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

Development Application for _____
Name of Applicant

Address of site 21 Palm Beach Road, Palm Beach

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk ***Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report***

I, Ben White *on behalf of* White Geotechnical Group Pty Ltd
(Insert Name) (Trading or Company Name)

on this the 9/4/19 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 $10million.

I:
Please mark appropriate box

☒ 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 **21 Palm Beach Road, Palm Beach**

Report Date: 9/4/19

Author: BEN WHITE

Author's Company/Organisation: **WHITE GEOTECHNICAL GROUP PTY LTD**

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

Australian Geomechanics Society Landslide Risk Management March 2007.

White Geotechnical Group company archives.

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 Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group 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 _____
Name of Applicant

Address of site 21 Palm Beach Road, Palm Beach

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 **21 Palm Beach Road, Palm Beach**

Report Date: 9/4/19

Author: BEN WHITE

Author's Company/Organisation: WHITE GEOTECHNICAL GROUP PTY LTD

Please mark appropriate box

☒ Comprehensive site mapping conducted **29/3/19**
(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 **1/4/19**

☒ 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 Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group Pty Ltd

GEOTECHNICAL INVESTIGATION:

Proposed New Garage at **21 Palm Beach Road, Palm Beach**

1. Proposed Development

1.1 Demolish the existing garage and construct a new garage in a similar location by excavating to a maximum depth of ~0.8m into the slope.

1.2 Details of the proposed development are shown on 8 drawings prepared by Network Design, issue DA, sheets numbered 1-4, dated December 2018.

2. Site Description

2.1 The site was inspected on the 29th March, 2019.

2.2 This residential property is on the low side of the road and has a W aspect. It is located on the moderately graded upper middle reaches of a hillslope. From the road frontage, the slope falls at an average angle of ~18° to the downhill boundary. The natural slope below the property continues at moderate angles. The grade above the block eases as the crest of the slope is approached.

2.3 At the road frontage a concrete driveway runs down and across the slope to a garage and gravel parking area on the N side of the property (Photos 1 & 2). The garage will be demolished as part of the proposed works. Fill has been placed on the slope to level an area for a lawn to the N of the gravel parking area (Photo 3). The fill is battered at stable angles and has been planted with native vegetation to stabilise the slope (Photo 4). A moderately sloping garden encompasses the area between the road frontage and the house (Photo 5). An excavation to a maximum depth of ~1.2m has been made on the uphill side of the house to level an area for the house and for a paved patio (Photo 6). The cut is supported by a stable dimensioned sandstone block wall. The part two storey sandstone block, timber framed and clad house is supported

on sandstone block walls and sandstone block piers (Photo 7). No significant signs of movement or cracking were observed in the external supporting walls of the house and the supporting sandstone block piers stand vertical. The slope on either side of the house has been terraced with stable, rough sandstone block retaining walls that reach a maximum height of ~0.5m (Photo 8). Some of the walls have been constructed over sandstone boulders that are sitting in stable positions. Sandstone boulders and smaller joint blocks scatter the slope across the site (Photo 9). The boulders and joint blocks appear to have been in place for some time and are in stable positions. A bed of Medium Strength Sandstone outcrops in the NW corner of the property (Photo 10). The remains of a mortared sandstone block building sit upon the sandstone bed. A narrow lawn extends along the downhill boundary. The garage will be demolished as part of the proposed works.

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Narrabeen Group Rocks with the contact of the Hawkesbury Sandstone along the road frontage. Narrabeen Group Rocks are described as interbedded laminite, shale and quartz to lithic quartz sandstone. The Hawkesbury sandstone is described as a medium to coarse grained quartz sandstone with very minor shale and laminate lenses.

4. Subsurface Investigation

Three Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. The locations of the tests are shown on the site plan. It should be noted that a level of caution should be applied to interpreting DCP test results. The test will not pass through hard buried objects so in some instances it can be difficult to determine whether refusal has occurred on an obstruction in the profile or on the natural rock surface. This is not expected to be an issue for the testing on this site and the results are as follows:

DCP TEST RESULTS – Dynamic Cone Penetrometer			
Equipment: 9kg hammer, 510mm drop, conical tip.			Standard: AS1289.6.3.2- 1997
Depth(m) **Blows/0.3m**	**DCP 1** (~RL30.7)	**DCP 2** (~RL28.1)	**DCP 3** (~RL26.7)
0.0 to 0.3	4	6	1F
0.3 to 0.6	4	4	13
0.6 to 0.9	15	8	29
0.9 to 1.2	15	18	#
1.2 to 1.5	10F	12	
1.5 to 1.8	8	#	
1.8 to 2.1	13		
2.1 to 2.4	24		
2.4 to 2.7	40		
2.7 to 3.0	#		
	End of Test @ 2.7m	Refusal on Rock @ 1.4m	Refusal on Rock @ 0.9m

#refusal/end of test. F=DCP fell after being struck showing little resistance through all or part of the interval.

DCP Notes:
DCP1 – End of test @ 2.7m, DCP still very slowly going down, yellow clay on wet tip.
DCP2 – Refusal on rock @ 1.4m, DCP bouncing off rock surface, white impact dust on dry tip.
DCP3 – Refusal on rock @ 0.9 m, DCP bouncing off rock surface, white impact dust on dry tip.

5. Geological Observations /Interpretation

The natural slope materials are colluvial at the near surface and residual at depth. In the test locations, the ground materials consist of a sandy topsoil over firm to stiff clays to depths of between ~0.6 to 2.2m below the current ground surface. Fill to a maximum depth of ~1.5m has been paced on the slope to level an area for the gravel parking space. No other fills were encountered or observed during the testing on the site. The test results on the high side of the proposed garage show a weathered rock profile (DCP1) while the results on the downhill side (DCP 2 and 3) are typical of a Medium Strength Sandstone profile. To account for this

variability in terms of bearing pressure we consider the rock to be very low strength. It is to be noted that this material can appear as a mottled stiff clay when it is cut up by excavation equipment. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Normal ground water seepage is expected to move over the exposed rock and the buried surface of the rock and through the cracks. Due to the slope and elevation of the block, the water table is expected to be many metres below the base of the proposed excavation.

7. Surface Water

No evidence of significant surface flows were observed on the property during the inspection. Normal sheet wash from the slope above will be intercepted by the street drainage system.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above or beside the property. The moderate slope that falls across the property and continues below is a potential hazard (**Hazard One**). The proposed excavation for the storage room is a potential hazard until retaining walls are installed. (**Hazard Two**).

SEE OVER THE PAGE FOR HAZARD RISK ANALYSIS

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The moderate slope that falls across the property and continues below failing onto on the proposed works.	The cut for the storage room collapsing onto the worksite before retaining walls are in place.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Minor (8%)	'Minor' (8%)
RISK TO PROPERTY	'low' (2×10^{-6})	'Moderate' (2×10^{-5})
RISK TO LIFE	2.7×10^{-7}/annum	2.7×10^{-7}/annum
COMMENTS	This level of risk to life and property is '**ACCEPTABLE'**.	This level of risk to property is '**UNACCEPTABLE'**. To move the risk levels to acceptable levels the recommendations in **Section 13** are to be followed.

(See Aust. Geomech. Jnl. Mar 2007 Vol. 42 No 1, for full explanation of terms)

9. Suitability of the Proposed Development for the Site

The proposed development is suitable for the site. No geotechnical hazards will be created by the completion of the proposed development provided it is carried out in accordance with the requirements of this report and good engineering and building practice.

10. Stormwater

Accounting for the existing garage the new garage will not add significant stormwater runoff to the site.

11. Excavations

An excavation to a maximum depth of ~0.8m is required to install a storage level under the proposed garage. It is expected to be through fill, topsoil and possibly clay. It is envisaged that

excavations through fill, soil and clay can be carried out with a bucket only. No excavations through rock are expected.

12. Vibrations

Possible vibrations generated during excavations through sandy soil and clays will be below the threshold limit for building damage.

13. Excavation Support Requirements

The small cut for the proposed storage level under the garage will stand at near vertical angles for a short period of time until the retaining walls are in place, provided the cut is prevented from becoming saturated.

The cut batters are to be covered to prevent access of water in wet weather and loss of moisture in dry weather. The covers are to be tied down with metal pegs or other suitable fixtures so they can't blow off in a storm. Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. The materials and labour to construct the retaining walls are to be organised, so on completion of the excavation, they can be constructed as soon as possible. The excavation is to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast.

Excavation spoil is to be removed from site.

14. Retaining Walls

For cantilever or singly propped retaining walls it is suggested the design be based on a triangular distribution of lateral pressures using the parameters shown in Table 1.

SEE OVER THE PAGE FOR TABLE 1

Table 1 – Likely Earth Pressures for Retaining Walls

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill and Sandy Soil	20	0.40	0.55
Residual Clays	20	0.35	0.45

For rock classes refer to Pells et al "Design Loadings for Foundations on Shale and Sandstone in the Sydney Region". Australian Geomechanics Journal 1978.

It is to be noted that the earth pressures in Table 1 do not account for any surcharge loads, assume the surface above the wall is near level and retaining walls are fully drained. Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining walls are to have sufficient back wall drainage and be backfilled immediately behind the wall with free draining material (such as gravel). This material is to be wrapped in a non-woven Geotextile fabric (i.e. Bidim A34 or similar), to prevent the drainage from becoming clogged with silt and clay. If no back wall drainage is installed in retaining walls, the likely hydrostatic pressures are to be accounted for in the structural design.

15. Foundations

Piers supported on the underlying Very Low Strength Rock is a suitable bearing material for the proposed garage and storage room. A maximum allowable bearing pressure of 600kPa can be assumed for footings supported on Very Low Strength Rock.

It is recommended the footings be dug, inspected and poured in quick succession (ideally the same day if possible). If the footings get wet, they will have to be drained and the soft wet layer of shale on the footing surface will have to be removed before concrete is poured.

If a rapid turnaround from footing excavation to the concrete pour is not possible, a sealing layer of concrete may be added to the footing surface after it has been cleaned.

NOTE: If the contractor is unsure of the footing material required, it is more cost-effective to get the geotechnical consultant on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over-excavation in clay-like shaly-rock but can be valuable in all types of geology.

16. Inspection

The client and builder are to familiarise themselves with the following required inspection as well as council geotechnical policy. We cannot provide geotechnical certification for the owner or the regulating authorities if the following inspection has not been carried out during the construction process.

- All footings are to be inspected and approved by the geotechnical consultant while the excavation equipment is still onsite and before steel reinforcing is placed or concrete is poured.

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Important Information about Your Report

It should be noted that Geotechnical Reports are documents that build a picture of the subsurface conditions from the observation of surface features and testing carried out at specific points on the site. The spacing and location of the test points can be limited by the location of existing structures on the site or by budget and time constraints of the client. Additionally the test themselves, although chosen for their suitability for the particular project, have their own limiting factors. The testing gives accurate information at the location of the test, within the confines of the tests capability. A geological interpretation or model is developed by joining these test points using all available data and drawing on previous experience of the geotechnical consultant. Even the most experienced practitioners cannot determine every possible feature or change that may lie below the earth. All of the subsurface features can only be known when they are revealed by excavation. As such a Geotechnical report can be considered an interpretive document. It is based on factual data but also on opinion and judgement that comes with a level of uncertainty. This information is provided to help explain the nature and limitations of your report.

With this in mind, the following points are to be noted:

- If upon the commencement of the works the subsurface ground or ground water conditions prove different from those described in this report it is advisable to contact White Geotechnical Group immediately, as problems relating to the ground works phase of construction are far easier and less costly to overcome if they are addressed early.

- If this report is used by other professionals during the design or construction process any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

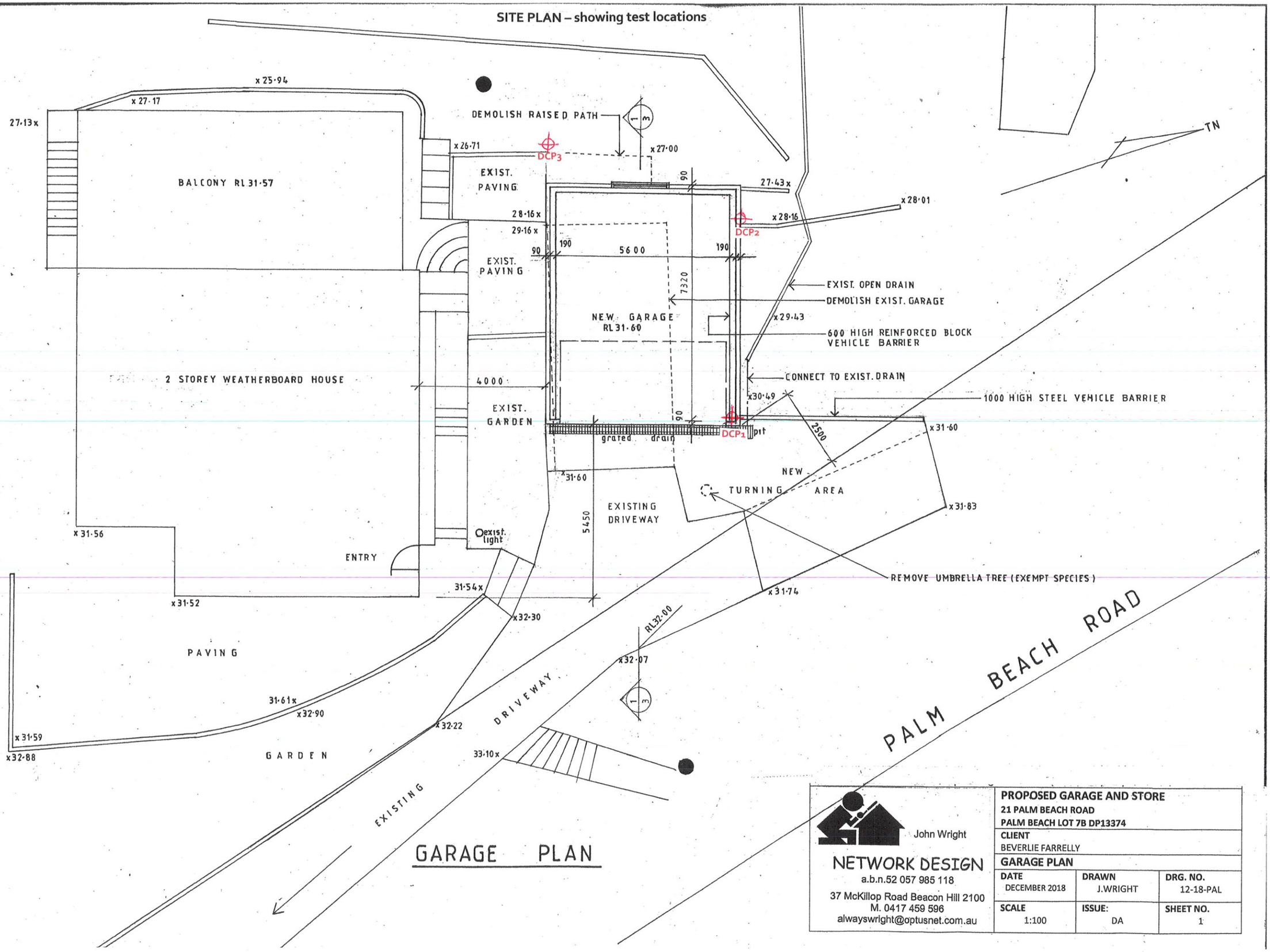
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- This report should not be applied to any other project other than that outlined in section 1.0.

- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report contact White Geotechnical Group. We are familiar with a variety of techniques to reduce risk and can advise if your proposed methods are suitable for the site conditions.

SITE PLAN – showing test locations

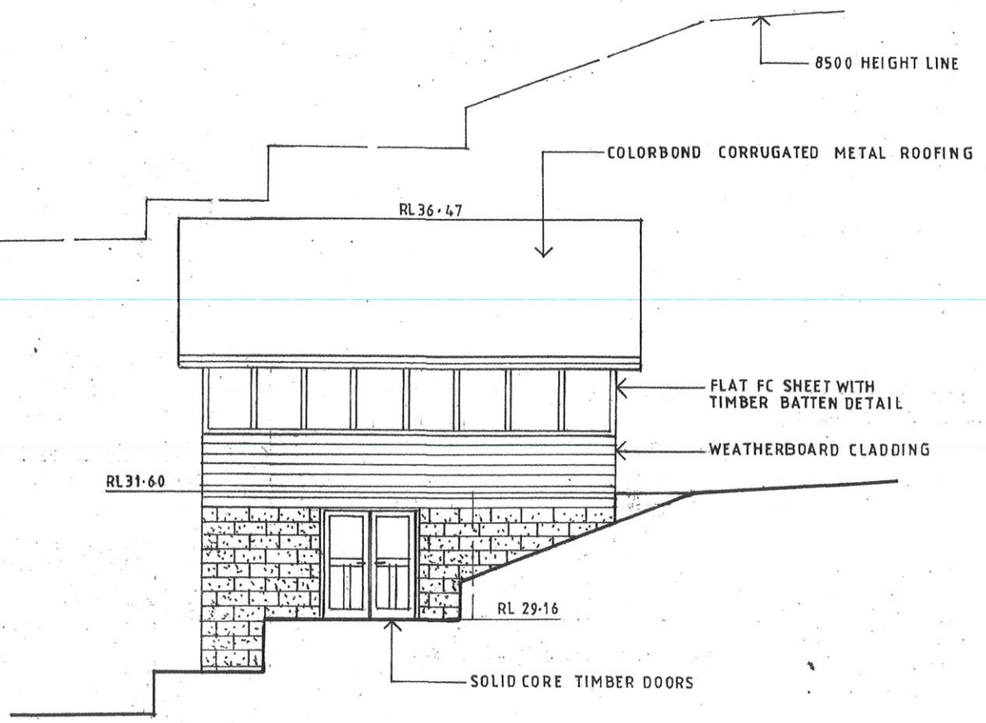


GARAGE PLAN

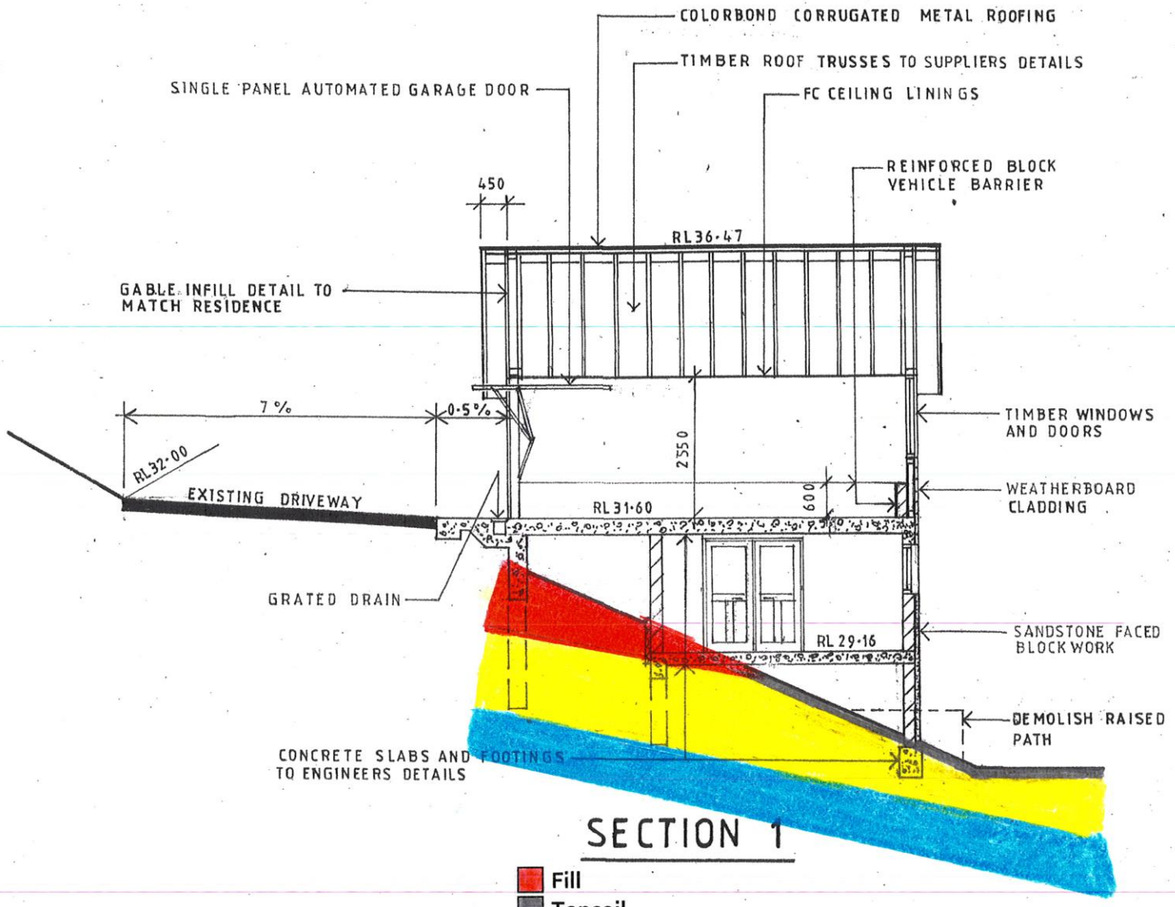
John Wright
NETWORK DESIGN
a.b.n.52 057 985 118
37 McKillop Road Beacon Hill 2100
M. 0417 459 596
alwayswright@optusnet.com.au

PROPOSED GARAGE AND STORE **21 PALM BEACH ROAD** **PALM BEACH LOT 7B DP13374**		
CLIENT BEVERLIE FARRELLY		
GARAGE PLAN		
DATE DECEMBER 2018	**DRAWN** J.WRIGHT	**DRG. NO.** 12-18-PAL
SCALE 1:100	**ISSUE:** DA	**SHEET NO.** 1

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



SOUTH ELEVATION



SECTION 1

- Fill
- Topsoil
- Sandy Clay and Clay – Firm to Stiff
- Very Low Strength Rock

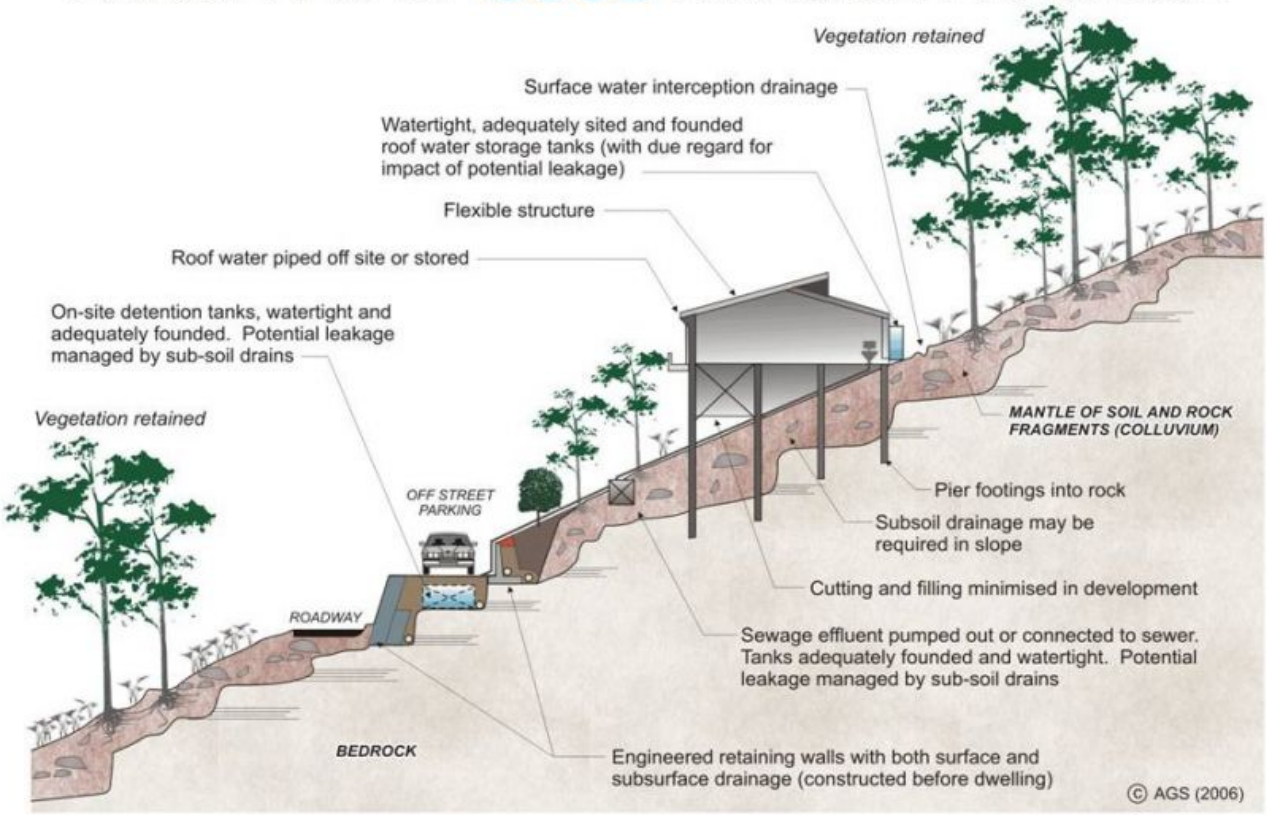
Notes

1. All dimensions to be checked on site by builder prior to the commencement of works. Figured dimensions to be used. Do not scale drawing. All dimensions in millimetres unless shown otherwise.
2. All concrete works to be in accordance with AS3600 and Engineers plans and specifications.
3. All timber framing to AS1684 & 1720 and Engineers details where relevant.
4. All brick and blockwork to be in accordance with AS3700.
5. All new glazing to be in accordance with AS1288. Windows and doors to be installed in accordance with manufacturers specifications. Flashing details to comply with the relevant exposure condition for each window or door.
6. All works generally to be in accordance with local council bylaws and the Building Code of Australia.
7. All work to be left in a safe and stable condition at the end of each day.

John Wright
NETWORK DESIGN
a.b.n.52 057 985 118
37 McKillop Road Beacon Hill 2100
M. 0417 459 596
alwayswright@optusnet.com.au

PROPOSED GARAGE AND STORE **21 PALM BEACH ROAD** **PALM BEACH LOT 7B DP13374**		
CLIENT BEVERLIE FARRELLY		
SOUTH ELEVATION AND SECTION		
DATE DECEMBER 2018	**DRAWN** J.WRIGHT	**DRG. NO.** 12-18-PAL
SCALE 1:100	**ISSUE:** DA	**SHEET NO.** 3

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE