

REPORT ON GEOTECHNICAL ASSESSMENT

for

PROPOSED ALTERATIONS AND ADDITIONS

at

13 CAPUA PLACE, AVALON BEACH

Prepared For

Jenny Beashel

Project No.: 2020-027

March, 2020

Document Revision Record

Issue No	Date	Details of Revisions
0	13 th March 2020	Original issue

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GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for _____

Name of Applicant _____

Address of site 13 Capua Place, Avalon

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

I, Troy Crozier on behalf of Crozier Geotechnical Consultants

on this the 13th March 2020 certify that I am a ~~geotechnical engineer or engineering geologist or coastal engineer~~ as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least \$2million.

I:

- ☐ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009
- ☐ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009
- ☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.
- ☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.
- ☒ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.
- ☐ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: Geotechnical Assessment for Proposed Alterations and Additions

Report Date: 13th March 2020

Project No.: 2020-027

Author: T. Crozier

Author's Company/Organisation: Crozier Geotechnical Consultants

Documentation which relate to or are relied upon in report preparation:

Design Plans by JJ Drafting, Job No.: 752/19, Dated: November 2019

Survey by SDG, Reference: 8017, Dated: 23/10/2019

I am aware that the above Geotechnical Report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature

Name ... Troy Crozier

Chartered Professional Status... RPGeo (AIG)

Membership No. ... 10197

Company... Crozier Geotechnical Consultants



GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1(a) - Checklist of Requirements For Geotechnical Risk Management Report for Development Application

Development Application for _____	Name of Applicant _____
Address of site ___13 Capua Place, Avalon_____	

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

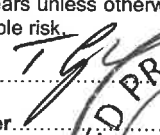
Geotechnical Report Details:

Report Title: Geotechnical Assessment for Proposed Alterations and Additions	Project No.: 2020-027
Report Date: 13 th March 2020	Author: T. Crozier
Author's Company/Organisation: Crozier Geotechnical Consultants	

Please mark appropriate box

- ☒ Comprehensive site mapping conducted _____ 20th February 2020 _____
(date)
- ☐ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)
- ☐ Subsurface investigation required
 - ☐ No Justification
 - ☐ Yes Date conducted
- ☐ Geotechnical model developed and reported as an inferred subsurface type-section
- ☐ Geotechnical hazards identified
 - ☐ Above the site
 - ☐ On the site
 - ☐ Below the site
 - ☐ Beside the site
- ☐ Geotechnical hazards described and reported
- ☐ Risk assessment conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
 - ☐ Consequence analysis
 - ☐ Frequency analysis
- ☐ Risk calculation
- ☐ Risk assessment for property conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☐ Risk assessment for loss of life conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☐ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater - 2009
- ☒ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the specified conditions are achieved.
- ☒ Design Life Adopted:
 - ☒ 100 years
 - ☐ Other _____ specify _____
- ☒ Geotechnical Conditions to be applied to all four phases as described in the Geotechnical Risk Management Policy for Pittwater - 2009 have been specified
- ☒ Additional action to remove risk where reasonable and practical have been identified and included in the report.
- ☐ Risk assessment within Bushfire Asset Protection Zone.

I am aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ensuring that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

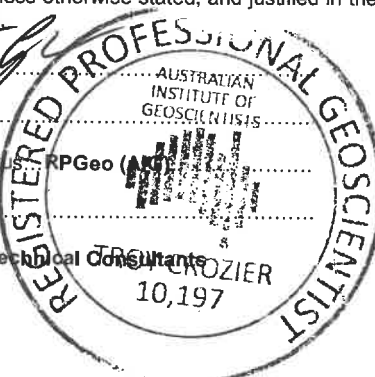
Signature 

Name ...Troy Crozier.....

Chartered Professional Status: RPGeo (Aust)

Membership No. ...10197.....

Company... Crozier Geotechnical Consultants



Date: 13th March 2020

Project No.: 2020-027

Page: 1 of 11

**GEOTECHNICAL ASSESSMENT FOR PROPOSED ALTERATIONS AND ADDITIONS
13 CAPUA PLACE, AVALON BEACH, NSW.**

1. INTRODUCTION:

This report details the results of a geotechnical assessment carried out as part of proposed alterations and additions at 13 Capua Place, Avalon, NSW. The assessment was undertaken by Crozier Geotechnical Consultants (CGC) at the request of the client Jenny Beashel.

It is understood that the proposed works involve demolition of the existing garage and construction of a new garage with a workshop above. The works appear to require no bulk excavation however it is likely to require minor excavation for new footings.

The site is located within the H1 (highest category) landslip hazard zone as identified within Northern Beaches Councils - Pittwater LEP/DCP (Geotechnical Risk Management Policy for Pittwater - 2009) (Sheet GTH_016). Therefore, the site requires a geotechnical landslip assessment to be conducted in support of a Development Application. The site is also located within an area designated as Class 5 Acid Sulfate Soils hazard (Acid Sulfate Soils Map - Sheet ASS_016).

The investigation and reporting were undertaken as per the Tender P20-048, Dated: 10th February 2020. This report includes a detailed description of site conditions, assessment of proposed works, geotechnical assessment of landslip and recommendations for construction to maintain the 'Acceptable Risk Management' criteria.

The geotechnical investigation included:

- a) Detailed geotechnical inspection and photographic record of the entire site and limited inspection of adjacent land, with identification of geotechnical conditions including landslip hazards related to the existing site and proposed structures.

The following plans and diagrams were supplied for this work;

- Design Plans by JJ Drafting, Job No.: 752/19, Dated: November 2019.
- Survey by SDG, Reference: 8017, Dated: 23/10/2019

2. SITE FEATURES:

2.1. Description:

The site is a rectangular shaped block located on the low south side of Capua Place at mid-slope level on a steep south dipping slope. A natural drainage gully passes down slope along the sites eastern side boundary. The existing house is accessed via a common driveway and is a one and two storey residential house with separate garage to the east.

The site has an angled front boundary of 34.65m and long eastern side boundary of 36.10m in length with a total area of 1084.8m², as referenced from the provided survey plan.

An aerial photograph of the site and its surrounds is provided below, as sourced from NSW Government Six Map spatial data, as Figure: 1.

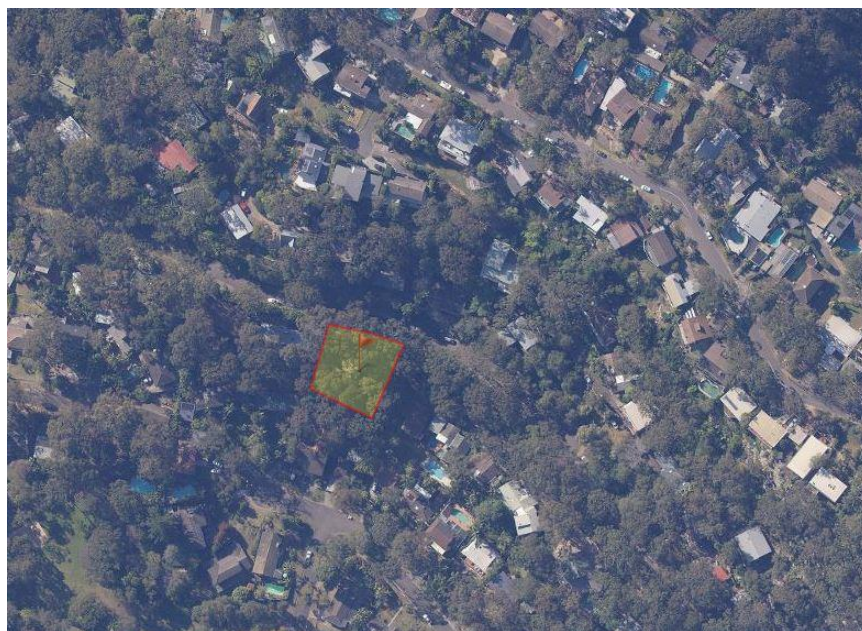


Figure: 1 – site and surrounding properties

2.2. Geology:

Reference to the Sydney 1:100,000 Geological Series sheet (9130) indicates that the site is located directly down slope of the boundary between the Hawkesbury Sandstone (Rh) and underlying Upper Narrabeen Group Shales (Rnn). Our experience in the area indicates the site will be underlain by Newport Formation (Upper Narrabeen Group) rock which is of middle Triassic Age. The Newport Formation typically comprises interbedded laminite, shale and quartz to lithic quartz sandstones and pink clay pellet sandstones.

Narrabeen Group rocks are dominated by shales and thin siltstone/sandstone beds and often form rounded convex ridge tops with moderate angle ($<20^{\circ}$) side slopes. These side slopes can be either concave or convex depending on geology, internally they comprise interbedded shale and siltstone beds with close spaced bedding partings that have either close spaced vertical joints or in extreme cases large space convex joints. The shale often forms deeply weathered profiles with silty or medium to high plasticity clays and a thin silty colluvial cover.

3. FIELD WORK:

3.1. Methods:

The field investigation comprised a walk over inspection and mapping of the site and limited inspection of adjacent properties on the 20th February 2020 by a Principal Engineering Geologist. It included a photographic record of site conditions as well as geological/geomorphological mapping of the site and adjacent land including examination of existing structures and slopes. Explanatory notes are included in Appendix: 1.

3.2. Field Observations:

The road reserve is gently (5°) east dipping where it passes the site before becoming gently ($<7^{\circ}$) west dipping from adjacent to the site's eastern boundary. The road is formed with a bitumen pavement and then concrete kerb and guttering with a piped drainage system located adjacent to the low point and the sites eastern boundary. A narrow gently sloping lawn/soil slope is located adjacent to the kerb before the reserve becomes steeply (22°) to very steeply (36°) south sloping down into the site and the common access driveway. The slope shows only minor creep movement and surface erosion.

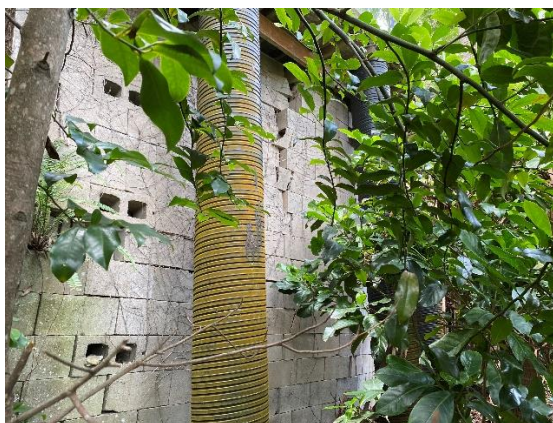
The common access driveway extends from the sites north-east corner, steeply (20°) down to the site's eastern boundary where it becomes moderately sloping before rising up into the neighbouring property to the east (No. 15). The driveway appears formed via minor cut and fill and is of concrete construction and in reasonable condition with no significant deformation/cracking evident.

On the low south side of the driveway is a very steep ($\leq 34^{\circ}$) soil slope containing isolated medium size trees, small boulders and low vegetation. The base of this slope is defined by a low ($<1.0\text{m}$) dry stacked rock retaining wall adjacent to the site house and garage. The slope shows only minor creep movement and surface erosion.

The existing garage is a single level brick structure over a concrete pavement and is formed directly adjacent to the low rock retaining wall at the base of the driveway slope. To the south of the driveway, concrete pavements extend several metres to create an open terrace and access to the site house. The outer southern side of the terrace is raised up to 4.0m above the slope and is supported via an apparent non-cored filled block wall and then a series of concrete columns. At the western end the block wall is not visible and appears covered by mortared flagging. The garage structure, terrace pavements, columns and the flagging appear in good condition however the exposed block wall contains significant open cracks and dislocation of blocks, indicating it was poorly constructed.



Photograph: 1 Terrace with flagging at west end and columns below south end.



Photograph: 2 Showing dis-located block work and columns supporting terrace.

The existing house is a one and two storey brick structure that appears of 1960-1970's construction, with a lower floor level formed below the southern half over a sub-floor cavity due to the ground surface slope to the south. The house is formed with brick external walls to brick strip footings with some internal brick footing walls along with isolated brick columns to pad footings supporting timber internal floors. The house generally appears in good condition however several open, diagonal cracks are evident at the south-west corner and along the lower southern wall.



Photograph: 3 Showing crack at south-west corner1



Photograph: 4 Showing stepped crack southern wall

Moderate ($\leq 18^\circ$) sloping gardens with scattered medium size trees and low vegetation extend down the western side of the house into the south-west corner of the property including around the lower southern side of the house. In the south-east corner of the site is a near level lawn that appears excavated into the slope with a low (<1.20m) timber sleeper retaining wall supporting garden beds above its northern side. There were no signs of excess creep, surface erosion or instability identified in this part of the site.



Photograph: 5 Showing lawn and then wall supporting gardens, looking north from south corner.



Photograph:6 Showing properties downslope to south.

The neighbouring property to the west (No. 11) contains a stepped brick and timber residential house on the front half of the block, adjacent to Capua Place, with moderate vegetated slope to the rear. The property levels appear relatively un-modified and it is at a similar level to the site along the common boundary.

The neighbouring property to the east (No. 15) contains a raised single level timber house supported up to 4.0m above the slope with a part lower brick level. Open gardens and a near level terrace are located along the western side, adjacent to the common boundary with the site.

The neighbouring properties to the rear (No. 7 and 8 Buyuma Pl) contain one and two storey residential house structures on the front half of the blocks, adjacent to the valley floor with moderate ($<15^\circ$) lawn and garden slopes extending up to the common boundary with the site.

The neighbouring buildings and properties were only inspected from within the site or from the road reserve however the visible aspects did not show any significant signs of large-scale slope instability or other major geotechnical concerns which would impact the site or the proposed development.

4. COMMENTS:

4.1. Geotechnical Assessment:

The site inspection identified no existing or impending landslip instability or geotechnical hazards within the site or adjacent properties. The soil slopes are vegetated, show no signs of concentrated surface stormwater flow, erosion or groundwater seepage and the trees show no significant trunk curvature or indicators of slope movement. Slow creep movement of soils and buried boulders will occur over time due to gravitational forces and surface moisture conditions, however at the time of inspection there were no indications of impending instability.

The existing terrace adjacent to the garage appears part supported by a poorly built and deformed concrete block wall/retaining wall of significant height. It could not be confirmed whether or not this wall is retaining soils, though it does not appear to be, and it does not appear to be supporting the terrace above. The condition/situation of the wall appears to present a hazard to the site, however if there is no lateral soil retention or vertical support to the concrete terrace above, the hazard is purely a safety issue for the residents within the garden bed adjacent to the wall base. It is therefore recommended that the wall and ground conditions to its rear be investigated during the garage construction works with geotechnical and structural engineering assessment.

The proposed works are understood to involve the demolition of the existing garage and construction of a new garage with a workshop above. The new structure will be formed above existing ground surface levels and requires no bulk excavation, retention or filling. Therefore, the proposed works are considered separate from and not affected by a geotechnical hazard. As such no further geotechnical investigation or reporting is considered necessary as part of this Development Application to meet Council's policy requirements.

There were no indicators of Acid Sulfate Soils within the site, which is located above AHD 38.90 whilst the proposed works will not lower the water table and will have negligible impact on local hydrogeological conditions. As such no further investigation or reporting is required in regard to ASS as part of this proposed development application.

The most critical aspect of the development is ensuring that new footings are suitably founded within either stable residual soils or bedrock and that all hard surface stormwater collection is controlled and discharged via a piped engineered system, that is maintained for the life of the development, taken as 50 years.

The proposed works are considered suitable for the site and may be completed with negligible impact to existing nearby structures within the site or neighbouring properties provided the recommendations of this report are implemented in the design and construction phases.

4.2. Slope Stability & Risk Assessment:

Based on our site mapping no credible geological/geotechnical landslip hazards were identified which need to be considered in relation to the existing site and proposed development. As such a risk assessment is not required as the works are considered separate from, and not affected by, a geotechnical landslip hazard.

The entire site and surrounding slopes have been assessed as per the Pittwater Council Geotechnical Risk Management Policy 2009 and no credible landslip hazards were identified, therefore the site is considered to meet the 'Acceptable' risk management criteria for the design life of the development, taken as 50 years, provided the property is maintained as per the recommendations of this report.

4.3. Design & Construction Recommendations:

Design and the construction recommendations are tabulated below:

4.3.1. New Footings:	
Site Classification as per AS2870 – 2011 for new footing design	Class 'P' for footings due to slope
Type of Footing	Strip/pile/pad recommended
Sub-grade material and Maximum Allowable Bearing Capacity	<ul style="list-style-type: none"> - Very Stiff Clay: 200kPa - Hard Clay: 400kPa - Weathered, ELS-VLS Bedrock: 700kPa
Site sub-soil classification as per <i>Structural design actions AS1170.4 – 2007, Part 4: Earthquake actions in Australia</i>	B _e – Rock Site
Remarks: All new footings must be inspected by an experienced geotechnical professional before concrete or steel are placed to verify the bearing capacities and stability. This is mandatory to allow them to be 'certified' at the end of the project. Stormwater collected on hard surface areas as part of the proposed development should be connected to a site stormwater system and preferably discharged off site.	

4.4. Conditions Relating to Design and Construction Monitoring:

To allow certification as part of construction, building and post-construction activity for this project, it will be necessary for Crozier Geotechnical Consultants to:

1. Review and approve the structural design drawings, for compliance with the recommendations of this report prior Construction Certificate.
2. Inspect all new footings to confirm compliance to design assumptions with respect to allowable bearing pressure and stability prior to the placement of steel or concrete.
3. Inspect and review structural assessment of the concrete block wall below the terrace with any required stabilising measures implemented.
4. Inspect completed development including stormwater collection and disposal systems.

The client and builder should make themselves familiar with the requirements spelled out in this report for inspections during the construction phase. Crozier Geotechnical Consultants cannot provide certification for the Occupation Certificate if it has not been called to site to undertake the required inspections.

We have interpreted the design life requirements specified within Councils Risk Management Policy to refer to structural elements designed to support the adjacent slope, control stormwater and maintain the risk of instability within 'Acceptable' limits. Specific structures and features that may affect the maintenance and stability of the site in relation to the proposed development are considered to comprise:

- stormwater and subsoil drainage systems,
- soil slope erosion and instability,
- maintenance of trees/vegetation on this and adjacent properties,

Man-made features should be designed and maintained for a design life consistent with surrounding structures (as per AS2870 – 2011 (50 years)). In order to attain an "Acceptable Risk Management Criteria" for a design life of 100 years as detailed by the Councils Risk Management Policy, it will be necessary for the property owner to adopt and implement a maintenance and inspection program. It is considered that the proposed house will have a design life of 50 years from its upgrade following the proposed works.

If a maintenance and inspection schedule are not implemented the "Acceptable" risk levels for the design life of the property may not be attained.

A recommended program is given in Table: 1 below and should also include the following guidelines:

- The conditions on the block don't change from those present at the time this report was prepared, except for the changes due to new development.
- There is no change to the property due to an extraordinary event external to this site, and the property is maintained in good order and in accordance with the guidelines set out in;
 - a) CSIRO sheet BTF 18
 - b) Australian Geomechanics "Landslide Risk Management" Volume 42, March 2007.
 - c) AS 2870 – 2011, Australian Standard for Residential Slabs and Footings

Where changes to site conditions are identified during the maintenance and inspection program, reference should be made to relevant professionals (e.g. structural engineer, geotechnical engineer or Council).

It is assumed that Northern Beaches Council will control development on neighbouring properties, carry out regular inspections and maintenance of the road verge, stormwater systems and large trees on public land adjacent to the site so as to ensure that stability conditions do not deteriorate with potential increase in risk level to the site.

Also individual Government Departments will maintain public utilities in the form of power lines, water and sewer mains to ensure they don't leak and increase either the local groundwater levels or landslide potential.

Table 1: Recommended Maintenance and Inspection Program for Future Developments

Structure	Maintenance/ Inspection Item	Frequency
Stormwater Drains.	Owner to inspect to ensure that the drains and pipes are free of debris & sediment build-up. Clear surface grates and litter.	Every year or following each major rainfall event
Retaining Walls or remedial measures	Owner to inspect walls for deviation from as constructed condition or for excess deterioration/rotation or signs of soil settlement/erosion or significant cracking adjacent to crest.	Every two years or following major rainfall events. Replace existing non-engineered walls as required prior to their failure
Large Trees on or adjacent to site	Arborist to check condition of trees and remove branches and dead trees as required	Every five years

N.B. Provided the above schedule is maintained the design life of the property should conform AS2870 and Councils 100 years stability criteria

5. CONCLUSION:

The site inspection did not identify any signs of previous or impending landslip instability or significant geotechnical hazards within the site or directly adjacent properties. Steep soil slopes will be subject to natural gravitational creep and soil erosion whilst ground conditions upslope of the road reserve, within the rear of the upslope neighbouring properties, are unconfirmed and could contain landslide/rockfall hazards to the site. However, there were no indications of previous landslip instability and no indications of impending instability within the site or visible adjacent properties.

The proposed works involve construction of a new garage to replace the existing structure with no requirement for excavation, filling or retention. As such the proposed works will not create a landslip hazard.

The proposed works are relatively minor from a geotechnical perspective and will not create any new instability, therefore the proposed works are separate from and not affected by a geotechnical hazard, and no further geotechnical assessment or reporting is required as part of this DA.

It is considered that the site will meet the 'Acceptable' risk management criteria for the design life of the development taken as 50 years from the proposed works provided the property is maintained as per the recommendations of this report.

Prepared By:



Troy Crozier

Principal

MAIG, RPGeo – Geotechnical and Engineering

Registration No.: 10197

7. REFERENCES:

1. Australian Geomechanics Society 2007, “Landslide Risk Assessment and Management”, Australian Geomechanics Journal Vol. 42, No 1, March 2007.
2. Geological Society Engineering Group Working Party 1972, “The preparation of maps and plans in terms of engineering geology” Quarterly Journal Engineering Geology, Volume 5, Pages 295 - 382.
3. C. W. Fetter 1995, “Applied Hydrology” by Prentice Hall. V. Gardiner & R. Dackombe 1983, “Geomorphological Field Manual” by George Allen & Unwin
4. Australian Standard AS 2870 – 2011, Residential Slabs and Footings – Construction
5. Australian Standard AS1170.4 – 2007, Part 4: Earthquake actions in Australia