# GEOTECHNICAL INVESTIGATION:

New House, Granny Flat & Studio at **4 Southern Cross Way, Allambie Heights**

## 1. Proposed Development

**1.1** Demolish the existing house.

**1.2** Construct a new three storey house with garage and suspended driveway by excavating to a maximum depth of ~2.1m.

**1.3** Construct a new granny flat and studio on the downhill side of the property.

**1.4** Construct an OSD tank between the proposed granny flat and studio by excavating to a maximum depth of ~2.2m.

**1.5** Details of the proposed development are shown on 7 drawings prepared by Sabton & Son, drawing number PR020.03. Pages numbered 1, 8a and 9 are Issue D, dated 23/3/25. Pages numbered 2 to 5 are Issue 1, dated 10/4/20. Additional details are shown on 3 stormwater plans prepared by Australiawide Consulting Services, dated 21/5/21. Two of the stormwater drawings are numbered SW02-A and SW03. The other drawing is unnumbered.

## 2. Site Description

**2.1** The site was inspected on the 20th of July, 2020.

**2.2** This residential property is on the low side of the road and has an E aspect. It is located on the gentle to moderately graded upper reaches of a hillslope. The natural slope falls at an average angle of ~8° from the uphill boundary of the property to the downhill side of the existing house. The rocky slope below the existing house falls at an angle of ~15°. The slope above and below the property continues at similar angles.

**2.3** At the road frontage a concrete and concrete stripped driveway runs down the slope to a carport beside the house (Photos 1 & 2). Sandstone is exposed at the surface

under the carport at the uphill side (Photo 3). The part two storey brick and weatherboard clad house is supported on brick walls and brick (Photos 4 & 5). The supporting walls show no significant signs of movement and the supporting piers stand vertical (Photo 6). Competent Medium Strength Sandstone bedrock outcrops across the slope on the downhill side of the property (Photo 7). Stable low sandstone block retaining walls support fill on the downhill side of the house and carport (Photo 8). No signs of slope instability were observed on the property that could have occurred since the property was developed. The adjoining neighbouring properties were observed to be in good order as seen from the street and subject 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

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:

| DCP TEST RESULTS – Dynamic Cone Penetrometer | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Equipment: 9kg hammer, 510mm drop, conical tip. | | | | | | | | Standard: AS1289.6.3.2 - 1997 | |
| **Depth(m) Blows/0.3 m** | **DCP 1** (~RL82.9) | **DCP 2** (~RL82.4) | **DCP 3** (~RL81.7) | **DCP 4** (~RL80.8) | **DCP 5** (~RL80.2) | **DCP 6** (~RL79.7) | **DCP 7** (~RL78.4) | **DCP 8** (~RL8.6) | **DCP 9** (~RL77.1) |
| 0.0 to 0.3 | 6 | 17 | 18 | 4 | 4 | 4 | Rock exposed at surface | 4 | Rock exposed at surface |
| 0.3 to 0.6 | 18 | 9 | 5 | 3 | 3 | 7 | | 8 | |
| 0.6 to 0.9 | 32 | # | # | # | | 45 | | # | |
| 0.9 to 1.2 | 38 | | | | | 16 | | | |
| 1.2 to 1.5 | # | | | | | 21 | | | |
| 1.5 to 1.8 | | | | | | # | | | |
| | Refusal @ 1.1m | Refusal @ 0.4m | Refusal @ 0.4m | Refusal @ 0.4m | Refusal @ 0.4m | Refusal @ 1.4m | | Refusal @ 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 – Refusal on rock @ 1.1m, DCP bouncing off rock surface, white sandstone fragments on dry tip.
DCP2 – Refusal on rock @ 0.4m, DCP bouncing off rock surface, white sandstone fragments on dry tip.
DCP3 – Refusal on rock @ 0.4m, DCP bouncing off rock surface, dark brown soil on moist tip.
DCP4 – Refusal on rock @ 0.4m, DCP bouncing off rock surface, dark brown soil on moist tip.
DCP5 – Refusal on rock @ 0.4m, DCP bouncing off rock surface, dark brown soil on moist tip.
DCP6 – Refusal on rock @ 1.4m, DCP bouncing off rock surface, dark brown soil on damp tip.
DCP7 – Medium Strength Sandstone exposed at the surface.
DCP8 – Refusal on rock @ 0.5m, DCP bouncing off rock surface, dark brown soil on damp tip.
DCP9 – Medium Strength Sandstone exposed at the surface.

## 5. Geological Observations/Interpretation

The surface features of the block are controlled by the outcropping and 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 fill, topsoil and clay that fills the bench step formation. Fill provides level platforms on the downhill side of the house and carport. In the

test locations, where rock was not exposed, it was encountered at depths of between ~0.4 to ~1.4m below the current surface, being deeper in the filled areas and slightly variable due to the stepped nature of the rock. The sandstone exposed across the property is estimated to be Medium Strength or better and similar strength rock is expected to underlie the entire site. See Type Section attached for a diagrammatical representation of the expected ground materials.

## 6. Groundwater

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

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

## 7. Surface Water

No evidence of surface flows were observed on the property during the inspection. Normal sheet wash from the slope above will be intercepted by the street drainage system for Southern Cross Way above.

## 8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The gentle to moderately graded slope that falls across the property and continues above and below is a potential hazard (**Hazard One**). The vibrations from the proposed excavations are a potential hazard (**Hazard Two**). The proposed excavations are a potential hazard until retaining structures are in place (**Hazard Three**).

**RISK ANALYSIS SUMMARY ON NEXT PAGE**

**Geotechnical Hazards and Risk Analysis - Risk Analysis Summary**

| HAZARDS | Hazard One | Hazard Two | Hazard Three |
|---|---|---|---|
| **TYPE** | The gentle to moderate slope that falls across the property and continues above and below failing and impacting on the proposed works. | The vibrations produced during the proposed excavations for the house and OSD tank impacting on the surrounding structures. | The proposed excavations for the house and OSD tank collapsing onto the worksite and undercutting the S common boundary wall (Photo 2) during the excavation process. |
| **LIKELIHOOD** | 'Unlikely' ($10^{-4}$) | 'Possible' ($10^{-3}$) | 'Possible' ($10^{-3}$) |
| **CONSEQUENCES TO PROPERTY** | 'Medium' (12%) | 'Medium' (15%) | 'Medium' (15%) |
| **RISK TO PROPERTY** | 'Low' ($2 \times 10^{-5}$) | 'Moderate' ($2 \times 10^{-4}$) | 'Moderate' ($2 \times 10^{-4}$) |
| **RISK TO LIFE** | $4.2 \times 10^{-7}$/annum | $5.3 \times 10^{-7}$/annum | $3.7 \times 10^{-5}$/annum |
| **COMMENTS** | This level of risk is 'ACCEPTABLE'. | This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Sections 11 & 12** are to be followed. | This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels, the recommendations in **Section 13** are to be followed. |

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

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

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

## 10. Stormwater

The fall is away from the street. The stormwater engineer is to refer to council stormwater policy for suitable options.

## 11. Excavations

An excavation to a maximum depth of ~2.1m will be required to construct the proposed new house. Another excavation to a maximum depth of ~2.2m will be required to construct the proposed OSD tank.

The excavations are expected to be through fill, topsoil and clay, with Medium Strength Sandstone or better expected at depths of up to~1.4m below the current surface where it is not exposed, being deeper in the filled areas and slightly variable due to the stepped nature of the rock. It is envisaged that excavations through fill, soil and clay can be carried out with an excavator and toothed bucket and excavations through Medium Strength Sandstone or better will require grinding or rock sawing and breaking.

## 12. Vibrations

Possible vibrations generated during excavations through fill, soil and clay will be below the threshold limit for building damage utilising a domestic sized excavator up to 16 tonnes.

Excavations through Medium Strength Rock or better should be carried out to minimise the potential to cause vibration damage to the sewer main (150mm diameter vitrified clay pipe), S neighbouring house, S neighbouring pool and N neighbouring house. Allowing 0.5m for backwall drainage, the setbacks are as follows:

- The house excavation is set back ~2.1m from the S neighbouring house, ~2.0m from the S neighbouring pool and ~5.5m from the N neighbouring house.
- The OSD tank excavation is set back ~2.0m from the sewer main.

Dilapidation reporting carried out on the S and N neighbouring properties is recommended prior to the excavation works commencing to minimise the potential for spurious building damage claims.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the surrounding structures and infrastructure. Vibration monitoring will be required to verify this is achieved. Vibration monitoring must include a light/alarm so the operator knows if vibration limits have been exceeded. The equipment is to log and record vibrations throughout the excavation works.

In Medium Strength rock or better techniques to minimise vibration transmission will be required. These include:

- Rock sawing the excavation perimeter to at least 1.0m deep prior to any rock breaking with hammers, keeping the saw cuts below the rock to be broken throughout the excavation process.
- Limiting rock hammer size.
- Rock hammering in short bursts so vibrations do not amplify.
- Rock breaking with the hammer angled away from the nearby sensitive structures.
- Creating additional saw breaks in the rock where vibration limits are exceeded, as well as reducing hammer size as necessary.
- Use of rock grinders (milling head).

Should excavation induced vibrations exceed vibration limits after the recommendations above have been implemented, excavation works are to cease immediately and our office is to be contacted.

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

## 13. Excavation Support Requirements

An excavation to a maximum depth of ~2.1m will be required to construct the proposed new house. Another excavation to a maximum depth of ~2.2m will be required to construct the proposed OSD tank. Allowing 0.5m for backwall drainage, the house excavation is set back ~0.5m from the S common boundary brick wall (Photo 2). The OSD tank excavation is set back sufficiently from the surrounding structures and property boundaries.

Given the exposed bedrock and depth to rock shown by the test results, the S common boundary brick wall (Photo 2) is expected to be supported on rock. However, to be sure, exploration pits along the wall 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 confirmed to be supported on Medium Strength Rock, the excavation may commence. If they are not, the wall will need to be underpinned prior to the excavation commencing. Underpinning requires permission of the neighbour. The extent of the area of the required exploration pits/underpinning are shown in orange on the attached site plan.

Underpinning is to follow the underpinning sequence 'hit one miss two'. Under no circumstances is the bulk excavation to be taken to the edge of the wall and then underpinned. Underpins are to be constructed from drives that should not exceed 0.6m in width along strip footings and should be proportioned according to footing size for other foundation types. Allowances are to be made for drainage through the underpinning to prevent a build-up of hydrostatic pressure. Underpins that are not designed as retaining walls are to be supported by retaining walls. The void between the retaining walls and the underpinning is to be filled with free-draining material such as gravel.

Where underpinning is not required and where space permits, the cut batters for the house excavation through fill and soil are to be battered temporarily at 1.0 Vertical to 2.0 Horizontal (26°) until the retaining walls are in place. Excavations through clay are expected to stand at

near vertical angles for short periods of time until the retaining walls are in place, provided the cut batters are kept from becoming saturated.

The cut batters for the OSD tank excavation through fill, soil and clay are expected to stand at near-vertical angles for short periods of time until the tank structure is installed, provided the cut batters are kept from becoming saturated. If the cut batters remain unsupported for more than a few days before the construction of the tank structure they are to be temporarily supported until the tank structure is in place.

Medium Strength Sandstone or better is expected to stand at vertical angles unsupported subject to approval by the geotechnical consultant

During the excavation process, the geotechnical consultant is to inspect the excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support. If additional ground support is required this will likely involve the use of mesh, rock bolts, and sprayed concrete.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters through fill, soil and clay are to be covered to prevent access of water in wet weather and loss of moisture in dry weather. The covers are to be tied down with metal pegs or other suitable fixtures so they cannot blow off in a storm. The materials and labour to construct the retaining walls / tank 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.

Upon completion of the excavation, it is recommended the cut faces be supported with retaining walls to prevent any potential future movement of joint blocks in the cut face that can occur over time, when unfavourable jointing is obscured behind the excavation face.

Additionally, retaining walls will help control seepage and to prevent minor erosion and sediment movement.

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

## 14. Retaining Structures

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

**Table 1 – Likely Earth Pressures for Retaining Structures**

| Unit | Earth Pressure Coefficients | | |
|---|---|---|---|
| | Unit weight ($kN/m^3$) | 'Active' $K_a$ | 'At Rest' $K_0$ |
| Fill and Topsoil | 20 | 0.40 | 0.55 |
| Residual Clays | 20 | 0.35 | 0.45 |
| Medium Strength Sandstone | 24 | 0.00 | 0.01 |

For rock classes refer to Pells et al "Design Loadings for Foundations on Shale and Sandstone in the Sydney Region".

It is to be noted that the earth pressures in Table 1 assume a level surface above the wall, do not account for any surcharge loads and assume retaining walls are fully drained. Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

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

retaining structures the full hydrostatic pressures are to be accounted for in the retaining structure design.

## 15. Site Classification

The site classification in accordance with AS2870-2011 is Class S. Assume no significant ground movement from moisture changes for foundations supported on Medium Strength Sandstone or better.

## 16. Foundations

The proposed house and OSD tank are expected to be seated in Medium Strength Sandstone. This is a suitable foundation material. Where the rock drops away with the slope on the downhill side, shallow spread footings/piers will be required to maintain a uniform bearing material across the structure. Spread footings or piers supported off Medium Strength Sandstone are suitable foundations for the proposed suspended driveway, granny flat and home office. A maximum allowable bearing pressure of 1000kPa can be assumed for footings on Medium Strength Sandstone.

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 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.

## 17. Inspections

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

- The geotechnical consultant is to inspect any exploration pits required to expose the foundation materials of the S common boundary wall (Photo 2).
- During the excavation process, the geotechnical consultant is to inspect the excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support.
- 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.

Dion Sheldon
BEng(Civil)(Hons) MIEAust NER,
Geotechnical Engineer.

Reviewed By:

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AIG., RPGeo Geotechnical & Engineering.
No. 10307
Engineering Geologist & Environmental Scientist.


*Photo 1*


*Photo 2*


*Photo 3*


*Photo 4*


*Photo 5*


*Photo 6*


*Photo 7*


*Photo 8*

## 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.

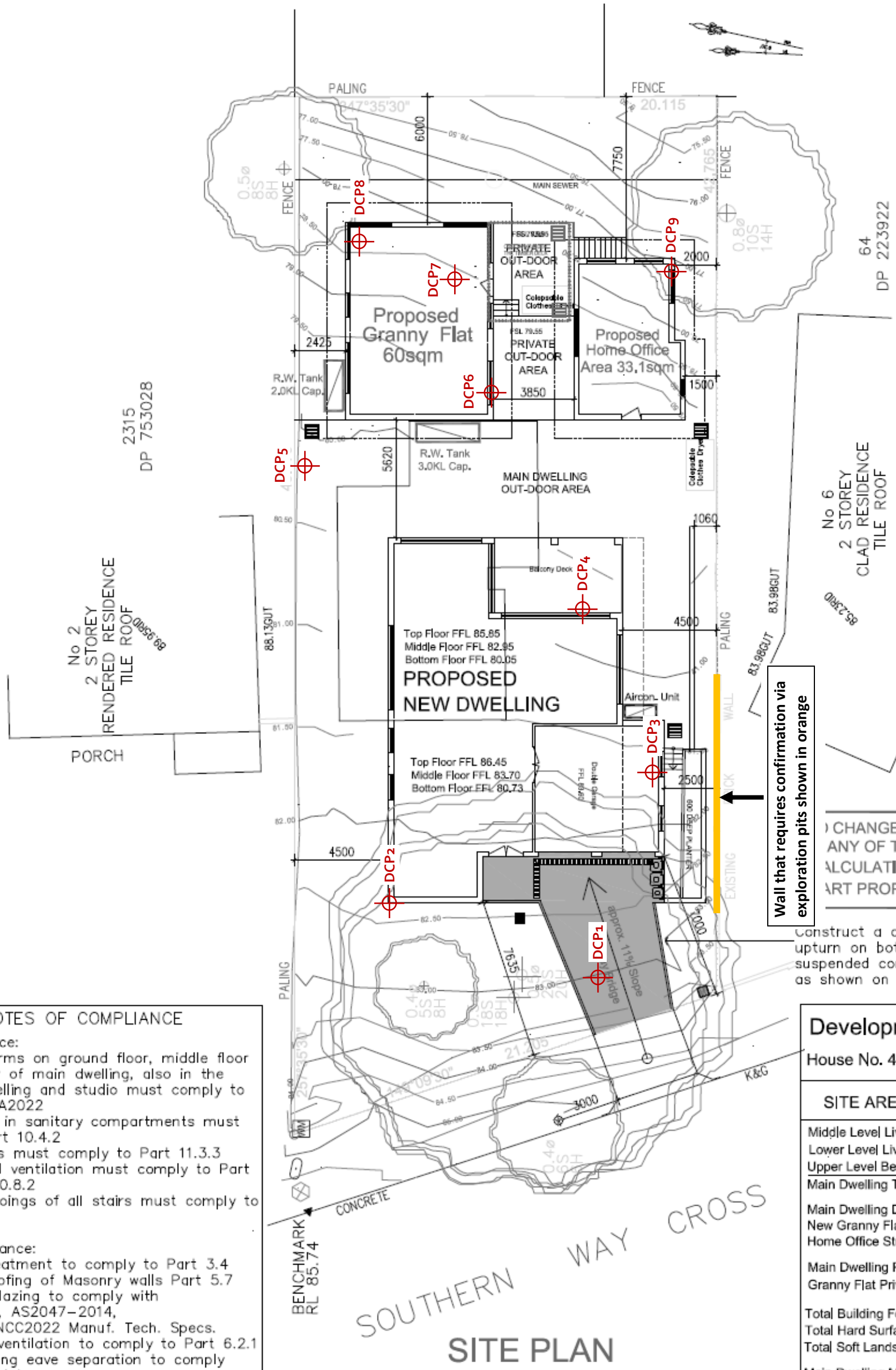
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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 – showing test locations




) CHANGES ARE PROPOSED
ANY OF THE DEVELOPMENT
ALCULATIONS OR LAYOUTS
ART PROPOSAL ON P8a & P9.

Construct a concrete apron upturn on both sides of the suspended concrete driveway as shown on the side elevations.

# SITE PLAN

NOTE: THIS SET OF DRAWINGS (PRO20.03, Page 1 - 10) HAVE BEEN AMENDED TO COMPLY TO D. A. 2020/1691 CONDITIONS. 1, 13 & 18.

## GENERAL NOTES OF COMPLIANCE

BCA Compliance:
All smoke alarms on ground floor, middle floor and first floor of main dwelling, also in the secondary dwelling and studio must comply to Part 9.5.1 BCA2022
Lift of hinges in sanitary compartments must comply to Part 10.4.2
All balustrades must comply to Part 11.3.3
All mechanical ventilation must comply to Part 10.6.2, Part 10.8.2
Raisers and goings of all stairs must comply to Part 11.2

N C C Compliance:
I....Termite treatment to comply to Part 3.4
II...Weatherproofing of Masonry walls Part 5.7
III..Part 8.3–Glazing to comply with AS1288–2006, AS2047–2014,
H1D8 of the NCC2022 Manuf. Tech. Specs.
IV..Sub–floor ventilation to comply to Part 6.2.1
V...Vertical lining eave separation to comply to Part 9.3.1 (5)
VI..Non–Combustible eave lining to comply to Part 9.2.9 (4)(b)
VII..Waterproofing to comply with:
NCC 2022 Part 10.2 H2D8
AS3740, AS4654.1 and AS4654.2

## Development Calculations

House No. 4 - Lot 2316 - DP 753028

SITE AREA = 927.80 m²

| | |
|---|---|
| Middle Level Living Area | 117.94sqm |
| Lower Level Living Area | 163.17sqm |
| Upper Level Bedrooms Area | 148.14sqm |
| Main Dwelling Total Floor Area | 429.25sqm |
| Main Dwelling D / Garage Area | 35.40sqm |
| New Granny Flat Floor Area | 60.00sqm |
| Home Office Studio Floor Area | 33.10sqm |
| Main Dwelling Private Open Space | 99.00sqm |
| Granny Flat Private Open Space | 60.00sqm |
| Total Building Footprint Area | 343.57sqm |
| Total Hard Surface Area | 389.38sqm |
| Total Soft Landscape Area (53.24%) | 494.01sqm |
| Main Dwelling Minimum Front Setback | 7.0m |
| Main Dwelling Northern Side Setback | 4.50m |
| Main Dwelling Southern Setback | 4.5m / 2.5m |
| Granny Flat Side Setback | 2.425m |
| Granny Flat Rear Setback | 6.0m |
| Office Studio Side Setback | 1.5m / 2.00m |
| Office Studio Rear Setback | 7.74m |

DESIGN CERTIFICATION

This is to certify that the Architectural issue B drawings have incorporated all the amendments requested in conditions 1,13&18 of DA Consent (DA2020/1691) and they comply in accordance to the general requirements of the local DCP and LEP Objectives.



PROJECT
Proposed modification to OSD tank and stormwater layout to reduce on site rock excavation.

| | | |
|---|---|---|
| D | MODS. TO STORMWATER SEC. 4.55 APPL. | MAR. 2025 |
| C | RAINWATER TANK REPOSITIONED TO SIDE SETBACK | MAR. 2022 |
| B | ISSUED FOR CC APPLICATION | MAR. 2022 |
| A | ISSUED FOR DA APPLICATION | OCT. 2020 |

ADDRESS
4 Southern Cress Way
Allambie Heights NSW

CLIENT
Mr. Chris Jaczac

| DRAWN | SCALE | DATE |
|---|---|---|
| AJ | 1:200 | 2025.03.23 |

DRAWING No: PR020.03, Page 1 | ISSUE D

SABTON & SON
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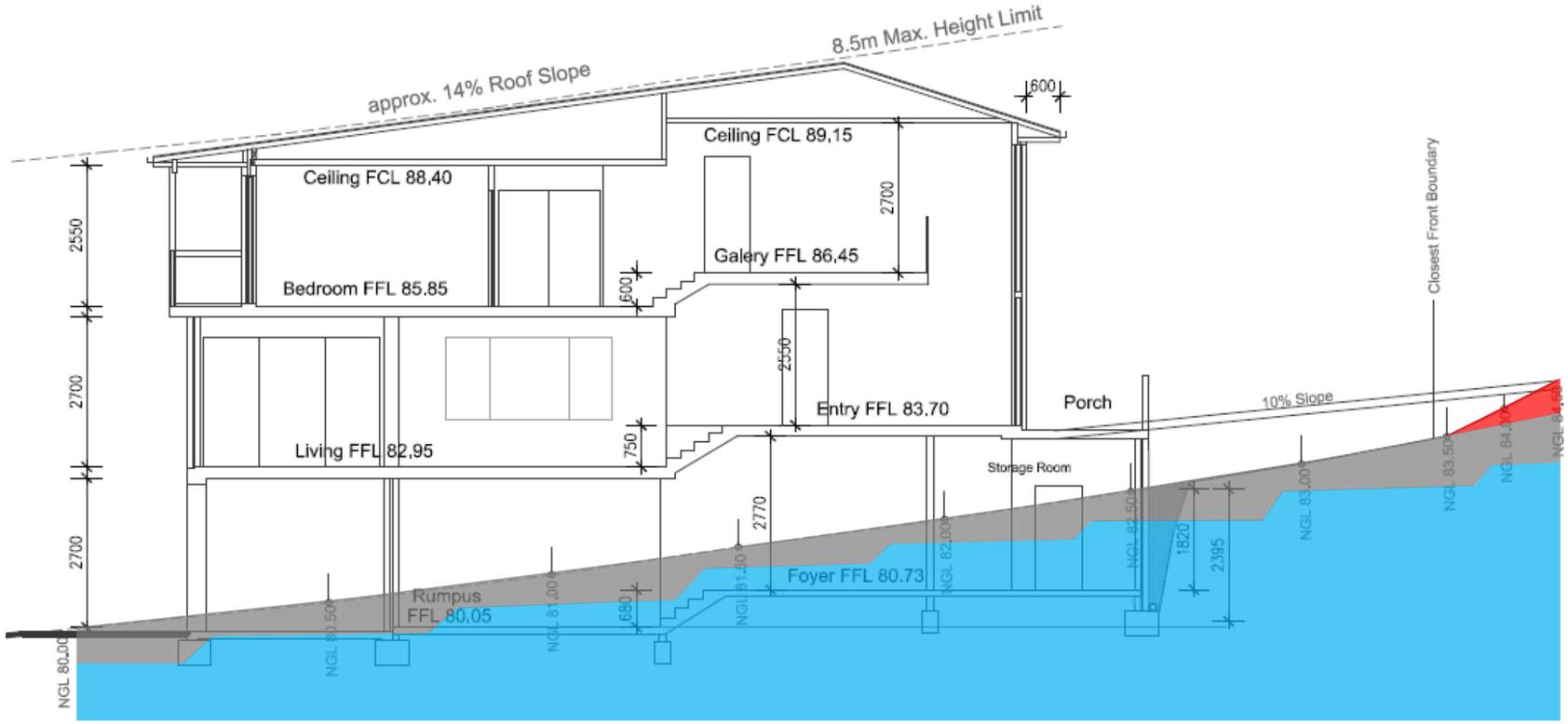
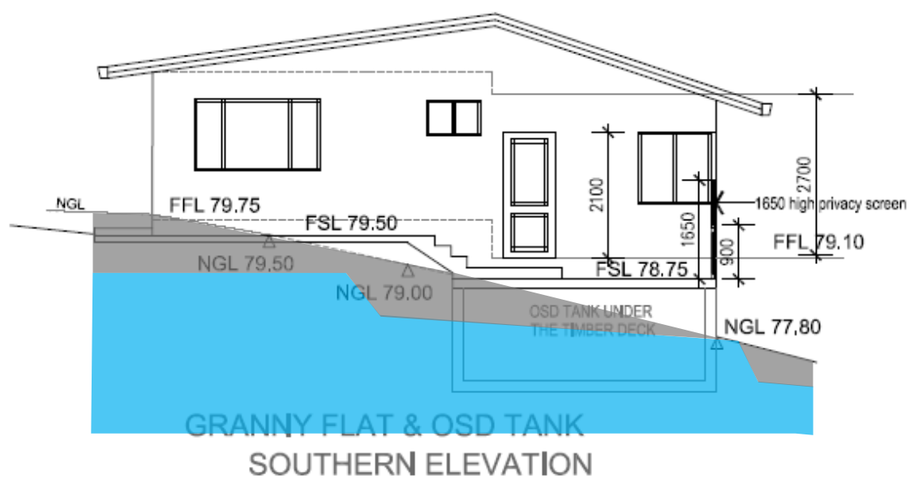
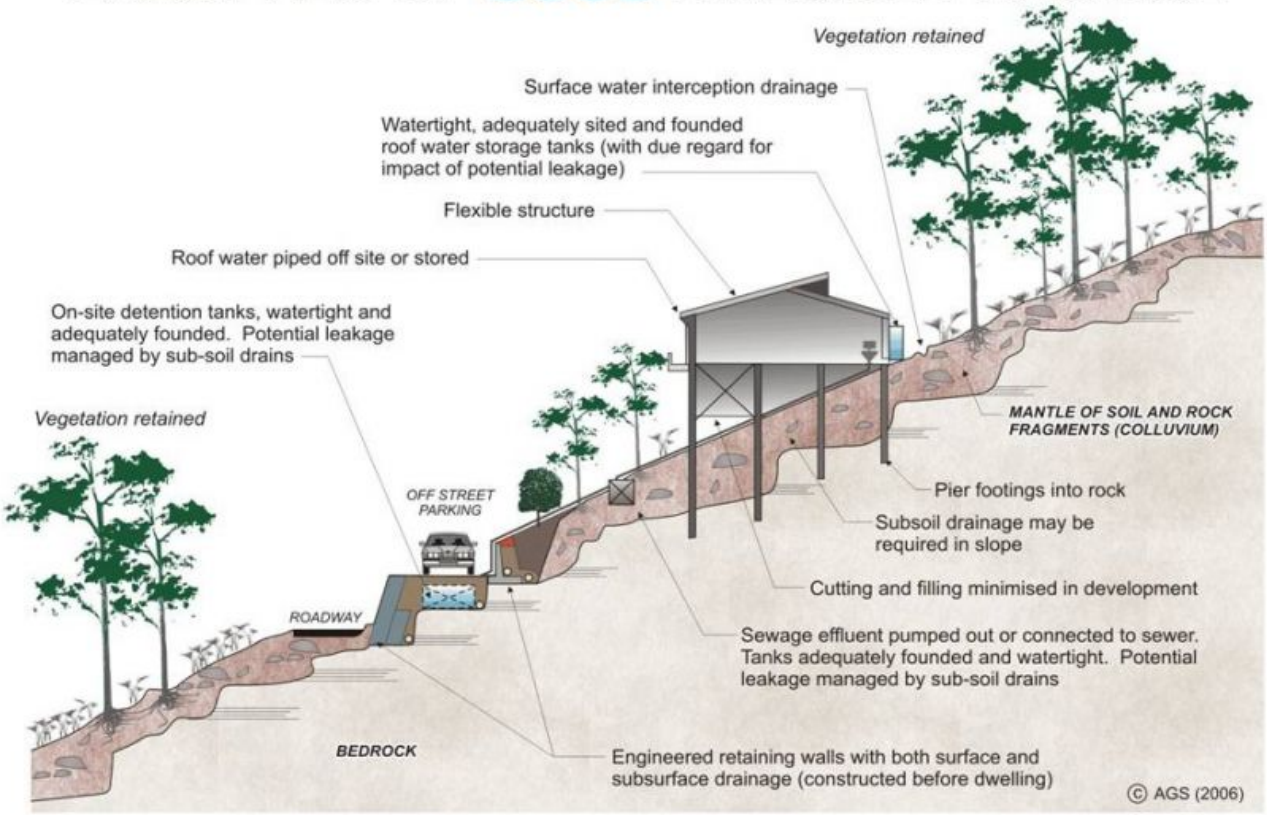
**TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials**




**Fill**
**Topsoil and Clay**
**Hawkesbury Sandstone – Medium Strength**



# EXAMPLES OF **GOOD** HILLSIDE PRACTICE




# EXAMPLES OF **POOR** HILLSIDE PRACTICE