12 Enterprise Avenue
Berwick 3806
ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
tseymour@terrafirmalabs.com.au
www.terrafirmalabs.com.au
ABN: 11 925 206 385

Geotechnical Report
Level One Inspection and Testing

Riverwalk Estate Stage 13
Werribee

Prepared for:

Excell Gray Bruni Pty Ltd
12 Allied Drive
Tullamarine VIC 3043

PROJECT No: 9059

7th November 2016

Prepared by:

TERRA FIRMA LABORATORIES
Geotechnical Inspection and Testing Authority

12 Enterprise Ave
BERWICK, VIC. 3806
Phone: 03 9769 5799 Fax: 03 9769 4799
Email: tseymour@terrafirmalabs.com.au

12 Enterprise Avenue
Berwick 3806
ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
tseymour@terrafirmalabs.com.au
www.terrafirmalabs.com.au
ABN: 11 925 206 385

Geotechnical Report Level One Inspection and Testing
Riverwalk Estate Stage 13

1. Introduction

Terra Firma Laboratories was engaged by *Excell Gray Bruni Pty Ltd* as the geotechnical inspection and testing authority to provide Level 1 supervision and testing works on the earthworks component for Riverwalk Estate Stage 13. This work was conducted over the period of 09/08/2016 to 05/09/2016.

This report presents that the allotment earthworks was carried out in accordance with *AS3798-2007 Guidelines for Earthworks for Commercial and Residential Development* and in compliance with the compaction control specifications established by the contractor.

2. Scope of Works

2.1. Areas of work

The areas of work included Lots 1301 to 1336. The site will be a residential area.

The area on which fill was placed is shown on site plan (Appendix 1) based on drawings prepared by SMEC and provided by *Excell Gray Bruni Pty Ltd*.

The supervision work by *Terra Firma Laboratories* involved both inspection of sub grade preparation work and full time inspection and testing of fill placement.

2.2. Specification

The placement of fill on the areas of work was to be carried out in accordance with *AS3798-2007 Guidelines for Earthworks for Commercial and Residential Development,* as directed by *Excell Gray Bruni Pty Ltd*. At all times during placement of fill materials Terra Firma Laboratories maintained a Geotechnical Technician on site to perform the supervision and testing as required by AS3798-2007.

A technical specification for compaction control requirements was provided by Excell Gray Bruni Pty Ltd and established that:
As referenced from AS3798-2007 (Section 5.2) establishes a specification requirement for a minimum density ratio of not less than 95% noting that soils containing more than 20% of particles coarser than 37.5mm cannot be tested for relative compaction using the procedures of AS1289.

Field density testing shall be undertaken at a frequency of not less than 3 tests per visit.

Test Rolling is required for all layers of structural fill and materials within 150mm of permanent subgrade level so as to withstand test rolling without visible deformation or springing. Corrective action is required where unstable areas exceed 20% of the area being considered by test rolling.

terra firma laboratories

12 Enterprise Avenue
Berwick 3806
ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
tseymour@terrafirmalabs.com.au
www.terrafirmalabs.com.au
ABN: 11 925 206 385

3. Inspection and Testing

3.1. Sub-Grade Preparation

Subgrade preparation involved stripping the site down of topsoil and organic matter to a depth of approximately 200mm below existing levels detailed on the site plans. The sub-grade area was then proof-rolled to determine soft or otherwise unsuitable zones and such zones rectified as necessary. The sub-grade was watered and scarified prior to fill placement to aid layer bonding.

3.2. Fill materials

The materials used as fill were locally sourced and observed to generally consist of Silty Clay, sourced from stockpiled materials on site. No particles greater than 150mm were observed. The fill was nominated as clean fill by the contractor.

3.3. Fill Construction

The contractor had the following plant available on-site during the construction period for use in the fill placement:

- *Excavators*
- *Dump Truck*
- *Grader*
- *Pad Foot Roller*
- *Smooth Drum Roller*
- *Water Cart*

All fill was placed in layers of thicknesses not exceeding 300mm. *The work area was typically a 2 or 3 lot area on any one particular day*. At the completion of a placed layer, compaction testing was performed to confirm appropriate compaction had been achieved and supported the observations made.

It was observed that finished levels were in accordance with levels marked on site by survey. These levels are shown on site plans attached in Appendix 1.

The final 300mm of fill placed across the site was placed as a topsoil layer/ growing medium and should be considered as non structural, as it was placed in an uncontrolled manner, as allowed by specifications.

4. Compaction Control Testing

Testing comprised of a total of 56 in-situ density tests, with a summary of results included in Appendix 2. Test Reports are referenced in Appendix 3.

Test numbers, 1317, 1320 and 1329 originally failed to meet specification. *Excell Gray Bruni Pty Ltd* were notified and asked to rework the areas appropriately. Upon adequate reworking *Terra Firma Laboratories* would perform a retest; this process would continue until a minimum of 95% compactions was achieved.

12 Enterprise Avenue
Berwick 3806
ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
tseymour@terrafirmalabs.com.au
www.terrafirmalabs.com.au
ABN: 11 925 206 385

It should be noted that the tests are a representation of the fill placed and support the visual assessment of the works completed. Each lot does not necessarily require a compaction test to comply. The compaction control testing indicated that the engineered fill on all lots complied with the technical specification.

5. Uncontrolled Works

Terra Firma Laboratories cannot verify any works completed by others after the final date specified in the introduction. Uncontrolled works may include, but not limited to trenching for services, cut and fill works for slab preparation or subsequent removal of vegetation and back fill of holes.

6. Clean Fill

Terra Firma Laboratories cannot guarantee that the material used as a filling medium is free from chemical or other contamination.

7. Statement of Compliance

Inspections and testing of the fill areas at this site indicate that both sub grade preparation and fill placement have been conducted in accordance with the specification and that the completed fill areas of greater than 300mm, as shown on the site plan attached, and not any preceding the 09/08/2016 or work completed after the 05/09/2016, may be certified as being compliant with the specification.

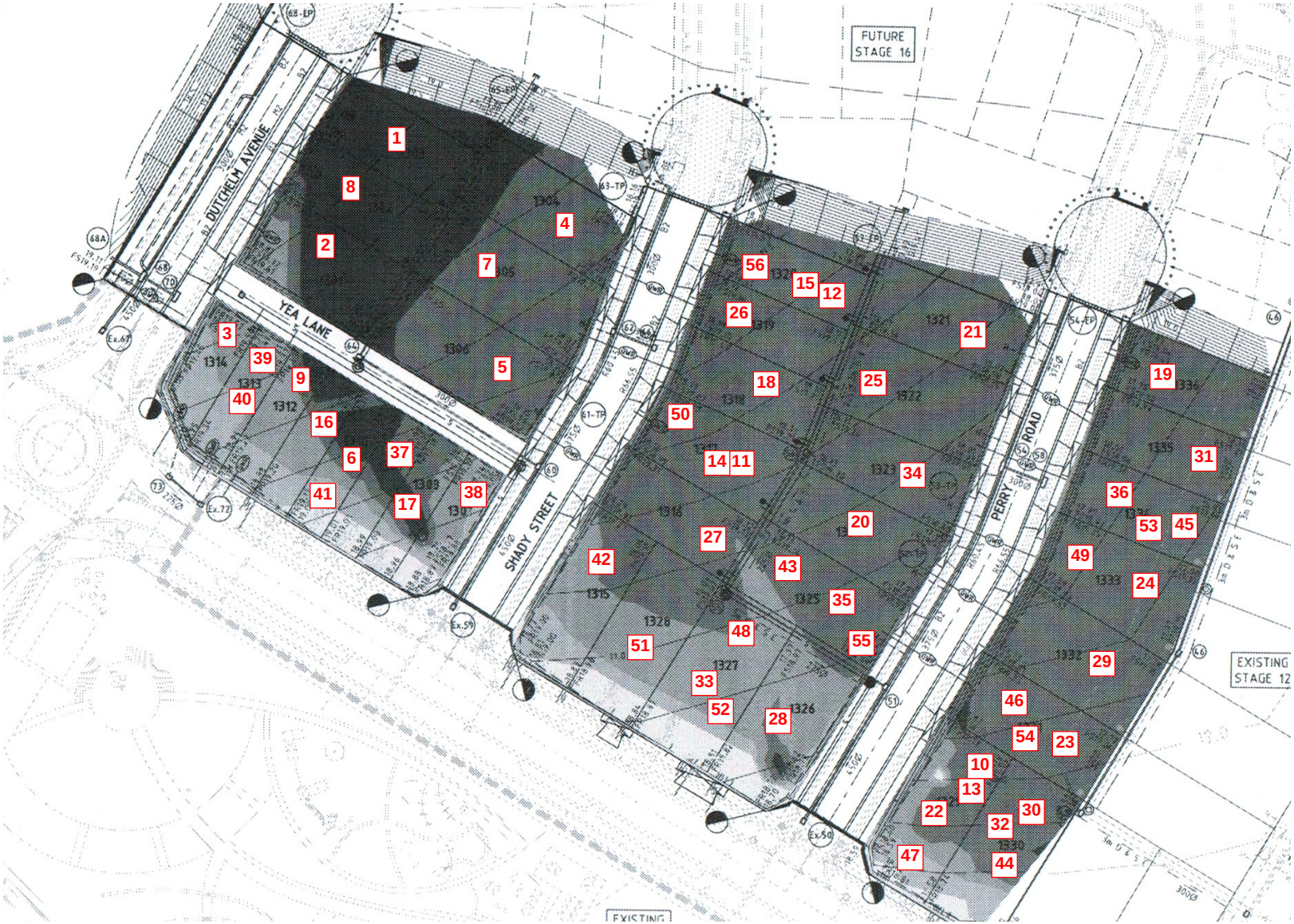
For and on behalf of
Terra Firma Laboratories,

T Seymour

Tom Seymour
Lab Manager

12 Enterprise Avenue
Berwick 3806
ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
tseymour@terrafirmalabs.com.au
www.terrafirmalabs.com.au
ABN: 11 925 206 385

APPENDICES
Appendix 1: Site Plans
Appendix 2: Test Summary
Appendix 3: Test Reports



terra firma laboratories

12 Enterprise Ave
Berwick
Vic 3806

Test Location Plan

Client : Excell Gray Bruni

Project : Riverwalk Estate Stage 13

Scale
NTS

Level One Test Summary

Client: Excell Gray Bruni **Specification:** 95%
Project: Riverwalk Estate Stage 13 **Project No:** 9059

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
9/08/2016	1	L1		100.5	PASS	1303	9059-5
9/08/2016	2	L1		97.5	PASS	1301	9059-5
9/08/2016	3	L1		96	PASS	1314	9059-5
10/08/2016	4	L2		95.5	PASS	1304	9059-7
10/08/2016	5	L2		100.5	PASS	1306	9059-7
10/08/2016	6	L2		99.5	PASS	1310	9059-7
12/08/2016	7	L3		95.5	PASS	1305	9059-9
12/08/2016	8	L3		98.5	PASS	1302	9059-9
12/08/2016	9	L3		95.5	PASS	1312	9059-9
15/08/2016	10	L4		94	FAIL	1329	9059-11
15/08/2016	11	L4		92.5	FAIL	1317	9059-11
15/08/2016	12	L4		91	FAIL	1320	9059-11
16/08/2016	13	L4	10	103	PASS	1329	9059-13
16/08/2016	14	L4	11	99.5	PASS	1317	9059-13
16/08/2016	15	L4	12	100.5	PASS	1320	9059-13
16/08/2016	16	L5		98	PASS	1311	9059-13
16/08/2016	17	L5		96	PASS	1308	9059-13
16/08/2016	18	L5		98.5	PASS	1318	9059-13
17/08/2016	19	L3		97	PASS	1336	9059-15
17/08/2016	20	L3		96.5	PASS	1324	9059-15
17/08/2016	21	L3		97	PASS	1321	9059-15
18/08/2016	22	L4		98.5	PASS	1329	9059-17
18/08/2016	23	L4		97.5	PASS	1331	9059-17
18/08/2016	24	L4		98.5	PASS	1333	9059-17
22/08/2016	25	L5		97	PASS	1322	9059-19
22/08/2016	26	L5		100	PASS	1319	9059-19
22/08/2016	27	L5		97	PASS	1316	9059-19
22/08/2016	28	L6		99	PASS	1326	9059-19
22/08/2016	29	L6		99	PASS	1332	9059-19
22/08/2016	30	L6		98	PASS	1330	9059-19
24/08/2016	31	L7		102.5	PASS	1335	9059-20
24/08/2016	32	L7		101.5	PASS	1330	9059-20
24/08/2016	33	L7		100	PASS	1327	9059-20
25/08/2016	34	L6		97.5	PASS	1323	9059-23
25/08/2016	35	L7		100	PASS	1325	9059-23
25/08/2016	36	L7		97	PASS	1334	9059-23
26/08/2016	37	FSL		100.5	PASS	1309	9059-27
26/08/2016	38	FSL		100	PASS	1307	9059-27
26/08/2016	39	FSL		98.5	PASS	1313	9059-27
29/08/2016	40	FSL		102	PASS	1313	9059-29
29/08/2016	41	FSL		98.5	PASS	1310	9059-29

Level One Test Summary

Client: Excell Gray Bruni **Specification:** 95%
Project: Riverwalk Estate Stage 13 **Project No:** 9059

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
29/08/2016	42	FSL		97.5	PASS	1315	9059-29
29/08/2016	43	FSL		100.5	PASS	1325	9059-29
29/08/2016	44	L7		99.5	PASS	1330	9059-29
29/08/2016	45	L7		98.5	PASS	1334	9059-29
30/08/2016	46	L8		95.5	PASS	1331	9059-31
30/08/2016	47	L8		98.5	PASS	1329	9059-31
31/08/2016	48	L7		99.5	PASS	1327	9059-32
31/08/2016	49	L8		102.5	PASS	1333	9059-32
1/09/2016	50	L6		96.5	PASS	1317	9059-33
1/09/2016	51	L6		98	PASS	1328	9059-33
2/09/2016	52	L8		102	PASS	1327	9059-34
2/09/2016	53	L8		99.5	PASS	1334	9059-34
5/09/2016	54	FSL		99.5	PASS	1331	9059-36
5/09/2016	55	FSL		99.5	PASS	1325	9059-36
5/09/2016	56	FSL		101.5	PASS	1320	9059-36

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-5
date of issue 11-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	09-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**1**	**2**	**3**			
location	Lot No	1303	1301	1314			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 1	Layer 1	Layer 1			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.04	2.01	2.01			
field dry density	t/m3	1.72	1.69	1.69			
field moisture content	%	18.7	18.7	18.5			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.03	2.06	2.09			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.0	-0.5	-0.5			
Moisture ratio	**%**	**96.0**	**97.0**	**97.0**			
Hilf density ratio (R_{HD})	**%**	**100.5**	**97.5**	**96.0**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-7
date of issue 12-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	10-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**4**	**5**	**6**			
location	Lot No	1304	1306	1310			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.95	2.05	1.98			
field dry density	t/m3	1.66	1.75	1.69			
field moisture content	%	17.3	17.3	17.2			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.04	2.04	1.99			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5	-3.0			
Moisture ratio	**%**	**91.5**	**92.0**	**84.5**			
Hilf density ratio (R_{HD})	**%**	**95.5**	**100.5**	**99.5**			

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-9
date of issue 16-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	12-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**7**	**8**	**9**			
location	Lot No	1305	1302	1312			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 3	Layer 3	Layer 3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.99	2.01	2.01			
field dry density	t/m3	1.69	1.69	1.69			
field moisture content	%	17.9	18.4	18.6			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.08	2.04	2.1			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-0.5	-1.0	1.0			
Moisture ratio	**%**	**97.0**	**95.0**	**104.5**			
Hilf density ratio (R_{HD})	**%**	**95.5**	**98.5**	**95.5**			

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-11
date of issue 17-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	15-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**10**	**11**	**12**			
location Lot No		1329	1317	1320			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 4	Layer 4	Layer 4			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.96	1.97	1.95			
field dry density	t/m3	1.67	1.68	1.65			
field moisture content	%	17.5	16.9	17.7			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.09	2.13	2.14			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		0.5	-0.5	0.0			
Moisture ratio	**%**	**103.5**	**96.5**	**100.5**			
Hilf density ratio (R_{HD})	**%**	**94.0**	**92.5**	**91.0**			

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-13
date of issue 18-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	16-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**13**	**14**	**15**	**16**	**17**	**18**
location Lot No		Re Test of 10	Re Test of 11	Re Test of 12	1311	1308	1318
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13	Stage 13	Stage 13	Stage 13
depth from F.S.L.	m	Layer 4	Layer 4	Layer 4	Layer 5	Layer 5	Layer 5
measurement depth	mm	275	275	275	275	275	275
field wet density	t/m^3	2.09	2.04	2.06	2.07	2.05	2.03
field dry density	t/m3	1.77	1.73	1.73	1.75	1.75	1.72
field moisture content	%	18.4	17.9	18.8	18.1	17.0	18.0
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard	standard	standard	standard
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0	19.0	19.0
percent of oversize material	wet	0	0	0	0	0	0
peak converted wet density	t/m^3	2.03	2.05	2.04	2.11	2.13	2.06
adjusted peak converted wet density	t/m^3	-	-	-	-	-	-
moisture variation from OMC (-dry,+wet)%		-1.0	-1.0	-0.5	0.5	0.0	-0.5
Moisture ratio	**%**	**95.5**	**95.5**	**97.0**	**103.5**	**101.5**	**97.0**
Hilf density ratio (R_{HD})	**%**	**103.0**	**99.5**	**100.5**	**98.0**	**96.0**	**98.5**

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-15
date of issue 19-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	17-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**19**	**20**	**21**			
location Lot No		1336	1324	1321			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 3	Layer 3	Layer 3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.04	2.06	2.06			
field dry density	t/m3	1.74	1.76	1.76			
field moisture content	%	17.0	17.2	17.2			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.1	2.14	2.12			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		1.0	1.0	0.5			
Moisture ratio	**%**	**106.5**	**106.0**	**103.0**			
Hilf density ratio (R_{HD})	**%**	**97.0**	**96.5**	**97.0**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-17
date of issue 22-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	18-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**22**	**23**	**24**			
location Lot No		1329	1331	1333			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 4	Layer 4	Layer 4			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.08	2.06	2.05			
field dry density	t/m3	1.74	1.75	1.75			
field moisture content	%	19.4	17.9	16.7			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.11	2.11	2.08			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		1.0	1.0	1.0			
Moisture ratio	**%**	**104.5**	**105.0**	**105.0**			
Hilf density ratio (R_{HD})	**%**	**98.5**	**97.5**	**98.5**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-19
date of issue 26-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	22-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**25**	**26**	**27**	**28**	**29**	**30**
location Lot No		1322	1319	1316	1326	1332	1330
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13	Stage 13	Stage 13	Stage 13
depth from F.S.L.	m	L5	L5	L5	L6	L6	L6
measurement depth	mm	250	250	250	250	250	250
field wet density	t/m^3	2.04	2.04	2.04	2.07	2.09	2.09
field dry density	t/m3	1.73	1.72	1.71	1.75	1.77	1.77
field moisture content	%	18.1	18.5	18.8	18.4	17.9	18.2
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard	standard	standard	standard
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0	19.0	19.0
percent of oversize material	wet	0	0	0	0	0	0
peak converted wet density	t/m^3	2.1	2.04	2.1	2.09	2.11	2.13
adjusted peak converted wet density	t/m^3	-	-	-	-	-	-
moisture variation from OMC (-dry,+wet)%		0.5	0.5	0.5	0.5	-1.0	-1.0
Moisture ratio	**%**	**104.0**	**103.5**	**102.5**	**103.5**	**95.5**	**95.0**
Hilf density ratio (R_{HD})	**%**	**97.0**	**100.0**	**97.0**	**99.0**	**99.0**	**98.0**

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-20
date of issue 26-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	24-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**31**	**32**	**33**			
location	Lot No	1335	1330	1327			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 7	Layer 7	Layer 7			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.05	2.09	2.07			
field dry density	t/m3	1.73	1.83	1.63			
field moisture content	%	18.6	14.5	26.6			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2	2.06	2.07			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-3.5	-1.0			
Moisture ratio	**%**	**92.5**	**80.5**	**97.0**			
Hilf density ratio (R_{HD})	**%**	**102.5**	**101.5**	**100.0**			

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-23
date of issue 29-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	25-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**34**	**35**	**36**			
location Lot No		1323	1325	1334			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	Layer 6	Layer 7	Layer 7			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.05	2.05	2.04			
field dry density	t/m3	1.75	1.72	1.72			
field moisture content	%	17.4	19.3	18.4			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.1	2.05	2.1			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		1.0	0.0	0.5			
Moisture ratio	**%**	**105.0**	**100.0**	**103.5**			
Hilf density ratio (R_{HD})	**%**	**97.5**	**100.0**	**97.0**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-27
date of issue 30-Aug-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	26-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**36**	**37**	**38**			
location	Lot No	1309	1307	1313			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.04	2.06	2.04			
field dry density	t/m3	1.75	1.76	1.74			
field moisture content	%	16.7	16.9	16.8			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	2.03	2.06	2.07			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-3.0	-3.0	-4.0			
Moisture ratio	**%**	**83.5**	**84.5**	**80.0**			
Hilf density ratio (R_{HD})	**%**	**100.5**	**100.0**	**98.5**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-29
date of issue 01-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	29-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**40**	**41**	**42**	**43**	**44**	**45**
location Lot No		1313	1310	1315	1325	1330	1334
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13	Stage 13	Stage 13	Stage 13
depth from F.S.L.	m	FSL	FSL	FSL	FSL	Layer 7	Layer 7
measurement depth	mm	275	275	275	275	275	275
field wet density	t/m^3	2.05	2.08	2.07	2.04	2.04	2.02
field dry density	t/m3	1.76	1.77	1.77	1.73	1.75	1.74
field moisture content	%	16.2	17.5	16.5	17.6	16.6	15.9
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard	standard	standard	standard
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0	19.0	19.0
percent of oversize material	wet	0	0	0	0	0	0
peak converted wet density	t/m^3	2.01	2.11	2.12	2.03	2.05	2.05
adjusted peak converted wet density	t/m^3	-	-	-	-	-	-
moisture variation from OMC (-dry,+wet)%		-3.0	-1.0	-1.0	-3.0	-1.5	-3.0
Moisture ratio	**%**	**84.5**	**95.5**	**94.5**	**85.0**	**90.5**	**84.0**
Hilf density ratio (R_{HD})	**%**	**102.0**	**98.5**	**97.5**	**100.5**	**99.5**	**98.5**

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-31
date of issue 05-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	30-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**46**	**47**				
location	Lot No	1331	1329				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13				
depth from F.S.L.	m	Layer 8	Layer 8				
measurement depth	mm	275	275				
field wet density	t/m^3	2.02	2.05				
field dry density	t/m3	1.72	1.78				
field moisture content	%	17.4	14.8				
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard				
oversize material retained on AS sieve	mm	19.0	19.0				
percent of oversize material	wet	0	0				
peak converted wet density	t/m^3	2.12	2.08				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		0.5	-1.0				
Moisture ratio	**%**	**104.0**	**93.5**				
Hilf density ratio (R_{HD})	**%**	**95.5**	**98.5**				

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-32
date of issue 05-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	31-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**48**	**49**				
location	Lot No	1327	1333				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13				
depth from F.S.L.	m	Layer 7	Layer 8				
measurement depth	mm	275	275				
field wet density	t/m^3	2.07	2.04				
field dry density	t/m3	1.77	1.75				
field moisture content	%	17.0	16.7				
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard				
oversize material retained on AS sieve	mm	19.0	19.0				
percent of oversize material	wet	0	0				
peak converted wet density	t/m^3	2.08	1.99				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-0.5	-1.0				
Moisture ratio	**%**	**96.0**	**94.5**				
Hilf density ratio (R_{HD})	**%**	**99.5**	**102.5**				

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-33
date of issue 05-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	01-Sep-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**50**	**51**				
location	Lot No	1317	1328				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13				
depth from F.S.L.	m	Layer 6	Layer 6				
measurement depth	mm	275	275				
field wet density	t/m^3	2.10	2.09				
field dry density	t/m3	1.82	1.80				
field moisture content	%	15.4	15.9				
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard				
oversize material retained on AS sieve	mm	19.0	19.0				
percent of oversize material	wet	0	0				
peak converted wet density	t/m^3	2.18	2.13				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-1.0	-0.5				
Moisture ratio	**%**	**95.0**	**96.0**				
Hilf density ratio (R_{HD})	**%**	**96.5**	**98.0**				

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-34
date of issue 06-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	MP
time	All Day
date	02-Sep-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**52**	**53**				
location Lot No		1327	1334				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13				
depth from F.S.L.	m	Layer 8	Layer 8				
measurement depth	mm	275	275				
field wet density	t/m^3	2.09	2.08				
field dry density	t/m3	1.78	1.77				
field moisture content	%	17.6	17.6				
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard				
oversize material retained on AS sieve	mm	19.0	19.0				
percent of oversize material	wet	0	0				
peak converted wet density	t/m^3	2.05	2.09				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-0.5	0.5				
Moisture ratio	**%**	**96.0**	**103.5**				
Hilf density ratio (R_{HD})	**%**	**102.0**	**99.5**				

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

Terrafirma Laboratories - Deer Park Laboratory
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 9059-36
date of issue 07-Sep-2016

Client	Excell Gray Bruni
Client address	12 Allied Drive, Tullamarine, 3043
Project	Riverwalk Estate Stage 12,13,14
Location	Werribee

Feature	Lot Fill
Layer thickness (mm)	300

tested by	JN
time	All Day
date	05-Sep-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**54**	**55**	**56**			
location Lot No		1331	1325	1320			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 13	Stage 13	Stage 13			
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.91	1.91	1.94			
field dry density	t/m3	1.48	1.50	1.54			
field moisture content	%	28.7	27.4	25.5			
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m^3	1.92	1.91	1.91			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.0	-0.5	-1.0			
Moisture ratio	**%**	**96.5**	**97.5**	**96.0**			
Hilf density ratio (R_{HD})	**%**	**99.5**	**99.5**	**101.5**			

material description

Silty CLAY

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards.
requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signature
R Schembri