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

Development Application for _____
Name of Applicant

Address of site 32 Nareen Parade, North Narrabeen

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 29/11/24 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 **32 Nareen Parade, North Narrabeen**

Report Date: 28/11/24

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 MScGEOL AIG., RPGeo

Membership No. 10306

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 32 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 **32 Nareen Parade, North Narrabeen**

Report Date: 28/11/24

Author: BEN WHITE

Author's Company/Organisation: **White Geotechnical Group Pty Ltd**

Please mark appropriate box

☒ Comprehensive site mapping conducted **10/4/24**
(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 **10/4/24**

☒ 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 MScGEOL AIG., RPGeo

Membership No. 222757

Company **White Geotechnical Group Pty Ltd**

GEOTECHNICAL INVESTIGATION:

New Spa and Storeroom at **32 Nareen Parade, North Narrabeen**

1. Proposed Development

1.1 Install a spa and deck on the NW side of the property by excavating to a maximum depth of ~1.0m.

1.2 Construct a new store room by excavating to a maximum depth of ~0.8m.

1.3 Details of the proposed development are shown on 9 drawing prepared by Drafting Help, project number, drawings numbered 1 to 9, dated 27.09.2022.

2. Site Description

2.1 The site was inspected on the 10th April, 2024.

2.2 This residential property accessed by a Right of Carriageway (ROW) off the high side of Nareen Parade and has a SW aspect. It is located on the steeply graded middle reaches of a hillslope. The natural slope rises across the property at steep angles. The slope above and below the property continues at similar angles.

2.3 At the road frontage, a concrete ROW runs up the slope to a parking area and garage on the downhill side of the property (Photo 1). The slope below the ROW has partially collapsed and has undercut the ROW. The owner informed us it is currently undergoing remediation works by another geotechnical firm. The cut for the garage is supported by a ~2.5m high retaining wall (Photo 2). This wall is clad and its condition could not be assessed but no significant signs of tilting were visible. A series of stable timber log retaining walls reaching up to ~0.8m high terrace the slope between the garage and the house (Photo 3). A series of stable timber retaining walls between ~0.6m and ~1.0m step up past a suspended timber studio and terrace the steeply

sloping lawn area above the house (Photos 4 -6). The lawn and garden area extend to the upper boundary (Photo 7).

3. Geology

The Sydney 1:100 000 Geological Sheet indicates the site is underlain by the Newport Formation of the Narrabeen Group. This is described as interbedded laminite, shale, and quartz to lithic-quartz sandstone.

4. Subsurface Investigation

One hand Auger Hole (AH) was put down to identify soil materials. Four Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to weathered rock. The locations of the tests are shown on the site plan attached. It should be noted that a level of caution should be applied when 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. However, excavation and foundation budgets should always allow for the possibility that the interpreted ground conditions in this report vary from those encountered during excavations. See the appended "Important information about your report" for a more comprehensive explanation. The results are as follows:

AUGER HOLE 1 (~RL29.0) **–** AH1 (Photo 8)

Depth (m)	**Material Encountered**
0.0 to 0.2	**FILL**, brown and yellow clay, fine grained, stiff, dry.
0.2 to 1.0	**CLAY**, orange, fine grained, stiff, dry.

Refusal on Rock @ 1.0m. Auger grinding. No water table encountered.

DCP RESULTS ON THE NEXT PAGE

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** (~RL28.0)	**DCP 2** (~RL29.5)	**DCP 3** (~RL29.5)	**DCP 4** (~RL28.0)
0.0 to 0.3	2	3	3	3
0.3 to 0.6	3	7	7	5
0.6 to 0.9	7	24	23	11
0.9 to 1.2	31	24	12	23
1.2 to 1.5	#	#	#	31
1.5 to 1.8				#
	Refusal on Rock @ 1.2m	Refusal on Rock @ 1.2m	Refusal on Rock @ 1.1m	Refusal on Rock @ 1.3m

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

DCP Notes:

DCP1 – Refusal on rock @ 1.2m, DCP bouncing off rock surface, orange clay on dry tip.
DCP2 – Refusal on rock @ 1.2m, DCP bouncing off rock surface, orange clay on dry tip.
DCP3 – Refusal on rock @ 1.1m, DCP bouncing off rock surface, orange clay on dry tip.
DCP4 – Refusal on rock @ 1.3m, DCP bouncing off rock surface, orange clay on dry tip.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the test locations, the ground materials consist of shallow soils over clays. The clay merges into the underlying weathered rock at depths of between ~0.9m to ~1.2m below the current surface. The weathered zone is interpreted to be Very Low Strength Rock or better. 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 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 works.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours. This will move down the slope at a relatively high velocity due to the steep slope.

It is recommended as part of the development a cut off drain be installed across the upper reaches of the site to catch surface flows from the slope above. The captured flows from this drain should be piped to the street. All drains, pits and associated plumbing are to be oversized and designed to cope with extreme prolonged rainfall events. The drain is to be designed by a stormwater/civil engineer in consultation with the geotechnical consultant. It is a condition of the slope stability assessment in Section 8 (**Hazard One**) that this be done.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above or beside the property. The steeply graded slope that rises across the property and continues below is a potential hazard (**Hazard One**). The proposed excavations are a potential hazard until retaining structures are in place (**Hazard Two**). The proposed excavations undercutting the footings for the house is a potential hazard (**Hazard Three**).

RISK ANALYSIS SUMMARY ON THE NEXT PAGE

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The steep slope that rises across the property and continues above and below failing and impacting on the proposed works.	The excavations (to a maximum depth of 1.0m) collapsing onto the work site before retaining structures are in place.	The proposed excavations undercutting the footings of the house causing failure.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (15%)	'Medium' (15%)	'Medium' (35%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	9.1×10^{-7}/annum	8.3×10^{-6}/annum	5.3×10^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE', provided the recommendations in **Section 7 & 13** are followed.	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 13 and 14** are to be followed.	This level of risk to life and property is 'UNACCEPTABLE'. To move risk 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

The fall is to Nareen Parade. Roof water from the development is to be piped to the street drainage system through any tanks that may be required by the regulating authorities.

11. Excavations

An excavation to a maximum depth of ~1.0m is required to install the proposed spa. A second excavation to a maximum depth of ~0.8m is required to construct the proposed storage room.

The excavations are expected to be through shallow soil over clay with Very Low Strength Rock or better expected at depths of between ~0.9m to ~1.2m in the area of the proposed excavation. It is envisaged that excavations through soil, clay, and Extremely Low Strength Shale can be carried out with an excavator and toothed bucket.

12. Vibrations

No excessive vibrations will be generated by excavation through soil, sandy clay, and Extremely Low Strength Shale. Any vibrations generated by a domestic machine and bucket up to 20 tonne carrying out excavation works will be below the threshold limit for infrastructure or building damage.

13. Excavation Support Requirements

Bulk excavation for the proposed spa

The excavation for the proposed spa will reach a maximum depth of ~1.0m.

No structures or boundaries are expected to lie within the zone of influence of the proposed excavation.

The soil, clay, and rock up to Very Low Strength Rock portions of the proposed spa excavation are expected to stand at near-vertical angles for short periods of time until the spa structure is installed, provided the cut batters are kept from becoming saturated. If the cut batters through soil and clay remain unsupported for more than a day before spa construction commences, they are to be supported with typical pool shoring until the spa structure is in place.

Bulk excavation for the proposed storeroom

The excavation for the proposed storeroom will reach a maximum depth of ~0.8m. Allowing 0.5m for back wall drainage, the setbacks from the proposed excavation to the existing structures/boundaries are as follows:

- Flush with the supporting posts of the existing house.
- ~0.5m from the NW common boundary.

As such, the posts of the existing house and the NW common boundary will lie within the zone of influence of the proposed excavation. In this instance, the zone of influence is the area above a theoretical 45° line from the base of the excavation towards the surrounding structures and boundaries. This line reduces to 30° through the fill and soil.

As such, any walls and piers that fall within the footprint of the excavations are to be removed and the house be propped and supported with beams prior to the excavation through rock commencing.

Where the remaining posts of the subject house fall within the zone of influence of the excavation, exploration pits will need to be put down by the builder to determine the foundation depth and material. These are to be inspected by the geotechnical consultant.

The house will need to be propped with the props supported beyond the zone of influence of the proposed store room excavation. Alternatively, the supporting posts can be underpinned to rock or to below the zone of influence of the cut prior to the excavation commencing. See the site plan attached for the minimum extent of the required underpinning.

Where room permits, the fill and soil portion of the excavation is expected to stand temporarily at batter angles of 30° (1.0 Vertical to 1.7 Horizontal). Where there is not room for these batters, such as along the NW side of the excavation, the excavation through fill and soil will need to be temporarily or permanently supported prior to the commencement of the excavation, or during the excavation process in a staged manner, so cut batters are not left unsupported. The support will need to be designed / approved by the structural engineer. See the site plan attached for the minimum extent of the required shoring.

Advice applying to both excavations

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters through fill, soil, and clay 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 cannot blow off in a storm. The materials and labour to construct the pool structure/retaining walls are to be organised so on completion of the excavations they can be constructed as soon as possible. The excavations are to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast.

All excavation spoil is to be removed from site following the current Environmental Protection Agency (EPA) waste classification guidelines.

14. Retaining Structures

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

Table 1 – Likely Earth Pressures for Retaining Structures

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill and Topsoil	20	0.40	0.55
Residual Clays	20	0.35	0.45
Extremely Low Strength Rock	22	0.25	0.38
Very Low Strength Rock	22	0.22	0.35

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 assume a level surface above the structure, do not account for any surcharge loads from the slope and assume retaining structures are fully drained. Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining structures are to have sufficient back-wall drainage and be backfilled immediately behind the structure 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 structures the full hydrostatic pressures are to be accounted for in the retaining structure design.

15. Foundations

The proposed spa is to be supported on piers embedded at least 1.0m into Very Low Strength Rock or better and taken to below the base of the downslope garage retaining wall. Provided the footings are taken to and embedded into this ground material at the required depths no surcharge loads from the proposed structure will be transferred onto the existing retaining wall.

The storeroom can be supported on piers taken to the underlying Very Low Strength Rock or better,

A maximum allowable bearing pressure of 600kPa can be assumed for footings on Very Low Strength Rock. It should be noted that this material is a soft rock and a rock auger will cut through it so the builders should not be looking for refusal to end the footings.

As the bearing capacity of clay and shale reduces when it is wet, we recommend 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 layer of wet clay or 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. Site Maintenance

Where slopes approach or exceed 20°, such as on this site, it is prudent for the owners to occasionally inspect the slope (say annually or after heavy rainfall events, whichever occurs first). Should any of the following be observed: movement or cracking in retaining walls, cracking in any structures, cracking or movement in the slope surface, tilting or movement in established trees, leaking pipes, or newly observed flowing water, or changes in the erosional process or drainage regime, then a geotechnical consultant should be engaged to assess the slope. We can carry out these inspections upon request. The risk assessment in **Section 8** is subject to this site maintenance being carried out.

17. Geotechnical Review

The structural plans are to be checked and certified by the geotechnical engineer as being in accordance with the geotechnical recommendations. On completion, a Form 2B will be issued. This form is required for the Construction Certificate to proceed.

18. Inspections

The client and builder are to familiarise themselves with the following required inspections as well as council geotechnical policy. We cannot provide geotechnical certification for the owners and Occupation Certificate if the following inspections have not been carried out during the construction process.

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

White Geotechnical Group Pty Ltd.

Tyler Jay Johns
BEng (Civil)(Hons),
Geotechnical Engineer.

Reviewed By:

Nathan Gardner B.Sc. (Geol. & Geophys. & Env. Stud.)
AIG., RPGeo Geotechnical & Engineering.
No. 10307
Engineering Geologist & Environmental Scientist.

REGISTERED PROFESSIONAL GEOSCIENTIST
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
NATHAN GARDNER
RPGeo No:
10307

Photo 1

Photo 2

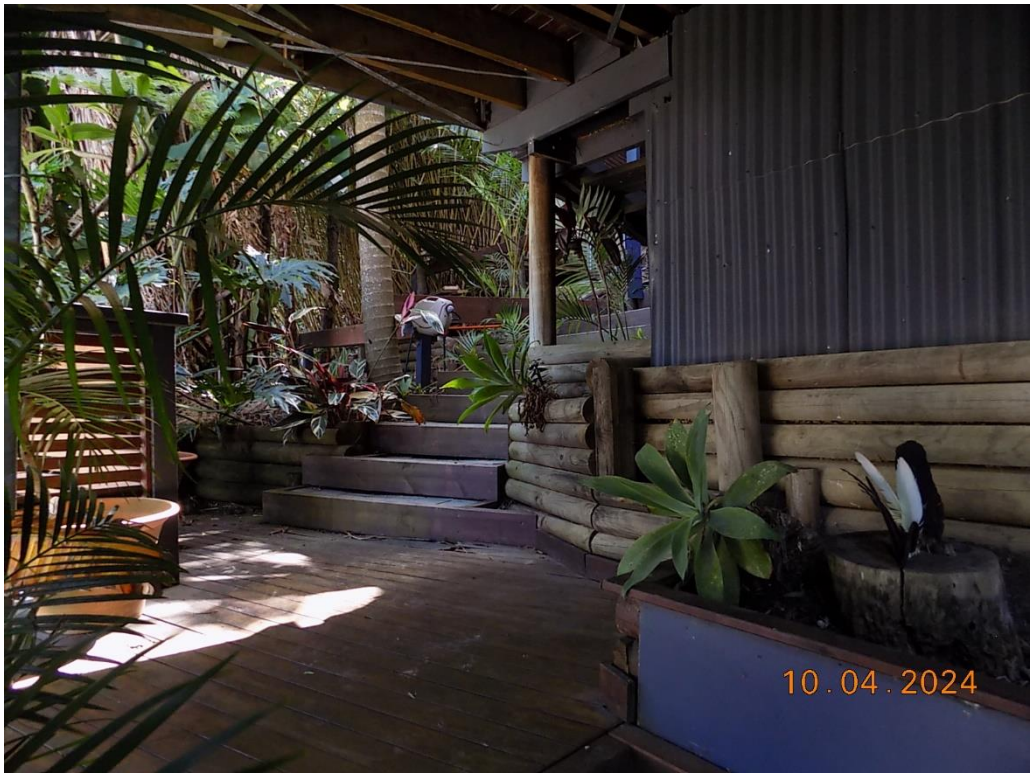


Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8 (Top to Bottom)

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 test's 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 SURVEY – showing test locations and required exploration pits / underpinning

THIS DETAIL IS NOT A 'LAND SURVEY" AS DEFINED BY THE BY THE SURVEYING AND SPATIAL INFORMATION ACT 2002. ANY BUILDING, CONSTRUCTION OR FENCING WILL REQUIRE A FURTHER SURVEY TO BE UNDERTAKEN TO DETERMINE AND MARK THE BOUNDARIES. THIS PLAN IS TO BE USED FOR DETAIL PURPOSES ONLY AND BOUNDARIES SHOWN ON THIS PLAN ARE NOT TO BE USED FOR ANY BUILDING OR FENCING SET OUT.

THIS SURVEY IS LIMITED TO THOSE PARTS OF THE SUBJECT BUILDING AND ANY OTHER IMPROVEMENTS AND SERVICES THAT WERE VISIBLE AND ACCESIBLE.

ALL SERVICES MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. AN INDEPENDANT AND UPDATED INQUIRY OF "DIAL BEFORE YOU DIG" AND ANY RELEVANT SERVICE PROVIDERS TO ASCERTAIN THE EXISTENCE OF ANY FURTHER SERVICES NOT VISIBLE AT THE TIME OF THIS SURVEY.

ANY STRUCTURES RELATED TO PHYSICAL FEATURES (BUILDINGS, TREES, SERVICES, ETC) MUST BE CONFIRMED PRIOR TO FINAL DESIGN. THE DIAMETER OF TREE TRUNKS CONTAINED WITHIN TREE SYMBOLS MAY BE NOT TO SCALE AND MAY BE INDICATIVE ONLY. PLEASE CONFIRM TRUNK DIAMETER, SPREAD AND HEIGHT NOTED ON THE PLAN.

THE BEARINGS ON THESE PLAN BOUNDARIES ARE FROM LAND AND PROPERTY INFORMATION PLANS. THEY ARE ON ISG NORTH. IF ACCURATE TRUE NORTH IS REQUIRED A FURTHER SURVEY WOULD BE NECESSARY.

LEVELS SHOWN ARE TO AUSTRALIAN HEIGHT DATUM. ORIGIN OF RL'S; SSM 40945 - RL 2.383 (A.H.D.)

SCHEDULE OF EASEMENTS

B- EASEMENT FOR SERVICES 1 WIDE & VARIABLE

D- EASEMENT FOR DRAINAGE OF WATER 1 WIDE & VARIABLE WIDTH.

G- RIGHT OF CARRIAGEWAY & EASEMENT FOR DRAINAGE OF WATER VARIABLE WIDTH.

H - RIGHT OF CARRIAGEWAY VARIABLE WIDTH.

TRUE NORTH SURVEYS

16 / 9 NARABANG WAY, BELROSE 2085

TEL : 94500868 FAX : 94500268 EMAIL: admin@truenorthsurveys.com.au

PROJECT : PLAN SHOWING PARTIAL DETAIL AND LEVELS OVER LOT 422 IN DP 1004511. AT No.32 NAREEN PARADE, NORTH NARRABEEN.

SHEET No. 1 **OF** 1 **SHEETS**

DRAWING No. : 8610DU

CLIENT : MR DEAN DALLWITZ

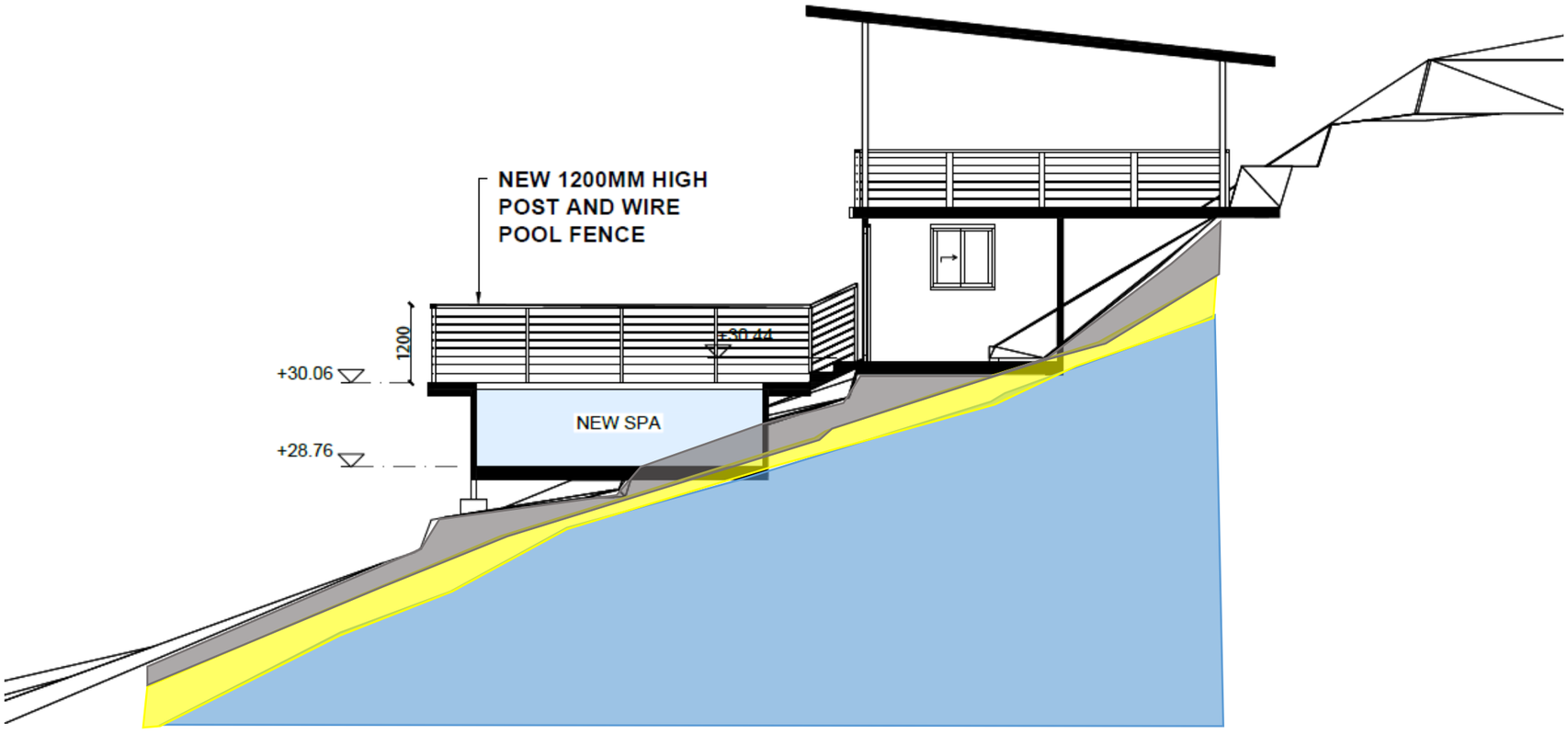
JOB REF : 8610

DATUM : A.H.D **DATE :** 29/06/2017 **SCALE :** 1 : 100

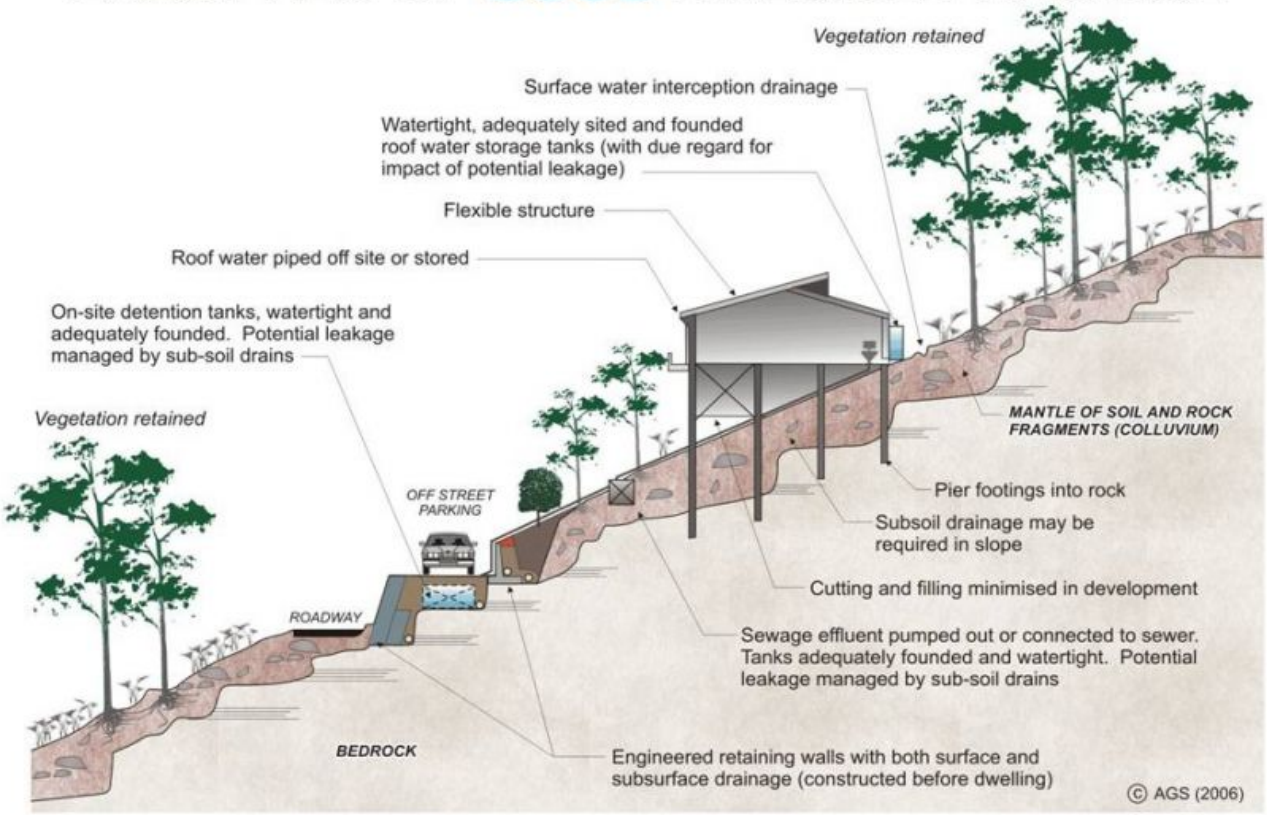
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

Expected Ground Materials

- Fill
- Topsoil
- Clay – Firm to Stiff
- Narrabeen Group Rocks – Extremely Low Strength Rock or better - *after being cut up by excavation equipment can resemble a stiff to hard clay.*



EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE