GEOTECHNICAL INVESTIGATION:

New Pool at **50 Pacific Parade, Manly**

1. Proposed Development

1.1 Install a new pool on the N side of the house by excavating to a maximum depth of ~1.6m.

1.2 Extend the existing deck on the N side of the house.

1.3 Details of the proposed development are shown on 4 drawings provided by Formed Gardens, job number FG 21 927, drawings numbered 001 to 003, Revision B, dated 9/6/21.

2. Site Description

2.1 The site was inspected on the 13th July, 2021.

2.2 This residential property is near level with the road. The block is located on the near level terrain W of Manly Beach.

2.3 At the road frontage, a concrete driveway runs to a paved parking area on the S side of the house (Photo 1). The two storey timber clad duplex is supported by brick piers (Photos 1 & 2). The supporting piers stand vertical (Photo 3). A level lawn extends from the N side of the house to the N property boundary (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 Hawkesbury Sandstone. The test results indicate the site is underlain by deep sands to the extent of the testing. No sandstone was encountered.

4. Subsurface Investigation

One Auger Hole (AH) was put down to identify the soil materials. Two Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the sands underlying the site. The locations of the tests are shown on the site plan. 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 be an issue for the testing on 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 (~RL2.4) **–** AH1 (Photo 4)

Depth (m)	Material Encountered
0.0 to 0.7	**TOPSOIL**, sandy soil, dark brown, damp, fine to medium grained with fine trace organic matter.
0.7 to 1.2	**SAND**, grey, damp, Loose to Medium Dense, medium to course grained.
1.2 to 1.7	**SAND**, grey, wet, Loose to Medium Dense, medium to course grained.

End of Hole @ 1.7m in wet sand. Watertable encountered at ~1.2m.

DCP TEST RESULTS ON NEXT PAGE

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** (~RL2.4)	**DCP 2** (~RL2.4)
0.0 to 0.3	3	1F
0.3 to 0.6	4	1F
0.6 to 0.9	8	2
0.9 to 1.2	11	6
1.2 to 1.5	6	4
1.5 to 1.8	6	7
1.8 to 2.1	8	9
2.1 to 2.4	4	4
2.4 to 2.7	2	2
2.7 to 3.0	2	1
3.0 to 3.3	2	2
3.3 to 3.6	2	2
3.6 to 3.9	7	5
3.9 to 4.2	5	5
4.2 to 4.5	4	5
4.5 to 4.8	6	4
4.8 to 5.1	7	4
5.1 to 5.4	#	#
	End of Test @ 5.1m	End of Test @ 5.1m

#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 @ 5.1m, DCP still going down, grey sand on damp tip.

DCP2 – End of test @ 5.1m, DCP still going down, dark brown/grey sand on damp tip.

5. Geological Observations/Interpretation

The site is underlain by alluvial sediment that extends to the extent of the testing at 5.1m. To summarise the test results, a sandy topsoil to a depth of ~0.7m overlies sands of variable density that range from Loose to Medium Dense to a depth of ~2.1m. These overlie sands of variable density that range from Very Loose to Loose that extend to at least the extent of the testing at 5.1m. See the Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

The watertable was encountered at a depth of ~1.2m (~RL1.2) below the current surface. This is to be noted by the pool builders as it will have an impact on excavation stability and the excavation walls will need to be supported until the pool structure is in place as per the recommendations in **Section 13**. It should be noted the watertable 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 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 for the pool is a potential hazard until retaining structures are in place (**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 work site 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	8.3×10^{-6}/annum
COMMENTS	This level of risk to life and property is 'UNACCEPTABLE'. To move 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

No significant stormwater runoff will be created by the proposed development.

11. Excavations

An excavation to a maximum depth of ~1.6m is required to install the proposed pool. The excavation is expected to be through topsoil and sand. It is envisaged that excavations through soil and sand can be carried out with an excavator and bucket.

12. Vibrations

Possible vibrations generated during excavations through soil and sand will be below the threshold limit for building damage.

13. Excavation Support Requirements

An excavation to a maximum depth of ~1.6m is required to install the proposed pool. The excavation comes flush with the E common boundary. Additionally, the watertable was encountered at a depth of ~1.2m. This has implications for the excavation stability that need to be considered in the design and construction.

The cut batters are to be temporarily supported until the pool structure is in place. The ground support is to be designed and approved by a structural engineer. Seepage is expected through the profile from a depth of ~1.2m and is likely the water will cause undercutting and slumping through the sand cut batter. An example of suitable ground support is a sandbag retaining wall that is installed as the excavation is progressed and remains in place while the pool is formed and poured. The sandbags allow water flow but prevent sediment movement and subsequent batter collapse. It should be noted that this is one of many possible shoring solutions.

The deepest part of the excavation is 0.4m below the watertable. A sump and pump will be required during construction to keep the base of the pool excavation dry. Pumps should only be used when they are required for construction and should not be left operating consistently at other times to minimise draw down effects on the watertable.

The materials and labour to construct the pool is to be organised so on completion of the excavations it 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. Retaining Structures

For cantilever or singly-propped retaining structures, it is suggested the design be based on a triangular pressure 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
Topsoil, Sand	20	0.40	0.55

For rock classes refer to Pells et al "Design Loadings for Foundations on Shale and Sandstone in the Sydney Region". Australian Geomechanics Journal 1978.

It is to be noted that the earth pressures in Table 1 assume a level surface above the structure, do not account for any surcharge loads and assume retaining structures 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 likely hydrostatic pressures are to be accounted for in the structural design.

15. Foundations

Spread footings supported on the underlying sandy topsoil and taken to a minimum depth of 0.4m are suitable footings for the proposed deck extension. A maximum allowable bearing pressure of 100kPa can be assumed for footings on topsoil.

The footing walls are to be shored with timber to prevent collapse. The base of the footing excavations in sandy soil should be compacted as the excavation will loosen the upper sands. This can be carried out with a hand-held plate compactor. Water may be used to assist in compaction in sandy soil 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.

The proposed pool is expected to be seated in Loose to Medium Dense sand. Although the underlying ground material at the base of the pool has an adequate bearing pressure to support the pool we recommend screw piles be installed to prevent possible 'pop-out' that can occur when the pool is empty and floats on the water table and subsequently pops out of the ground. The Structural Engineer is to calculate the required pressure for the screw piles to resist buoyancy.

Note that we do not certify screw pile foundations. Screw pile design varies between contractors and we are not privy to the details of individual design or how the screw pile contractor converts torque to bearing pressure. As such, the screw pile contractor is totally responsible for ensuring the screw piles can support the loads on the piles and that these are within acceptable settlement limits.

If another method of "hold down" is used and the pool can be supported on the sand at the base of the excavation, it should be compacted as the excavation will loosen the upper sands. This can be carried out with a hand-held plate compactor. As a guide to the level of compaction required, a density index of >65% is to be achieved, correlating to a dense sand. The geotechnical consultant is to inspect and test the compacted base of the pool excavation to ensure the required density has been achieved.

If the cost of these measures to prevent 'pop out' are considered too much and the owners wish to support the pool on the base of the excavation only, we point out the pool will always need to be kept full of water to prevent the possibility of it floating on the water table during wet periods. We recommend the pool be anchored. If it is not and the pool does pop out of the ground, we accept no liability whatsoever.

REQUIRED INSPECTION ON NEXT PAGE

16. Inspection

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 regulating authorities if the following inspection has not been carried out during the construction process.

- All footings (excluding screw pile foundations) 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.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist.

Photo 1

Photo 2

Photo 3

Photo 4

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.

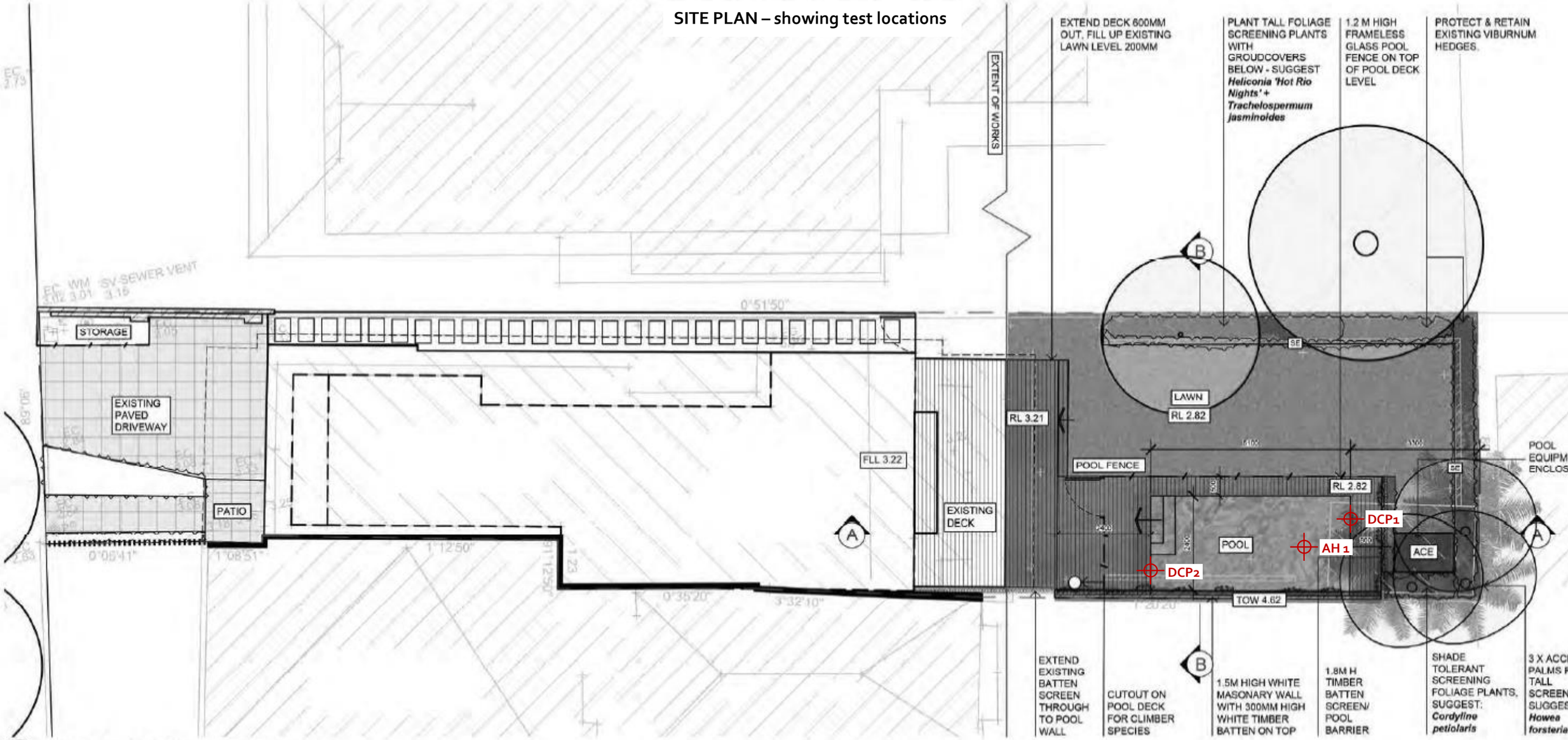
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



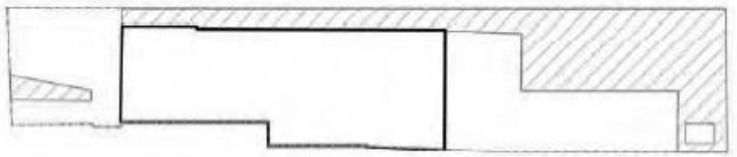
01 LANDSCAPE WORKS PLAN

1:100

PROPOSED PLANT SCHEDULE

QTY	KEY	BOTANICAL NAME	COMMON NAME	MATURE HEIGHT	MATURE SPREAD	POT SIZE	SPACING
TREES/FERNS							
3	Hf	*Howea forsteriana*	Kentia Palms	6m	4m	100L	As Shown
SCREEN PLANTS/SHRUBS/ACCENTS							
5	HH	*Heliconia 'Hot Rio Nights'*	Hot Rio Nights Heliconia	4m	2m	300mm	As Shown
3	Cs	*Cordyline stricta*	Narrow Leaf Palm Lily	2m	1m	200mm	600mm
GROUNDCOVERS/CLIMBERS							
45	TJ	*Trachelospurmum jasminoides*	Chinese Star Jasmine	Climbing	Climbing	140mm	500mm
3	BS	*Bougainvillea 'Scarlet O'Hara'*	Scarlet O'Hara Bougainvillea	Climbing	Climbing	300mm	400mm

02 PROPOSED PLANTING SCHEDULE



LANDSCAPE CALCULATIONS-
SITE AREA DIAGRAM

TOTAL SITE AREA = 244.60m²

TOTAL OPEN SPACE AREA = 87.45m²

REQUIRED MINIMUM LANDSCAPE AREA: 35% OF OPEN SPACE = 30.60m²

PROPOSED SOFT LANDSCAPE AREA = 55m²

03 LANDSCAPE AREA CALCULATION

The contractor shall check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Description	Drawn	Check	Date
B	FOR DA	KS	LB	09.04.2021
A	FOR REVIEW	MA	LB	29.04.2021

Legend:

Retain / protect existing tree
Planted areas Refer key & notes
Turf
Batten fence
Decking
Climber plants
RL 2.82 Proposed spot height
Rendered brick wall
Proposed glazed pool fence

North point:

Scale 1:100 @A3

formed gardens
design & construction
304/20 Dale St
Brookvale NSW 2100
Australia
Tel: (61 2) 8338 0800
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Web: www.formedgardens.com.au
Formed Gardens Pty Ltd
ABN 29 123 977 702

Client:
AMY SMITH

Project:
50 PACIFIC PDE
MANLY
NSW 2095

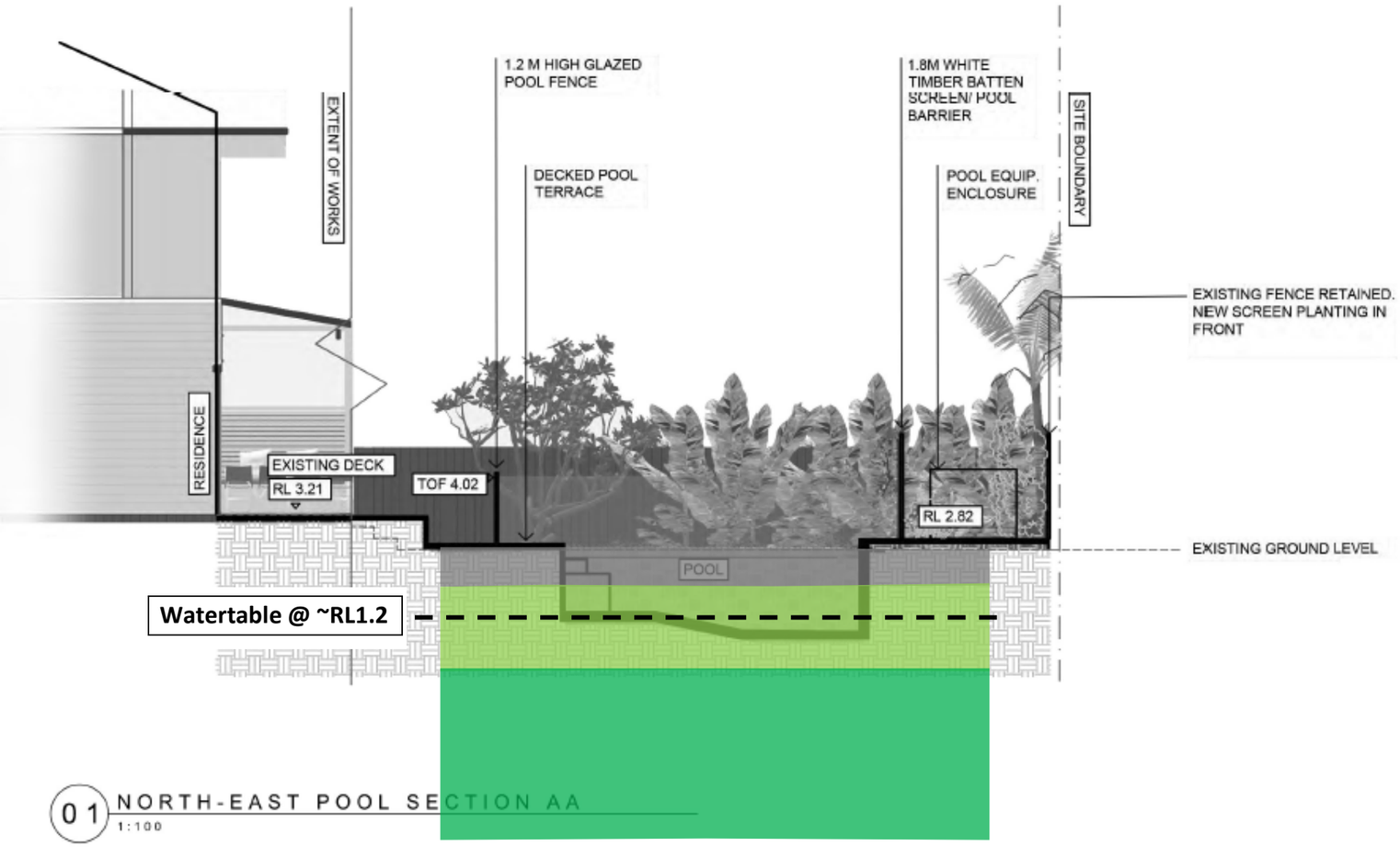
Drawing Name:
LANDSCAPE
AND SWIMMING POOL PLAN

Sheet 2 of 3

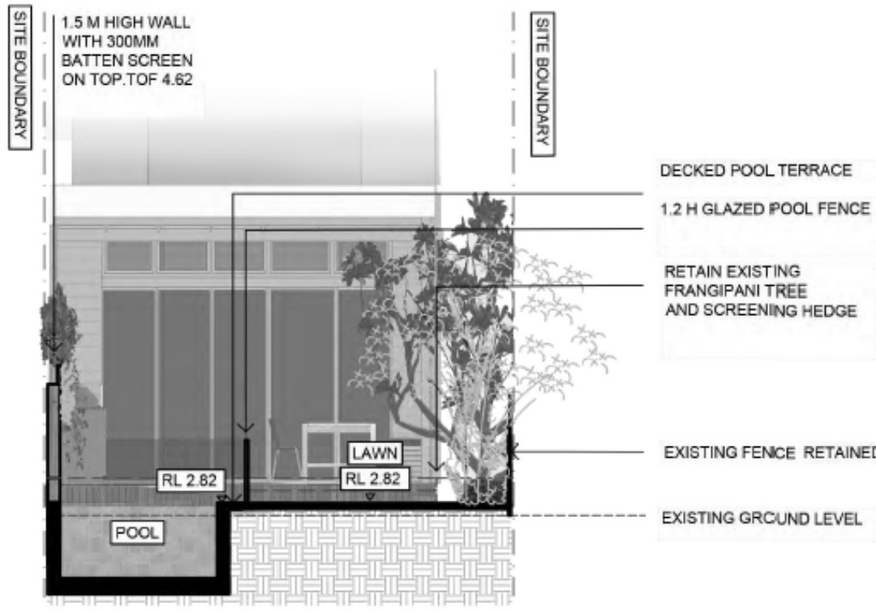
Drawing Stage:
DEVELOPMENT APPLICATION

Job Number:	Drawing Number:	Rev:
FG 21 927	002	B

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



01 NORTH-EAST POOL SECTION AA
1:100



02 SOUTH-WEST POOL SECTION - BB
1:100

- Topsoil
- Sand – Loose to Medium Dense
- Sand – Very Loose to Loose

The contractor shall check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Description	Drawn	Check	Date
B	FOR DA	KS	LB	09.06.2021
A	FOR REVIEW	MA	LB	26.04.2021

Legend:

North point:

Scale: 0 0.5 1 2 3m 1:100 @A3

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Web: www.formedgardens.com.au
Formed Gardens Pty Ltd
ABN 29 123 977 702

Client: AMY SMITH

Project: 50 PACIFIC PDE
MANLY
NSW 2095

Drawing Name: SECTIONS

Sheet 3 of 3

Drawing Stage: DEVELOPMENT APPLICATION

Job Number: FG 21 927
Drawing Number: 003
Rev: B