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# **LEVEL 1 INSPECTION & TESTING HARRIOTT ESTATE STAGE 11 ARMSTRONG CREEK**

Prepared for BILD Group Pty Ltd

**Report Reference: GSSW1690.1 AA**

**Date: 18 November 2022**

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## PROJECT DETAILS

Project Reference	GSSW1690.1	Rev	AA
Project Title	Harriott Estate Stage 11		
Project Location	Armstrong Creek	State	VIC
Date	18 November 2022		

## CLIENT DETAILS

Prepared For (Client)	BILD Group Pty Ltd
Client Address	133 Metrolink Cct, Campbellfield VIC 3061

## DISTRIBUTION

Original Held By	Ground Science South West Pty Ltd
One (1) Electronic Copy	BILD Group Pty Ltd

This document presents the results of the Level 1 Inspection and Testing performed by Ground Science South West for the aforementioned project, as the nominated project Geotechnical Inspection & Testing Authority (GITA). This report is detailed for the sole use of the intended recipient(s). Should you have any questions related to this report please do not hesitate to contact the undersigned.

### AUTHOR:

**Michael Knez**  
Geotechnical Engineer

### REVIEWED:

**Gee Singh, RPEng**  
Senior Geotechnical Engineer

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## 1. INTRODUCTION

This report presents the results of the inspection activities, compaction control and laboratory testing services performed by Ground Science South West Pty Ltd for the Harriott Estate Stage 11 project, located within Armstrong Creek, Victoria (the site).

## 2. PROJECT UNDERSTANDING

It is understood that the project involves the placement of fill as part of the bulk earthworks phase for Harriott Estate Stage 11. Ground Science was engaged to provide Level 1 Inspection and Testing services for the construction of these areas. Authorisation to proceed was provided by BILD Group Pty Ltd (the 'Client'). GPR Consulting Pty Ltd prepared the civil drawings for the project.

Level 1 Inspection & Testing, as defined in AS3798 (2007) 'Guidelines on Earthworks for Commercial and Residential Developments' provides for full time inspection of the construction of controlled fill and compaction testing in accordance with AS1289 'Methods of Testing Soils for Engineering Purposes' and AS1726 (2017) 'Geotechnical Site Investigations'. Ground Science performed the role of the project Geotechnical Inspection & Testing Authority (GITA) with all Level 1 Inspection and Testing services described in this report undertaken by an experienced GITA site representative.

## 3. SCOPE OF WORK

### 3.1 AREAS OF WORK

Ground Science provided Level 1 Inspection and Testing services for the construction of fill in areas requiring greater than 200mm of fill to achieve finished levels. The areas requiring Level 1 Inspection & Testing are shown on the supplied construction drawing, on Figure 1, prepared by GPR Consulting Pty Ltd (Harriott at Armstrong Creek Stage 11 - Layout Plan [0352-11-R02 Rev A]).

This report details the Level 1 earthworks process performed on site which commenced on 4<sup>th</sup> of November 2022 and was completed on the same day, requiring 1 full day of inspection and testing works.

### 3.2 PLACEMENT METHODOLOGY

A technical specification for the fill operations was not provided. The placement of controlled fill on the above-mentioned areas was carried out in accordance with Level 1 fill procedures as detailed in AS3798 (2007) 'Guidelines on Earthworks for Commercial and Residential Developments'. The following fill placement guideline was adopted for the works:

- All existing loose surficial fill, topsoil, soft material, vegetation and materials containing significant organic matter were removed to expose the natural soil subgrade;
- Suitable fill material, sourced by the contractor and approved by Ground Science, was placed in loose horizontal layers not exceeding 300mm in thickness;
- The controlled fill material was compacted to achieve a target Dry Density Ratio of at least 95% Standard Compaction (AS 1289: 5.1.1, 5.4.1 or 5.7.1), based on our understanding that future building loads would be similar to residential type structures (i.e. non-commercial structural loading);
- The fill was moisture conditioned to within +/- 3% of the standard optimum moisture content;
- The fill material was sorted and mixed to eliminate particles greater than 20% by volume, particles coarser than 37.5mm and no particle over 200mm in any dimension;
- The frequency of field density testing adopted for the project was generally in line with the requirements for large scale developments (Type 1), as detailed in AS3798 (2007), which nominates a frequency of not less than:

- 1 test per layer or 200mm per 2500m<sup>2</sup>;
- 1 test per 500m<sup>3</sup> distributed reasonably evenly throughout the full depth and area; or
- 3 tests per site visit; whichever requires the most tests.

#### **4. INSPECTION AND TESTING**

##### **4.1 SUBGRADE PREPARATION**

Site stripping was carried out prior to Ground Science South West's involvement in the project. It is understood that BILD Group removed all organics, topsoil and compressible (soft) soils between 2<sup>nd</sup> and 4<sup>th</sup> of November 2022. Inspection of the newly prepared subgrade surface was carried out on 4<sup>th</sup> of November 2022 by the representative geotechnician from Ground Science South West. Topsoil was still present in some areas and further stripping was undertaken until a suitable subgrade surface was observed. A proof roll with a rubber tyre moxy truck loaded to 50 tonne was performed and was noted to show minimum deflection. At the time of the inspection, the prepared subgrade was observed to be generally close of optimum moisture content. The prepared subgrade surface was then inspected and deemed suitable for subsequent works to proceed.

The above stripped subgrade was visually assessed using tactile methods described in AS1726 (2017) and approved by the GITA representative throughout the project.

##### **4.2 CONSTRUCTION MATERIALS**

The fill material used in this project was nominated by the on-site contractor. All the materials used for the project was sourced from on site. The material was carted across site in dump trucks and stockpiled adjacent to the fill zones. Ground Science performed an assessment of the fill source to identify the following material characteristics:

- Material suitability as an engineering property;
- Cohesiveness;
- Free of building debris and vegetative matter;
- Free of oversize rock particles.

Visual assessments on the above-mentioned properties were conducted on-site and the fill material used was considered acceptable for use on this project. The nominated fill products were visually assessed to comprise of CLAY, with sand, trace gravel, medium to high plasticity, brown, sand fine to coarse grained, gravel fine, moist. Ground Science did not perform any quality assurance, quality control, chemical or environmental analysis on the above fill material.

The fill source was assessed to range from dry to close of the optimum moisture content. Portions of the fill material that were found to be dry were moisture conditioned using a water cart prior to compaction. All fill materials were generally considered suitable for use as engineered fill.

##### **4.3 FILL CONSTRUCTION**

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

- Bulldozer;
- Scraper;
- Water Cart;
- Padfoot Compactor.

During fill placement, the weather conditions were windy with temperatures typically ranging from 9 to 13 degrees Celsius.

The filling process was generally consistent throughout the project and involved the approved fill stockpiled adjacent to the fill placement zones. The material was spread using a scraper or bulldozer into thin loose layers. These layers were then moisture conditioned by a water cart, applying a minimum of 1-2 passes to bring the placed material close to optimum moisture content. Each layer was compacted using a padfoot roller applying a minimum of 5-8 passes, per layer observed. The thin layers of fill were compacted to form a composite layer, measuring 200mm thick, prior to undertaking the field density testing. This process was adopted for the fill placement works.

#### **4.4 RESULTS OF COMPACTION CONTROL TESTING**

Level 1 Inspection and Testing was undertaken by experienced technicians from Ground Science who attended the site for the duration of the construction phase and nominated the location of the in-situ density tests. Testing comprised a total of 4 in-situ density tests using a nuclear moisture-density gauge in accordance with Australian Standard (AS1289 5.8.1) together with 4 "Rapid HILF" Compaction tests (AS1289 5.7.1).

Field density and compaction control testing report sheets are presented in Appendix A. It should be noted that the tests are a representation of the fill placed and support the visual assessment of the works completed. No test areas failed to meet the required target density ratio or the required moisture condition.

#### **4.5 FINAL SURFACE LEVELS**

Observations were made by a Ground Science staff member that filling had been complete up to the nominated finished levels designated on Figure 1 as per confirmation provided from the contractor's site foreman. We understand that the observed final levels are the constructed finished surface levels of the controlled fill. The overall fill depths are estimated using onsite visual tactile methods and may not be a true representation of fill depths given that conditions on site may change over time. True fill depths should be obtained from the contractor's survey data.

#### **5. COMPLIANCE**

Ground Science Staff have undertaken Level 1 Inspection and Testing services of the construction of the controlled fill in the areas designated on Figure 1. Ground Science field staff have also observed that the prepared subgrade provided an adequate base for the subsequent placement of controlled fill.

Based on observations made by Ground Science staff and the results of density tests, we consider that the controlled fill placed has been constructed in accordance with the guidelines provided by the technical specification provided in AS3798 (2007) and AS2870 (2011).

It should be noted that the final fill layers may be subjected to adverse weather conditions resulting in either surface softening or drying and cracking over time; regardless of the compactive efforts and moisture conditioning applied during the works. The integrity of the top 200mm to 300mm of the fill will deteriorate with time and should be taken into account by the foundation engineer prior to the construction of dwellings or buildings. The levels nominated in this report are a guide to amounts of fill placed and do not necessarily reflect an accurate survey of the fill levels.

#### **6. UNDERSTANDING LEVEL 1 INSPECTION & TESTING**

The purpose of performing Level 1 Inspection and Testing is to ensure compliance of the fill with the specification. The engagement of a Geotechnical Inspection Testing Authority (GITA) allows the contractor to perform their role in the construction of the filling operation while the GITA monitors the quality control process of the fill placement. The visual observations of thorough processes and work practices by the contractor allows the GITA to approve the subsequent placement of fill without having to wait for the completion of testing and the extended time it takes to get a test result back. The GITA will however, carry out random spot checks of the filling operations throughout the day's production as confirmation that the placement procedures and the fill moisture content is appropriate. At

the end of a day's production the GITA will sign off the completed works as satisfactory. Any failed tests will result in that particular area of operation requiring rectification in the following mornings activities. This may be as simple as extra rolling with compaction plant if moisture conditioning is suitable. Sometimes these areas may be retested if the GITA feels it is necessary.

While AS3798 (2007) is a guideline on the minimum requirements of filling on commercial and residential developments, some projects require a more detailed project specification to deal with site specific issues. While moisture conditioning of fill sources aids in the ease with which compaction is achieved, it is not necessarily a physical characteristic that determines if the placed fill is acceptable. In some situations, the moisture requirement is an extremely important function of the final constructed product. In these situations, a specific project specification should apply to the project as detailed by the designing geotechnical engineer. These are typical of clay liners for wetlands, dams, landfill liners and caps and an array of other engineering situations. Creating a consolidated platform of which is similar to equivalent surrounding natural conditions is the primary aim of level one processes, preventing the occurrence of differential ground movements to footing structures.

Level 1 Inspection & Testing requires full time inspection and testing of the fill placement undertaken on a site. Ground Science (project GITA), are notified daily (or at the completion of each day's work) by the project foreman where subsequent days of fill placement under Level 1 is to occur. On projects that rely upon the importation of a fill source, there can be delays in the receipt of sufficient materials to warrant fill placement works which may result in periods of time where a GITA representative is not required on site. It is the contractor's responsibility to notify the GITA when works proceed and their attendance on site is required again. A GITA relies upon the integrity of the contractor to advise when site attendance is required and makes all reasonable visual attempts to assess if the works are the same as the previous days attendance.

**For & on behalf of  
Ground Science Pty Ltd**

**AUTHOR:**



**Michael Knez  
Geotechnical Engineer**

**REVIEWED:**



**Gee Singh, RPEng  
Senior Geotechnical Engineer**

## 7. LIMITATIONS

This type of investigation (as per our commission) is not designed or capable of locating all soil conditions, (which can vary even over short distances). The advice given in this report is based on the assumption that the test results are representative of the overall soil conditions. However, it should be noted that actual conditions in some parts of the Site might differ from those found. If further sampling reveals soil conditions significantly different from those shown in our findings, Ground Science must be consulted. Maintenance and upkeep of finished fill placement must be regularly monitored as exposure to extended weather periods/other elements may cause surface drying which may lead to cracking. Conversely, excessive exposure to moisture may cause heaving/softening in the soils.

It is recognised that the passage of time affects the information and assessment provided in this document. Ground Science's assessment is based on information that existed at the time of the preparation of this document. It is understood that the services provided allowed Ground Science to form no more than an opinion of the actual site conditions observed during sampling and observations of the site visit and cannot be used to assess the effects of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

The scope and the period of Ground Science services are described in the proposal and are subject to restrictions and limitations. Ground Science did not perform a complete assessment of all possible conditions or 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 Ground Science in regards to it.

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 Ground Science for incomplete or inaccurate data supplied by others.

Any drawings or figures 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.

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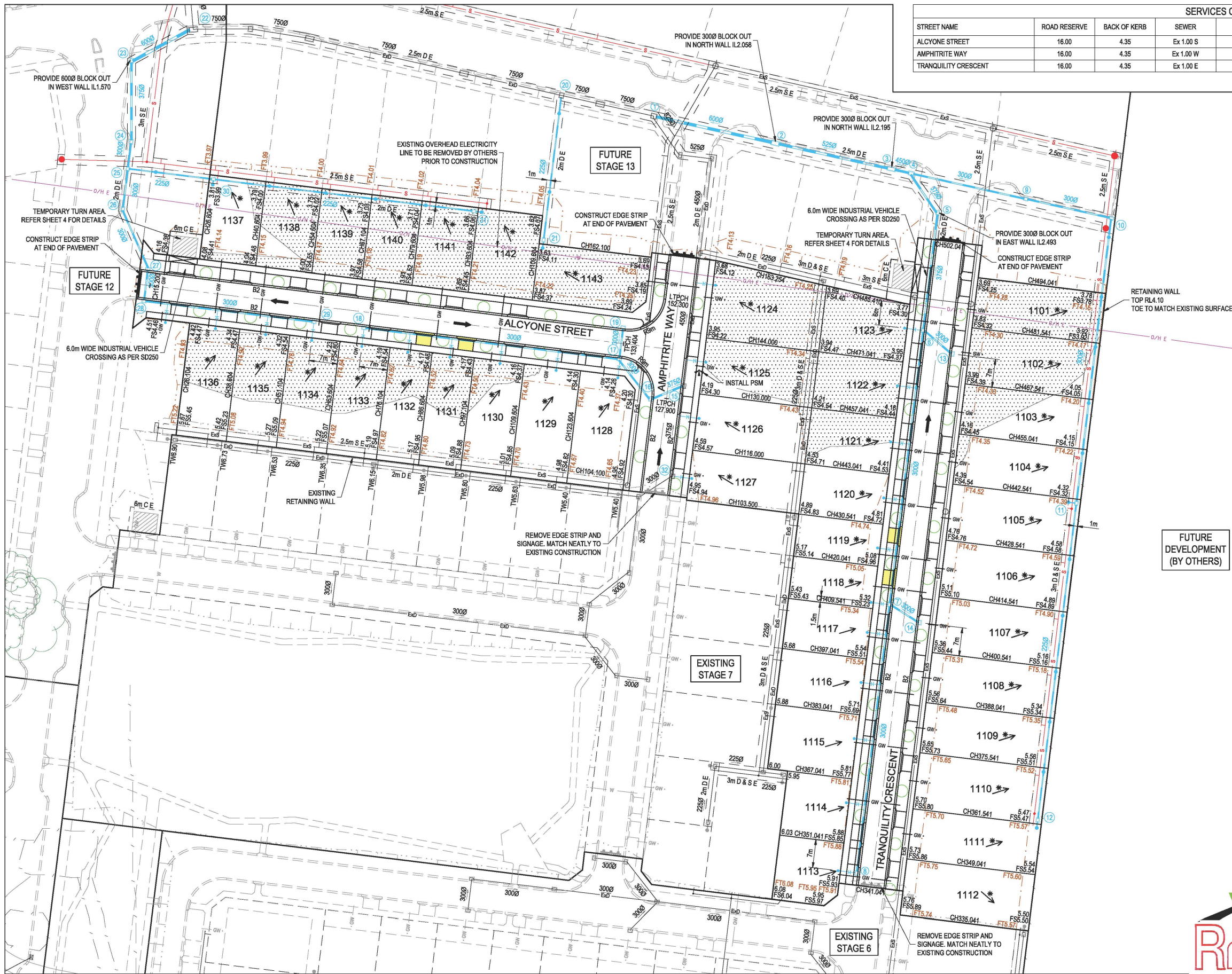


## 8. REFERENCES

- AS3798 (2007) Guidelines on Earthworks for Residential and Commercial Developments.
- AS2870 (2011) Residential Slabs and Footings.
- AS1289 Methods of Testing Soils for Engineering Purposes.
- AS1726 (2017): Geotechnical Site Investigations

**FIGURE 1**

Harriott at Armstrong Creek Stage 11 - Layout Plan [0352-11-R02 Rev A]



SERVICES OFFSET SCHEDULE									
STREET NAME	ROAD RESERVE	BACK OF KERB	SEWER	GAS	NON DRINKING WATER	DRINKING WATER	COMMUNICATIONS	ELECTRICITY	LIGHT POLES
ALCYONE STREET	16.00	4.35	Ex 1.00 S	2.10 S	2.80 S	3.10 S	1.85 N	2.60 N	3.45 N
AMPHITRITE WAY	16.00	4.35	Ex 1.00 W	2.10 E	2.80 E	3.10 E	1.85 W	2.60 W	3.45 W
TRANQUILITY CRESCENT	16.00	4.35	Ex 1.00 E	2.10 E	2.80 E	3.10 E	1.85 W	2.60 W	3.45 W

GREATER GEELONG CITY COUNCIL  
PLANNING ENVIRONMENT ACT 1987  
GREATER GEELONG PLANNING SCHEME

Endorsed Plan  
Planning Permit No: PP-1389-2018 Cert 15677  
Sheet 2 of 17  
Approved By Jack Golden  
Approved Date 28/10/2022

NOTE: THIS IS NOT A BUILDING APPROVAL

VEHICLE CROSSINGS		
STANDARD VEHICLE CROSSINGS ARE TO BE 4.0m WIDE OFFSET 1.0m FROM THE SIDE BOUNDARY		
NON STANDARD VEHICLE CROSSINGS ARE TO BE LOCATED AS PER BELOW		
LOT	WIDTH (m)	OFFSET (m)
1118	3.7	0.6
1119	3.7	0.6
1131	3.7	0.6
1132	3.7	0.6

NOTE: HOUSE DRAINS  
HOUSE DRAINS TO LOTS 1124 TO 1127 ARE TO BE CONNECTED TO EXISTING DRAINAGE.

NOTE: STREET TREES  
INDICATIVE STREET TREE LOCATION. ULTIMATE LOCATION TO BE PROVIDED BY THE LANDSCAPE ARCHITECTS.

**WARNING**  
BEWARE OF UNDERGROUND SERVICES  
The locations of underground services are approximate only and their exact position should be proven on site.  
No guarantee is given that all existing services are shown. Locate all underground services before commencement of works.  
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Rev	Amendment	Des/Dt	App'd	Date	Legend	
A	Initial Issue	GP/DP	MG	25/08/22	Existing Drainage	Ex D
					Existing Sewer	Ex S
					Existing Gas	Ex G
					Existing Electricity UG	Ex E
					Existing Electricity OH	Ex E
					Existing Communications	Ex T
					Existing Drinking Water	Ex DW
					Existing Non Drinking Water	Ex NDW
					Existing Swale Drain	Ex SD
					Drainage	D
					Main Drainage	M
					Sewer	S
					Swale Drain	SD
					Gas & Water Conduits	GW
					Direction of Lot Fall	DF
					Direction of Overland Flow	DOF
					Allotment to be Evenly Graded	AG
					Vehicle Crossings	VC
					Existing Surface Level at Title	135.12
					Finished Surface at Title	FS135.12
					Level at Top/Toe of Batter/Ridge	FT135.12
					Centreline Chaining	CH90.370
					Sleeper Retaining Wall	SRW
					Rock Retaining Wall	RRW
					PSM / TBM	PSM / TBM
					Structural Fill > 200mm	SF
					Concrete Infill	CI



Principal  
**HARRIOTT**  
AT ARMSTRONG CREEK

Jinding Australia  
Level 53, 525 Collins Street  
Melbourne Vic 3000

**GPR Consulting**

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Suite 217, 202 Jells Road  
Wheeler Hill Vic 3150  
Telephone 0456 634 727  
© GPR Consulting Pty Ltd

Council City of Greater Geelong  
Project **Harriott at Armstrong Creek Stage 11**  
Title **Layout Plan**  
Designed: G.Pratt  
Drafted: D.Pratt  
Authorised: M.Graham  
Date: August 2022

Scale @ A1: 1:500  
0 5 10 15 20 25

Drawing No. **0352-11-R02**  
Sheet 02 of 17  
Rev **A**

## **APPENDIX A**

Field Density Test Report Sheets & Test Locations



# Material Test Report

**Report Number:** GSSW1690-1  
**Issue Number:** 1  
**Date Issued:** 08/11/2022  
**Client:** BILD GROUP (CAMPBELLFIELD, VIC)



**Ground Science South West**

Geotechnical & Environmental Consultants

Ground Science South West Pty Ltd  
 10 Dowsett Street South Geelong Vic 3220  
 Phone: (03) 5282 1566  
 Email: chrism@groundscience.com.au

**Project Number:** GSSW1690  
**Project Name:** HARRIOT ESTATE STAGE 11  
**Project Location:** ARMSTRONG CREEK  
**Work Request:** 13956  
**Date Sampled:** 04/11/2022 10:00  
**Dates Tested:** 04/11/2022 - 07/11/2022  
**Sampling Method:** AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted  
**Specification:** 95% Standard Compaction & +/- 3% Moisture Variation  
**Lot Number:** Lots 1101-1104 & 1120-1143  
**Material:** CLAY, with sand, trace gravel, brown, high plasticity  
**Material Source:** Onsite



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Chris Mamalis  
 Laboratory Manager  
 NATA Accredited Laboratory Number: 20109

## Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1

Sample Number	1690-S1	1690-S2	1690-S3	1690-S4
Date Tested	04/11/2022	04/11/2022	04/11/2022	04/11/2022
Time Tested	10:31	11:53	12:53	16:03
Test Request #/Location	Lot 1140	Lot 1124	Lot 1133	Lot 1102
Easting	270409	270524	270471	270573
Northing	5766065 (Zone 55H)	5766015 (Zone 55H)	5765992 (Zone 55H)	5766021 (Zone 55H)
Layer / Reduced Level	1	1	1	1
Thickness of Layer (mm)	300	300	300	300
Soil Description	CLAY, with sand, trace gravel, high plasticity	CLAY, with sand, trace gravel, high plasticity	CLAY, with sand, trace gravel, high plasticity	CLAY, with sand, trace gravel, high plasticity
Test Depth (mm)	275	275	275	275
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	0	0	0
Field Wet Density (FWD) t/m <sup>3</sup>	2.00	2.08	2.01	2.01
Field Moisture Content %	23.6	22.3	29.1	25.8
Field Dry Density (FDD) t/m <sup>3</sup>	1.62	1.70	1.56	1.60
Peak Converted Wet Density t/m <sup>3</sup>	2.03	2.01	2.02	1.96
Adjusted Peak Converted Wet Density t/m <sup>3</sup>	**	**	**	**
Moisture Variation (Wv) %	-0.5	0.0	0.0	1.0
Adjusted Moisture Variation %	**	**	**	**
Hilf Density Ratio (%)	98.5	103.5	99.5	102.5
Compaction Method	Standard	Standard	Standard	Standard
Report Remarks	**	**	**	**

### Moisture Variation Note:

Positive values = test is dry of OMC

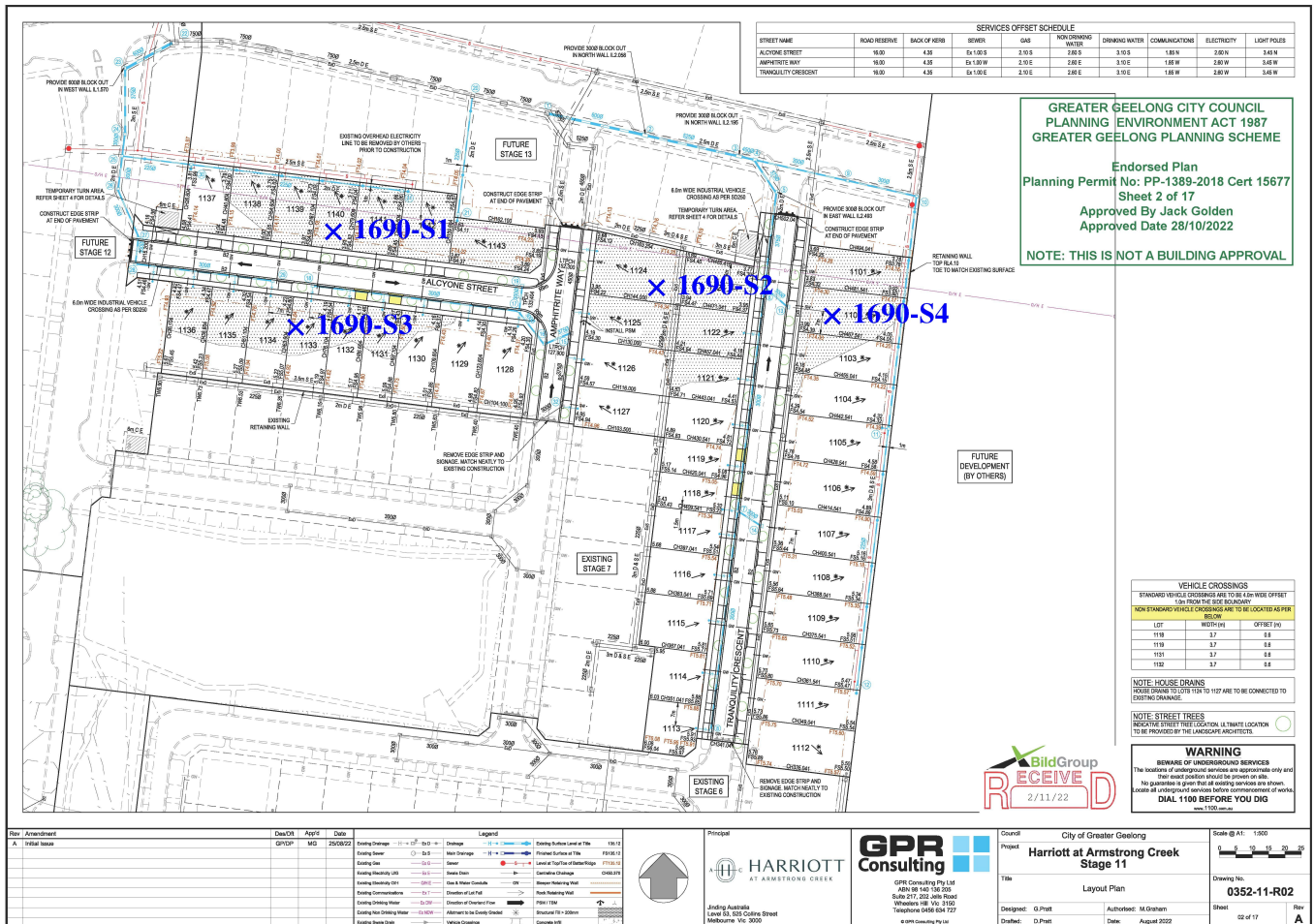
Negative values = test is wet of OMC

# Sample Locations Plan



**Ground Science South West**

Geotechnical & Environmental Consultants



## **APPENDIX B**

### Site Photographs







