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Geotechnical Report
Level One Inspection and Testing

Riverwalk Estate Stage 14
Werribee VIC

Prepared for:

Excell Gray Bruni
12 Allied Drive
Tullamarine VIC

PROJECT No 9059

21 April 2017.

Prepared by:

TERRA FIRMA LABORATORIES
Geotechnical Inspection and Testing Authority

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Geotechnical Report Level One Inspection and Testing
Riverwalk Estate Stage 14

1. Introduction

Terra Firma Laboratories was engaged by *Excell Gray Bruni* as the geotechnical inspection and testing authority to provide Level 1 supervision and testing works on the earthworks component for Riverwalk Estate Stage 14. This work was conducted over the period of 05/06/2016 to 02/09/2016.

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 lot numbers 1401 to 1438. The site will be a residential estate.

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*.

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*. 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.

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.

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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:

- *Dump Trucks*
- *Grader*
- *Compactor*
- *Pad Foot Roller*
- *Water Cart*
- *Excavator*

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

Test numbers 11 and 28 originally failed to meet specification. *Excell Gray Bruni* were Notified and asked to rework the area appropriately. Upon adequate reworking *Terra Firma Laboratories* would perform a re-test.; this process would continue until a minimum compaction effort of 95% was achieved.

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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 06/06/2017 or work completed after the 02/09/2016, may be certified as being compliant with the specification.

For and on behalf of
Terra Firma Laboratories,

T Seymour

Tom Seymour
Lab Manager

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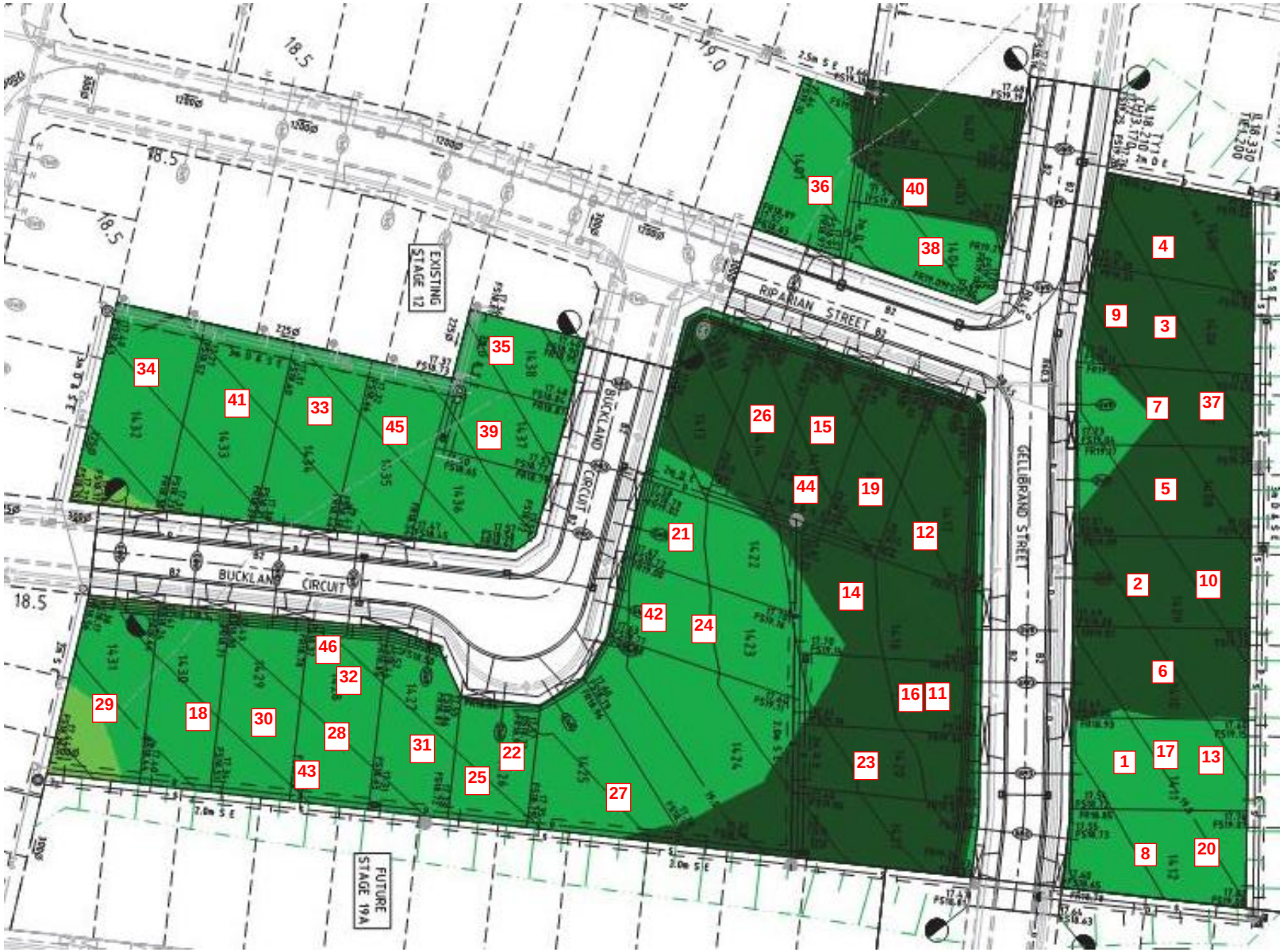
APPENDICES

Appendix 1: Site Plans

Appendix 2: Test Summary

Appendix 3: Test Reports



terra firma laboratories

47 National Avenue
Pakenham VIC 3810

Test Location Plan

Client : Excell Gray Bruni

Project : Riverwalk Estate Stage 14

Scale
NTS

Level One Test Summary

Client: Excell Gray Bruni **Specification:** 95%
Project: Riverwalk Estate Stage 14 **Project No:** 9059

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
5/06/2016	1	L1		100	PASS	1411	9059-1
5/06/2016	2	L1		100	PASS	1409	9059-1
5/06/2016	3	L1		98.5	PASS	1406	9059-1
6/08/2016	4	L2		95	PASS	1405	9059-2
6/08/2016	5	L2		101	PASS	1408	9059-2
6/08/2016	6	L2		97.5	PASS	1410	9059-2
8/08/2016	7	L3		98	PASS	1407	9059-3
8/08/2016	8	L3		96	PASS	1412	9059-3
8/08/2016	9	L3		95.5	PASS	1406	9059-3
9/08/2016	10	L4		96.5	PASS	1409	9059-4
9/08/2016	11	L1		91	FAIL	1419	9059-4
9/08/2016	12	L1		96.5	PASS	1417	9059-4
10/08/2016	13	L5		98.5	PASS	1411	9059-6
10/08/2016	14	L2		100	PASS	1418	9059-6
10/08/2016	15	L2		98.5	PASS	1415	9059-6
10/08/2016	16	L1	11	97	PASS	1419	9059-6
12/08/2016	17	L5		97	PASS	1411	9059-8
12/08/2016	18	L3		95.5	PASS	1430	9059-8
12/08/2016	19	L3		96.5	PASS	1416	9059-8
15/08/2016	20	FSL		98	PASS	1412	9059-10
15/08/2016	21	L4		99	PASS	1422	9059-10
15/08/2016	22	L4		96.5	PASS	1426	9059-10
16/08/2016	23	L5		96	PASS	1420	9059-12
16/08/2016	24	L5		98	PASS	1423	9059-12
16/08/2016	25	L2		100	PASS	1426	9059-12
17/08/2016	26	L6		99	PASS	1414	9059-14
17/08/2016	27	L6		97	PASS	1425	9059-14
17/08/2016	28	L6		94.5	FAIL	1428	9059-14
18/08/2016	29	L3		97.5	PASS	1431	9059-18
18/08/2016	30	L4		99.5	PASS	1429	9059-18
18/08/2016	31	L4		104	PASS	1427	9059-18
24/08/2016	32	L6	28	104	PASS	1428	9059-21
24/08/2016	33	L4		103	PASS	1434	9059-21
24/08/2016	34	L4		99.5	PASS	1432	9059-21
24/08/2016	35	L5		99.5	PASS	1438	9059-21
25/08/2016	36	FSL		101	PASS	1401	9059-24
25/08/2016	37	L5		101	PASS	1407	9059-24
25/08/2016	38	L6		100.5	PASS	1404	9059-24
26/08/2016	39	FSL		99.5	PASS	1437	9059-28
26/08/2016	40	FSL		102.5	PASS	1403	9059-28
26/08/2016	41	FSL		102	PASS	1433	9059-28

Level One Test Summary

Client: Excell Gray Bruni **Specification:** 95%
Project: Riverwalk Estate Stage 14 **Project No:** 9059

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
29/08/2016	42	FSL		99	PASS	1423	9059-30
29/08/2016	43	FSL		99	PASS	1428	9059-30
29/08/2016	44	FSL		99	PASS	1415	9059-30
2/09/2016	45	FSL		98	PASS	1435	9059-35
2/09/2016	46	FSL		98	PASS	1428	9059-35

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 9059-1
date of issue 09-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	05-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		1411	1409	1406			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 1	Layer 1	Layer 1			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.08	2.10	2.00			
field dry density	t/m3	1.80	1.83	1.69			
field moisture content	%	15.2	15.0	18.7			
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	3	5	8			
peak converted wet density	t/m^3	-	-	-			
adjusted peak converted wet density	t/m^3	2.08	2.10	2.03			
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5	-1.0			
Moisture ratio	**%**	**91.5**	**90.5**	**95.0**			
Hilf density ratio (R_{HD})	**%**	**100.0**	**100.0**	**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 9059-2
date of issue 09-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	06-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		1405	1408	1410			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.00	2.01	1.88			
field dry density	t/m3	1.76	1.77	1.53			
field moisture content	%	13.3	13.6	22.6			
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	4	2	3			
peak converted wet density	t/m^3	-	-	-			
adjusted peak converted wet density	t/m^3	2.10	1.99	1.92			
moisture variation from OMC (-dry,+wet)%		-3.0	-3.0	-3.0			
Moisture ratio	**%**	**82.0**	**82.0**	**88.0**			
Hilf density ratio (R_{HD})	**%**	**95.0**	**101.0**	**97.5**			

material description

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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 9059-3
date of issue 10-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	08-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		1407	1412	1406			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 3	Layer 3	Layer 3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.85	1.85	1.87			
field dry density	t/m3	1.50	1.52	1.56			
field moisture content	%	23.1	21.9	19.9			
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	1.89	1.93	1.96			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-3.0	-3.0	-3.0			
Moisture ratio	**%**	**87.5**	**87.5**	**86.0**			
Hilf density ratio (R_{HD})	**%**	**98.0**	**96.0**	**95.5**			

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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 9059-4
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		**10**	**11**	**12**			
location Lot No		1409	1419	1417			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 4	Layer 1	Layer 1			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.90	1.87	1.87			
field dry density	t/m3	1.55	1.54	1.50			
field moisture content	%	22.0	21.4	24.6			
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	1.97	2.05	1.94			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.0	0.5	0.5			
Moisture ratio	**%**	**96.0**	**103.0**	**103.0**			
Hilf density ratio (R_{HD})	**%**	**96.5**	**91.0**	**96.5**			

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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 9059-6
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		**13**	**14**	**15**	**16**		
location Lot No		1411	1418	1415	1419 Re-Test of 11		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14	Stage 14		
depth from F.S.L.	m	Layer 5	Layer 2	Layer 2	Layer 1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.94	1.88	1.93	1.88		
field dry density	t/m3	1.56	1.55	1.62	1.57		
field moisture content	%	24.4	21.3	18.8	19.9		
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0	0		
peak converted wet density	t/m^3	1.97	1.88	1.96	1.94		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-4.0	-3.0	-1.5	-3.0		
Moisture ratio	**%**	**84.0**	**87.5**	**92.0**	**87.0**		
Hilf density ratio (R_{HD})	**%**	**98.5**	**100.0**	**98.5**	**97.0**		

material description

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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 9059-8
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	MP
time	All Day
date	12-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**17**	**18**	**19**			
location	Lot No	1411	1430	1416			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 6	Layer 3	Layer 3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.89	1.87	1.90			
field dry density	t/m3	1.55	1.51	1.53			
field moisture content	%	21.9	23.5	24.0			
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	1.95	1.96	1.96			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5	-1.5			
Moisture ratio	**%**	**93.0**	**92.5**	**93.5**			
Hilf density ratio (R_{HD})	**%**	**97.0**	**95.5**	**96.5**			

material description

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Approved Signature
R Schembri

LABORATORY ACCREDITATION No **15357**

/ersion 4 September 2015

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 9059-10
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, RS
time	All Day
date	15-Aug-2016
checked by	RS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**20**	**21**	**22**			
location Lot No		1412	1422	1426			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	FSL	Layer 4	Layer 4			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.91	1.70	1.71			
field dry density	t/m3	1.62	1.35	1.35			
field moisture content	%	18.0	25.8	26.7			
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	1.95	1.72	1.77			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-3.0	-3.5	-3.5			
Moisture ratio	**%**	**85.5**	**89.0**	**88.5**			
Hilf density ratio (R_{HD})	**%**	**98.0**	**99.0**	**96.5**			

material description

Silty CLAY

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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 9059-12
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		**23**	**24**	**25**			
location Lot No		1420	1423	1426			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 5	Layer 5	Layer 2			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.95	2.05	2.02			
field dry density	t/m3	1.69	1.70	1.70			
field moisture content	%	15.8	20.3	19.3			
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	5	8	0			
peak converted wet density	t/m^3	-	-	2.02			
adjusted peak converted wet density	t/m^3	2.03	2.09	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-1.0	-1.5			
Moisture ratio	**%**	**90.0**	**94.0**	**92.5**			
Hilf density ratio (R_{HD})	**%**	**96.0**	**98.0**	**100.0**			

material description

Silty CLAY

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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 9059-14
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		**26**	**27**	**28**			
location	Lot No	1414	1425	1428			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 6	Layer 6	Layer 6			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.94	1.90	1.90			
field dry density	t/m3	1.56	1.57	1.57			
field moisture content	%	24.1	21.1	21.4			
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	1.96	1.96	2.01			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-0.5	1.0	-1.0			
Moisture ratio	**%**	**97.5**	**104.0**	**96.0**			
Hilf density ratio (R_{HD})	**%**	**99.0**	**97.0**	**94.5**			

material description

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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 9059-18
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		**29**	**30**	**31**			
location	Lot No	1431	1429	1427			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	Layer 3	Layer 4	Layer 4			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.94	1.96	1.97			
field dry density	t/m3	1.49	1.51	1.56			
field moisture content	%	29.9	29.8	26.4			
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	1.99	1.97	1.9			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-3.0	-3.0	-3.0			
Moisture ratio	**%**	**90.0**	**90.0**	**88.5**			
Hilf density ratio (R_{HD})	**%**	**97.5**	**99.5**	**104.0**			

material description

Silty CLAY

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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 9059-21
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		**32**	**33**	**34**	**35**		
location Lot No		Retest of 28	1434	1432	1438		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14	Stage 14		
depth from F.S.L.	m	Layer 6	Layer 4	Layer 4	Layer 5		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.93	1.90	1.92	1.98		
field dry density	t/m3	1.52	1.50	1.54	1.59		
field moisture content	%	27.4	27.1	25.1	24.9		
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard	standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0	0		
peak converted wet density	t/m^3	1.86	1.85	1.93	1.99		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-3.0	-3.0	-0.5	-1.5		
Moisture ratio	**%**	**89.0**	**89.0**	**97.0**	**93.0**		
Hilf density ratio (R_{HD})	**%**	**104.0**	**103.0**	**99.5**	**99.5**		

material description

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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 9059-24
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		**36**	**37**	**38**			
location	Lot No	1401	1402	1404			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	FSL	Layer 5	Layer 6			
measurement depth	mm	275	275	275			
field wet density	t/m^3	2.05	2.03	2.05			
field dry density	t/m3	1.68	1.66	1.68			
field moisture content	%	22.1	21.9	22.3			
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	3			
peak converted wet density	t/m^3	2.03	2.01	-			
adjusted peak converted wet density	t/m^3	-	-	2.04			
moisture variation from OMC (-dry,+wet)%		0.5	0.5	-0.5			
Moisture ratio	**%**	**103.5**	**103.0**	**97.0**			
Hilf density ratio (R_{HD})	**%**	**101.0**	**101.0**	**100.5**			

material description

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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 9059-28
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		**39**	**40**	**41**			
location Lot No		1437	1403	1433			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.97	1.96	2.01			
field dry density	t/m3	1.60	1.61	1.66			
field moisture content	%	23.6	21.7	21.3			
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	3			
peak converted wet density	t/m^3	1.98	1.91	-			
adjusted peak converted wet density	t/m^3	-	-	1.97			
moisture variation from OMC (-dry,+wet)%		1.5	-3.0	-1.0			
Moisture ratio	**%**	**107.5**	**87.0**	**96.0**			
Hilf density ratio (R_{HD})	**%**	**99.5**	**102.5**	**102.0**			

material description

Silty CLAY

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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 9059-30
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		**42**	**43**	**44**			
location	Lot No	1423	1428	1415			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14	Stage 14			
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.97	1.95	1.96			
field dry density	t/m3	1.60	1.57	1.55			
field moisture content	%	22.7	24.0	26.5			
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	5	11	0			
peak converted wet density	t/m^3	-	-	1.98			
adjusted peak converted wet density	t/m^3	1.99	1.97	-			
moisture variation from OMC (-dry,+wet)%		-3.0	-2.5	-1.0			
Moisture ratio	**%**	**87.5**	**88.0**	**97.0**			
Hilf density ratio (R_{HD})	**%**	**99.0**	**99.0**	**99.0**			

material description

Silty CLAY

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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 9059-35
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		**45**	**46**				
location	Lot No	1435	1428				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		Stage 14	Stage 14				
depth from F.S.L.	m	FSL	FSL				
measurement depth	mm	275	275				
field wet density	t/m^3	2.01	2.00				
field dry density	t/m3	1.53	1.55				
field moisture content	%	31.6	28.4				
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	2.04				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-0.5	-0.5				
Moisture ratio	**%**	**97.5**	**98.0**				
Hilf density ratio (R_{HD})	**%**	**98.0**	**98.0**				

material description

Silty CLAY

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