

# **AS2870:2011 SITE ASSESSMENT**

**70 Beach Road**

**Kingston Beach**

**December 2023**



GEO-ENVIRONMENTAL  

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S O L U T I O N S

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## **Investigation Details**

<b>Client:</b>	Glanville Architects
<b>Site Address:</b>	70 Beach Road, Kingston Beach
<b>Date of Inspection:</b>	12/12/2023
<b>Proposed Works:</b>	New Unit(s)
<b>Investigation Method:</b>	Hand Auger
<b>Inspected by:</b>	M. Campbell

## **Site Details**

<b>Certificate of Title (CT):</b>	197675/1
<b>Title Area:</b>	Approx. 1901 m <sup>2</sup>
<b>Applicable Planning Overlays:</b>	Landslip Hazard, Biodiversity Protection Area
<b>Slope &amp; Aspect:</b>	11° NE facing slope
<b>Vegetation:</b>	Mixed Flora Disturbed

## **Background Information**

<b>Geology Map:</b>	MRT
<b>Geological Unit:</b>	Permian
<b>Climate:</b>	Annual rainfall 600mm
<b>Water Connection:</b>	Mains
<b>Sewer Connection:</b>	Serviced-Mains
<b>Testing and Classification:</b>	AS2870:2011, AS1726:2017 & AS4055:2021

## Investigation

A number of bore holes were completed to identify the distribution and variation of the soil materials at the site, bore hole locations are indicated on the site plan. See soil profile conditions presented below. Tests were conducted across the site to obtain bearing capacities of the material at the time of this investigation.

### **Soil Profile Summary**

BH 1,2 Depth (m)	BH 3 Depth (m)	USCS	Description
0.00-0.40	0.00-0.50	SM	<b>Silty SAND:</b> grey, brown, slightly moist, loose,
0.40-0.80	0.50-1.10	CI	<b>Silty CLAY:</b> medium plasticity, grey, brown, slightly moist, stiff,
0.80-1.00	1.10-1.20	GC	<b>Clayey GRAVEL:</b> yellow, dry very dense, refusal

## Site Notes

Soils on the site are developing from Permian sediments. The clay fraction is likely to show moderate ground surface movement.

## Site Classification

The site has been assessed and classified in accordance with AS2870:2011 “Residential Slabs and Footings”.

The site has been classified as:

### **Class M**

Y<sup>rs</sup> range: **20-40mm**

Notes: that is a moderately reactive clay.

**Wind Loading Classification**

According to “AS4055:2021 - Wind Loads for Housing” the house site is classified below:

<b>Wind Classification:</b>	<b>N2</b>
Region:	A
Terrain Category:	2.5
Shielding Classification:	PS
Topographic Classification:	T1
Wind Classification:	N2
Design Wind Gust Speed – m/s ( $V_{h,u}$ ):	40

**Construction Notes & Recommendations**

The site has been classified as **Class M** - Moderately reactive clay or silt site, which may experience moderate ground movement from moisture changes. Some variation of subsoil depth and weathering of underlying rock is likely.

Site conditions indicate possible removal of trees on the site which may have implications for the preparation of foundations, and specific care must be taken to ensure any remnant roots or loose soil are adequately removed prior to construction.

It is recommended the foundations be placed on the underlying bedrock to minimise the potential for foundation movement.

All earthworks on site must comply with AS3798:2012, and I further recommend that consideration be given to drainage and sediment control on site during and after construction. Care should also be taken to ensure there is adequate drainage in the construction area to avoid the potential for weak bearing and foundation settlement associated with excessive soil moisture.

I also recommend that during construction that I and/or the design engineer be notified of any major variation to the foundation conditions as predicted in this report.

Dr John Paul Cumming B.Agr.Sc (hons) PhD CPSS GAICD

*Director*

## Explanatory Notes

### 1 Scope of Works

The methods of description and classification of soils used in this report are based largely on Australian Standard 1726 – Geotechnical Site Investigations (AS1726:2017), with reference to Australian Standard 1289 – Methods for testing soils for engineering purposes (AS1289), for eventual Site Classification according to Australian Standard 2870 (AS2870:2011) – Residential Slabs and Footings and Australian Standard 1547 (AS1547:2012) On-site domestic wastewater management.

#### 1.1 Site Classification AS2870:2011

Site classification with reference to the above Australian Standards are based on site reactivity.

Class	Foundation Conditions	Characteristic Surface Movement
<b>A</b>	Most sand and rock sites with little or no ground movement from moisture changes.	<b>0mm</b>
<b>S</b>	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.	<b>0 – 20mm</b>
<b>M</b>	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes.	<b>20 – 40mm</b>
<b>H-1</b>	Highly reactive clay sites, which may experience high ground movement from moisture changes.	<b>40 – 60mm</b>
<b>H-2</b>	Highly reactive clay sites, which may experience very high ground movement from moisture changes.	<b>60 – 75mm</b>
<b>E</b>	Extremely reactive sites, which may experience extreme ground movement from moisture changes.	<b>&gt;75mm</b>

*Note: Soils where foundation performance may be significantly affected by factors other than reactive soil movement are classified as **Class P**.*

A site is classified as **Class P** when:

- The bearing capacity of the soil profile in the foundation zone is generally less than 100kpa
- If excessive foundation settlement may occur due to loading on the foundation.
- The site contains uncontrolled fill greater than 0.8m in depth for sandy sites and 0.4m in depth for other soil materials.
- The site is subject to mine subsistence, landslip, collapse activity or coastal erosion.
- The site is underlain by highly dispersive soils with significant potential for erosion
- If the site is subject to abnormal moisture conditions which can affect foundation performance

## 1.2 Soil Characterisation

This information explains the terms of phrase used within the soil description area of the report.

It includes terminology for cohesive and non-cohesive soils and includes information on how the Unified Soil Classification Scheme (USCS) codes are determined.

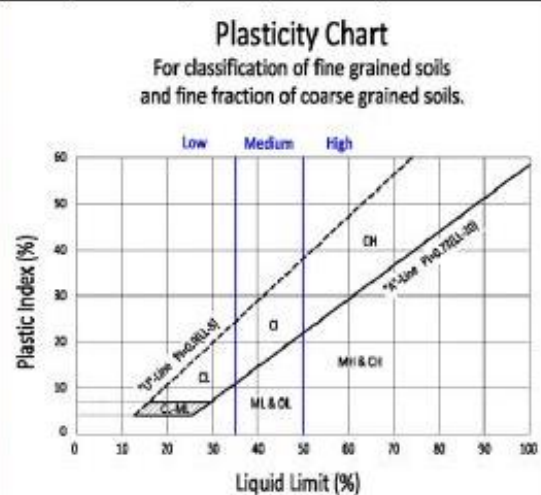
<b>NON COHESIVE – SAND &amp; GRAVEL</b>		
<b>Consistency Description</b>	<b>Field Test</b>	<b>Dynamic Cone Penetrometer blows/100 mm</b>
Very loose (VL)	Easily penetrated with 13 mm reinforcing rod pushed by hand.	0 - 1
Loose (L)	Easily penetrated with 13 mm reinforcing rod pushed by hand. Can be excavated with a spade; 50 mm wooden peg can be easily driven.	1 - 3
Medium dense (MD)	Penetrated 300 mm with 13 mm reinforcing rod driven with 2 kg hammer, - hard shovelling.	3 - 8
Dense (D)	Penetrated 300 mm with 13 mm reinforcing rod driven with 2 kg hammer, requires pick for excavation: 50 mm wooden peg hard to drive.	8 - 15
Very dense (VD)	Penetrated only 25 - 50 mm with 13 mm reinforcing rod driven with 2 kg hammer.	>15

<b>COHESIVE - SILT &amp; CLAY</b>		
<b>Consistency Description</b>	<b>Field Test</b>	<b>Indicative undrained shear strength kPa</b>
Very soft	Easily penetrated >40 mm by thumb. Exudes between thumb and fingers when squeezed in hand.	<12
Soft	Easily penetrated 10 mm by thumb. Moulded by light finger pressure	>12 and <25
Firm	Impression by thumb with moderate effort. Moulded by strong finger pressure	>25 and <50
Stiff	Slight impression by thumb cannot be moulded with finger.	>50 and <100
Very Stiff	Very tough. Readily indented by thumbnail.	>100 and <200
Hard	Brittle. Indented with difficulty by thumbnail.	>200

### 1.3 USCS Material Descriptions

Soils for engineering purposes are the unconsolidated materials above bedrock, they can be residual, alluvial, colluvial or aeolian in origin.

Major Divisions		Particle size mm	USCS Group Symbol	Typical Names	Laboratory Classification				NOTES	
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	BOULDERS	200			% < 0.075 mm (2)	Plasticity of fine fraction	$C_u = \frac{D_{60}}{D_{30}}$	$C_c = \frac{(D_{30})^3}{(D_{10})(D_{60})}$	(1) Identify fines by the method given for fine-grained soils.  (2) Borderline classifications occur when the percentage of fines (fraction smaller than 0.075 mm size) is greater than 5% and less than 12%. Borderline classifications require the use of SP-SM, GW-GC.	
	COBBLES	63								
	GRAVELS (more than half of coarse fraction is larger than 2.36 mm)	coarse	20	GW	Well graded gravels and gravel-sand mixtures, little or no fines	0-5	—	>4		Between 1 and 3
		medium	6	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	0-5	—	Fails to comply with above		
		fine	2.36	GM	Silty gravels, gravel-sand-silt mixtures (1)	12-50	Below 'A' line or PI < 4	—		—
				GC	Clayey gravels, gravel-sand-clay mixtures (1)	12-50	Above 'A' line and PI > 7	—		—
	SANDS (more than half of coarse fraction is smaller than 2.36 mm)	coarse	0.6	SW	Well graded sands and gravelly sands, little or no fines	0-5	—	>6		Between 1 and 3
		medium	0.2	SP	Poorly graded sands and gravelly sands, little or no fines	0-5	—	Fails to comply with above		
		fine	0.075	SM	Silty sands, sand silt mixtures (1)	12-50	Below 'A' line or PI < 4	—		—
				SC	Clayey sands, sand-clay mixtures (1)	12-50	Above 'A' line and PI > 7	—		—
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	SILTS & CLAYS (Liquid Limit ≤ 50%)		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Use the gradation curve of material passing 63 mm for classification of fractions according to the criteria given in 'Major Divisions'					
			CL CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays						
			OL	Organic silts and clays of low plasticity						
	SILTS & CLAYS (Liquid Limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts						
			CH	Inorganic clays of high plasticity, fat clays						
			OH	Organic silts and clays of high plasticity						
	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils						



Grain size analysis is performed by two processes depending on particle size. Sand silt and clay particles are assessed using a standardised hydrometer test, and coarse sand and larger is assessed through sieving by USCS certified sieves. For more detail see the following section.

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 – 0.06mm
Fine/Medium Sand	0.06 – 2.0mm
Coarse Sand	2.0mm – 4.75mm
Gravel	4.75mm – 60.00mm

#### 1.4 Bearing Capacities and DCP testing.

DCP and PSP weighted penetrometer tests – Dynamic Cone Penetrometer (DCP) and Perth Sand Penetrometer (PSP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration. Normally, there is a depth limitation of 1.2m but this may be extended in certain conditions by the use of extension rods. The methods for the two tests are quite similar.

- Dynamic Cone Penetrometer – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS 1289, Test 6.3.2).
- Perth Sand Penetrometer – a 16mm diameter flat-ended rod is driven with a 9kg hammer, dropping 600mm (AS 1289 Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.

Site Anomalies – During construction GES will need to be notified of any major variation to the foundation conditions as predicted in this report.



**1.5 Batter Angles for Embankments (Guide Only)**

Note : Retaining walls or other form of soil retaining methods must be adopted where the slope ratio is greater than that indicated in the table below :-

FILL EMBANKMENTS

CUT EMBANKMENTS

MATERIAL TYPE (refer soils report)		EMBANKMENT SLOPES (Height : Length)	
		Compacted Fill	Cutting
Stable Rock (A*)		2 : 3	6 : 1
Sand (A*)		1 : 2	2 : 3
Silt (P*)		1 : 4	1 : 4
Clay	Firm Clay	1 : 2	1 : 1
	Soft Clay	Not Suitable	2 : 3
Soft Soils (P*)		Not Suitable	Not Suitable

## Glossary of Terms

**Bearing Capacity** – Maximum bearing pressure that can be sustained by the foundation from the proposed footing system under service loads which should avoid failure or excessive settlement.

**Clay** – (Mineral particles less than 0.002mm in diameter). Fine grained cohesive soil with plastic properties when wet. Also includes sandy clays, silty clays, and gravelly clays.

**Dynamic Cone Penetrometer (DCP)** – Field equipment used to determine underlying soil strength and therefore bearing capacity (kPa) by measuring the penetration of the device into the soil after each hammer blow.

**Dispersive soil** – A soil that has the ability to pass rapidly into suspension in water.

**Footing** – Construction which transfers the load from the building to the foundation.

**Foundation** – Ground which supports the building

**Landslip** – Foundation condition on a sloping site where downhill foundation movement or failure is a design consideration.

**Qualified Engineer** – A professional engineer with academic qualifications in geotechnical or structural engineering who also has extensive experience in the design of the footing systems for houses or similar structures.

**Reactive Site** – Site consisting of clay soil which swells on wetting and shrinks on drying by an amount that can damage buildings on light strip footings or unstiffened slabs. Includes sites classified as S, M, H-1, H-2 & E in accordance with AS2870-2011.

**Sand** – (Mineral particles greater than 0.02mm in diameter). Granular non-cohesive, non-plastic soil that may contain fines including silt or clay up to 15%.

**Services** – Means all underground services to the site including but not limited to power, telephone, sewerage, water & storm water.

**Silt** – (Mineral particles 0.002 – 0.02mm in diameter). Fine grained non-cohesive soil, non-plastic when wet. Often confers a silky smoothness of field texture, regularly includes clay and sand to form clayey silts, sandy silts and gravelly silts.

**Site** – The site title, as denoted by address, lot number, or Certificate of Title (CT) number, or Property Identification Number (PID).

**Surface Movement (Ys)** – Design movement (mm) at the surface of a reactive site caused by moisture changes.

## **Disclaimer**

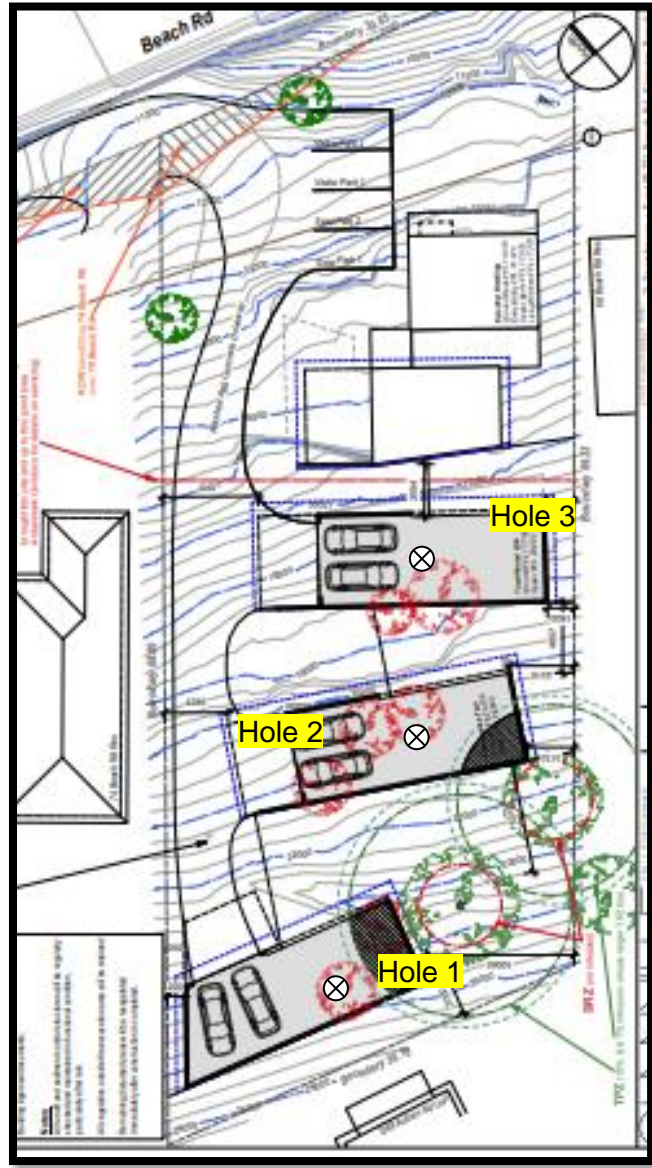
This Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and the Client. To the best of GES's knowledge, the information presented herein represents the client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that discussed in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible geotechnical parameter or the soil conditions over the whole area of the site. Soil and rock samples collected from the investigation area are assumed to be representative of the areas from where they were collected and not indicative of the entire site. The conclusions discussed within this report are based on observations and/or testing at these investigation points.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third a party.

**Site Plan**



# CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE ITEM

Section 321

Form **55**

To:  Owner /Agent  
 Address  
  Suburb/postcode

## Qualified person details:

Qualified person:   
Address:     
Phone No:   
Fax No:   
Licence No:  Email address:

Qualifications and Insurance details:  (description from Column 3 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

Speciality area of expertise:  (description from Column 4 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

## Details of work:

Address:    Lot No:   
Certificate of title No:   
The assessable item related to this certificate:  (description of the assessable item being certified)  
Assessable item includes –  
- a material;  
- a design  
- a form of construction  
- a document  
- testing of a component, building system or plumbing system  
- an inspection, or assessment, performed

## Certificate details:

Certificate type:  (description from Column 1 of Schedule 1 of the Director's Determination - Certificates by Qualified Persons for Assessable Items n)

This certificate is in relation to the above assessable item, at any stage, as part of - (tick one)

building work, plumbing work or plumbing installation or demolition work   
or

a building, temporary structure or plumbing installation:

In issuing this certificate the following matters are relevant –

Documents:	The attached soil report for the address detailed above in 'details of work'
Relevant calculations:	Reference the above report.
References:	AS2870:2011 residential slabs and footings AS1726:2017 Geotechnical site investigations CSIRO Building technology file – 18.

*Substance of Certificate: (what it is that is being certified)*

Site Classification consistent with AS2870-2011.
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*Scope and/or Limitations*

The classification applies to the site as inspected and does not account for future alteration to foundation conditions as a result of earth works, drainage condition changes or variations in site maintenance.
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**I, John-Paul Cumming certify the matters described in this certificate.**

Qualified person:

*Signed:*

*Certificate No:*

*Date:*

J9838

13/12/2023



A handwritten signature in black ink, appearing to read 'John Paul Cumming', written over a light grey background.