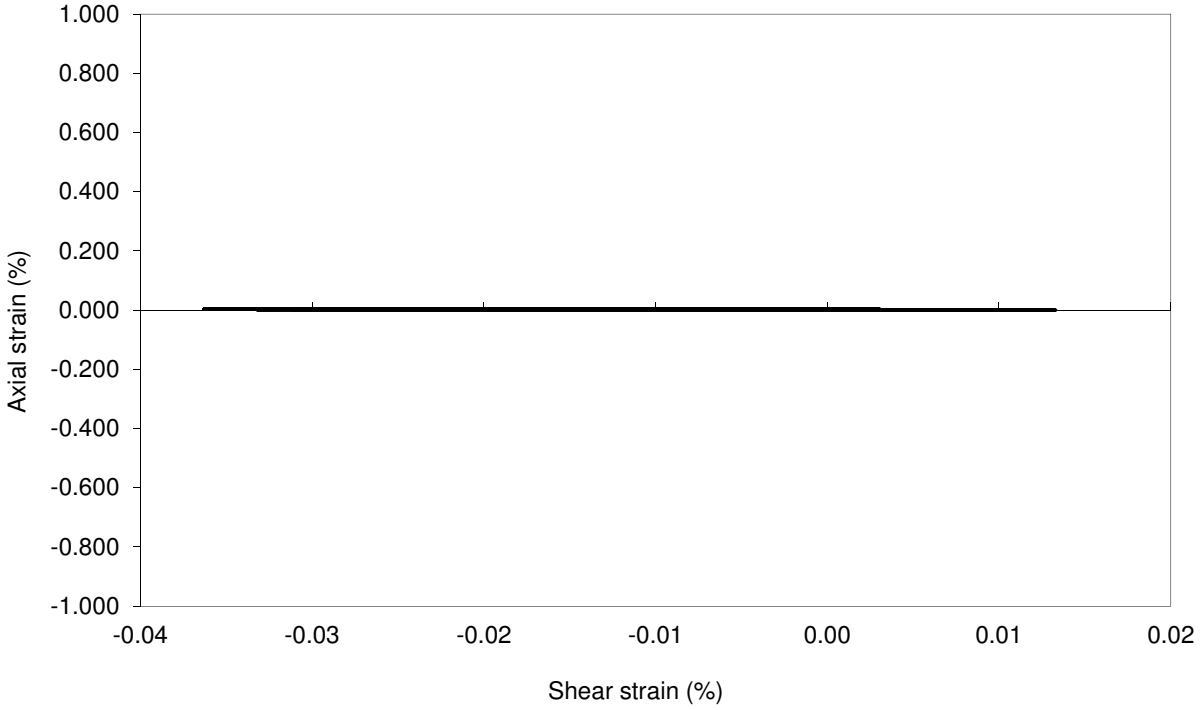

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

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(Cohesive Soils)- In general accordance with ASTM D6528-07

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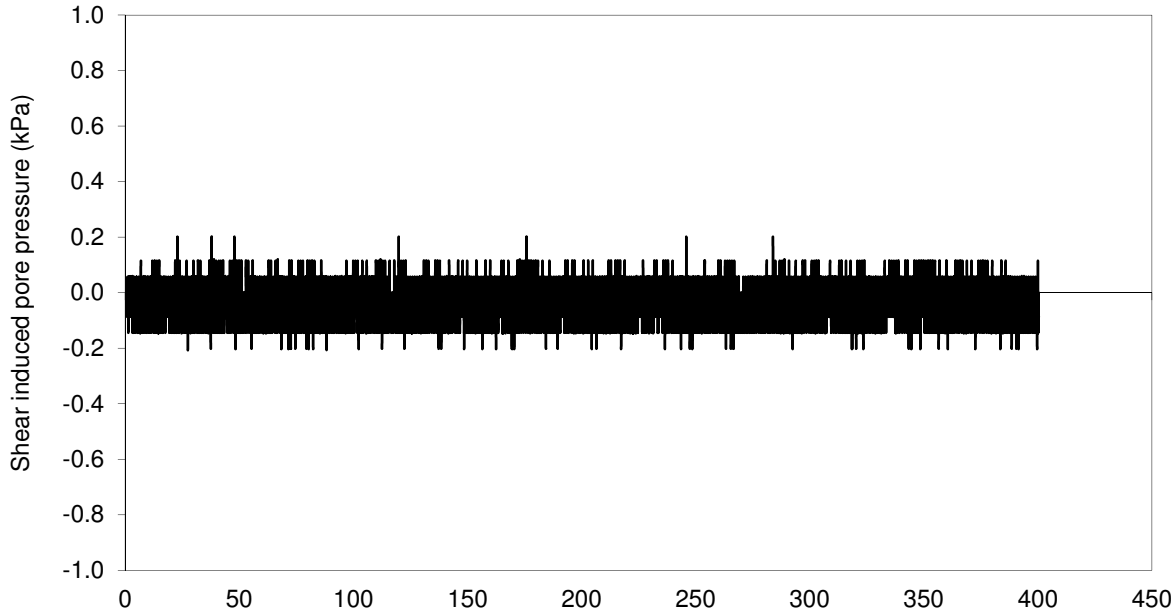

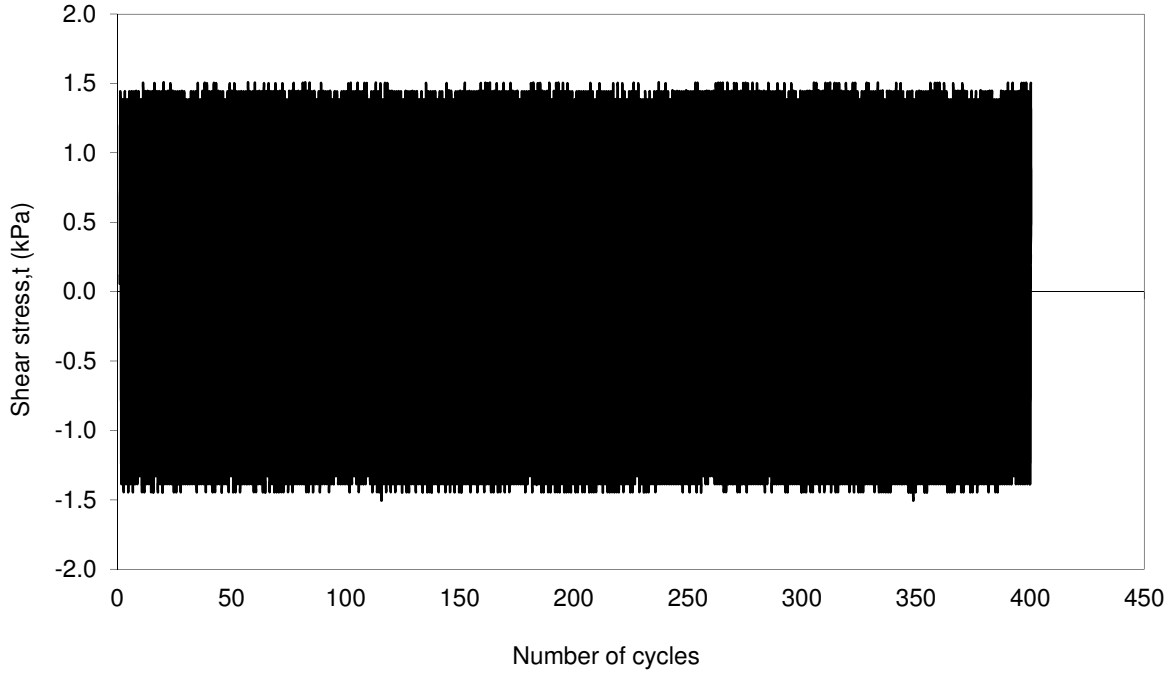

Drained cyclic Pre-shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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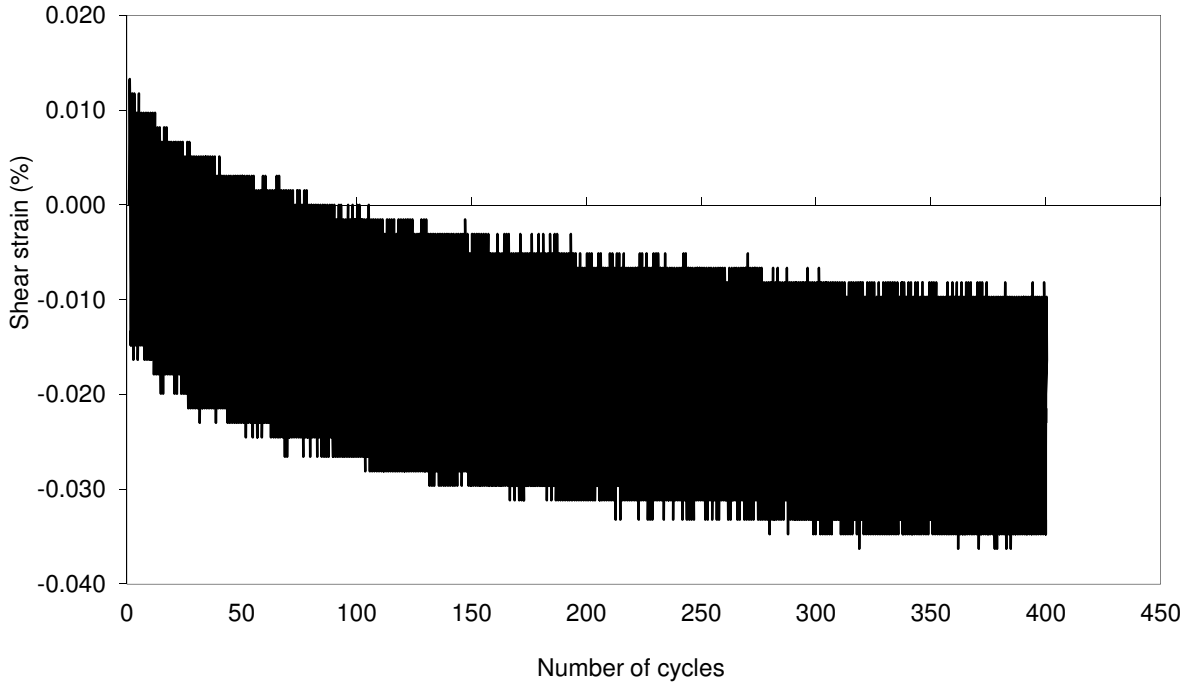

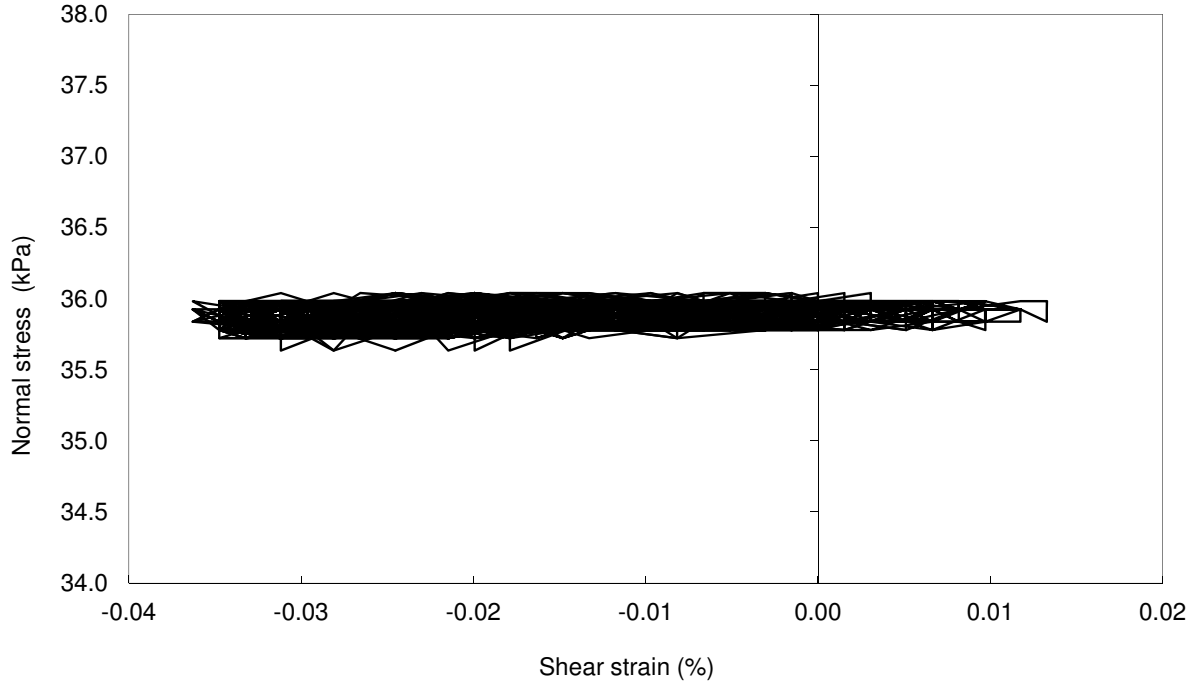

Drained cyclic Pre-shear #1

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Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

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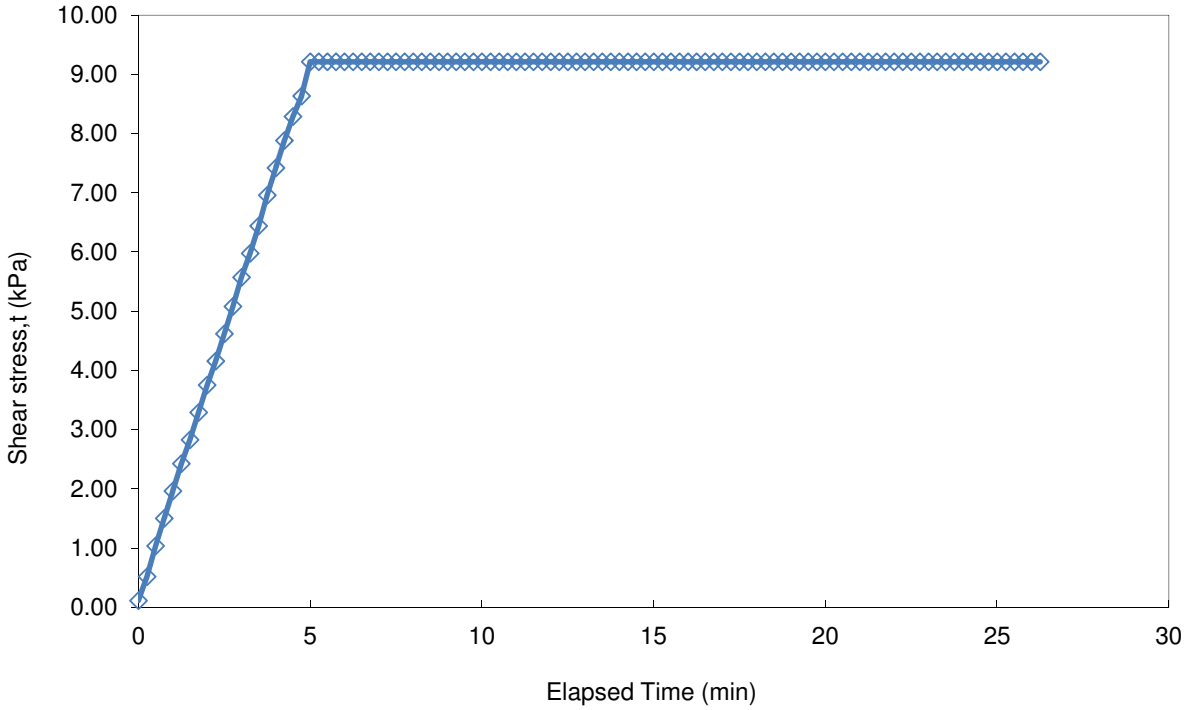
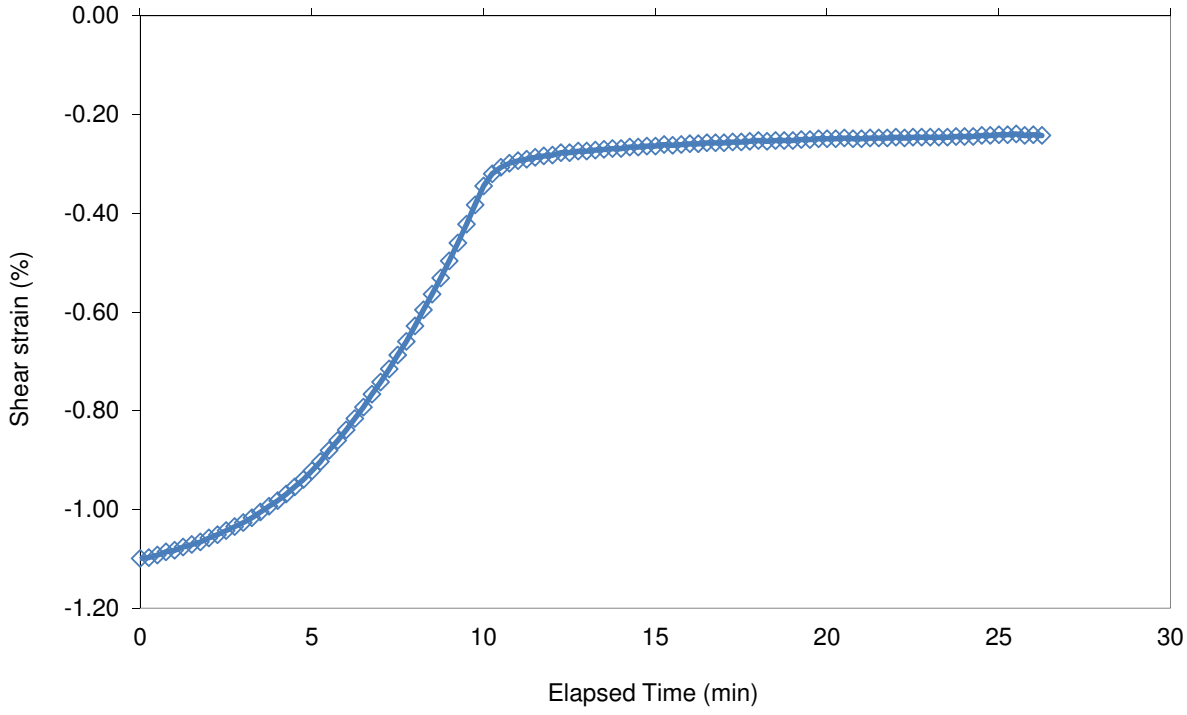
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)





Drained loading to average shear stress #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)

END OF DRAINED CYCLIC PRE-SHEARING STAGE #1

Height :	19.6	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	35.9	kPa
Shear stress:	0.1	kPa
Duration:	#N/A	Min.

END OF DRAINED LOADING TO AVERAGE SHEAR STRESS #2 (PRIOR TO CYCLIC SHEAR #2)

Height :	19.6	mm
Diameter :	66.4	mm
Normal stress:	35.92	kPa
Shear stress :	9.2	kPa
Duration	575	Min.

UNDRAINED CYCLIC SHEAR STAGE

Average shear stress:	9.10	(kPa)
Cyclic shear stress (+/-):	10.9	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	15	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.465	-0.629	19.2	-1.2	24.7	2.0
5	4.087	-2.795	19.4	-1.6	42.1	18.5
10	9.396	-3.986	19.2	-1.2	42.0	19.2
15	17.754	-3.159	19.5	0.3	42.0	20.5
18	23.594	-0.603	19.5	0.3	42.1	20.6
20	26.131	0.717	19.4	0.3	42.1	20.4
21	27.107	0.714	19.5	0.5	42.0	20.8
22	28.510	1.625	19.5	0.5	42.1	21.2
23	28.394	1.778	19.6	0.7	42.1	20.0
24	33.327	1.632	18.5	0.6	42.1	20.5

Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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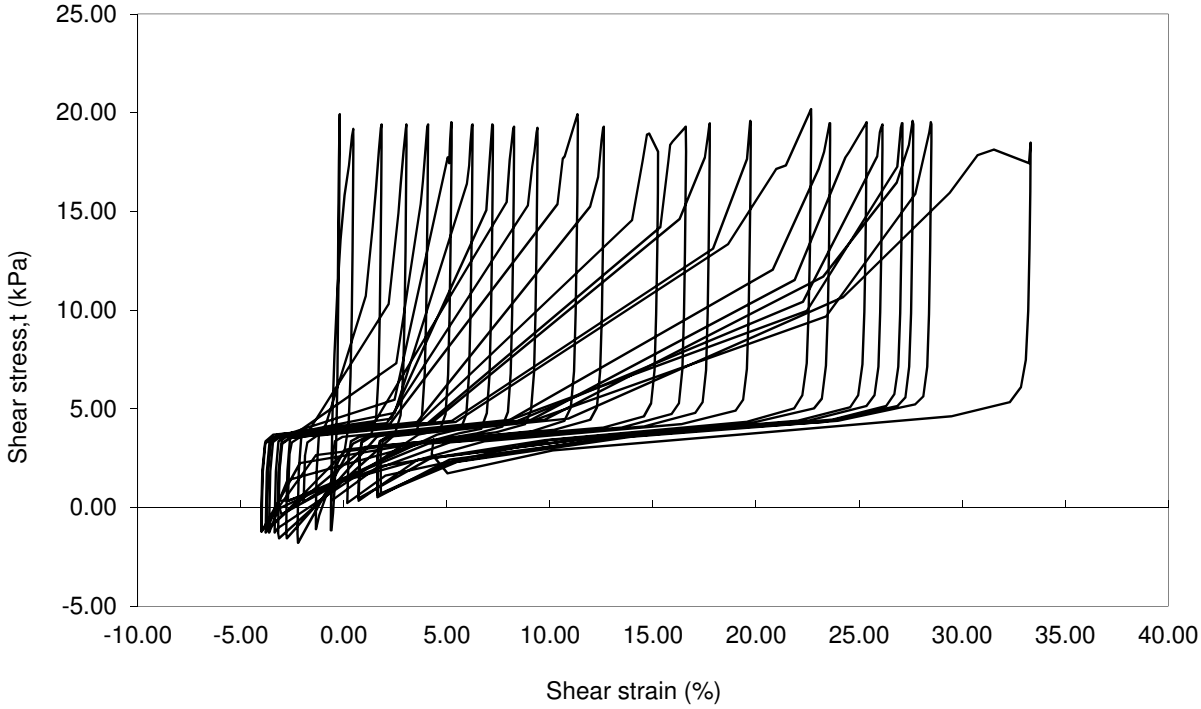
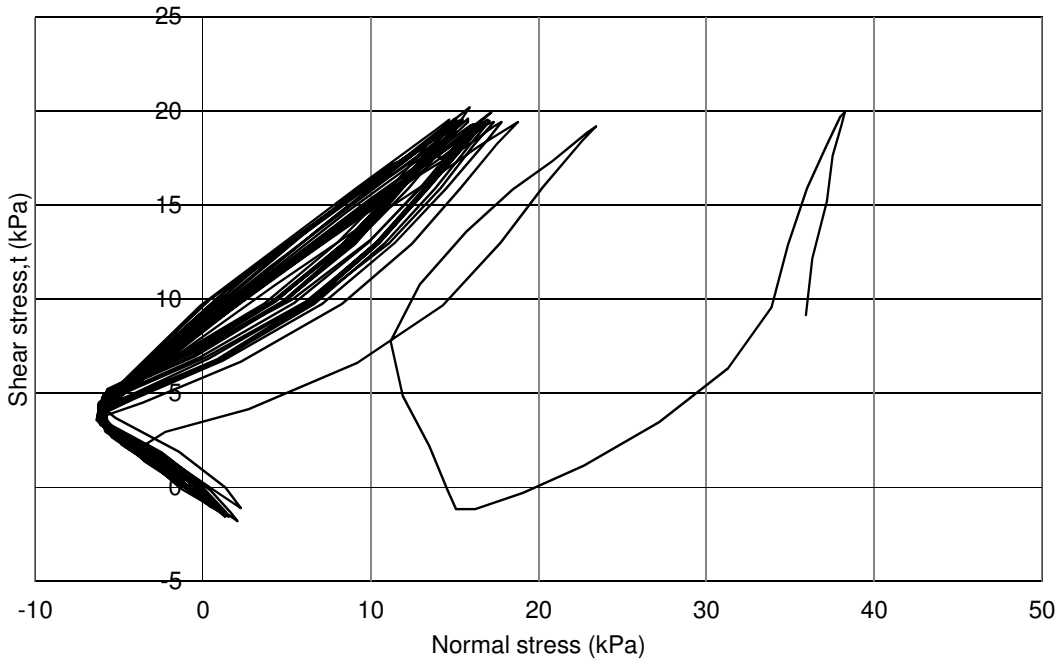
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)





Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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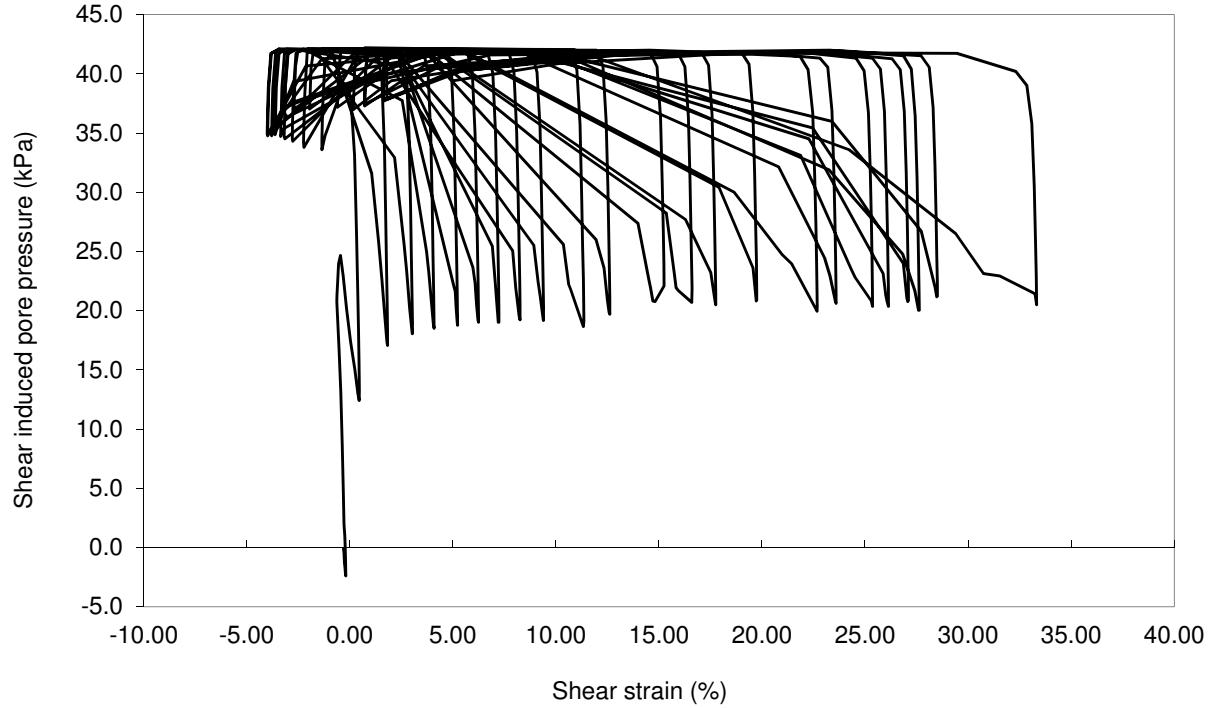
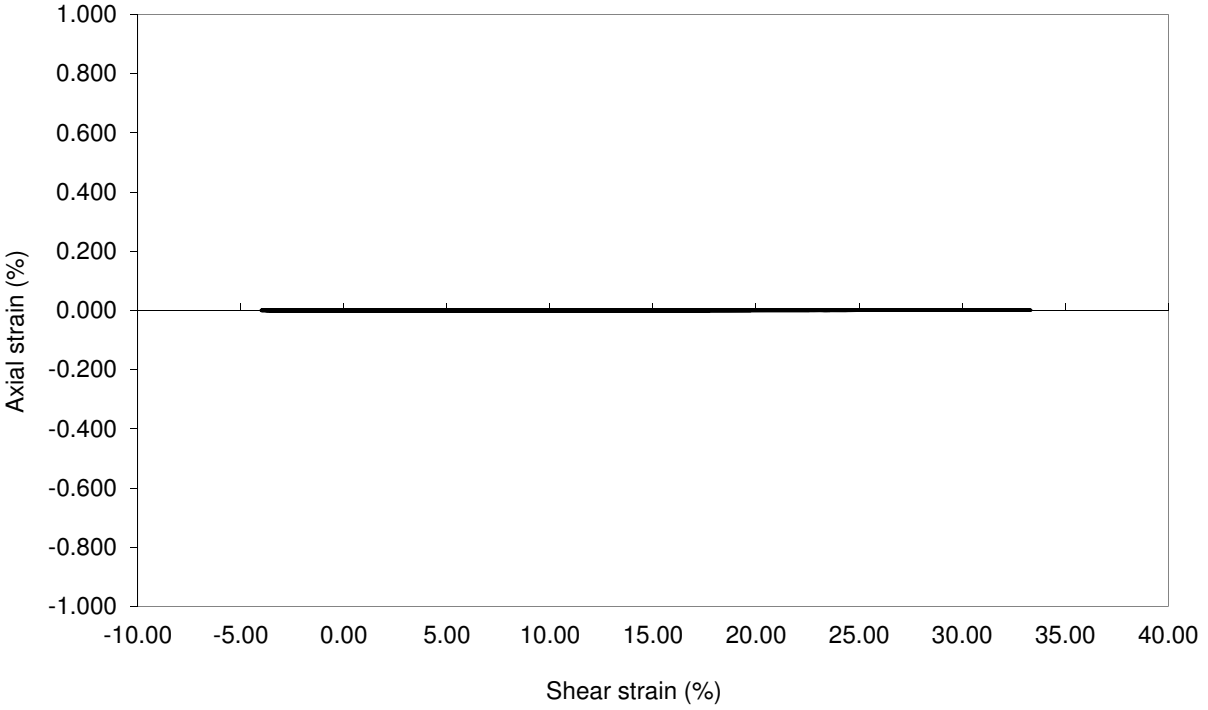
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)





Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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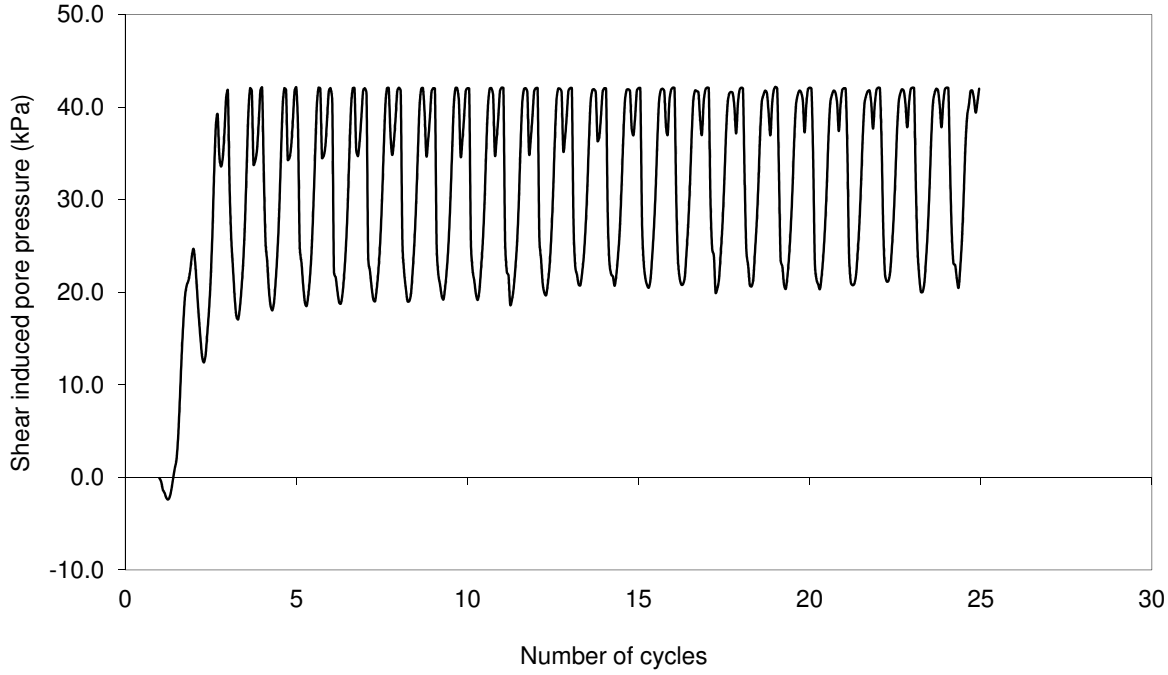

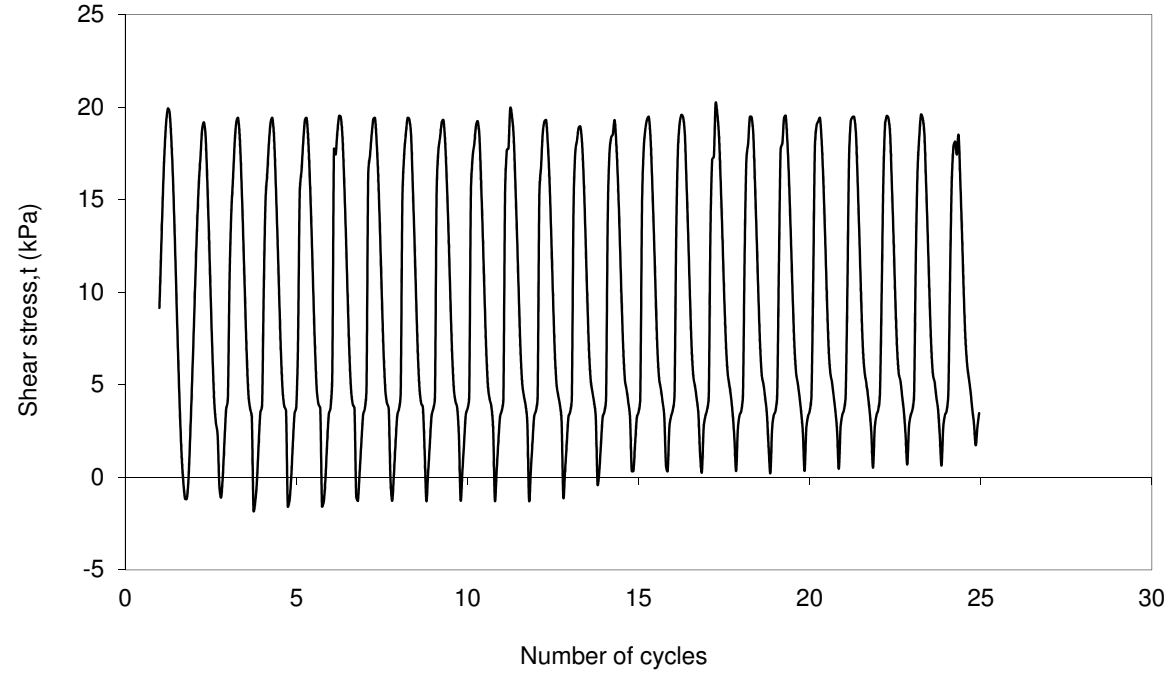

Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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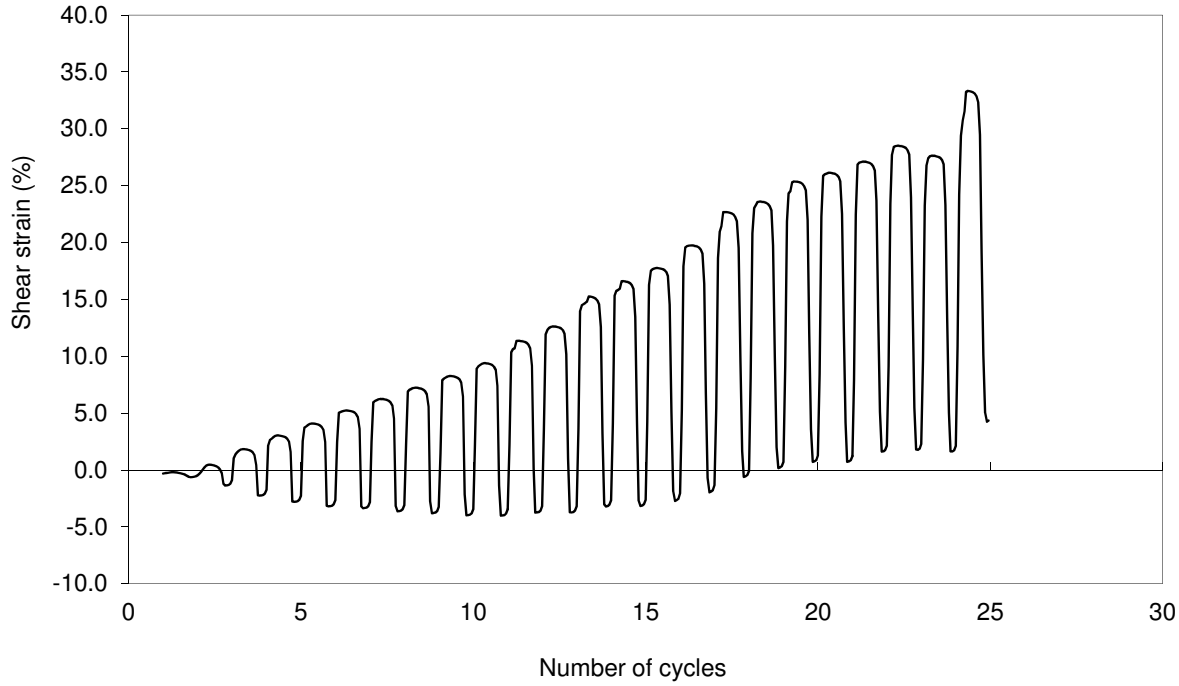
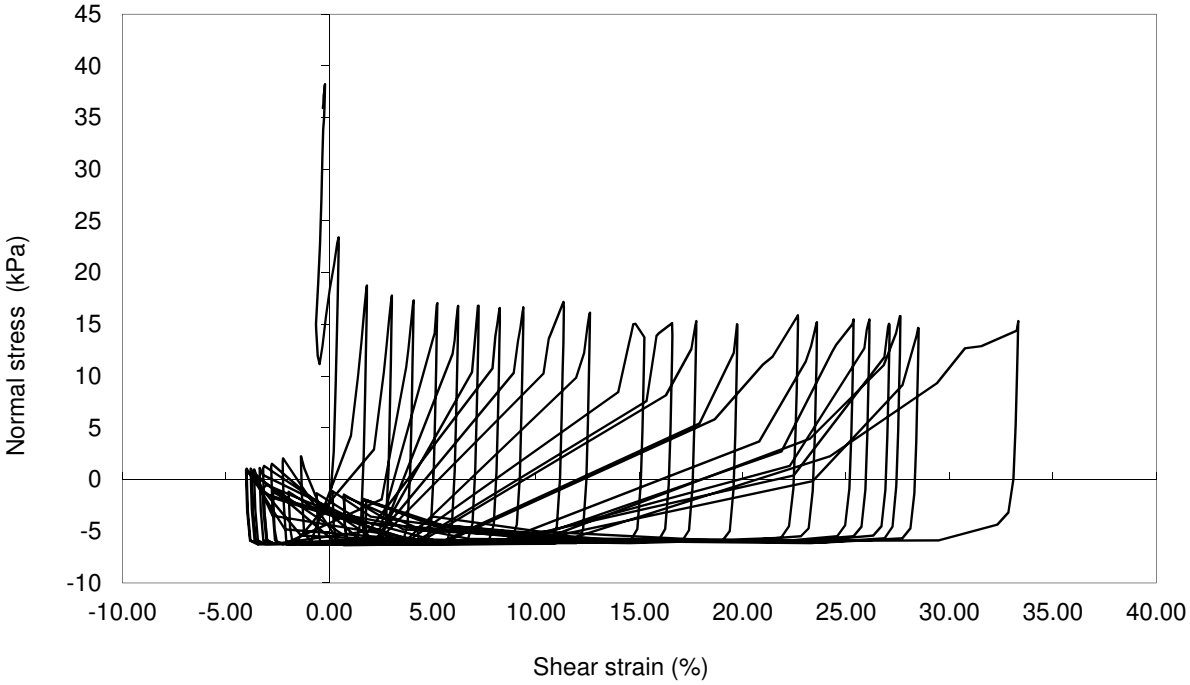
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#2)





Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	D14	Description (visual) :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	18.54	%	15.46	%	
Bulk density :	1.66	Mg/m^3			
Dry density :	1.40	Mg/m^3			
Particle density (assumed)	2.66	Mg/m^3			
Initial voids ratio (e_o)	0.9001				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.58	% (for stage)
Normal stress:	36.0	kPa
Voids ratio (e_o):	0.8892	
Max. Consolidation stress:	36.0	kPa
Max. Consolidation strain:	0.58	% (for stage)
Duration:	794	Min.

PRIOR TO CYCLIC DRAINED PRE-CONDITIONING		
Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	36.0	kPa
Voids ratio (e_o):	0.8892	
Max. Consolidation stress:	36.0	kPa
Max. Consolidation strain:	0.00	% (for stage)
Duration	0	Min.

CYCLIC DRAINED PRE-CONDITIONING STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	1.44	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	400	(sinusoidal wave form)
Failure:	NA	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.012	-0.013	1.4	-1.4	0.3	0.0
5	0.010	-0.015	1.4	-1.4	0.2	0.0
10	0.008	-0.015	1.6	-1.4	0.2	0.0
50	0.007	-0.018	1.5	-1.4	0.1	0.1
100	0.004	-0.021	1.5	-1.4	0.2	0.1
400	-0.007	-0.032	1.4	-1.4	0.2	0.0

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC**	Russell Geotechnical Innovations
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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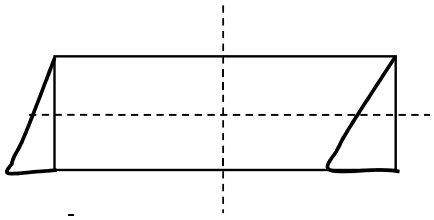
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

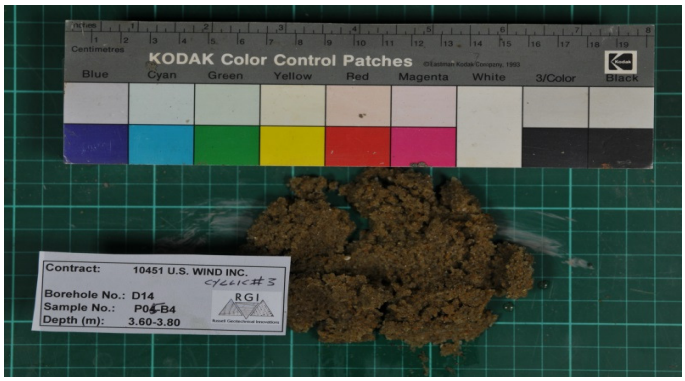
Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved		Project Number:	**RGI/1130**
Initials:	CSR	Project Name:	**10451 U.S. WIND INC**
Date:	14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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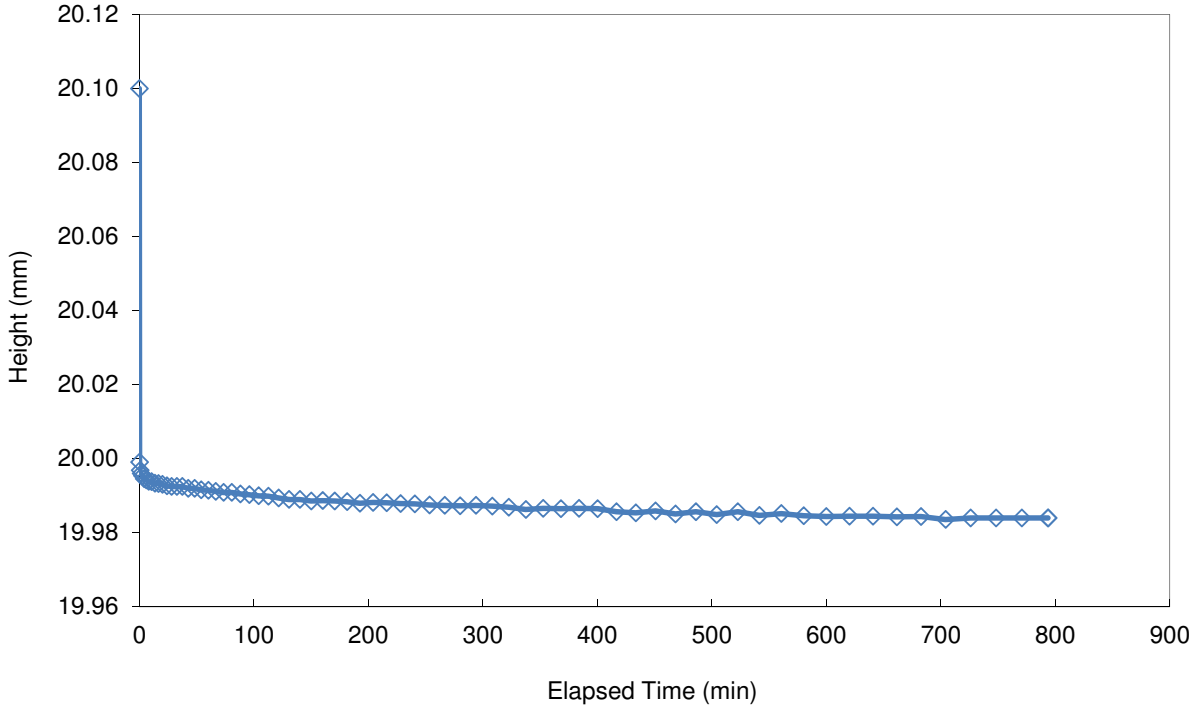

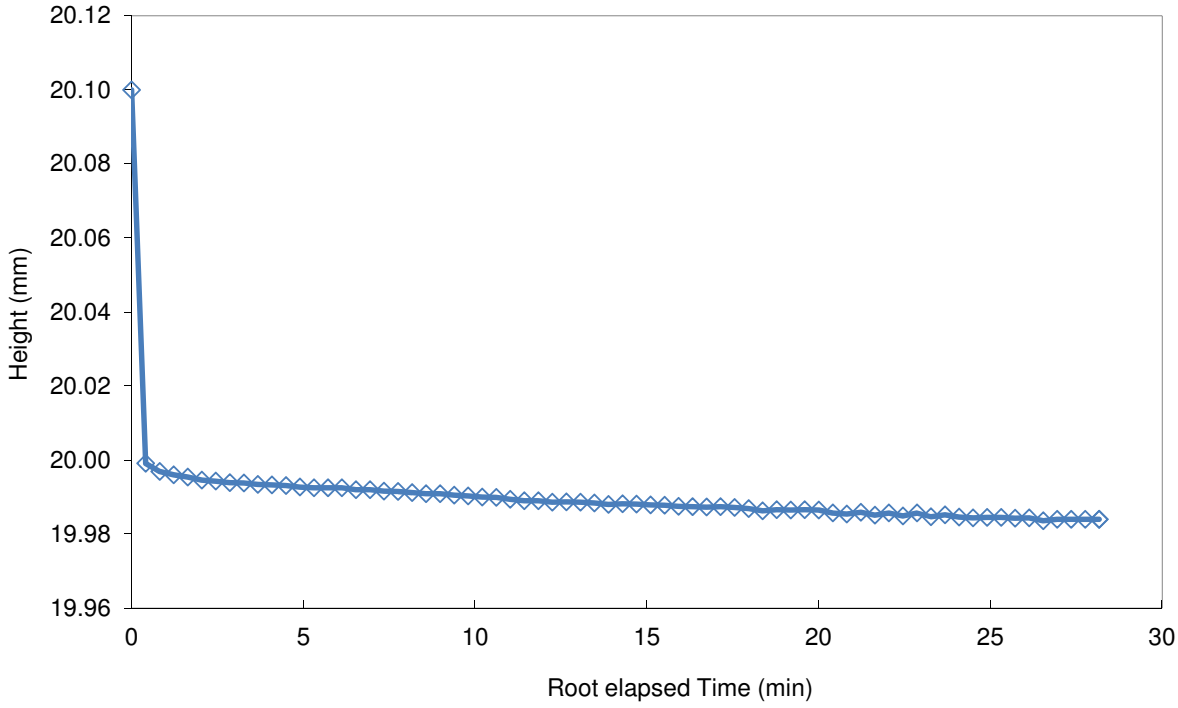

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

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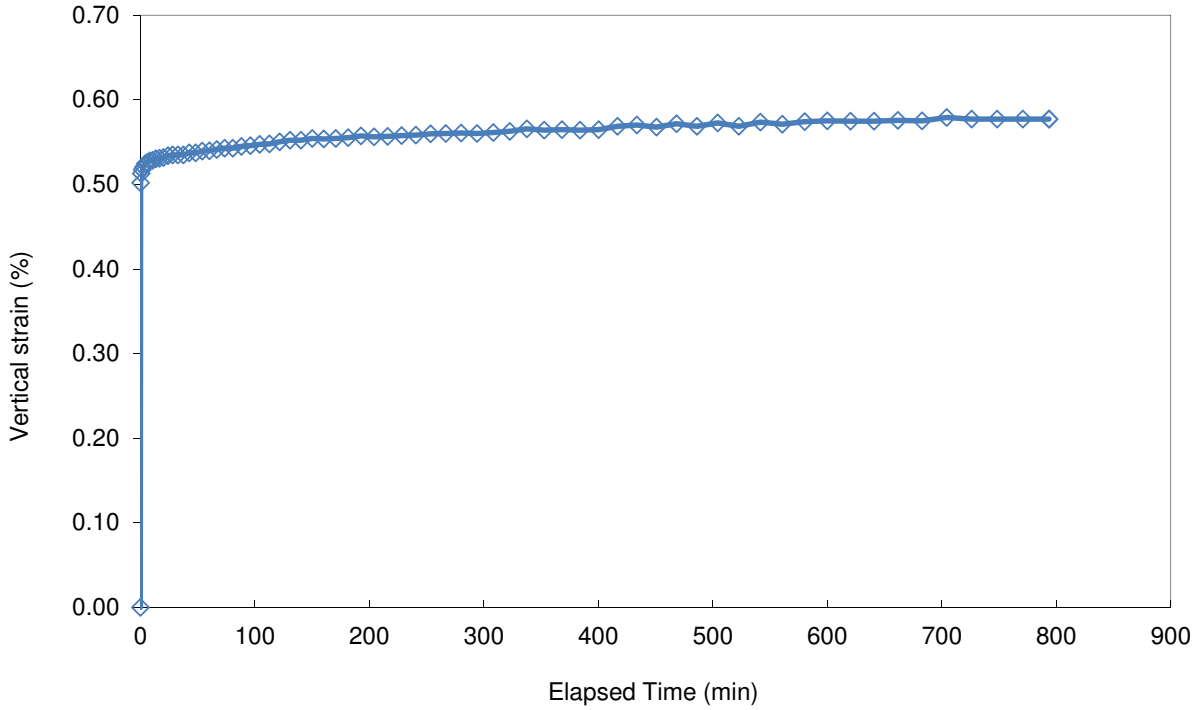

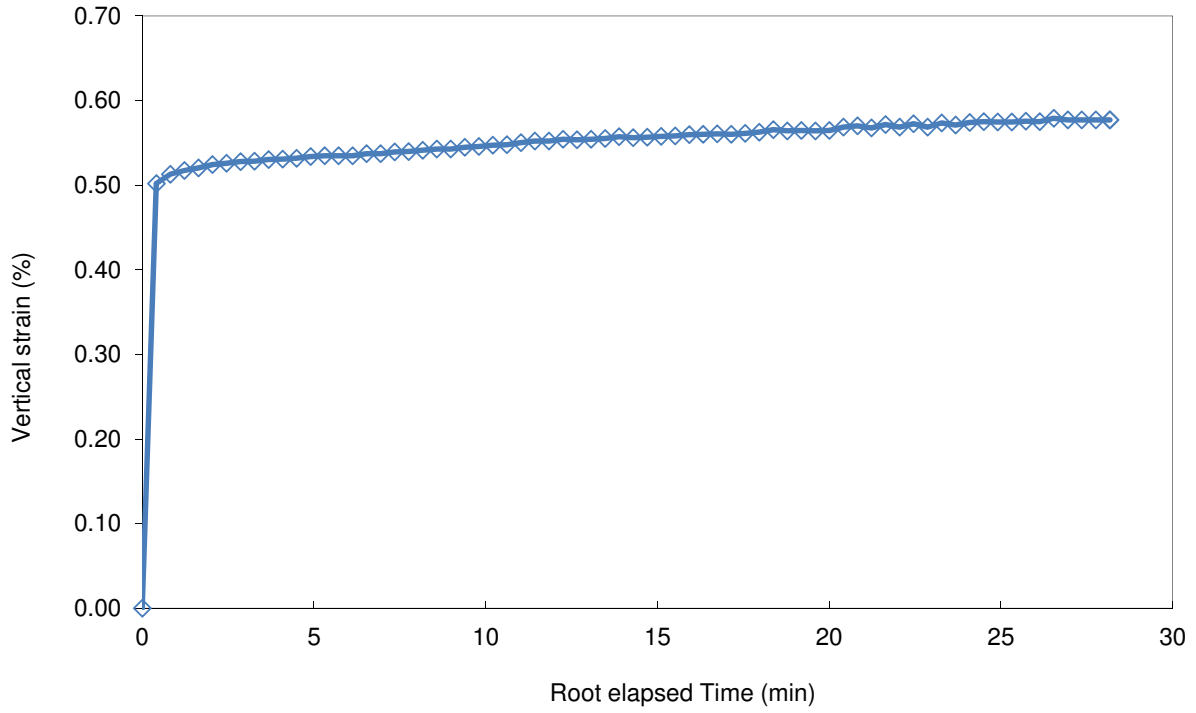

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
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(Cohesive Soils)- In general accordance with ASTM D6528-07

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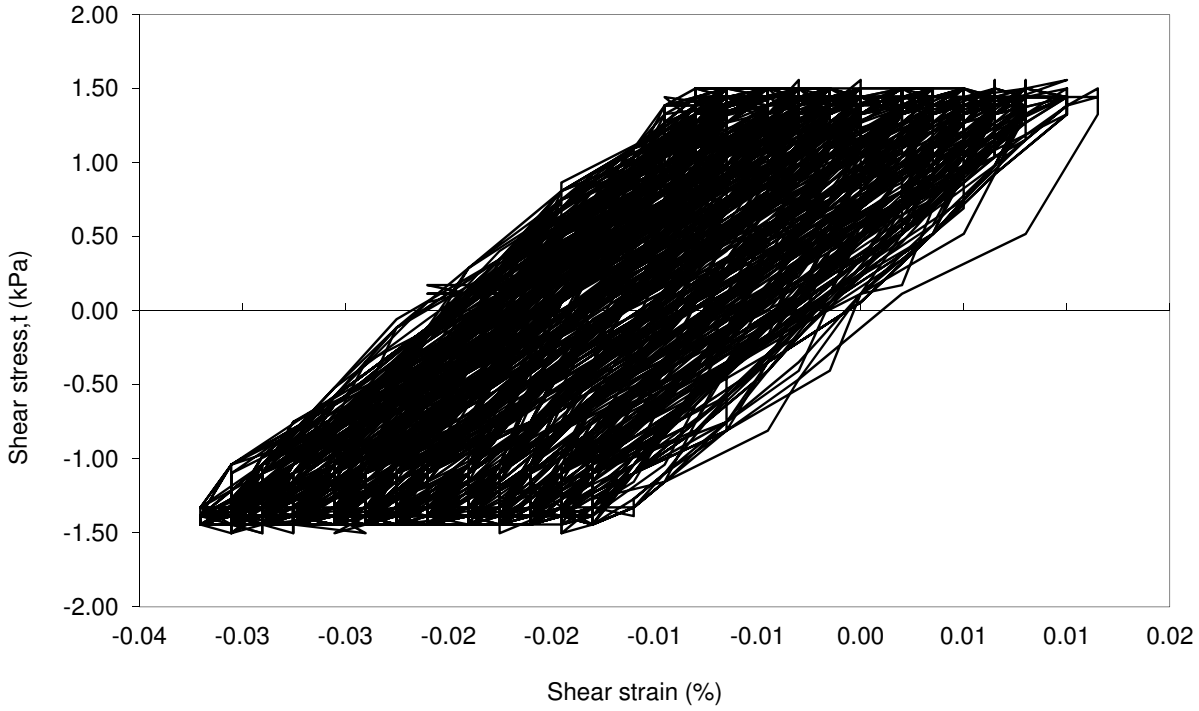

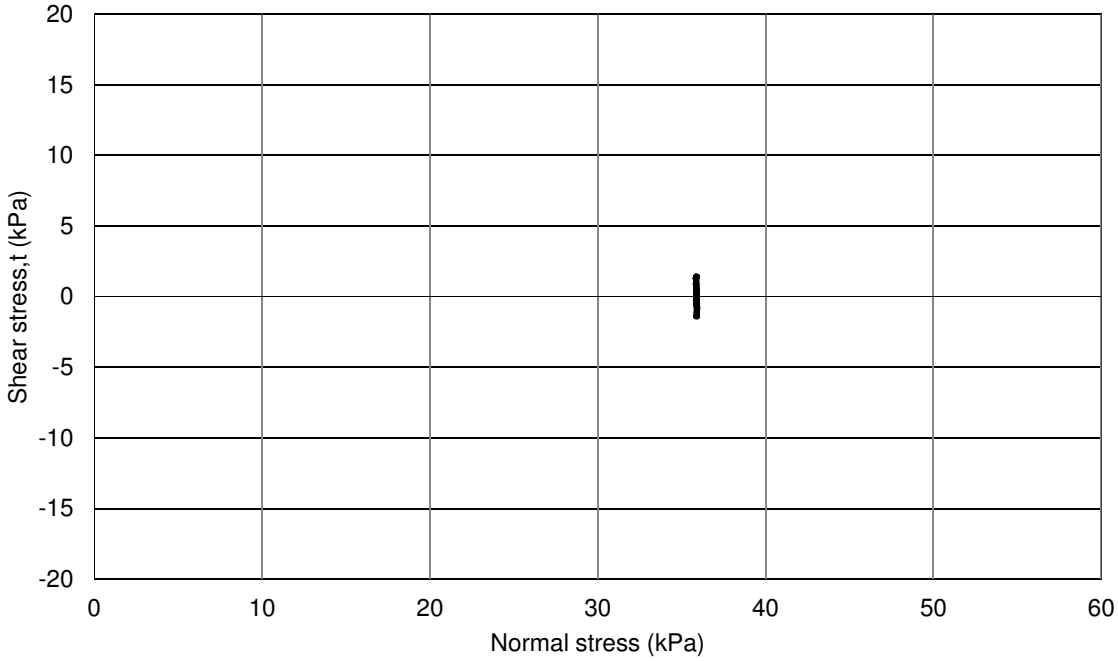

Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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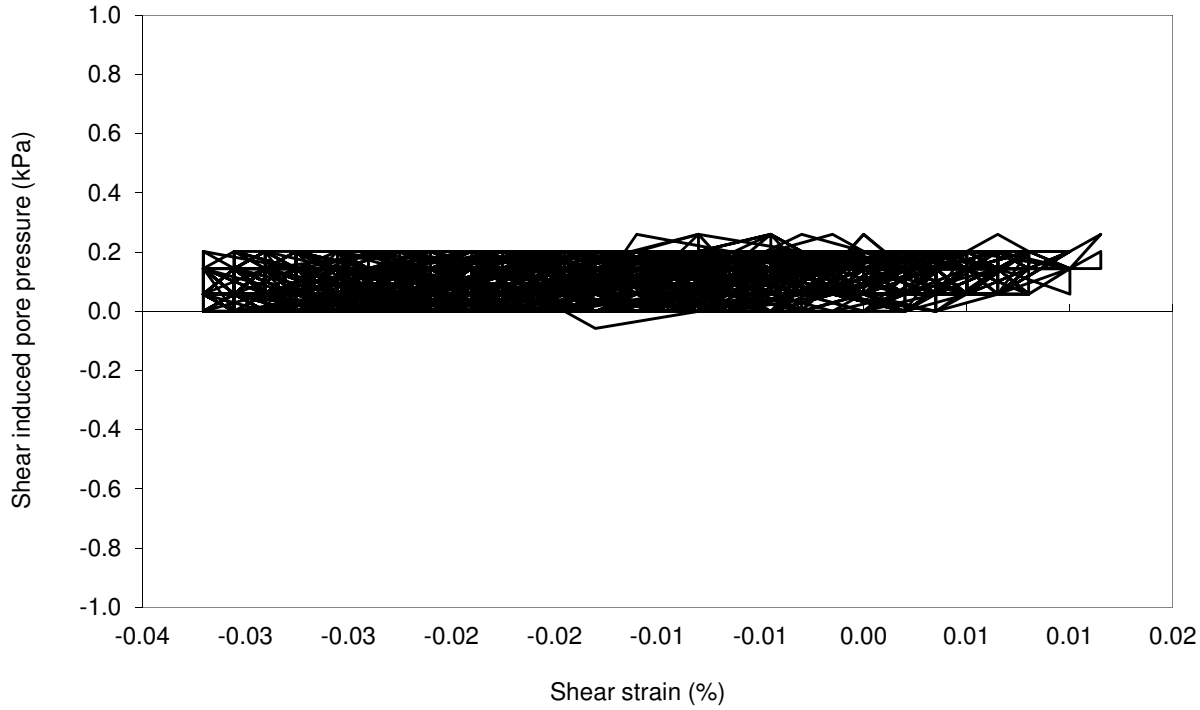
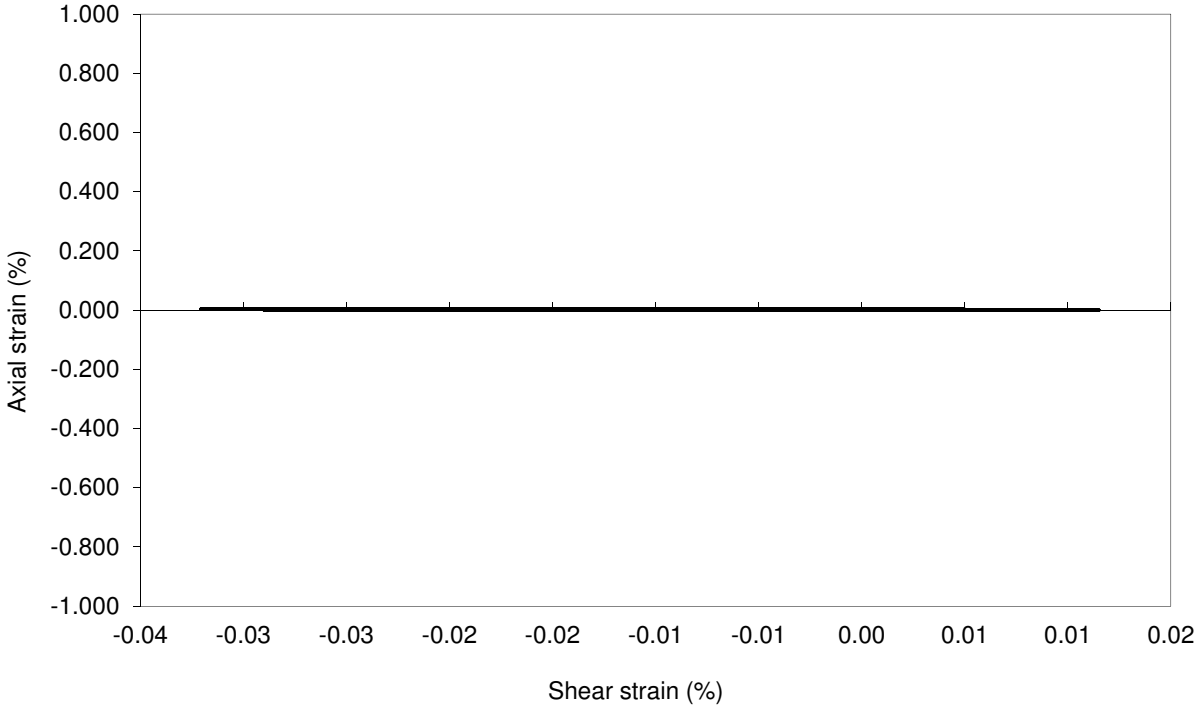
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)



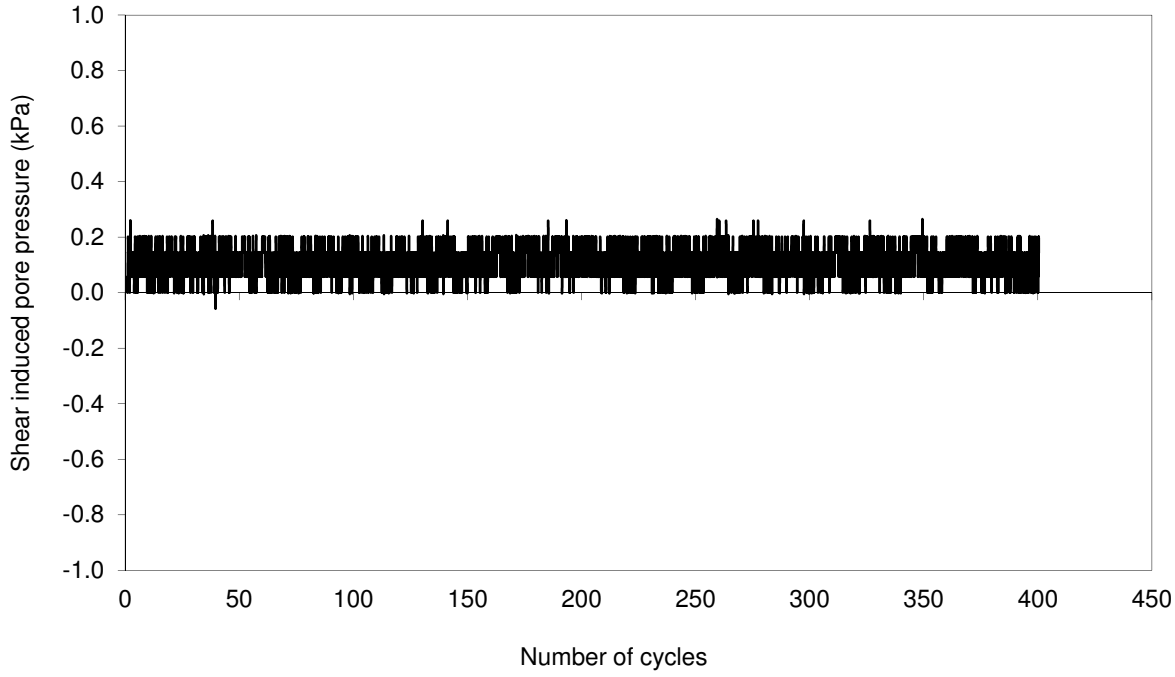


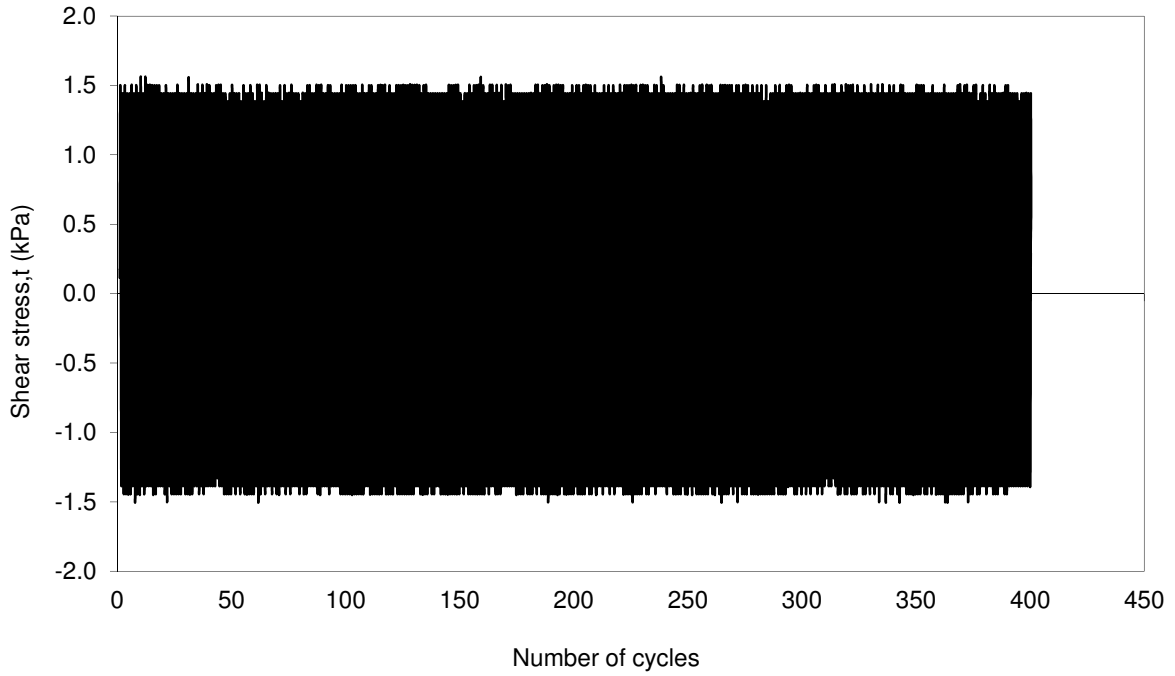
Drained cyclic Pre-shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 14/02/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)





Drained cyclic Pre-shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
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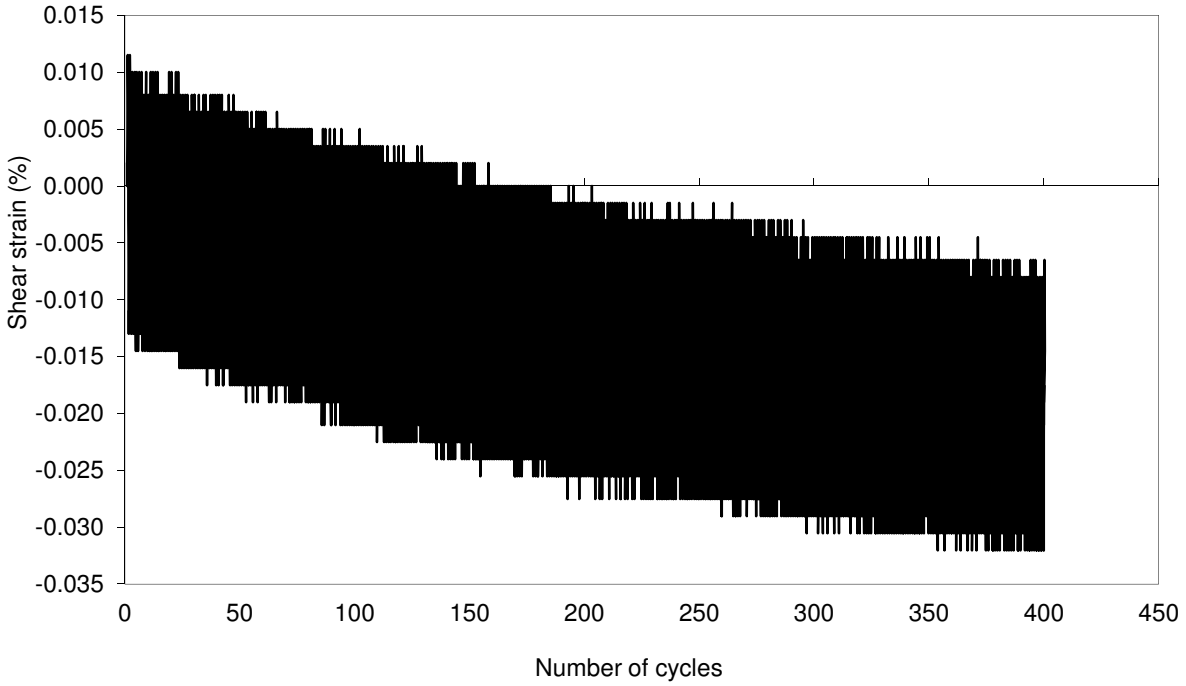

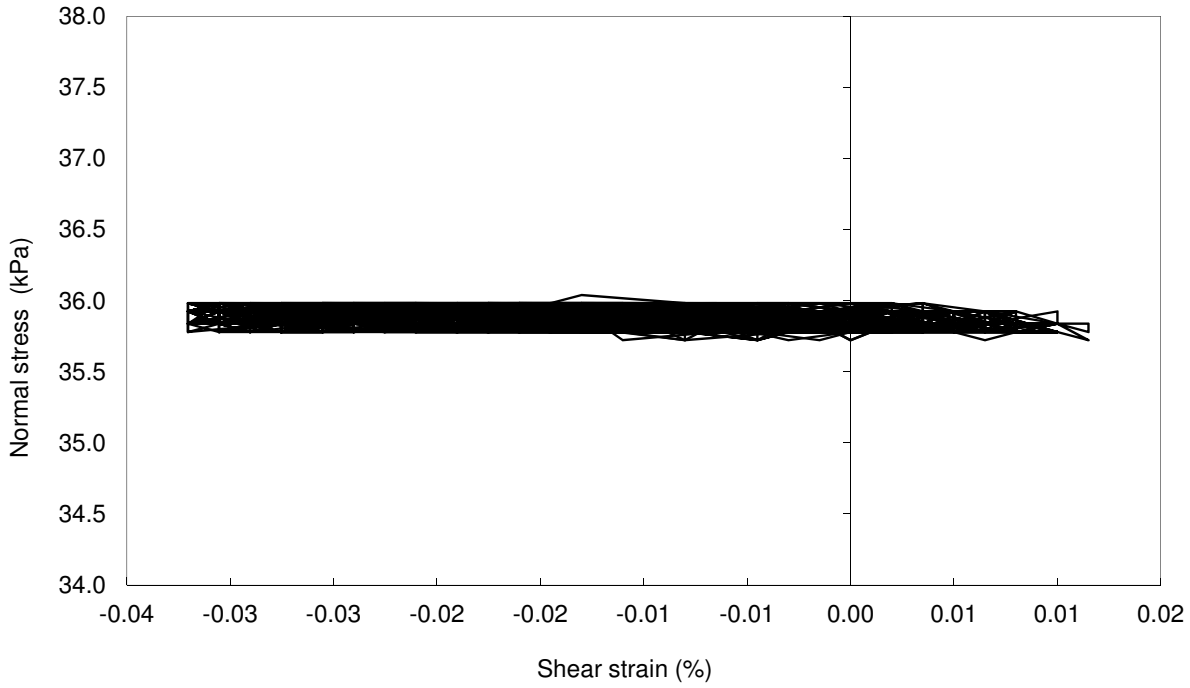

Drained cyclic Pre-shear #1

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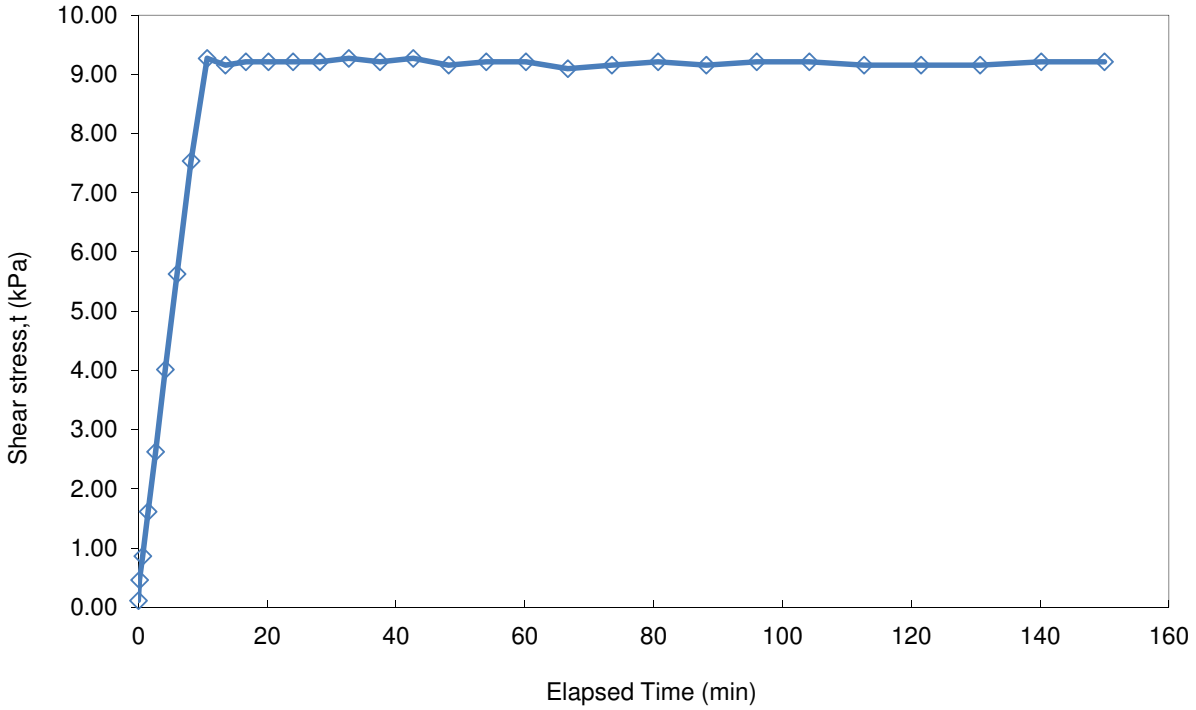

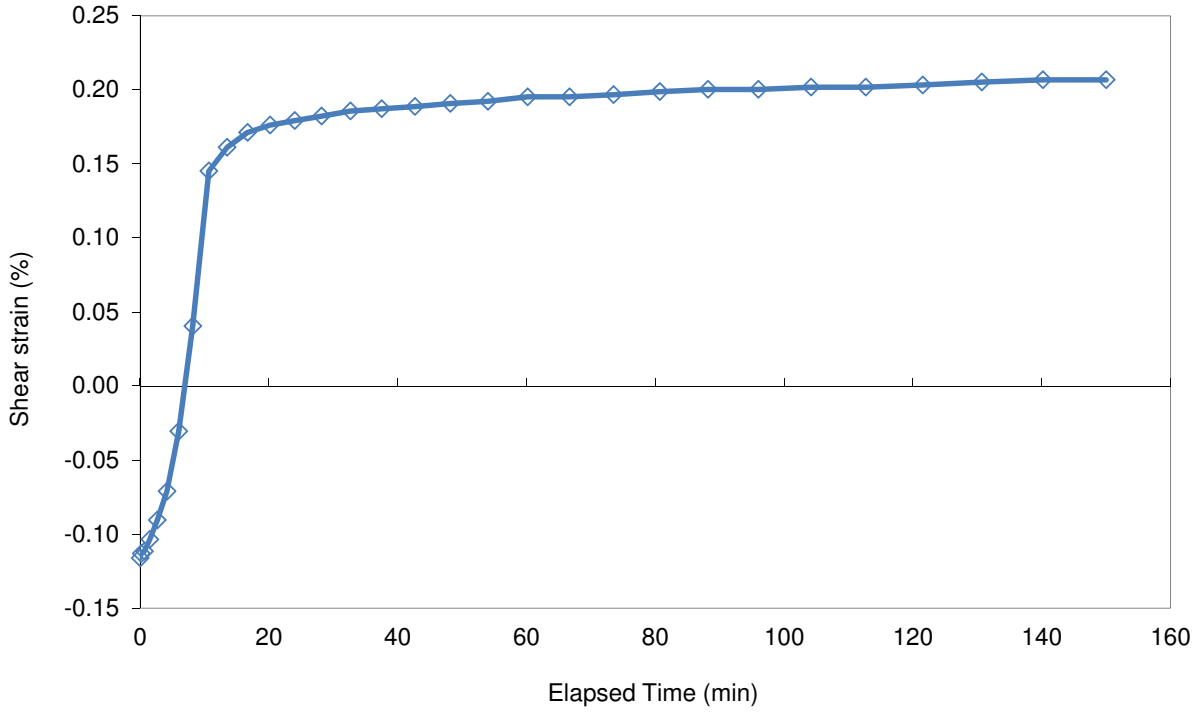

Drained loading to average shear stress #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)

END OF DRAINED CYCLIC PRE-SHEARING STAGE #1

Height :	20.0	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	35.9	kPa
Shear stress:	0.1	kPa
Duration:	155	Min.

END OF DRAINED LOADING TO AVERAGE SHEAR STRESS #2 (PRIOR TO CYCLIC SHEAR #2)

Height :	20.0	mm
Diameter :	66.4	mm
Normal stress:	35.92	kPa
Shear stress :	9.1	kPa
Duration	900	Min.

UNDRAINED CYCLIC SHEAR STAGE

Average shear stress:	9.10	(kPa)
Cyclic shear stress (+/-):	6.9	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	150	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	2.843	2.124	15.7	2.0	33.2	14.2
5	3.812	3.300	15.8	2.1	34.9	15.7
10	4.882	4.458	16.0	2.0	35.6	16.9
20	6.382	6.017	16.1	2.0	35.8	17.8
50	9.389	9.069	16.2	2.1	35.8	19.1
100	12.694	12.401	16.2	2.1	36.1	20.0
120	13.786	13.499	16.2	2.1	36.0	20.2
140	14.834	14.548	16.2	2.1	36.1	20.6
150	15.333	15.047	16.2	2.1	36.2	20.6
155	15.583	15.296	16.2	2.1	36.2	20.8

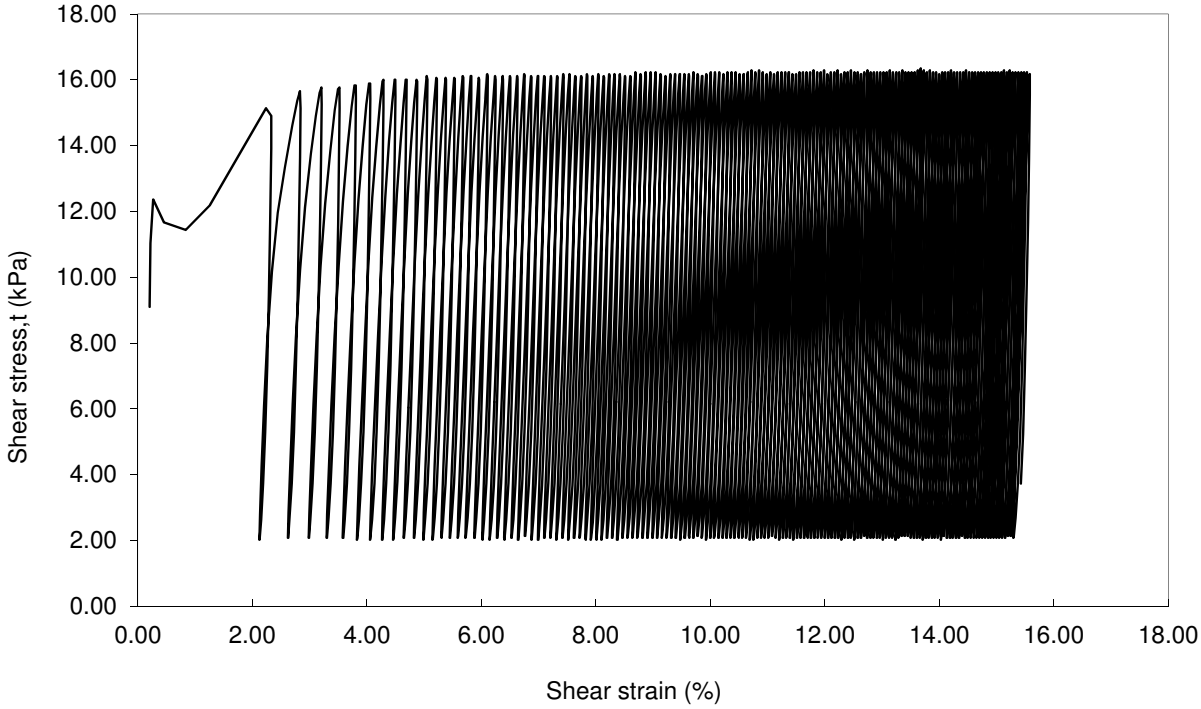
Cyclic simple shear #2

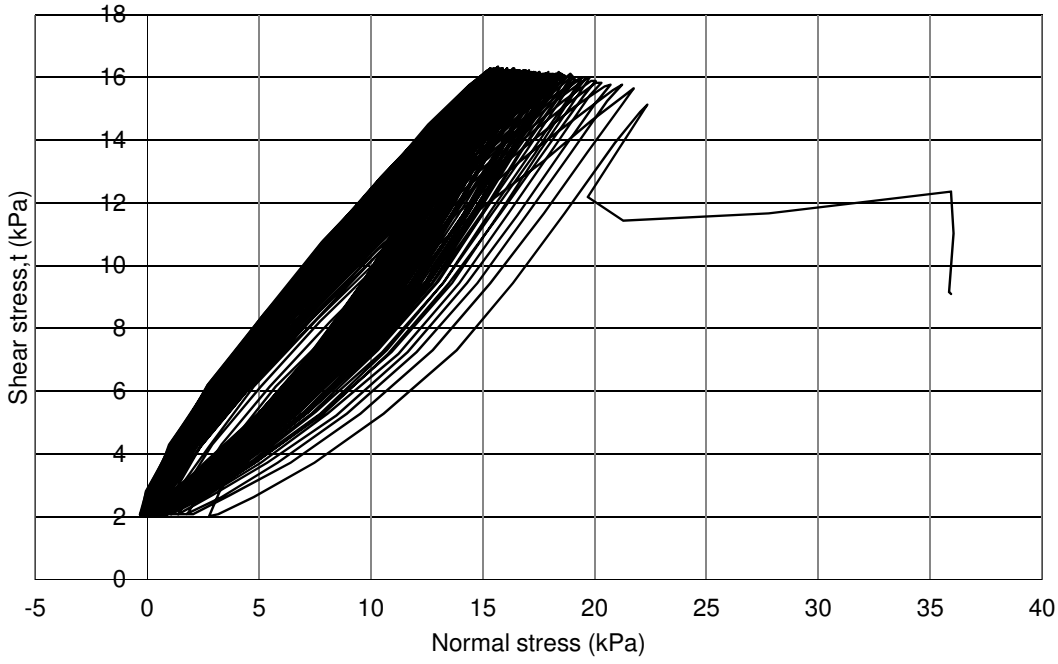
Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)





Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
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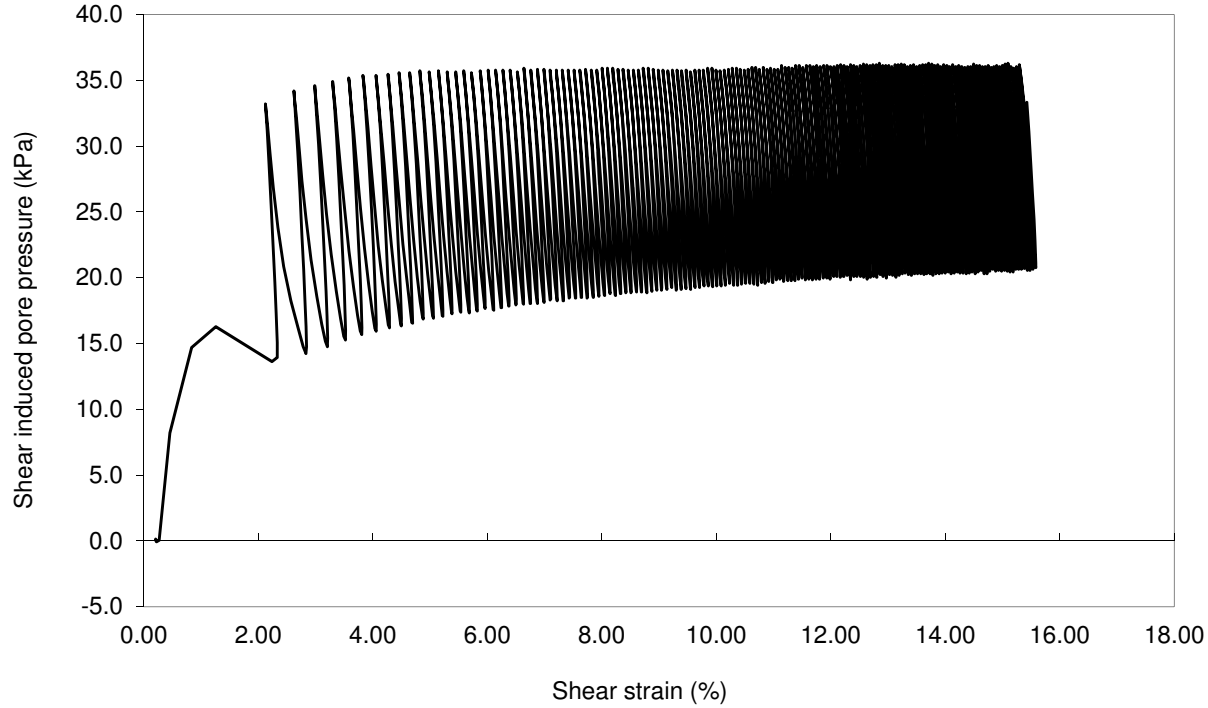

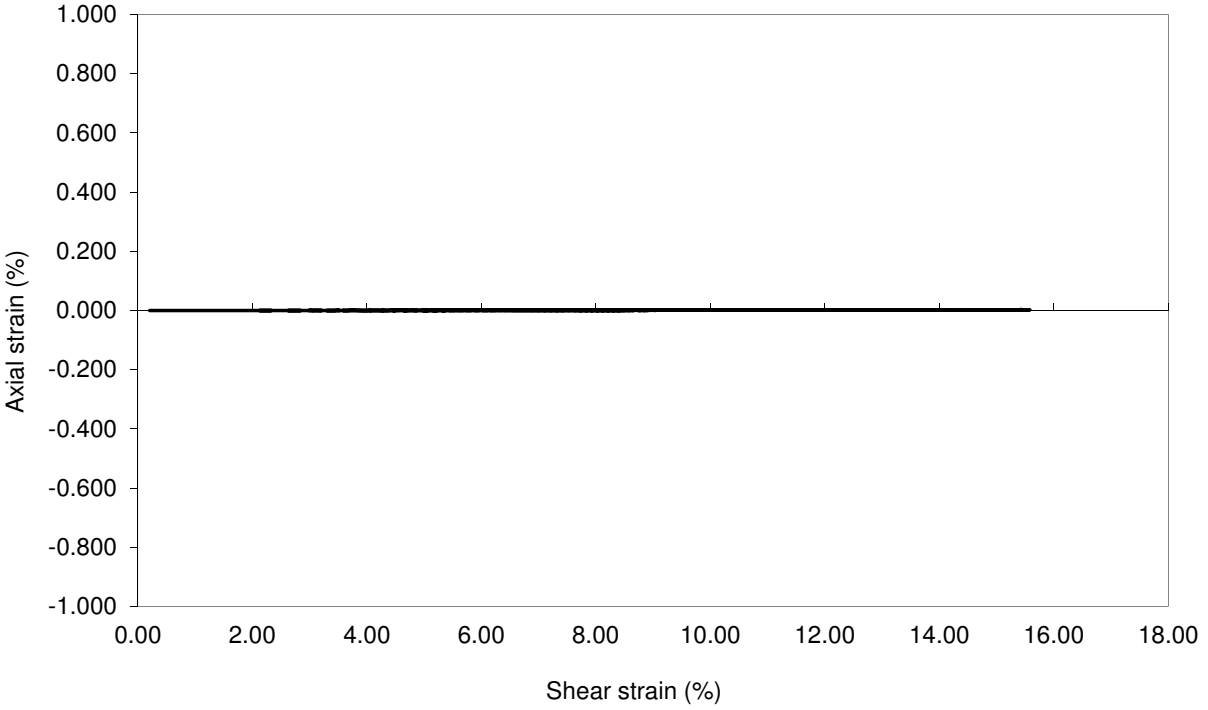

Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

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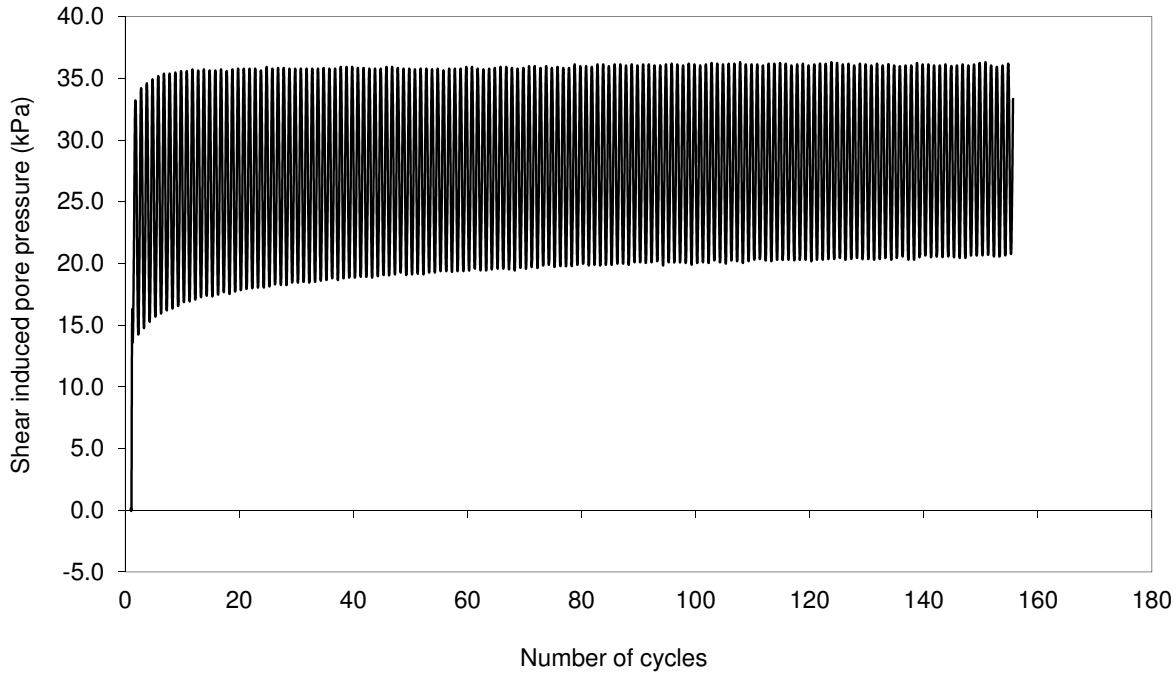

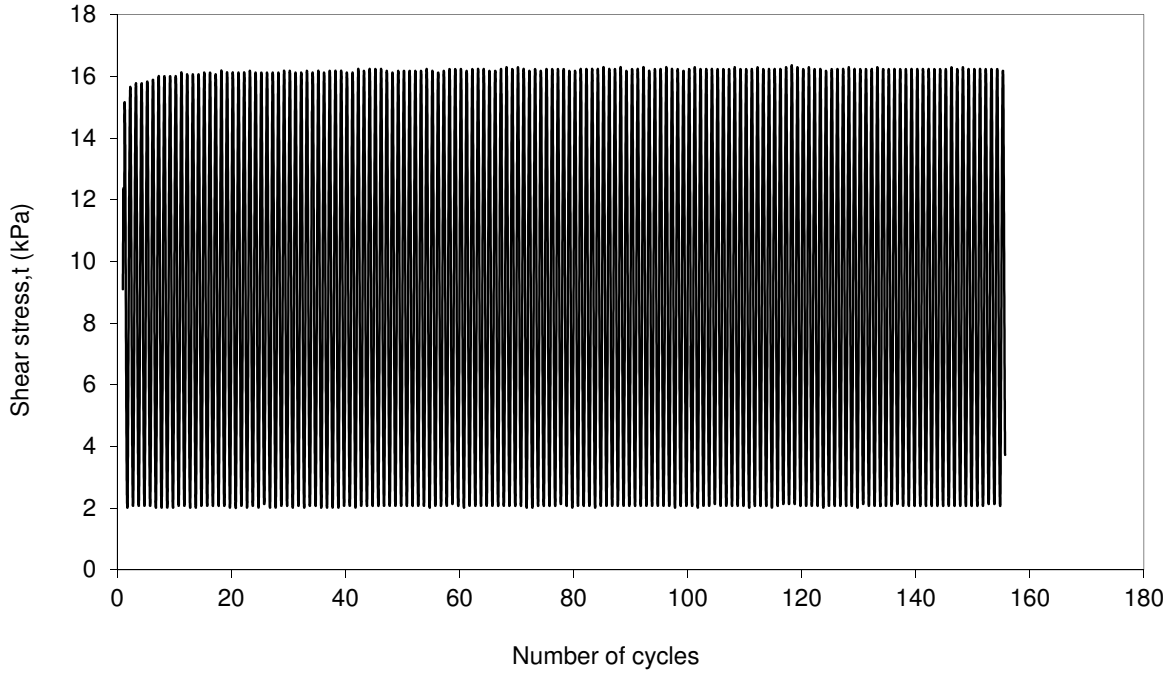

Cyclic simple shear #2

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC**
Date: 14/02/2016		

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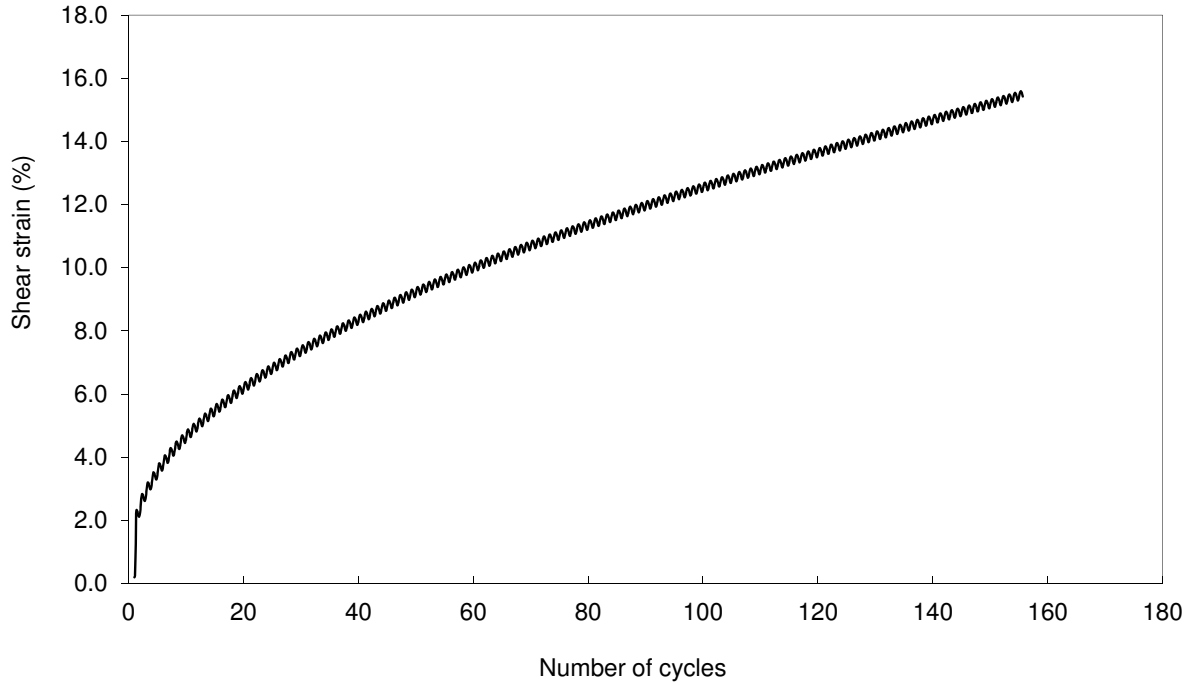
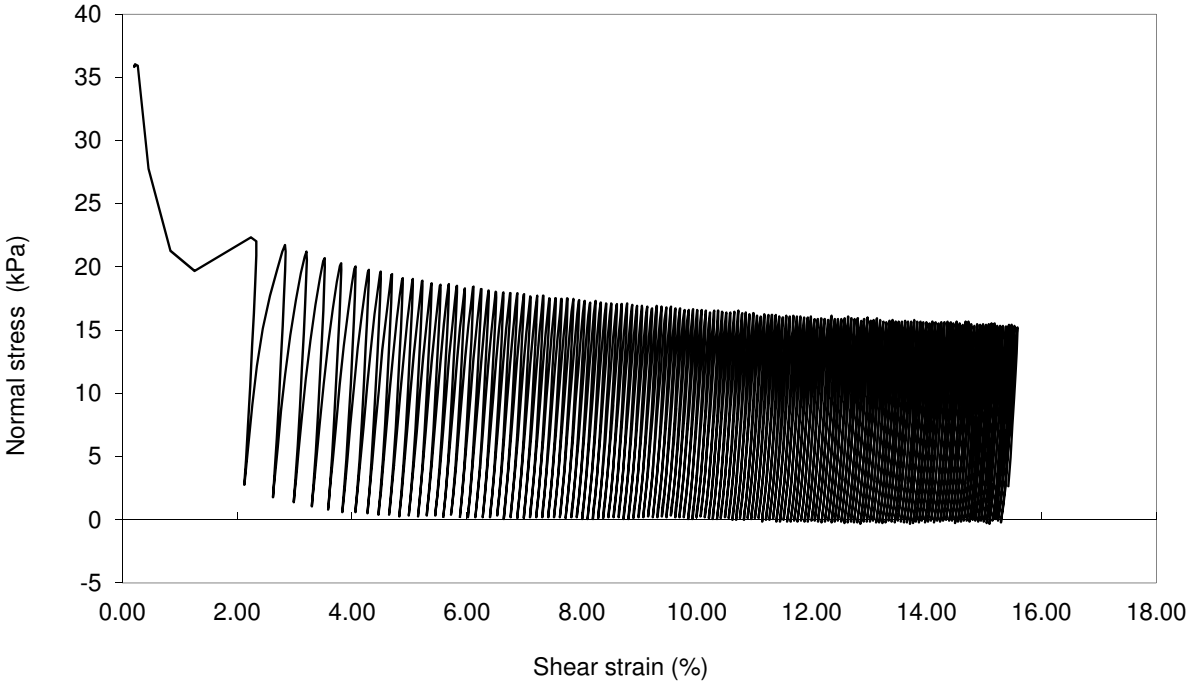
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	D14	Description :
Sample Number:	P05-B4	Buff brown fine/medium SAND with some fine gravel
Sample Depth (m):	3.60-3.80	and rare shell fragments (Cyclic#3)





Cyclic simple shear #2

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC**	
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	G7	Description (visual) :	
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with	
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#1)	

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.30	%	17.30	%	
Bulk density :	2.04	Mg/m^3			
Dry density :	1.70	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.5744				
Test Duration:			2 Days		

END OF CONSOLIDATION #1		
Height :	19.2	mm
Diameter :	66.4	mm
Axial strain:	4.54	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5029	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	4.54	% (for stage)
Duration:	662	Min.

PRIOR TO CYCLIC SHEAR		
Height :	19.2	mm
Diameter :	66.4	mm
Axial strain:	4.54	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5029	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	4.54	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	5.9	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	25	(exceeds 15% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	0.252	-0.420	5.8	-5.9	9.8	2.5
5	0.425	-23.785	5.7	-5.8	13.8	5.0
10	0.395	-5.324	5.7	-6.0	15.6	5.7
15	-0.578	-9.221	5.4	-6.0	15.8	5.3
20	-2.069	-13.024	5.1	-6.1	15.9	4.8
25	-4.346	-16.841	5.0	-6.0	16.1	5.7
28	-5.818	-19.069	5.1	-6.2	15.8	5.7
31	-7.127	-21.251	5.0	-6.2	15.7	5.4
32	-7.754	-22.150	4.9	-6.2	15.7	5.2
33	-8.065	-22.812	4.9	-5.9	15.7	5.8
34	-8.712	-23.617	4.9	-6.7	15.7	5.7

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 12/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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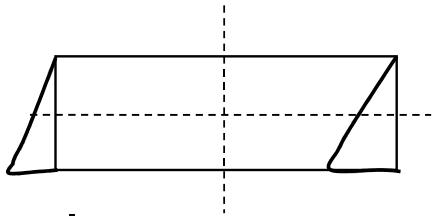
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#1)

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



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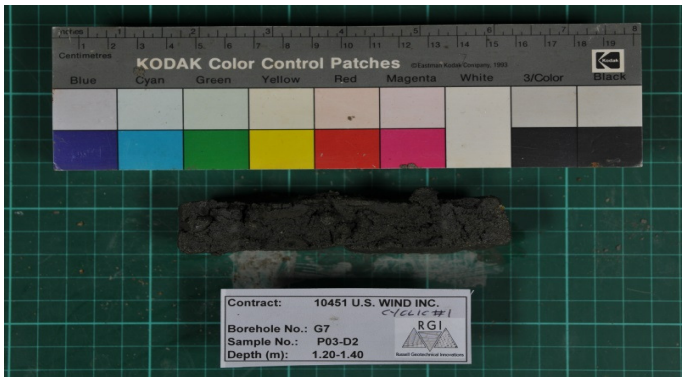

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

Russell Geotechnical Innovations

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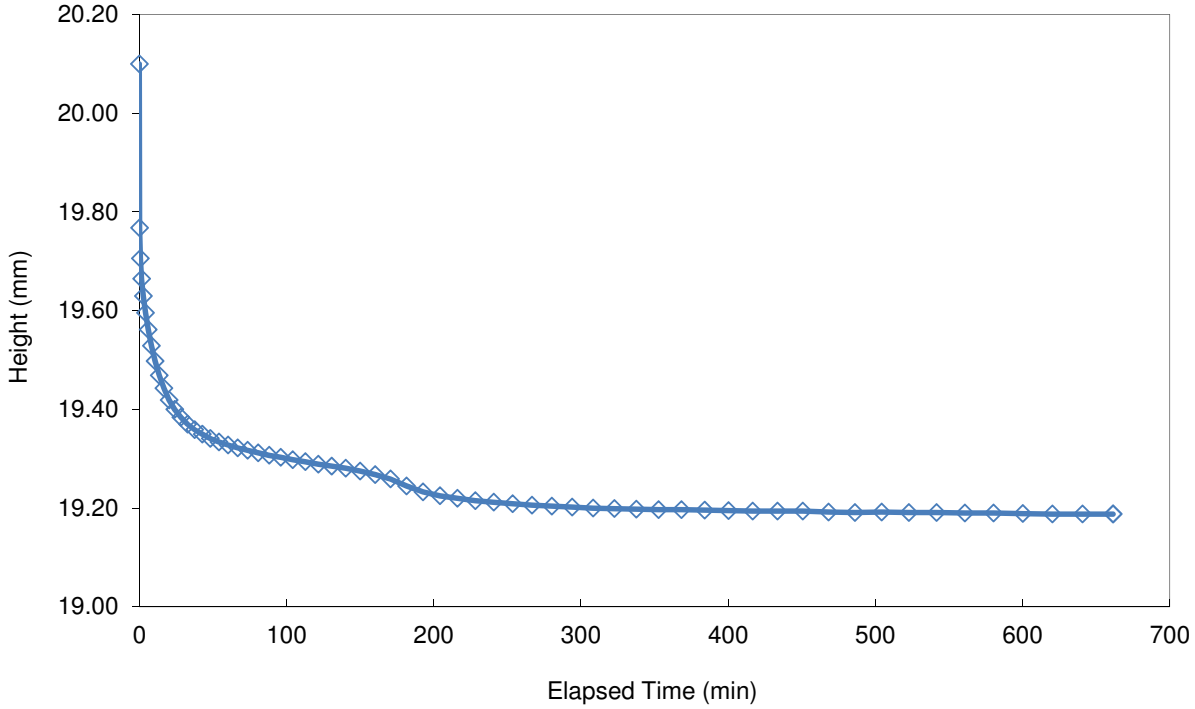

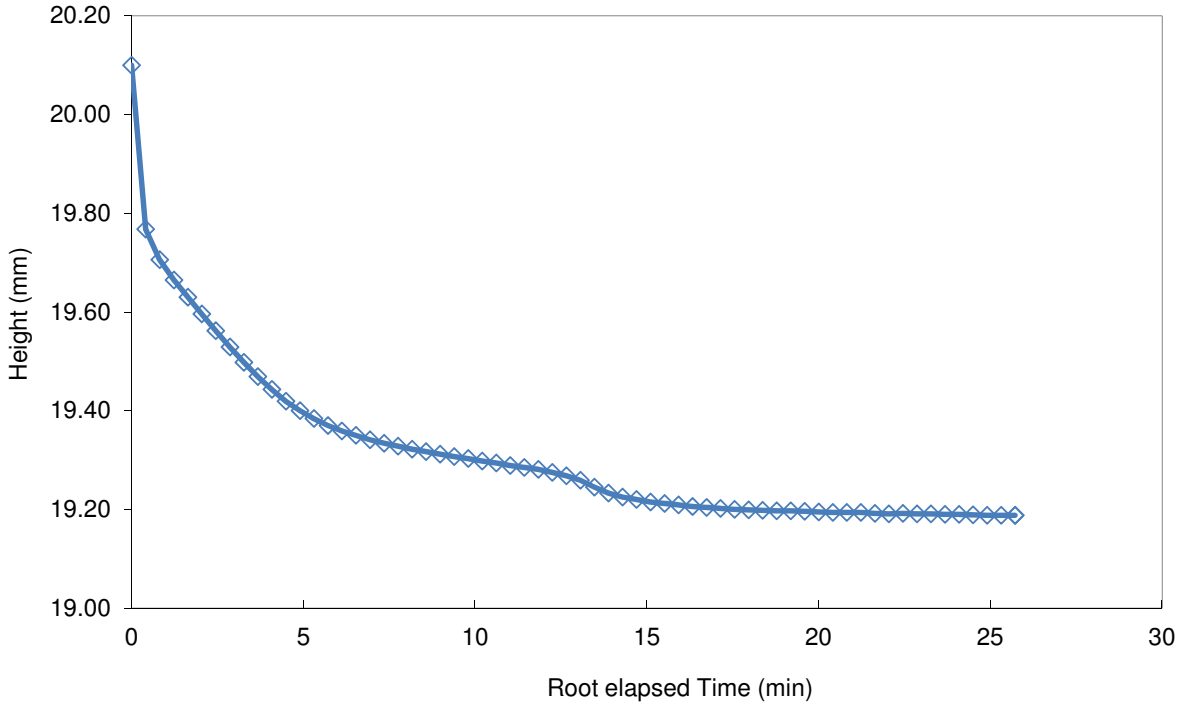

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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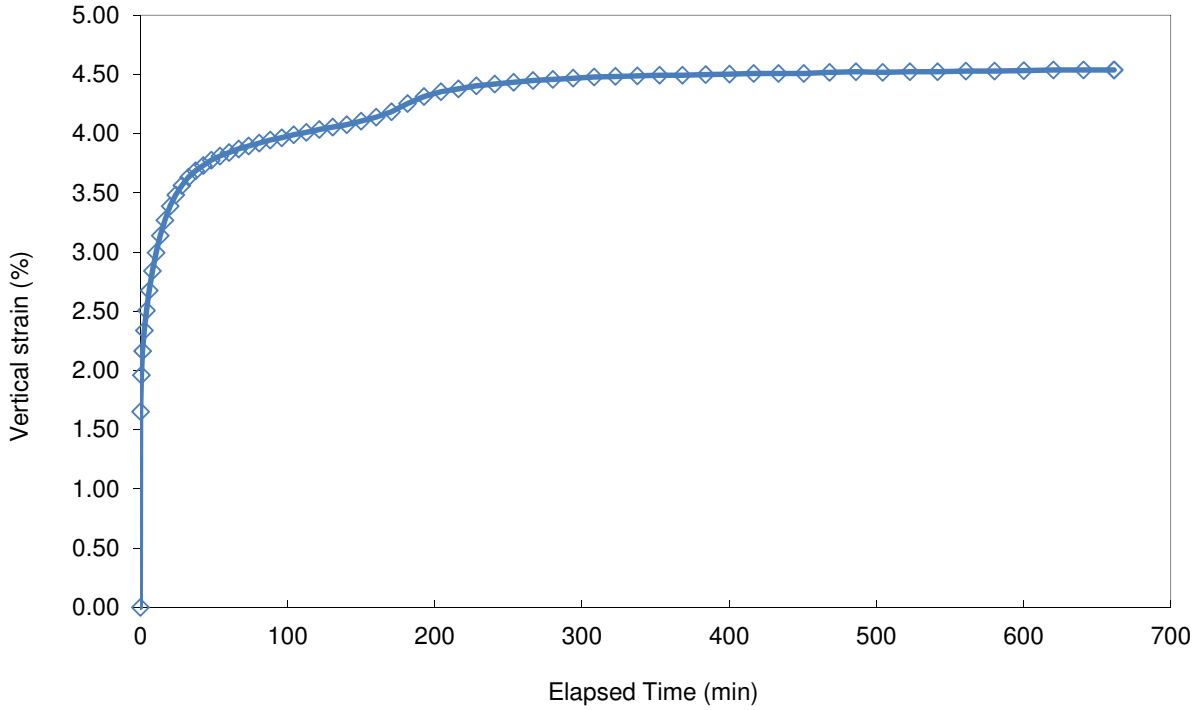

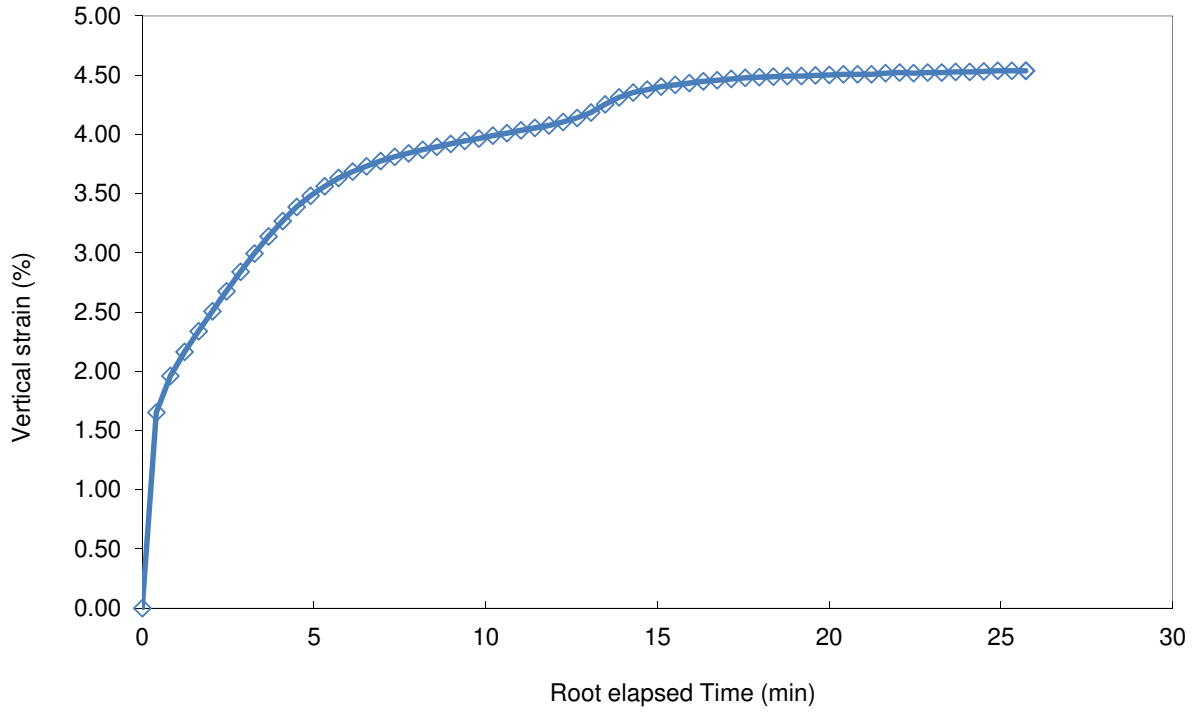

Consolidation stage #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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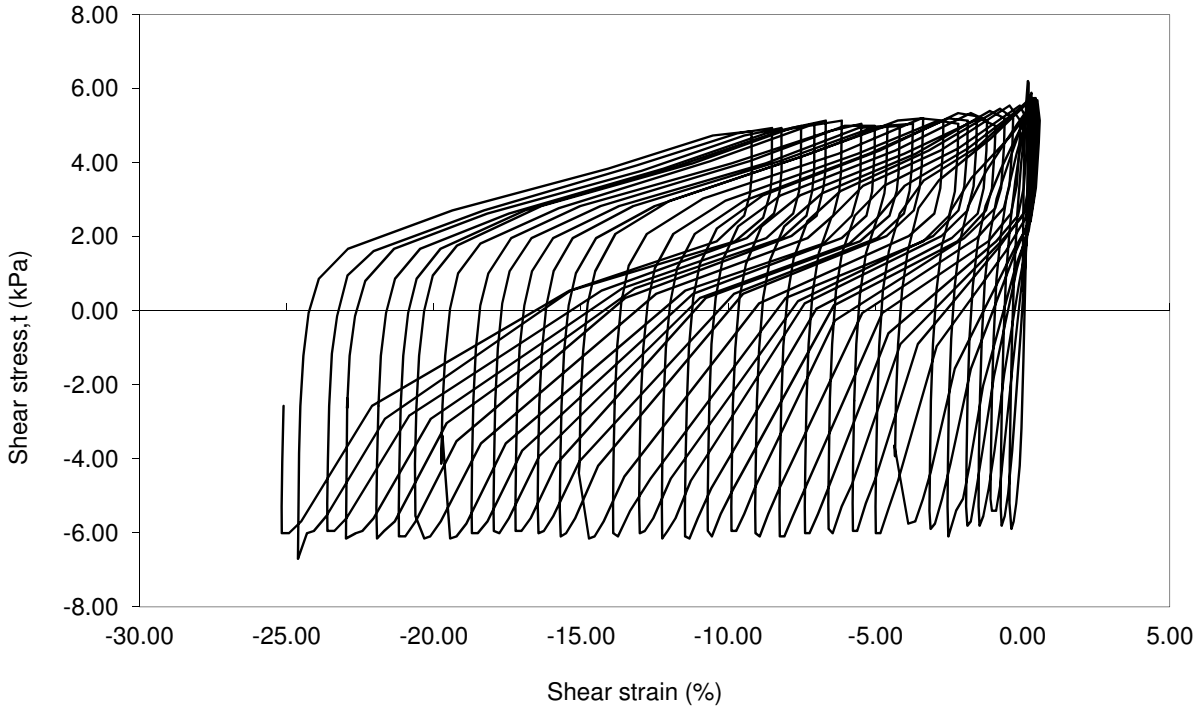

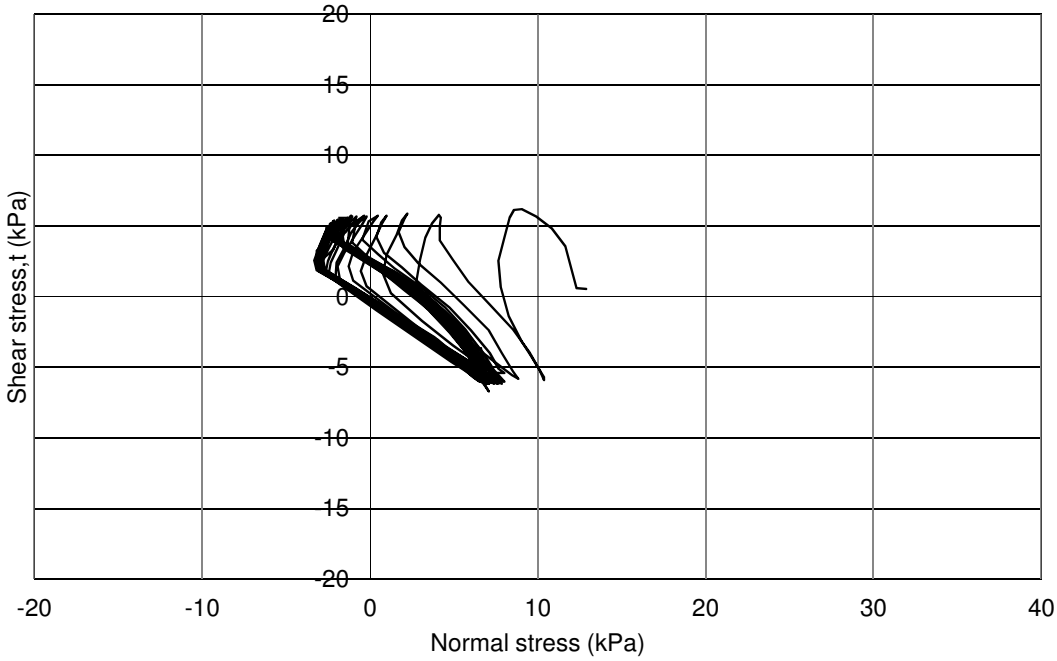

Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 12/02/2016		

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(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
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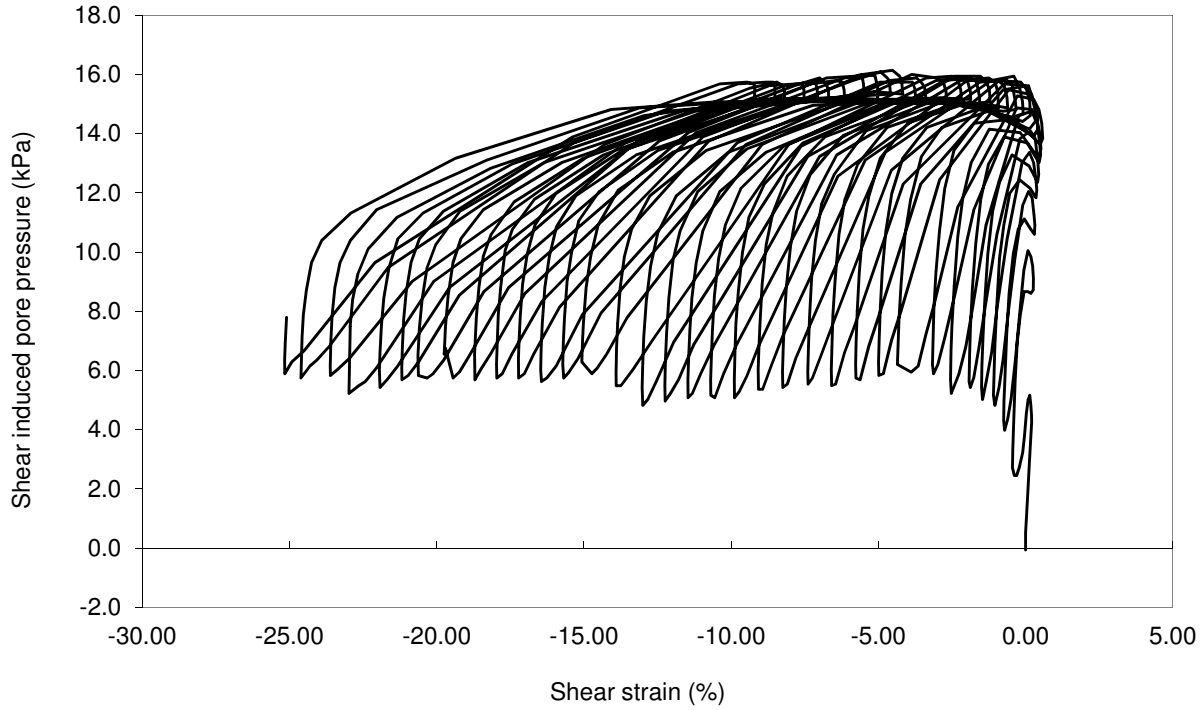

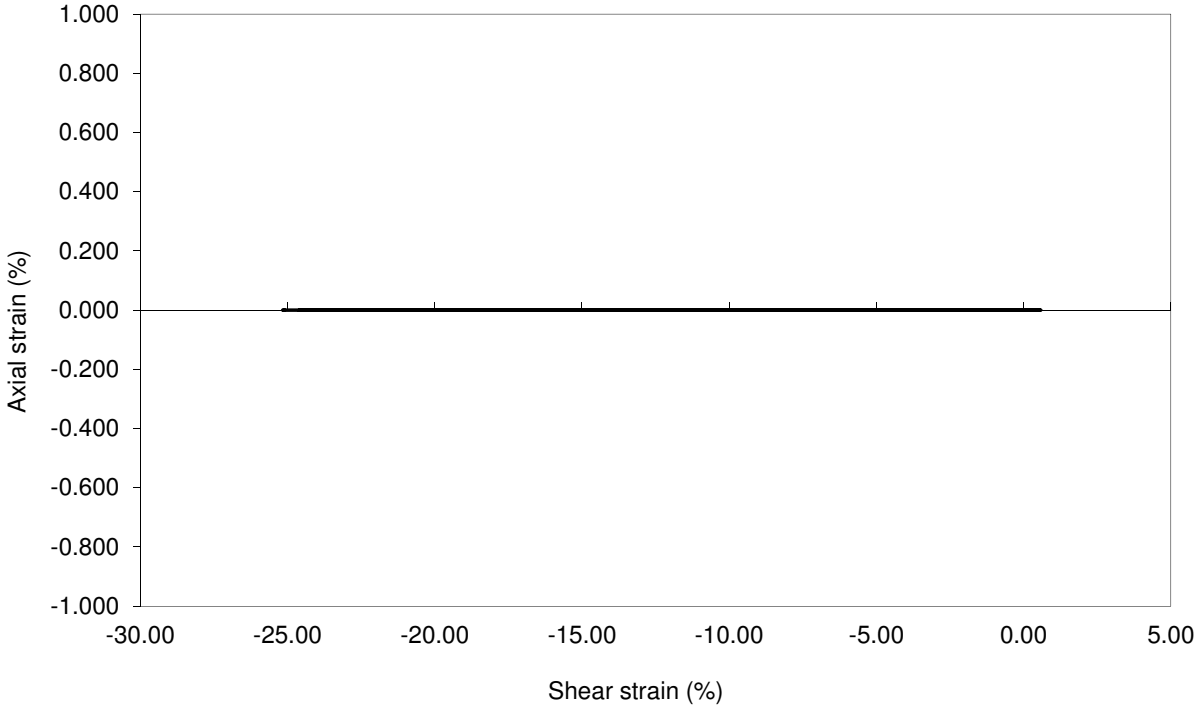

Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
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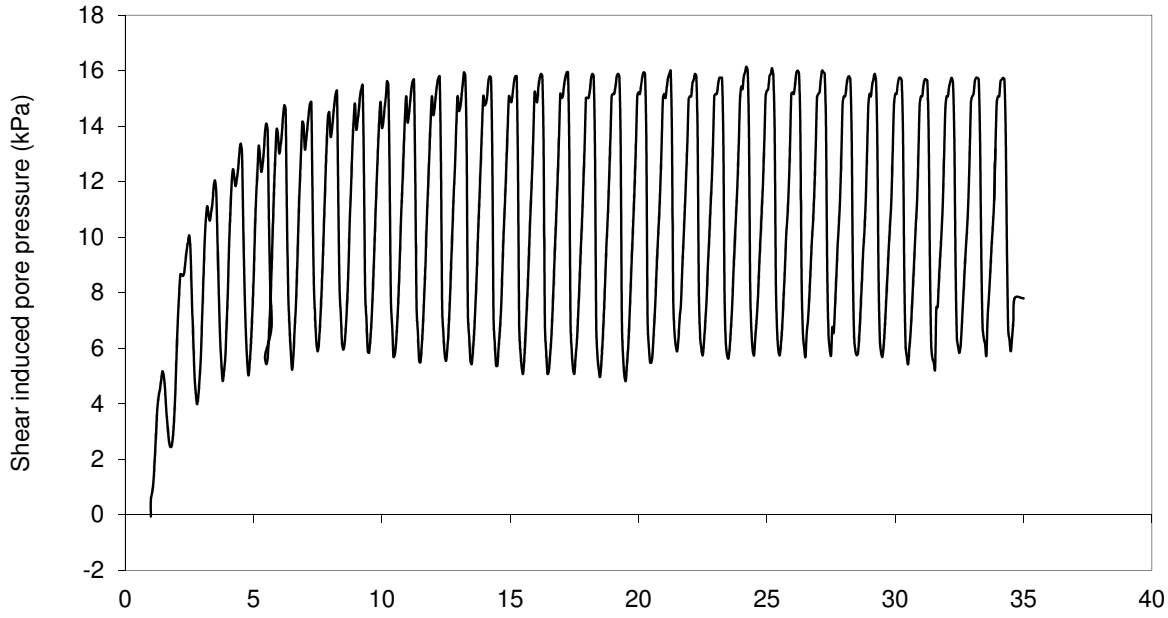

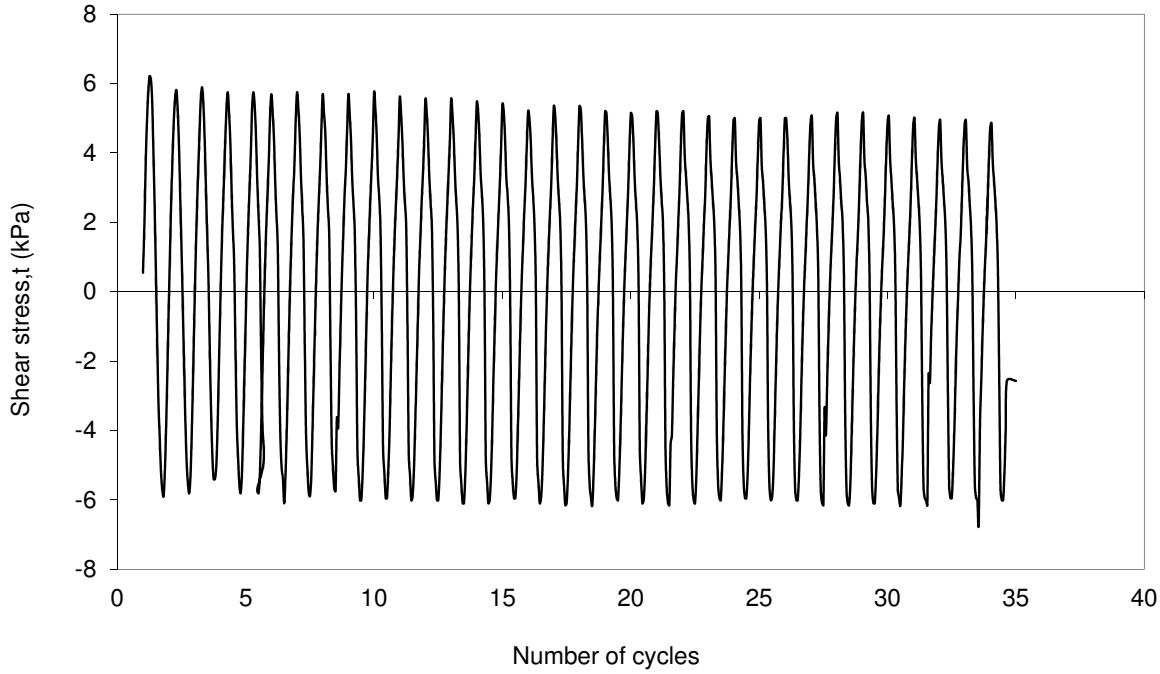

Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
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Date: 12/02/2016		

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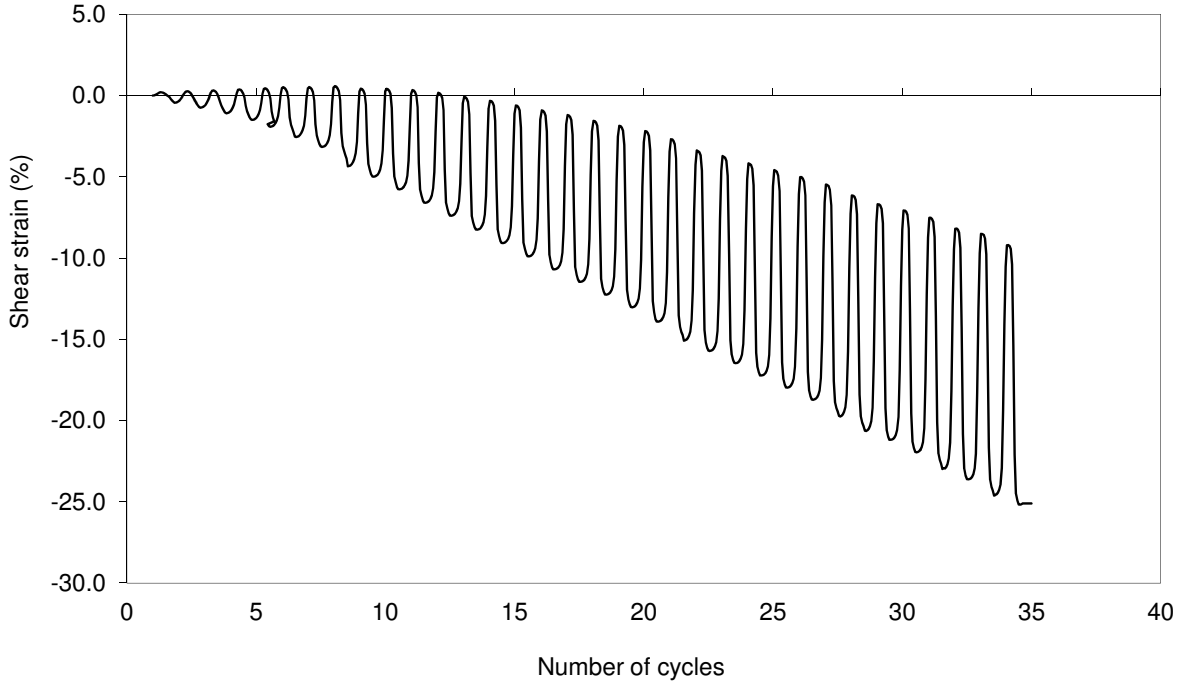
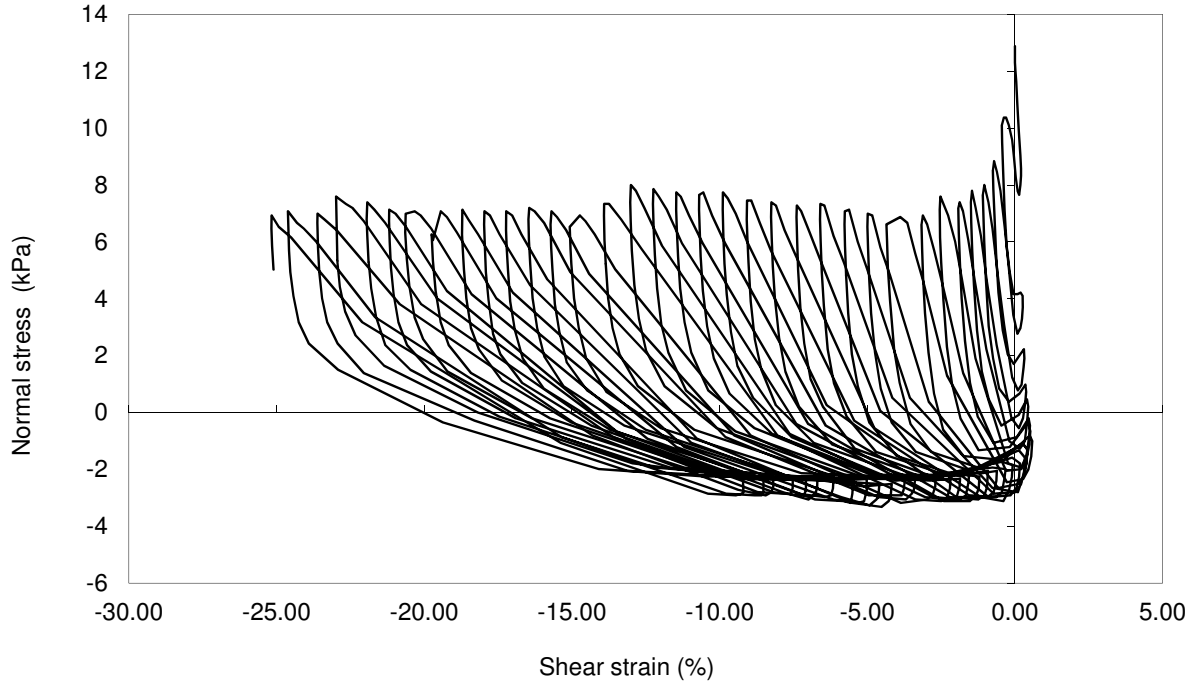
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	G7	Description (visual) :	
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with	
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#2)	

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.30	%	17.03	%	
Bulk density :	2.04	Mg/m^3			
Dry density :	1.70	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.5744				
Test Duration:			2 Days		

END OF CONSOLIDATION #1		
Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	3.50	% (for stage)
Normal stress:	13.0	kPa
Voids ratio (e_o):	0.5193	
Max. Consolidation stress:	13.0	kPa
Max. Consolidation strain:	3.50	% (for stage)
Duration:	794	Min.

PRIOR TO CYCLIC SHEAR		
Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	3.50	% (for stage)
Normal stress:	13.0	kPa
Voids ratio (e_o):	0.5193	
Max. Consolidation stress:	13.0	kPa
Max. Consolidation strain:	3.50	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	8.6	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	5	(exceeds 15% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.386	-3.457	8.3	-7.9	16.5	-0.4
5	3.250	-15.991	8.5	-8.6	19.6	0.4
6	3.401	-18.087	8.4	-8.6	19.8	1.2
7	3.297	-20.224	8.3	-8.6	19.8	3.1
8	3.272	-22.073	8.2	-8.7	19.8	4.0
9	3.234	-23.588	8.1	-8.7	19.8	4.0
10	3.106	-25.106	8.0	-8.8	19.8	4.2
11	2.902	-26.679	7.9	-8.8	19.8	4.6
12	2.550	-28.162	7.8	-8.7	19.8	4.8
13	2.138	-29.760	7.7	-8.7	19.8	5.3

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
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Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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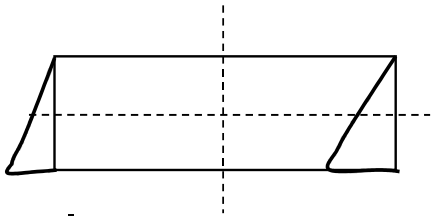
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

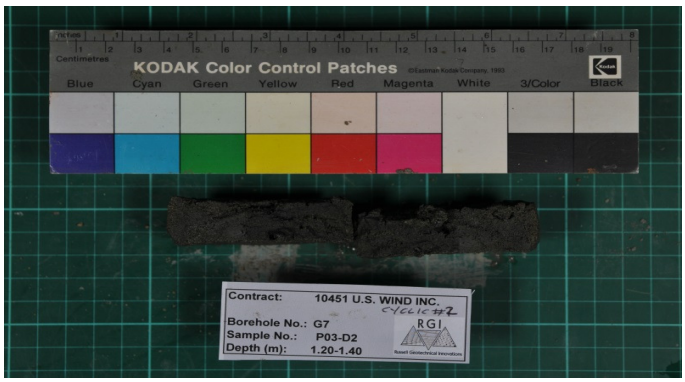
Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#2)

SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

Russell Geotechnical Innovations

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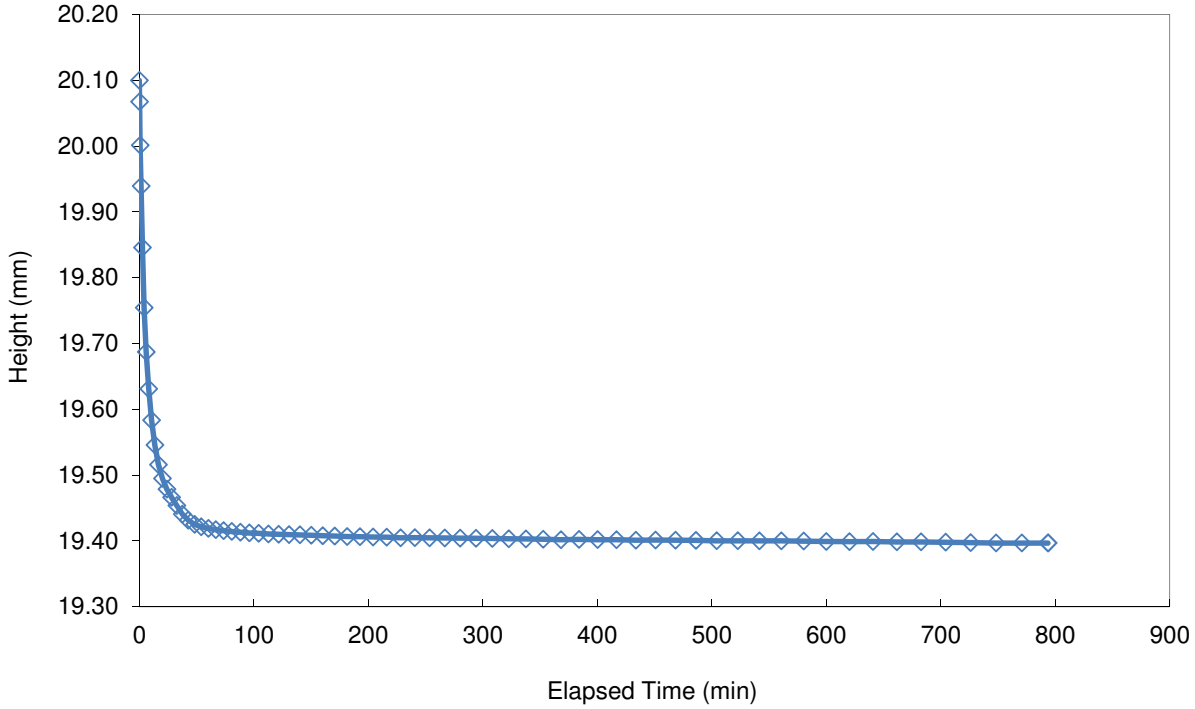
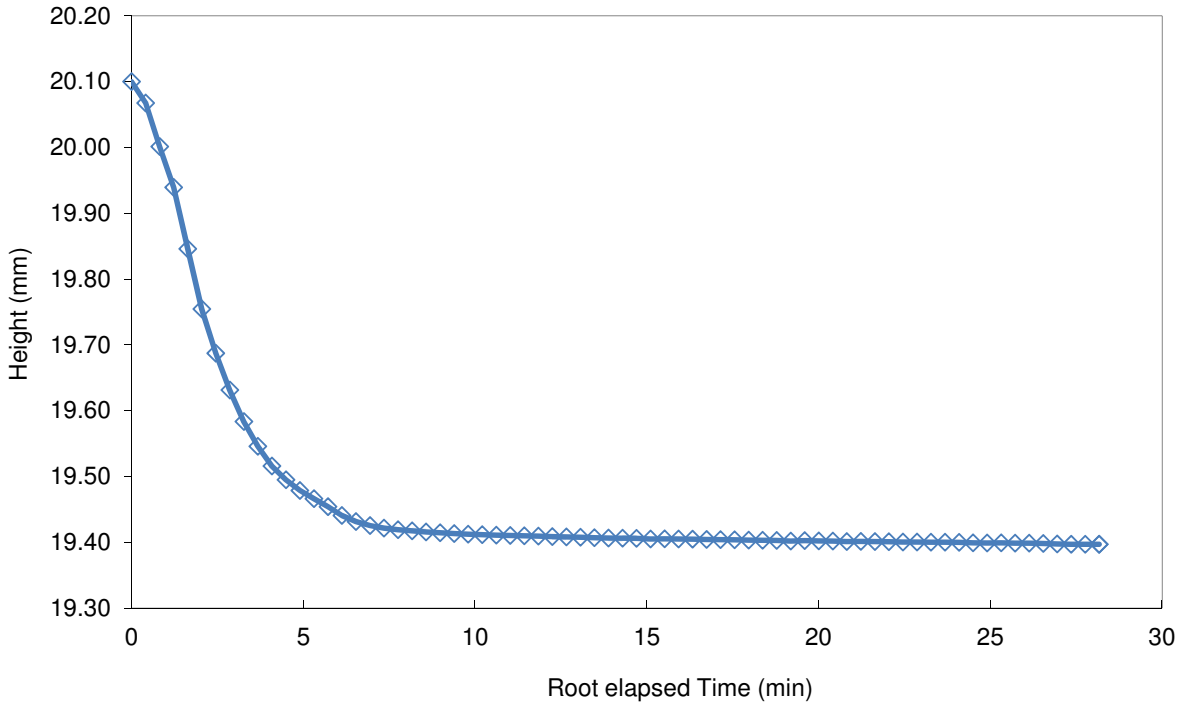
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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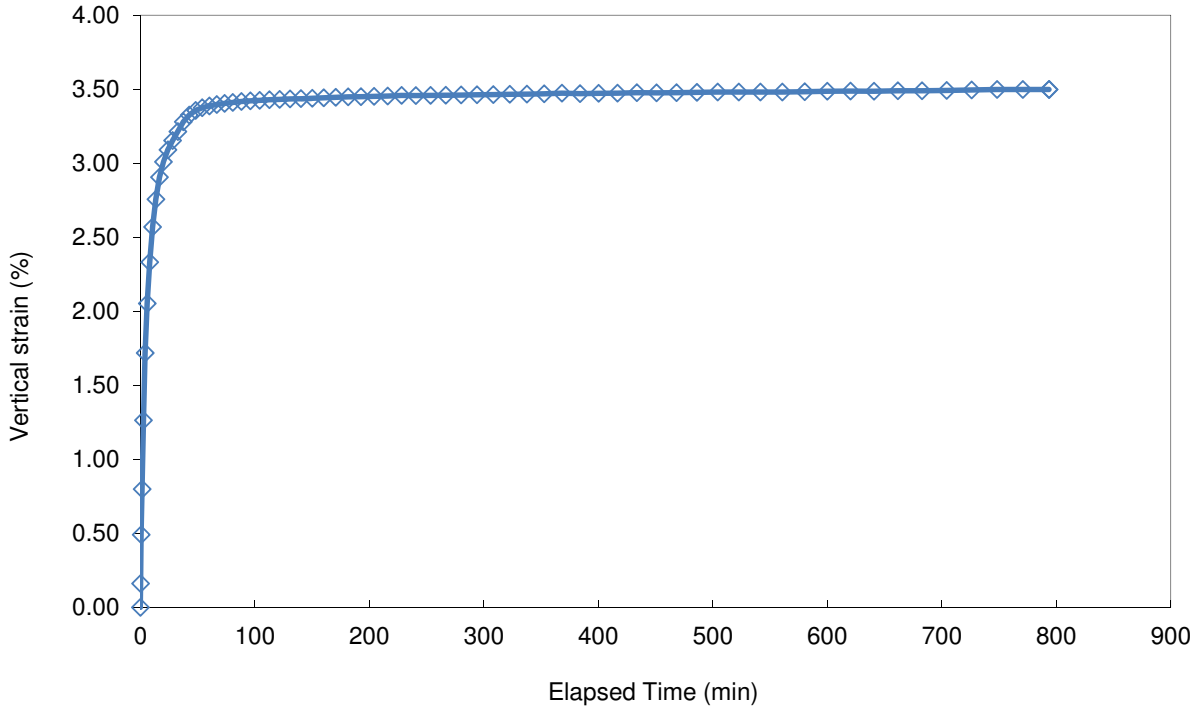

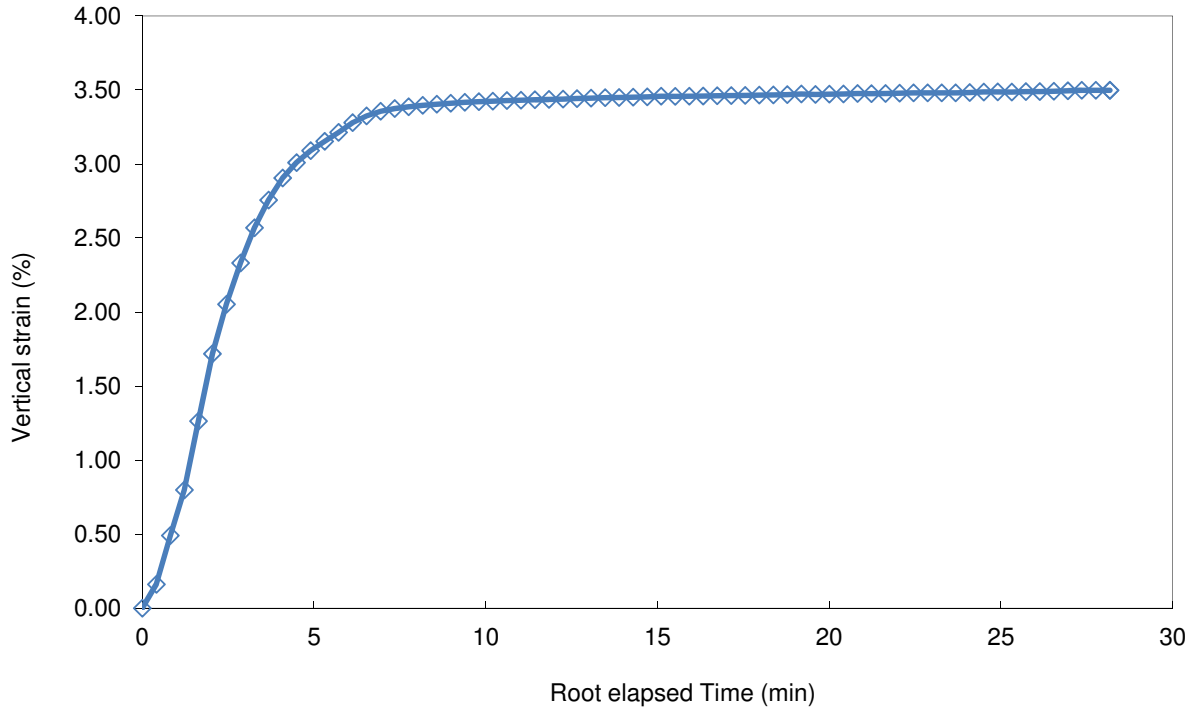

Consolidation stage #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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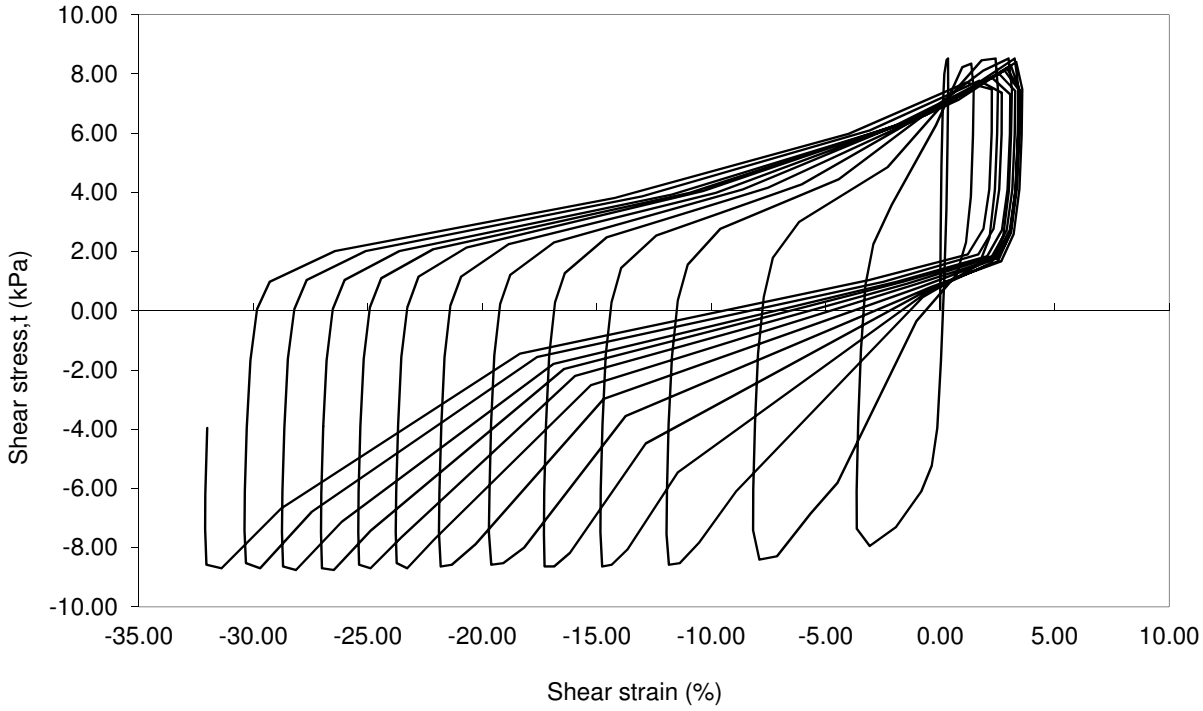

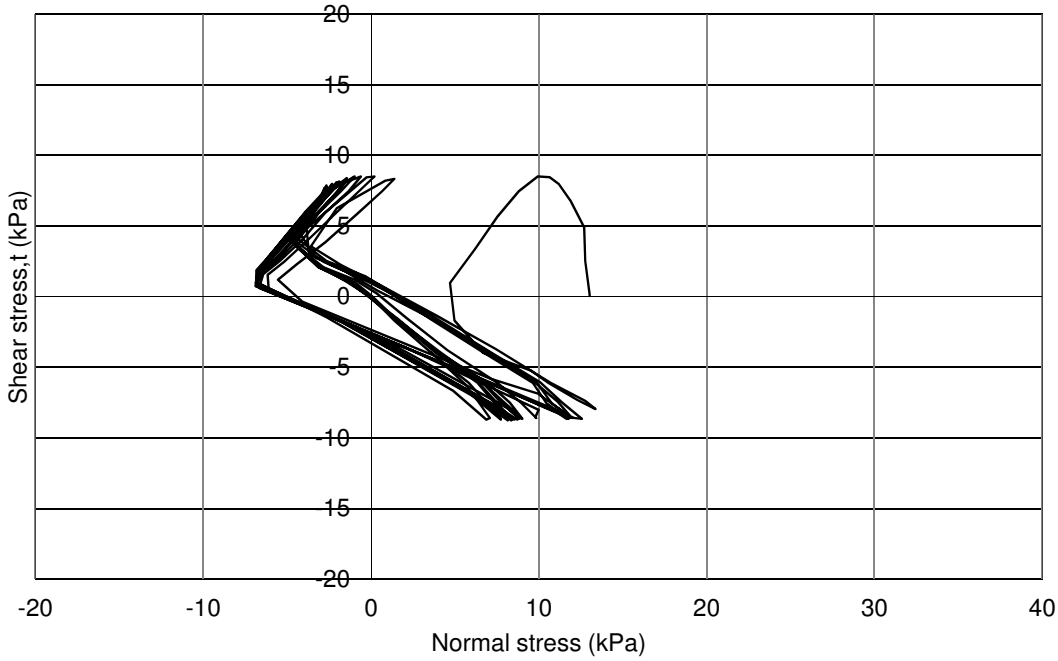

Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
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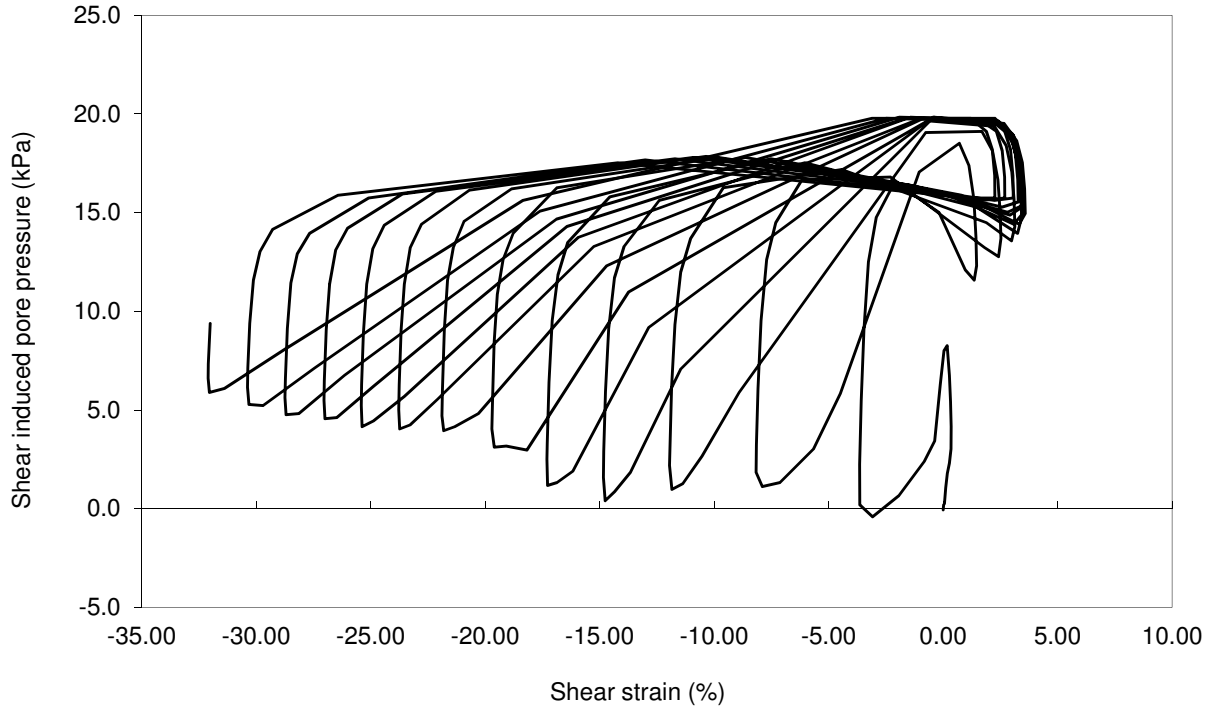

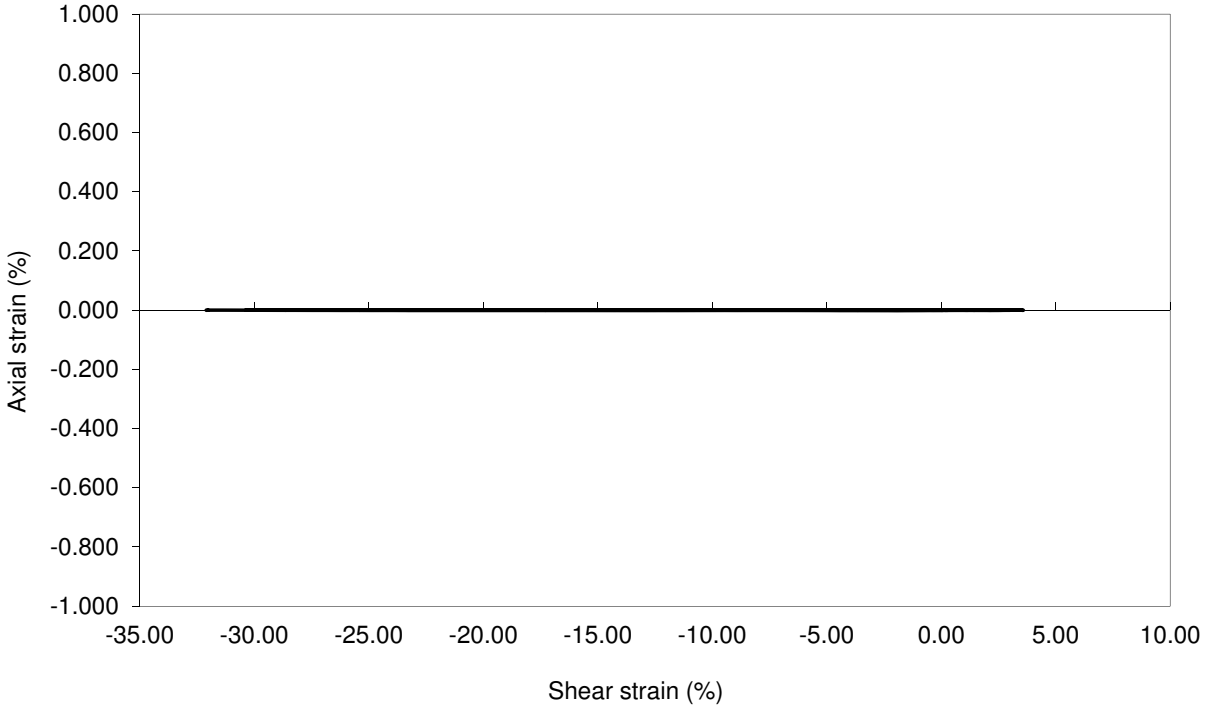

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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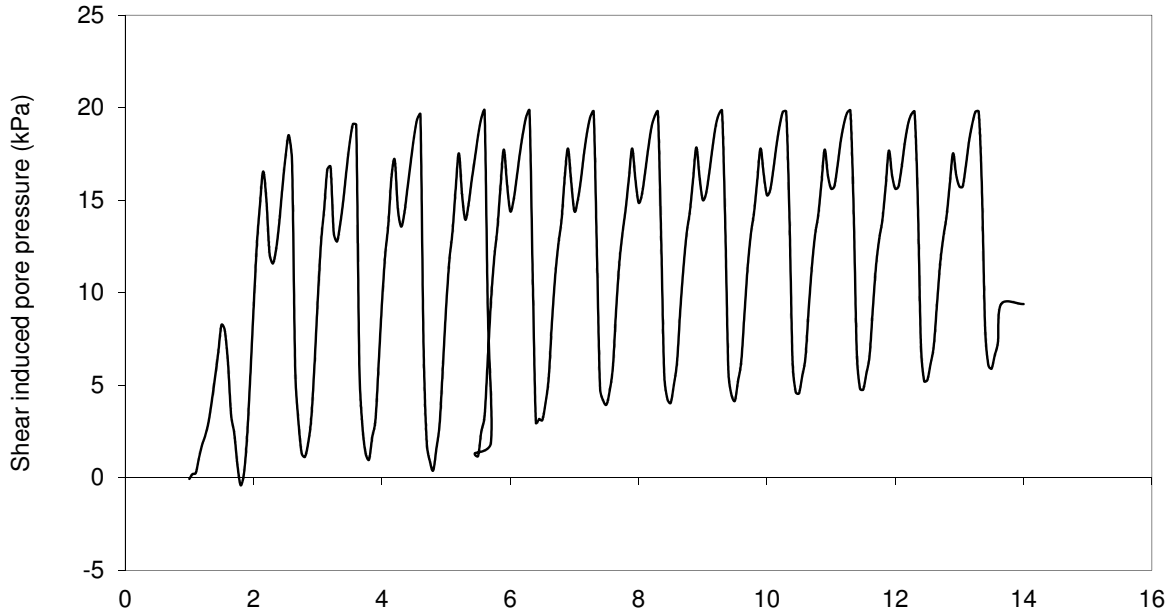
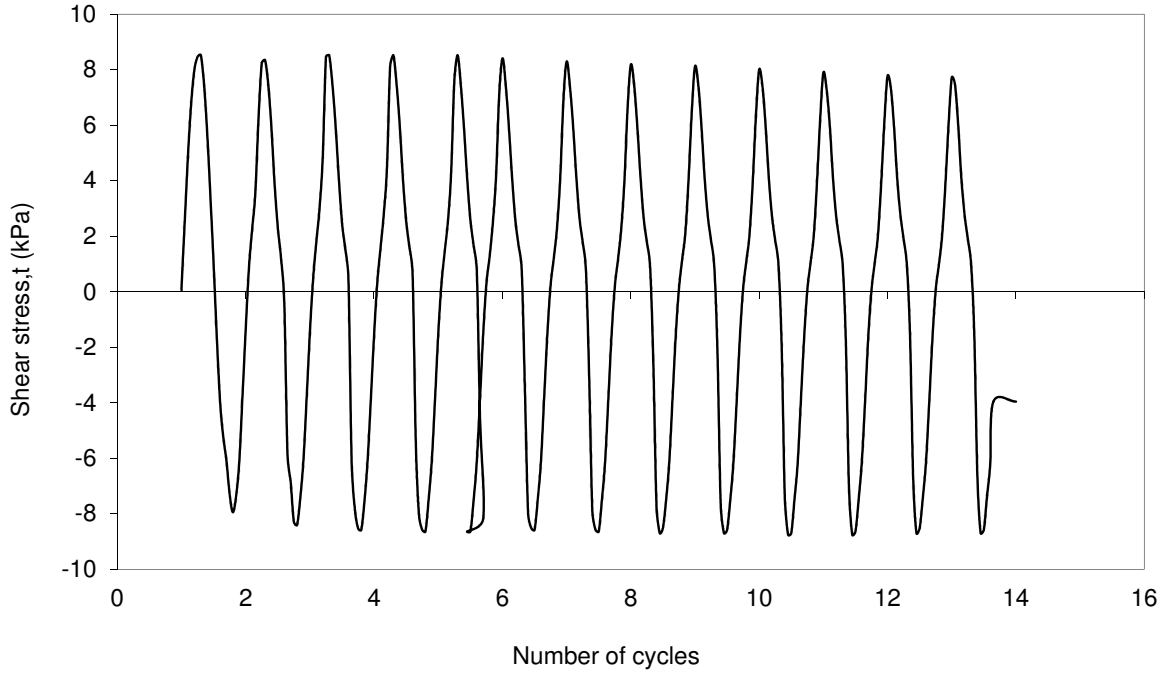
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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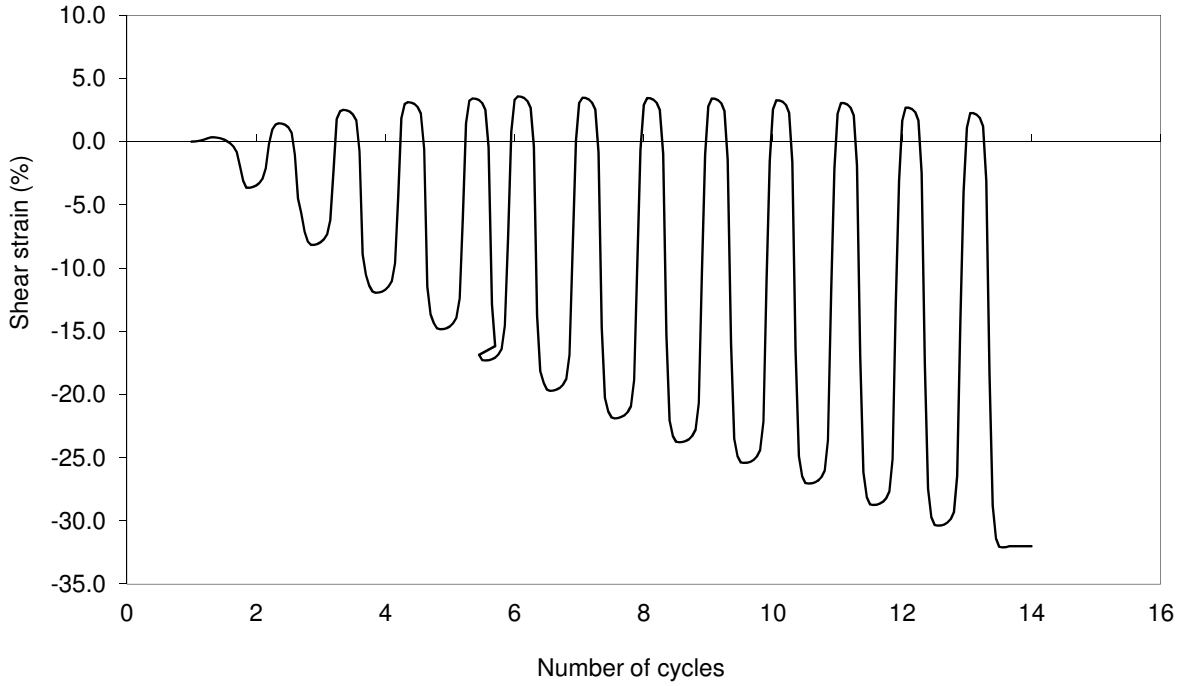
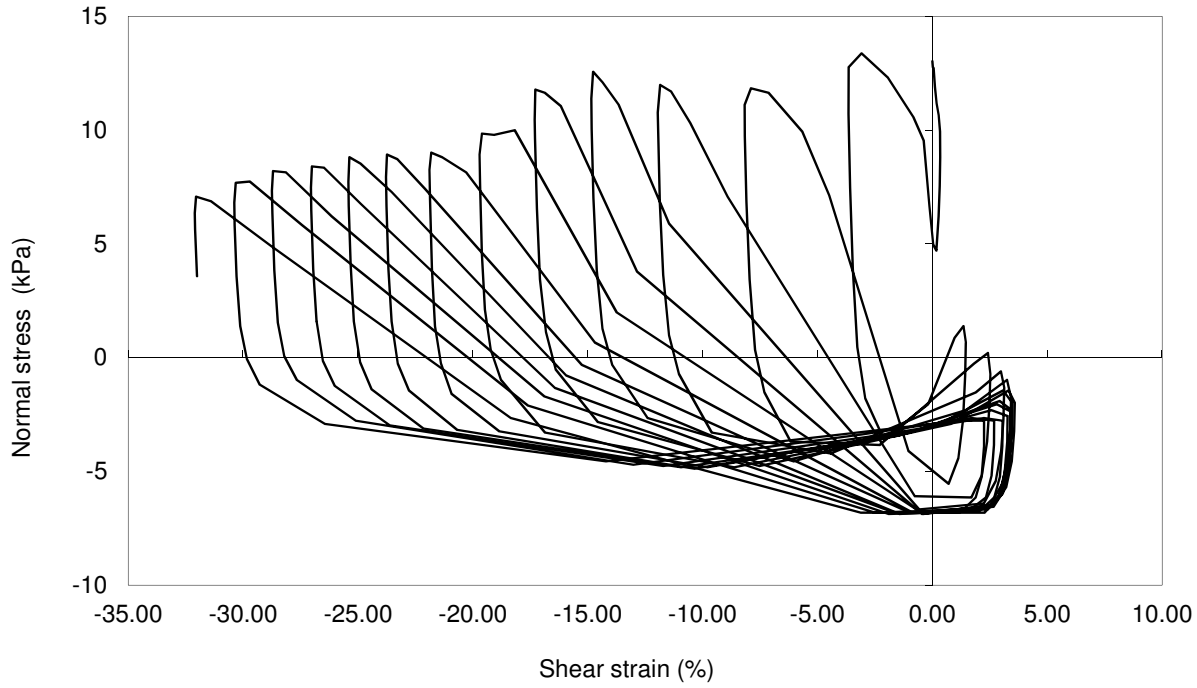
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	G7	Description (visual) :	
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with	
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)	

SPECIMEN DETAILS	Sample type:	Disturbed		Trimming Procedure:	Compacted
	Initial Values		Final Values		
Height :	20.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.30	%	17.27	%	
Bulk density :	2.04	Mg/m³			
Dry density :	1.70	Mg/m³			
Particle density (assumed)	2.67	Mg/m³			
Initial voids ratio (e_o)	0.5744				
Test Duration:			2 Days		

END OF CONSOLIDATION #1		
Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	3.47	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5197	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	3.47	% (for stage)
Duration:	1121	Min.

PRIOR TO CYCLIC SHEAR		
Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	3.47	% (for stage)
Normal stress:	12.8	kPa
Voids ratio (e_o):	0.5197	
Max. Consolidation stress:	12.8	kPa
Max. Consolidation strain:	3.47	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	11	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	5	(exceeds 15% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	5.221	-8.695	11.0	-10.9	16.0	0.7
3	7.721	-11.545	11.2	-11.4	18.1	1.5
4	10.380	-13.055	12.8	-11.3	17.5	-1.3
5	11.659	-15.457	12.4	-12.0	16.7	-1.3
6	13.396	-16.648	11.4	-11.5	16.5	0.4
7	14.828	-17.689	11.0	-11.4	16.7	0.3
8	15.741	-18.678	11.6	-12.2	17.1	0.3
11	2.902	-26.679	7.9	-8.8	19.8	4.6
12	2.550	-28.162	7.8	-8.7	19.8	4.8
13	2.138	-29.760	7.7	-8.7	19.8	5.3

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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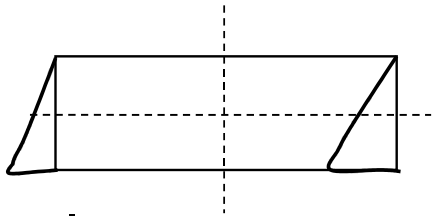
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

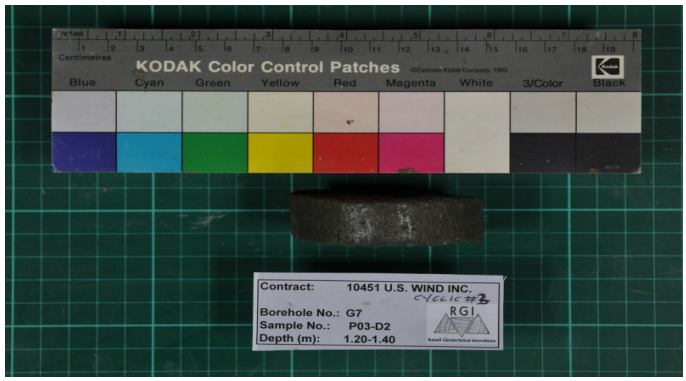
Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)

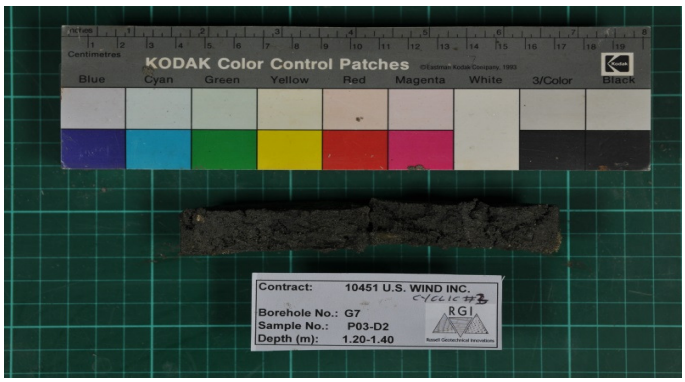
SPECIMEN DETAILS

Initial Height:	20.1	mm
Initial Diameter:	66.4	mm



Elevation





Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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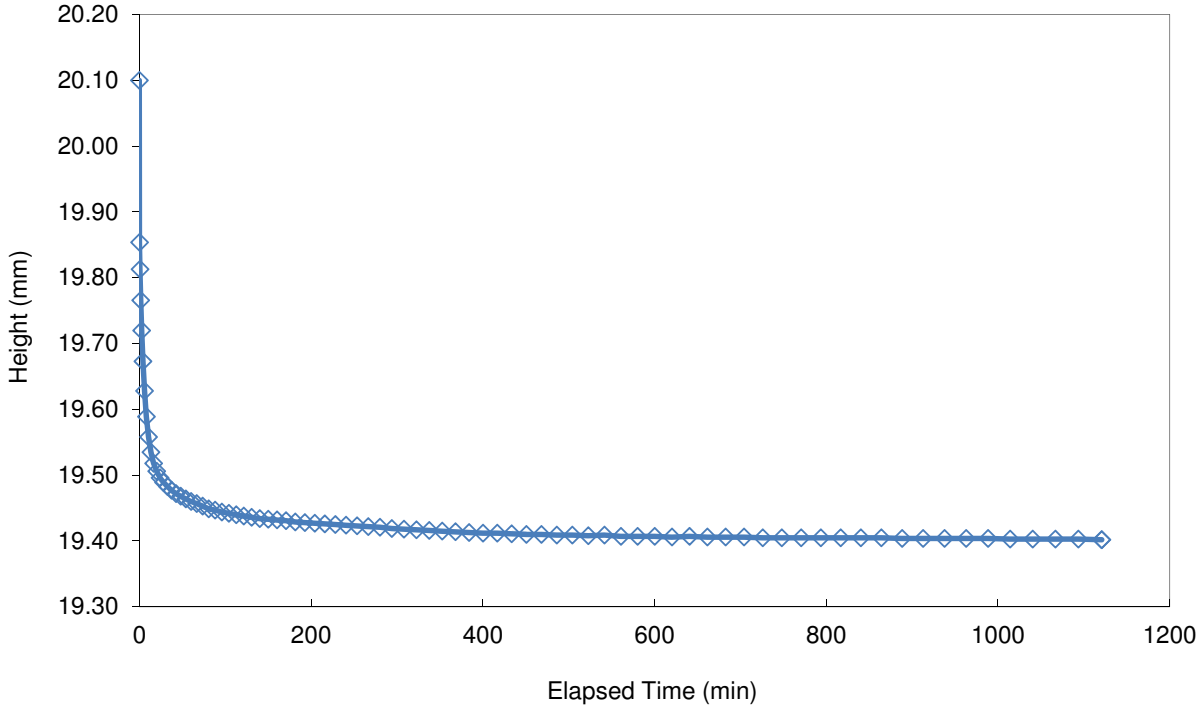
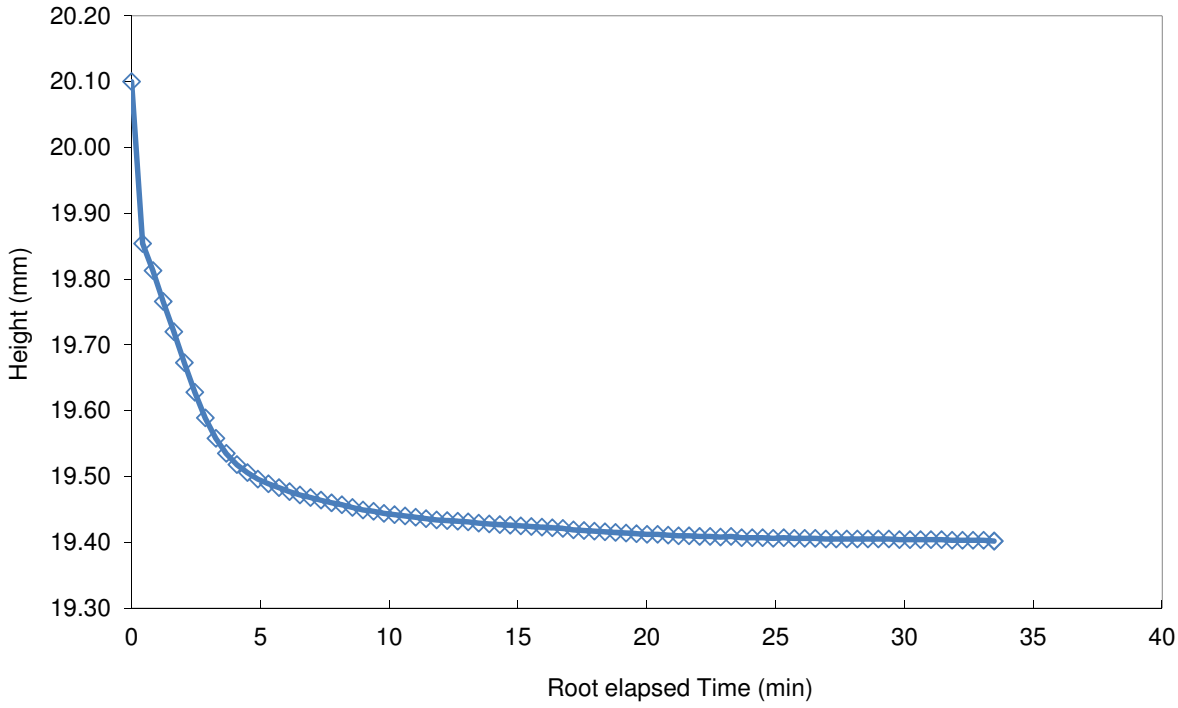
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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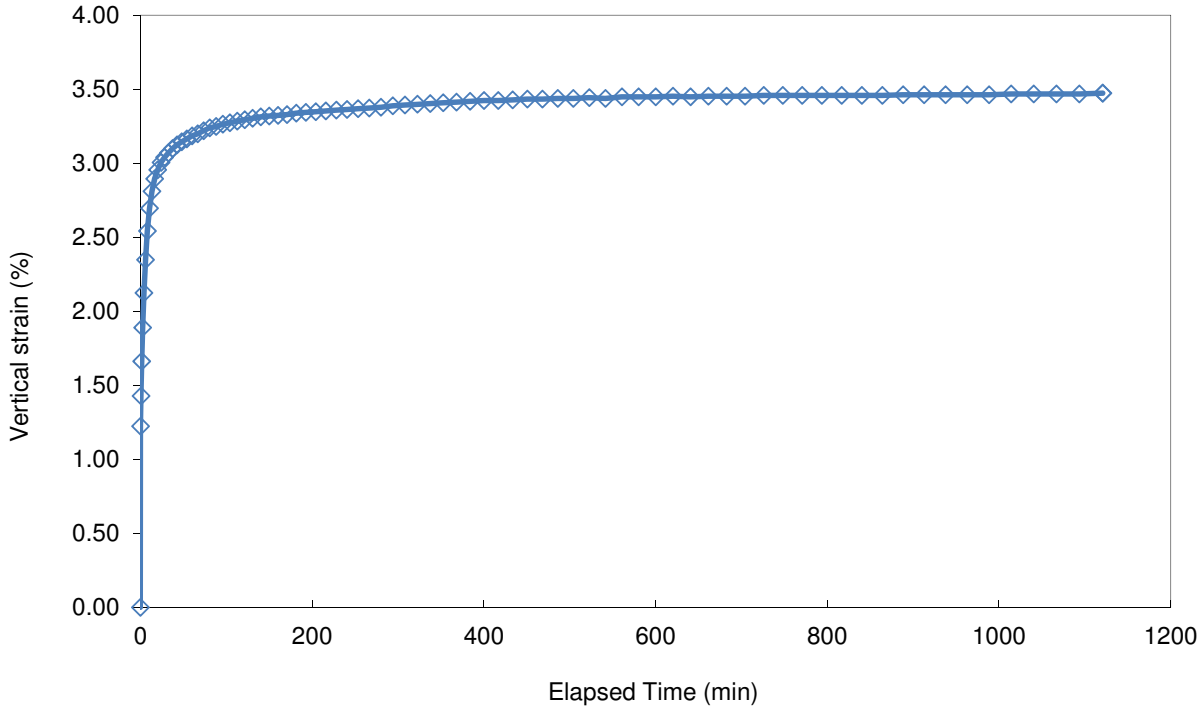
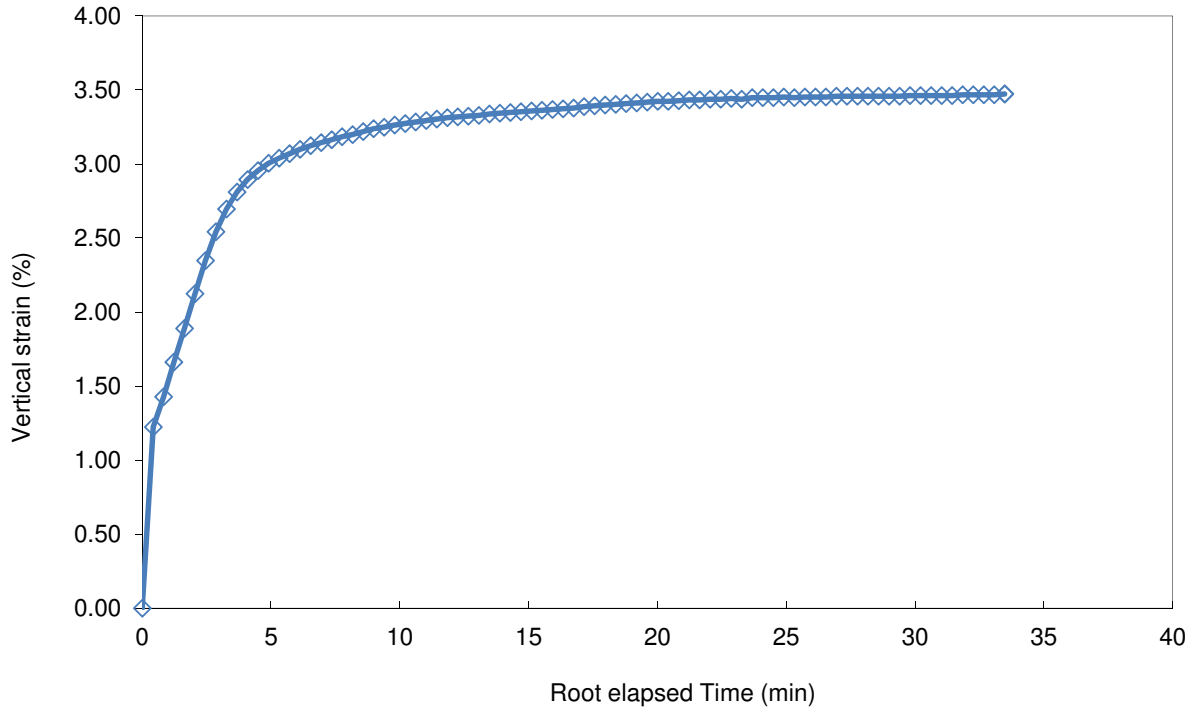
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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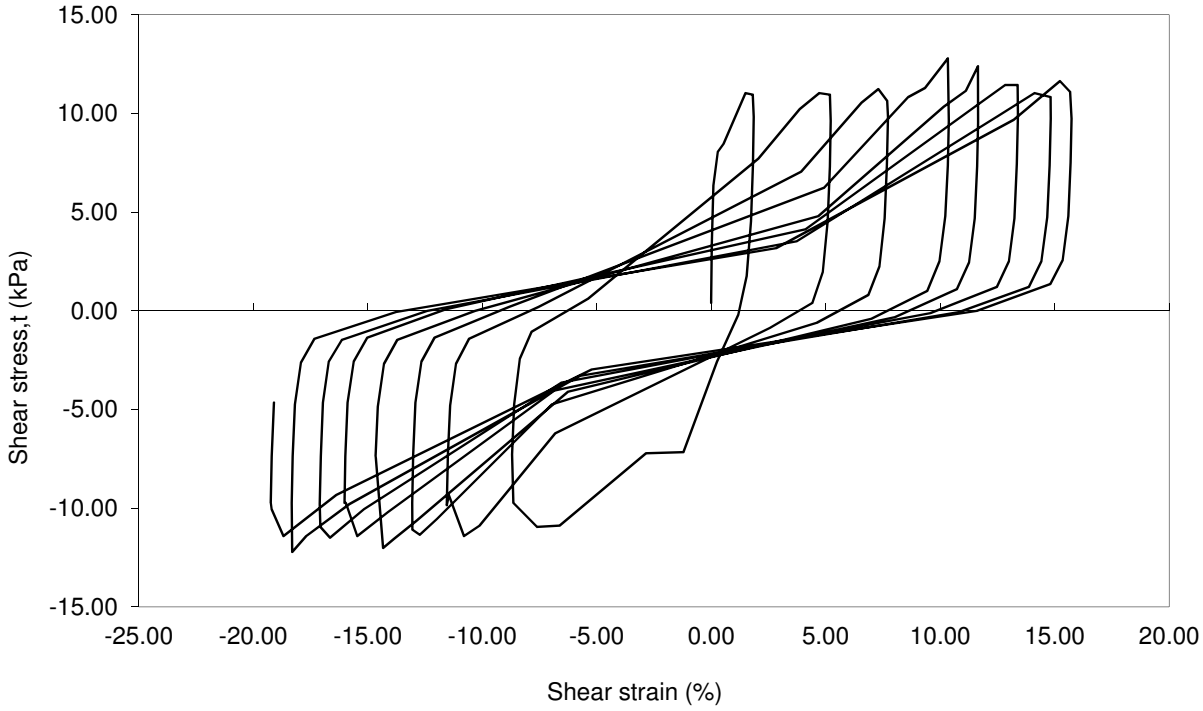
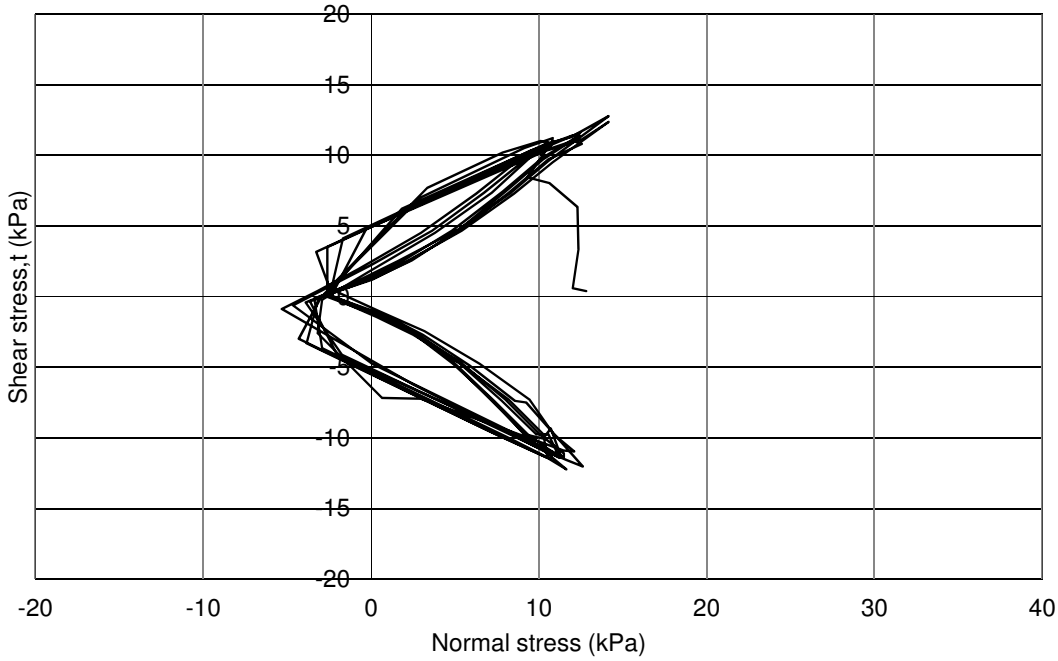
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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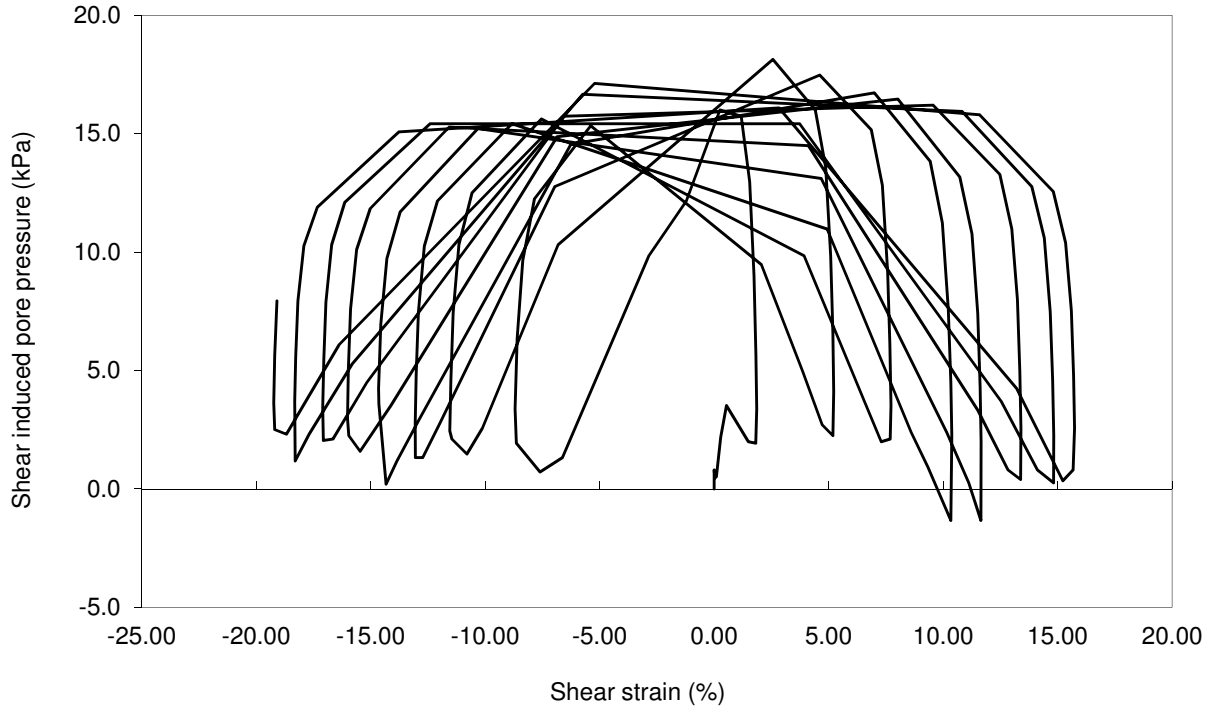
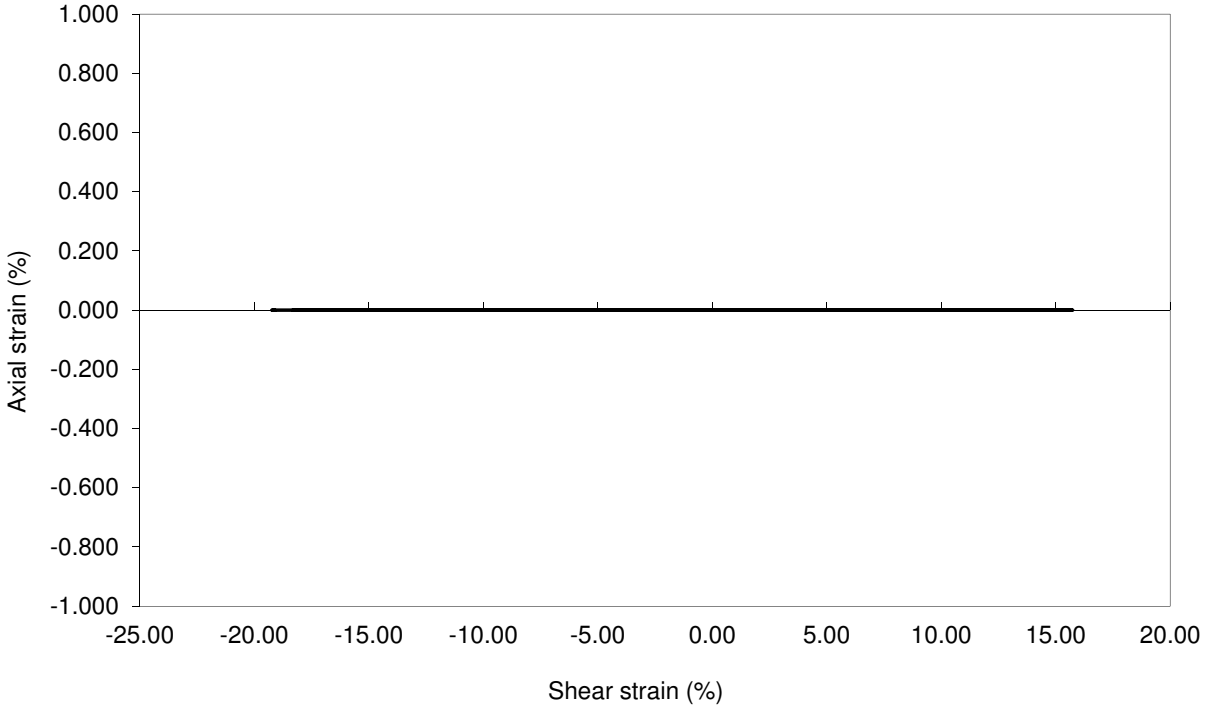
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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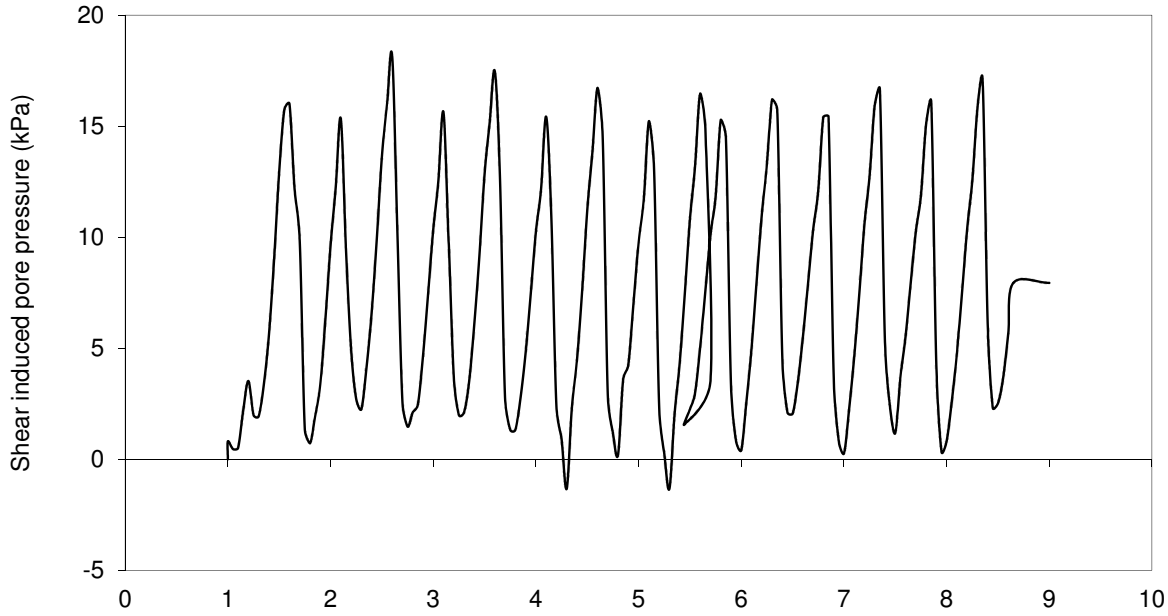
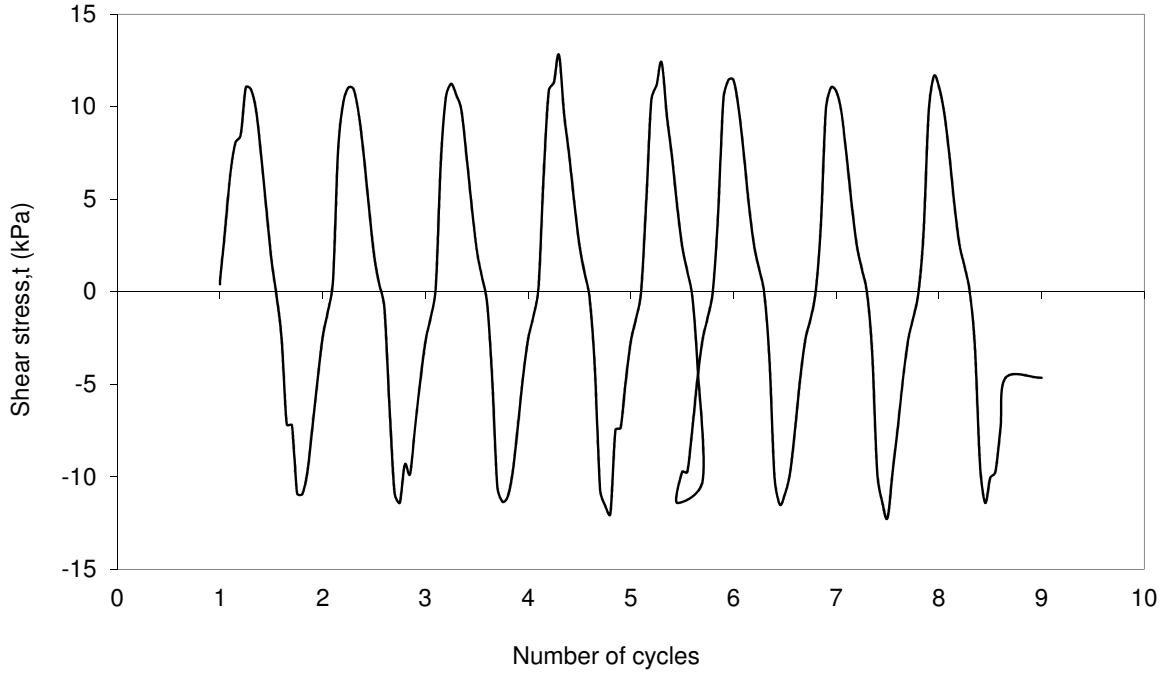
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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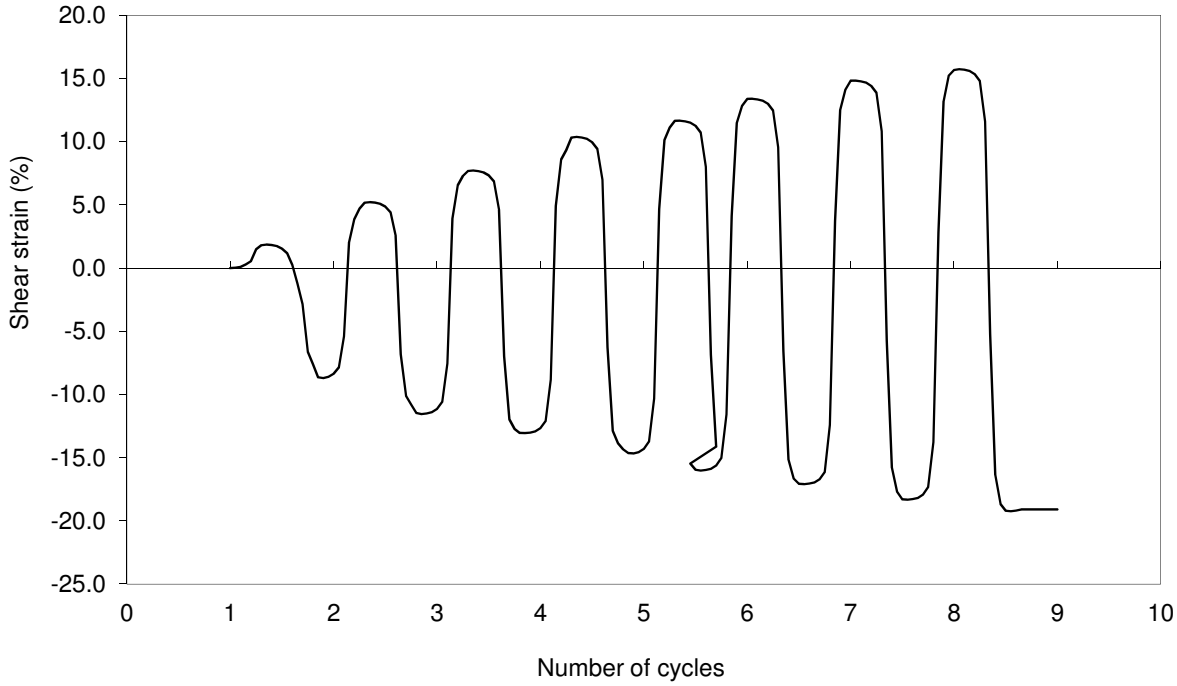
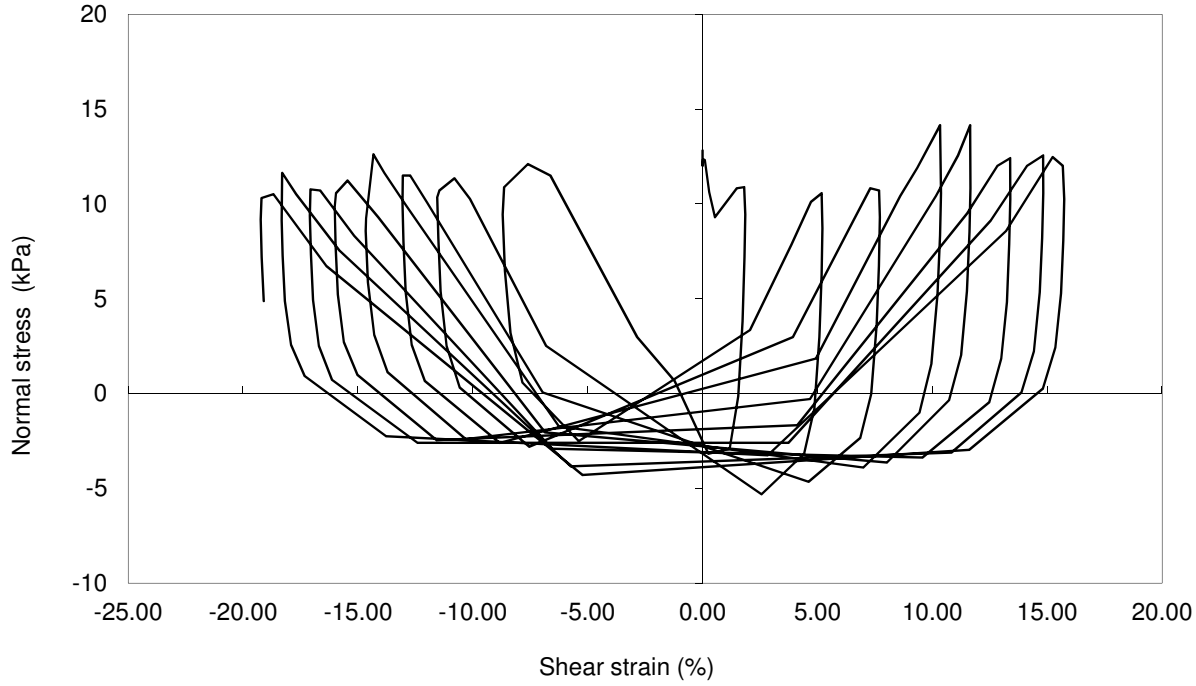
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G7	Description :
Sample Number:	P03-B2	Soft grey very SANDY CLAY / CLAYEY SAND with
Sample Depth (m):	1.20-1.40	occasional shell fragements (Cyclic#3)





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	G17A	Description (visual) :
Sample Number:	P01-Q2	Stiff grey CLAY with snad lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #1)

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	22.3	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	29.12	%	32.50	%
Bulk density :	1.79	Mg/m^3		
Dry density :	1.39	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.9217			

Test Duration: 3 Days

END OF CONSOLIDATION #1

Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	7.70	% (for stage)
Normal stress:	481.8	kPa
Voids ratio (e_o):	0.7738	
Max. Consolidation stress:	481.8	kPa
Max. Consolidation strain:	7.70	% (for stage)
Duration:	1176	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	443.0	kPa
Shear stress	52.0	kPa
Duration	17	Min.

CYCLIC SHEAR STAGE

Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	62.0	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	398	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.758	0.214	113.6	-9.6	77.6	55.7
5	2.001	0.419	113.6	-9.6	114.5	105.6
10	2.274	0.633	113.8	-9.6	158.9	138.1
20	2.654	0.935	113.8	-9.5	199.4	170.6
50	3.511	1.612	114.0	-9.6	257.2	215.0
100	4.767	2.581	113.8	-9.3	305.0	247.5
200	7.265	4.577	113.8	-8.6	354.3	275.4
250	8.770	5.833	113.8	-8.1	369.4	284.0
300	10.396	7.255	113.8	-7.3	379.1	289.0
350	12.314	9.003	113.8	-7.2	387.1	293.8
398	15.002	11.540	113.6	-6.9	392.4	297.2

Checked and approved
Initials: *CSR*
Date: 21/01/2016

Project Number: **RGI/1130**
Project Name: **10451 U.S. WIND INC.**

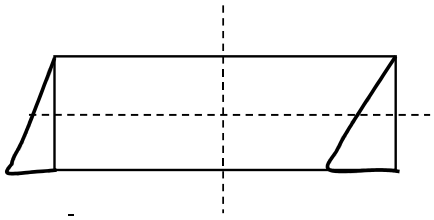
RGI
Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

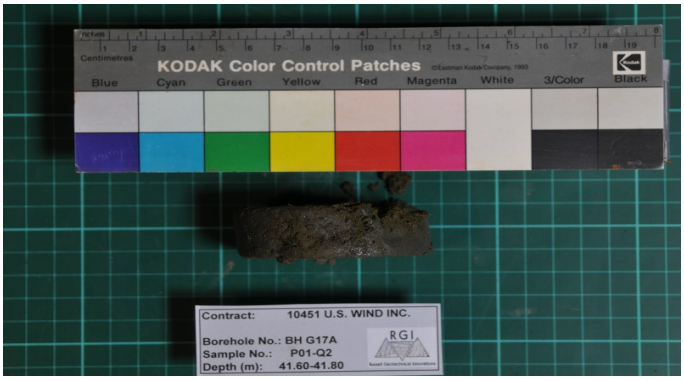
Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with snad lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #1)

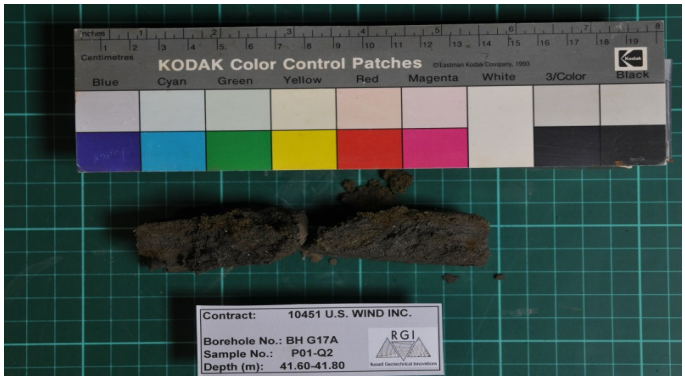
SPECIMEN DETAILS

Initial Height:	22.3	mm
Initial Diameter:	66.4	mm



Elevation





Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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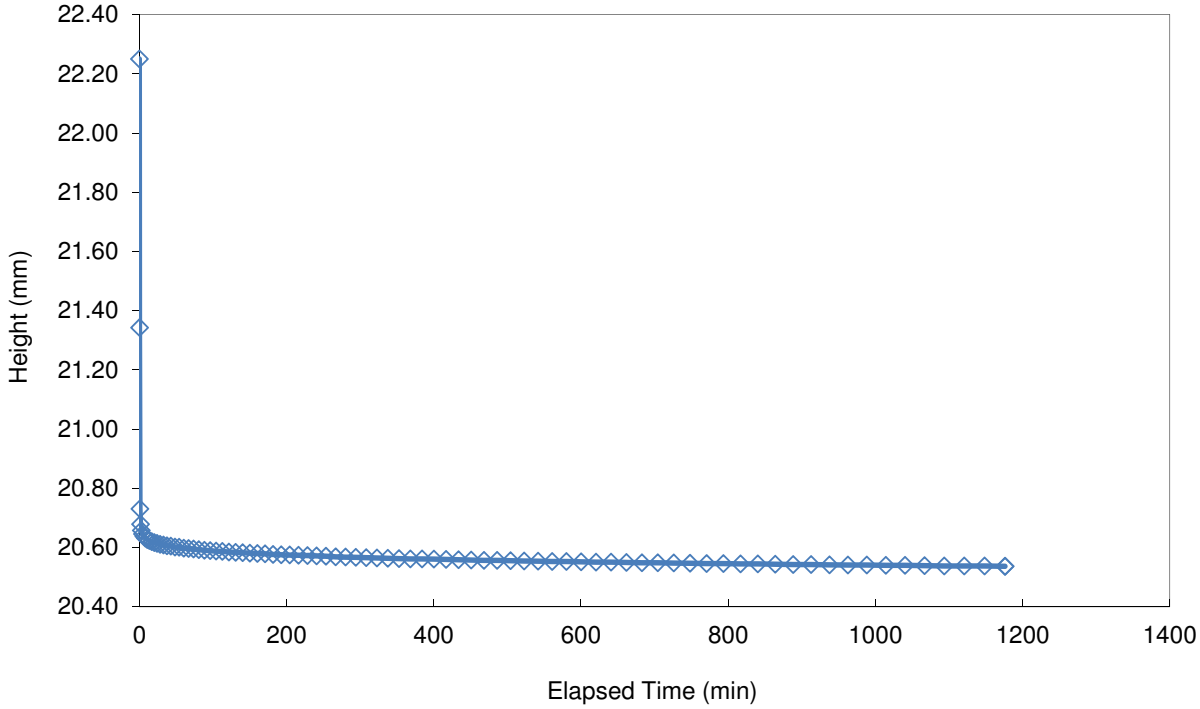
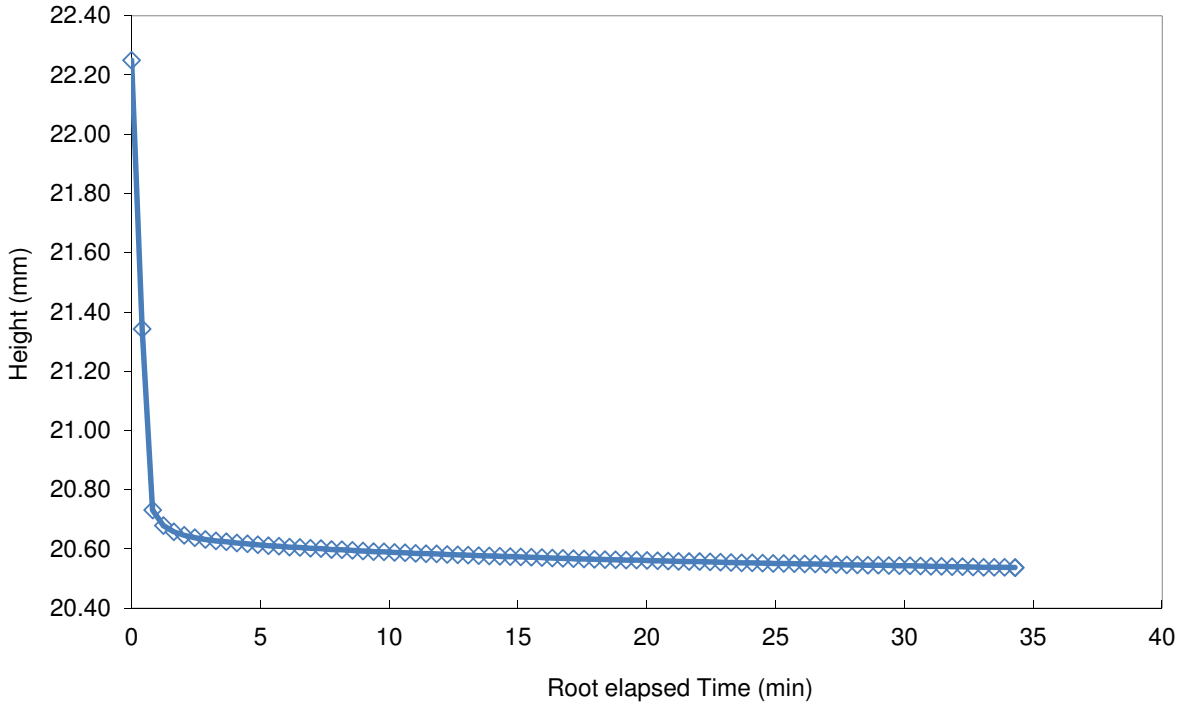
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with snad lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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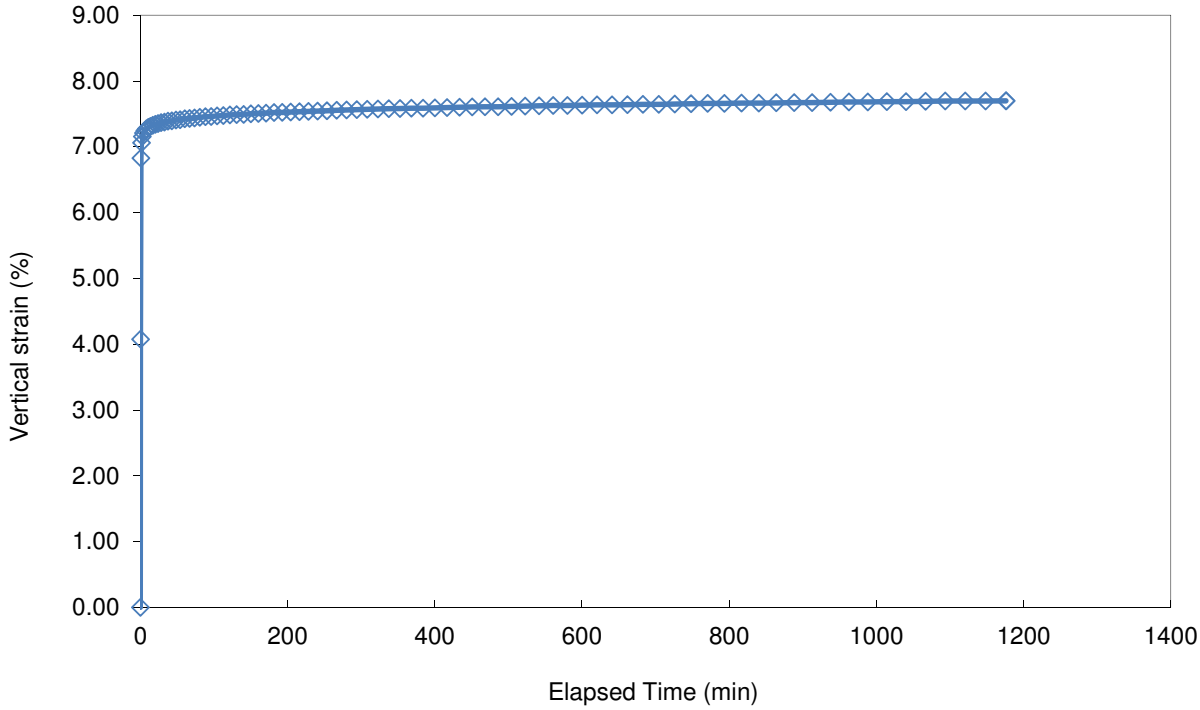
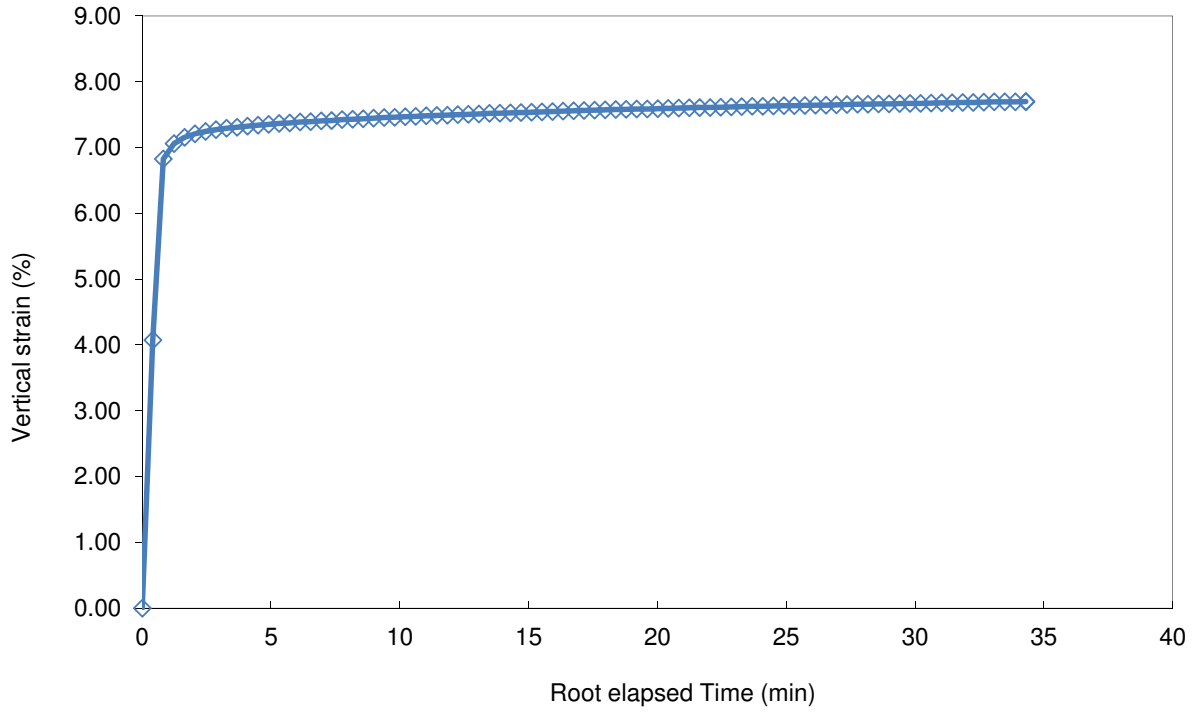
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with snad lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #1)





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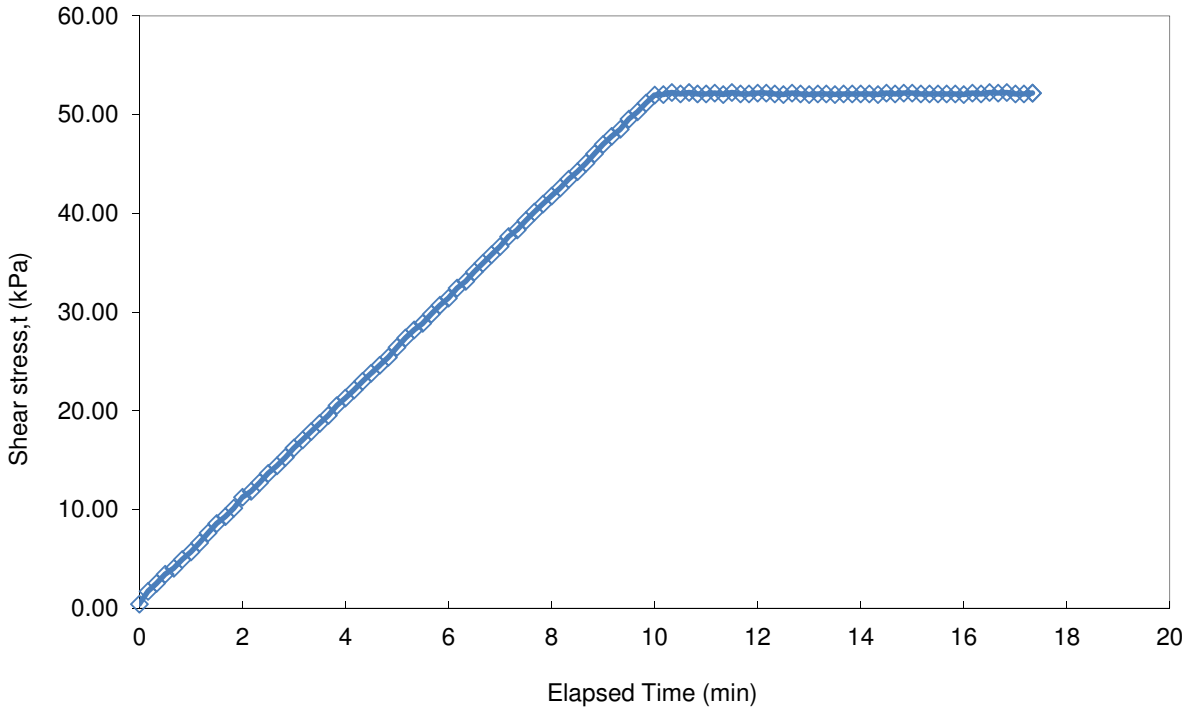

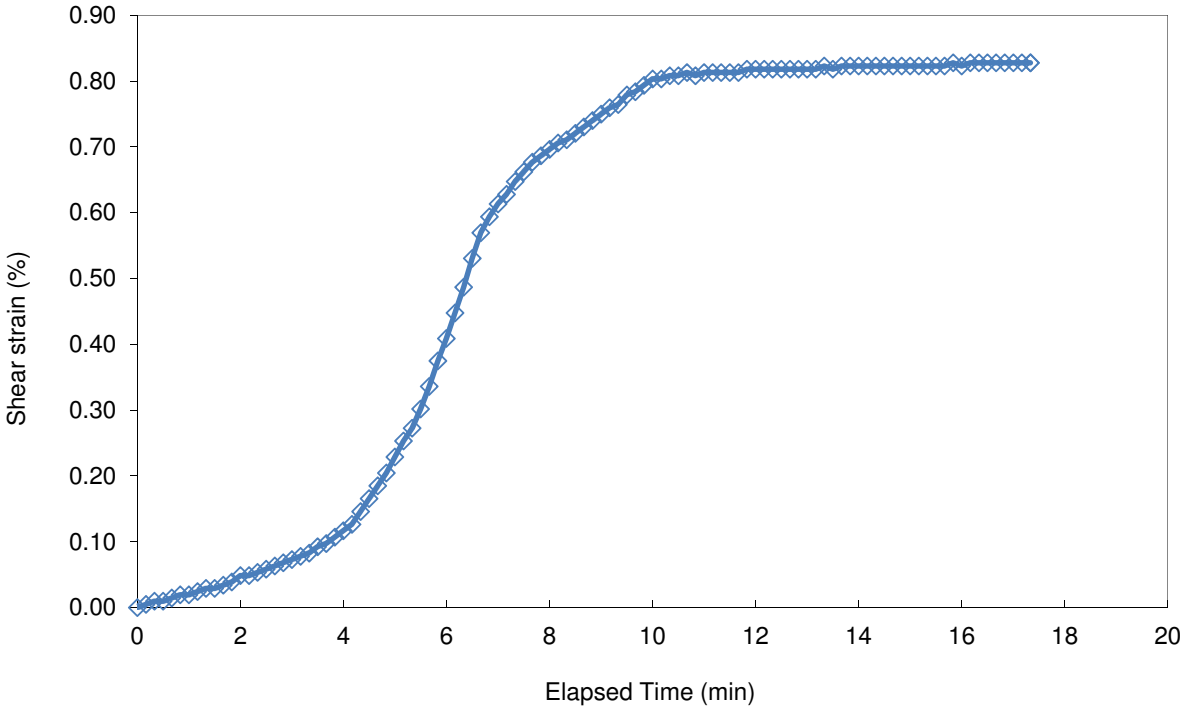

Loading to average shear stress #1

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Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 21/01/2016		

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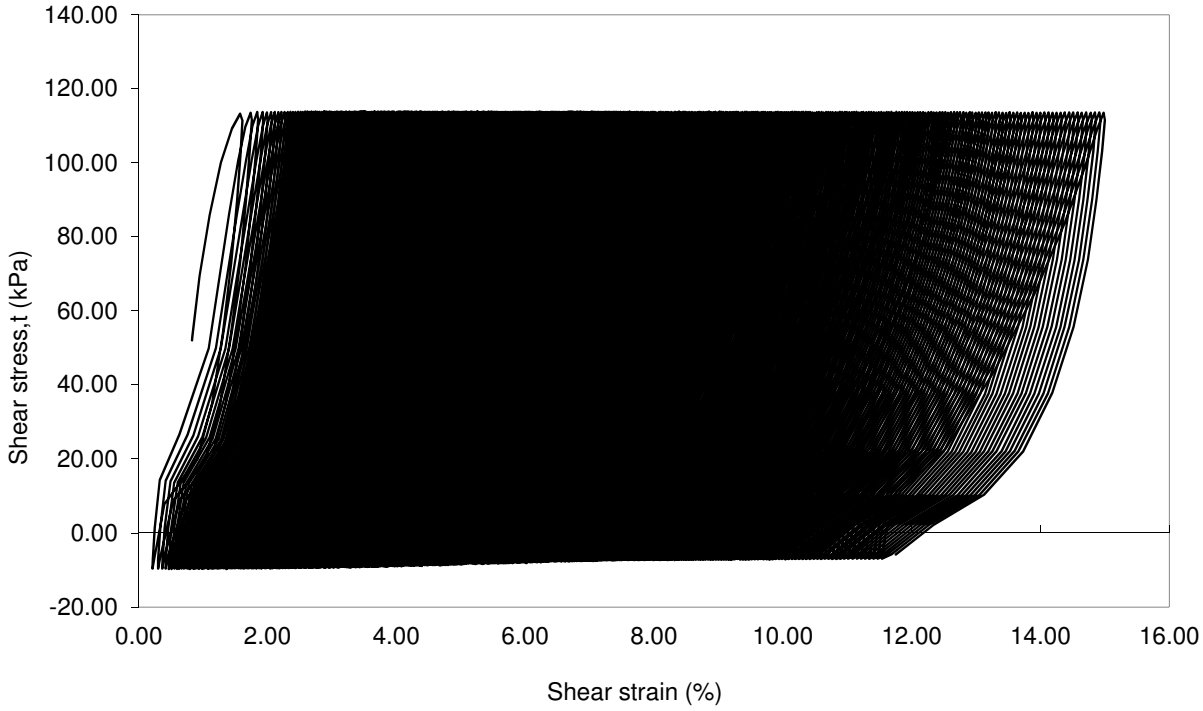

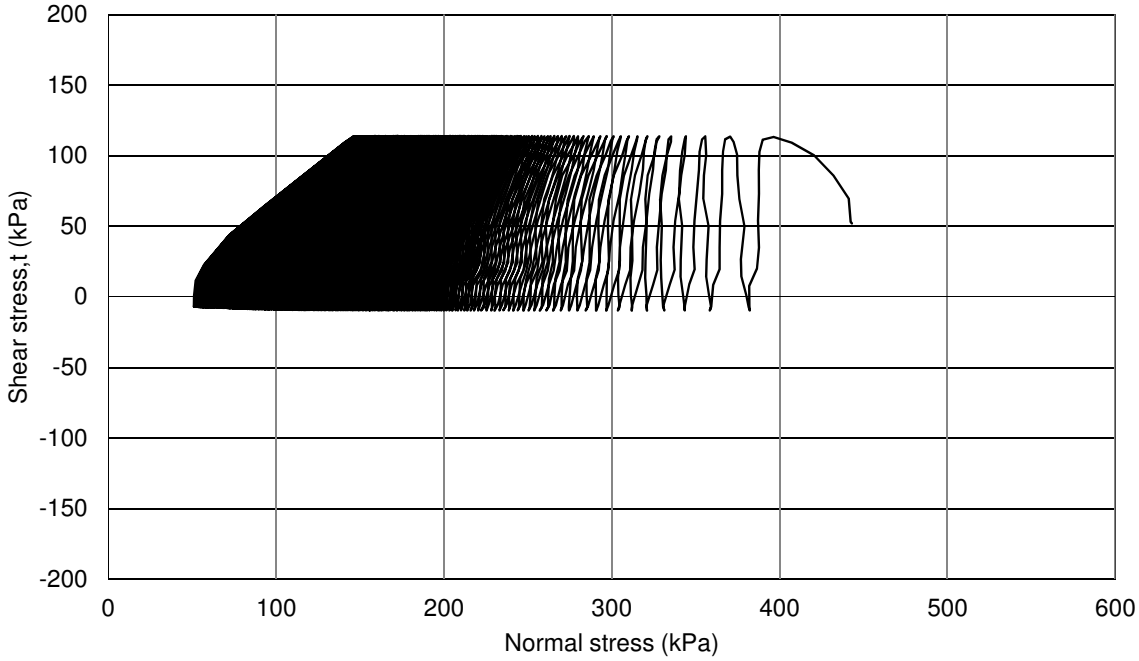

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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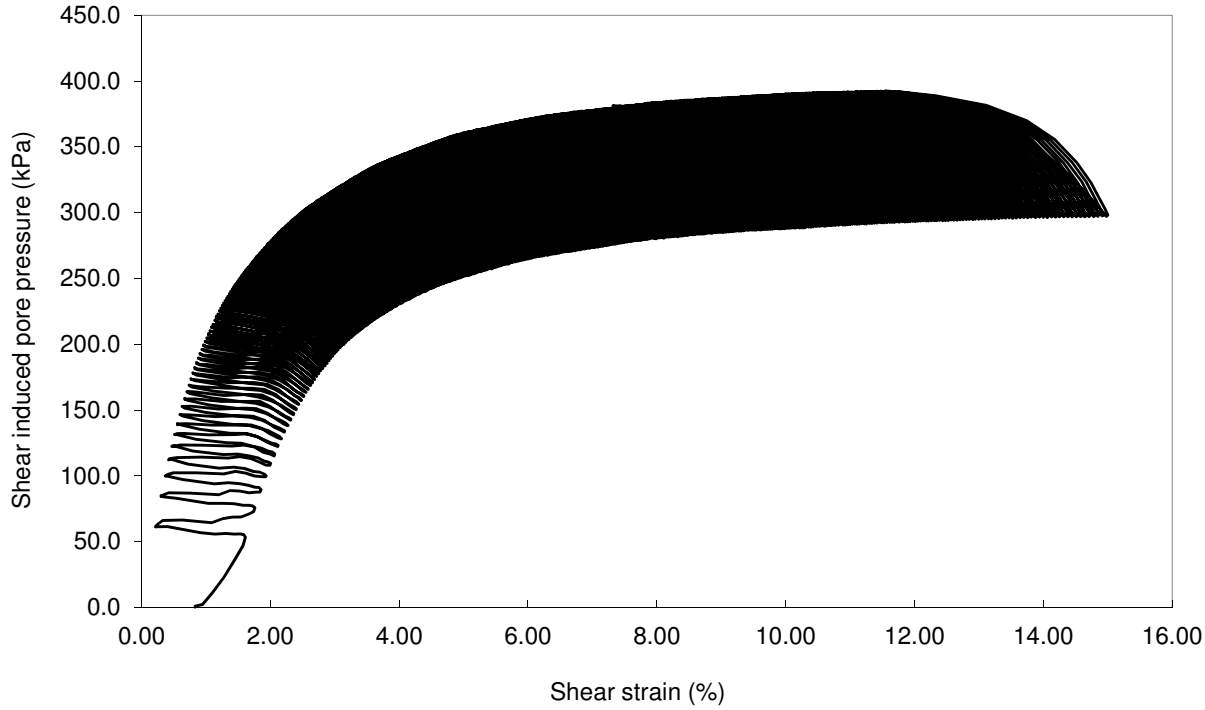

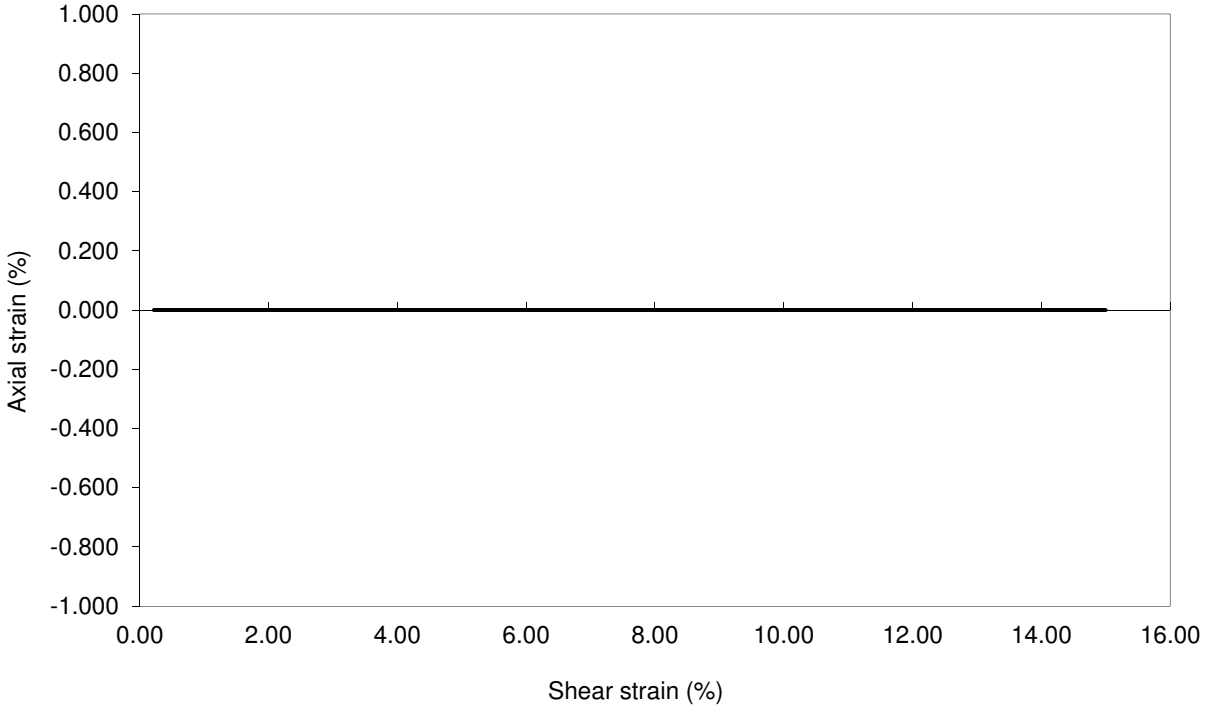

Cyclic simple shear #1

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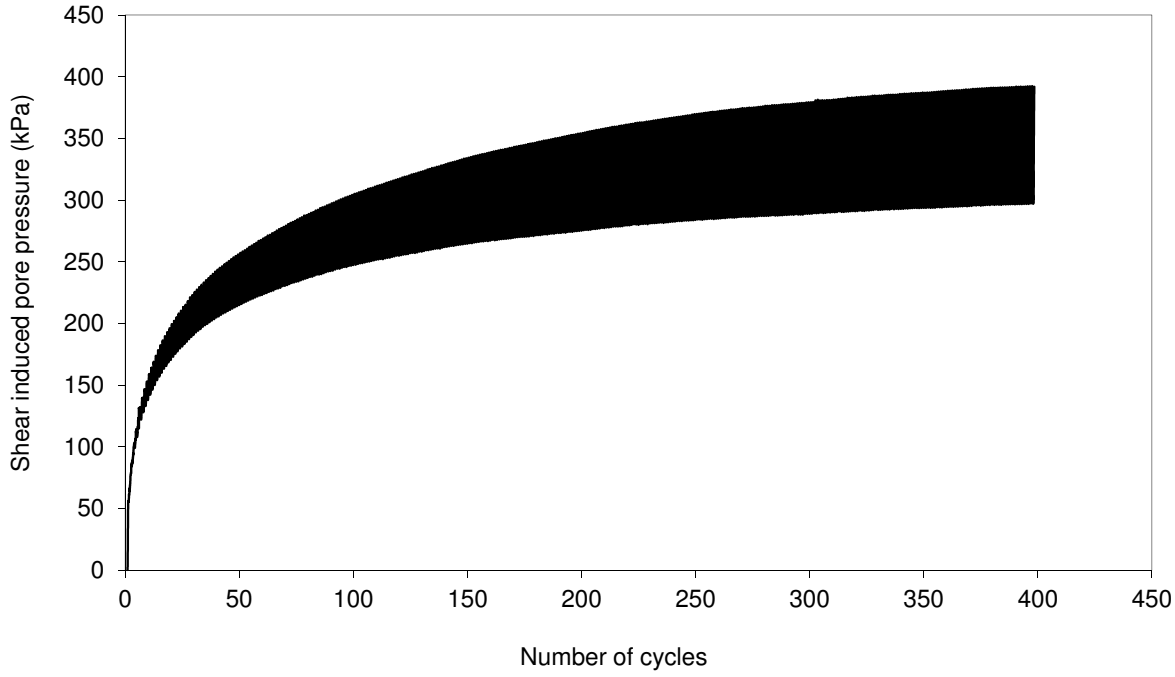

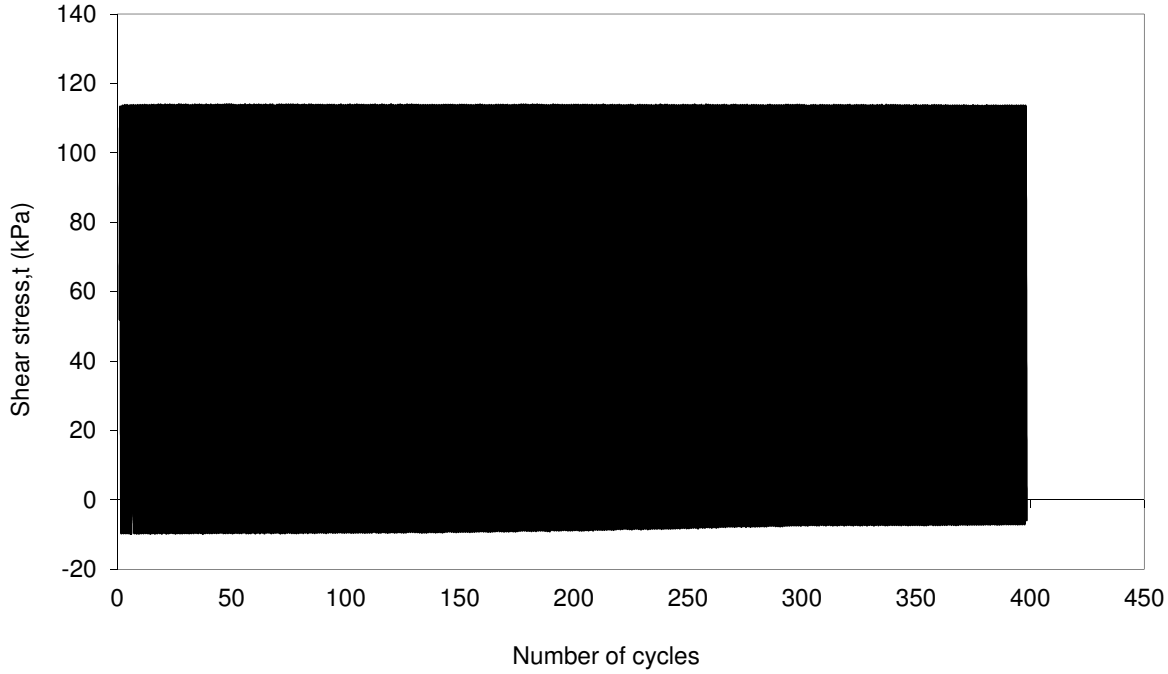

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with snad lenses and occasional shells
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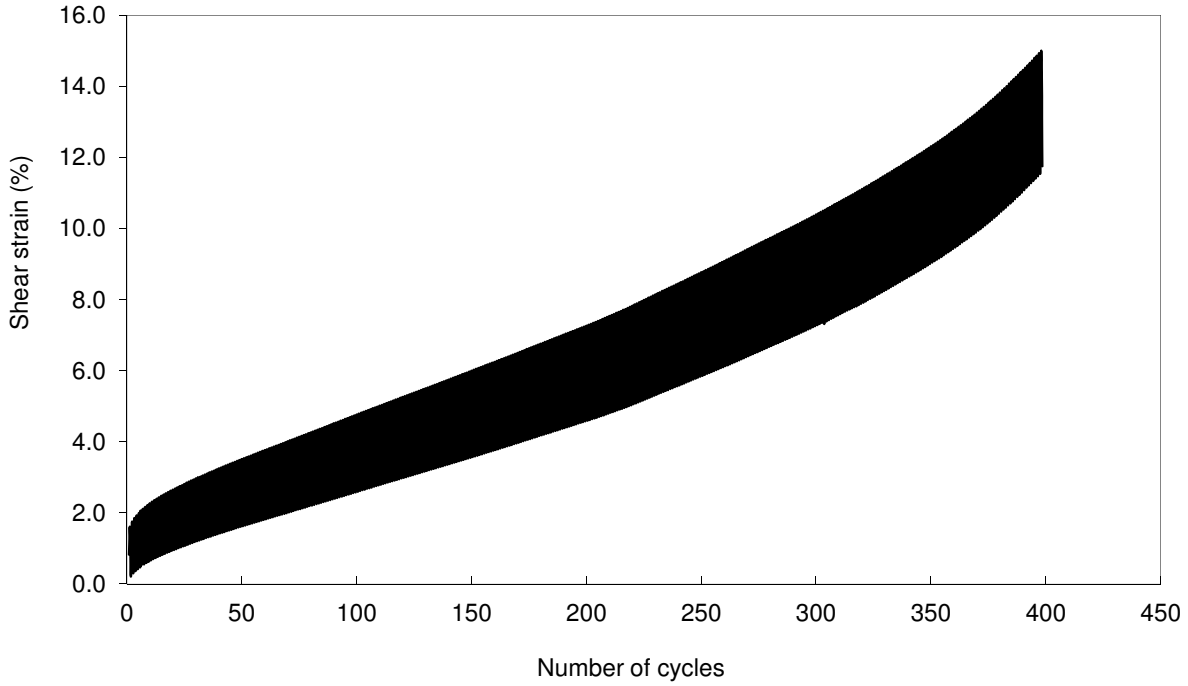

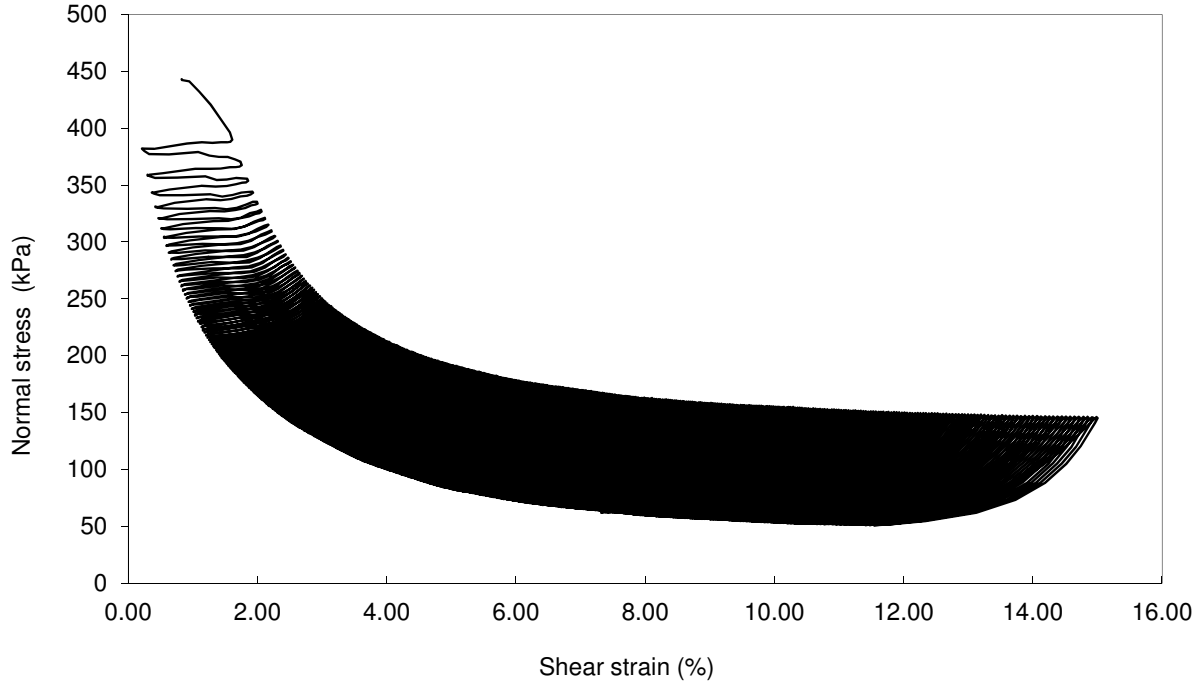

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	G17A	Description (visual) :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #2)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.5	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	36.16	%	36.67	%	
Bulk density :	1.75	Mg/m³			
Dry density :	1.29	Mg/m³			
Particle density (assumed)	2.67	Mg/m³			
Initial voids ratio (e_o)	1.0731				
Test Duration:				3 Days	

END OF CONSOLIDATION #1		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	7.86	% (for stage)
Normal stress:	481.8	kPa
Voids ratio (e_o):	0.9102	
Max. Consolidation stress:	481.8	kPa
Max. Consolidation strain:	7.86	% (for stage)
Duration:	1121	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	446.3	kPa
Shear stress	52.2	kPa
Duration	56	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	62.0	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	63	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	3.055	0.207	154.0	-50.9	113.4	85.7
5	3.589	0.585	154.6	-50.8	171.7	143.7
10	4.139	0.938	154.7	-50.7	217.1	173.2
20	4.970	1.432	154.7	-50.4	254.4	203.3
30	5.792	1.905	154.7	-50.3	280.4	222.7
40	6.845	2.510	154.4	-50.0	303.5	238.4
45	7.556	2.914	154.2	-49.8	314.6	245.3
50	8.519	3.453	153.9	-48.9	325.6	252.1
55	10.026	4.310	153.1	-47.7	338.2	258.3
60	13.232	6.170	150.9	-45.8	351.4	264.0
63	17.618	9.194	147.3	-44.7	353.4	261.5

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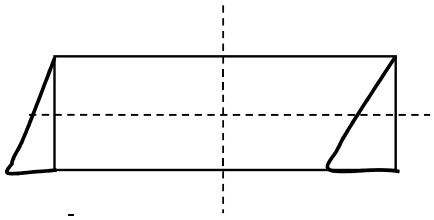
Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

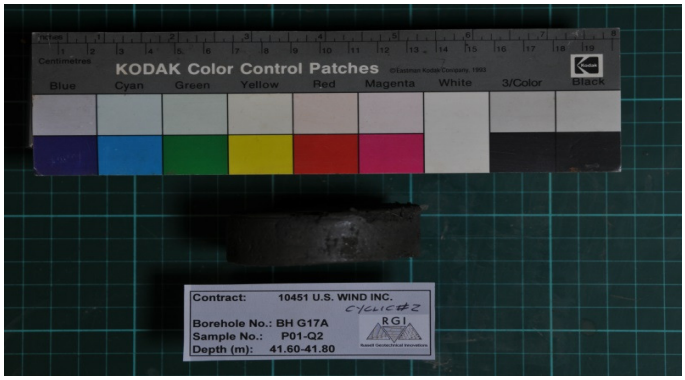
Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #2)

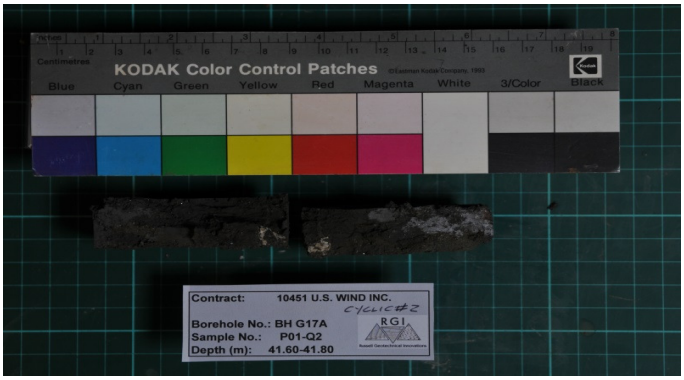
SPECIMEN DETAILS

Initial Height:	21.5	mm
Initial Diameter:	66.4	mm



Elevation





Failure Sketch

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Date: 26/01/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

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Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
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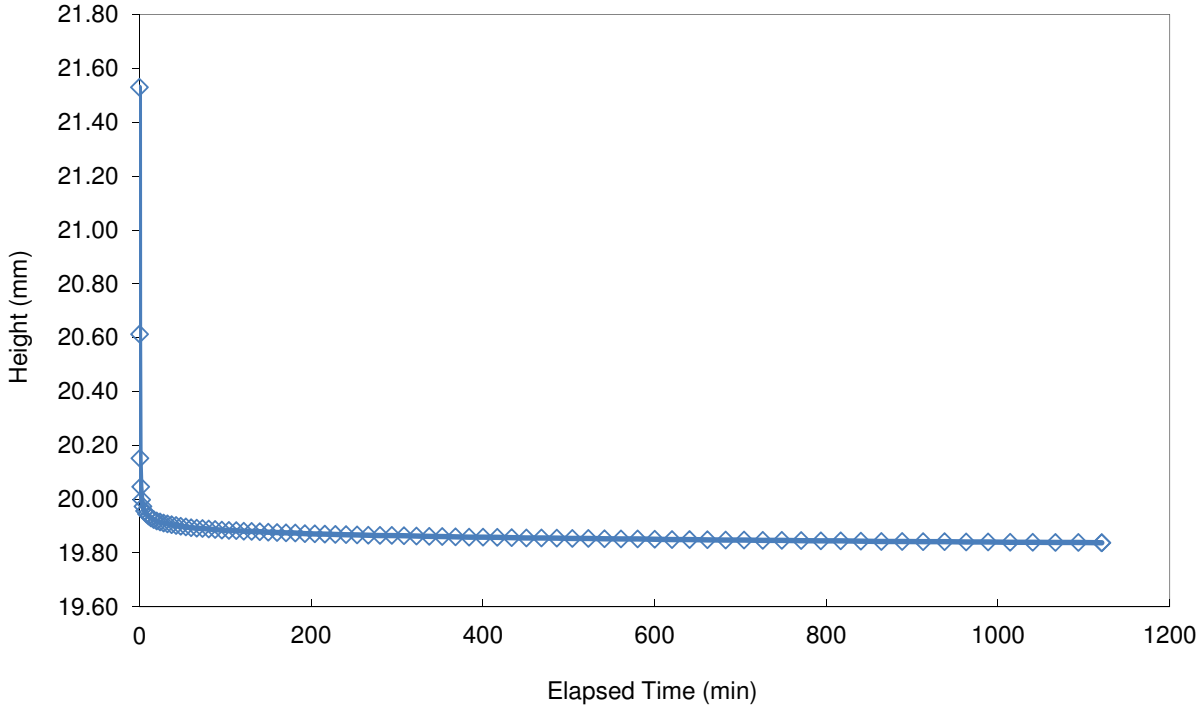

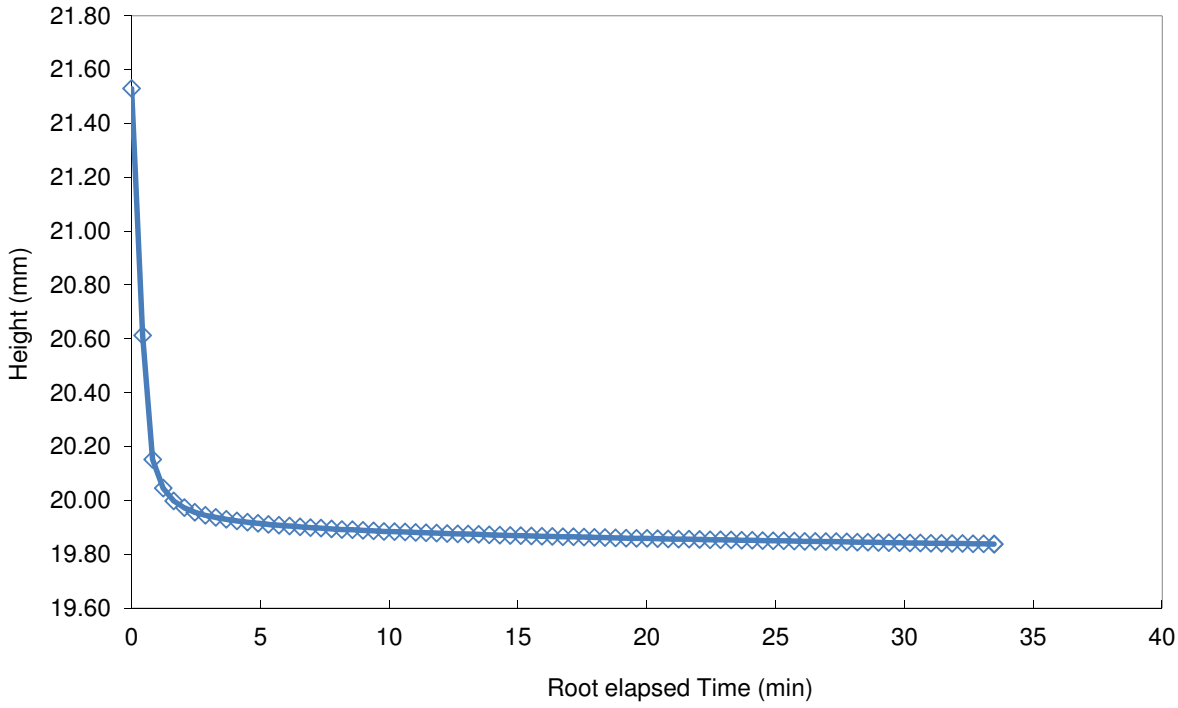

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
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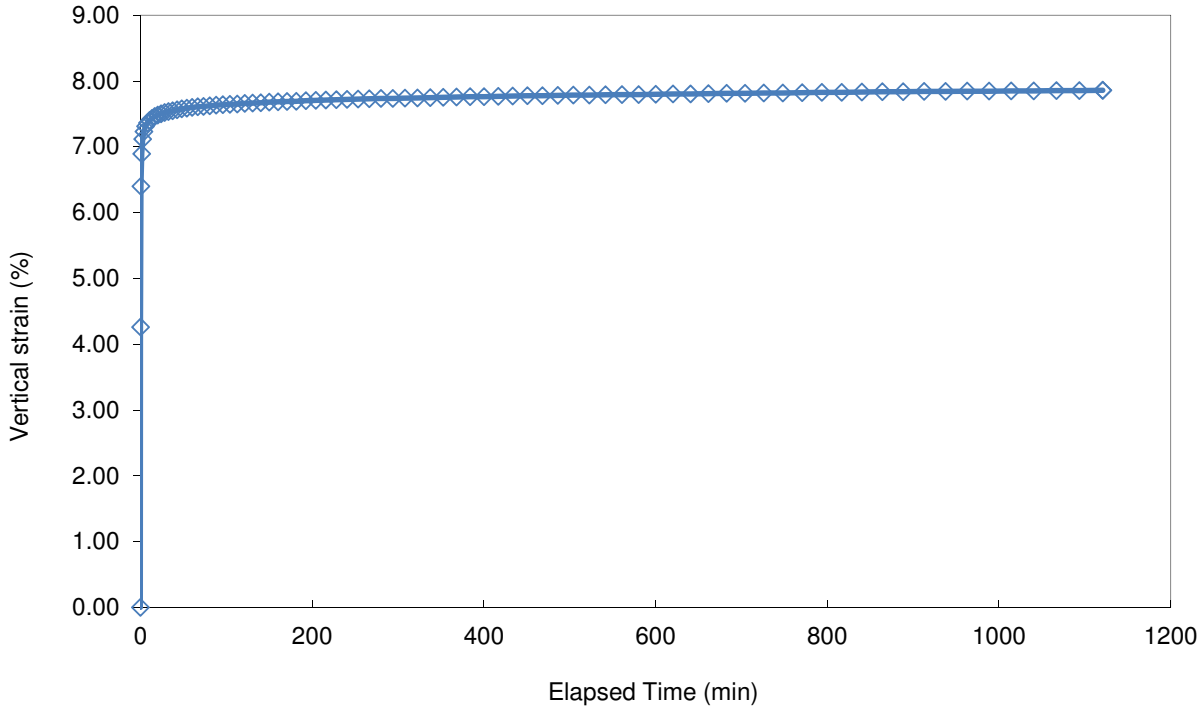

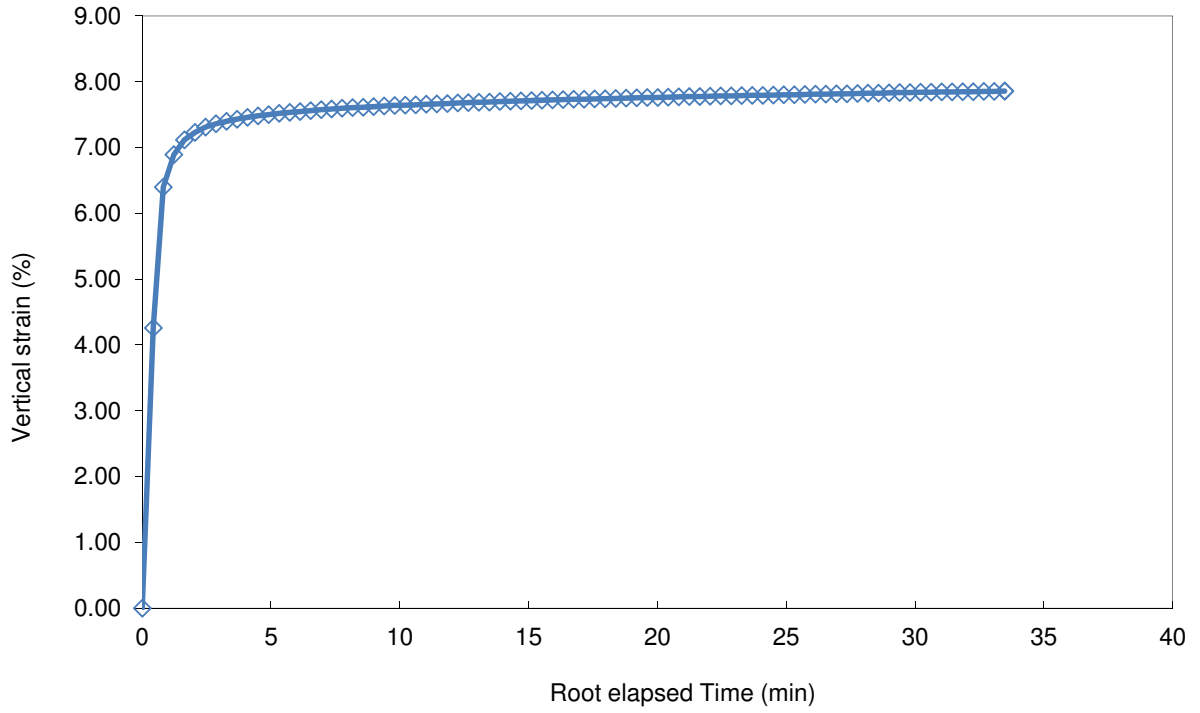

Consolidation stage #1

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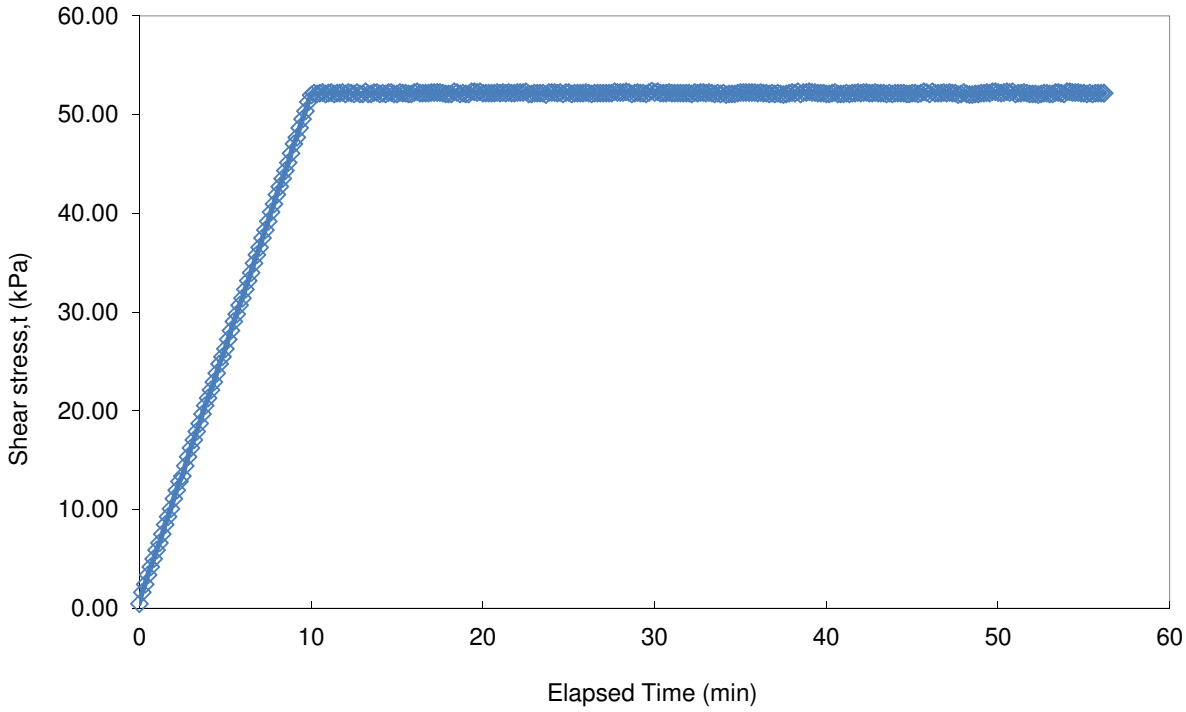

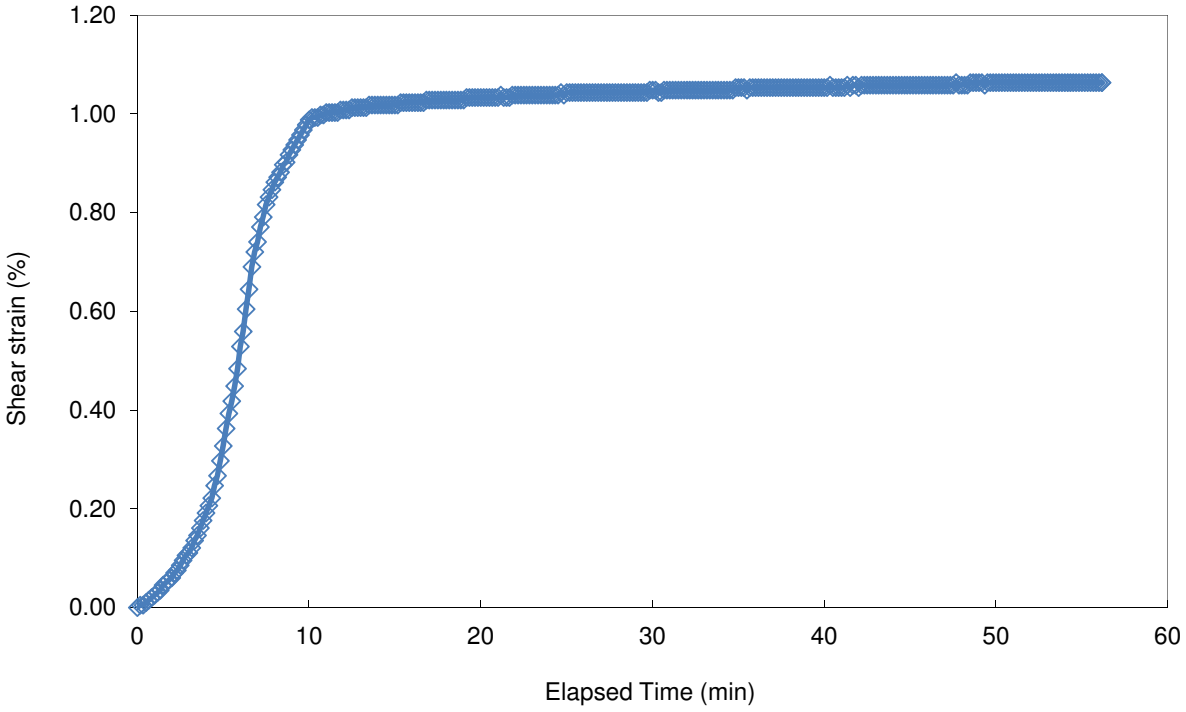

Loading to average shear stress #1

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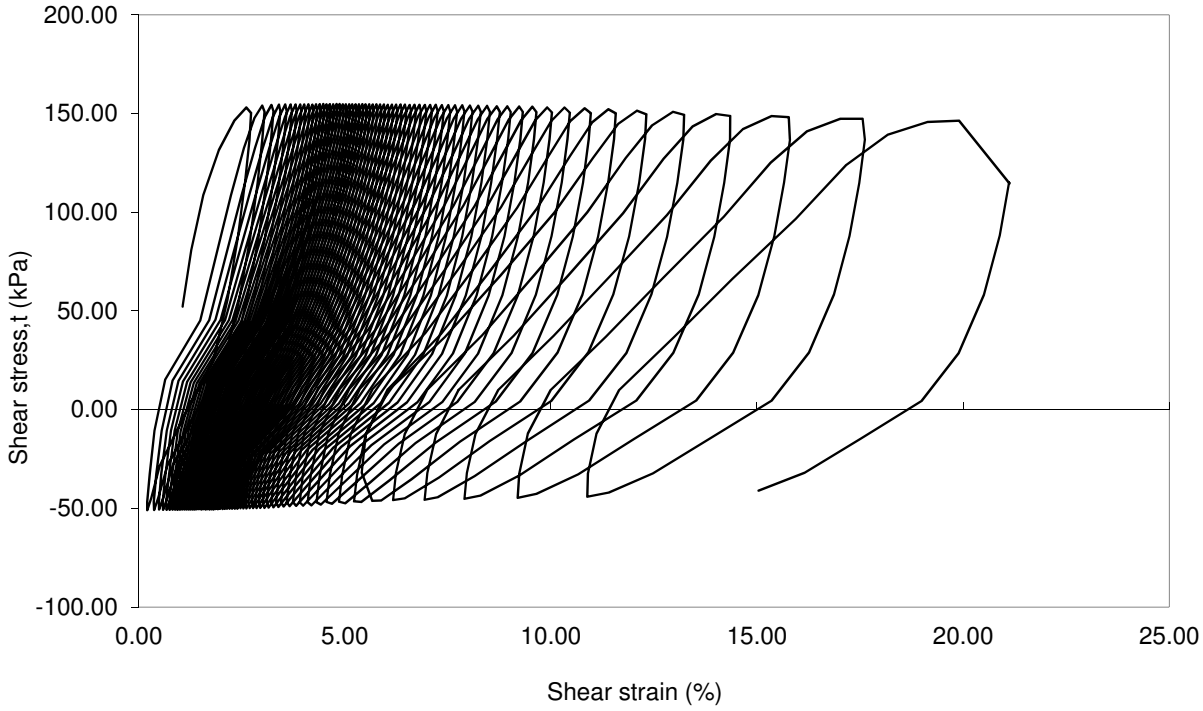

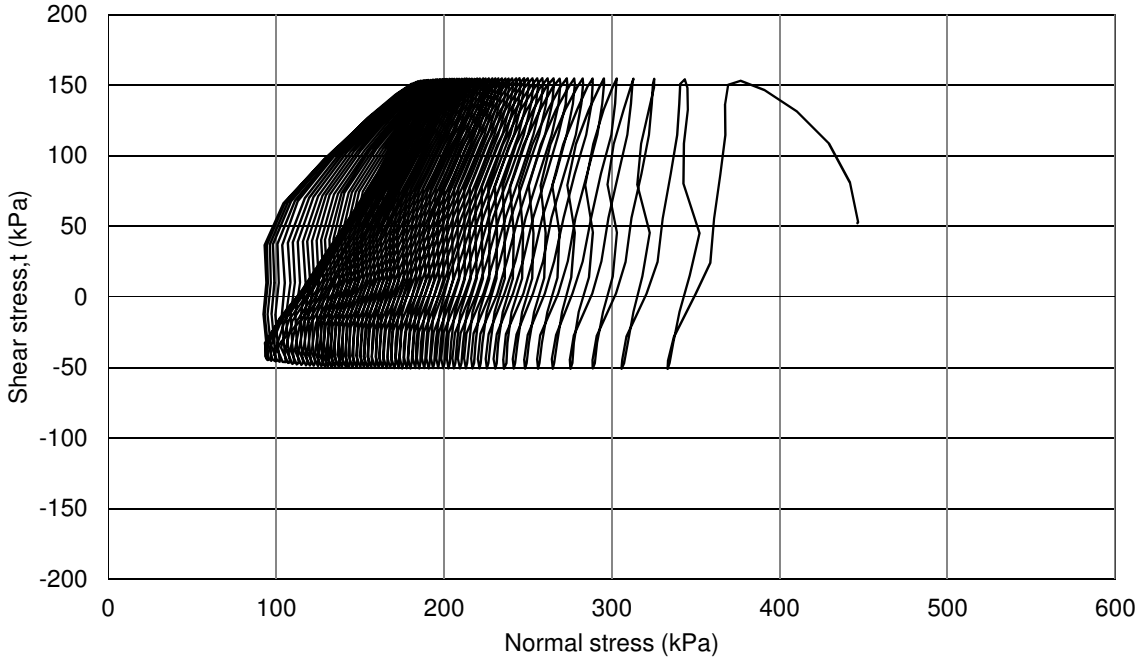

Cyclic simple shear #1

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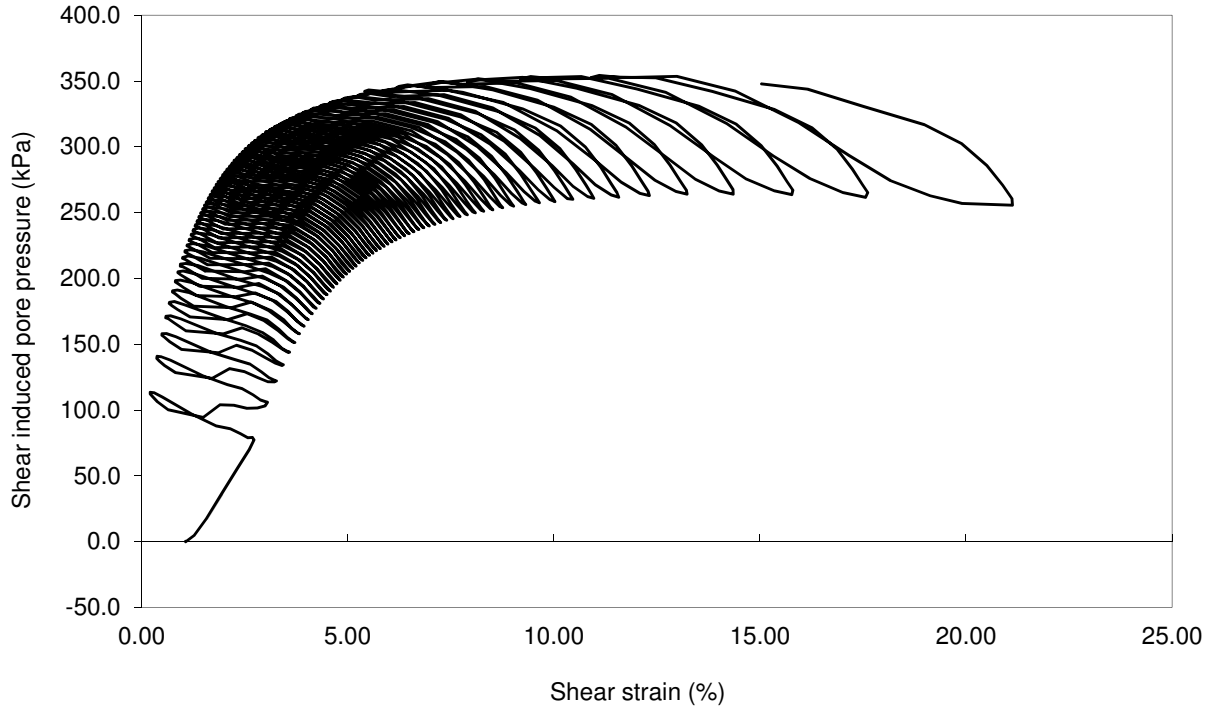

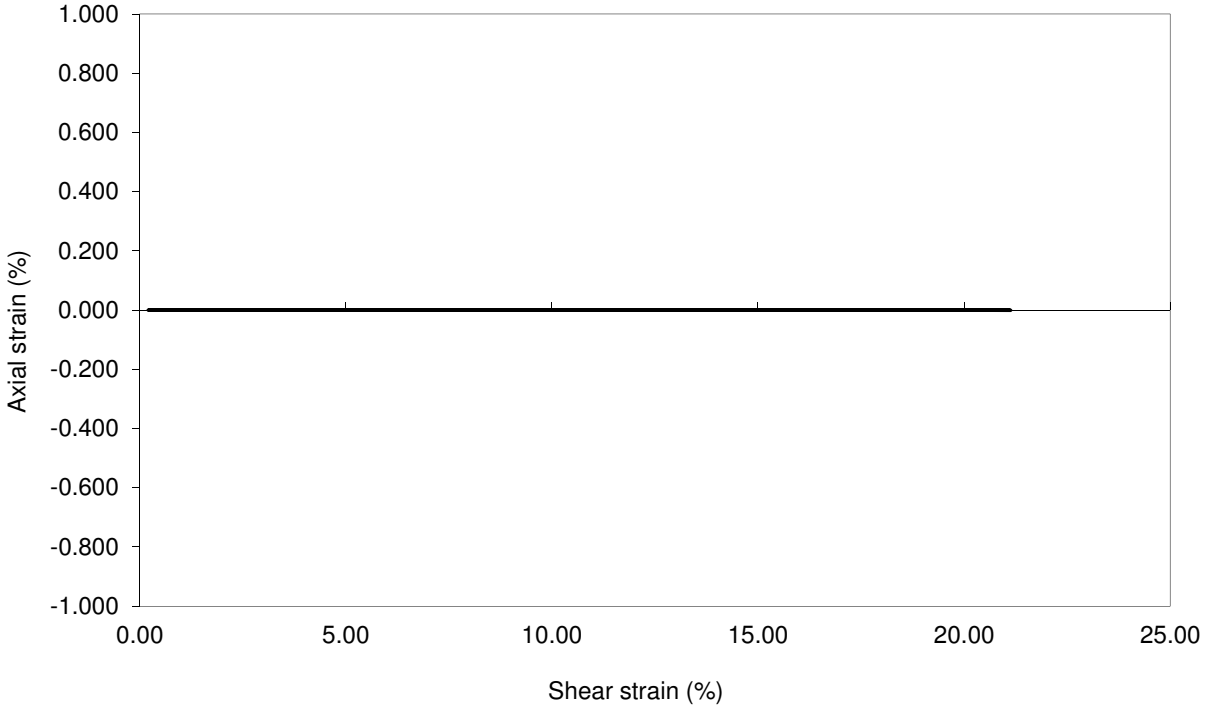

Cyclic simple shear #1

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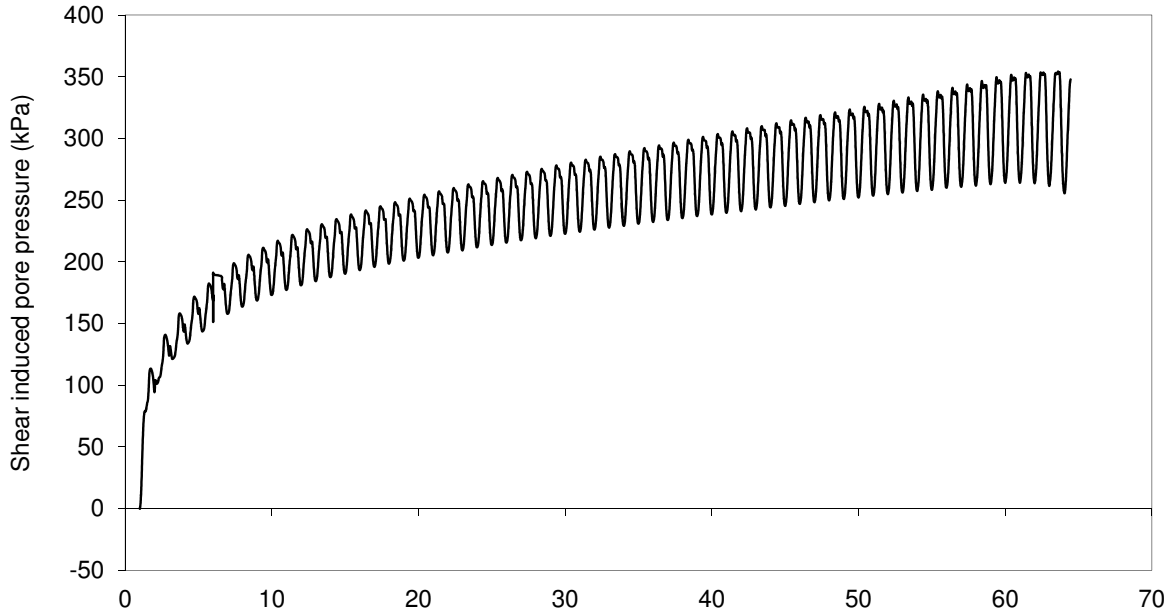
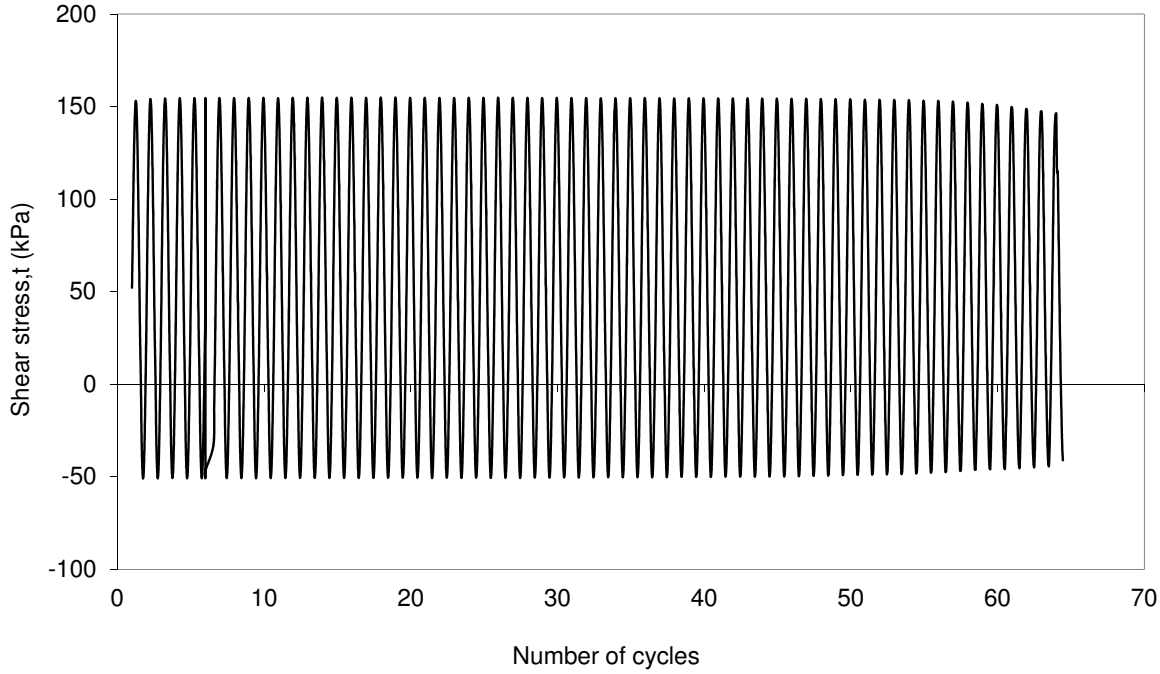
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 26/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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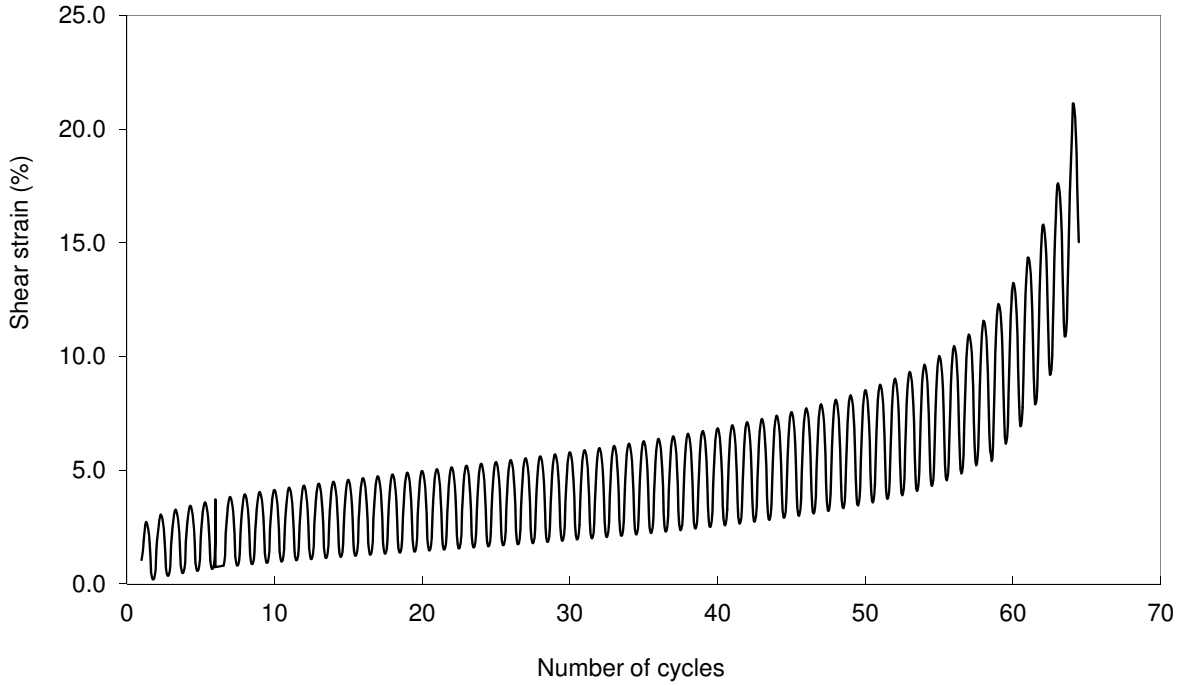
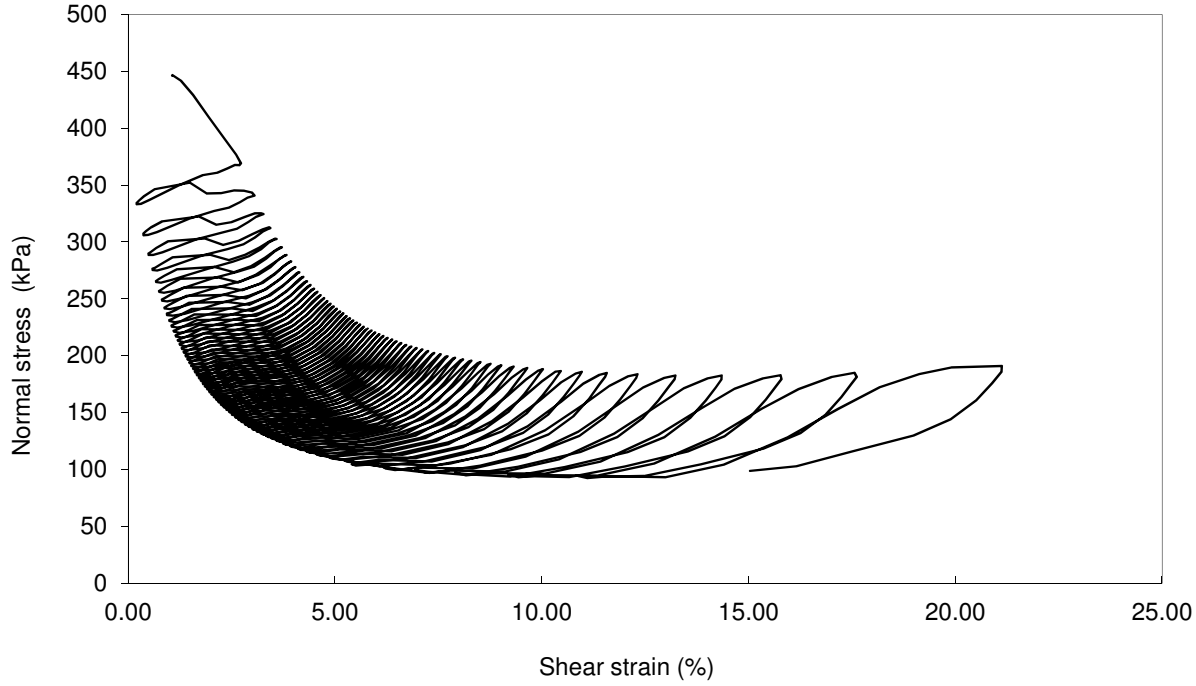
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 26/01/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	G17A	Description (visual) :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.5	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	42.16	%	41.10	%	
Bulk density :	1.75	Mg/m³			
Dry density :	1.23	Mg/m³			
Particle density (assumed)	2.67	Mg/m³			
Initial voids ratio (e_o)	1.1645				
Test Duration:				3 Days	

END OF CONSOLIDATION #1		
Height :	19.7	mm
Diameter :	66.4	mm
Axial strain:	8.32	% (for stage)
Normal stress:	481.8	kPa
Voids ratio (e_o):	0.9844	
Max. Consolidation stress:	481.8	kPa
Max. Consolidation strain:	8.32	% (for stage)
Duration:	1148	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)		
Height :	19.7	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	453.2	kPa
Shear stress	52.2	kPa
Duration	19	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	45.9	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	1500	Did not Fail

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.545	0.299	98.6	6.9	39.4	11.6
5	1.626	0.446	98.6	7.1	55.2	31.2
10	1.692	0.532	98.5	7.0	66.9	44.5
20	1.753	0.608	98.7	7.1	78.1	55.6
50	1.824	0.699	98.7	6.9	89.9	68.3
100	1.874	0.770	98.8	6.9	97.5	77.0
200	1.925	0.851	98.7	6.6	104.3	86.2
500	2.001	1.008	98.8	6.5	115.9	97.4
800	2.037	1.023	98.7	6.6	120.0	101.2
1200	2.067	1.028	98.8	6.6	122.8	104.7
1500	2.082	1.044	98.6	6.6	125.4	108.0

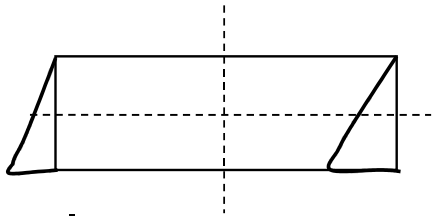
Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 11/02/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

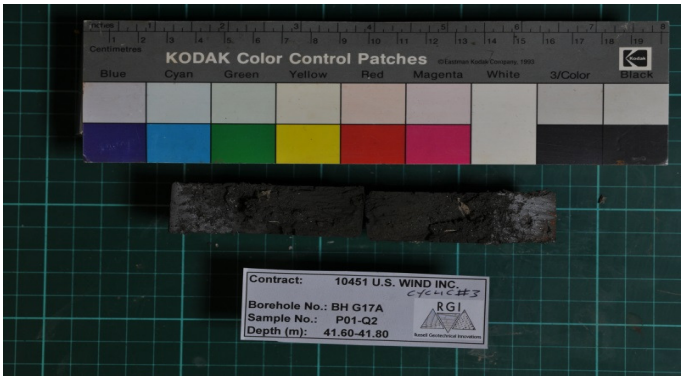
Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)

SPECIMEN DETAILS

Initial Height:	21.5	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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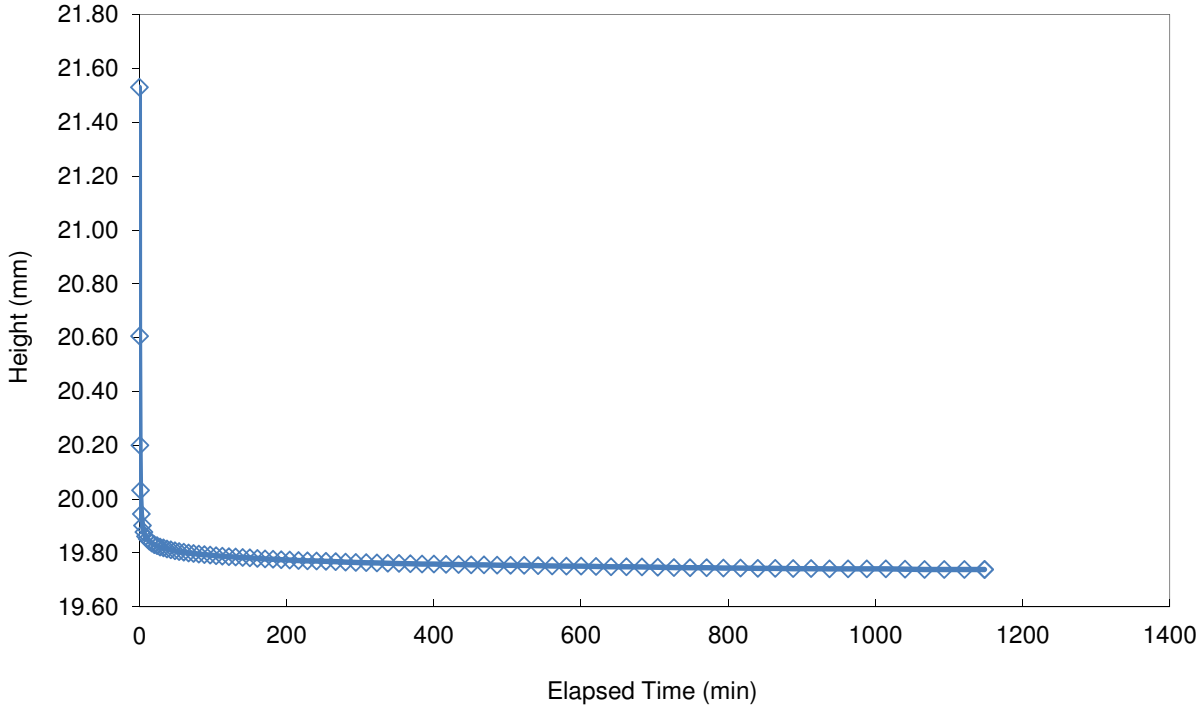
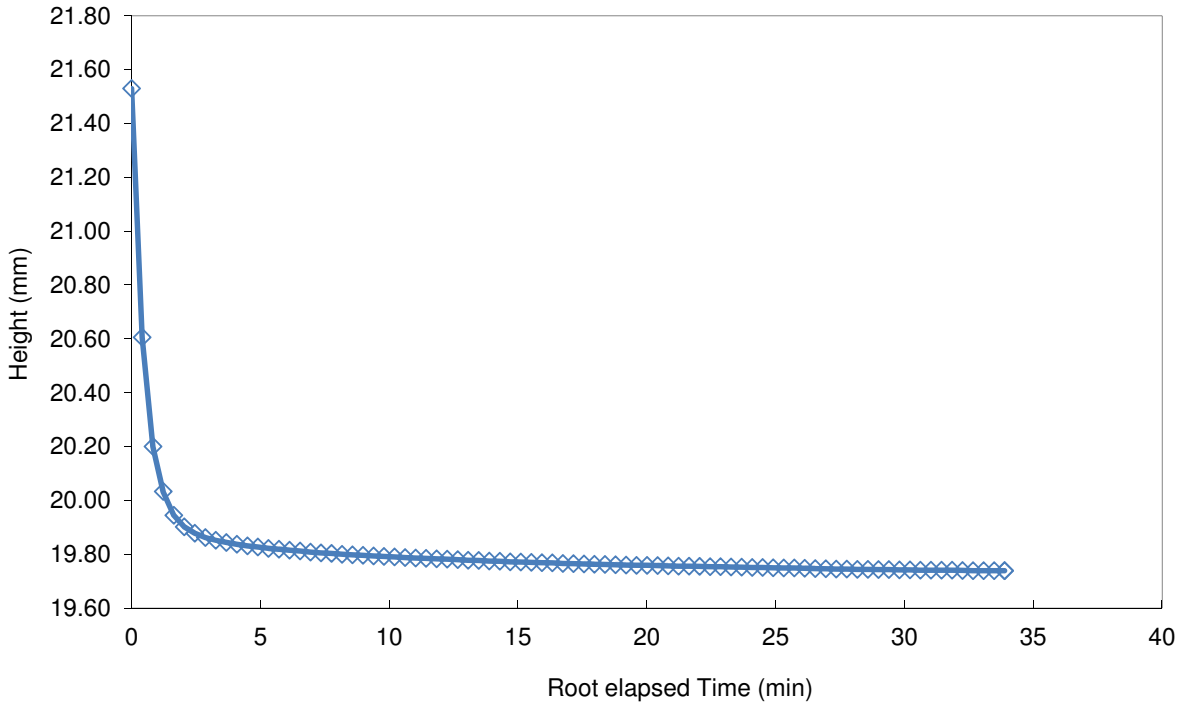
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

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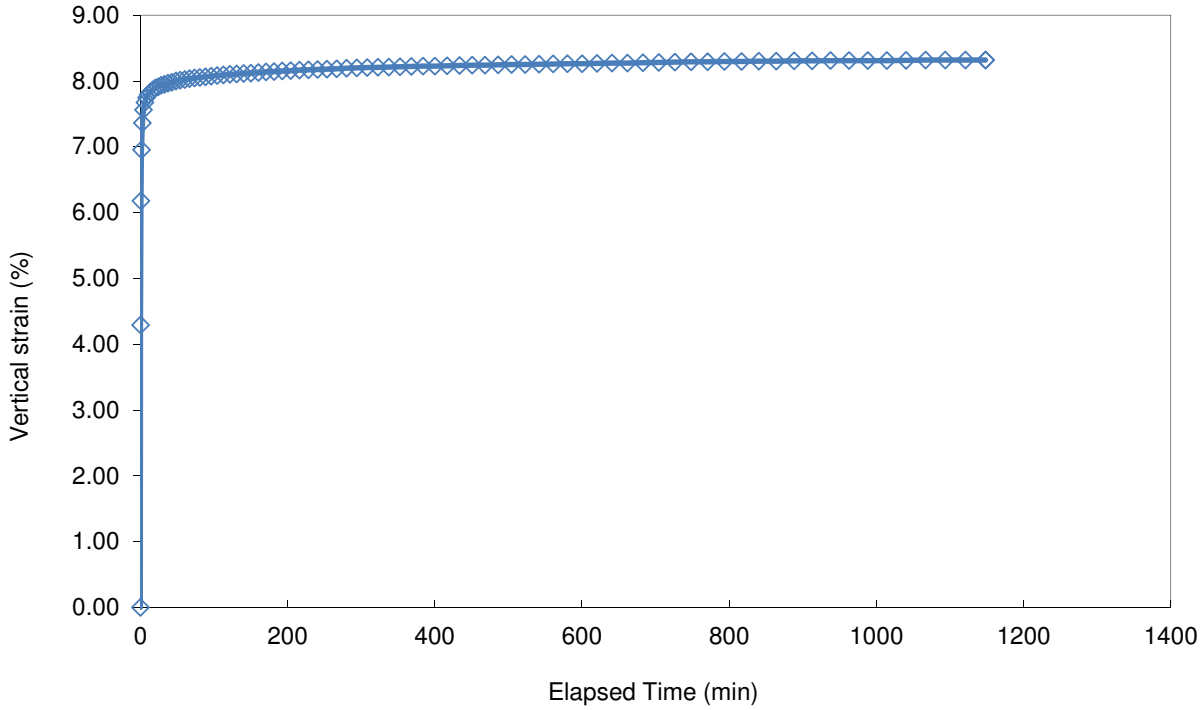
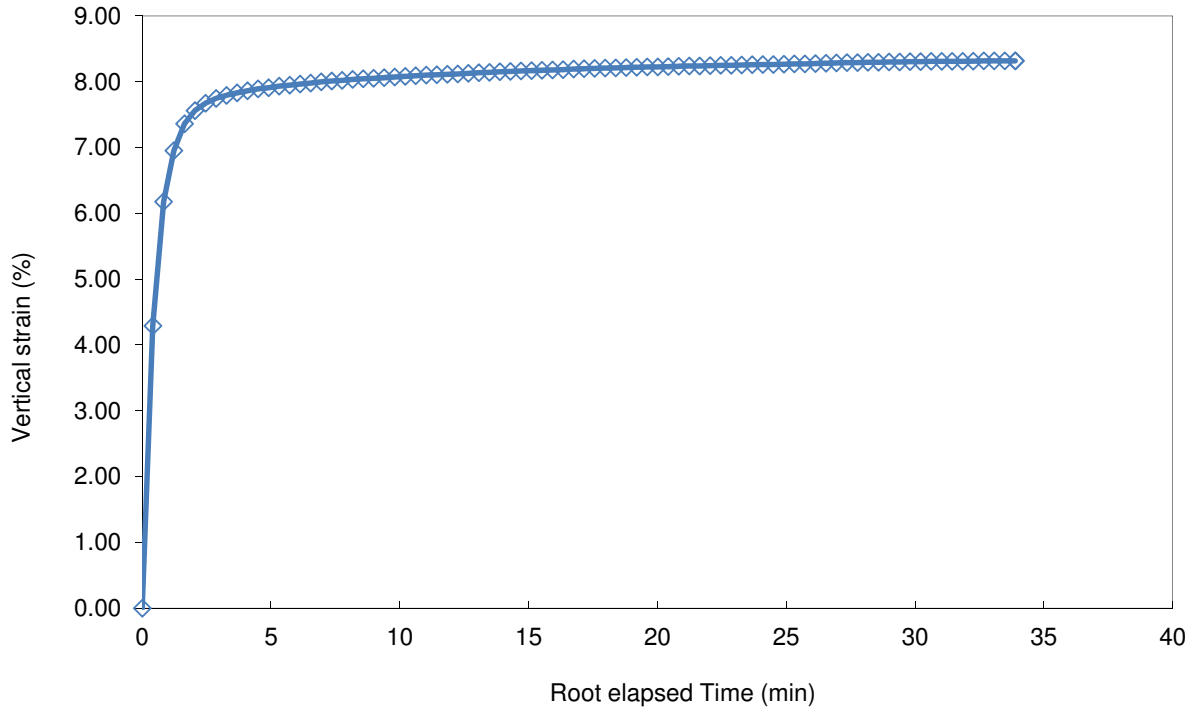
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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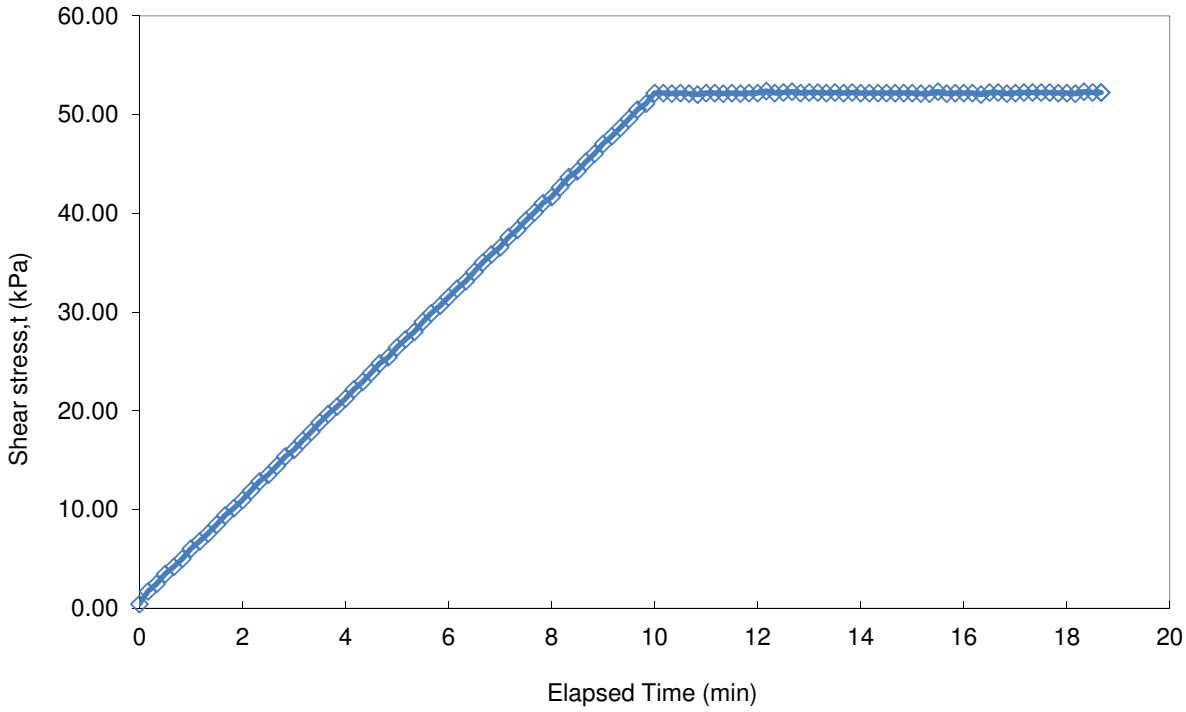
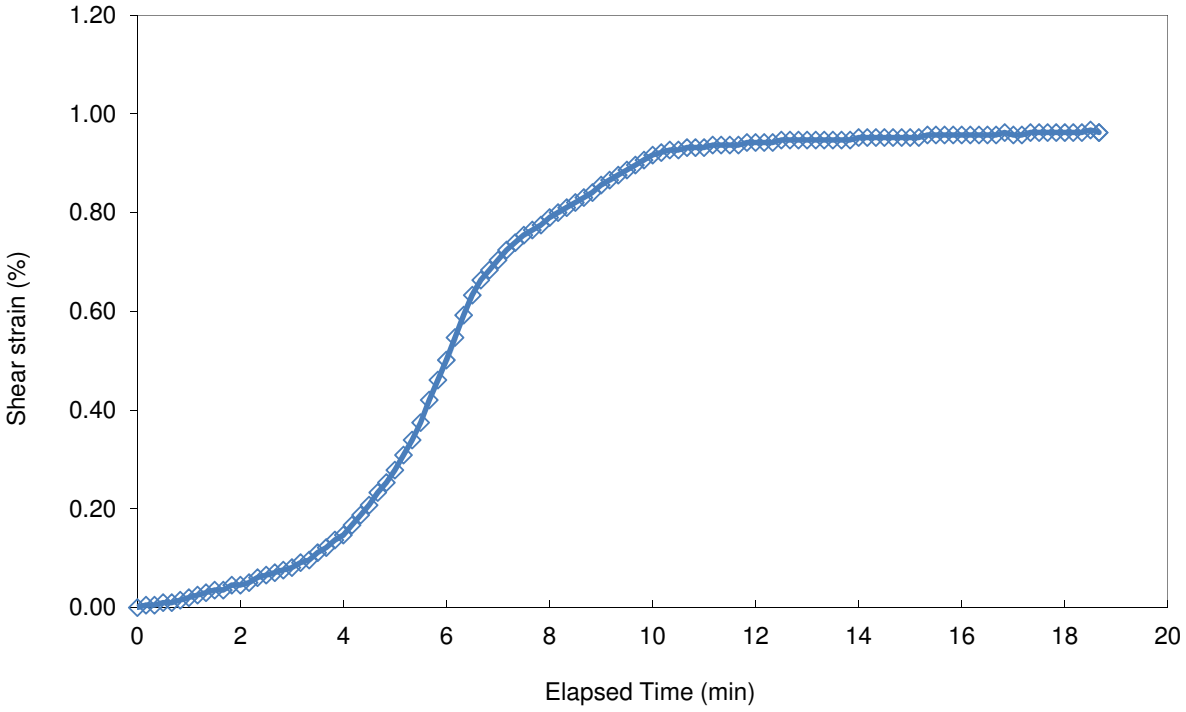
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Loading to average shear stress #1

Checked and approved	Project Number: **RGI/1130**	
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 11/02/2016		

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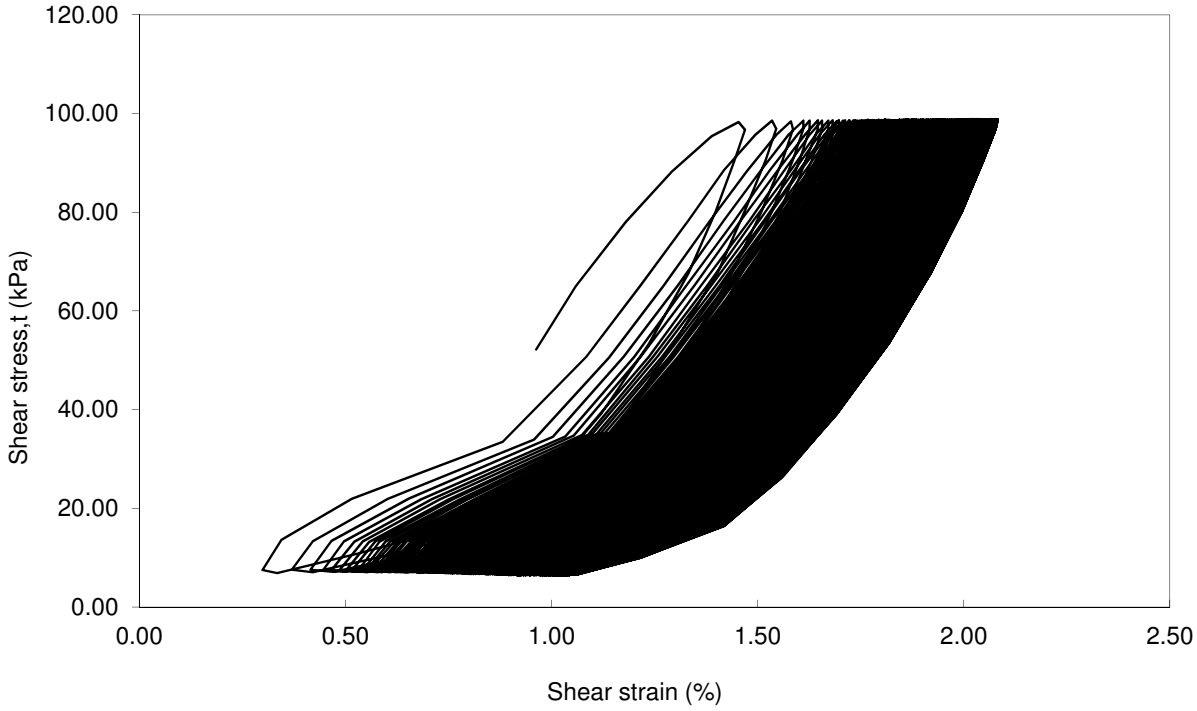
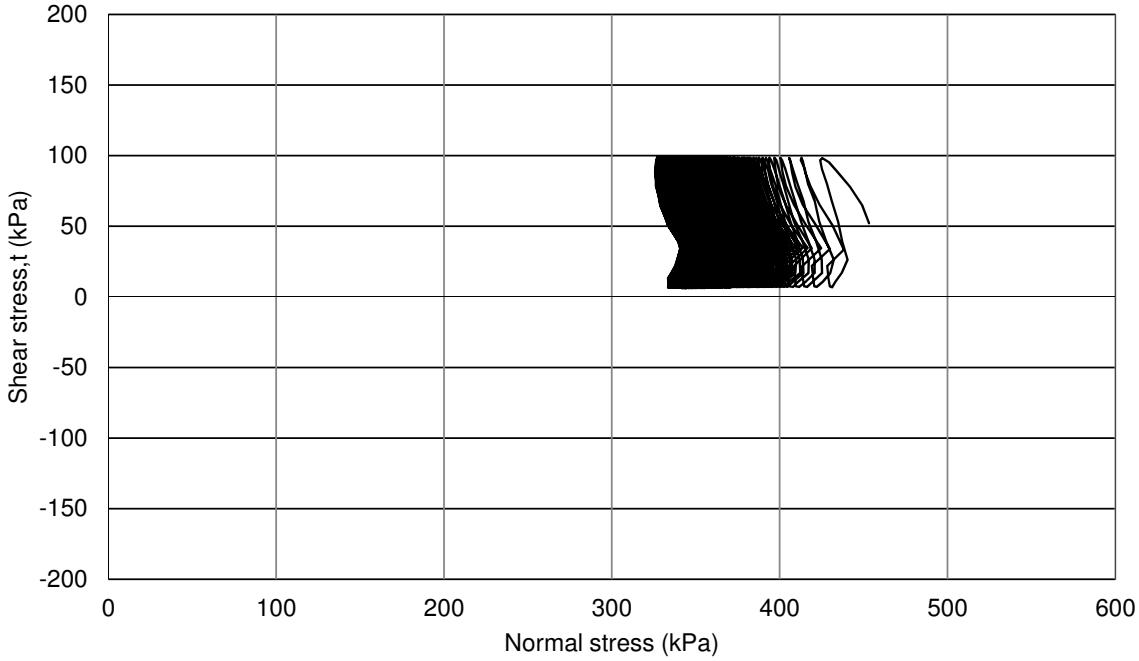
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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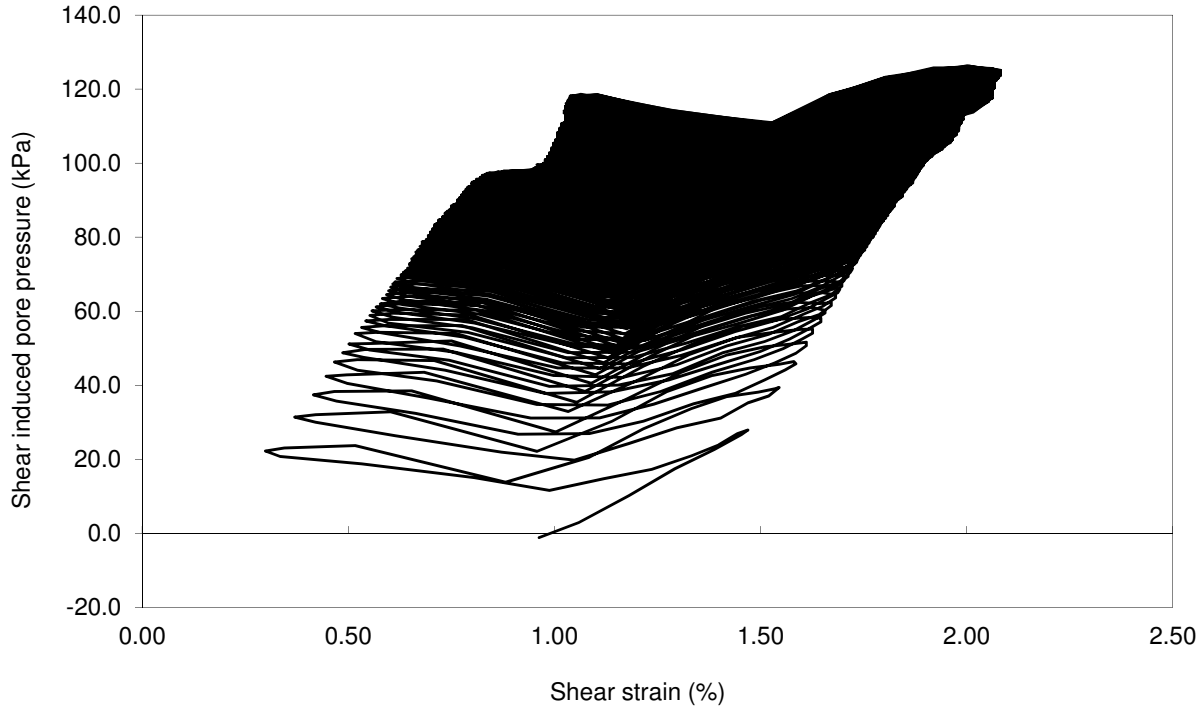
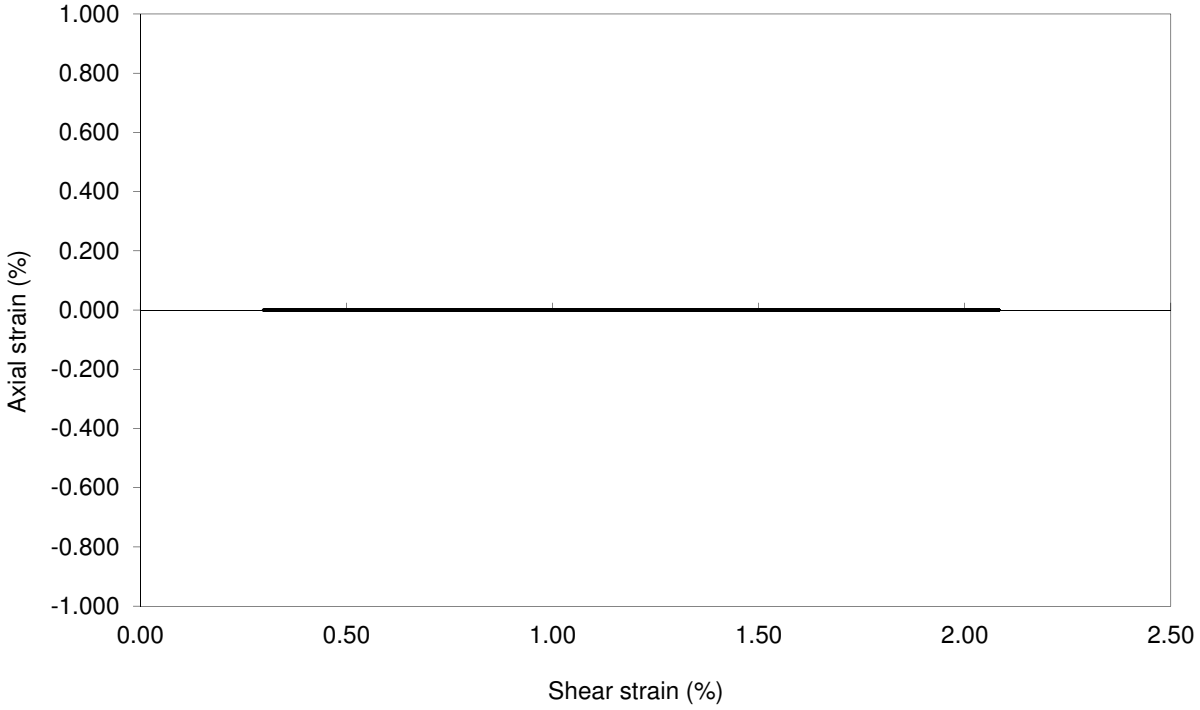
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

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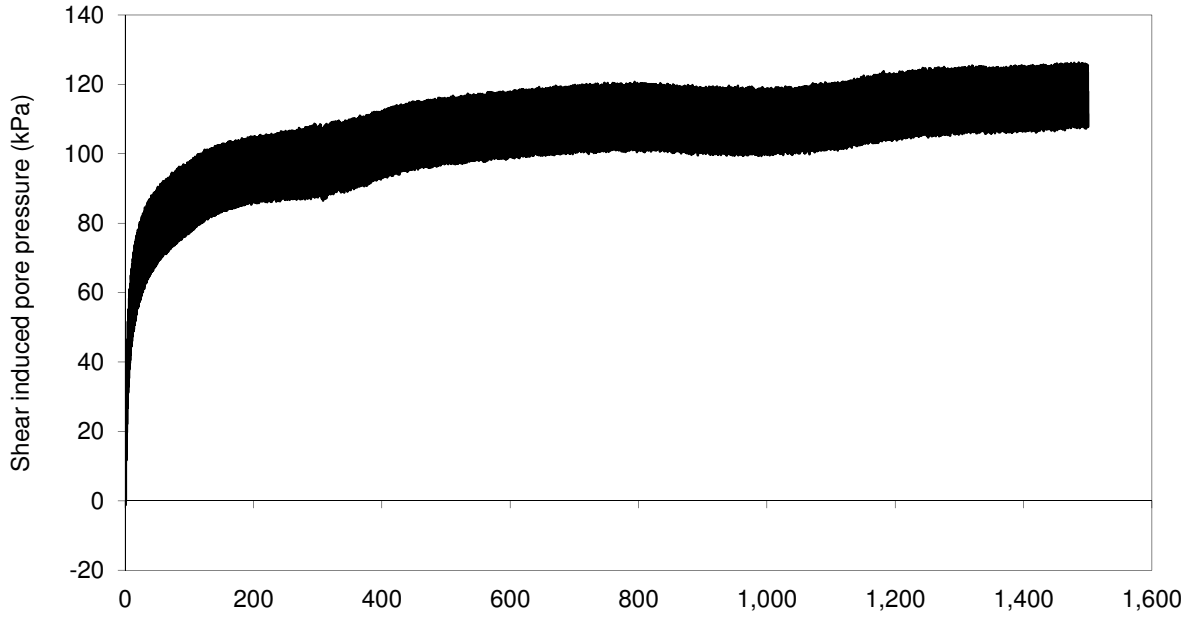
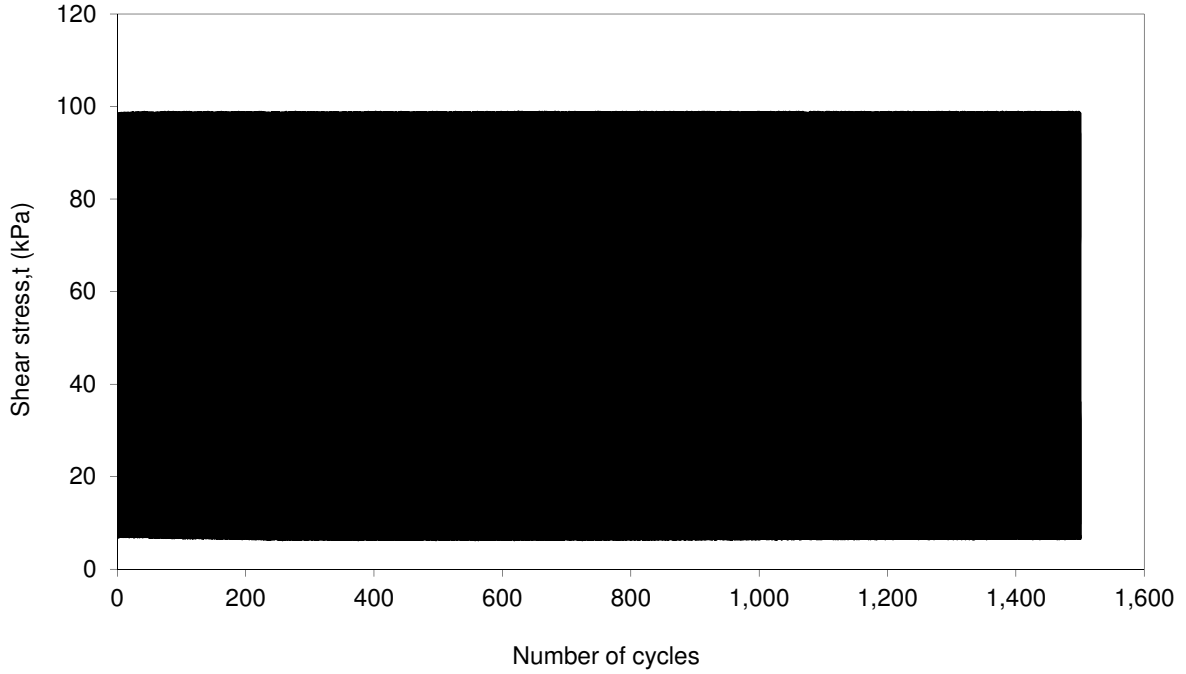
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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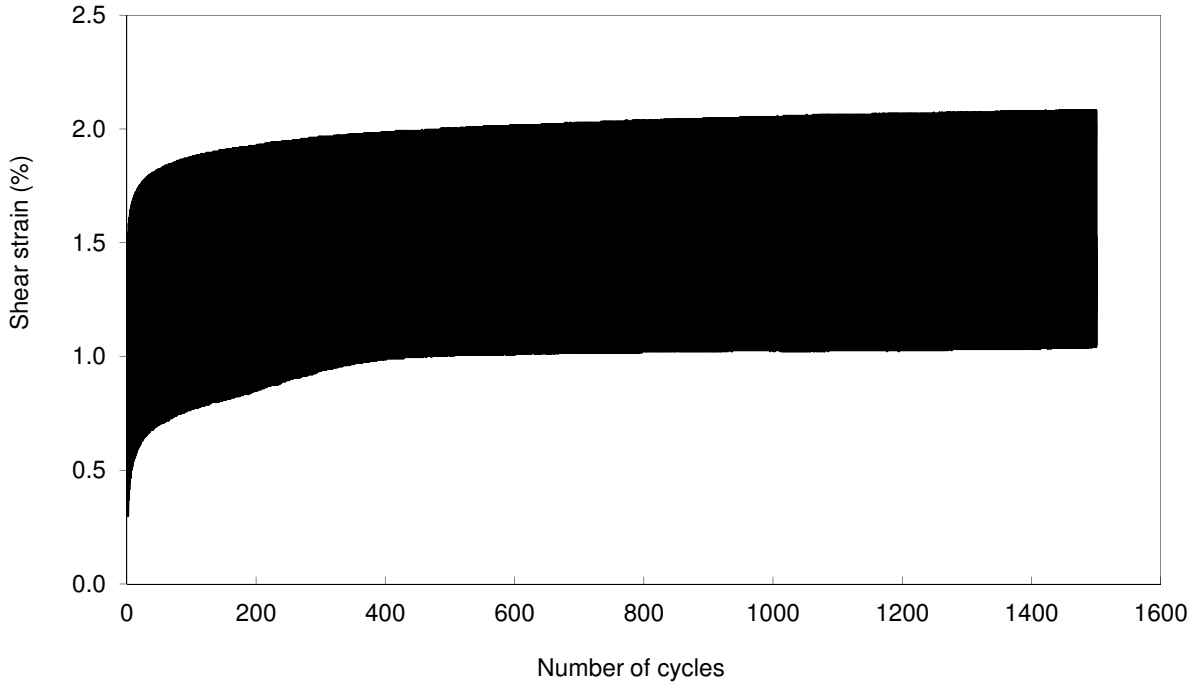
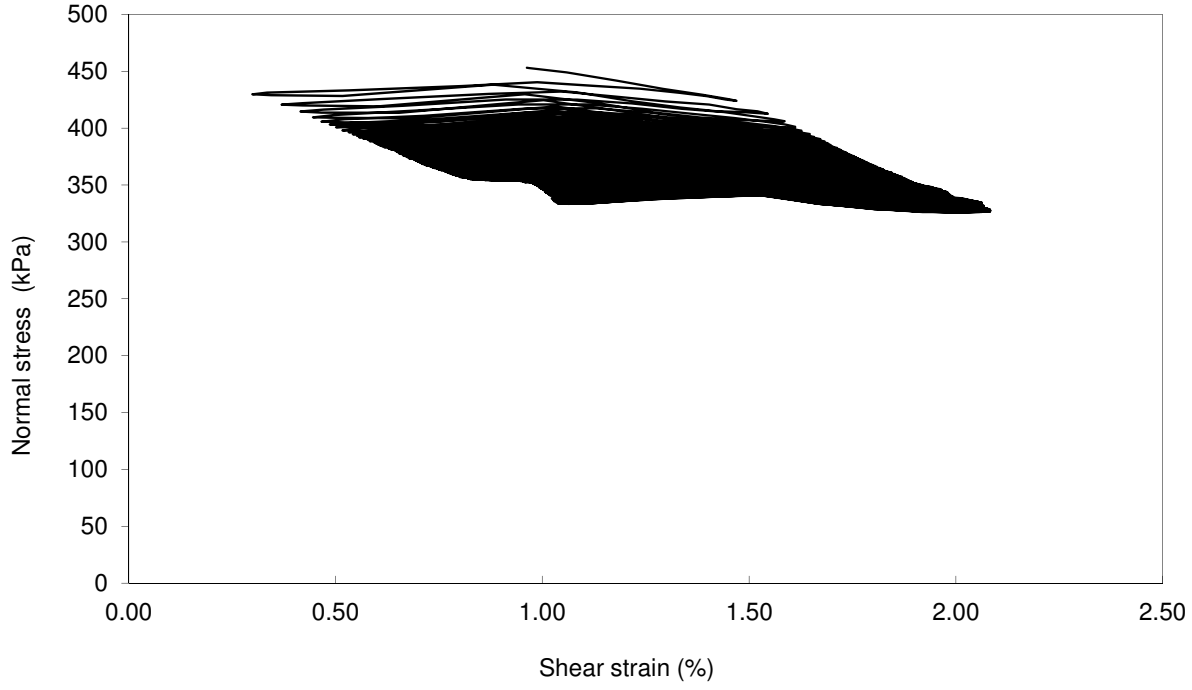
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	G17A	Description :
Sample Number:	P01-Q2	Stiff grey CLAY with sand lenses and occasional shells
Sample Depth (m):	41.65-41.68	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 11/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	H10	Description (visual) :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.55-26.59	(slightly micaceous)- CYCLIC #1

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.1	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	32.01	%	30.42	%
Bulk density :	1.89	Mg/m^3		
Dry density :	1.43	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.8612			
Test Duration:			3 Days	

END OF CONSOLIDATION #1

Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	4.36	% (for stage)
Normal stress:	267.8	kPa
Voids ratio (e_o):	0.7801	
Max. Consolidation stress:	267.8	kPa
Max. Consolidation strain:	4.36	% (for stage)
Duration:	1176	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	255.2	kPa
Shear stress	24.7	kPa
Duration	13	Min.

CYCLIC SHEAR STAGE

Average shear stress:	24.7	(kPa)
Cyclic shear stress (+/-):	72.6	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	17	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	6.796	-0.040	96.3	-48.9	164.1	104.1
5	10.747	0.074	97.3	-47.4	218.3	126.3
8	14.091	-0.317	97.1	-47.9	229.2	131.1
10	16.559	-0.554	96.8	-48.3	232.6	134.5
11	17.958	-0.900	96.3	-48.4	233.5	133.2
12	19.531	-1.182	96.1	-48.5	234.3	135.9
13	21.331	-1.138	95.5	-48.4	234.7	138.0
14	23.517	-0.653	95.4	-48.3	234.3	141.3
15	26.218	-0.213	95.2	-48.2	233.1	143.3
16	29.843	0.514	94.8	-48.0	231.6	147.9
17	35.378	1.795	94.2	-47.5	228.2	160.8

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

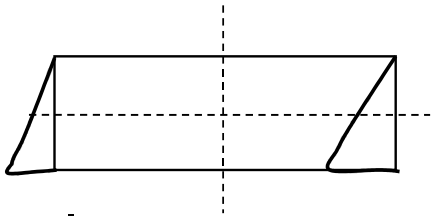
RGI
Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.55-26.59	(slightly micaceous)- CYCLIC #1

SPECIMEN DETAILS

Initial Height:	21.1	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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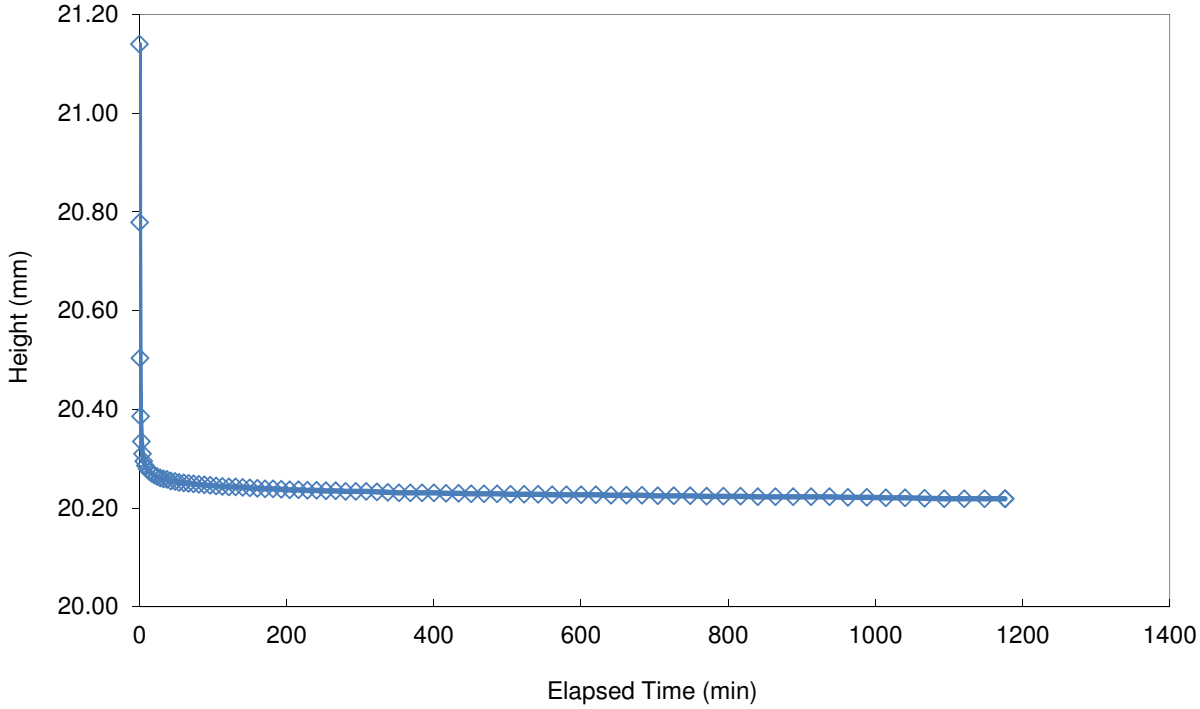
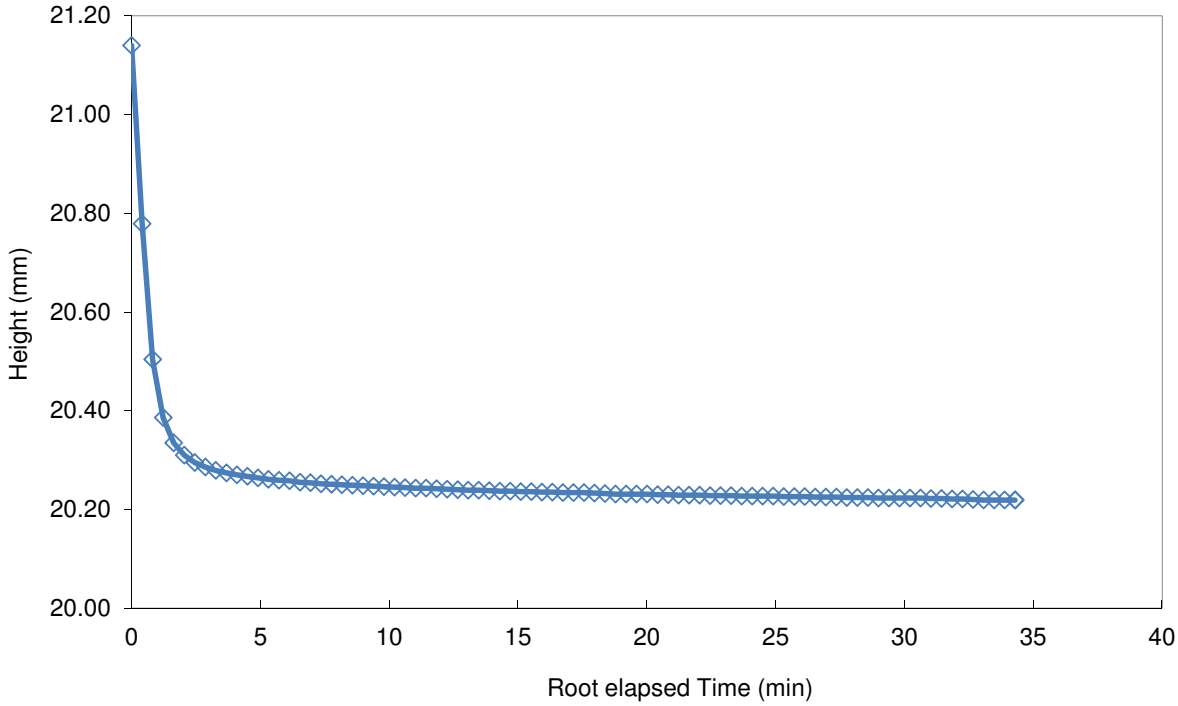
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.55-26.59	(slightly micaceous)- CYCLIC #1





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

Russell Geotechnical Innovations

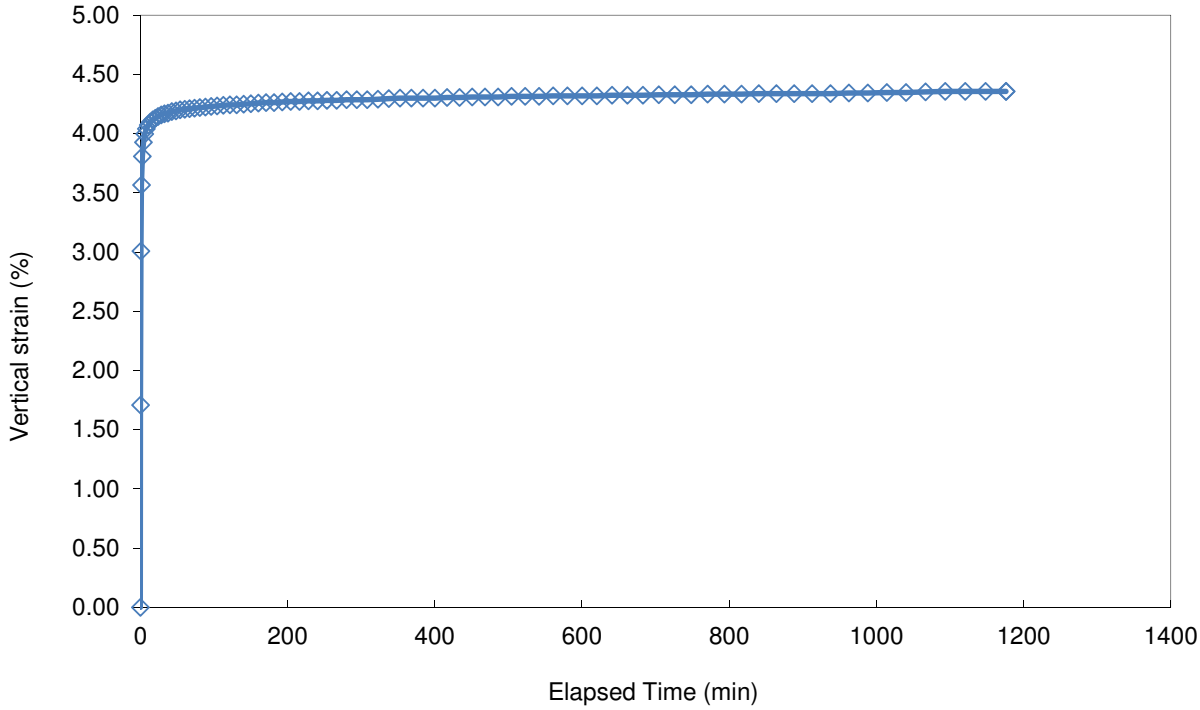
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

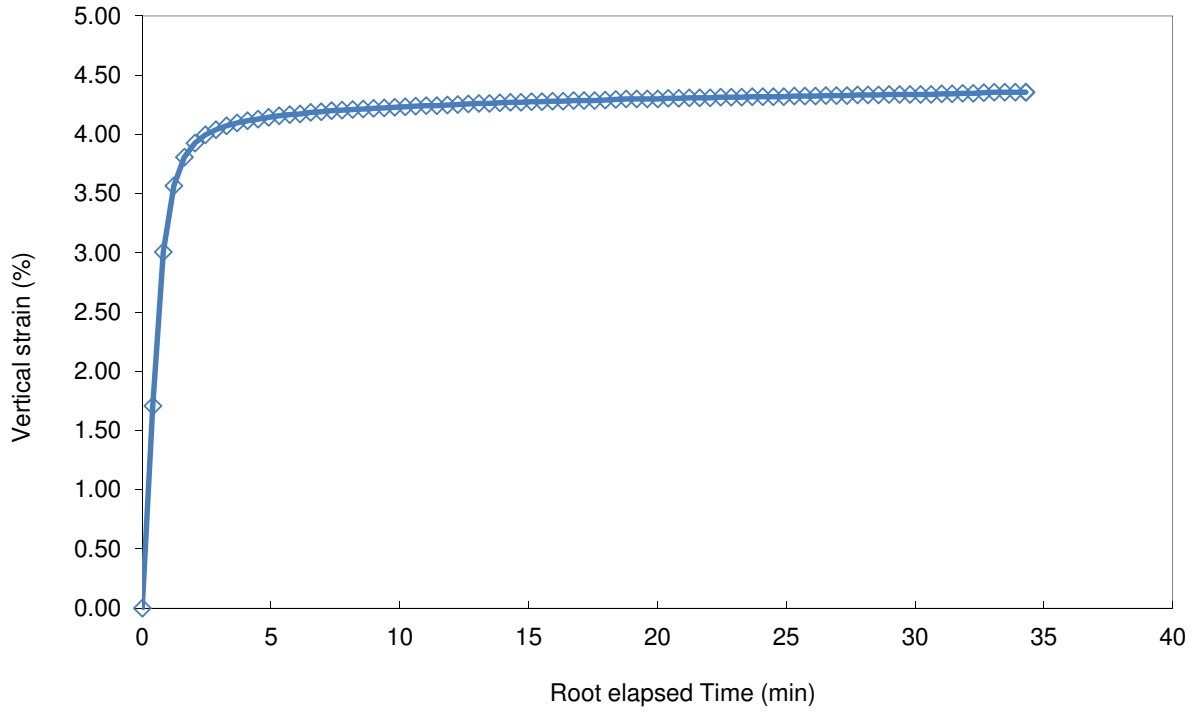
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHH10 P09Q2 2650 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.55-26.59	(slightly micaceous)- CYCLIC #1





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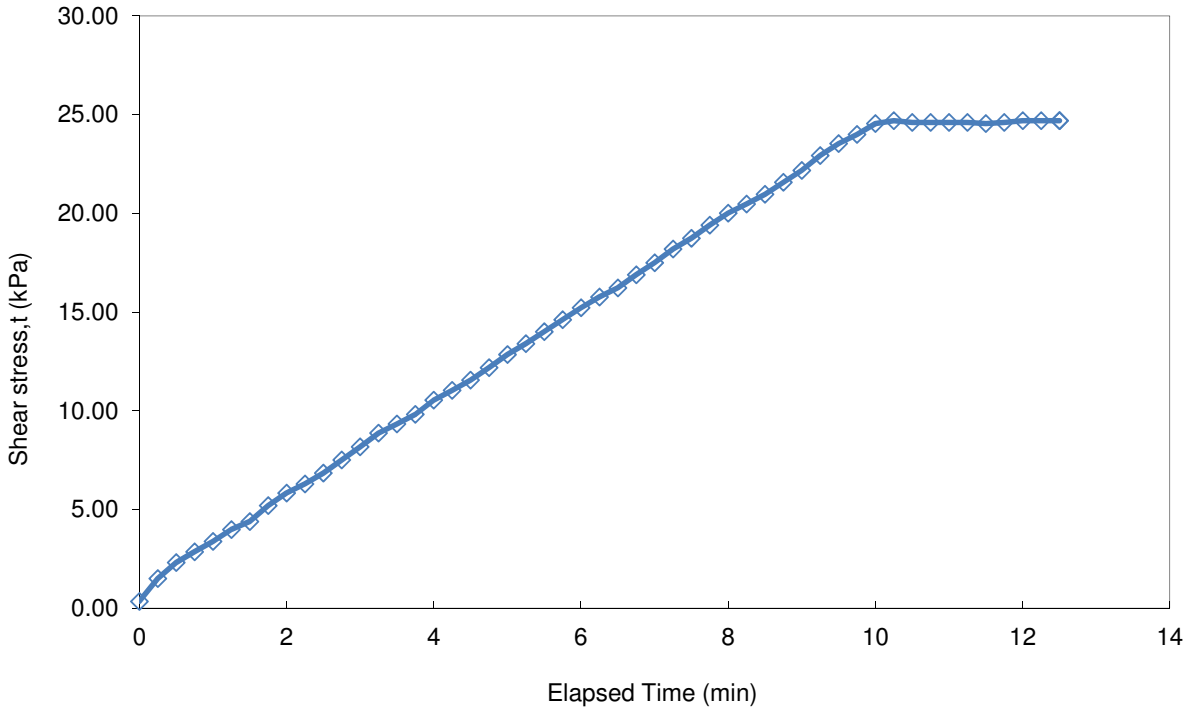

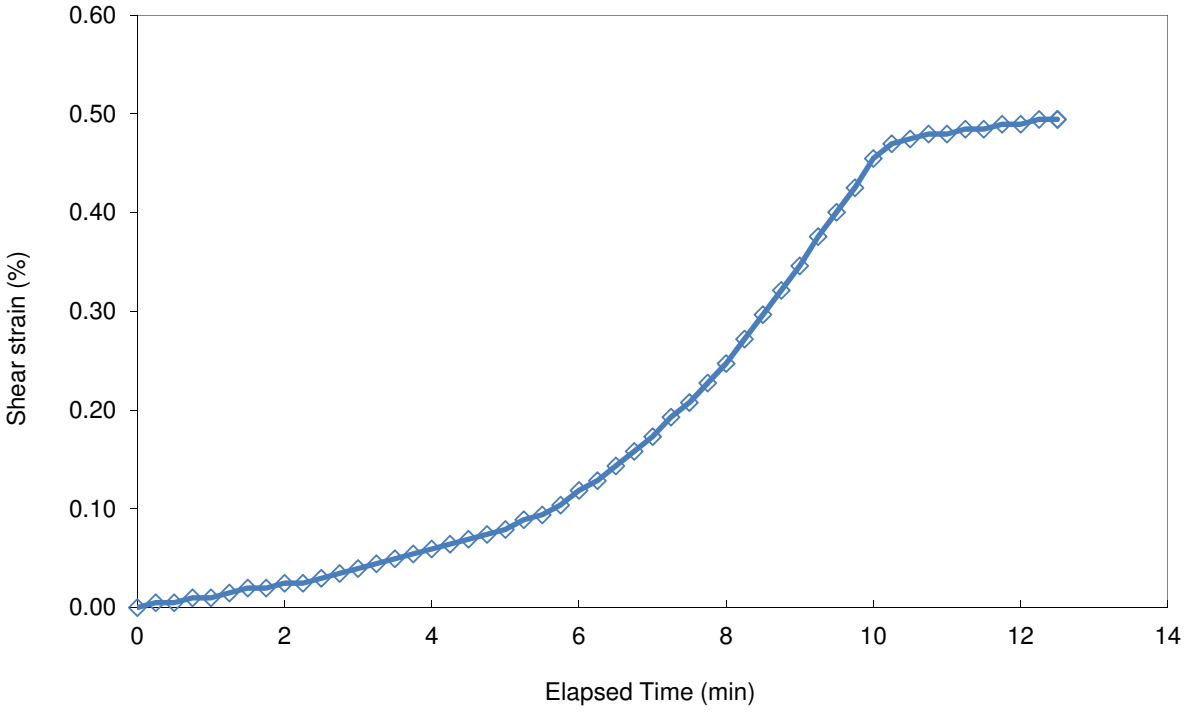

Loading to average shear stress #1

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Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 05/02/2016		

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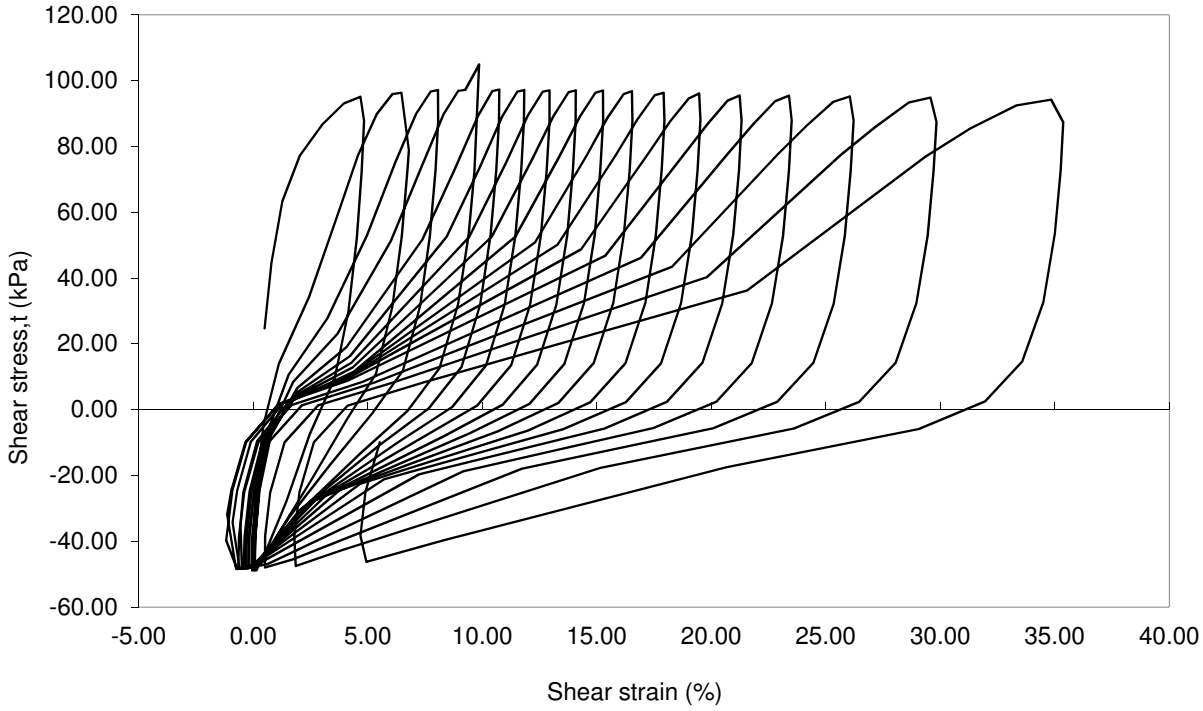

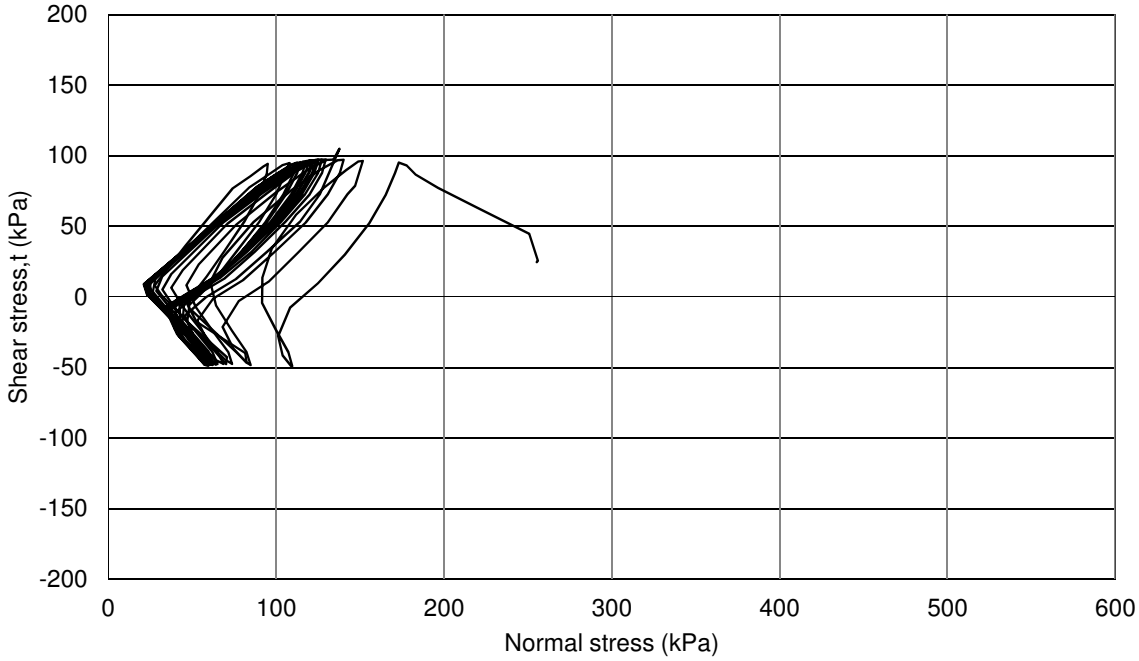

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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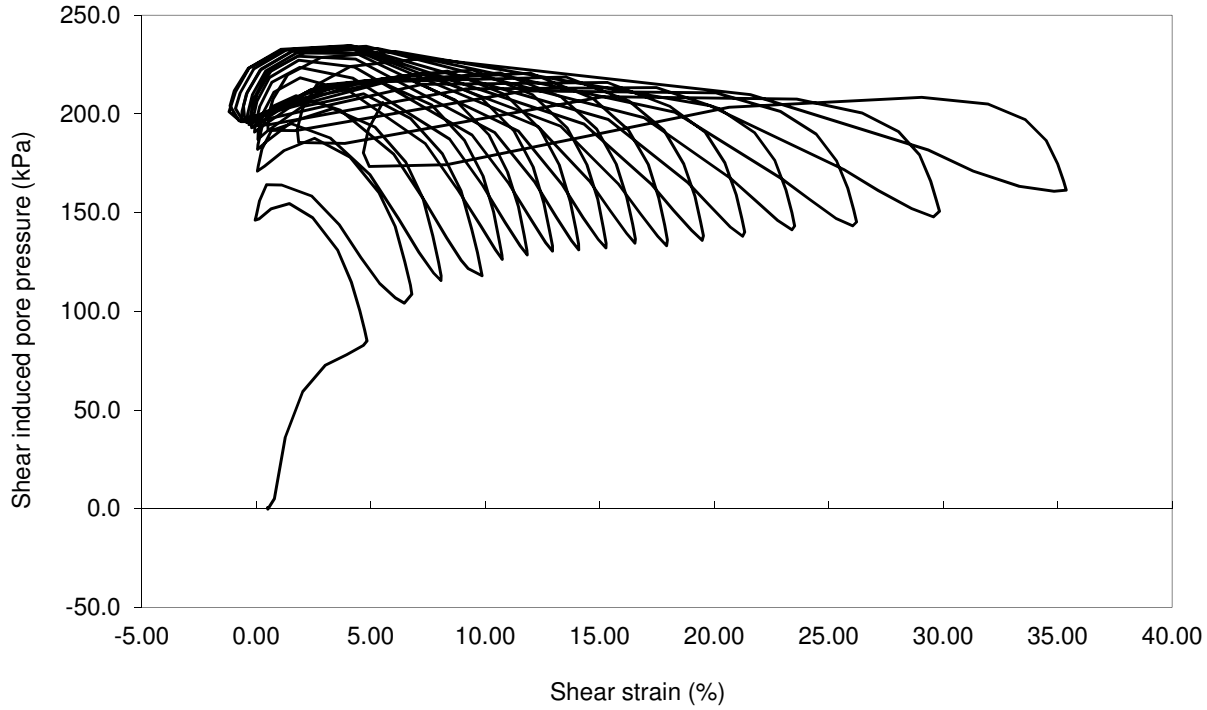

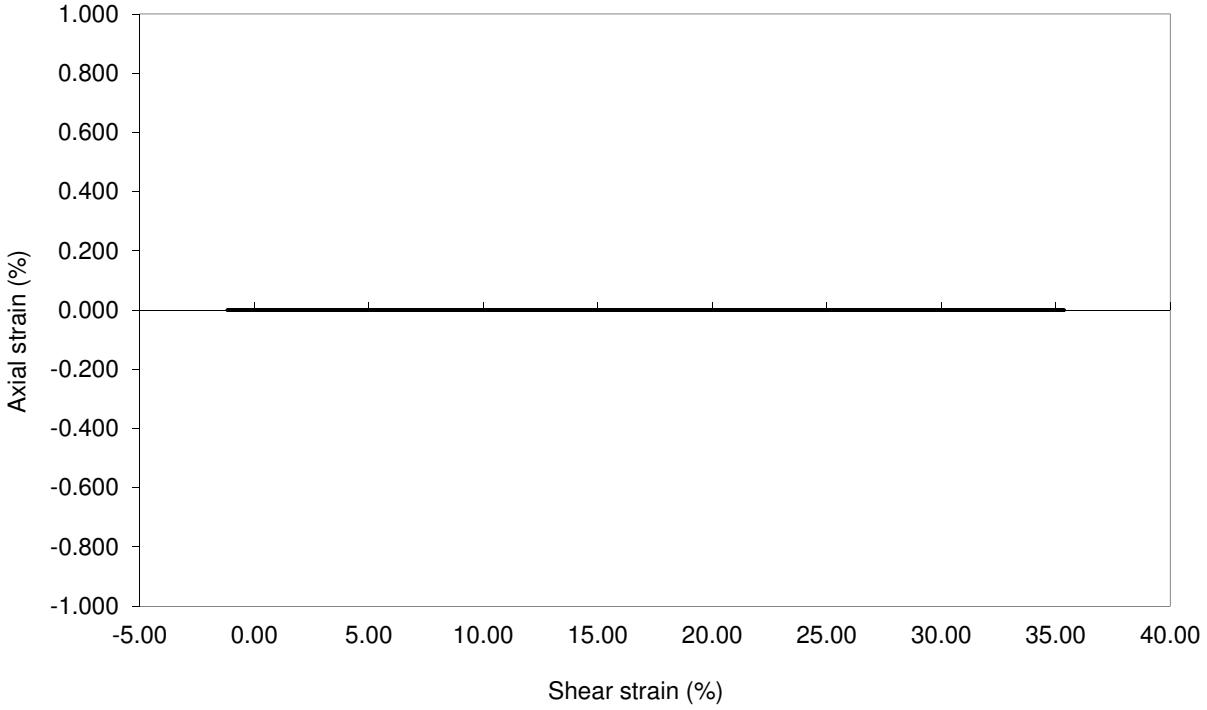

Cyclic simple shear #1

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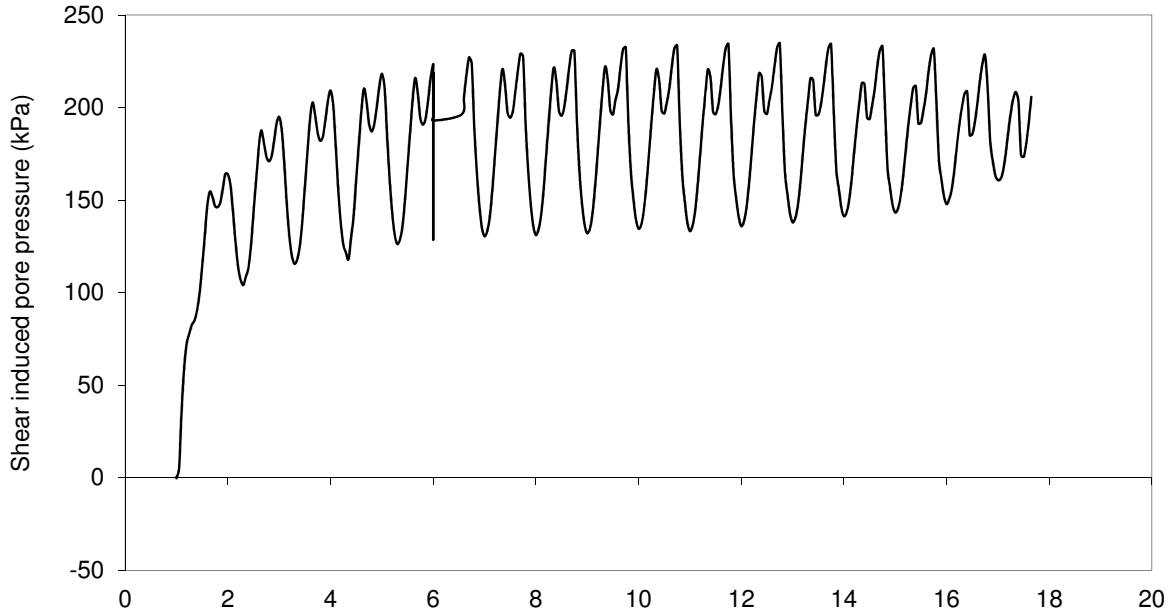

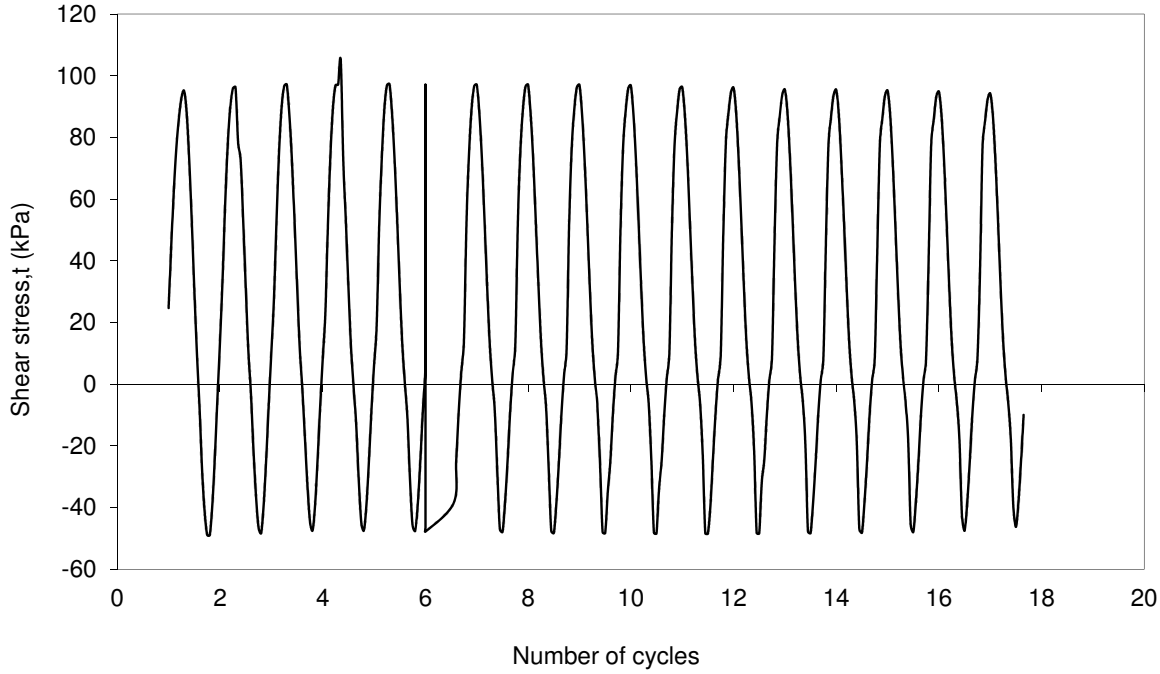

Cyclic simple shear #1

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Date: 05/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

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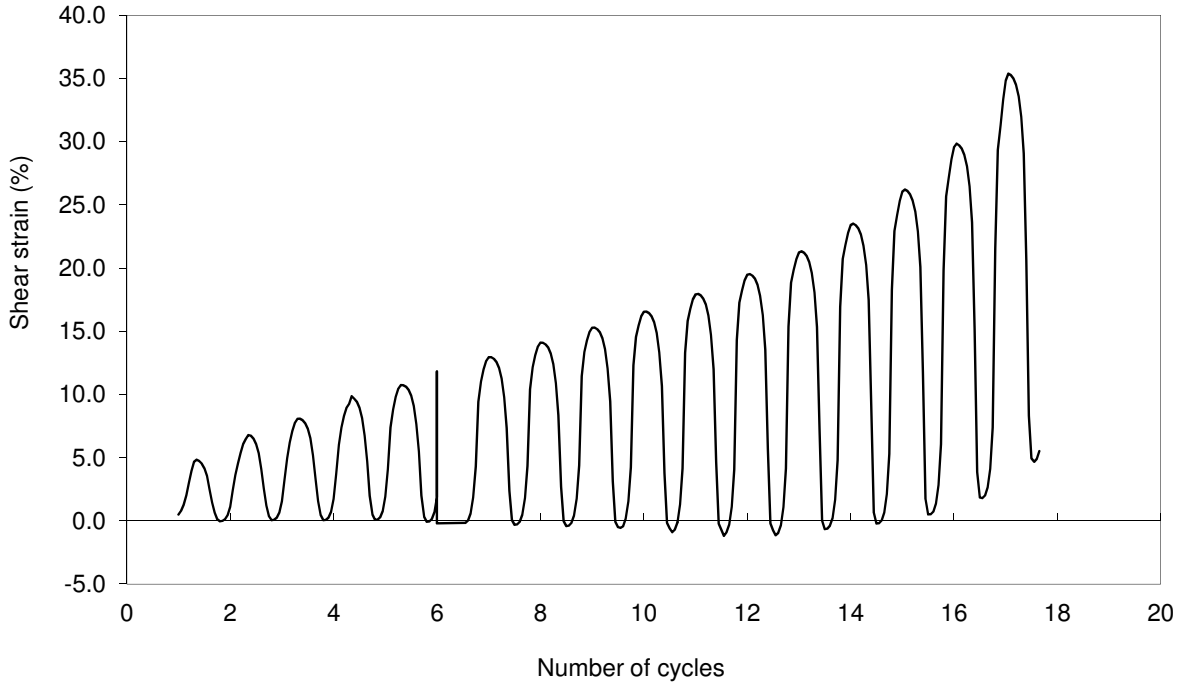

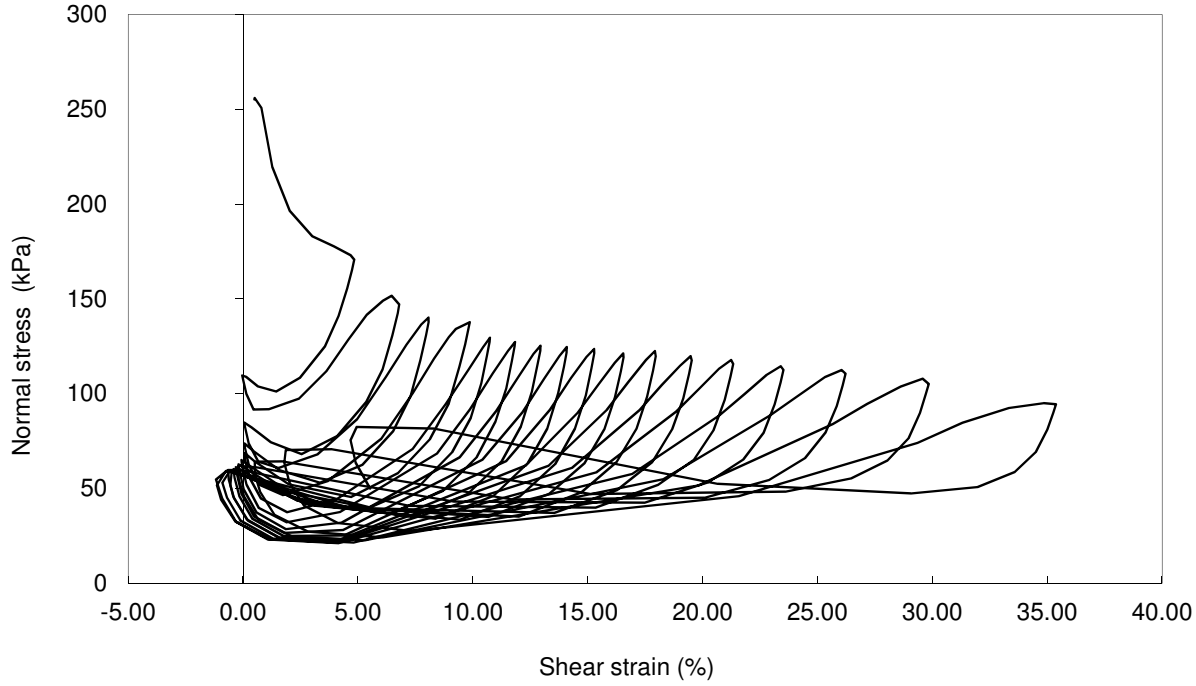

Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	H10	Description (visual) :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.59-26.63	(slightly micaceous)- CYCLIC #2

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.1	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	32.01	%	30.42	%
Bulk density :	1.89	Mg/m^3		
Dry density :	1.43	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.8612			

Test Duration: 3 Days

END OF CONSOLIDATION #1

Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	4.52	% (for stage)
Normal stress:	267.8	kPa
Voids ratio (e_o):	0.7770	
Max. Consolidation stress:	267.8	kPa
Max. Consolidation strain:	4.52	% (for stage)
Duration:	864	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	248.1	kPa
Shear stress	24.7	kPa
Duration	72	Min.

CYCLIC SHEAR STAGE

Average shear stress:	24.7	(kPa)
Cyclic shear stress (+/-):	52.3	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	73	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	2.779	0.302	76.4	-28.2	92.9	65.0
5	3.651	0.704	76.8	-27.9	144.2	102.7
10	4.717	1.060	76.9	-27.2	180.9	124.4
20	6.530	1.471	76.8	-26.2	205.6	143.0
30	8.323	1.694	76.7	-26.0	217.6	151.8
40	10.419	1.645	76.4	-26.0	226.1	157.1
50	13.189	1.888	76.2	-26.3	233.0	160.4
60	17.167	2.472	75.4	-26.2	236.5	161.3
65	20.120	3.230	74.8	-26.1	237.2	162.3
70	24.782	5.167	74.3	-25.9	235.6	164.6
73	28.646	6.897	74.1	-25.8	233.7	168.1

Checked and approved
Initials: *CSR*
Date: 05/02/2016

Project Number: **RGI/1130**
Project Name: **10451 U.S. WIND INC.**

RGI
Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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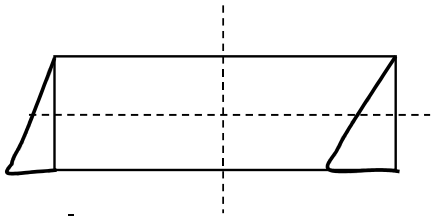
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.59-26.63	(slightly micaceous)- CYCLIC #2

SPECIMEN DETAILS

Initial Height:	21.1	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

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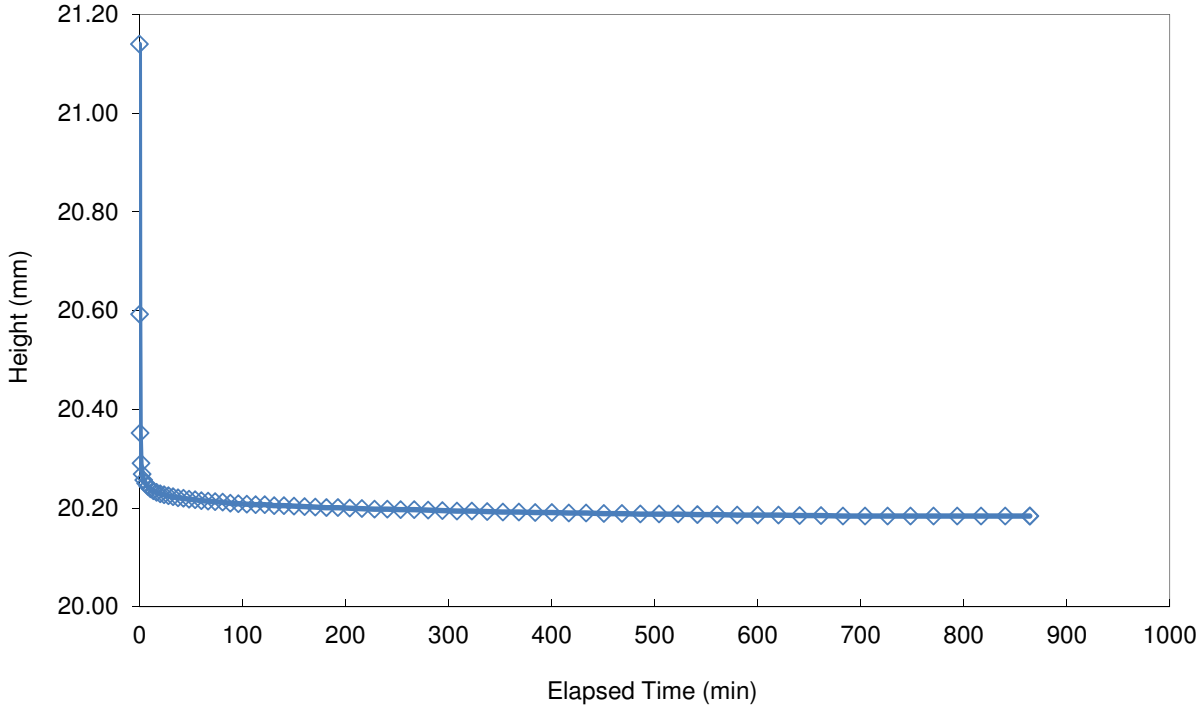

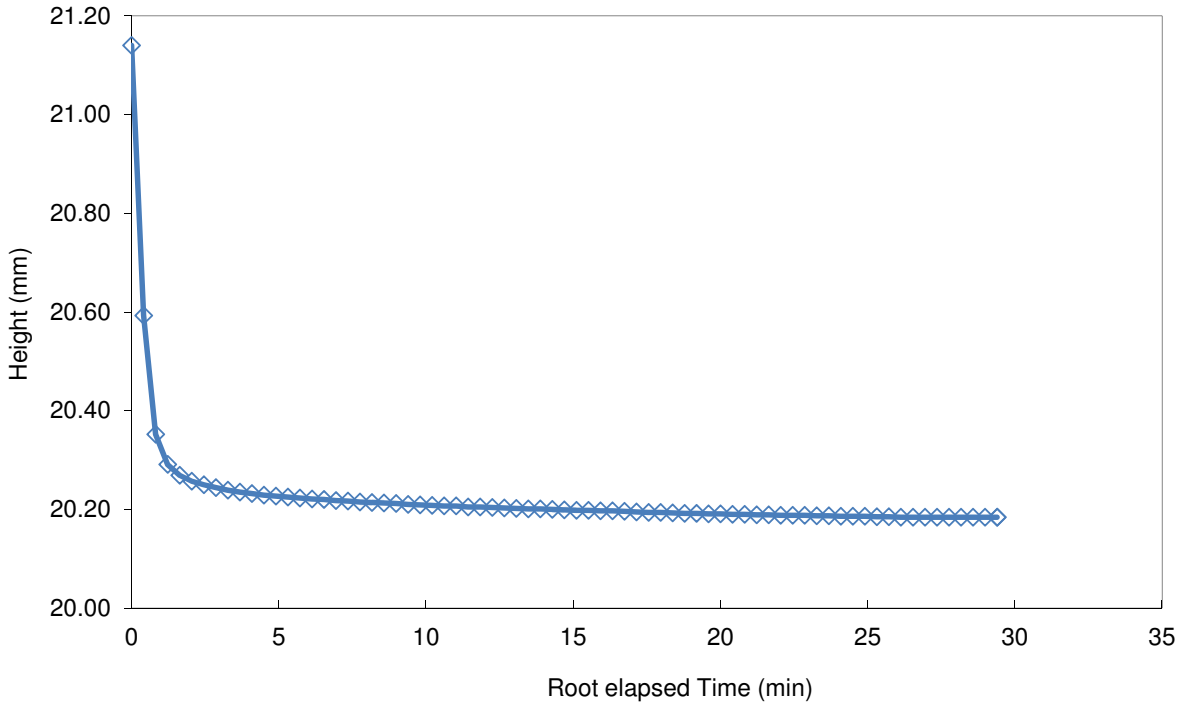

Consolidation stage #1

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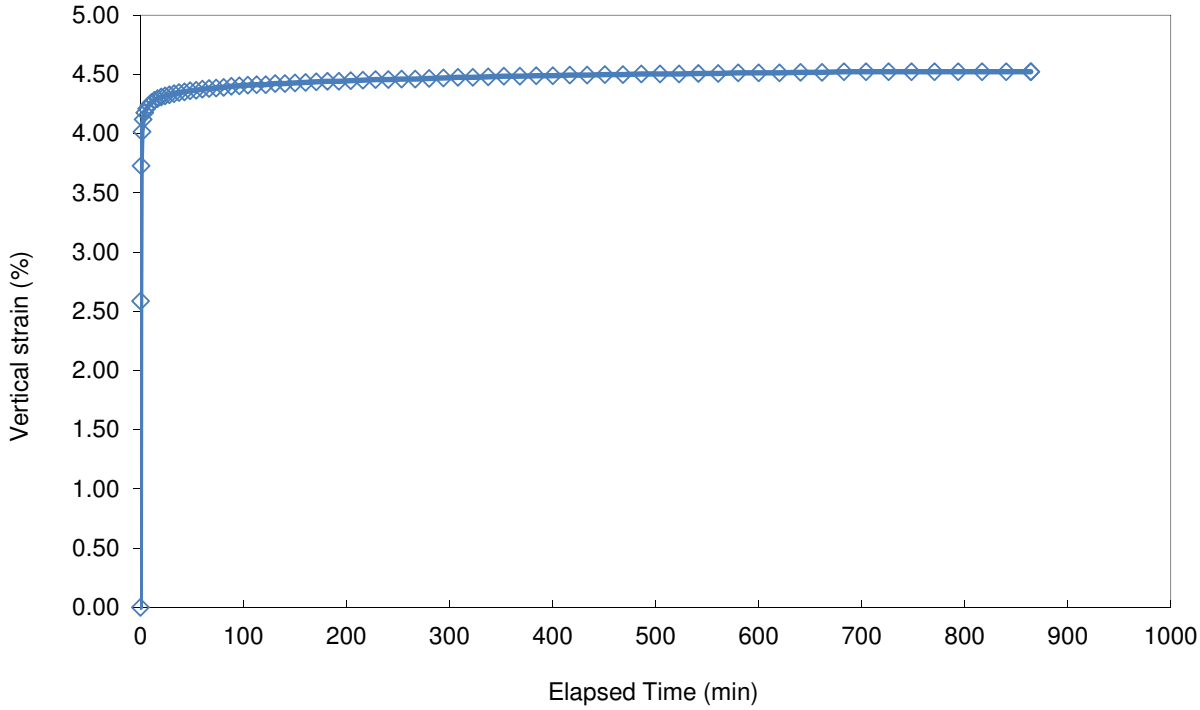

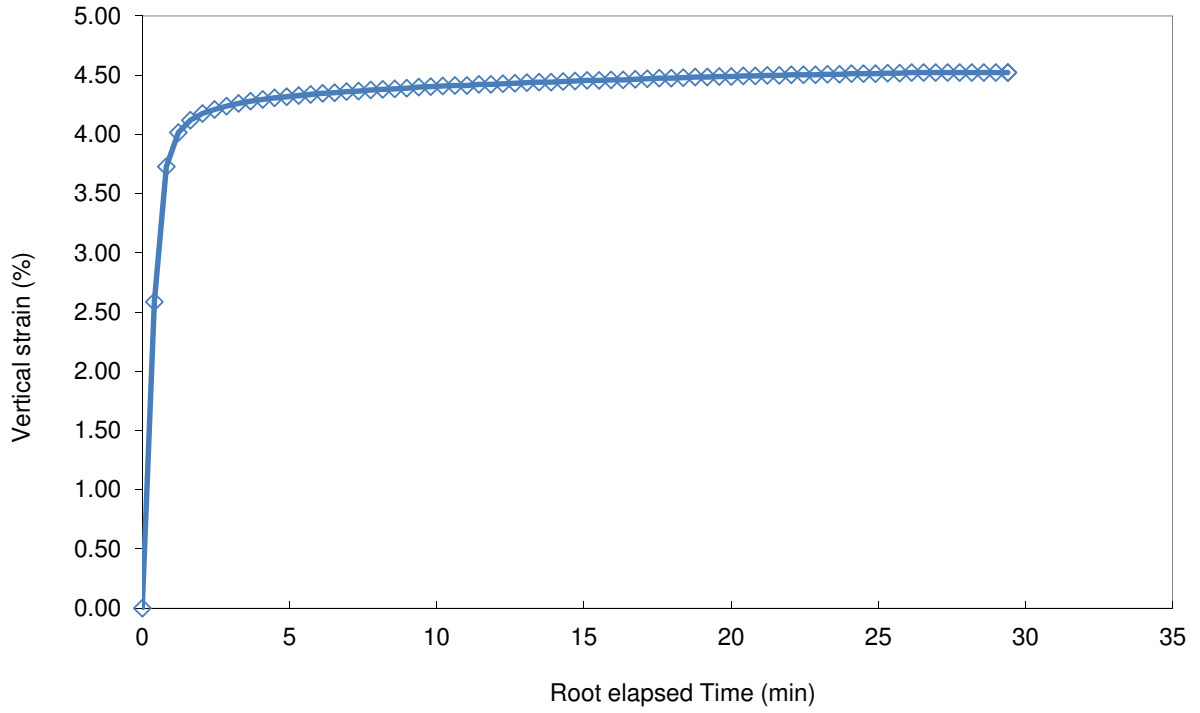

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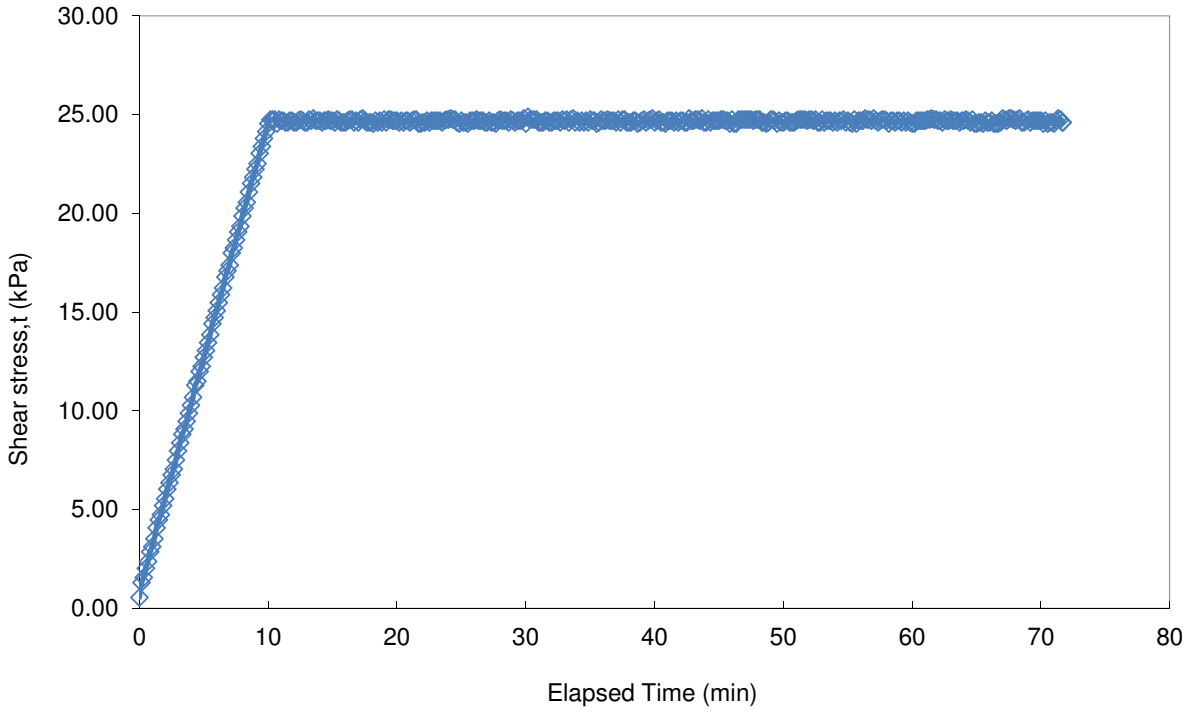

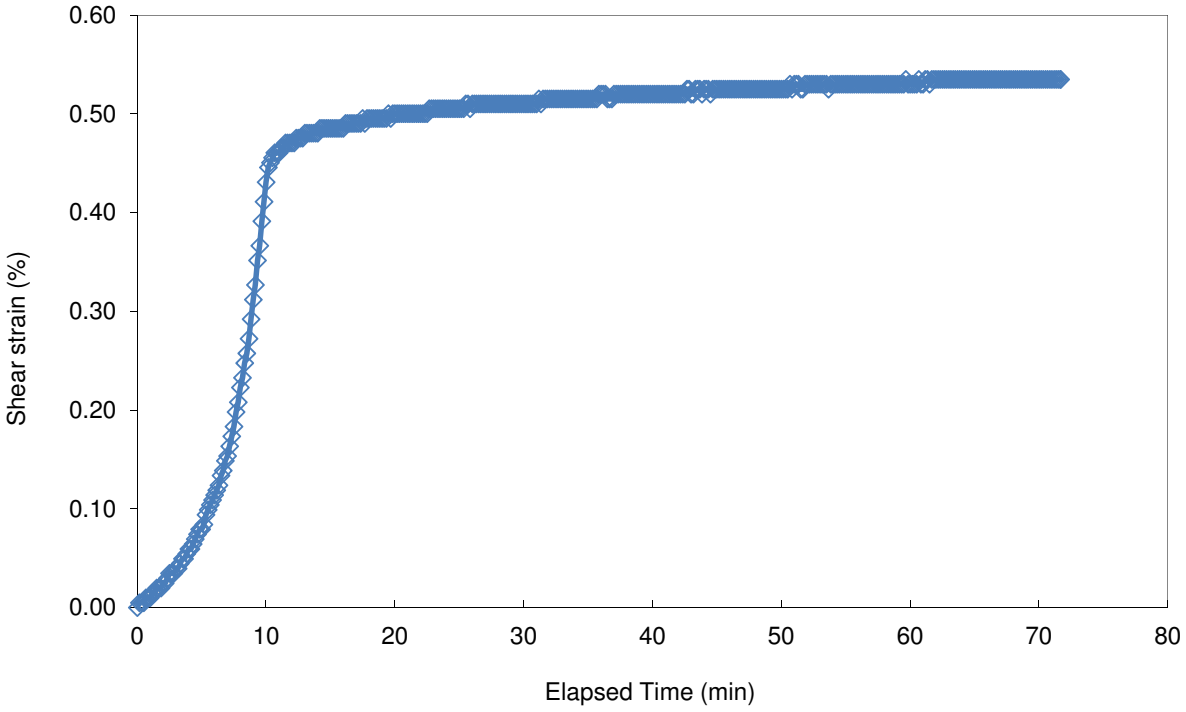

Loading to average shear stress #1

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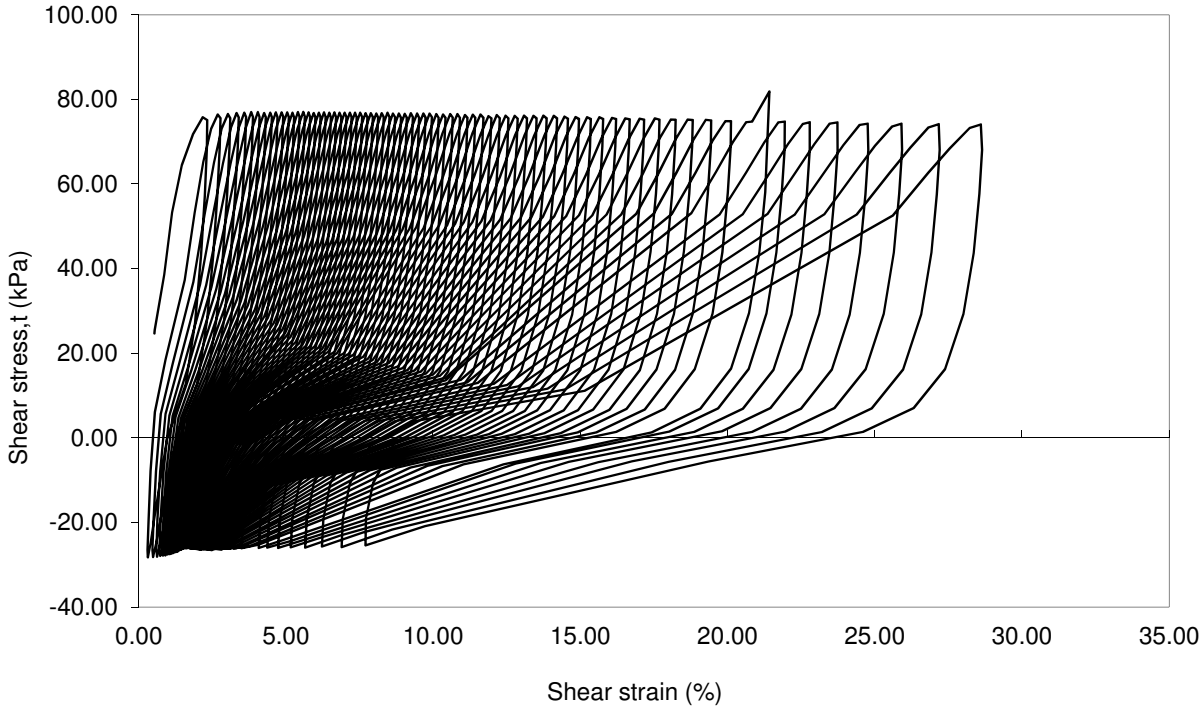

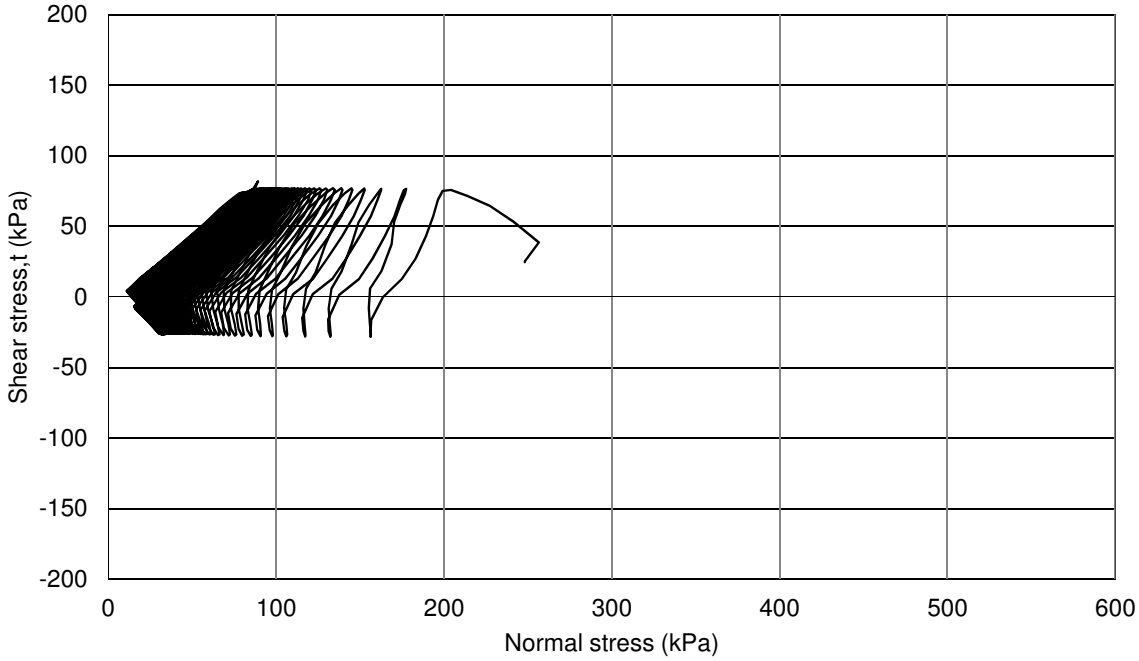

Cyclic simple shear #1

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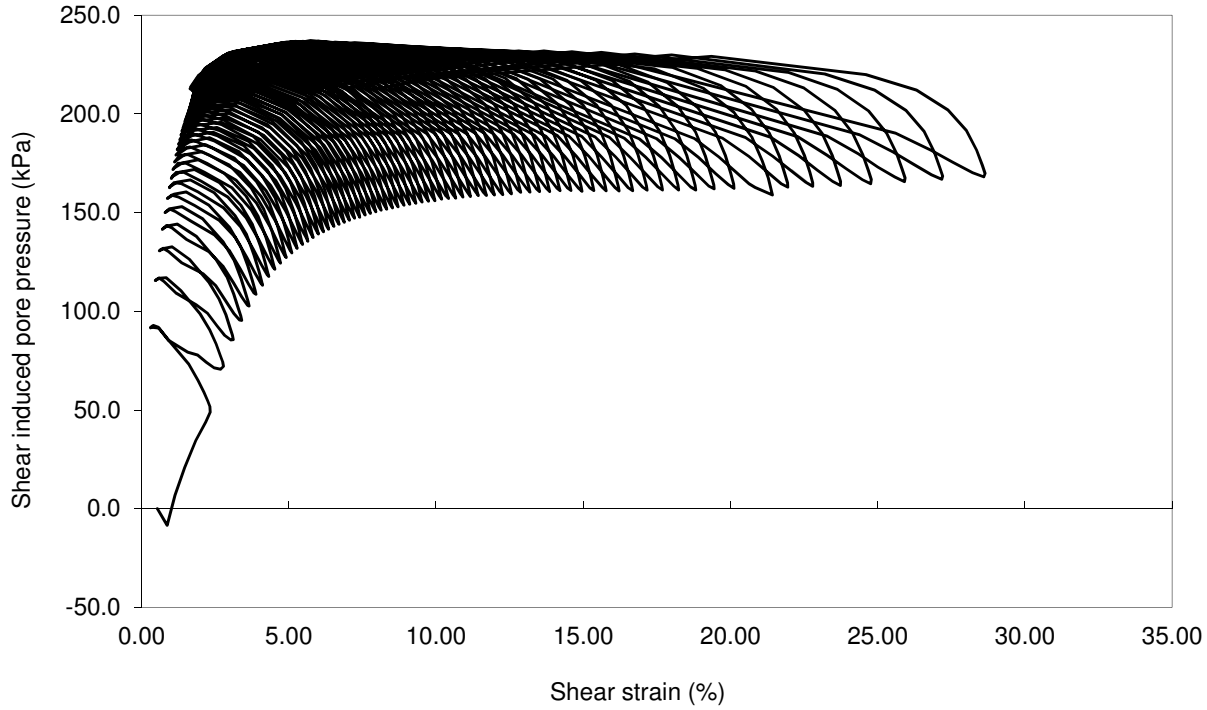

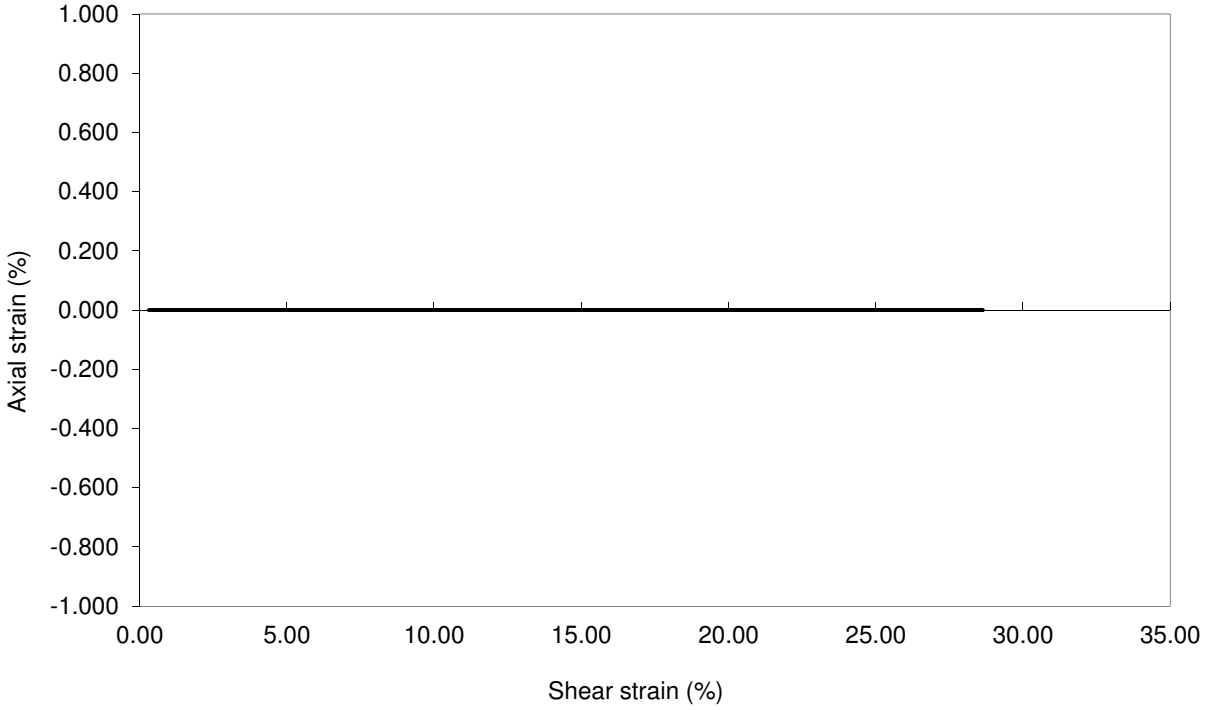

Cyclic simple shear #1

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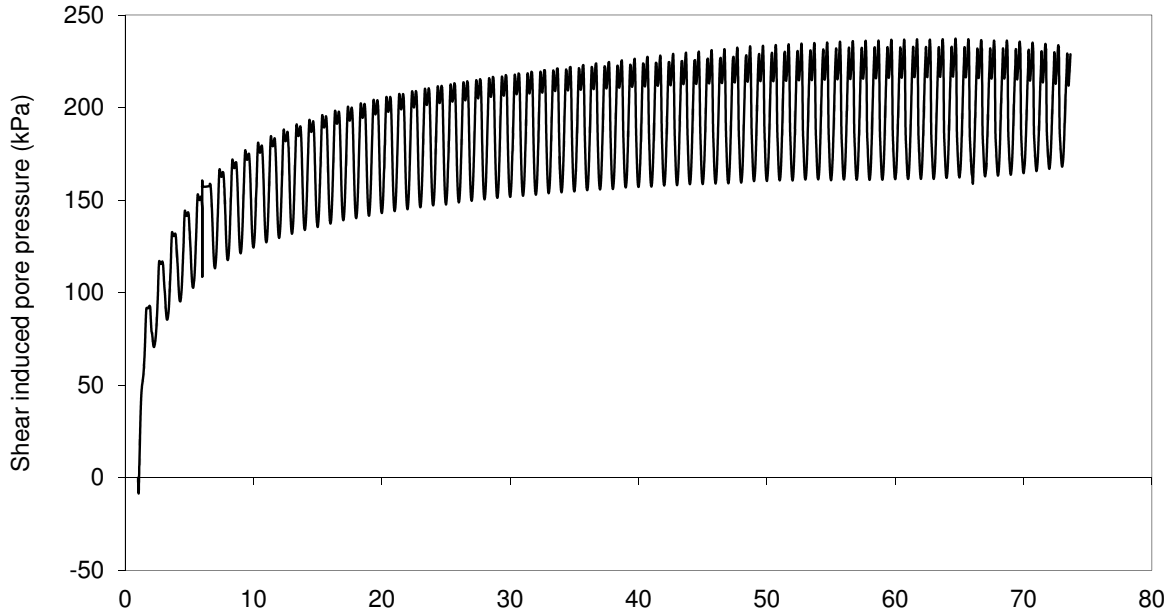
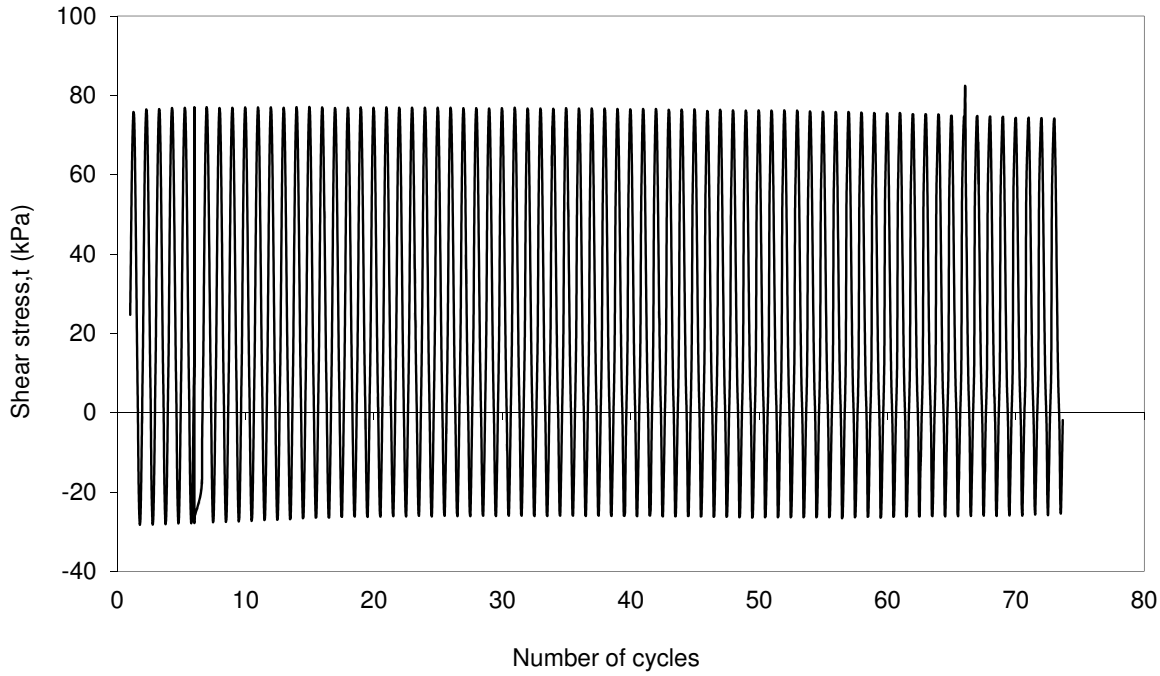
Sample Depth (m):	26.59-26.63	(slightly micaceous)- CYCLIC #2





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 05/02/2016		

Russell Geotechnical Innovations

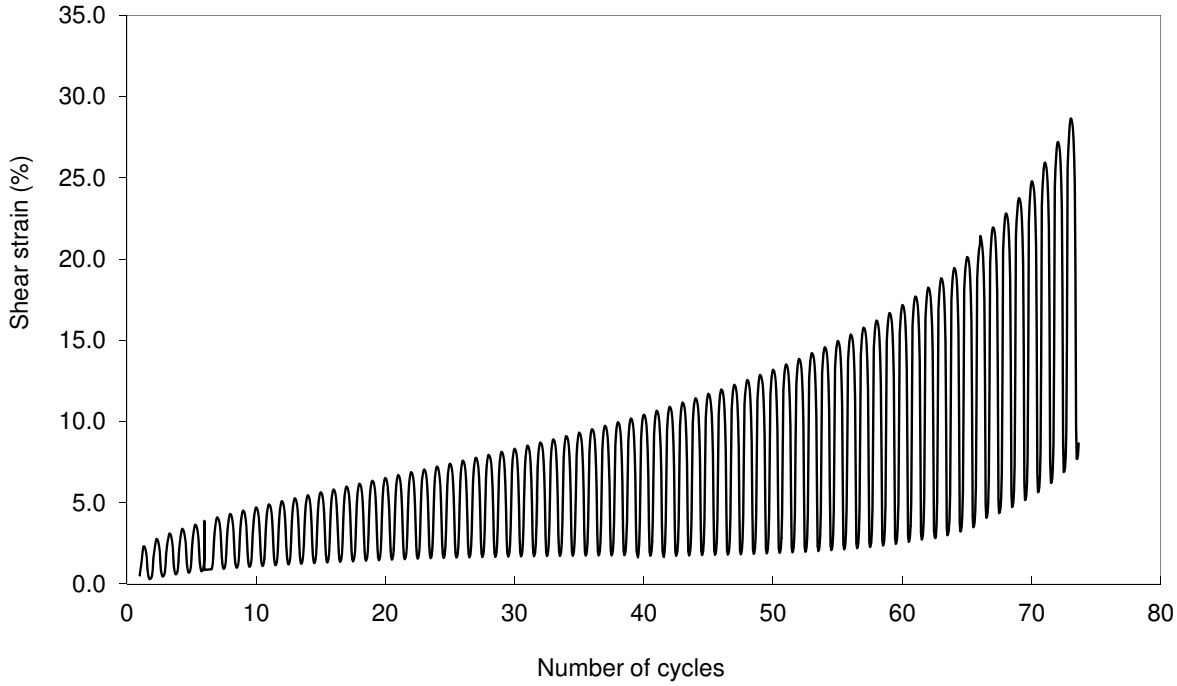
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

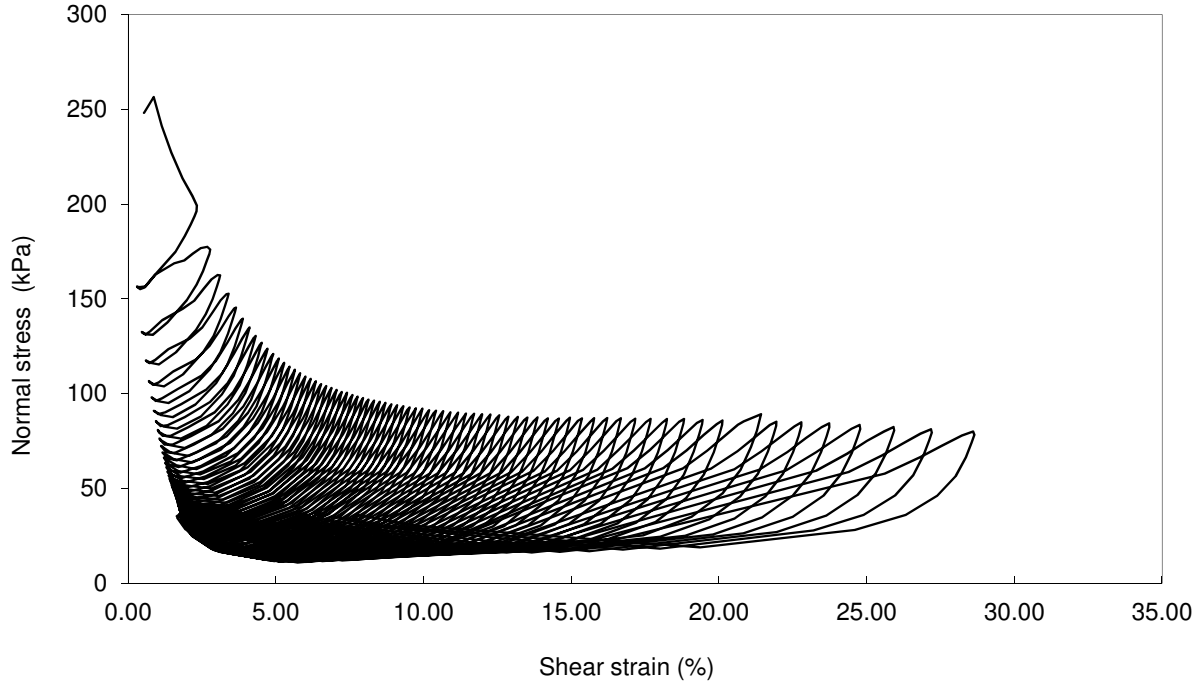
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHH10 P09Q2 2650 DSScyc#2.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.59-26.63	(slightly micaceous)- CYCLIC #2





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 05/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	H10	Description (visual) :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.2	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	31.11	%	31.45	%	
Bulk density :	1.88	Mg/m^3			
Dry density :	1.43	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.8634				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	6.77	% (for stage)
Normal stress:	267.8	kPa
Voids ratio (e_o):	0.7374	
Max. Consolidation stress:	267.8	kPa
Max. Consolidation strain:	6.77	% (for stage)
Duration:	1148	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	246.4	kPa
Shear stress	24.7	kPa
Duration	37	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	24.7	(kPa)
Cyclic shear stress (+/-):	38.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	241	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.954	0.313	62.8	-14.0	66.2	45.0
5	2.303	0.591	63.1	-13.9	102.4	78.8
10	2.737	0.894	63.0	-13.7	133.8	101.2
20	3.398	1.328	63.0	-13.8	159.7	122.4
50	4.964	2.308	63.1	-13.4	192.8	147.5
100	7.065	3.479	62.9	-12.5	214.7	161.5
200	11.645	5.368	62.9	-12.4	233.4	172.5
241	15.003	6.651	62.5	-12.3	236.5	175.3
303	32.303	17.619	68.5	-11.6	234.2	182.8
306	37.090	22.072	59.9	-11.3	235.1	191.1
307	42.812	24.461	58.9	-11.2	234.5	189.6

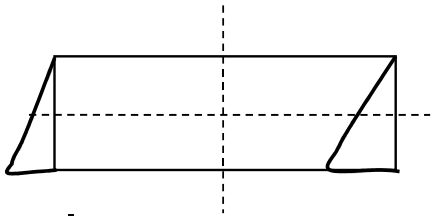
Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 14/02/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

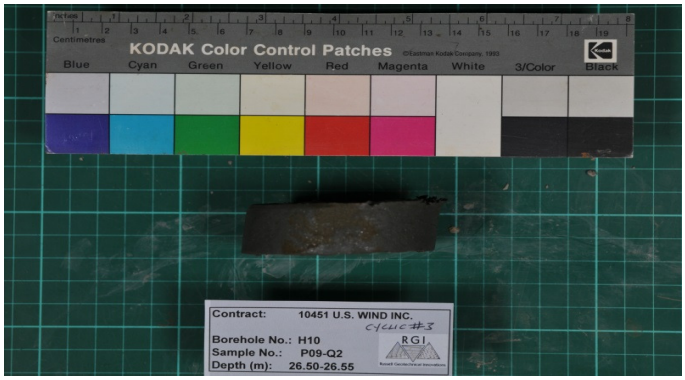
Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3

SPECIMEN DETAILS

Initial Height:	21.2	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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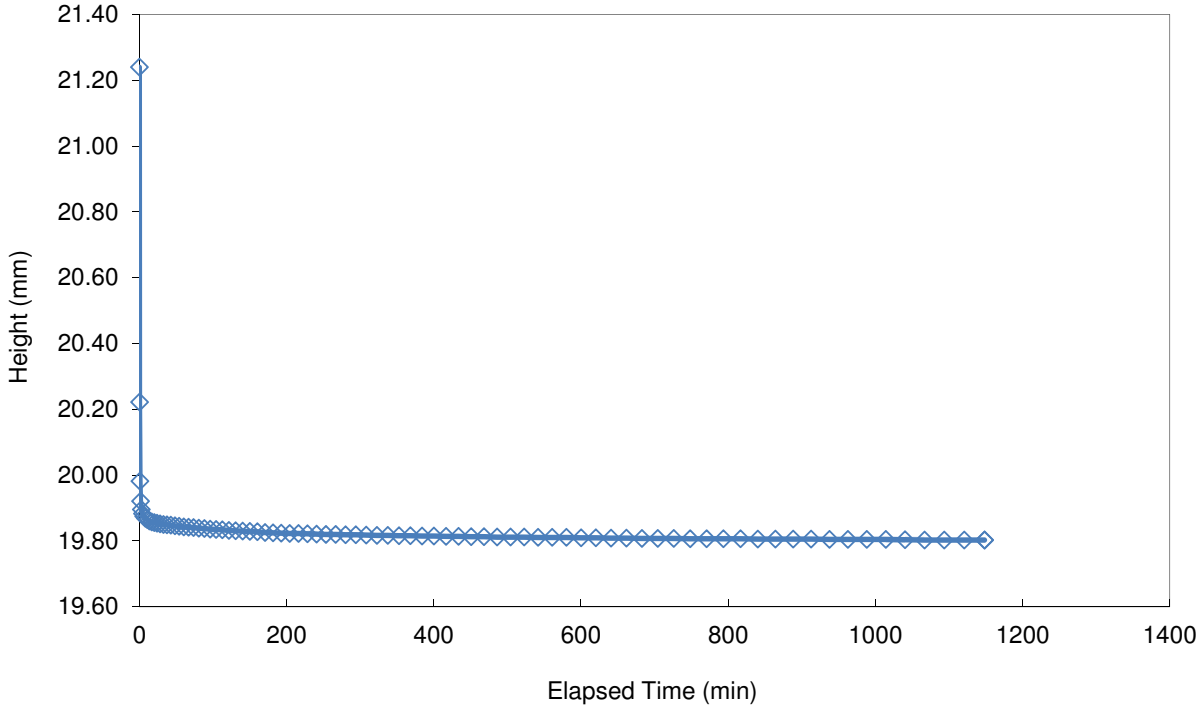
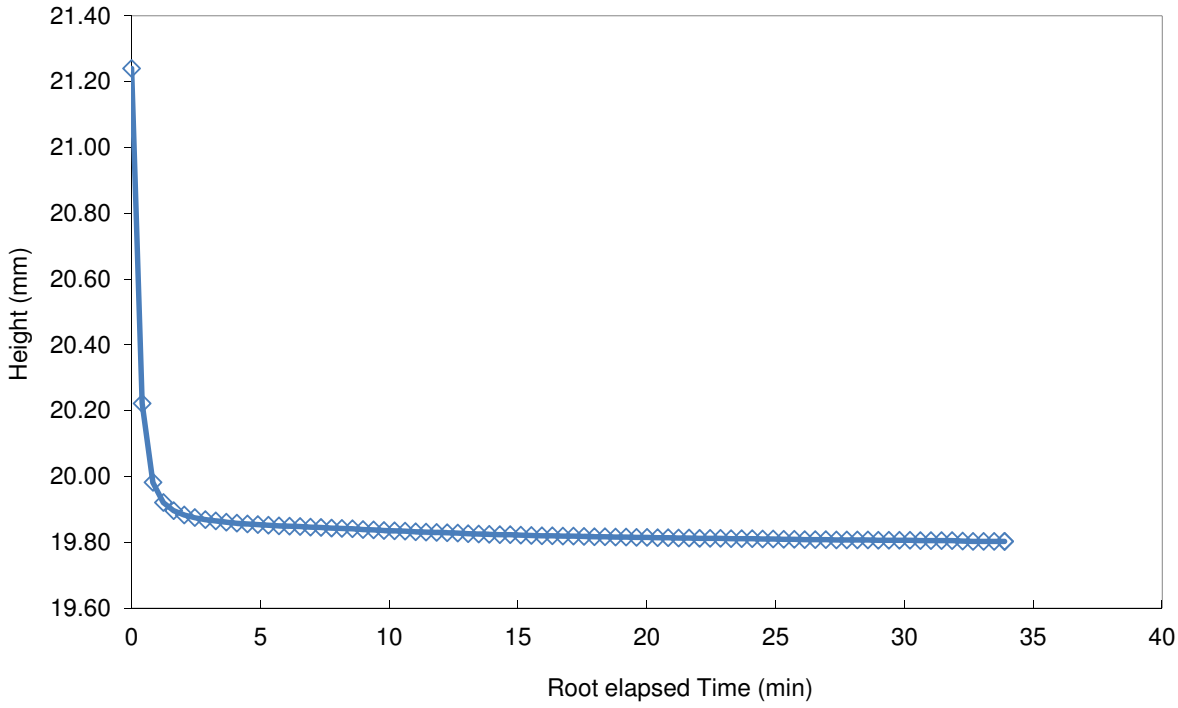
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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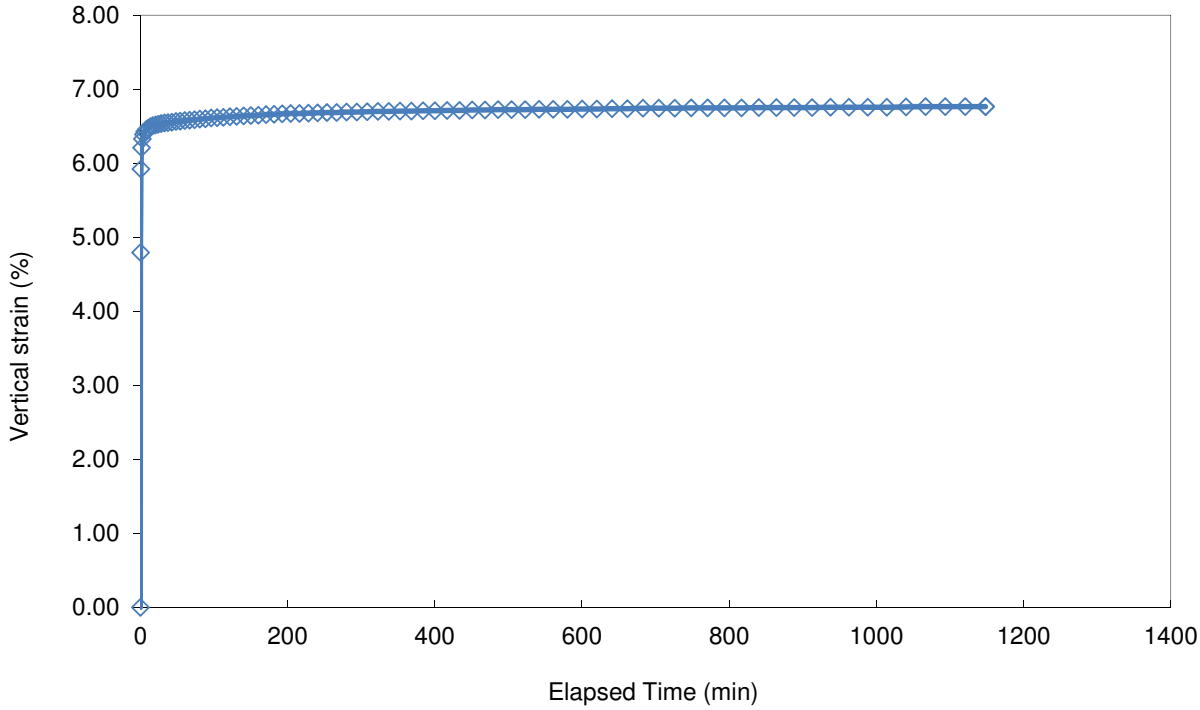
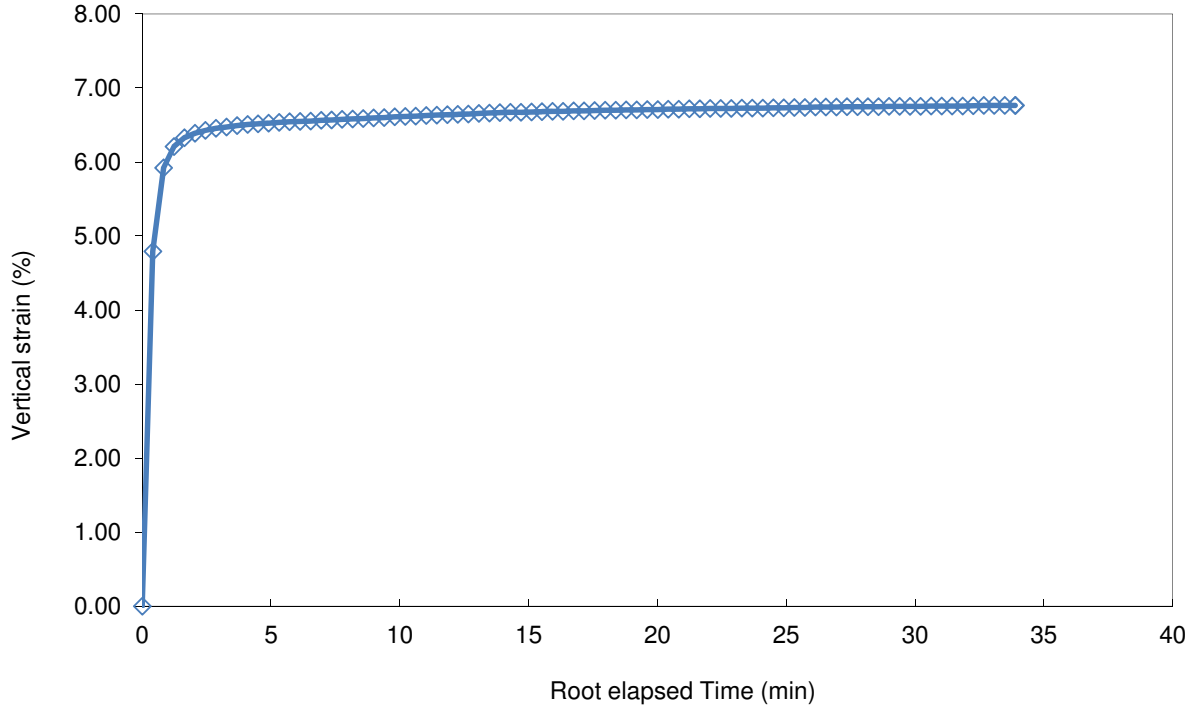
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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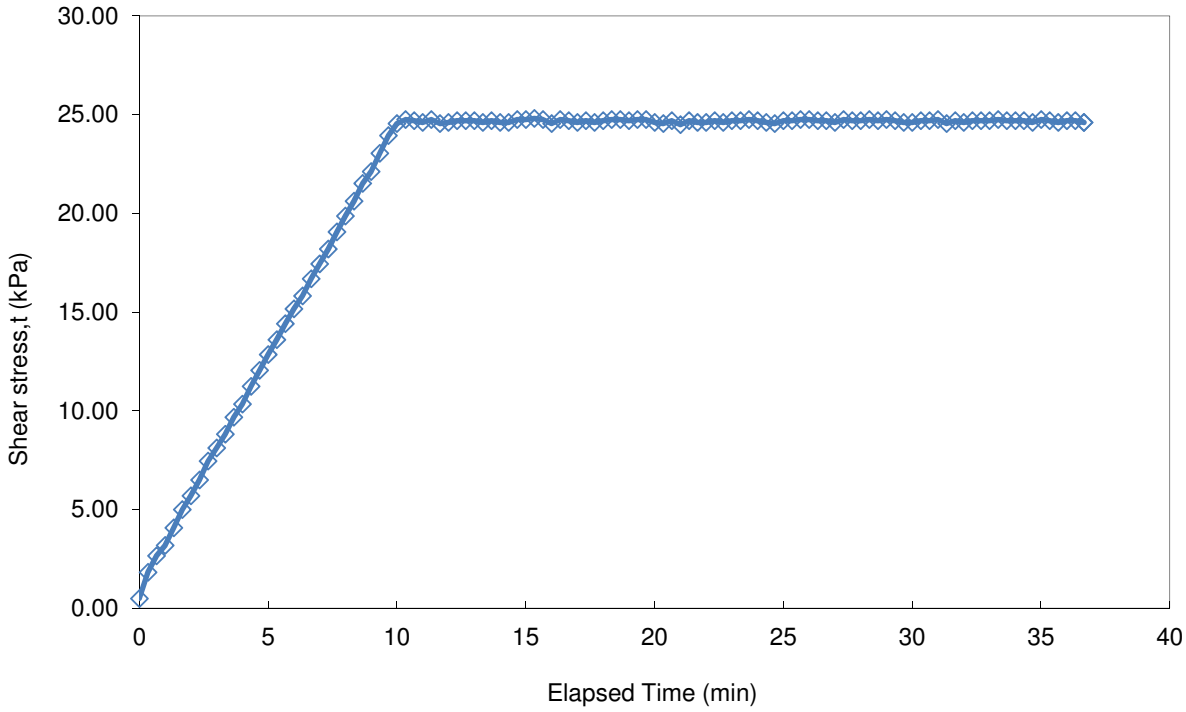
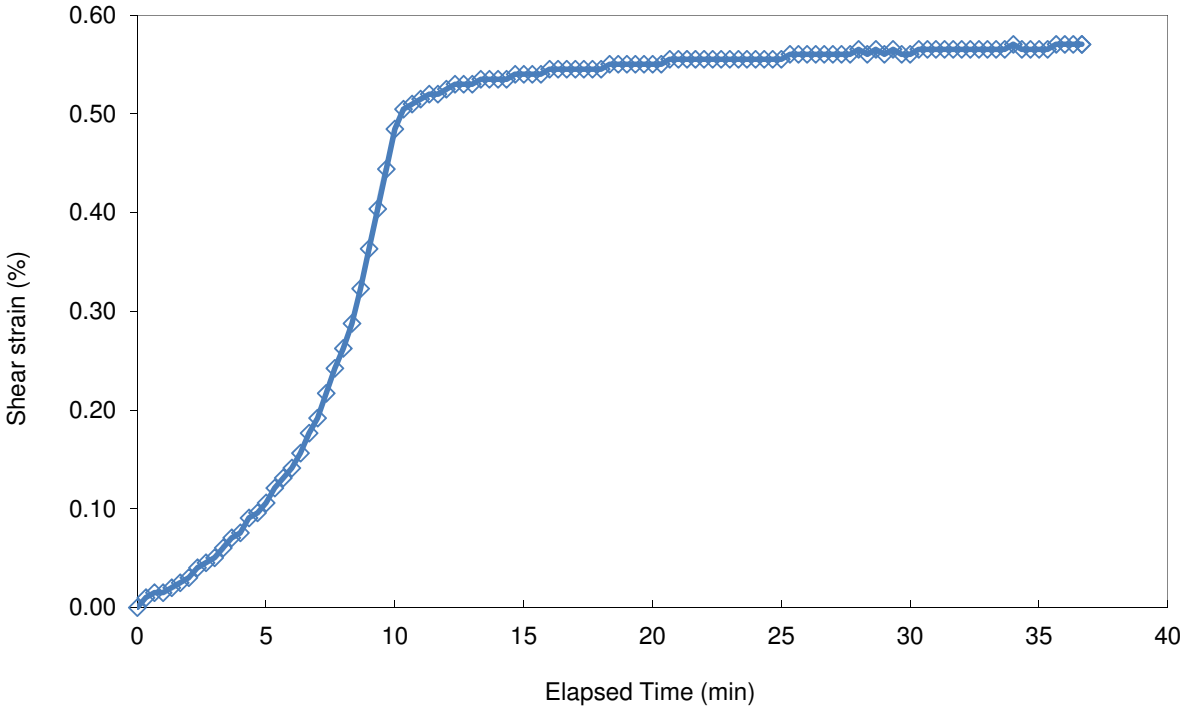
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Loading to average shear stress #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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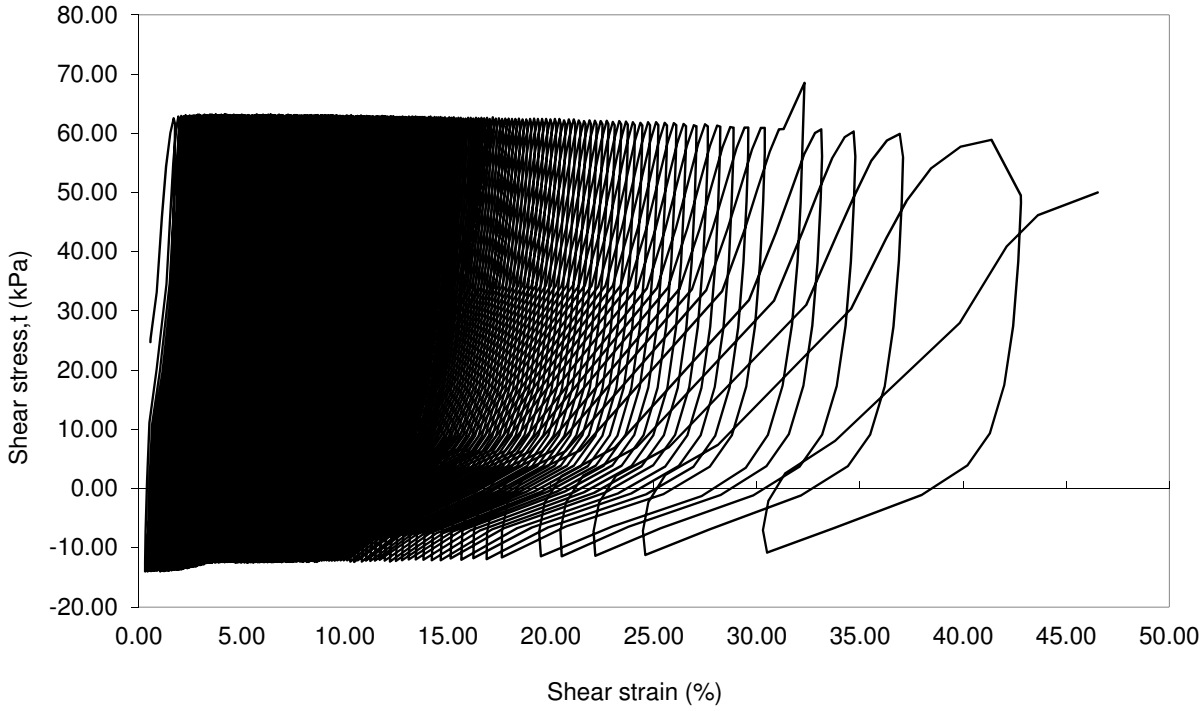
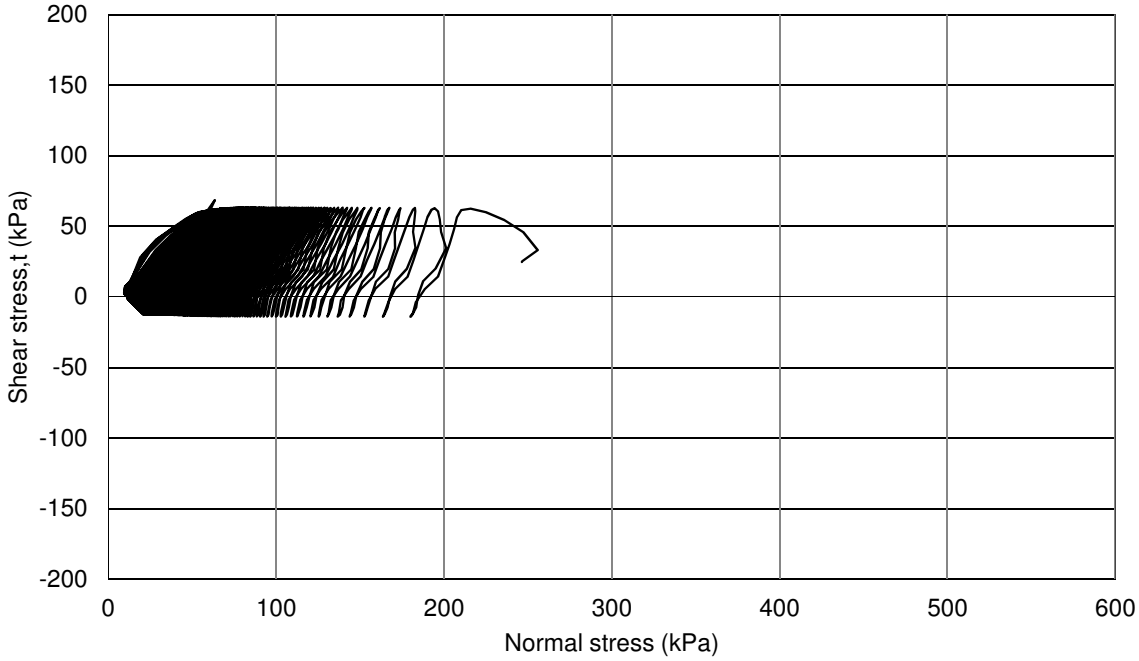
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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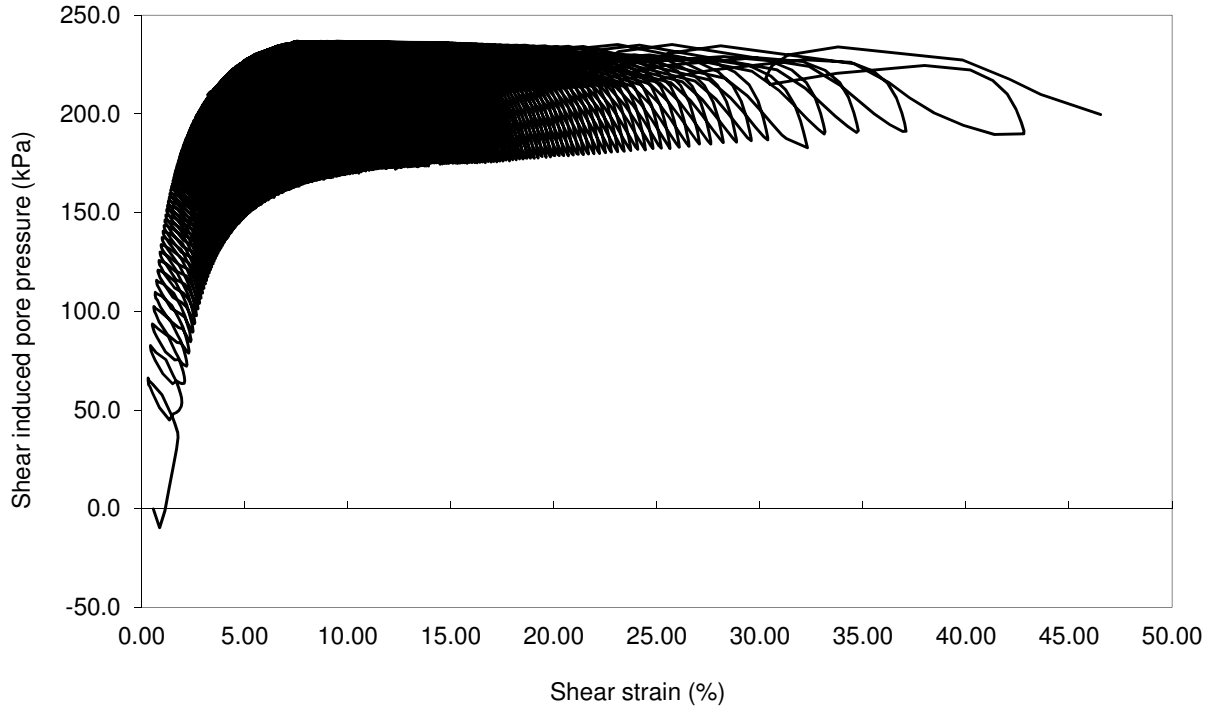
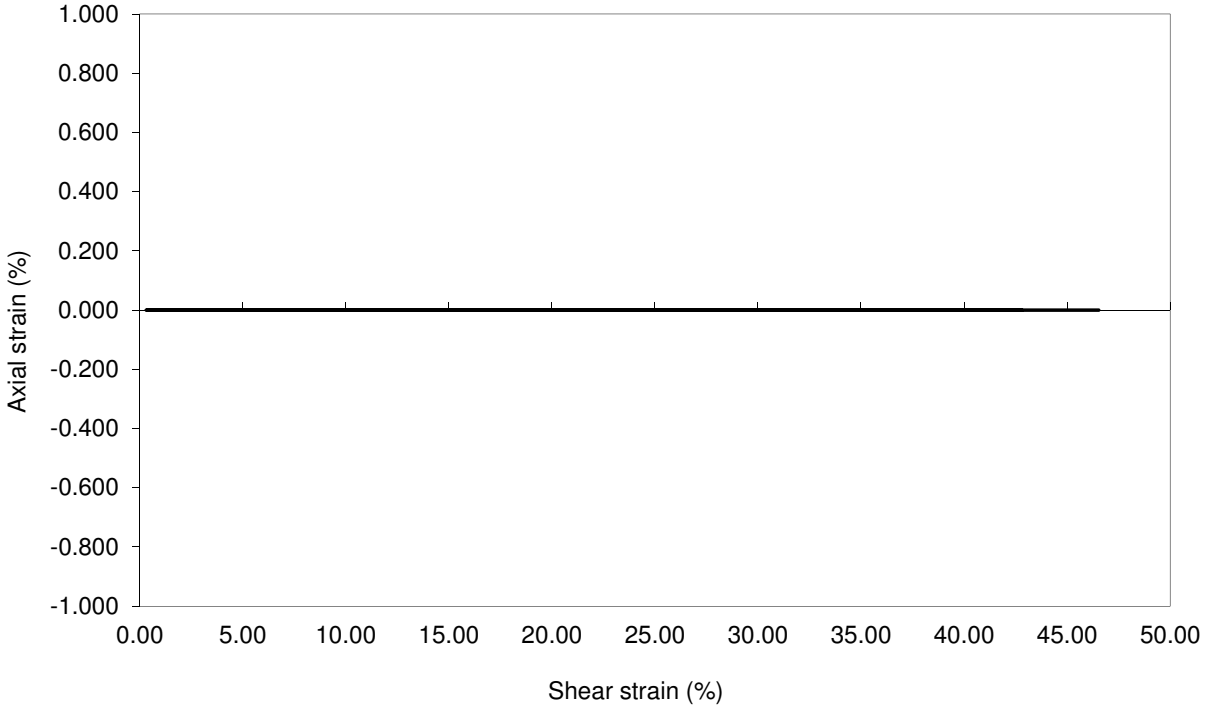
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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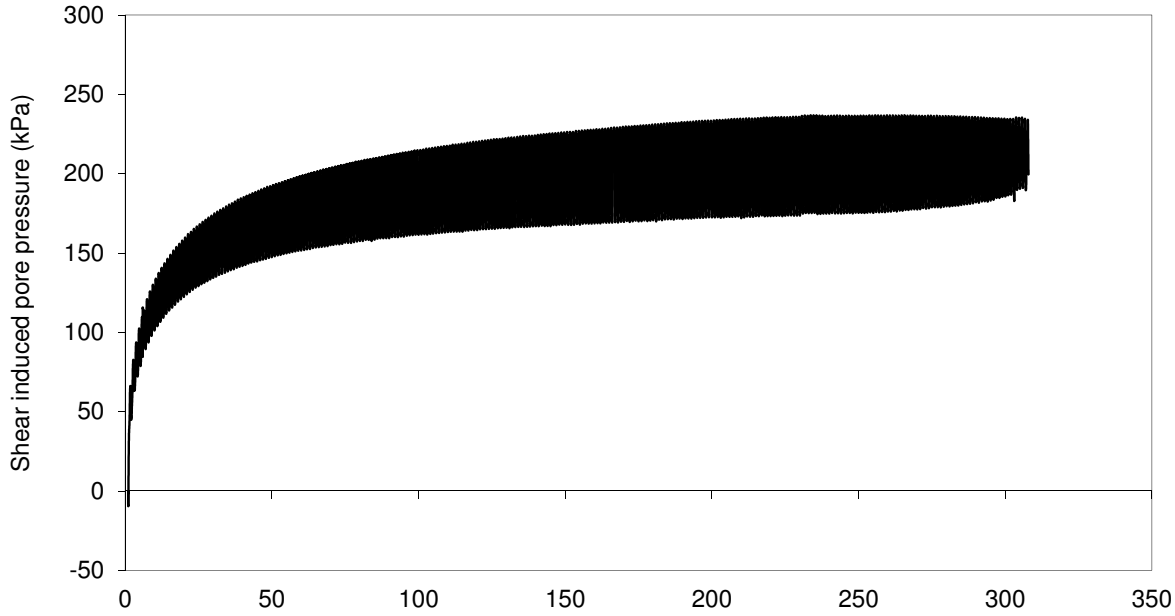
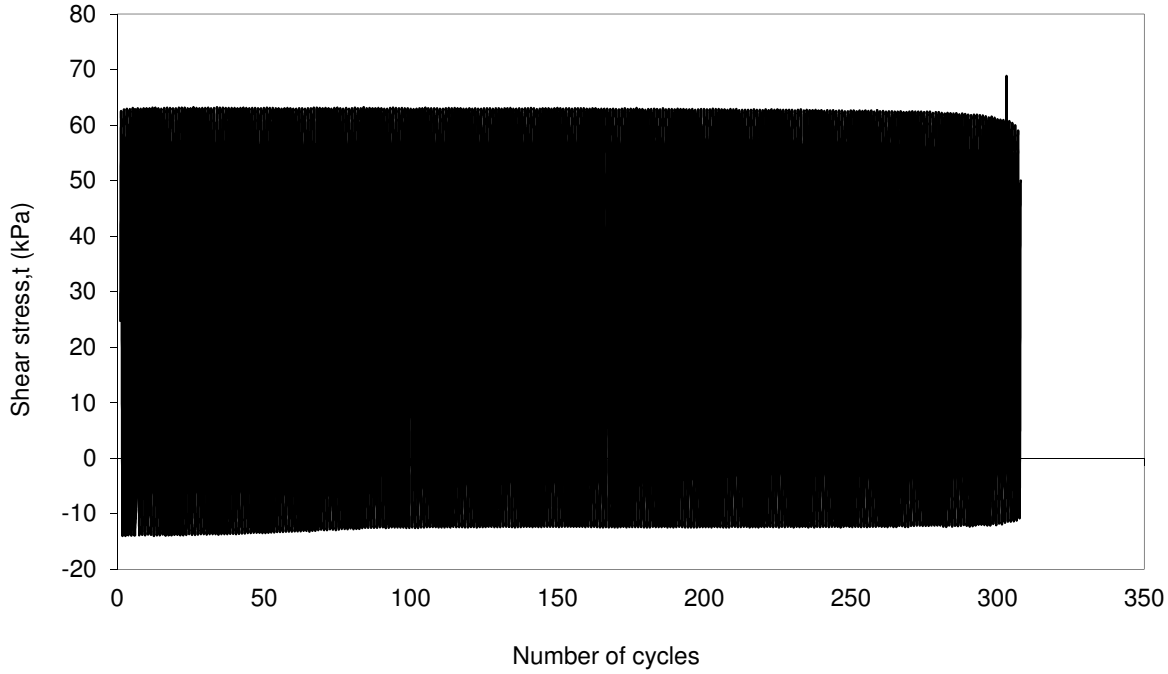
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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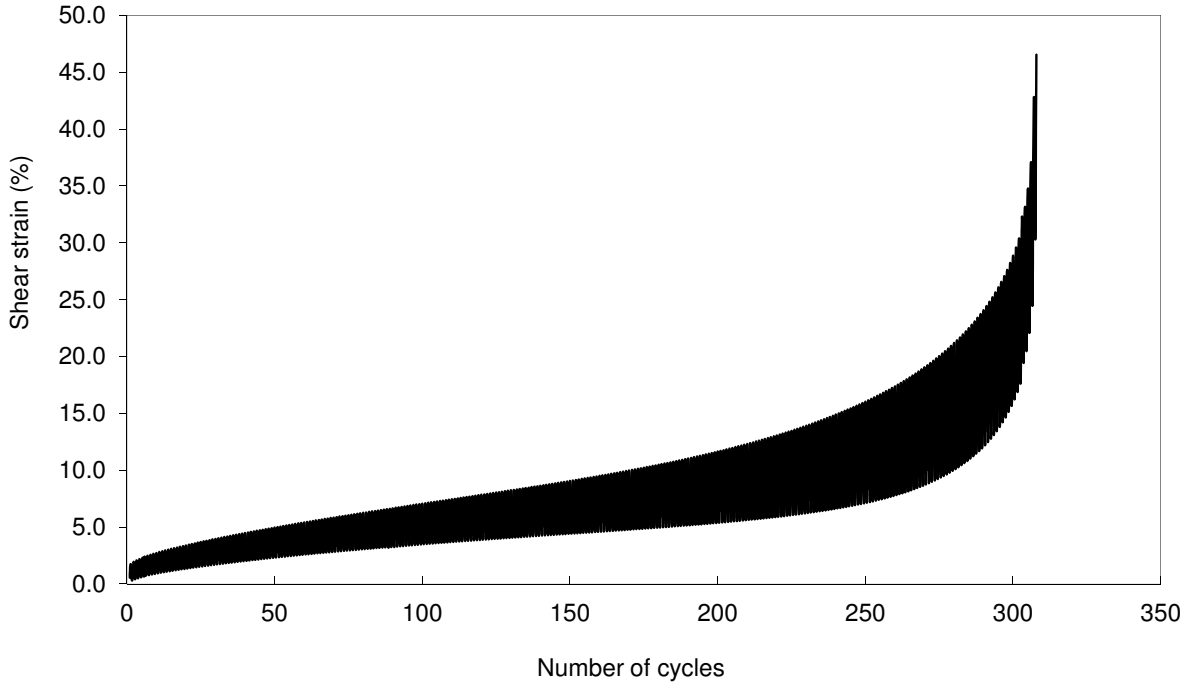
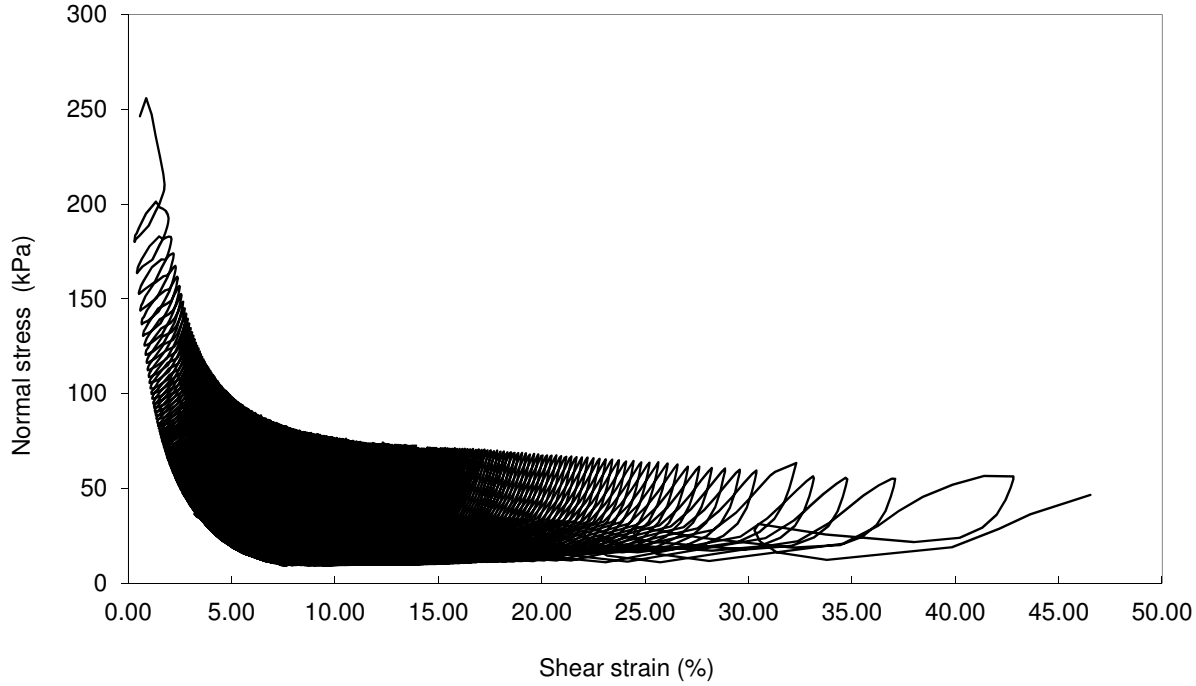
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P09-Q2	Firm/stiff grey very sandy CLAY
Sample Depth (m):	26.63-26.67	(slightly micaceous)- CYCLIC #3





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	H10	Description (visual) :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.2	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	19.12	%	17.30	%	
Bulk density :	2.01	Mg/m^3			
Dry density :	1.69	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.5788				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	3.19	% (for stage)
Normal stress:	530.9	kPa
Voids ratio (e_o):	0.5284	
Max. Consolidation stress:	530.9	kPa
Max. Consolidation strain:	3.19	% (for stage)
Duration:	1262	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	3.19	% (for stage)
Normal stress:	530.9	kPa
Voids ratio (e_o):	0.5284	
Max. Consolidation stress:	530.9	kPa
Max. Consolidation strain:	3.19	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	146.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	4	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	11.306	-7.132	140.1	-138.8	513.4	276.4
3	16.182	-13.086	146.4	-148.2	520.8	293.5
4	21.050	-16.724	140.7	-140.8	524.2	299.4
5	19.834	-20.342	16.4	-140.8	524.4	302.8

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 08/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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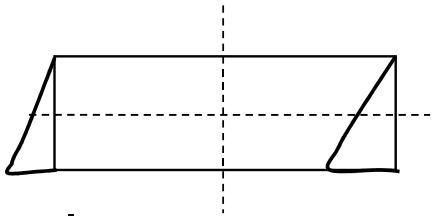
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)

SPECIMEN DETAILS

Initial Height:	21.2	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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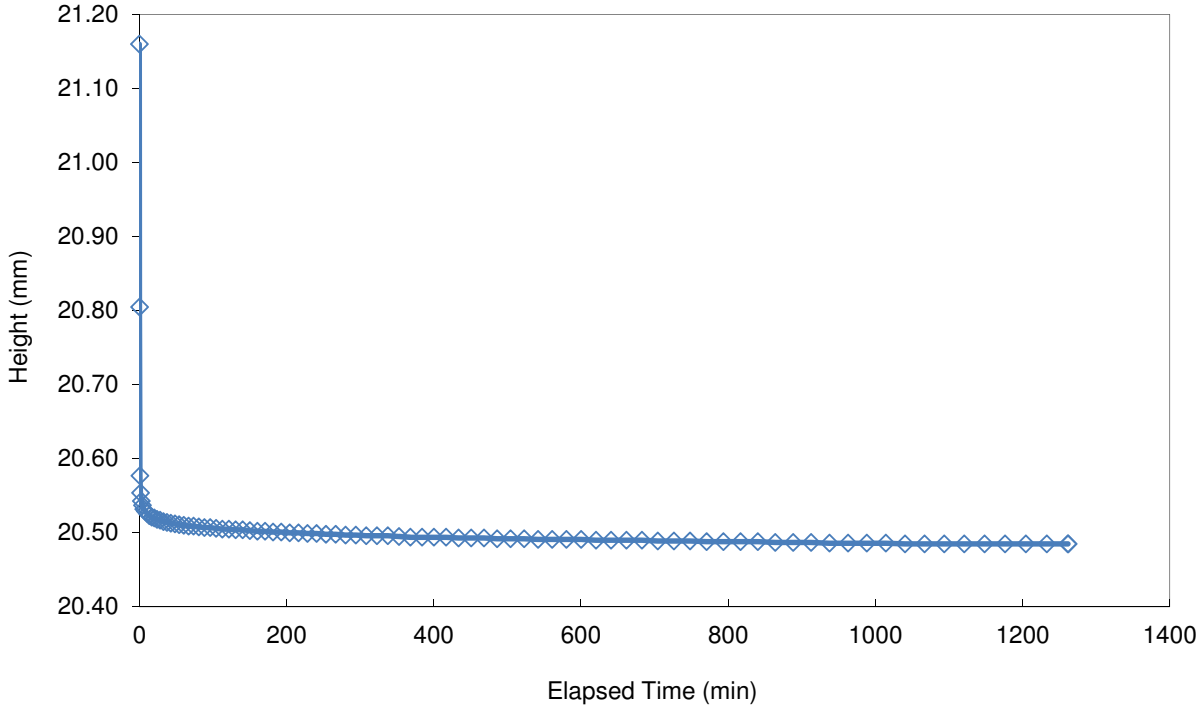
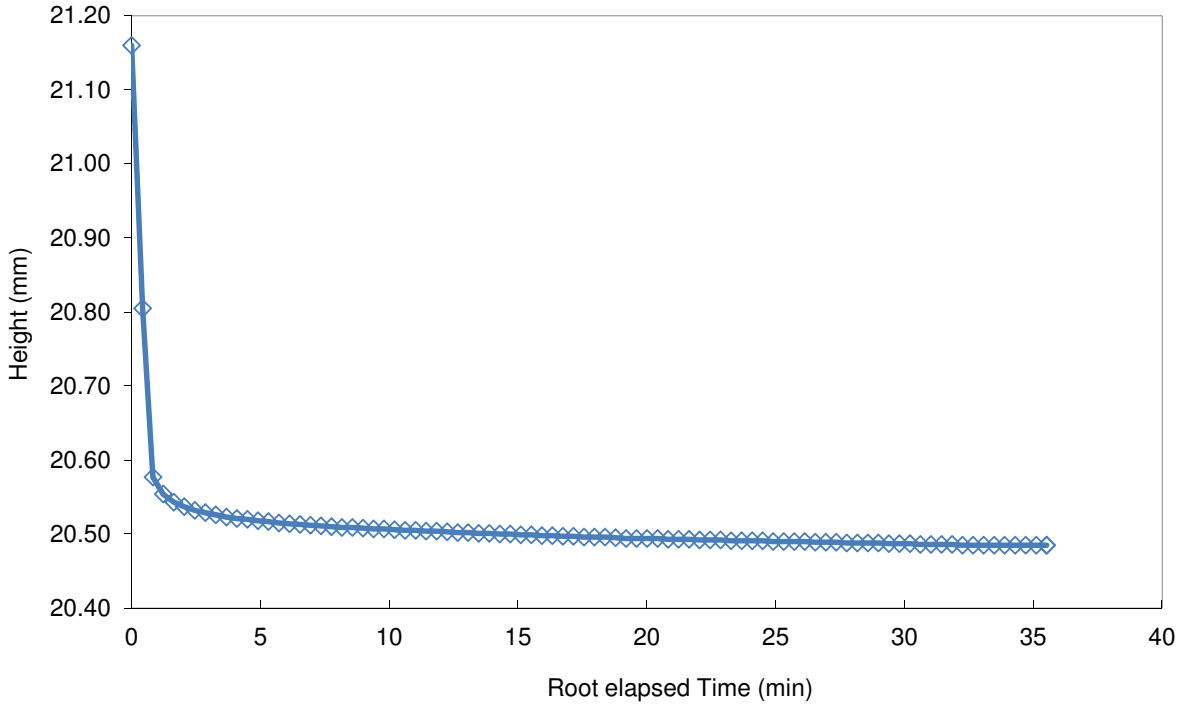
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

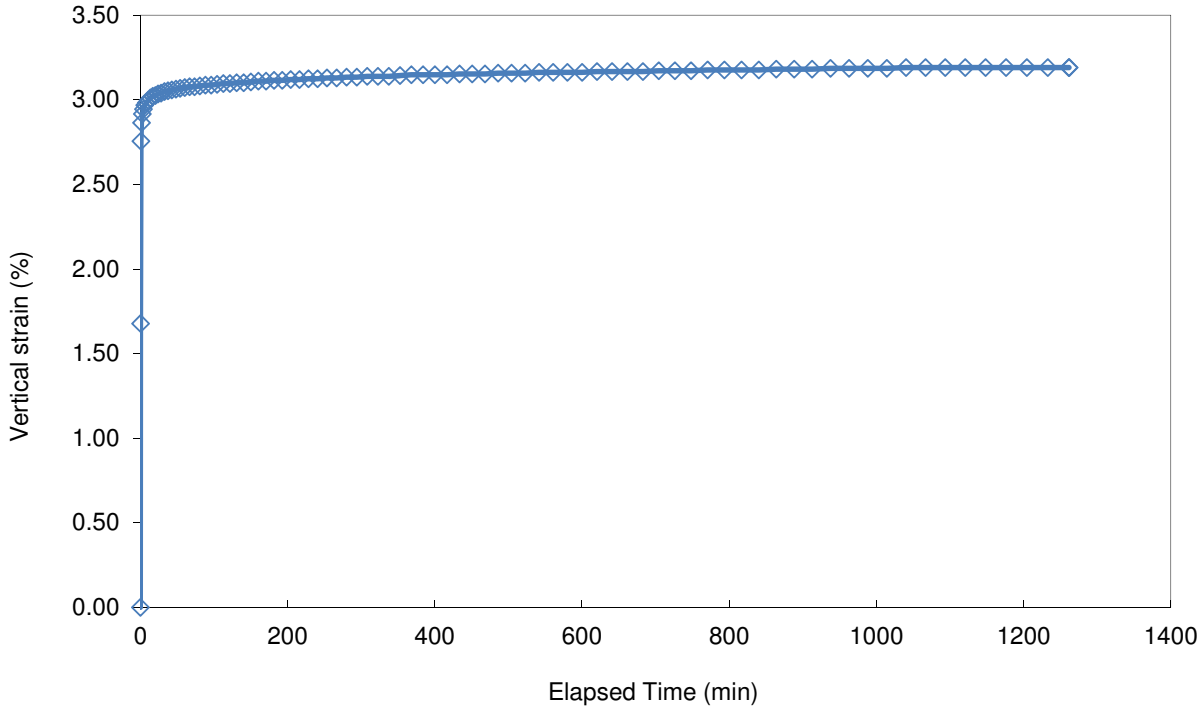
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

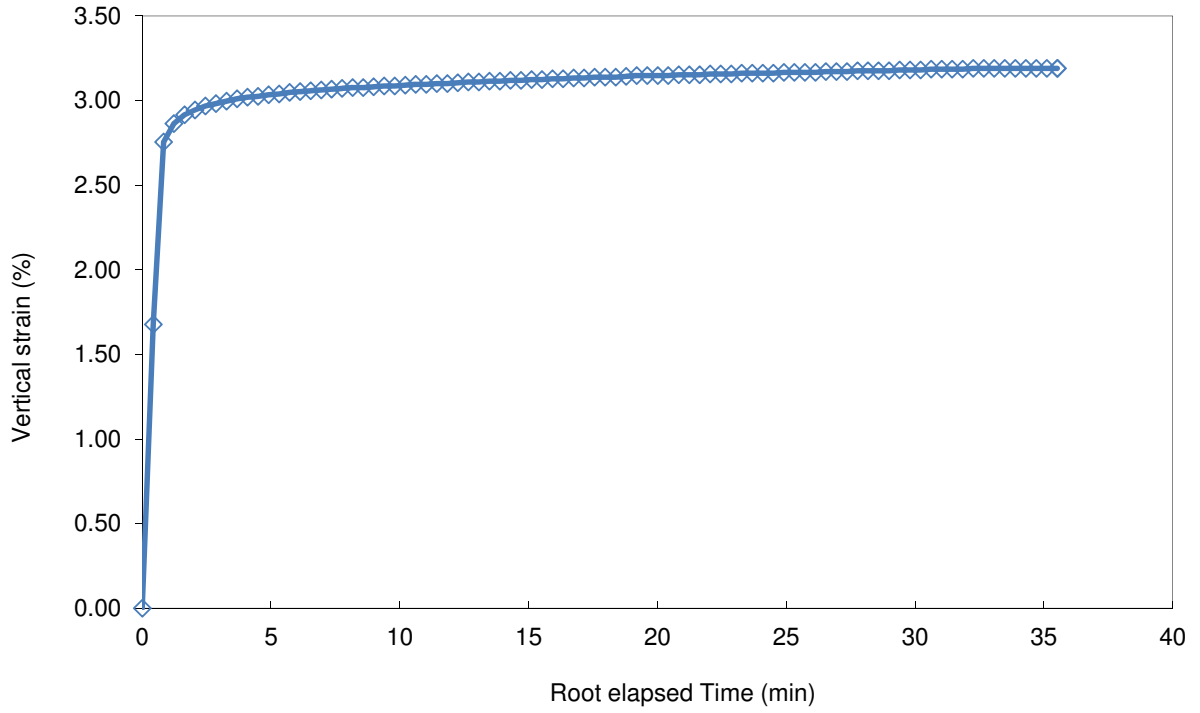
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHH10 P16Q2 5460 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

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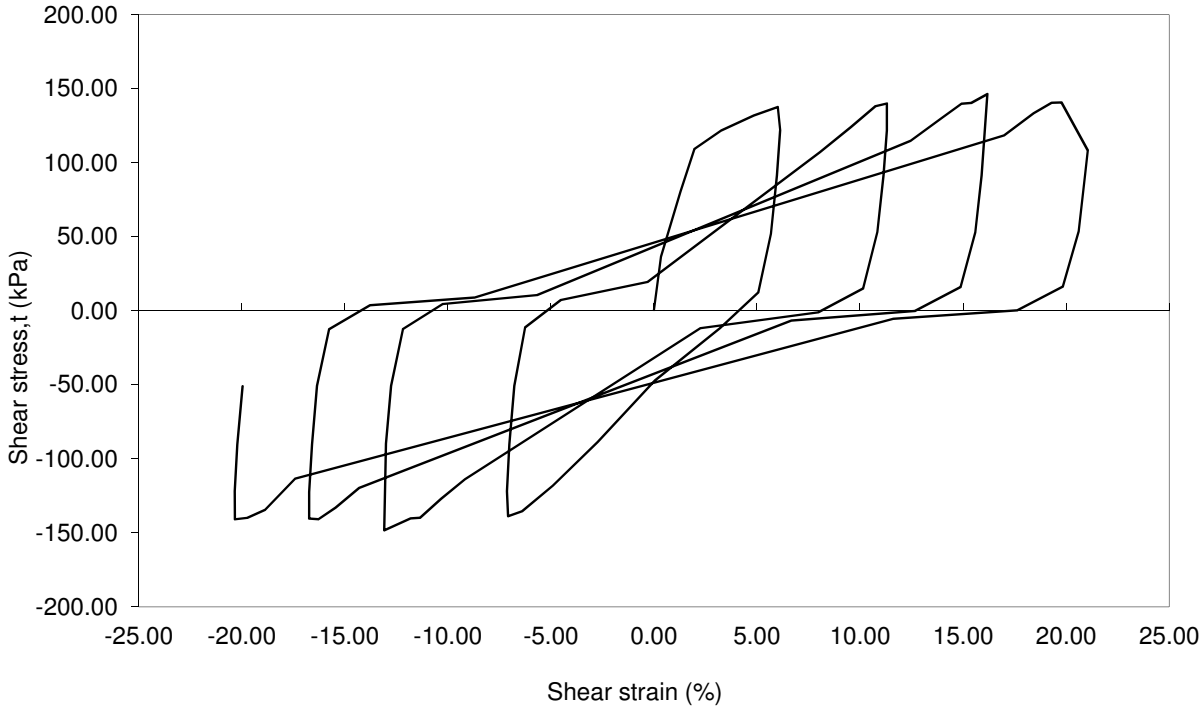
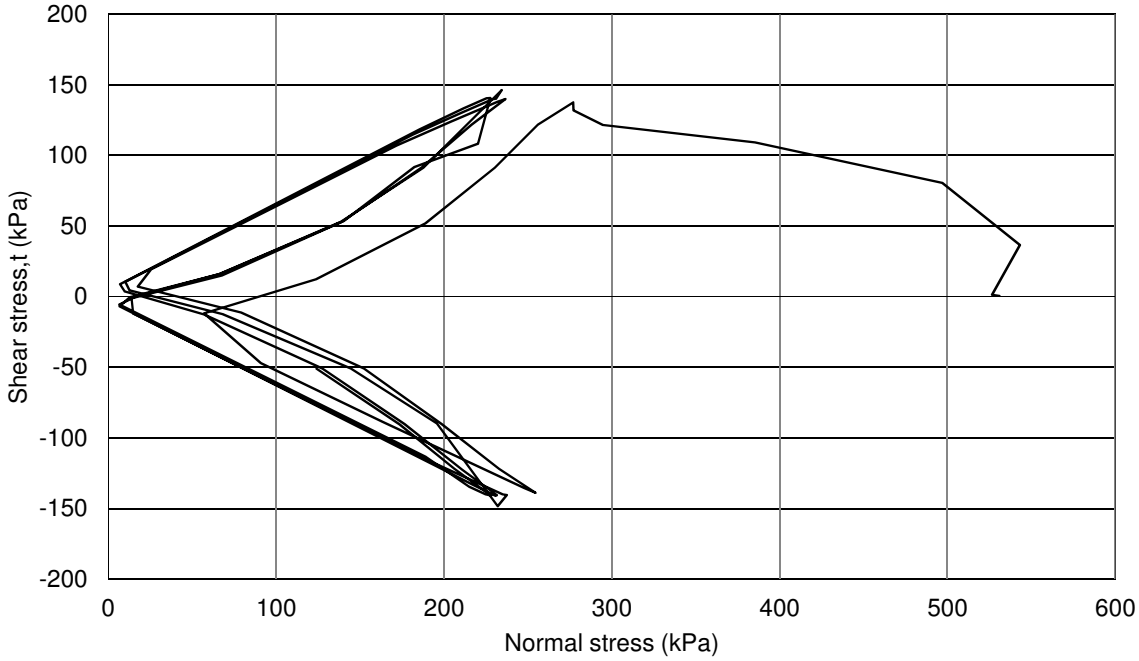
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

RGI
Russell Geotechnical Innovations

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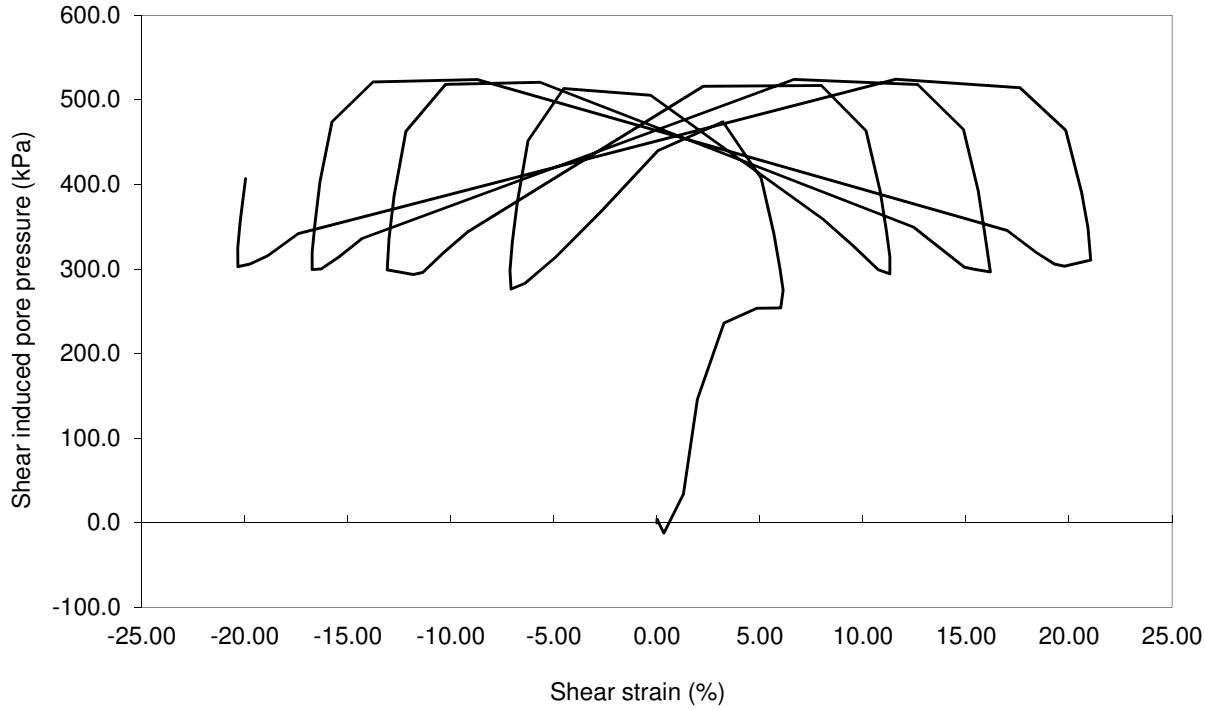
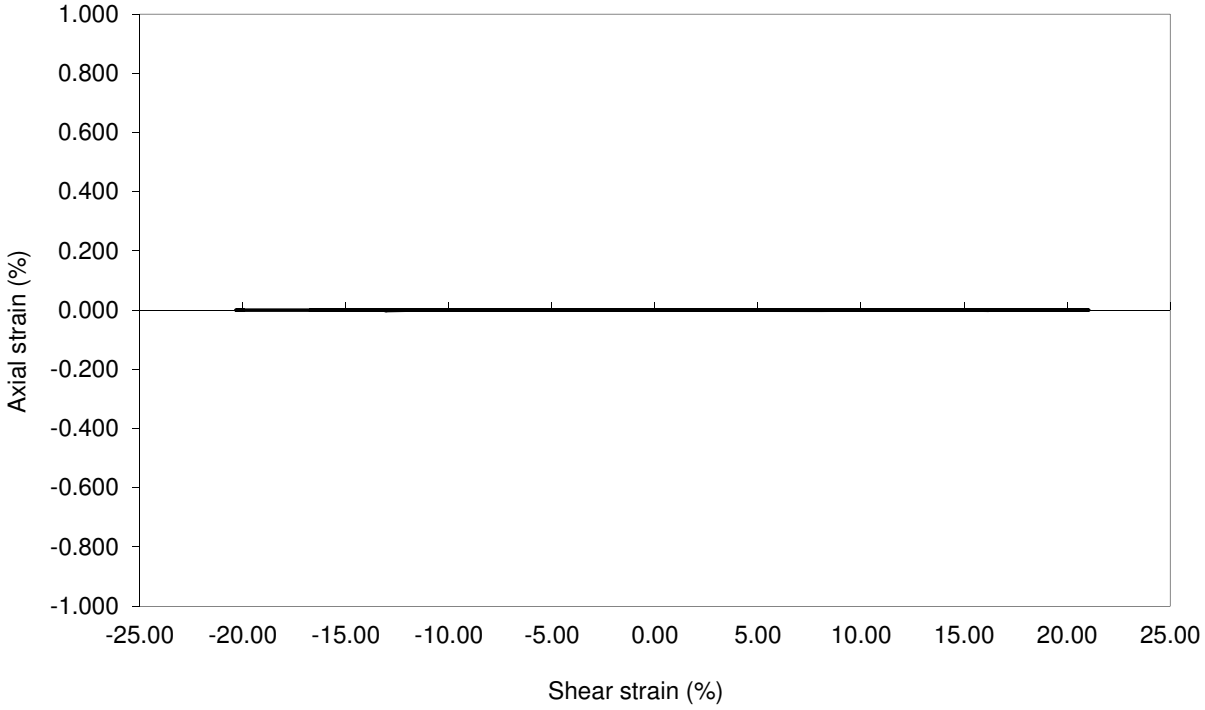
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

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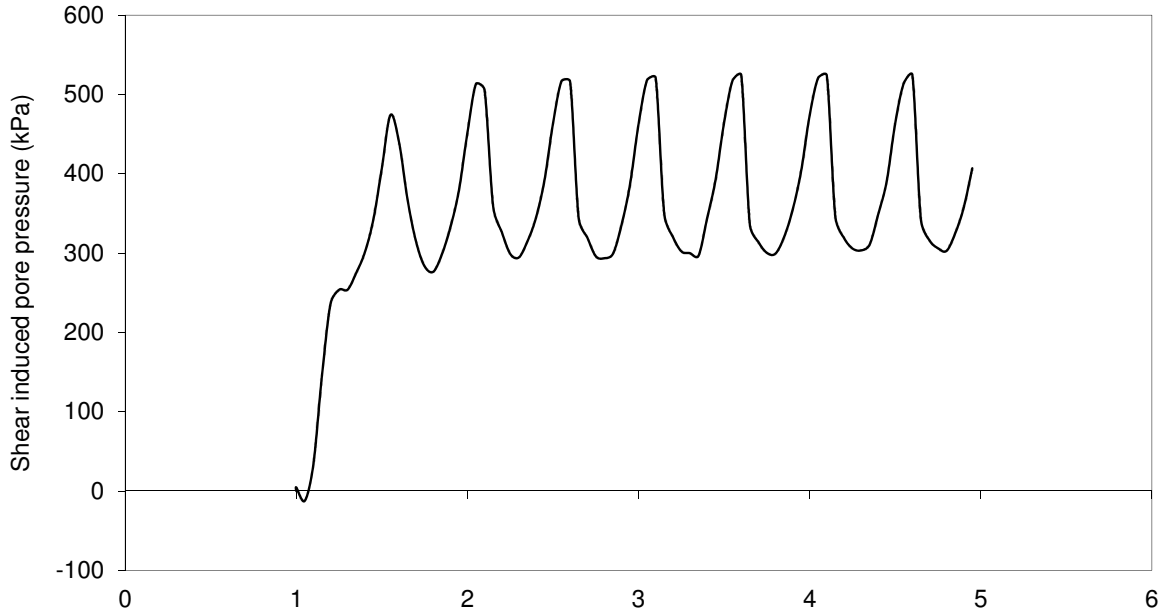
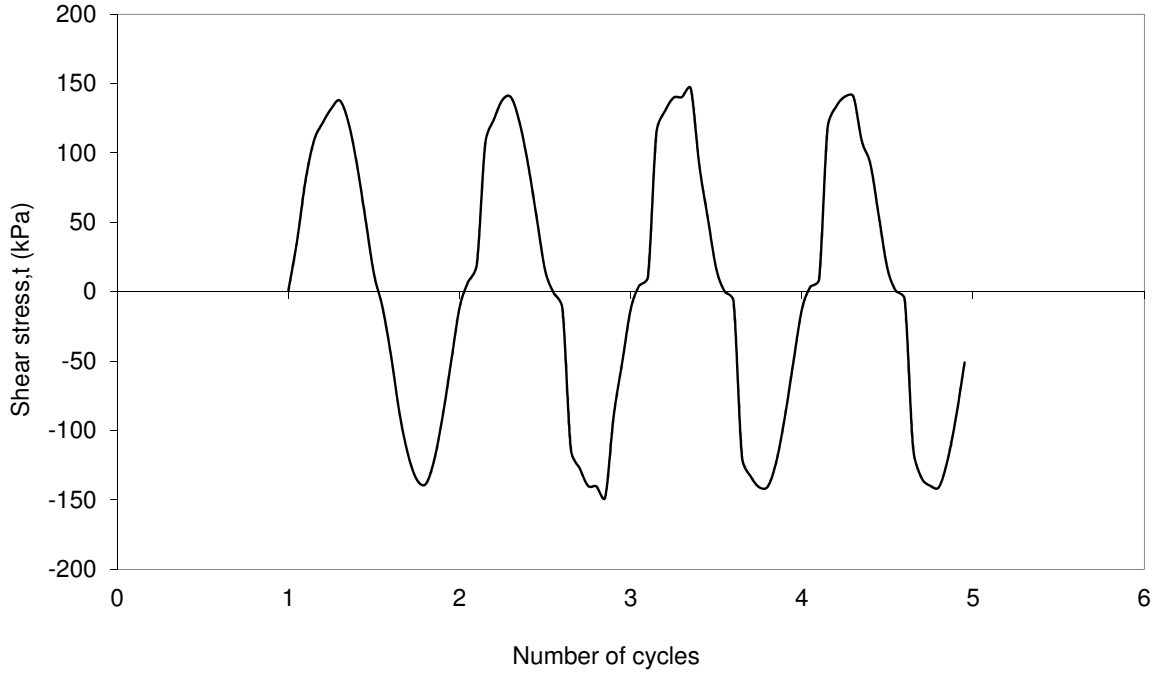
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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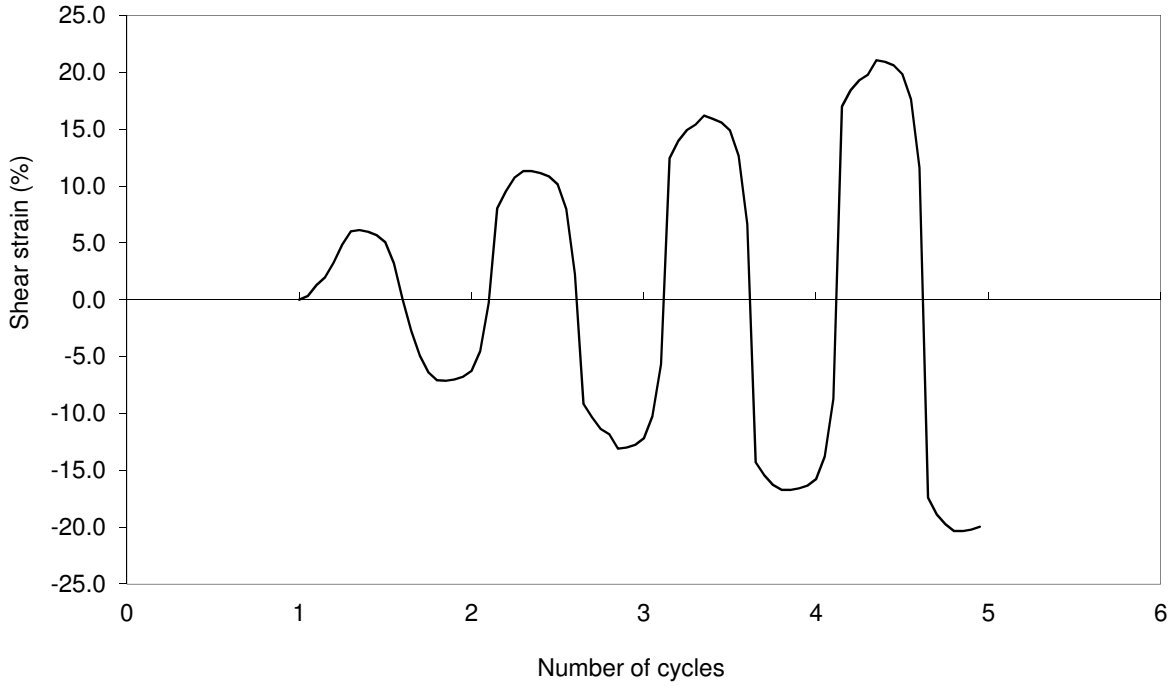
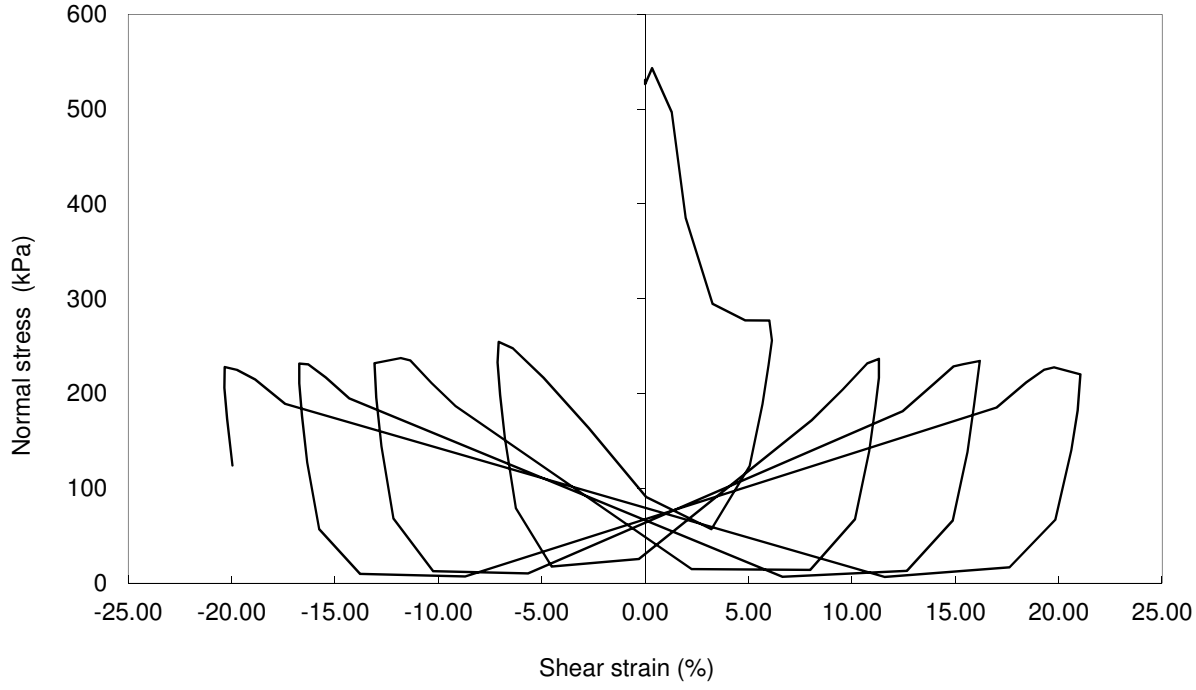
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 08/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	H10	Description (visual) :	
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of	
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)	

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.0	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.46	%	19.89	%	
Bulk density :	2.04	Mg/m^3			
Dry density :	1.70	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.5747				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	4.00	% (for stage)
Normal stress:	530.8	kPa
Voids ratio (e_o):	0.5116	
Max. Consolidation stress:	530.8	kPa
Max. Consolidation strain:	4.00	% (for stage)
Duration:	1233	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.2	mm
Diameter :	66.4	mm
Axial strain:	4.00	% (for stage)
Normal stress:	530.8	kPa
Voids ratio (e_o):	0.5116	
Max. Consolidation stress:	530.8	kPa
Max. Consolidation strain:	4.00	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	74.8	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	20	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.379	-0.412	74.8	-74.8	159.9	74.5
5	1.726	-0.729	74.3	-74.6	323.8	276.9
10	5.347	-3.780	72.4	-72.6	516.0	409.6
15	10.799	-8.785	72.0	-71.7	528.8	426.5
16	11.930	-9.891	71.9	-71.6	529.1	427.2
17	13.061	-10.998	71.8	-71.5	529.1	428.2
18	14.202	-12.228	71.5	-71.5	529.3	428.2
19	15.313	-13.498	71.8	-71.6	528.9	428.6
20	16.499	-14.867	71.8	-71.2	529.3	427.2
21	17.595	-16.241	71.8	-71.0	528.9	427.4

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 12/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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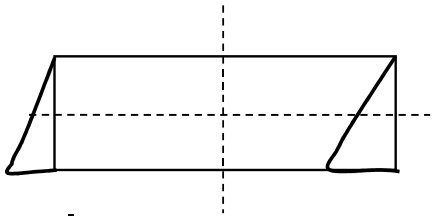
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)

SPECIMEN DETAILS

Initial Height:	21.0	mm
Initial Diameter:	66.4	mm



Elevation

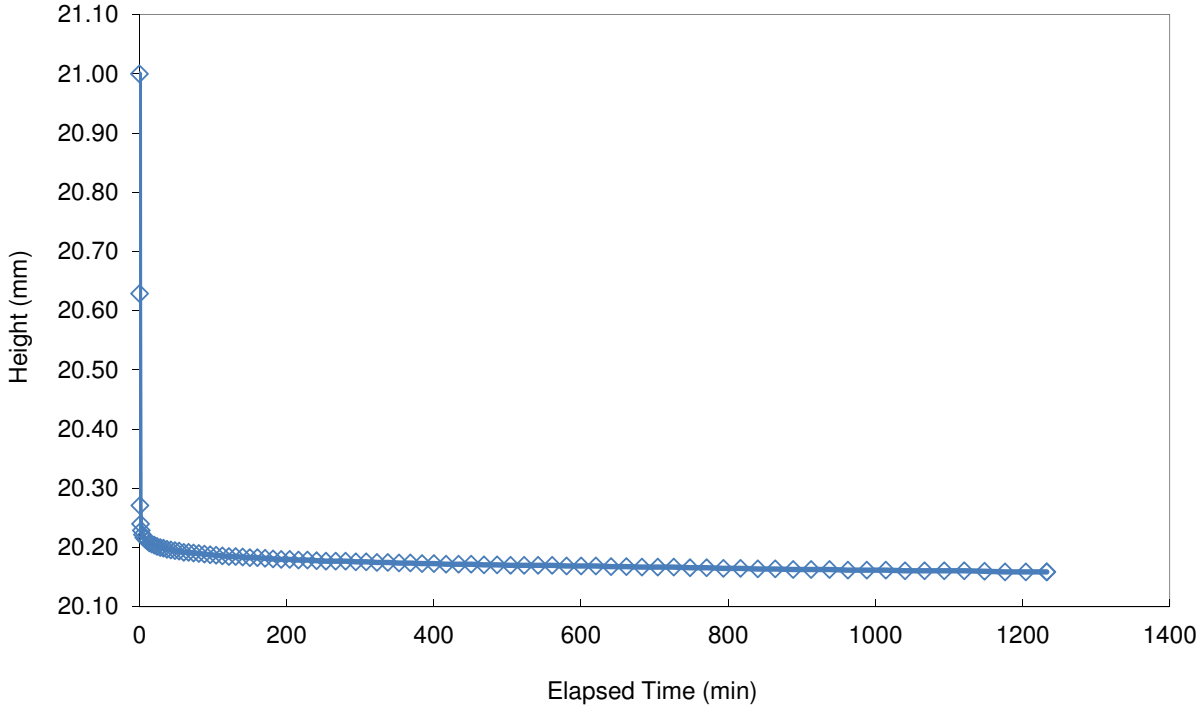
Failure Sketch

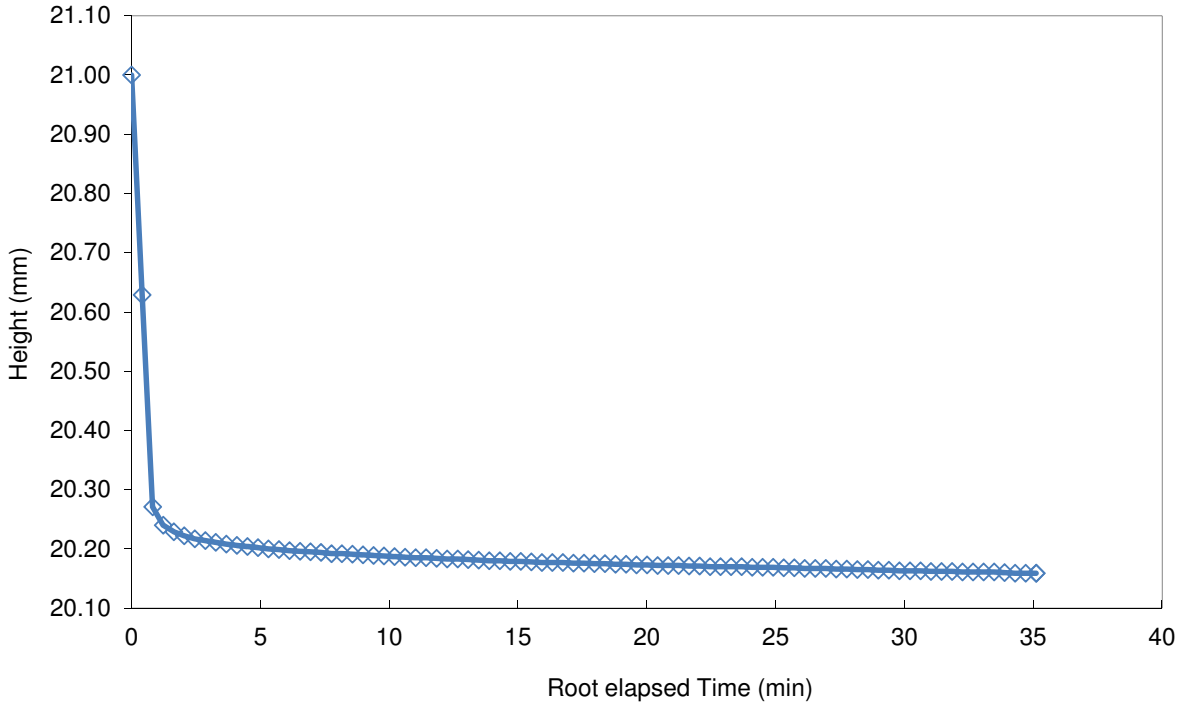
Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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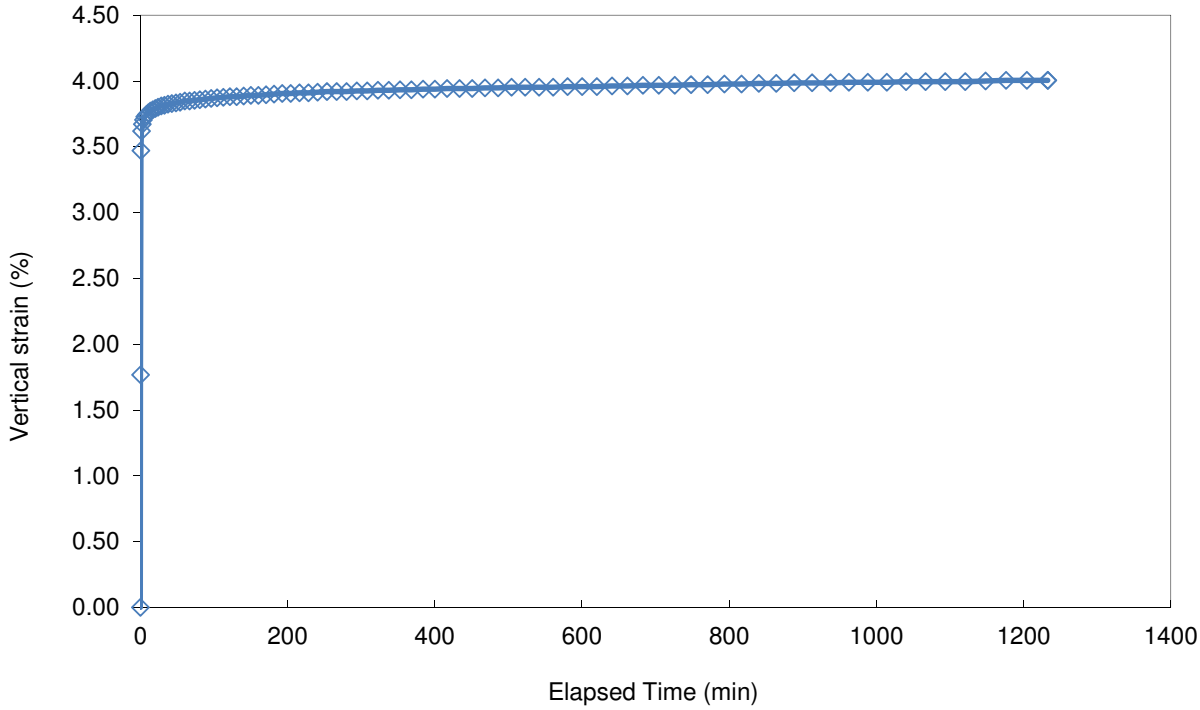
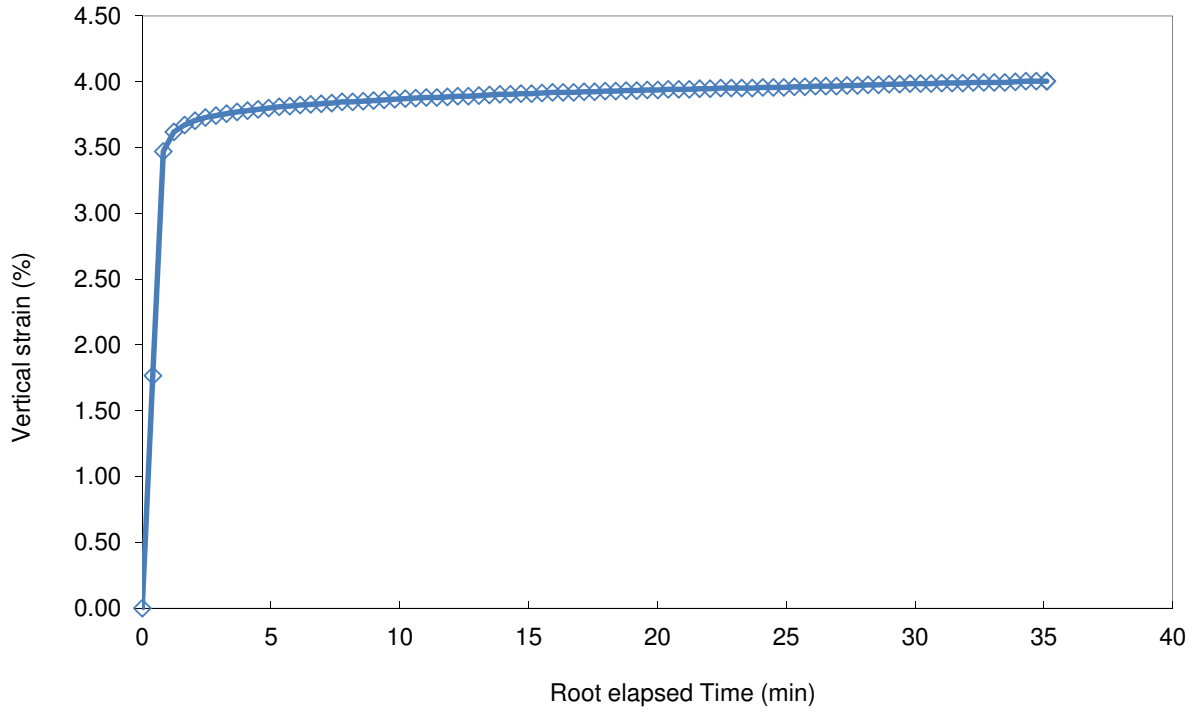
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Consolidation stage #1

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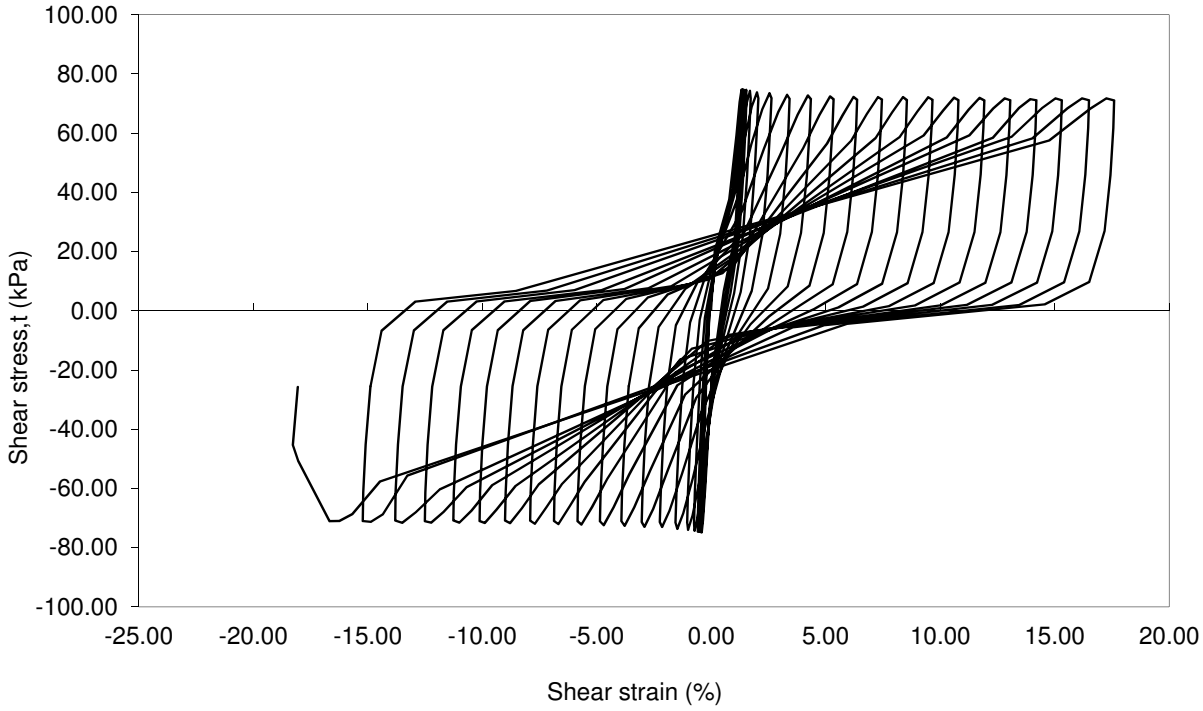
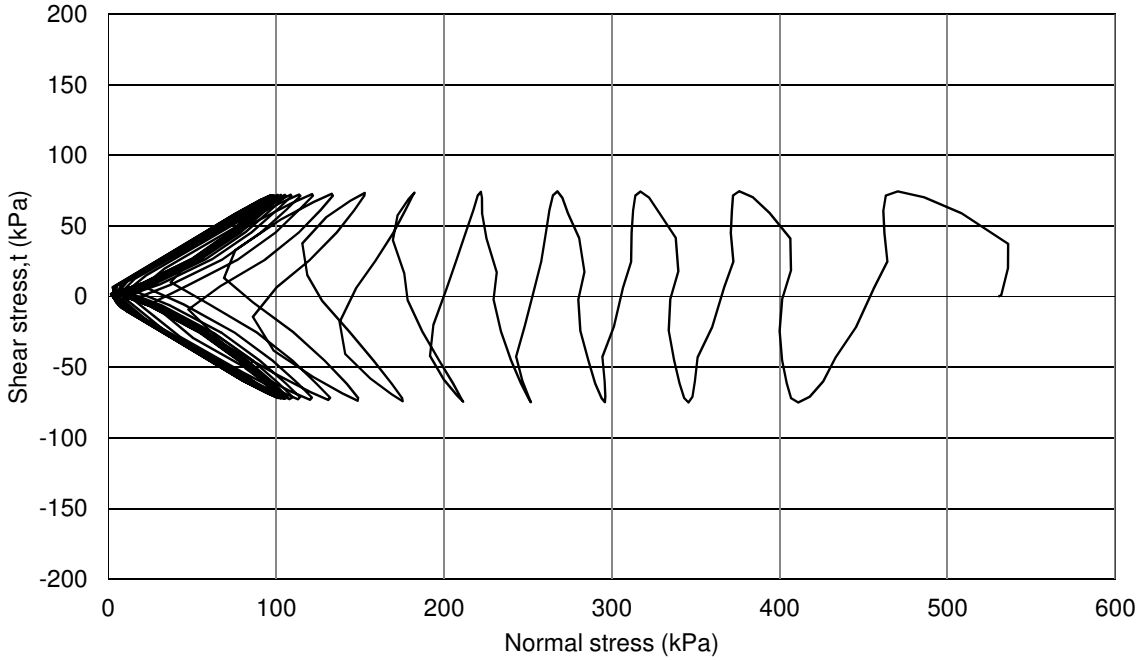
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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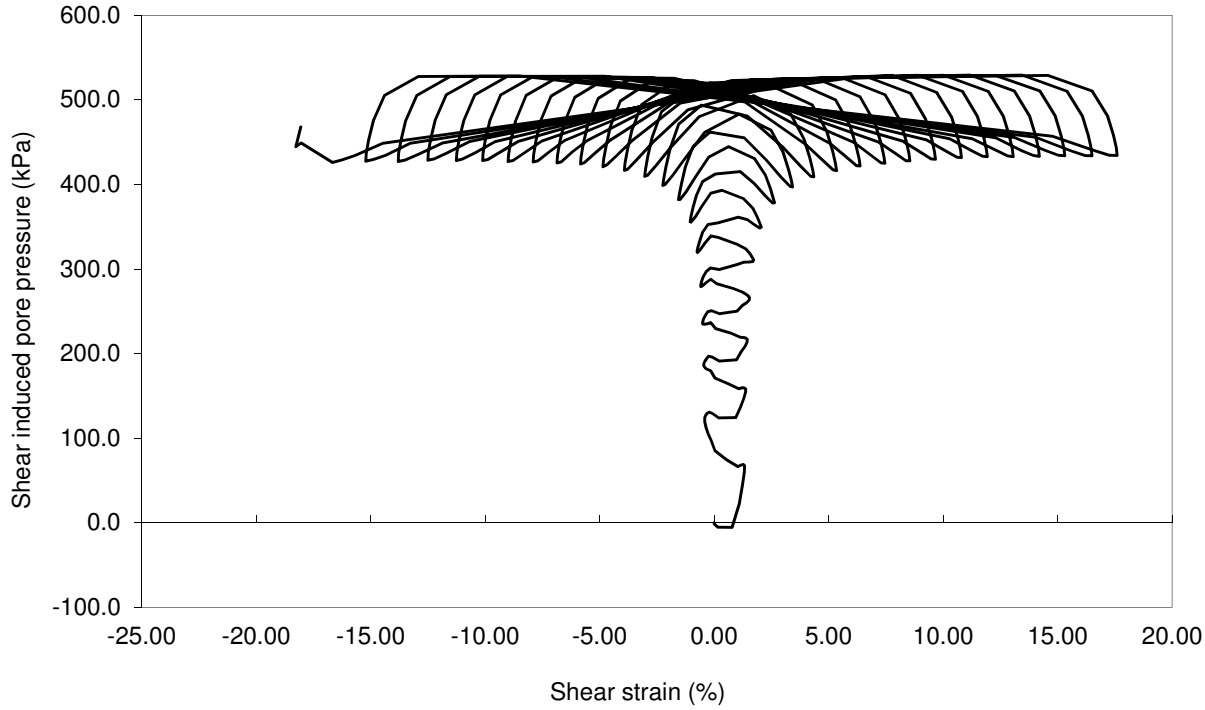
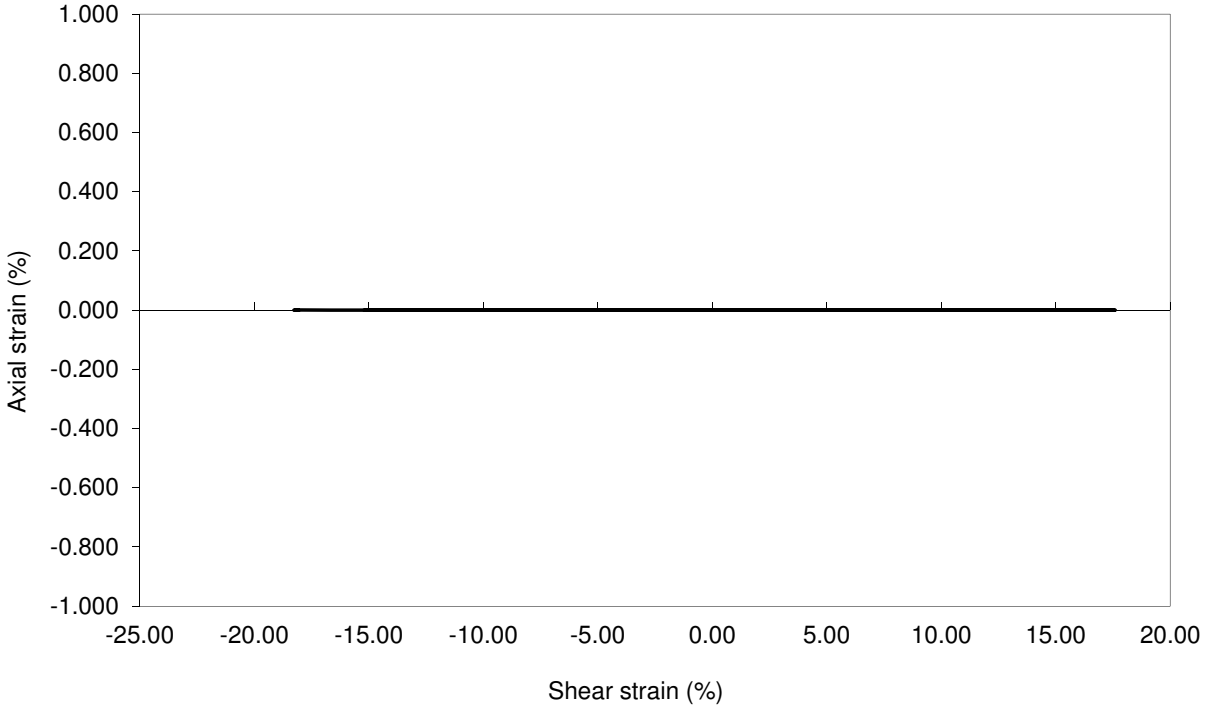
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 12/02/2016		

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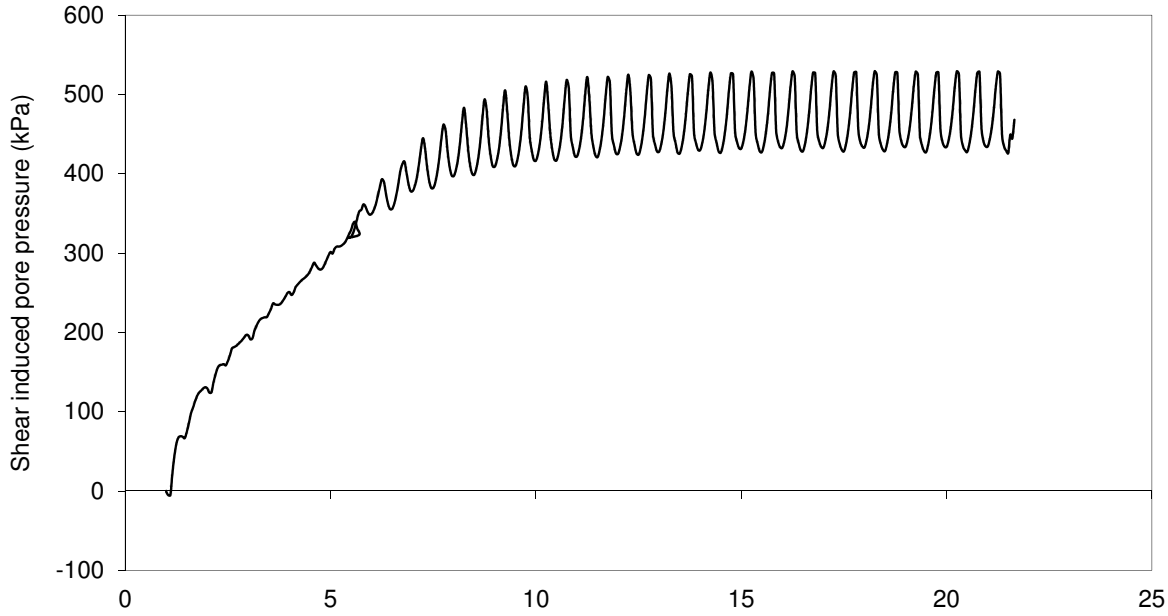
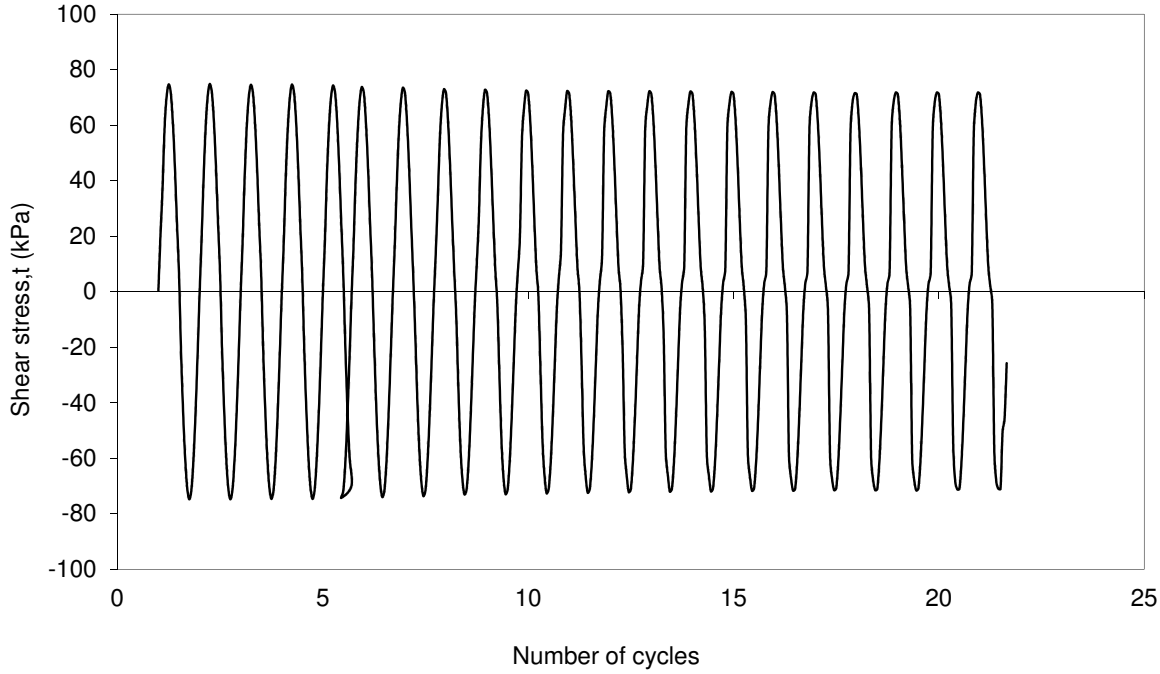
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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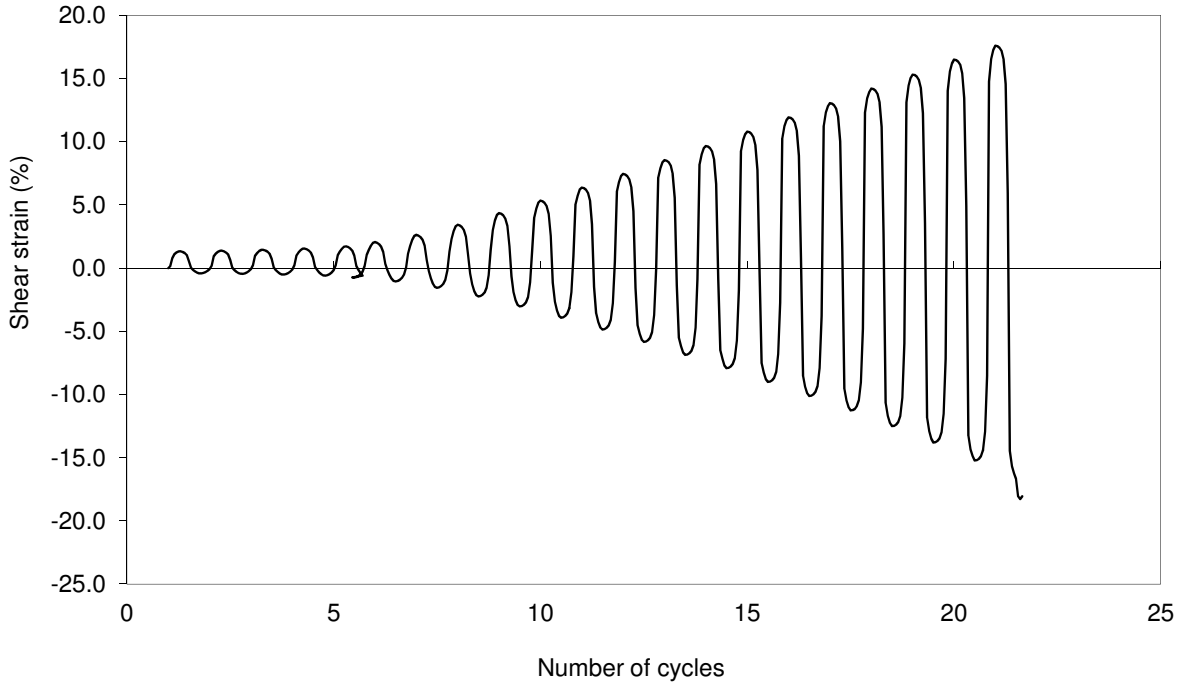
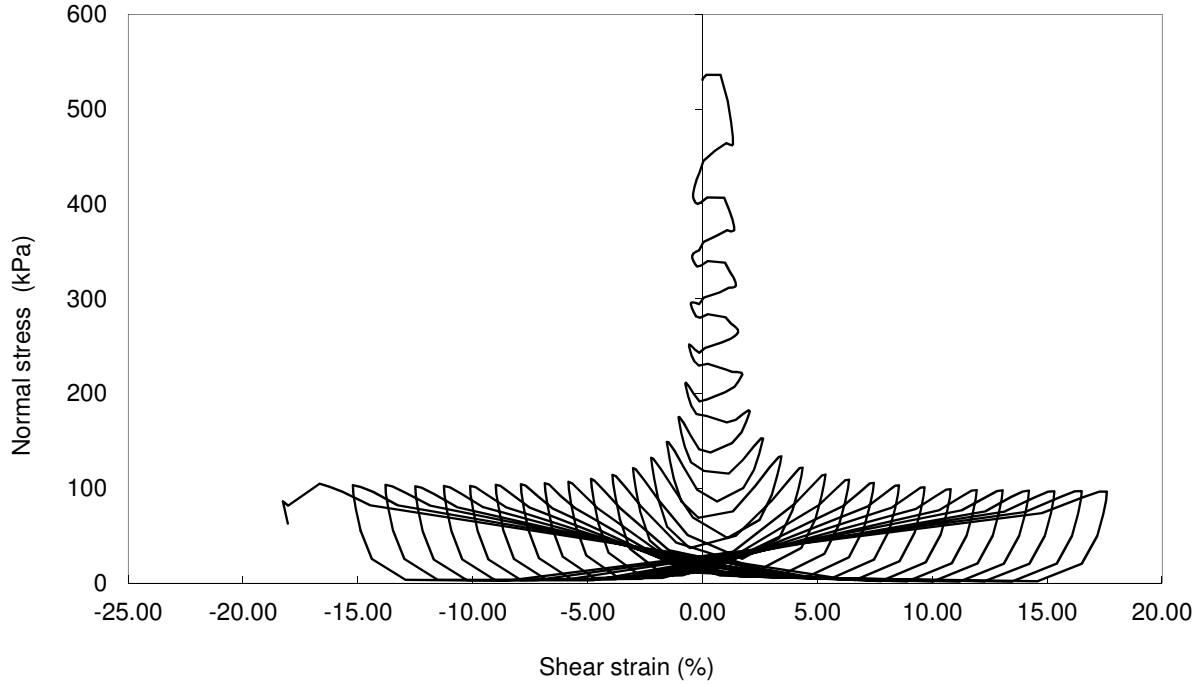
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.65-54.69	clayey sand - (Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 12/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	H10	Description (visual) :	
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of	
Sample Depth (m):	54.69-54.73	clayey sand - (Cyclic Test #3)	

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.1	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	20.24	%	18.86	%	
Bulk density :	2.00	Mg/m^3			
Dry density :	1.66	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.6090				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	3.75	% (for stage)
Normal stress:	530.7	kPa
Voids ratio (e_o):	0.5486	
Max. Consolidation stress:	530.7	kPa
Max. Consolidation strain:	3.75	% (for stage)
Duration:	1094	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	3.75	% (for stage)
Normal stress:	530.7	kPa
Voids ratio (e_o):	0.5486	
Max. Consolidation stress:	530.7	kPa
Max. Consolidation strain:	3.75	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	56.1	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	31	(SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.099	-0.241	56.0	-56.0	91.4	50.6
5	1.153	-0.236	56.1	-56.1	196.5	144.7
10	1.217	-0.271	56.1	-55.9	281.0	246.0
15	1.370	-0.419	55.8	-55.9	375.0	341.6
20	2.971	-1.887	54.7	-54.9	507.3	426.2
25	7.582	-6.483	54.0	-54.0	532.7	450.8
28	10.562	-10.345	54.0	-55.0	533.1	453.1
31	12.336	-16.759	53.9	-56.0	533.5	450.4
32	12.449	-18.124	53.9	-55.6	533.7	450.1
33	12.838	-19.489	53.9	-55.7	533.7	451.3

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

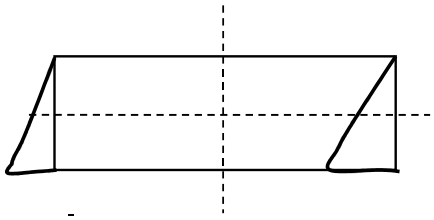
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHH10 P16Q2 5460 DSScyc#3.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.69-54.73	clayey sand - (Cyclic Test #3)

SPECIMEN DETAILS

Initial Height:	21.1	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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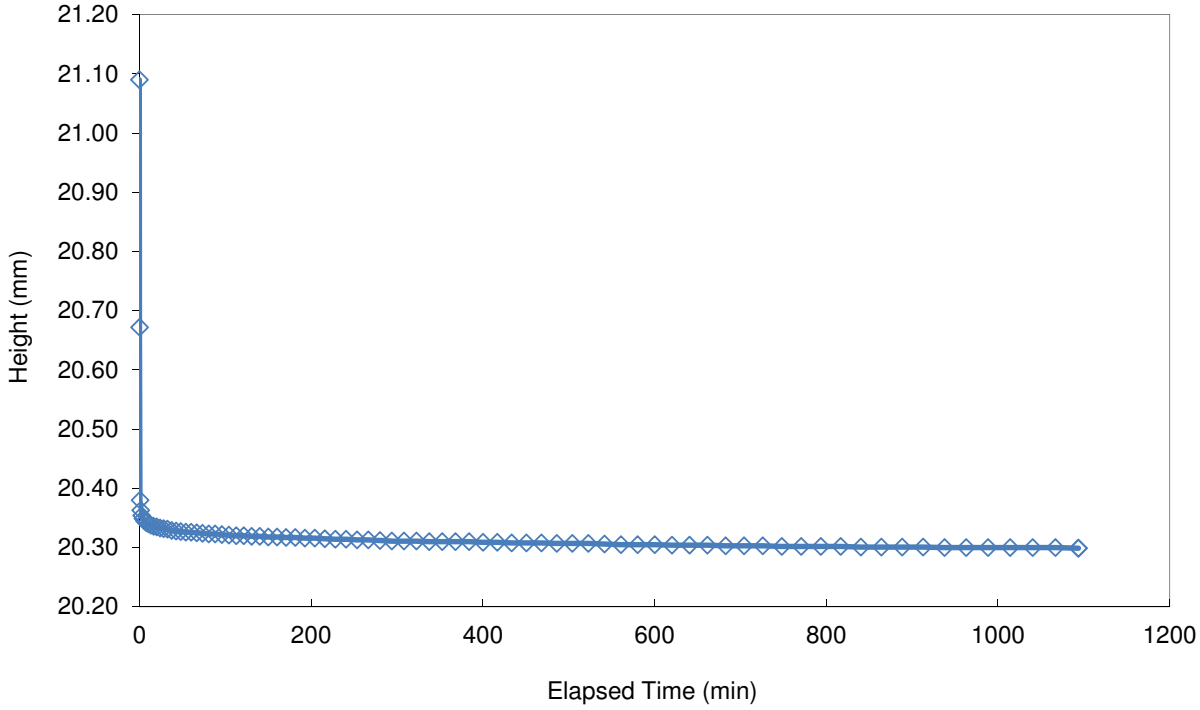

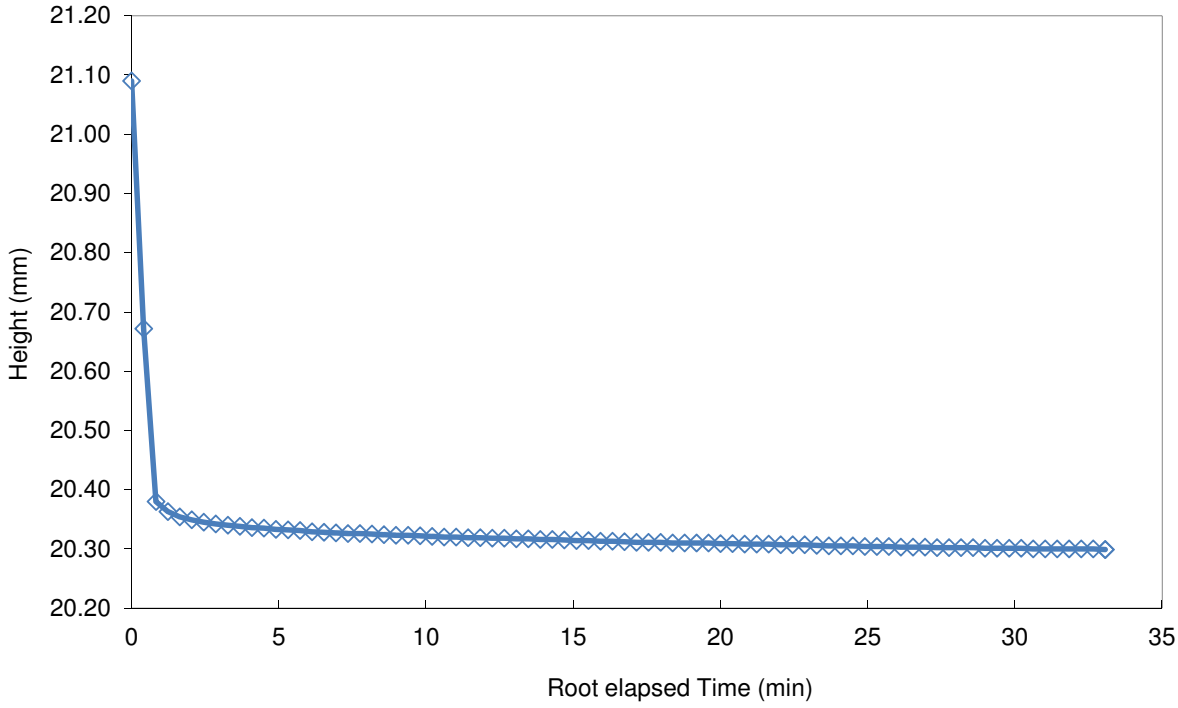

Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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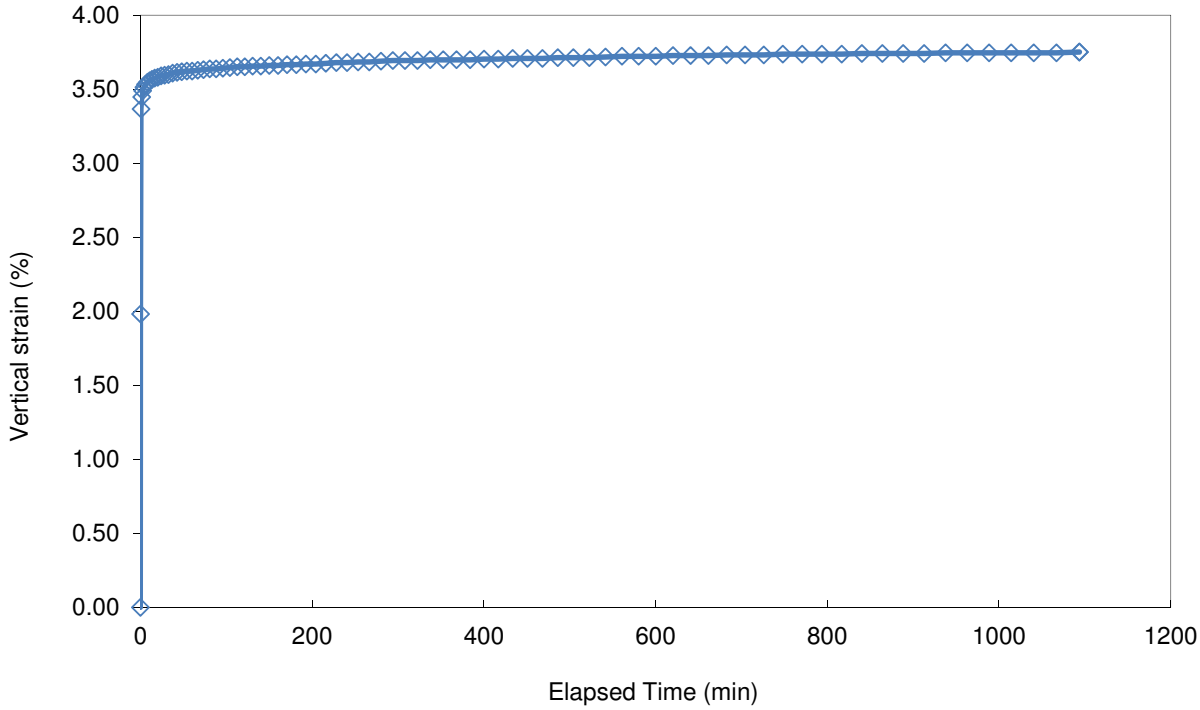

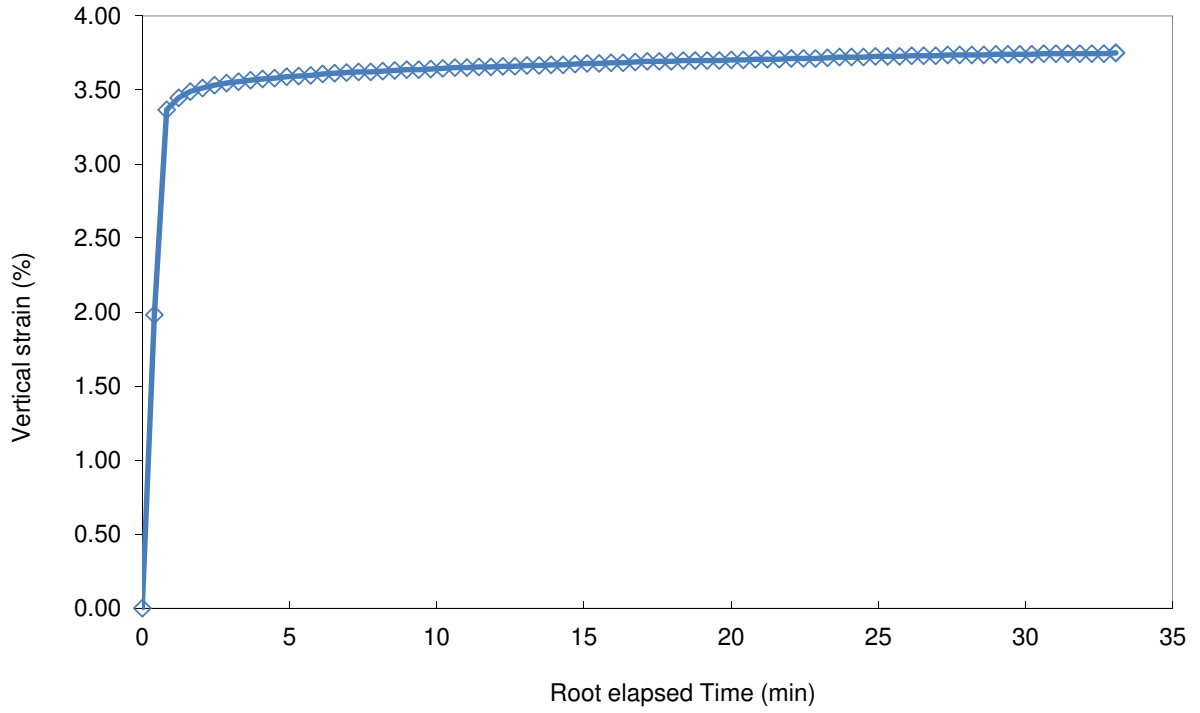

Consolidation stage #1

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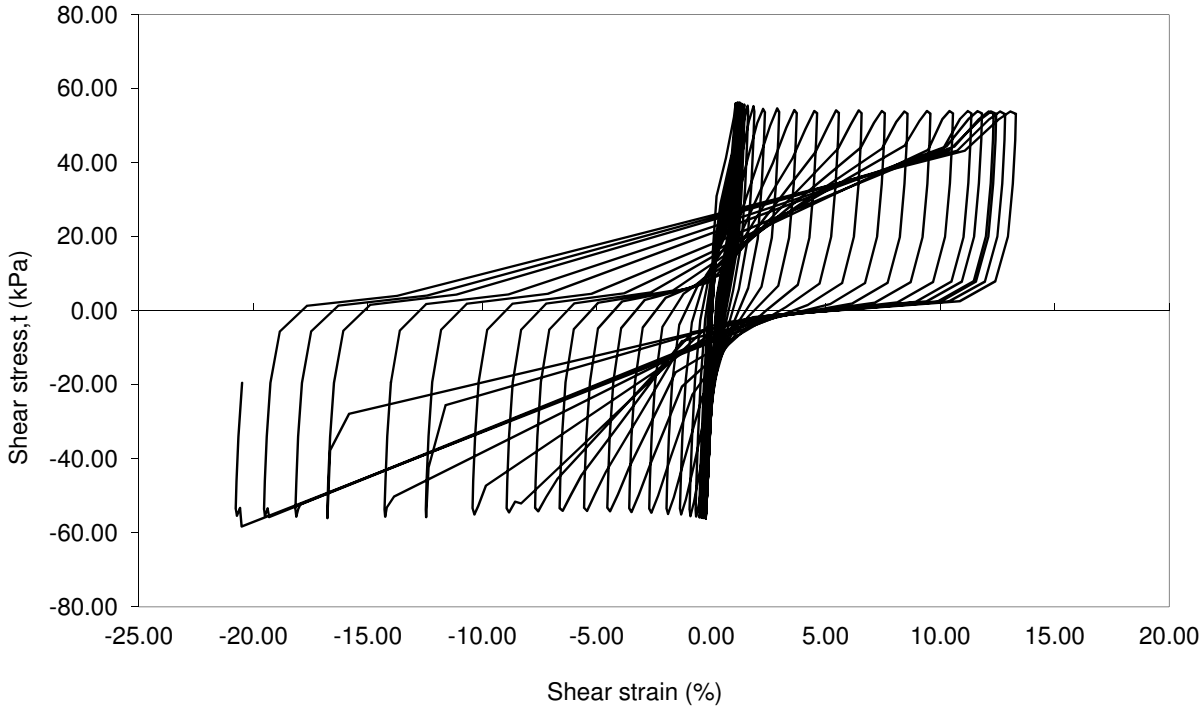

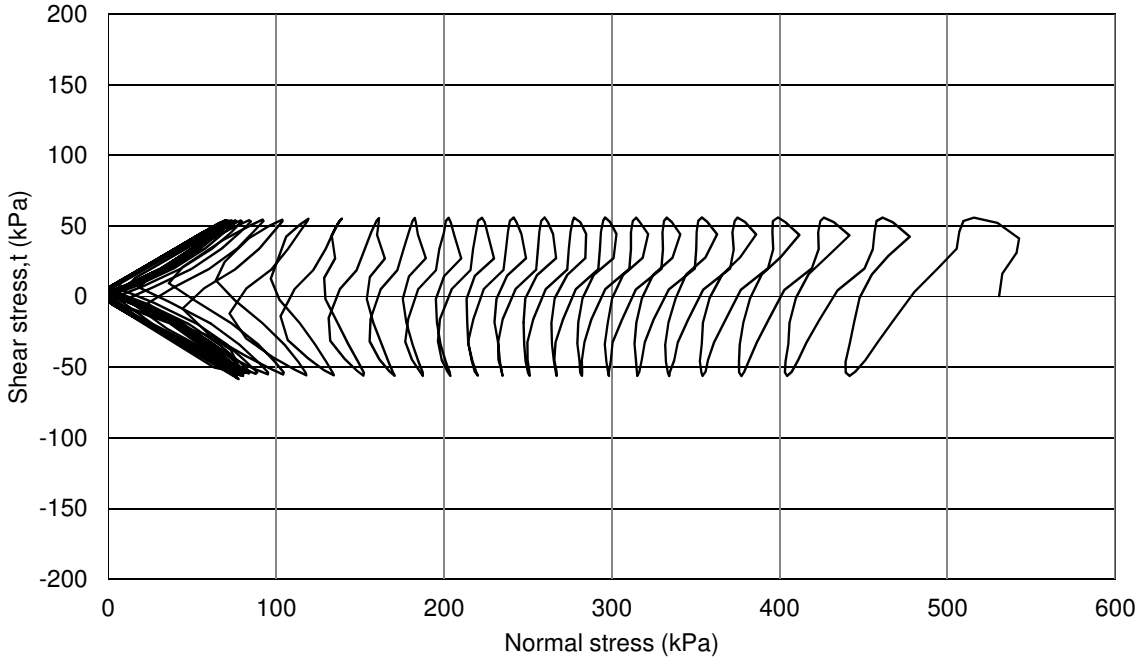

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
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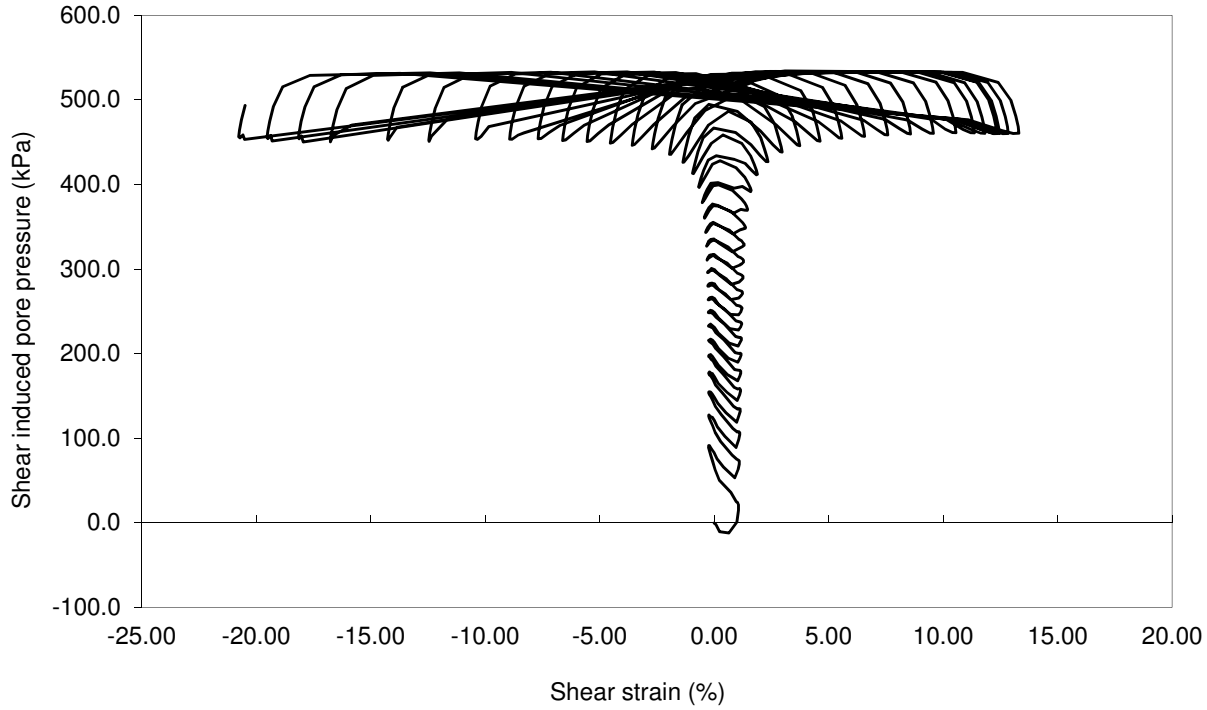

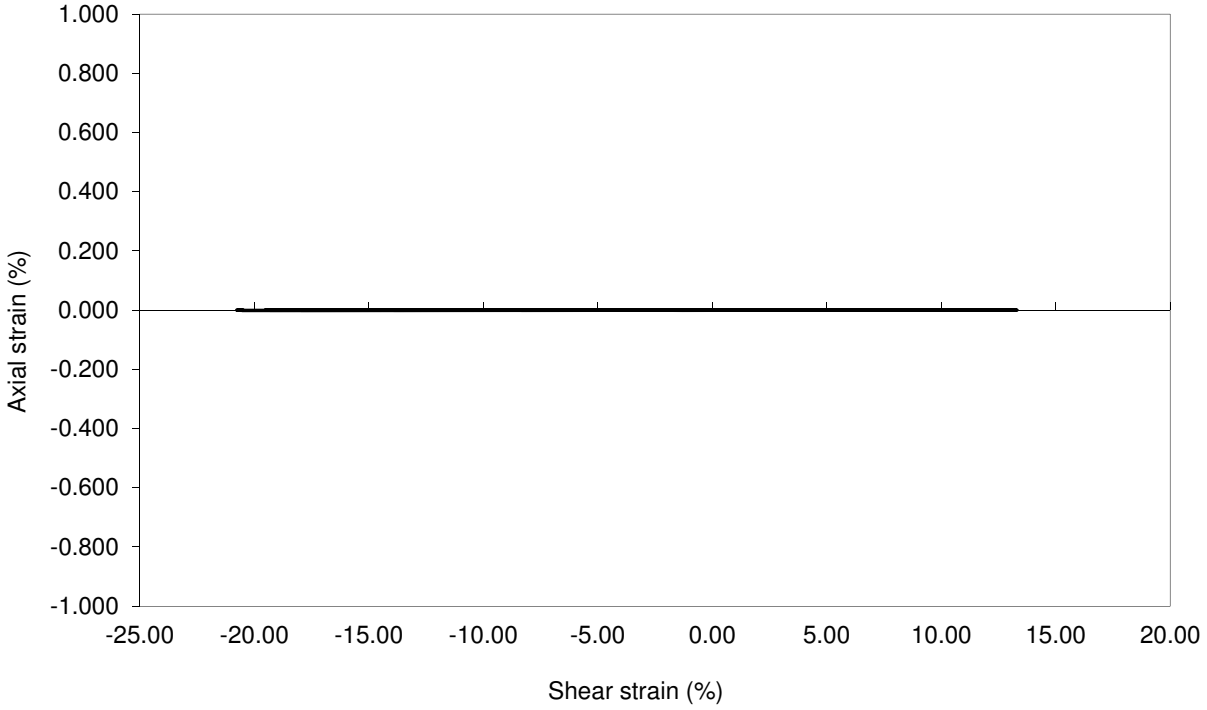

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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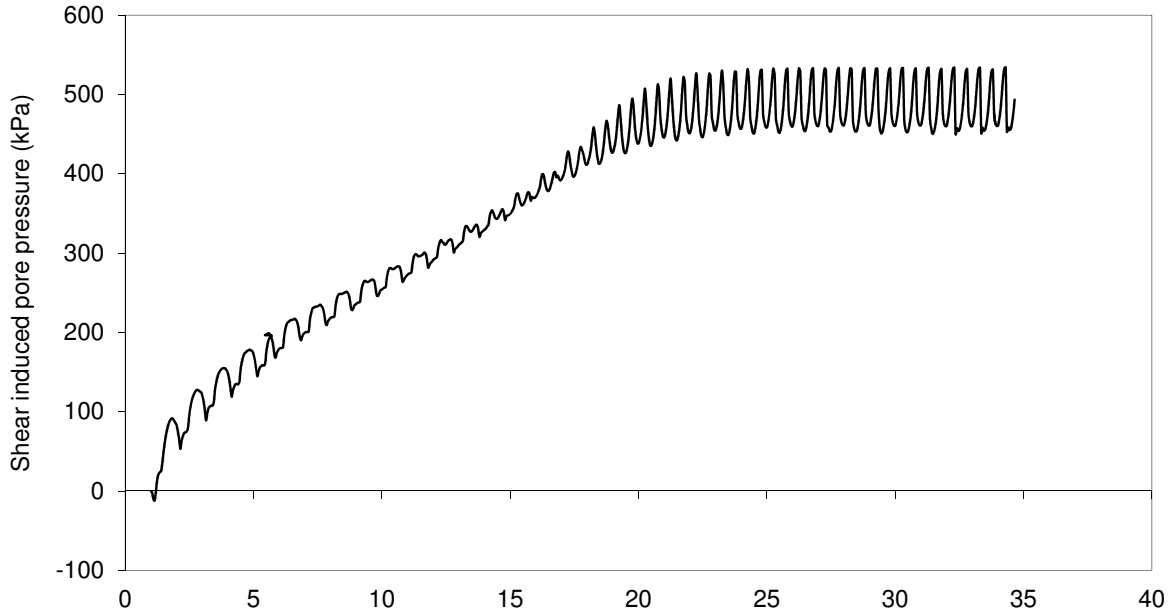
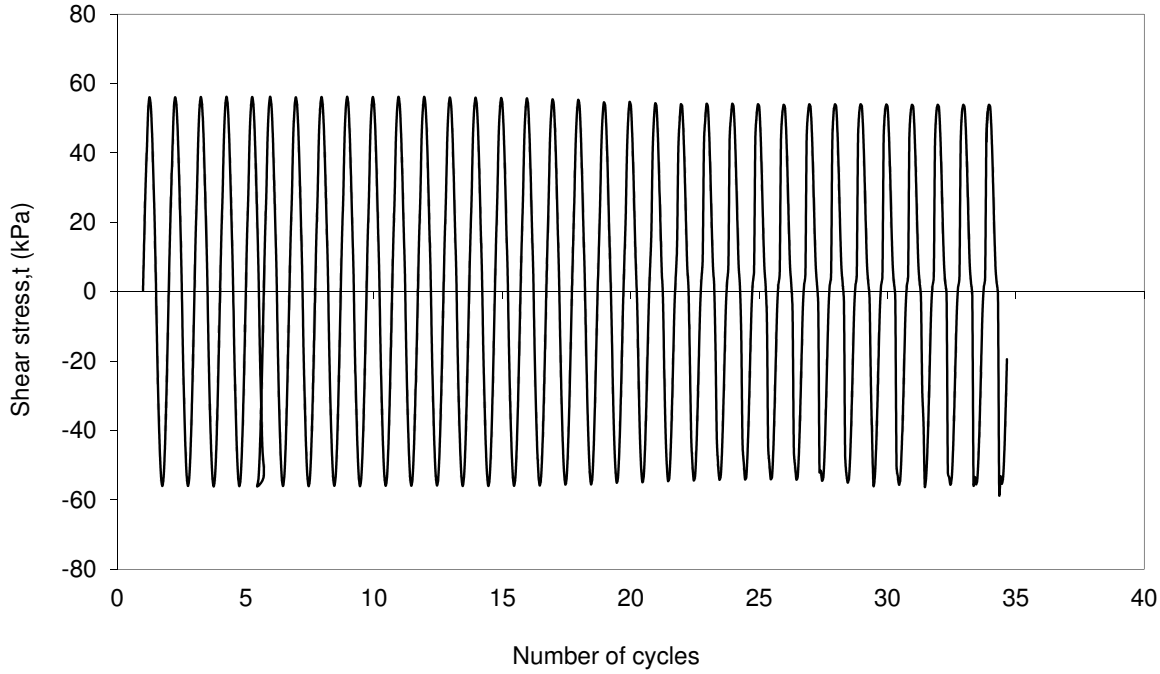
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.69-54.73	clayey sand - (Cyclic Test #3)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

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Authorised Signatory: C.S.Russell (Director)

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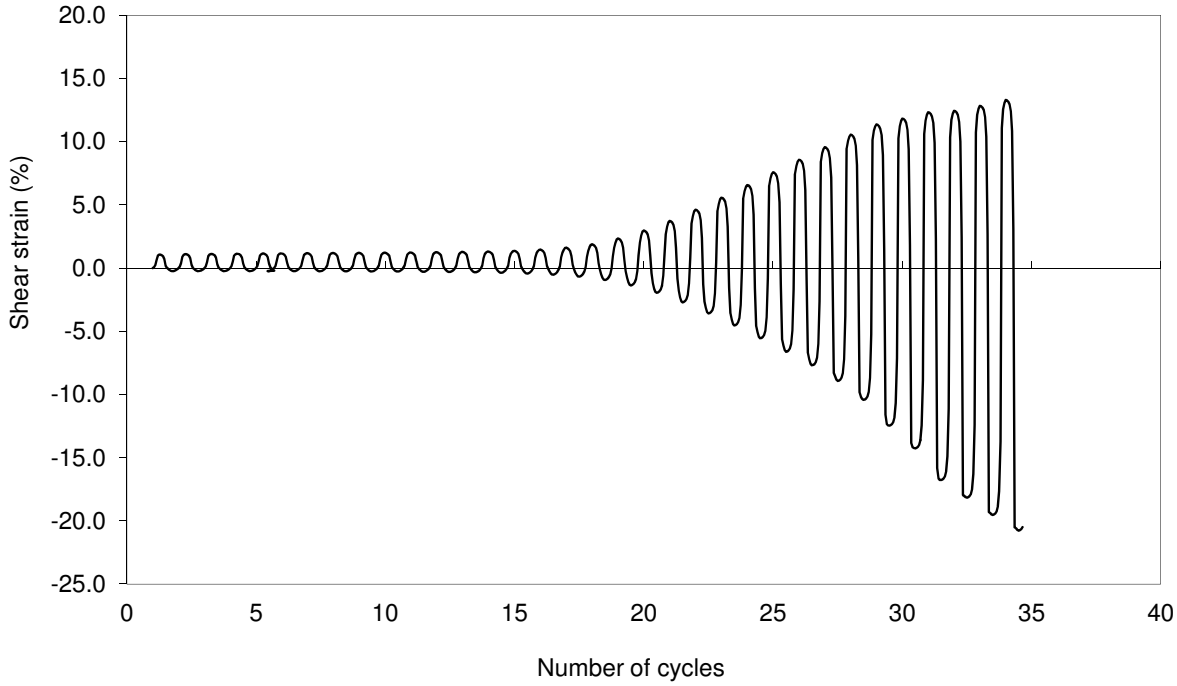
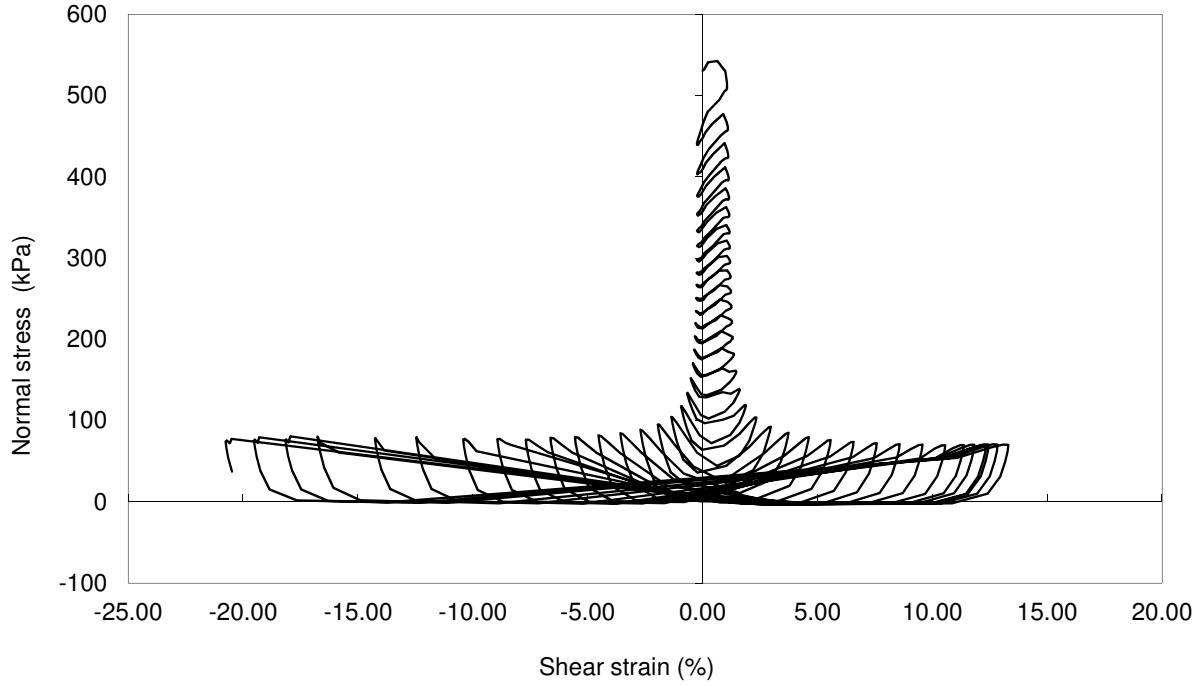
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	H10	Description :
Sample Number:	P16-Q2	Compact grey fine/medium SAND with lenses of
Sample Depth (m):	54.69-54.73	clayey sand - (Cyclic Test #3)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	K16	Description (visual) :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.40-48.45	(Cyclic Test #1)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.7	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	25.35	%	23.63	%	
Bulk density :	1.93	Mg/m^3			
Dry density :	1.54	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.7362				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	6.42	% (for stage)
Normal stress:	412.9	kPa
Voids ratio (e_o):	0.6247	
Max. Consolidation stress:	412.9	kPa
Max. Consolidation strain:	6.42	% (for stage)
Duration:	938	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	6.42	% (for stage)
Normal stress:	412.9	kPa
Voids ratio (e_o):	0.6247	
Max. Consolidation stress:	412.9	kPa
Max. Consolidation strain:	6.42	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	110.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	22	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	2.301	-1.254	107.8	-107.5	160.8	86.8
4	2.901	-1.972	107.1	-107.2	233.5	203.6
6	3.452	-2.685	106.1	-106.7	287.7	238.1
8	4.180	-3.501	105.4	-106.2	312.4	255.3
10	5.114	-4.942	104.3	-104.4	334.3	266.4
12	5.965	-5.744	103.8	-103.8	351.9	273.0
15	7.445	-7.396	103.3	-102.9	360.7	272.8
21	12.324	-13.523	99.5	-99.0	358.5	270.8
22	14.025	-15.766	98.2	-97.6	359.0	271.7
24	22.906	-24.411	91.0	-93.1	363.5	268.5
25	21.623	-46.413	17.3	-84.8	339.6	303.5

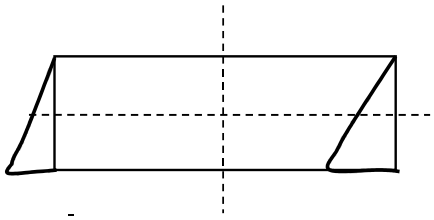
Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 06/01/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.40-48.45	(Cyclic Test #1)

SPECIMEN DETAILS

Initial Height:	21.7	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 06/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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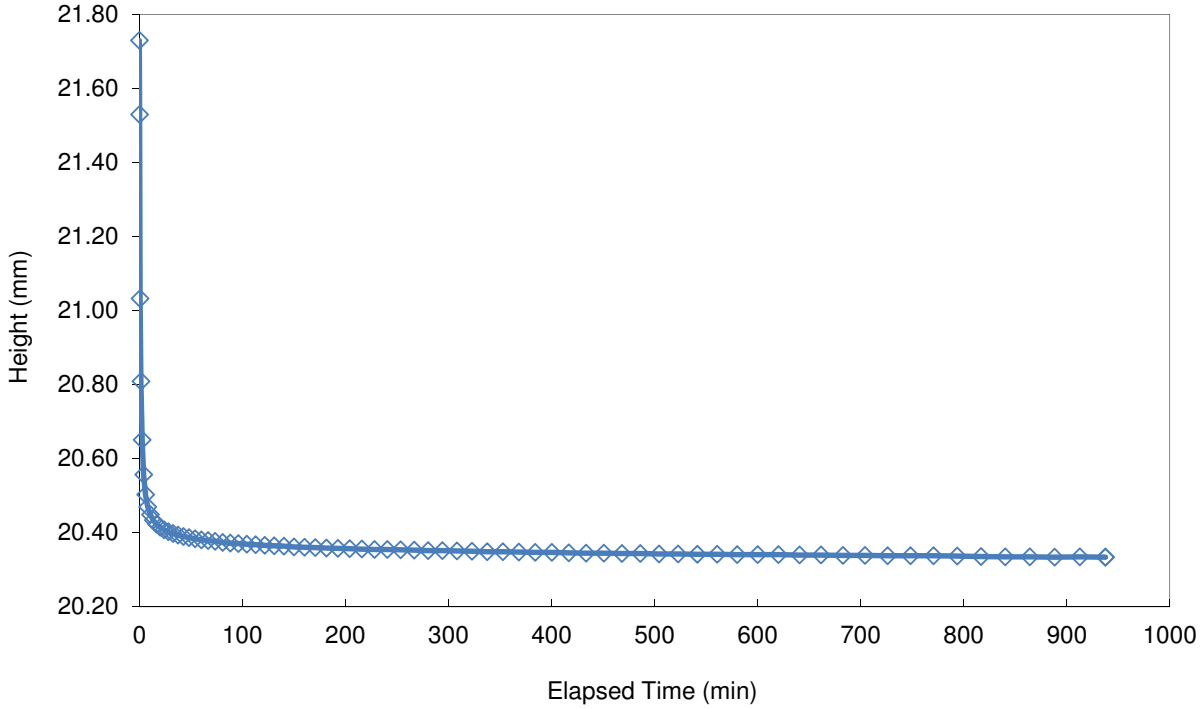
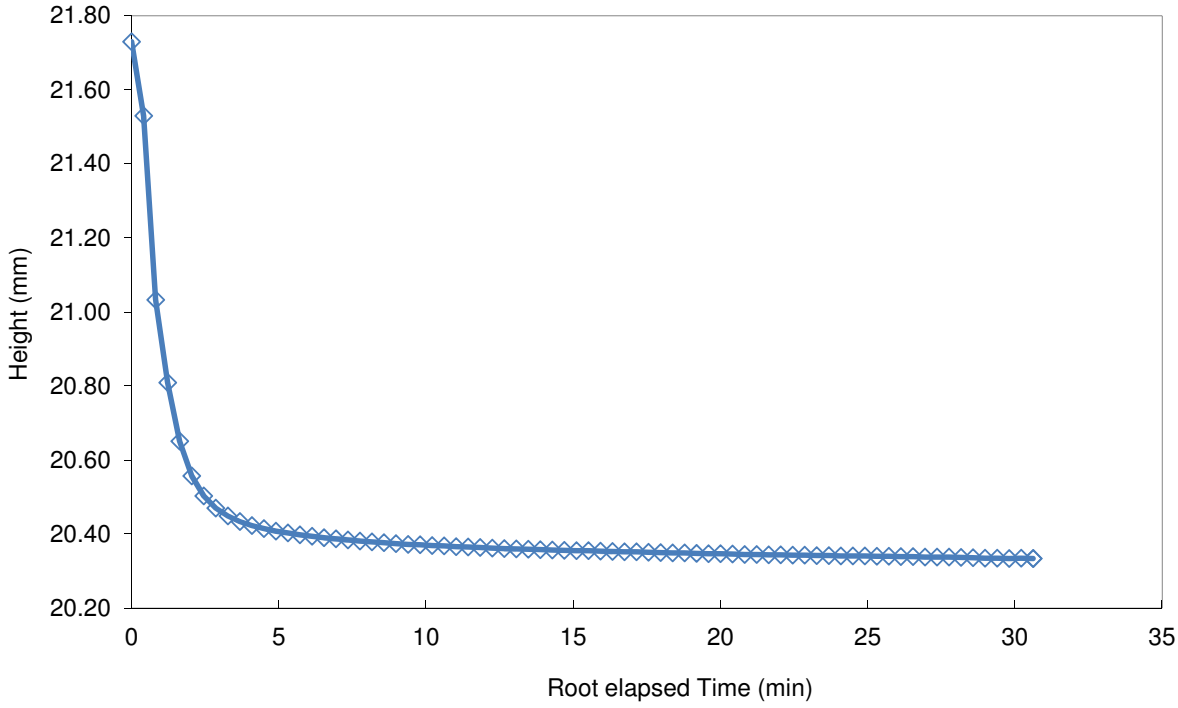
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.40-48.45	(Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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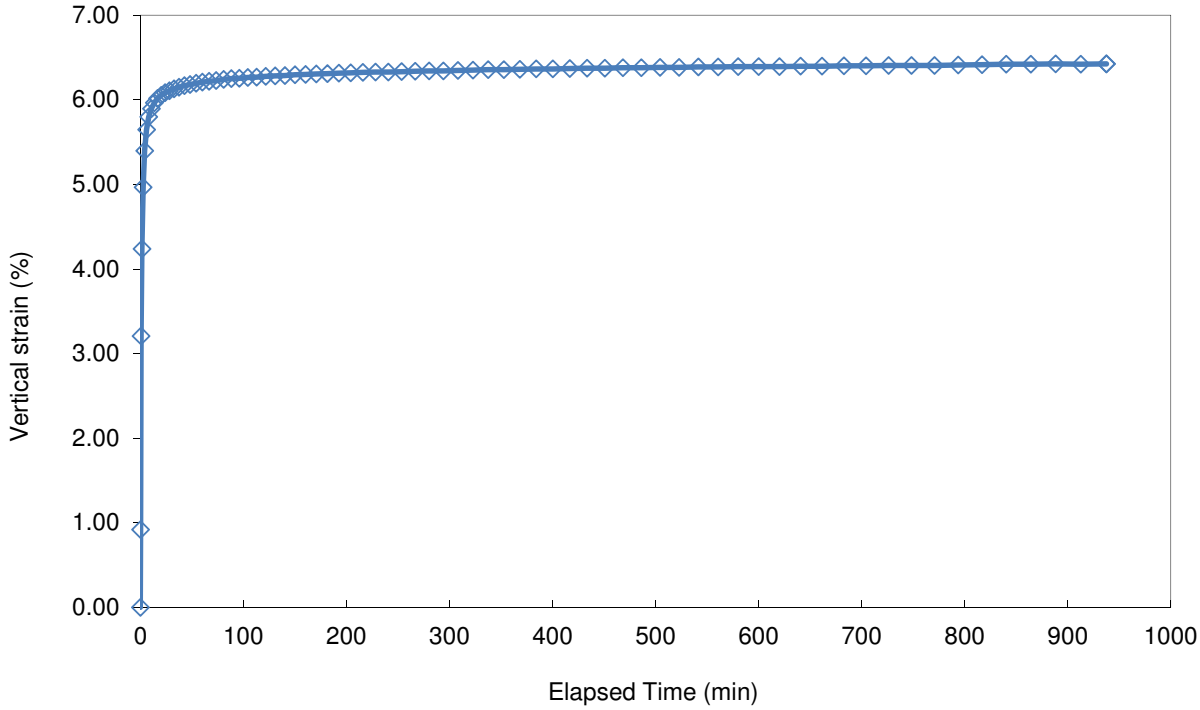

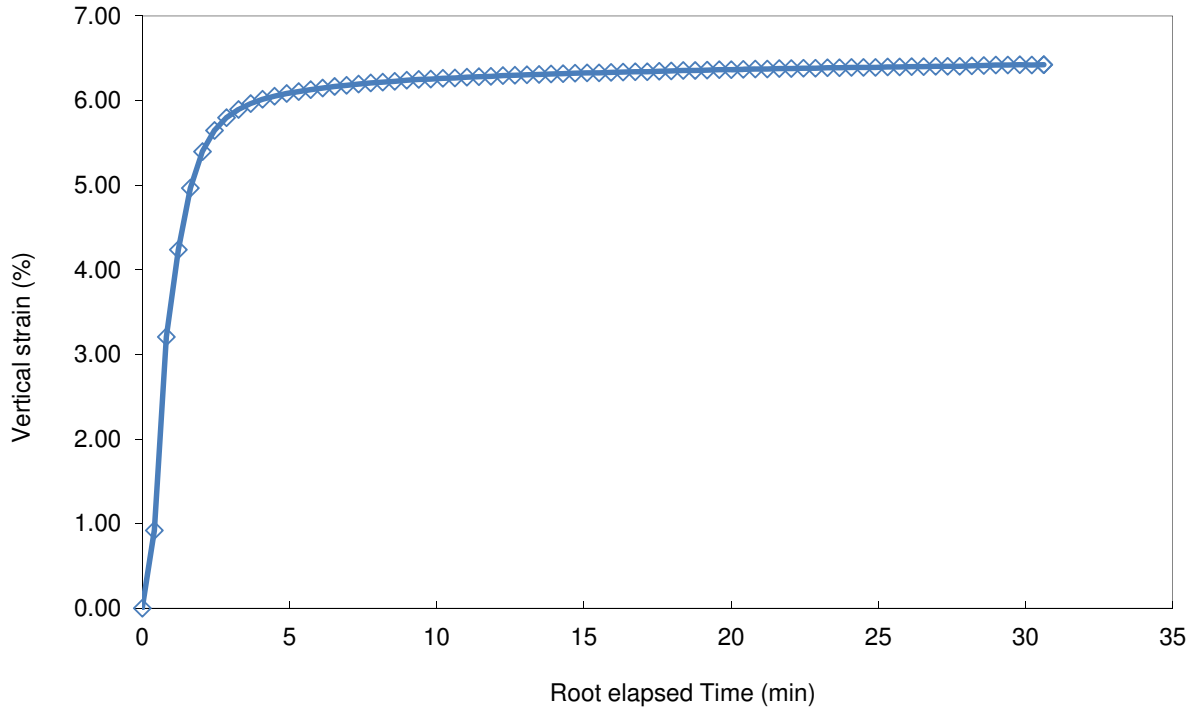

Consolidation stage #1

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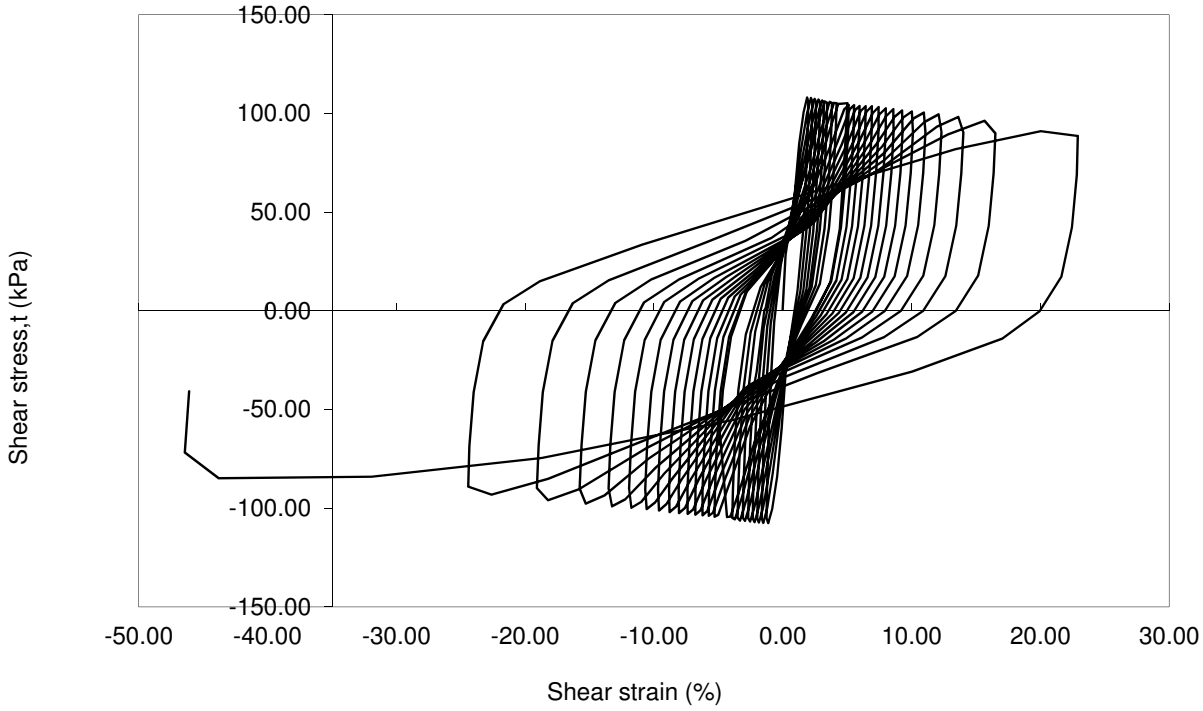

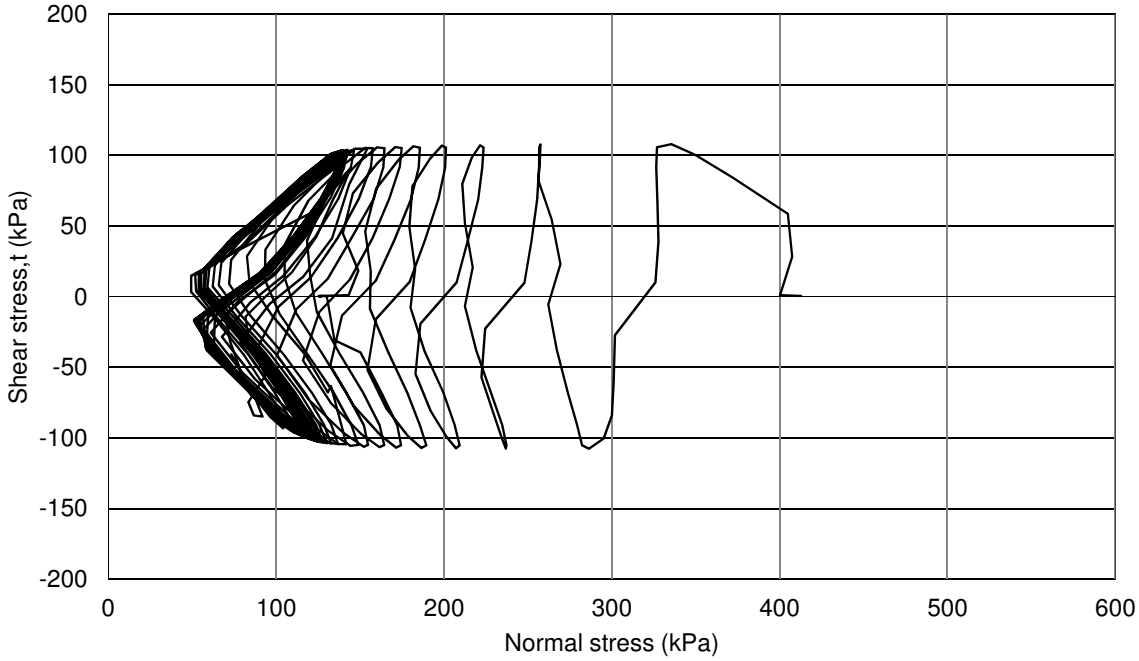

Cyclic simple shear #1

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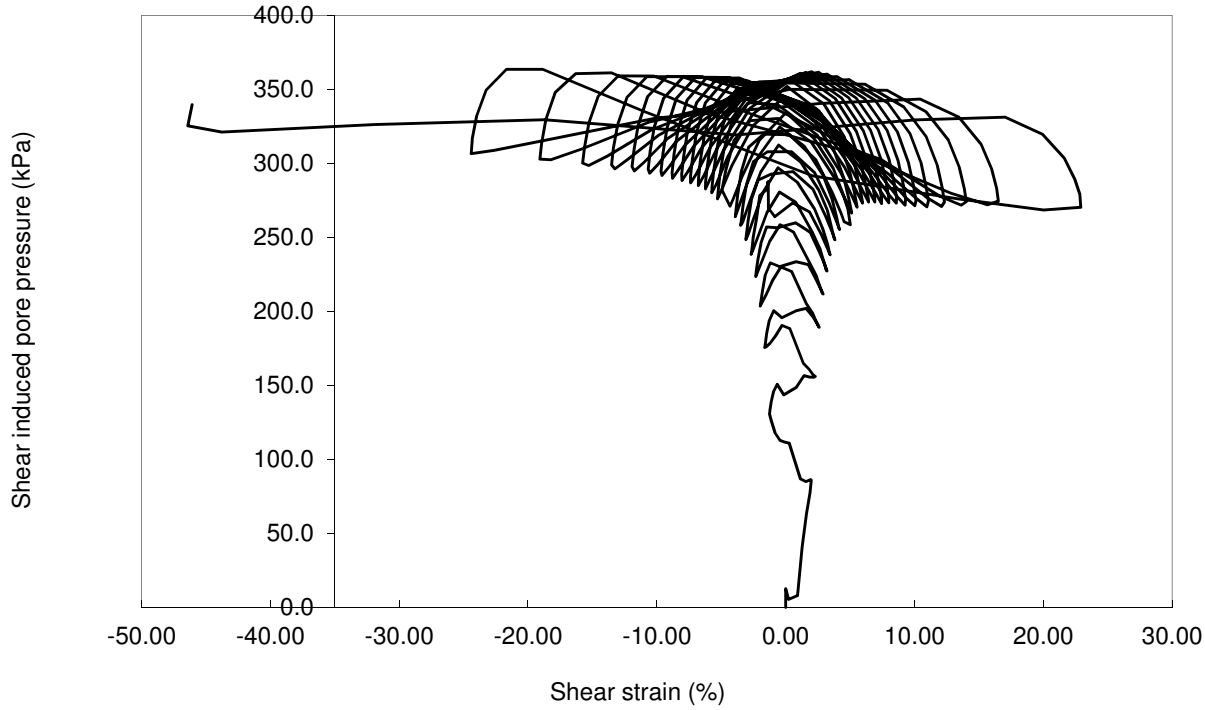

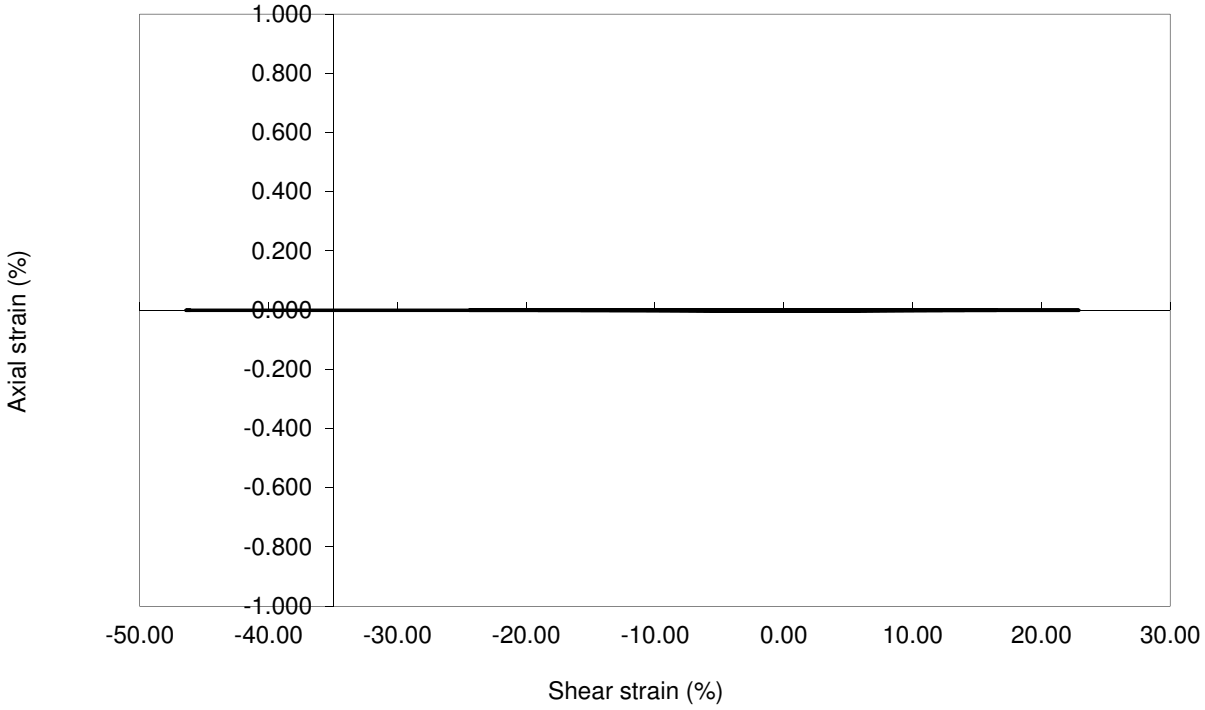

Cyclic simple shear #1

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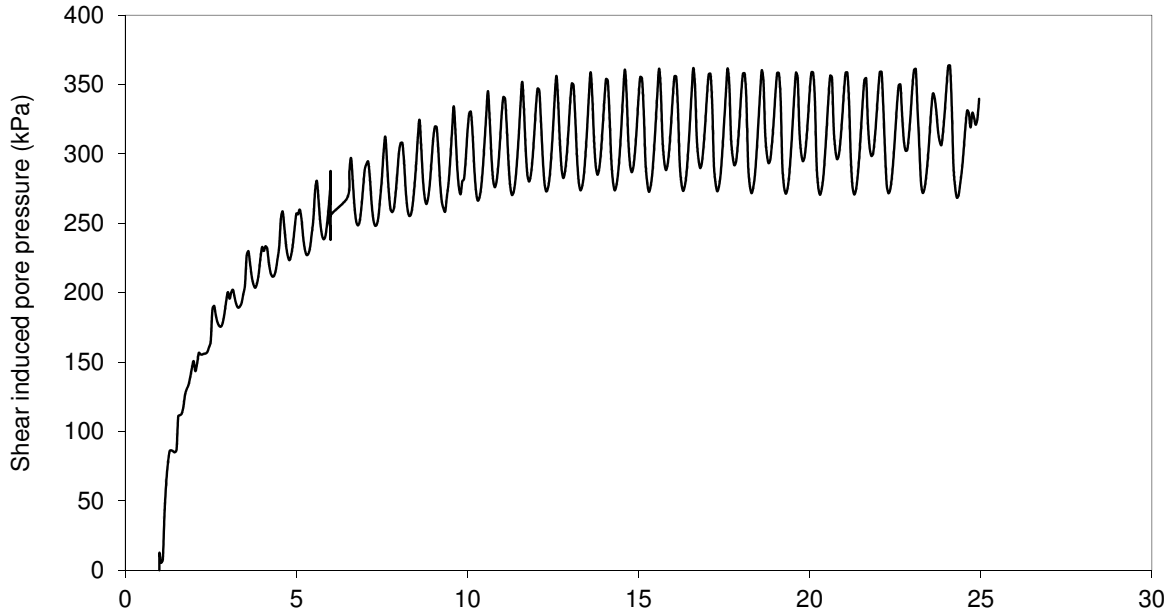
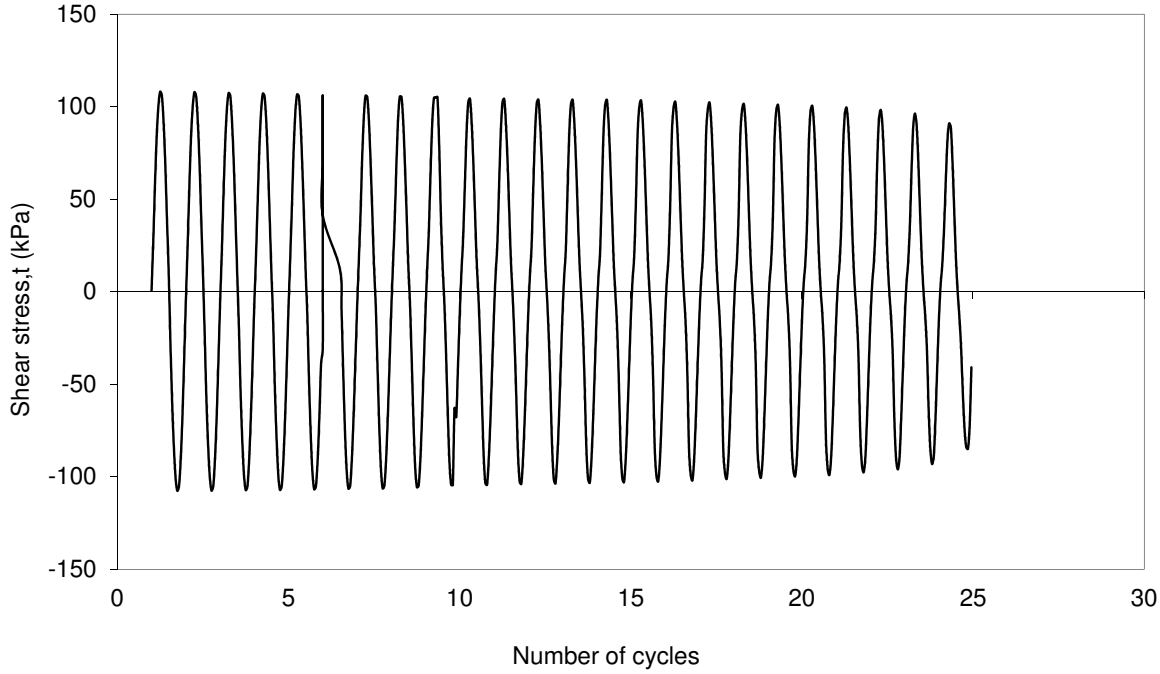
Sample Depth (m):	48.40-48.45	(Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 06/01/2016		

Russell Geotechnical Innovations

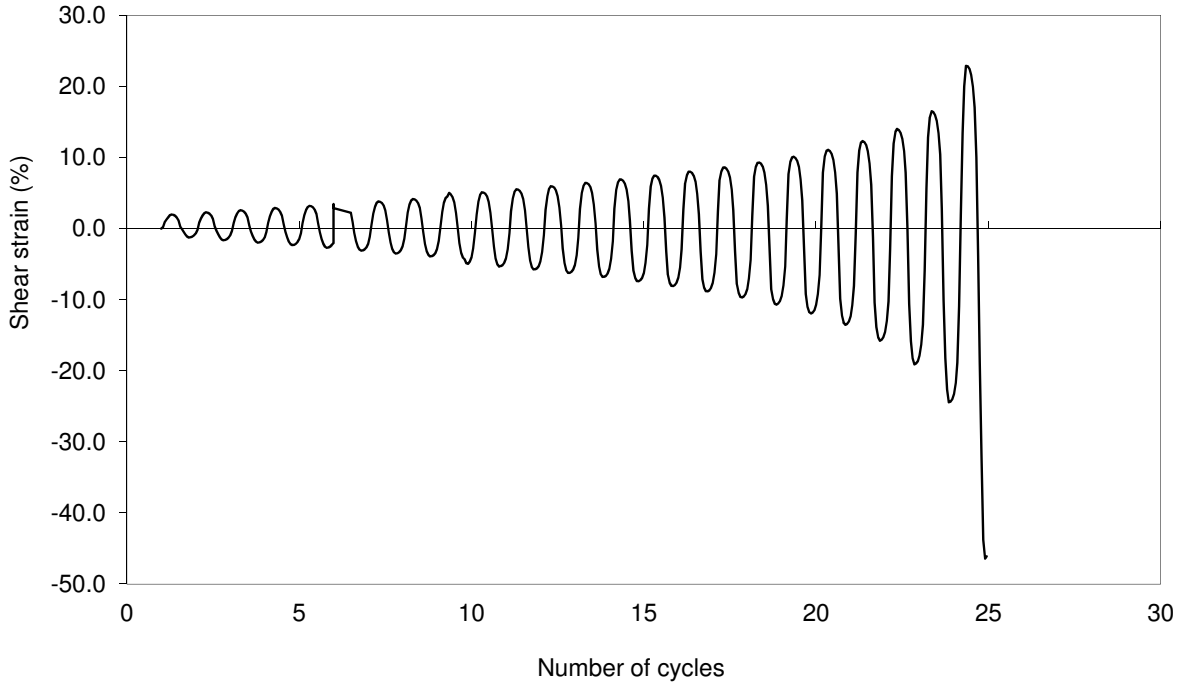
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

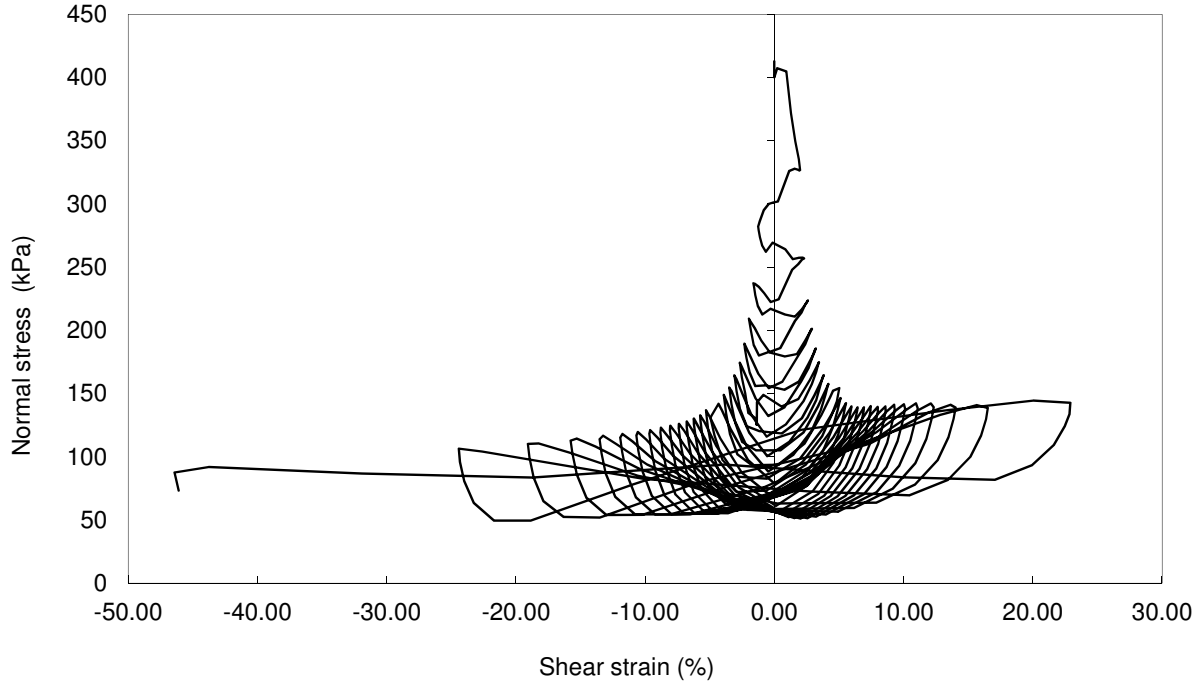
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHK16 P17Q1 4840 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.40-48.45	(Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 06/01/2016		

RGI
Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 **(DSScyc)**

Borehole Number:	K16	Description (visual) :	
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules	
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)	

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.7	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	26.81	%	24.60	%	
Bulk density :	1.89	Mg/m^3			
Dry density :	1.49	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.7906				
Test Duration:				3 Days	

END OF CONSOLIDATION #1		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	6.66	% (for stage)
Normal stress:	412.9	kPa
Voids ratio (e_o):	0.6713	
Max. Consolidation stress:	412.9	kPa
Max. Consolidation strain:	6.66	% (for stage)
Duration:	2774	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	6.66	% (for stage)
Normal stress:	412.9	kPa
Voids ratio (e_o):	0.6713	
Max. Consolidation stress:	412.9	kPa
Max. Consolidation strain:	6.66	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	151.5	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	6	Cycles

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	5.621	-4.082	150.0	-147.7	260.9	150.2
3	7.253	-6.346	148.6	-147.6	311.6	225.8
4	8.944	-8.490	147.0	-145.8	342.5	233.5
5	11.005	-10.995	144.1	-142.8	351.6	235.6
6	14.767	-22.483	140.5	-139.9	346.1	230.6

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 08/01/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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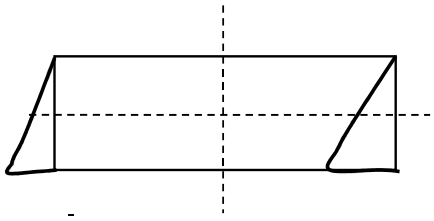
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)

SPECIMEN DETAILS

Initial Height:	21.7	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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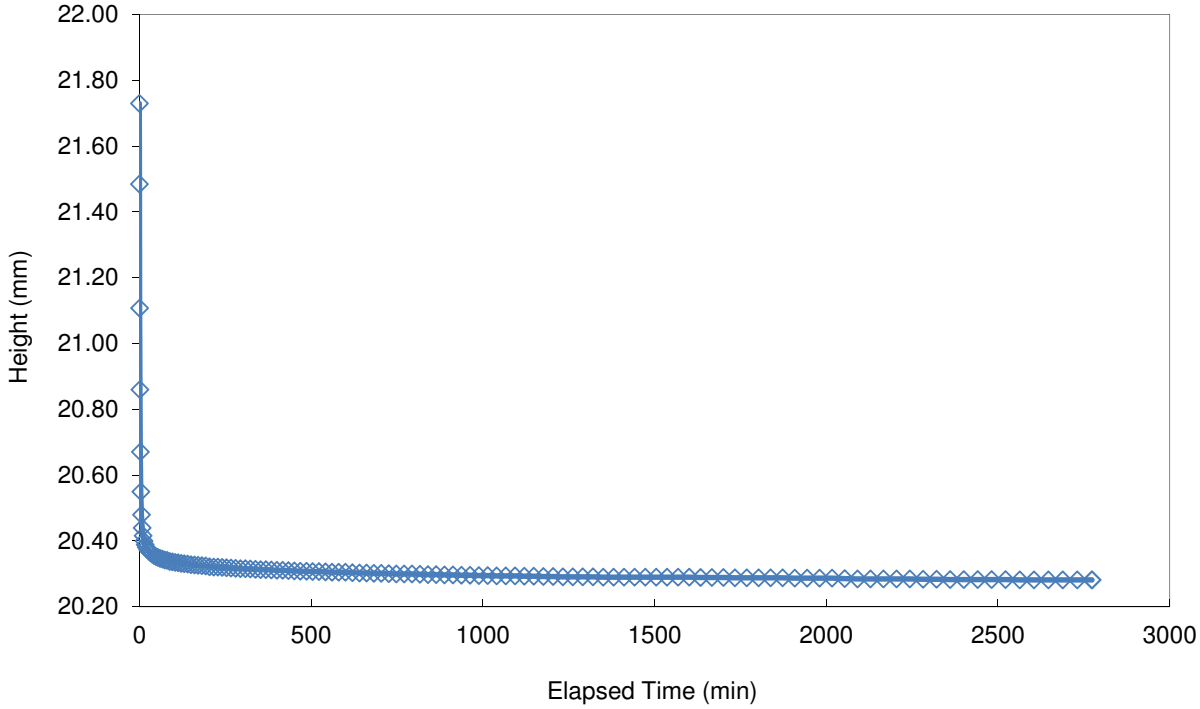
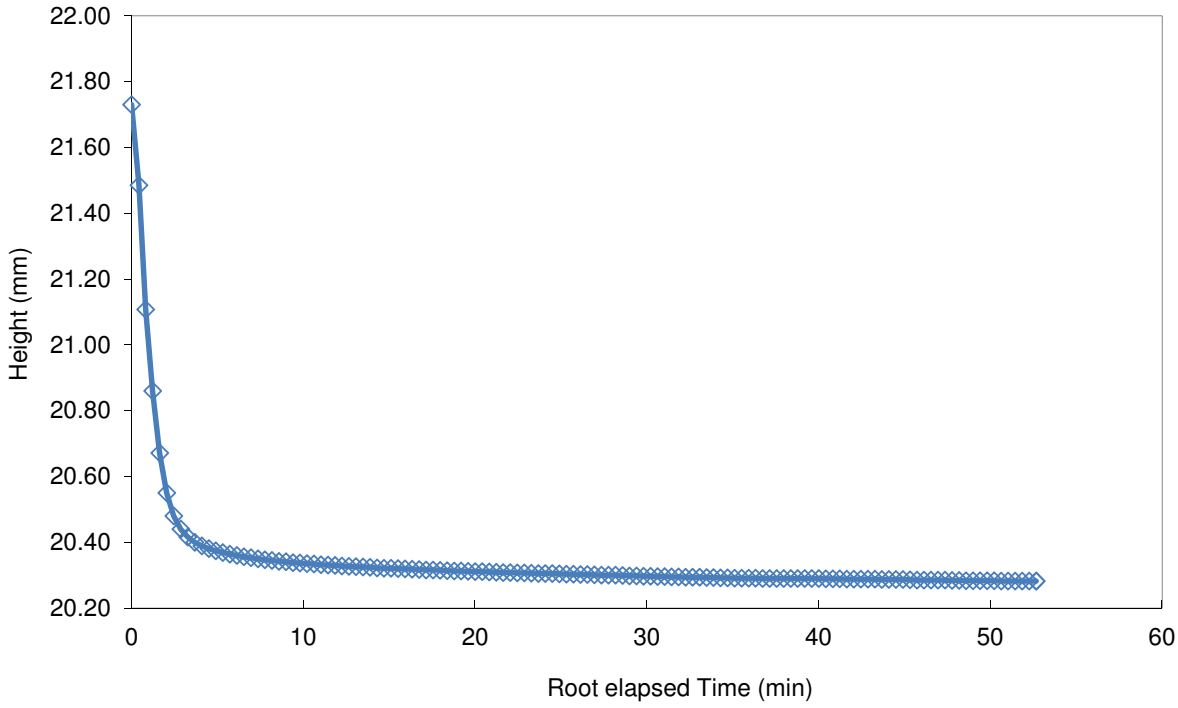
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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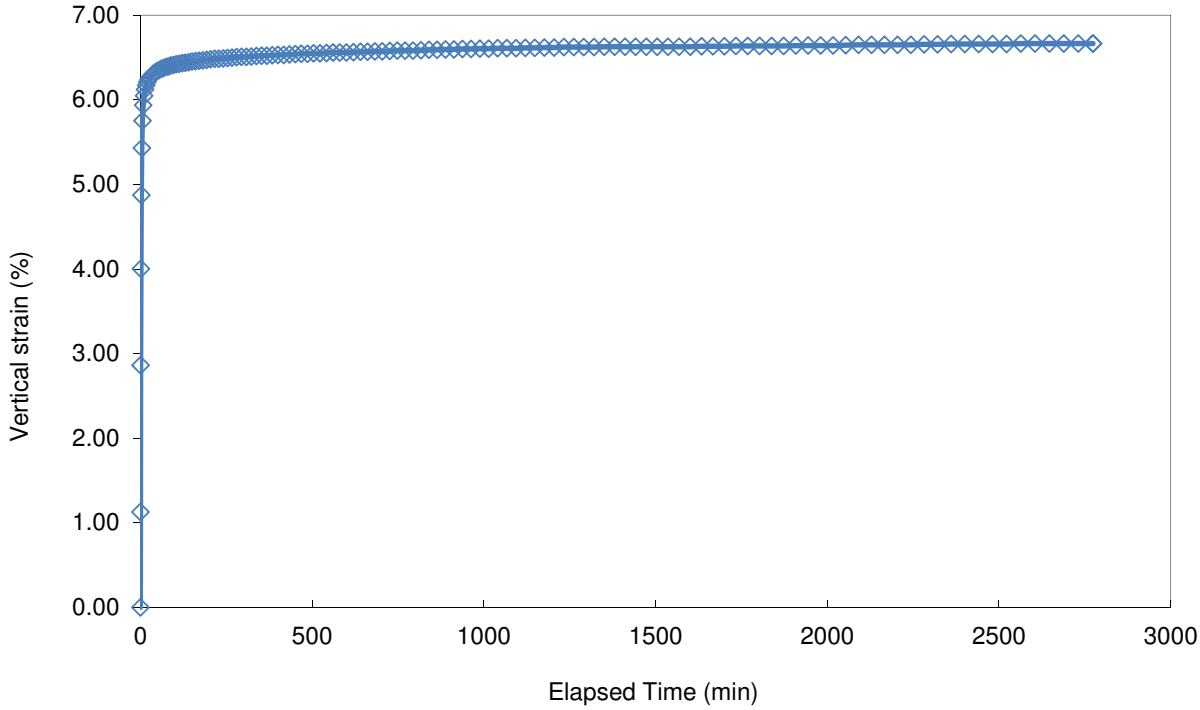
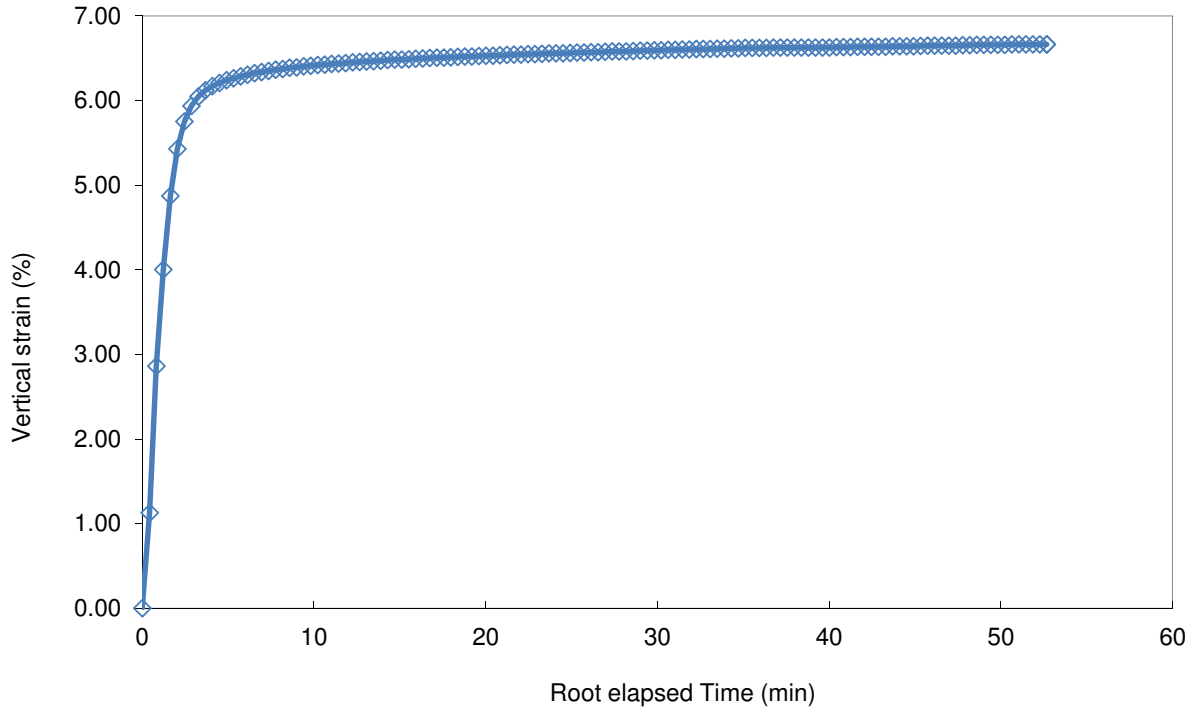
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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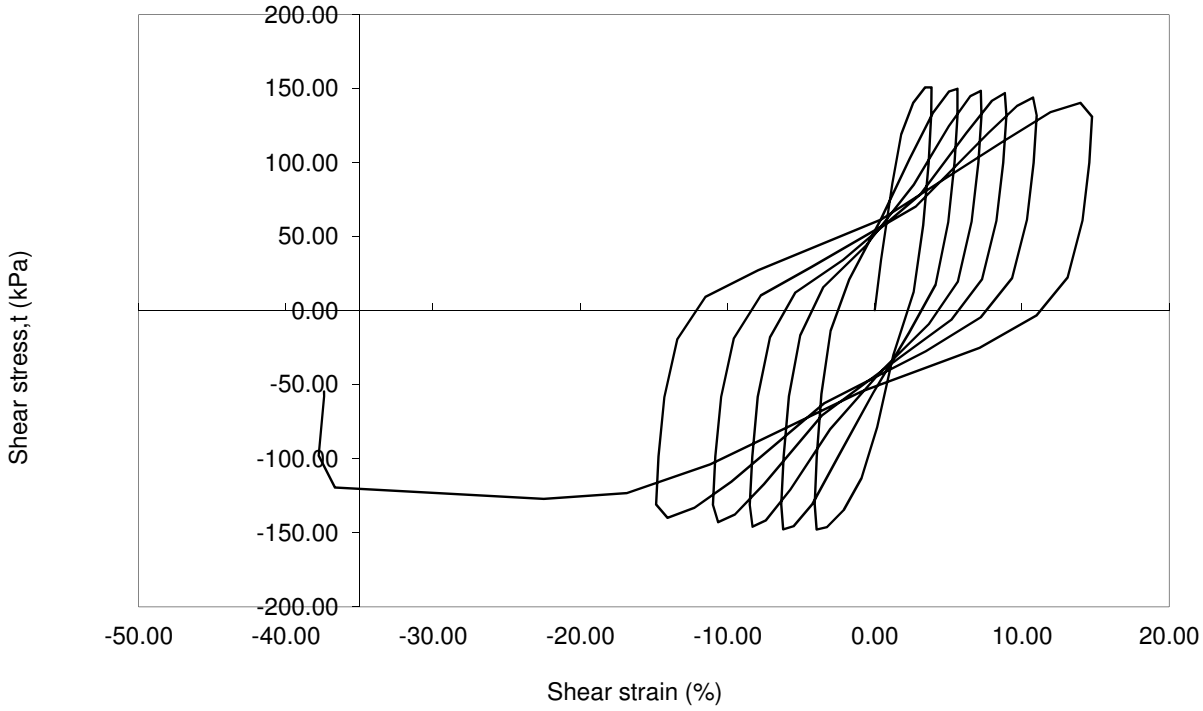
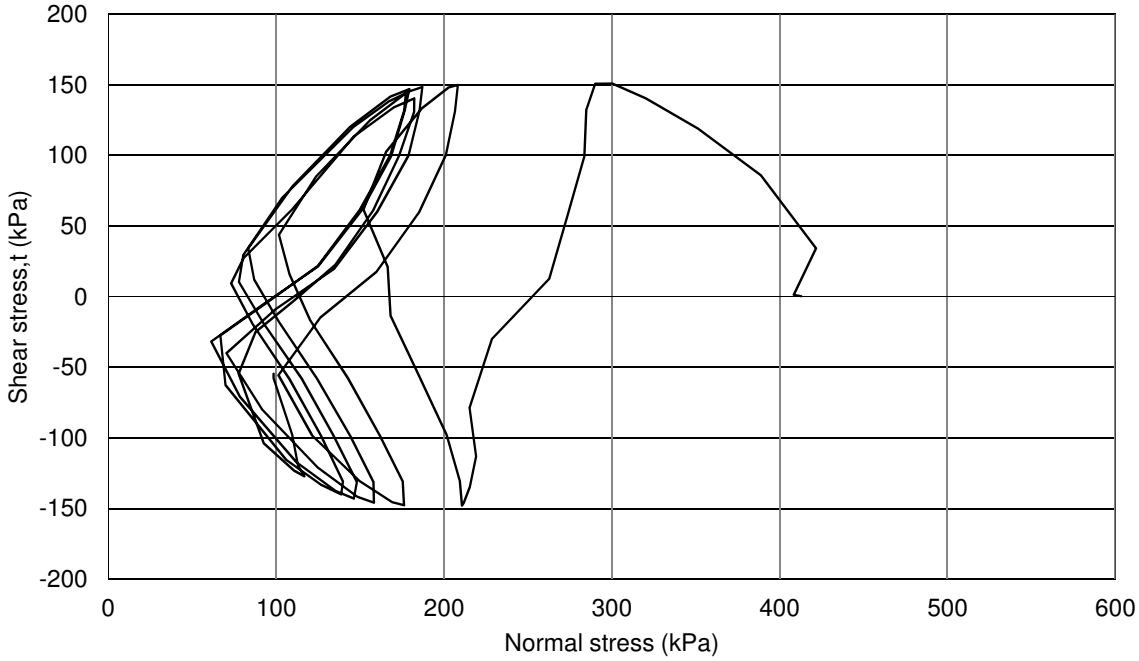
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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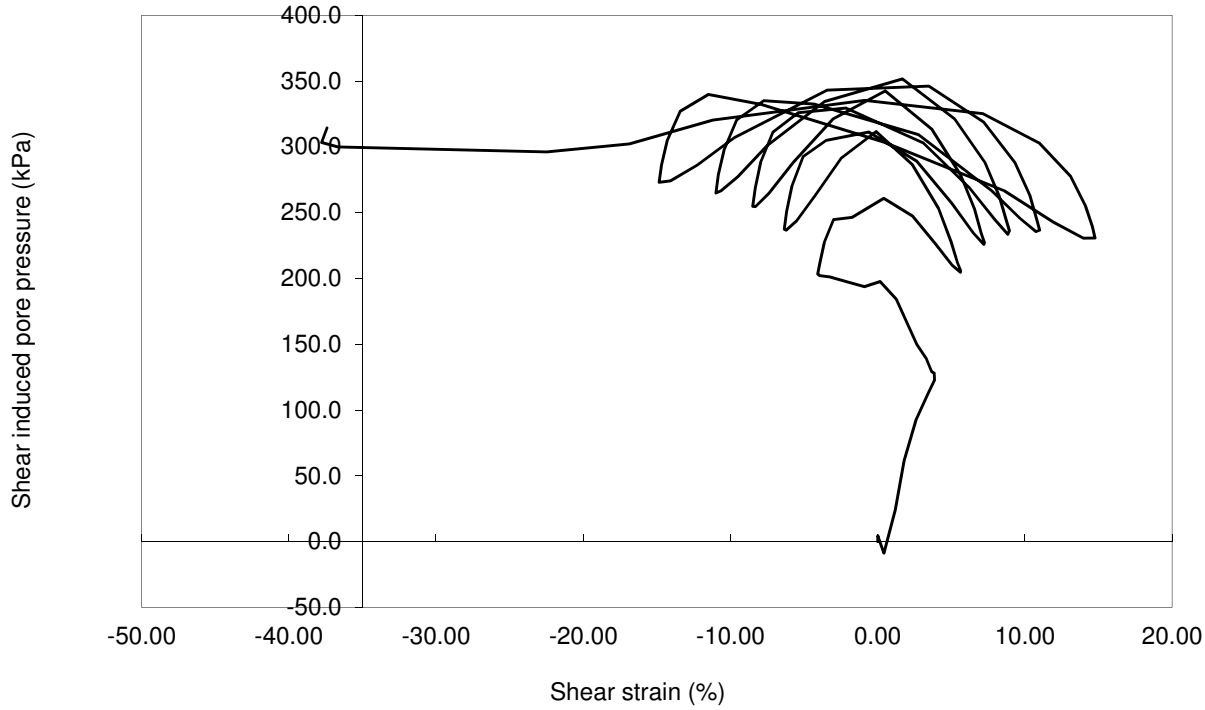
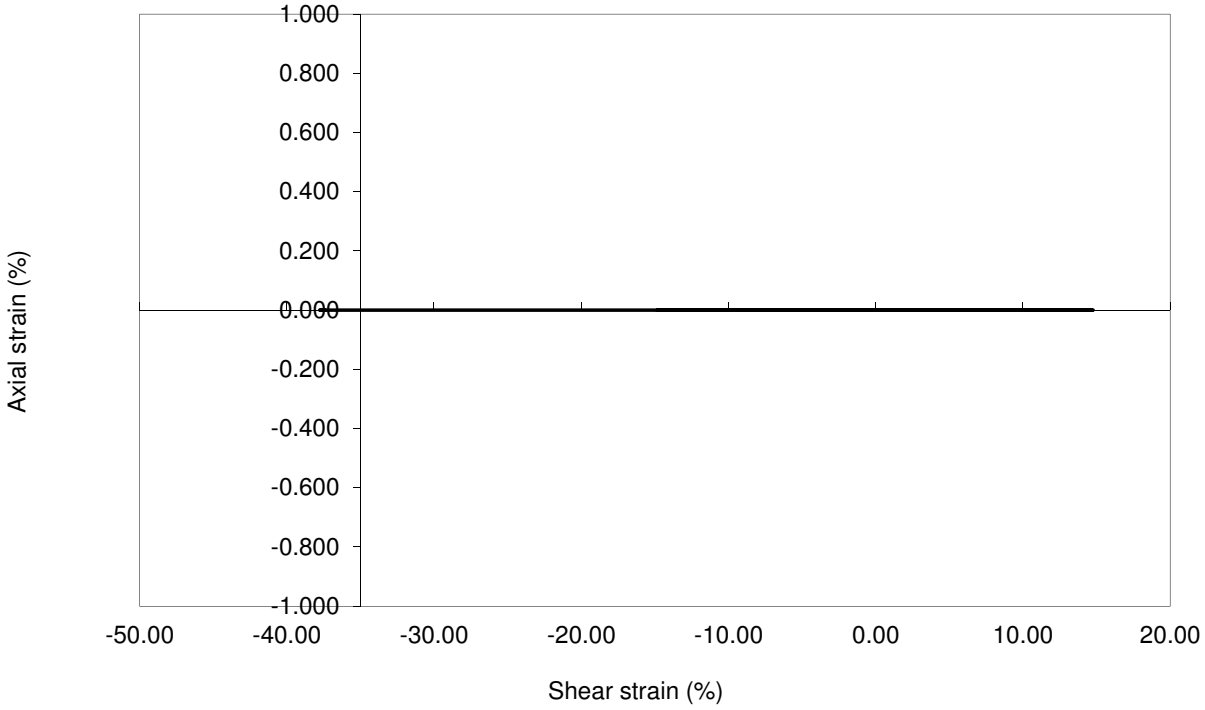
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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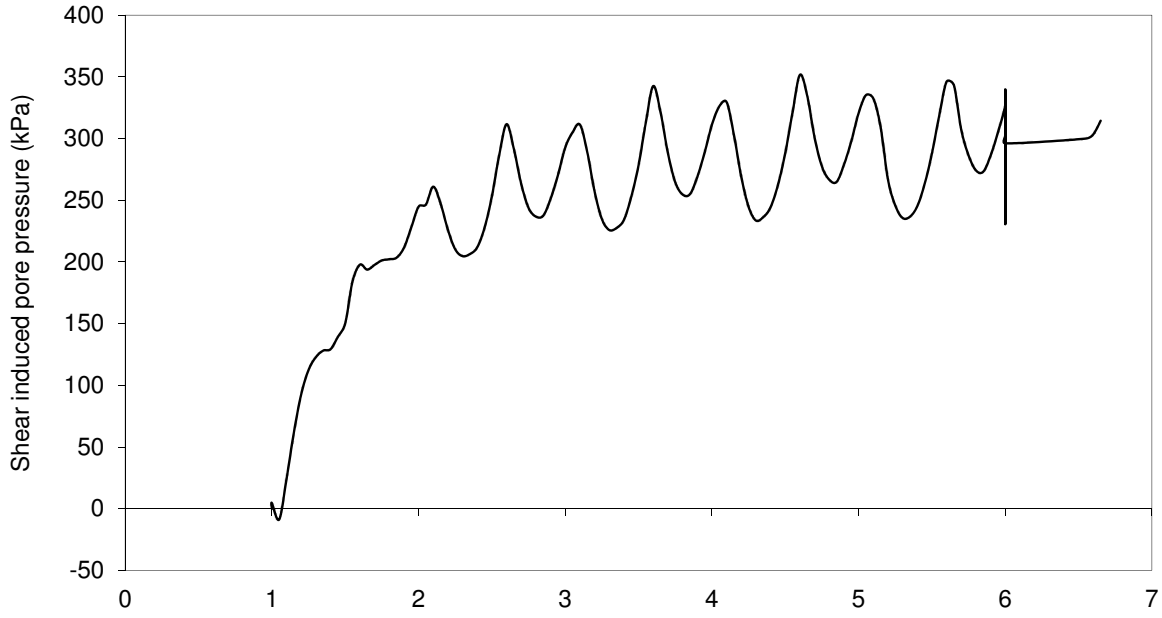
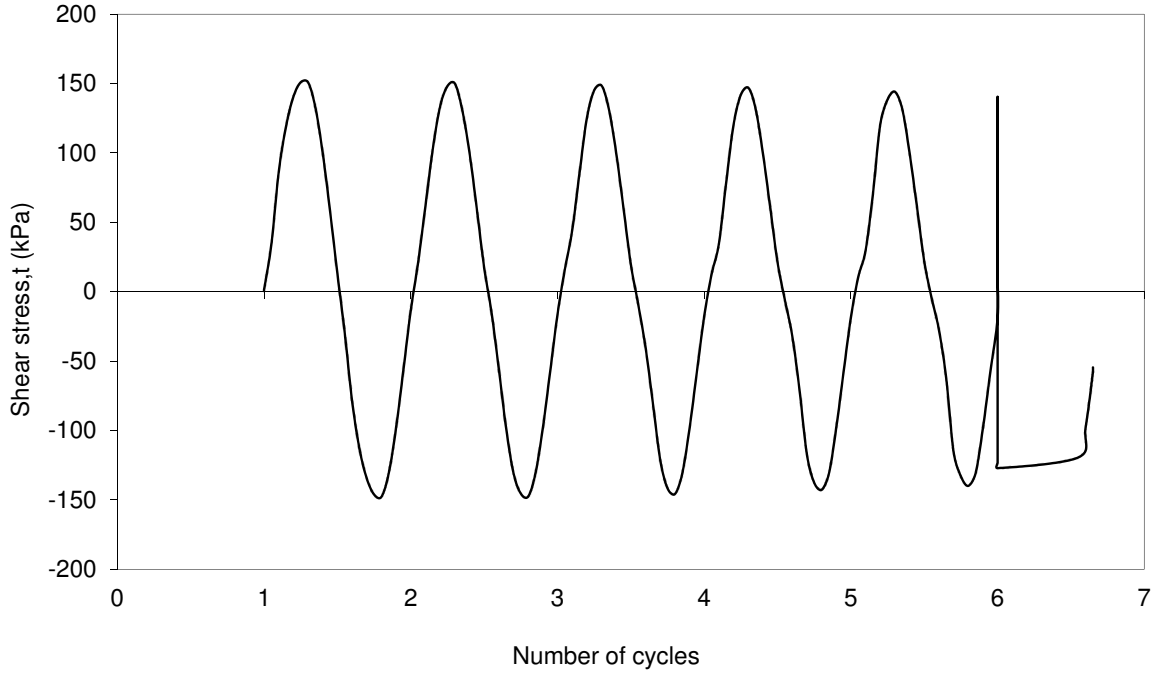
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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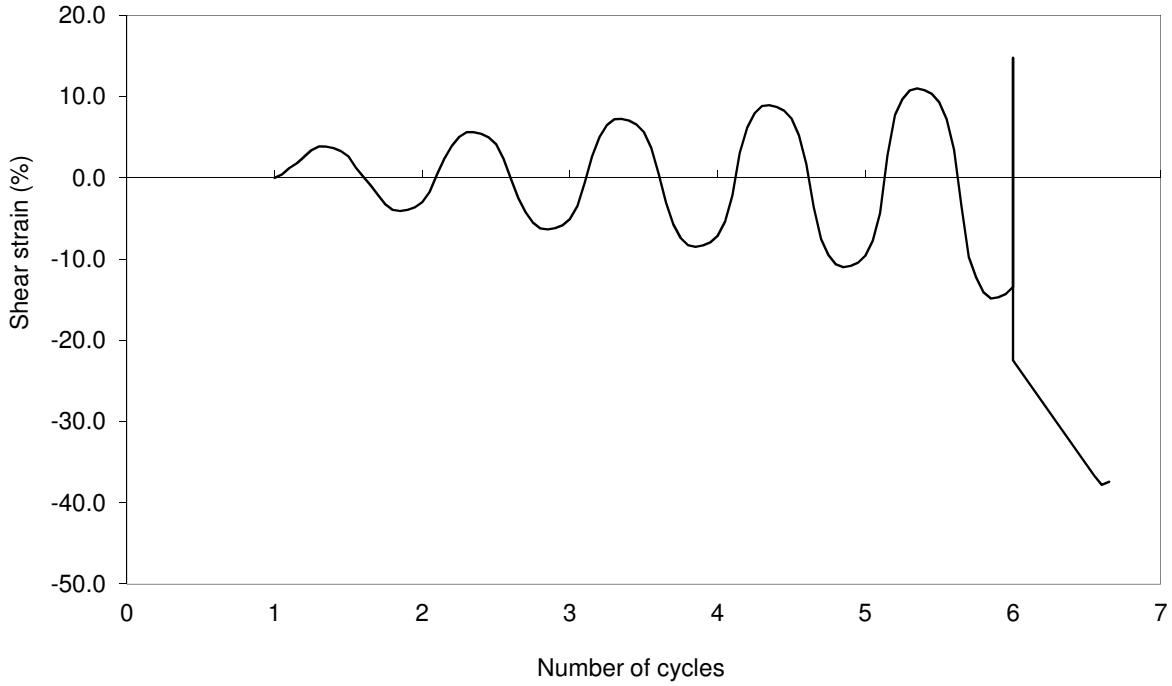
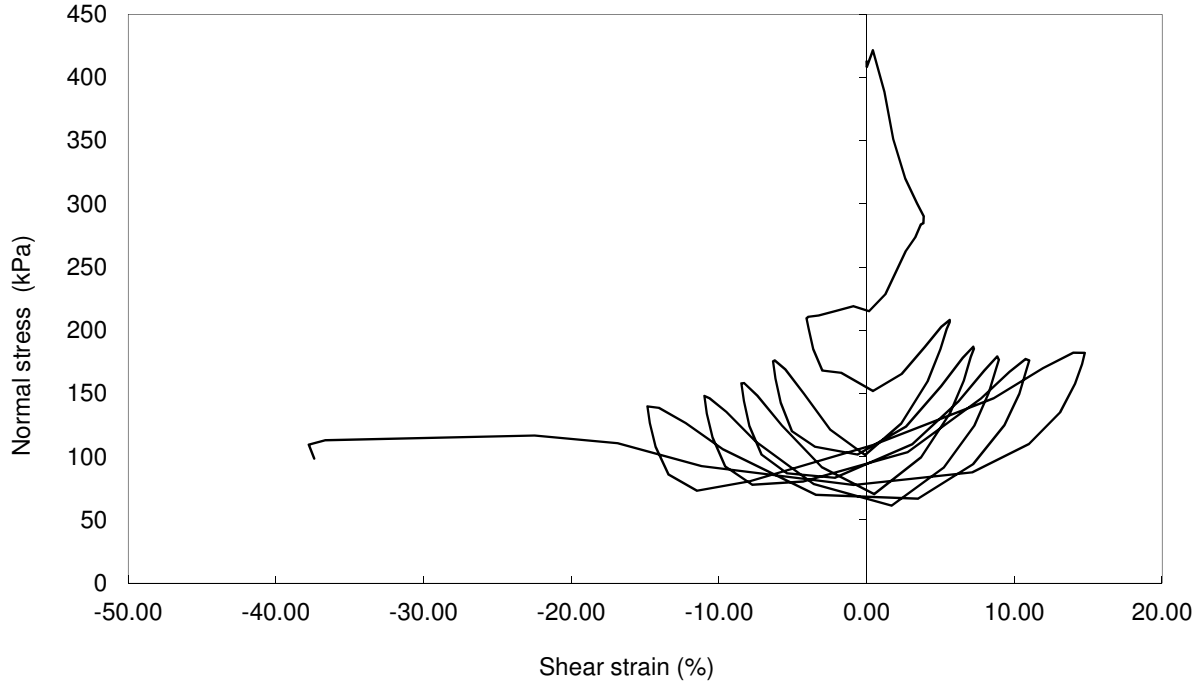
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.45-48.50	(Cyclic Test #2)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	K16	Description (visual) :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.7	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	25.87	%	24.83	%	
Bulk density :	1.92	Mg/m^3			
Dry density :	1.53	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	0.7504				
Test Duration:				3 Days	

END OF CONSOLIDATION #1		
Height :	20.4	mm
Diameter :	66.4	mm
Axial strain:	6.02	% (for stage)
Normal stress:	412.8	kPa
Voids ratio (e_o):	0.6451	
Max. Consolidation stress:	412.8	kPa
Max. Consolidation strain:	6.02	% (for stage)
Duration:	1121	Min.

PRIOR TO CYCLIC SHEAR		
Height :	20.4	mm
Diameter :	66.4	mm
Axial strain:	6.02	% (for stage)
Normal stress:	412.8	kPa
Voids ratio (e_o):	0.6451	
Max. Consolidation stress:	412.8	kPa
Max. Consolidation strain:	6.02	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	68.8	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	6	Cycles

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.146	-0.397	69.0	-68.9	66.8	36.4
5	1.185	-0.436	69.1	-68.9	120.7	80.7
10	1.219	-0.465	69.0	-68.8	156.7	112.1
20	1.254	-0.499	69.0	-68.9	183.8	141.5
50	1.312	-0.553	69.0	-68.9	218.8	178.1
100	1.386	-0.622	69.1	-68.9	243.3	204.4
200	1.464	-0.710	69.1	-68.9	267.6	230.0
500	1.611	-0.862	69.1	-68.9	296.1	261.8
1000	1.831	-1.082	69.0	-68.8	319.6	283.3
1200	1.939	-1.190	68.9	-68.7	328.3	291.3
1500	2.145	-1.405	68.8	-68.7	339.8	300.1

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 21/01/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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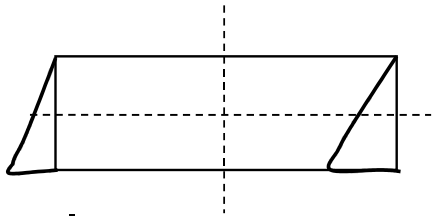
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)

SPECIMEN DETAILS

Initial Height:	21.7	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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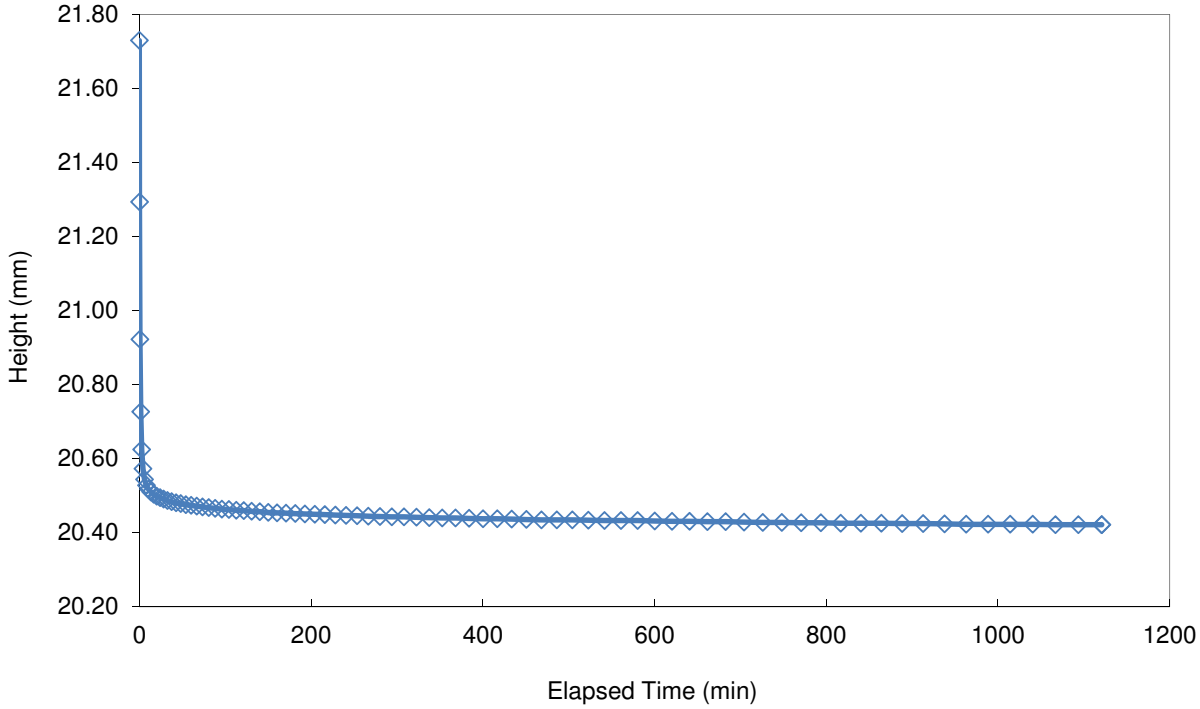
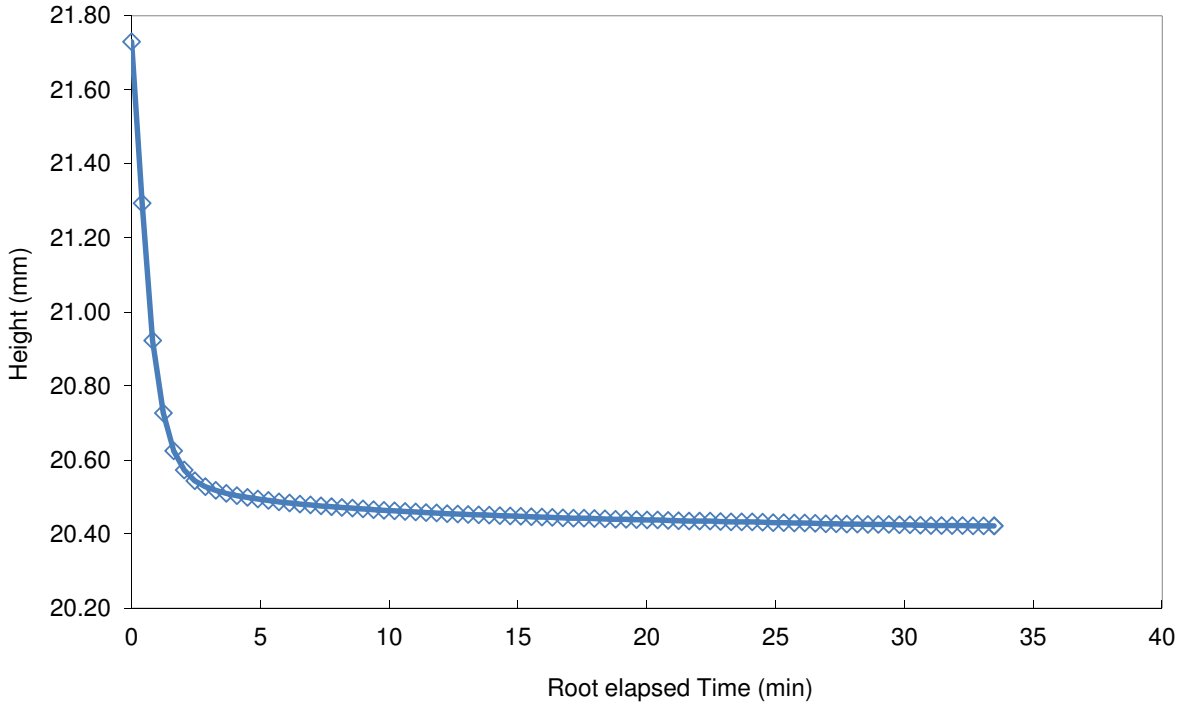
Authorised Signatory: C.S.Russell (Director)

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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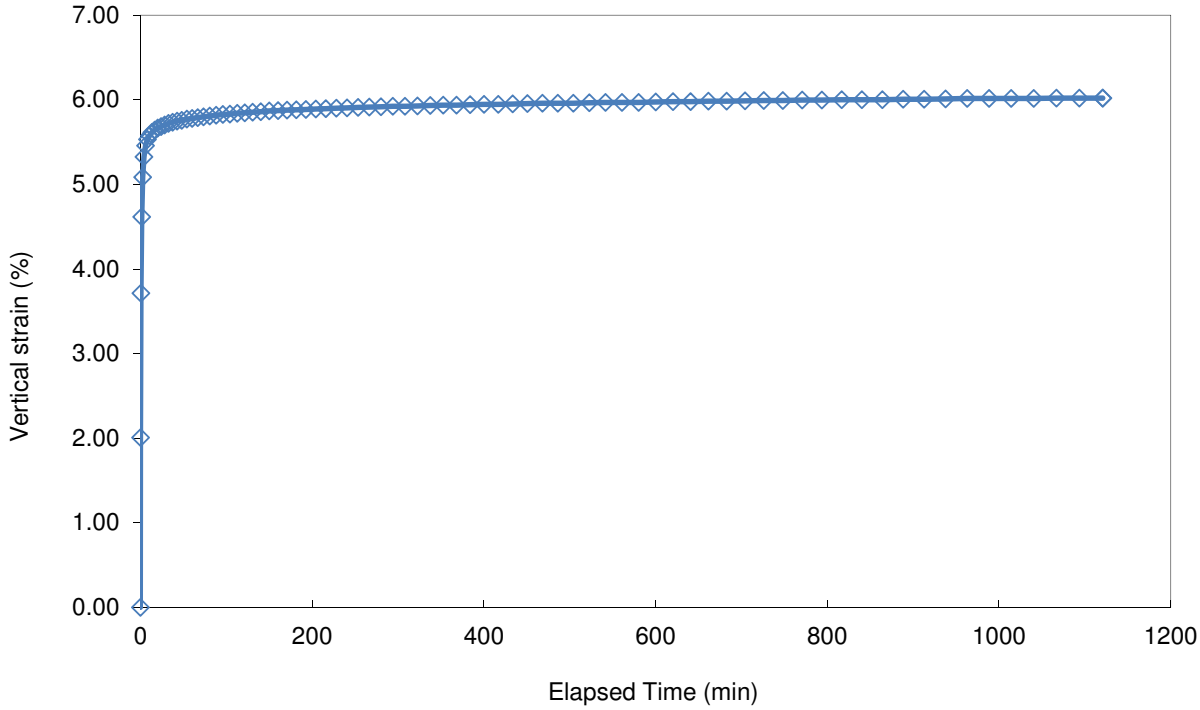
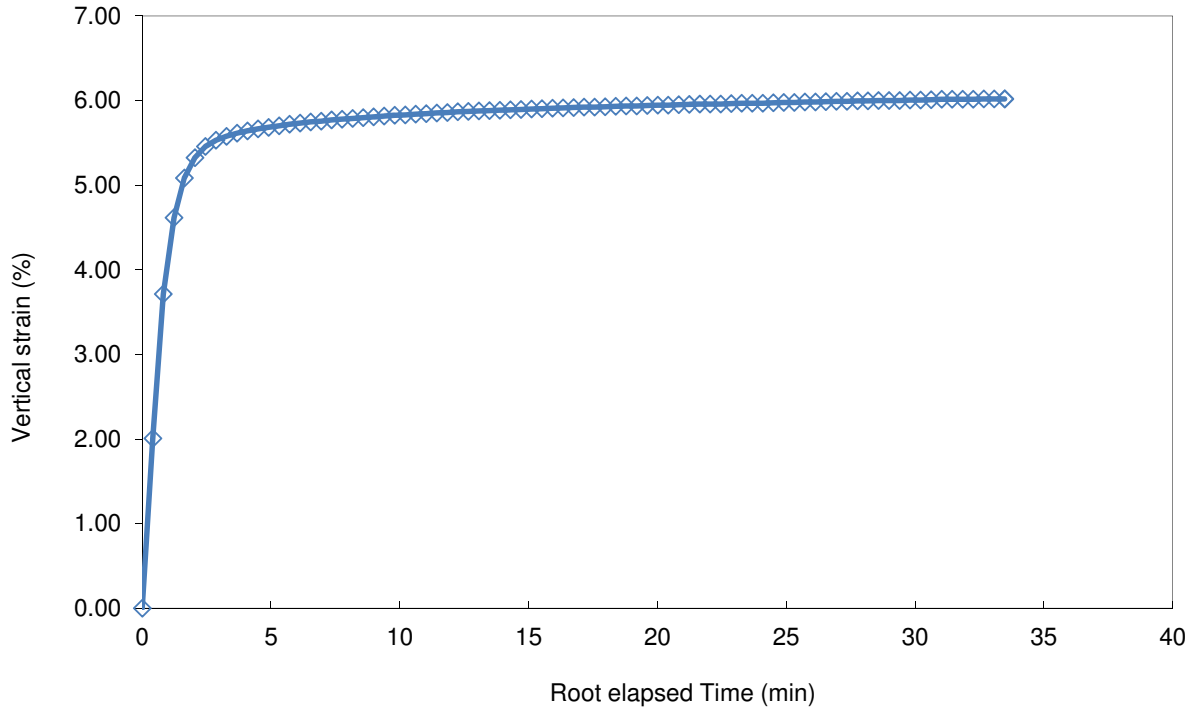
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

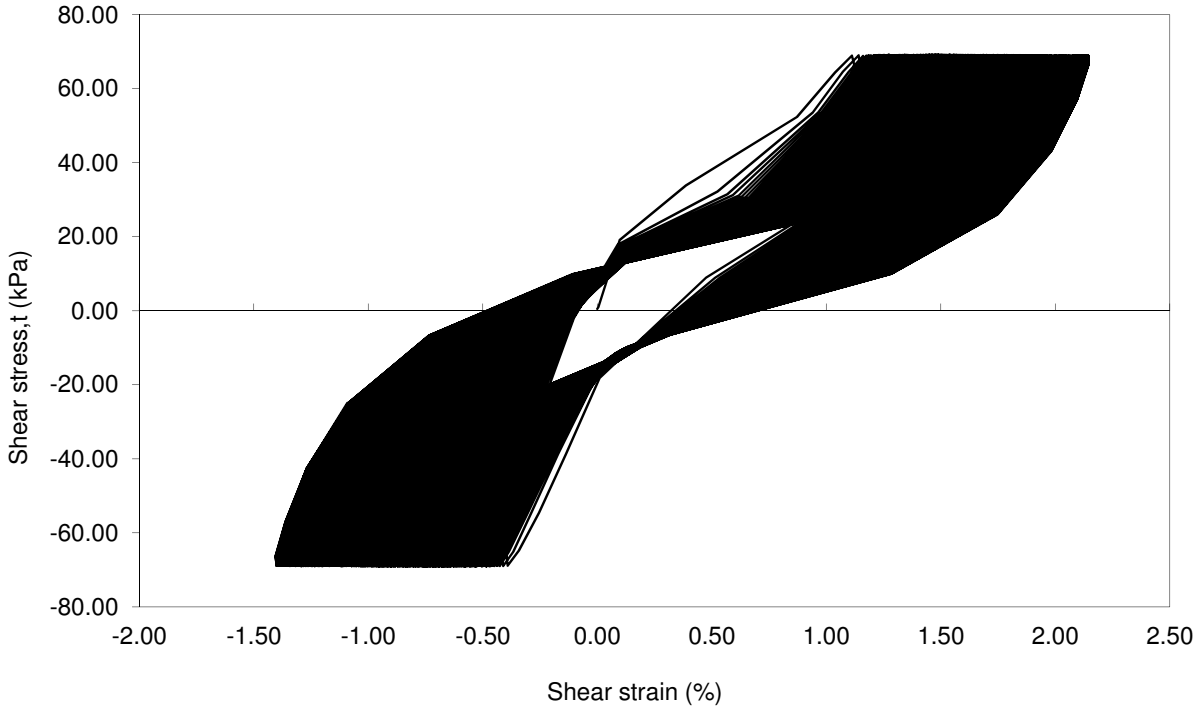
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

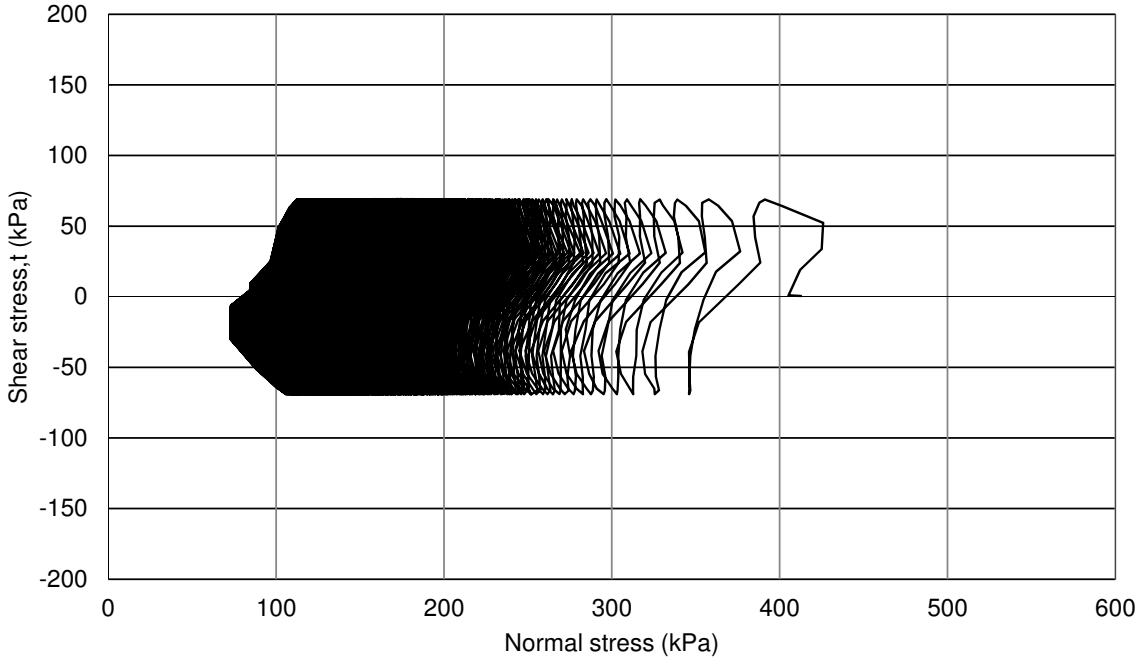
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHK16 P17Q1 4840 DSScyc#3.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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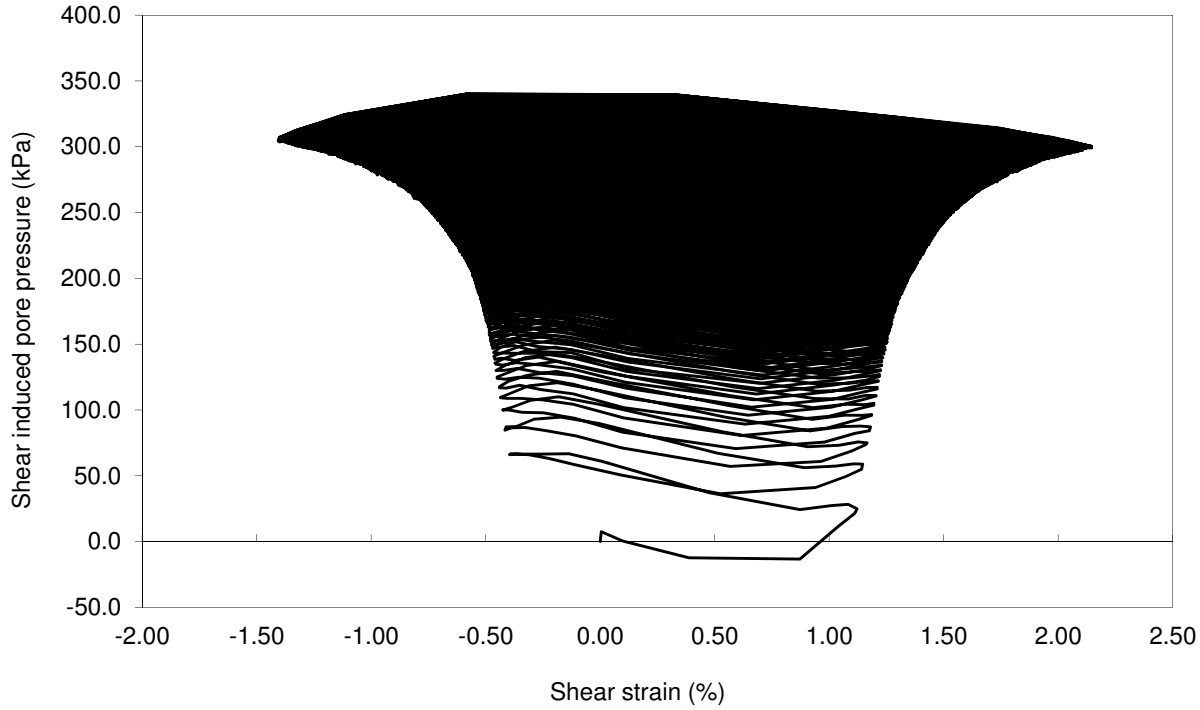
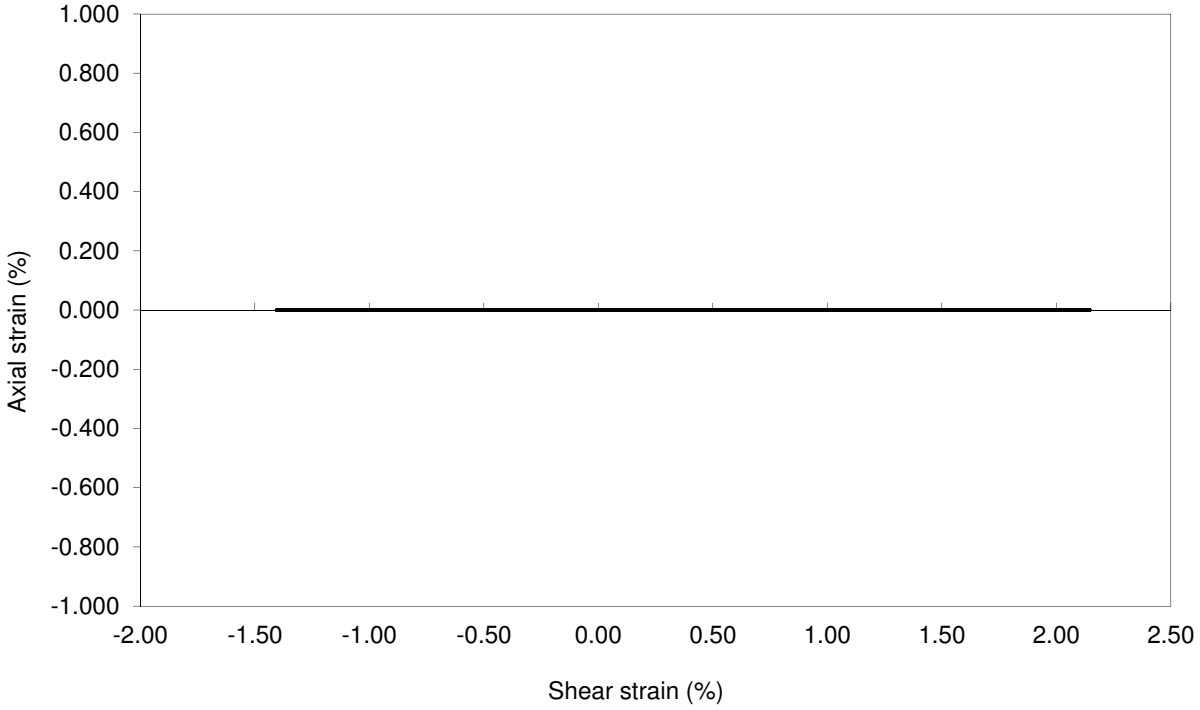
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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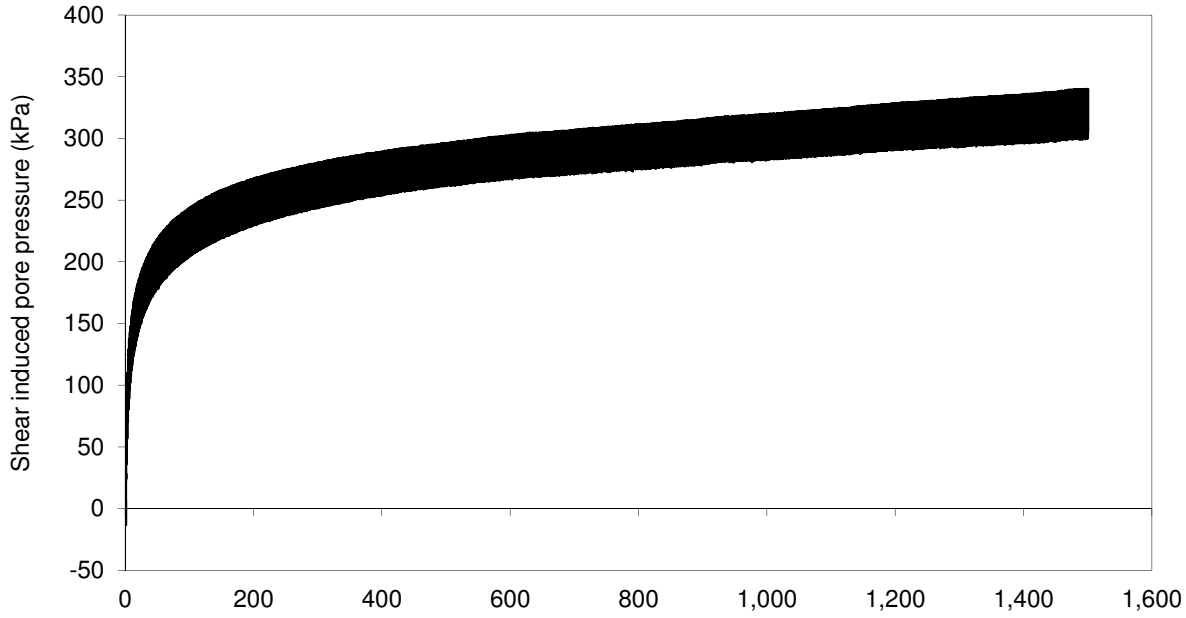
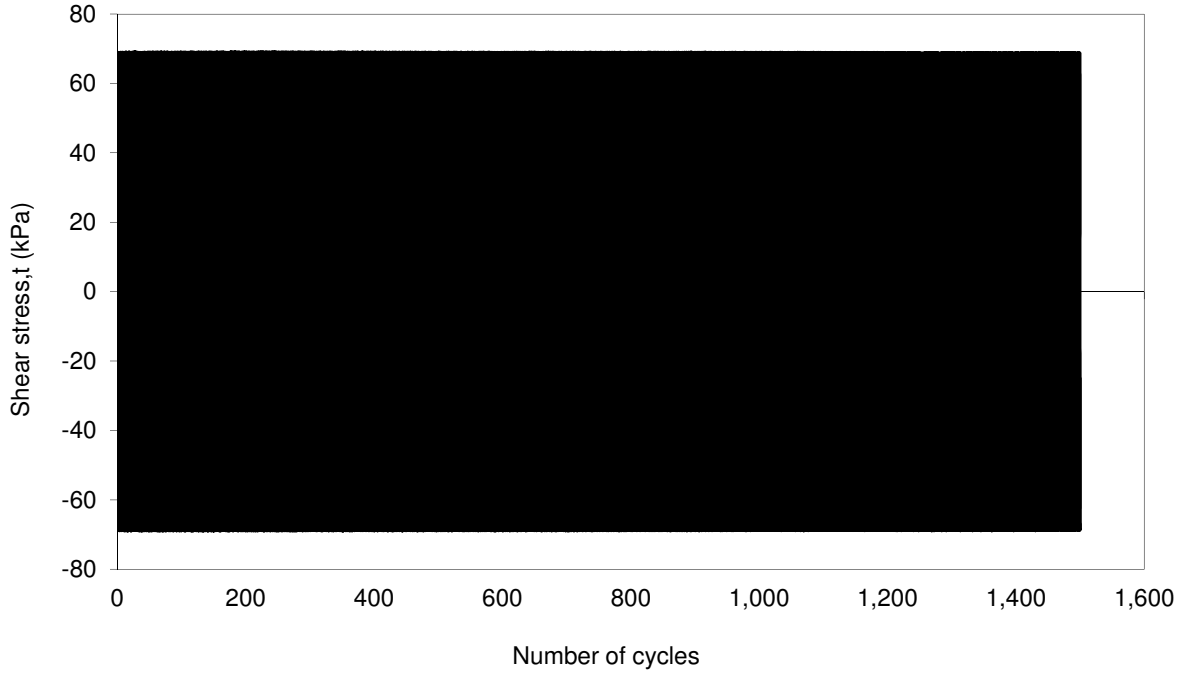
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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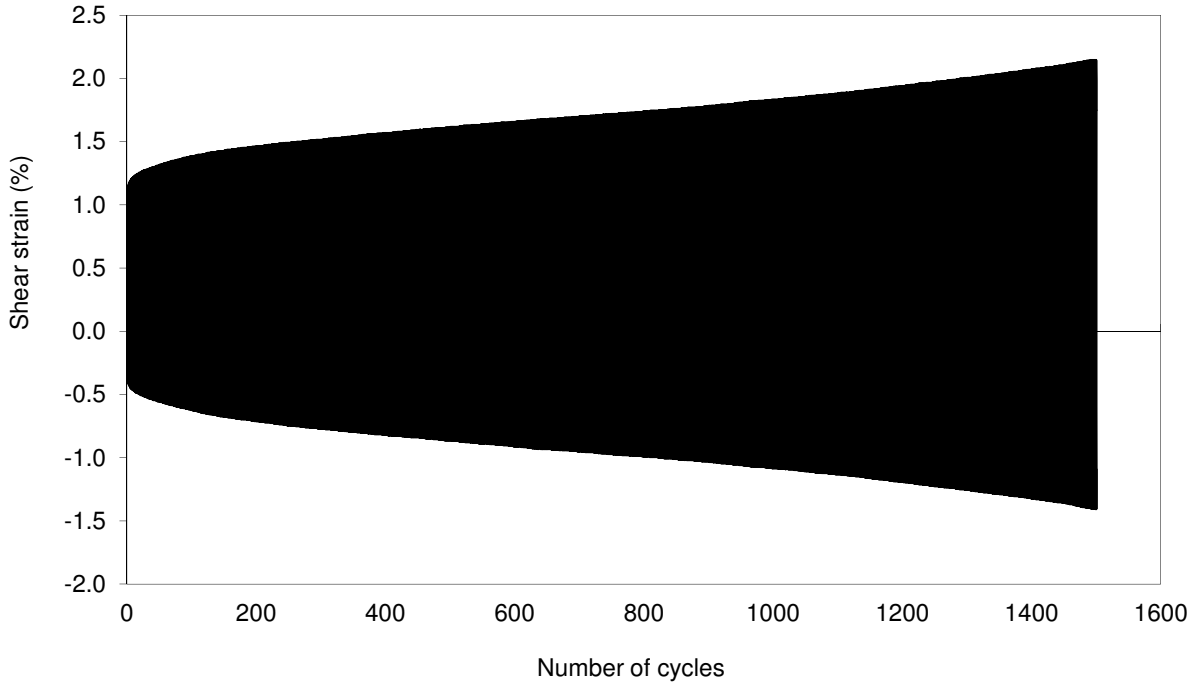
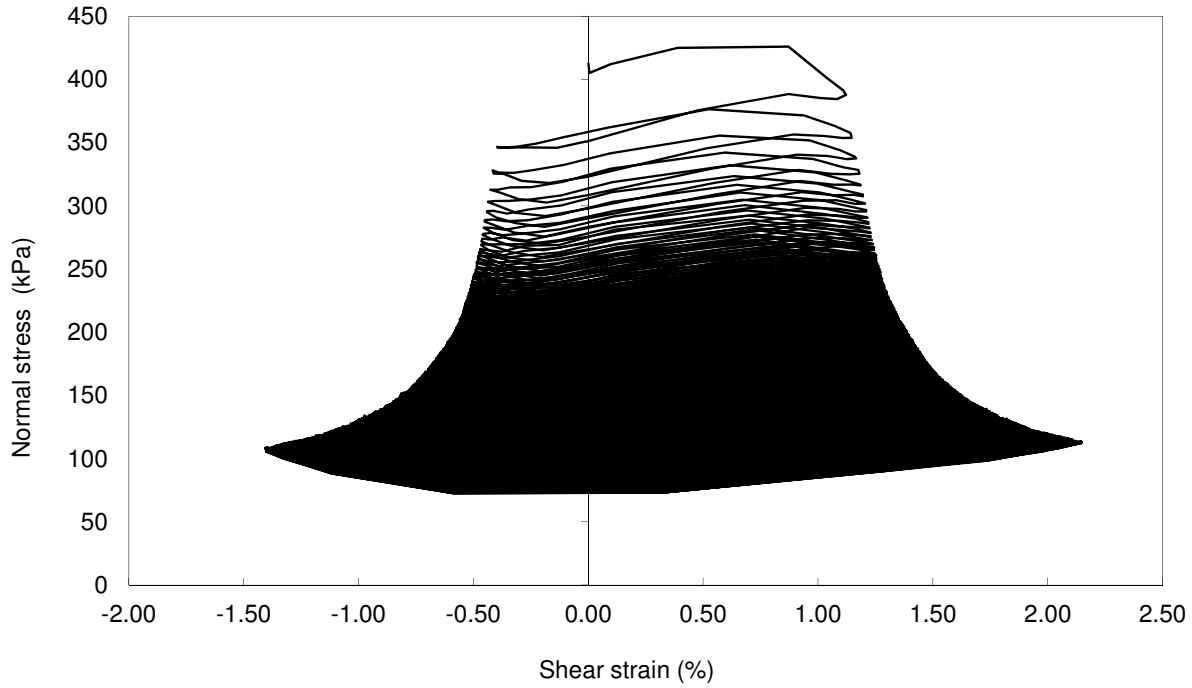
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P17-Q1	Stiff brown micaceous sandy CLAY with pyrite nodules
Sample Depth (m):	48.50-48.55	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	K16	Description (visual) :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.3	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	42.14	%	41.41	%	
Bulk density :	1.72	Mg/m^3			
Dry density :	1.21	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	1.2126				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.2	mm
Diameter :	66.4	mm
Axial strain:	10.10	% (for stage)
Normal stress:	600.9	kPa
Voids ratio (e_o):	0.9892	
Max. Consolidation stress:	600.9	kPa
Max. Consolidation strain:	10.10	% (for stage)
Duration:	1014	Min.

PRIOR TO CYCLIC SHEAR		
Height :	19.2	mm
Diameter :	66.4	mm
Axial strain:	10.10	% (for stage)
Normal stress:	600.9	kPa
Voids ratio (e_o):	0.9892	
Max. Consolidation stress:	600.9	kPa
Max. Consolidation strain:	10.10	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	143.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	519	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.743	-0.960	142.5	-142.3	130.6	47.4
5	1.826	-1.075	142.6	-142.6	184.5	145.9
10	1.904	-1.174	142.5	-142.8	226.5	192.1
20	1.998	-1.268	142.7	-142.8	265.3	232.0
50	2.155	-1.435	142.7	-142.7	312.6	278.4
100	2.317	-1.612	142.7	-142.7	348.3	311.6
200	2.551	-1.894	142.8	-142.7	389.5	343.0
300	2.802	-2.202	142.6	-142.5	420.2	362.9
400	3.178	-2.682	142.3	-142.5	449.1	382.1
500	4.659	-4.811	140.8	-140.6	493.3	405.9
518	8.739	-12.230	128.3	-126.6	502.7	388.4

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 21/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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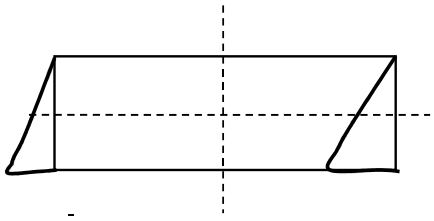
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

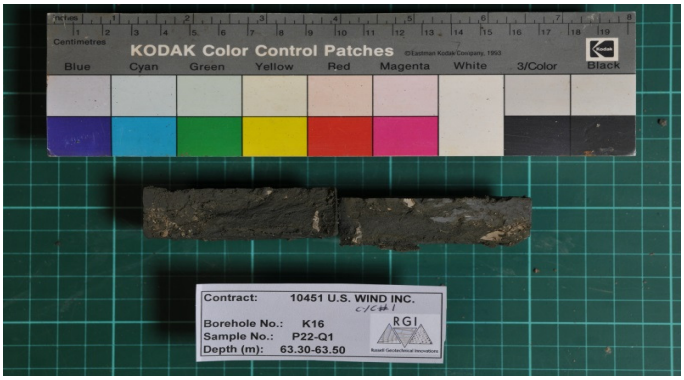
Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)

SPECIMEN DETAILS

Initial Height:	21.3	mm
Initial Diameter:	66.4	mm



Elevation



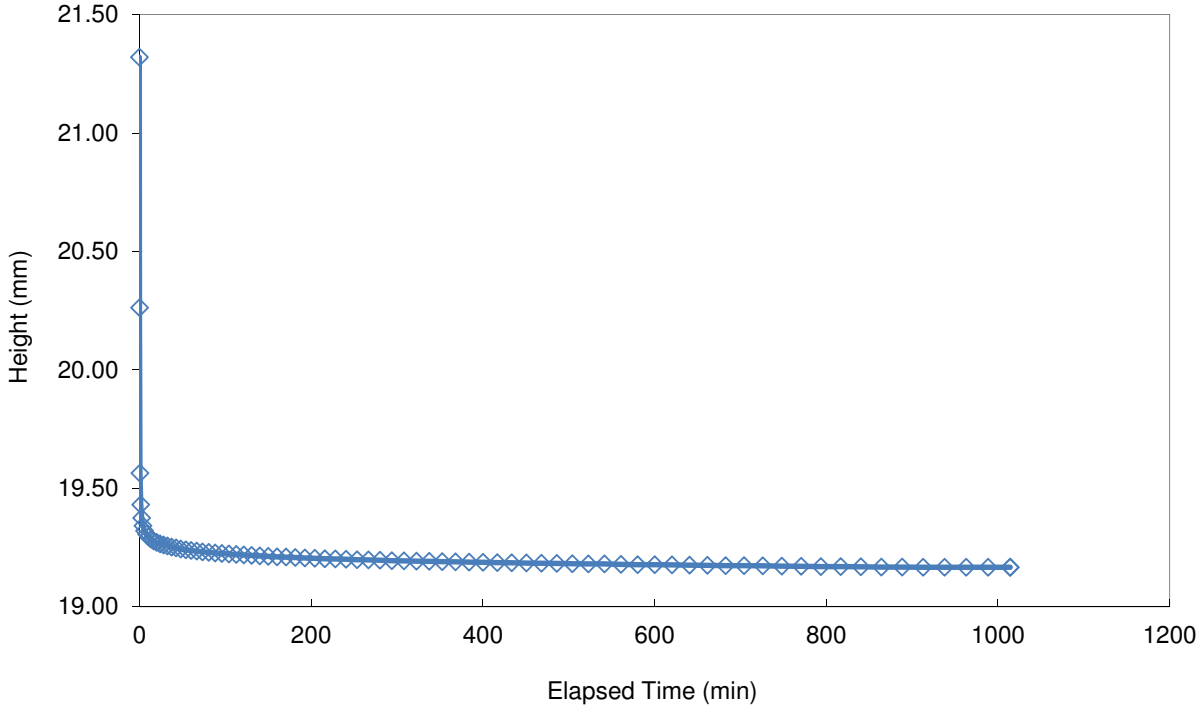
Failure Sketch

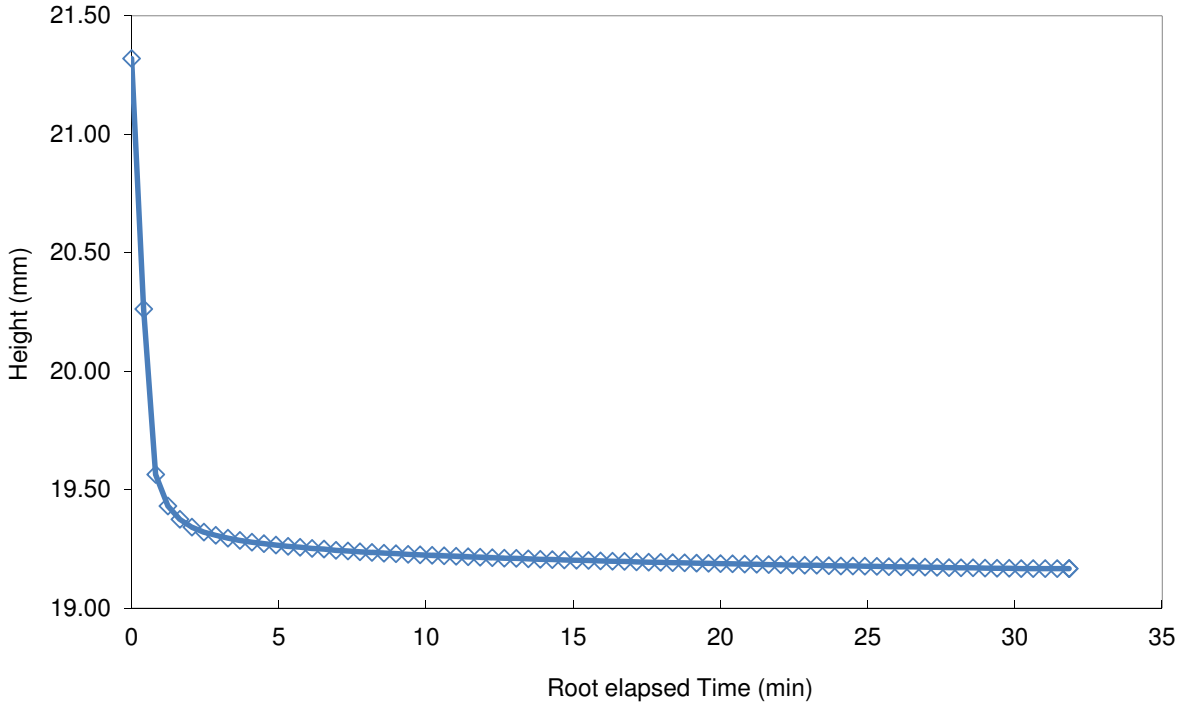
Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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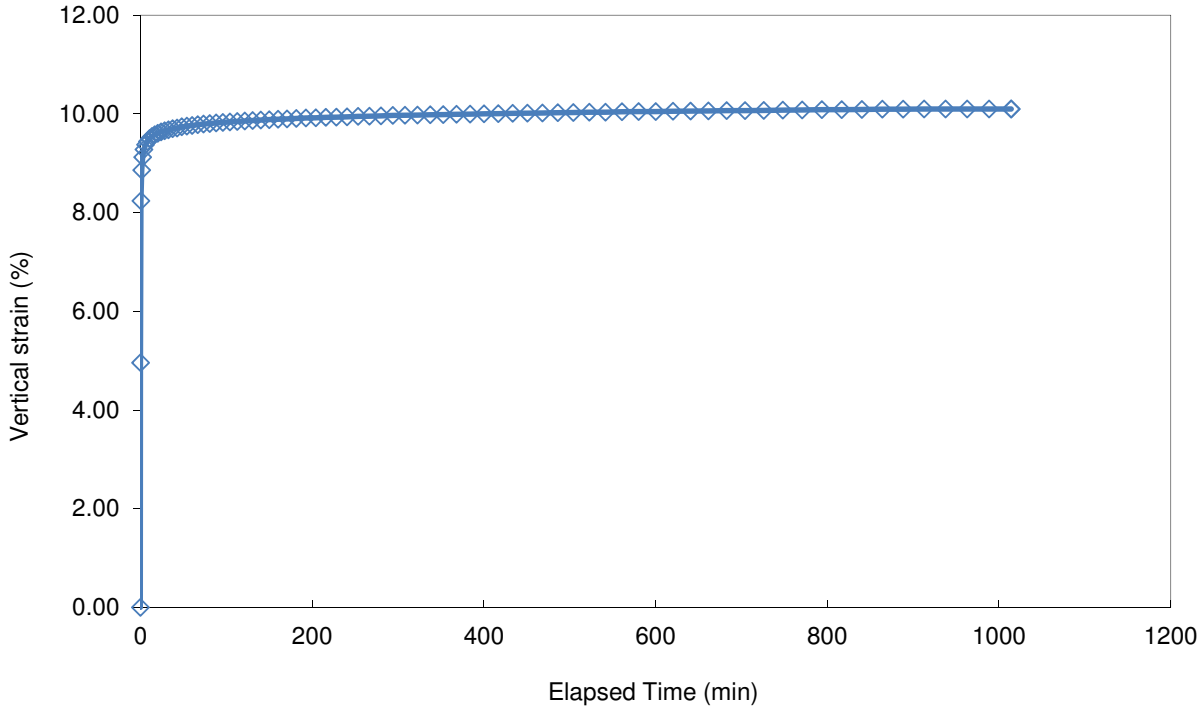
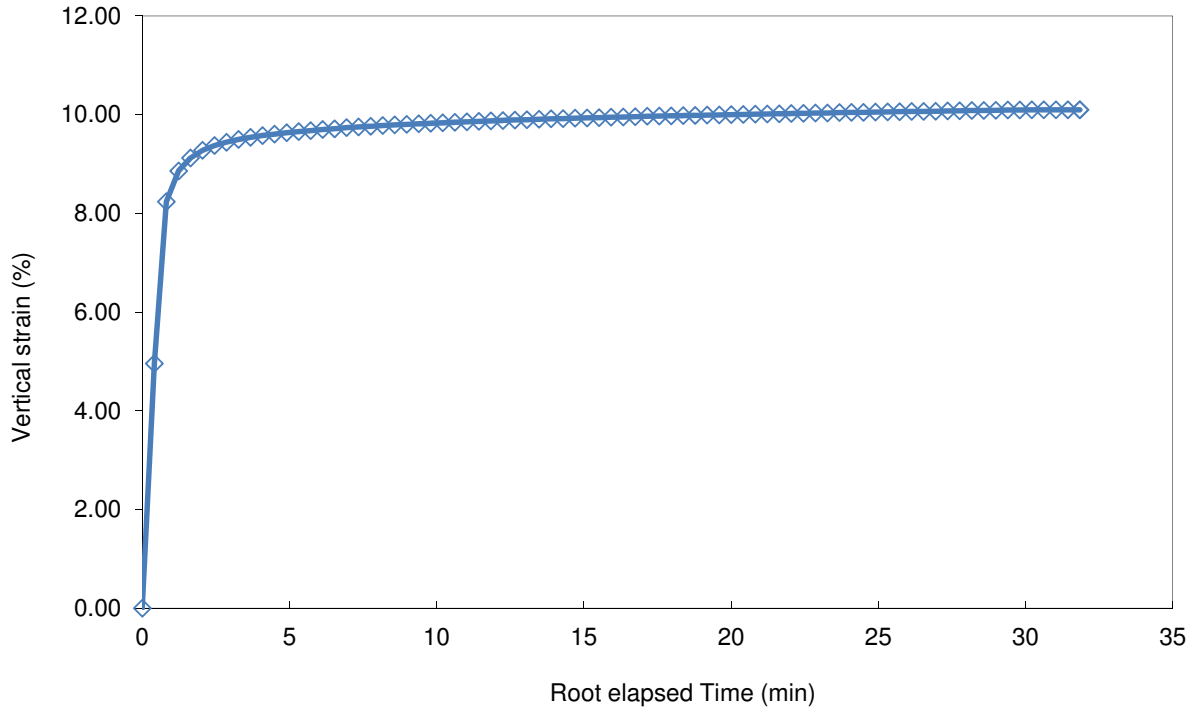
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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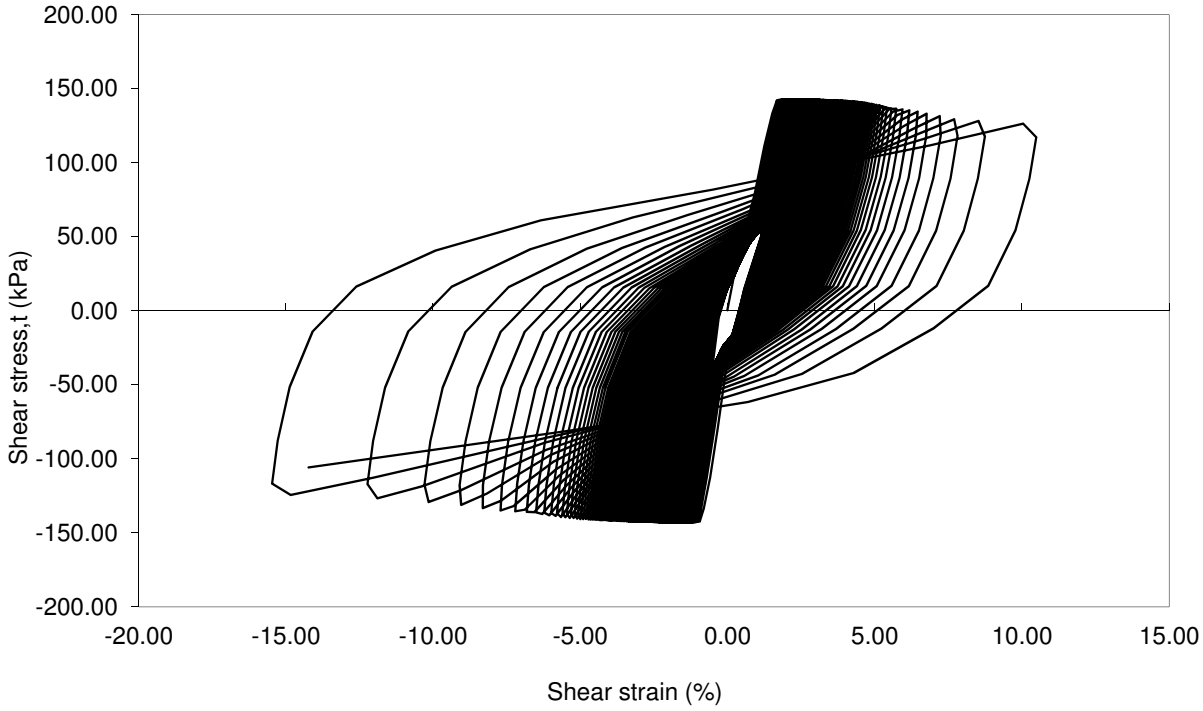
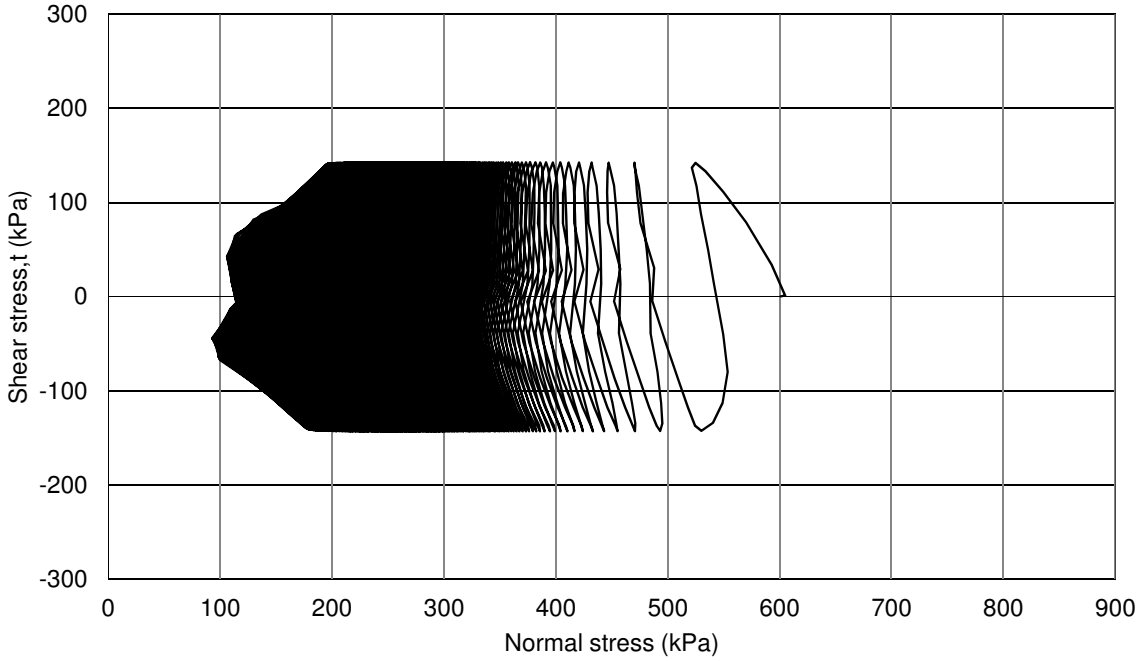
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
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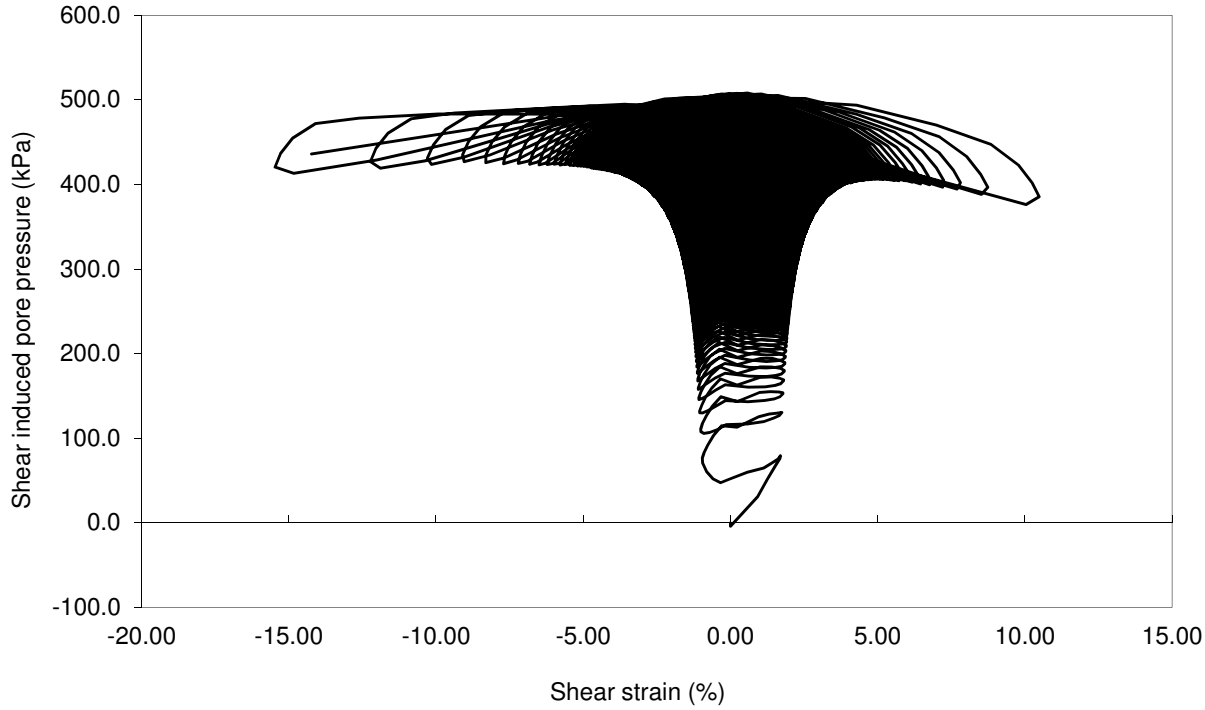
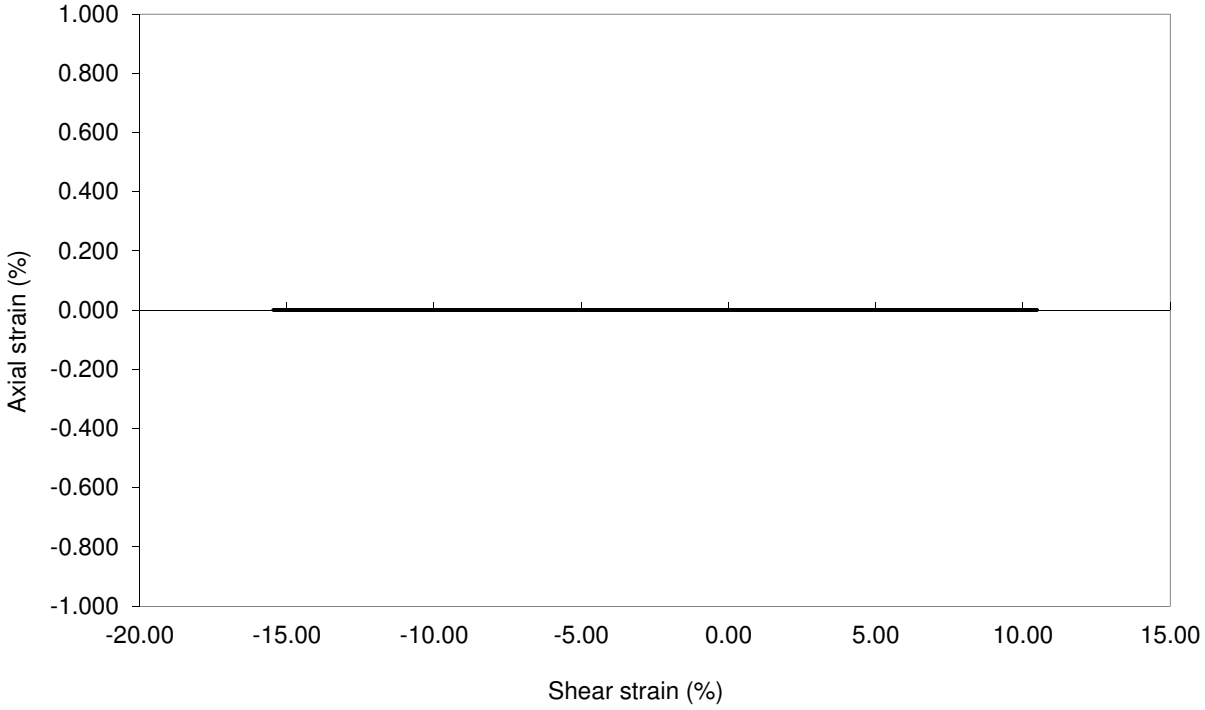
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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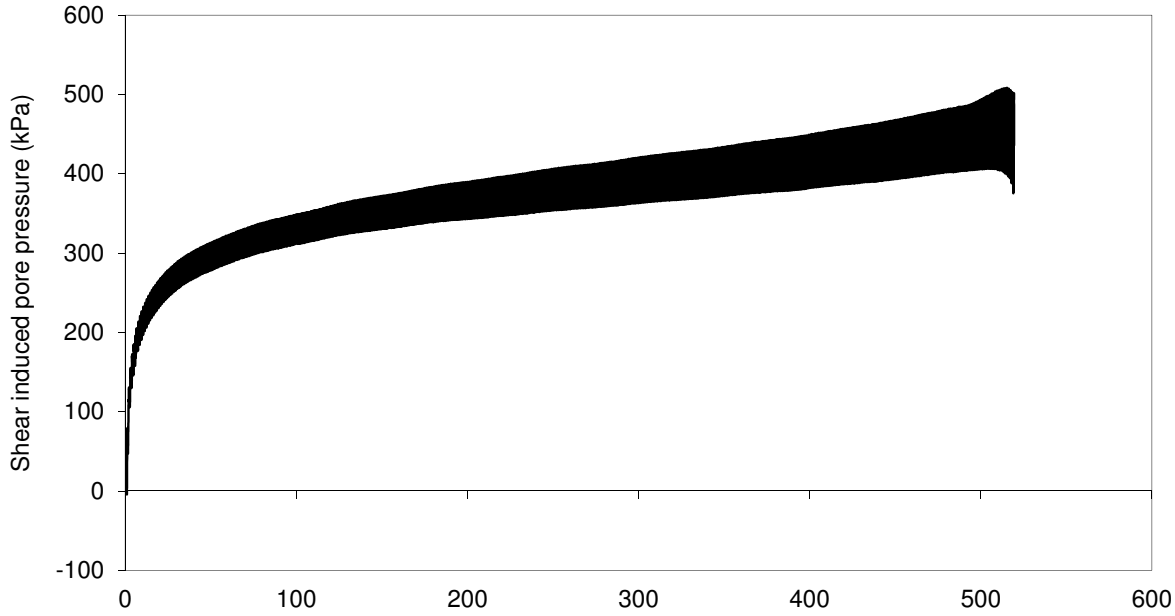
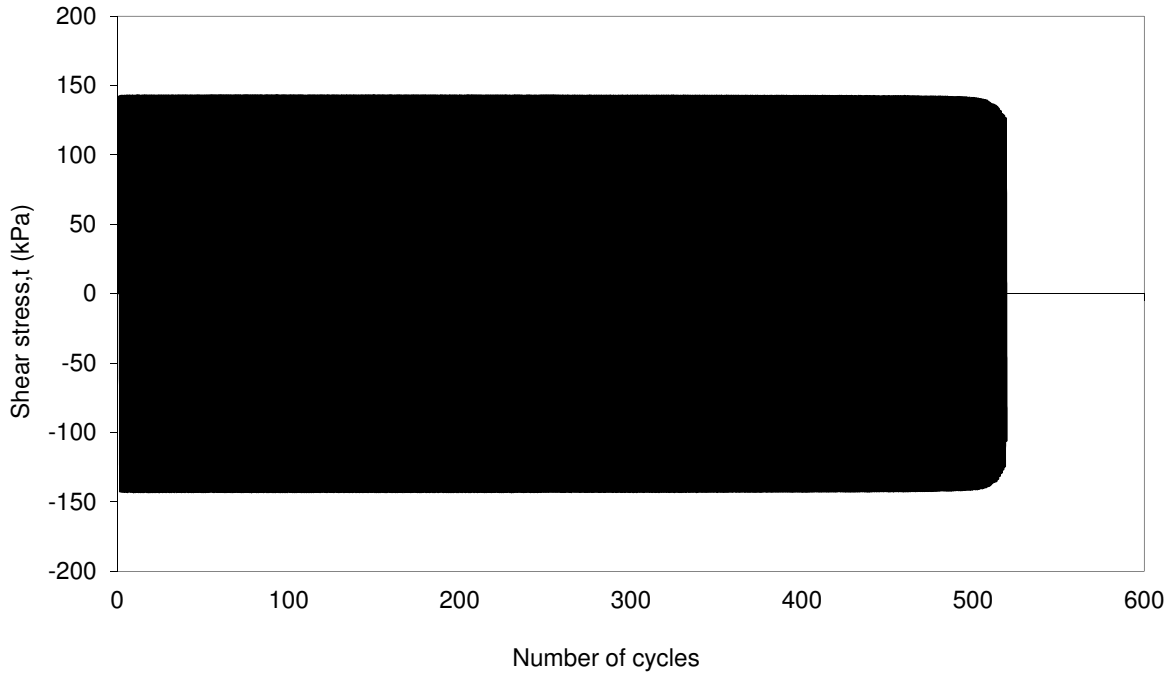
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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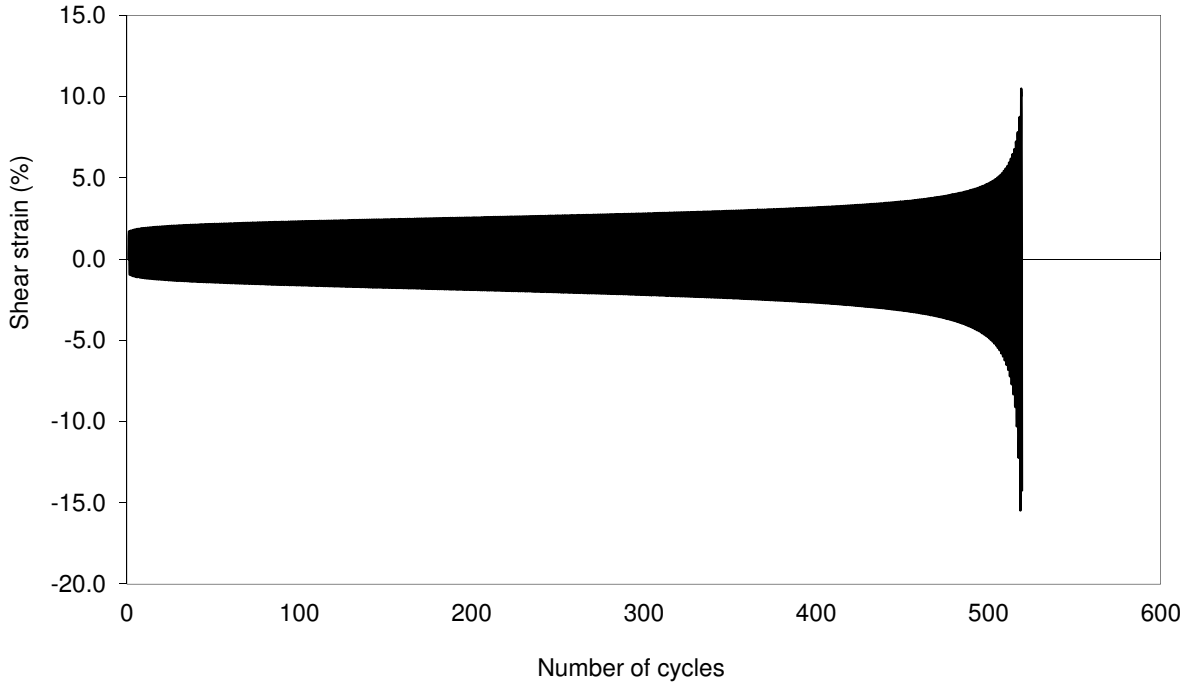
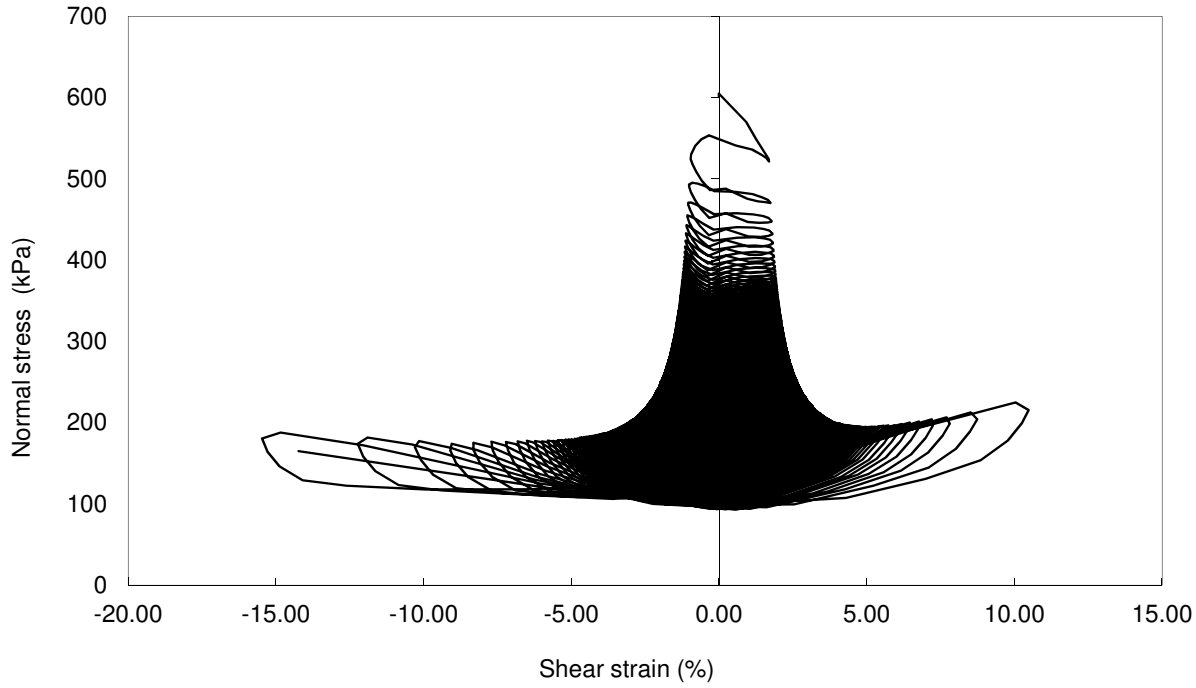
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #1)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 21/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	K16	Description (visual) :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #2)

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.4	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	43.00	%	42.12	%
Bulk density :	1.71	Mg/m^3		
Dry density :	1.19	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	1.2345			
Test Duration:			3 Days	

END OF CONSOLIDATION #1

Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	9.41	% (for stage)
Normal stress:	600.8	kPa
Voids ratio (e_o):	1.0243	
Max. Consolidation stress:	600.8	kPa
Max. Consolidation strain:	9.41	% (for stage)
Duration:	1148	Min.

PRIOR TO CYCLIC SHEAR

Height :	19.4	mm
Diameter :	66.4	mm
Axial strain:	9.41	% (for stage)
Normal stress:	600.8	kPa
Voids ratio (e_o):	1.0243	
Max. Consolidation stress:	600.8	kPa
Max. Consolidation strain:	9.41	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE

Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	197.1	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	17	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	2.956	-1.826	194.4	-193.2	232.0	124.4
5	3.466	-2.708	194.4	-194.0	352.4	280.8
7	3.812	-3.446	194.3	-193.5	410.0	315.6
9	4.214	-4.142	193.6	-192.8	438.9	330.1
11	4.751	-5.050	192.6	-191.6	463.9	344.6
13	5.586	-6.329	190.9	-188.9	484.0	356.9
14	6.241	-7.206	188.9	-186.5	491.8	360.8
15	7.433	-8.232	185.8	-185.4	496.3	359.7
16	9.310	-9.878	181.5	-182.0	506.8	357.4
17	12.591	-14.484	173.6	-173.4	508.0	351.3

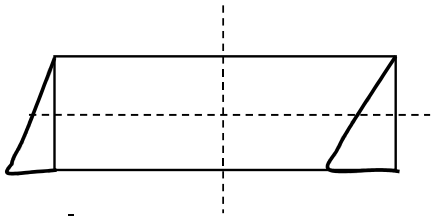
Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 22/01/2016		

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #2)

SPECIMEN DETAILS

Initial Height:	21.4	mm
Initial Diameter:	66.4	mm



Elevation

Note: On removal from equipment sample found to have activated a slip plane within a horizontal silt lense.

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 22/01/2016		

Russell Geotechnical Innovations

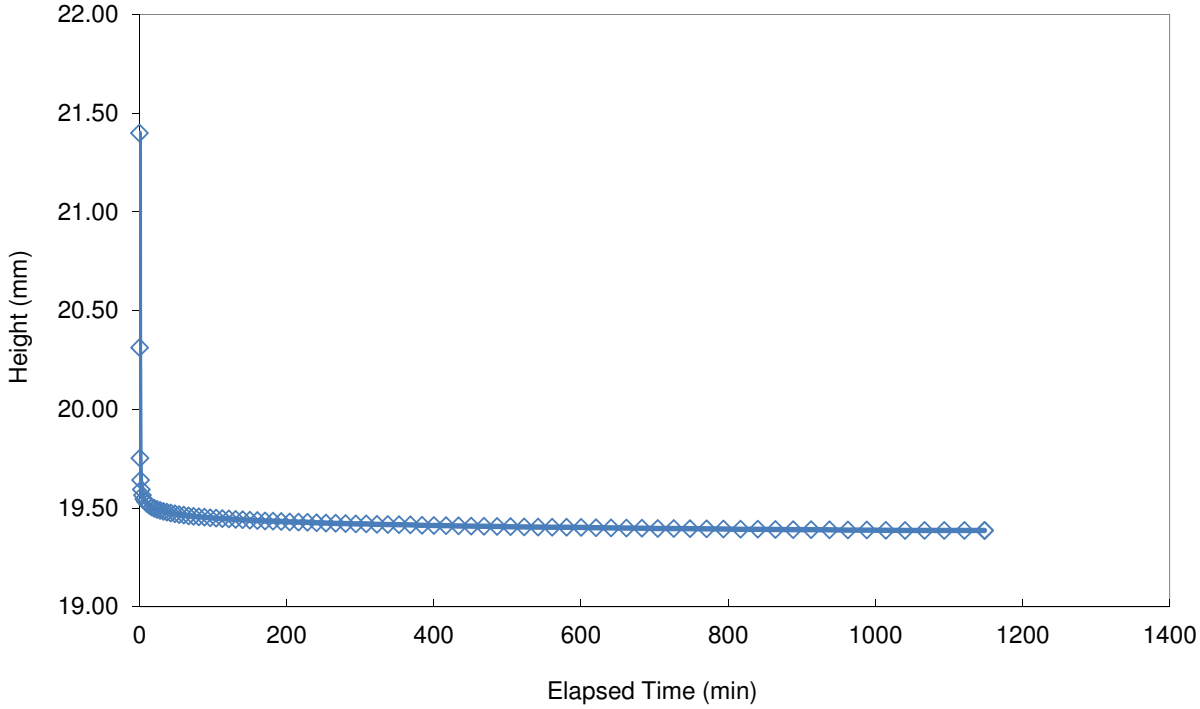
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

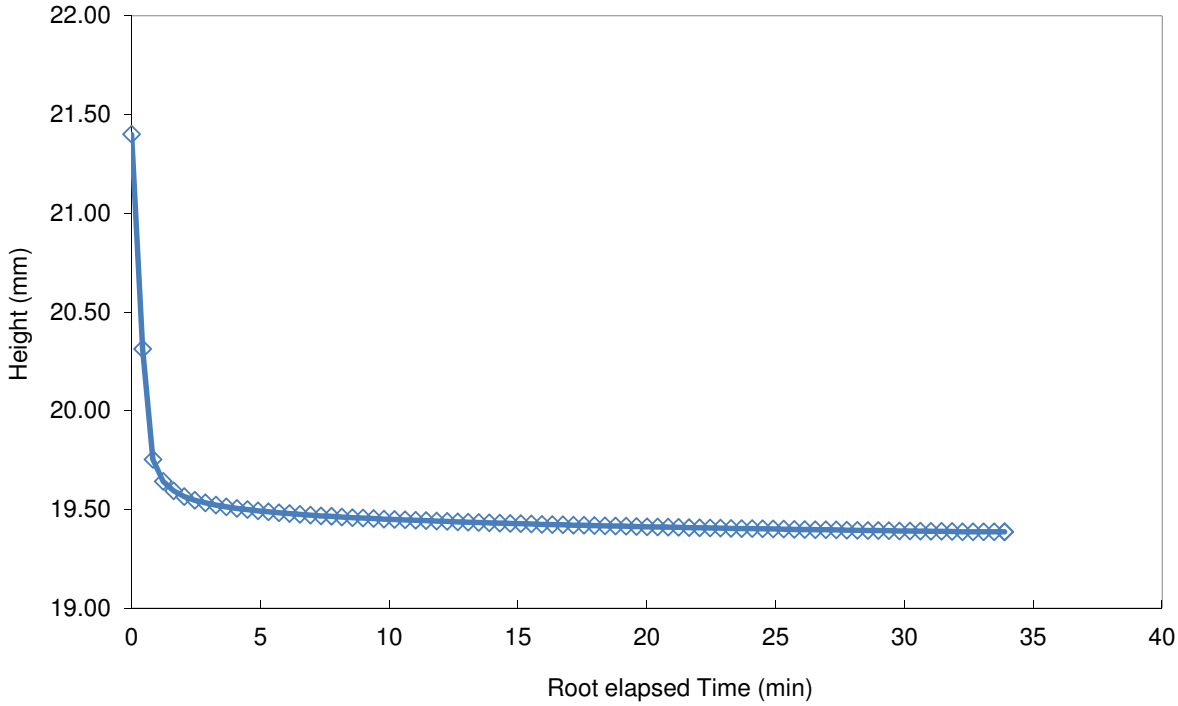
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHK16 P22Q1 6335 DSScyc#2.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #2)





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 22/01/2016		

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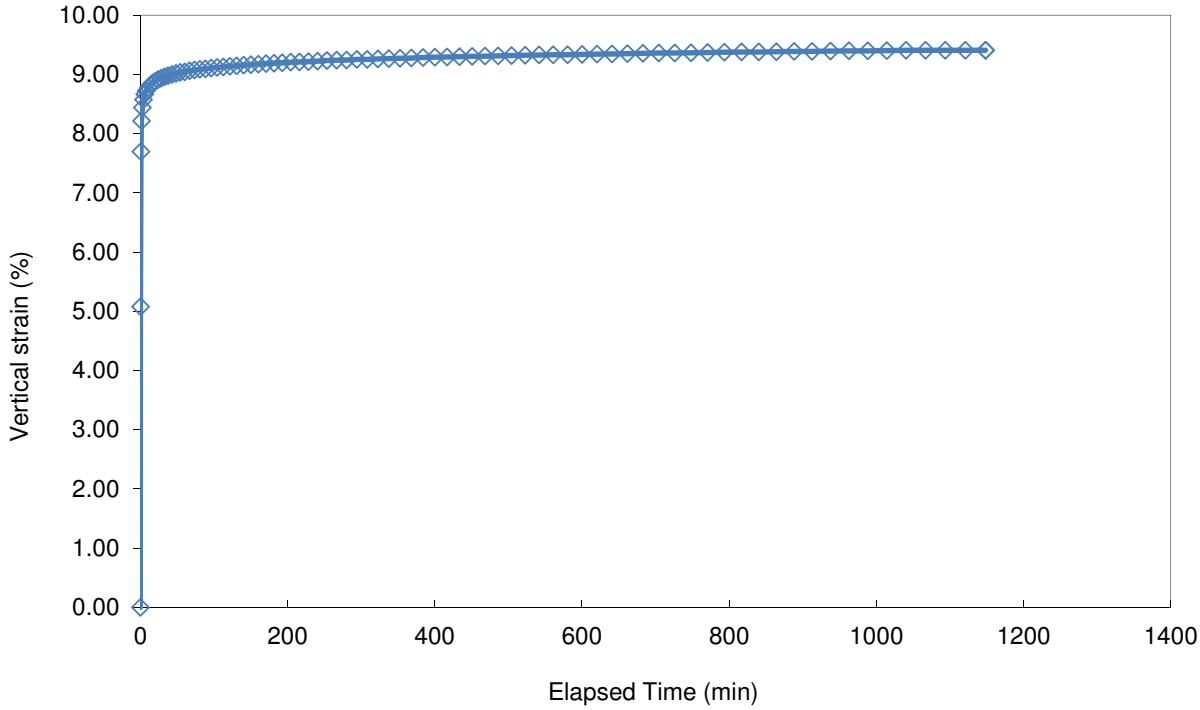

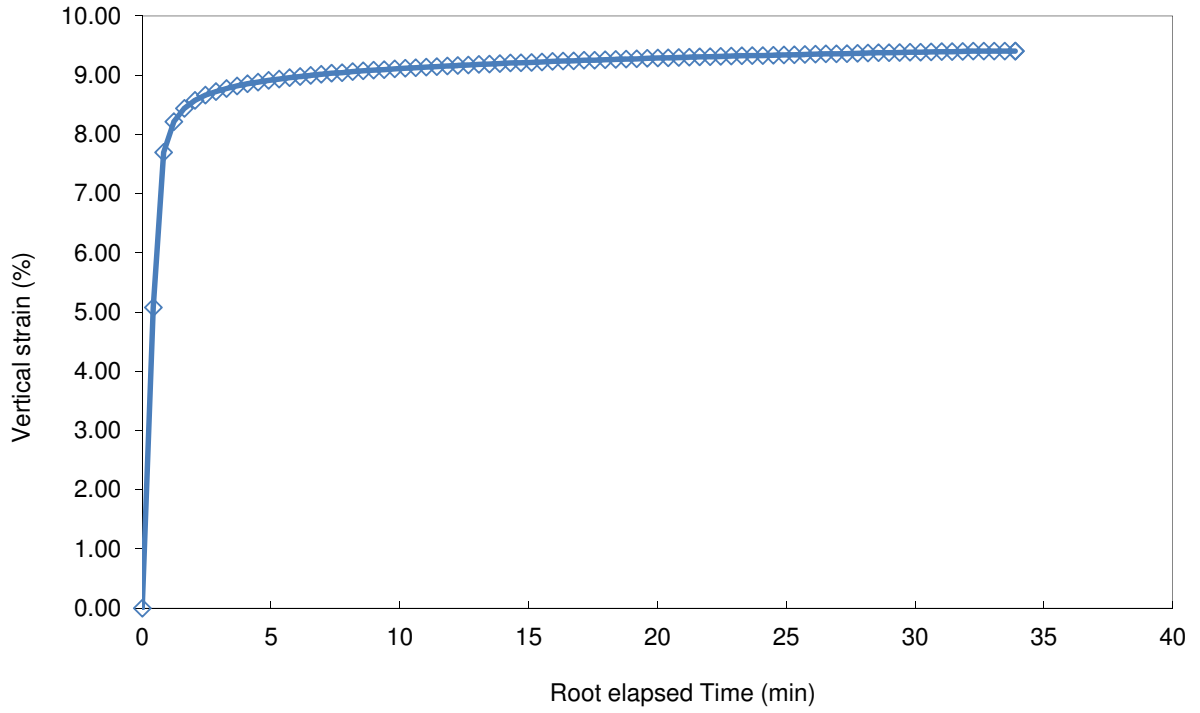

Consolidation stage #1

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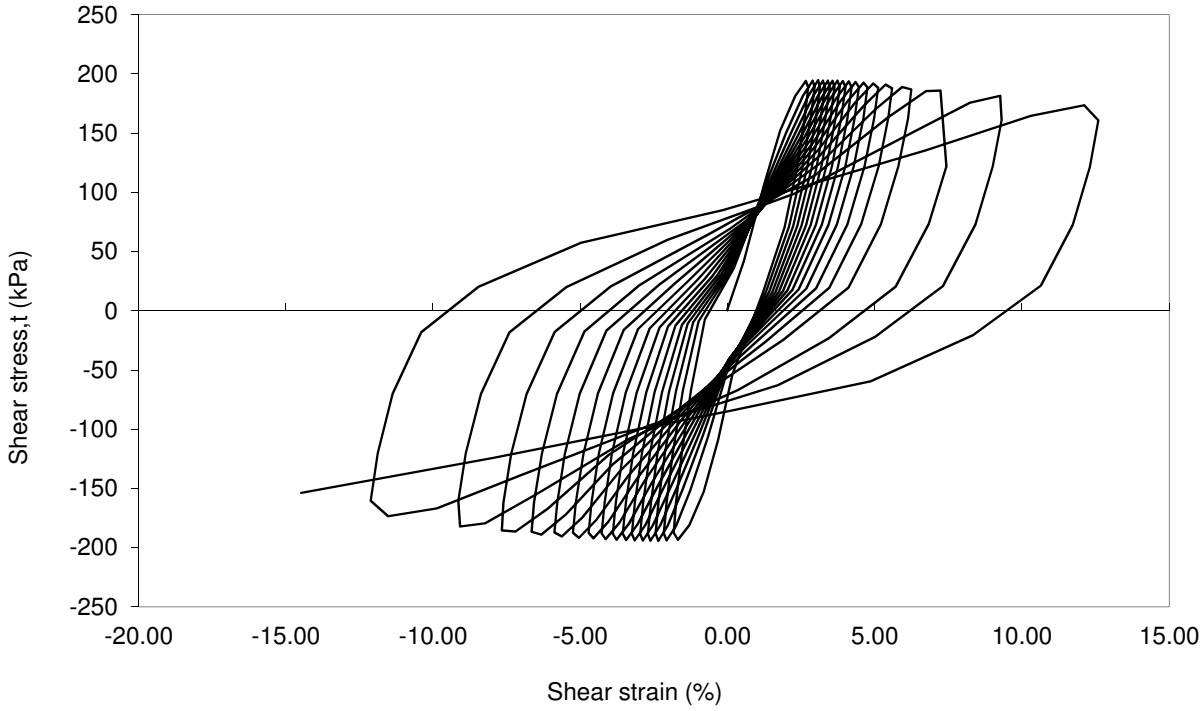

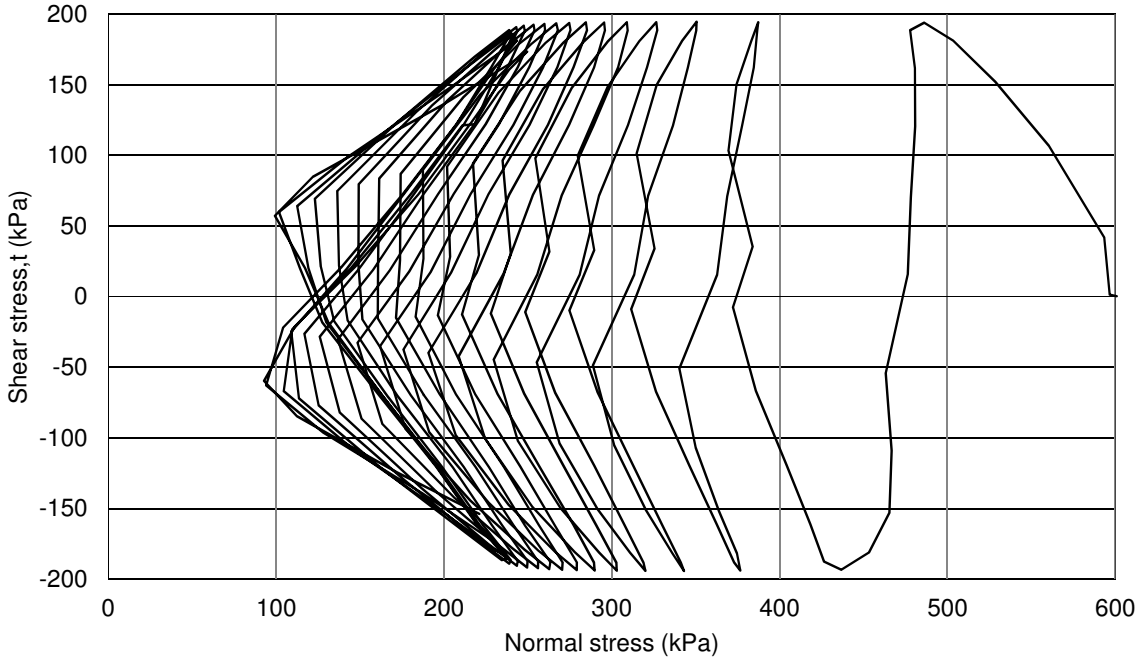

Cyclic simple shear #1

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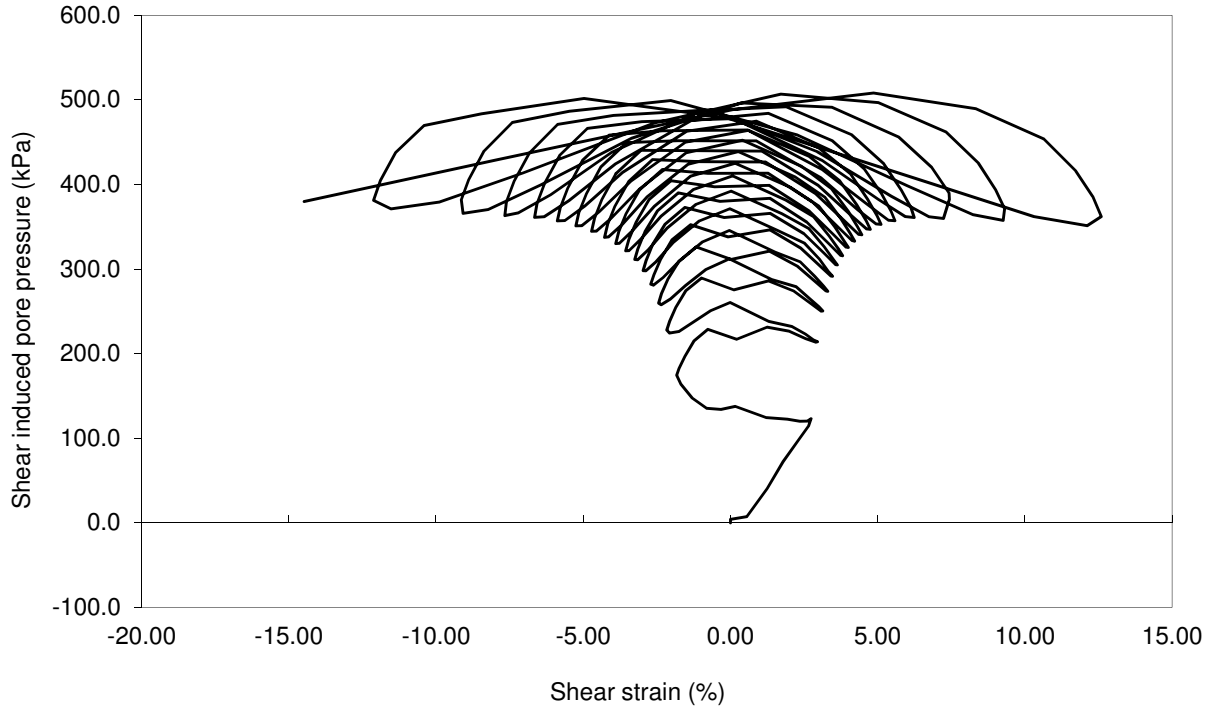

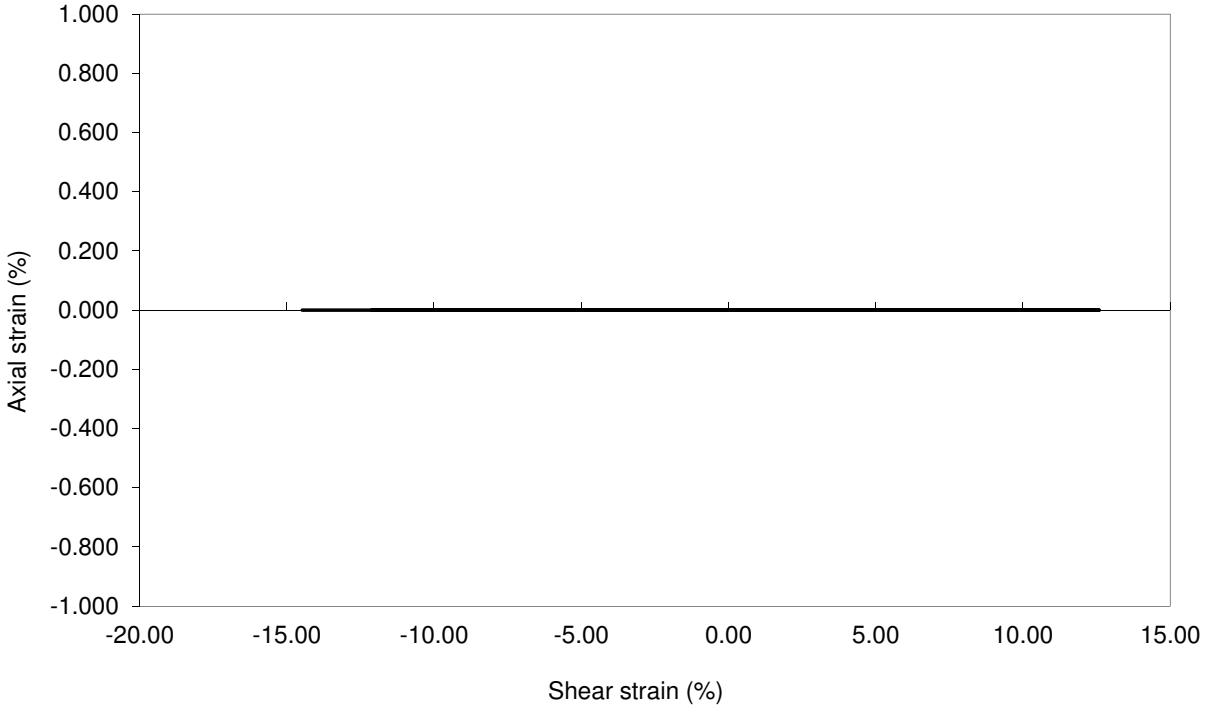

Cyclic simple shear #1

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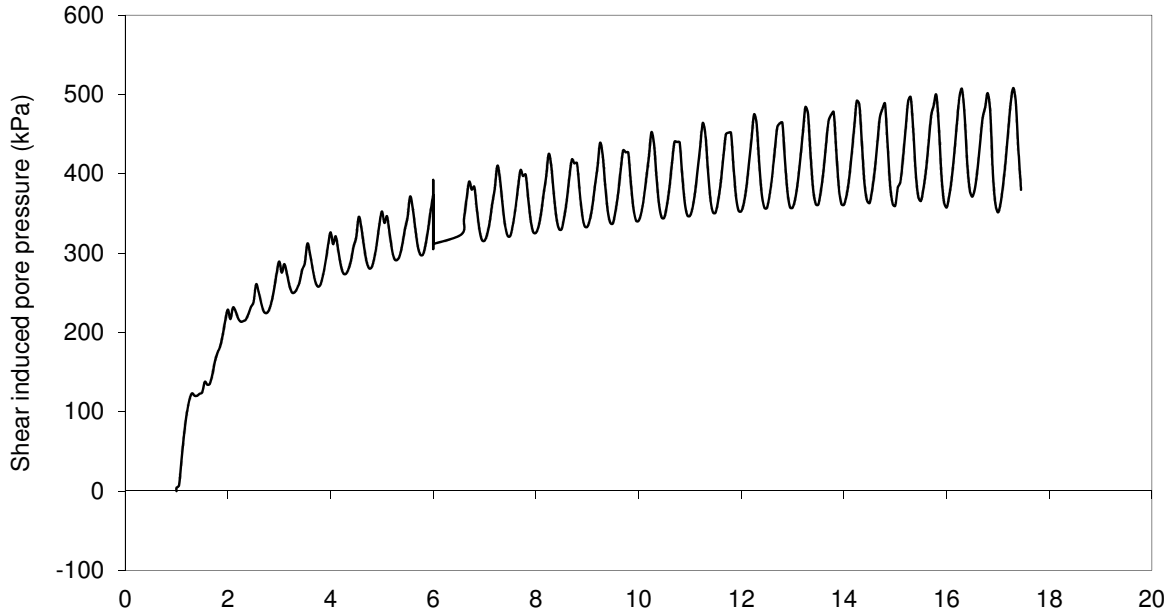

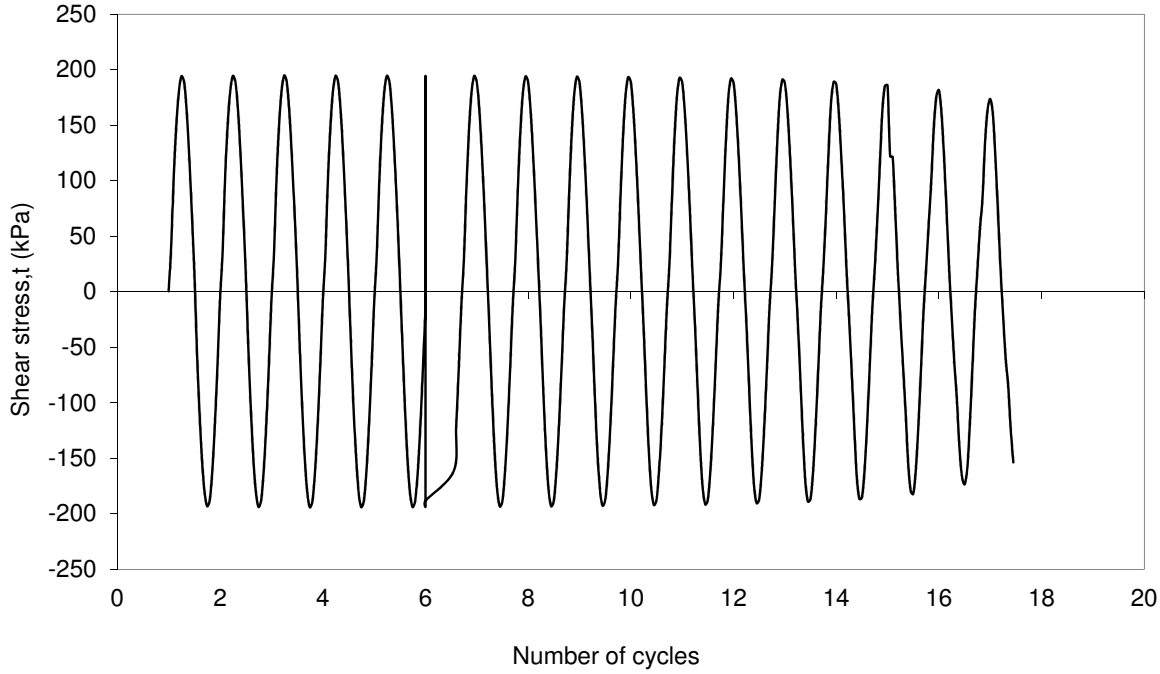

Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 22/01/2016		

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Authorised Signatory: C.S.Russell (Director)

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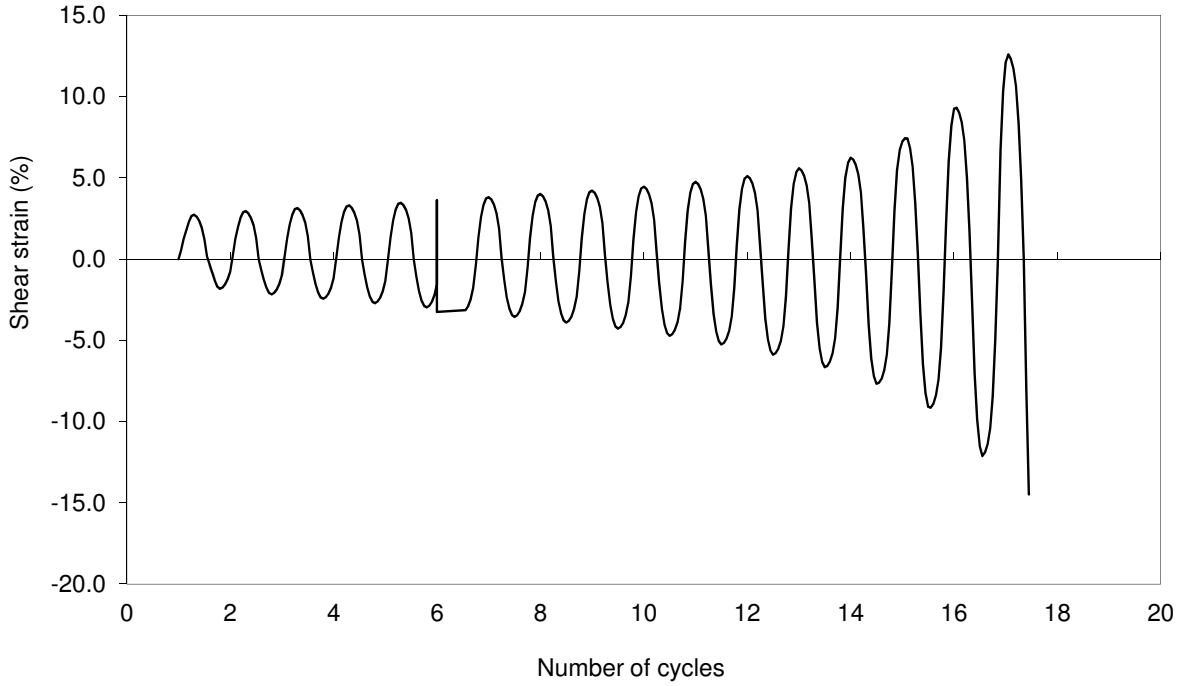
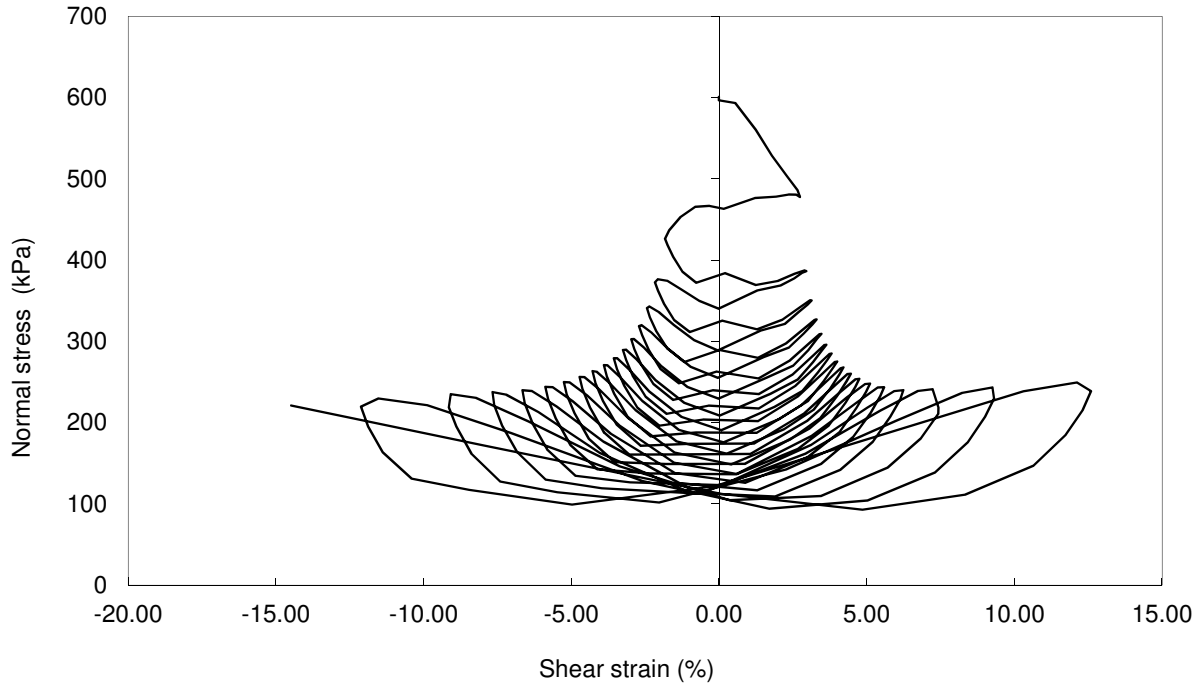
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.35-63.40	(Cyclic Test #2)





Cyclic simple shear #1

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Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 22/01/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	K16	Description (visual) :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.45-63.50	(Cyclic Test #3)

SPECIMEN DETAILS	Sample type:	Undisturbed		Trimming Procedure:	Lathe
	Initial Values		Final Values		
Height :	21.6	mm			
Diameter :	66.4	mm			
H:D ratio	0.3				
Moisture content :	40.09	%	39.93	%	
Bulk density :	1.69	Mg/m^3			
Dry density :	1.21	Mg/m^3			
Particle density (assumed)	2.67	Mg/m^3			
Initial voids ratio (e_o)	1.2075				
Test Duration:			3 Days		

END OF CONSOLIDATION #1		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	8.16	% (for stage)
Normal stress:	600.8	kPa
Voids ratio (e_o):	1.0273	
Max. Consolidation stress:	600.8	kPa
Max. Consolidation strain:	8.16	% (for stage)
Duration:	1291	Min.

PRIOR TO CYCLIC SHEAR		
Height :	19.8	mm
Diameter :	66.4	mm
Axial strain:	8.16	% (for stage)
Normal stress:	600.8	kPa
Voids ratio (e_o):	1.0273	
Max. Consolidation stress:	600.8	kPa
Max. Consolidation strain:	8.16	% (for stage)
Duration	0	Min.

CYCLIC SHEAR STAGE		
Average shear stress:	0	(kPa)
Cyclic shear stress (+/-):	125.4	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	972	

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.635	-0.727	124.8	-124.6	121.5	49.5
5	1.710	-0.782	124.8	-124.8	172.2	132.8
10	1.776	-0.817	125.0	-124.8	210.7	176.5
20	1.852	-0.858	124.8	-124.9	248.1	215.9
50	1.978	-0.938	125.0	-124.9	295.9	262.8
100	2.099	-1.029	125.0	-124.8	330.5	295.0
200	2.255	-1.166	125.0	-125.0	366.8	328.0
500	2.639	-1.539	124.9	-124.9	423.5	376.1
800	3.270	-2.255	124.5	-124.6	475.3	413.9
900	3.961	-3.108	124.1	-124.3	503.7	432.6
972	13.618	-18.407	108.0	-104.2	532.6	408.1

Checked and approved	Project Number: **RGI/1130**	RGI
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	Russell Geotechnical Innovations
Date: 14/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

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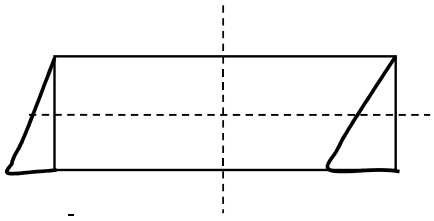
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	K16	Description :
Sample Number:	P22-Q1	Stiff grey silty CLAY with shells
Sample Depth (m):	63.45-63.50	(Cyclic Test #3)

SPECIMEN DETAILS

Initial Height:	21.6	mm
Initial Diameter:	66.4	mm



Elevation

Note: On removal from equipment sample found to have activated a slip plane within a horizontal silt lense.

Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
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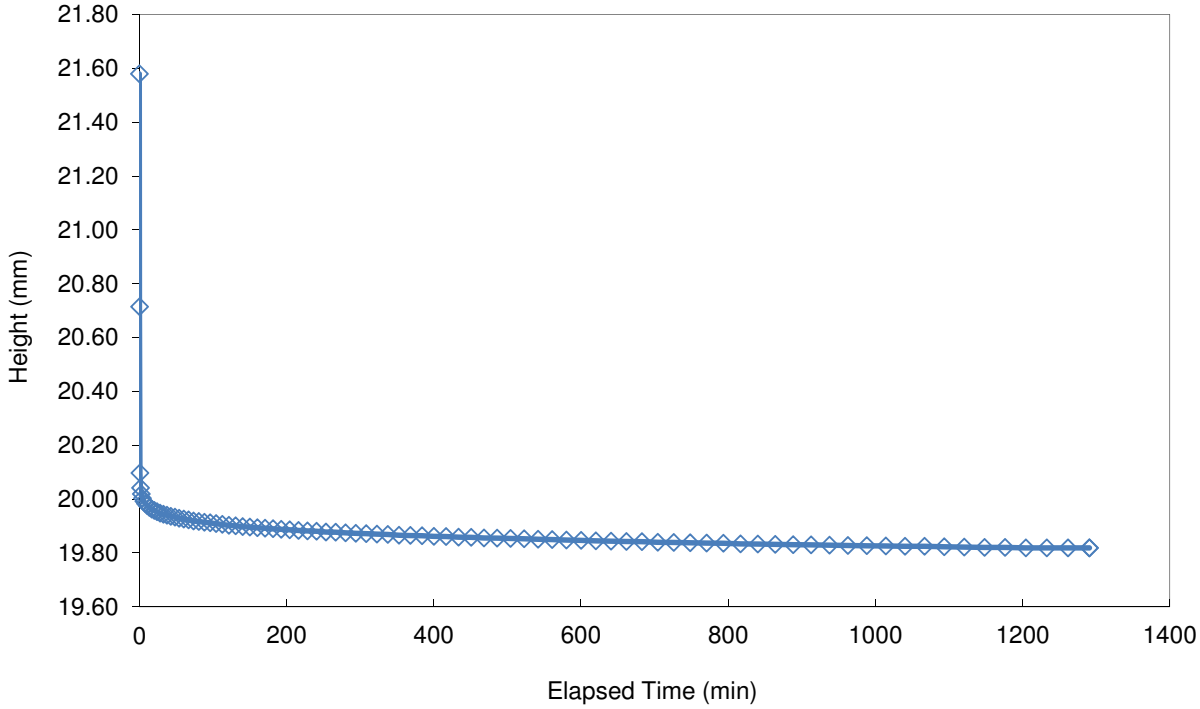

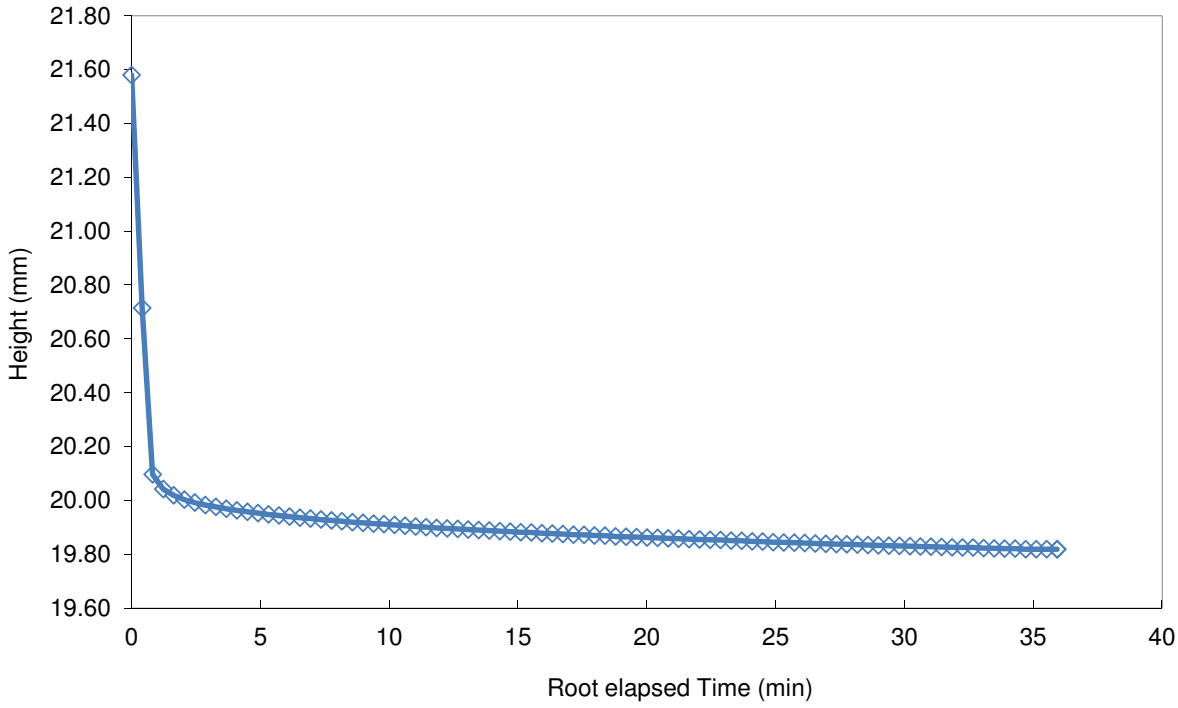

Consolidation stage #1

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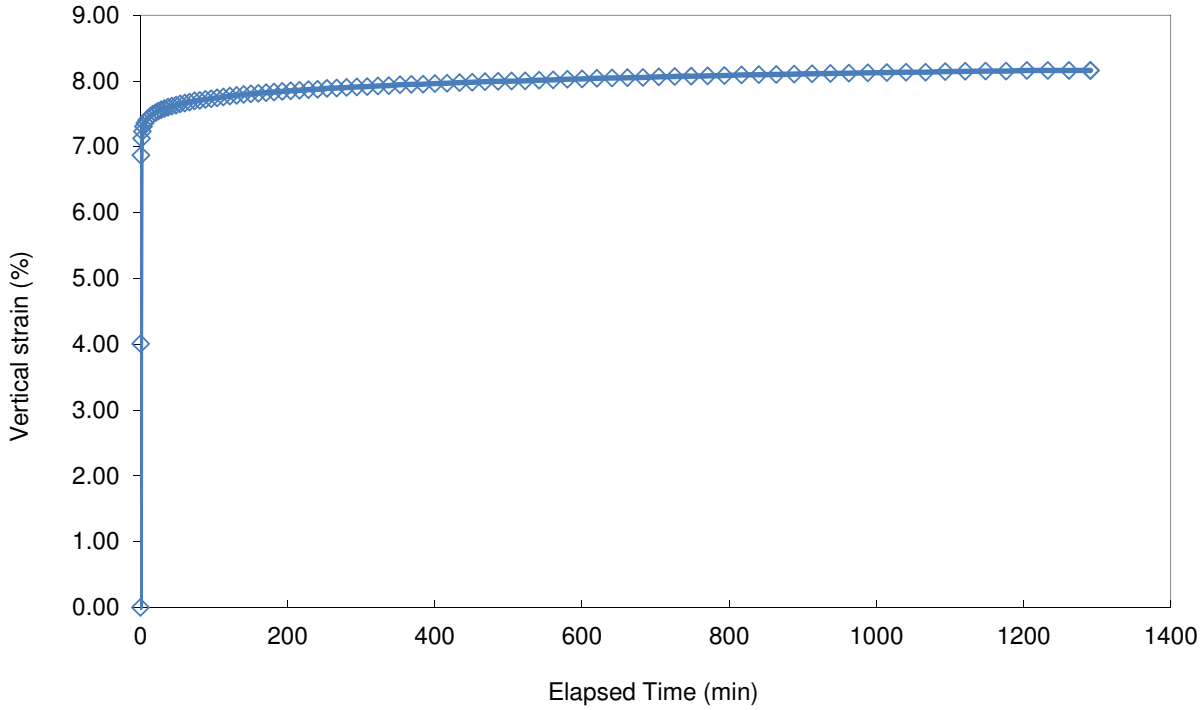

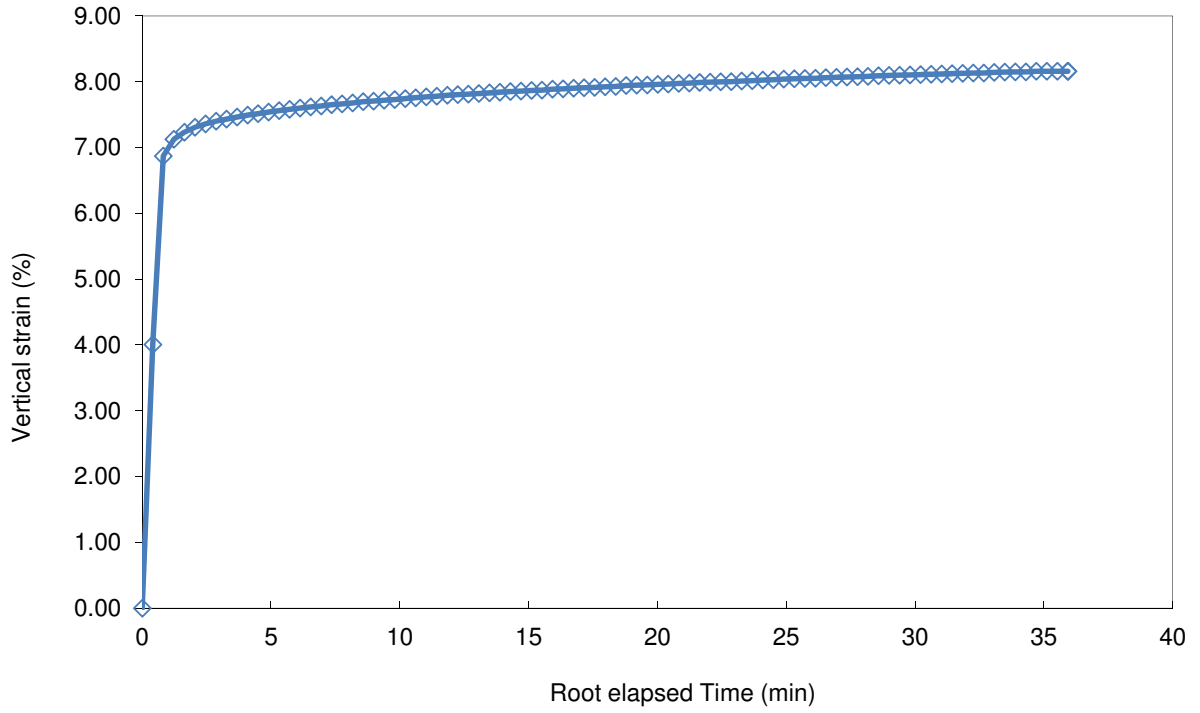

Consolidation stage #1

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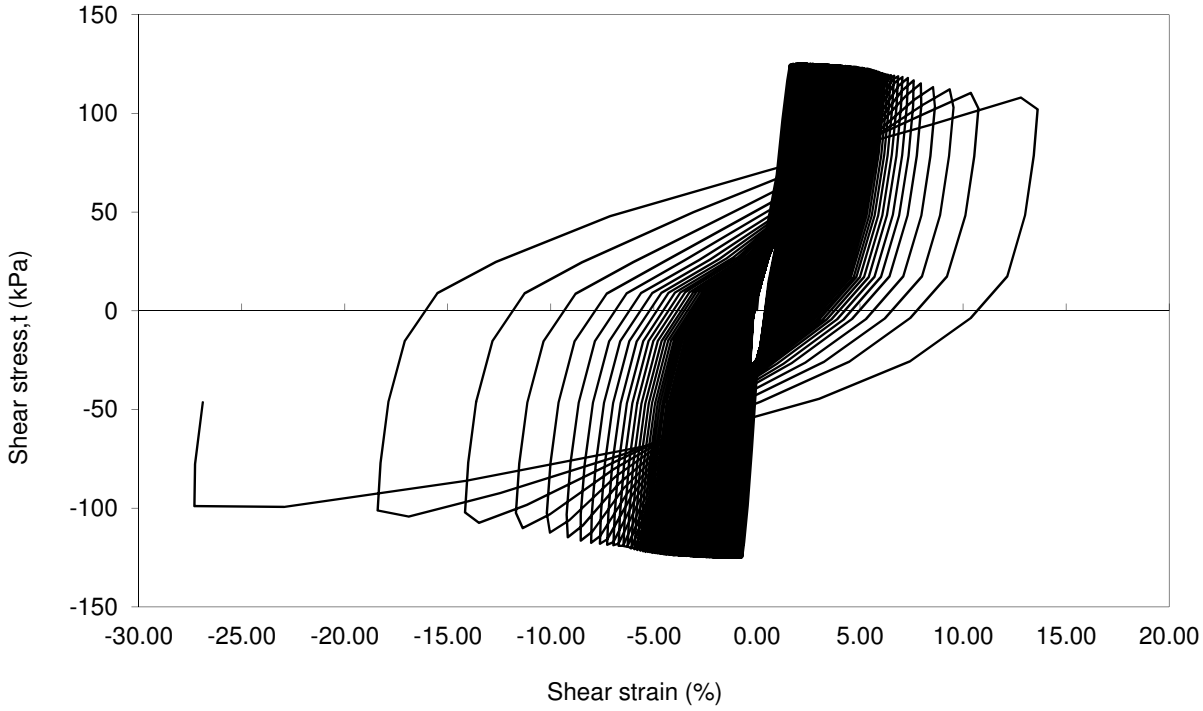

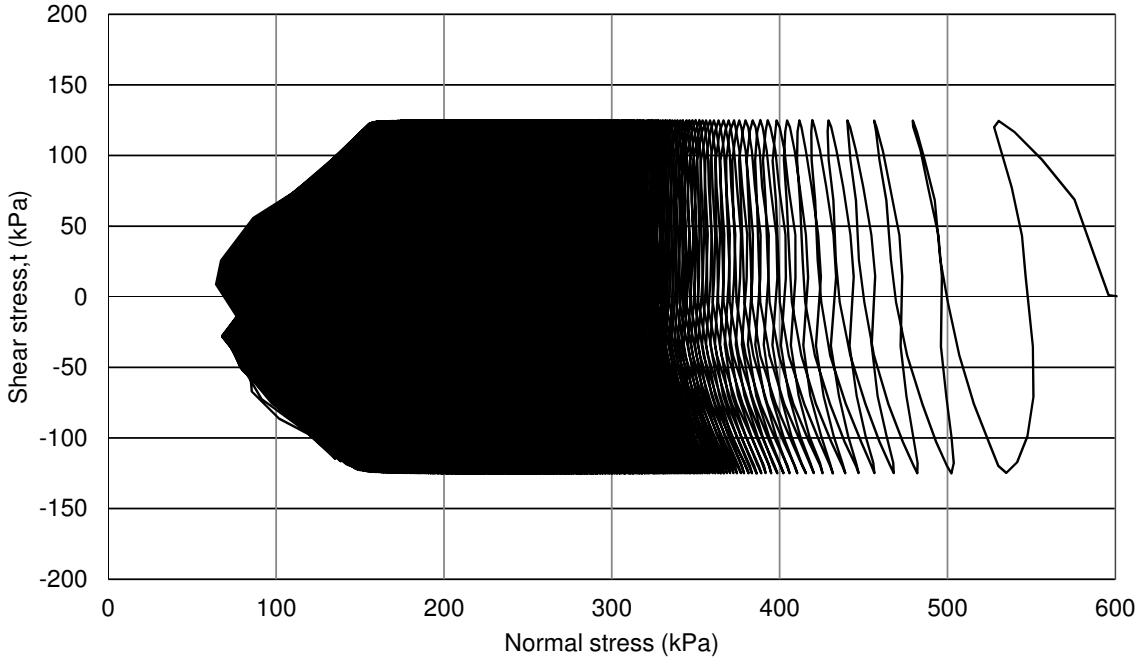

Cyclic simple shear #1

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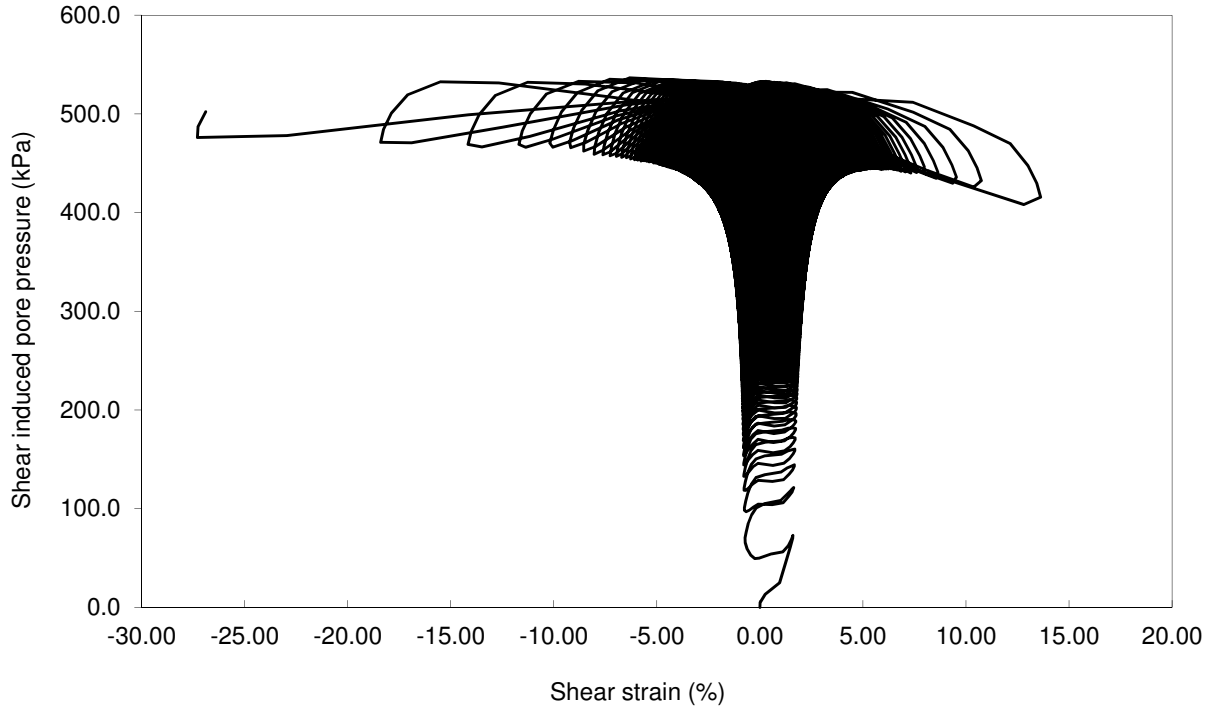

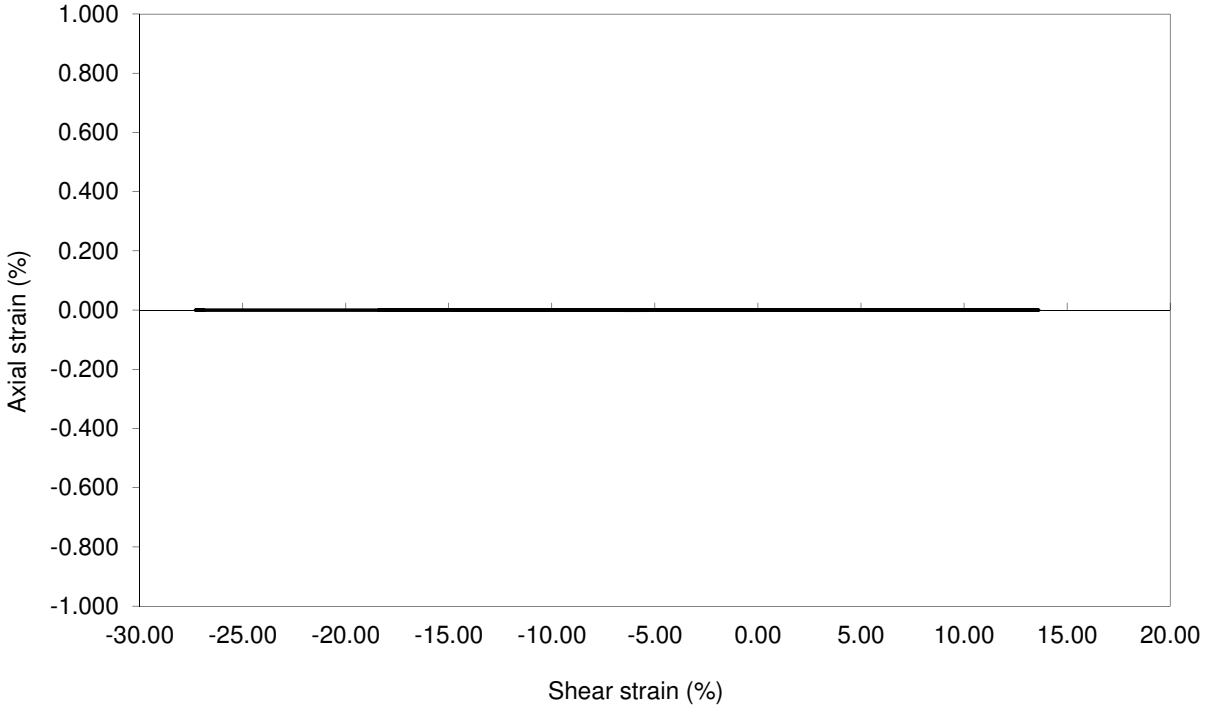

Cyclic simple shear #1

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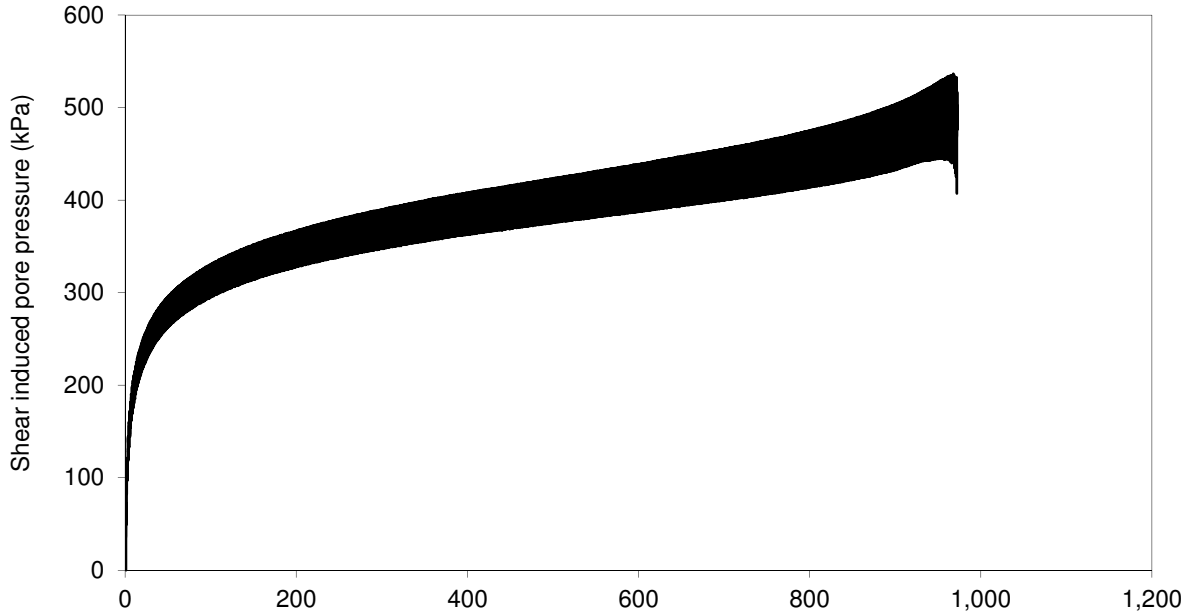

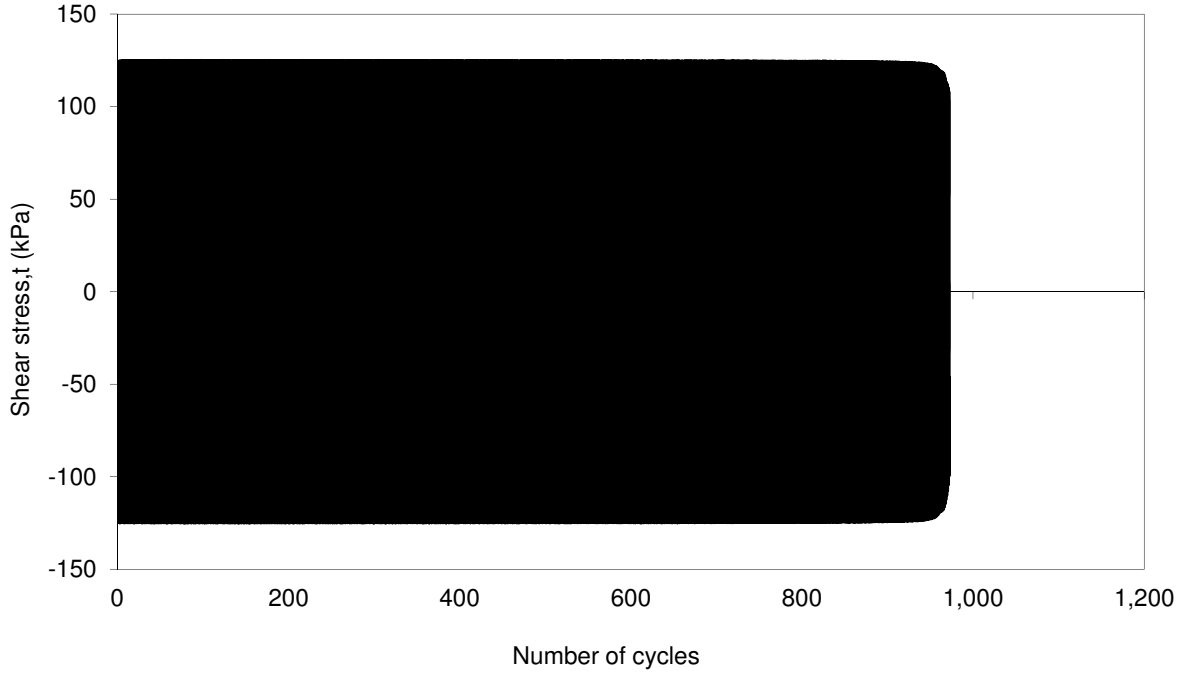

Cyclic simple shear #1

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Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
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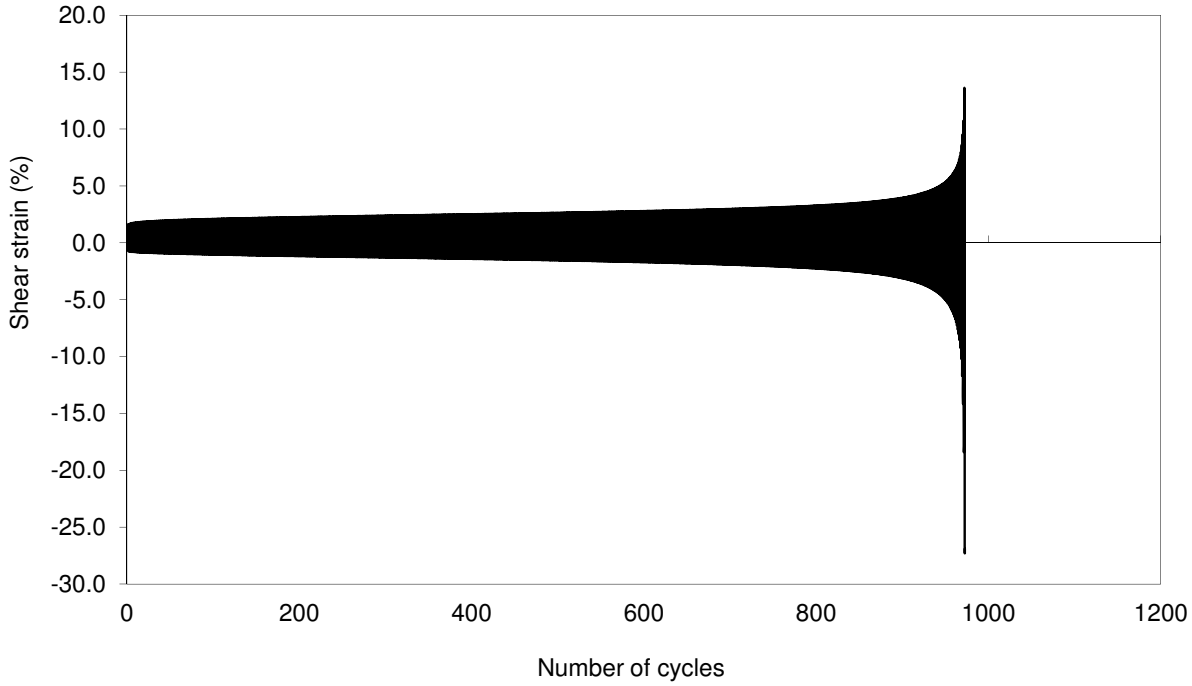
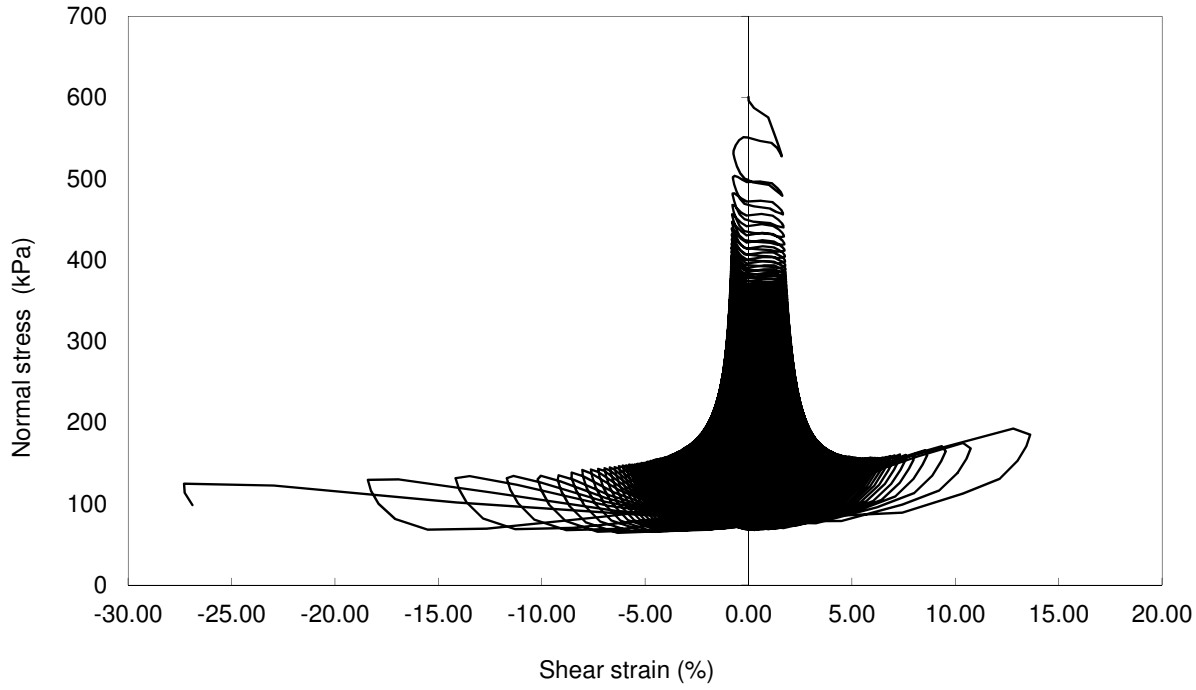
Sample Depth (m):	63.45-63.50	(Cyclic Test #3)





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 14/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHK16 P22Q1 6335 DSScyc#3.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	MET TOWER	Description (visual) :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.6	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	27.51	%	27.50	%
Bulk density :	1.92	Mg/m^3		
Dry density :	1.50	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.7770			
Test Duration:			3 Days	

END OF CONSOLIDATION #1

Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	5.02	% (for stage)
Normal stress:	309.8	kPa
Voids ratio (e_o):	0.6879	
Max. Consolidation stress:	309.8	kPa
Max. Consolidation strain:	5.02	% (for stage)
Duration:	1094	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.5	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	268.0	kPa
Shear stress	46.6	kPa
Duration	25	Min.

CYCLIC SHEAR STAGE

Average shear stress:	46.6	(kPa)
Cyclic shear stress (+/-):	66.5	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	26	% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	5.152	1.388	111.9	-21.0	134.2	74.9
5	7.056	2.863	113.3	-19.1	179.9	97.6
10	9.218	4.470	113.8	-18.5	202.6	110.6
15	11.040	5.883	113.8	-17.9	212.3	116.9
20	12.861	7.314	113.7	-17.4	218.1	120.9
25	14.994	8.990	113.4	-17.0	222.4	125.6
26	15.471	9.374	113.3	-17.2	223.1	126.3
31	18.145	11.600	113.1	-16.7	226.3	131.7
34	20.015	13.221	112.7	-16.3	227.0	134.3
36	21.393	14.434	112.5	-16.3	227.1	135.7

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

RGI
Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

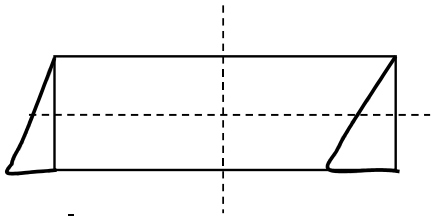
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

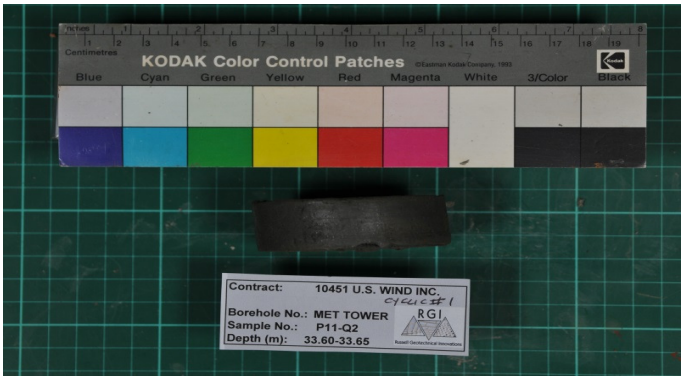
Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1

SPECIMEN DETAILS

Initial Height:	21.6	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: *CSR*	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

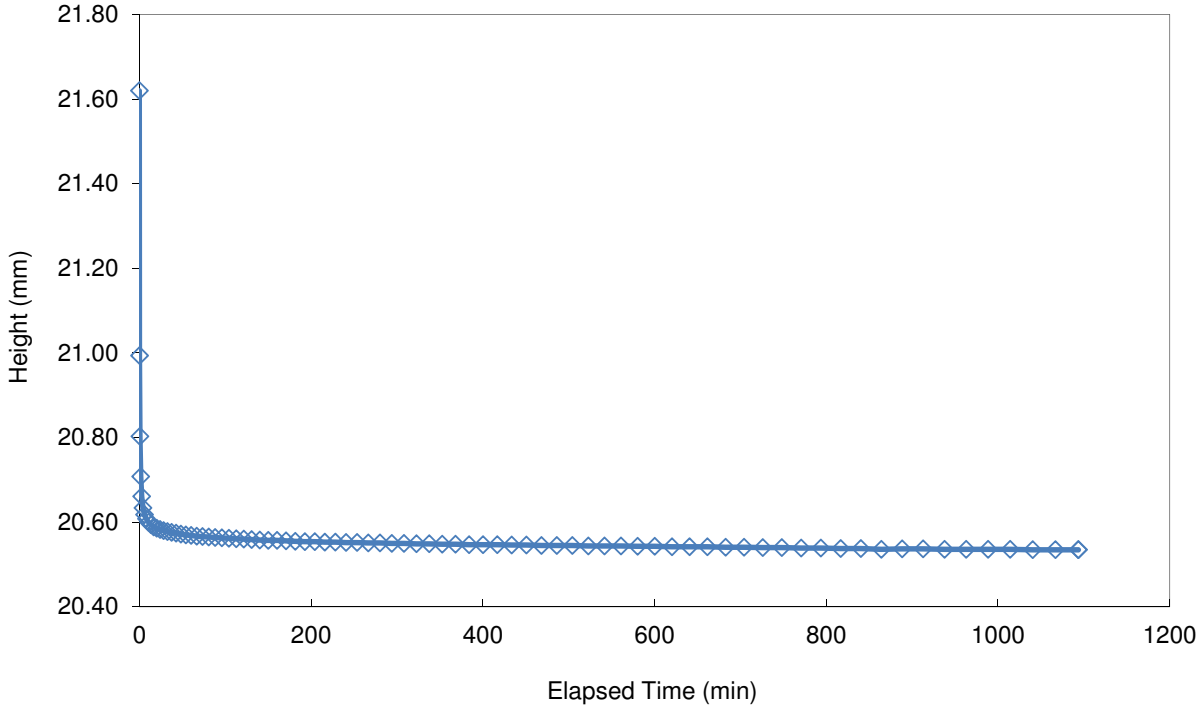
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

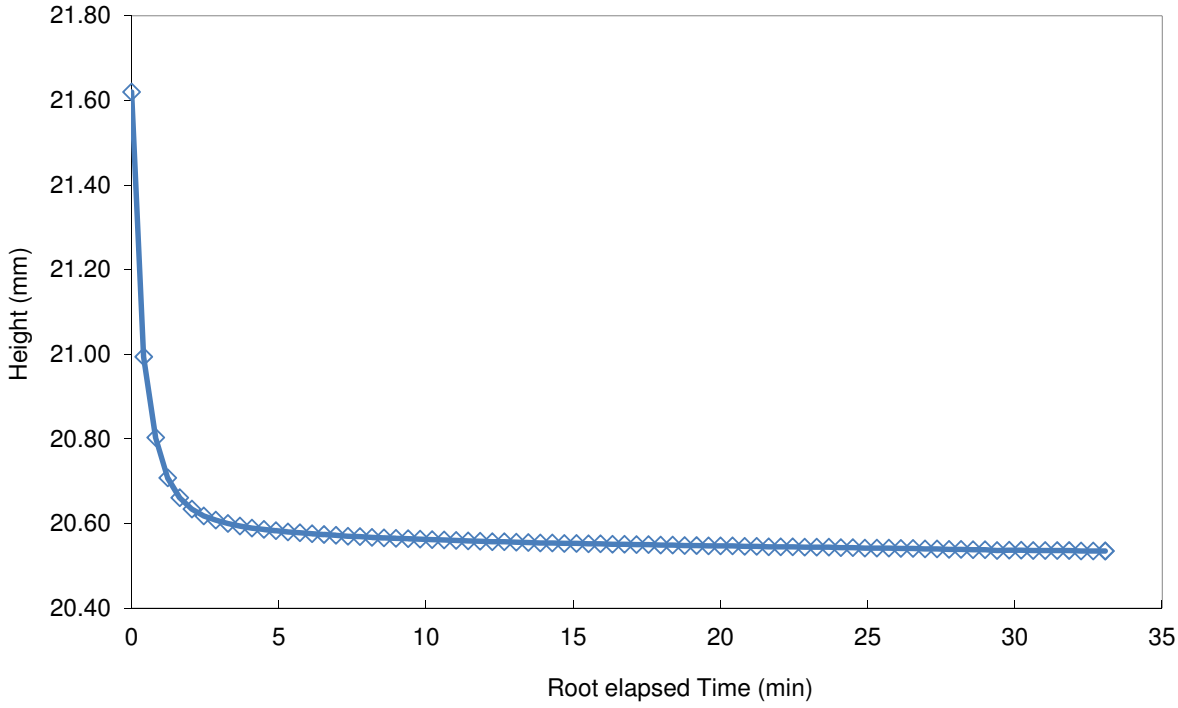
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

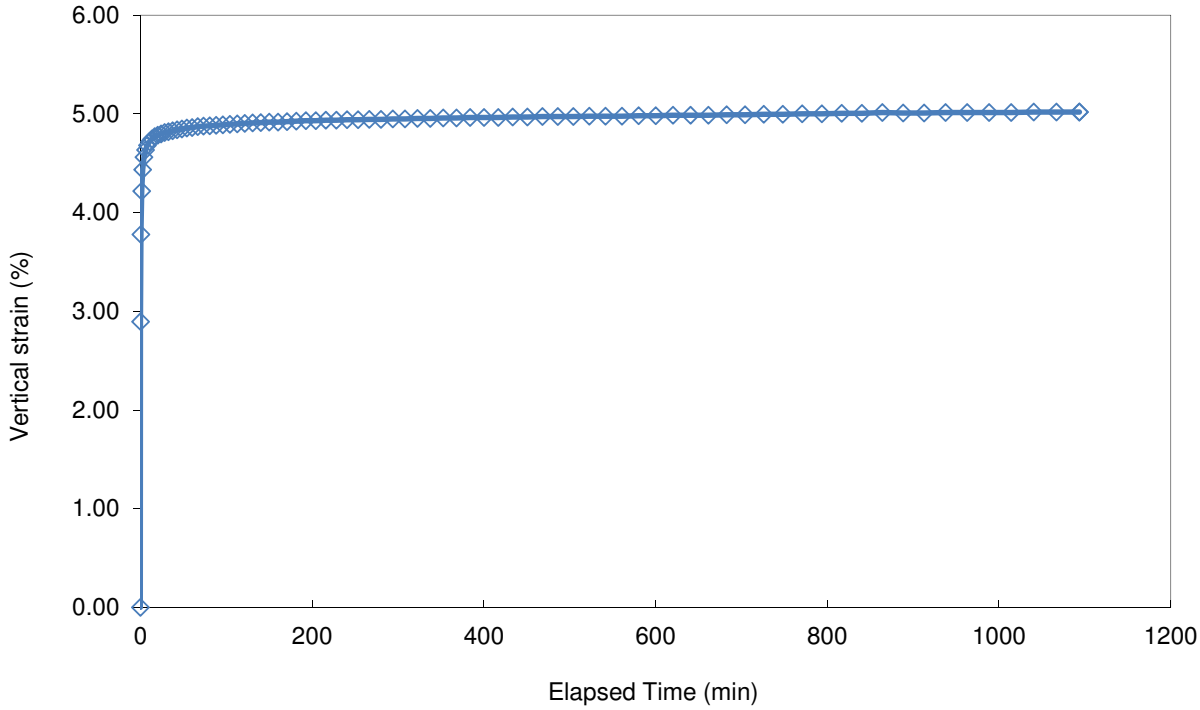
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

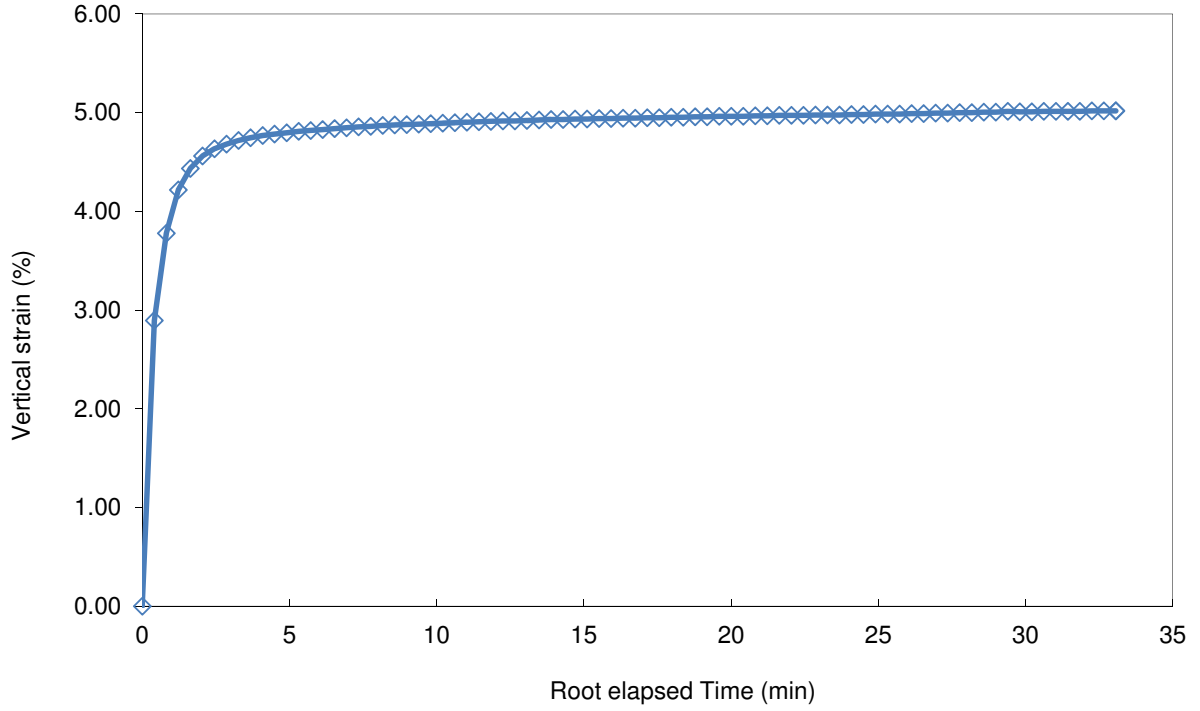
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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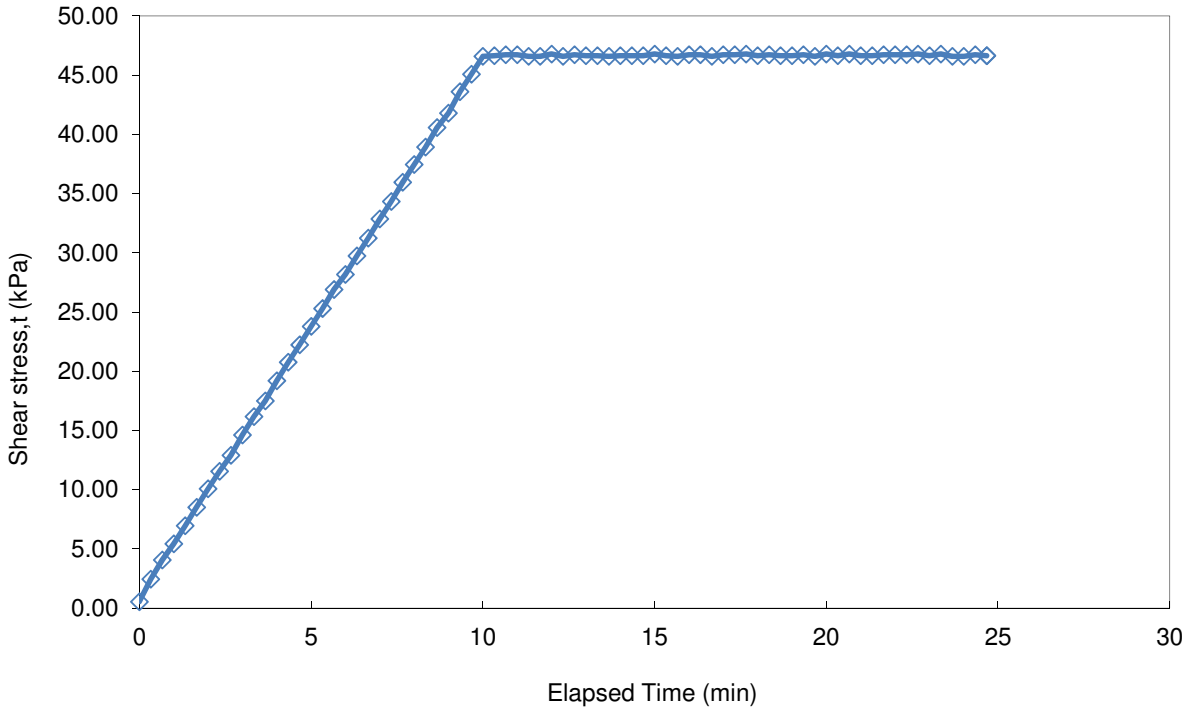
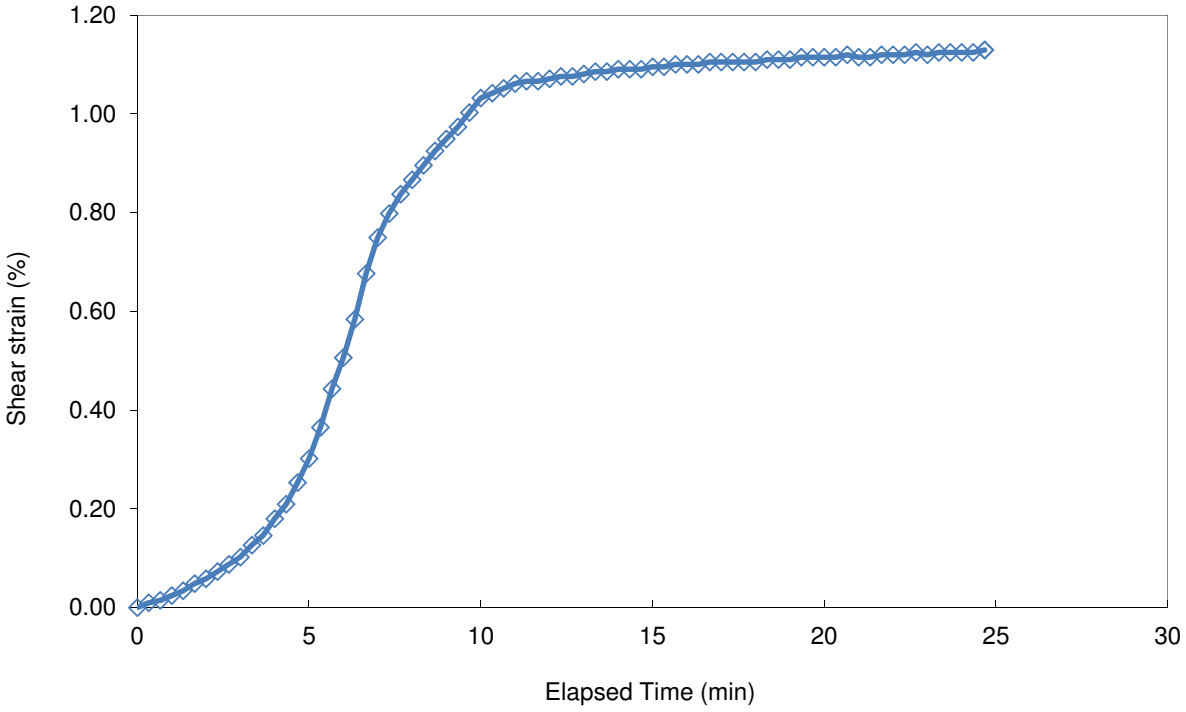
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Loading to average shear stress #1

Checked and approved	Project Number: **RGI/1130**	
Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 08/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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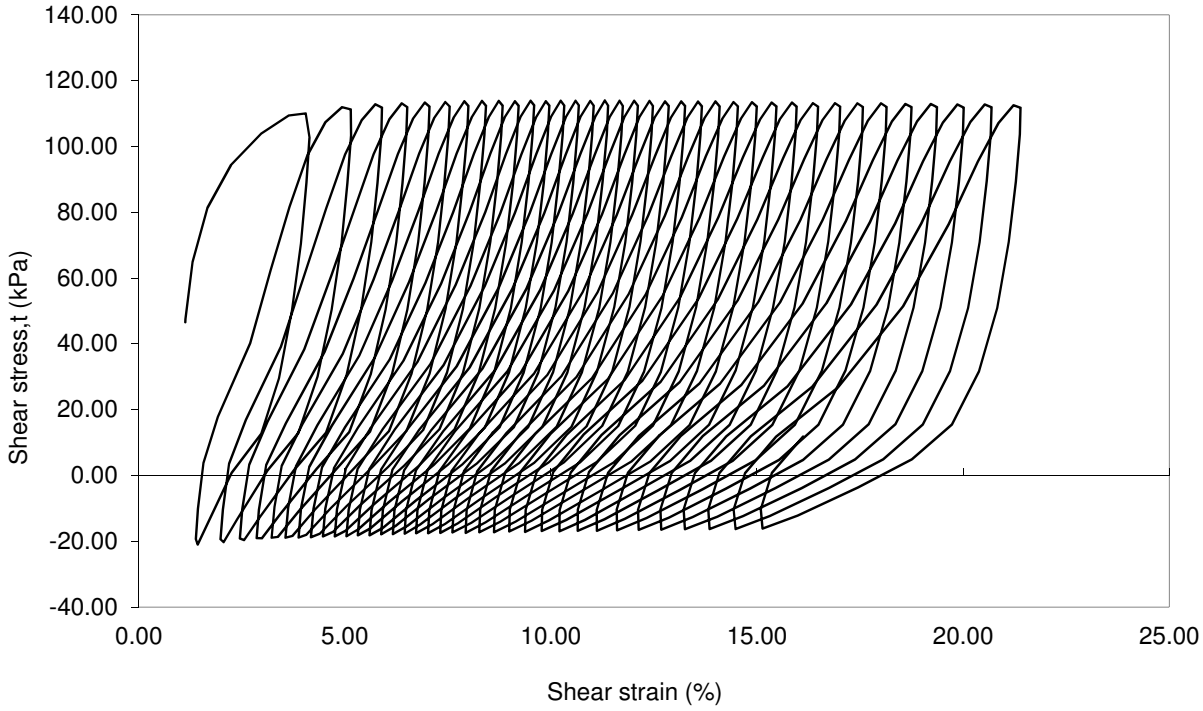
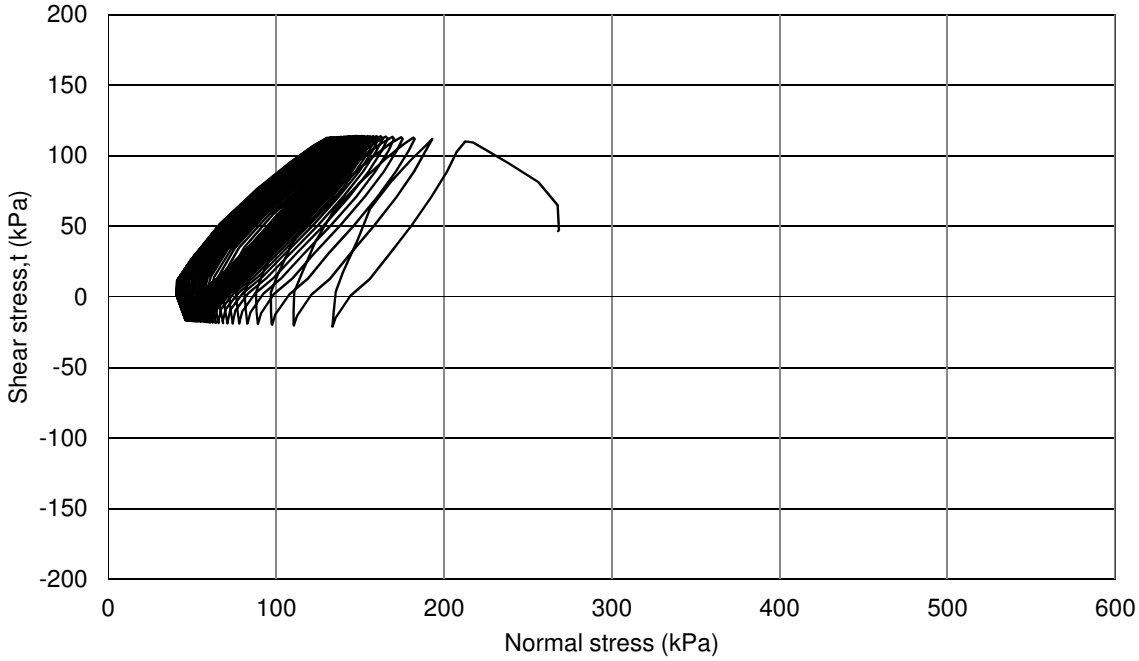
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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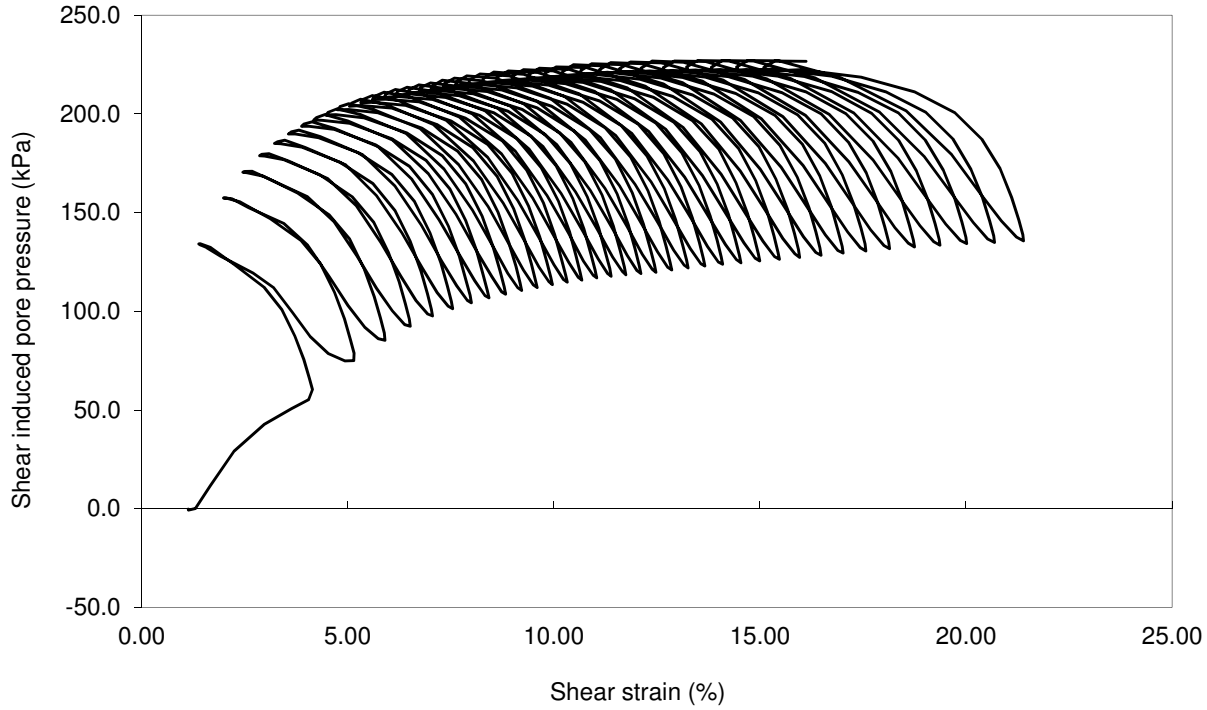
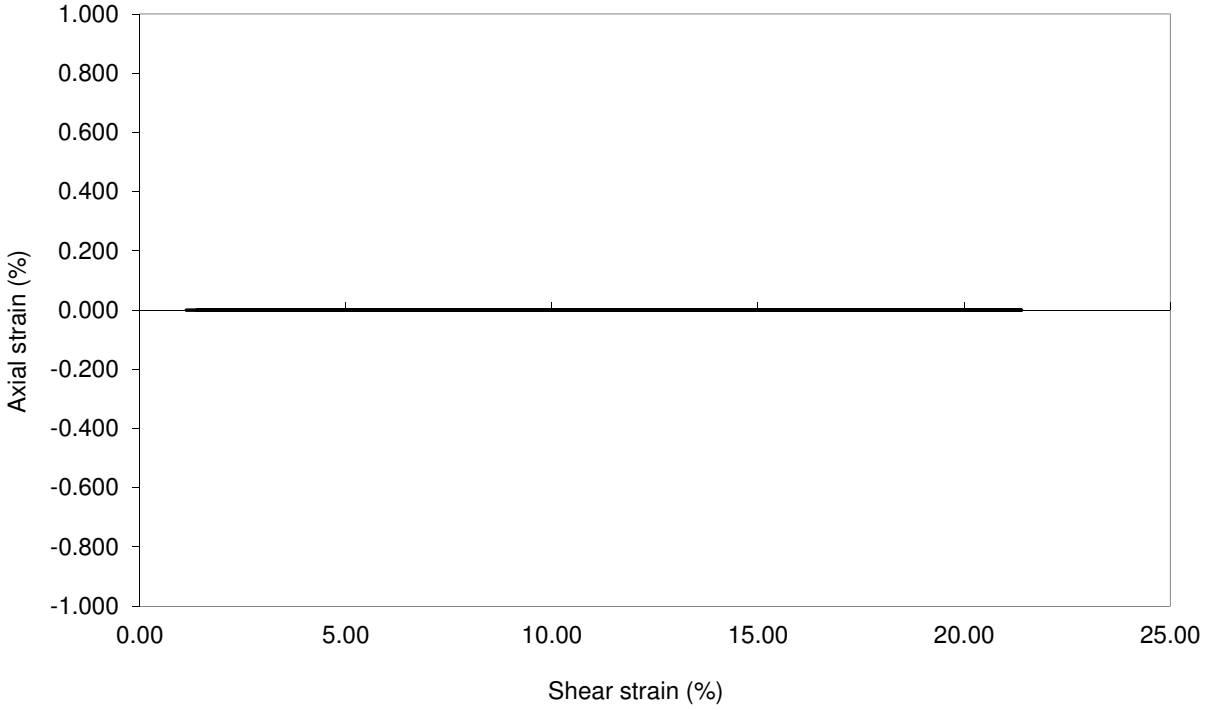
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

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Authorised Signatory: C.S.Russell (Director)

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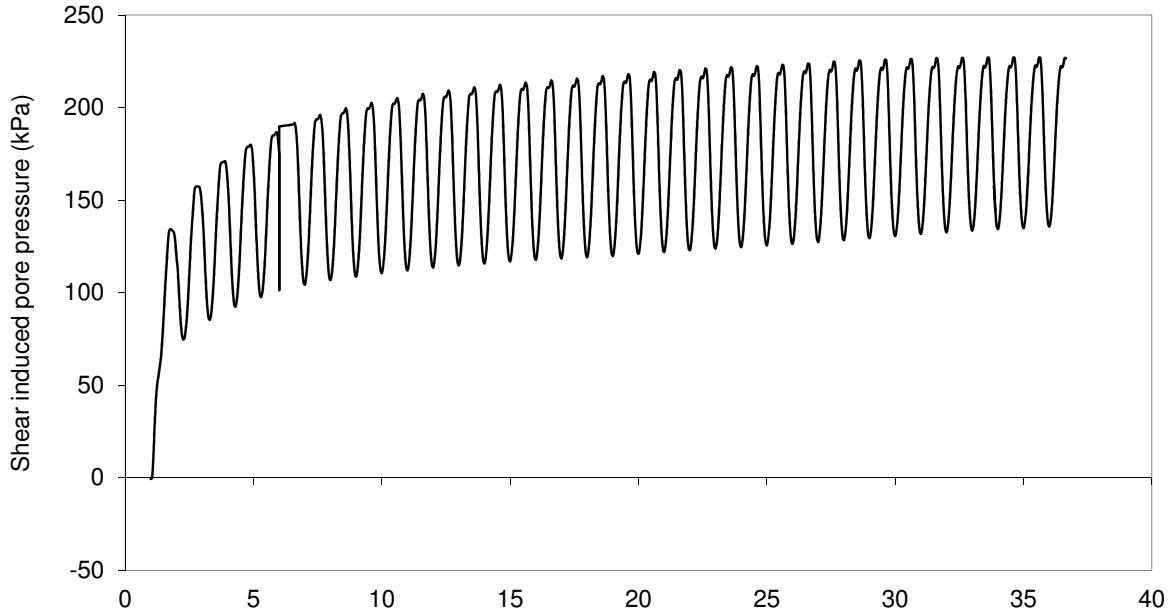
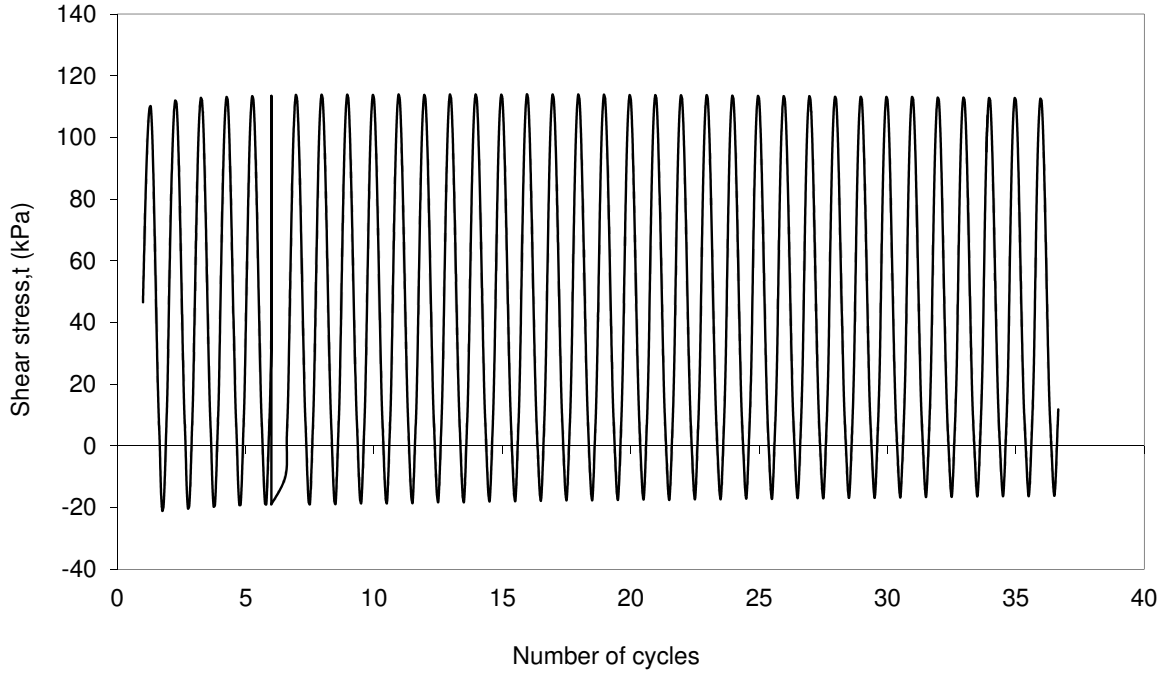
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Cyclic simple shear #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 08/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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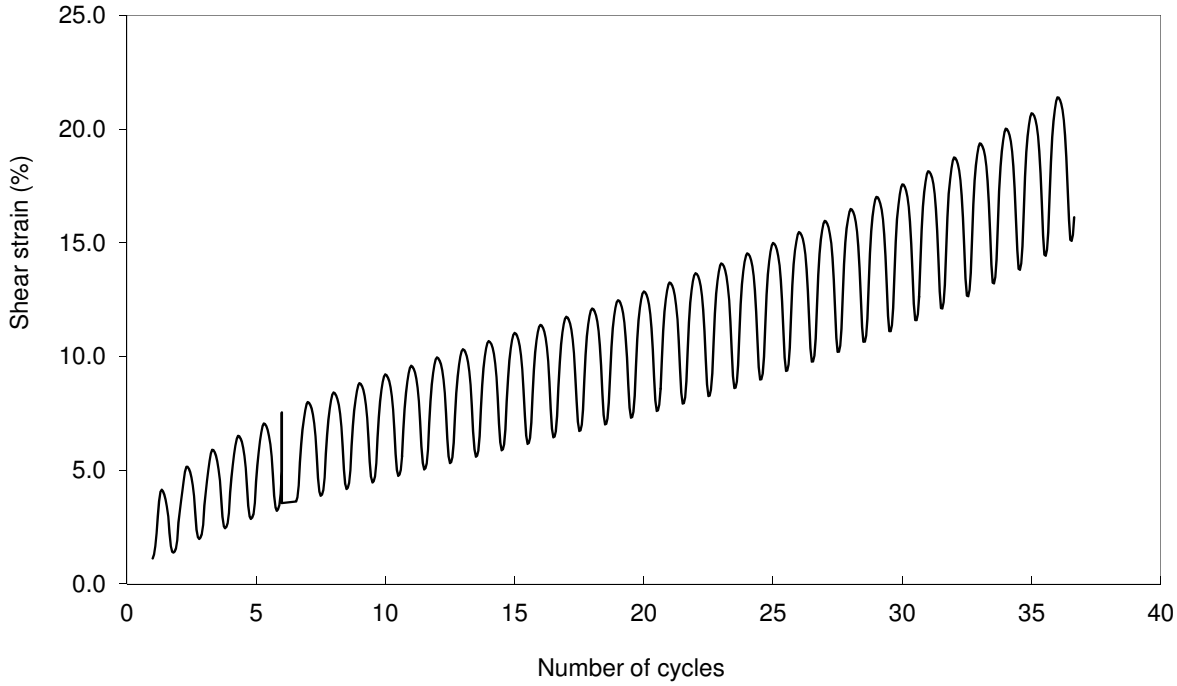
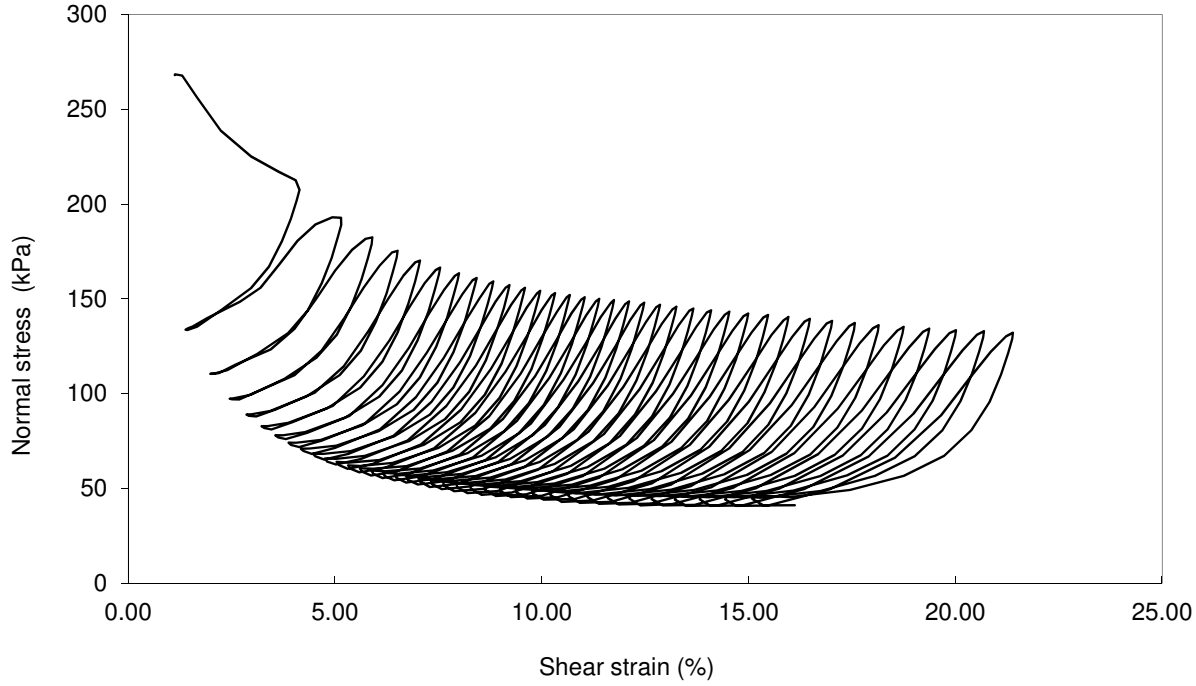
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #1





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 08/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#1.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	MET TOWER	Description (visual) :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #2

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.4	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	27.37	%	27.25	%
Bulk density :	1.92	Mg/m^3		
Dry density :	1.51	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.7711			
Test Duration:			3 Days	

END OF CONSOLIDATION #1

Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	5.22	% (for stage)
Normal stress:	310.0	kPa
Voids ratio (e_o):	0.6786	
Max. Consolidation stress:	310.0	kPa
Max. Consolidation strain:	5.22	% (for stage)
Duration:	1094	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.3	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	252.6	kPa
Shear stress	46.3	kPa
Duration	56	Min.

CYCLIC SHEAR STAGE

Average shear stress:	46.3	(kPa)
Cyclic shear stress (+/-):	46.0	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	368	(15% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	1.712	0.741	91.3	0.2	62.2	47.1
5	2.209	1.259	91.7	0.2	96.8	71.7
10	2.744	1.752	91.9	0.2	123.7	87.1
20	3.499	2.428	91.9	0.3	145.0	102.1
50	4.919	3.713	92.1	0.3	169.9	118.8
100	6.444	5.114	92.2	0.5	185.3	129.1
200	8.780	7.305	92.1	0.6	197.6	138.7
300	11.531	9.936	92.1	0.8	204.0	145.5
350	13.879	12.206	91.9	0.9	207.9	150.0
368	15.029	13.325	92.0	0.9	209.5	151.7
406	18.239	16.469	91.7	1.0	211.4	152.0

Checked and approved
Initials: *CSR*
Date: 15/02/2016

Project Number: **RGI/1130**
Project Name: **10451 U.S. WIND INC.**

RGI
Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

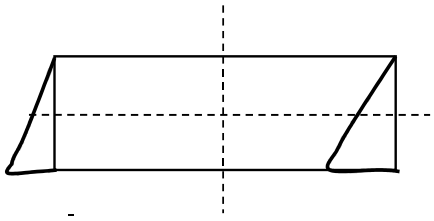
C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#2.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

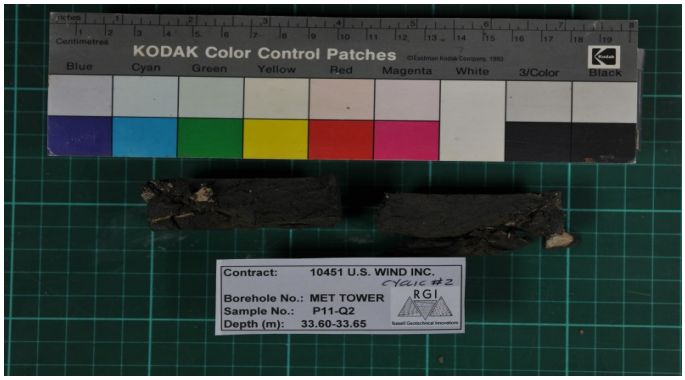
Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #2

SPECIMEN DETAILS

Initial Height:	21.4	mm
Initial Diameter:	66.4	mm



Elevation



Failure Sketch

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

Russell Geotechnical Innovations

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

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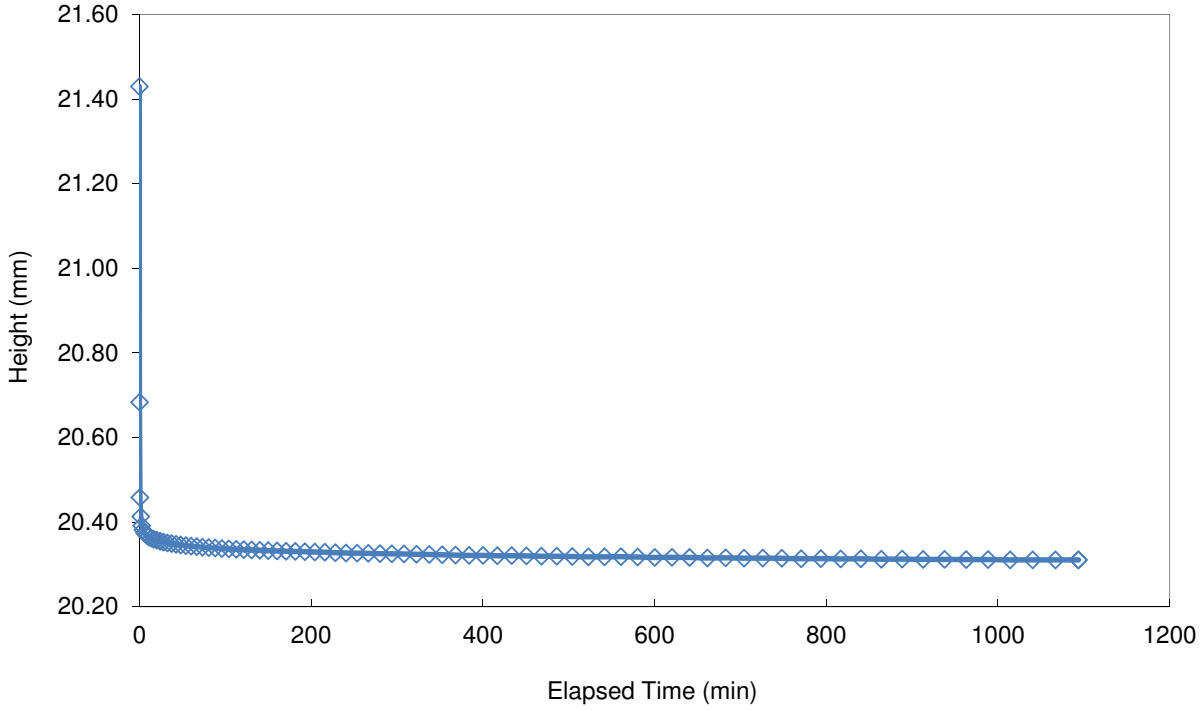
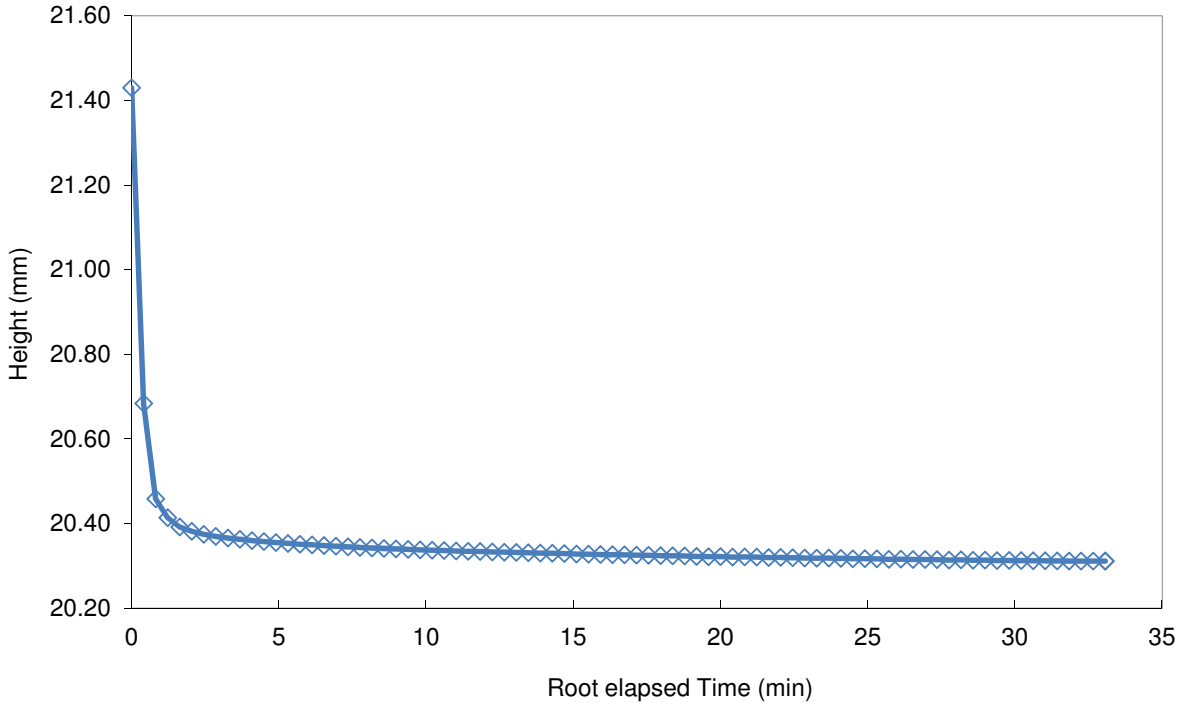
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #2





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

Russell Geotechnical Innovations

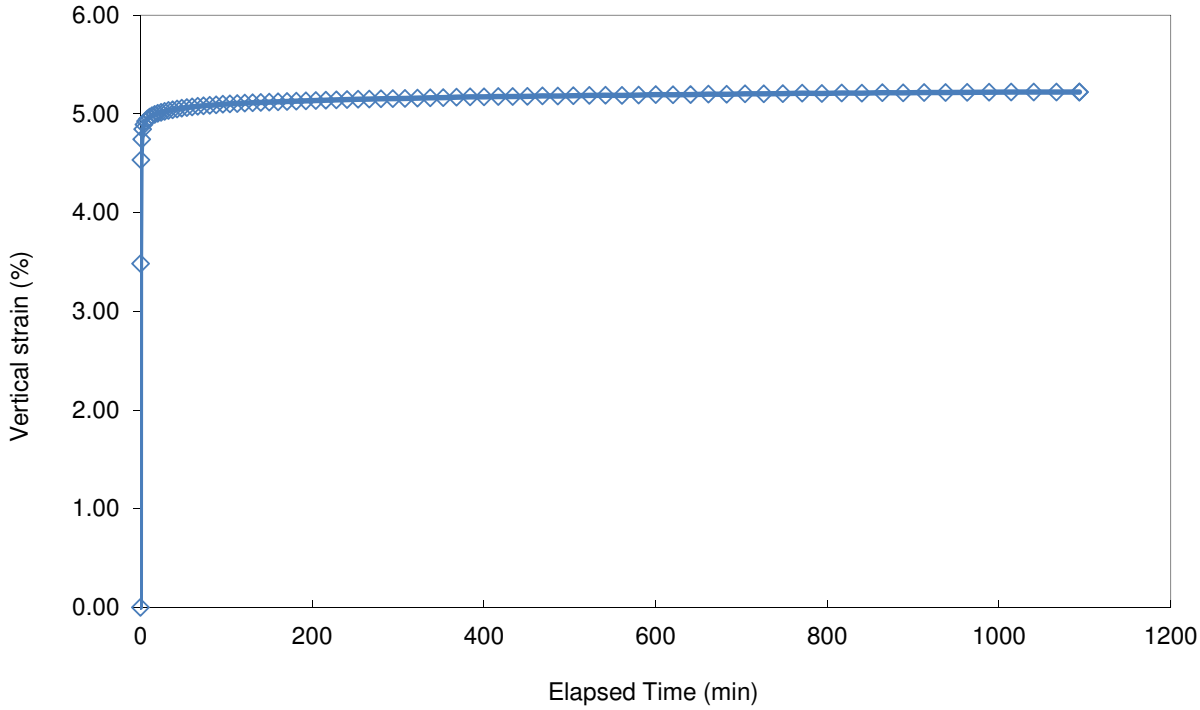
Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

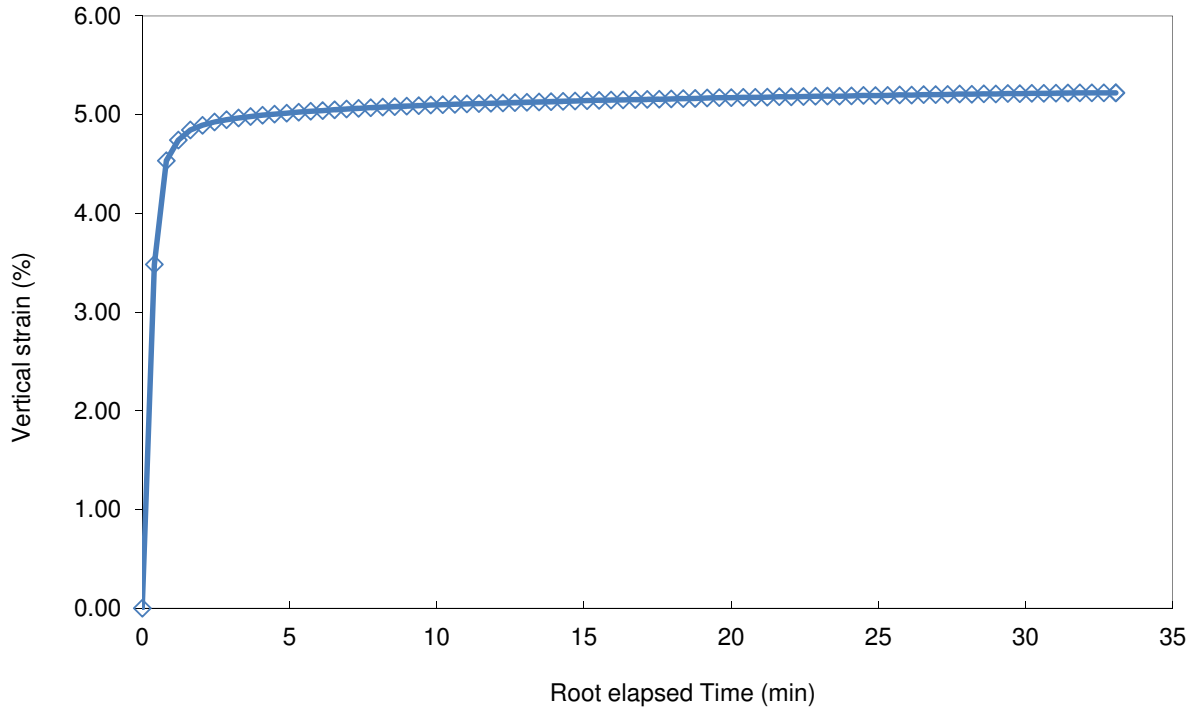
Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#2.xlsx]Sheet1

Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.65-33.70	fine gravel (slightly micaceous)- CYCLIC #2





Consolidation stage #1

Checked and approved	Project Number:	**RGI/1130**
Initials: CSR	Project Name:	**10451 U.S. WIND INC.**
Date: 15/02/2016		

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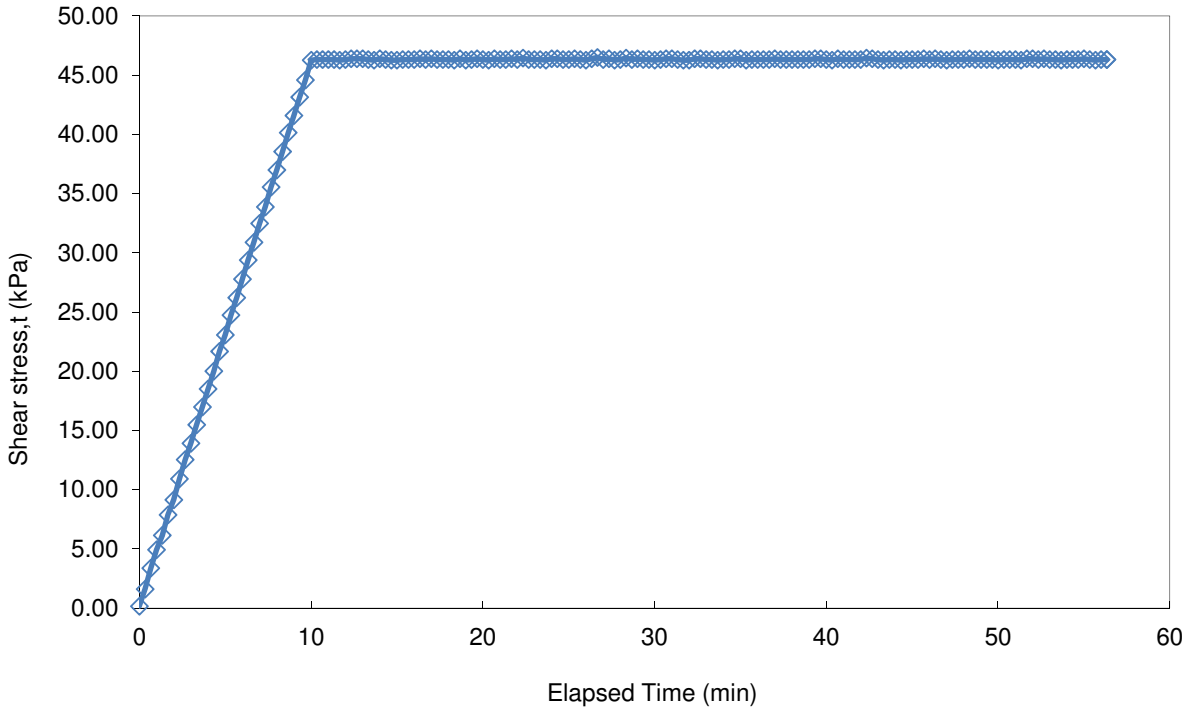

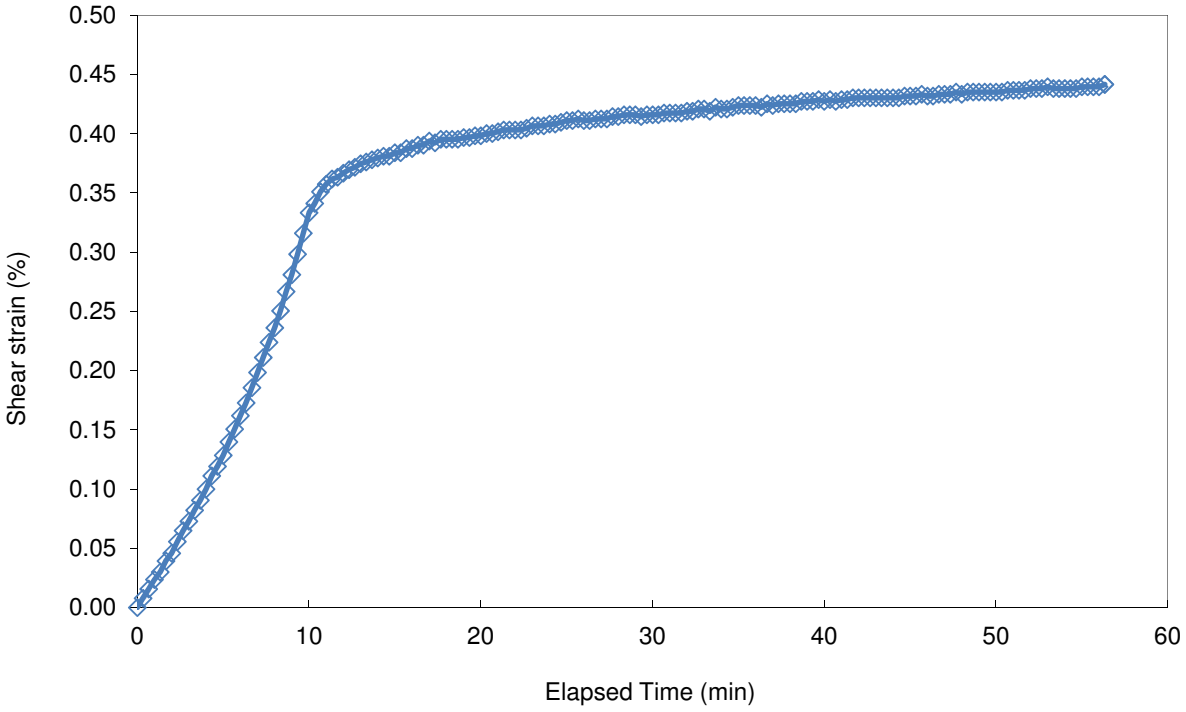

Loading to average shear stress #1

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Initials: *CSR*	Project Name: **10451 U.S. WIND INC.**	
Date: 15/02/2016		

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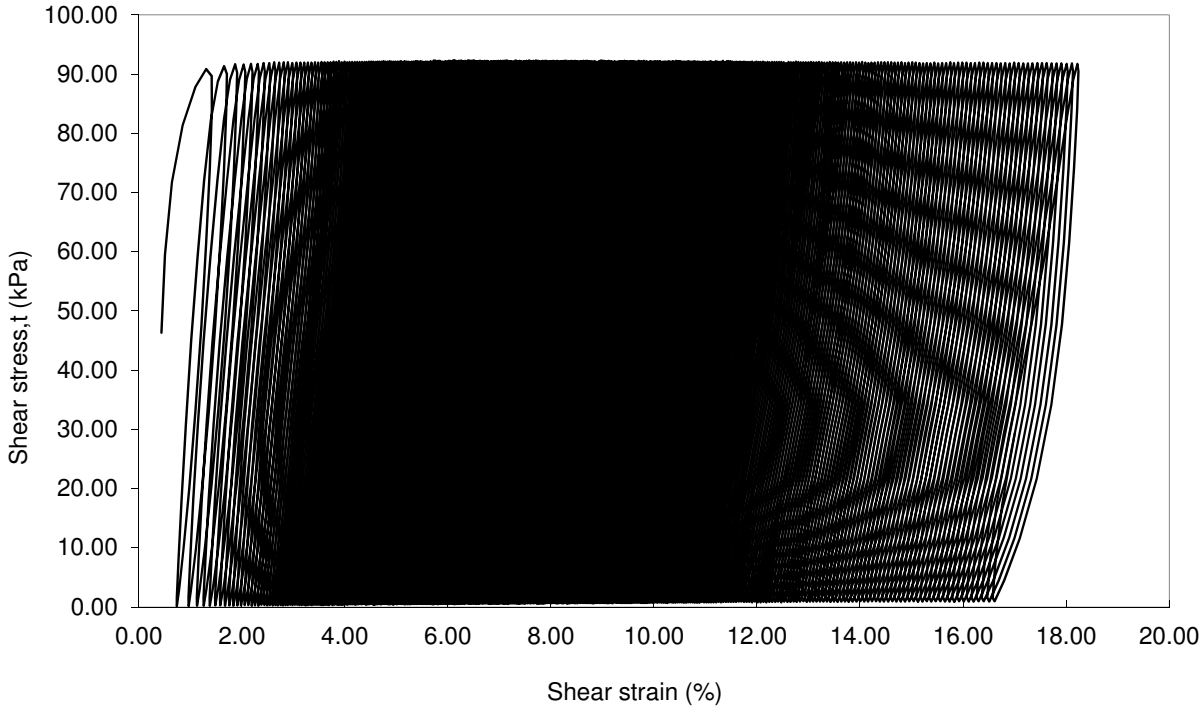

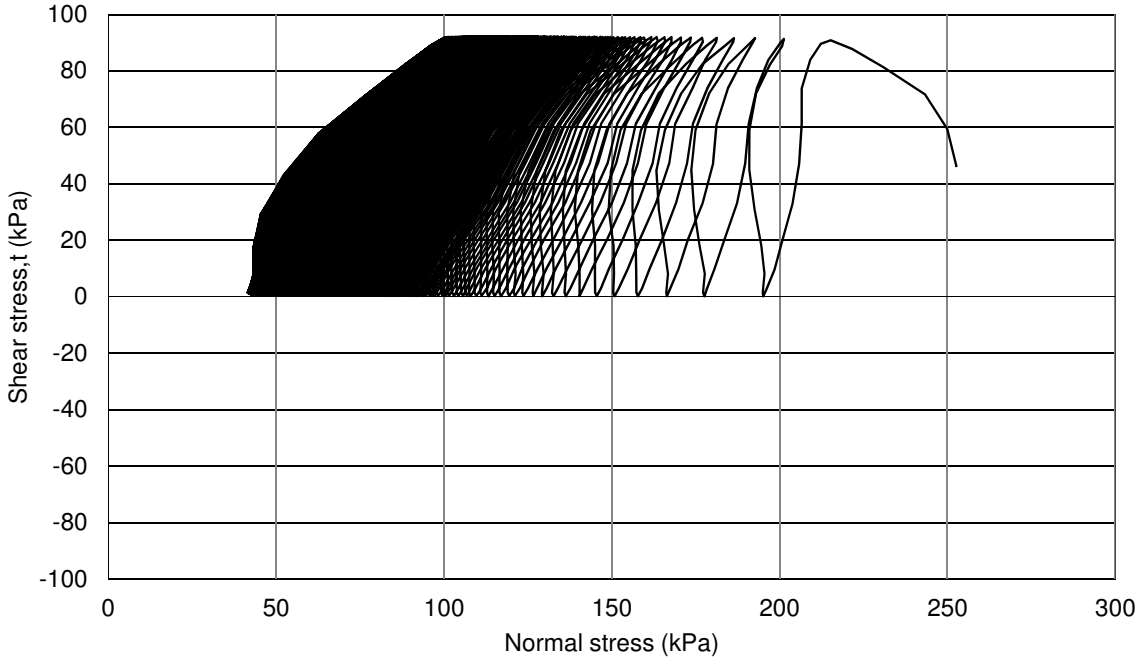

Cyclic simple shear #1

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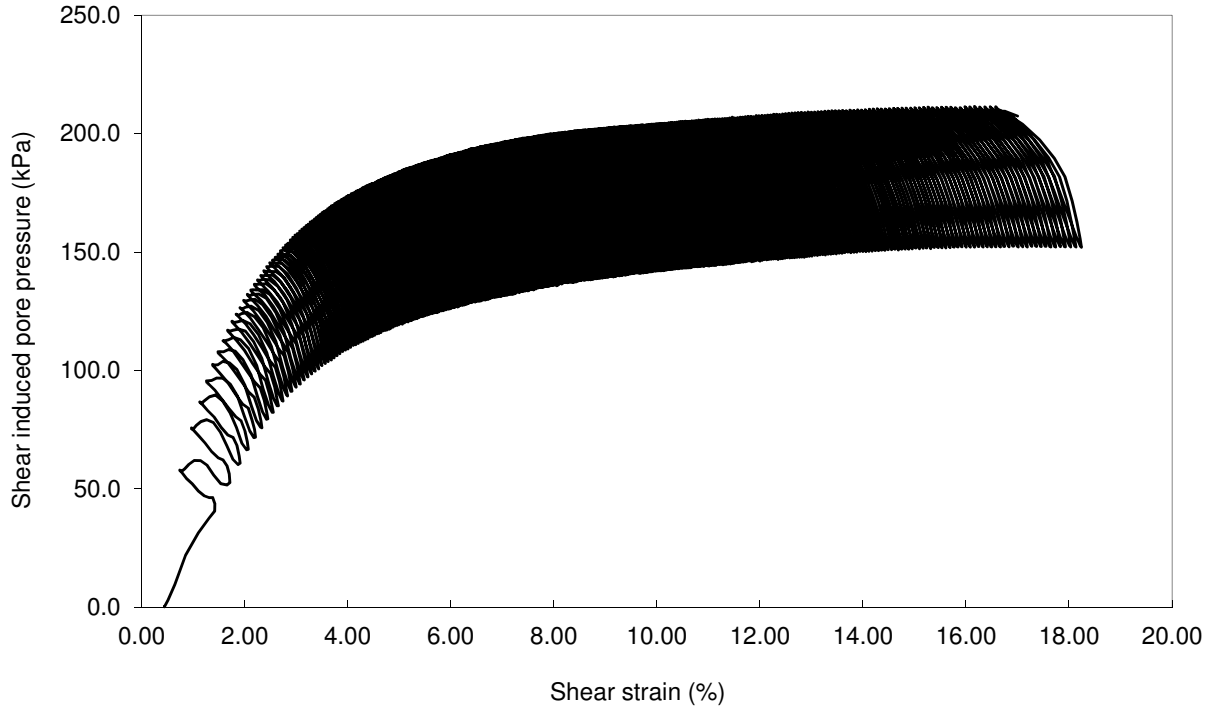

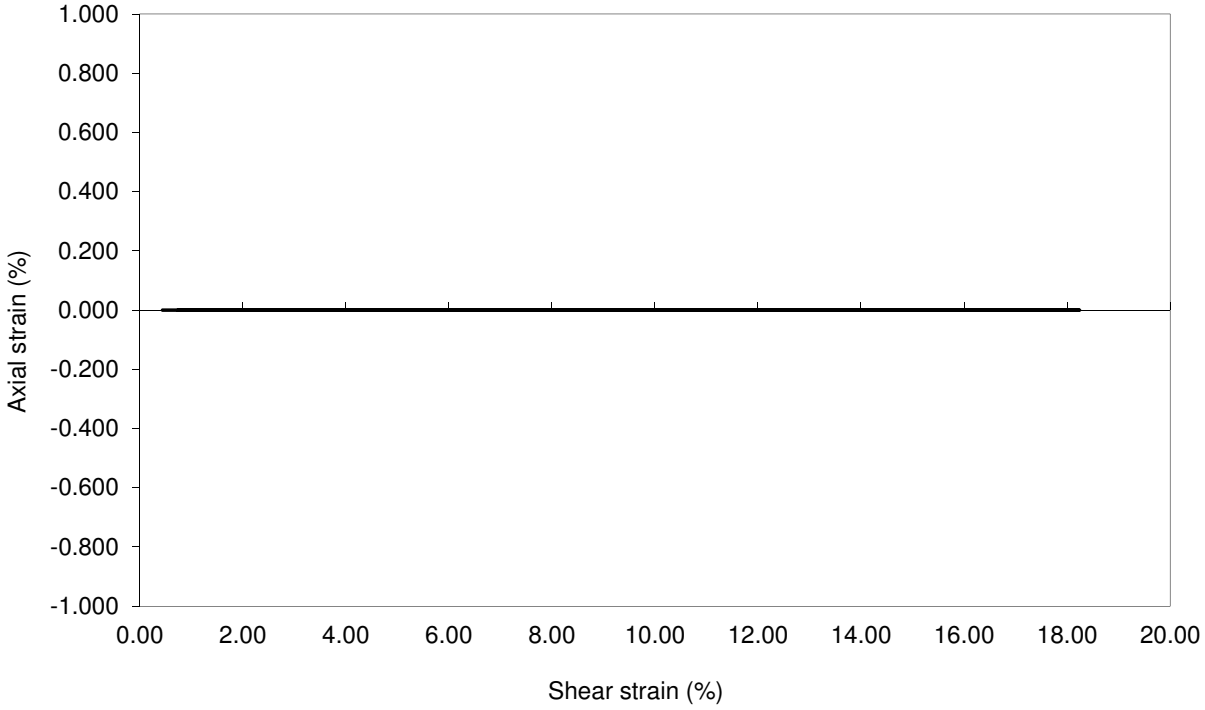

Cyclic simple shear #1

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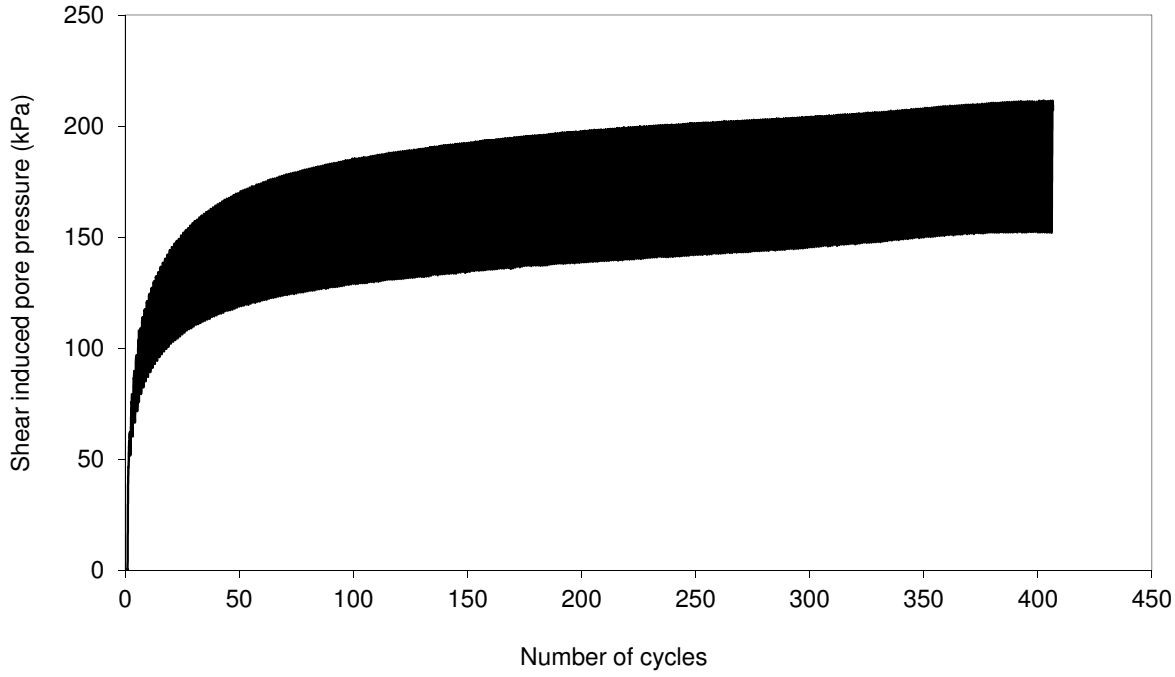

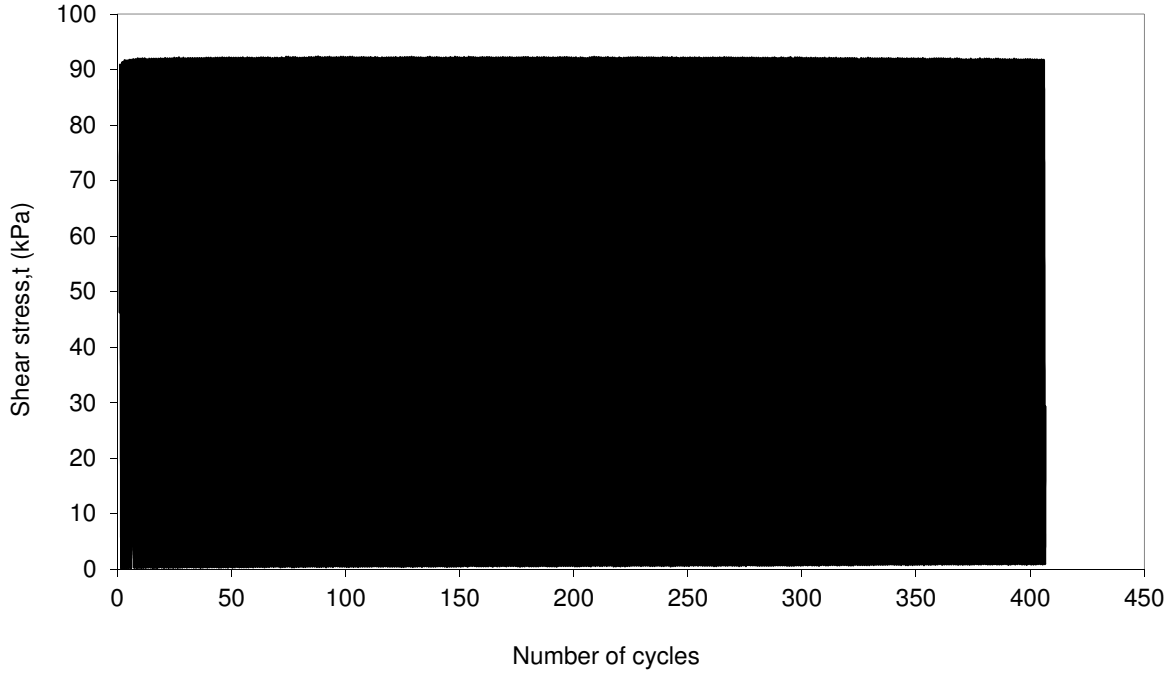

Cyclic simple shear #1

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Initials: *CSR*	Project Name:	**10451 U.S. WIND INC.**
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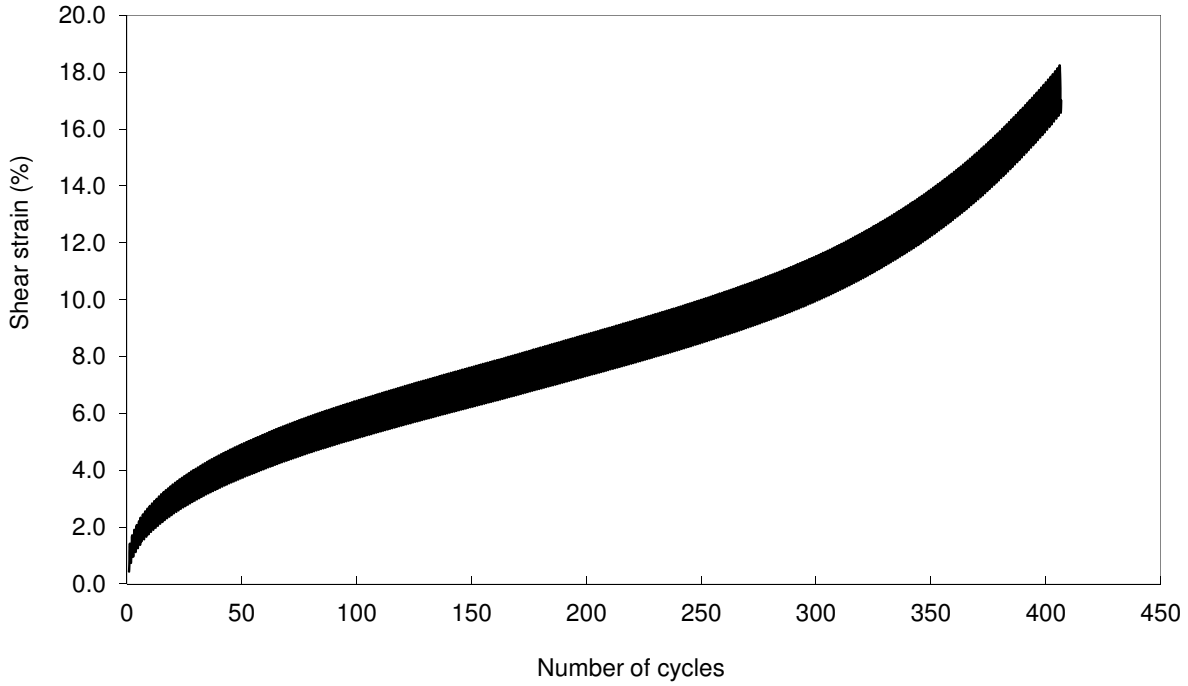

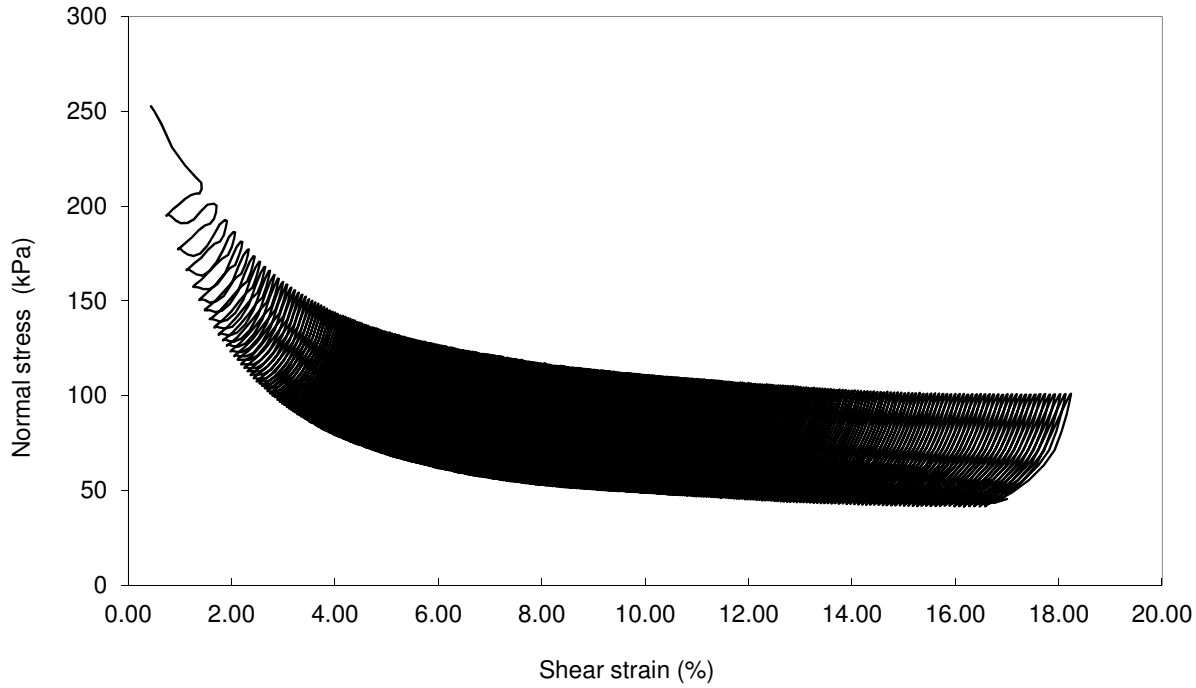

Cyclic simple shear #1

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Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07 (DSScyc)

Borehole Number:	MET TOWER	Description (visual) :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.70-33.74	fine gravel (slightly micaceous)- CYCLIC #3

SPECIMEN DETAILS Sample type: Undisturbed Trimming Procedure: Lathe

	Initial Values		Final Values	
Height :	21.2	mm		
Diameter :	66.4	mm		
H:D ratio	0.3			
Moisture content :	27.12	%	27.24	%
Bulk density :	1.91	Mg/m^3		
Dry density :	1.50	Mg/m^3		
Particle density (assumed)	2.67	Mg/m^3		
Initial voids ratio (e_o)	0.7781			
Test Duration:			3 Days	

END OF CONSOLIDATION #1

Height :	20.1	mm
Diameter :	66.4	mm
Axial strain:	5.34	% (for stage)
Normal stress:	309.9	kPa
Voids ratio (e_o):	0.6832	
Max. Consolidation stress:	309.9	kPa
Max. Consolidation strain:	5.34	% (for stage)
Duration:	938	Min.

PRIOR TO CYCLIC SHEAR (END OF LOADING TO Tave)

Height :	20.1	mm
Diameter :	66.4	mm
Axial strain:	0.00	% (for stage)
Normal stress:	255.6	kPa
Shear stress	46.6	kPa
Duration	104	Min.

CYCLIC SHEAR STAGE

Average shear stress:	46.6	(kPa)
Cyclic shear stress (+/-):	96.5	(kPa)
Frequency:	0.1	(Hz)
No. of cycles:	1500	(sinusoidal wave form)
Failure:	3	(15% SA shear strain)

Cycle No. (N)	Max. shear strain (%)	Min. shear strain (%)	Max. shear stress (kPa)	Min. shear stress (kPa)	Max. pore press. (kPa)	Min. pore press. (kPa)
2	13.183	1.095	141.9	-51.1	202.4	72.5
3	17.106	1.772	141.7	-50.7	225.3	77.7
4	21.994	2.768	140.8	-50.9	236.9	82.1
5	32.872	4.784	136.4	-50.4	243.6	92.2

Checked and approved
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Project Number: **RGI/1130**
Project Name: **10451 U.S. WIND INC.**

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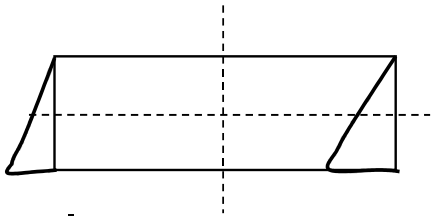
Consolidated Undrained Direct Cyclic Simple Shear Test
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.70-33.74	fine gravel (slightly micaceous)- CYCLIC #3

SPECIMEN DETAILS

Initial Height:	21.2	mm
Initial Diameter:	66.4	mm



Elevation

Failure Sketch

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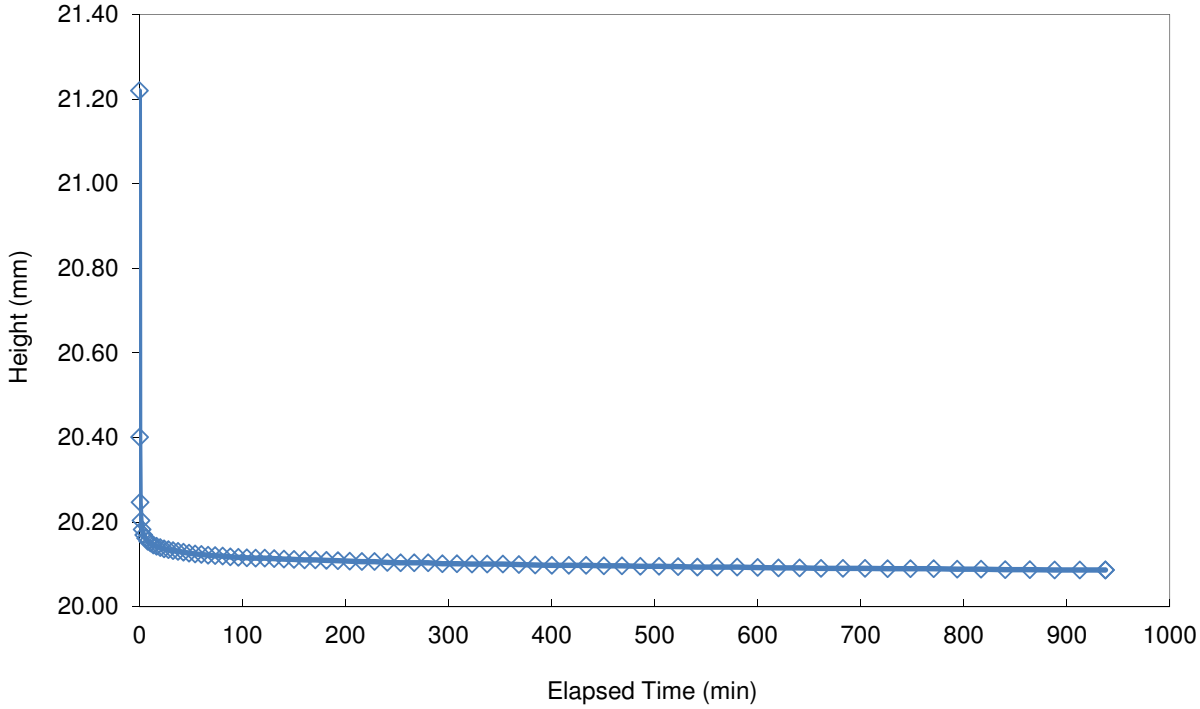

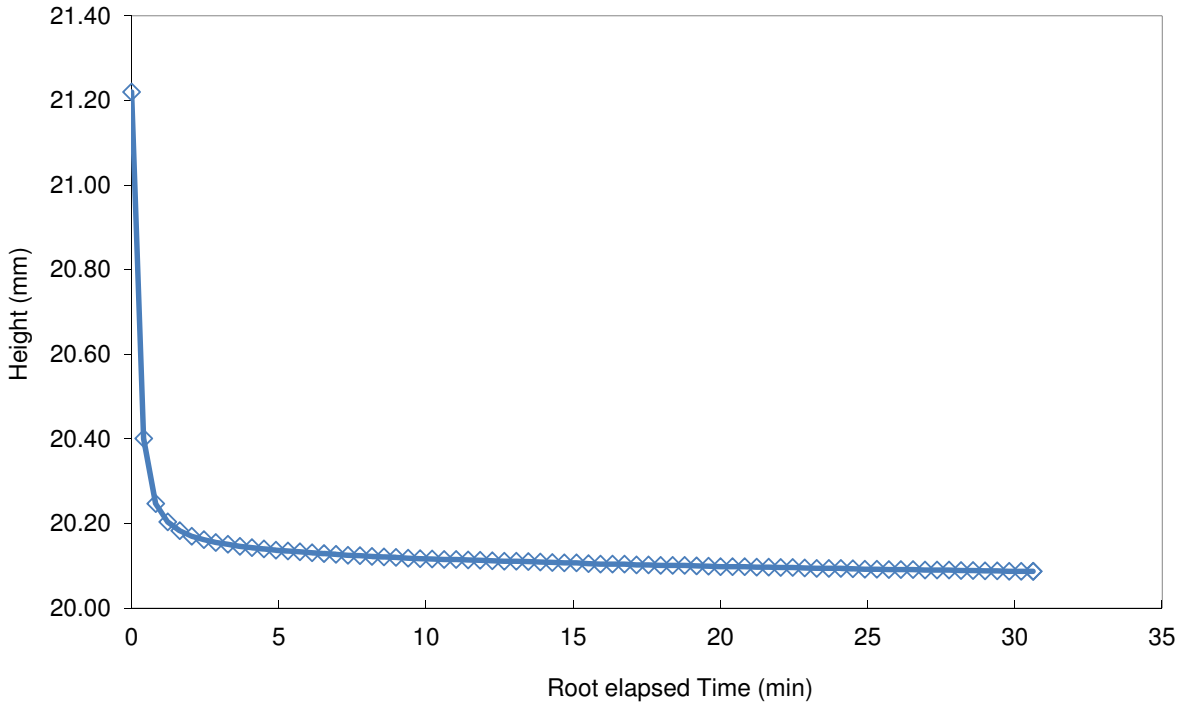

Consolidation stage #1

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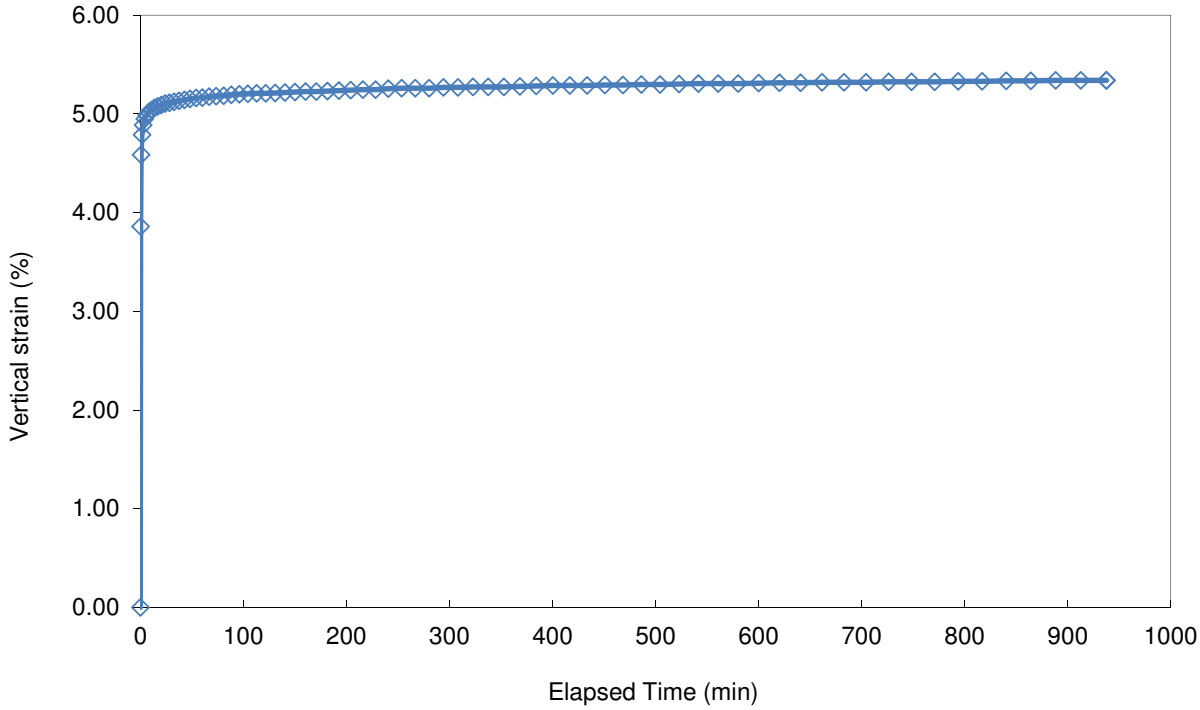

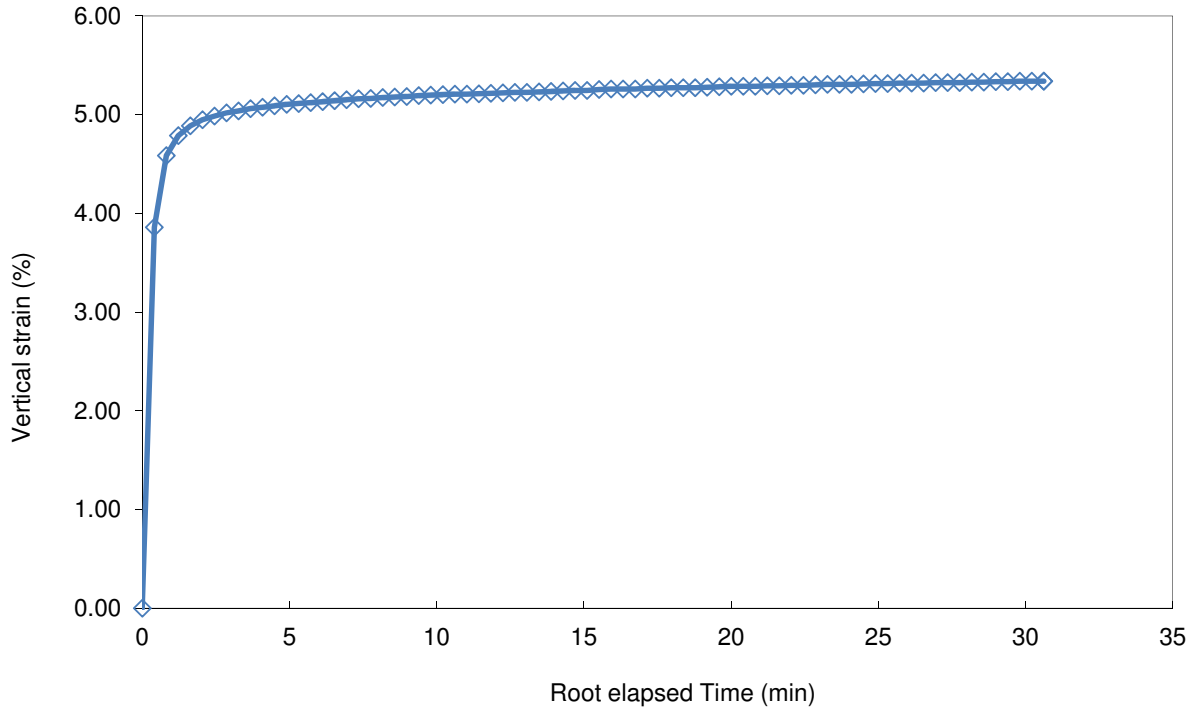

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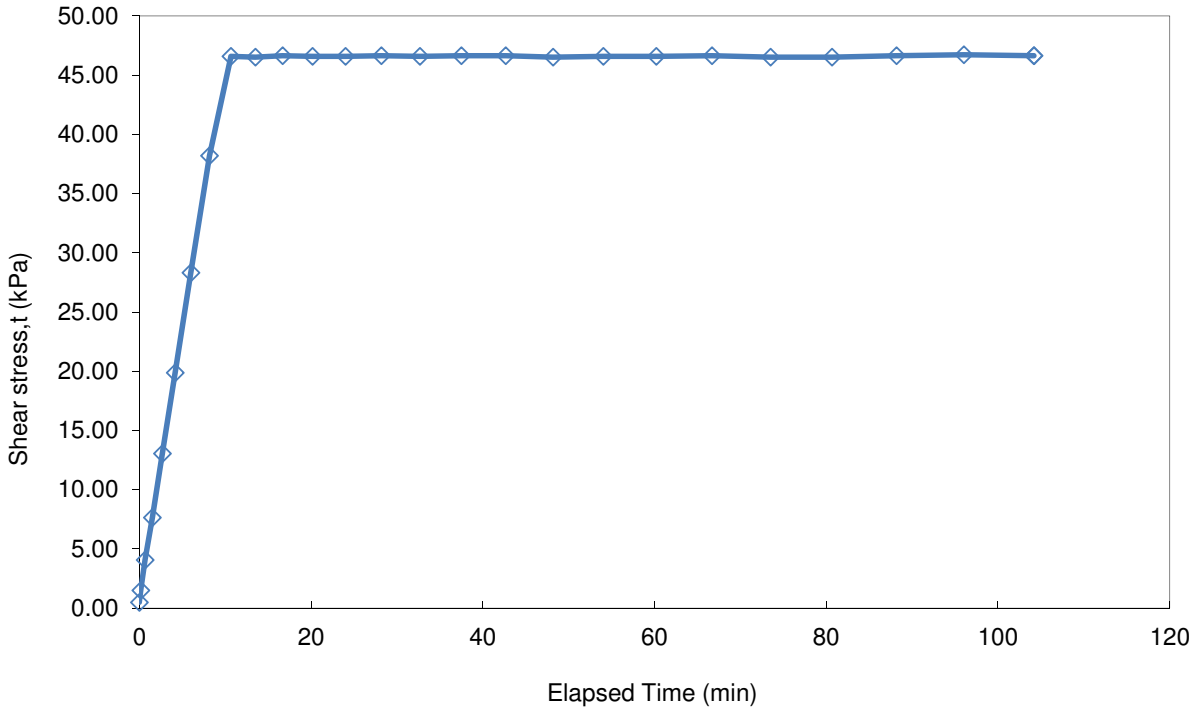

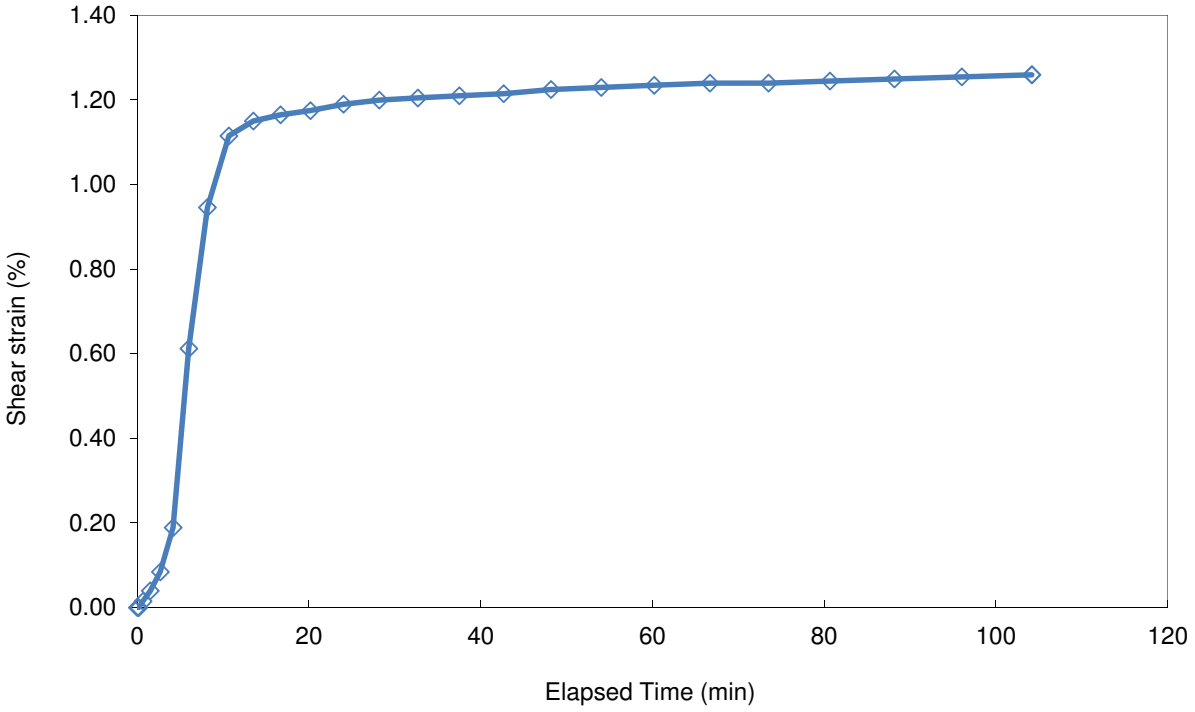

Loading to average shear stress #1

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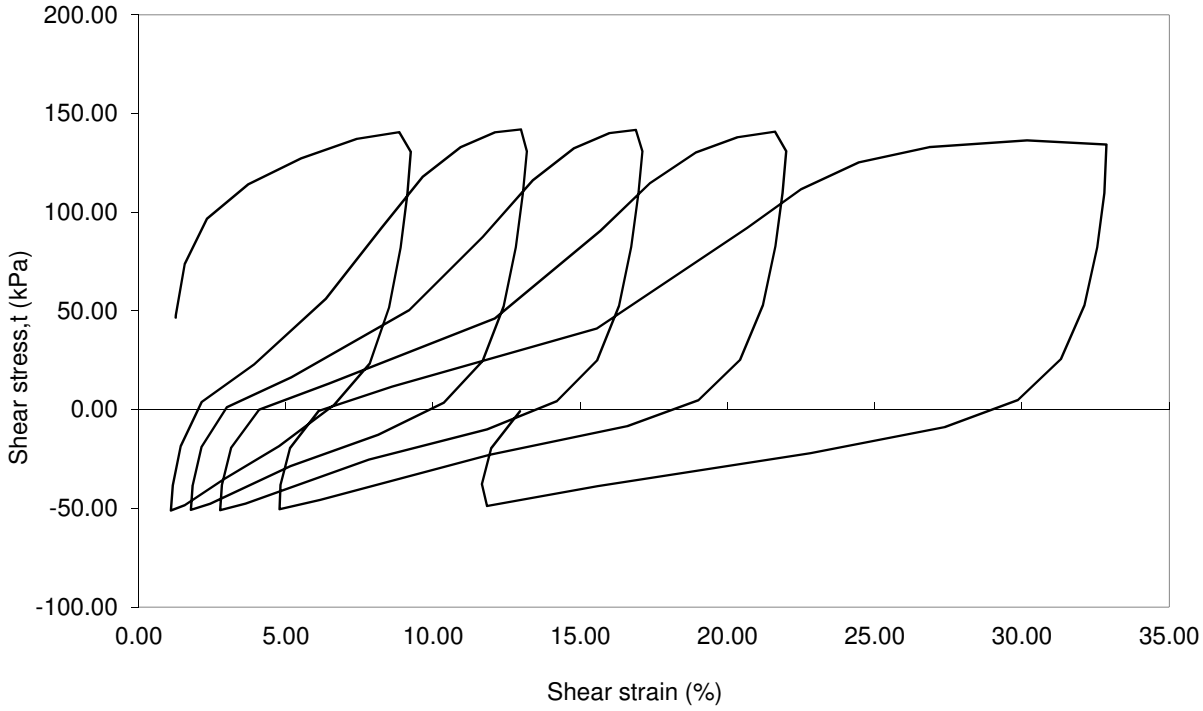

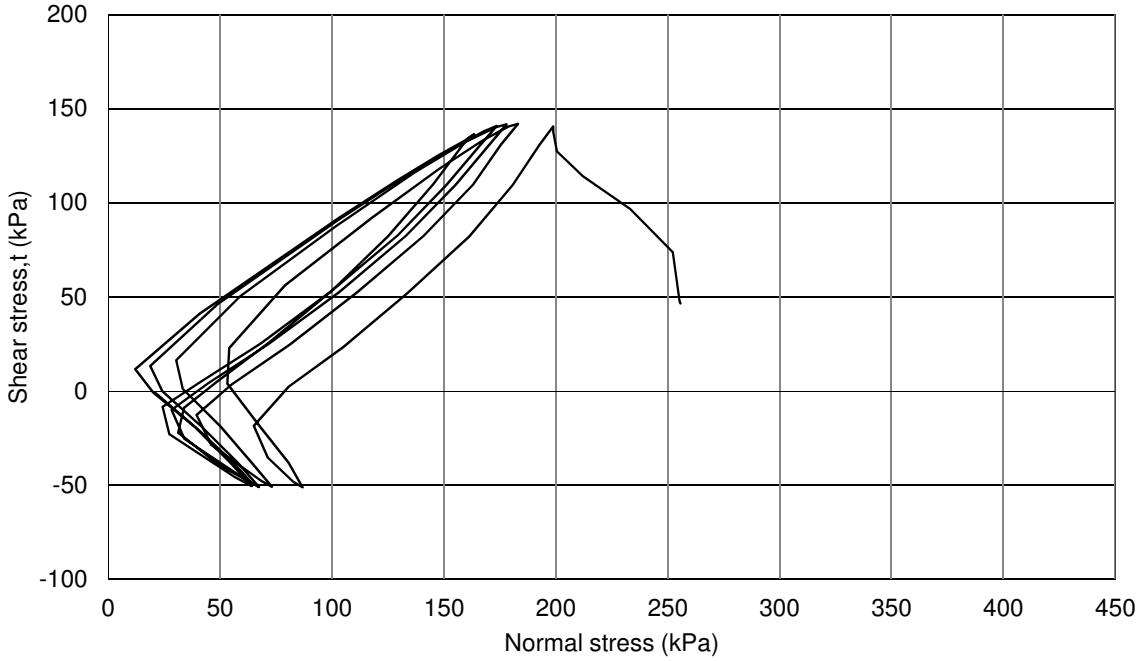

Cyclic simple shear #1

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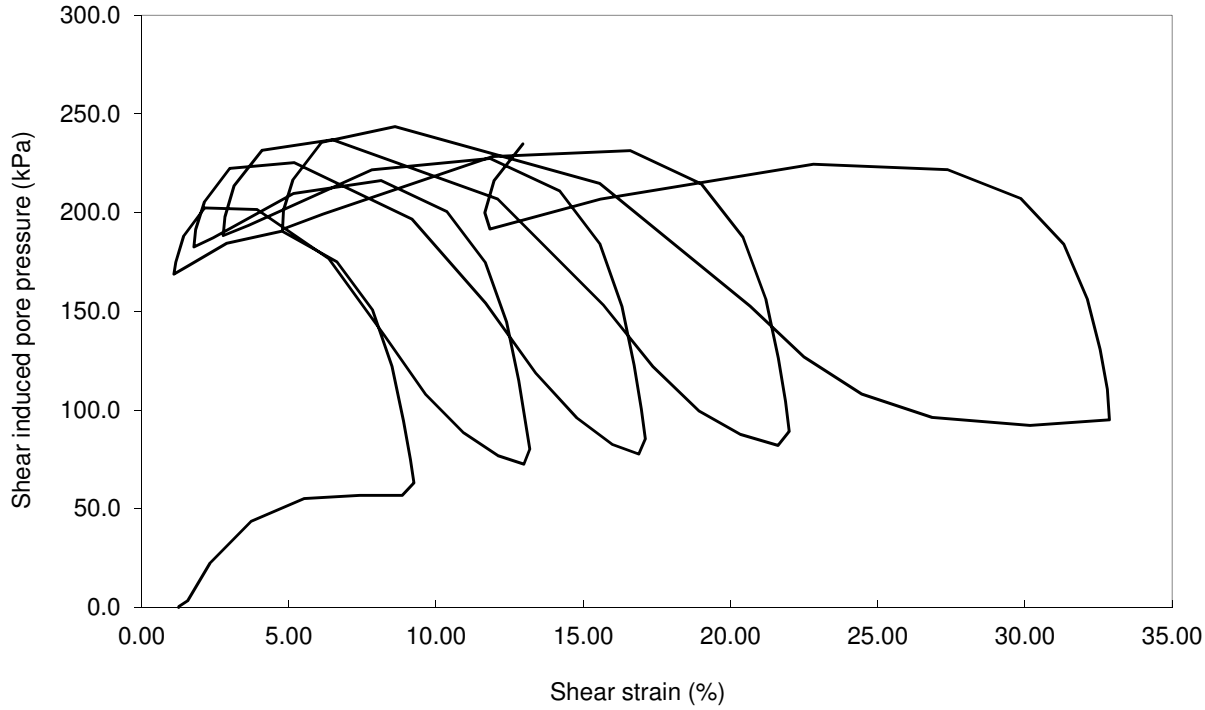

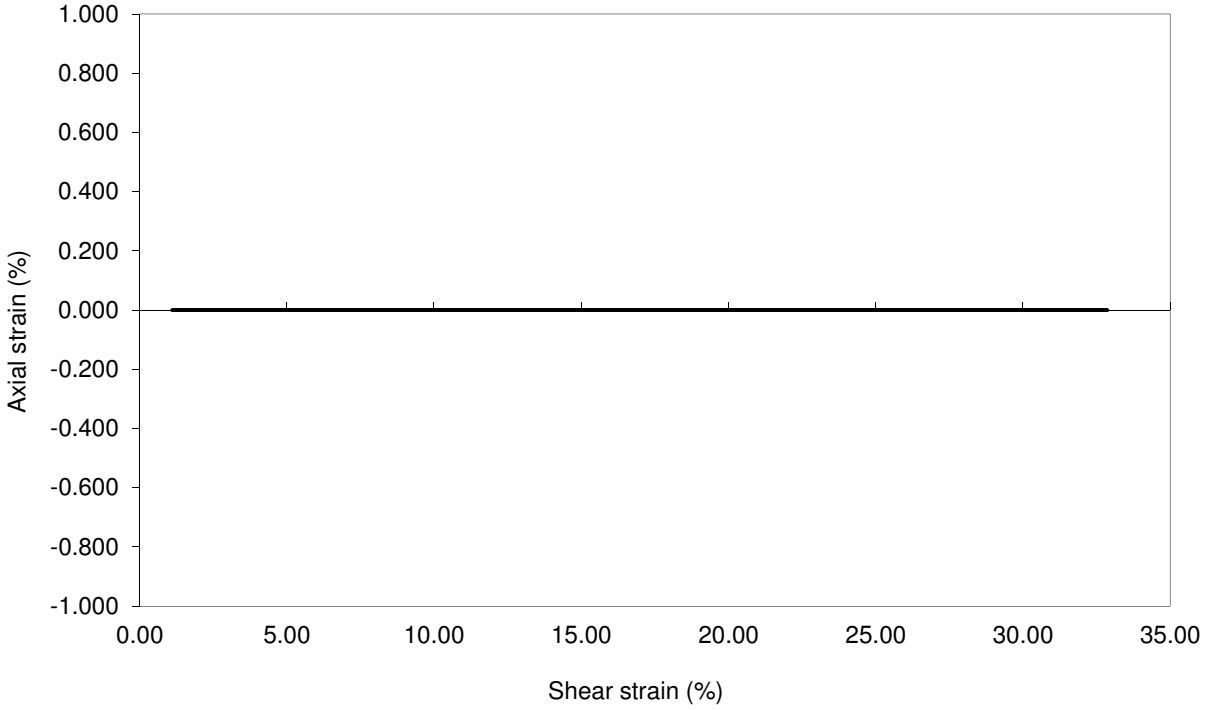

Cyclic simple shear #1

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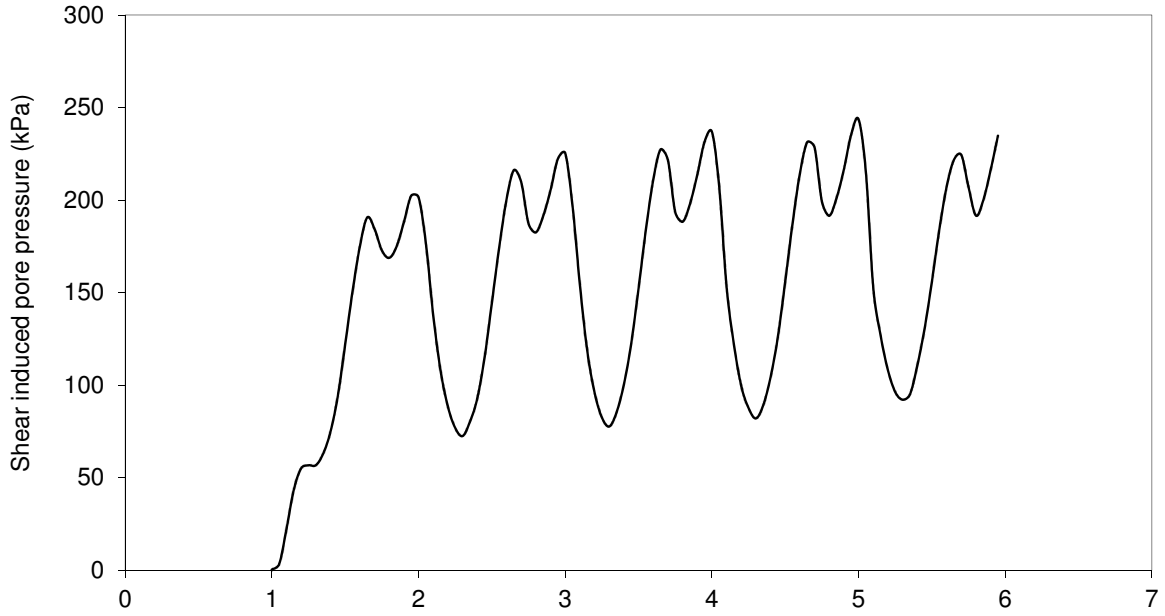

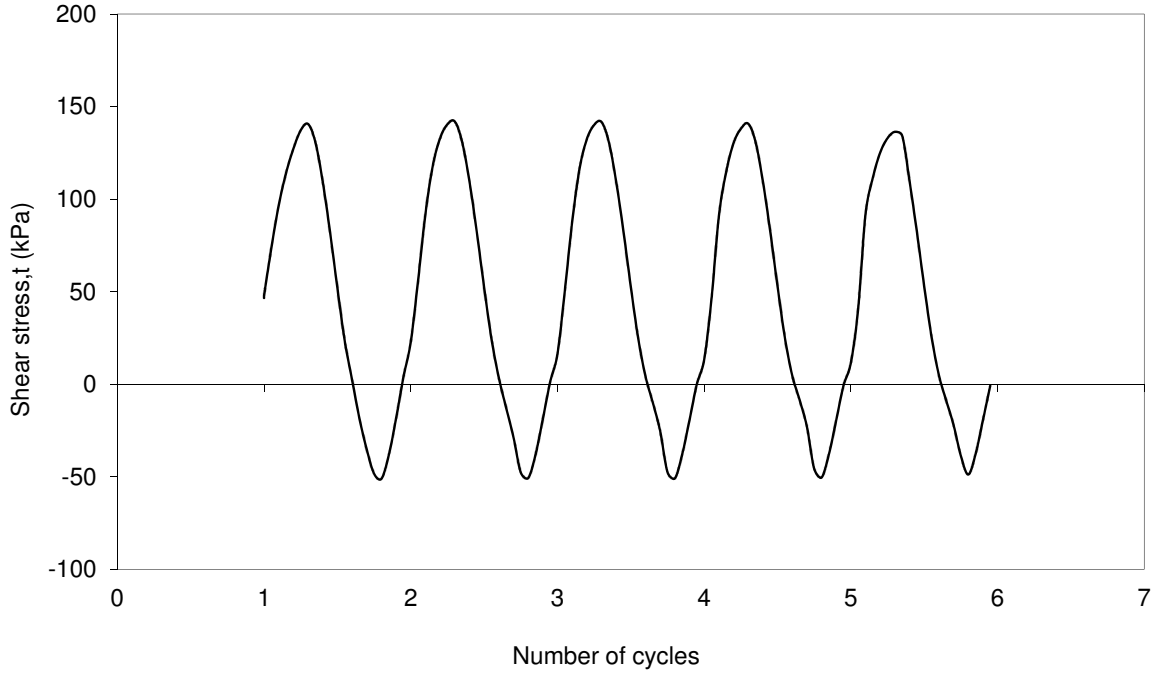

Cyclic simple shear #1

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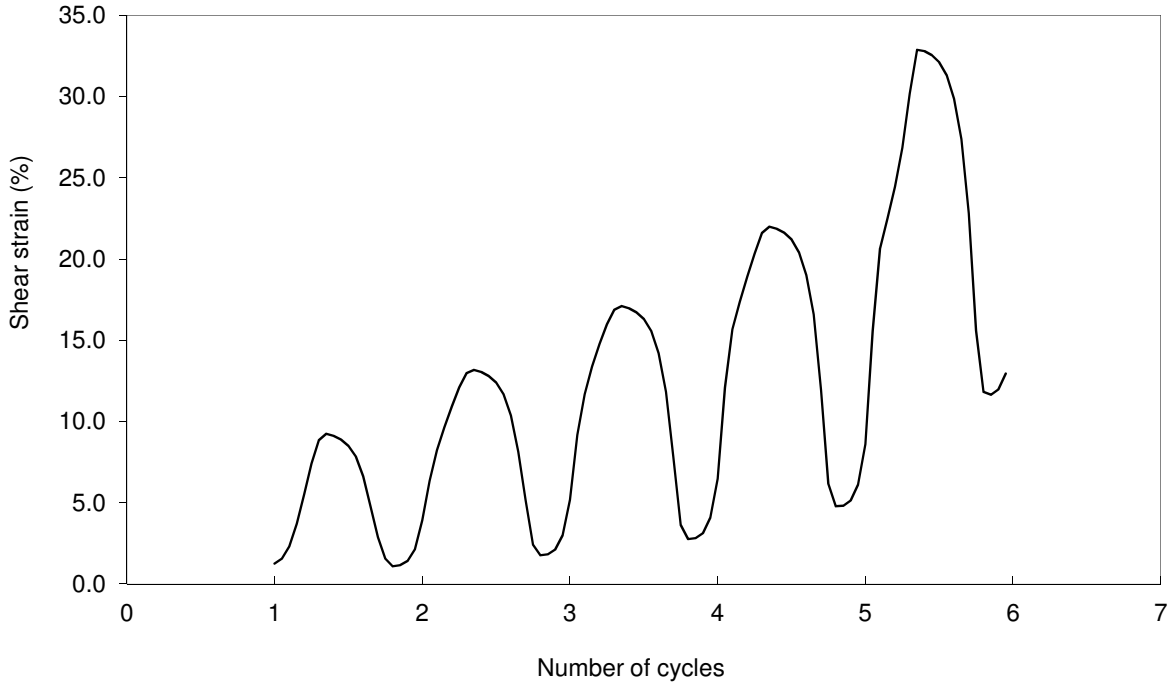
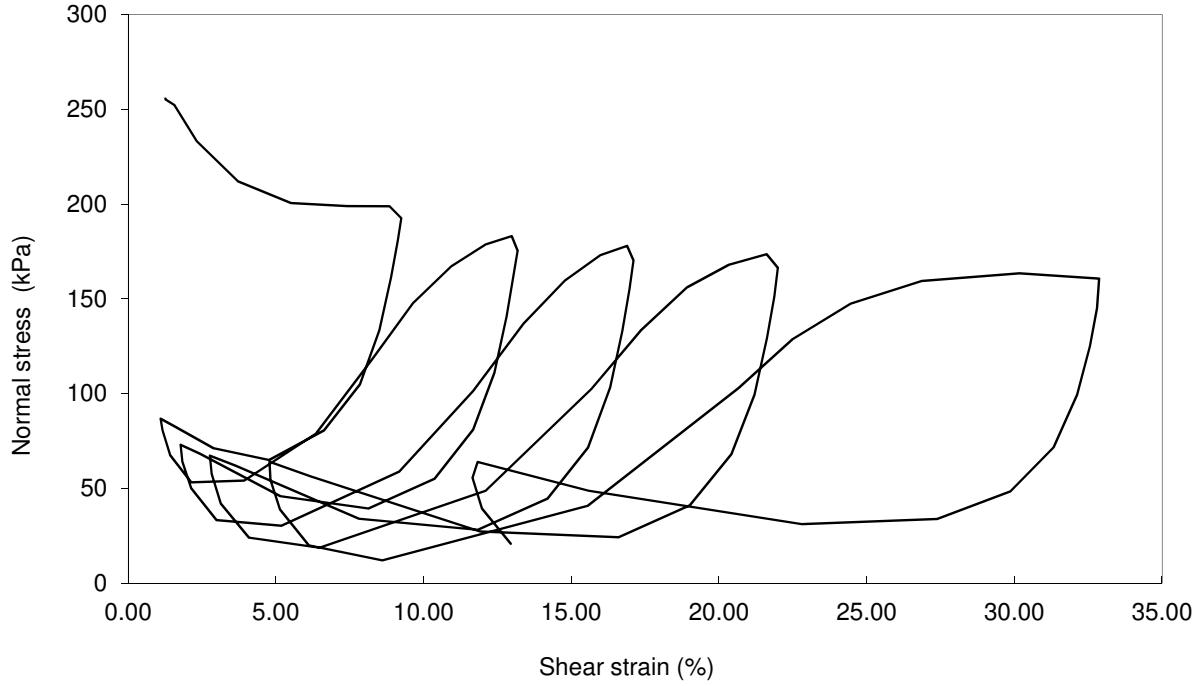
(Cohesive Soils)- In general accordance with ASTM D6528-07

Borehole Number:	MET TOWER	Description :
Sample Number:	P11-Q2	Firm/stiff grey clayey silty SAND with sheels and occasional
Sample Depth (m):	33.70-33.74	fine gravel (slightly micaceous)- CYCLIC #3





Cyclic simple shear #1

Checked and approved	Project Number: **RGI/1130**	RGI Russell Geotechnical Innovations
Initials: CSR	Project Name: **10451 U.S. WIND INC.**	
Date: 15/02/2016		

Test carried out by Russell Geotechnical Innovations Limited, Alpha 319, Chobham Business Centre, Chobham, Surrey,GU24 8JB

Authorised Signatory: C.S.Russell (Director)

C:\Users\Chris\Documents\Processing Files\RGI_1130 10451 US WIND INC\[BHMET TOWER P11Q2 3360 DSScyc#3.xlsx]Sheet1

3.13 Chemical Laboratory Results

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-D14_A

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1B1	0.15	0								SAND	
P4B1	2.08	0								SAND	
P5B2	3.25	0								SAND	
P5B3	3.50	0								SAND	
P6B1	7.15	0								SAND	
P11B1	24.68	0								Silty SAND	
P1B1	1.13	2								SAND	
P2B1	25.63	0								Silty SAND	
P12B1	64.53	0								Silty SAND	
P13B2	68.28	0								Silty SAND	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G7

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P2B2	0.83	2								SAND	
P3B3	1.50	0								SAND	
P4B1	4.55	1								SAND	
P5B1	8.10	0								SAND	
P7AB1	12.65	0								SAND	
P8B1	14.59	0								SAND	
P17B1	46.55	5								Clayey SAND	
P18B2	50.50	0								Clayey SAND	
P19B1	53.10	2								Silty SAND	
P20B1	57.15	0								Silty SAND	
P21B1	60.70	0								Sandy CLAY	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-G17_A

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1B1	0.20	1								SAND	
P2B1	0.68	0								SAND	
P3B2	1.88	0								Silty SAND	
P4B1	5.13	0								Silty SAND	
P5B1	8.13	0								Silty SAND	
P9B1	17.10	0								SAND	
P10B2	18.73	0								SAND	
P11B1	29.63	0								SAND	
P2B1	44.63	1								Silty SAND	
P6B1	60.13	10								Sandy CLAY	Mostly Shell
P7B1	64.15	1								Sandy CLAY	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-H10

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1B1	0.10	0								SAND	
P2B1	1.15	3								SAND	
P3B1	2.30	8								SAND	
P5B1	10.15	0								SAND	
P6AB1	13.65	0								SAND	
P8B1	23.63	1								Silty SAND	
P10B1	30.15	2								Sandy CLAY	
P12B2	38.48	1								Silty SAND	
P13B1	42.15	0								Silty SAND	
P14B2	46.50	3								Clayey SAND	
P15B1	50.10	0								Silty SAND	
P16B1	54.10	0								Silty SAND	
P17B1	56.15	0								Silty SAND	
P18B1	59.65	0								Silty SAND	
P19B1	63.25	0								Silty SAND	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-I21_A_B

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1B1	0.10	0								SAND	
P1B2	0.38	1								SAND	
P2B1	1.10	1								SAND	
P3B1	2.15	1								SAND	
P4B3	6.03	4								Silty SAND	
P1B1	9.60	1								SAND	
P3B1	14.60	0								SAND	
P4AB1	17.58	0								SAND	
P5B2	21.38	0								SAND	
P6B1	25.13	0								SAND	
P4B1	36.61	0								Silty SAND	
P5B2	39.95	0								Silty SAND	
P7B1	48.10	1								Sandy CLAY	
P8B2	51.38	0								Sandy SILT	
P12B1	67.05	1								Silty SAND	
P13B1	71.13	1								Silty SAND	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-K16

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1AB1	0.08	1								SAND	
P3B1	3.63	2								SAND	
P4AB1	7.60	3								SAND	
P10B1	22.13	0								SAND	
P12B1	28.20	1								SAND	
P13B1	31.15	0								SAND	
P19B3	51.55	0								Sandy CLAY	
P23B3	67.10	5								Clayey SAND	
P24B1	71.20	1								Silty SAND	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

10451 Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
BH-MET TOWER

Push Number	Level in core (m)	Carbonate Content (%)	Chalk Content $CaCO_3$ (%)	Organic Matter (%)	pH		Sulphate Content		Chloride Content Cl (mg/L)	Principal Soil Type	Remarks
					Detemination in Water	Determination in Calcium Chloride	Water Soluble SO_4 (g/L)	Acid Soluble SO_4 (%)			
P1B1	0.15	3								SAND	
P1B3	0.63	4								Silty SAND	
P2B1	1.10	6								Silty SAND	
P2B2	1.33	4								Silty SAND	
P3B1	2.15	3								Silty SAND	
P4B1	5.18	3								Silty SAND	
P5B1	8.65	2								Silty SAND	
P6B1	12.62	0								Silty SAND	
P14AB1	44.65	0								Silty SAND	
P16AB2	53.80	0								Sandy CLAY	

CHEMICAL TESTS - CARBONATE, ORGANIC MATTER, pH, SULPHATE, CHLORIDE

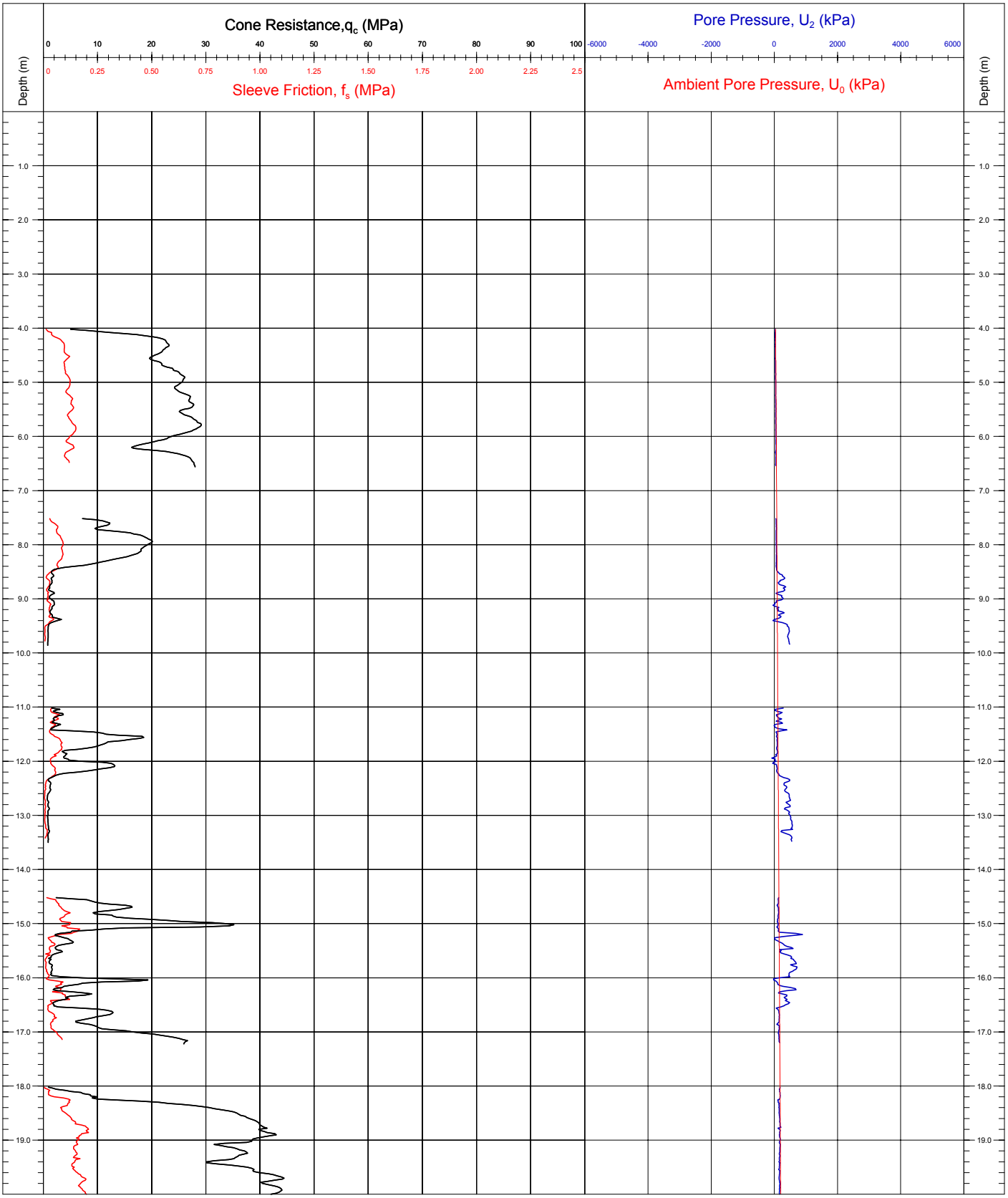
BS 1377 : Part 3 : 1990 - Section 3.0, 5.0, 6.3, 9.0
ASTM D4373

APPENDIX 4

4.1 CPTU Results (Measured and Derived)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

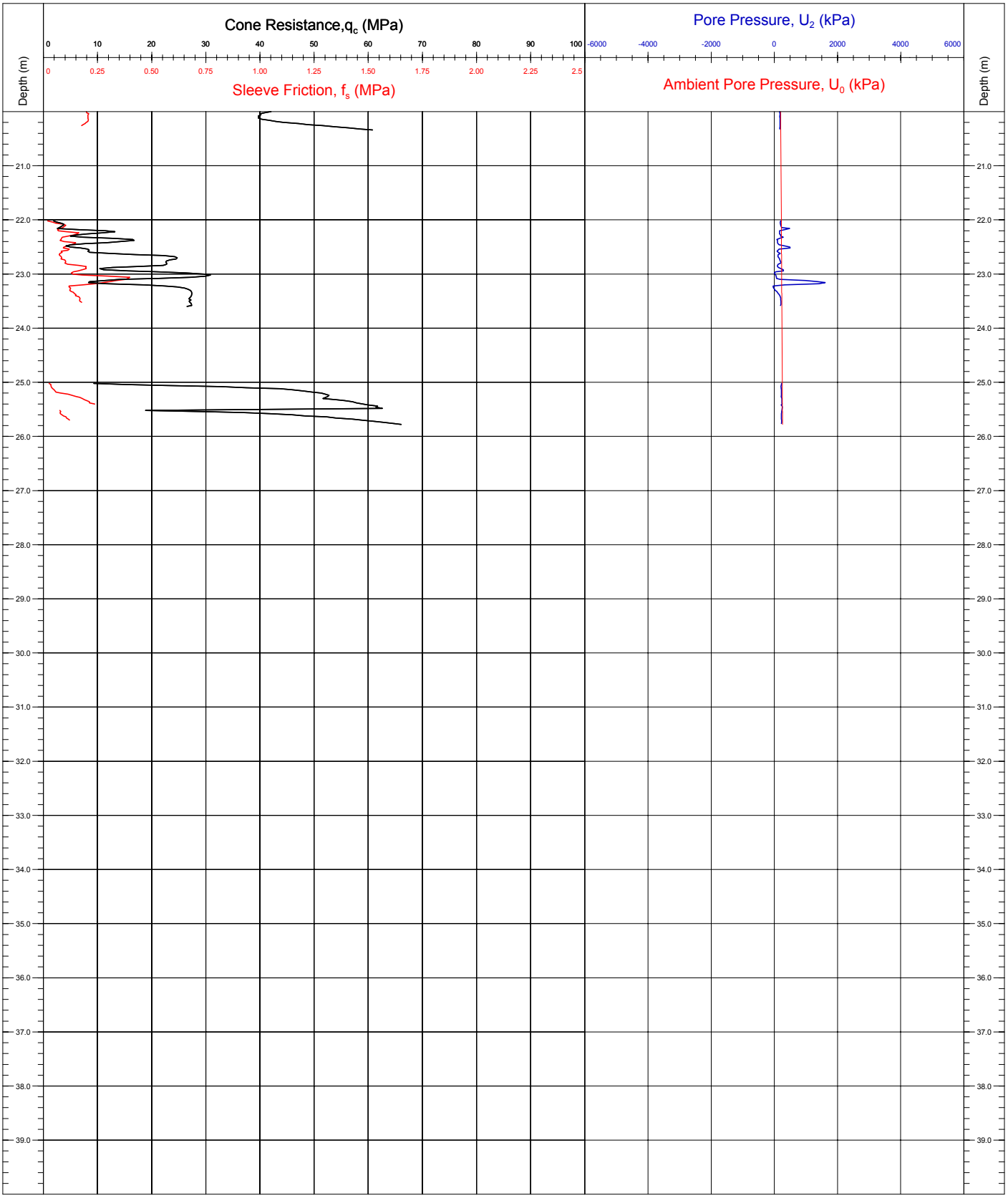
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.0E**	**4243606.0N**	CPT Number **BH - D14**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**		Page: 1/2
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.83**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **SH** (28/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

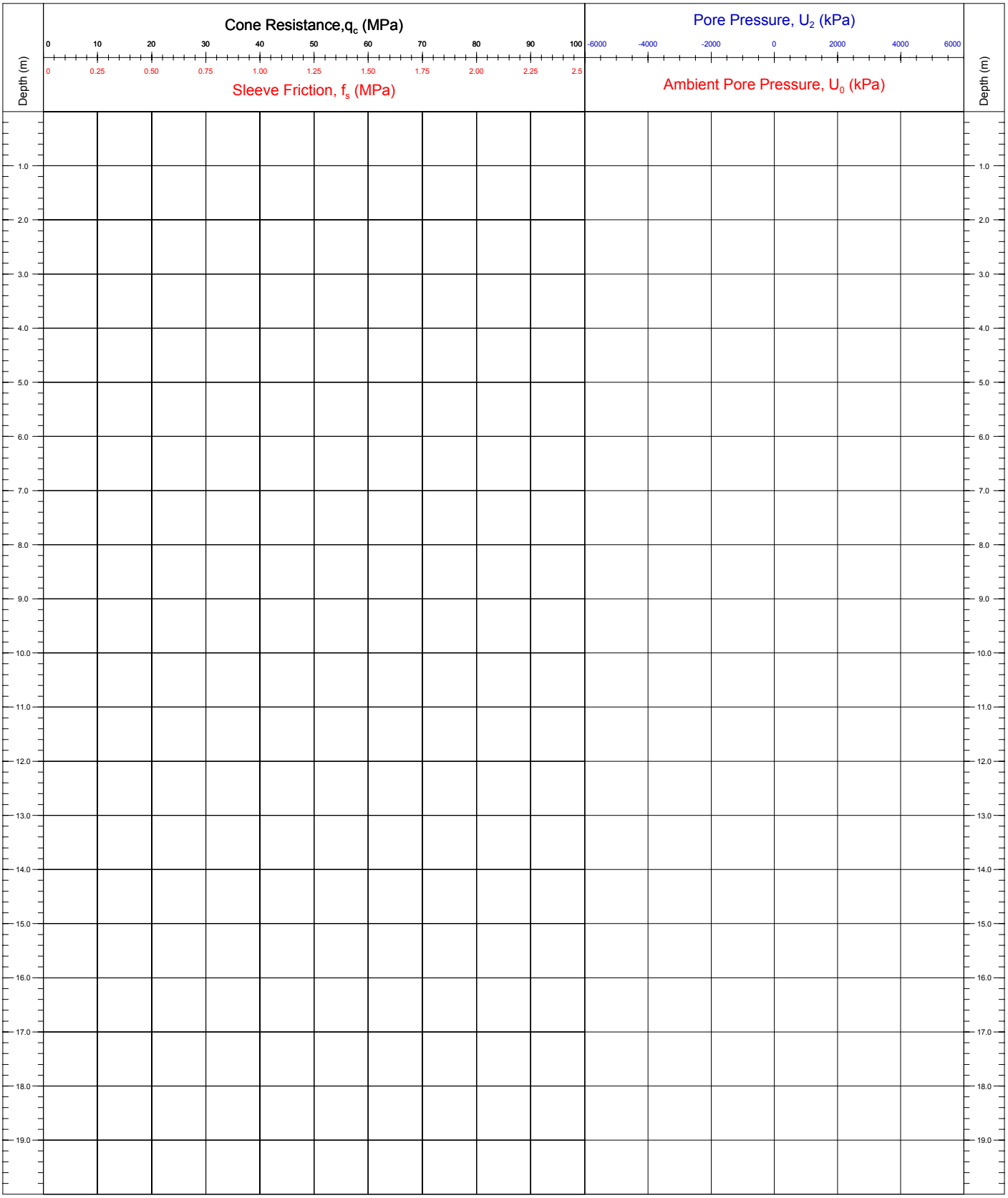
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.0E 4243606.0N**	CPT Number	**BH - D14**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**	Page: 2/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.83**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary / Draft / Final	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	**SH** (28/06/2015) / **JG** (14/12/2014) / ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

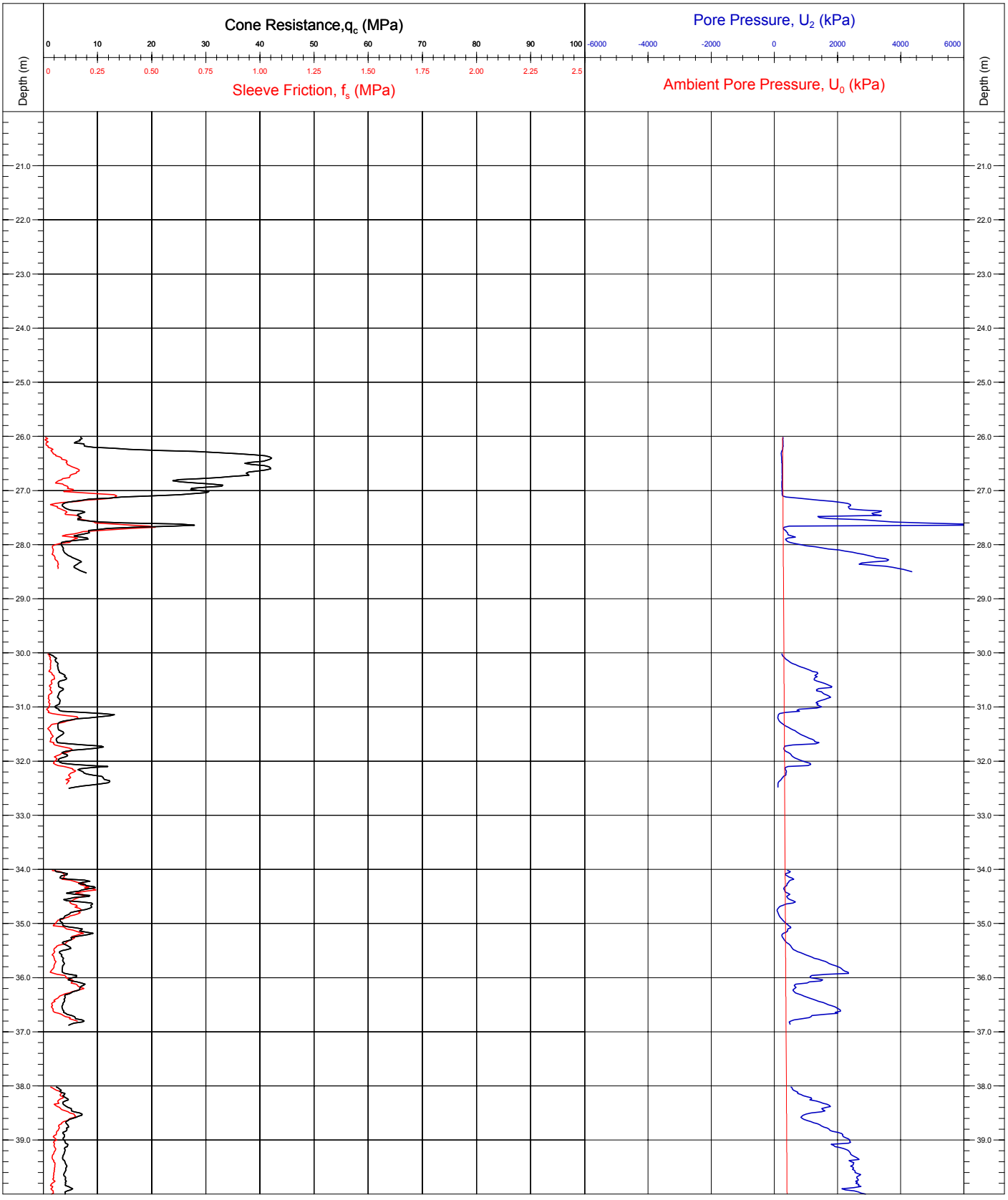
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E**	**4243612.0N**	CPT Number
Contract	**10451**	Latitude/ Longitude			**BH - D14A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		Page: 1/4
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (30/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

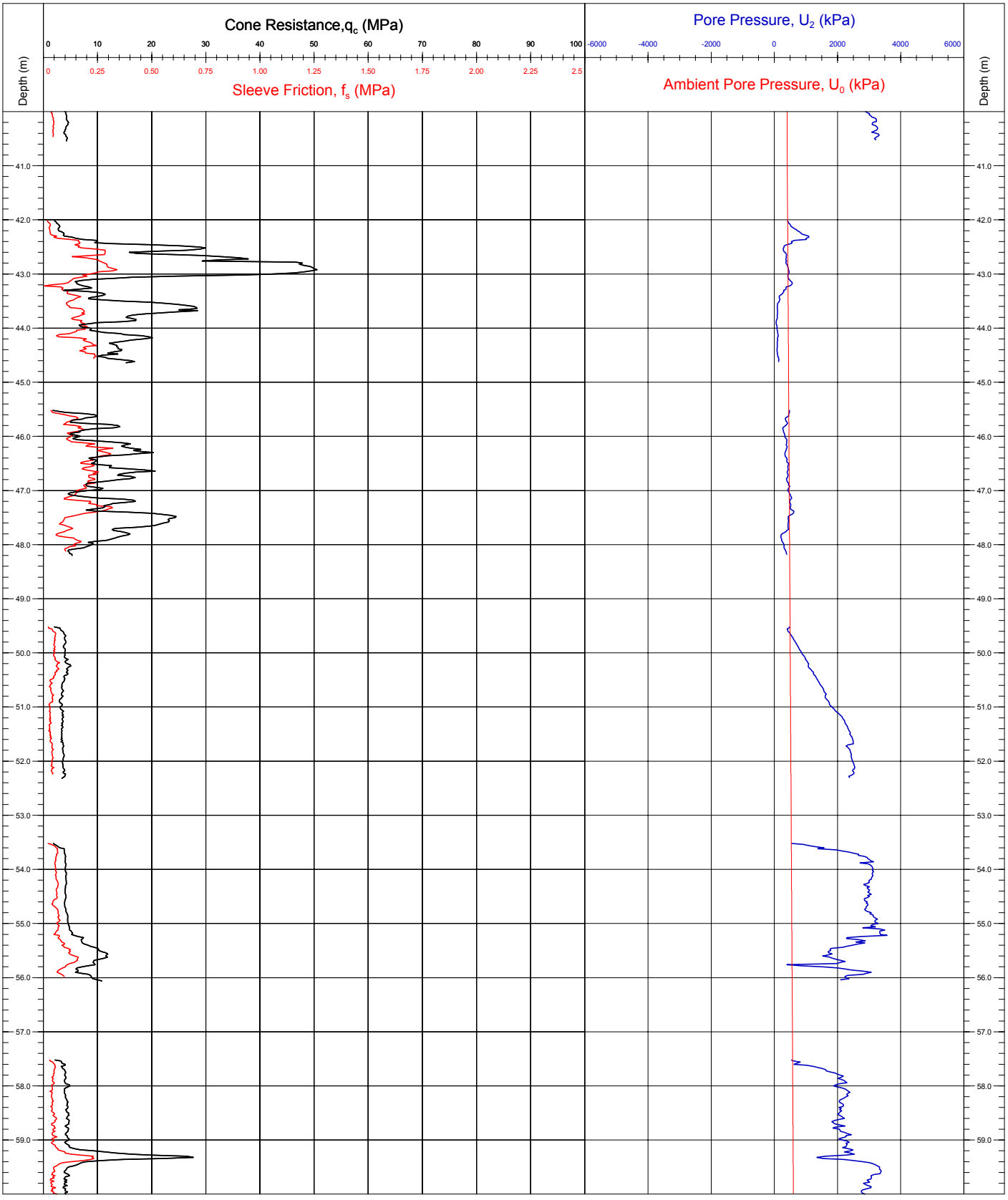
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E** **4243612.0N**	CPT Number	**BH - D14A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (30/06/2015)	Draft: **JG** (14/12/2014)
		CRS **GRS 80 UTM ZONE 18 N (75 W)**		Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

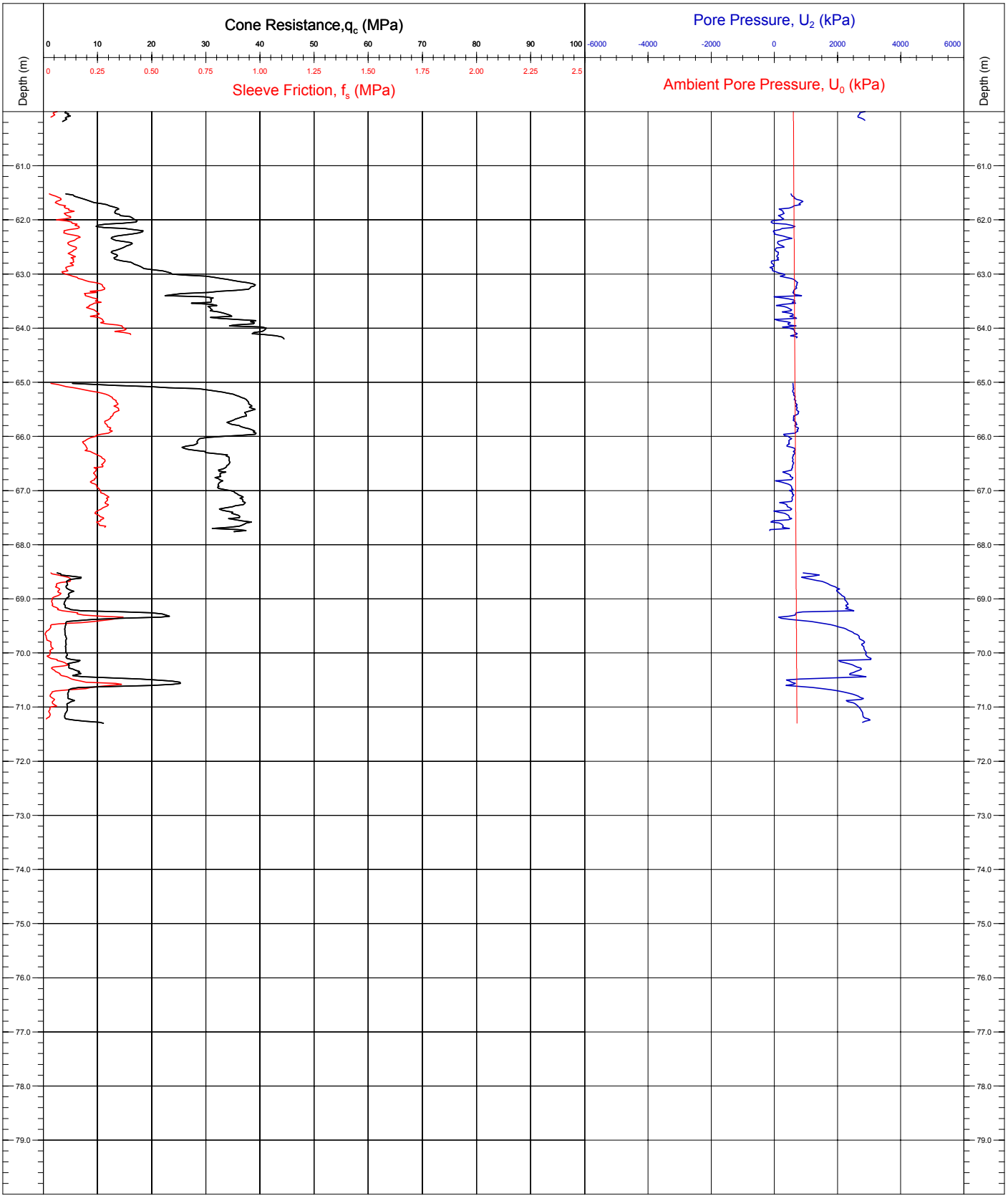
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E** **4243612.0N**	CPT Number	**BH - D14A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (30/06/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

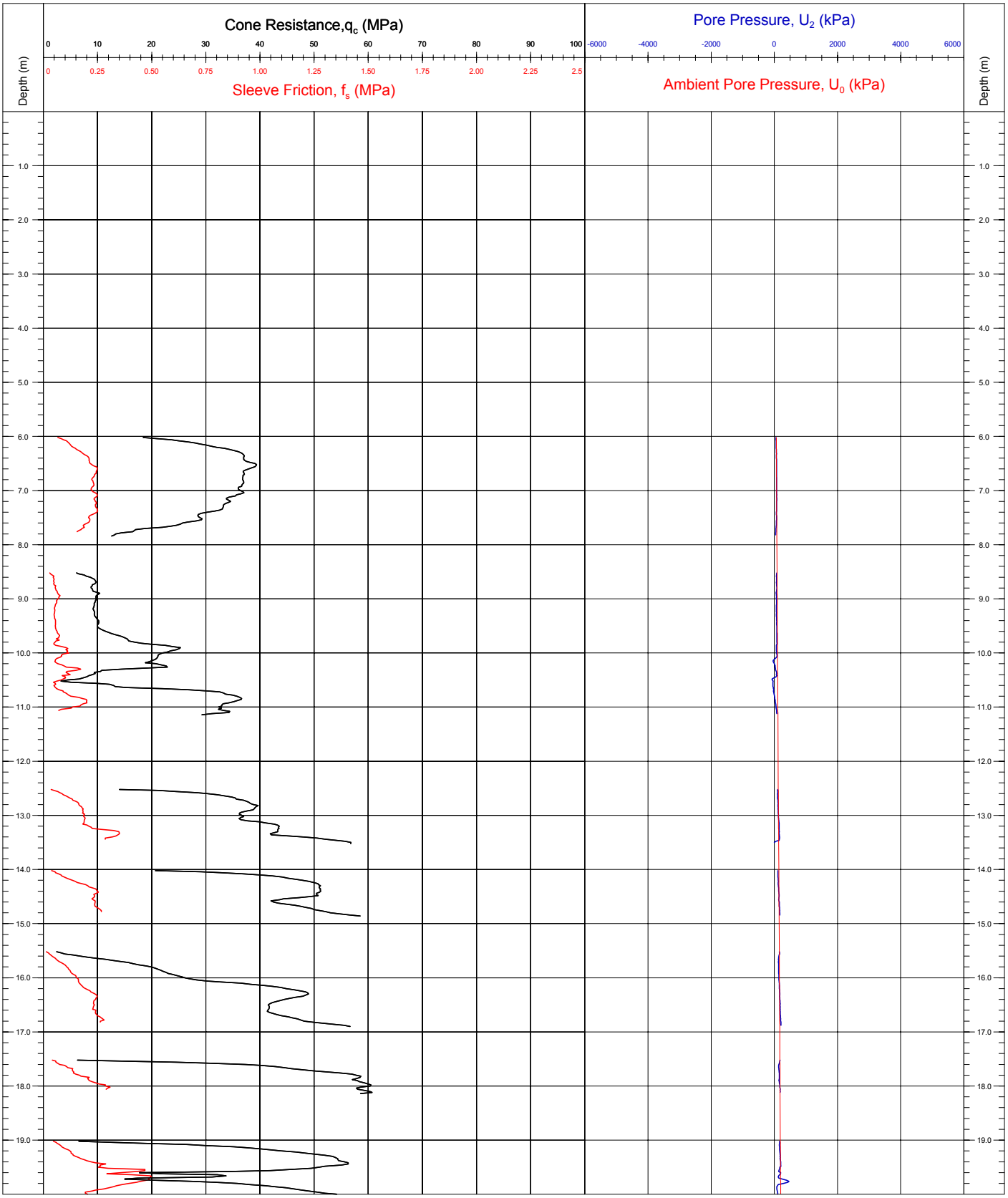
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CPT Number	**BH - D14A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (30/06/2015)	Draft: **JG** (14/12/2014)
		CRS **GRS 80 UTM ZONE 18 N (75 W)**		Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

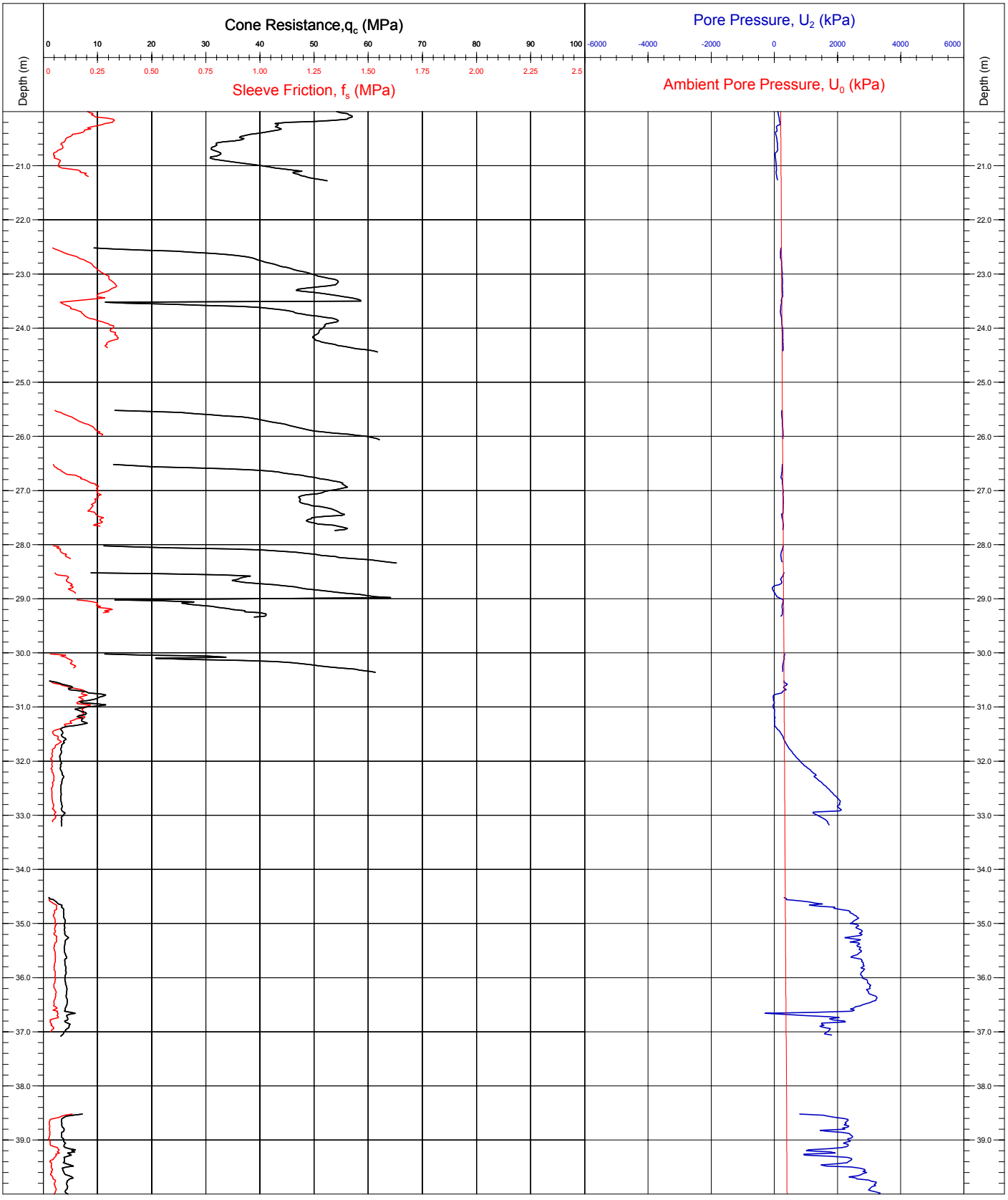
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G17**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 1/3	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

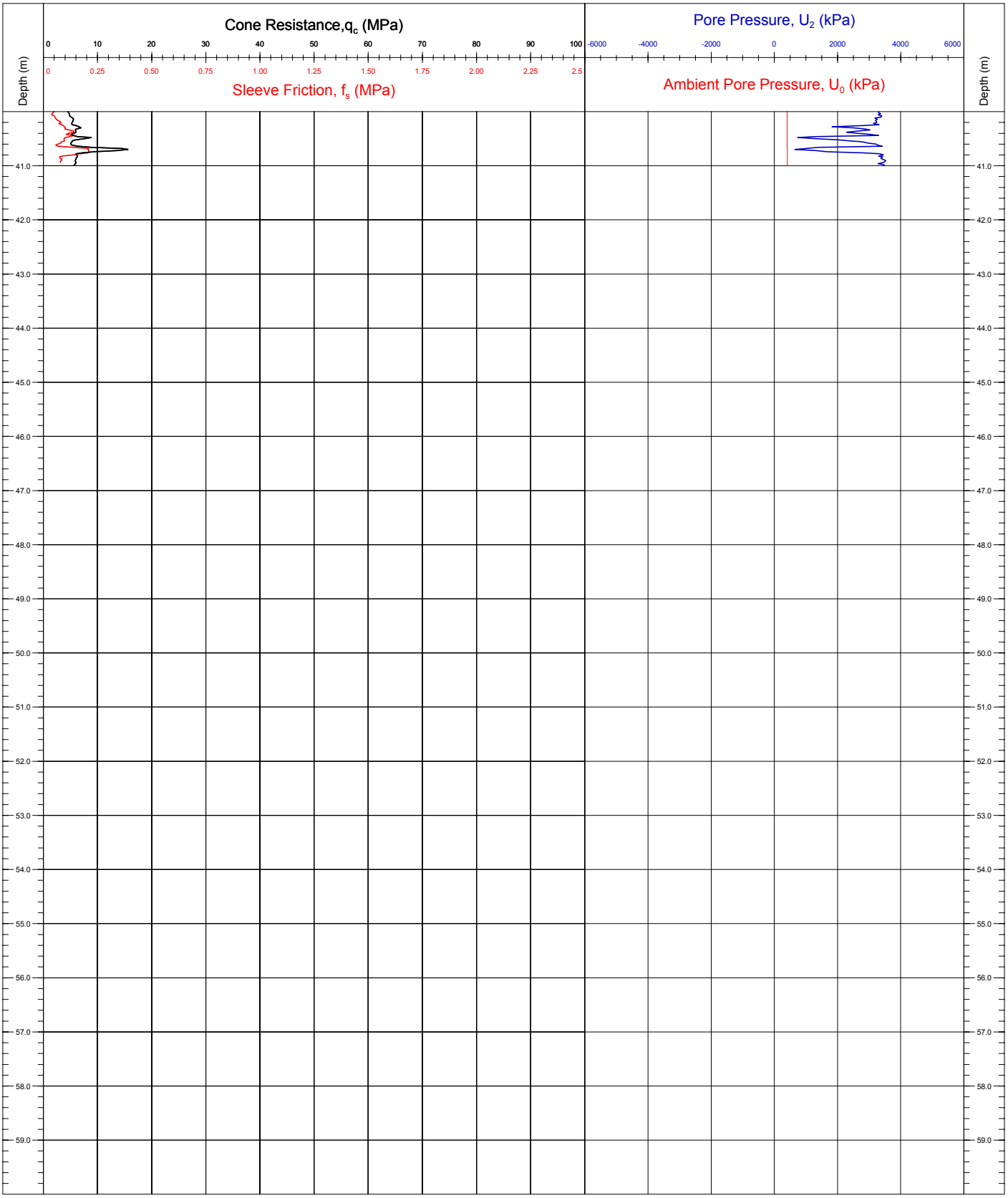
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G17**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 2/3	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

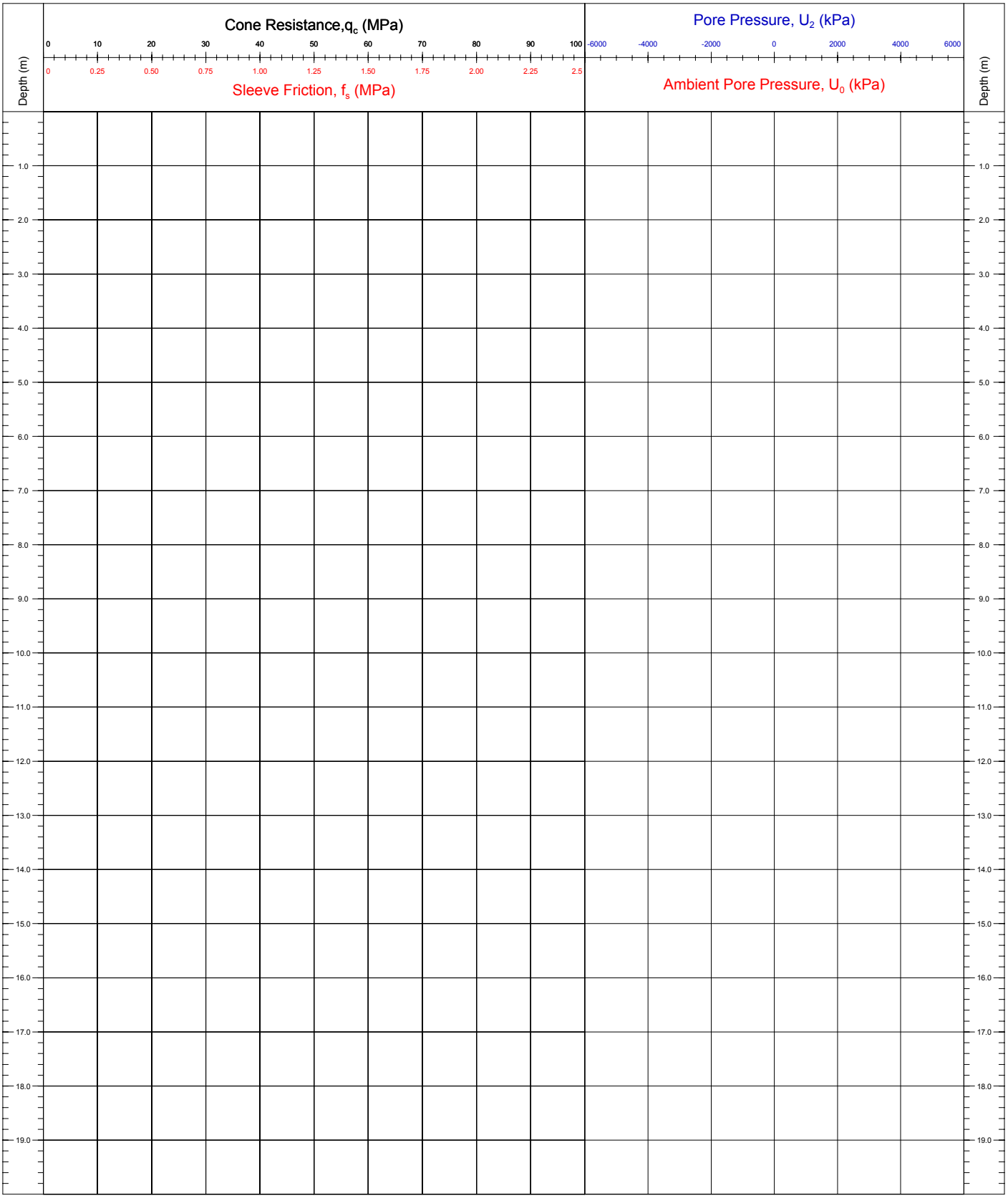
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G17**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 3/3	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

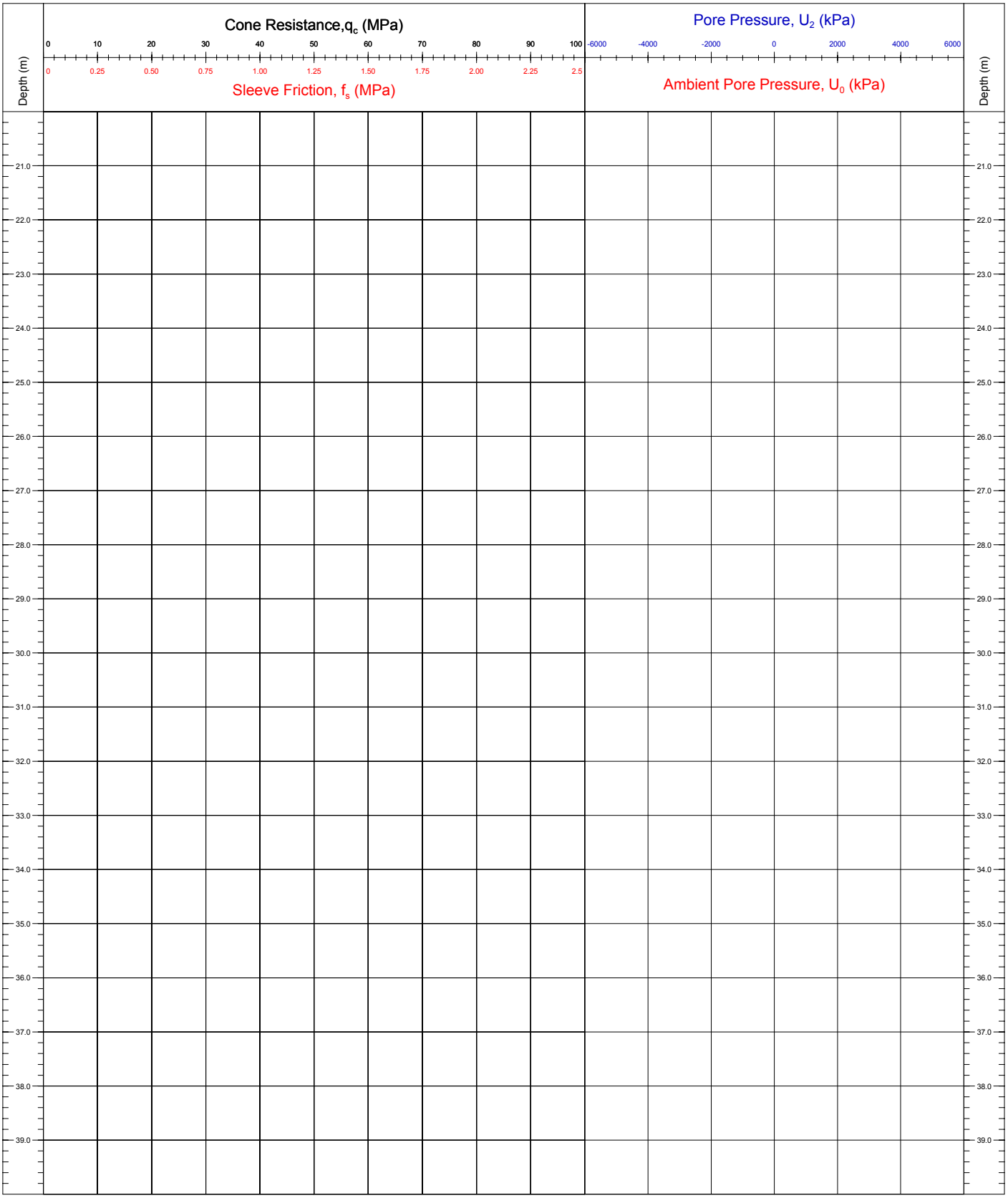
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 1/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

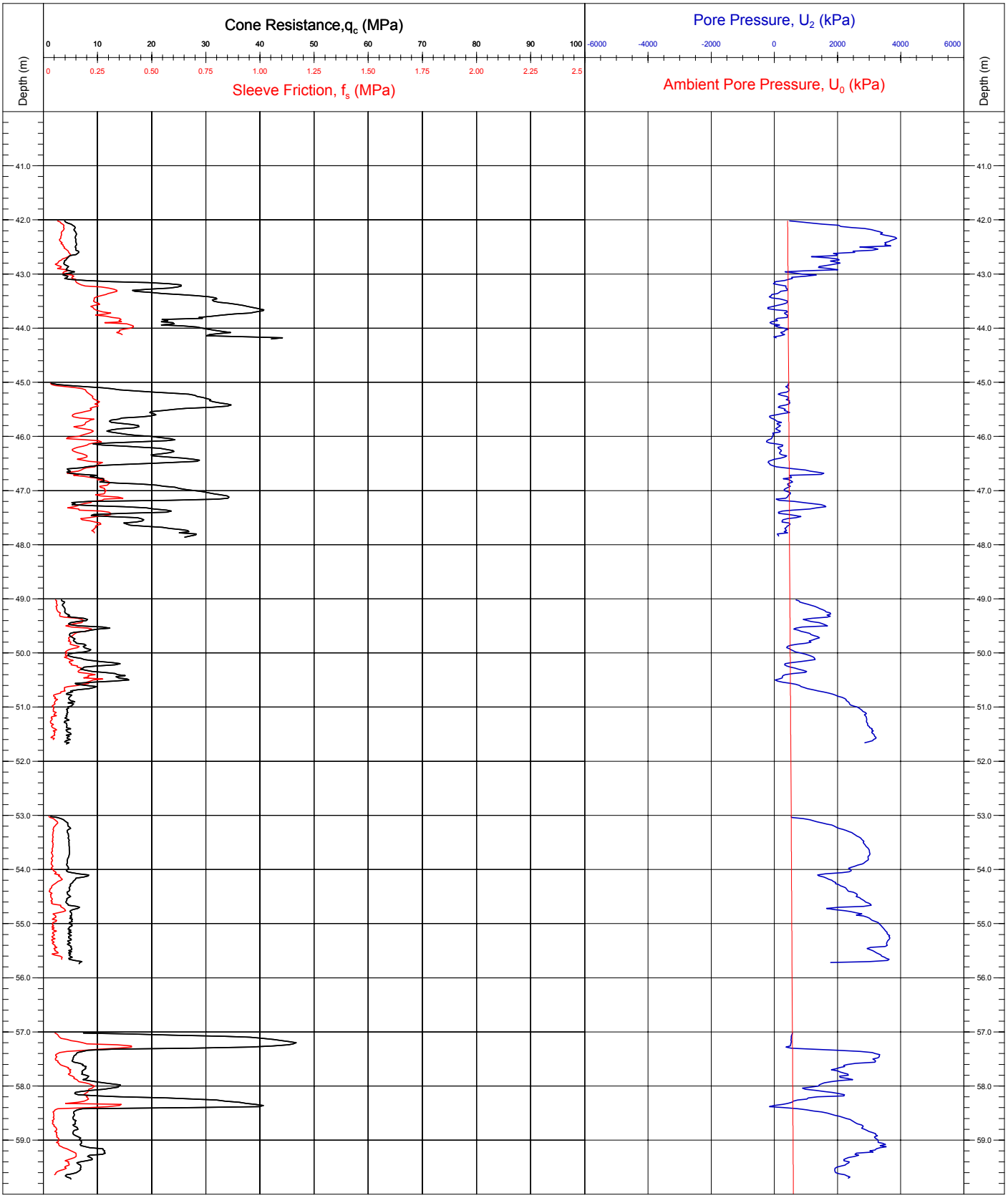
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 2/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

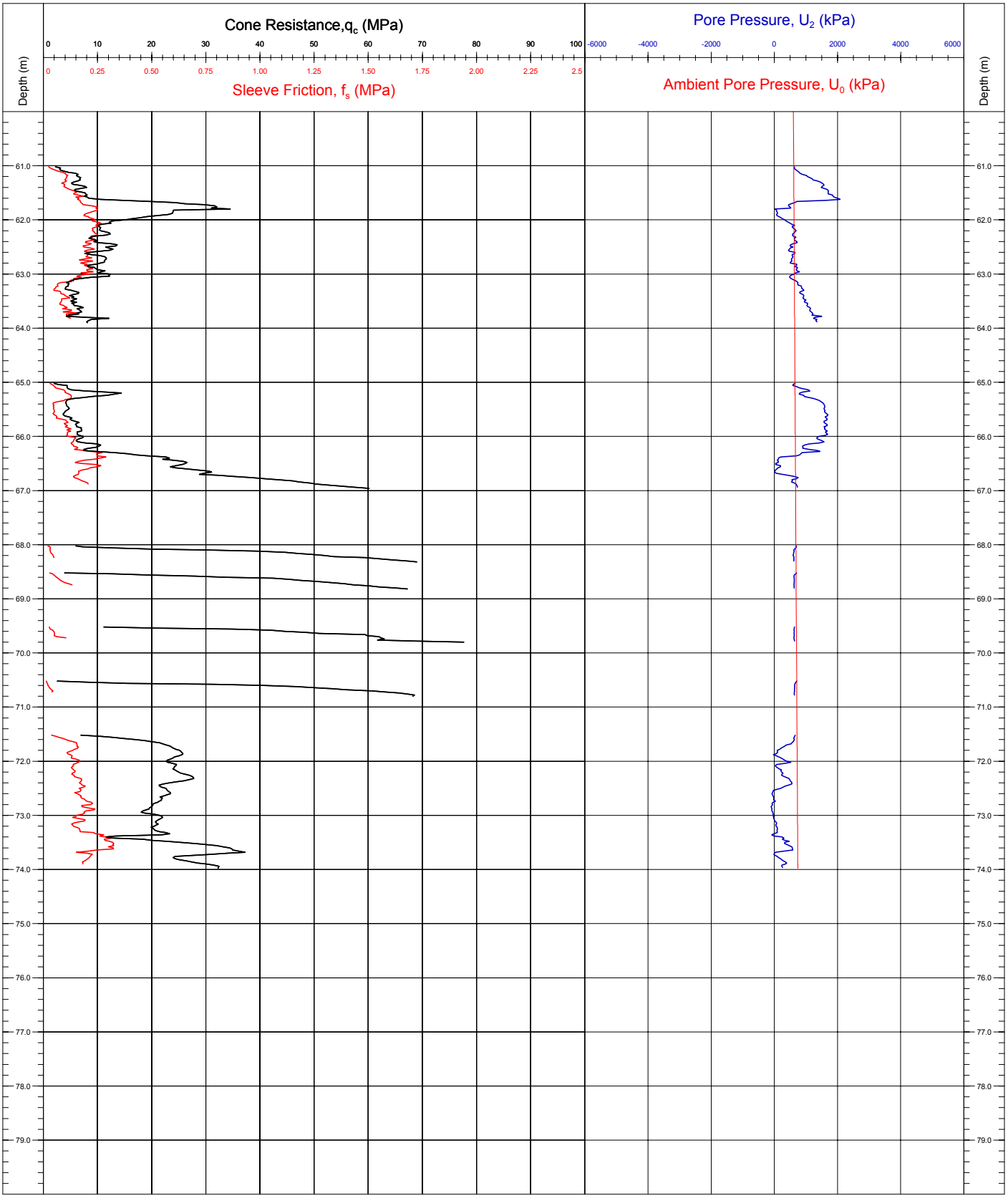
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E** **4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 3/4	
		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014) Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

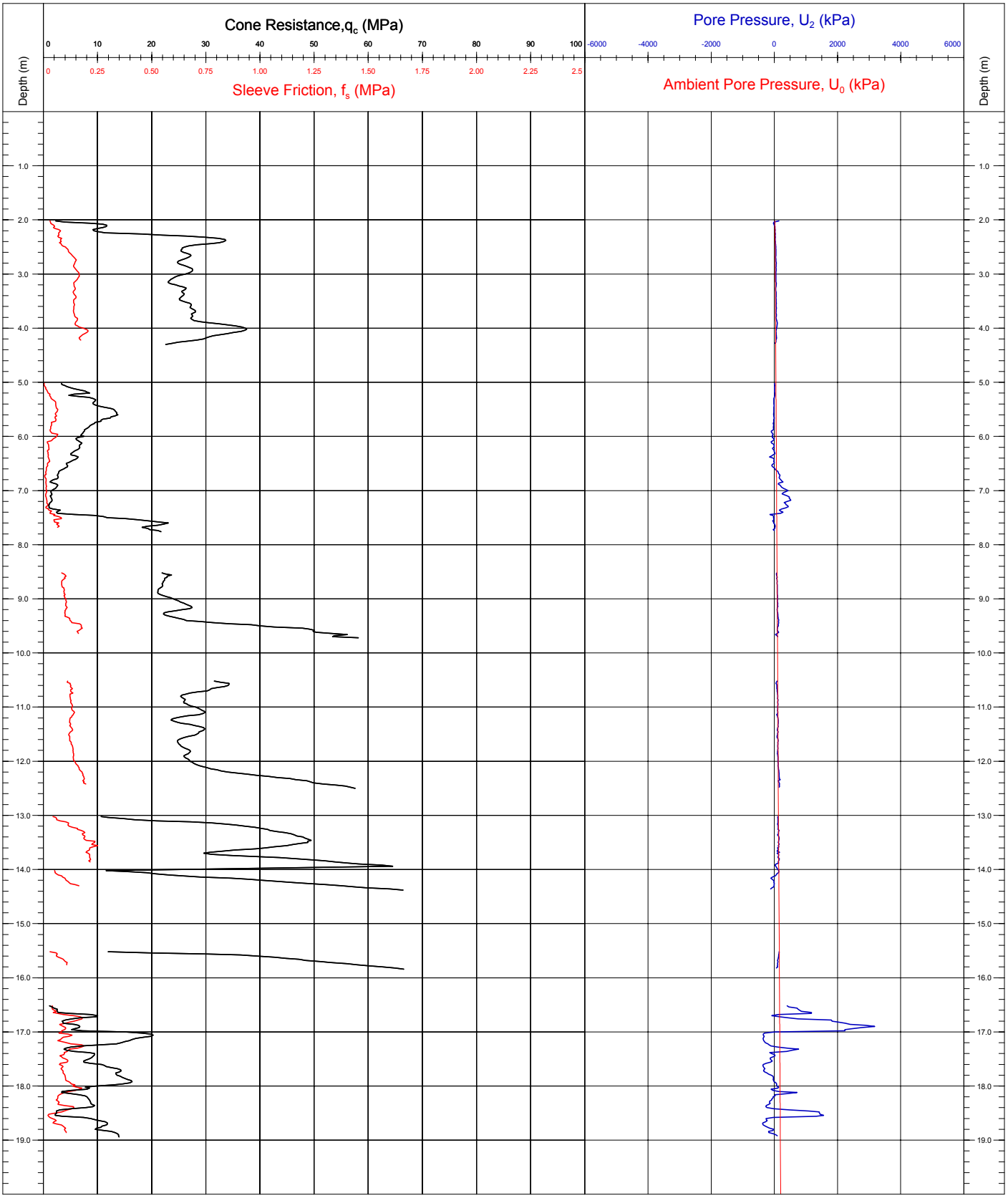
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 4/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

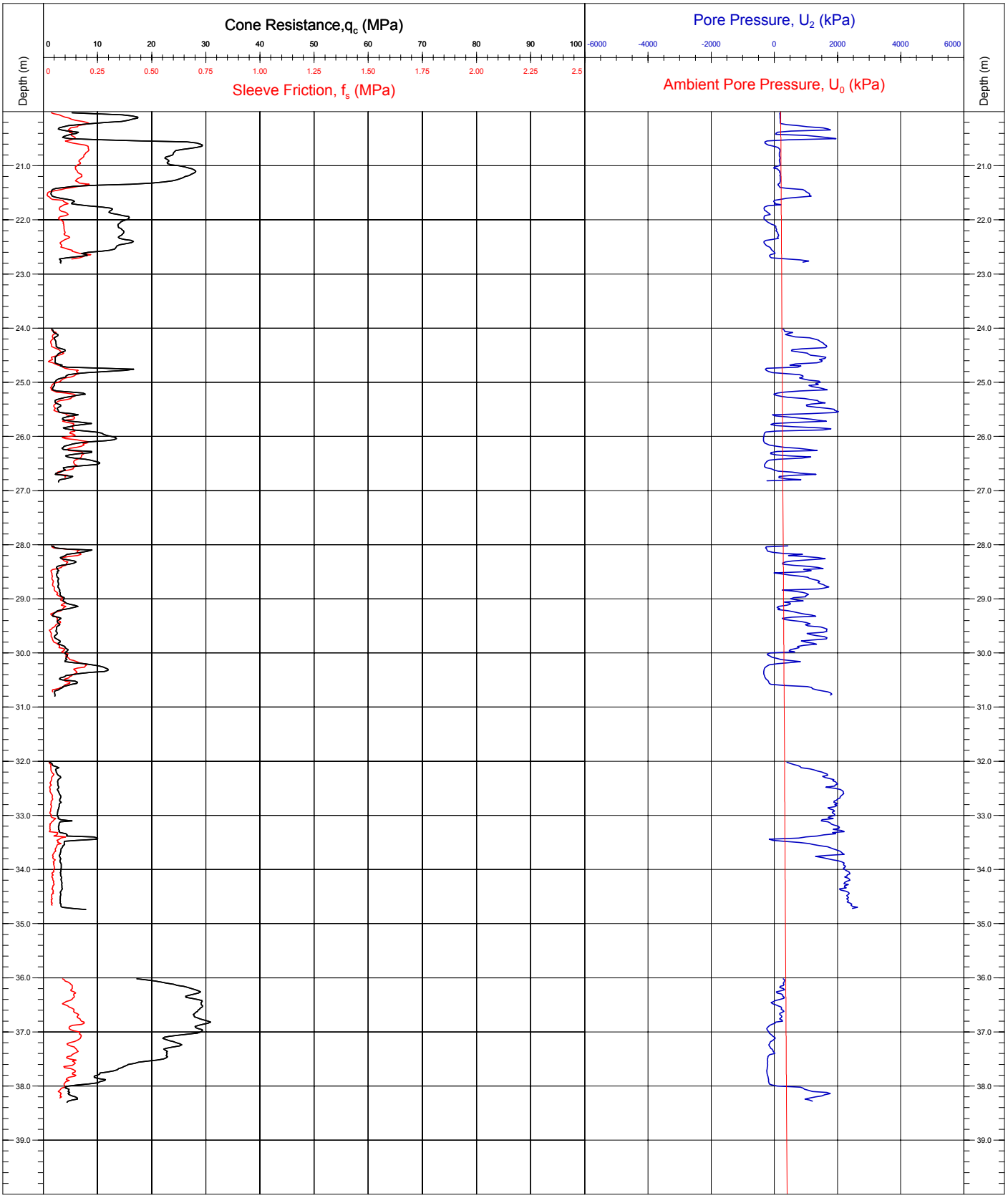
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

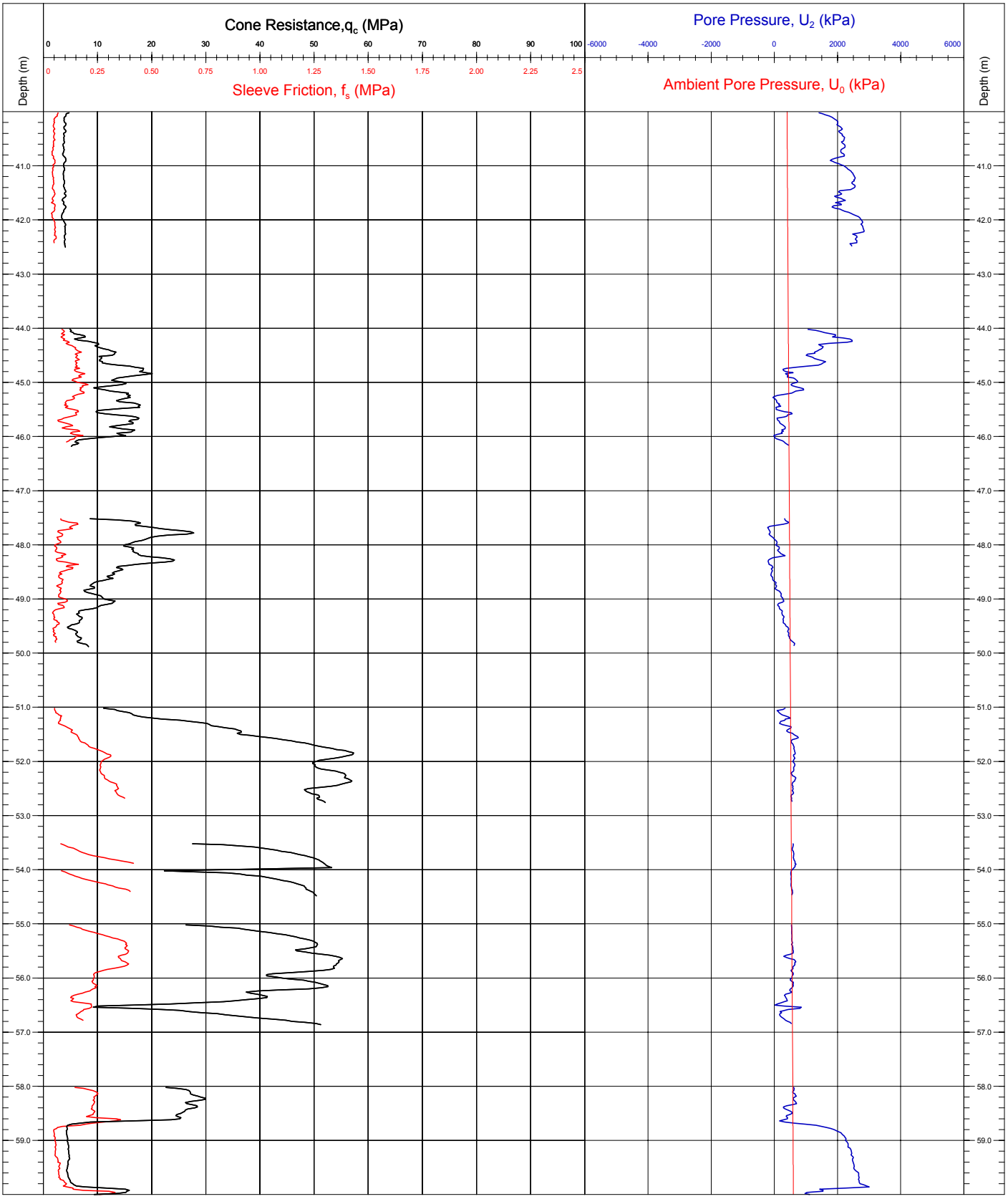
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015)	Draft: **JG** (14/12/2014)	Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

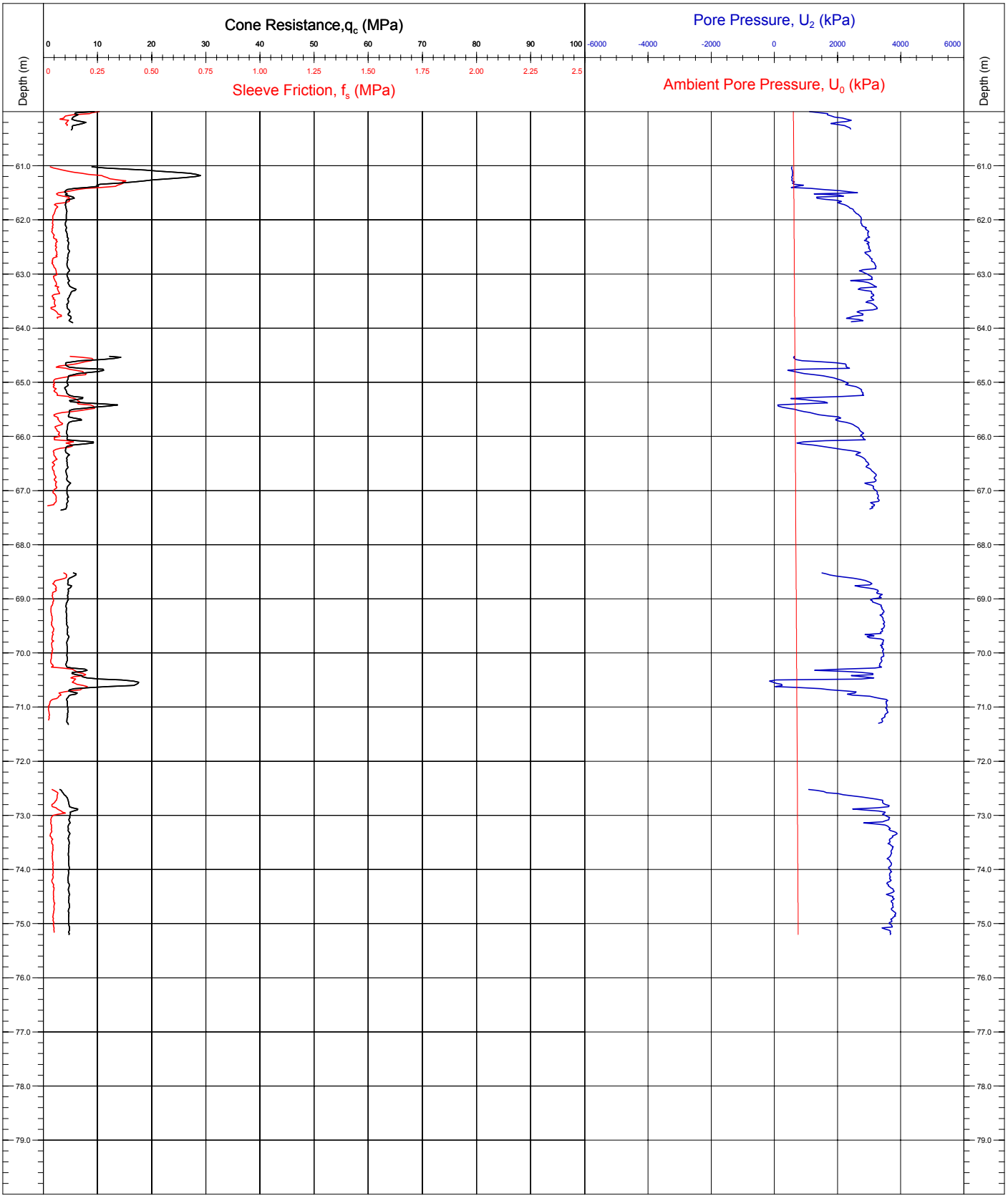
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E** **4251306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G7**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

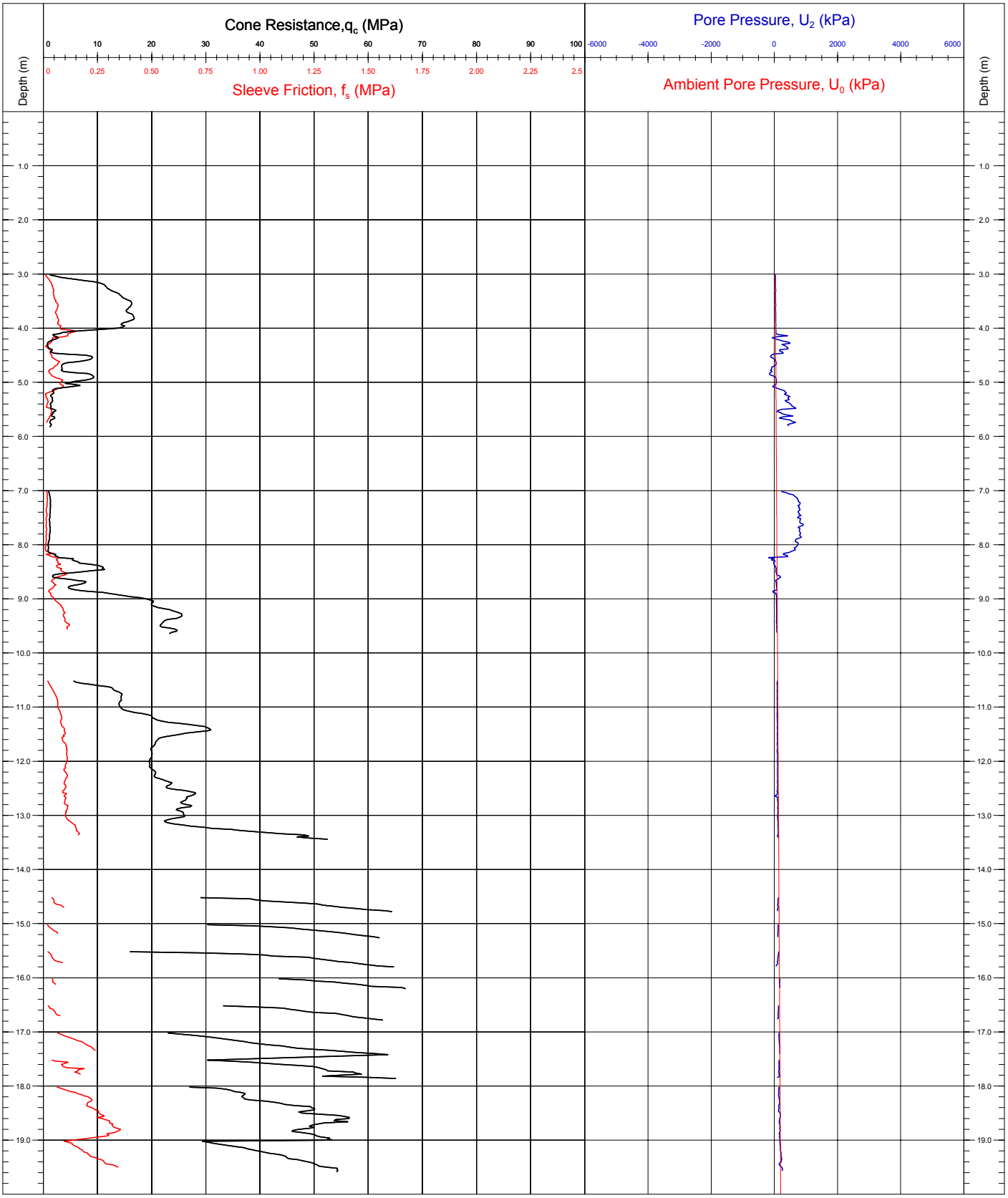
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015)	Draft: **JG** (14/12/2014)
		CRS **GRS 80 UTM ZONE 18 N (75 W)**		Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

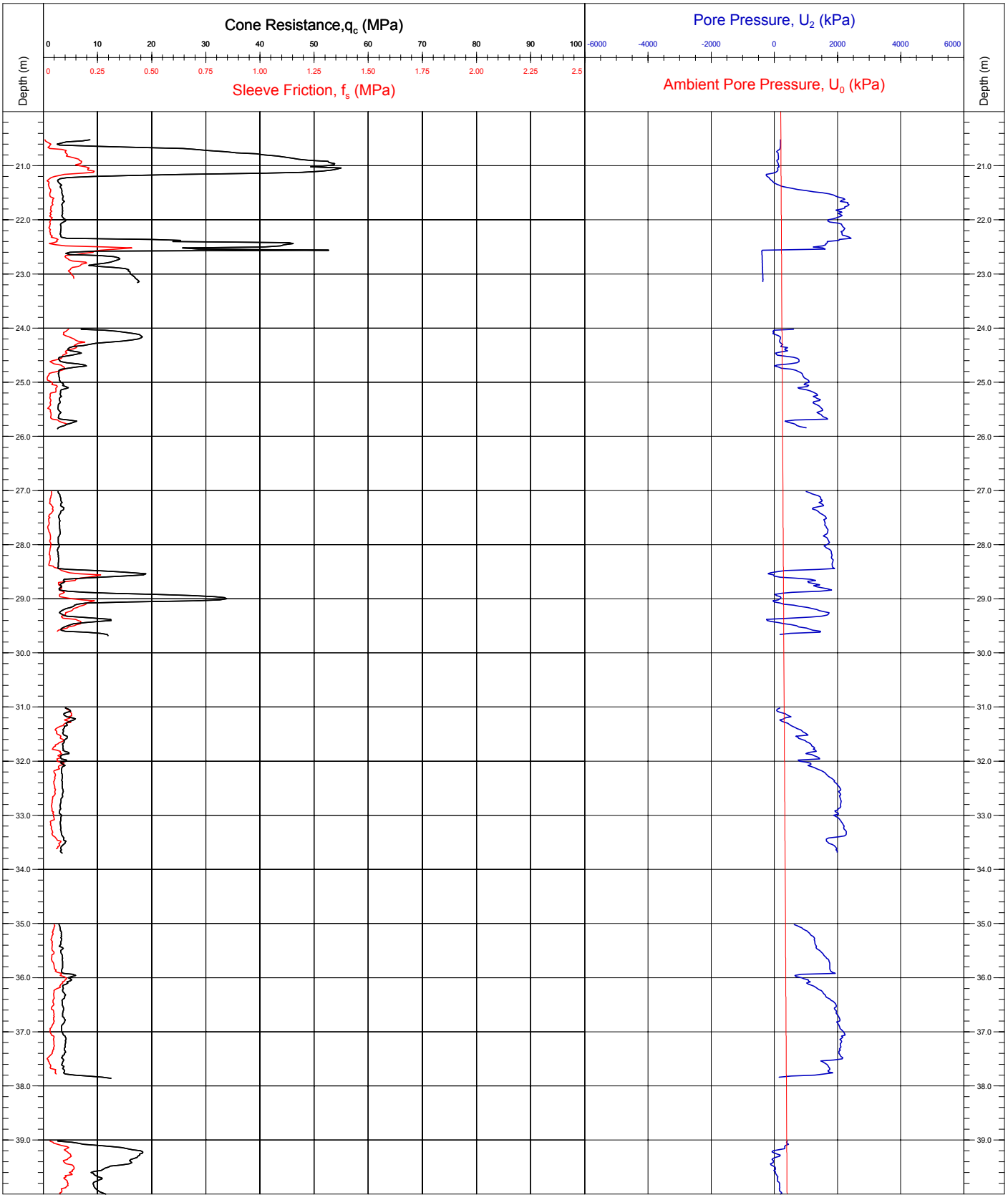
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

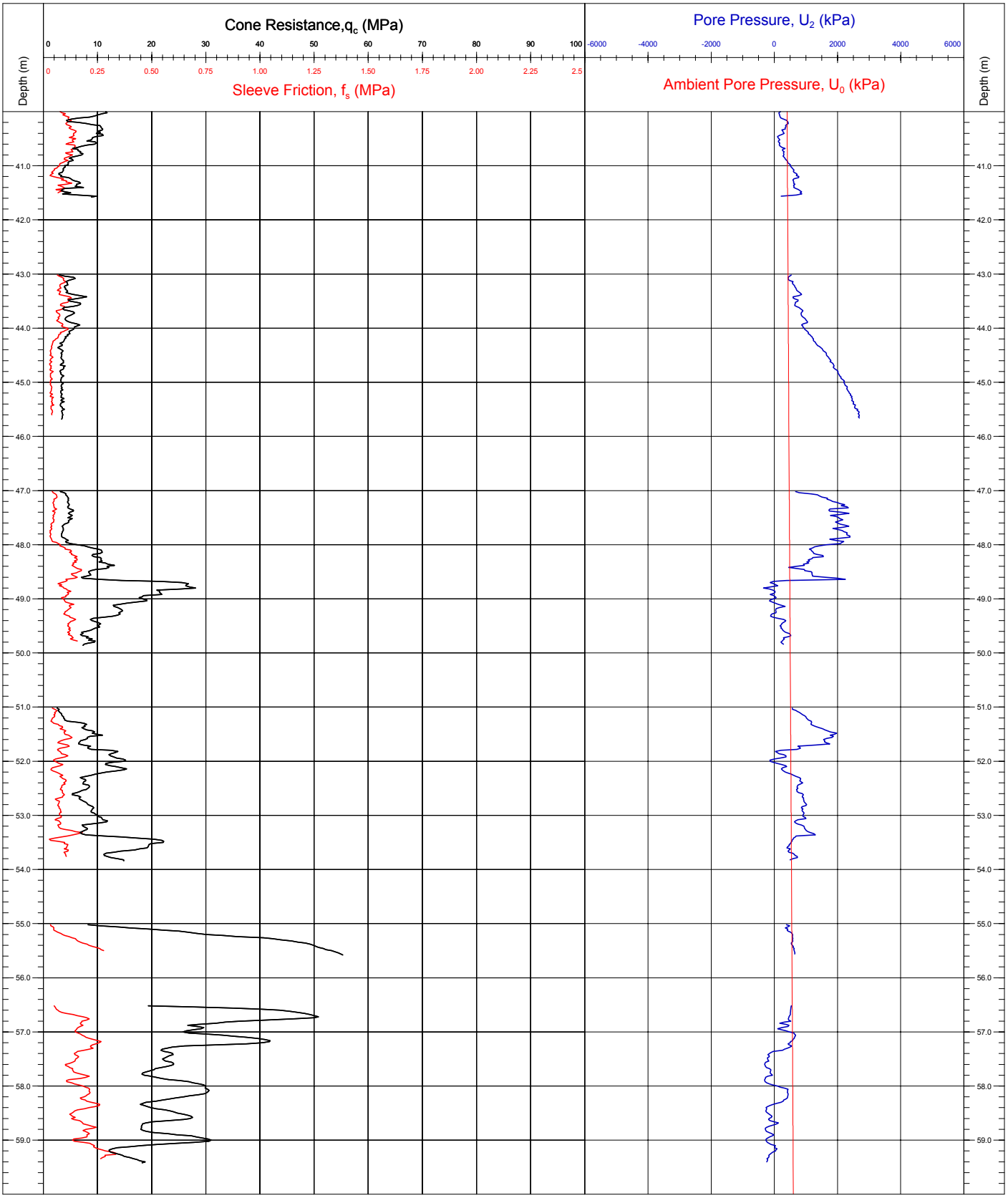
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E** **4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

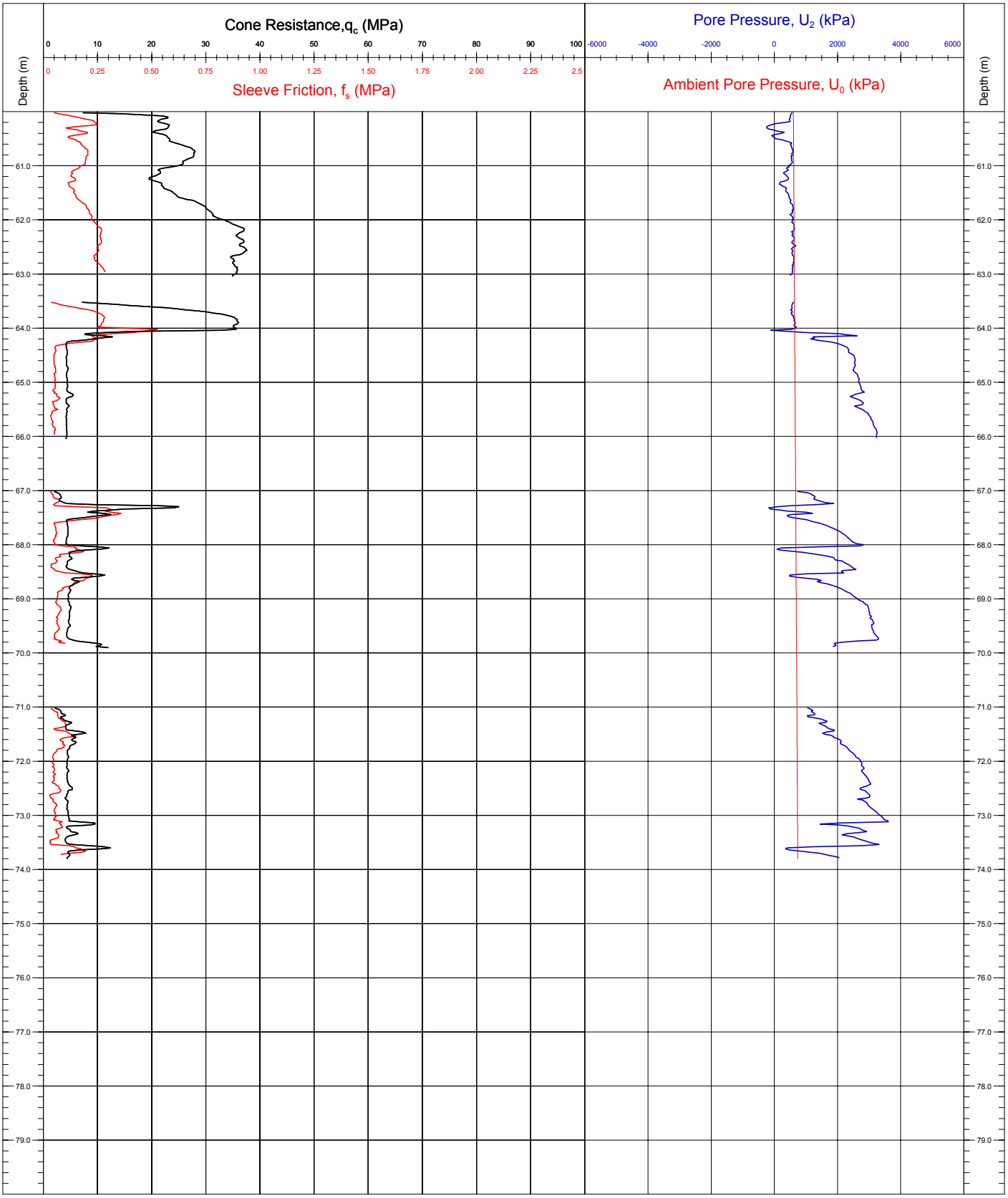
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

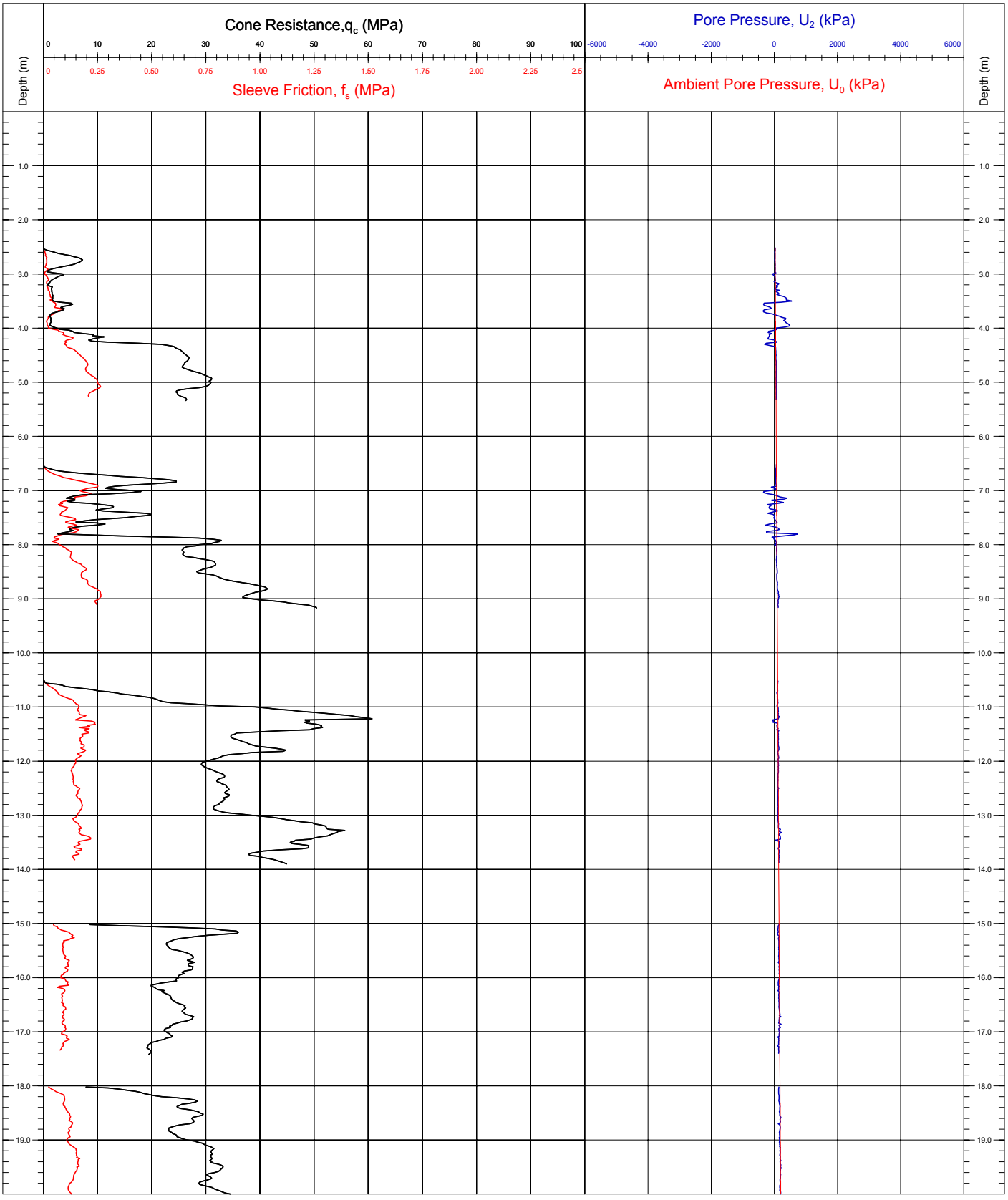
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

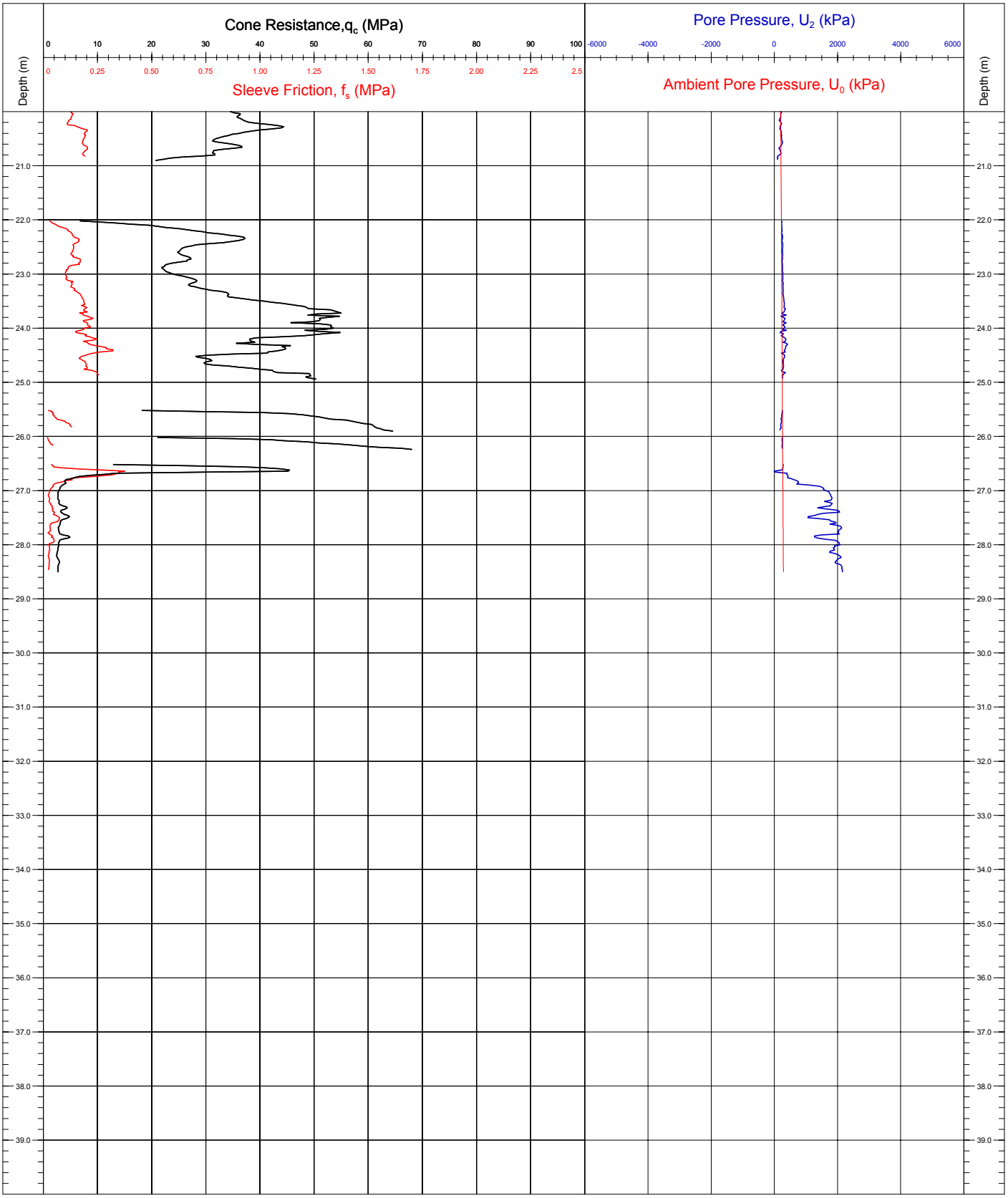
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - I21A**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**	Page: 1/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

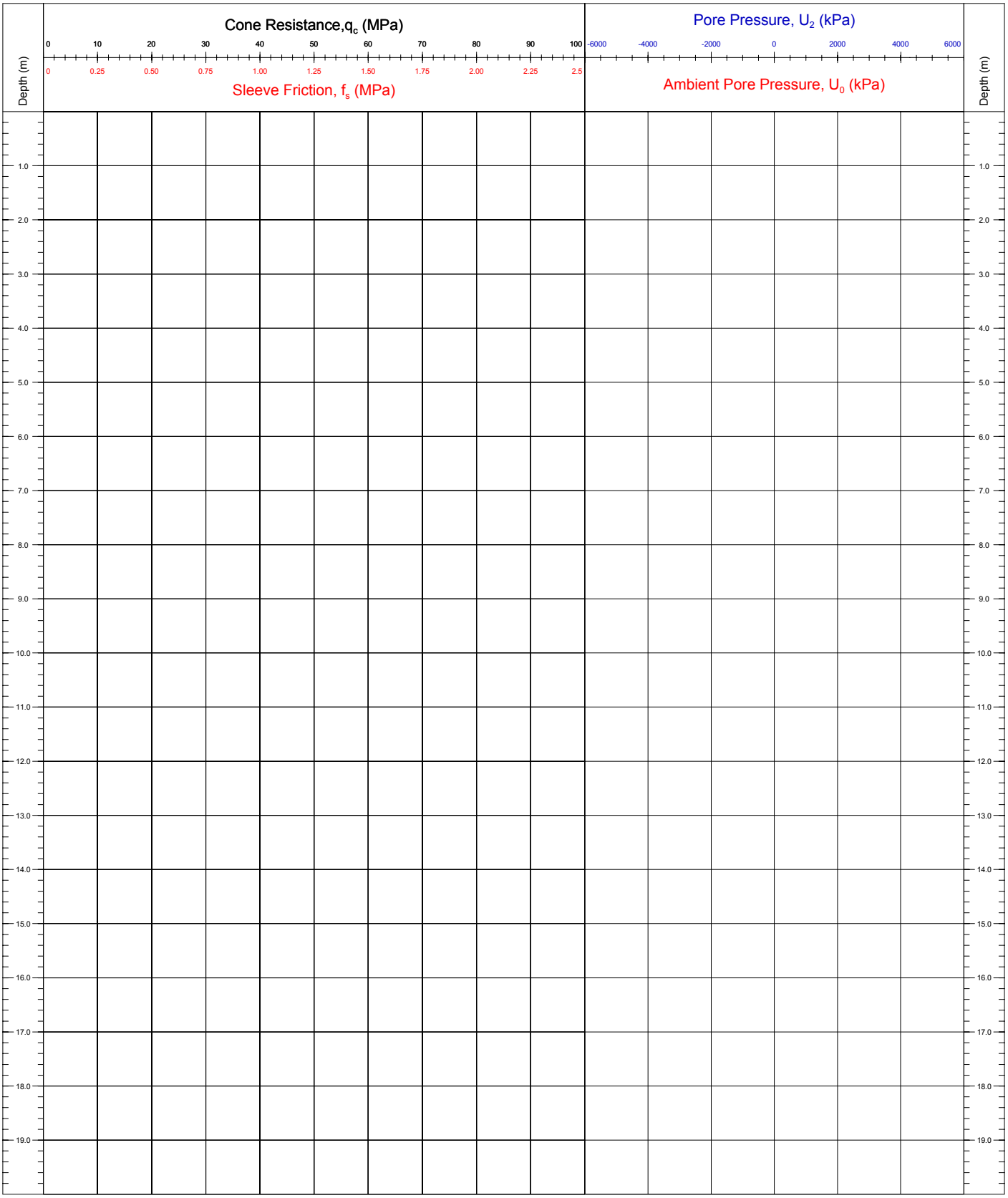
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - I21A**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**	Page: 2/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

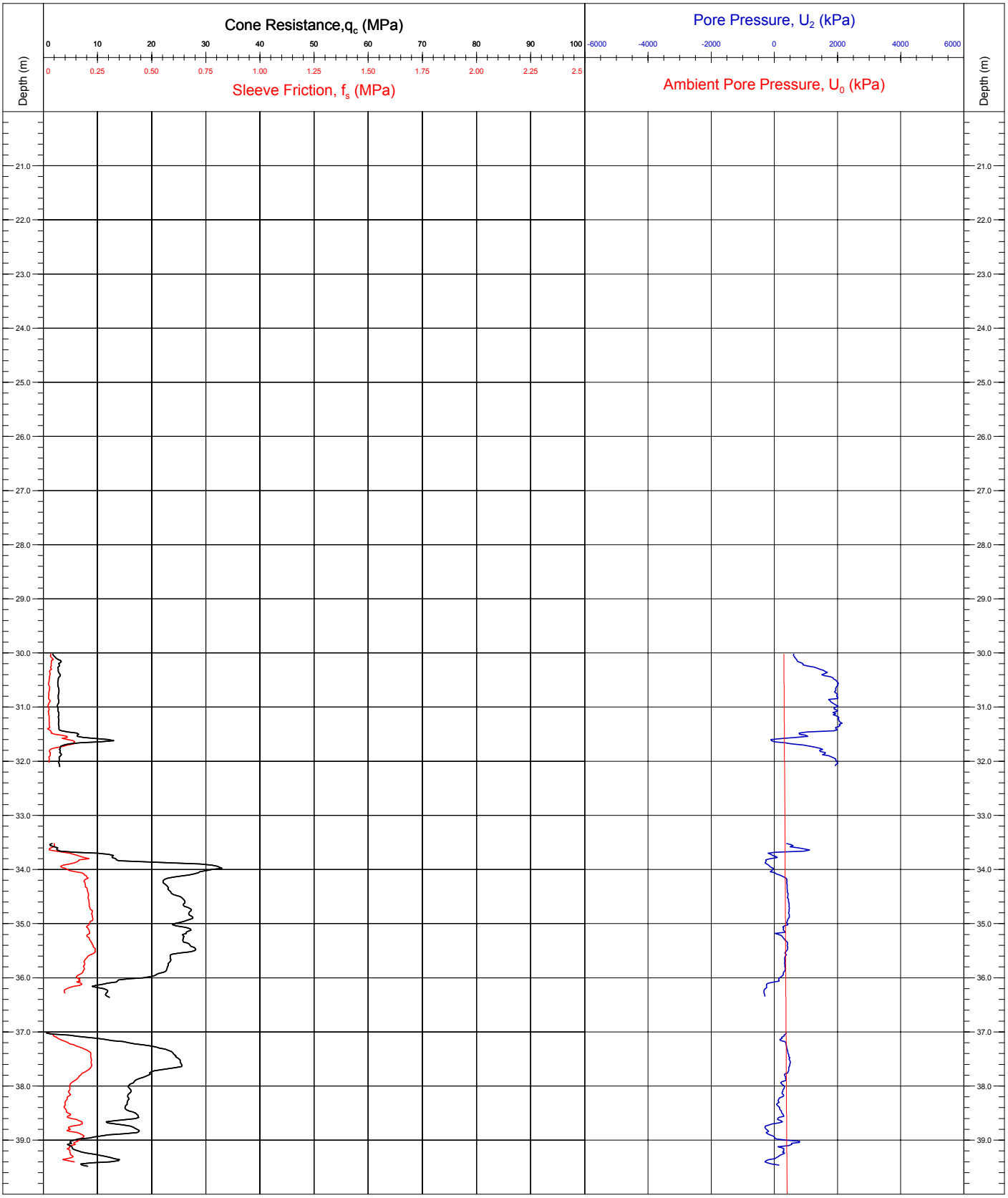
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - I21B**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (24/06/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

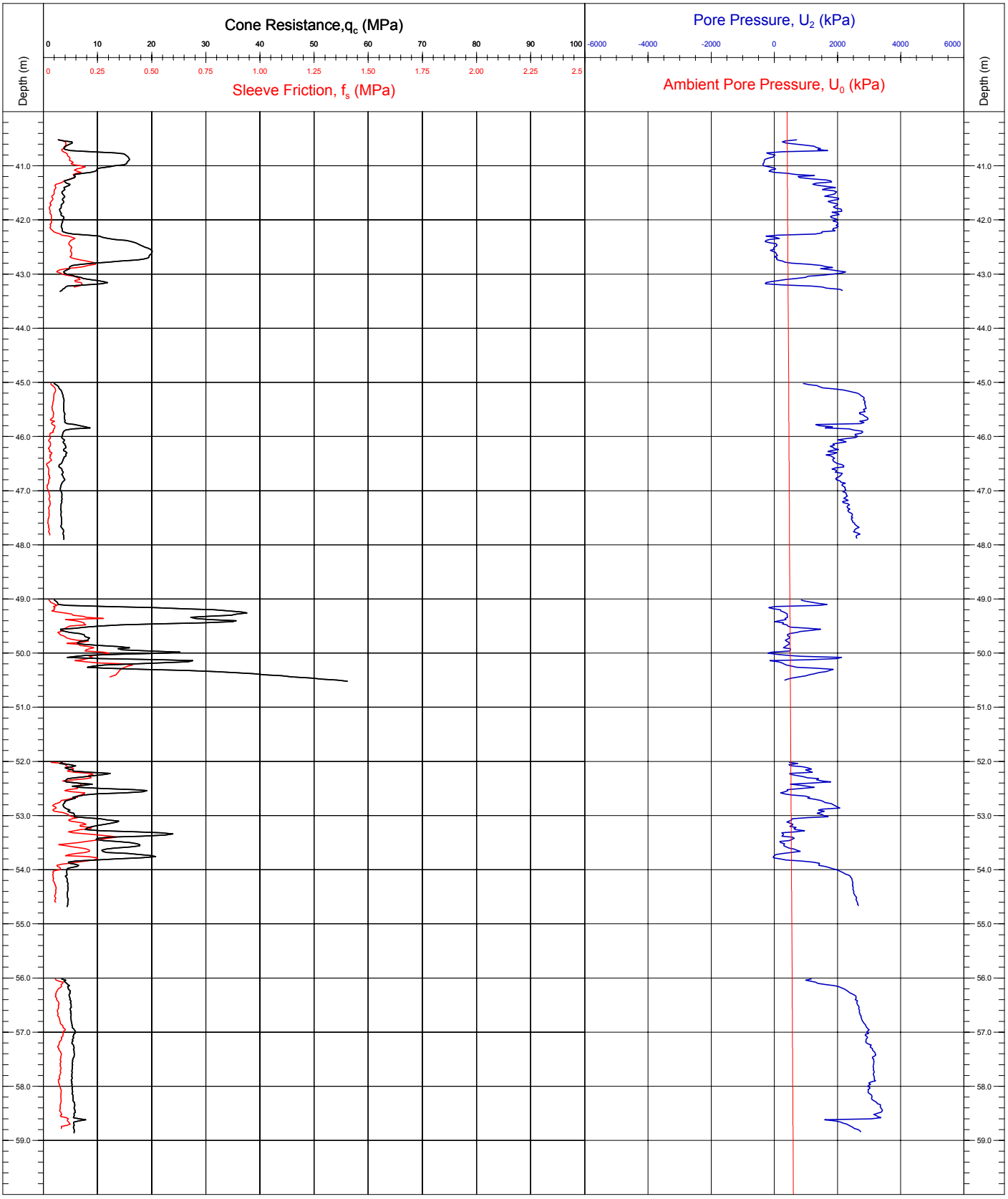
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E**	**4235906.0N**	CPT Number
Contract	**10451**	Latitude/ Longitude			**BH - I21B**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		Page: 2/4
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (24/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

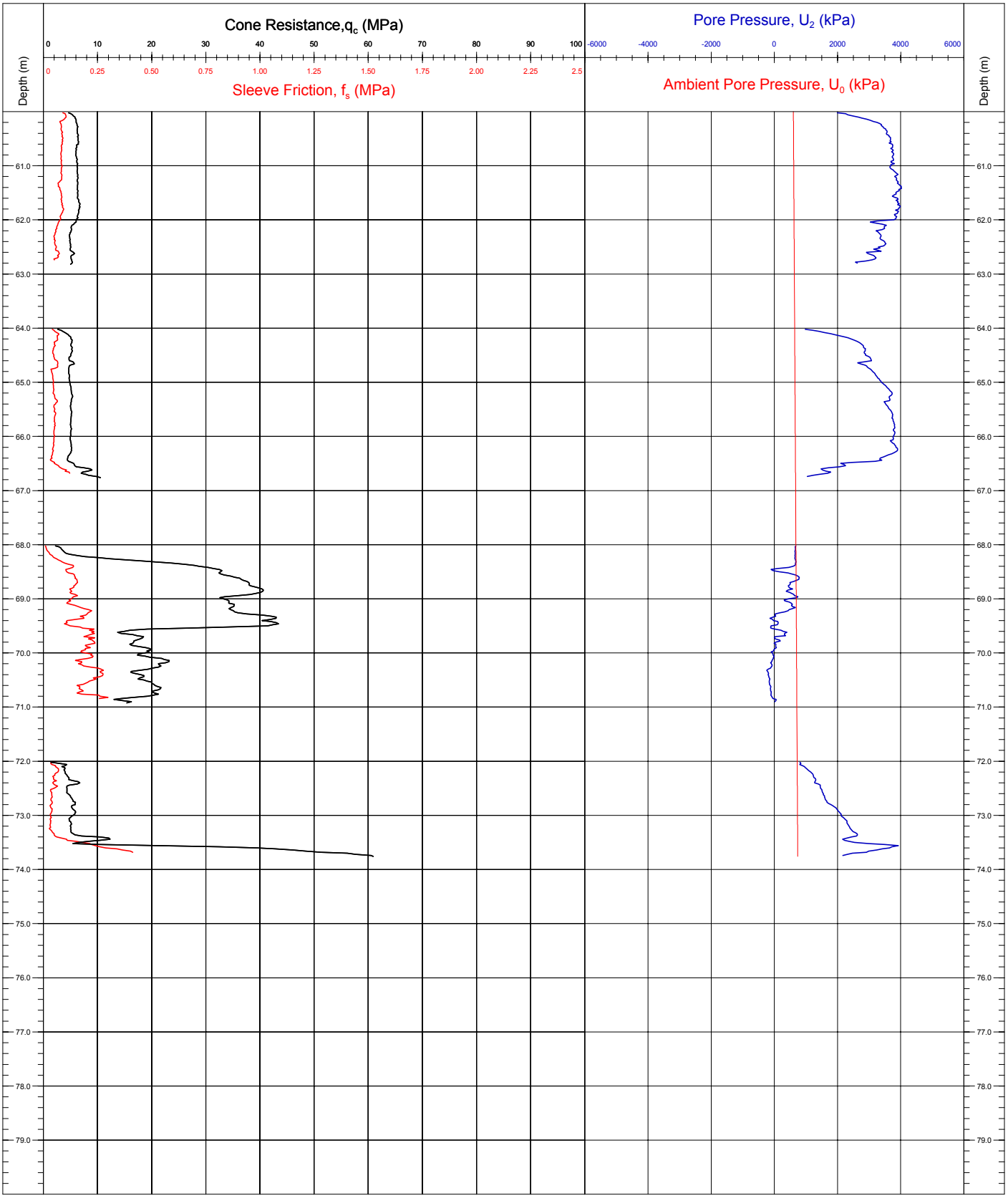
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	**BH - I21B**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (24/06/2015)	Draft: **JG** (14/12/2014)
		CRS **GRS 80 UTM ZONE 18 N (75 W)**		Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

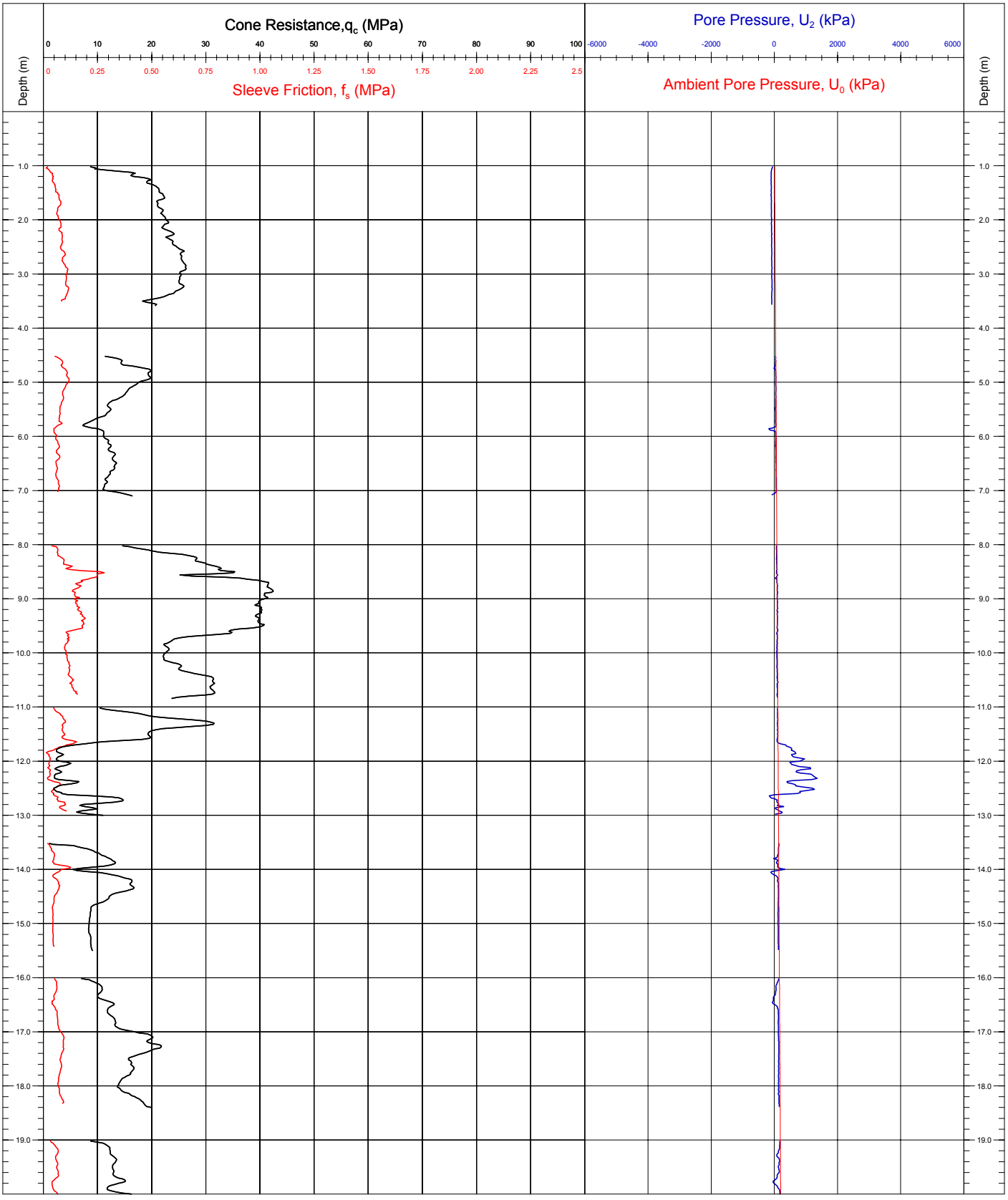
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E**	**4235906.0N**	CPT Number **BH - I21B**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		Page: 4/4
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		QC Status
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**		Preliminary: **X** (24/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		Base Inclination	**X = 0.0° / Y = 0.0°**		
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

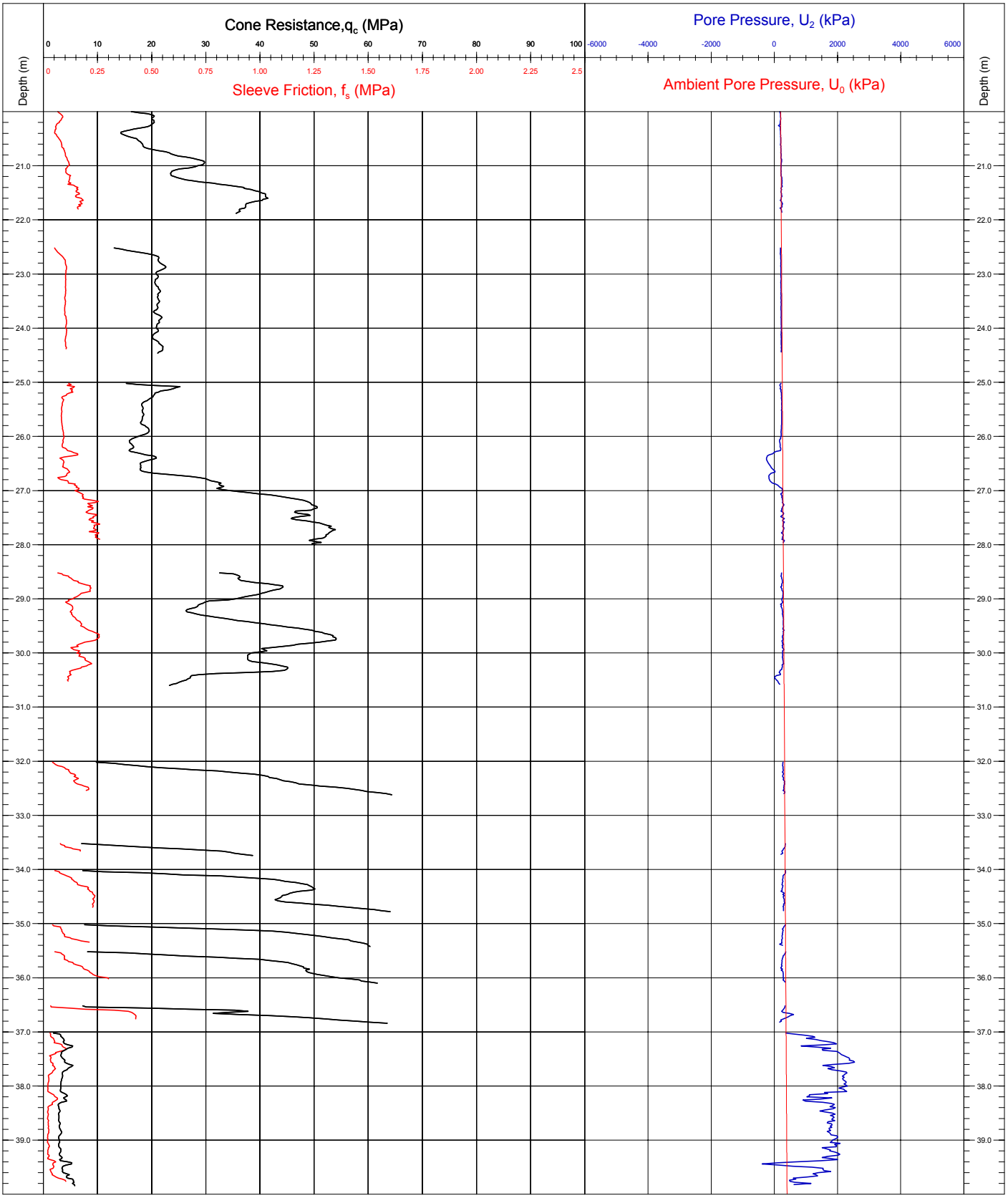
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

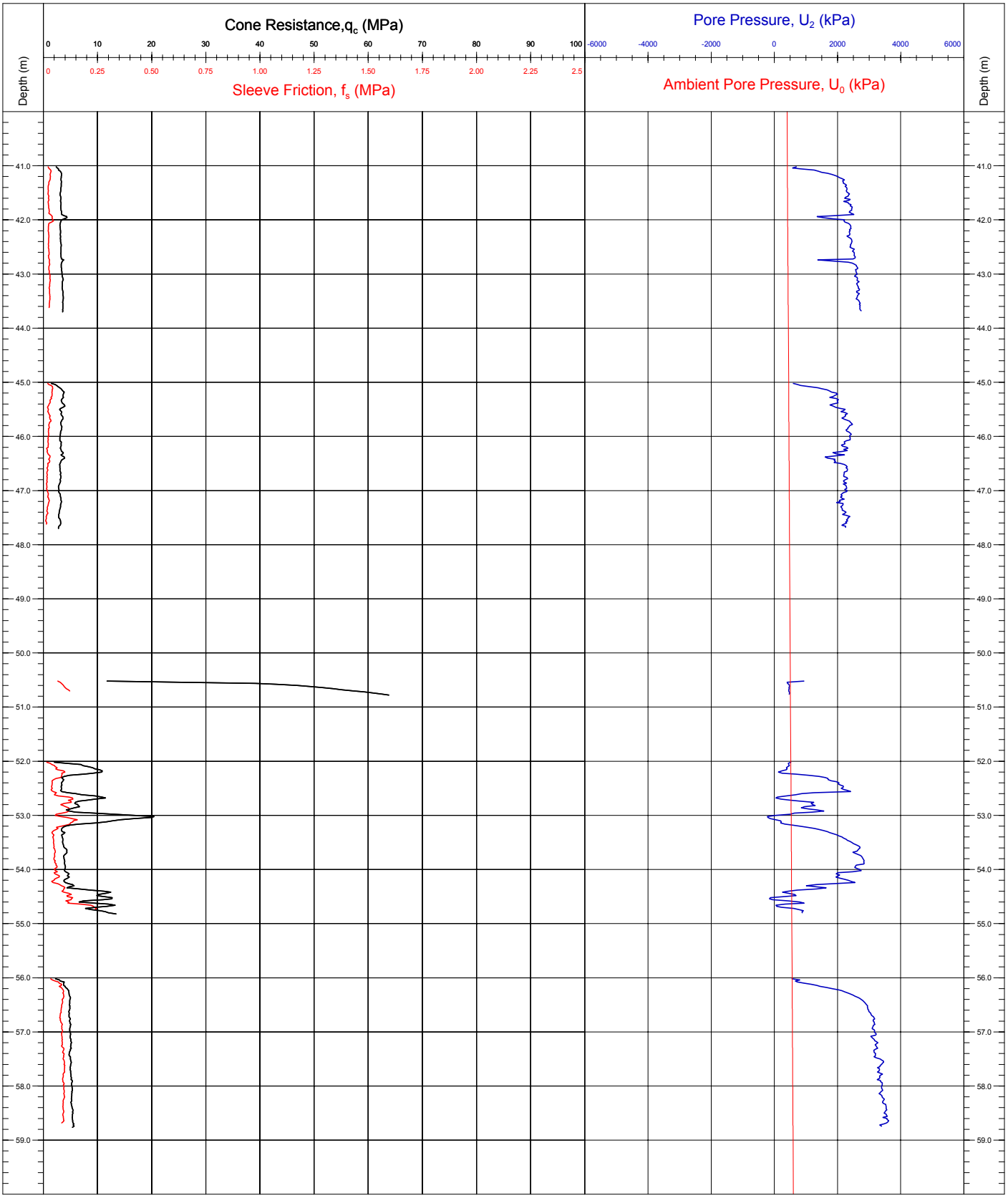
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

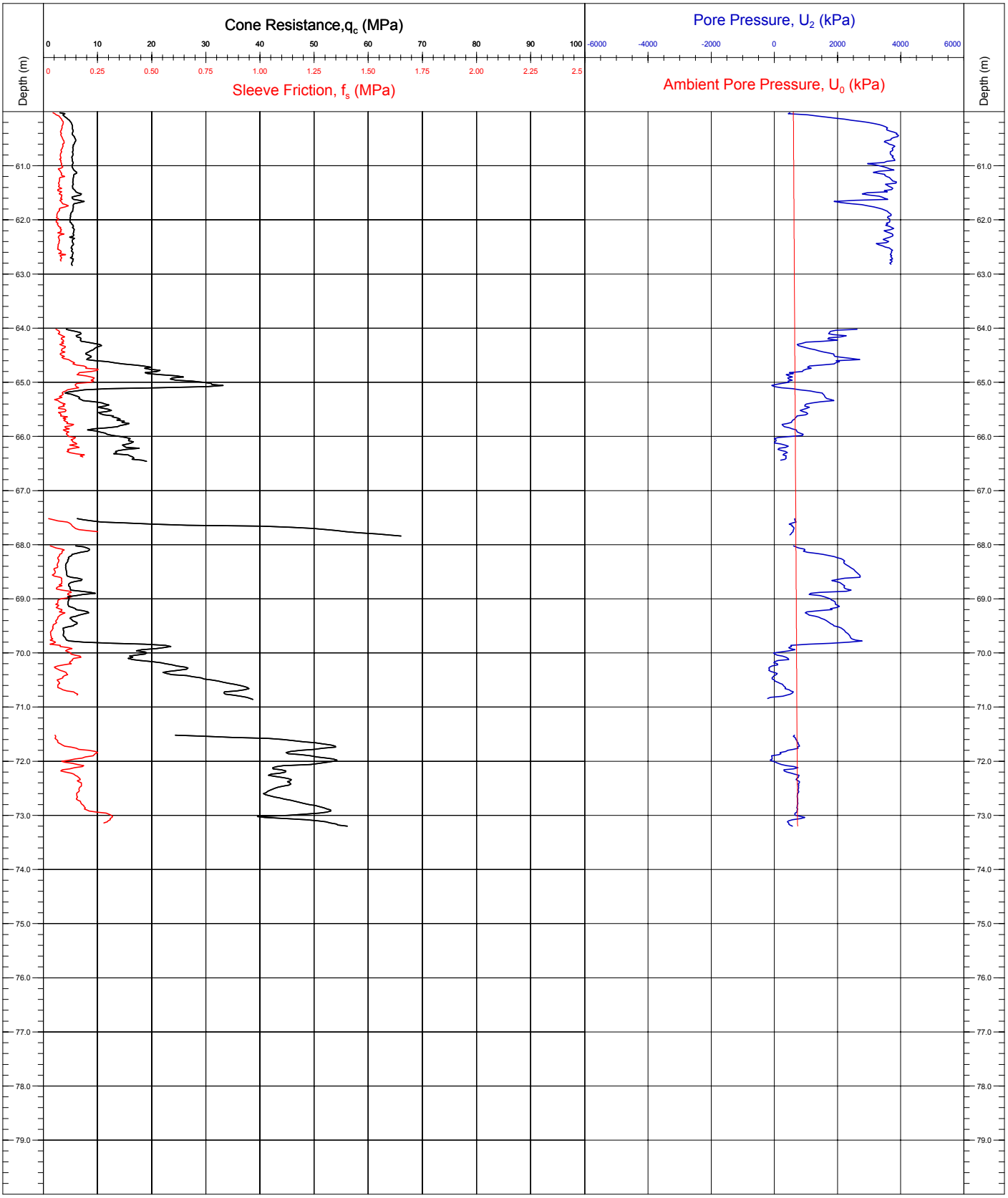
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

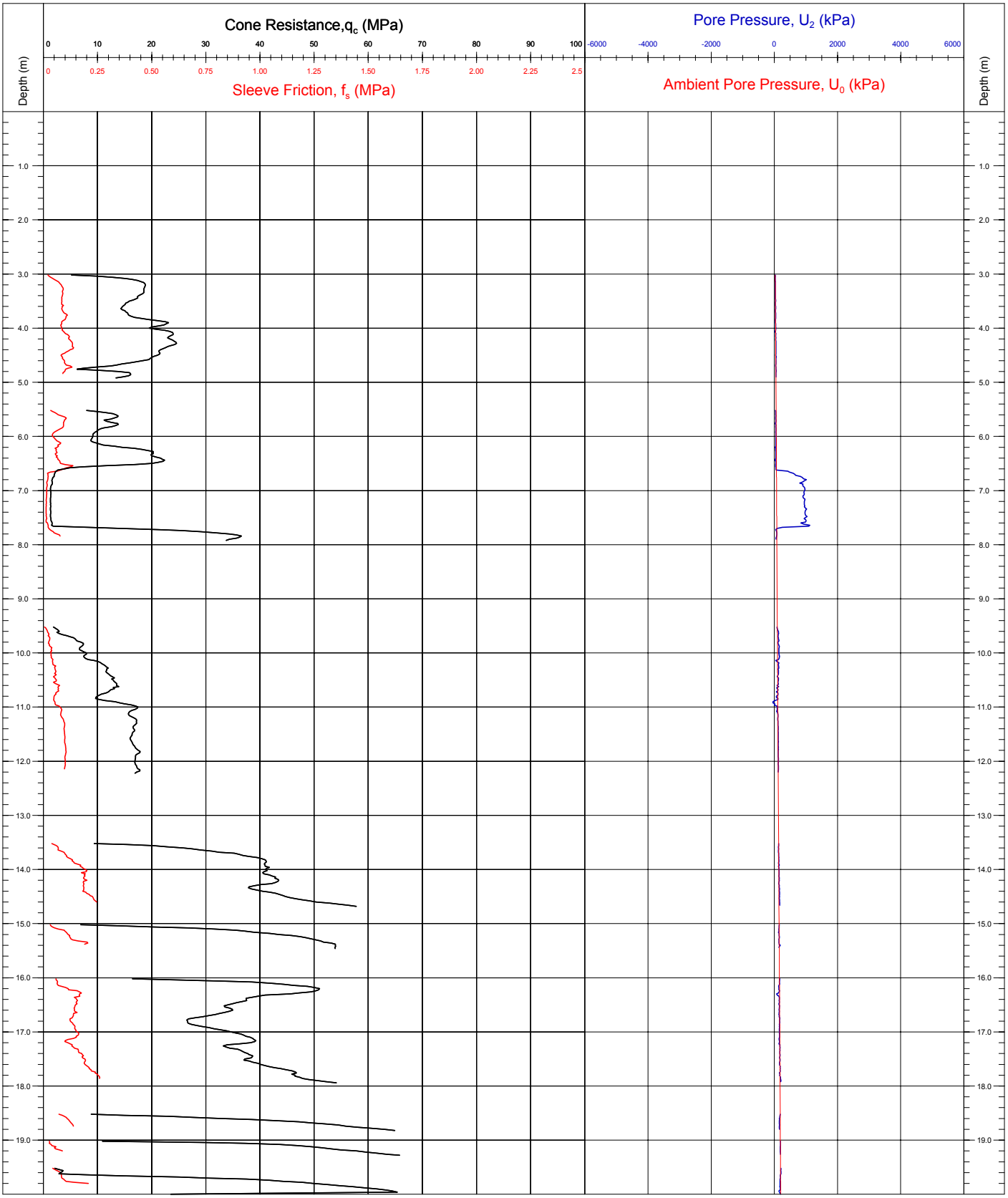
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

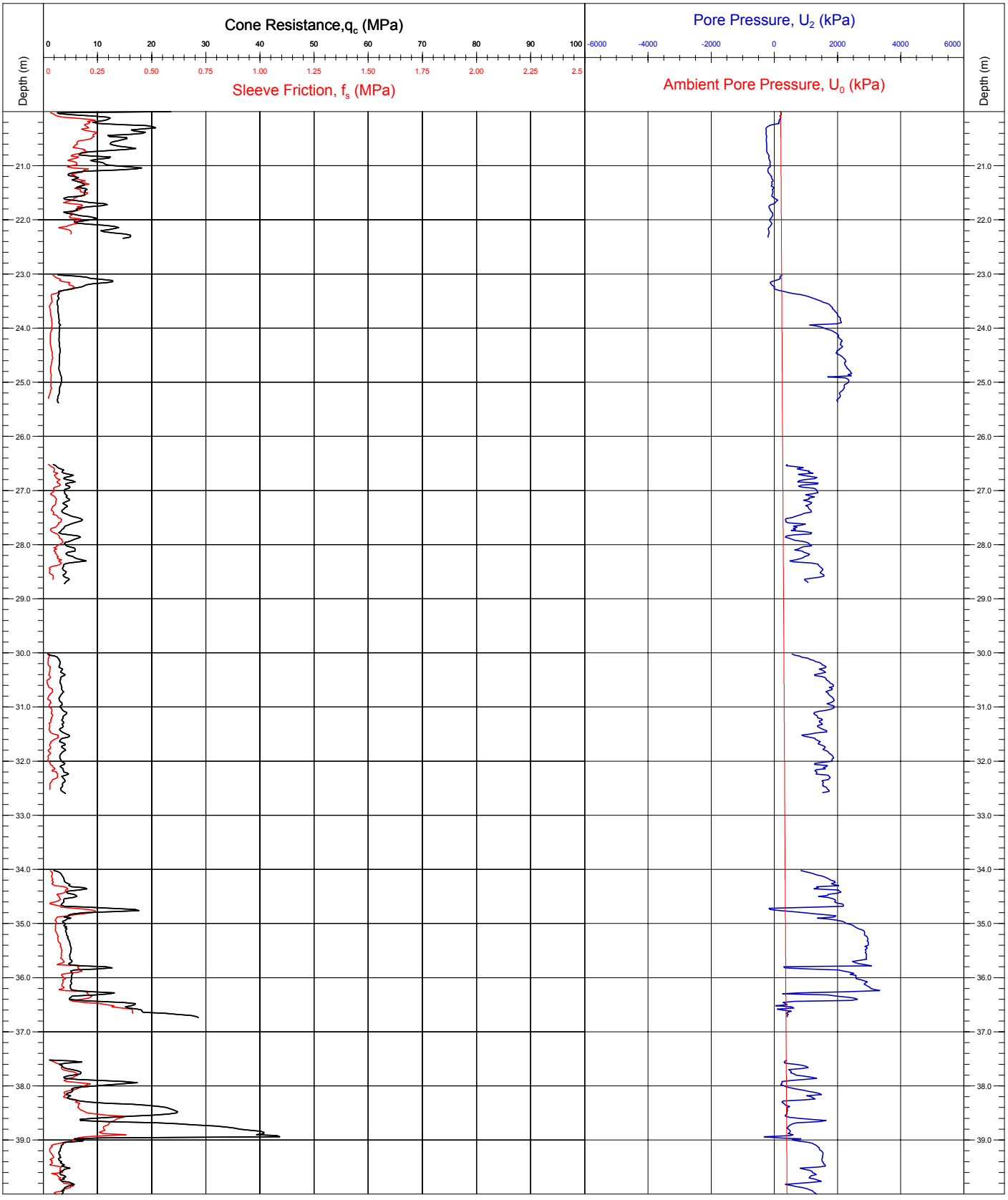
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)** / Draft: **JG (14/12/2014)** / Final: **()**	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

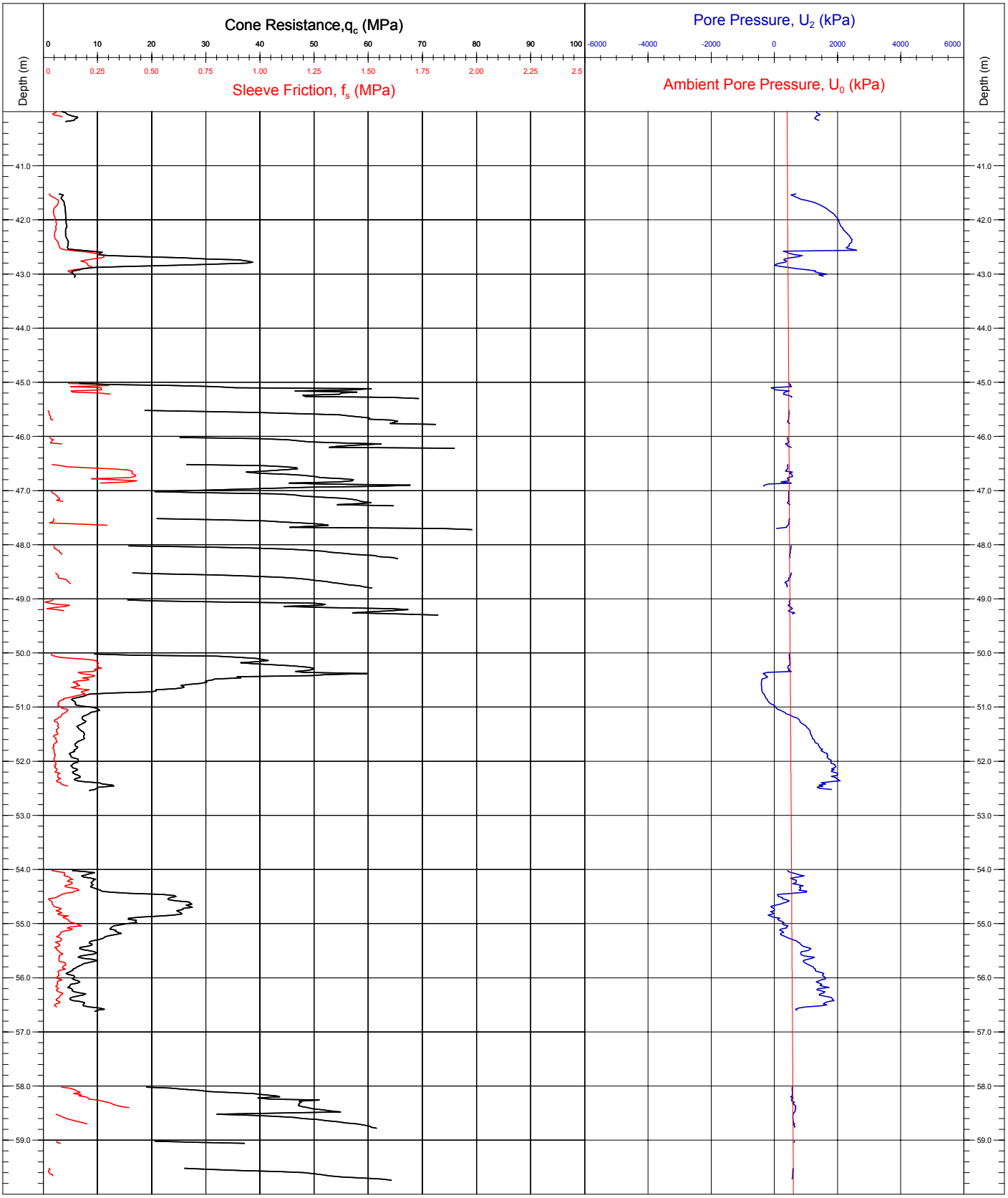
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)** / Draft: **JG (14/12/2014)** / Final: **()**	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

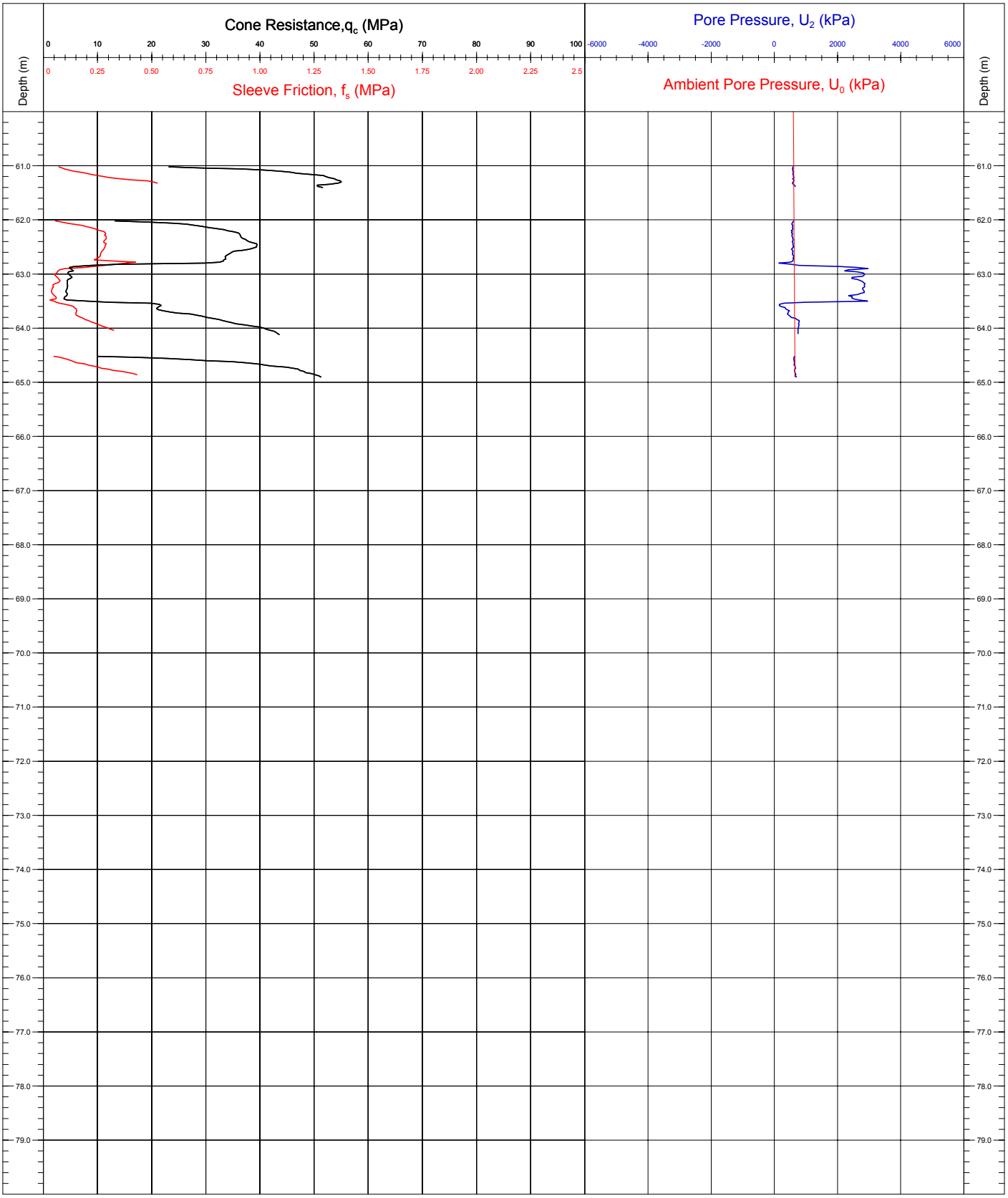
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)** / Draft: **JG (14/12/2014)** / Final: **()**	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

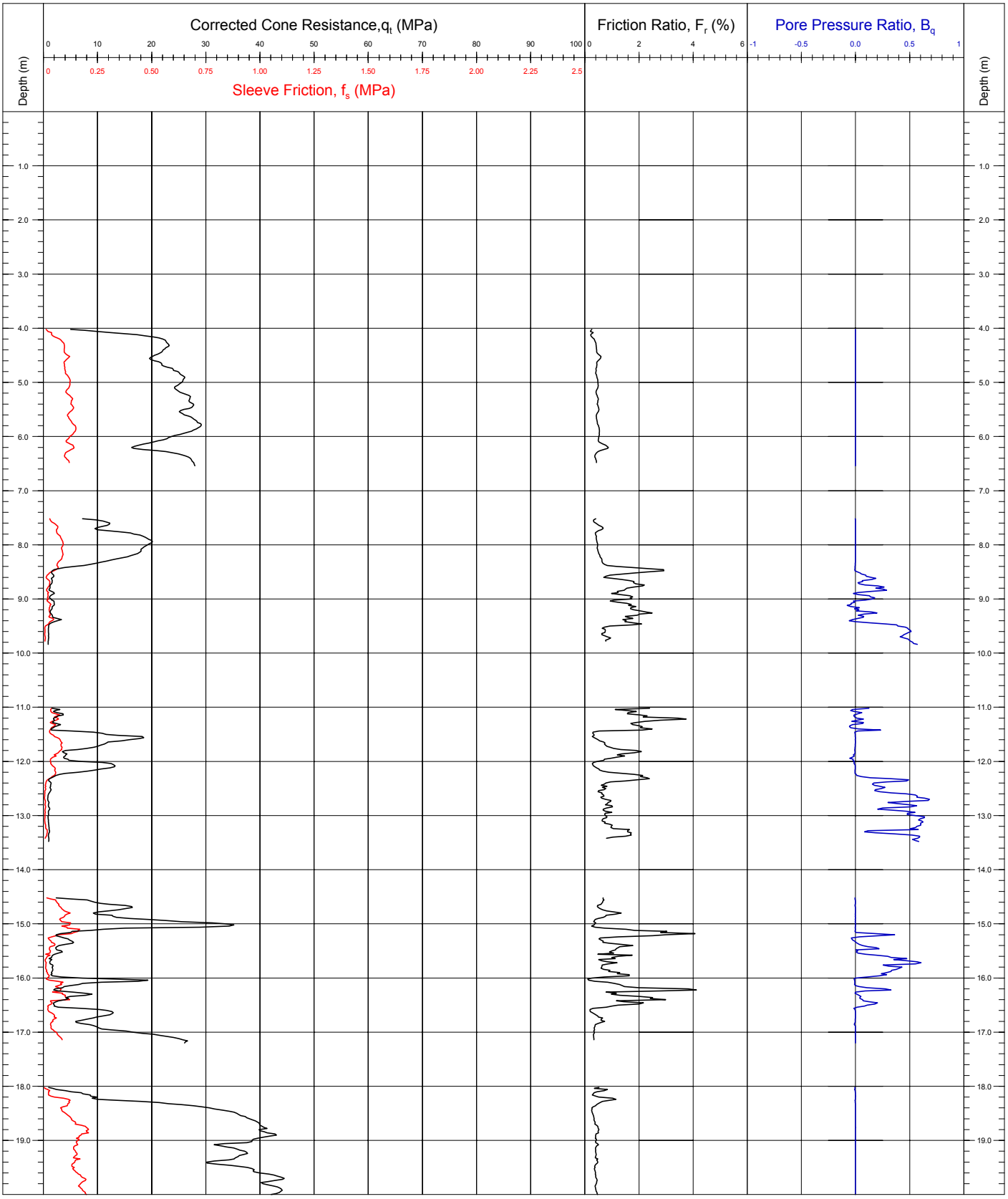
IN SITU CPTU TESTING - MEASURED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (25/06/2015)	Draft: **JG** (14/12/2014) Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

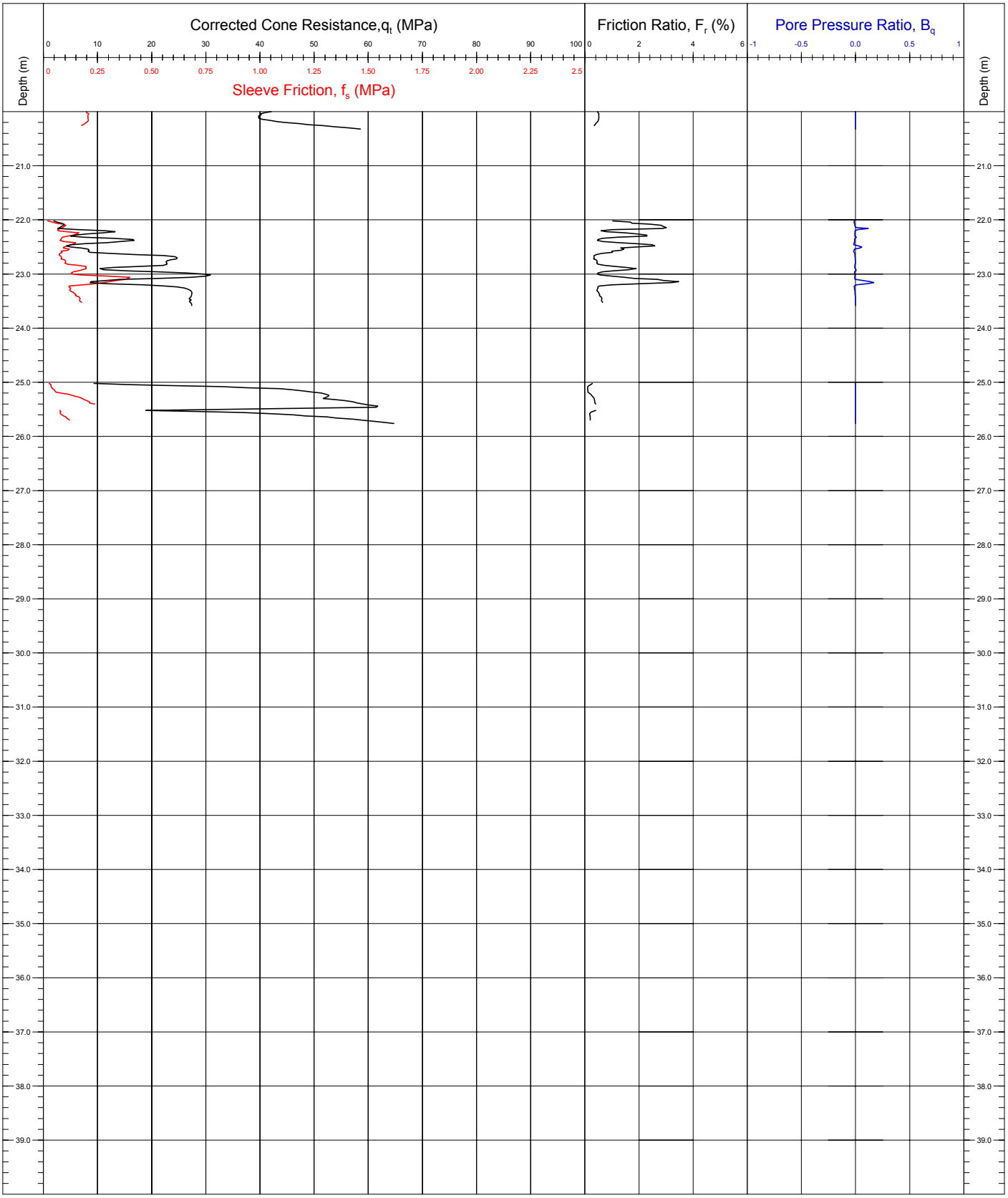
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.0E**	**4243606.0N**	CPT Number **BH - D14**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**		Page: 1/2
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.83**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **SH** (28/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

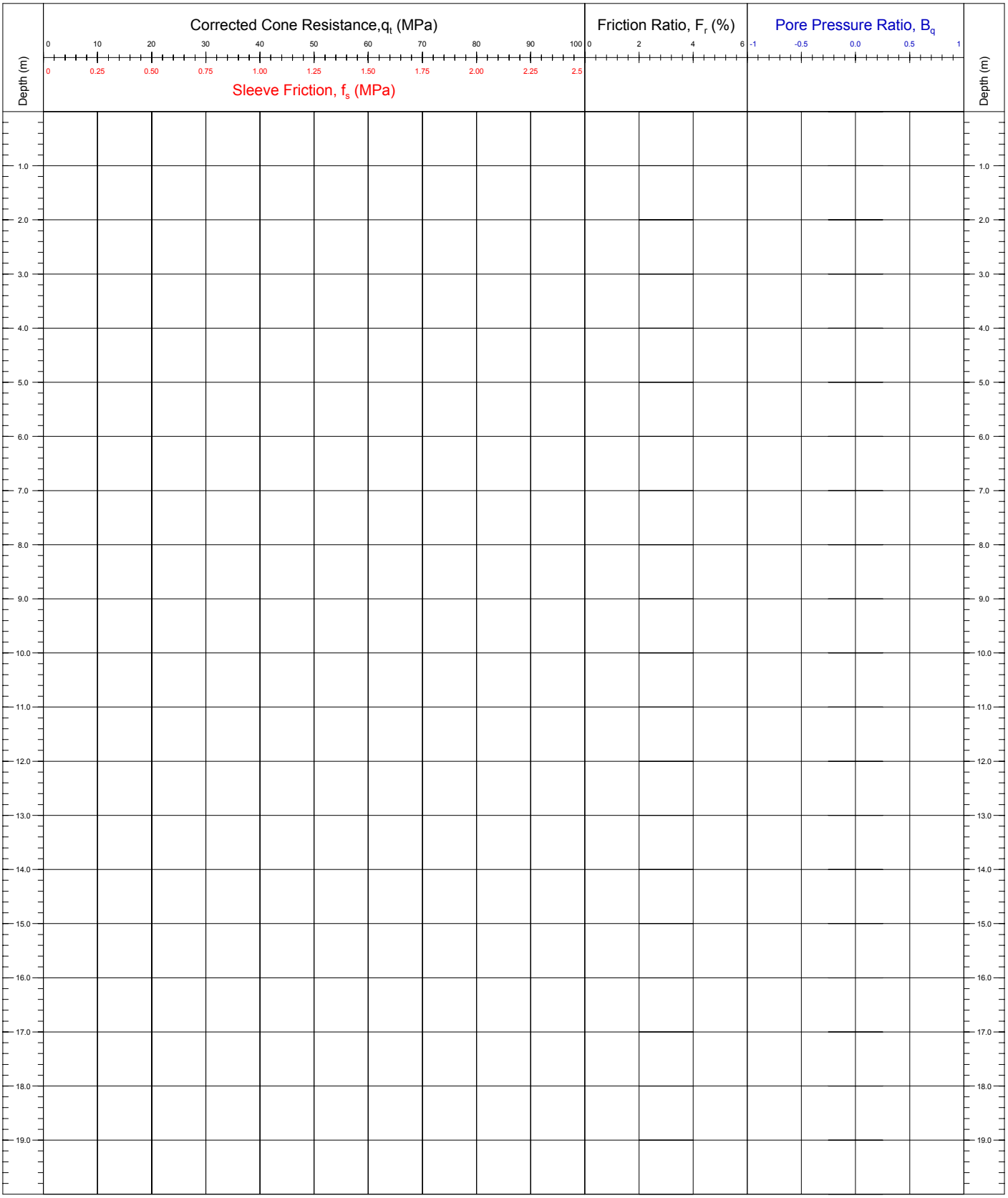
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.0E 4243606.0N**	CPT Number	**BH - D14**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**28/06/2015**	Page: 2/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.83**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH (28/06/2015)**	Draft: **JG (14/12/2014)** Final: **()**
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

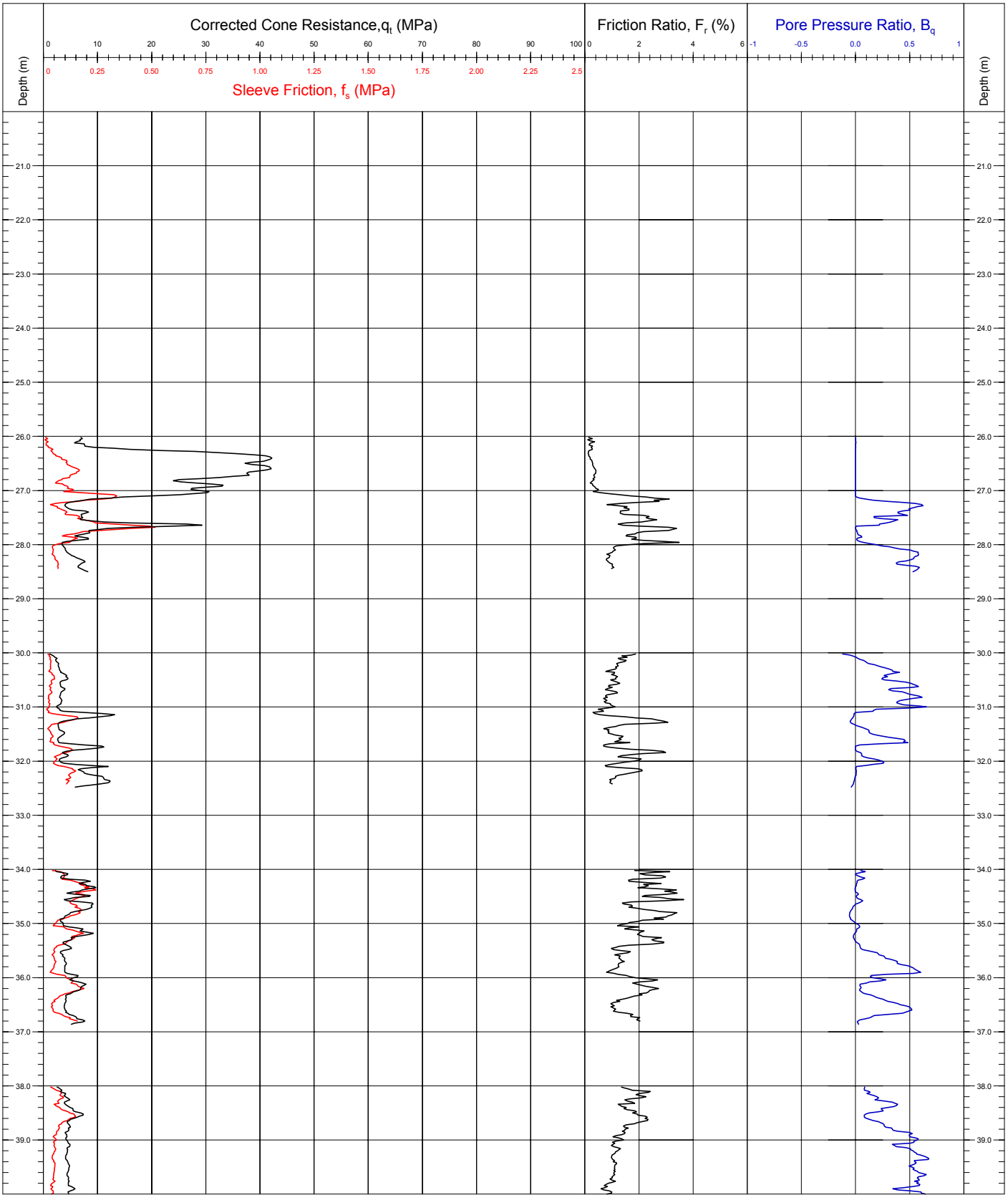
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CPT Number	**BH - D14A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (30/06/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

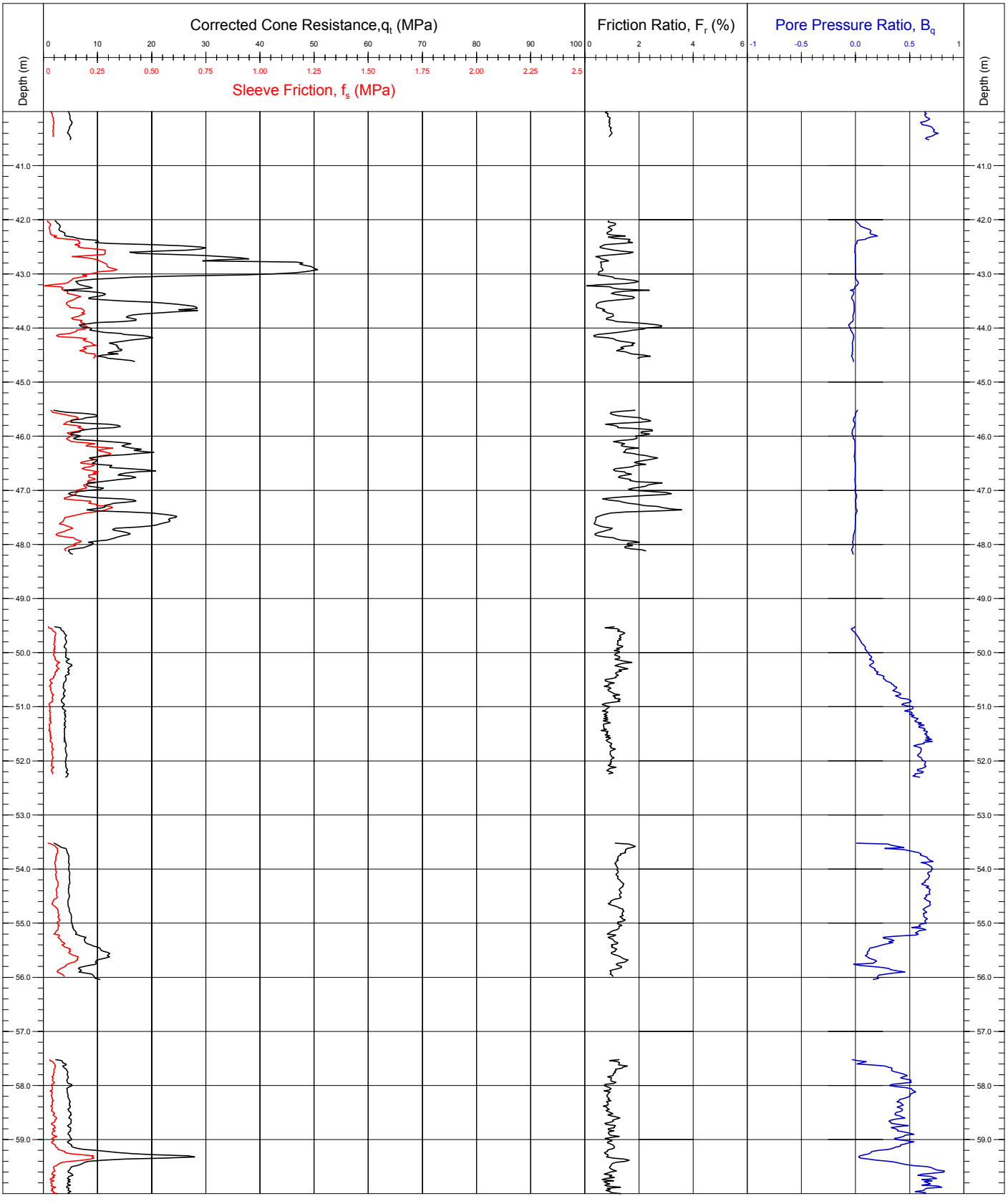
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E**	**4243612.0N**	CPT Number
Contract	**10451**	Latitude/ Longitude			**BH - D14A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		Page: 2/4
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (30/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

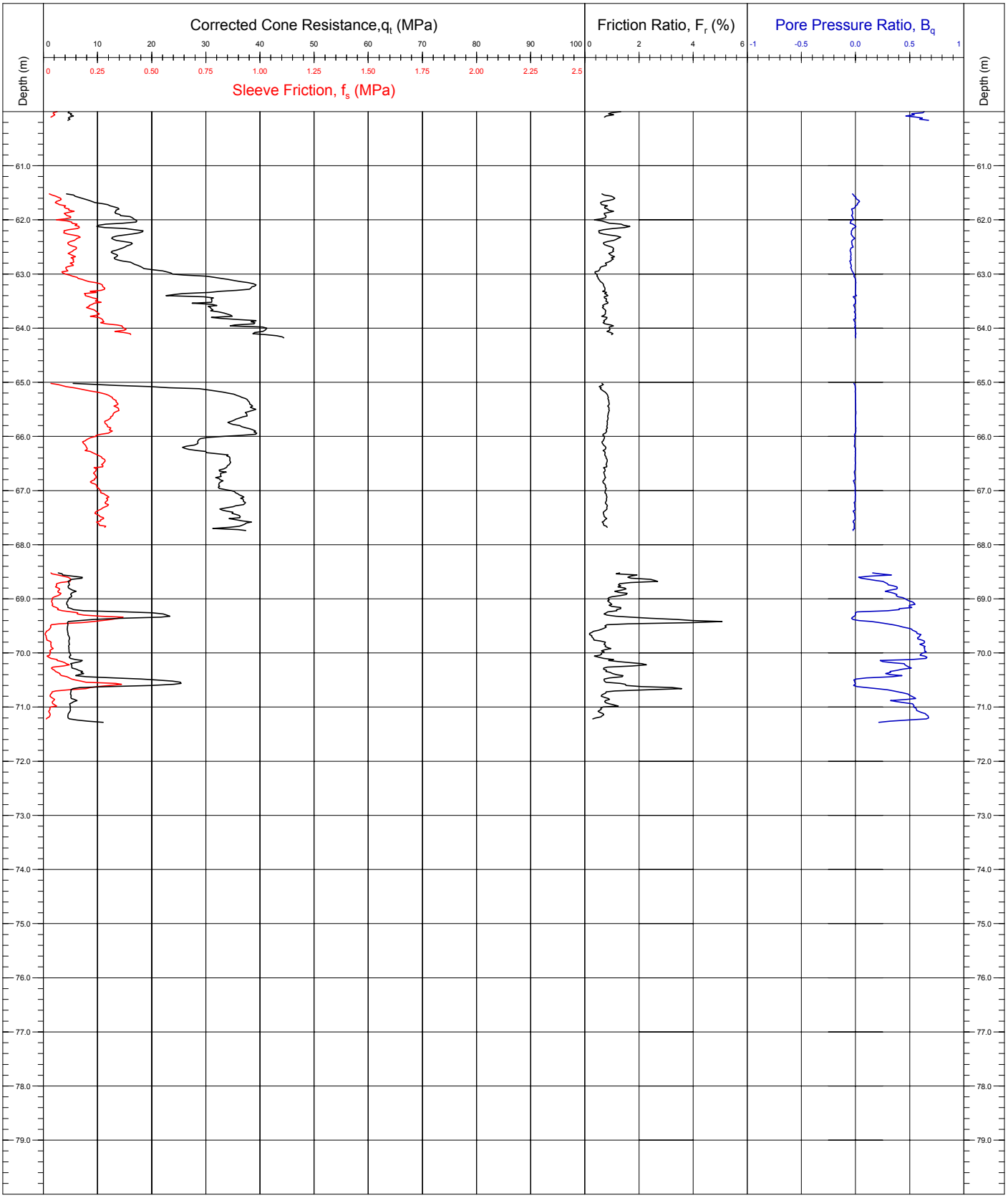
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CPT Number	**BH - D14A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (30/06/2015) / Draft: **JG** (14/12/2014) / Final: **()**	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

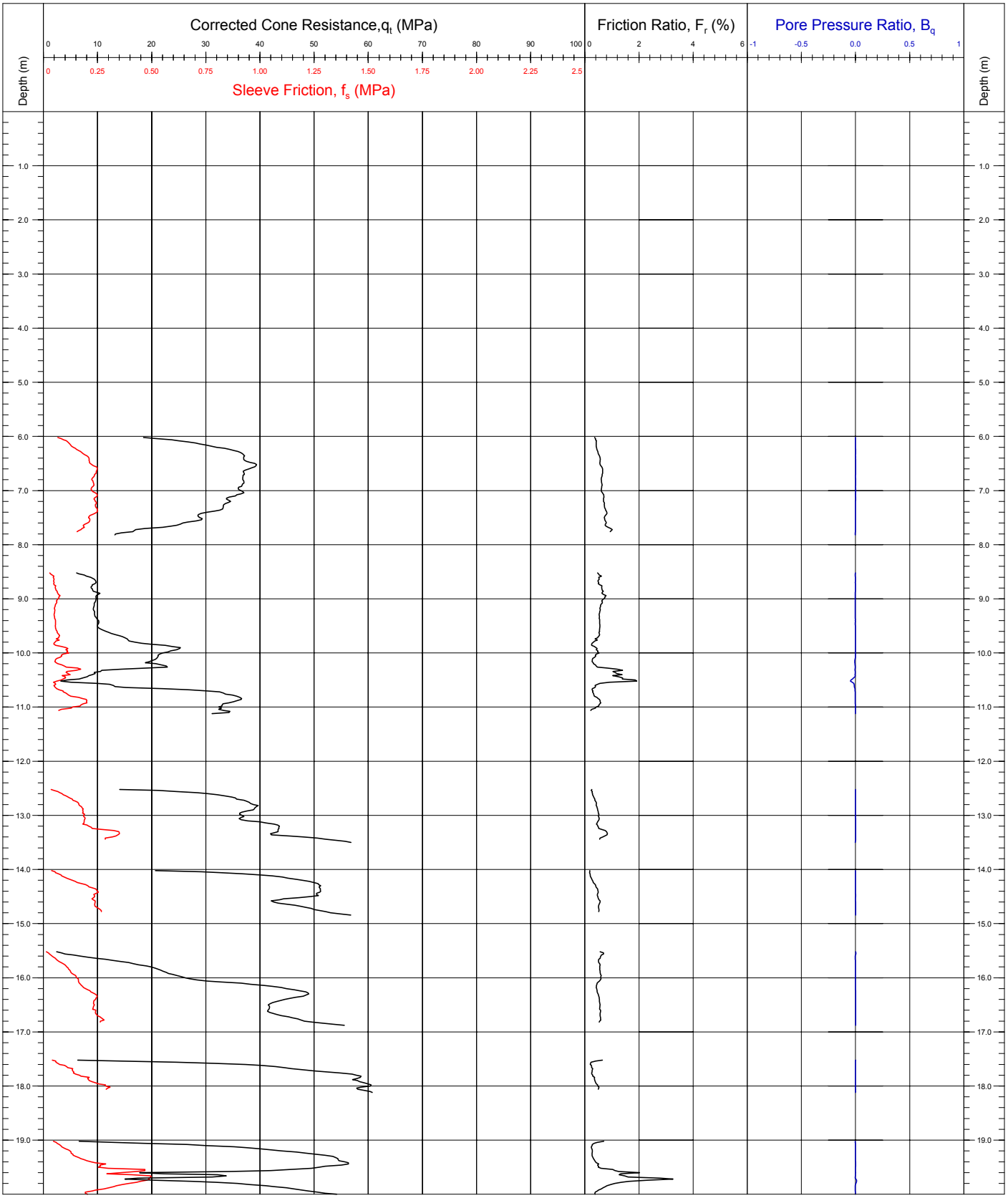
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**515755.1E**	**4243612.0N**	CPT Number
Contract	**10451**	Latitude/ Longitude			**BH - D14A**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**19.1**		
Vessel	**MV Ocean Discovery**	Date of Test	**30/06/2015**		Page: 4/4
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (30/06/2015) / Draft: **JG** (14/12/2014) / Final: **()**
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

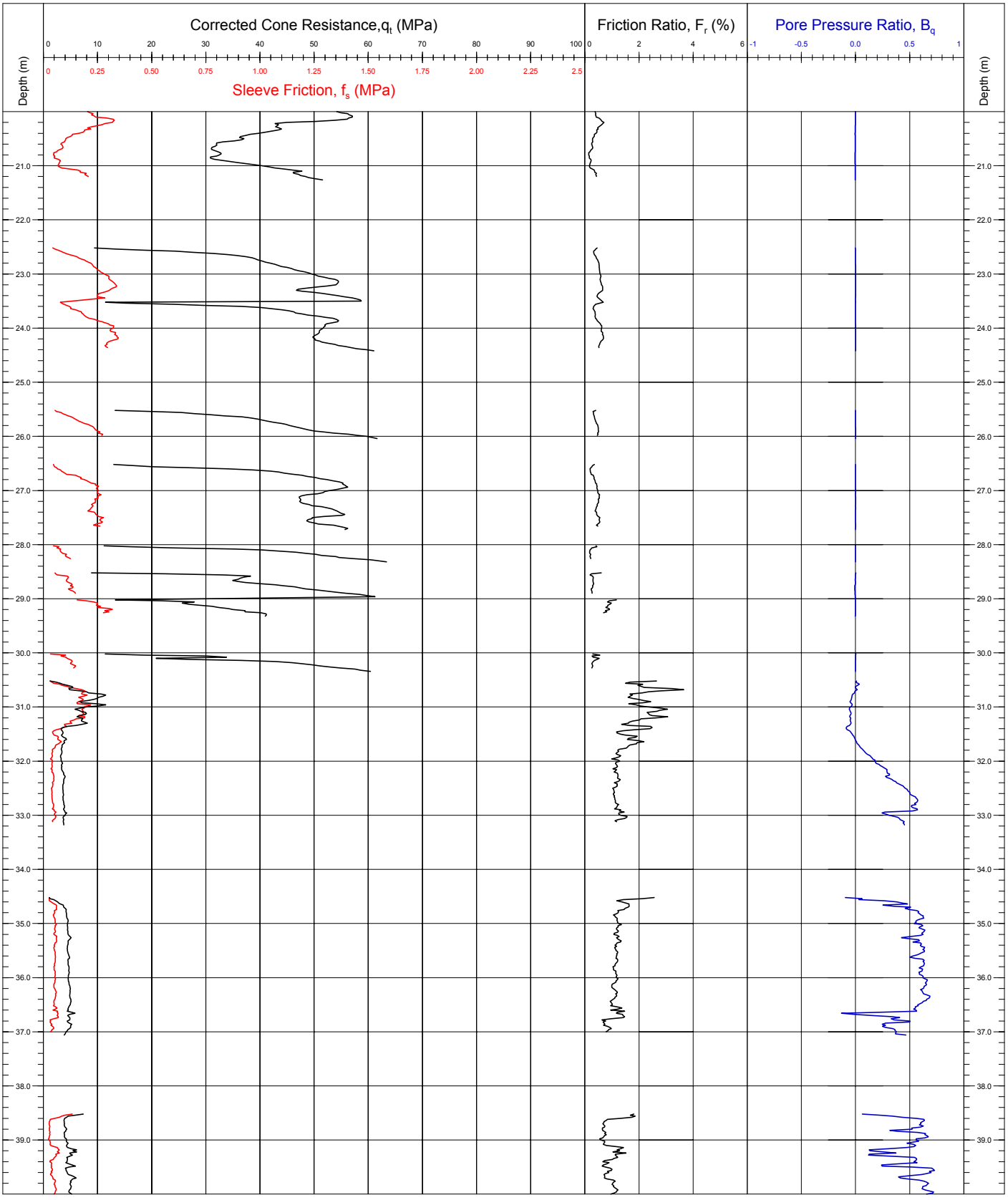
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E** **4240306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G17**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 1/3	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

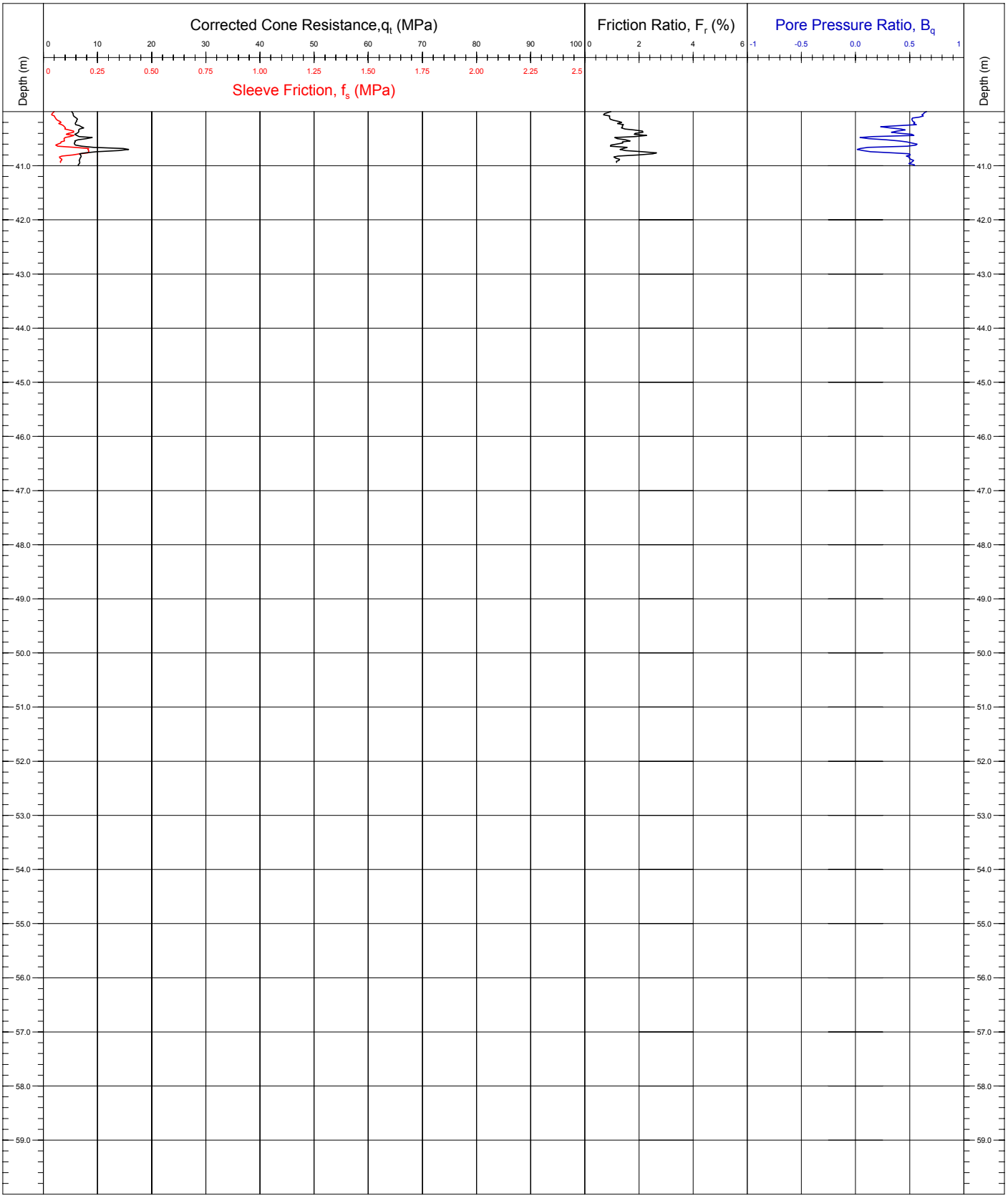
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - G17**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 2/3	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary / Draft / Final	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	() / () / ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

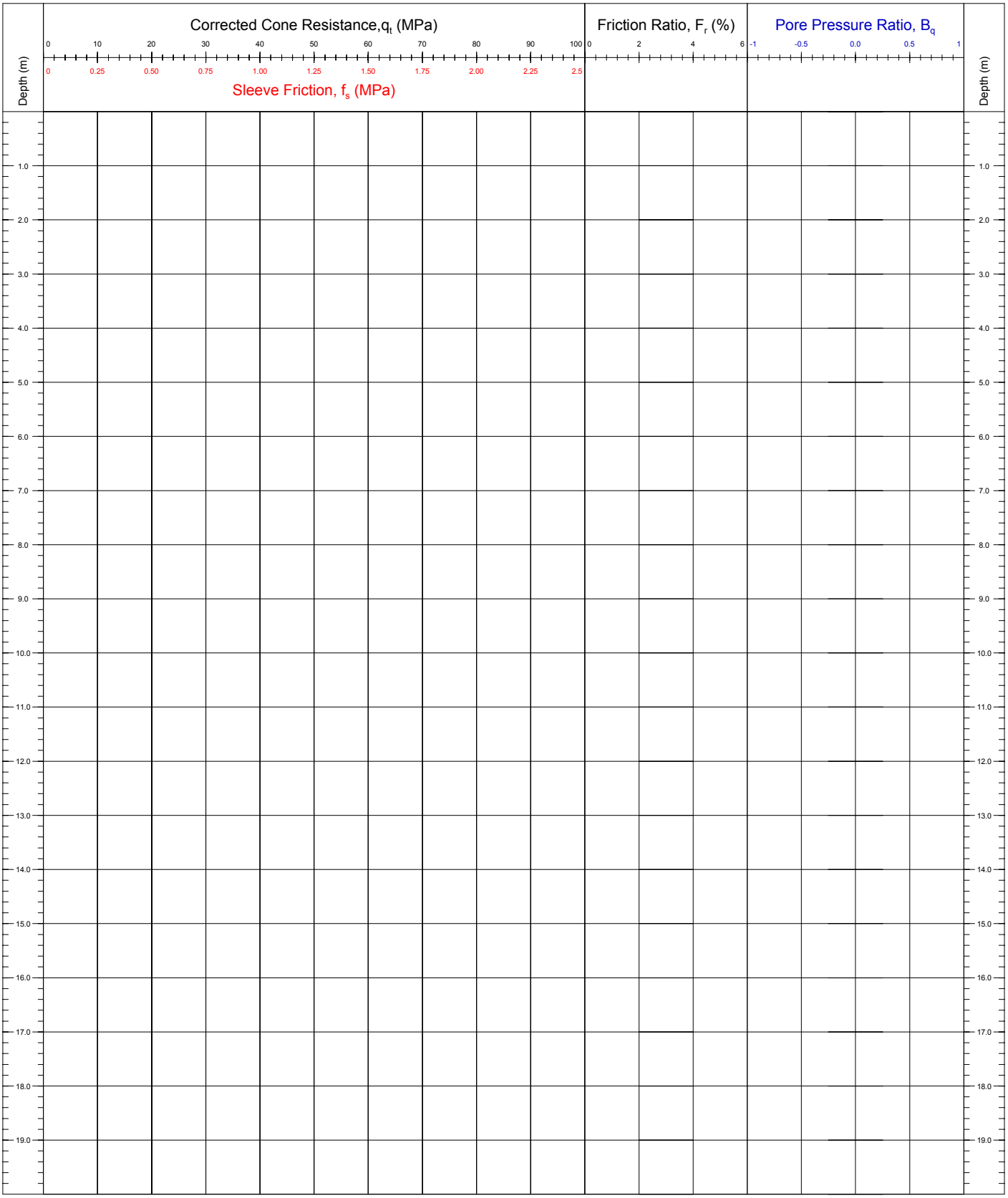
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4240306.0N**	CPT Number **BH - G17**
Contract	**10451**	Latitude/ Longitude		
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**	
Vessel	**MV Ocean Discovery**	Date of Test	**01/07/2015**	Page: 3/3
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

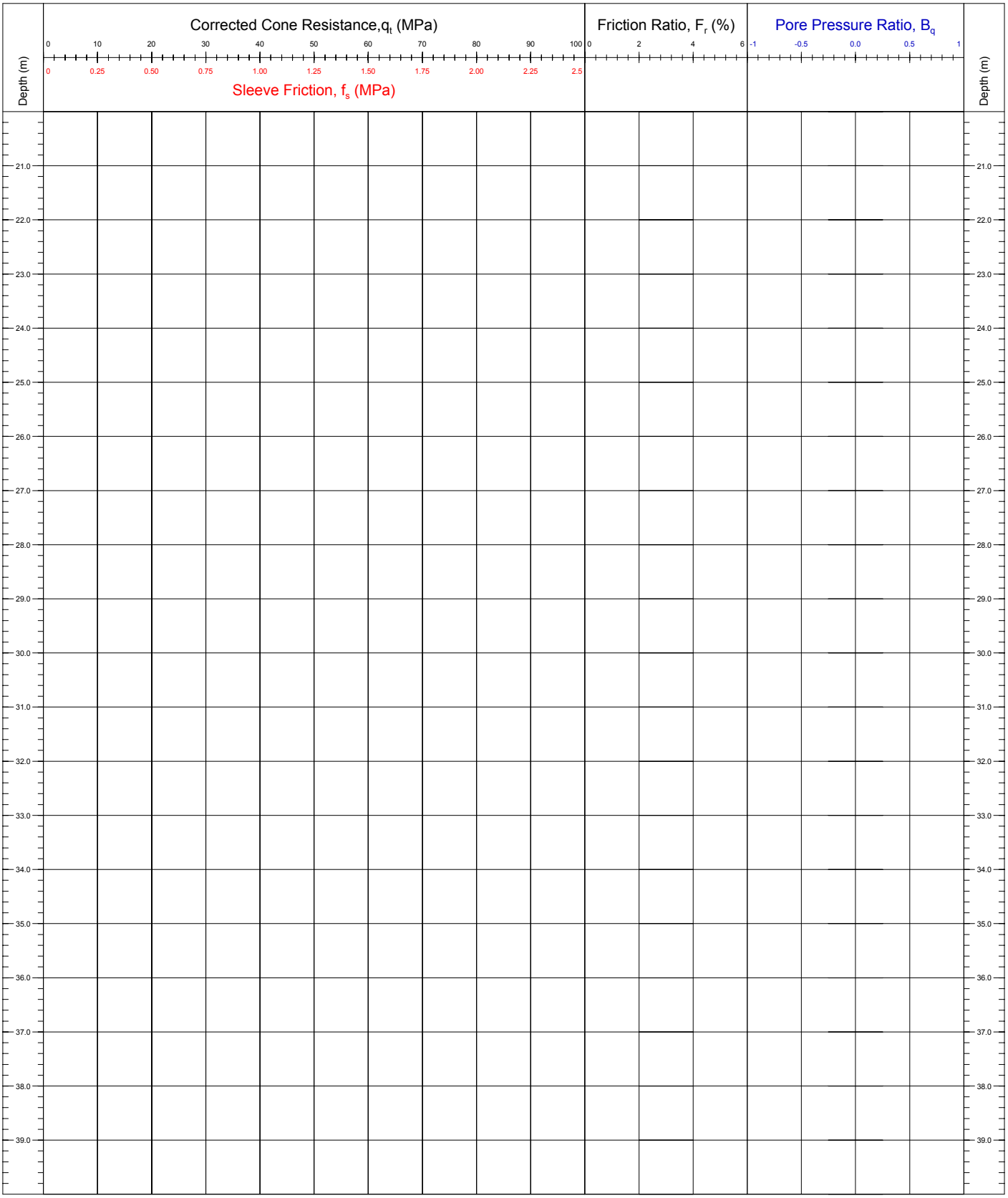
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 1/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

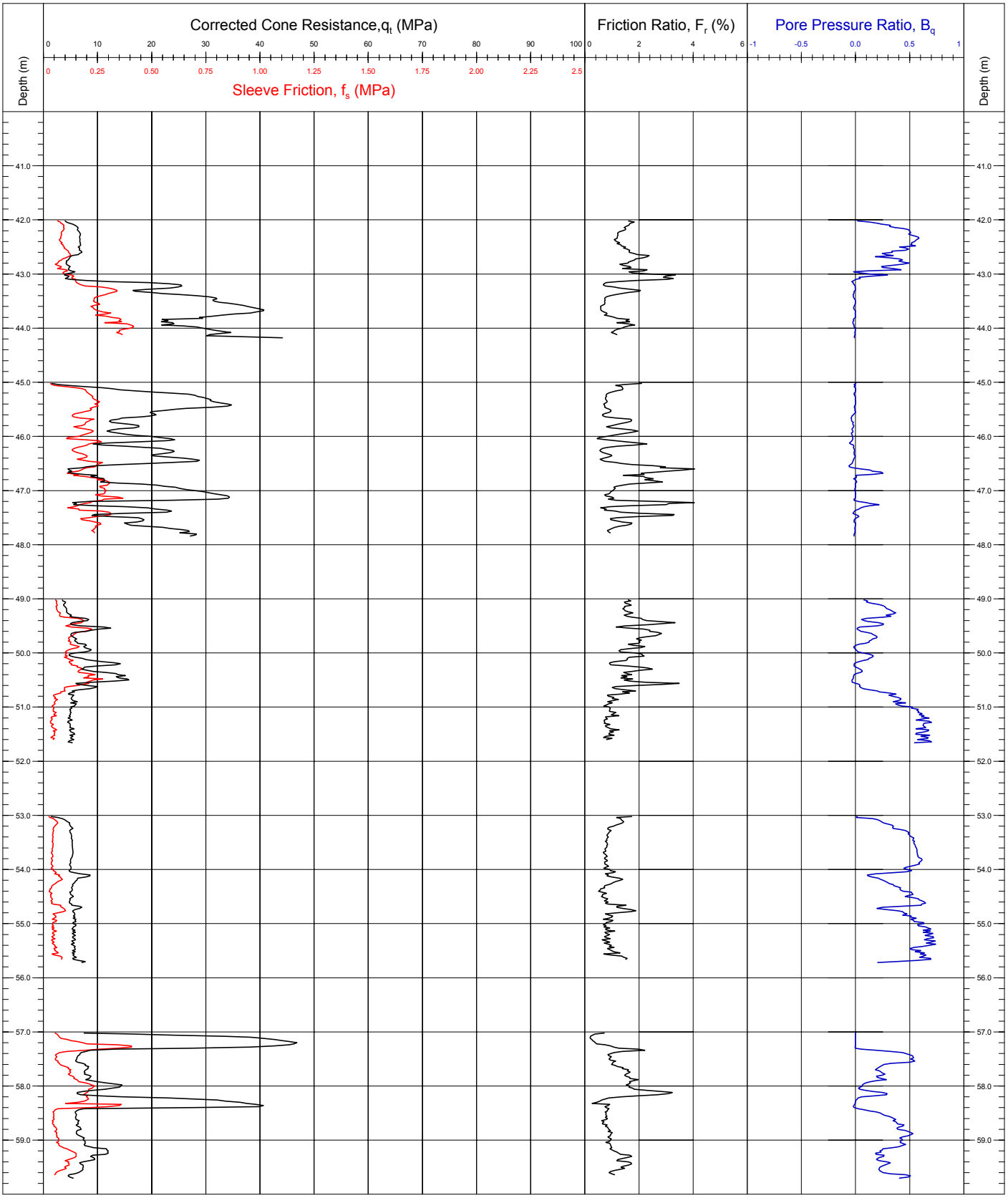
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 2/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

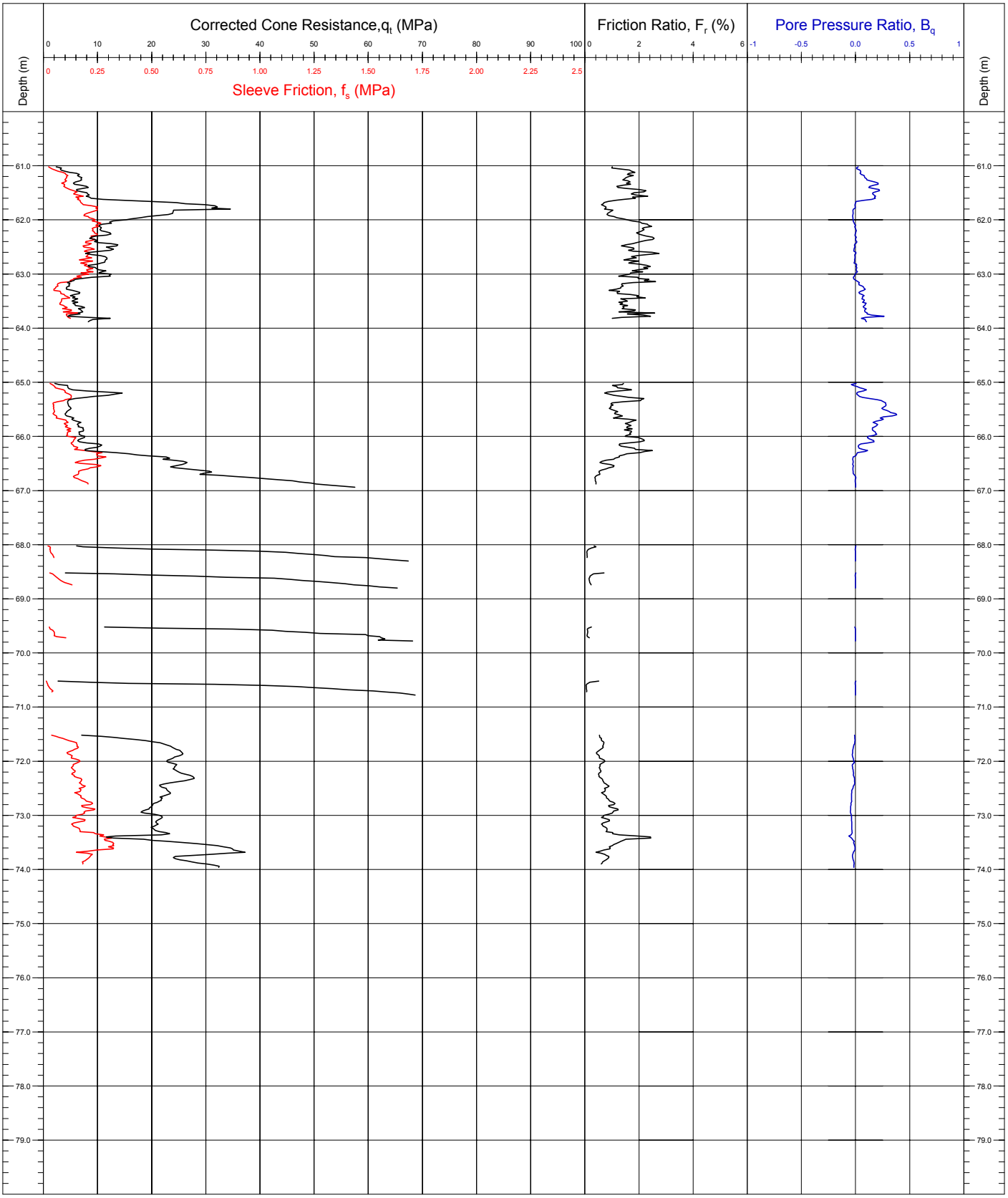
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 3/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary / Draft / Final	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	**NV-S** (03/07/2015) / **JG** (14/12/2014) / ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

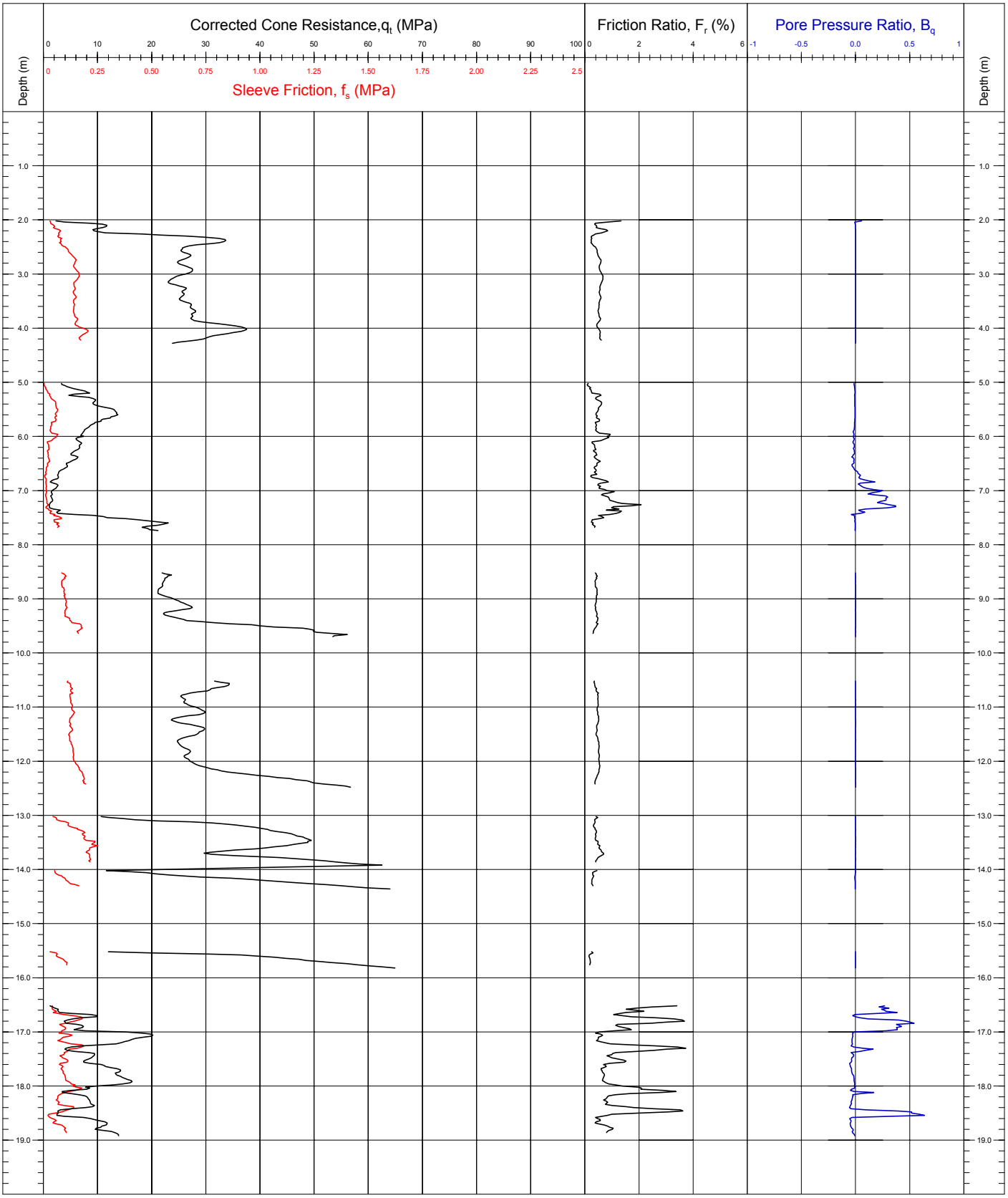
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Number	**BH - G17A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.9**		
Vessel	**MV Ocean Discovery**	Date of Test	**02/07/2015**	Page: 4/4	
Comments: BH-G17 abandoned at 41.02m due to weather. Location details are taken from BH-G17A.		Cone No.(type)/α Factor	**100904G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **NV-S** (03/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

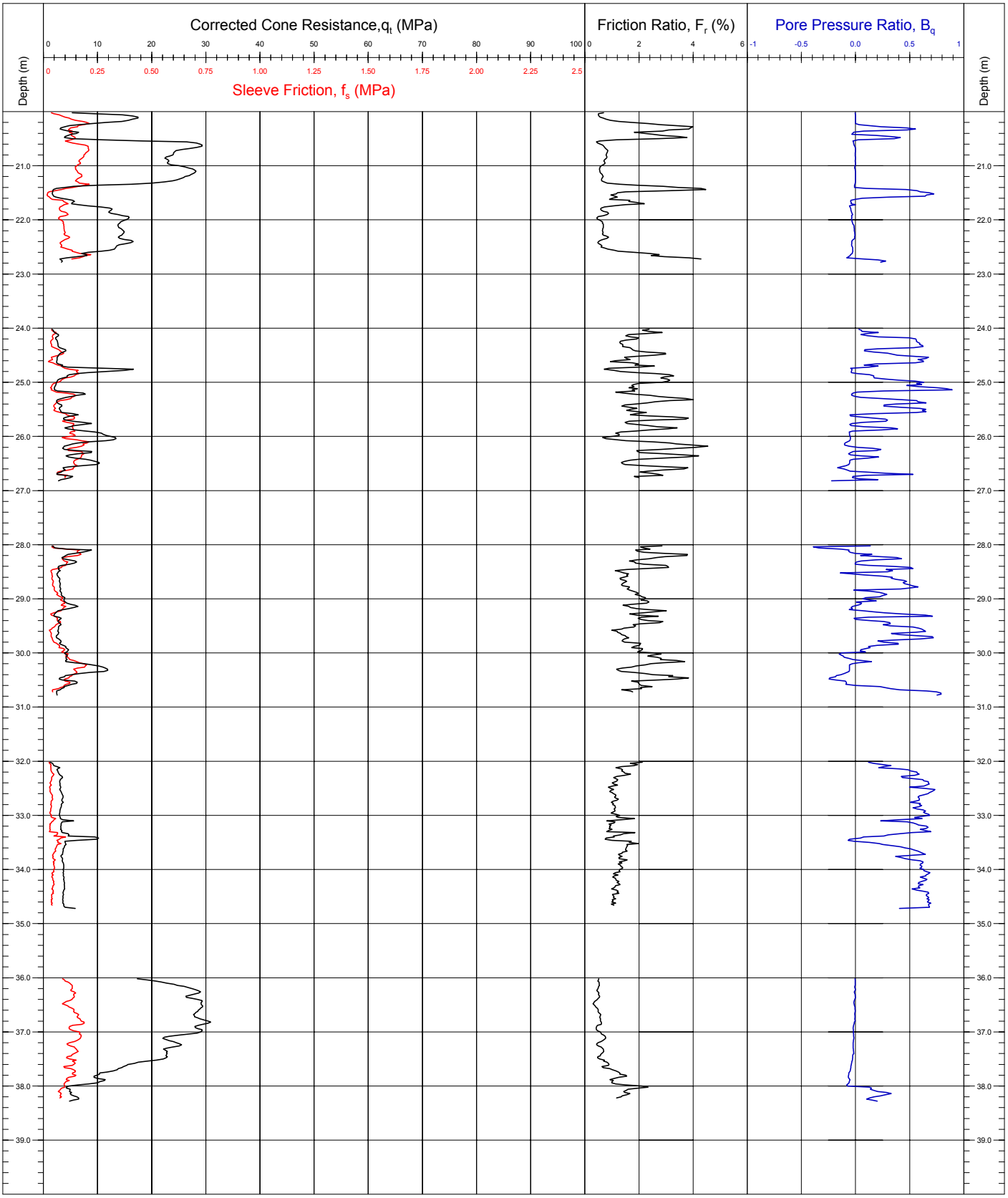
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

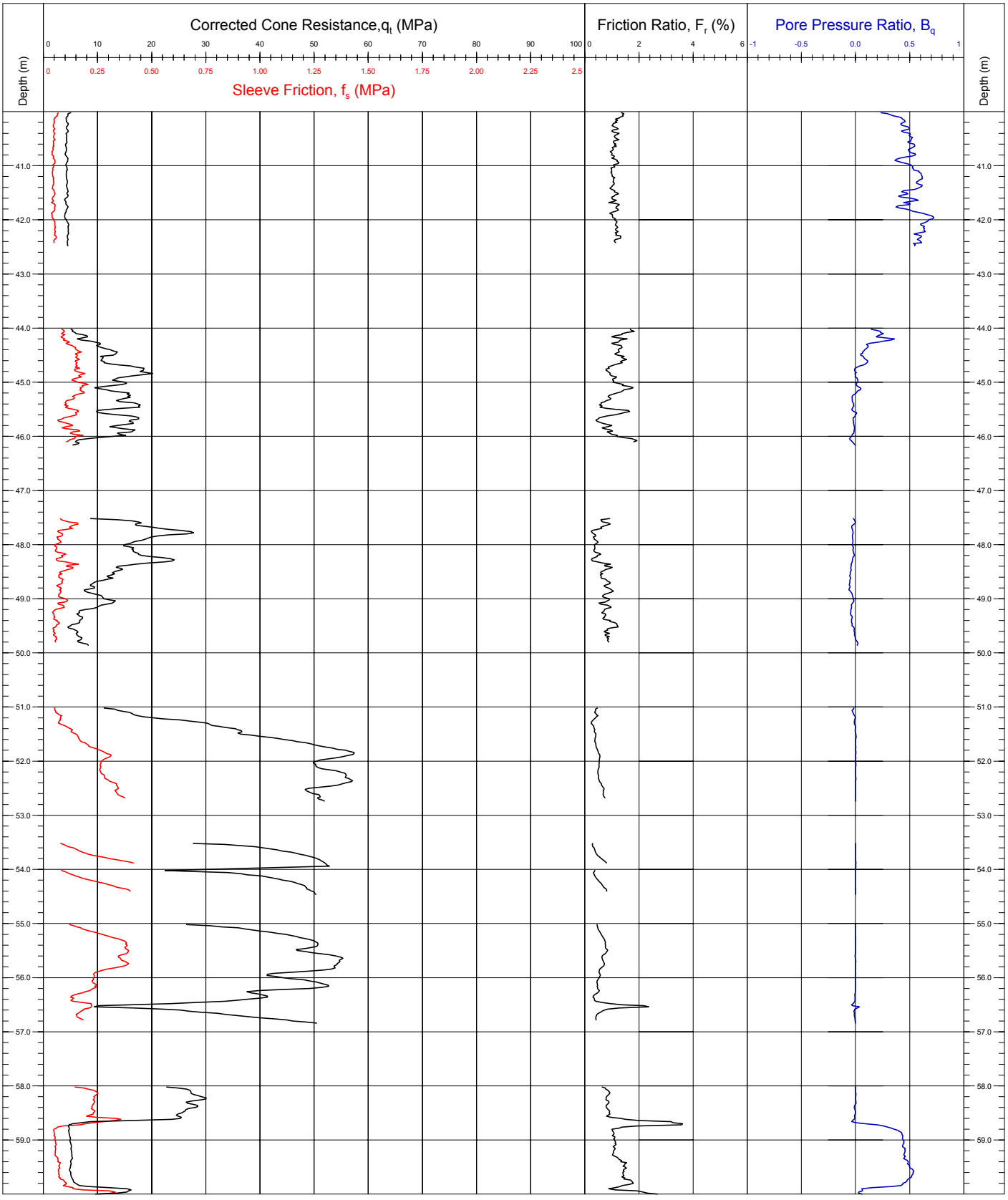
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number **BH - G7**
Contract	**10451**	Latitude/ Longitude		
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**	
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 2/4
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

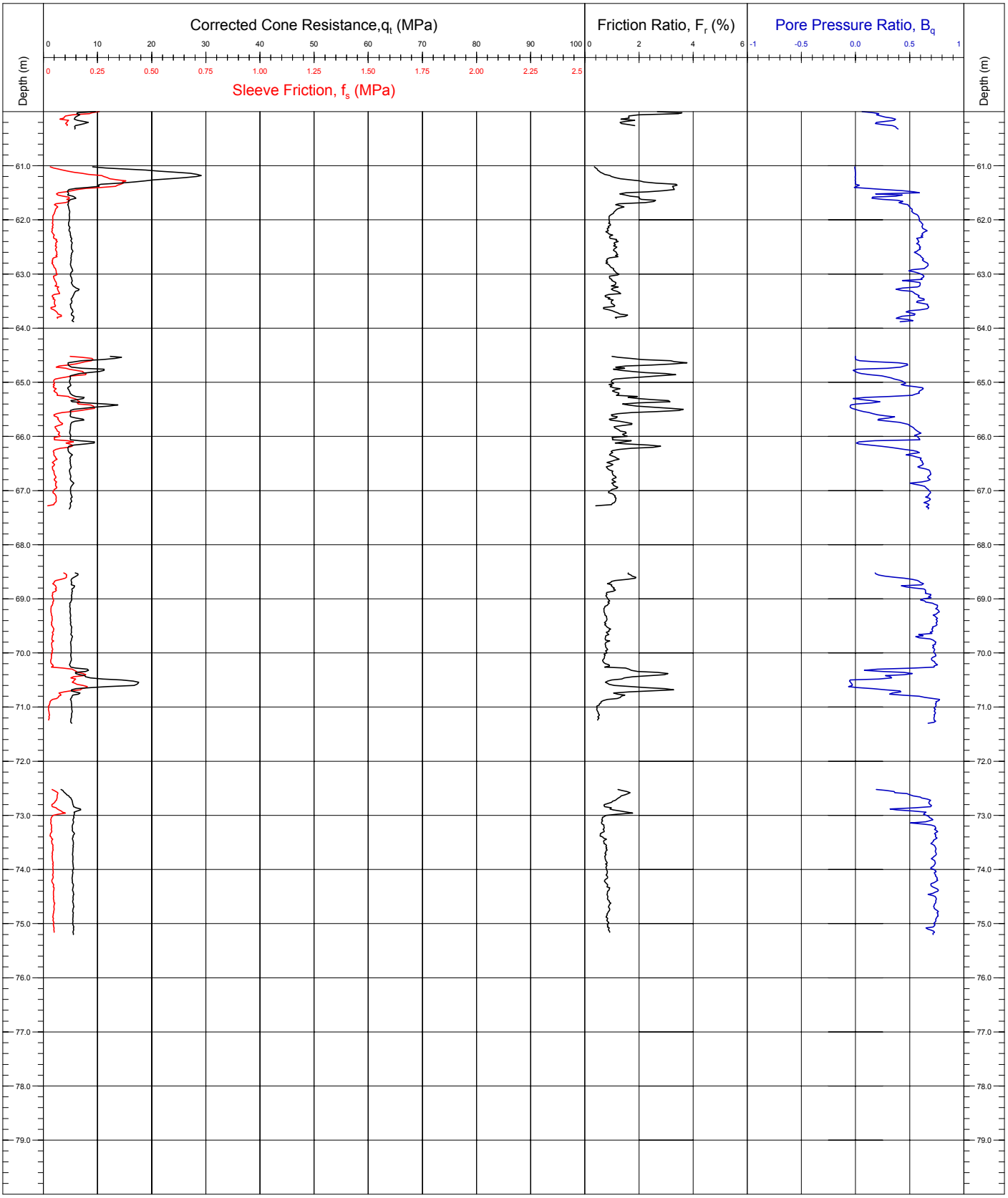
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

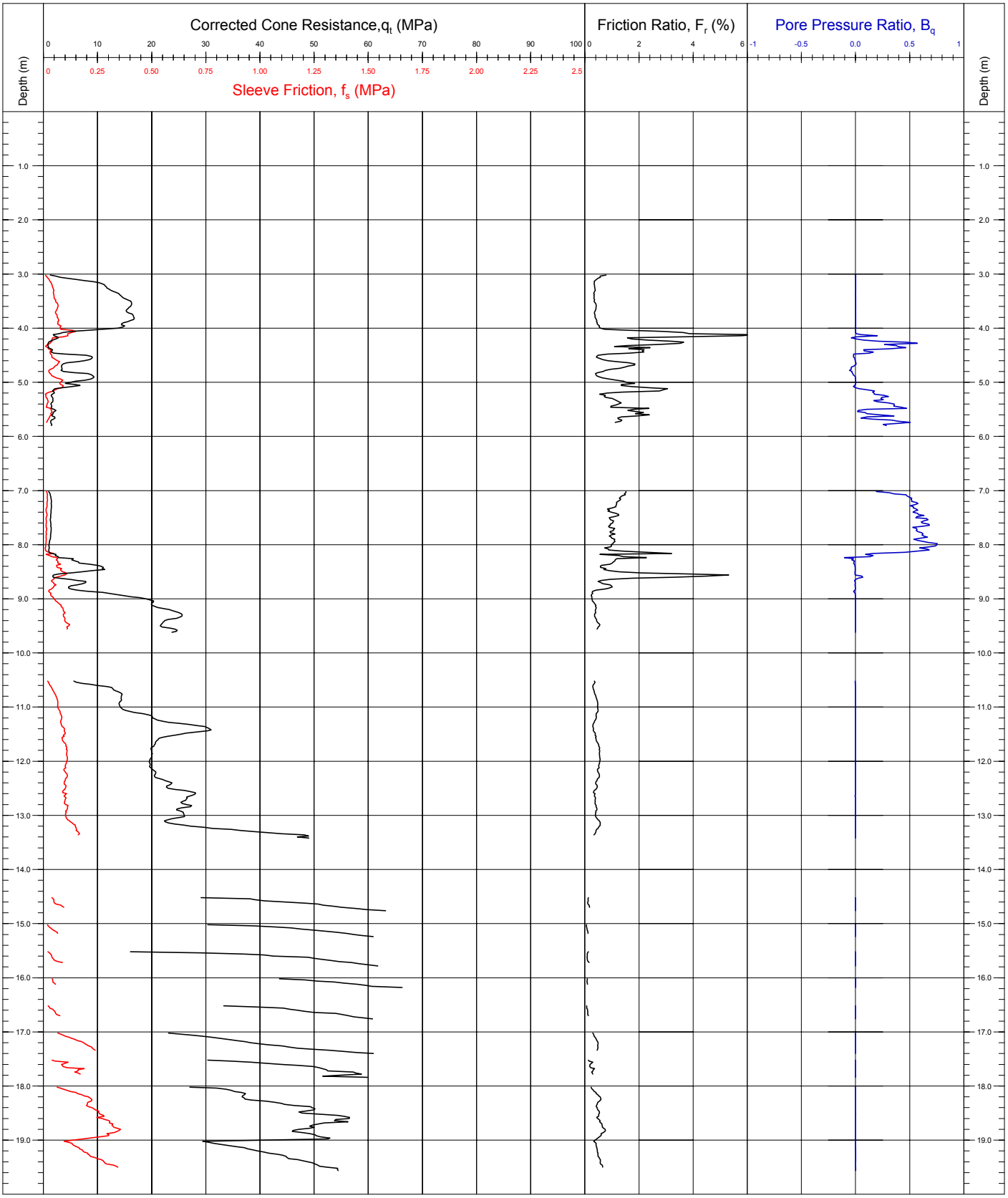
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**519055.0E 4251306.0N**	CPT Number	**BH - G7**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**25.0**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**06/07/2015 to 07/07/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (07/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

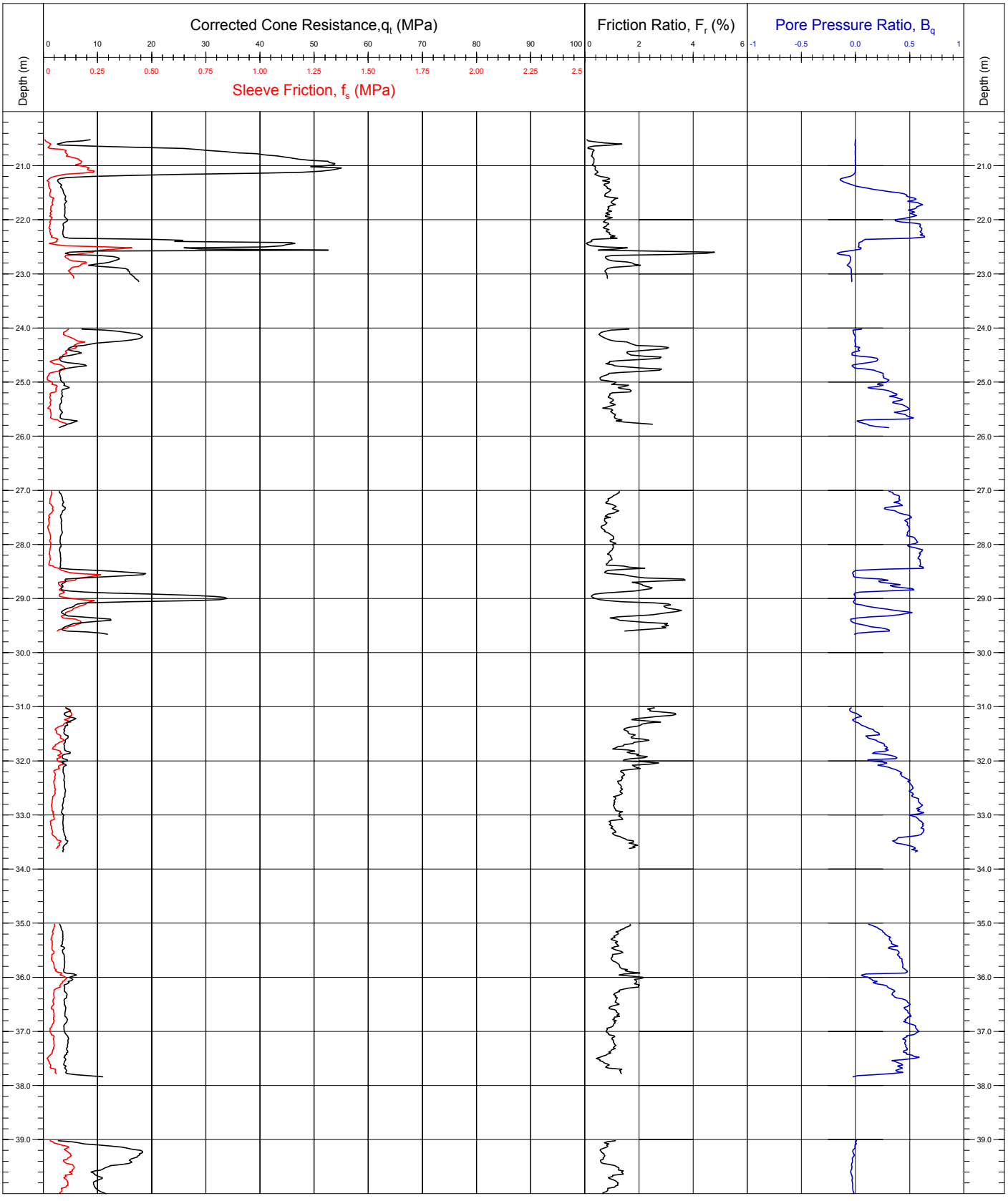
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E** **4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

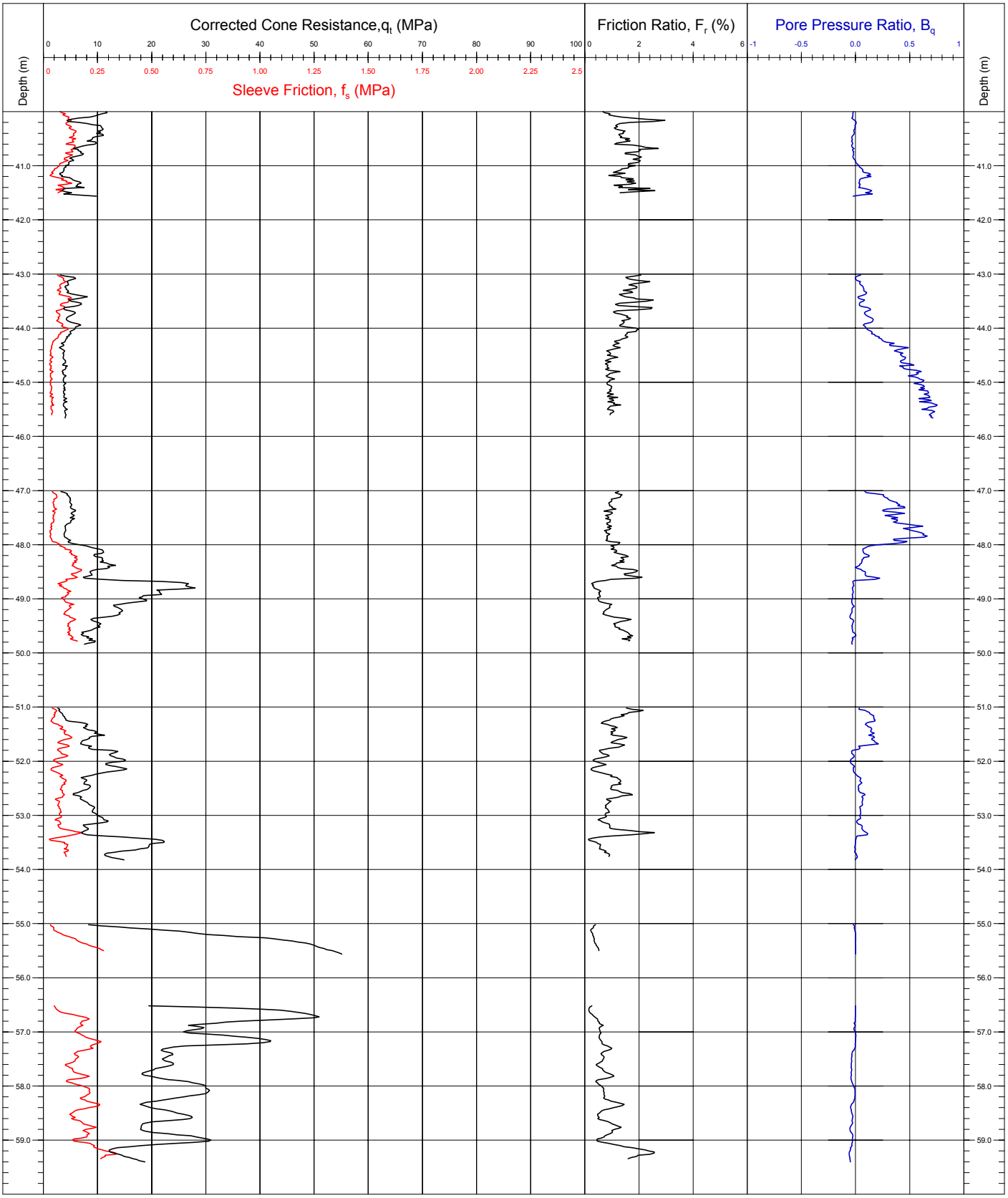
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E** **4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary / Draft / Final	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	() () ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

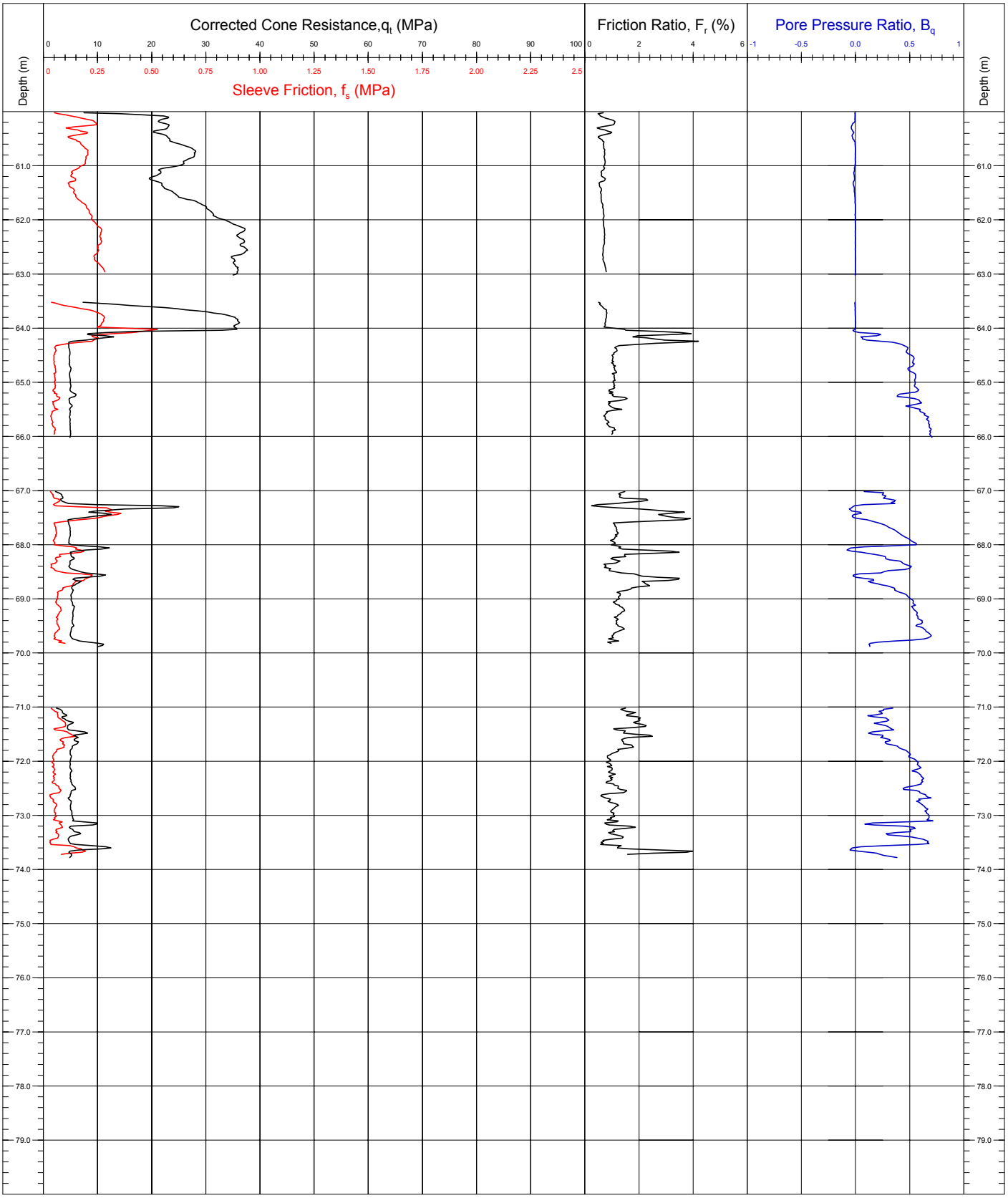
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - H10**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**		
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

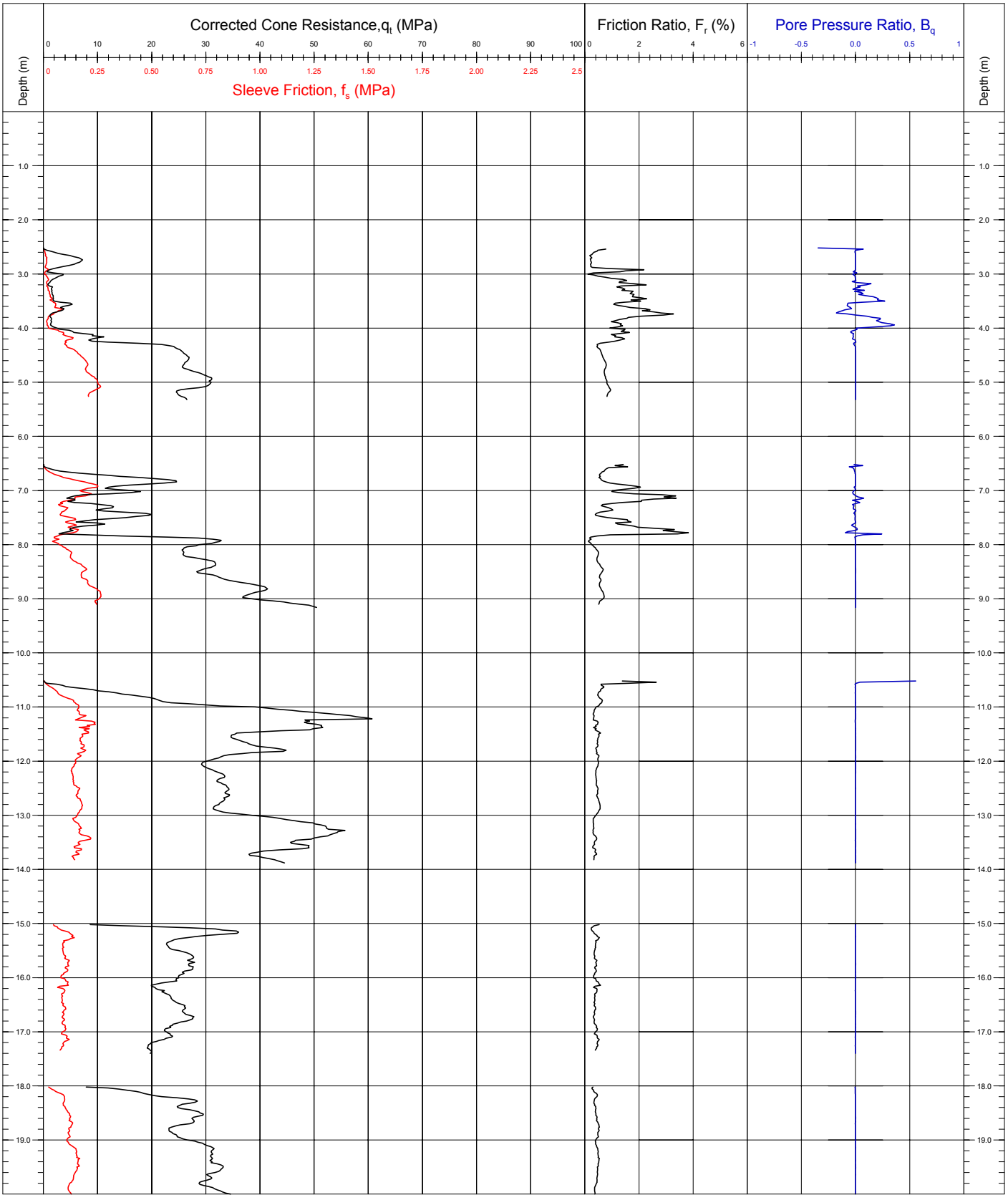
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**520154.3E 4248006.5N**	CPT Number **BH - H10**
Contract	**10451**	Latitude/ Longitude		
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.8**	
Vessel	**MV Ocean Discovery**	Date of Test	**05/07/2015**	Page: 4/4
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: () Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

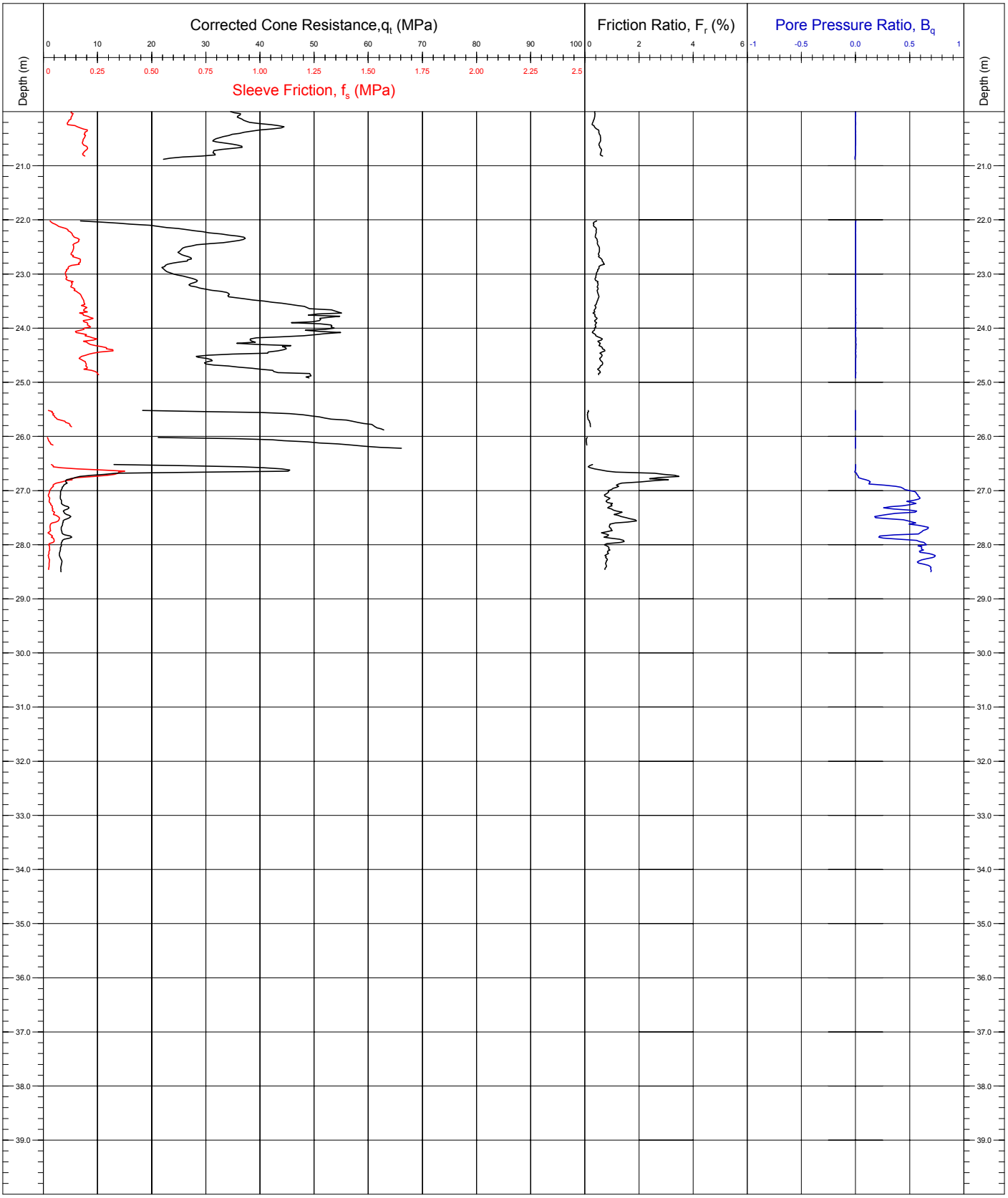
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	**BH - I21A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**	Page: 1/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

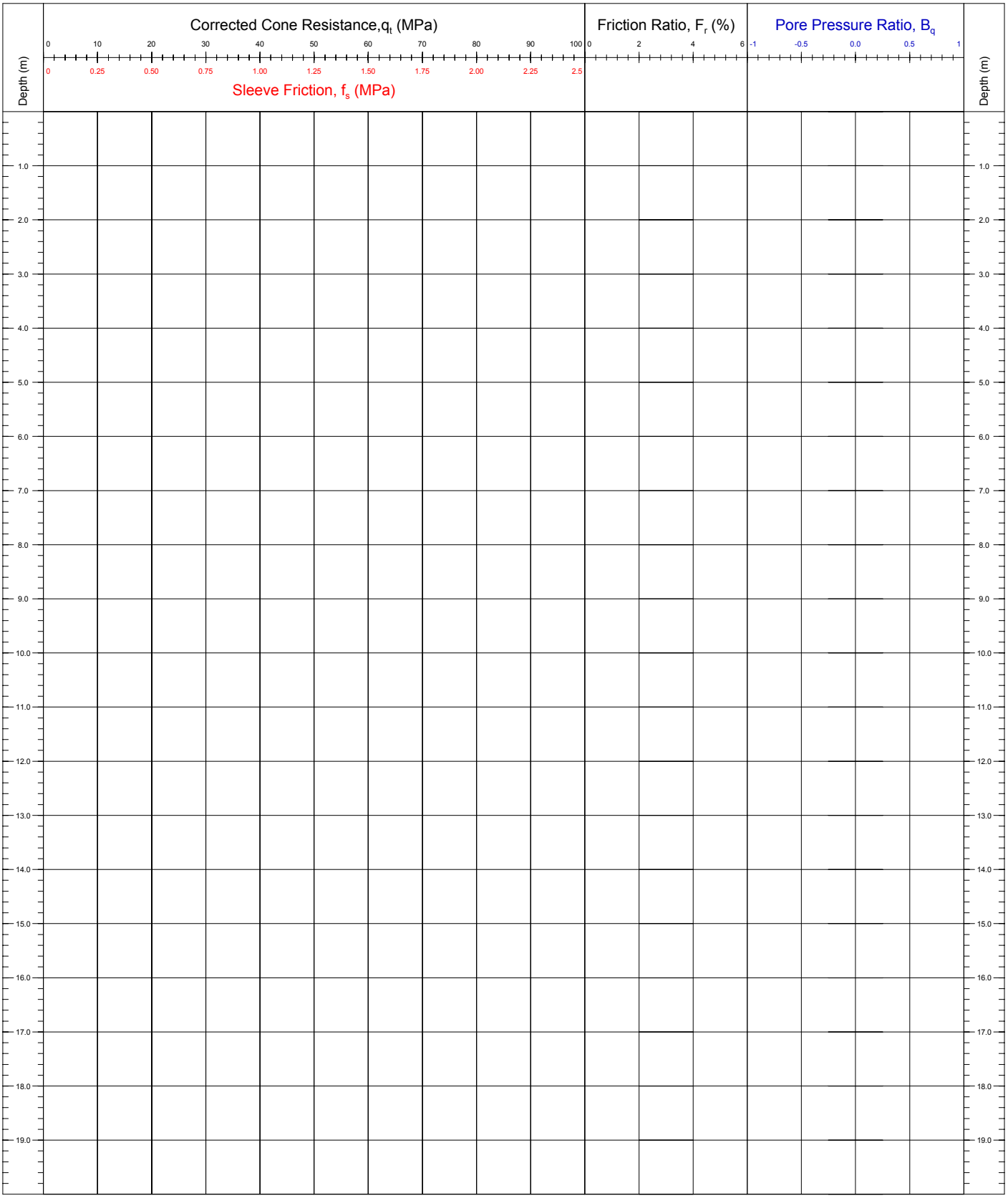
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	**BH - I21A**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**26.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**23/06/2015**	Page: 2/2	
Comments:		Cone No.(type)/α Factor	**081213G (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: ()	Draft: () Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

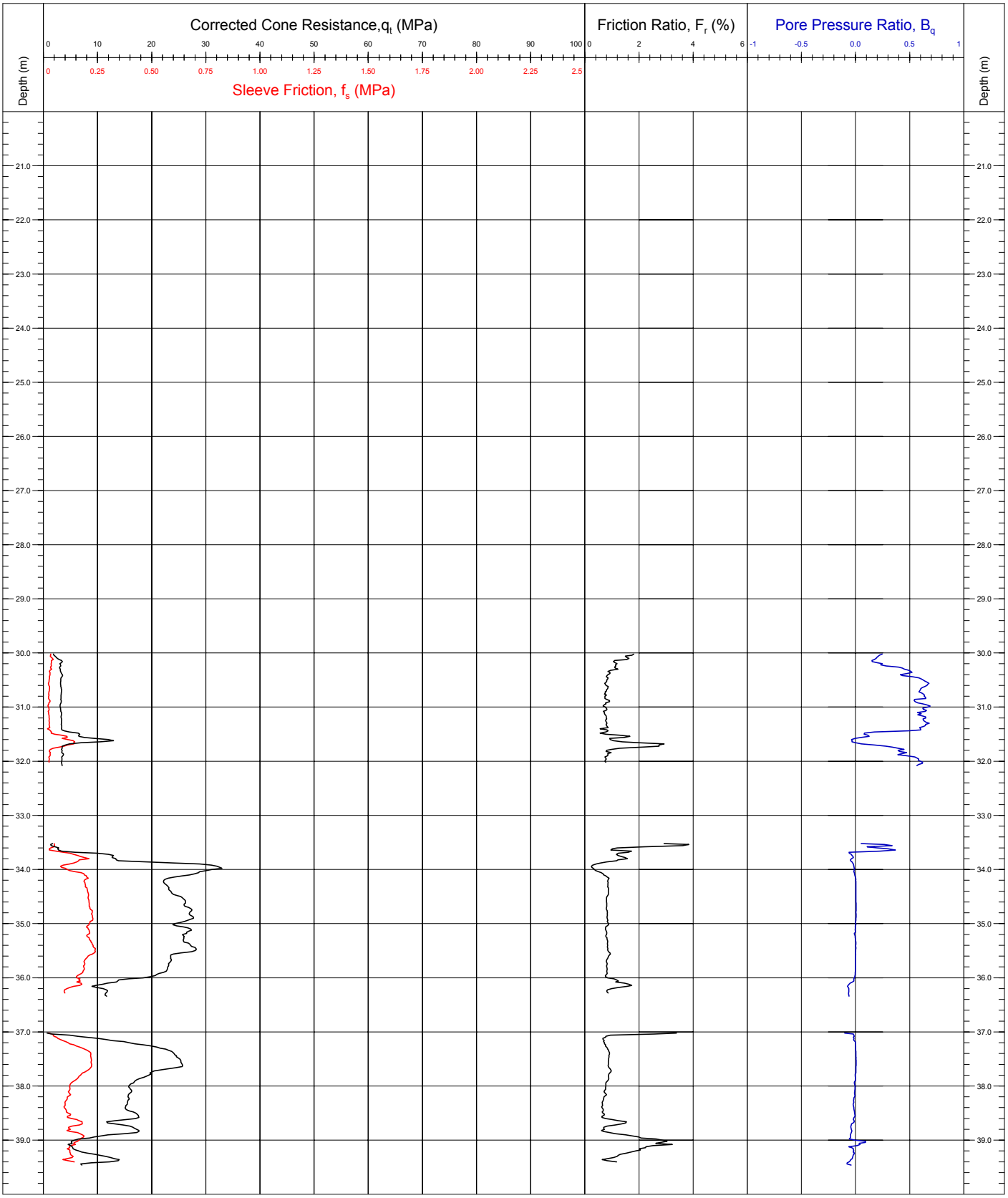
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	
Contract	**10451**	Latitude/ Longitude		**BH - I21B**	
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (24/06/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

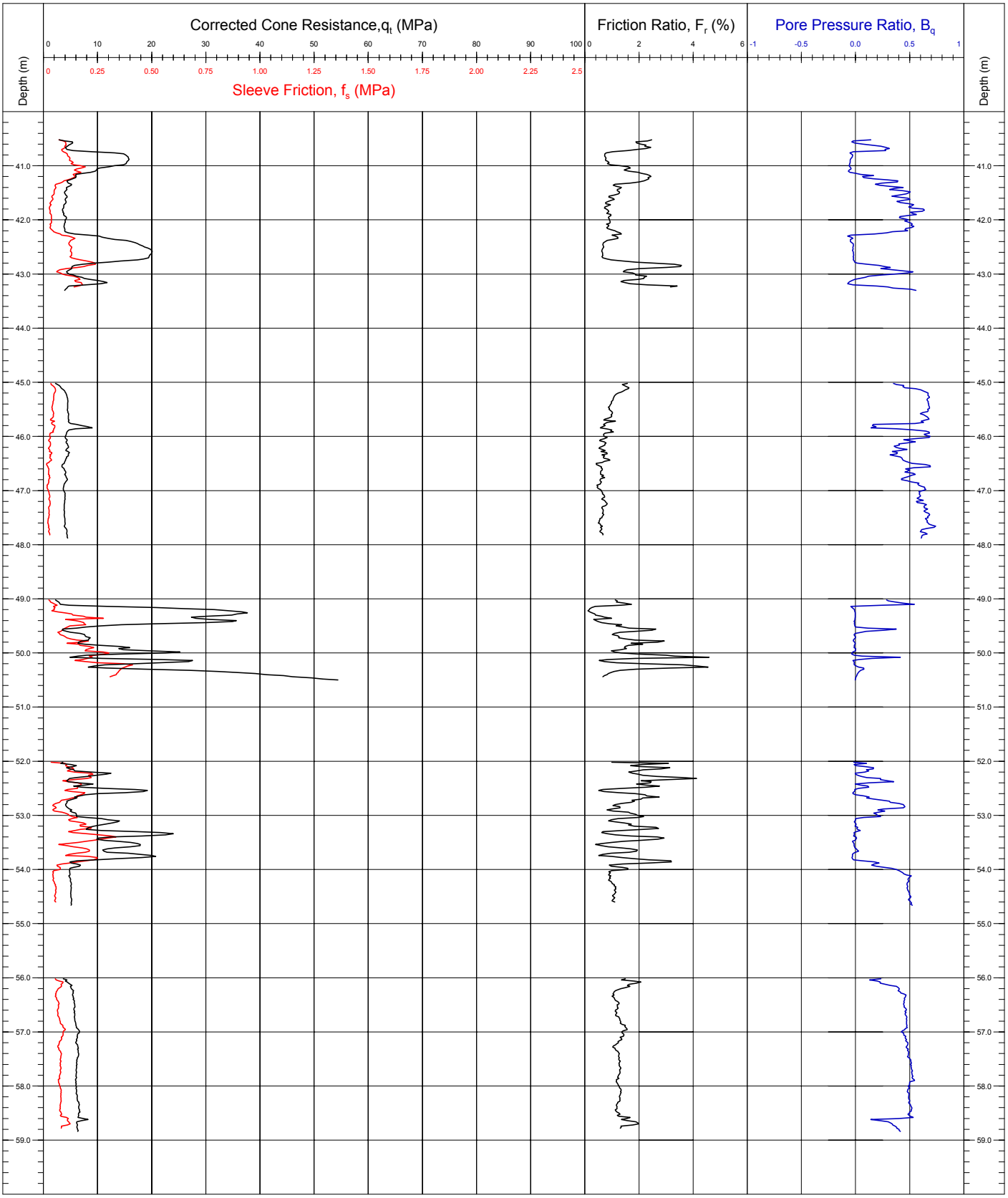
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E**	**4235906.0N**	CPT Number
Contract	**10451**	Latitude/ Longitude			**BH - I21B**
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		Page: 2/4
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (24/06/2015) / Draft: **JG** (14/12/2014) / Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

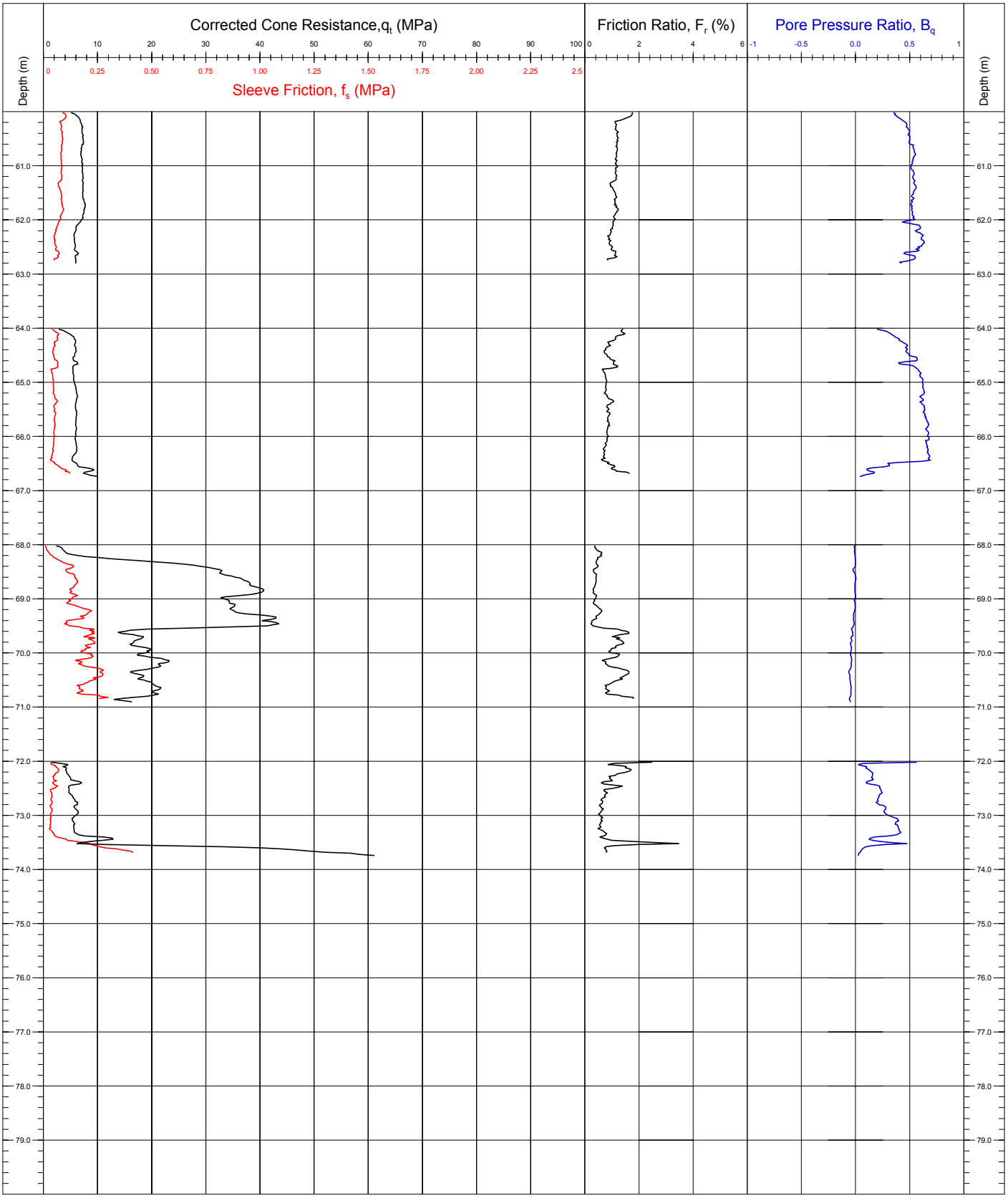
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E**	**4235906.0N**	CPT Number **BH - I21B**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**		Page: 3/4
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**		QC Status
		Base Inclination	**X = 0.0° / Y = 0.0°**		Preliminary: **X** (24/06/2015); Draft: **JG** (14/12/2014); Final: ()
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

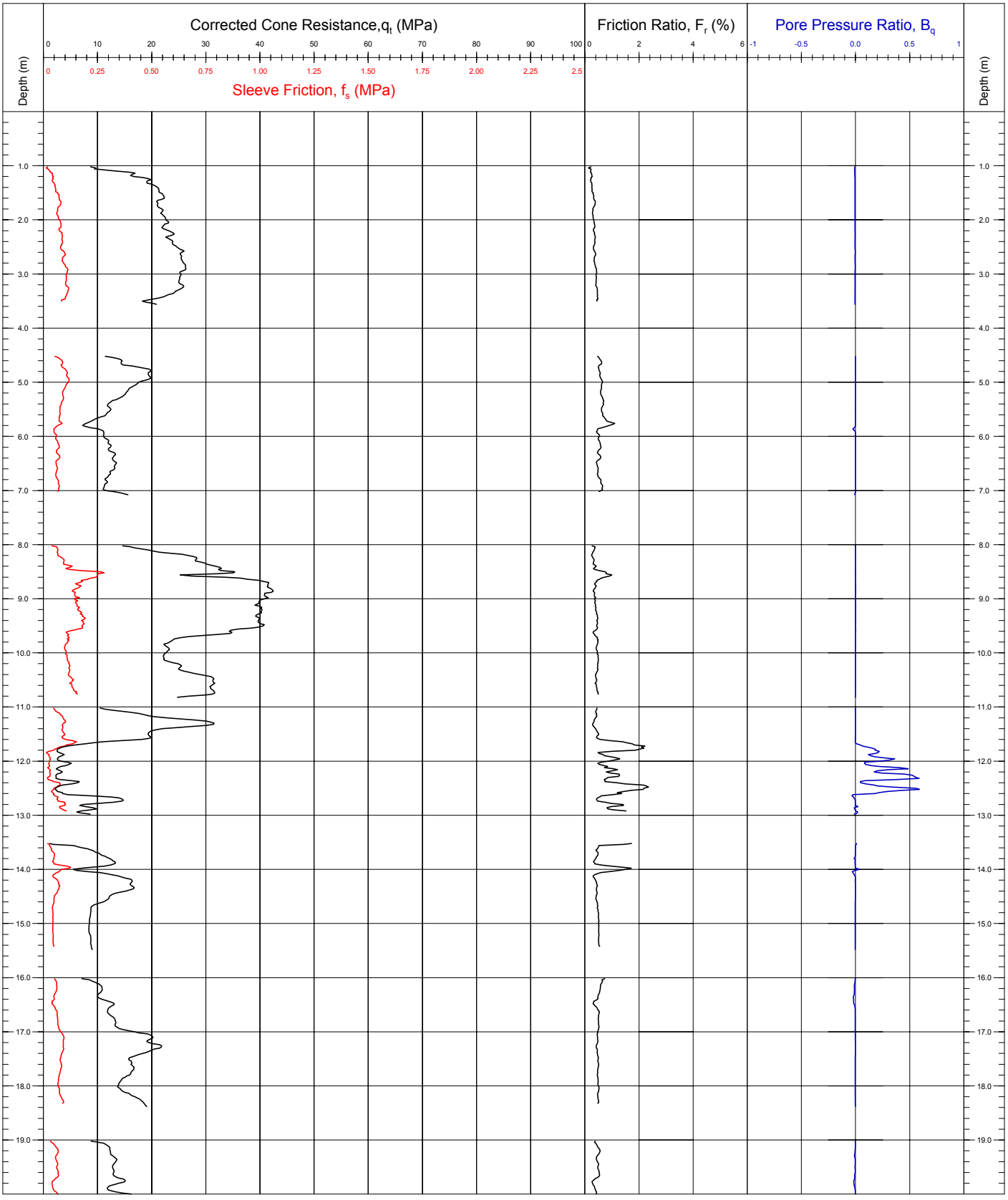
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Number	**BH - I21B**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**23.0**		
Vessel	**MV Ocean Discovery**	Date of Test	**24/06/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**100981 (10cm^2) / 0.75**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (24/06/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

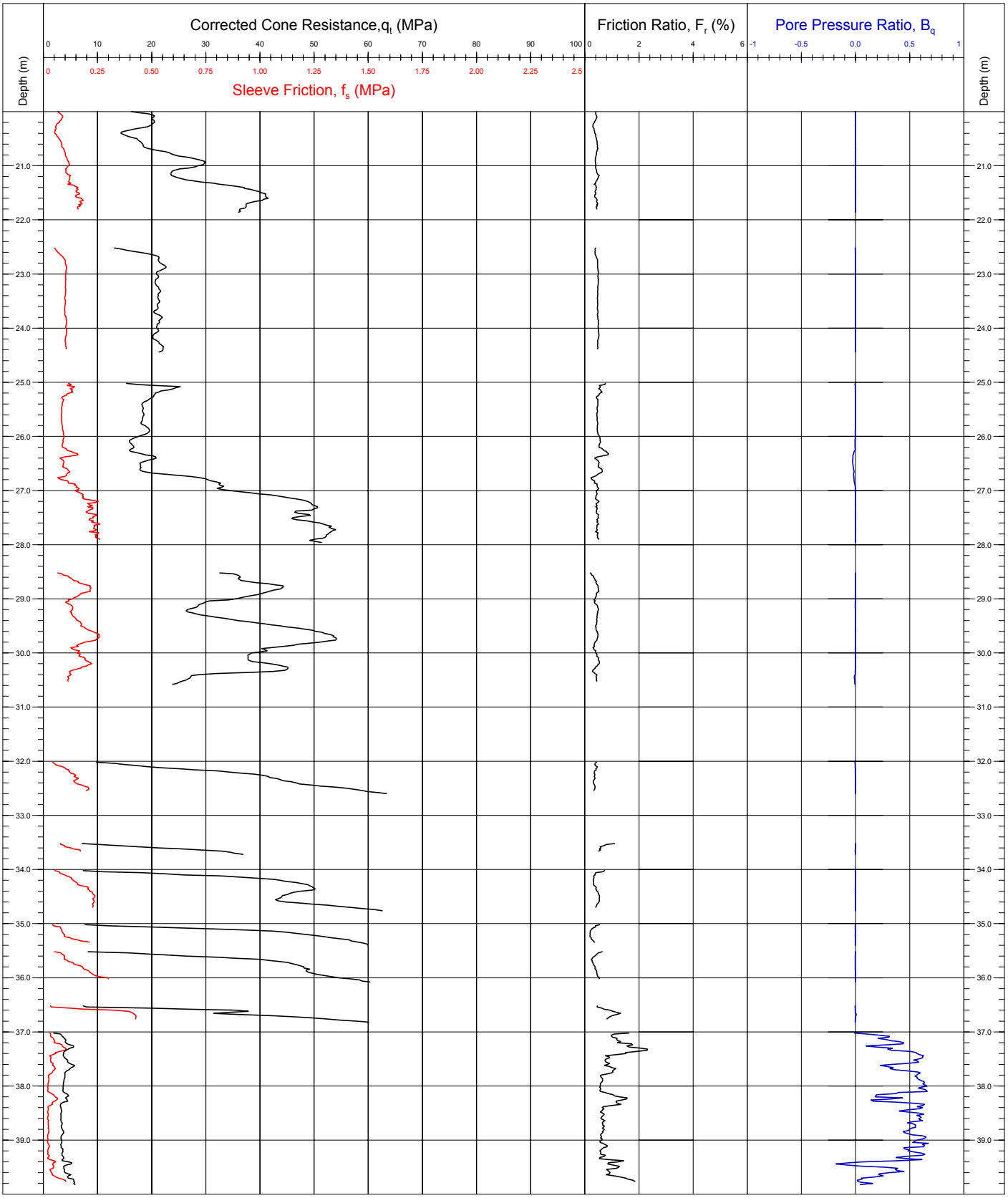
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

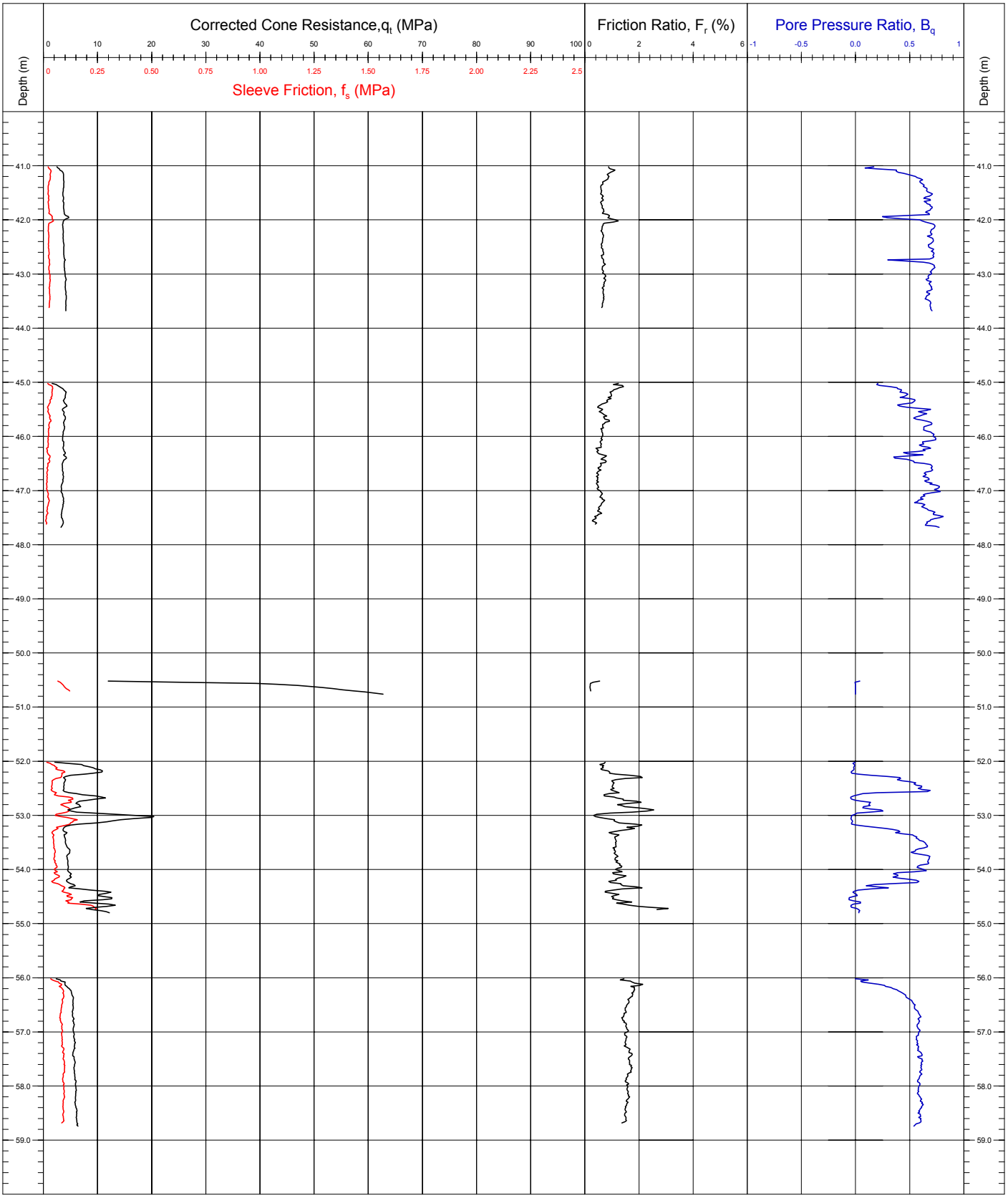
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH (04/07/2015)**	Draft: **JG (14/12/2014)** Final: **()**
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

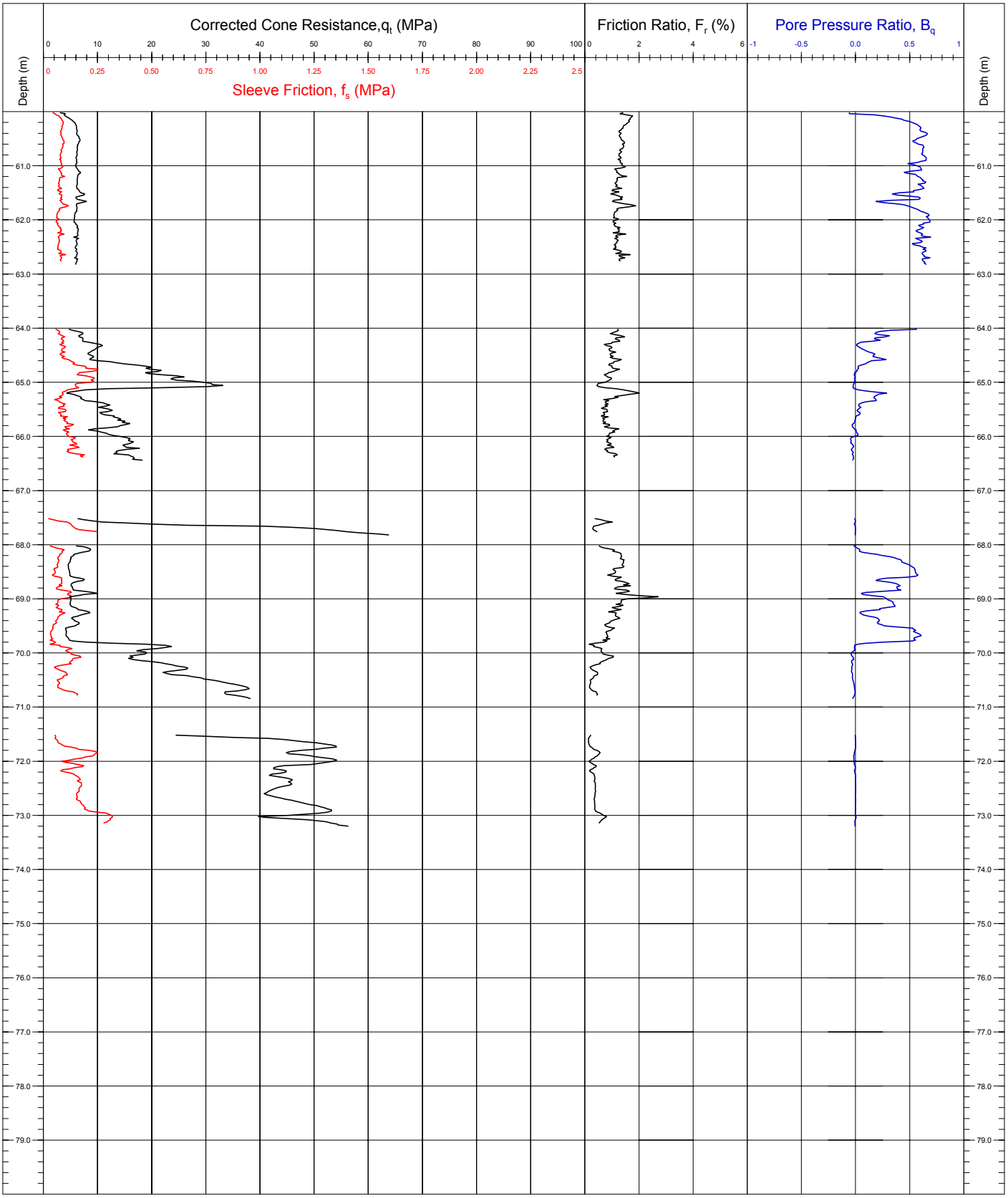
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

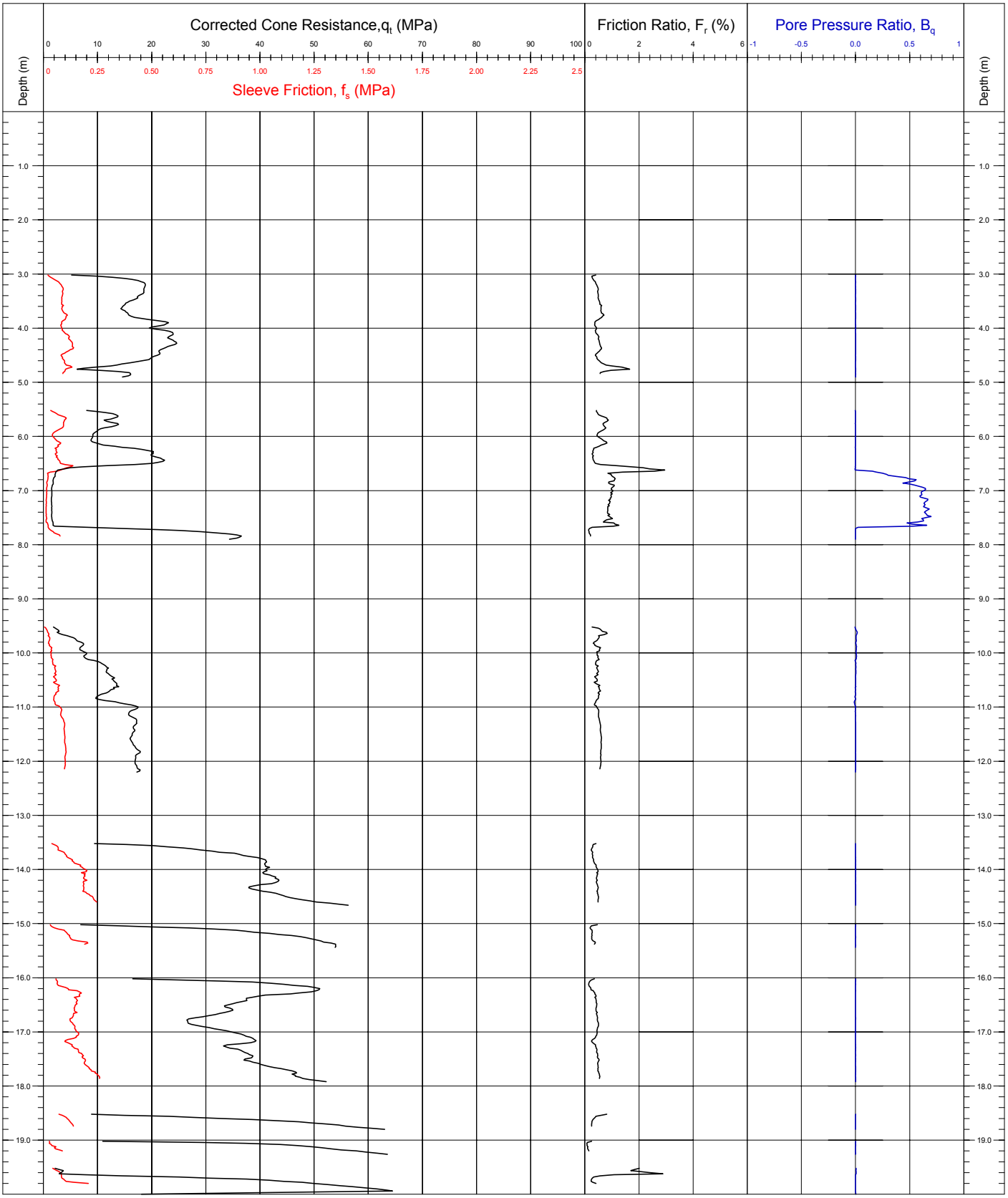
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**523454.4E 4241406.3N**	CPT Number	**BH - K16**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**24.6**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**03/07/2015 to 04/07/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**120911G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **SH** (04/07/2015) / Draft: **JG** (14/12/2014) / Final: ()	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

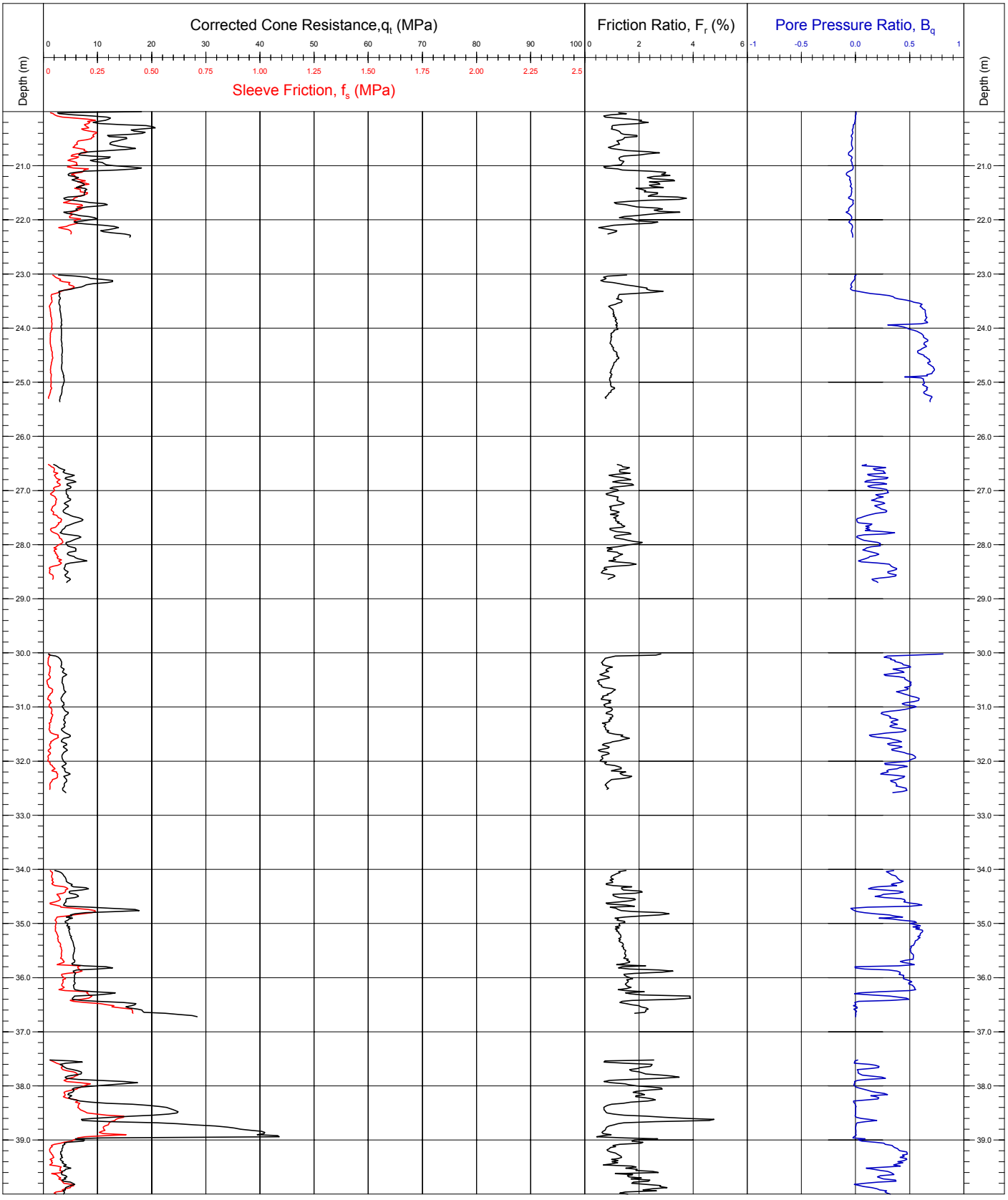
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 1/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)**	Draft: **JG (14/12/2014)** Final: **()**
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

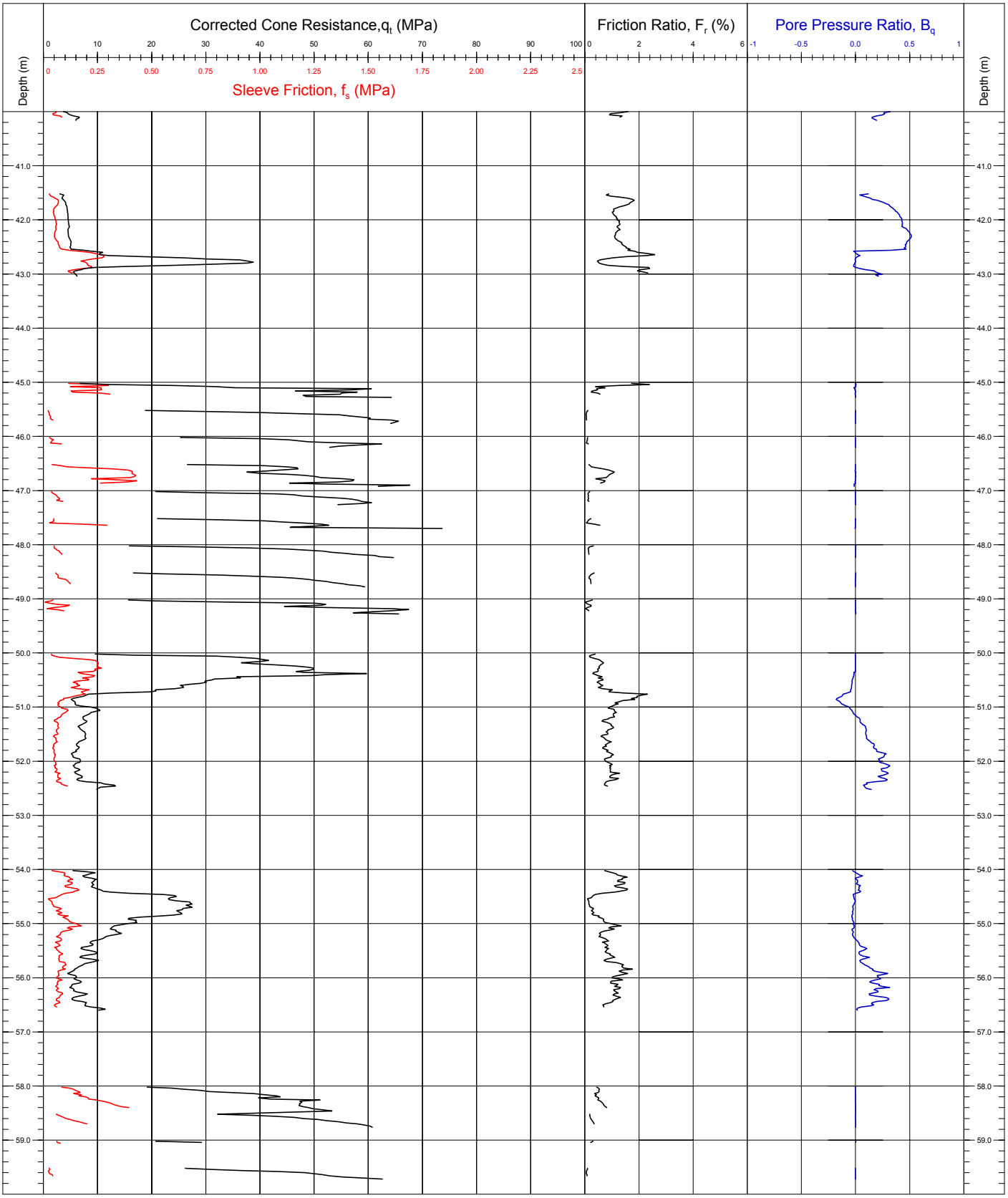
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 2/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X** (25/06/2015)	Draft: **JG** (14/12/2014)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Final: ()	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

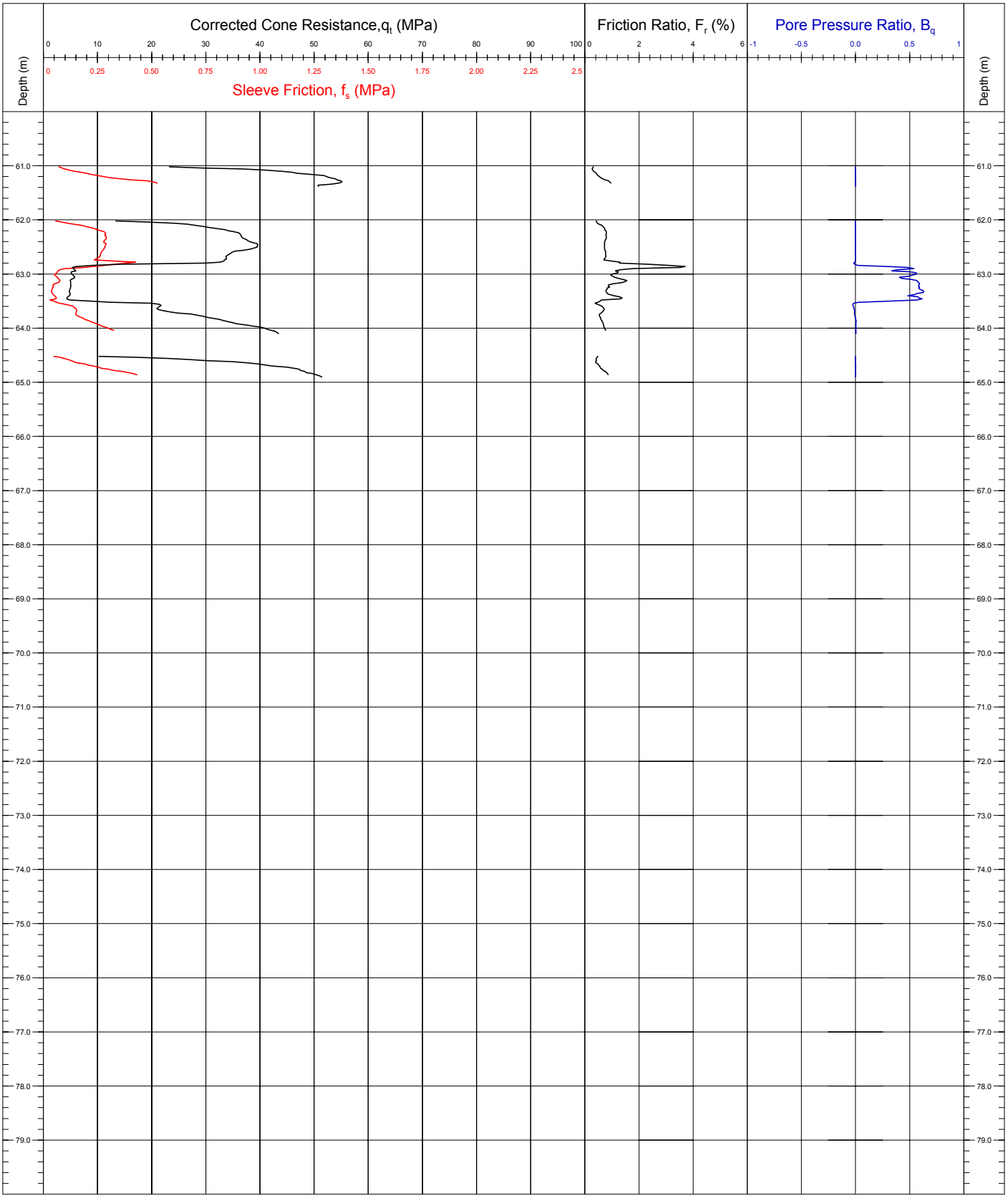
IN SITU CPTU TESTING - DERIVED PARAMETERS



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 3/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)**	Draft: **JG (14/12/2014)** Final: **()**
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area

IN SITU CPTU TESTING - DERIVED PARAMETERS

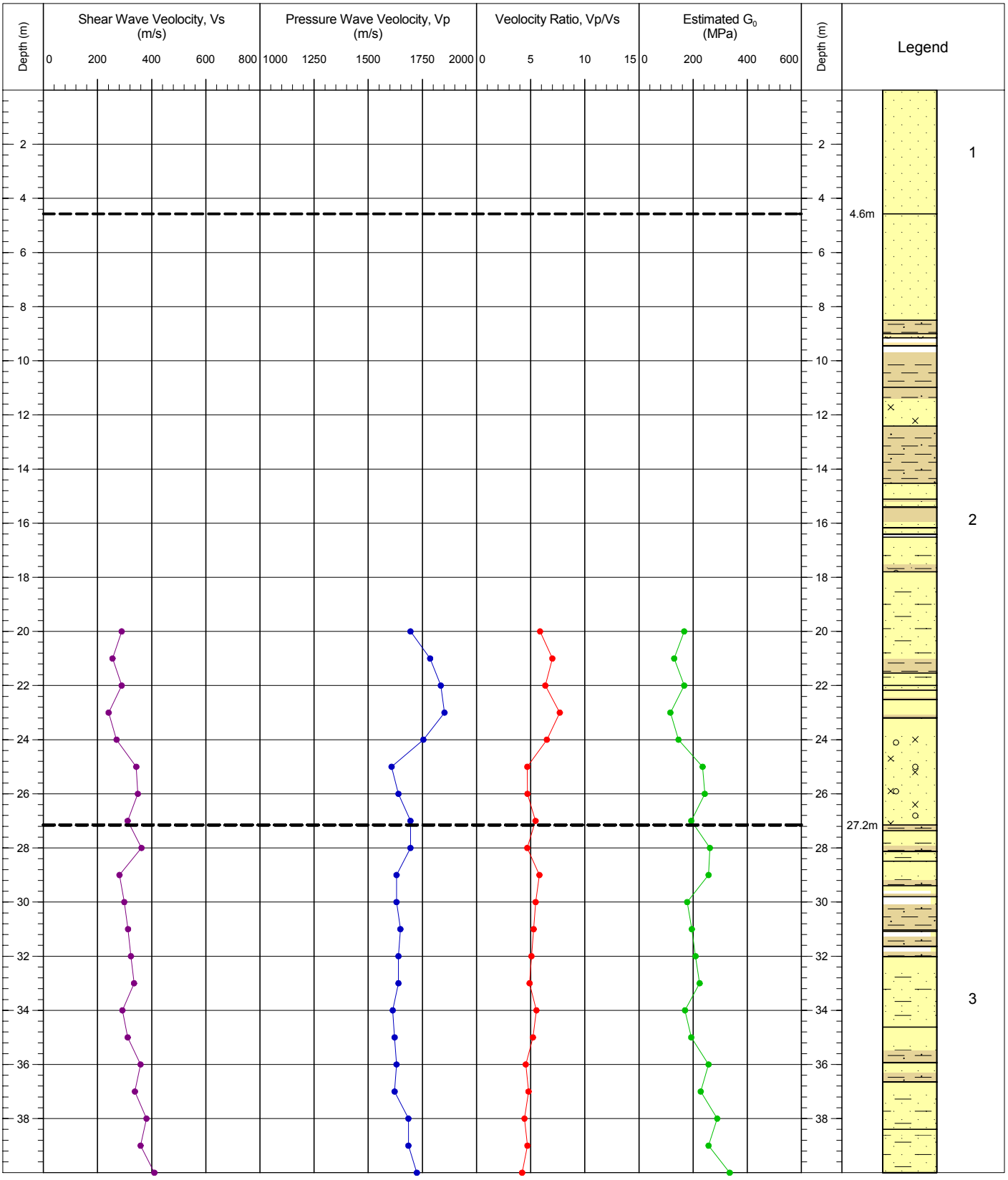


Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Number	**BH - MET TOWER**
Contract	**10451**	Latitude/ Longitude			
Client Name/Ref	**US Wind Inc./REF11449**	Water Depth (mLAT)	**27.7**		
Vessel	**MV Ocean Discovery**	Date of Test (Start/End)	**19/06/2015 to 20/06/2015**	Page: 4/4	
Comments:		Cone No.(type)/α Factor	**070815G (10cm^2) / 0.79**	QC Status	
		Base Inclination	**X = 0.0° / Y = 0.0°**	Preliminary: **X (25/06/2015)** / Draft: **JG (14/12/2014)** / Final: **()**	
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**		

APPENDIX 5

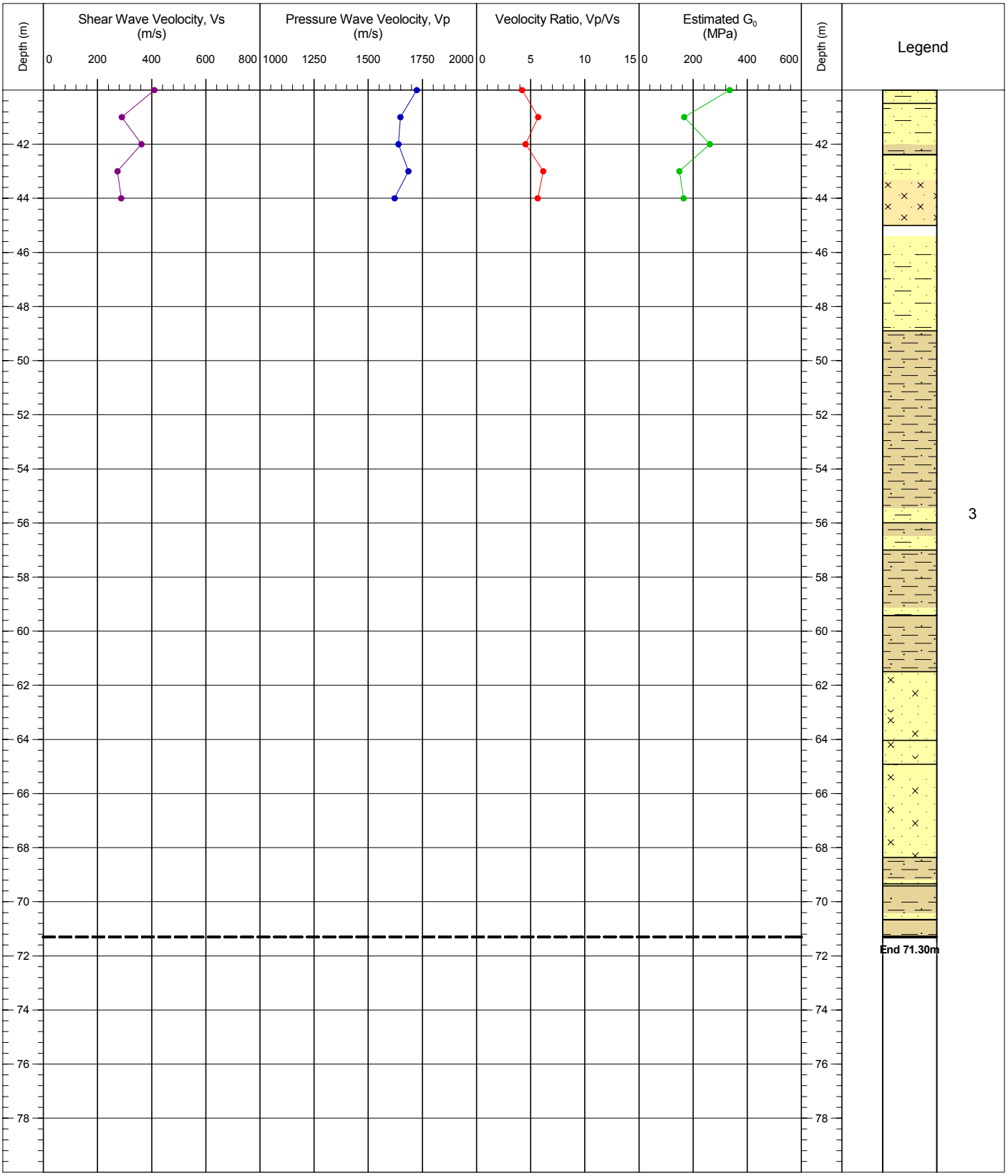
5.1 PS Logging Results

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



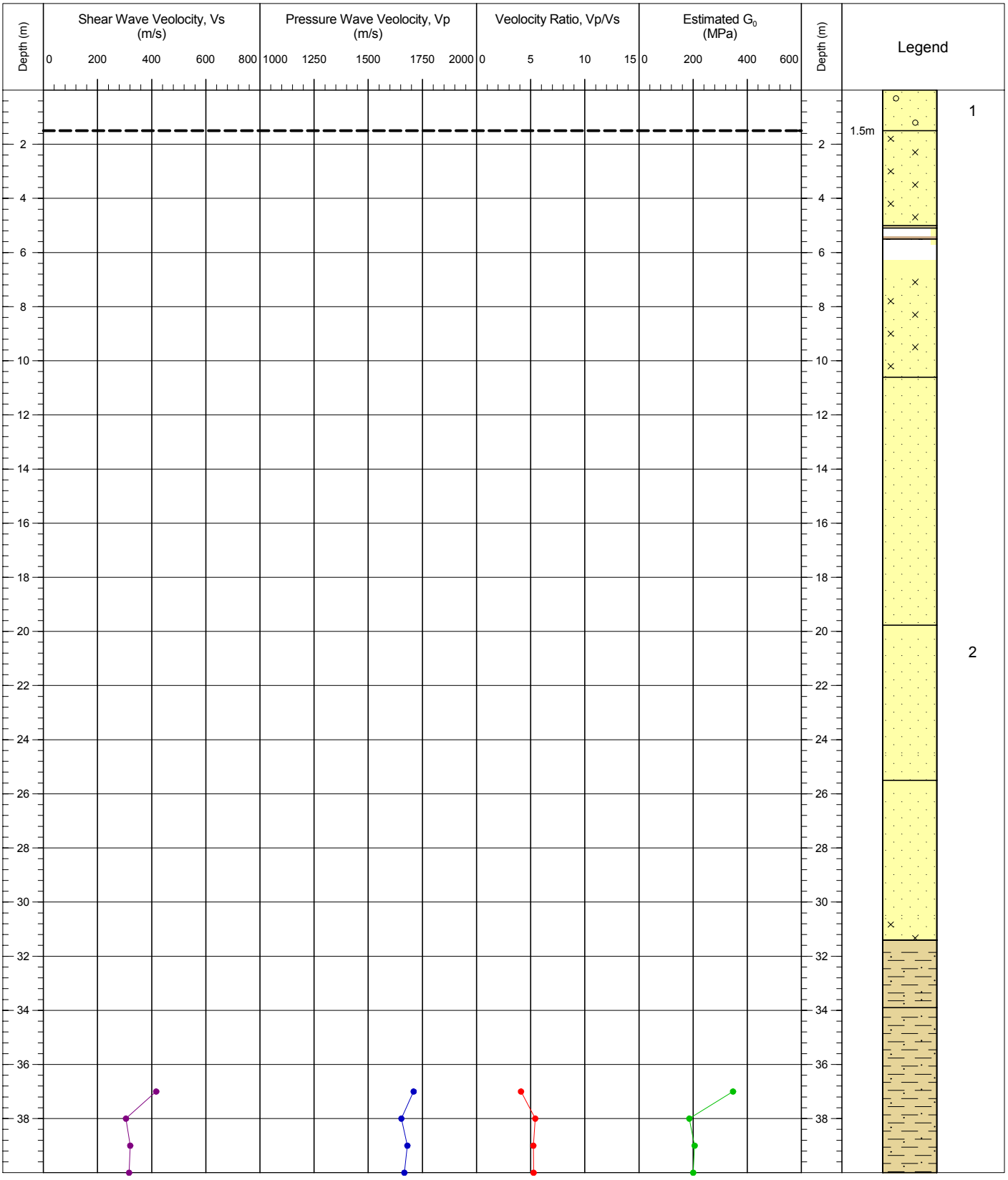
Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CPT Name: BH - D14_A
Contract	**10451**	Water Depth (0)	**19.1**	
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**30/06/2015**	Filename -
Vessel	**MV Ocean Discovery**	Final Depth	**71.30m**	QC Status
Comments:		Hole Type	**Borehole (Sampling)**	Preliminary: **SMc** (28/09/2015) / Draft: **JG** (14/12/2015) / Final: **RS** (16/12/2015)
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



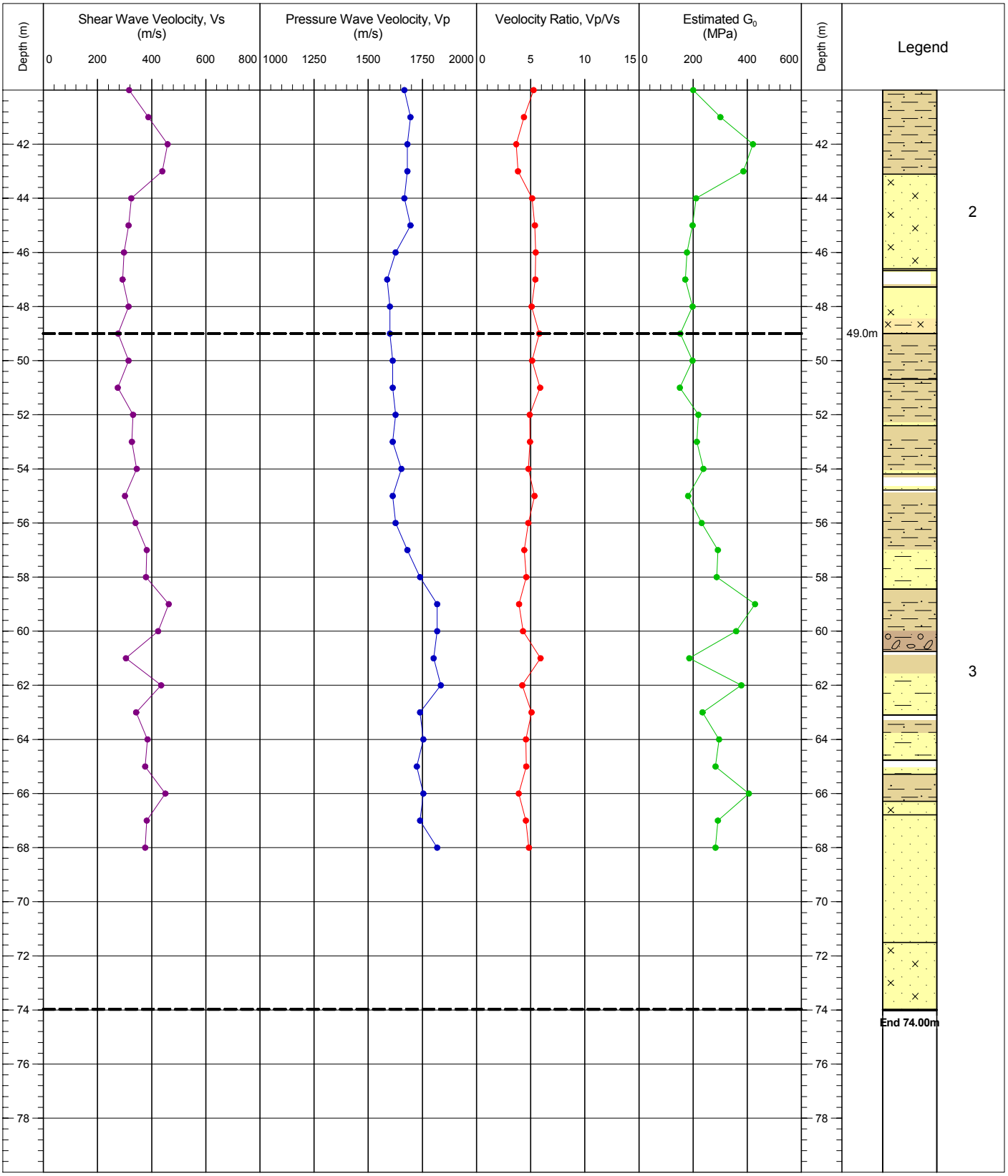
Area	**Maryland USA**	Coordinates	**515755.1E 4243612.0N**	CPT Name
Contract	**10451**	Water Depth (0)	**19.1**	BH - D14_A
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**30/06/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**71.30m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015) · Draft: **JG** (14/12/2015) · Final: **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



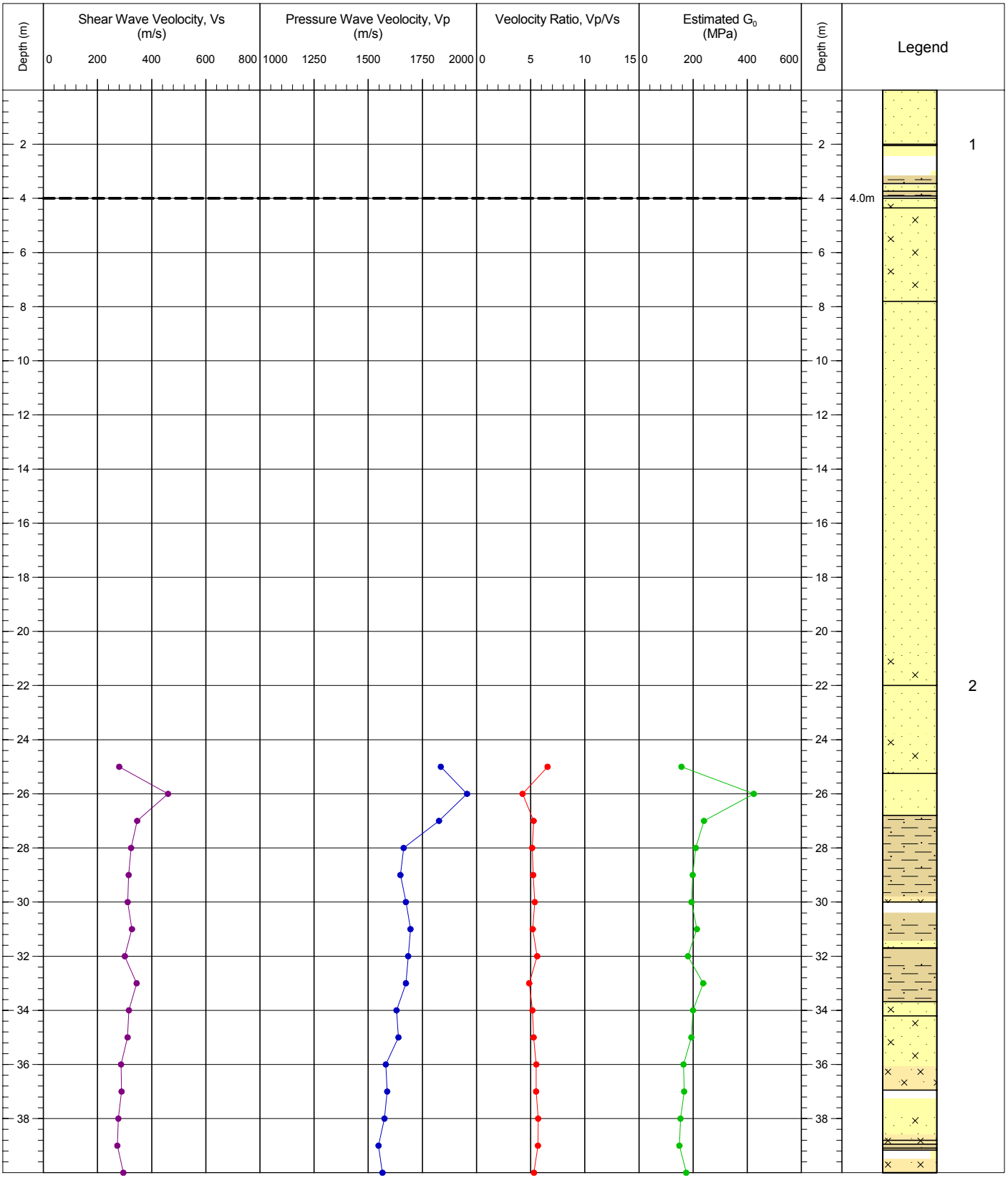
Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Name: BH - G17_A
Contract	**10451**	Water Depth (0)	**24.9**	
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**02/07/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**74.00m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015); Draft: **JG** (14/12/2015); Final: **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



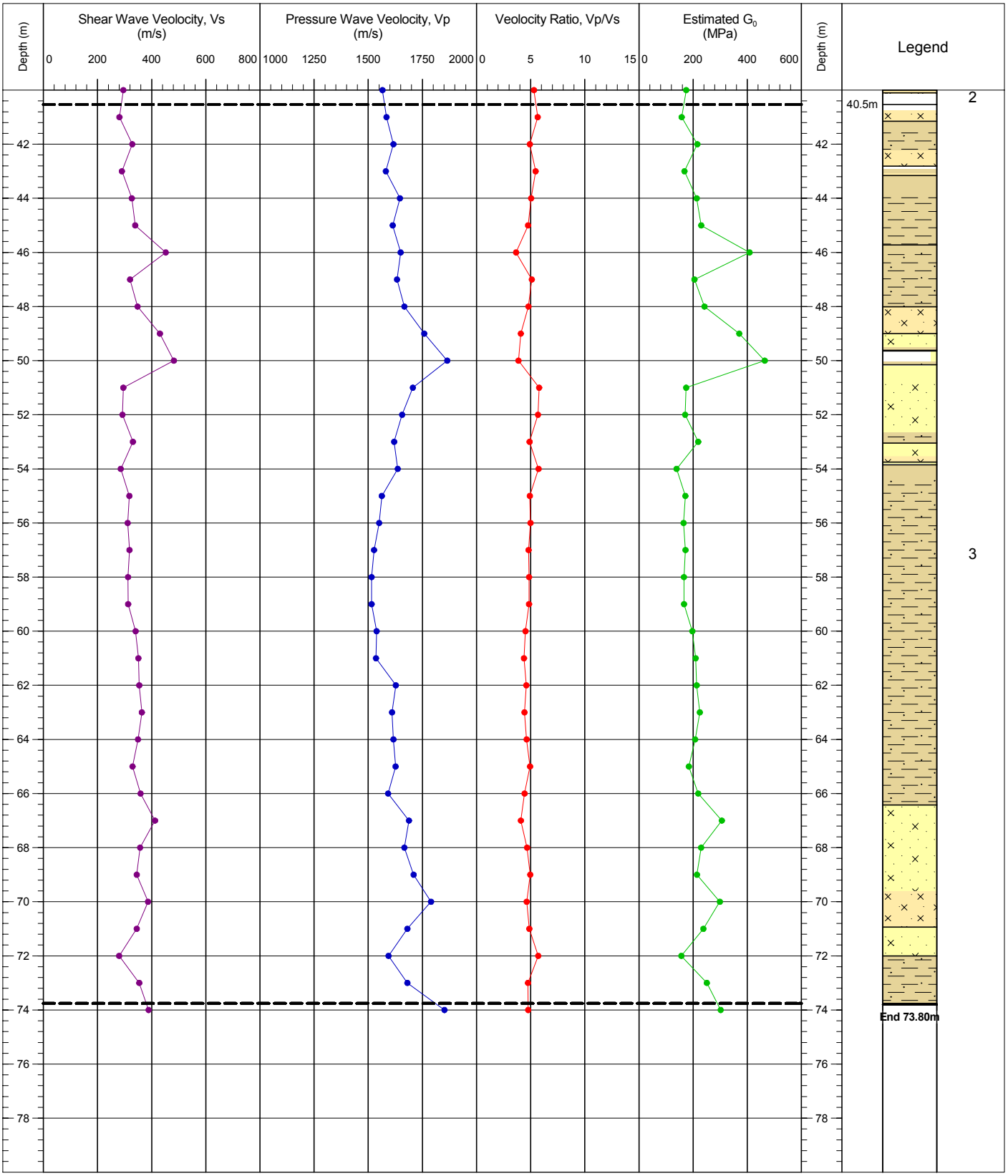
Area	**Maryland USA**	Coordinates	**519056.4E 4240311.6N**	CPT Name: BH - G17_A
Contract	**10451**	Water Depth (0)	**24.9**	
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**02/07/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**74.00m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status: Preliminary / Draft / Final
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	**SMc** (28/09/2015) / **JG** (14/12/2015) / **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



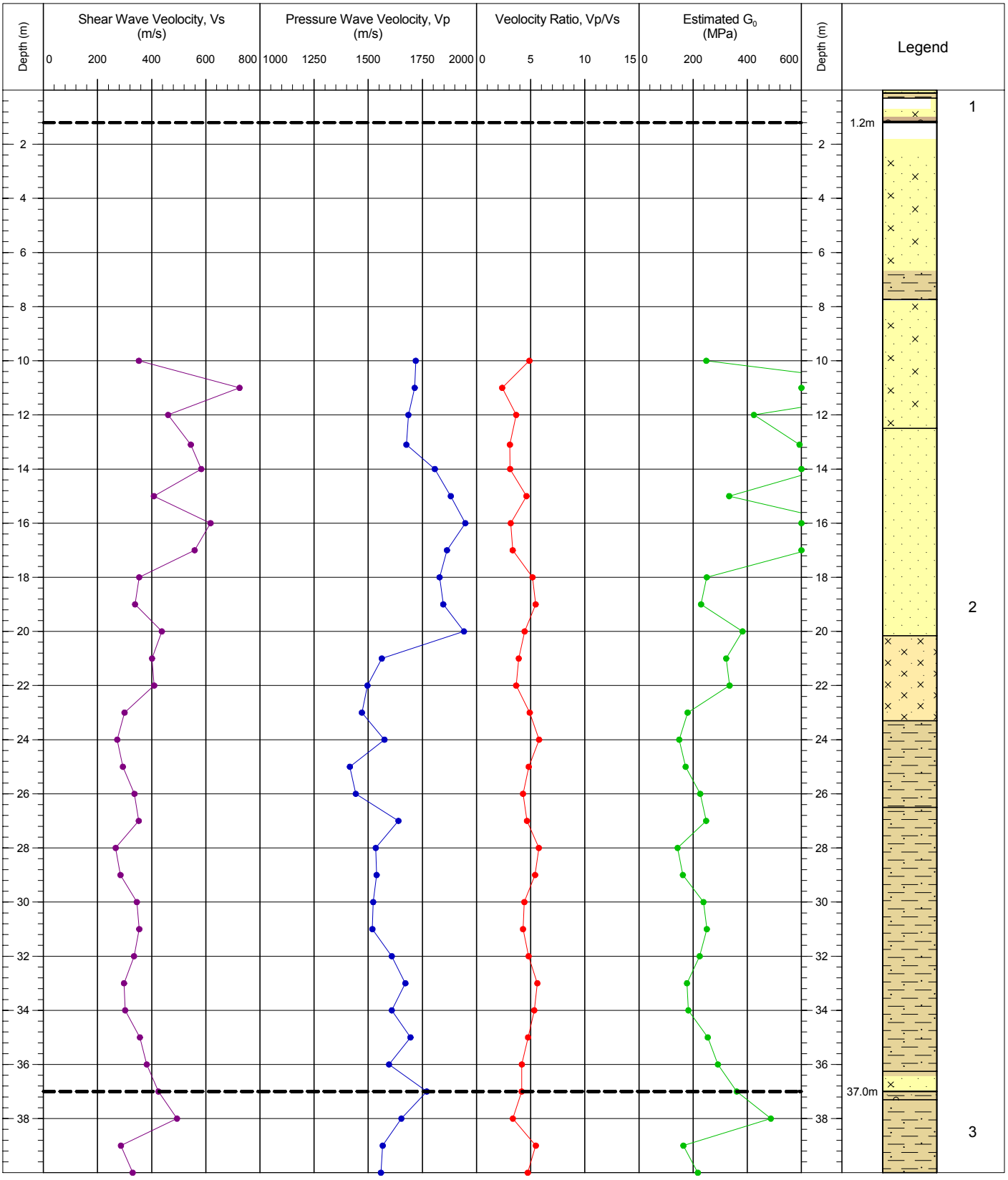
Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Name
Contract	**10451**	Water Depth (0)	**23.0**	BH - I21_A_B
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**24/06/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**73.80m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015) · Draft: **JG** (14/12/2015) · Final: **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



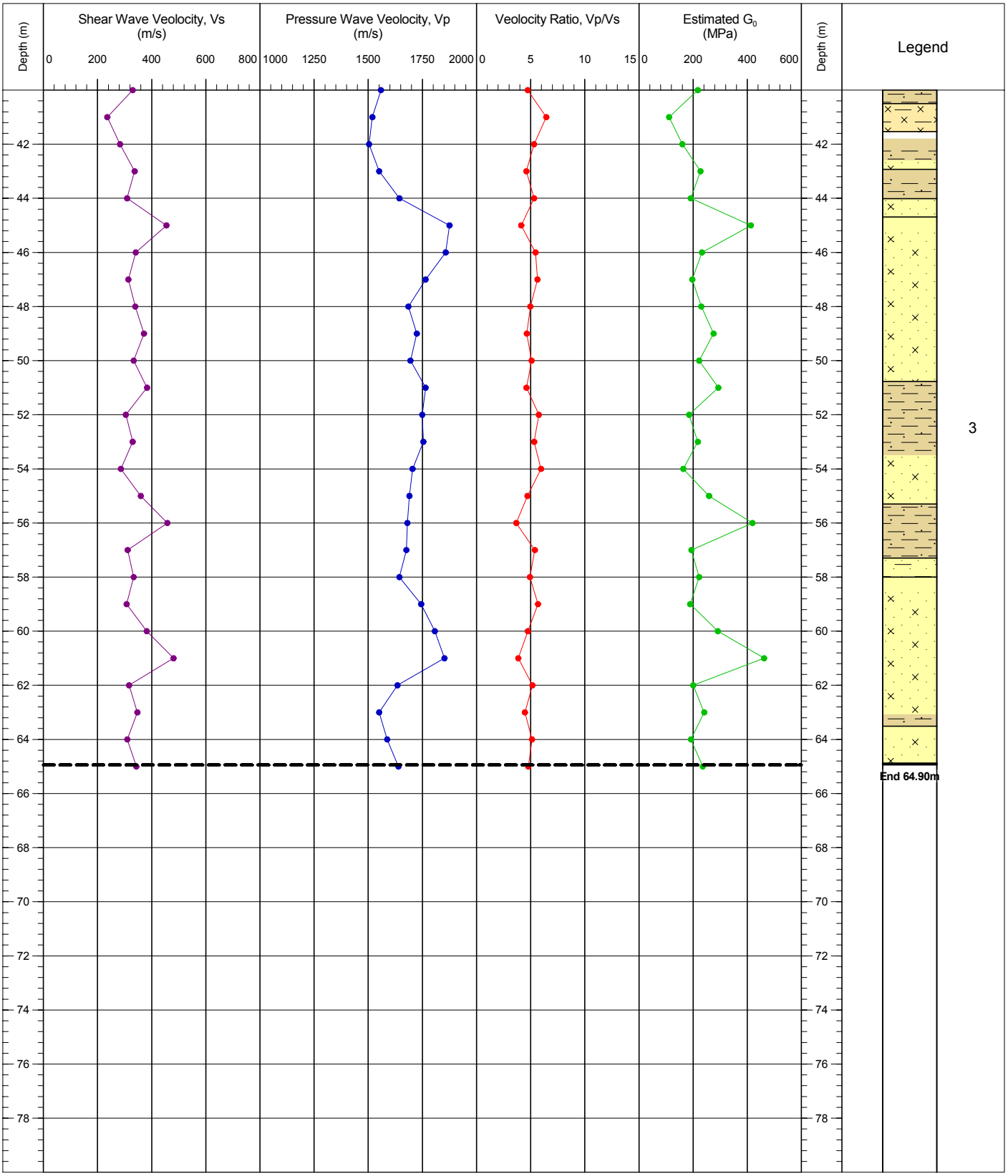
Area	**Maryland USA**	Coordinates	**521255.0E 4235906.0N**	CPT Name
Contract	**10451**	Water Depth (0)	**23.0**	BH - I21_A_B
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test	**24/06/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**73.80m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015) / Draft: **JG** (14/12/2015) / Final: **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Name: BH - MET TOWER_
Contract	**10451**	Water Depth (0)	**27.7**	
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**64.90m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015); Draft: **JG** (14/12/2015); Final: **RS** (16/12/2015)

Geotechnical Marine Survey Investigation for the Maryland Wind Energy Area
PS LOGGING



Area	**Maryland USA**	Coordinates	**521533.9E 4244983.3N**	CPT Name
Contract	**10451**	Water Depth (0)	**27.7**	BH - MET TOWER_
Client Name/Ref	**US Wind Inc./REF11449**	Date of Test (Start-End)	**19/06/2015 - 20/06/2015**	
Vessel	**MV Ocean Discovery**	Final Depth	**64.90m**	Filename -
Comments:		Hole Type	**Borehole (Sampling)**	QC Status
		CRS	**GRS 80 UTM ZONE 18 N (75 W)**	Preliminary: **SMc** (28/09/2015) · Draft: **JG** (14/12/2015) · Final: **RS** (16/12/2015)