GEOTECHNICAL INVESTIGATION:

New Pool at **129 Upper Clontarf Street, Seaforth**

1. Proposed Development

1.1 Construct a new pool and parking platform on the E side of the property.

1.2 Details of the proposed development are shown on 2 drawings prepared by Space Landscape Designs, Project number 201765, drawings numbered DA-01 and 02, Revision A, dated 9/7/20.

2. Site Description

2.1 The site was inspected on the 18th December, 2019.

2.2 This residential property has a S aspect. The block runs longways to the W so the slope is a cross-fall. It is located on the edge of a sandstone ridge that steps down the site creating two level benches. The slope falls across the site at an average angle of ~29°. The slope above the property continues at gentle angles. The grade below the property continues at moderate angles.

2.3 At the road frontage, a concrete driveway runs across the upper sandstone bench to a garage attached to the E side of the house (Photos 1 & 2). A sandstone cliff face falls from the downhill side of the driveway to a level lawn area at the lower common boundary (Photos 3 & 4). The cliff reaches a maximum height of ~6.0m. The majority of the cliff displays no significant geological defects. The W end of the cliff is undercut in two locations. The E location is undercut ~2.0m and has a relatively thin cantilever arm in relation to its overhang length (Photo 5). The undercut has been remediated in the past with three steel posts and a rough, stack rock blade wall. Only one of the steel posts still makes contact with the underside of the undercut joint block. See **Section 11** for recommendations regarding this undercut. The W location is undercut ~1.5m, has a relatively thick cantilever arm in relation to its overhang length,

and displays no signs of cracking through the cantilever arm as viewed from above or below (Photo 6). The undercut rocks will be removed during the construction of the proposed pool. The part three-storey brick house is supported on brick walls (Photo 2). No significant signs of movement were observed in the supporting brick walls. Some of the supporting walls were observed to be supported directly off outcropping sandstone.

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

As Medium Strength Sandstone was observed to be outcropping across the location of the proposed pool, no subsurface investigation was undertaken (Photo 4).

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 typically overlain by sandy soils and firm to stiff sandy clays that fill the bench-step formation. Medium Strength Sandstone was observed to be outcropping across the location of the proposed pool and, as sandstone bedrock was observed to be outcropping immediately downslope of the base of the cliff, is expected at a maximum depth of ~1.0m below the base of the cliff. 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. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The construction of the proposed pool impacting on the undercut cliff face is a potential hazard (**Hazard One**).

Risk Analysis Summary

HAZARDS	Hazard One
TYPE	The construction of the proposed pool impacting on the undercut cliff face causing failure (Photos 5 & 6).
LIKELIHOOD	'Unlikely' (10^{-4})
CONSEQUENCES TO PROPERTY	'Medium' (35%)
RISK TO PROPERTY	'Low' (2×10^{-5})
RISK TO LIFE	4.2×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the recommendations in **Sections 11 & 12** are 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

The proposed pool will require partial excavation through Medium Strength Sandstone. The portion of the rock to be cut sits above the E undercut rock (Photo 5). To ensure the stability of the rock face into the future, we recommend all significant undercut portions of this rock face be cut back to form a sheer rock face.

The excavations through the undercut rock are to be carried out first. To reduce risk, they are to be undertaken using rock saws and are to be picked out without the use of pneumatic hammers. This is to ensure any vibrations generated during the excavation are below the threshold to impact on the rock face stability or to cause building damage. Following these recommendations, vibration monitoring will not be required.

We envisage most, if not all of the undercut rock will be removed by the pool excavation. If any significant undercut portions of the rock remain, these are to be supported with spaced blade walls. The requirement for this work will be assessed by the geotechnical consultant and is to be carried out before the construction of the pool commences. The blade walls are to be a minimum of 0.4m wide and are to be supported on foundations taken to rock. The tops of the walls are to be in full contact with the undersides of the undercut rocks so non-shrink grout will be required to achieve this. The blade walls are to be designed by the Structural Engineer in consultation with Geotechnical Consultant.

The geotechnical consultant is to inspect the completed excavation while the excavation equipment is still on site, and before pool shell construction commences, to ensure no additional support/excavation is required.

12. Foundations

Piers supported off Medium Strength Sandstone are suitable footings for the proposed pool and parking platform. This material is expected to be exposed at the current surface or is expected at a depth of ~1.0m below the current surface at the base of the cliff. No portions of the pool are to be supported on any undercut portions of the exposed rock outcrop. Where footings are over an exposed sloping rock surface, they may be supported off level pads cut into the rock. Assume a maximum allowable bearing pressure of 1000kPa for footings supported off 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.

REQUIRED INSPECTIONS ARE ON THE NEXT PAGE

13. 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 regulating authorities if the following inspections have not been carried out during the construction process.

- The geotechnical consultant is to inspect the completed excavation while the excavation equipment is still on site, and before pool shell construction commences, to ensure no additional support/excavation is required.

- The geotechnical consultant is to inspect any completed blade walls that may be required prior to the commencement of any construction work on the pool.

- All footings (including any that may be required for blade walls) 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.

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
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No. 222757
Engineering Geologist

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

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.

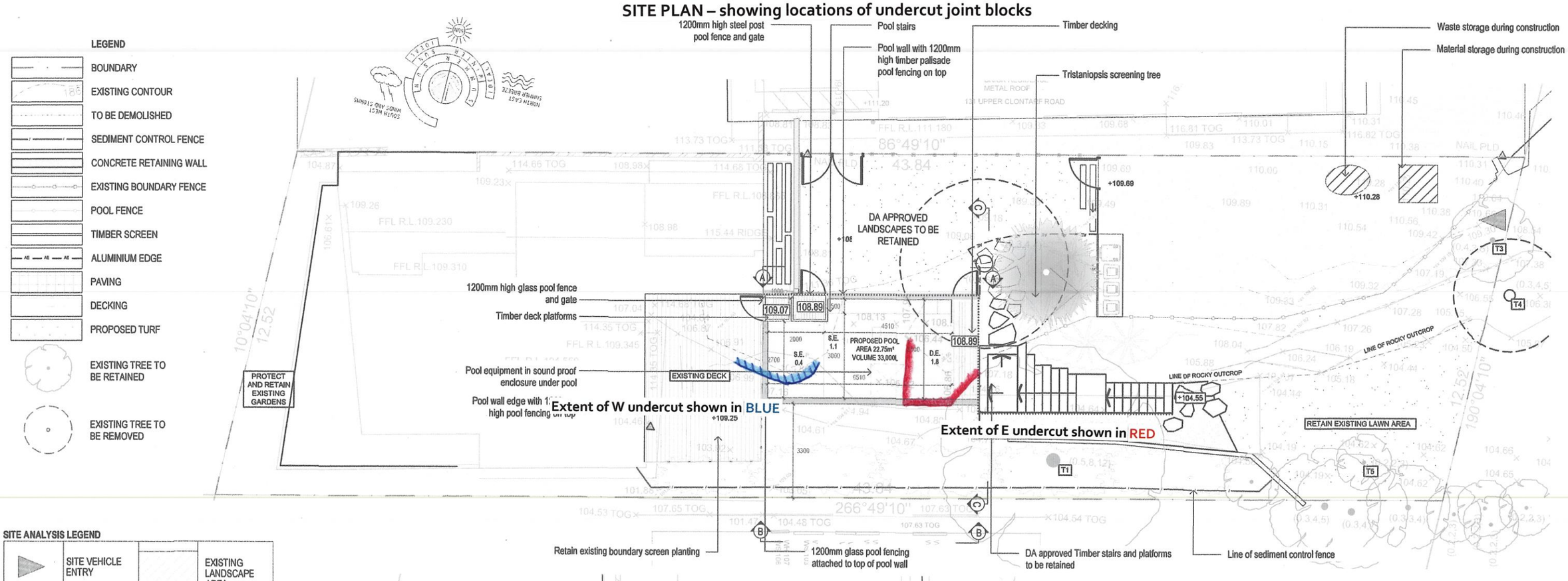
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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.

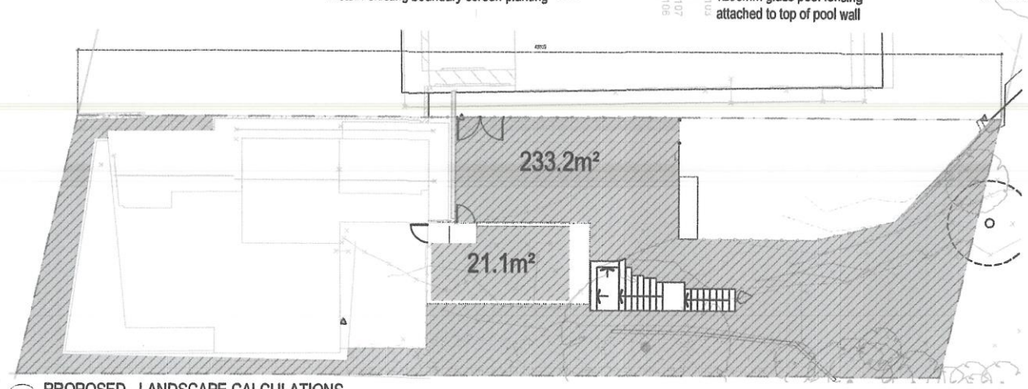
- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar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

SITE PLAN – showing locations of undercut joint blocks

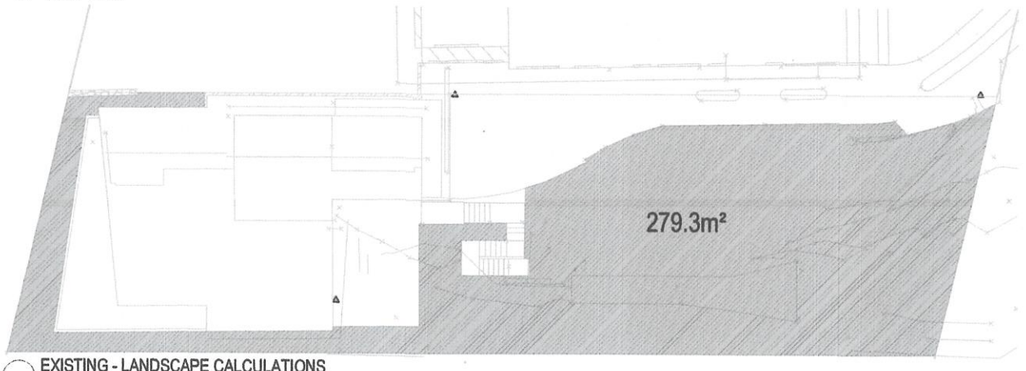


SITE ANALYSIS LEGEND

	SITE VEHICLE ENTRY		EXISTING LANDSCAPE AREA
	WASTE STORAGE AREA		MATERIALS STORAGE AREA
NEW WORKS COLOURS			BRICK
	TIMBER		CONCRETE
	GLASS		METAL



PROPOSED - LANDSCAPE CALCULATIONS
Scale 1:200.

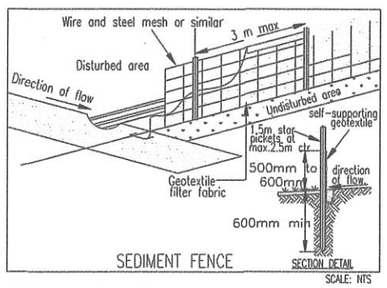


EXISTING - LANDSCAPE CALCULATIONS
Scale 1:200.

Residential Development Control Area OS4 requires 60% of site area to be Open Space with 40% of that open space to be Landscaped Area.

Site Area:	534.2m²		
Open Space required:	320.5m²	60%	
Open Space proposed:	773.1m²	66%	Complies
Maximum pool component of OS	211.7m²	30%	
Pool proposed of Open Space:	40.1m²	6%	Complies
Landscape Area required:	282.2m²	40% of 705.6m²	
Existing Landscape Area:	95.8m²	13%	Non-compliance
Landscape Area proposed:	129.1m²	18%	Non-compliance

Denotes Open Space >3m
Denotes Landscape Area >0.5m
Denotes Pool Component of OS



SEDIMENT & EROSION CONTROL NOTES

During earthworks the following procedures shall be followed:

1. Install silt barriers where shown on plan prior to commencement of works.
2. Silt barriers to be maintained regularly & after heavy rain by removal of built up silt & spreading silt on existing site when 50% capacity.
3. Repair any damages to fence immediately.
4. Clean up spillages outside silt fence immediately.
5. Sediment control measures to be left in place until works completed.
6. Topsoil from the work's area will be stockpiled for later use in landscaping if necessary.
7. Approved bins for building waste, concrete and mortar slurries, paints and acid washings will be provided by contractor.

POOL NOTES:

1/ Refer to Pool Fencing Code per AS 1926.1 - 2012 for compliance of the safety barriers for swimming pools.

2/ Overflow of pool is to be connected to sewer according to Sydney Water Specifications.

3/ Pool pavement pattern and setout shown is indicative only. No allowance has been made for coping overhang, mortar gaps and joints.

4/ Pool fence shown is the approximate position of proposed 1200mm(h) minimum childproof safety barrier with sc/sl gate in accordance with AS1926.1-2012. The proposed pool enclosure has been designed to comply with the Australian Standard, the Swimming Pools Act and Swimming Pool Regulations.

5/ The boundary fence inside the pool zone must be a minimum height of 1800mm with a non climbable zone of 900mm on the inside of the fencing. Any shrubs or plants located adjacent to the inside of the boundary fence must be maintained for the lifetime of the development at a height that does not interfere with the 900mm non climbable zone.

NOTES:
- Contractors to check and verify all dimensions and all levels on site prior to any works.
- Any discrepancies should be immediately referred to Space Landscape Designs.
- All work to comply with B.C.A. Statutory Authorities and relevant Australian Standards.
- Dimensions recognised over scaling. All measurements are in millimetres.

Rev.	Date	Issue	Checked
A	09/07/20	Preliminary Issue	AE

DRAFT

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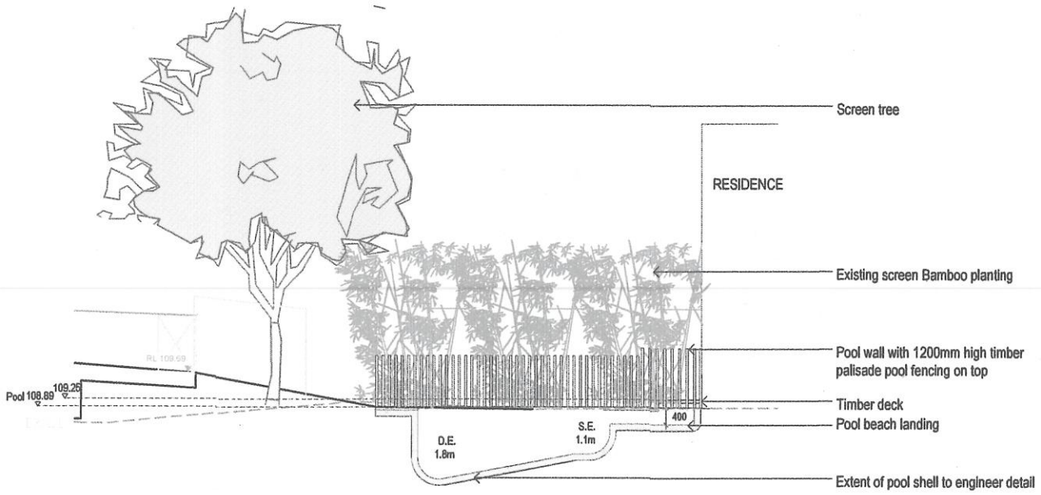
DRN: L.Poulton
DATE: 30/06/2020
SCALE: 1:100@A2
PROJECT NO: 201765

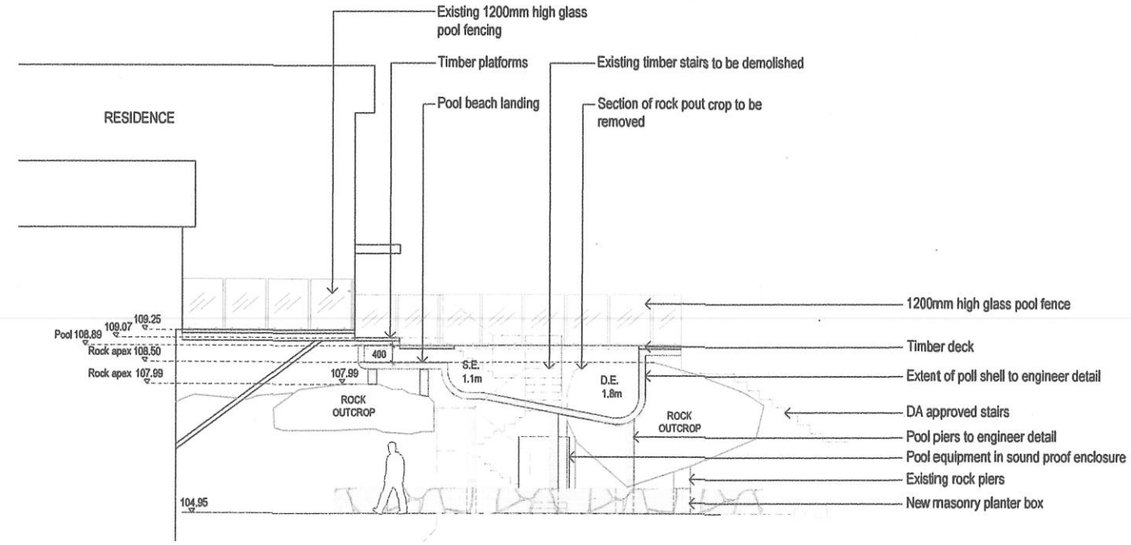
NORTH

DRAWING TITLE: SITE PLAN / SITE ANALYSIS / EROSION AND SEDIMENT CONTROL PLAN
DRAWING No: DA-01
Rev: A

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



SECTION ELEVATION - AA
SCALE 1:100



SECTION ELEVATION - BB
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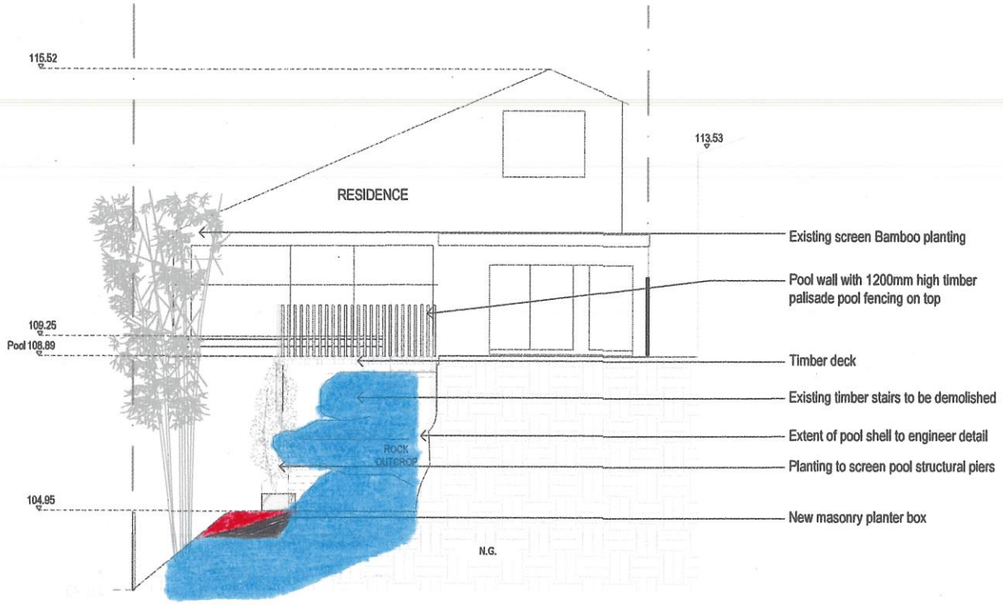

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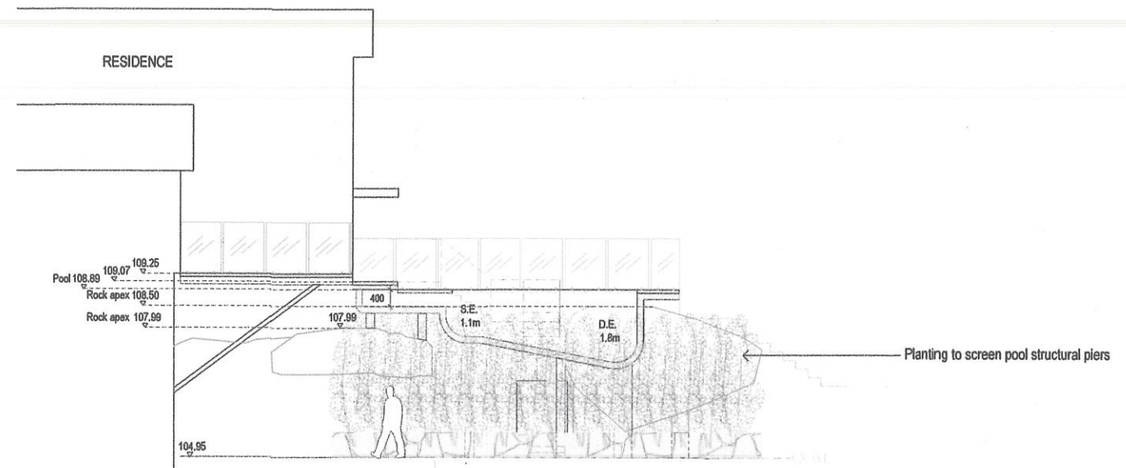

SECTION ELEVATION - BB - PLANTING
SCALE 1:100

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

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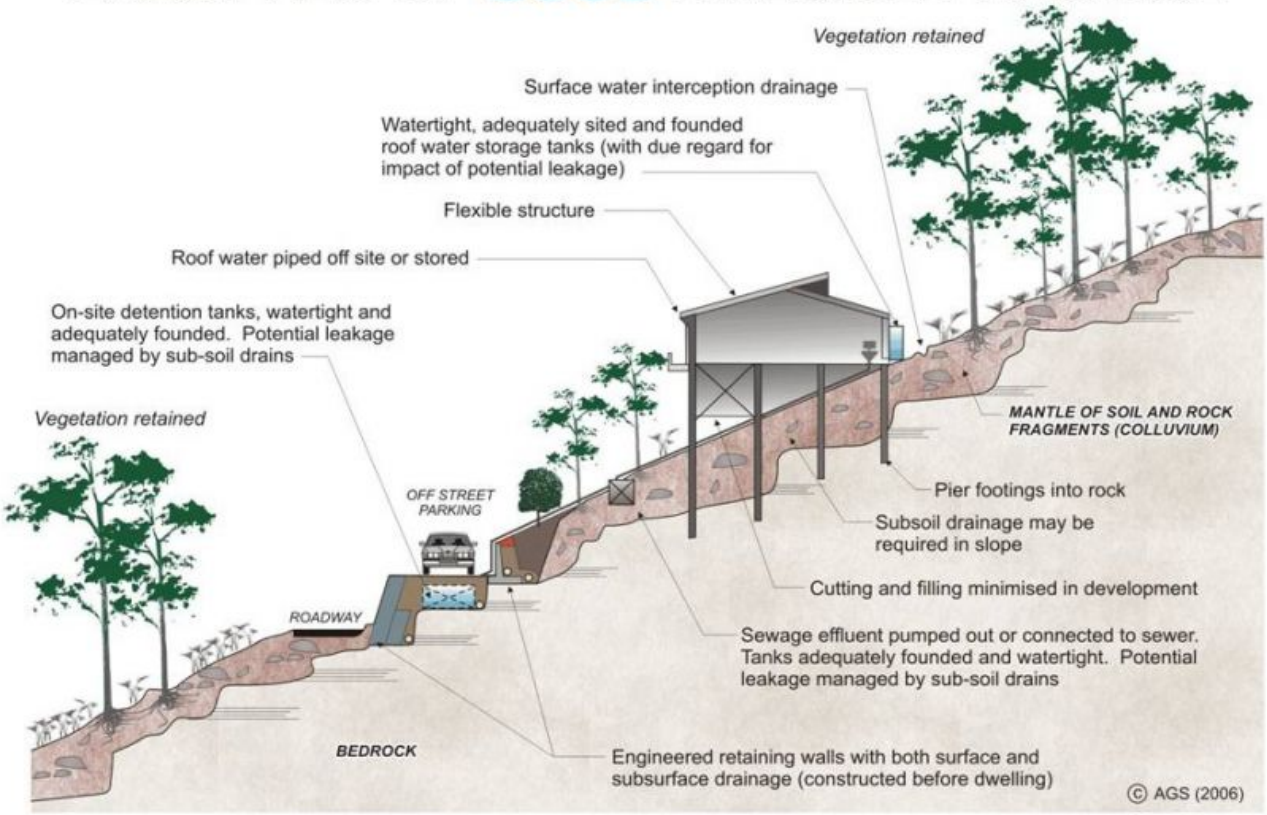
NORTH

DRAWING TITLE: SECTION / ELEVATIONS
DRAWING No: DA-02
Rev: A

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE