38 Lindley Avenue, Narrabeen

Geotechnical Comments for New DA

We have revisited the site on the 8th of October, 2019 and reviewed the geotechnical report done by this firm for a previous DA and the 11 plans for a new DA by Buck & Simple, Project number 1138, drawing numbered D010 is Revision 1, and drawings numbered D000, 011, 101, 110, 300, 301, and 400 to 403 are Revision 2, all drawings dated 4/10/19.

The new DA includes:

- Redesigning the proposed new house, reducing excavation depths.
- Increasing the excavation depth for the proposed new pool from ~1.2m to ~2.0m.

Provided the excavation support advice in the original report is followed, this DA does not alter the recommendations or the risk assessment in the original report carried out by this firm numbered J0581A and dated the 15th August, 2016.

White Geotechnical Group Pty Ltd.

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GEOTECHNICAL INVESTIGATION:

New house at **38 Lindley Avenue, Narrabeen**

1. Proposed Development

1.1 Demolish the existing house and construct a new house and carport.

1.2 Install a pool on the downhill side of the proposed house.

1.3 Details of the proposed development are shown on 6 drawings prepared by Walter Barda Design, project number 2016.07, Issue A, drawings numbered 1101, 2002, 2008, 3002, 8001 & 8002 dated 20/06/16.

2. Site Description

2.1 The site was inspected on the 16th September, 2015.

2.2 This residential property is located on the low side of the road and has a northerly aspect. The block is positioned on the gently graded lower middle reaches of a hillslope that falls to Narrabeen Lake. At the road frontage the natural slope falls at an average angle of ~7° to the lower boundary. There is cross fall up to a maximum of ~2.0m towards the eastern boundary that is most pronounced across the upper boundary. The slope above and below the property continues at gradually increasing angles.

2.3 At the road frontage a paved driveway runs to a parking area above the house (Photo 1 & 2). The single storey rendered brick house is in good condition for its age. One of its supporting brick piers is tilting ~5° downhill (Photo 3). This type of settlement is common in houses of a similar age. The house is estimated to be 30 years old and the movement probably occurred in the years immediately after construction. Any further movement is expected to be minor and the pier is currently considered stable. The remaining brick piers and walls display no signs of movement. A fill has been placed on the downhill side of the house to create a level lawn (Photo 4). It is supported by an old mortared sandstone flagging wall that appears well constructed (Photo 5). This wall also supports a cut for the right of carriageway that extends beside the eastern boundary of the subject property. Another right of carriageway extends beside the western boundary of the property to service the neighbouring property below. The cut batter for this

carriageway is supported by an old, low elevation, treated pine retaining wall that will be replaced as part of the proposed works (Photo 6).

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by the Newport Formation of the Narrabeen Group. This is described as interbedded laminite, shale and quartz to lithic quartz sandstone.

4. Subsurface Investigation

Five Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to weathered rock. The location of the tests are shown on the site plan 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) Blows/0.3m	DCP 1	DCP 2	DCP 3	DCP 4	DCP 5
0.0 to 0.3	1F	2	6	1F	2
0.3 to 0.6	2	7	9	5	6
0.6 to 0.9	6	9	21	13	16
0.9 to 1.2	13	29	#	26	42
1.2 to 1.5	21	21		#	#
1.5 to 1.8	36	#			
1.8 to 2.1	#				
	End of Test @ 1.8m	Refusal on Rock @ 1.3m	Refusal on Rock @ 0.8m	Refusal on Rock @ 1.1m	End of Test @ 1.2m

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

DCP Notes:
DCP 1 – End of test @ 1.8m, DCP still slowly going down, wet muddy tip, shaft wet and muddy from 0.9m.
DCP 2 – Refusal on rock @ 1.3m, DCP bouncing off rock surface, clean dry tip.
DCP 3 – Refusal on rock @ 0.8m, DCP bouncing off rock surface, clean dry tip.
DCP 4 – Refusal on rock @ 1.1m, DCP bouncing off rock surface, clean dry tip.
DCP 5 – End of test @ 1.2m, DCP still slowly going down, wet muddy tip, shaft wet and muddy from 0.9m.

5. Geological Interpretation

The slope materials are colluvial at the near surface and residual at depth. They consist of thin sandy topsoil over sandy clays and clays with rock fragments throughout the profile. The sandy clays and clays merge into the weathered zone of the under lying rocks at an average depth of ~1.2m below the current surface, being deeper where filling has been undertaken on the downhill side of the house. It is interpreted form ground testing that the fill reaches a maximum depth of ~0.5m. Deeper filling is expected immediately behind the retaining wall. The weathered zone is interpreted as extremely to very low strength rock. It is to be noted that this material is a soft rock and can appear as a mottled stiff clay when it is cut up by excavation equipment. A band of medium strength sandstone is exposed immediately below the lower boundary of the property.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the clay and 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 base of the proposed development.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection but it is expected normal sheet wash moves down the site during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The slope that falls across the property and continues above and below at increasing angles is a potential hazard (**Hazard One**). The proposed excavations are a potential hazard until retaining structures are in place (**Hazard Two**). The additional surcharge loads from the proposed pool are a potential hazard to the existing retaining wall below (**Hazard Three**).

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The slope that falls across the property and continues above and below at increasing angles failing and impacting on the house and proposed development.	The unsupported pool excavation collapsing and impacting on the downhill supporting walls of the proposed house (depending on the order of construction).	The additional surcharge loads from the proposed pool causing the retaining wall along the E common boundary to fail (Photo 5).
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (10%)	'Medium' (25%)	'Medium' (35%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	7.9×10^{-6}/annum	4.6×10^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels the recommendations in **Section 16** are to be followed.	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels the recommendations in **Section 16** 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.

Stormwater from the roof of the existing house was either discharged beside the house or piped underground to a location that could not be visually identified. Ideally, stormwater from the proposed house is to be piped through an easement to the street drainage system below. If this is not feasible an infiltration/dispersion trench is suitable as a last resort, provided flows are kept close to natural runoff for

the site or designed to a flow rate as determined by infiltration testing. All stormwater is to be piped through any tanks that may be required by the regulating authorities.

11. Excavations.

An excavation to maximum depth of ~1.5m is required to landscape the area on the uphill side of the house. Another excavation to a maximum depth of ~1.2m is required to install the proposed pool. Both excavations are expected to be through a shallow sandy topsoil over a firm to stiff clay with extremely low to very low strength rock expected at an average depth of ~1.2m below the current surface. It is envisaged the excavations can be carried out with a bucket only and that rock hammers will not be required.

12. Vibrations.

Possible vibrations generated during excavations through sandy topsoil and sandy clays will be below the threshold limit for building damage.

13. Excavation Support Requirements

The cut batters for the pool and landscaping will stand unsupported at near vertical angles for short periods of time until the retaining structures are installed provided the cut batters are kept from becoming saturated. If the cut batters are left for more than a few days the sandy soil and sandy clay portions are to be temporarily battered at 1.0 Vertical to 1.0 Horizontal (45°) until retaining structures are in place.

The cut batters 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 structures 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 Structures

Retaining structures supporting soil and clay can be designed for a lateral earth pressure coefficient K_a of 0.35 and assume a bulk density of 20kN/m^3. Assume a K_a of 0.25 and a bulk density of 22kN/m^3 for extremely low to very low strength rock

Any surcharge loads that may act on the retaining structures (i.e. from the lower side of the proposed house onto the proposed pool) are to be accounted for in the design.

All retaining structures 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 structures likely hydrostatic pressures are to be accounted for in the design.

15. Site Classification

The site classification in accordance with AS2870-2011 is Class M.

16. Foundations

A piered concrete raft slab, isolated piers or strip footings supported on the underlying extremely low strength shale are suitable footings for the proposed house and carport. Required pier depths to encounter this material are expected to be ~1.2m below the current surface. It should be noted that this material is a soft rock that a rock auger will cut through so the builders should not be looking for refusal to end the footings. A maximum allowable pressure of 600kPa can be assumed for footings supported on extremely low strength shale.

The lower edge of the proposed pool will be ~0.5m away from the E common boundary where the slope drops away. It is supported by an old mortared flagging retaining wall (Photo 5). To ensure no additional loads are transferred onto wall the proposed pool structure it is to be supported on piers taken to extremely low strength shale. The piers are to be taken below the walls zone of influence. In this instance the zone of influence is the area above a theoretical 45^{o} line from the base of the wall towards the proposed footings.

As the bearing capacity of shale reduces when it is wet we recommend the footings be dug, inspected and poured in quick succession (ideally the same day if possible). If the footings get wet they will have to be drained and the soft layer of wet clay or weathered rock on the footing surface will have to be removed before concrete is poured.

If a rapid turnaround from footing excavation to the concrete pour is not possible a sealing layer of concrete may be added to the footing surface after it has been cleaned.

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. 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 owners or 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 professional before concrete is placed.

White Geotechnical Group Pty Ltd.

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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 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.

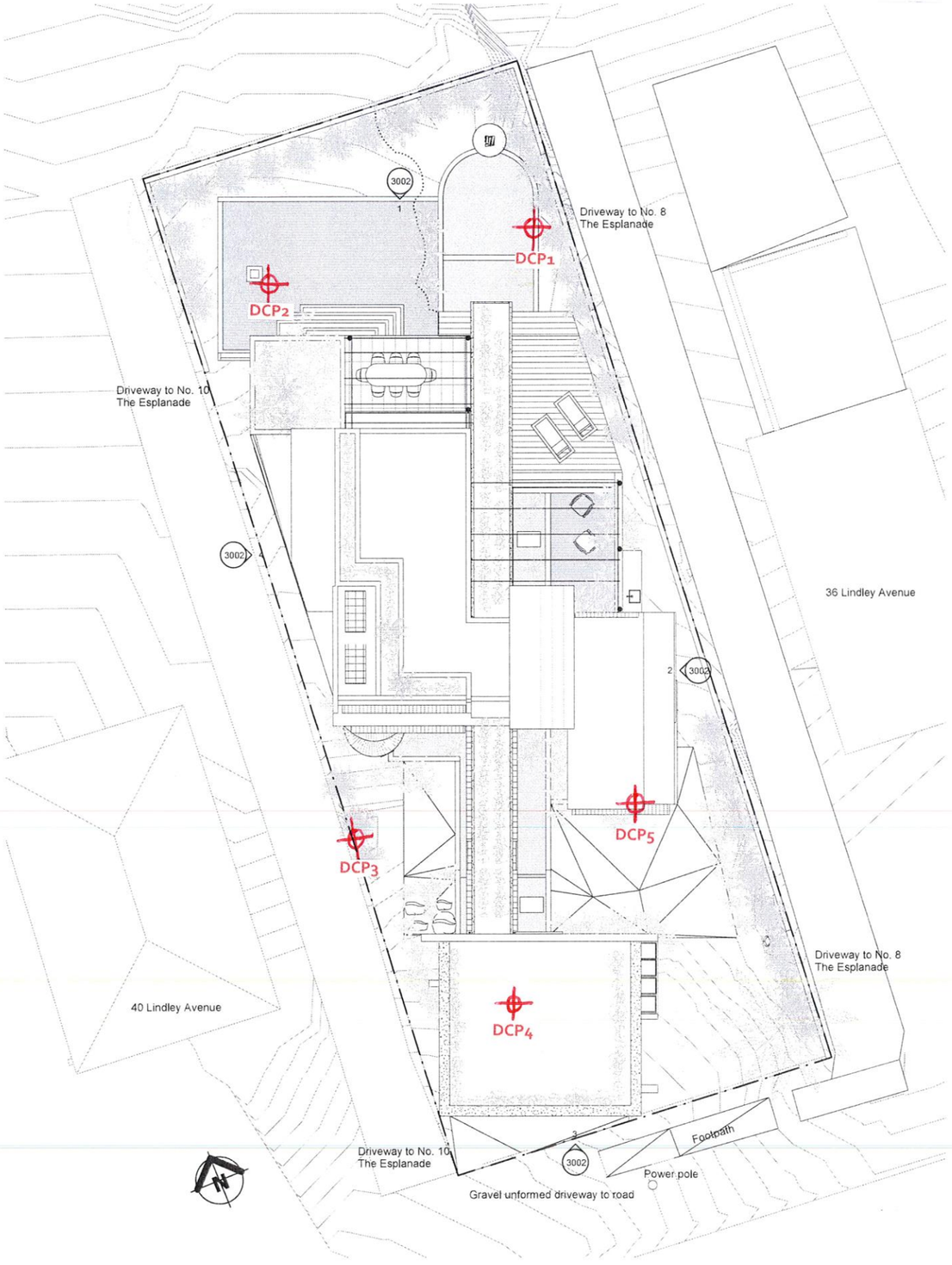
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

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

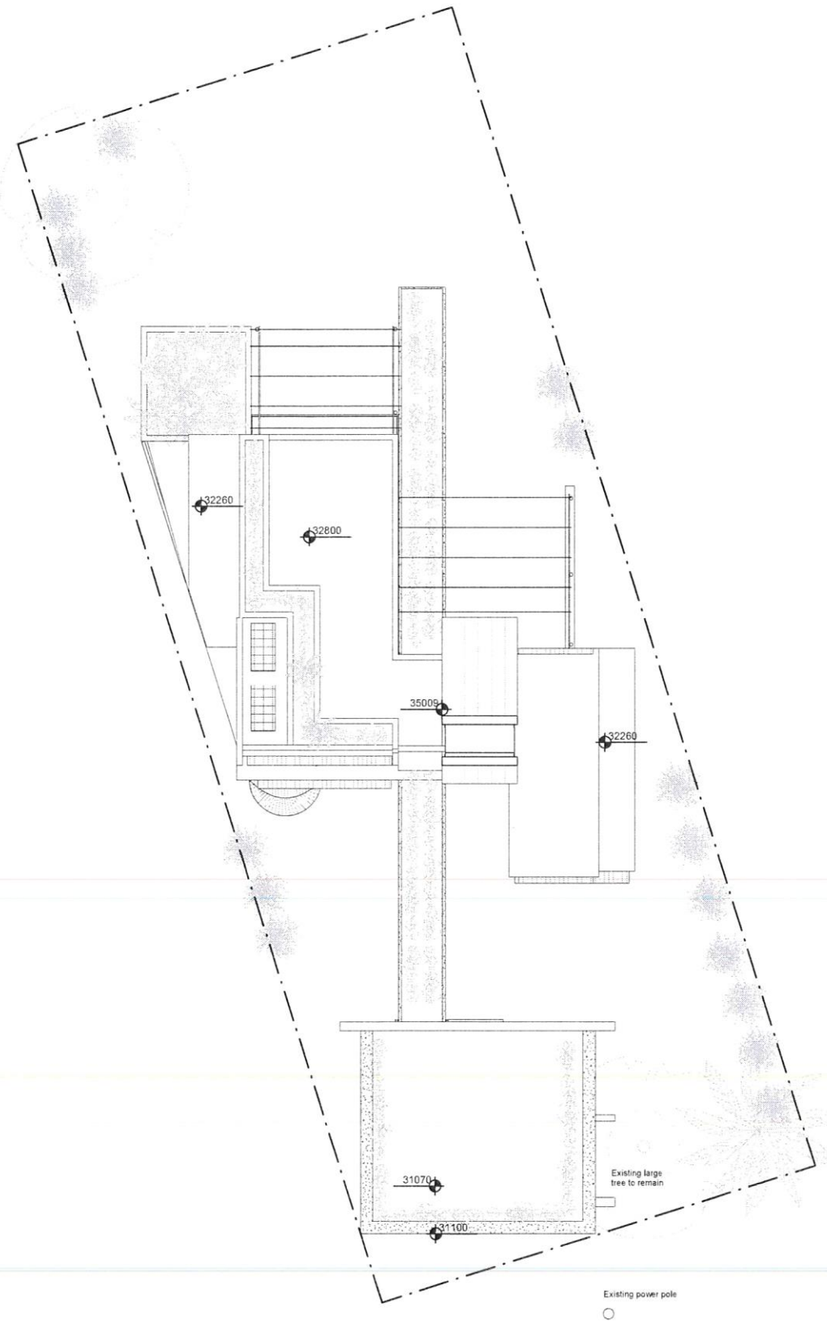
- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- 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



1 Site Plan
1 : 100



2 Roof Plan
1 : 100

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Revisions		
No.	Description	Date
A	Consultant Fee Proposals	20.06.2016

O'Farrell Residence

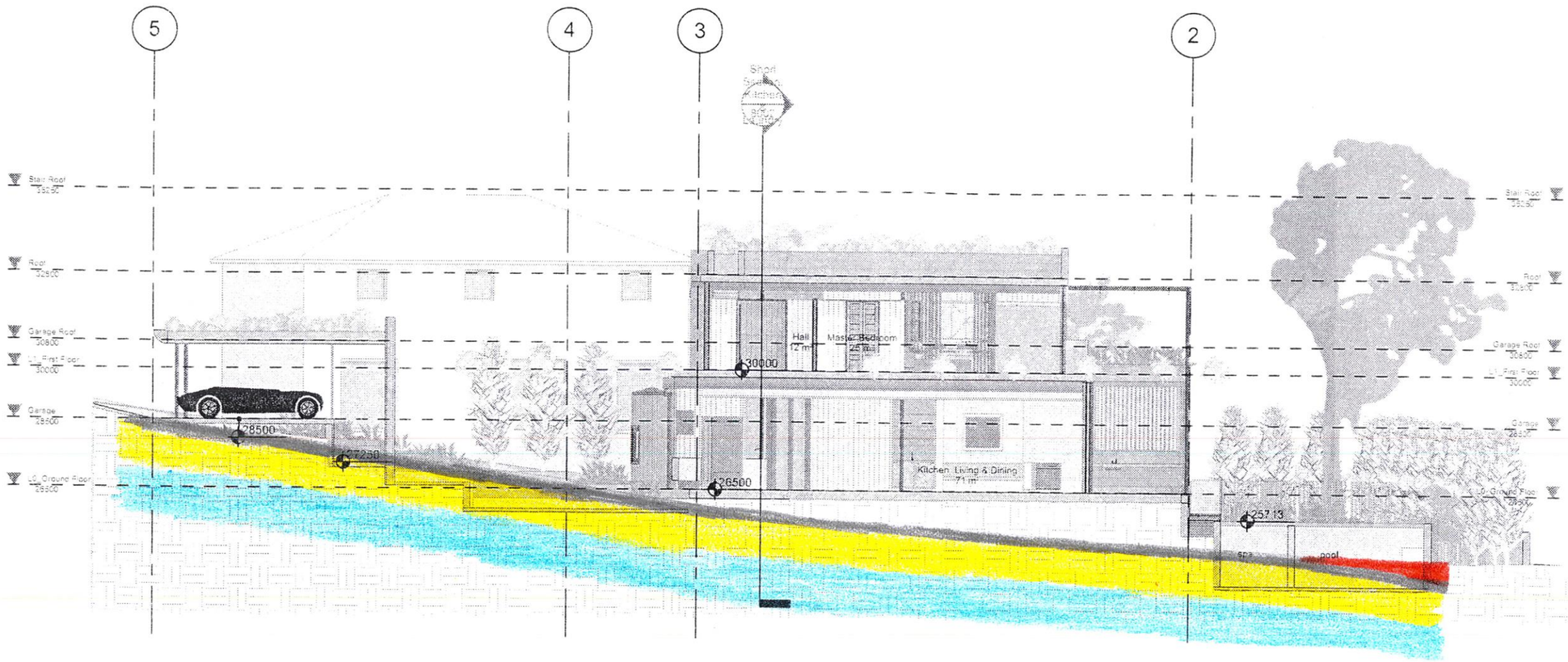
Paul O'Farrell

This Drawing must not be used for Construction unless signed as Approved

Project Number: 2016.07	38 Lindley Avenue Narrabeen NSW 2101
Project Status: DA	
Sheet: Site Plan & Roof Plan	

Print Date & Time	20/06/2016 10:59:16 AM	
File Path	Z:\2016_07_O'Farrell\00 - Architectural Plans\201607_ OFarrell Residence Current Option.Dwg >>	
Drawn By: RF	Checked By: WB	Approved By: Approver
Scale @ A1 1 : 100		
Drawing Number: 1101		Issue: A

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



1 Long Section/Kitchen
1 : 100

Fill
Topsoil
Sandy Clay – Firm to Stiff
Narrabeen Group Rocks – Extremely Low to Very Low Strength Rock - after being cut up by excavation equipment can resemble a stiff to hard clay.