# GEOTECHNICAL AND ACID SULFATE INVESTIGATION REPORT



1127 Barrenjoey Road, Palm Beach NSW 2108

Dr J & R Kennedy – February 2021





# **DOCUMENT CONTROL**

# **GEOTECHNICAL AND ACID SULFATE INVESTIGATION REPORT**

1127 Barrenjoey Road, Palm Beach NSW 2108

# **PREPARED FOR**

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- Attachment B: Acid Sulfate Soil Map
- Attachment C: Bore Logs
- Attachment D: Laboratory Reports



# **1. INTRODUCTION**

Geo-Logix Pty Ltd (Geo-Logix) was engaged by Tregale & Associates Pty Ltd (Tregale) to conduct geotechnical and acid sulfate investigations of the site at 1127 Barrenjoey Road, Palm Beach NSW (the site). The investigations were undertaken as part of proposed site redevelopment (Figure 1).

# **1.1 Proposed Development**

Based on concept plans provided by Tregale (Attachment A), Geo-Logix understands that the proposed development comprises demolition of the existing house and construction of a new residential block with a two-level garage and basement. Geo-Logix understands that the proposed development has the following parameters:

- The proposed development is 10 m set back from Barrenjoey Road, this area is to be a driveway and soft landscaping;
- The development will consist of three levels including stories above ground and one basement level with car stacker;
- Ground floor level will be between RL 2.85 and 3.85 and the basement will have a finished floor level of between 1.15 and -0.4 RL, a maximum excavation of approximately 3.250 m;
- An inset swimming pool to between 0.2 and 1.2 m deep, and
- Driveway access to the site will be off Barrenjoey Road.

# **1.2 Objectives and Scope of Work**

The objective of the geotechnical investigation was to assess the subsurface soil strata in order to provide soil parameters and engineering recommendations for site earthwork and proposed construction.

The objective of the acid sulfate investigation was to assess whether soils on the site are actual or potential acid sulfate soils and, if needed, provide advice on acid sulfate soil (ASS) management procedures required to facilitate redevelopment.

To satisfy the above objectives Geo-Logix completed the following scope of work:

- Review of the ASS and geological maps for the area;
- Visual appraisal of the site conditions and locality;
- Drilling of four borings (BH1–BH4) spread across the site including the footprint of proposed excavation by push tube and solid stem auger to a maximum of 8.1 metres below grade (mbg) or refusal on bedrock. (Figure 2);
- Logging of the soil borings in accordance with the Unified Soil Classification System (USCS);
- Collection of soil samples every metre or at changes of soil type;
- Perform field pH and oxidised pH screening on each collected soil sample to assess the presence of ASS;
- Submit one sample from each boring for laboratory assessment for ASS via Chromium Reducible Sulfur Analysis;



- Backfilling of the borings with onsite soils;
- Dynamic Cone Penetrometer (DCP) testing adjacent to the boring locations BH2 and BH3 to assess the relative density and/or consistency of the subsurface soils, and
- Provision of this report detailing the results of the above investigation, recommendations for design and construction of the proposed development.

# **2. SITE INFORMATION**

# 2.1 Site Identification and Description

Site identification details for the investigation are presented in the table below:

Street Address	Lot and Deposited Plan (DP)	Approximate Area (m²)		
1127 Barrenjoey Road, Palm Beach NSW	Lot D DP 313630	624		

Property information sourced from NSW Six Maps (https://maps.six.nsw.gov.au/, last accessed 18/08/2020)

The following site descriptions are based on observation made during the site investigation conducted by Geo-Logix on 28 July 2020.

The subject site is located in a residential area in Palm Beach, NSW. The site forms a rectangular shaped lot approximately 624 m<sup>2</sup> in size, comprising 294.5 m<sup>2</sup> of built upon area and 329.5 m<sup>2</sup> of landscaped area. The lot is bound by Barrenjoey Road to the east, residential properties to the south and north and Pittwater Bay to the west. The site is accessed from Barrenjoey Road located the east.

At the time of Geo-Logix's investigation, the central portion of the site is occupied by a two storey residential property of brick and weatherboard construction, with a partial basement in the western portion. A paved courtyard s present immediately to the east of the property, with a gravel driveway occupying the eastern third of the site. There is a small shed located in the north western portion of the site. The western portion of the site is covered by lawn and has direct access to the beach and Pittwater Bay. Directly to the north and south of the site are residential properties and the boundary is marked by timber panel fencing and vegetation. On the southern boundary of the site, there is a large Norfolk Pine, approximately 1.2 m in diameter and approximately 35 m in height.

The site is relatively flat. Based on site survey information (Detailed Surveys, 2020) the site is located at approximately 3 m above Australian Height Datum (AHD) and slopes down slightly to the west by approximately 0.7 m.

# 2.2 Regional Geology

Review of the 1:100,000 Sydney Geology Map (Geological Survey of New South Wales, 1983) indicates the geology beneath the site to typically comprise Holocene sediments of predominantly coarse to fine quartz sad, with shell fragments and occasionally silt underlain by the Newport Formation of the Narrabeen Group characterised by interbedded laminate, shale and quartz to lithic-quartz sandstone with some clay pellet sandstone which outcrops to the east of the site.



# 2.3 Regional Soils

Reference to the NSW OEH online soil mapping portal (eSPADE v2.0, 2020) indicates that the site is located in the Woy Woy Soil Landscape, characterised by deep (>200cm) siliceous sands and occasional podzols of sandy rises, humus podzols in poorly drained areas and calcareous sands near beaches.

# 2.4 Regional Acid Sulfate Soils

Acid Sulfate Soils (ASS) are those soils that naturally contain iron sulfides which, when exposed to air after being disturbed, can produce sulfuric acid due to oxidation of the sulfides. Their formation requires the presence of iron rich sediments, sulfate (usually from sea water), removal of reaction products such as bicarbonate, the presence of sulfate-reducing bacteria and an abundant supply of organic matter. These conditions generally exist in mangroves, salt marshes, inter-tidal areas and on the beds of coastal rivers and lakes. In Australia they generally occur in soil horizons at a height of less than 5 m AHD.

The adverse environmental impacts of acid sulfate soil disturbance can be significant and include fish kills, fish disease, release of heavy metals from contaminated sediments, and human and ecological impacts.

Potential Acid Sulfate Soils (PASS) are ASS which are unoxidised in their natural state. They possess the potential to generate acid upon lowering of the water table, excavation or other disturbance resulting in exposure to oxygen.

Actual Acid Sulfate Soils (AASS) are ASS which are partially or wholly oxidised in their natural state. The pore water in these soils is acidic as a result of previous acid generation. The potential for additional acid generation may also exist.

Reference to the NSW OEH online acid sulfate soil risk mapping tool (eSPADE v2.0, 2020) and NSW Government Central Resource for Sharing and Enabling Environmental Data in NSW (SEED, 2020) indicates that the site is underlain by soils of a low probability with an occurrence at 1–3 mbg.

Review of the Acid Sulfate Soils Risk Map (The Central Resource for) indicates low probability that site underlain by potential acid sulfate soils (ASS). The ASS map is presented in Attachment B.

# 2.5 Regional Hydrology

It is expected that groundwater follows natural regional topography and flows to the west towards Pittwater Bay. Reference to the Australian Groundwater Explorer (Bureau of Meteorology, 2020) indicates that there are approximately 29 registered groundwater bores within a 500 mm radius of the site, all of which are registered for water supply.

# **3. METHOD OF INVESTIGATION**

# **3.1 Investigation Methods**

Geotechnical fieldwork was undertaken on 28 July 2020 by Kiran Baby (Project Engineer). Sample locations are presented in Figure 2.

Prior to commencement of the borings, the site was scanned for underground services and utilities by an independent utility locator and cross-checked with the results of a 'Dial Before You Dig' (DBYD) search.



Soil bores BH1 and BH2 were extended to a depth of 5.25 mbg and 8.10 mbg respectively using a track mounted drill rig (Miniprobe) equipped with push tubes and solid stem augers. These bores were advanced to termination in TC-bit auger refusal on sandstone bedrock.

Soil bores BH3 and BH4 were drilled to a maximum depth of to 5.3 mbg using a track mounted drill rig (Geoprobe) equipped with push tubes. Soil borings were drilled until push tube refusal on sandstone bedrock located between 5.3 and 8.1 mbg.

Dynamic Cone Penetrometer (DCP) tests were carried out in soils adjacent to BH2 and BH3 to a maximum depth of 3.0 mbg determine the consistency/density of in-situ soils. During site works the encountered soils were logged in accordance with the Unified Soil Classification System (USCS). A copy of the bore logs and DCP results are presented in Attachment C.

For the acid sulfate soil assessment, soil samples were collected in zip lock bags at 1 m intervals. At each interval, two subsamples were tested in the field for pH and oxidised pH. Initially, in situ pH was measured using a Manutec pH soil test kit. Oxidised pH was then analysed using hydrogen peroxide followed by a pH test. The reaction of the soil during oxidation was recorded using a Fizz Rating scale of 1.0 (No reaction to slight) to 4.0 (Extreme reaction). Bagged samples were placed on ice in an esky for transport under chain of custody to NATA accredited laboratory (Eurofins) for analysis of chromium reducible sulfur in selected samples.

At the completion of drilling/excavation each test bore or test pit was reinstated with soil cuttings.

Quality assurance (QA) procedures adopted to prevent cross contamination between samples included the use of fresh disposable nitrile gloves for collecting each soil sample. The soil samples were collected from the push-tube sampler and directly from the flight of the auger.

# 4. INVESTIGATION RESULTS

# 4.1 Surface and Subsurface Conditions

The following sections contain a summarised account of the site surface and subsurface. For detailed descriptions of individual locations please refer to the boring logs, provided in Attachment C. The following ground conditions were revealed by the recent investigation:

# Filling

Fill was encountered across the site to depths of between 0.4 and of 0.8 mbg and was typically described as moderately compacted sand with minor inclusions of gravel, ironstone blocks and brick.

# Alluvial Sand

Onsite native soils underlying fill comprised dark yellowish orange, loose, coarse grained Sand (SP) which extended to between 3.70 and 5.10 mbg. No evidence of ASS was observed during drilling.

# Bedrock

Weathered sandstone/shale was encountered at between 4.4 and 4.6 mbg with drilling refusal at 5.3 mbg.

### Groundwater

Groundwater was encountered at 1.5 mbg in all borings during fieldworks. Groundwater is expected to affect construction activities on site, dewatering is discussed in Section 6.4.



# **5. ACID SULFATE SOILS ASSESSMENT**

# 5.1 On-site pH Screening

The existing pH of soil was moderately neutral to alkaline (pH 7.5 to 8.5). Following addition of hydrogen peroxide, no significant change in pH occurred in majority of soil samples. Additionally, the samples displayed minimal visible reaction to oxidation. As such in situ screening was not indicative of actual or potential ASS.

# **5.2 Laboratory Results**

Based on the results of field pH screening, soil samples were selected from varying depths in the soil profile across the site and submitted to Eurofins for NATA accredited testing under full chain of custody documentation. Analytical results are presented in Table 1 at the rear of this report. Laboratory reports are included in Attachment D.

The laboratory results were compared against the acid sulfate soils action criteria defined in Table 4.4 of the NSW ASS Manual (ASSMAC, 1998). The action criteria for earthworks disturbing soil with less than 5% clay content include  $\geq 0.03\%$  chromium oxidisable sulfur content (SCr) or an equivalent acidity,  $\geq 18$  mol H+/tonne. Acid base accounting based on the results of chromium suite analysis is summarised in the following table:

	Acid Base Accounting							
	Range o	f Results						
Category	Sulfur Units	Acidity Units	Discussion					
	(%S)	(mol H⁺/t)						
Existing Acidity	< 0.003	- 2	Titratable Actual Acidity (TAA) did not exceed the laboratory					
Existing Actuity	< 0.005	< 2	reporting limits in any of the analysed soil samples.					
Dotoptial Agidity	< 0.00F 0.00F	-2.26	Chromium reducible sulfur was not detected at concentrations					
Polential Actuity	< 0.005-0.006	< 3-3.0	greater than the action criteria in any soil samples.					
Acid Neutralising	22 11 0	1 400 2 800	Significant acid neutralising capacity was measured in all					
Capacity	2.3-11.0	1,400-3,000	samples.					
Not Acidity	< 0.02	- 10	Net acidity did not exceed the laboratory reporting limits in any					
Net Actuity	< 0.02	< 10	soil samples analysed.					

Exceedances of the action criteria are in bold.

n/a = not applicable

The laboratory results did not identify actual or potential ASS in the analysed samples.

# 5.3 Acid Sulfate Soil Risk

Based on the in-situ and laboratory tests, no acid sulfate soils (ASS) were identified on site. Onsite soils are not considered actual or potential ASS. An Acid Sulfate Soil Management Plan (ASSMP) is not recommended for the site redevelopment works.



# **6. GEOTECHNICAL RECOMMENDATIONS**

# 6.1 Earthworks

The subject site should be prepared in accordance with AS 3798-2007 Section 6.1 and filled in accordance with AS 3798-2007 Section 6.2.

## **Initial Site Preparation**

Following demolition of the existing residential house, utilities should be located and rerouted as necessary and any abandoned pipes or utility conduits should be removed or filled with grout. Utility trench excavations must be cut to competent bearing soils and backfilled with properly compacted structural fill.

Topsoil and other surface features such as pavements, and foundations should be stripped from the site, including an area extending at least 1.5 m laterally beyond any planned structures or improvements.

## **Structural Filling**

Where the above site preparation procedures create excavations below the proposed final grade, the excavations should be backfilled with properly compacted structural fill. Under no circumstances should topsoil or other organic-laden soils be placed as fill beneath structures.

Once final grade is reached in cut areas, and prior to fill placement in areas of the site that will receive new fill, the subgrade should be evaluated by a geotechnical engineer or their representative. Following subgrade evaluation, the exposed subgrade should be test-rolled in accordance with AS 3798-2007.

Materials selected for use as Structural Fill should not contain organic matter, waste construction debris, or deleterious materials. Fill materials should have a Standard Maximum Dry Density (AS 1289.5.1.1–2003) greater than 1.5 t/m<sup>3</sup> and be granular material or be of low or medium plasticity. Clean onsite fill meeting the above criteria may be used as Structural Fill.

Fill materials should be placed in individual lifts of 300 mm or less loose measurement and compacted using a sheep's foot roller for cohesive soils and a smooth drum roller for cohesionless soils. Fill should be compacted to a minimum of 98% of standard compaction with a moisture content of  $\pm 2\%$  of the optimum moisture content.

Test rolling and fill placement should be undertaken under Level 2 Inspection and Testing.

# 6.2 Excavations

Excavations up to 3.5 m in depth will be required to facilitate the proposed basement. The basement excavation is expected to encounter sandy fill and loose sandy soils. Excavation of the soils is expected to be achievable by excavator. Due to the presence of collapsing sand, no excavation with unsupported faces are recommended. Excavations extending beneath the water table, encountered at 1.5 mbg are expected to collapse rapidly.

Construction vibrations, groundwater management, batter and shoring of excavations are discussed in the following sections.



# 6.3 Temporary and Permanent Batter Slopes and Shoring

Shallow excavations not extending below the water table, such as for the proposed pool, may be supported by batters of 2H:1V to 4H:1V subject to inspection by a competent person.

Stormwater runoff should be directed away from the tops of excavations by use of berm drains. Scouring of excavation faces due to runoff should be repaired prior to further works within the excavation(s).

The contractor is solely responsible for temporary excavation design and should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. Properly installed silt fence should be used at the base of batter slopes to prevent offsite migration of sediment. Scouring of excavation faces due to runoff should be repaired prior to further works within the excavation(s). All permanent batters should be protected from erosion by vegetation or other measures and designed with adequate surface and subsurface drainage.

In no case should slope height, slope inclination, or excavation depth, including utility trench depth, exceed those specified in local, state, and national safety regulations, and in no case should workers enter unbattered and unsupported excavations.

Onsite soils comprise primarily comprise loose sand and are considered to be incapable of supporting a vertical face below the water table for short or long term excavations. Conventional methods of sheet piling are not recommended due to induced vibrations of the loose sands. Alternatively methods such as permeation grout injection to solidify the loose sands in situ is recommended. Extensive dewatering of the site soils is not recommended due to the possible long term settlement of adjoining foundations. Colloidal permeation injection techniques can facilitate excavation below the water table and avoid extensive and continuous dewatering. These techniques are to be used in conjunction with braced false formwork and mechanical retaining structures.

Design of all retaining structures should be undertaken in accordance with AS4678-2002. Furthermore, the design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation, traffic loadings and adjacent buildings. Consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (e.g. from flooding, storm surge or broken services).

Detained		Effective	Angle of Friction ∳' (°)	Earth	Ultimate		
Material	(kN/m <sup>3</sup> )	c' (kPa)		At rest (K₀)	Active (Ka)	Passive (K <sub>p</sub> )	Passive Pressure (kPa)
Onsite Fill and Alluvial Sand	21		28	0.55	0.35	2.75	
Weathered Shale/Sandstone	24	50	32	0.47	0.30	3.25	
Class III Shale/Sandstone	24	150	37	0.25*	0.2*		2,000

The following earth pressure coefficients are recommended for use in design of temporary and permanent retaining structures:

-- Not applicable.

\*This value assumes no adverse jointing.

The 'at rest' earth pressure coefficient ( $K_0$ ) is suitable for retaining structures where anchors or other methods such as the basement and first floor slabs restrain retaining wall movement or where significant movements cannot be tolerated (rigid wall). A uniform or trapezoidal earth pressure distribution should be



adopted. It should be noted that shoring which is designed for this 'at rest' coefficient will still undergo some lateral movements.

The active earth pressure coefficient ( $K_a$ ) is suitable for retaining structures allowing movement of the top. For these structures the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

The passive earth pressure coefficient ( $K_p$ ) is suitable for the calculation of resisting forces at the toe of concrete, reinforced stone, or masonry walls. Based on previous experience at similar sites, it is expected that medium strength shale or sandstone may exist 2–3 m beneath the achieved drilling depths. Where ultimate passive resistance values for piles founded in medium strength or better rock are used, a factor of safety must be applied to these ultimate values to limit the amount of wall movement that is required to mobilise the passive resistance. The top 0.5 m of the rock socket should be ignored in calculations to account for defects and tolerance.

Based on the geology and site setting, Geo-Logix considers that temporary soil anchors are unlikely to be a suitable support method for pile restraint during excavation. Walls should therefore be cantilevered or internally braced and/or propped.

For braced or propped walls, where minor movements can be tolerated e.g. where there are no movement sensitive structures or buried services within 2H of the excavation, we recommend the use of a trapezoidal earth pressure distribution of 6H (kPa) for the soil and Class IV/V bedrock, where H is the retained height in metres. These pressures should be assumed to be uniform over the central 50% of the support system. For the shotcrete infill panel design, a trapezoidal earth pressure distribution and a lateral earth pressure of 4H (kPa) can be adopted for the soil and Class IV/V bedrock.

For braced or propped walls, supporting areas sensitive to lateral movement e.g. where there are movement sensitive structures or buried service present within 2H of the excavation, a trapezoidal earth pressure distribution of 8H (kPa) should be adopted for the soil profile and Class IV/V bedrock, where H is the retained height in metres. These pressures should be assumed to be uniform over the central 50% of the support system. For the shotcrete infill panel design, a trapezoidal earth pressure distribution and a lateral earth pressure of 6H (kPa) can be adopted for the soil and Class IV/V bedrock.

Any surcharge affecting the walls (e.g. traffic, construction loads, adjacent footings, inclined backfill surface, etc.) should be allowed in the design using the appropriate earth pressure coefficient from above.

# 6.4 Groundwater Inflow

Groundwater was encountered at 1.5 mbg and is within the depth of expected onsite excavations. Significant groundwater inflow is expected into onsite excavations and dewatering is expected to be necessary during the excavation works.

So long as excavation walls are fully sealed by sheet piling or secant or contiguous piles, spear point relief well are expected to be sufficient for dewatering.

During excavation and installation, the excavation floor should be monitored for boiling (vertical groundwater inflow) or instability. If instability develops, hydrostatic pressure should be balanced within the excavation and alternate dewatering methods will need to be considered.

The proposed pool and basement should be designed so as to prevent any potential floating condition, including consideration of a raised groundwater elevation due to flooding.



During any dewatering operation, the elevation of groundwater away from the excavation should be monitored. Depression of the water table should be minimised as this may lead to subsidence of adjacent structures. Water table depression is minimised by decreasing the amount of water extracted to the extent possible.

# 6.5 Periods of Respite During Excavation

Geo-Logix understands that Council expect periods of respite for neighbouring properties during excavation. Prior to any such period it should be ensured that the excavation is secured from entry and retaining walls are well braced and sealed from groundwater inflow to the extent practicable. Periodic inspection by the pile installer or other competent person is recommended during such periods.

# **6.6 Construction Induced Vibrations**

If percussive piling methods, including sheet piling or driven piles are used, consideration must be given to possible construction induced ground vibration. Construction induced vibrations may also result from the use of vibratory equipment to compact onsite soils.

If percussive piling is adopted, on-site guidance by a vibration specialist is recommended during the early part of excavation. This should include vibration characterisation trials which are used to define vibration levels for the selected equipment. Peak Particle Velocity (PPV) is usually the adopted measure of ground vibration and the safe limits depend on the sensitivity of the adjoining structures and services. There are a number of Australian and overseas publications which provide vibration velocity guideline levels (or safe limits) including:

- Australian Standard AS2187.2-2006 Explosives Storage and use Use of explosives Appendix J: Ground Vibrations and Airblast Overpressure;
- DIN 4150 Part 3 1999. Effects if Vibration on Structures;
- Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline;
- British Standard BS 7385-1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings;
- British Standard BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

The most appropriate guidelines levels for the proposed excavation work are provided in AS2187.2-2006, which refers to guideline values from BS7385-2 for the prevention of minor or cosmetic damage occurring in structures from ground vibration. Additionally, the guideline levels provided in DIN 4150 Part 3 is considered an appropriate source for guideline levels.

Ideally, safe limits should be determined by a specialist vibration consultant. However, as a preliminary guide, and considering the above guidelines and the type of adjoining structures present, Geo-Logix recommend a maximum PPV of 10 mm/sec (measured at the foundations of adjoining structures) to prevent cosmetic and structural damage.

The PPV limits of 10 mm/sec are expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in the following table:



Geo-Logix notes human discomfort levels caused by vibration are typically less than the levels that are likely to cause cosmetic or structural damage to structures. Therefore, complaints may be lodged by neighbours before any cosmetic or structural damage occurs.

Regardless, Geo-Logix recommends that dilapidation surveys be carried out on adjoining properties prior to construction to confirm that the construction works are not causing damage. These surveys should be agreed to, and the report signed, by the owners of the adjacent building prior to work commencing. Based on the site location, Geo-Logix also recommends that if percussive piling techniques are employed, ongoing vibration monitoring be performed during works.

# 6.7 Site Classification

The natural soil profile comprises sandy soils with limited clay content and is considered to be equivalent to a Class 'A', free surface movement with changes in moisture is not expected in the natural onsite soils in accordance with AS2870—2011.

Geo-Logix notes that this site classification has not included poor site drainage, leaking plumbing, and exceptionally wet or dry moisture conditions.

# 6.8 Norfolk Island Pine at 1125 Barrenjoey Road

Trees may affect adjacent foundations and retaining structures by altering soil moisture conditions. In clay soils this causes volume changes which can lead to differential settlement and/or failure of earth retention structures. Normally, the presence of trees along the site's boundary, in particular the large Norfolk Island Pine on the southern boundary would be considered in accordance with Appendix H of AS2870-2011. However, based on the site profile being clean sand, it is not expected that changes in soil moisture content caused by the trees would result in a deleterious impact on the footings.

# 6.9 Ground Slabs and Pavements

Slab and pavement designs are based on the CBR and modulus of the subgrade materials encountered after any excavation or re-grading has taken place. The principal aim of the subgrade preparation is to provide a uniform foundation over the entire slab/pavement formation which will not give rise to unevenness in the slab/pavement surface under the design loads. Provided the final subgrade performs under test-rolling and is compacted to at least 98% standard compaction a design CBR of 10% is considered appropriate for pavements and slabs with a subgrade comprised of onsite sandy fill or native soil.

Exterior slabs and pavements should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

# 6.10 Foundations

Geo-Logix recommends that footings for the proposed development be founded on a consistent medium to minimise any potential differential settlements. Due to the potential for liquefaction, the shallow water table and the loose sand soil profile, isolated pad footings and strip footings are not recommended except for very lightly loaded structures (< 30 kPa).



The site conditions comprise loose cohesionless material underlain by bedrock of weathered sandstone/ shale present at depths of between 3.7 and 5.1 mbg. It is expected that the portion of the proposed dwelling underlain by the proposed basement will be founded on the contiguous or secant end bearing piles as recommended for excavation shoring. Other portions of the dwelling are also recommended to be founded on the underlying rock. Screw piles, cased bored piles, auger cast piles are considered appropriate. Due to the potential for construction induce vibrations, driven piles are not recommended.

Piles bearing in the underlying weathered sandstone/shale may be designed based on allowable bearing capacity of 700 kPa (Pells et.al,1998). Auger cast or bored piles should be founded a minimum of 2 pile diameters into weathered rock. Screw piles should be installed in accordance with the manufacturer's specifications.

All footing systems should be designed and constructed in accordance with the recommendations contained in AS 2870-2011 and/or AS 2159-2009 by a suitably qualified and experienced structural engineer. Geo-Logix also recommends consultation with a specialist piling contractor to discuss final design of piled foundations.

# 6.11 Aggressivity/Exposure Classification

As the site is located in a coastal area (within 1 km of the shoreline), in accordance with AS3600-2009 and AS2159-2009, concrete and steel structures in contact with soil should be designed based on no less than severely aggressive, B2, exposure.

# 6.12 Seismic Site Classification and Liquefaction

Structural design for earthquake loads should be carried out in accordance with the relevant provisions in AS1170.4–2007. At this preliminary stage, based on the subsurface soil profile encountered during this investigation, and with reference to Tables 3.2 and 4.1 of AS1170.4-2007, the site subsoil class is considered to be  $D_e$  (Deep or Soft Soil) with a hazard factor (Z) of 0.08.

Due to the presence of loose clean sands and a shallow, there is a low potential for soil liquefaction at the site. This risk is not considered relevant for deep foundations bearing on the underlying sandstone.

# 6.13 Geotechnical Risk Management

While the site is not located within a mapped geotechnical hazard zone, in accordance with council's direction, the landslip hazard arising from the proposed basement excavation has been assessed for risk to property and life using the general methodology outlined by the Australian Geomechanics Society (Landslide Risk Management AGS Subcommittee 2007). For the purposes of this assessment, an acceptable level of geotechnical risk for property has been taken as "Low" while an accepted annual probability of loss of life is  $1 \times 10^{-6}$ .

Hazard	Likelihood	Consequence	Risk
Rapid, gross instability arising from proposed excavation	Barely Credible – where excavation stabilisation/retention measures described in this report and the construction management plan are adhered to.	Major	Very Low

Hazards potentially affecting property are summarised in the following table.

For loss of life, the individual risk can be calculated from:



## $R_{(LoL)} = P_{(H)} \times P_{(S:H)} \times P_{(T:S)} \times V_{(D:T)}$

where:

- $R_{(LoL)}$  is the risk (annual probability of loss of life (death) of an individual)
- $P_{(H)}$  is the annual probability of the hazardous event occurring (failure of slope)
- $P_{(S:H)}$  is the probability of spatial affect by the hazard (e.g. of the event impacting the development, taking into account the distance of a given event from the development)
- $P_{(T:S)}$  is the temporal probability (e.g. of the development being occupied by the individual) at the time of the spatial affect
- $V_{(D:T)}$  is the vulnerability of the individual (probability of loss of life of the individual given the event).

The assessed individual risk to life for persons most at risk (i.e. residents and neighbours) resulting from slope instability is summarised in the following table.

Hazard	<b>P</b> (H)	<b>Р</b> (S:H)	<b>P</b> (T:S)	<b>V</b> (D:T)	<b>R</b> (LoL)
Rapid, gross instability arising from proposed excavation	10-6	1	1	1	1.0×10 <sup>-6</sup>

Geo-Logix considers that the proposed construction meets 'Acceptable Risk Management' criteria with respect to both property and life under current and foreseeable conditions, subject to the recommendations within this report.



# 7. LIMITATIONS

The recommendations submitted are based on the available project information and the subsurface information obtained by Geo-Logix. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Geo-Logix should be notified immediately to determine if there are consequences to the recommendations provided in this report. If Geo-Logix is not retained to perform these functions, Geo-Logix cannot be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

After the plans and specifications are more complete the geotechnical engineer should be provided with the opportunity to review the final design plans and specifications to assess whether our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

Geo-Logix has conducted the investigation in accordance with accepted methodologies and state and national guidelines for investigation of ASS. Geo-Logix has formed an interpretation based on scientific principal and experience.

By accepting the advice presented in the Geo-Logix report you agree to indemnify Geo-Logix against any loss, damage, liability, claim, suits, demands and actions for advice which, as a result of local geological/hydrogeological anomalies caused pollution or exacerbated existing pollution. This report has been prepared for the exclusive use of client and their consultants for the specific application to the construction of the proposed redevelopment at 1127 Barrenjoey Road, Palm Beach NSW.



# 8. REFERENCES

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**FIGURES** 





**TABLES** 



	Units	Action Criteria					
			Sample ID	BH1/0.8-1.0	BH1/1.6-1.8	BH1/2.7-2.9	BH1/3.8-4.0
			Depth (m)	1.0	1.8	2.9	4.0
			Date	28/07/2020	28/07/2020	28/07/2020	28/07/2020
pH <sub>F</sub> (natural)	pH Units	-		8.5	8.0	7.5	7.5
pH <sub>FOX</sub> (oxidised)	pH Units	-		8.0	8.0	7.5	7.5
ΔрΗ	pH Units	-		0.5	0.0	0.0	0.0
Reaction Rating*	unitless	-		1.0	1.0	1.0	1.0
pH <sub>KCl</sub>	pH Units	-		9.9			
TAA - Titratable Actual Acidity	mol. H <sup>*</sup> /t	18		<2			
S <sub>CR</sub> - Chromium Reducible Sulfur	% S	0.03		<0.005			
$S_{CR}$ - Chromium Reducible Sulfur	eq. mol. H <sup>+</sup> /t	18		<3			
S <sub>KCI</sub> - KCI Extractable Sulphur	% S	-		n/a			
S <sub>HCI</sub> - HCI Extractable Sulphur	% S	-		n/a			
S <sub>NAS</sub> - Net Acid Soluable Sulphur	% S	-		n/a			
ANC Finess Factor	unitless	_		1.5			
ANC <sub>BT</sub> - Acid Neutralising Capacity	%CaCO <sub>3</sub>	-		7.2			
Net Acidity	% S	0.03		<0.02			
Net Acidity	eq. mol. H <sup>+</sup> /t	18		<10			
Liming Pote	ka CaCO /t			~1			
	ky CaCO <sub>3</sub> /l	-		<1			

Notes:

Action Criteria = ASSMAC (1998) Acid Sulfate Soils Assessment Guidelines, Table 4.4.

\*Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide:

- 1.0 No reaction to slight;
- 2.0 Moderate reaction;

3.0 - Strong reaction with persistent froth; and

4.0 - Extreme reaction.

action criteria not available

< # or ND = analyte(s) not detected in excess of laboratory reporting limit

-- = sample not analysed

n/a = not applicable

Dold/red indicates avaaadance of ostion aritaria



	Units	Action Criteria					
			Sample ID	BH1/4.4-4.5	BH2/0.2	BH2/0.8-1.0	BH2/1.8-2.0
			Depth (m)	4.5	0.2	1.0	2.0
			Date	28/07/2020	28/07/2020	28/07/2020	28/07/2020
pH <sub>F</sub> (natural)	pH Units	-		7.5	7.5	8.0	8.0
pH <sub>FOX</sub> (oxidised)	pH Units	-		7.5	7.5	8.0	8.0
ΔрΗ	pH Units	-		0.0	0.0	0.0	0.0
Reaction Rating*	unitless	-		1.0	1.0	1.0	1.0
pH <sub>KCl</sub>	pH Units	-					
TAA - Titratable Actual Acidity	mol. H <sup>+</sup> /t	18					
S <sub>CR</sub> - Chromium Reducible Sulfur	% S	0.03					
$S_{\rm CR}$ - Chromium Reducible Sulfur	eq. mol. H <sup>+</sup> /t	18					
S <sub>KCI</sub> - KCI Extractable Sulphur	% S	-					
S <sub>HCI</sub> - HCI Extractable Sulphur	% S	-					
S <sub>NAS</sub> - Net Acid Soluable Sulphur	% S	-			-		
ANC Finess Factor	unitless	-					
ANC <sub>BT</sub> - Acid Neutralising Capacity	%CaCO <sub>3</sub>	-					
Net Acidity	% S	0.03					
Net Acidity	eq. mol. H⁺/t	18					
Liming Rate	kg CaCO₃/t	-					

Notes:

Action Criteria = ASSMAC (1998) Acid Sulfate Soils Assessment Guidelines, Table 4.4.

\*Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide:

- 1.0 No reaction to slight;
- 2.0 Moderate reaction;

3.0 - Strong reaction with persistent froth; and

4.0 - Extreme reaction.

action criteria not available

< # or ND = analyte(s) not detected in excess of laboratory reporting limit

-- = sample not analysed

n/a = not applicable



	Units	Action Criteria					
			Sample ID	BH2/2.8-3.0	BH2/3.8-4.0	BH2/5.6-5.8	BH3/0.8-1.0
			Depth (m)	3.0	4.0	5.8	1.0
			Date	28/07/2020	28/07/2020	28/07/2020	28/07/2020
pH <sub>F</sub> (natural)	pH Units	-		8.0	8.0	8.0	8.0
pH <sub>FOX</sub> (oxidised)	pH Units	-		8.0	8.0	8.0	8.0
ΔрΗ	pH Units	-		0.0	0.0	0.0	0.0
Reaction Rating*	unitless	-		1.0	1.0	1.0	2.0
pH <sub>KCl</sub>	pH Units	-				10	
TAA - Titratable Actual Acidity	mol. H <sup>+</sup> /t	18				<2	
S <sub>CR</sub> - Chromium Reducible Sulfur	% S	0.03				<0.005	
$S_{CR}$ - Chromium Reducible Sulfur	eq. mol. H <sup>+</sup> /t	18				<3	
S <sub>KCI</sub> - KCI Extractable Sulphur	% S	-				n/a	
S <sub>HCI</sub> - HCI Extractable Sulphur	% S	-				n/a	
S <sub>NAS</sub> - Net Acid Soluable Sulphur	% S	-				n/a	
ANC Finess Factor	unitless	-				1.5	
ANC <sub>BT</sub> - Acid Neutralising Capacity	%CaCO <sub>3</sub>	-				11	
Net Acidity	0/ 6	0.02				<0.02	
Not Acidity	70 5	0.03				<0.02	
Net Addity	eq. moi. H /t	10				<10	
Liming Rate	kg CaCO₃/t	-				<1	

Notes:

Action Criteria = ASSMAC (1998) Acid Sulfate Soils Assessment Guidelines, Table 4.4.

\*Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide:

- 1.0 No reaction to slight;
- 2.0 Moderate reaction;

3.0 - Strong reaction with persistent froth; and

4.0 - Extreme reaction.

action criteria not available

< # or ND = analyte(s) not detected in excess of laboratory reporting limit

-- = sample not analysed

n/a = not applicable



	Units	Action Criteria					
			Sample ID	BH3/1.6-1.8	BH3/2.8-3.0	BH3/3.7-3.8	BH3/4.8-5.0
			Depth (m)	1.8	3.0	3.8	5.0
			Date	28/07/2020	28/07/2020	28/07/2020	28/07/2020
pH <sub>F</sub> (natural)	pH Units	-		7.5	8.0	8.0	8.0
pH <sub>FOX</sub> (oxidised)	pH Units	-		7.5	8.0	8.0	8.0
ΔрΗ	pH Units	-		0.0	0.0	0.0	0.0
Reaction Rating*	unitless	-		1.0	1.0	1.0	1.0
pH <sub>KCI</sub>	pH Units	-			10		
TAA - Titratable Actual Acidity	mol. H⁺/t	18			<2		
S <sub>CR</sub> - Chromium Reducible Sulfur	% S	0.03			<0.005		
$S_{CR}$ - Chromium Reducible Sulfur	eq. mol. H⁺/t	18			<3		
S <sub>KCI</sub> - KCI Extractable Sulphur	% S	-			n/a		
S <sub>HCI</sub> - HCI Extractable Sulphur	% S	-			n/a		
S <sub>NAS</sub> - Net Acid Soluable Sulphur	% S	-			n/a		
ANC Finess Factor	unitless	_			1.5		
ANC <sub>BT</sub> - Acid Neutralising Capacity	%CaCO <sub>3</sub>	-			19		
Not Apidity	0/ 0	0.02			-0.02		
	% 5	0.03			<0.02		
Net Actuity	eq. mol. H /t	18			<10		
Liming Rate	kg CaCO <sub>3</sub> /t	-			<1		

Notes:

Action Criteria = ASSMAC (1998) Acid Sulfate Soils Assessment Guidelines, Table 4.4.

\*Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide:

- 1.0 No reaction to slight;
- 2.0 Moderate reaction;

3.0 - Strong reaction with persistent froth; and

4.0 - Extreme reaction.

action criteria not available

< # or ND = analyte(s) not detected in excess of laboratory reporting limit

-- = sample not analysed

n/a = not applicable

Dold/red indicates avaaadance of ostion aritaria



	Units	Action Criteria						
			Sample ID	BH4/0.8-1.0	BH4/1.8-2.0	BH4/2.8-3.0	BH4/3.8-4.0	BH4/4.8-5.0
			Depth (m)	1.0	2.0	3.0	4.0	5.0
			Date	28/07/2020	28/07/2020	28/07/2020	28/07/2020	28/07/2020
pH <sub>F</sub> (natural)	pH Units	-		7.5	7.5	8.0	8.0	7.5
pH <sub>FOX</sub> (oxidised)	pH Units	-		7.5	7.5	8.0	8.0	7.5
ΔрΗ	pH Units	-		0.0	0.0	0.0	0.0	0.0
Reaction Rating*	unitless	-		1.0	1.0	1.0	1.0	1.0
pH <sub>KCI</sub>	pH Units	-						9.9
TAA - Titratable Actual Acidity	mol. H⁺/t	18						<2
S <sub>CR</sub> - Chromium Reducible Sulfur	% S	0.03						0.006
S <sub>CR</sub> - Chromium Reducible Sulfur	eq. mol. H <sup>+</sup> /t	18						3.6
S <sub>KCI</sub> - KCI Extractable Sulphur	% S	-						n/a
S <sub>HCI</sub> - HCI Extractable Sulphur	% S	-						n/a
S <sub>NAS</sub> - Net Acid Soluable Sulphur	% S	-						n/a
ANC Finess Factor	unitlaca							15
	%CaCO	-						1.5
Arto <sub>BT</sub> - Acid Neutralising Capacity	70CaCO3	-						30
Net Acidity	% S	0.03						<0.02
Net Acidity	eq. mol. H⁺/t	18						<10
Liming Rate	kg CaCO₃/t	-						<1

### Notes:

Action Criteria = ASSMAC (1998) Acid Sulfate Soils Assessment Guidelines, Table 4.4.

\*Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide:

- 1.0 No reaction to slight;
- 2.0 Moderate reaction;

3.0 - Strong reaction with persistent froth; and

4.0 - Extreme reaction.

- = action criteria not available

< # or ND = analyte(s) not detected in excess of laboratory reporting limit

-- = sample not analysed

n/a = not applicable

**ATTACHMENT A** 















# DA SUBMISSION DRAWING















# PROPOSED BEACHSCAPE ELEVATION

SCALE - APPROX 1 : 200 @A3

1129, 1127 & 1125 FROM SURVEY 1131, 1123& 1121 FROM VISUAL OBSERVATION

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DRAWING **ELEVATION** (FAC

PALM BEACH NSW 2108

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Reg. Architect - Matthew Tregale NSW 7415

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PALM BEACH NSW 2108



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	DRAWING NO .:		REV. :
- EAST ELEVATION RRENJOEY ROAD)	D	A-09	



	Date: 03/04/20	
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ROAD PALM BEACH NSW 2108 D IN DP 313630)	PROPOSAL SERIES	
	DRAWING NO.: REV.	:
- SOUTH ELEVATION CING 1125)	DA-10	



# SECTION / ELEVATION 5 - EAST ELEVATION (FACING BEACH PAVILION)

SCALE - APPROX 1 : 100 @A3

REFER TO BUILDING COLOURS & MATERIALS BOARD DA-20 FOR FURTHER DETAIL OF EXTERNAL MATERIALS AND FINISHES.

REFER DA-16 TO DA-19 INCLUSIVE FOR 3D SKETCH IMAGE MASSING MODEL VIEWS

REFER TO DA-21 & DA-22 FOR WINDOW. GLAZED DOOR AND SKYLIGHT SCHEDULE AND BASIX COMMITMENTS

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	-	DA LODGEMENT	26/11/20	Architects & Urban Designers DR & MRS KENNEDY	AT 1127 BARRENJOEY R (LOT D I	
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		P.O.Box 603, St. Ives, NSW 2075		P.O.Box 603, St. Ives, NSW 2075 PALM BEACH NSW 2108		
				Member T: (02) 9983 1712 M: 0418 791 920	SECTION / ELEVATION	
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RL	RIDGE
10.	95

1129





# SECTION / ELEVATION 6 - WEST ELEVATION (FACING FRONT PAVILION)

SCALE - APPROX 1 : 100 @A3

REFER TO BUILDING COLOURS & MATERIALS BOARD DA-20 FOR FURTHER DETAIL OF EXTERNAL MATERIALS AND FINISHES.

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REFER TO DA-21 & DA-22 FOR WINDOW, GLAZED DOOR AND SKYLIGHT SCHEDULE AND BASIX COMMITMENTS

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	DRAWING NO .:		REV. :
ATIC SECTION B - B	D	A-14	



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SCALE - APPROX. 1:100 AT A3										
	5		] 10M							
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usability, completeness or accuracy of data transfered electronidally. Recipients should when necessary request a	-	PRE-DA MEETING 1	02/07/20	Architects & Urban Designers	DR & MRS KENNEDY 1127 BARRENJOEY ROAD,	NEW DETACHED DWELLING				
hard copy version for verification. Use figured dimensions in preference to scale. All dimensions to be verified on site.	-	DA LODGEMENT	26/11/20			AT 1127 BARRENJOEY ROAD PALM BEACH NSW 2108 (LOT D IN DP 313630)			SAL	
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				Member Australian institute of Architects Reg. Architect – Matthew Tregale NSW 7415		DIAGRAMMATIC SECTION C - C		DA-15		

# DA SUBMISSION DRAWING NOT FOR CONSTRUCTION



MASSING MODEL VIEW 1 FROM BARRENJOEY ROAD LOOKING NORTH EAST

SCALE - NTS (NB - EXISTING TREES & VEGETATION NOT SHOW FOR CLARITY)



# MASSING MODEL VIEW 2 FROM BARRENJOEY ROAD LOOKING SOUTH EAST

(NB - EXISTING TREES & VEGETATION NOT SHOW FOR CLARITY)

SCALE - NTS

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hard copy version for verification. Use figured dimensions in preference to scale. All dimensions to be verified on site.	•	DA LODGEMENT	26/11/20	Architects & Urban Designers Tregale & Associates Pty Ltd. P.O.Box 603, St. Ives, NSW 2075 T : (02) 9983 1712 M : 0418 791 920 E : matthewtregale@bigpond.com	DR & MRS KENNEDY 1127 BARRENJOEY ROAD.	AT 1127 BARRENJOEY R (LOT D I
©Copyright These drawings and designs and the copyright thereof are the property of Tregale & Associates P/L and must not be used retained or copied without the written permission of Tregale & Associates P/L.					PALM BEACH NSW 2108	DRAWING : MASSING MO (FROM BARF
ACN 135 339 954				Reg. Architect – Matthew Tregale NSW 7415		-

# DA SUBMISSION DRAWING NOT FOR CONSTRUCTION

### GENERAL NOTES

SCHEMATIC DESIGN -THESE DRAWINGS HAVE BEEN PREPARED FOR DA LODGEMENT ONLY AND HAVE NOT BEEN PREPARED FOR ANY OTHER PURPOSE. -ALL LAYOUTS ARE SCHEMATIC AND SHOULD BE VERIFIED PRIOR TO PREPARATION OF CONSTRUCTION DOCUMENTATION -DO NOT SCALE OF THESE PLANS



CHED DWELLING ROAD PALM BEACH NSW 2108 IN DP 313630)		Date: 03/04/20 DRAWING SERIES: PROPOS SERIES	AL
	DRAWING NO .:		REV. :
ODEL VIEWS 1 & 2 RRENJOEY ROAD)	D	A-16	





SCALE - NTS

(NB - EXISTING TREES & VEGETATION NOT SHOW FOR CLARITY)

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hard copy version for verification. Use figured dimensions in preference to scale. All dimensions to be verified on site.	-	DA LODGEMENT	26/11/20	Architects & Urban Designers DR & MRS KENNE 1127 BARRENJOE 1127 BARRENJOE PALM BEACH NSV PALM BEACH NSV F: (02) 9983 1712 M: 0418 791 920 E: matthewtregale@bigpond.com Reg. Architect – Matthew Tregale NSW 7415	DR & MRS KENNEDY 1127 BARRENJOEY ROAD.	AT 1127 BARRENJOEY R (LOT D I	
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# DA SUBMISSION DRAWING NOT FOR CONSTRUCTION

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CHED DWELLING		Date: 03/04/20 DRAWING SERIES:	
ROAD PALM BEACH NSW 2108 IN DP 313630)		SERIES	AL
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MODEL VIEW 3 ENJOEY ROAD	D	A-17	





SCALE - NTS (NB - EXISTING TREES & VEGETATION NOT SHOW FOR CLARITY)

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usability, completeness or accuracy of data transfered electronidally. Recipients should when necessary request a	-	PRE-DA MEETING 1	02/07/20	Architects & Urban Designers Architects & Urban Designers Tregale & Associates Pty Ltd. P.O.Box 603, St. Ives, NSW 2075 T: (02) 9983 1712 M: 0418 791 920 E in orthonomous designers		NEW DETAC
hard copy version for verification. Use figured dimensions in preference to scale. All dimensions to be verified on site.	-	DA LODGEMENT	26/11/20		AT 1127 BARRENJOEY R (LOT D I	
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### GENERAL NOTES

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# MASSING MODEL VIEW 5 - FROM BEACH SIDE

SCALE - NTS

(NB - EXISTING TREES & VEGETATION NOT SHOW FOR CLARITY)

Tregale & Associates accept no responsibility for the	REV.	DETAILS	DATE	Traciale & Associates CLIENT:	PROJECT :
usability, completeness or accuracy of data transfered electronidally. Recipients should when necessary request a	-	PRE-DA MEETING 1	02/07/20	iregaie & Associates	
hard copy version for verification. Use figured dimensions in preference to scale. All dimensions to be verified on site.	-	DA LODGEMENT	26/11/20	Architects & Urban Designers DR & MRS KENNEDY	AT 1127 BARRENJOEY R (LOT D I
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ACN 135 339 954				of Architects Reg. Architect – Matthew Tregale NSW 7415	

# DA SUBMISSION DRAWING NOT FOR CONSTRUCTION

### GENERAL NOTES

SCHEMATIC DESIGN -THESE DRAWINGS HAVE BEEN PREPARED FOR DA LODGEMENT ONLY AND HAVE NOT BEEN PREPARED FOR ANY OTHER PURPOSE. -ALL LAYOUTS ARE SCHEMATIC AND SHOULD BE VERIFIED PRIOR TO PREPARATION OF CONSTRUCTION DOCUMENTATION -DO NOT SCALE OF THESE PLANS

SURVEY DATA -EXISTING SITE DATA, CONTEXT AND LEVELS SHOWN ON THESE DRAWINGS ARE BASED ON SURVEY PREPARED BY DETAILED SURVEYS CONSULTING SURVEYORS DATED 28/02/20. AS THESE DRAWINGS HAVE BEEN PREPARED BASED ON THE WORK OF OTHERS, REFERENCE SHOULD BE MADE BACK TO ORIGINAL SURVEY FOR VERIFICATION OF ALL LEVELS AND SITE DETAIL.

### Date: 03/04/20 DRAWING SERIES: CHED DWELLING ROAD PALM BEACH NSW 2108 PROPOSAL IN DP 313630) SERIES DRAWING NO .: REV. MODEL VIEW 5 DA-19 BEACH SIDE

**ATTACHMENT B** 



**ATTACHMENT C** 



# Geo-Logix Pty Ltd Building Q2, Level 3

Unit 2309 / 4 Daydream Street Warriewood NSW 2102 www.geo-logix.com.au

Project Number:	2001056
Hole Depth:	5.25 m
Date Started:	28/07/2020
Date Completed:	28/07/2020

Project Name:	Geotechnical & Acid Sulfate Investigations Report									
Location / Site:	1127 Barrenjoey Rd, Palm Beach NSW									
Client:	Tregale & Associates Pty Ltd									
Contractor:	Terratest Pty Ltd									
Method:	Direct Push , Solid Flight Auger (Miniprobe)									

Image: Second	Method	Water Level	Depth (mBGL)	RL (mAHD)	Sample Type	HC Odour	Sample ID	pH₅	pH <sub>Fox</sub>	Reaction	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture
R         Z         BH10.8-10         8.5         8         1         R         C         BH10.8-10         8.5         8         1         R         R         C         BH10.8-10         8.5         8         1         R         R         Z         BH11.8-18         8         8         1         R         SAND - dark yellowish orange (10YR 6/6), 100% sand, 20% (100% sand, 20% (100% sand, 1006e.         Wet           2         R         Z         BH112.7-2.9         7.5         7.5         1         Image         SAND - dark yellowish orange (10YR 6/6), 100% sand, medium         wet           3         R         Z         BH112.7-2.9         7.5         7.5         1         Image															
Image:			0.20 0.30											FILL - brown (10YR 4/6), 98% sand, 2% gravel, poorly compacted.	damp
Image: state         R         Z         BH1/0.8-1.0         8.5         8         1         Fill moderate yellowish for (10YR 6/6), 5% day, 5% slit, 60% sand, 30% gravel, moderately compacted.         Image: state			0.50								ш			FILL - moderate brown (5YR 4/4), 10% clay, 70% sand, 20% gravel, moderately compacted.	damp
Image: Part of the part			-											FILL - moderate yellowish brown (10YR 5/4), 100% sand, moderately compacted.	moist
Image: Sample of the second			1		R	Z	BH1/0.8-1.0	8.5	8	1		SP		FILL - moderate red (5R 4/6), 5% clay, 5% silt, 60% sand, 30% gravel, moderately compacted, with ironstone blocks.	
Image: Normal Section         R         Z         BH1/1.6-1.8         8         8         1         SAND - dark yellowish orange (10YR 6/6), 100% sand, loose.         wet           Image: Normal Section         Image: Normal Section         R         Z         BH1/2.7-2.9         7.5         7.5         1         Image: Normal Section         SAND - dark yellowish orange (10YR 6/6), 100% sand, medium         wet           Image: Normal Section         R         Z         BH1/3.8-4.0         7.5         7.5         1         Image: Normal Section         SAND - dark yellowish orange (10YR 6/6), 100% sand, medium         wet           Image: Normal Section         R         Z         BH1/3.8-4.0         7.5         7.5         1         Image: Normal Section         SANDSTONE - dark yellowish orange (10YR 6/6), 100% sand, medium         wet           Image: Normal Section         D         Z         BH1/4.4-4.5         7.5         7.5         1         Image: Normal Section         SANDSTONE - dark yellowish orange (10YR 6/6), 100% sand, medium         wet           Image: Normal Section         D         Z         BH1/4.4-4.5         7.5         7.5         1         Image: Normal Section         SANDSTONE - dark yellowish orange (10YR 6/6), 100% sand, medium         media           Image: Normal Section         D         Z         B			-											SAND - dark yellowish orange (10YR 6/6), 100% sand, loose.	
Image         Image <th< td=""><td></td><td>¥</td><td><u>1.50</u></td><td></td><td>R</td><td>7</td><td>BH1/1 6-1 8</td><td>8</td><td>8</td><td>1</td><td></td><td>┢</td><td></td><td>SAND - dark yellowish orange (10YR 6/6), 100% sand, loose.</td><td>wet</td></th<>		¥	<u>1.50</u>		R	7	BH1/1 6-1 8	8	8	1		┢		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose.	wet
Image: See Sample of the section of the sectin of the section of the section of the section of the section of			2			_	2,			•					
Image: Providence of the	PT		-									ISP			
Image of the second			2.60												
1       1       1       R       Z       BH1/3.8-4.0       7.5       7.5       1       Weathered SANDSTONE - dark yellowish orange (10YR 6/6), very dense.         1       0       Z       BH1/4.4-4.5       7.5       7.5       1       SP       SANDSTONE - dark yellowish orange (10YR 6/6), very dense.         1       0       Z       BH1/4.4-4.5       7.5       7.5       1       SANDSTONE - dark yellowish orange (10YR 6/6).         1       1       1       1       1       1       1       1       1         1	om.au		-		R	z	BH1/2.7-2.9	7.5	7.5	1	ral			SAND - dark yellowish orange (10YR 6/6), 100% sand, medium dense, more coarse, shells present.	wet
Image: Street State of Period S	umad.c		3								Natu	SP			
Tomous Properties       Sample Type	www.re		-												
Image: New Section of the section o	vhite at		3.70												
Auge       -	laurie v		4		R	z	BH1/3.8-4.0	7.5	7.5	1				Weathered SANDSTONE - dark yellowish orange (10YR 6/6), very dense.	
Normalize       D       Z       BH1/4.4-4.5       7.5       7.5       1       SANDSTONE - dark yellowish orange (10YR 6/6).         Sandstructure       Sandstructure       Sandstructure       Sandstructure       Sandstructure       Sandstructure         Model       Ender Period       Stength Testing       Stength Testing       Stength Testing       Additional Comments         Model       L ow       Stength Testing       Stength Testing       Stength Testing       Encontend Groundwater         Statistics       Continuous       Stength Testing       Stength Testing       Encontend Groundwater       Stength Testing       Encontend Groundwater         Statistics       Stength Testing       Encontend Groundwater       Encontend Groundwater       Encontend Groundwater       Encontend Groundwater       Encontend Groundwater         Statistics       Logged By:       Kiran Baby       Date:       28/07/2020	rawn by		-												
Image: Second of the second	AM - dr		-		D	Z	BH1/4.4-4.5	7.5	7.5	1					
Abbreviations     Sample Type     Strength Testing       Abbreviations     Sample Type     Strength Testing       H High     Disturbed     Disturbed       L Low     B Bulk       Z Zero     R Representative       J Jar     Abbreviations       Kiran Baby     Date:       2 Zero     Log Drawn By: Laurie White	0:02:58 SFA		4.80									⊢		SANDSTONE - dark vellowish orange (10YR 6/6).	
Abbreviations       Additional Comments         H High       D Disturbed         D Disturbed       Strength Testing         M Medium       D Disturbed         L Low       B Bulk         P Pocket Penetrometer         P Pocket Penetrometer         P Pocket Penetrometer         J Jar         Abbreviations         Kepresentative         C Continuous         J Jar         Abbreviations         Kepresentative         C Continuous         J Jar         Abbreviations         Kiran Baby         Date:         28/07/2020	1/20 1		5												
Abbreviations       Additional Comments         Hydrocarbon Odour       Sample Type         Abbreviations       Strength Testing         Hydrocarbon Odour       Sample Type         D Disturbed       U Undisturbed         U Undisturbed       DCP Dynamic Cone Penetrometer         PP Pocket Penetrometer       Pocket Penetrometer         Vater Levels       Encountered Groundwater         Stabilised Groundwater       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater         Op Drawn By: Laurie White       Logged By:       Kiran Baby       Date:       28/07/2020	3DT 8/1		-											<b>Terminated at 5.250 m</b> SFA refusal.	
Abbreviations       Sample Type       Strength Testing         H High       D Disturbed       SPT       Stradard Penetration Test         U Undisturbed       D Dynamic Cone Penetrometer       PP         P Pocket Penetrometer       PP       Pocket Penetrometer         Vater Levels       Encountered Groundwater       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater       Stabilised Groundwater         Op Drawn By:       Laurie White       Logged By:       Kiran Baby       Date:       28/07/2020	J GL.G		F												
Abbreviations       Additional Comments         Hydrocarbon Odour       Sample Type       Strength Testing         H High       D Disturbed       SPT       Standard Penetration Test         M Medium       U Undisturbed       DCP       Dynamic Cone Penetrometer         L Low       B Bulk       PP       Pocket Penetrometer         Z Zero       R Representative C Continuous J Jar       Encountered Groundwater         Stabilised Groundwater       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater         Op Drawn By:       Laurie White       Logged By:       Kiran Baby       Date:       28/07/2020	CH.GF		6												
M       Medium       U       U. Undisturbed       SP1       Standard renetration lest         M       Medium       U       U. Undisturbed       DCP       Dynamic Cone Penetrometer         V       L       Low       B       Buk       PP       Pocket Penetrometer         Z       Zero       R       Representative       V       Encountered Groundwater         Jar       Asb Asbestos       V       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater         Option       Log Drawn By: Laurie White       Logged By:       Kiran Baby       Date:       28/07/2020		Σ Δ Abbreviations ≊ Hydrocarbon Odour Sample Type Strength Testing									Additional Comments				
2       2010       in inclusion bit direction         C       Continuous J Jar Asb Asbestos       V         Encountered Groundwater Stabilised Groundwater       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater         Stabilised Groundwater       Stabilised Groundwater         Operation       Log Drawn By: Laurie White       Logged By: Kiran Baby       Date: 28/07/2020         Operation       Destruction       Discrete Stability       Date: 28/07/2020	C n nigit U Unisturbed SPT Standard Penetration 1est     Medium U Undisturbed DCP Dynamic Cone Penetrometer     So L Low B Bulk PP Pocket Penetrometer								er						
Nou nouristitis     ✓ Stabilised Groundwater       Image: Stabilised Groundwater     Logged By:       Kiran Baby     Date:     28/07/2020       Image: Stabilised Groundwater     Diale:	C Continuous Water Levels C Continuous J Jar														
Log Drawn By: Laurie White Logged By: Kiran Baby Date: 28/07/2020	ss202(				ASD AS	DESIOS	Stabilised Grour	ndwater							
Leter 10/08/2020		Log Drawn By: Laurie White							) Dreuma	d.com	Logged By: Kiran Baby Date: 28/07/2020 Checked By: Ted Lilly Date: 10/08/2020				

Date: 10/08/2020 Sheet: 1 of 1



# Geo-Logix Pty Ltd Building Q2, Level 3

Unit 2309 / 4 Daydream Street Warriewood NSW 2102 www.geo-logix.com.au

Project Number:	2001056
Hole Depth:	8.10 m
Date Started:	28/07/2020
Date Completed:	28/07/2020

Project Name:	Geotechnical & Acid Sulfate Investigations Report								
Location / Site:	1127 Barrenjoey Rd, Palm Beach NSW								
Client:	Tregale & Associates Pty Ltd								
Contractor:	Terratest Pty Ltd								
Method:	Direct Push , Solid Flight Auger (Miniprobe)								

Method	Water Level	Depth (mBGL)	RL (mAHD)	Sample Type	HC Odour	Sample ID	PH⊧	рН <sub>ғох</sub>	Reaction	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Dynamic Cone Penetrometer
Γ															blows/100mm
┢		0.20	-		7		7.5	7.5	1	Fill			FILL - moderate brown (5YR 3/4), 5% clay, 90% sand, 5% gravel, poorly compacted, with organic material.	damp	
		0.40 					7.0	7.0	•				FILL - moderate brown (5YR 3/4), 10% clay, 70% sand,	moist	
				R	z	BH2/0.8-1.0	8	8	1		SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, poorly graded.		
ΡŢ	:	<u>1.60</u>		R	z	BH2/1.8-2.0	8	8	1				SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, more coarse grained.	wet	
		- - - - - - -		R	z	BH2/2.8-3.0	8	8	1		SP				
tt www.reumad.com.au		- - - - - - - - - - - - - - - - - - -		R	z	BH2/3.8-4.0	8	8	1	Natural	SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, medium dense.	wet	
H.GPJ GL.GDT 8/11/20 10:02:39 AM - drawn by laurie white a SFA				D	z	BH2/5.6-5.8	8	8	1				Weathered SANDSTONE - dark yellowish orange (10YR 6/6), very dense.		
BEAC		-											Terminated at 8.100 m SFA refusal.		
3ASS2020+DCP 2001056 PALM	Abbreviations       Sample Type       Strength Testing         Hydrocarbon Odour       D Disturbed       SPT       Standard Penetration Test         M       Medium       U Undisturbed       DCP       Dynamic Cone Penetrometer         Low       B       Bulk       PP       Pocket Penetrometer         Z       Zero       R       Representative       Water Levels         J       Jar       Incountered Groundwater         Asb Asbestos       Image: Stabilised Groundwater							۲ ۲			Additional Comments	07/2020			
Contact: laurie.white@reumad.com.au									d.com.	Checked By: Ted Lilly Date: 10/	08/2020				



Geo-Logix Pty Ltd Building Q2, Level 3 Unit 2309 / 4 Daydream Street Warriewood NSW 2102 www.geo-logix.com.au

Project Number:	2001056
Hole Depth:	5.30 m
Date Started:	28/07/2020
Date Completed:	28/07/2020

Project Name:	Geotechnical & Acid Sulfate Investigations Report								
Location / Site:	1127 Barrenjoey Rd, Palm Beach NSW								
Client:	Tregale & Associates Pty Ltd								
Contractor:	Terratest Pty Ltd								
Method:	Direct Push (Geoprobe)								

Mothod	Water Level	Depth (mBGL)	RL (mAHD)	Sample Type	HC Odour	Sample ID	pH⊧	pH <sub>Fox</sub>	Reaction	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Dynamic Cone Penetrometer
															blows/100mm 10 20
		0.20	-							Ē			FILL - dark yellowish orange (10YR 6/6), 100% sand, moderately compacted.	damp	
		0.40	-									XX	FILL - brownish black (5YR 2/1), 10% clay, 70% sand,	damp	
				R	Z	BH3/0.8-1.0	8	8	2		SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, poorly graded.	moist	
iom.au	⊻	1.60 - - - - - - - - - - -		R	Z	BH3/1.6-1.8	7.5	7.5	1				SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, coarse grained.	wet	
y laurie white at www.reumad.c		3	R Z BH3	BH3/2.8-3.0 BH3/3.7-3.8	8	8	1	Natura	SP						
GDT 8/18/20 4:08:13 PM - drawn b T		4 4.10 - - 4.70 - 5 -		R	Z	BH3/4.8-5.0	8	8	1		SP		SAND - greyish orange pink (5YR 7/2), 100% sand, medium dense, weathered sandstone, shale & ironstone fragments. Weathered SANDSTONE - greyish orange pink (5YR 7/2), very dense.	wet	
SS2020+DCP 2001056 PALM BEACH.GPJ GL	Abbreviations         Hydrocarbon Odour         Bulk         P         D         P         Pocket Penetrometer         Zero         R         Representative         Var         Asb Asbestos         D         Stabilised Groundwater							r			Terminated at 5.300 m         Push tube refusal.         Additional Comments				
GLLOGA	Log Drawn By: Laurie White Contact: laurie.white@reumad.com.au							d.com.	Logged By:Kiran BabyDate: 28/Checked By:Ted LillyDate: 18/	07/2020 08/2020					

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GLOGAS

Geo-Logix Pty Ltd Building Q2, Level 3 Unit 2309 / 4 Daydream Street Warriewood NSW 2102 www.geo-logix.com.au

Project Number:	2001056
Hole Depth:	5.30 m
Date Started:	28/07/2020
Date Completed:	28/07/2020

Project Name:	Geotechnical & Acid Sulfate Investigations Report									
Location / Site:	1127 Barrenjoey Rd, Palm Beach NSW									
Client:	Tregale & Associates Pty Ltd									
Contractor:	Terratest Pty Ltd									
Method:	Direct Push (Geoprobe)									

Method	Water Level	Depth (mBGL)	RL (mAHD)	Sample Type	HC Odour	Sample ID	рН <sub>F</sub>	рН <sub>ғох</sub>	Reaction	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture
		- - - - 0.80								Fill			FILL - moderate brown (5YR 3/4), 10% clay, 70% sand, 20% gravel, moderately compacted, with bricks.	damp
		0.80 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1		R	Z	BH4/0.8-1.0	7.5	7.5	1		SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose.	moist
				R	Z	BH4/1.8-2.0	7.5	7.5	1		SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, more coarse grained.	wet
hite at www.reumad.com.au PT				R	Z	BH4/2.8-3.0	8	8	1	Natural	SP		SAND - dark yellowish orange (10YR 6/6), 100% sand, loose, finer grained sand.	wet
drawn by laurie w				R	Z	BH4/3.8-4.0	8	8	1					
- MA (		4.60									SP		SAND - greyish orange pink (5YR 7/2), 100% sand, medium dense, weathered sandstone & shale.	wet
8/11/20 10:03:00		- - 5 -		R	Z	BH4/4.8-5.0	7.5	7.5	1				Weathered SANDSTONE / SHALE - greyish orange pink (5YR 7/2), dense.	
GPJ GL.GDT {		-											<b>Terminated at 5.300 m</b> Push tube refusal.	
HOK _	1	6												
Abbreviations Abbreviations Hydrocarbon Odour H High H High L Low Z Zero 00000 C		S Idour	Sample D Dis U Un B Bu R Re C Co J Jan Asb Asi	Type sturbed disturbed lk presentative ntinuous	Strength Testing       SPT     Standard Penetin       DCP     Dynamic Cone I       PP     Pocket Penetror       Water Levels        Encountered Gr        Stabilised Grour	ration Test Penetromete meter oundwater ndwater	۱۲					Additional Comments Irrigation water line encountered at 0.5m.		

ATTACHMENT D



# Certificate of Analysis

# **Environment Testing**

Geo-Logix P/L Bld Q2 Level 3, 2309/4 Daydream St Warriewood NSW 2102





NATA Accredited Accreditation Number 1261 Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Ted Lilly

Report Project name Project ID Received Date **734705-S** PALM BEACH - GEOTECH & ASS 2001056 Jul 29, 2020

Client Sample ID			BH1/0.8-1.0	BH2/5.6-5.8	BH3/2.8-3.0	BH4/4.8-5.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-JI48276	S20-JI48277	S20-JI48278	S20-JI48279
Date Sampled			Jul 28, 2020	Jul 28, 2020	Jul 28, 2020	Jul 28, 2020
Test/Reference	LOR	Unit				
Chromium Suite						
pH-KCL	0.1	pH Units	9.9	10.0	10	9.9
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	< 0.003
Chromium Reducible Sulfur <sup>S04</sup>	0.005	% S	< 0.005	< 0.005	< 0.005	0.006
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	3.6
Sulfur - KCI Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCI Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCI Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite <sup>S02</sup>	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	7.2	11	19	36
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	1400	2200	3800	7100
Acid Neutralising Capacity - equivalent S% pyrite (s- ANCbt) <sup>S03</sup>	0.02	% S	2.3	3.5	6.1	11
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate <sup>S01</sup>	1	kg CaCO3/t	< 1	< 1	< 1	< 1
Extraneous Material						
<2mm Fraction	0.005	g	180	140	140	97
>2mm Fraction	0.005	g	0.10	15	3.0	1.1
Analysed Material	0.1	%	100	90	98	99
Extraneous Material	0.1	%	< 0.1	9.7	2.2	1.1
% Moisture	1	%	4.3	13	17	16



### Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	Aug 03, 2020	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	Aug 03, 2020	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Brisbane	Aug 04, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			

Date Reported: Aug 05, 2020

• eurofine									New Zealand	aland									
ABN –	50 005 085 521	Enviro	nment Te	ofins.com	Melbour Monter Dandeno Phone : + NATA # 7 Site # 12	ne ey Roac ng Sout 61 3 85 1261 54 & 14	l h VIC 31 64 5000 271	Sydney           Unit F3, Building F           5         16 Mars Road           Lane Cove West NSW 2066           Phone : +61 2 9900 8400           NATA # 1261 Site # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794	Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 767 Phone : 0800 856 450 IANZ # 1290							
Co Ad	Company Name:       Geo-Logix P/L         Address:       Bld Q2 Level 3, 2309/4 Daydream St         Warriewood       NSW 2102							der N port # none: ix:	: PO3976 734705 02 9979 1722 02 9979 1222		Received:         Jul 29, 2020 2:40           Due:         Aug 5, 2020           Priority:         5 Day           Contact Name:         Ted Lilly								
Pro Pro	oject Name: oject ID:	PALM BEAC 2001056	CH - GEOTEC	H & ASS							Eurofins Analytica	l Services Manager : Ur	sula Long						
Sample Detail								Moisture Set											
Melb	ourne Laborate	ory - NATA Site	# 1254 & 142	271															
Sydr	ney Laboratory	- NATA Site # 1	8217																
Bris	bane Laborator	y - NATA Site #	20794			Х	х	х											
Pertl	h Laboratory - I	NATA Site # 237	736																
Exte No	rnal Laboratory Sample ID	/ Sample Date	Sampling Time	Matrix	LAB ID														
1	BH1/0.8-1.0	Jul 28, 2020		Soil	S20-JI48276		х	х											
2	BH2/5.6-5.8	Jul 28, 2020		Soil	S20-JI48277		х	х											
3	BH3/2.8-3.0	Jul 28, 2020		Soil	S20-JI48278		Х	Х											
4	BH4/4.8-5.0	Jul 28, 2020		Soil	S20-JI48279		х	Х											
5	BH1/1.6-1.8	Jul 28, 2020		Soil	S20-JI48280	Х													
6	BH1/2.7-2.9	Jul 28, 2020		Soil	S20-JI48281	х													
7	BH1/3.8-4.0	Jul 28, 2020		Soil	S20-JI48282	Х													
8	BH1/4.4-4.5	Jul 28, 2020		Soil	S20-JI48283	Х													
9	BH2/0.8-1.0	Jul 28, 2020		Soil	S20-JI48284	Х													
10	BH2/1.8-2.0	Jul 28, 2020		Soil	S20-JI48285	X													

	fine			Austra	lia		New Zealand					
ABN - 50 005 085 521	web : www.eurofi	Environment	Testing reurofins.com	Melbour 6 Monter Dandenc Phone : - NATA # Site # 12	ne rey Road ong Sout +61 3 85 1261 54 & 14	1 h VIC 3175 564 5000 271	Sydney Unit F3, Building F 16 Mars Road Lane Cove West NSW 2066 Phone : +61 2 9900 8400 NATA # 1261 Site # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794	Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 767 Phone : 0800 856 450 IANZ # 1290	
Company Name: Address:	Geo-Logix F Bld Q2 Leve Warriewood NSW 2102	P/L ⊧I 3, 2309/4 Daydream St			O Re Pl Fa	rder No. eport #: none: ax:	PO3976 734705 02 9979 1722 02 9979 1222		Received: Due: Priority: Contact Name:	Jul 29, 2020 2:40 PM Aug 5, 2020 5 Day Ted Lilly	Λ	
Project Name: Project ID:	PALM BEA0 2001056	CH - GEOTECH & ASS							Eurofins Analytica	I Services Manager : UI	sula Long	
	Sa	ample Detail		HOLD	Chromium Reducible Sulfur Suite	Moisture Set						
Melbourne Laborato	ry - NATA Site	# 1254 & 14271										
Sydney Laboratory -	NATA Site # 1	18217										
Brisbane Laboratory	- NATA Site #	ŧ 20794		Х	X	X						
Perth Laboratory - N	ATA Site # 23	736										
11 BH2/2.8-3.0	Jul 28, 2020	Soil	S20-JI48286	X								
12 BH2/3.8-4.0	Jul 28, 2020	Soil	S20-JI48287	X								
13 BH3/0.8-1.0	Jul 28, 2020	Soil	S20-JI48288	X								
14 BH3/1.6-1.8	Jul 28, 2020	Soil	S20-JI48289	X								
15 BH3/3.7-3.8	Jul 28, 2020	Soil	S20-JI48290	X		<b> </b>						
16 BH3/4.8-5.0	Jul 28, 2020	Soil	S20-JI48291	X		<b> </b>						
17 BH4/0.8-1.0	Jul 28, 2020	Soil	S20-JI48292	X		<b> </b>						
18 BH4/1.8-2.0	Jul 28, 2020	Soil	S20-JI48293	X								
19 BH4/2.8-3.0	Jul 28, 2020	Soil	S20-JI48294	X		$\left  \right $						
20 BH4/3.8-4.0	Jul 28, 2020	Soil	S20-JI48295	X								
Test Counts				16	4	4						



### Internal Quality Control Review and Glossary

### General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site 1. Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- 2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- 3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- 5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds
- 6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- 7. Samples were analysed on an 'as received' basis.
- 8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
- This report replaces any interim results previously issued. 9.

### **Holding Times**

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days. \*\*NOTE: pH duplicates are reported as a range NOT as RPD

### Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms	
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
сос	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
СР	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

### QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

### QC Data General Comments

- 1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- 2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 3. Organochlorine Pesticide analysis where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
- 4. Organochlorine Pesticide analysis where reporting Spike data, Toxaphene is not added to the Spike.
- Total Recoverable Hydrocarbons where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported 5. in the C10-C14 cell of the Report.
- 6. pH and Free Chlorine analysed in the laboratory Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- 7. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
- 8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
- 9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
- 10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.



### **Quality Control Results**

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Chromium Suite									
pH-KCL			%	98			80-120	Pass	
Acid trail - Titratable Actual Acidity			%	98			80-120	Pass	
Chromium Reducible Sulfur			%	100			80-120	Pass	
Acid Neutralising Capacity (ANCbt)			%	95			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate							1		
Chromium Suite				Result 1	Result 2	RPD			
pH-KCL	S20-JI48276	CP	pH Units	9.9	9.9	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	S20-JI48276	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	S20-JI48276	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	S20-JI48276	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	S20-JI48276	СР	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCI Extractable	S20-JI48276	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	S20-JI48276	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	S20-JI48276	СР	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	S20-JI48276	СР	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	S20-JI48276	CP	% CaCO3	7.2	7.3	2.0	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	S20-JI48276	СР	% S	2.3	2.3	2.0	30%	Pass	
ANC Fineness Factor	S20-JI48276	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	S20-JI48276	СР	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	S20-JI48276	СР	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	S20-JI48276	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-JI43113	NCP	%	9.7	9.7	1.0	30%	Pass	



### Comments

N/A
Yes
No

### **Qualifier Codes/Comments**

Code Description

S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCI is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

### Authorised By

Ursula Long Myles Clark Analytical Services Manager Senior Analyst-SPOCAS (QLD)

Glenn Jackson General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

\* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Environment TestingMelbourne<br/>6 Monterey Road<br/>Dandenong South Vic 3175Sydney<br/>Unit F3, Building F<br/>Unit F3, Building F<br/>Lane Cove West NSW 2066<br/>Phone : +61 2 9900 8400<br/>NATA # 1261Brisbane<br/>1/21 Smallwood Place<br/>Murarie QLD 4172<br/>Phone : +61 2 9900 8400<br/>NATA # 1261 Site # 18217

web : www.eurofins.com.au

Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736

e.mail : EnviroSales@eurofins.com ABN - 50 005 085 521

# Sample Receipt Advice

Geo-Logix P/L
Ted Lilly
PALM BEACH - GEOTECH & ASS
2001056
Not provided
5 Day
Jul 29, 2020 2:40 PM
734705

# Sample information

- A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- $\checkmark$ Sample Temperature of a random sample selected from the batch as recorded by Eurofins Sample Receipt : 4.7 degrees Celsius.
- All samples have been received as described on the above COC.
- COC has been completed correctly.
- Attempt to chill was evident.
- Appropriately preserved sample containers have been used.
- All samples were received in good condition.
- Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- $\mathbf{V}$ Appropriate sample containers have been used.
- $\times$ Split sample sent to requested external lab.
- $\times$ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

# Contact notes

If you have any questions with respect to these samples please contact:

Ursula Long on Phone : or by e.mail: UrsulaLong@eurofins.com

Results will be delivered electronically via e.mail to Ted Lilly - tlilly@geo-logix.com.au.

Geo-Lo Building Q2, 2309/4 Dayo Warriewood, ABN: 86 116 89	eo-Logix Pty Ltd       CHAIN OF CUSTODY         ilding Q2, Level 3       Project Manager:       Image:         09/4 Daydream St       Image:       Image:       Image:         arriewood, NSW 2102       Contact email:       Lilly@gco-bgit.com.au       /kbaby@gco-bgit.com.au         N: 86 116 892 936       Project Name:       Image:       Image:       Image:							,	Page      of																						
P: (02) 9979 1 F: (02) 9979 1	722 222	Project Numb	per:	21	001	05	6	Date Submitted:Q 9/	7/0	202	0				TAT	requ	ired	:		5	TD						able				
				N	latr	ix		ANALYSIS	RE	QL	JIR	ED											(H	·			R			7	
Lab ID	Sample ID	Date	soil	water	air	paint, filters	other	Comments	COMPOSITE	TRH - C6 - C10	TRH - C10 - C40	vocs	BTEXN	PAHs	PCBs	OCPs	OPPs	Phenols	Metals - M8	Metals - Lead	Metals - Specify *	Asbestos (ID only	Asbestos (WA DC	Foreign Materials	Conductivity (EC)	H	Chromium	Hold	SUITE		Eurofins MGT Suite Codes
	BH1/08-1.0	28/07/2020																												B1 B1A	TRH/BTEXN TRH/MAH
	BH1/1.6-1.8	1	V										4. S. S.															V	1	B2	TRH/BTEXN/Pb
	BH1/2.7-2.9		1																									V	-	B2A B3	TRH/MAH/Pb PAH/Phenols
	BH1/3.8-4.0		V					SA PARA																				V	•	B4	TRH/BTEXN/PAH
	BH1/4:4-45		1																									V	1	B4A B5	TRH/BTEXN/PAH/Phenols TRH/BTEXN/M7
	BH2/08-10		1																									V	1	B6	TRH/BTEXN/M8
	BH2/1.8-2.0		1																									1		B7 B7A	TRH/BTEXN/PAH/M8 TRH/BTEXN/PAH/Phenols/M8
	BH2/28-30		1	•																								1	1	B8	TRH/VOC/PAH/M8
	BH2/3.8-4.0		V																									~	1	B9	
- Sheet Sh	BH2/56-5.8		1																											B11	Na/K/Ca/Mg/Cl/SO <sub>4</sub> /CO <sub>3</sub> /HCO <sub>3</sub> /NH <sub>3</sub> /NO <sub>3</sub>
	BH3/0.8-1.0		V																									V		B11A	B11/Alkalinity
	BH3/1.6-1.8		1																									1	1	B11B	TRH/BTEXN/Oxygenates/Ethanol
	BH3/2.8-3.0																												-	B12A	TRH/BTEXN/Oxygenates
	BH3/37-38																											1	1	B13 B14	OCP/PCB OCP/OPP
	BH3/4.8-5:0														3													1	1	B15	OCP/OPP/PCB
4	BHA 10:8-1.0		1							1411 A								2.2						13				V		B16	TDS/SO <sub>4</sub> /CH <sub>4</sub> /Alk/BOD/COD/HPC/CUB
	BH11-8-2.0																											1		B18	CI-/SO₄/pH
	BH4/28-30	Y	1																									P	1	B19 B20	N/P/K CEC/%ESP/Ca/Ma/Na/K

Metals\*\*(circle) As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Cr <sup>6+</sup>, Cr <sup>3+</sup>, Fe <sup>2+</sup>, Fe <sup>3+</sup>, Be, B, Al, V, Mn, Fe, Co, Se, Sr, Sn, Mo, Ag, Ba, Tl, Bi, Sb

# **Chain of Custody**

Received by: <u>Marcs</u> Date/Time: <u>79.7/20</u> Gran 29/7 2:40 #734705 KB Date/Time: 29 7 Signature: Relinquished by:

Version: V1 Issued: June 2015 Review: January 2022

<b>Geo-Log</b> Building Q2, 2309/4 Dayd Warriewood, ABN: 86 116 892 P: (02) 9979 11 F: (02) 9979 12	gix Pty Ltd Level 3 ream St NSW 2102 1936 722 222	CHAIN OF CUSTODY Project Manager: TED HALY Contact email: Llilly@geo-logix.com.au/kbaby@geo-logix.com.au Project Name: Palm Beach-Geoted & A55 Project Number: 201056 Date Submitted: 29/7/2020 ANALYSIS REQUIRED										Page       2 of 2         Purchase Order No:																			
Lab ID	Sample ID	Date	soil	water	latriz	paint, filters	other	Comments	COMPOSITE	TRH - C6 - C10	TRH - C10 - C40	VOCs	BTEXN	PAHs	PCBs	OCPs	OPPs	Phenols	Metals - M8	Metals - Lead	Metals - Specify " TCL P	Asbestos (ID only)	Asbestos (WA DOH)	Foreign Materials	Conductivity (EC)	PH c	Chromin Re	Hold	SUITE		Eurofins MGT Suite Codes
	BH4/3·8-4·0 BH4/4·8-5·0	2.8/7/2020																												B1A B2 B2 B2 B3 B4 B4A B6 B7 B7 B7A B8 B9 B10 B11 B11A B11B B12 B12A B12 B12A B13 B14 B15 B16	TRH/MAH           TRH/BTEXN/Pb           TRH/MAH/Pb           PAH/Phenols           TRH/BTEXN/PAH           TRH/BTEXN/PAH           TRH/BTEXN/PAH/Phenols           TRH/BTEXN/PAH/Phenols           TRH/BTEXN/PAH/Phenols           TRH/BTEXN/PAH/Phenols/MB           TRH/BTEXN/PAH/Phenols/MB           TRH/BTEXN/PAH/Phenols/MB           TRH/BTEXN/PAH/OCP/MB           TRH/BTEXN/PAH/OCP/MB           TRH/BTEXN/PAH/OCP/OPP/MB           Nark/Ca/Mg/Cl/SO_/CO_/HCO_/NH_/NO_           B11/ALkalinity           B11/EC/TDS           TRH/BTEXN/Oxygenates/Ethanol           OCP/PCB           OCP/PCB           OCP/OPP           OCP/OPP/CB           TDS/SO_(CH_/AIk/BOD/COD/HPC/CUB
																														B17 B18 B19 B20	SO <sub>4</sub> /NO <sub>3</sub> /Fe++/HPC/CUB CI-/SO <sub>4</sub> /pH N/P/K , CEC/%ESP/Ca/Ma/Na/K

Metals\*\*(circle) As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Cr <sup>6+</sup>, Cr <sup>3+</sup>, Fe <sup>2+</sup>, Fe <sup>3+</sup>, Be, B, Al, V, Mn, Fe, Co, Se, Sr, Sn, Mo, Ag, Ba, Tl, Bi, Sb

# **Chain of Custody**

Date/Time: 29/7 Signature: Received by: Marco Date/Time: 29/7/20 Signature: 12:51 Gran 29/7 2:40 ##734705 KB Relinquished by:

n -2

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# #AU04\_Enviro\_Sample\_NSW

From: Sent: To:	Kiran Baby <kbaby@geo-logix.com.au> Thursday, 30 July 2020 8:43 AM #AU04_Enviro_Sample_NSW</kbaby@geo-logix.com.au>
Subject:	RE: Eurofins Sample Receipt Advice - Report 734705 : Site PALM BEACH - GEOTECH & ASS (2001056)
Follow Up Flag:	Follow up
Flag Status:	Completed

Hi Grace,

Can you update the purchase order number on this one?

PO3976

Thanks,

Kiran

From: EnviroSampleNSW@eurofins.com [mailto:EnviroSampleNSW@eurofins.com]
Sent: Wednesday, 29 July 2020 5:31 PM
To: Ted Lilly <tlilly@geo-logix.com.au>
Cc: Kiran Baby <kbaby@geo-logix.com.au>
Subject: Eurofins Sample Receipt Advice - Report 734705 : Site PALM BEACH - GEOTECH & ASS (2001056)

Dear Valued Client,

Please find attached a Sample Receipt Advice (SRA), a Summary Sheet and a scanned copy of your Chainof-Custody (COC). It is important that you check this documentation to ensure that the details are correct such as the Client Job Number, Turn Around Time, any comments in the Notes section and sample numbers as well as the requested analysis. If there are any irregularities then please contact your Eurofins | mgt Analytical Services Manager as soon as possible to make certain that they get changed.

Regards

Grace Tuckwell Sample Receipt

**Eurofins | Environment Testing** 

Unit F3, Parkview Building 16 Mars Road LANE COVE WEST NSW 2066 AUSTRALIA Phone: +61 29900 8421 Email: <u>EnviroSampleNSW@eurofins.com</u> Website:<u>environment.eurofins.com.au</u>

EnviroNote 1098 - Melbourne PFAS Accreditation EnviroNote 1103 - NATA Accreditation for Dioxins Click <u>here</u> to report this email as spam.

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