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Mango Property Services Pty Ltd

Preliminary Geotechnical Assessment

Preliminary Geotechnical Assessments
130 Great Alpine Rd., Hotham Heights

23 March 2018

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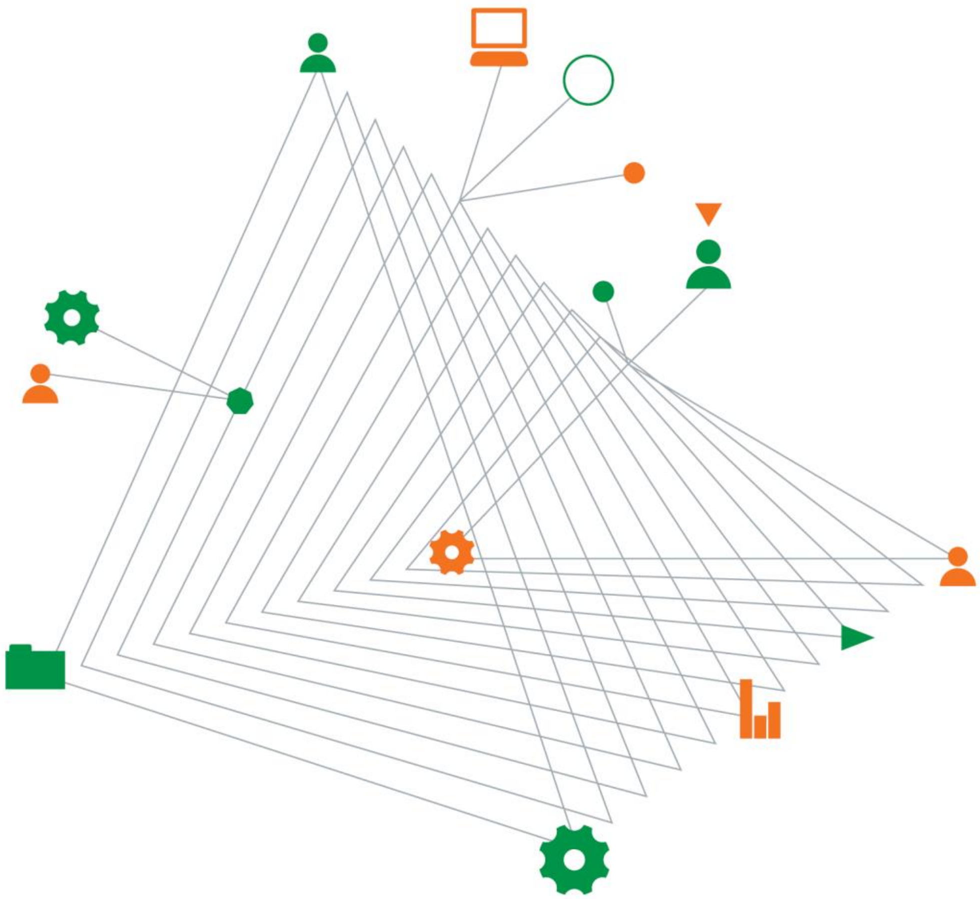

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Preliminary Geotechnical Assessment

Prepared for

Mango Property Services Pty Ltd
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23 March 2018

Document authorisation

Our ref: 754-MELGE213637-AB

We trust this report meets your current requirements for the project. If you have any queries related to this report, or require further assistance, please contact Farid Khayyer or the undersigned.

For and on behalf of Coffey

G. Manivannan

Ganesh Manivannan
Associate Geotechnical Engineer

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Quality information

Revision history

Revision	Description	Date	Author	Reviewer	Signatory
0	Preliminary Geotechnical Assessments	23 March 2018	F. Khayyer	E. Kaltenbach	G. Manivannan

Distribution

Report Status	No. of copies	Format	Distributed to	Date
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1. Introduction

This report presents the results of a preliminary geotechnical assessment (PGA) carried out by Coffey Services Australia Pty Ltd (Coffey) for the proposed residence at 130 Great Alpine Rd, Hotham Heights, VIC 3741. The investigation was commissioned by Mr Adrian Beer of Mango Property Services Pty Ltd (MPS) on 3 March 2018 and was performed in general accordance with Coffey proposal 754-MELGEP213637 Rev1 dated 9 February 2018.

The objectives of the Preliminary Geotechnical Assessment (PGA) were to evaluate the subsurface conditions at the site relevant to the proposed development and to provide geotechnical recommendations. A risk assessment of the potential landslide hazards was also carried out as per Schedule 1 of the Erosion Management Overlay in the Alpine Planning Scheme (2004), Victoria.

2. Scope of work

The scope of work carried out to meet the above objectives included:

- A review of regional geology;
- A review of SMEC report “Alpine Resorts Geotechnical Stability Review – Mt Hotham”, dated 1999;
- A review of previous geotechnical investigation reports for nearby sites;
- A site surface observation and geological assessment by an engineering geologist;
- Assessment of subsurface and groundwater conditions;
- Assessment of slope instability, potential landslide hazards and landslide risk assessments;
- Geotechnical recommendations for earthworks; and
- Analysis of foundation bearing pressures.

It is understood that the existing building is being extended to include a basement garage and an expanded first floor with added mezzanine. It is proposed that the new extension will be supported independently over the existing structure. This is planned, internally, through steel columns to concrete footings below the existing building and externally with new steel framework form the garage structure and external works. The final plan area of the dwelling is about 19m by 12m, and may involve excavation of up to 1.5m.

Two test pits have been excavated within or as close as possible to the footprint of the proposed dwelling (a sketch showing the design layout provided by MPS) to assist with the probable depth to rock and a geotechnical cross section of the site. Engineering logs of the test pits are presented in Appendix A together with explanation sheets which outline the terms and symbols used in the preparation of the logs. The investigation locations plan is shown in Figure 1. The result of the mapping is presented in Figure 2. The site geotechnical observations and cross section are shown in Figure 3 and Figure 4. Photographs of the site are presented on Figure 5.

Landslide risk management and a completed Form 1 to the “Erosion Management Overlay – Schedule 1 Management of Geotechnical Hazard” are presented in Appendices B and C.

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3. Previous geotechnical assessments

3.1. SMEC assessment (1999)

SMEC completed a stability review and hazard assessment of the ski lodge sites along Davenport Dr and Alpine Rd in 1999. A summary of the assessment for this site is shown in Table 1. The assessed hazard rating for a shallow landslide, cut excavation and fill embankment ranged from 'Low' to 'Very Low'. There was no rock fall hazard at the site.

Table 1. Assessed hazard ratings by SMEC

Type of Slope Failure	Assessed Hazard Rating
Natural Shallow Landslide	Very low
Rock fall	Not applicable
Cut Excavation	Low
Fill Embankment	Low

3.2. Coffey Assessments (2007 to 2016)

Coffey has previously undertaken preliminary geotechnical assessments for nearby residential dwellings at 2, 13, 18 and 19 Higgi Drive, Mt Hotham Ski Company and Mt Hotham ARMB. Providing that the geotechnical recommendations adopted during the design and construction, the assessed hazard rating for the identified hazards ranged from 'Low' to 'Very Low'.

4. Field Investigation

The geotechnical investigation was carried out as follows:

- A site walkover by an Associate Geologist from Coffey on 21 January 2018; and
- A geotechnical investigation carried out on 5 and 6 February 2018 comprising excavation of 2 test pits with a target depth of 3.0m or prior effective penetration refusal.

The investigation locations are referenced as TP01 and TP02. The site boundary, investigation locations, and existing features are shown in Figure 1.

One of the test pits was located as close as possible to the proposed dwelling with the other positioned within the dwelling footprint. The investigation locations were designated based on the excavator accessibility as well as the underground services location.

The test pits were excavated using a Backhoe 432F supplied and operated by Resort Management Board (RMB) equipment. On completion of the fieldwork, the test pits were backfilled in 0.1 m layers and compacted with the excavator bucket and tracks. Excess spoil was heaped on top to allow for future settlement.

The fieldwork was carried out in the presence of a geotechnical engineer from Coffey who located the test pits, nominated sampling and prepared engineering logs.

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The engineering test pit logs are presented in Appendix A, together with Coffey explanation sheets which describe the terms and symbols used in their preparation. Photographs of the test pits have been presented at the bottom of the log sheets.

5. Results of field investigation

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5.1. Surface conditions

The observations made during the site walkover are summarized below:

- Sloping block;
- The existing building is a two-storey lodge constructed with timber shingles on exterior, stone wall between walls and foundations;
- Meta-siltstone outcropping at surface;
- Vegetation is grass, small shrubs, mature snow gums;
- Cut to Alpine Rd faced with basalt boulders (riprap revetment), approx. 4m high; and
- An access track exists between the crest of the cut to the Alpine Rd and the actual site.

5.2. Regional Geology

Based on the published geological map (DEDJTR 50k Geology, 2014) and previous work we have conducted at Mt Hotham, the ground condition is expected to comprise a variable depth of residual soil overlaying weathered sandstone/siltstone (Pinnak Sandstone) as described below.

- Sandstone: dark to pale grey, brown and green colours; very thick to thin-bedded.
- Siltstone: dark grey to green and brown, well-bedded, with smooth regular banding.

5.3. Subsurface conditions

The natural subsurface conditions encountered in TP01 and TP02 are consistent with the published geology.

Details of the materials encountered in the test pits are described in the engineering logs presented in Appendix A. Site specific subsurface conditions are summarized in Table 2 and Table 3. A site plan and geological section are presented in Figure 3 and Figure 4.

Table 2. Summary of the subsurface conditions

Test Pit Number	Excavated Depth (m)	Refusal on Extremely Weathered Rock	Topsoil / Fill Thickness (m)	Colluvial Soil Thickness (m)	Residual Soil Thickness (m)	Extremely Weathered Rock Thickness (m)	Cobbles and Boulders
TP01	0.4	Y	0.1	0.25	0.05	N/A	Y
TP02	0.1	Y	0.05	-	0.05	N/A	Y

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5.4. Groundwater

In general, the site appears to be naturally well-drained with surface runoff discharging to the north.

No groundwater was observed in the test pits during the time of the investigation. A local perched groundwater table may be present at other times and fluctuations in their levels and seepage could occur due to rainfall, melting of snow and other factors.

5.5. Observations of slope instability

In general, the site is underlain by transported/residual soil (up to about 0.4m thick) which is in turn underlain by weathered rock. The slope is slightly steep and convex-linear.

No evidence indicative of deep seated slope instability was observed within the site at the time of our field assessment. Site specific steepness and instability issues are provided in Table 3.

Table 3. Site Information

Surface Conditions	Subsurface Conditions	Earthworks and Surrounding Area
Slope Angle: 5-12 deg to north-west Slope Shape: Slightly steep to gently undulating, slightly convex Vegetation: Grass, small shrubs, mature snow gums. Features: Siltstone outcrops, the existing building is a two-storey lodge constructed with timber shingles on exterior, stone wall between walls and foundations, cut to Alpine Rd faced with basalt boulders (riprap) Surface Water Drainage: Natural drainage line toward north Groundwater: N/A Instability: No evidence of instability	Depth to Rock (Depth of Soil): 0.1-0.4m (Figure 3 and Figure 4) Slope of Rock Face: Approx. 5-10 deg Rock Type: Sandstone/siltstone Rock substance strength: medium Rock structure: Closely spaced joint structure/laminations Soil Type: Silty clay/clayey sand	Fill height: N/A Fill slope: N/A Cut height: N/A Cut Slope: N/A Evidence of instability: No Surrounding area: N/A

6. Landslide risk assessment

6.1. Risk assessment procedure

In accordance with Schedule 1 of Erosion Management Overlay in the Victorian Alpine Planning Scheme (2004), the slope risks associated with development of the site have been considered in the context of the “Landslide Risk Management”, published in the Australian Geomechanics Society publication, dated March 2007 (AGS Guidelines). The system is based on identification of likelihood of occurrence, its consequences to the structure and human life for the identified hazards. These

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assessments are then combined using a risk assessment matrix to obtain a risk assessment for the specific site for each hazard.

6.2. Principles of risk assessment

Risk assessment and management principles applied to slopes can be interpreted as answering the following questions:

- What are the issues? (SCOPE DEFINITION).
- What might happen? (HAZARD IDENTIFICATION).
- How likely is it? (LIKELIHOOD).
- What damage or injury might result? (CONSEQUENCE).
- How important is it? (RISK EVALUATION).
- What can be done? (RISK TREATMENT).

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The risk is the combination of the likelihood, the consequences and the exposure to the identified hazard. All these factors are taken into account when evaluating a risk and deciding whether treatment is required. In the following sections of the report we have assessed the risks to properties and life using a qualitative approach as per the recommendations of the AGS Guidelines (2007).

The qualitative likelihood, consequence and risk terms used in this report for risk to property are explained in Appendix B. A matrix that brings together different combinations of likelihood and consequence defines the risk terms. Risk matrices help communicate the results of risk assessment, rank risks, set priorities and develop transparent approaches to decision making. The risk assessment of the sites with regard to the proposed new buildings is presented in Table 4.

6.3. Potential slope hazards

Based on the site observations, the results of our field testing and the available drawings of the proposed development (sketch design provided by MPS), the following potential slope hazards have been identified at the site:

- Scenario 1: Failure of the adjacent building footings during the excavation for the proposed new dwelling;
- Scenario 2: Failure of the existing building footings;
- Scenario 3: Failure of the proposed building footings; and
- Scenario 4: Failure of slope cut faced to Great Alpine Rd (supported by riprap revetment).

6.4. Risk to property

In Table 4, a list of our judgements of the likelihood, consequences and risk to property associated with the potential slope hazards in the site are presented. The assessments in Table 4 are judgements based on our understanding of the landslide hazard in the study area and our knowledge and experience. The assessment applies to the proposed developments and should there be any changes, the risk assessment presented in this report may change.

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Table 4. Summary of slope instability and landslide risk assessments (risk to properties)

Scenario No	Possible Initiating Circumstances	Likelihood (1)	Consequence	Risk	Revised Risk (2)
1	Loss of bearing capacity due to proximity of proposed footing excavation to existing footings.	Rare	Major	Low	Low
	Unsupported steep slope and saturation of materials	Unlikely	Major	Moderate	Low
2	Poor construction practices (additional loading during construction) / high groundwater	Rare Unlikely	Medium Medium	Low Moderate	Low Low
3	Poor construction practices / high groundwater	Rare Unlikely	Medium Medium	Low Moderate	Low Low
4	Deep landslide due to the construction loading/high groundwater	Rare	Medium	Low	Low

Notes:

(1) – Refer Appendix B for definitions of likelihood, consequence and risk terms.

(2) – Revised risk assessment if recommendations provided in Section 7 are incorporated into the design and construction for the works.

The results of the risk assessment indicate that there is a 'Low' to 'Moderate' risk classification if poor construction practices are used during excavation and construction of the proposed development which is consistent with risk level shown on available hazard maps for Mt. Hotham (Figure 2). If the geotechnical recommendations provided in Section 7 of this report are adopted the potential instability risk hazard would be reduced to 'Low'.

6.5. Risk of loss of life

The AGS Guideline recommends that the risk to life should be considered when assessing landslide risk. The landslide record from Australia and elsewhere indicates that most deaths and injuries are associated with fast moving landslides and associated high speed moving objects when there is insufficient warning for people present to take evasive action. People are most vulnerable if buried in open space, trapped in vehicles that are buried and crushed or in a building that collapses or is inundated with debris.

The landslide hazard Scenario 1, described in Table 4, represents instabilities that could occur from unsupported temporary cut batters during the excavation and construction of the proposed footings. Such instabilities could cause serious injury or deaths, depending on several factors (e.g. time of day, speed and size of instability, where people are working at the time of failure, how failure interacts with structures etc.). We strongly recommend appropriate construction practices, such as those described in Section 7, are adopted to reduce the risk of such events from occurring. Provided such practices are adopted, we assess that the risk to life is not credible.

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The landslide hazard Scenarios 2, 3 and 4, described in Table 4, represent potential instabilities, mainly after the construction period. We recommend the geotechnical recommendations in this report should be incorporated into the design of the project and the founding conditions should be assessed by a suitably experienced individual during the construction to confirm that the proposed structures are founded within competent materials. Provided these recommendations are incorporated into the design and construction of the development, we assess that the risk to life is not credible.

7. Geotechnical Assessment

The proposed building development should be carried out in accordance with sound engineering principles and good hillside practice (refer Appendix B). Geotechnical recommendations for the proposed developments are provided in the following sections.

7.1. Earthworks

7.1.1. Excavation conditions

Based on the subsurface conditions encountered within the test pits, the previous assessment and the site review, the materials to be excavated would comprise layers of fill, topsoil and weathered rock.

We assess that excavation of the fill and natural soils should be able to be carried out using backhoes or tracked excavators.

Our test pits were terminated in medium strength rock. It is possible that higher strength rock could exist at greater depth (towards founding levels) and thus we consider it prudent if during excavation there is equipment available for ripping and/or rock breaking as required.

7.1.2. Batter Slopes

The recommended temporary and permanent batter slopes for unsupported cuts of up to 3m depth in the various materials are provided in Table 5. It is recommended that no surcharge loadings be placed or located from the crest of a batter cut within a distance of 2m and that surface water should be diverted away from the crests of batter slopes.

Table 5. Recommended batter slopes

Description of Material	Temporary Batter Slope	Permanent Batter Slopes
Topsoil / new/existing fill / natural soils	1(V):1(H)	1(V):2(H)
Highly or less weathered/better rock	2(V):1(H)	1(V):1.5(H)

Notwithstanding the above recommended batter slopes, there may be unfavourably oriented joints or other defects leading to potential local sliding or toppling instability of blocks or wedges of rock. Rock so affected may require stabilising measures such as laying back of the slope, rock bolting and/or temporary meshing or similar stabilising works. Accordingly, it is recommended that the unsupported batters should be viewed by Coffey during excavation to assess the requirements for stabilising measures.

Steeper slopes than recommended in Table 5 may be possible for the less weathered rock, but would require a site specific assessment by an experienced geotechnical engineer or engineering geologist during excavation.

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7.1.3. Reuse of excavated in situ soils

Should filling be required to prepare the building platforms at the site. The following comments are provided for the reuse of excavated materials for engineered or landscape fill, if required:

- Uncontrolled material which contains, rootlets, large boulders and fragments of steel, plastic and glass is not considered suitable for reuse and should be removed from site;
- Natural soils are assessed as suitable for reuse in engineered fill; and
- Extremely weathered or fresher sandstone/siltstone is considered likely to be suitable for reuse as engineered fill provided particles larger than 75mm in size are broken down or excluded.

7.1.4. Fill construction procedure

New fill should be placed and compacted to an engineering specification in general accordance with the recommendations outlined in AS3798-2007 *"Guidelines on Earthworks for Commercial and Residential Developments"*. The following procedure is recommended as a guide for site preparation and the placement of controlled fill:

- Remove existing fill, vegetation, root affected or other potentially deleterious material from the proposed fill area;
- The exposed natural/residual soils should then be scarified to a depth of about 150mm, moisture conditioned to within ±2% of standard optimum moisture content (SOMC) and then re-compacted to a minimum dry density ratio of 98% (standard compaction) in accordance with AS1289 5.1.1, 5.4.1 or 5.7.1;
- Soft or weak areas identified during the compaction process that do not respond to further compaction should be removed and replaced with suitable site materials in layers not exceeding 250mm thickness and should be compacted to the above criteria; and
- Subsequent layers of fill should be placed in uniform 250mm thick layers, moisture conditioned and compacted to the above criteria.

Earthworks should be carried out during dry weather conditions. Provision should be made for effective diversion of surface water from outside the site. The runoff from the site should be treated to remove excess sediments before discharge.

7.1.5. Groundwater, surface water and erosion considerations

We assess that the groundwater table is likely to be below the proposed excavation level and no significant dewatering would be required during the excavation for foundations. However, we recommend that normal provision should be made for sumps and pumps to control surface and groundwater seepage that may occur from wet weather and melting of snow. Such seepages should be collected and diverted away from the site.

Erosion control is important in Alpine areas. Stripping of near-surface material should only be made where necessary during site preparation. Where it is necessary to remove vegetation but not the existing soil, the vegetation should be cut or slashed to allow the root structure to remain to assist in limiting erosion. Any exposed soil should be protected from erosion during and post construction.

7.2. Footings

It is recommended that the footings be founded in the highly or less weathered rock and proportioned using an allowable bearing capacity of 500kPa. Should footings be founded in the natural soils/extremely weathered rock they may be proportioned using an allowable bearing capacity of 125kPa. It is recommended that footings are not founded in uncontrolled fill or soft/firm natural soil.

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The footings should be founded at an adequate depth below finished ground level to provide lateral stability. Footings located on steep slopes and founded within the rock should be keyed into the rock to a depth of at least 300mm. On or adjacent to steep slopes, shallow footings are not recommended within the soils.

Shallow footings proportioned in accordance with the above recommendations are assessed to have load induced settlements of no greater than 0.5% of the width of the footing.

Excavated foundation pads and strips should be assessed by a suitably experienced geotechnical engineer or engineering geologist prior to the concreting.

7.3. Site classification

The natural soil at the site comprises medium plasticity clay. Characteristic surface movements similar to those of a **Class S** site should be expected on this site. If engineered clay fill is to be placed to depths greater than 0.4m or the site excavated by more than 0.5m, the characteristic surface movements and site classification should be re-assessed.

It should be noted that the site classification in accordance with AS2870-2011 is applicable for residential buildings or buildings that have a similar construction method and loading. The above classification is presented as a guide only and the designer should assess the applicability of the above site classification to the proposed building.

8. Applicability

Recommendations and opinions contained in this report are based on the interpretation of subsurface conditions from a limited number of field tests at point locations and information from published geological maps. The nature and continuity of the subsoil away from the test locations are inferred, but it must be appreciated that actual conditions could vary from the assumed geotechnical model. If conditions other than those described are encountered, Coffey should be engaged to assess whether the recommendations should be revised.

The attached *"Important Information about your Coffey Report"* provides additional information in the uses and limitations of this report.

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Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

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Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

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revision	description	drawn	approved	date

Test Pit Location

.... **Site Boundary**

drawn	FK
approved	N.A.
date	22/03/18
scale	NTS
original size	A3

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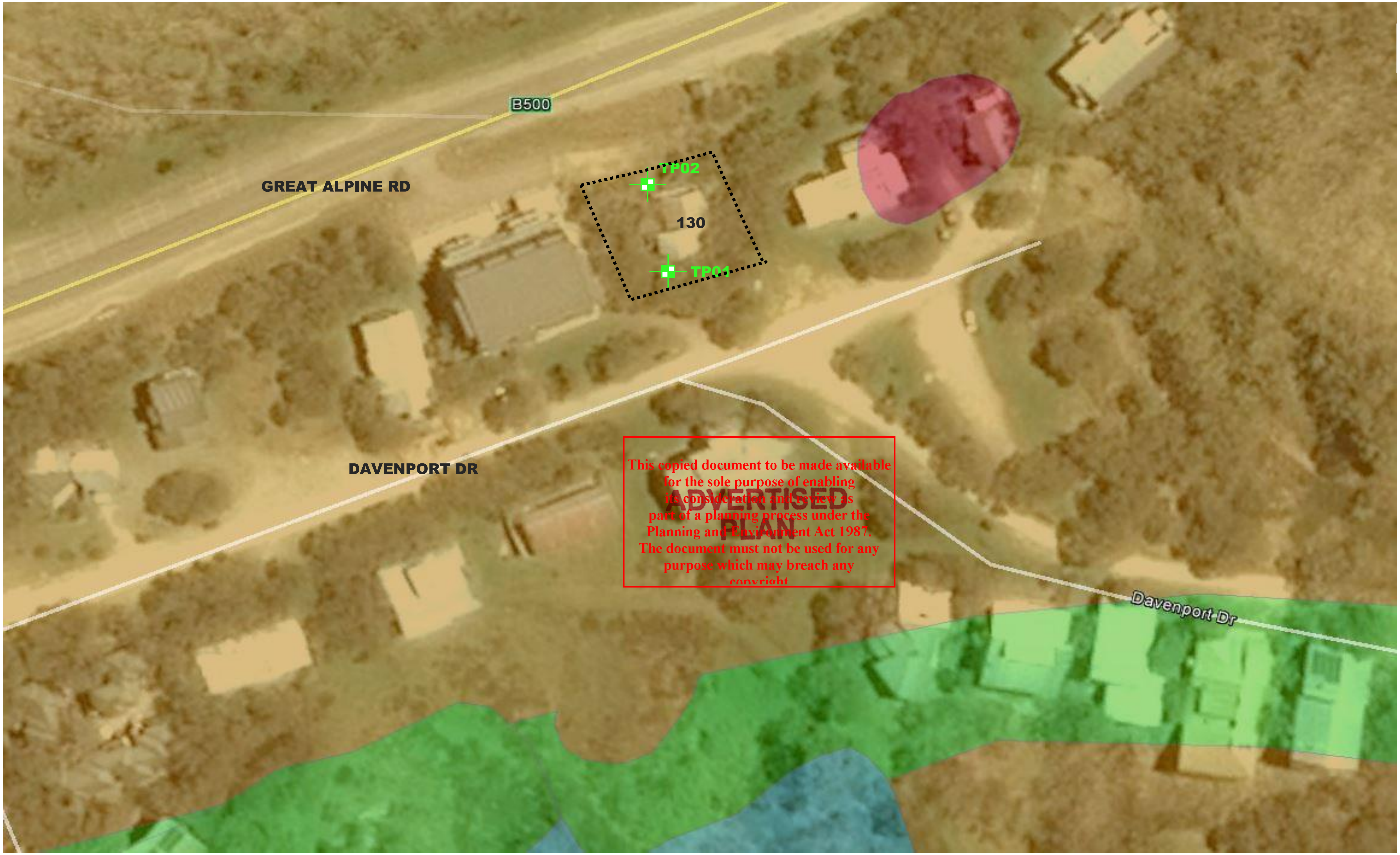
client:	MANGO PROPERTY SERVICES
project:	130 GREAT ALPINE RD PRELIMINARY GEOTECHNICAL ASSESSMENT
title:	INVESTIGATION LOCATIONS PLAN
project no: 754-MELGE213637	figure no: FIGURE 1



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revision	description	drawn	approved	date

Test Pit Location

Landslide Hazard Zoning

- **Very High**
- **High**
- **Medium**
- **Low**

drawn	FK
approved	N.A.
date	22/03/18
scale	NTS
original size	A3

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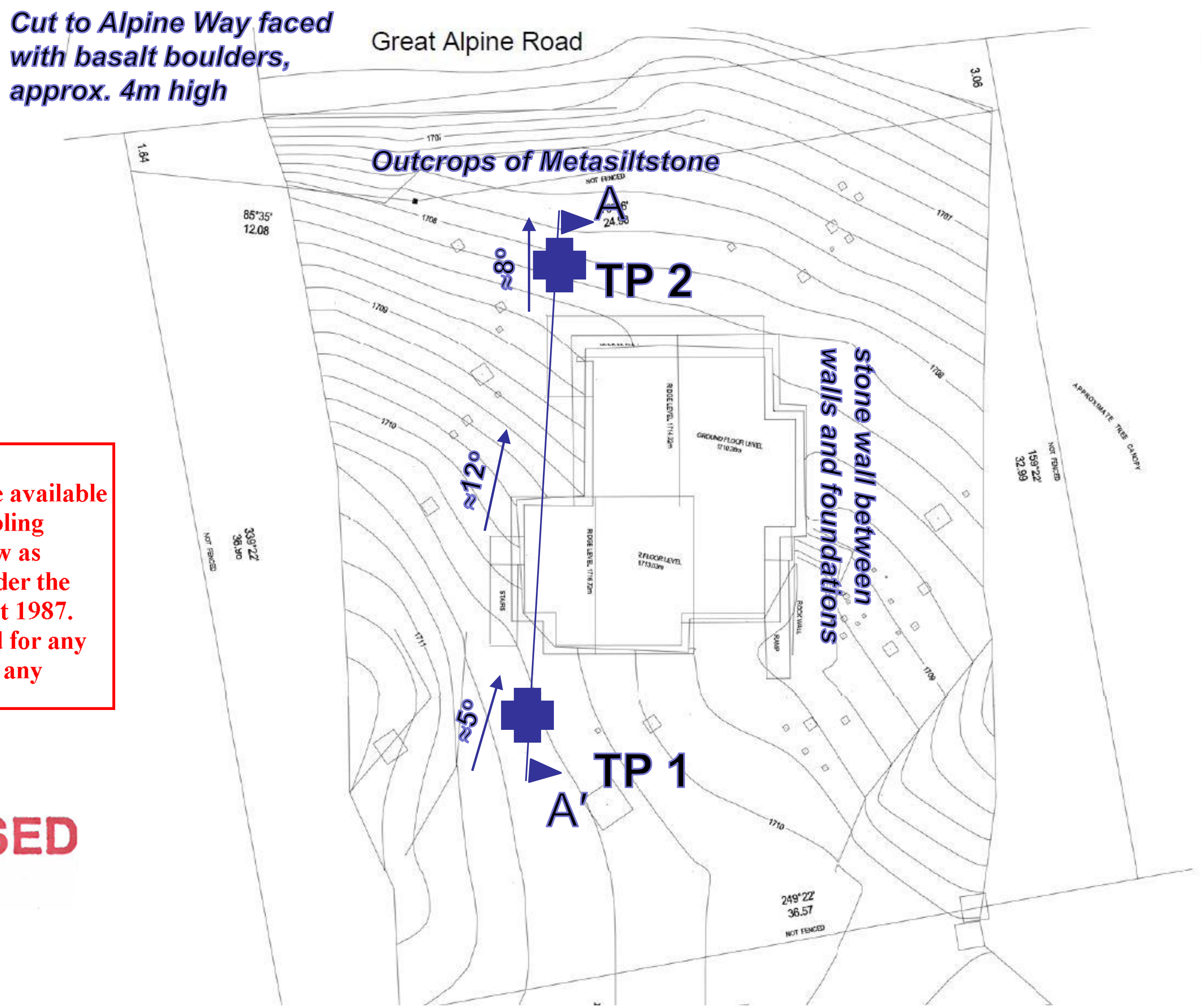
client:	MANGO PROPERTY SERVICES
project:	130 GREAT ALPINE RD PRELIMINARY GEOTECHNICAL ASSESSMENT
title:	LANDSLIDE HAZARD MAP
project no: 754-MELGE213637	figure no: FIGURE 2



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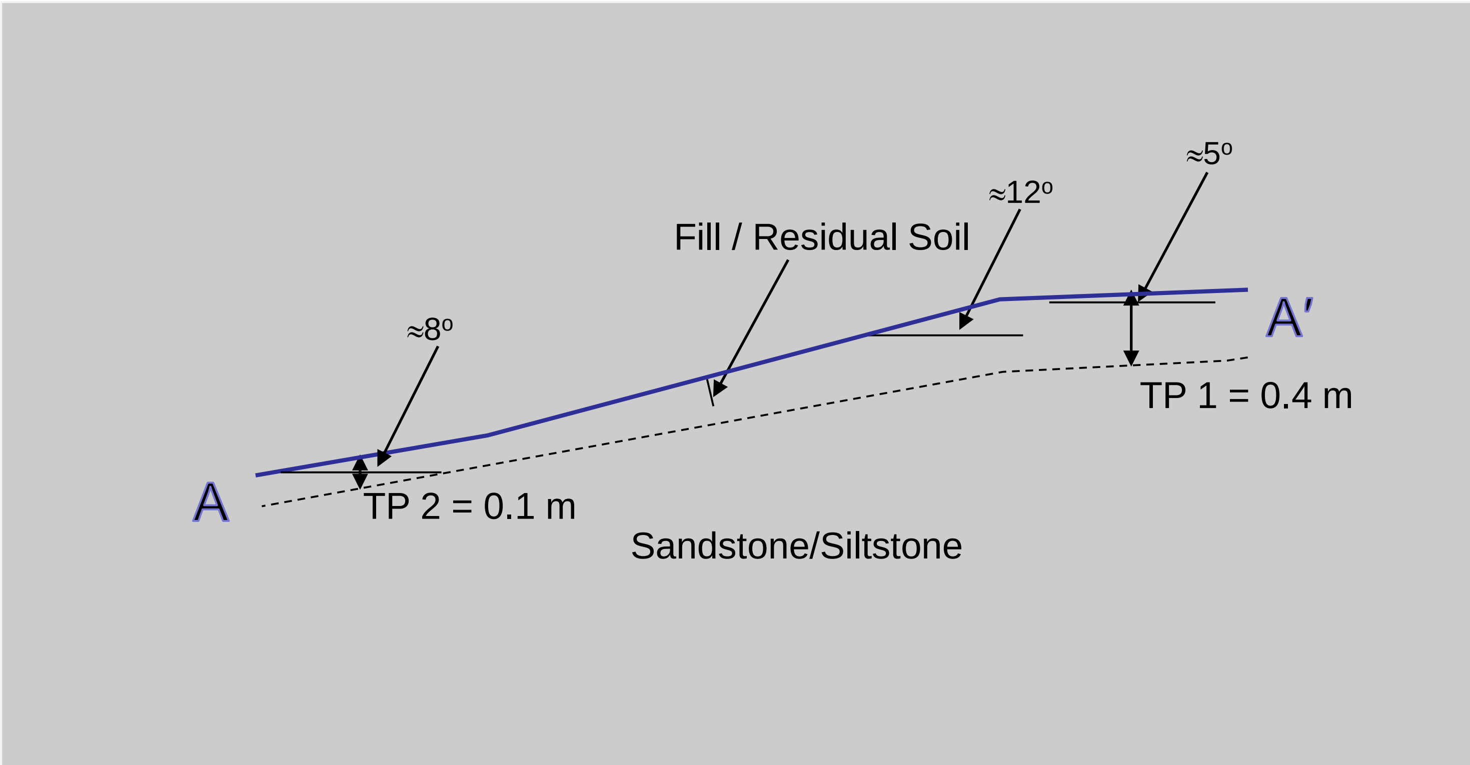
LEGEND

- Test Pit
- 10° → Slope angle

drawn	FK	coffey A TETRA TECH COMPANY	client:	MANGO PROPERTY SERVICES
approved	PL		project:	130 GREAT ALPINE RD
date	22/3/2018			
scale	NTS		title:	GEOTECHNICAL OBSERVATIONS
original size	A4		project no: 754-MELGE213637	FIGURE 3



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drawn	FK	coffey A TETRA TECH COMPANY	client:	MANGO PROPERTY SERVICES
approved	PL		project:	130 GREAT ALPINE RD
date	22/3/2018			
scale	NTS		title:	SECTION A–A'
original size	A4		project no: 754-MELGE213637	FIGURE 4

PHOTOGRAPH 1 - SITE LOOKING NORTH

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PHOTOGRAPH 2 - SITE LOOKING SOUTH-WEST

drawn	FK	coffey A TETRA TECH COMPANY	client:	MANGO PROPERTY SERVICES
approved	N/A		project:	130 GREAT ALPINE RD
date	22/3/2018			
scale	NTS		title:	PHOTOGRAPHS
original size	A4		project no: 754-MELGE213637	figure no: FIGURE 5

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Appendix A – Engineering Logs / Test Pit and Photographs

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Soil Description Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 µm to 2.36 mm
	medium	200 µm to 600 µm
	fine	75 µm to 200 µm

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lenticular shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible.
Residual soil	Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope by gravity).
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.

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Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)				USC	PRIMARY NAME
COARSE GRAINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	GRAVEL
			Predominantly one size or a range of sizes with more intermediate sizes missing.	GP	GRAVEL
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	GM	SILTY GRAVEL
			Plastic fines (for identification procedures see CL below)	GC	CLAYEY GRAVEL
	SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes	SW	SAND
			Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	SAND
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	SM	SILTY SAND
			Plastic fines (for identification procedures see CL below).	SC	CLAYEY SAND

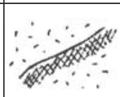
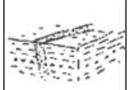
(A 0.075 mm particle is about the smallest particle visible to the naked eye)

		IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.				
		DRY STRENGTH	**DILATANCY**	**TOUGHNESS**	**USC**	**PRIMARY NAME**
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	SILTS & CLAYS Liquid limit less than 50	None to Low	Quick to slow	None	ML	SILT
		Medium to High	None	Medium	CL	CLAY
		Low to medium	Slow to very slow	Low	OL	ORGANIC SILT
	SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low to medium	MH	SILT
		High	None	High	CH	CLAY
		Medium to High	None	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS		Readily identified by colour, odour, spongy feel and frequently by fibrous texture.			Pt	PEAT

• Low plasticity – Liquid Limit w_L less than 35%. • Medium plasticity – w_L between 35% and 50%. • High plasticity – w_L greater than 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length.	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	DEFINITION	DIAGRAM
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	

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Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Rock Substance In engineering terms roch substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.

Defect Discontinuity or break in the continuity of a substance or substances.

Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME Simple rock names are used rather than precise geological classification.

PARTICLE SIZE Grain size terms for sandstone are:

Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm

FABRIC Terms for layering of penetrative fabric (eg. bedding, cleavage etc.) are:

Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on properties.
Distinct	Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	**RS**	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered Material	**XW**	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric still visible.
Highly Weathered Rock	**HW**	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of minerals in pores.
Moderately Weathered Rock	**MW**	The whole of the rock substance is discoloured, usually by iron staining or bleaching , to the extent that the colour of the fresh rock is no longer recognisable.
Slightly Weathered Rock	**SW**	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Fresh Rock	**FR**	Rock substance unaffected by weathering.

Notes on Weathering:

1. AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction. DW may be used with the definition given in AS1726.
2. Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, $I_{s(50)}$ (MPa)	Field Guide
Very Low	**VL**	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30mm thick can be broken by finger pressure.
Low	**L**	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	**M**	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	**H**	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	**VH**	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
Extremely High	**EH**	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

Notes on Rock Substance Strength:

1. In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
2. The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
3. The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index $I_{s(50)}$. The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

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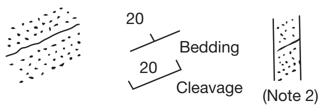
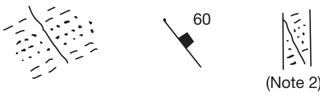
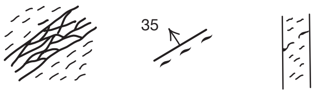
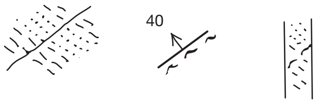
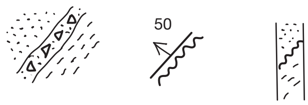
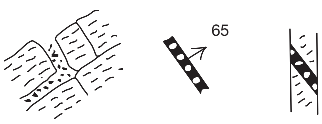
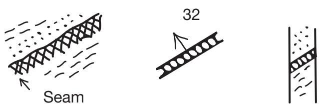
Rock Description Explanation Sheet (2 of 2)

COMMON DEFECTS IN ROCK MASSES

Term	Definition	Diagram / Map Symbol / Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.	
Joint	A surface or crack across which the rock has little or no tensile strength. but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.	
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.	
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.	
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.	
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.	
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in place.	

DEFECT SHAPE — TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

ROUGHNESS TERMS

Slickensided	Grooved or striated surface, usually polished
Polished	Shiny smooth surface
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.

COATING TERMS

Clean	No visible coating
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.

BLOCK SHAPE TERMS

Blocky	Approximately equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greate than cross section

Notes on Defects:

1. Usually borehole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

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Engineering Log - Excavation

Excavation ID.	***TP01***
sheet:	1 of 1
project no.	***754-MELGE213637***
client:	***Adrian Beer***
principal:	
project:	***130 Great Alpine Road***
location:	***Mouth Hotham***
date excavated:	***05 Feb 2018***
date completed:	***05 Feb 2018***
logged by:	***FK***
checked by:	***PL***

position: E: 513699; N: 5905832 (WGS84)
surface elevation: Not Specified
pit orientation: N-S
equipment type: 432F Backhoe
excavation method: Backhoe
excavation dimensions: 1.2 m long 0.7 m wide

excavation information | **material substance**

method	support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
BH	N		Not Observable					CL	**TOPSOIL: Silty CLAY**: medium plasticity, dark brown, trace fine to medium grained sand (loam).	M	VS		**TOPSOIL** Rootlets
								CL	**Silty CLAY**: medium plasticity, dark brown, trace fine to medium grained sand, trace fine to coarse grained sub-angular to angular gravel.		VS / S		**COLLUVIAL SOIL** Rootlets HP 40 kPa
									CLAYEY SAND: fine to coarse grained, pale grey, mottled orange, with fine to coarse grained angular gravel.		St / VSt		**RESIDUAL SOIL** HP 120 kPa
						0.5			Test pit TP01 terminated at 0.4 m Refusal Refusal on Rock				
						1.0							
						1.5							

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image

TP01

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
N none
S shoring

penetration
1 2 3
no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
U## undisturbed sample ##mm diameter
D disturbed sample
B bulk disturbed sample
E environmental sample
HP hand penetrometer (kPa)
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
VS vane shearpeak/remouded (uncorrected kPa)
R refusal

classification symbol & soil description
based on Unified Classification System

moisture
D dry
M moist
W wet
W_P plastic limit
W_L liquid limit

consistency / relative density
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

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Engineering Log - Excavation

Excavation ID.	**TP02**
sheet:	1 of 1
project no.	**754-MELGE213637**
client:	**Adrian Beer**
principal:	
project:	**130 Great Alpine Road**
location:	**Mouth Hotham**
date excavated:	**05 Feb 2018**
date completed:	**05 Feb 2018**
logged by:	**FK**
checked by:	**PL**

position: E: 513695; N: 5905854 (WGS84) | surface elevation: Not Specified | pit orientation: N-S
equipment type: 432F Backhoe | excavation method: Backhoe | excavation dimensions: 1.1 m long 0.7 m wide

excavation information / **material substance**

method	support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
BH	N		Not Observable	D				CL	**TOPSOIL: Silty CLAY**: medium plasticity, dark brown, with fine to medium grained sand (loam).	M	VS		**TOPSOIL** rootlets
									CLAYEY SAND: fine to coarse grained, pale grey, mottled orange, with fine to coarse grained angular gravel.				**RESIDUAL SOIL** rootlets
									Test pit TP02 terminated at 0.1 m Refusal Refusal on Rock				HP 50 kPa; HP 150 kPa; HP 300 kPa; HP >500 kPa
						0.5							
						1.0							
						1.5							

image

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TP02

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- N none
- S shoring

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- U## undisturbed sample ##mm diameter
- D disturbed sample
- B bulk disturbed sample
- E environmental sample
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shearpeak/remouded (uncorrected kPa)
- R refusal

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- W_P plastic limit
- W_L liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

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Appendix B – Landslide Risk Management

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APPENDIX C: LANDSLIDE RISK ASSESSMENT

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

QUALITATIVE MEASURES OF LIKELIHOOD

Approximate Annual Probability		Implied Indicative Landslide Recurrence Interval		Description	Descriptor	Level
Indicative Value	Notional Boundary					
10^{-1}	$5x10^{-2}$	10 years	20 years	The event is expected to occur over the design life.	ALMOST CERTAIN	A
10^{-2}		100 years	200 years	The event will probably occur under adverse conditions over the design life.	LIKELY	B
10^{-3}	$5x10^{-3}$	1000 years	2000 years	The event could occur under adverse conditions over the design life.	POSSIBLE	C
10^{-4}	$5x10^{-4}$	10,000 years	20,000 years	The event might occur under very adverse circumstances over the design life.	UNLIKELY	D
10^{-5}	$5x10^{-5}$	100,000 years	200,000 years	The event is conceivable but only under exceptional circumstances over the design life.	RARE	E
10^{-6}	$5x10^{-6}$	1,000,000 years		The event is inconceivable or fanciful over the design life.	BARELY CREDIBLE	F

Note: (1) The table should be used from left to right; use Approximate Annual Probability or Description to assign Descriptor, not *vice versa*.

QUALITATIVE MEASURES OF CONSEQUENCES TO PROPERTY

Approximate Cost of Damage		Description	Descriptor	Level
Indicative Value	Notional Boundary			
200%	100%	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage.	CATASTROPHIC	1
60%	40%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage.	MAJOR	2
20%	10%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage.	MEDIUM	3
5%	1%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.	MINOR	4
0.5%		Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a notional boundary of 0.1%. See Risk Matrix.)	INSIGNIFICANT	5

Notes: (2) The Approximate Cost of Damage is expressed as a percentage of market value, being the cost of the improved value of the unaffected property which includes the land plus the unaffected structures.

(3) The Approximate Cost is to be an estimate of the direct cost of the damage, such as the cost of reinstatement of the damaged portion of the property (land plus structures), stabilisation works required to render the site to tolerable risk level for the landslide which has occurred and professional design fees, and consequential costs such as legal fees, temporary accommodation. It does not include additional stabilisation works to address other landslides which may affect the property.

(4) The table should be used from left to right; use Approximate Cost of Damage or Description to assign Descriptor, not vice versa

APPENDIX C: – QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

LIKELIHOOD		CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost of Damage)				
	Indicative Value of Approximate Annual Probability	**1: CATASTROPHIC 200%**	**2: MAJOR 60%**	**3: MEDIUM 20%**	**4: MINOR 5%**	**5: INSIGNIFICANT 0.5%**
A – ALMOST CERTAIN	10^{-1}	VH	VH	VH	H	M or **L** (5)
B - LIKELY	10^{-2}	VH	VH	H	M	**L**
C - POSSIBLE	10^{-3}	VH	H	M	M	**VL**
D - UNLIKELY	10^{-4}	H	M	**L**	**L**	**VL**
E - RARE	10^{-5}	M	**L**	**L**	**VL**	**VL**
F - BARELY CREDIBLE	10^{-6}	**L**	**VL**	**VL**	**VL**	**VL**

Notes: (5) For Cell A5, may be subdivided such that a consequence of less than 0.1% is Low Risk.

(6) When considering a risk assessment it must be clearly stated whether it is for existing conditions or with risk control measures which may not be implemented at the current time.

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RISK LEVEL IMPLICATIONS

Risk Level		Example Implications (7)
VH	VERY HIGH RISK	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.
H	HIGH RISK	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	MODERATE RISK	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	LOW RISK	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

Note: (7) The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; these are only given as a general guide.

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Landslide Risk Management

Important Information about AGS 2007 Appendix C (1 of 2)

INTRODUCTION

This sheet provides important information on the following Appendix C which has been copied from "Practice note guidelines for landslide risk management 2007". The "Practice Note" and accompanying "Commentary" (References 1 & 2, hereafter referred to as AGS2007) are part of a series of documents on landslide risk management prepared on behalf of, and endorsed by, the Australian Geomechanics Society. These documents were primarily prepared to apply to residential or similar development.

It should be noted that AGS2007 define landslides as "the movement of a mass of rock, debris or earth down a slope". This definition includes falls, topples, slides, spreads and flows from both natural and artificial slopes.

LANDSLIDE LIKELIHOOD ASSESSMENT

The assessment of the likelihood of landsliding requires evidence-based judgements.

Judging how often and how much an existing landslide will move is difficult. Judging the likelihood of a new landslide occurring is even harder. Records of past landslides can provide some information on what has happened, but are invariably incomplete and often provide little or no guidance on less frequent events that may occur. Often judgements have to be made about the likelihood of infrequent events with serious consequences, with little or no help from historical records. Slope models, which reflect evidence-based knowledge of how a slope was formed, how it behaved in the past and how it might behave in the future, are used to support judgements about what might happen. Because of the difficulties in assessing landslide likelihood, different assessors may make different judgements when presented with the same information.

The likelihood terms in Appendix C can be taken to imply that it is possible to distinguish between low probability events (e.g. between events having a probability of 1 in 10,000 and 1 in 100,000). In many circumstances it will not be possible to develop defensibly realistic judgements to do so, and so joint terms need to be used (e.g. Likely or Possible). For further discussion on landslide likelihood and other matters see References 3, 4 and 5.

CONSEQUENCES OF LANDSLIDES

There can be direct (e.g. property damage, injury / loss of life) and indirect (e.g. litigation, loss of business confidence) consequences of a landslide. The assessment of the importance (seriousness) of the consequences is a value judgement best made by those most affected (e.g. client, owner, regulator, public). The main role of the expert is usually to understand and explain what and who might be affected, and what damage or injury might occur.

Appendix C implies that we can anticipate total cost (direct and indirect) of landslide damage to about half an order of magnitude (e.g. the difference between $30,000 and $100,000). This involves predicting the location, size, travel distance and speed of a landslide, the response of a building (often before it has been built), the nature and the extent of damage, repair costs as well as indirect consequences such as legal costs, accommodation etc. There can be other direct and indirect consequences of a landslide which can be difficult to anticipate, let alone quantify and cost. The situation is analogous to the cost of work place accidents where the hidden costs can range from less than one to more than 20 times the visible direct costs (Reference 5).

In many circumstances it will not be possible to develop defensibly realistic judgements to enable use of a single consequence descriptor from Appendix C, and so joint terms need to be used (e.g. Minor or Medium). In our experience, explicit descriptions of potential consequences (e.g. rocks up to 0.5m across may fall on a parked car) help those affected to make their own judgements about the seriousness of the consequences.

RISK MATRIX

The main purpose of a risk matrix is to help rank risks, set priorities and help the decision making process. The risk terms should be regarded only as a guide to the relative level of risk as they are the product of an evidence-based quantitative judgement of likelihood and a value judgement about consequences, both of which involve considerable uncertainty. Different assessors may arrive at different judgements on the risk level.

Using Appendix C, many existing houses on sloping land will be assessed to have a Moderate Risk.

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Landslide Risk Management

Important Information about AGS 2007 Appendix C (2 of 2)

RISK LEVEL IMPLICATIONS

In general, it is the responsibility of the client and/or owner and/or regulatory authority and/or others who may be affected to decide whether to accept or treat the risk. The risk assessor and/or other advisers may assist by making risk comparisons, discussing treatment options, explaining the risk management process, advising how others have reacted to risk in similar situations, and making recommendations. Attitudes to risk vary widely and risk evaluation often involves considering more than just property damage (e.g. environmental effects, public reaction, political consequences, business confidence etc).

The risk level implications in Appendix C represent a very specific example and are unlikely to be generally applicable. In our experience the typical response of regulators to assessed risk is as follows:

Assessed risk	Typical response of client/ owner/ regulator/ person affected
Very High, High [1]	Treats seriously. Usually requires action to reduce risk. Will generally avoid development.
Moderate	May accept risk. Usually looks for ways to reduce risk if reasonably practicable.
Low, Very Low [1]	Usually regards risk as acceptable. May reduce risk if reasonably practicable.

1 The distinctions between Very High and High and between Low and Very Low risks are usually used to help set priorities.

REFERENCES

1. AGS (2007). "Practice note guidelines for landslide risk management 2007". Australian Geomechanics, Vol. 42, No. 1, pp 63-114.
2. AGS (2007). "Commentary on practice note guidelines for landslide risk management 2007". Australian Geomechanics, Vol. 42, No. 1, pp 115-158.
3. Baynes, F.J., Lee I.K. and Stewart, I.E., (2002). "A study of the accuracy and precision of some landslide risk analyses." Australian Geomechanics, Vol. 37, No. 2, pp 149-156.
4. Baynes, et. al., (2007). "Concerns about the Practice Note Guidelines for Landslide Risk Management 2007." Letter to the editor, Australian Geomechanics, Vol. 2, No. 4, pp 63-114.
5. Moon, A.T., and Wilson, R,A., (2004). "Will it happen? – Quantitative judgements of landslide likelihood". Proceedings of the Australia New Zealand conference on Geomechnics, Centre of continuing education, University of Auckland, Vol. 2, pp 754-760.

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APPENDIX G - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	

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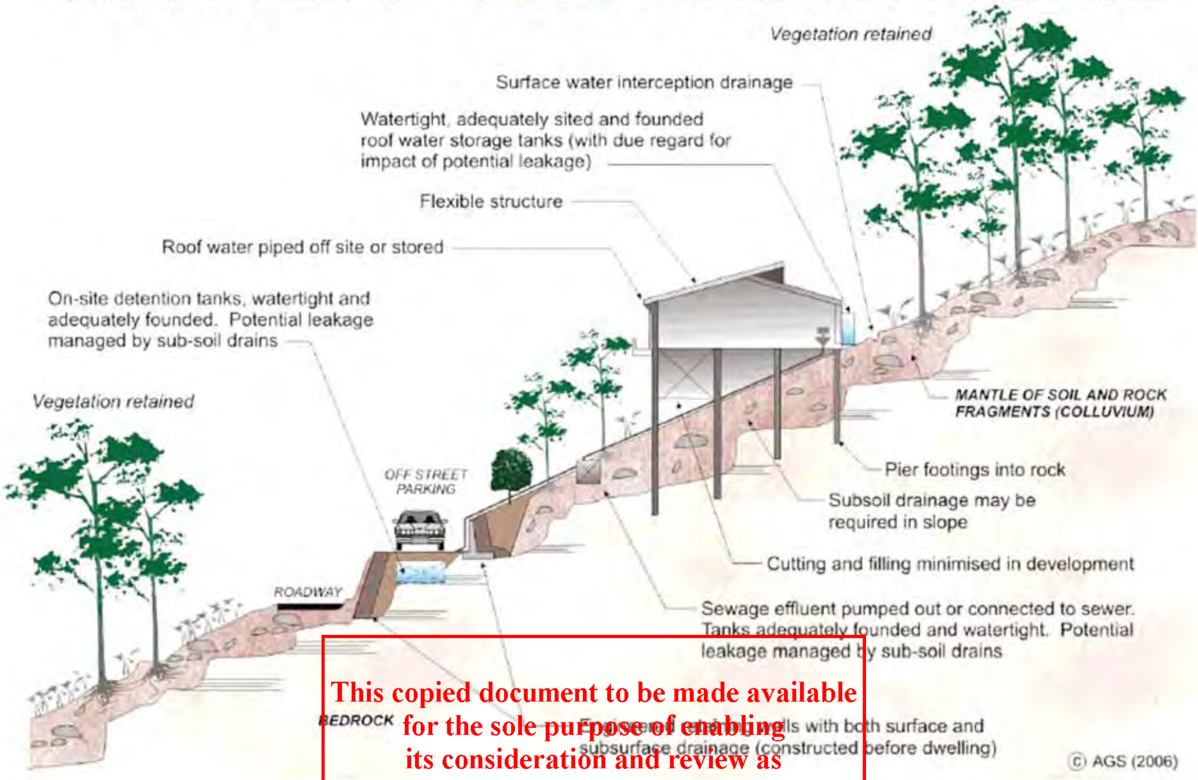
EXAMPLES OF GOOD HILLSIDE PRACTICE



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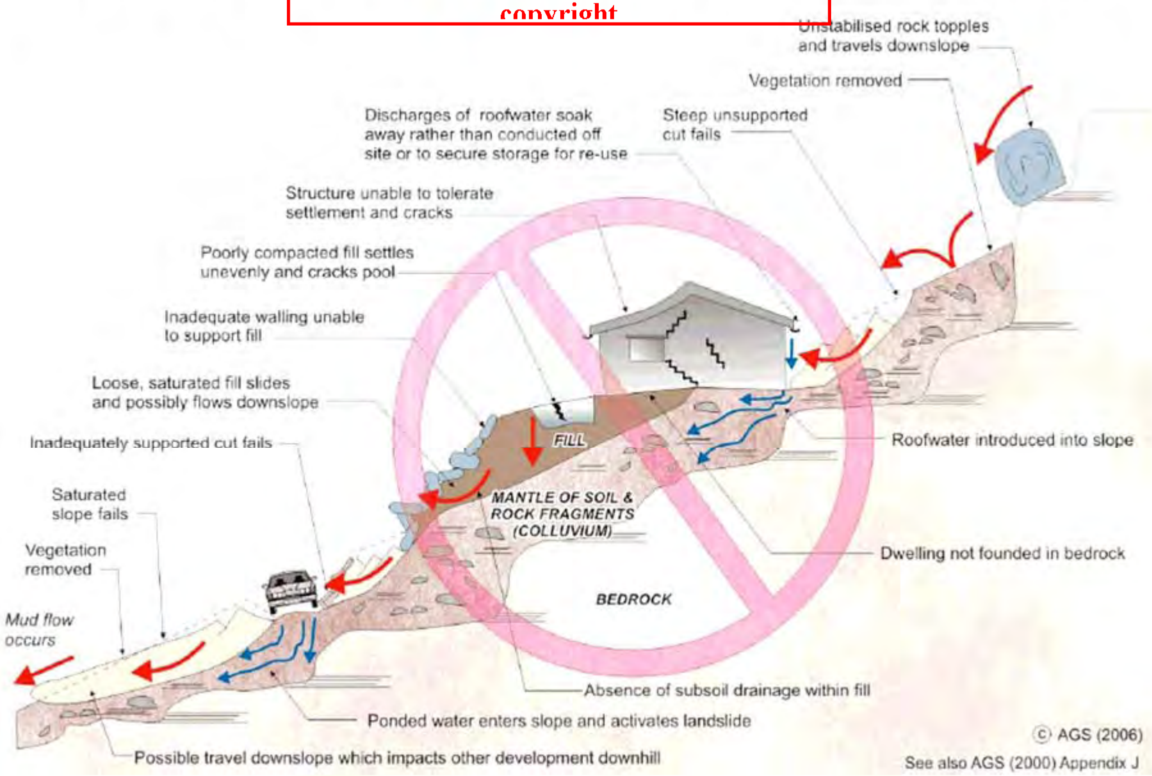
EXAMPLES OF POOR HILLSIDE PRACTICE



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Appendix C – Erosion Management overlay-Schedule 1 Management of Geotechnical Hazards

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Department of Sustainability and Environment

ALPINE RESORTS PLANNING SCHEME

Erosion Management Overlay – Schedule 1 Management of Geotechnical Hazard

FORM 1

Declaration and/or verification made by geotechnical engineer or engineering geologist as part of a geotechnical report

Name of application: Preliminary Geotechnical Assessment for Proposed Building Allotment

Address of subject site: 130 Great Alpine Rd, Hotham Heights, VIC 3741

I, Ganeshalingam Manivannan (insert name) of Coffey Services Pty Ltd (trading or company name)

on 23 March 2018 (insert date)

certify that I am a geotechnical engineer or engineering geologist as defined by the Erosion Management Overlay (Schedule 1 – Management of Geotechnical Hazard) and I have: (tick appropriate box):

☐ prepared the Geotechnical Report referenced below in accordance with the Australian Geomechanics Society's Geotechnical Risk Management Guidelines and Clause 3 of the EMO1

or

■ technically verified that the geotechnical report referenced below has been prepared in accordance with the AGS's Geotechnical Risk Management Guidelines and Clause 3 of the EMO1.

Geotechnical report details:

Report title:	Preliminary Geotechnical Assessments - 130 Great Alpine Rd, Hotham Heights, VIC 3741
Report date:	23 March 2018
Report reference:	754-MELGE213637-AB
Author:	Ganeshalingam Manivanna
Author's affiliation:	CPEng, 2321684

Documentation relied upon in report preparation:

Architectural Drawings, Topographic Plan and Conceptual Draft Plans

I am aware that the Geotechnical Report I have either prepared or am technically verifying for the above development is to be submitted in support of a development application for the proposed development 130 Great Alpine Rd, Hotham Heights, VIC 3741 (name of development) requiring approval from the Minister for Planning.

Further, I hold a current professional indemnity insurance policy of at least $2 million, evidence of which is attached with this form.

Name Ganeshalingam Manivannan

Signature G. Manivannan.

Date 23 March 2018

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Victoria The Place To Be

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