

Geotechnical & Acid Sulfate Soils Investigation Report Proposed Multi-Storey Residential Development 280 MacArthur Avenue, Hamilton



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Executive Summary

This report presents the results of a geotechnical and acid sulfate soils (ASS) investigation carried out by Core Consultants Pty Ltd (Core) for a proposed multi-storey residential development at 280 MacArthur Avenue, Hamilton. The proposed development includes a number of four- and five-level unit buildings over a single-level partly inground basement. Bulk excavation to about 2 m below ground level (BGL) is anticipated.

Borehole drilling, electronic cone penetration testing and geophysical testing was undertaken between 22 April and 2 May 2024. Geotechnical and ASS laboratory testing was undertaken.

The site history indicates that the site consisted of a river inlet until the early 1900's when the area of Hamilton was reclaimed land using dredge spoil. The subsurface conditions encountered and interpreted from the site history generally comprised the following:

- Fill (uncontrolled), typically firm or stiff gravelly clay, to about 1 to 1.6 m BGL, over
- Fill/dredge spoil (uncontrolled) comprising soft clay (material dredged from the adjacent Brisbane River channel), to depths of possibly about 5 m BGL, although difficult to differentiate from the underlying material,
- Upper alluvium, generally comprising interbedded loose sand and firm clay to about 15 m to 20 m BGL, over
- Lower alluvium, generally loose to medium dense sand and stiff clay, becoming medium dense or dense gravel from about 30 m to 32 m BGL.

Groundwater seepage was encountered in the auger boreholes at about RL 2 m to 3.45 m AHD and was measured at standing depths within the monitoring wells at approximately RL 1.1 m to 1.4 m AHD. Ordinarily near the Brisbane River where sands are present, groundwater levels would be tidally dominated and occur at or around high tide level about RL 1 m to 1.5 m and rise temporarily and locally due to ingress after rainfall. It is understood the storm tide level for this site is RL 3.1 m (i.e. below basement level). Groundwater conditions can vary over distance and time and apart from tide and rainfall be influenced by changes to surface and subsurface drainage conditions and human influences.

Temporary batters in the sands and clays (up to 2 m deep) could be formed at 1V:1.5H. For excavations where space does not permit temporary batters (e.g. close to the site boundary), engineer-designed temporary support will be required (e.g. anchored sheet piles).

At basement level and where clay fill is encountered, the subgrade will comprise weak clay, untrafficable for almost all machines. A working platform of at least 0.3 m would be required for smaller machines. For larger equipment (e.g. piling rig), a substantial working platform of 0.8 m to 1 m or more could be required on the soft clay subgrade.

Consolidation settlement should be anticipated under new loads (e.g. from buildings or fill), e.g. as evidenced in access shafts along Macarthur Avenue. Estimated consolidation settlement at the CPT locations range between about 70 mm and 75 mm, for an assumed new load of 20 kPa. Differential settlement will be likely due to variation in load and clay thickness/extent, as well as due to varying structural loads and supports (e.g. between piled and non-piled elements).

Due to the presence of uncontrolled fill and potential consolidations settlements, the site would be classified *Class P* in accordance with AS 2870-2011.

Due to the anticipated consolidation settlement, as well as the presence of very loose and loose silty sands which may be susceptible to liquefaction under earthquake conditions, the structure will need to be fully suspended on piles (including basement slab). Driven precast concrete piles are considered suitable (with management of vibration impacts), founded in the dense gravel alluvium expected from approximately 30 m to 32 m BGL. Alternatively, CFA piles could be considered, founding in the dense materials at depth. The AS1170.4-2007 *Structural design actions* site subsoil classification for earthquake actions design is considered to be *Class* D_e – *Deep or soft soil site*.

The results of this investigation indicate there is the likelihood of disturbance of low levels of actual and high levels of potential acidity associated with the proposed development. Based on the net acidity values, lime treatment is considered necessary for the proposed excavation works. It is recommended that an ASS management plan (ASS MP) be developed and implemented.

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Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
BHC	Emma Mohler	RevA	May 2024	Email (PDF)
BHC	Maggie Biggs	RevB	May 2024	Email (PDF)

1.0 INTRODUCTION

This report presents the results of a geotechnical and acid sulfate soils (ASS) investigation carried out by Core Consultants Pty Ltd (Core) for a proposed multi-storey residential development at 280 MacArthur Avenue, Hamilton.

The work was carried out for Brisbane Housing Company (BHC), in accordance with our proposal Q004943-001-L-Rev2, dated 15 April 2024.

Core also conducted a preliminary contamination assessment concurrently with the geotechnical and ASS investigation (refer report J002388-001-R-Rev0).

2.0 PROPOSED DEVELOPMENT

The proposed development includes a number of four and five-level unit buildings over a single-level partly inground basement, as shown in Images 1 and 2 below. Bulk excavation to about RL 3.4 m (about 2 m below finished ground level and up to about 1 to 1.5 m below existing ground level) is anticipated.



Image 1: Extract from proposed development plan at ground level.



Image 2: Extract from proposed development plan schematic cross section.

3.0 SITE DESCRIPTION

The site is located at 280 MacArthur Avenue, Hamilton. It comprises a portion of Lot 1 on SP337697 and covers an area of approximately 7980 m^{2.} The site location is shown in Image 3 below.



Image 3: Site location (Aerial image sourced from Nearmap, Annotations by Core).

At the time of the investigation, the site comprised a vacant lot covered with grass.

The elevation of the site ranges between about RL 4 m and 5 m Australian Height Datum (AHD), generally sloping down towards the south-eastern boundary.

Macarthur Avenue bounds the site to the north, with Chevron Commercial building and Old Shoreline Park beyond, then followed by a drainage line. To the east the site is bounded by vacant grassed land followed by Macarthur Avenue and high density residential dwellings. Karakul Road and Barcham Road form the southern and western site boundaries, respectively, followed by industrial development areas. The Brisbane River is located approximately 300 m to the south.





Photograph 1: General site conditions at the time of fieldwork.

4.0 METHOD OF INVESTIGATION

4.1 Review of Available Information

To assess likely ground conditions a review of published geological maps, aerial images, acid sulfate soils maps and available geotechnical information was undertaken (refer Section 5).

4.2 Underground Services

Prior to commencing the intrusive site investigation, an underground services search was undertaken at the test locations using an electro-magnetic wand for electrical services, and ground penetrating radar (GPR) for drainage and water services.

4.3 Borehole Drilling

Boreholes were drilled between 22 April and 2 May 2024 in the presence of geotechnical personnel from Core, at the locations shown on the attached Figure 1 (Appendix A). Borehole positions were recorded in the field using a handheld GPS unit.

Six boreholes were auger-drilled using a 4WD mounted drill rig to 4 m or 4.5 m BGL for ASS sampling (BH1 to BH6). Two 'deep' boreholes were drilled using a track-mounted drill rig, to about 35 m BGL. Standard Penetration Testing (SPT) was conducted at regular intervals in the boreholes and disturbed and undisturbed (U50 tube) samples taken.

A groundwater standpipe was installed in BH1 and BH5 (denoted MW1 and MW2) for groundwater level measurement and sampling and the other boreholes backfilled. Details of the standpipe construction are shown on the borehole reports.

4.4 Cone Penetration Testing (CPTs)

Six cone penetration tests (CPT1 to CPT6) were pushed using a truck mounted rig on 22 April 2024 to supplement the borehole data and provide data on the compressible soils. These were pushed to refusal at depths of about 30 m to 32 m BGL. The CPT is a probe instrumented to measure resistance on the tip and a following sleeve and also to measure pore water pressure, with these readings captured at close intervals.

4.5 Geophysical Testing

Geophysical testing in the form of multi-channel analysis of surface waves (MASW) was undertaken on 29 April 2024 by a geotechnical engineer/engineering geophysicist from Core and comprised two survey alignments (denoted Line1 and Line 2).

MASW geophysical surveys use seismic surface (Rayleigh) wave phase and frequency data to estimate shear-wave velocities of the subsurface materials.

The MASW acquisition comprised the use of a 24-channel landstreamer array with 4.5 Hz geophones spaced horizontally at 1 m. Each survey comprises a single 1-Dimensional vertical sounding recorded at the centre of the geophone array; as shown on Image 1 below. Vertical soundings were carried out at approximately 10 m intervals along each survey line.

The array was connected to a Geometrics Geode, with data recorded using the Geometrics Seismodule Controller Software (SCS). A sampling rate of 0.5 ms and sample record length of 2 seconds was adopted. The seismic source was a 7 kg sledgehammer striking a polyethylene plate, with an offset of 6 m. Vertical stacking of the seismic source was carried out to minimise ambient noise (i.e., wind and traffic) and increase the signal to noise ratio.

Sounding co-ordinates (X-Y-Z) were recorded in the field with a Trimble GNSS device with typically \pm 0.2 m accuracy. Co-ordinates were recorded using Map Grid of Australia (GDA2020) and height above mean sea level (AUSGeoid20).

The acquired data was processed using the *SurfSeis 6* software, by Kansas Geological Society. Dispersion images were generated, which show the frequency versus the percentage intensity of phase velocity, for each acquired field record. A dispersion curve was then produced by picking the maximum intensity

velocities (of the fundamental mode) across the useful range of frequencies. The dispersion curves for each survey alignment were put through an 8-layer inversion algorithm to produce one-dimensional shear-wave velocity soundings.

The S-wave soundings were then gridded using Golden Software's *Surfer* 22 to produce two-dimensional shear-wave velocity sections.

The geophysical survey line locations are shown on Figure 1 in Appendix A, and the survey results are shown in Figure 2 in Appendix A.

The quality of the produced MASW dispersion curves for each sounding was typically good, with high signalto-noise (S/N) ratios for the fundamental-mode dispersion energy, for a frequency range between about 4 Hz and 20 Hz.



Image 4: Example MASW acquisition schematic.

4.6 Acid Sulfate Soils Sampling

The ASS component of the investigation was planned based on the findings of a desktop assessment (refer Section 7.0) and with reference to the following '*National Acid Sulfate Soils Guidance*' documents:

- National acid sulfate soils sampling and identification methods manual¹
- National acid sulfate soils identification and laboratory methods manual²
- Guidance for the dewatering of acid sulfate soils in shallow groundwater requirements³
- Queensland State Planning Policy 2017 (SPP17) ⁴

For this assessment, samples were recovered from four of the boreholes (BH1 - BH3 and BH5) at 0.25 m intervals to a depth of 4 m BGL. ASS sampling protocols in the field were conducted to minimise oxidation prior to laboratory testing and followed the above referenced guidelines.

4.7 Groundwater Sampling

Groundwater sampling is undertaken in accordance with the following:

- Department of Environment Science and Innovation (DESI) Monitoring and Sampling Manual 2018.
- Groundwater was assessed using the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Brisbane River Estuary Environmental Values and Water Quality Objectives Part of Basin 143.

¹ Sullivan L, Ward N, Toppler N, Lancaster G, *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual* (2018), Department of Agriculture and Water Resources, Canberra ACT.

² Sullivan L, Ward N, Toppler N, Lancaster G, *National Acid Sulfate Soils guidance: National acid sulfate soils identification and laboratory methods manual* (2018), Department of Agriculture and Water Resources, Canberra ACT.

³ Sullivan L, Ward N, Toppler N, Lancaster G, *National Acid Sulfate Soils guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments* (2018), Department of Agriculture and Water Resources, Canberra ACT.

⁴ State Planning Policy (2017), State of Queensland, Department of Infrastructure, Local Government and Planning.

The site is located within the Brisbane River Estuary – middle estuary waters area with the water quality objectives adopted for the environmental Value Zone and water type.

For this assessment, samples were recovered from the two monitoring wells (MW01 & MW02) that were installed to a depth of 4 m BGL. Samples were immediately placed in airtight containers supplied by the testing laboratory and then placed into a chilled insulated esky for transportation to the laboratory.

4.8 Laboratory Testing

4.8.1 Geotechnical Testing

Soil samples were forwarded to a NATA-accredited laboratory for geotechnical laboratory classification testing comprising particle size distribution, Atterberg limits, Emerson class, soil aggressivity and soaked CBR testing.

Geotechnical laboratory test results are discussed in Section 5.7.

4.8.2 Acid Sulfate Soil Testing

A total of 64 samples were screened to assess field pH (pH_F) and pH after oxidation (pH_{FOX}) using 30% hydrogen solution.

The pH_F/pH_{FOX} screening method consists of two steps. In the first step, the field pH of a 1:5 soil/water suspension is measured (pH_F). In the second step, a 30% Hydrogen Peroxide solution is added to a second sample of the same material which is then heated to accelerate the oxidation of the sample. The pH after oxidation (pH_{FOX}) is then measured. A significant difference between the pH_F and pH_{FOX} results is an indication of potential acid sulfate soils (PASS); however, test results may be affected by other inclusions such as shell material and organics.

Based on the results of pH screening tests, 10 samples were selected and dispatched to Eurofins to undergo quantitative analysis by the Chromium Reducible Sulfur (CRS) suite in accordance with ASS Method 23F and 22B laboratory procedures of Ahern et al (2004).

This CRS method includes analysis of 'inherent buffering capacity' from naturally occurring alkaline materials (i.e. calcite, coral debris, fine shell fragments) and 'retained acidity' which includes sulfur held in stable oxidation minerals such as 'jarosite' and allows for calculation of 'net acidity'. The CRS test method was selected in preference to the Suspension Peroxide Oxidation Combined Acidity & Sulfur (SPOCAS) method as is gives more accurate indications of pyrite content where significant amounts of organic matter (and organic derived acidity) are present in the soil samples. An overall acid-base accounting method was used to calculate a 'net acidity' value which is used to qualify analytical test results and calculate liming rates. This equation is:

Net Acidity = Actual Acidity (as TAA) + Retained Acidity (as S_{NAS}) + Potential Acidity (as S_{CR}) - insitu Acid Neutralising Capacity (ANC).

A groundwater sample was also recovered from the standpipes (MW1 and MW2) and screened in the field, after initial purging. The groundwater sample was then dispatched to Eurofins/MGT (Eurofins) to undergo further water quality analysis.

All sample collection, in-situ testing and dispatch were performed in accordance with Core procedures for water quality monitoring and the Department of Environment and Science (DES) Monitoring and Sampling Manual 2018.

Both groundwater samples were analysed for Total and dissolved Aluminium and Iron, Anions Cations, Chloride and Sulphides.

5.0 RESULTS

5.1 Published Geological Mapping

The Queensland Geotechnical Database (QGD) indicates that the site is located in an area of Quaternary age Anthropocene comprising :*Gravel, sand and silt; man-made deposits generally associated with land-fill or mining (tailings, dumps and rehabilitated areas)*". An extract of the relevant geological map is shown in Image 5 below.



Image 5: Extract from QGD map showing regional geology (not to scale).

5.2 Historical Information & Aerial Images

The site history ('Northshore History') indicates that the site consisted of a river inlet until the early 1900's when the area of Hamilton was reclaimed as part of dredging of the Brisbane River to allow safer access for vessels, with the dredge spoil placed behind a 'training wall' across the inlet to create additional land. This dredging and filling process was conducted over decades of time. In 1999 the land was considered high enough to produce a Deed of Grant to the Port Of Brisbane. The land was initially leased for shipping freight handling purposes until the 2010's when the land was redeveloped for future community development.

Historical aerial images (QImagery) indicate the following:

- In 1946 and up until 1963 the land was a back channel of the Brisbane River and grass paddocks
- By 1967 (refer Image 6a) land development along the riverbank had started and the river channel was less evident
- By 1978 surrounding land was largely developed with buildings, although the site itself appeared undeveloped
- In 1981 (refer Image 6b) there appears to be sand reclamation at the site; after that the site appears grassed until the car storage was constructed sometime between 1994 and 1997
- The site was used for car storage until 2009 at which time MacArthur Avenue was constructed and part of the site adjoining MacArthur Avenue became grassed whilst the remainder continued as vehicle storage
- The vehicle storage was discontinued by late 2020 and construction of local roads had occurred.



Image 6a: 1967 aerial image (QImagery).

Image 6b: 1981 aerial image (QImagery).

5.3 Previous Geotechnical Investigation

A previous 'broad-scale' geotechnical investigation has been carried out in the area by Butler Partners, including the current site of interest (refer report *Preliminary Geotechnical Investigation, Proposed High Density Residential Development, 240A, 250 and 280 Macarthur Avenue, Hamilton*', ref. 018-150J, dated October 2020; and Image 7 below).

The previous investigation included four deep boreholes (1 to 4), ten shallow boreholes (5 to 14) and eleven Cone Penetration Tests (CPT 1 to 11). The subsurface profile encountered in boreholes 5, 6 and 13 and inferred in CPTs 3, 4, 7 and 8 in the area of the current site of interest, and inferred from nearby deep boreholes 2 and 3, in summary comprised:

- Fill to 1.1 to 1.2 m BGL comprising clayey sands; dynamic cone penetration (DCP) tests indicate this fill was mostly relatively dense apart from a loose band around 0.4 m BGL at borehole 13. No records to confirm the fill was placed in a controlled manner were seen (nor would be usually available for dredge spoil placement) and the fill would be considered uncontrolled
- 'Upper alluvium' (possibly including some dredge spoil?) comprising very soft to firm clay to about 6.5 to 7.5 m BGL, then very loose to loose clayey sand (with a firm clay band in places) to about 16 to 17 m BGL
- Lower alluvium comprising loose to medium dense clayey sand (with stiff clay bands in places) then medium dense with dense material encountered below about 30 m to 31 m BGL where the CPTs met refusal
- Dense sandy gravel was encountered at 30 m BGL in borehole 1, and 33 m BGL in borehole 3, which extended to the end of the boreholes at 31 m and 35 m BGL respectively.

Groundwater was encountered mostly at levels of RL 1.1 m to 2.5 m but locally down to RL 0.4 m and up to RL 3.3 m.

The previous investigation included geotechnical laboratory testing as follows:

- Emerson class tests with results of 4 to 5
- Particle size distribution tests with silt/clay fractions of 16% to 54% and sand fractions of 46% to 84%
- Plasticity tests with liquid limits of 55% to 78% and plasticity indexes of 2% to 47%

- Shrink swell tests with shrinkages of 4.5% to 10.1% and shrink swell indexes of 2.4% to 5.7%
- Standard compaction tests with a maximum dry density of 1.76 to 2.08 t/m³ and optimum moisture contents of 9.3% to 14.5%
- Soaked CBR tests with CBR values of 4%, 15% and 25 %.

The previous ASS laboratory testing indicated that the sand and clay have potential acidity but also contained high levels of acid neutralising capacity (ANC) which appeared to be due to shells. Shells cannot not be relied upon for neutralising acidity and are not included in the assessment of neutralized. The liming rates for the sand fill (in one sample only tested) were found to be 4 kg/t and for the underlying clays varying from 5kg/t to 6 kg/t (e.g. boreholes 1, 2, 7, 12 and 13 but 23 kg/t to 33 kg/t in others, e.g. boreholes 4, 5, 6, 7 and 10).



Image 7: Previous investigation locations (extract from Butler Partners report 018-150J dated October 2020, with site location by Core).

5.4 Published Acid Sulfate Soil Information

This site is mapped as a high probability (>70%) for the presence of ASS, likely due to the elevation of the site and proximity to the Brisbane River. An extract of the relevant ASS map is shown in Image 8.



Image 8: Extract from QGD map showing ASS classification (not to scale).

5.5 Subsurface Conditions

The subsurface conditions encountered in the boreholes and interpreted from the site history, CPT and MASW results generally comprised the following:

- Fill, typically firm or stiff gravelly clay, to about 1 to 1.6 m BGL, over
- Fill/dredge spoil comprising soft clay (material dredged from the adjacent Brisbane River channel), to depths of possibly about 5 m BGL, although difficult to differentiate from the underlying material,
- Upper alluvium, generally comprising interbedded loose sand and firm clay to about 15 m to 20 m BGL, over
- Lower alluvium, generally loose to medium dense sand and stiff clay, becoming medium dense or dense gravel from about 30 m to 32 m BGL.

The upper fill and dredge spoil is deemed 'uncontrolled' because of lack of geotechnical inspection and density testing records.

Groundwater seepage was encountered in the auger boreholes at about RL 2 m to 3.45 m AHD and was measured at standing depths within the monitoring wells at approximately RL 1.1 m to 1.4 m AHD. Ordinarily near the Brisbane River where sands are present, groundwater levels would be tidally dominated and occur at or around high tide level about RL 1 m to 1.5 m and rise temporarily and locally due to ingress after rainfall. It is understood the storm tide level for this site is RL 3.1 m (i.e. below basement level). Groundwater conditions can vary over distance and time and apart from tide and rainfall be influenced by changes to surface and subsurface drainage conditions and human influences.

5.6 In Situ Permeability Testing

Insitu falling head permeability testing was undertaken in monitoring wells on 26 April 2024. The test results provided the following indicative permeability (k) values:

- MW01: *k* value of 5.0 x 10⁻⁷ m/sec
- MW02: k value of 1.5 x 10⁻⁷ m/sec

5.1 Laboratory Testing

Geotechnical laboratory testing was performed at a NATA-accredited laboratory and comprised Atterberg limits, Emerson class and soil aggressivity tests. The laboratory test results are attached in Appendix D and summarised below in Tables 1 to 4. Laboratory test results are discussed further in Section 6.

Table 1: Summary Atterberg Limits and Emerson Class Testing Results

Borehole	Dopth (m)	Soil Description		Plas	ticity	Linear Shrinkage	Emerson		
(no.)	Deptil (III)	oon Description	LL (%)	PL (%)	PI (%)	WPI (%)	(%)	Class	
7	1.0 – 1.45	Silty Clay	Silty Clay 45 17 28 250		2503	12.0	2		
8	0.0-0.5	Sandy Clay	-	-	-	-	-	2	

Notes: LL – Liquid Limit, PL – Plastic Limit, PI – Plastic Index, LS – linear shrinkage WPI – weighted plasticity index (PI x %<0.425mm)

Table 2: Summary of Particle Size Distribution Results

Borobolo			Particle Size Distribution						
(no.)	Depth (m)	Soil Description	% < 4.75 mm	% < 2.36 mm	% < 0.425 mm	% < 0.075 mm			
4	0.2 - 0.5	Clayey Sand	81	74	54	28			
7	1.0 – 1.45	Silty Clay	100	97	89	65			
7	7 5.5 – 5.95		99	99	97	95			
8	0 – 0.5	Sandy Clay	87	80	73	68			

Table 3: Summary of Compaction and CBR results

Borobolo				Compactio	on and CBR	
(no.)	Depth (m)	Soil Description	SMDD (t/m³)	ОМС (%)	CBR (%)	Swell (%)
4	0.2 - 0.5	Clayey Sand	1.87	14.5	6	0

Notes: SMDD – standard maximum dry density OMC - optimum moisture content

Table 4: Summary of Soil Aggressivity Testing Results

Borehole No./Depth	Soil Description	Chloride (mg/kg)	Conductivity (uS/cm)	рН	Resistivity (Ωm)	Sulphate (mg/kg)	% moisture
BH7 2.5 – 2.95 m	Silty Clay	2700	3700	8.5	2.7	240	46
BH8 5.5-5.95 m	Silty Clay	2900	2900	7.8	3.4	260	49

6.0 GEOTECHNICAL COMMENTS & RECOMMENDATIONS

6.1 Excavations

Basement excavation is anticipated to encounter predominantly sand or clay fill. These materials are expected to be excavatable using conventional earthmoving equipment such as excavators up to 8 t in size although larger machines would likely be used for production rates. If concrete is encountered, a rock breaker could be required. The sand and the underlying clay should be separated during excavation as they are likely to require differing disposal and treatment requirements.

6.2 Temporary Batter Stability

Temporary batters in the sands and clays (up to 2 m deep) could be formed at 1V:1.5H, provided there are no surcharge loads, services or structures close to the excavation crest. Batter slopes will need to be confirmed by a geotechnical engineer at the time of construction. Flatter slopes or temporary support will be required in soft clays or if groundwater is present in the face or toe of the batter.

For excavations where space does not permit temporary batters (e.g. close to the site boundary), engineerdesigned temporary support will be required. This could comprise temporary sheet piling, with possibly one or two rows of temporary anchors in the sand fill (due to poor toe support afforded by the soft clays) depending on wall height. Anchors extending beyond the site boundary would require permission from the adjacent landowner. Propping of sheet piles could be considered with angled prop to a block on the subgrade; cross excavation props will not be practical given the large excavation width. A fully piled support system (e.g. contiguous piles) could also be considered which could be incorporated into the structural design (piled foundations / basement wall); but would be significantly greater cost.

6.3 Trafficability & Working Platforms

The sand subgrade should be trafficable for tracked machines but not trucks and other rubber-tyred machines. Capping with 0.2 m to 0.3 m of granular fill (e.g. recycled 'CBR45') is expected to be required on sand subgrade. For a piling rig with bearing pressures of up to 250 kPa (e.g. driven pile rig), a working platform of 0.3 m to 0.5 m of CBR45 granular fill might be required.

At basement level where clay is encountered, the subgrade be untrafficable for almost all machines. A working platform of at least 0.3 m would be required for smaller machines, underlain by geofabric (which would be beneficial for support for construction of the basement slab). For larger equipment (e.g. piling rig), a substantial working platform of 0.8 m to 1 m or more could be required on the soft clay subgrade (involving over-excavation and additional spoil to manage). Consideration should be given to undertake excavation, and if practical piling, from the existing surface (and cut piles cut off to design level).

Working platform design must be undertaken by suitably qualified RPEQ when the crane/rig load specifications are known.

6.4 Filling

Any localised new filling required to achieve design levels should be undertaken under 'Level 1' inspection and testing as detailed in Australian Standard AS3798-2007 *Guidelines on earthworks for residential and commercial developments*. A low plasticity granular fill (CBR 15 material) should be used, compacted to a minimum Dry Density ratio of 98 5 (Standard) within 2 % of optimum moisture content.

6.5 Consolidation Settlement

Long term settlements of the land due to compression of the softer clays in the upper alluvium is anticipated (e.g. as evidenced in the road surface adjoining access shafts along Macarthur Avenue).

In order to assess the settlement characteristics of the weaker clay layers encountered in the CPTs, the tip resistance was compared to those expected for normally consolidated clays as well as those for lightly overconsolidated clays at differing overconsolidation margins (OCM). From this analysis, an OCM of 30 kPa was found to best represent the nature of the clays (refer Image 9). The analysis therefore indicates that the upper alluvial clay is lightly over-consolidated. Consolidation settlement should therefore be anticipated under new loads (e.g. from structure or pavements supported on ground and not piles, or fill).

Estimated primary consolidation settlement at the CPT locations range between about 70 mm and 75 mm, for assumed new development loads not exceeding 20 kPa. If larger loads are proposed then higher primary settlements can be expected as well as additional secondary settlements; further advice should be obtained if such higher loads are to be considered.

Differential settlement will be likely due to variation in clay thickness/extent as well as due to varying structural loads and supports (e.g. between piled and non-piled elements). This will need to be considered in the development design, e.g. detailing of gravity services and other entry points as well as other parts of the development, noting they will be remaining settlements in the existing roads and filled areas due to that fill.



Image 9: Analysis of CPT tip resistance results.

6.6 Basement Design

The partly in-ground basement will be constructed above expected groundwater levels and tanking/ waterproofing and catering for hydrostatic uplift does not seem warranted. Basement walls should have drainage behind them to cater for any localised seepage from the surface and to prevent water pressures on the wall. Because the wall is propped by the ground floor/podium slab an at rest active earth pressure coefficient of 0.5 would be appropriate for design of walls retaining the materials encountered. Walls should be designed for surcharge loads by multiplying the surcharge by the earth pressure coefficient. Unless walls are designed for surcharges from compaction equipment, only small hand guided equipment should be used behind walls.

6.7 Site Classification

This structure it outside the scope of Australian Standard AS 2870-2011 *Residential slabs and footings* but the site classification derived in accordance that standard can provide an indication of the likely magnitude of reactive (shrink and swell) movements associated with normal seasonal soil moisture variations and is required for hydraulic design.

Due to the presence of uncontrolled fill and potential consolidations settlements, the site would be classified *Class P* in accordance with AS 2870-2011. Ground surface movement due to seasonal moisture variation (' y_s ' value) for at this site are likely to be negligible due to the presence of surface sands. However,

consolidation settlement will be the main ground movement criteria for design (refer Section 6.5). Based on available information, provided there are no large development loads not supported on piles, *Class H1* could be adopted for plumbing design.

6.8 Foundations

Due to the anticipated consolidation settlement, as well as the presence of very loose and loose silty sands which may be susceptible to liquefaction under earthquake conditions, the structure will need to be fully suspended on piles (including the basement slab).

Driven precast concrete piles are considered suitable, founded in the dense gravel alluvium expected from approximately 30 m to 32 m BGL. Piles driven to set would achieve the full structural capacity of the piles. Driven piles generate vibrations, however as there are no structures close to the site the impacts are expected to be manageable by a competent piling contractor.

Alternatively, CFA piles could be considered, founding in the dense materials at depth. Bored piles are likely to encounter construction difficulty due to the loose/soft soils and groundwater and would be unsuitable. The ultimate geotechnical strengths ($R_{d,ug}$) given in Table 1 may be adopted for the design of CFA piles.

C (
Strata	Unfactored Ultimate Shaft Adhesion (kPa)	Unfactored Ultimate End Bearing (kPa)
Soft to Firm clays or Loose / Very Loose sands	-	-
Medium Dense sands and Stiff to Hard clays	25	-
Dense to Very Dense sandy gravel	100	1,800

Table 1: Ultimate Geotechnical Strengths (R_{d,ug}) for CFA Pile Design.

The $R_{d,ug}$ values provided in Table 1 above will need to be multiplied by a suitable geotechnical strength reduction factor (Φ_{gb}) to obtain design geotechnical strength ($R_{d,g}$) of piles in compression and tension. Where no load testing is proposed, and after assessing the design average risk rating (ARR) in accordance with the guidelines presented in AS 2159, a Φ_{gb} value of 0.45 is suggested for preliminary design but higher values may be possible depending on verification testing undertaken.

Where piles are designed to carry tension loads, the shaft adhesion values provided above are to be used, multiplied by a suitable a Φ_{gb} value. Where pile load testing is undertaken on a sufficient number of piles for compression loads the use of higher Φ_{gb} values may be possible, in accordance with AS 2159.

If working stress methods are used in pile design, the $R_{d,ug}$ values should be divided by a factor of safety of 2.5 to calculate the maximum single pile working load.

Piles should be designed and installed by an appropriately experienced contractor and in accordance with AS 2159-2009 (Ref.5).

If any soil conditions encountered during footing construction are found to differ from those noted in the geotechnical investigation, Core should be notified immediately, and further assessment carried out to determine if changes to footing design are required.

All footings should found such that they are not adversely affected by any adjacent excavations batter slopes, trenches, or retaining walls that are not designed to support building loads. To minimise the potential for any adverse interaction effects, footings should found at least below a plane extending 1 m horizontally from the base of trenches/batter slopes/excavations/retaining walls, then rising up at 1V:1H. This requirement is illustrated in Diagram 1.



Diagram 1: Exclusion zone for base of footings.

6.9 Site Sub-soil Classification

The AS1170.4-2007 Structural design actions site subsoil classification for earthquake actions design is considered to be Class D_e – Deep or soft soil site, due to the presence of very soft and very loose soils.

6.10 Aggressivity of Soils

Chemical analysis can provide an indication of the potential for long term damage to foundations, buried pipelines, in-ground structures, services and other infrastructure. Soil texture is also important in this regard, as granular soils allow oxygen exchange (oxidation) to occur more readily and are also more permeable.

Australian Standard AS 2159-2009 *Piling - Design and installation* provides the range of exposure classification of the surface of steel piles and concrete piles based on the range of chemical conditions in the soil and the possibility of changes in groundwater levels.

Exposure classifications will be provided on receipt of laboratory testing results (in an updated version of this report), as follows:

- For concrete piles in soil, *Mild* in accordance with Table 6.4.2(C) of AS 2159-2009
- For steel piles in soil, *Non-aggressive* in accordance with Table 6.5.2(C) of AS 2159-2009.

6.11 Pavements

It is expected the basement will be fully suspended, so pavements relying on ground support would only likely comprise the crossover and entrance driveways. Design parameters for pavements will depend on the subgrade materials present after earthworks and the type, depth and quality of any fill used (if any) to bring the site to design levels. If subgrade conditions exposed following earthworks differ from those encountered in the boreholes, further subgrade evaluation (including further testing) should be undertaken during the construction stage.

The likely subgrade conditions for on-ground pavements (such as entry driveways) could comprise sand or clay fill. The laboratory CBR test on a sandy clay sample retuned a CBR value of 6%. A design CBR of 5% is recommended for the sandy clay fill.

Properly drained subgrades should allow for open graded drains that shed water and prevent ponding.

7.0 ACID SULFATE SOIL ASSESSMENT

The development of ASS is commonly the result of marine or estuarine deposition of sulfate and iron bearing sediments in the presence of an abundant source of readily decomposable organic matter resulting in the deposition of pyrite. This pyrite is stable within the soil so long as anoxic conditions prevail. Oxidation of this material produces acidic conditions and oxidation typically occurs as the material is exposed above the water table by excavation, and by lowering the water table during dewatering processes.

Previous experience and available guidelines indicate that ASS are normally restricted in extent to recent (Holocene to Pleistocene age) soil horizons deposited in a saline environment below RL 5 m. The National Acid Sulfate Soils sampling and identification methods manual indicates that sites should be investigated for ASS materials if there is any evidence that reasonably suggests that ASS materials may be present in the vicinity, and that these materials may be disturbed. Examples of such evidence may include the following:

- Soil materials disturbance of 100 m³ or more located within an area mapped with at least a moderate risk of ASS materials occurring within 3 m of the natural soil surface.
- Soil materials disturbance of 100 m³ or more, with excavation likely from below the natural water table, in an area with at least a moderate risk of ASS materials occurring within 3 m of the natural soil surface, or with at least a moderate risk of ASS materials occurring deeper than 3 m of the natural soil surface.
- Temporary or permanent lowering of the water table in areas mapped with a risk of ASS materials occurring within 3 m of the natural soil surface.

The topography of the site is consistent with the above criteria (i.e. surface elevation below RL 5 m AHD) and the proposed development involves excavations that will exceed the above trigger levels. Due to the proposed excavation works required, an assessment of potential disturbance of ASS is required.

7.1 Investigation Aims

The aims of this investigation were to:

- Conduct an ASS assessment in general accordance with the National Sampling Guidelines;
- Quantitatively identify the presence or absence of ASS across the site;
- If necessary, assess the likely impact of the proposed development on ASS and groundwater; and
- If necessary, provide prudent management measures so that the release of acid leachate from disturbed soil and groundwater does not have significant adverse effects on the natural and built environment or human health.

The results of the ASS investigation are set out in the following sections.

7.2 Groundwater Conditions

A groundwater sample was collected from MW1 and MW2 to provide a baseline reading of the groundwater conditions. The following groundwater test results were obtained:

- Neutral conditions (pH 7.0 to 7.2).
- Electrical conductivity reported saline conditions.
- Sulfidic odour (i.e. rotten egg gas) was observed in MW02.
- Alkalinity (Bicarbonate as CaCO₃) was reported in groundwater (MW01 & MW02) above 200mg/L. This value is usually observed within limestone bedrock aquifers.
- Elevated heavy metals were reported including iron and aluminium. MW02 has high levels of total aluminium, total iron and magnesium. This is common in these groundwater environments and potentially due to the high turbidity observed in MW02.

A copy of the groundwater results is provided in Appendix F.

7.3 Preliminary Screening

Results of preliminary screening are summarised in Table E1 (Appendix E).

The mean soil pH (represented by pH_F results) was 8, ranging from pH 6.7 to pH 8.4.

The preliminary screening results indicate a low (some medium) probability of actual (existing) acid sulfate soils (AASS) or potential acid sulfate soils (PASS).

7.4 Quantitative Soils Analysis

Table 3 below shows the ASS action levels adopted in Queensland. These categories are used to identify whether action / management of ASS spoil is required, based on 'net acidity'. For major fill works and disturbances of more than 1,000 tonnes, an action criterion of 0.03% S equivalents (18 moles / tonne) is adopted for all soil types. We estimate more than about 500 m³ of material will be excavated (e.g. stripping, footings, ground slabs), therefore, we have adopted > 1000 tonnes as the criteria for this investigation.

Table 3: ASS Action Criteria.

Type of Materi	al	Action 1-1000 tonn	Criteria es disturbed	Action Criteria > 1000 tonnes disturbed (and major fill projects)			
		Existing + Po	tential Acidity	Existing + Po	tential Acidity		
Texture range McDonald et al. (1990)	Approx clay content (%)	Equivalent sulfur %S oxidisable	Equivalent acid mol H⁺/ tonne	Equivalent sulfur %S oxidisable (oven-dry basis)	Equivalent acid mol H⁺/ tonne (oven-dry basis)		
Coarse Texture Sands to loamy sands	≤5	0.03 18		0.03	18		
Medium Texture Sandy loams to light clays	5 – 40	0.06	36	0.03	18		
Fine Texture Medium to heavy clays and silty clays	≥40	0.10	62	0.03	18		

Results of quantitative analysis carried out are summarised in Table E1, attached. Laboratory test certificates are also included in Appendix E.

Results of the 10 samples analysed are summarised below:

- All ten samples returned Titratable Actual Acidity (TAA) results below the Action Criteria of 18 mol H+/ tonne ranging from <2 to 8.7 mole H+/t.
- Eight samples, returned Oxidisable Sulfur as Scr above the Action Criteria of 0.03%S ranging from 0.010 to 0.41%S.
- Eight samples returned pH KCI values exceeding pH 6.5 and as such, all 10 samples were subjected to analysis for acid neutralising capacity (ANC) and reported concentrations ranging up to 920 mole H+/t.
- No samples returned pH HCl value of pH 4.5 and therefore were not tested for retained acidity (S_{NAS}).

Concentrations of acid neutralising capacity (ANC) were high in six samples >250 mole H+/t. ANC can be an indicator of a natural lime source (e.g. shells) or previous lime treatment. No shells were observed within the soil to 4m BGL. Shell fragments were observed from 16 m BGL within BH07 and BH08. For 8 of the 10 samples analysed, net acidity exceeded the relevant QASSIT 'Action Criteria' indicating that management and/or lime neutralisation treatment will be required if these soils are disturbed.

7.5 Extent and Severity

The results from this investigation indicate low levels of actual and high levels of potential acidity are distributed throughout the soil profile (up to 4.0 m BGL).

The SPP14 Guidelines require that the level of treatment for management of ASS is based on treatment of all existing and potential acidity. The results of the laboratory testing have been accumulated in an Acid-Base Account to give the Net Acidity for each sample in units of mol H⁺/tonne as presented in Table E1, attached. This value has been calculated from sulfur trail potential acidity (S_{Cr}) plus actual acidity (TAA).

A preliminary liming rate has been calculated in kg CaCO₃/t and kg CaCO₃/m³ using a factor of safety (fineness factor) of 1.5 and an assumed bulk density of 1.8 tonne/m³. Consideration of the tabulated laboratory results indicates that high levels of potential acidity are fairly uniformly distributed throughout the soil profile.

Due to the difficulty in mixing the soft silty clay material and the presence of lime within the dredge spoil fill, it is considered that adoption of a uniform liming rate, not exceeding the 90th percentile of relevant test results for 'net acidity', i.e., 34 kg CaCO₃/m³, will be sufficiently conservative to limit the risk of environmental impact. Soils have been separated into two types the surface Gravelly Clay Fill to 0.75m BGL and the lower alluvial Clays and dredging spoil from 0.75 m BGL. Table 5 below provides the recommended liming rates calculated for each soil type.

Table 5: Recommended Liming Rates

Soil Type	Colour	Bottom of Layer, Depth Range	Treatment Rate**
Gravelly Clay (Fill)	Brown	0.0 – 0.75 m BGL	4 kg CaCO₃/m³
Alluvial Clays / Fill Dredging Spoil	Grey, dark grey, dark brown and black	0.75 – 4.0 m BGL*	34 kg CaCO ₃ /m³

Note: * Maximum depth of ASS sampling and analysis

** Liming rate based on 90th percentile values.

7.6 Risk Assessment

As the proposed excavations will intersect soils with existing and potential acidity, there will be a requirement for management of that acidity. Given the anticipated volume of soils that will be disturbed (calculated to be greater than 1,000 m³) and required lime treatment, management of existing and retained acidity at this site would be classified as XH (Extra high) treatment in accordance with Queensland Soil Management Guidelines V4.0 - Table 4.2 (i.e. > 25 tonnes of aglime).

The Guidelines require that for Category XH treatment a stand-alone Acid Sulfate Soil Management Plan (ASS MP) must be provided. Recommendations on strategies included in the ASS MP are outlined below in Section 7.7.

Based on the results of the investigation and the proposed earthworks to 3.5 m AHD, the risk of impact to the surrounding environment is considered moderate. Provided that the management measures outlined in Section 7.0 of this report are adhered to and an ASS MP is prepared for the project and implemented, the environmental risk will be further reduced.

7.7 Recommendations

The results of this investigation indicate there is the likelihood of disturbance of low levels of actual and high levels of potential acidity associated with the proposed development. Based on the net acidity values, lime treatment is considered necessary for the proposed excavation works. It is recommended that an ASS management plan (ASS MP) be developed and implemented.

Potential for groundwater seepage to be encountered during earthworks and construction will be dependent upon the prevailing weather conditions at that time. All groundwater seepage (if encountered) and stormwater collected within excavations, should be directed to a holding point for regular monitoring and treatment as necessary before discharging off site.

Water quality monitoring should be undertaken for the full duration of earthworks activities.

8.0 LIMITATIONS

Should you require any further information please contact the undersigned. We draw your attention to the document, Limitations, which is included in Appendix G.

Core Consultants Pty Ltd

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WM/CJ/AM/cj

A.B.N. 75 603 384 050

Andrew Middleton BE(Civil) FIEAust EngExec CPEng NER RPEQ 4366 Senior Principal Geotechnical Engineer

Appendix A Figures





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Appendix B Reports of Boreholes Explanatory Notes



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Job	No	: J0	02388				-			_	Checked Date : 03/06/2024
METHOD	Penetration Resistance	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	Well Diagram
				4.3	ES: 0-0.2 m: BH1 - 0-0.2m		GC	FILL Gravelly CLAY: fine to coarse sized gravel, with fine to coarse grained sand, medium plasticity, brown.	w≈ PL	F-St	-Concrete Cement
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	This report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.										



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				3.9	ES: 0-0.2 m:			FILL Sitty to gravelly CLAY: fine to medium sized gravel, with fine to medium grained sand, medium plasticity, brown with pale brown.			
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				3.9	ES:0-0.2 m: (w/w)			FILL Clayey SAND: fine to coarse grained, with fine to medium sized gravel, medium plasticity clay, brown.			
			-	-	BDS: 0.2-0.5 m:		SC		м	MD	
				-	ES: 0.4-0.5 m: DS: 0.5-1 m:		СН	FILL Sandy CLAY: fine to medium grained sand, high plasticity, brown with pale brown.	w≈ PL	F	
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				3.9		~~~~~	Ŭ	FILL Sandy CDAV/EL, fine to searce sized fine to searce grained cand with			Doct Backfill
					ES: 0-0.2 m:			medium plasticity clay, brown, concrete (possibly fragments) encountered			
				-	ASS: 0.0.25 m.			between 0.5-0.8m in this location with refusal on 3 attempts			
			_		ASS: 0.25-0.5 m						
				-	7,665. 0.20 0.0 11.		GW		м	MD	
			-		50:0405m						50mm PVC Solid
					ASS: 0.5-0.75 m:						-Bentonite
				F	A00. 0.3-0.73 m.			FILL Clause SAND, find grained trace find sized gravel law plasticity alow		-	
			-	— 3	ASS: 0.75-1 m:			dark grey.	w-		
			— 1		ES: 0.9-1 m:		Sc		М		
				-	ASS: 1-1.25 m:						
			-		SPTSomplo:1.1.45 m:						
					,1,1			FILL Silty to sandy CLAY: fine grained sand, high plasticity, dark grey.			
			L	Γ	(N=2)						
					ASS: 1.25-1.5 m:						
				-							
			-				сн		w >	S-F	
n SFA			_	<u> </u>	ASS: 1.75-2 m:				PL		
00mr			— 2		ES: 1.9-2 m:						-Flitter Pack Sand
Ę				-	ASS: 2-2.25 m:						
			-				L				
		►		-	ASS: 2.25-2.5 m:		сн	With fine sized gravel.	w≈ \LL		
			_		ES: 2.3-2.4 m:				w > Pl		50mm PVC Slotted
				L	ASS: 2.5-2.75 m:				1.5		
			_								[12] - 22] · · · · · · · · · · · · · · · · · ·
		$\mathbf{\underline{T}}$		- 1	SPTSample:2.5-2.95 m: (N=0)						
			<u> </u>		ASS: 2.75-3 m:						
				F	ES: 2.9-3 m:						
			-		ASS. 3-3.25 M:						
			_	-	ASS: 3.25-3.5 m:		сн			vs	
				-	ASS: 3.5-3.75 m:						
			ASS: 3.75-4 m:								
			-	-	SPTSample:4-4.45 m: (N=0)						End Plug
			_	<u> </u>		000000		BH5 Terminated at 4 45m	+	+	<u>[*******,*]********</u>
				ſ							
			_								
				1							
<u> </u>	I			L		I	I	I	1	L	<u> </u>
			This r	eport	must be read in co	njuncti	ion w	vith accompanying notes and abbreviations. It has been pr	epare	d for	geotechnical
		р	urpose	es onl	y, without attempt	to asse	ess po	ossible contamination. Any references to potential contam	inatic	on are	e for information
	only and do not necessarily indicate the presence or absence of soil or groundwater contamination.										



Clie	nt	: Br	isbane H	ousing	l Company			East : 508,268.02 North : 6,964,570.98 56J			Sheet : 1 OF 4 Logged : DS	
Loca	ation	: 34	0 MacArt	hur Av	renue, Hamilton QLD			Drill Rig : P160			Checked : CJ	
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	DCP TEST (Blows per 100 mm)	
ADT	L			4.75 - 			CI CL-	FILL Sandy to silty CLAY: fine to medium grained sand, with fine to medium sized gravel, medium plasticity, dark brown.	W-M- w < PL	s		
		Seepage	- 1 	- - 	SPT 2,1,0 (N=1) REC=450		CI	fine to medium grained sand, with fine to medium sized gravel, trace low to medium plasticity silt. FILL/DREDGE SPOIL Silty CLAY: with fine to medium grained sand, medium plasticity, dark grey grey-brown.	V_PL w > PL			
150mm Washbore	L-M		 - 3 - 	2	SPT 0,0,0 (N=0) REC=450					VS		
			4 	- - -	SPT 0,0,0 (N=0) REC=410			Silty CLAY ALLUVIAL: low plasticity, dark grey brown, with fine to medium grained sand, trace fine sized gravel.			_	
			5 6 	- - 	U75 Tube: PP=5kPa		CL			S		
	м		- 7 -	- 	U75 Tube: PP=5kPa		sc	Clayey SAND fine to medium grained, low to medium plasticity clay.	 w	 VL-L		
			- - 8 -	- 	SPT		SW	with medium plasticity clay, pale grey pale brown.		MD		
			- - - -	4 - 	3,5,6 (N=11) REC=39		sw	Coarse sized gravel, trace medium plasticity clay, dark grey.				
	This report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.											



Client : Brisbane Housing Company Project : Unit Development Location : 340 MacArthur Avenue, Hamilton QLD Job No : J002388								East : 508,268.02 North : 6,964,570.98 56J Contractor : North Coast Drilling Drill Rig : P160 Inclination :			Sheet Logged Logged Date Checked Checked Date	: 2 OF 4 : DS 22/04/2024 : CJ : 05/06/2024			
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	DCP TE	EST (Blows	per 100	mm) E	s الا
			- - - 11	-5.2 - 6 -			sw sc	Coarse sized gravel, trace medium plasticity clay, dark grey. Clayey SAND ALLUVIAL: fine to medium grained, dark grey dark brown, low plasticity clay, strong smell of sulfur .		L-MD	-	10 13	20	20	30
150mm Washbore			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - -	SPT 2,1,3 (N=4) REC=398		CI	Silty to sandy CLAY ALLUVIAL: medium plasticity, dark grey dark brown, fine to medium grained sand.	w≈ PL	St					
	м		- 15 - 15 - 16 - 16 - 17 - 17 - 17 - 17 - 19 - 19 - 19	- - - - - - - - - - - - - - - - - - -	SPT 0,0,3 (N=3) REC=450 1,1,5 (N=6) REC=450	41) 1) 1) 1)	sc sc sc	Clayey SAND ALLUVIAL: fine to medium grained, dark grey dark brown, low to medium plasticity clay. Fine grained, medium plasticity clay, clay band. Medium to coarse grained.	W	VL					
		р	This re urpose	eport s onl	must be read in co y, without attempt only and do not n	njuncti to asse ecessa	on w ss pc rily ii	with accompanying notes and abbreviations. It has been possible contamination. Any references to potential conta ndicate the presence or absence of soil or groundwater	prepai iminat contar	red for ion are ninatio	geotechnic e for inform on.	al			






REPORT OF BOREHOLE: BH6

Clie	nt	: Br	isbane H	lousing	J Company			East : 508,272.50 North : 0.00 56J			Sheet : 1 OF 1 Logged : EA
Proj	ect	: Ur	nit Develo	opment	t ronua Hamilton OLD			Contractor : All-Tech Drilling			Logged Date 29/04/2024
Job	No	: J0	02388	unur Av	ente, Hamiton QLD		_	Inclination :			Checked Date : 03/06/2024
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	REMARKS
				3.9	ES:0-0.2 m: (w/w)			FILL Sitty to gravelly CLAY: fine to medium sized gravel, with fine to medium grained sand, medium plasticity, brown.			
			-	-	BDS: 0.2-0.5 m:		GC		w ≈ PL	F-St	
			- 	-	ES: 0.4-0.5 m: DS: 0.5-1 m:		сн	FILL Sandy CLAY: fine to medium grained sand, high plasticity, brown with pale brown.		F	
				— з			sм	FILL Silty SAND: fine to medium grained, with low plasticity clay, brown.	м	L-M D	
				-	ES: 0.9-1 m:		сн	FILL Silty CLAY: trace fine grained sand, high plasticity, black tending to dark grey.	w > PL	VS- S	
			_	-	FS: 14-15 m	ł		With fine sand bands.			
				-							
SFA			Ī	2	ES: 1.9-2 m:						
100mm	Low		2	-							
				-							
			-	-			сн				
			_	-1	ES: 2.9-3 m:						
			3	-							
				-							
				-							
			4	0							
								BH6 Terminated at 4m			
			-								
			Ļ								
				-							
-				<u> </u>	<u> </u>						
		рі	This re urpose	eport es onl	must be read in co y, without attempt	njuncti to asse	ion w ess po	/ith accompanying notes and abbreviations. It has been pre- ossible contamination. Any references to potential contami-	epare inatio	ed for on are	geotechnical e for information
					only and do not n	ictessd	ii iiy l	manage the presence of absence of soll of groundwater col	inalii	mati	20.

		C	re	9					REP	OR	OF BOREHOLE: BH8
Clie Pro Loc Job	nt ect ation No	ltan : B : U : 34 : J(ts pty risbane H nit Develo 40 MacAr 002388	Itd lousing opmen thur Av	l Company t enue, Hamilton QLD			East : 508,263.99 North : 6,964,639.82 56J Contractor : North Coast Drilling Drill Rig : P160 Inclination :			Sheet : 1 OF 4 Logged : DS Logged Date 01/05/2024 Checked : CJ Checked Date : 05/06/2024
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	DCP TEST (Blows per 100 mm) ⊟
			-	-	DS:		SM	Silty SAND TOPSOIL: fine to medium grained, trace fine to medium sized gravel, dark brown. FILL/DREDGE SPOIL Sandy CLAY: fine to medium grained sand, trace	SLM- _D w≈	L	
ADT			- - 	- 	SPT 		CI- CH	fine to medium sized gravel, medium to high plasticity, dark brown grey.	PL	F	
		Seepage	2	- - 2 -	DS: DS From auger			ark brown. FILL/DREDGE SPOIL Silty CLAY: low plasticity, dark grey, possibly fill/dredge spoil.			
			- 	- 1 - 1 -	SPT 0,0,0 (N=0) REC=45(CL		w > PL	VS	
			- 4	0 _				Silty CLAY POSSIBLY ALLUVIAL SOIL: low plasticity, dark grey brown,			-
			-	-	U75 Tube: PP=<5kPa			trace fine grained sand.			
ashbore	L		_ 5 _				CL			VS-S	
150mm W			- - 6 -		U75 Tube: PP=<5kPa						
			- 7 -	3 - -	SPT 6,4,7 (N=11) REC=10		sc sc	Clayey SAND POSSIBLY ALLUVIAL SOIL: fine grained, with fine sized gravel, dark grey brown, low plasticity clay. Clayey SAND ALLUVIAL: medium to coarse grained, trace fine sized gravel, dark grey brown, medium plasticity clay.	<u>M</u> / W	VL MD	
			- - 8 -		077						
			_ 9	5 	SPT 2,2,0 (N=2) REC=280			Silty CLAY ALLUVIAL: medium plasticity, dark grey blue grey, trace fine grained sand, possibly clay band.			
			-	6			СІ		w > PL	VS	
		p	This re urpose	eport es onl	must be read in co y, without attempt only and do not r	njuncti to asse iecessa	ion w ess po irily ii	with accompanying notes and abbreviations. It has been possible contamination. Any references to potential conta ndicate the presence or absence of soil or groundwater	prepai aminat contar	red for ion ar minati	r geotechnical e for information on.

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REPORT OF BOREHOLE: BH8

Clie Proj Loca Job	nt ect ation No	: Bi : Ui : 34 : JC	isbane H nit Develo 0 MacArt 02388	ousing opment thur Av	Company t enue, Hamilton QLD	1		East : 508,263.99 North : 6,964,639.82 56J Contractor : North Coast Drilling Drill Rig : P160 Inclination :			Sheet Logged Logged Date Checked Checked Dat	: 3 OF : DS 01/05/2 : CJ = : 05/06	4 2024 /2024		
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	DCP	TEST (B	lows	20	mm) 📇
	L-M		- - - 21 -	- - 17 - - - 		[] []	sc	Medium to coarse grained, trace fine sized gravel.		MD			15	20	<u>29</u> ¥
a	L		22 23 23 24 24 	- - 	SPT 0,0,0 (N=0) REC=270		sc	Trace low plasticity silt, trace shell fragments <5mm.							
150mm Washbore			- 25 -		SPT 8,8,12 (N=20) REC=24		CI	Clayey to silty CLAY medium plasticity, dark grey blue grey, trace shell fragments <5mm. Sandy to silty GRAVEL ALLUVIAL: fine to medium sized, medium to	w > PL	 VSt					
	L-M		- 26 - 27 - 27 - 27 - 28		SPT 5,11,14 (N=25) REC=211	Action of the second of the se	GM	coarse grained sand, dark brown dark grey.	w	MD					
	L		-	-	SPT 7,2,1 (N=3) REC=400	000	CI	Silty to sandy Silty CLAY ALLUVIAL: medium plasticity, grey, possible clayband shells present. Silty to sandy GRAVEL ALLUVIAL: fine to medium sized, coarse grained	v ≈ PL	vs					
	L-M		29 	25 - - 	SPT 13,15,15 (N=30)	694. 56940066	GM	sand, brown grey.	w						
		р	This re urpose	eport s onl	must be read in co y, without attempt only and do not n	njuncti to asse ecessa	on w ss pc rily iı	ith accompanying notes and abbreviations. It has been ssible contamination. Any references to potential conta ndicate the presence or absence of soil or groundwater	prepar minati contar	ed for ion are ninatio	geotechn e for infori on.	ical nation			



REPORT OF BOREHOLE: BH8

Clie Proj Loc: Job	nt ect ation No	: Bi : U : 34 : JC	isbane H nit Develo 0 MacAr 02388	lousing opmen thur Av	Company t enue, Hamilton QLD			East : 508,263.99 North : 6,964,639.82 56J Contractor : North Coast Drilling Drill Rig : P160 Inclination :			Sheet Logged Logged Date Checked Checked Date	: 4 OF 4 : DS 01/05/2024 : CJ : 05/06/202	4		
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (meters)	DEPTH RL	SAMPLE OR FIELD TEST	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE DESCRIPTION	CONSISTENCY DENSITY	DCP T	EST (Blow	s per 100) mm)	ہ ۳
150mm Washbore N	г М Кек				SPT 13,13,18 (N=31) REC=400 SPT 18,17,16 (N=33) REC=370 (N=33) REC=370 SPT 24,24,30 (N=54) REC=410 SPT 24,24,30 (N=54) REC=410		GM GM GM GM	Silty to sandy GRAVEL ALLUVIAL: fine to medium sized, coarse grained sand, brown grey. Medium to coarse sized. RESIDUAL. Fine to coarse sized, trace low to medium plasticity clay, possible clay band. Silty GRAVEL ALLUVIAL: medium to coarse sized, trace coarse grained sand, trace medium plasticity clay, orange velow orange-brown, gravel: (dark grey with black banding. BH8 Terminated at 35.41m (Target depth reached. Backfilled upon completion)	S DES	D MD		10 15	20	25	30
		р	This re urpose	eport s onl	must be read in co y, without attempt only and do not n	njuncti to asse ecessa	ion w ess po irily ii	with accompanying notes and abbreviations. It has been possible contamination. Any references to potential conta ndicate the presence or absence of soil or groundwater	prepai aminat contar	red foi ion are minati	geotechni for inform on.	cal nation			



EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS	Auger Screwing	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
AD	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
*V	V - Bit	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
т	TC - Bit, e.g. ADT	RC	Reverse Circulation	HMLC	Diamond Core – 63mm
HA	Hand Auger	PT	Push Tube	BH	Tractor Mounted Backhoe
ADH	Hollow Auger	СТ	Cable Tool Rig	EX	Tracked Hydraulic Excavator
DTC	Diatubre Coring	JET	Jetting	EE	Existing Excavation
WB	Washbore or Bailer	NDD	Non-destructive digging	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L Low resistance . Rapid penetration possible with little effort from the equipment used

M Medium resistance. Excavation possible at an acceptable rate with moderate effort from equipment used

H High resistance to penetration/excavation. Further penetration is possible at a slow rate

R Refusal or Practical Refusal. No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER	
¥	Water level shown at date Partial water loss
ightarrow	Water inflow Complete water loss
GROUNDWATER NC OBSERVED	T The observation of groundwater whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUND WATER NO ENCOUNTERED	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.
SAMPLING AND TE	STING
SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed Sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength (sv = peak value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
WPT	Water pressure tests
DCP	Dynamic cone penetration test
CPT	Dynamic cone penetration test
CPTu	Static cone penetration test with pore pressure (u) measurement
ROCK CORE RECOV	ERY
TCR = Total	Core Recovery (%)SCR = Solid Core Recovery (%)RQD = Rock Quantity Designation (%)
$= \frac{\text{Length of co}}{\text{Length of}}$	$\frac{\text{re recovered}}{\text{core run}} \times 100 \qquad = \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100 \qquad = \frac{\sum \text{Axial lengths of core > 100 mm}}{\text{Length of core run}} \times 100$



METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS

	FILL			E==:	_] CI	AY (CL,CI	, or CH)		
	GRAVEL (GP	or SW/)				RGANIC S	Oll S (OL or	OH or Pt)	
0000				<u>4 40</u>					
	SAND (SP or	SW)		00	្វុ C(OBBLES or	BOULDER	S	
× × ×	SILT (ML or M	1 H))	2				
Combinations	s of these basic symbo	ls may be used to indica	ate mi	xed ı	materials such a	is sandy cla	ay.		
CLASSIFICA		D STRATIGRAPHY							
Soil and Roc	k is classified and deso	ribed in Reports of Bore	eholes	and	Test Pits using	the preferr	ed method g	jiven in AS 1726 - 2017.	The material proper-
ties are asse	ssed in the field by visu	al/tactile methods.							
	PARTICLE SIZ	E					PLASTIC PRO	DPERTIES	
Major Division	Sub Division	Particle Size		40 -	[
B	oulders	>200 mm						CH High placticity	
С	obbles	63 - 200 mm	(30 -	- Lo	CL w plasticity		Cl High plasticity	
Gravel	Coarse	20 - 63 mm	%) Xi			clay		clay	
Gravel	Medium	6.7 - 20 mm	Inde	20 -	-				
Gravel	Fine	2.36 - 6.7 mm	city					OF High	H or MH liquid limit silt
Sand	Coarse	0.6 - 2.36 mm	lasti	10 -	_				
Sand	Medium	0.21 - 0.6 mm	₽.		CL/ML Clay	/Silt		Low liquid Low liquid limit silt	
Sand	Fine	0.075 - 0.21 mm		0 -	OL or ML - Low	liquid limit silt		-+ - + - +	
	Silt	0.002 - 0.075 mm		(D 10	20	30 Liqui	40 50 60 d Limit (%)	70 80
	Clay	<0.002 mm							
MOISTURE		ARSE GRAINED SOIL	AS	1726	- 2017				
Symbol	Term		Des	crip	tion				
D	Dry		Non	-coh	esive and free r	unning			
М	Moist		Soil	feels	s cool, darkened	l in colour, t	tends to stic	k together	
w	Wet		Soil	feels	s cool. darkened	l in colour.	soil sticks to	aether. free water forms	when handling
MOISTURE			464	1726	2017	,		5 ,	
WOISTORE		GRAINED SOIL	AJ	1/20	- 2017				
Symbol	Term		Des	crip	tion				
W <pl< td=""><td>Moist dry of liquid li</td><td>nit</td><td>Har</td><td>d and</td><td>d friable or powo</td><td>dery</td><td></td><td></td><td></td></pl<>	Moist dry of liquid li	nit	Har	d and	d friable or powo	dery			
W = PL	Moist near plastic li	nit	Soil	s car	n be molded at a	a moisture o	condition ap	proximately equal to the	plastic limit
W >PL	Moist, wet of plastic	limit	Soil	s usı	ally weakened	and free wa	ater forms o	n hands when handling	
W = LL	Wet near plastic lim	it							
W > LL	Wet, wet of liquid lir	nit							
		AS1726—2017	-	REL	ATIVE DENSIT	Y OF COA	RSE GRAIN		AS1726—2017
Symbol	Term	Undrained Shear		Sym	ibol	Term		Density Index %	SPT 'N' #
Symbol	Term	Strength	_	VL		Very Loos	se	Less than 15	0 to 4
VS	Very Soft	0 to 12 kPa		L		Loose		15 to 35	4 to 10
S	Soft	12 to 25 kPa		MD		Medium D	Dense	35 to 65	10 to 30
F	Firm	25 to 50 kPa		D		Dense		65 to 85	30 to 50
St	Stiff	50 to 100 kPa		VD		Very Den	se	Above 85	Above 50
VSt	Very Stiff	100 to 200 kPa		In th	e absence of test	results, con	sistency and	density may be assessed fr	om correlations with
Н	Hard	Above 200 kPa		the o	observed behavio	ur of the ma	aterial.		



TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND

ABBREVIATIONS FOR DEFECT DESCRIPTIONS

ROCK M	ATERIAL STREN	GTH CLASSIFICA	TION	AS1726—2017
Symbol	Term	Uniaxial Compressive Strength (MPa)	Point Load Strength I _{s (50)} (MPa)	Field Guide
VL	Very Low Strength	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick. Pieces up to 30 mm thick can be broken with finger pressure.
L	Low Strength	2 to 6	0.1 to 0.3	Easily scored with knife. Indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point. A piece of core 150 mm by 50 mm may be broken by hand. Sharp edges of core are friable and break during handling.
М	Medium Strength	6 to 20	0.3 to 1	Readily scored with a knife. A piece of core 150 mm by 50 mm can be broken by hand with difficulty.
Н	High Strength	20 to 60	1 to 3	A piece of core 150 mm by 50 mm cannot be broken by hand but can be broken by a pick with a single firm blow. Rock rings under hammer.
VH	Very High Strength	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow. Rock rings under hammer.
EH	Extremely High Strength	Above 200	Above 10	Specimen requires many blows with geological pick to break through intact material. Rock rings under hammer.

• = Diametral Point Load Test ∇ = Axial Point Load Test

CLASSIFI WEATHER	CATIO	ON OF MATERIAL		AS1726—2017				
Symbo	ol	Term				Field Guide		
RS		Residual Soil (Noi	te 1)	Material is weathered to fabric of original rock are	such an extent that no longer visible b	t it has soil properties. M ut the soil has not been	ass structure and n significantly transpo	naterial texture and orted.
XW		Extremely Weather (Note 1)	ered	Material is weathered to fabric of original rock are	such an extent that still visible.	t is has soil properties. N	lass structure and r	naterial texture and
HW		Highly Weathered	(Note 2)	The whole rock mass is original rock is not recog als have weathered to cl deposition of weathering	discoloured, usually nizable. Rock stren ay minerals. Porosi products in pores.	/ by iron staining or beac gth is significantly chang ty may be increased by l	ching to the extent t ged by weathering. leaching, or may be	hat the colour of the Some primary miner- e decreased due to
MH		Moderately Weath (Note 2)	nered	The whole of the rock ma colour of the original rock	aterial is discoloured is not recognizable	d, usually by iron stainin e, but shows little or no o	g or bleaching to th change in strength t	e extent that the from fresh rock.
SW		Slightly Weathere	d	Pock is partially discolou from fresh rock.	red with staining or	bleaching along joints b	out shows little or no	o change of strength
FR		Fresh		Rock shows no signs of	decomposition of in	ndividual minerals or colo	our change.	
Note 1		The term 'Extreme of the original rock	ely Weath c of the wo	ered rock' is misleading as ord 'material', eg. Extreme	s the material has s ly Weathered grani	soil properties. The word ite or Extremely Weather	'rock' should be re red material.	placed with the name
Note 2		Where it is not pos be used.	ssible to d	istinguish between 'Highly	Weathered' and 'N	Moderately Weathered' r	ock the term 'Distin	ctly Weathered' may
		DEFECT TYPE	E/DESCRI	PTION	DEFE	CT PROFILE	DEFECT I	ROUGHNESS
В	Bedo	ding Parting	V	Vein	- Symbol PL	Description Planar	DESC	RIPTION
J	Joint	:	HB/DB	Handling/Drilling Break	St	Stepped Undulating	Symbol Sl	Description Slickenside
EW	Extre Sear	emely Weathered n	С	Contact	DEFECT INF	FILL DESCRIPTION	Sm Ro	Smooth Rough
FZ	Frac	ture Zone	L	Cleavage	Cn	Clean: No visible coating	Vertical Borehole (inclination from h	e s - The dip orizontal) for the
CZ/S	Crus	hed Zone/Seam	Х	Foliation	Sn	Stain: Coated 1 to	defect is given. Inclined Borehold	es - The inclination
IS	Infille	ed Seam	S	Schistocity	Vr	Veneer: < 1 mm	is measured as the core axis.	e acute angle to the
SZ/S	Shea	ared Zone/Seam			Ct	Coating: 1 to 3 mm		

Appendix C Cone Penetration Test Results



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT01

Total depth: 28.67 m, Date: 22/04/2024

Surface Elevation: 4.30 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

Depth	m (m) Elevation: 4.30 (m)	Description	qt (MPa)	Ksbt (m/s)	N60	Es (MPa)	Dr	Phi (°)	M (MPa)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma	
1.0 2.0 3.0		Clay	0.4	-	2.6	-	-	-	1.7	19.2	24.5	0.4	1.8	19.0	
4.0 5.0 6.0 7.0															
8.0 9.0 10.0 11.0 12.0		Silty sand & sandy silt	2.7	5.22E-7	9.4	38.1	27.9	32.2	30.6	46.5	-	-	-	19.0	
13.0 14.0		Clay	0.8	1.33E-9	4.6	-	-	-	1.7	28.6	36.8	0.2	1.1	19.0	
15.0		Clay & silty clay	1.9	4.51E-8	8.3	-	-	-	12.3	45.5	62.2	0.4	1.8	19.0	
16.0 17.0 18.0		Silty sand & sandy silt	5.3	1.45E-6	16.6	62.1	33.0	33.3	55.2	75.8	-	-	-	19.0	
19.0 20.0 21.0 22.0 23.0		Clay & silty clay	3.3	7.00E-8	13.6	-	-	-	25.3	73.7	120.0	0.5	2.4	19.0	
24.0 25.0 26.0		Sand & silty sand	7.2	1.22E-6	22.4	-	-	-	54.1	95.3	147.2	0.5	2.5	19.0	
27.0 28.0															
30.0 31.0 32.0															
-33.0-	0 20 1 2 3 4 Tip resistance (MPa) Ic					l									-



Tabular results

.:: Layer No: 1 ::.		
Code: 1 Start depth: 1.01 (m), End of	lepth: 7.99 (m)	
Description: Clay		
Basic results	Estimation results	
Total cone resistance: 0.44 ±0.22 MPa	Permeability: $0.00E+00 \pm 2.70E-08 \text{ m/s}$	Constrained Mod.: 1.71 ±3.97 MPa
Sleeve friction: 11.12 ±9.43 kPa	N ₆₀ : 2.56 ±0.86 blows	Go: 19.23 ±4.13 MPa
Ic: 3.24 ±0.23	Es: 0.00 ±0.00 MPa	Su: 24.51 ±16.15 kPa
SBT _n : 3	Dr (%): 0.00 ±0.00	Su ratio: 0.38 ±0.66
SBTn description: Clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 1.76 ±3.06
	Unit weight: 19.00 ±0.00 kN/m ³	

	End domth: 12.00 (m)	
Code: 2 Start deptn: 7.98 (m),	End deptn: 13.00 (m)	
Description: Silty sand & sandy silt		
Basic results	Estimation results	
Total cone resistance: 2.72 ±1.31 MPa	Permeability: $5.22E-07 \pm 2.10E-06 \text{ m/s}$	Constrained Mod.: 30.64 ±18.43 MPa
Sleeve friction: 14.88 ±7.19 kPa	N_{60} : 9.41 ±2.90 blows	Go: 46.46 ±9.83 MPa
Ic: 2.36 ±0.32	Es: 38.15 ±7.68 MPa	Su: 0.00 ±0.00 kPa
SBT _n : 5	Dr (%): 27.94 ±3.78	Su ratio: 0.00 ±0.00
SBTn description: Silty sand & sandy silt	φ (degrees): 32.21 ±0.38 °	O.C.R.: 0.00 ±0.00
	Unit weight: 19.00 ±0.00 kN/m ³	
.:: Layer No: 3 ::.		
Code: 3 Start depth: 13.00 (m)	End depth: 14.12 (m)	
Description: Clay		
Basic results	Estimation results	
Total cone resistance: 0.78 ±0.26 MPa	Permeability: $1.33E-09 \pm 3.33E-09 m/s$	Constrained Mod.: 1.73 ±3.17 MPa
Sleeve friction: 6.89 \pm 6.05 kPa	N_{60} : 4.64 ±1.10 blows	Go: 28.64 ±7.27 MPa
Ic: 3.24 ±0.12	Es: 0.00 ±0.00 MPa	Su: 36.84 ±18.94 kPa
SBT _n : 3	Dr (%): 0.00 ±0.00	Su ratio: 0.24 ±0.13
SBTn description: Clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 1.11 ±0.60
	Unit weight: 19.00 ± 0.00 kN/m ³	
.:: Layer No: 4 ::.		
Code: 4 Start depth: 14.07 (m)	End depth: 15.75 (m)	
Description: Clay & silty clay		
Basic results	Estimation results	
Total cone resistance: 1.92 ±1.55 MPa	Permeability: $4.51E-08 \pm 1.32E-06$ m/s	Constrained Mod.: 12.33 ±26.16 MPa
Sleeve friction: 12.95 ±4.95 kPa	N_{60} : 8.34 ±3.38 blows	Go: 45.47 ±10.98 MPa
1 2 60 10 11	Es: 0.00 ±0.00 MPa	Su: 62.19 ±29.92 kPa
IC: 2.69 ± 0.44	$D_{r}(0/2) = 0.00 \pm 0.00$	Su ratio: 0.38 ±0.19
IC: 2.69 ±0.44 SBT _n : 4	DI ($\%$). 0.00 ±0.00	
IC: 2.69 \pm 0.44 SBT _n : 4 SBTn description: Clay & silty clay	φ (degrees): 0.00 ±0.00 °	O.C.R.: 1.75 ±0.88

Code: 5

Start depth: 15.75 (m), **End depth:** 19.15 (m)

$\ensuremath{\textbf{Description:}}$ Silty sand & sandy silt

Basic results

Total cone resistance: 5.29 ± 2.97 MPa Sleeve friction: 28.54 ± 10.91 kPa Ic: 2.21 ± 0.37 SBT_n: 5 SBTn description: Silty sand & sandy silt

Estimation results

```
Permeability: 1.45E-06 ±8.23E-06 m/s
N<sub>60</sub>: 16.59 ±5.64 blows
Es: 62.11 ±10.79 MPa
Dr (%): 33.03 ±6.98
\phi (degrees): 33.27 ±1.09 °
Unit weight: 19.00 ±0.00 kN/m<sup>3</sup>
```

Constrained Mod.: 55.21 ±28.87 MPa Go: 75.77 ±14.84 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00

.:: Layer No: 6 ::.

SBT description: N/A

Code: 6 Start depth: 19.13 (m), End depth: 25.20 (m)							
Description: Clay & silty clay							
Basic results	Estimation results						
Total cone resistance: 3.25 ±2.22 MPa	Permeability: 7.00E-08 ±1.72E-06 m/s	Constrained Mod.: 25.31 ±36.33 MPa					
Sleeve friction: 27.06 ±17.39 kPa	N_{60} : 13.58 ±4.77 blows	Go: 73.75 ±17.85 MPa					
Ic: 2.64 ±0.42	Es: 0.00 ±0.00 MPa	Su: 120.00 ±71.25 kPa					
SBT _n : 4	Dr (%): 0.00 ±0.00	Su ratio: 0.52 ±0.33					
SBTn description: Clay & silty clay	φ (degrees): 0.00 ±0.00 °	O.C.R.: 2.40 ±1.51					
	Unit weight: 19.00 \pm 0.00 kN/m ³						
.:: Layer No: 7 ::.							
Code: 7 Start depth: 25.17 (m),	, End depth: 28.63 (m)						
Description: Sand & sity sand							
Basic results	Estimation results						
Total cone resistance: 7.21 ±5.81 MPa	Permeability: 1.22E-06 ±1.08E-04 m/s	Constrained Mod.: 54.06 ±44.36 MPa					
Sleeve friction: 0.00 ±46.51 kPa	N ₆₀ : 22.36 ±8.41 blows	Go: 95.34 ±22.50 MPa					
Ic: 0.00 ±2.29	Es: 0.00 ±0.00 MPa	Su: 147.20 ±98.82 kPa					
SBT _n : 0	Dr (%): 0.00 ±0.00	Su ratio: 0.53 ±0.36					

O.C.R.: 2.46 ±1.66

 ϕ (degrees): 0.00 ±0.00 °

Unit weight: 19.00 \pm 0.00 kN/m³

CPeT-IT v.3.6.2.6 - CPTU data presentation & interpretation software - Report created on: 1/05/2024, 1:18:04 PM Project file: C:\Users\bhare\Documents\GEF\J2388 Hamilton.cpt



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT01

Total depth: 28.67 m, Date: 22/04/2024 Surface Elevation: 4.30 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

					Summa	ary tabl	e of mean v	values				
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E _s (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, Go (MPa)	Undrained strength, Su (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
1.01	6.98	0.00E+00	2.6	0.0	0.0	0.0	1.7	19.2	24.5	0.4	1.8	19.0
7.99	0.50	(±2.70E-08)	(±0.9)	(±0.0)	(±0.0)	(±0.0)	(±4.0)	(±4.1)	(±16.2)	(±0.7)	(±3.1)	(±0.0)
7.98	5.02	5.22E-07	9.4	38.1	27.9	32.2	30.6	46.5	0.0	0.0	0.0	19.0
13.00	5.02	(±2.10E-06)	(±2.9)	(±7.7)	(±3.8)	(±0.4)	(±18.4)	(±9.8)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
13.00	1 12	1.33E-09	4.6	0.0	0.0	0.0	1.7	28.6	36.8	0.2	1.1	19.0
14.12	1.12	(±3.33E-09)	(±1.1)	(±0.0)	(±0.0)	(±0.0)	(±3.2)	(±7.3)	(±18.9)	(±0.1)	(±0.6)	(±0.0)
14.07	1.68	4.51E-08	8.3	0.0	0.0	0.0	12.3	45.5	62.2	0.4	1.8	19.0
15.75	1.00	(±1.32E-06)	(±3.4)	(±0.0)	(±0.0)	(±0.0)	(±26.2)	(±11.0)	(±29.9)	(±0.2)	(±0.9)	(±0.0)
15.75	3 40	1.45E-06	16.6	62.1	33.0	33.3	55.2	75.8	0.0	0.0	0.0	19.0
19.15	5.10	(±8.23E-06)	(±5.6)	(±10.8)	(±7.0)	(±1.1)	(±28.9)	(±14.8)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
19.13	6.07	7.00E-08	13.6	0.0	0.0	0.0	25.3	73.7	120.0	0.5	2.4	19.0
25.20	0.07	(±1.72E-06)	(±4.8)	(±0.0)	(±0.0)	(±0.0)	(±36.3)	(±17.9)	(±71.3)	(±0.3)	(±1.5)	(±0.0)
25.17	3 46	1.22E-06	22.4	0.0	0.0	0.0	54.1	95.3	147.2	0.5	2.5	19.0
28.63	3.40	(±1.08E-04)	(±8.4)	(±0.0)	(±0.0)	(±0.0)	(±44.4)	(±22.5)	(±98.8)	(±0.4)	(±1.7)	(±0.0)

Depth values presented in this table are measured from free ground surface





Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 28.67 m, Date: 22/04/2024 Surface Elevation: 4.30 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing





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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT02

Total depth: 28.79 m, Date: 22/04/2024

Surface Elevation: 3.90 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

Depth (m) Elevation: 3.90 (m)	Description	qt (MPa)	Ksbt (m/s)	N 60	Es (MPa)	Dr	Phi (°)	M (MPa)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma	
DRILL OUT DRILL OUT 1.0 .0 2.0 .0 3.0 .0 5.0 .0	Clay	0.3	-	2.1	-	-	-	1.1	15.5	18.3	0.3	1.5	19.0	
6.0 7.0 8.0 9.0 6.61	Sand & silty sand	5.0	8.18E-6	13.5	43.6	37.1	34.2	50.1	55.0	-	-	-	19.0	
10.0 11.0 12.0	Clay & silty clay	1.7	4.99E-8	7.1	-	-	-	12.4	40.0	63.6	0.5	2.2	19.0	
13.0	Sensitive fine grained	0.6	9.05E-10	4.0	-	-	-	0.8	21.2	24.8	0.2	0.8	19.0	
14.0 15.0 16.0 17.0	Silty sand & sandy silt	2.8	2.02E-7	10.7	48.5	26.3	32.2	26.8	55.0	-	-	-	19.0	
18.0	Sand & silty sand	7.4	5.03E-6	20.7	68.5	35.5	33.4	80.8	87.1	-	-	-	19.0	
20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0	Clay & silty clay	2.9	-	12.9	-	-	-	20.8	71.5	119.6	0.5	2.2	19.0	
28.0 29.0 30.0 31.0 32.0 33.0	Sand & silty sand	9.1	5.13E-6	25.4	82.6	34.4	33.0	95.1	105.0	-	-	-	19.0	
0 1 2 3 4 Tip resistance (MPa) Ic														



Tabular results

.:: Layer No: 1 ::.		
Code: 1 Start depth: 1.00 (m), End of	depth: 6.61 (m)	
Description: Clay		
Basic results	Estimation results	
Total cone resistance: 0.33 \pm 0.07 MPa	Permeability: $0.00E+00 \pm 4.21E-09 \text{ m/s}$	Constrained Mod.: 1.14 ±1.35 MPa
Sleeve friction: 8.24 ±4.18 kPa	N_{60} : 2.14 ±0.43 blows	Go: 15.52 ±2.56 MPa
Ic: 3.31 ±0.13	Es: 0.00 ±0.00 MPa	Su: 18.33 ±4.48 kPa
SBT _n : 3	Dr (%): 0.00 ±0.00	Su ratio: 0.32 ±0.28
SBTn description: Clay	φ (degrees): 0.00 ±0.00 °	O.C.R.: 1.48 ±1.30
	Unit weight: 19.00 ±0.00 kN/m ³	

Code: 2 Start depth: 6.61 (m),	End depth: 9.70 (m)			
Description: Sand & sity sand				
Basic results	Estimation results			
Total cone resistance: 5.05 ±2.94 MPa	Permeability: 8.18E-06 ±3.07E-05 m/s	Constrained Mod.: 50.13 ±17.23 MPa		
Sleeve friction: 19.99 ±11.65 kPa	N_{60} : 13.50 ±5.36 blows	Go: 55.03 ±14.43 MPa		
Ic: 1.97 ±0.27	Es: 43.64 ±11.01 MPa	Su: 0.00 ±0.00 kPa		
SBT _n : 6	Dr (%): 37.11 ±10.22	Su ratio: 0.00 ±0.00		
SBTn description: Sand & silty sand	φ (degrees): 34.16 ±1.69 °	O.C.R.: 0.00 ±0.00		
	Unit weight: 19.00 ± 0.00 kN/m ³			
:: Layer No: 3 ::.				
Code: 3 Start depth: 9.70 (m),	End depth: 12.50 (m)			
Description: Clay & silty clay				
Basic results	Estimation results			
Total cone resistance: 1.66 ±1.22 MPa	Permeability: 4.99E-08 ±1.20E-06 m/s	Constrained Mod.: 12.43 ±20.32 MPa		
Sleeve friction: 13.32 ±7.73 kPa	N_{60} : 7.15 ±2.77 blows	Go: 40.00 ±10.23 MPa		
ic: 2.69 ±0.39	Es: 0.00 ±0.00 MPa	Su: 63.55 ±31.64 kPa		
SBT _n : 4	Dr (%): 0.00 ±0.00	Su ratio: 0.48 ±0.26		
SBTn description: Clay & silty clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 2.22 ±1.20		
	Unit weight: 19.00 \pm 0.00 kN/m ³			
:: Layer No: 4 ::.				
Code: 4 Start depth: 12.50 (m)	, End depth: 13.57 (m)			
Description: Sensitive fine grained				
Basic results	Estimation results			
Total cone resistance: 0.60 ±0.03 MPa	Permeability: $9.05E-10 \pm 3.11E-10 \text{ m/s}$	Constrained Mod.: 0.81 ±0.15 MPa		
Sleeve friction: $3.06 \pm 0.66 \text{ kPa}$	N_{60} : 4.00 ±0.00 blows	Go: 21.17 ±1.03 MPa		
Ic: 3.32 ±0.06	Es: 0.00 ±0.00 MPa	Su: 24.78 ±2.12 kPa		
SBT _n : 1	Dr (%): 0.00 ±0.00	Su ratio: 0.17 ±0.02		
SBTn description: Sensitive fine grained	φ (degrees): 0.00 ±0.00 °	O.C.R.: 0.77 ±0.07		
	Unit weight: 19.00 ±0.00 kN/m ³			
.:: Layer No: 5 ::.				

Start depth: 13.59 (m), End depth: 17.95 (m)

Description: Silty sand & sandy silt

Basic results

Total cone resistance: 2.84 ±1.69 MPa Sleeve friction: 16.20 ±10.73 kPa Ic: 2.49 ±0.34 SBT_n: 5 SBTn description: Silty sand & sandy silt

Estimation results

```
Permeability: 2.02E-07 ±1.93E-06 m/s
N<sub>60</sub>: 10.69 ±3.86 blows
Es: 48.53 ±8.44 MPa
Dr (%): 26.33 ±4.67
φ (degrees): 32.17 ±0.39 °
Unit weight: 19.00 ±0.00 kN/m<sup>3</sup>
```

Constrained Mod.: 26.84 ±25.96 MPa Go: 54.96 ±14.08 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00

.:: Layer No: 6 ::.

Code: 6	Start depth: 17.90 (m), End depth: 19.97 (m)								
Description: Sand	l & sity sand								
Basic results		Estimation results							
Total cone resistance	ce: 7.42 ±2.05 MPa	Permeability: $5.03E-06 \pm 6.96E-06 \text{ m/s}$	Constrained Mod.: 80.82 ±15.11 MPa						
Sleeve friction: 32.8	38 ±12.20 kPa	N_{60} : 20.74 ±3.70 blows	Go: 87.07 ±10.21 MPa						
Ic: 2.05 ±0.21		Es: 68.52 ±7.93 MPa	Su: 0.00 ±0.00 kPa						
SBT _n : 6		Dr (%): 35.52 ±5.01	Su ratio: 0.00 ±0.00						
SBTn description: S	and & silty sand	φ (degrees): 33.40 ±1.15 °	O.C.R.: 0.00 ±0.00						
		Unit weight: 19.00 ±0.00 kN/m ³							

Code: 7

Start depth: 19.97 (m), End depth: 27.47 (m)

Description: Clay & silty clay

Basic results

Total cone resistance: 2.94 ± 1.71 MPa Sleeve friction: 23.32 ± 13.95 kPa Ic: 2.72 ± 0.38 SBT_n: 4 SBTn description: Clay & silty clay

Estimation results Permeability: 0.00E+00 ±9.70E-07 m/s

$$\label{eq:N60} \begin{split} &\text{N}_{60} \colon 12.88 \pm 3.95 \text{ blows} \\ &\text{Es: } 0.00 \ \pm 0.00 \ \text{MPa} \\ &\text{Dr (\%): } 0.00 \ \pm 0.00 \\ &\phi \ (\text{degrees}) \colon 0.00 \ \pm 0.00 \ ^\circ \\ &\text{Unit weight: } 19.00 \ \pm 0.00 \ \text{kN/m}^3 \end{split}$$

Constrained Mod.: 20.83 ±30.57 MPa Go: 71.47 ±16.32 MPa Su: 119.62 ±60.49 kPa Su ratio: 0.48 ±0.24 O.C.R.: 2.22 ±1.13

.:: Layer No: 8 ::.

Code: 8

Start depth: 27.47 (m), End depth: 28.70 (m)

Description: Sand & sity sand

Basic results

Total cone resistance: 9.10 ± 3.14 MPa Sleeve friction: 0.00 ± 39.71 kPa Ic: 2.04 ± 0.25 SBT_n: 6 SBTn description: Sand & silty sand

Estimation results

Permeability: 5.13E-06 ±1.28E-05 m/s N₆₀: 25.39 ±5.85 blows Es: 82.61 ±14.22 MPa Dr (%): 34.45 ±5.63 ϕ (degrees): 33.02 ±1.24 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 95.12 ±25.06 MPa Go: 105.04 ±17.61 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT02

Total depth: 28.79 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

					Summa	ary tabl	e of mean v	values				
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E _s (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G ₀ (MPa)	Undrained strength, Su (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
1.00	5.61	0.00E+00	2.1	0.0	0.0	0.0	1.1	15.5	18.3	0.3	1.5	19.0
6.61	5.01	(±4.21E-09)	(±0.4)	(±0.0)	(±0.0)	(±0.0)	(±1.4)	(±2.6)	(±4.5)	(±0.3)	(±1.3)	(±0.0)
6.61	3 09	8.18E-06	13.5	43.6	37.1	34.2	50.1	55.0	0.0	0.0	0.0	19.0
9.70	5.05	(±3.07E-05)	(±5.4)	(±11.0)	(±10.2)	(±1.7)	(±17.2)	(±14.4)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
9.70	2 80	4.99E-08	7.1	0.0	0.0	0.0	12.4	40.0	63.6	0.5	2.2	19.0
12.50	2100	(±1.20E-06)	(±2.8)	(±0.0)	(±0.0)	(±0.0)	(±20.3)	(±10.2)	(±31.6)	(±0.3)	(±1.2)	(±0.0)
12.50	1 07	9.05E-10	4.0	0.0	0.0	0.0	0.8	21.2	24.8	0.2	0.8	19.0
13.57	1107	(±3.11E-10)	(±0.0)	(±0.0)	(±0.0)	(±0.0)	(±0.2)	(±1.0)	(±2.1)	(±0.0)	(±0.1)	(±0.0)
13.59	4.36	2.02E-07	10.7	48.5	26.3	32.2	26.8	55.0	0.0	0.0	0.0	19.0
17.95		(±1.93E-06)	(±3.9)	(±8.4)	(±4.7)	(±0.4)	(±26.0)	(±14.1)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
17.90	2 07	5.03E-06	20.7	68.5	35.5	33.4	80.8	87.1	0.0	0.0	0.0	19.0
19.97	2107	(±6.96E-06)	(±3.7)	(±7.9)	(±5.0)	(±1.1)	(±15.1)	(±10.2)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
19.97	7 50	0.00E+00	12.9	0.0	0.0	0.0	20.8	71.5	119.6	0.5	2.2	19.0
27.47	7.50	(±9.70E-07)	(±3.9)	(±0.0)	(±0.0)	(±0.0)	(±30.6)	(±16.3)	(±60.5)	(±0.2)	(±1.1)	(±0.0)
27.47	1.23	5.13E-06	25.4	82.6	34.4	33.0	95.1	105.0	0.0	0.0	0.0	19.0
28.70	1.20	(±1.28E-05)	(±5.8)	(±14.2)	(±5.6)	(±1.2)	(±25.1)	(±17.6)	(±0.0)	(±0.0)	(±0.0)	(±0.0)

Depth values presented in this table are measured from free ground surface



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 28.79 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing





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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

СРТ: СРТ03

Total depth: 32.23 m, Date: 22/04/2024

Surface Elevation: 3.90 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

Depth (m) Elevation: 3.90 (m)	Description	qt (MPa)	Ksbt (m/s)	N60	Es (MPa)	Dr	Phi (°)	M (MPa)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma (kN/m ³)	
DR 1.0 2.0 3.0 4.0 5.0 6.0	AILLOUT 0.00 Clay 3.00 . .	0.3	2.36E-9	2.1	-	-	-	1.5	15.7	19.1	0.4	1.8	19.0	
7.0 8.0	6.31 Sand & silty sand	6.2	3.10E-5	15.3	48.8	42.9	34.9	55.8	59.6	-	-	-	19.0	
9.0 10.0 11.0 12.0	8.79 Clay & silty clay	2.0	5.22E-7	7.5	-	-	-	22.1	40.7	77.2	0.6	2.8	19.0	
13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0	12.44 Sensitive fine grained 13.43 Silty sand & sandy silt	0.6 3.2	1.24E-9 -	4.0 12.0	- 56.4	- 28.4	- 32.5	1.1 28.8	23.1 61.2	-	-	-	19.0 19.0	
21.0 22.0 23.0 24.0 25.0 26.0	Clay & silty clay	2.9	3.57E-8	13.1	-	-	-	19.7	73.0	115.2	0.5	2.2	19.0	
27.0 28.0 29.0 30.0 31.0 32.0 33.0	27.05 Sand & silty sand	15.9	4.01E-5	36.6	-	_	-	116.7	126.1	222.8	0.7	3.2	19.0	
0 20 1 2 Tip resistance (MPa) Ic	3 4													



Tabular results

.::	Layer	No:	1	::.
	-			

```
Code: 1
```

Start depth: 0.00 (m), End depth: 6.31 (m)

Description: Clay

Basic results

Total cone resistance: 0.28 ± 0.17 MPa Sleeve friction: -1386.89 \pm 3238.41 kPa Ic: 2.79 \pm 1.21 SBT_n: 3 SBTn description: Clay

Estimation results

Permeability: $2.36E-09 \pm 5.20E-09 \text{ m/s}$
N_{60} : 2.11 ±0.69 blows
Es: 0.00 ±0.00 MPa
Dr (%): 0.00 ±0.00
φ (degrees): 0.00 ±0.00 °
Unit weight: 19.00 \pm 0.00 kN/m ³

Constrained Mod.: 1.54 ±1.84 MPa Go: 15.66 ±3.81 MPa Su: 19.11 ±8.28 kPa Su ratio: 0.38 ±0.32 O.C.R.: 1.78 ±1.47

Code: 2 Start depth: 6.31 (m),	End depth: 8.88 (m)			
Description: Sand & sity sand				
Basic results	Estimation results			
Total cone resistance: 6.25 ±2.82 MPa	Permeability: 3.10E-05 ±3.17E-05 m/s	Constrained Mod.: 55.84 ±17.58 MPa		
Sleeve friction: 27.01 \pm 9.33 kPa	N ₆₀ : 15.34 ±5.07 blows	Go: 59.60 ±12.65 MPa		
Ic: 1.99 ±0.39	Es: 48.76 ±7.66 MPa	Su: 0.00 ±0.00 kPa		
SBT _n : 6	Dr (%): 42.90 ±8.58	Su ratio: 0.00 ±0.00		
SBTn description: Sand & silty sand	φ (degrees): 34.89 ±1.65 °	O.C.R.: 0.00 ±0.00		
	Unit weight: 19.00 ± 0.00 kN/m ³			
:: Layer No: 3 ::.				
Code: 3 Start depth: 8.79 (m),	End depth: 12.44 (m)			
Description: Clay & silty clay				
Basic results	Estimation results			
Total cone resistance: 1.98 ±0.91 MPa	Permeability: 5.22E-07 ±7.03E-07 m/s	Constrained Mod.: 22.05 ±15.35 MPa		
Sleeve friction: 14.14 ±6.79 kPa	N_{60} : 7.54 ±2.08 blows	Go: 40.68 ±7.54 MPa		
Ic: 2.64 ±0.35	Es: 0.00 ±0.00 MPa	Su: 77.24 ±26.76 kPa		
SBT _n : 4	Dr (%): 0.00 ±0.00	Su ratio: 0.60 ±0.22		
SBTn description: Clay & silty clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 2.75 ±1.01		
	Unit weight: 19.00 ±0.00 kN/m ³			
.:: Layer No: 4 ::.				
Code: 4 Start depth: 12.44 (m)	, End depth: 13.50 (m)			
Description: Sensitive fine grained				
Basic results	Estimation results			
Total cone resistance: 0.65 ± 0.05 MPa	Permeability: $1.24E-09 \pm 6.17E-10$ m/s	Constrained Mod.: 1.10 ±0.32 MPa		
Sleeve friction: 3.96 ± 0.80 kPa	N_{60} : 4.00 ±0.00 blows	Go: 23.06 ±1.39 MPa		
Ic: 3.28 ±0.08	Es: 0.00 ±0.00 MPa	Su: 28.62 ±3.80 kPa		
SBT _n : 1	Dr (%): 0.00 ±0.00	Su ratio: 0.19 ±0.03		
SBTn description: Sensitive fine grained	φ (degrees): 0.00 ±0.00 °	O.C.R.: 0.89 ±0.13		

.:: Layer No: 5 ::.

Code: 5

Start depth: 13.43 (m), End depth: 21.00 (m)

Description: Silty sand & sandy silt

Basic results

Total cone resistance: 3.21 ± 2.55 MPa Sleeve friction: 20.16 ± 12.93 kPa Ic: 2.48 ± 0.40 SBT_n: 5 SBTn description: Silty sand & sandy silt

Estimation results

```
Permeability: 0.00E+00 ±3.71E-06 m/s N_{60}: 11.97 ±5.73 blows
Es: 56.40 ±12.20 MPa
Dr (%): 28.35 ±5.54
\phi (degrees): 32.46 ±0.64 °
Unit weight: 19.00 ±0.00 kN/m<sup>3</sup>
```

Constrained Mod.: 28.82 ±35.05 MPa Go: 61.21 ±20.17 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00

.:: Layer No: 6 ::.

SBT description: N/A

Code: 8Start depth: 20.90 (m)	, End depth: 27.05 (m)	
Description: Clay & silty clay		
Basic results	Estimation results	
Total cone resistance: 2.95 ±2.17 MPa	Permeability: $3.57E-08 \pm 1.72E-06$ m/s	Constrained Mod.: 19.74 ±34.92 MPa
Sleeve friction: 25.02 ±18.24 kPa	N ₆₀ : 13.07 ±4.79 blows	Go: 73.01 ±19.45 MPa
Ic: 2.74 ±0.42	Es: 0.00 ±0.00 MPa	Su: 115.25 ±65.59 kPa
SBT _n : 4	Dr (%): 0.00 ±0.00	Su ratio: 0.47 ±0.26
SBTn description: Clay & silty clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 2.17 ±1.22
	Unit weight: 19.00 ± 0.00 kN/m ³	
.:: Layer No: 7 ::.		
Code: 6 Start depth: 27.05 (m)	, End depth: 32.20 (m)	
Description: Sand & sity sand		
Basic results	Estimation results	
Total cone resistance: 15.92 ±4.45 MPa	Permeability: $4.01E-05 \pm 9.40E-05 m/s$	Constrained Mod.: 116.69 ±26.47 MPa
Sleeve friction: 0.00 ±50.91 kPa	N_{60} : 36.59 ±6.25 blows	Go: 126.09 ±19.08 MPa
Ic: 0.00 ±1.77	Es: 0.00 ±0.00 MPa	Su: 222.78 ±110.15 kPa
SBT _n : 0	Dr (%): 0.00 ±0.00	Su ratio: 0.70 ±0.34

O.C.R.: 3.22 ±1.57

 ϕ (degrees): 0.00 ±0.00 °

Unit weight: 19.00 ±0.00 kN/m³

CPeT-IT v.3.6.2.6 - CPTU data presentation & interpretation software - Report created on: 1/05/2024, 12:51:32 PM Project file: C:\Users\bhare\Documents\GEF\J2388 Hamilton.cpt



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT03

Total depth: 32.23 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

Summary table of mean values												
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E₅ (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G ₀ (MPa)	Undrained strength, Su (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
0.00	6 31	2.36E-09	2.1	0.0	0.0	0.0	1.5	15.7	19.1	0.4	1.8	19.0
6.31	0.51	(±5.20E-09)	(±0.7)	(±0.0)	(±0.0)	(±0.0)	(±1.8)	(±3.8)	(±8.3)	(±0.3)	(±1.5)	(±0.0)
6.31	2 57	3.10E-05	15.3	48.8	42.9	34.9	55.8	59.6	0.0	0.0	0.0	19.0
8.88	2.57	(±3.17E-05)	(±5.1)	(±7.7)	(±8.6)	(±1.6)	(±17.6)	(±12.7)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
8.79	3 65	5.22E-07	7.5	0.0	0.0	0.0	22.1	40.7	77.2	0.6	2.8	19.0
12.44	5.05	(±7.03E-07)	(±2.1)	(±0.0)	(±0.0)	(±0.0)	(±15.4)	(±7.5)	(±26.8)	(±0.2)	(±1.0)	(±0.0)
12.44	1.06	1.24E-09	4.0	0.0	0.0	0.0	1.1	23.1	28.6	0.2	0.9	19.0
13.50	1.00	(±6.17E-10)	(±0.0)	(±0.0)	(±0.0)	(±0.0)	(±0.3)	(±1.4)	(±3.8)	(±0.0)	(±0.1)	(±0.0)
13.43	7 57	0.00E+00	12.0	56.4	28.4	32.5	28.8	61.2	0.0	0.0	0.0	19.0
21.00	,,	(±3.71E-06)	(±5.7)	(±12.2)	(±5.5)	(±0.6)	(±35.0)	(±20.2)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
20.90	6 15	3.57E-08	13.1	0.0	0.0	0.0	19.7	73.0	115.2	0.5	2.2	19.0
27.05	0.15	(±1.72E-06)	(±4.8)	(±0.0)	(±0.0)	(±0.0)	(±34.9)	(±19.4)	(±65.6)	(±0.3)	(±1.2)	(±0.0)
27.05	5 1 5	4.01E-05	36.6	0.0	0.0	0.0	116.7	126.1	222.8	0.7	3.2	19.0
32.20	5.15	(±9.40E-05)	(±6.3)	(±0.0)	(±0.0)	(±0.0)	(±26.5)	(±19.1)	(±110.2)	(±0.3)	(±1.6)	(±0.0)

Depth values presented in this table are measured from free ground surface



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 32.23 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing





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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

СРТ: СРТ04

Total depth: 31.20 m, Date: 22/04/2024

Surface Elevation: 3.90 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

Depth (m) Elevation: 3.90 (m)	Description	qt (MPa)	Ksbt (m/s)	N60	Es (MPa)	Dr	Phi (°)	M (MPa)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma	
1.0 2.0 3.0 4.0 5.0	DRILL OUT IN	Clay	0.4	-	2.3	-	-	-	1.5	16.4	21.3	0.4	1.7	19.0	
7.0 8.0	7.01	Sand & silty sand	6.2	1.82E-5	15.4	46.2	40.9	34.4	57.9	58.9	-	-	-	19.0	
9.0 10.0 11.0 12.0	9.14	Clay & silty clay	1.8	9.57E-8	7.4	-	-	-	16.3	40.4	67.3	0.5	2.3	19.0	
13.0	12.57	Sensitive fine grained	0.6	8.35E-10	3.8	-	-	-	0.7	20.1	22.9	0.2	0.7	19.0	
14.0	13.77	Clay	1.1	3.95E-9	5.7	-	-	-	3.6	34.5	50.1	0.3	1.4	19.0	
15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0		Silty sand & sandy silt	3.4	-	13.0	56.0	27.3	32.4	30.4	66.9	-	_	-	19.0	
25.0	24.86	Silty sand & sandy silt	7.4	3.19E-6	21.5	72.2	31.2	32.4	82.8	92.0	-	-	-	19.0	
27.0	26.38	Clay & silty clay	3.2	2.25E-8	14.7	-	-	-	20.2	84.8	123.2	0.4	2.0	19.0	
28.0 29.0 30.0 31.0 32.0 	27.86	Sand & silty sand	13.2	1.91E-5	32.6	96.2	40.6	34.3	120.1	122.6	-	-	-	19.0	
	0 20 1 2 3 4 Tip resistance (MPa) Ic														

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Tabular results

.:: Layer No: 1 ::.								
Code: 1 Start depth: 1.01 (m), End depth: 6.99 (m)								
Description: Clay								
Basic results	Estimation results							
Total cone resistance: 0.38 ±0.21 MPa	Permeability: $0.00E+00 \pm 3.42E-08$ m/s	Constrained Mod.: 1.54 ±3.02 MPa						
Sleeve friction: 8.20 ±3.28 kPa	N_{60} : 2.26 ±0.91 blows	Go: 16.37 ±5.20 MPa						
Ic: 3.22 ±0.20	Es: 0.00 ±0.00 MPa	Su: 21.25 ±11.23 kPa						
SBT _n : 3	Dr (%): 0.00 ±0.00	Su ratio: 0.36 ±0.21						
SBTn description: Clay	ϕ (degrees): 0.00 ±0.00 °	O.C.R.: 1.66 ±0.96						
	Unit weight: 19.00 ±0.00 kN/m ³							

.:: Layer No: 2 ::.								
Code: 2Start depth: 7.01 (m)	, End depth: 9.15 (m)							
Description: Sand & sity sand								
Basic results	Estimation results							
Total cone resistance: 6.18 ±1.53 MPa	Permeability: $1.82E-05 \pm 2.45E-05 m/s$	Constrained Mod.: 57.87 ±5.84 MPa						
Sleeve friction: 21.52 ±4.83 kPa	N_{60} : 15.37 ±2.51 blows	Go: 58.93 ±5.84 MPa						
Ic: 1.87 ±0.15	Es: 46.24 ±4.58 MPa	Su: 0.00 ±0.00 kPa						
SBT _n : 6	Dr (%): 40.90 ±5.35	Su ratio: 0.00 ±0.00						
SBTn description: Sand & silty sand	φ (degrees): 34.36 ±1.08 °	O.C.R.: 0.00 ±0.00						
	Unit weight: 19.00 ± 0.00 kN/m ³							

.:: Layer No: 3 ::.

```
Code: 3
```

Start depth: 9.14 (m), End depth: 12.55 (m)

Description: Clay & silty clay

Basic results

Total cone resistance: 1.84 ± 0.91 MPa Sleeve friction: 12.41 ± 5.59 kPa Ic: 2.60 ± 0.37 SBT_n: 4 SBTn description: Clay & silty clay

Permeability: 9.57E-08 ±1.05E-06 m/s

Estimation results

N₆₀: 7.40 ±1.94 blows Es: 0.00 ±0.00 MPa Dr (%): 0.00 ±0.00 ϕ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 16.32 ±16.38 MPa Go: 40.37 ±6.37 MPa Su: 67.26 ±31.29 kPa Su ratio: 0.50 ±0.25 O.C.R.: 2.33 ±1.18

.:: Layer No: 4 ::.

4 Start depth: 12.57	(m), End depth:	13.80 (m)	l
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Description: Sensitive fine grained

Basic results

Code:

Total cone resistance: 0.57 ± 0.05 MPa Sleeve friction: 2.53 ± 1.00 kPa Ic: 3.34 ± 0.07 SBT_n: 1 SBTn description: Sensitive fine grained

Estimation results

Permeability: 8.35E-10 ±4.79E-10 m/s N₆₀: 3.83 ±0.36 blows Es: 0.00 ±0.00 MPa Dr (%): 0.00 ±0.00 ϕ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 0.72 ±0.20 MPa Go: 20.07 ±1.83 MPa Su: 22.88 ±3.63 kPa Su ratio: 0.15 ±0.02 O.C.R.: 0.70 ±0.11

.:: Layer No: 5 ::.

Start depth: 13.77 (m), End depth: 14.92 (m)

Description: Clay

Basic results

Code: 5

Total cone resistance: 1.05 \pm 0.49 MPa Sleeve friction: 8.81 \pm 5.01 kPa Ic: 3.07 \pm 0.23 SBT_n: 3 SBTn description: Clay

Estimation results

Permeability: $3.95E-09 \pm 8.13E-08$ m/s N₆₀: 5.72 ± 1.38 blows Es: 0.00 ± 0.00 MPa Dr (%): 0.00 ± 0.00 ϕ (degrees): 0.00 ± 0.00 ° Unit weight: 19.00 ± 0.00 kN/m³ Constrained Mod.: 3.63 ±8.13 MPa Go: 34.48 ±7.18 MPa Su: 50.12 ±21.81 kPa Su ratio: 0.31 ±0.14 O.C.R.: 1.44 ±0.64

Layer No: 0								
Code: 6	Start depth: 14.89 (m),	End depth: 24.87 (m)						
Description: Silty	sand & sandy silt							
Basic results		Estimation results						
Total cone resistance	ce: 3.41 ±2.09 MPa	Permeability: $0.00E+00 \pm 3.53E-06$ m/s	Constrained Mod.: 30.42 ±30.33 MPa					
Sleeve friction: 20.9	99 ±10.84 kPa	N_{60} : 13.00 ±4.20 blows	Go: 66.95 ±13.51 MPa					
Ic: 2.50 ±0.39		Es: 56.04 ±9.89 MPa	Su: 0.00 ±0.00 kPa					
SBT _n : 5		Dr (%): 27.31 ±5.89	Su ratio: 0.00 ±0.00					
SBTn description: Silty sand & sandy silt		φ (degrees): 32.36 ±0.61 °	O.C.R.: 0.00 ±0.00					
		Unit weight: 19.00 \pm 0.00 kN/m ³						
.:: Layer No: 7 ::.								
Code: 7	Start depth: 24.86 (m),	End depth: 26.39 (m)						
Description: Silty	sand & sandy silt							
Basic results		Estimation results						
Total cone resistance	ce: 7.36 ±2.03 MPa	Permeability: 3.19E-06 ±6.64E-06 m/s	Constrained Mod.: 82.76 ±17.18 MPa					

Sleeve friction: 24.55 ±10.29 kPa Ic: 2.11 ±0.21 SBT_n: 5 SBTn description: Silty sand & sandy silt

N₆₀: 21.50 ±3.59 blows Es: 72.17 ±8.27 MPa

φ (degrees): 32.44 ±0.56 °

Unit weight: 19.00 ±0.00 kN/m³

Dr (%): 31.23 ±4.49

Go: 91.98 ±10.60 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00

.:: Layer No: 8 ::.

8	Start depth: 26.	38 (m), End dept l	h: 27.83 (m)
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Description: Clay & silty clay

Basic results

Code:

Total cone resistance: 3.18 ±2.19 MPa Sleeve friction: 34.29 ±21.13 kPa Ic: 2.81 ±0.44 SBT_n: 4 SBTn description: Clay & silty clay

Estimation results

Permeability: 2.25E-08 ±7.59E-07 m/s N₆₀: 14.69 ±5.01 blows Es: 0.00 ±0.00 MPa Dr (%): 0.00 ±0.00 φ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³

Constrained Mod.: 20.18 ±39.44 MPa Go: 84.84 ±20.85 MPa Su: 123.24 ±85.96 kPa Su ratio: 0.44 ±0.31 O.C.R.: 2.05 ±1.44

.:: Layer No: 9 ::.

Start depth: 27.86 (m), End depth: 31.01 (m)

Description: Sand & sity sand

Basic results

Code: 9

Total cone resistance: 13.20 ±2.65 MPa Sleeve friction: 41.97 ±12.23 kPa Ic: 1.86 ±0.13 SBT_n: 6 SBTn description: Sand & silty sand

Estimation results

```
Permeability: 1.91E-05 ±2.40E-05 m/s
N<sub>60</sub>: 32.60 ±4.31 blows
Es: 96.24 ±8.83 MPa
Dr (%): 40.61 ±5.09
φ (degrees): 34.27 ±1.07 °
Unit weight: 19.00 ±0.00 kN/m<sup>3</sup>
```

Constrained Mod.: 120.14 ±11.63 MPa Go: 122.64 ±11.25 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT04

Total depth: 31.20 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

Summary table of mean values												
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E _s (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G ₀ (MPa)	Undrained strength, Su (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
1.01	5 98	0.00E+00	2.3	0.0	0.0	0.0	1.5	16.4	21.3	0.4	1.7	19.0
6.99	5.90	(±3.42E-08)	(±0.9)	(±0.0)	(±0.0)	(±0.0)	(±3.0)	(±5.2)	(±11.2)	(±0.2)	(±1.0)	(±0.0)
7.01	2 14	1.82E-05	15.4	46.2	40.9	34.4	57.9	58.9	0.0	0.0	0.0	19.0
9.15	2.11	(±2.45E-05)	(±2.5)	(±4.6)	(±5.4)	(±1.1)	(±5.8)	(±5.8)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
9.14	3 41	9.57E-08	7.4	0.0	0.0	0.0	16.3	40.4	67.3	0.5	2.3	19.0
12.55	5.11	(±1.05E-06)	(±1.9)	(±0.0)	(±0.0)	(±0.0)	(±16.4)	(±6.4)	(±31.3)	(±0.3)	(±1.2)	(±0.0)
12.57	1 23	8.35E-10	3.8	0.0	0.0	0.0	0.7	20.1	22.9	0.2	0.7	19.0
13.80	1.25	(±4.79E-10)	(±0.4)	(±0.0)	(±0.0)	(±0.0)	(±0.2)	(±1.8)	(±3.6)	(±0.0)	(±0.1)	(±0.0)
13.77	1 15	3.95E-09	5.7	0.0	0.0	0.0	3.6	34.5	50.1	0.3	1.4	19.0
14.92	1115	(±8.13E-08)	(±1.4)	(±0.0)	(±0.0)	(±0.0)	(±8.1)	(±7.2)	(±21.8)	(±0.1)	(±0.6)	(±0.0)
14.89	9 98	0.00E+00	13.0	56.0	27.3	32.4	30.4	66.9	0.0	0.0	0.0	19.0
24.87	5150	(±3.53E-06)	(±4.2)	(±9.9)	(±5.9)	(±0.6)	(±30.3)	(±13.5)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
24.86	1 53	3.19E-06	21.5	72.2	31.2	32.4	82.8	92.0	0.0	0.0	0.0	19.0
26.39	1100	(±6.64E-06)	(±3.6)	(±8.3)	(±4.5)	(±0.6)	(±17.2)	(±10.6)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
26.38	1.45	2.25E-08	14.7	0.0	0.0	0.0	20.2	84.8	123.2	0.4	2.0	19.0
27.83	1115	(±7.59E-07)	(±5.0)	(±0.0)	(±0.0)	(±0.0)	(±39.4)	(±20.8)	(±86.0)	(±0.3)	(±1.4)	(±0.0)
27.86	3 15	1.91E-05	32.6	96.2	40.6	34.3	120.1	122.6	0.0	0.0	0.0	19.0
31.01	5115	(±2.40E-05)	(±4.3)	(±8.8)	(±5.1)	(±1.1)	(±11.6)	(±11.3)	(±0.0)	(±0.0)	(±0.0)	(±0.0)

Depth values presented in this table are measured from free ground surface



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 31.20 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing





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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT05

Total depth: 29.52 m, Date: 22/04/2024

Surface Elevation: 3.90 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

. 1

Depth (m) Elevation: 3.90 (m)		qt (MPa)	Ksbt (m/s)	N 60	Es (MPa)	Dr	Phi (°)	М (МРа)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma (kN/m³)
DRILL OUT DRILL OUT 1.0 1.0 2.0 3.00 4.0 5.0	C lay	0.3	1.25E-9	2.1	-	-	-	1.3	15.8	19.7	0.3	1.6	19.0
6.0 7.0 8.0 9.0	8 Sand & silty sand	5.4	7.97E-6	14.4	47.2	39.3	34.4	54.1	59.0	-	-	-	19.0
10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0	Clay & silty clay	1.9	-	8.1	-	-	-	14.8	45.1	75.1	0.5	2.3	19.0
18.1	1 Sand & silty sand	7.4	4.95E-6	20.7	68.4	34.2	33.0	84.2	87.1	-	-	-	19.0
21.0 22.0 23.0 24.0 25.0	G Clay & silty clay	3.0	7.52E-8	12.5	-	-	-	23.9	67.1	117.6	0.5	2.3	19.0
26.0 27.0 26.0	G Sand & silty sand Clay & silty clay	11.8 2.8	1.48E-5 1.17E-8	29.8 13.7	90.1 -	40.1 -	34.4 -	111.1 16.1	114.8 82.1	- 123.4	- 0.4	- 2.1	19.0 19.0
28.0 29.0 30.0 31.0 32.0 33.0	Sand & silty sand	10.8	9.98E-6	28.4	88.1	36.4	33.4	109.0	112.3	-	-	-	19.0
0 1 2 3 4 Tip resistance (MPa) Ic													

4.1

CPeT-IT v.3.6.2.6 - CPTU data presentation & interpretation software - Report created on: 1/05/2024, 1:19:47 PM Project file: C:\Users\bhare\Documents\GEF\J2388 Hamilton.cpt



Tabular results

.:: Layer No: 1 ::.								
Code: 1 Start depth: 1.00 (m), End depth: 6.51 (m)								
Description: Clay								
Basic results	Estimation results							
Total cone resistance: 0.34 ±0.08 MPa	Permeability: $1.25E-09 \pm 4.38E-09 \text{ m/s}$	Constrained Mod.: 1.35 ±0.86 MPa						
Sleeve friction: 8.48 ±2.78 kPa	N_{60} : 2.14 ±0.56 blows	Go: 15.82 ±3.72 MPa						
Ic: 3.26 ±0.14	Es: 0.00 ±0.00 MPa	Su: 19.72 ±4.42 kPa						
SBT _n : 3	Dr (%): 0.00 ±0.00	Su ratio: 0.35 ±0.17						
SBTn description: Clay	φ (degrees): 0.00 ±0.00 °	O.C.R.: 1.61 ±0.81						
	Unit weight: 19.00 ±0.00 kN/m ³							
Code: 2 Start depth: 6.48 (m),	End depth: 9.70 (m)							
--	---	------------------------------------	--	--	--	--		
Description: Sand & sity sand								
Basic results	Estimation results							
Total cone resistance: 5.36 ±2.00 MPa	Permeability: 7.97E-06 \pm 1.79E-05 m/s	Constrained Mod.: 54.12 ±12.64 MPa						
Sleeve friction: 25.40 \pm 6.49 kPa	N ₆₀ : 14.38 ±3.58 blows	Go: 58.96 ±8.81 MPa						
Ic: 1.98 ±0.26	Es: 47.25 ±5.86 MPa	Su: 0.00 ±0.00 kPa						
SBT _n : 6	Dr (%): 39.32 ±6.47	Su ratio: 0.00 ±0.00						
SBTn description: Sand & silty sand	φ (degrees): 34.42 ±1.22 °	O.C.R.: 0.00 ±0.00						
	Unit weight: 19.00 ±0.00 kN/m ³							
:: Layer No: 3 ::.								
Code: 3 Start depth: 9.72 (m),	End depth: 18.12 (m)							
Description: Clay & silty clay								
Basic results	Estimation results							
Total cone resistance: 1.93 ±1.29 MPa	Permeability: $0.00E+00 \pm 9.68E-07 \text{ m/s}$	Constrained Mod.: 14.78 ±21.74 MPa						
Sleeve friction: 13.49 ±9.00 kPa	N_{60} : 8.14 ±3.31 blows	Go: 45.09 ±13.85 MPa						
Ic: 2.68 ±0.35	Es: 0.00 ±0.00 MPa	Su: 75.14 ±45.53 kPa						
SBT _n : 4	Dr (%): 0.00 ±0.00	Su ratio: 0.50 ±0.29						
SBTn description: Clay & silty clay	φ (degrees): 0.00 ±0.00 °	O.C.R.: 2.30 ±1.32						
	Unit weight: 19.00 \pm 0.00 kN/m ³							
:: Layer No: 4 ::.								
Code: 4 Start depth: 18.11 (m)	End depth: 20.45 (m)							
Description: Sand & sity sand								
Basic results	Estimation results							
Total cone resistance: 7.40 ±1.16 MPa	Permeability: 4.95E-06 ±3.59E-06 m/s	Constrained Mod.: 84.21 ±8.54 MPa						
Sleeve friction: 32.53 ±5.96 kPa	N_{60} : 20.72 ±2.19 blows	Go: 87.12 ±6.65 MPa						
Ic: 2.06 ±0.10	Es: 68.36 ±5.22 MPa	Su: 0.00 ±0.00 kPa						
	Dr (%): 34.23 ±3.32	Su ratio: 0.00 ±0.00						
SBT _n : 6								
SBTn description: Sand & silty sand	φ (degrees): 33.01 ±0.64 °	O.C.R.: 0.00 ±0.00						

Description: Clay & silty clay

Basic results

Total cone resistance: 3.03 ±1.76 MPa Sleeve friction: 18.33 ±8.17 kPa Ic: 2.63 ±0.34 SBT_n: 4 SBTn description: Clay & silty clay

Estimation results

```
Permeability: 7.52E-08 ±1.04E-06 m/s
N<sub>60</sub>: 12.48 ±4.07 blows
Es: 0.00 ±0.00 MPa
Dr (%): 0.00 ±0.00
\phi (degrees): 0.00 ±0.00 °
Unit weight: 19.00 ±0.00 kN/m<sup>3</sup>
```

Constrained Mod.: 23.88 ±30.06 MPa Go: 67.07 ±14.39 MPa Su: 117.57 ±52.57 kPa Su ratio: 0.51 ±0.22 O.C.R.: 2.33 ±1.00

.:: Layer No: 6 ::.

Code: 6 Start depth: 25.50 (r	n), End depth: 26.04 (m)	
Description: Sand & sity sand		
Basic results	Estimation results	
Total cone resistance: 11.79 ±2.49 MPa	Permeability: $1.48E-05 \pm 1.41E-05 m/s$	Constrained Mod.: 111.07 ±12.26 MPa
Sleeve friction: 43.63 ±11.51 kPa	N_{60} : 29.81 ±4.00 blows	Go: 114.81 ±10.29 MPa
Ic: 1.90 ±0.16	Es: 90.09 ±8.08 MPa	Su: 0.00 ±0.00 kPa
SBT _n : 6	Dr (%): 40.10 ±5.54	Su ratio: 0.00 ±0.00
SBTn description: Sand & silty sand	φ (degrees): 34.44 ±1.04 °	O.C.R.: 0.00 ±0.00
	Unit weight: 19.00 \pm 0.00 kN/m ³	
.:: Layer No: 7 ::.		

Code: 7

Start depth: 26.04 (m), End depth: 27.58 (m)

Description: Clay & silty clay

Basic results

Total cone resistance: 2.76 \pm 1.61 MPa Sleeve friction: 34.52 \pm 17.78 kPa Ic: 2.91 \pm 0.37 SBT_n: 4 SBTn description: Clay & silty clay

Estimation results

Permeability: 1.17E-08 ±3.36E-07 m/s N₆₀: 13.68 ±3.89 blows Es: 0.00 ±0.00 MPa Dr (%): 0.00 ±0.00 ϕ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³

(m)

Constrained Mod.: 16.13 ±28.97 MPa Go: 82.09 ±17.37 MPa Su: 123.44 ±66.84 kPa Su ratio: 0.45 ±0.25 O.C.R.: 2.07 ±1.13

.:: Layer No: 8 ::.

	Code: 8	Start depth: 27.58 (m), End depth: 29.41
--	---------	--

Description: Sand & sity sand

Basic results

Total cone resistance: 10.83 ± 1.21 MPa Sleeve friction: 34.36 ± 32.95 kPa Ic: 1.95 ± 0.13 SBT_n: 6 SBTn description: Sand & silty sand

Estimation results

Permeability: 9.98E-06 ±8.64E-06 m/s N₆₀: 28.43 ±3.13 blows Es: 88.13 ±16.15 MPa Dr (%): 36.41 ±2.82 ϕ (degrees): 33.36 ±0.86 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 108.99 ±14.32 MPa Go: 112.31 ±20.58 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT05

Total depth: 29.52 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

					Summa	ary tabl	e of mean v	values				
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E₅ (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G ₀ (MPa)	Undrained strength, Su (IPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
1.00	5 51	1.25E-09	2.1	0.0	0.0	0.0	1.3	15.8	19.7	0.3	1.6	19.0
6.51	5.51	(±4.38E-09)	(±0.6)	(±0.0)	(±0.0)	(±0.0)	(±0.9)	(±3.7)	(±4.4)	(±0.2)	(±0.8)	(±0.0)
6.48	3 22	7.97E-06	14.4	47.2	39.3	34.4	54.1	59.0	0.0	0.0	0.0	19.0
9.70	5.22	(±1.79E-05)	(±3.6)	(±5.9)	(±6.5)	(±1.2)	(±12.6)	(±8.8)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
9.72	8 40	0.00E+00	8.1	0.0	0.0	0.0	14.8	45.1	75.1	0.5	2.3	19.0
18.12	0110	(±9.68E-07)	(±3.3)	(±0.0)	(±0.0)	(±0.0)	(±21.7)	(±13.9)	(±45.5)	(±0.3)	(±1.3)	(±0.0)
18.11	2 34	4.95E-06	20.7	68.4	34.2	33.0	84.2	87.1	0.0	0.0	0.0	19.0
20.45	2.51	(±3.59E-06)	(±2.2)	(±5.2)	(±3.3)	(±0.6)	(±8.5)	(±6.6)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
20.46	5.05	7.52E-08	12.5	0.0	0.0	0.0	23.9	67.1	117.6	0.5	2.3	19.0
25.51	0100	(±1.04E-06)	(±4.1)	(±0.0)	(±0.0)	(±0.0)	(±30.1)	(±14.4)	(±52.6)	(±0.2)	(±1.0)	(±0.0)
25.50	0.54	1.48E-05	29.8	90.1	40.1	34.4	111.1	114.8	0.0	0.0	0.0	19.0
26.04	010 1	(±1.41E-05)	(±4.0)	(±8.1)	(±5.5)	(±1.0)	(±12.3)	(±10.3)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
26.04	1.54	1.17E-08	13.7	0.0	0.0	0.0	16.1	82.1	123.4	0.4	2.1	19.0
27.58	110 1	(±3.36E-07)	(±3.9)	(±0.0)	(±0.0)	(±0.0)	(±29.0)	(±17.4)	(±66.8)	(±0.2)	(±1.1)	(±0.0)
27.58	1.83	9.98E-06	28.4	88.1	36.4	33.4	109.0	112.3	0.0	0.0	0.0	19.0
29.41	2.00	(±8.64E-06)	(±3.1)	(±16.1)	(±2.8)	(±0.9)	(±14.3)	(±20.6)	(±0.0)	(±0.0)	(±0.0)	(±0.0)

Depth values presented in this table are measured from free ground surface



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 29.52 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing





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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

СРТ: СРТ06

Total depth: 32.12 m, Date: 22/04/2024

Surface Elevation: 3.90 m

Coords: X:0.00, Y:0.00

Cone Type:

Cone Operator: Black Insitu Testing

Depth (m) Elevation: 3.90 (m)	Description	qt (MPa)	Ksbt (m/s)	N60	Es (MPa)	Dr	Phi (°)	M (MPa)	Go (MPa)	Su (kPa)	Su ratio	OCR	Gamma (kN/m ³)	
1.0 2.0 3.0 4.0 5.0	.00. Clay	0.4	-	2.4	-	-	-	1.5	18.1	20.9	0.3	1.6	19.0	
6.0 7.0 8.0 9.0	.86 Sand & silty sand	5.3	4.97E-6	14.7	51.3	40.2	34.9	53.5	62.8	-	-	-	19.0	
10.0 11.0 12.0	Clay & silty clay	1.8	5.24E-8	7.7	-	-	-	15.8	44.0	84.3	0.6	2.9	19.0	
13.0	.70 Sensitive fine grained	0.6	8.35E-10	4.0	-	-	-	0.8	20.9	24.0	0.2	0.7	19.0	Ĺ
14.0	Clay	1.1	4.27E-9	5.8	-	-	-	3.8	35.2	53.2	0.3	1.5	19.0	
15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0	Clay & silty clay	3.2	-	12.7	-	-	-	30.0	68.3	134.4	0.6	2.9	19.0	
25.0 26.0 27.0 28.0 29.0	.56 د Silty sand & sandy silt	5.9	6.62E-7	19.8	75.4	30.3	32.4	56.0	93.6	-	-	-	19.0	
$\begin{array}{c} 30.0 \\ 31.0 \\ 32.0 \\ \hline \end{array}$	Sand & silty sand	15.7	4.03E-5	36.9	105.6	43.7	34.9	128.9	131.0	-	-	-	19.0	



Tabular results

.:: Layer No: 1 ::. **Code:** 1 Start depth: 1.00 (m), End depth: 6.88 (m) Description: Clay **Basic results** Estimation results Total cone resistance: 0.38 ±0.29 MPa Permeability: 0.00E+00 ±5.27E-07 m/s Constrained Mod.: 1.49 ±4.24 MPa Sleeve friction: 11.48 ±5.62 kPa N₆₀: 2.38 ±0.80 blows Go: 18.08 ±3.81 MPa Ic: 3.29 ±0.22 Es: 0.00 ±0.00 MPa Su: 20.88 ±6.91 kPa Dr (%): 0.00 ±0.00 SBT_n: 3 Su ratio: 0.35 ±0.30 φ (degrees): 0.00 ±0.00 ° SBTn description: Clay O.C.R.: 1.61 ±1.40 Unit weight: 19.00 ±0.00 kN/m³

.:: Layer No: 2 ::.									
Code: 2	Start depth: 6.86 (m),	End depth: 9.81 (m)							
Description: Sand	l & sity sand								
Basic results		Estimation results							
Total cone resistance: 5.26 ±3.00 MPa		Permeability: 4.97E-06 ±2.99E-05 m/s	Constrained Mod.: 53.54 ±18.38 MPa						
Sleeve friction: 31.9	9 ±8.91 kPa	N ₆₀ : 14.72 ±5.17 blows	Go: 62.75 ±11.84 MPa						
Ic: 2.03 ±0.34		Es: 51.27 ±7.86 MPa	Su: 0.00 ±0.00 kPa						
SBT _n : 6		Dr (%): 40.23 ±8.34	Su ratio: 0.00 ±0.00						
SBTn description: S	and & silty sand	φ (degrees): 34.86 ±1.28 °	O.C.R.: 0.00 ±0.00						
		Unit weight: 19.00 \pm 0.00 kN/m ³							
.:: Layer No: 3 ::.									

Code: 3

Start depth: 9.80 (m), End depth: 12.70 (m)

Description: Clay & silty clay

Basic results

Total cone resistance: 1.80 ± 0.81 MPa Sleeve friction: 17.21 ± 6.01 kPa Ic: 2.69 ± 0.32 SBT_n: 4 SBTn description: Clay & silty clay

Permeability: 5.24E-08 ±4.98E-07 m/s N_{60} : 7.67 ±1.88 blows Es: 0.00 ±0.00 MPa

Estimation results

Dr (%): 0.00 ±0.00

 ϕ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 15.80 ±15.11 MPa Go: 43.97 ±7.24 MPa Su: 84.31 ±38.55 kPa Su ratio: 0.63 ±0.30 O.C.R.: 2.89 ±1.38

.:: Layer No: 4 ::.

4	Start depth: 12.70 (m), End depth:	13.80 ((m)	I
---	------------------------------------	---------	-----	---

Description: Sensitive fine grained

Basic results

Code:

Total cone resistance: 0.59 ± 0.02 MPa Sleeve friction: 2.93 ± 0.56 kPa Ic: 3.33 ± 0.06 SBT_n: 1 SBTn description: Sensitive fine grained

Estimation results

Permeability: 8.35E-10 ±1.99E-10 m/s N₆₀: 4.00 ±0.00 blows Es: 0.00 ±0.00 MPa Dr (%): 0.00 ±0.00 ϕ (degrees): 0.00 ±0.00 ° Unit weight: 19.00 ±0.00 kN/m³ Constrained Mod.: 0.75 ±0.11 MPa Go: 20.91 ±0.78 MPa Su: 23.96 ±1.81 kPa Su ratio: 0.16 ±0.01 O.C.R.: 0.73 ±0.06

.:: Layer No: 5 ::.

Code: 5 Start depth: 13.80 (m), End depth: 15.01 (m)

Description: Clay

Basic results

Total cone resistance: 1.08 ± 0.45 MPa Sleeve friction: 9.46 ± 4.02 kPa Ic: 3.06 ± 0.25 SBT_n: 3 SBTn description: Clay

Estimation results

Permeability: $4.27E-09 \pm 4.00E-08$ m/s N₆₀: 5.78 ± 1.27 blows Es: 0.00 ± 0.00 MPa Dr (%): 0.00 ± 0.00 ϕ (degrees): 0.00 ± 0.00 ° Unit weight: 19.00 ± 0.00 kN/m³ Constrained Mod.: 3.83 ±6.82 MPa Go: 35.22 ±6.73 MPa Su: 53.20 ±28.38 kPa Su ratio: 0.33 ±0.18 O.C.R.: 1.52 ±0.85

Code: 6 Start depth: 15.00 (m), End depth: 24.58 (m) Description: Clay & silty clay Basic results Estimation results

Total cone resistance: 3.20 ± 1.79 MPa Sleeve friction: 23.91 ± 11.83 kPa Ic: 2.58 ± 0.33 SBT_n: 4 SBTn description: Clay & silty clay

Estimation results

Permeability: $0.00E+00 \pm 1.94E-06$ m/s N₆₀: 12.72 ± 3.90 blows Es: 0.00 ± 0.00 MPa Dr (%): 0.00 ± 0.00 φ (degrees): 0.00 ± 0.00 ° Unit weight: 19.00 ± 0.00 kN/m³ Constrained Mod.: 30.04 ±27.87 MPa Go: 68.31 ±13.81 MPa Su: 134.38 ±46.99 kPa Su ratio: 0.64 ±0.22 O.C.R.: 2.94 ±1.00

.:: Layer No: 7 ::.

.:: Layer No: 6 ::.

Code: 7

Start depth: 24.56 (m), End depth: 29.50 (m)

Description: Silty sand & sandy silt

Basic results

Total cone resistance: 5.85 ± 3.05 MPa Sleeve friction: 29.36 ± 13.16 kPa Ic: 2.31 ± 0.46 SBT_n: 5 SBTn description: Silty sand & sandy silt

Permeability: 6.62E-07 ±7.34E-06 m/s N₆₀: 19.84 ±5.31 blows Es: 75.42 ±8.62 MPa Dr (%): 30.32 ±5.09

 ϕ (degrees): 32.41 ±0.62 ° Unit weight: 19.00 ±0.00 kN/m³

Estimation results

Constrained Mod.: 55.98 ±38.11 MPa Go: 93.59 ±12.67 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00

.:: Layer No: 8 ::.

Code: 8	Start depth: 29.50 (m),	End depth: 32.11 (m)
---------	-------------------------	----------------------

Description: Sand & sity sand

Basic results

Total cone resistance: 15.69 ± 3.85 MPa Sleeve friction: 51.16 ± 21.08 kPa Ic: 1.77 ± 0.34 SBT_n: 6 SBTn description: Sand & silty sand

Estimation results

Permeability: $4.03E-05 \pm 4.72E-05$ m/s N₆₀: 36.86 ± 6.38 blows Es: 105.64 ± 13.64 MPa Dr (%): 43.65 ± 6.32 ϕ (degrees): 34.93 ± 1.38 ° Unit weight: 19.00 ± 0.00 kN/m³ Constrained Mod.: 128.88 ±26.04 MPa Go: 131.04 ±26.48 MPa Su: 0.00 ±0.00 kPa Su ratio: 0.00 ±0.00 O.C.R.: 0.00 ±0.00



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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

CPT: CPT06

Total depth: 32.12 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing

						<u> </u>						
From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT _{N60} (blows/30cm)	E _s (MPa)	D _r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, Go (MPa)	Undrained strength, Su (IPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
1.00	5 88	0.00E+00	2.4	0.0	0.0	0.0	1.5	18.1	20.9	0.3	1.6	19.0
6.88	5.00	(±5.27E-07)	(±0.8)	(±0.0)	(±0.0)	(±0.0)	(±4.2)	(±3.8)	(±6.9)	(±0.3)	(±1.4)	(±0.0)
6.86	2 95	4.97E-06	14.7	51.3	40.2	34.9	53.5	62.8	0.0	0.0	0.0	19.0
9.81	2.95	(±2.99E-05)	(±5.2)	(±7.9)	(±8.3)	(±1.3)	(±18.4)	(±11.8)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
9.80	2 90	5.24E-08	7.7	0.0	0.0	0.0	15.8	44.0	84.3	0.6	2.9	19.0
12.70	2.50	(±4.98E-07)	(±1.9)	(±0.0)	(±0.0)	(±0.0)	(±15.1)	(±7.2)	(±38.6)	(±0.3)	(±1.4)	(±0.0)
12.70	1 10	8.35E-10	4.0	0.0	0.0	0.0	0.8	20.9	24.0	0.2	0.7	19.0
13.80	1.10	(±1.99E-10)	(±0.0)	(±0.0)	(±0.0)	(±0.0)	(±0.1)	(±0.8)	(±1.8)	(±0.0)	(±0.1)	(±0.0)
13.80	1 21	4.27E-09	5.8	0.0	0.0	0.0	3.8	35.2	53.2	0.3	1.5	19.0
15.01	1.21	(±4.00E-08)	(±1.3)	(±0.0)	(±0.0)	(±0.0)	(±6.8)	(±6.7)	(±28.4)	(±0.2)	(±0.9)	(±0.0)
15.00	0 58	0.00E+00	12.7	0.0	0.0	0.0	30.0	68.3	134.4	0.6	2.9	19.0
24.58	5.50	(±1.94E-06)	(±3.9)	(±0.0)	(±0.0)	(±0.0)	(±27.9)	(±13.8)	(±47.0)	(±0.2)	(±1.0)	(±0.0)
24.56	4 04	6.62E-07	19.8	75.4	30.3	32.4	56.0	93.6	0.0	0.0	0.0	19.0
29.50	т.9т	(±7.34E-06)	(±5.3)	(±8.6)	(±5.1)	(±0.6)	(±38.1)	(±12.7)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
29.50	2.61	4.03E-05	36.9	105.6	43.7	34.9	128.9	131.0	0.0	0.0	0.0	19.0
32.11	2.01	(±4.72E-05)	(±6.4)	(±13.6)	(±6.3)	(±1.4)	(±26.0)	(±26.5)	(±0.0)	(±0.0)	(±0.0)	(±0.0)

Summary table of mean values

Depth values presented in this table are measured from free ground surface



Core Consultants

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Project: Proposed Unit Development

Location: 340 MacArthur Avenue, Hamilton

Total depth: 32.12 m, Date: 22/04/2024 Surface Elevation: 3.90 m Coords: X:0.00, Y:0.00 Cone Type: Cone Operator: Black Insitu Testing



Appendix D Geotechnical Laboratory Test Certificates



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52 Second Avenue Maroochydore QLD 4558

SAMPLE REGISTER AND LABORATORY TEST REQUEST FORM

Date: 9/05/202	24		Job N	lumbe	er:			J002	388												Page: 1 of 1
Client: Core Co	nsultants		Proje	ct Ma	nager	:		WM					Sto	rage L	ocatio	on:		Gara	ge		
Project: Unit Dev	elopment		Field	Engin	ieer :			DS					Tu	oes :				U75			
Location: 340 Mac	arthur Avenu	ue, Hamilton QLD																			Bags : 1
			CLASS	SIFICA	ATION	TESTS	3			MISC	ELLAN	IEOUS	3							SAMPLE DATE	REMARKS
LAB SAMPLE NO	BORE	DEPTH / SAMPLE IDENTIFICATION	MOISTURE CONTENT	VISUAL CLASSIFICATION	BULK DENSITY	ATTERBERG LIMITS & LINEAR SHRINKAGE	PERCENT FINES	PSD	SHRINK / SWELL	COMPACTION*	CBR* (SINGLE POINT)	CBR* (FIVE POINT)	xoHq	VANE SHEAR	EMERSON CLASS NUMBER	Soil pH & EC	Plasticity Test (WPI)	Aggressivity (pH, sulfate, chloride)		TO BE COMPLETED BY FIELD SUPERVISOR	* ADDITIONAL TEST DETAILS MAY BE REQUIRED
Silty Clay (FILL/DREDGE SPOIL)	BH7	SPT (1.0-1.45)				x		x							x					1/05/2024	
Silty Clay (FILL/DREDGE SPOIL)	BH7	SPT (2.5-2.95)																x		1/05/2024	
Silty Clay (FILL/DREDGE SPOIL)	BH7	U75 (5.5-5.95)						x												1/05/2024	
Sandy Silty Clay (FILL/DREDGE SPOIL)	BH4	BDS (0.2-0.5)						x			x				x					1/05/2024	MDD 97%
Sandy Clay (FILL/DREDGE SPOIL)	BH8	DS(0.0-0.5)						x							x					1/05/2024	
Clayey Sand (ALLUVIAL)	BH8	U75 (4.0-45)						x												1/05/2024	
Clayey Sand (ALLUVIAL)	BH8	U75 (5.5-5.95)																x		1/05/2024	
LABS DISPAT	CHED TO:	SQS					ALL SAMPLES RECEIVED IN ORDER														
BY: DS	SIGNED:		ON:	9/05	/2024	ļ	BY:			S	IGNE	D:					ON				

Report Number:	B-24-519-39
Issue Number:	1
Date Issued:	28/05/2024
Client:	Core Consultants Pty Ltd
	Unit 3/31 Londor Close, Hemmant Qld 4174
Contact:	Andrew Middleton
Project Number:	B-24-519
Project Name:	Quality Assurance 2024
Project Location:	340 McArthur Avenue, Hamilton Qld
Client Reference:	J2388
Work Request:	14880
Sample Number:	B-14880A
Date Sampled:	09/05/2024
Dates Tested:	13/05/2024 - 24/05/2024
Sampling Method:	Sampled by Client - Tested as Received
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection:	Selected by Client
Sample Location:	BH7, Depth: 1.0 - 1.45m
Material Source:	Onsite Material

Particle Size Distribution (AS1289 3.6.1)											
Sieve	Passed %	Passing Limits									
4.75 mm	100										
2.36 mm	97										
1.18 mm	94										
0.6 mm	91										
0.425 mm	89										
0.3 mm	87										
0.15 mm	75										
0.075 mm	65										

Atterberg Limit (AS1289 3.1.2 & 3.2	.1 & 3.3.1 & Q252)	Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Passing 0.425 (%)	89		
Liquid Limit (%)	45		
Plastic Limit (%)	17		
Plasticity Index (%)	28		
Weighted Plasticity Index (%)	2503		
		N.41	N.4
Linear Shrinkage (AS1289 3.4.1)		IVIIN	iviax
Moisture Condition Determined By	AS 1289.3.1.2	IVIIN	Max
Linear Shrinkage (AS1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%)	AS 1289.3.1.2 12.0		Max
Linear Shrinkage (AS1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%) Cracking Crumbling Curling	AS 1289.3.1.2 12.0 Curlin	g	
Linear Shrinkage (AS1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%) Cracking Crumbling Curling Emerson Class Number of a Soil (A	AS 1289.3.1.2 12.0 Curlin S 1289 3.8.1)	Min g Min	Max
Linear Shrinkage (AS1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%) Cracking Crumbling Curling Emerson Class Number of a Soil (A Emerson Class	AS 1289.3.1.2 12.0 Curlin S 1289 3.8.1) 2	g Min	Max
Linear Shrinkage (AS 1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%) Cracking Crumbling Curling Emerson Class Number of a Soil (A Emerson Class Soil Description	AS 1289.3.1.2 12.0 Curlin S 1289 3.8.1) 2 Sandy Clay	g Min	Max
Linear Shrinkage (AS 1289 3.4.1) Moisture Condition Determined By Linear Shrinkage (%) Cracking Crumbling Curling Emerson Class Number of a Soil (A Emerson Class Soil Description Nature of Water	AS 1289.3.1.2 12.0 Curlin S 1289 3.8.1) 2 Sandy Clay Distilled	Min g Min	Max



SQS

Brisbane Laboratory 105 Granite Street Geebung QLD 4034 Phone: (07) 3284 8766 Email: brisbane@sqs.net.au



Approved Signatory: Torin Pegler Senior Soil Technician NATA Accredited Laboratory Number: 2911

Particle Size Distribution



Report Number: B-24-519-39

Report Number:	B-24-519-39
Issue Number:	1
Date Issued:	28/05/2024
Client:	Core Consultants Pty Ltd
	Unit 3/31 Londor Close, Hemmant Qld 4174
Contact:	Andrew Middleton
Project Number:	B-24-519
Project Name:	Quality Assurance 2024
Project Location:	340 McArthur Avenue, Hamilton Qld
Client Reference:	J2388
Work Request:	14880
Sample Number:	B-14880C
Date Sampled:	09/05/2024
Dates Tested:	13/05/2024 - 24/05/2024
Sampling Method:	Sampled by Client - Tested as Received
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection:	Selected by Client
Sample Location:	BH7, Depth: 5.5 - 5.95m
Material Source:	Onsite Material

Particle Size Distribution (AS1289 3.6.1)				
Sieve	Passed %	Passing Limits		
13.2 mm	100			
9.5 mm	100			
6.7 mm	99			
4.75 mm	99			
2.36 mm	99			
1.18 mm	98			
0.6 mm	98			
0.425 mm	97			
0.3 mm	97			
0.15 mm	96			
0.075 mm	95			



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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Torin Pegler Senior Soil Technician NATA Accredited Laboratory Number: 2911

Particle Size Distribution



Report Number: Issue Number:	B-24-519-39
Date Issued:	28/05/2024
Client:	Core Consultants Ptv Ltd
	Unit 3/31 Londor Close, Hemmant Qld 4174
Contact:	Andrew Middleton
Project Number:	B-24-519
Project Name:	Quality Assurance 2024
Project Location:	340 McArthur Avenue, Hamilton Qld
Client Reference:	J2388
Work Request:	14880
Sample Number:	B-14880D
Date Sampled:	09/05/2024
Dates Tested:	13/05/2024 - 24/05/2024
Sampling Method:	Sampled by Client - Tested as Received
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection:	Selected by Client
Sample Location:	BH4, Depth: 0.2 - 0.5m
Material Source:	Onsite Material

California Bearing Ratio (AS 1289 6.1.1 &	2.1.1)	Min	Max
CBR taken at	5 mm		
CBR %	6		
Method of Compactive Effort	Stan	dard	
Method used to Determine MDD	AS 1289 5	.1.1 & 2	2.1.1
Method used to Determine Plasticity	Vis	ual	
Maximum Dry Density (t/m ³)	1.87		
Optimum Moisture Content (%)	14.5		
Laboratory Density Ratio (%)	96.5		
Laboratory Moisture Ratio (%)	103.0		
Dry Density after Soaking (t/m ³)	1.81		
Field Moisture Content (%)	13.8		
Moisture Content at Placement (%)	14.7		
Moisture Content Top 30mm (%)	16.2		
Moisture Content Rest of Sample (%)	16.3		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours (h)	71.2		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	4.0		
Particle Size Distribution (AS1280.3.6.1)			

Farticle Size Distributio	II (AO 1209 J	.0.1)			
Sieve	Passed %		Passing L	imits.	
26.5 mm	1(00			
19 mm	9	6			
13.2 mm	9	2			
9.5 mm	9	0			
6.7 mm	8	5			
4.75 mm	8	1			
2.36 mm	7	4			
1.18 mm	7	0			
0.6 mm	6	1			
0.425 mm	5	4			
0.3 mm	4	4			
0.15 mm	3	2			
0.075 mm	2	8			
Emerson Class Numbe	r of a Soil (A	S 1289 3.8.	1)	Min	Max
Emerson Class		2			
Soil Description		Sandy	Clay		
Nature of Water		Distil	led		

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Approved Signatory: Torin Pegler Senior Soil Technician NATA Accredited Laboratory Number: 2911

California Bearing Ratio





Report Number: B-24-519-39	

Temperature of Water (°C)

Report Number:	B-24-519-39
Issue Number:	1
Date Issued:	28/05/2024
Client:	Core Consultants Pty Ltd
	Unit 3/31 Londor Close, Hemmant Qld 4174
Contact:	Andrew Middleton
Project Number:	B-24-519
Project Name:	Quality Assurance 2024
Project Location:	340 McArthur Avenue, Hamilton Qld
Client Reference:	J2388
Work Request:	14880
Sample Number:	B-14880E
Date Sampled:	09/05/2024
Dates Tested:	13/05/2024 - 24/05/2024
Sampling Method:	Sampled by Client - Tested as Received
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection:	Selected by Client
Sample Location:	BH8, Depth: 0.0 - 0.5m
Material Source:	Onsite Material

Particle Size Distributio	n (AS1289 3	3.6.1)			
Sieve	Passed %		Passing L	imits	
19 mm	10	00			
13.2 mm	9	8			
9.5 mm	9	5			
6.7 mm	9	0			
4.75 mm	8	7			
2.36 mm	8	0			
1.18 mm	7	7			
0.6 mm	7	4			
0.425 mm	73				
0.3 mm	7	2			
0.15 mm	7	0			
0.075 mm	6	8			
Emerson Class Number of a Soil (AS 1289 3.8.1) Min Max					
Emerson Class		2			
Soil Description		Sandy	Clay		
Nature of Water		Distilled			
Temperature of Water (^o C)		22			

ww.sqs.net.au SOIL QUALITY SERVICES AMB Geotech SQS Pty Ltd ABN 36 631 788 620

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Approved Signatory: Torin Pegler Senior Soil Technician NATA Accredited Laboratory Number: 2911

Particle Size Distribution



Report Number:	B-24-519-39
Issue Number:	1
Date Issued:	28/05/2024
Client:	Core Consultants Pty Ltd
	Unit 3/31 Londor Close, Hemmant Qld 4174
Contact:	Andrew Middleton
Project Number:	B-24-519
Project Name:	Quality Assurance 2024
Project Location:	340 McArthur Avenue, Hamilton Qld
Client Reference:	J2388
Work Request:	14880
Sample Number:	B-14880F
Date Sampled:	09/05/2024
Dates Tested:	13/05/2024 - 24/05/2024
Sampling Method:	Sampled by Client - Tested as Received
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Site Selection:	Selected by Client
Sample Location:	BH8, Depth: 4.0 - 4.5m
Material Source:	Onsite Material

Particle Size Distribution (AS1289 3.6.1)				
Sieve	Passed %	Passing Limits		
2.36 mm	100			
1.18 mm	100			
0.6 mm	100			
0.425 mm	100			
0.3 mm	100			
0.15 mm	99			
0.075 mm	98			



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Approved Signatory: Torin Pegler Senior Soil Technician

NATA Accredited Laboratory Number: 2911

Particle Size Distribution





AMB Geotech SQS Pty Ltd 15 Malduf Street Chinchilla Qld 4413

Attention:

Michael Mauff

Report Project name Project ID Received Date **1097646-S** B-24-519

May 14, 2024

Client Sample ID Sample Matrix Eurofins Sample No.			B-14880B Soil B24- My0044735	B-14880G Soil B24- My0044736
		Linit	way 09, 2024	way 09, 2024
	LUK	Unit		
Chloride	5	mg/kg	2700	2900
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	3700	2900
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.5	7.8
Resistivity*	0.5	ohm.m	2.7	3.4
Sulphate (as SO4)	30	mg/kg	240	260
Sample Properties				
% Moisture	1	%	46	49





NATA Accredited Accreditation Number 1261 Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Chloride	Melbourne	May 22, 2024	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Melbourne	May 22, 2024	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25 °C as rec.)	Melbourne	May 22, 2024	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4)	Melbourne	May 22, 2024	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
% Moisture	Melbourne	May 16, 2024	14 Days
- Method: LTM-GEN-7080 Moisture			

•••	ourofing	ABN: 50 005 0	vironment Tes	ting Australia Pty	Ltd				Eurofins ARL Pty Ltd ABN: 91 05 0159 898	Eurofins ProMicro Pty I ABN: 47 009 120 549	Burofins Environment Testing NZ Ltd 49 NZBN: 9429046024954					
web: web: web: web: web: web: web: web:	ww.eurofins.com.au	Melbourne 6 Monterey Re Dandenong S VIC 3175 +61 3 8564 50 NATA# 1261 Site# 1254	Geelong bad 19/8 Lewala buth Grovedale VIC 3216 VIC 3216 000 +61 3 8564 NATA# 1261 Site# 25403	Sydney an Street 179 Magowar Girraween NSW 2145 5000 +61 2 9900 84 I NATA# 1261 Site# 18217	Canberra Road Unit 1,2 Dacre Stree Mitchell ACT 2911 00 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisb t 1/21 S Murar QLD T: +61 NATA Site#	ane Smallwood Pla rie 4172 7 3902 4600 # 1261 20794	Newcastle ce 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402		
Co Ad Pro	ompany Name: Idress: oject Name:	AMB Geotec 15 Malduf St Chinchilla Qld 4413	ch SQS Pty L reet	td			Order Repor Phone Fax:	No.: AME tt #: 1097 a: 07 4	32768 7646 668 9716	Ri Di Pi Ci	eceived: Je: iority: ontact Name:	May 14, 202 May 21, 202 5 Day Michael Mau	4 4:45 PM 4 ff			
Pro	oject ID:	B-24-519								Eur	ofins Analytica	I Services Manag	ger : Ryan Gil	lbert		
		Sa	mple Detail			Aggressivity Soil Set	Moisture Set									
Melk	ourne Laborator	y - NATA # 12	61 Site # 12	54		X	X									
Exte No	ernal Laboratory Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	B-14880B	May 09, 2024		Soil	B24-My0044735	Х	X									
2	B-14880G	May 09, 2024		Soil	B24-My0044736	Х	X									
Test	Counts					2	2									



Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units		
mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
μg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

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APHA	American Public Health Association
CEC	Cation Exchange Capacity
сос	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
твто	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 - 150%, VOC recoveries 50 - 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- 1. Where a result is reported as 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 are not data from your samples.
- 3. 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.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. 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
Method Blank									
Chloride			mg/kg	< 5			5	Pass	
Conductivity (1:5 aqueous extract at	: 25 °C as rec.)		uS/cm	< 10			10	Pass	
Method Blank							_		
Sulphate (as SO4)			mg/kg	< 30			30	Pass	
LCS - % Recovery									
Conductivity (1:5 aqueous extract at	: 25 °C as rec.)		%	84			70-130	Pass	
LCS - % Recovery									
Chloride			%	103			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate	•								
				Result 1	Result 2	RPD			
Chloride	M24-My0046966	NCP	mg/kg	7.6	7.7	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	M24-My0060303	NCP	uS/cm	310	320	1.6	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	M24-My0060303	NCP	pH Units	8.0	7.9	pass	30%	Pass	
Resistivity*	M24-My0060303	NCP	ohm.m	32	31	1.6	30%	Pass	
Sulphate (as SO4)	M24-My0046966	NCP	mg/kg	40	45	10	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	B24-My0044368	NCP	%	86	88	2.7	30%	Pass	



Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Emily ONeill Mary Makarios Analytical Services Manager Senior Analyst-Inorganic

Glenn Jackson Managing Director

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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Appendix E Acid Sulfate Soil Laboratory Test Certificates

TABLE E1 - SUMMARY OF ACID SULFATE SOIL FIELD AND LABORATORY ANALYSIS RESULTS

				Qu	uick Screening	Test			Existi	ng Acidity	Potentia	al Acidity	Acid	Neutralising Ca	pacity			Retained Acidi	ty		A	cid Base Accoun	ting		
BH ID	Depth (m)	Description	pH⊧	AASS likelihood ¹	pH _{FOX}	PASS likelihood ²	Reaction	Remark	рН КСІ	Titratable Actual Acidity	Chromium Reducible Sulfur	acidity - Chromium Reducible Sulfur	Acid Neutralising Capacity	acidity - Acid Neutralising Capacity	sulfidic - Acid Neutralising Capacity	Net Acid Soluble Sulfur	acidity - Net Acid Soluble Sulfur	sulfidic - Net Acid Soluble Sulfur	KCI Extractable Sulfur	HCI Extractable Sulfur	ANC Fineness Factor	Net Acidity (sulfur units) (- ANC)	Net Acidity (acidity units) (-ANC)	Required I	Lime Rate
			pH Unit		pH Unit				pH Unit	mole H+ / t	% S	mole H+ / t	% CaCO3	mole H+ / t	% pyrite S	% S	mole H+ / t	% pyrite S	% S	% S		% S	mole H+ / t	kg CaCO3/t	kg CaCO3/m ³
	0.0-0.25	Gravelly Clay (Fill)	8.2	L	7.8	L	L																		
	0.25-0.5	Sandy Gravelly Clay (Fill)	8.0	L	7.2	L	L																	I	
	0.5-0.75	Silty Clay	8.0	L	7.2	L	L		6.2	5.1	0.049	31	N/A	N/A	N/A	N/A	N/A	N/A	0.019	N/A	15	0.06	36	27	4.0
	1.0-1.25	Silty Clay	7.6	L	5.5	M	L	^	0.2	5.1	0.045	51	19/75	19/6	IN/A	19/6	11/0	19/2	0.013	IN/A	1.5	0.00	30	2.1	4.5
	1.25-1.5		7.4	L	6.2	L	L																		
	1.5-1.75		7.8	L	6.2	L	L	-																I	
BH1	2.0-2.25		8.0	L	6.4	L	L																		
	2.25-2.5		8.1	L	7.2	L	L	x	8.2	< 2	0.400	250	2.10	410	0.66	N/A	N/A	N/A	0.039	N/A	1.5	0.40	250	19.0	34.2
	2.5-2.75		8.1	L	8.3	L	L																	I]	
	3.0-3.25		8.2	L	7.8	L	L																		
	3.25-3.5		8.2	L	8.0	L	L																		
	3.5-3.75		8.4	L	7.2	L	L																	I]	
	0.0-0.25	Gravelly Clay (Fill)	6.7	L	5.0	L	L																		
	0.25-0.5		6.9	L	4.7	М	L	x	5.9	8.7	0.031	19	N/A	N/A	N/A	N/A	N/A	N/A	0.011	N/A	1.5	0.05	28	2.1	3.8
	0.5-0.75		7.7	L	7.2	L	L																		
	0.75-1.0	Sandy Silty Clay (Fill)	7.9	L	8.1	L	L																	J	
	1.25-1.5	Silty Clay	7.7	L	5.7	M	L	x	7.2	< 2	0.150	95	1.70	330	0.53	N/A	N/A	N/A	0.015	N/A	1.5	0.15	95	7.1	12.8
	1.5-1.75		8.0	L	7.7	L	L																		
BH2	1.75-2.0		8.1	L	6.9	L	L																		
	2.0-2.25		8.2	L	7.0																			l	
	2.5-2.75		8.0	L	6.8	L	L	x	8.3	< 2	0.340	210	2.60	530	0.85	N/A	N/A	N/A	0.041	N/A	1.5	0.34	210	16.0	28.8
	2.75-3.0		8.2	L	8.0	L	L																		
	3.0-3.25		8.2	L	7.8	L	L																	I]	
	3.5-3.75		8.3	L	7.6	L	L																		
	3.75-4.0		8.1	L	7.1	L	L																		
	0.0-0.25	Gravelly Clay (Fill)	7.9	L	7.6	L	L																	<u> </u>	
	0.25-0.5		7.8	L	6.0	L		x	6.8	< 2	0.017	10	0.92	180	0.30	N/A	N/A	N/A	0.008	N/A	1.5	< 0.02	< 10	< 1	-
	0.75-1.0	Silty Clay	8.1	L	7.8	L	L																	· · · · · · · · · · · · · · · · · · ·	
	1.0-1.25		8.4	L	7.3	L	L																	I	
	1.25-1.5		8.3	L	7.4	L	L																	I]	
DUO	1.75-2.0		8.1	L	7.2	L	L	x	8.0	< 2	0.350	220	2.20	430	0.69	N/A	N/A	N/A	0.053	N/A	1.5	0.35	220	16.0	28.8
BH3	2.0-2.25		8.4	L	7.6	L	L																		
	2.25-2.5		8.2	L	7.4	L	L																	I	
	2.5-2.75		8.1	L	8.0	L	L																		
	3.0-3.25		8.2	L	8.3	L	L																		
	3.25-3.5		8.1	L	7.8	L	L																		
	3.5-3.75		8.1	L	8.1																			l	
	0.0-0.25	Sandy Gravel (Fill)	8.2	L	7.6	L	L	x	6.8	< 2	0.010	6	0.55	110	0.18	N/A	N/A	N/A	< 0.005	N/A	1.5	< 0.02	< 10	< 1	-
	0.25-0.5		8.1	L	7.1	L	L																		
	0.5-0.75	Clavey Sand (Fill)	8.0	L	7.5	L	L		0.6	2	0.060	42	4.60	020	1.50	N/A	NI/A	NI/A	0.012	N/A	15	0.07	42	22	5.0
	1.0-1.25	Clayey Sand (Fill)	8.4	L	6.9	L	L	*	0.0	~2	0.009	40	4.00	920	1.50	IN/A	N/A	IN/A	0.013	N/A	1.0	0.07	43	3.3	0.9
	1.25-1.5	Sandy Silty Clay	8.4	L	7.2	L	L	x	7.8	< 2	0.410	250	2.10	420	0.67	N/A	N/A	N/A	0.047	N/A	1.5	0.41	250	19.0	34.2
	1.5-1.75		8.4	L	7.4	L	L																	I	
BH5	1.75-2.0		8.4	L	6.9																			l	
	2.25-2.5	Silty Clay	8.4	L	8.4	L	L																	·+	
	2.5-2.75		8.2	L	7.5	L	L																		
	2.75-3.0		8.2	L	7.7	L	L																	I]	
	3.25-3.5		8.2	L	8.4	L	L																		
	3.5-3.75		8.3	L	8.4	L	L																		
	3.75-4.0	Numbe	8.3	L	8.4	L	L																		
		Mir	04 1 6.7		4.0																				
		Max Mear	K 8.4 1 8.0		8.4 7.2																				
		Std Deviation	n 0.3		0.9																				
		 Actual Acid Sulfate Soil (AASS) likelihood is indicated by Low (L Potential Acid Sulfate Soil (PASS) likelihood is indicated by Low (& no shade)(pH _F > 5), L & no shade)(∆ pH fr	, Medium (M & yellow s rom pH _F to pH _{FOX} is < 2	shade)(pH _F 5 ≤ pH _F < 2 pH units), Medium (< 4) and High (H & red M & yellow shade)(∆ p	d shade)(pH _F ≤ 4). pH from pHF to pH _{FOX}	cis ≥ 2 pH units OR pH	IFOX is <3)) and Hig	h (H & red shade)(∆ pH	from pHF to pH _{FOX} is	≥ 2 pH units AND pH	FOX is <3)										90th Per	Average centile (excluding Fill)	19.2 34.2



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Cre consultants

clarity • commitment • passion

52 Second Avenue Maroochydore QLD 4558 Phone: 5475 5900 TEST REQUEST FORM

Eurofins I mgt 1/21 Smallwood Place, Murarrie QLD 4172 Phone: 3902 4600

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BH1 BH1	Sample Depth (m) 0.0-0.25 0.25-0.5	Media Soil Soil	No. of Bags	SAMPLE DATE 22/04/2024 22/04/2024	× × Acid Sulfate	Chromium S			Remarks an
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	BHZ	0.5-0.75	Soil	1	22/04/2024	X		
	BH2	0.75-1.0	Soil	1	22/04/2024	X		
	BH2	1.0-1.25	Soil	1	22/04/2024	X		~
	BH2	1.25-1.5	Soil	1	22/04/2024	X		63
	BH2	1.5-1.75	Soil	1	22/04/2024	X		
	BH2	1.75-2.0	Soil	1	22/04/2024	x		
	BH2	2.0-2.25	Soil	1	22/04/2024	X		
	BH2	2.25-2.5	Soil	1	22/04/2024	X		
	BH2	2.5-2.75	Soil	1	22/04/2024	X		
	BH2	2.75-3.0	Soil	1	22/04/2024	X		
	BH2	3.0-3.25	Soil	1	22/04/2024	X		
	BH2	3.25-3.5	Soil	1	22/04/2024	X		
	BH2	3.5-3.75	Soil	1	22/04/2024	x		
	BH2	3.75-4.0	Soil	1	22/04/2024	x		
	BH3	0.0-0.25	Soil	1	22/04/2024	X		
	BH3	0.25-0.5	Soil	1	22/04/2024	X		
	BH3	0.5-0.75	Soil	1	22/04/2024	X		
	BH3	0.75-1.0	Soil	1	22/04/2024	X		
	BH3	1.0-1.25	Soil	1	22/04/2024	X		
	BH3	1.25-1.5	Soil	1	22/04/2024	X		
	BH3	1.5-1.75	Soil	1	22/04/2024	X		
	BH3	1.75-2.0	Soil	1	22/04/2024	X		
	BH3	2.0-2.25	Soil	1	22/04/2024	X		
	BH3	2.25-2.5	Soil	1	22/04/2024	X		
	BH3	2.5-2.75	Soil	1	22/04/2024	X		
	BH3	2.75-3.0	Soil	1	22/04/2024	x		
	BH3	3.0-3.25	Soil	1	22/04/2024	x		
	BH3	3.25-3.5	Soil	1	22/04/2024	X		
	сриВН3	3.5-3.75	Soil	1	22/04/2024	X		
	Test Bequest Soil - Fu	rofin3.75-4.0	Soil	1	22/04/2024	X		Date: 12/07/2018
	. our requote our - Lu		001		LLIUTILULT	~		ver. 1.02

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TEST REQUES	ST FORM
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	Concul	tante					
	0.0-0.25	Soll	1	22/04/2024	X		
BH5	0.25-0.5	Soil	1	22/04/2024	X	1/21 Smallwoo	
cidenta . cou	nm10:3-0:75 ·	passionSoil	1	22/04/2024	X		
52 Sppng Avenue	0.75-1.0	Soil	1	22/04/2024	X		
Phone: 5475 5000	⁵⁸ 1.0-1.25	Soil	1	22/04/2024	X		
BH5 3300	1.25-1.5	Soil	1	22/04/2024	X		
BH5	1.5-1.75	Soil	1	22/04/2024	X		
BH5	1.75-2.0	Soil	1	22/04/2024	X		
BH5	2.0-2.25	Soil	1	22/04/2024	X		
BH5	2.25-2.5	Soil	1	22/04/2024	X		
BH5	2.5-2.75	Soil	1	22/04/2024	X		
BH5	2.75-3.0	Soil	1	22/04/2024	x		a a second a
BH5	3.0-3.25	Soil	1	22/04/2024	X		
BH5	3.25-3.5	Soil	1	22/04/2024	X		
BH5	3.5-3.75	Soil	1	22/04/2024	x		
BH5	3.75-4.0	Soil	1	22/04/2024	X		A CONTRACTOR

Checked by:

Date Sent:

22/04/2024

CJ

4/29/24, 5:06 PM

From: Christie Johnson <cjohnson@coreconsultants.com.au> Sent: 29 April 2024 4:48 PM To: #AU03_EnviroSampleBris <EnviroSampleBris@eurofins.com>; Zoe Flynn <ZoeFlynn@eurofins.com> Cc: Cameron Kay <ckay@coreconsultants.com.au> Subject: COC - J2388 for Chromium Suite

CAUTION: EXTERNAL EMAIL - Sent from an email domain that is not formally trusted by Eurofins.

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https://outlook.office.com/mail/EnviroSampleBris@eurofins.com/id/AAQkAGU0YTYyNTBiLWJjZjUtNGQzZi05YWYxLWYzZDIhNTY3NGE0OQAQ...

Hi Zoe,

As discussed please find the COC for the further testing of ASS samples attached.

These have already been tested for pHf and pHfox.

If you have any questions please contact either myself or Cam Kay on the details below. Kind Regards

Christie Johnson I B.Eng (Environmental) | Geo-Environmental Engineer T: +61 7 3569 2907 M: +61 411 094 288 E: cjohnson@coreconsultants.com.au



unshime Coast: Unit 1 / 18 Lysaght Street, Coolum Beach Old 4 risbane Unit 3 / 31 Londor Close, Hemmant Old 4174



1092017



1/1

COre consultants

clarity • commitment • passion 52 Second Avenue Maroochydore QLD 4558 Phone: 5475 5900

Order No.:					Xo		
lob No :	.12388				PH		
Job None	U2000		-		pu		
IOD Name:	Macartnur A	venue, Hamilton	-		Hfai	SKCI	
C.O.C. No.:	TR02	Quotation No.			een - p	Suite (
Sampled By:	<u>CJ</u>	_ Contact Name:	Christie Jol	nnson	eld scr	Sulfur	Details
Email Report to:	cjohnson@corecon maddis@corecons	nsultants.com.au, ckay@c sultants.com.au, eanugool	orecosultants.com prasert@corecons	n.au,_ ultants.com.au	i (pH fi	cable 3	Other
Prior Storage:	lce				ate Soi	n Redu	and or
SAMPLE ID	Sample Depth (m)	Media	No. of SAMPLE DATE Bags		Acid Sulf	Chromiun	Remarks
BH1	0.0-0.25	Soil	1	22/04/2024			
BH1 BH1	0.25-0.5	Soil	1	22/04/2024			
BH1	0.75-1.0	Soil	1	22/04/2024		x	
BH1	1.0-1.25	Soil	1	22/04/2024			
BH1	1.25-1.5	Soil	1	22/04/2024			
BH1	1.5-1.75	Soil	1	22/04/2024			
BH1	1.75-2.0	Soil	1	22/04/2024			
BH1	2.0-2.25	Soil	1	22/04/2024			
BH1	2.25-2.5	Soll	1	22/04/2024		x	
BH1	2.5-2.75	Soil	1	22/04/2024			
BH1	3.0-3.25	Soil	1 1	22/04/2024	19		
BH1	3.25-3.5	Soil	1	22/04/2024			
BH1	3.5-3.75	Soil	1	22/04/2024			
BH1	3.75-4.0	Soil	1	22/04/2024			A
PH2	0.0.0.25	Call	1	22/04/2024			-
BH2	0.0-0.25	Soil	1	22/04/2024		x	 >
BH2	0.5-0.75	Soil	1 1	22/04/2024		^	 J
BH2	0.75-1.0	Soil	1	22/04/2024			
BH2	1.0-1.25	Soil	1	22/04/2024			
BH2	1.25-1.5	Soil	1	22/04/2024		x	3
BH2	1.5-1.75	Soil	1	22/04/2024			
BHZ	1.75-2.0	Soll	1	22/04/2024			
BH2	2 25-2 5	Soil	1	22/04/2024			
BH2	2.5-2.75	Soil	1 1	22/04/2024		x	
BH2	2.75-3.0	Soil	1	22/04/2024			
BH2	3.0-3.25	Soil	1	22/04/2024			
BH2	3.25-3.5	Soil	1	22/04/2024			
BH2	3.5-3.75	Soil	1	22/04/2024			
DITZ	0.70-4.0	501		22/04/2024			
BH3	0.0-0.25	Soil	1	22/04/2024			
BH3	0.25-0.5	Soil	1	22/04/2024		x	
BH3	0.5-0.75	Soil	1	22/04/2024			
BH3 BH2	0.75-1.0	Soll	1	22/04/2024			
BH3	1 25-1 5	Soil	1	22/04/2024			
BH3	1.5-1.75	Soil	1	22/04/2024			
BH3	1.75-2.0	Soil	1	22/04/2024		x	
BH3	2.0-2.25	Soil	1	22/04/2024			
BH3	2.25-2.5	Soil	1	22/04/2024			
BH3	2.5-2.75	Soil	1	22/04/2024			
BH3 BH3	2./5-3.0	Soll	1	22/04/2024			
BH3	3.25-3.5	Soil	1	22/04/2024			
BH3	3.5-3.75	Soil	1	22/04/2024			
BH3	3.75-4.0	Soil	1	22/04/2024			
BH5	0.0-0.25	Soil	1	22/04/2024		X	
BH5	0.25-0.5	Soil	1	22/04/2024			
BH5	0.75-1.0	Soil	1	22/04/2024		x	
BH5	1.0-1.25	Soil	1	22/04/2024		~	
BH5	1.25-1.5	Soil	1	22/04/2024	1	x	
BH5	1.5-1.75	Soil	1	22/04/2024			
BH5	1.75-2.0	Soil	1	22/04/2024			
BH5	2.0-2.25	Soil	1	22/04/2024			
BHS	2.25-2.5	Soll	1	22/04/2024			
BH5	275-30	Soil	1	22/04/2024			
BH5	30-325	Soil	1	22/04/2024			
BH5	3.25-3.5	Soil	1	22/04/2024			
BH5	3.5-3.75	Soil	1	22/04/2024			
DU5	3.75-4.0	Soil	1	22/04/2024	1		
BHJ				LLIOWLOLI			
BHJ				LEIGHLOLI			

TEST REQUEST FORM

Eurofins I mgt 1/21 Smallwood Place, Murarrie QLD 4172 Phone: 3902 4600

Checked by:

Date Sent: 29/04 FRM - 043 Test Request Soil - Eurofins

CJ

29/04/2024

1092017



www.eurofins.com.au

EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

Eurofins ARL Pty Ltd Eurofins ProMicro Pty Ltd Eurofins Environment Testing NZ Ltd

ABN: 50 005 085 52	21					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 9429046024954					
Melbourne 6 Monterey Road	Geelong 19/8 Lewalan Street	Sydney 179 Magowar Road	Canberra Unit 1,2 Dacre Street	Brisbane 1/21 Smallwood Place	Newcastle 1/2 Frost Drive	Perth 46-48 Banksia Road	Perth ProMicro 46-48 Banksia Road	Auckland 35 O'Rorke Road	Auckland (Focus) Unit C1/4 Pacific Rise,	Christchurch 43 Detroit Drive	Tauranga 1277 Cameron Road		
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West	Welshpool	Welshpool	Penrose,	Mount Wellington,	Rolleston,	Gate Pa,		
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304	WA 6106	WA 6106	Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112		
+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448	+61 8 6253 4444	+61 8 6253 4444	+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568		
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 2377	NATA# 2561	IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402		
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	Site# 25079 & 25289	Site# 2370	Site# 2554						

Sample Receipt Advice

Company name:	Core Consultants Pty Ltd
Contact name:	Christie Johnson
Project name:	MACARTHUR AVENUE HAMILTON
Project ID:	J2388
Turnaround time:	3 Day
Date/Time received	Apr 24, 2024 2:50 PM
Eurofins reference	1090835

Sample Information

- \checkmark A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ 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.
- Appropriate sample containers have been used.
- Sample containers for volatile analysis received with zero headspace.
- X Split sample sent to requested external lab.
- X Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Alana Wadsworth on phone : 0499 810 009 or by email: envirosamplebris@eurofins.com

Results will be delivered electronically via email to Christie Johnson - cjohnson@coreconsultants.com.au.

Note: A copy of these results will also be delivered to the general Core Consultants Pty Ltd email address.

Global Leader - Results you can trust

		Eurofins Er	vironment Tes	ting Australia Pty	Ltd			Eurofins ARL Pty Ltd	Eurofins ProMicro Pty Lt	d Eurofins Enviro	onment Testing NZ L	.td	
🔅 eurofins		ABN: 50 005 0	85 521					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 942904602	4954		
web: wy email: E	ww.eurofins.com.au	Melbourne 6 Monterey Ro Dandenong Si VIC 3175 +61 3 8564 500 m NATA# 1261 Site# 1254	Geelong 19/8 Lewala outh Grovedale VIC 3216 +61 3 8564 NATA# 1261 Site# 25403	Sydney n Street 179 Magowar Girraween NSW 2145 5000 +61 2 9900 8/ NATA# 1261 Site# 18217	Canberra Road Unit 1,2 Dacre Stree Mitchell ACT 2911 00 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle te 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
Co Ad	mpany Name: dress:	Core Consul 18 Lysaght S Coolum Bea QLD 4573	tants Pty Ltd St ch			Order Repor Phone Fax:	No.: t #: 1090 :: 07 54	835 475 5900	Rec Due Pric Cor	Received:Apr 2-Due:Apr 3-Priority:3 DayContact Name:Christian		4, 2024 2:50 PM ;0, 2024 y stie Johnson	
Pro Pro	oject Name: oject ID:	MACARTHU J2388	IR AVENNUE	HAMILTON					Eurofins A	Analytical Serv	ices Manager : /	Alana Wadsw	orth
Bris	hano I aboratoru	Sa	mple Detail	4		Acid Sulfate Soils Field pH Test							
Dris		- NATA # 120	1 Site # 2075	14									
No	Sample ID	Sample Date	Sampling	Matrix	LAB ID								
1	BH1 0.0-0.25	Apr 22, 2024		Soil	B24-Ap0064109	x							
2	BH1 0.25-0.5	Apr 22, 2024		Soil	B24-Ap0064110	x							
3	BH1 0.5-0.75	Apr 22, 2024		Soil	B24-Ap0064111	x							
4	BH1 0.75-1.0	Apr 22, 2024		Soil	B24-Ap0064112	х							
5	BH1 1.0-1.25	Apr 22, 2024		Soil	B24-Ap0064113	х							
6	BH1 1.25-1.5	Apr 22, 2024		Soil	B24-Ap0064114	х							
7	BH1 1.5-1.75	Apr 22, 2024		Soil	B24-Ap0064115	x							
8	BH1 1.75-2.0	Apr 22, 2024		Soil	B24-Ap0064116	X							
9	BH1 2.0-2.25	Apr 22, 2024		Soil	B24-Ap0064117	x							
10	BH1 2.25-2.5	Apr 22, 2024		Soil	B24-Ap0064118	x							
11	BH1 2.5-2 75	Apr 22, 2024		Soil	B24-Ap0064119	X							
12	BH1 2 75-3 0	Apr 22, 2024		Soil	B24-Ap0064120	x							
13	BH1 3.0-3 25	Apr 22, 2024		Soil	B24-Ap0064121	X							
<u> </u>		,, , _ , _ , _ , _ , _ , _ ,											

	Eurofins Enviro	onment Testing A	Australia Pty Ltd				Eurofins ARL Pty Ltd	Eurofins ProMicro Pty I	td Eurofins Envir	onment Testing NZ I	_td	
🚯 eurofins	ABN: 50 005 085 5	521					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 942904602	4954		
web: www.eurofins.com.au email: EnviroSales@eurofins.com	Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Stree Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney et 179 Magowar Roa Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra d Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Plac Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle te 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
Company Name: Address:	Core Consultan 18 Lysaght St Coolum Beach QLD 4573	ts Pty Ltd			Order Repor Phone Fax:	No.: t #: 1090 :: 07 5-	9835 475 5900	Re Di Pr Co	eceived: ue: iority: ontact Name:	Apr 24, 2024 Apr 30, 2024 3 Day Christie John	Apr 24, 2024 2:50 PM Apr 30, 2024 3 Day Christie Johnson	
Project Name: Project ID:	MACARTHUR / J2388	AVENNUE HAI	MILTON					Eurofins	Analytical Serv	vices Manager : A	Alana Wadsw	orth
	Samp	ole Detail			Acid Sulfate Soils Field pH Test							
Brisbane Laboratory	- NATA # 1261 S	ite # 20794			X							
14 BH1 3.25-3.5	Apr 22, 2024	Soil	B	24-Ap0064122	х							
15 BH1 3.5-3.75	Apr 22, 2024	Soil	B	24-Ap0064123	х							
16 BH1 3.75-4.0	Apr 22, 2024	Soil	B	24-Ap0064124	x							
17 BH2 0.0-0.25	Apr 22, 2024	Soil	B	24-Ap0064125	X							
18 BH2 0.25-0.5	Apr 22, 2024	Soil	B	24-Ap0064126	x							
19 BH2 0.5-0.75	Apr 22, 2024	Soil	B	24-Ap0064127	x							
20 BH2 0.75-1.0	Apr 22, 2024	Soil	B	24-Ap0064128	x							
21 BH2 1.0-1.25	Apr 22, 2024	Soil	B	24-Ap0064129	X							
22 BH2 1.25-1.5	Apr 22, 2024	Soil	B	24-Ap0064130	x							
23 BH2 1 5-1 75	Apr 22, 2024	Soil	B	24-Ap0064131	x							
24 BH2 1 75-2 0	or 22, 2024	Soil	B	24-Ap0064132	x							
25 BH2 2 0 2 25	Nor 22, 2024			24_Ap0064132	X							
	22, 2024	30II 86:1		24-Ap0004133	×							
	1pi 22, 2024	501	B	24-Ap0064134	~							
21 BH2 2.5-2.75 /	Apr 22, 2024	501	B	24-Ap0064135	<u> </u>							
28 BH2 2.75-3.0	Apr 22, 2024	Soil	B2	24-Ap0064136	X							
29 BH2 3.0-3.25	Apr 22, 2024	Soil	B	24-Ap0064137	X							

	Eurofins Envir	onment Testing A	Australia Pty Ltd				Eurofins ARL Pty Ltd	Eurofins ProMicro Pty	Ltd Eurofins Envir	onment Testing NZ I	_td	
🚯 eurofing	ABN: 50 005 085 5	521					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 942904602	4954		
web: www.eurofins.com.au email: EnviroSales@eurofins.com	Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254 Site# 1254	Geelong 19/8 Lewalan Stree Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney Canberra treet 179 Magowar Road Unit 1.2 Dacre Street Girraween Mitchell NSW 2145 ACT 2911 10 +61 2 9900 8400 +61 2 6113 8091 NATA# 1261 NATA# 1261 Site# 18217 Site# 25466		Brisbane Newcastle 1/21 Smallwood Place 1/2 Frost Drive Murarrie Mayfield West QLD 4172 NSW 2304 T: +61 7 3902 4600 +61 2 4968 8448 NATA# 1261 NATA# 1261 Site# 20794 Site# 25079 & 25289		Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
Company Name: Address:	Core Consultan 18 Lysaght St Coolum Beach QLD 4573	its Pty Ltd			Order Repor Phone Fax:	No.: t #: 1090 :: 07 5	9835 475 5900	R D P C	eceived: ue: riority: ontact Name:	Apr 24, 2024 Apr 30, 2024 3 Day Christie John	Apr 24, 2024 2:50 PM Apr 30, 2024 3 Day Christie Johnson	
Project Name: Project ID:	MACARTHUR / J2388	AVENNUE HAI	MILTON					Eurofins	s Analytical Serv	vices Manager : /	Alana Wadsw	orth
	Samp	ole Detail			Acid Sulfate Soils Field pH Test							
Brisbane Laboratory	- NATA # 1261 S	ite # 20794			х							
30 BH2 3.25-3.5	Apr 22, 2024	Soil	Bź	24-Ap0064138	X							
31 BH2 3.5-3.75	Apr 22, 2024	Soil	B	24-Ap0064139	X							
32 BH2 3.75-4.0	Apr 22, 2024	Soil	B	24-Ap0064140	x							
33 BH3 0.0-0.25	Apr 22, 2024	Soil	B	24-Ap0064141	x							
34 BH3 0.25-0.5	Apr 22, 2024	Soil	B	24-Ap0064142	x							
35 BH3 0.5-0.75	Apr 22, 2024	Soil	B	24-Ap0064143	x							
36 BH3 0.75-1.0	Apr 22, 2024	Soil	B	24-Ap0064144	x							
37 BH3 1 0-1 25	Apr 22, 2024	Soil	B	24-Ap0064145	x							
38 BH3 1 25-1 5	Apr 22, 2024	Soil	B	24-Ap0064146	x							
39 BH3 1 5-1 75	Apr 22, 2024	Soil	B	24-Ap0064147	x							
40 BH3 1 75-2 0	Apr 22, 2024	Soil	B	24 Ap0064148	x							
11 BH3 2 0-2 25	$\Delta pr 22, 2024$		D	24-Ap0064140	X							
41 DI 13 2.0-2.23	Apr 22, 2024	30II 861		24-Ap0004149	×							
	Apr 22, 2024	301		24-Ap0004150	~							
43 DH3 2.3-2.75	Apr 22, 2024	501	B	24-Ap0004151	~							
44 BH3 2.75-3.0	Apr 22, 2024	501	B	24-Ap0064152	×							
45 BH3 3.0-3.25	Apr 22, 2024	501	B	24-Ap0064153	<u> </u>							

		Eurofi	ns Enviro	onment Testing A	Australia Pty Ltd				Eurofins ARL Pty Ltd	Eurofins ProMicro Pty L	td Eurofins Enviro	Eurofins Environment Testing NZ Ltd					
web: www.eurofins.com.au email: EnviroSales@eurofins.com		ABN: 50	005 085 5	21					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 942904602	4954					
		Melbou 6 Monte Danden VIC 317 +61 3 8 m NATA# 2 Site# 12	rne ong South '5 564 5000 1261 254	Geelong 19/8 Lewalan Stree Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney Canberra Street 179 Magowar Road Unit 1,2 Dacre Street Girraween Mitchell NSW 2145 ACT 2911 00 +61 2 9900 8400 +61 2 6113 8091 NATA# 1261 NATA# 1261 Site# 25466 Site# 25466		Brisbane Newcastle 1/21 Smallwood Place 1/2 Frost Drive Murarrie Mayfield West QLD 4172 NSW 2304 T: +61 7 3902 4600 +61 2 4968 8448 NATA# 1261 NATA# 1261 Site# 20794 Site# 25079 & 25289		Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402			
C A	Company Name: Address:	Core Co 18 Lysag Coolum QLD 457	nsultan ght St Beach 73	ts Pty Ltd			Order Repo Phon Fax:	No.: rt #: 1090 e: 07 5	0835 475 5900	Re Du Pri Co	ceived: e: ority: ntact Name:	Apr 24, 2024 Apr 30, 2024 3 Day Christie John	Apr 24, 2024 2:50 PM Apr 30, 2024 3 Day Christie Johnson				
P P	Project Name: Project ID:	MACAR J2388	THUR /	AVENNUE HA	MILTON					Eurofins	Analytical Serv	ices Manager : /	Alana Wadsw	orth			
			Samp	le Detail			Acid Sulfate Soils Field pH Test										
Bri	isbane Laboratory	/ - NATA #	1261 S	ite # 20794			х										
46	BH3 3.25-3.5	Apr 22, 202	24	Soil	B	24-Ap0064154	х										
47	BH3 3.5-3.75	Apr 22, 202	24	Soil	B	24-Ap0064155	х										
48	BH3 3.75-4.0	Apr 22, 202	24	Soil	B	24-Ap0064156	х										
49	BH5 0.0-0.25	Apr 22, 202	24	Soil	B	24-Ap0064157	х										
50	BH5 0.25-0.5	Apr 22, 202	24	Soil	B	24-Ap0064158	х										
51	BH5 0.5-0.75	Apr 22, 20	24	Soil	B	24-Ap0064159	x										
52	BH5 0.75-1.0	Apr 22, 20	24	Soil	B	24-Ap0064160	x										
53	BH5 1.0-1.25	Apr 22, 20	24	Soil	B	24-Ap0064161	x										
54	BH5 1.25-1.5	Apr 22, 20	24	Soil	B	24-Ap0064162	X										
55	BH5 1.5-1.75	Apr 22, 20	24	Soil	B	24-Ap0064163	X										
56	BH5 1 75-2 0	Apr 22, 20	24	Soil	B	24-Ap0064164	X										
57	BH5 2.0-2 25	Apr 22, 20	24	Soil	R	24-Ap0064165	x										
58	BH5 2 25-2 5	Apr 22, 20	24	Soil	R'	24-Ap0064166	x										
50	BH5 2 5-2 75	Apr 22, 20	24	Soil	D	24-Ap0064167	x										
60	BH5 2 75 2 0	Apr 22, 20	24		D	24-Ap0004107	X										
61	BU5 2.70-3.0	Apr 22, 20	24	001		24-Ap0004100	×										
01	10 3.0-3.23	<u>77</u> µ1 22, 20,	24	1301		24-MP0004109											

•	C 1	Eurofins Er	nvironment Tes	ting Australia Pty	_td				Eurofins ARL Pty Ltd	Eurofins ProMicro	Pty Ltd	y Ltd Eurofins Environment Testing NZ Ltd						
🛟 eurofins		ABN: 50 005 0	085 521	Sudaay	Canharra	Brichan		Neuropatio	ABN: 91 05 0159 898	ABN: 47 009 120 549		NZBN: 9429046024	4954	Christshursh	Tourongo			
web: www.eurofins.c email: EnviroSales@	com.au @eurofins.com	6 Monterey Ro Dandenong So VIC 3175 +61 3 8564 50 NATA# 1261 Site# 1254	Occepting Cad 19/8 Lewala outh Grovedale VIC 3216 000 +61 3 8564 NATA# 1261 Site# 25403	Sydney n Street 179 Magowar Girraween NSW 2145 5000 +61 2 9900 84 NATA# 1261 Site# 18217	Canberta Road Unit 1,2 Dacre Stree Mitchell ACT 2911 00 +61 2 6113 8091 NATA# 1261 Site# 25466	 1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794 		Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 2528	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 9 Site# 2370	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554		35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	, 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402			
Company N Address:	Name:	Core Consul 18 Lysaght S Coolum Bea QLD 4573	Core Consultants Pty Ltd 18 Lysaght St Coolum Beach QLD 4573					Order No.: Report #: 1090835 Phone: 07 5475 5900 Fax:				Received:Apr 24, 2024 2:50 PMDue:Apr 30, 2024Priority:3 DayContact Name:Christie Johnson						
Project Nar Project ID:	me:	MACARTHU J2388	IR AVENNUE	E HAMILTON						Euro	fins Aı	nalytical Serv	ices Manager : .	Alana Wadsw	orth			
Sample Detail																		
Brisbane La	boratory -	NATA # 1261	1 Site # 2079	94		Х												
62 BH5 3.2	25-3.5 A	pr 22, 2024		Soil	B24-Ap0064170	X												
63 BH5 3.5	5-3.75 A	pr 22, 2024		Soil	B24-Ap0064171	X												
64 BH5 3.7	75-4.0 A	pr 22, 2024		Soil	B24-Ap0064172	X												
Test Counts						64												


Core Consultants Pty Ltd 18 Lysaght St Coolum Beach QLD 4573

Attention:

Christie Johnson

Report	109
Project name	MA
Project ID	J23
Received Date	Apr

1092017-S-V2 MACARTHUR AVENUE HAMILTON J2388 Apr 29, 2024

Client Sample ID			BH1 0.75-1.0	BH1 2.5-2.75	BH2 0.25-0.5	BH2 1.25-1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0075202	B24- Ap0075203	B24- Ap0075204	B24- Ap0075205
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	37	34	43	44
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	4.3
Analysed Material	0.1	%	100	100	100	91
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	8.9
Net Acidity (Excluding ANC)		-				
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	0.02	% S	0.06	0.40	0.05	0.15
CRS Suite - Net Acidity - NASSG (Excluding ANC)	10	mol H+/t	36	250	28	95
CRS Suite - Liming Rate - NASSG (Excluding ANC)	1	kg CaCO3/t	2.7	19	2.1	7.1
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	6.2	8.2	5.9	7.2
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	5.1	< 2	8.7	< 2
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	0.008	< 0.003	0.014	< 0.003
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	0.049	0.40	0.031	0.15
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	31	250	19	95
Extractable Sulfur						
Sulfur - KCI Extractable	0.005	% S	0.019	0.039	0.011	0.015
HCI Extractable Sulfur	0.005	% S	N/A	N/A	N/A	N/A
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	N/A	N/A	N/A	N/A
HCI Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	N/A	2.1	N/A	1.7
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	N/A	0.66	N/A	0.53
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	N/A	410	N/A	330
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	0.06	< 0.02	0.05	< 0.02
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	36	< 10	28	< 10
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	kg CaCO3/t	2.7	< 1	2.1	< 1	
Sample Properties						
% Moisture	1	%	27	46	20	37



Client Sample ID			BH1 0.75-1.0	BH1 2.5-2.75	BH2 0.25-0.5	BH2 1.25-1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0075202	B24- Ap0075203	B24- Ap0075204	B24- Ap0075205
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	34	-	44
>2mm Fraction	0.005	g	-	< 0.005	-	4.3
Analysed Material	0.1	%	-	100	-	91
Extraneous Material	0.1	%	-	< 0.1	-	8.9

Client Sample ID			BH2 2.5-2.75	BH3 0.25-0.5	BH3 1.75-2.0	BH5 0.0-0.25
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0075206	B24- Ap0075207	B24- Ap0075208	B24- Ap0075209
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	45	28	48	45
>2mm Fraction	0.005	g	3.9	< 0.005	< 0.005	8.3
Analysed Material	0.1	%	92	100	100	84
Extraneous Material	0.1	%	7.9	< 0.1	< 0.1	16
Net Acidity (Excluding ANC)						
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	0.02	% S	0.34	< 0.02	0.35	< 0.02
CRS Suite - Net Acidity - NASSG (Excluding ANC)	10	mol H+/t	210	10	220	< 10
CRS Suite - Liming Rate - NASSG (Excluding ANC)	1	kg CaCO3/t	16	< 1	16	< 1
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	8.3	6.8	8.0	6.8
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	< 2	< 2	< 2	< 2
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	< 0.003
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	0.34	0.017	0.35	0.010
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	210	10	220	6.0
Extractable Sulfur						
Sulfur - KCI Extractable	0.005	% S	0.041	0.008	0.053	< 0.005
HCI Extractable Sulfur	0.005	% S	N/A	N/A	N/A	N/A
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	N/A	N/A	N/A	N/A
HCI Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	2.6	0.92	2.2	0.55
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	0.85	0.30	0.69	0.18
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	530	180	430	110
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	< 1	< 1	< 1	< 1
Sample Properties						
% Moisture	1	%	40	16	37	11



Client Sample ID Sample Matrix Eurofins Sample No.			BH2 2.5-2.75 Soil B24- Ap0075206	BH3 0.25-0.5 Soil B24- Ap0075207	BH3 1.75-2.0 Soil B24- Ap0075208	BH5 0.0-0.25 Soil B24- Ap0075209
Test/Reference	LOR	Unit	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	45	28	48	45
>2mm Fraction	0.005	g	3.9	< 0.005	< 0.005	8.3
Analysed Material	0.1	%	92	100	100	84
Extraneous Material	0.1	%	7.9	< 0.1	< 0.1	16

Client Sample ID			RHE 0 75 1 0	DUE 1 25 1 5
Sample Matrix			Soil	Soil
			3011 B24-	3011 B24-
Eurofins Sample No.			Ap0075210	Ap0075211
Date Sampled			Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit		
Extraneous Material				
<2mm Fraction	0.005	g	36	23
>2mm Fraction	0.005	g	< 0.005	< 0.005
Analysed Material	0.1	%	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1
Net Acidity (Excluding ANC)				
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	0.02	% S	0.07	0.41
CRS Suite - Net Acidity - NASSG (Excluding ANC)	10	mol H+/t	43	250
CRS Suite - Liming Rate - NASSG (Excluding ANC)	1	kg CaCO3/t	3.3	19
Actual Acidity (NLM-3.2)				
pH-KCL (NLM-3.1)	0.1	pH Units	8.6	7.8
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	< 2	< 2
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	< 0.003	< 0.003
Potential Acidity - Chromium Reducible Sulfur				
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	0.069	0.41
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	43	250
Extractable Sulfur				
Sulfur - KCI Extractable	0.005	% S	0.013	0.047
HCI Extractable Sulfur	0.005	% S	N/A	N/A
Retained Acidity (S-NAS)				
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	N/A	N/A
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	N/A	N/A
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	N/A	N/A
HCI Extractable Sulfur Correction Factor	1	factor	2.0	2.0
Acid Neutralising Capacity (ANCbt)				
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	4.6	2.1
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	1.5	0.67
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	920	420
ANC Fineness Factor		factor	1.5	1.5
Net Acidity (Including ANC)				
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	< 0.02	< 0.02
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	< 10	< 10
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	< 1	< 1
Sample Properties				
% Moisture	1	%	23	41



Client Sample ID			BH5 0.75-1.0	BH5 1.25-1.5
Sample Matrix			Soil	Soil
Eurofins Sample No.			B24- Ap0075210	B24- Ap0075211
Date Sampled			Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit		
Chromium Suite (SKCI) - NASSG (Excluding ANC)				
<2mm Fraction	0.005	g	36	23
>2mm Fraction	0.005	g	< 0.005	< 0.005
Analysed Material	0.1	%	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Extraneous Material	Brisbane	May 07, 2024	6 Week
- Method: LTM-GEN-7050/7070			
Chromium Suite - NASSG (Excluding ANC)	Brisbane	May 07, 2024	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Chromium Suite (SKCI) - NASSG (Excluding ANC)	Brisbane	Apr 30, 2024	6 Week
- Method: LTM-GEN-7070			
% Moisture	Brisbane	Apr 30, 2024	14 Days
Mothed: LTM CEN 7090 Mojeture			

Method: LTM-GEN-7080 Moisture

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web: w email: E	ww.eurofins.com.au	Melbourne Melbourne 6 Monterey Ro Dandenong Si VIC 3175 +61 3 8564 50 m NATA# 1261 Site# 1254	Geelong Dad 19/8 Lewalar outh Grovedale VIC 3216 VIC 3216 000 +61 3 8564 \$ NATA# 1261 Site# 25403	Sydney n Street 179 Magowar R Girraween NSW 2145 5000 +61 2 9900 840 NATA# 1261 Site# 18217	Canberra oad Unit 1,2 Dacre Street Mitchell ACT 2911 0 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisb 1/21 S Murar QLD T: +61 NATA Site#	ane Smallwood Plac rrie 4172 1 7 3902 4600 # 1261 20794	Newcastle to 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
Company Name: Core Consultants Pty Ltd Address: 18 Lysaght St Coolum Beach QLD 4573							Order Repor Phone Fax:	No.: t #: 1092 :: 07 5-	2017 475 5900	Rec Due Prio Con	eived: : rity: tact Name:	Apr 29, 2024 May 2, 2024 3 Day Christie John	4:48 PM	
Pro Pro	oject Name: oject ID:	MACARTHU J2388	IR AVENUE H	HAMILTON						Eurofins A	nalytical Serv	ices Manager : A	Alana Wadsw	orth
Sample Detail					Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)								
Bris	bane Laboratory	- NATA # 126	1 Site # 2079	4		Х	х							
Exte	ernal Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID									
1	BH1 0.75-1.0	Apr 22, 2024		Soil	B24-Ap0075202	Х	X							
2	BH1 2.5-2.75	Apr 22, 2024		Soil	B24-Ap0075203	Х	X							
3	BH2 0.25-0.5	Apr 22, 2024		Soil	B24-Ap0075204	Х	X							
4	BH2 1.25-1.5	Apr 22, 2024		Soil	B24-Ap0075205	Х	X							
5	BH2 2.5-2.75	Apr 22, 2024		Soil	B24-Ap0075206	Х	X							
6	BH3 0.25-0.5	Apr 22, 2024		Soil	B24-Ap0075207	Х	X							
7	BH3 1.75-2.0	Apr 22, 2024		Soil	B24-Ap0075208	Х	X							
8	BH5 0.0-0.25	Apr 22, 2024		Soil	B24-Ap0075209	Х	X							
9	BH5 0.75-1.0	Apr 22, 2024		Soil	B24-Ap0075210	Х	X							
10	BH5 1.25-1.5	Apr 22, 2024		Soil	B24-Ap0075211	Х	X							
Test	Counts					10	10							



Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units		
mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
μg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

I Inite

••••••	
APHA	American Public Health Association
CEC	Cation Exchange Capacity
сос	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
твто	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 - 150%, VOC recoveries 50 - 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- 1. Where a result is reported as 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 are not data from your samples.
- 3. 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.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. 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							I	-	
Actual Acidity (NLM-3.2)									
pH-KCL (NLM-3.1)			%	100			80-120	Pass	
Titratable Actual Acidity (NLM-3.2)			%	99			80-120	Pass	
LCS - % Recovery							T		
Potential Acidity - Chromium Red	ucible Sulfur								
Chromium Reducible Sulfur (s-SCr)	(NLM-2.1)		%	104			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate							1		
Net Acidity (Excluding ANC)				Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-Ap0075202	СР	% S	0.06	N/A	N/A	30%	Pass	
CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-Ap0075202	СР	mol H+/t	36	N/A	N/A	20%	Pass	
CRS Suite - Liming Rate - NASSG (Excluding ANC)	B24-Ap0075202	СР	kg CaCO3/t	2.7	N/A	N/A	30%	Pass	
Duplicate									
Actual Acidity (NLM-3.2)				Result 1	Result 2	RPD			
Titratable Actual Acidity (NLM-3.2)	B24-Ap0075202	CP	% pyrite S	0.008	0.008	2.8	30%	Pass	
Duplicate									
Potential Acidity - Chromium Redu	ucible Sulfur			Result 1	Result 2	RPD			
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B24-Ap0075202	СР	mol H+/t	31	31	<1	30%	Pass	
Duplicate									
Extractable Sulfur				Result 1	Result 2	RPD			
Sulfur - KCI Extractable	B24-Ap0075202	CP	% S	0.019	0.019	1.0	30%	Pass	
Duplicate									
Acid Neutralising Capacity (ANCbt)			Result 1	Result 2	RPD			
ANC Fineness Factor	B24-Ap0075202	CP	factor	1.5	1.5	<1	30%	Pass	
Duplicate									
Net Acidity (Including ANC)				Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (including ANC)	B24-Ap0075202	СР	% S	0.06	0.06	<1	30%	Pass	
CRS Suite - Net Acidity - NASSG (Including ANC)	B24-Ap0075202	СР	mol H+/t	36	36	<1	30%	Pass	
CRS Suite - Liming Rate - NASSG (Including ANC)	B24-Ap0075202	СР	kg CaCO3/t	2.7	2.7	<1	30%	Pass	
Duplicate							I		
Net Acidity (Excluding ANC)	1			Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-Ap0075211	СР	% S	0.41	N/A	N/A	30%	Pass	
CRS Suite - Net Acidity - NASSG (Excluding ANC)	B24-Ap0075211	СР	mol H+/t	250	N/A	N/A	20%	Pass	
CRS Suite - Liming Rate - NASSG (Excluding ANC)	B24-Ap0075211	СР	kg CaCO3/t	19	N/A	N/A	30%	Pass	
Duplicate									
Actual Acidity (NLM-3.2)				Result 1	Result 2	RPD			
pH-KCL (NLM-3.1)	B24-Ap0075211	CP	pH Units	7.8	7.8	<1	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-Ap0075211	CP	mol H+/t	< 2	< 2	<1	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-Ap0075211	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Potential Acidity - Chromium Redu	ucible Sulfur			Result 1	Result 2	RPD			
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	B24-Ap0075211	СР	% S	0.41	0.40	1.0	20%	Pass	
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B24-Ap0075211	CP	mol H+/t	250	250	1.0	30%	Pass	



Duplicate									
Extractable Sulfur				Result 1	Result 2	RPD			
Sulfur - KCI Extractable	B24-Ap0075211	CP	% S	0.047	N/A	N/A	30%	Pass	
Duplicate									
Acid Neutralising Capacity (ANCbt	t)			Result 1	Result 2	RPD			
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	B24-Ap0075211	СР	% CaCO3	2.1	2.1	<1	20%	Pass	
Acid Neutralising Capacity - (s- ANCbt) (NLM-5.2)	B24-Ap0075211	СР	% S	0.67	0.67	<1	30%	Pass	
ANC Fineness Factor	B24-Ap0075211	CP	factor	1.5	1.5	<1	30%	Pass	
Duplicate									
Net Acidity (Including ANC)				Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (including ANC)	B24-Ap0075211	СР	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity - NASSG (Including ANC)	B24-Ap0075211	СР	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate - NASSG (Including ANC)	B24-Ap0075211	СР	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
Sample Properties					Result 2	RPD			
% Moisture	B24-Ap0075211	СР	%	41	41	<1	30%	Pass	



Comments

This report has been revised V2 following analysis change. S15 results for all samples have now been replaced by the s11 results.

Custody Seals Intact (if used) N/A Attempt to Chill was evident Yes Sample correctly preserved Yes Appropriate sample containers have been used Yes Sample containers for volatile analysis received with minimal headspace Yes Samples received within HoldingTime Yes Some samples have been subcontracted No	Sample Integrity	
Attempt to Chill was evidentYesSample correctly preservedYesAppropriate sample containers have been usedYesSample containers for volatile analysis received with minimal headspaceYesSamples received within HoldingTimeYesSome samples have been subcontractedNo	Custody Seals Intact (if used)	N/A
Sample correctly preservedYesAppropriate sample containers have been usedYesSample containers for volatile analysis received with minimal headspaceYesSamples received within HoldingTimeYesSome samples have been subcontractedNo	Attempt to Chill was evident	Yes
Appropriate sample containers have been used Yes Sample containers for volatile analysis received with minimal headspace Yes Samples received within HoldingTime Yes Some samples have been subcontracted No	Sample correctly preserved	Yes
Sample containers for volatile analysis received with minimal headspace Yes Samples received within HoldingTime Yes Some samples have been subcontracted No	Appropriate sample containers have been used	Yes
Samples received within HoldingTime Yes Some samples have been subcontracted No	Sample containers for volatile analysis received with minimal headspace	Yes
Some samples have been subcontracted No	Samples received within HoldingTime	Yes
	Some samples have been subcontracted	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:

Jonathon Angell	Senior Analyst-Sample Properties
Jonathon Angell	Senior Analyst-SPOCAS

Glenn Jackson Managing Director

- 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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Core Consultants Pty Ltd 18 Lysaght St Coolum Beach QLD 4573

Attention:

Christie Johnson

Report
Project name
Project ID
Received Date

1090835-S MACARTHUR AVENUE HAMILTON J2388 Apr 24, 2024



NATA Accredited Accreditation Number 1261 Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Client Sample ID			BH1 0.0-0.25	BH1 0.25-0.5	BH1 0.5-0.75	BH1 0.75-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064109	B24- Ap0064110	B24- Ap0064111	B24- Ap0064112
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.0	8.0	7.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.8	7.2	7.2	5.2
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH1 1.0-1.25	BH1 1.25-1.5	BH1 1.5-1.75	BH1 1.75-2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064113	B24- Ap0064114	B24- Ap0064115	B24- Ap0064116
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.6	7.4	7.8	8.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.5	6.2	6.2	7.9
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH1 2.0-2.25	BH1 2.25-2.5	BH1 2.5-2.75	BH1 2.75-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064117	B24- Ap0064118	B24- Ap0064119	B24- Ap0064120
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.0	8.1	8.1	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.4	7.2	8.3	8.0
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0



Client Sample ID			BH1 3.0-3.25	BH1 3.25-3.5	BH1 3.5-3.75	BH1 3.75-4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064121	B24- Ap0064122	B24- Ap0064123	B24- Ap0064124
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.2	8.4	8.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.8	8.0	7.2	8.3
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH2 0.0-0.25	BH2 0.25-0.5	BH2 0.5-0.75	BH2 0.75-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064125	B24- Ap0064126	B24- Ap0064127	B24- Ap0064128
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.7	6.9	7.7	7.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.0	4.7	7.2	8.1
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH2 1.0-1.25	BH2 1.25-1.5	BH2 1.5-1.75	BH2 1.75-2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064129	B24- Ap0064130	B24- Ap0064131	B24- Ap0064132
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.6	7.7	8.0	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.5	5.7	7.7	6.9
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH2 2.0-2.25	BH2 2.25-2.5	BH2 2.5-2.75	BH2 2.75-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064133	B24- Ap0064134	B24- Ap0064135	B24- Ap0064136
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.2	8.0	8.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.0	7.7	6.8	8.0
Reaction Ratings*505	0	comment	4.0	4.0	4.0	4.0



Client Sample ID			BH2 3.0-3.25	BH2 3.25-3.5	BH2 3.5-3.75	BH2 3.75-4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064137	B24- Ap0064138	B24- Ap0064139	B24- Ap0064140
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.3	8.3	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.8	7.2	7.6	7.4
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH3 0.0-0.25	BH3 0.25-0.5	BH3 0.5-0.75	BH3 0.75-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064141	B24- Ap0064142	B24- Ap0064143	B24- Ap0064144
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.9	7.8	7.4	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.1	7.6	6.0	6.2
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH3 1.0-1.25	BH3 1.25-1.5	BH3 1.5-1.75	BH3 1.75-2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064145	B24- Ap0064146	B24- Ap0064147	B24- Ap0064148
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.4	8.3	8.2	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.8	7.3	7.4	7.3
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH3 2.0-2.25	BH3 2.25-2.5	BH3 2.5-2.75	BH3 2.75-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064149	B24- Ap0064150	B24- Ap0064151	B24- Ap0064152
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.4	8.2	7.9	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.2	7.6	7.4	8.1
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0



Client Sample ID Sample Matrix Eurofins Sample No.			BH3 3.0-3.25 Soil B24- Ap0064153	BH3 3.25-3.5 Soil B24- Ap0064154	BH3 3.5-3.75 Soil B24- Ap0064155	BH3 3.75-4.0 Soil B24- Ap0064156
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.1	8.1	8.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	8.0	8.3	7.8	8.1
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH5 0.0-0.25	BH5 0.25-0.5	BH5 0.5-0.75	BH5 0.75-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064157	B24- Ap0064158	B24- Ap0064159	B24- Ap0064160
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.1	8.0	8.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.9	7.6	7.1	7.5
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH5 1.0-1.25	BH5 1.25-1.5	BH5 1.5-1.75	BH5 1.75-2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064161	B24- Ap0064162	B24- Ap0064163	B24- Ap0064164
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.4	8.4	8.4	8.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.0	6.9	7.2	7.4
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH5 2.0-2.25	BH5 2.25-2.5	BH5 2.5-2.75	BH5 2.75-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B24- Ap0064165	B24- Ap0064166	B24- Ap0064167	B24- Ap0064168
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.3	8.4	8.2	8.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.2	6.9	8.4	7.5
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0



Client Sample ID Sample Matrix Eurofins Sample No.			BH5 3.0-3.25 Soil B24- Ap0064169	BH5 3.25-3.5 Soil B24- Ap0064170	BH5 3.5-3.75 Soil B24- Ap0064171	BH5 3.75-4.0 Soil B24- Ap0064172
Date Sampled			Apr 22, 2024	Apr 22, 2024	Apr 22, 2024	Apr 22, 2024
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.2	8.3	8.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.7	8.0	8.4	8.4
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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	
Acid Sulfate Soils Field pH Test	Brisbane	Apr 26, 2024	
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			

Holding Time 7 Days

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web: v email:	www.eurofins.com.au	Melbourne 6 Monterey R Dandenong S VIC 3175 +61 3 8564 50 NATA# 1261 Site# 1254	Geelong oad 19/8 Lewala iouth Grovedale VIC 3216 000 +61 3 8564 NATA# 1261 Site# 25403	Sydney n Street 179 Magowar R Girraween NSW 2145 5000 +61 2 9900 840 NATA# 1261 Site# 18217	Canberra oad Unit 1,2 Dacre Street Mitchell ACT 2911 0 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Sma Murarrie QLD 417 T: +61 7 NATA# 12 Site# 207	allwood Place 72 3902 4600 261 794	Newcastle e 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554		Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
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1	BH1 0.0-0.25	Apr 22, 2024		Soil	B24-Ap0064109	Х									
2	BH1 0.25-0.5	Apr 22, 2024		Soil	B24-Ap0064110	Х									
3	BH1 0.5-0.75	Apr 22, 2024		Soil	B24-Ap0064111	Х									
4	BH1 0.75-1.0	Apr 22, 2024		Soil	B24-Ap0064112	Х									
5	BH1 1.0-1.25	Apr 22, 2024		Soil	B24-Ap0064113	Х									
6	BH1 1.25-1.5	Apr 22, 2024		Soil	B24-Ap0064114	Х									
7	BH1 1.5-1.75	Apr 22, 2024		Soil	B24-Ap0064115	Х									
8	BH1 1.75-2.0	Apr 22, 2024		Soil	B24-Ap0064116	Х									
9	BH1 2.0-2.25	Apr 22, 2024		Soil	B24-Ap0064117	Х									
10	BH1 2.25-2.5	Apr 22, 2024		Soil	B24-Ap0064118	Х									
11	BH1 2.5-2.75	Apr 22, 2024		Soil	B24-Ap0064119	Х									
12	BH1 2.75-3.0	Apr 22, 2024		Soil	B24-Ap0064120	Х									
13	BH1 3.0-3.25	Apr 22, 2024		Soil	B24-Ap0064121	Х									

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Project JD: JACARTHUR AVENNUE HAMILTON J288 Eurofins Analytical Services Manager : Alana Wadswort Sample Detail Bug Britsbare Laboratory - NATA # 1261 Site # 20794 x I H11 325-35 Apr 22, 2024 Soil B24-Ap0064122 x I6 H11 375-37 Apr 22, 2024 Soil B24-Ap0064122 x I7 H20 0-025 Apr 22, 2024 Soil B24-Ap0064122 x I8 H20 2-55-37 Apr 22, 2024 Soil B24-Ap0064122 x I8 H20 2-55-37 Apr 22, 2024 Soil B24-Ap0064122 x I8 H20 2-55-37 Apr 22, 2024 Soil B24-Ap0064122 x I8 H21 0-57-10 Apr 22, 2024 Soil B24-Ap0064122 x I8 H21 0-57-10 Apr 22, 2024 Soil B24-Ap0064122 x I8 H21 0-57-10 Apr 22, 2024 Soil B24-Ap0064122 x I8 H21 0-57-10 Apr 22, 2024 Soil B24-Ap0064122 x I8	Con Ado	npany Name: Iress:	Core Consu 18 Lysaght Coolum Bea QLD 4573	Iltants Pty Ltd St ach				Order Repor Phone Fax:	No.: t #: 109(:: 07 5	0835 9475 5900		Rece Due: Prior Cont	eived: rity: tact Name:	Apr 24, 2024 Apr 30, 2024 3 Day Christie Johr	2:50 PM son	
Briebane Laboratory - NATA # 1261 Site # 20794 × 4 BH13 25-35 Apr 22, 2024 Soil B24-p0064122 × 15 BH13 5-3.75 Apr 22, 2024 Soil B24-Ap0064122 × 16 BH13 75-4.0 Apr 22, 2024 Soil B24-Ap0064124 × 17 BH2 0.0-0.25 Apr 22, 2024 Soil B24-Ap0064124 × 18 BH2 0.0-0.5 Apr 22, 2024 Soil B24-Ap0064124 × 18 BH2 0.0-0.5 Apr 22, 2024 Soil B24-Ap0064128 × 19 BH2 0.0-7.6 Apr 22, 2024 Soil B24-Ap0064128 × 20 BH2 0.7-7.6 Apr 22, 2024 Soil B24-Ap0064128 × 21 BH2 1.0-7.75 Apr 22, 2024 Soil B24-Ap0064128 × 21 BH2 1.0-7.5 Apr 22, 2024 Soil B24-Ap0064128 × 22 BH2 1.5-7.5 Apr 22, 2024 Soil B24-Ap0064128 × 23 BH2 1.5-7.5 Apr	Pro Pro	ject Name: ject ID:	MACARTHI J2388	UR AVENNUE H	AMILTON						Euro	ofins A	nalytical Serv	ices Manager : /	Alana Wadsw	orth
Historatory - NATA # 1261 Site # 20794X14BH1 3.25-3.5Apr 22, 2024SoilB24-Ap0064122X15BH1 3.5-3.76Apr 22, 2024SoilB24-Ap0064123X16BH1 3.75-4.0Apr 22, 2024SoilB24-Ap0064125X17BH2 0.0-0.25Apr 22, 2024SoilB24-Ap0064125X18BH2 0.25-0.5Apr 22, 2024SoilB24-Ap0064126X19BH2 0.5-0.75Apr 22, 2024SoilB24-Ap0064127X20BH2 0.75-1.0Apr 22, 2024SoilB24-Ap0064128X21BH2 1.0-1.25Apr 22, 2024SoilB24-Ap0064129X22BH2 1.25-1.5Apr 22, 2024SoilB24-Ap0064130X23BH2 1.5-1.75Apr 22, 2024SoilB24-Ap0064130X24BH2 1.75-2.0Apr 22, 2024SoilB24-Ap0064132X25BH2 2.0-2.25Apr 22, 2024SoilB24-Ap0064132X26BH2 2.5-2.56Apr 22, 2024SoilB24-Ap0064132X26BH2 2.5-2.57Apr 22, 2024SoilB24-Ap0064133X27BH2 2.5-2.57Apr 22, 2024SoilB24-Ap0064134X28BH2 2.5-2.57Apr 22, 2024SoilB24-Ap0064135X28BH2 2.5-2.57Apr 22, 2024SoilB24-Ap0064135X28BH2 2.5-2.57Apr 22, 2024SoilB24-Ap0064135X28BH			S	ample Detail			Acid Sulfate Soils Field pH Test									
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web: w email: I	ww.eurofins.com.au EnviroSales@eurofins.cor	Melbourne 6 Monterey I Dandenong VIC 3175 +61 3 8564 3 m NATA# 1261 Site# 1254	Geelong Road 19/8 Lewalan South Grovedale VIC 3216 5000 +61 3 8564 50 NATA# 1261 Site# 25403	Sydney Street 179 Magowar R Girraween NSW 2145 000 +61 2 9900 840 NATA# 1261 Site# 18217	Canberra oad Unit 1,2 Dacre Stree Mitchell ACT 2911 0 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane t 1/21 Sma Murarrie QLD 417 T: +61 7 3 NATA# 12 Site# 207	illwood Plac 2 3902 4600 261 94	Newcastle te 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554		Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
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30	BH2 3.25-3.5	Apr 22, 2024	5	Soil	B24-Ap0064138	х									
31	BH2 3.5-3.75	Apr 22, 2024	5	Soil	B24-Ap0064139	х									
32	BH2 3.75-4.0	Apr 22, 2024	5	Soil	B24-Ap0064140	х									
33	BH3 0.0-0.25	Apr 22, 2024	6	Soil	B24-Ap0064141	х									
34	BH3 0.25-0.5	Apr 22, 2024	5	Soil	B24-Ap0064142	х									
35	BH3 0.5-0.75	Apr 22, 2024	6	Soil	B24-Ap0064143	X									
36	BH3 0.75-1.0	Apr 22, 2024	9	Soil	B24-Ap0064144	x									
37	BH3 1.0-1.25	Apr 22, 2024	9	Soil	B24-Ap0064145	x									
38	BH3 1.25-1.5	Apr 22, 2024		Soil	B24-Ap0064146	x									
39	BH3 1.5-1.75	Apr 22, 2024		Soil	B24-Ap0064147	x									
40	BH3 1 75-2 0	Apr 22, 2024		Soil	B24-Ap0064148	x									
41	BH3 2 0-2 25	Anr 22 2024		Soil	B24-Ap0064149	X									
42	BH3 2 25-2 5	Anr 22, 2024		Soil	B24-An0064150	x									
13	BH3 2 5-2 75	Apr 22, 2024		Soil	B24-Ap0004150	x									
43	BH2 2 75 2 0	Apr 22, 2024			B24 Ap0064131	× ×									
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62	BH5 3.25-3.5	Apr 22, 2024	So	il E	324-Ap0064170	Х								
63	BH5 3.5-3.75	Apr 22, 2024	So	il E	324-Ap0064171	Х								
64	BH5 3.75-4.0	Apr 22, 2024	So	il E	324-Ap0064172	X								
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Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units		
mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
μg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

I Inite

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APHA	American Public Health Association
CEC	Cation Exchange Capacity
сос	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
твто	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 - 150%, VOC recoveries 50 - 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- 1. Where a result is reported as 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 are not data from your samples.
- 3. 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.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data



Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064110	CP	pH Units	8.0	8.0	pass	20%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064125	CP	pH Units	6.7	7.0	pass	20%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064129	CP	pH Units	7.6	7.7	pass	20%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064149	CP	pH Units	8.4	8.3	pass	20%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064159	CP	pH Units	8.0	8.1	pass	20%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064169	CP	pH Units	8.2	8.2	pass	20%	Pass	
Duplicate							-		
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Ap0064170	CP	pH Units	8.2	8.2	pass	20%	Pass	



Comments

Sample Integrity	
Custody Seals Intact (if used) N/	I/A
Attempt to Chill was evident Ye	'es
Sample correctly preserved Ye	'es
Appropriate sample containers have been used Ye	es
Sample containers for volatile analysis received with minimal headspace Ye	es
Samples received within HoldingTime Ye	'es
Some samples have been subcontracted No.	lo

Qualifier Codes/Comments

Code

Description

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. 4.0; Extreme reaction. S05

Authorised by:

Emily ONeill Jonathon Angell

Analytical Services Manager Senior Analyst-SPOCAS

Glenn Jackson Managing Director

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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Appendix F Groundwater Analytical Results

			Lab Report Number	1091787	1091787
			Field ID	MW1	MW2
			Sample Type	Primary	Primary
			Date	29 Apr 2024	29 Apr 2024
		Brisbane River			
		WQOs (Middle			
		Esturine			
	Unit	Waters)	EQL		
ield					
Temperature	۰C	NA		24.1	25.2
pH	unit	7.0-8.4		7.1	7.2
Conductivity	us/cm	NA		35879	40898
Redox	mV	NA		-76	292.4
Odour	Observation			Nil	Sulfidic Odour
Turbidity	Observation			low	high
norganics					
Alkalinity (Bicarbonate as CaCO3)	mg/L		20	3,000	3,200
Alkalinity (Carbonate as CaCO3)	mg/L		20	<20	<20
Alkalinity (Hydroxide as CaCO3)	mg/L		20	<20	<20
Alkalinity (total) as CaCO3	mg/L		20	3,000	3,200
Chloride	mg/L		1	13,000	15,000
Sodium	mg/L		0.5	7,700	9,600
Sulphate	mg/L		5	24	28
Metals					
Aluminium (Total)	mg/L		0.05	1.9	240
Aluminium (dissolved)	mg/L		0.05	<0.05	< 0.05
Calcium	mg/L		0.5	230	280
Iron (Total)	mg/L		0.05	6.0	460
Iron (dissolved)	mg/L		0.05	0.78	0.47
Magnesium	mg/L		0.5	690	1,100
Potassium	mg/L		0.5	190	260

Notes: Environmental Protection (Water and Wetland Biodiversity) Policy 2019, Brisbane River Estuary Environmental Values and Water Quality Objectives - Part of Basin 143.

#1091787

TR03				(s)					2010/01/01/03/56010
J002388				eta	5	b			
Contamination	Site Assessment - Ma	acarthur Av, Ham	nilton	Ĕ	d Ire	NSul	Sector Sector and S		
TR03	Quotation No.			heav	im an	loride			
CJ	Contact Name:	Cam - 040882	5619	/led 8	minit	s, Ch			
ckay@corecons	ultants.com.au ; cjohn	son@coreconsulta	ants.com.au	lisso	d Allu	ation			
jzoljan@corecon Fridge	sultants.com.au; coreo	consultants@esda	t.com.au.	EXN, D	ssolve	and O			
Sample Depth (m)	Media	Bottles/via s	SAMPLE	B6 (TRH, BTI	Total and Dis	Total Anions			망
	Water	6	29/04/2024	x	×	×			
	Water	6	29/04/2024	x	x	x			
	Water	2	29/04/2024	×					
		*** 2	DAYT	ΛΤ					
	TR03 Contamination TR03 CJ ckay@corecons jzoljan@corecon Fridge	J002388 Contamination Site Assessment - Ma TR03 Quotation No. CJ Contact Name: ckay@coreconsultants.com.au ; cjohn jzoljan@coreconsultants.com.au; corec Fridge	J002388 Contamination Site Assessment - Macarthur Av, Ham TR03 Quotation No. CJ Contact Name: Cam - 040882 ckay@coreconsultants.com.au ; cjohnson@coreconsultants@esda creconsultants@esda Fridge Image: Signal S	J002388 Contamination Site Assessment - Macarthur Av, Hamilton TR03 Quotation No. CJ Contact Name: Cam - 0408825619 ckay@coreconsultants.com.au ; cjohnson@coreconsultants.com.au jzoljan@coreconsultants.com.au jzoljan@coreconsultants.com.au; coreconsultants@esdat.com.au Fridge Image: Signed Sig	J002388 Contamination Site Assessment - Macarthur Av, Hamilton TR03 Quotation No. CJ Contact Name: Cam - 0408825619 ckav@coreconsultants.com.au ; cjohnson@coreconsultants.com.au rive jzoljan@coreconsultants.com.au ; cjohnson@coreconsultants.com.au rive Fridge Junce Junce value Value Supervision Value Value Supovision Value	Invos Image: Second and the second a	1003 388	J002388 Contamination Site Assessment - Macarthur Av, Hamilton Image: Site Assessment - Macarthur Av, Hamilton TR03 Quotation No. Email Contact Name: Cam - 0408825619 CAJ Contact Name: Cam - 0408825619 Email Contact Name: Cam - 0408825619 ckav@coreconsultants.com.au ciphinson@coreconsultants.com.au Email Contact Name: Cam - 0408825619 Email Contact Name: Email Contact Na	J002388 Contamination Site Assessment - Macarthur Av, Hamilton Image: Contamination Site Assessment - Macarthur Av, Hamilton IR03 Quotation No. Image: Contact Name: Cam - 0408825619 Image: Contact Name: Cam - 0408825619 ckay@coreconsultants.com.au; ciphnson@coreconsultants.com.au Image: Contact Name: Cam - 0408825619 Image: Contact Name: Cam - 0408825619 ckay@coreconsultants.com.au; ciphnson@coreconsultants.com.au Image: Contact Name: Cam - 0408825619 Image: Contact Name: Cam - 0408825619 ckay@coreconsultants.com.au; ciphnson@coreconsultants.com.au Image: Contact Name: Cam - 0408825619 Image: Contact Name: Cam - 0408825619 chay@coreconsultants.com.au; ciphnson@coreconsultants.com.au Image: Contact Name: Cam - 0408825619 Image: Cam - 0408825619 chay@coreconsultants.com.au; ciphnson@coreconsultants.com.au Image: Cam - 0408825619 Image: Cam - 0408825619 izoljan@coreconsultants.com.au; coreconsultants@esdat.com.au Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam - 0408825619 Image: Cam -

LIECKED BY Eloi & Fitzgeradd LATE 29/9/24, 3:20pm, 26.6 ()

COC - J2388 Groundwater

Christie Johnson <cjohnson@coreconsultants.com.au>

Mon 29/04/24 3:20 PM

To:Zoe Flynn <ZoeFlynn@eurofins.com>;#AU03_EnviroSampleBris <EnviroSampleBris@eurofins.com>;Ryan Gilbert <RyanGilbert@eurofins.com> Cc:Cameron Kay <ckay@coreconsultants.com.au>

1 attachments (23 KB) J002388 - TR03 - Groundwater.xlsx;

> **CAUTION:** EXTERNAL EMAIL - Sent from an email domain that is not formally trusted by Eurofins. Do not click on links or open attachments unless you recognise the sender and are certain that the content is safe.

Hi Zoe,

Please find the COC attached for the groundwater samples dropped off today. We require a quick Turn around Time. Please contact me if this cannot be completed. Also due to lack of staff we require the samples to be filtered for the dissolved metals, please.

Any question contact either myself or Cam Kay on the details below. Regards

Christie Johnson I B.Eng (Environmental) | Geo-Environmental Engineer T: +61 7 3569 2907 M: +61 411 094 288 E: cjohnson@coreconsultants.com.au



 Sunshine Coast
 Unit 1 / 18 Lysaght Street, Coo um Beach Qid 4573

 Brisbane
 Unit 3 / 31 Londor Close, Hemimant Qid 4174

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 Environmental



#1091787

TR03				(s)					220304-008 23	
J002388				eta	5	b l				
Contamination	Site Assessment - Ma	acarthur Av, Ham	nilton	Ĕ	d Ire	/Sul				
TR03	Quotation No.			heav	im an	loride				
CJ	Contact Name:	Cam - 040882	5619	/led 8	minit	s, Ch				
ckay@corecons	ultants.com.au ; cjohn	son@coreconsult	ants.com.au	lisso	d Allu	ation				
jzoljan@corecon Fridge	sultants.com.au; cored	consultants@esda	t.com.au.	EXN, D	ssolve	and O				
Sample Depth (m)	Media	Bottles/via	SAMPLE	B6 (TRH, BTI	Total and Dis	Total Anions				hold
	Water	6	29/04/2024	x	×	×				
	Water	6	29/04/2024	x	x	x				
	Water	2	29/04/2024	×						
		*** 2	DAYT	ЛТ						
	J002388 Contamination TR03 CJ ckay@coreconst jzoljan jzoljan jzolj	J002388 Contamination Site Assessment - Main - Ma	J002388 Contamination Site Assessment - Macarthur Av, Ham TR03 Quotation No. CJ Contact Name: Cam - 040882 ckay@coreconsultants.com.au; cjohnson@coreconsultants@esda chay@coreconsultants.com.au; coreconsultants@esda Fridge in the second	J002388 Contamination Site Assessment - Macarthur Av, Hamilton TR03 Quotation No. CJ Contact Name: Cam - 0408825619 ckay@coreconsultants.com.au ; cjohnson@coreconsultants.com.au jzoljan@coreconsultants.com.au ; cjohnson@coreconsultants.com.au jzoljan@coreconsultants.com.au ; coreconsultants@esdat.com.au. 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LIECKED BY Eloi & Fitzgeradd LATE 29/9/24, 3:20pm, 26.6 ()

COC - J2388 Groundwater

Christie Johnson <cjohnson@coreconsultants.com.au>

Mon 29/04/24 3:20 PM

To:Zoe Flynn <ZoeFlynn@eurofins.com>;#AU03_EnviroSampleBris <EnviroSampleBris@eurofins.com>;Ryan Gilbert <RyanGilbert@eurofins.com> Cc:Cameron Kay <ckay@coreconsultants.com.au>

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 Brisbane
 Unit 3 / 31 Londor Close, Hemimant Qid 4174

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EnviroSales@eurofins.com

Eurofins Envir	onment Testing /	Australia Pty Ltd				Eurofins ARL Pty Ltd	Eurofins ProMicro Pty	Ltd Eurofins Envir	onment Testing NZ	1 Ltd	
ABN: 50 005 085 5	21					ABN: 91 05 0159 898	ABN: 47 009 120 549	NZBN: 942904602	4954		
Melbourne 6 Monterey Road	Geelong 19/8 Lewalan Street	Sydney 179 Magowar Road	Canberra Unit 1,2 Dacre Street	Brisbane 1/21 Smallwood Place	Newcastle e 1/2 Frost Drive	Perth 46-48 Banksia Road	Perth ProMicro 46-48 Banksia Road	Auckland 35 O'Rorke Road	Auckland (Focus) Unit C1/4 Pacific Rise,	Christchurch 43 Detroit Drive	Tauranga 1277 Cameron Road,
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West	Welshpool	Welshpool	Penrose,	Mount Wellington,	Rolleston,	Gate Pa,
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304	WA 6106	WA 6106	Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112
+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448	+61 8 6253 4444	+61 8 6253 4444	+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 2377	NATA# 2561	IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	Site# 25079 & 25289	Site# 2370	Site# 2554				

Sample Receipt Advice

Company name:	Core Consultants Pty Ltd
Contact name:	Cameron Kay
Project name:	CONTAMINATION SITE ASSESSMENT - MACARTHUR AV HAMILTON
Project ID:	J002388
Turnaround time:	3 Day
Date/Time received	Apr 29, 2024 3:20 PM
Eurofins reference	1091787

Sample Information

- A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ 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.
- X Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- X Split sample sent to requested external lab.
- X Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Alana Wadsworth on phone : 0499 810 009 or by email: envirosamplebris@eurofins.com

Results will be delivered electronically via email to Cameron Kay - ckay@coreconsultants.com.au.

Note: A copy of these results will also be delivered to the general Core Consultants Pty Ltd email address.

Global Leader - Results you can trust

Eurofins Environment Testing Australia Pty Ltd													Eurofi	ns ARL Pty Ltd	Eurofins ProMicro Pty I	y Ltd Eurofins Environment Testing NZ Ltd				
	eurofing	ABN: 50 005	ABN: 50 005 085 521										ABN: 91	05 0159 898	ABN: 47 009 120 549	NZBN: 9429046024954				
web: www.eurofins.com.au email: EnviroSales@eurofins.com		Melbourne 6 Monterey R Dandenong S VIC 3175 +61 3 8564 5 NATA# 1261 Site# 1254	Melbourne Geelong Sydney Canberra 6 Monterey Road 19/8 Lewalan Street 179 Magowar Road Unit 1,2 Dacre Str 19/8 Lewalan Street 179 Magowar Road Unit 1,2 Dacre Str Dandenong South Grovedale Giraween Mitchell VIC 3175 VIC 3216 NSW 2145 ACT 2911 +61 3 8564 5000 +61 3 8564 5000 +61 2 9900 8400 +61 2 6113 8091 NATA# 1261 NATA# 1261 NATA# 1261 NATA# 1261 Site# 1254 Site# 25403 Site# 18217 Site# 25466					Brisbane Nu st 1/21 Smallwood Place 1/ Murarrie M QLD 4172 N T: +61 7 3902 4600 +1 NATA# 1261 N Site# 20794 S		Newcastle e 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289		3 5289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370		Perth ProMicro 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	Auckland 35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402	
Company Name: Core Consultants Pty Ltd Address: 18 Lysaght St Coolum Beach QLD 4573								O Re Pl Fa	rder I eport hone: ax:	No.: #:	T 1 C	FR03 10917)7 547	'87 75 590	0	Re Di Pr Co	eceived: ue: 'iority: ontact Name:	Apr 29, 2024 May 2, 2024 3 Day Cameron Ka	3:20 PM		
Pro Pro	oject Name: oject ID:	CONTAMIN J002388	ATION SIT	E ASSI	ESSMENT -	MACARTHUR A	V HA	MILTO	NC						Eurofins	Analytical Serv	rices Manager : A	Alana Wadsw	orth	
Sample Detail						Aluminium	Aluminium (filtered)	Iron	Iron (filtered)	Eurofins Suite B6 (filtered metals)	Eurofins Suite B6 (filtered metals)	Eurofins Suite B11E: CI/SO4/Alkalinity	Eurofins Suite B11C: Na/K/Ca/Mg							
Mell	oourne Laborator	y - NATA # 12	261 Site # '	1254							Х	Х								
Bris	bane Laboratory	- NATA # 126	1 Site # 20)794			Х	X	X	X	X	Х	X	X						
Exte No	sample ID	Sample Date	Sampling Time	g I	Matrix	LAB ID														
1	MW1	Apr 29, 2024		Wate	er I	324-Ap0072868	Х	X	Х	Х		Х	Х	х						
2	MW2	Apr 29, 2024		Wate	er I	324-Ap0072869	Х	X	Х	Х	Х		Х	х						
3	QA01	Apr 29, 2024		Wate	er I	324-Ap0072870					Х									
Test	Counts	· · · · ·				•	2	2	2	2	3	3	2	2						



Core Consultants Pty Ltd 18 Lysaght St Coolum Beach QLD 4573

Attention:

Cameron Kay

Report Project name Project ID Received Date **1091787-W** CONTAMINATION SITE ASSESSMENT - MACARTHUR AV HAMILTON J002388 Apr 29, 2024

Client Sample ID Sample Matrix Eurofins Sample No.			MW1 Water B24- Ap0072868	MW2 Water B24- Ap0072869	QA01 Water B24- Ap0072870
Date Sampled			Apr 29, 2024	Apr 29, 2024	Apr 29, 2024
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM	Fractions	0			
TRH C6-C9	0.02	ma/L	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1
втех					
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	91	98	108
Total Recoverable Hydrocarbons - 2013 NEPM	Fractions				
Naphthalene ^{N02}	0.01	mg/L	< 0.01	< 0.01	< 0.01
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	< 0.02	< 0.02
Total Recoverable Hydrocarbons - 2013 NEPM	Fractions				
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1	< 0.1
Chloride	1	mg/L	13000	15000	-
Sulphate (as SO4)	5	mg/L	24	28	-
Alkalinity (speciated)		1			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	3000	3200	-
Carbonate Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	-
Total Alkalinity (as CaCO3)	20	mg/L	3000	3200	-





Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.



Client Sample ID Sample Matrix			MW1 Water	MW2 Water	QA01 Water
Eurofins Sample No.			B24- Ap0072868	B24- Ap0072869	B24- Ap0072870
Date Sampled			Apr 29, 2024	Apr 29, 2024	Apr 29, 2024
Test/Reference	LOR	Unit			
Heavy Metals					
Aluminium	0.05	mg/L	1.9	240	-
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	-
Arsenic (filtered)	0.001	mg/L	0.007	0.008	0.009
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	0.001	0.001	0.002
Copper (filtered)	0.001	mg/L	0.002	< 0.001	0.002
Iron	0.05	mg/L	6.0	460	-
Iron (filtered)	0.05	mg/L	0.78	0.47	-
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	0.0002	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.006	0.002	0.002
Zinc (filtered)	0.005	mg/L	0.032	< 0.005	< 0.005
Eurofins Suite B11C: Na/K/Ca/Mg					
Calcium	0.5	mg/L	230	280	-
Magnesium	0.5	mg/L	690	1100	-
Potassium	0.5	mg/L	190	260	-
Sodium	0.5	mg/L	7700	9600	-



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Eurofins Suite B6 (filtered metals)			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Apr 30, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Apr 30, 2024	14 Days
- Method: LTM-ORG-2010 BTEX and Volatile TRH			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 30, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 30, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8 filtered	Brisbane	Apr 30, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11E: CI/SO4/Alkalinity			
Chloride	Brisbane	Apr 30, 2024	28 Day
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO4)	Brisbane	Apr 30, 2024	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Brisbane	Apr 30, 2024	14 Day
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Heavy Metals	Brisbane	Apr 30, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Brisbane	Apr 30, 2024	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11C: Na/K/Ca/Mg	Brisbane	Apr 30, 2024	180 Day
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

	_	Ltd							Eurofi	ns ARL Pt	ty Ltd Eurofins ProMicro	Pty Ltd E	/ Ltd Eurofins Environment Testing NZ Ltd						
	eurofine	ABN: 50 005	ABN: 50 005 085 521									ABN: 91	05 0159 89	ABN: 47 009 120 549	N	ZBN: 9429046024	4954		
web: w email: E	ww.eurofins.com.au EnviroSales@eurofins.con	Melbourne 6 Monterey R Dandenong S VIC 3175 +61 3 8564 5 m NATA# 1261 Site# 1254	Melbourne Geelong Sydney Canberra 6 Monterey Road 19/8 Lewalan Street 179 Magowar Road Unit 1,2 Dacre Street Dandenong South Grovedale Girraween Mitchell VIC 3175 VIC 3216 NSW 2145 ACT 2911 +61 3 8564 5000 +61 3 8564 5000 +61 2 9900 8400 +61 2 6113 8091 NATA# 1261 NATA# 1261 NATA# 1261 NATA# 1261 Site# 1254 Site# 25403 Site# 18217 Site# 25466					od Place 2 4600	Newcastle ce 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289		8 5289	Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370		Perth ProMicro d 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	A 3 7 4 + 1/	Auckland 55 O'Rorke Road Penrose, Auckland 1061 64 9 526 4551 ANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Roa Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402
Company Name: Core Consultants Pty Ltd Address: 18 Lysaght St Coolum Beach QLD 4573							O Ri Pi Fa	rder N eport hone: ax:	No.: #:	-	FR03 10917 07 54	787 75 590	00		Received: Due: Priority: Contact Name:		Apr 29, 2024 3:20 PM May 2, 2024 3 Day Cameron Kay		
Pro Pro	oject Name: oject ID:	CONTAMIN J002388	IATION SITE	ASSESSMENT	- MACARTHUR A	V HA	MILTO	NC						Euro	ofins Ana	lytical Serv	ices Manager : /	Alana Wadsw	vorth
Sample Detail						Aluminium	Aluminium (filtered)	Iron	Iron (filtered)	Eurofins Suite B6 (filtered metals)	Eurofins Suite B6 (filtered metals)	Eurofins Suite B11E: Cl/SO4/Alkalinity	Eurofins Suite B11C: Na/K/Ca/Mg						
Melt	bourne Laborator	ry - NATA # 12	261 Site # 12	254						Х	Х								
Bris	Brisbane Laboratory - NATA # 1261 Site # 20794						х	Х	х	х	Х	х	x						
Exte	ernal Laboratory																		
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID														
1	MW1	Apr 29, 2024		Water	B24-Ap0072868	Х	Х	Х	х		Х	Х	x						
2	MW2	Apr 29, 2024		Water	B24-Ap0072869	Х	Х	Х	Х	Х		х	х						
3	QA01	Apr 29, 2024		Water	B24-Ap0072870					х									
Test	t Counts					2	2	2	2	3	3	2	2						


Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units		
mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
μg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

I Inite

••••••	
APHA	American Public Health Association
CEC	Cation Exchange Capacity
сос	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
твто	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 - 150%, VOC recoveries 50 - 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

- 1. Where a result is reported as 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 are not data from your samples.
- 3. 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.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. 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
Method Blank		1	1	T		
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	1					
TRH C6-C9	mg/L	< 0.02		0.02	Pass	
TRH C10-C14	mg/L	< 0.05		0.05	Pass	
TRH C15-C28	mg/L	< 0.1		0.1	Pass	
TRH C29-C36	mg/L	< 0.1		0.1	Pass	
Method Blank		1	I	I	1	
BTEX	1					
Benzene	mg/L	< 0.001		0.001	Pass	
Toluene	mg/L	< 0.001		0.001	Pass	
Ethylbenzene	mg/L	< 0.001		0.001	Pass	
m&p-Xylenes	mg/L	< 0.002		0.002	Pass	
o-Xylene	mg/L	< 0.001		0.001	Pass	
Xylenes - Total*	mg/L	< 0.003		0.003	Pass	
Method Blank		1	1	I		
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	1					
Naphthalene	mg/L	< 0.01		0.01	Pass	
TRH C6-C10	mg/L	< 0.02		0.02	Pass	
Method Blank		1	1	I		
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	1					
TRH >C10-C16	mg/L	< 0.05		0.05	Pass	
TRH >C16-C34	mg/L	< 0.1		0.1	Pass	
TRH >C34-C40	mg/L	< 0.1		0.1	Pass	
Method Blank		1	1	I		
Alkalinity (speciated)	1					
Total Alkalinity (as CaCO3)	mg/L	< 20		20	Pass	
Method Blank		1		1	-	
Heavy Metals						
Aluminium (filtered)	mg/L	< 0.05		0.05	Pass	
Arsenic (filtered)	mg/L	< 0.001		0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002		0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001		0.001	Pass	
Copper (filtered)	mg/L	< 0.001		0.001	Pass	
Iron (filtered)	mg/L	< 0.05		0.05	Pass	
Lead (filtered)	mg/L	< 0.001		0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001		0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001		0.001	Pass	
Zinc (filtered)	mg/L	< 0.005		0.005	Pass	
Method Blank		1	I I	T	-	
Heavy Metals						
Aluminium	mg/L	< 0.05		0.05	Pass	
Iron	mg/L	< 0.05		0.05	Pass	
Method Blank		1	I I	1	-	
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	mg/L	< 0.5		0.5	Pass	
Magnesium	mg/L	< 0.5		0.5	Pass	
Potassium	mg/L	< 0.5		0.5	Pass	
Sodium	mg/L	< 0.5		0.5	Pass	
LCS - % Recovery						
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	%	110		70-130	Pass	
TRH C10-C14	%	120		70-130	Pass	



Test			Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery				Т	1	1	r	
BTEX								
Benzene			%	113		70-130	Pass	
Toluene			%	110		70-130	Pass	
Ethylbenzene	Ethylbenzene			115		70-130	Pass	
m&p-Xylenes			%	111		70-130	Pass	
Xylenes - Total*			%	111		70-130	Pass	
LCS - % Recovery					r	1		
Total Recoverable Hydrocarbons -	2013 NEPM Fract	ions						
Naphthalene			%	123		70-130	Pass	
TRH C6-C10			%	111		70-130	Pass	
LCS - % Recovery					1 1	1	1	
Total Recoverable Hydrocarbons -	2013 NEPM Fracti	ions						
TRH >C10-C16			%	119		70-130	Pass	
LCS - % Recovery					1 1	1	1	
Chloride			%	104		70-130	Pass	
Sulphate (as SO4)			%	105		70-130	Pass	
LCS - % Recovery					r	1		
Alkalinity (speciated)								
Total Alkalinity (as CaCO3)			%	119		70-130	Pass	
LCS - % Recovery					r	1		
Heavy Metals								
Aluminium (filtered)			%	99		80-120	Pass	
Arsenic (filtered)			%	102		80-120	Pass	
Cadmium (filtered)			%	104		80-120	Pass	
Chromium (filtered)			%	97		80-120	Pass	
Copper (filtered)			%	94		80-120	Pass	
Iron (filtered)			%	99		80-120	Pass	
Lead (filtered)			%	96		80-120	Pass	
Mercury (filtered)			%	96		80-120	Pass	
Nickel (filtered)			%	97		80-120	Pass	
Zinc (filtered)			%	94		80-120	Pass	
LCS - % Recovery				1	1	1	r	
Heavy Metals								
Aluminium			%	96		80-120	Pass	
Iron			%	95		80-120	Pass	
LCS - % Recovery				-				
Eurofins Suite B11C: Na/K/Ca/Mg								
Calcium			%	100		80-120	Pass	
Magnesium			%	101		80-120	Pass	
Potassium			%	97		80-120	Pass	
Sodium			%	116		80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery				1	1	1		
Total Recoverable Hydrocarbons -	1999 NEPM Fract	ions		Result 1				
TRH C6-C9	M24-My0000680	NCP	%	96		70-130	Pass	
TRH C10-C14	M24-Ap0074925	NCP	%	88		70-130	Pass	
Spike - % Recovery					 			
BTEX	11			Result 1				
Benzene	M24-My0000680	NCP	%	104		70-130	Pass	
Toluene	M24-My0000680	NCP	%	99		70-130	Pass	
Ethylbenzene	M24-My0000680	NCP	%	107		70-130	Pass	
m&p-Xylenes	M24-My0000680	NCP	%	113		70-130	Pass	
o-Xylene	M24-My0000680	NCP	%	116		70-130	Pass	



Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Xylenes - Total*	M24-My0000680	NCP	%	114			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons -	2013 NEPM Fract	ions		Result 1					
Naphthalene	M24-My0000680	NCP	%	118			70-130	Pass	
TRH C6-C10	M24-My0000680	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons -	2013 NEPM Fract	ions		Result 1					
TRH >C10-C16	M24-Ap0074925	NCP	%	89			70-130	Pass	
Spike - % Recovery				1	1				
				Result 1					
Chloride	B24-Ap0058488	NCP	%	92			70-130	Pass	
Sulphate (as SO4)	B24-Ap0058488	NCP	%	110			70-130	Pass	
Spike - % Recovery				1	1				
Heavy Metals				Result 1					
Aluminium	B24-Ap0055722	NCP	%	99			75-125	Pass	
Aluminium (filtered)	B24-Ap0060362	NCP	%	98			75-125	Pass	
Arsenic (filtered)	B24-Ap0060362	NCP	%	97			75-125	Pass	
Cadmium (filtered)	B24-Ap0060362	NCP	%	100			75-125	Pass	
Chromium (filtered)	B24-Ap0060362	NCP	%	98			75-125	Pass	
Copper (filtered)	B24-Ap0060362	NCP	%	98			75-125	Pass	
Iron	B24-Ap0055722	NCP	%	98			75-125	Pass	
Iron (filtered)	B24-Ap0060362	NCP	%	99			75-125	Pass	
Lead (filtered)	B24-Ap0060362	NCP	%	97			75-125	Pass	
Mercury (filtered)	B24-Ap0060362	NCP	%	93			75-125	Pass	
Nickel (filtered)	B24-Ap0060362	NCP	%	98			75-125	Pass	
Zinc (filtered)	B24-Ap0060362	NCP	%	100			75-125	Pass	
Spike - % Recovery				I			1		
Eurofins Suite B11C: Na/K/Ca/Mg	Γ			Result 1					
Calcium	B24-Ap0055722	NCP	%	91			75-125	Pass	
Magnesium	B24-Ap0055722	NCP	%	94			75-125	Pass	
Potassium	B24-Ap0055722	NCP	%	93			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate				I					
Total Recoverable Hydrocarbons -	1999 NEPM Fract	ions		Result 1	Result 2	RPD			
TRH C6-C9	M24-Ap0076667	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	M24-Ap0074923	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	M24-Ap0074923	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M24-Ap0074923	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate				- · ·					
BTEX	MO.4. A. 0070007	NOD		Result 1	Result 2	RPD	0.001		
Benzene	M24-Ap0076667	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
	M24-Ap0076667	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	M24-Ap0076667	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	M24-Ap0076667	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
O-Xylene	M24-Ap0076667	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total"	M24-Ap0076667	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Tetel Decoverable Hydrocerbone	2012 NEDM Freed	lana		Deput 1	Deput 2				
Nanhthalene			ma/l			~1	30%	Page	
	M24-Ap0076667		mg/L			~1	20%	F dSS Doco	
Dunlicate	10124-Ap0070007	NCP	nig/L	< 0.02	< 0.02	< 1	30%	r a55	
Total Recoverable Hydrocarbons	2013 NEDM Erect	ione		Result 1	Result 2	RDD			
TRH \C10-C16	M24-An007/022	NCP	ma/l			~1	30%	Pass	
TRH \C16-C34	M24-An0074022	NCP	mg/L	< 0.05	< 0.05	~1	30%	i ass Pace	
TRH \C34-C40	M24-Ap0074923	NCP	ma/l			~1	30%	Pase	
	10127 Ap0014323		ing/∟	<u> </u>	< 0.1	~ 1	0070	1 433	



Duplicate									
	_			Result 1	Result 2	RPD			
Chloride	B24-Ap0058488	NCP	mg/L	40	40	<1	30%	Pass	
Sulphate (as SO4)	B24-Ap0058488	NCP	mg/L	67	70	4.3	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	B24-Ap0059220	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Carbonate Alkalinity (as CaCO3)	B24-Ap0059220	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	B24-Ap0059220	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	B24-Ap0059220	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	B24-Ap0055741	NCP	mg/L	0.12	0.13	5.0	30%	Pass	
Aluminium (filtered)	B24-Ap0060361	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic (filtered)	B24-Ap0060361	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	B24-Ap0060361	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	B24-Ap0060361	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	B24-Ap0060361	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iron	B24-Ap0055741	NCP	mg/L	0.96	1.0	5.2	30%	Pass	
Iron (filtered)	B24-Ap0060361	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Lead (filtered)	B24-Ap0060361	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	B24-Ap0060361	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	B24-Ap0060361	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	B24-Ap0060361	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	B24-Ap0055741	NCP	mg/L	7.3	7.4	1.4	30%	Pass	
Magnesium	B24-Ap0055741	NCP	mg/L	9.2	9.6	4.9	30%	Pass	
Potassium	B24-Ap0055741	NCP	mg/L	8.3	8.6	4.1	30%	Pass	
Sodium	B24-Ap0051459	NCP	mg/L	10000	9000	12	30%	Pass	



Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	No
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code Description

N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.

F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised by:

Emily ONeill Jonathon Angell Jonathon Angell Joseph Edouard Joseph Edouard

Glenn Jackson Managing Director

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.

Analytical Services Manager

Senior Analyst-Inorganic

Senior Analyst-Metal

Senior Analyst-Organic

Senior Analyst-Volatile

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COre consultants <u>FALLING HEAD PERMEABILITY TEST</u>

clarity • commitment • passion

Client	BHC	Bore No	BH1/MW1
Project	Proposed Unit Development	Test Date	April 24, 2024
Location	MacArthur Avenue, Hamilton	Project No.	J002388
Tested by	EA	Checked	
Remarks			

				_
Depth of borehole (H)	4.00	m	(measured from ground surface)	
Depth to bottom of seal (Hb)	4.00	m	(measured from ground surface)	1
Test section length (L)	3.0	m		
Diameter of pipe (D _p)	0.05	m	Note **:	
Diameter of test section (D _h)	0.10	m	1. $d = D_p$ or D_h if no gravel pack	
Dia. of water surface (d)**	0.069	m		
Static depth to gw (h _s) (tos)	4.00	m		
Depth of water in screen (Ls)	3.00	m	if water surface is within gravel	
Bore inclination	0	0	pack	
Stickup of pipe (s)	0.40	m	1	



where

t*, y*, $t_1 = 0$, $y_1 = 1$ define slope of a straight line fitted to the observations

$t_1(min) =$	5.00	t*(min) =	25.00
$y_1(m) =$	2.12	y*(m) =	4.424
K =	5.0E-07	m/sec	

i = 1, 2, 3,n

		Depth to	Diff. in	y =
i	Time	water	water levels	h _s - h _i
	t	h _i	h _S - h _i	h _s - h ₁
	(min)	(m)	(m)	
1	0.00	37	33.000	1.000
2	0.08	40	36.000	1.091
3	0.17	44	40.000	1.212
4	0.25	44	40.000	1.212
5	0.33	45	41.000	1.242
6	0.58	46	42.000	1.273
7	0.67	48	44.000	1.333
8	0.83	49	45.000	1.364
9	1.00	51	47.000	1.424
10	2.00	59	55.000	1.667
11	3.00	65	61.000	1.848
12	4.00	70	66.000	2.000
13	5.00	74	70.000	2.121
14	10.00	87	83.000	2.515
15	15.00	98	94.000	2.848
16	25.00	150	146.000	4.424
17	30.00	220	216.000	6.545
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Client	BHC	Bore No	BH5/MW2
Project	Proposed Unit Development	Test Date	April 24, 2024
Location	MacArthur Avenue, Hamilton	Project No.	J002388
Tested by	EA	Checked	
Remarks			

Depth of borehole (H)	4.00 m	(measured from ground surface)
Depth to bottom of seal (Hb)	4.00 m	(measured from ground surface)
Test section length (L)	3.0 m	
Diameter of pipe (D _p)	0.05 m	Note **:
Diameter of test section (D _h)	0.10 m	1. $d = D_p$ or D_h if no gravel pack
Dia. of water surface (d)**	0.069 m	
Static depth to gw (h _s) (tos)	4.00 m	
Depth of water in screen (Ls)	3.00 m	if water surface is within gravel
Bore inclination	0 °	pack
Stickup of pipe (s)	0.40 m	



where $t^*, y^*, t_1 = 0, y_1 = 1$ define slope of a straight line fitted to the observations

$t_1(min) =$	15.00	t*(min) =	30.00	
$y_1(m) =$	6.17	y*(m) =	7.278	
K = 1.5E-07 m/sec				

i = 1, 2, 3,n

		Depth to	Diff. in	y =
i	Time	water	water levels	<u>h</u> _S - h _i
	t	h _i	h _s - h _i	h _S - h ₁
	(min)	(m)	(m)	
1	0	22	18.000	1.000
2	0.833	30	26.000	1.444
3	0.17	30	26.000	1.444
4	0.33	40	36.000	2.000
5	0.42	40	36.000	2.000
6	0.75	50	46.000	2.556
7	1.00	50	46.000	2.556
8	2.00	62	58.000	3.222
9	3.00	71	67.000	3.722
10	4.00	78	74.000	4.111
11	5.00	84	80.000	4.444
12	6.00	90	86.000	4.778
13	10.00	102	98.000	5.444
14	15.00	115	111.000	6.167
15	20.00	124	120.000	6.667
16	25.00	131	127.000	7.056
17	30.00	135	131.000	7.278
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Appendix G Limitations



LIMITATIONS

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