



Qualtest Geotechnical & Laboratory
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**Geotechnical Investigation
& Landslide Risk Assessment
Proposed Residential Development
#17 Courtney Drive,
Upper Coomera QLD 4209**

August 27, 2026

Presented To

Courtney Upper Coomera
Developments Pty Ltd

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Geotechnical Investigation & Landslide Risk Assessment Proposed Residential Development 17 Courtney Drive, Upper Coomera, QLD 4209

Interpretative Report

Report Ref. No: 9603 Rev E – 25-474

August 27, 2026



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1 INTRODUCTION

This report presents the findings of the geotechnical investigation undertaken at the site with street address #17 Courtney Drive, Upper Coomera, QLD. The Real Property Description is Lot 182 on RP156422. It is understood that a residential subdivision is proposed for the site and that this geotechnical report will be relied upon to inform all phases of the engineering designs and incorporation into any civil construction tender documents.

An additional scope was to complete a potential landslide risk assessment pre- and post-construction.

The work was commissioned by Mr Harry Wilson, representing CFMG Capital on behalf of Courtney Upper Coomera Developments Pty Ltd (the Client). The work was undertaken in general accordance with out fee proposal QGQ25-3611-9607, dated October 24, 2025.

The fieldwork was undertaken on November 07, 2025. The approximate geographical location of the site is highlighted in red in *Figure 1*.



Figure 1: The Geographical Location of The Site Highlighted in Red

1.1 Proposed Development

It is understood that the proposed development area covers a land area of approximately 33,430m² consisting of a staged land subdivision project. Qualtest has not been privy to the engineering drawing. However, as is typical for such projects, the following structures/activities are expected to be included in the development:

- Bulk earthworks, including cut and fill activities to create residential allotments;
- Retaining structures;
- Road and drainage networks, including easement;
- Sewer and water reticulation works;
- Detention basin;
- Recreational parks, environmental & open space; and
- Soft and hard landscaping.

Figure 2 presents an excerpt of the concept plan showing a potential reconfiguration layout of the site.

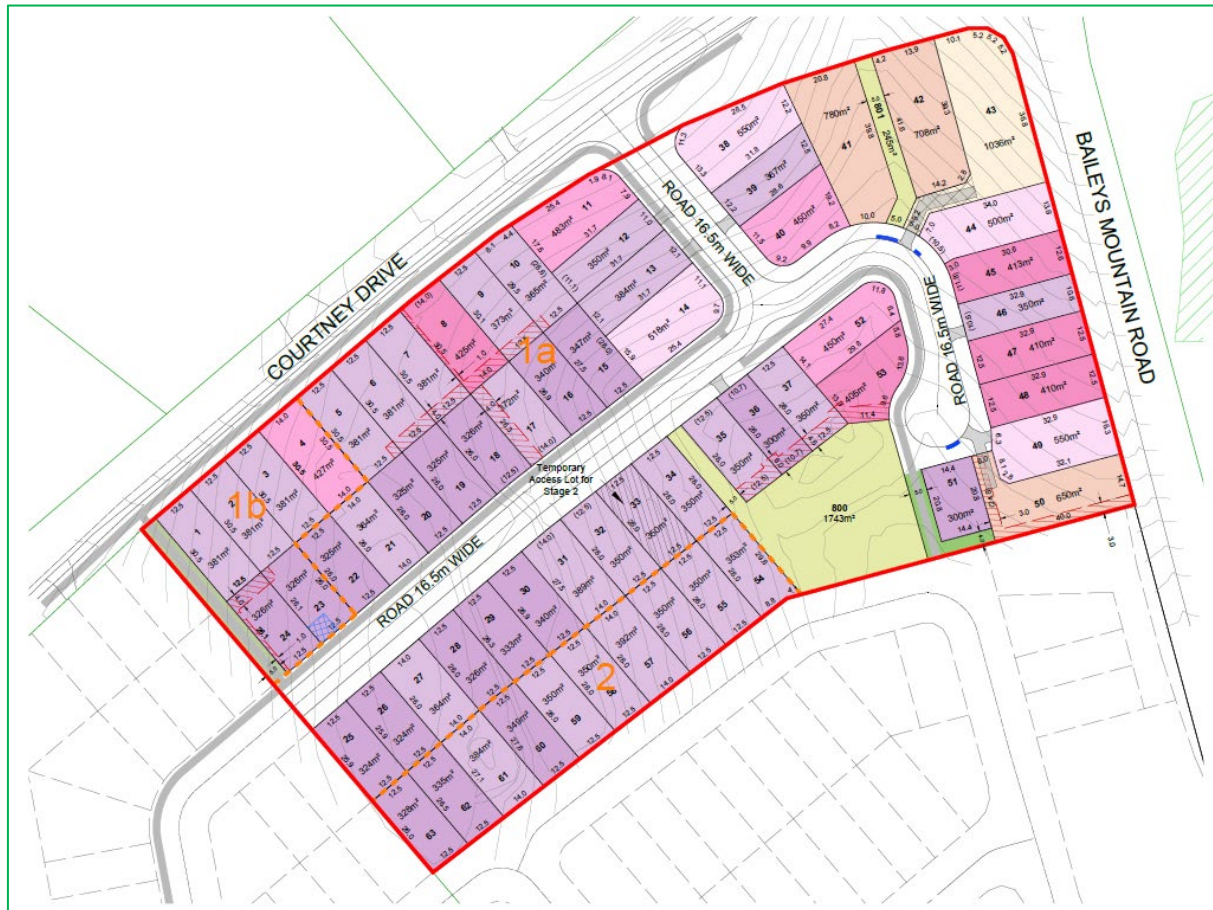


Figure 2: Proposal Plan – The Proposed Layout of the Development (Source Saunders Havill Plan, Dated 13/03/2026)

1.2 Purpose

This interpretative report aims to present the client and its partners with a geotechnical report to be relied on for the following purposes:

- To inform all phases of design, including operational works and detailed design, and
- For incorporation into any civil and construction tender documents.

1.3 Scope of Work

The client provided the following scope of work:

Broadscale Geotechnical Investigation and Landslide Risk Assessment, including

- Subsurface conditions in accordance with AS 1726-2017.
- Landslide Risk Assessment, which assesses the suitability of the site for residential development. A Landslide Susceptibility Rating is assigned to each proposed new Lot, and recommendations on how to maintain or improve stability.
- Geotechnical issues or constraints for development.
- Drainage recommendations.

Broadscale earthworks recommendations, including:

- Suitability of cut for reuse as fill.
- Compaction standards.
- Stripping depths.
- Trafficability.

- Excavatability.
- Safe temporary batter slopes for cuts.
- Fill batter slopes.
- Broadscale site classification in accordance with AS.2870-2011, including predicted ground movement and site reactivity at selected borehole locations.
- Preliminary foundation recommendations.
- Preliminary retaining wall design parameters.
- Preliminary pavement design parameters, based on results of soaked CBR testing.
- General recommendations for residential development at the site.

For the landslide risk assessment, the following excerpt from the local council is applicable:

- The Landslide Hazard Overlay Map of the City Plan (V12) identifies areas of the site with “Moderate” Landslide Hazard. As such, the Landslide Overlay Code is applicable.
- In order to demonstrate compliance with the geotechnical outcomes of the Landslide Hazard overlay code, the applicant needs to submit a geotechnical report prepared and signed by an RPEQ specialising in geotechnical engineering and experienced in slope stability assessment, addressing the following issues in support of a future Development Application for the proposal.
 - a. The report should provide site-specific landslide risk assessment for each proposed lot impacted by the landslide Hazard Overlay. The risk assessment should be based on surface and subsurface geotechnical information of the site/lot. The report should demonstrate that each lot achieves a landslide risk rating of ‘Low’ or better. The report should provide a summary table of the landslide risk assessment for the proposed lots. If the report determines any lot with a ‘Moderate’ or worse risk rating, it should recommend appropriate and adequate risk mitigation measures to reduce the risk rating to ‘Low’ or better.
 - b. The report should include a certification from a Registered Professional Engineer of Queensland (RPEQ) specialising in geotechnical engineering confirming that each proposed lot achieves a landslide risk rating of ‘Low’ or better and each lot is suitable for its intended use, and
 - c. The report should provide appropriate engineering recommendations for any earthworks in order to achieve and maintain a factor of safety of at least 1.5.

2 Structure of Report / Methodology

For clarity, this report has been prepared in two sections:

- Section A – Geotechnical Site Investigation Report; and
- Section B – Landslide Risk Assessment Report.

SECTION A – GEOTECHNICAL SITE INVESTIGATION

2.1 Standards

This investigation has predominantly been undertaken in line with the following Australian Standards (AS):

- AS 1289 – Methods of testing soils for engineering purposes;
- AS 1289.6.3.2-1997 – Soil strength and consolidation tests – Determination of the penetration resistance of a soil – 9 kg dynamic cone penetrometer;
- AS 3798 – Guidelines on earthworks for commercial and residential developments;
- AS 2870 – Residential slabs and footings; and
- AS 1726:2017 – Geotechnical site investigations.

2.2 Literature Review

An initial literature review was undertaken before conducting the site investigation, covering the site's geology and geomorphology, a review of documents provided by the client, and a search for any other information that was publicly available.

2.2.1 Information Provided

The Client provided the following information to assist in preparing this report:

- Email Request for proposal – Received from Mr Mark Bessell, representing Kasa Group, Dated October 23, 2025.
- Proposal Plan - Prepared by Saunders Havill, Drawing No: 13087 P01, Rev A – PRO 01, Dated 13/03/2026.
- Email Correspondence – Received from Mr Harry Wilson representing CFMG Capital, dated Mrch 10 2026, updating the client entity name.

2.2.2 Previous Reports

At the time of writing this report, Qualtest is unaware of any previous geotechnical report for the site or nearby sites.

2.2.3 Site Geology

The online *Queensland Globe* Detailed Surface Geology (1:100k) map shows the site is underlain by the following geological unit:

- Neranleigh-Fernvale beds (DCf) – Devonian to Carboniferous-aged Sedimentary rock unit with a lithological summary of mudstone, shale, arenite, chert, jasper, basic metavolcanics, pillow lava, conglomerate.

It is therefore the near-surface materials are residual in origin, weathered from the underlying parent bedrock.

An extract from the Detailed Surface Geology map showing the site is presented in *Figure 3*.





Figure 4a, b, c & d: Selected Photographs of the Site

2.3 Site Investigation

2.3.1 Underground Services

An online inquiry was lodged on BYDA.com prior to the start of drilling activities. Based on the results of the BYDA inquiry, the boreholes were positioned to avoid any underground services at the site.

2.3.2 Geotechnical Investigation

The geotechnical investigation comprised a desktop study, fieldwork, and laboratory testing.

Qualtest, in collaboration with the client, nominated the location of the seven (7) boreholes to maximise geotechnical information gathering. The seven boreholes designated QT1 to QT7 were drilled across the site to a target depth of 3.0m or earlier refusal. The boreholes were drilled using a 4WD ute-mounted Jacro 200 drill rig fitted with a 100mm diameter solid auger and a Tungsten Carbide drill bit.

A 300mm diameter auger was used to recover bulk samples for CBR testing at selected borehole locations. The fieldwork was supervised by a Qualtest Geotechnical Engineer, who logged the boreholes per Australian Standard AS 1726-2017.

For subsequent laboratory testing, disturbed and undisturbed soil samples were collected at various depths in the boreholes. Select materials were tested to address the scope of work.

All boreholes were backfilled with spoil won from the drilling operations. The approximate location of the boreholes as drilled on the day of investigation is illustrated in *Figure 5*.

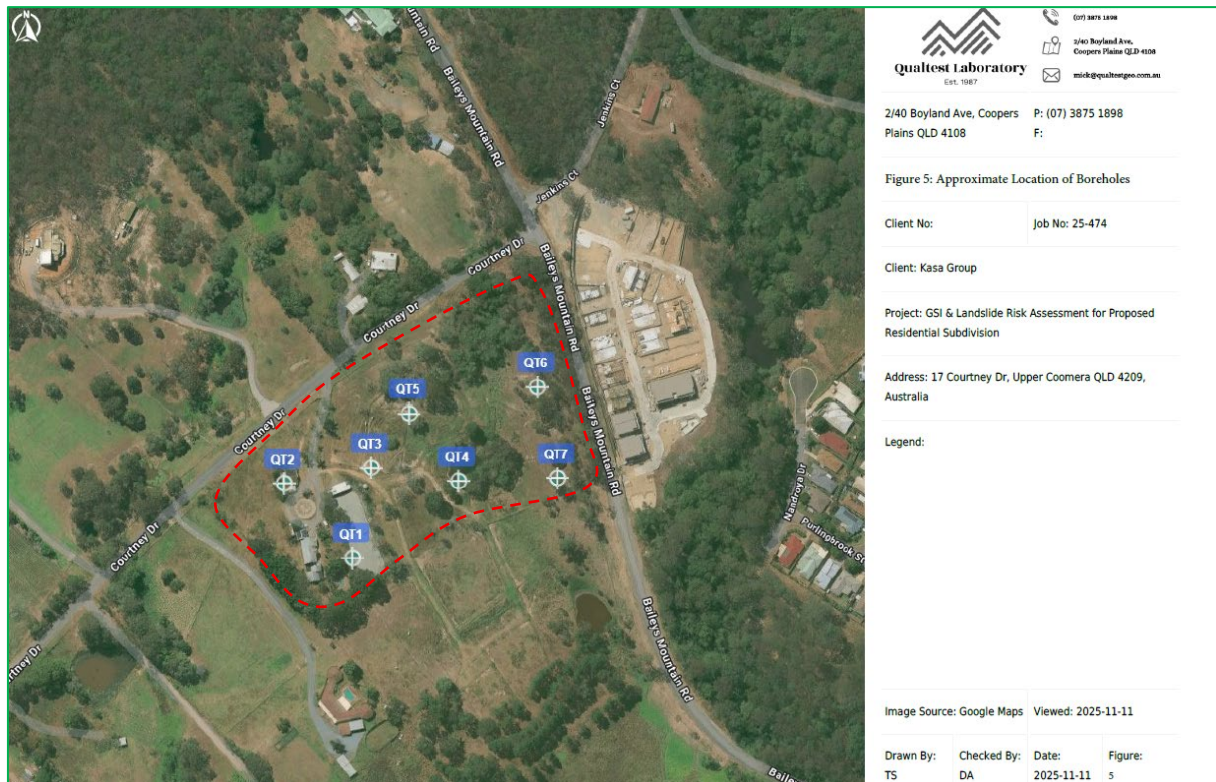


Figure 5: The Site Showing the Approximate Borehole Locations

2.3.2.1 DCP Testing

Dynamic cone penetrometer (DCP) testing was carried out at each borehole (QT1 to QT7) location prior to drilling. The DCP tests extended to refusal depths between 0.5 to 1.4m below ground level (bgl).

The results of the DCP tests are included in the borehole logs in *Appendix A*. In summary, DCP blow counts ranged from 2 blows per 100mm penetration to refusal (hammer bouncing). The low blow counts were generally recorded in the upper-level topsoil layer. With increasing depth, blow counts rapidly increased, indicative of the shallow depth to rock at the site.

2.3.2.2 Subsurface Conditions

The detailed subsurface conditions encountered at the borehole locations, together with the DCP test results, are presented in *Appendix A*.

In general, the boreholes (QT1 – QT7) encountered an upper silty sand topsoil overlying an intermediate residual soil layer, which rapidly grades into weathered sandstone bedrock.

The subsurface profile is further described as follows:

Topsoil	Observed at all borehole locations and was classified as loose to dense silty sand. The topsoil layer was noted to be relatively thin at most locations, ranging from 0.1 to 0.2m in thickness.
Slopewash	Observed underneath the topsoil at all boreholes except QT5. These materials extended to a maximum depth of 0.6m. The slopewash materials were predominantly described as loose to medium dense silty sand with a localised section of silty sandy gravel. Slopewash is material that has been transported by gravity/run off and deposited downslope.
Residual Soils	Observed in all boreholes except QT1, underneath the topsoil or slopewash. These materials were described as low to high plasticity sandy clay and clay of stiff to hard consistencies. The residual soils extended to depths ranging from 0.5 to 1.5m before grading into weathered rock.
Weathered Siltstone / Sandstone	Observed in all boreholes, these materials were identified as weathered sandstone rock recovered as dense to very dense clayey sand. These materials have been assessed to be extremely to highly weathered sandstone; however, at auger refusal depth, the materials are expected to be at least moderately weathered and of low to medium-strength rock.

2.3.2.3 Groundwater

Standing groundwater was not encountered in any of the boreholes. However, the typical encountered profile of upper slopewash materials over residual clay, is conducive for the development of perched water conditions at this interface following prolonged rainfall.

It should be noted that groundwater levels could be influenced by climatic conditions as well as the soil material properties, profile and may differ during the construction phase.

2.3.2.4 Geotechnical Model

A preliminary geotechnical model of the subsurface conditions encountered based on the boreholes is illustrated in *Table 1*.

Table 1: The Preliminary Geotechnical Model Based on Borehole Profiles

BH ID	Depth Range (m)				
	Topsoil	Slope-wash	Residual Soil	Weathered Rock	Termination Depth
QT1	0.0 – 0.1	0.1 – 0.3	NE	0.3 – 0.6	0.6 ^(R)
QT2	0.0 – 0.1	0.1 – 0.3	0.3 – 0.5	0.5 – 1.3	1.3 ^(R)
QT3	NE	0.0 – 0.1	0.1 – 0.5	0.5 – 0.6	0.6 ^(R)
QT4	0.0 – 0.1	0.1 – 0.6	0.6 – 1.5	1.5 – 2.7	2.7 ^(R)
QT5	0.0 – 0.1	NE	0.1 – 0.9	0.9 – 1.3	1.3 ^(R)
QT6	0.0 – 0.1	0.1 – 0.5	0.5 – 1.0	1.0 – 3.0	3.0 ^(TD)
QT7	0.0 – 0.1	0.1 – 0.5	0.5 – 0.8	0.8 – 3.0	3.0 ^(TD)
NE = not encountered, R = refusal, TD = target depth					

3 Laboratory Testing and Results

Selected soil samples were tested for geotechnical properties at Qualtest's NATA-accredited laboratory in Brisbane in accordance with relevant Australian Standards (AS). Tests outside the scope of Qualtest laboratory were outsourced.

The quantity and type of laboratory tests performed in this investigation are summarised in *Table 2*.

Table 2: Laboratory Testing Program

Laboratory Test	Quantity	Reference Standard
4-Day Soaked CBR	3	AS1289.6.1.1
Particle Size Distribution	3	AS1289.3.6.1
Atterberg Limits	3	AS1289.3.1.2, 3.2.1, 3.3.3, 3.4.1
Shrink-Swell	3	AS1289.7.1.1
Emerson Class Number	4	AS1289.3.8.1

The laboratory test certificates for the investigation are presented in *Appendix B*.

3.1 California Bearing Ratio (CBR)

Selected soil samples recovered from across the site were tested for 4-day soaked CBR using the test methods described in AS1289.6.1.1-2014. The samples were compacted using Standard compaction effort at optimum moisture content and soaked for four days under a 4.5kg surcharge. The tests were conducted at Qualtest's NATA-accredited laboratory in Brisbane.

Select soil samples collected from QT3, QT6 and QT7 at shallow depths were tested for 4-day soaked CBR. A summary of the laboratory CBR test results for the subgrade materials is presented in *Table 3*, and returned CBR values of about 7% for the three samples.

Table 3: Summary of Laboratory CBR Test Results

BH ID	Sample Depth, m	MDD (t/m ³)	OMC (%)	Swell (%)	CBR (%)
QT3	0.3 – 0.6	1.72	18.0	1.5	7
QT7	0.2 – 0.8	1.77	15.0	2.0	7
QT7	0.3 – 0.8	1.79	14.0	1.5	8

3.2 Particle Size Distribution

The behaviour of coarse-grained soils (sands and gravels) can be predicted by classifying the soil in terms of its particle size distribution (PSD). AS 1726-2017 denotes soils with fine contents ($\leq 75 \mu\text{m}$) greater than or equal to 35% will behave geomechanically as fine-grained soil and, therefore, are to be described as cohesive soils.

Three (3) soil samples recovered from boreholes QT3, QT4 and QT5 were subjected to a particle size distribution test. The results of the particle size distribution tests conducted on the selected samples are presented in *Table 4*.

The results indicate the site soils are predominantly clay-based soils, which is in agreement with the materials observed during the fieldwork.

Table 4: Results of Particle Size Distribution Tests

BH ID	Sample Depth, m	Material Type	Grading		
			Gravel (%)	Sand (%)	Fines (%)
QT3	0.3 – 0.50	Sandy Clay	7	37	56
QT4	0.2 – 0.60	Sandy Clay	6	55	39
QT5	0.7 – 0.95	Sandy Clay	6	31	63

3.3 Atterberg Limits

The behaviour of fine-grained soils (silts and clays) can be predicted by classifying the soil in terms of its plasticity. Plasticity is broadly described as either “High”, “Medium”, or “Low”.

Soils behave very differently depending on their moisture content. It can exist as either a solid at very low moisture contents, a semi-solid, a plastic, or a liquid at ever-increasing moisture contents. To determine plasticity, the moisture content is determined to define the boundaries between semi-solid, plastic, and liquid. The minimum moisture content at which the soil becomes plastic is known as the “Plastic Limit”, and the minimum moisture content at which the soil behaves as a liquid is known as the “Liquid Limit”. These limits collectively are known as the Atterberg Limits.

Soils with liquid limits below 35% are described as Low plasticity, liquid limits between 35 and 50% are described as medium plasticity and liquid limits above 50% are described as High plasticity.

The ‘Plasticity Index’ of soil is the range of moisture contents where the soil exhibits plastic behaviour. This is calculated by subtracting the Plastic Limit from the Liquid Limit of the soil. Soils with a plasticity Index greater than 25% are often referred to as high plasticity.

The Atterberg limits of soil samples recovered from selected boreholes, QT3, QT4 and QT5, were tested, including linear shrinkage.

A summary of the test results is presented in Table 5 and indicates the presence of low to medium-plasticity clays.

Table 5: Results of the Atterberg Limit Tests

BH ID	Sample Depth, m	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Weighted Plasticity Index (%)	Linear Shrinkage (%)
QT3	0.3 – 0.50	44	17	27	2171	12.5
QT4	0.2 – 0.60	17	14	3	235	1.5
QT5	0.7 – 0.95	53	15	38	3218	15.0

3.4 Shrink-Swell

The shrink-swell test is a simple test routinely employed in Australian geotechnical engineering practice to quantitatively assess the expansive potential of undisturbed or remoulded clay soils and to guide the design of footings on these soils.

A fundamental rationale for using the shrink-swell test is that it evaluates the soil over both wetting (swell) and drying (shrink) phases. Hence, the result is independent of the initial moisture state of the soil sample and defines a unique soil class related to the fundamental properties of the soil.

Three (3) undisturbed soil samples (U50) recovered from boreholes QT3, QT4 and QT6 were subjected to shrink-swell testing.

The test results are summarised in Table 6, with a maximum shrink-swell index (Iss) of 2.5%, indicative of the presence of moderately reactive clays.

Table 6: The Summary of the Shrink-Swell Test Results

BH ID	Sample Depth, m	Shrinkage (%)	Swell (%)	Shrink-Swell Index (I_{ss}), %
QT3	0.3 – 0.45	2.1	2.2	1.8
QT4	0.9 – 1.10	2.7	3.5	2.5
QT6	0.6 – 0.75	3.0	2.1	2.2

3.5 Emerson Class Number Test

When brought into contact with water, soil can release silt and clay particles into suspension and increase the turbidity of water. Turbid water in soils indicates susceptibility to erosion.

The Emerson Class Number can measure the potential of soil to release silt and clay particles into suspension. The values range from one (high potential) to eight (low potential). Classes 1 to 3 are considered dispersive, Class 4 indicates the presence of carbonate or gypsum and is slightly dispersive, Classes 5 and 6 are deemed non-dispersive, and Classes 7 and 8 are water-stable Soils (non-slaking), but if it swells (Class 7), it retains its original size and shape (Class 8).

Samples collected from across the site were subjected to Emerson Class tests. The dispersive potential of the soils, as assessed by the Emerson Class Number, is presented in *Table 7* and is indicative of dispersive and non-dispersive soil characteristics.

Table 7: The Summary of Emerson Class Test Results

BH ID	Sample Depth (m)	Material	Emerson Class Number	Remarks
QT1	0.10 – 0.3	Silty Sand	5	<i>Non-Dispersive</i>
QT2	0.30 – 0.5	Clay	3	<i>Dispersive</i>
QT5	0.10 – 0.3	Clayey Sand	3	<i>Dispersive</i>
QT7	0.45 – 0.7	Clay	3	<i>Dispersive</i>

4 Geotechnical Engineering Assessment

Based on our understanding of the proposed development, the following sections have been provided to assist with the geotechnical aspects of the design and construction phases. It is noted that the recommendations and comments given in this report are broadscale in nature.

4.1 Bearing Capacity of Soils

The bearing capacity of the subsurface profiles encountered onsite was determined using DCP test data acquired during the November 11, 2025, investigation, including laboratory test data, correlations, and visual-tactile observations onsite.

Campanella & Robertson (1983) developed a correlation between DCP blow counts and the bearing capacity of soils. This relation was adopted to derive the allowable bearing capacity of the subsurface profile with a safety factor of 4.0 for cohesive soils with a foundation factor $N_c = 5$

The allowable bearing capacity of the subsurface soils at the DCP test locations (QT1 to QT7) with depth is presented in *Figure 6*.

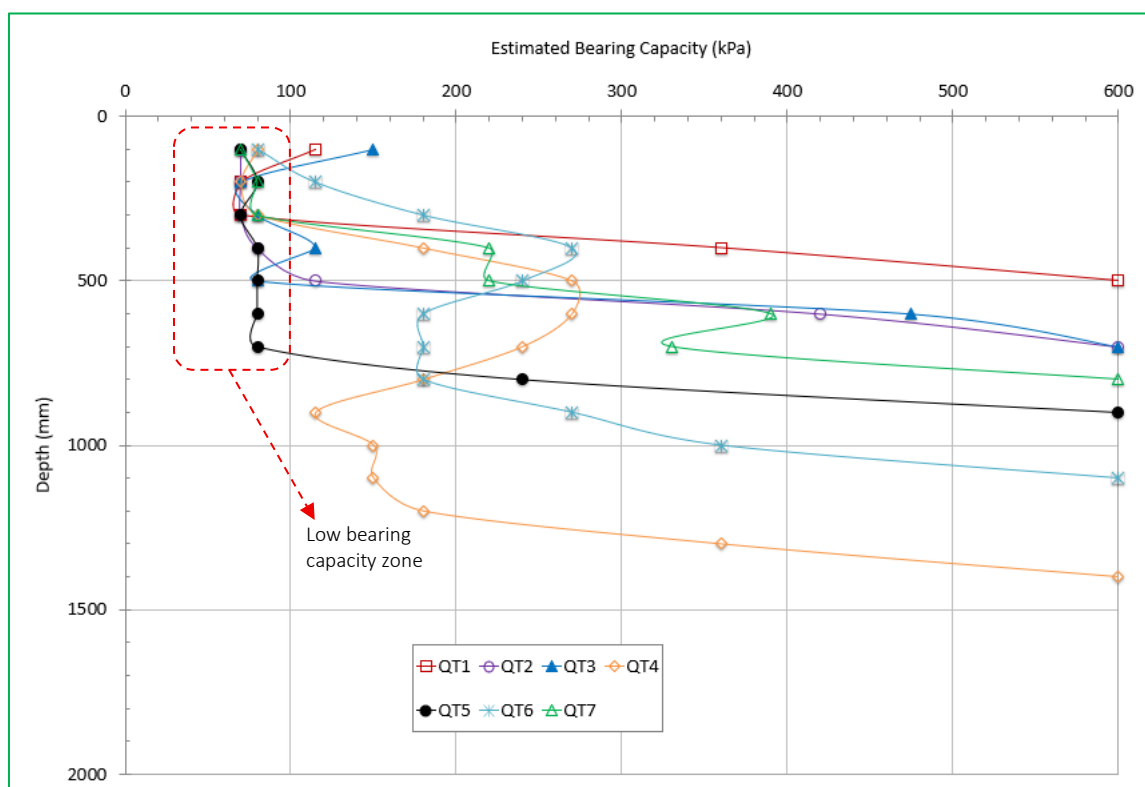


Figure 6: The Allowable Bearing Capacity of Soils with Depth; Derived from DCP Data

Based on the above, Qualtest recommends the following allowable bearing pressures:

- Topsoil/Slopewash = not recommended (remove)
- Clay-Based Residual Soils (stiff to very stiff) = 150kPa
- Extremely to Highly Weathered Sandstone = 250kPa
- Moderately Weathered Sandstone = 700kPa

Any engineered fill, placed in accordance with *Table 8 of AS3798*, is considered appropriate as a foundation material and can be assigned an allowable bearing pressure of 100kPa.

At locations where the bearing capacity is determined to be less than the recommended values, the area should be excavated to depths exposing competent ground and reassessed by a competent person prior to backfill and compaction activities.

The above recommended allowable bearing pressures should be confirmed by a competent person during construction.

4.2 Young's Modulus of Soils

Young's modulus is an elastic soil parameter and a measure of soil stiffness, and it is defined as the ratio of the stress along an axis over the strain along that axis in the range of elastic soil behaviour.

In this investigation, the soil Young's modulus (E), commonly referred to as soil elastic modulus, was calculated using correlation equations with DCP test data.

For the clay or sand-based upper low-strength soils, the known CBR values were used to calculate the elastic deformation modulus (E) using a correlation published by Powell et al. (1984), per Equation 1.

$$E(\text{MPa}) = 17.6 \times \text{CBR}^{0.64} \quad \text{Eqn. 1}$$

For the stiff to very stiff underlying alluvial soils, the correlation proposed by Jianzhou et al. (2022) was used to determine Young's modulus of the soil, per Equation 2.

$$E(\text{MPa}) = 338 \times PR^{-0.39} \quad \text{Eqn. 2}$$

Where

PR = the number of hammer blows required to produce 300mm of rod penetration.

From equations 1 and 2, Qualtest recommends the following conservative Young's modulus of the encountered materials:

- Slopewash = not recommended (remove)
- Clay-Based Residual Soils (stiff to very stiff) = 6MPa
- Extremely to Highly Weathered Sandstone = 15MPa
- Moderately Weathered Sandstone = 30MPa

For site won controlled fill, Qualtest recommends a Young's modulus of = 3.5MPa

4.3 Site Classification

To determine the broadscale soil classification, a number of site features are considered, including the subsurface profile, the surface topography, existing vegetation, and the proposed development. Given that the site contains steep ground slopes and earthworks developments are likely to create fill heights greater than 0.4m and planned removal of trees, the site is assigned **Class P** per AS2870-2011.

The site was also classified based on characteristic surface movement (y_s) estimated in accordance with Clause 2.3 and applying Table 2.3 of AS2870-2011. The I_{ss} (i.e., 2.5) obtained from laboratory testing was adopted to calculate y_s . The change in suction was estimated from published literature as 1.2pF, and the design soil suction change (H_s) depth of 1.7m was acquired from the literature and a cracked % H_s of 50%.

The depth to top of rock is relatively shallow but varies across the site. Adopting a range of clay depths of 0.5 to 1.5m, a potential ground surface movement of about 11mm to 28mm can be expected under normal moisture conditions. This is consistent with a site **Class S to M**.

The potential ground surface movements are subject to change when:

- Cut-to-fill or imported earthworks operations are carried out;
- Abnormal site soil moisture conditions are allowed to develop; and
- Tree planting is carried out, or existing trees are removed, on or adjacent to the site.

4.4 Dispersive soils/Emerson Class

Four (4) samples subjected to Emerson Class Number tests returned as either 3 or 5. In general, the Emerson class of 5 was recorded for a topsoil sample, while the Emerson Class of 3 was recorded for residual clay samples. This is indicative of dispersive subsoils at the site.

Effective erosion and sedimentation control measures relevant to clearing and trenching operations should be installed and maintained for the duration of construction. The preparation of an erosion and sediment control plan is outside this commission; however, the following general principles should be incorporated into the design/construction phases:

- External Water flows should be diverted around or away from the site. Excavations/exposed soils and stockpiles should be stabilised/protected
- Sediment fences and other sediment trapping devices should be placed strategically at downslope boundaries and perimeters of stockpiles/work areas.

4.5 Embedment Recommendations for Sewer and Water

Trench foundations at this site are likely to include controlled fill, residual soils and weathered sandstone rock. The Emerson Class testing shows that the site contains materials with dispersive soil characteristics. The preliminary recommended trench embedment types have been selected to allow for the variability of materials onsite and are presented in *Table 8*. The actual trench foundation and embedment materials, as well as the presence of groundwater, should be verified at the time of construction.

Table 8: Recommended Trench Embedment Types

Material	Trench Embedment Type	Comments
Site Won - Controlled Fill	Type 4 – Sewer, Type D – Water	Trench Foundation > 50 kPa
Residual Soils	Type 4 – Sewer, Type D – Water	Trench Foundation > 50 kPa
Weathered Rock (XW Rock)	Type 4 – Sewer, Type D – Water	Trench Foundation > 50 kPa
Weathered Sandstone (MW Rock)	Type 3 – Sewer, Type C – Water	Trench Foundation > 50 kPa

4.6 Pavement Design

Three (3) near-surface sand-based soil samples were collected and subjected to a 4-day soaked CBR test to indicate the suitability of the existing near-surface soils as subgrade support. The 4-day soaked California Bearing Ratio (CBR) tests returned values of 7 and 8%.

Qualtest recommends a preliminary CBR design value of 3% for the clay-based soils to account for natural variations in the subsurface profiles. Where weathered rock (highly to moderately weathered sandstone) is exposed at the subgrade level, a preliminary CBR of 10% may be adopted for pavement design.

4.7 Shallow Footing Systems

Slab-on-ground, pad, and strip footings are considered appropriate for the site, provided the allowable bearing pressures presented in *Table 9* are adhered to. Based on ground conditions, all structures should be supported by select engineered fill and keyed into the existing slope face, where applicable.

Table 9: Preliminary Recommended Parameters for Foundation Design

Material		Allowable Bearing Pressure (kPa)	
		Slab on ground/Strip Footing	Pad Footings
Topsoil, Uncontrolled Fill, Slopewash	Soft or Loose	<100 (NR)	<100 (NR)
Controlled Fill	Stiff or better	100	100
Residual Soils	St to H or D to VD	150	150
XW to HW Sandstone	Hard or Very Dense	250	250
MW Sandstone	VLS to LS	700	700
Note: NR = not recommended, VS = very soft, F = firm, St = stiff, H = hard, D = dense, VD = very dense XW = extremely weathered, HW = highly weathered, MW = moderately weathered, VLS = very low strength, LS = low strength All founding materials should be verified by a suitably qualified person during construction.			

4.8 Potential Fill Settlement

Preliminary estimates of the total long-term settlements of controlled fill are summarised below.

Preliminary estimates could be in the order of up to 50mm for fill up to 5m thick and up to 100mm where fill is up to 10m thick. Differential settlements of 25mm to 75mm could occur where the thickness of fill varies over short distances.

It is recommended that the civil designer identify locations where fill thicknesses vary greater than 2.0m over a 10m linear distance. Fill variances over this distance can result in unfavourable site classifications and stresses on rigid underground services and pavements.

Where deep filling is to occur along roadways and where the thickness of fill is likely to vary over short distances, the following could be considered:

- Construct earthwork to the underside of underground services. This applies to the deepest of the underground services, and not every underground service. For example, sewer is likely to be the deepest of the underground services.
- Place a geotextile over the surface of the fill at the underside of the underground services, such as Bidim A44 or equivalent, for the full width of the road reserve.
- Continue to construct the fill to the final earthworks levels in accordance with Section 4.13.

The use of a geotextile at the underside of the underground services will not reduce or prevent long-term settlements. However, it will assist in reducing the stresses on rigid underground services and pavements and soften the effects.

At locations where deep fill and varying fill thickness occur over short distances on lots, unfavourable site classifications can be expected.

4.9 Thrust Block Design Parameters

Thrust blocks may be designed based on the allowable horizontal bearing capacities provided in Table 10.

Table 10: Preliminary Parameters for Thrust Block Design

Material		Allowable Horizontal Bearing Pressure (kPa)
Topsoil, Uncontrolled Fill, Slope-wash, Water-softened Upper layers	Soft or Loose	NR
Controlled Fill	Stiff or better	50
Residual Soil	Stiff or better	75
XW to HW Sandstone Rock	VSt to H or D to VD	125
≥MW Sandstone Rock	VLS to LS	350
NR = not recommended, VSt = very stiff, H = hard, D = dense, VD = very dense, XW = extremely weathered, HW = highly weathered, VLS = very low strength, LS = low strength		

4.10 Bulking Factors

The bulking factor is the ratio or percentage of the volume change of excavated material to the volume of the original volume before excavation.

Bulking occurs when soil is excavated. One cubic metre of insitu material expands and does not always translate into one cubic metre of fill when placed and compacted on the site. Bulking can significantly affect the balance of cut and fill volumes and, hence, the cost of the earthworks.

Excavation increases the volume of material. It is, therefore, necessary to use a bulking factor to determine the volume of material that will be created by excavation. The bulking factor is defined as:

$$\text{Bulking Factor} = \frac{\text{Volume after Excavation}}{\text{Volume before Excavation}}$$

Based on experience, engineering judgement, laboratory demonstrations, and published typical values (Look, 2014), *Table 11* provides estimated bulking factors for the material types encountered on the site.

Table 11: Bulking Factors

Material	Bulking Factor for Transportation
Clay-Based Soil	1.25
Sand-Based Soil	1.01
Extremely to Highly Weathered Sandstone	1.35
Moderately Weathered or Better Sandstone	1.55

Typical wastage of approximately 5% by volume may be adopted.

4.11 Friction Angle and Cohesion

The internal friction angle of the stiff (or better) clay/sand-based soils was determined using graphical correlations proposed by Ladd et al. (1977) and Bjerrum and Simons (1960).

The following parameters are recommended for the encountered materials:

- Slopewash = not recommended (remove)
- Controlled Fill = 25°
- Clay-Based Residual Soils = 26°
- Extremely to Highly Weathered Sandstone = 29°
- Moderately Weathered (or better) Sandstone = 35°

For the cohesion parameter, the following should be adopted:

- Slopewash = not recommended (remove)
- Controlled Fill = 2kPa
- Clay-Based Soils = 5kPa
- Extremely to Highly Weathered Sandstone = 6kPa
- Moderately Weathered (or better) Sandstone = 15kPa

4.12 Retaining Wall Parameters

This section provides recommendations for free-headed and fixed-headed retaining walls that may be constructed as part of the proposed development.

Passive earth pressures for the site can be calculated by the Rankine (1857) method, which assumes no soil cohesion or wall soil friction. The design of fixed or free-headed permanent retaining wall systems supporting fill or natural clay soil can be based on the lateral earth pressure distribution given as:

$$p_a = \frac{1}{2} k_a \gamma H^2 - 2cH + 2c^2/\gamma$$

In the above equation, H(m) is the height of the wall, γ (kN/m³) is the unit weight of the soil, k_a is the coefficient of active earth pressure, and c is soil cohesion.

Retaining walls are to be designed with respect to internal stability properties such as sliding, overturning, and bearing capacity failure. The retaining walls are also to be assessed and designed for global stability. Internal and global stability design should be carried out in accordance with AS4678:2002 (Earth-Retaining Structures). Preliminary design parameters for retaining walls onsite are shown in *Table 12*.

Table 12: Retaining Wall Design Parameters for Backfill Slope Angle

Origin	Description	Bulk density, γ (kN/m ³)	Long-Term Friction Angle, ($^{\circ}$)	K_o	K_a	K_p	Long-Term Cohesion, C' (kPa)
Controlled Fill	Stiff or better	18	25	0.58	0.41	2.46	2
Clay-Based Soils	Stiff or Better	18	26	0.56	0.39	2.56	4
XW to HW Rock	Hard or VD	20	29	0.52	0.35	2.88	6
MW Rock	Very Low to Low Strength	22	35	0.43	0.27	3.69	15

Drainage is perhaps one of the most important considerations in the design and construction of earth-retaining structures, and it is necessary to separate the surface drainage from the subsoil drainage system.

Surface water must be diverted away from the back of retaining walls to prevent ponding of surface water behind the top of the wall. This usually includes placing a 500mm to 800mm thick layer of compacted clay over the subsoil system to act as a seal.

Subsoil drainage comprising free-draining granular material connected to slotted PVC pipes must be placed behind the permanent retaining walls to prevent the buildup of groundwater pressures behind the walls, and this must be discharged to the point of legal discharge.

4.13 Earthworks Recommendations

All earthwork procedures should be carried out in a responsible manner in accordance with AS.3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments". The earthworks contractor should make themselves familiar with the site conditions.

Given the subsurface profile encountered on site and considering the proposed earthworks operations, it is recommended that all earthwork activities be supervised under Level 1 engineering supervision and an engineering certification provided by a registered professional engineer (RPEQ).

The earthwork recommendations are presented in the following subsections:

4.13.1 Existing Slopewash/Fill

The investigation has revealed slopewash/fill of varying quality and quantity across the site. The slopewash/fill is unsuitable to support structural load and should be removed and replaced in accordance with AS 3798 recommendations.

4.13.2 Stripping Depths

Topsoil was encountered at all drilled locations. Based on the observed subsurface profiles, the topsoil is expected to be relatively thin. The stripping depth for topsoil at the site is expected to be about 100 to 200mm. Following the removal of topsoil, the exposed surface should be proof-rolled prior to any fill placement.

In addition, the upper soils were identified as slopewash and are required to be stripped.

4.13.3 Depth to Rock

Weathered rock was encountered in all boreholes drilled at the site. Based on the borehole logs, the depth to top of rock across the site varied between 0.3 to 1.5m bgl.

4.13.4 Excavation Conditions

It is generally expected that the materials in which the drill rig met refusal would be moderately to slightly weathered sandstone rock. The depth of these high-strength rock layer has been recorded to vary between 0.6 to >3m bgl.

Generally, it is expected that 8 to 14+ excavator fitted with general-purpose/toothed buckets will be required to excavate topsoil, slopewash, residual soils and extremely to highly weathered sandstone rock.

For moderately to slightly weathered sandstone, a 32t+ excavator fitted with a ripper or hydraulic hammer may be required to efficiently excavate the rock. Larger machinery may be required as the materials are expected to increase in strength with increasing depth.

4.13.5 Trafficability

At the time of the field investigation, trafficability within the proposed development area was generally considered to be good due to the dry conditions and existing vegetation cover.

Trafficability problems could arise for earthworks and construction machinery from:

- Softening of the upper-level soils during and after periods of rainfall. This may require the installation of seepage cut-off drains (northeastern portion) should construction commence during or following an extended period of wet weather; and
- Disturbance of the upper-level soil fabric with the removal of vegetation. Depressions could be formed, resulting in potential water traps, which could cause further softening of exposed soils.

To improve the site's trafficability, it is recommended that the exposed surface be inspected and assessed following stripping. Areas that demonstrate excessive movement and/or do not improve sufficiently under proof rolling should be removed and replaced as required.

Maintaining adequate drainage conditions is also essential at the northeastern fringe. It should be ensured that runoff is diverted away from the construction area to prevent the ponding of water.

Preferably, earthworks should be scheduled in dry weather following a period of not less than one week of little or no rainfall.

The contractors should fully inform themselves of the ground conditions onsite prior to the commencement of earthworks. This requirement should be explicit in any earthwork specifications or contract.

4.13.6 Subgrade Preparation and Compaction Standards

The following earthworks procedures are recommended:

- Clearing, grubbing, and stripping should be carried out across the site;
- The existing topsoil and any encountered soft/slopewash soils should be excavated from the development areas to expose competent (very stiff or dense) soils. All tree roots must be removed, the perimeter excavated to the maximum depth of tree roots, and replaced with compacted fill layers;
- Following stripping and removal of the topsoil and any upper slopewash soils, the competent exposed natural surface should be proof rolled under the supervision of a geotechnical engineer using a vehicle with a tare of at least 20 tonnes and then compacted to 98% at +2 or -2% OMC, Standard Maximum Dry Density (SMDD). Areas demonstrating excessive movement should be treated (dried and recompacted) or removed and replaced with compacted fill. Treatment should be to a standard sufficient so that the subgrade passes proof rolling and that compaction can be achieved in the first layer of fill;
- Temporary cut batters in existing residual materials should generally not exceed 27°, subject to inspection and approval by an experienced geotechnical engineer;
- Depressions formed by the removal of vegetation, underground elements and including the reclamation of the dam., should have all disturbed and weakened soils removed.
- If imported fill is required, it is recommended to be low reactivity and conform to the following imported fill specification:
 - Max Particle Size 150mm;
 - Minimum soaked CBR 8%; and
 - Shrink Swell Index 1.0% Max.

Testing of the placed and compacted fill should be carried out at frequencies defined in AS3798 *Table 8.1* for Type 1 Earthworks.

The subgrade shall be graded to drain effectively to subsoil drains and should be cleaned of any softened material prior to pouring of footings or placement of fill materials. Foundation gradients shall be verified by a competent person to avoid the formation of a potential slide plane.

4.13.7 Reuse of Excavated Material

All site-won materials (sand/clay-based, weathered rock) are suitable for reuse as structural fill onsite, provided the materials are moisture-conditioned and are free of organics, topsoil, soft soils, and deleterious materials.

All earthworks should be carried out by experienced contractors in general accordance with AS3798-2007 (Guidelines on Earthworks for Commercial and Residential Developments). Quality control of the earthworks should be carried out under Level One Inspection and Testing as defined in AS3798 – 2007.

4.13.8 Safe Batter Angles

Batters can be constructed to the following short and long-term gradients presented in *Table 13*. This is very significant as fill batters may be placed on sloping ground.

The short-term is deemed to be no longer than a 4-week period, and following wet weather (rainfall), the short-term batter slopes would need to be reassessed for stability.

Temporary and permanent batters exceeding 3.0m in height will require benching at 3.0m high vertical intervals. The benches should be at least 1.5m wide.

Batters should be covered by topsoil, mulched, and vegetated to prevent drying and cracking. Further assessment of the batter angles may be required once the exact geometry and materials have been finalised.

It is essential that permanent batter faces are suitably protected from erosion and scour by appropriate drainage.

Table 13: Recommendations for Cut and Fill Batters

Material	Short term	Long term
Controlled Fill	18° (1V:3H)	14° (1V:4H)
Residual Soils (stiff or Better)	27° (1V:2H)	14° (1V:4H)
Weathered Rock	45° (1V:1H)	27° (1V:2H)

4.14 Phreatic Surface

Groundwater and seepage were not encountered in any of the boreholes at the time of the investigation, with a maximum drilled depth of about 3.0m bgl. This implies that the depth of the regional groundwater table is greater than 3.0m bgl; however, the actual depth to the regional groundwater table is unknown at this stage.

There is the possibility of the development of perched water at the interface between the upper sand-based soils and the underlying indurated residual soils/rock surface.

4.15 Existing Dam Treatment

It is understood that the existing water dam will be reclaimed and will form part of the proposed subdivision. Borehole QT4 was drilled in the vicinity of the existing water, and the logs show the presence of rock at about 1.5m bgl. Because the ground surface slopes towards the dam, it is most likely that the depth to bedrock may be at about 2.0m within the dam's footprint.

For proper treatment of the dam area prior to fill placement, the following recommendations are provided:

- Dewatering of the dam into a temporary detention basin.
- All soft soils in and around the dam must be removed to expose a competent foundation.
- Proof roll the exposed foundation, and any identified locations of discernible movements should be excavated and replaced with select fill. A competent person should observe and approve all fill foundations.
- Place select fill under a Level 1 supervision and testing program to reclaim the dam.

SECTION B – LANDSLIDE HAZARD

5 LANDSLIDE RISK ASSESSMENT

This section of the report aims to establish the landslide risk of the existing slopes and post-construction conditions.

5.1 Scope of Work

The site has been identified as subject to unstable soils/landslip hazards and, as such, requires a slope stability report from an RPEQ geotechnical engineer.

This site-specific slope stability assessment report is prepared in accordance with the following:

- a. The report should provide site-specific landslide risk assessment for each proposed lot impacted by the landslide Hazard Overlay. The risk assessment should be based on surface and subsurface geotechnical information of the site/lot. The report should demonstrate that each lot achieves a landslide risk rating of 'Low' or better. The report should provide a summary table of the landslide risk assessment for the proposed lots. If the report determines any lot with a 'Moderate' or worse risk rating, it should recommend appropriate and adequate risk mitigation measures to reduce the risk rating to 'Low' or better.
- b. The report should include a certification from a Registered Professional Engineer of Queensland (RPEQ) specialising in geotechnical engineering, confirming that each proposed lot achieves a landslide risk rating of 'Low' or better and each lot is suitable for its intended use; and
- c. The report should provide appropriate engineering recommendations for any earthworks in order to achieve and maintain a factor of safety of at least 1.5.

5.2 Site Slopes

The site contains ground slopes that typically vary from 5 to 15 degrees. In addition to the natural slopes, the site has previously undergone earthworks that have created a variety of landform features - these include cut and fill batters, low-height retaining walls, an inground swimming pool and a water dam.

5.3 Landslide Risk Assessment/Methodology

Based on the information provided by the Client, our methodology in addressing the landslide risk assessment included the following:

- A geotechnical site walkover for landslide risk assessment of the existing site slopes, fill conditions, and proposed earthworks;
- Review of the survey data for the site;
- Review of proposed development plans;
- Review of the engineering drawings; and
- Review of AS3798 – Guidelines on Earthworks for Commercial and Residential Developments.

A suitably qualified and experienced geotechnical engineer undertook the detailed site walkover on November 07, 2025.

5.3.1 Geotechnical Issues

Based on the site conditions, issues of geotechnical relevance are the following:

- The disturbance of a site with slopes of approximately 5 to 15° that can cause the current stable slopes to become unstable.
- The proposed fill placement on sloping ground.
- The existing site topography.
- The potential and consequences of failure of the proposed new structures onsite, including cut-to-fill batters, retaining structures and footing systems.

5.3.2 Landslide Assessment Criteria and Methodology

With a view to managing risks to life and property associated with natural disasters such as landslides, etc., that pose to occupants in a development, it is Council's requirement that the susceptibility of such developments to natural disasters should be addressed. The following criteria are considered as part of Council's Operational Work conditions for approving a Site:

- That the landslide risk susceptibility of a site should be deemed to be 'low' in accordance with 'Landslide Risk Management' Australian Geomechanics Journal Vol. 42, No. 1 March 2007.
- Part B of the Council's requirement indicates that where the average grade of a finished lot surface exceeds 15%, the site must be certified by a geotechnical professional as having a 'low risk' in relation to landslide.

The methodology adopted for the landslide risk assessment at this site was to the requirements of Australian Geomechanics (AGS) Landslide Risk Management guidelines as contained in the Australian Geomechanics Journal Vol. 42 No. 1, March 2007. Due to the broad scope of the AGS journal, it does not specifically cover small-scale developments. The work of Hargreaves and Kidd (2012), which is in line with AGS Vol. 42, No. 1 2007, has conceptualised landslide risk management in a way that is amenable to small-sized developments and has been adopted for this assessment.

This study by Hargreaves and Kidd (2012) provides an evaluation of the level of site hazards in relation to landsliding. The hazard rating is based on a five-level system and classified into Very Low, Low, Moderate, High, and Very High categories.

The implications of this hazard rating classification are indicated in *Table 14*.

Table 14: Implications of Hazard Classification

Hazard Rating	Description	Implications
Very Low (VL)	The event is conceivable but only under exceptional circumstances	Accepted. Managed by routine procedures
Low (L)	The event might occur under very adverse conditions	Can be accepted. Treatment to maintain or reduce risk level should be defined.
Moderate (M)	The event could occur under adverse conditions	May be acceptable provided treatment plan is implemented to maintain or reduce risk level.
High (H)	The event will probably occur under adverse conditions	Detailed investigation, planning and implementation of treatment options essential to reduce risk to acceptable levels.
Very High (VH)	The event is expected to occur	Extensive investigation, planning and implementation of treatment options essential to reduce risk to acceptable levels.

5.3.3 Assessment of Site Features and Relative Frequency Analysis

Gold Coast City Council's online Landslide Hazard Overlay Map has identified the site as having a landslide risk potential (Moderate).

An extract from the Landslide Overlay map of Gold Coast City Council showing the site is presented in *Figure 7*.

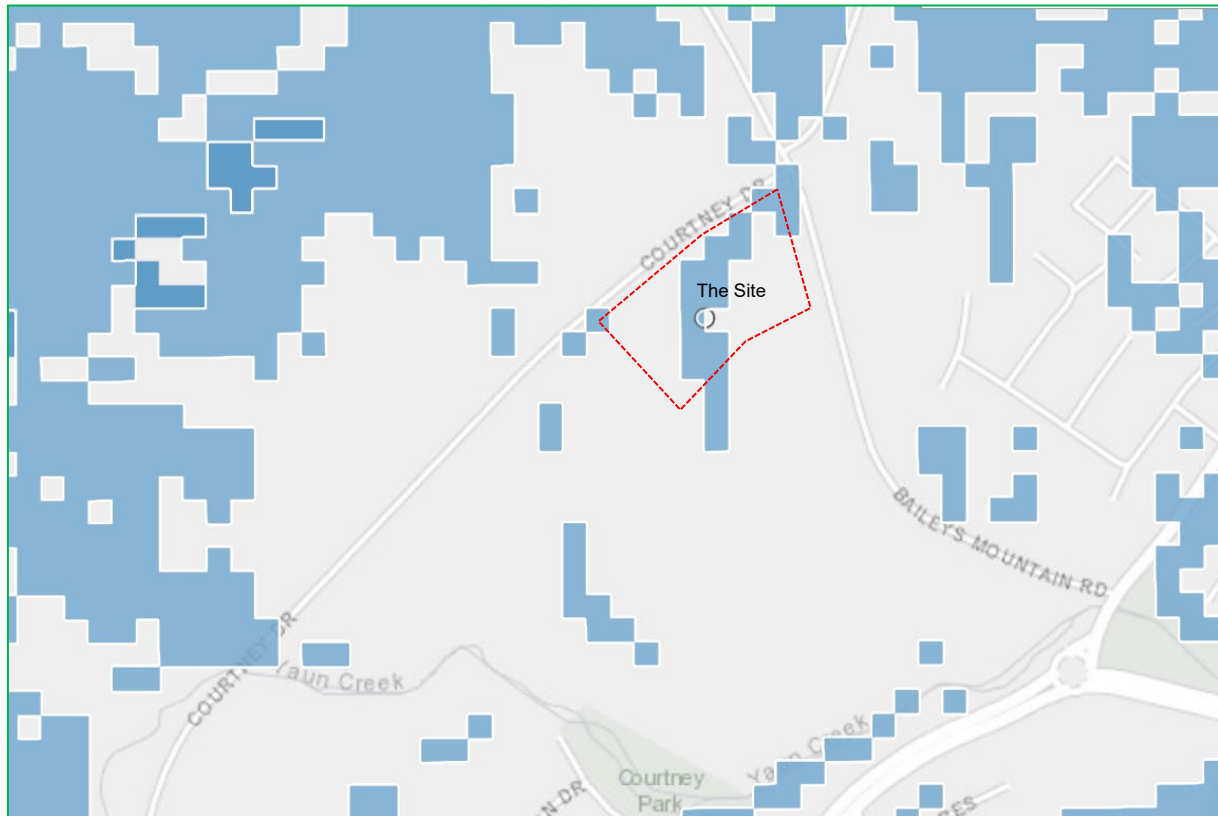


Figure 7: Excerpt from GCCC Landslide Hazard Map - Approx Location of Site Highlighted in Red.

5.3.4 Geotechnical Site Walkover

A site inspection was undertaken to confirm the geological, geomorphological, fill conditions and to assess the likely hazard rating based on site features that contribute to the initiation of a landslide.

The slope stability walkover assessment was undertaken on November 07, 2025.

A site report and frequency analysis were undertaken during the visit. The site report is a standard form that identifies the site features that contribute to the occurrence of a landslide.

The major site features relevant to this assessment for natural and man-made slopes are:

1. **Slope Angle:** In general, the steeper the average surface slope angle, the higher the risk of slope instability. Slope angles were directly measured onsite as well as calculated based on the detailed survey plan;
2. **Slope Shape and Features:** The shape of the slope provides an indication of the method of slope development and the materials below the surface. Concave shapes often indicate past movements;
3. **Engineering Properties of Sub-surface Materials:** The engineering properties of the materials forming the subsurface profile contribute to the risk of slope instability. Most slope failures occur in soil-strength material, and deeper soils increase the likelihood of slope failure. The available information indicates shallow soils overlying weathered rock. However, care should be taken where slope-wash, uncontrolled fill or colluvium soils occur as these materials have a higher potential to trigger instability;
4. **The Concentration of Surface/Ground Water:** Water is one of the most important factors in landslides' occurrence. The majority of slope failures occur during or following rainfall events when there is a combination of surface erosion and saturation of subsurface materials. The concentration of Groundwater: The presence of a high groundwater table can provide a similar long-term situation to a rainfall event and contribute to slope failure without a major rainfall event;
5. **Evidence of Instability:** In many cases, slope failures occur due to the reactivation of previous landslides. The presence of features that indicate past slope instability provides evidence that could initiate future slope movement;

6. Regional position on a hillside; and
7. Site geology
8. Cut depth;
9. Cut batter angle;
10. Cut batter support;
11. Fill depth;
12. Fill batter angle;
13. Fill Batter Support;
14. Type of fill;
15. Wastewater, sewerage, etc;
16. Stormwater disposal;
17. Expandable/mechanical stormwater and drainage pipe connectors;
18. Footing system;
19. The foundation strata;
20. In-ground tanks (any type); and
21. Landscaping.

Additional observations onsite include:

- No areas of major distress or slope instability were noted;
- No free groundwater or seepage was observed across the site;
- No tension cracks were observed within the site;
- No hummocky or bulging soils were identified on the site slopes;
- Depth to bedrock was shallow across the site; and
- Physical observations made on trees/fence posts indicate signs of soil creep.

5.3.5 Landslide Risk Assessment

Evaluation of these features in a Landslide Frequency Assessment Form (Appendix C) provided an indication of their relative importance to slope failure. The assessment of the features included the allocation of a weighted factor for each feature based on site observations, judgment, and experience. This allows a Relative Frequency to be calculated by multiplying the selected factors together for each of the above site conditions highlighted in blue and green.

From the assessment of results from their study (Hargreaves and Kidd 2012) and other studies in similar terrain, a correlation between Relative Frequency and Hazard Rating has been established, as shown in Table 15.

Table 15: Correlation between Relative Frequency and Hazard Rating

Relative Frequency (Output)	Hazard Rating (Susceptibility)
< 0.2	Very Low (VL)
0.2 – 0.6	Low (L)
> 0.6 – 2.0	Moderate (M)
> 2.0 – 6.0	High (H)
> 6.0	Very High (VH)

The above major site features listed in Section 5.3.4 have been considered in determining a likelihood estimate of landslides in this property. The features relevant to this site under consideration, as recommended by Hargreaves and Kidd (2012), apply to **Case 1 (1 - 7)** and **Case 4 (1 – 22)**.

With knowledge of the proposed development (earthworks, retention systems, fill, etc.), the assessment has been carried out for the pre- and post-development stages.

For a typical Lot in the development, the assessment indicates that the relative frequency (Output) pre-development is **0.52** for Case 1 (items 1 to 7), which implies that the landslide risk on the development site is "**Low**" (Appendix C).

To ensure the potential landslide risk level remains "**Low**" or better post-development, the recommendations presented in Section 5.4 should be implemented during and after construction.

5.4 Landslide Risk Mitigation Strategy

The following recommendations are provided to maintain the "low" or better landslide risk level onsite during and post-earthworks.

5.4.1 Fill

The borehole logs disclosed no fill onsite. However, given the landform and the disturbed state, it is expected that localised areas of fill may be present across the site. We are not privy to the placement conditions of fill onsite, and therefore, all existing fill is deemed uncontrolled. Any material identified as fill is deemed unsuitable to support structural loads.

Material described as slopewash was recorded on the sloping ground and may present an increased landslide risk. These materials must be removed and replaced with fill that is engineered and certified. All fill must be such that it is keyed into the competent sloping surface.

5.4.2 Fill Placement

Site won, or imported fill must be placed in accordance with AS3798-2007. Imported select fill material should be a good quality select fill material with a soaked CBR of at least 10%, a maximum aggregate size of 50mm, and a maximum Shrink/Swell Index of 1.0%. Fill must be keyed into the existing slopes.

5.4.3 Cut and Fill Batter Support

Permanent cut/fill batters must be cut to a grade no greater than 14 degrees (1V:4H). Batters steeper than 14 degrees should be appropriately retained. A post and concrete sleeper wall is deemed appropriate for the subsurface conditions. However, if the bedrock is exposed at foundation level, boulder/sandstone block walls will also be suitable.

5.4.4 Stormwater Disposal

Stormwater collected within the site should be directed into designated drains and directed to Council's stormwater system. Disposal of stormwater on the surface is not permitted in the immediate vicinity of proposed building areas.

5.4.5 Site Drainage

Surface runoff should be diverted away from proposed retaining walls and dwellings to prevent scouring, riling, and erosion. The site drain shall be designed and inspected by a qualified person.

5.4.6 Footing System

All footings must be designed in accordance with AS2870-2011. It is expected that pier-supported slab-on-ground, pad and strip footing systems will be used onsite.

However, the following should be noted:

- Piers must be extended beyond any fill/slopewash and sufficiently socketed into at least very stiff or dense residual soils.
- The fill pad for a raft/slab footing must be constructed under a Level 1 inspection regime and certified as a controlled fill.
- The footings for the retaining wall must be well-socketed into the underlying rock.

5.4.7 Roof Water Control

Ensure house downspouts are not flowing onto any fill/slopes/retaining walls but are collected and channelled into storm water drains. Leaks along these lines should be avoided.

5.4.8 Erosion Control

Erosion protection of all exposed batters should be carried out at the site. All runoff at the site should be appropriately channelled to ensure that runoff does not cause severe erosion that may result in adverse ground profiles.

5.4.9 Retaining Walls

All proposed retaining structures should be designed by a qualified person and checked for global stability, sliding, and rotational failure.

Following the implementation of the above recommendations, the site has been reassessed, based on Cases 1 – 22, and all the future lots can be shown to have a landslide risk rating of “Low”.

Table 16 presents a landslide risk matrix that includes all the proposed lots of the development. The Lot numbering system has been based on the supplied Saunders Havill Proposal Plan Rev L, dated 20/01/2026.

Table 16: Lot Rating

Lot	Landslide Risk Features	Initial Landslide Rating	Mitigating features	Residual Land-slide Rating
1 - 3	Slopes to Northwest at about 10 degrees	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
4 - 8	- Near top of Ridgeline with less steep slopes - Possible fill in sections due to previous earthworks	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
9 - 15	Slopes to Southeast at about 15 degrees	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
16 - 18	- Slopes to Southeast at about 15 degrees - Uneven ground in sections due to previous development	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
19- 22	- Near top of Ridgeline with less steep slopes - Possible fill in sections due to previous earthworks	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
23 - 25	- Slopes to Northwest at about 10 degrees - Possible fill in sections due to previous earthworks	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
26 - 27	- Near top of Ridgeline with less steep slopes - Possible fill in sections due to previous earthworks	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
28 - 31	- Uneven Ground conditions due to previous earthworks - Possible fill in section - Steep batters	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
32 - 34	- Slopes to east at about 10 to 15 degrees - Uneven ground in sections - gully flow	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
35-37	- Uneven ground conditions - Possible water softened materials as part of the existing dam	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
38 - 41	Slopes to Southeast at about 15 degrees	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low

42 - 43	Slopes up to about 15 degrees into gully/drainage path	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
44 - 45	Slopes to the south-west at about 10 - 15 degrees	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
46 - 49	- Slopes to west at about 10 degrees - Some uneven ground condition	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
50 - 51	Slopes to west at about 10 - 15 degrees	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
52 - 53	- Slopes up to about 15 degrees into gully/drainage path - Uneven ground conditions - Possible water softened materials as part of the existing dam	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
54 - 57	Slopes to east at about 10 to 15 degrees	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
58 - 60	- Uneven Ground conditions due to previous earthworks - Possible fill in section - Fill batters	Low to Moderate	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
61	- Near top of Ridgeline - Inground pool to be reclaimed - Possible fill in section	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low
62 - 63	- Near top of Ridgeline with less steep slopes - Possible fill in sections due to previous earthworks	Low	Develop site appropriately, particularly adhering to recommendation given in section 5.4 of this report	Low

6 Conclusions

This geotechnical interpretative report is a product of a site investigation conducted for the site with street address #17 Courtney Drive, Upper Coomera. The site's Real Property Description is Lot 182 on RP156422. The property covers a gross land area of approximately 33,400m², and it is proposed for a subdivision to create some 63 lots.

The regional geological maps indicate that the site lies within the Neranleigh-Fernvale beds (DCf) geological unit. The boreholes drilled onsite encountered topsoil and slopewash overlying residual soils that grade into weathered sandstone rock at shallow depths. The depth to top of rock varied across the site, ranging from 0.3 to 1.5m bgl.

The site has been assigned a **Class P**, given the current slopes, the susceptibility to landslide events, proposed fill heights and the planned removal of trees.

The clays in the underlying soil profile were established to have a typical potential ground movement of between 10 to 30mm under normal moisture conditions, which corresponds to a **Class S to M** site in accordance with AS2870-2011.

The proposed development at the site is expected to include road and drainage infrastructure as well as cut-to-fill earthen pads supported by retaining structures. The report provides design and construction recommendations and advice to ensure that the development is appropriate for the site conditions.

The site has been identified as being within the map overlay for landslide hazards. As such, the Gold Coast City Council requested a site-specific report addressing the stability of the site slopes pre- and post-construction.

The slope stability (landslide) assessment has been conducted, and the site, in its current state, has been assigned a "Low to Moderate" landslide risk category. The site was also reassessed following the completion of the proposed earthworks. Provided the recommendations itemised in Section 5.4 are adhered to, the risk of landslide events remains "Low" for the site.

Based on the results of the geotechnical investigation, including the potential landslide risk assessment, Qualtest concludes that the site is suitable for the proposed development and it has a "Low" risk of slope instability, provided the recommendations outlined in this report are adhered to.

7 Disclaimer

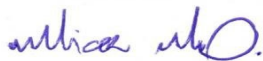
This report has been prepared on behalf of and for the exclusive use of CFMG Capital and its partners in accordance with the scope of work outlined in Proposal QGQ25–361–9448Rev A, dated October 24, 2025. This report is not intended for and should not be relied upon by any third party. In preparing this report, Qualtest relied upon information provided by CFMG Capital. This report must be read in conjunction with the attached appendices and kept in its entirety without separating individual pages or sections. This report, or sections from this report, should not be used as part of a specification for a project without review and agreement by Qualtest.

Interpretations and recommendations provided in the report are based on the ground conditions at the site, only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. This is because ground conditions are subject to change from place to place and with time due to geological processes and/or because of human influences.

The advice provided by Qualtest is based on the conditions encountered onsite at the time of the investigation. If different ground conditions are encountered following the issuance of this report, Qualtest should be notified so that further advice can be provided.

Should you require further information regarding the above, please do not hesitate to contact this office.

Yours faithfully,



MICHAEL MORRISON

For and on behalf of

QUALTEST LABORATORY PTY LTD



DENNIS ALAZIGHA, RPEQ 22169

Appendix A: Engineering Logs

Appendix B: Laboratory Test Certificates

Appendix C: The Landslide Frequency Assessment Form

Attachment A

Engineering Logs



Qualtest Laboratory
Est. 1987

UTM : 56J	Drill Rig : Jaco 200	Job Number : 25-474
Easting (m) : 527863.07	Driller Supplier : Civiltech	Client : Kasa Group
Northing (m) : 6917788.85	Logged By : TS	Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis
Ground Elevation : Not Surveyed	Reviewed By : DA	Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia
Total Depth : 0.6 m BGL	Date : 07/11/2025	Loc Comment :

Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing
	4		0.1	Topsoil		SM	D	Silty SAND: fine to medium grained, medium dense, dark brown, dry, with rootlets.	MD	D: EM	
	2			Slopewas		SM	M-D		L		
	2		0.3	Rock		SST	D	Gravelly Silty SAND: fine to medium grained, fine sized gravel, loose, dark grey mottled orange brown, moist to dry.	D-VD		
	12										
	20/70										
							Gravelly to Clayey SAND: fine to coarse grained, fine to coarse sized gravel, dense to very dense, pale grey mottled orange brown, low plasticity clay.				
								QT1 Refusal at 0.6 m (Max Tc)			

Water  Water inflow  Water outflow  Ground water Level during drilling	Weathering XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	Altering XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	Consistency VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	Density VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	Rock Strength VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	Tests&Results U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.
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UTM : 56J Easting (m) : 527814.61 Northing (m) : 6917841.34 Ground Elevation : Not Surveyed Total Depth : 1.3 m BGL	Drill Rig : Jaco 200 Driller Supplier : Civiltech Logged By : TS Reviewed By : DA Date : 07/11/2025	Job Number : 25-474 Client : Kasa Group Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia Loc Comment :
--	--	---

Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing							
	2		0.1	Topsoil		SM	D	Silty SAND: fine to medium grained, loose, dark brown, dry, with rootlets.	L									
	2			Slopewas		SM	M-D											
	2			0.3		CI	M	Silty SAND: fine to medium grained, loose, dark grey mottled orange brown, moist to dry.	F-St	D: EM								
	3																	
	4																	
	14			0.5	Rock		SST	D	Sandy to Silty CLAY: medium plasticity, firm to stiff, pale grey mottled yellow orange brown, fine to medium grained sand, moist.	VL								
	20/80																	
							SANDSTONE: fine to medium grained, pale grey mottled orange brown, very low strength.											
								QT2 Refusal at 1.3 m (Max Tc)										
<table><tr><td>Water  Water inflow  Water outflow  Ground water Level during drilling </td><td>Weathering XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh</td><td>Altering XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered</td><td>Consistency VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet</td><td>Density VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense</td><td>Rock Strength VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high</td><td>Tests&Results U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.</td></tr></table>												Water  Water inflow  Water outflow  Ground water Level during drilling 	Weathering XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	Altering XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	Consistency VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	Density VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	Rock Strength VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	Tests&Results U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.
Water  Water inflow  Water outflow  Ground water Level during drilling 	Weathering XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	Altering XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	Consistency VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	Density VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	Rock Strength VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	Tests&Results U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.												

UTM : 56J	Drill Rig : Jaco 200	Job Number : 25-474
Easting (m) : 527876.51	Driller Supplier : Civiltech	Client : Kasa Group
Northing (m) : 6917852.33	Logged By : TS	Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis
Ground Elevation : Not Surveyed	Reviewed By : DA	Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia
Total Depth : 0.6 m BGL	Date : 07/11/2025	Loc Comment :

Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing
	5		0.1	Slopewas		GM	D	Sandy to Silty GRAVEL: coarse sized, fine to coarse grained sand, sub-angular loose to medium dense, pale grey mottled orange brown, dry.	L-MD	D: PI/PSD U50: ISS D: CBR	
	2			Residual		CH	M		F-St		
	3		0.5		SST	D	SANDSTONE: fine to medium grained, pale grey mottled yellow brown, very low strength.	VL			
	4										
	3										
	16										
	20/60							QT3 Refusal at 0.6 m (Max Tc)			

Water	Weathering	Altering	Consistency	Density	Rock Strength	Tests&Results
 Water inflow  Water outflow  Ground water Level during drilling 	XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.



Job Number : 25-474
Client : Kasa Group
Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis
Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia
Loc Comment :

Page 1 of 1

UTM : 56J Easting (m) : 527903.34 Northing (m) : 6917889.91 Ground Elevation : Not Surveyed Total Depth : 1.3 m BGL	Drill Rig : Jaco 200 Driller Supplier : Civiltech Logged By : TS Reviewed By : DA Date : 07/11/2025	Job Number : 25-474 Client : Kasa Group Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia Loc Comment :
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Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing
	2		0.1	Topsoil		SM	D	Silty SAND: fine to medium grained, loose, pale grey mottled brown, dry, with rootlets.	L		
	3			Residual		CL	M		F	D: EM	
	2		0.3					Sandy to Silty CLAY: low plasticity, firm, pale brown mottled orange, fine to medium grained sand, moist.			
	3			Residual		CI					
	3							Sandy CLAY: medium plasticity, firm, pale brown mottled orange red, fine to medium grained sand, trace fine sized gravel, moist.			
	3										
	3		0.7					Silty CLAY: high plasticity, very stiff to hard, pale brown mottled orange red, trace fine to medium grained sand, moist.			
	8			Residual		CH			VSt-H	D: PI/PSD	
	20/90		0.9					SANDSTONE: fine to medium grained, pale grey brown, very low strength.			
				Rock		SST	D		VL		

QT5 Refusal at 1.3 m (Max Tc)											
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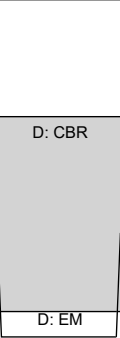
Water  Water inflow  Water outflow  Ground water Level during drilling Weathering XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh Altering XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered Consistency VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet Density VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense Rock Strength VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high Tests&Results U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.											
--	--	--	--	--	--	--	--	--	--	--	--

UTM : 56J Easting (m) : 527993.69 Northing (m) : 6917908.35 Ground Elevation : Not Surveyed Total Depth : 3 m BGL	Drill Rig : Jaco 200 Driller Supplier : Civiltech Logged By : TS Reviewed By : DA Date : 07/11/2025	Job Number : 25-474 Client : Kasa Group Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia Loc Comment :
--	--	---

Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing
	3		0.1	Topsoil		SM	D	Silty SAND: fine to medium grained, loose, dark brown, dry.	L		
	4			Slopewas		SM			MD-D		
	6							Silty SAND: fine to medium grained, medium dense to dense, pale grey, dry.		D: CBR	
	9										
	8										
	6		0.5	Residual		CH	M	CLAY: high plasticity, stiff, pale grey mottled orange, moist.	St		
	6									U50: ISS	
	6										
	9		0.8	Residual		CI	M-D	Sandy CLAY: medium plasticity, very stiff, pale grey mottled yellow brown, fine to medium grained sand, moist to dry.	VSt		
	12		1.0								
	20/80			Rock		SST	D	SANDSTONE: fine to medium grained, pale brown mottled grey orange, very low strength.	VL		
QT6 Terminated at 3 m (Target Depth)											

Water	Weathering	Altering	Consistency	Density	Rock Strength	Tests&Results
 Water inflow  Water outflow  Ground water Level during drilling 	XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.

UTM : 56J	Drill Rig : Jaco 200	Job Number : 25-474
Easting (m) : 528008.16	Driller Supplier : Civiltech	Client : Kasa Group
Northing (m) : 6917844.29	Logged By : TS	Project : GSI & Landslide Risk Assessment for Proposed Residential Subdivis
Ground Elevation : Not Surveyed	Reviewed By : DA	Location : 17 Courtney Dr, Upper Coomera QLD 4209, Australia
Total Depth : 3 m BGL	Date : 07/11/2025	Loc Comment :

Drilling Method	DCP graph	Water	Depth (m)	Soil Origin	Graphic Log	Classification Code	Moisture	Material Description	Consistency/Density	Samples	Testing
	2		0.1	Topsoil		SM	D	Silty SAND: fine to medium grained, loose, pale grey brown, dry.	L		
	3			Slopewas		SM			L-MD		
	3						Silty SAND: fine to medium grained, loose to medium dense, pale grey mottled orange, dry.				
	7										
	7		0.5	Residual		CI	M	Sandy CLAY: medium plasticity, very stiff, pale grey mottled yellow orange, fine to medium grained sand, moist.	VSt		
	13										
	11		0.8	Rock		SST	D	SANDSTONE: fine to medium grained, pale grey mottled orange, very low strength.	VL		
	20/70										
	QT7 Terminated at 3 m (Target Depth)										

Water	Weathering	Altering	Consistency	Density	Rock Strength	Tests&Results
 Water inflow  Water outflow  Ground water Level during drilling 	XW : Extremely weathered DW : Distinctly weathered HW : Highly weathered MW : Moderately weathered SW : Slightly weathered FR : Fresh	XA : Extremely altered DA : Distinctly altered HA : Highly altered MA : Moderately altered SA : Slightly altered	VS : Very soft S : Soft F : Firm St : Stiff VSt : Very stiff H : Hard FR : Friable Moisture D : Dry M : Moist W : Wet	VL : Very loose L : Loose MD : Medium dense D : Dense VD : Very dense	VLS : Very low LS : Low MS : Medium HS : High VH : Very high XH : Extremely high	U50 : Undisturbed 50mm diam tube. D : Disturbed sample. SPT : Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm. PP : Hand penetrometer estimate of unconfined compressive strength, kPa. S : Vane shear value kPa. DCP : Dynamic Cone Penetrometer test.

APPENDIX B

Laboratory Test Certificates

Material Test Report

Report Number: 25-474-1
Issue Number: 2 - This version supersedes all previous issues
Reissue Reason: Results Added
Date Issued: 18/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Project Location: 19115
Work Request: 19115
Sample Number: S19115A
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 17/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT3, Depth: 0.3-0.6M



Qualtest Laboratory Pty Ltd
Brisbane Laboratory
2 / 40 Boyland Ave Cooper Plains QLD 4108
Phone: 0417 011 515
Email: greg@qualtestgeo.com

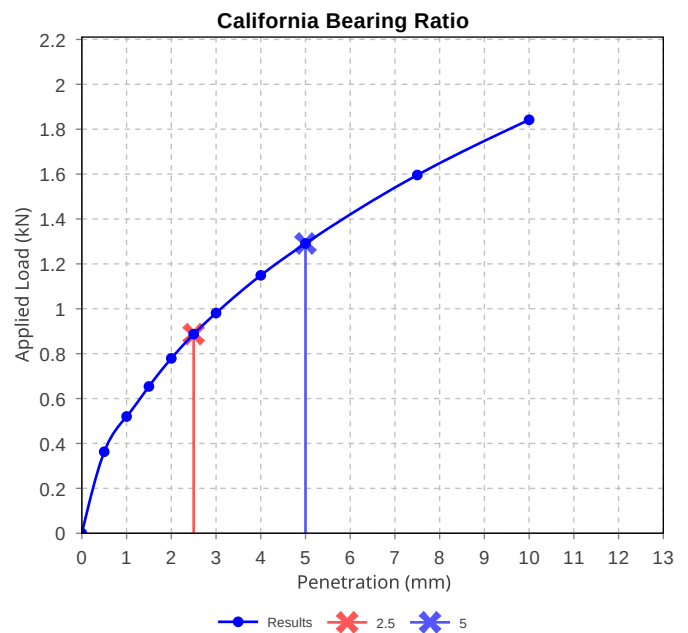
Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Greg Gibson
ql-greg

NATA Accredited Laboratory Number: 2316

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	7		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual		
Maximum Dry Density (t/m ³)	1.72		
Optimum Moisture Content (%)	18.0		
Laboratory Density Ratio (%)	100.5		
Laboratory Moisture Ratio (%)	98.0		
Dry Density after Soaking (t/m ³)	1.71		
Field Moisture Content (%)	17.0		
Moisture Content at Placement (%)	17.4		
Moisture Content Top 30mm (%)	19.0		
Moisture Content Rest of Sample (%)	19.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	24		
Swell (%)	1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: 25-474-1
Issue Number: 2 - This version supersedes all previous issues
Reissue Reason: Results Added
Date Issued: 18/11/2025
Client: KASA GROUP
 PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Project Location: 19115
Work Request: 19115
Sample Number: S19115B
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 17/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT6, Depth: 0.2-0.8M



Qualtest Laboratory Pty Ltd
 Brisbane Laboratory
 2 / 40 Boyland Ave Cooper Plains QLD 4108
 Phone: 0417 011 515
 Email: greg@qualtestgeo.com

Accredited for compliance with ISO/IEC 17025 - Testing

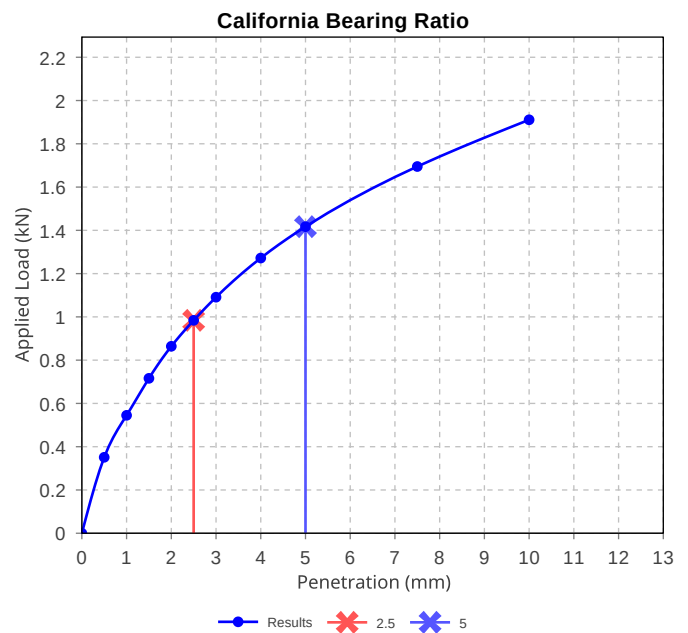


Greg Gibson

Approved Signatory: Greg Gibson
 ql-greg

NATA Accredited Laboratory Number: 2316

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	7		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual		
Maximum Dry Density (t/m ³)	1.77		
Optimum Moisture Content (%)	15.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	103.0		
Dry Density after Soaking (t/m ³)	1.73		
Field Moisture Content (%)	14.5		
Moisture Content at Placement (%)	15.5		
Moisture Content Top 30mm (%)	18.6		
Moisture Content Rest of Sample (%)	17.9		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	24.5		
Swell (%)	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: 25-474-1
Issue Number: 2 - This version supersedes all previous issues
Reissue Reason: Results Added
Date Issued: 18/11/2025
Client: KASA GROUP
 PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Project Location: 19115
Work Request: 19115
Sample Number: S19115C
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 17/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT7, Depth: 0.3-0.8M



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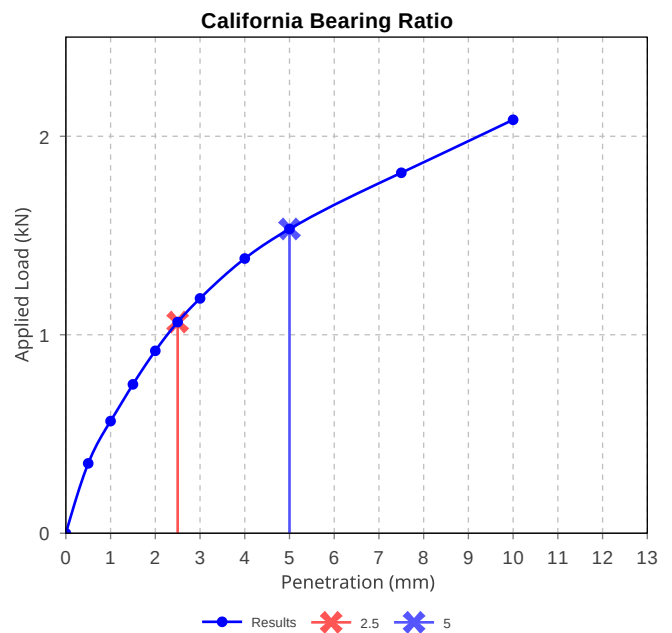


Handwritten signature of Greg Gibson

Approved Signatory: Greg Gibson
 ql-greg

NATA Accredited Laboratory Number: 2316

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	8		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual		
Maximum Dry Density (t/m ³)	1.79		
Optimum Moisture Content (%)	14.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	102.5		
Dry Density after Soaking (t/m ³)	1.76		
Field Moisture Content (%)	11.7		
Moisture Content at Placement (%)	14.3		
Moisture Content Top 30mm (%)	18.8		
Moisture Content Rest of Sample (%)	19.1		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	48		
Swell (%)	1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115D
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 13/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT1, Depth: 0.1-0.3M



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Approved Signatory: Rhys Mitchell
Field Technician
NATA Accredited Laboratory Number: 2316

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	5		
Soil Description	Silty sand		
Nature of Water	Distilled		

Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE
SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115E
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 13/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT2, Depth: 0.3-0.5M



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Approved Signatory: Rhys Mitchell
Field Technician
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Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	3		
Soil Description	Silty CLAY		
Nature of Water	Distilled		

Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115F
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 13/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT5, Depth: 0.1-0.3M



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Approved Signatory: Rhys Mitchell
Field Technician
NATA Accredited Laboratory Number: 2316

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	3		
Soil Description	Clayey SAND		
Nature of Water	Distilled		

Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115G
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 13/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT7, Depth: 0.45-0.7M



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Approved Signatory: Rhys Mitchell
Field Technician
NATA Accredited Laboratory Number: 2316

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	3		
Soil Description	Silty CLAY		
Nature of Water	Distilled		

Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
 PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115H
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 12/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT3, Depth: 0.3-0.5M



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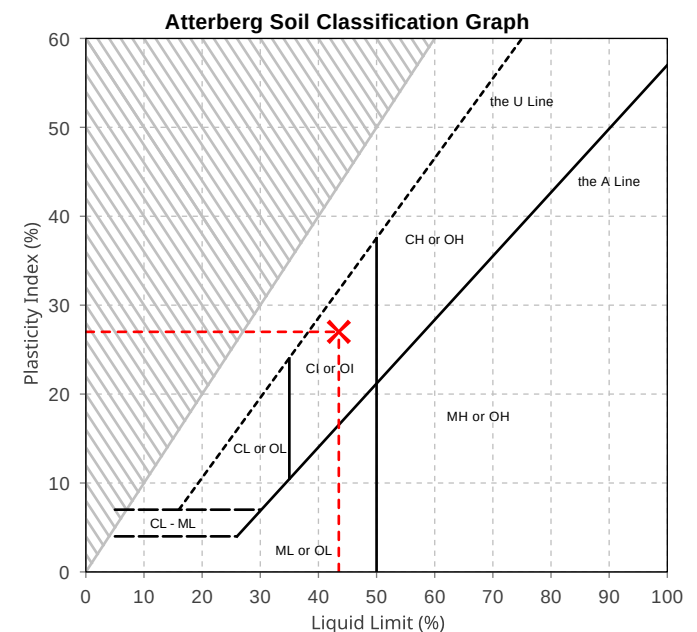
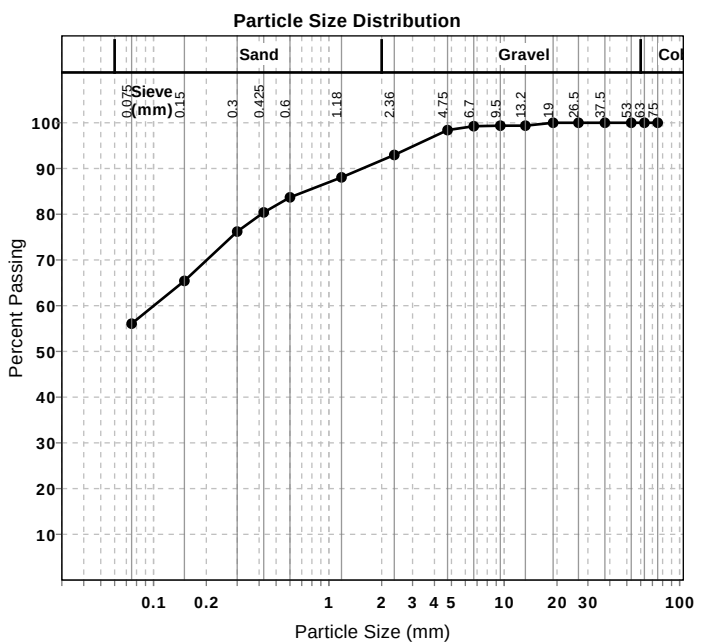


Approved Signatory: Rhys Mitchell
 Field Technician
 NATA Accredited Laboratory Number: 2316

Sieve	Passed %	Passing Limits	Retained %	Retained Limits
75 mm	100		0	
63 mm	100		0	
53 mm	100		0	
37.5 mm	100		0	
26.5 mm	100		0	
19 mm	100		0	
13.2 mm	99		1	
9.5 mm	99		0	
6.7 mm	99		0	
4.75 mm	98		1	
2.36 mm	93		5	
1.18 mm	88		5	
0.6 mm	84		4	
0.425 mm	80		3	
0.3 mm	76		4	
0.15 mm	65		11	
0.075 mm	56		9	

	Min	Max
Sample History	Oven Dried	
Preparation Method	Dry Sieve	
Liquid Limit (%)	44	
Plastic Limit (%)	17	
Plasticity Index (%)	27	
Weighted Plasticity Index (%)	2171	

	Min	Max
Moisture Condition Determined By	AS 1289.3.1.2	
Linear Shrinkage (%)	12.5	
Cracking Crumbling Curling	Curling	



Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
 PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S191151
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 12/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT4, Depth: 0.2-0.6M



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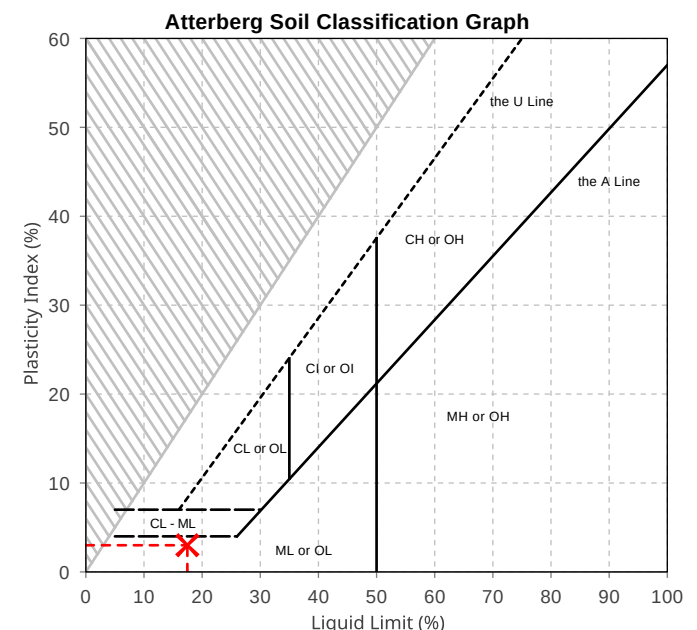
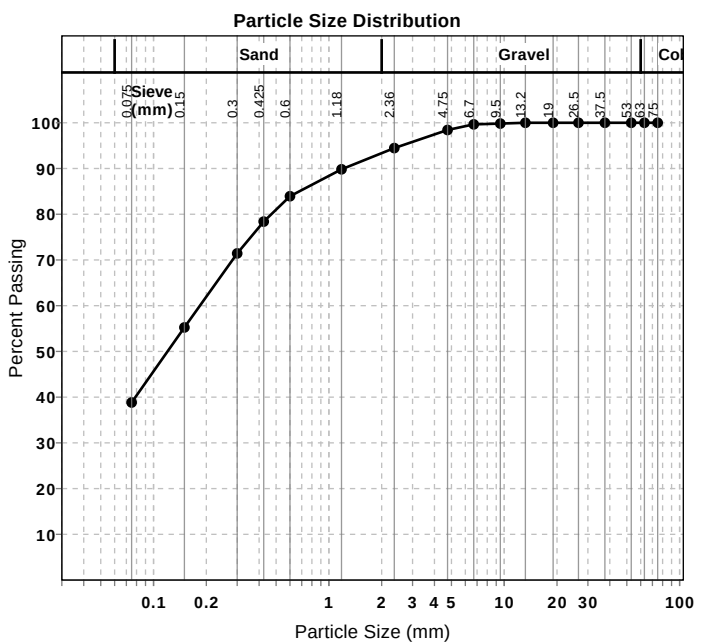


Approved Signatory: Rhys Mitchell
 Field Technician
 NATA Accredited Laboratory Number: 2316

Sieve	Passed %	Passing Limits	Retained %	Retained Limits
75 mm	100		0	
63 mm	100		0	
53 mm	100		0	
37.5 mm	100		0	
26.5 mm	100		0	
19 mm	100		0	
13.2 mm	100		0	
9.5 mm	100		0	
6.7 mm	100		0	
4.75 mm	98		1	
2.36 mm	94		4	
1.18 mm	90		5	
0.6 mm	84		6	
0.425 mm	78		6	
0.3 mm	71		7	
0.15 mm	55		16	
0.075 mm	39		16	

	Min	Max
Sample History	Oven Dried	
Preparation Method	Dry Sieve	
Retained 0.425 (%)	6	
Liquid Limit (%)	17	
Plastic Limit (%)	14	
Plasticity Index (%)	3	
Weighted Plasticity Index (%)	235	

	Min	Max
Moisture Condition Determined By	AS 1289.3.1.2	
Linear Shrinkage (%)	1.5	
Cracking Crumbling Curling	None	



Material Test Report

Report Number: 25-474-1
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
 PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115J
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 12/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT5, Depth: 0.7-0.95



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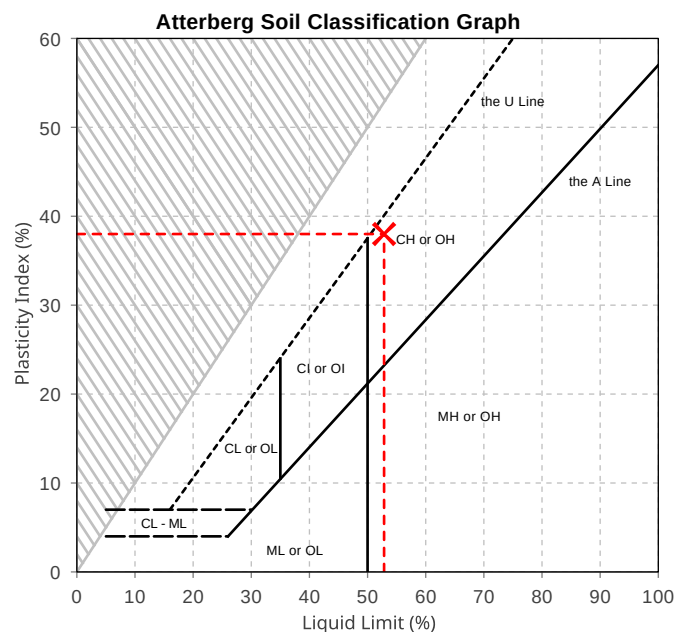
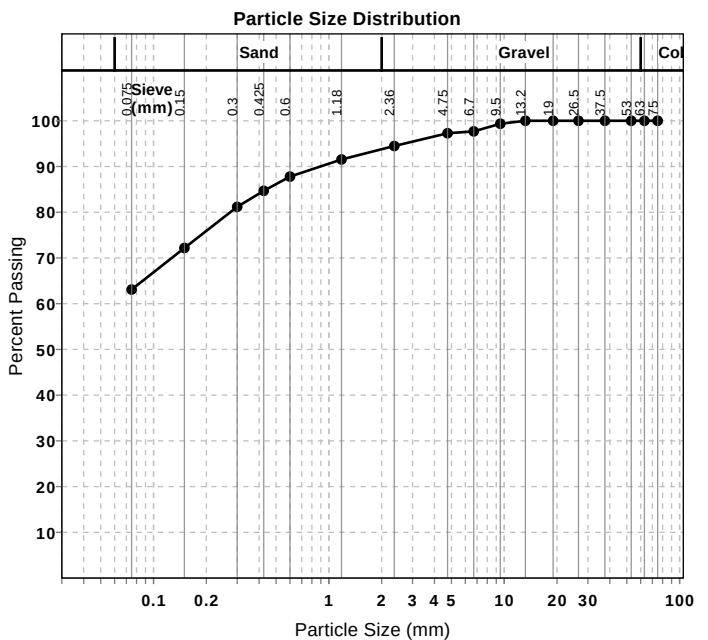


Approved Signatory: Rhys Mitchell
 Field Technician
 NATA Accredited Laboratory Number: 2316

Particle Size Distribution (AS1289 3.6.1)					
Sieve	Passed %	Passing Limits	Retained %	Retained Limits	
75 mm	100		0		
63 mm	100		0		
53 mm	100		0		
37.5 mm	100		0		
26.5 mm	100		0		
19 mm	100		0		
13.2 mm	100		0		
9.5 mm	99		1		
6.7 mm	98		2		
4.75 mm	97		0		
2.36 mm	94		3		
1.18 mm	92		3		
0.6 mm	88		4		
0.425 mm	85		3		
0.3 mm	81		4		
0.15 mm	72		9		
0.075 mm	63		9		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	53		
Plastic Limit (%)	15		
Plasticity Index (%)	38		
Weighted Plasticity Index (%)	3218		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	15.0		
Cracking Crumbling Curling	Curling		



Material Test Report

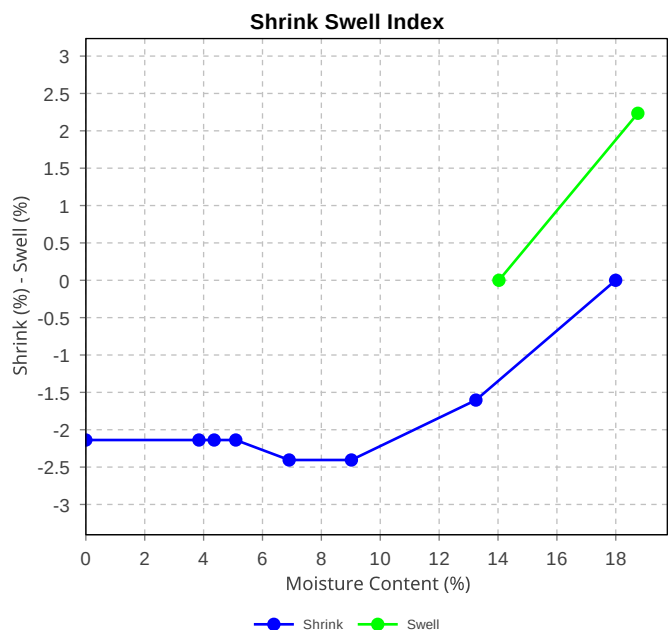
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Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115K
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 10/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT3, Depth: 0.3-0.45M



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Rhys Mitchell (Field Technician)

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	1.8
Visual Description	Orange Grey silty Clay
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	
Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	2.1
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	18.0
Swell Test	
Initial Pocket Penetrometer (kPa)	
Final Pocket Penetrometer (kPa)	
Initial Moisture Content (%)	14.0
Final Moisture Content (%)	18.8
Swell (%)	2.2
* scope of accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

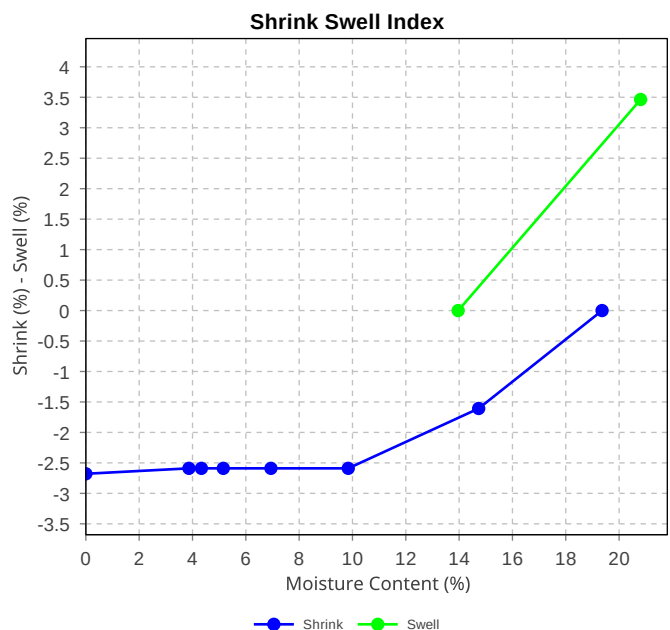
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Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115L
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 10/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT4, Depth: 0.9-1.1M



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Rhys Mitchell (Field Technician)

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	2.5
Visual Description	Orange Grey silty Clay
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	
Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	2.7
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	19.4
Swell Test	
Initial Pocket Penetrometer (kPa)	
Final Pocket Penetrometer (kPa)	
Initial Moisture Content (%)	14.0
Final Moisture Content (%)	20.8
Swell (%)	3.5
* scope of accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

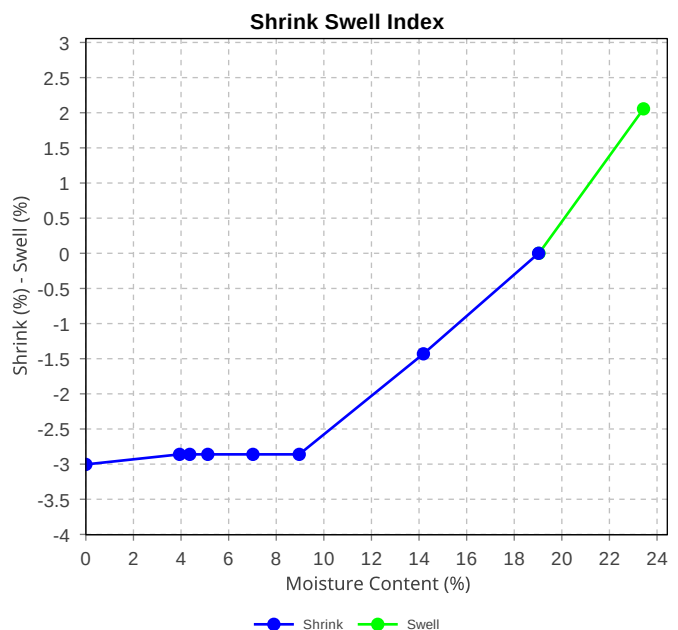
Report Number: 25-474-1A
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Sample Number: S19115M
Date Sampled: 10/11/2025
Dates Tested: 10/11/2025 - 10/11/2025
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection: Selected by Client
Sample Location: QT6, Depth: 0.6-0.75M



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Rhys Mitchell (Field Technician)

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	2.2
Visual Description	Gre Silty Clay
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	
Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	3.0
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	19.0
Swell Test	
Initial Pocket Penetrometer (kPa)	
Final Pocket Penetrometer (kPa)	
Initial Moisture Content (%)	19.0
Final Moisture Content (%)	23.4
Swell (%)	2.1
* scope of accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

Report Number: 25-474-1A
Issue Number: 1
Date Issued: 14/11/2025
Client: KASA GROUP
PO Box 4967, Gold City MC QLD 9726
Contact: Mark Bessell
Project Number: 25-474
Project Name: GEOTECHNICAL SITE INVESTIGATION & LANDSLIDE
SLIDE ASSESSMENT
Project Location: 17 COURTNEY DRIVE, UPPER COOMERA QLD 4209
Work Request: 19115
Dates Tested: 10/11/2025 - 10/11/2025
Location: #17 Courtney Drive, Upper Coomera



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Rhys Mitchell (Field Technician)

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	S19115K	S19115L	S19115M		
Date Sampled	10/11/2025	10/11/2025	10/11/2025		
Date Tested	10/11/2025	10/11/2025	10/11/2025		
Material Source	In-situ	In-situ	In-situ		
Sample Location	QT3 (0.3-0.45M)	QT4 (0.9-1.1M)	QT6 (0.6-0.75M)		
Inert Material Estimate (%)	0	0	0		
Pocket Penetrometer before (kPa)	**	**	**		
Pocket Penetrometer after (kPa)	**	**	**		
Shrinkage Moisture Content (%)	18.0	19.4	19.0		
Shrinkage (%)	2.1	2.7	3.0		
Swell Moisture Content Before (%)	14.0	14.0	19.0		
Swell Moisture Content After (%)	18.8	20.8	23.4		
Swell (%)	2.2	3.5	2.1		
Shrink Swell Index Iss (%)	1.8	2.5	2.2		
Visual Description	Orange Grey silty Clay	Orange Grey silty Clay	Gre Silty Clay		
Cracking	SC	SC	SC		
Crumbling	No	No	No		
Remarks	**	**	**		

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.

Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.

NATA Accreditation does not cover the performance of pocket penetrometer readings.



APPENDIX C

Landslide Assessment Form



Qualtest Laboratory
Est. 1987

Slope Hazard Rating at 17 Courtney Drive, Upper Coomera, QLD 4209

Grade	(1) Natural Surface Conditions	Level	Factor
	<5°	L	0.1
✓	5° to 15°	M	0.5
	15° to 30°	M	0.8
	30° to 45°	H	0.8
	> 45°	M	0.8

	(2) Slope Shape/Appearance	Level	Factor
	Crest or ridge	L	0.7
✓	Planar/convex	M	0.9
	Rough/irregular	H	1.2
	Concave	H	1.5

Grade	(3) Site Geology	Level	Factor
	Problematical geological boundary	VH	1.5
	Volcanic extrusive (basalts etc)	H	1.2
	Volcanic intrusive (granites etc)	M	1.0
✓	Sedimentary rocks	M	1.0
	Low-grade metamorphic rocks	M	1.0
	High-grade metamorphic rocks	L	0.9
	Hill wash (recent colluvial)	VH	2.0

Grade	(4) Soil Profile	Level	Factor
	Bedrock as surface	VL	0.1
	Residual Soil – bedrock < 1m	L	0.5
✓	Residual Soil – bedrock 1 to 3m	M	0.9
	Residual Soil – bedrock > 3m	H	1.5
	Transported Soil - < 1m deep	H	1.5
	Transported Soil - 1 to 3m deep	VH	2.0
	Transported Soil – 3 to 6m deep	VH	4.0
	Transported Soil - > 6m deep	VH	2.0

Grade	(5) Regional Position on Hillside (refer AS4055-2066)	Level	Factor
	Ridgeline	VL	0.7
	Crest	L	0.8
	Upper 1/3 of slope	M	0.9
✓	Mid 1/3 of slope	H	1.2
	Lower 1/3 of slope	H	1.5

Grade	(6) Evidence of Groundwater	Level	Factor
	No evidence	L	0.7
✓	Minor moistness	M	0.9
	Generally wet	H	1.5
	Evidence of spring	VH	3.0
	Do not know	VH	4.0

Grade	(7) Evidence of Slope Instability	Level	Factor
	No sign of instability	L	0.8
✓	Indicators of soil creep	H	1.2
	Minor irregularity	VH	2.0
	Major irregularity	VH	5.0
	Active instability	VH	10.0
	Don't know	VH	15.0

Pre Construction Output = 0.5x0.7x1.0x0.5 x0.8 x0.7x0.8=

0.08

Grade	(8) Cut Depth	Level	Factor
	No cut existing nor proposed	L	0.9
	<1m	M	1.1
✓	1 to 3m	M	1.5
	3 to 6m	H	1.7
	>6m	VH	2.5

Grade	(9) Cut batter angle	Level	Factor
✓	<30°	L	0.5
	30° to 45°	M	1.0
	45° to 60°	M	1.5
	>60°	VH	3.0

Grade	(10) Cut Batter Support	Level	Factor
	Engineered concrete / masonry wall	L	0.5
	Engineered crib wall	M	0.9
	V gabion wall	M	1.0
	Engineered dry rock stack wall	H	1.2
✓	Engineered post and wale wall	H	1.5
	Other (including non-engineered)	VH	2.0

Grade	(11) Fill	Level	Factor
	No fill – existing nor proposed	L	0.9
	<1m	M	1.1
✓	1 to 3m	M	1.5
	3 to 6m	H	1.7
	>6m	VH	2.5

Grade	(12) Fill Batter Angle	Level	Factor
✓	<30°	L	0.5
	30° to 45°	H	1.2
	45° to 60°	VH	2.0
	>60°	VH	4.0

Grade	(13) Fill Batter Support	Level	Factor
	Engineered concrete / masonry wall	L	0.8
	Engineered crib wall	M	1.0
	V gabion wall	H	1.2
	Engineered dry rock stack wall	VH	1.5
✓	Engineered post and wale wall	V	1.8
	Other (including non-engineered)	VH	4.0

Grade	(14) Type of Fill	Level	Factor
✓	AS3798 (Level 1 Certified)	L	0.7
	Compacted but not certified	M	1.0
	Track-rolled fill (Clay)	H	1.2
	Tracked-rolled fill (sand)	VH	1.5
	Obvious compressible fill	VH	3.0

	(15) Wastewater, Sewerage	Level	Factor
✓	Fully sewerer	M	0.8
	Onsite surface disposal within 10m of structure	H	1.5
	Onsite surface disposal > 10m of structure	M	0.9
	Onsite subsurface disposal within 10m of structure	VH	2.0
	Onsite subsurface disposal > 10m of structure	H	1.0
	Not known	VH	4.0

Grade	(16) Stormwater Disposal	Level	Factor
✓	To the kerb or council system	M	0.7
	Rainwater tank with engineer approved overflow	M	0.7
	Rainwater tank without engineer approved overflow	H	1.2
	Dispersed >10m downslope (approved)	M	1.0
	Directly onto ground	M	1.5
	Onsite rubble pit	VH	3.0
	Not known	VH	4.0

Grade	(17) Expandable / Mechanical Stormwater & Drainage Pipe Connectors	Level	Factor
	Specifically, engineer designed and inspected	L	0.8
✓	As per AS2870-2011 for extremely reactive sites	M	1.0
	Not used	VH	2.0
	Not known	VH	4.0

Grade	(18) Footing System	Level	Factor
	Timber/flexible floor (suspended, able to be re-leveled)	L	0.7
	Engineer designed suspended slab	M	1.0
✓	As per AS2870-2011	H	1.2
	Less than AS2870-2011 generally applies to old houses)	VH	2.0
	Not known	VH	4.0

Grade	(19) The Foundation Strata	Level	Factor
✓	Bedrock	L	0.7
	Residual Soil	M	1.0
	Transported Soil	H	1.2
	Fill	VH	3.0
	Not Known	VH	4.0

Grade	(20) In-ground Tank	Level	Factor
	>10m from footing	L	0.7
	6 to 10m from footing	M	1.0
	3 to 6m from footing	H	1.2
	<3m from footing	VH	3.0
	Not known	VH	4.0

Grade	(21) Landscaping	Level	Factor
	AS2870-2011 compliant (+upslope diversion bund/swale)	L	0.7
✓	AS2870-2011 compliant	M	0.9
	Non-AS2870-2011 compliant	H	1.5
	Obvious evidence of water ponding/poor drainage	VH	2.5
	Not known	VH	4.0

Grade	(22) For Upslope Boulder / Flow Event Only	Level	Factor
	Engineer designed catching net	L	0.7
	Engineer designed upslope bund	M	0.9
	Engineer designed upslope fence	M	1.0
	Non engineer approved method	H	1.5
	No action taken	VH	4.0

Summary		
1	Natural Soil Conditions	0.5
2	Slope Shape/Appearance	0.9
3	Site Geology	1.0
4	Soil Profile	0.9
5	Regional Position on Hillside	1.2
6	Evidence of Groundwater	0.9
7	Evidence of Slope Instability	1.2
8	Cut depth	1.5
9	Cut batter angle	0.5
10	Cut batter support	1.5
11	Fill depth	1.5
12	Fill batter angle	0.5
13	Fill batter support	1.8
14	Type of fill	0.7
15	Wastewater system (sewerage etc)	0.8
16	Stormwater disposal	0.7
17	Expandable/mechanical pipes	1.0
18	Footing system	1.2
19	The foundation strata	1.2
20	In-ground tanks	N/A
21	Landscaping	0.9
22	Upslope boulder/flow events only	N/A
Remediation Output =		0.40

* The numeral factors allocated to these site features are based on visual observations, engineering judgment, and experience.

Output	Susceptibility
< 0.2	Very Low Risk (VLR)
0.2 – 0.6	Low Risk (LR)
0.6 – 2.0	Moderate Risk (MR)
2.0 – 6.0	High Risk (HR)
>6.0	Very High Risk (VHR)

VLR = Acceptable. Manage by normal slope maintenance procedures.

LR = Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.

MR = May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning, and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.

HR = Unacceptable without treatment. Detailed investigation, planning, and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.

VHR = Unacceptable without treatment. Extensive detailed investigation and research, planning, and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work is likely to cost more than the value of the property.