White geotechnical group

Sydney, Northern Beaches & beyond. Geotechnical Consultants

J0813B.
18th October, 2017

48 Tatiara Crescent, North Narrabeen

Geotechnical Comments for Section 96.

We have reviewed the existing geotechnical report, the original plans, and the amended plans by JD Evans & Co numbered 1818-1 to 9, Issue C, dated 18.7.17, and 1818-10, dated 15.4.16.

The changes include:

- Relocate the secondary dwelling
- Add a carport
- Add access stairs to the proposed secondary dwelling
- Add a verandah to the main house

The proposed changes are considered minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the original report carried out by this firm numbered J0813A and dated the 25th November, 2016.

White Geotechnical Group Pty Ltd.

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

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

Development Application for _____
Name of Applicant

Address of site 48 TATIARA CRESCENT, NORTH NARRABEEN

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

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

on this the 30/11/16 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 $2million.
I have:

Please mark appropriate box

☒ 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

☒ I 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 paragraph 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy fro Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ Have examined the site and the proposed development/alteration in detail and am of the opinion that the Development Application only involves Minor Development/Alterations that do not require a Detailed Geotechnical Risk Assessment and hence my report is in accordance with the Geotechnical Risk Management Policy for Pittwater – 2009 requirements for Minor Development/Alterations.

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

Geotechnical Report Details:

Report Title: Geotechnical Report **48 TATIARA CRESCENT, NORTH NARRABEEN**

Report Date: 25/11/16

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 **48 TATIARA CRESCENT, 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 **48 TATIARA CRESCENT, NORTH NARRABEEN**

Report Date: 25/11/16

Author: BEN WHITE

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

Please mark appropriate box

- ☒ Comprehensive site mapping conducted 04/05/16 (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 04/05/16
- ☒ 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:

Alterations & Additions and Secondary Dwelling at
48 Tatiara Crescent, North Narrabeen

1. Proposed Development

1.1 Extend the existing parking area uphill to immediately below an existing rock retaining wall.

1.2 Construct a verandah on the lower side of the existing house.

1.3 Install a secondary dwelling on the uphill side of the house.

1.4 Details of the proposed development are shown on 9 drawings prepared by J.D. Evans & Company, drawings numbered 1818-1 to 9, Issue A dated the 21/09/16.

2. Site Description

2.1 The site was inspected on the 4th May, 2016.

2.2 This residential property is on the high side of the road and has a SW aspect. It is located on the moderate to steeply graded upper middle reaches of a hillslope. At the road frontage the natural slope rises at an average angle of ~16° that increases to ~40° above the house where a sandstone face rises. Sandstone beds are also exposed under house. The slope above the property continues at steep angles. The land surface below falls at moderate angles.

2.3 At the road frontage a gravel driveway runs to car parking area along the lower boundary (Photo 1). The cut for the road is supported by mortared rock and stack rock retaining walls that appear stable. The cut for the parking area is supported by a ~1.0m high treated pine retaining wall. Its supporting timber posts are tilting downhill to a maximum angle of ~5° (Photo 2). A cut and fill has been made into the slope to create a platform for the house. The fill batter below the house is supported by a mortared rock retaining wall that appears stable (Photo 3). The majority of the cut is through competent medium strength sandstone (Photo 4). The shallow soil and clay portions are slightly battered uphill and appear stable (Photo 5). The two storey brick and timber framed and clad house is in good condition for its age. No significant cracking or movement was observed in its external supporting walls. A concrete drainage channel has been cut into the sandstone and extends across the uphill and W sides of the house. It directs surface water from

the slope above to a pipe that runs to the street drainage system below (Photo 5 & 6). Piped water from above also discharges into the channel and we were informed on site by the owner that the pipe extends from the neighbouring property above. The land surface above the house rises at steep angles and a band of competent, medium strength sandstone outcrops and forms a cliff face (Photo 7 & 8). Some lower strength seams were observed around jointing and bedding planes that were more prevalent towards the base of the rock face. Minor erosion through soil and clay was observed immediately below a section of the exposed bedrock (Photo 9 & 10). The erosional process appears to be due to surface flow from the slope above and any potential failure is expected to be very small scale and limited in extent by the shallow underlying bedrock. The surrounding land surface consists of native undisturbed trees and vegetation (Photo 11). A right of carriageway lines the upper boundary of the subject property (Photo 12).

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Hawkesbury Sandstone. It is described as a medium to coarse grained quartz sandstone with very minor shale and laminate lenses.

4. Subsurface Investigation

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

SEE THE DCP RESULTS OVER THE 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**	**DCP 2**	**DCP 3**	**DCP 4**	**DCP 5**
0.0 to 0.3	1F	1F	1F	1F	1F
0.3 to 0.6	3F	6F	21	9	6
0.6 to 0.9	11	4	36	11	14
0.9 to 1.2	16	5	#	#	#
1.2 to 1.5	9	9			
1.5 to 1.8	#	11			
1.8 to 2.1		29			
2.1 to 2.4		38			
2.4 to 2.7		#			
	Refusal on Rock @ 1.5m	End of Test @ 2.7m	Refusal on Rock @ 0.9m	Refusal on Rock @ 0.7m	Refusal on Rock @ 0.8m

#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 @ 1.5m, DCP bouncing off rock surface, white impact dust on tip.
DCP2 – End of test @ 2.7m, DCP still very slowly going down, clean dry tip.
DCP3 – Refusal on rock @ 0.9m, DCP bouncing off rock surface, clean dry tip.
DCP4 – Refusal on rock @ 0.7m, DCP bouncing off rock surface, yellow rock fragments on dry tip.
DCP5 – Refusal on rock @ 0.8m, DCP bouncing off rock surface, clean dry tip.

5. Geological Observations /Interpretation

The surface features of the block are controlled by the outcropping and underlying sandstone bedrock that steps up the property forming sub horizontal benches between the steps. Where the grade is steeper the steps are larger and the benches narrower. Where the slope eases the opposite is true. Where the rock is not exposed it is overlain by manmade filling and natural sandy soils over sandy clays that cover the bench step formation. In the test locations the depth to rock ranged between 0.7 to 2.0m below the current surface, being deeper due to filling placed on the lower side of the house. The outcropping sandstone on the property is estimated to be medium strength or better and similar strength rock is expected to underlie the entire site. See the Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

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

7. Surface Water

No evidence of significant surface flows were observed on the property during the inspection. Normal sheet wash will move over the site and from the slope above during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed below or beside the property. The steeply graded land surface that rises across the upper half of the property and continues above is a potential hazard (**Hazard One**). The vibrations produced during the proposed excavations are a potential hazard (**Hazard Two**). The proposed excavations for the parking area extension and secondary dwelling are potential hazards (**Hazards Three & Four**).

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The rock face that rises above the house and the steep slope that continues above failing and impacting on the proposed secondary dwelling or the existing house.	The vibrations produced during the excavation process for the proposed parking area extension damaging the retaining wall above and the walls of the subject house.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (20%)	'Medium' (15%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})
RISK TO LIFE	5.5×10^{-7}/annum	8.2×10^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'. Provided the recommendations in **Section 17** are followed.	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk levels to acceptable the recommendations in **Section 12** are to be followed.

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

HAZARDS	Hazard Three	Hazard Four
TYPE	The excavation for the proposed parking area undercutting the retaining wall immediately above and causing it to collapse onto the work site.	The proposed excavations for the secondary dwelling collapsing onto the work site during the excavation process and impacting on the house below.
LIKELIHOOD	'Likely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (30%)	'Medium' (15%)
RISK TO PROPERTY	'High' (2×10^{-3})	'Moderate' (2×10^{-3})
RISK TO LIFE	5.5×10^{-3}/annum	7.3×10^{-5}/annum
COMMENTS	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 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.

There is fall to the street below the property. All stormwater or drainage runoff from the proposed 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 ~2.5m will be required to extend the existing parking area uphill. It is expected to be through a shallow fill and soil over a firm to stiff clay with medium strength sandstone expected at an average depth of ~1.5m below the current surface. Two, small stepped cuts will be required for the proposed secondary dwelling. The lower upper will reach a maximum depth of ~1.5m and the upper cut will reach a depth of ~0.8m. Where medium strength sandstone is not immediately below the soil it is

overlain by a shallow sandy soil and firm to stiff sandy clay with rock expected at a maximum depth of ~0.9m below the current surface.

The excavation for the parking area extension is easily accessible and it is envisaged that the excavations through fill, sandy soil and sandy clay can be carried out by an excavator and bucket and excavations through rock will require grinding or rock sawing and breaking. Due to the steep slope and small scale excavations for the proposed secondary dwelling it is envisaged that all excavations will be carried out with hand tools such as shovels and jackhammers.

12. Vibrations.

Due to steep slope and small scale excavations it is expected the excavation for the proposed secondary dwelling will be carried out with hand tools (such as shovels and jack hammers) and the vibrations produced will be below the threshold limit for building damage.

During the excavation process for the proposed parking area extension the possible vibrations generated during excavations through fill, sandy soil and sandy clays will be below the threshold limit for building damage.

It is expected that the majority of the excavations will be through medium strength sandstone or better. Excavations through rock should be carried out to minimise the potential to cause vibration damage to the existing retaining wall above and the supporting walls of the subject house. The retaining wall will be located immediately above the excavation and the house will be as close as ~5.0m. Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the perimeter of the excavation. Vibration monitoring will be required to verify this is achieved.

If a milling head is used to grind the rock vibration monitoring will not be required. Alternatively if rock sawing is carried out around the perimeter of the excavation boundaries in not less than 1.0m lifts, a rock hammer up to 300kg could be used to break the rock without vibration monitoring. Peak particle velocity will be less than 5mm/sec at the perimeter of the excavation using this method provided the saw cuts are kept well below the rock to broken.

It is worth noting that vibrations that are below thresholds for building damage may be felt by the occupants of the house and garage.

13. Excavation Support Requirements

The excavation for the proposed parking area extension will be immediately below an existing mortared stack rock retaining wall. This is not an engineered wall.

To ensure the integrity of the existing retaining wall and the safety of the people working below the wall it is to be secured before the work commences with a piered wall or similar retaining works. The uphill side of the excavation can be supported with secant or contiguous piers that extend at least 0.15m above the current surface. The piers will be embedded entirely through medium strength sandstone so a mini piling rig or similar equipment capable of drilling through medium strength sandstone will be required to carry out this work. A standard excavator cannot pier through rock as would be required for this option. Alternatively an anchored sprayed concrete wall may be installed over the existing wall to upgrade it. If the wall is strengthened with steel and sprayed concrete on a footing, the footing will need to be piered and embedded below the base of the excavation to provide lateral support and a mini piling rig or similar will be required to carry out this work. The option chosen is to be designed by the structural engineer in consultation with the geotechnical professional and it is to be carried out prior to any excavation commencing.

Where ground support is not required for the parking area excavation (i.e. the N and S sides) the fill and sandy soil portion of the proposed house excavations are to be temporarily battered at 1.0 Vertical: 1.7 Horizontal until permanent retaining walls are in place. The sandy clay portions of the cut will stand at near vertical angles for a short period of time until retaining walls are installed provided they are prevented from becoming saturated. Excavations through medium strength sandstone will stand at vertical angles unsupported subject to approval by the geotechnical professional.

Due to the steep slope surrounding the excavations for the proposed secondary dwelling the sandy soil and sandy clay portions of the excavations are to be temporarily battered at 1.0 Vertical: 1.0 Horizontal (45°) until permanent retaining walls are in place. Excavations through medium strength sandstone or better will stand at vertical angles unsupported subject to approval by the geotechnical professional.

Where excavations for the proposed secondary dwelling exceed a maximum height of 0.7m the geotechnical professional is to inspect the cut during the excavation process to ensure ground materials are as expected and to ensure that temporary support is not required.

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 can't blow off in a storm. Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. The materials and labour to construct the retaining walls are to be organised so on completion of the 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 or be supported by engineered retaining walls.

14. Retaining Walls

Retaining walls supporting sandy soil and sandy clays can be designed for a lateral earth pressure coefficient K_a of 0.45 and assume a bulk density of 20kN/m^3. Cuts through medium strength sandstone will exert no earth pressure subject to the inspection of the cut face by the geotechnical professional to ensure no wedges or other defects are present. An ultimate passive pressure of4.0 MPa can be assumed for medium strength sandstone. It should be noted a factor of safety should be applied to the ultimate passive pressure.

It is likely the starter bars for the retaining walls can be drilled and grouted directly into the sandstone at the base of the cut subject to an inspection and approval of the exposed rock by the geotechnical professional. It is to be noted that starter bars will need to be set back at least 0.5m from the cliff edge into rock that is free from low strength seams.

Any surcharge loads that may act on the proposed retaining walls are to be accounted for in the design.

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

15. Site Classification

The site classification in accordance with AS2870-2011 for footings supported on sandstone bedrock is Class A.

16. Foundations

The proposed secondary dwelling is to be supported on shallow piers or pads potted at least ~0.3m into the underlying medium strength sandstone. Alternatively, where a level pad can be cut into the medium strength sandstone suitable bar can be grouted no less than 0.4m into the rock to fix the footings. Where this material is not exposed at the base of the excavations it is expected at a maximum depth of ~0.9m below the current surface. All footings are to be positioned on rock that is free from lower strength seams, cracks or other geological defects that will lower rock strength. A maximum allowable bearing pressure of 1.2MPa can be assumed for footings on medium strength sandstone.

The existing house is expected to be supported on strip footings supported on the underlying medium strength sandstone. To ensure a uniform bearing material across the old and new structures we recommend the proposed verandah be supported piers taken to the underlying medium strength sandstone. This ground material is expected at depths between 1.5 to 2.0m below the current surface, being deeper due to the filling located over the area of the proposed verandah. We do not recommend any footings be supported on fill.

The base of the parking excavation is expected to be in medium strength sandstone which is a suitable bearing material. If this ground material is not exposed on the downhill side extended rafts or shallow piers will be required to maintain a uniform bearing material, if the slab is not separated with construction joints.

Naturally occurring vertical cracks known as joints commonly occur in sandstone. These are generally filled with soil and are the natural seepage paths through the rock. They can extend to depths of several metres and are usually relatively narrow but can range between 0.1 to 0.8m wide. If a pad footing falls over a joint in the rock the construction process is simplified if with the approval of the structural engineer the joint can be spanned or alternatively the footing can be repositioned so it does not fall over the joint.

NOTE: If the contractor is unsure of the footing material required it is more cost effective to get the geotechnical professional 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.

17. Site Maintenance

Where slopes exceed 30° such as that above the house it is prudent for the owners to occasionally inspect the slope (say annually or after heavy rainfall events, whichever occurs first). Should any significant signs

of movement, changes in the erosional process or drainage regime be observed a geotechnical professional should be consulted to assess the slope. The Risk Analysis Assessment in this report is conditional on this general observation being carried out.

All retaining walls on the property are to be inspected for new movement on an annual basis or after prolonged heavy rainfall, whichever occurs first by the owners of the subject property (Photo 1 & 2). Should further movement be observed a geotechnical professional is to be engaged to assess the movement and provide a plan for remediation should it be required.

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 owner or the Occupation Certificate if the following inspection has not been carried out during the construction process.

- The geotechnical professional is to inspect and approve any piers dug for the lateral support of retaining walls, while the machine is still on site and before steel or concrete is placed.

- On the steep slope above the house where excavations exceed a maximum height of 0.7m the geotechnical professional is to inspect the cut during the excavation process to ensure ground materials are as expected and that temporary support is not required.

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

White Geotechnical Group Pty Ltd.

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

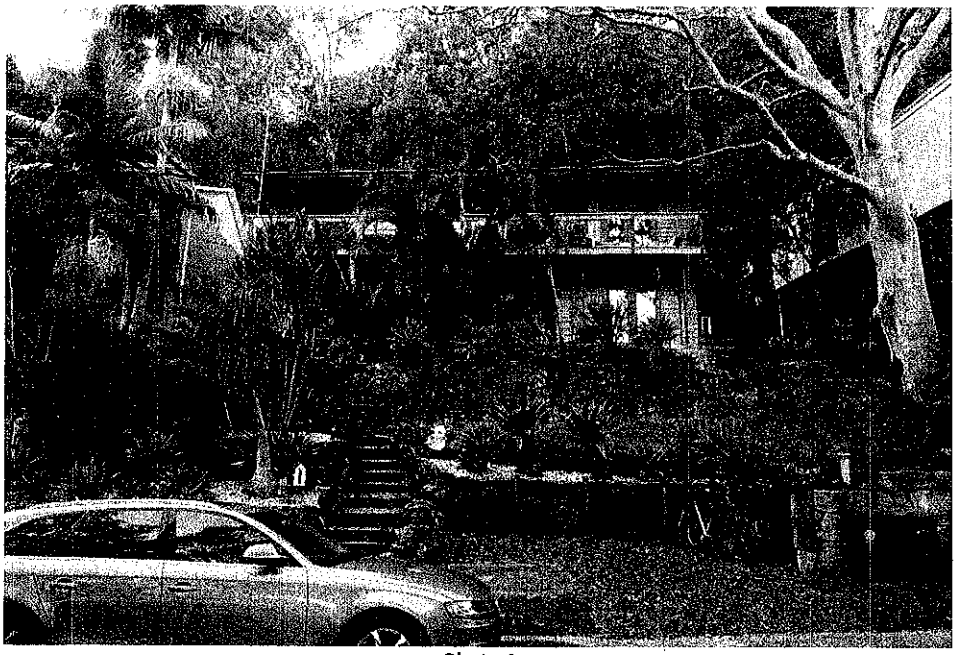


Photo 1

Photo 2

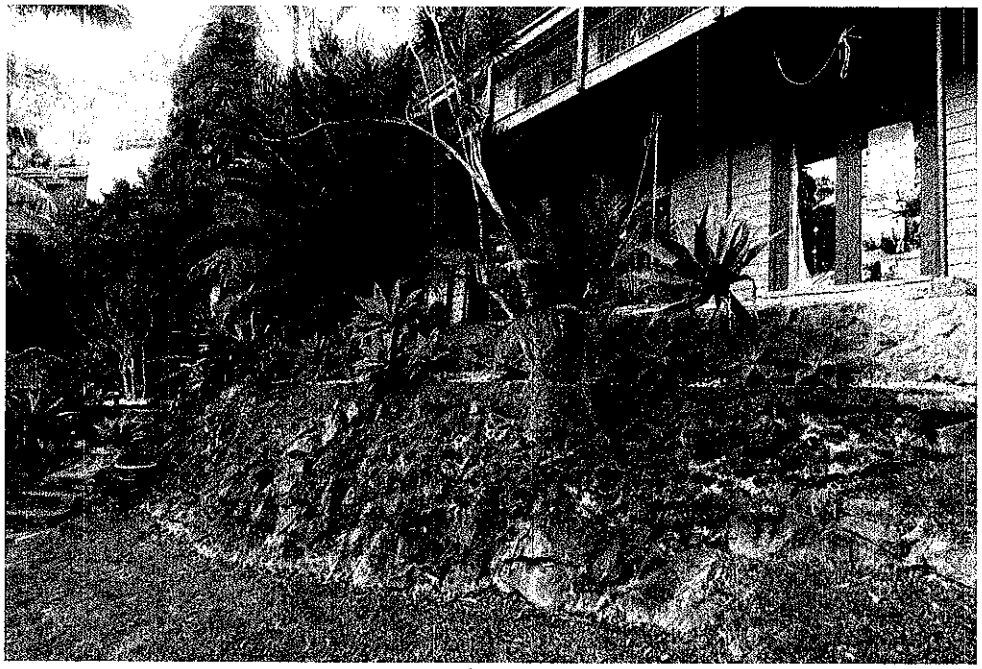


Photo 3

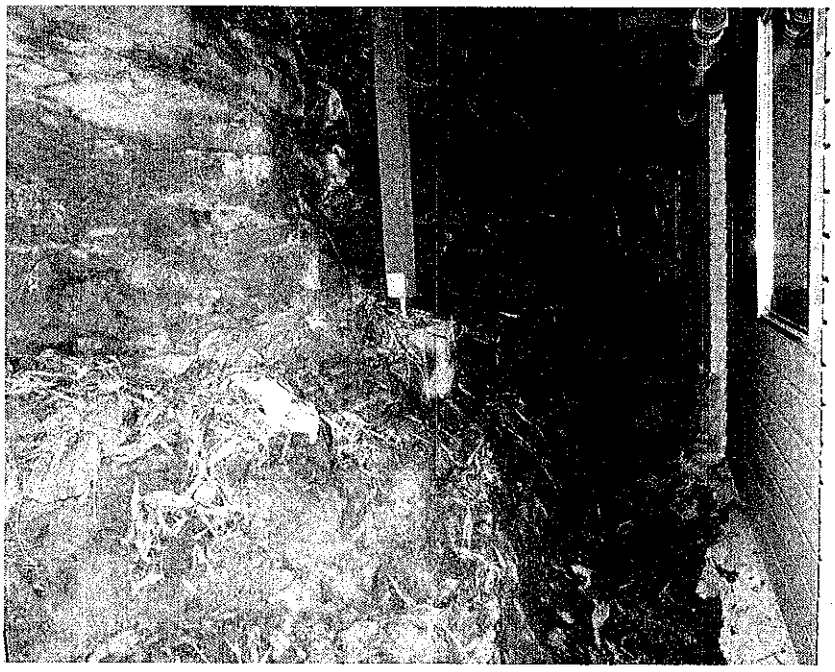


Photo 4

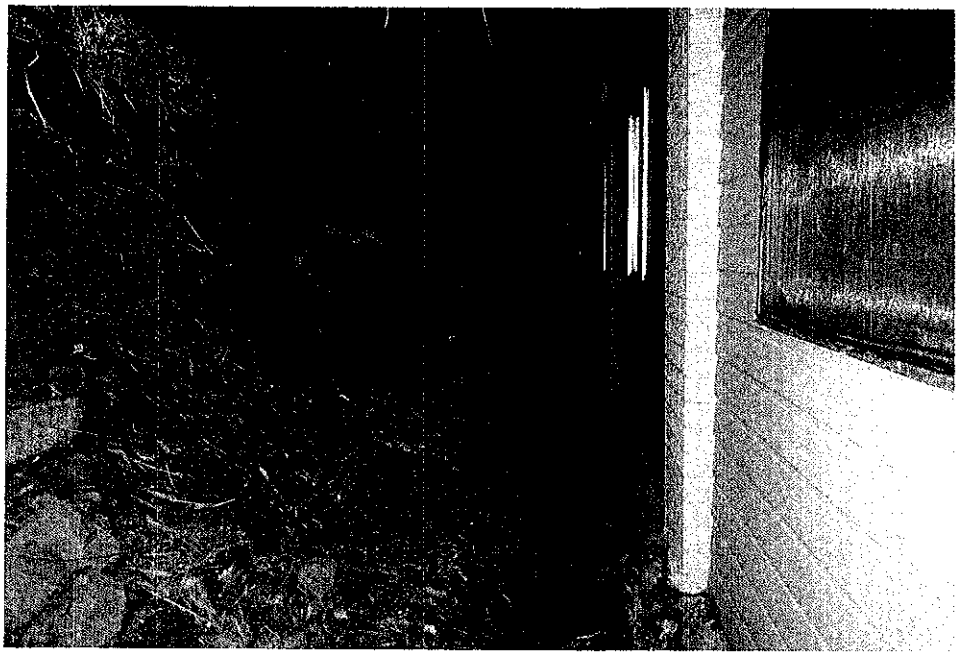


Photo 5

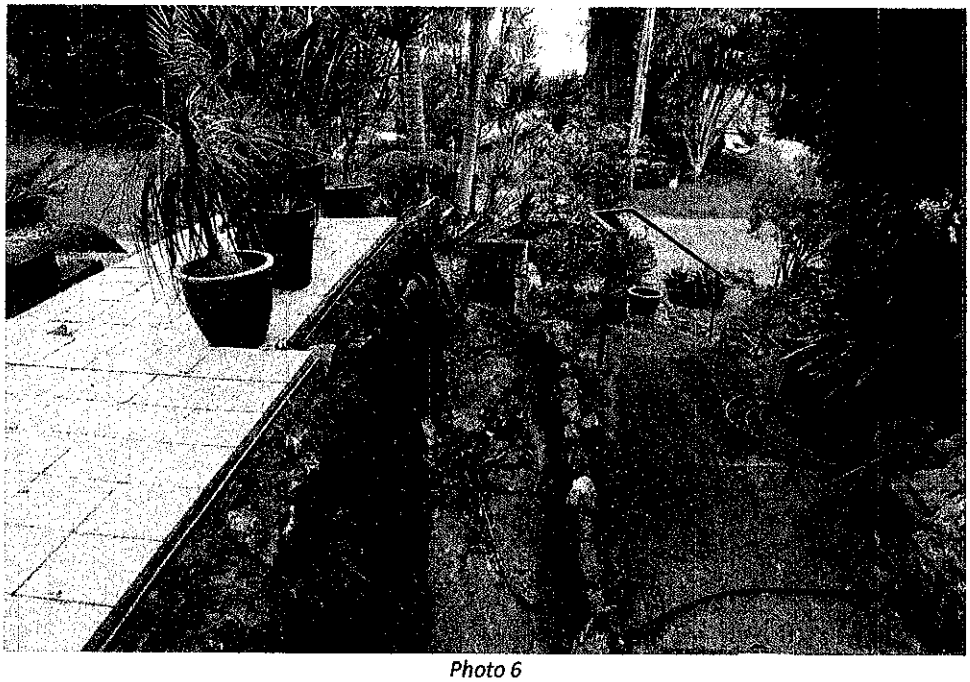


Photo 6

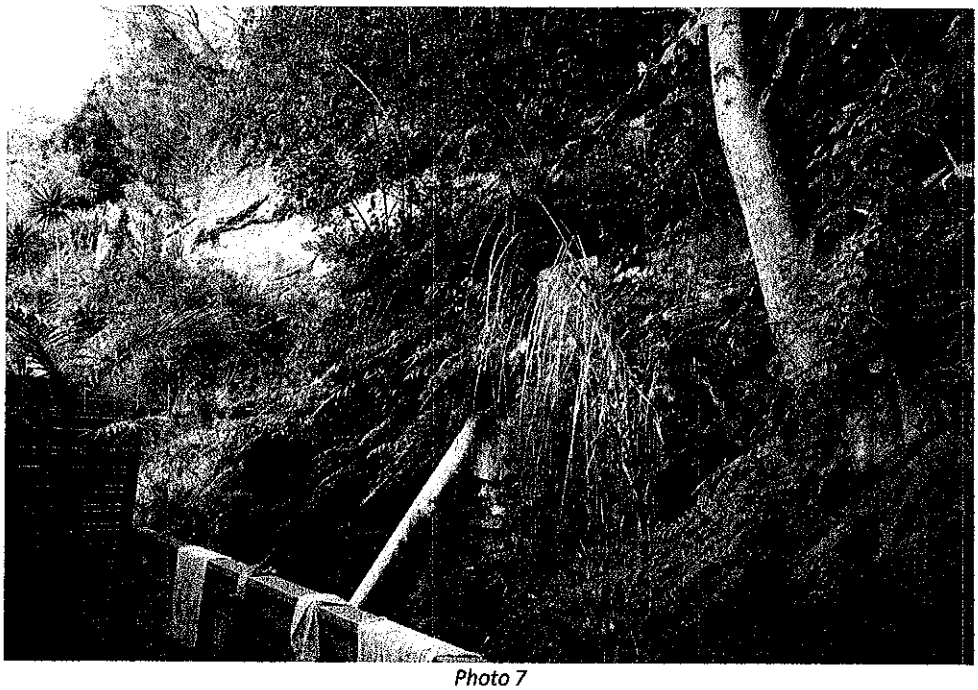


Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Important Information about Your Report

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

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

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

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

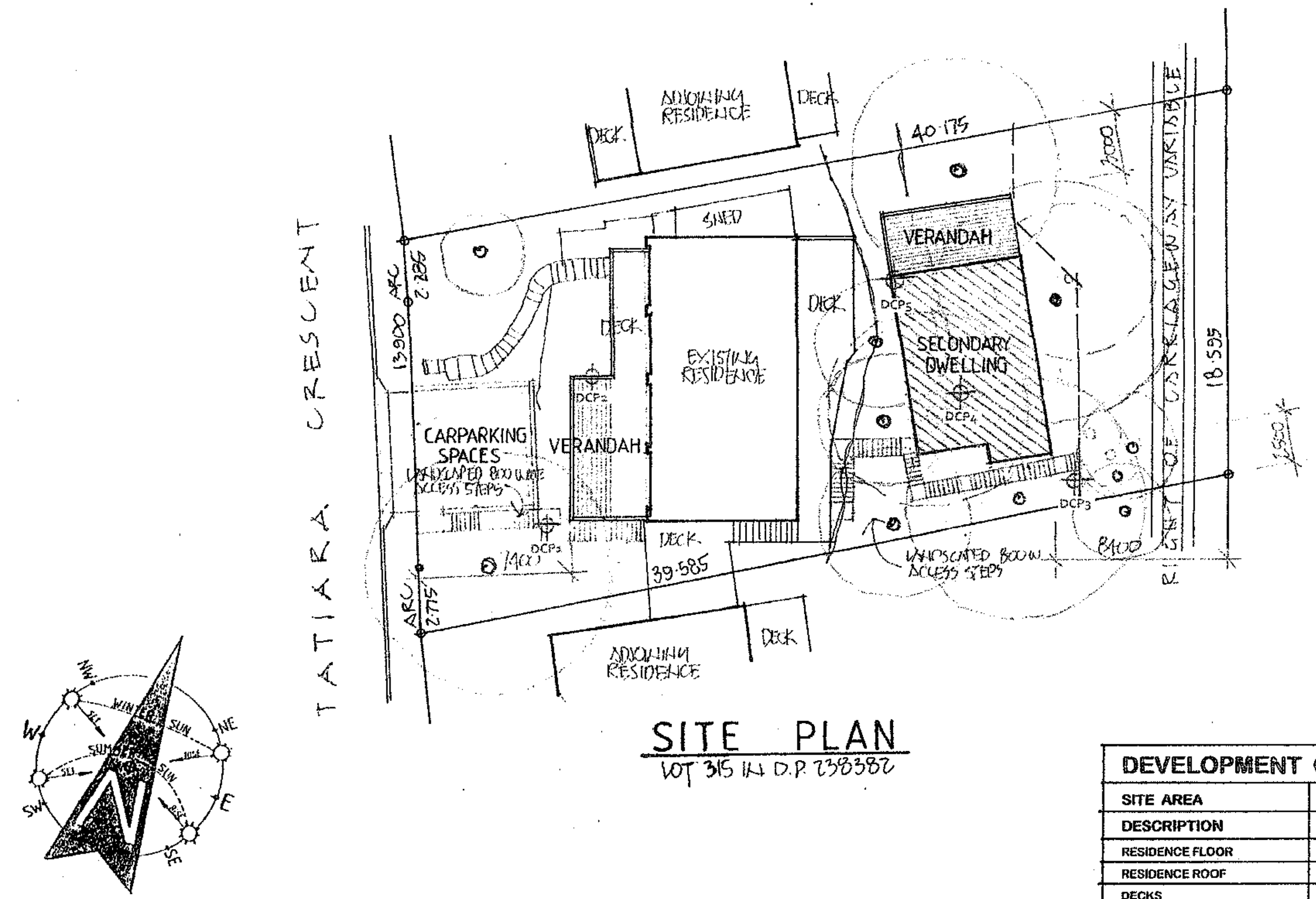
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

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

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

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

SITE PLAN – showing test locations



SITE PLAN

LOT 315 IN D.P. 238382

DEVELOPMENT CALCULATIONS

SITE AREA	739.20 SQUARE METRES	
DESCRIPTION	EXISTING SQM	PROPOSED SQM
RESIDENCE FLOOR	201.48	201.48
RESIDENCE ROOF	109.40	109.40
DECKS	62.60	102.20
SHED	11.80	11.80
ROW DRIVEWAY	37.35	3.725
SECONDARY DWELLING	—	60.00
TOTAL HARD SURFACE	212.15 (28.15%)	311.75 (42.17%)

NOTES:

1. THE BUILDER IS TO CHECK AND CONFIRM ALL NECESSARY DIMENSIONS AND LEVELS ON SITE PRIOR TO ORDERING MATERIALS AND COMMENCING CONSTRUCTION. DO NOT SCALE OFF THE DRAWING.
2. SHOULD ANY DEVELOPMENT OR CONSTRUCTION OCCUR ON OR NEAR BOUNDARIES, THE BOUNDARIES SHOULD BE CLEARLY MARKED ON SITE BY THE REGISTERED LAND SURVEYORS.

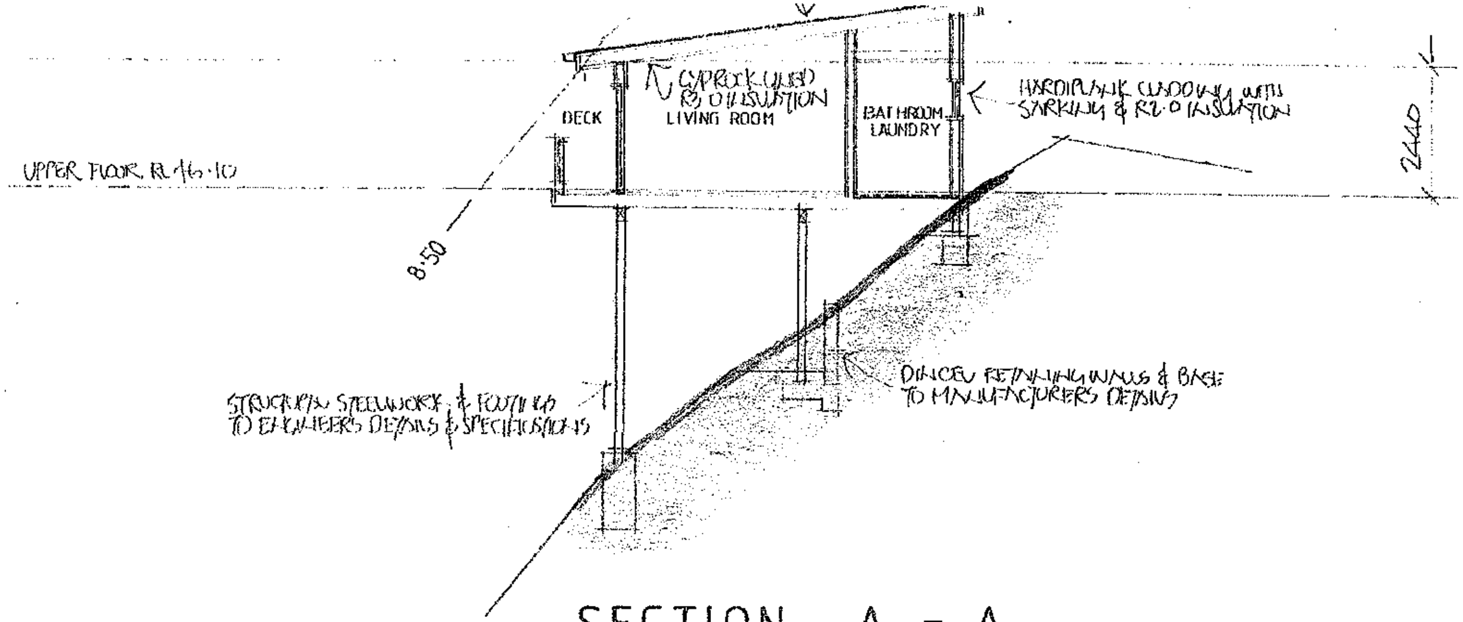
A | S10 DELIVERED PARKING SPACES | 21.9

J.D. EVANS and COMPANY
DESIGN AND BUILDING CONSULTANTS
74 RIVIERA AVENUE, AVALON BEACH, 2107
Phone 0418 ... mobile 0418 970 500
www.jdeco.com.au email info@jdeco.com.au

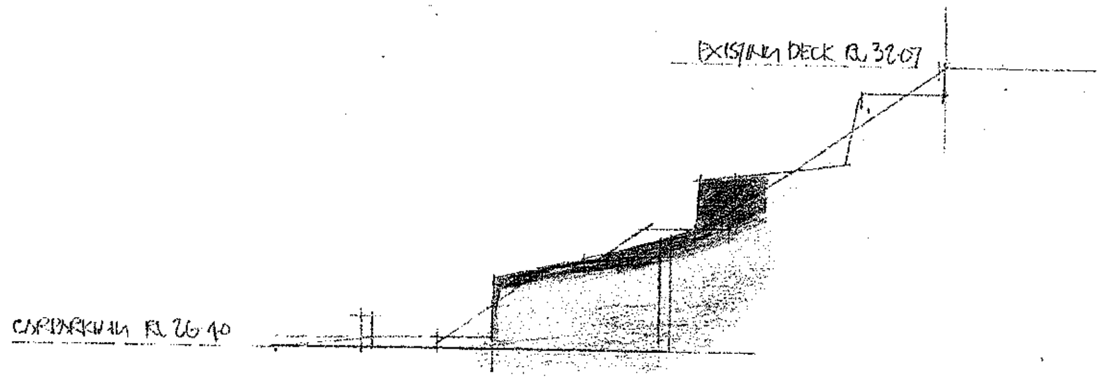
PROJECT
PROPOSED ALTERATIONS/ADDITIONS & SECONDARY DWELLING AT No. 48 TATIARA CRESCENT NORTH NARRABEEN N. S. W. 2101
DUNCAN & MURIEL JOURNEE

DATE 15/4/2016 SCALE 1:200
DRAWN JDE
DRAWING No. 1818-1 ISSUE A

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



SECTION A - A



SOUTH ELEVATION

- Fill
- Sandy Soil
- Sandy Clay – Firm to Stiff
- Hawkesbury Sandstone – Medium Strength

COPYRIGHT

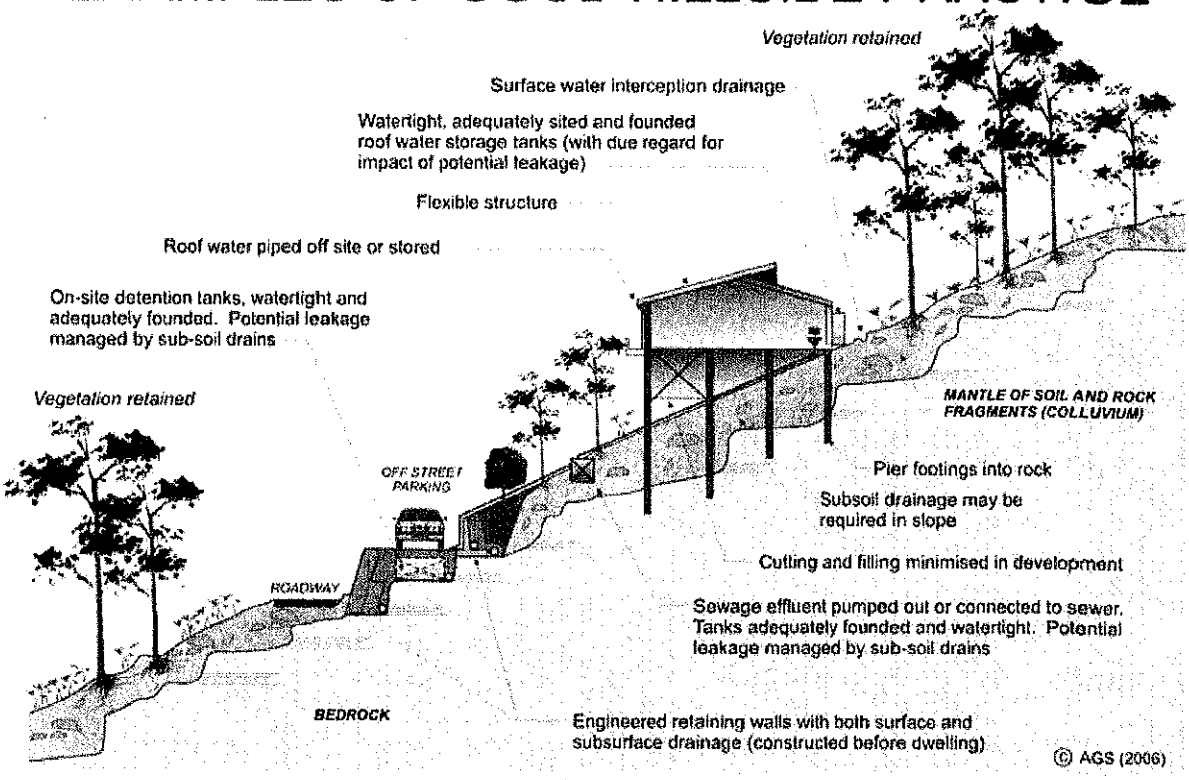
A S/D PROPOSED & PARKING 21.9

J.D. EVANS and COMPANY
DESIGN AND BUILDING CONSULTANTS
74 RIVIERA AVENUE, AVALON BEACH, 2107
Phone 9918 9208 mobile 0418 276 506
www.jdeco.com.au email info@jdeco.com.au

PROJECT
PROPOSED ALTERATIONS/ADDITIONS & SECONDARY DWELLING AT
No. 40 TATIARA CRESCENT
NORTH NARRABEEN N. S. W. 2101
DUNCAN & MURIEL JOURNEE

DATE 15/4/2016	SCALE 1:100
DRAWN JDE	CHECKED
DRAWING No. 1818 - 8	ISSUE A

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE