GEOTECHNICAL INVESTIGATION:

Subdivision and New Houses at **12-14 Gladys Avenue, Frenchs Forest**

1. Proposed Development

1.1 Demolish the existing driveway and houses. Subdivide the property into 4 separate lots.

1.2 Construct a new driveway with right of way that will run to new garages on each lot. The driveway will require an excavation to a maximum depth of ~2.2m.

1.3 Install a below ground OSD tank by excavating to a maximum depth of ~2.5m.

1.4 Lot 1: Construct a new two storey house with garage by excavating to a maximum depth of ~3.1m.

1.5 Lot 2: Construct a new part three storey house with garage.

1.6 Lot 3: Construct a new two storey house with garage by excavating to a maximum depth of ~2.7m.

1.7 Lot 4: Construct a new two storey house with garage by excavating to a maximum depth of ~1.0m.

1.8 Details of the proposed development are shown on 5 design drawings prepared by RK Designs, project number 22-46, sheets numbered .1 and 1 to 4, Issue D, dated 21/7/22. Additional details of the proposed development are shown on 6 design drawings prepared by NKP Architecture, drawings numbered DA 02 to DA 07, dated 15/8/22. Details of the proposed driveway are shown on 2 drawings prepared by The Traffic Plans Company, drawing number TPC-2022-10658-002, sheets numbered 1 and 2, dated 11/8/22. Stormwater details are shown on 8 drawings prepared by JCO Consultants, job

number 20220060, drawings numbered DA-SW100, DA-SW200, DA-SW201, DA-SW300, DA-SW500 to DA-SW502 and DA-SW600, dated 15/8/22.

2. Site Description

2.1 The site was inspected on the 22nd April, 2022.

2.2 These residential properties are on the low side of the road and have a NW aspect. They are located on the gentle to steeply graded upper reaches of a hillslope. The natural slope falls at gentle angles before reaching top of outcropping Hawkesbury Sandstone bedrock that steps down the slope. The outcropping rock is estimated (from the site survey) to range from ~2m to ~5m high. The slope below the rock face falls at an average angle of ~18°. The slope above the property decreases in grade. The slope below the property gradually decreases in grade.

2.3 At the road frontage, a shared bitumen driveway (Photo 1) runs to a concrete carport at 14 Gladys Ave and a concrete driveway at 12 Gladys Ave.

14 Gladys Ave, Frenchs Forest

The carport roof is supported by brick columns that stand vertical. The part two storey brick and timber clad house is supported by brick walls (Photos 2 & 3). The external supporting walls show no significant signs of movement. A pool that shows no significant signs of movement is located on the downhill side of the house (Photo 4). The pool was partially empty at the time of inspection. A gently sloping lawn and timber clad shed is located on the downhill side of the pool. Fill reduces the grade of the lawn.

Outcropping Hawkesbury Sandstone bedrock steps down the slope on the downhill side of the lawn. The outcropping rock is estimated (from the site survey) to be up to ~5m high. The majority of the area below the rock face was inaccessible due to overgrown vegetation and could not be assessed. The visible portion of the rock face

is estimated to be undercut by up to ~1.5m (Photo 5). The visible undercut has a relatively thick cantilever arm in relation to its overhang length and is currently considered to be stable. The slope below the rock face is densely vegetated (Photo 6). Sandstone bedrock outcrops in places on the slope. Sandstone joint blocks are embedded in stable positions in the slope.

12 Gladys Ave, Frenchs Forest

A concrete driveway runs down the slope to the house. A lawn is located beside the driveway. A cut and fill at the bottom of the lawn provides a level platform for the uphill side of the house and reduces the grade of the lawn. The cut and fill batter is battered at steep angles but is thickly vegetated and appears to be stable (Photo 7). A masonry retaining wall ~1.8m high supports a cut on the E side of the house and filling for a lawn area on 14 Gladys Ave (Photo 8). Part of the wall was obscured by vegetation and could not be adequately assessed. The visible portion of the wall appears to be stable. The single storey rendered masonry house is supported by concrete block walls, brick walls and brick piers (Photos 9 & 10). The supporting walls and piers stand vertical and show no significant signs of movement (Photo 11). Part of the concrete block walls supporting the house are constructed on exposed sandstone bedrock. Water was observed flowing through a crack in the rock. There was some moderate rainfall at the time of the inspection. Water was observed to be drawn up the rock and into the lower concrete blocks, however a damp course has be placed to prevent the water from moving further up the wall.

A near level lawn area extends off the downhill side of the house. Sandstone bedrock steps down the slope on the downhill side of the lawn (Photo 12). The outcropping rock is estimated to be up to ~4m high. The upper portion of the rock is obscured by vegetation. The rock face is undercut at the base slightly, but has a thick cantilever arm in relation to its overhang length and is currently considered to be stable. A pool that shows no significant signs of movement is located on the downhill side of the rock

face (Photo 13). The pool was partially empty at the time of inspection. The slope below the pool is thickly vegetated (Photo 14). Sandstone bedrock outcrops in places on the slope. Sandstone joint blocks are embedded in stable positions in the slope.

Summary

No signs of slope instability were observed on the properties that could have occurred since the properties were developed. 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. It is described as a medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

4. Subsurface Investigation

Two Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. 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 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:

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** (~RL142.1)	**DCP 2** (~RL141.6)
0.0 to 0.3	4	23
0.3 to 0.6	4	24
0.6 to 0.9	4	2
0.9 to 1.2	#	#
	Refusal on rock @ 0.8m	Refusal on rock @ 0.7m

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

DCP Notes:

DCP1 – Refusal on rock @ 0.8m, DCP bouncing off rock surface, dark brown soil and brown orange clayey sand on wet tip.

DCP2 – Refusal on rock @ 0.7m, DCP bouncing off rock surface, orange and grey clayey sand and sandy clay and dark brown soil on muddy wet tip.

5. Geological Observations/Interpretation

The surface features of the block are controlled by the 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 overlain by a thin sandy topsoil, sand and sandy clay that fills the bench step formation. Rock is exposed at the surface at the downhill side of the proposed garage and above and below the proposed new houses. In the test locations, the depth to rock ranged from ~0.7m to ~0.8m below the current surface. DCP testing and boreholes completed by another firm on the property encountered rock at depths from between ~0.2m to ~2.1m below the current surface. See the test results from the other firm (Martens and Associates) attached to this report. The majority of the sandstone underlying the property is estimated to be Medium Strength or better. A borehole (at surface RL151.9)

carried out by the other firm at the N side of the property (12 Gladys Ave) encountered fill to a depth of ~0.6m over clay. The clay was underlain by weathered Low Strength Sandstone at a depth of 2.1m before hitting refusal on Medium Strength Sandstone at a depth of 3.85m (~RL148.05). 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 in the location is expected to be many metres below the proposed works.

7. Surface Water

Evidence of recent surface flows were observed on the outcropping sandstone bedrock on the uphill side of the proposed new house on Lot 2 (Photo 12). It is recommended that drainage measures be installed on the uphill sides of the proposed houses to capture and divert any surface water that flows over the rock face.

If the owners know or become aware in the future of any other overland flows that enter the property during heavy prolonged rainfall events our office is to be informed so appropriate drainage measures can be recommended and installed. It is a condition of the slope stability assessment in Section 8 (**Hazard One**) that this be done.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The steeply graded slope that falls across the properties and continues above and below is a potential hazard (**Hazard One**). The vibrations from the proposed excavations are a potential hazard (**Hazard Two**). The proposed excavations are a potential hazard (**Hazard Three**).

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The gentle to steeply graded slope that falls across the properties and continues above and below failing and impacting on the property.	The vibrations produced during the proposed excavations impacting on the surrounding structures.	The proposed excavations for the driveway, houses and OSD tanks collapsing onto the worksite and impacting the neighbouring properties before retaining structures are in place.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (15%)	'Medium' (20%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	5.3×10^{-7}/annum	7.4×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE', provided the recommendations in **Section 7** are carried out.	This level of risk to property is 'ACCEPTABLE', provided the recommendations in **Sections 11 & 12** are followed.	This level of risk to life and property is 'ACCEPTABLE', provided the recommendations in **Section 13** 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

The fall is away from the street. The stormwater plans show that the stormwater from the proposed development will be piped to an easement via OSD tanks. We consider this suitable.

11. Excavations

Excavations are required to construct the proposed driveway, houses and OSD tank. The excavation depths are as follows:

- The driveway excavation reaches a maximum depth of ~2.2m.
- The house excavations for Lots 1, 3 and 4 reach maximum depths of ~3.1m, ~2.7m and ~1.0m respectively. No excavating is required for the house on Lot 2.
- The below ground OSD tank reaches a maximum depth of ~2.5m.

The excavations are expected to be through fill, topsoil, sand and clay, with Low to Medium Strength Sandstone expected from exposed at the surface to ~2.1m below the current surface.

It is envisaged that excavations through fill, soil, sand, clay and rock up to Low Strength can be carried out with an excavator and toothed bucket and excavations through Medium Strength Sandstone or better will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations through fill, soil, sand, clay and rock up to Low Strength will be below the threshold limit for building damage utilising a domestic sized excavator up to 20 tonne.

Excavations through Medium Strength Rock or better should be carried out to minimise the potential to cause vibration damage to the W and E neighbouring properties. Allowing for backwall drainage, the setbacks are as follows:

- The driveway excavation is set back ~4.8m from the W neighbouring house (10A Gladys Ave) and 5.2m from the W neighbouring pool (10B Gladys Ave).
- The Lot 1 house excavation is set back ~9.0m from the W neighbouring pool (10B Gladys Ave).
- The Lot 3 house excavation is set back ~9.4m from the E neighbouring house (16A Gladys Ave).

Dilapidation reporting carried out on the W and E neighbouring properties (10A, 10B and 16A Gladys Ave) is recommended prior to the excavation works commencing to minimise the possibility of spurious building damage claims.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the property boundaries. Vibration monitoring will be required to verify this is achieved. Vibration monitoring must include a light/alarm so the operator knows if vibration limits have been exceeded. The equipment is to log and record vibrations throughout the excavation works.

In Medium Strength rock or better techniques to minimise vibration transmission will be required. These include:

- Rock sawing the excavation perimeter to at least 1.0m deep prior to any rock breaking with hammers, keeping the saw cuts below the rock to be broken throughout the excavation process.
- Limiting rock hammer size.
- Rock hammering in short bursts so vibrations do not amplify.
- Rock breaking with the hammer angled away from the nearby sensitive structures.
- Creating additional saw breaks in the rock where vibration limits are exceeded.
- Use of rock grinders (milling head).

13. Excavation Support Requirements

The Lot 1 house excavation comes flush with the W common boundary. The Lot 4 house excavation comes flush with the E common boundary.

The W side of the Lot 1 house cut and the E side of the Lot 4 house cut will need to be temporarily or permanently supported prior to the commencement of the excavation through rock, or during the excavation process in a staged manner, so cut batters through fill, soil, sand and clay are not left unsupported. The support will need to be designed/approved by the structural engineer. See the Excavation and Fill Plan attached for the minimum extent of the required shoring shown in blue.

Where shoring is not required, the fill, soil and sand portions of the excavations are to be battered temporarily at 1.0 Vertical to 2.0 Horizontal (26°) until the retaining walls/OSD tank structures are in place. Excavations through clay and rock up to Low Strength are expected to stand at near vertical angles for short periods of time until the retaining walls/OSD tank structures are in place, provided the cut batters are kept from becoming saturated.

Medium Strength Sandstone or better is expected to stand at vertical angles unsupported subject to approval by the geotechnical consultant.

During the excavation process, the geotechnical consultant is to inspect the excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support. If additional ground support is required this will likely involve the use of mesh, rock bolts and sprayed concrete.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters through fill, soil, clay and weathered sandstone up to Low Strength 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/OSD tank structures are to be organised so on completion of the excavation they 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. If the cut batters through fill, soil, sand,

clay and weathered sandstone remain unsupported for more than a few days before the construction of the retaining walls/OSD tanks they are to be temporarily supported until the retaining walls/OSD tanks are in place.

Upon completion of the excavation, where the cut face is not supported by the OSD tank structure it is recommended the cut faces be supported with retaining walls to prevent any potential future movement of joint blocks in the cut face that can occur over time, when unfavourable jointing is obscured behind the excavation face. Additionally, retaining walls will help control seepage and to prevent minor erosion and sediment movement.

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 Walls

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill, Topsoil, Sand	20	0.40	0.55
Residual Clays	20	0.35	0.45
Low Strength Sandstone	24	0.20	0.34
Medium Strength Sandstone	24	0.00	0.01

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 wall, do not account for any surcharge loads and assume retaining walls are fully drained. Rock strength 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 below ground OSD tank and the uphill sides of the proposed houses for Lots 1 & 3 are expected to be seated in Medium Strength Sandstone. This is a suitable foundation material. Where the proposed houses, garages and other structures are not seated in rock, they are to be supported on footings taken to rock. This ground material is expected at the surface or at a maximum depth of ~2.1m below the current surface. A maximum allowable bearing pressure of 1000kPa can be assumed for footings supported on Medium Strength Sandstone.

Footings can include piers, strip footings, pad footings, or a thickened edge slab supported off Medium Strength Sandstone. It is the responsibility of the structural engineer to determine the type of footings to be used and their placement/layout.

Part of the Lot 2 house will be constructed over the footprint of the existing pool. If the pool shell is to remain in place, the portion of the proposed house that will be over the footprint of the pool is to be supported on piers drilled through the base of the pool shell and taken to the rock below the base of the pool. Drainage holes are to be core drilled through the side of the pool near the base on the downhill side.

All footings supported on Medium Strength Sandstone are to be set back at least 0.6m from any steps in the rock and are to be set back at least 1.0m from the top edge of any large rock faces on site (Photo 12).

No footings are to be supported on undercut rock. If during the markout footings are over undercut rock, they are to be moved back upslope beyond the undercut.

The proposed driveway can be supported off the exposed rock or off the natural surface after any organic matter has been stripped. Where the foundation material across the driveway structure changes, expansion joints are to be installed to separate the different foundation materials and to accommodate minor differential movement. A maximum allowable bearing pressure of 100kPa can be assumed for soil of the natural surface. Alternatively, where the driveway is not seated in rock it can be supported on piers taken to rock.

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 ON NEXT PAGE

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 excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support.

- 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.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist.

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

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.

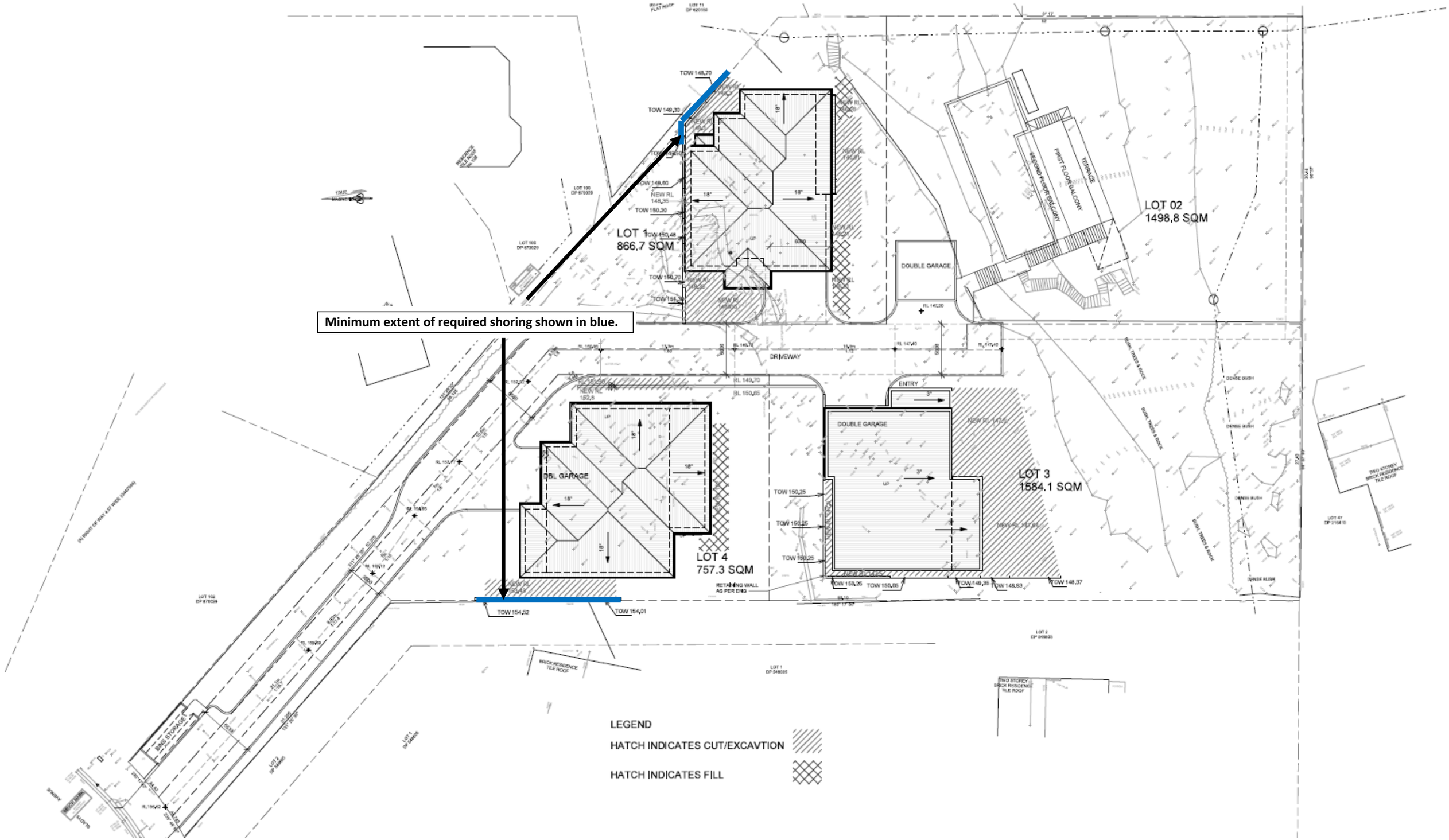
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

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

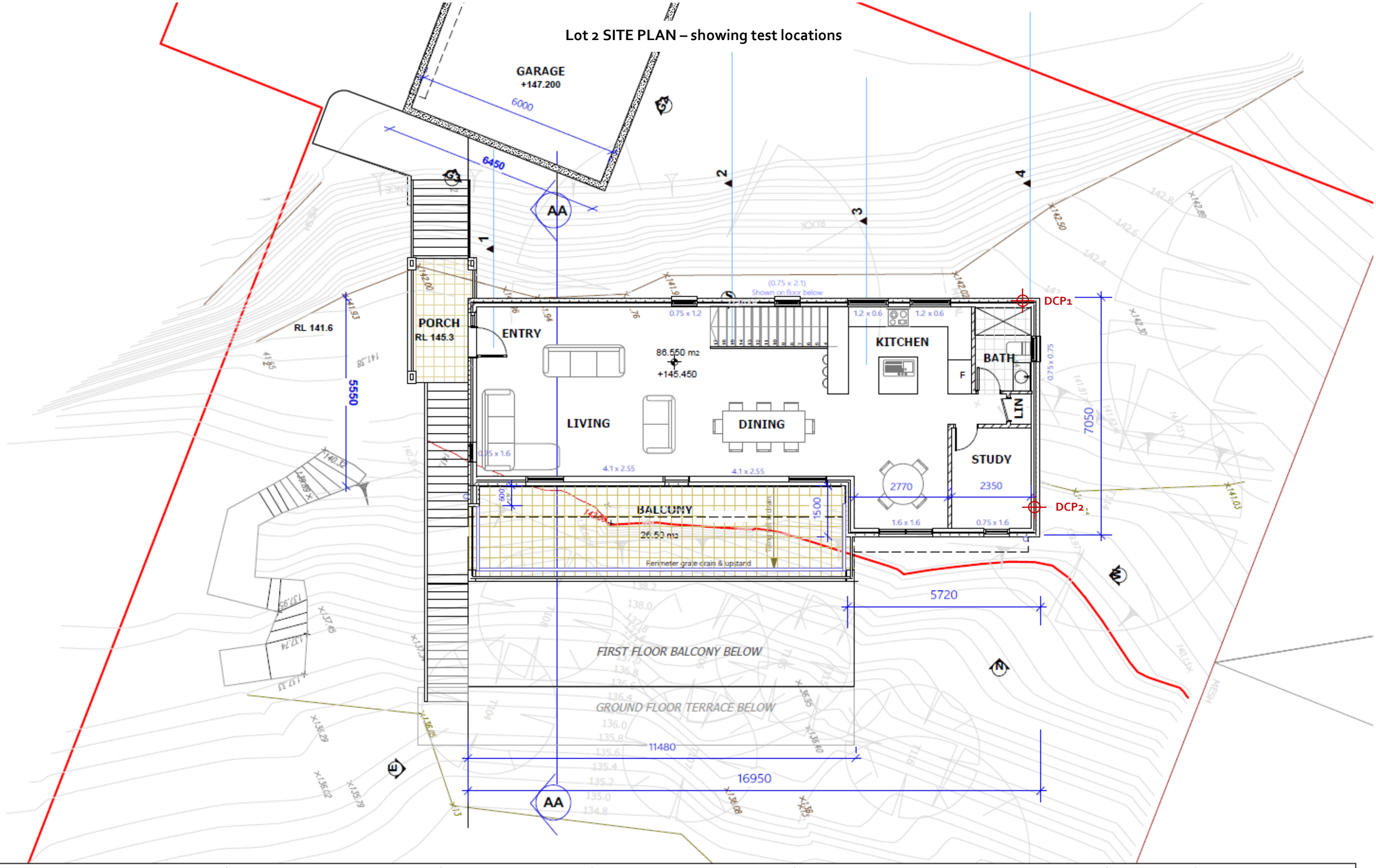
- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- 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.

EXCAVATION AND FILL PLAN



Lot 2 SITE PLAN – showing test locations



NKP ARCHITECURE NSW ARB No. 10425 BEVERLY HILLS SYDNEY NSW 2209 M: 04 2072 5400 E: neil@nkparchitecture.com.au W: nkparchitecture.com.au	CLIENT: **MR JACK ZHANG** PROJECT ADDRESS: **No. 12-14 GLADYS AVENUE, FRENCHS FOREST NSW 2030**	REVISION HISTORY: DATE / COMMENT / REV. 16.03.22 / FOR CONSULTANTS / A 23.03.22 / FOR CONSULTANTS / A 30.03.22 / FOR CONSULTANTS / A 15 Aug.22 / Issued for DA / B	GENERAL NOTES: ■ These plans are subject copyright and ,must not be used copied or reproduced without the authority of the designer ■ The Builder is to verify dimensions prior to commencement ■ If any discrepancies arise they are to be reported to the designer prior to the commencement of the works ■ Do not scale figured dimensions dimension is not shown or is required consult with the designer ■ Do not alter the design either architecturally or structurally without prior consultation with the designer or engineer	DRAWING: **LOT 2 - PROPOSED SECOND FLOOR PLAN**	NORTH	SCALE: 1:100 @ A3 DRAWING NO. **DA 02**

STORMWATER PLAN

GROUND FLOOR

PIT SCHEDULE

PIT No.	GRATED INLET	PIT SIZE	SURFACE LEVEL	INVERT LEVEL
SP1	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	156.16	155.70
SP2	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	155.36	154.90
SP3	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	154.50	154.05
SP4	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	152.34	151.65
SP5	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	149.70	149.20
SP6	GRATED INLET (CLASS C) WITH OCEANGUARD	600 x 600	148.50	147.90
SP7	GRATED INLET (CLASS C) WITH OCEANGUARD	900 x 900	147.40	146.40
SP8	GRATED INLET (CLASS C)	900 x 900	147.40	145.90
SP9	GRATED INLET (CLASS B)	900 x 900	137.50	136.50
SP10	GRATED INLET (CLASS B)	900 x 900	133.50	132.70
SP11	GRATED INLET (CLASS B)	600 x 600	131.30	130.85 (IN) 130.50 (OUT)
SP12	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	153.50	153.05
SP13	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	153.10	152.65
SP14	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	150.20	148.20
SP15	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	149.40	148.60
SP16	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	147.10	146.65
SP17	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	149.50	149.05
SP18	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	150.50	148.80
SP19	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	148.95	148.50
SP20	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	148.40	147.95
SP21	GRATED INLET (CLASS B)	450 x 450	142.20	141.75
SP22	GRATED INLET (CLASS B)	450 x 450	141.95	141.50
SP23	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	138.50	137.00

OSD DESIGN SUMMARY

SITE AREA: 4704m2
EXISTING SITE NODE WAS MODELED AS FULLY UNDEVELOPED NATURAL SURFACE FOR PURPOSE OF MODELING.

5YR ARI PRE-DEVELOPMENT DISCHARGE = 86L/s
5YR ARI POST-DEVELOPMENT BYPASS = 36L/s
5YR ARI POST-DEVELOPMENT DISCHARGE = 42L/s

20YR ARI PRE-DEVELOPMENT DISCHARGE = 137L/s
20YR ARI POST-DEVELOPMENT BYPASS = 62L/s
20YR ARI POST-DEVELOPMENT DISCHARGE = 55L/s

100YR ARI PRE-DEVELOPMENT DISCHARGE = 206L/s
100YR ARI POST-DEVELOPMENT BYPASS = 92L/s
100YR ARI POST-DEVELOPMENT DISCHARGE = 70L/s

OSD VOLUME REQUIRED BY 'DRAINS' MODEL= 31.5m3
OSD VOLUME PROVIDED = 34.8m3

NOTE

1. ALL OUTLET PIPES FROM OSD TANKS TO BE 150mm AT 1% FALL (MIN)
2. ALL DOWNPIPE PIPES TO RAINWATER TANK TO BE 100mm DIA (UNO), FINAL DOWNPIPE LOCATIONS TO BE DESIGN IN CC STAGE
3. ALL OUTLET PIPES FROM GRATED TRENCHES TO BE 100mm DIA (UNO)

LEGEND

DRAINAGE PIPES VIA GRAVITY
CHARGED DRAINAGE PIPES TO RWT/OSD — CDW —
SUB SOIL DRAINAGE (AG LINE)
EXISTING DRAINAGE PIPE — SW —
● RDP Ø100mm ROOF DOWNPIPE
● DP Ø100mm DOWNPIPE
● DDO 100mm DIA DISH DRAIN OUTLET
● RWO 150mm DIA FLOOR WASTE
● BO 100mm DIA FLOOR WASTE (BALCONY OUTLET)

ABOVE GROUND COMBINED RWT/OSD TANK (3300L x 1000W x 2020H SLIMLINE TANK BY YINGSPAN WATER OR SIMILAR)
TOP OF TANK RL:150.32
IL:148.20
RWT VOLUME REQUIRED:1.5m3 (MIN.)
OSD VOLUME REQUIRED:4.3m3 (MIN.)
PSD:8L/s
ORIFICE Ø:60mm
ORIFICE CL: 148.61
SUBJECT TO DETAILED DESIGN IN CC STAGE

Ø150mm uPVC O/F FROM RWT/OSD

ABOVE GROUND COMBINED RWT/OSD TANK (2700L x 1000W x 2020H SLIMLINE TANK BY YINGSPAN WATER OR SIMILAR)
TOP OF TANK RL:140.32
IL:140.20
RWT VOLUME REQUIRED:1.5m3 (MIN.)
OSD VOLUME REQUIRED:1m3 (MIN.)
PSD:8L/s
ORIFICE Ø:70mm
ORIFICE CL: 141.05
SUBJECT TO DETAILED DESIGN IN CC STAGE

EX. Ø375mm RCP (SPP01248)
EX. Ø525mm RCP
EXISTING PIT (SP01248) RL:127.21 IL:126.59
REFER TO STORMWATER SYSTEM ASSESSMENT REPORT PREPARED BY WASTAS & ASSOCIATES CONSULTING ENGINEERS, FOR DETAILED CAPACITY ASSESSMENT.

(E) PROPOSED EASEMENT FOR DRAINAGE 1m WIDE

RETAINING WALL TO STRUCTURAL ENGINEERS DESIGN
PIPE IL:131.775

BELOW GROUND OSD/STORMFILTER TANK

ON-SITE DETENTION TANK (OSD)
SURFACE RL:147.40
IL:145.90
AVG. WATER PONDING: 1,000m
AREA:32.70m2 (INTERNAL)
VOLUME REQUIRED:31.00m3
VOLUME PROVIDED:34.83m3
TWL:147.40
PSD:64L/s
ORIFICE Ø:168mm
ORIFICE CL:146.013

STORMFILTER TANK (SF)
MINIMUM SURFACE AREA: 10m2
(11 x TALL) 690 PSORB CARTRIDGE STORMFILTER)

REFER TO DRAWING DA-SW300 FOR DETAILS.

HATCHED AREA TO BYPASS OSD SYSTEM (212m²)

200mm WIDE x 200mm DEEP GRATED DRAIN (TYPICAL)

VERTICAL DROP FROM EXPOSED UPSTREAM PIPE TO IL:141.60

FFL 148.40 · FFL 148.25 · FFL 139.30 · FFL 147.20 · FFL 153.55 · FFL 153.28 · FFL 153,60 · FFL 147.45 · FFL 147.55

LOT 1 · LOT 2 · LOT 3 · LOT 4 · LOT 84 DP 30700 · LOT 83 DP 30700

GLADYS AVENUE

REV.	DATE	AMENDMENT	INT.	APP.
5	15/08/2022	ISSUED FOR DA	JL	JH
4	25/05/2022	ISSUED FOR REVIEW	JL	JH
3	19/05/2022	ISSUED FOR REVIEW	JL	JH
2	15/05/2022	ISSUED FOR REVIEW	JL	JH
1	11/04/2022	ISSUED FOR REVIEW	JL	JH

Client: JACK ZHANG
Architect: NKP ARCHITECURE
JCO CONSULTANTS PTY LTD
SUITE 801C, No.1 RIDER BOULEVARD, RHODES NSW 2138
EMAIL: Jason@jcoconsultants.com.au

Project: PROPOSED SUBDIVISION
12-14 GLADYS AVENUE
FRENCHS FOREST NSW 2030
Drawing Title: STORMWATER MANAGEMENT CONCEPT PLAN - GROUND FLOOR
Design: J.L · Drawn: J.L · Validate: J.H

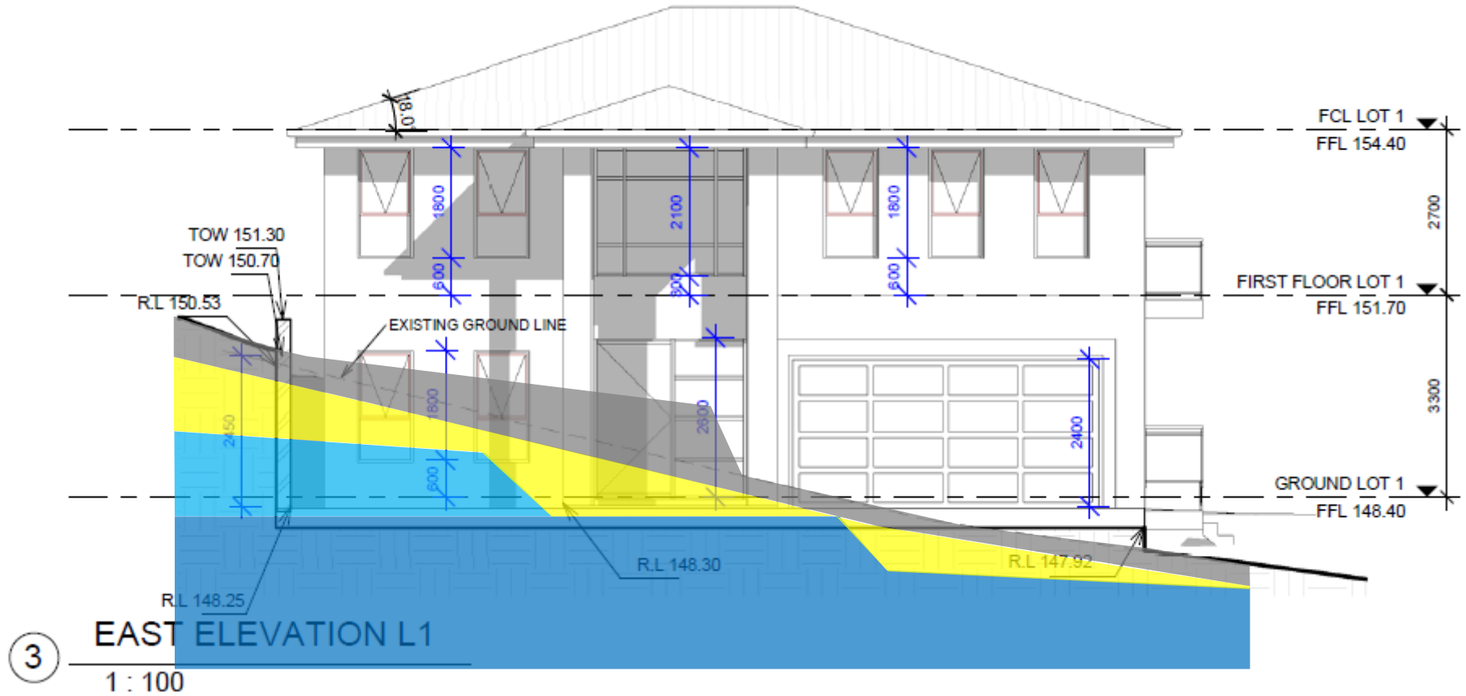
Job Number: 20220060
Drawing Number: DA-SW200
Scale: 1:200 · Date: 15/08/2022 · Size: A1 · Datum: A.H.D
North Point

Status: DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION
Scale: 0 5 10 15 20m
SCALE 1:200 @A1

DATE PLOTTED: 16 August 2022 2:52 PM

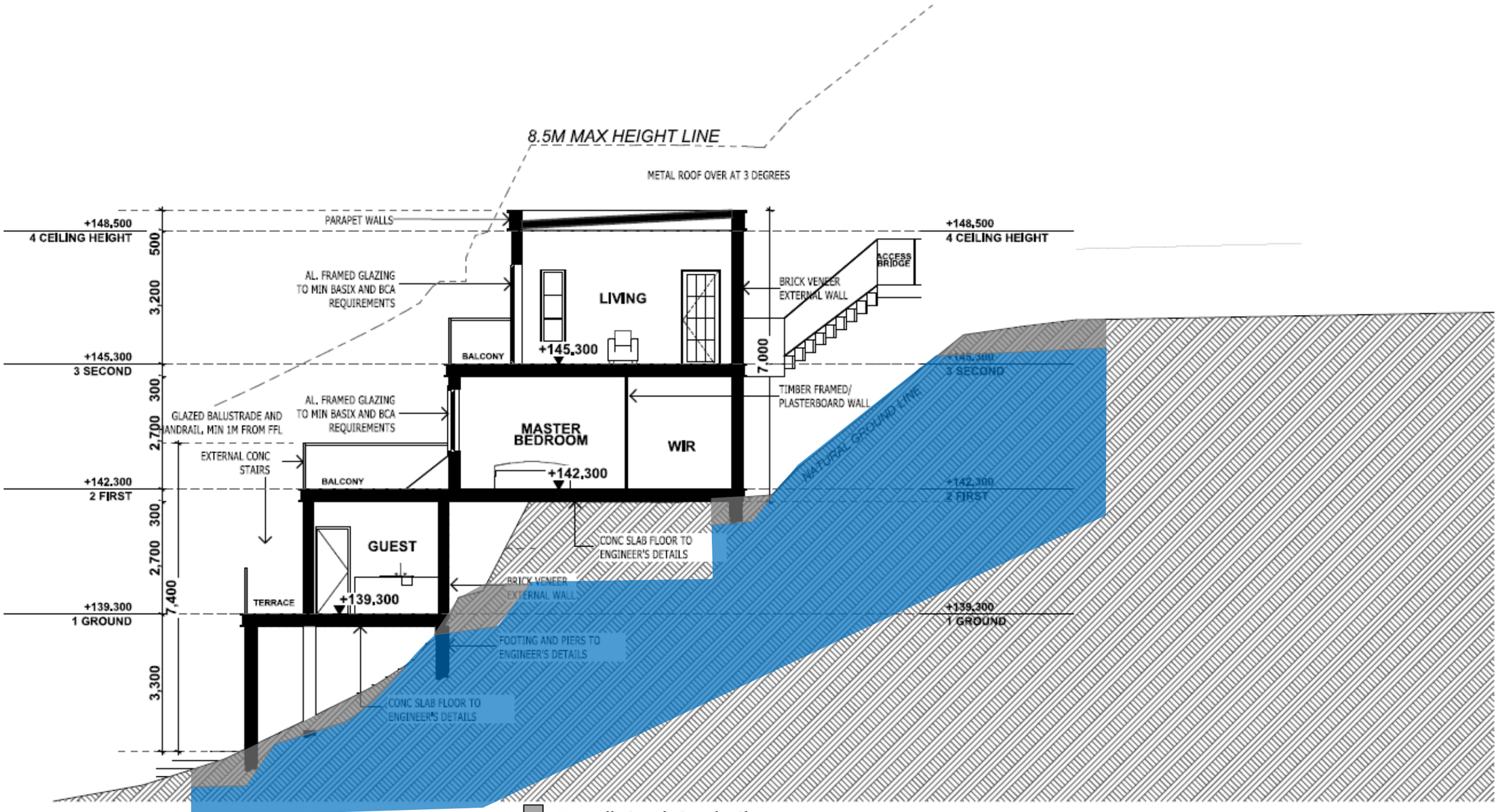
CAD File: P:\2022\20220060-12-14 Gladys Avenue, Frenchs Forest\Civil\cad\DA-SW200.dwg

LOT 1 TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



- Fill, Topsoil and Sand
- Sandy Clay
- Hawkesbury Sandstone – Low Strength
- Hawkesbury Sandstone – Medium Strength

LOT 2 TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



Topsoil, Sand, Sandy Clay

Hawkesbury Sandstone – Medium Strength

NKP ARCHITECTURE
NSW ARB No. 10425
BEVERLY HILLS
SYDNEY NSW 2209
M: 04 2072 5400
E: neil@nkparchitecture.com.au
W: nkparchitecture.com.au

CLIENT:
MR JACK ZHANG

PROJECT ADDRESS:
No. 12-14 GLADYS AVENUE, FRENCHS FOREST NSW 2030

REVISION HISTORY:

DATE	COMMENT	REV.
16.03.22	FOR CONSULTANTS	A
23.03.22	FOR CONSULTANTS	A
30.03.22	FOR CONSULTANTS	A

GENERAL NOTES:

- These plans are subject copyright and must not be used, copied or reproduced without the authority of the designer.
- The Builder is to verify dimensions prior to commencement.
- If any discrepancies arise they are to be reported to the designer prior to the commencement of the works.
- Do not scale, use figured dimensions only. If a dimension is not shown or is required consult with the designer.
- Do not alter the design either architecturally or structurally without prior consultation with the designer or engineer.

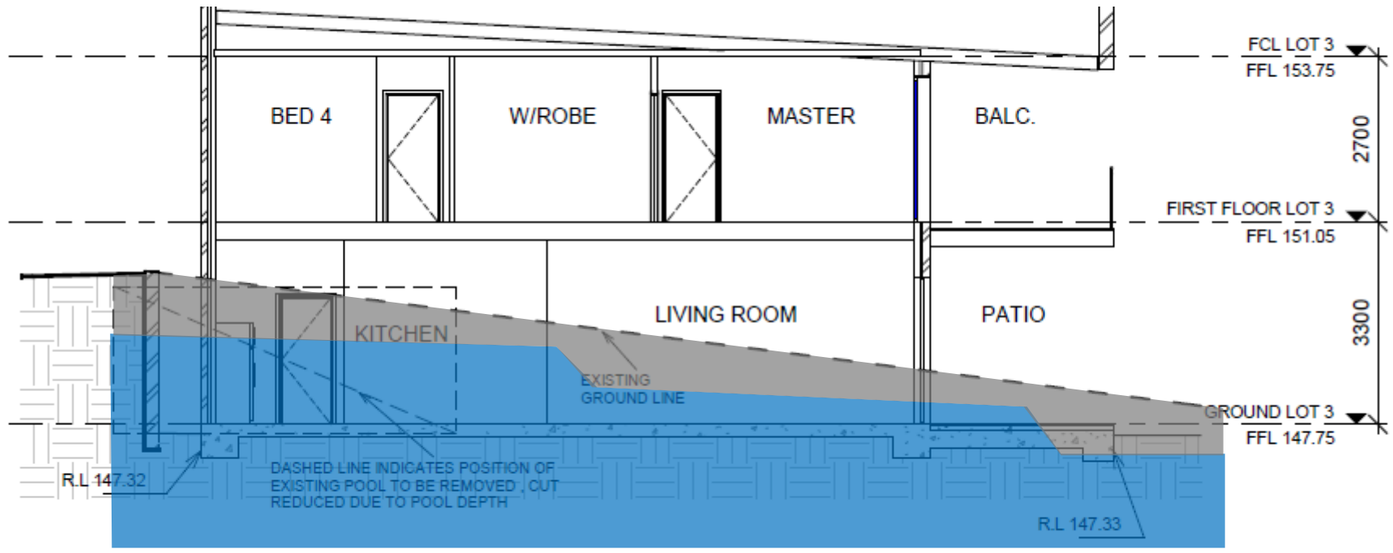
DRAWING:
LOT 2 - SECTION A-A

NORTH

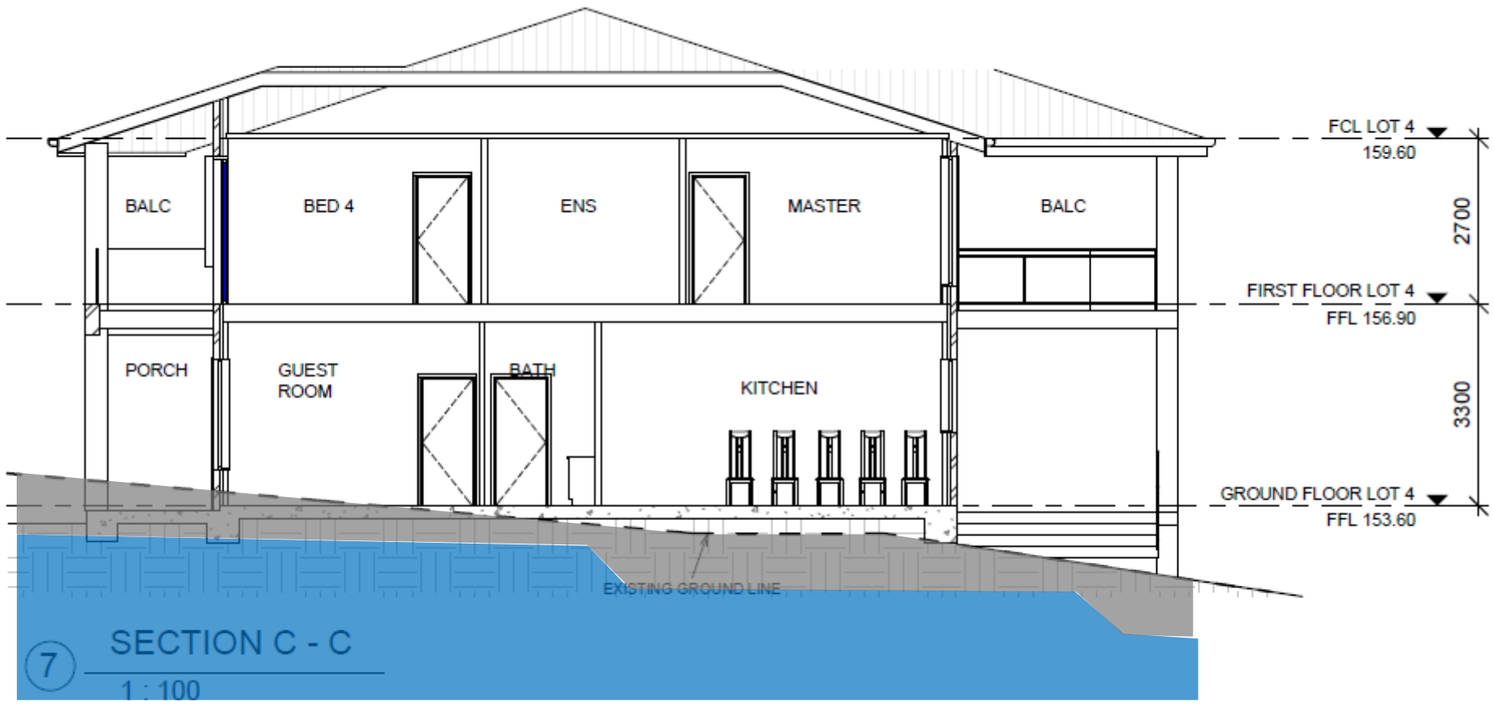
SCALE:
1:100@ A3

DRAWING NO.
DA502

LOTs 3 & 4 TYPE SECTIONS – Diagrammatical Interpretation of expected Ground Materials



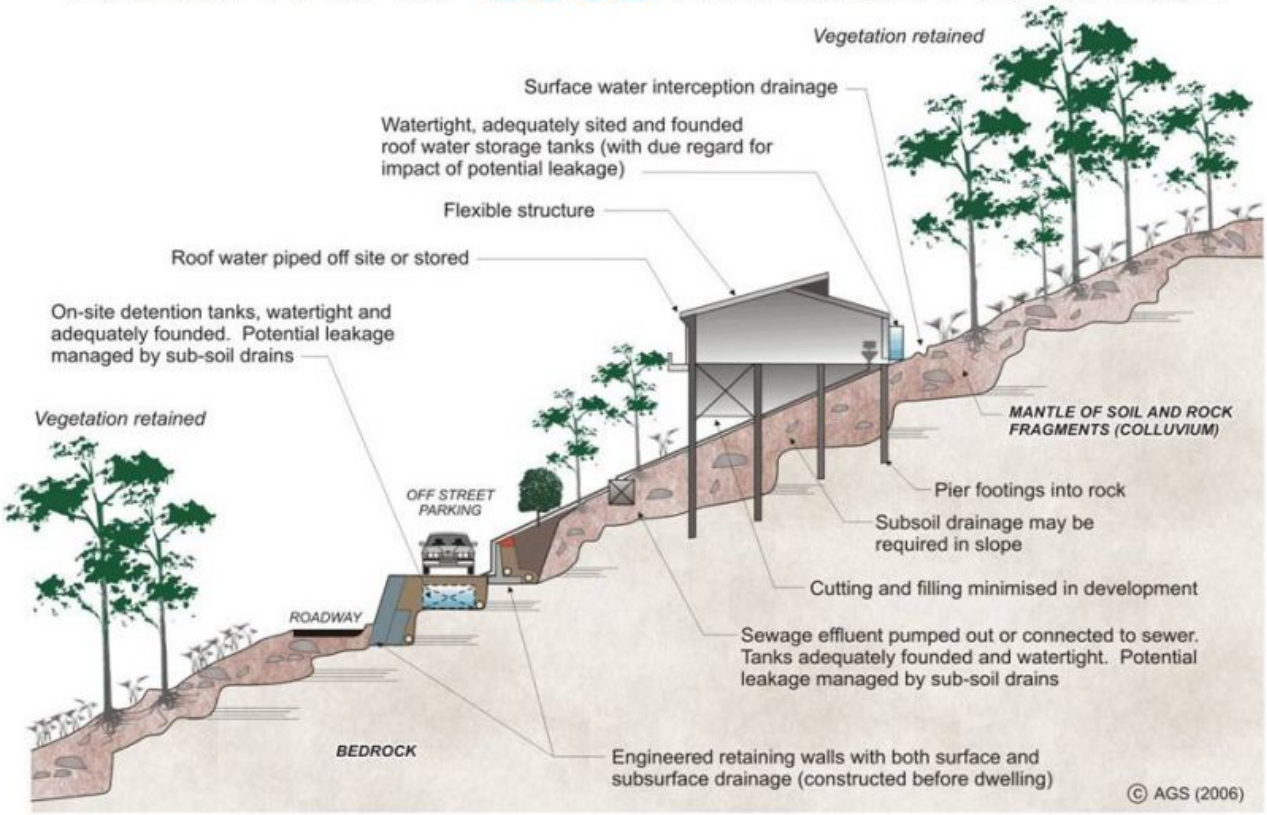
7 SECTION B - B
1 : 100



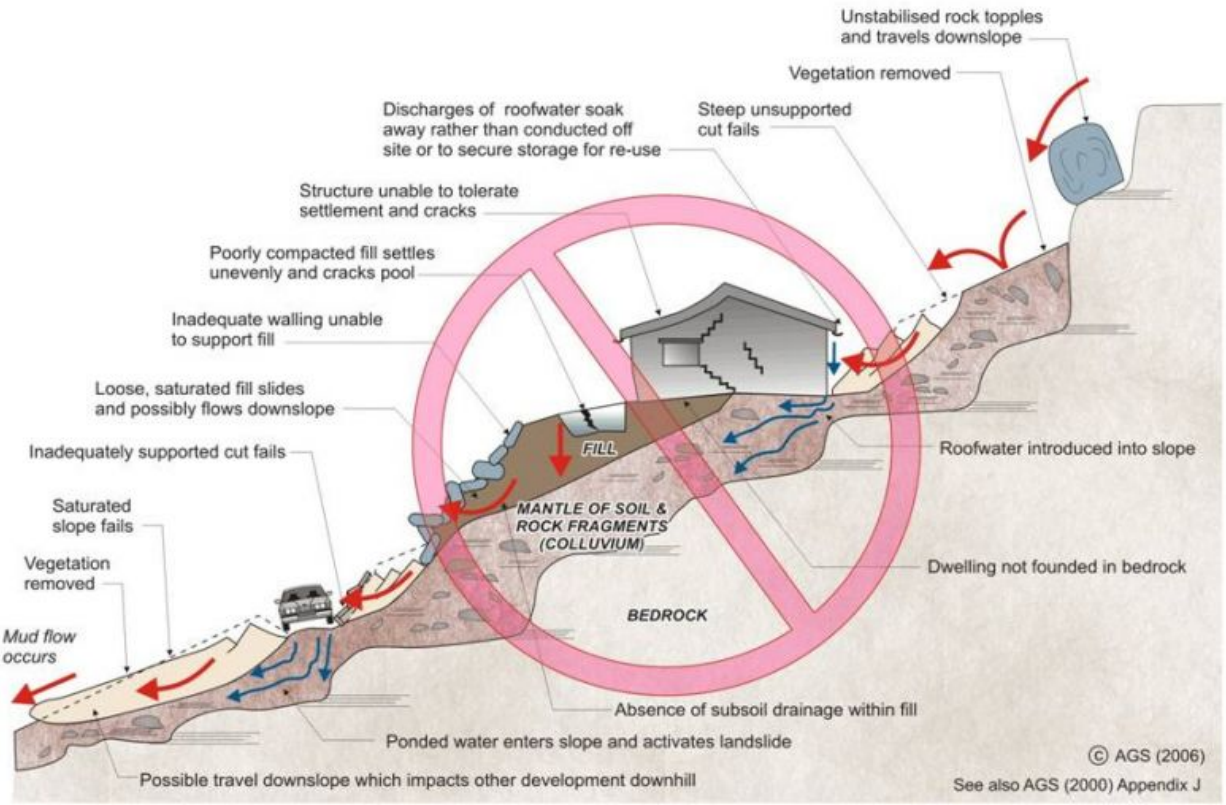
7 SECTION C - C
1 : 100

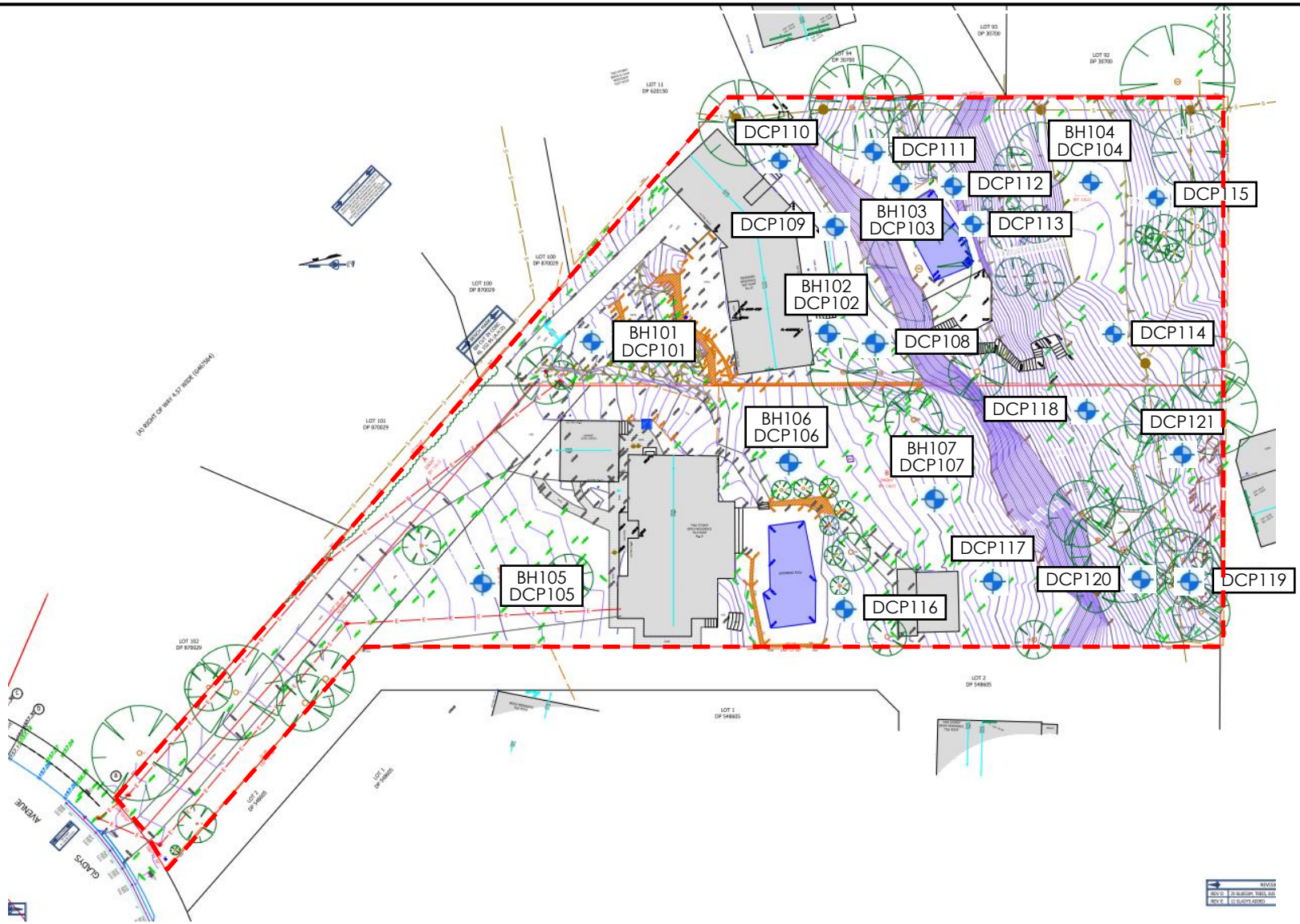
Topsoil, Sand, Sandy Clay
Hawkesbury Sandstone – Medium Strength

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE





Key:

Approximate borehole and DCP test locations

Indicative site boundary

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	WB	**EXISTING SITE SURVEY AND GEOTECHNICAL TESTING PLAN** **12 Gladys Avenue, Frenchs Forest, NSW** (Source: NGEO, 2020)	Drawing: **FIGURE 1**
Approved:	SK		
Date:	14.07.2020		Job No: P1806545JR01V04
	NA		

CLIENT	Gladys Forest Pty Ltd C/- Alphabuild Australia Pty Ltd	COMMENCED	25/05/2018	COMPLETED	25/05/2018	**REF BH101**
PROJECT	Preliminary Geotechnical Investigation	LOGGED	DI	CHECKED	HN	Sheet 1 OF 1
SITE	12 & 14 Gladys Ave, Frenchs Forest, NSW	GEOLOGY	Hawkesbury Sandstone	VEGETATION	Grass	PROJECT NO. P1806545
EQUIPMENT	4WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	151.9 m	DATUM AHD
EXCAVATION DIMENSIONS	Ø100 mm x 3.85 m depth	NORTHING		ASPECT	North	SLOPE 5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	L	Not Encountered	0	151.50				SM	FILL: Silty SAND; fine to medium grained; brown and dark brown; trace clay.	D	MD	FILL
				0.40 151.10					With subangular to subrounded sandstone gravels.			
			0.5	*0.60* 150.90				CL	Sandy CLAY; low plasticity; pale brown and orange-brown; inferred stiff to very stiff.			RESIDUAL SOIL
	M		1.0	*1.20* 150.30					Orange-brown.	M<<PL	St - VSt	
	H		1.5	*1.40* 150.10					Pale yellow and pale grey.			
				1.60 149.90					Grey, pale grey and yellow.			
AT	M		2.0	*2.10* 149.40					SANDSTONE; fine to medium grained; grey and pale grey; inferred low strength; distinctly weathered.			WEATHERED ROCK 2.10: V-bit refusal.
			2.5									
			3.0	*3.30* 148.20					Inferred low strength; dark red, red and pale red.			
	H		3.5									
				3.85					Hole Terminated at 3.85 m			3.85: TC-bit refusal on inferred low to medium strength sandstone.
			4.0									
			4.5									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - BOREHOLE

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P1806545BH101,BH102,BH107,BH111,BH113,BH114,BH116 V01.GPJ <<DrawingFile>> 15/06/2020 18:28 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: Martens 2.00 2016-11-13 Prj: Martens 2.00 2016-11-13

Dynamic Cone Penetrometer Test Log Summary

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Suite 201, 20 George Street, Hornsby, NSW 2077 Ph: (02) 9476 9999 Fax: (02) 9476 8767, mail@martens.com.au, www.martens.com.au

Site	12 - 14 Gladys Avenue, Frenchs Forest, NSW	**DCP Group Reference**	P1806545JS01V01
Client	Gladys Forest Pty Ltd, C/- Alphabuild Australia Pty Ltd	**Log Date**	25.05.2018
Logged by	DI / HD		
Checked by	HN		
Comments	DCP commenced at 50 mm BGL.		

TEST DATA

Depth Interval (m)	DCP101	DCP102	DCP103	DCP104	DCP105	DCP106	DCP107	DCP108
0.15	4	1	1	2	1	3	1	2
0.30	2	2	9	1	2	8	8	2
0.45	3	2	15	3	10	4/100 mm	7	3/20 mm
0.60	5	3	6/75 mm	4/100 mm	7	Bounce at 0.45 m	3	Bounce at 0.37 m
0.75	Bounce at 0.65 m	Bounce at 0.65 m	Bounce at 0.575 m	Bounce at 0.6 m	8		2	
0.90					7		14	
1.05					5		5	
1.20					9/50 mm		3	
1.35					Bounce at 1.15 m		4/100 mm	
1.50							Bounce at 1.5 m	
1.65								
1.80								
1.95								
2.10								
2.25								
2.40								
2.55								
2.70								
2.85								
3.00								
3.15								
3.30								
3.45								
3.60								
3.75								
3.90								
4.05								

Dynamic Cone Penetrometer Test Log Summary

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Site	12 - 14 Gladys Avenue, Frenchs Forest, NSW	**DCP Group Reference**	P1806545JS01V01
Client	Gladys Forest Pty Ltd, C/- Alphabuild Australia Pty Ltd	**Log Date**	25.05.2018
Logged by	DI / HD		
Checked by	HN		
Comments	DCP commenced at 50 mm BGL.		

TEST DATA

Depth Interval (m)	DCP109	DCP110	DCP111	DCP112	DCP113	DCP114	DCP115	DCP116
0.15	1	3	4	3	4	2	3	2
0.30	8	4/120 mm	Bounce at 0.2 m	9	12	11	5	3
0.45	4	Bounce at 0.27 m		10	16	17	4	Bounce at 0.35 m
0.60	Bounce at 0.5 m			8	13	10/100 mm	6	
0.75				9/100 mm	21	Bounce at 0.6 m	9	
0.90				Bounce at 0.75 m	8		8/75 mm	
1.05					7		Bounce at 0.875 m	
1.20					10			
1.35					29			
1.50					Bounce at 1.4 m			
1.65								
1.80								
1.95								
2.10								
2.25								
2.40								
2.55								
2.70								
2.85								
3.00								
3.15								
3.30								
3.45								
3.60								
3.75								
3.90								
4.05								

Dynamic Cone Penetrometer Test Log Summary

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Site	12 - 14 Gladys Avenue, Frenchs Forest, NSW	**DCP Group Reference**	P1806545JS01V01
Client	Gladys Forest Pty Ltd, C/- Alphabuild Australia Pty Ltd	**Log Date**	25.05.2018
Logged by	DI / HD		
Checked by	HN		
Comments	DCP commenced at 50 mm BGL.		

TEST DATA

Depth Interval (m)	DCP117	DCP118	DCP119	DCP120	DCP121			
0.15	1	3	7	2	6			
0.30	6	3	Bounce at 0.2 m	3	8			
0.45	5/50 mm	23		12	6			
0.60	Bounce at 0.4 m	11		12	7			
0.75		22		7	8			
0.90		8		10	4			
1.05		12		16	8			
1.20		Bounce at 1.1 m		18	4/100 mm			
1.35				13/75 mm	Bounce at 1.2 m			
1.50				Bounce at 1.325 m				
1.65								
1.80								
1.95								
2.10								
2.25								
2.40								
2.55								
2.70								
2.85								
3.00								
3.15								
3.30								
3.45								
3.60								
3.75								
3.90								
4.05								