GEOTECHNICAL INVESTIGATION:

New House and Pool at **24 Beach Road, Collaroy**

1. Proposed Development

1.1 Demolish the existing house and driveways.

1.2 Construct a new two storey house with garage and driveway.

1.3 Install a new pool at the N side of the proposed new house by excavating to a maximum depth of ~1.8m.

1.4 Details of the proposed development are shown on 22 drawings prepared by Rama Architects, drawings numbered DA-000, DA-001, DA-100, DA-101, DA300 to DA-303, DA-400, DA-401, DA-500 to DA-503, DA-800 and DA-900 to DA-906, Revision 01, dated 11/10/24.

2. Site Description

2.1 The site was inspected on the 2nd September, 2024.

2.2 This residential property has dual access. It is on the high side of Beach Road and the low side of Cliff Road. The property has an E aspect. It is located on the gently graded toe of a hillslope. The natural slope rises across the property at angles of <5°. The slope above the property gradually increases in grade. The slope below the property eases to near level angles.

2.3 At the Beach Road frontage, a concrete driveway runs to a garage on the ground floor of the house (Photo 1). The part two storey house with garage is supported on brick walls and columns (Photos 1 & 2). The external supporting walls show no significant signs of movement and the supporting columns stand vertical. Near level lawn and garden areas extend off the E and W sides of the house. A concrete driveway accessed from Cliff Road runs to a parking area at the W side of the house

(Photo 2). 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 Alluvial Stream and Estuarine Sediment (Qha). This is described as silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers.

4. Subsurface Investigation

One hand Auger Hole (AH) was put down to identify the soil materials. Five Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative densities of the sediments underlying the site. 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 expected to have occurred for DCPs 3 & 4. 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:

AUGER HOLE 1 (~RL9.5) **–** AH1 (Photo 3)

Depth (m)	Material Encountered
0.0 to 0.3	**FILL**, silty soil and sand, dark brown, grey, moist, fine to medium grained.
0.3 to 0.7	**TOPSOIL**, silty and peaty soil, dark brown, black, moist, Medium Dense, fine to medium grained, high organic content.
0.7 to 1.4	**ALLUVIAL SEDIMENT,** Sand, grey, moist to damp, Dense, medium grained.
1.4 to 2.0	**CLAY**, probably alluvial sediment, damp to wet, Stiff to Hard.

Refusal @ 2.0m on Hard Clay. Groundwater seepage encountered at 1.6m.

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** (~RL9.5)	**DCP 2** (~RL9.4)	**DCP 3** (~RL9.7)	**DCP 4** (~RL9.7)	**DCP 5** (~RL9.8)
0.0 to 0.3	8	6	8	10	9
0.3 to 0.6	16	6	#	#	9
0.6 to 0.9	29	6			7
0.9 to 1.2	28	22			21
1.2 to 1.5	32	32			33
1.5 to 1.8	16	30			52
1.8 to 2.1	68	60			#
2.1 to 2.4	#	60			
2.4 to 2.7		#			
	Refusal @ 2.1m	End of test @ 2.3m	Refusal @ 0.2m	Refusal @ 0.2m	End of test @ 1.8m

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

DCP Notes:

DCP1 – Refusal @ 2.1m, DCP thudding, grey sand on wet tip.
DCP2 – End of test @ 2.3m, DCP still very slowly going down, light brown clay, grey clay and dark brown soil on damp tip.
DCP3 – Refusal @ 0.2m, DCP thudding, dark brown soil on moist tip.
DCP4 – Refusal @ 0.2m, DCP thudding, dark brown soil on moist tip.
DCP5 – End of test @ 1.8m, DCP still very slowly going down, brown and maroon clay on damp tip.

5. Geological Observations/Interpretation

The site is underlain by fill, topsoil and sand over sandy clays. Minor filling has been placed across the property for lawn and garden areas. Medium Dense to Dense Sand extends to depths of between ~1.2m to ~1.5m below the current surface. This is underlain by Stiff to Hard sandy clay. The DCP tests are interpreted to have encountered refusal on Hard clay (DCP1) or were terminated at a very high blow count in this ground material (DCPs 2 & 5). DCPs 3 & 4 are expected to have encountered refusal on an obstruction in the profile. The

sandy clays underlying the site are interpreted to be alluvial. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Ground water seepage was encountered in AH1 at a depth of ~1.6m below the current surface (~RL7.9). This is expected to be groundwater seepage that has concentrated or pooled above the less permeable Hard sandy clay layer in the sub-surface profile.

Due to the elevation of the block, the water table in the location is expected to be several 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 that is generated on the property will be quickly be absorbed into the sandy soil where surfaces are unsealed.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above, below or beside the property. The proposed excavation is a potential hazard (**Hazard One**).

RISK ANALYSIS SUMMARY ON NEXT PAGE

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One
TYPE	The proposed excavation for the pool collapsing onto the worksite and impacting the neighbouring properties before retaining structures are in place.
LIKELIHOOD	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (15%)
RISK TO PROPERTY	'Moderate' (2×10^{-4})
RISK TO LIFE	3.7×10^{-5}/annum
COMMENTS	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 to Beach Road. All stormwater 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 ~1.8m is required to install the proposed pool. The excavation is expected to be through fill, topsoil, sand, and clay.

Excavations through fill, soil, sand, and clay can be carried out with an excavator and toothed bucket.

12. Vibrations

It is expected the proposed excavation will be carried out with an excavator and toothed bucket and the vibrations produced will be below the threshold limit for building or infrastructure damage utilising a domestic sized excavator up to 16 tonne.

13. Excavation Support Requirements

An excavation to a maximum depth of ~1.8m is required to install the proposed pool. The excavation is set back ~0.7m from the N common boundary, ~0.7m from the N neighbouring concrete pathway and ~1.8m from the N neighbouring house. Provided the N neighbouring house is founded at least 0.4m below the current surface, it will be outside the zone of influence of the excavation.

The N common boundary and N neighbouring concrete pathway will be within the zone of influence of the excavation. In this instance, the zone of influence is the area above a theoretical 30° line (from horizontal) through fill/soil/sand and a 45° line through clay from the base of the excavation towards the surrounding structures and boundaries.

Due to the presence of mostly soil/sand profile and the proximity to the N common boundary and concrete pathway, all sides of the pool excavation are to be temporarily supported with typical pool shoring such as braced form ply until the pool structure is in place. See the Site Plan attached for the minimum extent of the required shoring shown in blue.

During the excavation process, the geotechnical consultant is to inspect the cut face in 1.5m intervals as it is lowered to ensure ground materials are as expected and that additional support is not required.

The materials and labour to construct the pool structure are to be organised so on completion of the excavation it 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.

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, Topsoil, and Sand	20	0.40	0.55
Clay	20	0.35	0.45

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. Ground materials 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. Foundations

The proposed house and garage are to be supported on a raft slab or spread footings embedded at least 0.4m below the current surface and into the Medium Dense topsoil/sand of the natural profile. A maximum allowable bearing pressure of 100kPa can be assumed for footings embedded in Medium Dense topsoil/sand.

The footing excavation walls in soil/sand are to be shored with timber to prevent collapse prior to the concrete pour. The base of the footing excavations should be compacted as the excavation will loosen the upper soil/sand. This can be carried out with a hand-held plate compactor. Water may be used to assist in compaction but footing materials should be kept damp but not saturated. As a guide to the level of compaction required a density index of >85% is to be achieved, correlating to a very dense sand.

The geotechnical consultant is to inspect and test the compacted bases of all prepared foundations in soil/sand to ensure the required density has been achieved.

The proposed pool is expected to be seated in Stiff to Hard clay. This is a suitable foundation material. If any portion of the pool is not seated in clay, shallow piers embedded into this ground material will be required to maintain a uniform foundation material across the structure. A maximum allowable bearing pressure of 200kPa can be assumed for footings embedded in Stiff to Hard clay.

As the bearing capacity of clay 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 clay on the footing surface will have to be removed before concrete is poured.

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.

16. 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.

- During the excavation process, the geotechnical consultant is to inspect the cut face in 1.5m intervals as it is lowered to ensure ground materials are as expected and that additional support is not required.

- The geotechnical consultant is to inspect and test the compacted bases of all prepared foundations in soil/sand while the compaction equipment and contractors are still on site. 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.

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No. 10306
Engineering Geologist.

Photo 1

Photo 2

Photo 3: AH1 – Downhole is from top to bottom.

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.

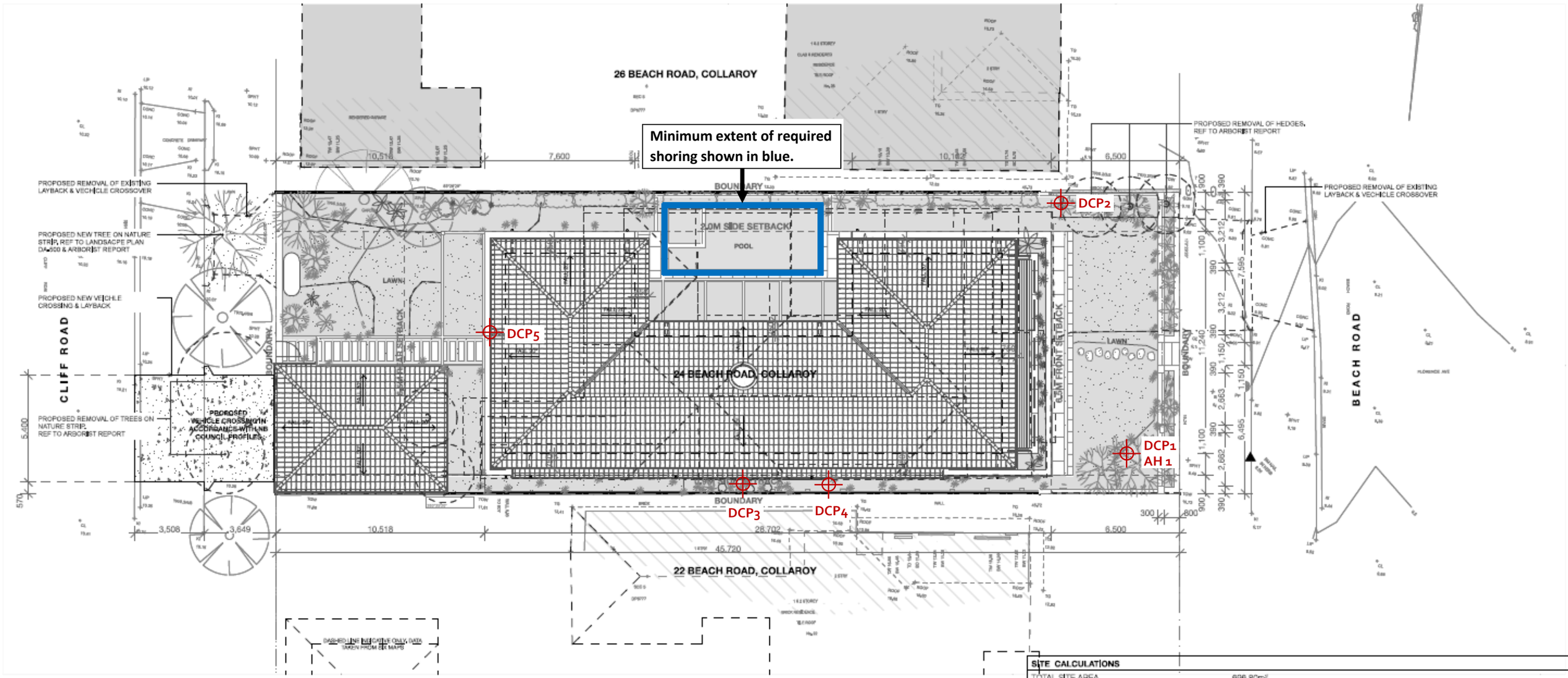
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



SITE PLAN **A3 @1:200**

SITE CALCULATIONS			
TOTAL SITE AREA	696.80m²		
EXISTING		**PROPOSED**	
GROUND FLOOR - GROSS FLOOR AREA	~134.74m²	GROUND FLOOR - GROSS FLOOR AREA	225.18m²
FIRST FLOOR - GROSS FLOOR AREA	~224.74m²	FIRST FLOOR - GROSS FLOOR AREA	173.35m²
TOTAL - GROSS FLOOR AREA	~359.48m²	TOTAL - GROSS FLOOR AREA	398.53m²
GARAGE AND STORAGE - AREA	~114.0m²	GARAGE AND STORAGE - AREA	55.21m²
APPROX. ROOF - AREA	~278.17m²	ROOF - AREA	320.11m²
APPROX. DECK AND TERRACE - AREA	~92.93m²	DECK AND TERRACE - AREA	103.08m²
HARD SURFACE - AREA	504.82m²/72.42%	HARD SURFACE - AREA	369.11m²/52.97%
LANDSCAPED OPEN SPACE - AREA	160.51m²/23.04%	LANDSCAPED OPEN SPACE - AREA	309.20m²/44.37%
UNCALC. SOFT LANDSCAPE - AREA	31.67m²/4.55%	UNCALC. SOFT LANDSCAPE - AREA	18.49m²/2.66%
POOL - VOLUME	N/A	POOL & SPA - VOLUME	38m³

NORTH

NOTE: THESE DRAWINGS ARE NOT FOR CONSTRUCTION, FOR DA APPROVAL ONLY
NOTE: DO NOT SCALE OFF THIS DRAWING
NOTE: ALL WORKS TO BE IN ACCORDANCE WITH THE NCC, 2019
NOTE: ALL WORKS TO BE IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS
NOTE: ALL WORKS TO BE IN ACCORDANCE WITH THE BASIX REQUIREMENTS

KEY:

- DENOTES EXISTING STRUCTURE TO BE RETAINED
- DENOTES PROPOSED NEW STRUCTURE
- DENOTES AREA OF SOFT LANDSCAPING
- DENOTES AREA OF SWIMMING POOL
- DENOTES EXISTING STRUCTURE TO BE DEMOLISHED

PROJECT:
NEW RESIDENTIAL DWELLING INCLUDING SWIMMING POOL AND ASSOCIATED LANDSCAPING

CLIENT:
DAN & DANIELLE DE GAIL

LOCATION:
24 BEACH ROAD, COLLAROY, NSW

PROJECT STAGE:
DEVELOPMENT APPLICATION

DRAWING TITLE:
COVER & SITE INFORMATION: SITE PLAN

SCALE:
1:200 @ A3

DATE OF ISSUE:
11/10/2024

DRAWING NO.
DA-001

REVISION:
01

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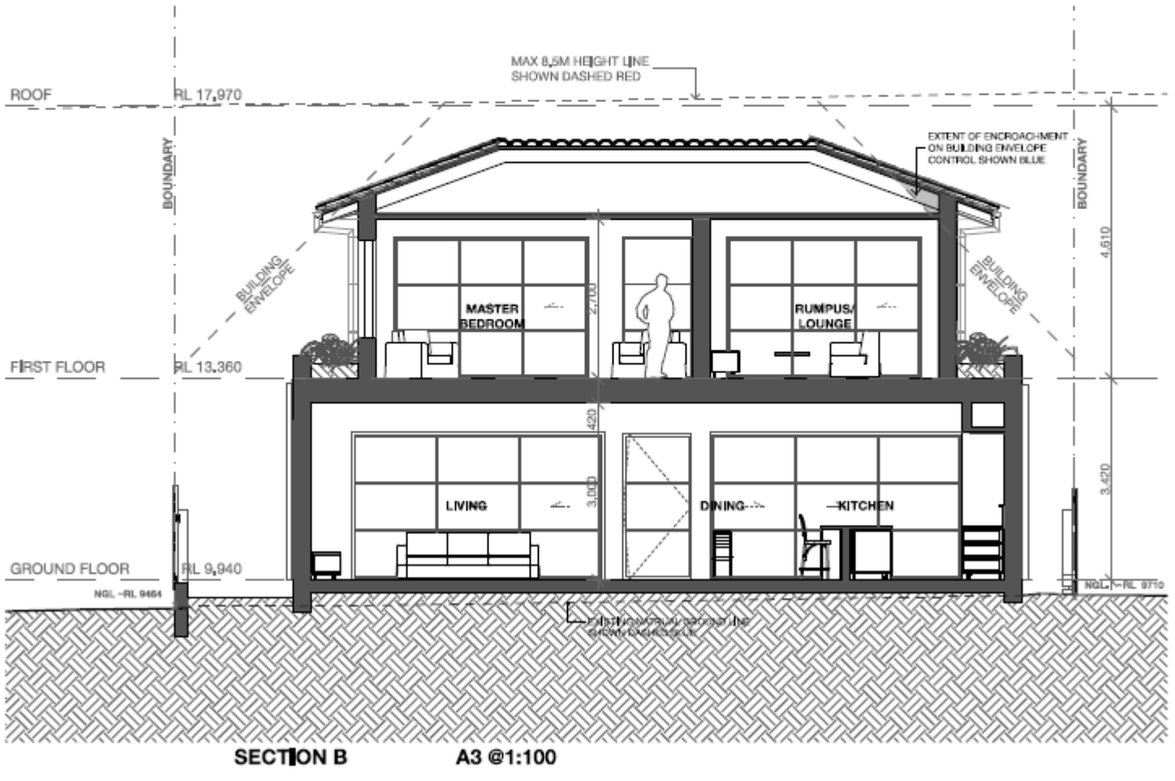
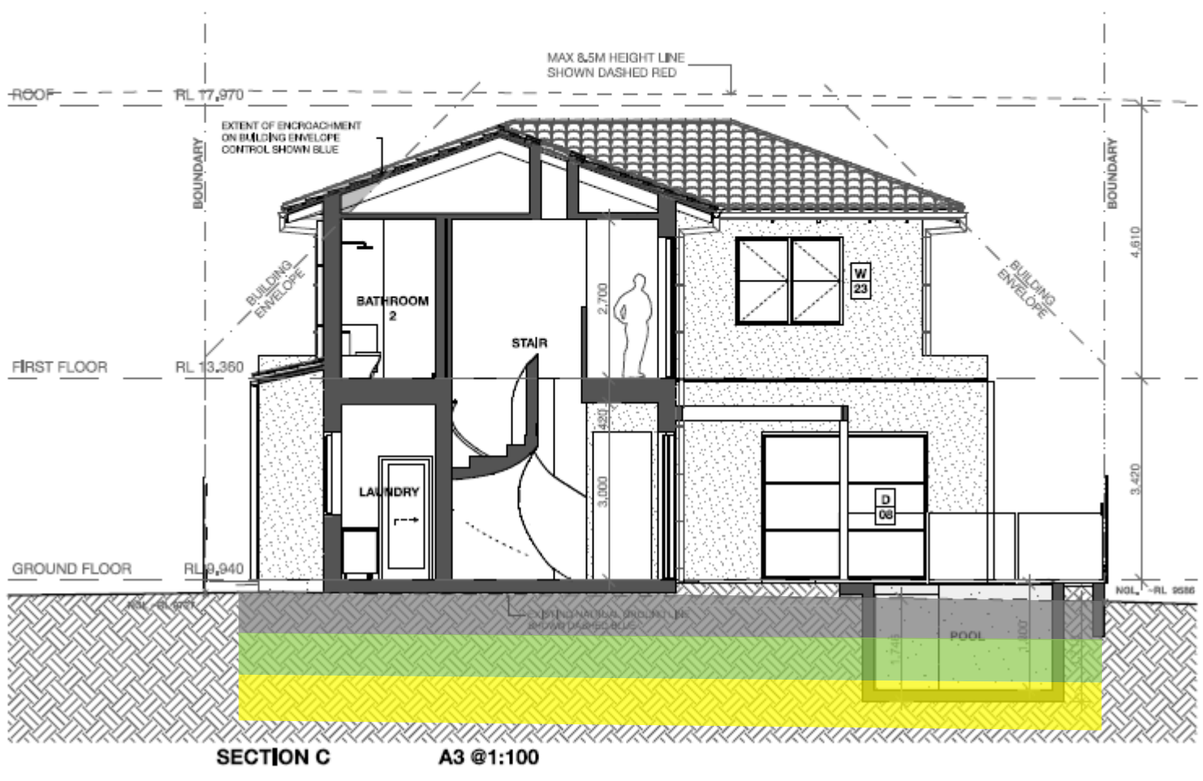
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



SECTION B **A3 @1:100**



SECTION C **A3 @1:100**

- Sandy fill and Topsoil – Medium Dense
- Sand – Medium Dense to Dense
- Alluvial Clays – Stiff to Hard

NOTE: THESE DRAWINGS ARE NOT FOR CONSTRUCTION, FOR DA APPROVAL ONLY
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NOTE: ALL WORKS TO BE IN ACCORDANCE WITH THE BASIX REQUIREMENTS

KEY:

- DENOTES EXISTING STRUCTURE TO BE RETAINED
- DENOTES PROPOSED NEW STRUCTURE
- DENOTES AREA OF SOFT LANDSCAPING
- DENOTES AREA OF SWIMMING POOL
- DENOTES EXISTING STRUCTURE TO BE DEMOLISHED

PROJECT:
NEW RESIDENTIAL DWELLING INCLUDING SWIMMING POOL AND ASSOCIATED LANDSCAPING

CLIENT:
DAN & DANIELLE DE GAIL

LOCATION:
24 BEACH ROAD,
COLLAROY, NSW

PROJECT STAGE:
DEVELOPMENT APPLICATION

DRAWING TITLE:
SECTIONS: SHEET 02

SCALE:
1:100 @ A3

DATE OF ISSUE:
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DRAWING NO.
DA-401

REVISION:
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