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

Development Application for Mr Toby Browne

Name of Applicant

Address of site 3 Panima Place, Newport, NSW

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

I, Paul Roberts *on behalf of* *JK Geotechnics*
(Insert Name) (Trading or Company Name)

on this the 12 August 2021 certify that I am an engineering geologist 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.
we/I have:

Please mark appropriate box

☒ 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

☐ ~~I.~~ *Are*/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. *We*/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 *are*/am of the opinion that the Development Application only involves Minor Development/Alterations that do not require a Detailed Geotechnical Risk Assessment and hence my/*our* report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements for Minor Development/Alterations.

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

Geotechnical Report Details:

Report Title: Geotechnical Assessment

Report Date: 19 August 2021 *Report Ref No: 34266RDrpt*
:
Author: David Schwarzer/Paul Roberts

Author's Company/Organisation: *JK Geotechnics*

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

Geotechnical Investigation and Stability Assessment report (Ref 30842Zrpt Rev1 dated 6 October 2017)
Survey plan prepared by C.M.S. Surveyors Pty Ltd (Ref 12715detail dated 23 April 2021)
Architectural drawings prepared by MHD Architects (Drawings Nos. A001, A101, A201, A202 and A221, dated 26 May 2021)

~~I am~~ *We are* 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~~ *confirming* 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, *as discussed in the Report*.

Signature

Name Paul Roberts

Chartered Professional Status CP Eng

Membership No. 2307698

Company: *JK Geotechnics.*

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

Development Application for Mr Toby Browne

Name of Applicant

Address of site 3 Panima Place, Newport, NSW

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 Assessment
Report Date: 19 August 2021 *Report Ref No: 34266RDrpt*
Author: David Schwarzer/Paul Roberts
Author's Company/Organisation: *JK Geotechnics*

Please mark appropriate box

☒ Comprehensive site mapping conducted 25 June 2021
(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, Site had been previously investigated.
- ☐ Yes Date conducted ……

☒ 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~~ *recommendations presented in the Report are adopted.*

☒ 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~~ *We are* aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ~~ensuring~~ *confirming* 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 *as discussed in the Report*.

Signature
Name Paul Roberts
Chartered Professional Status CP Eng
Membership No. 2307698.
Company *JK Geotechnics Pty Ltd.*

REPORT TO

TOBY BROWNE

ON

GEOTECHNICAL ASSESSMENT (In Accordance with Pittwater Council Risk Management Policy)

FOR

PROPOSED ALTERATIONS & ADDITIONS

AT

3 PANIMA PLACE, NEWPORT, NSW

Date: 19 August 2021
Ref: 34266RDrpt

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Report prepared by:

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For and on behalf of
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NORTH RYDE BC NSW 1670

DOCUMENT REVISION RECORD

Report Reference	Report Status	Report Date
34266RDrpt	Final Report	19 August 2021

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ATTACHMENTS

1 INTRODUCTION

This report presents the results of our geotechnical assessment of the proposed alterations and additions at 3 Panima Place Newport, NSW. The location of the site is shown in Figure 1. The assessment was commissioned by Mr Toby Browne by return of a signed 'Acceptance of Proposal' form dated 17 June 2021 in accordance with our proposal (Ref P54393HD) dated 17 June 2021. The site was inspected by our Senior Geotechnical Engineer on 25 June 2021, in order to assess the existing stability of the site and the effect on stability of the proposed development.

Details of the proposed development are presented in Section 5 below. In summary, however, it is proposed to demolish the existing dilapidated boatshed and portions of the existing retaining walls located in the north-western corner of the site and construct a new boatshed which will extend southwards into the site from the current boatshed location. Excavation for the proposed boatshed will extend to a maximum depth of about 4m below the existing surface levels. The excavation will also extend about 6m into the existing tiered garden beds which step and slope down to the west in the south-western corner of the site.

In 2017, JK Geotechnics completed a geotechnical investigation and prepared a geotechnical assessment report (Ref. 30842Zrpt rev1) dated 6 October 2017 and completed a number of geotechnical inspections during construction of the now completed alterations and additions. In preparation of this current report, we have referred to the results of the previous investigation and geotechnical inspections.

The purpose of the assessment was to carry out a desktop study of our previous investigation and site reports prepared during construction and to carry out a walkover inspection of the site. Based on the information obtained, we present our comments and recommendations on expected excavation conditions, drainage, retention systems and design, footing design and the boatshed floor slab. The site was inspected in detail to assess the existing stability of the site and the effect on stability of the proposed alterations and additions.

This report has been prepared in accordance with the requirements of the Geotechnical Risk Management Policy for Pittwater (2009) as discussed in Section 6 below. It is understood that the report will be submitted to Council as part of the DA documentation. Our report is preceded by the completed Council Forms 1 and 1a.

2 ASSESSMENT METHODOLOGY

2.1 Walkover Survey

This stability assessment is based upon a detailed inspection of the topographic, surface drainage and geological conditions of the site and its immediate environs. These features were compared to those of other similar lots in neighbouring locations to provide a comparative basis for assessing the risk of instability affecting the proposed development. The attached Appendix A defines the terminology adopted for the risk assessment together with a flowchart illustrating the Risk Management Process based on the guidelines given in AGS 2007c (Reference 1).

A summary of our observations is presented in Section 3 below. Our specific recommendations regarding the proposed development are discussed in Section 7 following our geotechnical assessment.

The attached Figure 2 presents a geotechnical sketch plan showing the principal geotechnical features present at the site and includes the test locations from our previous investigation. Figure 2 is based on the survey plan prepared by C.M.S. Surveyors Pty Ltd (Ref 12715detail dated 23 April 2021) with the proposed boatshed superimposed. Additional features on Figure 2 have been measured by hand held inclinometer and tape measure techniques and hence are only approximate. An explanation of geotechnical mapping symbols used on Figure 2 are presented on the attached Figure 4. Figure 3 presents a typical cross-section through the site based on the survey data augmented by our mapping observations.

3 SUMMARY OF OBSERVATIONS

We recommend that the summary of observations which follows be read in conjunction with the attached Figure 2.

- The site is located at the toe of the western flank of the Pittwater peninsular on a slope grading down to the north at approximately 10°.
- The site has a trapezoidal shape, being about 48m long (east to west) by 19m and 31m wide (north to south).
- Site surface levels were similar to the local topography, stepping and slopping at 34° to 38° across the northern extent down to a flat grassed area along the Pittwater foreshore.
- At the time of the inspection, the central portion of the site was occupied by a two storey rendered house. The house appeared to be in good condition.
- A three car rendered garage with concrete hardstand was located in the southern portion of the site and was accessed from the east by the asphaltic concrete shared driveway off Panima Place. The garage appeared to be in good condition.
- An in-ground pool was located adjacent to the northern side of the house. Along the northern side, the pool was approximately 1.2m to 3.5m higher than ground surface levels to the north. The pool appeared to be in good condition.
- To the north of the pool and house, the site stepped down through garden beds and grass covered terraces which were supported along their northern edge by timber and rendered retaining walls. The retaining walls ranged from about 0.9m to 3.5m in height and were in good condition.
- Located in the north-western corner of the site was a dilapidated boatshed with a concrete boat ramp leading to the northern foreshore. The lower approximately 1m portion of the brick walls of the boatshed were supporting the adjacent surface levels (including the neighbours to the west) which were typically sloping down to the north-east. The walls were in poor condition with significant cracking and missing sections. The upper timber portions of the walls and roof were also in poor condition.

- Along the northern foreshore, as mentioned above, was a flat grassed area. The foreshore area was retained by a timber seawall approximately 1.0m high, founded on a mass concrete footing above a pebble beach. It appeared that the inter-tidal zone extended up to the face of the seawall. The seawall and concrete footing appeared to be in poor condition with obvious signs of deterioration of the timber panels, outward rotation of the wall towards Pittwater and cracking through the concrete footing.
- Two timber jetties supported on piles extended from the eastern and western ends of the seawall. The piles were of either timber or concrete construction and appeared to be in good condition.
- A two storey brick house with one storey extension currently under construction was setback about 3m to 4m beyond the eastern site boundary. The neighbouring property had similar levels as the subject site. The house and extension appeared to be in good condition when viewed from within the subject site.
- A two storey rendered house was setback about 1.5m from the northern end of the western site boundary. Adjacent to the proposed boatshed the neighbouring surface levels were similar across the common boundary and were sloping down to the north at up to 38°.

4 EXPECTED SUBSURFACE CONDITIONS

The 1:100,000 geological map of Sydney indicates that the site is underlain by the Newport Formation of the Narrabeen Group which comprises “interbedded sandstone, shale and laminate”.

Based on the results of our previous geotechnical investigation and our inspections during construction, the expected generalised subsurface profile comprises fill over residual silty clay with shale bedrock at relatively shallow depths. A summary of the expected subsurface conditions is presented below.

Fill

A limited depth of silty clay fill is expected in the garden beds behind the existing retaining walls and in the northern foreshore area where it was encountered from surface level in BH1 and extended to a depth of about 1m.

Residual Clay

Residual silty clay of medium to high plasticity and of stiff to hard strength is typically expected to underlie the fill and extend to the bedrock surface.

Weathered Bedrock

Shale bedrock was inferred at a depth of about 1m (BH4) and was present at the base of the footing excavations for the terrace retaining wall directly to the south of the proposed boatshed. The bedrock is anticipated to be extremely weathered and of hard (soil) strength on first contact improving rapidly with depth to very low and low (rock) strength.

Groundwater

Groundwater seepage was encountered at a depth of 0.7m during drilling BH4. A standing groundwater level was measured at 1.0m upon completion of drilling BH4. It is anticipated that water encountered within the borehole is most likely influenced by tidal variations.

5 PROPOSED DEVELOPMENT

We understand from the provided architectural drawings (Drawing Nos A001, A002, A101, A201, A202 and A221, dated 26 June 2021, Issue A) prepared by Mark Hurcum Design Practice, that the proposed alterations and additions will include the following

- Demolition of the existing boatshed including retaining walls, floor slab and footings.
- Excavation into the existing northern sloping site to a maximum depth of about 4m.
- Construction of a boat shed extension with a garden bed terrace.

The footprint of the proposed development is indicated on Figure 2.

6 GEOTECHNICAL ASSESSMENT

The site is located on a hillside slope of 10° increasing to 38° over the northern end. The site generally appears to be well drained and is underlain by bedrock from shallow depth. Other than the timber seawall, our inspection indicated no evidence of any recent mass soil and/or rock slope instability or downslope creep.

6.1 Potential Landslide Hazards

We consider that the potential landslide hazards associated with the site to be the following:

A Instability of existing retaining walls:
- (i) Over the northern portion of the site; and
- (ii) Existing seawall along the foreshore;

B Instability of the natural hillside slope:
- (i) To the south of the existing house;
- (ii) Beneath the existing house; and
- (iii) To the north of the existing house.

C Instability of temporary excavation batters.

D Instability of proposed boatshed retaining walls.

These potential hazards are indicated in schematic form on the attached Figure 3.

6.2 Risk Analysis

The attached Table A summarises our qualitative assessment of each potential landslide hazard and of the consequences to property should the landslide hazard occur. Use has been made of data in MacGregor *et al* (2007) to assist with our assessment of the likelihood of a potential hazard occurring. Based on the above, the qualitative risks to property have been determined. The terminology adopted for this qualitative assessment is in accordance with Table A1 given in Appendix A. Table A indicates that the assessed risk to property under existing conditions and following construction varies between Very Low and Low, which would be considered 'acceptable' in accordance with the criteria given in Reference 1 and the Pittwater Council Risk Management Policy.

We have also used the indicative probabilities associated with the assessed likelihood of instability to calculate the risk to life. The temporal and vulnerability factors that have been adopted are given in the attached Table B together with the resulting risk calculation. Our assessed risk to life for the person most at risk during and following construction ranges between about $1x10^{-8}$ and $5x10^{-10}$. This would be considered to be 'acceptable' in relation to the criteria given in Reference 1 and the Pittwater Council Risk Management Policy.

6.3 Risk Assessment

The Pittwater Risk Management Policy requires suitable measures 'to remove risk'. It is recognised that, due to the many complex factors that can affect a site, the subjective nature of a risk analysis, and the imprecise nature of the science of geotechnical engineering, the risk of instability for a site and/or development cannot be completely removed. It is, however, essential that risk be reduced to at least that which could be reasonably anticipated by the community in everyday life and that landowners are made aware of reasonable and practical measures available to reduce risk as far as possible. Hence, where the policy requires that 'reasonable and practical measures have been identified to remove risk', it means that there has been an active process of reducing risk, but it does not require the geotechnical engineer to warrant that risk has been completely removed, only reduced, as removing risk is not currently scientifically achievable.

Similarly, the Pittwater Risk Management Policy requires that the design project life be taken as 100 years unless otherwise justified by the applicant. This requirement provides the context within which the geotechnical risk assessment should be made. The required 100 years baseline broadly reflects the expectations of the community for the anticipated life of a residential structure and hence the timeframe to be considered when undertaking the geotechnical risk assessment and making recommendations as to the appropriateness of a development, and its design and remedial measures that should be taken to control risk. It is recognised that in a 100 year period external factors that cannot reasonably be foreseen may affect the geotechnical risks associated with a site. Hence, the Policy does not seek the geotechnical engineer to warrant the development for a 100 year period, rather to provide a professional opinion that foreseeable geotechnical risks to which the development may be subjected in that timeframe have been reasonably considered.

Our assessment of the probability of failure of existing structural elements such as retaining walls (where applicable) is based upon a visual appraisal of their type and condition at the time of our inspection. Where

existing structural elements such as retaining walls will not be replaced as part of the proposed development, where appropriate we identify the time period at which reassessment of their longevity seems warranted. In preparing our recommendations given below we have adopted the above interpretations of the Risk Management Policy requirements. We have also assumed that no activities on surrounding land which may affect the risk on the subject site would be carried out. We have further assumed that all Council's buried services are, and will be regularly maintained to remain, in good condition.

We consider that our risk analysis has shown that the site and existing and proposed development can achieve the 'Acceptable Risk Management' criteria in the Pittwater Risk Management Policy provided that the recommendations given in Section 7 below are adopted. These recommendations form an integral part of the Landslide Risk Management Process.

7 COMMENTS AND RECOMMENDATIONS

We consider that the proposed development may proceed provided the following specific design, construction and maintenance recommendations are adopted to maintain and reduce the present risk of instability of the site and to control future risks. These recommendations address geotechnical issues only and other conditions may be required to address other aspects.

7.1 Conditions Recommended to Establish the Design Parameters

7.1.1 All proposed footings must be founded in bedrock. The footings should be designed for an allowable bearing pressure of 600kPa, subject to inspection by a geotechnical engineer prior to pouring.

7.1.2 Subject to inspection by a geotechnical engineer temporary batters for the proposed excavation should be no steeper than 1 Vertical (V) in 1 Horizontal (H) within the soil profile and extremely weathered rock and vertical in competent rock. All surcharge and footing loads must be kept well clear of the excavation perimeter.

7.1.3 Where the required batters cannot be accommodated within the site geometry, or where not preferred, a retention system would be required and should be installed prior to excavation commencing. We recommend the retention system comprise a soldier pile wall with reinforced shotcrete infill panels. Where soldier piles do not extend below bulk excavation level then the toes will require permanent support with rock bolts. Where nearby structures within and neighbouring, the site lie within a horizontal distance of at least the excavation height then temporary anchoring and/or internal propping is likely to be required. The infill panels must be progressively installed as excavation proceeds (i.e. at maximum 1.5m depth intervals). Alternatively, the sides of the excavation could be progressively supported by reinforced shotcrete and soil nails installed as excavation proceeds. Design parameters are provided in Section 7.1.5 below.

7.1.4 The surface water discharging from the new roof and paved areas must be diverted to outlets for controlled discharge to the existing stormwater system which appears to drain to the north.

7.1.5 The proposed new retaining walls should be designed using the following parameters:

– Progressively anchored or propped walls may be designed using a trapezoidal earth pressure distribution of 4H kPa, where H is the retained height in metres. However, if movement sensitive structures or buried services lie close to the excavation then the earth pressure distribution should be increased to 6H kPa; see Figure 5.

- For design of conventional walls that will be propped, backfilled and permanently supported by the structure, we recommend the use of a triangular lateral earth pressure distribution with an 'at rest' earth pressure coefficient (k_o) of 0.6 for the retained profile, assuming a horizontal backfill surface.

– For design of conventional walls, where some minor movements of retaining walls may be tolerated, adopt a triangular lateral earth pressure distribution and an 'active' earth pressure coefficient, K_a, of 0.3, for the retained height, assuming a horizontal backfill surface.

– A bulk unit weight of 20kN/m^3 should be adopted for the soil profile.

– Any surcharge affecting the walls (eg. existing footings, live loading, compaction stresses, etc) should be allowed in the design.

– The retaining walls should be provided with complete and permanent drainage of the ground behind the walls. The subsoil drains should incorporate a non-woven geotextile fabric (eg. Bidim A34), to act as a filter against subsoil erosion.

– Toe resistance of the soldier pile wall may be achieved by socketing the piles into bedrock. An allowable lateral stress of 200kPa may be adopted for design.

– Soil nails/rock bolts/anchors that may be required should be bonded into at least very low strength bedrock where an allowable bond strength of 200kPa may be adopted for design.

7.1.6 The structural engineer must design the shoring walls, calculate the potential deflections (and associated settlements) and make an assessment of the effect of the deflections and settlements on nearby structures. The structural engineer must then make an assessment as to whether the shoring walls must be stiffened, and whether underpinning of the nearby structures is required.

7.1.7 Permission from neighbouring property owner to the south must be sought prior to installation of soil nails or anchors which will extend across the common boundary.

7.1.8 The guidelines for Hillside Construction given in Appendix B should also be adopted.

7.2 Conditions Recommended to the Detailed Design to be Undertaken for the Construction Certificate

7.2.1 All structural design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

7.2.2 All hydraulic design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

7.2.3 All landscape design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

7.2.4 Dilapidation surveys must be carried out on the neighbouring buildings and structures to the west. A copy of the dilapidation report must be provided to the neighbours and Council or the Principal Certifying Authority.

7.2.5 An excavation/retention methodology must be prepared prior to bulk excavation commencing. The methodology must include but not be limited to proposed excavation techniques, the proposed excavation equipment, excavation sequencing, geotechnical inspection intervals or hold points, vibration monitoring procedures, monitor locations, monitor types, contingency plans in case of exceedances.

7.2.6 The excavation/retention methodology must be reviewed and approved by the geotechnical engineer.

7.3 Conditions Recommended During the Construction Period

7.3.1 The geotechnical engineer must inspect all footing excavations prior to placing reinforcement or pouring the concrete.

7.3.2 The approved excavation/retention methodology must be followed.

7.3.3 Bulk excavations must be progressively inspected by the geotechnical engineer as excavation proceeds. We recommend inspections at 1.5m vertical depth intervals and on completion.

7.3.4 Proposed material to be used for backfilling behind retaining walls must be approved by the geotechnical engineer prior to placement.

7.3.5 Compaction density of the backfill material must be checked by a NATA registered laboratory to at least Level 2 in accordance with, and to the frequency outlined in, AS3798, and the results submitted to the geotechnical engineer.

7.3.6 If they are to be retained, the existing stormwater system, sewer and water mains must be checked for leaks by using static head and pressure tests under the direction of the hydraulic engineer or architect, and repaired if found to be leaking.

7.3.7 The geotechnical engineer must inspect all subsurface drains prior to backfilling.

7.3.8 An 'as-built' drawing of all buried services at the site must be prepared (including all pipe diameters, pipe depths, pipe types, inlet pits, inspection pits, etc).

7.3.9 The geotechnical engineer must confirm that the proposed alterations and additions have been completed in accordance with the geotechnical report.

We note that all above Conditions must be complied with. Where this has not been done, it may not be possible for Form 3, which is required for the Occupation Certificate to be signed.

7.4 Conditions Recommended for Ongoing Management of the Site/Structure(s)

The following recommendations have been included so that the current and future owners of the subject property are aware of their responsibilities:

7.4.1 All existing and proposed surface (including roof) and subsurface drains must be subject to ongoing and regular maintenance by the property owners. In addition, such maintenance must also be carried out by a plumber at no more than 10 yearly intervals; including provision of a written report confirming scope of work completed (with reference to the 'as-built' drawing) and identifying any required remedial measures.

7.4.2 The existing retaining walls within the northern portion of the site must be inspected by a structural engineer at no more than 15 yearly intervals; including the provision of a written report confirming scope of work completed and identifying any required remedial measures.

7.4.3 No cut or fill in excess of 0.5m (eg. for landscaping, buried pipes, retaining walls, etc), is to be carried out on site without prior consent from Pittwater Council.

7.4.4 Where the structural engineer has indicated a design life of less than 100 years then the structure and/or structural elements must be inspected by a structural engineer at the end of their design life; including a written report confirming scope of work completed and identifying the required remedial measures to extend the design life over the remaining 100 year period.

7.5 Possible Additional Stabilisation Measures

7.5.1 The existing timber seawall along the foreshore is in poor condition and has been assumed to be located outside the site. Whilst the assessed risk is at an 'acceptable' level we forewarn that should the seawall collapse then this will expose the retained sands within the foreshore to an increased likelihood of coastal erosion. Over time the erosion of the foreshore will extend landward and may impact the site. Our recommendation is that the seawall be repaired and the property owners should engage a coastal engineer to assess the stability of the seawall and advise on the scope and extent of repairs.

8 OVERVIEW

It is possible that the subsurface soil, rock or groundwater conditions encountered during construction may be found to be different (or may be interpreted to be different) from those inferred from our surface observations in preparing this report. Also, we have not had the opportunity to observe surface run-off patterns during heavy rainfall and cannot comment directly on this aspect. If conditions appear to be at variance or cause concern for any reason, then we recommend that you immediately contact this office.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Reference 1: Australian Geomechanics Society (2007c) *'Practice Note Guidelines for Landslide Risk Management'*, Australian Geomechanics, Vol 42, No 1, March 2007, pp63-114.

Reference 2: MacGregor, P, Walker, B, Fell, R, and Leventhal, A (2007) *'Assessment of Landslide Likelihood in the Pittwater Local Government Area'*, Australian Geomechanics, Vol 42, No 1, March 2007, pp183-196.

TABLE A

SUMMARY OF RISK ASSESSMENT TO PROPERTY

POTENTIAL LANDSLIDE HAZARD	EXISTING CONDITIONS					DURING AND AFTER COMPLETION OF PROPOSED DEVELOPMENT AND IMPLEMENTATION OF RECOMMENDATIONS OUTLINED IN SECTION 7						
	A: Instability of existing retaining walls		B: Instability of the hillside slopes			A: Instability of existing retaining walls		B: Instability of the hillside slopes			C: Instability of temporary excavation batters	D: Instability of proposed boatshed retaining walls
	(i) Over the northern portion of the site	(ii) Existing timber seawall along the foreshore	(i) To the south of the existing house	(ii) Beneath the existing house	(iii) To the north of the existing house	(i) Over the northern portion of the site	(ii) Existing timber seawall along the foreshore	(i) To the south of the existing house	(ii) Beneath the existing house	(iii) To the north of the existing house		
Assessed Likelihood	Unlikely	Almost Certain	Rare	Rare	Rare	Unlikely	Unlikely	Rare	Rare	Rare	Unlikely	Rare
Assessed Consequence	Minor	Insignificant	Minor	Minor	Minor	Minor	Insignificant	Minor	Minor	Minor	Minor	Minor
Risk	Low	Low	Very low	Very Low	Very Low	Low	Very Low	Very low	Very Low	Very Low	Low	Very Low
Comments	A Assumes: • A (i) walls have been engineer designed, and • A (i) & (ii) localised instability. B Assumes localised instability.					A Assumes: • A (i) walls have been removed as part of the works, and the remaining walls have been engineer designed, • A (ii) seawall repair works carried out, and • A (i) and (ii) localised instability. B Assumes localised instability. C: Assumes recommended batter slopes will be adopted and excavation batters inspected by geotechnical engineer. D: Assumes the retaining walls will be properly engineered.						

TABLE B

SUMMARY OF RISK ASSESSMENT TO LIFE - DURING AND AFTER CONSTRUCTION OF PROPOSED DEVELOPMENT

POTENTIAL LANDSLIDE HAZARD	A: Instability of existing retaining walls		B: Instability of the hillside slopes			C: Instability of temporary excavation batters	D: Instability of proposed boatshed retaining walls
	(i) Over the northern portion of the site	(ii) Existing timber seawall along the foreshore	(i) To the south of the existing house	(ii) Beneath the existing house		(iii) To the north of the existing house	
Assessed Likelihood	Unlikely	Unlikely	Rare	Rare		Rare	Unlikely	Rare
Indicative Annual Probability	10^{-4}	10^{-4}	10^{-5}	10^{-5}		10^{-5}	10^{-4}	10^{-5}
Persons at risk	Persons in northern yard area	Persons at crest or toe	Persons in garage area	Persons in house		Persons over northern portion of site	Persons at crest or working within the excavation	Persons in the boatshed
Number of Persons Considered	2	2	2	4	OR 1	2	2	2
Duration of Use of area Affected (Temporal Probability)	2 hours/day i.e. 0.08	1 hour/day 2 days/week i.e. 0.01	2 hours/day i.e. 0.08	10hrs/day i.e. 0.4	20hrs/day i.e. 0.8	2 hours/day i.e. 0.08	8 hours/day 5 days/week for 6 months i.e. 0.12	2 hours/day 2 days/week i.e. 0.02
Probability of not Evacuating Area Affected	0.2	0.2	0.2	0.2	0.4	0.1	0.4	0.2
Spatial Probability	2m failure over 110m of walls i.e. 0.03	1.5m failure over 30m length of wall i.e. 0.05	25% i.e. 0.25	30% i.e. 0.3	10% i.e. 0.1	20% i.e. 0.2	1m failure over 6m length of excavation i.e. 0.2	2m failure over 6m length of wall i.e. 0.2
Vulnerability to Life if Failure Occurs Whilst Person Present	0.3	0.05	0.2	0.3	0.3	0.1	0.1	0.1
Risk for Person most at Risk	$1.4x10^{-8}$	$5x10^{-10}$	$0.8x10^{-9}$	$7.2x10^{-8}$	$9.6x10^{-8}$	$1.6x10^{-9}$	$9.6x10^{-8}$	$8x10^{-10}$
Total Risk	$2.9x10^{-8}$	$1x10^{-9}$	$1.6x10^{-8}$	$1.4x10^{-7}$	–	$3.2x10^{-9}$	$1.9x10^{-7}$	$1.6x10^{-9}$

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

This plan should be read in conjunction with the JK Geotechnics report.

Title: **SITE LOCATION PLAN**

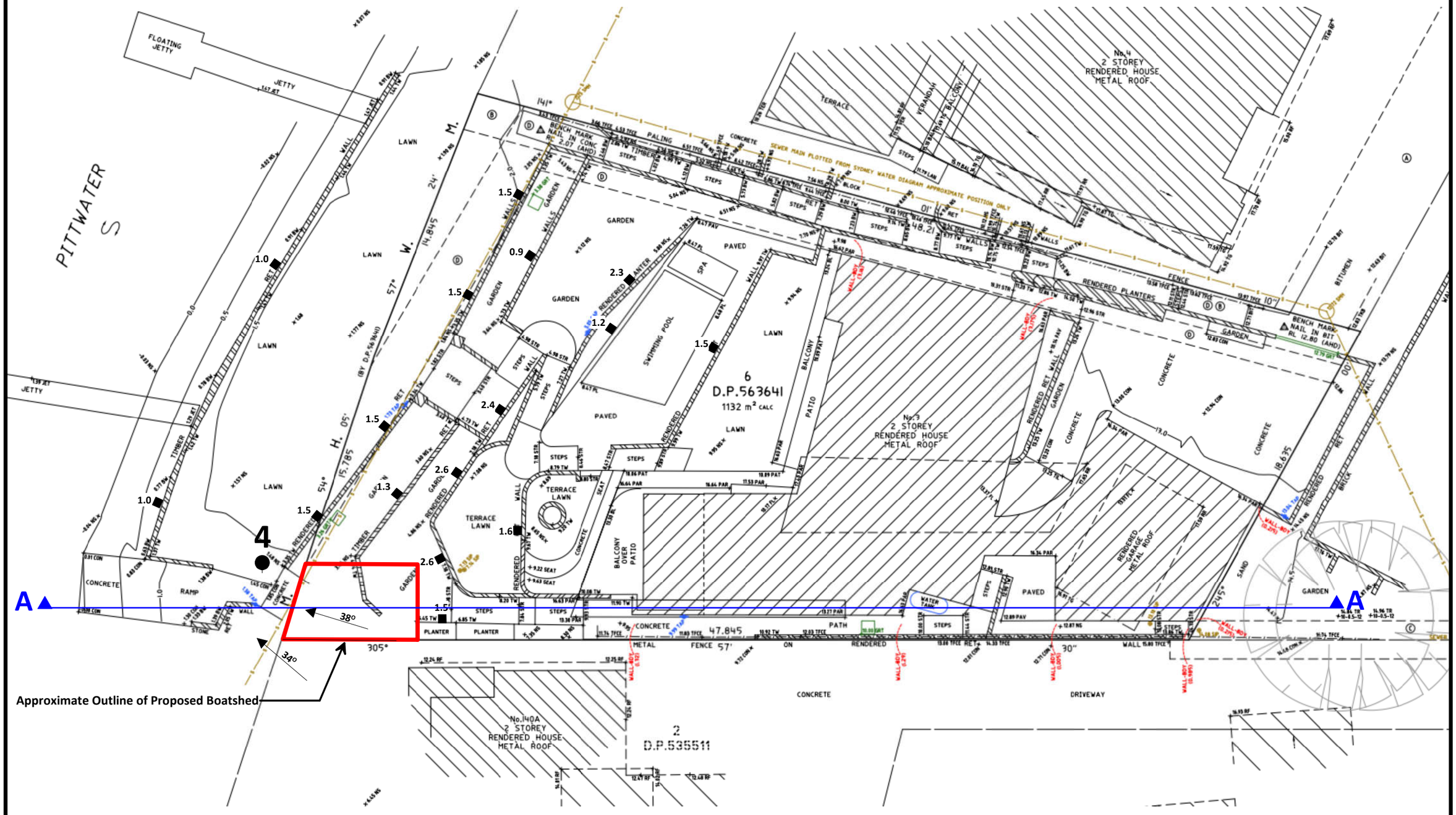
Location: 3 PANIMA PLACE
NEWPORT, NSW

Report No: 34266RD

Figure No: 1

J K **Geotechnics**

PLOT DATE: 20/09/2017 11:38:36 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\30000'S\30842Z NEWPORT\CAD\30842Z.DWG

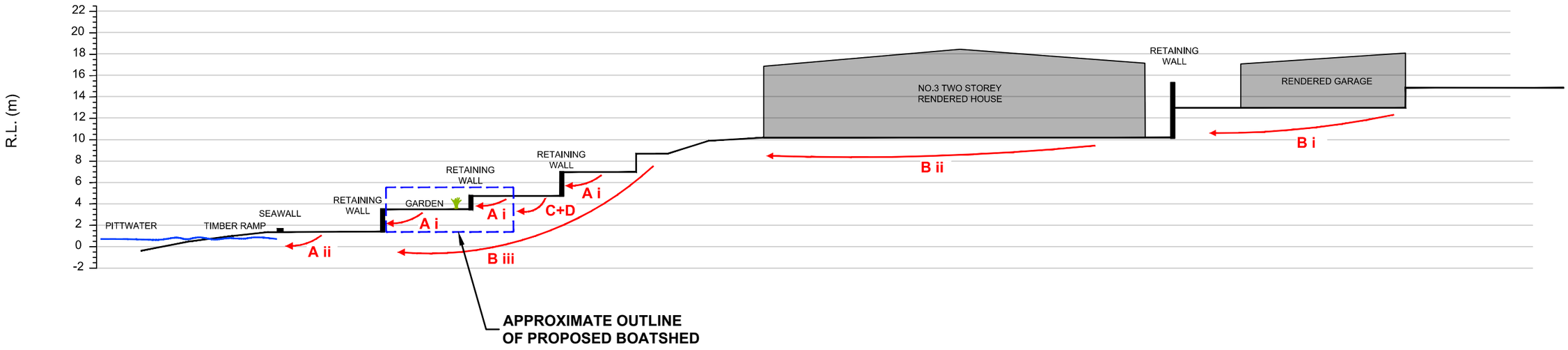


LEGEND

● Hand Auger Borehole from our Previous Geotechnical Investigation

Scale	0 — 10 Metres, 1:200@A3
Title:	GEOTECHNICAL SKETCH PLAN
Location:	3 PANIMA PLACE, NEWPORT, NSW
Report No:	34266RD
Figure No:	2

JKGeotechnics



NOTE:
FOR HAZARD DESCRIPTION REFER TO TABLE A.

0 4 8 12 16 20
V:SCALE 1:400 @A3 METRES
0 2 4 6 8 10
H:SCALE 1:200 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GEOTECHNICAL SKETCH SECTION A-A**

Location: 3 PANIMA PLACE, NEWPORT, NSW

Report No: 34266RD

Figure No: 3

JKGeotechnics

PLOT DATE: 11/08/2021 2:26:29 PM DWG FILE: Z:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\34000'S\34266PD NEWPORT\CAD\34266RD.DWG

TOPOGRAPHY

Symbol *Ground Profile*

convex
concave
} well defined or angular break of slope

convex
concave
} poorly defined or smooth change of slope

breaks of slope
changes of slope
} convex and concave too close together to allow the use of separate symbols

sharp
rounded
} ridge crest

Cliff or escarpment or sharp break
40° or more (estimated height in metres)
3

15 Uniform Slope
10 Concave Slope
8 Convex Slope
} Slope direction and angle (Degrees)

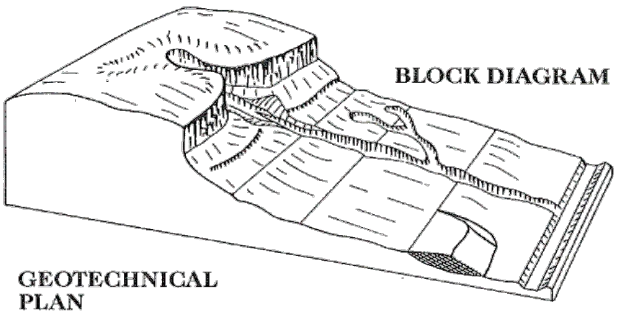
Top
Bottom
} Cut or fill slope, arrows pointing down slope

Hummocky or irregular ground

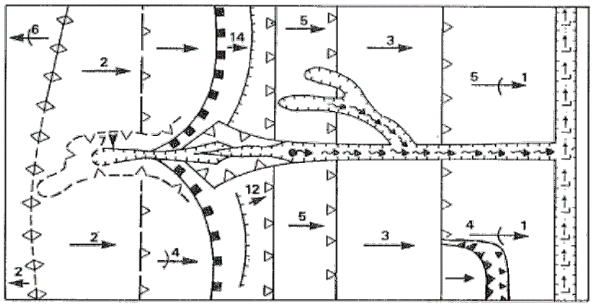
OTHER FEATURES

Boulder
Seepage/spring
Swallow hole for runoff
Natural water course
Open drain, unlined
Open drain, lined
Fenceline
Property boundary
Dry Stone Wall
J —— J Major joint in rock face
200 (opening in millimetres)
– T – T – Tension crack
10 (opening in millimetres)
Masonry or concrete wall
Ponding water
Boggy or swampy area

EXAMPLE OF USE OF TOPOGRAPHIC SYMBOLS:



GEOTECHNICAL PLAN

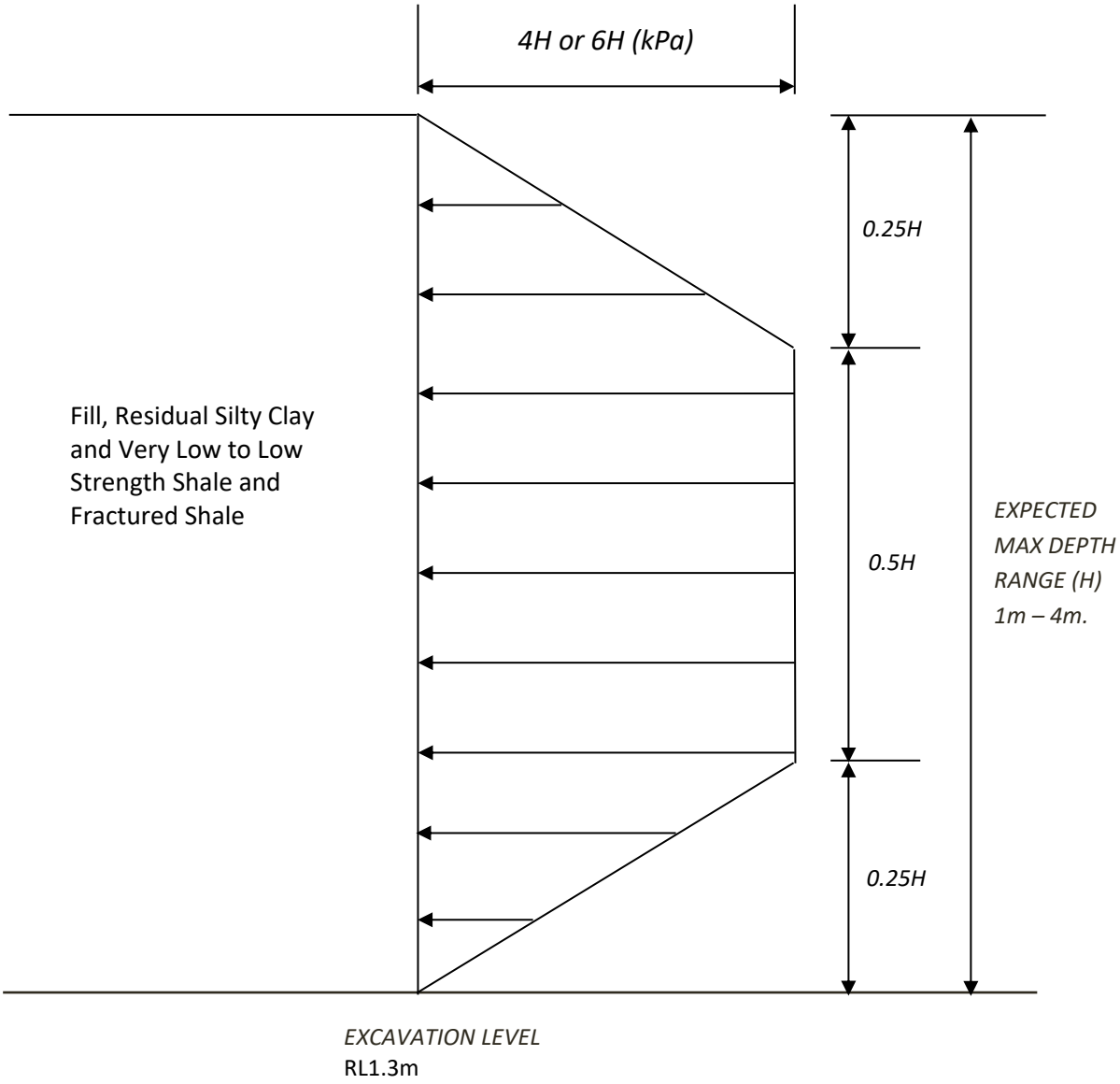


(After Gardiner, V & Dackombe, R. V. (1983), Geomorphological Field Manual; George Allen & Unwin).

Title: GEOTECHNICAL MAPPING SYMBOLS		
Location: 3 PANIMA PLACE, NEWPORT, NSW		
Report No: 34266RD	Figure No: 4	
JKGeotechnics		

This plan should be read in conjunction with the JK Geotechnics report.

PLOT DATE: 12/08/2021 11:19:11 AM DWG FILE: Y:\34000'S\34266P'D NEWPORT\CAD\34266RD.DWG



NOTE:

1 Use 4H for temporary case and for design where no movement sensitive structures or services are located within a horizontal distance 'H' from line of excavation.

2 Use 6H for design where movement sensitive structures or services are located within a horizontal distance 'H' from line of excavation.

3 Surcharge and groundwater pressures must be added to the above, if applicable.

4 Refer to text of report.

RECOMMENDED DESIGN PRESSURES FOR ANCHORED OR PROPPED RETAINING WALLS – FULL DEPTH RETENTION