

GEOTECHNICAL RISK ASSESSMENT REPORT FOR THE PROPOSED MONOPOLE NSW100619

AT THE

**PERISHER VALLEY SKI RESORT
KOSCIUSZKO ROAD
PERISHER VALLEY NSW**

Report No: 1241299-2

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CLIENT : Decon Technologies Pty Ltd
12 Dalmore Drive
SCORESBY VIC 3179

PROJECT : Site Number: NSW100619
Site Name: PERISHER VALLEY SKI RESORT
Street Address: Perisher Valley Ski Resort, Kosciuszko Road
(-36.401963, 148.404718)
Town: PERISHER VALLEY NSW

PROPOSAL : It is proposed to construct a 20.0 metre high monopole tower and a pre-fabricated equipment cabin/shelter at this site.

1. COMMISSION:

Carry out relevant insitu soil tests, log the borehole, and recommend suitable bearing capacities and founding depths for the proposed structure.

Carry out a risk assessment in accordance with AGS 2000.

All testing and observations carried out are to follow the relevant provisions of AS 1726:2017 (Geotechnical Site Investigations).

2. SITE GEOLOGY:

Geological maps of the area suggest that the site is in an area of Silurian Granodiorite. The natural soils encountered during the site investigation confirmed this.

3. SITE TOPOGRAPHY:

The ground surface over the site is undulating. The ground cover comprises of natural grasses and native trees.

4. INVESTIGATION:

One borehole was drilled by hand auger, mechanical auger and rock coring techniques at the approximate location shown on the attached plan.

The log of the borehole is attached showing the soil descriptions and depths along with any cohesive strengths measured and observed densities of non-cohesive soils.

5. FINDINGS:

The borehole revealed that the natural soil profile consisted of silty CLAY overlying extremely weathered ROCK, GRANITE, followed by distinctly weathered ROCK, GRANITE

Groundwater was not intersected in the borehole during the field investigation.

6. Risk Assessment – Essential Requirements Checklist

A review of plans and site photographs has been conducted by Civiltest on 14 March 2025, to conform to the essential requirements outlined in the NSW Government Planning & Environment, Geotechnical Policy Kosciuszko Alpine Resorts Form 1 (declaration and certification) for this proposal:

- a) No geotechnical hazards were identified during the initial site investigation, or during the review of contour plans and site photographs.
- b) N/A
- c) The initial geotechnical investigation was conducted on 7 November 2024, and the investigation was reviewed on 14 March 2025 to ensure that the investigation report conforms to the requirements of AGS 2000 and the Form 1 declaration.
- d) Site photographs and a contour plan of the site have been reviewed as part of the geotechnical risk assessment.
- e) The following geotechnical model has been constructed based on the contour plan Ref: "5801_Perisher Valley Telecommunications site survey PWBURNS PL 20240606".

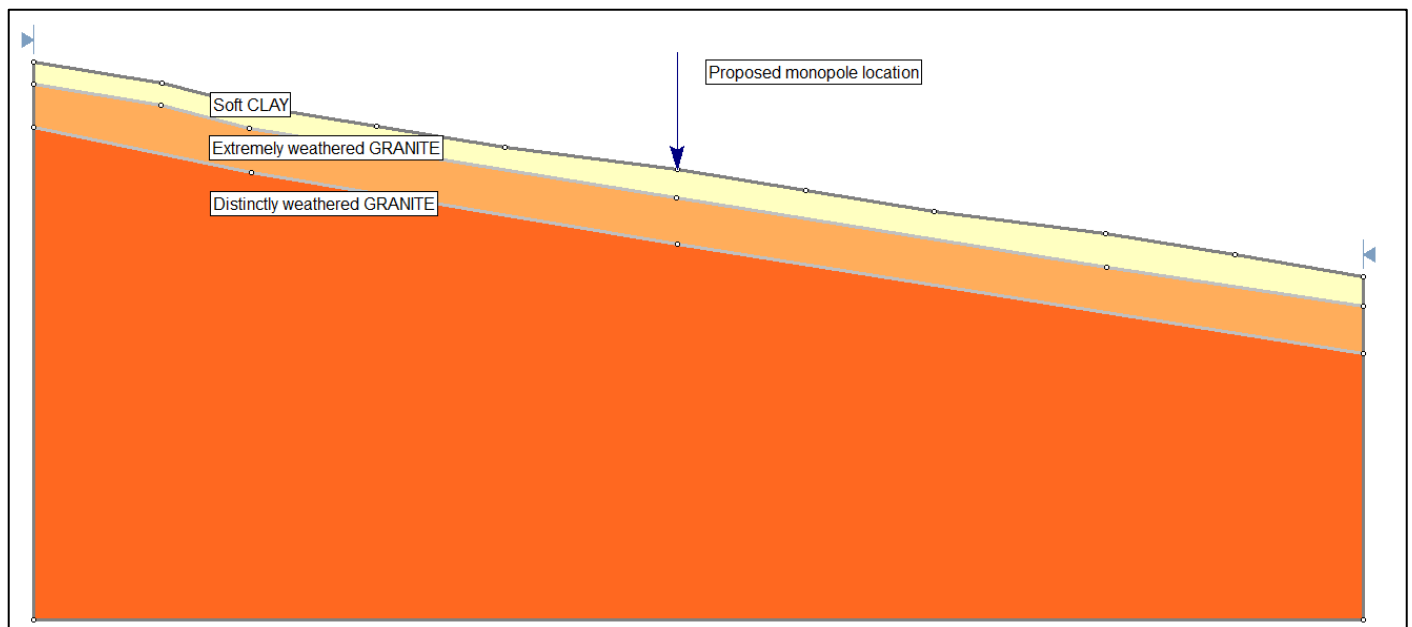


Figure 6.1 – Constructed geotechnical model of the proposed monopole site

- f) The proposed monopole development is considered suitable at this site. The engineering log notes the presence of soft CLAY at the surface of the site, and so good drainage practice should be maintained during and after construction to avoid the risk of surface creep.

7. RESISTIVITY IN SOIL BY CONDUCTIVITY MEASUREMENT:

The resistivity of the soil at this site was measured using the Wenner method (or four-pin method) following AS1768 – 2003.

As resistivity measurements are often distorted and invalidated by underground pieces of metal, underground aquifers, building footings, and the like, it is advisable that the resistivity at the site is checked after the tower/pole and service buildings have been built.

Test Number	Spacing (m)	Orientation	pE (Ω m)	ohms Per Cubic Metre
1	0.5	N-S	2086.02	692559.44
2	1	N-S	2752.04	1205394.22
3	2	N-S	4637.00	3422107.18
4	3	N-S	2054.61	671856.29
5	4	N-S	2513.28	1005312.00
6	6	N-S	3521.11	1973227.40
7	8	N-S	4322.84	2974115.02
8	10	N-S	7433.03	8793269.28
9	12	N-S	6031.87	5790597.12
10	16	N-S	7539.84	9047808.00
11	0.5	E-W	2202.26	771892.69
12	1	E-W	2507.00	1000291.72
13	2	E-W	3593.99	2055762.51
14	3	E-W	2356.20	883575.00
15	4	E-W	2764.61	1216427.52
16	6	E-W	3581.42	2041411.68
17	8	E-W	5428.68	4690383.67
18	10	E-W	6785.86	7328724.48
19	12	E-W	5956.47	5646736.97
20	16	E-W	7539.84	9047808.00

8. SITE CLASSIFICATION:

After considering the area geology, the soil profile encountered in the borehole, the proposed superstructure, and the climatic zone of the area, this site has been classified as CLASS P with respect to foundation construction (Australian Standard 2870 - 2011 Residential Slabs and Footings), due to the presence of currently growing and/or to be removed trees. However, this classification is technically not correct for the proposed type of structure, therefore is given as a guide only.

It is anticipated that the normal seasonal surface movement at this site without considering the abnormal moisture condition will not exceed 40mm.

It must be emphasised that the heave mentioned, and recommendations referred to in this report are based solely on the observed soil profile at the time of the investigation for this report without taking into account the effects of any abnormal moisture conditions that may develop after construction as defined in Clause 1.3.3 (A) (B) (C) (D) (E).

9. RECOMMENDATIONS FOR EQUIPMENT CABIN/SHELTER:

9.1 Edge Beams:

Although classified as CLASS P, it is recommended that a CLASS M (Refer AS 2870 - 2011) slab on ground should be used at this site with edge beams founded not less than 200mm below the finished surface level surrounding the structure.

However, the founding depth must be at least 100mm into any of the naturally occurring firm silty CLAY as described in the engineering logs, which from the site investigation can be assumed to have an allowable bearing pressure of 80kPa at this depth.

As a guide to the founding depths with regard to the above, along with information obtained from the bore, the founding depth at this site will be approximately 400mm in relationship to the existing surface, where this surface is assumed to be the finished surface level surrounding the structure.

After excavations for the footings have been completed, if there is any doubt as to the bearing capacity of the founding soil, then this company should be contacted.

9.2 Slab and or Stiffening Beams:

Any organic and deleterious matter should be removed from under the proposed slab area to a depth of not less than 50mm and replaced with levelling fill (See 8.4 below) under the slab and internal beams. This excavated surface can be assumed to have an allowable bearing pressure of at least 60kPa.

After excavations for the footings have been completed, if there is any doubt as to the bearing capacity of the founding soil, then this company should be contacted.

9.3 Modulus of Subgrade Reaction:

The surface material will provide a subgrade for the slab and based on the field observations and testing, can be assumed to have a modulus of subgrade reaction of 25kPa/mm. This is providing that all the vegetation and any soil containing deleterious matter have been removed and any soft areas have been well compacted.

9.4 Levelling Fill:

Up to 300mm of site derived clayey or 600mm of site-derived sandy or imported sandy levelling fill including existing fill material, if any, may be placed under the slab and internal beams providing that this filling is placed in 150mm thick layers and compacted in a moist condition using a light weight vibratory roller or vibratory plate tamper or similar to form a dense layer. Based on the likely condition of this levelling fill, an allowable bearing pressure of at least 50kPa can be assumed to exist beneath the slab and any internal beams founded in or on this filling.

If more than 300mm of site derived clayey or 600mm of site-derived sandy or imported sandy fill including existing fill material, if any, is required, then the slab must be designed as a suspended slab and supported by a grid of beams founded through any fill material in accordance with the above edge beam recommendations (or see 10.2 below).

Due to the nature and composition of the soil profile found in the site, construction during or after wet weather may be difficult. Therefore, it is recommended that an open cut drain be constructed around the proposed site to a depth of not less than 300mm below the site foundation material, or CLAY, whichever occurs first to intercept any groundwater. There is no need to maintain this drain after construction to ground level has been reached. At this stage the drain should be backfilled, failure to do so may have detrimental effects.

9.5 Foundations Adjacent to Easements:

It is recommended that where any footings are to be constructed next to existing underground services (sewers, etc.), then these footings or edge beams should be founded at a depth below the invert of the service at an angle of 45° for CLAYS and 30° for SANDS, unless special consideration has been given to the founding material.

After excavations for the footings have been completed, if there is any doubt as to the bearing capacity of the founding soil, then this company should be contacted.

10. RECOMMENDED TOWER FOUNDATIONS, ULTIMATE STRENGTH DESIGN:

10.1 Geotechnical Strength Reduction Factor:

A copy of Table 4.3.2(A) in AS2159 - 2009 used in the determination of Individual Risk Rating (IRR) and in turn the Average Risk Rating (ARR), is reproduced below. The relevant IRR values relating to the geotechnical investigation and established parameters have been included. It is recommended that the design engineer for the project should insert relevant IRR values for Design and Installation and determine the Average Risk Rating (ARR) and the corresponding Basic Geotechnical Strength Reduction Factor for use in Ultimate Strength Design.

Risk Factor	Weighting Factor (w _i)	IRR
SITE:		
Geological Complexity of the site	2	2
Extent of Ground Investigation	2	5
Amount & Quality of Geotechnical Data	2	5
DESIGN:		
Experience with similar foundations in similar Geological Conditions	1	2
Method of Assessment of Geotechnical Parameters for Design	2	5
Design Methods adopted	1	
Method of utilising results of in situ test data and installation data	2	
INSTALLATION:		
Level of Construction Control	2	
Level of performance monitoring of the supported structure during and after construction	0.5	

Copies of Table 4.3.2(B) and Table 4.3.2(C) from AS2159 – 2009 are attached to assist the engineer in the determination of ARR and the geotechnical strength reduction factor.

10.2 Foundations:

Foundations of the tower may adopt mass concrete pad footings. The following ultimate bearing pressures can be used at the depths indicated. These must be factored using the above reduction factor, determined from the completed table above.

Material	Depth (m)	Ultimate Bearing Pressure (kPa)
Extremely weathered ROCK, GRANITE – Low strength	1.0	800
Distinctly weathered ROCK, GRANITE – Medium strength	2.0	1200

An alternative foundation system to mass footings is bored piers. The pile foundation should be designed using the geotechnical properties given below and the specific pile properties, geometry and depth of embedment of the chosen pile foundation.

Material	Depth (m)	Ultimate Skin Friction (kPa)	Ultimate End Bearing (kPa)	Ultimate Lateral Resistance (kPa)
Distinctly weathered ROCK, GRANITE – Medium strength	3.0	200	3300	3000
Distinctly weathered ROCK, GRANITE – Medium strength	6.0	350	3800	3800
Distinctly weathered ROCK, GRANITE – Medium strength	8.0	400	4000	4000

10.3 Material Parameters:

Depth Range (m)	Material	γ_{bulk} (kN/m ³)	ϕ_u (deg)	ϕ' (deg)	C_u (kPa)	C' (kPa)	E (MPa)	UC (MPa)	ν	k_h (MN/m ³)	K_a	K_o	K_p	δ (deg)
0.0-0.6	Silty CLAY – Soft to firm	20.0	15	25	30	5	20-30	0.41	-	15	0.41	0.58	2.46	16
0.6-1.5	Extremely weathered ROCK, GRANITE – Low strength	21.5	-	-	-	-	350-1,000	0.6-2.0	0.25	300-1,000	-	-	-	-
1.5-9.0	Distinctly weathered ROCK, GRANITE – Medium strength	22.0	-	-	-	-	3,000-8,500	5-15	0.22	3,000-8,500	-	-	-	-

Where

- γ_{bulk} = Unit weight of the soil
- ϕ_u = Undrained angle of shearing resistance in the unsaturated condition
- ϕ' = Effective angle of shearing resistance
- C_u = Undrained cohesion in the unsaturated condition
- C' = Effective cohesion
- E = Elastic (Young's) modulus
- UC = Unconfined compressive strength – only for unfractured rock mass
- ν = Poisson's ratio
- k_h = Horizontal subgrade modulus
- K_a = Active earth pressure coefficient
- K_o = At-rest earth pressure coefficient
- K_p = Passive earth pressure coefficient
- δ = Soil/wall friction angle (2/3 of effective angle of shearing resistance)

The potential for liquefaction in the encountered soil profile is negligible.

Based on the Rock Quality Designation (RQD) and the strength of the rock, it is recommended that for shallow foundation construction, a 20-tonne excavator (with a hydraulic rock breaker) or similar equipment should be allowed for. An auger with a rock bit, or a core barrel with a rock bit, would be required for the excavation of bored piers.

If there is any doubt as to the bearing capacity of the founding soil, then this company should be contacted.

11. CONDITIONS OF THE RECOMMENDATIONS:

Since the soil horizons and layers can vary in depth and thickness over the site, the depths and bearing pressures given above are given as a guide only. If the footings are founded at the minimum depth, as stated, and are in the soil as described in the logs of boring for this site, then the requirements of this report have been met.

11.1 Where any filling is to be placed (other than under the floor slab, refer to 8.4 above) the footing founding depths recommended in this report will need to be increased accordingly by the depth of that fill unless one of the following occurs:-

11.1.1 The base of the footing is founded in the founding soil recommended in sections 8 and 9 above.

11.2 The description of the soils found in the borehole closely follows those outlined in AS 1726:2017 (Geotechnical Site Investigations). Colour descriptions can vary with soil moisture content. It should be noted therefore, colour and shade descriptions mentioned in this report are made when the soil is in a moist condition.

11.3 After excavations for the footings have been completed, if there is any doubt as to the bearing capacity of the founding soil, then this company should be contacted.

11.4 This report has been compiled and recommendations made based on information supplied in the brief to Civiltest Pty Ltd and from the field investigation and observations made including the extent of if any, site filling. Every care has been taken within the terms of the brief to ensure that the field investigation is representative of the site. Therefore, if it is found that for any reason information received by Civiltest Pty Ltd is incorrect or conditions on site vary considerably during construction to those described in this report then the comments and recommendations made in this report may need to be amended.

11.5 To ensure acceptable long-term performance of the footing systems recommended in this report, care should be taken that the fundamental building, landscaping, and long-term maintenance procedures are adhered to as set out in the CSIRO Division of Building, Construction, and Engineering: Building Technology File 18-2011, "Foundation Maintenance and Footing Performance: A homeowners guide" which is available on the CSIRO website <http://www.publish.csiro.au/home.htm>. This information sheet forms an integral part of this report.

11.6 Abnormal Moisture Conditions:

The recommendations made in this report are based on current findings and investigations. Civiltest Pty Ltd cannot be held responsible for any financial loss and/or hardship in relation to the construction of the structure and future performance of the footing system if relevant historical information has not been supplied in writing by the client to Civiltest Pty Ltd. (For example, the recent removal of trees or buildings or any other activity that is likely to have created abnormal moisture conditions as defined in AS2870.)

11.7 The recommendations given in this report have been based largely on the soil conditions encountered at the time of the field investigation. Under inclement weather or prolonged wet weather conditions, the soil conditions noted and reported herein could vary. It is advisable to undertake construction during and following dry weather conditions (i.e., not during or following inclement weather or prolonged wet weather conditions).

11.8 Whilst Civiltest Pty Ltd has accepted the commission for the work reported herein, the ownership of the report and any liabilities associated with it, remain with Civiltest Pty Ltd until all relevant accounts have been paid.

11.9 Any levels referred to in Civiltest Pty Ltd reports should be regarded as general and are not to be interpreted as surveyed confirmed levels. All levels should be checked and confirmed by a licensed surveying organisation or qualified personnel.

11.10 Finally, no responsibility will be taken for this report if it is altered in any way or is not reproduced in full.

This report consists of twelve pages including a site plan. Appendices A, B, C and D are attached.

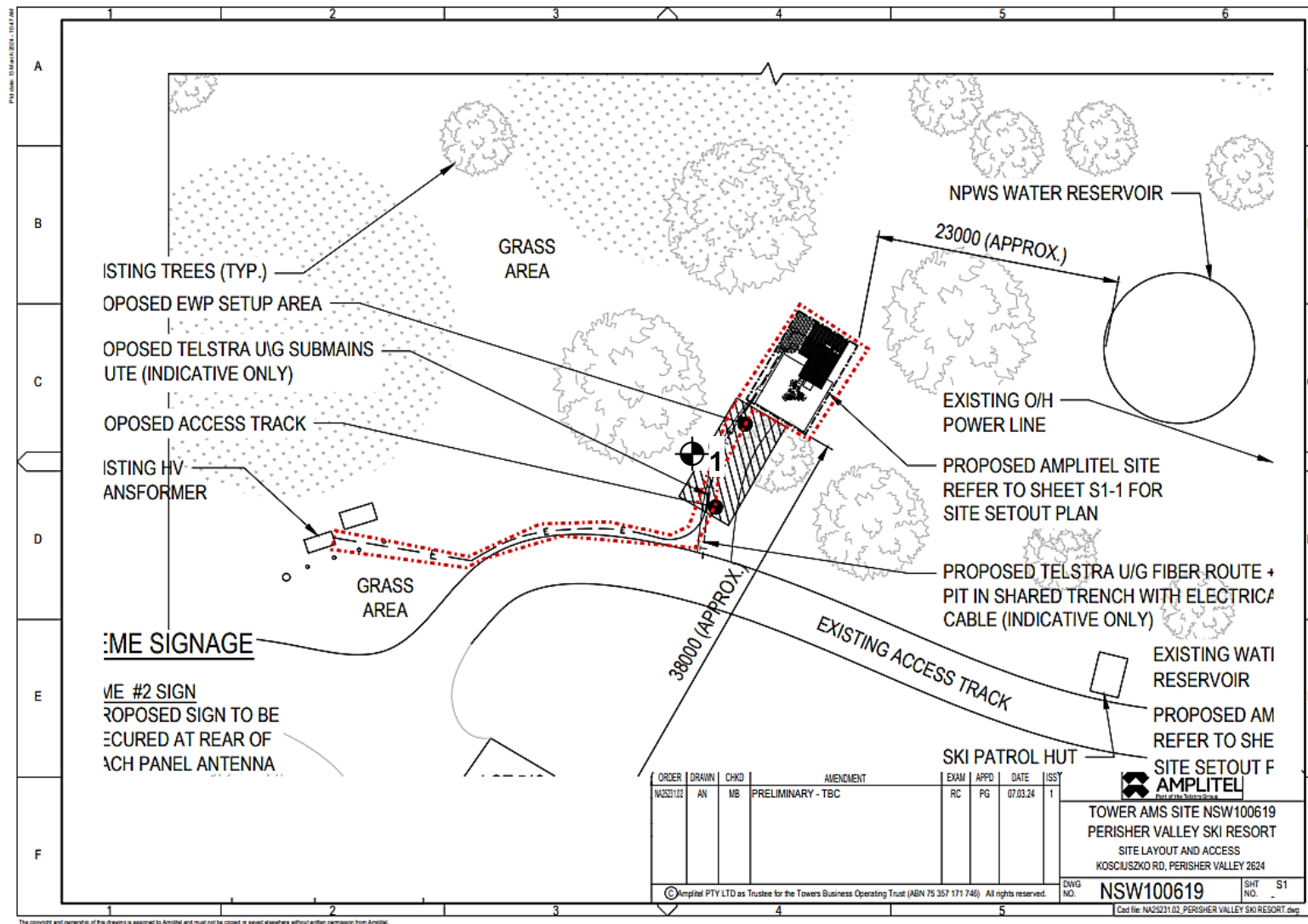


JINKE YU
SENIOR GEOTECHNICAL ENGINEER
CIVILTEST PTY LTD

REF: mc/am/PK/ms/sl/DT/jy/sb

14 March 2025

LOCATION OF TEST SITE: NSW100619 PERISHER VALLEY SKI RESORT, KOSCIUSZKO ROAD, PERISHER VALLEY NSW



 Denotes Borehole

THIS PLAN IS NOT INTENDED TO BE AN
ACCURATE DEPICTION OF THE NUMBER, SIZE
OR LOCATION OF TREES AND/OR SHRUBS

NOT TO SCALE

Appendix A

Engineering Log

ENGINEERING LOG

REPORT NO. 1241299-1

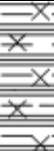


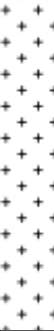



BOREHOLE NO. 1

DATE: 07-NOV-2024

FIELD TECHNICIAN: MC AM

DRILLING METHOD: HA & SFA : Hand Auger & Track Rig

PROJECT LOCATION: Perisher Valley Ski Resort Kosciuszko Road (-36.401963, 148.404718) (NSW100619 PERISHER VALLEY SKI RESORT) P

DEPTH (m)	METHOD	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING				
					DEPTH (m)	RESULTS			
						Is(50) MPa	SPT	DCP Blows/100mm	PP (kg/cm ²)
0.3		CL CLAY, silty, trace gravel Brown; Moist(w<PL); Soft Gravel is rounded to sub-rounded, fine grained							
0.6		CL CLAY, silty, trace gravel Brown grey; Dry; Firm Gravel is rounded to sub-rounded, fine grained							
1.5		Extremely Weathered GRANITE Grey brown; Dry; Low strength							
2.0	Coring 1ST RUN	Distinctly Weathered GRANITE Grey; Dry; Medium strength	TCR:40% RQD:28% IF, FR 20° to 60° RF V UN RO 10-70mm						
3.5		Distinctly Weathered GRANITE White mottled black; Dry; Medium strength	TCR:96% RQD:93% FR 10° to 70° RF V UN RO, VR 0-20mm						
5.0	Coring 2ND RUN	Distinctly Weathered GRANITE White mottled black; Dry; Medium strength	TCR:98% RQD:94% FR 10° to 65° K V UN RO 0-4mm						
	Coring 3RD RUN	Distinctly Weathered GRANITE White mottled black; Dry; Medium strength Continued on next page	TCR:94% RQD:45% FR						

Fracture Type

BP	Bedding Parting
JT	Joint
FT	Fault
SM	Seam
SZ	Sheared Zone
CS	Crushed Seam
IZ	Infilled Zone
FZ	Fractured Zone

Surface Shape

PD	Planar
CV	Curved
IRR	Irregular
UN	Undular
ST	Stepped

Infill

K	Clean
CL	Clay
CA	Carbonate
IR	Iron
RF	Rock Fragments
RC	Rock Fragments and Clay

Roughness

SL	Slicken sided
PO	Polished
SO	Smooth
RO	Rough
VR	Very Rough

Infill Thickness

V	Veneer less than 1mm thick
SN	Stain less than 1mm thick
Number	Other thick

Rock Quality

TCR	Total Core Recovery %
RQD	Rock Quality Designation %

Appendix B

Soil Resistivity

Soil resistivity is another term for specific resistance of soil and is expressed in ohm metres (symbol $\Omega \cdot m$). The resistivity of the soil depends on its chemical and mechanical composition, moisture content and temperature.

Methodology

The measuring method in accordance to Australian Standard AS/NZS 1768 (Int): 2003 is based on the measuring procedure universally accepted Wenner method developed by Dr. Frank Wenner of the US Bureau of Standards in 1915. (Ref: F. Wenner. A method of measuring Earth Resistivity; Bull National Bureau of Standards, Bull 12 (4) 258, s 478-496; 1915/16.

The Wenner or four-pin method of soil resistivity measurement involves the use of four test pins (test electrodes) equally spaced in a straight line and driven to the same depth d , not exceeding 5 Percent of their separation and not more than 1 metre in any case.

The ground stakes are positioned in a straight line equidistant from one another and a distance between one another reflecting the depth to be measured. The ground stakes are screwed no deeper than $1/3$ the distance from one another. A known fixed current is generated by the resistivity measuring instrument (GEO) between the two outer ground stakes and a drop in potential (which is the result of resistance) is then measured automatically between the two inner ground stakes, then the GEO displays the resistance value in ohms. Because measurement results are often distorted and invalidated by underground pieces of metal, underground aquifers etc, additional measurement is taken in which the stake's axis is turned 90 degrees. By changing the depth and distance several times a profile is produced that can determine a suitable ground resistance system.

The Wenner or four-pin method of soil resistivity measurement formula is as follows:

pE Formula:	$2 \pi a RE$
pE	mean value of resistivity ($\Omega \cdot m$)
RE	measured resistance (Ω)
a	probe distance (m)

Table 1

Refer to Appendix C for Field Resistivity Measurements.

Field Resistivity Results (Example only)

Test Number	Spacing (m) a	Orientation	RE Ω	pE (Ω m)	Ohms per cubic metre
1	20	E-W	0.18	22.62	81.43

Table 2

Mean value of resistance at 20m spacing (E-W) is 22.62 Ω m and 81.43 ohms per cubic metre at 20m spacing.

Ohms per metre calculation

To measure the soil resistivity GEO reading in ohms, spacing (a) is multiplied by pE (Ω m), multiplied by RE Ω value (0.18).

Example:

Refer to test number 1:

Formula: $20 \times 22.62 \times 0.18 = 81.43$ ohms per cubic metre.

The above calculation can be adopted based on the specific requirements at the subject land.

APPENDIX C

Report No: 1241299-1

Date: 7/11/2024

Site Name: NSW100619 PERISHER VALLEY SKI RESORT NSW

Soil Resistivity Test

FIELD READINGS				CALCULATIONS*	
Test Number	Spacing (m)	Orientation	RE Ω	pE (Ω m)	ohms per cubic metre
1	0.5	N-S	664.00	2086.02	692559.44
2	1	N-S	438.00	2752.04	1205394.22
3	2	N-S	369.00	4637.00	3422107.18
4	3	N-S	109.00	2054.61	671856.29
5	4	N-S	100.00	2513.28	1005312.00
6	6	N-S	93.40	3521.11	1973227.40
7	8	N-S	86.00	4322.84	2974115.02
8	10	N-S	118.30	7433.03	8793269.28
9	12	N-S	80.00	6031.87	5790597.12
10	16	N-S	75.00	7539.84	9047808.00
11	0.5	E-W	701.00	2202.26	771892.69
12	1	E-W	399.00	2507.00	1000291.72
13	2	E-W	286.00	3593.99	2055762.51
14	3	E-W	125.00	2356.20	883575.00
15	4	E-W	110.00	2764.61	1216427.52
16	6	E-W	95.00	3581.42	2041411.68
17	8	E-W	108.00	5428.68	4690383.67
18	10	E-W	108.00	6785.86	7328724.48
19	12	E-W	79.00	5956.47	5646736.97
20	16	E-W	75.00	7539.84	9047808.00

*pE Formula: $2 \pi a RE$

pE mean value of resistivity (Ω m)

RE measured resistance (Ω)

a probe distance (m)

Formula For cubic metre: $pE \times a \times RE \Omega$ phm per cubic metre

Meter: FLUKE/AEMC

Appendix D

Table 4.3.2(B) and Table 4.3.2(C) from AS2159 – 2009

TABLE 4.3.2(B) INDIVIDUAL RISK RATING (IRR)	
Risk level	Individual risk rating (IRR)
Very low	1
Low	2
Moderate	3
High	4
Very high	5

TABLE 4.3.2(C) BASIC GEOTECHNICAL STRENGTH REDUCTION FACTOR (ϕ_{gb}) FOR AVERAGE RISK RATING			
Range of average risk rating (ARR)	Overall risk category	ϕ_{gb} for low redundancy systems	ϕ_{gb} for high redundancy systems
ARR ≤ 1.5	Very low	0.67	0.76
1.5 < ARR ≤ 2.0	Very low to low	0.61	0.70
2.0 < ARR ≤ 2.5	Low	0.56	0.64
2.5 < ARR ≤ 3.0	Low to moderate	0.52	0.60
3.0 < ARR ≤ 3.5	Moderate	0.48	0.56
3.5 < ARR ≤ 4.0	Moderate to high	0.45	0.53
4.0 < ARR ≤ 4.5	High	0.42	0.50
>4.5	Very high	0.40	0.47