



# **Douglas Partners**

*Geotechnics | Environment | Groundwater*

Report on  
Geotechnical Investigation

Proposed TRG Bushfire Response and Training  
Centre  
Block 45 Section 3, Hume

Prepared for  
Forestrack Pty Ltd

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**Integrated Practical Solutions**





# Douglas Partners

Geotechnics | Environment | Groundwater

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## Report on Geotechnical Investigation

### Proposed TRG Bushfire Response and Training Centre

### Block 45 Section 3, Hume

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## 1. Introduction

This report presents the results of a geotechnical investigation undertaken for a proposed TRG Bushfire Response and Training Centre (TRG) at Block 45 Section 3, Hume. The investigation was commissioned in an email dated 15 August 2020 from Forestrack Pty Ltd and was undertaken in accordance with Douglas Partners' proposal CAN200112 dated 23 March 2020.

It is understood that the proposed development of the site will include the construction of light industrial style buildings, helipad and internal pavements including parking areas. It is further understood that geotechnical investigation was requested to provide information on subsurface conditions to assist with further design works.

The geotechnical investigation was undertaken to provide comment on the following:

- subsurface conditions including groundwater (if encountered) at the investigated locations;
- site classification to AS2870:2011;
- site preparation and earthworks, excavation conditions and support including batter slopes and retaining walls;
- site drainage;
- suitable footings systems, allowable bearing pressures and estimated settlement; and
- pavement design considerations.

The investigation included the excavation of twenty-two (22) test pits and laboratory testing of selected samples. The details of the field work are presented in this report, together with comments and recommendations on the items listed above.

This report must be read in conjunction with the notes "About this Report" which are included in Appendix A.

## 2. Proposed Development

It is understood that the proposed TRG Bushfire Response and Training Centre will comprise an 'L'-shaped building; two helicopter parking stands and a helicopter landing pad; pavement areas for vehicle access/manoeuvring; and car, truck and heaving machinery parking. It is further understood that access to the proposed development will be from the southern corner of the site off Sheppard Street.

Based on surface levels across the site and the concept plans provided by the client, it is expected that the development will be constructed on one or more cut to fill platform(s) with cut depths of up to 2 – 2.5 m expected and fill depths of about 1 m.

### 3. Site Description

The site comprises an irregular shaped area of 1.61 ha in size and is located at the northern end of the light industrial suburb of Hume. The block is bordered to the east / south east by Sheppard Street, to the north / north west by Lanyon Drive and to the south west by neighbouring industrial blocks. Refer to Drawing 1 in Appendix B for the development layout and aerial image of the site and surrounding areas.

Site levels within the proposed development area fall slightly from the north to the south/south-east. Site levels near the north western and north eastern boundaries fall towards Lanyon Drive and Sheppard Street respectively, away from the development area.

At the time of the investigation, the site was covered in dense grass vegetation up to 1.5 m in height, with trees of heights up to approximately 15 m located in the northern half of the site (see Drawing 1, Appendix B). High strength, slightly weathered corestones were located at the surface in the northern/north-eastern corner of the site. 1 – 1.5 m high stockpiles of concrete, metal sheeting, bricks and other building rubble and soil, were located in the centre of the site and mostly overgrown with vegetation, including two rectangular mounds running approximately from the north-west to the south-east approximately 40 m in length (see Drawing 2 in Appendix B). Figures 1 and 2 below show the site at the time of site investigation, and the corestones located within the northern/north eastern corner of the site.

It is noted that the site was previously used as a compound for the civil contractor who constructed the Lanyon Drive duplication. Therefore, the presence of backfilled trenches and/or dispersed fill can not be discounted and can only be fully detected at the time of construction.



**Figure 1: View of site looking south from Pit 15.**



**Figure 2: View of high strength corestones in the northern/north-east corner of the site, near Pit 12.**

## 4. Local Geology

BMR (1992) indicates that the site is underlain by either rock of the Deakin Volcanics that typically comprise rhyodacitic ignimbrite or tuff, sandstone and shale. The rock is overlain by colluvial and residual soils. The south-eastern corner of the block is likely to be underlain by rhyodacitic ignimbrite, while the rest of the block is likely to be underlain by tuff, sandstone or shale. The geotechnical investigation confirmed the expected geology with either rhyodacitic ignimbrite or tuffaceous sandstone encountered within the test pits that encountered rock.

## 5. Field Work Methods

The field work comprised the excavation of 22 test pits (Pits 1 – 22). The pits were excavated using a CAT 304C CR mini-excavator (~5 tonne) fitted with a 300 mm wide bucket fitted with tiger teeth to depths of 1.5 – 3.0 m.

Dynamic cone penetrometer (DCP) tests (AS 1289 6.3.2:1997) were undertaken from the surface adjacent to each test pit location to provide an indication of the in-situ strength profile of the upper site soils. Samples of the site soils were collected for laboratory testing and for reference purposes.

The approximate test location coordinates provided on each test pit log were determined on site using a hand-held GPS which is accurate only to about 3 – 5 m. Surface levels have been broadly estimated from the site plan provided by the client. The approximate test locations and site boundary are shown on Drawing 1 (Appendix B).

## 6. Field Work Results

The test pits logs, including the results of the DCP tests, are presented in Appendix C together with notes that define classification methods and descriptive terms.

The test pits encountered a relatively uniform subsurface profile of colluvial soils, then residual soils over weathered rock. Some minor fill was encountered across the site. The typical subsurface sequence can be summarised as follows:

- TOPSOIL/TOPSOIL FILL – generally comprising clay and silt with rootlets to depths of 0.1 – 0.6 m;
- FILL – poorly graded, fine (5 mm) gravel trench fill in Pit 13 to a depth of 0.5 m;
- CLAY - generally firm to hard, moist to dry low to high plasticity clay with varying silt, sand and gravel including some ironstone nodules and iron staining to depths of 0.5 – 3.0 m in Pits 1 – 11 and 13 – 22. Pit 14 encountered clayey sand from 2.2 m which was grading to weathered rock. Pits 1 – 6, 13 and 14 were terminated at limit of investigation depths of 1.5 – 3.0 m.
- WEATHERED ROCK – very low to medium strength, highly to moderately weathered tuffaceous sandstone or rhyodacitic ignimbrite from depths of 0.3 – 2.7 m in Pits 7 – 12 and Pits 15 – 22. Pits 7 – 10, 12, 15, 20 and 21 were terminated at limit of investigation depths of 1.5 – 3.0 m, whilst Pits 11, 16 – 19 and 22 were terminated at slow progress or refusal depths of 1.5 – 2.7 m.

The upper 0.4 – 0.7 m of the soil profile has been impacted by the ongoing wet weather during the winter months.

No free groundwater was observed during excavation of the test pits. However, the pits were backfilled immediately following excavation precluding longer term monitoring of groundwater levels. Groundwater conditions rarely remain constant and can change seasonally due to variations in rainfall, temperature and soil permeability. For these reasons, it is noted that the moisture condition of the site soils may vary considerably from the time of the investigation compared to at the time of construction.

## 7. Laboratory Testing

Six samples of soil recovered from the test pits were tested in the laboratory for measurement of either compaction properties, California bearing ratio (CBR) or plasticity. The detailed laboratory test report sheets are included in Appendix D with the results summarised in Table 1 and 2 below. The CBR testing was carried out on samples compacted to about 100% standard maximum dry density at close to standard optimum moisture content. The samples were soaked for four days under surcharge loading of 4.5 kg.

**Table 1 - Result of CBR Laboratory Testing**

Pit No	Depth (m)	Field Description	FMC (%)	OMC (%)	MDD (t/m <sup>3</sup> )	CBR (%)
2	0.5 – 0.7	Clay	21.5	22.0	1.62	12
11	0.4 – 0.6	Silty Sandy Clay	9.9	12.0	1.93	14
20	0.5 – 0.7	Gravelly Clay	16.1	14.0	1.88	20

where OMC = Optimum moisture content (std)      CBR = California bearing ratio  
 FMC = Field moisture content                      MDD = Maximum dry density (std)

**Table 2 - Result of Atterberg laboratory testing**

Pit No	Depth (m)	Field Description	FMC (%)	W <sub>L</sub> (%)	W <sub>P</sub> (%)	PI (%)	LS (%)
8	0.7	Silty Sandy Clay	23.6	56	29	27	13.5
19	0.6	Clay	20.2	50	22	28	14.0
22	1.2	Clay	28.3	91	30	61	20.0

Where FMC = Field moisture content      W<sub>L</sub> = Liquid limit      W<sub>P</sub> = Plastic limit      PI = Plastic limit  
 LS = Linear shrinkage

## 8. Comments

### 8.1 General Notes on Subsurface Conditions

The subsurface conditions are relatively uniform across the site, consisting of deep topsoils, natural clayey soils over weathered rock. Minor fill and buried conduits were found in Pits 13 and 22. As mentioned above, this is likely associated with the site compound established on the site during construction of the Lanyon Drive duplication approximately 10 years ago.

Depth to weathered rock, where encountered, ranged from 0.3 m to 2.7 m deep. Shallow rock was present in the northern corner of the site, while rock was not encountered within the test pits in the southern part of the site. Clayey soil strengths ranged from firm to hard, while moisture contents ranged from wet to dry.

No free groundwater was observed during the site investigation; however this does not preclude the possibility of groundwater after periods of heavy rainfall or seepages during any potential excavations.

### 8.2 Site Classification

Site classification in accordance with AS 2870:2011 provides guidance on the patterns and magnitude of moisture related seasonal ground movements that must be considered in design. Due to adverse moisture conditions arising from existing trees, topsoil depth greater than 0.4 m, presence of stockpiles and uncontrolled fill, and soils of insufficient/marginal strength (soft and firm, wet soils) located in parts of the development area, the site is classified as Class P.

Notwithstanding the Class P classification, based on soil reactivity including the additional tree-induced suction change and allowing for variation in the subsoil profile, the current natural soil profile would be equivalent to worst case high range Class H1 (highly reactive) conditions which takes into consideration the additional influence of trees. It must be noted that parts of the undeveloped site, mainly at the northern end, would be equivalent to Class S (slightly reactive) conditions due to shallow rock.

The site classification must be reassessed should the subsurface profile change by either cutting or filling and/or if the presence of service trenches, retaining walls or submerged structures are within the zone of influence of the proposed footings. Reference must be made to the comments provided below.

The site classification is only applicable to one or two storey residential style structures as described AS2870 – 2011. In addition, reference to Clause 3.1.1 of AS 2870 – 2011 indicates that the foundation details given in AS 2870 are not applicable to buildings longer than 30 m.

### 8.3 Site Preparation

#### 8.3.1 Stripping

Site preparation for the construction of pavement areas and structures should include the removal of uncontrolled / undocumented fill, topsoils, vegetation and other deleterious materials such as moisture affected soils, organic matter and/or tree root affected soils from the proposed construction areas.

Based on the results of the investigation, an average topsoil / topsoil fill stripping depth of around 0.3 – 0.4 m is expected. Localised topsoil stripping depths of up to 0.6 m (Pits 17 and 21) will be required.

Stripping of moisture impacted soil below the topsoil based on the test pit data at the time excavation (May 2021), will likely require an additional stripping depth of 0.1 – 0.3 m. However, based on recent ongoing rainfall through the winter months, this depth is expected to have increased.

Deeper excavations could occur, where localised unsuitable materials such as fill mounds or backfilled trenches are encountered, if inclement weather precedes construction or if the contractor adopts inappropriate stripping methods. Preceding weather conditions will have a significant influence on stripping depths.

Any fill encountered during stripping works including old service trench backfill materials must be considered uncontrolled and fully removed unless Level 1 fill certification (AS3798:2007) is produced.

It is noted that semi-mature and mature trees are scattered across the northern end of the site and as such root affected soil will be encountered if the trees are removed. The depth of root affected soils can only be determined on-site during site works however allowance should be made for at least 0.5 m (possibly up to 1 – 1.5 m for mature trees) of excavation of these soils in areas adjacent to trees.

### **8.3.2 Excavation Conditions**

The investigation has indicated subsurface conditions generally comprising topsoil and natural clayey soils underlain by very low to medium strength weathered rock to the limit of investigation or refusal depths.

Maximum excavation depths of around 2 – 2.5 m are anticipated in order to achieve the current concept design level for the proposed development. Removal of the overburden soils and bedrock up to low strength could be expected to be removed using conventional earthmoving plant. Any medium to high strength rock encountered during excavation works should be able to be excavated and ripped using a medium sized (20 – 40 tonne) excavator or bulldozer. The use of pneumatic hammers cannot be discounted, particularly in detailed excavations. It is noted that large, high to very high strength corestones were located at the surface of the soil in the northern corner of the site. These corestones will be difficult to remove with conventional earthmoving equipment and may require either removal with a pneumatic rock hammer or ripping by a large bulldozer (D9 equivalent or greater).

Whilst groundwater was not encountered during the field investigation, it is noted that the extent of groundwater inflow into any potential excavations would be dependent on prior weather conditions. Groundwater seepages must be anticipated following rainfall.

### **8.3.3 Trafficability of Excavation Surfaces**

Excavated surfaces in the clayey soils are likely to be slippery and difficult to traffic over by all but tracked vehicles during and after wet weather. It is suggested that consideration be given to the armouring the excavation base and any access ramps by a suitably graded crushed rock or recycled crushed concrete which is free draining and which will be structurally stable under construction traffic.

### 8.3.1 Excavation Batters

For permanent excavations in the topsoil, natural soils and rock up to low strength, maximum gradients of 3H:1V (horizontal:vertical) for natural soils and 1H:1V for medium or greater strength bedrock (subject to inspection and joint defects) are recommended. To minimise surface erosion, the batters must be protected with toe and spoon drains and vegetated as soon as possible after construction. Rock batters may require stabilisation via draped and dowelled mesh should jointing be adverse or cut heights be greater than say 1.5 m. Exposed weathered rock will degrade and spall over time, therefore maintenance must be expected. For temporary excavations, maximum gradients of 1H:1V and 0.5H:1V are suggested for natural soils and weathered rock respectively, unless adverse jointing is present which would then require flatter batters.

### 8.3.2 Retaining Walls

Where cantilevered retaining structures with level ground behind are proposed, it is suggested that earth pressures on retaining walls due to the retained soils be based on a triangular pressure distribution calculated as follows:

$$h_z = \gamma k_a z$$

where,	$h_z$	=	horizontal pressure at depth $z$
	$\gamma$	=	unit weight of retained soil
		=	20 kN/m <sup>3</sup> for soils
		=	22 kN/m <sup>3</sup> for weathered rock
	$k_a$	=	active earth pressure coefficient
		=	0.3 for compacted fill, medium dense/very stiff sandy/clayey soil
		=	0.25 for weathered rock (fractured)
	$k_0$	=	0.5 for movement intolerant areas

Drainage behind all retaining walls must be provided or, alternatively, full hydrostatic pressure allowed for in design. In the event that hydrostatic pressures are allowed, densities of the retained soils can be appropriately reduced to the buoyant values.

Where applicable, superimposed surcharge loads due to adjacent roadways, inclined surfaces etc. should also be accommodated in the design of such structures.

### 8.3.3 Reuse of Excavated Material

Stripped topsoils are unsuitable for use in engineered fill but can be used in landscape mounds or other non-structural applications. The natural soils underlying the topsoil generally comprise clayey soils with variable silt, sand and gravel content. The low to medium plasticity soils appear suitable for use as general fill or controlled fill following blending and moisture reconditioning (significant drying). The high plasticity clays are susceptible to shrink / swell movements with changes in moisture conditions. It is considered that the reuse of any medium to high/high plasticity soils for controlled fill applications should be used with caution otherwise site classifications used for structure footing systems would be required to be significantly higher than in the natural state. Similarly, CBR values adopted for pavements would need to be reduced (say less than 2%) should medium to high and high plasticity clays be reused near design subgrade level. It is advised that if reuse is required and then it should be used at depth (i.e. greater than 1 m from surface).

Upon excavation, the extremely low to low strength rock will most likely deteriorate to have similar properties as to sandy clay soil with reuse considered suitable in controlled fill and embankment fill areas, provided rock particles are broken down to less than 75 – 100 mm in size.

As excavation proceeds into medium or higher strength bedrock (generally below bucket refusal or for corestones), it would be expected that the rock would excavate as cobble and boulder sized fragments, which would need to be crushed (using a crushing plant) to a general maximum particle size of 75 mm prior to use within fill areas. It is likely that minimal fines would be created during the rock crushing process and that blending with the overlying soil may be required to create a suitable (well graded) fill material. If the use of a crushing plant is seen as prohibitive, then consideration should be given to restricting the re-use of excavated rock materials to road embankment fills where the material specification (particle size) are less restrictive.

Soils that are extensively affected by tree roots would be considered unsuitable.

The stripped mixture of topsoil and cobbles, essentially would also be considered unsuitable, however if the rock and topsoil is separated, some of this material could possibly be re-used in embankments.

If fill is imported to the site, then the engineering properties (e.g. plasticity, reactivity, CBR, etc.) should ideally be equivalent, or superior, to the existing suitable materials on site.

Prior to reuse of material excavated from site, a waste classification assessment should be undertaken in accordance with current ACT Environment Protection Unit guidelines.

### **8.3.4 Fill Placement and Compaction**

Prior to fill placement, the stripped surfaces must be inspected and/or test rolled in the presence of a geotechnical engineer. Any areas exhibiting deflections under test rolling must be appropriately treated at the direction of the geotechnical consultant.

All controlled fill should be placed in horizontal layers of maximum 250 mm loose thickness and compacted to a minimum dry density ratio of 98 % relative to standard compaction. Moisture contents must be maintained within 3% points dry to 1% point wet of standard optimum values.

All constructed fill batters should be constructed no steeper than 3:1 (horizontal:vertical), protected against erosion by vegetating the exposed surface and construction of toe and spoon drains as a means of controlling surface water flows on the batters. Flatter batters would be required should they need to be maintained regularly for safety reasons.

To validate the filling quality, field inspections and in-situ testing of future earthworks must be undertaken in order to satisfy the requirements for Level 1 controlled filling AS 3798:2007.

## 8.4 Drainage

As discussed above, groundwater seepages are not likely within the site, however appropriate measures should be in place for potential rainfall events and overland flow.

It must be acknowledged that the likely earthworks to create desired design surface levels will result in the drainage (surface and subsurface) characteristics of the site being significantly altered. The performance of the future structure(s) and pavements will be heavily dependent on designing and constructing suitable drainage measures such as diversion swales and cut off drains around the upper perimeter.

## 8.5 Foundations

All footings must be founded within a uniform bearing stratum of suitable strength/material, below the zone of influence of any uncontrolled fill (if left in place), service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice. Structure design will need to ensure suitable drainage and uniform moisture conditions are maintained in the vicinity of the footings otherwise footing performance would be compromised. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

For building structures, suitable footing systems could include pad and strip footings, or bored cast-in situ reinforced concrete piers founding in suitable natural soils or weathered rock. Suggested allowable base bearing pressures are as follows:

- |  |           |
|--|-----------|
| • Controlled fill                        | 150 kPa   |
| • Stiff clayey soils:                    | 100 kPa   |
| • Very stiff clayey / dense sandy soils: | 150 kPa   |
| • Very low to low strength rock:         | 1,000 kPa |
| • Medium strength rock:                  | 2,000 kPa |

Due to the likely column loads, and based upon an expected excavation depth of 2 – 2.5 m below existing surface levels, it is expected that the northern corner of the proposed building area will expose weathered rock after site cut. It is recommended that all footings be founded in at least very low to low strength rock to minimise the risks of settlements (total and differential). Piers could be utilised in areas where rock is not exposed or close to the surface following bulk earthworks. The advantages of founding footings within weathered rock is resulting settlements would be expected less than a few millimetres.

It is essential that all excavations for footings be inspected by an experienced geotechnical engineer to confirm the foundation conditions and assumed design parameters are suitable. The inspection would also check that the excavation bases are adequately cleared of loose soil, rock or other debris, and that the footings will not be destabilised by any adjacent excavations.

To minimise degradation of foundation materials due to rainfall, all footings must be either protected by a blinding layer or actual pouring of concrete footing on the same day as excavation/drilling.

## 8.6 Pavement Considerations

Based on the results of the field investigation and laboratory testing it is suggested that a design CBR of 3% be adopted for preliminary pavement designs. Areas with weathered rock exposed at subgrade level, a design CBR of 6% to 10% could be adopted, pending weathering and strength of the rock. It is noted that the CBR value in areas of high plasticity clays will be likely be less than 3% and as such subgrade replacement or adoption of a lower CBR value would be required in those areas.

The CBR of any imported fill should also be assessed to confirm the suggested design value is appropriate.

Prevailing weather conditions prior to and at the time of construction will be critical in achieving satisfactory subgrade and foundation performance. The site is underlain by residual soils with high contents of clay which will prove to be highly problematic should moisture contents increase to greater than 2% from optimum moisture content.

If construction does not immediately follow site preparation (thus exposing the foundation soils to weather) and/or it is undertaken in the colder months of the year with average to above average rainfall, deterioration would be expected, thus requiring rectification. In conjunction with subgrade preparation procedures, temporary drainage systems must be constructed prior to installation of the final works.

All earthworks should be undertaken under close supervision and consultation with the geotechnical consultant in order to avoid any unnecessary over excavation. The standard of construction, the selection of materials and quality of workmanship for the roads should satisfy the requirements of the latest edition of the ACT Government Municipal Infrastructure Technical Specifications.

Surface and subsoil drainage must be installed and maintained to protect the pavement and subgrade. Subsoil drains should be located at a minimum of 0.5 m depth below the subgrade level and be included adjacent to any traffic islands.

## 9. Geotechnical Review

It is recommended that DP review the geotechnical aspects of the proposed development design and layout and earthworks plan to assess any potential risk areas and provide commentary on remedial measures.

## 10. References

AS 1289.6.3.2:1997 Rec 2013, *Soil strength and consolidation tests—Determination of the penetration resistance of a soil—9 kg dynamic cone penetrometer test*, Standards Australia.

AS 2870:2011, *Residential Slabs and Footings*, Standards Australia.

AS 3798:2007, *Guidelines on Earthworks for Commercial and Residential Developments*, Standards Australia.

BMR (1992), *Geology of Canberra 1:100 000 Geological Series Sheet 8727*, Bureau of Mineral Resources

## 11. Limitations

Douglas Partners (DP) has prepared this report for this project at Block 45 Section 3, Hume in accordance with DP's revised proposal dated 15 March 2021 and acceptance received from Forestrack Pty Ltd. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Forestrack Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

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**Douglas Partners Pty Ltd**

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## **Appendix A**

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About This Report

# About this Report

# Douglas Partners



## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

## **Information for Contractual Purposes**

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

## **Site Inspection**

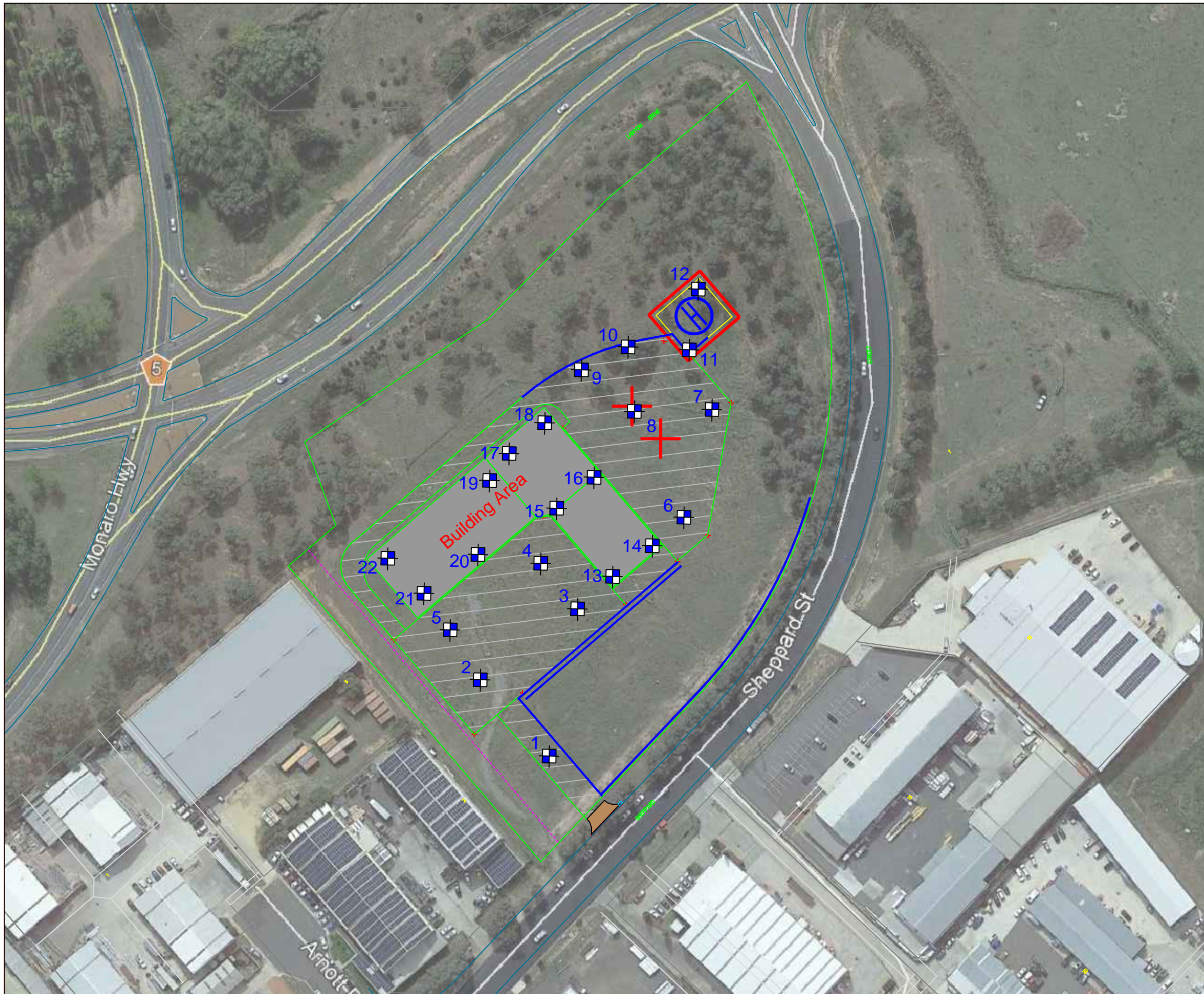
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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## **Appendix B**



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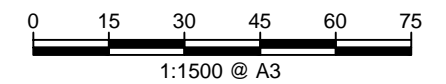
Drawing 1 – Test Location Plan  
Drawing 2 – Site Features Plan



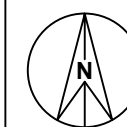
Locality Plan

**LEGEND**

-  Test Pit Location (Approximate)
-  Proposed Helicopter Parking Stand (Approximate)



Note: Base drawing taken from NearMaps

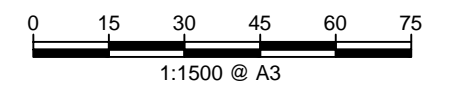




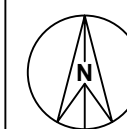
**Locality Plan**

**LEGEND**

- Approximate Development Outline
- Approximate Building Outline
- Approximate Extent of Stockpiles
- Approximate Extent of Corestones



Note: Base drawing taken from NearMaps



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## **Appendix C**

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Explanatory Notes  
Test Pit Logs



## Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

## Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

## Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

## Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

## Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

## Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

## Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:  
4,6,7  
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:  
15, 30/40 mm

# Sampling Methods

The results of the SPT tests can be related empirically to the engineering properties of the soils.

## **Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests**

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.



## Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)

- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)

- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with 'Mix of Soil and Cobbles/Boulders' with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

# Soil Descriptions

## Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

## Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

## Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;

- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

## Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.  
Soil tends to stick together.  
Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.  
Soil tends to stick together, free water forms when handling.

## Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- 'Moist, dry of plastic limit' or 'w < PL' (i.e. hard and friable or powdery).
- 'Moist, near plastic limit' or 'w ≈ PL' (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- 'Moist, wet of plastic limit' or 'w > PL' (i.e. soils usually weakened and free water forms on the hands when handling).
- 'Wet' or 'w ≈ LL' (i.e. near the liquid limit).
- 'Wet' or 'w > LL' (i.e. wet of the liquid limit).



## Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index  $I_{s(50)}$  is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Abbreviation	Unconfined Compressive Strength MPa	Point Load Index * $I_{s(50)}$ MPa
Very low	VL	0.6 - 2	0.03 - 0.1
Low	L	2 - 6	0.1 - 0.3
Medium	M	6 - 20	0.3 - 1.0
High	H	20 - 60	1 - 3
Very high	VH	60 - 200	3 - 10
Extremely high	EH	>200	>10

\* Assumes a ratio of 20:1 for UCS to  $I_{s(50)}$ . It should be noted that the UCS to  $I_{s(50)}$  ratio varies significantly for different rock types and specific ratios should be determined for each site.

## Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
<i>Note: If HW and MW cannot be differentiated use DW (see below)</i>		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

# Rock Descriptions

## Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

## Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

## Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

# Symbols & Abbreviations

# Douglas Partners



## Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

## Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

## Water

▷	Water seep
▽	Water level

## Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U <sub>50</sub>	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

## Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

## Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

## Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

## Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

## Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

## Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

## Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

## Other

fg	fragmented
bnd	band
qtz	quartz

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 588 AHD  
**EASTING:** 697428  
**NORTHING:** 6082041

**PIT No:** 1  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
588		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist, w<PL, firm, TOPSOIL -from 0.15m, stiff											
	0.4	Gravelly CLAY (CL/CI): low to medium plasticity, yellow brown, ironstone gravel to 12mm, with iron staining, trace silt, moist, w~PL, stiff to very stiff, colluvium		D	0.5								
	0.7	CLAY (CI): medium plasticity, brown mottled orange-grey, trace silt, fine to coarse grained sand and gravel to 8mm, moist, w<PL, very stiff, residual		D	0.9								
587	1	CLAY (CH): high plasticity, yellow grey, trace silt, moist, w<PL, hard, residual		D	1.3								
	1.5	Pit discontinued at 1.5m -limit of investigation											
	2												
586													
	3												
585													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 588 AHD  
**EASTING:** 697402  
**NORTHING:** 6082071

**PIT No:** 2  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
588	0.1	TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist, w>PL, stiff, TOPSOIL											
	0.4	Clayey SILT (ML): low plasticity, pale grey, low plasticity clay, trace rootlets, wet to moist, w>PL, firm to stiff, colluvium											
	0.5	CLAY (CI): medium plasticity, yellow brown, with silt, iron staining and ironstone nodules to 10mm, moist to wet, w>PL, stiff, colluvium		B	0.5								
	0.7	-from 0.6m, moist to dry, w<PL, hard			0.7								
587	0.95	CLAY (CI): medium plasticity, yellow brown mottled grey, trace silt, iron staining and fine to medium grained sand, moist to dry, w<PL, very stiff to hard, residual											
	1.2			D	1.2		pp = 250-400						
	1.8	-from 1.6m, medium to high plasticity											
	1.8	Pit discontinued at 1.8m -limit of investigation											
586	2												
	3												
585	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 588 AHD  
**EASTING:** 697440  
**NORTHING:** 6082098

**PIT No:** 3  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)					
				Type	Depth	Sample	Results & Comments		5	10	15	20		
588		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist to dry, w<PL, very stiff, TOPSOIL												
	0.3	Silty CLAY/Clayey SILT (ML): low plasticity, grey brown, low plasticity clay, trace rootlets, dry to moist, w<PL, very stiff, colluvium -from 0.45m, hard		D	0.5									
	0.7	Silty CLAY (CL/CI): low to medium plasticity, pale yellow brown, trace iron staining and ironstone nodules to 8mm, moist to dry, w<PL, hard, colluvium		D	0.9									
587	1													
	1.1	CLAY (CI): medium plasticity, yellow-brown mottled orange, with silt, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual  -from 1.4m, yellow/grey brown		D	1.3									
	1.8	Pit discontinued at 1.8m -limit of investigation												
586	2													
585	3													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	∇	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697426  
**NORTHING:** 6082116

**PIT No:** 4  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589	0.25	TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet to moist, w>PL, firm to stiff, TOPSOIL											
	0.8	CLAY (CI): medium plasticity, yellow brown, trace silt, iron staining and ironstone nodules to 10mm, wet to moist, w>PL, firm to stiff, colluvium  -from 0.45m, moist, w<PL, stiff to very stiff		D	0.5								
588	1	CLAY (CL/CI): low to medium plasticity, yellow/grey brown, with silt, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual											
	1.4	CLAY (CI/CH): medium to high plasticity, yellow/grey brown, with silt, trace fine to coarse grained sand, moist, w<PL, very stiff, residual											
	1.6	Pit discontinued at 1.6m -limit of investigation											
587	2												
586	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697391  
**NORTHING:** 6082091

**PIT No:** 5  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589	0.2	TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist, w~PL, stiff, TOPSOIL											
	0.8	CLAY (CI/CH): medium to high plasticity, orange/yellow brown, with silt, trace fine to medium grained sand, moist, w~PL, stiff to very stiff, residual		D	0.5								
588	1.0	CLAY (CI): medium plasticity, orange/grey brown, trace silt, iron staining and fine to medium grained sand, moist to dry, w<PL, very stiff, residual		D	1.2								
	1.6	Pit discontinued at 1.6m -limit of investigation											
587	2.0												
586	3.0												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	≻	Water seep
E	Environmental sample	≻	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697482  
**NORTHING:** 6082133

**PIT No:** 6  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589		TOPSOIL/Silty CLAY (CL): low plasticity, brown, with rootlets, wet to moist, w<PL, soft to firm, TOPSOIL											
	0.3	Silty CLAY (CL/CI): low to medium plasticity, orange brown, with rootlets, wet to moist, w>PL, firm to stiff, colluvium -from 0.45m, moist to wet, stiff											
	0.7	CLAY (C): medium plasticity, dark yellow brown, with iron staining, ironstone nodules to 10mm and silt, moist to dry, w<PL, hard, colluvium		D	0.8								
588	1.0	CLAY (C): medium plasticity, orange/grey brown, with silt, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual		D	1.3								
	1.6	Pit discontinued at 1.6m -limit of investigation											
587	2												
586	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PL(D)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 590 AHD  
**EASTING:** 697494  
**NORTHING:** 6082174

**PIT No:** 7  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)					
				Type	Depth	Sample	Results & Comments		5	10	15	20		
590		TOPSOIL/Silty CLAY (CL): low plasticity, brown, with rootlets, wet, w>PL, soft, TOPSOIL												
	0.4	-from 0.3m, firm												
		CLAY (CL/CI): low to medium plasticity, brown, with silt, trace fine to coarse grained sand, moist to wet, w>PL, stiff, residual		B	0.5									
		-from 0.75m, stiff to very stiff			0.7									
589	1													
	1.2	Sandy CLAY (CI): medium plasticity, grey, fine to coarse grained, moist to dry, w<PL, very stiff, residual tuffaceous sandstone		D	1.3									
	1.4	TUFFACEOUS SANDSTONE: fine to coarse grained, grey, dry to moist, very low to low strength, highly weathered, highly fractured		D	1.6									
588	1.75	Pit discontinued at 1.75m -limit of investigation												
588	2													
587	3													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 591 AHD  
**EASTING:** 697464  
**NORTHING:** 6082174

**PIT No:** 8  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
591		TOPSOIL/Silty CLAY (CL): low plasticity, brown, with rootlets, wet, w<PL, soft to firm, TOPSOIL											
	0.35	Silty CLAY (CL/CI): low to medium plasticity, red brown mottled yellow, trace fine to medium grained sand, moist to dry, w<PL, very stiff, residual											
		-from 0.75m, hard		D	0.7								
	1	-from 1.0m, yellow/grey brown, with fine to coarse grained sand											
	1.3	TUFFACEOUS SANDSTONE: fine to coarse grained, grey, dry to moist, very low to low strength, extremely to highly weathered, highly fractured		D	1.4								
	1.5	Pit discontinued at 1.5m -limit of investigation											
590													
	2												
589													
	3												
588													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 592 AHD  
**EASTING:** 697444  
**NORTHING:** 6082190

**PIT No:** 9  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
592		TOPSOIL/Silty Sandy CLAY (CL): low plasticity, brown, fine to coarse grained sand, with rootlets, moist to dry, w<PL, firm to stiff, TOPSOIL											
	0.25	Silty Sandy CLAY (CL): low plasticity, red brown, fine to coarse grained sand, dry to moist, w<PL, hard, extremely weathered tuffaceous sandstone		D	0.4								
	0.5	TUFFACEOUS SANDSTONE: fine to coarse grained, red brown, dry to moist, very low strength, extremely to highly weathered, highly fractured		D	0.8								
591	1	-from 1.1m, low strength, highly weathered, highly fractured											
	1.5	Pit discontinued at 1.5m -limit of investigation											
590	2												
589	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 592 AHD  
**EASTING:** 697462  
**NORTHING:** 6082199

**PIT No:** 10  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)					
				Type	Depth	Sample	Results & Comments		5	10	15	20		
592	0.2	TOPSOIL/Silty Sandy CLAY (CL): low plasticity, brown, fine to coarse grained sand, with rootlets, moist to dry, w<PL, stiff, TOPSOIL												
	0.5	Silty Sandy CLAY (CL): low plasticity, red brown, fine to coarse grained sand, with roots, dry to moist, w<PL, hard, extremely weathered tuffaceous sandstone												
	1.0	TUFFACEOUS SANDSTONE: fine to coarse grained, red/grey, dry to moist, very low to low strength, highly weathered, highly fractured		D	1.0									
591	1.5	Pit discontinued at 1.5m -limit of investigation												
590	2.0													
589	3.0													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	∇	Water seep
E	Environmental sample	≡	Water level
		PL(D)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 590 AHD  
**EASTING:** 697485  
**NORTHING:** 6082197

**PIT No:** 11  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
590	0.2	TOPSOIL/Silty Sandy CLAY (CL): low plasticity, brown, fine to coarse grained sand, with rootlets, moist to dry, w<PL, firm to stiff, TOPSOIL											
	0.4	Silty Sandy CLAY (CL): low plasticity, red brown, fine to coarse grained sand, with high strength, rhyodacitic gravel to 60mm, wet to moist, w>PL, firm to stiff, residual -from 0.3m, very stiff											
	0.6	-from 0.45m, dry to moist, hard		B									
	0.8	TUFFACEOUS SANDSTONE: fine to coarse grained, red/grey, dry to moist, very low to low strength, highly weathered, highly fractured											
589	1.0	-from 1.0m, grey, low strength		D									
	1.45	-from 1.4m, medium strength, moderately weathered, fractured Pit discontinued at 1.45m -refusal											
588	2												
587	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 591 AHD  
**EASTING:** 697489  
**NORTHING:** 6082221

**PIT No:** 12  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
591	0.3	TOPSOIL/Silty Sandy CLAY (CL): low plasticity, brown, fine to coarse grained sand, with rootlets, moist to dry, w<PL, stiff, TOPSOIL											
	0.7	TUFFACEOUS SANDSTONE: fine to coarse grained, red/grey, with high to very high strength corestones up to 600mm in size within rock matrix and exposed through to surface, dry to moist, very low to low strength, highly weathered, highly fractured		D	0.7								
590	1												
	1.5			D	1.5								
	1.8	-from 1.7m, grey, low to medium strength, highly weathered, highly fractured		D	1.8								
589	1.9	Pit discontinued at 1.9m -slow progress											
588	2												
	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	≻	Water seep
E	Environmental sample	≻	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 588 AHD  
**EASTING:** 697454  
**NORTHING:** 6082110

**PIT No:** 13  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
588	0.1	TOPSOIL FILL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist to wet, w<PL, stiff, TOPSOIL FILL  FILL/GRAVEL (GP): gravel to 5mm, blue grey, trench, FILL  -at 0.4m, 50mm conduit (empty)											
	0.5	CLAY (CI): medium plasticity, yellow brown, with iron staining and ironstone nodules to 12mm, trace silt, moist, w~PL, very stiff, colluvium		B	0.6								
					0.8								
587	1												
	1.1	CLAY (CI/CH): medium to high plasticity, yellow grey brown, with silt, moist to dry, w<PL, hard, residual											
				D	1.5		pp >400						
586	2												
	2.2	CLAY (CI/CH): medium to high plasticity, orange/grey brown, with silt, trace high strength gravel to 60mm, moist to dry, w<PL, hard, likely extremely weathered bedrock											
				D	2.5		pp >400						
585	3	Pit discontinued at 3.0m -limit of investigation											

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697470  
**NORTHING:** 6082122

**PIT No:** 14  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589	0.2	TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet to moist, w<PL, firm, TOPSOIL											
	0.45	Silty CLAY (CL/CI): low to medium plasticity, brown, with ironstone nodules to 12mm and iron staining, wet to moist, w>PL, firm then stiff, colluvium		D	0.3								
	0.8	CLAY (C): medium plasticity, yellow brown, with iron staining and ironstone nodules to 12mm, trace silt, moist, w<PL, very stiff, colluvium											
588	1	Silty CLAY (CI): medium plasticity, orange/grey brown, trace fine to medium grained sand, moist to dry, w<PL, hard, residual		D	1.2								
587	2												
	2.2	Clayey SAND (SC): fine to coarse grained, orange brown, low to medium plasticity clay, trace silt, dry to moist, apparently dense to very dense, likely extremely weathered rock		D	2.5								
586	3	Pit discontinued at 3.0m -limit of investigation											

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697433  
**NORTHING:** 6082137

**PIT No:** 15  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
589	0.2	<p>TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet, w&lt;PL, firm, TOPSOIL</p> <p>CLAY (C): medium plasticity, yellow brown, with silt and ironstone nodules to 12mm, trace iron staining, wet, w&gt;PL, stiff to firm, colluvium</p> <p>-from 0.45m, very stiff</p> <p>-from 0.6m, moist to dry, w&lt;PL, hard</p>										
588	0.9	<p>Silty CLAY (CI): medium plasticity, orange/grey brown, trace fine to medium grained sand, moist to dry, w&lt;PL, hard, residual</p> <p>-from 1.5m, trace gravel to 10mm</p>		D	1.8							
587	2.2	<p>CLAY (C): medium plasticity, grey mottled dark red, with silt, trace gravel to 5mm, moist to dry, w&lt;PL, hard, residual</p>		D	2.5							
586	2.7	TUFFACEOUS SANDSTONE: fine to coarse grained, pale grey, very low to low strength, highly weathered, highly fractured, with iron staining										
586	3.0	Pit discontinued at 3.0m -limit of investigation										

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 590 AHD  
**EASTING:** 697448  
**NORTHING:** 6082149

**PIT No:** 16  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
590		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet, w<PL, soft to firm, TOPSOIL											
	0.4	CLAY (CL/CI): low to medium plasticity, yellow brown, with silt, iron staining and ironstone nodules to 10mm, moist to wet, w>PL, stiff, colluvium		D	0.6								
	0.8	CLAY (CI): medium plasticity, brown, with silt, moist to dry, w<PL, hard		D	1.1								
589	1	Silty CLAY (CI): medium plasticity, orange/grey brown, trace fine to medium grained sand, moist to dry, w<PL, hard, residual											
	1.4	Silty CLAY (CI): medium plasticity, orange/grey brown, trace fine to medium grained sand, moist to dry, w<PL, hard, residual											
	1.9	Silty Sandy CLAY (CI): medium plasticity, grey mottled orange brown, fine to medium grained sand, moist to dry, w<PL, hard, residual		D	2.1		pp >400						
588	2	TUFFACEOUS SANDSTONE: fine to coarse grained, grey.brown, dry to moist, very low strength, highly weathered, highly fractured		D	2.4								
	2.3	TUFFACEOUS SANDSTONE: fine to coarse grained, grey.brown, dry to moist, very low strength, highly weathered, highly fractured											
	2.6	Pit discontinued at 2.6m -slow progress											
587	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 590 AHD  
**EASTING:** 697415  
**NORTHING:** 6082159

**PIT No:** 17  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)					
				Type	Depth	Sample	Results & Comments		5	10	15	20		
590		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, cobbles and boulders to 250mm, trace fine to medium grained sand and asphaltic gravel and cobbles, moist to dry, w<PL, very stiff, TOPSOIL												
	0.45	CLAY (C): medium plasticity, yellow/red brown, with silt, trace ironstone nodules to 10mm and iron staining, moist to dry, w<PL, hard, residual		D	0.6									
	0.8	CLAY (C): medium plasticity, red/grey, with silt, moist to dry, w<PL, hard, residual												
589	1													
	1.2	CLAY (CI/CH): medium to high plasticity, red/orange brown, with fine to coarse grained sand and silt, moist to dry, w<PL, hard, residual		D	1.4									
	1.8													
588	2	TUFFACEOUS SANDSTONE: fine to coarse grained, grey, dry to moist, very low to low strength, highly weathered, highly fractured												
	2.5	Pit discontinued at 2.5m -slow progress												
587	3													

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 591 AHD  
**EASTING:** 697429  
**NORTHING:** 6082170

**PIT No:** 18  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
591	0.0 - 0.4	TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet to moist, w<PL, firm, TOPSOIL -from 0.15m, stiff											
590	0.4 - 0.6	CLAY (CI): medium plasticity, yellow/red brown, with silt, trace fine to coarse grained sand, moist, w<PL, stiff, residual -from 0.45m, moist to dry, w<PL, hard		B	0.4								
	0.6 - 1.2												
	1.2 - 1.4	Sandy CLAY (CL/CI): low to medium plasticity, grey, fine to coarse grained sand, trace silt, moist to dry, w<PL, hard, extremely weathered tuffaceous sandstone		D	1.3								
	1.4 - 1.65	TUFFACEOUS SANDSTONE: fine to coarse grained, grey, dry to moist, low to medium strength, highly weathered, highly fractured -from 1.6m, medium strength, highly to moderately weathered, highly fractured to fractured Pit discontinued at 1.65m -slow progress		D	1.5								
589	2.0												
588	3.0												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	∇	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 590 AHD  
**EASTING:** 697407  
**NORTHING:** 6082148

**PIT No:** 19  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
590		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, wet, w<PL, firm, TOPSOIL											
	0.4	CLAY (CI): medium plasticity, yellow brown mottled orange, with silt, iron staining, ironstone nodules to 10mm and fine to coarse grained sand, moist to dry, w<PL, hard, residual		D	0.6								
	0.8	Silty CLAY (CI): medium plasticity, orange/grey brown, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual		D	1.0								
589	1	Clayey SAND (SC): fine to coarse grained, grey/red, low plasticity clay, trace silt, dry to moist, very dense, extremely weathered tuffaceous sandstone		D	1.6								
	1.7	TUFFACEOUS SANDSTONE: fine to coarse grained, grey, dry to moist, very low to low strength, highly weathered, highly fractured											
588	2	-from 2.0m, low to medium strength, highly to moderately weathered, highly fractured to fractured		D	2.0								
	2.2	Pit discontinued at 2.2m -slow progress											
587	3												

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)
		PL(A)	Point load axial test Is(50) (MPa)
		PID	Photo ionisation detector (ppm)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697402  
**NORTHING:** 6082120

**PIT No:** 20  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589		TOPSOIL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist to wet, w<PL, stiff, TOPSOIL											
	0.4	Gravelly CLAY (CL/CI): low to medium plasticity, brown, ironstone gravel to 10mm, with iron staining, trace silt, moist to wet, w>PL, stiff, colluvium		B	0.5								
	0.8	CLAY (CL/CI): low to medium plasticity, brown mottled red/yellow, with silt and fine to medium grained sand, moist to dry, w<PL, very stiff, colluvium			0.7								
588	1	CLAY (CL/CH): medium to high plasticity, yellow/grey brown, with silt, trace fine to coarse grained sand, moist, w<PL, very stiff, residual		D	1.2								
	1.4	CLAY (CI/CH): medium to high plasticity, yellow/grey brown, with silt, trace fine to coarse grained sand, moist, w<PL, very stiff, residual		D	1.5								
587	2												
	2.4	Sandy CLAY (CL/CI): low to medium plasticity, grey, fine to coarse grained sand, trace silt, moist to dry, w<PL, very stiff, residual											
	2.7	TUFFACEOUS SANDSTONE: fine to coarse grained, pale grey, very low to low strength, highly weathered, highly fractured, trace medium to high strength seams		D	2.8								
586	3	Pit discontinued at 3.0m -limit of investigation											

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	≧	Water seep
E	Environmental sample	≧	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697381  
**NORTHING:** 6082105

**PIT No:** 21  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589	0.05	FILL/GRAVEL (GP): gravel to 10mm, blue grey, loose to medium dense, FILL TOPSOIL/Clayey SILT (ML): low plasticity, grey brown, low plasticity clay, moist, w<PL, stiff, TOPSOIL											
	0.55	CLAY (CL/CI): low to medium plasticity, brown/orange brown, with ironstone nodules, trace silt and iron staining, moist, w<PL, very stiff, colluvium		D	0.7								
	0.8	CLAY (CI): medium plasticity, yellow/grey brown, with silt, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual		D	1.0								
588	1												
	1.3	CLAY (CI): medium plasticity, yellow/grey brown, with silt, moist to dry, w<PL, very stiff, residual		D	1.6		pp = 280-370						
	2												
587	2												
	2.5	Sandy CLAY (CL/CI): low to medium plasticity, grey, fine to coarse grained sand, trace silt, moist to dry, w<PL, very stiff, residual		D	2.7		pp = 210-250						
	2.8	RHYODACITE IGNIMBRITE: fine to coarse grained, grey, dry to moist, very low to low strength, highly weathered, highly fractured		D	2.9								
586	3	-from 2.9m, low strength, highly weathered, highly fractured Pit discontinued at 3.0m -limit of investigation											

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Forestrack Pty Ltd  
**PROJECT:** Proposed TRG Bushfire Response & Training Centre  
**LOCATION:** Block 45 Section 3, Hume

**SURFACE LEVEL:** 589 AHD  
**EASTING:** 697367  
**NORTHING:** 6082119

**PIT No:** 22  
**PROJECT No:** 103038.00  
**DATE:** 10/5/2021  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
589	0.3	TOPSOIL FILL/Clayey SILT (ML): low plasticity, brown, low plasticity clay, with rootlets, trace fine to medium grained sand, moist to wet, w<PL, firm, TOPSOIL FILL  -at 0.2m, 32mm conduit											
	0.8	Silty CLAY (CL/CI): low to medium plasticity, orange brown, moist to wet, w>PL, stiff, residual  -from 0.45m, moist to dry, w<PL, hard		D	0.6								
588	1.9	CLAY (CI/CH): medium to high plasticity, brown, with silt, trace fine to coarse grained sand, moist to dry, w<PL, hard, residual		D	1.2								
587	2.1	Sandy CLAY (CL/CI): low to medium plasticity, grey, fine to coarse grained sand, trace silt, moist to dry, w<PL, very stiff, residual											
	2.7	RHYODACITE IGNIMBRITE: fine to coarse grained, grey brown, dry to moist, very low to low strength, highly weathered, highly fractured		D	2.4								
586	3.0	Pit discontinued at 2.7m -slow progress											

**RIG:** CAT 304 CR mini excavator fitted with a 300mm wide bucket

**LOGGED:** ADFH

**SURVEY DATUM:** MGA94 Zone 55

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Surface levels and coordinates are approximate only and must not be relied upon

Sand Penetrometer AS1289.6.3.3  
 Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PLD	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

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## **Appendix D**

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Laboratory Test Report Sheets

# Material Test Report

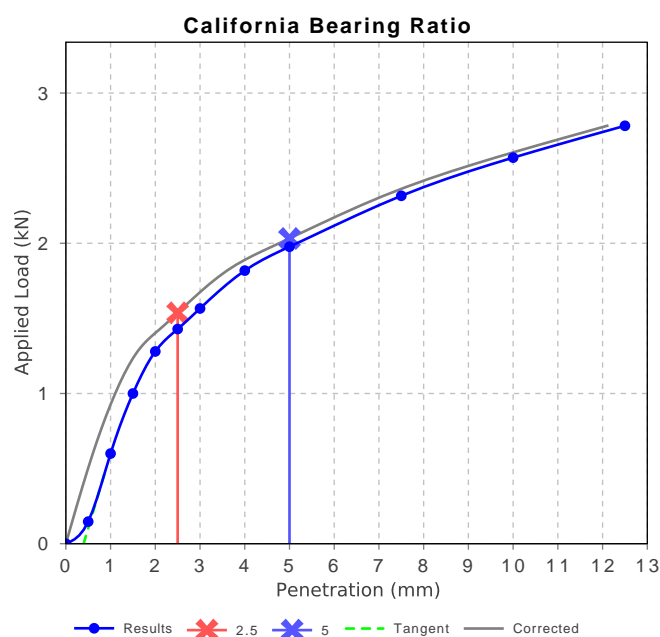
**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
 76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918A  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 31/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 2 , Depth: 0.5-0.7  
**Material:** Clay



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris  
 Assistant Laboratory Manager  
 Laboratory Accreditation Number: 828

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	12.0		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m <sup>3</sup> )	1.62		
Optimum Moisture Content (%)	22.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.5		
Dry Density after Soaking (t/m <sup>3</sup> )	1.61		
Field Moisture Content (%)	21.5		
Moisture Content at Placement (%)	22.3		
Moisture Content Top 30mm (%)	25.2		
Moisture Content Rest of Sample (%)	23.8		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	24.8		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		
<b>Moisture Content (AS 1289 2.1.1)</b>			
Moisture Content (%)		21.5	



# Material Test Report

**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918B  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 26/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 8 , Depth: 0.7  
**Material:** Silty Sandy Clay



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris

Assistant Laboratory Manager

Laboratory Accreditation Number: 828

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	56		
Plastic Limit (%)	29		
<b>Plasticity Index (%)</b>	<b>27</b>		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	13.5		
Cracking Crumbling Curling	Cracking		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	23.6

# Material Test Report

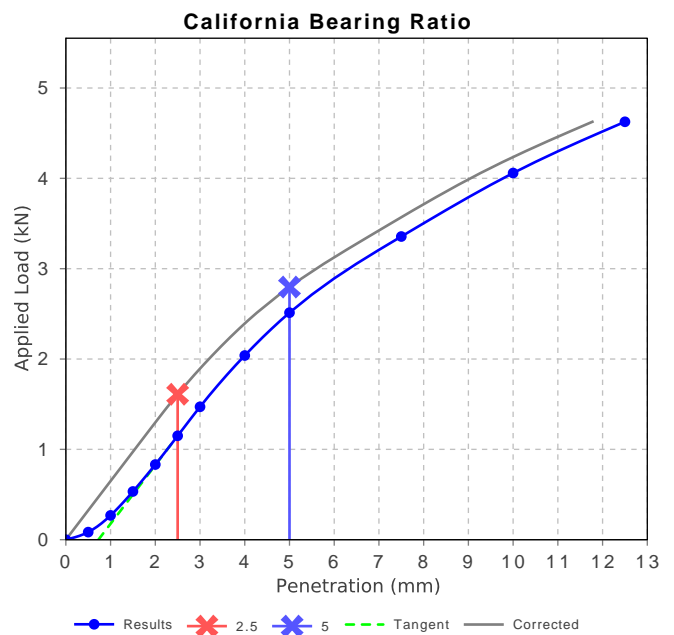
**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
 76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918C  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 31/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 11 , Depth: 0.4-0.6  
**Material:** Silty Sandy Clay



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris  
 Assistant Laboratory Manager  
 Laboratory Accreditation Number: 828

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	14.0		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m <sup>3</sup> )	1.93		
Optimum Moisture Content (%)	12.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	101.5		
Dry Density after Soaking (t/m <sup>3</sup> )	1.93		
Field Moisture Content (%)	9.9		
Moisture Content at Placement (%)	12.3		
Moisture Content Top 30mm (%)	14.3		
Moisture Content Rest of Sample (%)	13.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	72.2		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	7.8		
<b>Moisture Content (AS 1289 2.1.1)</b>			
Moisture Content (%)			9.9



# Material Test Report

**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
 76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918D  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 26/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 19 , Depth: 0.6  
**Material:** Clay



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris

Assistant Laboratory Manager

Laboratory Accreditation Number: 828

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	22		
<b>Plasticity Index (%)</b>	<b>28</b>		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	14.0		
Cracking Crumbling Curling	None		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	20.2

# Material Test Report

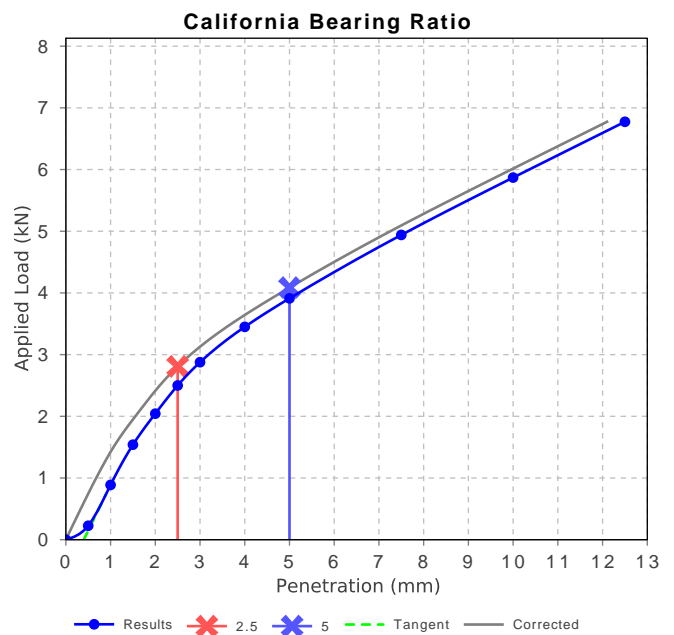
**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
 76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918E  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 31/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 20 , Depth: 0.5-0.7  
**Material:** Gravelly Clay



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Approved Signatory: Brachlan Harris  
 Assistant Laboratory Manager  
 Laboratory Accreditation Number: 828

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	<b>20.0</b>		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m <sup>3</sup> )	1.88		
Optimum Moisture Content (%)	14.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	99.5		
Dry Density after Soaking (t/m <sup>3</sup> )	1.88		
Field Moisture Content (%)	16.1		
Moisture Content at Placement (%)	14.1		
Moisture Content Top 30mm (%)	16.9		
Moisture Content Rest of Sample (%)	15.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	24.7		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		
<b>Moisture Content (AS 1289 2.1.1)</b>			
Moisture Content (%)		16.1	



# Material Test Report



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Approved Signatory: Brachlan Harris

Assistant Laboratory Manager

Laboratory Accreditation Number: 828

**Report Number:** 103038.00-1  
**Issue Number:** 1  
**Date Issued:** 01/06/2021  
**Client:** Forestrack Pty Ltd  
 76 Sheppard Street, Hume ACT 2620  
**Contact:** Bob Thompson  
**Project Number:** 103038.00  
**Project Name:** Proposed TRG Bushfire Response and Training Centre  
**Project Location:** Block 45 Section 3, Hume ACT  
**Work Request:** 5918  
**Sample Number:** GU-5918F  
**Date Sampled:** 10/05/2021  
**Dates Tested:** 13/05/2021 - 26/05/2021  
**Sampling Method:** Sampled by Engineering Department  
*The results apply to the sample as received*  
**Sample Location:** Pit 22 , Depth: 1.2  
**Material:** Clay

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	91		
Plastic Limit (%)	30		
<b>Plasticity Index (%)</b>	<b>61</b>		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	20.0		
Cracking Crumbling Curling	Curling		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	28.3