GEOTECHNIQUE® PTY LTD

ABN 64 002 841 063

Job No: 14657/1
Our Ref: 14657/1-AA
2 April 2020

Ms L Boguradzki
c/- S & D Consulting Pty Ltd
420 Somerville Road
HORNSBY HEIGHTS NSW 2077
Email: david@sdconsulting.net.au

Attention: Mr D Muller

Dear Sir

re: **Proposed Additions and Alterations**
185 Prince Alfred Street, Newport
Preliminary Geotechnical Investigation and Preliminary Slope Stability Assessment

This report presents the results of a preliminary geotechnical investigation and preliminary slope stability assessment carried out at the above site.

We understand that the proposed development at the above site includes additions and alterations to existing residence, including construction of garage and timber decks supported by poles. The proposed works will involve only minor cut (less than 1.0m deep) and some fill placement. Proposed additions and alterations are indicated on attached Development Plan.

The site is located within Landslip Hazard Zone H1 and H2. The council requires that a geotechnical investigation and slope stability assessment are carried out for developments within Hazard Zones H1 and H2. Therefore, a preliminary geotechnical investigation and a preliminary slope stability assessment are required for the following:

- To assess the risk of slope instability within and in the vicinity of the site at existing conditions and after completion of the proposed development.
- To assess sub-surface conditions across the site and provide preliminary recommendations on design of footings for the proposed development.

Background Information

Reference to the Geological Map of Sydney (scale 1:100,000) indicates that the bedrock at the site Newport Formation belonging to Narrabeen Group and comprises interbedded laminite, shale and quartz to lithic quartz sandstone with minor clays.

Reference to the Soil Landscape Map (1:100,000) of Sydney indicates that the landscape at the site belongs to the Gymea Group, which is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone, with local relief of 20m to 80m and ground slopes less than 25%, broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrops. The sub-surface soil in this group is likely to be sandy, highly permeable and susceptible to erosion. This map also indicates that the landscape might have been disturbed by human activities, including complete disturbance, removal or burial of soil.

Field Work
Field work for the preliminary geotechnical investigation and preliminary slope assessment was carried out on 20 March 2020 and consisted of the following:

- A walk over survey to assess (1) existing site conditions (2) signs of slope instabilities including landslides, landslips and debris flows and (3) surface and groundwater conditions.
- Drilling a borehole using a hand auger. Borehole was located within the footprint of proposed garage and terminated due to auger refusal in sandstone bedrock at depths of about 0.5m from existing ground surface.
- Conducting Dynamic Cone Penetration (DCP) test adjacent to the borehole to assess strength characteristics of the sub-surface soil. The DCP test was terminated due to refusal at a depth of 0.5m.

The field work was carried out by a Geotechnical Engineer form this company.

Site Conditions
The site is of trapezoidal shape measuring about 1277m^2 in plan. The following observations were made during field work:

- The site is accessed by a long driveway from Prince Alfred Parade and bound by residential dwellings in all sides.
- The ground surface across the site is dipping towards the south at about 20 to 25 degrees.
- There is an existing dwelling in the southern portion of the site and open spaces are densely vegetated with scattered mature trees.
- Sandstone bedrock outcrops at several locations within and in the vicinity of the site.

Based on information from a shallow borehole and site observation, the sub-surface profile across the site is anticipated to comprise a sequence of topsoil/colluvium underlain by sandstone bedrock. The topsoil/colluvium is predominantly silty sand of fine to medium grained with some gravel and bedrock is sandstone. Bedrock outcrops at several locations within the site but the depth to bedrock is anticipated up to about 0.5m to 1.0m deep in some locations.

Groundwater seepage was not observed on the ground surface and up to depth of about 0.5m from existing ground surface. However, it should be noted that groundwater level might vary due to rainfall, temperature and other factors not evident during field work.

DISCUSSION AND RECOMMENDATIONS

Preliminary Slope Stability Assessment
The risk of slope instability for the proposed development includes sliding of natural soils (including topsoil/colluvium) and sliding of bedrock in the natural slope and/or excavated slope during proposed development works.

Site factors such as slope angles, depth of natural soils, strength of sub-surface materials (including soils and bedrock) and concentrations of water generally govern the stability of a site. The Australian Geomechanics Society recommends that the landslide risk of a site is assessed on the basis of the likelihood of a landslide event and the consequences of that event (Reference 1). The guidelines on qualitative measures for the likelihood and consequence of landslides and assumed level of risk are also provided by The Australian Geomechanics Society (Reference 1). Applying these guidelines, the site for the proposed alterations and additions, as it exists, is assessed as follows:

- **Qualitative Measures of Likelihood** - It is our assessment that a landslide event could occur under very adverse circumstances (with indicative annual probability $\approx 10^{-4}$), i.e.: Landslide is "Unlikely".
- **Qualitative Measures of Consequences to Property** - It is our assessment that the consequences of a landslide event to the property would be "Minor", resulting limited damage to parts of the structure and/or part of the site requiring some stabilisation works.
- **Qualitative Risk Analysis** – Based on the above Qualitative Measures, the site for the proposed development, as it exists, is assessed to have a "Low Risk". Definitions of the risk levels are provided by The Australian Geomechanics Society and reproduced below:

Risk Level		Implication
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. Works likely to cost more than the value of the property.
H	**High Risk**	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Works would cost a substantial sum in relation to the value of the property.
M	**Moderate Risk**	May be tolerable 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 possible.
L	**Low Risk**	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, on-going maintenance is required.
VL	**Very Low Risk**	Acceptable. Manage by normal slope maintenance procedures.

The "Low Risk" is tolerable for residential development. However, it is possible that the risk level could be worsened during proposed development works if development works are carried out without due consideration to the possible risk of slope instability.

Proposed additions and alterations to existing residence, including construction of garage and timber decks, does not involve significant excavations and garage and deck will be supported by poles with footings founded in sandstone bedrock anticipated at shallow depths. Therefore, it is our assessment that the risk level for the site will not be worsened during proposed development works and hence, the site will be suitable for proposed additions and alterations provided the following.

- Site preparation, including cut and fill, is carried out in accordance with the recommendations presented in this report.

- Construction of the garage and deck are carried out in accordance with “Guidelines for Hillside Constructions”, a copy of which is attached.
- Cut and fill slopes are battered for long term stability or retained with engineered retaining walls designed in accordance with recommendations presented in this report.
- All footings are founded in sandstone bedrock and designed in accordance with recommendations presented in this report.

Site Preparation

Proposed development is anticipated to involve only minor excavations, less than 1.0m in depth, and possibly some fill placement. Therefore, materials to be excavated are expected to comprise only soils (including topsoil/colluvium) and sandstone bedrock. Excavation into bedrock may be required for footing excavations and is anticipated to be less than 0.3m in depth. Although the nature of sandstone could not be assessed during this investigation, it is anticipated that the upper 0.3m of sandstone would be very low to low strength sandstone. Therefore, excavation for the proposed development is likely to be limited to within soils and very low to low strength sandstone. Therefore, it is considered that excavation of soils and very low to low strength sandstone can be achieved using conventional earthmoving equipment. We do not expect significant groundwater inflow during proposed excavation works.

We recommend the following procedures for placement of controlled fill, where required:

- Strip existing topsoil to expose colluvium or bedrock.
- Undertake proof rolling of the exposed colluvium to detect potentially weak spots (ground heave). Excavate areas of localised heaving to a depth of about 300mm and replace with granular fill, compacted as described below. Proof rolling will not be required if bedrock is exposed after stripping of topsoil.
- Undertake proof rolling of soft spots backfilled with granular fill, as described above. If the backfilled area shows movement during proof rolling, this office should be contacted for further recommendations.
- Fill should be placed in horizontal layers of 200mm to 250mm maximum loose thickness and compacted to a Minimum Dry Density Ratio (MDDR) of 95% Standard, at moisture content within 2% of Optimum Moisture Content (OMC). Controlled fill should preferably comprise non-reactive fill (e.g. crushed sandstone), with a maximum particle size not exceeding 75mm, or low plasticity clay. Colluvium and sandstone obtained from excavations within the site may be selectively used in controlled fill, after moisture conditioning and removal of unsuitable materials.
- Fill placement should be supervised to ensure that material quality, layer thickness, testing frequency and compaction criteria conform to the specifications. We recommend "Level 2" or better supervision, in accordance with Australian Standard AS3798-2007 (Reference 2).

Batter Slopes and Retaining Structures

Cut and fill slopes during and after proposed development works should be battered for stability or retained by engineered retaining structures. Recommend cut and fill slopes in fill for long term stability is 1 Vertical to 2.5 Horizontal. The cut slopes in sandstone bedrock may be vertical.

Cut and fill slopes steeper than those recommended above would need to be retained by engineered retaining structures. Although, battering of slopes is likely to be the preferred option, appropriate retaining structures for the proposed development, if preferred, could comprise gravity walls or cantilever walls.

The design of any retaining structure should also be checked for bearing capacity, overturning, sliding and overall stability of the slope.

Footings
It is our assessment that the sandstone bedrock will be encountered at shallow depths of less than 1.0m. Therefore, we recommend that the footings for the proposed development works are founded on sandstone bedrock.

Loading conditions for the proposed residence are not known at this stage. However, due to shallow depth to sandstone bedrock, we consider appropriate footings would comprise shallow footings (pad and strip footings) founded in sandstone bedrock. The recommended allowable bearing pressure for design of footings founded in sandstone bedrock is 1000kPa.

An experienced Geotechnical Engineer, on the basis of assessment made during footing excavation should confirm appropriate founding levels and allowable bearing pressure during construction. The engineer should also ascertain appropriateness of recommended allowable bearing pressure if footings are founded above and within the 1 Horizontal to 1 Vertical line projected from the base of any excavation or toe of a slope.

General Comment
Based on results of a preliminary geotechnical investigation and a preliminary slope stability assessment, it is our preliminary assessment that the risk of slope instability across the site tolerable for a residential development at its existing conditions and after proposed additions and alterations. Therefore, it is our assessment that the site is suitable for proposed additions and alterations provided the design and construction of the proposed structures are carried out in accordance with recommendations provided in this report. Therefore, signed Forms 1 and 1a required by the council are attached.

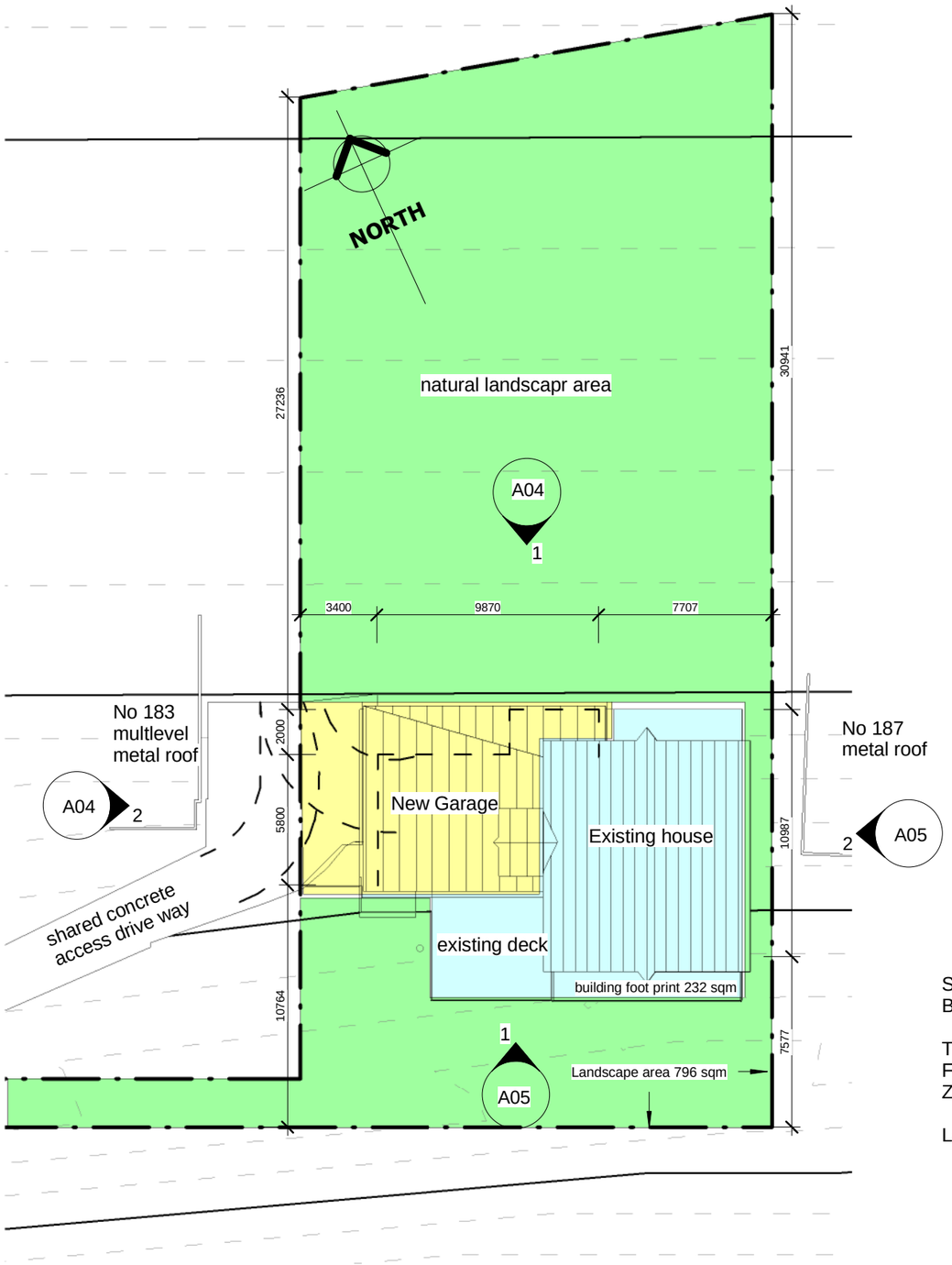
The assessments and recommendations presented in this report are based on site observations and shallow borehole drilled using a hand auger. Therefore, assessments and recommendations presented in this report are based on a generalised sub-surface profile and should be considered as preliminary only. This means that actual sub-surface soil and rock conditions across the site could differ from those expected (generalised). If such differences are encountered during construction, we recommend that this office is contacted immediately for further advice, as the recommendations presented in this report might have to be reassessed.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

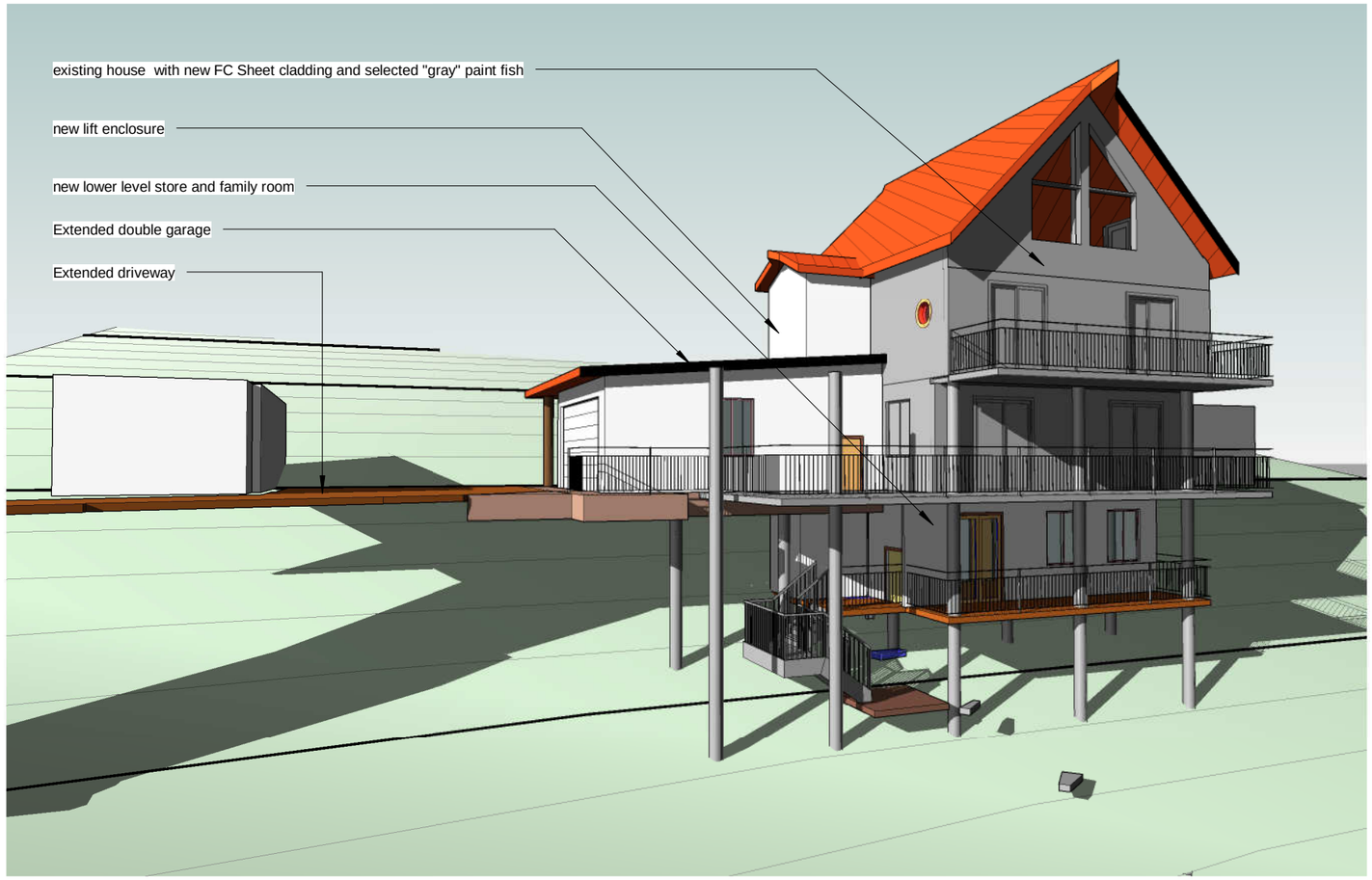
INDRA JWORCHAN
Principal Geotechnical Engineer

Attached Proposed Development Plan
Guidelines for Hillside Constructions
Forms 1 and 1A



1 SITE PLAN

1 : 250



2 External View 1

Site	1277	sqm
Building foot print area	95+137=232	sqm
Total floor area	176	sqm
FSR	0.13 : 1	
Zone E4 Environmental Living		
Landscaparea	83% (60% min.)	

Note ;

Construction of the New work

Metal Roof as existing

Window - metal frame (white) glazing

New FC cladding to external wall with selected paint finish colour "Gray"

External paint colour

DA only

MS Boguadzki

Alteration and Addition @ 185 Prince Alfred Pde Newport NSW 2106

Site plan

AUSDECON
Contact : Hom
Mob:0400 422886
homt@optusnet.com.au

Project number	1915
Date	190824
Drawn by	ht

A01

Scale @ A3 As indicated

All right reserved - romithom

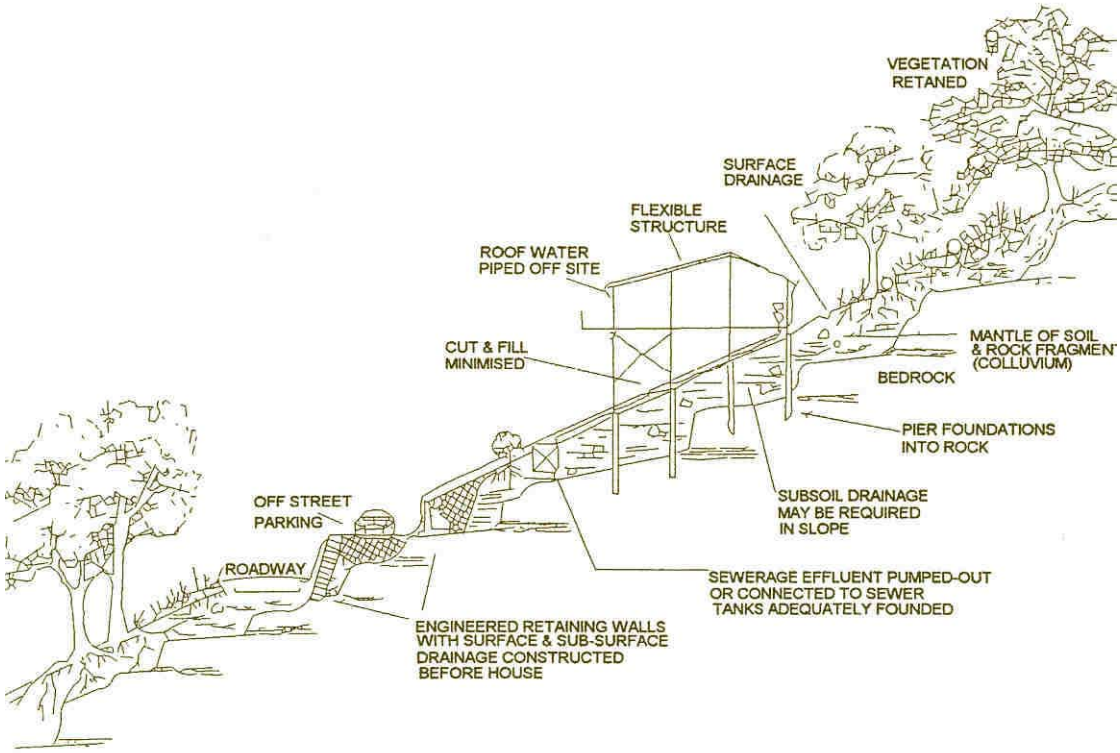
18/02/2020 10:53:20 AM

TABLE 1 SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical consultant 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 of Instability and Implications for Development in mind.	*Plan development without regard for the Risk Instability.*
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickworks, 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.	
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 and compact clean fill materials. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate sub-surface drainage.	*Loose or poorly compacted fill.* *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 become unstable. 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 sub-surface 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 un-reinforced block work* *Lack of sub-surface drains and weep holes.*
FOUNDATIONS	Support on or within rock where practicable. Use rows of piers or strip foundations oriented up and down slope. Design for lateral creep pressures. Backfill foundation 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 generous fall 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.*
SUB-SURFACE	Provide filter around sub-surface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some low risk areas. Storage tanks should be water-tight and adequately founded.	*Discharge sullage directly onto and into slopes.*
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 leak in supply pipes. Where structural distress is evident seek advice. If seepage observed, determine cause or seek advice on consequences.	

This table is an extract from GEOTECHNICAL RISKS ASSOCIATED WITH HILLSIDE DEVELOPMENT as presented in Australian Geomechanics News, Number 10 1985, which discusses the matter more fully.

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE

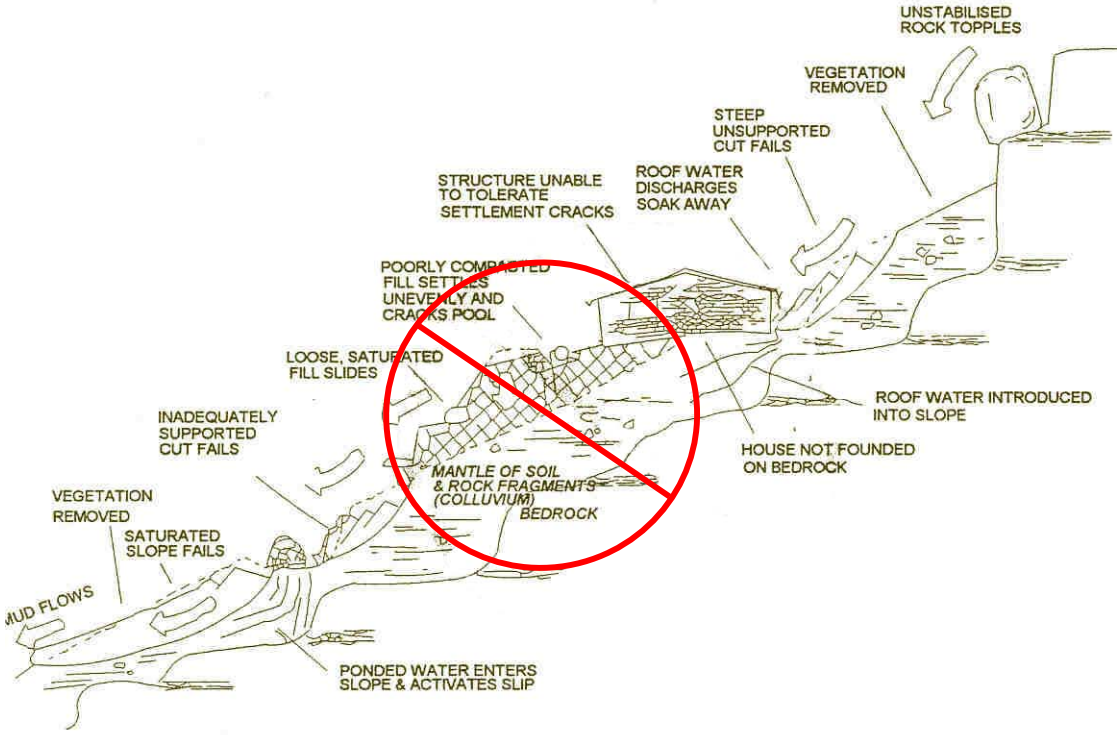


FIGURE 1. ILLUSTRATIONS OF GOOD AN POOR HILLSIDE PRACTICE

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1 – To be submitted with Development Application

Development Application for Ma L Boguradzki c/- S & D Consulting Pty Ltd

Address of site *185 Prince Alfred Parade, Newport*

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

I, Indra Jworchan, on behalf of Geotechnique Pty Ltd

on this the *3 April 2020* certify that I am a geotechnical engineer or engineering geologist 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.

Please mark appropriate box

√ have prepared the 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 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 am of the opinion that the Development Application only involves Minor Development/Alterations that do not require a Detailed Geotechnical Risk Assessment and hence my report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements for Minor Development/Alterations.

□ Provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: *Geotechnical Investigation Report Nos* 14657/1-AA

Report Date: *3 April 2020*

Author*: Indra Jworchan*

Author's Company/Organisation: *Geotechnique Pty Ltd*

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

Australian Geomechanics Society (AGS), Landslide Zoning Working Group. "Guideline for Landslide Susceptibility, Hazard and Risk Zoning for Land Use Planning", Journal and News of Australian Geomechanics Society, Volume 42, No 1, March, 2007.

Pittwater Council, Geotechnical Risk Management Policy for Pittwater- 2009

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 - Indra Jworchan
Chartered Professional Status - CPEng
Membership No.- 806995
Company - Geotechnique Pty Ltd

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

Development Application for Ma L Boguradzki c/- S & D Consulting Pty Ltd

Address of site *185 Prince Alfred Parade, Newport*

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 Investigation Report No* 14657/1-AA

Report Date: *2 April 2020*

Author*: Indra Jworchan*

Author's Company/Organisation: *Geotechnique Pty Ltd*

Please mark appropriate box

√ Comprehensive site mapping conducted 20 March 2020

√ 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 on…20 March 2020……

√ 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 - Indra Jworchan
Chartered Professional Status - CPEng
Membership No.- 806995
Company - Geotechnique Pty Ltd