Geotechnical Laboratory Testing Master List

Project Area	Investigation ID	Depth (m) From	Depth (m) To	Sample Type	Testing Status (as of 15 Feb. 2022)	No. of test	Test											
							Organic content	Atterberg Limits incl. NWC	PSD (Wet sieve & pipette/hydrometer)	Particle density	Uniaxial Compressive Strength (without strain measurement)	1D consolidation	UU Triaxial - 3 stages, undisturbed	CU Triaxial - 3 stages, undisturbed	Uniaxial Compressive Strength (with strain measurement)	Point Load Index (axial)	Corrosivity suite (pH, chloride, sulphate)	Determination of water content
							12	17	19	1	16	19	20	8	1	30	14	17
EB3C	DH301	4.50	5.00	Push tube	Results received			1				1	1	1				1
EB3C	DH301	18.50	18.75	Corestick	Results received						1				1			
EB3C	DH301	18.75	19.00	Corestick	Results received											1		
EB3C	DH301	23.10	23.40	Corestick	Results received						1					1		
EB3C	DH301	13.15	13.50	Jar	Results received												1	
EB3C	DH301	15.45	15.80	Jar	Results received												1	
EB3C	DH301_P	13.40	13.50	Bag	Results received		1											
EB3C	DH302	6.50	7.00	Push tube	Results received			1	1			1	1					1
EB3C	DH302	9.00	9.50	Push tube	Results received		1					1	1					
EB3C	DH302	7.50	8.15	Jar	Results received												1	
EB3C	DH302	12.42	12.69	Corestick	Results received						1					2		
EB3C	DH303	7.50	8.00	Push tube	Results received			1	1			1						1
EB3C	DH303	9.50	10.00	Push tube	Results received		1	1				1						1
EB3C	DH303	2.4	3	Jar	Results received												1	
EB3C	DH303	14.23	14.42	Corestick	Results received											2		
EB3C	DH304	5.5	6	Push tube	Results received			1					1					1
EB3C	DH304	9.5	10	Push tube	Results received		1					1	1	1				
EB3C	DH304	5.00	5.35	Jar	Results received												1	
EB3C	DH304	10.95	11.20	Jar	Results received												1	
EB3C	DH304	11.27	11.44	Corestick	Results received											2		
EB3C	DH304	23.51	23.82	Corestick	Results received											2		
EB3C	DH304	23.82	24.00	Corestick	Results received						1							
EB3C	DH305_P	18.13	18.50	Corestick	Results received						1					1		
EB3C	DH306	6.00	6.50	Push tube	Results received			1	1									1
EB3C	DH306	7.50	8.00	Push tube	Results received							1	1					
EB3C	DH306	18.48	18.70	Corestick	Results received						1							
EB3C	DH306	18.80	18.94	Corestick	Results received											1		
EB3C	DH307	1.95	2.40	Jar	Results received												1	
EB3C	DH307	14.45	14.88	Corestick	Results received						1					1		
EB3C	DH308	7.00	7.30	Jar	Results received												1	
EB3C	DH308_P	15.78	15.98	Corestick	Results received											1		
EB3C	DH308_P	1.00	1.38	Corestick	Results received						1					1		
EB3C	DH308_P	3.33	3.67	Corestick	Results received						1					1		
EB3C	DH309_P	7.50	8.00	Push tube	Results received			1	1			1		1				1
EB3C	DH309_P	9.00	9.50	Push tube	Results received			1	1	1		1	1					1
EB3C	DH311_P	5.50	6.00	Push tube	Results received			1	1									1
EB3C	DH311_P	9.00	9.50	Push tube	Results received		1		1									
EB3C	DH312	7.00	7.50	Bag	Results received			1	2									1
EB3C	DH312	1.25	1.50	Corestick	Results received						1					1		
EB3C	DH312	3.20	3.70	Corestick	Results received						1					2		
EB3C	DH314	1.75	2.25	Push tube	Results received			1	1			1		1				1
EB3C	DH314	1.50	1.80	Jar	Results received												1	
EB3C	DH315_P	1.50	2.00	Push tube	Results received								1					
EB3C	DH316_P	6.00	6.50	Push tube	Results received								1					
EB3C	DH316_P	9.00	9.50	Push tube	Results received		1					1	1					
EB3C	DH318	4.00	4.50	Jar	Results received												1	
EB3C	DH318_P	3.00	3.50	Push tube	Results received								1					
EB3C	DH318_P	10.20	10.90	Bag	Results received				1									1
EB3C	DH319	5.20	5.80	Jar	Results received												1	
EB3C	DH319_P	10.50	11.00	Push tube	Results received				1			1						
EB3C	DH320	6.00	6.10	Bag	Results received		1											
EB3C	DH320	25.23	25.34	Corestick	Results received											1		
EB3C	DH322	6.50	7.00	Bag	Results received		1	1										1
EB3C	DH322	11.00	11.50	Bag	Results received			1	2									1
EB3C	DH322	18.45	18.57		Results received						1							
EB3C	DH322	21.60	21.92	Corestick	Results received						1							
EB3C	DH322	21.92	22.18	Corestick	Results received											2		
EB3C	DH323	0.50	1.00	Jar	Results received												1	
EB3C	DH323	5.50	6.00	Push tube	Results received		1					1	1					
EB3C	DH323	3.00	3.45	Bag	Results received			1	2									1
EB3C	DH323	21.84	22.01	Corestick	Results received						1							
EB3C	DH323	22.01	22.13	Corestick	Results received											1		
EB3C	DH324	4.50	5.00	Push tube	Results received								1					
EB3C	DH324	7.00	7.50	Push tube	Results received			1										1
EB3C	DH324	15.45	15.55	Corestick	Results received											1		
EB3C	DH324	15.63	15.72	Corestick	Results received											1		
EB3C	DH325	1.20	2.00	Jar	Results received												1	
EB3C	DH325	4.00	4.50	Push tube	Results received			1	2				1					
EB3C	DH325	5.50	6.00	Push tube	Results received							1	1					
EB3C	DH325	5.40	5.50	Bag	Results received		1											
EB3C	DH326	4.50	5.00	Push tube	Results received		1					1	1	1				
EB3C	DH327	2.50	3.00	Push tube	Results received							1	1					
EB3C	DH327	6.00	6.50	Push tube	Results received							1	1					
EB3C	DH328_P	3.80	4.20	Corestick	Results received						1					1		
EB3C	DH329	7.00	7.50	Push tube	Results received			1	1			1						1
EB3C	DH329	8.50	9.00	Push tube	Results received									1				
EB3C	DH329	12.00	12.50	Push tube	Results received		1					1	1	1				
EB3C	DH329	34.95	35.18	Corestick	Results received						1							
EB3C	DH329	35.20	35.34	Corestick	Results received											1		
EB3C	DH330	3.00	3.50	Push tube	Results received								1	1				
EB3C	DH330	2.00	2.50	Jar	Results received												1	
EB3C	DH330	20.61	20.89	Corestick	Results received											2		
EB3C	DH332	18.36	18.63	Corestick	Results received											1		

Eastern Busway

Determination of Solid Density of Medium and Fine soils

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Solid Density of Medium & Fine Soils - NZS 4402:1986 Test 2.7.2 (Vacuum)

TEST DETAILS

LOCATION	**ID**	DH309		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.4		
	Reference	-	**Depth**	9.0-9.5 m
	Description	sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Average Solid Density **2.76 t/m³**

TEST REMARKS

• The material used for testing was natural, whole soil. • Date tested 1/02/2023

Approved by KTP	CHME	**Date**	3/03/2023

Eastern Busway

Determination of the Particle Size Distribution

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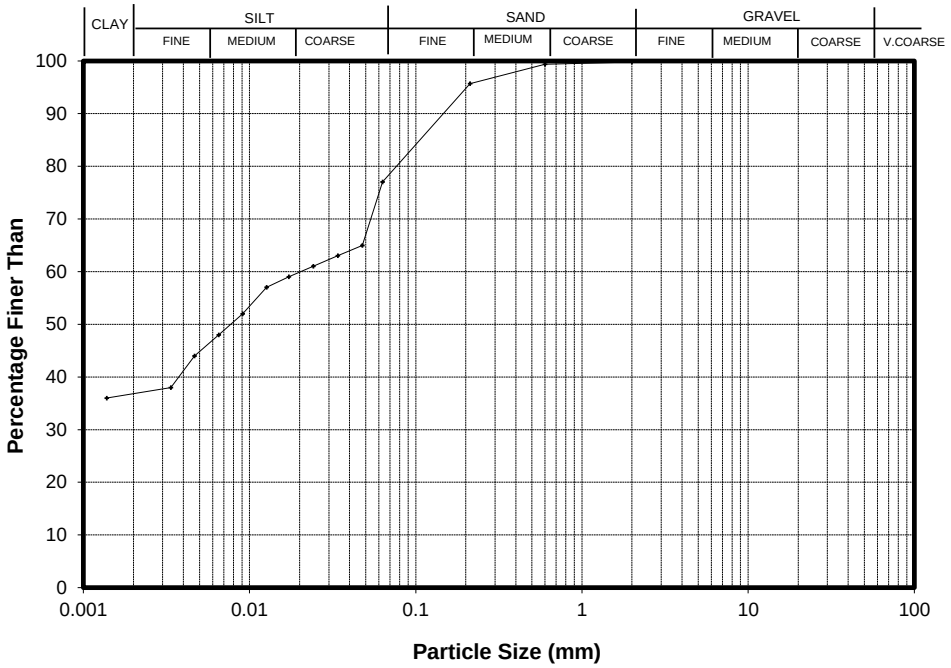
Site: Eastern Busway
BH No.: DH302 Sample ID.: AKL67.2
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: Schedule 7
Our Job No.: 1017784
Depth: 6.5-6.73 m

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
4.75	-		
3.35	-		
2.00	100		
0.600	99		
0.212	96		
0.063	77		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0477	65
0.0340	63
0.0242	61
0.0172	59
0.0127	57
0.0091	52
0.0065	48
0.0047	44
0.0034	38
0.0014	36

Sample history : Natural sample was tested
Description: clayey SILT with trace sand, blueish grey-brown, moist, high plasticity

Solid Density (Assumed) : 2.65 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 9.07
The classification of gravel-sand-silt-clay components were described on the basis of particle size analysis.
Sample description is not IANZ accredited.

Entered by : CAG 14/04/2022 Date : Checked by : GEGO 07/03/2023 Date : 28/04/2022

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Geotechnics Project ID 1017784.1000 Phase A

Customer Project ID 406084

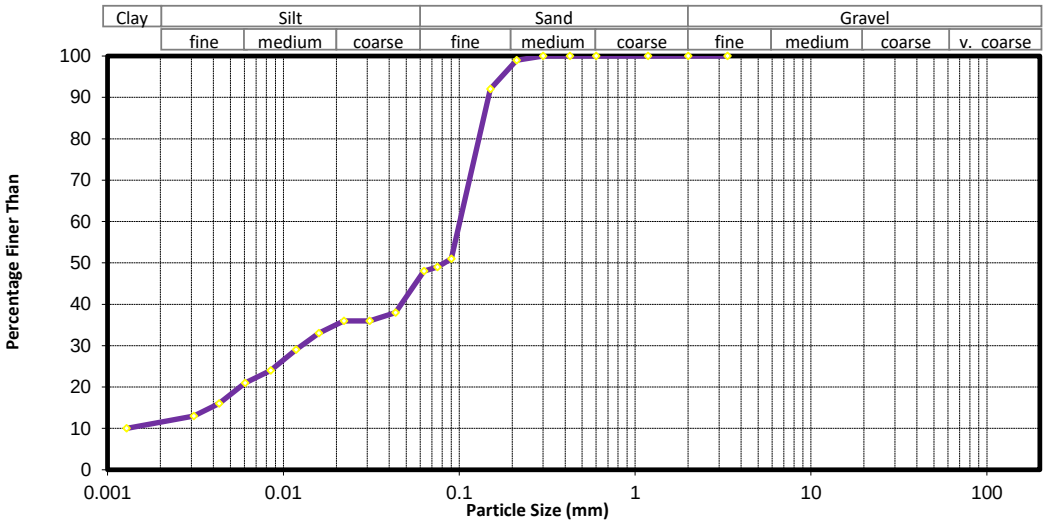
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH303		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.1		
	Reference	-	**Depth**	7.5-8.0 m
	Description	silty SAND with minor clay and trace of gravel, dark blueish grey with brown; firm, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	99
53.0	-	4.75	-	0.150	92
37.5	-	3.35	100	0.090	51
26.5	-	2.00	100	0.075	49
19.0	-	1.18	100	0.063	48

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0470	38	0.0035	13
0.0335	36	0.0014	10
0.0239	36		
0.0171	33		
0.0128	29		
0.0093	24		
0.0067	21		
0.0049	16		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/02/2023

This test result is IANZ accredited.

Approved by KTP **Date** 07/03/2023

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Geotechnics Project ID 1017784.1000 Phase 4

Customer Project ID 406084

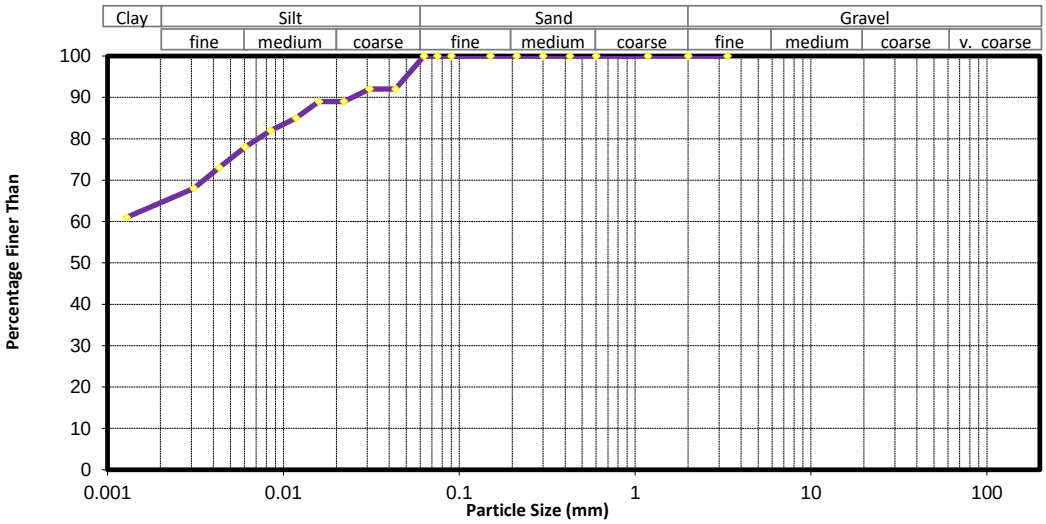
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH306		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.1		
	Reference	-	**Depth**	6.0-6.5 m
	Description	silty CLAY with trace of sand and gravel, light orange brown with orange; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	100
37.5	-	3.35	100	0.090	100
26.5	-	2.00	100	0.075	100
19.0	-	1.18	100	0.063	100

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0449	92	0.0031	68
0.0317	92	0.0013	61
0.0226	89		
0.0160	89		
0.0119	85		
0.0085	82		
0.0061	78		
0.0044	73		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **8/03/2023**

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Geotechnics Project ID 1017784.1000 Phase A

Customer Project ID 406084

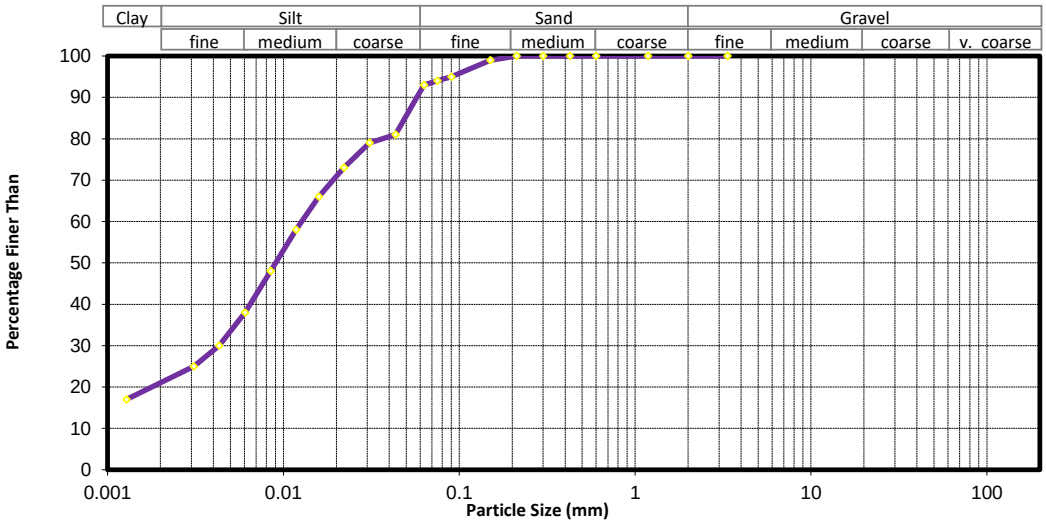
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH309		
	Description	Eastern Busway 11		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.3		
	Reference	-	**Depth**	7.5-8.0 m
	Description	clayey SILT with minor sand and trace of gravel, dark blueish grey; very soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	99
37.5	-	3.35	100	0.090	95
26.5	-	2.00	100	0.075	94
19.0	-	1.18	100	0.063	93

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0452	81	0.0035	25
0.0322	79	0.0015	17
0.0233	73		
0.0169	66		
0.0127	58		
0.0092	48		
0.0067	38		
0.0049	30		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **3/03/2023**

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

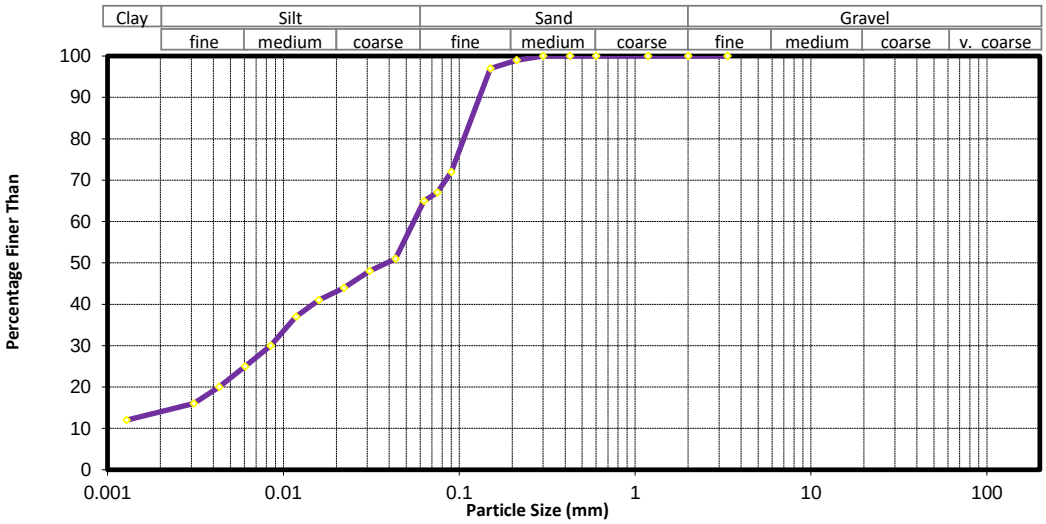
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH309		
	Description	Eastern Busway 11		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.4		
	Reference	-	**Depth**	9.0-9.5 m
	Description	sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	99
53.0	-	4.75	-	0.150	97
37.5	-	3.35	100	0.090	72
26.5	-	2.00	100	0.075	67
19.0	-	1.18	100	0.063	65

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0469	51	0.0034	16
0.0336	48	0.0014	12
0.0241	44		
0.0173	41		
0.0128	37		
0.0093	30		
0.0067	25		
0.0048	20		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.76 t/m³ (Measured)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **3/03/2023**

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Geotechnics Project ID 1017784.1000 Phase 4

Customer Project ID 406084

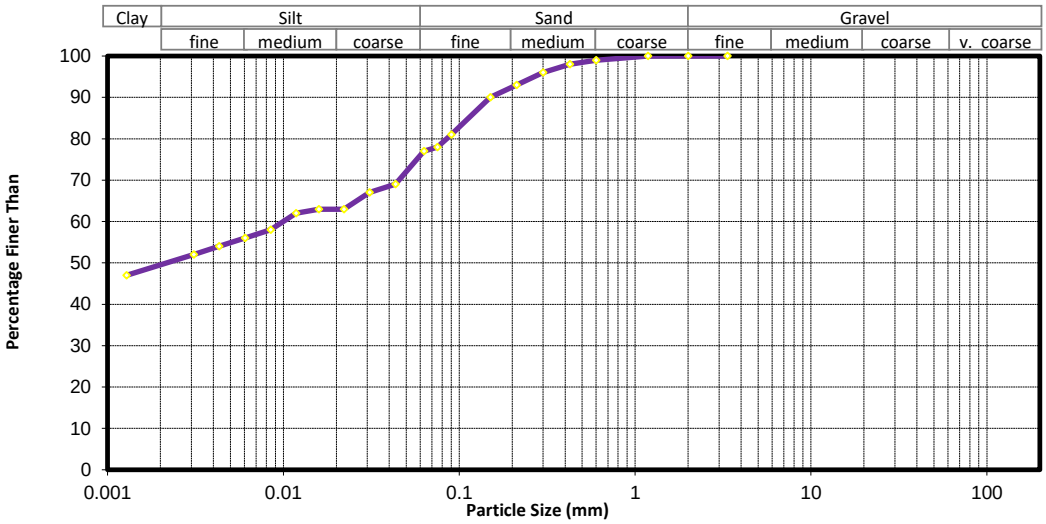
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH311		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.2		
	Reference	-	**Depth**	5.5-6.0 m
	Description	silty sandy CLAY with trace of gravel, dark greenish grey; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	98
75.0	-	9.50	-	0.300	96
63.0	-	6.70	-	0.212	93
53.0	-	4.75	-	0.150	90
37.5	-	3.35	100	0.090	81
26.5	-	2.00	100	0.075	78
19.0	-	1.18	100	0.063	77

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0456	69	0.0031	52
0.0325	67	0.0013	47
0.0233	63		
0.0165	63		
0.0121	62		
0.0087	58		
0.0062	56		
0.0044	54		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **8/03/2023**

GEOTECHNICS

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Geotechnics Project ID 1017784.1000 Phase 4

Customer Project ID 406084

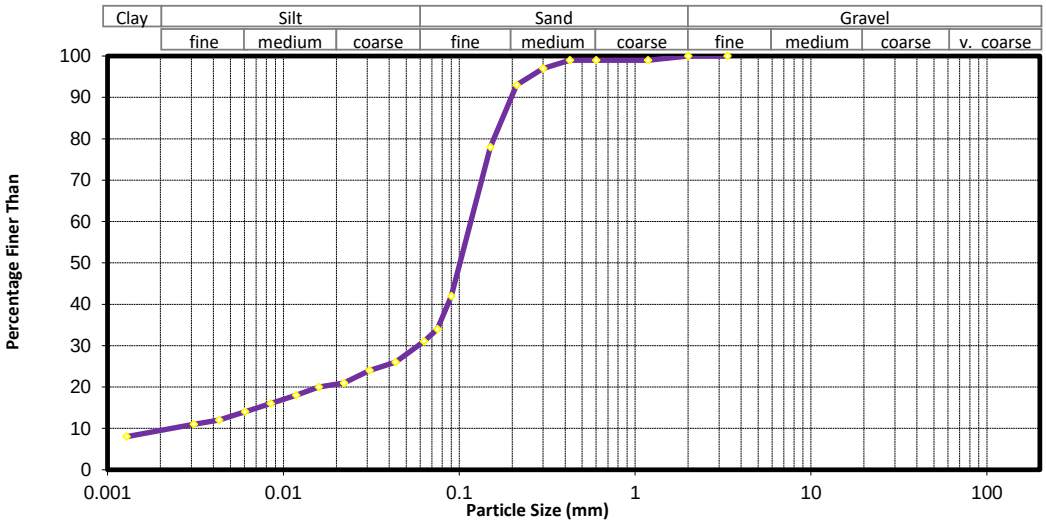
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH311		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.3		
	Reference	-	**Depth**	9.0-9.5 m
	Description	silty SAND with minor clay and trace of gravel, dark brown; firm, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	N/A
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	99
75.0	-	9.50	-	0.300	97
63.0	-	6.70	-	0.212	93
53.0	-	4.75	-	0.150	78
37.5	-	3.35	100	0.090	42
26.5	-	2.00	100	0.075	34
19.0	-	1.18	99	0.063	31

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0434	26	0.0034	11
0.0312	24	0.0014	8
0.0230	21		
0.0166	20		
0.0124	18		
0.0090	16		
0.0065	14		
0.0047	12		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **8/03/2023**

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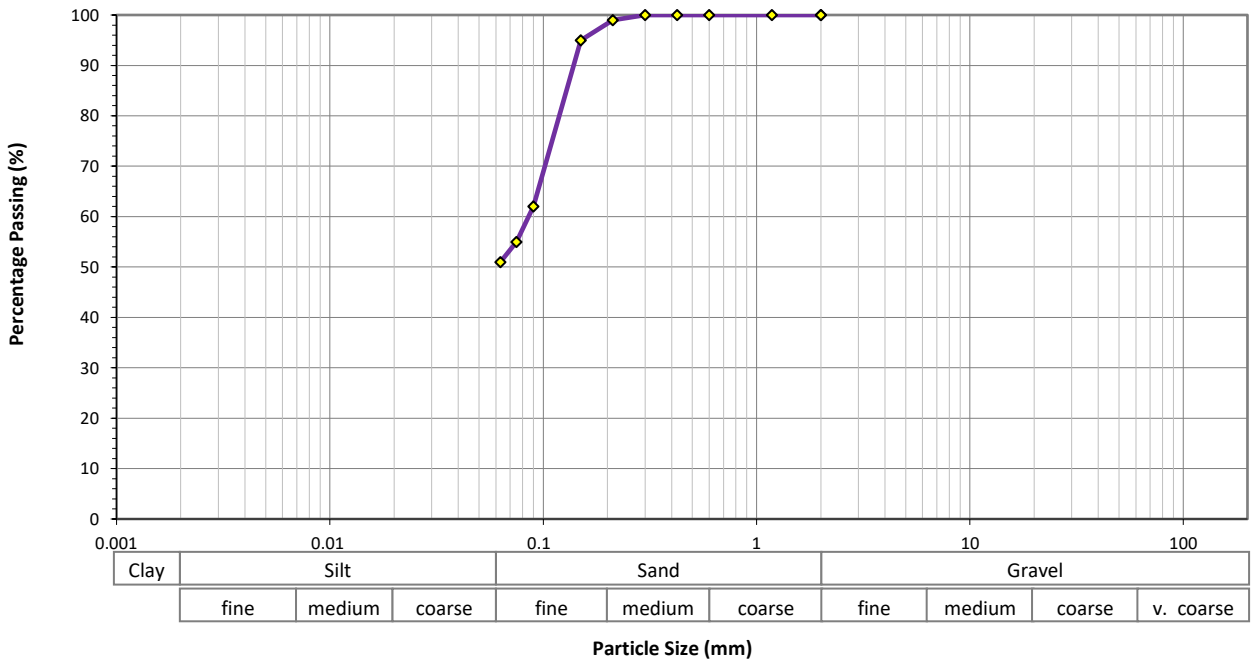
Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**ID**	DH312		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL101.1		
	Reference	-	**Depth**	7-7.5 m
	Description	sandy SILT minor clay, whiteish grey; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	100	0.150	95
63.0	-	13.2	-	1.18	100	0.090	62
53.0	-	9.50	-	0.600	100	0.075	55
37.5	-	6.70	-	0.425	100	0.063	51

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference.
Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

GEOTECHNICS

1 Hill Street, Onehunga Auckland
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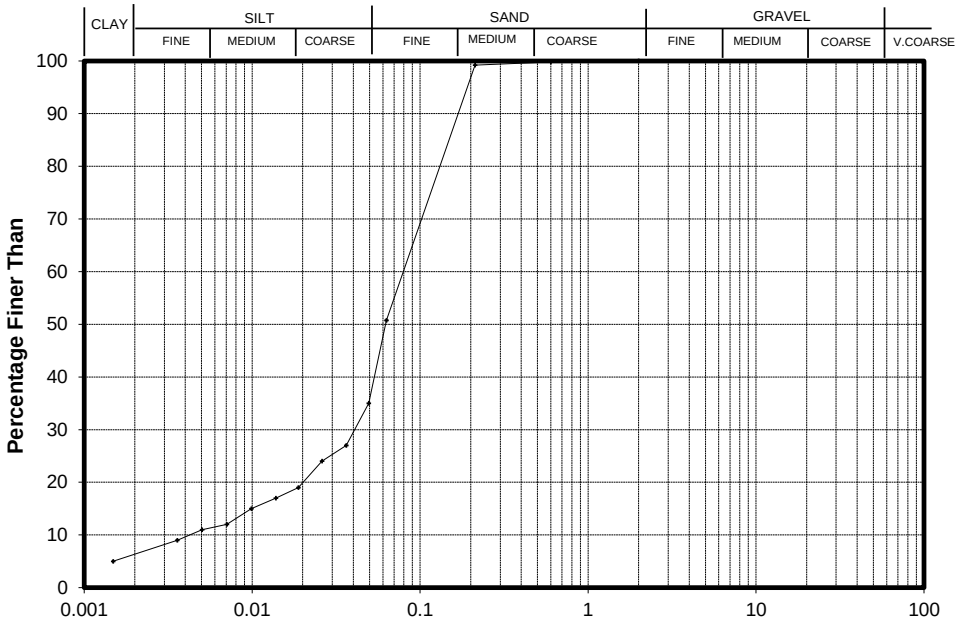
www.geotechnics.co.nz

Your Job No.: **ALCOE-103**
Our Job No.: **1017784**
Depth: **7-7.5 m**

Site: **Eastern Busway**
BH No.: **DH312** Sample ID.: AKL101.1
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
4.75	-		
3.35	-		
2.00	100		
0.600	100		
0.212	99		
0.063	51		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0494	35
0.0363	27
0.0260	24
0.0188	19
0.0138	17
0.0099	15
0.0071	12
0.0050	11
0.0036	9
0.0015	5

Sample history : Tested as recived
Description: sandy SILT minor clay, whiteish grey; soft, mosist, low plasticity

Solid Density (Measured) : 2.65 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.1
The classification of gravel-sand-silt-clay components were described on the basis of particle size analysis.
Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022

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Geotechnics Project ID 1017784.1000 Phase 4

Customer Project ID 406084

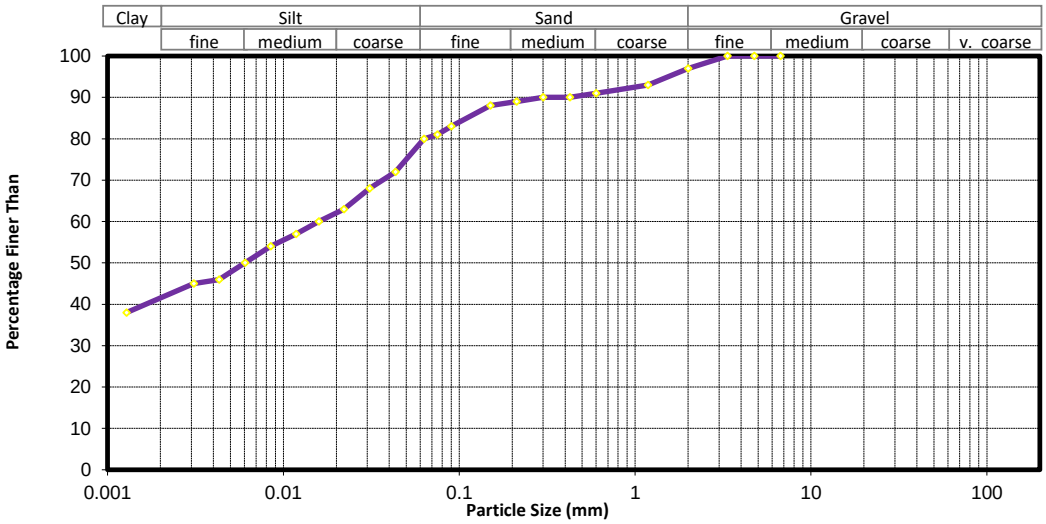
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH314		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.4		
	Reference	-	**Depth**	1.75-2.25 m
	Description	silty CLAY with some sand and trace of gravel, dark orange brown with black; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	91
100.0	-	13.2	-	0.425	90
75.0	-	9.50	-	0.300	90
63.0	-	6.70	100	0.212	89
53.0	-	4.75	100	0.150	88
37.5	-	3.35	100	0.090	83
26.5	-	2.00	97	0.075	81
19.0	-	1.18	93	0.063	80

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0434	72	0.0032	45
0.0312	68	0.0013	38
0.0226	63		
0.0162	60		
0.0121	57		
0.0087	54		
0.0062	50		
0.0045	46		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **8/03/2023**

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Geotechnics Project ID 1017784.1000.A.0

Customer Project ID 406084

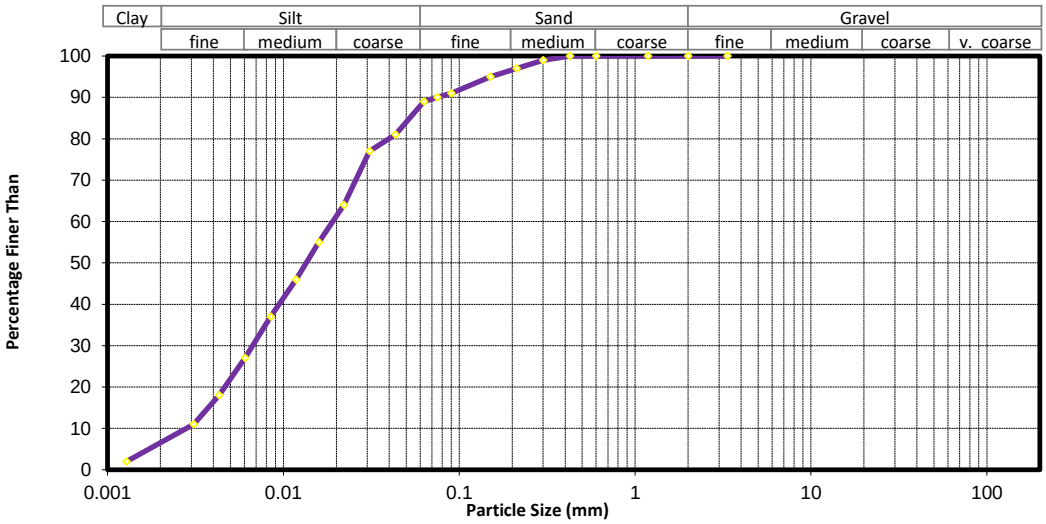
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH318_P		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL475.4		
	Reference	-	**Depth**	10.2-10.9 m
	Description	SILT with minor sand and clay and trace of gravel, light brownish grey with black; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	99
63.0	-	6.70	-	0.212	97
53.0	-	4.75	-	0.150	95
37.5	-	3.35	100	0.090	91
26.5	-	2.00	100	0.075	90
19.0	-	1.18	100	0.063	89

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0456	81	0.0036	11
0.0328	77	0.0015	2
0.0242	64		
0.0176	55		
0.0132	46		
0.0096	37		
0.0070	27		
0.0050	18		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 04/05/2023

This test result is IANZ accredited.

Approved by KTP SJA **Date** 11/05/2023

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Geotechnics Project ID 1017784.1000 Phase A

Customer Project ID 406084

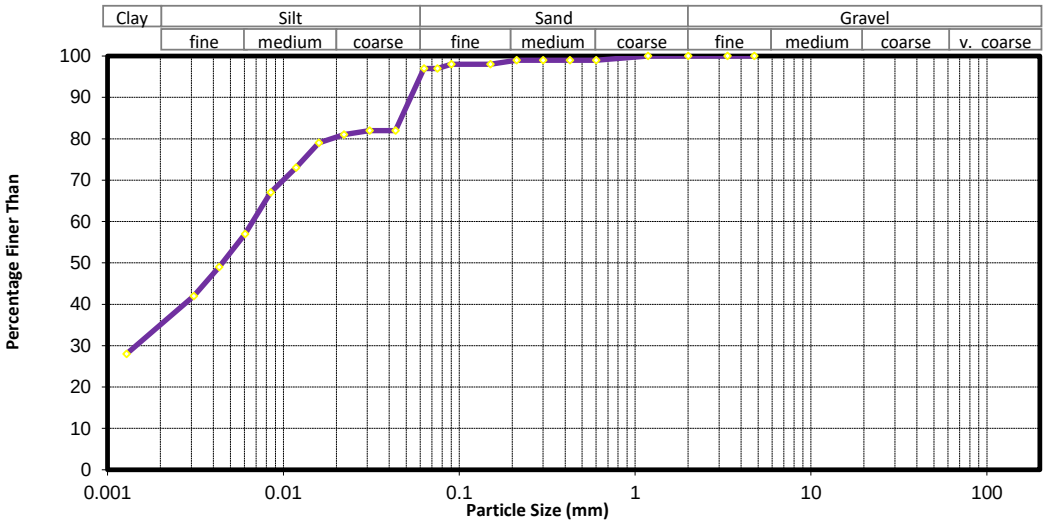
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH319_P		
	Description	Eastern Busway 11		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.5		
	Reference	-	**Depth**	10.5-11.0 m
	Description	clayey SILT with trace of sand and gravel, dark brown with black; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	99
75.0	-	9.50	-	0.300	99
63.0	-	6.70	-	0.212	99
53.0	-	4.75	100	0.150	98
37.5	-	3.35	100	0.090	98
26.5	-	2.00	100	0.075	97
19.0	-	1.18	100	0.063	97

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0466	82	0.0034	42
0.0329	82	0.0014	28
0.0234	81		
0.0167	79		
0.0124	73		
0.0089	67		
0.0065	57		
0.0047	49		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP **Date** 07/03/2023

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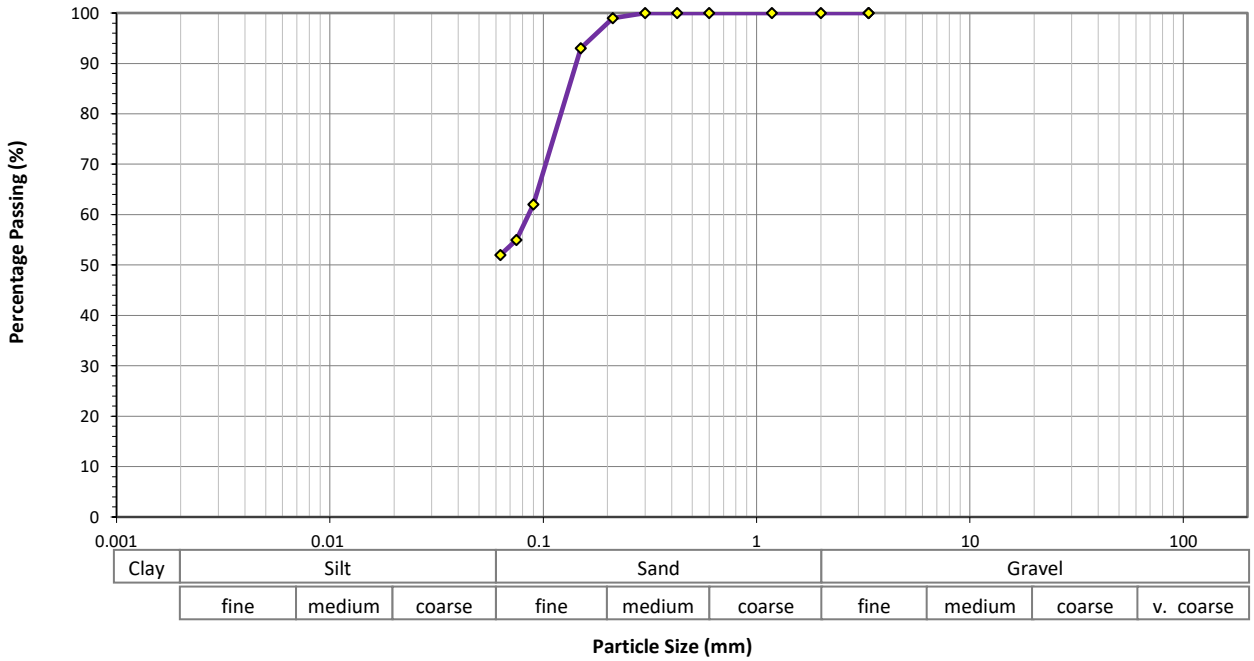
Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**ID**	DH322		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL103.2		
	Reference	-	**Depth**	11-11.5 m
	Description	sandy SILT minor clay, dark grey; soft, moist, non-plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	100	0.212	99
75.0	-	16.0	-	2.00	100	0.150	93
63.0	-	13.2	-	1.18	100	0.090	62
53.0	-	9.50	-	0.600	100	0.075	55
37.5	-	6.70	-	0.425	100	0.063	52

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference.
Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

GEOTECHNICS

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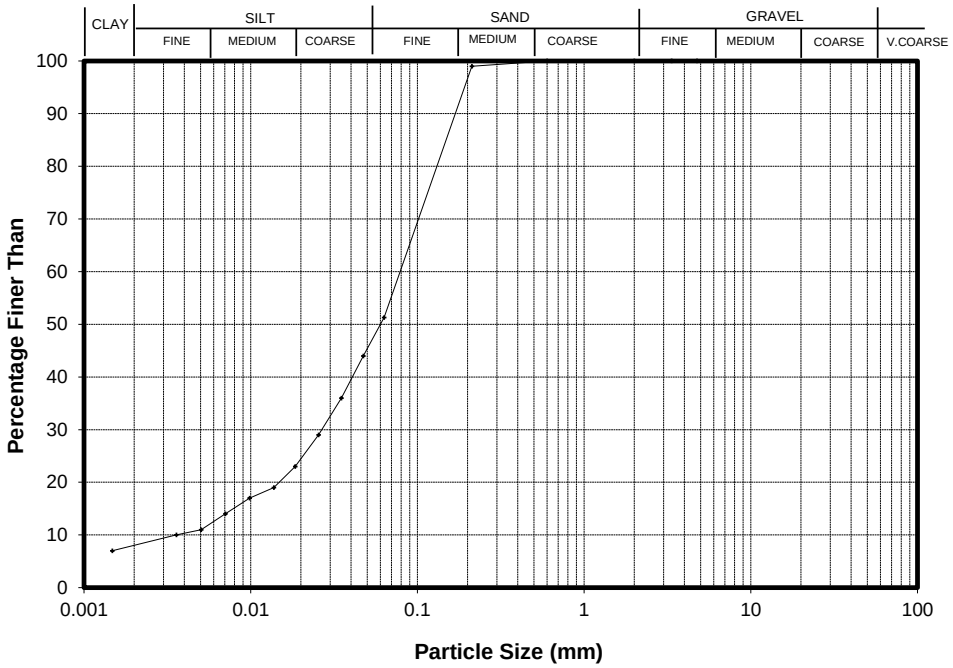
Site: **Eastern Busway**
BH No.: **DH322** Sample ID.: AKL103.2
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job N **ALCOE-103**
Our Job No **1017784**
Depth: **11-11.5 m**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
4.75	-		
3.35	-		
2.00	-		
0.600	100		
0.212	99		
0.063	51		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0474	44
0.0350	36
0.0255	29
0.0185	23
0.0138	19
0.0098	17
0.0070	14
0.0050	11
0.0036	10
0.0015	7

Sample history : Tested as Recived
Description: sandy SILT minor clay, dark grey; soft, moist, low plasticity

Solid Density (Assumed) : 2.65 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 9.7
The classification of gravel-sand-silt-clay components were described on the basis of particle size analysis.
Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022

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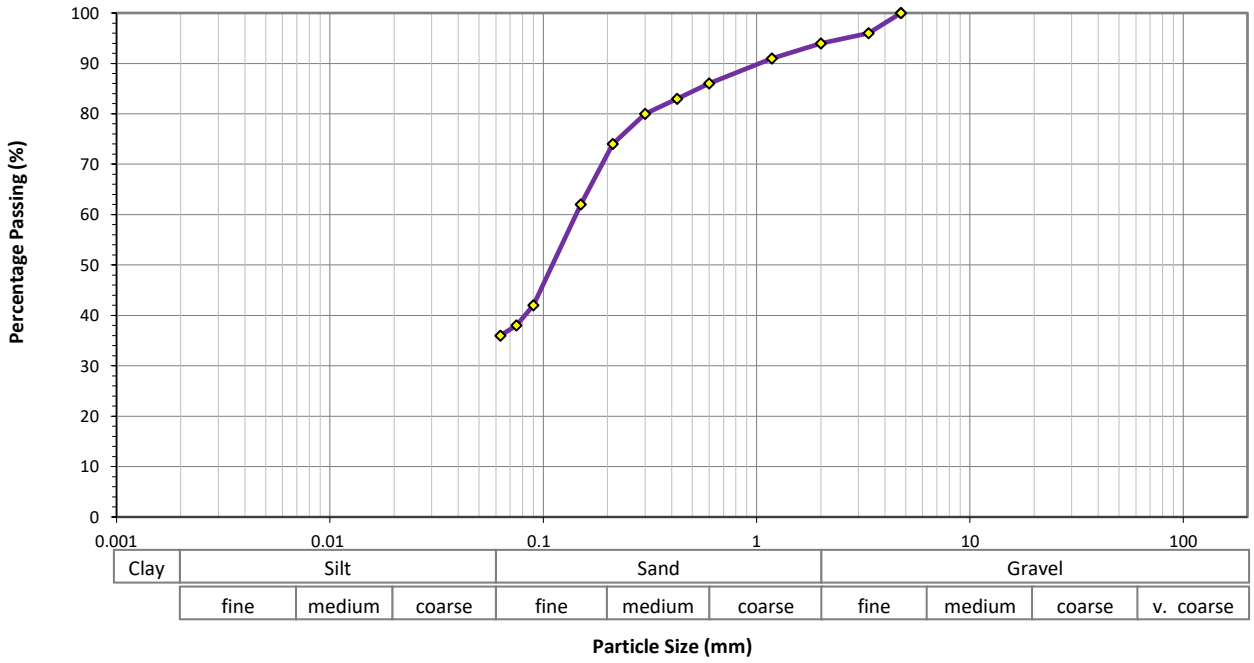
Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**ID**	DH323		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL104.2		
	Reference	-	**Depth**	3-3.45 m
	Description	silty SAND, minor clay, dark brown; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	100	0.300	80
100	-	19.0	-	3.35	96	0.212	74
75.0	-	16.0	-	2.00	94	0.150	62
63.0	-	13.2	-	1.18	91	0.090	42
53.0	-	9.50	-	0.600	86	0.075	38
37.5	-	6.70	-	0.425	83	0.063	36

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference.
Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

GEOTECHNICS

1 Hill Street, Onehunga Auckland
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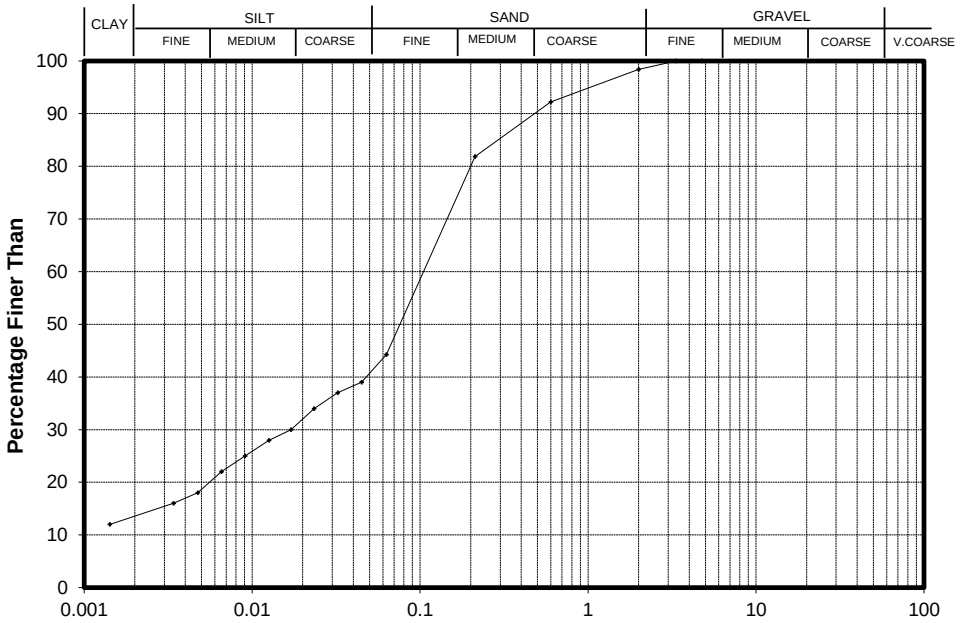
www.geotechnics.co.nz

Site: **ALCOE-103**
BH No.: **DH323** Sample ID.: AKL104.2
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **1017784**
Our Job No.: **ALCOE-103**
Depth: **3-3.45 m**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
4.75	100		
3.35	100		
2.00	98		
0.600	92		
0.212	82		
0.063	44		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0449	39
0.0322	37
0.0233	34
0.0170	30
0.0126	28
0.0091	25
0.0066	22
0.0048	18
0.0034	16
0.0014	12

Sample history : Tested as Recived
Description: silty SAND, minor clay, dark brown; soft, moist, low plasticity

Solid Density (Assumed) : 2.65 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.8
The classification of gravel-sand-silt-clay components were described on the basis of particle size analysis.
Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022

GEOTECHNICS

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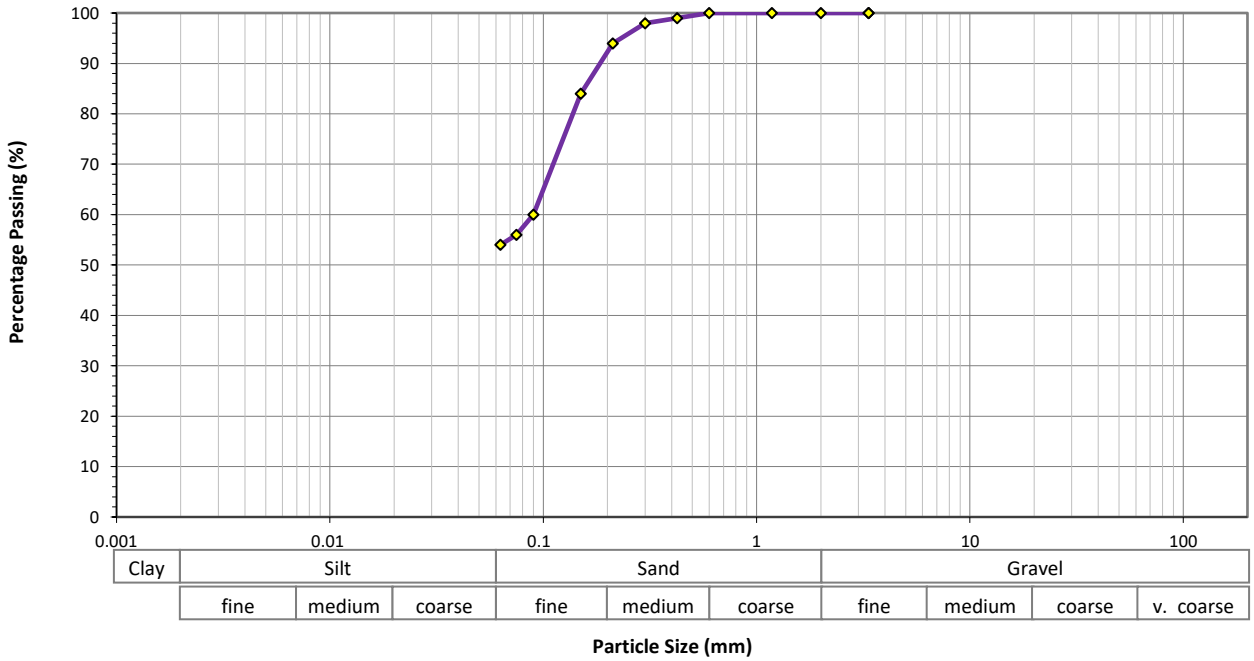
Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**ID**	DH325		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL106.1		
	Reference	-	**Depth**	4-4.5 m
	Description	silty SAND minor clay, light greyish brown; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	100	0.212	94
75.0	-	16.0	-	2.00	100	0.150	84
63.0	-	13.2	-	1.18	100	0.090	60
53.0	-	9.50	-	0.600	100	0.075	56
37.5	-	6.70	-	0.425	99	0.063	54

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference.
Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

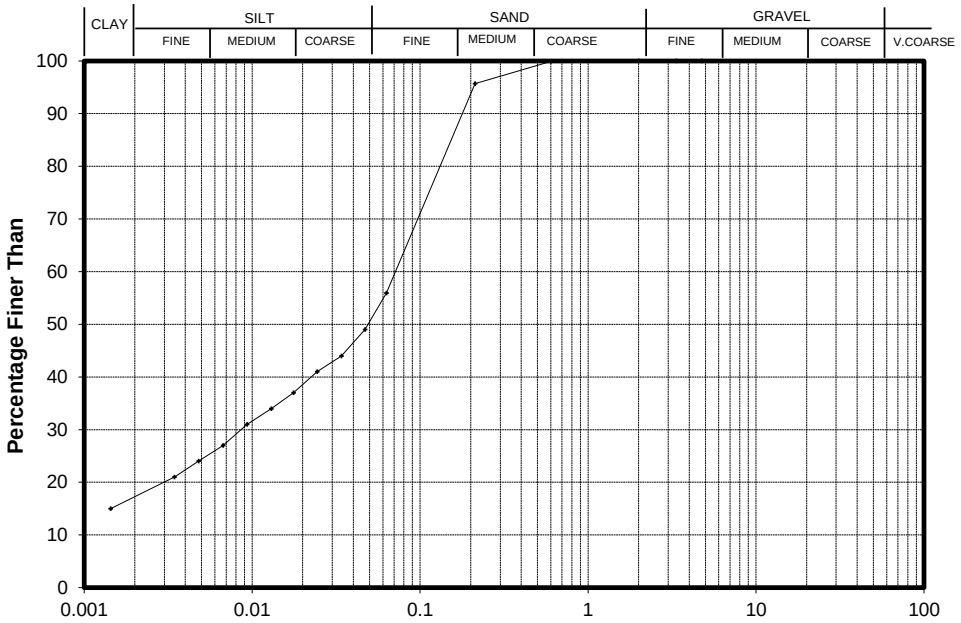
GEOTECHNICS

1 Hill Street, Onehunga Auckland
New Zealand
P 64 09 356 3510
www.geotechnics.co.nz

Site: **ALCOE-103**
BH No.: **DH325** Sample ID.: AKL106.1
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **ALCOE-103**
Our Job No.: **1017784**
Depth: **4-4.5 m**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
4.75	-		
3.35	-		
2.00	100		
0.600	100		
0.212	96		
0.063	56		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0470	49
0.0340	44
0.0244	41
0.0176	37
0.0130	34
0.0093	31
0.0067	27
0.0048	24
0.0034	21
0.0014	15

Sample history : Tested as Recived
Description: silty SAND minor clay, light greyish brown, soft, moist, low plasticity

Solid Density (Assumed) : 2.65 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 9.4
The classification of gravel-sand-silt-clay components were described on the basis of particle size analysis.
Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022

GEOTECHNICS

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Geotechnics Project ID 1017784.1000 Phase A

Customer Project ID 406084

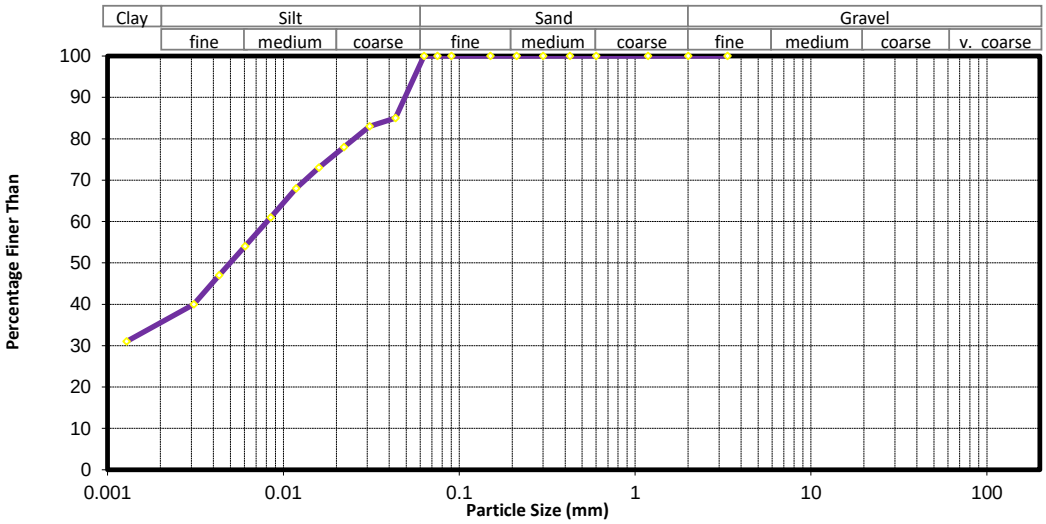
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

TEST DETAILS

LOCATION	**ID**	DH329_P		
	Description	Eastern Busway 11		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.6		
	Reference	-	**Depth**	7.0-7.5 m
	Description	clayey SILT with trace of sand and gravel, dark brownish grey with orange; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

PARTICLE SIZE ANALYSIS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	100
37.5	-	3.35	100	0.090	100
26.5	-	2.00	100	0.075	100
19.0	-	1.18	100	0.063	100

Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)	Equivalent Particle Diameter D (mm)	Percentage of Particles Finer than D (%)
0.0460	85	0.0034	40
0.0328	83	0.0014	31
0.0235	78		
0.0169	73		
0.0125	68		
0.0090	61		
0.0065	54		
0.0047	47		

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.
Suspension pH 8.0
The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP **CHME** **Date** **3/03/2023**

Organic Content by Ignition

GEOTECHNICS

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Geotechnics Project ID	1017784.1000.A.0
Customer Project ID	406084
Project Name	G-SL Eastern Busway

Organic Content by Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH301_P		
	Location Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL475.3	**Date Received**	-
	Reference	-	**Depth from**	13.4 m
			Depth to	13.5 m
	Description	organic clayey SILT, black with dark brown; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content	40 %

TEST REMARKS

• The material used for testing was natural, fraction passing a 9.5 mm sieve. • Date tested 2/05/2023 • The test was rounded to the nearest 5 % • For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than approximately 15 %.

Date tested: 02/05/2023

This test result is IANZ accredited.

Approved by KTP SJA **Date** 11/05/2023

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Geotechnics Project ID 1017784

Customer Project ID Schedule 7

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH302		
	Description	ALCOE-84		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL67.3		
	Reference	-	**Depth**	9 - 9.5 m
	Description	Peat with organic material, brownish black, soft.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **45%**

TEST REMARKS

Orgainc matter content was rounded to the nearest 5%.

Test By:	CAGI	**Date**	13/04/2022
Approved By		**Date**	25/05/2022

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Geotechnics Project ID

Customer Project ID

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH303		
	Description	Eastern Busway		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL371.2		
	Reference	-	**Depth**	9.5-10.0 m
	Description	clayey SILT, black; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content **30%**

TEST REMARKS

Date tested 28/02/2023.
Test was rounded to the nearest 1%.
For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than about 15% .

Test By:	KESA	**Date**	28/02/2023
Approved By KTP		**Date**	07/03/2023

GEOTECHNICS

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Auckland, New Zealand

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Geotechnics Project ID 1017784
Customer Project ID Schedule 7

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH304		
	Description	ALCOE-84		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL68.3		
	Reference	-	**Depth**	9.5 - 10 m
	Description	peat with organic material, brownish black, soft.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content **50%**

TEST REMARKS

Orgainc matter content was rounded to the nearest 5%.

Test By:	CAGI	**Date**	13/04/2022
Approved By	Glenn Anderson	**Date**	25/05/2022

GEOTECHNICS

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Geotechnics Project ID

Customer Project ID

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH311		
	Description	Eastern Busway 12		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL377.3		
	Reference	-	**Depth**	9.0-9.5 m
	Description	silty SAND with minor clay and trace of gravel, dark brown; firm, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content **< 1 %**

TEST REMARKS

Date tested 28/02/2023.
Test was rounded to the nearest 1%.
For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than about 15% .

Test By:	KESA	**Date**	28/02/2023
Approved By KTP	CHME	**Date**	8/03/2023

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Geotechnics Project ID	1017784.1000.A.0
Customer Project ID	406084
Project Name	G-SL Eastern Busway

Organic Content by Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH316		
	Location Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL475.2	**Date Received**	Unknown
	Reference	-	**Depth from**	9.0 m
			Depth to	9.5 m
	Description	organic clayey SILT, black with dark brown; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content	50 %

TEST REMARKS

• The material used for testing was natural, fraction passing a 9.5 mm sieve. • Date tested 2/05/2023 • The test was rounded to the nearest 5 % • For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than approximately 15 %.

Date tested: 02/05/2023

This test result is IANZ accredited.

Approved by KTP SJA **Date** 15/05/2023

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Geotechnics Project ID 1017784

Customer Project ID -

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH320		
	Description	-		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL102.1		
	Reference	-	**Depth**	6-6.1 m
	Description	spongy PEAT		
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **25%**

TEST REMARKS

Orgainc matter content was rounded to the nearest 5%.

Test By:	GEGO	**Date**	13/06/2022
Approved By		**Date**	17/06/2022

GEOTECHNICS

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Geotechnics Project ID 1017784

Customer Project ID ALCOE103

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH322		
	Description	-		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL103.1		
	Reference	-	**Depth**	6.5-7 m
	Description	peaty CLAY with decomposed wood flecks; soft, wet, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **15%**

TEST REMARKS

Organic matter content was rounded to the nearest 5%.

Test By:	GEGO	**Date**	13/06/2022
Approved By	EKH	**Date**	17/06/2022

GEOTECHNICS

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Geotechnics Project ID 1017784

Customer Project ID ALCOE-103

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH323		
	Description	ALCOE-103		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL104.3		
	Reference	-	**Depth**	5.5-6 m
	Description	peaty CLAY black; soft, wet, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULT

Organic Matter Content **15%**

TEST REMARKS

Organic matter content was rounded to the nearest 5%.

Test By:	GEGO	**Date**	13/06/2022
Approved By		**Date**	17/06/2022

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Geotechnics Project ID 1017784

Customer Project ID -

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH325		
	Description	-		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL106.2		
	Reference	-	**Depth**	5.40-5.5 **Description**
	clayey SILT with some peat; firm, moist, high plasticity			
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **4%**

TEST REMARKS

Organic matter content was rounded to the nearest 1%• The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%..

Test By:	GEGO	**Date**	13/06/2022
Approved By		**Date**	17/06/2022

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Geotechnics Project ID 1017784

Customer Project ID -

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH326		
	Description	**-Data**		
	-			
SAMPLE	**Geotechnics ID**	AKL107.1		
			Reference - **Depth** 4.5-5 m **Description**	
	spongy PEAT, black; very soft, wet, high plasticity			
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **65%**

TEST REMARKS

Organic matter content was rounded to the nearest 5%.

Test By:	GEGO	**Date**	13/06/2022
Approved By		**Date**	17/06/2022

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Geotechnics Project ID 1017784

Customer Project ID ALCOE-103

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**ID**	DH329		
	Description	-		
	Data	-		
SAMPLE	**Geotechnics ID**	AKL108.1		
	Reference	-	**Depth**	12-12.5 m
	Description	peaty CLAY, black; soft, wet, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description			

TEST RESULT

Organic Matter Content **35%**

TEST REMARKS

Organic matter content was rounded to the nearest 5%.

Test By:	GEGO	**Date**	13/06/2022
Approved By		**Date**	17/06/2022

Laboratory Vane Test

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1 Hill Street
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Geotechnics Project ID: 1017784.1000.2.0

Customer Project ID: EBA_16

Site: Eastern Busway

Test Method used: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

Laboratory Vane Test

Location ID	Sample Reference	Depth (m)	Sampling tube		Vane Shear Strength (kPa)	
			Type	Diameter (mm)	Peak	Residual
DH301	--	10.56	Push tube	55	150	93

Photo:

Soil description: 10.56-10.90m: clayey SILT with a trace of sand, firm, dark grey with some brown; moist, high plasticity

10.90-10.98m: clayey SILT with minor sand, firm, dark grey; moist, high plasticity

Location ID	Sample Reference	Depth (m)	Sampling tube		Vane Shear Strength (kPa)	
			Type	Diameter (mm)	Peak	Residual
DH318_P	--	12.4	Push tube	55	57	11

Photo:

Soil description: 12.34-12.46m: silty CLAY with some organics, soft, dark brownish grey; moist, high plasticity

Location ID	Sample Reference	Depth (m)	Sampling tube		Vane Shear Strength (kPa)	
			Type	Diameter (mm)	Peak	Residual
DH318_P	--	12.08	Push tube	55	45	9.9

Photo:

Soil description: 12.04-12.34m: Organic silty CLAY, soft, black; moist, high plasticity

Test Remarks

DH301- Requested top of sample tested, DH318_P- Request both ends tested

Tested by: CHLU Date: 24/04/2023 Approved by KTP: Date: 28/04/2023

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1 Hill Street, Onehunga, Auckland 1061
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www.geotechnics.co.nz

Your Job No.: EBA_12

Project ID: G-TL Eastern Busway

Our Job No.: 1017784.0000.2.0

Test Method: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

TEST RESULTS

Table 1: Test Results Summary

DH No.:		DH308
Depth	(m)	10.96m
Peak vane shear strength	(kPa)	149
Residual vane shear strength	(kPa)	22

Sample Description for

10.5-10.83m: silty CLAY, firm to soft, blueish dark grey; moist, extremely high plasticity

10.83-10.93: Clayey SILT with minor organic inclusions, firm, brown with grey; moist, high plasticity

10.93-10.99m: Organic clayey SILT, firm, black; high plasticity, moist

Remarks :

Diameter of the push tube: 54mm

Decriptions are not IANZ accredited.

Test by: CHLU

Date: 31/3/2023

Approved by:

Date: 3/04/2023

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Your Job No.: EBA_12

Project ID: G-TL Eastern Busway

Our Job No.: 1017784.0000.2.0

Test Method: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

TEST RESULTS

Table 1: Test Results Summary

DH No.:		DH315_P
Depth	(m)	6.36m
Peak vane shear strength	(kPa)	56
Residual vane shear strength	(kPa)	12

Sample Description for

6.0-6.22m: Clayey SILT with minor sand, soft, mottled grey and black with orange; moist, high plasticity

6.22-6.50m: Organic clayey SILT, soft, blackish brown; moist, extremely high plasticity

Remarks :

Diameter of the push tube: 54mm

Decriptions are not IANZ accredited.

Test by: CHLU

Date: 31/3/2023

Approved by:

Date: 3/04/2023

Eastern Busway

Consolidated-Undrained Triaxial Compression Test

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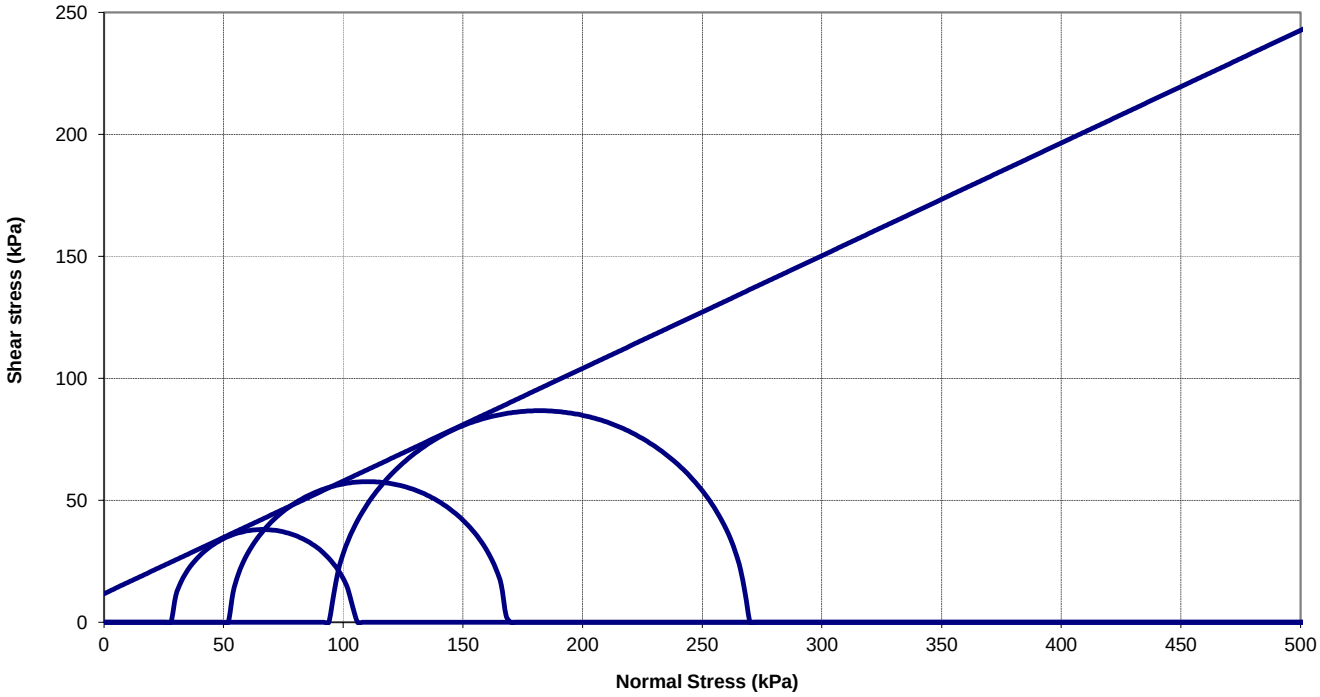
Geotechnics Project ID: 1017784.1000.B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site: Eastern Busway
Location ID: DH301
Sample Ref.: --
Depth: 4.89-4.99 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	111.52	mm	Initial Water Content:	42.0	%
Initial Sample Diameter:	54.04	mm	Initial Bulk Density:	1.79	t/m³
Initial B Value:	64	%	Initial Dry Density:	1.26	t/m³
B Value before Consolidation:	96	%	Final Water Content:	38.9	%

Test Results

	At the End of Consolidation Stage					Failure Values					
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)	
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$
Stage 1	50	51	400	0.99	0.00	76.10	1.39	104.50	28.40	0.43	2.46
Stage 2	100	101	400	1.42	0.01	115.37	1.42	168.07	52.70	0.44	2.51
Stage 3	200	201	400	3.35	0.01	173.50	3.05	268.80	95.30	0.95	3.56

Failure Mode & Photo

Planar

Effective Strength

Angle of Frictional Resistance: ϕ' = 25 °
Cohesion: c' = 12 kPa
Linear Regression Coefficient: r = 0.999

Sample History: Undisturbed core trimmed at natural water content.

Soil description: silty CLAY, orange brown with blueish grey; firm, moist, high plasticity

Test Speed: 0.015 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength parameters have been derived by using a linear regression fitting method.

Tested by: YHW Date: 3/04/2023 Approved by KTP: Date: 12/05/2023

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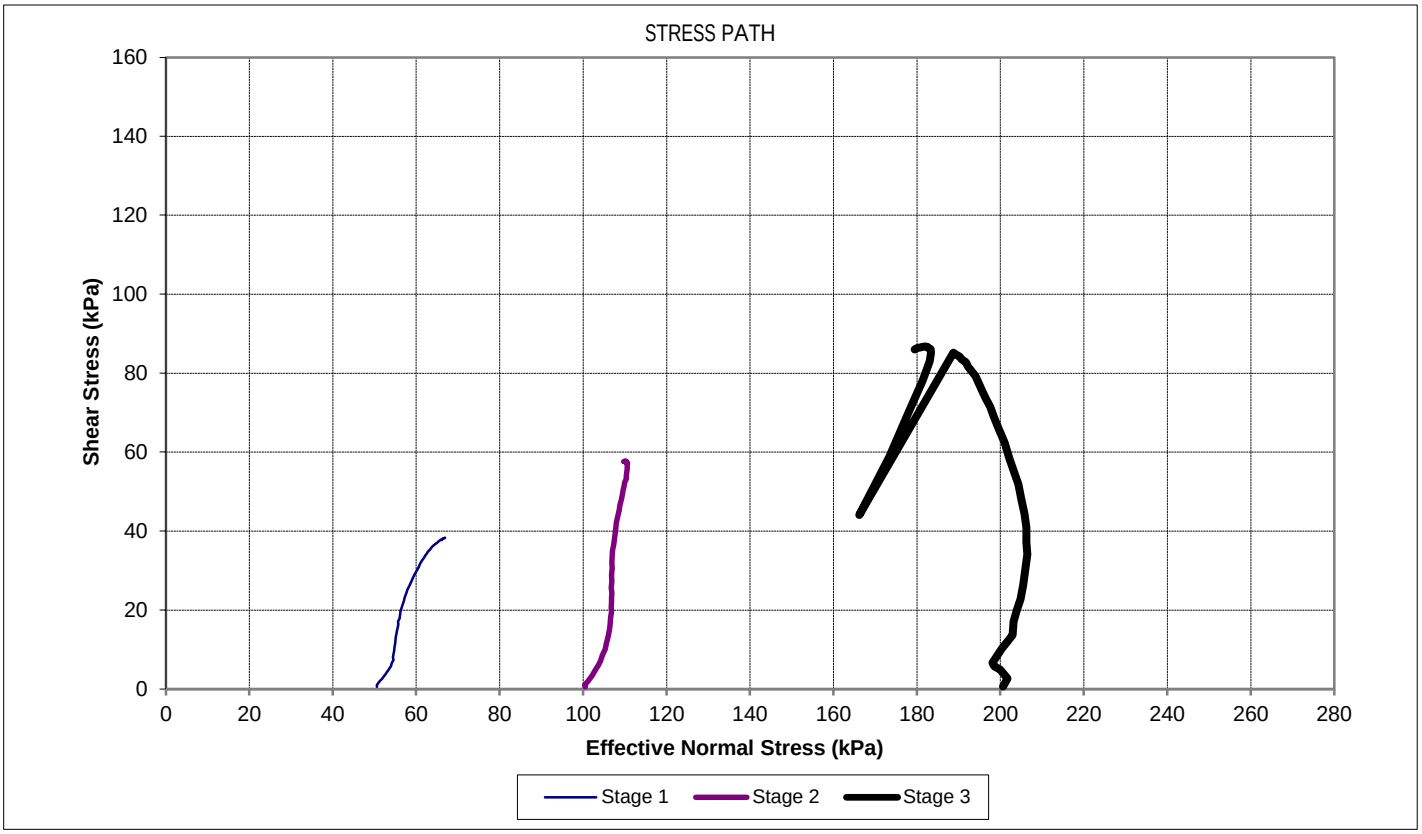
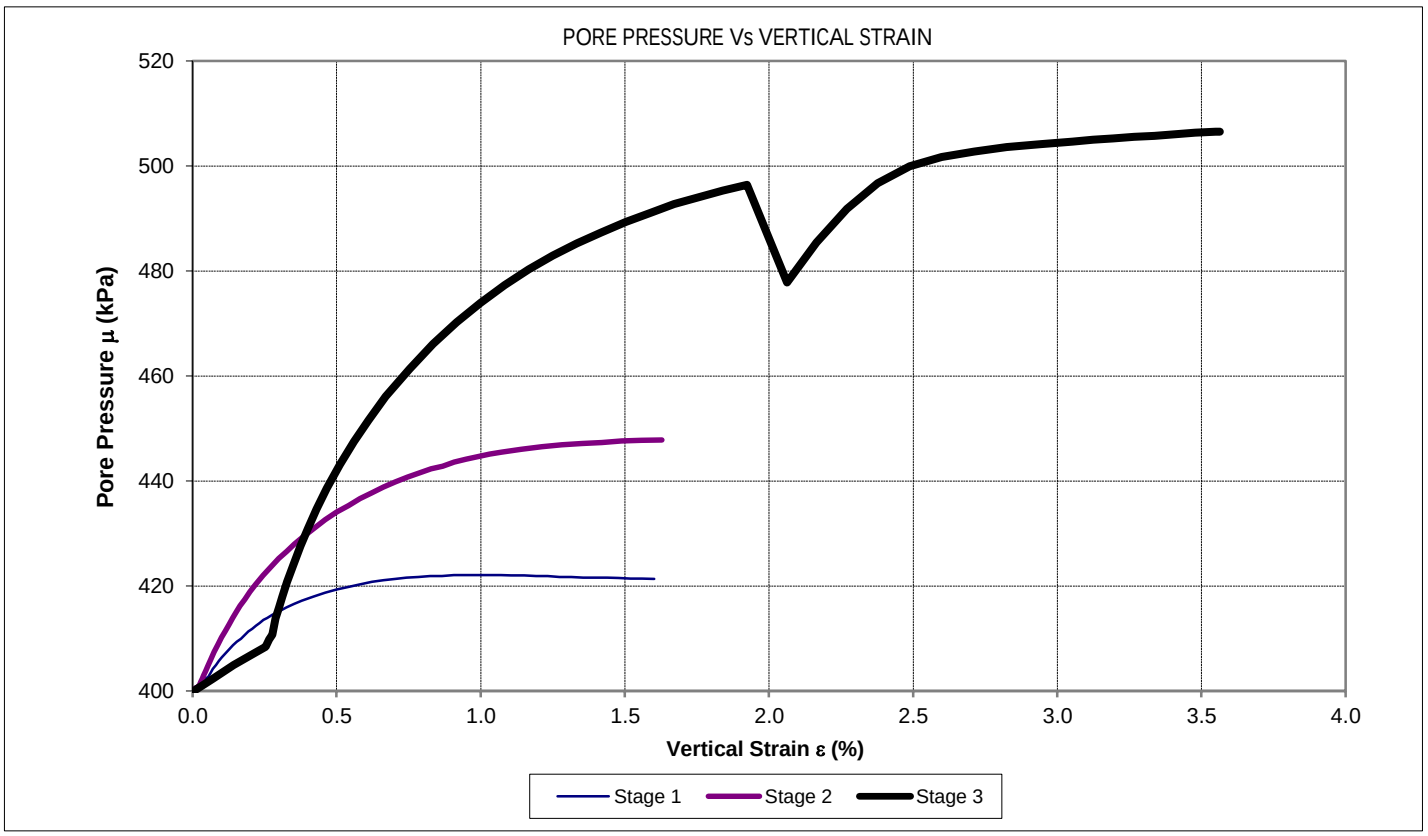
Geotechnics Project ID: 1017784.1000.B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site: Eastern Busway
Location ID: DH301
Sample Ref.: --
Depth: 4.89-4.99 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Tested by: YHW Date: 3/04/2023 Approved by KTP: Date: 12/05/2023

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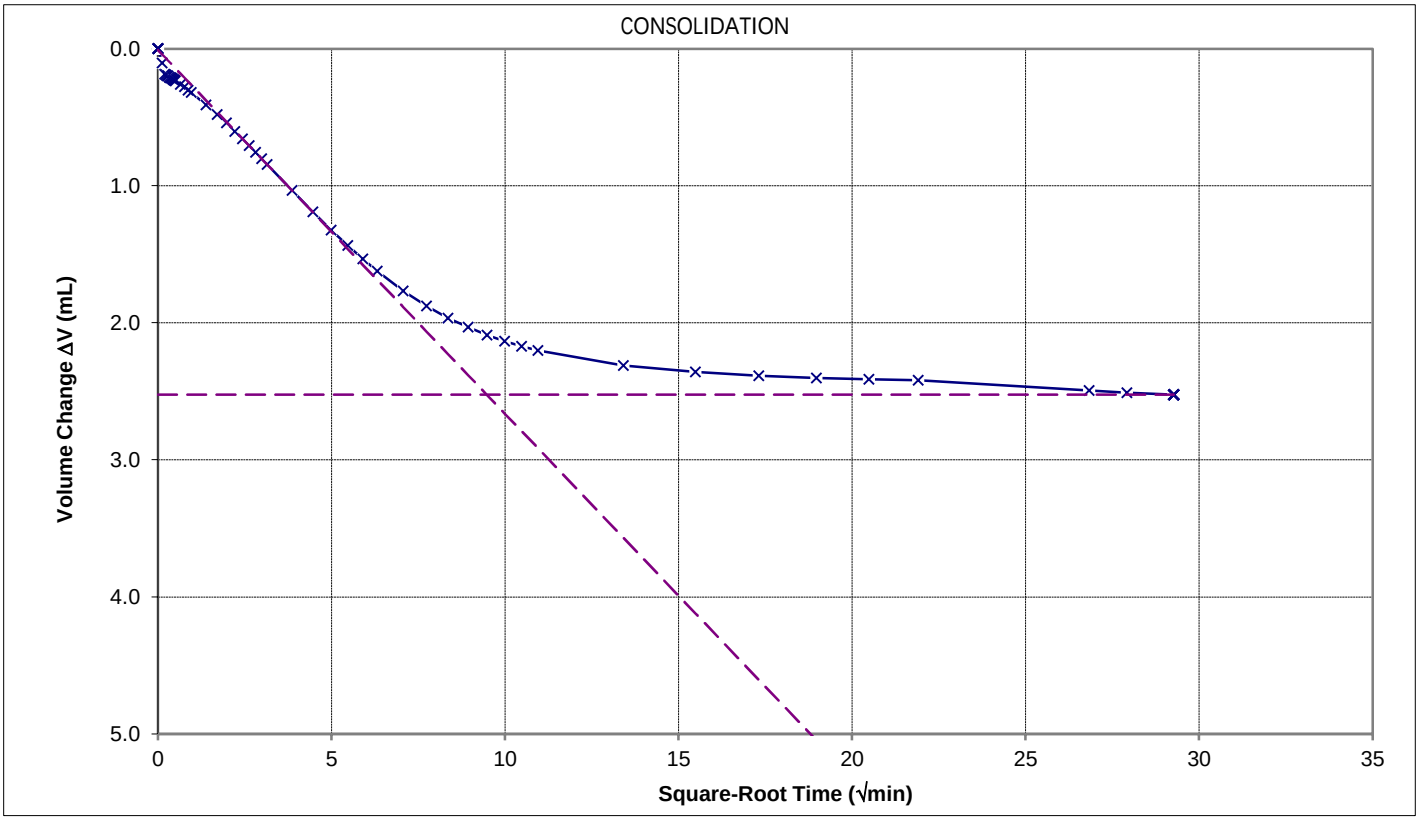
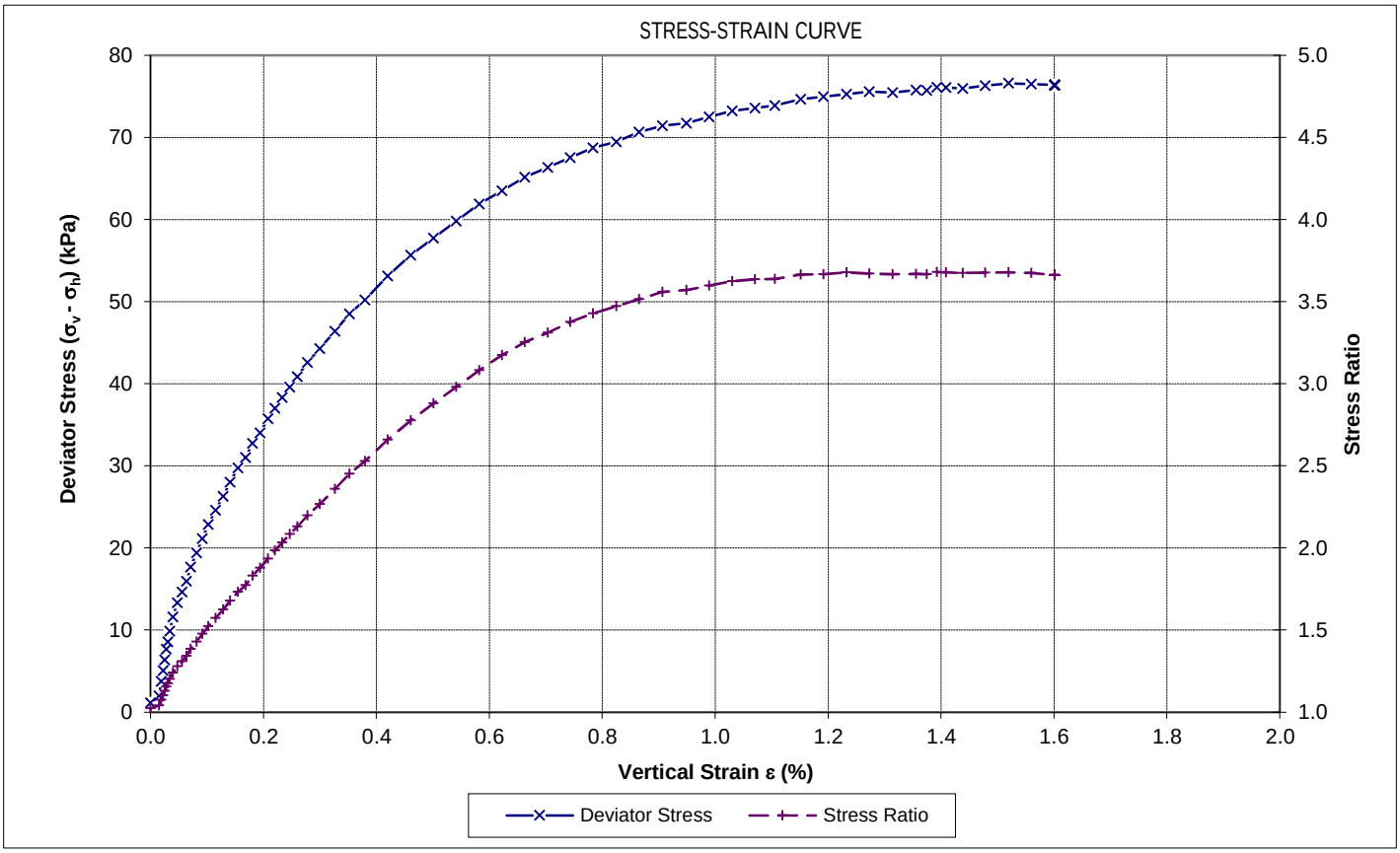
New Zealand
p. +64 9 356 3510

Geotechnics Project ID: 1017784.1000.B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site: Eastern Busway Location ID: DH301
Sample Ref.: -- Depth: 4.89-4.99 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS





Tested by: YHW Date: 3/04/2023 Approved by KTP: Date: 12/05/2023

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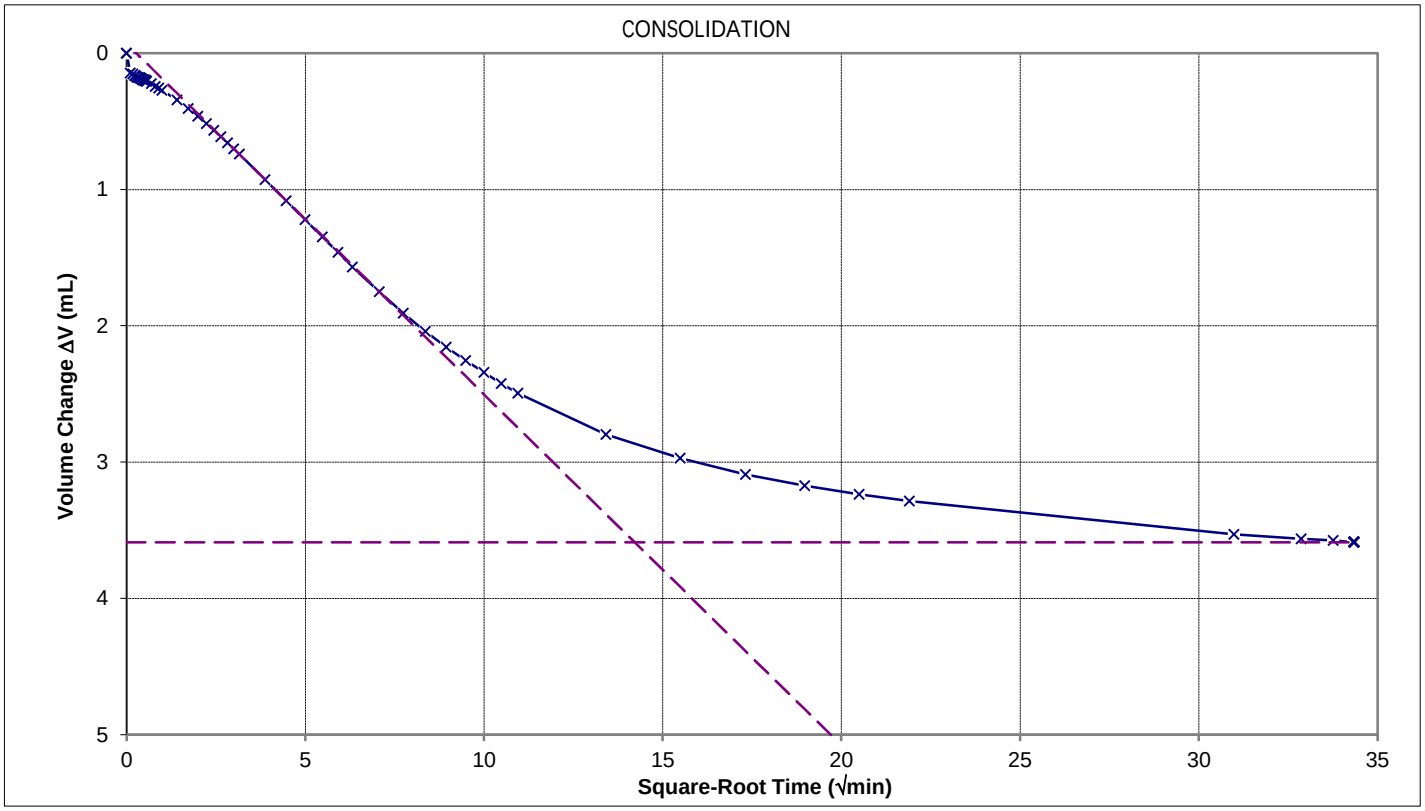
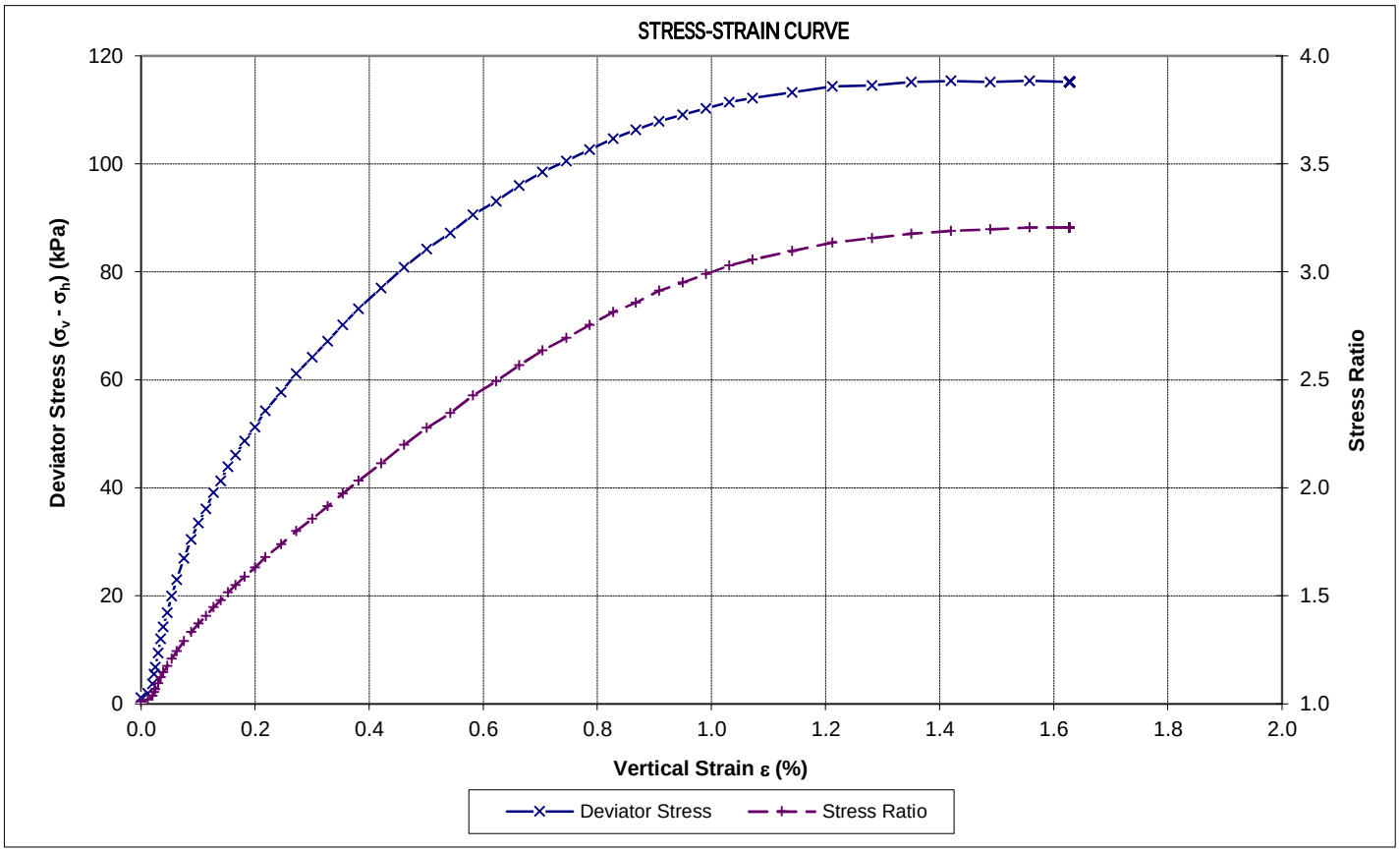
Geotechnics Project ID: 1017784.1000.B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site: Eastern Busway
Location ID: DH301
Sample Ref.: --
Depth: 4.89-4.99 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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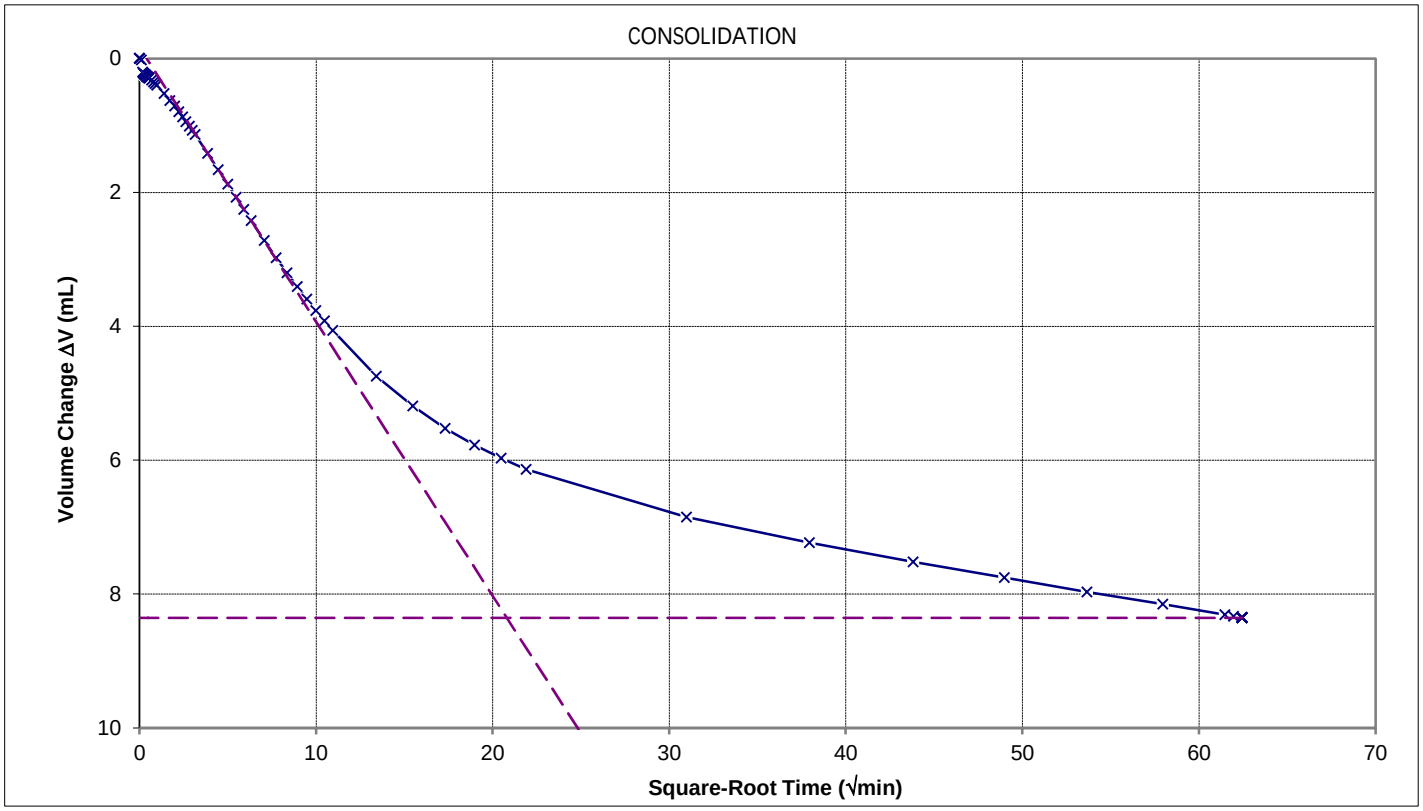
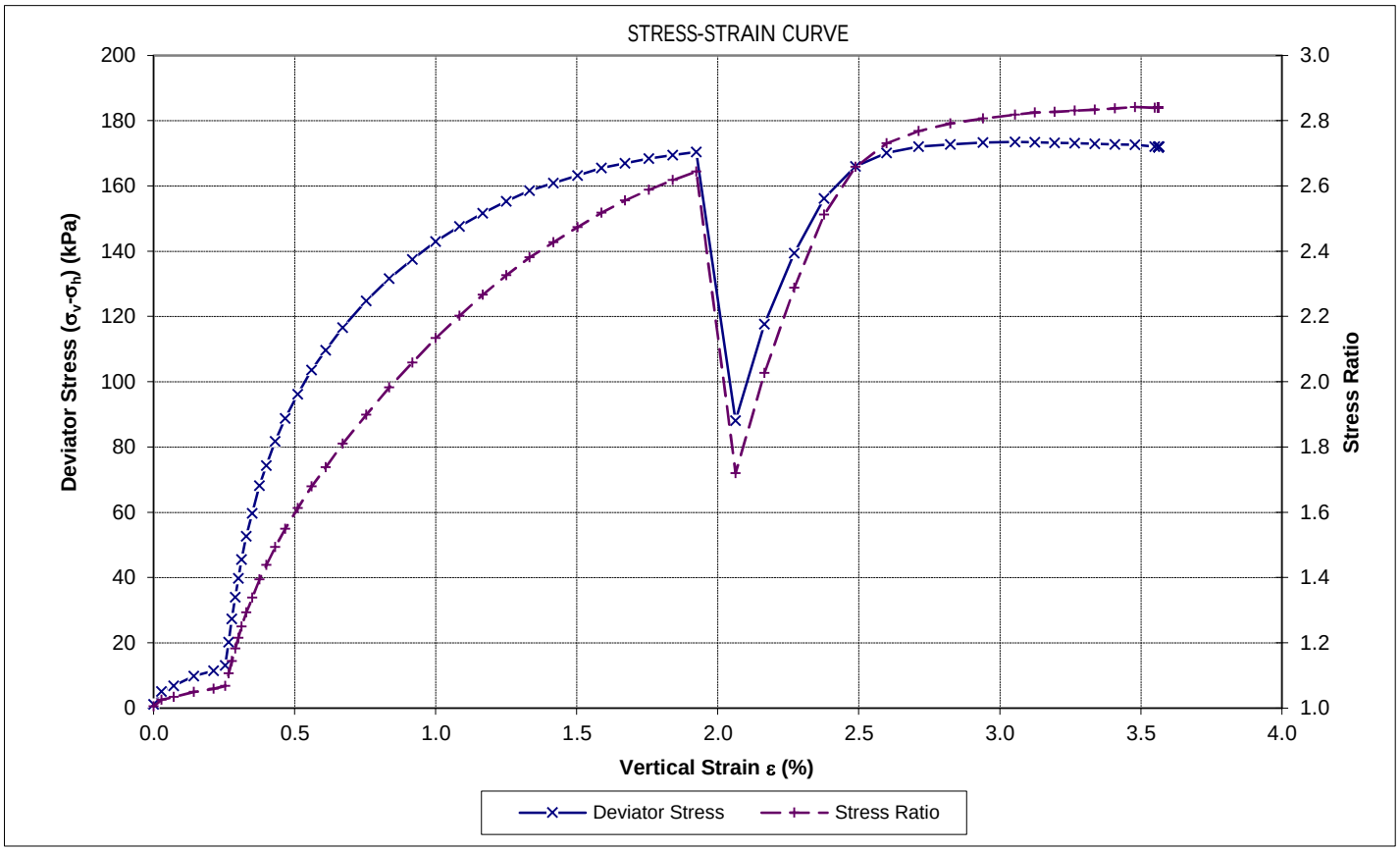
Geotechnics Project ID: 1017784.1000.B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site: Eastern Busway Location ID: DH301
Sample Ref.: -- Depth: 4.89-4.99 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





Tested by: YHW Date: 3/04/2023 Approved by KTP: Date: 12/05/2023

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Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH304
Sample Ref.: -- Depth: 9.67 - 9.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES

General Sample Parameters

Initial Sample Height:	113.05	mm	Initial Water Content:	126	%
Initial Sample Diameter:	53.81	mm	Initial Bulk Density:	1.28	t/m³
Initial B Value:	62	%	Initial Dry Density:	0.56	t/m³
B Value before Consolidation:	96	%	Final Water Content:	116	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	100	101	300	2.53	0.00	192.39	2.39	235.69	43.30	0.93	4.70	
Stage 2	200	201	300	2.47	0.01	253.43	2.71	340.23	86.80	1.06	4.72	
Stage 3	400	401	300	7.26	0.01	362.73	6.22	511.43	148.70	2.42	4.82	

	Total			Effective		
Angle of Frictional Resistance:	ϕ =	13	°	ϕ' =	27	°
Cohesion:	c =	55	kPa	c' =	37	kPa
Linear Regression Coefficient:	r =	1.000		r =	0.999	

Sample History: Undisturbed core trimmed at natural water content.

Soil description: Spongy PEAT, firm, black / dark brown.

Test Speed: 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear regression fitting method.

Approved Signatory: Date: 3/05/2022

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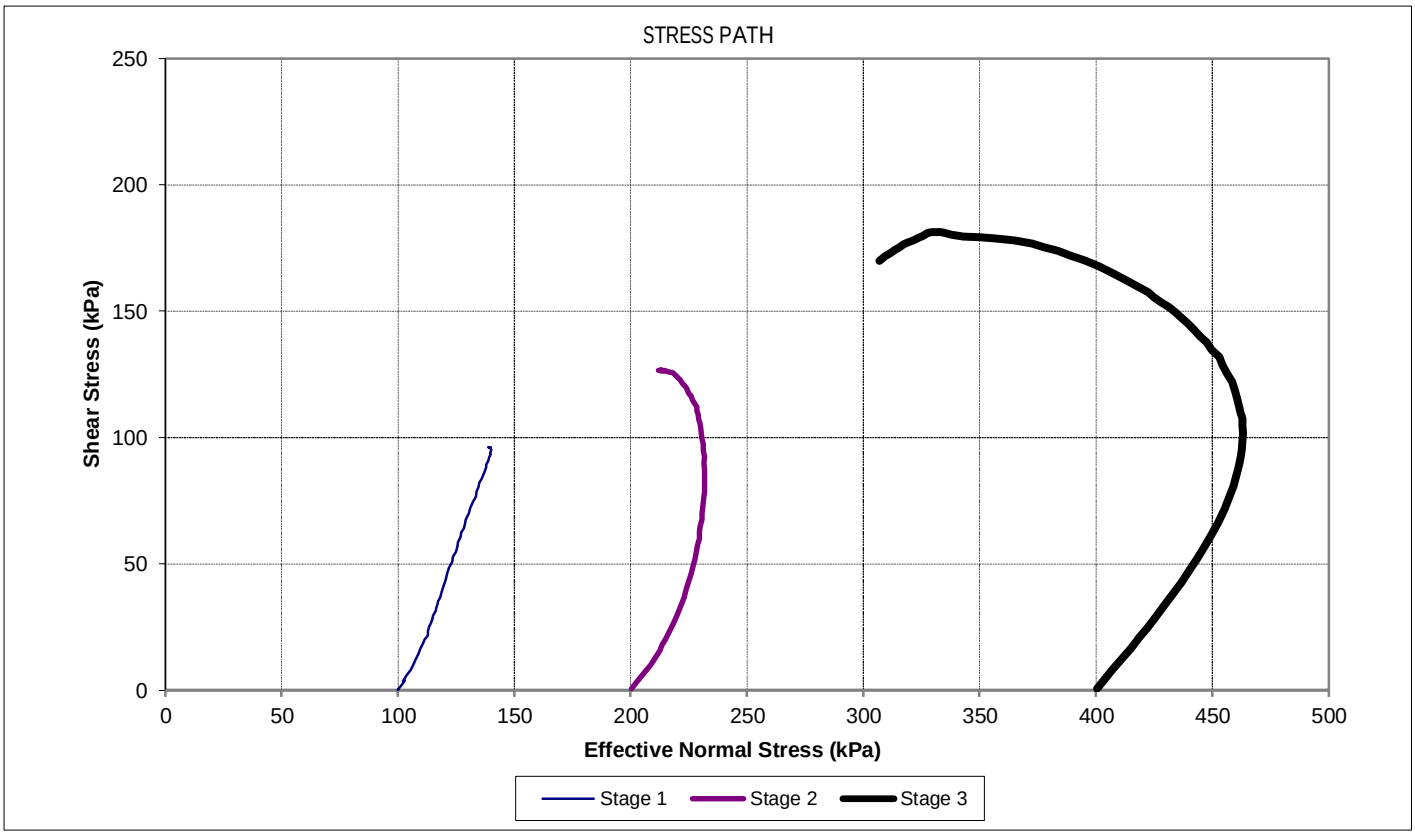
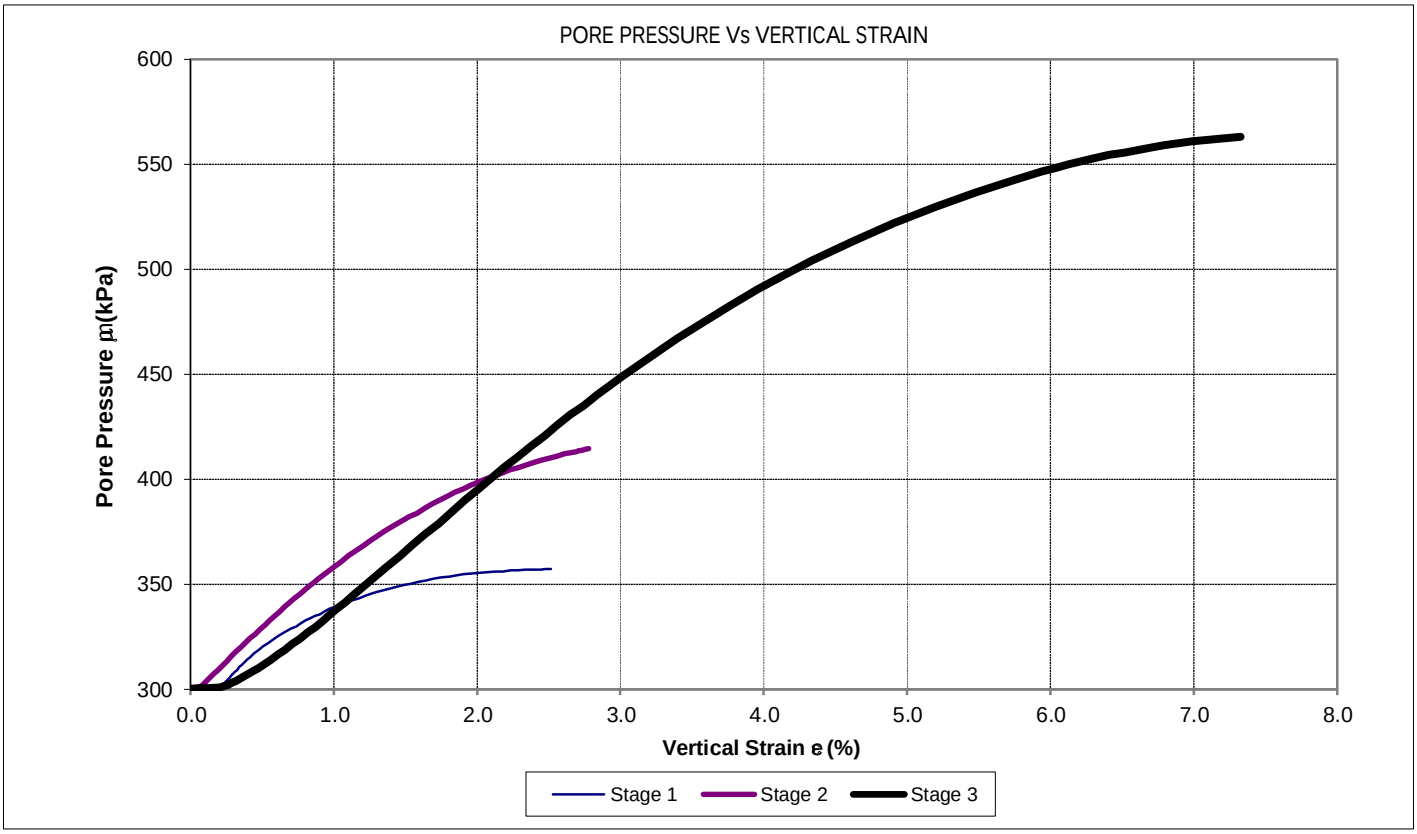
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH304
Sample Ref.: -- Depth: 9.67 - 9.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





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Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH304
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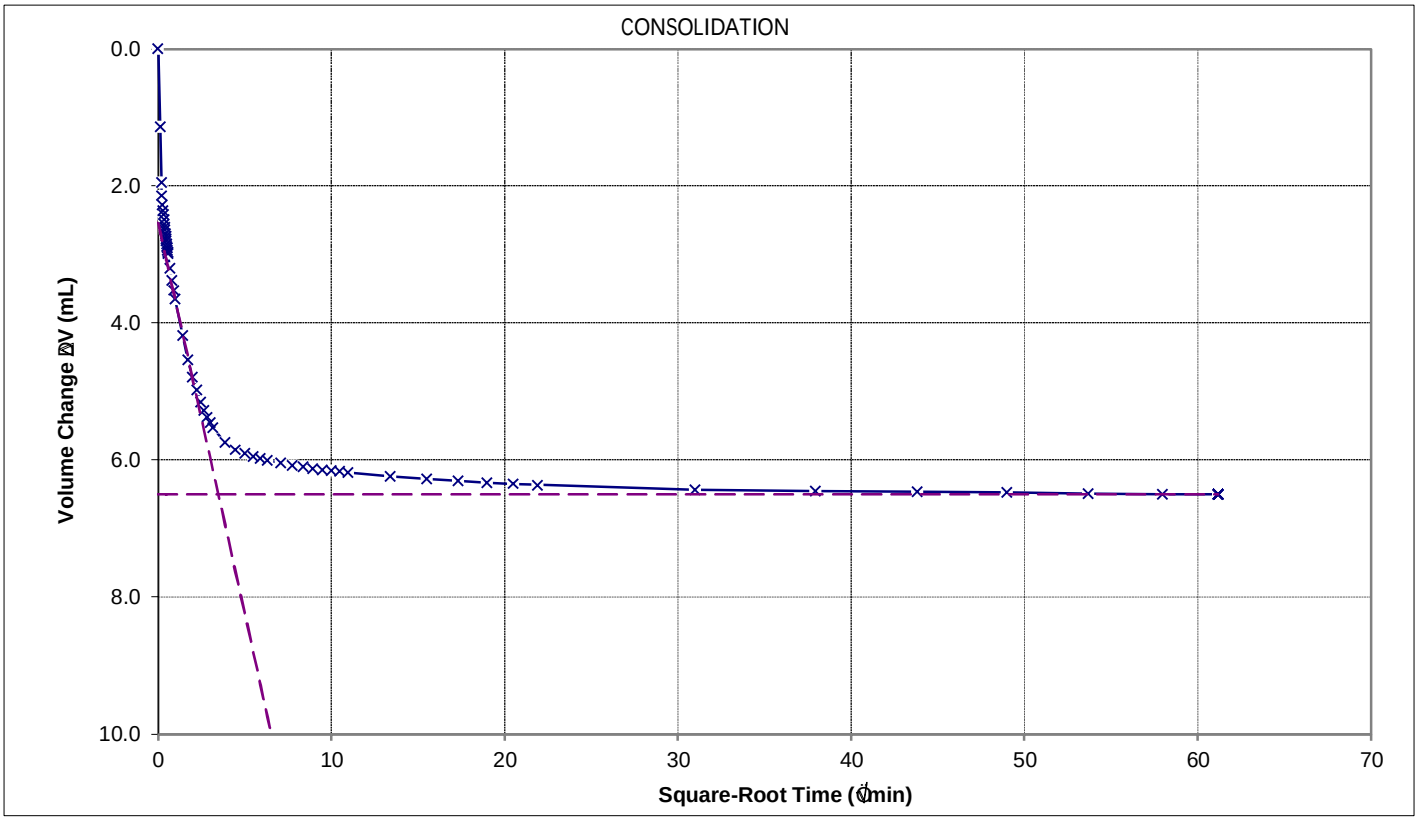
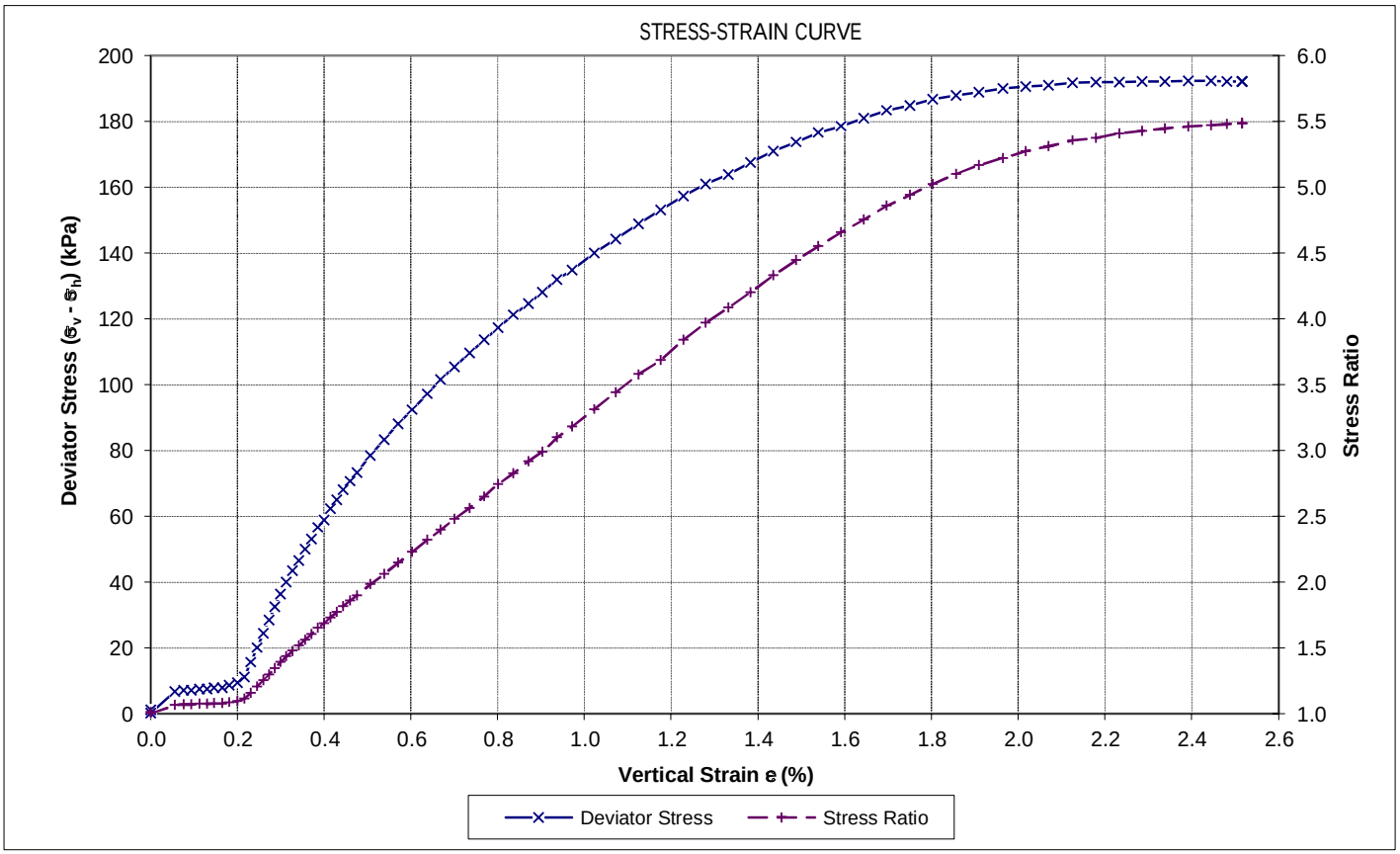
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS





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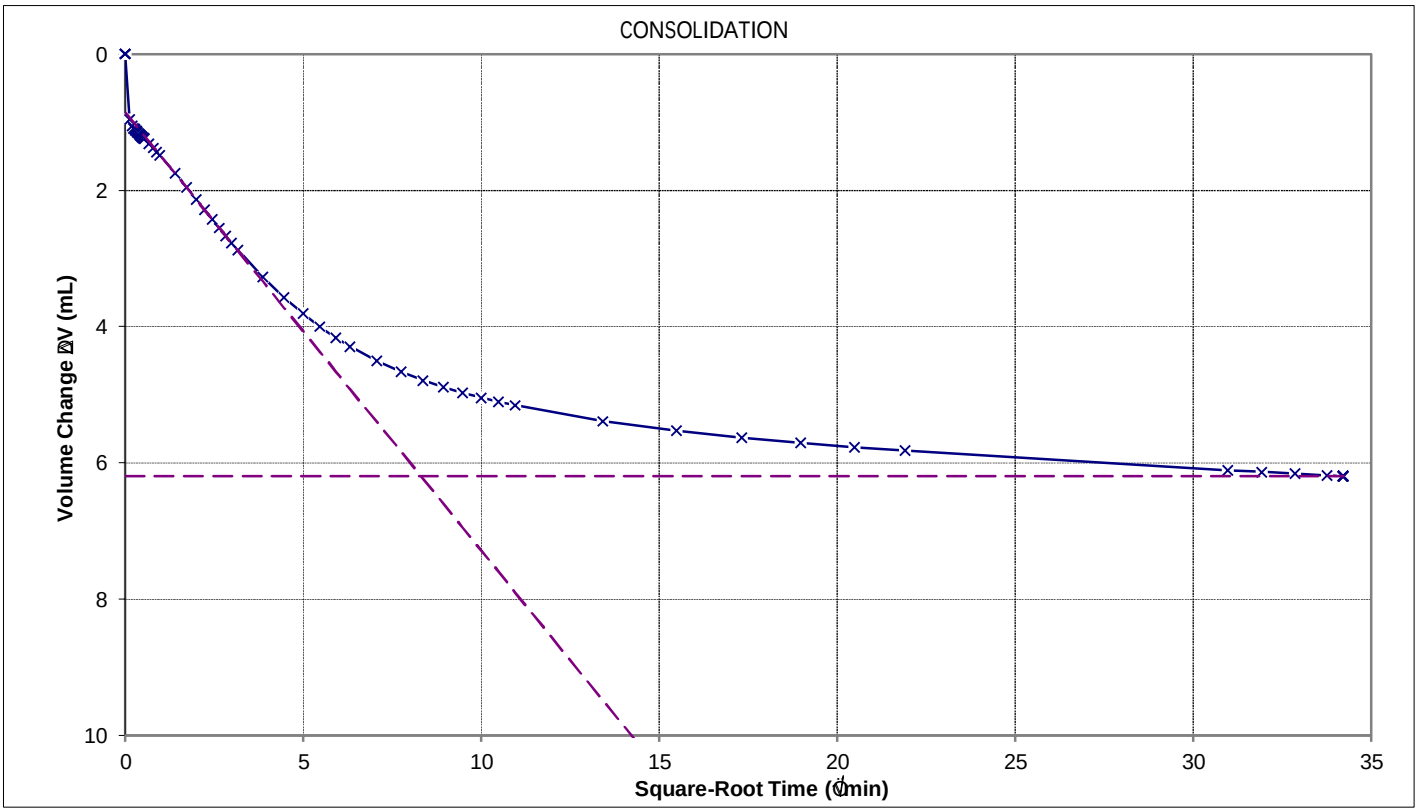
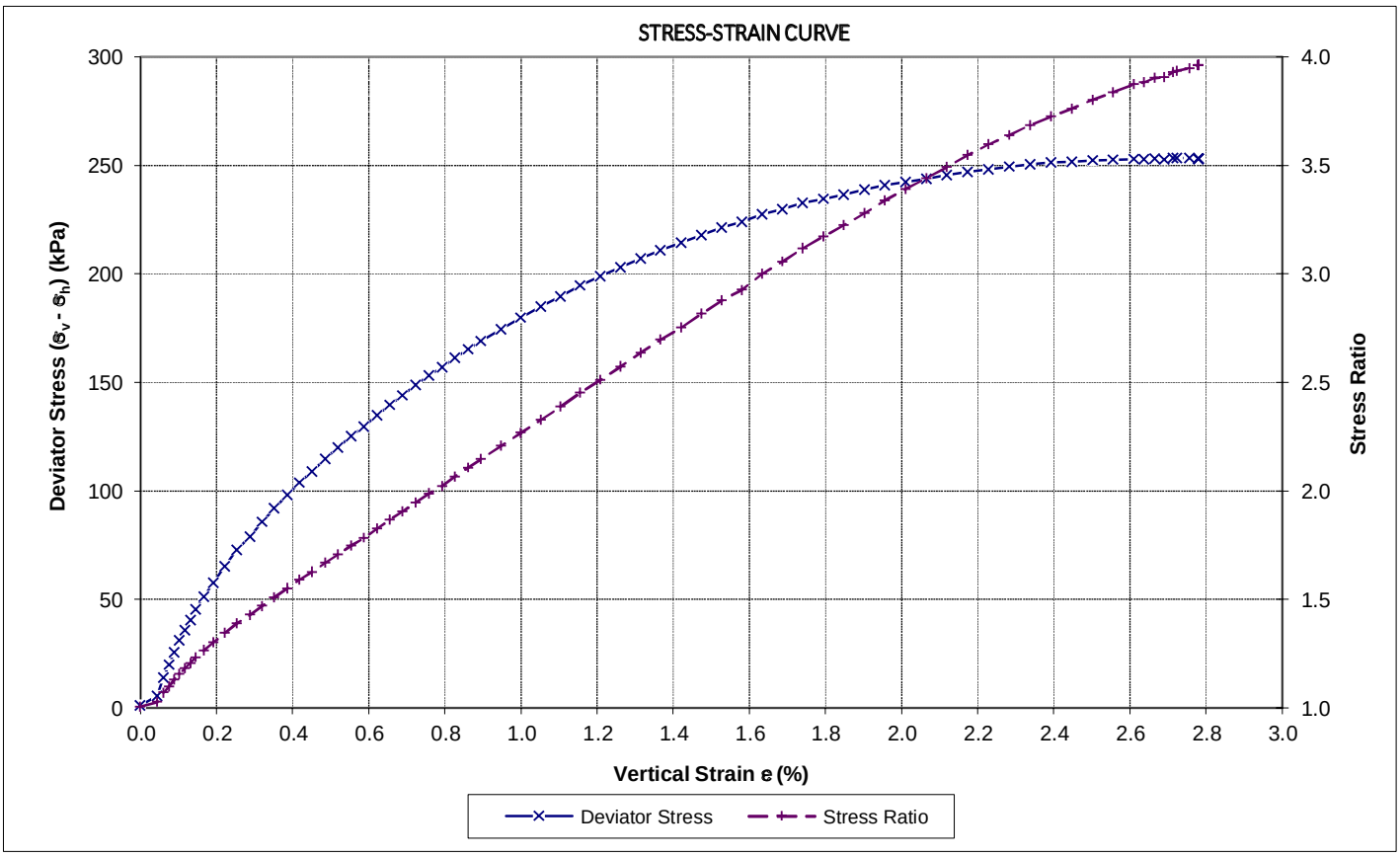
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH304
Sample Ref.: -- Depth: 9.67 - 9.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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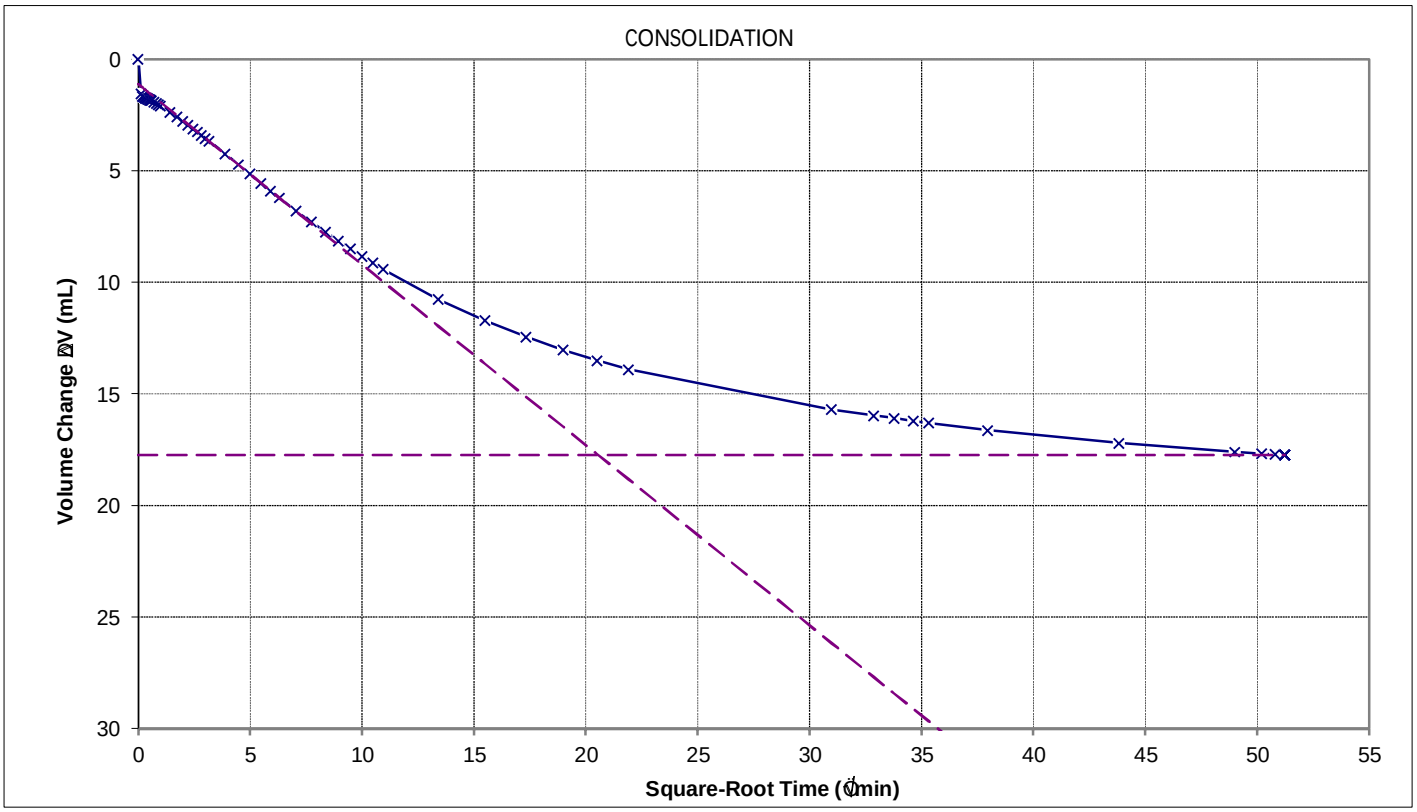
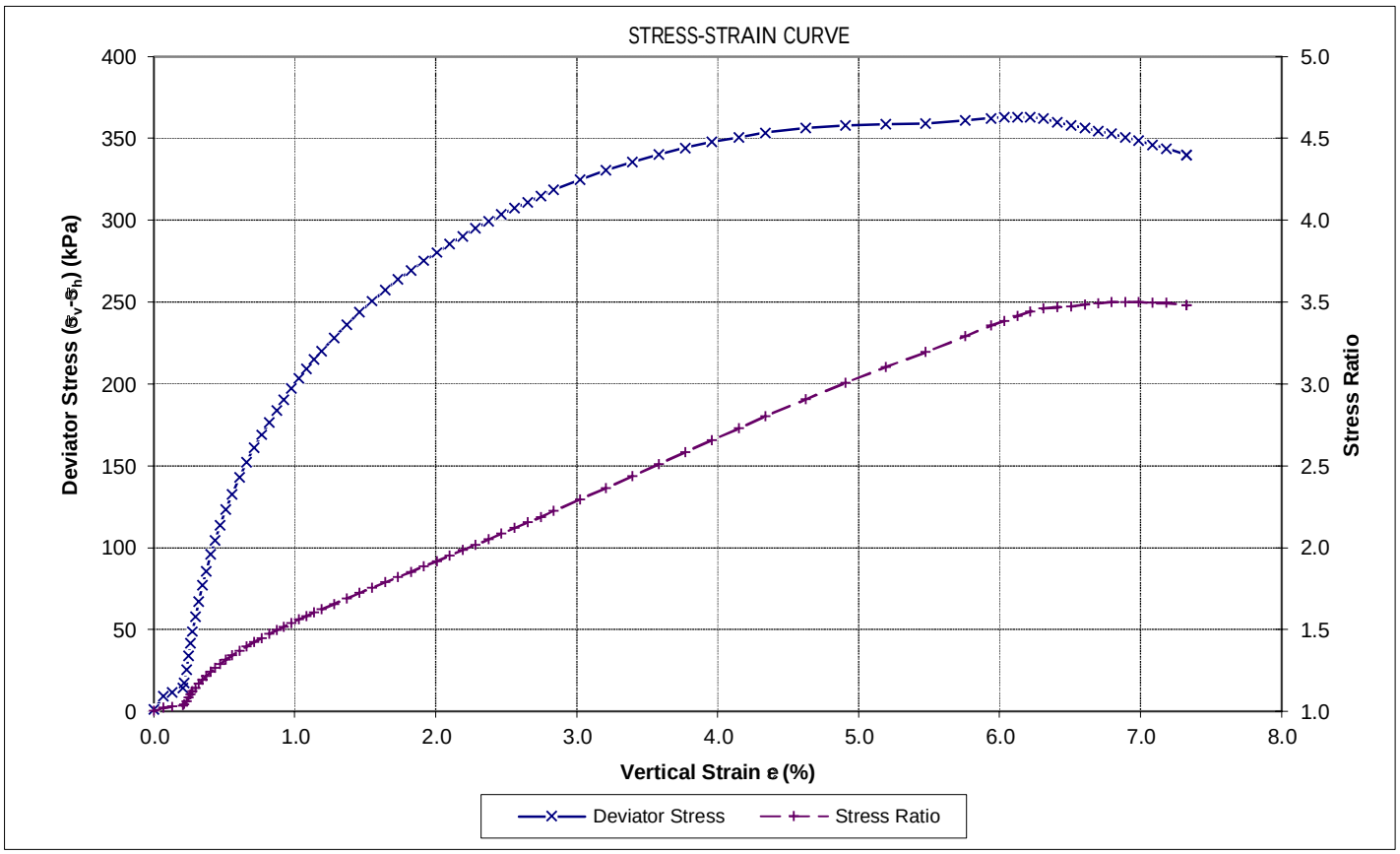
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH304
Sample Ref.: -- Depth: 9.67 - 9.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





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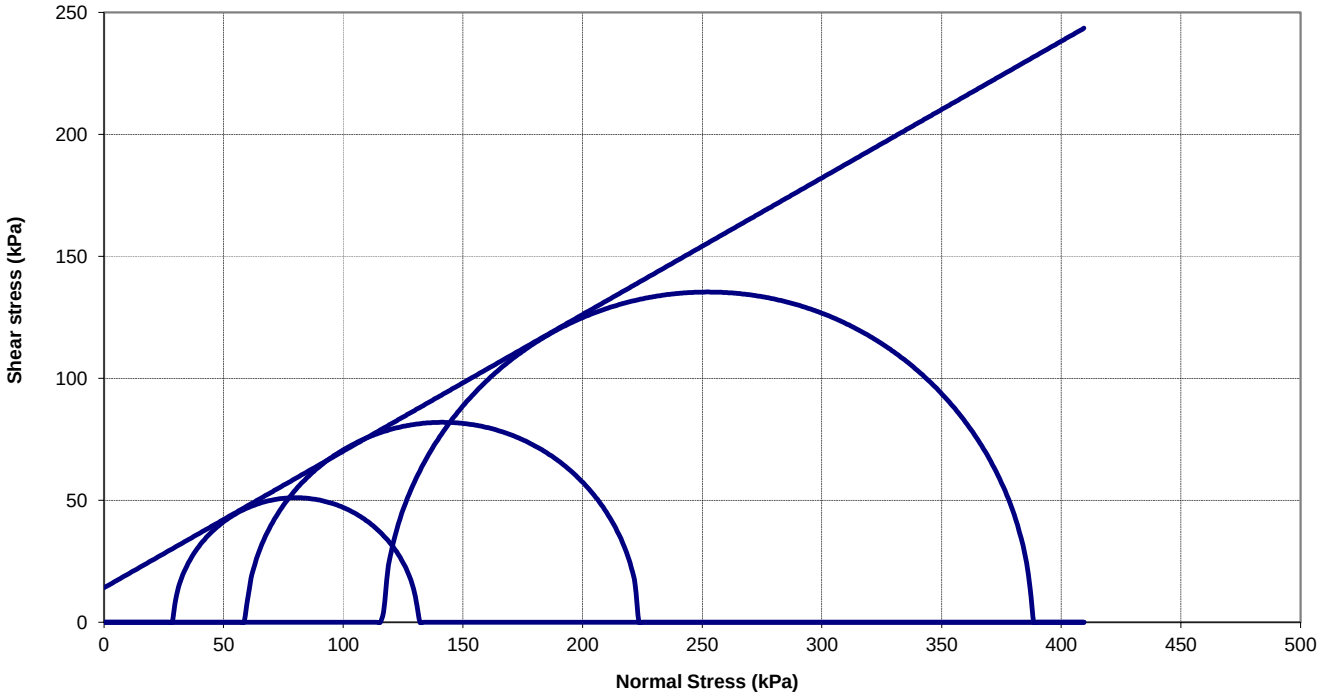
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site: Eastern Busway
Location ID: DH309
Sample Ref.: --
Depth: 7.77-7.94 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	106.82	mm	Initial Water Content:	44.7	%
Initial Sample Diameter:	53.48	mm	Initial Bulk Density:	1.83	t/m³
Initial B Value:		%	Initial Dry Density:	1.26	t/m³
B Value before Consolidation:	100	%	Final Water Content:	32.3	%

Test Results

	At the End of Consolidation Stage					Failure Values					
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)	
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$
Stage 1	75	76	300	4.61	0.00	102.15	7.42	131.25	29.10	2.35	3.61
Stage 2	150	151	300	3.99	0.01	163.99	5.53	223.49	59.50	1.75	3.57
Stage 3	300	301	300	4.43	0.01	270.81	3.65	387.71	116.90	1.16	3.56

Failure Mode & Photo

Planar / Plastic

Effective Strength

Angle of Frictional Resistance: ϕ' = 29 °
Cohesion: c' = 14 kPa
Linear Regression Coefficient: r = 1.000

Sample History: Undisturbed core trimmed at natural water content.

Soil description: CLAY, with a trace of sand (fine), soft, light grey; moist, high plasticity

Test Speed: 0.023 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength parameters have been derived by using a linear regression fitting method.

There was a sudden drop on vertical displacement and vertical load during the 2nd compression stage. The compression frame and measuring devices used for the test was checked and after the compression stage completed, and no issue found.

Tested by: YHW Date: 24/01/2023 Approved by KTP: Date: 16/03/2023

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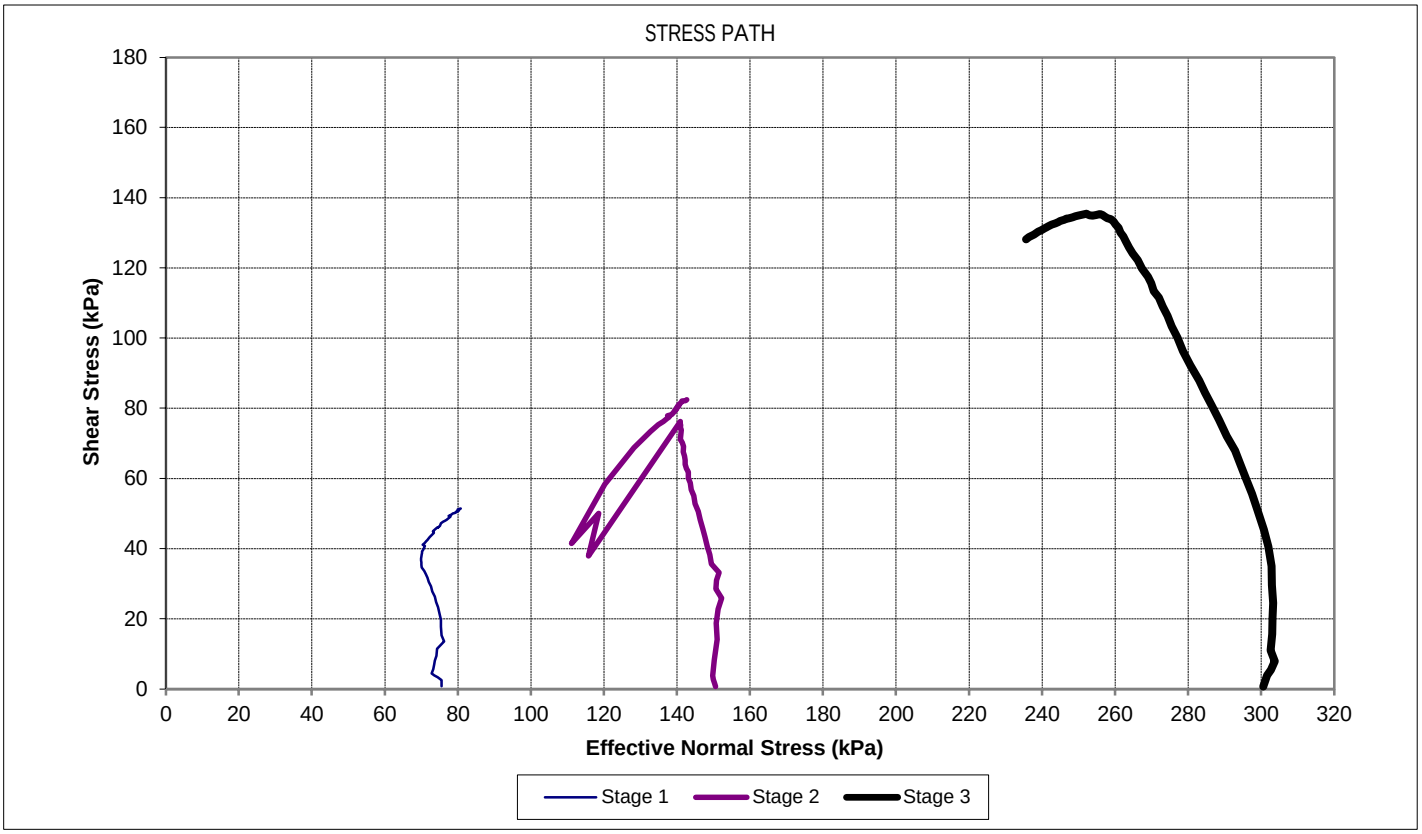
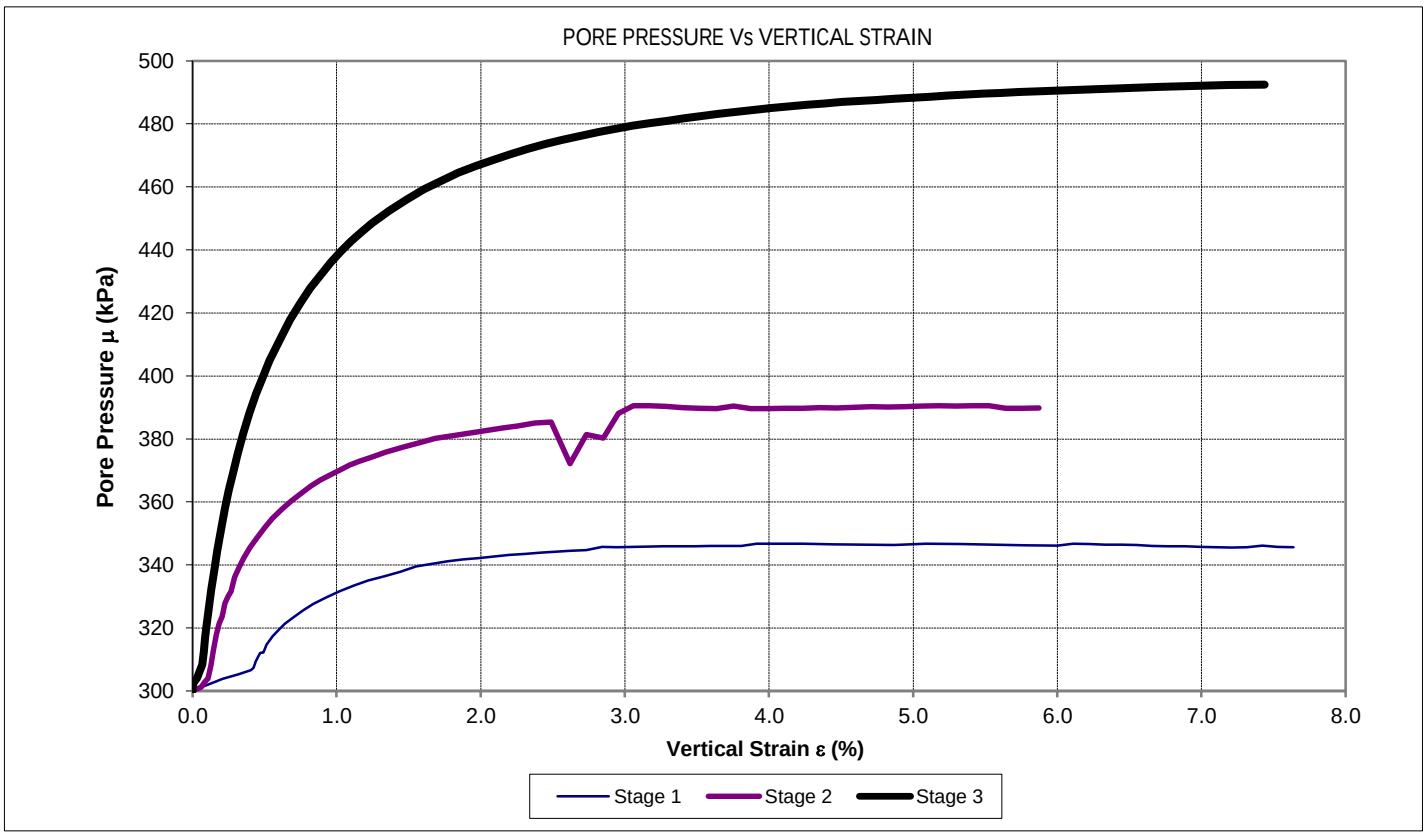
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site: Eastern Busway Location ID: DH309
Sample Ref.: -- Depth: 7.77-7.94 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Tested by: YHW Date: 24/01/2023 Approved by KTP: Date: 16/03/2023

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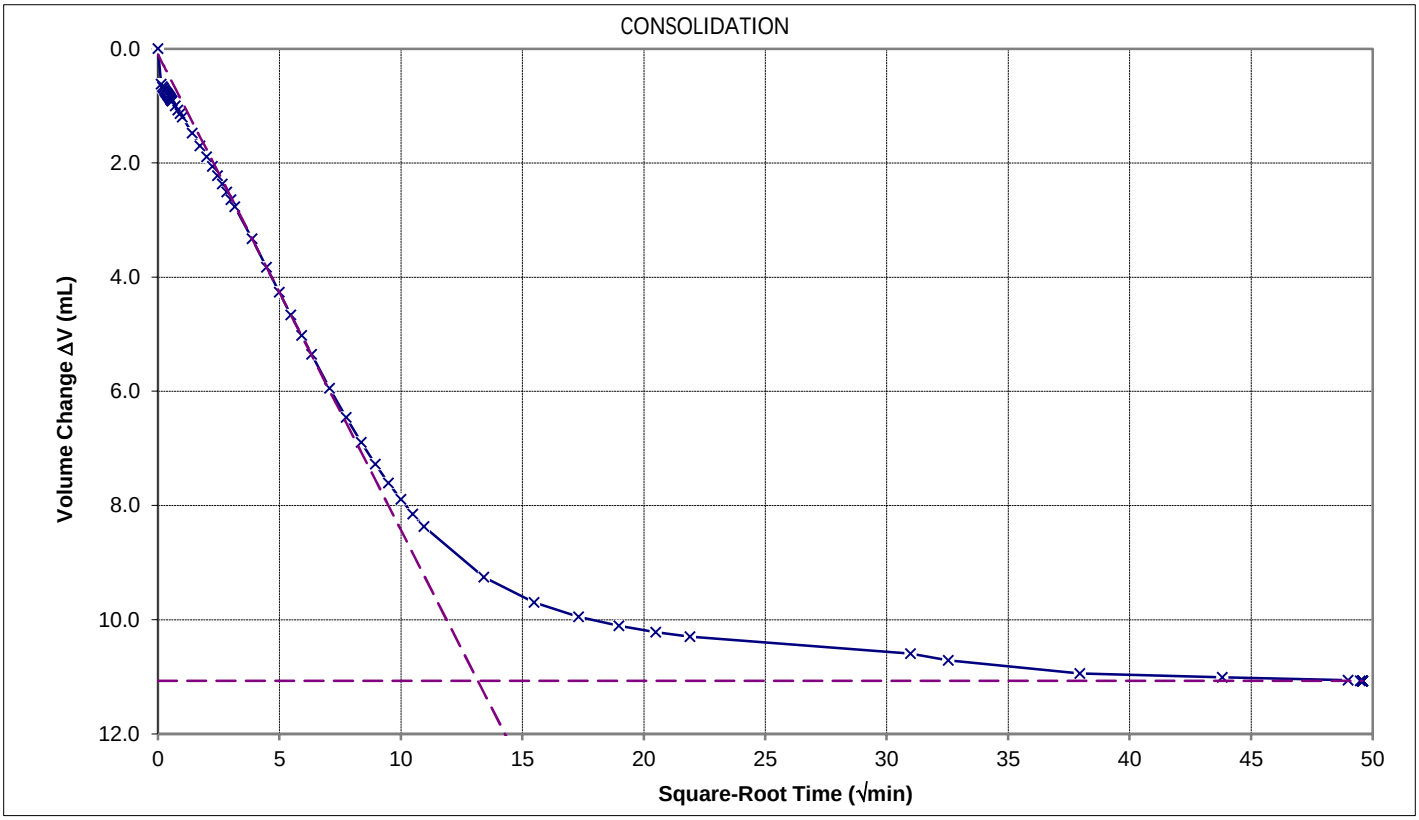
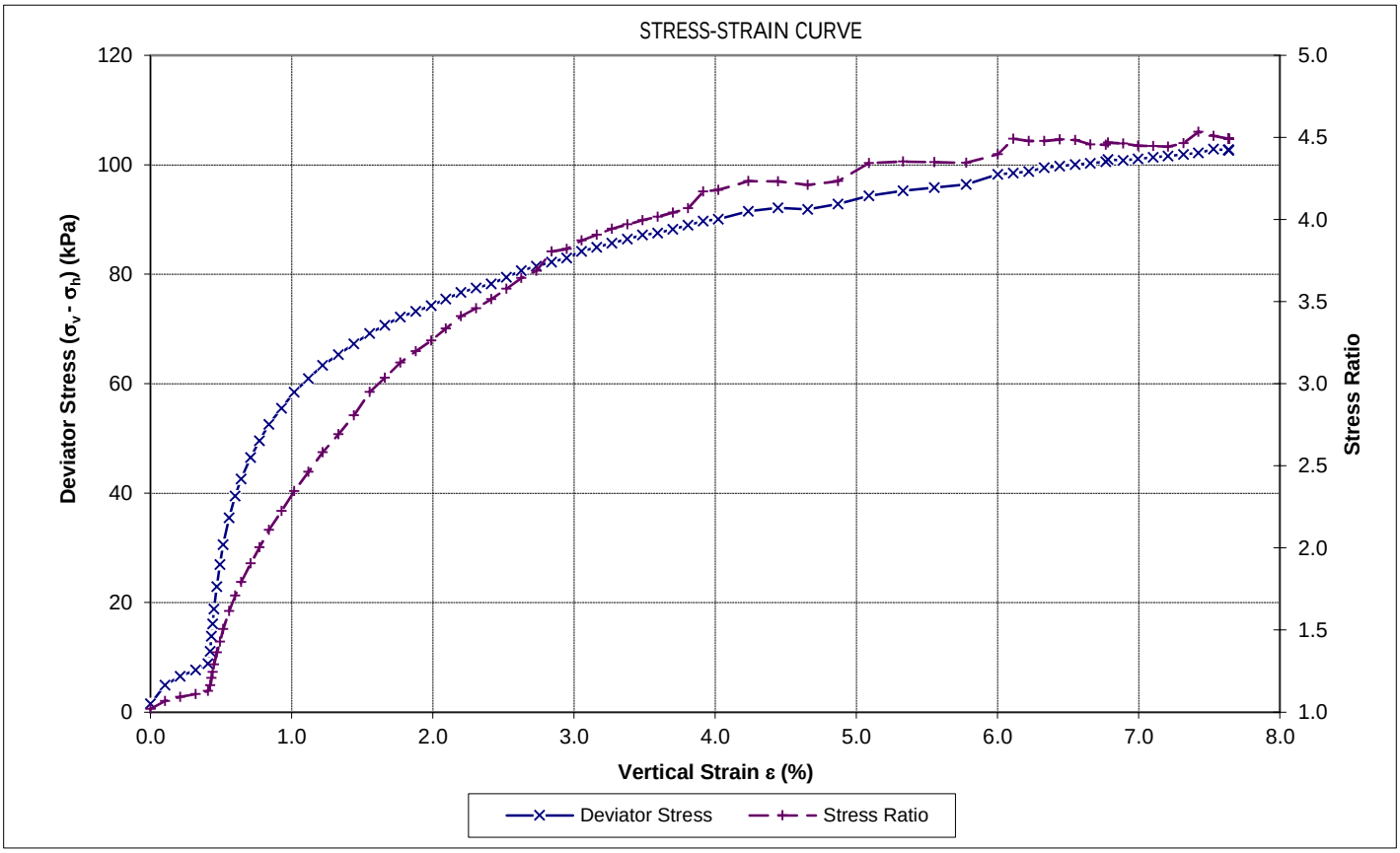
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site: Eastern Busway Location ID: DH309
Sample Ref.: -- Depth: 7.77-7.94 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS





Tested by: YHW Date: 24/01/2023 Approved by KTP: Date: 16/03/2023

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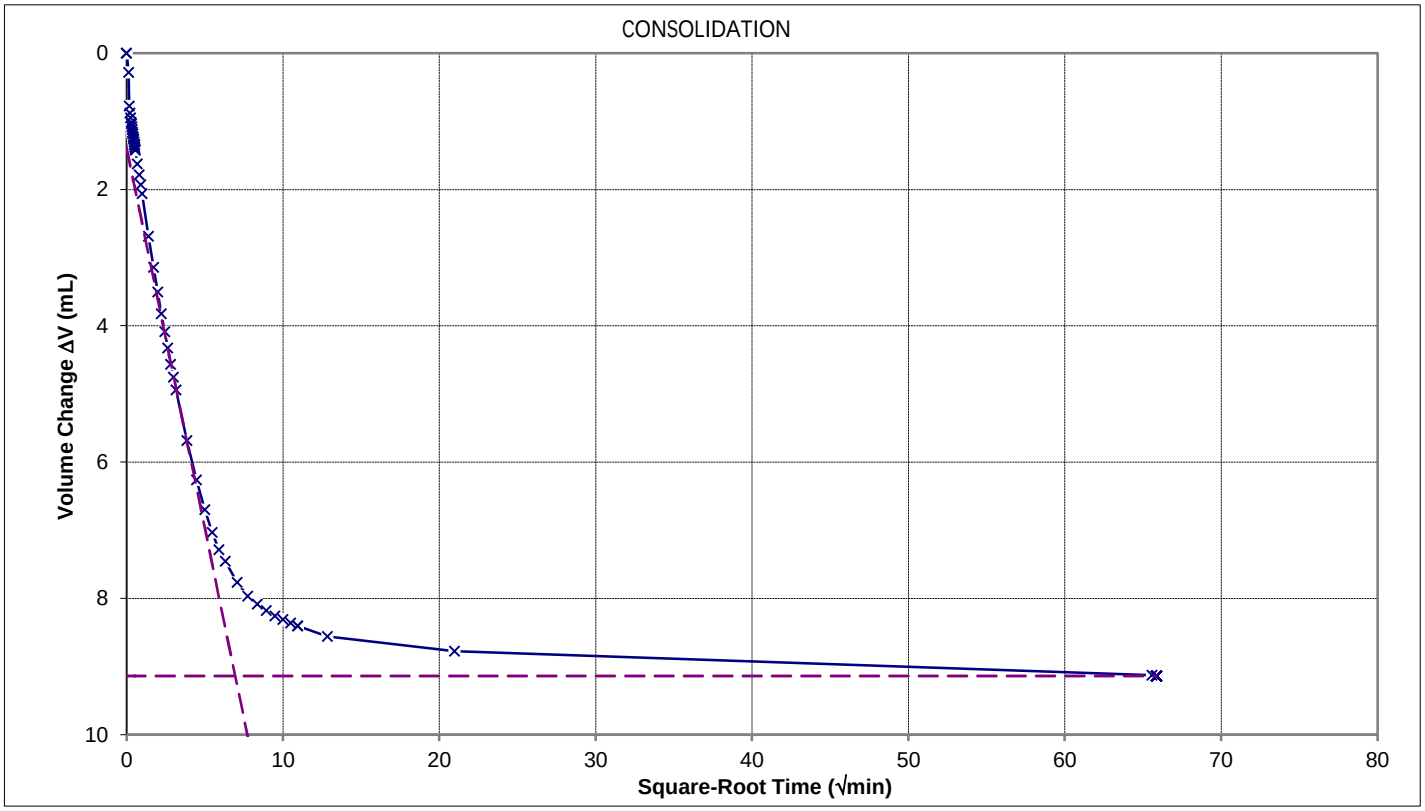
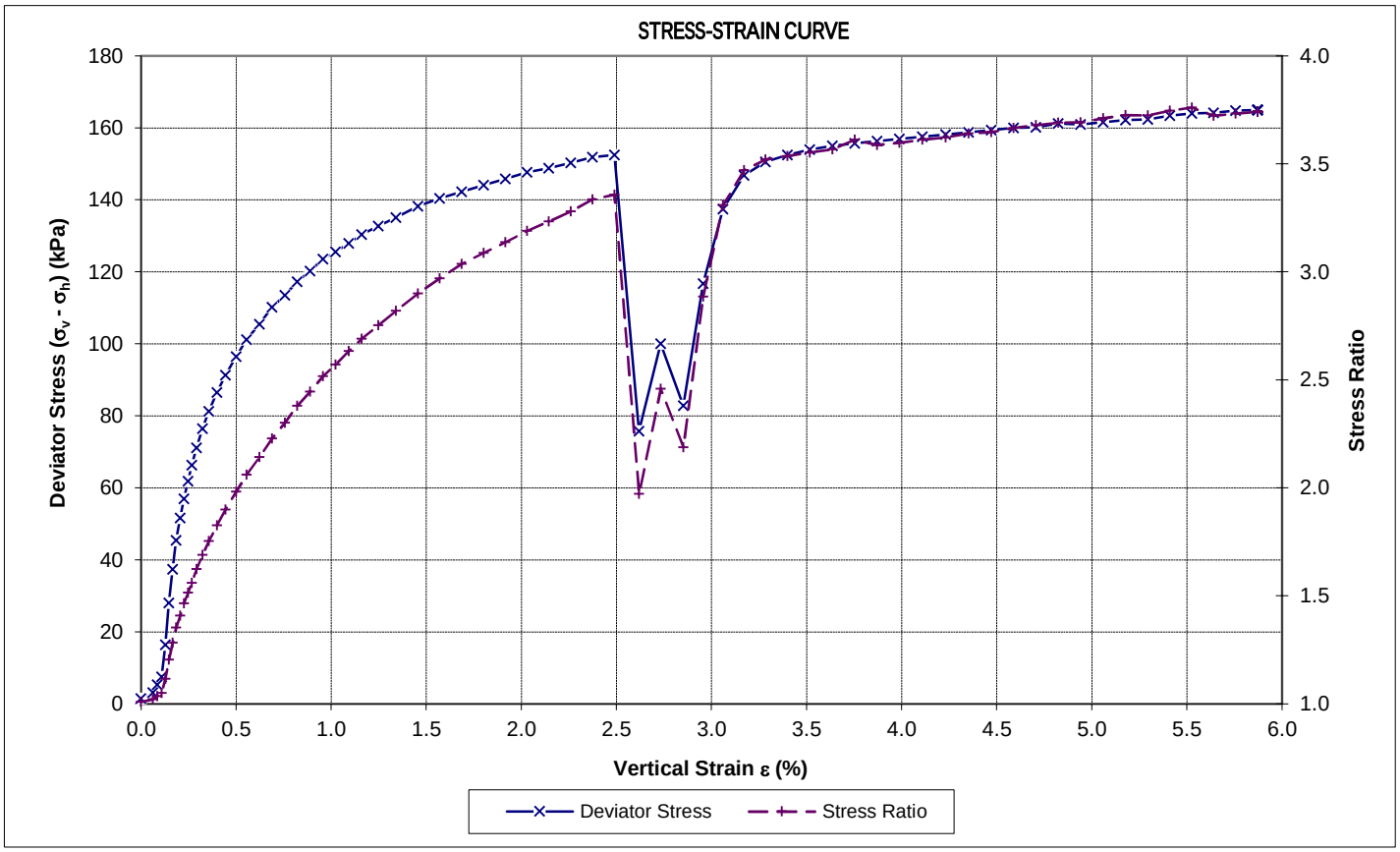
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site: Eastern Busway Location ID: DH309
Sample Ref.: -- Depth: 7.77-7.94 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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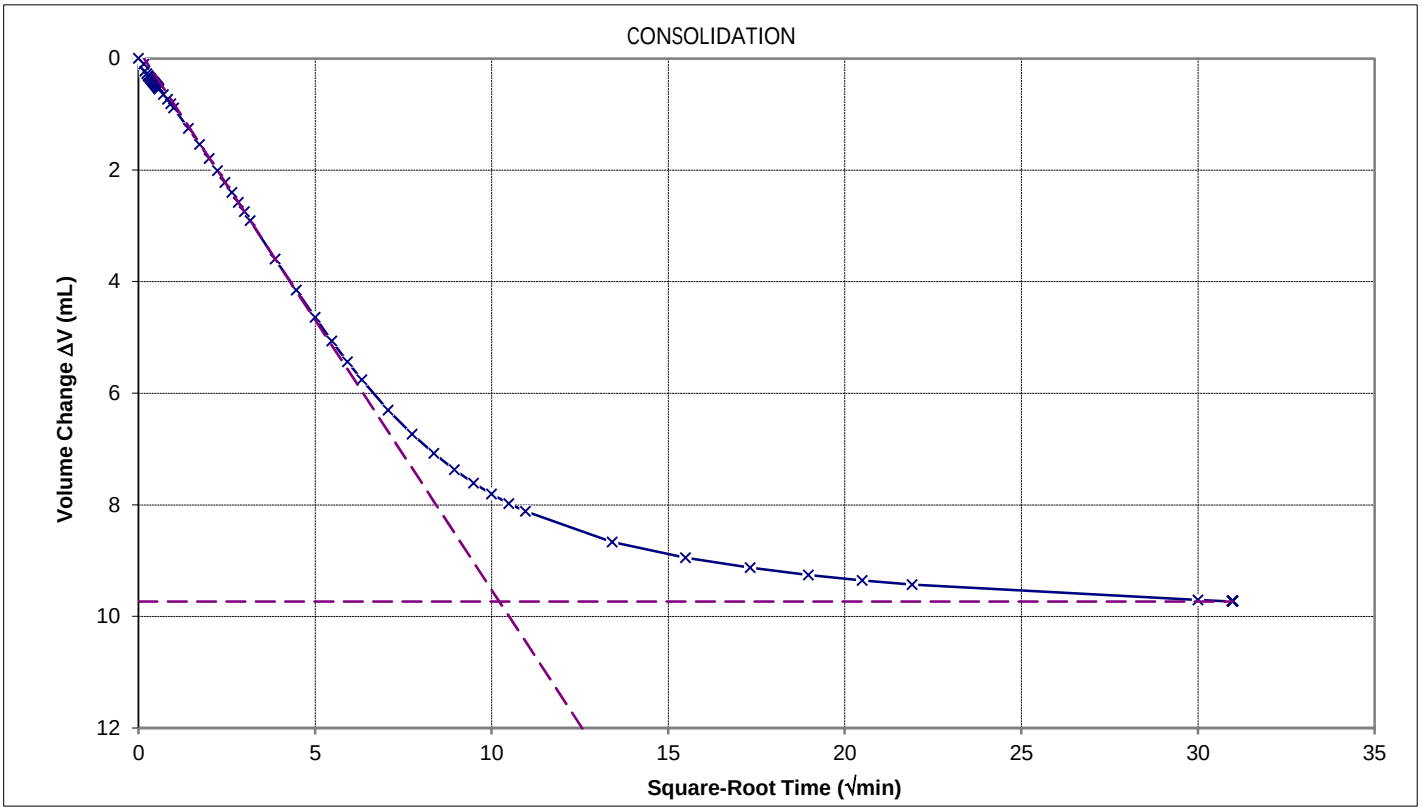
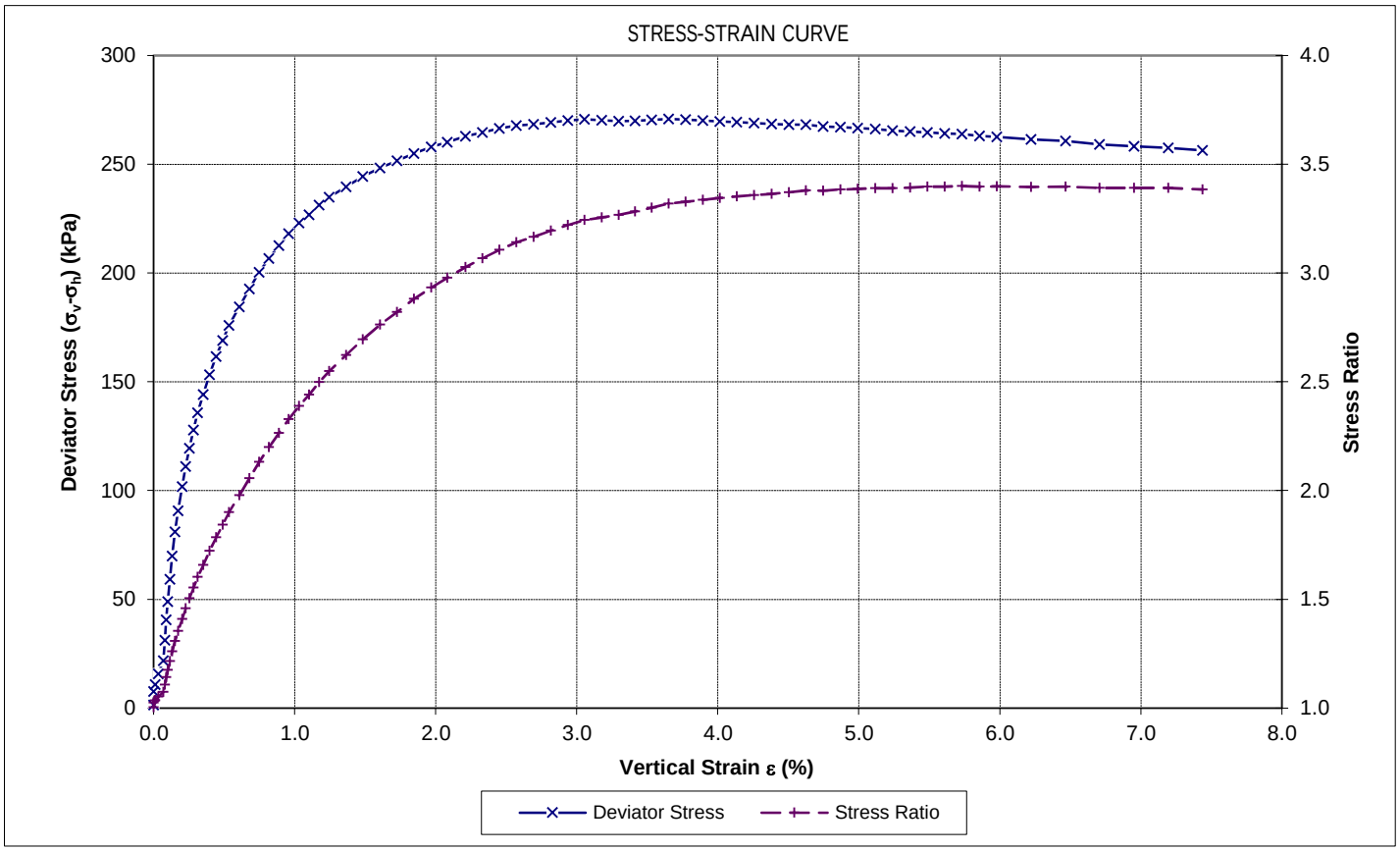
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site: Eastern Busway Location ID: DH309
Sample Ref.: -- Depth: 7.77-7.94 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





Tested by: YHW Date: 24/01/2023 Approved by KTP: Date: 16/03/2023

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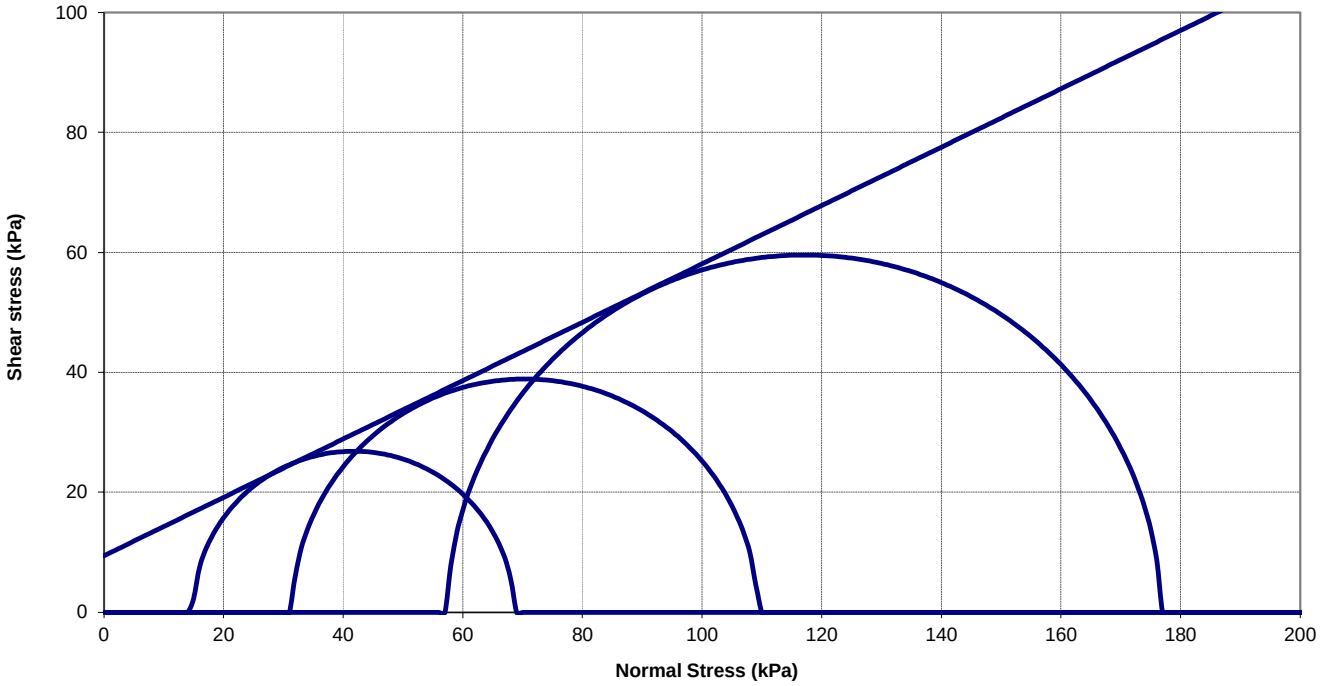
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_12

Site: Eastern Busway
Location ID: DH314
Sample Ref.: --
Depth: 1.88-2.00 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	111.40	mm	Initial Water Content:	38.5	%
Initial Sample Diameter:	53.37	mm	Initial Bulk Density:	1.76	t/m³
Initial B Value:	22	%	Initial Dry Density:	1.27	t/m³
B Value before Consolidation:	96	%	Final Water Content:	39.4	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	25	26	300	0.48	0.00	53.69	0.84	68.59	14.90	0.19	1.49	
Stage 2	50	51	300	0.85	0.00	77.77	2.60	109.27	31.50	0.58	3.57	
Stage 3	100	101	300	1.43	0.01	119.13	4.27	176.63	57.50	0.96	3.56	

Effective Strength

Angle of Frictional Resistance: $\phi' =$ 26 °
Cohesion: $c' =$ 9 kPa
Linear Regression Coefficient: $r =$ 1.000

Sample History: Undisturbed core trimmed at natural water content.

Soil description: silty CLAY, firm, light grey with orange and brown; high plasticity, moist

Test Speed: 0.012 - 0.022 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear regression fitting method.

Tested by: YHW Date: 24/02/2023 Approved by KTP: Date: 17/03/2023

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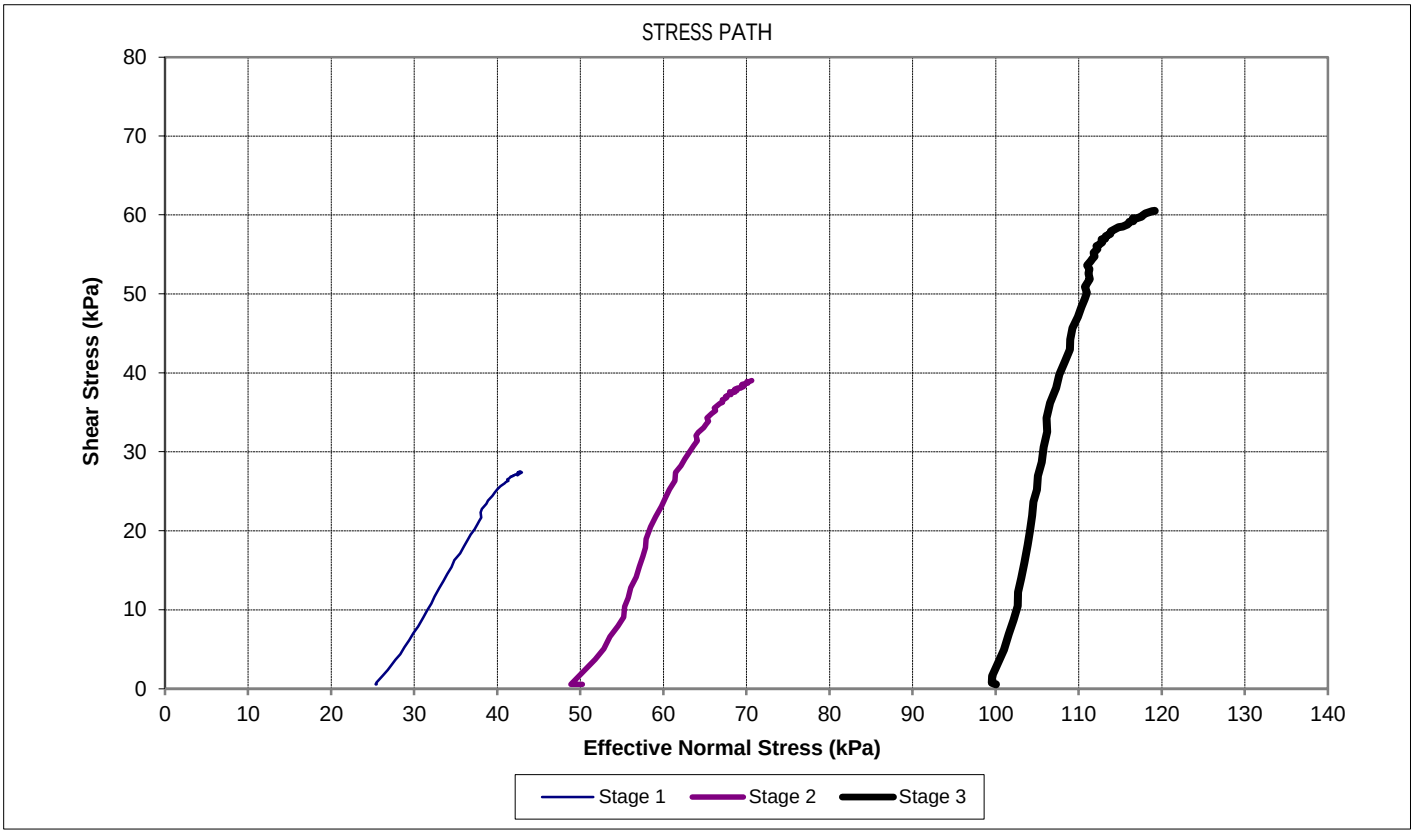
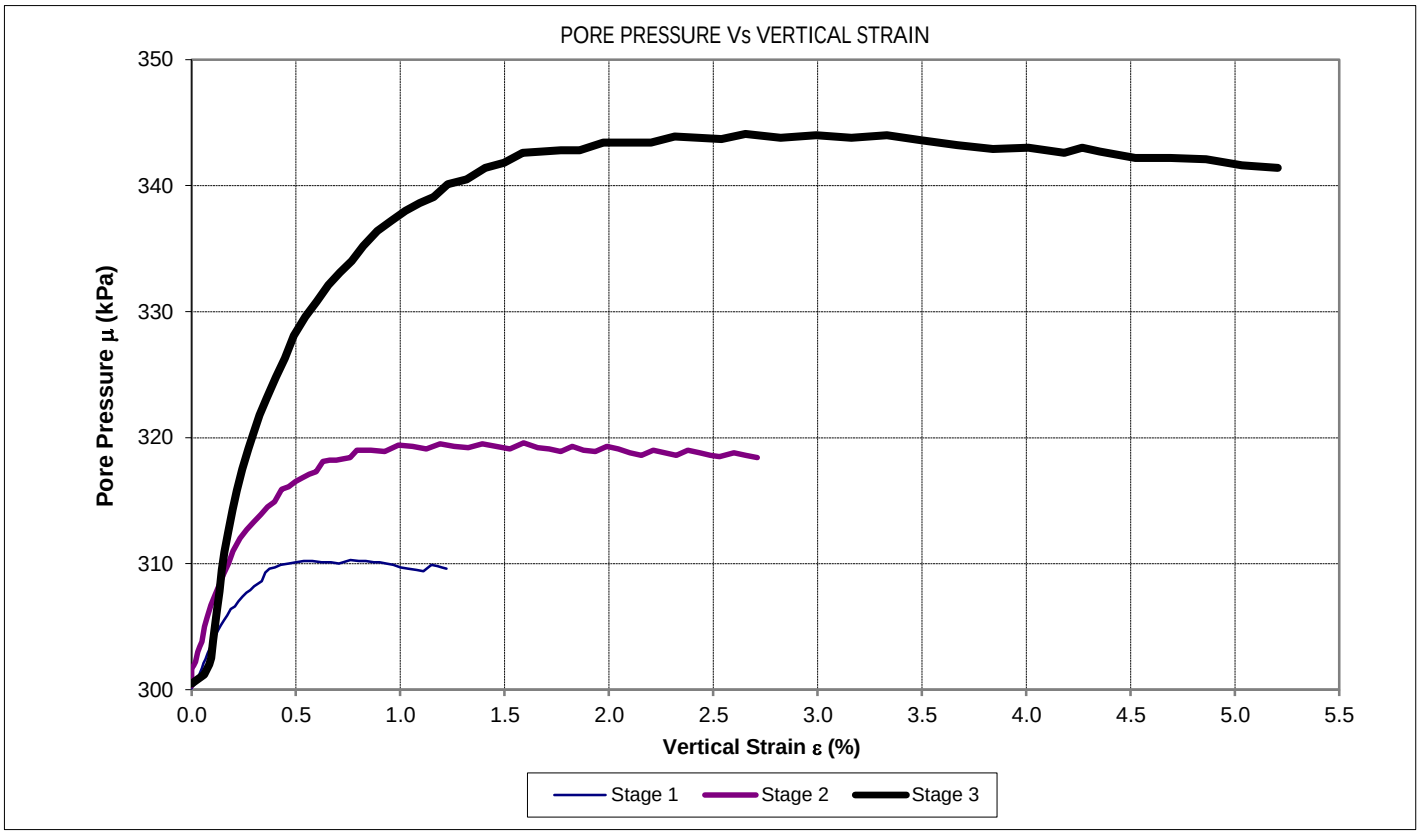
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_12

Site: Eastern Busway Location ID: DH314
Sample Ref.: -- Depth: 1.88-2.00 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





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Customer Project ID: EBA_12

Site: Eastern Busway Location ID: DH314
Sample Ref.: -- Depth: 1.88-2.00 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
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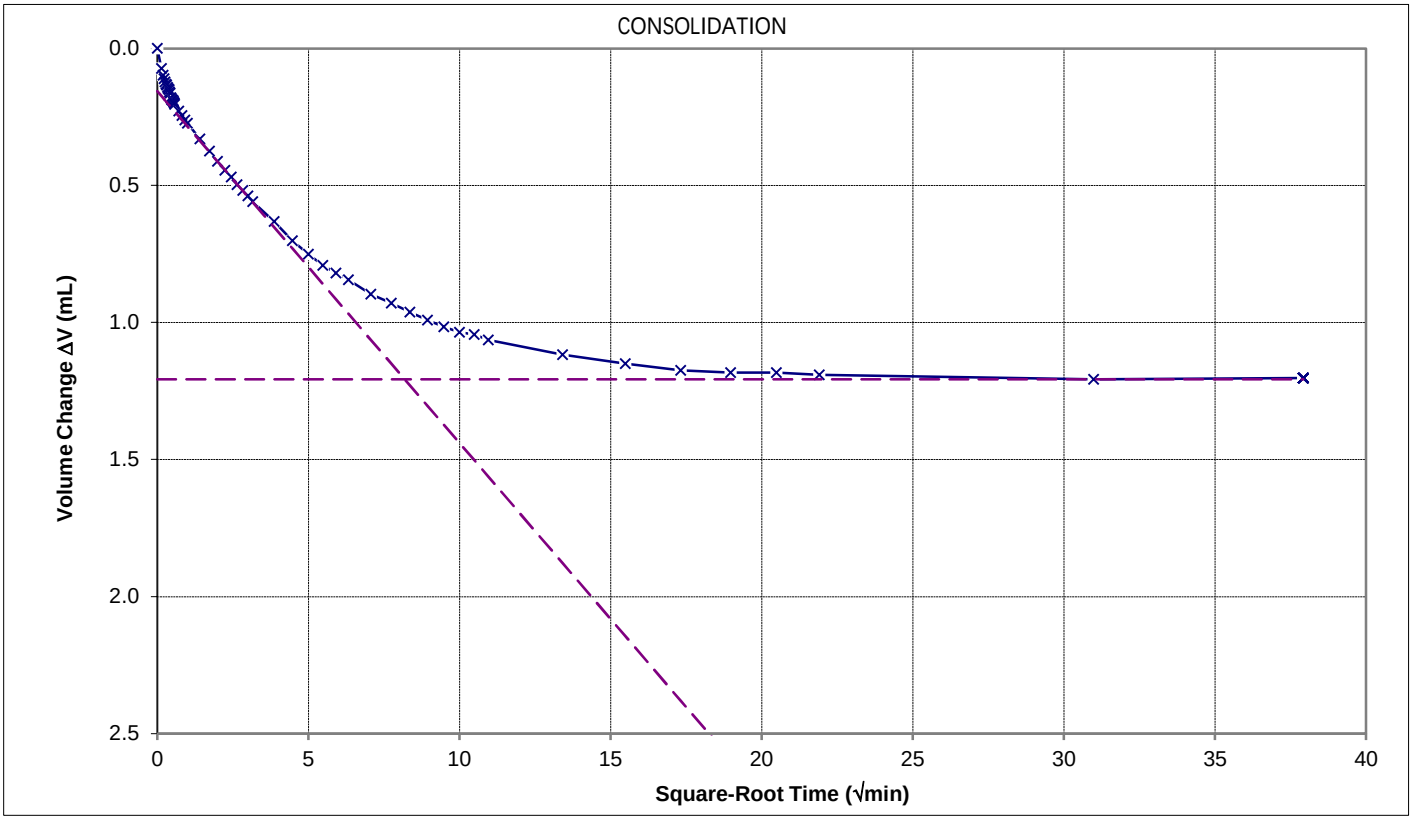
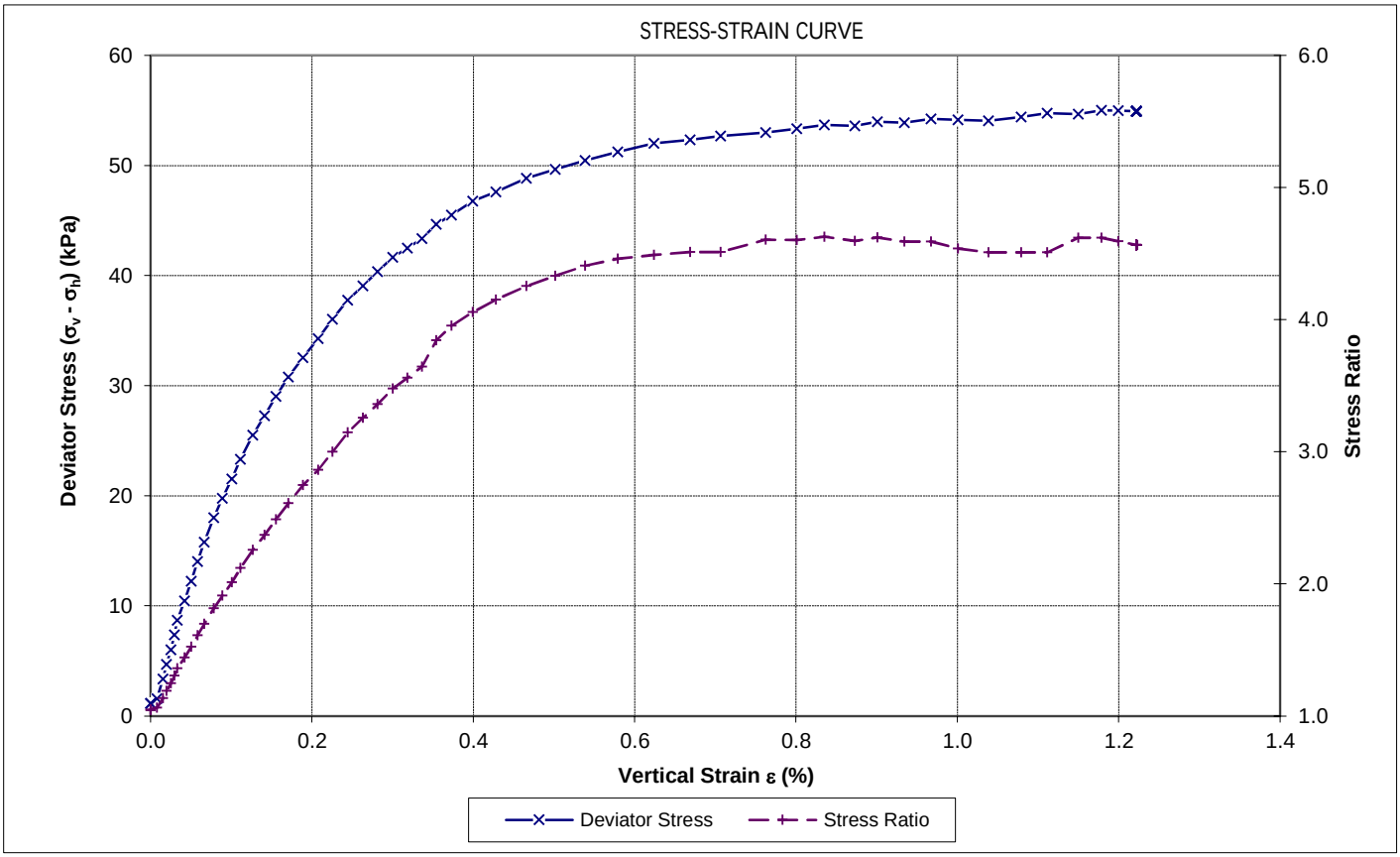
STAGE 1 GRAPHS





Tested by: YHW Date: 24/02/2023 Approved by KTP: Date: 17/03/2023

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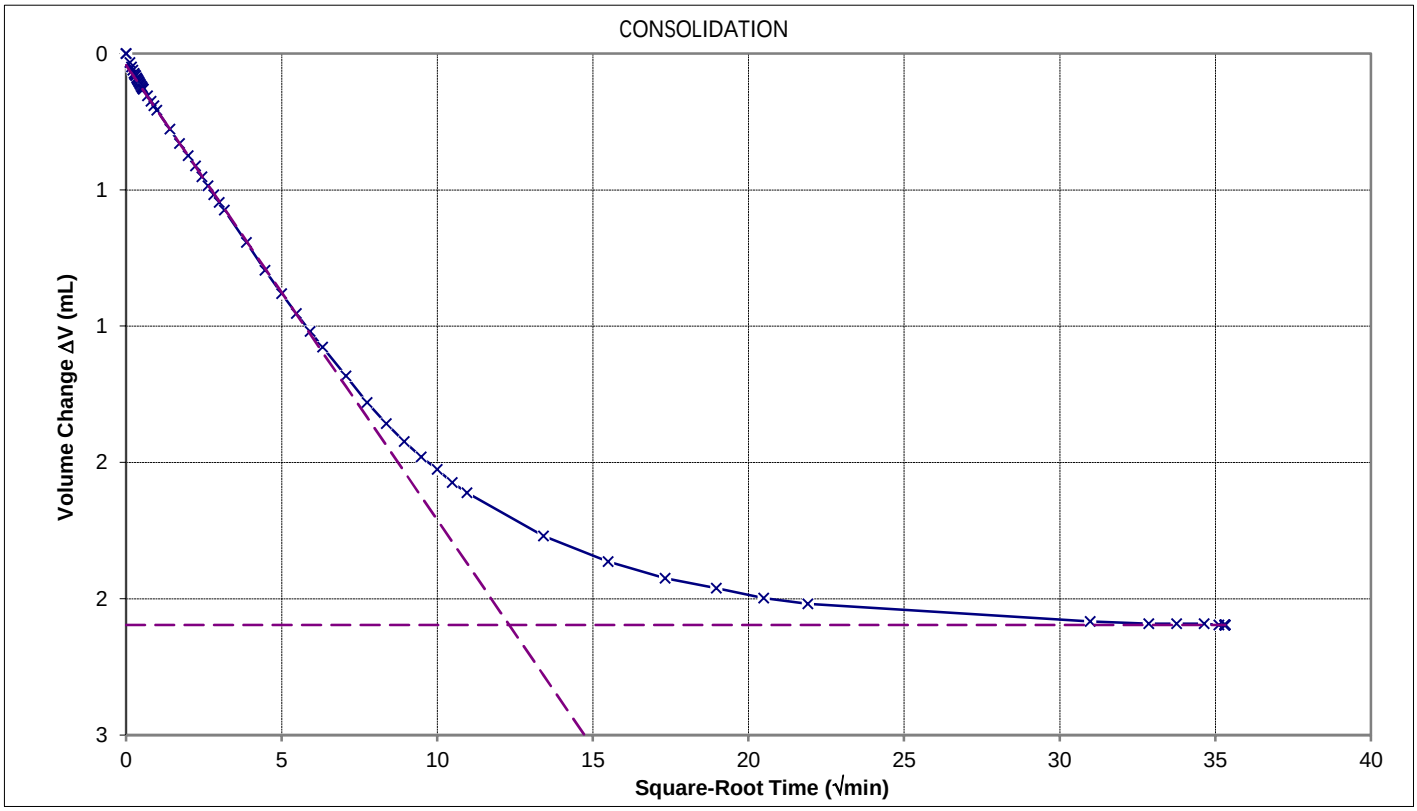
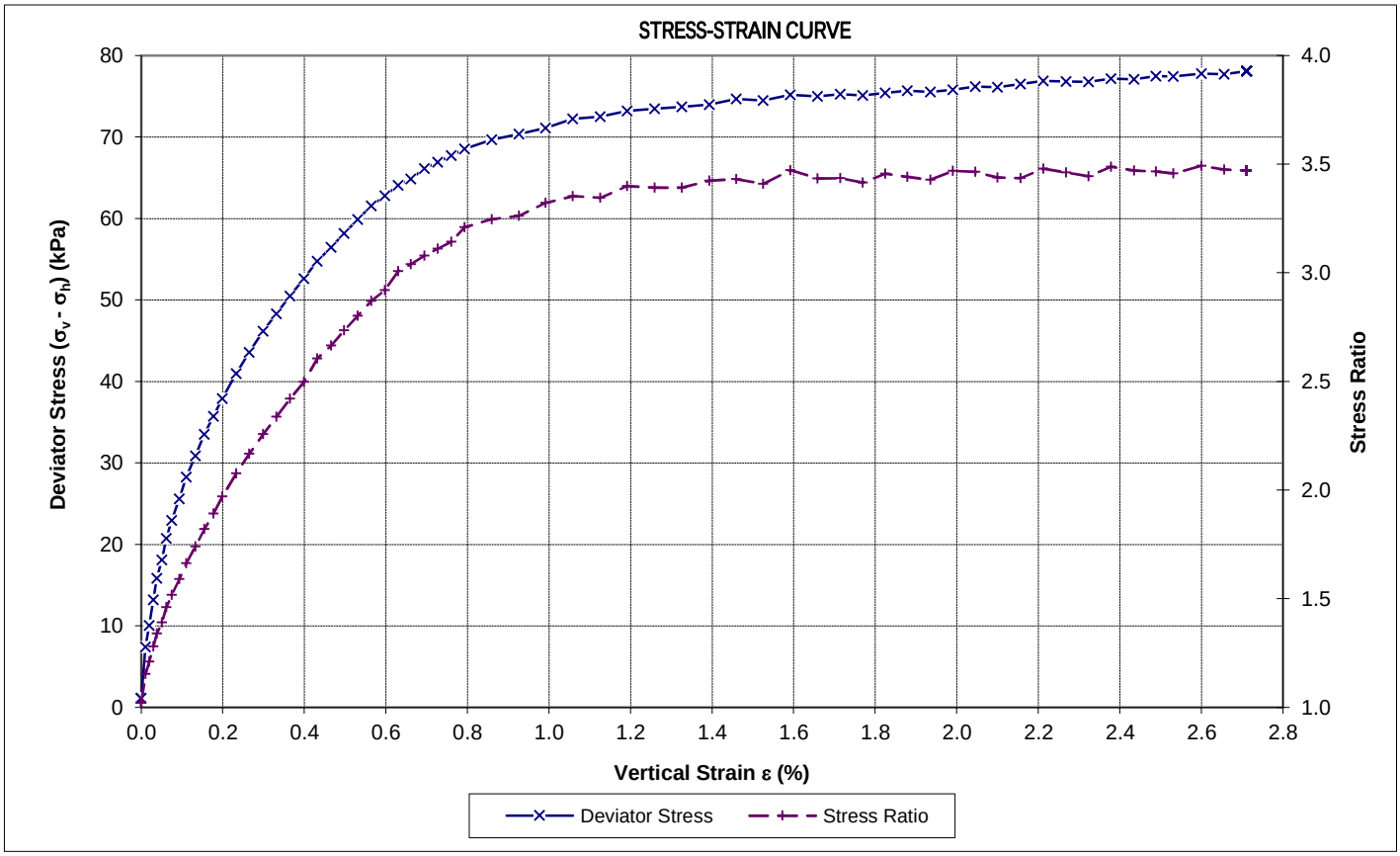
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_12

Site: Eastern Busway Location ID: DH314
Sample Ref.: -- Depth: 1.88-2.00 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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Geotechnics Project ID: 1017784.1000 Phase B
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Customer Project ID: EBA_12

Site: Eastern Busway Location ID: DH314
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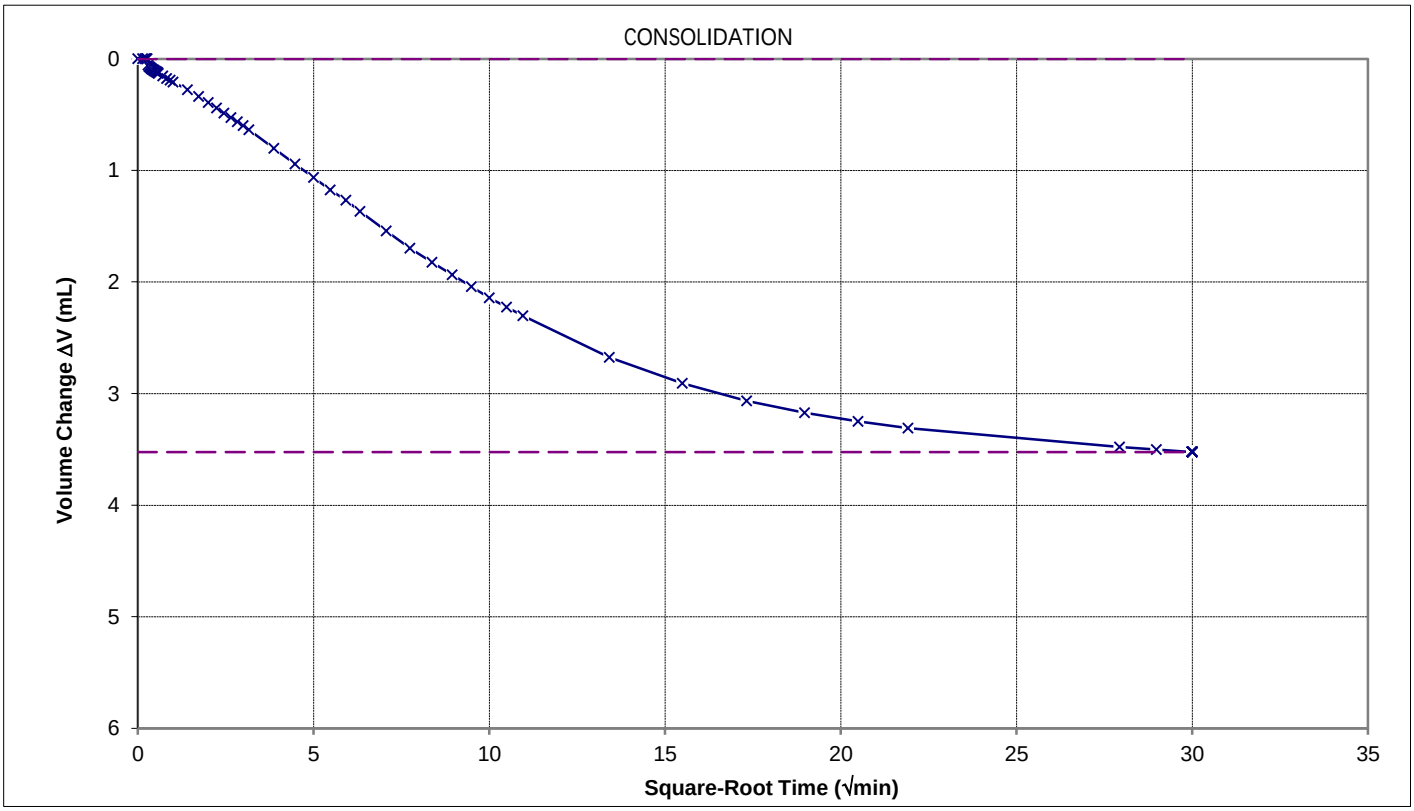
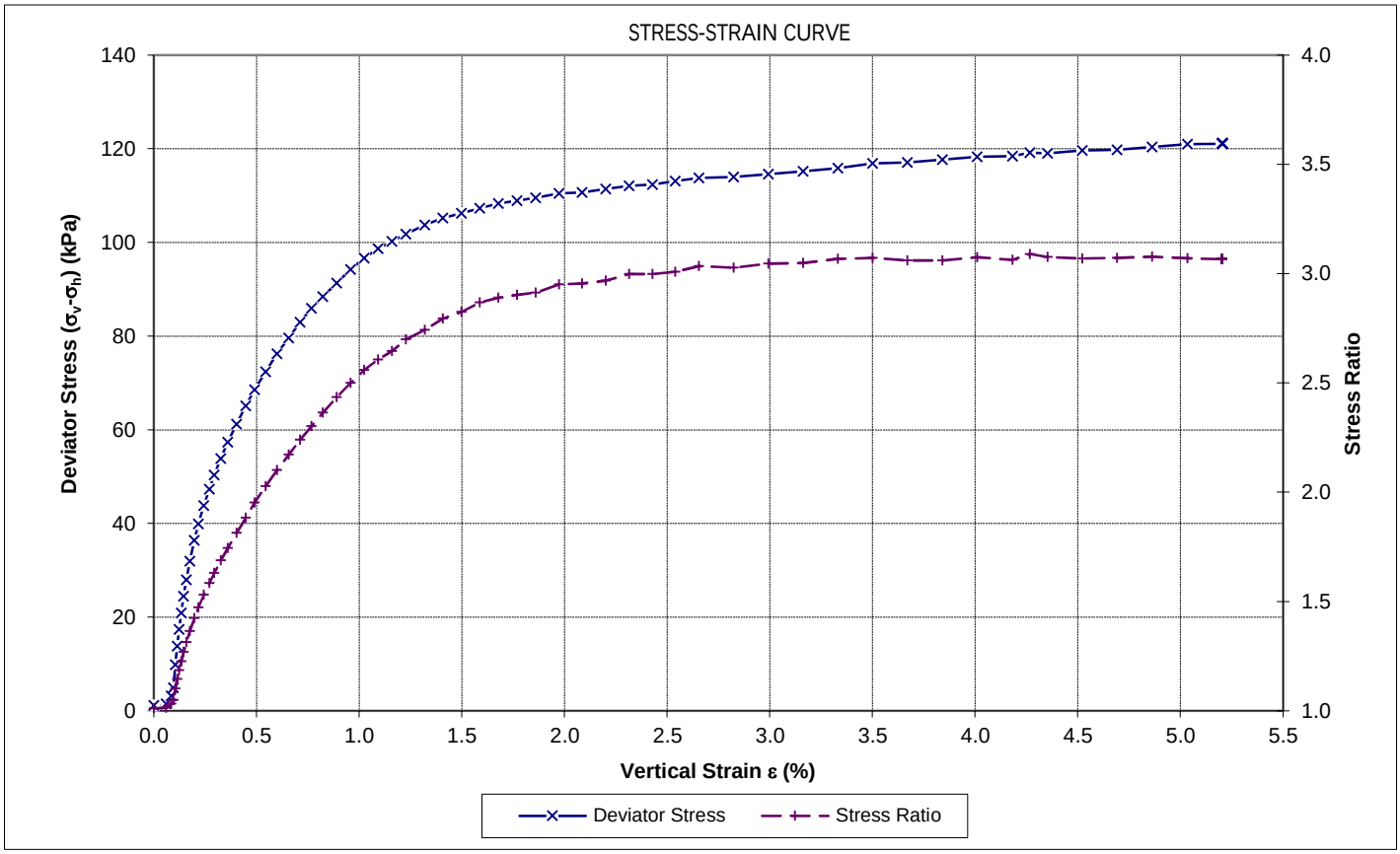
STAGE 3 GRAPHS





Tested by: YHW Date: 24/02/2023 Approved by KTP: Date: 17/03/2023

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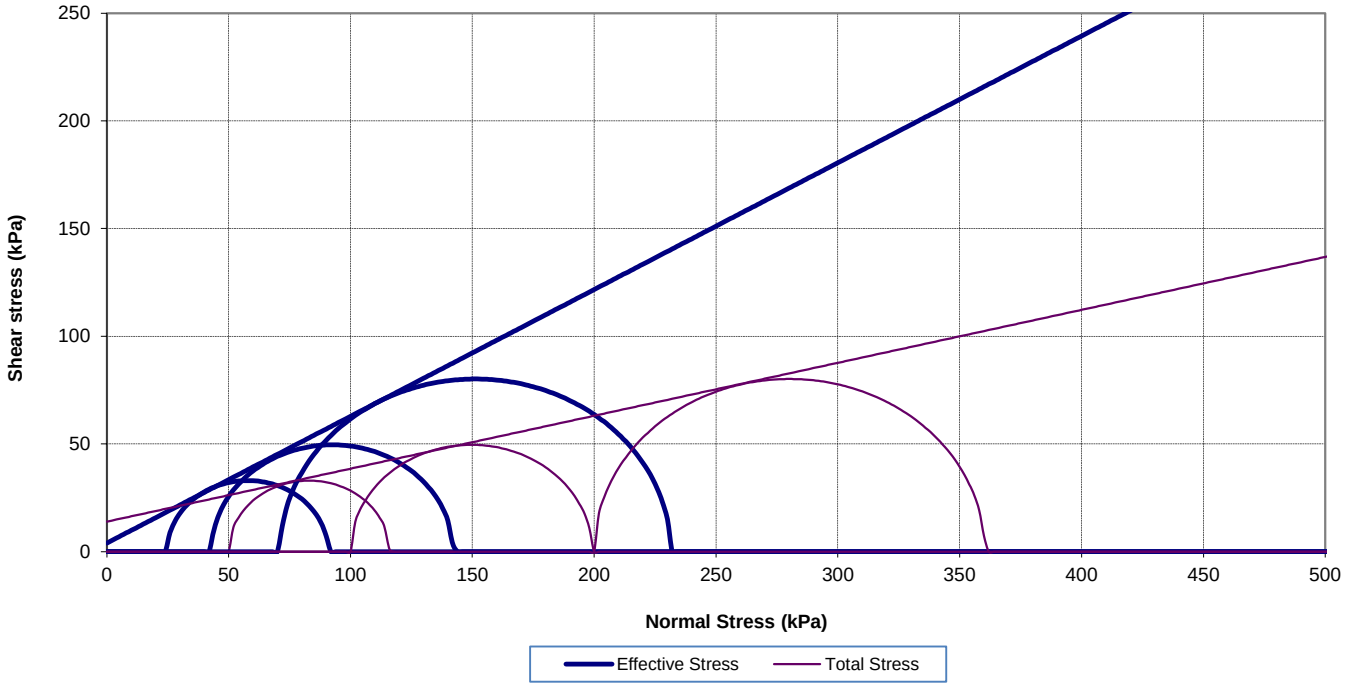
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH326
Sample Ref.: -- Depth: 4.66 - 4.79 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	113.58	mm	Initial Water Content:	115	%
Initial Sample Diameter:	53.77	mm	Initial Bulk Density:	1.37	t/m³
Initial B Value:	62	%	Initial Dry Density:	0.64	t/m³
B Value before Consolidation:	96	%	Final Water Content:	99.2	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	50	51	300	2.65	0.00	66.01	4.26	90.81	24.80	1.66	4.71	
Stage 2	100	101	300	3.45	0.01	99.22	3.79	142.12	42.90	1.47	4.72	
Stage 3	200	201	300	6.33	0.03	160.33	5.47	231.43	71.10	2.13	4.80	

		Total			Effective		
Angle of Frictional Resistance:	f =	14	°	f ¢=	30	°
Cohesion:	c =	14	kPa	c' =	4	kPa
Linear Regression Coefficient:	r =	1.000		r =	1.000	

Sample History: Undisturbed core trimmed at natural water content.

Soil description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Speed: 0.019 - 0.026 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear regression fitting method.

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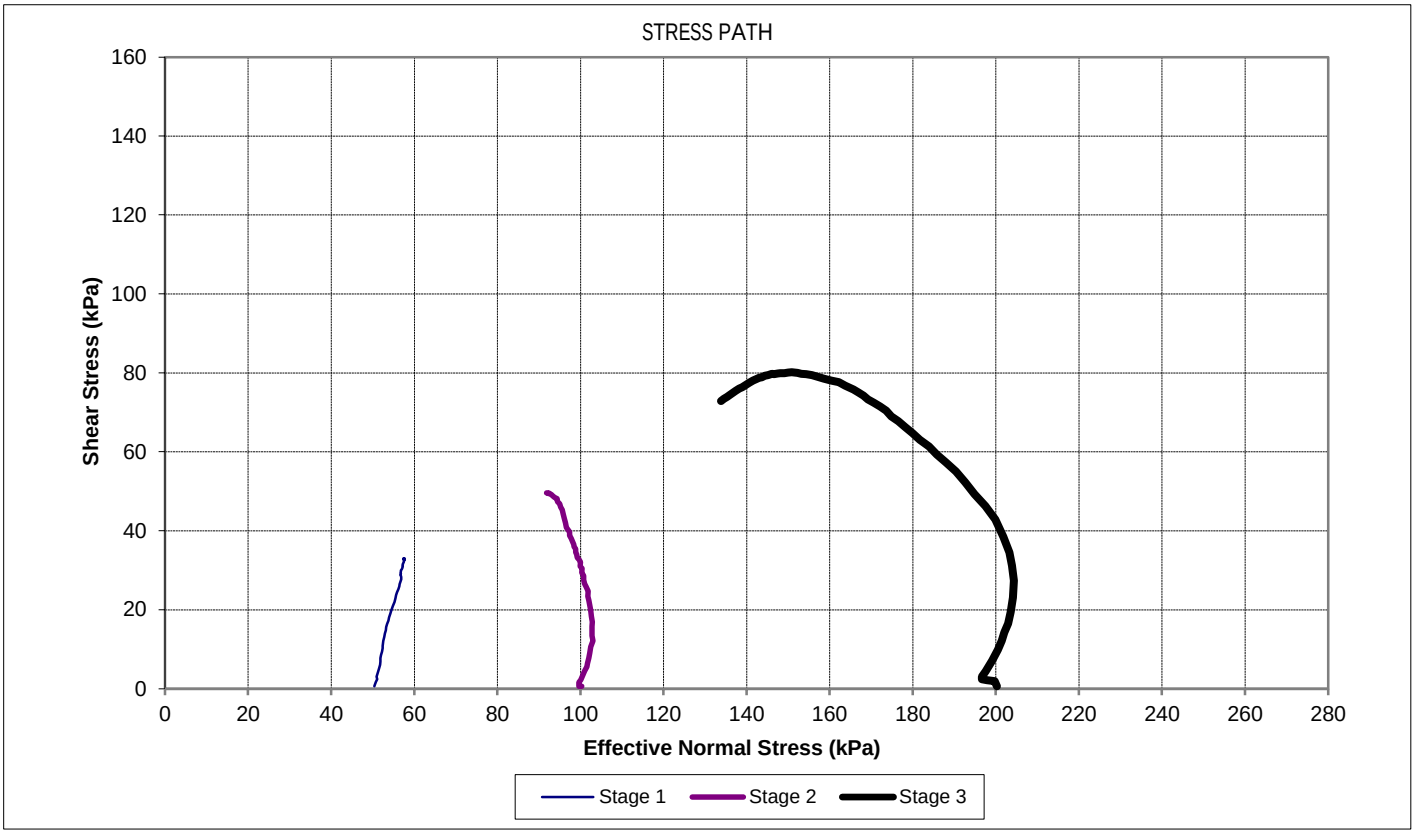
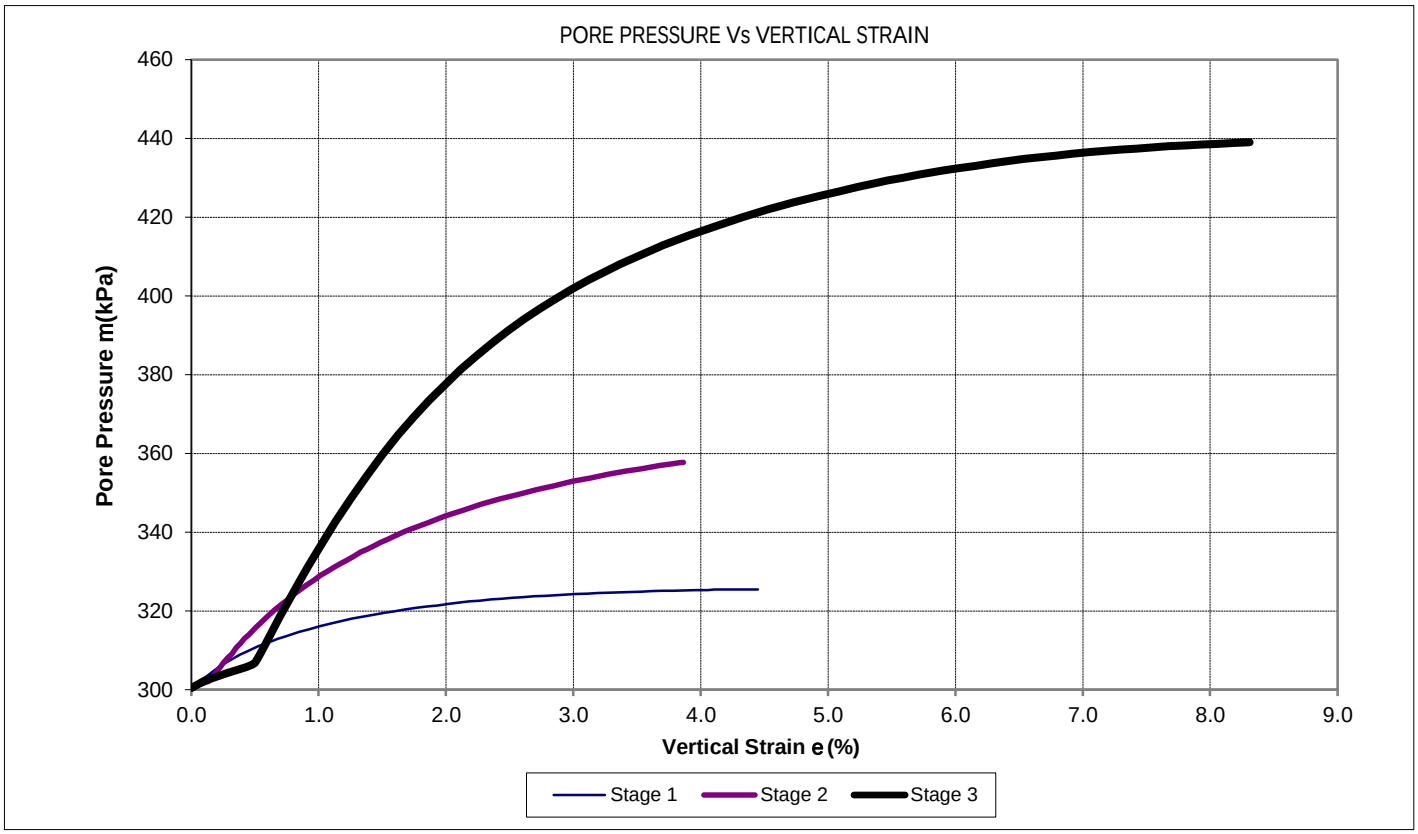
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH326
Sample Ref.: -- Depth: 4.66 - 4.79 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





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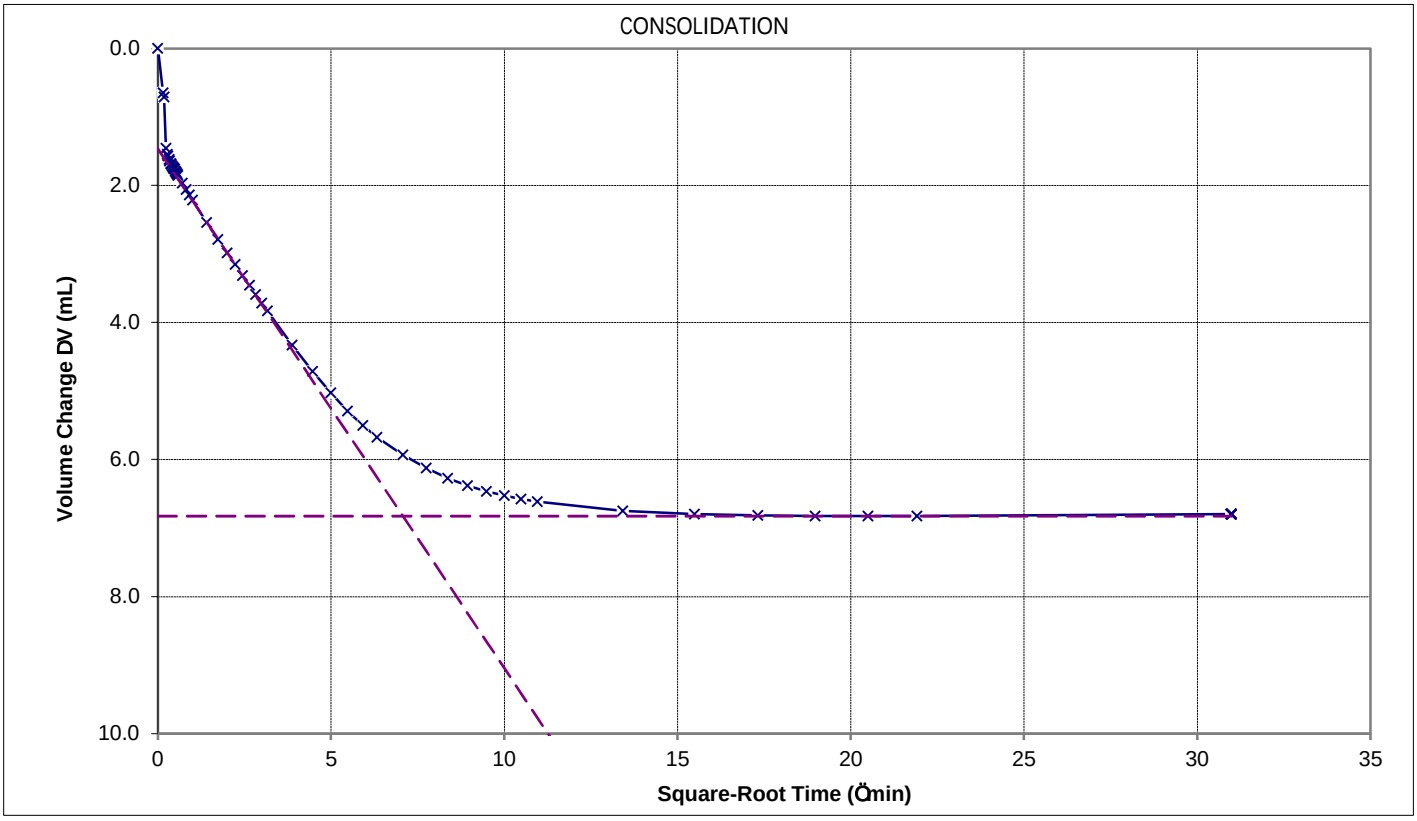
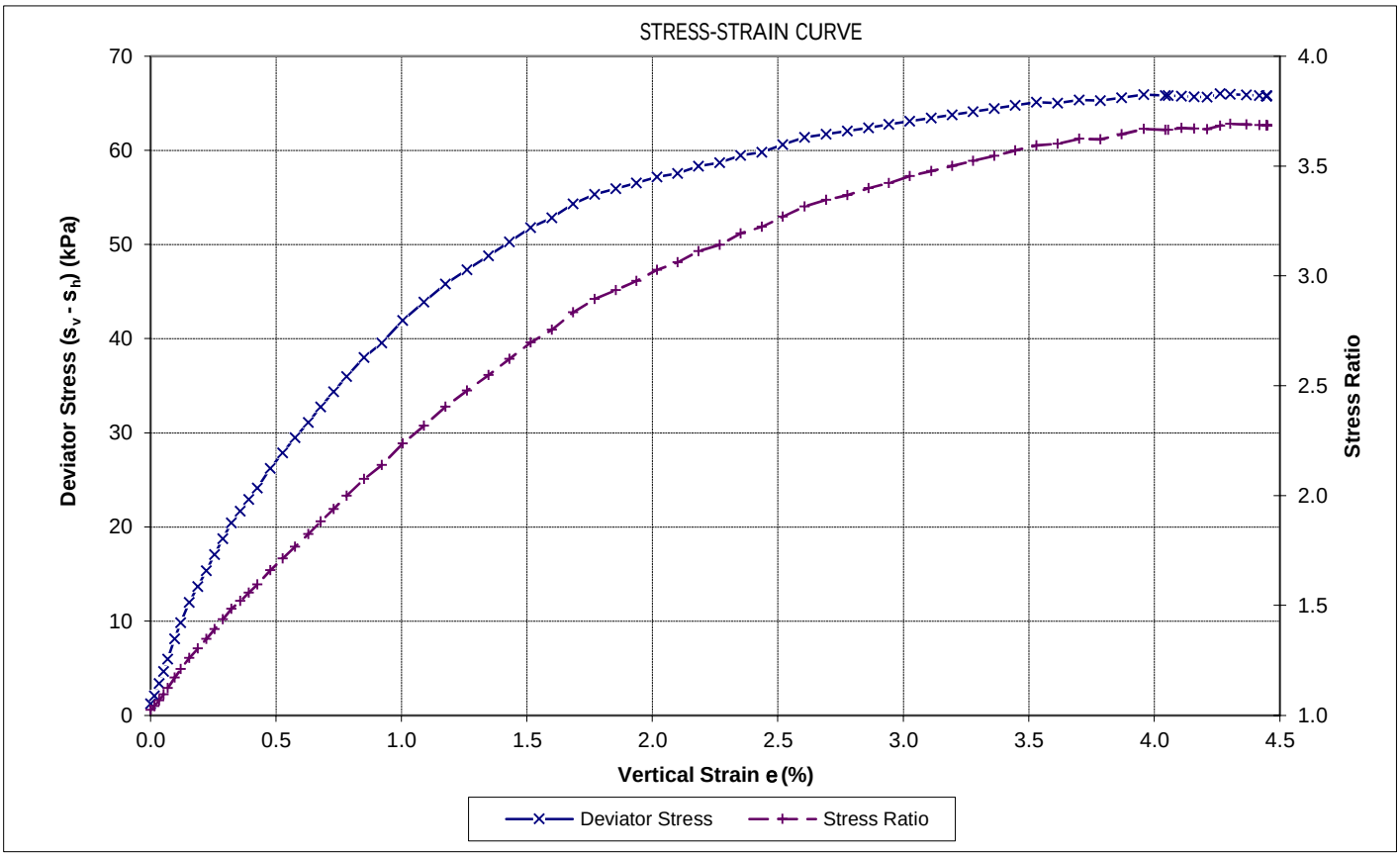
STAGE 1 GRAPHS





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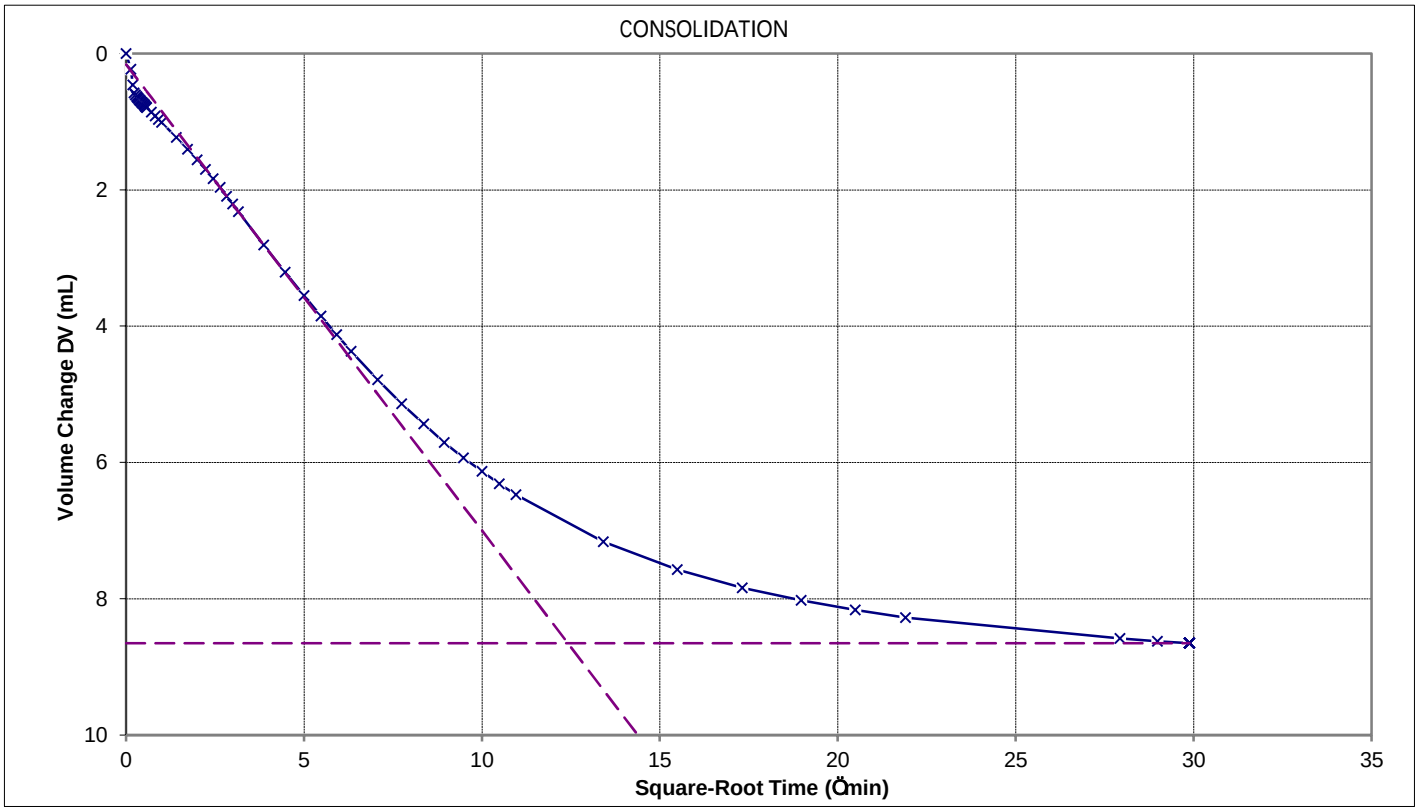
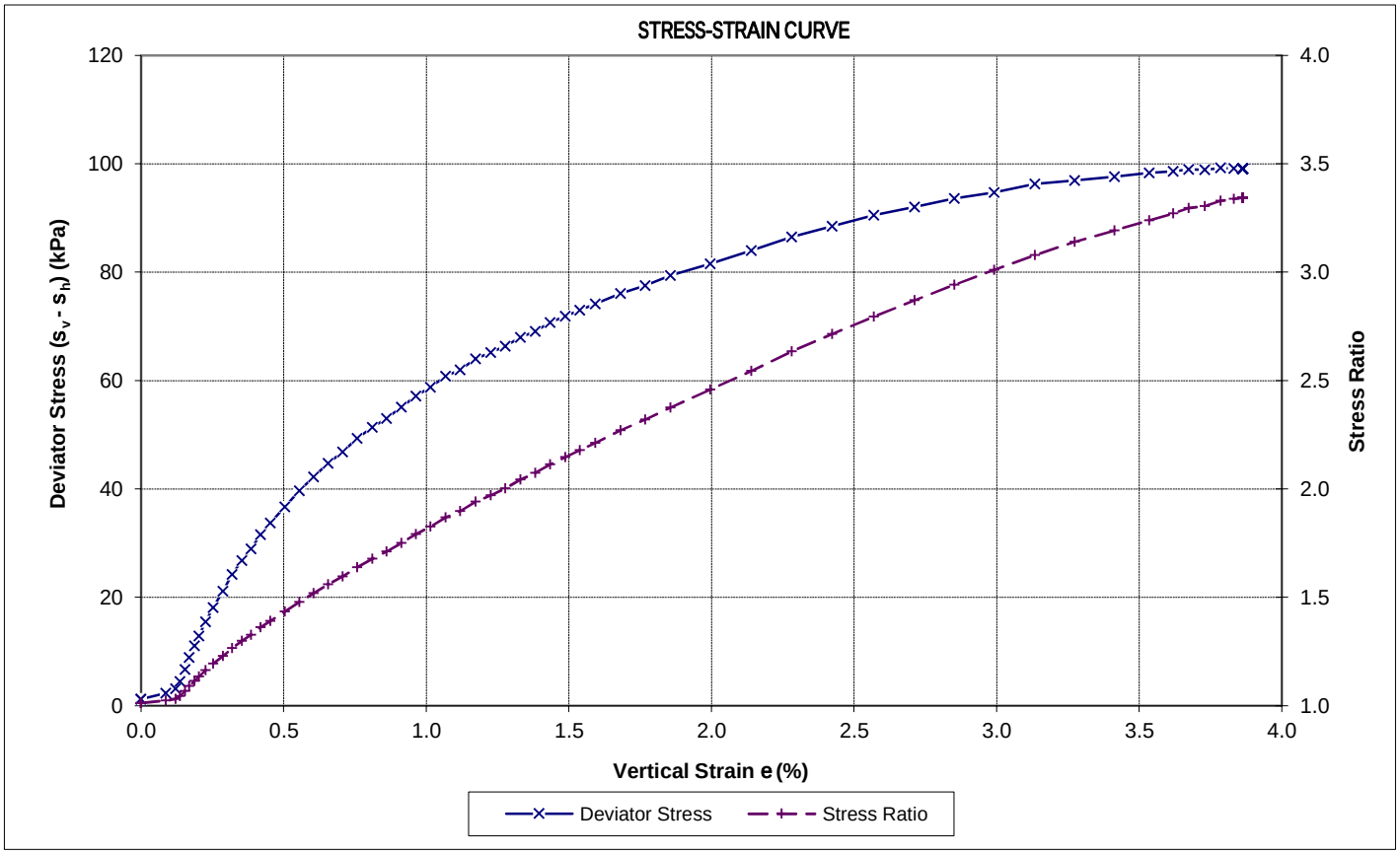
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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Site: Eastern Busway 2 Location ID: DH326
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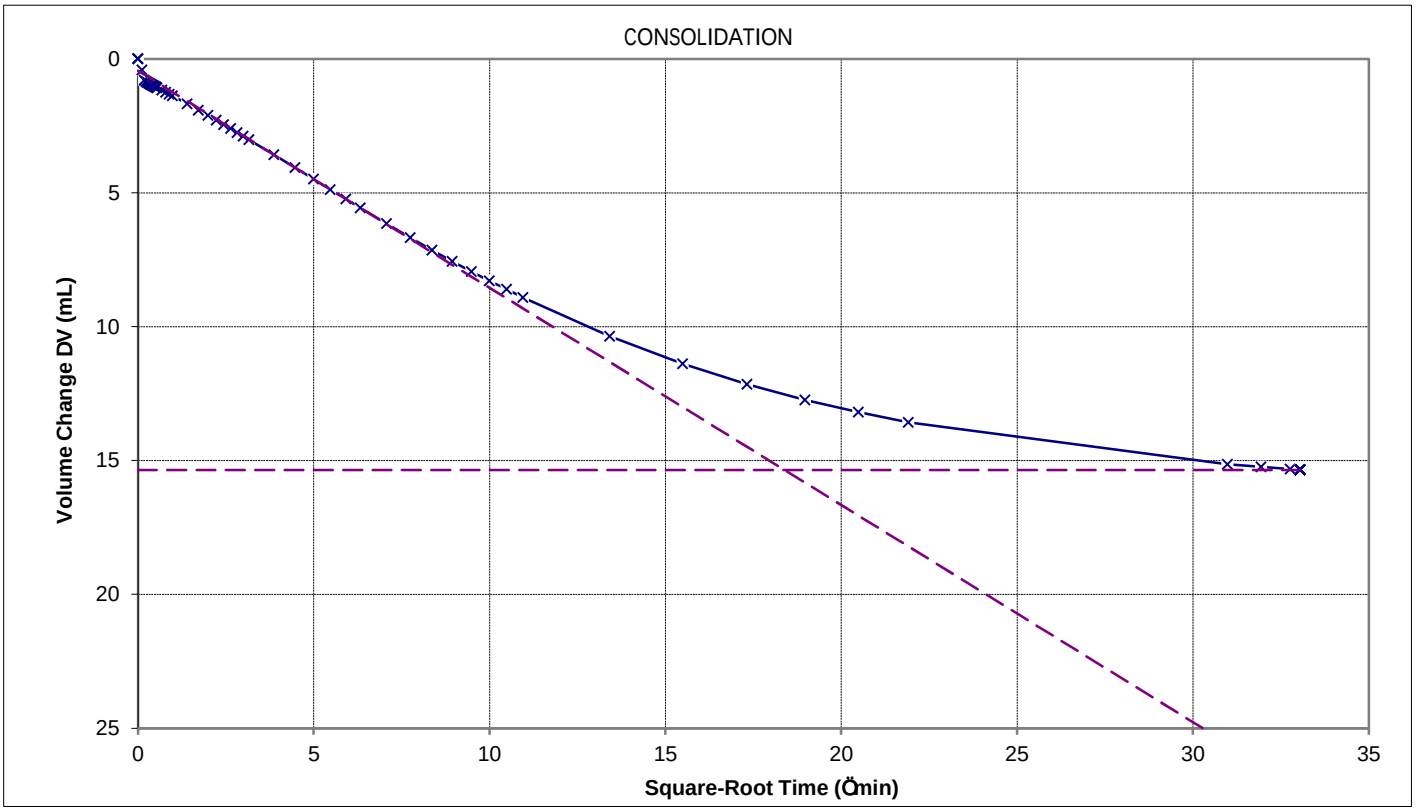
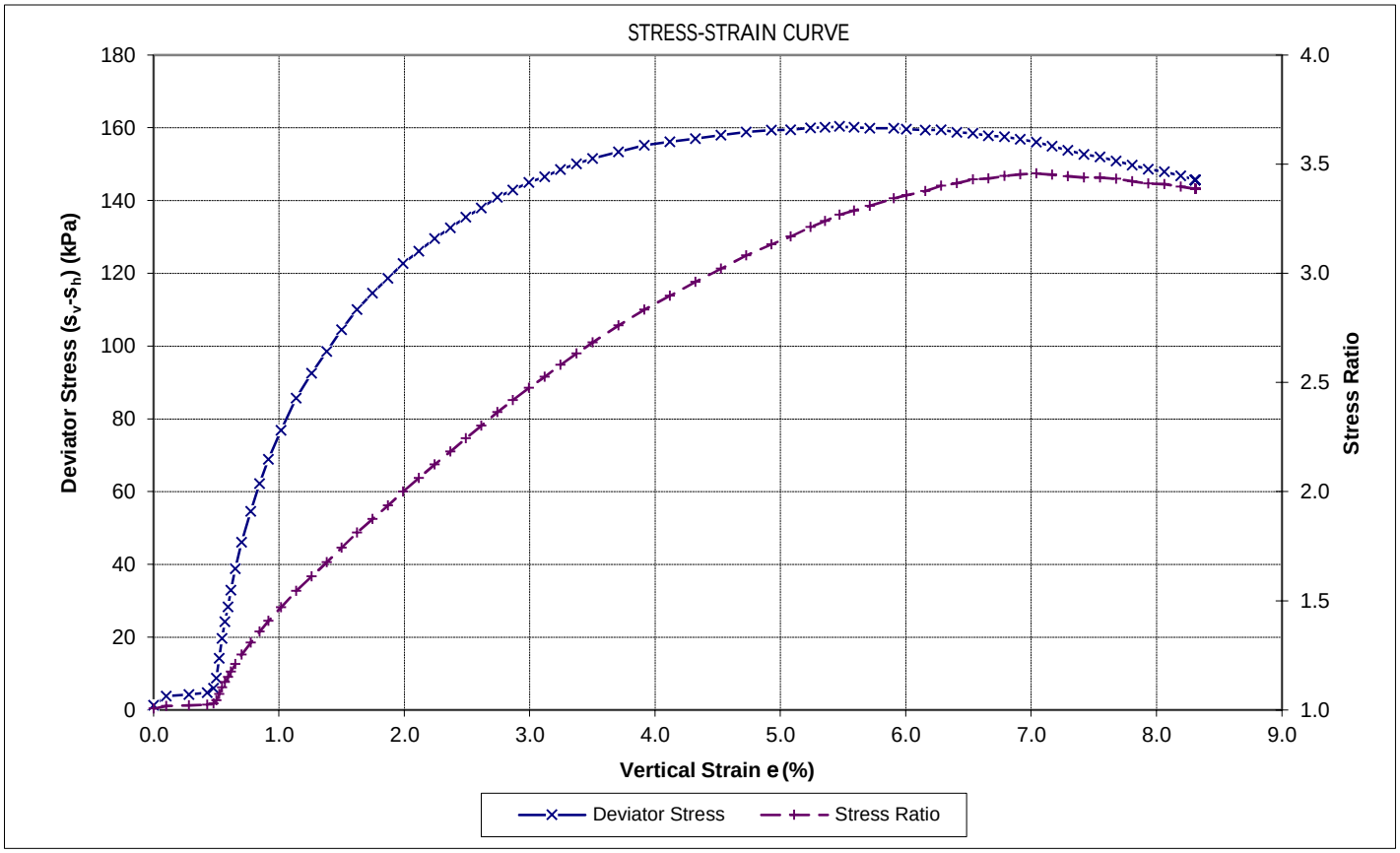
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





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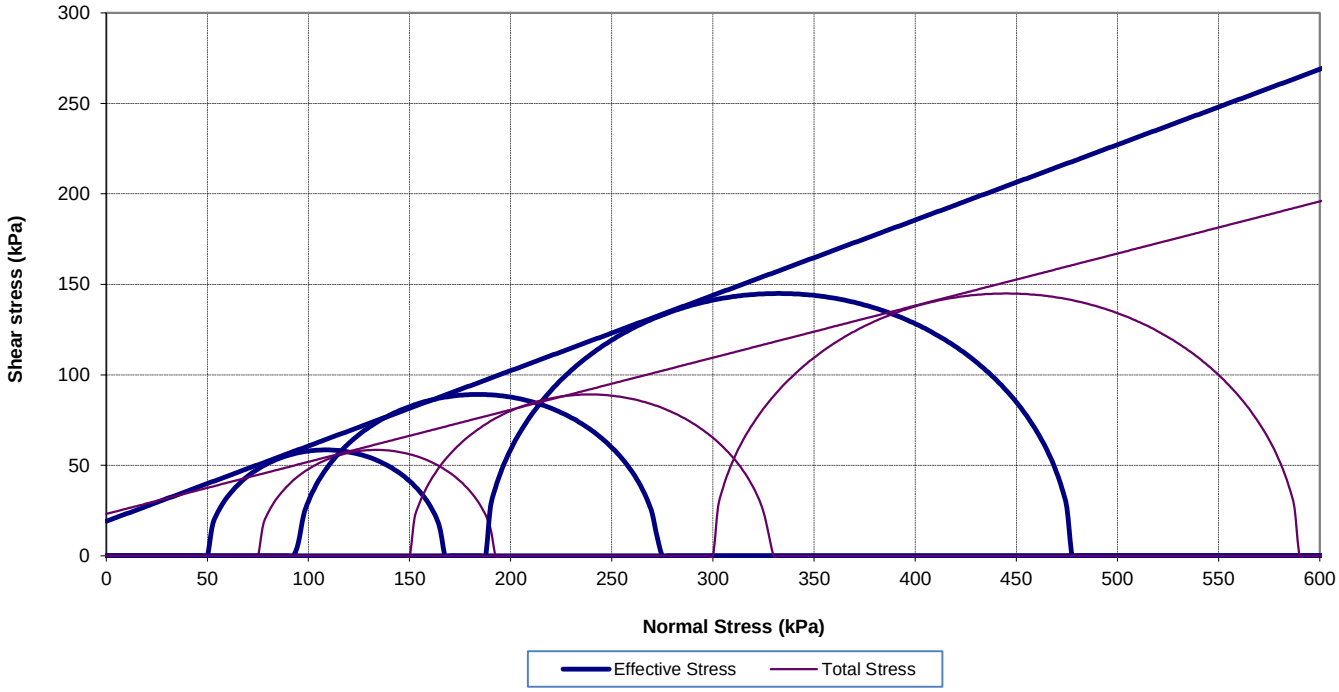
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 8.82-8.98 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	114.63	mm	Initial Water Content:	33.9	%
Initial Sample Diameter:	54.03	mm	Initial Bulk Density:	1.90	t/m³
Initial B Value:	--	%	Initial Dry Density:	1.42	t/m³
B Value before Consolidation:	98	%	Final Water Content:	32.0	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	75	76	300	2.71	0.00	117.02	2.55	167.02	50.00	0.99	4.69	
Stage 2	150	151	300	1.49	0.00	178.33	2.49	273.03	94.70	0.97	4.67	
Stage 3	300	301	300	2.51	0.00	289.93	3.45	477.43	187.50	1.34	4.68	

	Total			Effective		
Angle of Frictional Resistance:	ϕ =	16	°	ϕ' =	23	°
Cohesion:	c =	23	kPa	c' =	19	kPa
Linear Regression Coefficient:	r =	1.000		r =	1.000	

Sample History: Undisturbed core trimmed at natural water content.

Soil description: clayey SILT, stiff, blueish grey.

Test Speed: 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear regression fitting method.

Approved Signatory: Date: 13/07/2022

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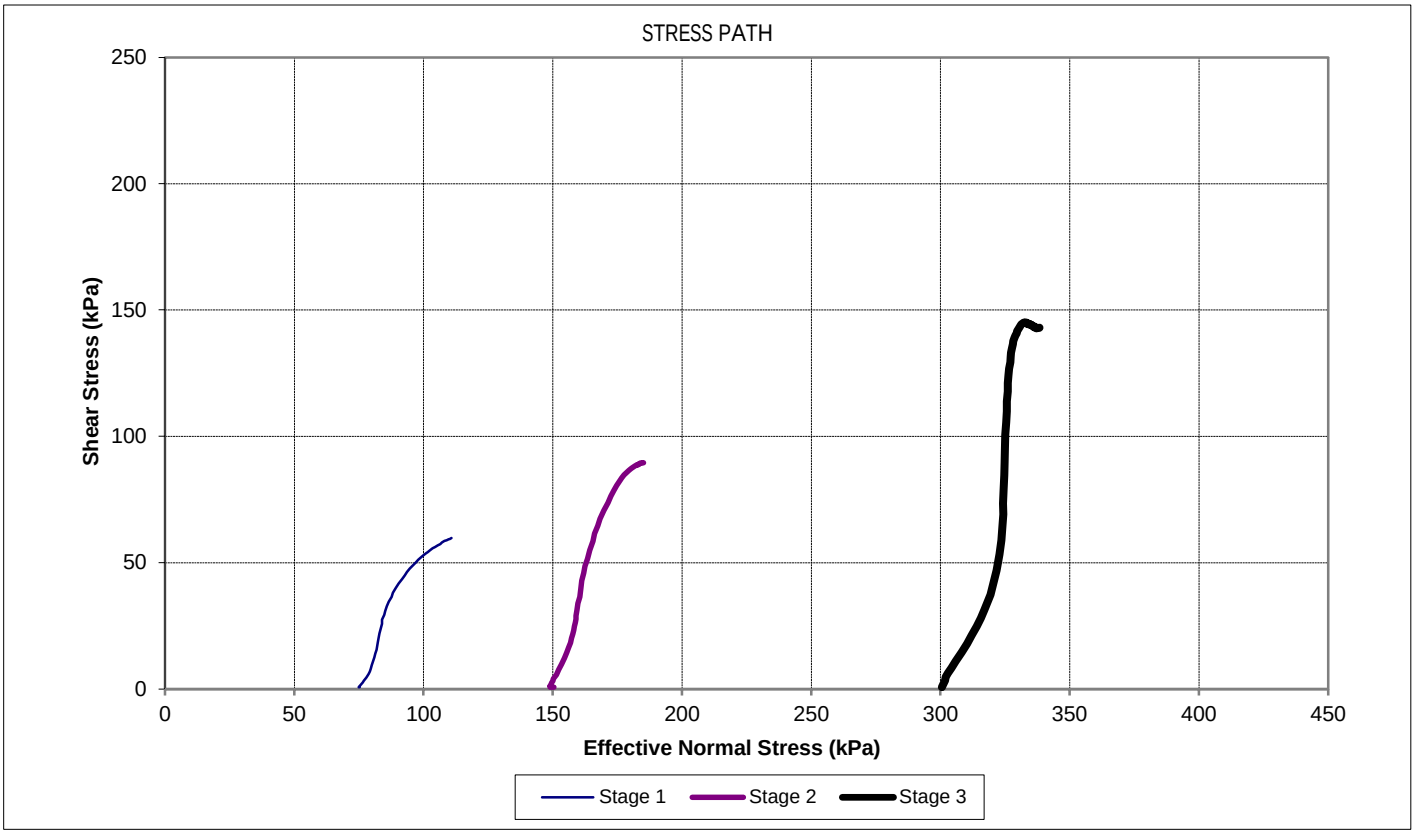
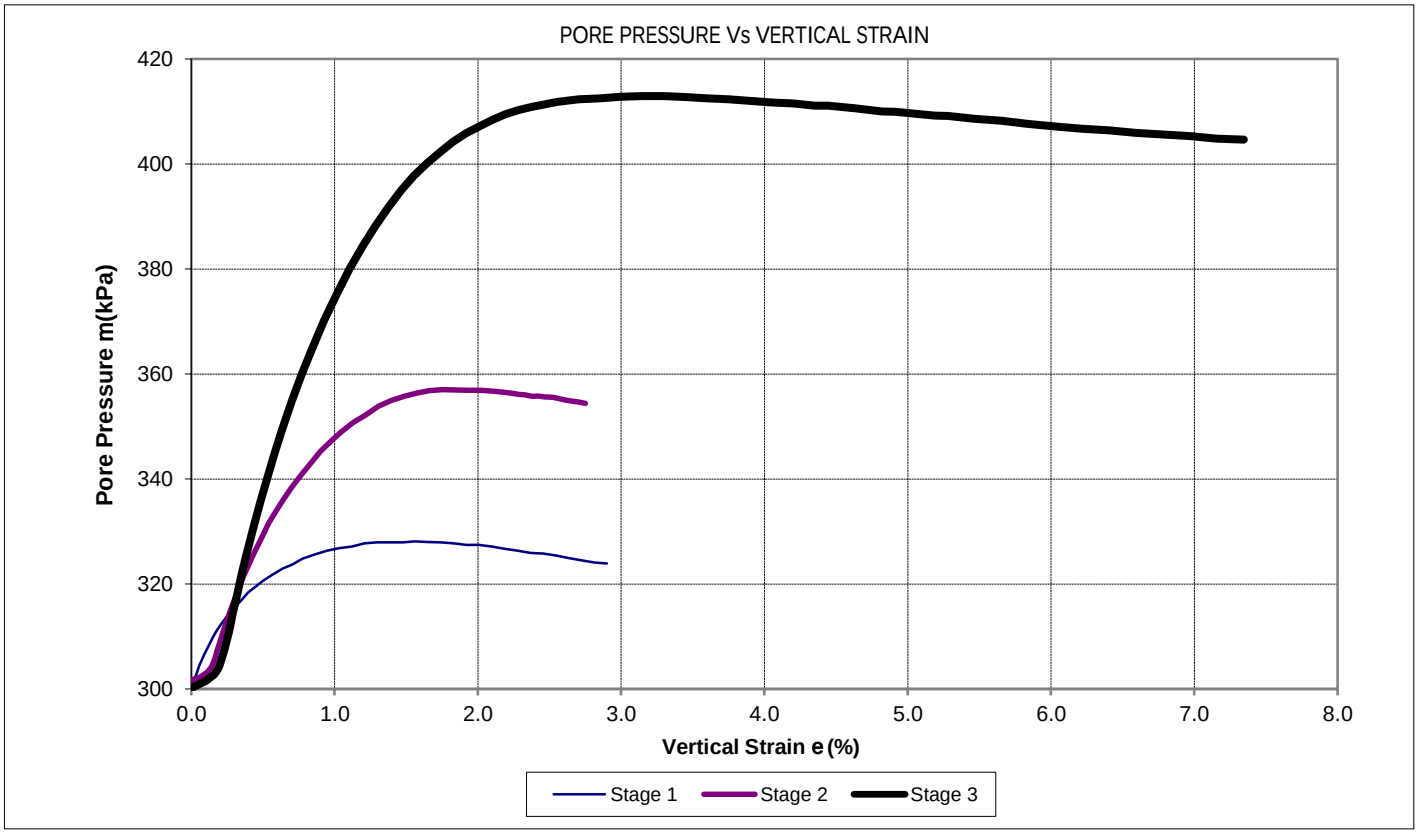
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 8.82-8.98 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





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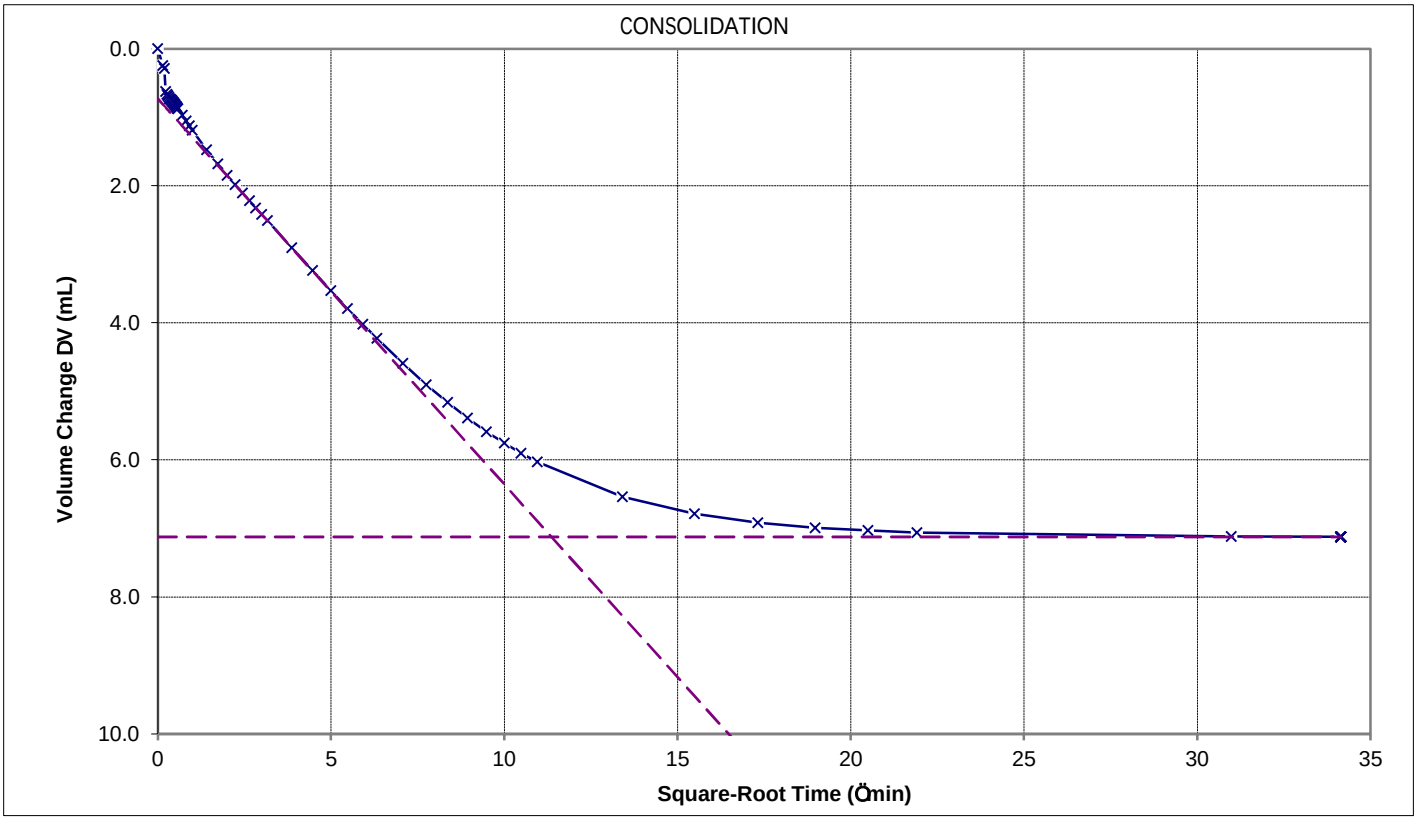
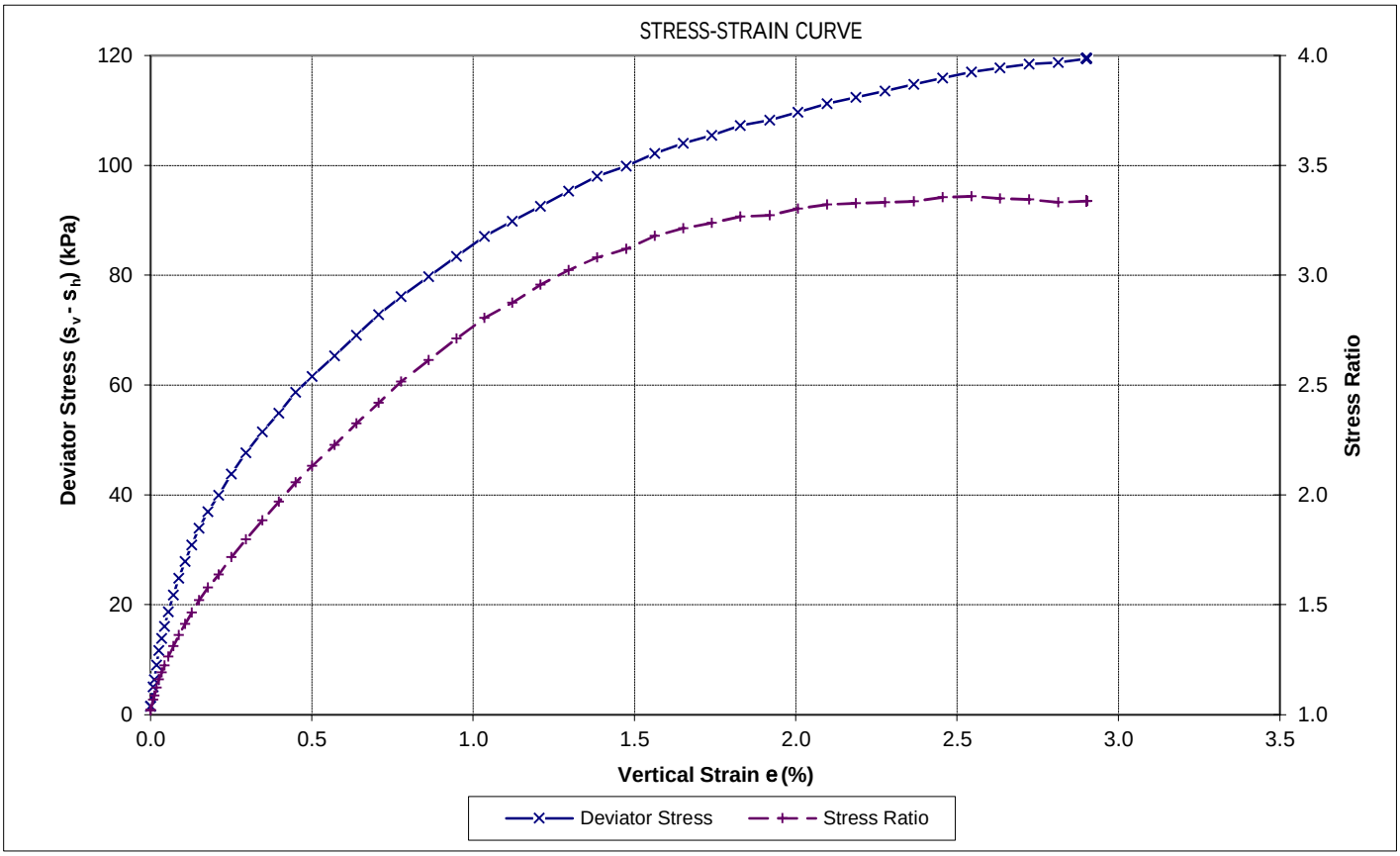
STAGE 1 GRAPHS





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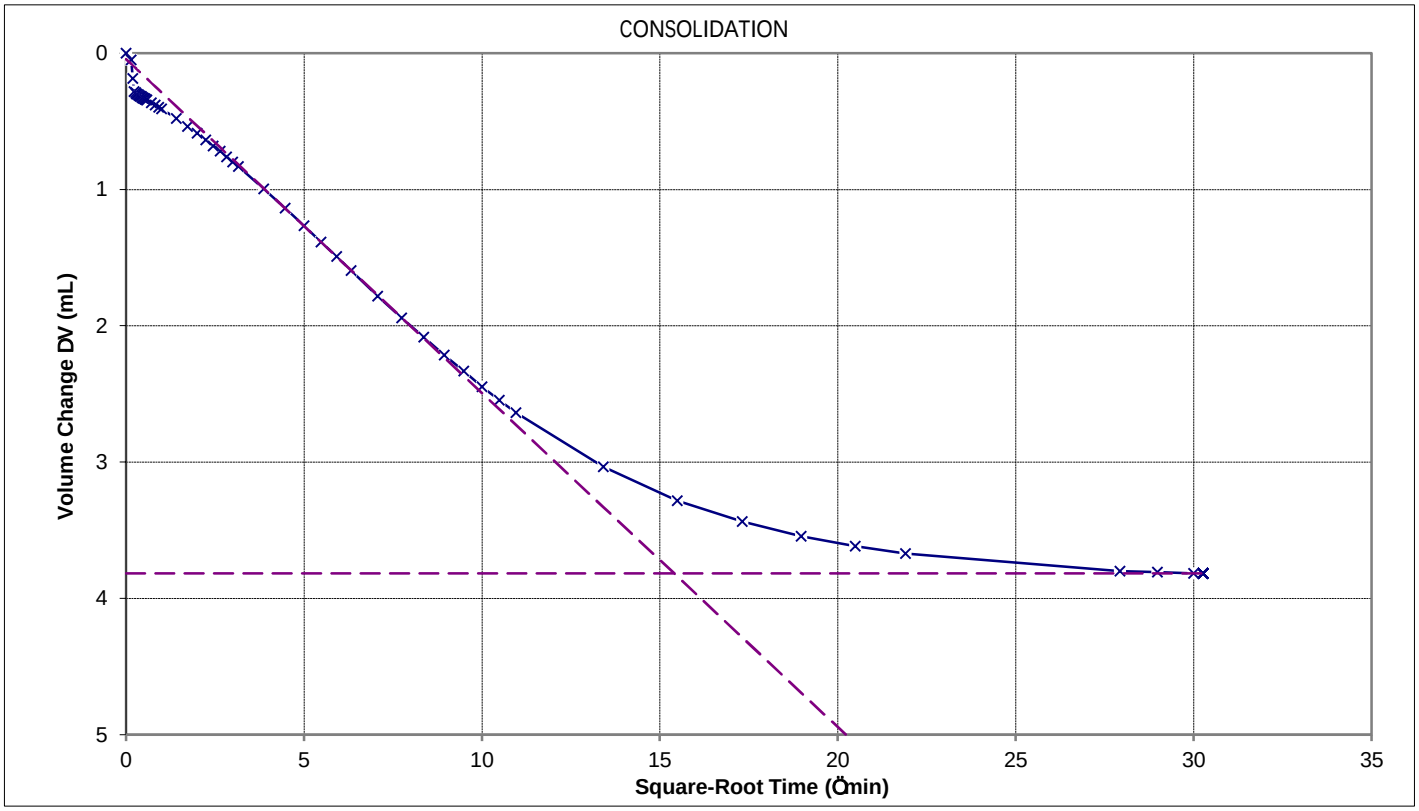
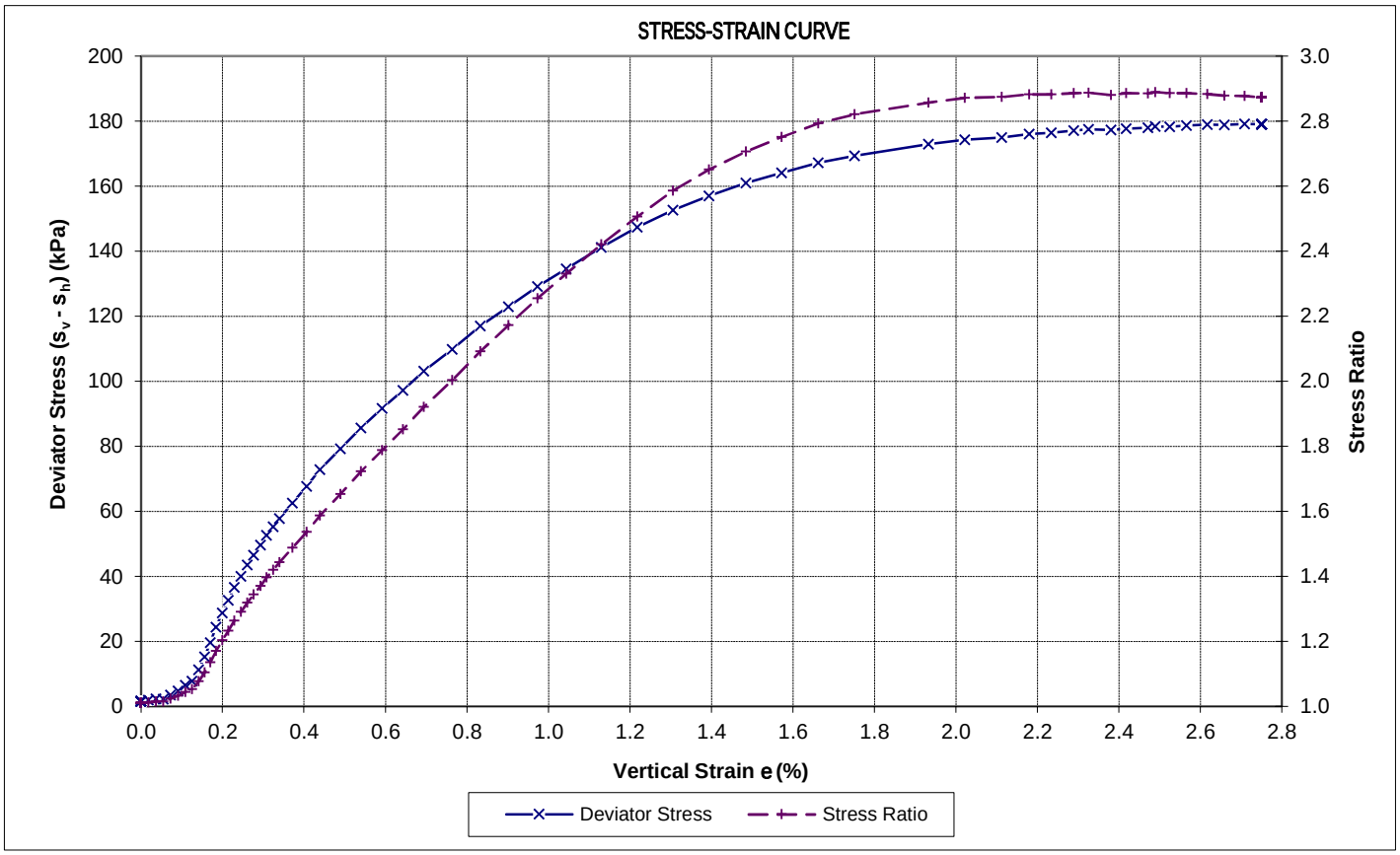
STAGE 2 GRAPHS





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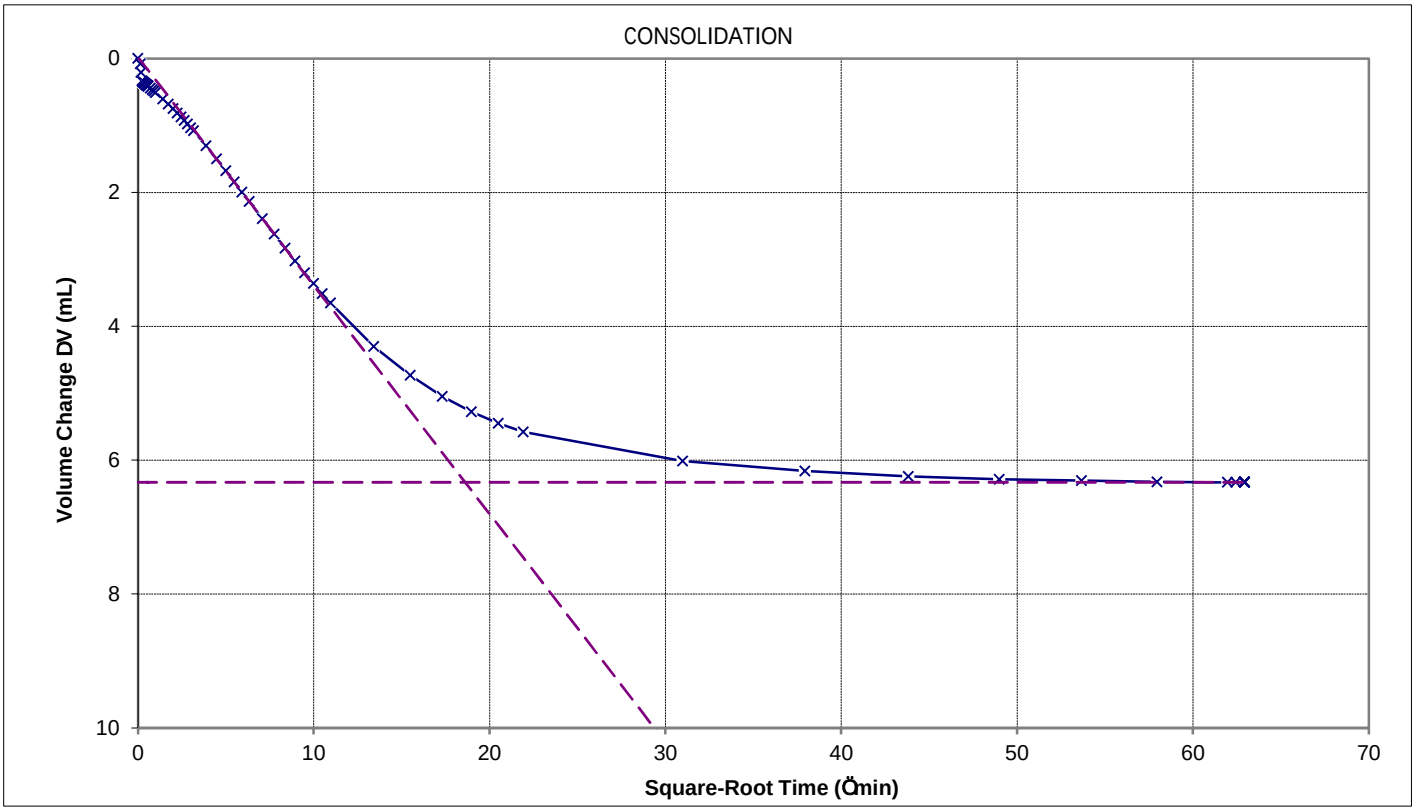
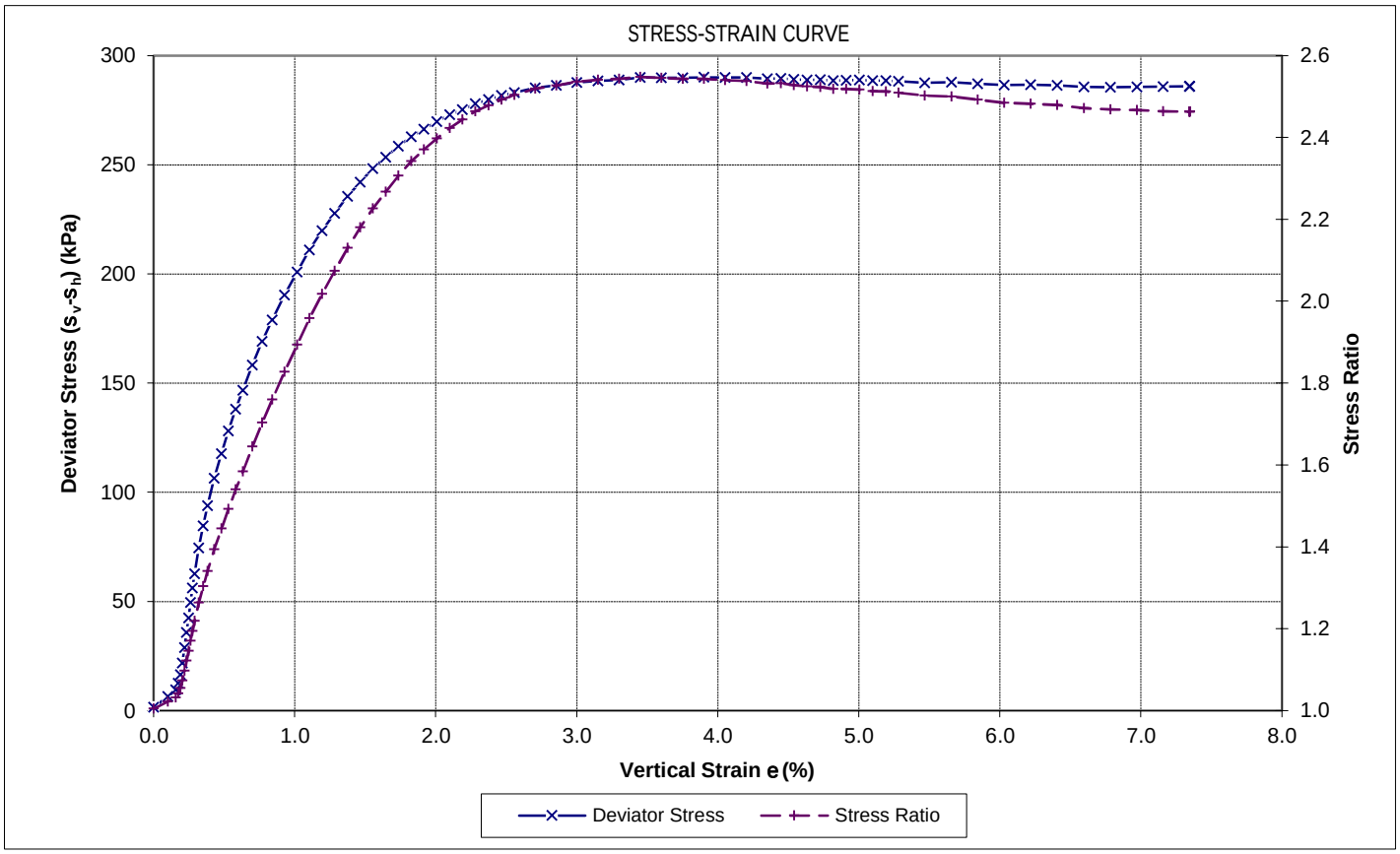
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





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Geotechnics Project ID: 1017784.0000 Phase B
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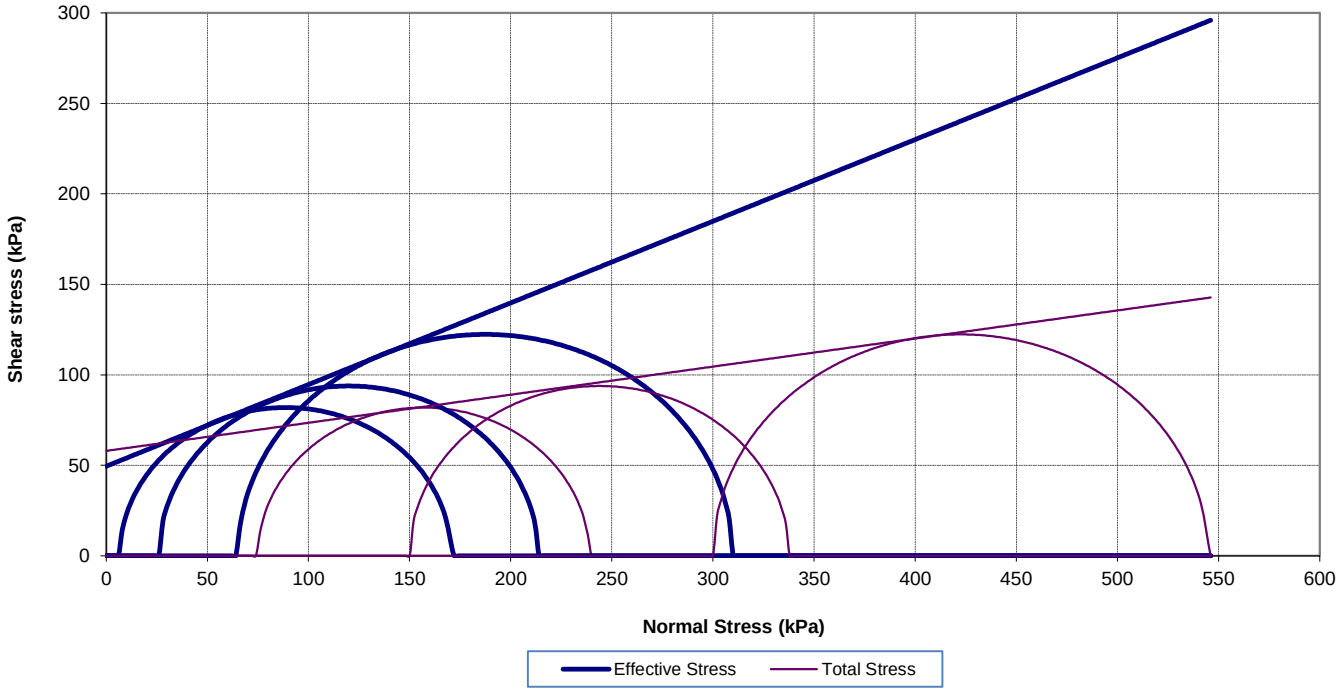
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 12.18 - 12.30 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	113.88	mm	Initial Water Content:	200	%
Initial Sample Diameter:	54.25	mm	Initial Bulk Density:	1.19	t/m³
Initial B Value:	6	%	Initial Dry Density:	0.40	t/m³
B Value before Consolidation:	100	%	Final Water Content:	181	%

Test Results

	At the End of Consolidation Stage						Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric			Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)		$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	75	76	300	2.17	0.00		163.85	2.59	170.55	6.70	0.60	4.66	
Stage 2	150	151	300	2.48	0.01		187.69	3.03	213.69	26.00	0.71	4.68	
Stage 3	300	301	300	7.97	0.03		244.71	5.67	309.71	65.00	1.32	4.78	

	Total			Effective		
Angle of Frictional Resistance:	ϕ =	9	°	ϕ' =	24	°
Cohesion:	c =	58	kPa	c' =	50	kPa
Linear Regression Coefficient:	r =	0.999		r =	1.000	

Sample History: Undisturbed core trimmed at natural water content.

Soil description: peaty CLAY, black; soft, wet, high plasticity

Test Speed: 0.018 - 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear regression fitting method.

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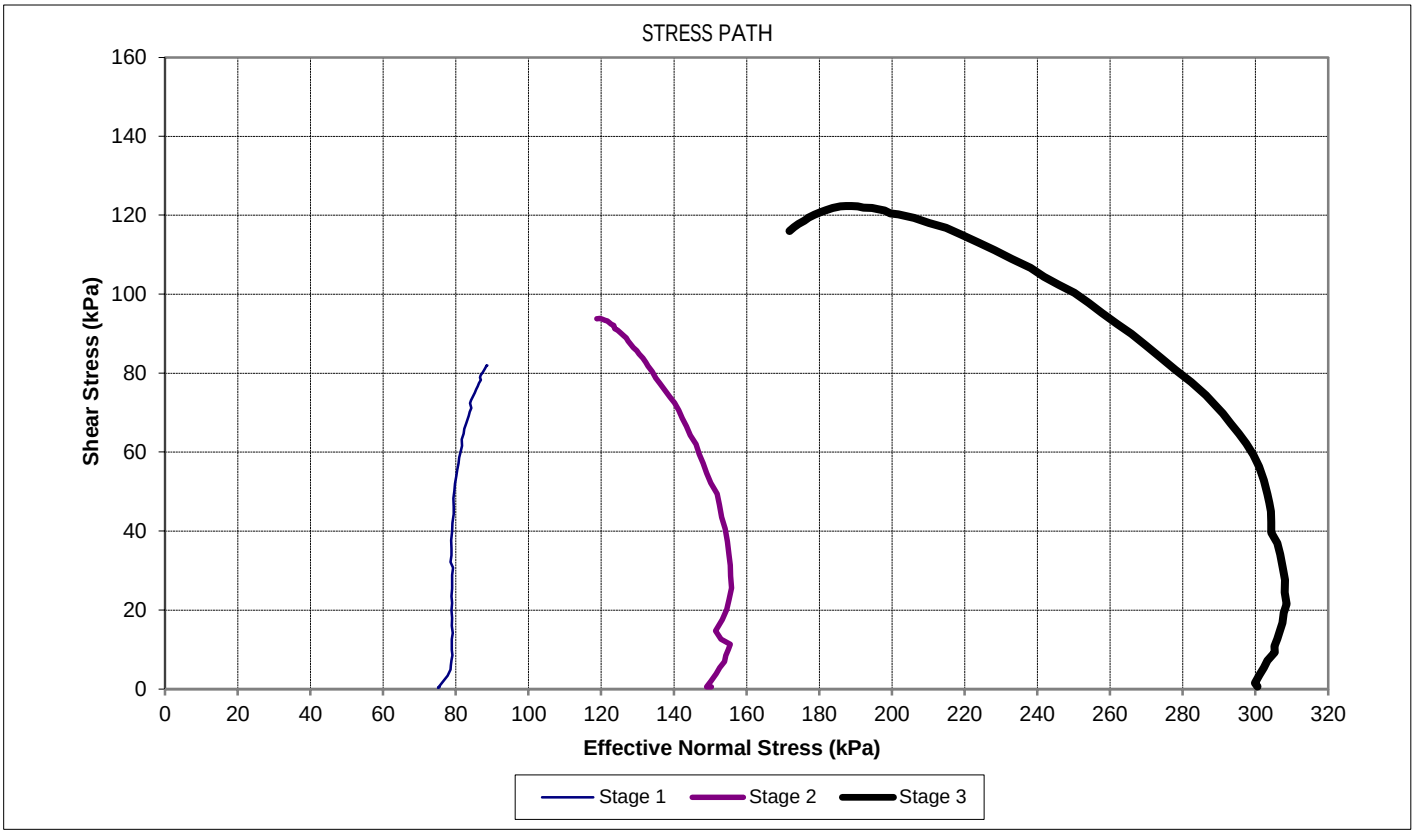
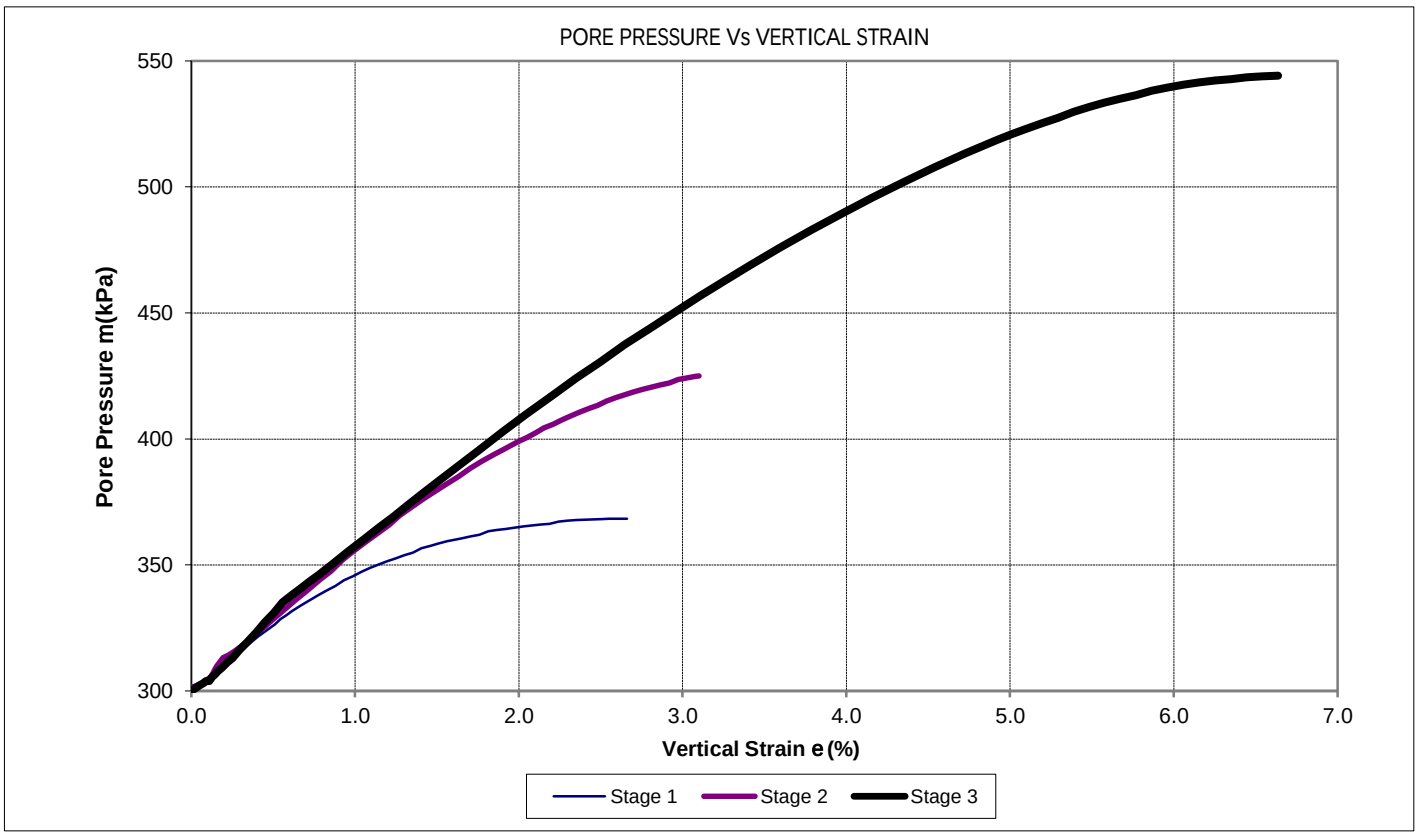
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





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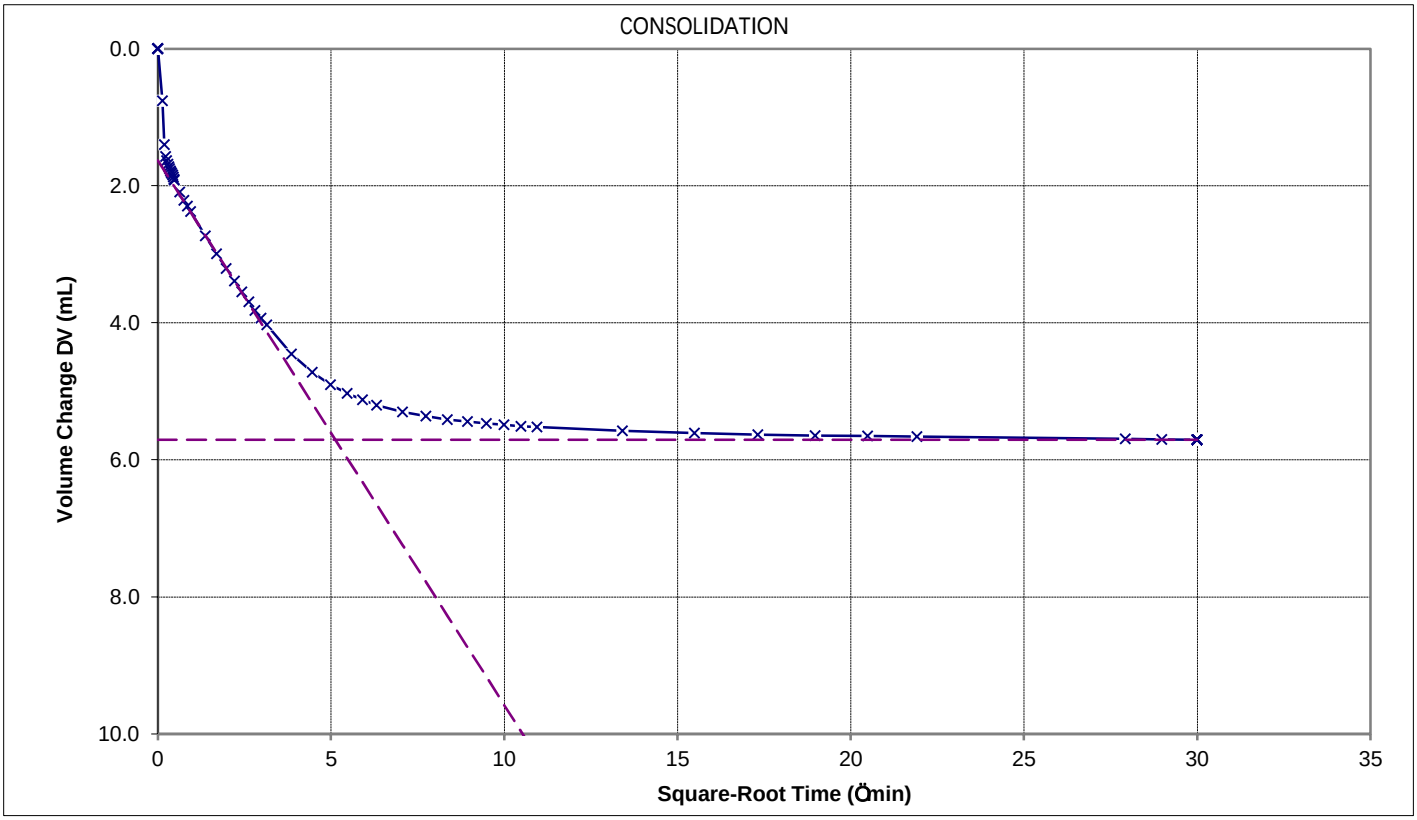
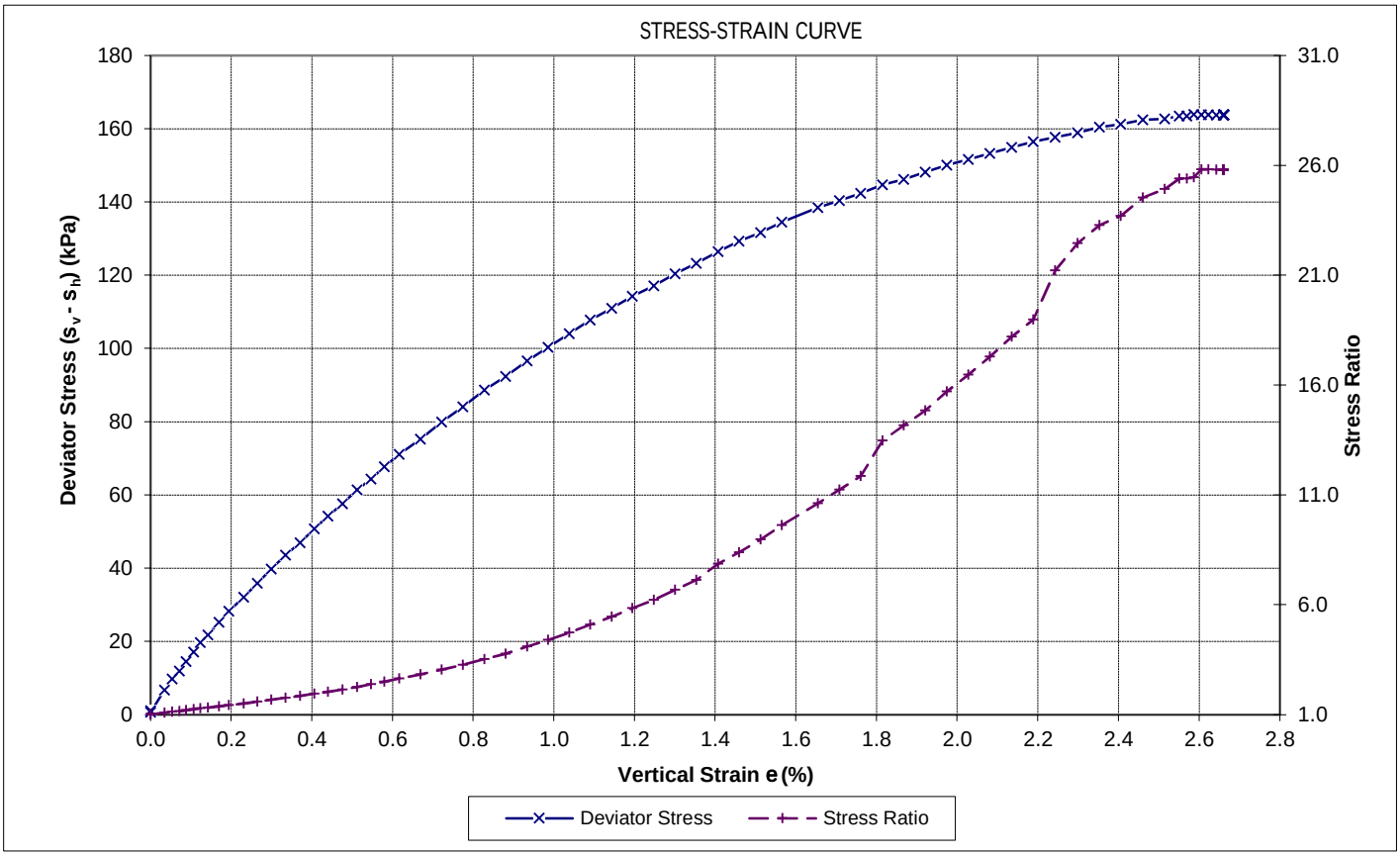
STAGE 1 GRAPHS





Approved Signatory: Date: 1/07/2022

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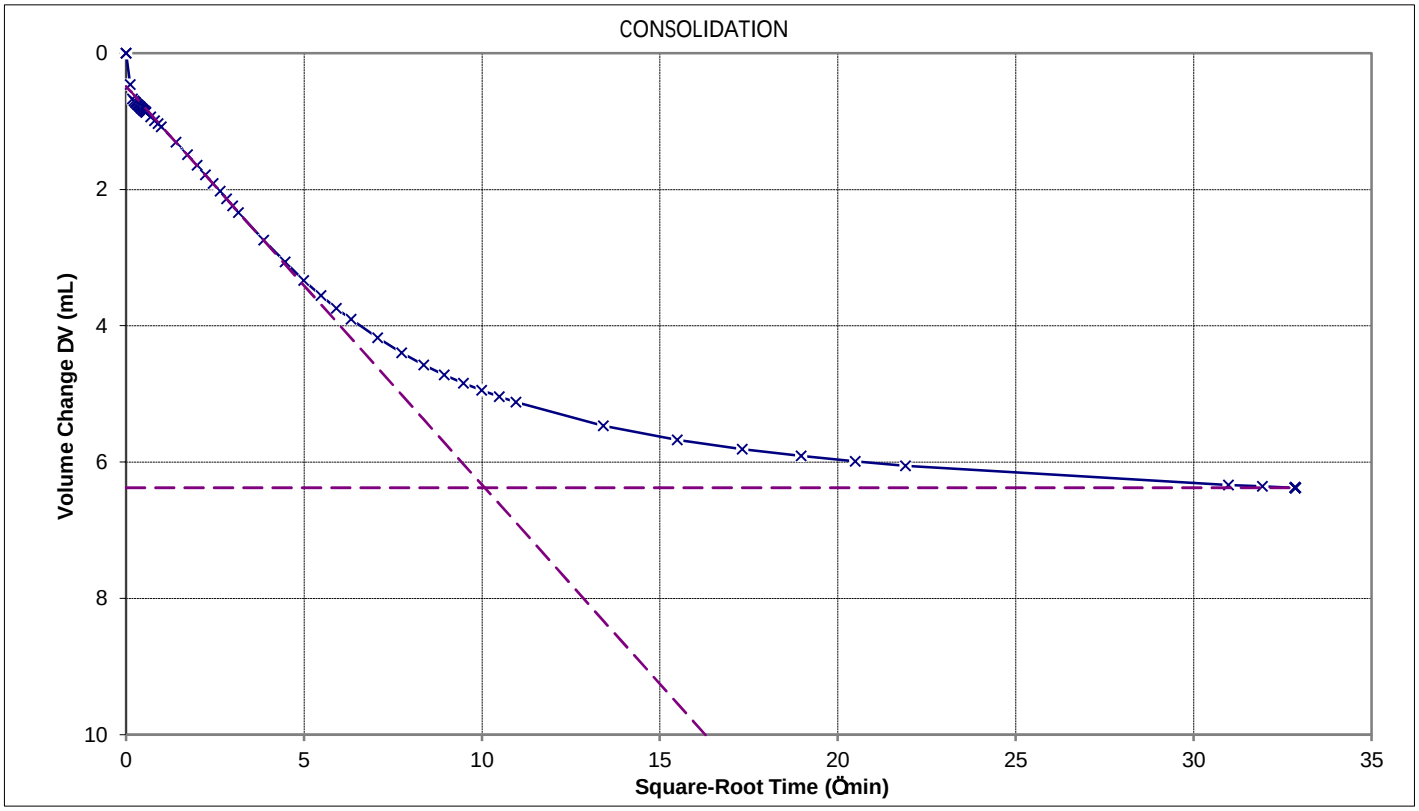
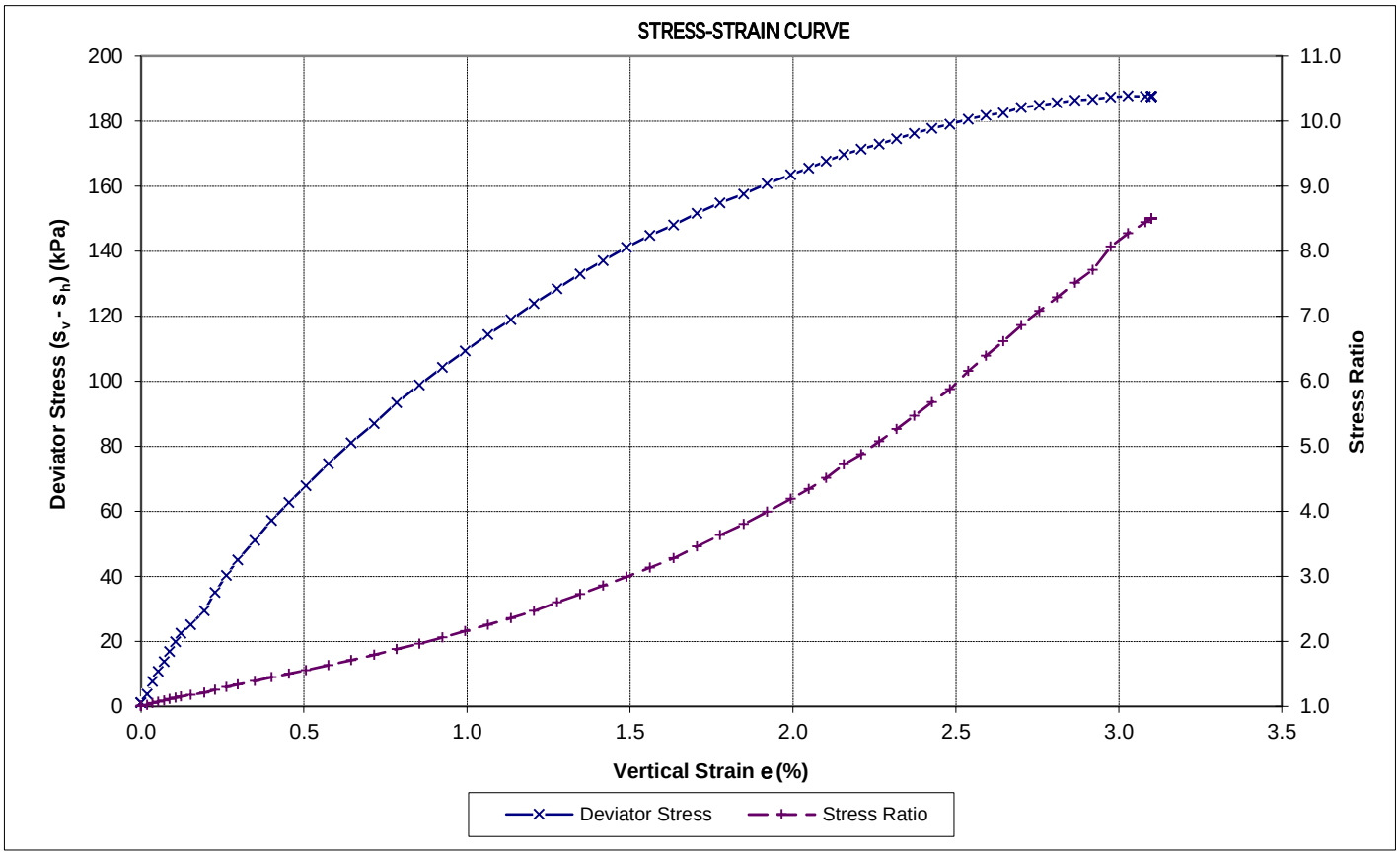
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 12.18 - 12.30 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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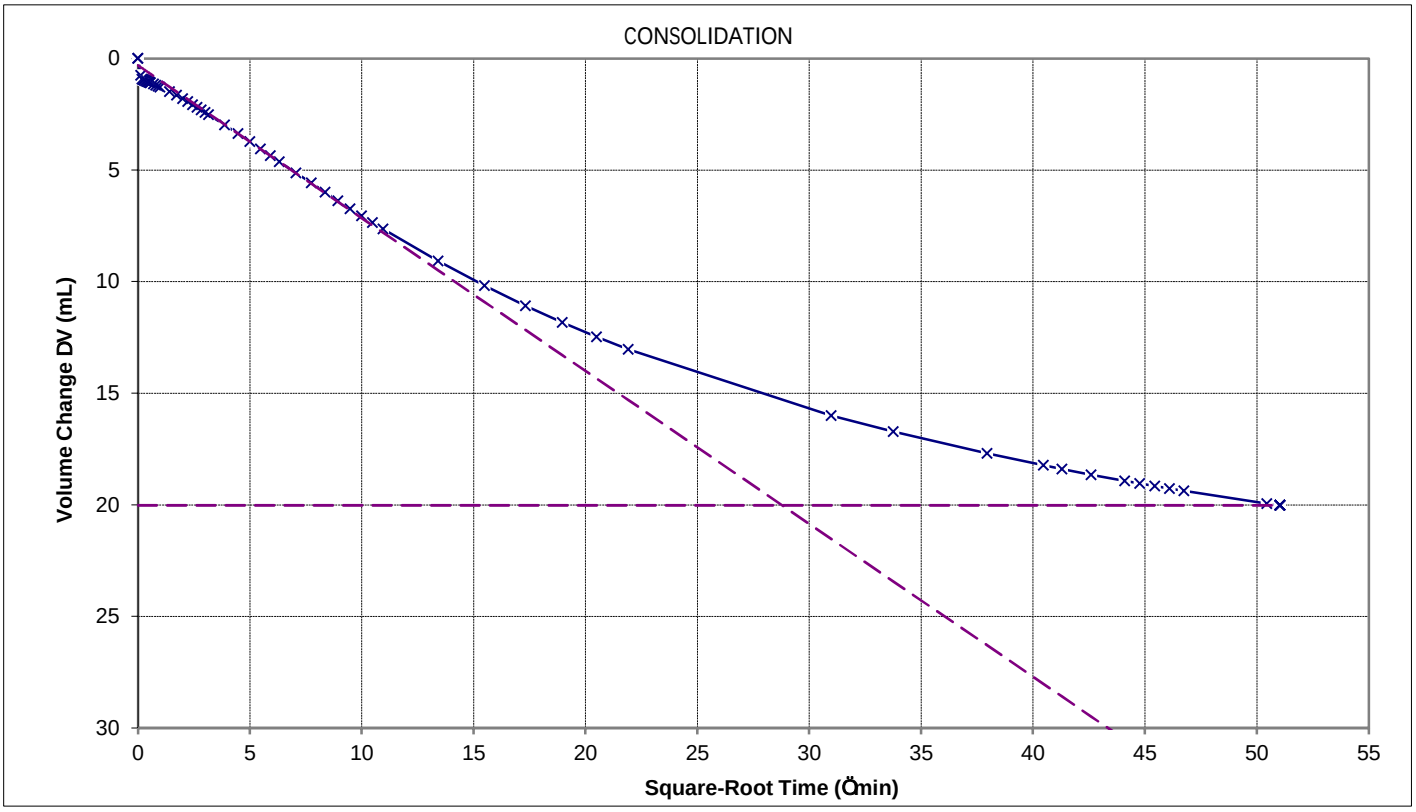
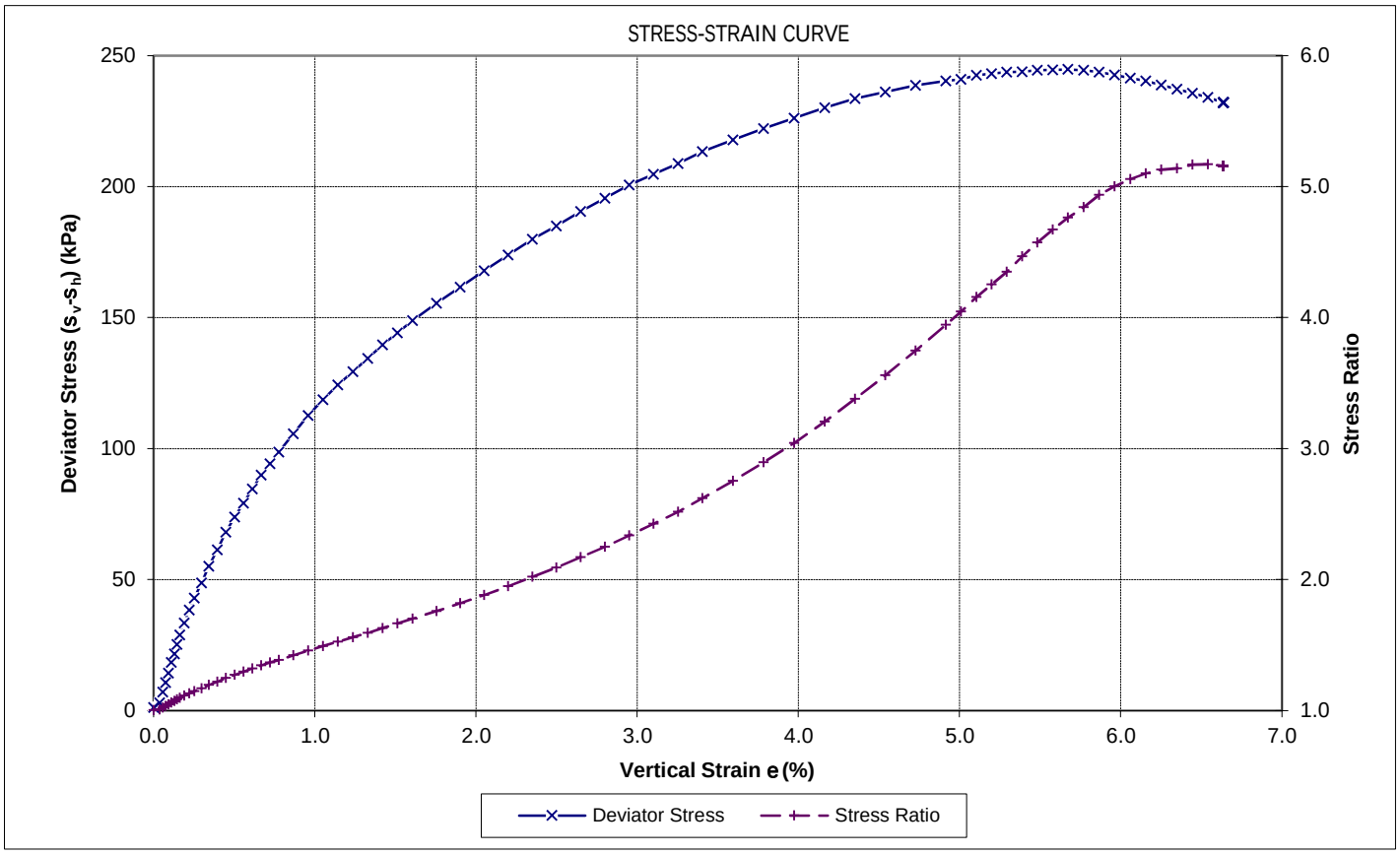
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 12.18 - 12.30 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





Approved Signatory: Date: 1/07/2022

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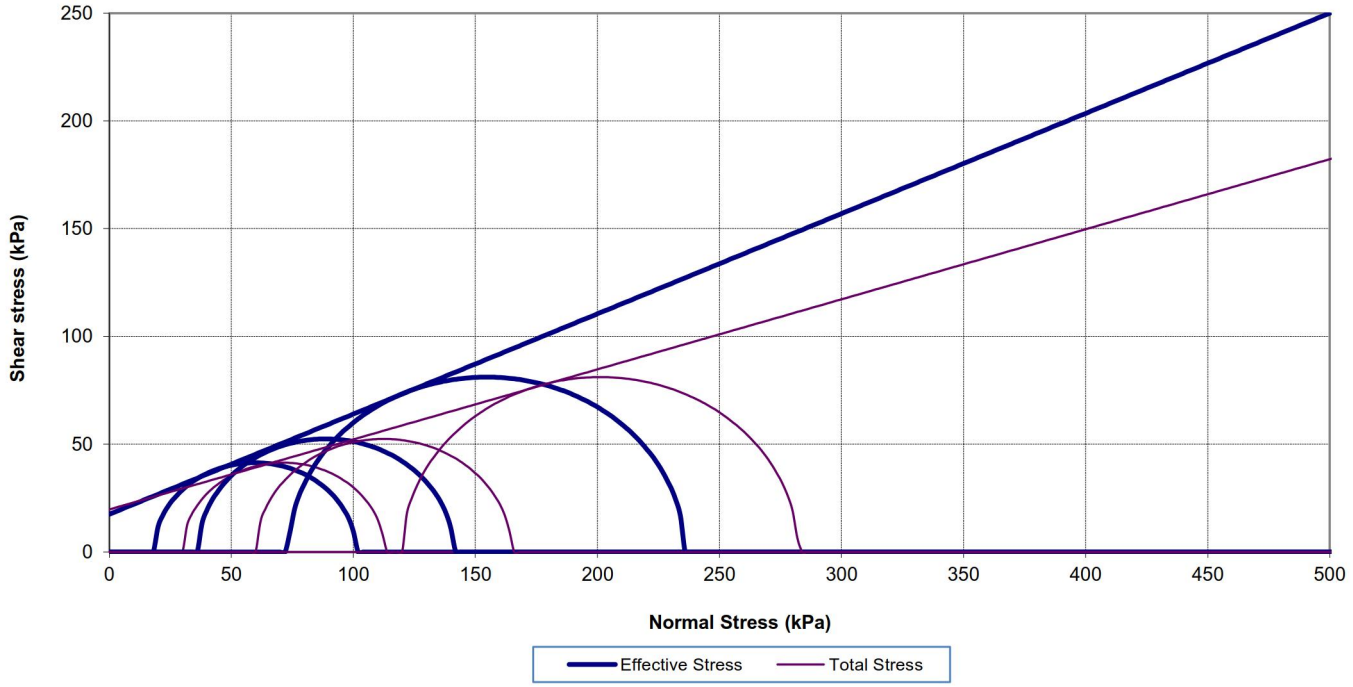
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330
Sample Ref.: -- Depth: 3.19 - 3.31 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	111.74	mm	Initial Water Content:	38.9	%
Initial Sample Diameter:	54.28	mm	Initial Bulk Density:	1.83	t/m³
Initial B Value:	--	%	Initial Dry Density:	1.32	t/m³
B Value before Consolidation:	96	%	Final Water Content:	40.0	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	Planar / Plastic
Stage 1	30	31	400	0.91	0.01	82.81	1.07	101.11	18.30	0.42	2.48	
Stage 2	60	61	400	0.49	0.00	104.87	0.84	141.17	36.30	0.33	1.94	
Stage 3	120	121	400	0.88	0.00	162.24	1.30	235.74	73.50	0.50	3.01	

	Total			Effective		
Angle of Frictional Resistance:	ϕ =	18	°	ϕ' =	25	°
Cohesion:	c =	20	kPa	c' =	17	kPa
Linear Regression Coefficient:	r =	0.998		r =	0.999	

Sample History: Undisturbed core trimmed at natural water content.

Soil description: SILT, clayey, firm to stiff, greenish/bluish grey with light grey.

Test Speed: 0.012 - 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength parameters have been derived by using a linear regression fitting method.

Approved Signatory: Date: 3/05/2022

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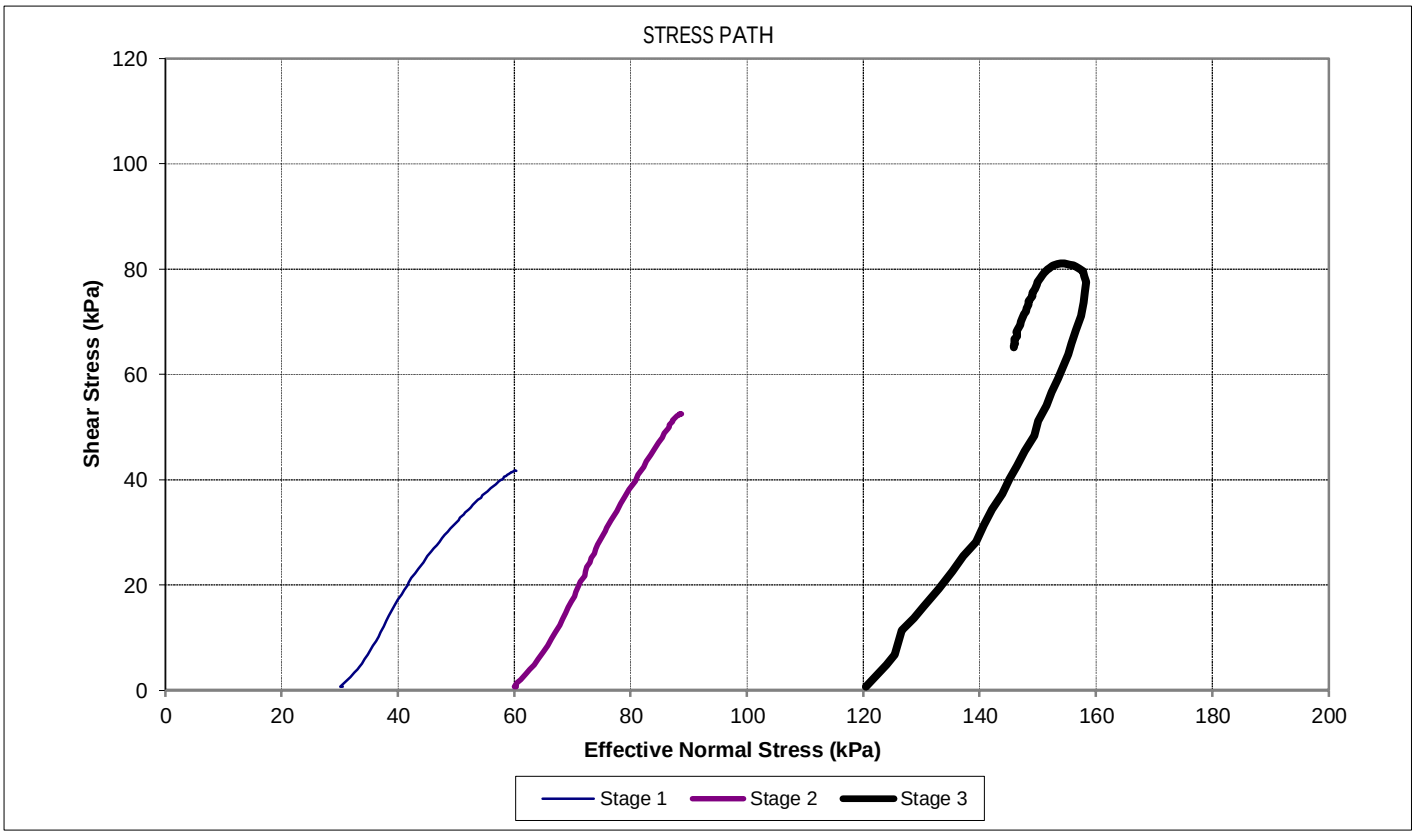
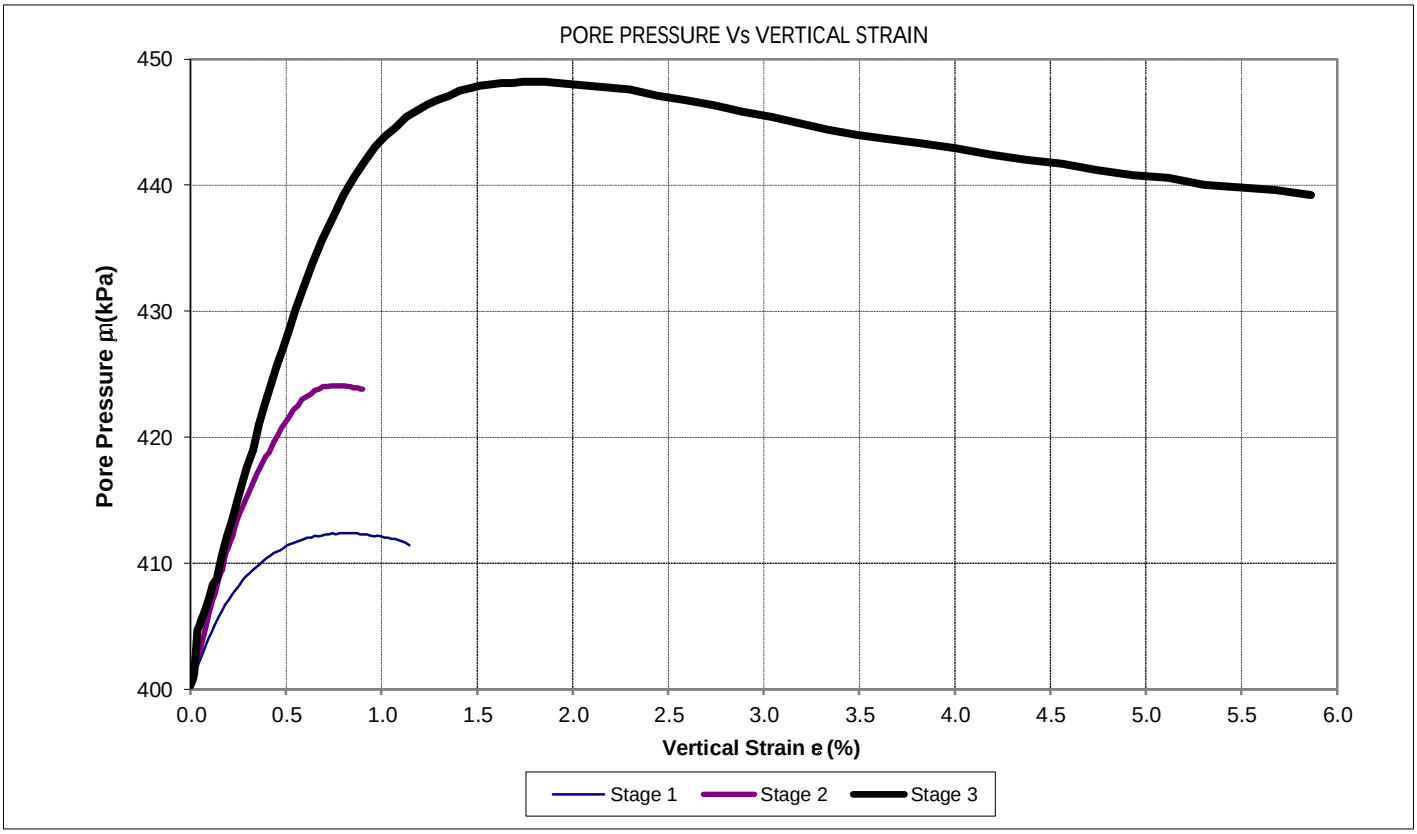
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2
Location ID: DH330
Sample Ref.: --
Depth: 3.19 - 3.31 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Approved Signatory: Date: 3/05/2022

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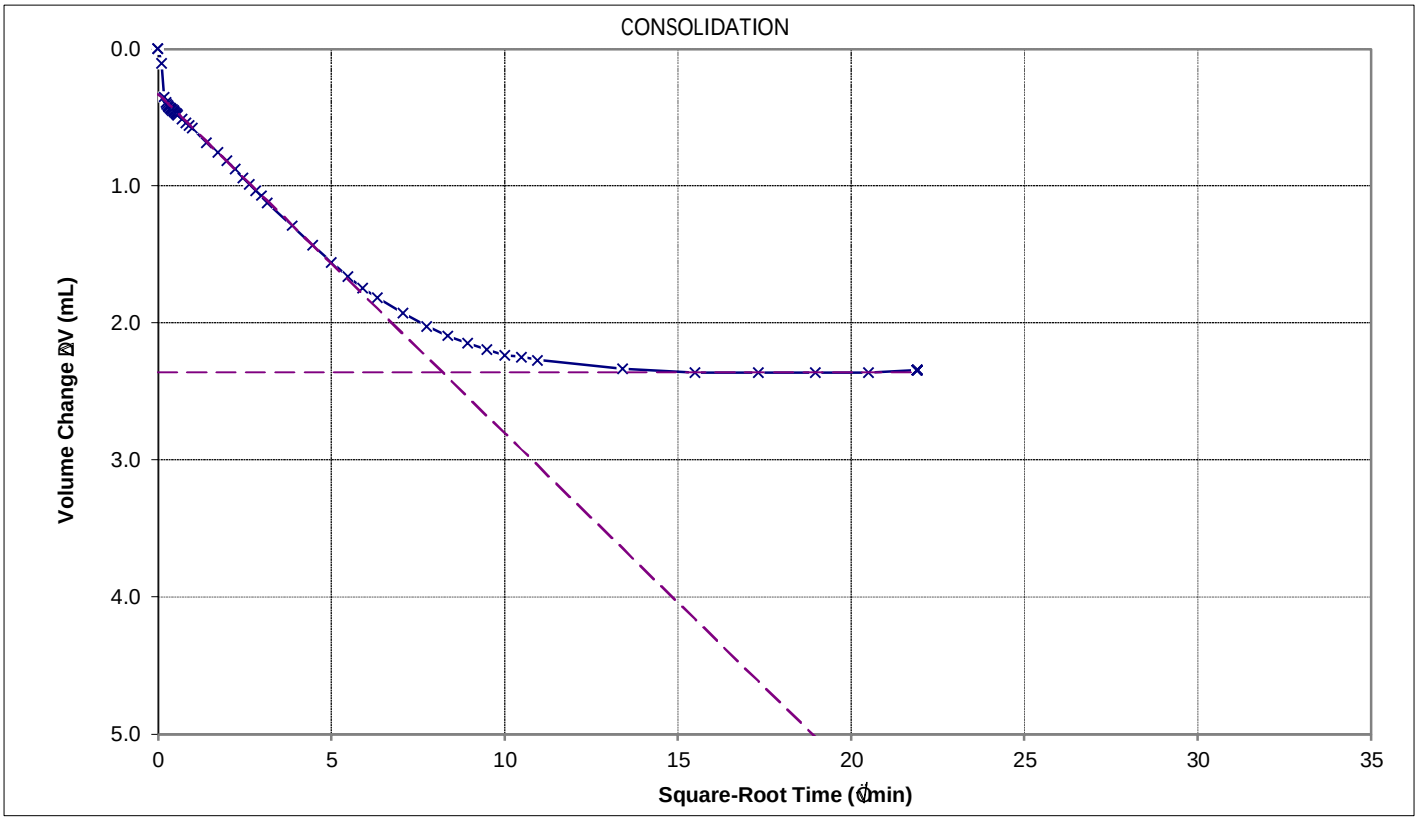
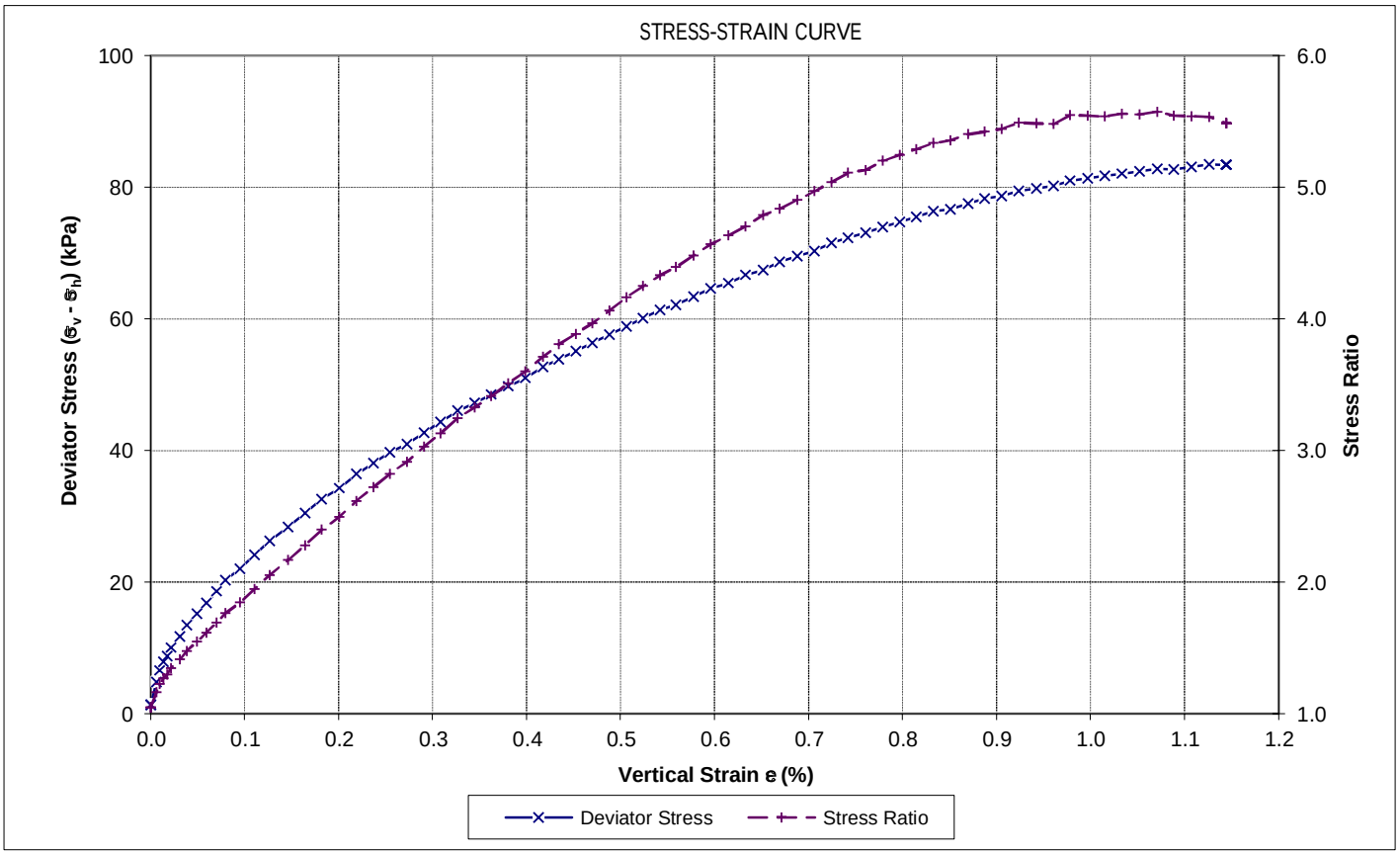
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330
Sample Ref.: -- Depth: 3.19 - 3.31 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS





Approved Signatory: Date: 3/05/2022

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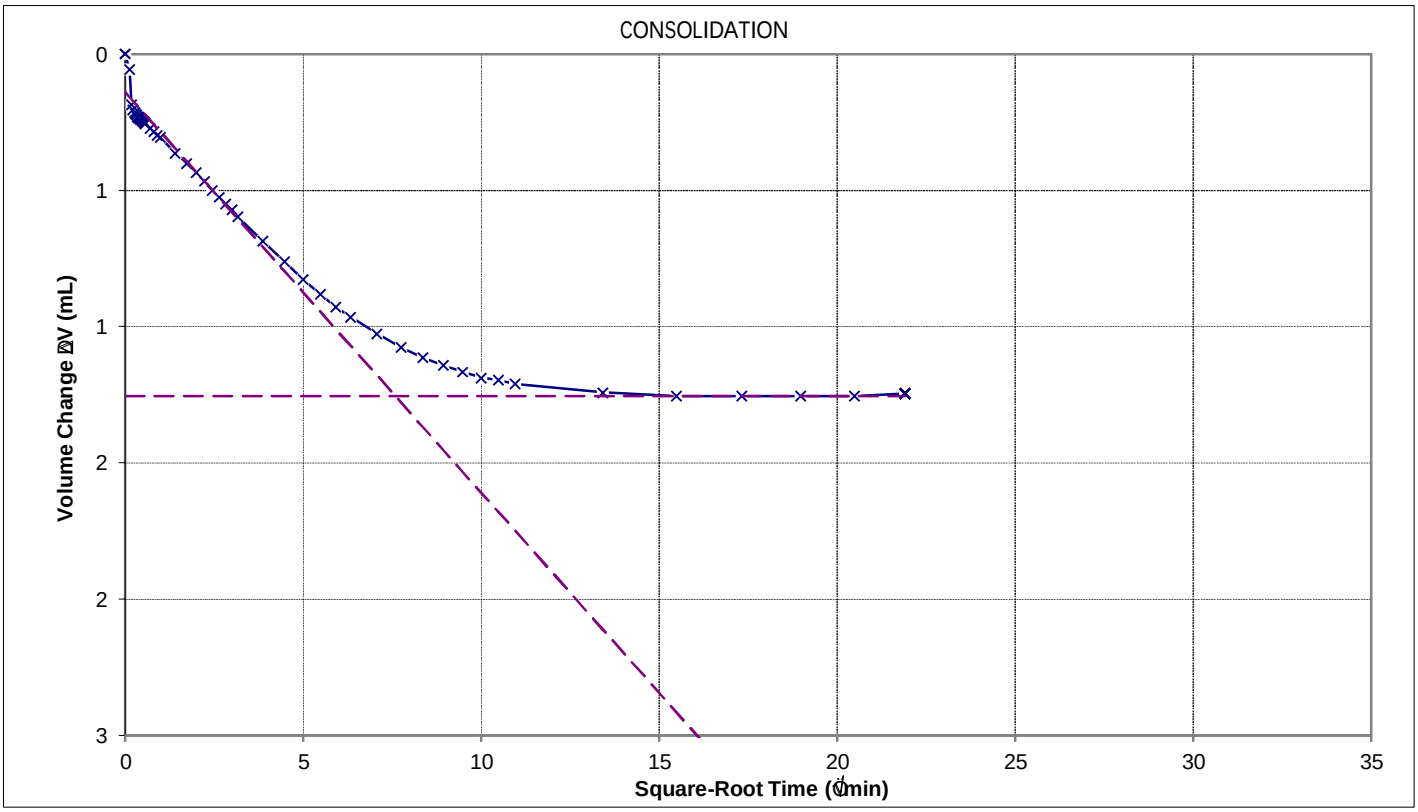
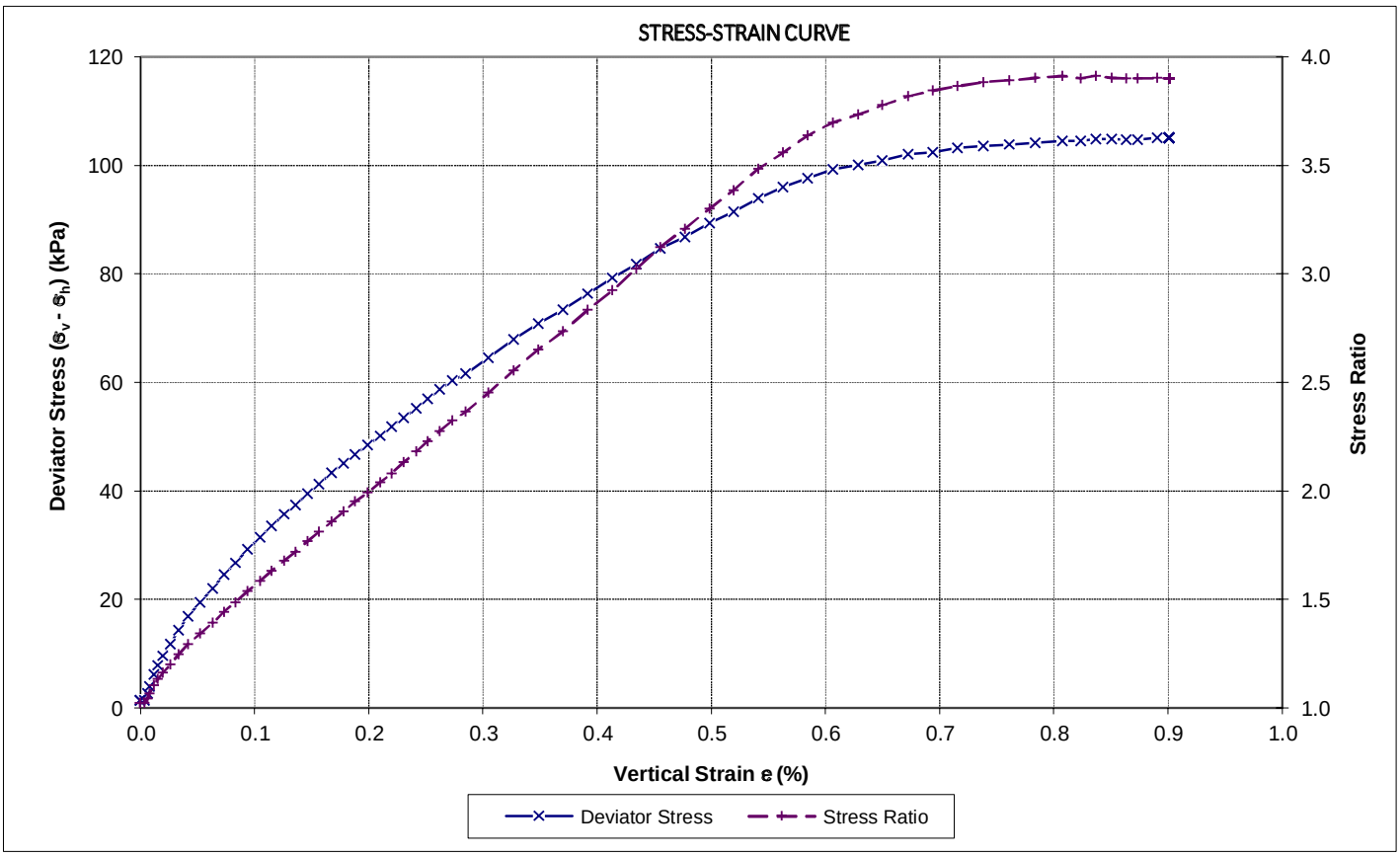
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330
Sample Ref.: -- Depth: 3.19 - 3.31 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





Approved Signatory: Date: 3/05/2022

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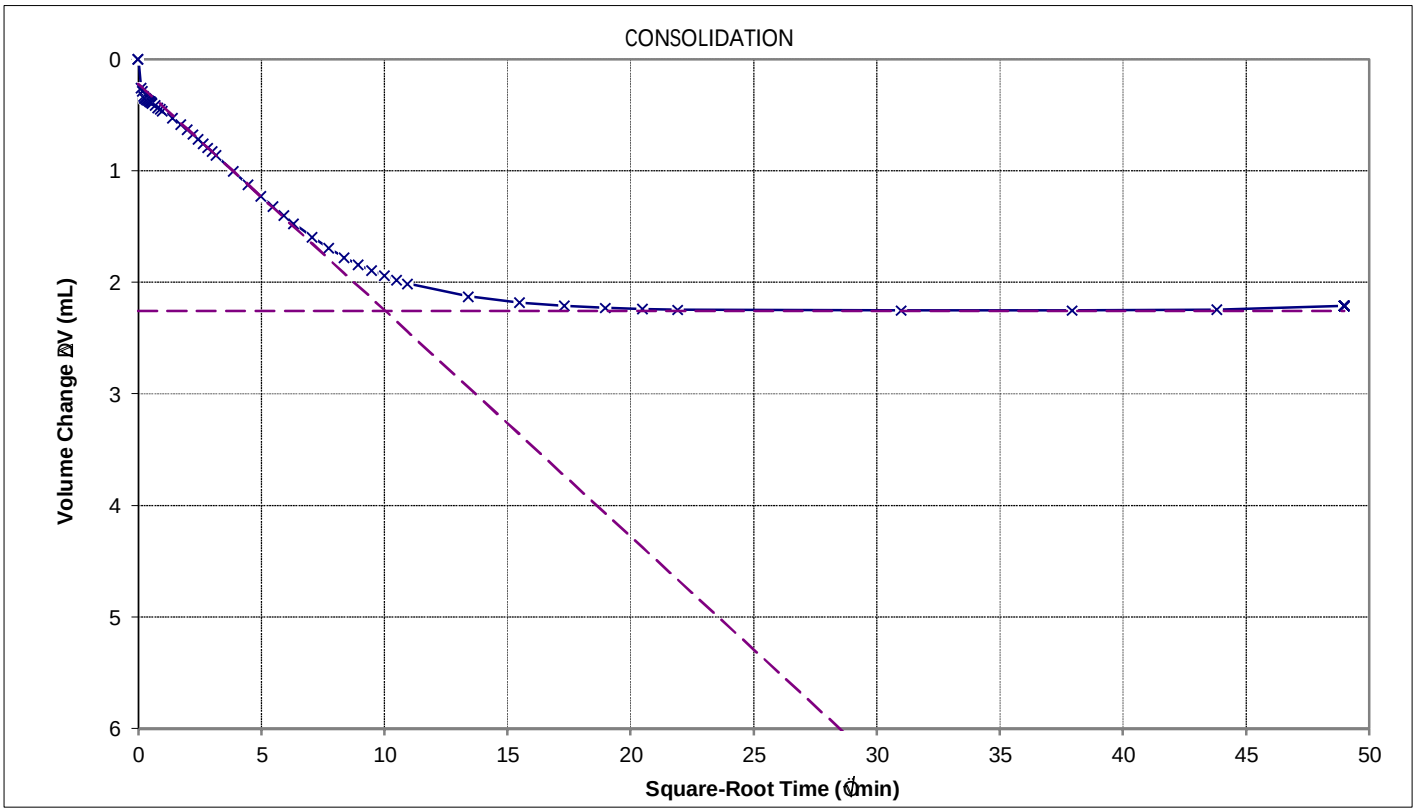
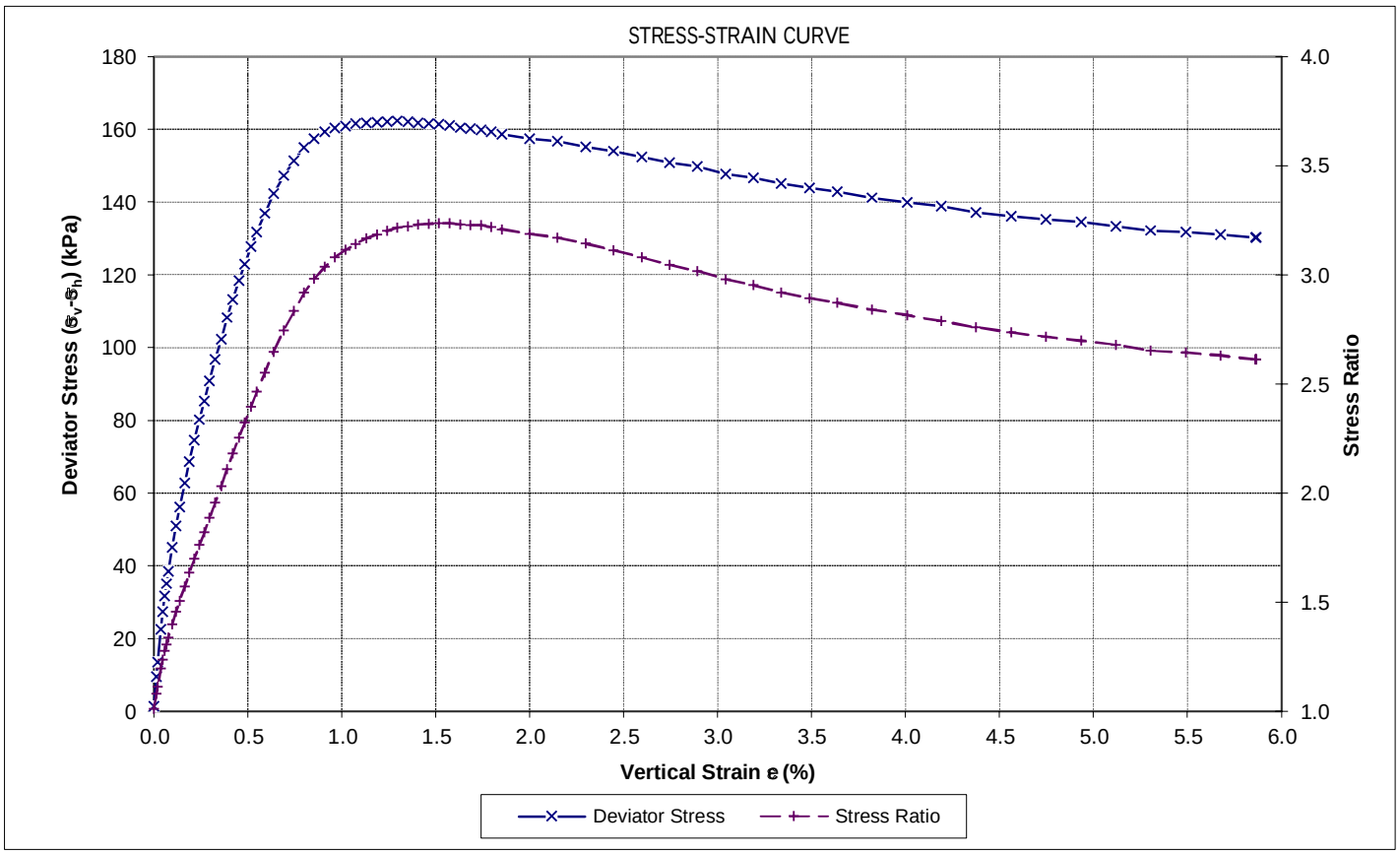
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330
Sample Ref.: -- Depth: 3.19 - 3.31 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





Approved Signatory: Date: 3/05/2022

Eastern Busway

Unconsolidated-Undrained Compression Test

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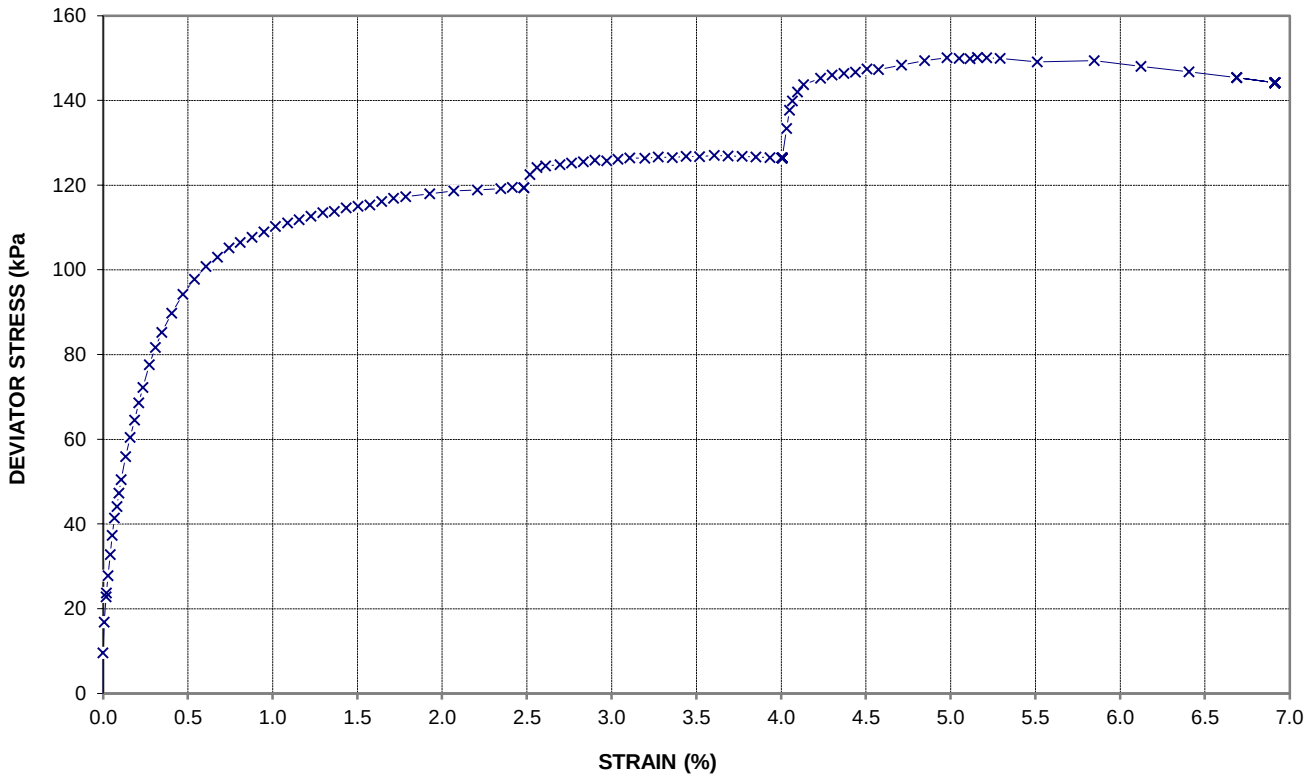
Geotechnics Project ID: 1017784.0000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH301
Sample No.: -- Depth: 4.51-4.62 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.12	mm	Bulk Density:	1.70	t/m³
Sample Diameter:	52.87	mm	Dry Density:	1.09	t/m³
Height / Diameter:	2.08		Water Content:	55.2	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	2.41	0.54	119.47	60	0.26
Stage 2	100	3.61	0.77	127.00	63	
Stage 3	200	5.16	1.04	150.15	75	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, orange brown with blueish grey; firm, moist, high plasticity.

Test Remarks: --

Tested by: CHLU Date: 11/04/2023 Approved by KTP: Date: 12/05/2023

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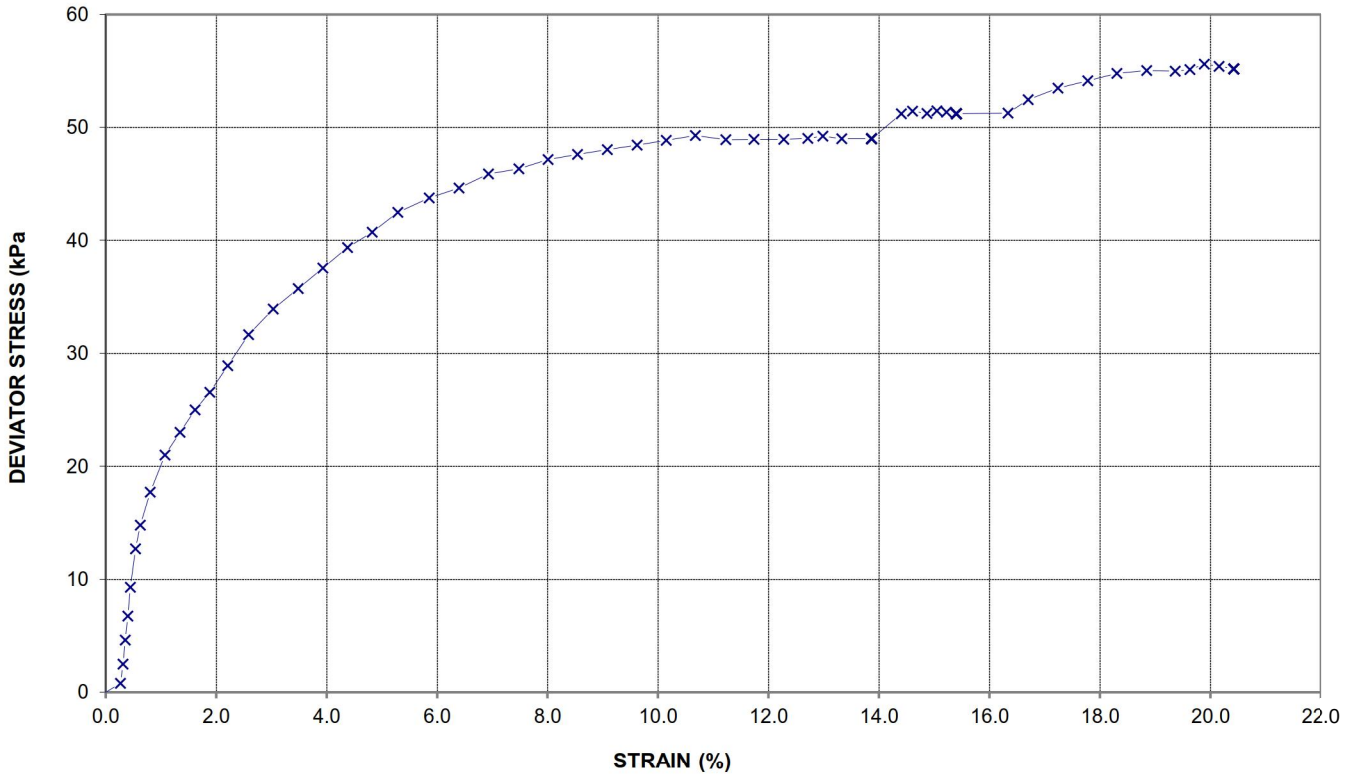
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site/Location: Eastern Busway 2 Location ID: DH302
Sample No.: -- Depth: 6.80 - 6.91 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	111.67	mm	Bulk Density:	1.79	t/m³
Sample Diameter:	54.46	mm	Dry Density:	1.29	t/m³
Height / Diameter:	2.05		Water Content:	38.8	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	10.68	1.73	49.26	25	0.30
Stage 2	100	15.05	2.14	51.46	26	
Stage 3	200	19.89	2.52	55.59	28	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILT, with some clay and sand, firm, grey.

Test Remarks: --

Approved Signature: Date: 3/05/2022

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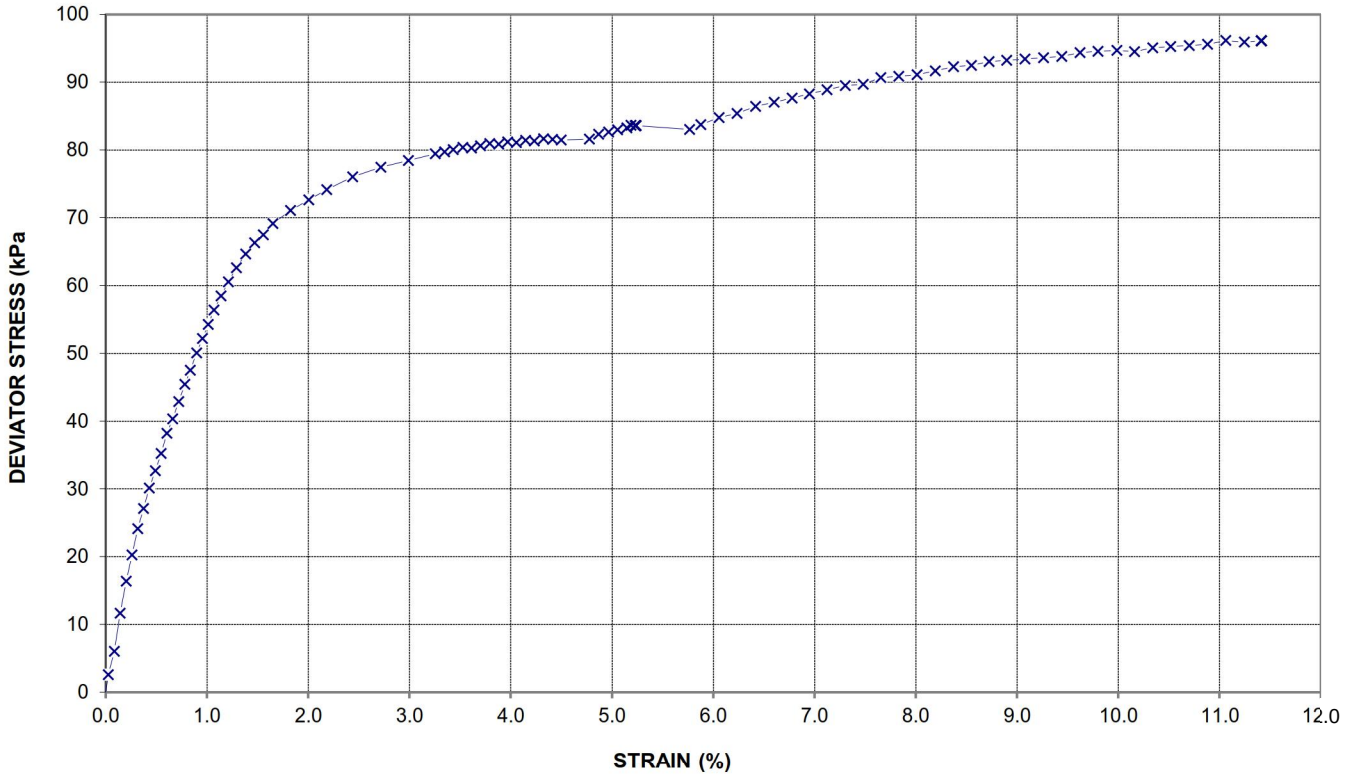
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site/Location: Eastern Busway 2 Location ID: DH302
Sample No.: -- Depth: 9.35 - 9.48 m (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.02	mm	Bulk Density:	1.29	t/m³
Sample Diameter:	54.20	mm	Dry Density:	0.57	t/m³
Height / Diameter:	2.09		Water Content:	124.8	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	100	4.32	0.87	81.64	41	0.57
Stage 2	200	5.19	1.02	83.63	42	
Stage 3	400	11.06	1.78	96.12	48	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, firm.

Test Remarks: --

Approved Signature: Date: 3/05/2022

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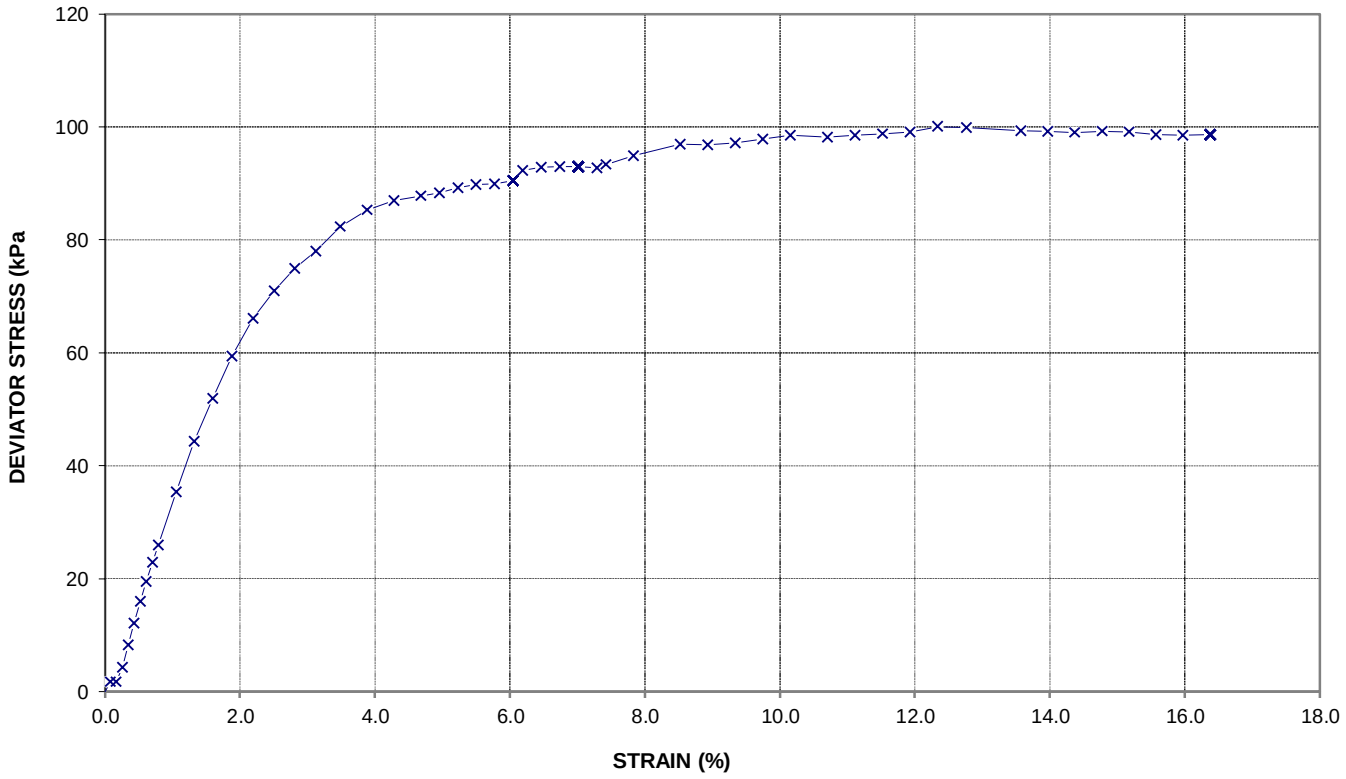
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site/Location: Eastern Busway 2 Location ID: DH304
Sample No.: -- Depth: 5.70 - 5.86 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	111.72	mm	Bulk Density:	1.83	t/m³
Sample Diameter:	53.86	mm	Dry Density:	1.32	t/m³
Height / Diameter:	2.07		Water Content:	38.9	%

Failure Value:

	Cell Pressure σ_3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress $\sigma_1 - \sigma_3$ (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	6.05	1.16	90.40	45	0.70
Stage 2	100	7.01	1.30	93.00	46	
Stage 3	200	12.34	1.92	100.06	50	

Mode of Failure: Planar / Plastic
Photo at Failure: NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILT, with some clay and minor sand, firm to stiff, brown with orangey brown and dark grey. A trace of organic matter was present.

Test Remarks: --

Approved Signature: Date: 3/05/2022

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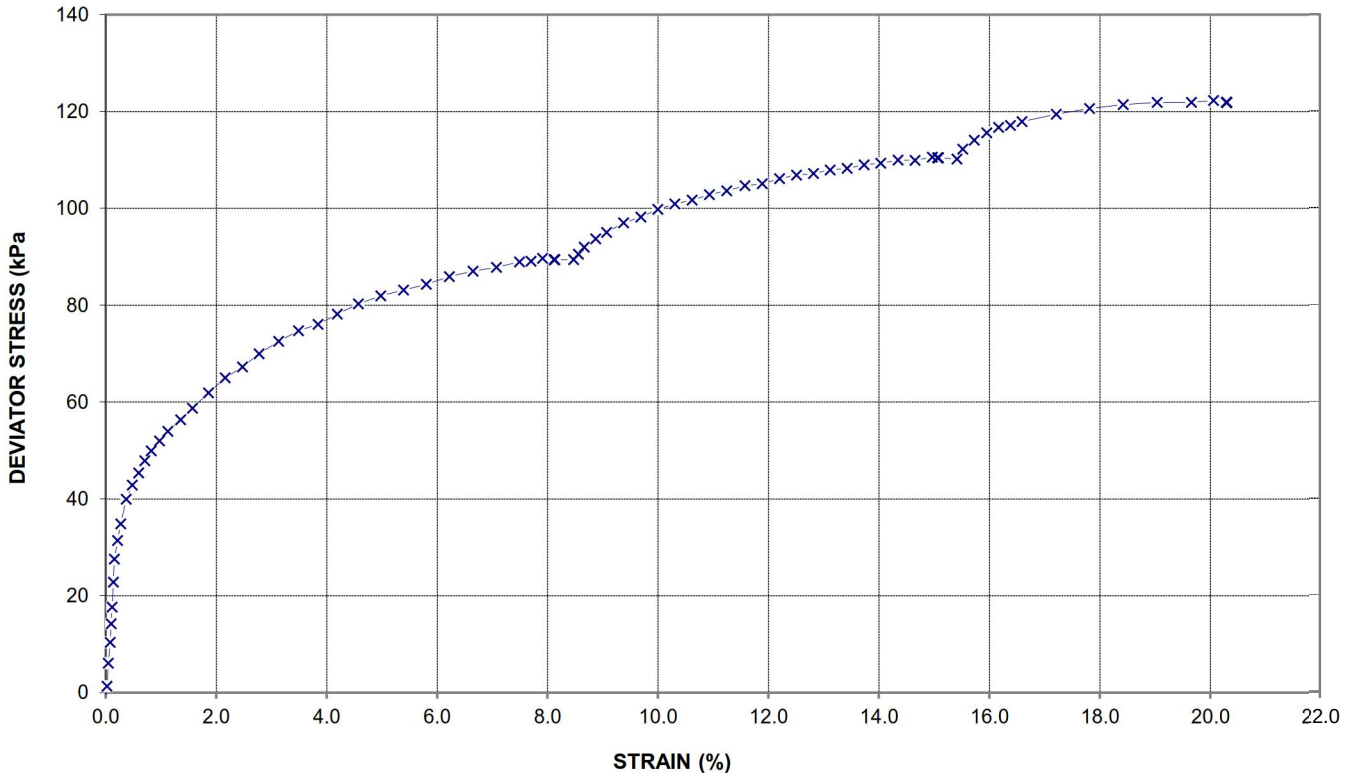
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site/Location: Eastern Busway 2 Location ID: DH304
Sample No.: -- Depth: 9.52 - 9.65 m (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	112.96	mm	Bulk Density:	1.39	t/m³
Sample Diameter:	54.31	mm	Dry Density:	0.73	t/m³
Height / Diameter:	2.08		Water Content:	91.2	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	100	7.91	1.41	89.62	45	0.64
Stage 2	200	14.97	2.14	110.55	55	
Stage 3	400	20.06	2.54	122.24	61	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, firm, black / dark brown.

Test Remarks: --

Approved Signature: Date: 2/05/2022

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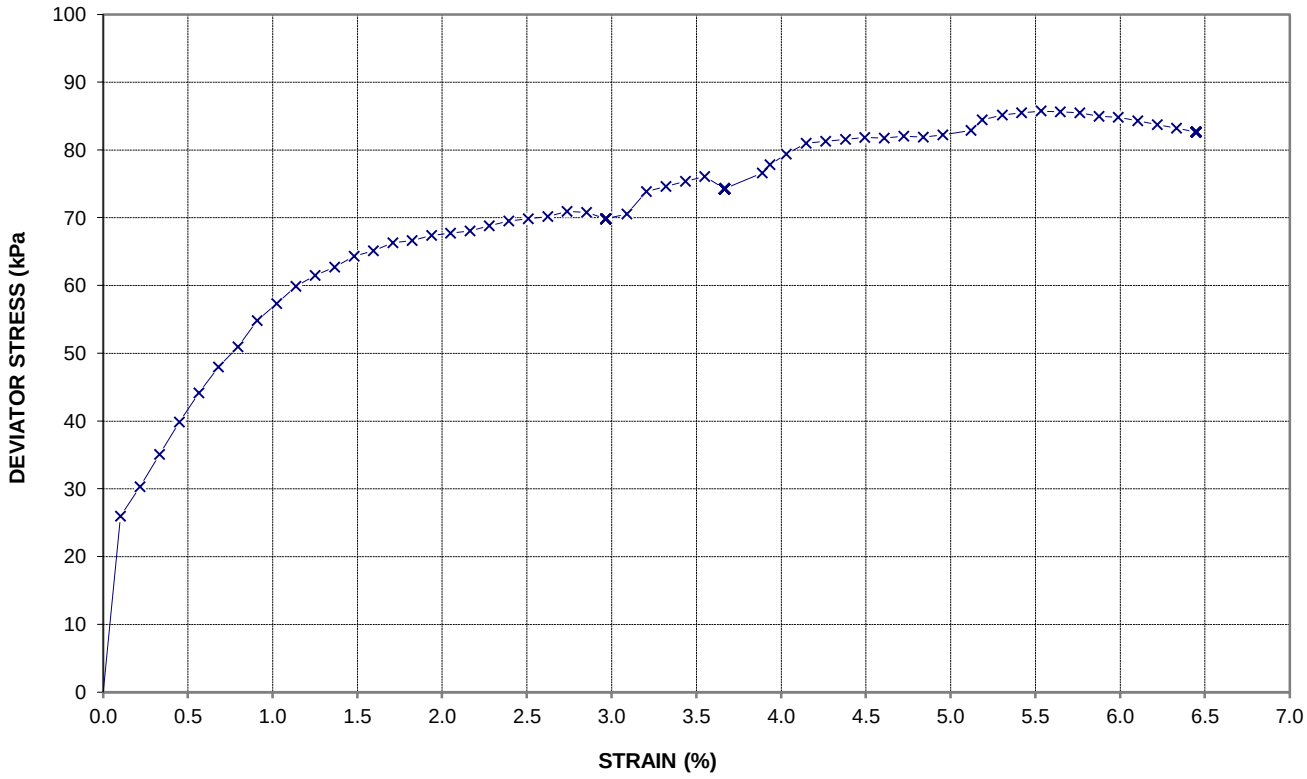
Geotechnics Project ID: 1017784.0000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_18

Site/Location: Eastern Busway Location ID: DH306
Sample No.: -- Depth: 7.75-7.86 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	109.82	mm	Bulk Density:	1.53	t/m³
Sample Diameter:	53.73	mm	Dry Density:	0.84	t/m³
Height / Diameter:	2.04		Water Content:	81.9	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	2.74	0.74	70.91	35	0.50
Stage 2	100	3.55	0.93	76.07	38	
Stage 3	200	5.53	1.35	85.73	43	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY with a trace of organics, soft, dark grey; moist, high plasticity

Test Remarks: --

Tested by: CHLU Date: 19/04/2023 Approved by KTP: Date: 11/05/2023

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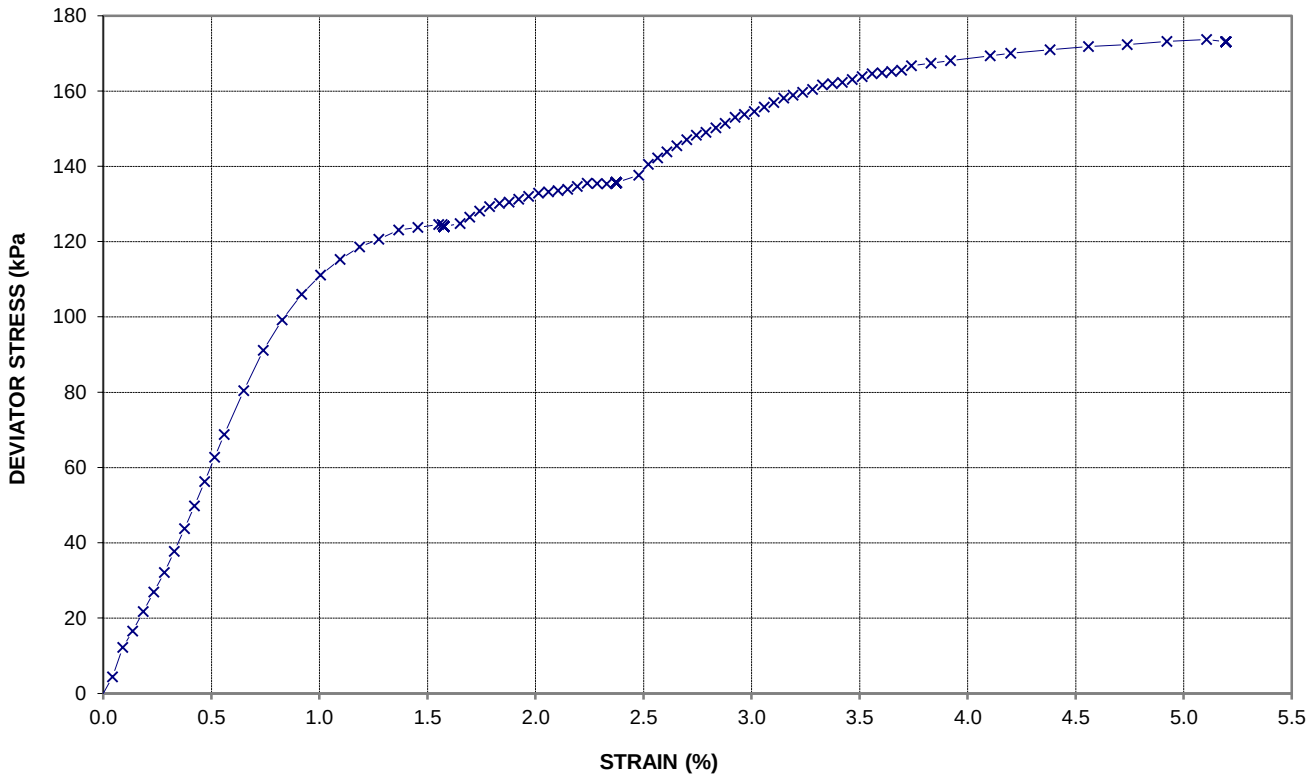
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway Location ID: DH309
Sample No.: -- Depth: 9.25-9.36 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.05	mm	Bulk Density:	1.94	t/m³
Sample Diameter:	54.07	mm	Dry Density:	1.46	t/m³
Height / Diameter:	2.04		Water Content:	32.7	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	1.55	0.26	124.51	62	0.20
Stage 2	100	2.37	0.39	135.67	68	
Stage 3	200	5.11	0.75	173.65	87	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILT with minor clay and sand (fine), soft, blueish grey; moist, high plasticity.

Test Remarks: --

Tested by: CHLU Date: 11/01/2023 Approved by KTP: Date: 16/03/2023

GEOTECHNICS
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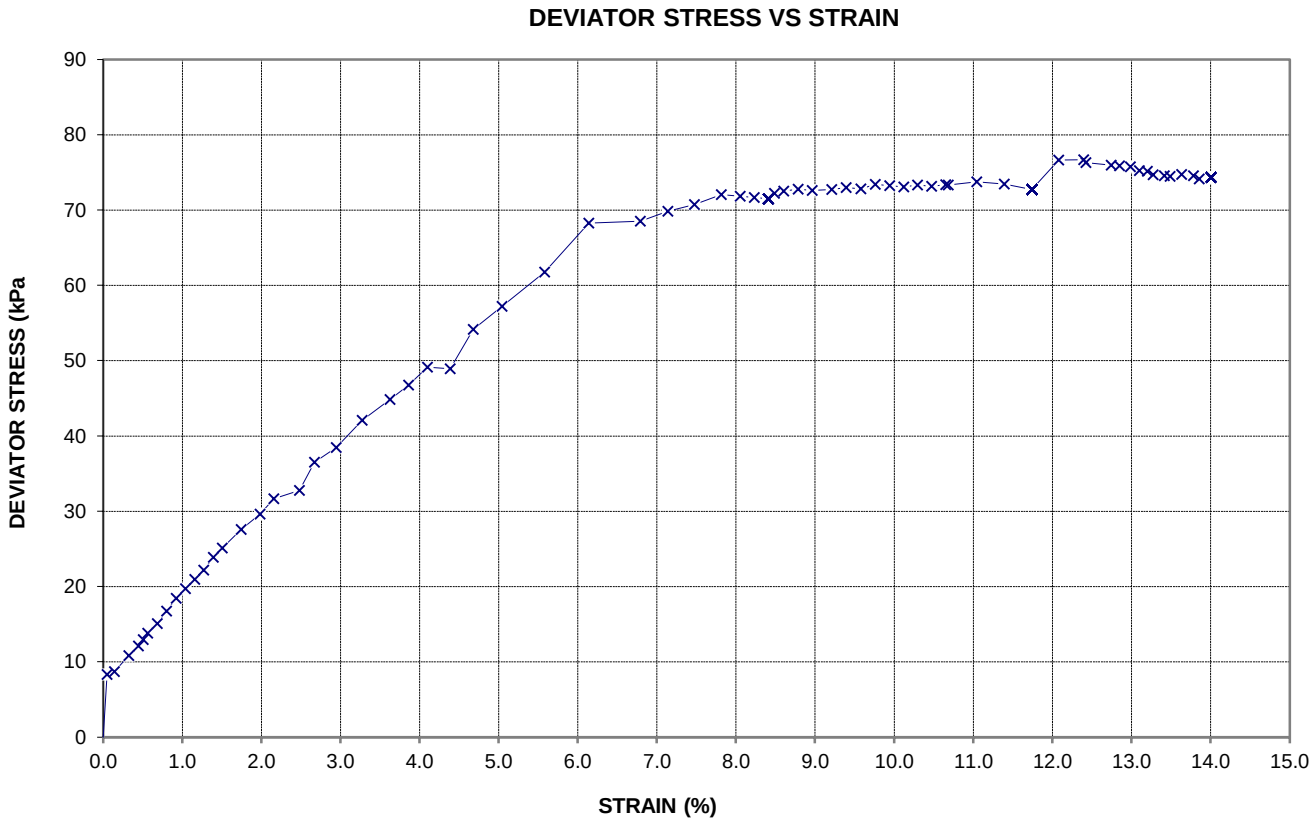
Geotechnics Project ID: 1017784.0000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH315
Sample No.: Depth: 1.80-1.91 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST



Initial Sample Parameters:

Sample Height:	110.44	mm	Bulk Density:	1.72	t/m³
Sample Diameter:	53.93	mm	Dry Density:	1.22	t/m³
Height / Diameter:	2.05		Water Content:	41.2	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	15	7.82	1.41	72.03	36	0.39
Stage 2	30	11.04	1.79	73.75	37	
Stage 3	60	12.40	1.93	76.69	38	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT , with minor sand and a trace of gravel, firm, mottled brown, orange and grey; moist, high plasticity

Test Remarks: --

Tested by: CHLU Date: 11/04/2023 Approved by KTP: Date: 28/04/2023

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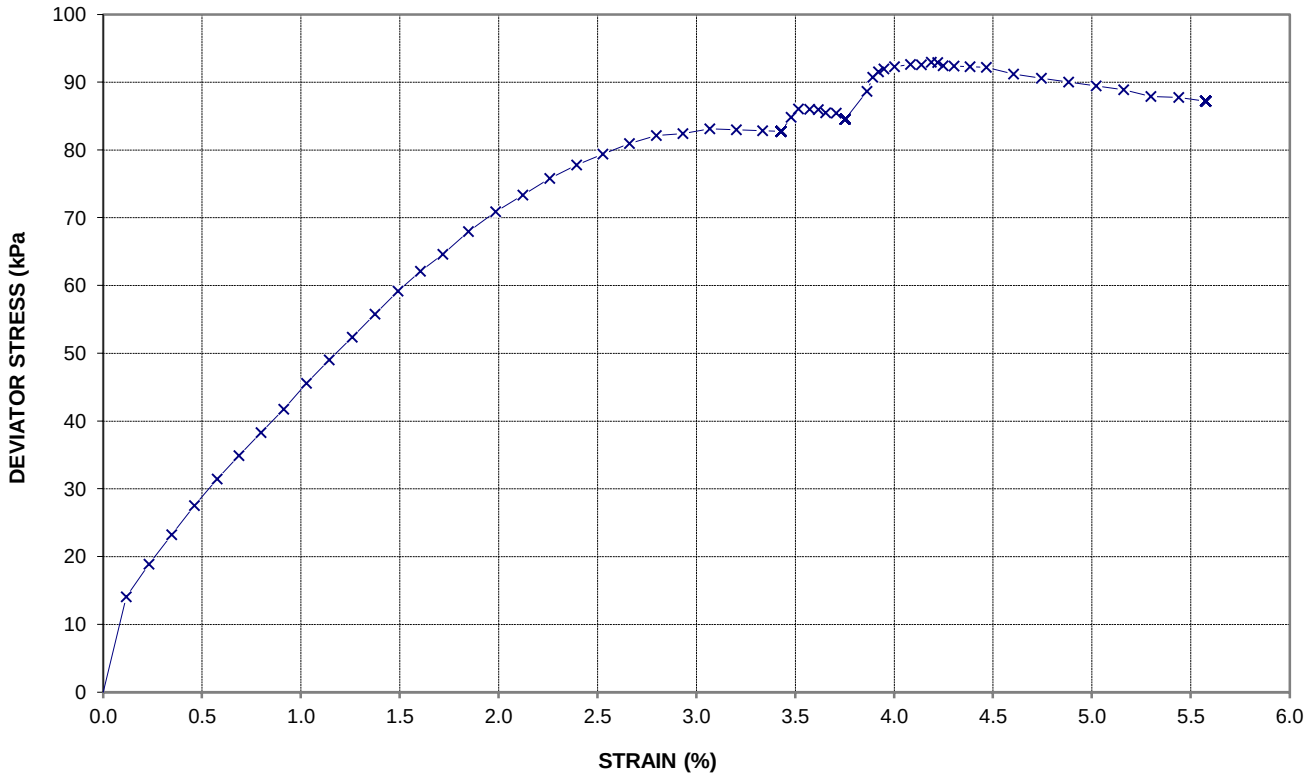
Geotechnics Project ID: 1017784.0000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH316
Sample No.: Depth: 9.38-9.49 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.16	mm	Bulk Density:	1.12	t/m³
Sample Diameter:	53.74	mm	Dry Density:	0.28	t/m³
Height / Diameter:	2.05		Water Content:	304.6	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	3.07	0.65	83.10	42	0.57
Stage 2	100	3.52	0.74	86.03	43	
Stage 3	200	4.19	0.86	92.91	46	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Organic clayey SILT, soft, black; moist, high plasticity, layer of plant fibers

Test Remarks: --

Tested by: CHLU Date: 18/04/2023 Approved by KTP: Date: 28/04/2023

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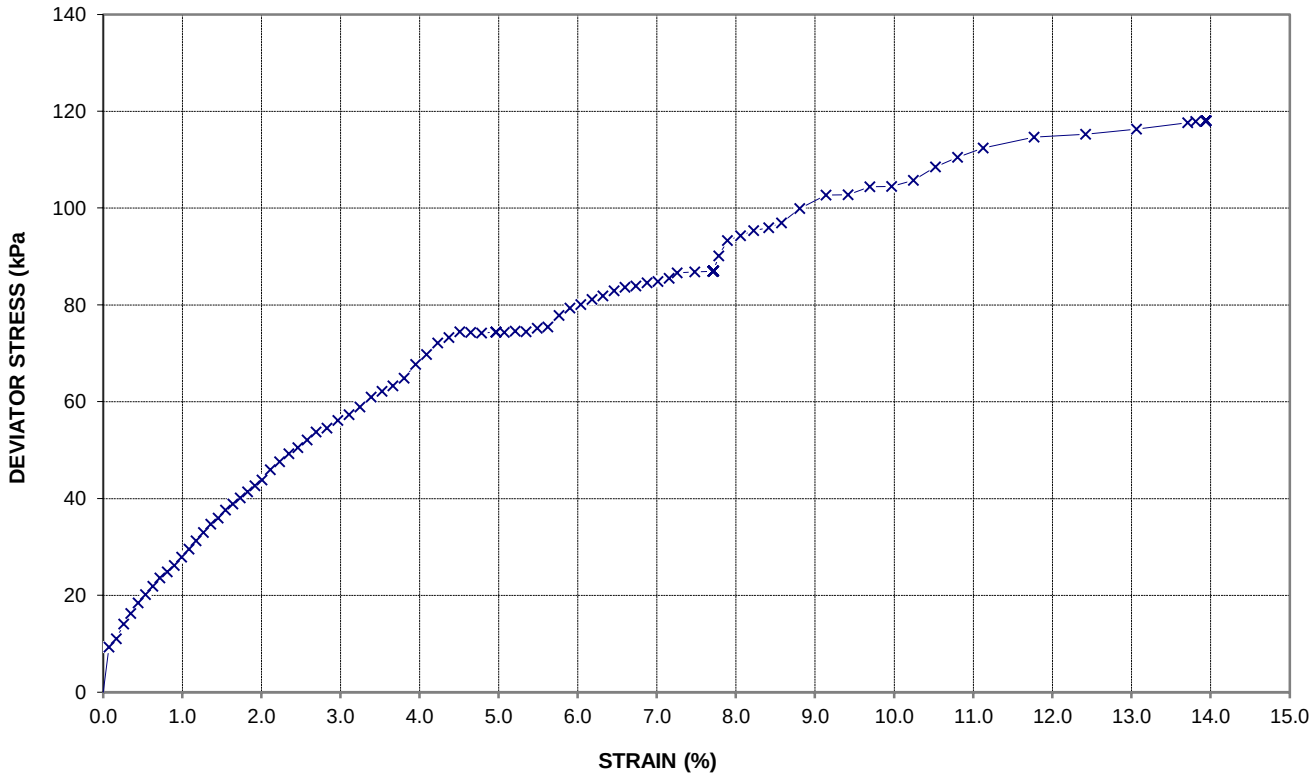
Geotechnics Project ID: 1017784.1000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_17

Site/Location: Eastern Busway Location ID: DH316
Sample No.: -- Depth: 6.32-6.43 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	108.62	mm	Bulk Density:	1.76	t/m³
Sample Diameter:	53.61	mm	Dry Density:	1.18	t/m³
Height / Diameter:	2.03		Water Content:	49.5	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	4.51	0.91	74.40	37	0.57
Stage 2	100	7.72	1.40	86.92	43	
Stage 3	200	13.94	2.08	118.03	59	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with minor sand, firm to soft, blueish grey; moist, low plasticity

Test Remarks: Test failed but deviator stress kept on increasing.

Tested by: CHLU Date: 19/04/2023 Approved by KTP: Date: 11/05/2023

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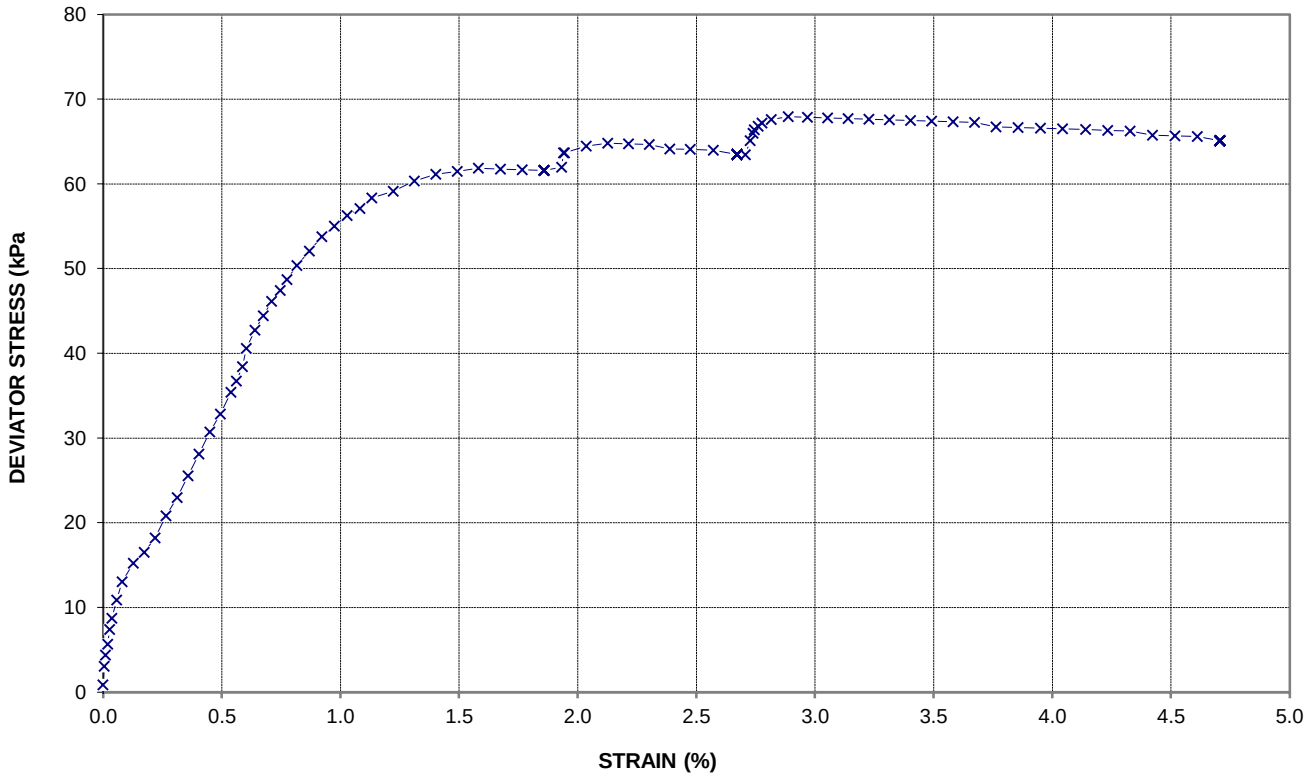
Geotechnics Project ID: 1017784.0000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH318_P
Sample No.: Depth: 3.19-3.30 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.01	mm	Bulk Density:	1.54	t/m³
Sample Diameter:	54.06	mm	Dry Density:	0.85	t/m³
Height / Diameter:	2.04		Water Content:	80.1	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	25	1.58	0.35	61.82	31	0.28
Stage 2	50	2.13	0.47	64.77	32	
Stage 3	100	2.89	0.61	67.93	34	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY with a trace of sand, soft, light grey; very high plasticity, moist

Test Remarks: --

Tested by: CHLU Date: 11/04/2023 Approved by KTP: Date: 28/04/2023

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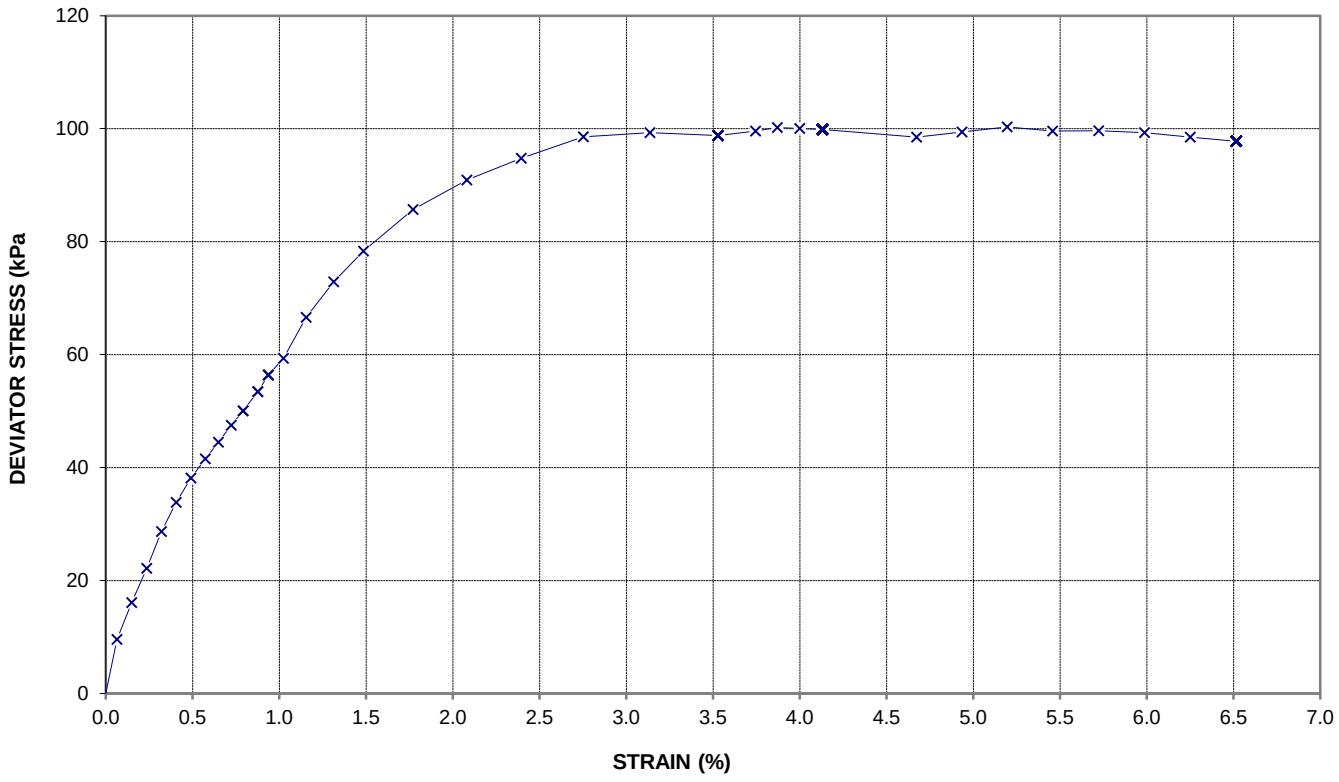
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH323
Sample No.: Depth: 5.73 - 5.88 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.23	mm	Bulk Density:	1.48	t/m³
Sample Diameter:	53.97	mm	Dry Density:	0.86	t/m³
Height / Diameter:	2.10		Water Content:	72.7	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	3.14	1.08	99.29	50	0.66
Stage 2	100	3.87	1.30	100.20	50	
Stage 3	200	5.20	1.66	100.30	50	

Mode of Failure: Planar

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: peaty CLAY black; soft, wet, high plasticity

Test Remarks: --

Approved Signature: Date: 4/07/2022

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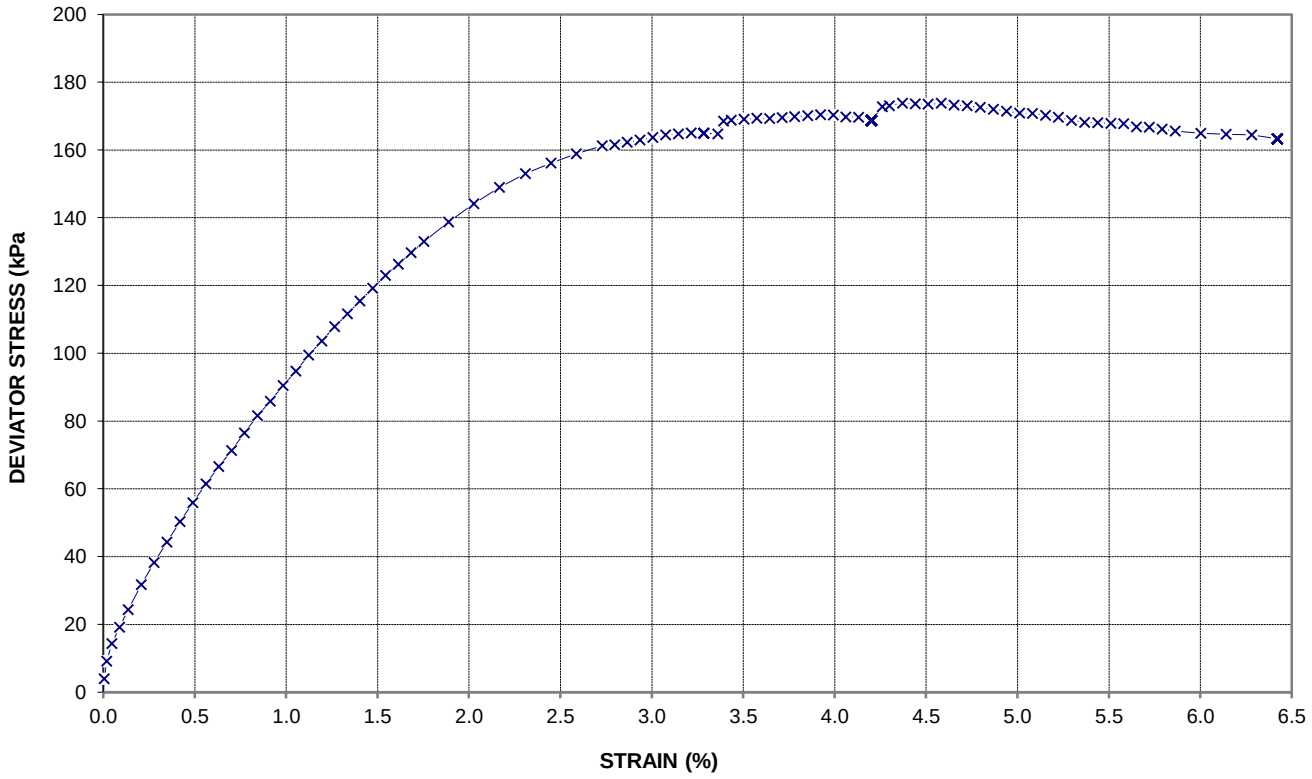
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway Location ID: DH324
Sample No.: Depth: 4.51-4.64 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	107.20	mm	Bulk Density:	1.28	t/m³
Sample Diameter:	54.06	mm	Dry Density:	0.51	t/m³
Height / Diameter:	1.98		Water Content:	149.4	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	3.22	0.34	164.97	82	0.30
Stage 2	100	3.92	0.40	170.39	85	
Stage 3	200	4.58	0.46	173.73	87	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: ORGANIC SOIL with minor clay, soft to firm, black with dark brown;moist, low plasicity

Test Remarks: --

Tested by: chlu Date: 27/02/2023 Approved by KTP: Date: 27/03/2023

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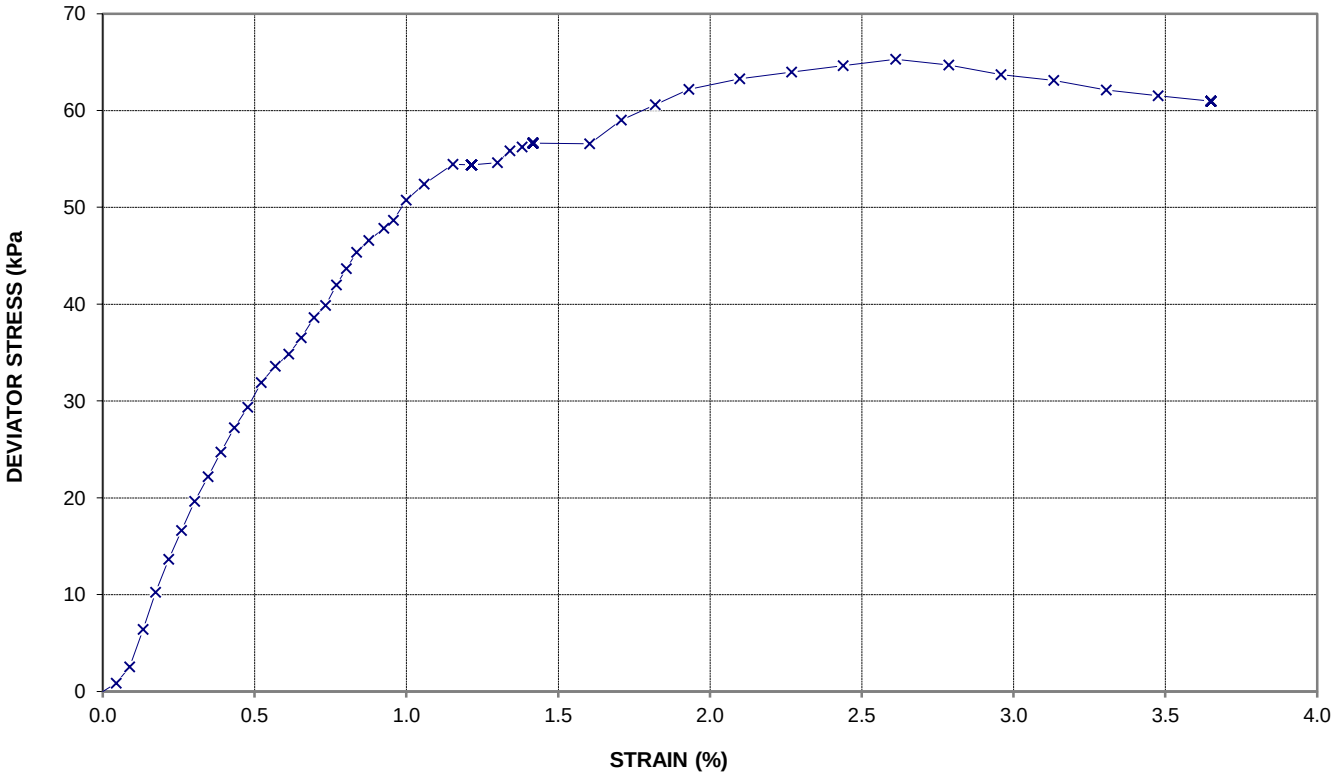
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH325
Sample No.: -- Depth: 5.77 - 5.88 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	114.78	mm	Bulk Density:	1.72	t/m³
Sample Diameter:	54.41	mm	Dry Density:	1.18	t/m³
Height / Diameter:	2.11		Water Content:	46.4	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	1.15	0.42	54.43	27	0.28
Stage 2	100	1.42	0.52	56.61	28	
Stage 3	200	2.61	0.91	65.28	33	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with some peat; firm, moist, high plasticity

Test Remarks: --

Approved Signature: Date: 4/07/2022

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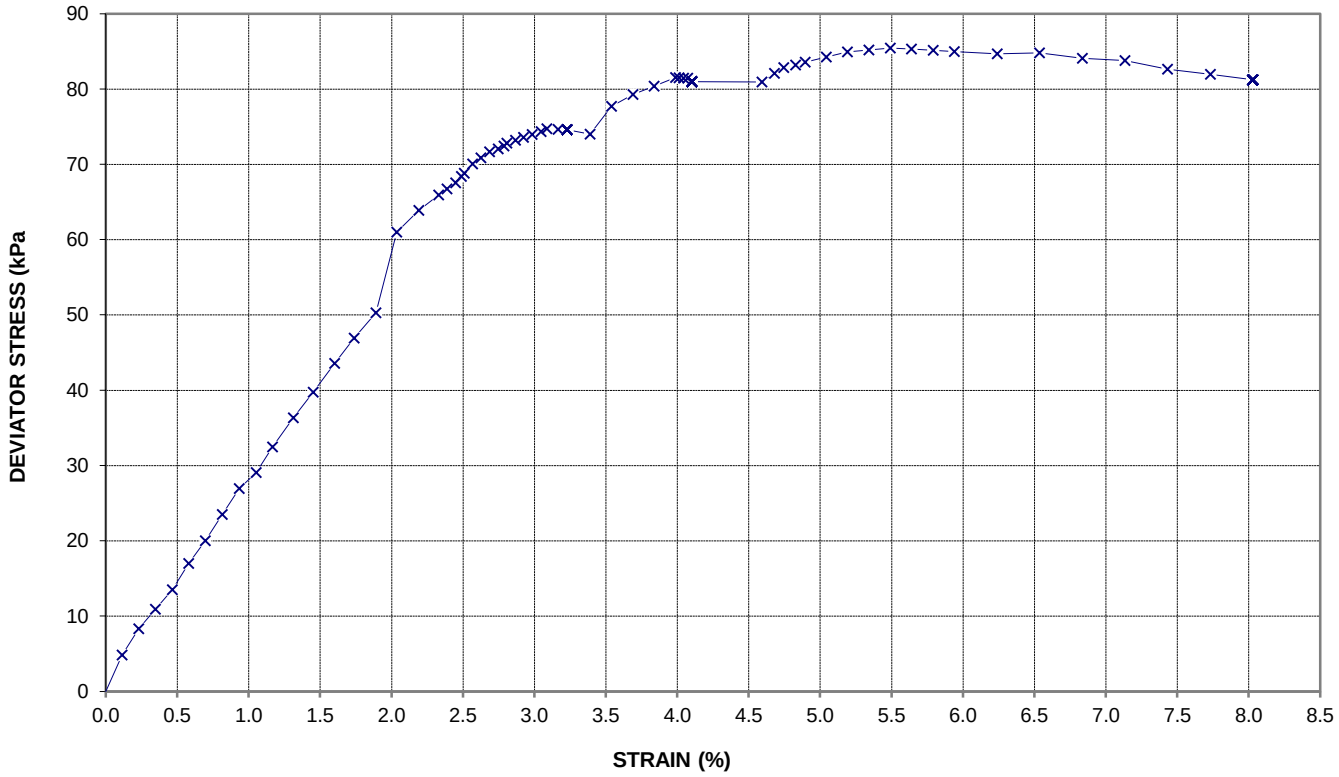
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH326
Sample No.: -- Depth: 4.83 - 4.96 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.40	mm	Bulk Density:	1.14	t/m³
Sample Diameter:	53.74	mm	Dry Density:	0.34	t/m³
Height / Diameter:	2.11		Water Content:	236	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	3.09	0.49	74.70	37	0.97
Stage 2	100	3.99	0.62	81.50	41	
Stage 3	200	5.49	0.80	85.44	43	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Remarks: --

Approved Signature: Date: 4/07/2022

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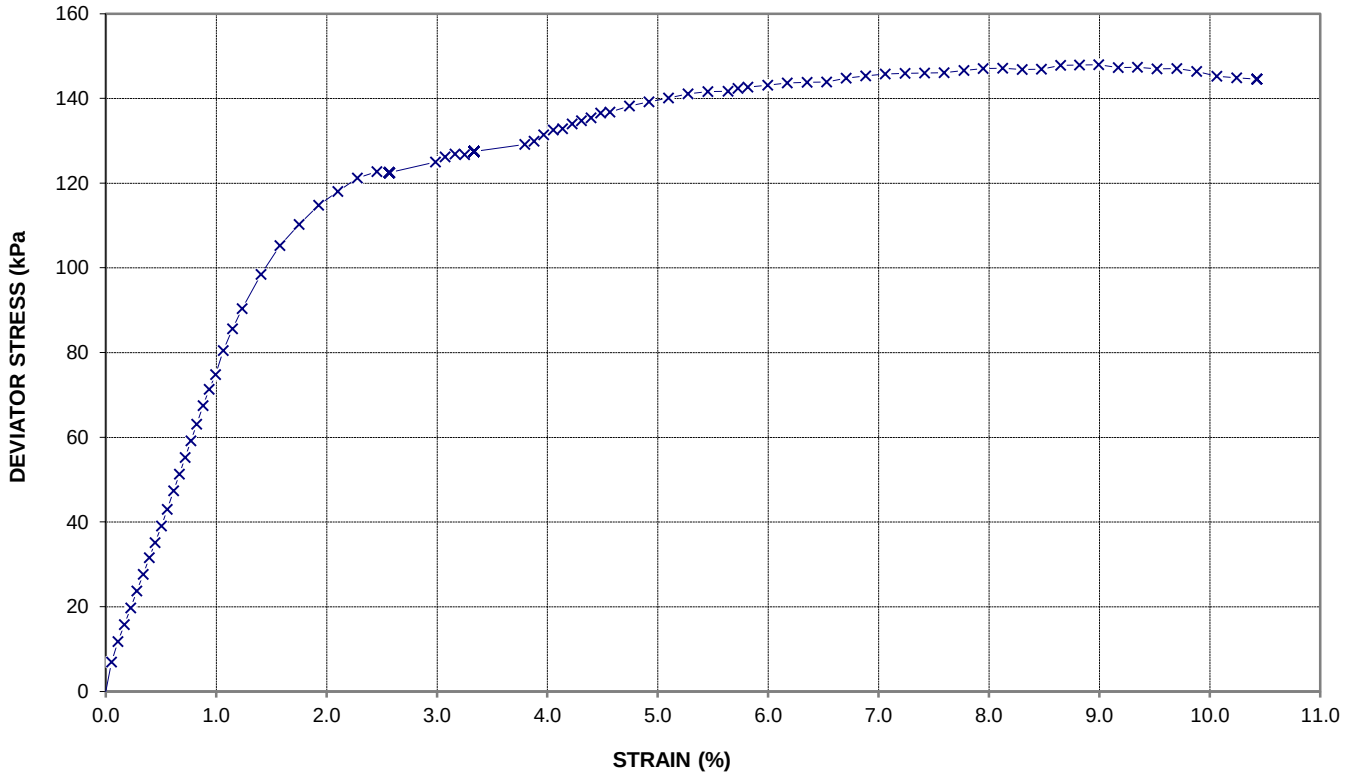
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH325
Sample No.: -- Depth: 4.36 - 4.48 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	112.80	mm	Bulk Density:	1.92	t/m³
Sample Diameter:	53.49	mm	Dry Density:	1.45	t/m³
Height / Diameter:	2.11		Water Content:	32.7	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	2.46	0.87	122.68	61	0.56
Stage 2	100	3.34	1.15	127.43	64	
Stage 3	200	9.00	2.55	147.95	74	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SAND, silty, with some clay, firm, light grey. A trace of organic matter was present.

Test Remarks: --

Approved Signature: Date: 4/07/2022

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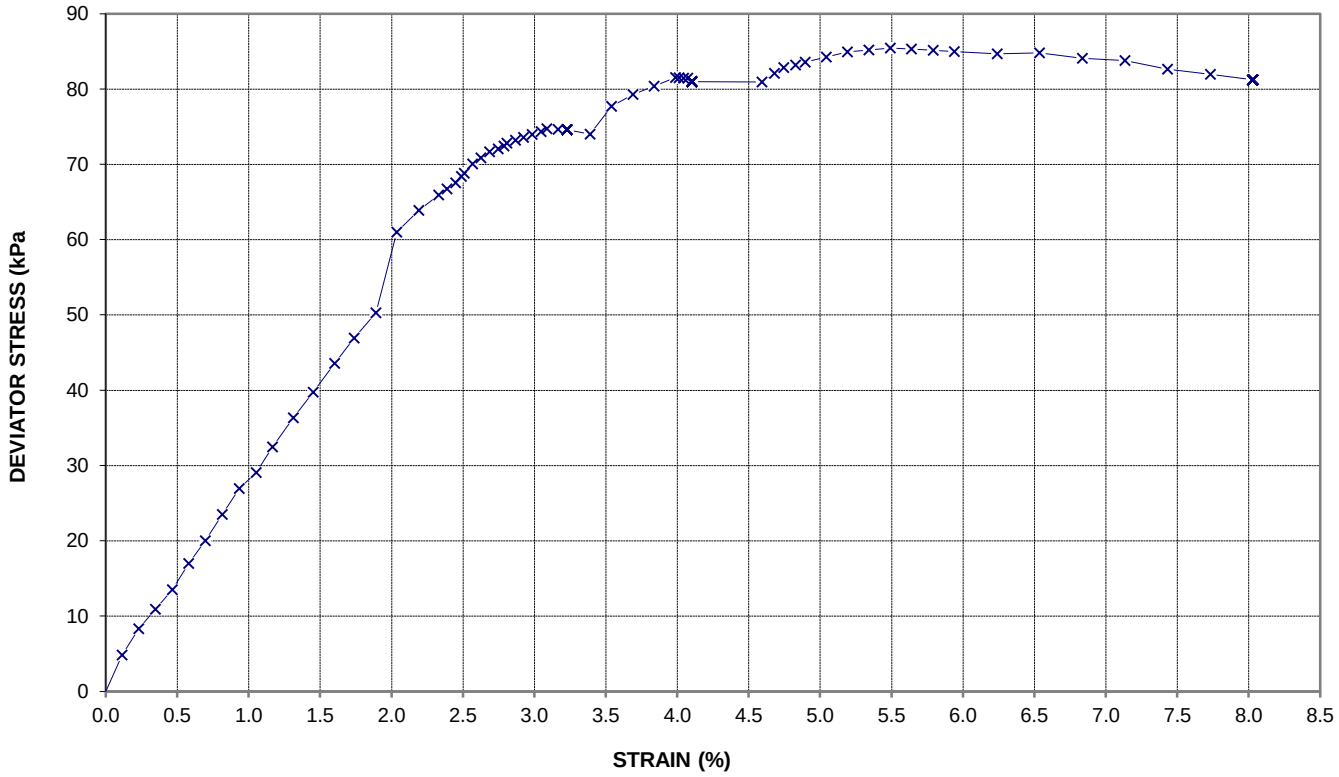
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH326
Sample No.: -- Depth: 4.83 - 4.96 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.40	mm	Bulk Density:	1.14	t/m³
Sample Diameter:	53.74	mm	Dry Density:	0.34	t/m³
Height / Diameter:	2.11		Water Content:	236	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	3.09	0.49	74.70	37	0.97
Stage 2	100	3.99	0.62	81.50	41	
Stage 3	200	5.49	0.80	85.44	43	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Remarks: --

Approved Signature: Date: 4/07/2022

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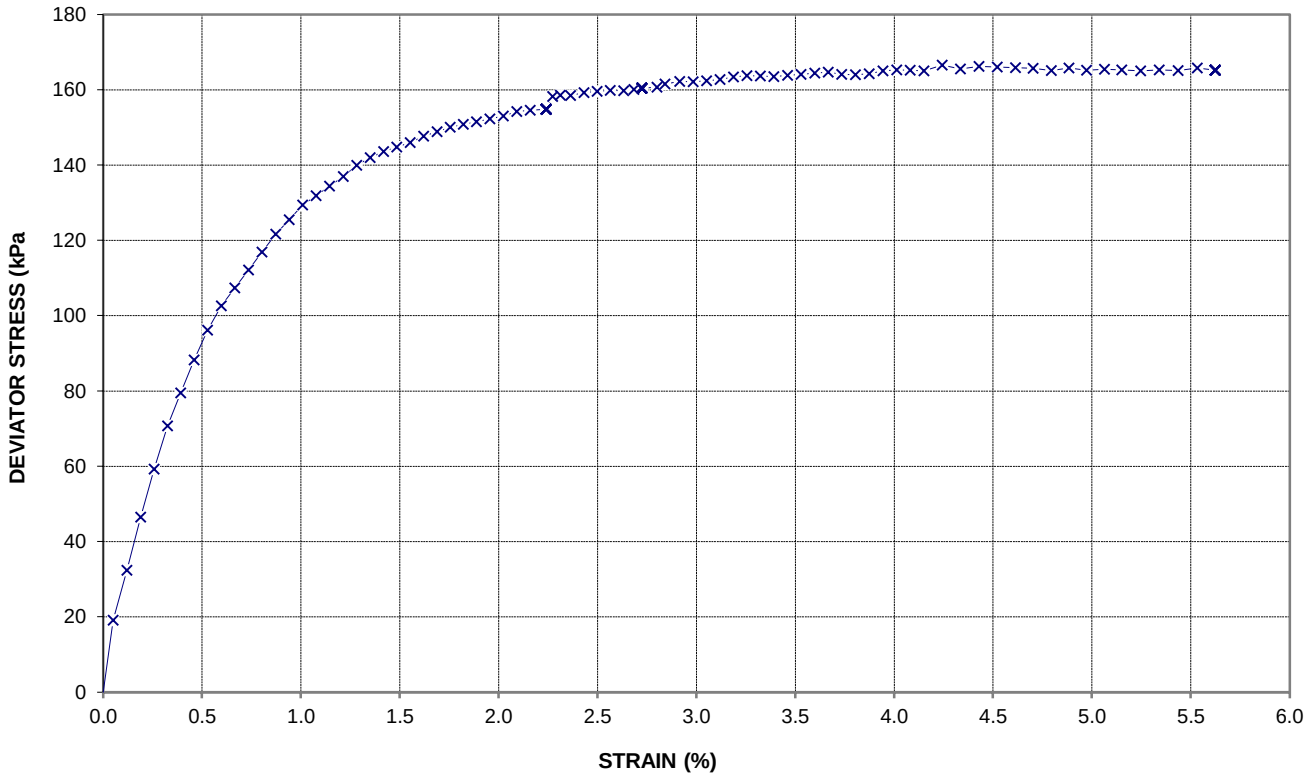
Geotechnics Project ID: 1017784.1000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_17

Site/Location: Eastern Busway Location ID: DH327
Sample No.: -- Depth: 2.75-2.86 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.34	mm	Bulk Density:	1.89	t/m³
Sample Diameter:	53.57	mm	Dry Density:	1.44	t/m³
Height / Diameter:	2.06		Water Content:	30.9	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	25	2.24	0.49	154.78	77	0.32
Stage 2	50	2.73	0.59	160.39	80	
Stage 3	100	4.24	0.87	166.52	83	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT, firm, light grey; moist, high plasticity

Test Remarks: --

Tested by: CHLU Date: 19/04/2023 Approved by KTP: Date: 11/05/2023

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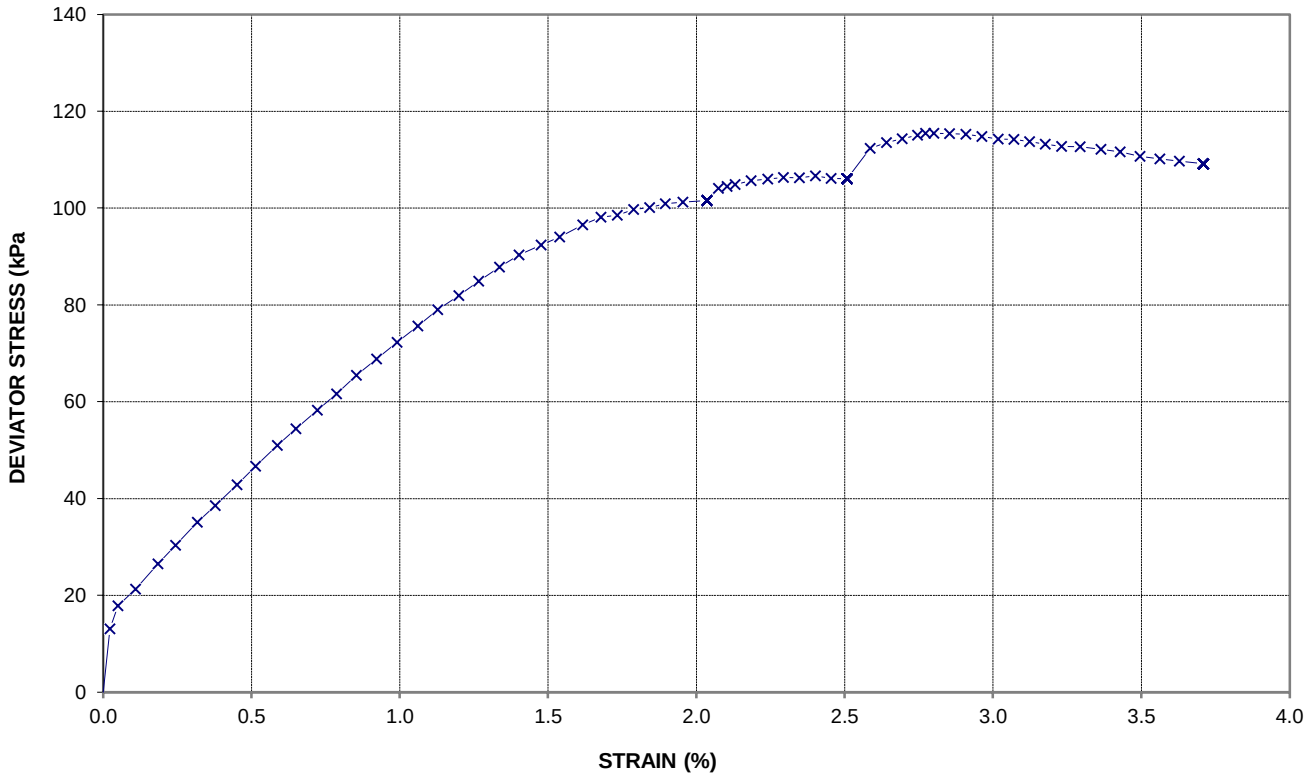
Geotechnics Project ID: 1017784.1000.Phase B.0
QESTLab Work Order ID:
Customer Project ID: EBA_17

Site/Location: Eastern Busway Location ID: DH327
Sample No.: Depth: 6.24-6.35 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	110.33	mm	Bulk Density:	1.21	t/m³
Sample Diameter:	54.07	mm	Dry Density:	0.44	t/m³
Height / Diameter:	2.04		Water Content:	172.3	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	50	2.04	0.45	101.53	51	0.60
Stage 2	100	2.40	0.52	106.60	53	
Stage 3	200	2.77	0.59	115.44	58	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: PEAT, firm, black; moist, amorphous.

Test Remarks: --

Tested by: CHLU Date: 18/04/2023 Approved by KTP: Date: 11/05/2023

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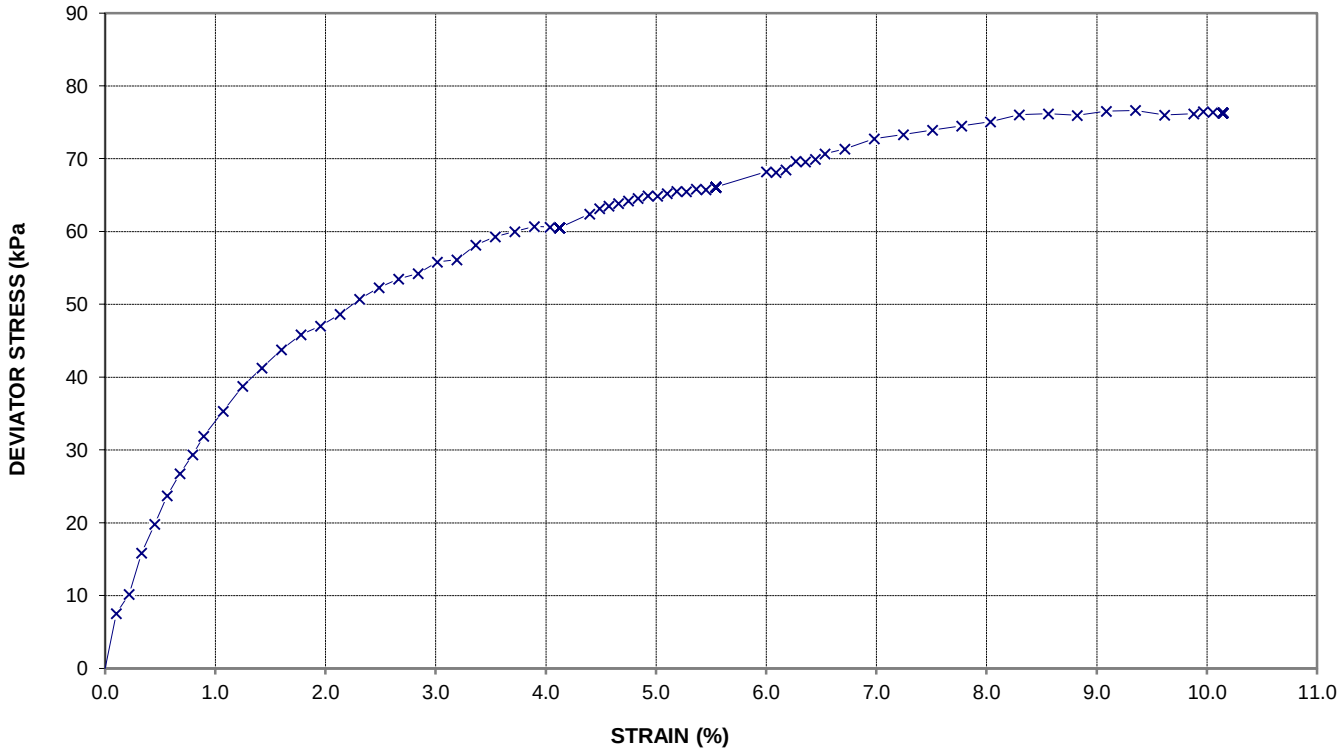
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH329
Sample No.: -- Depth: 12.35 - 12.48 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.34	mm	Bulk Density:	1.28	t/m³
Sample Diameter:	53.63	mm	Dry Density:	0.52	t/m³
Height / Diameter:	2.11		Water Content:	147	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 - σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	75	3.90	0.61	60.71	30	0.61
Stage 2	150	5.54	0.81	66.10	33	
Stage 3	300	9.35	1.21	76.66	38	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Peaty CLAY, black; soft, wet, high plasticity.

Test Remarks: --

Approved Signature: Date: 4/07/2022

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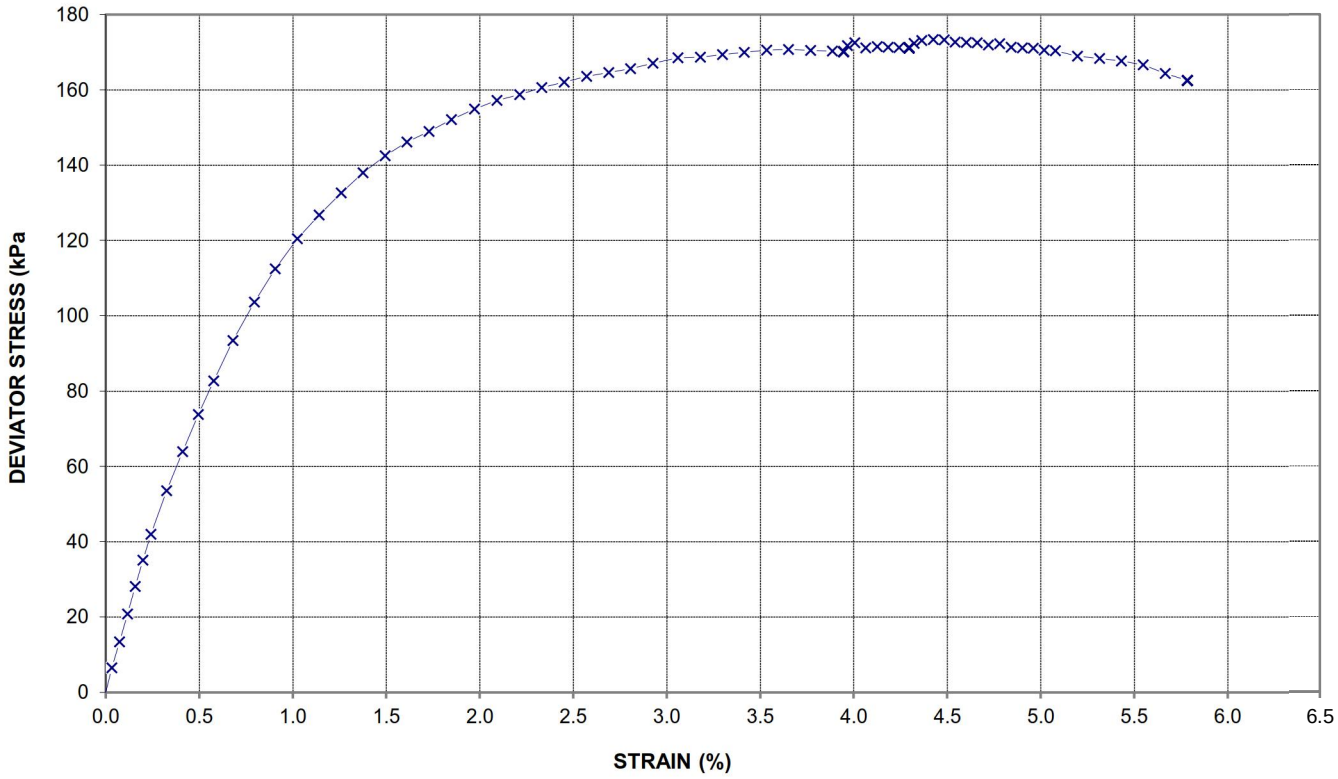
Geotechnics Project ID: 1017784.0000 Phase B
QESTLab Work Order ID:
Customer Project ID: ALCOE-84

Site/Location: Eastern Busway 2 Location ID: DH330
Sample No.: -- Depth: 3.31 - 3.43 (m)
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height:	113.11	mm	Bulk Density:	1.84	t/m³
Sample Diameter:	54.17	mm	Dry Density:	1.32	t/m³
Height / Diameter:	2.09		Water Content:	38.9	%

Failure Value:

	Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress σ1 – σ3 (kPa)	Shear Strength C_u (kPa)	Test Speed (mm/min)
Stage 1	30	3.65	0.76	170.68	85	0.38
Stage 2	60	4.01	0.82	172.49	86	
Stage 3	120	4.43	0.89	173.32	87	

Mode of Failure: Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILT, clayey, stiff to very stiff, greenish/bluish grey with light grey.

Test Remarks: --

Approved Signature: Date: 3/05/2022

Eastern Busway

One Dimensional Consolidation Test

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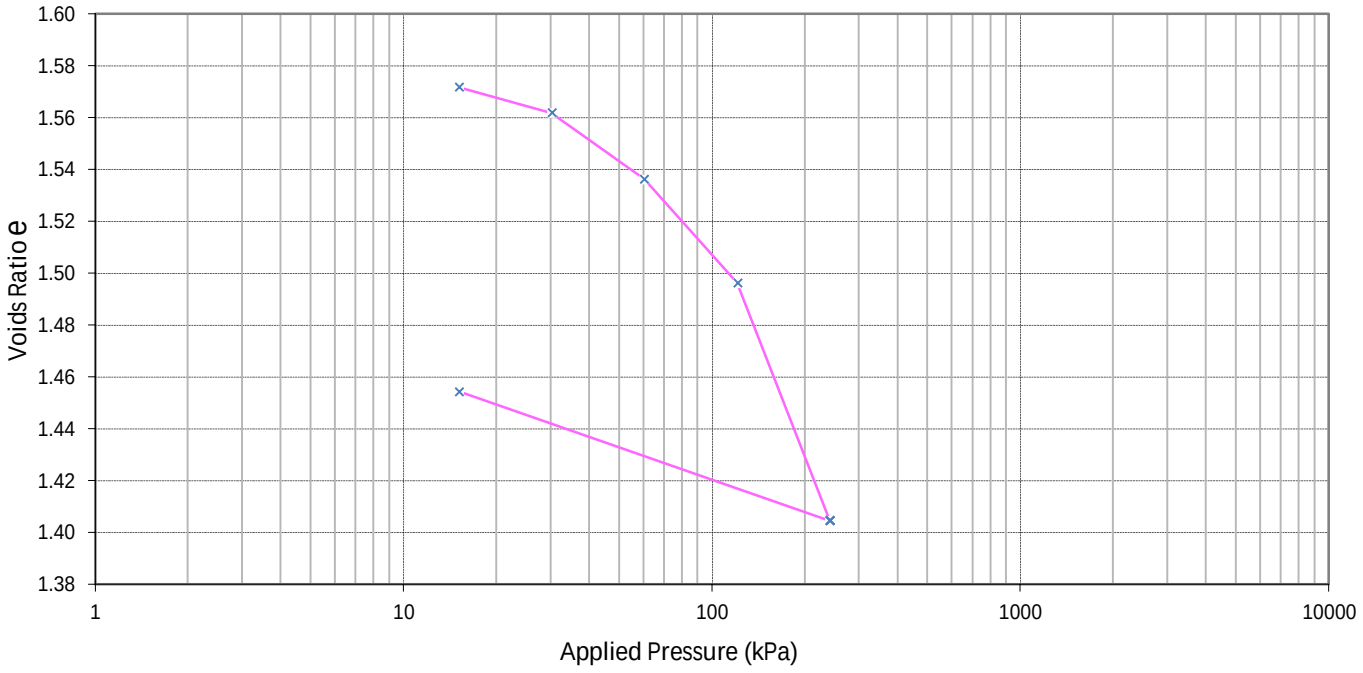
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH301
Sample Ref.: -- Depth: 4.62-4.65 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	58.7	%	Initial Saturation Degree:	100	%
Initial Bulk Density:	1.66	t/m³	Solid Density (assumed):	2.70	t/m³
Initial Dry Density:	1.05	t/m³	Temperature During Testing:	20.0 to 26.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	1.577			
Preload	15.1	1.572	0 to 15.1	NA	0.13
	30.2	1.562	15.1 to 30.2	66	0.26
	60.3	1.536	30.2 to 60.3	4.2	0.33
	121	1.496	60.3 to 121	2.2	0.26
Loading	241	1.404	121 to 241	1.0	0.31
Unload	15.1	1.454	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, firm, mottled brown and blueish grey; mosit, high plasticity, organic inclusions.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.7 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 4/04/2023 Approved by KTP: Date: 12/05/2023

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Your Job No.: **ALCOE-84**

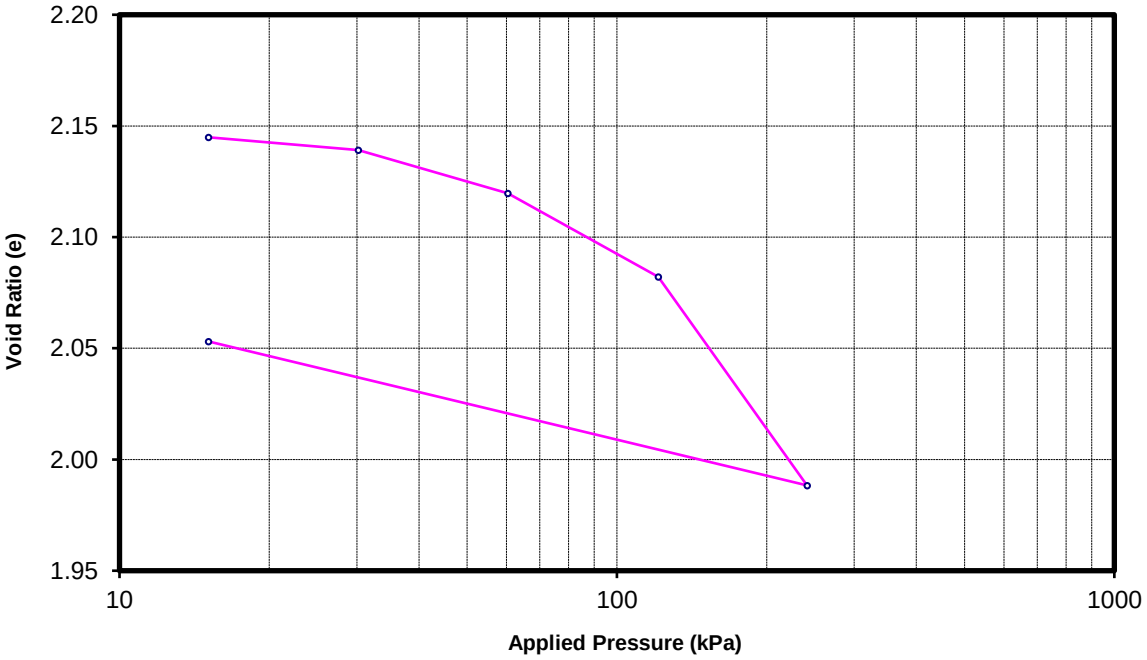
Site: **Eastern Busway Alliance**

Our Job No.: **1017784 Phase A**

BH No.: **DH302** Sample No.: **AKL67.4** Depth: **9.26 - 9.34 m**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)		Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	2.149				
Preload	15.1	2.145	0 to	15.1	NA	0.094
	30.2	2.139	15.1 to	30.2	13	0.121
	60.3	2.120	30.2 to	60.3	7	0.206
	121	2.082	60.3 to	121	6	0.198
	241	1.988	121 to	241	3	0.253
Unload	15.1	2.053	241 to	15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Spongy PEAT with organic material, soft, dark blackish brown

Initial Dry Density (t/m³): 0.75 Initial Water Content: 86.6%

Solid Density (t/m³): 2.35 (Assumed) Initial Saturation: 95%

Temperature During Testing: Max = 21 ^{0}C Min = 20 ^{0}C

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed a value of 2.35 t/m³.
Sample description is not IANZ accredited.

Entered by: CAGI Date: 29/04/2022 Checked by: CHLU Date: 20/5/2022

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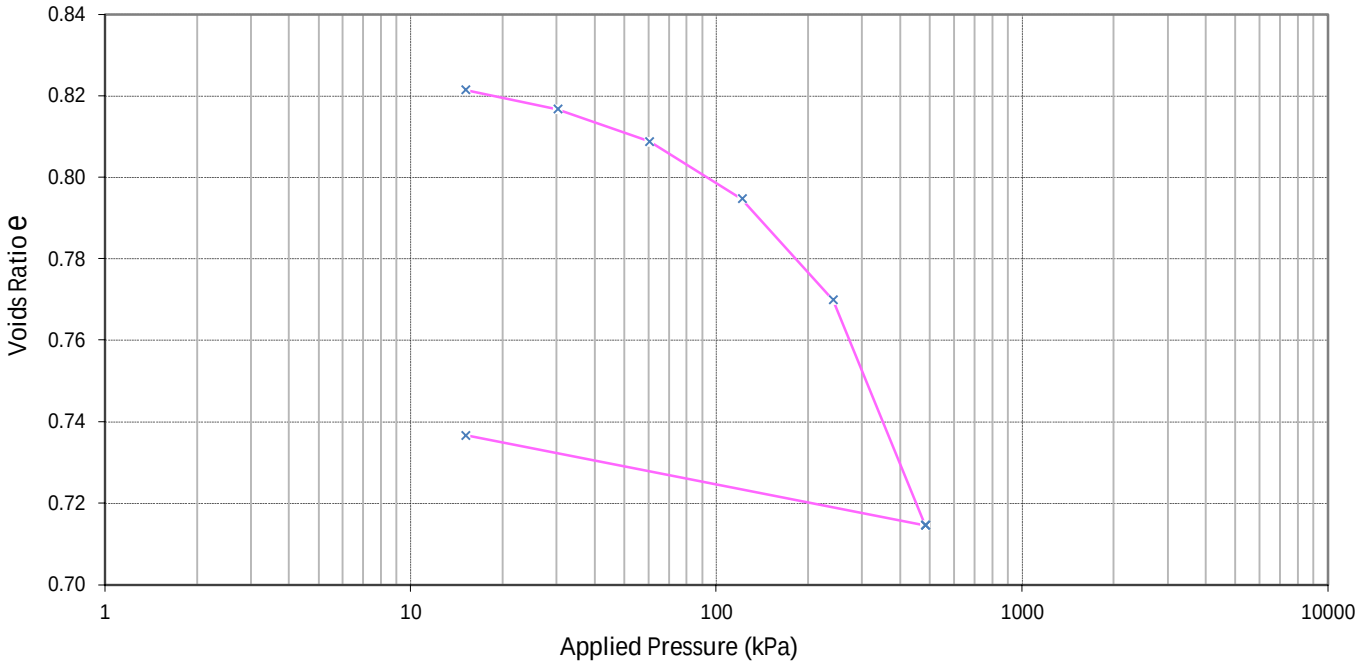
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway
Location ID: DH303
Sample Ref.: --
Depth: 7.76-7.80 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	29.2	%	Initial Saturation Degree:	92	%
Initial Bulk Density:	1.84	t/m³	Solid Density (assumed):	2.60	t/m³
Initial Dry Density:	1.42	t/m³	Temperature During Testing:	21.0 to 21.5	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	0.830			
Preload	15.1	0.821	0 to 15.1	NA	0.31
Loading	30.2	0.817	15.1 to 30.2	17	0.17
	60.3	0.809	30.2 to 60.3	13	0.14
	121	0.795	60.3 to 121	13	0.13
	241	0.770	121 to 241	13	0.12
	483	0.715	241 to 483	12	0.13
Unload	15.1	0.737	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: (fine) sandy SILT, firm, blueish dark grey with mottled orange; moist, low plasticity

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.6 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 28/02/2023 Approved by KTP: Date: 27/03/2023

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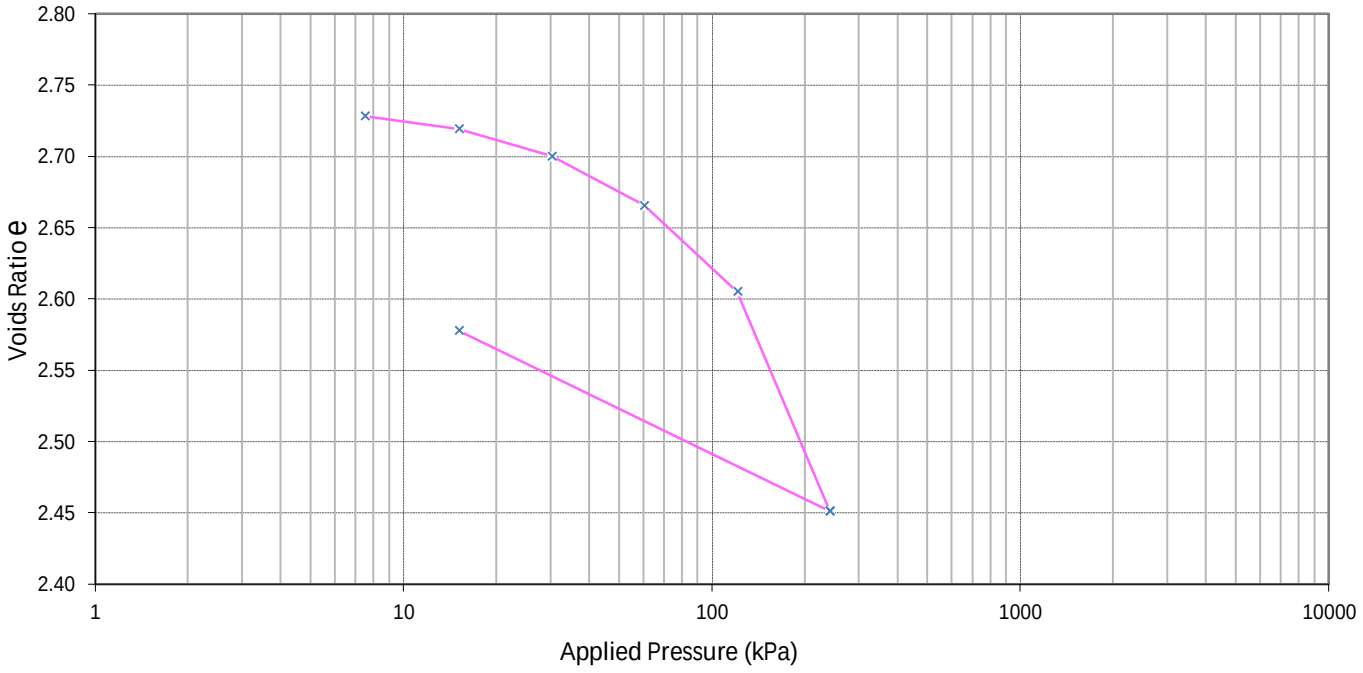
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway
Location ID: DH303
Sample Ref.: --
Depth: 9.77-9.81 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	105	%	Initial Saturation Degree:	100	%
Initial Bulk Density:	1.43	t/m³	Solid Density (assumed):	2.60	t/m³
Initial Dry Density:	0.70	t/m³	Temperature During Testing:	21.0 to 24.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	2.734			
Preload	7.5	2.728	0 to 7.5	NA	0.19
Loading	15.1	2.719	7.5 to 15.1	11	0.32
	30.2	2.700	15.1 to 30.2	11	0.34
	60.3	2.666	30.2 to 60.3	10	0.31
	121	2.605	60.3 to 121	5.1	0.27
	241	2.451	121 to 241	0.90	0.36
Unload	15.1	2.578	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: ORGANIC clayey SILT, with some clay, firm, black; high plasticity, moist.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.6 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 8/03/2023 Approved by KTP: Date: 31/03/2023

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Your Job No.: **ALCOE-84**

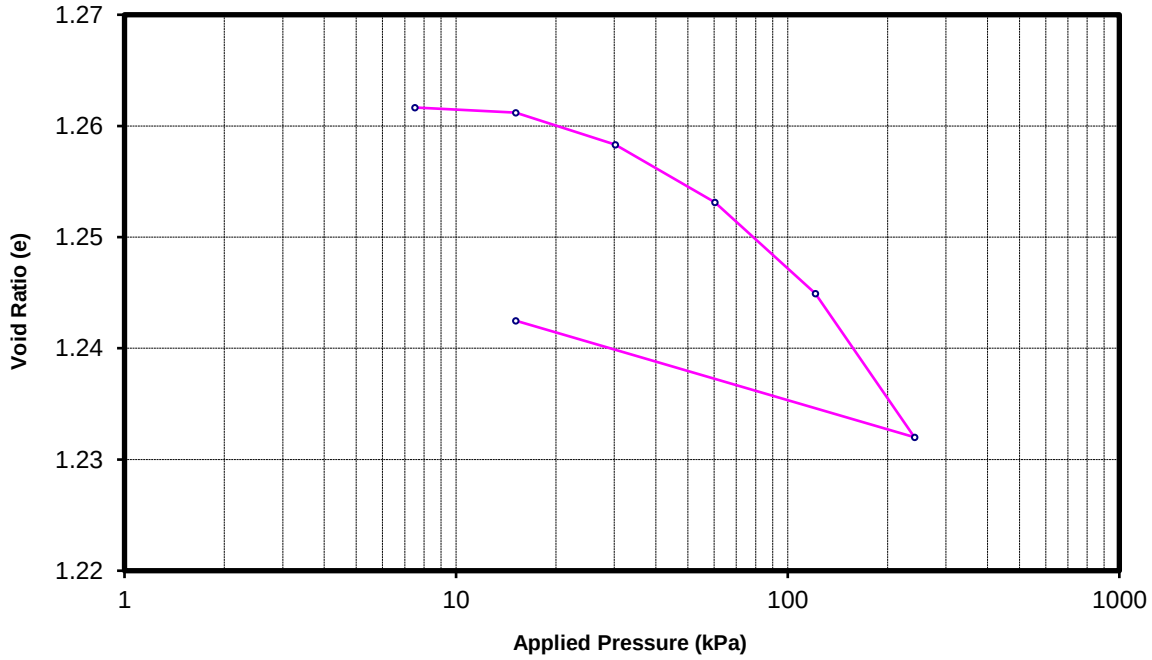
Site: **Eastern Busway Alliance**

Our Job No.: **1017784 Phase A**

BH No.: **DH303** Sample No.: **AKL68.1** Depth: **6 - 6.5 m**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)		Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	1.264				
Preload	7.5	1.262	0 to	7.5	NA	0.143
	15.1	1.261	7.5 to	15.1	34	0.085
	30.2	1.258	15.1 to	30.2	26	0.085
	60.3	1.253	30.2 to	60.3	24	0.076
	121	1.245	60.3 to	121	22	0.060
	241	1.232	121 to	241	13	0.048
Unload	15.1	1.242	241 to	15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Clayey SILT with minor sand, firm, medium brown.

Initial Dry Density (t/m³): 1.19 Initial Water Content: 46.2%

Solid Density (t/m³): 2.70 (Assumed) Initial Saturation: 99%

Temperature During Testing: Max = 21 ^{0}C Min = 20 ^{0}C

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed a value of 2.70 t/m³.
Sample description is not IANZ accredited.

Entered by: CAGI 13/04/2022 Checked by: CHLU Date: 20/5/2022

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Your Job No.: **ALCOE-84**

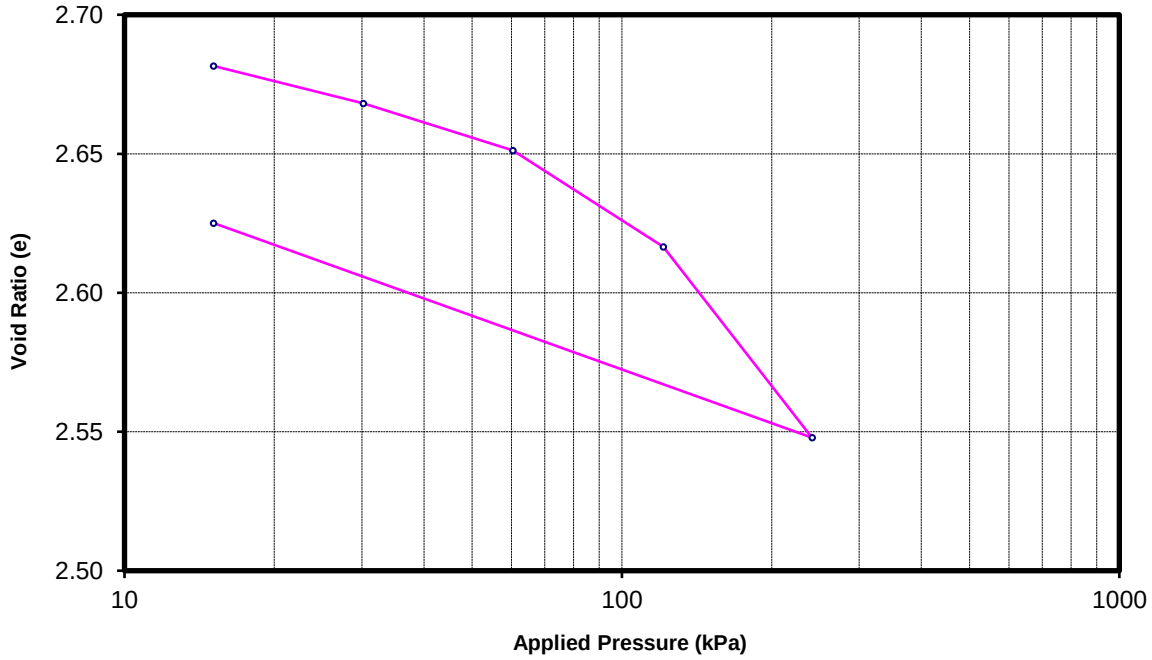
Site: **Eastern Busway Alliance**

Our Job No.: **1017784 Phase A**

BH No.: **DH304** Sample No.: **AKL68.4** Depth: **9.8 - 9.9 m**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	2.687			
Preload	15.1	2.682	0 to 15.1	NA	0.103
	30.2	2.668	15.1 to 30.2	14	0.242
	60.3	2.651	30.2 to 60.3	10	0.153
	121	2.617	60.3 to 121	7	0.156
	241	2.548	121 to 241	6	0.158
Unload	15.1	2.625	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Spongy PEAT with organic matter, soft, dark blackish brown.

Initial Dry Density (t/m³): 0.57 Initial Water Content: 121.5%

Solid Density (t/m³): 2.10 (Assumed) Initial Saturation: 95%

Temperature During Testing: Max = 21 ^{0}C Min = 20 ^{0}C

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed a value of 2.10 t/m³.
Sample description is not IANZ accredited.

Entered by: CAGI Date: 29/04/2022 Checked by: CHLU Date: 20/5/2022

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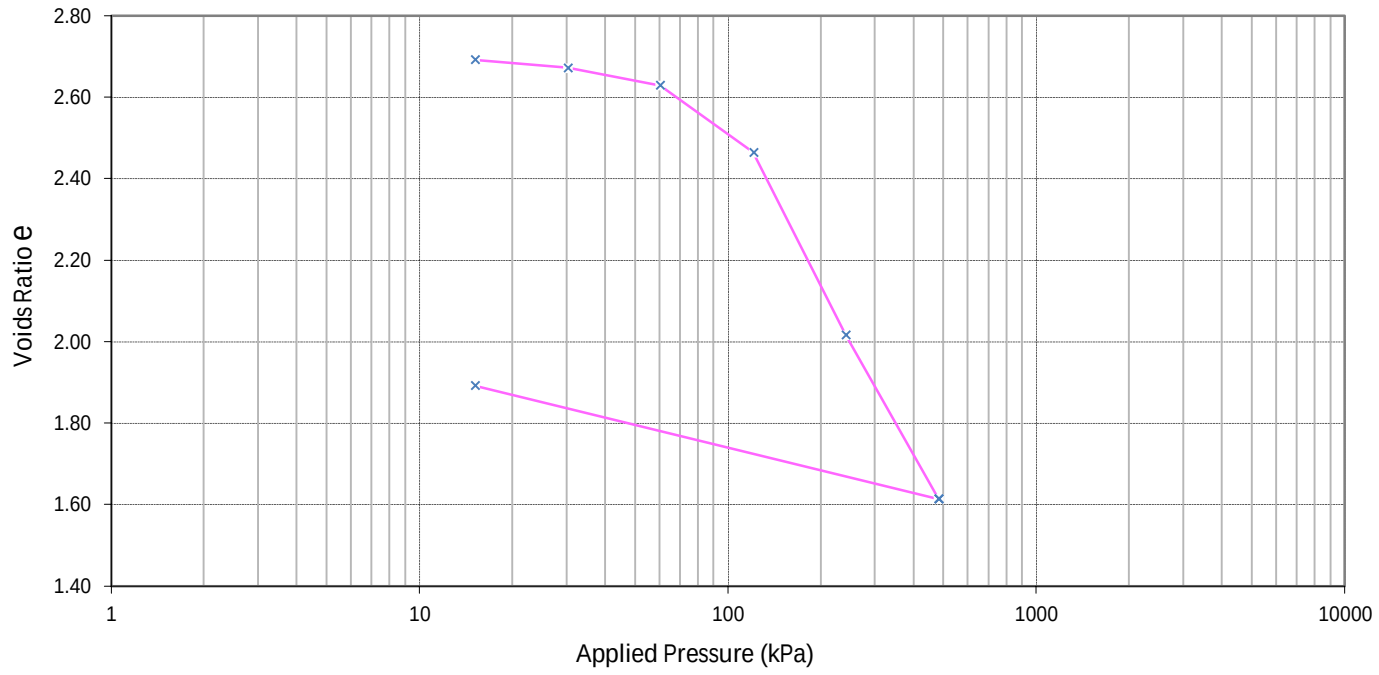
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_18

Site/Location: Eastern Busway Location ID: DH306
Sample Ref.: -- Depth: 7.88-7.92 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	102	%	Initial Saturation Degree:	100	%
Initial Bulk Density:	1.45	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	0.72	t/m³	Temperature During Testing:	20.0 to 26.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	2.701			
Preload	15.1	2.692	0 to 15.1	NA	0.17
Loading	30.2	2.672	15.1 to 30.2	11	0.35
	60.3	2.629	30.2 to 60.3	12	0.39
	121	2.464	60.3 to 121	4.4	0.75
	241	2.016	121 to 241	0.80	1.1
	483	1.613	241 to 483	0.80	0.55
Unload	15.1	1.892	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, firm to soft, blueish grey; moist, high plasticity

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 5/4/023 Approved by KTP: Date: 11/05/2023

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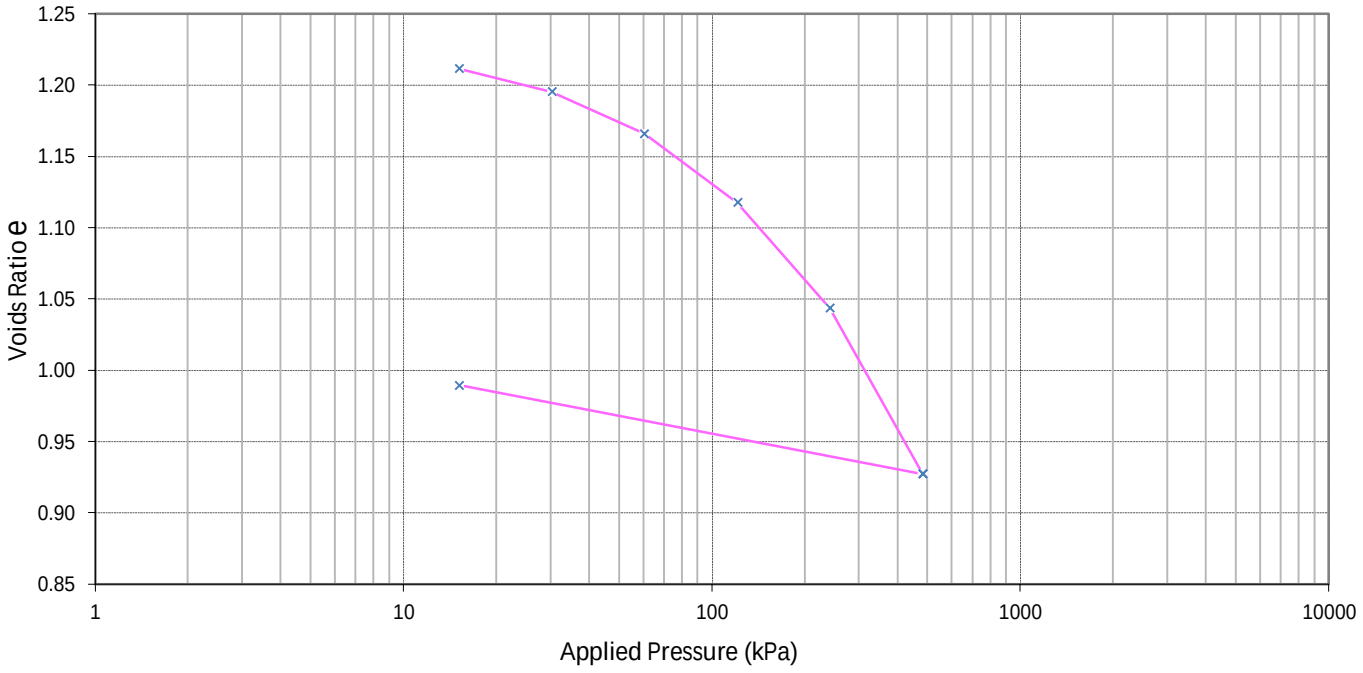
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway
Location ID: DH309
Sample Ref.: --
Depth: 7.69-7.73 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	43.8	%	Initial Saturation Degree:	99	%
Initial Bulk Density:	1.78	t/m³	Solid Density (assumed):	2.75	t/m³
Initial Dry Density:	1.24	t/m³	Temperature During Testing:	21.0 to 24.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	1.223			
Preload	15.1	1.212	0 to 15.1	NA	0.33
Loading	30.2	1.195	15.1 to 30.2	17	0.49
	60.3	1.166	30.2 to 60.3	19	0.44
	121	1.118	60.3 to 121	20	0.37
	241	1.044	121 to 241	13	0.29
	483	0.927	241 to 483	7.3	0.24
Unload	15.1	0.989	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT, soft to firm, blueish grey, moist, high plasticity.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.75 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 9/03/2023 Approved by KTP: Date: 31/03/2023

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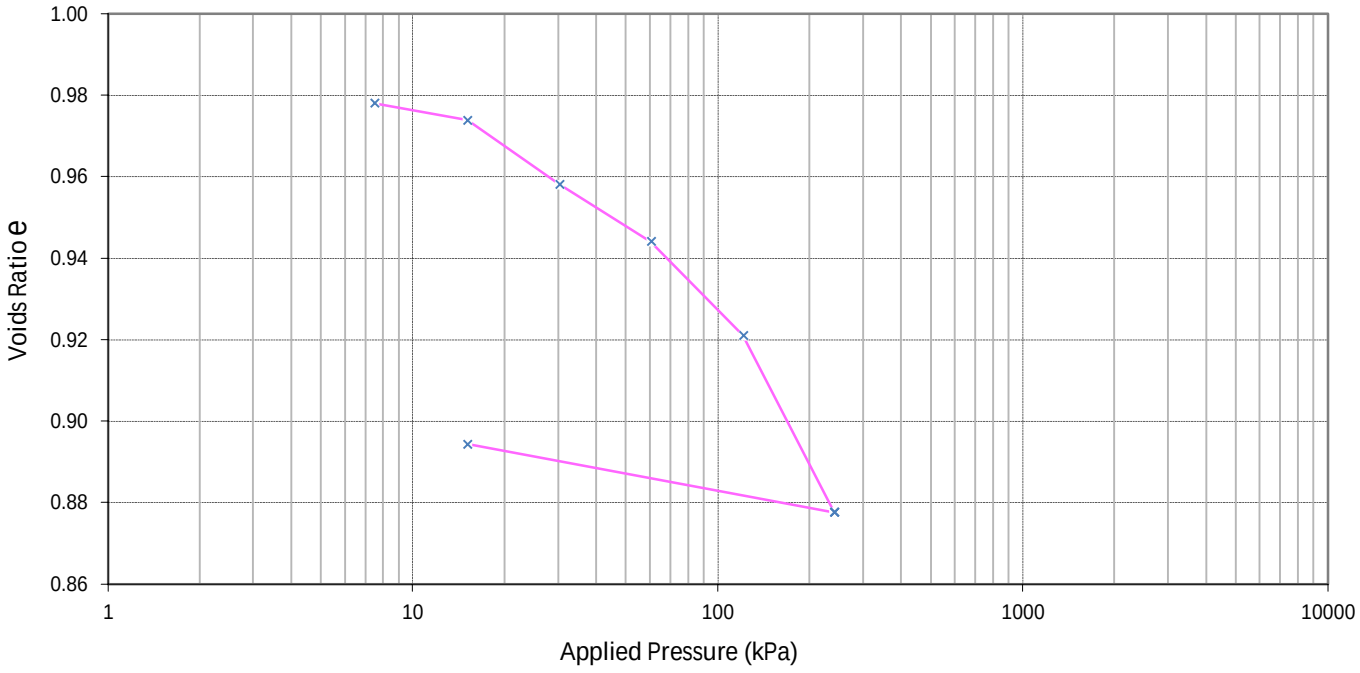
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway Location ID: DH309
Sample Ref.: -- Depth: 9.2-9.32 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	36.6	%	Initial Saturation Degree:	99	%
Initial Bulk Density:	1.83	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.34	t/m³	Temperature During Testing:	21.0 to 24.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	0.981			
Preload	7.5	0.978	0 to 7.5	NA	0.20
Loading	15.1	0.974	7.5 to 15.1	17	0.28
	30.2	0.958	15.1 to 30.2	14	0.53
	60.3	0.944	30.2 to 60.3	13	0.24
	121	0.921	60.3 to 121	16	0.19
	241	0.878	121 to 241	13	0.19
Unload	15.1	0.894	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: sandy SILT, with minor clay, soft to firm, blueish grey; moist, low plasticity

Test Remarks: Square root of time fitting method was used. The calculations of void ratio are affected by the solid density value, which was assumed to be 2.65 t/m³ for the test.
Consols are to be over a 24hour period

Tested by: CHLU Date: 8/03/2023 Approved by KTP: Date: 27/03/2023

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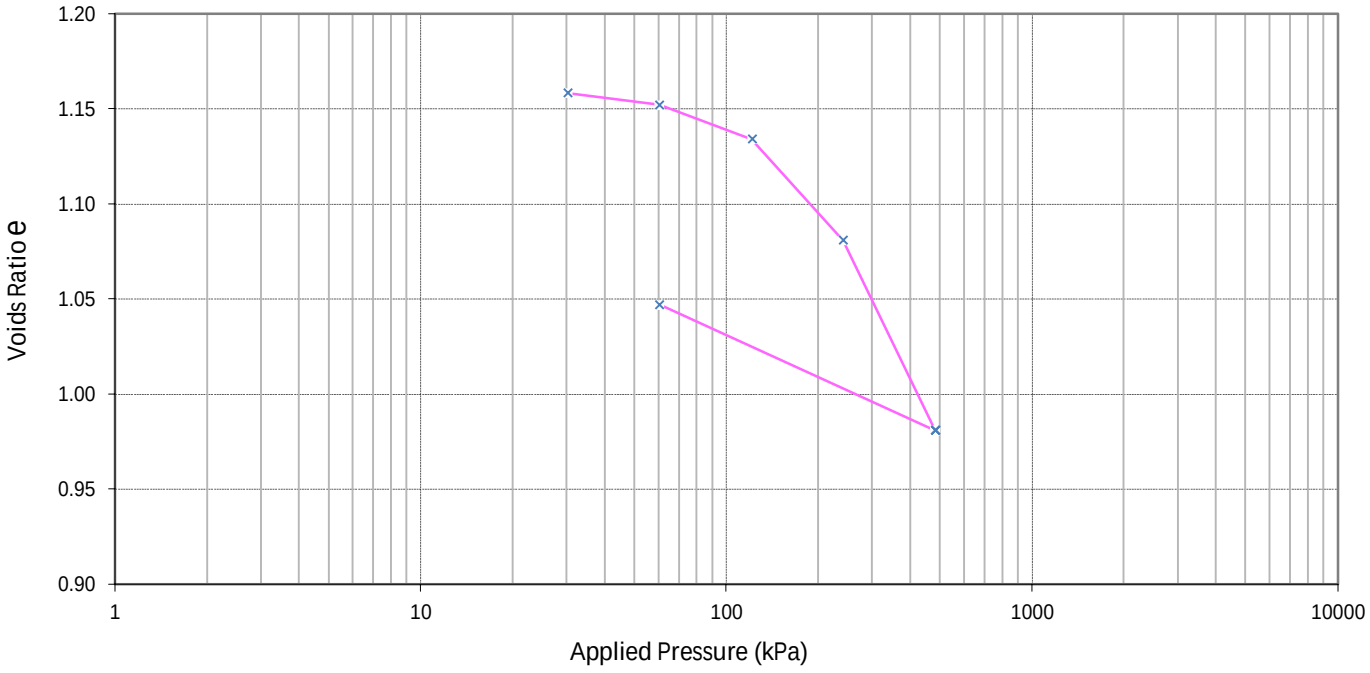
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_12

Site/Location: Eastern Busway
Location ID: DH314
Sample Ref.: --
Depth: 2.00-2.05 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	42.9	%	Initial Saturation Degree:	98	%
Initial Bulk Density:	1.76	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.23	t/m³	Temperature During Testing:	21.0 to 24.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	1.156			
Preload	30.2	1.158	0 to 30.2	NA	--
Loading	60.3	1.152	30.2 to 60.3	6.2	0.10
	121	1.134	60.3 to 121	1.9	0.14
	241	1.081	121 to 241	0.77	0.21
	483	0.981	241 to 483	0.42	0.20
Unload	60.3	1.047	483 to 60.3	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with a trace of sand (fine), firm, greyish brown; moist, high plasticity.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.
Due to swelling pre load was increased to 30 kPa

Tested by: CHLU Date: 28/03/2023 Approved by KTP: Date: 31/03/2023

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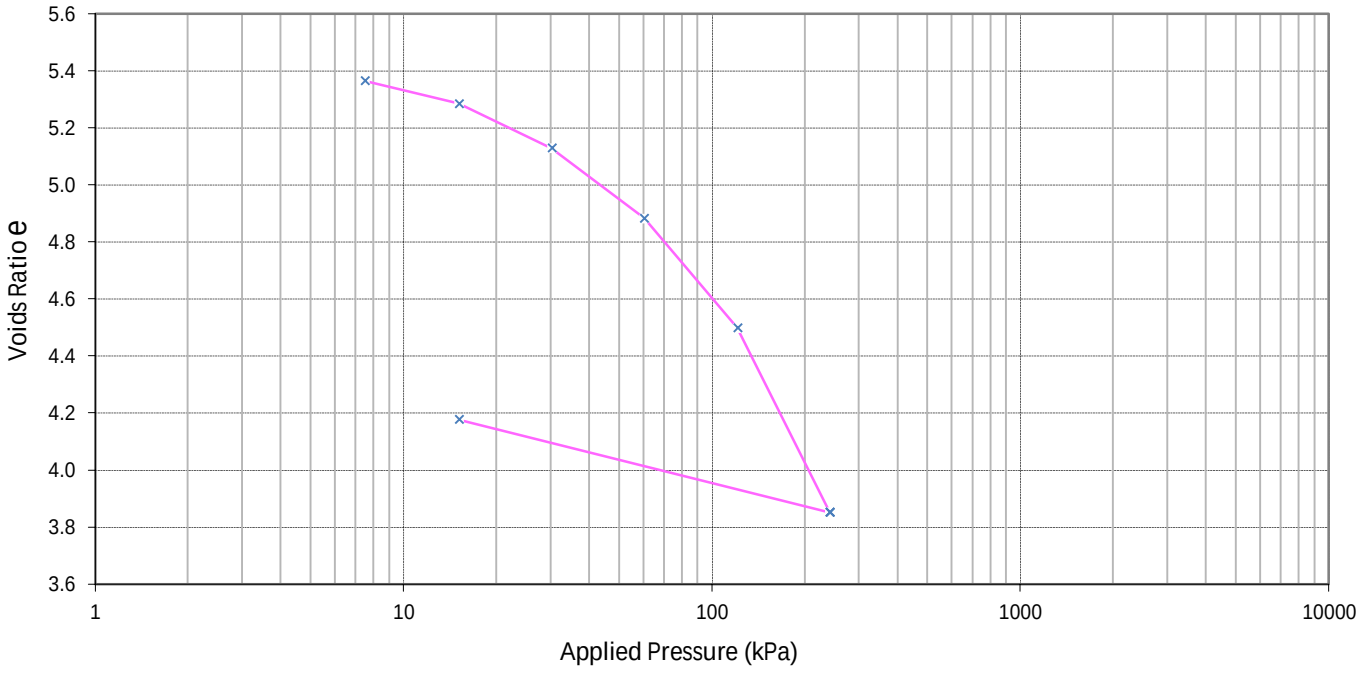
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_16

Site/Location: Eastern Busway Location ID: DH316
Sample Ref.: -- Depth: 9.02-9.06 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	307	%	Initial Saturation Degree:	93	%
Initial Bulk Density:	1.04	t/m³	Solid Density (assumed):	1.63	t/m³
Initial Dry Density:	0.26	t/m³	Temperature During Testing:	20.0 to 26.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	5.390			
Preload	7.5	5.365	0 to 7.5	NA	0.52
Loading	15.1	5.285	7.5 to 15.1	9.9	1.7
	30.2	5.129	15.1 to 30.2	1.9	1.6
	60.3	4.883	30.2 to 60.3	2.1	1.3
	121	4.500	60.3 to 121	1.5	1.1
	241	3.852	121 to 241	0.76	0.98
Unload	15.1	4.177	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Organic clayey SILT, soft to firm, black; moist to wet, high plasticity, rootlet inclusions

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.63 t/m³. The calculations of void ratio are affected by the solid density value.
Max pressure 241kPa

Tested by: CHLU Date: 6/04/2023 Approved by KTP: Date: 28/04/2023

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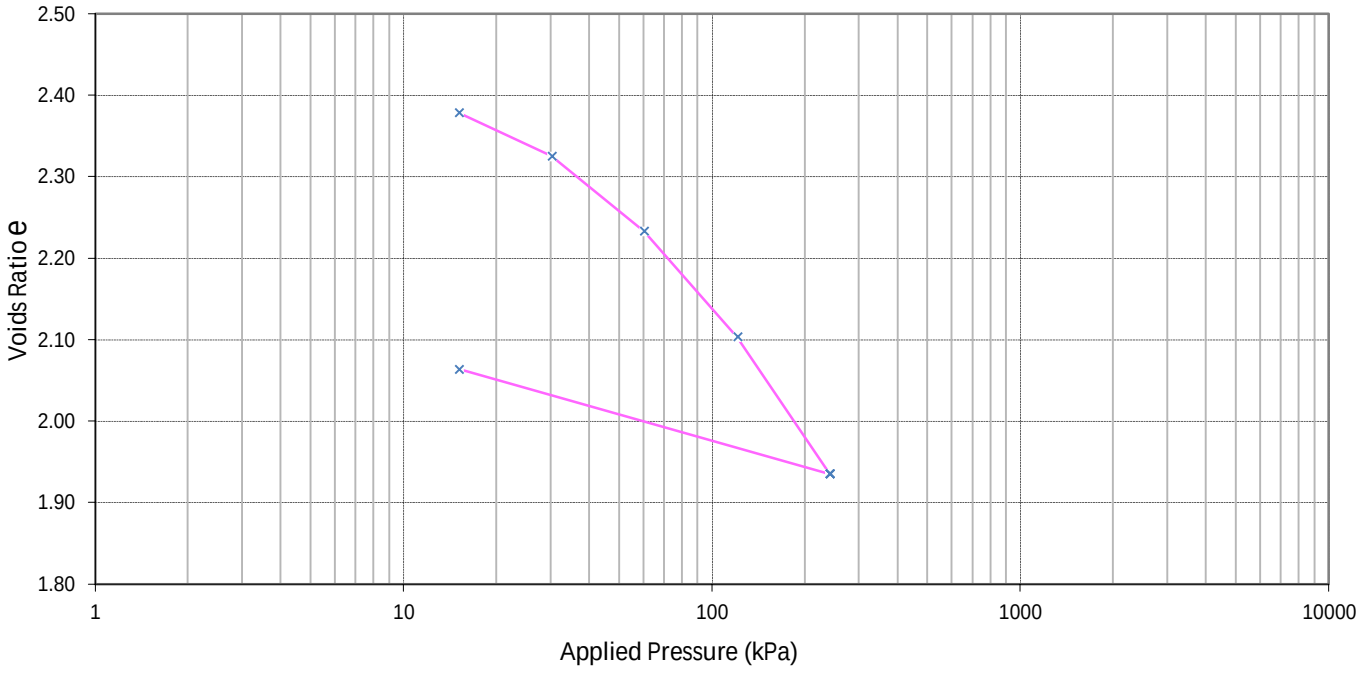
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway
Location ID: DH319
Sample Ref.: --
Depth: 10.92-10.96 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	87.8	%	Initial Saturation Degree:	95	%
Initial Bulk Density:	1.44	t/m³	Solid Density (assumed):	2.60	t/m³
Initial Dry Density:	0.76	t/m³	Temperature During Testing:	21.0 to 23.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	2.402			
Preload	15.1	2.378	0 to 15.1	NA	0.46
	30.2	2.325	15.1 to 30.2	0.99	1.0
	60.3	2.233	30.2 to 60.3	0.99	0.92
	121	2.103	60.3 to 121	1.1	0.66
Loading	241	1.935	121 to 241	1.0	0.45
Unload	15.1	2.064	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with a trace of sand, firm, dark brown with black; moist, high plasticity, organic inclusions

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.6 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 22/02/2023 Approved by KTP: Date: 31/03/2023

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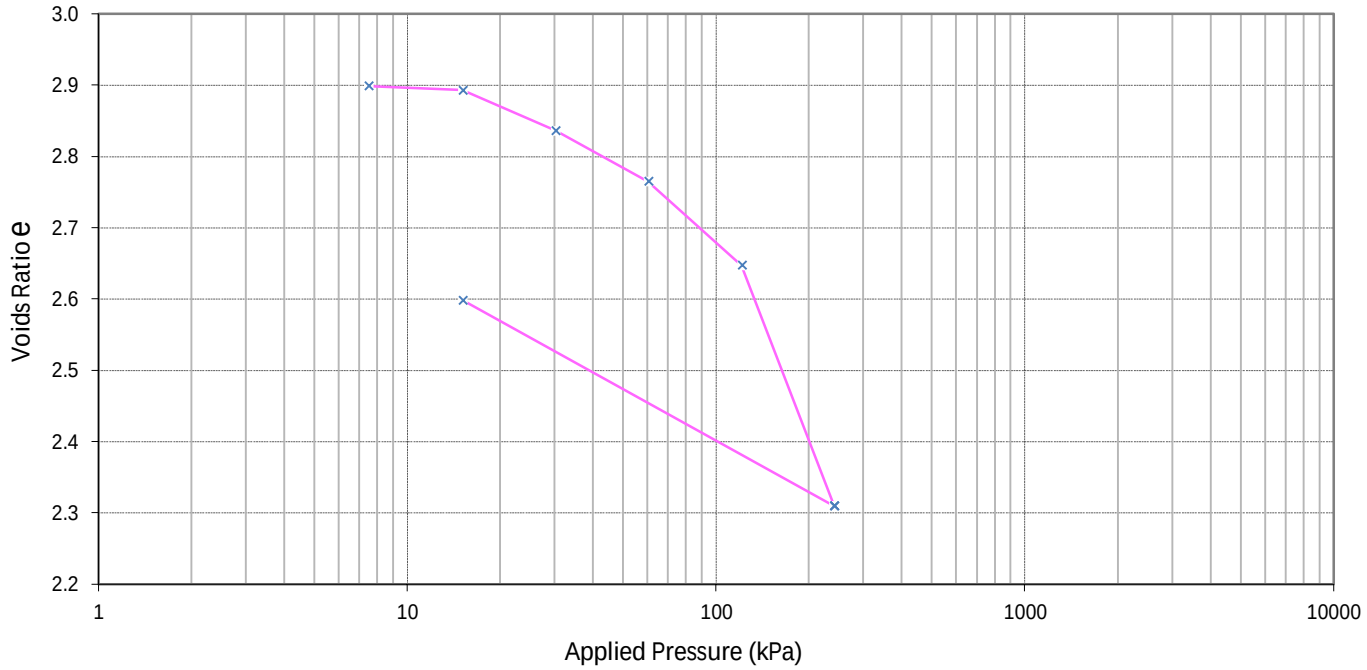
Geotechnics Project ID: 1017784.0000 Phase b
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH323
Sample Ref.: -- Depth: 5.85-5.98 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content	126	%	Initial Saturation Degree:	95	%
Initial Bulk Density:	1.27	t/m³	Solid Density (assumed):	2.20	t/m³
Initial Dry Density:	0.56	t/m³	Temperature During Testing:	23.0 to 25.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	2.914			
Preload	7.5	2.899	0 to 7.5	NA	0.52
Loading	15.1	2.893	7.5 to 15.1	9.8	0.2
	30.2	2.836	15.1 to 30.2	10	0.97
	60.3	2.765	30.2 to 60.3	9	0.62
	121	2.647	60.3 to 121	3.3	0.51
	241	2.310	121 to 241	2	0.77
Unload	15.1	2.598	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: peaty CLAY black; soft, wet, high plasticity.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.2 t/m³. The calculations of void ratio are affected by the solid density value.

Approved Signatory: Date: 1/07/2022

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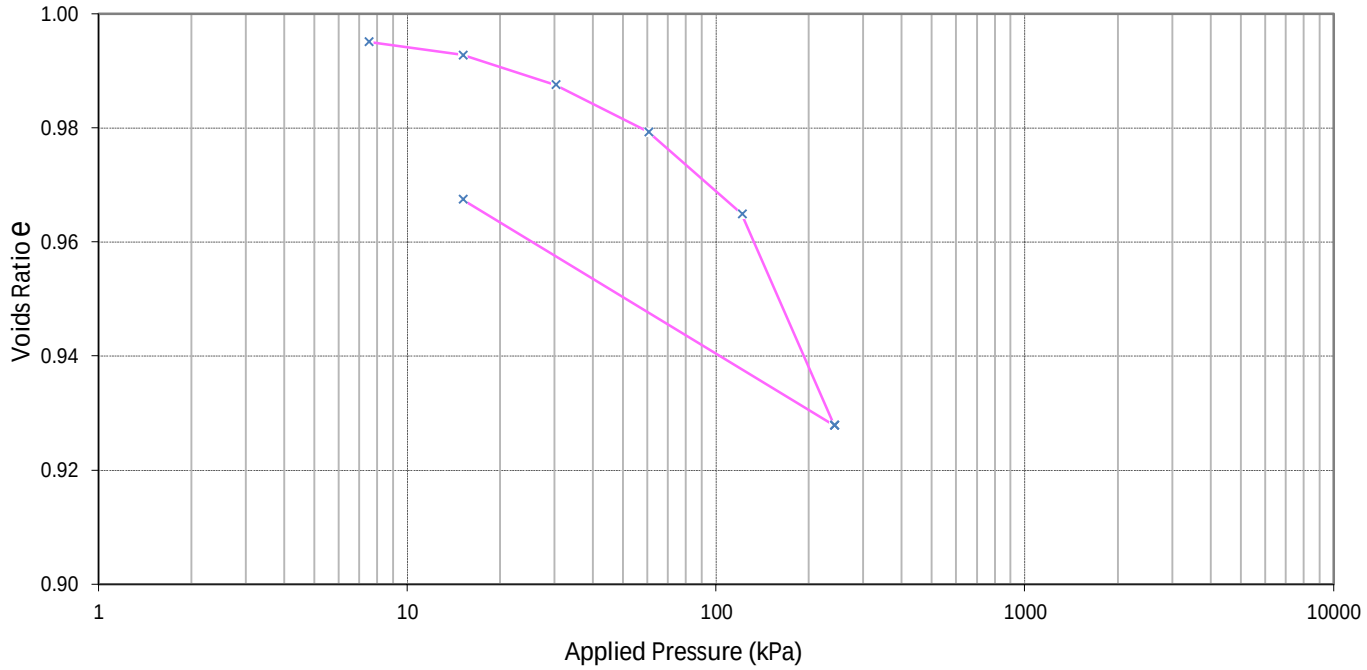
Geotechnics Project ID: 1017784.0000 Phase b
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH325
Sample Ref.: Depth: 5.69-5.75 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content	36.7	%	Initial Saturation Degree:	98	%
Initial Bulk Density:	1.82	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.33	t/m³	Temperature During Testing:	23.0 to 25.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	0.994			
Preload	7.5	0.995	0 to 7.5	NA	-0.072
Loading	15.1	0.993	7.5 to 15.1	19	0.15
	30.2	0.988	15.1 to 30.2	11	0.17
	60.3	0.979	30.2 to 60.3	8.9	0.14
	121	0.965	60.3 to 121	5.6	0.12
	241	0.928	121 to 241	5.4	0.16
Unload	15.1	0.967	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT, stiff, dark grey with blue and brown.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

Approved Signatory: Date: 1/07/2022

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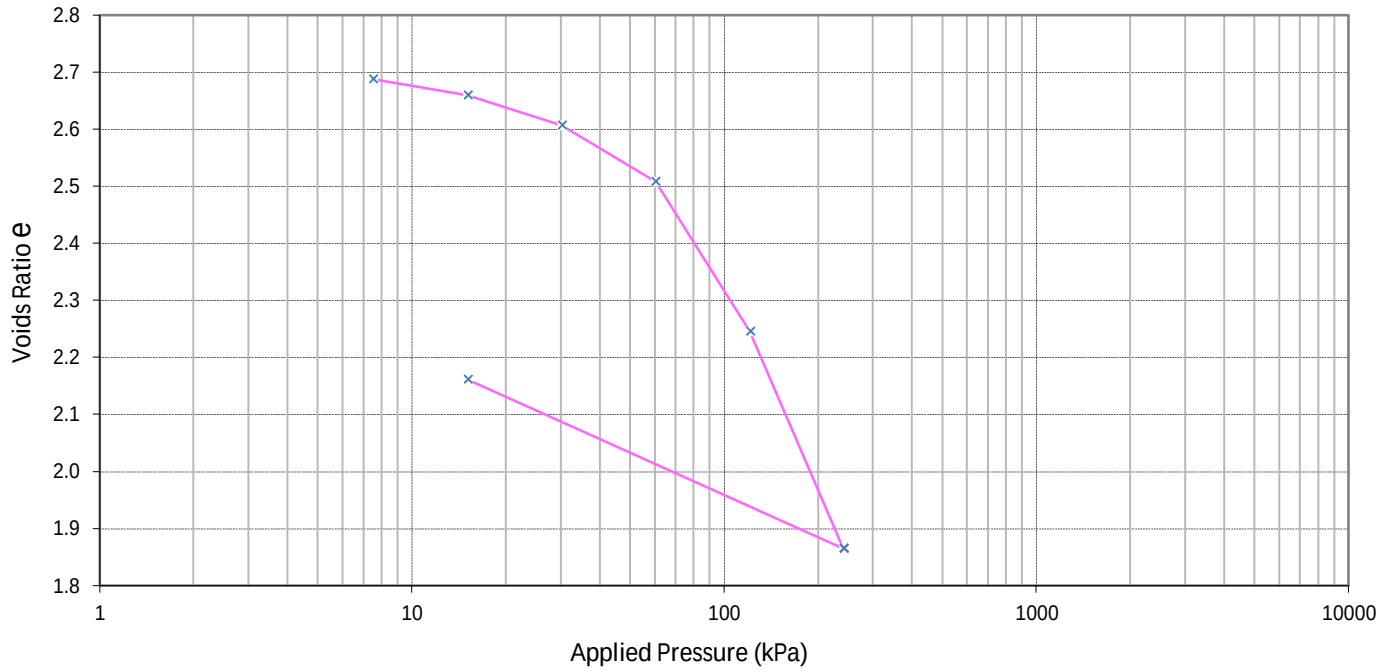
Geotechnics Project ID: 1017784.0000 Phase b
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH326
Sample Ref.: -- Depth: 4.79 - 4.83 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content	138	%	Initial Saturation Degree:	97	%
Initial Bulk Density:	1.22	t/m³	Solid Density (assumed):	1.90	t/m³
Initial Dry Density:	0.51	t/m³	Temperature During Testing:	23.0 to 25.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	2.692			
Preload	7.5	2.688	0 to 7.5	NA	0.14
Loading	15.1	2.660	7.5 to 15.1	12	1
	30.2	2.607	15.1 to 30.2	9.8	0.96
	60.3	2.508	30.2 to 60.3	8.7	0.91
	121	2.246	60.3 to 121	3.6	1.2
	241	1.865	121 to 241	2.5	0.98
Unload	15.1	2.161	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.9 t/m³. The calculations of void ratio are affected by the solid density value.

Approved Signatory: Date: 1/07/2022

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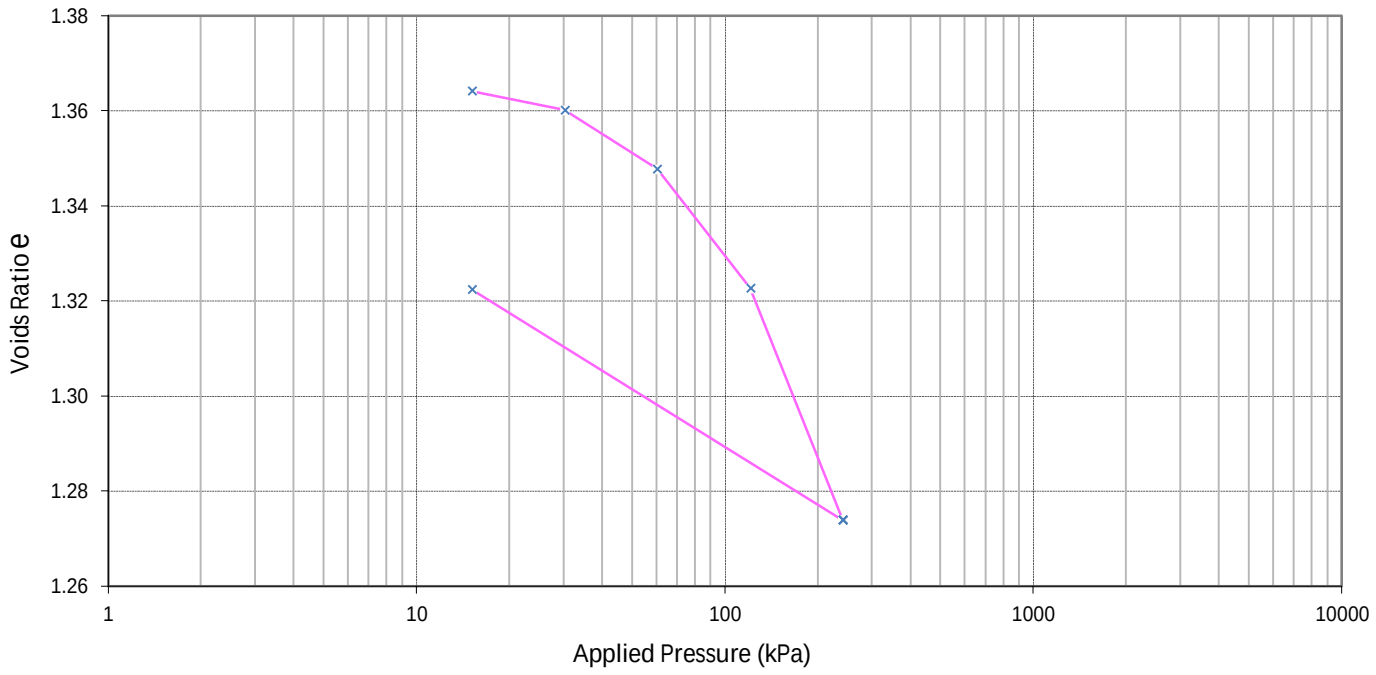
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_17

Site/Location: Eastern Busway Location ID: DH327
Sample Ref.: -- Depth: 2.95-2.99 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	50.2	%	Initial Saturation Degree:	99	%
Initial Bulk Density:	1.71	t/m³	Solid Density (assumed):	2.70	t/m³
Initial Dry Density:	1.14	t/m³	Temperature During Testing:	20.0 to 26.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	1.367			
Preload	15.1	1.364	0 to 15.1	NA	0.08
	30.2	1.360	15.1 to 30.2	3.0	0.11
	60.3	1.348	30.2 to 60.3	1.8	0.17
	121	1.323	60.3 to 121	1.7	0.18
Loading	241	1.274	121 to 241	1.6	0.17
Unload	15.1	1.322	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with a trace of sand, firm, light grey; moist, extremely high, plasticity

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.7 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 6/04/2023 Approved by KTP: Date: 11/05/2023

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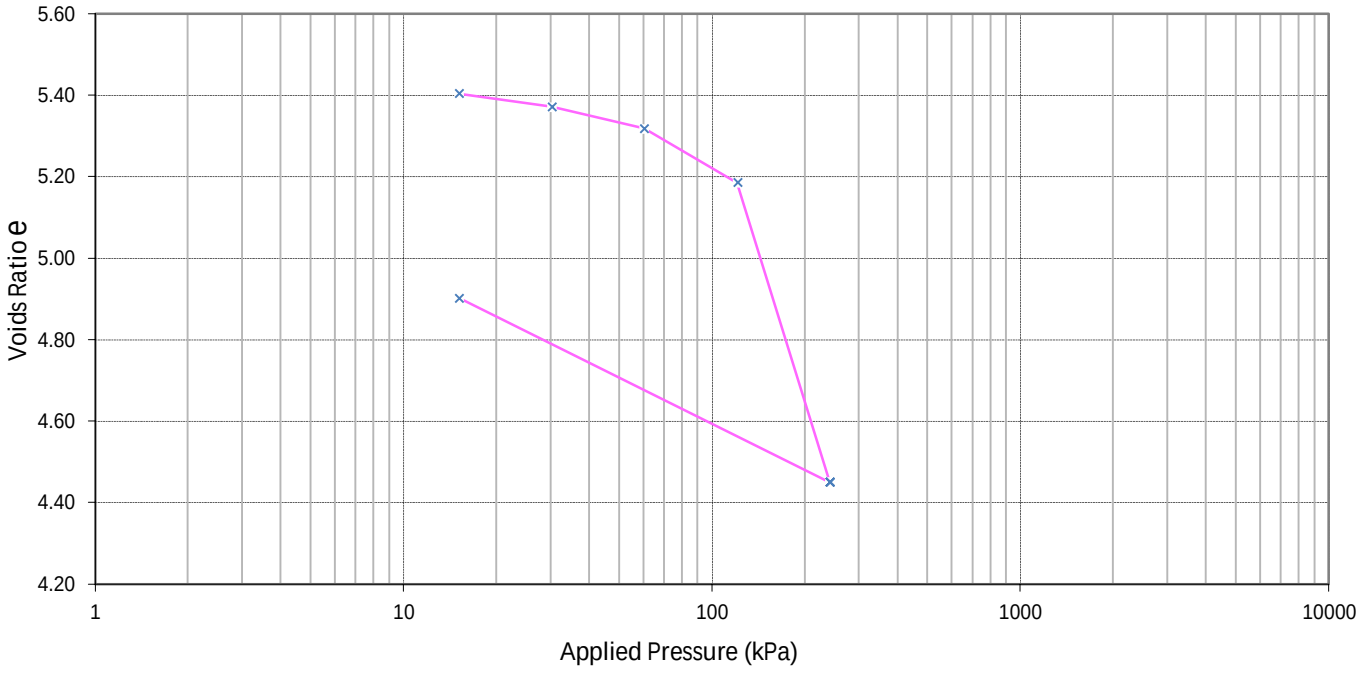
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_17

Site/Location: Eastern Busway Location ID: DH327
Sample Ref.: -- Depth: 6.36-6.4 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	290	%	Initial Saturation Degree:	96	%
Initial Bulk Density:	1.09	t/m³	Solid Density (assumed):	1.80	t/m³
Initial Dry Density:	0.28	t/m³	Temperature During Testing:	20.0 to 24.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	5.431			
Preload	15.1	5.405	0 to 15.1	NA	0.27
	30.2	5.371	15.1 to 30.2	54	0.34
	60.3	5.318	30.2 to 60.3	39	0.28
	121	5.186	60.3 to 121	19	0.35
Loading	241	4.450	121 to 241	1.4	0.99
Unload	15.1	4.901	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: PEAT, firm, black; moist, amorphous

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.8 t/m³. The calculations of void ratio are affected by the solid density value.
Max 241 kPa

Tested by: CHLU Date: 4/04/2023 Approved by KTP: Date: 11/05/2023

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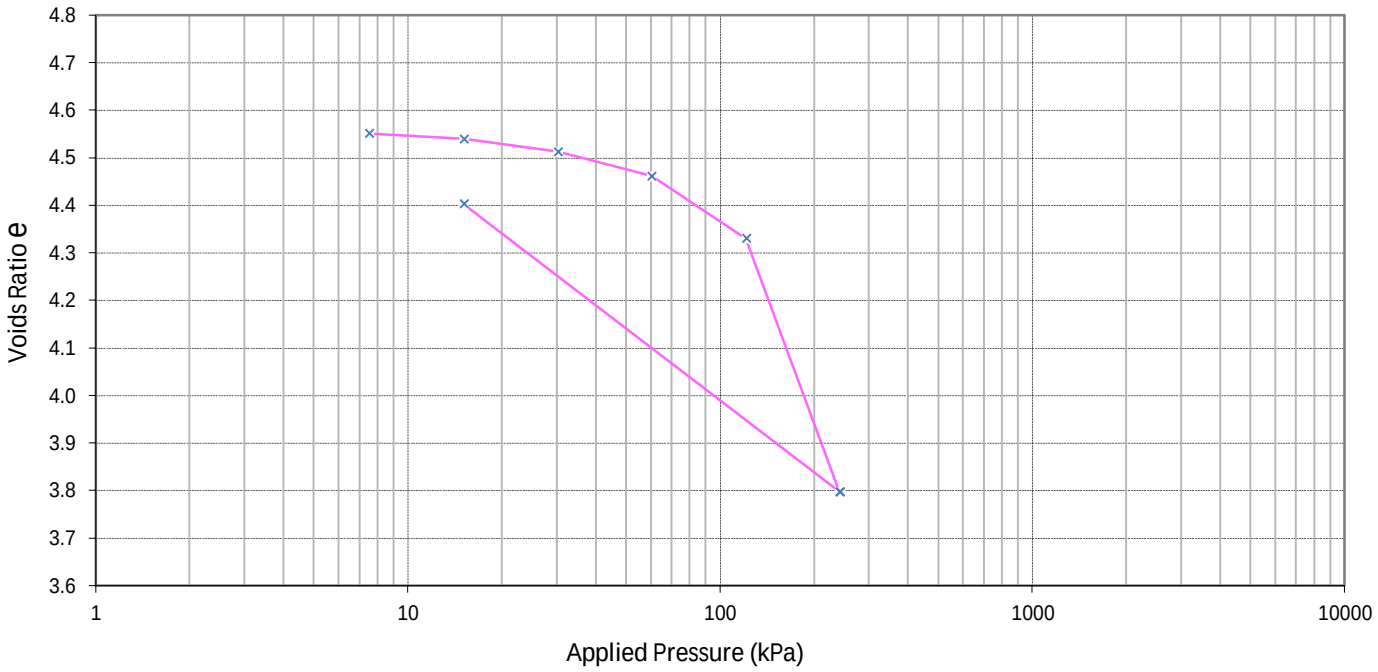
Geotechnics Project ID: 1017784.0000 Phase b
QESTLab Work Order ID:
Customer Project ID: ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH329
Sample Ref.: -- Depth: 12.25-12.3 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content	233	%	Initial Saturation Degree:	97	%
Initial Bulk Density:	1.14	t/m³	Solid Density (assumed):	1.90	t/m³
Initial Dry Density:	0.34	t/m³	Temperature During Testing:	23.0 to 25.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	4.552			
Preload	7.5	4.551	0 to 7.5	NA	0.036
Loading	15.1	4.539	7.5 to 15.1	10	0.28
	30.2	4.513	15.1 to 30.2	7.5	0.32
	60.3	4.461	30.2 to 60.3	6.2	0.31
	121	4.330	60.3 to 121	3.9	0.4
	241	3.798	121 to 241	0.89	0.83
Unload	15.1	4.403	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Sponge PEAT, with some clay, soft, black, high plasticity.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.9 t/m³. The calculations of void ratio are affected by the solid density value.

Approved Signatory: Date: 1/07/2022

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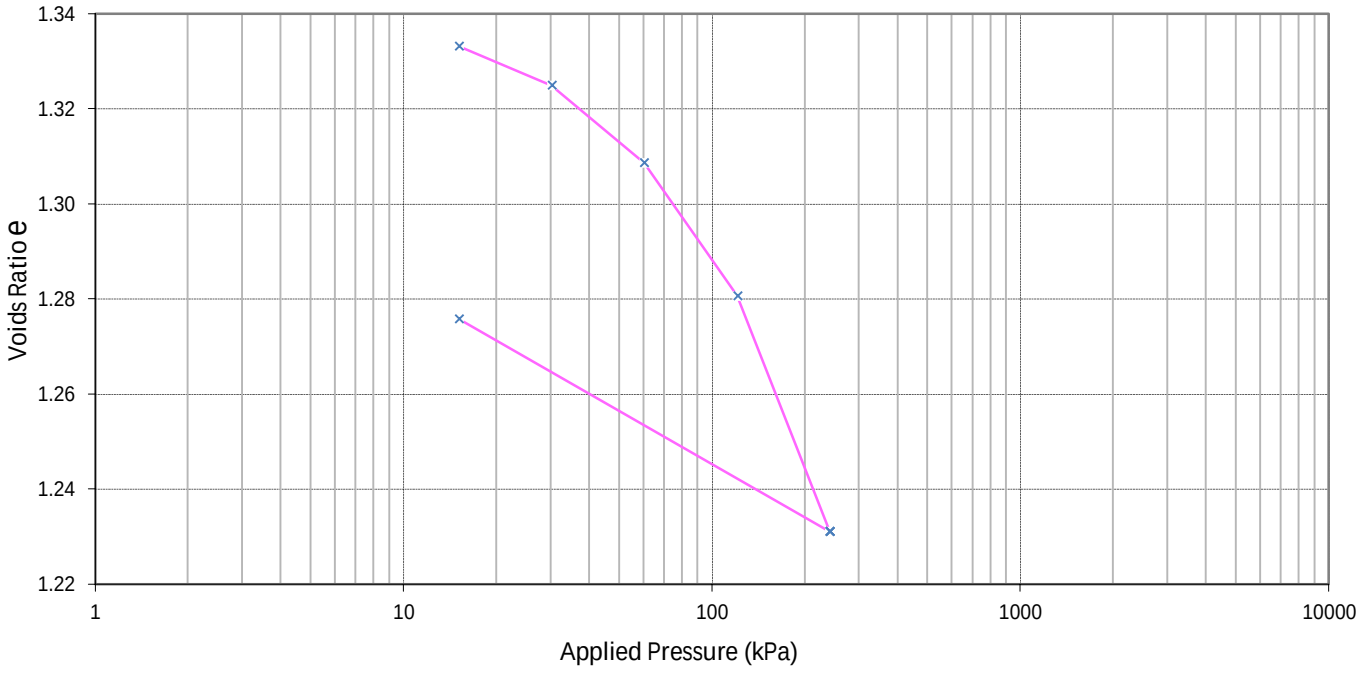
Geotechnics Project ID: 1017784.1000 Phase B
QESTLab Work Order ID:
Customer Project ID: EBA_11

Site/Location: Eastern Busway Location ID: BH329_P
Sample Ref.: -- Depth: 7.45-7.49 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Water Content:	50.1	%	Initial Saturation Degree:	99	%
Initial Bulk Density:	1.70	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.13	t/m³	Temperature During Testing:	21.0 to 23.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m2/yr)	Coefficient of Volume Compressibility Mv (m²/MN)
As received	0	1.340			
Preload	15.1	1.333	0 to 15.1	NA	0.19
	30.2	1.325	15.1 to 30.2	22	0.23
	60.3	1.309	30.2 to 60.3	39	0.23
	121	1.281	60.3 to 121	22	0.20
Loading	241	1.231	121 to 241	21	0.18
Unload	15.1	1.276	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, soft to firm, greyish brown; moist, high plasticity

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

Tested by: CHLU Date: 21/02/2023 Approved by KTP: Date: 31/03/2023

Corrosivity Suite

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Certificate of Analysis

Client:	Eastern Busway	**Lab No:**	3224044 SPv2
Contact:	Grace Wigglesworth	**Date Received:**	31-Mar-2023
	C/- The Fletcher Construction Company Limited -Inf	**Date Reported:**	17-May-2023
	Private Bag 92059	**Quote No:**	118436
	Victoria Street West	**Order No:**	454740
	Auckland 1142	**Client Reference:**	EBA_16 HILLS
		Submitted By:	Grace Wigglesworth

Sample Type: Soil

Sample Name:		DH301 13.15-13.5m 30-Mar-2023 12:00 pm	DH301 15.45-15.8m 30-Mar-2023 12:00 pm	DH307 1.95-2.4m 30-Mar-2023 12:00 pm	DH308 7.0-7.3m 30-Mar-2023 12:00 pm	DH314 1.5-1.8m 31-Mar-2023 12:00 pm
Lab Number:		3224044.1	3224044.2	3224044.3	3224044.4	3224044.5
Individual Tests						
Chloride	mg/kg dry wt	191	< 50	< 50	51	54
pH	pH Units	5.9	7.7	8.2	5.9	4.9
Water Soluble Sulphate as SO4 and SO3						
Water Soluble Sulphate	g/100g dry wt	0.084	0.074	0.035	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	0.070	0.062	0.029	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	0.42	0.37	0.17	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	0.35	0.31	0.14	< 0.10	< 0.10

Sample Name:		DH318 4.0-4.5m 31-Mar-2023 12:00 pm	DH319 5.2-5.8m 31-Mar-2023 12:00 pm	DH323 0.5-1.0m 31-Mar-2023 12:00 pm	DH325 1.2-2.0m 31-Mar-2023 12:00 pm
Lab Number:		3224044.6	3224044.7	3224044.8	3224044.9
Individual Tests					
Chloride	mg/kg dry wt	< 50	< 50	< 50	< 50
pH	pH Units	5.8	5.3	5.8	5.8
Water Soluble Sulphate as SO4 and SO3					
Water Soluble Sulphate	g/100g dry wt	< 0.010	0.013	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	< 0.010	0.011	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Non-Routine Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-9
Non-Routine sample preparation. Air drying and 425 um sieving.	Air dried and sieved, <425 um fraction. Used for sample preparation.	-	1-9
Non-Routine sample preparation. Air drying and 90 um sieving.	Air dried and sieved, <90 um fraction. Used for sample preparation.	-	1-9
Water Soluble Sulphate as SO4 and SO3		-	1-9
Water Soluble Chloride	Extraction into boiling water, potentiometric titration with silver nitrate. DIN 4030 Part 2 section 5.3.5.	50 mg/kg dry wt	1-9
pH	2.5:1 water:air dried, sub-2mm sieved soil, vol:wt, stand 8 hrs, electrometric with a pH meter. BS 1377: Part 3: 1990 section 9.5.	0.1 pH Units	1-9
Water Soluble Sulphate	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Water Soluble Sulphate as SO3	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9
Water Soluble Sulphate	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9
Water Soluble Sulphate as SO3	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 04-Apr-2023 and 17-May-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Martin Cowell - BSc
Client Services Manager - Environmental

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W www.hill-laboratories.com

Certificate of Analysis

Client:	Eastern Busway	**Lab No:**	3224044 SPv2
Contact:	Grace Wigglesworth	**Date Received:**	31-Mar-2023
	C/- The Fletcher Construction Company Limited -Inf	**Date Reported:**	17-May-2023
	Private Bag 92059	**Quote No:**	118436
	Victoria Street West	**Order No:**	454740
	Auckland 1142	**Client Reference:**	EBA_16 HILLS
		Submitted By:	Grace Wigglesworth

Sample Type: Soil

Sample Name:		DH301 13.15-13.5m 30-Mar-2023 12:00 pm	DH301 15.45-15.8m 30-Mar-2023 12:00 pm	DH307 1.95-2.4m 30-Mar-2023 12:00 pm	DH308 7.0-7.3m 30-Mar-2023 12:00 pm	DH314 1.5-1.8m 31-Mar-2023 12:00 pm
Lab Number:		3224044.1	3224044.2	3224044.3	3224044.4	3224044.5
Individual Tests						
Chloride	mg/kg dry wt	191	< 50	< 50	51	54
pH	pH Units	5.9	7.7	8.2	5.9	4.9
Water Soluble Sulphate as SO4 and SO3						
Water Soluble Sulphate	g/100g dry wt	0.084	0.074	0.035	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	0.070	0.062	0.029	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	0.42	0.37	0.17	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	0.35	0.31	0.14	< 0.10	< 0.10

Sample Name:		DH318 4.0-4.5m 31-Mar-2023 12:00 pm	DH319 5.2-5.8m 31-Mar-2023 12:00 pm	DH323 0.5-1.0m 31-Mar-2023 12:00 pm	DH325 1.2-2.0m 31-Mar-2023 12:00 pm
Lab Number:		3224044.6	3224044.7	3224044.8	3224044.9
Individual Tests					
Chloride	mg/kg dry wt	< 50	< 50	< 50	< 50
pH	pH Units	5.8	5.3	5.8	5.8
Water Soluble Sulphate as SO4 and SO3					
Water Soluble Sulphate	g/100g dry wt	< 0.010	0.013	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	< 0.010	0.011	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Non-Routine Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-9
Non-Routine sample preparation. Air drying and 425 um sieving.	Air dried and sieved, <425 um fraction. Used for sample preparation.	-	1-9
Non-Routine sample preparation. Air drying and 90 um sieving.	Air dried and sieved, <90 um fraction. Used for sample preparation.	-	1-9
Water Soluble Sulphate as SO4 and SO3		-	1-9
Water Soluble Chloride	Extraction into boiling water, potentiometric titration with silver nitrate. DIN 4030 Part 2 section 5.3.5.	50 mg/kg dry wt	1-9
pH	2.5:1 water:air dried, sub-2mm sieved soil, vol:wt, stand 8 hrs, electrometric with a pH meter. BS 1377: Part 3: 1990 section 9.5.	0.1 pH Units	1-9
Water Soluble Sulphate	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Water Soluble Sulphate as SO3	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9
Water Soluble Sulphate	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9
Water Soluble Sulphate as SO3	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 04-Apr-2023 and 17-May-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Martin Cowell - BSc
Client Services Manager - Environmental

Eastern Busway

Unconfined Compression Strength Test

GEOTECHNICS
1 Hill Street
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p. +64 9 356 3510

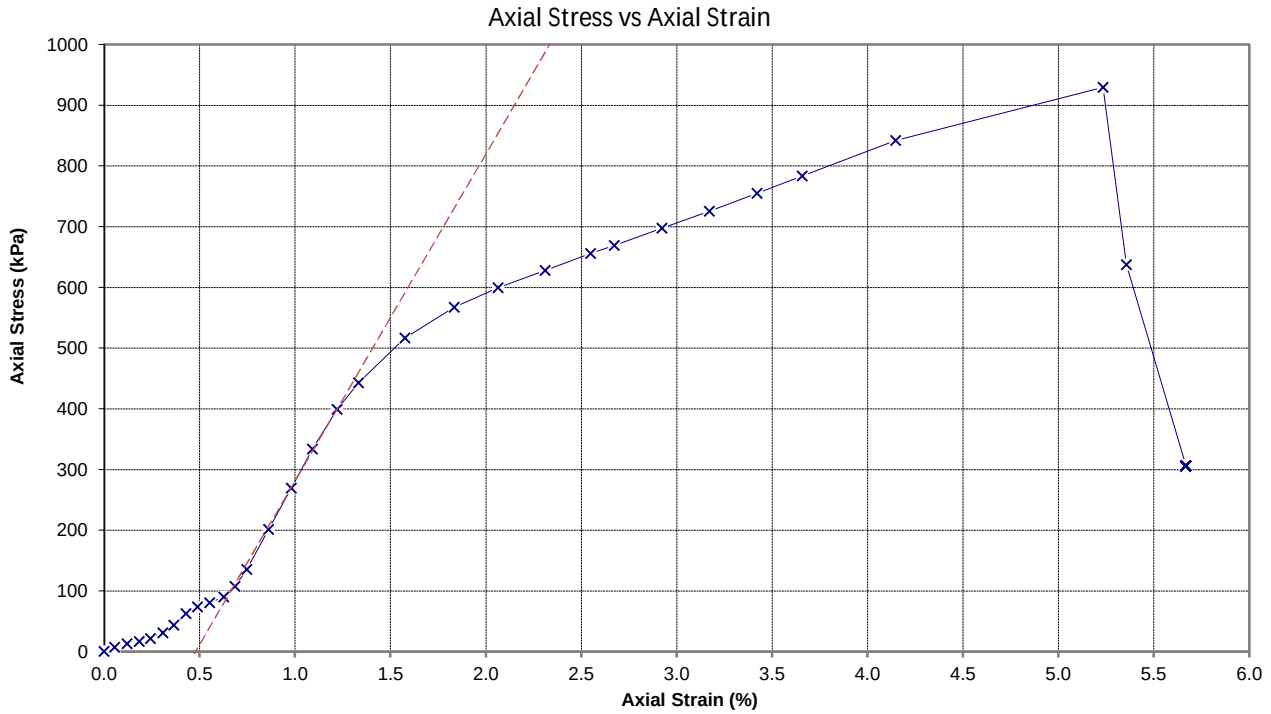
Geotechnics Project ID	1017784.1000.2.0
Customer Project ID	EBA_16

Site: Eastern Busway Location ID: DH301

Sample Ref.: -- Depth: 18.5-18.75 (m)

Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method D)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	121.67	Bulk Density (t/m³)	2.04
Sample Diameter (mm)	60.18	Dry Density (t/m³)	1.65
Test Length (mm)	121.67	Water Content (%)	23.6
Test Height / Diameter Ratio	2.02		

Failure Value:

Axial Strain ε (%)	Unconfined Compressive Strength q_u (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
5.24	929	0.33	54

Mode of Failure: Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILTSTONE, extremely weak, dark brownish grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Failure Photo:

Tested by: CHLU Date: 29/03/2023 Approved by: Date: 28/04/2023

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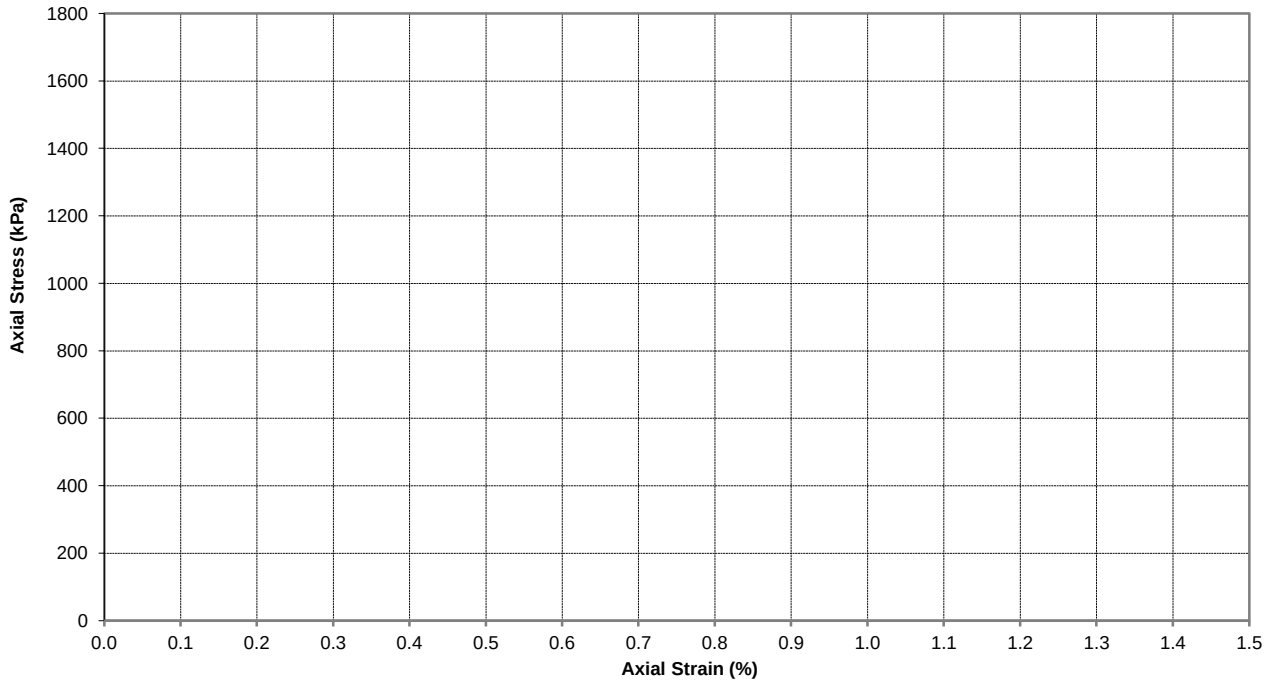
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_16

Site: Eastern Busway
Location ID: DH301
Sample Ref.: --
Depth: 23.1-23.4 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	120.77	Bulk Density (t/m³)	2.08
Sample Diameter (mm)	60.65	Dry Density (t/m³)	1.70
Test Length (mm)	120.77	Water Content (%)	21.8
Test Height / Diameter Ratio	1.99		

Failure Value:

Unconfined Compressive Strength q_u (kPa)

2354

Mode of Failure:

Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 29/03/2023 Approved by: Date: 28/04/2023

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Geotechnics Project ID 1017784
Customer Project ID Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL56.1				
Site	Eastern Busway ALCOE-84				
Test Request Number	-	**BH No.**	DH302	**Depth**	12.69-12.98 m
Sample Description	grey, very weak, sandy SILTSTONE				

Sample Parameters

Sample Height	(mm)	123.75	Bulk Density	(t/m³)	1.99
Sample Diameter	(mm)	60.35	Dry Density	(t/m³)	1.62
Test Height	(mm)	123.75	Water Content	(%)	23.0
Test H/D Ratio		2.05			

Failure Value
Unconfined Compressive Strength qu (kPa)
1850

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

Entered by: GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022

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Geotechnics Project ID 1017784
Customer Project ID Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL56.2				
Site	Eastern Busway ALCOE-84				
Test Request Number	-	**BH No.**	DH304	**Depth**	23.82-24.0 m
Sample Description	grey, very weak, sandy SILTSTONE				

Sample Parameters

Sample Height	(mm)	123.80	Bulk Density	(t/m³)	1.85
Sample Diameter	(mm)	61.86	Dry Density	(t/m³)	1.58
Test Height	(mm)	123.80	Water Content	(%)	17.3
Test H/D Ratio		2.00			

Failure Value
Unconfined Compressive Strength qu (kPa)
1700

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

Entered by: GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022

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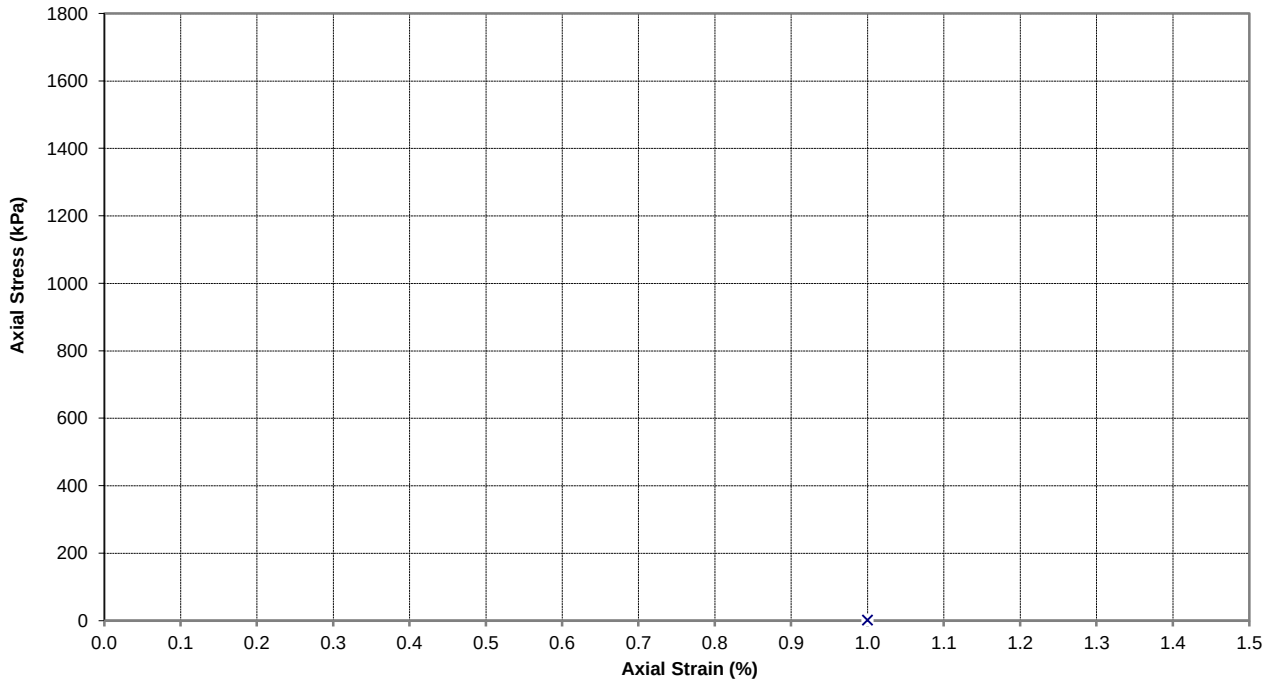
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_17

Site: Eastern Busway
Location ID: DH305
Sample Ref.: --
Depth: 18.17-18.29 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	124.91	Bulk Density (t/m³)	2.03
Sample Diameter (mm)	60.73	Dry Density (t/m³)	1.66
Test Length (mm)	124.91	Water Content (%)	22.0
Test Height / Diameter Ratio	2.06		

Failure Value:

Unconfined Compressive Strength q_u (kPa)

2441

Mode of Failure:

Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered SANDSTONE, very weak, dark brownish grey.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 29/03/2023 Approved by: Date: 11/05/2023

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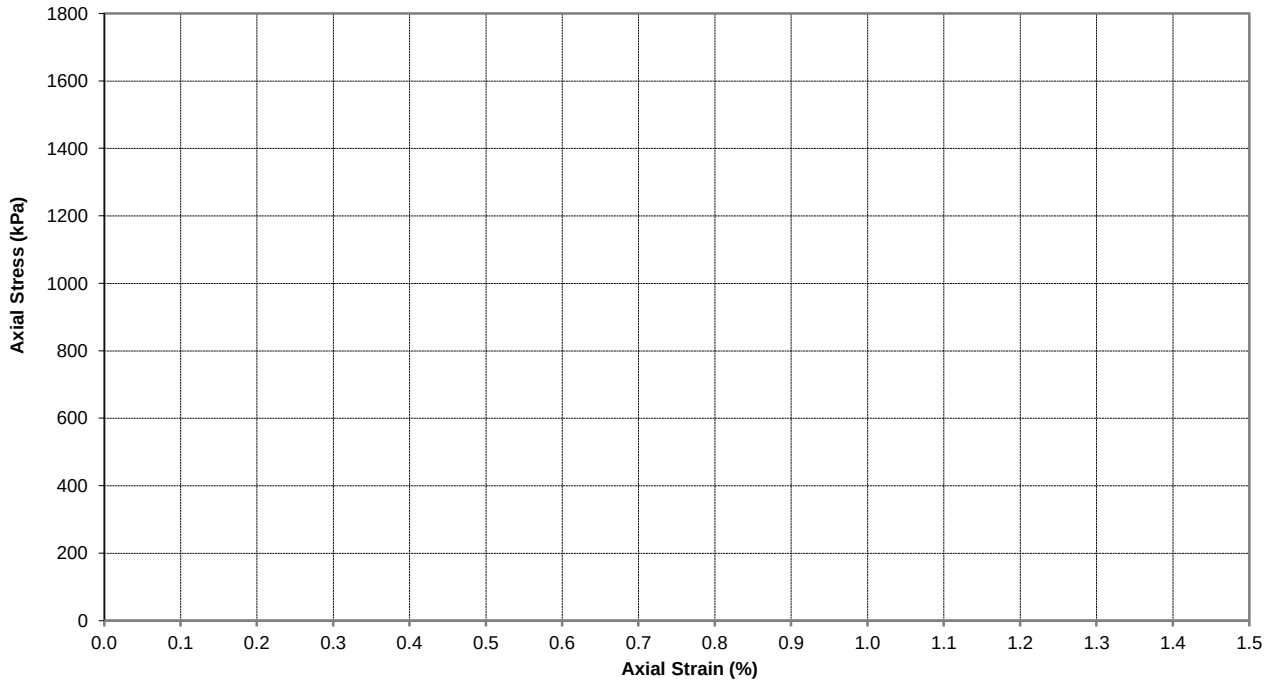
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_16

Site: Eastern Busway
Location ID: DH306
Sample Ref.: --
Depth: 18.48-18.7 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	124.77	Bulk Density (t/m³)	1.97
Sample Diameter (mm)	60.07	Dry Density (t/m³)	1.57
Test Length (mm)	124.77	Water Content (%)	25.2
Test Height / Diameter Ratio	2.08		

Failure Value:

Unconfined Compressive Strength q_u (kPa)

1330

Mode of Failure:
Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 29/03/2023 Approved by: Date: 28/04/2023

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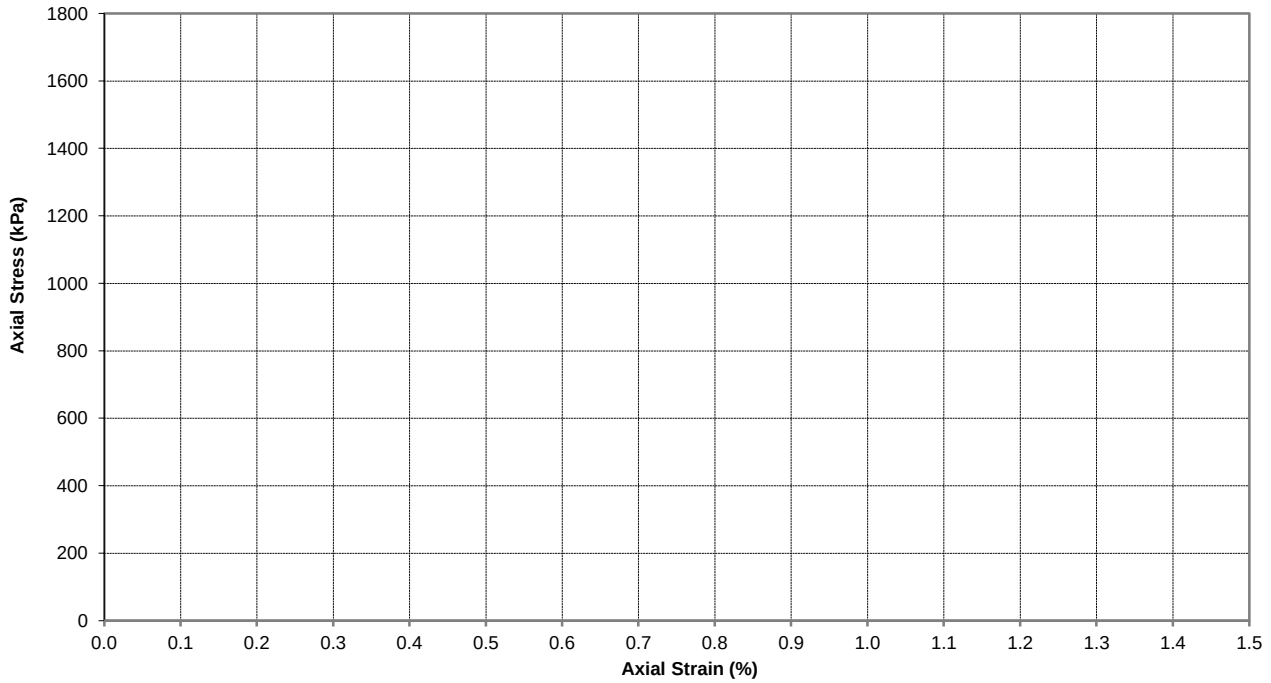
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_

Site: Eastern Busway
Location ID: DH307
Sample Ref.: --
Depth: 14.52-14.64 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	123.86	Bulk Density (t/m³)	1.96
Sample Diameter (mm)	60.49	Dry Density (t/m³)	1.59
Test Length (mm)	123.86	Water Content (%)	23.6
Test Height / Diameter Ratio	2.05		

Failure Value:

Unconfined Compressive Strength q_u (kPa)
1777

Mode of Failure:

Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, light grey.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Failure Photo:

Tested by: CHLU Date: 8/05/2023 Approved by: Date: 11/05/2023

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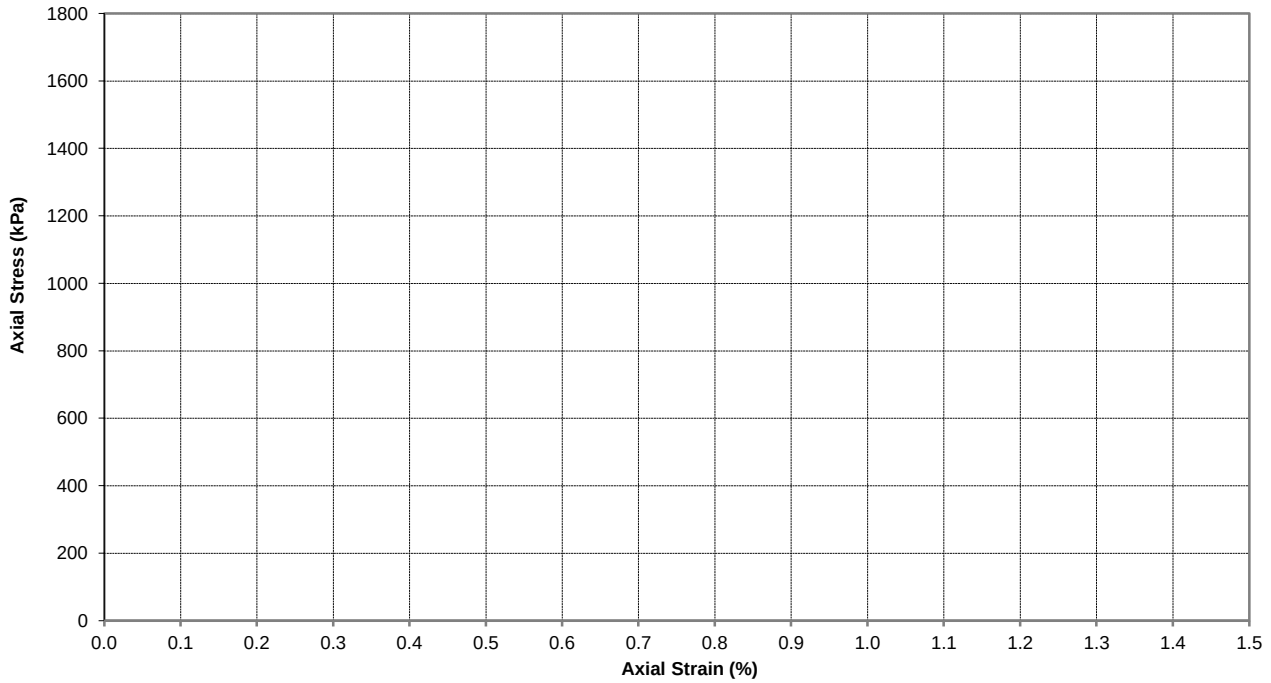
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_16

Site: Eastern Busway
Location ID: DH308
Sample Ref.: --
Depth: 1-1.38 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	125.36	Bulk Density (t/m³)	2.44
Sample Diameter (mm)	60.73	Dry Density (t/m³)	2.40
Test Length (mm)	125.36	Water Content (%)	1.4
Test Height / Diameter Ratio	2.06		

Failure Value:

Unconfined Compressive Strength q_u (kPa)

58871

Mode of Failure:

Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: BASALT, slightly weathered, strong, light grey and black; highly vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 30/03/2023 Approved by: Date: 28/04/2023

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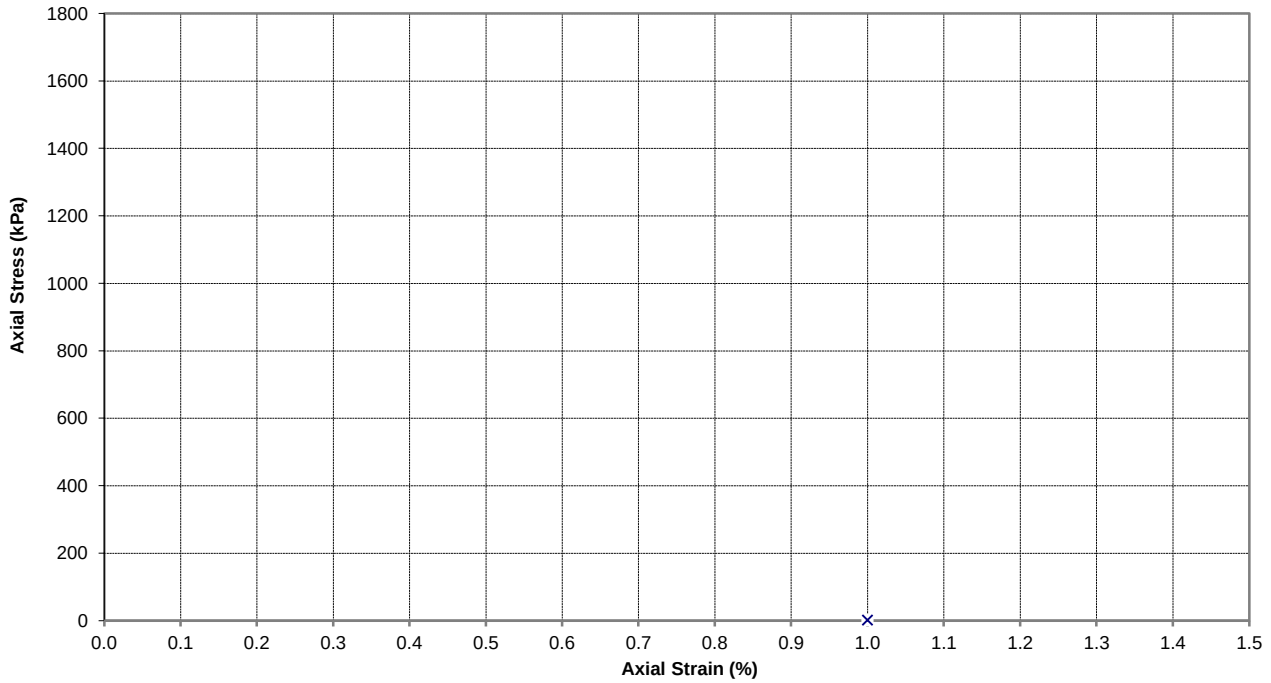
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_17

Site: Eastern Busway
Location ID: DH308_P
Sample Ref.: --
Depth: 3.35-3.47 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	124.18	Bulk Density (t/m³)	2.71
Sample Diameter (mm)	60.77	Dry Density (t/m³)	2.69
Test Length (mm)	124.18	Water Content (%)	0.9
Test Height / Diameter Ratio	2.04		

Failure Value:

Unconfined Compressive Strength q_u (kPa)

86345

Mode of Failure:

Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered BASALT, strong, light grey; slightly vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 30/03/2023 Approved by: Date: 11/05/2023

GEOTECHNICS
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Geotechnics Project ID: 1017784
Customer Project ID: ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL101.2				
Site	Eastern Busway				
BH No.	DH312			**Depth**	1.25-1.5 m
Sample Description	BASALT, vesicular, strong.				

Sample Parameters

Sample Height	(mm)	119.29	Bulk Density	(t/m³)	2.39
Sample Diameter	(mm)	60.49	Dry Density	(t/m³)	2.34
Test Height	(mm)	119.29	Water Content	(%)	1.9
Test H/D Ratio		1.97			

Failure Value
Unconfined Compressive Strength qu (kPa)
49000

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

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1 Hill Street
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Geotechnics Project ID: 1017784
Customer Project ID: ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL101.3				
Site	Eastern Busway				
BH No.	DH312			**Depth**	3.2-3.7 m
Sample Description	BASALT, vesicular, strong.				

Sample Parameters

Sample Height	(mm)	119.53	Bulk Density	(t/m³)	2.78
Sample Diameter	(mm)	60.39	Dry Density	(t/m³)	2.66
Test Height	(mm)	119.53	Water Content	(%)	4.4
Test H/D Ratio		1.98			

Failure Value
Unconfined Compressive Strength qu (kPa)
80000

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

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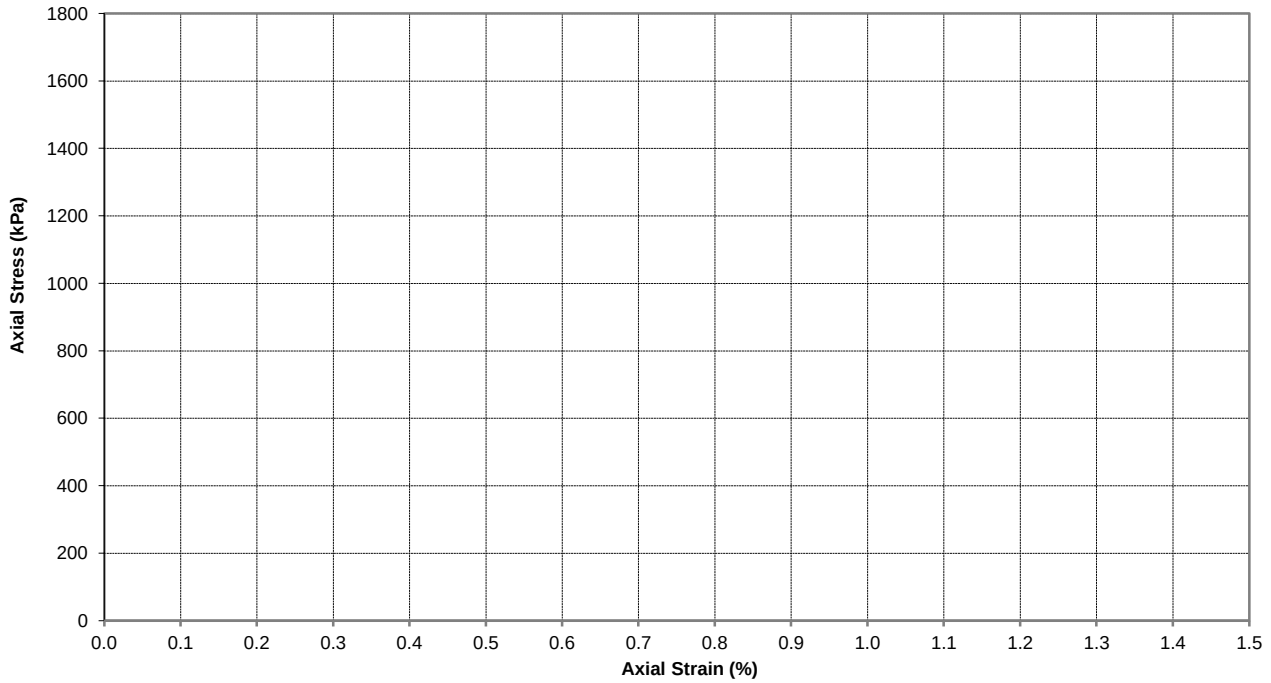
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_16

Site: Eastern Busway
Location ID: DH322
Sample Ref.: --
Depth: 18.45-18.57 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	120.10	Bulk Density (t/m³)	1.94
Sample Diameter (mm)	60.24	Dry Density (t/m³)	1.53
Test Length (mm)	120.10	Water Content (%)	27.2
Test Height / Diameter Ratio	1.99		

Failure Value:

Unconfined Compressive Strength q_u (kPa)
74

Mode of Failure:

Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILTSTONE, extremely weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Failure Photo:

Tested by: CHLU Date: 8/05/2023 Approved by: Date: 10/05/2023

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Geotechnics Project ID: 1017784
Customer Project ID: ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL103.3				
Site	Eastern Busway				
BH No.	DH322			**Depth**	21.6-21.92 m
Sample Description	SILTSTONE, grey, extremely weak				

Sample Parameters

Sample Height	(mm)	120.44	Bulk Density	(t/m³)	2.07
Sample Diameter	(mm)	60.33	Dry Density	(t/m³)	1.71
Test Height	(mm)	120.44	Water Content	(%)	21.3
Test H/D Ratio		2.00			

Failure Value
Unconfined Compressive Strength qu (kPa)
660

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

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Geotechnics Project ID: 1017784
Customer Project ID: ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL104.4				
Site	Eastern Busway				
BH No.	DH323			**Depth**	21.84-22.01 m
Sample Description	SILTSTONE, grey, extremely weak				

Sample Parameters

Sample Height	(mm)	111.12	Bulk Density	(t/m³)	2.13
Sample Diameter	(mm)	56.62	Dry Density	(t/m³)	1.83
Test Height	(mm)	111.12	Water Content	(%)	16.4
Test H/D Ratio		1.96			

Failure Value
Unconfined Compressive Strength qu (kPa)
860

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

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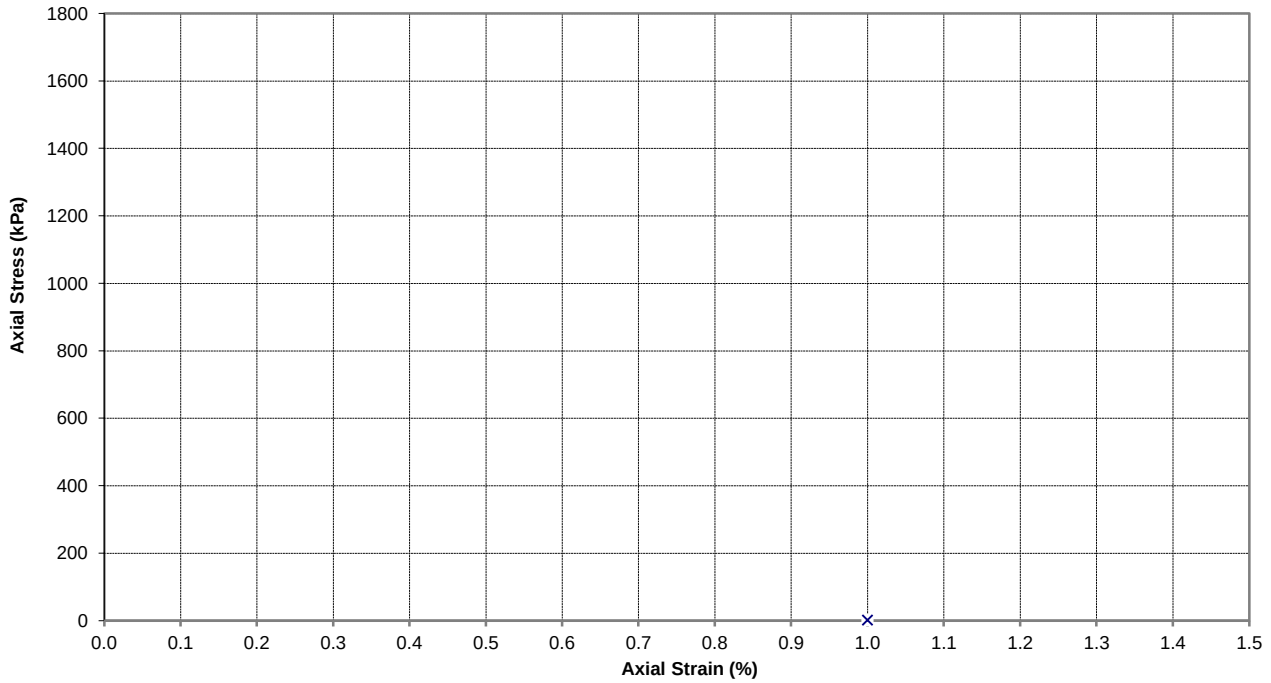
Geotechnics Project ID 1017784.1000.2.0
Customer Project ID EBA_17

Site: Eastern Busway
Location ID: DH328_P
Sample Ref.: --
Depth: 3.82-3.95 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
NZS 4402:1986 Test 2.1 Determination of Water Content

UNCONFINED COMPRESSION STRENGTH TEST

Axial Stress vs Axial Strain



Initial Sample Parameters:

Sample Length (mm)	125.45	Bulk Density (t/m³)	2.73
Sample Diameter (mm)	61.05	Dry Density (t/m³)	2.64
Test Length (mm)	125.45	Water Content (%)	3.3
Test Height / Diameter Ratio	2.05		

Failure Value:

Unconfined Compressive Strength q_u (kPa)
75975

Mode of Failure:

Shear

Failure Photo:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered BASALT, strong, light grey with black; vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.
The test is not IANZ accredited.

Tested by: CHLU Date: 30/03/2023 Approved by: Date: 11/05/2023

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Geotechnics Project ID: 1017784
Customer Project ID: ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL108.2				
Site	Eastern Busway				
BH No.	DH329			**Depth**	34.95-35.18 m
Sample Description	SILTSTONE, grey, very weak				

Sample Parameters

Sample Height	(mm)	112.17	Bulk Density	(t/m³)	2.06
Sample Diameter	(mm)	58.28	Dry Density	(t/m³)	1.71
Test Height	(mm)	112.17	Water Content	(%)	20.6
Test H/D Ratio		1.92			

Failure Value
Unconfined Compressive Strength qu (kPa)
1500

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

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Geotechnics Project ID 1017784
Customer Project ID Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details

Geotechnics Sample ID	AKL56.3				
Site	Eastern Busway ALCOE-84				
Test Request Number	-	**BH No.**	DH330	**Depth**	20.43-20.61 m
Sample Description	grey, extremely weak, SILTSTONE				

Sample Parameters

Sample Height	(mm)	122.57	Bulk Density	(t/m³)	2.12
Sample Diameter	(mm)	60.86	Dry Density	(t/m³)	1.74
Test Height	(mm)	122.57	Water Content	(%)	21.3
Test H/D Ratio		2.01			

Failure Value
Unconfined Compressive Strength qu (kPa)
650

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

Test Remarks

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

Entered by: GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022

Eastern Busway

Liquid Limit, Plastic limit, Plasticity index

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Geotechnics Project ID 1017784.1000.A.0
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH301		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL475.1		
	Reference	-	**Depth**	4.5-5.0 m
	Description	silty CLAY, orange brown with blueish grey; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**75**
Plastic Limit	**28**
Plasticity Index	**47**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 9/05/2023

This test result is IANZ accredited.

Approved by KTP **Date** 15/05/2023

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Geotechnics Project ID	1017784
Customer Project ID	Schedule 7

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH302		
	Description	ALCOE-84		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL67.1		
	Reference	-	**Depth**	6.5-7 m
	Description	clayey SILT with trace sand, blueish grey-brown, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**52**
Plastic Limit	**21**
Plasticity Index	**31**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

This test result is IANZ accredited.

Approved By Stan Anderson **Date** 25/05/2022

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH303		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.1		
	Reference	-	**Depth**	7.5-8.0 m
	Description	silty SAND with minor clay and trace of gravel, dark blueish grey with brown; firm, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**37**
Plastic Limit	**21**
Plasticity Index	**16**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 1/03/2023

This test result is IANZ accredited.

Approved by KTP **Date** 07/03/2023

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH303		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.2		
	Reference	-	**Depth**	9.5-10.0 m
	Description	clayey SILT, black; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**361**
Plastic Limit	**224**
Plasticity Index	**137**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 1/03/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	3/03/2023

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Geotechnics Project ID 1017784
Customer Project ID Schedule 7

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH304		
	Description	ALCOE-84		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL68.2		
	Reference	-	**Depth**	5.5-6 m
	Description	clayey SILT with trace sand, blueish grey-brown, moist, intermediate plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**44**
Plastic Limit	**24**
Plasticity Index	**20**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

This test result is IANZ accredited.

Approved By Steve Anderson **Date** 25/05/2022

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Geotechnics Project ID 1017784.1000 Phase 4
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH306		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.1		
	Reference	-	**Depth**	6.0-6.5 m
	Description	silty CLAY with trace of sand and gravel, light orange brown with orange; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**138**
Plastic Limit	**34**
Plasticity Index	**104**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 1/03/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	8/03/2023

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH309		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.3		
	Reference	-	**Depth**	7.5-8.0 m
	Description	clayey SILT with minor sand and trace of gravel, dark blueish grey; very soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**63**
Plastic Limit	**26**
Plasticity Index	**37**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 28/02/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	3/03/2023

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH309		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.4		
	Reference	-	**Depth**	9.0-9.5 m
	Description	sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**40**
Plastic Limit	**24**
Plasticity Index	**16**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 28/02/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	3/03/2023

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Geotechnics Project ID 1017784.1000 Phase 4
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH311		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.2		
	Reference	-	**Depth**	5.5-6.0 m
	Description	silty sandy CLAY with trace of gravel, dark greenish grey; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**91**
Plastic Limit	**33**
Plasticity Index	**58**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 1/03/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	8/03/2023

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Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH312		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL101.1		
	Reference	-	**Depth**	7-7.5 m
	Description	sandy SILT minor clay, whiteish grey; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**28**
Plastic Limit	**20**
Plasticity Index	**8**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.
Test By cagi 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

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Geotechnics Project ID 1017784.1000 Phase 4
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH314		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.4		
	Reference	-	**Depth**	1.75-2.25 m
	Description	silty CLAY with some sand and trace of gravel, dark orange brown with black; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**60**
Plastic Limit	**25**
Plasticity Index	**35**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 2/03/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	8/03/2023

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Geotechnics Project ID 1017784.1000.A.0
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH318_P		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL475.4		
	Reference	-	**Depth**	10.2-10.9 m
	Description	SILT with minor sand and clay and trace of gravel, light brownish grey with black; soft, moist, non plastic		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**Not Obtainable**
Plastic Limit	**Not Obtainable**
Plasticity Index	**Not Obtainable**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Both the final Liquid Limit and Plastic Limit results were unobtainable during the course of testing. • Date tested 10/05/2023

This test result is IANZ accredited.

Approved by KTP **Date** 11/05/2023

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Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH322		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL103.1		
	Reference	-	**Depth**	6.5-7 m
	Description	organic CLAY, with decomposed wood flecks; soft, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**126**
Plastic Limit	**45**
Plasticity Index	**81**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.
Test By cagi 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

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Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH322		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL103.2		
	Reference	-	**Depth**	11-11.5 m
	Description	sandy SILT minor clay, dark grey; soft, moist, non-plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**31**
Plastic Limit	**Non-Plastic**
Plasticity Index	**Result Not Obtainable**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • PL not obtainable.
Test By cagi 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

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Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH323		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL104.2		
	Reference	-	**Depth**	3-3.45 m
	Description	silty SAND, minor clay, dark brown; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**38**
Plastic Limit	**24**
Plasticity Index	**14**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.
Test By cagi 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

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Geotechnics Project ID 1017784.1000 Phase 4
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH324		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL377.6		
	Reference	-	**Depth**	7.0-7.5 m
	Description	sandy CLAY, greenish blueish grey; stiff, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**66**
Plastic Limit	**21**
Plasticity Index	**45**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 2/03/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	8/03/2023

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Geotechnics Project ID 1017784
Customer Project ID ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH325		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL106.1		
	Reference	-	**Depth**	4-4.5 m
	Description	silty SAND minor clay, light greyish brown; soft, moist, low plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**42**
Plastic Limit	**24**
Plasticity Index	**18**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.
Test By cagi 13/06/2022

This test result is IANZ accredited.

Approved By **Date** 17/06/2022

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Geotechnics Project ID 1017784.1000 Phase A
Customer Project ID 406084

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	DH329_P		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL371.6		
	Reference	-	**Depth**	7.0-7.5 m
	Description	clayey SILT with trace of sand and gravel, dark brownish grey with orange; firm, moist, high plasticity		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**65**
Plastic Limit	**32**
Plasticity Index	**33**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Date tested 28/02/2023

This test result is IANZ accredited.

Approved by KTP	CHME	**Date**	3/03/2023

Axial Point load strength

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Site: Eastern Busway - ALCOE-84

Your Job No.: **Schedule 7**

Our Job No.: **1017784.000**

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		DH302	DH302	DH303	DH303	DH304	DH304
Sample ID		AKL60.1	AKL60.2	AKL61.1	AKL61.2	AKL62.1	AKL62.2
Depth	(m)	12.42-12.69	12.42-12.69	14.23-14.42	14.23-14.42	11.27-11.44	11.27-11.44
Sample History		Natural	Natural	Natural	Natural	Natural	Natural
Shape		Core	Core	Core	Core	Core	Core
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
Type of Test		Axial	Axial	Axial	Axial	Axial	Axial
Direction of loading to plane of weakness		---	---	---	---	---	---
Average Distance D	(mm)	55.9	54.4	52.5	48.8	55.3	48.7
Average Width W	(mm)	60.8	60.5	60.8	60.7	61.1	61.1
Failure Load - Corrected Load P	(kN)	0.5900	0.647	0.13	0.23	0.4380	0.491
Platen Separation D'	(mm)	56	54	53	49	55	49
Equivalent core diameter $(De)^2$	(mm^2)	4322	4187	4065	3768	4305	3787
Equivalent core diameter (De)	(mm)	65.7	64.7	63.8	61.4	65.6	61.5
$Is = P/(De)^2$	(MPa)	0.13650	0.1545	0.031	0.061	0.10170	0.1296
Size Correction F = (De/50)^0.45		1.13	1.12	1.12	1.10	1.13	1.10
Strength Index Is(50)=F*Is	(MPa)	**0.154**	**0.173**	**0.035**	**0.067**	**0.115**	**0.143**
Mean Strength Index Is(50)=F*Is	(MPa)	---	---	---	---	---	---
Water Content	(%)	**21.9**	**20.6**	**22.1**	**24.4**	**21.4**	**21.7**

Sample Description:

AKL60.1-2: grey, very weak, SANDSTONE

AKL61.1-2: grey, extremely weak, SILTSTONE

AKL62.1-2: grey, very weak, SANDSTONE

Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from calibration records.

3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.

3) We have tested two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The sample description and test results are not IANZ accredited.

Test By GEGO **Date:** **27/04/2022**

Approved By Steve Anderson **Date:** 25/05/2022

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Site: Eastern Busway - ALCOE-84

Your Job No.: **Schedule 7**

Our Job No.: **1017784.000**

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		**DH304**	**DH304**	**DH330**	**DH330**		
Sample ID		**AKL63.1**	**AKL63.2**	**AKL64.1**	**AKL64.2**		
Depth	**(m)**	**23.51-23.82**	**23.51-23.82**	**20.61-20.89**	**20.61-20.89**		
Sample History		Natural	Natural	Natural	Natural		
Shape		Core	Core	Core	Core		
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw		
Type of Test		Axial	Axial	Axial	Axial		
Direction of loading to plane of weakness		---	---	---	---		
Average Distance D	**(mm)**	65.3	65.9	47.4	48.0		
Average Width W	**(mm)**	61.0	60.8	61.1	61.5		
Failure Load - Corrected Load P	**(kN)**	0.4380	0.387	0.44	0.34		
Platen Separation D'	**(mm)**	61	66	47	48		
Equivalent core diameter $(De)^2$	**(mm^2)**	5067	5105	3692	3761		
Equivalent core diameter (De)	**(mm)**	71.2	71.5	60.8	61.3		
$Is = P/(De)^2$	**(MPa)**	0.08640	0.0758	0.119	0.089		
Size Correction F = (De/50)^0.45		1.17	1.17	1.09	1.10		
Strength Index Is(50)=F*Is	**(MPa)**	**0.101**	**0.089**	**0.130**	**0.098**		
Mean Strength Index Is(50)=F*Is	**(MPa)**	---	---	---	---		
Water Content	**(%)**	**20.2**	**20.1**	**19.2**	**19.5**		

Sample Description:

AKL63.1-2: grey, extremely weak, SILTSTONE

AKL64.1-2: grey, extremely weak, SILTSTONE

0

Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from calibration records.

3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.

3) We have tested two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The sample description and test results are not IANZ accredited.

Test By GEGO **Date:** **27/04/2022**

Approved By Glenn Anderson **Date:** 25/05/2022

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Geotechnics Project ID: 1017784.0000.B.0
Customer Project ID: EBA_17

Site: Eastern Busway

Test Method used: ASTM D2216-19Determination of the Water Content
ASTM D5731-16Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		DH305_P	DH308	DH328_P			
Depth (m)		18.29-18.35	3.47-3.67	3.94-4.01			
Number of Specimens Tested		1	1	1			
Sample History		Concrete Saw	Concrete Saw	Concrete Saw			
Shape		Cylinder	Cylinder	Cylinder			
Type of Test		Axial	Axial	Axial			
Direction of loading		Parallel	Parallel	Parallel			
Distance D (mm)	1	64.10	64.45	63.05			
	2	64.33	64.74	62.48			
	3	64.21	64.74	62.87			
	Average	64.21	64.64	62.80			
Width W (mm)	1	60.48	60.65	60.98			
	2	60.89	60.76	61.01			
	3	60.30	60.75	60.94			
	Average	60.56	60.72	60.98			
Failure Load	Uncorrected Load P (kN)	0.9	28.0	28.0			
	Corrected Load P (kN)	0.894	28.035	28.035			
Platen Separation D' (mm)		64	60	63			
Equivalent core diameter $(D_e)^2$ $(mm)^2$		4951.07	4997.39	4875.93			
Equivalent core diameter D_e (mm)		70.36	70.69	69.83			
$Is = P/(D_e)^2$ (MPa)		0.1805	5.6099	5.7497			
Size Correction $F = (D_e/50)^{0.45}$		1.17	1.17	1.16			
Strength Index Is(50)=F*Is (MPa)		0.21	6.56	6.67			
Mean Strength Index Is(50)=F*Is (MPa)		--	--	--	--	--	--
Water content (%)		22.2	1.2	3.4			

Sample Description:

DH305_P	18.29-18.35 (m)	slightly unweathered SANDSTONE, weak, dark brownish grey
DH308	3.47-3.67 (m)	slightly unweathered BASALT, strong, light grey; slightly vesicular
DH328_P	3.94-4.01 (m)	slightly unweathered BASALT, strong, lightgrey with black, vesicular

Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.
For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from the calibration records.

3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The test results are not IANZ accredited.

Tested by:	CHLU	Date:	30/03/2023	Approved by KTP:	SJA	Date:	12/05/2023

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Geotechnics Project ID: 1017784.0000.B.0
Customer Project ID: EBA_18

Site: Eastern Busway
Test Method used: ASTM D2216-19Determination of the Water Content
ASTM D5731-16Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		DH307					
Depth (m)		14.46-14.52					
Number of Specimens Tested		1					
Sample History		Natural					
Shape		Cylinder					
Type of Test		Axial					
Direction of loading		Parallel					
Distance D (mm)	1	67.40					
	2	67.60					
	3	67.56					
	Average	67.52					
Width W (mm)	1	60.71					
	2	60.20					
	3	60.57					
	Average	60.49					
Failure Load	Uncorrected Load P (kN)	0.6					
	Corrected Load P (kN)	0.590					
Platen Separation D' (mm)		67					
Equivalent core diameter $(D_e)^2$ $(mm)^2$		5200.27					
Equivalent core diameter D_e (mm)		72.11					
$Is = P/(D_e)^2$ (MPa)		0.1134					
Size Correction $F = (D_e/50)^{0.45}$		1.18					
Strength Index Is(50)=F*Is (MPa)		0.13					
Mean Strength Index Is(50)=F*Is (MPa)		--	--	--	--	--	--
Water content (%)		23.8					

Sample Description:

DH304	14.46-14.52 (m)	SANDSTONE, very weak, dark grey

Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.
For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from the calibration records.

3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The test results are not IANZ accredited.

Tested by:	CHLU	Date:	8/05/2023	Approved by KTP:	SJA	Date:	12/05/2023

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Site: Eastern Busway - ALCOE-103

Your Job No.: **ALCOE-103**

Our Job No.: **1017784**

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		DH312	DH302	DH312	DH320	DH322	DH322
Sample ID		AKL101.2	AKL101.3	AKL101.4	AKL102.2	AKL103.4	AKL103.5
Depth	(m)	1.25-1.5 m	3.2-3.7 m	3.2-3.7 m	25.23-25.34 m	21.92-22.18 m	21.92-22.18 m
Sample History		Natural	Natural	Natural	Natural	Natural	Natural
Shape		Core	Core	Core	Core	Core	Core
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
Type of Test		Axial	Axial	Axial	Axial	Axial	Axial
Direction of loading to plane of weakness		---	---	---	---	---	---
Average Distance D	(mm)	60.1	60.0	60.1	53.1	50.0	51.4
Average Width W	(mm)	60.4	60.4	60.3	56.8	59.8	58.4
Failure Load - Corrected Load P	(kN)	20.111	24.069	36.594	0.236	0.084	0.084
Platen Separation D'	(mm)	60	60	60	53	50	51
Equivalent core diameter $(De)^2$	(mm^2)	4622	4607	4616	3845	3802	3821
Equivalent core diameter (De)	(mm)	68.0	67.9	67.9	62.0	61.7	61.8
$Is = P/(De)^2$	(MPa)	4.35120	5.2241	7.928	0.061	0.02210	0.0220
Size Correction F = (De/50)^0.45		1.15	1.15	1.15	1.10	1.10	1.10
Strength Index Is(50)=F*Is	(MPa)	**5.004**	**6.008**	**9.117**	**0.068**	**0.024**	**0.024**
Mean Strength Index Is(50)=F*Is	(MPa)	---	---	---	---	---	---
Water Content	(%)	**2.2**	**4.2**	**4.6**	**18.3**	**20.6**	**20.8**

Sample Description:

AKL101.2 - BASALT vesicular, dark grey, very strong

AKL101.3 - BASALT vesicular, dark grey, very strong

AKL101.4 -BASALT vesicular, dark grey, very strong

AKL102.2 - SANDSTONE, greenish grey, extremely weak

AKL103.4 - SILTSTONE, greenish grey, extremely weak

AKL103.4 - SILTSTONE, greenish grey, extremely weak

Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from calibration records.

3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.

3) We have tested one or two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The sample description and test results are not IANZ accredited.

Test By GEGO **Date:** 16/06/2022

Approved By **Date:** 17/06/2022

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www.geotechnics.co.nz

Site: Eastern Busway - ALCOE-103

Your Job No.: **ALCOE-103**

Our Job No.: **1017784**

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT LOAD TEST – AXIAL

BH No.:		DH323	DH324	DH324	DH329		
Sample ID		AKL104.5	AKL105.1	AKL105.2	AKL108.3		
Depth	(m)	22.01-22.13 m	15.45-15.55 m	15.63-15.72 m	35.2-35.34 m		
Sample History		Natural	Natural	Natural	Natural		
Shape		Core	Core	Core	Core		
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw		
Type of Test		Axial	Axial	Axial	Axial		
Direction of loading to plane of weakness		---	---	---	---		
Average Distance D	(mm)	51.7	51.5	55.7	48.7		
Average Width W	(mm)	56.0	56.1	53.2	58.6		
Failure Load - Corrected Load P	(kN)	0.236	0.084	0.033	0.286		
Platen Separation D'	(mm)	52	52	56	49		
Equivalent core diameter $(De)^2$	(mm^2)	3686	3676	3772	3637		
Equivalent core diameter (De)	(mm)	60.7	60.6	61.4	60.3		
$Is = P/(De)^2$	(MPa)	0.06400	0.0229	0.009	0.079		
Size Correction F = (De/50)^0.45		1.09	1.09	1.10	1.09		
Strength Index Is(50)=F*Is	(MPa)	**0.070**	**0.025**	**0.010**	**0.086**		
Mean Strength Index Is(50)=F*Is	(MPa)	---	---	---	---		
Water Content	(%)	**16.2**	**17.0**	**18.2**	**19.3**		

Sample Description:

AKL104.5 - SILTSTONE, greenish grey, extremely weak

AKL105.1 - SILTSTONE, greenish grey, extremely weak

AKL105.2 -SANDSTONE, greenish grey, extremely weak

AKL108.3 - SANDSTONE, greenish grey, extremely weak

Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

2) The corrected load (kN) is calculated from calibration records.

3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.

3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.

4) The sample description and test results are not IANZ accredited.

Test By GEGO **Date:** 16/06/2022

Approved By **Date:** 17/06/2022

Determination of water content

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Geotechnics Project ID
1017784.1000.A.0

Customer Project ID
406084

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH301		
Location Description	Eastern Busway		
Location Data - Easting	-		
Location Data - Northing	-		
Location Data - Level	-		
Location Data - Chainage	-		
Location Data - Offset	-		
Geotechnics Sample ID	AKL475.1		
Sample Reference	EBA_16		
Sample Depth	4.5-5.0 m		
Sample Description	silty CLAY, orange brown with blueish grey; firm, moist, high plasticity		
Specimen Reference	-		
Specimen Depth	-		
Specimen Description	-		
TEST RESULT			
Natural Water Content	**40.3%**		
TEST REMARKS			
	• The material used for testing was natural. • Date tested 28/04/2023 IANZ Accredited		
Approved by KTP Date	 15/05/2023		

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Geotechnics Project ID
1017784 Phase A

Customer Project ID
ALCOE-84

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH302	DH304	
Location Description	N/A	N/A	
Location Data - Easting	N/A	N/A	
Location Data - Northing	N/A	N/A	
Location Data - Level	N/A	N/A	
Location Data - Chainage	N/A	N/A	
Location Data - Offset	N/A	N/A	
Geotechnics Sample ID	AKL60.3	AKL62.3	
Sample Reference	N/A	N/A	
Sample Depth	6.80 - 6.91 m	5.70 - 5.86	
Sample Description	clayey SILT with trace sand, blueish grey-brown, stiff, high plasticity	clayey SILT with trace sand, blueish grey-brown, stiff, intermediate plasticity	
Specimen Reference	N/A	N/A	
Specimen Depth	N/A	N/A	
Specimen Description	N/A	N/A	
TEST RESULT			
Natural Water Content	**38.8%**	**38.9%**	
TEST REMARKS			
	• SAMPLE HISTORY UNDEFINED.	• SAMPLE HISTORY UNDEFINED.	
	IANZ Accredited	IANZ Accredited	
Approved By			
Date 25/05/2022			

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Geotechnics Project ID
1017784.1000 Phase A

Customer Project ID
406084

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH303	DH303	DH309
Location Description	Eastern Busway	Eastern Busway	Eastern Busway
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL371.1	AKL371.2	AKL371.3
Sample Reference	-	-	-
Sample Depth	7.5-8.0 m	9.5-10.0 m	7.5-8.0 m
Sample Description	silty SAND with minor clay and trace of gravel, dark blueish grey with brown; firm, moist, low plasticity	clayey SILT, black; soft, moist, high plasticity	clayey SILT with minor sand and trace of gravel, dark blueish grey; very soft, moist, high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	-	-	-
TEST RESULT			
Natural Water Content	**34.7%**	**94.3%**	**53.5%**
TEST REMARKS			
	• The material used for testing was natural. • Date tested 22/02/2023	• The material used for testing was natural. • Date tested 22/02/2023	• The material used for testing was natural. • Date tested 15/02/2023
	IANZ Accredited	IANZ Accredited	IANZ Accredited
Approved by KTP	CHME	CHME	CHME
Date	3/03/2023	3/03/2023	3/03/2023

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Geotechnics Project ID
1017784.1000 Phase A

Customer Project ID
406084

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH306	DH311	DH314
Location Description	Eastern Busway 12	Eastern Busway 12	Eastern Busway 12
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL377.1	AKL377.2	AKL377.4
Sample Reference	-	-	-
Sample Depth	6.0-6.5 m	5.5-6.0 m	1.75-2.25 m
Sample Description	silty CLAY with trace of sand and gravel, light orange brown with orange; soft, moist, high plasticity	silty sandy CLAY with trace of gravel, dark greenish grey; firm, moist, high plasticity	silty CLAY with some sand and trace of gravel, dark orange brown with black; soft, moist, high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	-	-	-
TEST RESULT			
Natural Water Content	**63.2%**	**58.8%**	**47.5%**
TEST REMARKS			
	• The material used for testing was natural. • Date tested 21/02/2023	• The material used for testing was natural. • Date tested 28/02/2023	• The material used for testing was natural. • Date tested 21/02/2023
	IANZ Accredited	IANZ Accredited	IANZ Accredited
Approved by KTP	CHME	CHME	CHME
Date	8/03/2023	8/03/2023	8/03/2023

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH309	DH329_P	
Location Description	Eastern Busway	Eastern Busway	
Location Data - Easting	-	-	
Location Data - Northing	-	-	
Location Data - Level	-	-	
Location Data - Chainage	-	-	
Location Data - Offset	-	-	
Geotechnics Sample ID	AKL371.4	AKL371.6	
Sample Reference	-	-	
Sample Depth	9.0-9.5 m	7.0-7.5 m	
Sample Description	sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity	clayey SILT with trace of sand and gravel, dark brownish grey with orange; firm, moist, high plasticity	
Specimen Reference	-	-	
Specimen Depth	-	-	
Specimen Description	-	-	
TEST RESULT			
Natural Water Content	**34.3%**	**47.5%**	
TEST REMARKS			
	• The material used for testing was natural. • Date tested 15/02/2023	• The material used for testing was natural. • Date tested 15/02/2023	
	IANZ Accredited	IANZ Accredited	
Approved by KTP	CHME	CHME	
Date	3/03/2023	3/03/2023	

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Geotechnics Project ID
1017784

Customer Project ID
ALCOE-103

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH312	DH322	DH322
Location Description	ALCOE-103	ALCOE-103	ALCOE-103
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL101.1	AKL103.2	AKL103.1
Sample Reference	-	-	-
Sample Depth	7-7.5 m	11-11.5 m	6.5-7 m
Sample Description	sandy SILT minor clay, whiteish grey; soft, moist, low plasticity	sandy SILT minor clay, dark grey; soft, moist, non-plasticity	organic CLAY, with decomposed wood flecks; soft, moist, high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	-	-	-
TEST RESULT			
Natural Water Content	**17.3%**	**22.9%**	**72.3%**
TEST REMARKS			
	• The material used for testing was natural.	• The material used for testing was natural.	• The material used for testing was natural.
Tested by: GEGO 13/06/2022	IANZ Accredited	IANZ Accredited	IANZ Accredited
Approved By	EKH	EKH	EKH
Date	17/06/2022	17/06/2022	17/06/2022

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Geotechnics Project ID
1017784.1000.A.0

Customer Project ID
406084

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH318_P		
Location Description	Eastern Busway		
Location Data - Easting	-		
Location Data - Northing	-		
Location Data - Level	-		
Location Data - Chainage	-		
Location Data - Offset	-		
Geotechnics Sample ID	AKL475.4		
Sample Reference	EBA_17		
Sample Depth	10.2-10.9 m		
Sample Description	SILT with minor sand and clay and trace of gravel, light brownish grey with black; soft, moist, high plasticity		
Specimen Reference	-		
Specimen Depth	-		
Specimen Description	-		
TEST RESULT			
Natural Water Content	**39.8%**		
TEST REMARKS			
	• The material used for testing was natural. • Date tested 28/04/2023 IANZ Accredited		
Approved by KTP Date	 11/05/2023		

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Geotechnics Project ID
1017784

Customer Project ID
ALCOE-103

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH323	DH325	
Location Description	ALCOE-103	ALCOE-103	
Location Data - Easting	-	-	
Location Data - Northing	-	-	
Location Data - Level	-	-	
Location Data - Chainage	-	-	
Location Data - Offset	-	-	
Geotechnics Sample ID	AKL104.2	AKL106.1	
Sample Reference	-	-	
Sample Depth	3-3.45 m	4-4.5 m	
Sample Description	silty SAND, minor clay, dark brown; soft, moist, low plasticity	silty SAND minor clay, light greyish brown; soft, mosit, low plasticity	
Specimen Reference	-	-	
Specimen Depth	-	-	
Specimen Description	-	-	
TEST RESULT			
Natural Water Content	**24.2%**	**33.1%**	
TEST REMARKS			
	• The material used for testing was natural.	• The material used for testing was natural.	
Tested by: GEGO 13/06/2022	IANZ Accredited	IANZ Accredited	
Approved By			
Date	17/06/2022	17/06/2022	

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Geotechnics Project ID
1017784.1000 Phase A

Customer Project ID
406084

Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS			
Location ID	DH324		
Location Description	Eastern Busway 12		
Location Data - Easting	-		
Location Data - Northing	-		
Location Data - Level	-		
Location Data - Chainage	-		
Location Data - Offset	-		
Geotechnics Sample ID	AKL377.6		
Sample Reference	-		
Sample Depth	7.0-7.5 m		
Sample Description	sandy CLAY, greenish blueish grey; stiff, moist, high plasticity		
Specimen Reference	-		
Specimen Depth	-		
Specimen Description	-		
TEST RESULT			
Natural Water Content	**43.1%**		
TEST REMARKS			
	• The material used for testing was natural. • Date tested 21/02/2023 IANZ Accredited		
Approved by KTP	CHME		
Date	8/03/2023		