THREDBO RESORT

PROPOSED WOMBAT WALK CONNECTOR
THREDBO, NSW

GEOTECHNICAL INVESTIGATION REPORT

NOVEMBER 2023

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TABLE OF CONTENTS

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1 INTRODUCTION

At the request of Thredbo Resort, ACT Geotechnical Engineers Pty Ltd carried out a geotechnical investigation for proposed Wombat Walk Connector mountain bike trail in Thredbo, NSW.

The development site is located within the designated "G" area on the geotechnical maps supporting the Geotechnical Policy Kosciuszko Alpine Resorts, requiring a geotechnical report. However, in accordance with Section 3.1 (e) of the Policy, the development is considered minor construction works which present "minimal or no geotechnical impact" on the site as determined by the attached Form 4. Therefore, a geotechnical investigation report is not considered necessary.

The construction of the MTB trail will comprise minor earthworks not involving excavations or fill in excess of one metre in vertical height. Low impact construction methods will be utilised to form the trail including hand tools and a mini excavator. The trail corridor will be a maximum of 3m wide, with the average 2.5m. The Project will require minor vegetation clearing, removal of loose rocks, compaction of the trail tread and trail demarcation using logs, rocks etc., installation of signage and site stabilisation and rehabilitation works.

An elevated platform will be installed in one location on the trail where it crosses a drainage line downslope of the existing Home Run trail platform.

The aim of the investigation was to:

(i) Identify subsurface conditions including the extent and nature of any fill materials, soil strata, bedrock type and depth, and groundwater presence.

(ii) Provide the site classification to AS2870 "Residential Slabs & Footings".

(iii) Advise on excavation conditions and suitability of excavated material for use as structural fill.

(iv) Advice for construction of building platforms.

(v) Drainage and other geotechnical advice.

2 SITE DESCRIPTION & GEOLOGY

The mountain bike (MTB) trail commences on the skiers left of Milk Run ski run, follows the existing Wombat Walk access track and terminates at the base of Snowgums Chairlift at Valley Terminal. The trail will require the installation of an elevated platform over the drainage line below the existing Home Run platform.

Local geology maps indicate the site to be underlain by Silurian age Bullenbalong Supersuite bedrock, part of the Mowambah Granodiorite, which includes granodiorite and granite.

3 INVESTIGATION METHODS

The site investigation was conducted on 1 October 2023, comprising three push-tube boreholes spread over the area of the proposed bike trail and drilled to ~2m depth, or shallower refusal in bedrock.

The subsurface profiles were logged in accordance with AS1726-2017. The locations of the boreholes are shown on Figure 2, and the detailed logs are included in Appendix A.

Definitions of geotechnical engineering terms used in the report on the borehole logs, including a copy of the USCS chart, are provided in Appendix B.

4 INVESTIGATION RESULTS

4.1 Subsurface Conditions

The subsurface conditions of the proposed development were investigated by three boreholes designated BH6 to BH8. The excavation logs in Appendix A can be referred to for more detail. Investigation pits found the subsurface profile to comprise:

Geological Profile	Typical Depth Interval	Description
TOPSOIL	0.0m to 0.2m/0.3m	SILTY SAND; low plasticity fines, fine to coarse sand, brown, grass roots, dry to moist, loose.
FILL	0.25m/0.3m to 0.6m/0.7m	Gravelly Clayey SAND; fine to coarse sand, low plasticity fines, sub-angular granite fine to coarse gravel, brown some sub-angular granite cobbles to 100mm size, trace of organic debris, dry to moist, loose to medium dense. Not encountered in BH8.
COLLUVIAL AND ALLUVIAL SOILS	0.2m/0.7m to 1.3m/>1.75m	Gravelly Clayey SAND; fine to coarse sand, low to medium plasticity fines, sub-angular granite fine to coarse gravel, brown, some sub-angular granite cobbles to 100mm size, dry to moist, loose to medium dense.
BEDROCK	Below 1.3m/>1.75m	Extremely to Highly Weathered (XW/HW) GRANODIORITE; fine to coarse grained, fine to coarse sub-angular gravel, grey, white, dry to moist, extremely weak to very weak strong rock. Potentially large boulders. Not encountered in BH7.

4.2 Groundwater

Groundwater was not encountered in the boreholes and the soil was mostly dry to moist. However, temporary, perched seepages could be encountered following rainfall within the more pervious soils. It is expected that intermittent groundwater would be present within the soils overlying the weathered granite.

5 DISCUSSION & RECOMMENDATIONS

5.1 Site Classification

Due to the presence of uncontrolled fill materials exceeding 0.4m depth, the presence of mature trees within the influence distance of the proposed structure and encountered ground conditions and gradient of the slope, the site is designated as a Class "P" (problem) site in accordance with AS2870. If the fill is removed, or if footings are founded in the colluvial/alluvial soil or weathered material below, a Class "S" (slightly reactive) category can be used in design of new footings. The characteristic ground surface movement "ys", as defined by AS2870 for the range of normal soil moisture conditions is estimated to be between 10mm to 20mm for the encountered subsurface profile described in Section 2.

Whilst the design method in AS2870-2011 Appendix H attempts to account for the effect of trees, due to the complexity of tree root geometry, variable moisture extraction by the trees and the difficultly in predicting tree growth, a precise assessment for the effects of trees is not possible.

Should earthworks (cut or fill) be undertaken on the site, or other activities which may cause abnormal moisture conditions to impact the soils within or near the building envelope beyond those addressed herein, the site classification shall be reassessed.

5.2 Footings

As the site has been classified as Class P, footing design for the platform shall be undertaken in accordance with engineering principles, based upon the requirements on AS2870 (Reference 2) and the characteristic ground surface movement estimate of 10mm to 20mm.

Proposed Wombat Walk modular bike bridge, piers/drive posts extending to granite bedrock below ~1.7m should be used. Bored piers, if extended to below alluvial perched seepages that perched above the regional unconfined aquifer in local depressions, may require liners, as pier holes could collapse below groundwater level. Therefore, CFA (Continuous flights auger), screw in piers or concrete/steel driven piles may be more practical.

For other structures founded at existing grade, footings, including thickened sections of slabs forming footings should be founded below any topsoil or uncontrolled fill soils in the medium dense colluvial/alluvial soils or weathered bedrock below 0.5m/0.7m depth or in newly placed controlled fill (Section 5.5).

Footings should be inspected by a geotechnical or structural engineer to confirm the ground conditions. Alternatively, footings could be founded in newly placed controlled fill (Section 5.6) or on bored piers/drive posts extending to weathered bedrock.

If designing footings based on engineering principles, recommended allowable end-bearing pressures for various footing systems and likely foundation materials are provided in Table 1.

TABLE 1. Recommended Allowable Bearing Pressures for Footings

Foundation Material Type	Depth Below Existing Surface	Allowable End-Bearing Pressure		
		Strips	Pads	Bored Piers / Driven Piles[1]
Newly Constructed Controlled Fill (Section 5.5)	-	100kPa	125kPa	N/A
Medium Dense or better Colluvial/Alluvial Soil	Below 0.5m/0.7m	100 kPa	125 kPa	200kPa
XW/HW Bedrock	Below 1.3m/>1.75m	600kPa	750kPa	1000kPa

[1]Assumes a minimum embedment depth of 4 pile diameters

Note: Ultimate bearing capacities would be 3 times the allowable values.

5.3 Excavation Conditions & Use of Excavated Material

Proposed earth works for the platform and minor cut-to-fill excavations for the MTB tracks will be through topsoil, existing fill, colluvial/alluvial soils, and possibly into Extremely to Highly Weathered (XW/HW) bedrock which are readily diggable by backhoe or medium sized excavator up to ~1m/>1.75m depth.

A high quality crushed rock or stabilised sand subgrade is advisable for general backfill under mountain road crossings, to prevent post-construction settlement. However, a properly compacted ordinary backfill of available low and medium plasticity sandy existing fill and colluvial/alluvial soils could provide a satisfactory, less expensive alternative.

The low/medium plasticity alluvial/colluvial soils can be used in controlled fill construction of building platforms if required, although rock particles should be broken down to <75mm size. Any medium to high plasticity soil, and silty topsoil/alluvial material are not typically used in controlled fill construction, but the topsoil could be used in non-structural applications such as landscaping.

If imported fill is required, a suitable select fill material would include a low or medium plasticity soil such as clayey sand or gravelly clayey sand, containing between 25% and 50% fines less than 0.075mm size (silt and clay), and no particles greater than 75mm size.

5.4 Stable Excavation Batters

The client advised that excavation batters won't be necessary due to the scope of works. However, if necessary, temporary site excavations to 1.5m depth can be formed near vertical, although loose fill should be cut back at 1(H):1(V). If required and space allows, deeper temporary cuts can be formed at 1(H):1(V) or benched at 1.5m intervals in soils, and 0.5(H):1(V) in weak rock.

Permanent cut & fill batter slopes should be formed at no steeper than 2(H):1(V) in soil and EW/HW bedrock and be protected against erosion by suitable methods.

5.5 Site Drainage

Suitable surface drainage should be provided to ensure that rainfall run-off or other surface water cannot pond against the trail tread and platform. Subsoil drains should be provided as required on the upslope sides of the trail tread.

REFERENCES

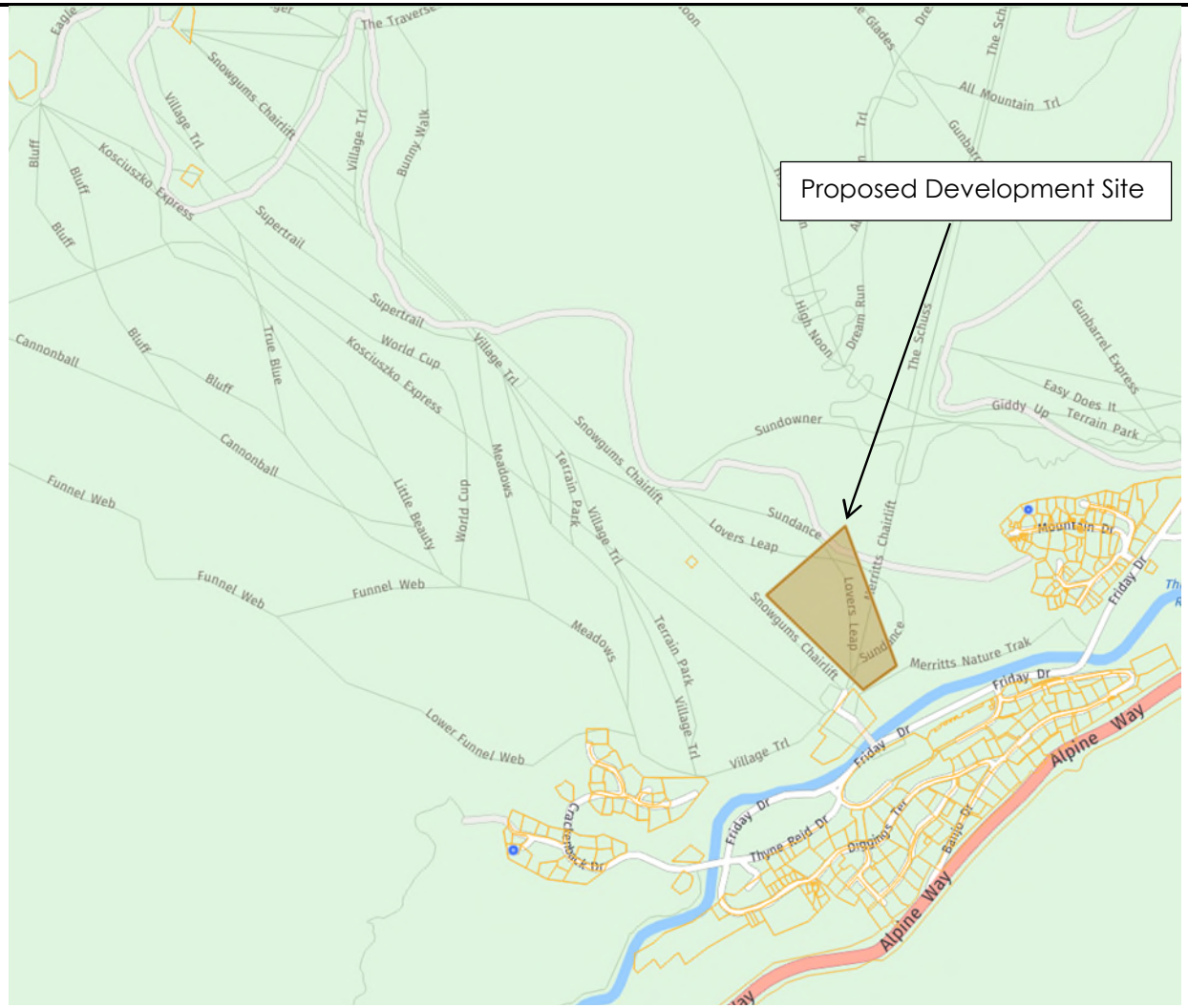
Reference 1 Geological Survey of NSW, "Monaro – 1:500,000 Geological Sheet", 1971.

Reference 2 Standards Australia, "AS2870 - Residential slabs and footings - Construction", 2011.

Reference 3 Standards Australia, "AS3798 - Guidelines on Earthworks for Commercial & Residential Developments", 1996.

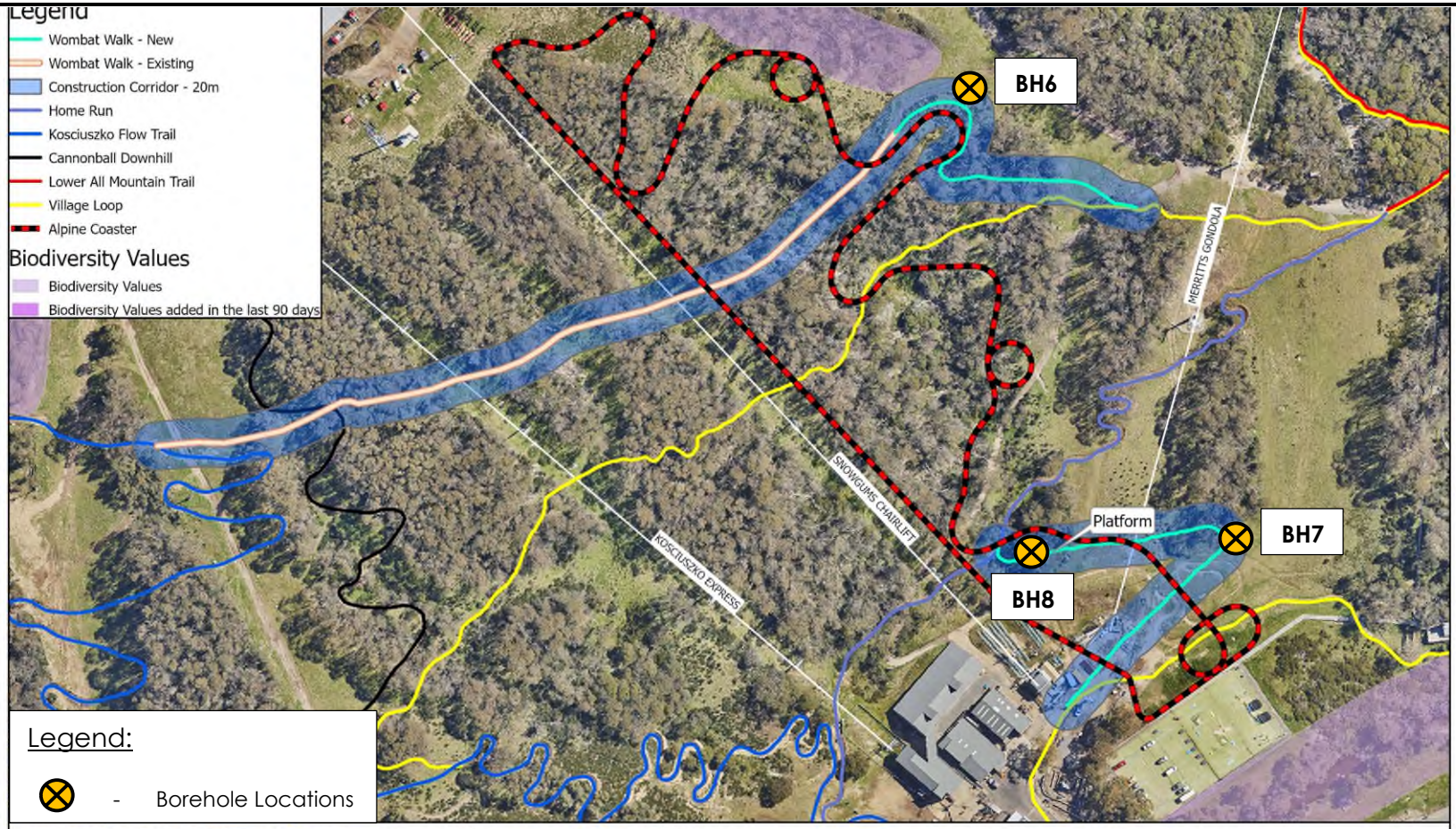
Reference 4 Geoscience Australia - http://www.ga.gov.au/darwin-view/hazards.xhtml# 13 July 2017.

Reference 5 Standards Australia, "AS1170.4 - 1993 - Minimum Design Loads on Structures Part 4: Earthquake Loads".



THREDBO RESORT
PROPOSED WOMBAT WALK CONNECTOR
THREDBO, NSW
SITE LOCALITY

ACT Geotechnical Engineers Pty Ltd	C14767.2	FIGURE 1



THREDBO RESORT
PROPOSED WOMBAT WALK CONNECTOR
THREDBO, NSW
AERIAL PHOTOGRAPH & BOREHOLE LOCATIONS

APPENDIX A
Borehole Log BH6 to BH8

Borehole Log

Borehole No. **BH6**

Sheet 1 of 1

Job No. C14767

CLIENT: Thredbo Resort

PROJECT PROPOSED BIKE TRAIL & SNOWMAKING SYSTEM THREDBO, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Pushtube
Hole Diameter : 50mm

Samples	Casing	Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure (Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure)	Consistency or Relative Density	Field Test Results	Geological Profile
				SM	SILTY SAND; low plasticity fines, fine to coarse sand, brown, grass roots, dry to moist.	LOOSE		TOPSOIL FILL
		0.25		SP-SC	Gravely Clayey SAND; fine to coarse sand, low plasticity fines, sub-angular granite fine to coarse gravel, brown, some sub-angular granite cobbles to 100mm size, trace of organic debris, dry to moist.	MEDIUM DENSE		FILL
		0.6		GC	Gravely Clayey SAND; fine to coarse sand, low to medium plasticity fines, sub-angular granite fine to coarse gravel, brown, some sub-angular granite cobbles to 100mm size, dry to moist.	DENSE		COLLUVIAL SOIL
		1.0						
		1.3			Extremely to Highly Weathered (XW/HW) GRANODIORITE; fine to coarse grained, fine to coarse sub-angular gravel, grey, white, dry to moist, extremely weak to very weak strong rock. Potentially large boulder refusal.			BEDROCK
		1.65			BOREHOLE TERMINATED AT 1.65m			
		2.0						
		2.4						

Logged By : AS Date : 11/3/23 Checked By : JM Date :

BOREHOLE/EXCAVATION LOG C14767.GPJ ACT GEO.GDT 5/12/23

ACT Geotechnical Engineers

Act Geo Engineers

Borehole Log

Borehole No.	**BH7**
Sheet	1 of 1
Job No.	C14767

CLIENT: Thredbo Resort

PROJECT: PROPOSED BIKE TRAIL & SNOWMAKING SYSTEM THREDBO, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Pushtube
Hole Diameter : 50mm

Samples	Casing	Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
				SM	SILTY SAND; low plasticity fines, fine to coarse sand, brown, grass roots, dry to moist.	LOOSE		TOPSOIL FILL
		0.3		SP-SC	Gravely Clayey SAND; fine to coarse sand, low plasticity fines, sub-angular granite fine to coarse gravel, brown, some sub-angular granite cobbles to 100mm size, trace of organic debris, dry to moist.	MEDIUM DENSE		FILL
		0.7		GC	Gravely Clayey SAND; fine to coarse sand, low to medium plasticity fines, sub-angular granite fine to coarse gravel, brown, some sub-angular granite cobbles to 100mm size, dry to moist.	DENSE		COLLUVIAL SOIL
		1.0						
		1.75			BOREHOLE TERMINATED AT 1.75m			
		2.0						
		2.4						

Logged By : AS Date : 11/3/23 Checked By : JM Date :

BOREHOLE/EXCAVATION LOG C14767.GPJ ACT GEO.GDT 5/12/23

ACT Geotechnical Engineers

Act Geo Engineers

Borehole Log

Borehole No.	BH8
Sheet	1 of 1
Job No.	C14767

CLIENT: Thredbo Resort

PROJECT: PROPOSED BIKE TRAIL & SNOWMAKING SYSTEM THREDBO, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Pushtube
Hole Diameter : 50mm

Samples	Casing	Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure (Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure)	Consistency or Relative Density	Field Test Results (Dynamic Cone Penetrometer Test, Results in Blows per 100mm)	Geological Profile
				SM	SILTY SAND; low plasticity fines, fine to coarse sand, brown, grass roots, dry to moist.	LOOSE	DCP 0, 0	TOPSOIL
		0.2		GC	Gravely Clayey SAND; fine to coarse sand, low to medium plasticity fines, sub-rounded granite fine to coarse gravel, brown, some sub-rounded granite cobbles to 200mm size, moist to wet.	LOOSE TO MEDIUM DENSE	0, 1, 2, 1, 1, 2, 3, 3, 3, 3, 6, 6, 6, 8, 10	COLLUVIAL AND ALLUVIAL SOILS
		1.0						
		1.7	+ + + + + +		Extremely to Highly Weathered (XW/HW) GRANODIORITE; fine to coarse grained, fine to coarse sub-angular gravel, grey, white, moist, extremely weak to very weak strong rock. Potentially large boulder refusal.		15	BEDROCK
		1.8					12, 15, 23, 25, 28	
		2.0						
		2.4			BOREHOLE TERMINATED AT 2.3m			

Logged By : AS Date : 11/3/23 | Checked By : JM Date :

BOREHOLE/EXCAVATION LOG C14767.GPJ ACT GEO.GDT 5/12/23

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Act Geo Engineers

APENDIX B

DEFINITIONS OF GEOTECHNICAL ENGINEERING TERMS

DESCRIPTION AND CLASSIFICATION OF SOILS

The methods of description and classification of soils used in this report are based on the Australian Standard 1726 – 1993, Geotechnical site investigations. In general, descriptions cover the following properties – soil type, colour, secondary grain size, structure, inclusions, strength or density and geological description.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy clay) on the following basis:

Classification	**Particle Size**
Clay	Less than 0.002mm
Silt	0.002mm to 0.06mm
Sand	0.06mm to 2.00mm
Gravel	2.00mm to 60.00mm
Cobbles	60mm (63mm) to 200mm
Boulders	>200mm

Soils are also classified according to the Unified Soil Classifications System which is included in this Appendix. Rock types are classified by their geological names.

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The terms are defined as follows:

Consistency	**Shear Strength su(kPa) (Representative Undrained Shear)**	
Very soft	< 12	<2 (~SPT "N")
Soft	12 - 25	2-4
Firm	25 - 50	4-8
Stiff	50 – 100	8-15
Very Stiff	100 – 200	15-30
Hard	> 200	>30

Non-cohesive soils are classified on the basis of relative density, generally from the results of in-situ standard penetration tests as below:

Term	**Relative Density (%)**	**SPT Blows/300mm 'N'**
Very loose	< 15	<4
Loose	15-35	4-10
Medium dense	35-65	10-30
Dense	65-85	30-50
Very Dense	>85	>50

SAMPLING

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are generally taken by one of two methods:

1. Driving or pushing a thin walled sample tube into the soil and withdrawing with a sample of soil in a relatively undisturbed state.

2. Core drilling using a retractable inner tube (R.I.T.) core barrel.

Such samples yield information on structure and strength in additions to that obtained from disturbed samples and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

PENETRATION TESTING

The relative density of non-cohesive soils is generally assessed by in-situ penetration tests, the most common of which is the standard penetration test. The test procedure is described in Australian Standard 1289 “Testing Soils for Engineering Purposes” Testing Soils for Engineering Purposes” – Test No. F3.1.

The standard penetration test is carried out by driving a 50mm diameter split tube penetrometer of standard dimensions under the impact of a 63 kg hammer having a free fall of 750mm.

The “N” value is determined as the number of blows to achieve 300mm of penetration (generally after disregarding the first 150mm penetration through possibly disturbed material). The results of these tests can be related empirically to the engineering properties of the soil.

The test is also used to provide useful information in cohesive soils under certain conditions, a good quality disturbed sample being recovered with each test. Other forms of in situ testing are used under certain conditions and where this occurs, details are given in the report.

DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

GENERAL DEFINITIONS – ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since "strong" and "permanent" are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water, can be remoulded and can be classified according to the Unified Soil Classification System. Three principal classes of soil recognized are:

Residual soils: soils which have been formed in-situ by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

Transported soils: soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind and gravity. Two important types of transported soil in engineering geology and materials investigations are:

Colluvium – a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principle forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances.

Alluvium – a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

Lateritic soils: soils which have formed in situ under the effects of tropical weathering include all reddish residual and non residual soils which genetically form a chain of material ranging from decomposed rock through clay to sesqui-oxide rich crusts. The term does not necessarily imply any compositional, textural or morphological definition; all distinctions useful for engineering purposes are based on the differences in geotechnical characteristics.

ROCK WEATHERING DEFINITIONS

Extremely Weathered (EW)	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered (HW)	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of the chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered (MW)	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered (SW)	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite, has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (Fr)	Rock substance unaffected by weathering.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the prominent degree of weathering first (e.g. EW-HW).

The various degrees of weathering do not necessarily define strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric, and some rocks may increase in strength during the weathering process.

Fresh drill cores of some rock types, such as basalt and shale may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS

This classification system provides a standardised terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable. Where other rock types are encountered, such as in dykes, standard geological descriptions are used for rock types and the same descriptions as below are used for strength, fracturing and weathering.

Under this system rocks are classified by Rock Type, Strength, Stratification Spacing, Degree of Fracturing and Degree of Weathering. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc) where these are relevant.

ROCK TYPE DEFINITIONS

ROCK TYPE	DEFINITION
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments.
Sandstone:	More than 50% of the rock consists of sand sized (0.06 to 2mm) grains.
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated.
Claystone:	More than 50% of the rock consists of silt or clay sized particles and the rock is not laminated.
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated.

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly Laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks.

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
Highly Fractured:	Core lengths are generally less than 20mm – 40mm with occasional fragments.
Fractured:	Core lengths are mainly 30mm – 100mm with occasional shorter and longer section.
Slightly Fractured:	Core lengths are generally 300mm – 1000mm with occasional longer sections and occasional sections of 100mm – 300mm.
Unbroken:	The core does not contain any fracture.

ROCK STRENGTH

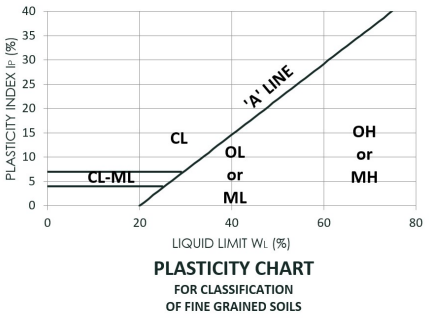
Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics.

Term	Point Load Index Is(50) MPa	Field Guide	Approx qu MPa*
Extremely Weak:	0.03	Easily remoulded by hand to a material with soil properties.	0.7
Very Weak:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Weak:	0.3	A piece of core 150mm long x 50mm dia. May be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium Strong:	1	A piece of core 150mm long x 50mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
Strong: (SW)	3	A piece of core 150mm long x 50mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very Strong (SW)	10	A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely Strong (Fr)	>10	A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	>240

The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ration to the point load index of 24:1. This ratio may vary widely.

Unified Soil Classification System (Metricated)
Data for Description Indentification and Classification of Soils

MAJOR DIVISIONS				DESCRIPTION				FIELD IDENTIFICATION						LABORATORY CLASSIFICATION				
				Group Symbol	Graphic Symbol	TYPICAL NAME	DESCRIPTIVE DATA				GRAVELS AND SANDS			Group Symbol		% [2] < 0.06mm	PLASTICITY OF FINE FRACTION			NOTES
											GRADATIONS		NATURE OF FINES	DRY STRENGTH						
COARSE GRAINED SOILS	More than 50% by dry mass, less than 60mm is greater than 0.06mm.	GRAVELS	More than 50% of coarse grains are greater than 2.0mm	GW		Well graded gravels and gravel-sand mixtures, little or no fines	Give typical name, indicate approximate percentages of sand and gravel, maximum size, angularity, surface condition and hardness of the coarse grains, local or geological name and other perfinent descriptive information, symbols in parenthesis. For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics. EXAMPLE: Silty Sand, gravelly, about 20% hard, angular gravel particles, 10mm maximum size, rounded and sub angular sand grains coarse to fine, about 15% non-plastic fines with low dry strength, well compacted and moist in place, light brown alluvial sand, (SM)	Determine approximate percentages of material over 60mm size, maximum size, shape, surface texture, hardness of material, geological description identify on estimated percentage mass of the various fractions.	COARSE GRAINED SOILS	More than half of the material less than 60mm is larger than 0.06mm	0.06mm is about the smallest particle visible to the naked eye	GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	GW	Use the gradation curve of material passing 60mm for classification of fractions according to criteria given under 'Major Division'.	0-5	-	>4	Between 1 and 3	1. Identify Fines by the method given for fine grained soils. 2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols eg SP-SM GW-GC
				GP		Poorly graded gravels and gravel-sand mixtures, little or no fines					POOR	Predominantly one size or range of sizes			GP		0-5	-	Fails to comply with above		
		GRAVELLY SOILS		GM		Silty gravels, gravel-sand-silt mixtures					GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	GM		12-50	Below 'A' line and Ip >7	-	-	
				GC		Clayey gravels gravel-sand-clay mixtures							Fines are plastic (1)		GC		12-50	Above 'A' line and Ip > 7	-	-	
		SANDS	More than 50% of coarse grains are greater than 2.0mm	SW		Well graded sands and gravelly sands, little or no fines					GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	SW		0-5	-	>6	between 1 and 3	
				SP		Poorly graded sands and gravelly sands, little or no fines					POOR	Predominantly one size or range of sizes			SP		0-5	-	Fails to comply with above		
		SANDY SOILS		SM		Silty sand, sand-silt mixtures					GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	SM		12-50	Below 'A' line or Ip < 4	-	-	
				SC		Clayey sands, sand-clay mixtures							Fines are plastic (1)		SC		12-50	Above 'A' line and Ip > 7	-	-	
											SILT AND CLAY FRACTION									
											Fraction smaller than 0 20mm AS sieve size									
FINE GRAINED SOILS	More than 50% by dry mass, less than 60mm is less than 0.06mm	Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, colour in wet condition, odour if any, local or geological name and r pertinent descriptive information, symbols in parenthesis. For undisturbed soil add information on structure, stratification, consistancy in undisturbed and remoulded states, moisture and drainage conditions. EXAMPLE Clayey Silt, brown, low plasticity, small percentage of fine sand, numerous vertical root-holes, firm and dry in place, fill, (ML).		FINE GRAINED SOILS	More than half of the material less than 50mm is less than 0.06mm		DRY STRENGTH	DILATANCY	TOUGHNESS	ML							
				CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.					None to low	Quick to slow	None		CL						
				OL		Organic silts and organic silty clays of low plasticity					Medium to high	None to very slow	Medium		OL						
		Liquid Limit more than 50%		MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.					Low to medium	Slow	Low		MH						
				CH		Inorganic clays of high plasticity, fat clays.					Low to medium	Slow to none	Low to medium		CH						
				OH		Organic clays of medium to high plasticity.					High to very high	None	High		OH						
											Medium to high	None to very slow	Low to medium								
				Pt		Peat muck and other highly organic soils.		Readily identified by colour, odour, spongy feel and generally by fibrous texture							Pt*	*Effervescence with H2O2	More than 50% passing 0.06mm	Below 'A' line			
																	Above 'A' line			
																	Below 'A' line			
																	Above 'A' line			
																	Below 'A' line			



PLASTICITY CHART
FOR CLASSIFICATION OF FINE GRAINED SOILS

ACT Geotechnical Engineers

ACT Geotechnical Engineers Pty Lt
ACN 063 673 530

5/9 Beaconsfield Street, Fyshwick ACT 2609
PO Box 9225, Deakin ACT 2600
Ph: (02) 6285 1547

Limitations in the Use and Interpretation of this Geotechnical Report

Our Professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject development and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive borehole and test pit logs, cross- sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory bore holes, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory bore holes and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between conducting this investigation and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and the recommendations considering the changed conditions and time lapse.

The summary bore hole and test pit logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the test holes progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The bore hole and test pit logs and related information depict subsurface conditions only at the specific locations and at the particular time designated on the logs. Soil conditions at the other locations may differ from conditions occurring at these bore hole and test pit locations. Also, the passage of time may result in a change in the soil conditions at these test locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, bore holes or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report: nor can our company be responsible for any construction activity on sites other than the specific site referred to in this report.

Form 4 – Minimal Impact Certification

DA Number: _____

This form may be used where minor construction works which present minimal or no geotechnical impact on the site or related land are proposed to be erected within the "G" line area of the geotechnical maps.

A geotechnical engineer or engineering geologist must inspect the site and/or review the proposed development documentation to determine if the proposed development requires a geotechnical report to be prepared to accompany the development application. Where the geotechnical engineer determines that such a report is not required then they must complete this form and attach design recommendations where required. A copy of Form 4 with design recommendation, if required, must be submitted with the development application.

Please contact the Alpine Resorts Team in Jindabyne for further information - phone 02 6456 1733.

To complete this form, please place a cross in the appropriate boxes ☐ and complete all sections.

1. Declaration made by geotechnical engineer or engineering geologist in relation to a nil or minimal geotechnical impact assessment and site classification

I,

Mr ☑ Ms ☐ Mrs ☐ Dr ☐ Other ☐

First Name: Jeremy

Family Name: Murray

OF

Company/organisation: ACT Geotechnical Engineers

certify that I am a geotechnical engineer /engineering geologist as defined by the "Policy" and I have inspected the site and reviewed the proposed development known as

Wombat Walk Connector bike trail – Thredbo

As a result of my site inspection and review of the following documentation

(List of documentation reviewed)

Thredbo Resort – Wombat Walk Connector – Site Plan

Department of Planning
Housing and Infrastructure

Issued under the Environmental Planning and Assessment Act 1979

Approved Application No 24/964

Granted on the 8 April 2024

Signed V Di Bono

Sheet No 10 of 11

I have determined that;

☑ the current load-bearing capacity of the existing building will not be exceeded or adversely impacted by the proposed development, and

☑ the proposed works are of such a minor nature that the requirement for geotechnical advice in the form of a geotechnical report, prepared in accordance with the "Policy", is considered unnecessary for the adequate and safe design of the structural elements to be incorporated into the new works, and

☑ in accordance with AS 2870.1 Residential Slabs and Footings, the site is to be classified as a type

(insert classification type)

"S"

☑ I have attached design recommendations to be incorporated in the structural design in accordance with this site classification.

I am aware that this declaration shall be used by the Department as an essential component in granting development consent for a structure to be erected within the "G" line area (as identified on the geotechnical maps) of Kosciuszko Alpine Resorts without requiring the submission of a geotechnical report in support of the development application.

2. Signatures

Signature

Chartered professional status

Cf Eng #2122247

Name

Jeremy Murray

Date

5/12/2023

3. Contact details

Alpine Resorts Team
Shop 5A, 19 Snowy River Avenue
P O Box 36, JINDABYNE NSW 2627
Telephone: 02 6456 1733
Facsimile: 02 6456 1736
Email: alpineresorts@planning.nsw.gov.au