

GEOTECHNICAL ASSESSMENT

For

PROPOSED SECONDARY DWELLING

At

48 NAREEN PARADE, NORTH NARRABEEN

Prepared For

Matthew Good

Project No.: 2019-116

July, 2019

Document Revision Record

Issue No	Date	Details of Revisions
0	24 th July, 2019	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 _____ 48 Nareen Parade, North Narrabeen	

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 25th July 2019 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

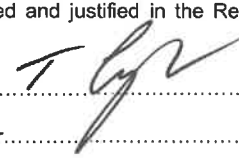
Geotechnical Report Details:

Report Title: Geotechnical Report for Proposed Secondary Dwelling	
Report Date: 24 th July 2019	Project No.: 2019-116
Author: Troy Crozier	
Author's Company/Organisation: Crozier Geotechnical Consultants	

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

Design Drawings by Connect drafting, Project No.: CD-061/19, Drawing No.: CD-061/19-V1, Sheet 1 and 2 of 2,
Dated: 14/04/19.
Site Survey Plan by Bee and Lethbridge, Job Ref.: 14841, Dated:

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 ____48 Nareen Parade, North Narrabeen _____	

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:

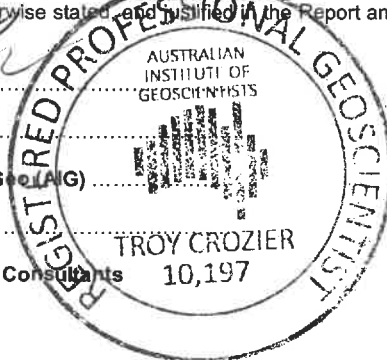
Report Title: Geotechnical Report for Proposed Secondary Dwelling
Report Date: 24 th July 2019 Project No.: 2019-116
Author: Troy Crozier
Author's Company/Organisation: Crozier Geotechnical Consultants

Please mark appropriate box

- ☒ Comprehensive site mapping conducted ____18th July 2019_____
- ☐ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)
- ☐ Subsurface investigation required
 - ☐ No JustificationMinor works, in gently sloping portion of site
 - ☐ 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
 - ☒ Other50 years..... 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...**RPG (AIG)**.....
 Membership No. ...**10197**.....
 Company... **Crozier Geotechnical Consultants**



Date: 24th July 2019

Project No: 2019-116

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**GEOTECHNICAL ASSESSMENT FOR PROPOSED SECONDARY DWELLING
48 NAREEN PARADE, NORTH NARRABEEN, NSW**

1. INTRODUCTION:

This report details the results of a geotechnical assessment carried out as part of a proposed secondary dwelling construction at 48 Nareen Parade, North Narrabeen, NSW. The assessment was undertaken by Crozier Geotechnical Consultants (CGC) at the request of the client Matthew Good.

It is understood that a secondary dwelling structure is proposed in the rear, upper north-east corner of the site. The single level dwelling will be constructed with a Finished Floor Level (FFL) at R.L. 23.00 within a portion of the site where ground surface levels vary from approximate R.L. 23.00 to RL 21.44. It is proposed to support the structure off columns to pad footings. The works require no bulk excavation, retention or filling and requires isolated footing excavations only.

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). Therefore the site requires a geotechnical landslip assessment to be conducted in support of a Development Application. This report therefore includes a detailed description of the field work, assessment of proposed works, geotechnical assessment and recommendations for construction to maintain the Acceptable Risk Management criteria.

The site is also located within an area designated as Class 5 Acid Sulfate Soils hazard (Acid Sulfate Soils Map - Sheet ASS_019) with Class 3 and Class 2 land located within the road reserve and parklands to the south.

The investigation and reporting were undertaken as per the Tender P19-257, Dated: 17th July 2019.

The geotechnical investigation included:

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

Project No: 2019-116 North Narrabeen, July, 2019

The following plans and diagrams were supplied for this work;

- Design Drawings by Connect drafting, Project No.: CD-061/19, Drawing No.: CD-061/19-V1, Sheet 1 and 2 of 2, Dated: 14/04/19.
- Site Survey Plan by Bee and Lethbridge, Job Ref.: 14841, Dated:

2. SITE FEATURES:

2.1. Description:

The site is a rectangular shaped block with angled rear boundary, located on the high north side of Nareen Parade. It is situated at the base, on the southern side, of a steep sided east plunging ridge line with gently sloping alluvial flood plain within the road reserve and extending south. The site falls from an approximate high of R.L. 24.5 in the north-east corner to a low of approximately R.L. 4.50 in the south-west corner, however a car space has been excavated to approximate R.L. 3.0 adjacent to the front boundary. The site has a front south boundary of 15.24m, side east boundary of 49.51m, side west boundary of 41.68m and rear north boundary of 17.14m, 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 Photograph 1.



Photograph: 1 of site and surrounding properties

The site is currently occupied by a three level timber residence located on the front half of the block with walled car parking area at the front with access up to the house through landscaped and retained gardens. The rear of the block contains landscaped and retained gardens, decks and an open lawn at the upper end. General views of the site are provided in Photograph: 2 to 4 below.



Photo: 2 – General view of front of site, facing north.

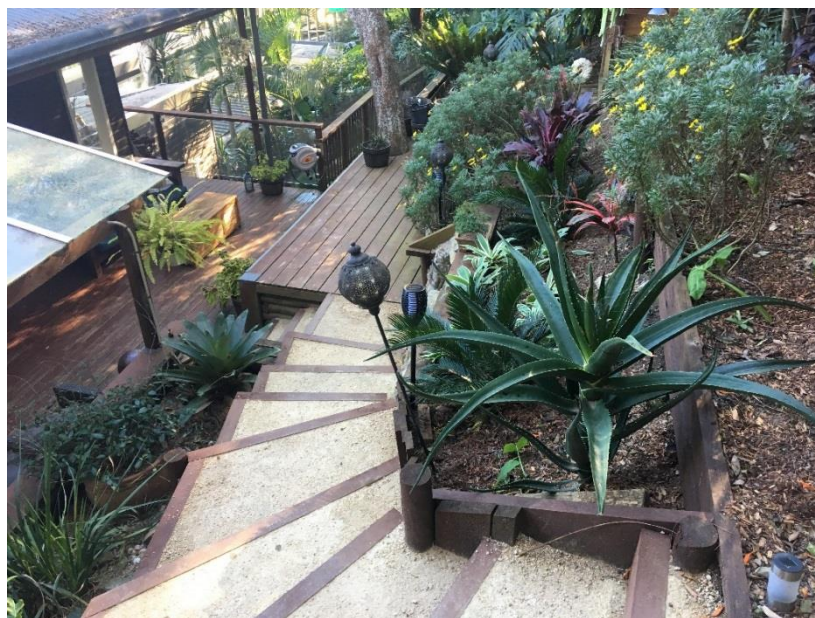


Photo: 3 – General view of landscaped gardens and decks at rear of house, facing west.



Photo: 4 – General view of rear upper portion of site, facing north-east.

2.2. Geology:

Reference to the Sydney 1: 100,000 Geological Series sheet (9130) indicates that the majority of the site is underlain by Newport Formation (Rnn) of the Upper Narrabeen Group. Newport Formation (Upper Narrabeen Group) is of middle Triassic Age and 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 adjacent properties on the 18th July 2019 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 site structures and slopes. Explanatory notes are included in Appendix: 1.

3.2. Field Observations:

The site is situated on the high north side of Nareen Parade, which is formed on the north edge of the flood plain related to Narrabeen lagoon. The road reserve is formed with gently sloping lawn to the base of a moderate ($\sim 18^\circ$) vegetated slope that rises up to the site's front boundary. A concrete driveway to concrete floor car parking space is located near the south-west corner of the site, extending through the road reserve slope and into the front edge of the site. This parking space is surrounded on its west, north and east by concrete block retaining walls of up to 2.5m height. There were no indications of landslip instability or geotechnical hazard that may impact the site within the road reserve.



Photo: 5 – Front slope of site

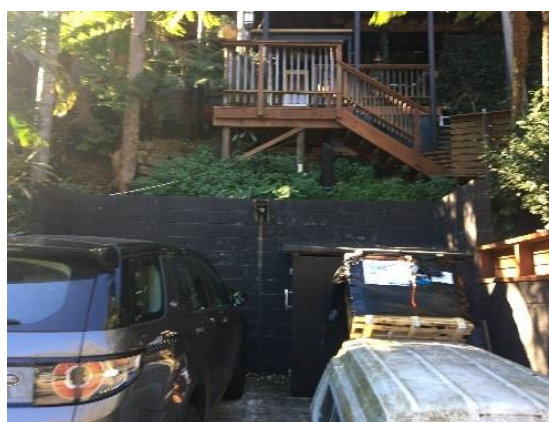


Photo: 6 - Parking bay at south-west corner

The front of the site is then formed with a moderate ($\sim 18^\circ$), vegetated slope along with terraced gardens that are supported by timber log retaining walls up to 1.20m in height that extend upslope to the front edge of the existing house with a pathway and steps between, see Photo: 5. The vegetated slope becomes steep towards the western boundary, above the car parking bay retaining wall, with a low dry stacked rock retaining wall formed across part of the slope, see Photo: 6. There were signs of minor creep movement within the timber and sandstone rock retaining walls however there were no indications of significant movement, previous or impending landslip instability or excess surface stormwater flow/erosion.

The existing house is a multi-level timber residential structure with a part brick lower level below the south-west corner. The house is supported above ground surface levels in part with a timber deck at the front supported off timber posts whilst a deck at the rear spans across from the house to the crest of a retaining wall to the north. The middle level of the house appears partially excavated into the hillslope along its rear northern side (Photo: 7) with a series of timber retaining walls supporting sloping gardens rising up from this level towards the rear of the block (Photo: 8).

The rear of the site is gently sloping and contains gardens, a deck and low (<1.0m) timber retaining walls with a gently north-west dipping lawn occupying the rear edge with gardens around its perimeters, see Photo: 9 and 10.

The neighbouring properties to the north (No. 24 and 26 Alleyne Avenue) contain residential house developments on the front half of the blocks with landscaped gardens stepping down to the common boundary with the site. Within No. 24 are several cemented sandstone rock retaining walls of up to 1.0m in height supporting lawns and gardens with gently south-west dipping lawn adjacent to the common boundary with the site. There were no indications of previous or impending slope instability within these properties that may impact the site.

The neighbouring property to the east (No. 46) contains a residential house development on the front half with a secondary dwelling formed near the rear northern boundary. The primary residence appears to be a two storey timber structure that is elongated across the block adjacent to the site house. The rear dwelling is a timber structure that is partially excavated into the slope along its rear northern side and raised above ground surface levels on its southern side. Gently to moderately south sloping gardens exist between the two dwellings. There were no signs of previous or impending instability or geotechnical hazard within the property that may impact the site.

The neighbouring property to the west (No. 50) contains a two storey rendered masonry and timber residential house structure located on the front half of the block, adjacent to the site dwelling. A masonry and then timber retaining walls support a terraced garden and then a moderate ($\sim 18^\circ$) south dipping vegetated slope that rises up to a suspended timber deck. A gently south dipping lawn is located at the rear of the block, surrounded by gardens and supported on its southern edge by a low (<1.0m) timber retaining wall. There were no signs of previous or impending slope instability or geotechnical hazard within the property that may impact the site.



Photo: 7 6 Rear edge of house, middle level



Photo: 8 6 Deck and retaining walls at rear of house



Photo: 9 - NE corner of site, looking towards No. 46

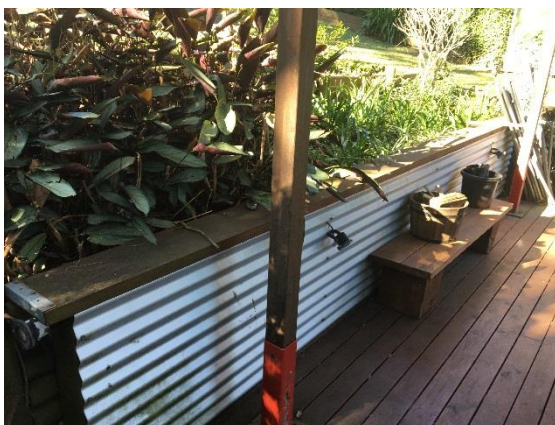


Photo: 10 6 Low timber retaining wall and deck

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 investigation identified that the existing house and associated landscaping structures are in good condition with no signs of excess surface stormwater flow, groundwater seepage, previous or impending landslip instability or excess creep movement. Timber and rock retaining walls will deteriorate with age however none appeared to indicate impending collapse at the time of inspection. All these walls are relatively low in height and provided they are replaced prior to excess deterioration they will not create a landslip hazard.

The proposed development involves construction of a new secondary dwelling above ground surface levels in the rear gently sloping portion of the site. The works require no bulk excavation, filling, or retention.

There are no indications of previous or impending instability within the site or adjacent properties with no sensible landslip hazards identified within the site, or adjacent properties, that may impact the site or proposed development. Therefore, the proposed works are considered separate from and not affected by a geotechnical hazard. As such no further geotechnical investigation or reporting is required as part of this Development Application to meet Council's policy requirements.

There were no indicators of Acid Sulfate Soils within the site 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 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 ó 2011 for new footing design	Class -Pøfor footings due to slope
Type of Footing	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 ó 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 -certifiedøat the end of the project. Stormwater collected on hard surface areas as part of the proposed development should be connected to the site stormwater system and preferably discharged off site or to a system which prevents concentrated flow across soil slopes.	

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.

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,
- retaining walls and 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 ó 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 existing 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 ó 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	Arbourist 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 adjacent properties. Timber and rock retaining walls within the site are generally low (<1.0m) and will be expected to slowly deteriorate and rotate with age, therefore provided they are maintained and replaced as per the maintenance schedule they are not considered to present a credible landslip hazard.

The proposed works involve construction of a secondary dwelling in the rear north-east corner of the block, suspended above the gently sloping lawn and garden areas 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 6 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 of 1996, Residential Slabs and Footings of Construction
5. Australian Standard AS1170.4 of 2007, Part 4: Earthquake actions in Australia