Appendix D2

Geotechnical investigations:

RMS Factual Geotechnical Investigation Report

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

Job No: **INFOLCOV00959AA**

Consolidation Test

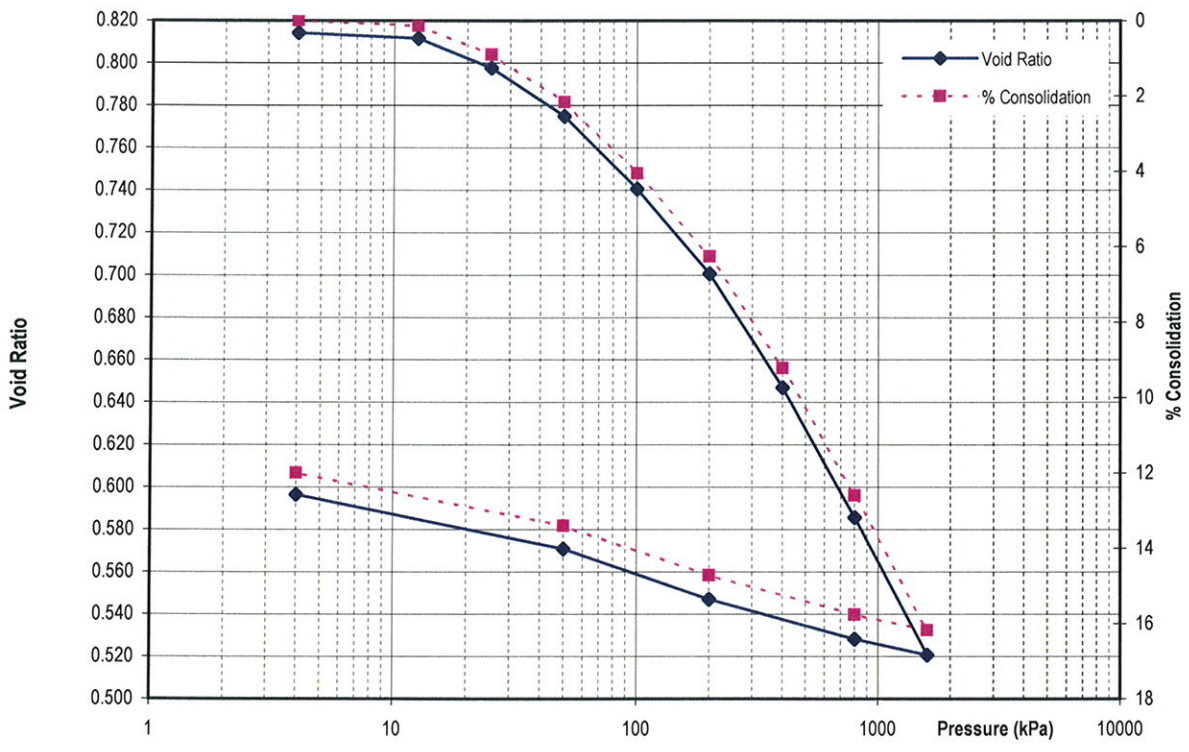
Sheet 1 of 1

Client:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Office:	SYDNEY
Principal:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Date:	19/5/2012
Project:	BERRY BYPASS	By:	GKC
Location:	PRINCES HIGHWAY	Checked:	GKC

Test Procedure:	AS1289 6.6.1				
Borehole:	B12	Depth:	1.10 to 1.65 m	Report No:	IOLT 5561
Sample No.	B12	Laboratory No's	LCOV12S-00424	Sample Type:	Undisturbed
Material Description:	(CI) SANDY SILTY CLAY - medium plasticity, mottled brown, some fine to coarse sand.				

Initial Dry Density (t/m^3):	1.45	Initial Moisture Content (%):	31.2	Initial Degree of Saturation (%):	101.8
Soil Particle Density (t/m^3):	2.65	Final Moisture Content (%):	24.6	Initial Specimen Height (mm):	19.901

Pressure Range (kPa)		Void Ratio		Consolidation	c_v	m_v	C_c	C_α
From	To	at start of load increment	at end of load increment	(%)	m^2/year	m^2/kN		
4	12.5	0.814	0.812	0.141	0.26764	0.00017	0.00516	
12.5	25	0.812	0.798	0.910	1.61394	0.00062	0.04633	
25	50	0.798	0.775	2.171	1.85593	0.00051	0.07601	
50	100	0.775	0.740	4.060	2.34558	0.00039	0.11386	
100	200	0.740	0.701	6.261	3.54978	0.00023	0.13263	
200	400	0.701	0.647	9.221	4.28154	0.00016	0.17836	
400	800	0.647	0.586	12.602	4.17660	0.00009	0.20380	
800	1600	0.586	0.521	16.180	5.12127	0.00005	0.21561	
1600	800	0.521	0.528	15.763				
800	200	0.528	0.547	14.723				
200	50	0.547	0.571	13.411				
50	4	0.571	0.596	11.999				



GLEN-CONS RPT-001-2010

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Lane Cove West Laboratory - Accreditation No. 431

This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/national standards

Garry K Collins

Approved Signatory

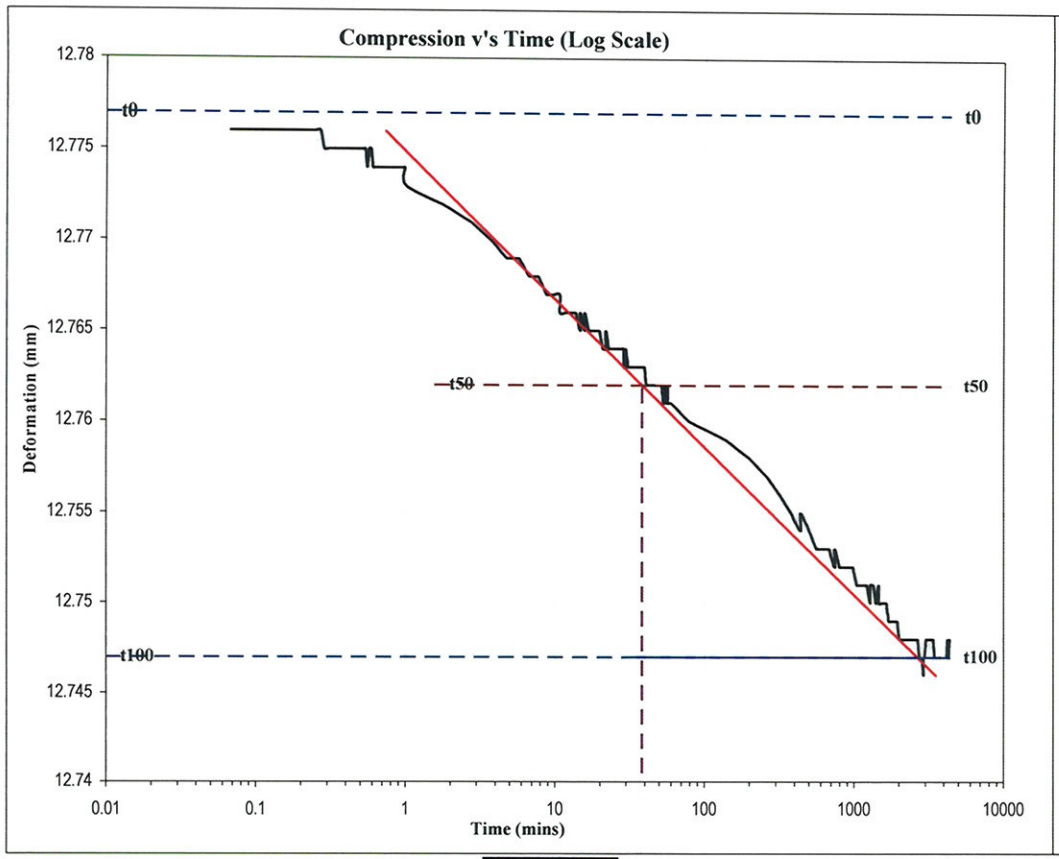
Stage Load : 13 kPa

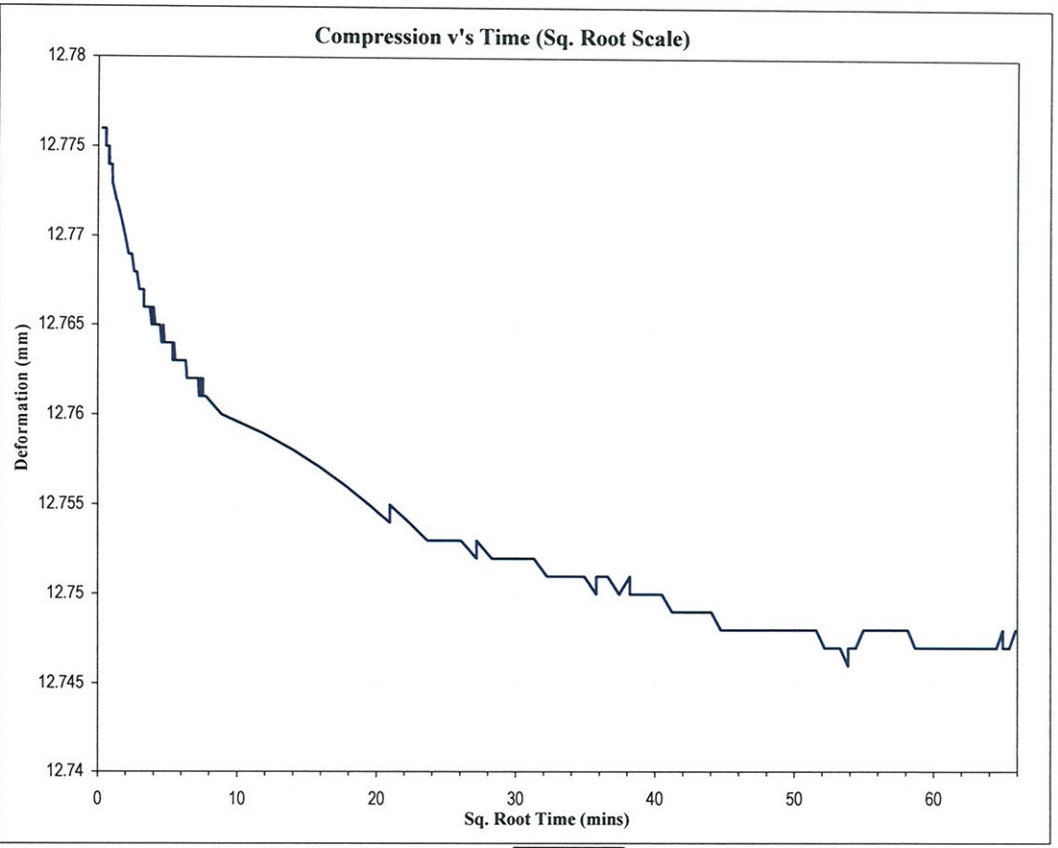
Rig Number : 12

Stage : 4.0 to 12.5

Stage 1

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
28.733	Time (mins)
1998.717	Time (mins)

Secondary	
3518.849	Time (mins)
3678.717	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 12.777 mm

(Dial) t100 = 12.747 mm

t100 = 2652.0 mins

(Dial) t50 = 12.762 mm

t50 = 38.1 mins

ΔHα 0 mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial dial gauge height = 12.776 mm

Final dial gauge height = 12.746 mm

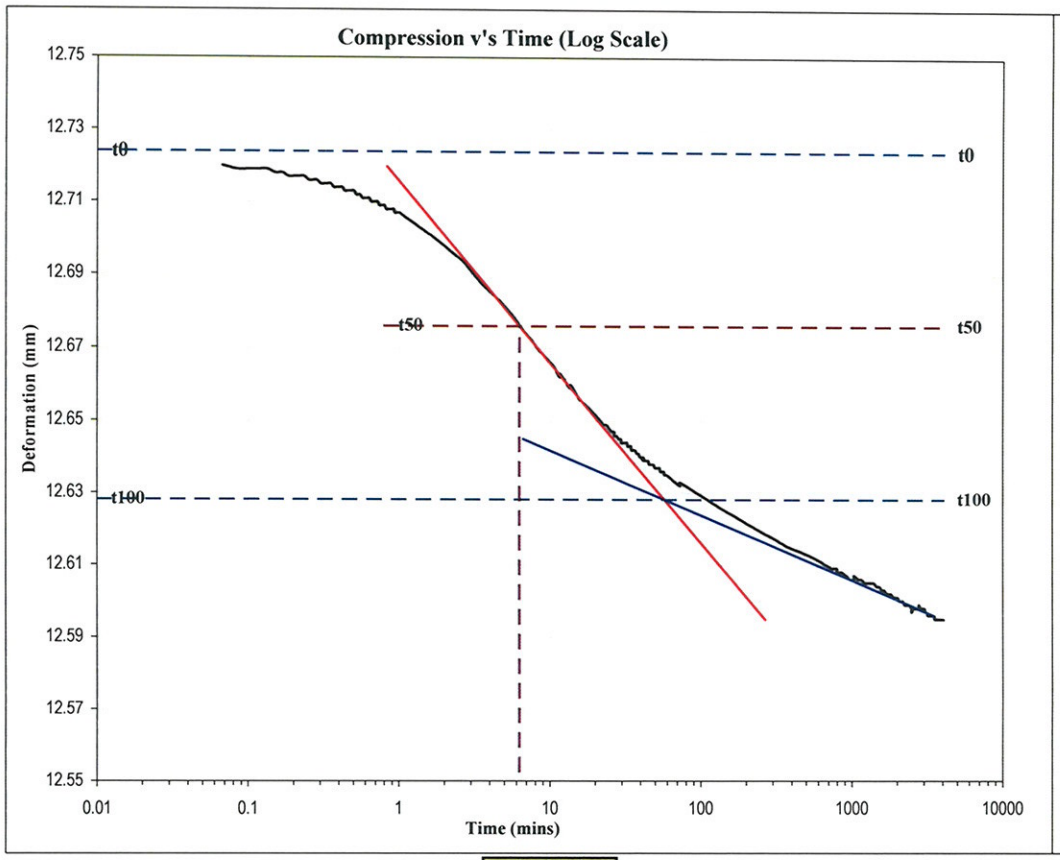
Stage Load : 25 kPa

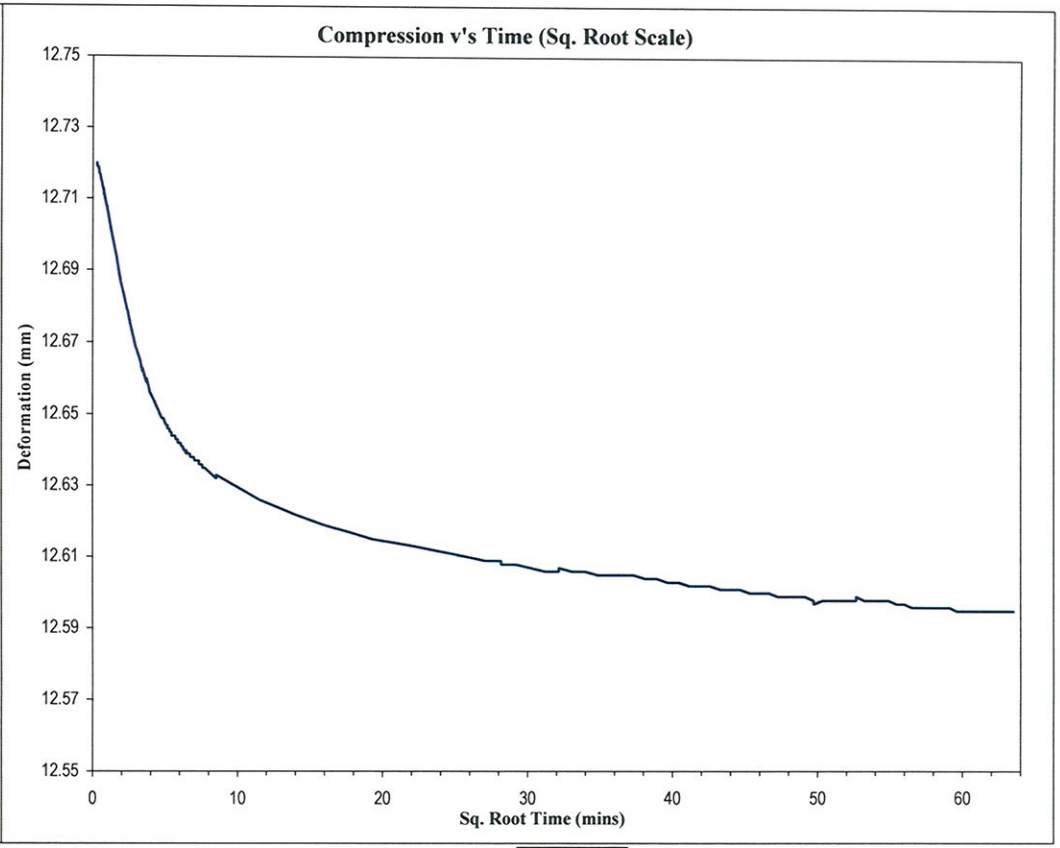
Rig Number : 12

Stage : 12.5 - 25

Stage 2

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
6.583	Time (mins)
16.583	Time (mins)

Secondary	
1000	Time (mins)
3492.583	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 12.724 mm

(Dial) t100 = 12.628 mm

t100 = 57.3 mins

(Dial) t50 = 12.676 mm

t50 = 6.3 mins

ΔHα 0.018 mm/log cycle

Initial dial gauge height = 12.720 mm

Final dial gauge height = 12.595 mm

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

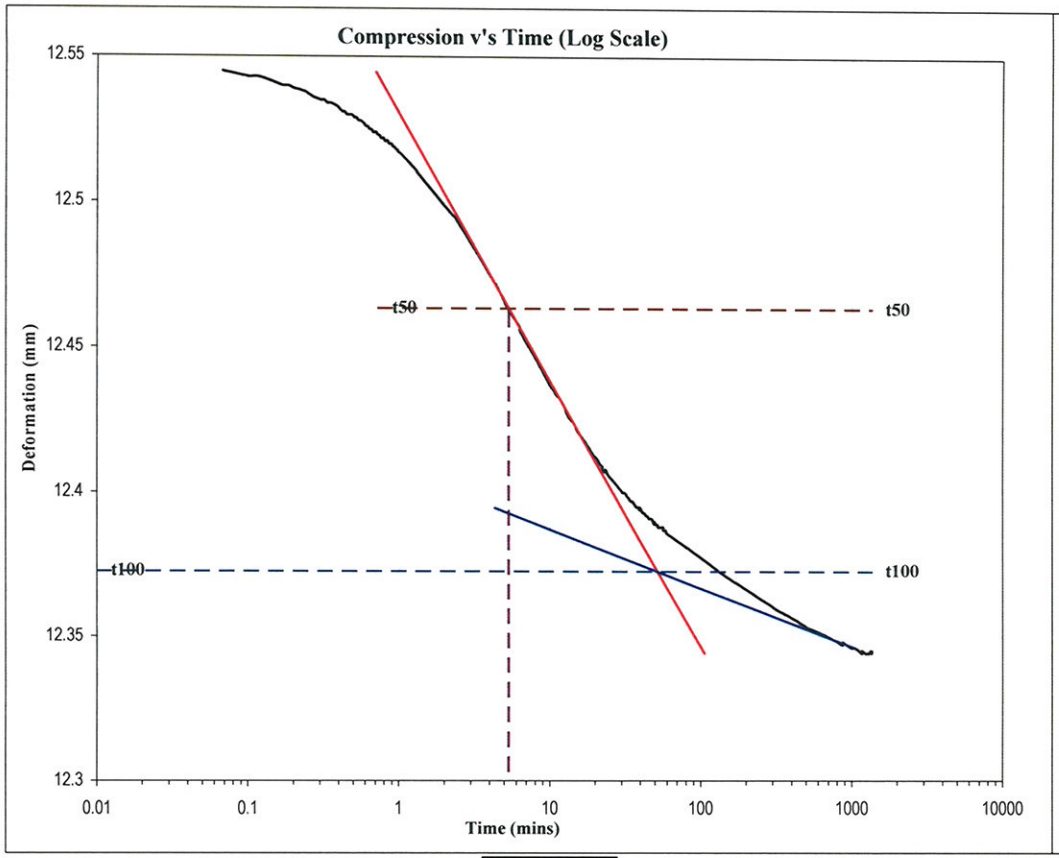
Stage Load : 50 kPa

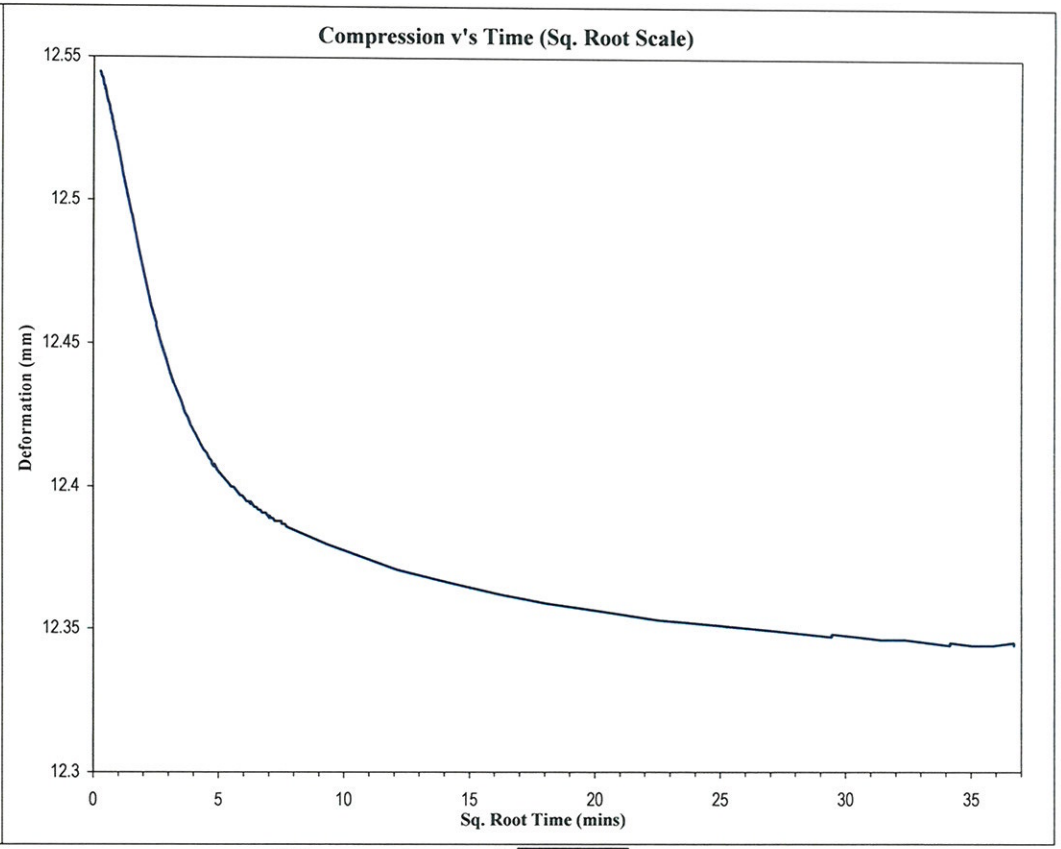
Rig Number : 12

Stage : 25 - 50

Stage 3

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
4.3	Time (mins)
12.3	Time (mins)

Secondary	
746.3	Time (mins)
1046.3	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 12.554 mm

(Dial) t100 = 12.373 mm

t100 = 51.6 mins

(Dial) t50 = 12.463 mm

t50 = 5.3 mins

ΔHα 0.0204 mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

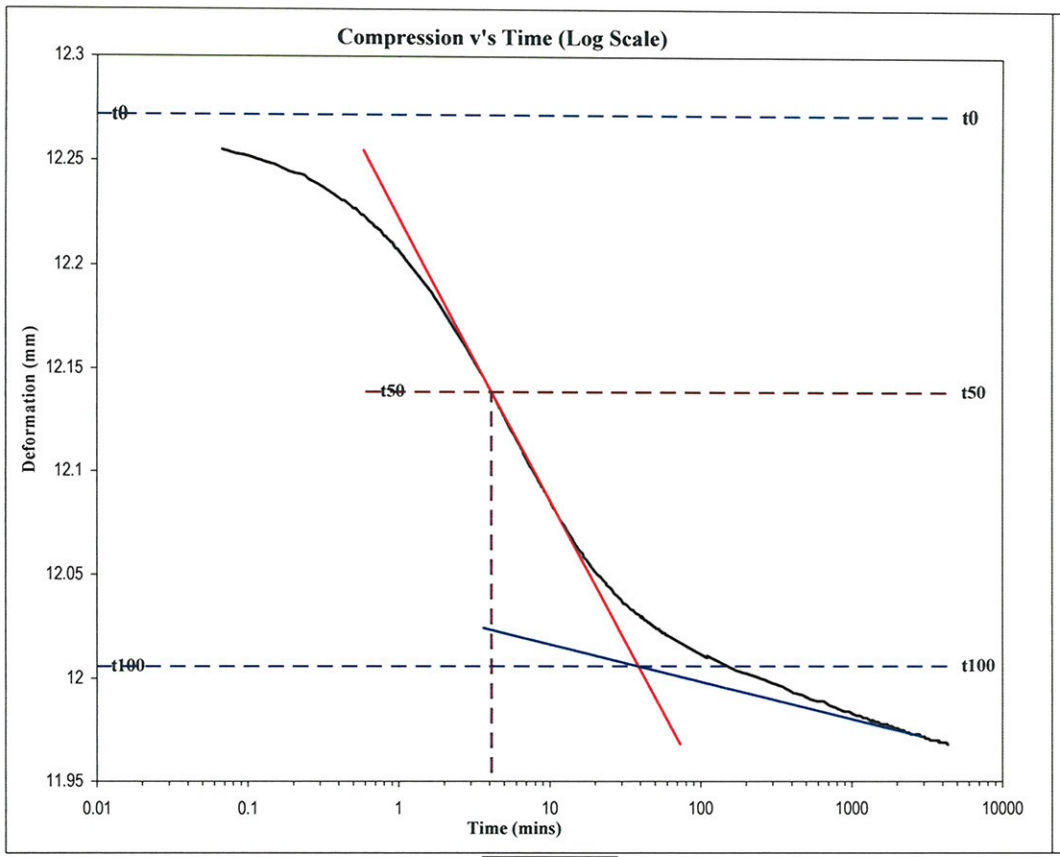
Initial dial gauge height = 12.545 mm

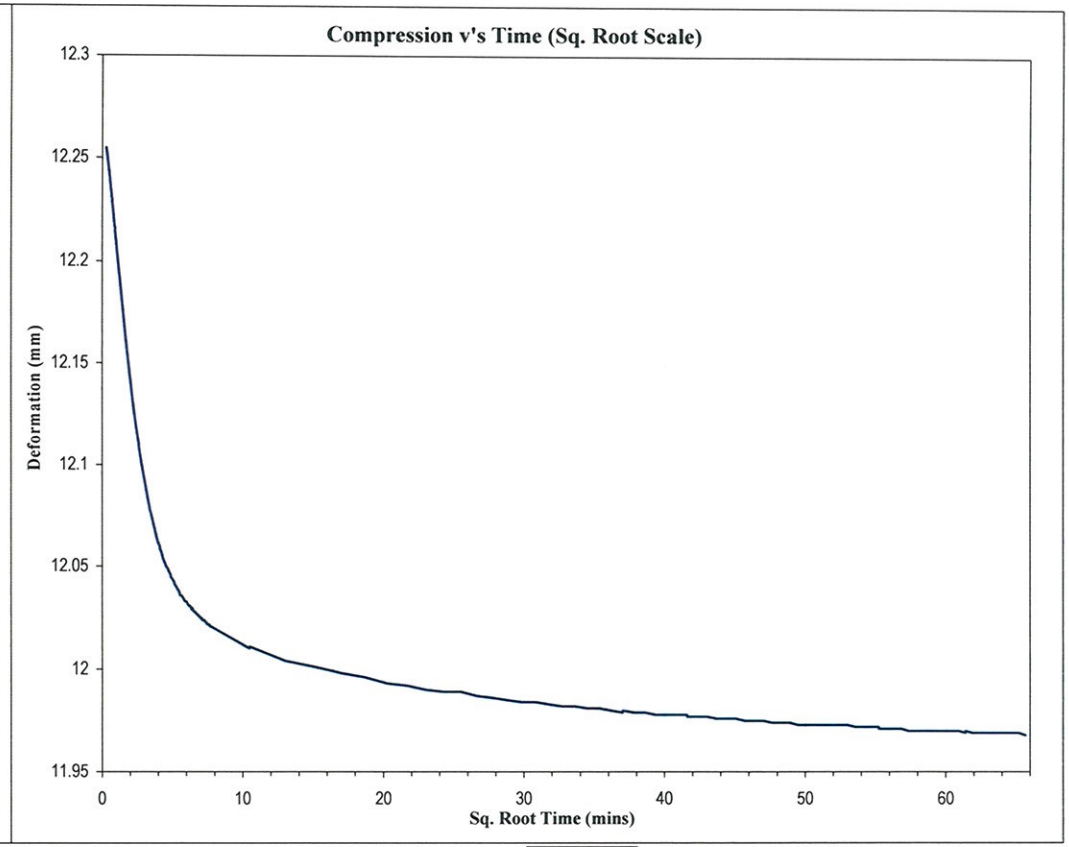
Final dial gauge height = 12.344 mm

Stage Load :	100 kPa
Rig Number :	12
Stage :	50 - 100

Stage 4

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
3.633	Time (mins)
9.65	Time (mins)

Secondary	
2269.65	Time (mins)
2929.65	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 12.272 mm
(Dial) t100 = 12.006 mm
t100 = 38.4 mins

(Dial) t50 = 12.139 mm
t50 = 4.1 mins

ΔHα 0.018 mm/log cycle

Initial dial gauge height = 12.255 mm
Final dial gauge height = 11.968 mm

t0 = #N/A mm
t90 = #N/A mm
t90 = #N/A mins

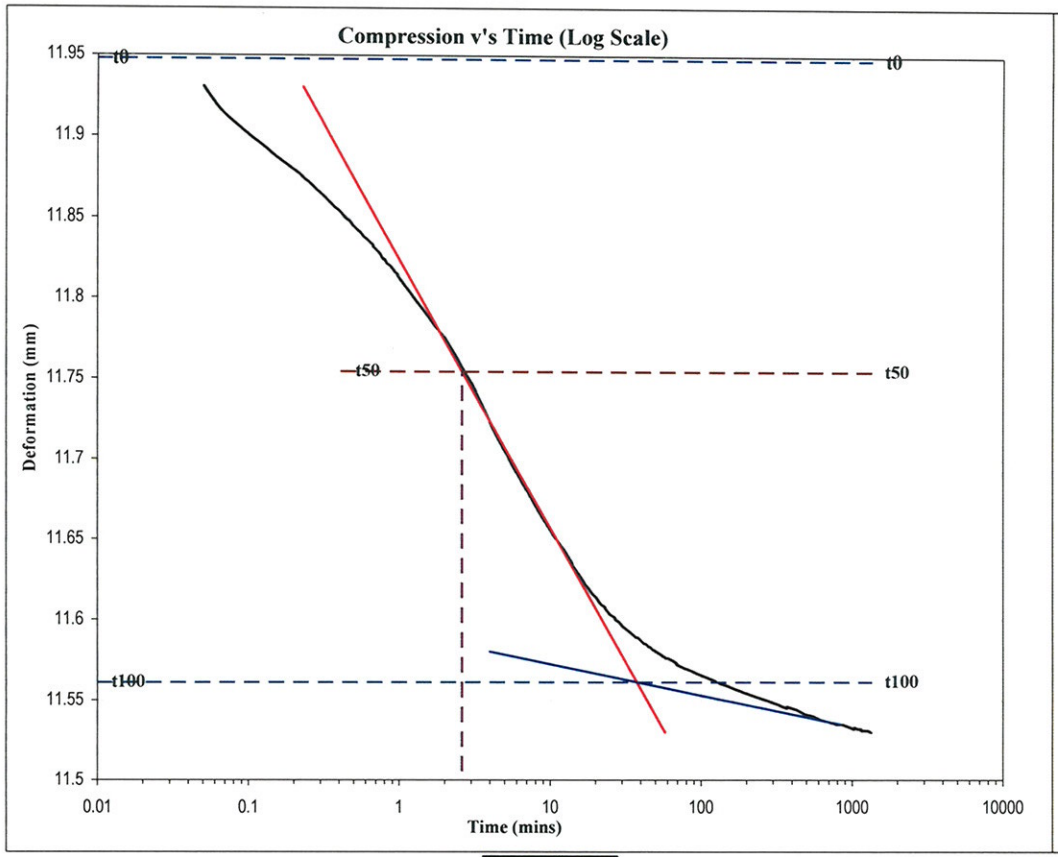
Stage Load : 200 kPa

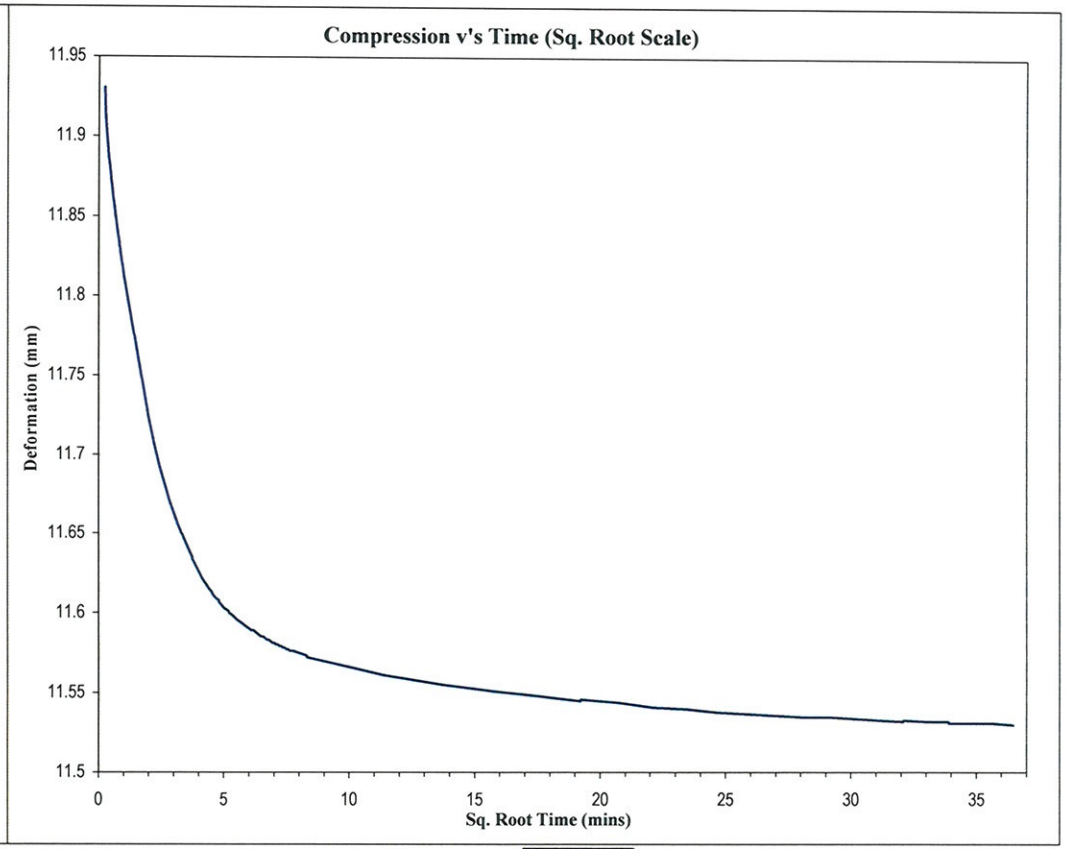
Rig Number : 12

Stage : 100 - 200

Stage 5

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
3.95	Time (mins)
10.967	Time (mins)

Secondary	
668.967	Time (mins)
848.967	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 11.948 mm

(Dial) t100 = 11.561 mm

t100 = 37.3 mins

(Dial) t50 = 11.755 mm

t50 = 2.6 mins

ΔHα 0.0193 mm/log cycle

Initial dial gauge height = 11.931 mm

Final dial gauge height = 11.530 mm

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

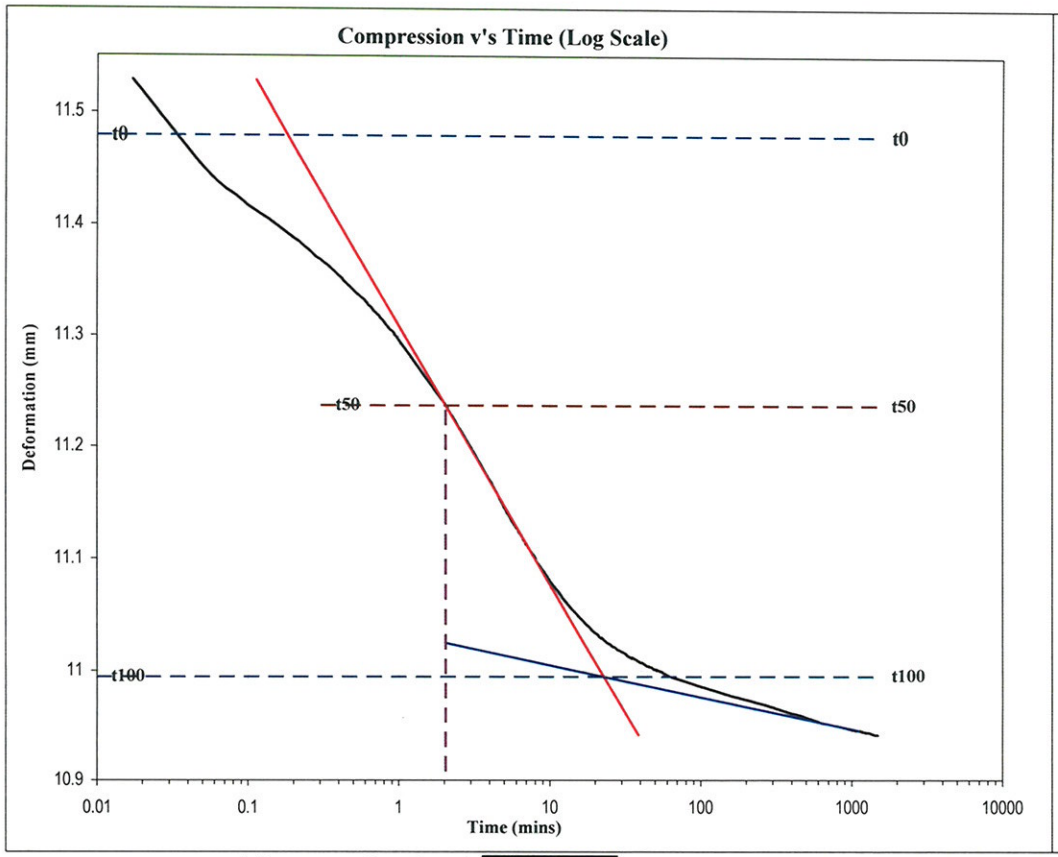
Stage Load : 400 kPa

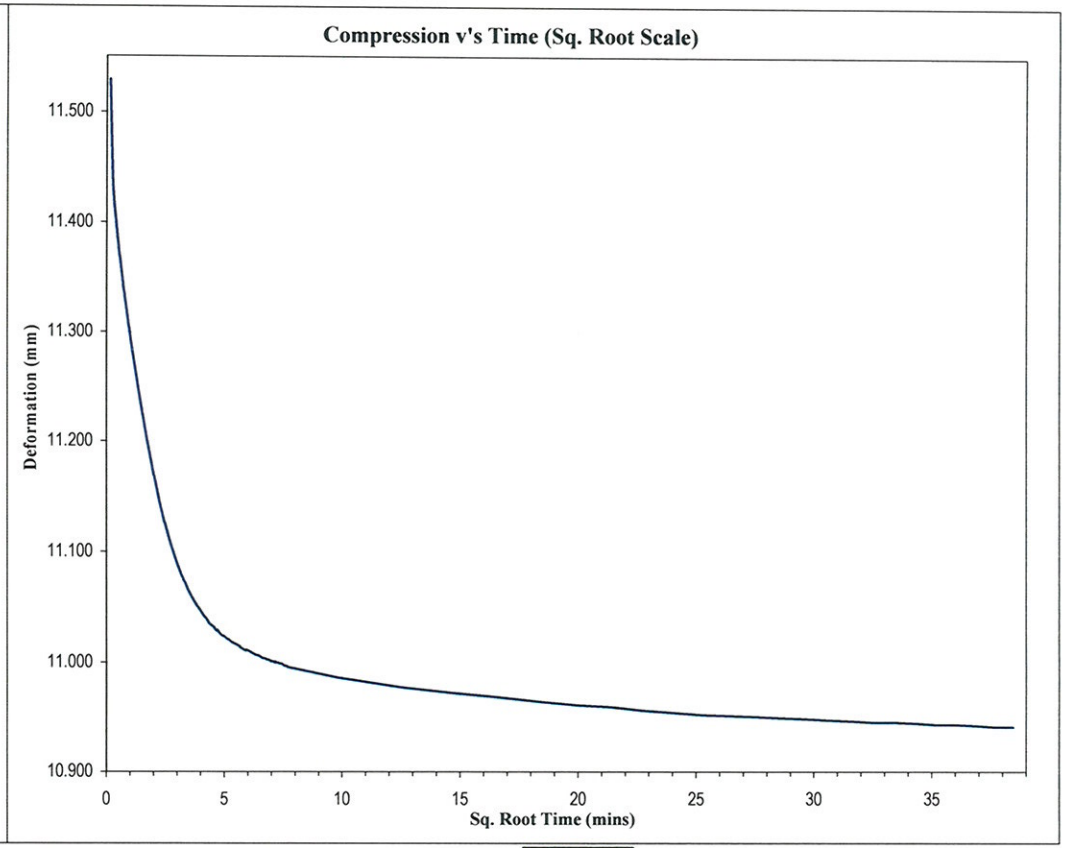
Rig Number : 12

Stage : 200 - 400

Stage 6

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
2.017	Time (mins)
8.033	Time (mins)

Secondary	
697	Time (mins)
1117.017	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 11.48 mm

(Dial) t100 = 10.995 mm

t100 = 22.7 mins

(Dial) t50 = 11.237 mm

t50 = 2.0 mins

ΔHα 0.0293 mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial dial gauge height = 11.529 mm

Final dial gauge height = 10.941 mm

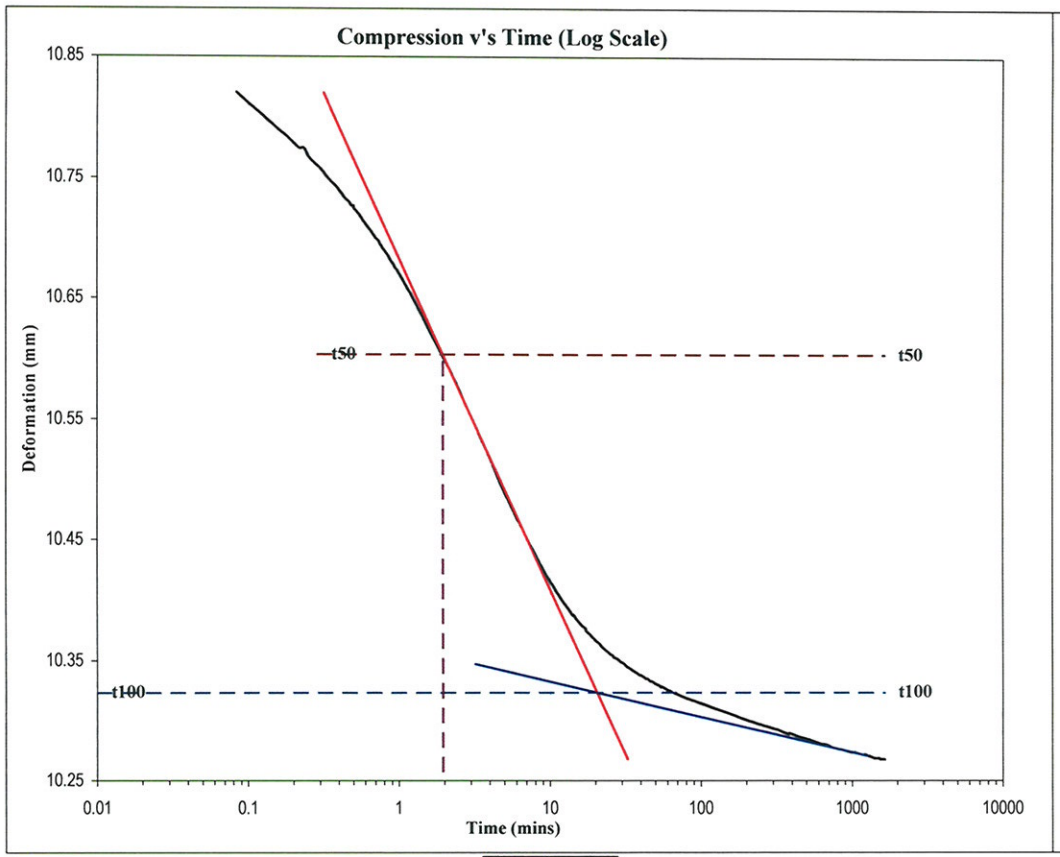
Stage Load : 800 kPa

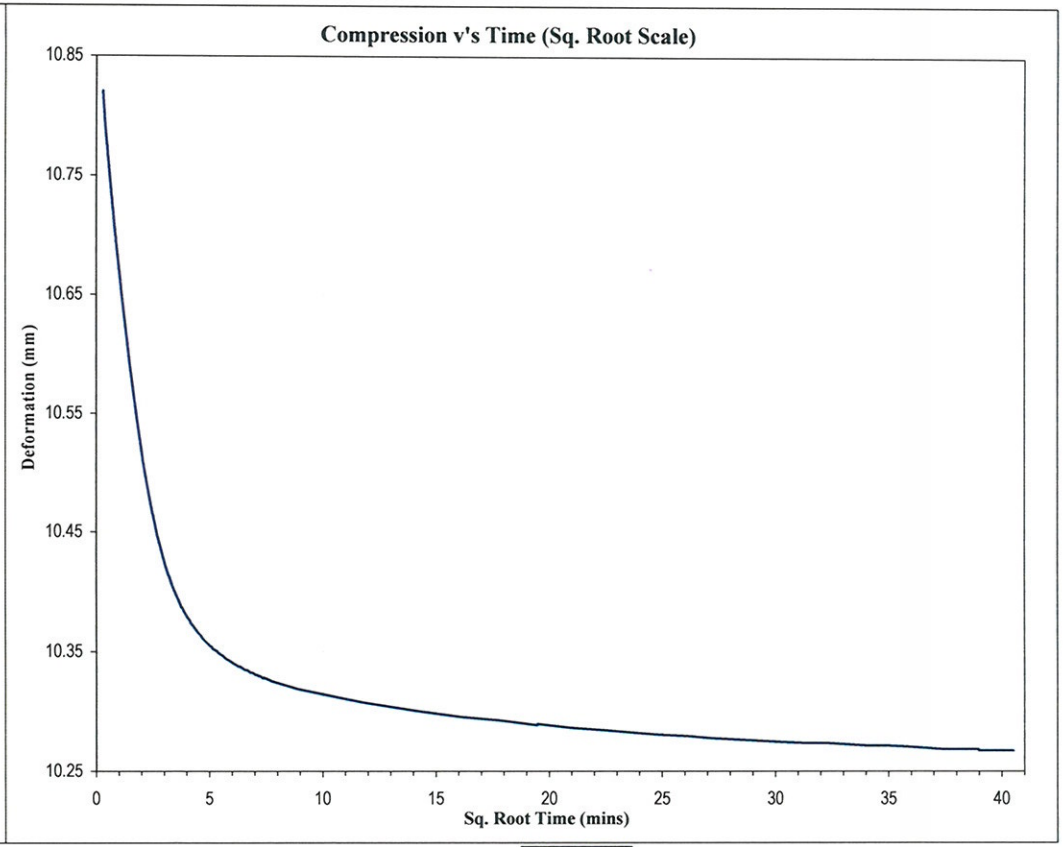
Rig Number : 12

Stage : 400 - 800

Stage 7

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Primary	
3.183	Time (mins)
7.183	Time (mins)

Secondary	
799.167	Time (mins)
1279.183	Time (mins)

Adjust max value of x axis

Primary	
	Root Time
	Root Time

(Dial) t0 = 10.884 mm

(Dial) t100 = 10.324 mm

t100 = 20.4 mins

(Dial) t50 = 10.604 mm

t50 = 1.9 mins

ΔHα 0.0294 mm/log cycle

Initial dial gauge height = 10.821 mm

Final dial gauge height = 10.268 mm

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

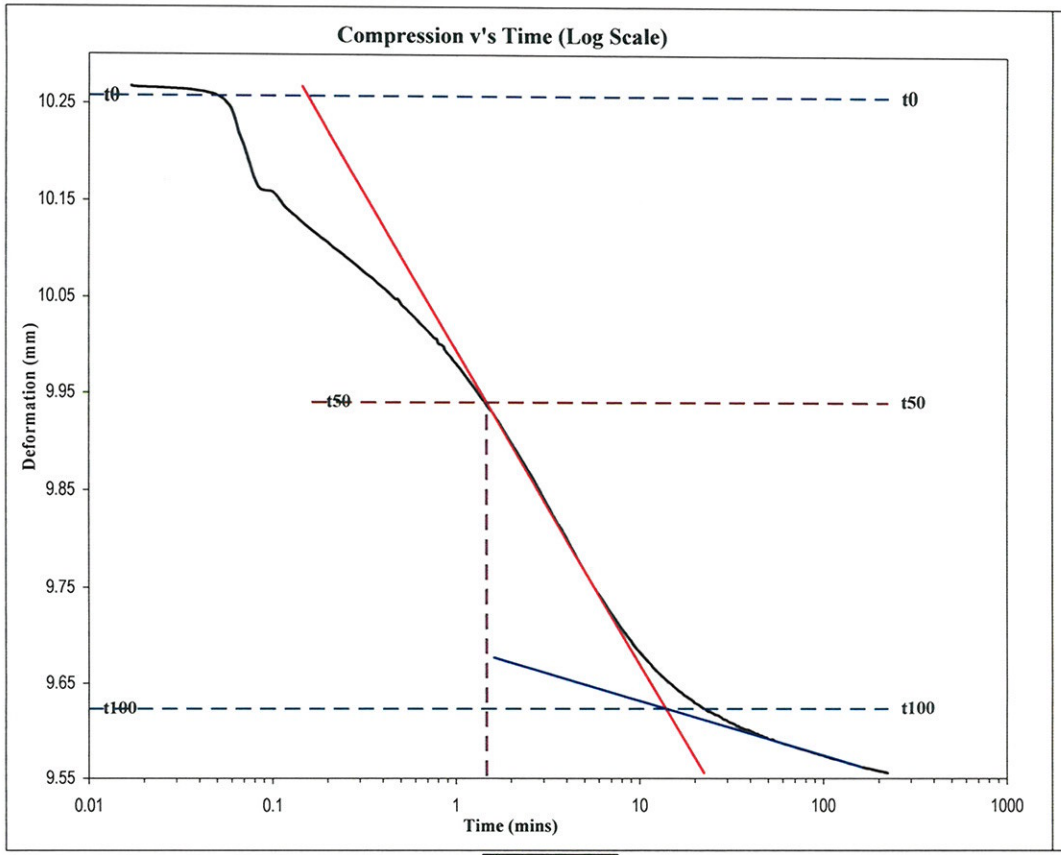
Stage Load : 1600 kPa

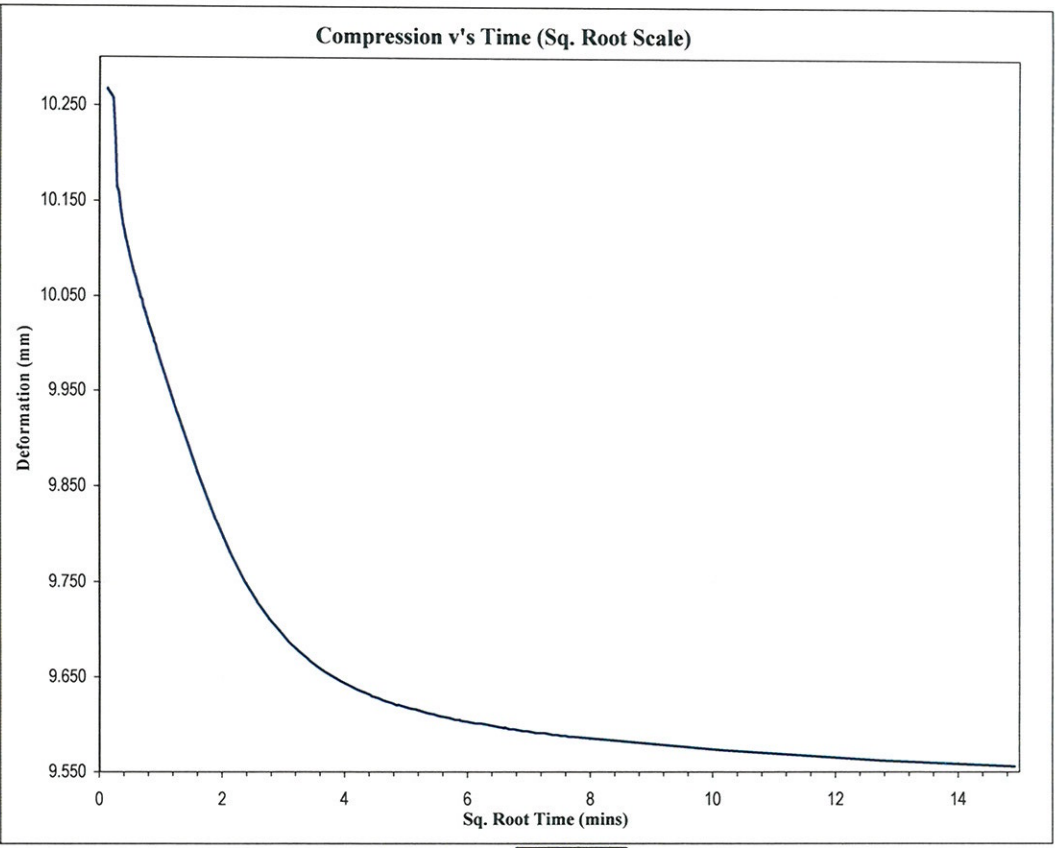
Rig Number : 12

Stage : 800 - 1600

Stage 8

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Primary	
1.6	Time (mins)
5.6	Time (mins)

Secondary	
100	Time (mins)
200	Time (mins)

Adjust max value of x axis

Primary	
	Root Time
	Root Time

(Dial) t0 = 10.258 mm

(Dial) t100 = 9.623 mm

t100 = 13.8 mins

(Dial) t50 = 9.941 mm

t50 = 1.5 mins

ΔHα 0.0574 mm/log cycle

Initial dial gauge height = 10.267 mm

Final dial gauge height = 9.556 mm

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

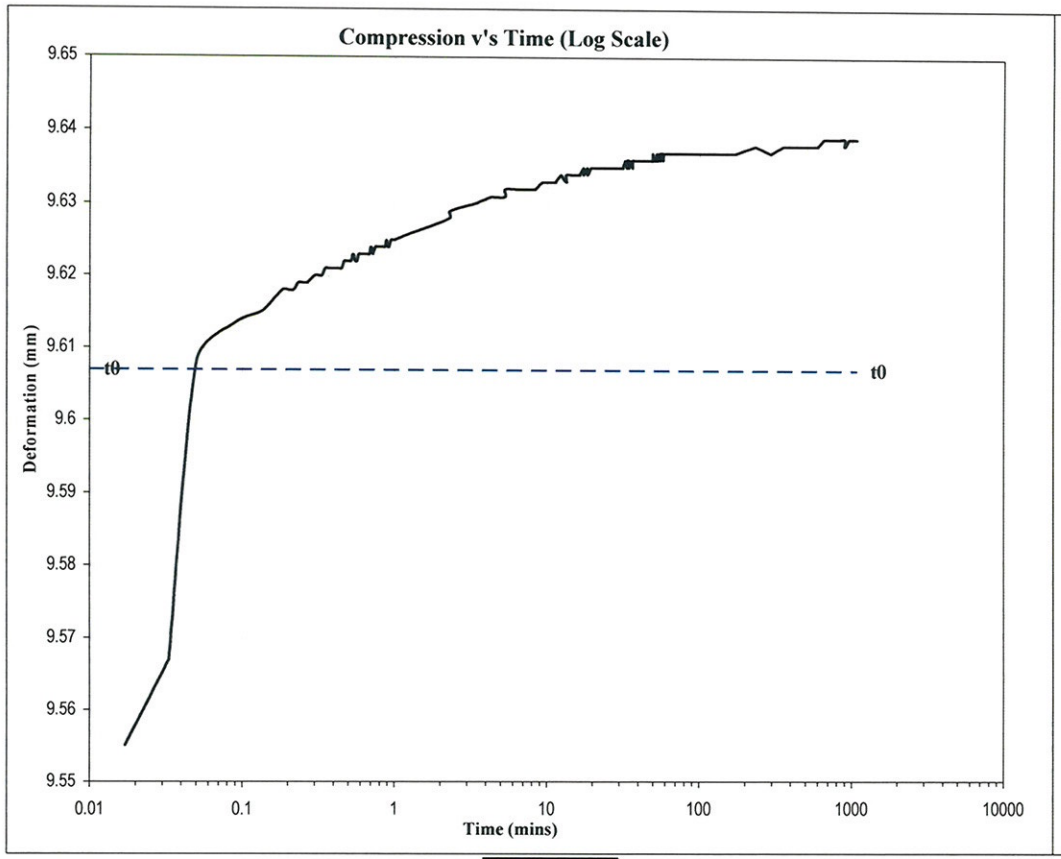
Stage Load : 800 kPa

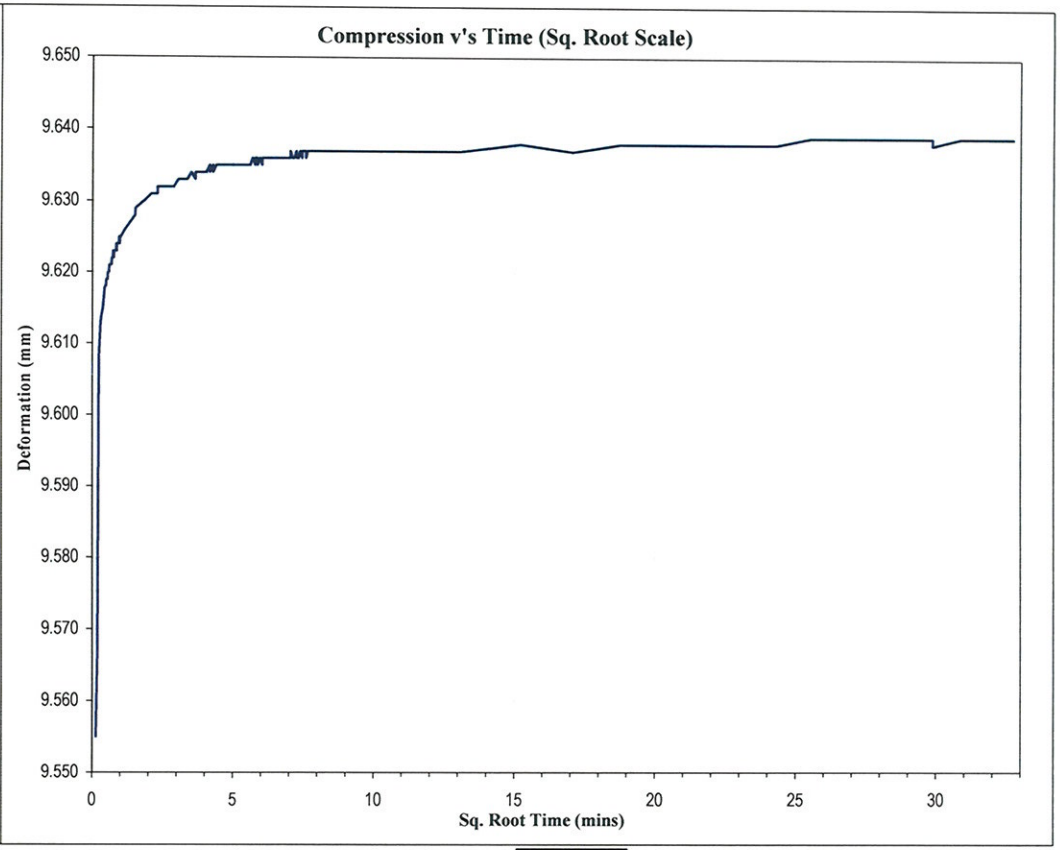
Rig Number : 12

Stage : 1600 - 800

Stage 9 (Rebound)

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
	Time (mins)
	Time (mins)

Secondary	
	Time (mins)
	Time (mins)

Primary	
	Root Time
	Root Time

(Dial) t0 = 9.607 mm

(Dial) t100 = #N/A mm

t100 = #N/A mins

(Dial) t50 = #N/A mm

t50 = #N/A mins

ΔH_α #N/A mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial dial gauge height = 9.555 mm

Final dial gauge height = 9.639 mm

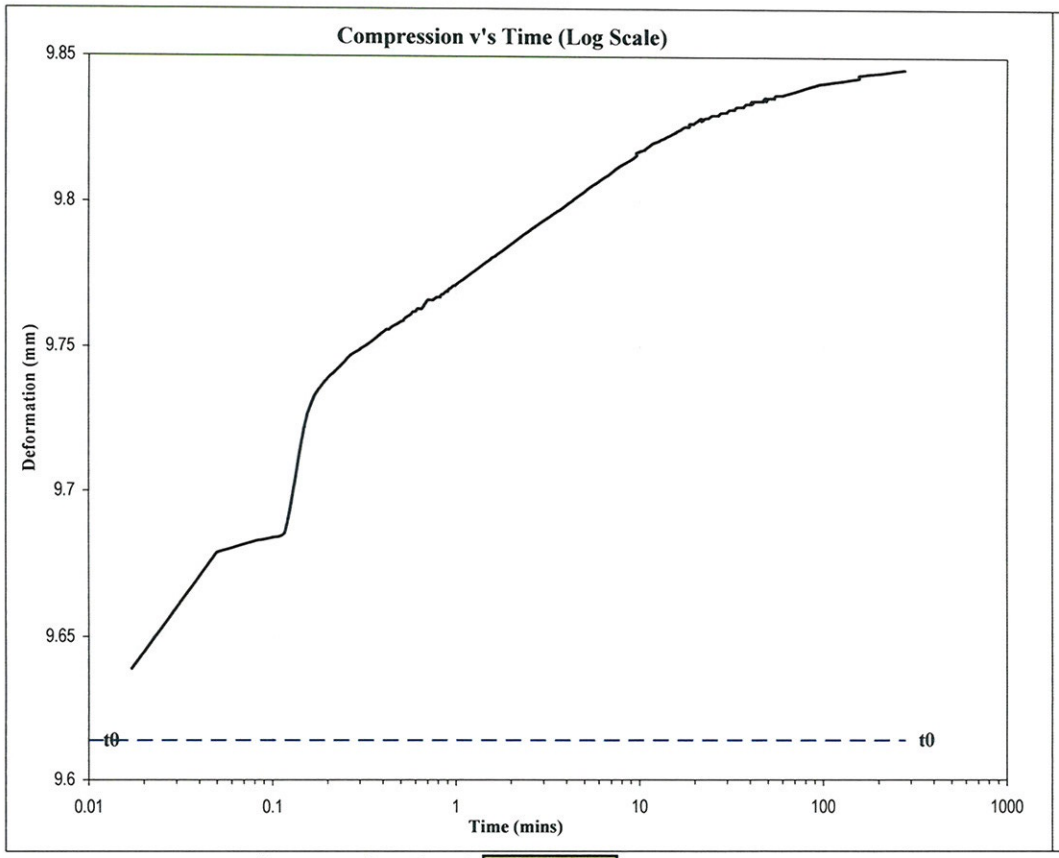
Stage Load : 200 kPa

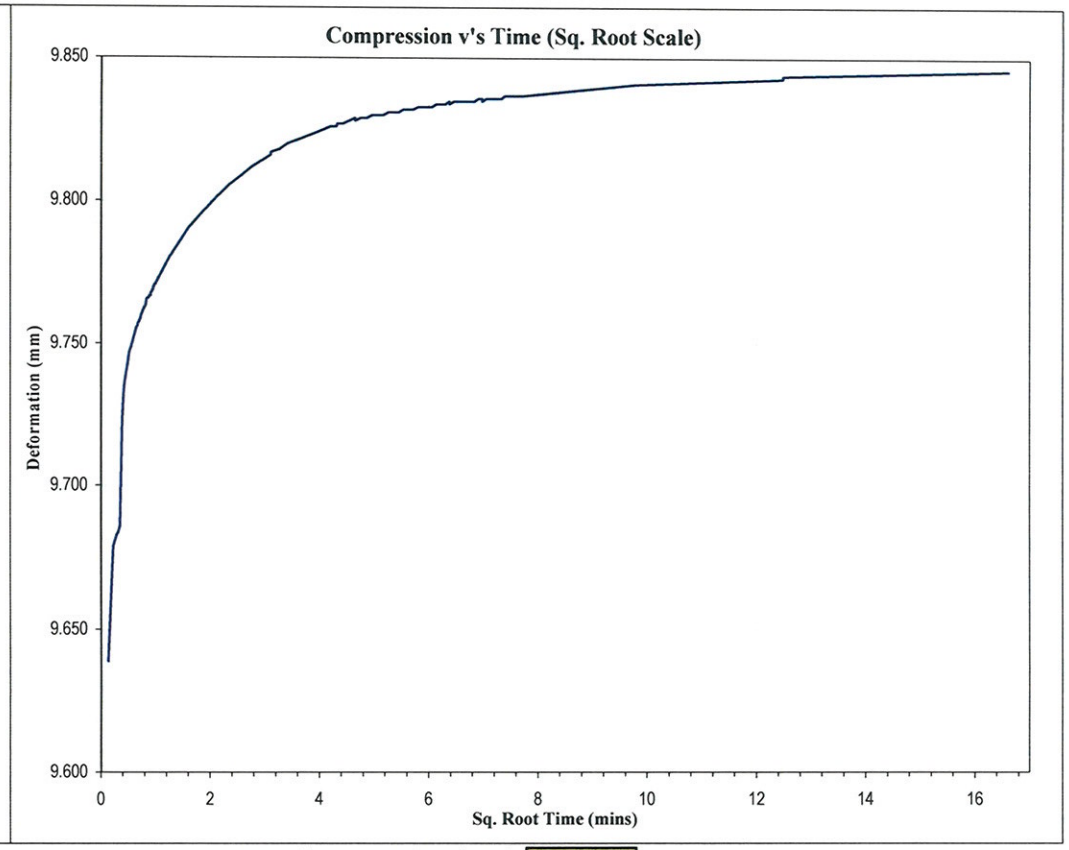
Rig Number : 12

Stage : 800 - 200

Stage 10 (Rebound)

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Primary	
	Time (mins)
	Time (mins)

Secondary	
	Time (mins)
	Time (mins)

Adjust max value of x axis

Primary	
	Root Time
	Root Time

t0 = 9.614 mm

t100 = #N/A mm

t100 = #N/A mins

t50 = #N/A mm

t50 = #N/A mins

ΔHα #N/A mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial stage height = 9.639 mm

Final stage height = 9.846 mm

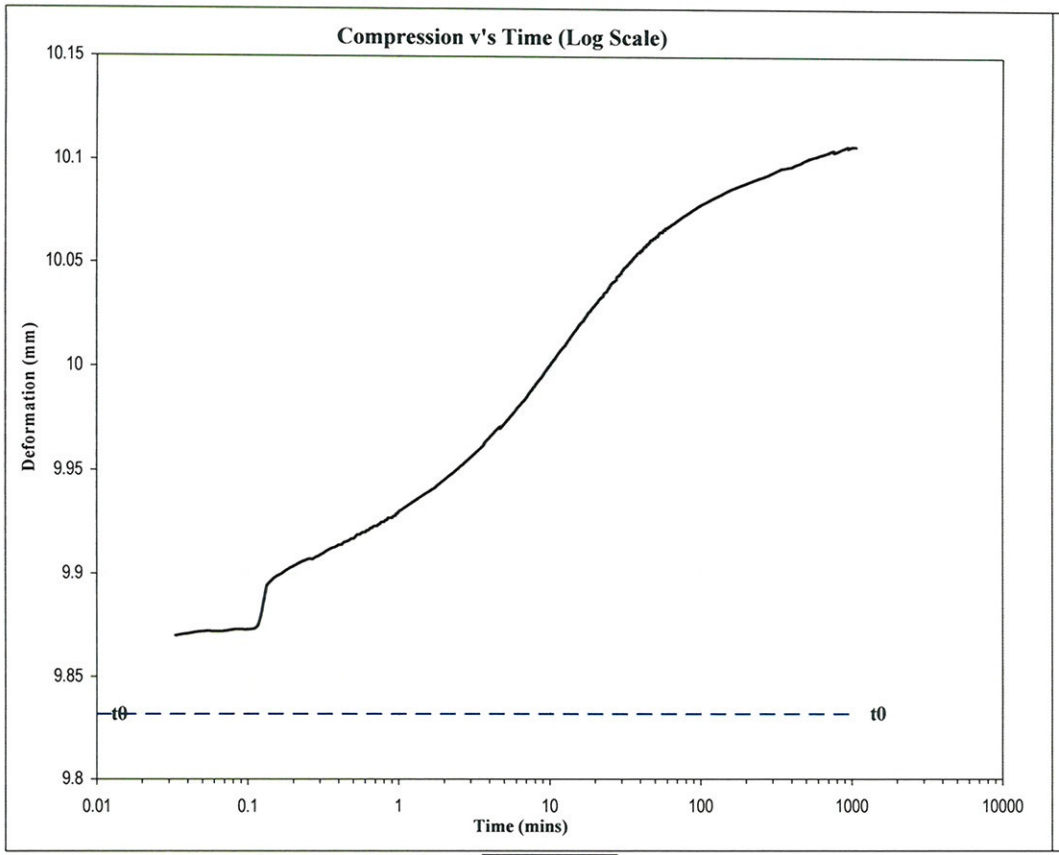
Stage Load : 50 kPa

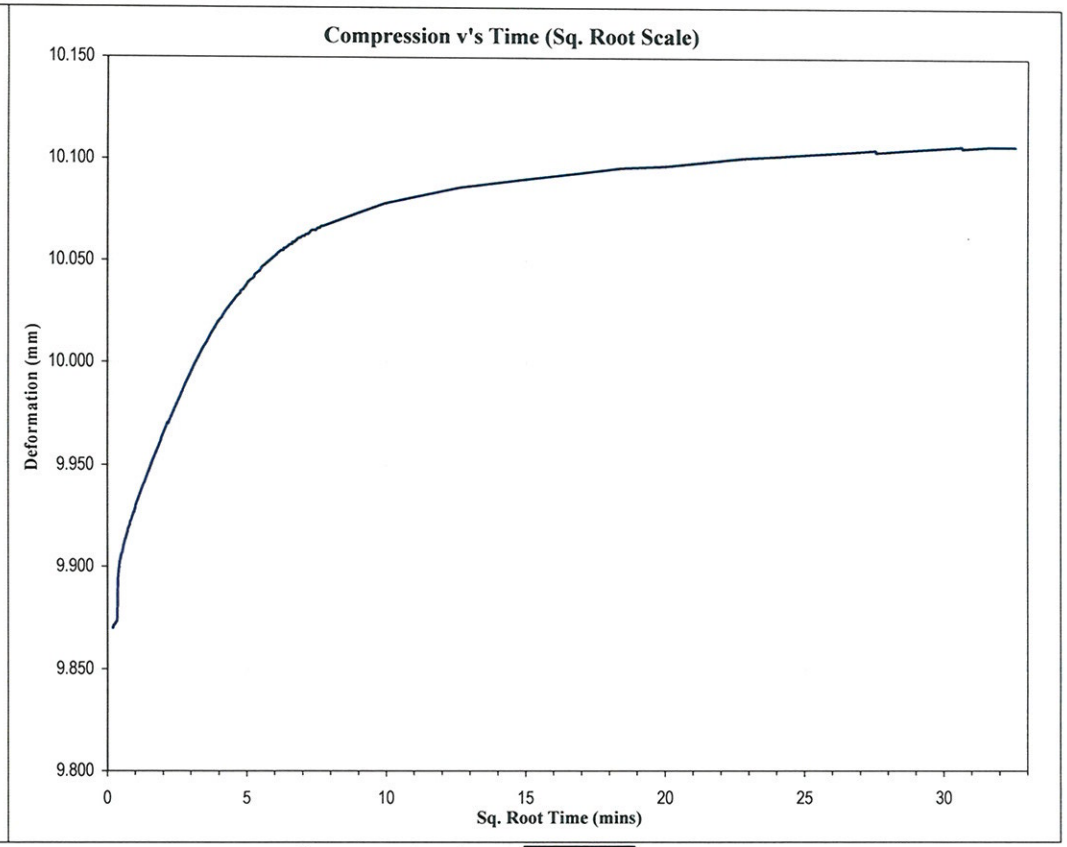
Rig Number : 12

Stage : 200 - 50

Stage 11 (Rebound)

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Adjust max value of x axis

Primary	
	Time (mins)
	Time (mins)

Secondary	
	Time (mins)
	Time (mins)

Primary	
	Root Time
	Root Time

t0 = 9.832 mm

t100 = #N/A mm

t100 = #N/A mins

t50 = #N/A mm

t50 = #N/A mins

ΔHα #N/A mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial stage height = 9.847 mm

Final stage height = 10.107 mm

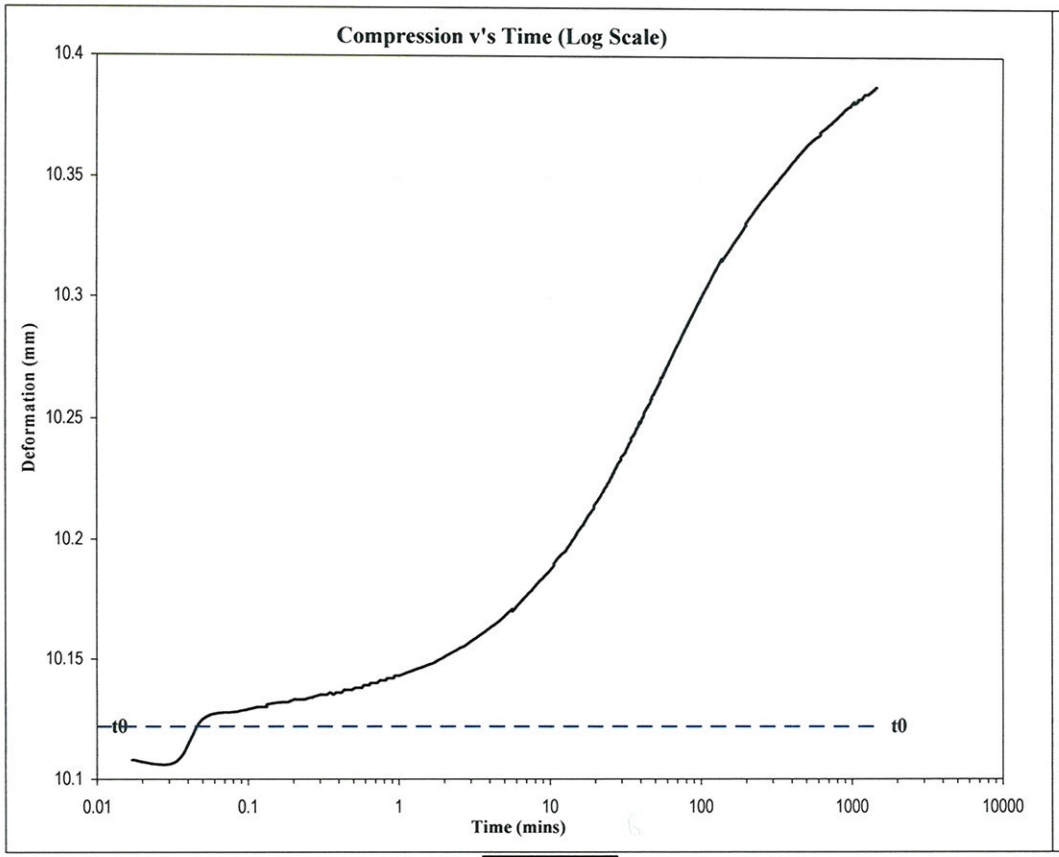
Stage Load : 4 kPa

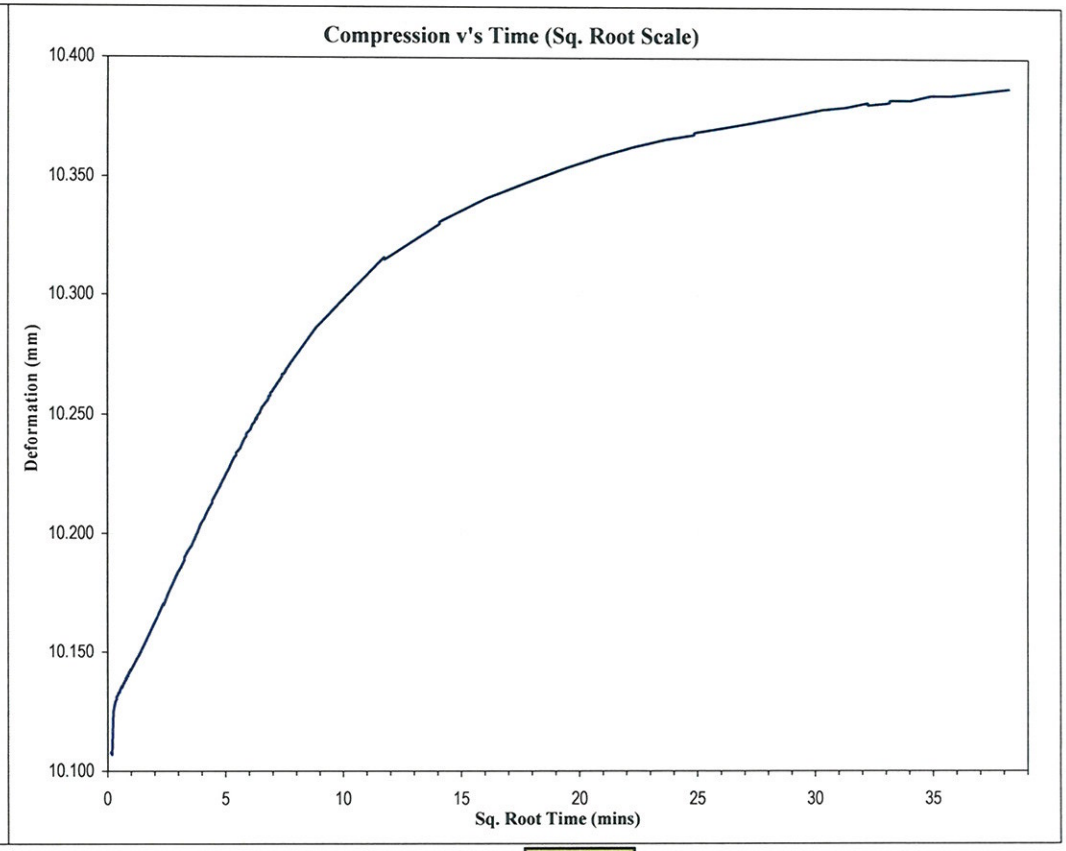
Rig Number : 12

Stage : 50 - 4

Stage 12 (Rebound)

SAMPLE NO : LCOV12S-00424





Adjust max value of x axis

Primary	
	Time (mins)
	Time (mins)

Secondary	
	Time (mins)
	Time (mins)

Adjust max value of x axis

Primary	
	Root Time
	Root Time

t0 = 10.122 mm

t100 = #N/A mm

t100 = #N/A mins

t50 = #N/A mm

t50 = #N/A mins

ΔHα #N/A mm/log cycle

t0 = #N/A mm

t90 = #N/A mm

t90 = #N/A mins

Initial height = 10.108 mm

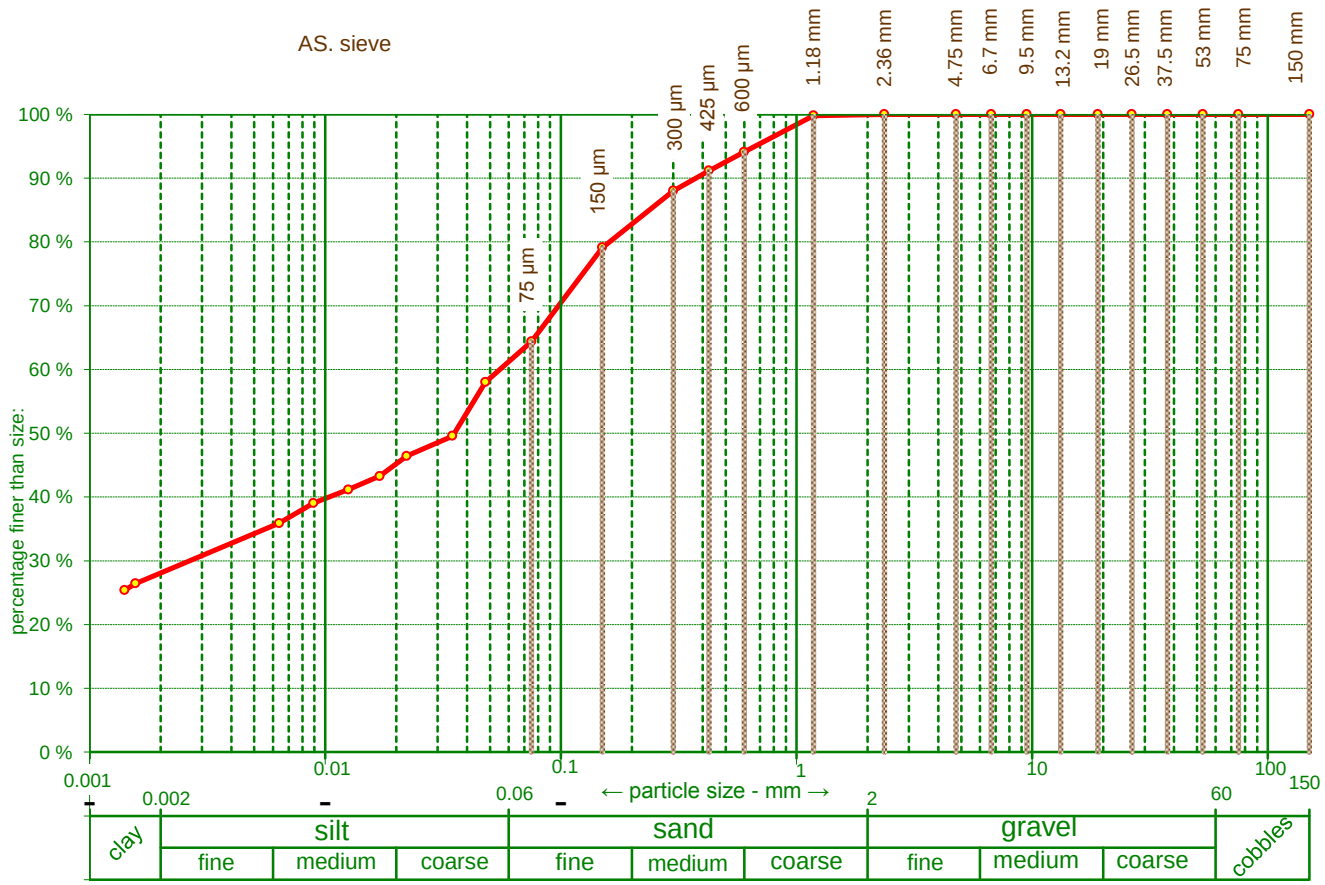
Final height = 10.388 mm

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

Unit 8/12 Mars Raod Lane Cove West, NSW, 2066
ph: (61 2) 9911 1000 Fax: (61 2) 9911 1003
ABN 92 114 364 046

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS REPORT

Client:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Job No:	INFOLCOV00959AA
Principal:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Laboratory:	Lane Cove West
Project:	BERRY BYPASS	Report Date	17-May-12
Location:	PRINCESS HIGHWAY	Test report No:	IOLT 5562
Test procedure:	AS1289.2.1.1;3.1.1;3.2.1;3.3.1;3.4.1;3.6.1:3.6.3	Depth:	2.00 to 2.35m
Sample No:	LCOV12S-00421		
Sample Identification:	B3		



Sieve Analysis		Hydrometer Analysis	
Sieve Size mm	% Passing	Particle Size µm	% Passing
75	100	47.8	58
53	100	34.7	50
37.5	100	22.2	46
26.5	100	17.0	43
19	100	12.5	41
13.2	100	8.9	39
9.5	100	6.4	36
6.7	100	1.6	26
4.75	100	1.4	25
2.36	100		
1.18	100		
600 µm	94		
425 µm	91		
300 µm	88		
150 µm	79		
75 µm	64		

ATTERBERG LIMITS			Procedures
Liquid Limit	%	48	AS1289 3.1.1
Plastic Limit	%	27	AS1289 3.2.1
Plasticity Index		21	AS1289 3.3.1
Linear Shrinkage	%	11.5	AS1289 3.4.1
Mould Length	mm	250.3	
Crumbling &/or Curling		Curling	
Sample History		Natural State ☑	Oven Dried ☐
Sample Preparation		Dry Sieved ☐	Wet Sieved ☑

NOTES:

Loss of mass in pretreatment:	No pretreatment.
Dispersion method:	Sodium hexametaphosphate and Sodium carbonate
Type of hydrometer:	ASTM
Soil Particle density (Assumed)	2.65g/cm3
Moisture Content (as received)	27.9%
N.D. = not determined	N.O.= not obtainable

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\RMS - BERRY\[B3 (2.00 to 2.35 m).xls]Stage8

NATA Accredited Laboratory No. 431
Approved Signatory: Garry Collins
Associate/Laboratory Manag

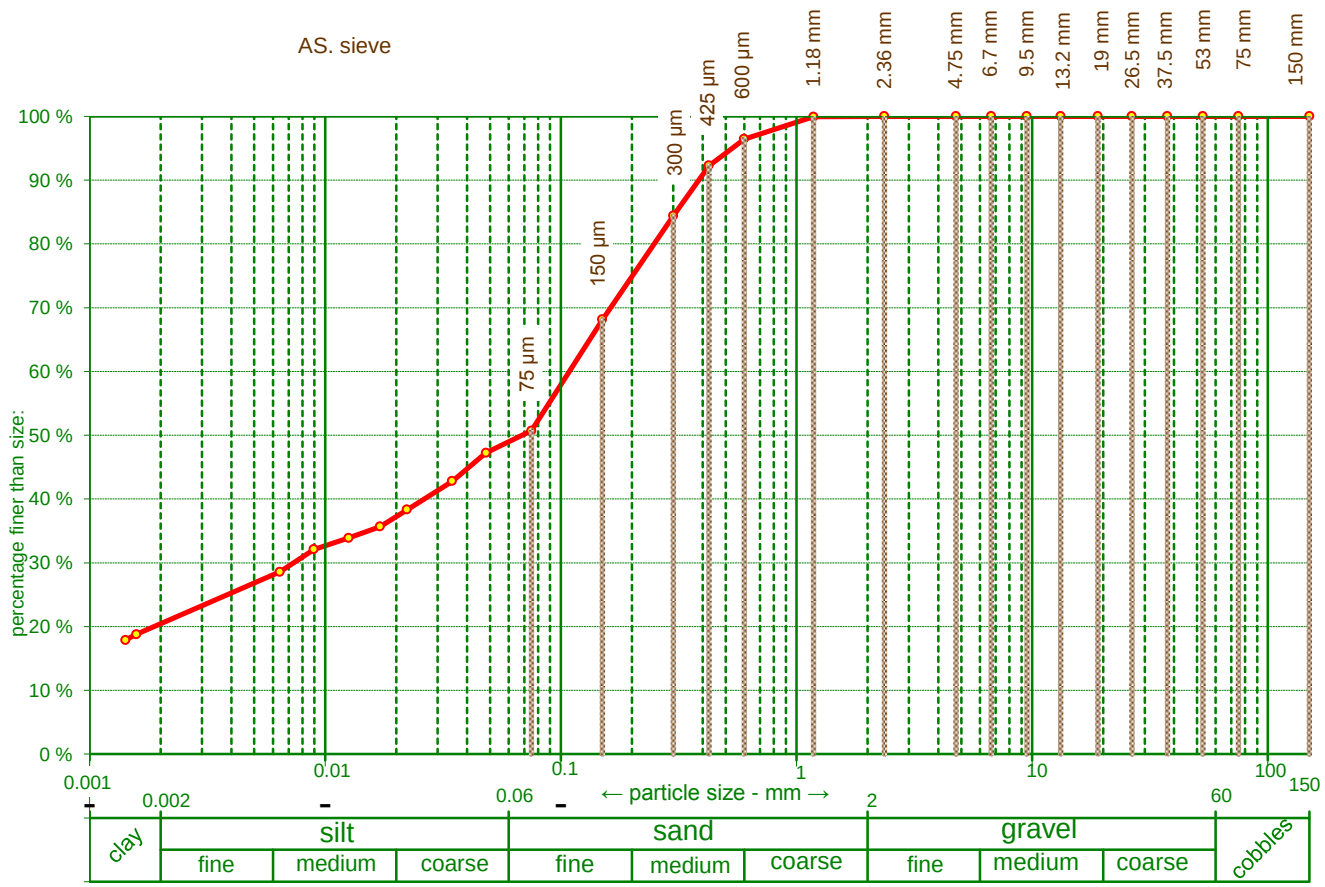
Date: 17 May 12

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

Unit 8/12 Mars Raod Lane Cove West, NSW, 2066
ph: (61 2) 9911 1000 Fax: (61 2) 9911 1003
ABN 92 114 364 046

PARTICLE SIZE DISTRIBUTION & ATTERBERG REPORT

Client:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Job No:	INFOLCOV00959AA
Principal:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Laboratory:	Lane Cove West
Project:	BERRY BYPASS	Report Date	8-May-12
Location:	PRINCESS HIGHWAY	Test report No:	IOLT 5563
Test procedure:	AS1289.2.1.1;3.1.1;3.2.1;3.3.1;3.4.1;3.6.1:3.6.3	Depth:	1.05 to 1.55m
Sample No:	LCOV12S-00422		
Sample Identification:	B5		



Sieve Analysis		Hydrometer Analysis	
Sieve Size mm	% Passing	Particle Size µm	% Passing
75	100	48.1	47
53	100	34.6	43
37.5	100	22.2	38
26.5	100	17.1	36
19	100	12.6	34
13.2	100	8.9	32
9.5	100	6.4	29
6.7	100	1.6	19
4.75	100	1.4	18
2.36	100		
1.18	100		
600 µm	96		
425 µm	92		
300 µm	84		
150 µm	68		
75 µm	51		

ATTERBERG LIMITS			Procedures
Liquid Limit	%	57	AS1289 3.1.1
Plastic Limit	%	34	AS1289 3.2.1
Plasticity Index		23	AS1289 3.3.1
Linear Shrinkage	%	12.0	AS1289 3.4.1
Mould Length	mm	250.4	
Crumbling &/or Curling		Crumbling	
Sample History		Natural State ☑	Oven Dried ☐
Sample Preparation		Dry Sieved ☐	Wet Sieved ☑

NOTES:

Loss of mass in pretreatment:	No pretreatment.
Dispersion method:	Sodium hexametaphosphate and Sodium carbonate
Type of hydrometer:	ASTM
Soil Particle density (Assumed)	2.65g/cm3
Moisture Content (as received)	35.1%
N.D. = not determined	N.O.= not obtainable

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\RMS - BERRY\Hydros\[B5 1.05 to 1.55m.xls]Report

NATA Accredited Laboratory No. 431
Approved Signatory: Garry Collins
Associate/Laboratory Manager

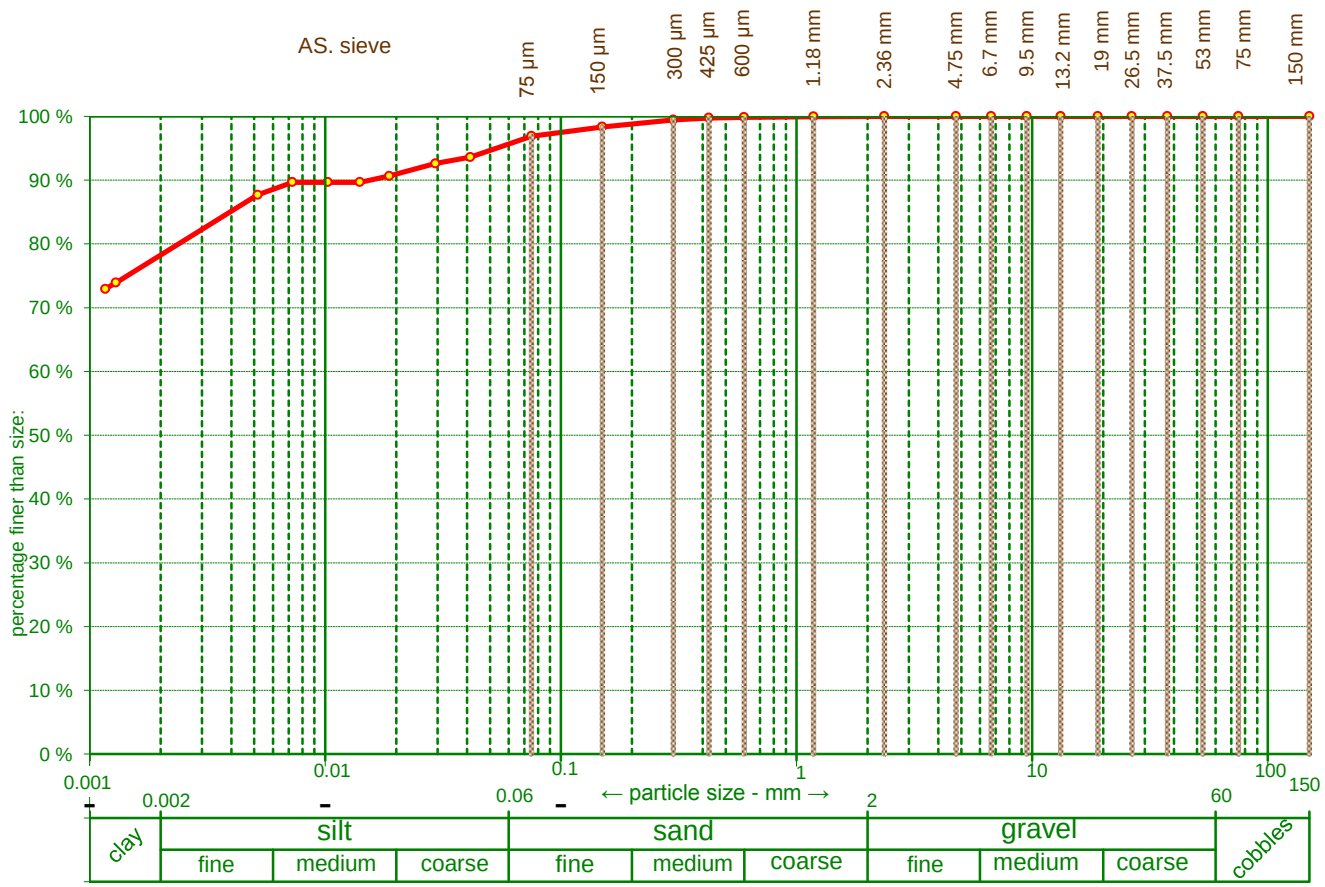
Date: 17 May 12

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

Unit 8/12 Mars Raod Lane Cove West, NSW, 2066
ph: (61 2) 9911 1000 Fax: (61 2) 9911 1003
ABN 92 114 364 046

PARTICLE SIZE DISTRIBUTION & ATTERBERG REPORT

Client:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Job No:	INFOLCOV00959AA
Principal:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Laboratory:	Lane Cove West
Project:	BERRY BYPASS	Report Date	17-May-12
Location:	PRINCESS HIGHWAY	Test report No:	IOLT 5564
Test procedure:	AS1289.2.1.1;3.1.1;3.2.1;3.3.1;3.4.1;3.6.1:3.6.3	Depth:	2.00 to 2.35m
Sample No:	LCOV12S-00423		
Sample Identification:	B9		



Sieve Analysis		Hydrometer Analysis	
Sieve Size mm	% Passing	Particle Size µm	% Passing
75	100	41.3	94
53	100	29.3	93
37.5	100	18.7	91
26.5	100	14.0	90
19	100	10.3	90
13.2	100	7.3	90
9.5	100	5.2	88
6.7	100	1.3	74
4.75	100	1.2	73
2.36	100		
1.18	100		
600 µm	100		
425 µm	100		
300 µm	99		
150 µm	98		
75 µm	97		

ATTERBERG LIMITS			Procedures
Liquid Limit	%	91	AS1289 3.1.1
Plastic Limit	%	36	AS1289 3.2.1
Plasticity Index		55	AS1289 3.3.1
Linear Shrinkage	%	18.0	AS1289 3.4.1
Mould Length	mm	250.2	
Crumbling &/or Curling		Curling	
Sample History		Natural State ☑	Oven Dried ☐
Sample Preparation		Dry Sieved ☐	Wet Sieved ☑

NOTES:

Loss of mass in pretreatment:	No pretreatment.
Dispersion method:	Sodium hexametaphosphate and Sodium carbonate
Type of hydrometer:	ASTM
Soil Particle density (Assumed)	2.65g/cm3
Moisture Content (as received)	42.5%
N.D. = not determined	N.O.= not obtainable

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\RMS - BERRY\Hydros\[B9 2.0 to 2.35m.xls]Report

NATA Accredited Laboratory No. 431
Approved Signatory: Garry Collins
Associate/Laboratory Manager

Date: 17 May 12

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

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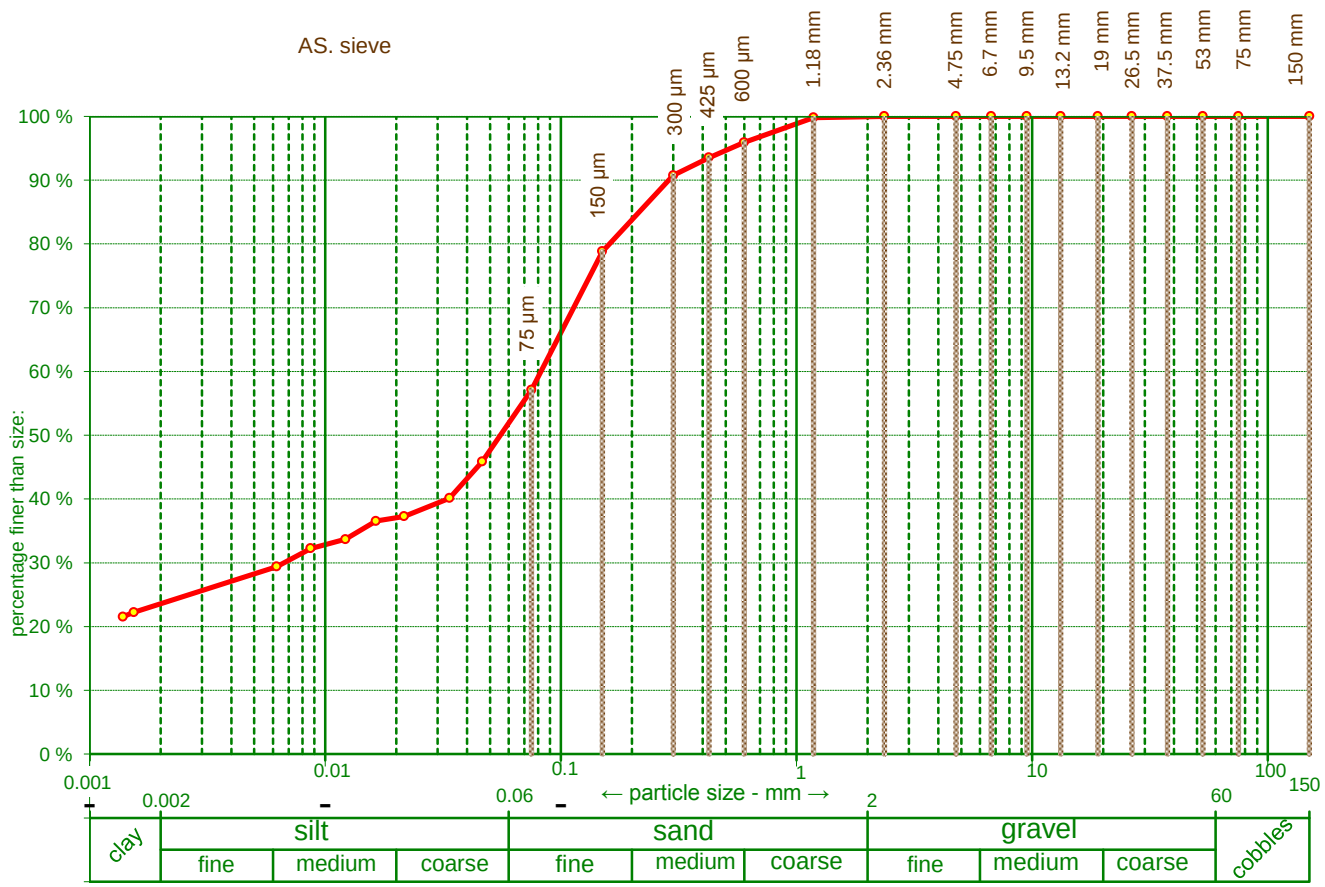
ph: (61 2) 9911 1000 Fax: (61 2) 9911 1003
ABN 92 114 364 046

PARTICLE SIZE DISTRIBUTION & ATTERBERG REPORT

Client:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Job No:	INFOLCOV00959AA
Principal:	ROADS AND MARITIME SERVICES, SOUTHERN REGION	Laboratory:	Lane Cove West
Project:	BERRY BYPASS	Report Date	8-May-12
Location:	PRINCESS HIGHWAY	Test report No:	IOLT 5565
Test procedure:	AS1289.2.1.1;3.1.1;3.2.1;3.3.1;3.4.1;3.6.1:3.6.3	Depth:	1.10 to 1.65m
Sample No:	LCOV12S-00424		
Sample Identification:	B12		



Sieve Analysis		Hydrometer Analysis	
Sieve Size mm	% Passing	Particle Size µm	% Passing
75	100	46.3	46
53	100	33.7	40
37.5	100	21.6	37
26.5	100	16.4	37
19	100	12.2	34
13.2	100	8.7	32
9.5	100	6.2	29
6.7	100	1.5	22
4.75	100	1.4	22
2.36	100		
1.18	100		
600 µm	96		
425 µm	94		
300 µm	91		
150 µm	79		
75 µm	57		

ATTERBERG LIMITS			Procedures
Liquid Limit	%	47	AS1289 3.1.1
Plastic Limit	%	26	AS1289 3.2.1
Plasticity Index		21	AS1289 3.3.1
Linear Shrinkage	%	9.5	AS1289 3.4.1
Mould Length	mm	250.4	
Crumbling &/or Curling		Curling	
Sample History		Natural State ☑	Oven Dried ☐
Sample Preparation		Dry Sieved ☐	Wet Sieved ☑

NOTES:

Loss of mass in pretreatment:	No pretreatment.
Dispersion method:	Sodium hexametaphosphate and Sodium carbonate
Type of hydrometer:	ASTM
Soil Particle density (Assumed)	2.65g/cm3
Moisture Content (as received)	31.2%
N.D. = not determined	N.O.= not obtainable

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\RMS - BERRY\Hydros\[B12 1.1 to 1.65m.xls]Report

NATA Accredited Laboratory No. 431
Approved Signatory: Garry Collins
Associate/Laboratory Manager

Date: 17 May 12

ROADS & MARITIME SERVICES
ENGINEERING TECHNOLOGY SERVICES - SOUTHERN
RUSSELL VALE LABORATORY (NATA ACCREDITATION #2599)
21 YORK PLACE, RUSSELL VALE
PO BOX 62, CORRIMAL, NSW 2518
TEL. (02) 4222 3241

TEST REPORT. SUBGRADE SOIL & ROAD GRAVEL ETC

Work: HW1. CITY OF SHOALHAVEN | **Lab No: A1992**

Gerringong to Berry Geotechnical Investigation | **Sampling Method: By Client**

Testing of Samples Obtained from SPT Holes and Bore Holes, Gerringong to Berry

Client Details: Daniel Horan – RMS Southern Geotech, Wollongong

No. of samples: 32 | Submitted By: D. Horan | Date Received: 18.04.12

Material Source		SPT and Bore Holes						
Description		Various Material						
Location (m)		G2B	G2B	G2B	G2B	G2B	G2B	G2B
Pavement Depth (m)		4.15-4.60	0.50-1.2	2.50-2.95	4.20-4.65	7.15-7.60	0.0-0.50	1.50-1.95
Sample No.		B3	B4	B4	B9	B9	B11	B11
Test Method	Pass 37.5mm %							
	Pass 26.5mm %							
	Pass 19.0 mm %							
	Pass 13.2 mm %							
	Pass 9.5 mm %							
AS1289.3.6.1	Pass 6.7 mm %							
	Pass 4.75mm %							
	Pass 2.36 mm %							
	Pass 1.18mm %							
	Pass 600µm %							
	Pass 425µm %							
	Pass 300µm %							
	Pass 150µm %							
	Pass 75µm %							
AS1289.3.1.2	Liquid Limit %	30	45	39	35	51	66	66
AS1289.3.2.1	Plastic Limit %	19	22	21	12	22	27	26
AS1289.3.3.1	Plasticity Index	11	23	18	23	29	39	40

Comments:
Sample History for AS1289.3.1.2/3.2.1/3.3.1 – Oven Dried
Prep Method for AS1289.3.1.2/3.2.1/3.3.1 – Dry Sieved

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Accredited for compliance with ISO/IEC 17025

Name: Glenn Smith **Signature:** **Designation: Technical Officer** **Date: 11 / 05 / 12**

ROADS & MARITIME SERVICES
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TEST REPORT. SUBGRADE SOIL & ROAD GRAVEL ETC

Work: HW1. CITY OF SHOALHAVEN | **Lab No: A1992**

Gerringong to Berry Geotechnical Investigation | **Sampling Method: By Client**

Testing of Samples Obtained from SPT Holes and Bore Holes, Gerringong to Berry

Client Details: Daniel Horan – RMS Southern Geotech, Wollongong

No. of samples: 32 | Submitted By: D. Horan | Date Received: 18.04.12

	Material Source	SPT and Bore Holes						
	Description	Various Material						
	Location (m)	G2B	G2B	G2B	G2B	G2B	G2B	G2B
	Pavement Depth (m)	7.15-7.60	0.50-0.95	1.50-1.95	5.70-6.15	1.50-1.95	5.60-6.10	7.15-7.60
	Sample No.	B11	B13	B13	B17	B19	B19	B19
Test Method	Pass 37.5 mm %							
	Pass 26.5mm %							
	Pass 19.0 mm %							
	Pass 13.2 mm %							
	Pass 9.5 mm %							
AS1289.3.6.1	Pass 6.7 mm %							
	Pass 4.75mm %							
	Pass 2.36 mm %							
	Pass 1.18mm %							
	Pass 600µm %							
	Pass 425µm %							
	Pass 300µm %							
	Pass 150µm %							
	Pass 75µm %							
AS1289.3.1.2	Liquid Limit %	29	38	37	40	45	59	39
AS1289.3.2.1	Plastic Limit %	17	20	16	21	19	20	16
AS1289.3.3.1	Plasticity Index	12	18	21	19	26	39	23

Comments:
Sample History for AS1289.3.1.2/3.2.1/3.3.1 – Oven Dried
Prep Method for AS1289.3.1.2/3.2.1/3.3.1 – Dry Sieved

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Name: Glenn Smith **Signature:** G Smith **Designation: Technical Officer** **Date: 11 / 05 / 12**

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TEST REPORT. SUBGRADE SOIL & ROAD GRAVEL ETC

Work: HW1. CITY OF SHOALHAVEN — **Lab No: A1992**

Gerringong to Berry Geotechnical Investigation — **Sampling Method: By Client**

Testing of Samples Obtained from SPT Holes and Bore Holes, Gerringong to Berry

Client Details: Daniel Horan – RMS Southern Geotech, Wollongong

No. of samples: 32 | Submitted By: D. Horan | Date Received: 18.04.12

Material Source		SPT and Bore Holes						
Description		Various Material						
Location (m)		G2B	G2B	G2B	G2B	G2B	G2B	G2B
Pavement Depth (m)		0.50-0.95	1.00-2.50	1.50-1.95	4.15-4.41	1.50-1.95	2.50-2.95	5.70-6.15
Sample No.		B21A	B21A	B22	B22	B23	B23	B23
Test Method	Pass 37.5 mm %							
	Pass 26.5mm %							
	Pass 19.0 mm %							
	Pass 13.2 mm %							
	Pass 9.5 mm %							
AS1289.3.6.1	Pass 6.7 mm %							
	Pass 4.75mm %							
	Pass 2.36 mm %							
	Pass 1.18mm %							
	Pass 600µm %							
	Pass 425µm %							
	Pass 300µm %							
	Pass 150µm %							
	Pass 75µm %							
AS1289.3.1.2	Liquid Limit %	89	74	69	36	65	63	45
AS1289.3.2.1	Plastic Limit %	25	21	24	23	23	21	23
AS1289.3.3.1	Plasticity Index	64	53	45	13	42	42	22

Comments:
Sample History for AS1289.3.1.2/3.2.1/3.3.1 – Oven Dried
Prep Method for AS1289.3.1.2/3.2.1/3.3.1 – Dry Sieved

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Name: Glenn Smith **Signature:** **Designation: Technical Officer** **Date: 11 / 05 / 12**

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TEST REPORT. SUBGRADE SOIL & ROAD GRAVEL ETC

Work: HW1. CITY OF SHOALHAVEN | **Lab No: A1992**

Gerringong to Berry Geotechnical Investigation | **Sampling Method: By Client**

Testing of Samples Obtained from SPT Holes and Bore Holes, Gerringong to Berry

Client Details: Daniel Horan – RMS Southern Geotech, Wollongong

No. of samples: 32 | Submitted By: D. Horan | Date Received: 18.04.12

	Material Source	SPT and Bore Holes						
	Description	Various Material						
	Location (m)	G2B	G2B	G2B	G2B	G2B	G2B	G2B
	Pavement Depth (m)	2.50-2.95	5.70-6.15	7.2-7.65	10.2-10.65	1.00-1.45	4.00-4.45	5.55-6.00
	Sample No.	BH10	BH10	BH14	BH14	BH15	BH15	BH15
Test Method	Pass 37.5 mm %							
	Pass 26.5mm %							
	Pass 19.0 mm %		100	100				
	Pass 13.2 mm %		96	96	100		100	
	Pass 9.5 mm %	100	95	93	97		99	100
AS1289.3.6.1	Pass 6.7 mm %	100	93	88	93		99	100
	Pass 4.75mm %	100	91	85	88		99	99
	Pass 2.36 mm %	99	87	77	79	100	98	99
	Pass 1.18mm %	97	83	70	71	100	97	99
	Pass 600µm %	95	79	64	66	100	96	96
	Pass 425µm %	93	76	60	64	99	95	89
	Pass 300µm %	90	71	57	61	99	94	75
	Pass 150µm %	83	61	50	55	94	91	58
	Pass 75µm %	76	53	41	49	86	88	51
AS1289.3.1.2	Liquid Limit %	72	40	34	50	82	65	55
AS1289.3.2.1	Plastic Limit %	20	19	21	31	23	21	18
AS1289.3.3.1	Plasticity Index	52	21	13	19	59	44	37

Comments:
Sample History for AS1289.3.1.2/3.2.1/3.3.1 – Oven Dried
Prep Method for AS1289.3.1.2/3.2.1/3.3.1 – Dry Sieved

Name: Glenn Smith **Signature:** **Designation: Technical Officer** **Date: 11 / 05 / 12**

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TEST REPORT. SUBGRADE SOIL & ROAD GRAVEL ETC

Work: HW1. CITY OF SHOALHAVEN — **Lab No: A1992**

Gerringong to Berry Geotechnical Investigation — **Sampling Method: By Client**

Testing of Samples Obtained from SPT Holes and Bore Holes, Gerringong to Berry

Client Details: Daniel Horan – RMS Southern Geotech, Wollongong

No. of samples: 32 | Submitted By: D. Horan | Date Received: 18.04.12

Material Source		SPT and Bore Holes						
Description		Various Material						
Location (m)		G2B	G2B	G2B	G2B			
Pavement Depth (m)		1.00-1.45	2.50-2.45	1.00-1.45	2.50-2.95			
Sample No.		BH20A	BH20A	BH22A	BH22A			
Test Method	Pass 37.5 mm %							
	Pass 26.5mm %							
	Pass 19.0 mm %			100				
	Pass 13.2 mm %			99				
	Pass 9.5 mm %			99				
AS1289.3.6.1	Pass 6.7 mm %	100		99				
	Pass 4.75mm %	100		99	100			
	Pass 2.36 mm %	100	100	98	100			
	Pass 1.18mm %	99	100	96	99			
	Pass 600µm %	99	100	94	96			
	Pass 425µm %	98	99	93	95			
	Pass 300µm %	97	99	92	94			
	Pass 150µm %	92	97	88	87			
	Pass 75µm %	81	89	78	74			
AS1289.3.1.2	Liquid Limit %	75	47	47	36			
AS1289.3.2.1	Plastic Limit %	23	15	19	17			
AS1289.3.3.1	Plasticity Index	52	32	28	19			

Comments:
Sample History for AS1289.3.1.2/3.2.1/3.3.1 – Oven Dried
Prep Method for AS1289.3.1.2/3.2.1/3.3.1 – Dry Sieved

Name: Glenn Smith **Signature:** **Designation: Technical Officer** **Date: 11 / 05 / 12**

Vane Shear Test Results

Carried out at: Coffey Geotechnics, Wollongong
Date: 18 May 2012
By: Chris Appelkamp

Results of 19mm Vane Shear in U75 tube as follows:

- Sample – Borehole B-15 (3.0m – 3.35m)
  - Test 1 @ 3.30m: Peak Su = 122kPa, Residual Su = 77.6kPa;

- Sample – Borehole B-19 (3.0m – 3.35m)
  - Test 2 @ 3.30m: Peak Su = 144.1kPa, Residual Su = 47.1kPa;

APPENDIX E

LABORATORY TEST RESULTS (ACID SULPHATE SOIL AND ROCK)

RESULTS OF ACID SULFATE SOIL ANALYSIS

48 samples supplied by Roads and Maritime Services on the 12th April, 2012 - Lab. Job No. B9284

Analysis requested by Daniel Horan.

(PO Box 477 DX 5178, WOLLONGONG NSW 5220)

Required if pH_{KCL} <4.5

Sample Site	EAL lab code	TEXTURE (note 6)	MOISTURE CONTENT (% moisture of total wet weight)	MOISTURE CONTENT (g moisture / g of oven dry soil)	TITRATABLE ACTUAL ACIDITY (TAA) (To pH 6.5) pH_{KCl}	TITRATABLE ACTUAL ACIDITY (TAA) (To pH 6.5) (mole H^+/tonne)	Extractable sulfate sulfur $\%S_{Kcl}$	Extractable sulfate sulfur (equivalent mole H^+/tonne)	REDUCED INORGANIC SULFUR (% chromium reducible S) (%Scr)	REDUCED INORGANIC SULFUR (% chromium reducible S) (mole H^+/tonne)	RETAINED ACIDITY (HCL extract) (as $\%S_{HCL} - \%S_{Kcl}$) $(\%S_{NAS})$	RETAINED ACIDITY S_{NAS} (mole H^+/tonne)	NET ACIDITY Chromium Suite mole H^+/tonne (based on %Scrs)	LIME CALCULATION Chromium Suite kg $CaCO_3$/tonne DW (includes 1.5 safety Factor when liming rate is $^+$ve)
Method Info.					*(ACTUAL ACIDITY)*				*(POTENTIAL ACIDITY)*		*(RETAINED ACIDITY)*		*note 5*	*note 4 and 6*
B11 (0.5m-0.95m)	*B9284/1*	Fine	22.8	0.3	5.54	26	..	..	<0.01	0	..	0	26	2.0
B11 (1.5m-1.95m)	*B9284/2*	Fine	21.3	0.3	5.97	16	..	..	<0.01	0	..	0	16	1.2
B13 (0.5m-0.95m)	*B9284/3*	Fine	20.4	0.3	6.26	13	..	..	<0.01	0	..	0	13	1.0
B13 (1.5m-1.95m)	*B9284/4*	Fine	21.7	0.3	5.74	16	..	..	0.01	6	..	0	22	1.6
B13 (2.5m-2.95m)	*B9284/5*	Fine	24.3	0.3	5.95	18	..	..	<0.01	0	..	0	18	1.3
B19 (0.5m-0.95m)	*B9284/6*	Fine	21.9	0.3	3.90	87	0.051	31	0.01	6	0.02	10	103	7.7
B19 (1.5m-1.95m)	*B9284/7*	Fine	23.2	0.3	5.13	30	..	..	<0.01	0	..	0	30	2.2
B19 (2.5m-2.95m)	*B9284/8*	Fine	27.6	0.4	3.91	124	0.080	50	1.62	1010	0.02	11	1146	85.9
B21A (0.5m-0.95m)	*B9284/9*	Fine	24.8	0.3	4.09	83	0.009	5	<0.01	0	<0.01	0	83	6.2
B21A (1.5m-1.95m)	*B9284/10*	Fine	20.1	0.3	4.16	62	0.005	3	0.02	12	0.01	5	79	5.9
B21A (2.5m-2.95m)	*B9284/11*	Fine	15.2	0.2	4.73	35	..	..	0.01	6	..	0	41	3.1
B22 (0.5m-0.95m)	*B9284/12*	Fine	24.8	0.3	4.01	119	0.016	10	0.01	6	<0.01	0	125	9.4
B22 (1.5m-1.95m)	*B9284/13*	Fine	22.9	0.3	3.69	105	0.007	4	0.01	6	<0.01	0	111	8.3
B22 (2.5m-2.95m)	*B9284/14*	Fine	20.5	0.3	3.94	70	0.009	6	0.01	6	0.01	3	79	5.9
N1 (0.5m-0.95m)	*B9284/15*	Fine	25.5	0.3	4.45	92	0.002	1	<0.01	0	0.01	5	97	7.3
N1 (1.5m-1.95m)	*B9284/16*	Fine	18.5	0.2	4.83	38	..	..	0.01	6	..	0	44	3.3
N2 (0.5m-0.95m)	*B9284/17*	Fine	18.8	0.2	5.48	32	..	..	0.01	6	..	0	39	2.9
N2 (1.5m-1.95m)	*B9284/18*	Fine	18.4	0.2	5.41	25	..	..	<0.01	0	..	0	25	1.9
B5 (0.5m-0.95m)	*B9284/19*	Fine	27.2	0.4	5.16	52	..	..	<0.01	0	..	0	52	3.9
B9 (0.5m-0.95m)	*B9284/20*	Fine	25.8	0.3	4.03	122	0.098	61	0.02	12	<0.01	0	134	10.0
B9 (1.5m-1.95m)	*B9284/21*	Fine	26.9	0.4	4.23	67	0.075	47	0.01	6	..	0	73	5.5
B9 (0.5m-0.95m)	*B9284/22*	Fine	22.2	0.3	4.61	28	..	..	0.01	6	..	0	34	2.5
B6 (0.5m-0.95m)	*B9284/23*	Fine	29.1	0.4	4.08	92	0.008	5	<0.01	0	<0.01	0	92	6.9
B6 (1.5m-1.95m)	*B9284/24*	Fine	20.4	0.3	4.15	115	0.012	7	0.01	6	0.01	4	124	9.3
B6 (2.5m-2.95m)	*B9284/25*	Fine	21.7	0.3	4.49	44	0.007	4	<0.01	0	0.01	4	48	3.6
B4 (0.5m-0.95m)	*B9284/26*	Fine	20.3	0.3	4.80	35	..	..	<0.01	0	..	0	35	2.6
B4 (1.5m-1.95m)	*B9284/27*	Fine	17.4	0.2	4.80	35	..	..	<0.01	0	..	0	35	2.6
B4 (2.5m-2.95m)	*B9284/28*	Fine	20.6	0.3	5.14	22	..	..	<0.01	0	..	0	22	1.7
B3 (0.5m-0.95m)	*B9284/29*	Fine	23.0	0.3	5.55	27	..	..	<0.01	0	..	0	27	2.0
B3 (1.5m-1.95m)	*B9284/30*	Fine	21.4	0.3	5.66	24	..	..	<0.01	0	..	0	24	1.8
B3 (2.5m-2.95m)	*B9284/31*	Fine	23.7	0.3	5.41	31	..	..	<0.01	0	..	0	31	2.3
B8 (0.5m-0.95m)	*B9284/32*	Fine	24.1	0.3	4.29	103	0.003	2	<0.01	0	0.01	4	107	8.0
B8 (1.5m-1.95m)	*B9284/33*	Fine	21.6	0.3	4.07	102	0.017	11	0.01	6	<0.01	0	108	8.1
B8 (2.5m-2.95m)	*B9284/34*	Fine	24.9	0.3	3.90	92	0.008	5	<0.01	0	<0.01	0	92	6.9
B2 (0.5m-0.95m)	*B9284/35*	Fine	22.6	0.3	4.51	58	..	..	<0.01	0	..	0	58	4.4
B2 (1.5m-1.95m)	*B9284/36*	Fine	21.2	0.3	5.04	41	..	..	<0.01	0	..	0	41	3.1
B17 (0.5m-0.95m)	*B9284/37*	Fine	18.7	0.2	5.13	30	..	..	<0.01	0	..	0	30	2.3
B17 (1.5m-1.95m)	*B9284/38*	Fine	21.2	0.3	5.13	28	..	..	<0.01	0	..	0	28	2.1
B17 (2.5m-2.95m)	*B9284/39*	Fine	24.3	0.3	5.70	24	..	..	<0.01	0	..	0	24	1.8
B23 (0.5m-0.95m)	*B9284/40*	Fine	24.8	0.3	4.91	48	..	..	<0.01	0	..	0	48	3.6
B23 (1.5m-1.95m)	*B9284/41*	Fine	21.7	0.3	4.35	68	0.037	23	<0.01	0	0.01	3	70	5.3
B23 (2.5m-2.95m)	*B9284/42*	Fine	22.0	0.3	5.07	45	..	..	<0.01	0	..	0	45	3.3
B7 (0.5m-0.95m)	*B9284/43*	Fine	26.7	0.4	4.59	84	..	..	<0.01	0	..	0	84	6.3
B7 (1.65m-1.25m)	*B9284/44*	Fine	27.9	0.4	4.90	38	..	..	<0.01	0	..	0	38	2.9
B7 (1.65m-3.10m)	*B9284/45*	Fine	24.3	0.3	4.24	94	0.026	16	<0.01	0	<0.01	0	94	7.0
B7 (3.00m-3.45m)	*B9284/46*	Fine	24.7	0.3	3.69	100	0.008	5	<0.01	0	<0.01	0	100	7.5
B12 (0.5m-0.95m)	*B9284/47*	Fine	22.9	0.3	5.05	32	..	..	<0.01	0	..	0	32	2.4
B12 (1.65m-2.1m)	*B9284/48*	Fine	24.1	0.3	5.39	27	..	..	<0.01	0	..	0	27	2.0

NOTE:

1 - All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)

2 - Samples analysed by SPOCAS method 23 (ie Suspension Peroxide Oxidation Combined Acidity & sulfate) and 'Chromium Reducible Sulfur' technique (Scr - Method 22B)

3 - Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). ***Acid Sulfate Soils Laboratory Methods Guidelines.*** QLD DNRME.

4 - Bulk Density is required for liming rate calculations per soil volume. Lab. Bulk Density is no longer applicable - field bulk density rings can be used and dried/ weighed in the laboratory.

5 - **ABA Equation: Net Acidity = Potential Sulfidic Acidity (ie. Scrs or Sox) + Actual Acidity + Retained Acidity - measured ANC/FF (with FF currently defaulted to 1.5)**

6 - The neutralising requirement, lime calculation, includes a 1.5 safety margin for acid neutralisation (an increased safety factor may be required in some cases)

7 - For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays

8 - .. denotes not requested or required. '0' is used for ANC and Snag calcs if TAA pH <6.5 or >4.5

9 - SCREENING, CRS, TAA and ANC are NATA accredited but other SPOCAS segments are currently not NATA accredited

10- Results at or below detection limits are replaced with '0' for calculation purposes.

11 - Projects that disturb >1000 tonnes of soil, the ≥0.03% S classification guideline would apply (refer to acid sulfate management guidelines).

12 - Results refer to samples as received at the laboratory. This report is not to be reproduced except in full.

(Classification of potential acid sulfate material if: coarse Scr≥0.03%S or 19mole H^+/t; medium Scr≥0.06%S or 37mole H^+/t; fine Scr≥0.1%S or 62mole H^+/t) - as per QUASSIT Guidelines

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

checked: .....
Graham Lancaster
Laboratory Manager

RESULTS OF SOIL ANALYSIS (Page 1 of 1)

48 samples supplied by Roads and Maritime Services on the 12th April, 2012 - Lab Job No. B9284
Analysis requested by Daniel Horan. - **Your Project: Samples 10, 15, 18, 19, 30 & 46**
(PO Box 477 DX 5178, WOLLONGONG NSW 5220).

	Method	Sample 10 B21A (1.5m-1.95m)	Sample 15 N1 (0.5m-0.95m)	Sample 18 N2 (1.5m-1.95m)	Sample 19 B5 (0.5m-0.95m)	Sample 30 B3 (1.5m-1.95m)	Sample 46 B7 (3.00m-3.45m)
	EAL job No.	***B9284/10***	***B9284/15***	***B9284/18***	***B9284/19***	***B9284/30***	***B9284/46***
Moisture (%)	*inhouse*	20	26	18	27	21	25
Texture	*See note 2 below.*	Fine	Fine	Fine	Fine	Fine	Fine
Soil pH (1:5 water)	Rayment and Lyons 4A1	5.75	5.14	5.31	6.14	5.93	6.41
Soil Conductivity (1:5 water dS/m)	Rayment and Lyons 4B1	0.057	0.192	0.066	0.040	0.081	0.045
Soil Resistivity (ohm.mm)	Calculation	175,039	51,991	152,300	252,653	124,224	221,239
Chloride (mg/kg)	Water Extract- Rayment and Lyons 5A2b	280	21	11	31	17	42
Chloride **(as %)**	Calculation	0.028	0.002	0.001	0.003	0.002	0.004
Sulfate (mg/kg)	Water Extract-Apha 3120 ICPOES	128	78	32	53	54	68
Sulfate **(as % SO_3)**	Calculation	0.010	0.006	0.003	0.004	0.004	0.005
Chloride / Sulfate Ratio	calculation	2.2	0.3	0.3	0.6	0.3	0.6

Notes:
1. ppm = mg/Kg dried soil
2. For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays
3. All results as dry weight DW - soils were dried at 6OoC for 48hrs prior to crushing and analysis.
4. For conductivity 1 dS/m = 1 mS/cm = 1000 μS/cm
5. Methods from Rayment and Lyons. Soil Chemical Methods - Australasia
6. Based on Australian Standard AS: 159-1995
7 - Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). ***Acid Sulfate Soils Laboratory Methods Guidelines.*** QLD DNRME.

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

checked: .....
Graham Lancaster
Laboratory Manager

Report Date/Time: 21 May 2012 7:39:32AM

Sample Receipt Notification (SRN)

Project:	EAL/C0049
Customer:	**Roads and Maritime Services**
Contact:	Matthew Boys
Client Job ID:	Rock Core AS
No. of Samples:	3 samples
Date Received:	18/05/2012 12:45:45PM
Comments:	Standard Request
Biller:	**Roads and Maritime Services** - Matthew Boys - 02 4221 2520

Environmental Analysis Laboratory
PO Box 157
Lismore NSW 2480
ABN: 41 995 651 524
Tel: (02) 6620 3678 Fax (02) 6620 3957
Email: eal@scu.edu.au

Test Request

Sample Text ID	Client Sample ID	AS-PACK-01 Chromium Suite	AS-SING-07 TPA	AS-SING-14 NAG Net Acidity	AS-SING-14 NAG pH
EAL/C0049/001	G11-02 B1-15.10-1	1	1	1	1
EAL/C0049/002	G11-02 B110.1-10.	1	1	1	1
EAL/C0049/003	G11-02 B1-5.63-5.7	1	1	1	1
Total		3	3	3	3

RESULTS OF ACID SULFATE ROCK ANALYSIS (Page 1 of 1)

3 samples supplied by Roads and Maritime Services on the 18th May, 2012 - Lab. Job No. C0049

Analysis requested by Matthew Boys. **Your Project: Rock Core**

(PO Box 477, WOLLONGONG NSW 2500).

Sample Site	EAL lab code	Texture	TITRATABLE ACTUAL ACIDITY (TAA)		TPA	TPA	Titratable Potential Acidity (TPA)	REDUCED INORGANIC SULFUR		ACID NEUTRALISING CAPACITY (ANC_{BT})		NAG pH	NAG NET ACIDITY Net Acid Generation	CLASSIFICATION (based on NAG pH and NAPP)	NET ACIDITY Chromium Suite (based on %Scr. ANC assumed to be zero if TAA pH<6.5)		ANC/MPA RATIO	NAPP (Net Acid Producing Potential) (does not include actual acidity)	CLASSIFICATION (based on NAPP)
		(note 6)	pH_{KCl}	(to pH 6.5) (mole H^+/tonne)	pH_{ox}	pH_{TPA}	mole H^+/tonne (to pH 6.5)	(%Scr)	(mole H^+/tonne)	(% $CaCO_3$)	(mole H^+/tonne)	pH	(to pH 7) (kg H_2SO_4/tonne)	(ie. NAF, PAF, UC)	(mole H^+/tonne)	(kg H_2SO_4/tonne)	>2 ideal (kg H_2SO_4/tonne)	(kg H_2SO_4/tonne)	(ie. 1- ACM; 2- NAF, 3- PAF-LC, 4- PAF)
Method No.			*23A*	*23F*	*23B*		*23G*	*22B*	*a- 22B*	*19A2*	*a-19A2*			***note 12***	*note 5*	*calculation*	..	***note 12***	***note 12***
1/G11-02 B1	*B0049/1*	Rock	8.53	0	6.27	6.66	0	0.59	368	2.73	545	6.96	0.2	NAF	4	0	1.5	-9	1-ACM
2/G11-02 B1	*B0049/2*	Rock	8.73	0	2.82	3.04	141	0.51	318	1.26	252	3.52	5.4	PAF	150	8	0.8	3	3-PAF-LC
3/G11-02 B1	*B0049/3*	Rock	5.64	9	6.21	5.94	4	0.01	6	0.04	8	6.48	1.3	NAF	10	1	1.3	0	2-NAF

NOTE:

1 - All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)

2 - Samples analysed by SPOCAS method 23 (ie Suspension Peroxide Oxidation Combined Acidity & sulfate) and 'Chromium Reducible Sulfur' technique (Scr - Method 22B)

3 - Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). ***Acid Sulfate Soils Laboratory Methods Guidelines.*** QLD DNRME.

4 - Bulk Density is required for liming rate calculations per soil volume. Lab. Bulk Density is no longer applicable - field bulk density rings can be used and dried/ weighed in the laboratory.

5 - **ABA Equation**: **Net Acidity = Potential Sulfidic Acidity (ie. Scrs or Sox) + Actual Acidity + Retained Acidity - measured ANC/FF (with FF currently defaulted to 1.5)**

6 - The neutralising requirement, lime calculation, includes a 1.5 safety margin for acid neutralisation (an increased safety factor may be required in some cases)

7 - For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays

8 - .. denotes not requested or required

9 - SCREENING, CRS, TAA and ANC are NATA accredited but other SPOCAS segments are currently not NATA accredited

10- Results at or below detection limits are replaced with '0' for calculation purposes.

11 - Projects that disturb >1000 tonnes of soil, the ≥0.03% S classification guideline would apply (refer to acid sulfate management guidelines).

12 - ROCK CLASSIFICATION = 1-ACM: acid consuming potential; 2-NAF: non-acid forming; 3-PAF-LC: potentially acid forming, low capacity (<5kg H2SO4/tonne); 4-PAF: potentially acid forming); UC = Uncertain.

13 - ROCK METHODS and classification from AMIRA international, May 2002. ARD Test Handbook, Project P387A Prediction and Kinetic Control of Acid Mine Drainage. Ian Walk Institute, Melbourne.

(Classification of potential acid sulfate material if: coarse Scr≥0.03%S or 19mole H+/t; medium Scr≥0.06%S or 37mole H+/t; fine Scr≥0.1%S or 62mole H+/t) - as per QUASSIT Laboratory Methods Guidelines

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checked: .....
Graham Lancaster
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