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

Development Application for _____
Name of Applicant

Address of site 948 Barrenjoey 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 6/10/23 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 **948 Barrenjoey Road, Palm Beach**
Report Date: 6/10/23

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 948 Barrenjoey 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 **948 Barrenjoey Road, Palm Beach**

Report Date: 6/10/23

Author: BEN WHITE

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

Please mark appropriate box

- ☒ Comprehensive site mapping conducted **25/7/23** (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 **25/7/23**
- ☒ 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 Inclined Lift at **948 Barrenjoey Road, Palm Beach**

1. Proposed Development

1.1 Demolish the existing inclined lift and install a new and extended inclined lift by excavating to a maximum depth of ~1.8m.

1.2 Details of the proposed development are shown on 4 drawings prepared by Peter Downes Designs, drawings numbered A2 2265 00A to 03A. All revision A. All dated 28/08/2023.

2. Site Description

2.1 The site was inspected on the 25th July, 2023; and previously on the 15th October, 2018, and 6th November, 2018.

2.2 This residential property is on the high side of the road and has a W aspect. It is located on the steeply graded lower middle reaches of a hillslope. The natural slope rises across the property at an average angle of ~21°. The slope above and below the property continues at similar steep angles.

2.3 At the road frontage, a shared concrete driveway runs up the slope to a garage on the downhill side of the property (Photo 1). A cut and fill has been made in the slope to provide a level platform for the garage. The fill is supported by a ~1.0m high stable mortared stack rock retaining wall (Photo 2). The cut is supported by a similar wall that was in excellent condition when we were last on site in 2018. The wall was obscured by the garage structure and access was not available during the recent inspection (Photo 3). The slope between the garage and the house is terraced with a series of mortared dimensioned sandstone block, and gabion basket retaining walls reaching a maximum height of ~3.0m where the cut for the existing inclined lift on the S side of the property was made (Photos 4 to 8). To maintain ongoing stability for

dimensioned sandstone walls they require occasional maintenance which may involve re-mortaring or repointing. While the mortar in some locations was observed to be failing (Photo 9), there has been no significant further movement of these walls since the last site visit. See **Section 13** "Site Maintenance" for treatment of the cracking. The part two-storey rendered masonry and timber clad house is supported by rendered masonry walls (Photo 5). No significant signs of movement or cracking was observed in the external supporting walls of the house. Two dimensioned sandstone block walls terrace the slope above the house. The lower wall reaches a maximum height of ~2.0m, providing a level platform for the lower ground floor and supporting the deck above (Photo 10). The dimensioned sandstone wall on which this footing is founded exhibits cracking to a width of 10mm (Photo 11). See **Section 13** for advice. The upper wall reaches a maximum height of ~1.0m and levels an area for a deck attached to the ground floor (Photo 12). Both walls are slightly angled back into the slope and are considered stable subject to ongoing maintenance. Low timber and dimensioned sandstone block retaining walls terrace the uphill slope, supporting fill for garden bedding (Photos 13 and 14). The remainder of the property rises steeply to the upper boundary (Photo 15), most of the vegetation here has been cleared since the previous inspection rendering the slope more susceptible to erosion, and shallow failure than it was previously. See **Section 13** for advice. There were multiple instances of large and undercut sandstone joint blocks on the steep, undeveloped bush slope above the property (Photos 16 and 17). Some of these had dislodged from the natural slope, whereas others exhibited horizontal bedding and were assumed to be in situ. The undercut rocks have relatively thick cantilever arms compared to their overhang length, have likely been in place for thousands of years prior to the development of this area and do not display any significant jointing or cracking which could impact on the stability of the rock face. As such, the rock faces are currently considered to be stable. However, if these rocks were to collapse, they would likely come to rest on the slope immediately below their current location.

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 the soil materials. Nine 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 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 have been an issue for this site. But due to the possibility that the actual ground conditions vary from our interpretation there should be allowances in the excavation and foundation budget to account for this. We refer to the appended "Important Information about Your Report" to further clarify. The results are as follows:

AUGER HOLE 1 (~RL28.4) **–** AH1 (Photo 18)

Depth (m)	**Material Encountered**
0.0 to 0.6	**CLAY**, derived from weathered shale, mottled grey and maroon, dry, hard.

End of test @ 0.6m in hard clay. No water table encountered.

DCP TEST 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 (~RL27.0)	DCP 2 (~RL28.2)	DCP 3 (~RL28.6)	DCP 4 (~RL27.2)	DCP 5 (~RL25.4)	DCP 6 (~RL27.1)	DCP 7 (~RL28.4)	DCP 8 (~RL30.7)	DCP 9 (~RL33.9)
0.0 to 0.3	7	4	3	6	12	15	12	4	18
0.3 to 0.6	6	3	3	6	15	27	10	10	27
0.6 to 0.9	6	10	6	25	10	#	36	10	#
0.9 to 1.2	8	7	6	40	16		45	20	
1.2 to 1.5	10	8	8	#	#		#	25	
1.5 to 1.8	13	10	13					25	
1.8 to 2.1	45	18	18					37	
2.1 to 2.4	#	19	19					#	
2.4 to 2.7		#	24						
2.7 to 3.0			40						
3.0 to 3.3			#						
	End of Test @ 2.1m	Refusal on rock @ 2.3m	End of Test @ 3.0m	End of Test @ 1.2m	Refusal on rock @ 1.1m	Refusal on rock @ 0.7m	End of Test @ 1.2m	End of Test @ 2.0m	Refusal on rock @ 0.5m

#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 @ 2.1m, DCP still very slowly going down, clean dry tip, orange clay in collar above tip.

DCP2 – Refusal on rock @ 2.3m, DCP bouncing on rock surface, red clay on dry tip, yellow clay in collar above tip.

DCP3 – End of test @ 3.0m, DCP still very slowly going down, white impact dust on dry tip, yellow/white clay in collar above tip.

DCP4 – End of test @ 1.2m, DCP still very slowly going down, white and red shale on dry tip, white and red shale in collar above tip.

DCP5 – Refusal @ 1.1m, DCP thudding, clean dry tip, mottled yellow orange clay in collar above tip.

DCP6 – Refusal @ 0.7m, DCP thudding, maroon clay on dry tip, golden sand and white clay in collar above tip.

DCP7 – End of test @ 1.2m, DCP still very slowly going down, yellow, grey and orange clay on dry tip.
DCP8 – End of test @ 2.0m, DCP still very slowly going down, yellow white maroon on dry tip.
DCP9 – Refusal @ 0.5m, DCP thudding, orange and maroon clay on dry tip and in collars.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the location of the proposed works, they consist of topsoil and natural clays derived from weathered shale. Filling has been placed across the property to provide a level platform for the driveway and for limited garden bedding. The clays merge into the weathered zone of the underlying shale at depths of between ~0.5 to ~2.7m below the current surface, being deeper due to the presence of filling and a variable weathering profile. The weathered zone is interpreted as Extremely Low to Low Strength Shale that becomes increasingly harder with depth. It is to be noted that this material can appear as a mottled stiff clay when it is cut up by excavation equipment. As observed in an excavation on the N neighbouring property, some sandstone floaters are likely to be embedded in the profile (Photo 19). See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Ground water seepage is expected to move over the denser layers in the profile including the surface of the natural clay buried under the fill/soil and the buried surface of the weathered rock under the clay. As a natural watercourse runs down the slope to the N of the property (Photo 20), we expect groundwater seepage to be higher across the block as slope seepage will move toward the watercourse. 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

Apart from the natural watercourse that runs down the slope to the N of the property, no evidence of surface flows were observed on the property during the inspection due to the grade of the slope. It is expected that sheet wash from the slope above will move onto the

site at relatively high velocities during heavy downpours. If the owners know or become aware in the future that overland flows enter the property during heavy prolonged rainfall events our office is to be informed so appropriate drainage measures can be recommended and installed. 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 beside the property. The steeply graded slope that rises across the property and continues above and below is a potential hazard (**Hazard One**). The dimensioned sandstone block retaining walls that terrace the property (**Hazard Two**). The large sandstone floaters above and on the property are a potential hazard (**Hazard Three**). The proposed excavation is a potential hazard (**Hazard Four**).

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The steep slope that rises across the property and continues above and below failing and impacting on the property.	Further movement of any dimensioned sandstone block retaining walls that exhibit cracking, causing failure.
LIKELIHOOD	'Unlikely' (10^{-4})	'Likely' (10^{-2})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (30%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'High' (2×10^{-3})
RISK TO LIFE	9.1×10^{-7}/annum	3.5×10^{-4}/annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the recommendations in **Sections 7 & 16** are carried out.	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels, the recommendations in **Section 16** are to be followed.

HAZARDS	Hazard Three	Hazard Four
TYPE	The large dislodged and undercut sandstone joint blocks above and on the property falling and impacting on the subject house and/or proposed works (Photo 16 & 17).	The proposed excavation collapsing onto the work site and impacting on the subject and neighbouring property before retaining walls are in place.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Major' (50%)	'Medium' (15%)
RISK TO PROPERTY	'Low' (6×10^{-5})	'Moderate' (2×10^{-4})
RISK TO LIFE	4.7×10^{-6}/annum	5.3×10^{-5}/annum
COMMENTS	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels, the recommendations in **Section 16** 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

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

11. Excavations

An excavation to a maximum depth of ~1.8m is required for the lower landing of the proposed inclined lift. The excavation is expected to be through fill, over hard clay with Extremely Low to Low Strength Shale expected at depths of ~0.7m or greater below the current ground level.

Excavations through fill/clay and Extremely Low to Low Strength Shale can be carried out with an excavator and toothed bucket.

12. Vibrations

It is expected the proposed excavations will be carried out with an excavator and toothed bucket and the vibrations produced will be below the threshold limit for building or infrastructure damage using a domestic sized excavator up to 16 tonnes.

13. Excavation Support Requirements

The lower landing excavation will reach a maximum depth of ~1.8m. The setbacks from the proposed excavation to the existing structures/boundaries are as follows:

- Flush with the SE common boundary.
- ~0.2m from a gabion basket retaining wall that runs along the S common boundary
- ~0.6m from a garage on the SE neighbouring property. However, the garage floor is at a lower elevation to the excavation, effectively increasing its setback.

As such, the SE common boundary, and the S neighbouring retaining wall will be within the zone of influence of the excavation. In this instance, the zone of influence is the area above a theoretical 30° line (from horizontal) through topsoil, and a 45° line through clay and shale from the base of the excavation towards the surrounding structures and boundaries.

Where the S neighbouring gabion basket wall (currently obscured by creeper) and the common boundary are within the zone of influence of the excavation, to protect the integrity of the structures and property, ground support will need to be installed before the excavation commences, or as the excavation progresses in a staged manner. See the site plan attached showing the extent of the recommended ground support in blue.

A cantilevered wall supported by soldier posts and whalers, designed by the Structural Engineer and approved by the Geotechnical Consultant, is one suitable form of support with

the soldier posts installed before the excavation commences. The following points outline the basic construction methodology:

- Drill prier holes to a depth that provides adequate embedment below the proposed bulk excavation to resist the likely earth pressures.
- Install soldier posts and concrete into each pier hole.
- Excavate between two soldier posts only, and install whalers immediately.
- Repeat the process until the excavation is complete and fully shored.
- Where possible the wall is to be tied into other structures to provide permanent bracing (i.e. concrete beams or a slab could abut each post at excavation level).

To drill the pier holes for the wall, a powerful excavator or small pilling rig that can excavate through Medium to High Strength Rock will be required. If a machine of this type is not available, we recommend carrying out core drilling before the construction commences to confirm the strength of the rock and to ensure the excavation equipment is capable of reaching the required depths.

The geotechnical consultant is to inspect the drilling process of the entire first pile and the ground materials at the base of all pier holes/excavations for ground support purposes.

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 excavations are to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast. If the cut batters remain unsupported for more than a few days before the construction of the retaining walls they are to be temporarily supported until the retaining walls are in place.

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

14. Retaining walls

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 walls

Unit	Earth Pressure Coefficients			
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0	Passive
Fill	20	0.40	0.55	N/A
Residual Clays	20	0.35	0.45	K_p = 2.0 'ultimate'
Extremely Low Strength Rock	22	0.25	0.38	K_p = 2.5 'ultimate'
Low Strength Rock	24	0.20	0.35	1000kPa 'ultimate'

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 and do not account for any surcharge loads, noting that surcharge loads from the structures above will be acting on the wall. It also assumes retaining structures are fully drained. It should be noted that passive pressure is an ultimate value and should have an appropriate safety factor applied. No passive resistance should be assumed for the top 0.4m to account for any disturbance from the excavation. Ground materials 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 lower landing of the new inclined lift can be supported on a thickened edge / raft slab supported on Extremely Low to Low Strength Shale. This material is expected to be exposed across the uphill side of the proposed excavation. Where it is not exposed, and where weathered rock drops away with the slope, piers taken to and embedded no less than 0.6m into this same material will be required to maintain a uniform foundation material across the structure. This ground material is expected at depths of between ~0.7m and ~1.1m below the current surface.

The owner informed us that they intend to reuse most of the foundations for the existing inclined lift. The structural engineer will need to confirm the structural adequacy of these foundations.

Any new piered foundations are to be taken to and embedded no less than 0.6m into the underlying Extremely Low to Low Strength Shale. This material is expected at depths of between ~0.5m to ~2.0m below the current surface in the area of the proposed works.

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

As the bearing capacity of clay and Extremely Low to Low Strength 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 and inspected.

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. Ongoing Maintenance/ Remedial works

The property is extensively terraced in mortared stack rock walls (Photos 2 to 13). These walls require occasional maintenance to ensure ongoing stability in the future. As such, they are to be monitored by the owners on a biannual basis or after heavy and/or prolonged rainfall events, whichever occurs first. A photographic record of these inspections is to be kept. Should further movement occur the walls are to be remediated so they meet current engineering standards.

The steep upper portion of the property has been mostly cleared of vegetation, increasing its risk of failure (Photo 15). This slope is to be planted out with native trees, shrubs, and ground cover. The plants should be chosen for their deep root systems that will bind and anchor the natural profile. Native plants are required because they generally have deeper root systems. A well-informed horticulturalist should be able to advise on the most suitable plants for this purpose taking into account the aspect and location (steep slope).

Where slopes are steep and approach or exceed 30°, such as on this site, it is prudent for the owners to occasionally inspect the slope (say annually or after heavy and prolonged 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 ongoing 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 certification for the regulating authorities or the owner if the following inspections have not been carried out during the construction process.

- The geotechnical professional is to inspect the drilling process of the entire first pier hole for the shoring retaining wall to confirm the ground materials are in line with our expectations. The depths of all finished pier holes are to be confirmed before steel is placed or concrete is poured.

- 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.

Nathan Gardner
B.Sc. (Geol. & Geophys. & Env. Stud.)
Engineering Geologist and Environmental Scientist.

Reviewed By:

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

Photo 1

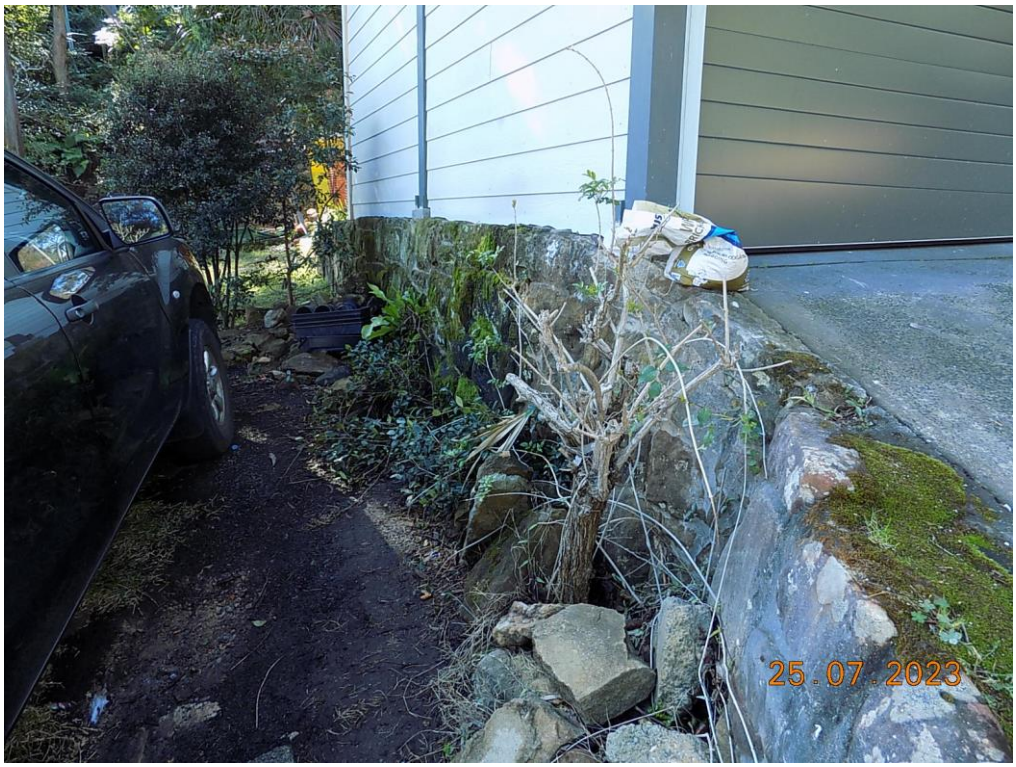


Photo 2

Photo 3

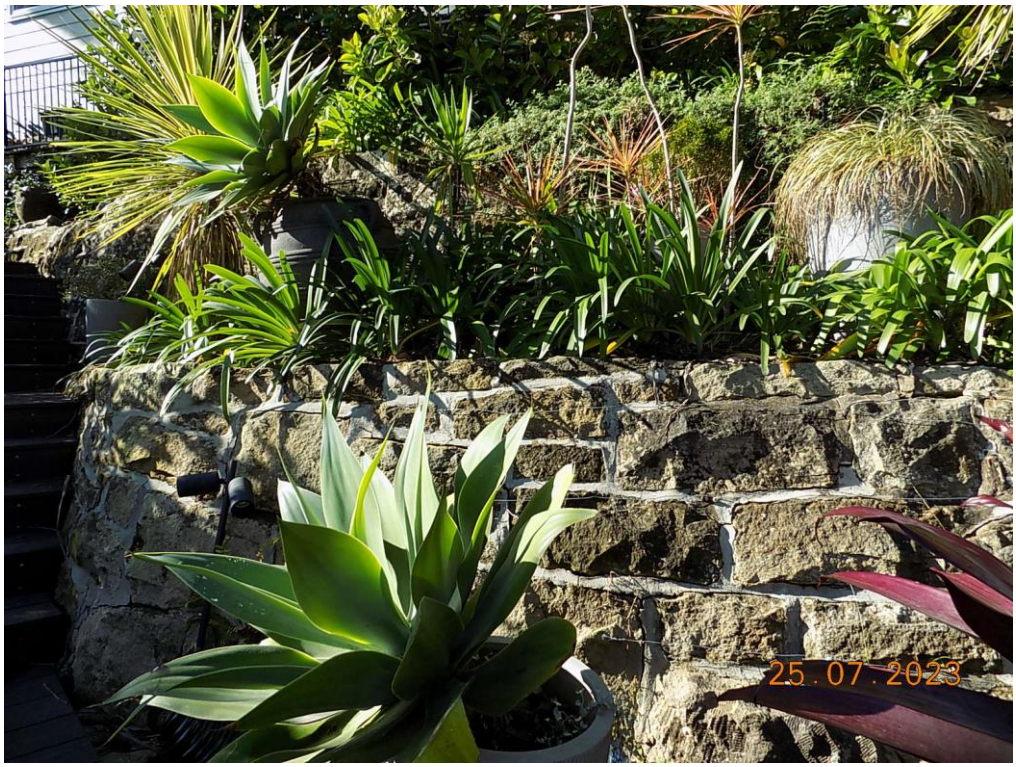


Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18 AH1 – downhole is top to bottom

Photo 19

Photo 20

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.

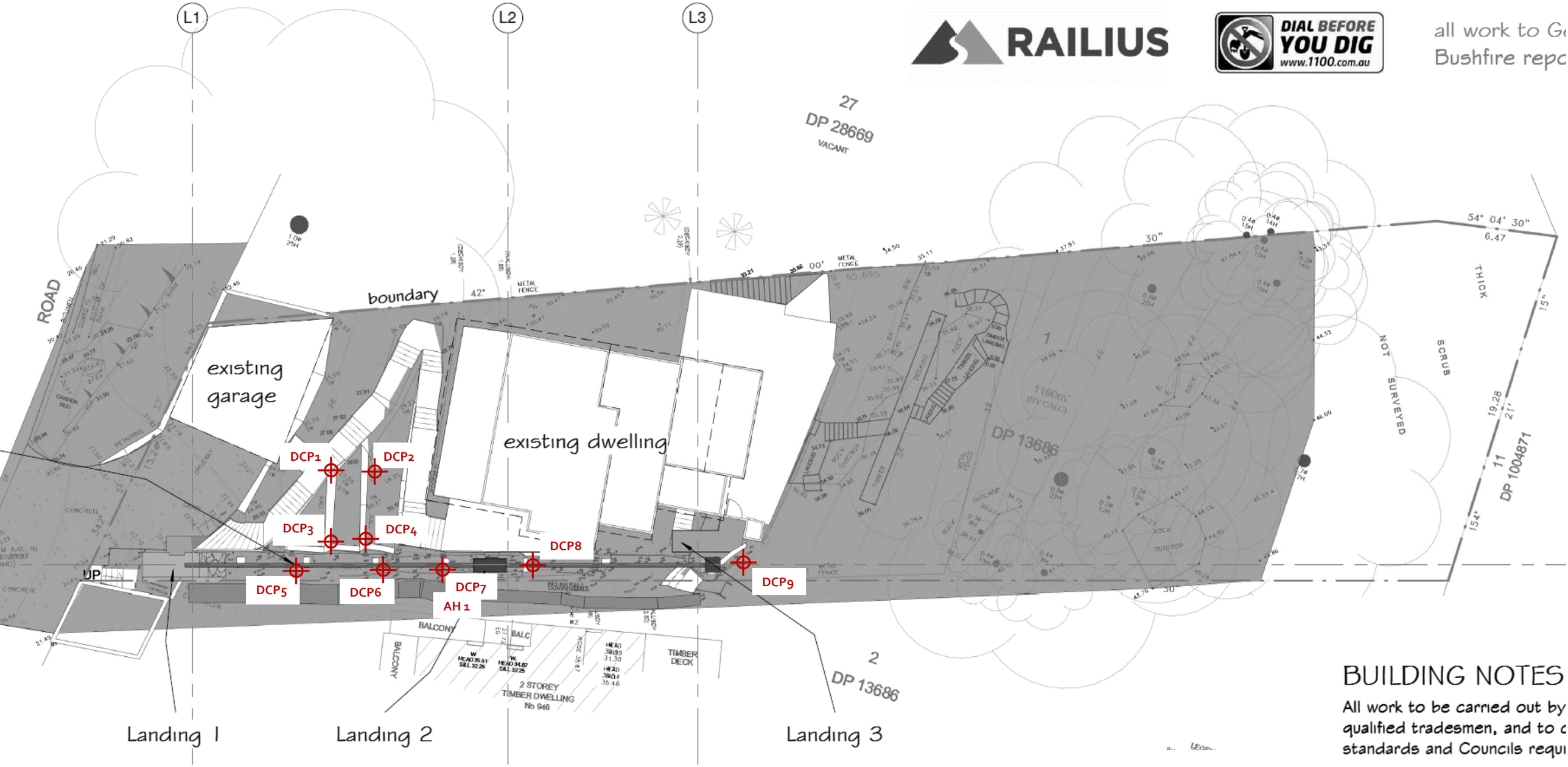
- If this report is used by other professionals during the design or construction process, any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

- 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 PLAN @ 1:100

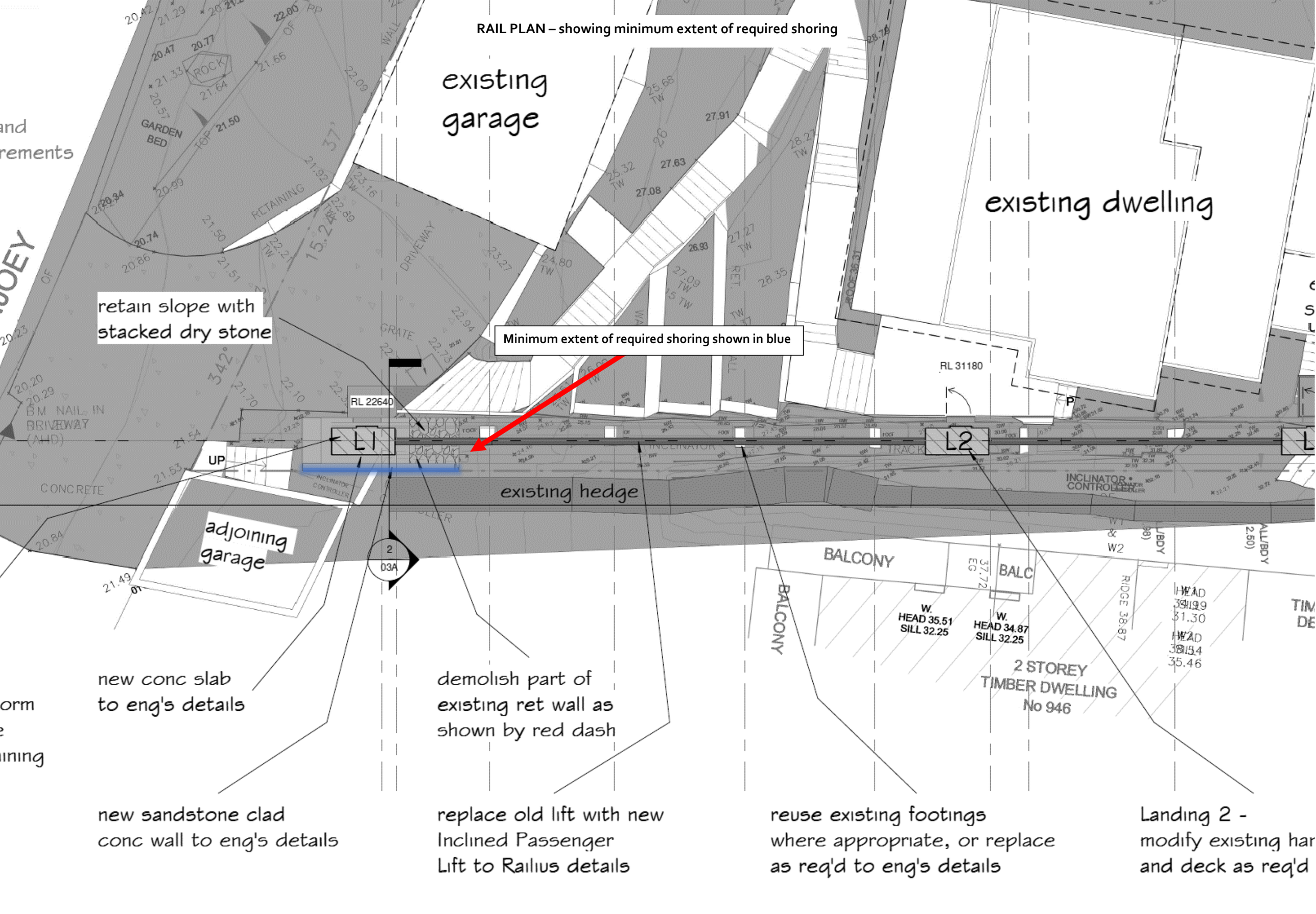
BUILDING NOTES

All work to be carried out by
qualified tradesmen, and to c
standards and Councils requi

Main contractor to be respo
necessary inspection certific

An approved sedimentation c
installed and maintained for t

RAIL PLAN – showing minimum extent of required shoring



new conc slab
to eng's details

demolish part of
existing ret wall as
shown by red dash

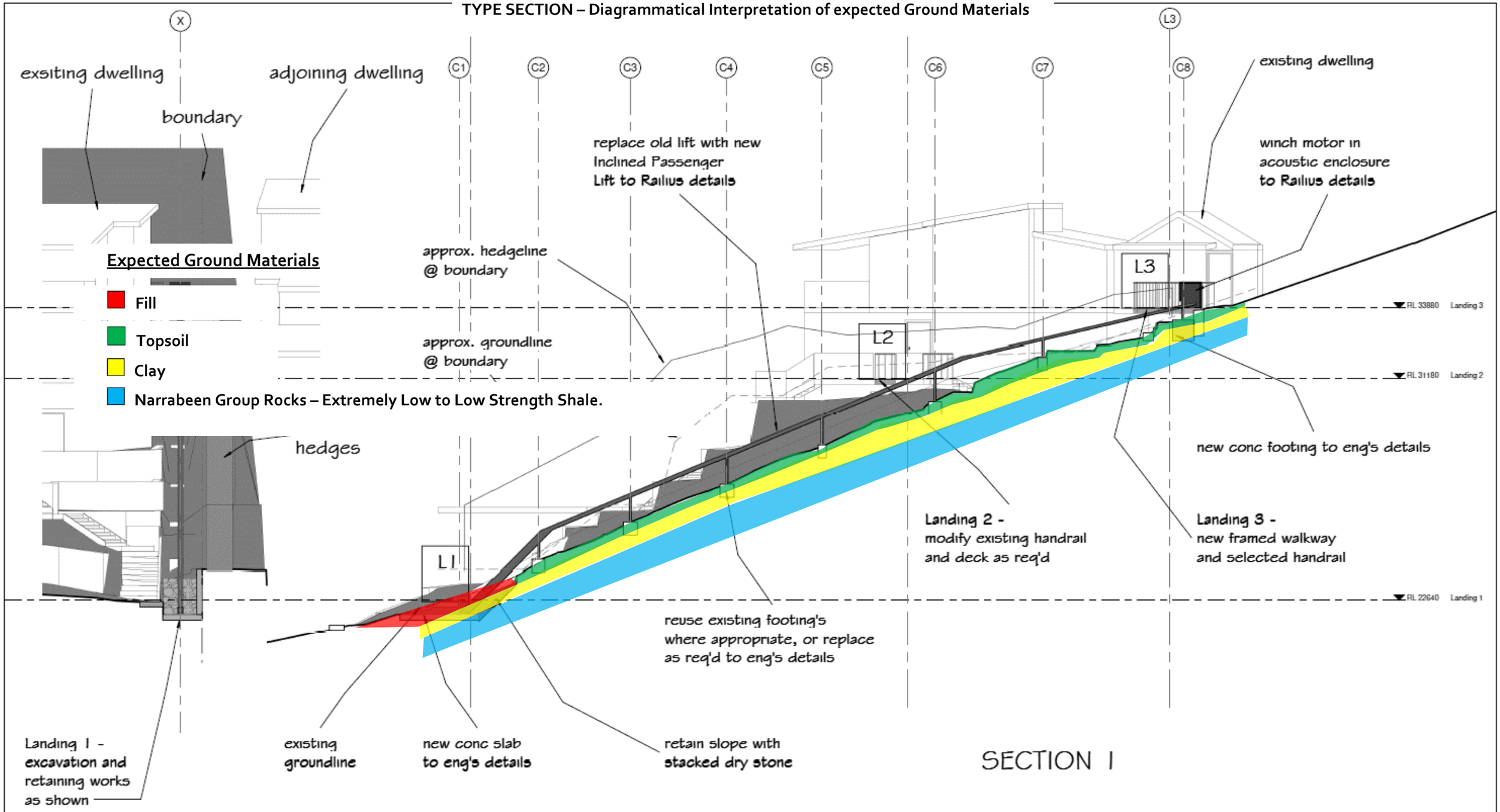
new sandstone clad
conc wall to eng's details

replace old lift with new
Inclined Passenger
Lift to Railius details

reuse existing footings
where appropriate, or replace
as req'd to eng's details

Landing 2 -
modify existing har
and deck as req'd

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



SECTION 2

SECTION 1

DA ISSUE

RAILIUS

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all work to Geotech and Bushfire report requirements

REVISION

REV A 28.8.23 - RAIL PROFILE AND TOP LANDING AREA UPDATEED

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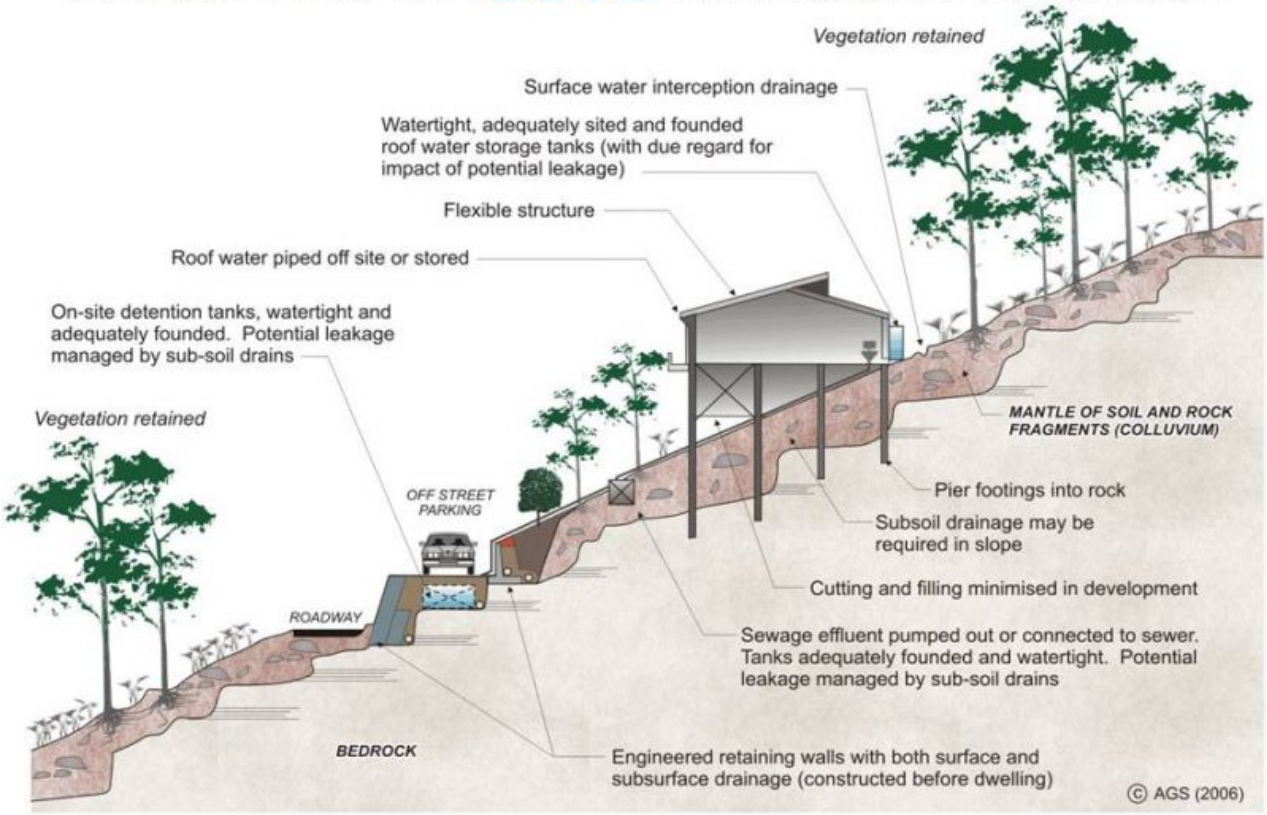
PROJECT	948 Barrenjoey Rd Palm Beach
DRAWING	Sections 1 & 2
DRAWN	SD
CHECKED	SD
SCALE	1 : 100
DATE	19.8.23
DRG.	A2 2265 03A

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE