Opalia Estate Stage 5

GITA Inspection Verification Report

Prepared For:	Lojac Civil Pty Ltd
Report Number	D21626A V1
Version Release Date	19 Aug 2021
Report Released By	C Caulfield
Title	Project Manager
Signature	

Our Head Office
47 National Ave
Pakenham, VIC 3810

Our Laboratories
Pakenham 03 9769 5799
Deer Park 03 8348 5596
Bibra Lake 08 9395 7220

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Appendices

1 Introduction

Terra Firma Laboratories was engaged by Lojac Civil Pty Ltd as the Geotechnical Inspection and Testing Authority (GITA) to provide Level 1 supervision and testing works on the earthworks component for Opalia Estate Stage 5. This work was conducted over the period of 29/07/2021 to 16/08/2021.

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 Work

2.1 Area of Work

The areas of work included lots 502 through to 511, 545 through to 547 and 558 through to 569, bounded by streets Pegasus Drive, Skypac Street and Hemsworth Road. The site will be a Residential development.

The area on which fill was placed is shown on site plan (Appendix 1: *Test Location Plan*) based on drawings prepared by Breese Pitt Dixon Pty Ltd (Drawing Reference: 6751 E/05) and provided by Lojac Civil Pty Ltd.

The supervision work by the GITA involved both inspection of sub grade preparation work and full time inspection and testing of fill placement.

2.2 Specification

The technical specification (Reference from Drawings) for compaction control requirements was provided by Lojac Civil Pty Ltd and established that:

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.

Section 5.2 of 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 5.1.1 and AS1289 5.2.1.

In accordance with Table 8.1 (AS3798), for large scale operations, (greater than 1500m^2), the minimum testing frequency is 1 test per layer per material type per 2500m^2 or 1 test per 500m^3 distributed reasonable evenly throughout full depth and area or 3 tests per lot. AS3798 defines a lot as "an area of work that is essentially homogenous in relation to material type and moisture condition, rolling response and compaction technique, and which has been used for the assessment of the relative compaction of an area of work". All three of these test frequencies must be achieved and this is typically confirmed to have been achieved when 3 tests per visit (day) have been completed.

2.3 Limitations

Terra Firma Laboratories cannot verify any works completed by others outside of the time period specified in the introduction. Uncontrolled works may include, but are not limited to trenching for services, cut and fill works for slab preparation or subsequent removal of vegetation and back fill of holes unless specified in section 2.1 of this report.

Terra Firma Laboratories cannot verify that the material used as a filling medium is free from chemical or other contamination. The scope and the period of Terra Firma Laboratories as described in the introduction are subject to restrictions and limitations. Terra Firma Laboratories did not perform a complete assessment of all possible conditions and circumstances that may exist at the site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Terra Firma Laboratories.

Verification of finished surface level to design levels is outside of the scope of the GITA report.

Any drawings or marked locations presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Terra Firma Laboratories for incomplete or inaccurate data supplied by others.

3 Construction Method

3.1 Subgrade Preparation

At the time of subgrade inspection the following was observed:

- Subgrade preparation involved stripping the site of topsoil, vegetation and organic matter to a depth of approximately 200mm below existing levels.
- The site was cleared of all trees and stumps to the extent necessary for the fill placement to proceed
- The roots of all trees and any debris was removed from site prior to any fill placement

The sub-grade area was then proof-rolled to confirm it was capable of withstanding test rolling without visible deformation or springing and any areas observed to be soft or otherwise unsuitable were rectified. The sub-grade was watered and scarified prior to fill placement to aid layer bonding.

3.2 Fill Placement

The contractor was observed to have suitable construction equipment and plant available on-site during the construction period for use in the fill placement.

All fill was placed in layers of thicknesses not exceeding 300mm. At the completion of a placed layer, compaction testing was performed to confirm appropriate compaction had been achieved and supported the observations made. It should be noted that the compaction tests are representative samples of the fill placed and support the visual assessment of the works completed. Each house lot does not necessarily require a compaction test to to have been conducted within the house allotment but may have been verified by testing conducted within up to a 2500m^2 area of the house lot.

Final fill placement levels were verified against design level by others. For the purposes of this report, it was observed that finished levels were in accordance with levels marked on site by survey markers.

The final 300mm of material placed across the site was placed as a topsoil layer or growing medium and should be considered as non-structural, as it was placed in an uncontrolled manner, as allowed by specifications and placement of the final 300mm of material was not observed by the GITA.

4 Construction Verification

Compaction Verification testing is summarized in a detailed test register with test certificates attached provided in Appendix 2: *Compaction Test Register and Test Certificates*. A test location

plan (D21626D1, Appendix 1) providing a schematic of test locations across the extent of scope of works for every placed layer of fill is also documented.

A total of 21 density tests (Hilf method in accordance with 1289 5.7.1) were undertaken with 0 failed results. The results summarised in the compaction test register (Appendix 2) confirm that for every layer of fill placed in a specific work area, satisfactory testing was completed.

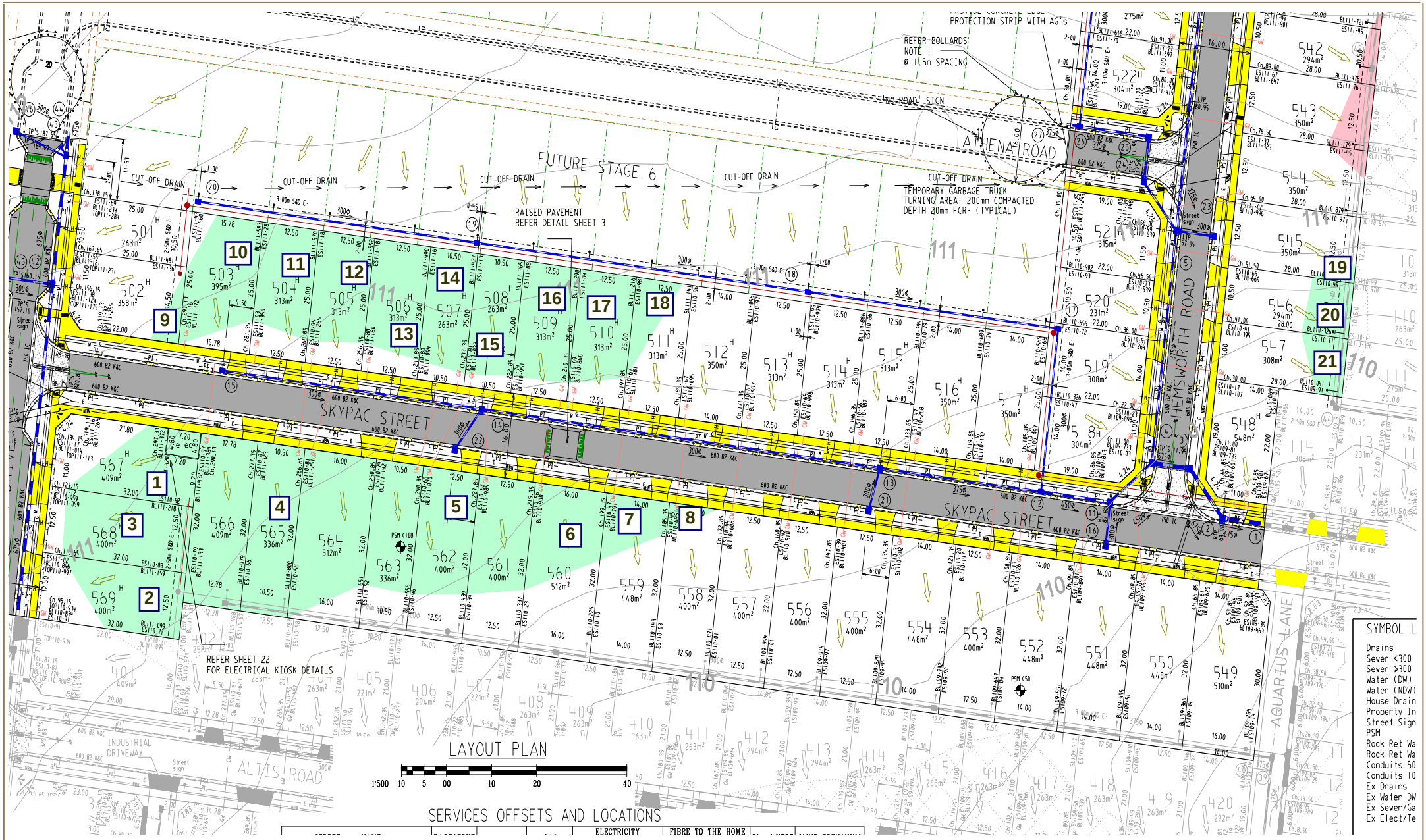
5 Statement of Compliance

The intention of this report is to provide a description of the earthworks construction for Stage 5 at Opalia Estate. For completed fill areas of greater than 300mm, and for works completed between 29/07/2021 and 16/08/2021, earthworks construction activities were conducted under the full time supervision of the Geotechnical Inspection and Testing Authority. 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. The earthworks construction for Stage 5 of Opalia Estate was observed to be constructed in compliance with the requirements of the Technical Specification.

Appendix 1: Test Location Plan

Our Head Office
47 National Ave
Pakenham, VIC 3810

Our Laboratories
Pakenham 03 9769 5799
Deer Park 03 8348 5596
Bibra Lake 08 9395 7220



terra firma laboratories

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Pakenham, VIC 3810

Our Laboratories
Pakenham 03 9769 5799
Deer Park 03 8348 5596
Bibra Lake 08 9395 7220

Test Location Plan

not to scale

Client: Lojac Civil Pty Ltd

Project: Opalia Estate, Stage 5

Reference: D21626 D1

Appendix 2: Compaction Test Register and Test Certificates

Compaction Test Register

Client: Lojac Civil Pty Ltd
Project No: D21626
Project: Opalia Estate Stage 5
Specification: 95%

Date:	Test No:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
29/07/2021	1	Layer 1		109.5%	Pass	Lot 567	D21626-1
29/07/2021	2	Layer 1		103.5%	Pass	Lot 569	D21626-1
29/07/2021	3	Layer 1		97.0%	Pass	Lot 568	D21626-1
29/07/2021	4	Layer 1		102.0%	Pass	Lot 565	D21626-1
29/07/2021	5	Layer 1		105.0%	Pass	Lot 562	D21626-1
29/07/2021	6	Layer 1		98.5%	Pass	Lot 560	D21626-1
29/07/2021	7	Layer 1		105.5%	Pass	Lot 559	D21626-1
29/07/2021	8	Layer 1		104.5%	Pass	Lot 558	D21626-1
13/08/2021	9	Layer 1		96.0%	Pass	Lot 502	D21626-3
13/08/2021	10	Layer 1		101.5%	Pass	Lot 503	D21626-3
13/08/2021	11	Layer 1		103.0%	Pass	Lot 504	D21626-3
13/08/2021	12	Layer 1		97.5%	Pass	Lot 505	D21626-3
13/08/2021	13	Layer 1		99.0%	Pass	Lot 506	D21626-3
13/08/2021	14	Layer 1		105.0%	Pass	Lot 507	D21626-3
13/08/2021	15	Layer 1		103.5%	Pass	Lot 508	D21626-3
13/08/2021	16	Layer 1		102.5%	Pass	Lot 509	D21626-3
13/08/2021	17	Layer 1		104.0%	Pass	Lot 510	D21626-3
13/08/2021	18	Layer 1		102.5%	Pass	Lot 511	D21626-3
16/08/2021	19	Layer 1		100.5%	Pass	Lot 547	D21626-2
16/08/2021	20	Layer 1		97.5%	Pass	Lot 546	D21626-2
16/08/2021	21	Layer 1		99.0%	Pass	Lot 545	D21626-2

Material Test Report

Report Number: D21626-1
Issue Number: 1
Date Issued: 02/08/2021
Client: Lojac Civil Pty Ltd
35/148 Chesterville Road, Moorabbin Vic 3189
Project Number: D21626
Project Name: Opalia estate stage 5 - Level one
Project Location: Melton South
Work Request: 3503
Date Sampled: 29/07/2021 12:15
Dates Tested: 29/07/2021 - 30/07/2021
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: 95% STD
Location: Opalia estate stage 5 - Level one
Material: Clay
Material Source: On site

terra firma laboratories
Deer Park Laboratory
Factory 1 80-82 Rebecca Drive Ravenhall VIC 3023
Phone: 0435 751 756
Email: ehippola@terrafirmalabs.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Eranda Hippola
Snr lab Tech
NATA Accredited Laboratory Number: 15357

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1				
Sample Number	D21-3503A	D21-3503B	D21-3503C	D21-3503D
Test Number	1	2	3	4
Date Tested	29/07/2021	29/07/2021	29/07/2021	29/07/2021
Time Tested	15:30	15:30	15:30	15:30
Test Request #/Location	Lot 567	Lot 569	Lot 568	Lot 565
Layer / Reduced Level	Layer 1	Layer 1	Layer 1	Layer 1
Thickness of Layer (mm)	250	250	250	250
Soil Description	Clay	Clay	Clay	Clay
Test Depth (mm)	225	225	225	225
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	6	7	0	3
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	**	0	**
Field Wet Density (FWD) t/m^3	2.11	1.95	1.74	1.86
Field Moisture Content %	18.5	25.8	25.8	25.5
Field Dry Density (FDD) t/m^3	1.80	1.57	1.39	1.49
Peak Converted Wet Density t/m^3	**	**	1.80	**
Adjusted Peak Converted Wet Density t/m^3	1.93	1.88	**	1.83
Adj. Optimum Moisture Content % (AS1289.5.4.1)	22.7	28.8	30.6	29.6
Adj. Field Moisture Content % (AS1289.5.4.1)	17.3	23.9	25.8	24.7
Moisture Ratio % (AS1289.5.4.1)	**	**	84.0	**
Adjusted Moisture Ratio % (AS1289.5.4.1)	76.0	83.0	**	83.5
Moisture Variation (Wv) %	**	**	4.5	**
Adjusted Moisture Variation %	5.0	4.5	**	4.5
Hilf Density Ratio (%)	**109.5**	**103.5**	**97.0**	**102.0**
Compaction Method	**Standard**	**Standard**	**Standard**	**Standard**
Report Remarks	**	**	**	**

Moisture Variation Note:
Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: D21626-1
Issue Number: 1
Date Issued: 02/08/2021
Client: Lojac Civil Pty Ltd
35/148 Chesterville Road, Moorabbin Vic 3189
Project Number: D21626
Project Name: Opalia estate stage 5 - Level one
Project Location: Melton South
Work Request: 3503
Date Sampled: 29/07/2021 12:15
Dates Tested: 29/07/2021 - 30/07/2021
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: 95% STD
Location: Opalia estate stage 5 - Level one
Material: Clay
Material Source: On site

terra firma laboratories
Deer Park Laboratory
Factory 1 80-82 Rebecca Drive Ravenhall VIC 3023
Phone: 0435 751 756
Email: ehippola@terrafirmalabs.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Eranda Hippola
Snr lab Tech
NATA Accredited Laboratory Number: 15357

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1				
Sample Number	D21-3503E	D21-3503F	D21-3503G	D21-3503H
Test Number	5	6	7	8
Date Tested	29/07/2021	29/07/2021	29/07/2021	29/07/2021
Time Tested	15:30	15:30	15:30	15:30
Test Request #/Location	Lot 562	Lot 560	Lot 559	Lot 558
Layer / Reduced Level	Layer 1	Layer 1	Layer 1	Layer 1
Thickness of Layer (mm)	250	250	250	250
Soil Description	Clay	Clay	Clay	Clay
Test Depth (mm)	225	225	225	225
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	6	7	9	6
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	**	**	**
Field Wet Density (FWD) t/m^3	1.91	1.83	2.00	1.97
Field Moisture Content %	20.4	27.3	22.6	23.5
Field Dry Density (FDD) t/m^3	1.60	1.46	1.66	1.62
Peak Converted Wet Density t/m^3	**	**	**	**
Adjusted Peak Converted Wet Density t/m^3	1.82	1.86	1.90	1.89
Adj. Optimum Moisture Content % (AS1289.5.4.1)	23.7	30.2	24.2	27.6
Adj. Field Moisture Content % (AS1289.5.4.1)	19.1	25.3	20.6	22.0
Moisture Ratio % (AS1289.5.4.1)	**	**	**	**
Adjusted Moisture Ratio % (AS1289.5.4.1)	81.0	84.0	85.0	80.0
Moisture Variation (Wv) %	**	**	**	**
Adjusted Moisture Variation %	4.5	4.5	3.5	5.0
Hilf Density Ratio (%)	**105.0**	**98.5**	**105.5**	**104.5**
Compaction Method	**Standard**	**Standard**	**Standard**	**Standard**
Report Remarks	**	**	**	**

Moisture Variation Note:
Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: D21626-2
Issue Number: 1
Date Issued: 18/08/2021
Client: Lojac Civil Pty Ltd
35/148 Chesterville Road, Moorabbin Vic 3189
Project Number: D21626
Project Name: Opalia estate stage 5 - Level one
Project Location: Melton South
Work Request: 3581
Date Sampled: 16/08/2021
Dates Tested: 16/08/2021 - 18/08/2021
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: 95% STD
Location: Opalia estate stage 5 - Level one
Lot Number: 545/546/547
Material: Clay
Material Source: On site

terra firma laboratories
Deer Park Laboratory
Factory 1 80-82 Rebecca Drive Ravenhall VIC 3023
Phone: 0435 751 756
Email: ehippola@terrafirmalabs.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Eranda Hippola
Snr lab Tech
NATA Accredited Laboratory Number: 15357

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	D21-3581A	D21-3581B	D21-3581C
Test Number	19	20	21
Date Tested	16/08/2021	16/08/2021	16/08/2021
Time Tested	13:00	13:00	13:00
Test Request #/Location	Lot 547	Lot 546	Lot 545
Layer / Reduced Level	Layer 1	Layer 1	Layer 1
Thickness of Layer (mm)	250	250	250
Soil Description	Clay	Clay	Clay
Test Depth (mm)	225	225	225
Sieve used to determine oversize (mm)	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	0	0
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	0	0
Field Wet Density (FWD) t/m^3	1.95	1.87	1.92
Field Moisture Content %	12.6	16.3	15.9
Field Dry Density (FDD) t/m^3	1.74	1.61	1.66
Peak Converted Wet Density t/m^3	1.94	1.92	1.94
Adjusted Peak Converted Wet Density t/m^3	**	**	**
Adj. Optimum Moisture Content % (AS1289.5.4.1)	14.7	17.8	17.3
Adj. Field Moisture Content % (AS1289.5.4.1)	12.6	16.3	15.9
Moisture Ratio % (AS1289.5.4.1)	85.5	92.0	92.5
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	**
Moisture Variation (Wv) %	2.0	1.5	1.5
Adjusted Moisture Variation %	**	**	**
Hilf Density Ratio (%)	**100.5**	**97.5**	**99.0**
Compaction Method	**Standard**	**Standard**	**Standard**
Report Remarks	**	**	**

Moisture Variation Note:
Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: D21626-3
Issue Number: 1
Date Issued: 18/08/2021
Client: Lojac Civil Pty Ltd
35/148 Chesterville Road, Moorabbin Vic 3189
Project Number: D21626
Project Name: Opalia estate stage 5 - Level one
Project Location: Melton South
Client Reference: Eski
Work Request: 3576
Date Sampled: 13/08/2021
Dates Tested: 13/08/2021 - 17/08/2021
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: 95% STD
Location: Opalia estate stage 5 - Level one
Material: Silty Clay
Material Source: On site

terra firma laboratories
Deer Park Laboratory
Factory 1 80-82 Rebecca Drive Ravenhall VIC 3023
Phone: 0435 751 756
Email: ehippola@terrafirmalabs.com.au

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Approved Signatory: Eranda Hippola
Snr lab Tech
NATA Accredited Laboratory Number: 15357

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1					
Sample Number	D21-3576A	D21-3576B	D21-3576C	D21-3576D	D21-3576E
Test Number	9	10	11	12	13
Date Tested	13/08/2021	13/08/2021	13/08/2021	13/08/2021	13/08/2021
Time Tested	03:30	03:30	03:30	03:30	03:30
Test Request #/Location	LOT 502	LOT 503	LOT 504	LOT 505	LOT 506
Layer / Reduced Level	Layer 1	Layer 1	Layer 1	Layer 1	Layer 1
Thickness of Layer (mm)	300	300	300	300	300
Soil Description	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
Test Depth (mm)	275	275	275	275	275
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	6	9	6	3
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	**	**	**	**
Field Wet Density (FWD) t/m^3	1.73	1.86	1.91	1.80	1.81
Field Moisture Content %	24.6	18.4	18.2	18.3	18.0
Field Dry Density (FDD) t/m^3	1.39	1.59	1.64	1.53	1.54
Peak Converted Wet Density t/m^3	1.81	**	**	**	**
Adjusted Peak Converted Wet Density t/m^3	**	1.84	1.85	1.84	1.83
Adj. Optimum Moisture Content % (AS1289.5.4.1)	27.4	21.8	21.6	19.1	19.2
Adj. Field Moisture Content % (AS1289.5.4.1)	24.6	17.3	16.6	17.3	17.5
Moisture Ratio % (AS1289.5.4.1)	89.5	**	**	**	**
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	79.5	77.0	90.5	91.5
Moisture Variation (Wv) %	3.0	**	**	**	**
Adjusted Moisture Variation %	**	4.5	5.0	2.0	1.5
Hilf Density Ratio (%)	**96.0**	**101.5**	**103.0**	**97.5**	**99.0**
Compaction Method	**Standard**	**Standard**	**Standard**	**Standard**	**Standard**
Report Remarks	**	**	**	**	**

Moisture Variation Note:
Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: D21626-3
Issue Number: 1
Date Issued: 18/08/2021
Client: Lojac Civil Pty Ltd
35/148 Chesterville Road, Moorabbin Vic 3189
Project Number: D21626
Project Name: Opalia estate stage 5 - Level one
Project Location: Melton South
Client Reference: Eski
Work Request: 3576
Date Sampled: 13/08/2021
Dates Tested: 13/08/2021 - 17/08/2021
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: 95% STD
Location: Opalia estate stage 5 - Level one
Material: Silty Clay
Material Source: On site

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Snr lab Tech
NATA Accredited Laboratory Number: 15357

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1					
Sample Number	D21-3576F	D21-3576G	D21-3576H	D21-3576I	D21-3576J
Test Number	14	15	16	17	18
Date Tested	13/08/2021	13/08/2021	13/08/2021	13/08/2021	13/08/2021
Time Tested	03:30	03:30	03:30	03:30	03:30
Test Request #/Location	LOT 507	LOT 508	LOT 509	LOT 510	LOT 511
Layer / Reduced Level	Layer 1	Layer 1	Layer 1	Layer 1	Layer 1
Thickness of Layer (mm)	300	300	300	300	300
Soil Description	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Silty Clay
Test Depth (mm)	275	275	275	275	275
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	12	5	5	7	4
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	**	**	**	**
Field Wet Density (FWD) t/m^3	1.98	1.90	1.90	1.93	1.88
Field Moisture Content %	17.8	18.4	18.1	17.6	18.3
Field Dry Density (FDD) t/m^3	1.71	1.62	1.62	1.66	1.60
Peak Converted Wet Density t/m^3	**	**	**	**	**
Adjusted Peak Converted Wet Density t/m^3	1.89	1.84	1.85	1.85	1.83
Adj. Optimum Moisture Content % (AS1289.5.4.1)	20.7	21.3	20.8	19.8	21.3
Adj. Field Moisture Content % (AS1289.5.4.1)	15.7	17.5	17.2	16.3	17.6
Moisture Ratio % (AS1289.5.4.1)	**	**	**	**	**
Adjusted Moisture Ratio % (AS1289.5.4.1)	76.0	82.0	82.5	82.0	82.5
Moisture Variation (Wv) %	**	**	**	**	**
Adjusted Moisture Variation %	5.0	4.0	3.5	3.5	3.5
Hilf Density Ratio (%)	**105.0**	**103.5**	**102.5**	**104.0**	**102.5**
Compaction Method	**Standard**	**Standard**	**Standard**	**Standard**	**Standard**
Report Remarks	**	**	**	**	**

Moisture Variation Note:
Positive values = test is dry of OMC
Negative values = test is wet of OMC