

## **GEOTECHNICAL INVESTIGATION:**

New Carport and Driveway at **9 Beatrice St, Clontarf.**

### **1. Proposed Development**

- 1.1** Construct a new carport, storeroom and lift near the SE corner of the existing house.
- 1.2** Construct a suspended steel mesh driveway with a concrete slab access ramp.
- 1.3** Details of the proposed development are shown on 5 drawings prepared by Spitfire Control, drawings numbered 1433/ MOD002 to 1433/ MOD006, dated 15<sup>th</sup> December 2019.

### **2. Site Description**

- 2.1** The site was inspected on the 11<sup>th</sup> and 18<sup>th</sup> of February, 2020.
- 2.2** This residential property is on the low side of the road and has a W aspect. It is located on the steeply graded upper reaches of a hillslope. The slope descends steeply from the road frontage to the uphill side of the house at an angle of ~32° before easing to an angle of ~26° from the uphill to downhill sides of the house. The slope eases to an angle of ~21° from the downhill side of the house to the downhill boundary of the property. The slope above and below the property decreases in grade.
- 2.3** Sandstone bedrock is outcropping on the uphill side of the Beatrice Street road frontage (Photo 1). The fill batter for the road merges into the natural slope that is supported at the toe by two stable stepped sandstone block retaining walls (Photos 2 & 3). The entire slope from the road to the upper retaining wall has a thick ground cover of creeper with some scattered shrubs and trees (Photo 4). The lower retaining wall has some stepped cracking through the mortar that is likely the result of the tree gum tree growing, immediately behind the wall (Photo 5). At the N side of

the sites the stepped retaining walls terminate at outcropping sandstone Bedrock that extends across the slope to the N common boundary where a ~ 3.0m high concrete block retaining wall in good condition supports a fill on the adjoining property (Photos 6 & 7). The wall can be seen to be founded on rock (Photo 8). At the S side of the frontage a timber staircase provides pedestrian access down the slope from the road frontage (Photos 9 & 10). Below the stepped walls a level lawn extends to the uphill side of the house (Photo 11). The single storey brick house is supported on walls that step down the slope (Photos 12 & 13). A concrete balcony extends off the downhill side of the house at a lower level to the living area of the house (Photo 14). The house structure is supported on brick walls, concrete piers and a concrete slab. The supporting walls and piers stand vertical and show no significant signs of movement (Photos 15 to 18). Low sandstone stack rock retaining walls line the slope along the N property boundary and well-constructed sandstone block retaining walls support the slope downhill of the balcony (Photo 19). Sandstone gabion retaining walls support the slope near the S side of the house (Photo 20). No signs of slope instability were observed on the property.

### **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 laminite lenses.

### **4. Subsurface Investigation**

We had been provided with requested test locations, some of which were in the road reserve. Dial before you dig indicated services were present. On site the service locator was unable to detect a secondary gas main and recommended no testing be carried out until A Gemena gas technician was able to confirm the location of the secondary gas main. After a second site visit with the technician the testing was carried out where services were not present. We note the presence of the services will alter the proposed pier locations.

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. 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 and the results are as follows:

| DCP TEST RESULTS – Dynamic Cone Penetrometer    |                    |                    |                               |                    |
|-------------------------------------------------|--------------------|--------------------|-------------------------------|--------------------|
| Equipment: 9kg hammer, 510mm drop, conical tip. |                    |                    | Standard: AS1289.6.3.2 - 1997 |                    |
| Depth(m)<br>Blows/0.3m                          | DCP 1<br>(~RL44.8) | DCP 2<br>(~RL42.6) | DCP 3<br>(~RL41.3)            | DCP 4<br>(~RL41.3) |
| 0.0 to 0.3                                      | 2                  | 3                  | 22                            | 8                  |
| 0.3 to 0.6                                      | 7                  | 7                  | 30                            | 7                  |
| 0.6 to 0.9                                      | 5                  | 20                 | #                             | 8                  |
| 0.9 to 1.2                                      | 17                 | 22                 |                               | 12                 |
| 1.2 to 1.5                                      | 17                 | 27                 |                               | #                  |
| 1.5 to 1.8                                      | #                  | 12                 |                               |                    |
| 1.8 to 2.1                                      |                    | 30                 |                               |                    |
| 2.1 to 2.4                                      |                    | #                  |                               |                    |
|                                                 | Refusal @ 1.5m     | End of Test @ 1.9m | Refusal @ 0.4m                | Refusal @ 1.1m     |

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

#### **DCP Notes:**

DCP1 – Refusal @ 1.5m, DCP bouncing, grey and maroon sandstone fragments on dry tip.

DCP2 – End of Test @ 1.9m, DCP still very slowing going down, orange sandstone fragments on dry tip.

DCP3 – Refusal @ 0.4m, DCP bouncing, white sandstone fragments on dry tip.

DCP4 – Refusal @ 1.1m, DCP bouncing, brown and orange sandstone fragments on dry tip.

## 5. Geological Observations/Interpretation

The surface features of the block are controlled by the underlying sandstone bedrock that steps down 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. The rock is overlain by soil and clay that fills the bench step formation. In the test locations, the depth to rock ranged between 0.4m to 1.9m below the current surface. The sandstone underlying the property is estimated to be Medium Strength or better. See Type Section attached for a diagrammatical representation of the expected ground materials.

## 6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the rock and through the cracks in the rock.

Due to the slope and elevation of the block, the water table in the location is expected to be many metres below the proposed works.

## 7. Surface Water

No evidence of 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 Beatrice Street above.

## 8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The steep slope that falls across the property and continues above and below is a potential hazard (**Hazard One**).

**RISK ANALYSIS SUMMARY IS ON THE NEXT PAGE**

## Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

| HAZARDS                  | Hazard One                                                                                                          |
|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| TYPE                     | The steep slope that falls across the property and continues above and below failing and impacting on the property. |
| LIKELIHOOD               | 'Unlikely' ( $10^{-4}$ )                                                                                            |
| CONSEQUENCES TO PROPERTY | 'Medium' (12%)                                                                                                      |
| RISK TO PROPERTY         | 'Low' ( $2 \times 10^{-5}$ )                                                                                        |
| RISK TO LIFE             | $8.3 \times 10^{-7}$ /annum                                                                                         |
| COMMENTS                 | This level of risk is 'ACCEPTABLE'.                                                                                 |

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

## 9. Suitability of the Proposed Development for the Site

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

## 10. Stormwater

The fall is to Amiens Road. Council stormwater piping runs through the property near the S boundary of the property. Stormwater from the proposed development is to be piped to the street drainage system below or to the council stormwater piping, through any tanks that may be required by the regulating authorities.

## 11. Excavations

Apart from those for footings and possible minor levelling, no excavations are required.

## 12. Foundations

Piers potted 0.3m into Medium Strength Sandstone are suitable foundations for the proposed carport, storeroom, lift and driveway. Medium Strength Sandstone is expected at a depth of ~0.4m to ~1.9m below the current ground surface. A maximum allowable bearing pressure of 1000kPa can be assumed for footings on Medium Strength Sandstone. See 'Section 4 Subsurface Investigation' in regards to buried underground services.

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 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.

## 13. Inspections

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 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 is still onsite and before steel reinforcing is placed or concrete is poured.

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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



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.

Note that alterations shown for existing dwelling are as per previously approved DA224/2013 and have not yet been built

edge of existing deck

extent of store room above

Partially demolish existing 600mm high garden wall

demolish existing pedestrian access stair

4.55MOD: alter position of lift, structural column configuration and extend existing boundary retaining wall

extend existing boundary retaining wall to suit new external stair

position of sw pipe

extent of elevated external access stair

1:1200

100

width of easement

1410

1400

1600

EXISTING PAVING

EXISTING LAWN

LIFT

DCP3

DCP2

DCP1

DCP4

columns, beams & all foundations to struct eng dr

extend existing paving as shown

position of sw pit

extent of elevated external access stair

STREET

BEATRICE

STUDY

LAUNDRY 13.190

KITCHEN

DINING

LIVING

BEDROOM

BATHROOM

DECK

HALL

A

B

C

D

E

F

34.5

32.5

31

30.5

31.5

32.5

33.5

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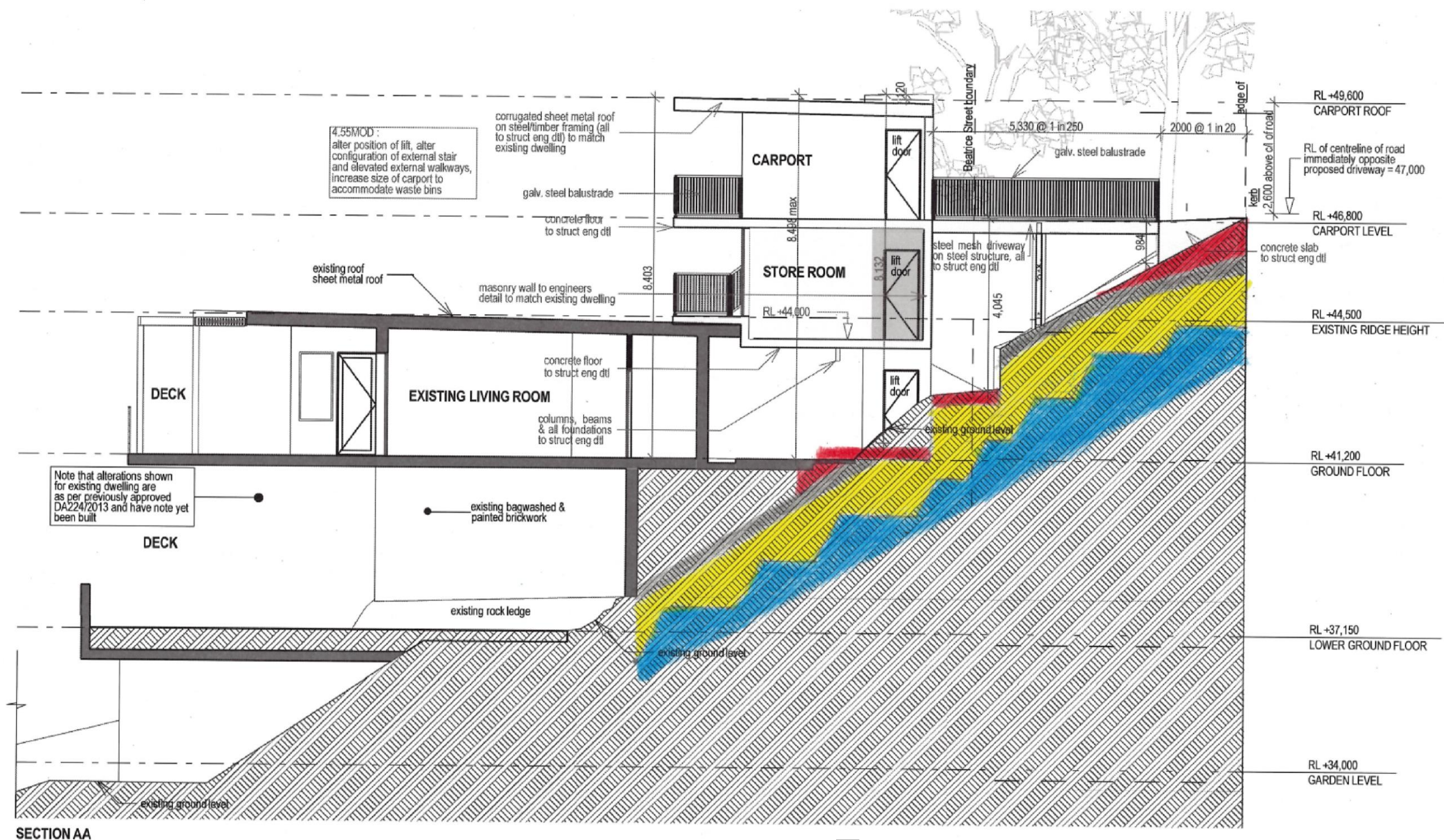
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**SPITFIRECONTROL**  
Corporate Workplace Strategies

## PROPOSED NEW CARPORT AT 9 BEATRICE STREET, CLONTARF

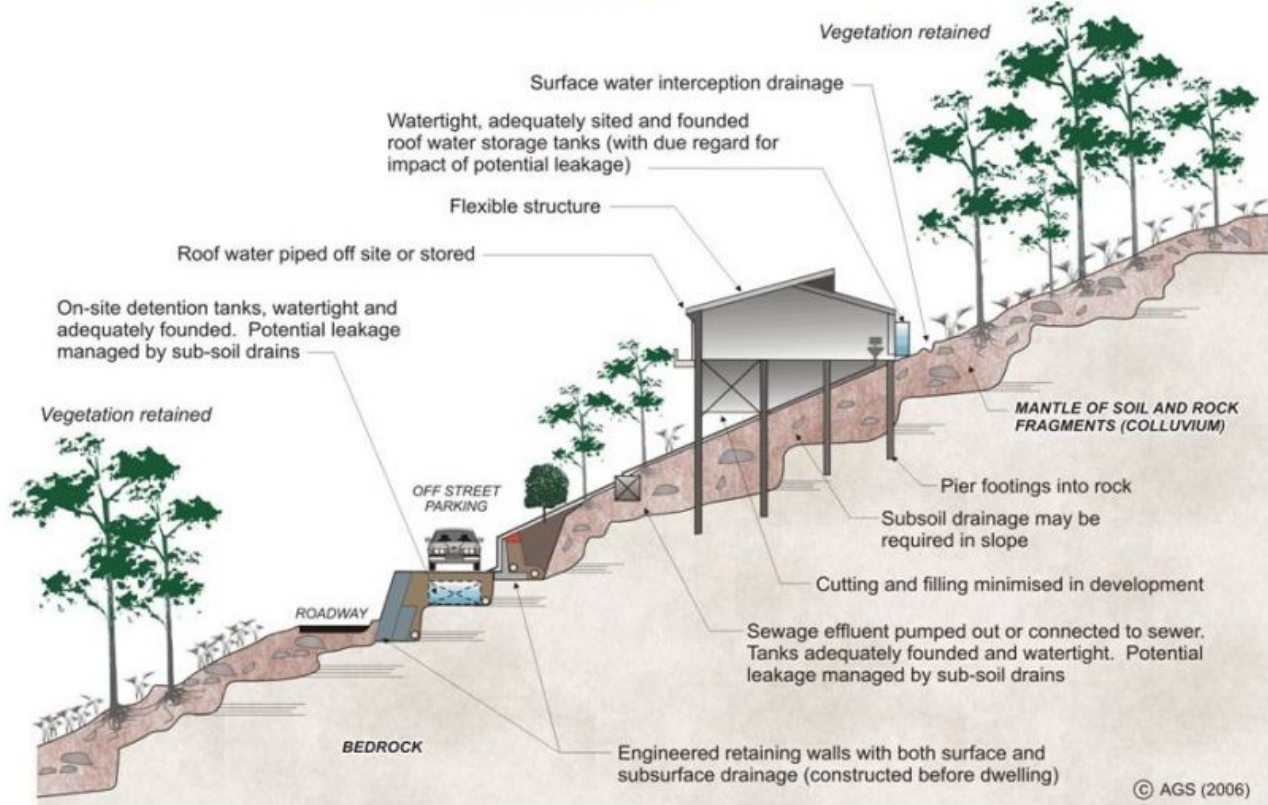
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# TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



- Fill
- Sandy Soil
- Clay
- Hawkesbury Sandstone – Medium Strength

# EXAMPLES OF **GOOD** HILLSIDE PRACTICE



# EXAMPLES OF **POOR** HILLSIDE PRACTICE

