GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for _____
Name of Applicant

Address of site 22 Hillcrest Avenue, Mona Vale

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk ***Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report***

I, Ben White *on behalf of* White Geotechnical Group Pty Ltd
(Insert Name) (Trading or Company Name)

on this the 29/11/24 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $10million.

I:
Please mark appropriate box

☒ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☒ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: Geotechnical Report **22 Hillcrest Avenue, Mona Vale**
Report Date: 29/11/24

Author: BEN WHITE

Author's Company/Organisation: **WHITE GEOTECHNICAL GROUP PTY LTD**

Documentation which relate to or are relied upon in report preparation:

Australian Geomechanics Society Landslide Risk Management March 2007.

White Geotechnical Group company archives.

I am aware that the above Geotechnical Report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company **White Geotechnical Group Pty Ltd**

REGISTERED PROFESSIONAL GEOSCIENTIST
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
BENJAMIN WHITE
RPGeo No: 10306

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1(a) - Checklist of Requirements for Geotechnical Risk Management Report for Development Application

Development Application for _____
Name of Applicant

Address of site 22 Hillcrest Avenue, Mona Vale

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

Geotechnical Report Details:

Report Title: Geotechnical Report **22 Hillcrest Avenue, Mona Vale**

Report Date: 29/11/24

Author: BEN WHITE

Author's Company/Organisation: WHITE GEOTECHNICAL GROUP PTY LTD

Please mark appropriate box

☒ Comprehensive site mapping conducted **16/10/24**
(date)

☒ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)

☒ Subsurface investigation required
- ☐ No Justification _____
- ☒ Yes Date conducted **16/10/24**

☒ Geotechnical model developed and reported as an inferred subsurface type-section

☒ Geotechnical hazards identified
- ☐ Above the site
- ☒ On the site
- ☒ Below the site
- ☐ Beside the site

☒ Geotechnical hazards described and reported

☒ Risk assessment conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☒ Consequence analysis
- ☒ Frequency analysis

☒ Risk calculation

☒ Risk assessment for property conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Risk assessment for loss of life conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the specified conditions are achieved.

☒ Design Life Adopted:
- ☒ 100 years
- ☐ Other _____
specify

☒ Geotechnical Conditions to be applied to all four phases as described in the Geotechnical Risk Management Policy for Pittwater - 2009 have been specified

☒ Additional action to remove risk where reasonable and practical have been identified and included in the report.

☐ Risk assessment within Bushfire Asset Protection Zone.

I am aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ensuring that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company **White Geotechnical Group Pty Ltd**

GEOTECHNICAL INVESTIGATION:

Alterations and Additions at **22 Hillcrest Avenue, Mona Vale**

1. Proposed Development

1.1 Demolish part of the existing house, leaving most of the existing walls and floors in place.

1.2 Extend the house at the N and SE sides, and construct a new paved area at the NE side of the house by excavating to a maximum depth of ~2.4m.

1.3 Add a new first floor addition to the existing house.

1.4 Construct a new deck at the NE side of the house. Alterations to the existing terrace at the SW side of the house.

1.5 Other minor internal and external alterations and additions to the existing house.

1.6 Construct a new pool with spa in the SE corner of the property by excavating to a maximum depth of ~1.8m.

1.7 Landscaping works across the property requiring minor levelling.

1.8 Details of the proposed development are shown on 19 drawings prepared by Rama Architects, drawings numbered DA-000, DA-001, DA-100 to DA-102, DA-300 to DA-302, DA-400, DA-401, DA-500 to DA-504, DA-800 and DA-900 to DA-902, Revision 01, dated 20/11/24.

2. Site Description

2.1 The site was inspected on the 16th October, 2024.

2.2 This residential property is located on the NE flank of a NW-SE trending ridge line that runs along the top of a ~50m high steep coastal escarpment. The slope falls at gentle angles from the house at the crest of the hill towards the NE before reaching the top of the escarpment. The slope below falls very steeply down the escarpment before quickly reaching a near vertical cliff some 40m high. The slope at the base of the cliff continues at very steep angles before reaching the rock platform at the waterfront of Pacific Ocean. The slope at the SW side of the property gradually increases in grade from gentle to moderate angles.

2.3 At the road frontage, a concrete driveway runs to a garage on the lower ground floor of the house (Photos 1 & 2). The two storey house is supported on brick walls and a concrete slab (Photos 1 & 2). The external supporting walls show no significant signs of movement. A concrete balcony extends off the NE side of the house (Photo 2). The concrete columns that support the balcony and roof above stand vertical. Cuts and fills provide level platforms for the driveway, house, and lawn/garden areas across the property. Stable brick, concrete block and sandstone block retaining walls up to ~1.8m high support the cuts and fills (Photos 1, 3 & 4).

- The top of the coastal escarpment is located along the NE boundary of the property (Photos 5 & 6). The slope at the top of the escarpment falls at very steep angles and is mostly densely vegetated (Photo 6). It is interpreted that a minor failure of the slope surface material has occurred at the SE side of the upper escarpment where the vegetation is sparse. The movement is expected to be the result of stormwater runoff from a pipe that terminates directly above the failed area (Photo 7). Below the vegetated slope is a near vertical cliff some 40m high (Photos 6, 8 & 9). The cliff consists of alternating thick and thinly bedded sandstone and shale/laminite. It displays some minor jointing and undercutting. The rock platform has a covering of dislodged sandstone boulders at the cliff base (Photo 10). Horton Coastal Engineering has provided

a 5mm/year to 12mm/year allowance for erosion of the cliff. See the Coastal Engineering Report attached to this report. Provided the foundations for the proposed structures are constructed following the recommendations in '**Section 16** Foundations', erosion of the cliff / coastal bluff is not expected to impact on the proposed structures in the next 100 years.

3. Geology

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

4. Subsurface Investigation

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 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 expected to have occurred for DCP4. 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 (~RL51.1) **–** AH1 (Photo 11)

Depth (m)	**Material Encountered**
0.0 to 0.5	**FILL**, silty soil and clay, with some rock fragments, dark brown, orange, moist, fine to coarse grained.
0.5 to 1.2	**CLAY**, dark brown/grey, firm to stiff, moist.

End of hole @ 1.2m in stiff clay. 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** (~RL53.0)	**DCP 2** (~RL51.2)	**DCP 3** (~RL50.8)	**DCP 4** (~RL52.6)	**DCP 5** (~RL52.4)
0.0 to 0.3	9	7	10	18	9
0.3 to 0.6	15	16	11	8	10
0.6 to 0.9	17	16	12	#	7
0.9 to 1.2	26	26	14		10
1.2 to 1.5	41	37	16		#
1.5 to 1.8	#	33	10		
1.8 to 2.1		#	47		
2.1 to 2.4			#		
	End of Test @ 1.4m	Refusal on Rock @ 1.7m	Refusal on Rock @ 2.1m	Refusal @ 0.4m	Refusal on Rock @ 1.1m

#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 @ 1.4m, DCP still very slowly going down, red orange clay on moist tip.

DCP2 – Refusal on Rock @ 1.7m, DCP thudding on rock surface, orange and white rock fragments on dry tip, orange clay in collar above tip.

DCP3 – Refusal on Rock @ 2.1m, DCP bouncing off rock surface, orange rock fragments and dark brown soil on dry tip.

DCP4 – Refusal @ 0.4m, DCP bouncing, brown soil on dry tip.

DCP5 – Refusal on Rock @ 1.1m, DCP bouncing off rock surface, brown soil on dry 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 and a thin topsoil over Firm to Stiff Clays. Fill to a maximum depth of ~1.0m provides level platforms for lawn and garden areas across the property. In the test locations, the clays merge into the weathered zone of the underlying rock at depths of between ~1.1m to ~2.1m below the current surface, being deeper in the filled areas (DCPs 2 & 3). The underlying rock is interpreted as Extremely Low to Medium

Strength Rock. This ground material is exposed across the seacliff below the property (Photos 6, 8 & 9). 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. Due to the slope and elevation of the block, the water table is expected to be many metres below the base of the proposed works.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The coastal bluff below the property are a potential hazard (**Hazard One**). The vibrations from the proposed excavations are a potential hazard (**Hazard Two**). The proposed excavations are a potential hazard until retaining structures are in place (**Hazard Three**).

RISK ANALYSIS SUMMARY ON NEXT PAGE

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	A mass failure of the coastal bluff impacting on the property or the proposed works.	The vibrations produced during the proposed excavations for the house extension and pool impacting on the surrounding structures and the coastal bluff.	The proposed excavations for the house extension and pool collapsing onto the worksite and undercutting the NW common boundary retaining wall during the excavation process.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (35%)	'Medium' (15%)	'Medium' (18%)
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^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Sections 11 & 12** 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 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

There is fall to Hillcrest Avenue. 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 ~2.4m is required to extend the lower ground floor of the existing house at the N side and construct a new paved area.

Another excavation to a maximum depth of ~1.8m is required to construct the proposed pool and spa.

The excavations are expected to be through fill, topsoil, and clay, with Extremely Low to Low Strength Rock expected at depths of between ~1.2m to ~2.1m below the current surface. Medium Strength rock or better may be encountered near the bases of the excavations.

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

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 16 tonne.

If Medium Strength rock or better is encountered, excavations through this ground material should be carried out to minimise the potential to cause vibration damage to the coastal bluff, NW neighbouring house, NW neighbouring pool, and SE neighbouring house. Allowing 0.5m for backwall drainage, the setbacks are as follows:

- The lower ground floor excavation comes flush with the subject house and is set back ~2.1m from the NW neighbouring house, ~3.0m from the NW neighbouring pool and ~2.0m from the coastal bluff.

- The pool excavation comes flush with the coastal bluff and is set back ~2.5m from the subject house and ~8.0m from the SE neighbouring house.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the coastal bluff, NW neighbouring house, NW neighbouring pool, and SE neighbouring house. 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, as well as reducing hammer size as necessary.
- Use of rock grinders (milling head).

Should excavation induced vibrations exceed vibration limits after the recommendations above have been implemented, excavation works are to cease immediately and our office is to be contacted.

It is worth noting that vibrations that are below thresholds for building damage may be felt by the occupants of the neighbouring houses.

13. Excavation Support Requirements

The downhill edge of the proposed works is located over the top of the very steep coastal bluff (Photo 6). Before the excavation or construction commences, a catch fence or barrier will need to be constructed below the proposed works to stop any ground material moving downslope in an uncontrolled manner during the excavation works or construction materials after completion of the excavation. The catch fence or barrier is to be designed and approved by the structural engineer. The contractors installing the fence or anyone else working on the cliff edge will need to be utilising the appropriate safety equipment – i.e. Harnesses.

Bulk Excavation for Lower Ground Floor Extension

Allowing for backwall drainage, the lower ground floor excavation is set back ~1.1m from a low retaining wall along the NW common boundary and ~2.1m from the NW neighbouring house. Provided the NW neighbouring house is founded at least 0.4m below the current surface, it will be outside the zone of influence of the excavation.

The low NW common boundary wall 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 and a 45° line through clay / weathered rock from the base of the excavation towards the surrounding structures and boundaries.

Due to the depth of the excavation and its proximity to the NW common boundary wall, ground support will need to be installed before the excavation commences, or as the excavation progresses in a staged manner. See the Lower Ground Floor Plan attached for the minimum extent of the required shoring shown in blue. Alternatively the boundary wall may be underpinned to below the zone of influence of the excavation prior to the excavation commencing. Underpinning requires permission from the NW neighbours.

A cantilevered wall supported by soldier posts and whalers, designed by the Structural Engineer and approved by the Geotechnical Consultant, is one suitable form of support with

the soldier posts installed before the excavation commences. The following points outline the basic construction methodology:

- Drill pier holes to a depth that provides adequate embedment below the proposed bulk excavation to resist the likely earth pressures.
- Install soldier posts and concrete into each pier hole.
- Excavate between two soldier posts only, and install whalers immediately.
- Repeat the process until the excavation is complete and fully shored.
- Where possible the wall is to be tied into other structures to provide permanent bracing (i.e., concrete beams or a slab could abut each post at excavation level).

To drill the pier holes for the wall, a small pilling rig that can excavate through Medium to High Strength Rock will be required.

The geotechnical consultant is to inspect the drilling process of the entire first pile and the ground materials at the base of all pier holes/excavations for ground support purposes.

Bulk Excavation for Pool

Another excavation to a maximum depth of ~1.8m is required to construct the proposed pool and spa. The excavation is set back sufficiently from the surrounding structures and property boundaries.

Due to the depth of the fill in the location of the pool, all sides of the excavation are to be temporarily supported with typical pool shoring such as braced form ply until the pool/spa structure is in place. See the Lower Ground Floor Plan attached for the minimum extent of the required shoring shown in blue.

Advice Applying to Both Excavations

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.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. The materials and labour to construct the retaining walls are to be organised so shoring walls can be installed as required. 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 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	Passive
Fill and Topsoil	20	0.40	0.55	N/A
Residual Clays	20	0.35	0.45	Kp = 2.0 'ultimate'
Extremely Low to Very Low Strength Rock	22	0.25	0.38	Kp = 2.5 'ultimate'
Low to Medium Strength Rock	24	0.20	0.35	1000kPa 'ultimate'

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 and do not account for any surcharge loads, noting that surcharge loads from the structures above will be acting on the wall that will need to be accounted for in the design. It also assumes retaining structures are fully drained. It should be noted that passive pressure is an ultimate value and should have an appropriate safety factor applied. No passive resistance should be assumed for the top 0.4m to account for any disturbance from the excavation. 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. Site Classification

The site classification in accordance with AS2870-2011 is Class P due to the depth of the fill and the proximity of the proposed works to the very steep coastal bluff below. The natural clay below the fill is interpreted to be moderately reactive.

16. Foundations

The proposed lower ground floor extension with paving is expected to be seated in Extremely Low Strength Rock or better where it is cut into the slope. This is a suitable foundation material. Where the proposed house additions are not seated in this ground material, piers taken to and embedded no less than 0.6m into Extremely Low Strength Rock or better will be required to maintain a uniform foundation material across the structure. This ground material is expected at depths of between ~1.1m to ~2.1m below the current surface. A maximum

allowable bearing pressure of 600kPa can be assumed for footings embedded in Extremely Low Strength Rock or better.

The proposed pool/spa with wet edge and landscaping retaining wall that are partially located over the coastal bluff are to be supported on piers taken at least 5.0m from the current surface or at least 3.0m from the base of the pool structure and be embedded into the underlying Low to Medium Strength Rock. This is to ensure the stability of the pool/spa, retaining wall and the coastal bluff. As such, a mini piling rig capable of drilling through Medium Strength Rock is required for this job. It is to be noted that a standard domestic excavator is not able to drill through Medium Strength rock and is not suitable for this job. We can provide names of local excavation contractors with suitable domestic piling rigs upon request.

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.

NOTE: If the contractor is unsure of the footing material required it is more cost effective to get the geotechnical professional on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over excavation in clay like shaly rock but can be valuable in all types of geology.

17. Geotechnical Review

The structural plans are to be checked and certified by the geotechnical engineer as being in accordance with the geotechnical recommendations. On completion, a Form 2B will be issued. This form is required for the Construction Certificate to proceed.

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 Occupation Certificate if the following inspections have not been carried out during the construction process.

- The geotechnical consultant is to inspect the drilling process of the entire first pier hole for the shoring retaining wall to confirm the ground materials are in line with our expectations. The depths of all finished pier holes are to be confirmed before steel is placed or concrete is poured.

- 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.

- 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.

Reviewed By:

Dion Sheldon
BEng(Civil)(Hons),
Geotechnical Engineer.

Ben White M.Sc. Geol.,
AIG., RPGeo Geotechnical & Engineering.
No. 10306
Engineering Geologist.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11: 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.

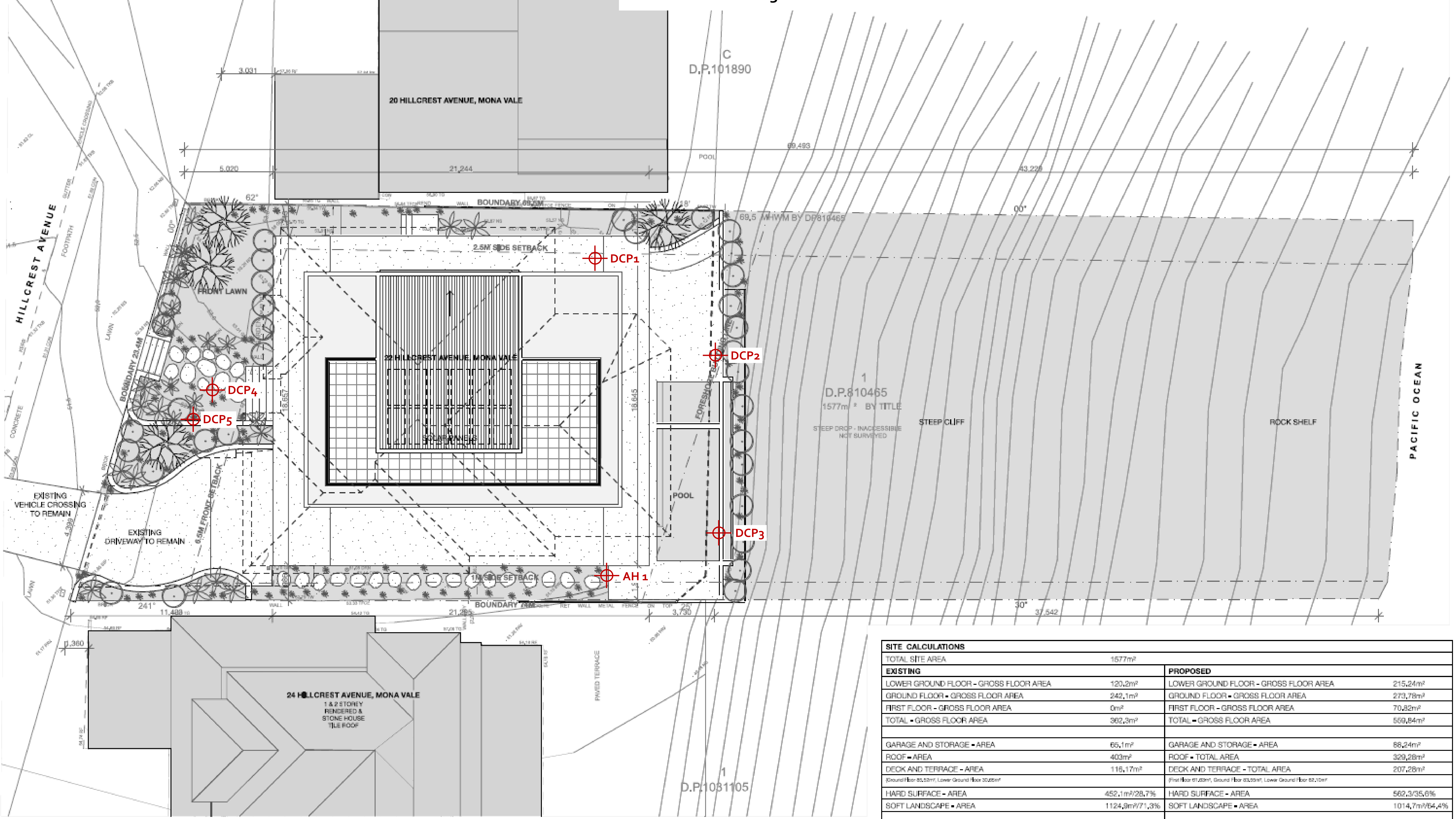
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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.

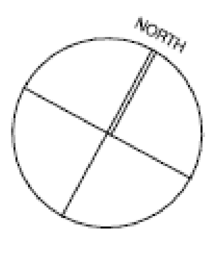
- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar 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 CALCULATIONS			
TOTAL SITE AREA	1577m²		
EXISTING		**PROPOSED**	
LOWER GROUND FLOOR - GROSS FLOOR AREA	120.2m²	LOWER GROUND FLOOR - GROSS FLOOR AREA	215.24m²
GROUND FLOOR - GROSS FLOOR AREA	242.1m²	GROUND FLOOR - GROSS FLOOR AREA	273.78m²
FIRST FLOOR - GROSS FLOOR AREA	0m²	FIRST FLOOR - GROSS FLOOR AREA	70.82m²
TOTAL - GROSS FLOOR AREA	362.3m²	TOTAL - GROSS FLOOR AREA	559.84m²
GARAGE AND STORAGE - AREA	65.1m²	GARAGE AND STORAGE - AREA	88.24m²
ROOF - AREA	403m²	ROOF - TOTAL AREA	329.28m²
DECK AND TERRACE - AREA	116.17m²	DECK AND TERRACE - TOTAL AREA	207.28m²
(Ground Floor 85.52m², Lower Ground Floor 30.65m²		(First Floor 61.63m², Ground Floor 83.55m², Lower Ground Floor 62.10m²	
HARD SURFACE - AREA	452.1m²/28.7%	HARD SURFACE - AREA	562.3/35.6%
SOFT LANDSCAPE - AREA	1124.9m²/71.3%	SOFT LANDSCAPE - AREA	1014.7m²/64.4%
POOL - VOLUME	0m³	POOL - VOLUME (Pool 47.16m³, Spa 9.44m³)	56.6m³

SITE PLAN A3 @1:200



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 N.C.C. 2022
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
- DENOTES PROPOSED ADDITION
- DENOTES PROPOSED ALERATIONS

PROJECT: ALTERATIONS AND ADDITIONS TO EXISTING DWELLING, INCLUDING NEW SWIMMING POOL AND ASSOCIATED LANDSCAPING

CLIENT: ZLAT AND BECC JOVANOV

LOCATION: 22 HILLCREST AVENUE, MONA VALE, NSW

PROJECT STAGE: DEVELOPMENT APPLICATION

DRAWING TITLE: COVER & SITE INFORMATION: SITE PLAN

SCALE: 1:200 @ A3

DATE OF ISSUE: 20/11/24

DRAWING NO. DA-001

REVISION: 01

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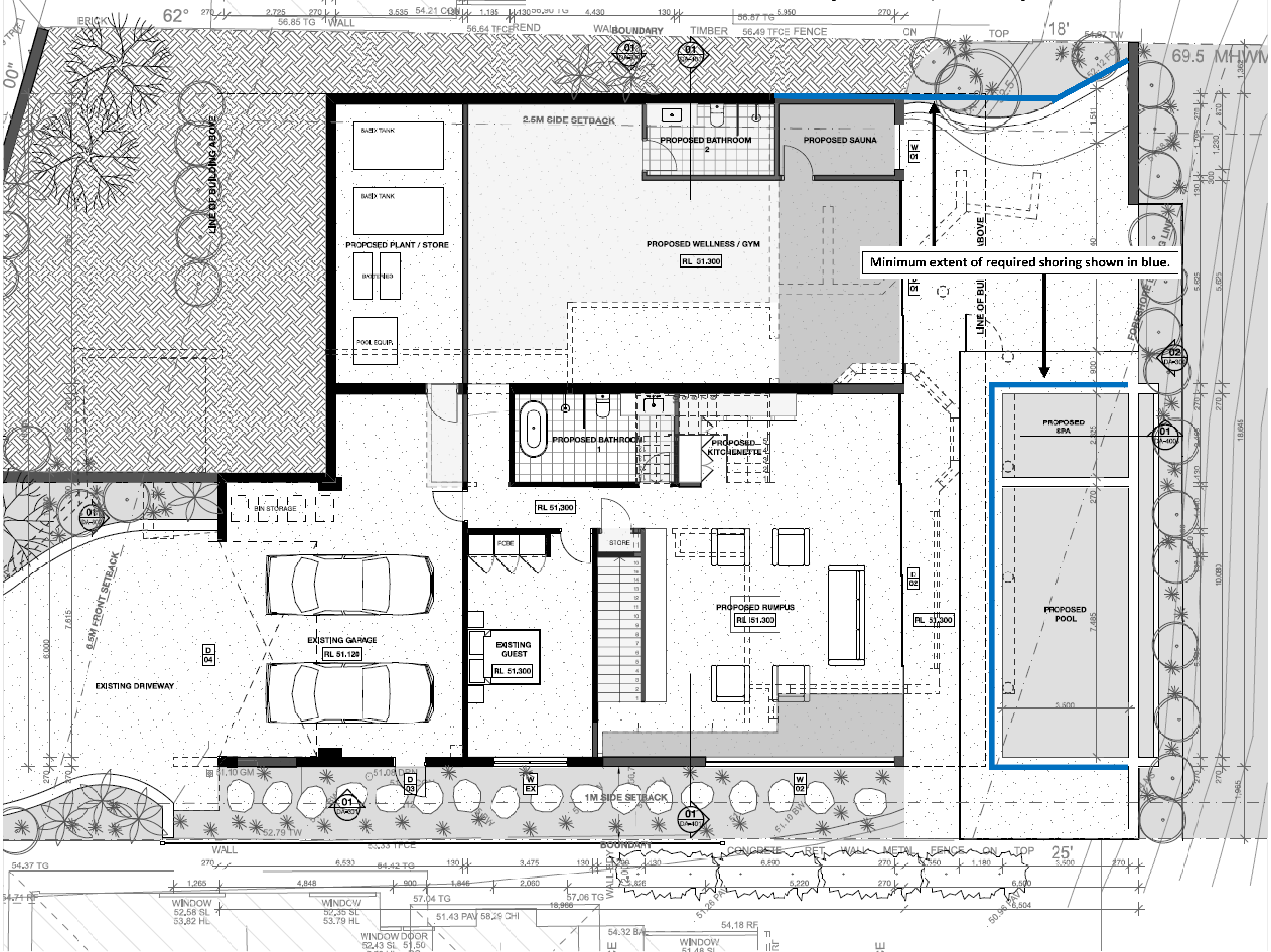
LOWER GROUND FLOOR PLAN – showing extent of required shoring



LOWER GROUND FLOOR A3 @1:100

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
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- DENOTES AREA OF PROPOSED ADDITION
- DENOTES AREA OF PROPOSED ALTERATIONS

PROJECT:
ALTERATIONS AND ADDITIONS TO EXISTING DWELLING, INCLUDING NEW SWIMMING POOL AND ASSOCIATED LANDSCAPING

CLIENT:
ZLAT AND BECC JOVANOV

LOCATION:
22 HILLCREST AVENUE, MONA VALE, NSW

PROJECT STAGE:
DEVELOPMENT APPLICATION

DRAWING TITLE:
GENERAL ARRANGEMENT PLANS: LOWER GROUND FLOOR

SCALE:
1:100 @ A3

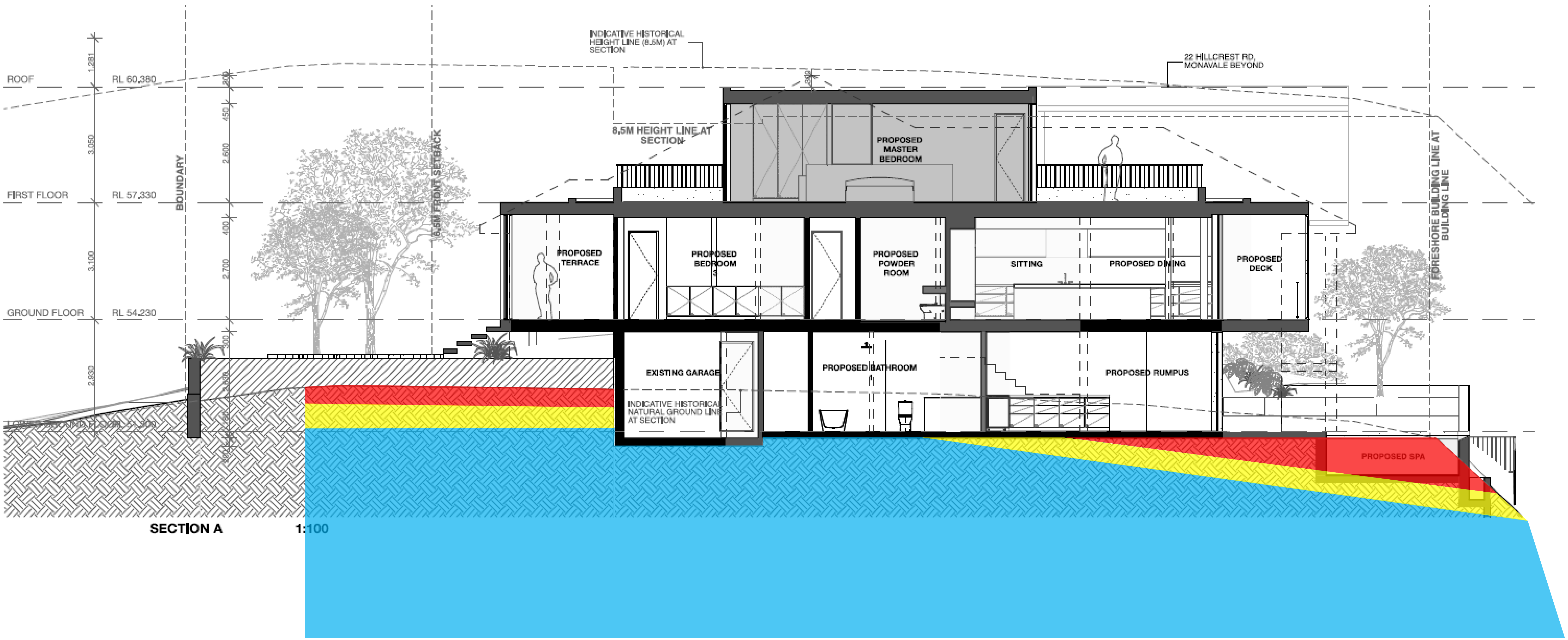
DATE OF ISSUE:
20/11/24

DRAWING NO.
DA-100

REVISION:
01

rama

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



Fill and Topsoil

Clay – Firm to Stiff

Narrabeen Group Rocks – Extremely Low to Medium Strength Rock

NOTE: THESE DRAWINGS ARE NOT FOR CONSTRUCTION, FOR DA APPROVAL ONLY
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PROJECT:
ALTERATIONS AND ADDITIONS TO EXISTING DWELLING, INCLUDING NEW SWIMMING POOL AND ASSOCIATED LANDSCAPING

CLIENT:
ZLAT AND BECC JOVANOV

LOCATION:
22 HILLCREST AVENUE, MONA VALE, NSW

PROJECT STAGE:
DEVELOPMENT APPLICATION

DRAWING TITLE:
SECTIONS: SHEET 01

SCALE:
1:100 @ A3

DATE OF ISSUE:
20/11/24

DRAWING NO.
DA-400

REVISION:
01

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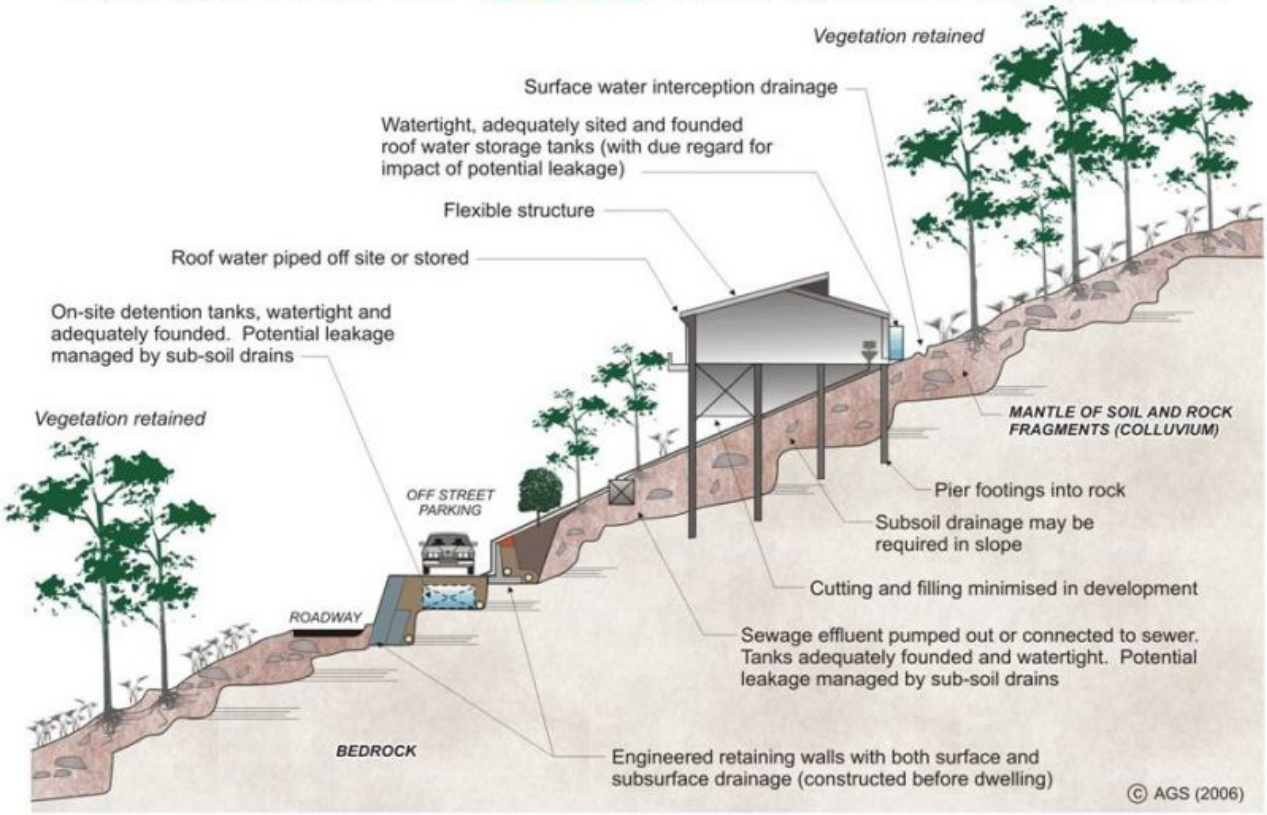
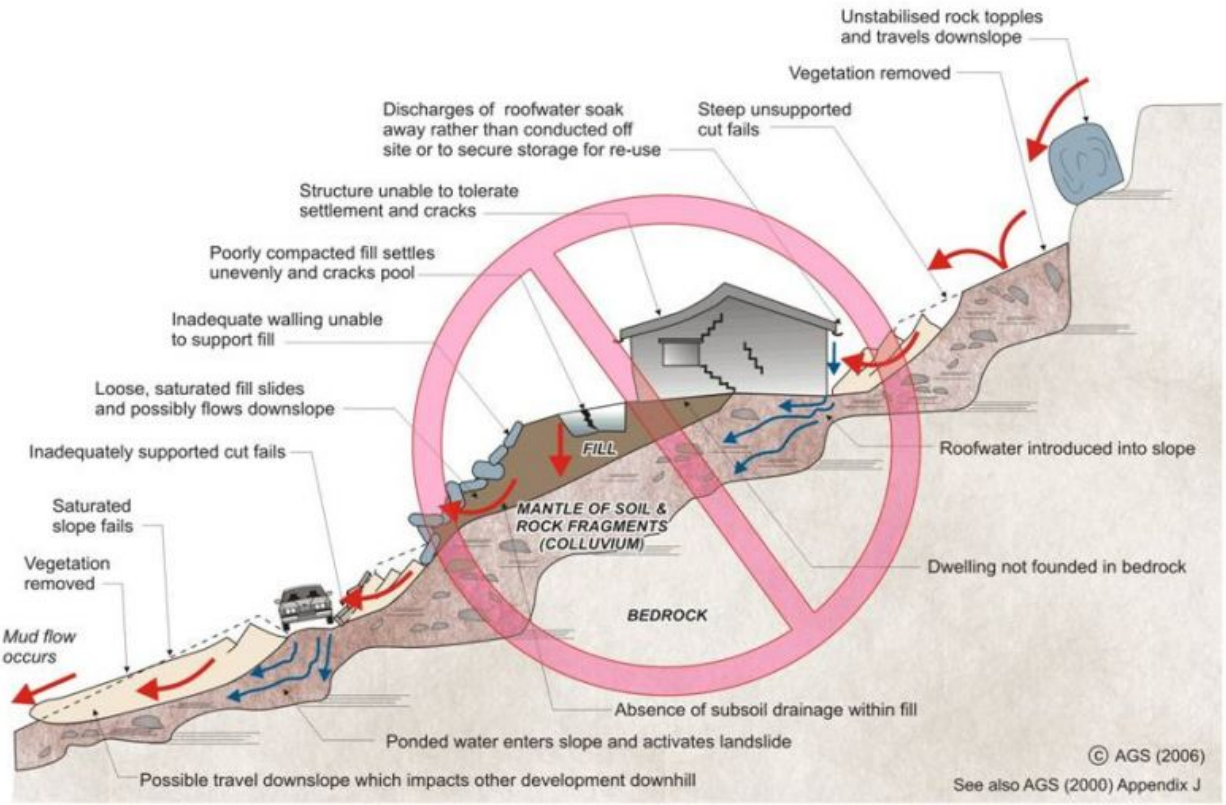
EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE



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26 November 2024

Coastal Engineering Advice on 22 Hillcrest Avenue Mona Vale

1. INTRODUCTION AND BACKGROUND

It is proposed to undertake substantial alterations and additions to a dwelling at 22 Hillcrest Avenue Mona Vale (the 'site'), and to construct a new pool, for which a Development Application is to be submitted to Northern Beaches Council. The site is located within a "Bluff/Cliff Instability" area designated on the *Coastal Risk Planning Map* (Sheet CHZ_018) that is referenced in *Pittwater Local Environmental Plan 2014*.

Therefore, the site is subject to Chapter B3.4 of the *Pittwater 21 Development Control Plan* (DCP)[1], and the *Geotechnical Risk Management Policy for Development in Pittwater*. Based on Chapter 6.5(i) of this policy, "a coastal engineer's report on the impact of coastal processes on the site and the coastal forces prevailing on the bluff must be incorporated into the geotechnical assessment as an appendix and the Coastal Engineer's assessment must be addressed through the Geotechnical Report and structural specification". Accordingly, this coastal engineering report is set out herein.

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 33 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia and Chartered Professional Engineer (CPEng) registered on the National Engineering Register. He is also a member of the National Committee on Coastal and Ocean Engineering (NCCOE) and NSW Coastal, Ocean and Port Engineering Panel (COPEP) of Engineers Australia. Peter has prepared coastal engineering reports for numerous cliff/bluff properties in the former Pittwater Local Government Area over the last few decades, including along Hillcrest Avenue. He has undertaken specific inspections of the site (including its cliff face and adjacent rock platform) on 3 and 16 October 2024.

All levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present in the ocean immediately adjacent to the NSW mainland. Completed Form No. 1 as given in the *Geotechnical Risk Management Policy for Pittwater* is attached at the end of the document herein.

[1] The Pittwater 21 DCP up to Amendment No. 27, which came into effect on 18 January 2021, was considered herein.

2. INFORMATION PROVIDED

Horton Coastal Engineering was provided with 19 drawings of the proposed works prepared by Rama Architects (Drawings DA-000, 001, 100 to 102, 300 to 302, 400, 401, 500 to 504, 800, and 900 to 902), all dated 20 November 2024 and Revision 01. A site survey by CMS Surveyors was also provided, reference 23364detail, Issue 1, and dated 1 May 2024.

3. EXISTING SITE DESCRIPTION

The site is located at the northern end of Mona Vale Headland, extending down to a rock platform and cliff at the southern end of Bungan Beach. A vertical aerial view of the site is provided in Figure 1, with a section through the site (denoted as Section A) approximately perpendicular to the top of the cliff also depicted in Figure 1[2]. An oblique aerial view of the site is in Figure 2, a view of the site from the rock platform at the base of the cliff is in Figure 3, and views of the seaward face of the dwelling at the site are provided in Figure 4 and Figure 5.

Figure 1: Aerial view of site (approximate red outline), with Section A in yellow and outline of proposed pool in blue (aerial photograph taken 22 September 2024)

[2] Note that the site boundary depicted in Figure 1 is only approximate.

Figure 2: Oblique aerial view of site (at arrow) on 1 May 2023, facing west

Figure 3: View of cliff face at site (extent at top of cliff approximately between arrows) on 3 October 2024, facing SSW

Figure 4: View of seaward face of dwelling at site on 16 October 2024, facing SSE

Figure 5: View of seaward face of dwelling at site on 16 October 2024, facing NNW (0.5 × zoom)

Coffey & Partners (1987) noted that the cliff/bluff at the northern end of Mona Vale Headland had a stepped profile. This was noted to be primarily due to the rock type, bedding spacing and degree of weathering, with near vertical faces developed in sandstone layers, and slopes of about 45° in units composed predominantly of shale/siltstone.

Based on NSW Government Airborne Laser Scanning (ALS) data that was collected in 2020, elevations versus distance along Section A (from Figure 1) are depicted in Figure 6.

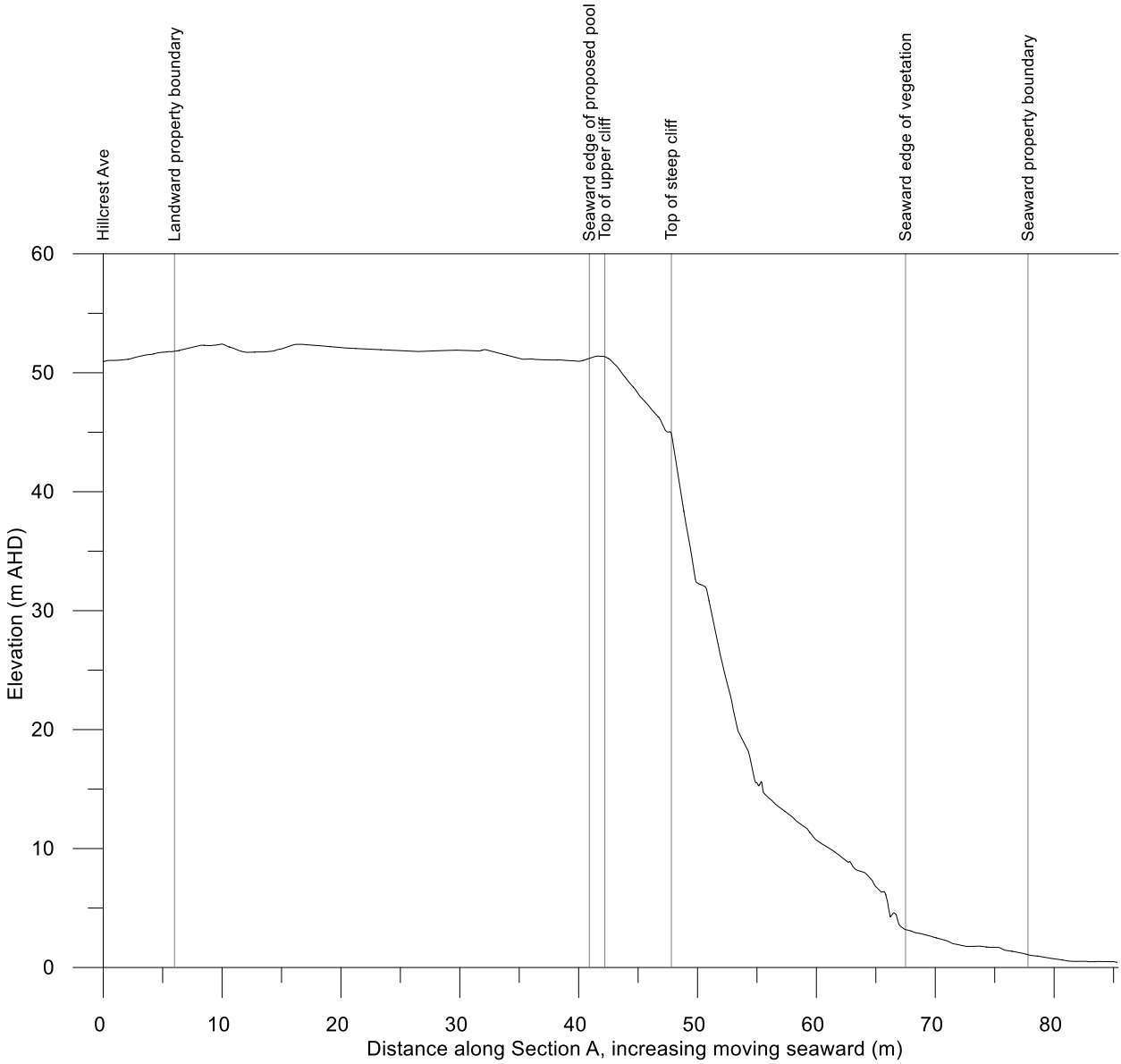


Figure 6: Section A through site, including cliff face and rock platform

Ground elevations along Section A approximately vary from about 51m AHD at Hillcrest Avenue, and also around that level over the dwelling footprint (which has a finished ground floor level of 51.3m on the seaward side), 51.3m AHD at the top of the upper cliff, 45.0m AHD at the top of the steep cliff, 3.2m AHD at the seaward edge of vegetation, and 1.1m AHD at the seaward property boundary. The average slope angle of the upper cliff is 51°, with the steeper section between 47.8m and 15.5m AHD having an average slope angle of 76°.

4. PROPOSED DEVELOPMENT

It is proposed to undertake substantial alterations and additions to the dwelling at the site, and to construct a new pool. An outline of the pool location is in Figure 1. Extensions on both levels are proposed at the NE and SE corners of the existing dwelling, as well as an additional upper level (centrally located). The existing ground floor level of 51.3m AHD is to be maintained in the proposed development, with the pool coping also at that level.

5. MECHANISMS FOR CLIFF EROSION

5.1 Preamble

Erosion of sheer cliffs can occur in two forms (Public Works Department, 1985), either:

- a slow, relatively gradual attrition of cliff material due to the effects of weathering; or
- relatively infrequent but sudden collapse of large portions of cliff face, due to undercutting, wave impact forces, changed groundwater conditions, rock shattering or increased loadings related to construction, and other processes.

Weathering may induce undercutting and toppling failure of overhanging blocks if the rate of weathering varies along the cliff profile. Erosion of steep slopes tends to occur suddenly in association with heavy rainfall or changes to drainage patterns, slope undercutting, and increases in load on the slope.

5.2 Weathering and Erosion

Both chemical and mechanical weathering can reduce the strength of cliff material (Sunamura, 1983). Chemical weathering includes hydration and solution, caused by the interaction between cliff material and sea water. Mechanical weathering comprises:

- the wetting and drying process in the intertidal zone;
- generation of repeated stresses in cliff material by periodic wave action (particularly waves that break on the cliff); and
- frost effects in cold latitudes.

Mechanical weathering can also be caused by wind.

Historical rates of recession for softer beds of Sydney coastline sandstone cliffs, which include chemical and mechanical weathering, have been determined to be 2mm to 5mm per year by Dragovich (2000). This is consistent with average rates of recession for Sydney Northern Beaches coastline sandstone cliffs of 4mm per year determined by Crozier and Braybrooke (1992).

An apparent approximate 30m of cliff recession (observed in aerial photography as the distance of the toe of the steep cliff section from the seaward edge of the rock platform at present) at and seaward of the site over the last 6,400 years (since sea levels stabilised around their present levels, and assuming that this toe was at the seaward edge of the rock platform at that time) represents an average recession rate of 5mm/year, consistent with the reported rates noted above. Note that maximum rates of recession for Sydney Northern Beaches coastline sandstone cliffs of 12mm/year were determined by Crozier and Braybrooke (1992).

The exposed cliff (steep unvegetated portion above the rock boulders and vegetated toe) at the site is above the intertidal zone (above 1m AHD) but would be impacted by wave runup at times, particularly during coastal storms with large waves and elevated water levels. This wave runup could extend up to levels of about 8m AHD at present in a 100 year Average Recurrence Interval (ARI) storm, increasing to around 9m AHD in 100 years if projected sea level rise is realised.

Given this, it should be assumed that both chemical and wave-induced mechanical weathering would apply at this site. A recession/weathering rate of 5mm per year of the cliff face is considered to be appropriate, with sensitivity testing for a rate of 12mm/year as a conservative 2.4 multiple rate increase to account for sea level rise[3]. These rates are considered to be reasonable to apply over a design life of 100 years, including allowance for projected sea level rise as noted above.

To be conservative, the rates can be applied over the entire exposed cliff face, although in reality it would be expected that runup would generally be below 9m AHD in a severe coastal storm over the 100 year design life (that stated, although wave-induced mechanical weathering would be limited to the lower portion of the cliff face, the upper cliff face is exposed to mechanical weathering through wind action). Therefore, an allowance for recession/weathering of the cliff face of about 5mm to 12mm per year should be considered and assessed by the geotechnical engineer[4].

The geotechnical engineer should consider these estimated rates in conjunction with an understanding of the particular nature of the cliff materials at the site, their resistance to erosion/recession, and potential failure planes related to geotechnical issues such as the joint spacing[5].

This should be confirmed by the geotechnical engineer, but it is expected that the recession/weathering described above would lead to undercutting and collapse of blocks on the cliff face over the long term, with failure planes at the joints[6]. That stated, any future failure of the upper slope of the cliff and in the vicinity of the proposed development may be unrelated to coastal processes at the base of the cliff, so other failure mechanisms should be considered by the geotechnical engineer.

6. COASTAL INUNDATION

With the development above 51m AHD, coastal inundation is not a significant risk to the proposed development over a planning period of well over 100 years, including consideration of projected sea level rise.

[3] There are no established methods to estimate increased recession rates of cliff lines due to sea level rise, but a 2.4 factor on historical rates is considered to be particularly conservative. In the 2011 *Wyong Coastal Zone Management Plan* (CZMP) and 2017 draft Wyong CZMP, a factor of 1.2 was used to 2100.
[4] Note that this does not mean that the cliff face is predicted to recede at a steady rate of 5 to 12mm/year. In reality, there are likely to be slower rates of weathering over decades or centuries until a significant undercut occurs that detaches a block above, which leads to a sudden loss of an extent of cliff face much larger than the order of 10mm. However, averaging this slower weathering and block failures over the long term, an average rate of 5mm to 12mm/year (which can also be stated as 0.5m to 1.2m per 100 years) is expected.
[5] Coffey & Partners (1987) noted that the controlling feature of interbedded sandstone/siltstone cliffs was the bedding spacing and relative proportion of sandstone/siltstone.
[6] Overhangs are currently evident in the cliff face, as visible in Figure 3.

7. MERIT ASSESSMENT

7.1 Preamble

The merit assessment herein has been undertaken assuming that the geotechnical engineer will find that the proposed development is at an acceptably low risk of damage from coastal erosion/recession of the cliff at the site, and other processes, for a design life of at least 100 years[7]. The assessment set out below is reliant on this being the case, so this assumption must be confirmed by the geotechnical engineer.

7.2 *State Environmental Planning Policy (Resilience and Hazards) 2021*

7.2.1 Preamble

Based on *State Environmental Planning Policy (Resilience and Hazards) 2021* (SEPP Resilience)[8] and its associated mapping, the site is partly within a "Coastal Environment" area (see Section 7.2.2) and within a "Coastal Use" area (see Section 7.2.3).

7.2.2 Clause 2.10

Based on Clause 2.10(1) of SEPP Resilience, "development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,
(b) coastal environmental values and natural coastal processes,
(c) the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
(f) Aboriginal cultural heritage, practices and places,
(g) the use of the surf zone".

This is not a coastal engineering matter, but it can be noted that with regard to (a), the proposed development would not be expected to adversely affect the biophysical and hydrological (surface and groundwater) environments, being in an existing developed area and with (it is understood) conventional stormwater management features such as piped drainage to the street. The proposed works would not be a source of pollution as long as appropriate construction environmental controls are applied, and note that an erosion and sediment control plan has been included as part of the architectural drawings.

Assuming that there are no threatened native flora or fauna species and their habitats of significance at the site that would be impacted by the proposed works, the works would not be

[7] At a location with underlying bedrock such as the site, it is the responsibility of the geotechnical engineer, not the coastal engineer, to determine the risk to the development.
[8] Formerly *State Environmental Planning Policy (Coastal Management) 2018*.

expected to adversely affect the ecological environment. It is understood that no trees are to be removed as part of the proposed development.

With regard to (b), the proposed development would not be expected to adversely affect coastal environmental values or natural coastal processes over an acceptably long design life, as it would be founded on a cliff well above wave action for an acceptably rare storm over an acceptably long life.

With regard to (c), the proposed development would not be expected to adversely impact on water quality, with the residential land use, as long as appropriate construction environmental controls are applied. No sensitive coastal lakes are located in the vicinity of the proposed development.

With regard to (d), the proposed development would not be expected to impact marine vegetation, undeveloped headlands and rock platforms, with none of these items in proximity to the development (being on an already developed headland, and being well above and landward of the rock platform at and seaward of the site for an acceptably rare storm and acceptably long life). No significant impacts on marine fauna and flora would be expected as a result of the proposed development, as the development would not interact with subaqueous areas for an acceptably rare storm and acceptably long life. Assuming that there are no species of native vegetation and fauna and their habitats of significance that would be impacted at the site, (d) is satisfied.

With regard to (e), it can be noted that the proposed development is entirely within the site boundary and will not alter existing public access arrangements outside of the site.

With regard to (f), a search of the Heritage NSW "Aboriginal Heritage Information Management System" (AHIMS) was undertaken on 26 November 2024. This resulted in no Aboriginal sites nor Aboriginal places being recorded or declared within at least 200m of the site.

With regard to (g), the proposed development would not interact with the surf zone for an acceptably rare storm occurring over an acceptably long life, so would not impact on use of the surf zone.

Based on Clause 2.10(2) of SEPP Resilience, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or
(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
(c) if that impact cannot be minimised—the development will be managed to mitigate that impact".

The proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 2.10(1).

7.2.3 Clause 2.11

Based on Clause 2.11(1) of SEPP Resilience, "development consent must not be granted to development on land that is within the coastal use area unless the consent authority:

(a) has considered whether the proposed development is likely to cause an adverse impact on the following:
  (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
  (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,
  (iii) the visual amenity and scenic qualities of the coast, including coastal headlands,
  (iv) Aboriginal cultural heritage, practices and places,
  (v) cultural and built environment heritage, and
(b) is satisfied that:
  (i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or
  (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
  (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and
(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development".

With regard to Clause (a)(i), the proposed development is entirely on private property and will not affect public foreshore, beach, headland or rock platform access.

Clauses (a)(ii) and a(iii) are not coastal engineering matters so are not considered herein. With regard to (a)(iv), no Aboriginal sites nor Aboriginal places have been recorded or declared within at least 200m of the site, as noted in Section 7.2.2.

With regard to (a)(v), the nearest environmental heritage item to the site listed in Schedule 5 of *Pittwater Local Environmental Plan 2014* is a house at 26 Grandview Parade Mona Vale. This heritage item is located at least 140m from the site. The proposed development would not be expected to impact on this or more distant heritage items.

With regard to (b), the proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 2.11(1) for the matters considered herein. Clause (c) is not a coastal engineering matter so is not considered herein.

7.2.4 Clause 2.12

Based on Clause 2.12 of SEPP Resilience, "development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land".

Assuming that the geotechnical engineer will find that the proposed development is at an acceptably low risk of damage from erosion/recession over a 100 year design life, and given that the proposed development is well above and landward of projected wave runup over 100 years, the proposed development would not even be expected to interact with coastal processes over its design life, let alone affect any other land. That is, the proposed development is unlikely to cause increased risk of coastal hazards on that land or other land over its design life.

7.2.5 Clause 2.13

Based on Clause 2.13 of SEPP Resilience, "development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land".

No certified coastal management program applies at the site.

7.2.6 Synthesis

The proposed development satisfies the requirements of *State Environmental Planning Policy (Resilience and Hazards) 2021* for the matters considered herein.

7.3 *Coastal Management Act 2016*

The management objectives for the "coastal environment" and "coastal use" coastal management areas are described in Section 8 and Section 9 respectively of the *Coastal Management Act 2016*. By addressing Clause 2.10 and 2.11 of SEPP Resilience in Section 7.2.2 and Section 7.2.3 respectively herein, these management objectives have essentially been addressed. There are no other matters relevant to the subject DA that need to be considered in the *Coastal Management Act 2016*.

7.4 *Pittwater Local Environmental Plan 2014*

7.4.1 Clause 7.5

Clause 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014) applies at the site, as the site is identified as "Bluff/Cliff Instability" on the Coastal Risk Planning Map Sheet CHZ_018. Based on Clause 7.5(3) of LEP 2014, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

(a) is not likely to cause detrimental increases in coastal risks to other development or properties, and
(b) is not likely to alter coastal processes and the impacts of coastal hazards to the detriment of the environment, and
(c) incorporates appropriate measures to manage risk to life from coastal risks, and
(d) is likely to avoid or minimise adverse effects from the impact of coastal processes and the exposure to coastal hazards, particularly if the development is located seaward of the immediate hazard line, and
(e) provides for the relocation, modification or removal of the development to adapt to the impact of coastal processes and coastal hazards, and
(f) has regard to the impacts of sea level rise, and
(g) will have an acceptable level of risk to both property and life, in relation to all identifiable coastline hazards".

With regard to (a) and (b), the proposed development would not increase coastal risks nor alter coastal processes and the impacts of coastal hazards, as it would not affect the wave impact process at the base of the cliff.

Items (c), (d) and (g) are for the geotechnical engineer to assess, with consideration of the findings herein. Assuming that they find that the proposed development is at an acceptably

low risk of damage over a 100 year planning period with appropriate measures incorporated in design and construction, (c), (d) and (g) would be met. On this basis, (e) should not be necessary, noting that this would be more applicable in a sandy beach environment. With regard to (f), sea level rise has been considered herein.

7.4.2 Clause 7.8

The proposed pool extends seaward of the Foreshore Building Line at the site (that is, the pool is in the Foreshore Area), so Clause 7.8 of LEP 2014 applies at the site.

In Clause 7.8(1) of LEP 2014, it is stated that the "objectives of this clause are as follows:

(a) to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area,
(b) to ensure continuous public access along the foreshore area and to the waterway".

The proposed pool is entirely on private property, and would not affect alongshore public access nor impact on natural foreshore processes.

Based on Clause 7.8(3) of LEP 2014, "development consent must not be granted under this clause unless the consent authority is satisfied that:

(a) the development will contribute to achieving the objectives for the zone in which the land is located, and
(b) the appearance of any proposed structure, from both the waterway and adjacent foreshore areas, will be compatible with the surrounding area, and
(c) the development will not cause environmental harm such as:
    i) pollution or siltation of the waterway, or
    ii) an adverse effect on surrounding uses, marine habitat, wetland areas, fauna and flora habitats, or
    iii) an adverse effect on drainage patterns, or
    iv) the removal or disturbance of remnant riparian vegetation, and
(d) the development will not cause congestion or generate conflict between people using open space areas or the waterway, and
(e) opportunities to provide continuous public access along the foreshore and to the waterway will not be compromised, and
(f) any historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out and of surrounding land will be maintained, and
(g) in the case of development for the alteration or rebuilding of an existing building wholly or partly in the foreshore area, the alteration or rebuilding will not have an adverse impact on the amenity or aesthetic appearance of the foreshore, and
(h) sea level rise, coastal erosion and recession, or change of flooding patterns as a result of climate change, have been considered".

For Item (a), the site is zoned as C4 Environmental Living, for which the objectives in *Pittwater Local Environmental Plan 2014* are as follows:

- to provide for low-impact residential development in areas with special ecological, scientific or aesthetic values;
- to ensure that residential development does not have an adverse effect on those values;

- to provide for residential development of a low density and scale integrated with the landform and landscape; and
- to encourage development that retains and enhances riparian and foreshore vegetation and wildlife corridors.

The proposed development does not impact on any of these objectives from a coastal or water engineering perspective.

Items (b), (f) and (g) are not coastal engineering matters, so are not considered herein.

For Item (c), the proposed development would not cause any significant pollution or siltation of the waterway and would not adversely impact on adjacent areas, if appropriate construction environmental controls are applied. Also, no remnant riparian vegetation is to be removed as part of the proposed development. Therefore, this item is satisfied.

For Item (d), the proposed works would not affect public use of the foreshore and would not cause any conflict with waterway uses, as they are entirely on private property.

For Item (e), the proposed development would not affect public access along the foreshore area.

For Item (h), sea level rise was considered in Section 5.2.

Based on Clause 7.8(4) of LEP 2014, "in deciding whether to grant consent for development in the foreshore area, the consent authority must consider whether and to what extent the development would encourage the following:

(a) continuous public access to and along the foreshore through or adjacent to the proposed development,
(b) public access to link with existing or proposed open space,
(c) public access to be secured by appropriate covenants, agreements or other instruments registered on the title to land,
(d) public access to be located above mean high water mark,
(e) the reinforcing of the foreshore character and respect for existing environmental conditions".

As stated above, the proposed development would not affect public access along the foreshore.

7.5 *Pittwater 21 DCP*

Based on Chapter B3.4 of the DCP, "development must not adversely affect or be adversely affected by geotechnical and coastal processes nor must it increase the level of risk for any people, assets and infrastructure in the vicinity due to geotechnical and coastal processes".

As noted in Section 7.2.4, the proposed development is not expected to increase the level of risk for any people, assets and infrastructure in the vicinity due to coastal processes. This item is satisfied if the geotechnical engineer confirms that the proposed development is at an acceptably low risk if being affected by geotechnical and coastal processes, and unlikely to increase the level of risk for any people, assets and infrastructure in the vicinity due to geotechnical processes.

8. FORM

A completed *Geotechnical Risk Management Policy for Pittwater* Form No. 1 is attached at the end of the document herein. Note that the declaration on Form No. 1 is not appropriate for a coastal report, with the revised declaration below:

> "I am aware that the above Coastal Report, prepared for the abovementioned site is to be submitted to assist with a geotechnical investigation for a Development Application for this site, with that geotechnical investigation relied on by Northern Beaches Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed. No declaration can be made on the geotechnical investigation as this has not been prepared nor reviewed by me, and nor do I have geotechnical engineering expertise".

9. CONCLUSIONS

An allowance for erosion/weathering of 5mm/year of the cliff at 22 Hillcrest Avenue Mona Vale, with sensitivity testing up to 12mm/year, should be considered and assessed by the geotechnical engineer. The geotechnical engineer should consider these estimated rates in conjunction with an understanding of the particular nature of the cliff materials at the site, their resistance to erosion, and potential failure planes related to geotechnical issues such as the joint spacing. That stated, any future failure of the upper slope of the cliff and in the vicinity of the proposed development may be unrelated to coastal processes at the base of the cliff, so other failure mechanisms should be considered by the geotechnical engineer.

Coastal inundation is not a significant risk to the proposed development over a planning period of well over 100 years. Given this, and assuming that the geotechnical engineer will find that the development is at an acceptably low risk of damage from erosion/recession over a 100 year design life, the proposed development satisfies the requirements of *State Environmental Planning Policy (Resilience and Hazards) 2021* (Clauses 2.10 to 2.13), the *Coastal Management Act 2016*, Clause 7.5 and Clause 7.8 of *Pittwater Local Environmental Plan 2014*, and Chapter B.4 of the *Pittwater 21 DCP* for the matters considered herein.

10. REFERENCES

Coffey & Partners (1987), "Coastal Management Study, Assessment of Bluff Areas", *Report No. S8002/1-AA*, March, for Warringah Shire Council

Crozier, PJ and JC Braybrooke (1992), "The morphology of Northern Sydney's rocky headlands, their rates and styles of regression and implications for coastal development", *26th Newcastle Symposium on Advances in the Study of the Sydney Basin*, University of Newcastle

Dragovich, Deirdre (2000), "Weathering Mechanisms and Rates of Decay of Sydney Dimension Sandstone", pp. 74-82 in *Sandstone City, Sydney's Dimension Stone and Other Sandstone Geomaterials*, edited by GH McNally and BJ Franklin, Environmental, Engineering and Hydrogeology Specialist Group (EEHSG), Geological Society of Australia, Monograph No. 5

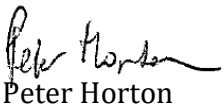
Public Works Department (1985), "Coastal Management Strategy, Warringah Shire, Report to Working Party", *PWD Report 85016*, June, prepared by AD Gordon, JG Hoffman and MT Kelly, for Warringah Shire Council

Sunamura, Tsuguo (1983), "Processes of Sea Cliff and Platform Erosion", Chapter 12 in *CRC Handbook of Coastal Processes and Erosion*, editor Paul D Komar, CRC Press Inc, Boca Raton, Florida, ISBN 0-8493-0208-0

11. SALUTATION

If you have any further queries, please do not hesitate to contact Peter Horton via email at peter@hortoncoastal.com.au or via mobile on 0407 012 538.

Yours faithfully
HORTON COASTAL ENGINEERING PTY LTD



Peter Horton
Director and Principal Coastal Engineer

Geotechnical Risk Management Policy for Pittwater Form No. 1 is attached overleaf

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for Zlatko and Rebecca Jovanov
Name of Applicant
Address of site 22 Hillcrest Avenue Mona Vale

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

I, Peter Horton *on behalf of* Horton Coastal Engineering Pty Ltd
(Insert Name) (Trading or Company Name)

on this the 26 November 2024 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million.
I:

Please mark appropriate box

☐ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☑ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Coastal
~~Geotechnical~~ **Report Details:**

Report Title: Coastal Engineering Advice on 22 Hillcrest Avenue Mona Vale
Report Date: 26 November 2024
Author: Peter Horton
Author's Company/Organisation: Horton Coastal Engineering Pty Ltd

Documentation which relate to or are relied upon in report preparation:

See Section 2 and Section 10 of coastal report

~~I am aware that the above Geotechnical Report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.~~

Signature Peter Horton ..... See revised declaration in Section 8 of report
Name ..... Peter Horton .....
Chartered Professional Status ..... MIEAust CPEng NER .....
Membership No. ..... 452980 .....
Company ..... Horton Coastal Engineering Pty Ltd .....