GEOTECHNICAL INVESTIGATION:

Alterations and Additions at **1 James Wheeler Place, Wheeler Heights**

1. Proposed Development

1.1 Demolish the existing driveway.

1.2 Construct new driveways and parking areas requiring minor levelling.

1.3 Various internal and external alterations and additions to the existing house.

1.4 Install a new pool at the S side of the existing house by excavating to a maximum depth of ~2.0m.

1.5 Retain but reduce the height of the existing pool shell, cap and use as an on-site water tank. Minor filling will be placed above the tank.

1.6 Construct a new outdoor eating area at the N side of the house and new pavilion with gym/studio adjacent to the existing tennis court.

1.7 Other minor external alterations and additions.

1.8 Details of the proposed development are shown on 23 drawings prepared by Synergy Construction Group, drawings numbered 0001, 0002, 0101 to 0110, 0201, 0202, 0211, 0212, 0221, 0222, 0401, 0402, 0501, 0901 and 1201, dated 9/7/25.

2. Site Description

2.1 The site was inspected on the 5th March, 2025.

2.2 This residential property is on the low side of the road and has a W aspect. It is located on the gentle to moderately graded lower reaches and toe of a hillslope. The natural slope falls across the property at an average angle of ~10°. The slope above

the property continues at similar angles. The slope below the property eases to near level angles across the council reserve beside Narrabeen Lagoon.

2.3 At the road frontage, a concrete and bitumen driveway runs down the slope to a garage at the E side of the house (Photos 1 & 2). A stable brick boundary wall up to ~2.5m high approximates the road frontage. The NE end of the wall is constructed on a stable concrete retaining wall (Photo 3) that supports a fill for the road reserve and a cut for a level area below. A stable shed and concrete parking area are located on this level area (Photo 4). The part two storey house with garage is supported on brick and sandstone block walls (Photos 2 & 5 to 7). The external supporting walls show no significant signs of movement. A balcony extends off the downhill side of the house (Photo 7). The posts that support the balcony stand vertical.

A pool that shows no significant signs of movement is located at the SW side of the house (Photo 8). Stable sandstone block and rendered masonry retaining walls up to ~3.5m high support fills for lawn, garden and paved areas across the property, and for a cut and fill for a tennis court in the NW corner of the property (Photos 9 to 12). The S side of the property is accessed via a gravel driveway with level parking area (Photo 12). An unsupported excavation up to ~1.5m high for the parking area has been taken through topsoil, clay and weathered rock (Photo 13). The excavation comes close to flush with a rendered masonry retaining wall supporting fill above (Photos 12 & 14). It is recommended the excavation be supported by a retaining wall as soon as possible.

3. Geology

The Sydney 1:100 000 Geological Sheet indicates the site is underlain by Alluvial Stream and Estuarine Sediment (Qha), although the Narrabeen Group Rocks are shown close to the E side of the property and at a residential scale the map is not always accurate. Ground testing indicates the proposed works are 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 hand Auger Holes (AH) were put down to identify the soil materials. Six 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 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:

AUGER HOLE 1 (~RL13.9) **–** AH1 (Photo 15)

Depth (m)	Material Encountered
0.0 to 1.2	**FILL**, sandy soil and clay, with some rock fragments, dark brown, brown, orange, dry to moist, fine to coarse grained.
1.2 to 1.4	**TOPSOIL**, sandy soil, dark brown, dry, fine to medium grained.
1.4 to 1.5	**CLAY**, orange brown, firm to stiff, dry.

End of Test @ 1.5m in firm to stiff clay. No Water table encountered.

TEST RESULTS CONTINUE ON NEXT PAGE

AUGER HOLE 2 (~RL15.7) **–** AH2 (Photo 16)

Depth (m)	Material Encountered
0.0 to 0.3	**FILL**, sandy soil and clay, with some rock fragments, dark brown, brown, orange, dry to moist, fine to coarse grained.
0.3 to 0.6	**TOPSOIL**, sandy soil, dark brown, dry to moist, fine to medium grained.
0.6 to 0.7	**CLAY**, orange, firm to stiff, dry.

End of Test @ 0.7m in firm to stiff clay. No Water table encountered.

AUGER HOLE 3 (~RL11.6) **–** AH3 (Photo 17)

Depth (m)	Material Encountered
0.0 to 0.3	**FILL**, sandy soil and clay, with some rock fragments, dark brown, brown, orange, dry to moist, fine to coarse grained.
0.3 to 0.5	**TOPSOIL**, sandy soil, dark brown, dry to moist, fine to medium grained.
0.5 to 0.7	**CLAY**, orange brown, firm to stiff, dry.

End of Test @ 0.7m in firm to stiff clay. No Water table encountered.

AUGER HOLE 4 (~RL7.5) **–** AH4 (Photo 18)

Depth (m)	Material Encountered
0.0 to 1.2	**FILL**, sandy soil, clayey soil and sandy clay with some rock fragments, dark grey, dark brown, orange, damp, fine to coarse grained.
1.2 to 1.4	**SANDY CLAY**, orange, firm to stiff, dry.

Refusal @ 1.4m, auger grinding on rock. No Water table encountered.

AUGER HOLE 5 (~RL4.7) **–** AH4 (Photo 19)

Depth (m)	**Material Encountered**
0.0 to 0.3	**CLAYEY SAND**, orange, maroon, moist, fine to coarse grained.
0.3 to 0.4	**SANDY CLAY**, light grey, firm to stiff, moist.

Refusal @ 0.4m, auger grinding on rock. No Water table encountered.

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** (~RL13.9)	**DCP 2** (~RL16.5)	**DCP 3** (~RL15.7)	**DCP 4** (~RL11.6)	**DCP 5** (~RL7.5)	**DCP 6** (~RL4.7)
0.0 to 0.3	14	10F	14	14	4	15
0.3 to 0.6	18	6F	14	16	4	6
0.6 to 0.9	10	17	18	6	8	#
0.9 to 1.2	11	33	30	#	31	
1.2 to 1.5	17	#	#		22	
1.5 to 1.8	26				#	
1.8 to 2.1	36					
2.1 to 2.4	#					
	End of Test @ 2.1m	Refusal on Rock @ 1.2m	Refusal on Rock @ 1.1m	Refusal on Rock @ 0.7m	Refusal on Rock @ 1.4m	Refusal on Rock @ 0.4m

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

DCP Notes:

DCP1 – End of Test @ 2.1m, DCP still very slowly going down, white impact dust on dry tip.
DCP2 – Refusal on Rock @ 1.2m, DCP bouncing off rock surface, orange clay on dry tip.
DCP3 – Refusal on Rock @ 1.1m, DCP thudding on rock surface, orange clay on dry tip.
DCP4 – Refusal on Rock @ 0.7m, DCP thudding on rock surface, orange brown clay on dry tip.
DCP5 – Refusal on Rock @ 1.4m, DCP bouncing off rock surface, dark brown sandy soil on muddy wet tip.
DCP6 – Refusal on Rock @ 0.4m, DCP bouncing off rock surface, orange clayey sand on moist tip.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the test locations, the ground materials consist of fill, a thin sandy topsoil and clayey sand over Firm to Stiff Clays. Fill to an estimated maximum depth of ~3.0m provides level platforms for lawn, garden, and paved areas across the property, and a level platform for the tennis court slab. In the test locations, the clays merge into the weathered zone of the underlying rock at depths of between ~0.4m to ~1.8m below the current surface, being deeper where the fill is deeper (DCPs 1 & 5). The weathered zone of the underlying rock is interpreted as Extremely Low to 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. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Ground water seepage is expected to move over the denser and less permeable clay and weathered rock layers in the sub-surface profile.

No water table was encountered to the extent of the testing at ~RL4.3. The water table is expected in the vicinity of ~RL0.0 to ~RL2.0. It should be noted the water table fluctuates with the tide and climatic changes.

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 James Wheeler Place above.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside or below the property. The gentle to moderately graded slope that falls across the property and continues above is a potential hazard (**Hazard One**). The proposed excavation is a potential hazard until retaining structures

are in place (**Hazard Two**). The additional surcharge loads from the proposed house, pool, and pavilion structures are a potential hazard to the existing retaining walls (Photos 9 to 12) (**Hazard Three**).

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 failing and impacting on the proposed works.	The proposed excavation collapsing onto the worksite during the excavation process.	The additional surcharge loads from the proposed structures transferring onto the existing retaining walls (Photos 9 to 12) that leads to failure.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (15%)	'Medium' (15%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	4.2×10^{-7}/annum	7.4×10^{-5}/annum	1.9×10^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'	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.	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels the recommendations in **Section 17** 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

There is fall from the proposed roofs to the 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 ~2.0m is required to install the proposed new pool. In addition, minor levelling is required for the proposed house additions, driveways and parking areas.

The excavations are expected to be through fill, topsoil and clay. Extremely Low to Low Strength Rock is expected to be encountered near the base of the new pool excavation at the deep end of the pool.

Excavations through fill, soil, clay and rock up to Low Strength are expected to be carried out with an excavator and toothed bucket.

12. Vibrations

It is expected the proposed excavations 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 using a domestic sized excavator up to 20 tonne.

13. Excavation Support Requirements

An excavation to a maximum depth of ~2.0m is required to install the proposed new pool. The excavation is set back sufficiently from the surrounding structures and property boundaries.

Due to the depth of the fill, 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.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported 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. The materials and labour to construct the retaining walls / pool structure are to be organised so on completion of the excavation 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 following the current Environmental Protection Agency (EPA) waste classification guidelines.

14. Fill

Minor filling will be placed across the property for landscaping and to provide a level platform for the proposed new hardstand at the NE side of the house. No fills are to be laid until the retaining walls are in place.

The surface is to be prepared before any fills are laid by removing any organic matter and topsoil. Fills are to be laid in a loose thickness not exceeding 0.3m.

For ease of design and construction it is recommended the fill be used as formwork for the hardstand only and the hardstand be supported on the underlying natural surface with

shallow piers. If the hardstand will be supported on the fill it is to be laid and compacted as engineered fill as follows:

Non-cohesive Soils – for pavements compact to a dry density ratio not less than 70% standard. Soil can be kept moist to aid in compaction. Compact the upper 150mm to a dry density ratio of not less than 80% standard.

Cohesive Soils – for pavements compact to a dry density ratio not less than 95% standard. The moisture content during compaction should be maintained at ± 2% of Standard Optimum. Compact the upper 150mm to a dry density ratio of not less than 100% standard.

The geotechnical consultant is to inspect and test the fill to ensure the required density has been achieved.

Filling within ~1.5m behind retaining walls should be compacted with light weight equipment such as a hand operated plate compacter or similar so as to not damage the wall. Where light weight compaction equipment is used fills are be laid in a loose thickness not exceeding 0.15m.

15. 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 ON NEXT PAGE

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 Clayey Sand	20	0.40	0.55
Residual Clays	20	0.35	0.45
Extremely Low to Low Strength Rock	22	0.25	0.38

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.

16. Site Classification

The site classification in accordance with AS2870-2011 is Class P due to the depth of the fill. The natural clays underlying the fill are interpreted to be moderately reactive.

17. Foundations

The proposed house additions, pool and pavilion are to be supported on piers taken to and embedded no less than 0.6m into Extremely Low Strength Rock or better. This ground material is expected at depths of between ~0.7m to ~3.5m below the current surface, being deeper where the fill is deeper. Provided the footings are taken to and embedded into this ground material no additional loads will be transferred onto the existing retaining walls. A maximum allowable bearing pressure of 600kPa can be assumed for footings embedded in Extremely Low Strength Rock or better. It should be noted that this material is a soft rock and a rock auger will cut through it so the builders should not be looking for refusal to end the footings.

The foundations supporting the existing house are currently unknown. Ideally, footings should be founded on the same footing material across the old and new portions of the structure. Where the footing material does change across the structure construction joints or similar are to be installed to prevent differential settlement, where the structure cannot tolerate such movement.

As the bearing capacity of weathered rock 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 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 and inspected.

The proposed driveways and parking areas can be supported off the natural surface after any organic matter has been stripped. A maximum allowable bearing pressure of 100kPa can be assumed for soil of the natural surface. Where these structures are cut into clay / weathered rock, they can be supported on these ground materials. A maximum allowable bearing pressure of 200kPa can be assumed for footings on firm to stiff clay. Where the foundation material across the driveway / parking area structure changes, construction joints are to be

installed to separate the different foundation materials and to accommodate minor differential movement. Alternatively, the driveway / parking areas can be supported on piers embedded in Extremely Low Strength Rock or better to maintain a uniform foundation material across the structure.

Minor filling will be placed to provide a level platform for the proposed new hardstand at the NE side of the house. For ease of design and construction it is recommended the fill be used as formwork for the hardstand only and the hardstand be supported on the underlying natural surface with shallow piers. If the hardstand will be supported on the fill it is to be laid and compacted as engineered fill following the recommendations in **Section 14.**

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.

18. 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.

- 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.

- If the proposed hardstand will be supported on engineered fill, the geotechnical consultant is to inspect and test the fill to ensure the required density has been achieved.

White Geotechnical Group Pty Ltd.

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Geotechnical Engineer.

Reviewed By:

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No. 10307
Engineering Geologist & Environmental Scientist.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

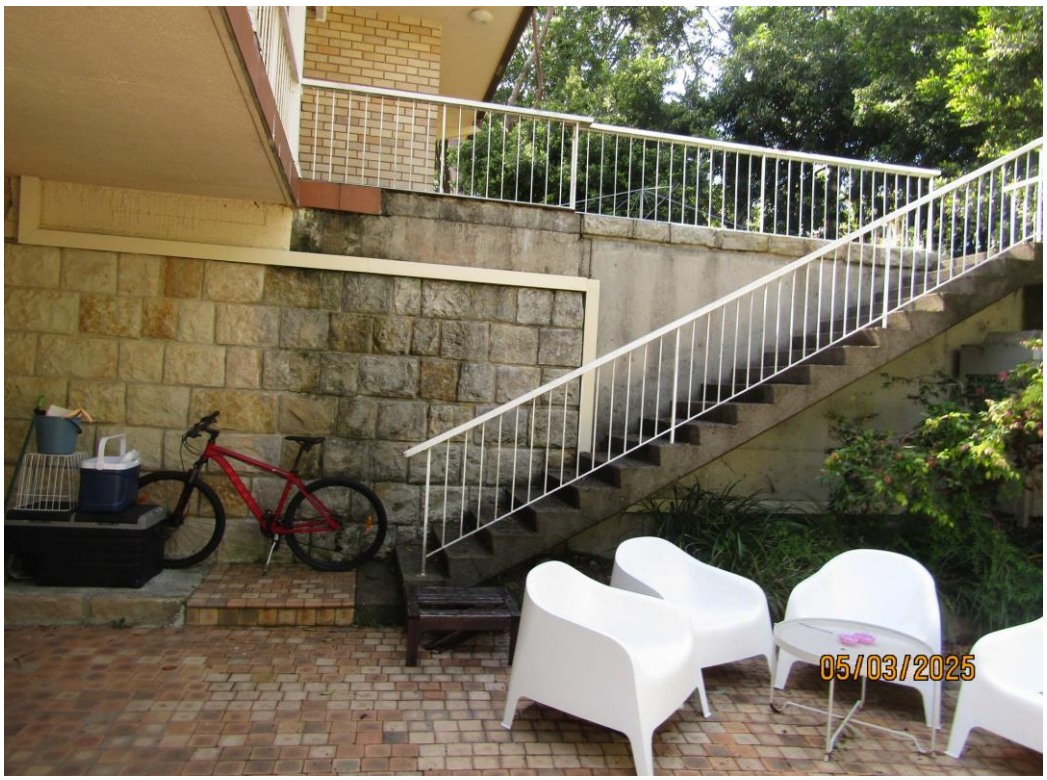


Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15: AH1 – Downhole is from top to bottom.

Photo 16: AH2 – Downhole is from top to bottom.

Photo 17: AH3 – Downhole is from top to bottom.

Photo 18: AH4 – Downhole is from top to bottom.

Photo 19: AH5 – 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.

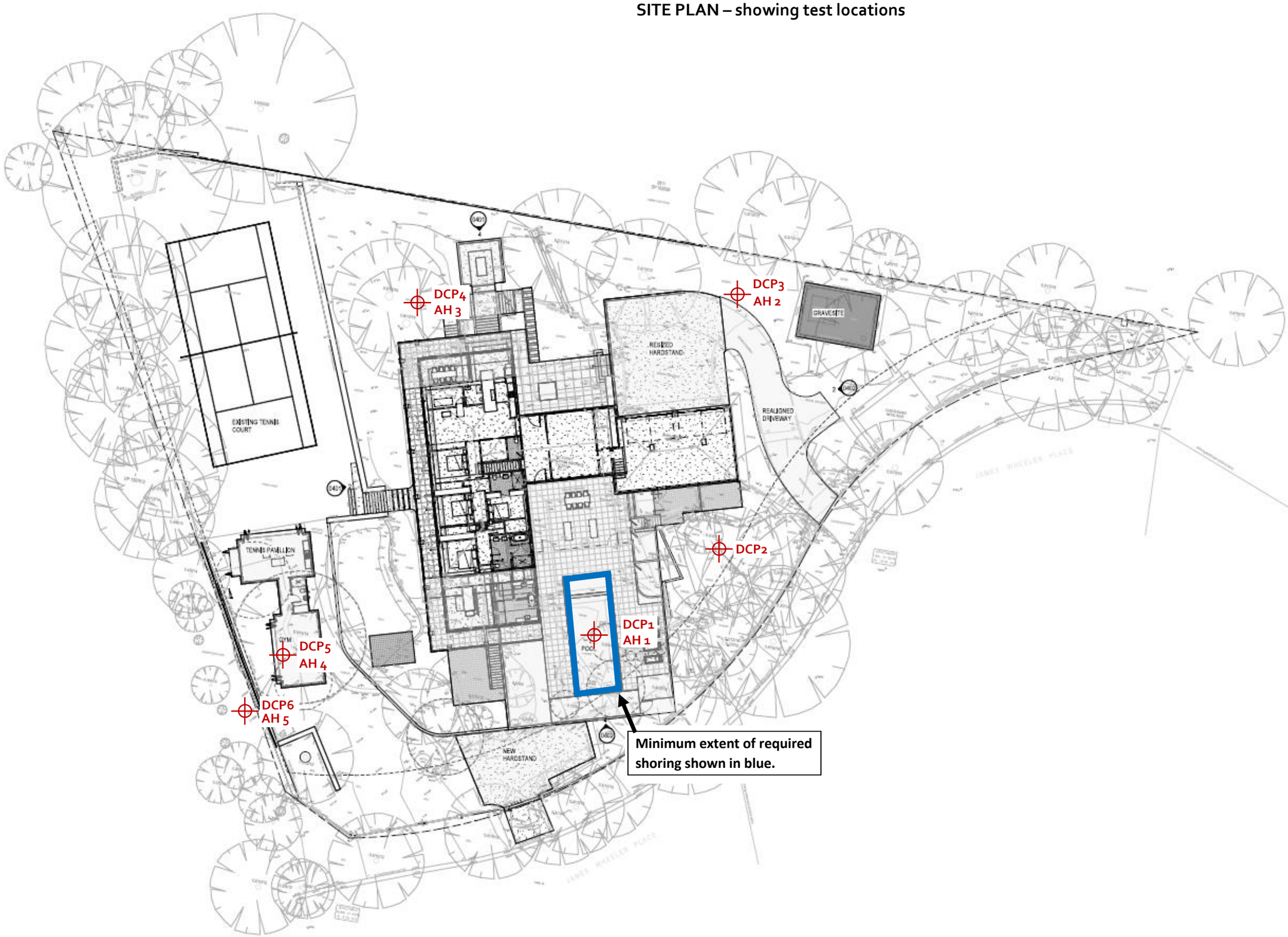
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



EXTENT OF NEW WORKS

HERITAGE ITEM

NOTE: WHERE NEW WORKS RELATE ONLY TO INTERNAL CONFIGURATION CHANGES, AREA OF WORKS MAY NOT BE SHADED

NOT FOR CONSTRUCTION

MFA
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SYNERGY Construction Group

SITE ADDRESS
1 JAMES WHEELER PLACE
WHEELER HEIGHTS

CLIENT
ALEX AND ASHLEE SMITH

#	DATE	DESCRIPTION
F	19/03/25	DESIGN UPDATE
G	24/03/25	DESIGN UPDATE 2
H	22/04/25	ISSUE TO LANDSCAPE
I	28/05/25	ISSUE TO CONSULTANTS
J	03/06/25	UPDATE PAVILION
K	06/06/25	UPDATE FOR BASIX
L	08/07/25	ISSUE FOR APPROVAL

PROJECT: SMITH - WHEELER HEIGHTS
TITLE: SITE PLAN
SCALE: As indicated @A1
DRAWING No: CD-0101_L

MFA
MICHEAL FOUNTAIN ARCHITECTS PTY. LTD.
2/5 NARABANG WAY BELROSE NSW 2085
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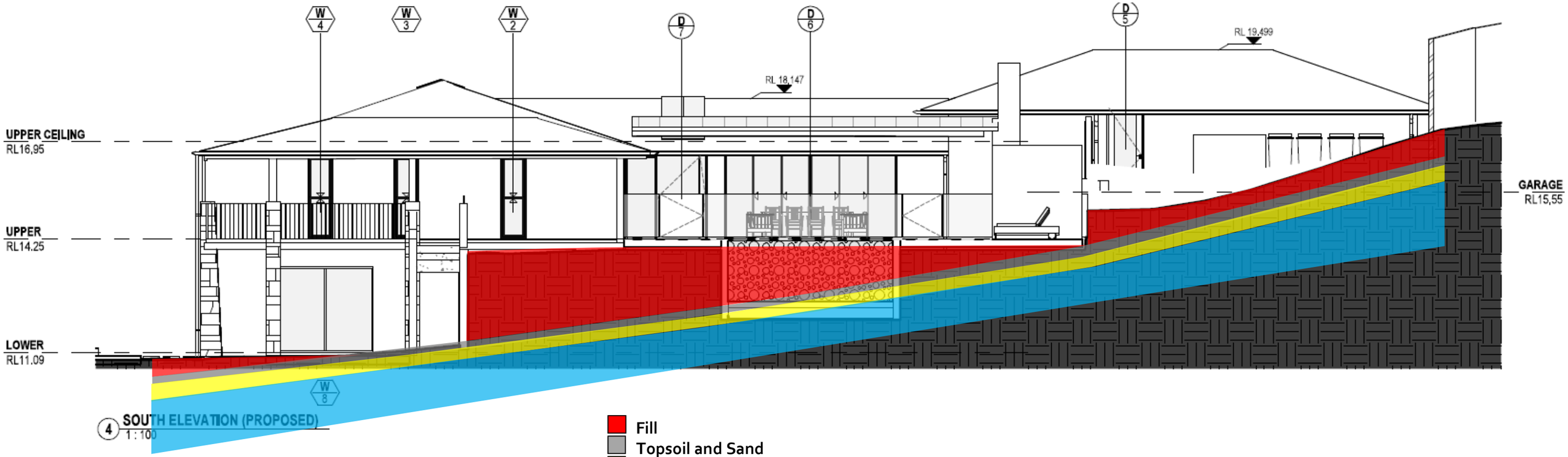
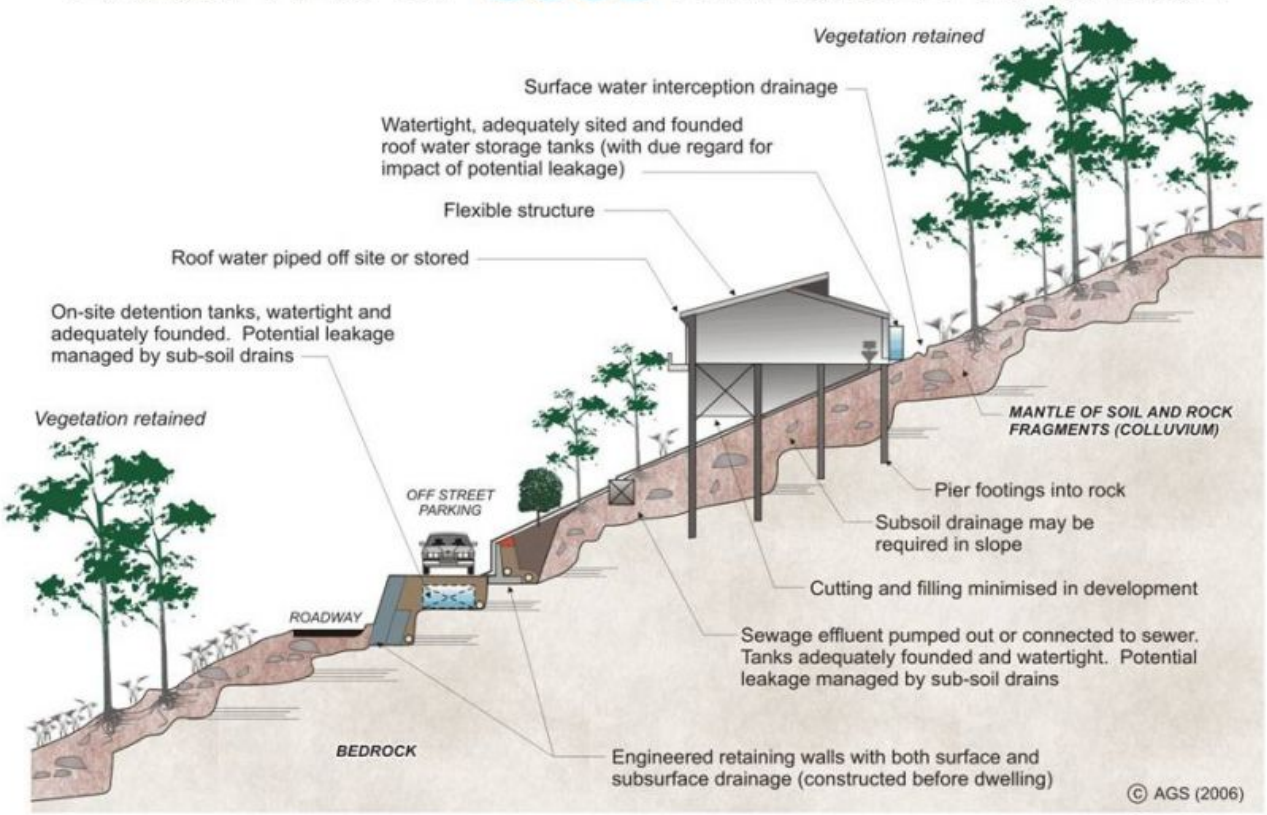
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



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

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE