

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

Development Application for _____
Name of Applicant

Address of site 47 Elaine Avenue, Avalon 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 7/12/21 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 47 Elaine Avenue, Avalon Beach
Report Date: 7/12/21

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	<u>47 Elaine Avenue, Avalon Beach</u>

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 <u>47 Elaine Avenue, Avalon Beach</u>
Report Date: <u>7/12/21</u>
Author: <u>BEN WHITE</u>
Author's Company/Organisation: <u>WHITE GEOTECHNICAL GROUP PTY LTD</u>

Please mark appropriate box

- ☒ Comprehensive site mapping conducted 26/11/21
(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 26/11/21
- ☒ 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:

New Pool at **47 Elaine Avenue, Avalon Beach**

1. Proposed Development

- 1.1** Install a pool on the E side of the property by excavating to a maximum depth of ~1.5m.
- 1.2** Details of the proposed development are shown on 3 drawings prepared by Right Angle Design & Drafting, project number RADD21026, drawings numbered P1 to P3, dated March, 2021.

2. Site Description

- 2.1** The site was inspected on the 26th November, 2021.
- 2.2** This residential property is level with the road and has an E aspect. It is located on the level to gently graded lower reaches and toe of a hillslope. The natural slope falls across the property at an average angle of <5°. A concrete-lined drainage channel runs through a gully immediately below the lower boundary. The slope above continues at gradually increasing angles.
- 2.3** At the road frontage, a concrete driveway runs to a carport attached to the W side of the house (Photo 1). In between the road frontage and the house is a level lawn area. The part two storey timber framed and clad house is supported on timber posts (Photos 2 & 3). The timber posts appear to stand vertical. A gently sloping lawn area extends from the E side of the house to the lower boundary (Photo 4). A concrete retaining wall supports the cut for a concrete-lined drainage channel immediately beyond the lower boundary (Photo 5).

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Alluvial Stream and Estuarine Sediment (Qha). Given the ground test results, the Newport Formation of the Narrabeen Group is expected to underlie the proposed works. 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 (~RL2.75) – AH1 (Photo 6)

Depth (m)	Material Encountered
0.0 to 0.3	FILL , dark brown clayey soil, fine to medium grained, loose, fine trace of organic matter, dry.
0.3 to 0.6	FILL , yellow and brown, fine grained, stiff, dry.
0.6 to 0.8	CLAY , black and yellow, fine grain, stiff to hard, dry.
0.8 to 0.9	CLAY , mottled yellow and maroon, hard, dry.

End of test @ 0.9m. No water table encountered.

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 (~RL2.8)	DCP 2 (~RL2.7)	DCP 3 (~RL2.8)	DCP 4 (~RL2.7)
0.0 to 0.3	4	6	7	5
0.3 to 0.6	6	11	7	7
0.6 to 0.9	11	19	18	12
0.9 to 1.2	37	11	27	12
1.2 to 1.5	#	8	35	12
1.5 to 1.8		27	#	22
1.8 to 2.1		52		34
2.1 to 2.4		#		#
	End of Test @ 1.2m	End of Test @ 2.1m	End of Test @ 1.4m	End of Test @ 2.1m

#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 @ 1.2m, DCP still going down slowly, dark brown clay on wet tip, dark brown clay smeared 0.9m up DCP.

DCP2 – End of test @ 2.1m, DCP still going down slowly, grey clay on wet tip.

DCP3 – End of test @ 1.4m, DCP still going down slowly, dark brown clay wet tip.

DCP4 – End of test @ 2.1m, DCP still going down slowly, grey clay wet 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 clayey soils and clays. The clays merge into the underlying weathered rock at depths of between ~1.2m to ~1.8m below the current surface. The weathered zone is interpreted to be Extremely Low Strength Shale. 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. The water table is expected to be below the base of the proposed excavation. However, during heavy rainfall events, the water table is expected to rise to the water level of the adjacent drainage channel.

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 for Elaine Avenue above.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above, below, or beside the property. The proposed excavation for the pool is a potential hazard until retaining structures are in place (**Hazard One**). The proposed excavation for the pool undercutting the footings for the house is a potential hazard (**Hazard Two**). The empty pool popping out of the ground and floating on the water table is a potential hazard (**Hazard Three**).

RISK ANALYSIS ON THE NEXT PAGE

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The excavation for the pool (up to a maximum depth of ~1.5m) collapsing onto the work site before retaining structures are in place.	The proposed excavation for the pool undercutting the footings of the deck causing failure.	The finished pool being emptied, resulting in it floating on the water table and popping out of the ground.
LIKELIHOOD	'Possible' (10^{-3})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (15%)	'Medium' (30%)	'Major' (40%)
RISK TO PROPERTY	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})	'High' (6×10^{-4})
RISK TO LIFE	8.3×10^{-6} /annum	5.3×10^{-5} /annum	8.3×10^{-7} /annum
COMMENTS	This level of risk to property is 'TOLERABLE'. 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.	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels the recommendations in Section 16 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

No significant additional stormwater runoff will be created by the proposed development.

11. Excavations

An excavation to a maximum depth of ~1.5m will be required to install the pool on the E side of the property. The excavation is expected to be through soil and clay with Extremely Low Strength Shale expected at depths of between ~1.2m and 1.8m. It is envisaged that excavations through soil, clay, and Extremely Low Strength Shale can be carried out with an excavator and 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 16 ton carrying out excavation works will be below the threshold limit for infrastructure or building damage.

13. Excavation Support Advice

The excavation for the proposed pool on the E side of the property will reach a maximum depth of ~1.5m. The setbacks are as follows:

- ~1.0m from the timber posts of the deck.
- ~1.6m from the S common boundary.
- ~3.5m from the E boundary and concrete retaining wall that supports an open drainage channel.

As such, only the timber posts of the deck 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 through clay and shale from the base of the excavation towards the surrounding structures and boundaries. This line reduces to 30° through the fill and soil.

The client informed us on site that the depth of the timber posts reached ~2.0m below the surface. If structural records can verify that the posts are below the zone of influence, the excavation can continue.

Otherwise, where the timber posts 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.

If the foundations are found to be supported below the zone of influence of the proposed excavation, the excavation may commence. If they are not, the deck will need to be propped with the props supported beyond the zone of influence of the proposed excavation. See the site plan attached for locations of required exploration pits.

The soil and clay portions of the proposed pool excavation are expected to stand at near-vertical angles for short periods of time until the pool 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 few days before pool construction commences, they are to be supported with typical pool shoring until the pool structure is in place.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. Unsupported cut batters through 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 can't blow off in a storm. The materials and labour to construct the pool structure 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.

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 pressure 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, Soil, and Residual Clays	20	0.35	0.45
Extremely Low Strength Shale	22	0.3	0.25

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, 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 likely hydrostatic pressures are to be accounted for in the structural design.

15. Foundations

A sewer runs across the downhill side of the property and under the location of the proposed pool. The pool is to be constructed to Sydney Water requirements which will require the concrete encasement of the sewer. The proposed pool is to be supported on piers taken to the underlying Extremely Low Strength Shale and pierced below the zone of influence of the sewer. This ground material is expected to be exposed across the uphill side of the proposed excavation. This ground material is expected at depths of between ~1.2m and ~1.8m below the current surface.

A maximum allowable bearing pressure of 600kPa can be assumed for footings on Extremely Low Strength Shale. 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.

We point out the pool will always need to be kept full of water to prevent it floating on the water table (that is expected to rise to the water level of the adjacent drainage channel during heavy rain events). We recommend the pool be anchored using piers or a similar hold down method to counteract buoyancy, calculated and designed by the structural engineer. If it is not and the pool does pop out of the ground, we accept no liability whatsoever.

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. 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.

17. 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

owners and Occupation Certificate 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 and contractors are 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 (Left to right)

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.

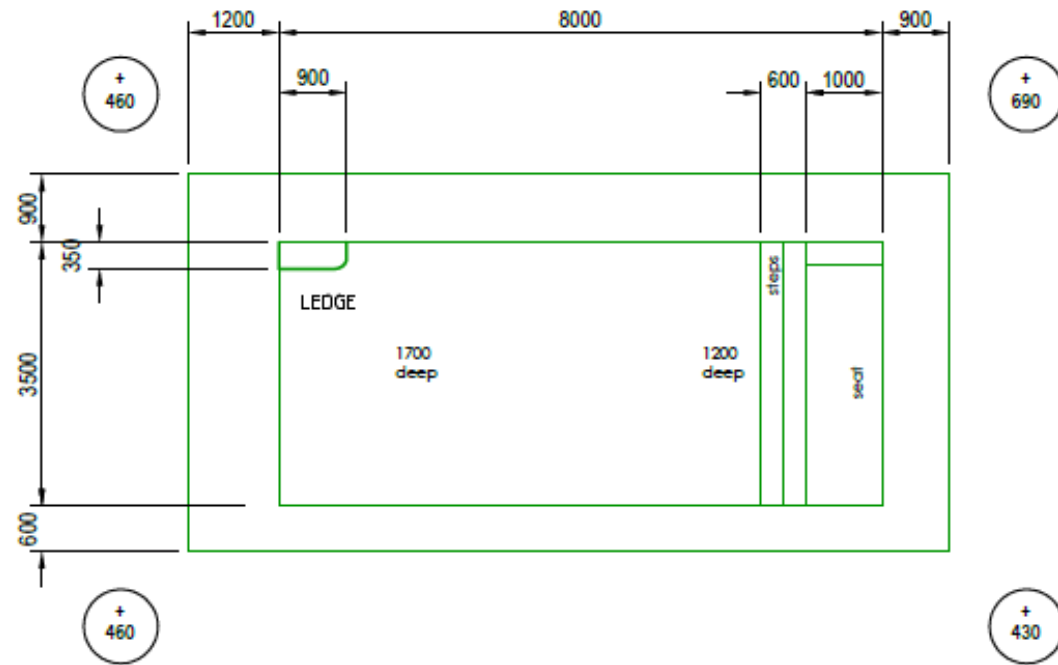
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PROPOSED POOL & ASSOCIATED WORKS
JAMES AND ALICIA CAMPBELL
LOT 19 DP21687
No. 47 ELAINE AVENUE
AVALON BEACH 2107

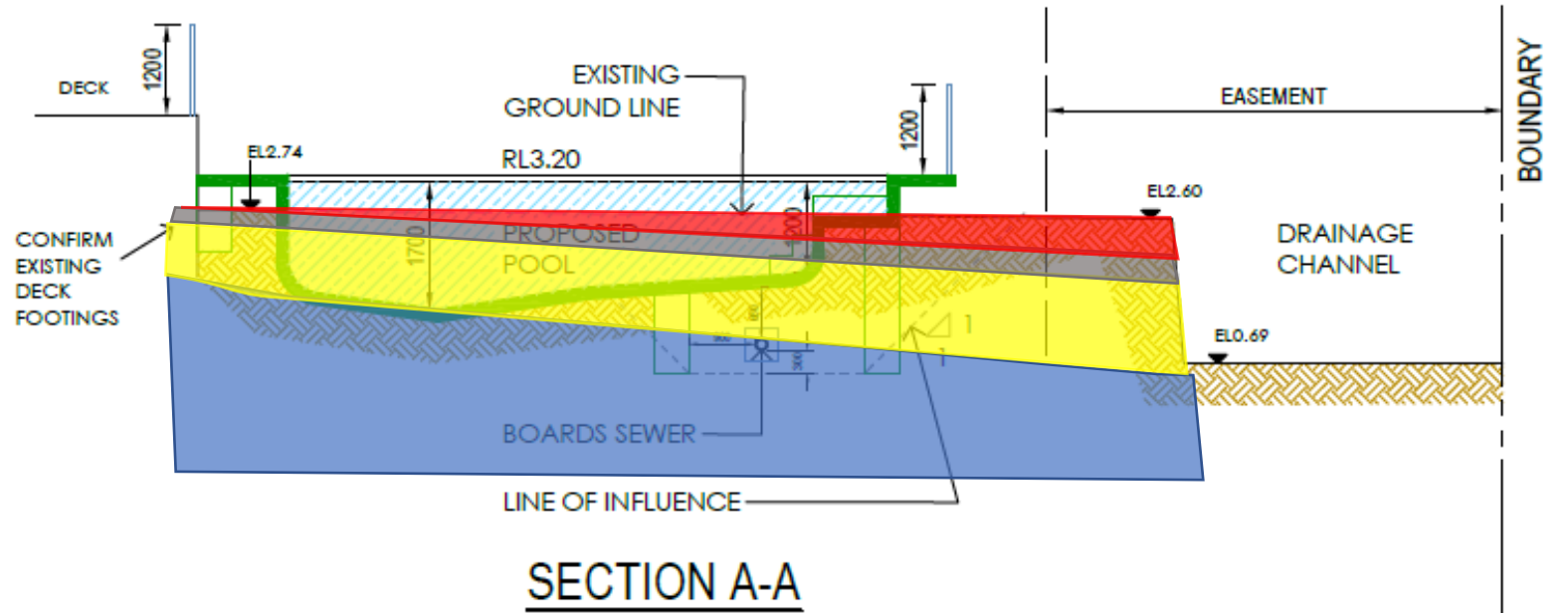
DATE	SCALE AT A3	JOB NUMBER	DWG NUMBER
MAR 2021	1:100	RADD21026	P2

TYPE SECTION – Diagrammatic Interpretation of expected Ground Materials

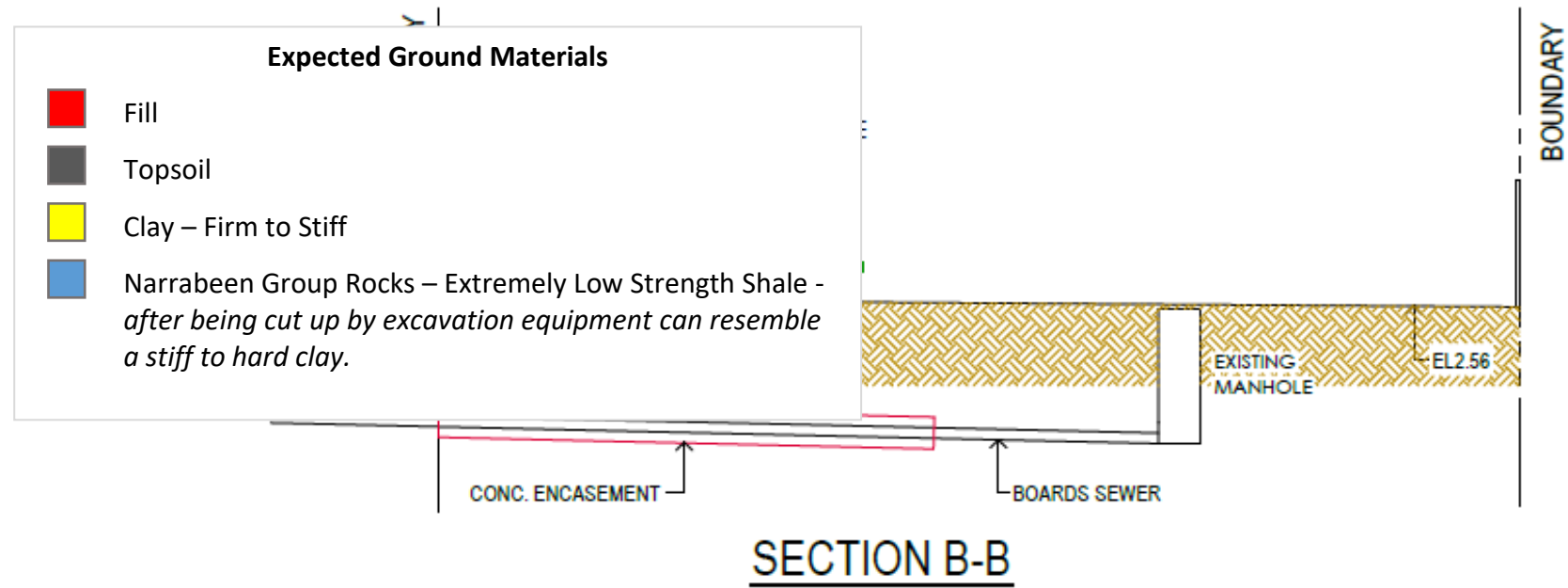


POOL PLAN

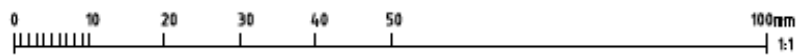

 DENOTES TOP OF POOL RELATIVE TO NATURAL GROUND LEVEL



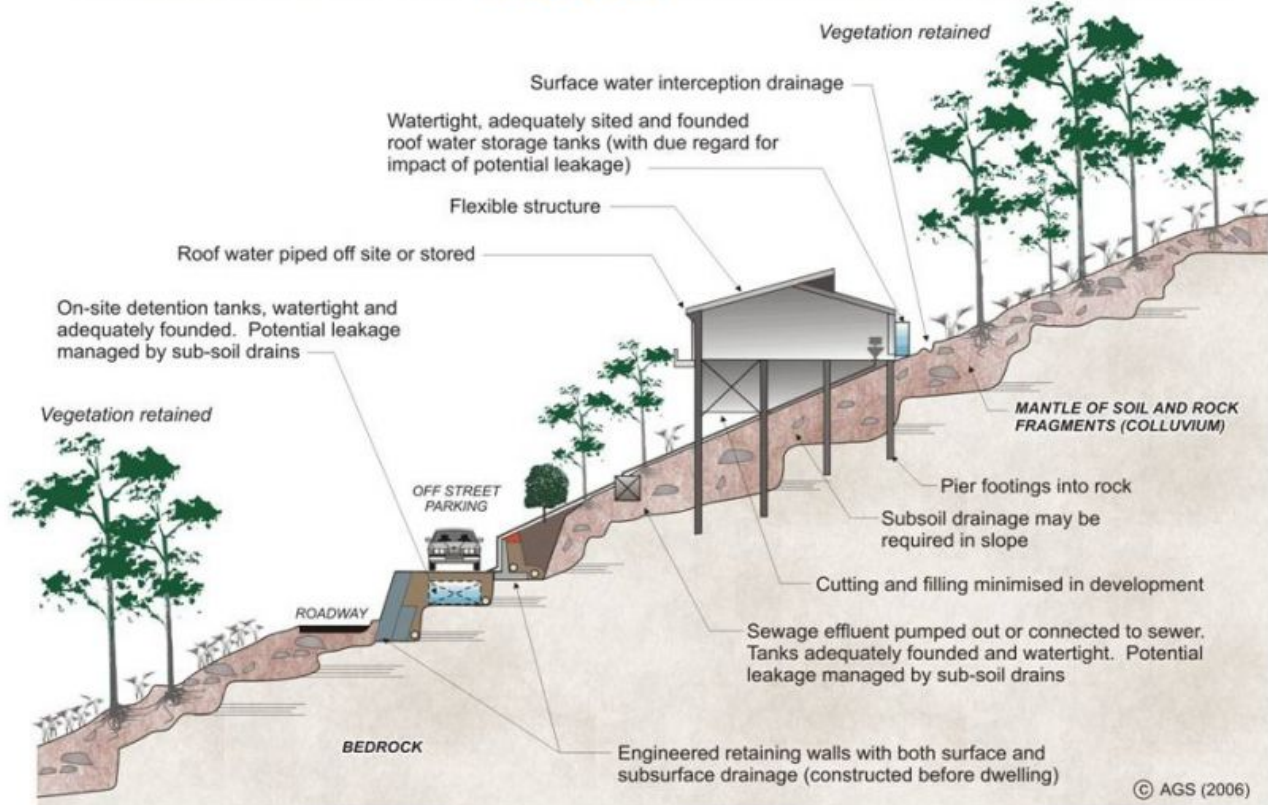
SECTION A-A



SECTION B-B



EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE

