Sutherland Shire Council

Cronulla Town Centre Design Stage 2

Geotechnical Investigation and Waste Classification Report

August 2019

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1. Introduction

1.1 Background

Sutherland Shire Council (Council) is planning redevelopment of Cronulla Town Centre, NSW; and other nearby infrastructure and requires information on subsurface conditions including waste classification. The two sites that form part of this planned redevelopment is shown in Figure 1 and include:

- Site 1: Cronulla Mall, Plaza, and Street, extending from the Kingsway to Purley Place and shown on Test Location Plan sheets 1 to 5 (Appendix A); and
- Site 2: A future toilet and associated wastewater infrastructure in the area between Cronulla Street at Monro Park and Beach Park Avenue and shown on Test Location Plan sheet 6 (Appendix A).

Figure 1 Site locality plan

The planned redevelopment may require some excavation to facilitate aspects of the work. The location of proposed excavations is yet to be confirmed; however, excavations within Site 1 are expected to be undertaken predominantly within the northern extent of the mall and plaza area.

The scope of work was carried out in general accordance with GHD's proposal to Council (REF: *210921509-PRP-GE-001_Cronulla Town Centre Design Stage 2 Fee Proposal*, dated 24th May, 2019).

1.2 Objectives

1.2.1 Geotechnical investigation

The objectives of the geotechnical investigation were to:

- Present the collected ground information, including borehole logs, in-situ testing, and laboratory test results;
- Assess implications of the ground conditions on future construction work (i.e. pavement excavations, micro-tunnelling, etc.).

Further, Council requires detailed information with respect to the existing/historical pavement/road layers across the site as no as-built records of this previous construction are available.

1.2.2 Preliminary waste classification

The objective for waste classification was to assess this material for possible offsite disposal in accordance with NSW EPA (2014) Waste Classification Guidelines – Part 1: Classifying Waste.

1.3 Limitations

This report has been prepared by GHD for Sutherland Shire Council and *may only be used and relied on by Sutherland Shire Council for the purpose agreed between GHD and the Sutherland Shire Council as set out in section 1 of this report.*

GHD otherwise disclaims responsibility to any person other than Sutherland Shire Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 8 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Sutherland Shire Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report should also be read in conjunction with the General Notes included in Appendix B.

2. Scope of work

To meet the project objectives, the following scope of work was carried out:

- Review of published information (e.g. topographic, geological, Acid Sulfate Soil Risk maps).
- Drilling of 34 boreholes (Site 1: 30 and Site 2: four) at locations nominated by Council to depths between 0.35 m (BH32) and 1.76 m (BH13) below ground level, where hand auger refusal was encountered. A concrete corer was engaged to advance and recover encountered pavement slabs throughout the majority of the site. The boreholes were subsequently advanced using a hand auger.
- Thirty-four Dynamic Cone Penetrometer (DCP) tests were carried out within each borehole location subsequent to the pavement coring to assist with assessment of in-situ material strength, to target depths of 2.0 m below ground level or prior refusal.
- Logging of subsurface conditions noting the extent of fill, groundwater inflows and any obvious evidence of potential contamination.
- Screening of soils using a Photoionisation Detector (PID) for the presence of Volatile Organic Compounds (VOCs).
- Geotechnical laboratory testing included:
  - Five samples for moisture content; Atterberg limits and soil aggressivity (EC, pH, resistivity, SO4-, Cl-);
- Laboratory analysis of selected soil samples for waste classification included:
  - 14 samples representing fill material for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), organophosphorus pesticides (OPP), asbestos and heavy metals.
  - Six samples for leachability testing using TCLP for chromium, nickel and benzo(a)pyrene to assist with assessing waste classification.
- QA/QC samples: two duplicate soil samples and one rinsate sample collected from the hand auger.
- Preparation of this report summarising results of fieldwork, presenting and interpreting analytical results and findings, comparing chemical concentrations to applicable assessment criteria and making conclusions and recommendations with respect to the objectives outlined in Section 1.2.

3. Desktop review

3.1 Existing land use

Council indicated that Cronulla Mall (the pedestrian-only portion of Cronulla Street from Kingsway to Purley Place) was constructed in 1988 overtop the existing road and footpath. The construction was believed to consist of concrete of varying depths with a tile finish, with new services installed under or trenched within the overlying concrete pavement slab.

The existing land use of the sites are broadly described below.

Site 1: Cronulla Street Mall, is occupied by several retail shops and commercial businesses. A dry cleaners business operates out of Shop 24.

Site 2: Monro Park and Beach Park Avenue consists of a relatively flat grassy recreational park and tiled pedestrian footpath gently falling to the east, respectively.

3.2 Topography and drainage

Reference to NSW Globe by the New South Wales Government indicates that the site is at an elevation between 10 m and 12 m above Australian Height Datum (AHD).

Site 1 is near level with surface levels adjusted to direct surface water runoff into stormwater drains throughout the site.

Site 2 generally falls gently to the east, and surface water runoff is expected to flow in this direction with some flow captured by the stormwater drains where paved surfaces are present. In unpaved areas, notably Monro Park, surface water is likely to infiltrate the ground surface.

3.3 Acid Sulfate Soils

With reference to the NSW Government Sharing and Enabling Environmental Data (SEED) website, there is no known occurrence of Acid Sulfate Soils (ASS) at the sites (aqua shading). Low risk ASS (yellow shading) is mapped approximately 150 m north east of Site 1; and high risk ASS (red shading) is mapped approximately 140 m west of Site 2.

Figure 1: Acid Sulfate Soil risk map

3.4 Local geology

The regional geology is described in the 1:100,000 Wollongong – Port Hacking Geological Map Sheet 9029-9129 (1985), which indicates that the site is located within the Hawkesbury Sandstone unit and typically comprises shallow surficial residual soil and underlying Hawkesbury Sandstone for the project area.

Hawkesbury Sandstone has been described as a variably weathered grey medium to coarse-grained quartz sandstone with minor shale and laminite lenses.

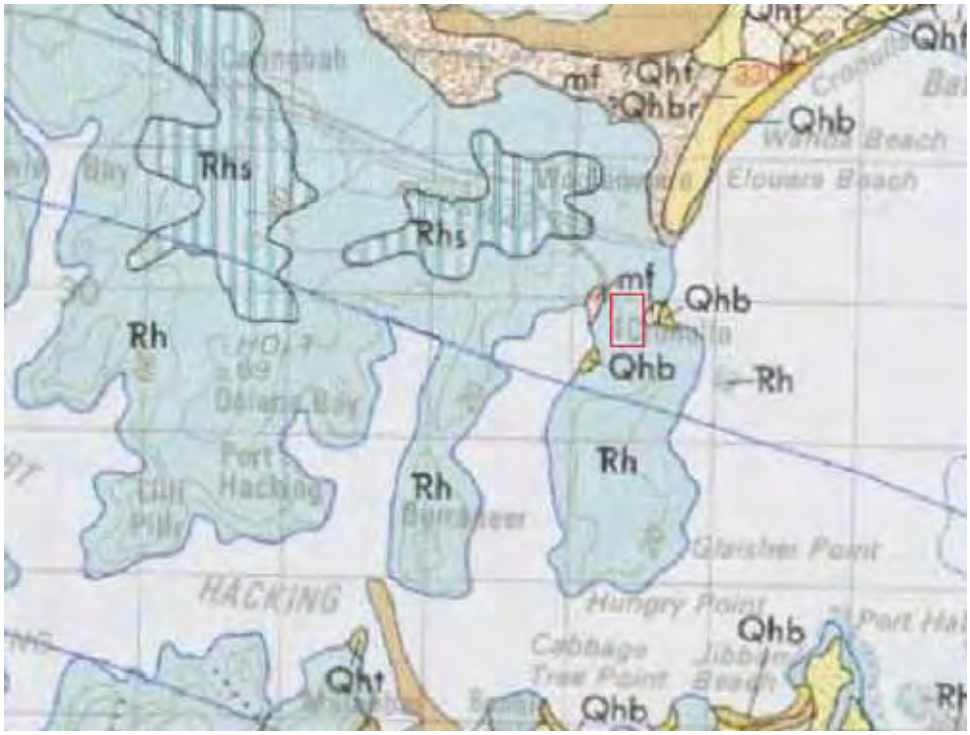

Figure 2: Regional geology of Cronulla, NSW

4. Assessment criteria

Waste classification of site soils was undertaken in general accordance with the six step procedure for classifying waste as detailed in the Waste Classification Guidelines - Part 1: Classifying Waste (NSW EPA (2014)).

Waste classification criteria adopted for this assessment are listed in Table LR1 in Appendix G.

5. Field investigation

5.1 Initial site visit

A site visit was undertaken on 13th May 2019 by members of Council's project delivery team and a Principal Engineering Geologist from GHD. During the site visit, borehole locations were nominated by Council and community engagement strategies were reviewed.

During service location, four boreholes (BH08, BH18, BH19, BH27) were cancelled due to proximity to nearby services and/or local shops and businesses.

5.2 Site observations

Fieldwork was undertaken between 2nd and 8th July 2019. Surrounding landscapes and site features are summarised below. Photos 1 and 2 below show the typical landscape around the investigation area.

5.2.1 Site 1 – Cronulla Plaza and Mall

Site 1 comprises a central plaza and mall. The plaza area comprises a tiled pedestrian footpath and contains a central auditorium, toilet facilities, children's playground, and the town clock.

The mall area comprises a tiled pedestrian footpath adjoined by cafés, restaurants, and other small commercial buildings to each side. At the southern end of the mall towards Purley Place, a bitumen-capped surface exists level with the rest of the pedestrian footpath, the footprint of a former planned structure.

No rock outcrops were observed on site. Further, no evidence of contamination was observed on the ground surface and no contaminating activities were observed over the site. Typical views of Site 1 are presented in the photos below.

Photo 1 Typical Site 1 view: Cronulla Plaza near Kingsway looking northwest, with children's playground at centre-left.

Photo 2 Typical Site 1 view: Cronulla Street near Purley Place looking east.

5.2.2 Site 2 – Monro Park and Beach Park Avenue

Site 2 comprises a concrete pedestrian footpath along Cronulla Street, adjacent to Cronulla Station to the west, a tiled pedestrian footpath (Beach Park Avenue) sloping gently to the eastern waterfront, and Monro Park, a relatively flat grassy recreational park with several isolated mature trees.

Areas adjoining the site comprise cafés and commercial buildings along the western edge of Monro Park, which is itself delineated by shrubs. No rock outcrops were observed on site.

No evidence of contamination was observed on the ground surface and no contaminating activities were observed over the site. Typical views of Site 2 are presented in the photos below.

Photo 3. Typical Site 2 view: Monro Park looking east.

Photo 4. Typical Site 2 view: Beach Park Ave looking west.

5.3 Fieldwork

5.3.1 General

The subsurface investigation was carried out between 2 and 8 July 2019 and site works were managed by appropriately experienced GHD personnel, in accordance with GHD Standard Operating Procedures.

For Site 1, 30 boreholes, designated BH01 to BH34 (where BH08, BH18, BH19, BH27 were not drilled), were drilled to depths between 0.35 m (BH32) and 1.76 m (BH013).

For Site 2, four boreholes, designated BH01B to BH04B, were drilled to depths between 0.6 m (BH01B) and 0.7 m (BH02B).

DCP's were carried out at each location, prior to hand augering, to a maximum depth of 2 m below ground surface.

The encountered soil profiles were logged onsite in general accordance with AS1726-2017. The borehole log sheets, DCP testing results, and photographs of the recovered pavement slabs are presented in Appendix C and should be read in conjunction with the associated Standard Sheets, which explain the symbols used and the limitations of logging procedures.

The recovered disturbed soil samples were transported to GHD's NATA-accredited materials and geotechnical testing laboratory for further assessment and testing.

Soil samples selected for chemical analysis for waste classification purposes were transported to Eurfofins Pty Ltd (Eurofins) a NATA-accredited laboratory. A copy of the chain of custody record is included in Appendix E.

Test Location Plan, located in Appendix A, illustrates the locations of the testing undertaken.

5.3.2 Methodology

Concrete coring, drilling and in-situ testing with DCP

Boreholes were drilled using a suite of discrete manual tools to minimise public disturbance based on available access and adequate clearance from known and identified services.

Boreholes within paved areas were cored using a diatube corer until underlying subbase/subgrade material was encountered.

Dynamic Cone Penetrometer (DCP) testing was carried out subsequent to the coring through the underlying material to assess in-situ strength characteristics until probable refusal or target depths were achieved. The boreholes were then advanced using a hand-auger until practical refusal or target depths were achieved.

Upon completion, the boreholes were backfilled with the excavated spoil and subsequently reinstated using the recovered pavement slab.

Soil sampling for waste classification

Samples were also collected with the aid of a 100 mm hand auger. The hand auger was washed with a phosphate free detergent, rinsed with potable water followed by rinsing with distilled water between sampling locations. A new pair of nitrile gloves were used during sample collection.

Soil samples were generally collected immediately below the pavement, in the fill or at major changes in stratigraphy, or where evidence of odours or staining was noted. Clean 250 mL glass jars were filled with soil to the brim and immediately sealed with Teflon lined caps to lower the potential for loss of volatile contaminants. Samples were then labelled and placed directly into ice filled cooler boxes. A minimum of 50 g of soil was placed in zip lock bags for asbestos testing.

Soil samples for chemical analyses were collected in duplicate into zip-lock bags. The headspace above each sample was measured using a PhotoCheck Tiger PID fitted with a 10.6eV lamp and calibrated with isobutylene gas at a concentration of 100 ppm. A copy of the instruments calibration certificate is included in Appendix F. This instrument allows rapid, semi quantitative analysis of ionisable volatile organic compounds in the soil.

6. Quality assurance/quality control

In order to validate the accuracy and validity of soil sampling results, a range of field and laboratory quality control (QC) samples were collected and assessed during the investigation. This assessment is presented below.

6.1 Field quality control review

The following field quality control was undertaken:

- Sampling was performed by a qualified GHD professionals generally in accordance with the procedures outlined in GHD's Standard Operating Procedures (SOPs) which are based on industry accepted protocols for environmental sampling and are consistent with Schedule B(2) of the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999, amended 2013.
- The PID was calibrated in accordance with manufacturer's instructions. A copy of the calibration certificate is included in Appendix F.
- Intra-laboratory duplicate samples were as follows, which was consistent with Schedule B3 of the NEPM (2013):
  - QC1 (intra-laboratory duplicate) and corresponding primary sample was BH12/0.5-0.6 m.
  - QC2 (intra-laboratory duplicate) and corresponding primary sample was BH01/0.2-0.3 m.
- Duplicate results are presented in Table QAQC1 in Appendix G.
- One rinsate sample designated WB1, was collected from the hand auger and analysed to check the effectiveness of equipment decontamination. Results are presented in Table QAQC2 in Appendix G.
- One laboratory prepared trip spike and trip blank samples (one of each) were carried into the field and despatched to the laboratory for analysis of volatile contaminants to check the potential for cross contamination or loss of volatile contaminants during transport and sample preparation at the laboratory. Results are presented in Table QAQC2 in Appendix G.
- Samples (as designated on the chain of custody form) were transported in ice-cooled chests to Eurofins Pty Ltd (Eurofins). A copy of the chain of custody record is included in Appendix E.

6.2 Field and laboratory quality control sample results

GHD reviewed the laboratory reports and results of field quality control samples and makes the following comments on field and laboratory quality control:

6.2.1 Field

- Sample collection and handling: Satisfactory - carried out in general accordance with GHD standard operating procedures and experienced sampling team, where consistency was maintained with field staff. Samples were also received in good condition at the laboratory.
- Holding times: samples were received and analysed by the laboratory within recommended holdings times of 14 days. However, the TCLP analysis for PAH on sample BH29/0.3-0.45 was carried out 13 days outside of the recommended holding time. The laboratory was requested to perform a repeat analysis for PAH on this sample. The repeat results were similar to those reported within holding time, where RPDs were between 10% and 20% for Total PAH and Benzo(a)Pyrene, respectively. Based on this result, it is considered that the TCLP result for PAHs are representative to the soil conditions at the time of sampling.
- Sample preservation: Appropriate laboratory supplied sample containers were used. The samples were received at the laboratory slightly above the recommended 6ºC, despite ice present in the eskies upon receipt to the laboratory. However, this does not appear to have affected results, as reported concentrations of volatile and semi-volatile contaminants were consistent with field observations, PID results and considered representative of soil at the time of sampling. Additionally, trip blank results were within control limits suggesting no acceptable loss of volatile contaminants during sampling or transportation to the laboratory.
- Laboratory reporting limits (LOR): All LORs were below adopted assessment criteria.
- Field quality control sample results:
  - Intra-laboratory duplicates: Higher RPD results, which exceeded the adopted RPD control limits of 30%, were recorded for arsenic, chromium and zinc in duplicate samples QC2, which correspond to primary sample BH12/0.5-0.6 m. It is likely that the variability observed in arsenic, chromium and zinc concentrations for field duplicates is also caused by sample heterogeneity. Therefore, variability in some heavy metal concentrations can be expected. The variability is unlikely to affect the conclusions and recommendations with respect to this waste classification, as the reported maximum concentrations are at least one order of magnitude lower than the General Solid Waste assessment criteria. Zinc concentrations reported the highest RPD but is not required to assess the waste classification of soil.
  - Rinsate: A zinc concentration of 0.006 mg/L was reported in the rinsate sample. The concentration was close to the laboratory reporting limit of 0.005 mg/L. The potential for cross contamination to have occurred is considered unlikely because the hand auger was decontaminated between each location by brushing clean within a Decon 90 solution, then rinsed with potable water and deionised water. This is consistent with Schedule B2 of the ASC NEPM (2013). This result is not considered to material affect the conclusions of this report, as zinc is not used to in the assessment of waste classification.
  - Trip blank: TRH and BTEX concentrations were reported below the laboratory detection limit.
  - Trip spike: The laboratory indicated that the trip spike was inadvertently spiked to a lower concentration and therefore unable to report the result as a percentage of the original spike.

6.2.2 Laboratory

- Laboratory quality control samples:
  - Blanks: Satisfactory – all results were within laboratory acceptance criteria.
  - Duplicates: Satisfactory – all results were within laboratory acceptance criteria.
  - Laboratory control spikes: Satisfactory – all results were within adopted acceptance criteria.
  - Matrix spikes: Satisfactory – all results were within adopted acceptance criteria.
  - Surrogates: Satisfactory – all results were within adopted acceptance criteria.

6.3 Data useability

GHD concluded that the overall analytical results are representative of the characteristics of materials sampled and suitable for the purposes of this waste classification assessment.

7. Results

7.1 Subsurface conditions

7.1.1 General

The encountered subsurface profile generally consisted of various layers of tiled or bitumen-capped pavement slabs underlain by variable fill (granular and probable reworked residual soils) subsequently underlain by native clay residual soil and probable Hawkesbury Sandstone bedrock (shallower to the south, based on DCP results).

The plaza area often consisted of an “isolated” pavement layer separated by fill (isolated upper and a lower pavement slabs) as well as at two distinct locations at the southern end of Cronulla Street (undertaken atop a bituminous capping –possibly a former decommissioned/covered structural base).

The central portion of the mall often consisted of a ‘double’ pavement layer consisting of two different pavement types separated by a polytheylene lining.

Otherwise generally only a ‘single’ or one upper pavement was encountered for the majority of the test locations.

Note that the wet weather conditions may have affected the observed moisture condition of the encountered subsurface materials.

The following sections, in conjunction with Table 1, below, presents a summary of the encountered subsurface conditions.

Table 1 Stratigraphic summary

Material / Borehole ID	Pavement (including tiling, concrete, etc.)		Topsoil / Fill		Residual soil		End of hole
	Depth (m bgl)	*Thickness (m)*	Depth (m bgl)	*Thickness (m)*	Depth (m bgl)	*Thickness (m)*	Depth (m bgl)
Section A: Cronulla Plaza and Cronulla St							
Axis 1							
BH01	0 – 0.14	*0.14*	0.14 – 0.42	*0.28*	0.42 – 1.70	*1.28*	1.70
BH02**	0 – 0.06 & 0.17 – 0.38	*0.06 & 0.21*	0.06 – 0.17 & 0.38 – 0.62*	*0.11 & 0.24*	0.62 – 0.81	*0.19*	0.81
BH03**	0 – 0.12 & 0.33 – 0.39	*0.12 & 0.05*	0.12 – 0.33 & 0.39 – 0.50	*0.21 & 0.11*	0.50 – 0.80	*0.30*	0.80
BH04	0 – 0.24	*0.24*	0.24 – 0.40	*0.16*	0.40 – 0.60	*0.20*	0.60
Axis 2							
BH05	0 – 0.25	*0.25*	0.25 – 0.90	*0.65*	0.90 – 1.20	*0.30*	1.20
BH06[D]	0 – 0.34	*0.34*	0.34 – 0.62	*0.28*	–	–	0.62
BH07[D]	0 – 0.34	*0.34*	0.34 – 0.60	*0.26*	0.60 – 0.90	*0.30*	0.90
Axis 3							
BH09	0 – 0.17	*0.17*	0.17 – 0.65	*0.48*	0.65 – 1.40	*0.75*	1.40
BH10[D]	0 – 0.34	*0.34*	0.34 – 0.50	*0.16*	0.50 – 0.73	*0.23*	0.73
BH11[D]	0 – 0.34	*0.34*	0.34 – 0.75	*0.41*	0.75 – 1.40	*0.65*	1.40
BH12	0 – 0.35	*0.35*	0.35 – 0.70	*0.35*	0.70 – 1.30	*0.60*	1.30
Axis 4							
BH13	0 – 0.17	*0.17*	0.17 – 0.55	*0.38*	0.55 – 1.76	*1.26*	1.76
BH14[D]	0 – 0.34	*0.34*	0.34 – 0.70	*0.36*	0.70 – 1.59	*0.89*	1.59
BH15[D]	0 – 0.32	*0.32*	0.32 – 0.45	*0.13*	0.45 – 0.85	*0.40*	0.85
BH16	0 – 0.25	*0.25*	0.25 – 0.40	*0.15*	0.40 – 1.45	*1.05*	1.45
Plaza							
BH17	–	–	0 – 0.45	*0.45*	0.45 – 0.98	*0.98*	0.98
BH20**	0 – 0.21	*0.21*	0.21 – 0.55	*0.34*	–	–	0.55
BH21	0 – 0.23	*0.23*	0.23 – 0.55	*0.32*	0.55 – 0.70	*0.15*	0.70
BH22	0 – 0.13	*0.13*	0.13 – 0.40	*0.27*	0.40 – 0.85	*0.45*	0.85
BH23	0 – 0.20	*0.20*	0.20 – 0.65	*0.45*	0.65 – 1.00	*0.35*	1.00
BH24	0 – 0.28	*0.28*	0.28 – 0.60	*0.32*	0.60 – 0.95	*0.35*	0.95
BH25	0 – 0.18	*0.18*	0.18 – 0.60	*0.42*	0.60 – 0.75	*0.15*	0.75
BH26	0 – 0.20	*0.20*	0.20 – 0.65	*0.45*	0.65 – 0.90	*0.25*	0.90
BH28**	0 – 0.31	*0.31*	0.31 – 0.50	*0.29*	–	–	0.50
BH29**	0 – 0.27	*0.27*	0.27 – 0.65	*0.28*	–	–	0.65
BH30**	0 – 0.16	*0.16*	0.16 – 0.45	*0.29*	–	–	0.45
BH31**	0 – 0.17 & 0.30 – 0.36	*0.17 & 0.06*	0.17 – 0.30	*0.13*	–	–	0.36
BH32**	0 – 0.22	*0.22*	0.22 – 0.35	*0.13*	–	–	0.35
BH33	0 – 0.21	*0.21*	0.21 – 0.85	*0.64*	0.85 – 1.10	*0.25*	1.10
BH34**	0 – 0.25	*0.25*	0.25 – 0.75	*0.50*	–	–	0.75
Section B: Monro Park and Beach Park Ave							
BH01-B	0 – 0.10	*0.10*	0.10 – 0.40	*0.30*	0.40 – 0.60	*0.20*	0.60
BH02-B	–	–	0.30 – 0.50	*0.20*	0.50 – 0.70	*0.20*	0.70
BH03-B	–	–	0.20 – 0.35	*0.15*	0.35 – 0.65	*0.20*	0.65
BH04-B	0 – 0.22	*0.22*	0.22 – 0.40	*0.18*	0.40 – 0.65	*0.25*	0.65

Notes:
– : Not encountered
* : Probable reworked/disturbed residual soil
[D]: Encountered/probable 'double pavement type (refer to Section 7.1.1)
**: Encountered/probable 'isolated' pavement type (refer to section 7.1.1)

7.1.2 Pavement

Pavement material

The encountered pavement consisted of various layers and materials, including:

- Tiling;
- Bedding layer (stabilised sand or general grout/cement mixture);
- Nominally mixed rounded to angular aggregate (5-20mm) reinforced concrete (underlain by orange polyethylene lining);
- Nominally mixed rounded aggregate (10-50mm) reinforced concrete (overlain by orange polyethylene lining);
- Nominally single-origin angular aggregate (5-10mm) concrete.

The above list is not exhaustive and described thusly for summary purposes. Reference should be made to the borehole logs and core photos (Appendix C) for further detail.

Overall, the encountered cored pavement concrete material was generally observed with few to no presence of voids and variable discolouration.

Pavement types

Further, for the purposes of this report, the pavement types have been categorised as follows:

- ‘Single’ pavement (e.g. comprising only one type of pavement);
- ‘Double’ pavement (e.g. comprising a mixed aggregate concrete directly underlain by a rounded aggregate concrete);
- ‘Isolated’ pavement e.g. comprising two layers of pavement separated by fill).

Refer to the annotated photographs of indicative typical pavement cores and cross sections provided in Figure 1 below:

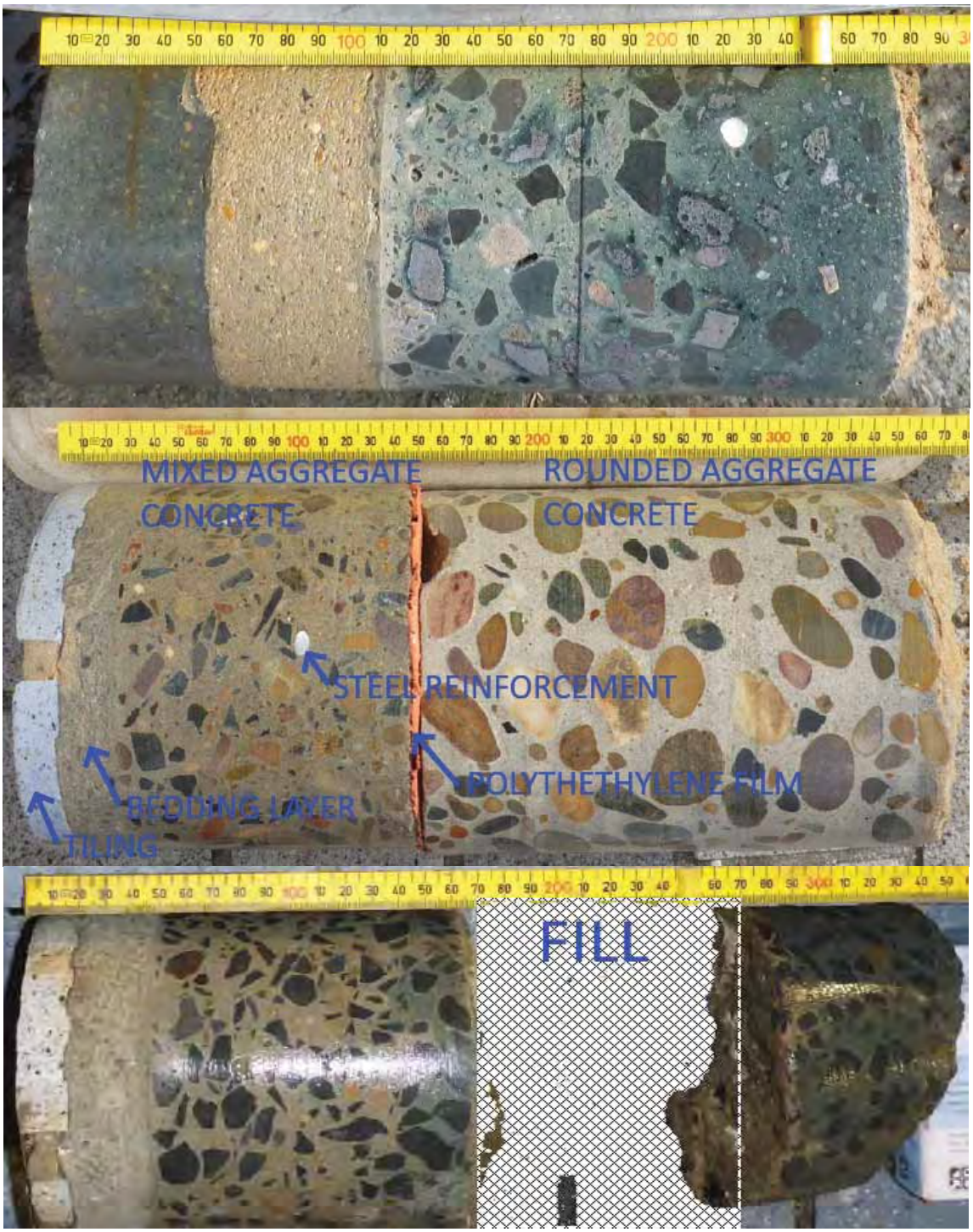

Figure 3 Indicative pavement core types

Top: 'Single' pavement type.

Middle: 'Double' pavement type.

Bottom: 'Isolated' pavement type.

7.1.3 Fill

The encountered fill was highly variable and ranged from either brown gravelly sand/sandy gravel or sandy/silty clay with gravel (possible reworked residual soil interface) with trace debris of medium dense to dense strength. Fill of variable type, consistency, and density with presence of debris is broadly considered as uncontrolled fill material.

7.1.4 Residual soil

The encountered residual soil was generally described as a low to high plasticity grey/brown mottled red-brown to orange clay with sand and gravel (ironstone) of firm to very stiff consistency.

7.1.5 Groundwater

Groundwater seepage was not observed during drilling of the boreholes.

7.1.6 Indicative cross sections

Using the above information for illustrative purposes, an indicative cross-section of the Cronulla Mall Strip is presented below.

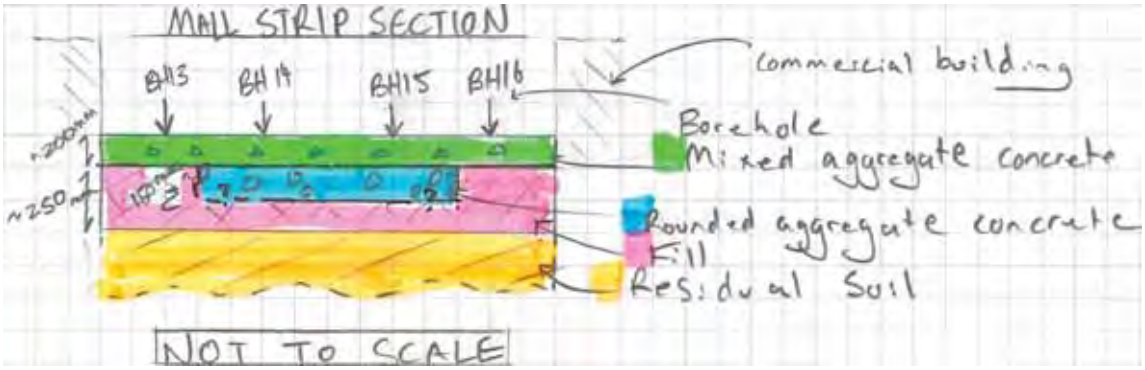

Figure 4 Indicative Mall Strip cross section with stratigraphy (Axes 2, 3, 4).

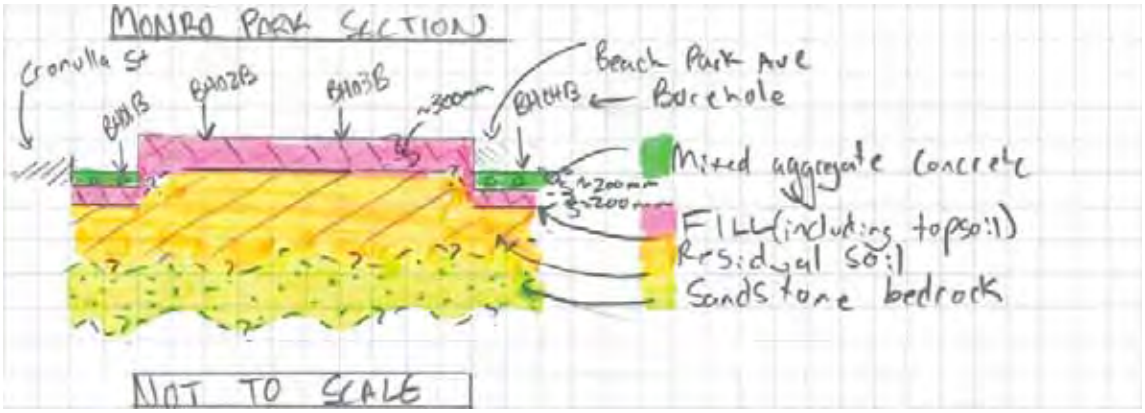

Figure 5 Indicative cross section of Monro Park and Beach Park Ave with stratigraphy (Site 2).

Note that the above sections are indicative only and reference should made to the detailed borehole logs and core photos following surveying of the site.

Due to the complexity of the plaza site and intersection with various structures (e.g. auditorium, toilet facilities) and pavement types ('single', 'double', and 'isolated' pavement types), an indicative cross section of Cronulla Plaza is not able to be provided at this preliminary stage.

7.2 Headspace screening results

Results of the soil vapour headspace measurements are presented on the test pit and borehole logs.

Soil samples screened recorded negligible readings ranging between 0.1 ppm and 0.6 ppm. This is generally consistent with field observations and the laboratory-tested soil samples. This indicates that significant volatile ionisable contamination was unlikely to be present in the samples screened.

7.3 Laboratory testing

Soil geotechnical classification and chemical laboratory testing for waste classification was undertaken on select soil samples recovered from the boreholes.

The samples were selected for analysis based on geological origin of the material, results of headspace screening and visual and olfactory observations so that samples appropriately represented materials requiring characterisation. For Site 1, the spatial distribution of samples selected for analysis was biased towards the northern part of the site, as excavation and potential generation of surplus soil was more likely to occur within this area of the site.

A dry cleaners business operates out of Shop 24. Borehole location BH16 was positioned approximately 1 m south of the dry cleaner shop. No apparent evidence of contamination such as odours or staining was observed at the time of sampling at BH16. A deeper sample was selected for analysis because the pavement would potentially reduce top-down migration of chemicals, if present.

An indistinct odour was noted at BH12 at 0.35 m. A sample from this depth was analysed for volatile and semi-volatiles analytes.

The geotechnical test results and chemical laboratory reports are presented in Appendix D and Appendix E, respectively.

A summary of the geotechnical laboratory testing and waste classification results are presented in the following sections.

7.3.1 Geotechnical laboratory testing

Table 2 Summary of geotechnical laboratory testing results

Borehole ID	Sample depth (m)	Moisture Content (MC) (%)	Plastic limit (PL) (%)	Plasticity Index (PI) (%)	Liquid limit (LL) (%)	USCS Classification	Electrical Conductivity (EC) (uS)	pH	Sulfate ($SO4^{2-}$)	Chloride (Cl^{-})
BH03	0.60 – 0.70	23.6	32	37	69	CH	58	6.0	66	20
BH10	0.50 – 0.70	10.5	16	19	35	CI	–	–	–	–
BH22	0.65 – 0.80	17.6	26	33	59	CH	110	6.3	160	20
BH33	1.00 – 1.10	21.0	33	45	78	CH	–	–	–	–
BH02-B	0.50 – 0.70	18.7	20	27	47	CI	65	6.6	35	46
Notes: – : Not tested										

7.3.2 Analytical results for waste classification

The laboratory results for this assessment are summarised in Table LR1 (Appendix G) and laboratory reports are included in Appendix E. GHD followed the six-step process described in Part 1 of the guidelines for assessing the classification of the soil to be excavated. Photos 5 to 9 show the material observed in borehole that forms part of this waste classification. According to the waste classification procedure:

- **Step 1 – Is the waste special waste?** No.
- **Step 2 – Is the waste liquid waste?** The material assessed is not a 'liquid waste' in its current form. The material should it require off-site disposal will be soil and capable of being picked up by a spade or shovel. This may need to be reassessed at the time of excavation, particularly following significant rainfall events.
- **Step 3 – Is the waste pre-classified?** Asphalt and concrete pre-classify as General Solid Waste (non-putrescible). The underlying material does not pre-classify.
- **Step 4 – Does the waste possess hazardous characteristics?** The material does not possess hazardous characteristics based on the site history, observations and chemical testing as defined under the Australian Code for the Transport of Dangerous Goods by Road and Rail.
- **Step 5 - Determining a waste's classification using chemical assessment:** The waste has been assessed using chemical analysis. The laboratory analytical results for soil are summarised in Table LR1 (Appendix G). The following comments are made with respect to the waste classification criteria for both fill and natural materials:
  - Specific contaminant concentrations were generally below the CT1 criteria, with the exception of nickel, chromium and benzo(a)pyrene BH01, BH05, BH26, BH28, BH29 and/or BH34. These concentrations were below the SCC1 criteria. Further assessment using the toxicity characteristic leachability procedure (TCLP) confirmed that leachable concentrations were below the TCLP1 criteria.
  - Remaining COPC concentrations did not exceed CT1 criteria.
  - No asbestos was observed during field works or from laboratory analysis
- **Step 6 - Is the waste putrescible or non-putrescible?** The material consisted predominantly of soil and thus is deemed to be non-putrescible. NSW EPA (2014) notes that materials that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials. Based on observations by GHD, the material is considered to be non-putrescible.

Photo 5 Silty gravel encountered at borehole BH26 between 0.20 m and 0.65 m (2/7/2019).

Photo 6 Gravelly sand fill material encountered at borehole BH32 between 0.22 m and 0.35 m (2/7/2019).

Photo 7 Subsurface conditions encountered at borehole BH12 between 0.16 m (grey on right) and 1.3 m (clay on left). Sample collected for this waste classification represented soil within the yellow outline (3/7/2019).

Photo 8 Gravelly sand fill at BH29 between 0.27 m and 0.65 m (2/7/2019).

8. Discussion and recommendations

8.1 Geotechnical investigation

8.1.1 General

The following engineering discussion is made with respect to the interpreted ground conditions as described above and our understanding of the nature of the proposed works during the preparation of this report.

Further works

It is understood that the Cronulla Mall and Plaza has undergone several episodes of upgrades/construction and that potential future works within the project area may broadly involve:

- Site 1: Pavement excavation/stripping and relocation of existing services in the Cronulla Mall area;
- Site 2: Construction of new toilet facilities at Monro Park and associated wastewater infrastructure bypass to Beach Park Ave through trenchless technology.

8.1.2 Temporary excavations/pavement stripping

It is envisaged that the proposed upgrade works at Cronulla Mall would comprise temporary excavations to relatively shallow depths or pavement stripping using cutting saws (e.g. where the pavement is able to be cut through and delaminated) and/or pneumatic drills/hammers, depending on construction methodology.

Based on the encountered subsurface profile, it is expected that the shallow excavations will primarily be undertaken through pavement, fill or firm to stiff residual soils, depending on location.

These conditions are likely to vary from one location to another, depending on the pavement profile as described above (e.g. multiple vs single pavements of varying thicknesses).

8.1.3 Trenchless construction

It is understood that Council plan to construct new toilet facilities and associated wastewater infrastructure between the northwestern corner of Monro Park and Beach Park Avenue.

It is envisaged that this process, depending on the specific methods adopted, will require the excavation of launch pits at the start of the micro-tunnelled sections, of a suitable size to contain the drill equipment, casing and pipe lengths, excavated spoil removal, sump pumping equipment and personnel. Similarly, recovery pits will need to be excavated at the end of the micro-tunnelled sections in order to recover the equipment.

Temporary support systems will be necessary at selected sections of the pipeline route (e.g. for the launch and recovery pits) depending on the subsurface conditions encountered at these sites and the excavation depth and configuration (use of benching or batter slopes). It is envisaged that a thrust block would be installed to provide a vertical surface suitable for reaction for the micro-tunnelling and/or pipe-jacking. Installation of temporary shaft or pit support (e.g. shoring) may also be required, depending on the excavation method and depth required.

Based on the expected ground conditions along the potential alignment (from the northwestern corner of Monro Park to Beach Park Avenue), it is expected that the micro-tunnel will be advanced primarily through sandstone bedrock and//or residual soils, and will require suitable micro-tunnelling techniques within the encountered subsurface strata.

It is recommended than an experienced geotechnical engineer assess the excavation conditions as temporary works progress, consistent with current NSW SafeWork requirements.

8.1.4 Groundwater considerations

As described in Section 7.1.5, groundwater was not observed during the investigation. However, drainage conditions during excavation may be different from those encountered during discrete drilling beneath the pavement.

However unlikely, it may be possible that groundwater is encountered during future excavation works and contingency for allowance for groundwater management (e.g. pumping) should be provided during construction as a precaution.

8.1.5 Durability of buried structures

Based on the chemical laboratory test results for soil aggressivity of the residual soil samples, the exposure classification as given for the portion of the concrete structures in contact with soil, according to Table 6.4.2(C) of Australian Standard AS 2159, was assessed to be “Non-aggressive”. However, a classification of “Mild” is recommended, to account for the limited testing undertaken and the potential for the exposure to change over the design life of the proposed structures due to changing land uses.

Further to the above, the strength and cover to reinforcement requirements for precast and cast in-situ concrete structures with “Non-aggressive” and “Mild” exposure classifications, recreated from Table 6.4.3 of Australian Standard AS 2159 – 2009 are given below:

Table 3 Strength and cover requirements for aggressive soils

Exposure classification	Minimum concrete strength (f’c) (MPa)	Minimum cover to reinforcement (mm)			
		50 year design life (Pre Cast)	100 year design life (Pre Cast)	50 year design life (Cast in-situ)	100 year design life (Cast in-situ)
Non-aggressive	50	20	25	45	65
Mild	50	20	30	60	75

8.2 Waste classification

The soils sampled from the test locations are indicative of a General Solid Waste (non-putrescible) classification in accordance with the NSW EPA (2014) Waste Classification Guidelines, Part 1 – Classifying Waste.

The client and nominated contractors should also note the following:

- The waste classification does not apply to any materials not represented by the samples tested in this report. Different material types will require additional testing.
- The waste classification was based on limited data, which better represented the northern area of Site 1. Should the planned excavation areas or depths change from the northern part of Site 1, further waste classification is recommended at the time of excavation.
- All waste must be disposed off-site to an appropriately licenced waste facility and prior approval sought from this facility before transporting offsite. Depending on the facility, the client should allow up to seven days for this approval process.
- All waste disposal dockets must be retained.

9. References

Geological Survey of NSW (1985) Wollongong-Port Hacking 1:100,000 Geological Series Sheet, First edition, Department of Mines, Sydney.

NSW EPA (2014) Waste Classification Guidelines - Part 1: Classifying Waste.

Appendices

Appendix A – Figures

Legend

Geotechnical Test Locations (indicative)
- A Borehole
- @ Borehole (cancelled)
- Sheet Index

Contours (1m)
Cadastre
Railway

Underground Utilities (OneSearch 29/04/2019)
- S Sewer
- C Communications
- S Electricity
- W Water
- G Gas
- D Stormwater
- RMS Roads (RMS)
- U Unclassified
- S (DBYD DBYD Sewer
- C (DBYD DBYD Communications
- E (DBYD DBYD Electricity
- W (DBYD DBYD Water
- G (DBYD DBYD Gas
- D (DBYD DBYD Stormwater
- EOT End of Trace

Paper Size ISO A3
0 3 6 9 12
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

O

GHD

Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 1 – Cronulla Mall (Plaza)

Project No. 21-28380
Revision No. B
Date 08 Aug 2019

Figure 1

G:\21\28380\GIS\Maps\Deliverables\21_28380_Z001_Cronulla_GeotechnicalTestLocationPlan.mxd
Print date: 08 Aug 2019 - 12:07

Data source: Background Image - Sutherland Shire Council, Geosurv, OneSearch (Survey Showing Underground Services: Cronulla Town Centre Area 1; 31 May 2019). General Topo - Sixmaps 2018 (Extracted: 12 July 2019). © Department of Finance, Services & Innovation 2017. Created by: kqvelasco

Legend

Geotechnical Test Locations (indicative)
A Borehole
Sheet Index
Contours (1m)
Cadastre
Railway

Underground Utilities (OneSearch 29/04/2019)
S Sewer
C Communications
S Electricity
W Water
G Gas
D Stormwater
RMS Roads (RMS)
U Unclassified
S (DBYD) DBYD Sewer
C (DBYD) DBYD Communications
E (DBYD) DBYD Electricity
W (DBYD) DBYD Water
G (DBYD) DBYD Gas
D (DBYD) DBYD Stormwater
EOT End of Trace

Paper Size ISO A3
0 2.5 5 7.5 10
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

O

GHD

Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 2 – Cronulla Mall (Axis 1)

Project No. 21-28380
Revision No. B
Date 07 Aug 2019

Figure 2

G:\21\28380\GIS\Maps\Deliverables\21_28380_2001_Cronulla_Geotechnical_TestLocationPlan.mxd
Print date: 07 Aug 2019 - 14:08

Legend

Geotechnical Test Locations (indicative)
A Borehole
Sheet Index
Contours (1m)
Cadastre
Railway

Underground Utilities (OneSearch 29/04/2019)
S Sewer
C Communications
S Electricity
W Water
G Gas
D Stormwater
RMS Roads (RMS)
U Unclassified
S (DBYD) DBYD Sewer
C (DBYD) DBYD Communications
E (DBYD) DBYD Electricity
W (DBYD) DBYD Water
G (DBYD) DBYD Gas
D (DBYD) DBYD Stormwater
EOT End of Trace

Paper Size ISO A3
0 2 4 6 8
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

O

GHD

Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 3 – Cronulla Mall (Axis 2)

Project No. 21-28380
Revision No. B
Date 07 Aug 2019

Figure 3

G:\21\28380\GIS\Maps\Deliverables\21_28380_2001_Cronulla_Geotechnical_TestLocationPlan.mxd
Print date: 07 Aug 2019 - 14:09

Data source: Background Image - Sutherland Shire Council, Geosurv, OneSearch (Survey Showing Underground Services: Cronula Town Centre Area 1; 31 May 2019). General Topo - Sixmaps 2018 (Extracted: 12 July 2019). © Department of Finance, Services & Innovation 2017. Created by: kqvelasco

Legend

Geotechnical Test Locations (indicative)
- A Borehole
- @ Borehole (cancelled)
- Sheet Index
- Contours (1m)
- Cadastre
- Railway

Underground Utilities (OneSearch 29/04/2019)
- S Sewer
- C Communications
- S Electricity
- W Water
- G Gas
- D Stormwater
- RMS Roads (RMS)
- U Unclassified
- S (DBYD) DBYD Sewer
- C (DBYD) DBYD Communications
- E (DBYD) DBYD Electricity
- W (DBYD) DBYD Water
- G (DBYD) DBYD Gas
- D (DBYD) DBYD Stormwater
- EOT End of Trace

Paper Size ISO A3

0 2 4 6 8

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

0

Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 4 – Cronulla Mall (Axis 3)

Project No. 21-28380
Revision No. B
Date 07 Aug 2019

Figure 4

G:\21\28380\GIS\Maps\Deliverables\21_28380_2001_Cronulla_Geotechnical_TestLocationPlan.mxd
Print date: 07 Aug 2019 - 14:10

Legend

Geotechnical Test Locations (indicative)
A Borehole
Sheet Index
Contours (1m)
Cadastre
Railway

Underground Utilities (OneSearch 29/04/2019)
S Sewer
C Communications
S Electricity
W Water
G Gas
D Stormwater
RMS Roads (RMS)
U Unclassified
S (DBYD) DBYD Sewer
C (DBYD) DBYD Communications
E (DBYD) DBYD Electricity
W (DBYD) DBYD Water
G (DBYD) DBYD Gas
D (DBYD) DBYD Stormwater
EOT End of Trace

Paper Size ISO A3
0 1.5 3 4.5 6
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 5 – Cronulla Mall (Axis 4)

Project No. 21-28380
Revision No. B
Date 07 Aug 2019

Figure 5

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Print date: 07 Aug 2019 - 14:11

Legend

Geotechnical Test Locations (indicative)
A Borehole
Sheet Index
Contours (1m)
Cadastre
Railway

Underground Utilities (OneSearch 29/04/2019)
S Sewer
C Communications
S Electricity
W Water
G Gas
D Stormwater
RMS Roads (RMS)
U Unclassified
S (DBYD) DBYD Sewer
C (DBYD) DBYD Communications
E (DBYD) DBYD Electricity
W (DBYD) DBYD Water
G (DBYD) DBYD Gas
D (DBYD) DBYD Stormwater
EOT End of Trace

Paper Size ISO A3
0 3.5 7 10.5 14
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

0

Sutherland Shire Council
Cronulla Town Centre Design Stage 2

Sheet 6 – Monro Park and Beach Park Avenue (Site 2)

Project No. 21-28380
Revision No. B
Date 07 Aug 2019

Figure 6

G:\21\28380\GIS\Maps\Deliverables\21_28380_2001_Cronulla_Geotechnical_TestLocationPlan.mxd
Print date: 07 Aug 2019 - 14:13

Data source: Background Image - Sutherland Shire Council, Geosurv, OneSearch (Survey Showing Underground Services: Cronulla Town Centre Area 1; 31 May 2019), General Topo - Sixmaps 2018 (Extracted: 12 July 2019). © Department of Finance, Services & Innovation 2017. Created by: kqvelasco

Appendix B – General notes

GENERAL NOTES

GHD
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The report contains the results of a geotechnical investigation or study conducted for a specific purpose and client. The results may not be used or relied on by other parties, or used for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the report are excluded unless they are expressly stated to apply in the report.

TEST HOLE LOGGING

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Moreover, the location of test holes should be considered approximate, unless noted otherwise (refer report). Reference should also be made to the relevant standard sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

GROUNDWATER

Unless otherwise indicated, the water depths presented on the test hole logs are the depths of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater depth may differ from this recorded depth depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this depth could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities such as a change is ground surface level. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate surveys, instrumentation techniques and monitoring programmes.

INTERPRETATION OF RESULTS

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data, often with only approximate locations (e.g. GPS). Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in ground conditions do occur in the natural environment, particularly between discrete test hole locations or available observation sites. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural processes.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to GHD for appropriate assessment and comment.

GEOTECHNICAL VERIFICATION

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system and/or to conduct monitoring as a result of this natural variability. Allowance for verification by appropriate geotechnical personnel must be recognised and programmed for construction.

FOUNDATIONS

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions must include at least all of the relevant test hole and test data, together with the appropriate Standard Description sheets and remarks made in the written report of a factual or descriptive nature.

Ref: DS5.5.1 Issue 0 Date: 05/10/2018

Appendix C – Borehole logs and photographs

SOIL DESCRIPTION AND CLASSIFICATION

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Soil is described in general accordance with Australian Standard AS 1726-2017 (Geotechnical Site Investigations) in terms of visual and tactile properties, with potential refinement by laboratory testing. AS 1726 defines soil as particulate materials that occur in the ground and can be disaggregated or remoulded by hand in air or water without prior soaking. Classification of the soil is undertaken following description.

SOIL DESCRIPTION

The soil description includes a) Composition, b) Condition, c) Structure, d) Origin and e) Additional observations. 'FILL', 'TOPSOIL' or a 'MIXTURE OF SOIL AND COBBLES / BOULDERS' (with dominant fraction first) is denoted at the start of a soil description where applicable.

a) Soil Composition (soil name, colour, plasticity or particle characteristics, secondary and then minor components)

Soil Name: A soil is termed a *coarse grained soil* where the dry mass of sand and gravel particles exceeds 65% of the total. Soils with more than 35% fines (silt or clay particles) are termed *fine grained soils*. The soil name is made up of the primary soil component (in BLOCK letters), prefixed by applicable secondary component qualifiers. Minor components are applied as a qualifiers to the soil name (using the words 'with' or 'trace').

Particles are differentiated on the basis of size. 'Boulders' and 'cobbles' are outside the soil particle range, though their presence (and proportions) is noted. While individual particles may be designated as silt or clay based on grain size, fine grained soils are characterised as silt or clay based on tactile behaviour or Atterberg Limits, and not the relative composition of silt or clay sized particles.

Colour: The prominent colour is noted, followed by (spotted, mottled, streaked etc.) then secondary colours as applicable. Roughly equally proportioned colours are prefixed by (spotted, mottled, streaked etc.). Colour is described in its moist condition, though both wet and dry colours may also be provided if appropriate.

Plasticity: Fine grained soils are designated within standard ranges of plasticity based on tactile assessment or laboratory assessment of the Liquid Limit.

Particle Characteristics: The particle shape, particle distribution and particle size range within a coarse grained soil is described using standard terms. Particle composition may be described using rock or mineral names, with specific terms for carbonate soils.

Secondary and Minor Components: The primary soil is described and modified by secondary and minor components, with assessed ranges as tabulated.

Carbonate Soils: Carbonate content can be assessed by use of dilute '10%' HCl solution. Resulting clear sustained effervescence is interpreted as a *Carbonate soil* (approximately >50% carbonate), while weak or sporadic effervescence indicates *Calcareous soil* (< 50% carbonate). No effervescence is interpreted as a non-calcareous soil.

Organic and Peat Soils: Where identified, organic content is noted. *Organic soil* (2% to 25% organic matter) is usually identified by colour (usually dark grey/black) and odour (i.e. 'mouldy' or hydrogen sulphide odour). *Peat* (>25% organic matter) is identified by a spongy feel and fibrous texture. Peat soils' decomposition may be described as '*fibrous*' (little / no decomposition), '*pseudo-fibrous*' (moderate decomposition) or '*amorphous*' (full decomposition).

Fraction	Components		Particle Size (mm)
Oversize	BOULDERS		> 200
	COBBLES		63 - 200
Coarse grained soil particles	GRAVEL	Coarse	19 - 63
		Medium	6.7 -19
		Fine	2.36 - 6.7
	SAND	Coarse	0.6 - 2.36
		Medium	0.21 - 0.6
		Fine	0.075 - 0.21
Fine grained soil particles	SILT		0.002 - 0.075
	CLAY		< 0.002

Plasticity Terms (Fine Grained Soils)		Laboratory Liquid Limit Range
Silt	**Clay**	
N/A	N/A	(Non Plastic)
Low Plasticity	*Low Plasticity*	≤ 35%
	Medium Plasticity	> 35% and ≤ 50%
High Plasticity	*High Plasticity*	> 50%

Particle Distribution Terms (Coarse Grained Soils)	
Well graded	good representation of all particle sizes
Poorly graded	one or more intermediate sizes poorly represented
Gap graded	one or more intermediate sizes absent
Uniform	essentially of one size

Particle Shape Terms (Coarse Grained Soils)		
Rounded	*Sub-angular*	*Flaky or Platy*
Sub-rounded	*Angular*	*Elongated*

Secondary and Minor Components for Coarse Grained Soils			
Fines (%)	**Modifier** (as applicable)	**Accessory coarse (%)**	**Modifier** (as applicable)
≤ 5	*'trace silt / clay'*	≤ 15	*'trace sand / gravel'*
> 5, ≤ 12	*'with clay / silt'*	> 15, ≤ 30	*'with sand / gravel'*
> 12	*prefix 'silty / clayey'*	> 30	*prefix 'gravelly / sandy'*

Secondary and Minor Components for Fine Grained Soils	
% Coarse	**Modifier** (as applicable)
≤ 15	add *"trace sand / gravel"*
> 15, ≤ 30	add *"with sand / gravel"*
> 30	prefix soil *"sandy / gravelly"*

SOIL DESCRIPTION AND CLASSIFICATION

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b) Soil Condition (moisture, relative density or consistency)

Moisture: Fine grained soils are described relative to plastic or liquid limits, while coarse grained soils are assessed based on appearance and feel. The observation of seepage or free water is noted on the test hole logs.

Moisture - Coarse Grained Soils		
Term		**Tactile Properties**
Dry	*('D')*	Non-cohesive, free running
Moist	*('M')*	Feels cool, darkened colour, tends to stick together
Wet	*('W')*	Feels cool, darkened colour, tends to stick together, free water forms when handling

Moisture - Fine Grained Soils		
Term		**Tactile Properties**
Moist, dry of plastic limit	*('$w < PL$')*	Hard and friable or powdery
Moist, near plastic limit	*('$w \approx PL$')*	Can be moulded
Moist, wet of plastic limit	*('$w > PL$')*	Weakened, free water forms on hands with handling
Wet, near liquid limit	*('$w \approx LL$')*	Highly weakened, tends to flow when tapped
Wet, wet of liquid limit	*('$w > LL$')*	Liquid consistency, soil flows

Relative Density (Non Cohesive Soils): The Density Index is inherently difficult to assess by visual or tactile means, and is normally assessed by penetration testing (e.g. SPT, DCP, PSP or CPT) with published correlations. Assessment may be affected by moisture and *in situ* stress conditions. Density Index assessment may be refined by combination of *in situ* density testing and laboratory reference maximum and minimum density ranges.

Consistency (Cohesive Soils): May be assessed by direct measurement (shear vane, CPT etc.), or approximate tactile correlations. Cohesive soils include fine grained soils, and coarse grained soils with sufficient fine grained components to induce cohesive behaviour. A 'design shear strength' must consider the mode of testing, the *in situ* moisture content and potential for variations of moisture which may affect the shear strength.

Relative Density (Non-Cohesive Soils)		
Term and (Symbol)		**Density Index (%)**
Very Loose	*(VL)*	≤ 15
Loose	*(L)*	> 15 and ≤ 35
Medium Dense	*(MD)*	> 35 and ≤ 65
Dense	*(D)*	> 65 and ≤ 85
Very Dense	*(VD)*	> 85

Consistency assessment can be influenced by moisture variation.

Consistency (Cohesive Soils)			
Term and (Symbol)		**Tactile Properties**	**Undrained Shear Strength**
Very Soft	*(VS)*	Extrudes between fingers when squeezed	< 12 kPa
Soft	*(S)*	Can be moulded by light finger pressure	12 - 25 kPa
Firm	*(F)*	Can be moulded by strong finger pressure	25 - 50 kPa
Stiff	*(St)*	Cannot be moulded by fingers	50 - 100 kPa
Very Stiff	*(VSt)*	Can be indented by thumb nail	100 - 200 kPa
Hard	*(H)*	Can be indented with difficulty by thumb nail	> 200 kPa
Friable	*(Fr)*	Easily crumbled or broken into small pieces by hand	-

c) Structure (zoning, defects, cementing)

Zoning: The *in situ* zoning is described using the terms below. *'Intermixed'* may be used for an irregular arrangement.

'layer' (a continuous zone across the exposed sample)

'lens' (a discontinuous layer with lenticular shape)

'pocket' (an irregular inclusion of different material).

'interbedded' or *"interlaminated'* (alternating soil types)

Defects: Described using terms below, with dimension orientation and spacing described where practical.

'parting' (an open or closed surface or crack sub parallel to layering with little / no tensile strength - open or closed)

'fissure' (as per a parting, though not parallel or sub parallel to layering – may include desiccation cracks)

'sheared seam' (zone of sub parallel near planar closely spaced intersecting smooth or slickensided fissures dividing the mass into lenticular or wedge shaped blocks)

'sheared surface' (a near planar, curved or undulating smooth, polished or slickensided surface, indicative of displacement)

'softened zone' (in clayey soils, usually adjacent to a defect with associated higher moisture content)

'tube' (tubular cavity, singly or one of a large number, often formed from root holes, animal burrows or tunnel erosion)

'tube cast' (an infilled tube – infill may vary from uncemented through to cemented or have rock properties)

'infilled seam' (sheet like soil body cutting through the soil mass, formed by infilling of open defects)

Cementation: Soils may be cemented by various substances (e.g. iron oxides and hydroxides, silica, calcium carbonate, gypsum), and the cementing agent shall be identified if practical. Cemented soils are described as:

'weakly cemented'	easily disaggregated by hand in air or water
'moderately cemented'	effort required to disaggregate the soil by hand in air or water

Materials extending beyond '*moderately cemented'* are encompassed within the rock strength range. Where consistent cementation throughout a soil mass is identified as a duricrust, it is described in accordance with duricrust rock descriptors. Where alternate descriptors of cementation development are applied for consistency with regional practices or geology, or client requirements, these are outlined separately.

SOIL DESCRIPTION AND CLASSIFICATION

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d) Origin

An interpretation is provided based on observations of landform, geology and fabric, and may further include assignment of a stratigraphic unit. The use of terms 'possibly' or 'probably' indicates a higher degree of uncertainty regarding the assessed origin or stratigraphic unit. Typical origin descriptors include:

Residual	Formed directly from in situ weathering with no visible structure or fabric of the parent soil or rock.
Extremely weathered	Formed directly from in situ weathering, with remnant and/or fabric from the parent rock.
Alluvial	Deposited by streams and rivers (may be applied more generically as transported by water).
Estuarine	Deposited in coastal estuaries, including sediments from inflowing rivers, streams, and tidal currents.
Marine	Deposited in a marine environment.
Lacustrine	Deposited in freshwater lakes.
Aeolian	Transported by wind.
Colluvial and Slopewash	Soil and rock debris transported down slopes by gravity (with or without assistance of water). Colluvium is typically applied to thicker / localised deposits, and slopewash for thinner / widespread deposits.
TOPSOIL	Surficial soil, typically with high levels of organic material. Topsoils buried by other transported soils are termed *'remnant topsoil'*. Tree roots within otherwise unaltered soil does not characterise topsoil.
FILL	Any material which has been placed by anthropogenic processes (i.e. human activity).

e) Additional Observations

Additional observations may be included to supplement the soil description. Additional observations may consist of notations relating to soil characteristics (odour, contamination, colour changes with time), inferred geology (with delineation of soil horizons or geological time scale) or notes on sampling and testing application (including the reliability, recovery, representativeness, or condition of samples or test conditions and limitations). If the material is assessed to be not representative, terms such as 'poor recovery', 'non-intact', 'recovered as' or 'probably' are applied.

SOIL CLASSIFICATION

Classification allocates the material within distinct soil groups assigned a two character Group Symbol:

Coarse Grained Soils (sand and gravel: more than 65% of soil coarser than 0.075 mm)

Major Division	Group Symbol	Soil Group
GRAVEL (more than half of the coarse fraction is > 2.36 mm)	GW	GRAVEL, well graded
	GP	GRAVEL, poorly graded
	GM	Silty GRAVEL
	GC	Clayey GRAVEL
SAND (more than half of the coarse fraction is < 2.36 mm)	SW	SAND, well graded
	SP	SAND, poorly graded
	SM	Silty SAND
	SC	Clayey SAND

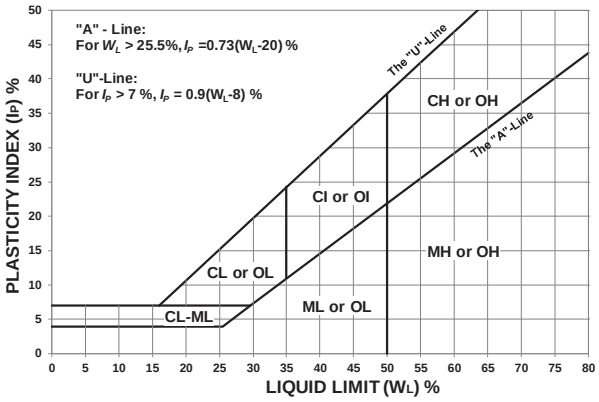
Fine Grained Soils (silt and clay: more than 35% of soil finer than 0.075 mm)

Major division	Group Symbol	Soil Group
SILT and CLAY (low to medium plasticity)	ML	SILT, low plasticity
	CL	CLAY, low plasticity
	CI	CLAY, medium plasticity
	OL	Organic SILT
SILT and CLAY (high plasticity)	MH	SILT, high plasticity
	CH	CLAY, high plasticity
	OH	Organic CLAY / SILT
Highly Organic	Pt	PEAT

Coarse grained soils with fines contents between 5% and 12% are provided a dual classification comprising the two group symbols separated by a dash, e.g. for a poorly graded gravel with between 5% and 12% silt fines (poorly graded 'GRAVEL with silt'), the classification is GP-GM.

For the purpose of classification, *poorly graded, uniform,* or *gap graded* soils are all designated as poorly graded. Soils that are dominated by boulders or cobbles are described separately and are not classified.

Classification is routinely undertaken based on tactile assessment with the soil description. Refinement of soil classification may be applied using laboratory assessment, including particle size distribution and Atterberg Limits. Atterberg Limits testing is applied to the sample portion finer than 0.425 mm. Fine grained soil components are assessed on the basis of regions defined within the Modified Casagrande Chart.



DYNAMIC CONE PENETROMETER (DCP) TESTING

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SCOPE

The Dynamic Cone Penetrometer (DCP) test comprises the measurement of the soil resistance to a steel rod driven into the ground by a dropped weight.

The DCP test is a simple manual test used in both sandy and clayey soils. The test is a measure of the shear strength of the soil at relatively shallow depth.

EQUIPMENT AND METHOD

A general description of the dynamic penetrometer apparatus used by our firm is presented in Australian Standard AS 1289.6.3.2. The equipment utilises a 9 kg sliding weight with a drop height of 510 mm. It is fitted with a conical tip. The equipment can be adjusted for a fall of 600 mm and use of a blunt tip in accordance with AS 1289.6.3.3.

The test data are generally recorded as the number of blows (n) per 50 mm of penetration. For specific applications (such as pavement investigations), the data may be collected in the reverse form, i.e. as mm per blow. The results are presented either in tabular or graphic form for reporting purposes.

INTERPRETATION

The interpretation of the DCP results is generally based on the assumption that the measured resistance is a function of soil strength. A profile of soil strength (cohesive soils) or density index (cohesionless soils) can thus be established. The test often can be used to qualitatively indicate the presence of soft or loose zones within a soil profile.

The energy of the system per unit area is similar to that of the larger Standard Penetration Test (SPT). Thus, the common relationships of SPT and other parameters can be used as a means of estimating soil properties, after appropriate site specific consideration. The interpretations from the test are approximate only, and this is particularly pertinent to sand profiles where the magnitude of confinement stress is important in the assessment of the results.

Interpretation of the DCP penetration rate at depth must be conducted with due regard to rod friction effects. In particular, care must be exercised with soft clay profiles where rod resistance may have an unconservative impact on the results. Care must also be exercised with soil profiles containing larger particles such as gravels and cobbles where penetration rate can be affected if the DCP tip strikes or glances off such particles.

In-situ California Bearing Ratio (CBR) values of clay soil subgrades are sometimes interpreted directly from DCP test results for use in road pavement design. In this case, the correlation between DCP and CBR based on that published in AUSTROADS Pavement Structural Design guide (AGPT02-17 Part 2) may be applied. This correlation should be verified by site specific laboratory testing, where appropriate. In addition, the effects of moisture content variations (in-situ versus design conditions) must be considered, as the DCP test only reflects the shear strength of the soil at the time of testing. Further information can be found in AUSTROADS Geotechnical Investigation and Design guide (AGRD07-08 Part 7).

Ref: DS5.4.3 Rev 0 Date: 05/10/2018

GLOSSARY OF SYMBOLS

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This standard sheet should be read in conjunction with all test hole log sheets and any idealised geological sections prepared for the investigation report.

GENERAL

Symbol	Description	Symbol	Description
D	Disturbed Sample	PZ	Piezometer Installation
U	Undisturbed Sampled (suffixed by sample size or tube diameter in mm if applicable)	R	Rising Head Permeability Test
		F	Falling Head Permeability Test
C	Core Sample (suffixed by diameter in mm)	PBT	Plate Bearing Test
SV	Shear Vane Test (suffixed by value in kPa)		Water Inflow (make)
SPT	Standard Penetration Test (with blows per 0.15m)		Water Outflow (loss)
N	SPT Value		Temporary Water Level
HB	SPT hammer bouncing		Final Water Level
PM	Pressuremeter Test		Point Load Test (axial)
PP	Pocket Penetrometer (suffixed by value in kPa)		Point Load Test (diametric)
PK	Packer Test	IMP	Impression Device Test

SOIL SYMBOLS

Main Components

SAND | CLAY | SILT

GRAVEL | FILL | TOPSOIL

Minor Components

sandy | clayey | silty

gravelly | vegetation, roots

Note: Natural soils are generally a combination of constituents, e.g. sandy CLAY

ROCK SYMBOLS

Sedimentary

SANDSTONE | SHALE

CLAYSTONE | CONGLOMERATE

SILTSTONE | COAL

Igneous

GRANITIC ROCK

IGNEOUS DYKE

BASALTIC ROCK

Note: Additional rock symbols may be allocated for a particular project.

NATURAL FRACTURES (Coding)

Fracture Type

JT	Joint
BP	Bedding Plane
Cb	Cross Bed
SS	Sheared Surface
SM	Seam
CS	Crushed Seam
FZ	Fragmented Zone
SZ	Shear Zone
VN	Vein

Orientation

For vertical non-oriented core ... “Dip” angle (eg. 5°) measured relative to horizontal
For inclined non-oriented core ... “Angle” measured relative to core axis.
For inclined oriented core ... “Dip” angle and “Dip Direction” angle (eg. 45°/225° mag.)

VT	Vertical
HZ or 0°	Horizontal
d	degrees

Infilling or Coating

CN	Clean
X	Carbonaceous
CLAY	Clay
KT	Chlorite
CA	Calcite
FE	Iron Oxide
MI	Micaceous
Mn	Manganese
Py	Pyrite
QZ	Quartz
VE	Veneer

Shape

PLN	Planar
CU	Curved
UN	Undulating
ST	Stepped
IR	Irregular

Roughness

POL	Polished
SLK	Slickensided
SO	Smooth
RF	Rough
VR	Very Rough

Others

DIS	Discontinuous
OP	Open
CL	Closed
TI	Tight

Ref: DS6.5.1 Issue 1.7 Date: 20/09/2010

CORE LOG SHEET NOTES

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The intention of Core Log Sheets is to present factual information measured from the core or as recorded in the field. Some interpretative information is inevitable in the location of core loss, description of weathering and identification of drilling induced fractures. This should be noted in the use of Core Log Sheets and remembered in their utilisation.

DRILLING AND CASING

The types of drilling used to advance the drill hole are recorded for relevant intervals. The types of drilling may include: NMLC coring, NQTT (NQ triple tube wire line), HW, HX, NW and NX casing, wash boring (tri-cone roller bit, TC drag bit, TC blade bit), or auger drilling (V-bit, TC drag bit).

The relevant progress is shown by abbreviated dates in the column.

WATER

Water lost or water made during drilling is recorded and subsequent readings of water levels in the borehole or piezometers are recorded here with dates of observation.

DRILL DEPTH AND CORE LOSS

Drilling intervals are shown by depth increments and horizontal marker lines. Core loss is measured as a percentage of the drill run. If the location of the core loss is known or strongly suspected, it is shown in a region of the column bounded by dashed horizontal lines. If unknown, core loss is assigned to the bottom of a coring run.

SAMPLES AND FIELD TESTS

The location of samples taken for testing or the location of field tests are indicated by the appropriate symbol from the GLOSSARY OF SYMBOLS Standard Sheet (or as applicable for the project) and are shown at the relevant location or over the relevant depth interval.

DEPTH (RL)

Changes in rock types or the locations of piezometer tips, samples, test intervals or other depths are shown as appropriate in terms of depth from the hole collar or in terms of RL.

For inclined holes the depths shown on the log refer to the drilled length along the borehole. The RL, where used, is the only transformed reference to true vertical depth.

STRATA

Rock types are presented graphically using the symbols shown on the GLOSSARY OF SYMBOLS Standard Sheet or as assigned for the project.

DESCRIPTION

The rock type is described in accordance with the ROCK DESCRIPTION Standard Sheet.

WEATHERING

Weathering is described, by code letters, in accordance with the ROCK DESCRIPTION Standard Sheet. A weathering term or range of terms is usually assigned to various strata.

It is noted, however, that the assignment of a term of weathering is subjective and is normally used for identification and does not imply engineering behaviour (such behaviour being controlled principally by rock substances strength and defect frequency - collectively, rock mass strength). Consequently, boundaries are often not shown and weathering may even not be reported where potentially misleading.

ESTIMATED STRENGTH

The strength of the rock substance is estimated by a combination of Point Load testing and tactile appraisal in accordance with the ROCK DESCRIPTION Standard Sheet. The estimated strength is presented in a histogram form. Both axial and diametric point load test results can be presented using the symbols on the GLOSSARY OF SYMBOLS Standard Sheet and the variation between axial and diametric values is indicative of anisotropy or fissility of the rock unit.

NATURAL FRACTURES

The identification of natural fractures requires an endeavour to exclude drilling induced breaks in the core and, as such, can be somewhat subjective. Natural fractures exist prior to coring the rock, whereas artificial fractures occur either during coring, during placing core in the core boxes, or during examination or transportation, or core after being boxed.

The log of Natural Fractures is presented as a combination of Fracture Spacing, Visual and Description columns. Coding is presented on the GLOSSARY OF SYMBOLS Standard Sheet.

ROCK QUALITY DESIGNATION (RQD) INDEX OPTION

The Core Log Sheet has an optional field column to record the RQD index. For certain projects, such as tunnelling or underground mining investigations, rock mass ratings or classifications can be required as part of the design process. The Rock Quality Designation (RQD) Index forms a component of these rock mass ratings and provides a quantitative estimate of rock mass quality from rock core logs. The core must be a minimum of 54.7mm diameter (although NMLC-sized core is probably OK) for derivation of an RQD index.

The RQD index is expressed as a percentage of intact rock core (excludes extremely weathered rock/residual soil) greater than 100 mm in length over the total selected core length. The total selected core length should be based on identifiable engineering geological domain characteristics. Should this not be practicable, RQD can be measured on a per run basis.

Ref: DS6.2.1 Issue 1.6 Date: 13/03/2012

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET 1 OF 1

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°		**Processed :** RCO
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah		**Checked :** ICC
Date Started : 4/7/2019		**Date Completed :** 4/7/2019	**Logged by :** LCD/MG		**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40) Recorded Blows	Comments/ Observations
	Diatube				0.01		-	TILE: pale grey, 15mm.	-	-		
					0.02		-	BEDDING LAYER: stabilised sand, grey.				
					0.15		-	CONCRETE: dark grey, mixed aggregates up to 20mm. 0.13m, steel reinforcement.	M	L	DCP @ 0.2m: Refusal	
				ES/ D/ Q0003				FILL: Gravelly SAND: dark brown, fine to medium grained, fine to coarse sub-rounded to sub-angular gravel (volcanics and ironstone), trace silt (fill).				
				D	0.42		CH	CLAY: red-brown, high plasticity, trace medium to coarse sub-angular to sub-rounded gravel (residual).	w ≈ PL	F		
	Hand Auger	Nil	GNE					0.8m, becoming orange.		St		
1				ES/ D				0.9m, becoming orange mottled red.		VSt		
					1.20		CI	CLAY: red mottled grey and brown, medium plasticity (residual).	w ≈ PL	VSt		
								1.4m, becoming grey mottled red.				
				ES/ D	1.70			End of Borehole at 1.7 metres. Refusal.				
2											DCP @ 2.0m: Terminated	

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 21-28380

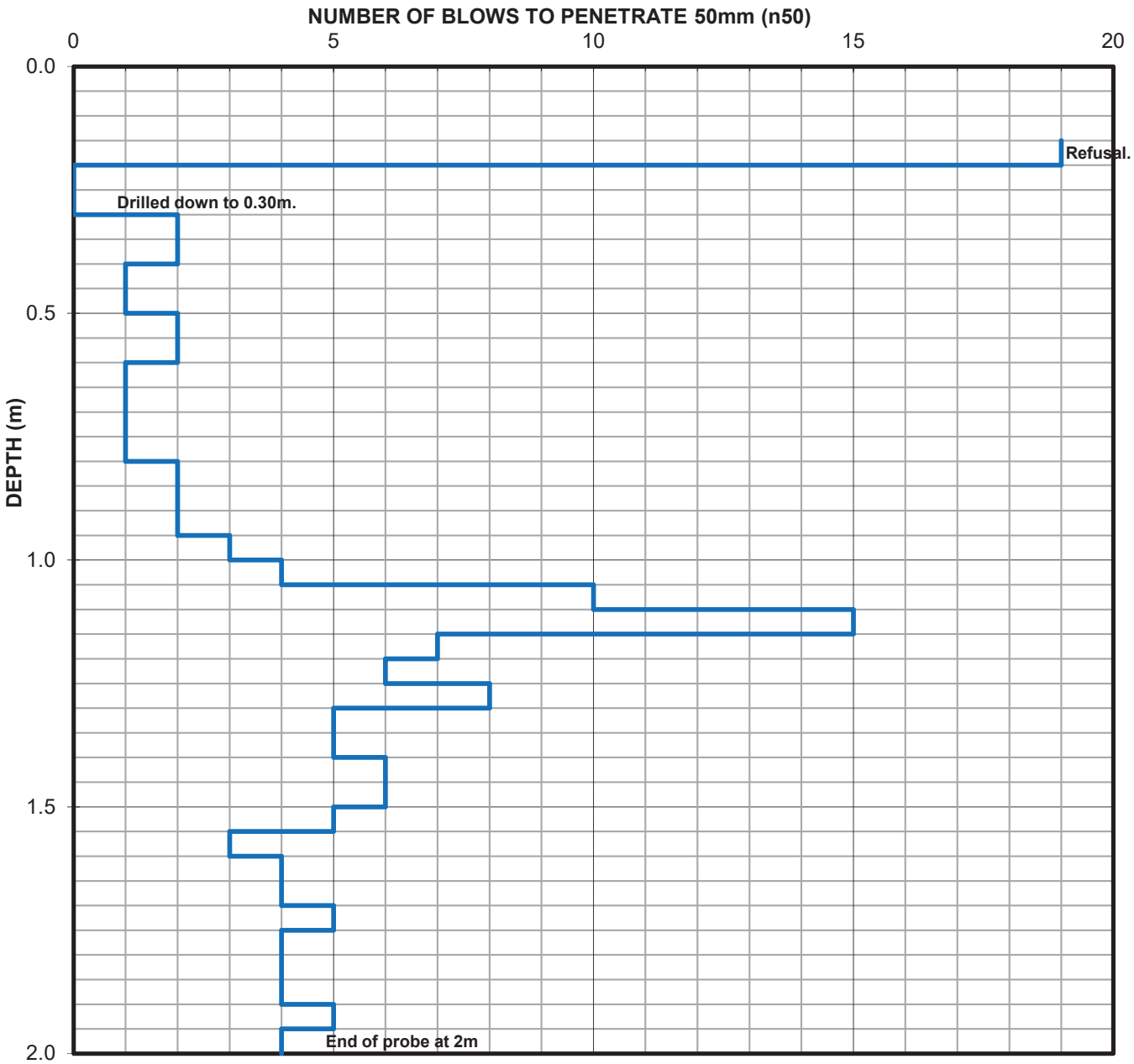
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP01

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH01		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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Job No. **2128380**


GHD
TP: BH01
DEPTH: 0.00 - 0.14
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET 2 OF 2

Position : Refer to test location plan	**Surface RL:** -	**Angle from Horiz. :** 90°	**Processed :** RCO
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah	**Checked :** ICC
Date Started : 4/7/2019	**Date Completed :** 8/7/2019	**Logged by :** LCD/MG	**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	Comments/ Observations
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm 0 20 40 Recorded Blows	
0	Diatube	Nil	GNE		0.06		-	CONCRETE: dark grey, mixed aggregates up to 15mm.	-	-		
							-	FILL: Sandy GRAVEL: dark brown, fine to coarse, sub-angular to sub-rounded, fine to coarse grained sand, trace silt (fill).	M	MD		
					0.17		-	CONCRETE: dark grey, mixed aggregates up to 15mm.	-	-	DCP @ 0.2m: Refusal	20
	Hand Auger			ES/ D	0.38		-	FILL: Gravelly SAND: brown, fine to medium grained, fine to coarse sub-rounded to sub-angular gravel (sandstone), trace clay (fill).	M	MD		13
				D	0.50		-	FILL: CLAY: dark brown, medium plasticity, with fine to coarse sub-rounded to sub-angular gravel (sandstone) (fill).	w ≈ PL	VSt		12
				D	0.62		CH	CLAY: brown mottled red, orange, high plasticity, with fine to coarse sub-angular to angular gravel (ironstone) (residual).	w ≈ PL	VSt		10
					0.81			0.71m, becoming orange mottled red, trace gravel (ironstone). End of Borehole at 0.81 metres. Refusal.				12
1												9
												12
												11
												8
												16
												14
												12
												17
												18
												18
												15
												9
2											DCP @ 2.0m: Terminated	

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 12-18380

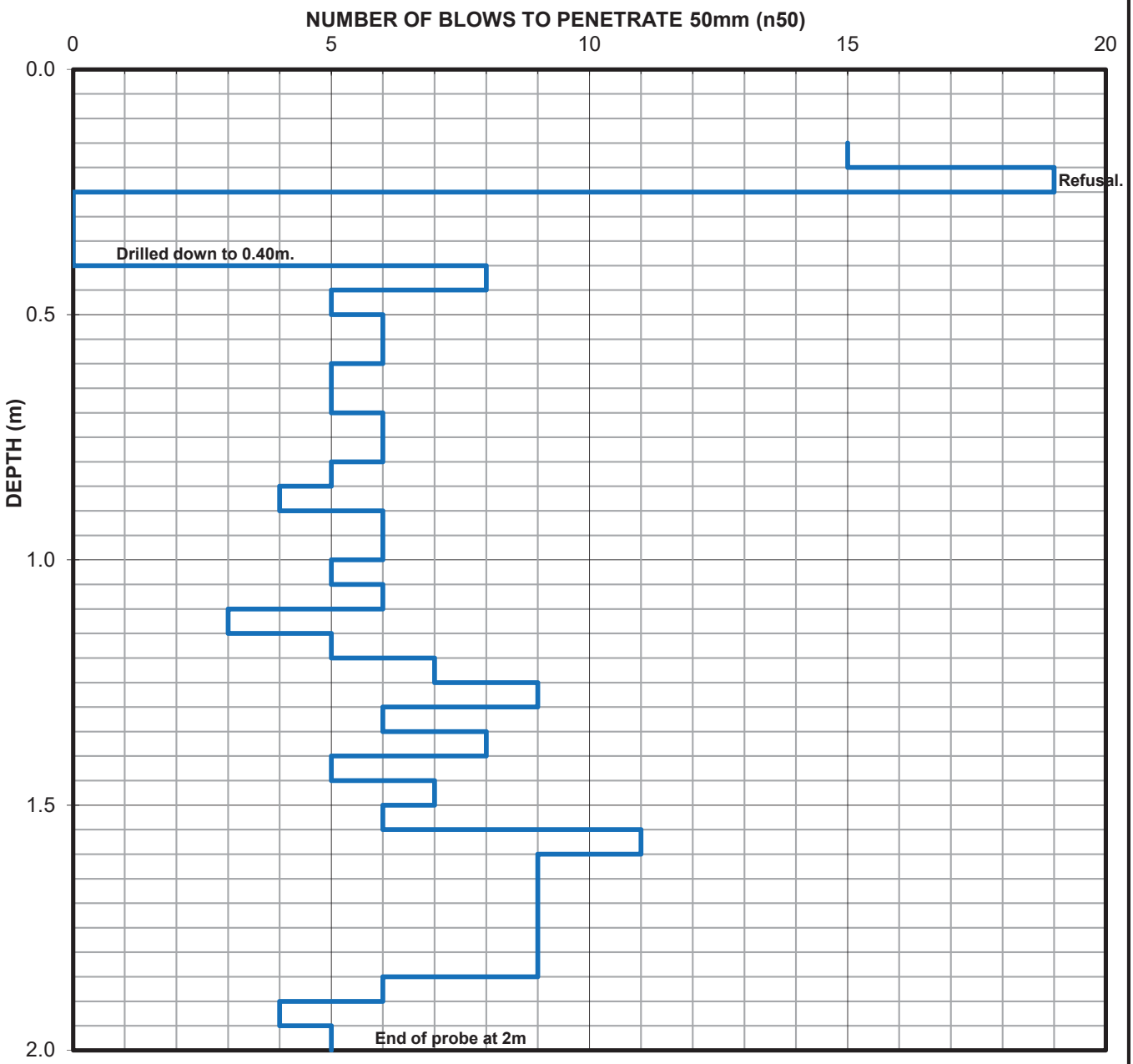
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP02

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	08/07/19
Adjacent Test Hole / Pit: BH02		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH02
DEPTH: 0.00 - 0.06m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

TP: BH02

DEPTH: 0.17 - 0.36m

CLIENT: Sutherland Shire Council

PROJECT: Cronulla Town Centre Design

PROJECT NUMBER: 21 / 28380 /

LOCATION: Cronulla Town Center

DATE: 3/7/19

BOREHOLE LOG SHEET

2 Ef   Yf @EHf wE DCM AS6L1v 106L 16-15750 C@f N&wwACENR@E SR2 1.2 MJ 2 HD 2 Ef RE/ MwARE 1.00.2 DR 1V5V63

Client : Sut(erland S(ire C, unoil

Project : Cr, nulla R, Gn Centre - De: ign Stage 1

Location : Cr, nulla / allOCr, nulla NSB

HOLE No. BH01

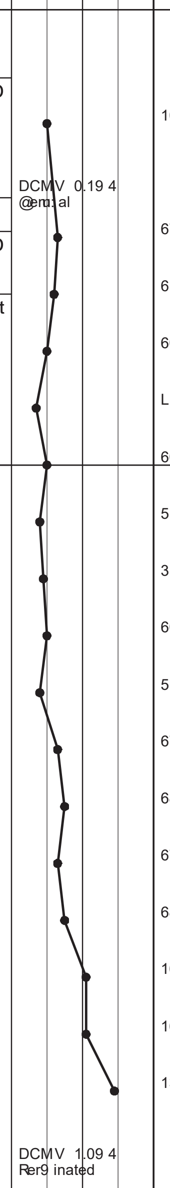
SHEET - OF -

Position : @ernr t, te: t l, oati, n ylan	**Surface RL:** -	**Angle from Horiz. :** 30°	**Processed :** @Cf
Rig Type : 150mm Diatube **Mounting:** Stand	**Contractor :** Diao, re	**Driller :** N, a(	**Checked :** pCC
Date Started : ULW1063	**Date Completed :** ULW1063	**Logged by :** wCDW 2	**Date:** 6V5W3

N, te4* indioate: : ignature: , n , riginal i: : ue , ml, g , r la: t re)i: i, n , ml, g

SCAwE R9 I	Drilling / et(, d	H, le Suyy, rt hCa: ing	B ater	Sa9 yle: \ Re: t:	Deyt(W@M 9 etre:	2 ray(io w, g	&SC ST9 b, l	Description [Cf YYwESWf &wDE@SWpwWRf MSf pv] t(en Sf pwNA/ E4o, l, urOyla: tioitTWri9 arT yartiole o(araoteri: tio: O eo, ndarT and 9 in, r o, 9 y, nent: Oz, ning F, riginl and @ CK NA/ E4grain : izeOo, l, urOnabrio and tektureOnolu: i, n: , r 9 in, r o, 9 y, nent: O durabilitTO trengt(OGeat(ering Walterati, nOdemeot:	/ , i: ture C, nditi, n	C, n: i: tenoT W Den: itT pndek	DCP Test Results bl, G: yer 6009 9 (0 10 U0)	@eo, rded Yl, G:	Comments/ Observations
	Diatube	Nil	2 NE				-	Cf NC@ERE4dars greTO9 iked aggregate: uy t, 709 9 .	-	-			
					0.61		-	xpww4SandT 2 @APEw4dars br, GnO rime t, o, ar: eO ub-r, unded t, : ub-angular F. and: t, ne and ba: altIO rime t, o, ar: e grained : andOtraoe : ilt Fillll.	S/	/ D		10	
				D	0.77		-	Cf NC@ERE4br, GnO9 iked aggregate: uy t, 189 9 .	-	-	DCMV 0.19 4 @emo: al		
	Hand Auger			D	0.73		-	xpww4SandT 2 @APEw4br, GnOrime t, 9 ediu9 O ub-r, unded t, : ub-angularOrime t, o, ar: e grained : andOtraoe olaT Fillll.	S/	/ D		67, 61	
				D	0.80		CH	CwAc 4br, Gn 9 , ttled redO(ig(yla: tioitTOGit(rime t, 9 ediu9 : ub-angular t, angular gra) el Fir, n: t, nel Fre: iduall. 0.v9 Obeo, 9 ing , range 9 , ttled red.	G~ Mw	PSt		60, L, 60	
					0.50			End , mY, re(, le at 0.5 9 etre: . @emo: al.			DCMV 1.09 4 Rer9 inated	5, 3, 60, 5, 67, 68, 67, 68, 16, 16, 13	

Depth scale: 6, 1



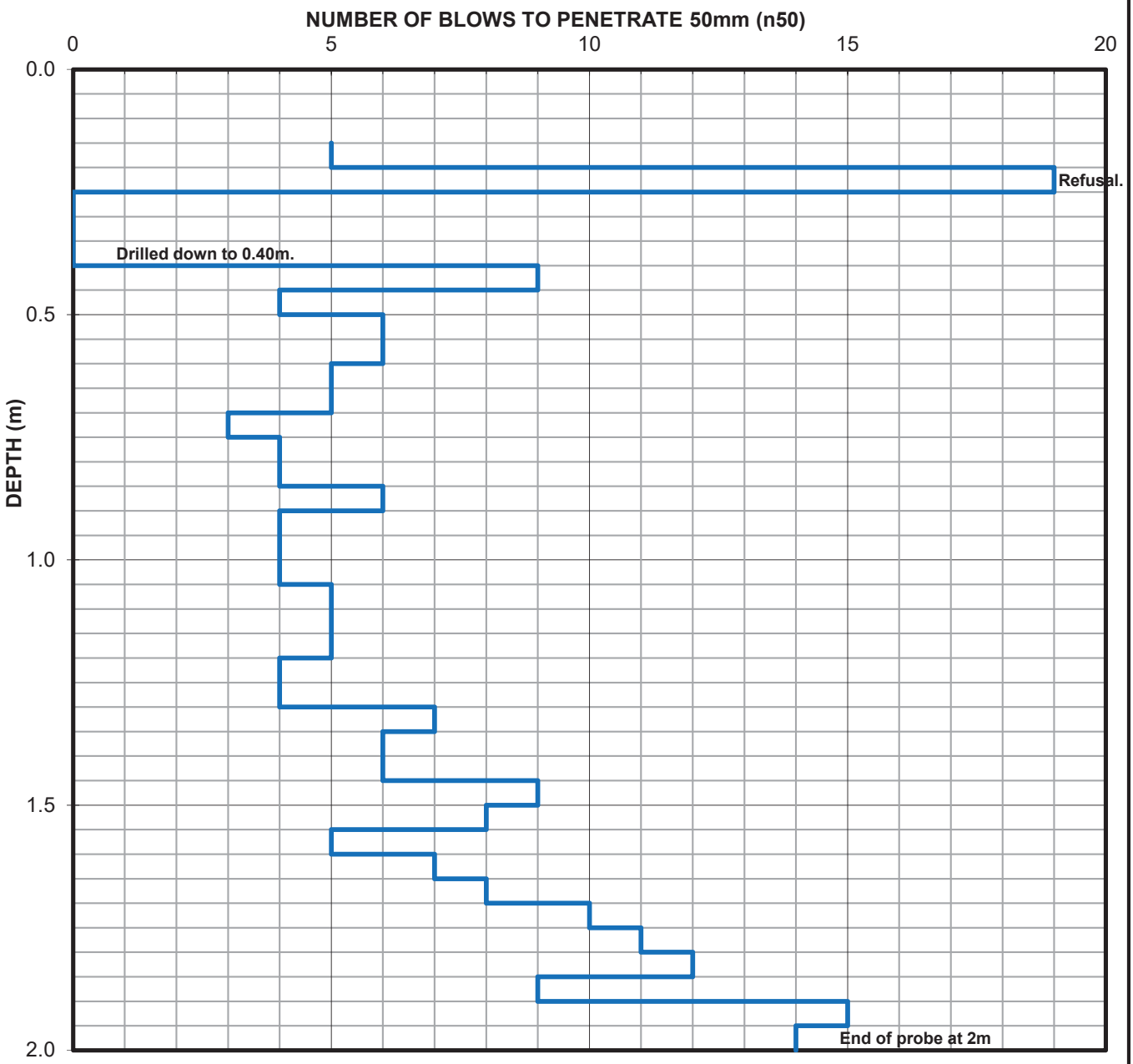
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP03

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	08/07/19
Adjacent Test Hole / Pit: BH03		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH03
DEPTH: 0.00 - 0.12m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 4/7/19

BOREHOLE LOG SHEET

Client :	Mutherland Mhire Coun(il	**HOLE No. BH04**	
Project :	Cronulla moSn Centre - Dekign Mtage 7		**SHEET 1 OF 1**
Location :	Cronulla E allf Cronulla NM\		
Position :	Oeœr to tekt lo(ation plan	**Surface RL:** -	**Angle from Horiz. :** P0°
Rig Type :	150mm Diatube **Mounting:** Mtand	**Contractor :** Dia(ore	**Driller :** Noah
Date Started :	3&&706P	**Date Completed :** 1&&706P	**Logged by :** GCD&E 5

Processed : OCy
Checked : :CC
Date: 6&1&6P

DRILLING					MATERIAL						DCP	
MCAG2 v4 Y	Drilling E ethod	Hole Mupport BCaking	\ ater	Mta4 plek Wrmektk	Depth &OG74 etrek	5 raphi(Cog	UMC MR4 bol	Description [Cy s s G2 M& y UGD2 OM&F:GG&ny / My :G] then My :GNAE 2 @olourf plakti(itR&pri4 arRparti(le (hara(terikti(kf ke(ondarRand 4 inor (o4 ponentkf zoning voriginYand Oy CK NAE 2 @rain kizef (olourf cabri(and texturef in(lukionk or 4 inor (o4 ponentkf durabilitRf ktrengthf Seathering &alterationf deœ(tk	E oikture Condition	Conkikten(R& DenkitR:ndex	DCP Test Results bloSk per 6004 4 0 70 30	Oe(orded s loSk	Note@ indi(atek kignaturek on original ikkue oclog or lakt re) ikion oclog Comments/ Observations
	Diatube	Nil	5 N2		0.06		-	mG2 @greRf 6V4 4 .	-	-			
					0.01		-	s 2 DD:N5 GAT2 O@tabiliked kandf greR	-	-			
							-	Cy NCO2 m2 @dar, greRf 4 ixed aggregatek up to 704 4 .	-	-		63	
	Hand Auger			D	0.73		-	F:GG@MandR5 OAI 2 G@dar, broSnf dine to (oarkef kub-rounded to kub-angular gra) el vkandktone and bakaltYf dine to (oarke grained kandf	E	ED		67	
				D	0.30		CH	tra(e kilt vdllY. CGAT@range 4 ottled redf high plakti(itRf tra(e dine to 4 ediu4 gra) el vironktoneYvrekidualY.	S= / G	M\		7	
					0.80			2 nd ocs orehole at 0.8 4 etrek. Oeœukal.			DC/ 9 7.04 @ mer4 inated	3	
6												8 P L 60 P 60 P 60 6V 68 68 6V 6V 66	
7													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Ge) el 7 7P Chriktie Mtreetf Mt Geonardk NM\ 708V Auktralia
m@+86 7 P387 3L00 F@+86 7 P387 3L60 2@kln4 ail9 ghd.(o4
Cy NMJGmN5 5 2y m2 CHN:CAG 2N5 :N22OM AND 5 2y Gy 5 :MmM

Job No.
21-28380

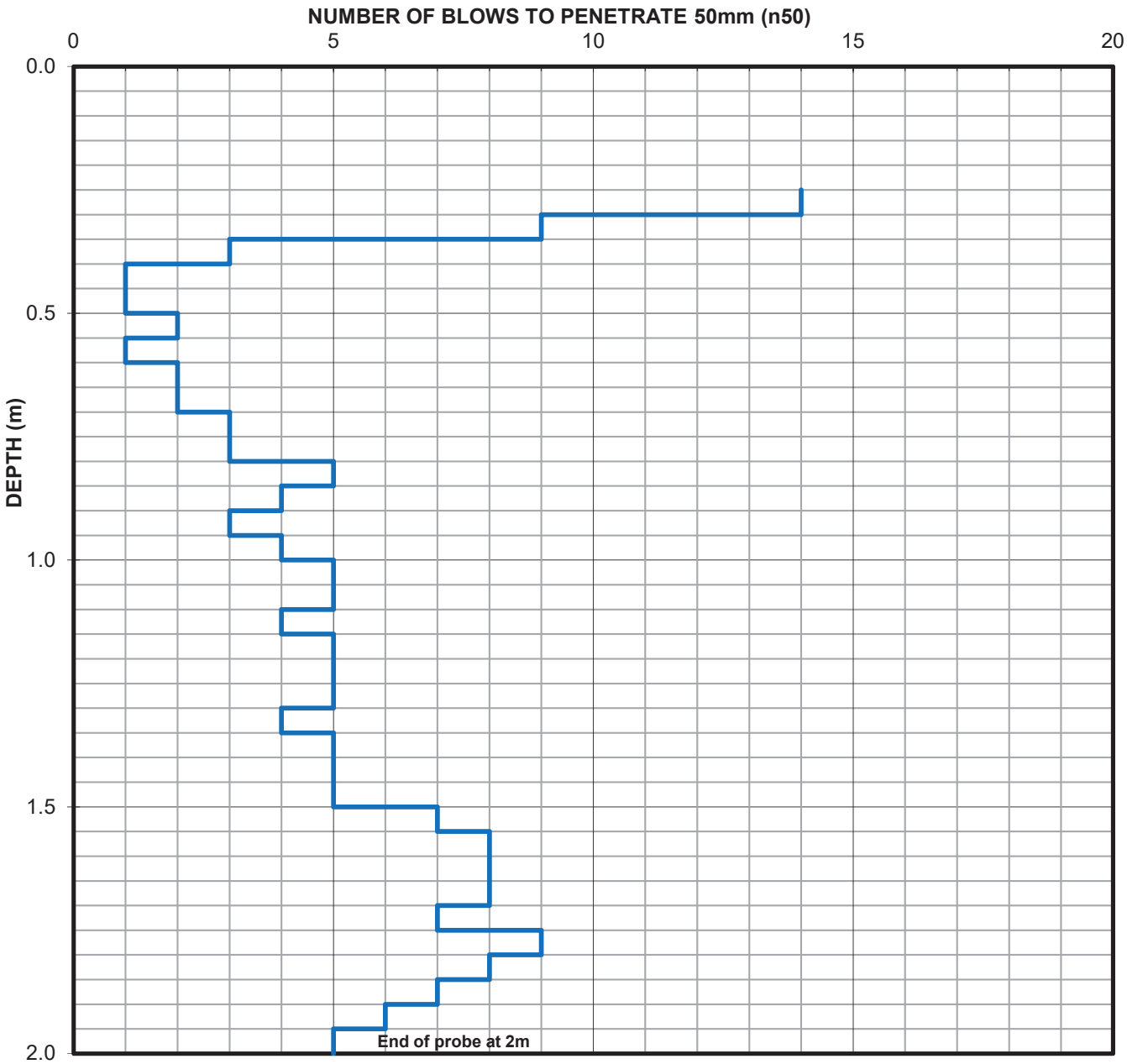
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP04

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	08/07/19
Adjacent Test Hole / Pit: BH04		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH04
DEPTH: 0.00 - 0.24m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : put(erland p(ire C, unFil

Project : Cr, nulla m Gn Centre - De@gn ptage 1

Location : Cr, nulla / allf Cr, nulla Npv

HOLE No. BH05

SHEET 1 OF 1

Position : 9 e4er t, te@l, Fati, n : lan	**Surface RL:** -	**Angle from Horiz. :** 2. z	**Processed :** 9 CO
Rig Type : 150mm Diatube **Mounting:** ptand	**Contractor :** DiaF, re	**Driller :** N, a(	**Checked :** 0CC
Date Started : 8h5h1. 32	**Date Completed :** 8h5h1. 32	**Logged by :** wCDh/ E	**Date:** 3Hh82

N, teV indiFate@@gnature@ n , riginal i@@e , 4l, g , r la@reW@ n , 4l, g

DRILLING					MATERIAL						DCP		Comments/ Observations
pCAwS I L c	Drilling / et(, d	H, le p u: : , rt) Ca@ng	v ater	paL : le@Y me@@	De: t(hI9 wcL etre@	Era: (iF w, g	BpC pRL b, l	**Description** &COs s wSphs OBwDS9 phx 0wlmOMpO0wLt(en pO0wNA/ SVF, l, urf : la@FitRh: riL arR: artiFle F(araFteri@F@@F, ndarRand L in, r F, L : , nent@*, ning l, rigincand 9 OC[NA/ SVgrain @ef F, l, urf 4abriF and tey turef inFlu@ n@ r L in, r F, L : , nent@ durabilitRf @rengt(f Geat(ering halterati, nf de4eRt@	/ , i@ure C, nditi, n	C, n@@enFRh Den@Rndey	**DCP Test Results** bl, G@ er 3. . L L . 1. 8.	9 eF, rded s l, G@	
	Diatube				. 6 1		-	m0wSV: ale greR 1. L L 6	-	-			
					. 6 7		-	s SDD0NE wATS9 V@abili@ed @andf greR6	-	-			
					. 688		-		-	-			
					. 685		-	CONC9 SmSVdark greR L iyed aggregate@u: t, 1. L L 6	/	w			
					. 617		-	x0wwVp andRE 9 Ao SwVbr, Gnf L ediuL t, F, ar@ef @b-r, unded t, @b-angular I4llc6	-	-			
	Hand Auger	Nil	ENS	D			-		/	D			
								CONC9 SmSVbr, Gnf L iyed aggregate@u: t, 1. L L 6			DCMP 6L V 9 e4u@l	1.	
					. 67.		-	x0wwVE 9 Ao SwVblaFkf 4ne t, F, ar@ef angular Ia@(altiFc I4llc6					
				D			-	x0wwVp ANDVRell, Gf 4ne t, L ediuL grainedf traFe r, , t@and r, , tlet@I4llc6	/	/ D-D			
				D	. 62.		C0	CwATVgreRL , ttled redf L ediuL : la@FitRIre@dualc6	G-Mw	H			
3					361.						DCMP 36l L V 9 e4u@l	1.	
								Snd , 4s , re(, le at 36l L etre@6 9 e4u@l6					
1													

ESOKs O9 SHOwSKDCMKAp351° K1. 35 13-1] . C9 ONBwwACSNm9 SKpmE1 6EMJ E HDKE SOKmS/ MwAmS 16 . 6EDm 1f] 182

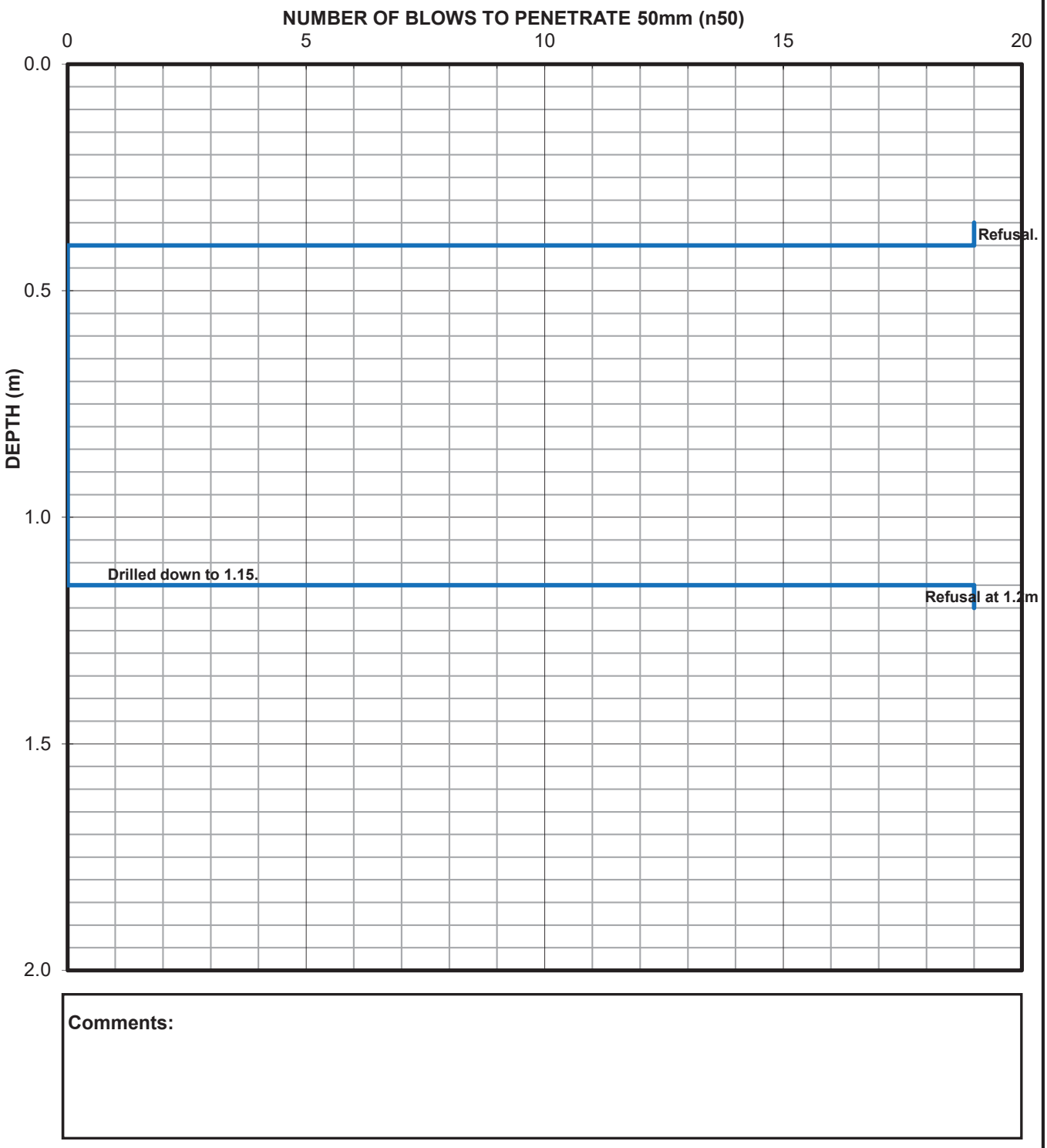
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP05

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH05		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH06
DEPTH: 0.00 - 0.34m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH06

SHEET 1 OF 1

Position : Refer to test location plan | **Surface RL:** - | **Angle from Horiz. :** 90° | **Processed :** RCO
Rig Type : 150mm Diatube | **Mounting:** Stand | **Contractor :** Diacore | **Driller :** Noah | **Checked :** ICC
Date Started : 4/7/2019 | **Date Completed :** 4/7/2019 | **Logged by :** LCD/MG | **Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40)	Recorded Blows	Comments/ Observations
	Diatube	Nil	GNE		0.02		-	TILE: pale grey, 15mm.	-	-			
					0.04		-	BEDDING LAYER: stabilised sand, grey.	-	-			
					0.15		-	CONCRETE: beige, mixed aggregates up to 20mm.	-	-			
								CONCRETE: pale beige, mixed rounded aggregates up to 30mm. 0.15m, plastic lining.	-	-		10	
	Hand Auger			D	0.34				M	D		18	
					0.37		-	FILL: SAND: yellow, medium grained, with roots and rootlets (fill).	M	VD			
							-	FILL: Gravelly SAND: brown, fine to medium grained, sub-angular to sub-rounded, fine to medium gravel, trace clay (fill).			DCP @ 0.55m: Refusal	20	
					0.62							18	
								End of Borehole at 0.62 metres. Refusal.				6	
												9	
												11	
1												10	
												10	
												15	
												18	
												12	
												11	
												12	
												11	
												14	
												15	
2											DCP @ 2.0m: Terminated	15	

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 21-28380

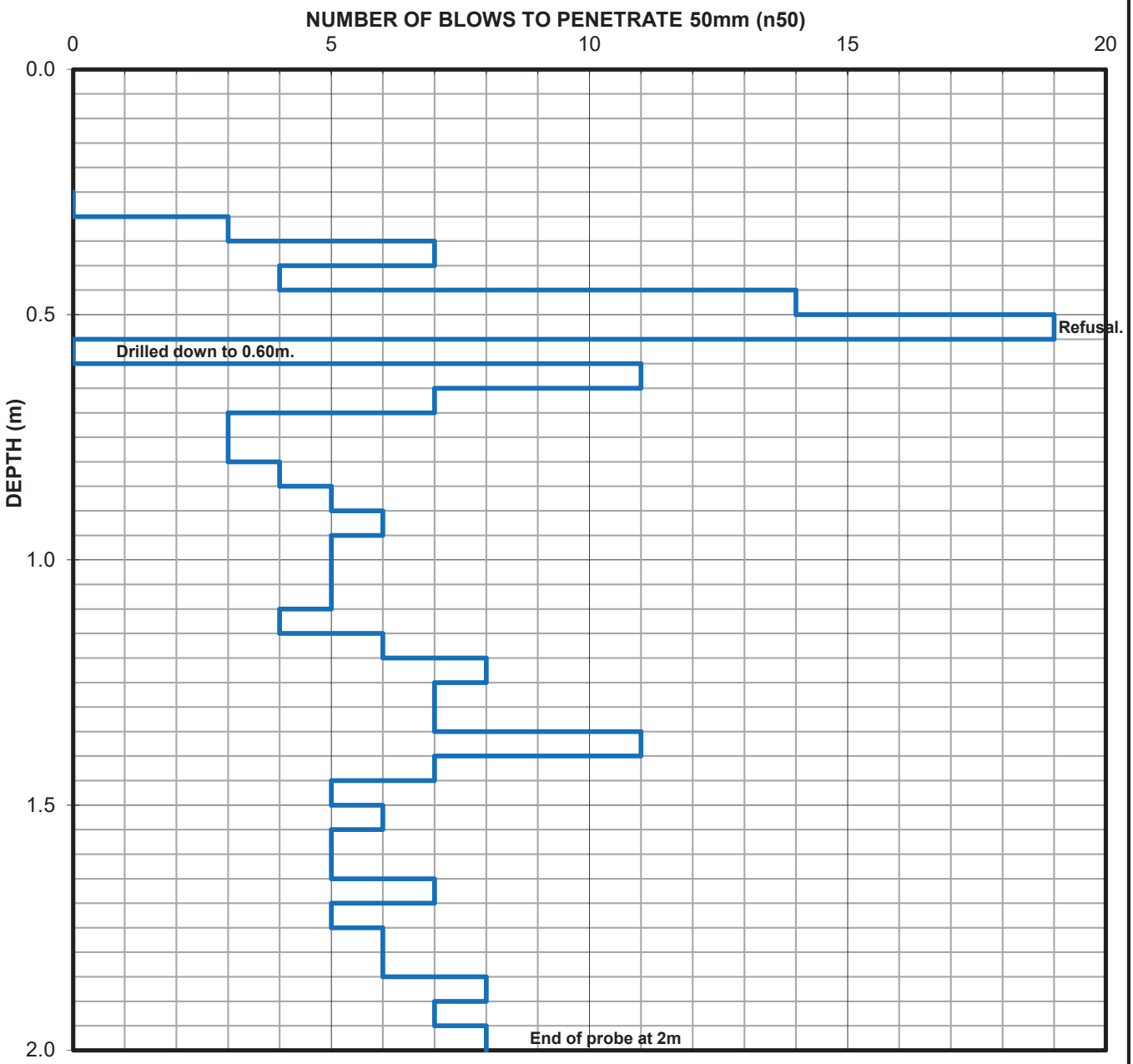
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP06

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH06		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH05
DEPTH: 0.00 - 0.25m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH06

SHEET 1 OF 1

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°		**Processed :** RCO
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah		**Checked :** ICC
Date Started : 4/7/2019	**Date Completed :** 4/7/2019		**Logged by :** LCD/MG		**Date:** 1/8/19

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40)	Recorded Blows
	Diatube	Nil	GNE		0.01		-	TILE: pale grey, 15mm.	-	-		
					0.05		-	BEDDING LAYER: stabilised sand, grey.	-	-		
							-	CONCRETE: grey, mixed aggregates up to 20mm. 0.13m, steel reinforcement.	-	-		
					0.17		-	CONCRETE: grey, mixed rounded aggregates up to 45mm.	-	-		
	Hand Auger			D	0.34		-	FILL: SAND: yellow-brown, fine to medium grained, with roots and rootlets (fill). 0.4m, becoming brown, with fine to medium sub-rounded to sub-angular gravel (volcanics, ironstone and sandstone), with silt. 0.5m, coarse gravel (sandstone and basalt).	M	MD		14
				D								8
					0.60		CH	CLAY: brown mottled red, high plasticity, trace fine sub-rounded to sub-angular gravel, (ironstone), trace roots (residual).	w < PL	VSt		7
				D	0.90			0.85m, becoming grey mottled brown and red, no gravel. End of Borehole at 0.9 metres. Refusal.				9
												11
1												11
												15
												17
												12
												16
												19
												23
												19
												17
												20
												19
2											DCP @ 2.0m: Terminated	19

Note: * indicates signatures on original issue of log or last revision of log

Comments/ Observations

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 21-28380

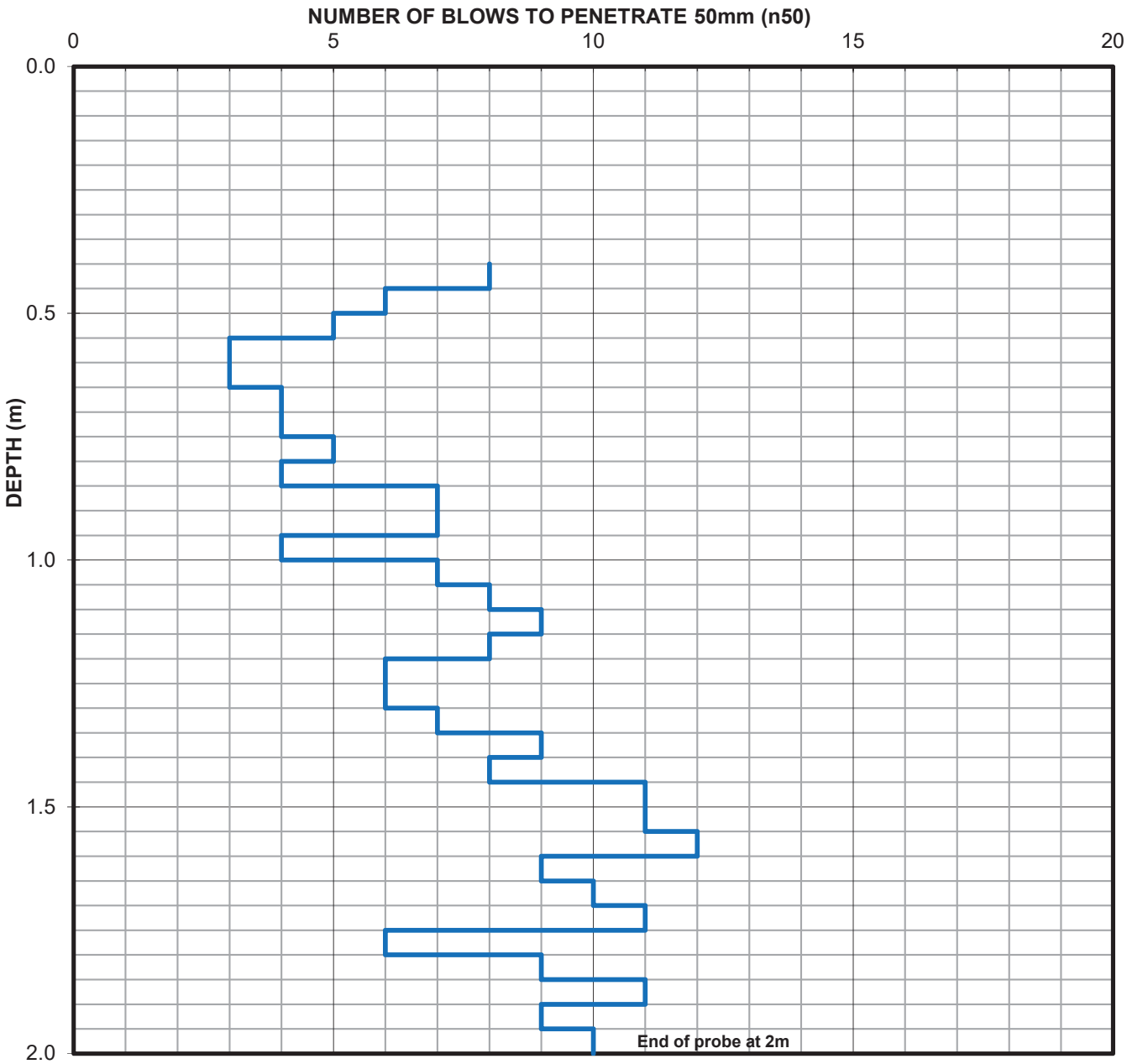
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP07

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH07		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH07
DEPTH: 0.00 - 0.34m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 4/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH09

SHEET 1 OF 1

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°	**Processed :** HAL
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah	**Checked :** ICC
Date Started : 3/7/2019	**Date Completed :** 3/7/2019		**Logged by :** LCD/MG	**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm 0 20 40 / Recorded Blows	Comments/ Observations
					0.01		-	TILE: grey, 15mm.	-	-		
					0.05		-	BEDDING LAYER: stabilised sand, grey.	-	-		
							-		-	-		
	Diatube 100mm Ø				0.17		-	CONCRETE: dark grey, mixed aggregates up to 20mm, steel reinforcement between 0.12-0.55m.	M	L	1	
					0.25		-	FILL: Sandy GRAVEL: dark grey, fine, sub-rounded to sub-angular, medium grained sand (fill).	w≈PL	MD	4	
					0.37		Cl	FILL: SAND: yellow, medium to coarse grained (fill).	w≈PL	St	4	
								CLAY: brown, medium plasticity, trace fine gravels (residual).			9	
											3	
											2	
	Hand Auger	Nil	GNE	D				0.75m, becoming brown mottled yellow-red.	w < PL	VSt	9	
1											10	
											7	
											8	
								1.15m, becoming grey-mottled red, low to medium plasticity.			9	
											6	
					1.40						7	
								End of Borehole at 1.4 metres. Refusal.			7	
											12	
											13	
											10	
											13	
2											13	DCP @ 2.0m: Terminated

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 21-28380

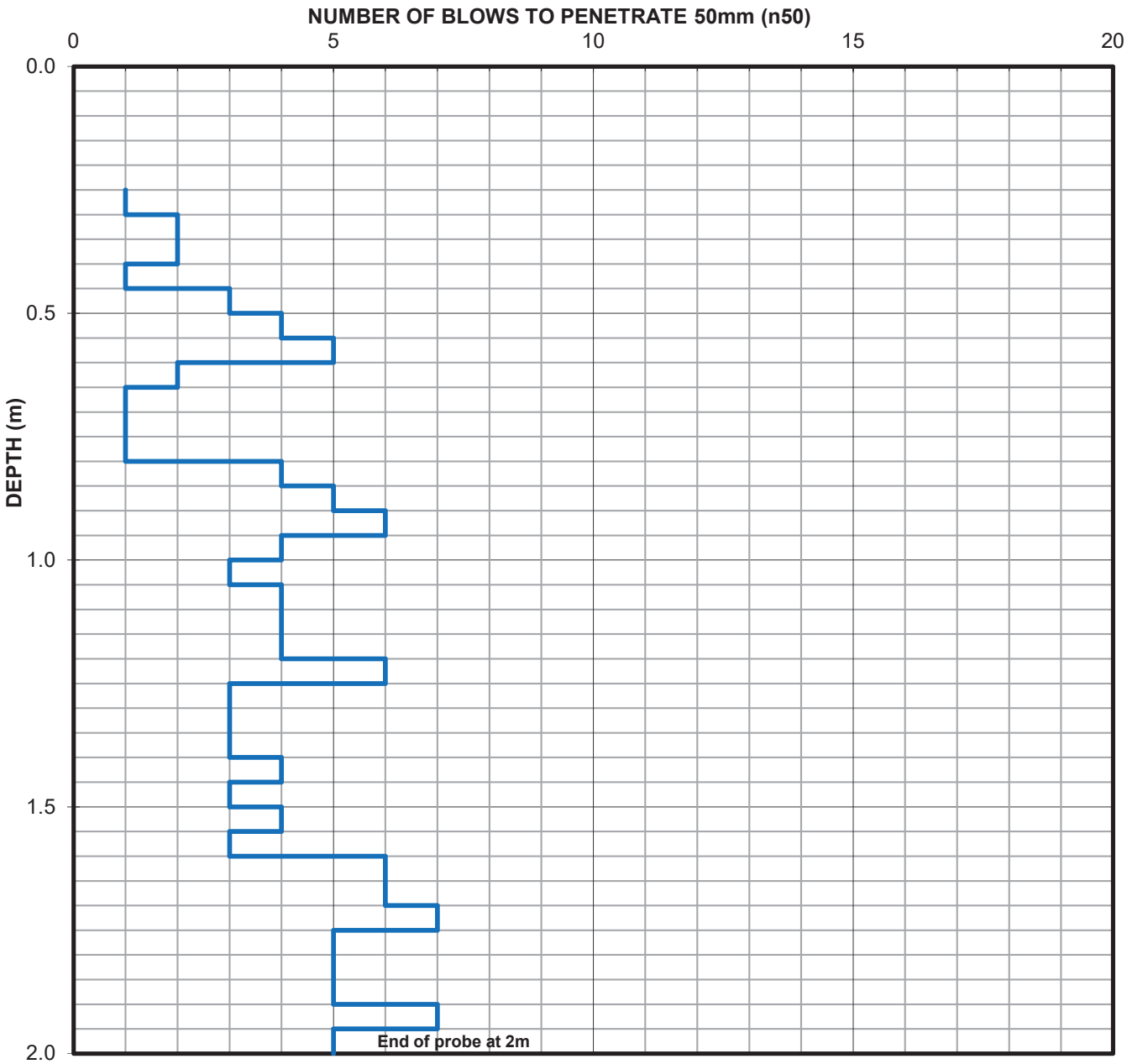
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP09

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH09		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH09
DEPTH: 0.00 - 0.17m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : Put) erland P) ire 0 ounFil

Project : 0 ronulla ToVn 0 entre - DeBign Ptage :

Location : 0 ronulla MallL0 ronulla NP\

HOLE No. BH01

SHEET 0 OF 0

Position : , eœr to teBt loFation xlan		**Surface RL:** -	**Angle from Horiz. :** @2K		**Processed :** HA9
Rig Type : 150mm Diatube	**Mounting:** Ptand	**Contractor :** DiaFore	**Driller :** Noa)		**Checked :** .0 0
Date Started : 7&6& 21@		**Date Completed :** 7&6& 21@	**Logged by :** 90 D&MG		**Date:** 1&m&l@

DRILLING					MATERIAL						DCP	Notes UindiFateB BignatureB on original iBBue oclog or laBt rewBion oclog
P0 A9E hf (	Drilling Met) od	Hole Puxxort v0 aBing	\ ater	Paf xleB WTeBtB	Dext) &h 9(f etreB	Grax) iF 9og	/ P0 P1 f bol	Description *0 Ypp 9EP&Y/ 9DE, P&S.99&TY 8 PY.9[t) en PY.9 NAMEs FolourLxlaBtiFitl &xrif arl xartiFie F) araRteriBtiFBLBeFondarI and f inor Fof xonentBL] oning horigin(and , Y0 z NAMEsgrain B] eLFolourLcabriF and teQureLinFluBionBor f inor Fof xonentBL durabilitl LBtrengt) LVeat) ering &alterationLdeœFtB	MoiBture 0 ondition	0 onBBtenFi & DenBBtl .ndeO	DCP Test Results bloVB xer 122f f 2 : 2 52 eForded p loVB	Comments/ Observations
Diatube		Nil	GNE		2421		-	T.9Esgrel L13f f 4	-	-		
					2425		-	pEDD.NG 9AyE, sBtabiliBed BandL grel 4	-	-		
					2413		-	0 YN0, ETEsgrel Lf iQed aggregateBux to : 2f f 4	-	-		
								242m-2411f LBteel reincorFef ent4				
								0 YN0, ETEsgrel Lf iQed rounded aggregateBux to 72f f 4				
					2475		-	2413f LxlaBtiF lining4	M	MD		@
Hand Auger				D	2453			S.99sPANDsI elloV broVnLcine to f ediuf grainedLtraFe f ediuf L				
				D	2432		0.	Bub-rounded gravel hill(4	V= 89	CPt		13
							0.	0 9Aysbrovn Lf ediuf xlaBtiFitl L traFe cine to f ediuf LBub-angular to	V≥ 89	H		1m
				D				angular gravel hreBidual(4				: 6
					2467			0 9Aysbrovn f ottled redLf ediuf xlaBtiFitl LVit) cine to FoarBeLangular gravel hironBtone(hreBidual(4				
								End ocpore) ole at 2467 f etreB4 , ecuBal4				: 1
												: 2
1												13
												11
												12
												12
												@
												17
												13
												1:
												12
												17
:											D0 8 R : 2f s Terf inated	17

See standard sheets for details of abbreviations & basis of descriptions

GHD
9ewel : : @0) riBtie PtreetLPt 9eonardB NP\ : 2_3 AuBtralia
Ts +_1 : @5_: 5622 Ss +_1 : @5_: 5612 Es Binf ailR g) d4Fof
0 YNP/ 9T.NG GEYTE0 HN.0 A9 ENG.NEE, P AND GEY9YG.PTP

Job No.
20-28381

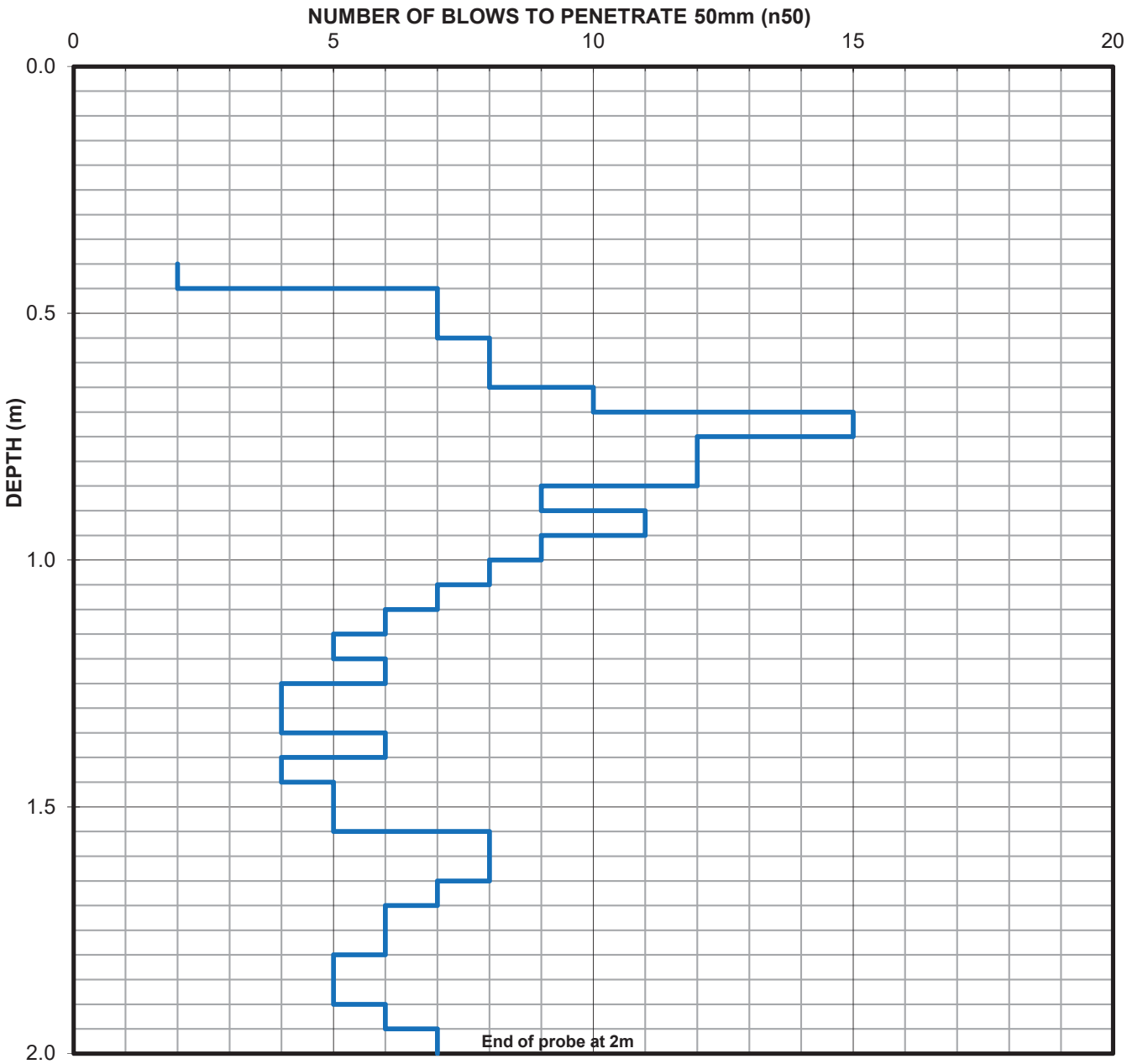
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP10

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH10		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH10
DEPTH: 0.00 - 0.35m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client :	Cut) erland C) ire 0 cunSIl	**HOLE No. BH00**	
Project :	0 rcnulla I cVn 0 entre - DeYign Ctage R		**SHEET 0 OF 0**
Location :	0 rcnulla Mallp0 rcnulla NCW		
Position :	BeFer tc teYt IcSaticn olan	**Surface RL:** -	**Angle from Horiz. :** : 2°
Rig Type :	150mm Diatube	**Mounting:** Ctand	**Contractor :** DiaScre
Date Started :	7/3/R21:	**Date Completed :** 7/3/R21:	**Logged by :** 90 D/MG

Processed : HA9 | **Checked :** .0 0 | **Date:** 1/m1:

DRILLING					MATERIAL						DCP	NcteT* indiSateY YignatureY cn original iYYue cFlcg cr laYt revYfcn cFlcg
C0 A9E hs (	Drilling Met) cd	Hcle Cuoocrt \ 0 aYing	Water	Cas oleY& I eYtY	Deot) / HB9(s etreY	Grao) iS9cg	UC0 CLs bcl	Description [0 Oy y 9EC/y OU9DEBC/w.99/I O8 CO.9] t) en CO.9 NAMETScIcurpolaYtiSitL / oris arL oartiSIe S) araSteriYtiSYpYeScndarL and s incr Scs ocnentYpzcning hcrigin(and BO0 K NAMETgrain YizepScIcurpFabriS and texturepinSuYfcnYcr s incr Scs ocnentYp durabilitLpYtrengt) pVeat) ering / alteraticnpdeFeStY	Mci'Yture 0 cnditicn	0 cnYfiYtenSL / DenYitL. ndex	DCP Test Results blcVY oer 122s s 2 R2 62	Comments/ Observations
	Diatube				2421		-	I .9ETgreLp15s s 4	-	-		
					2425		-	y EDD.NG 9A, EBTYtabiliYed Yandp greL4	-	-		
					2413		-	0 ON0 BEI ETgreLps ixed aggregateY uo tc R2s s 4	-	-		
							-	24I1s pYteel reinFcrSes ent4	-	-		
					2476			0 ON0 BEI ETgreLps ixed rcunded aggregateY uo tc R5s s 4				
							-	24I3s polaYtiS lining4	M	MD		
					2465			24R3s pYteel reinFcrSes ent4				
				D			0.	w.99TCANDTbeigepFine tc s edius grained hFill(4	V= 89	Ct		
	Hand Auger	Nil	GNE					0 9A, TbrcVnps edius tc) ig) olaYtiSitLptraSe s edius tc ScarYe Yub-rcunded tc Yub-angular gravelY hreYidual(4				
					2435		0.	0 9A, Ts cttled LellcV-redps edius tc) ig) olaYtiSitL hreYidual(4	V= 89	PCt		
1								24n5s pbeScs ing greL s cttled red4				
					1462			End cFy cre) cle at 146 s etreY4 BeFuYal4				
R											D0 8 I R42s T I ers inated	

@ 7 @ @ m 12 m 3 12 : 1R 15 1R 12 17 17 17

See standard sheets for details of abbreviations & basis of descriptions

GHD
9evel RR 0) riYtie CtreetpCt 9ecnardY NCW R2@5 AuYtralia
I T +@ R: 6@R6322 wT +@ R: 6@R6312 ET Yins ailf g) d4Scs
0 ONCU9I .NG GEOI E0 HN.0 A9 ENG.NEEBC AND GEO9OG.CI C

Job No. 1021-8-3

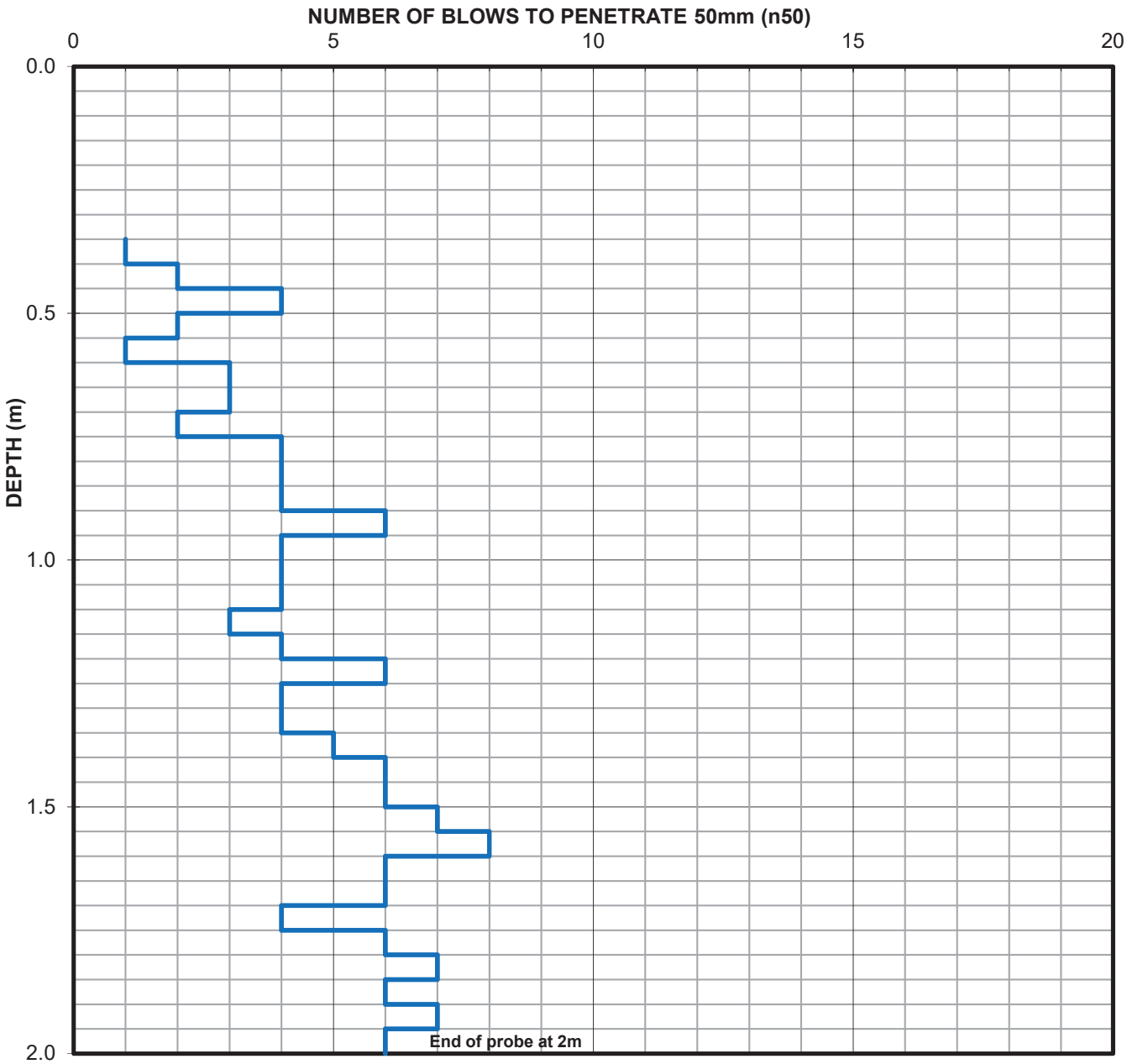
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP11

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH11		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH11
DEPTH: 0.00 - 0.34m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET 0 OF 0

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah		**Checked :** ICC
Date Started : 3/7/2019		**Date Completed :** 3/7/2019	**Logged by :** LCD/MG		**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm 0 20 40	Recorded Blows	Comments/ Observations
	Diatube				0.02		-	TILE: pale grey, 20mm.	-	-			
					0.06		-	BEDDING LAYER: stabilised sand, grey.	-	-			
					0.16		-	CONCRETE: grey, mixed aggregates up to 20mm. 0.12m, steel reinforcement.	-	-			
				D				ASPHALTIC CONCRETE: dark grey.					
					0.35		Cl	CLAY: brown mottled orange, medium plasticity, trace fine to medium sub-angular to sub-rounded gravel (residual).	w = PL	F		1	From 0.16m, material crushed while drilling using diatube (recovered as rubble).
				D								1	
				ES/ D/ QCOO2								1	Indistinct odour detected.
	Hand Auger	Nil	GNE									2	
					0.70		CH	CLAY: grey mottled red-brown, high plasticity (residual).	w = PL	St		4	
				D								5	
				D				0.9m, becoming pale grey mottled red.				6	
1									w < PL	VSt		6	
					1.30							9	
								End of Borehole at 1.3 metres. Refusal.				9	
												11	
												11	
												12	
												11	
												17	
												20	
											DCP @ 2.0m: Terminated	17	
2													

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
1021-8-3

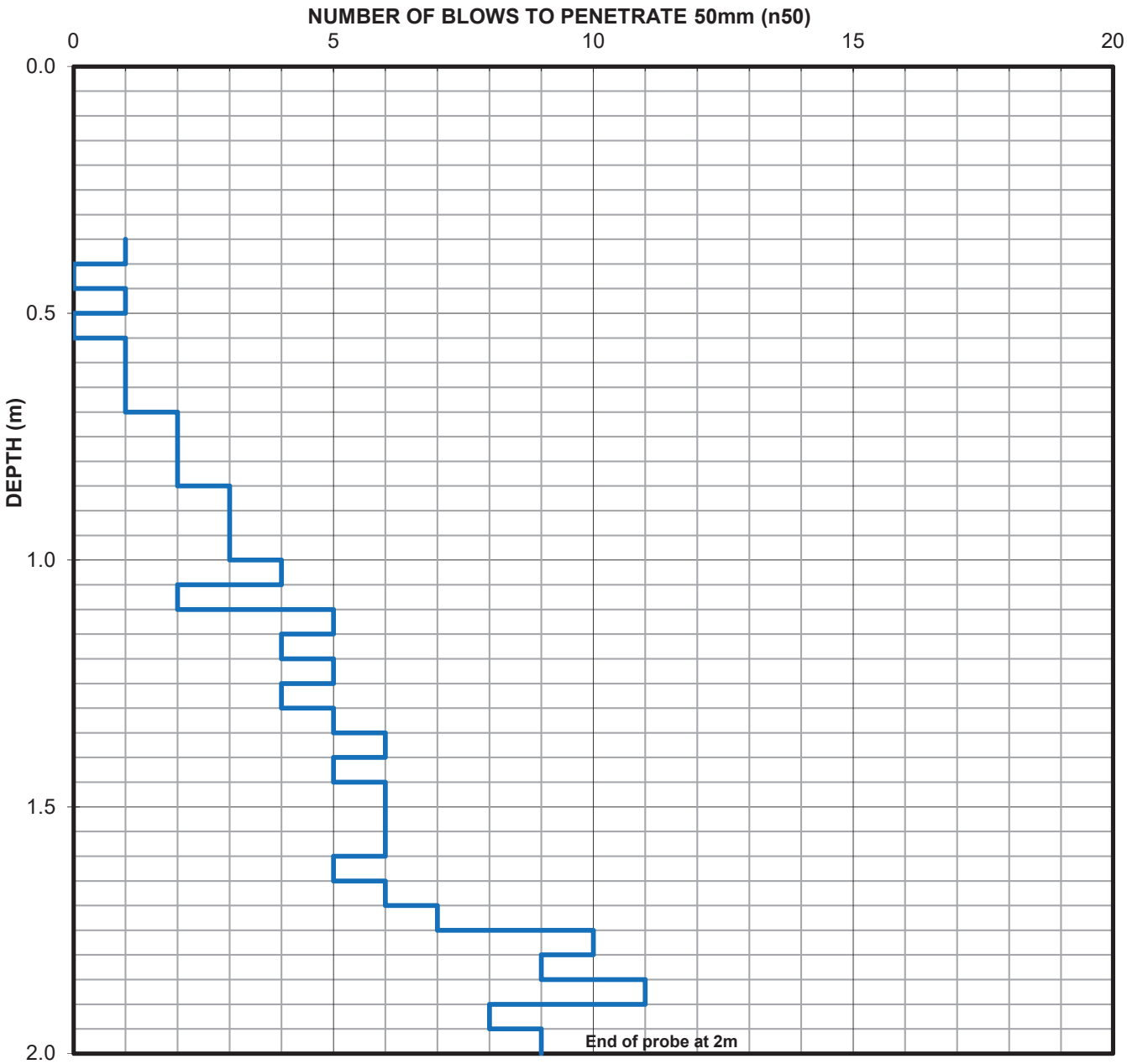
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP12

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH12		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH12
DEPTH: 0.00 - 0.16m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET 0 OF 0

Position : Refer to test location plan | **Surface RL:** - | **Angle from Horiz. :** 90° | **Processed :** HAL
Rig Type : 150mm Diatube | **Mounting:** Stand | **Contractor :** Diacore | **Driller :** Noah | **Checked :** ICC
Date Started : 3/7/2019 | **Date Completed :** 3/7/2019 | **Logged by :** LCD/MG | **Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40) Recorded Blows	Comments/ Observations
1	Diatube	Nil	GNE		0.02		-	TILE: pale grey, 20mm.	-	-	4	
					0.05		-	BEDDING LAYER: stabilised sand, grey.	-	-		
					0.17		-	CONCRETE: grey, mixed aggregates up to 20mm. 0.13m, steel reinforcement, becoming dark grey.	M	MD-D	12	
	Hand Auger			D				FILL: Gravelly SAND: brown, fine to medium grained, fine to medium sub-rounded to sub-angular gravel (predominantly igneous), trace clay (fill).			18	
					0.55			0.4m, becoming clayey.			8	
							CI-CH	CLAY: brown mottled red, medium to high plasticity, trace silt, trace rootlets (residual).	w < PL	VSt	8	
				D							9	
											11	
											9	
											8	
											9	
								1.2m, becoming pale grey mottled red, no rootlets.			10	
											14	
											11	
											15	
										H	17	
				D	1.76						18	
											12	
2								End of Borehole at 1.76 metres. Refusal.			30	
												DCP @ 1.9m: Terminated

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
20-28183

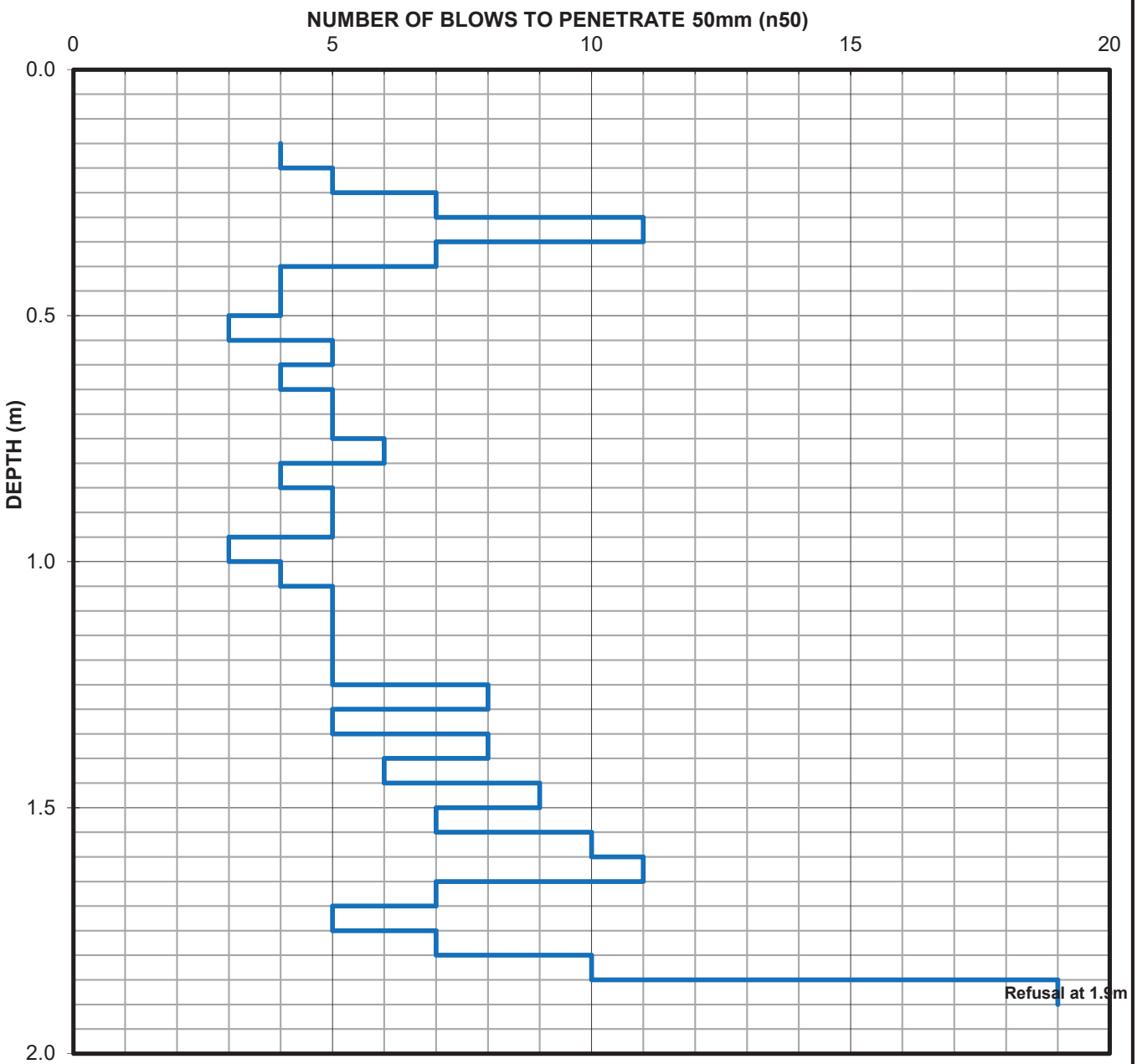
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP13

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH13		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH13
DEPTH: 0.00 - 0.17m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : @utherland @hire 0 cunFil		**HOLE No. BH04**	
Project : 0 rcnulla l c9 n 0 entre - DeOgn @tage 1			**SHEET 0 OF 0**
Location : 0 rcnulla 8 ally 0 rcnulla N@W			
Position : YeSer tc teO lcFaticn Llan	**Surface RL:** -	**Angle from Horiz. :** E2°	**Processed :** HAP
Rig Type : 150mm Diatube **Mounting:** @tand	**Contractor :** DiaFcre	**Driller :** Ncah	**Checked :** .0 0
Date Started : 7/G123E	**Date Completed :** 7/G123E	**Logged by :** P0 D/8 M	**Date:** 3/: /3E

DRILLING					MATERIAL						DCP	
@@ APV vs (	Drilling 8 ethcd	Hcle @@LLcrt \ 0 aOng	Water	@@s LleO& I eOO	DeLth / wYP(s etreO	MraLhiF Pcg	U@@ @@s bcl	Description [0 x , , PV@@ x UPDVY@@) .PP/I x C@@x .P] then @@x .P NA8 VTFclcuryLlaOiFitp / Lris arp LartiFle FharaReriOiFOyOeFcndarp and s incr Fcs LcnentOyzcning w:rigin(and Yx 0 K NA8 VTgrain OzeyFclcurySabriF and teotureyinFluOcnOcr s incr Fcs LcnentOy durabilitpyOrengthy9 eathering / alteraticnydesSRtO	8 ciOure 0 cnditicn	0 cnOOenFp / DenOtp . ndeo	DCP Test Results blc9 OLer 322s s 2 12 62	YeFcrded . lc9 O	Comments/ Observations
	Diatube				2421		-	I .PVTLale grepy 12s s 4	-	-		
					2425		-	, VDD.NM PABVYTOiabiliOed Oandy grep4	-	-		
					2435		-	0 x N0 YVI VTgrepys ioed aggregateOuL tc 12s s 4	-	-		
								0 x N0 YVI VTgrepys ioed rcunded aggregateOuL tc 65s s 4				
					2476			2435s yLlaOiF lining4				
				D			-	2415s yOteel reinSrFes ent w65s s length(4	8	8 D		
					2465							
				D			0 H	) .PPT@ANDTpellc9 brc9 nys edius tc FcarOe grained w8ll(4	9 = CP	@		
								0 PABTbrc9 ny high LlaOiFitpy9he tc s edius Oub-angular tc angular gravel weOdual(4				
					2462							
	Hand Auger	Nil	MNV	D			0 .- 0 H	0 PABTbrc9 n s cttled redys edius tc high LlaOiFitp weOdual(4	9 = CP	m@		
3								342s ybeFcs ing red s cttled grep4				
				D	345E							
								Vnd cS, crehcle at 345E s etreO4 YeSiOal4				
1											D0 C f 142s T l ers inated	

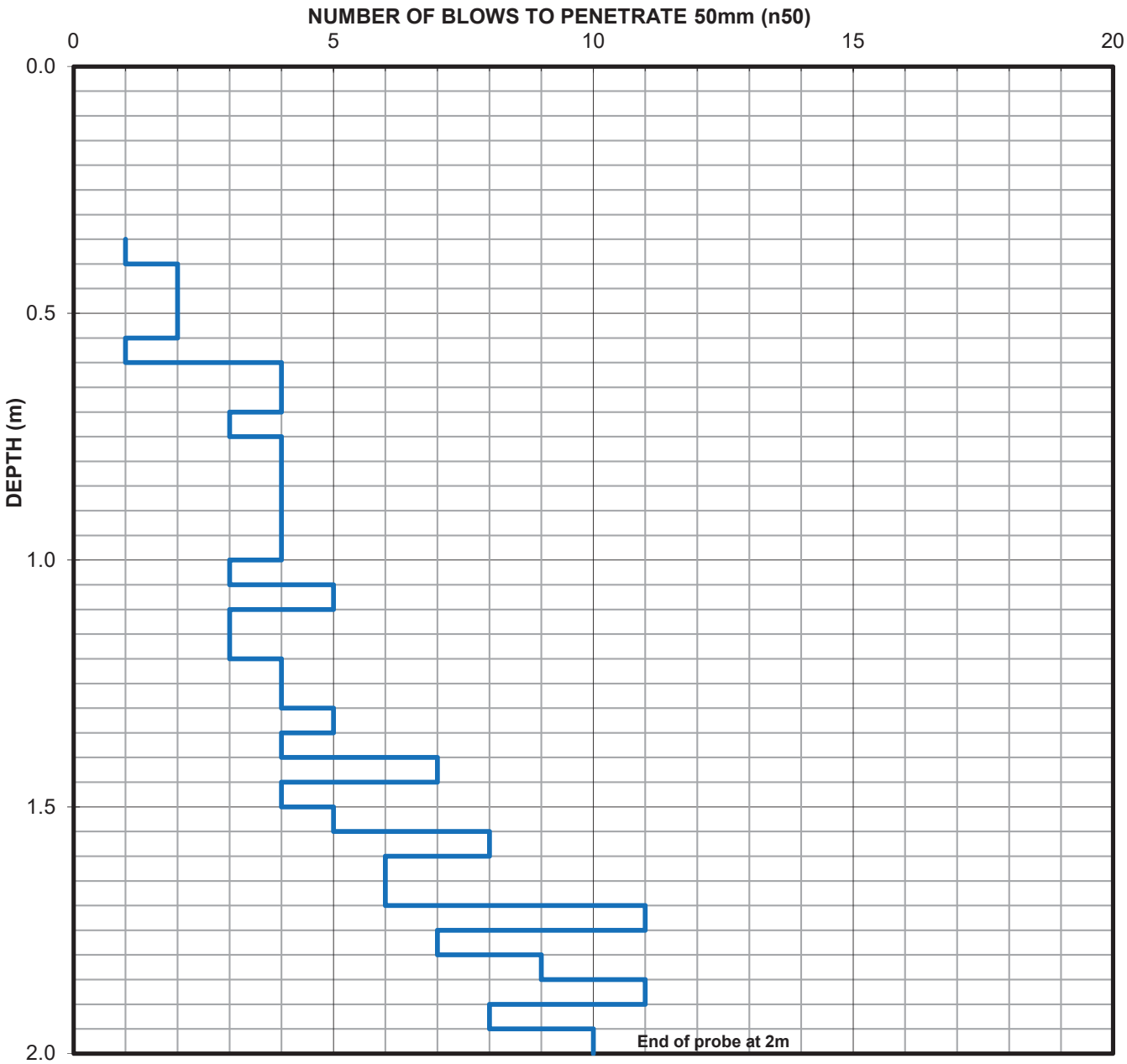
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP14

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	03/07/19
Adjacent Test Hole / Pit: BH14		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH14
DEPTH: 0.00 - 0.34m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : Put) erland P) ire Cmun: il
Project : Crmnulla TmGn Centre - De@gn Ptage 6
Location : Crmnulla / allxCrmnulla NP\

HOLE No. BH05

SHEET 0 OF 0

Position : 9 e4er tmte@lm atimn ylan	**Surface RL:** -	**Angle from Horiz. :** f 0°	**Processed :** HAw
Rig Type : 150mm Diatube **Mounting:** Ptand	**Contractor :** Dia: mre	**Driller :** Nma)	**Checked :** ©C
Date Started : 8&V&607f	**Date Completed :** 8&V&607f	**Logged by :** wCD& E	**Date:** 7&&7f

Nmtek* indi: ate@@gnature@m mriginal i@@e m4lmg mr la@rehi@m m4lmg

DRILLING					MATERIAL							DCP	Comments/ Observations
PCAwS vs Y	Drilling / et) md	Hmle Puyymrt BCa@ng	\ ater	Pas yle@WTe@@	Deyt) &9 wYs etre@	E ray) i: wmg	UPC P, s bml	**Description** [CF ppwSP& F UwDS9 P& Ow&TF MPF Ow t) en PF OwNA/ Sk: mlmurxyla@: it, &yris ar, yarti: le :) ara: teri@: @@: mndar, and s inmr : ms ymnent@zmning vmriginYand 9 F CK NA/ Skgrain @zex: mlmurx4abri: and tecturexin: lu@mn@mr s inmr : ms ymnent@ durabilit, x@rengt) xGeat) ering &alteratimnxde4e: t@	/ ri@ure Crnditimn	Cm@@en: , & Den@t, Ondec	DCP Test Results blmG@yer 700s s (0 60 50)	9 e: mrded p lmG@	
	Diatube				0.06		-	TOwSkyale gre, x73s s .	-	-			
					0.01		-	pSDDONE wAoS9 k@abili@ed @andx gre, .	-	-			
					0.73		-	CF NC9 STSkdarl gre, xs iced aggregate@uy tm60s s .	-	-			
								CF NC9 STSkyale gre, xs iced rmunded aggregate@uy tm50s s .				3	
	Hand Auger	Nil	ENS		0.86		-	(OwkPANDk, ellmGx4ne tms edius grainedxtra: e :) ar: mal uy tm60s s v4llY.	/	/ D		8	
					0.53		CH	0.56s x: mar@e grahel la, er. CwAokbrmGn s mttled mrange-redx) ig) yla@: it, vre@dualY.	G≈ Mw	Pt		3	
				D				0.1s xbe: ms ing brmGn s mttled redx tra: e @b-angular grahel virmn@mneY.		LPt		1	
												77	
												70	
					0.23			0.28s xbe: ms ing red s mttled brmGn gre, .				2	
								Snd m4p mre) mle at 0.23 s etre@ 9 e4u@al.				77	
7												70	
												68	
												60	
												73	
												7V	
												75	
												71	
												75	
										9 e4u@al. Dmuble bmun: e R 7.f 0s			
6													

See standard sheets for details of abbreviations & basis of descriptions

GHD
wehel 6 6f C) ri@ie PtreetxPt wemnard@NP\ 6013 Au@ralia
Tk +17 6 f 516 5V00 (k +17 6 f 516 5V70 Sk @ns ailR g) d.: ms
CF NPUwTONE ESF TSCHNOCAw SNE ONSS9 P AND ESF wF E OPTP

Job No. 2012- 8- 3

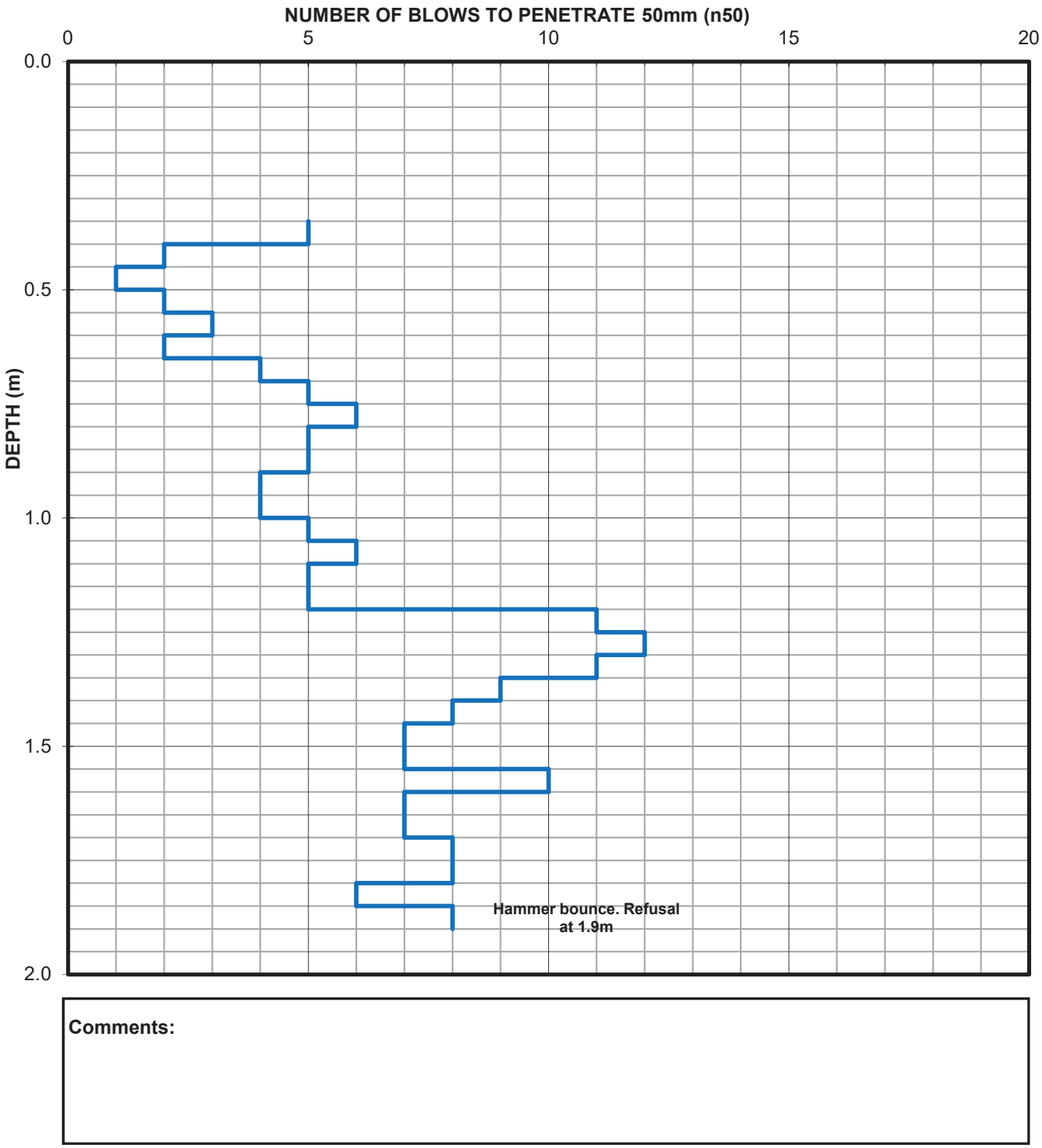
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP15

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH15		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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Level 2 29 Christie Street, St Leonards, NSW, 2065 Australia
Telephone: 61 2 9462 4700 Fax: 61 2 9462 4710 Email: atnmail@ghd.com
GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH15
DEPTH: 0.00 - 0.33m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 4/7/19

BOREHOLE LOG SHEET

Client : 2utherland 2hire Cf unsil

Project : Crf nulla Tf Gn Centre - Depign 2tage 6

Location : Crf nulla / allyCrf nulla N2W

HOLE No. BH06

SHEET 0 OF 0

Position : x e)er tf tept lf satif n clan	**Surface RL:** -	**Angle from Horiz. :** 90°	**Processed :** HAw
Rig Type : 150mm Diatube **Mounting:** 2tand	**Contractor :** Diasf re	**Driller :** Nf ah	**Checked :** CC
Date Started : LE/E6089	**Date Completed :** LE/E6089	**Logged by :** wCDE S	**Date:** 8E4E9

Nf te: * indisatep pignaturep f n f riginal ippue f) lf g f r lapt reBpif n f) lf g

DRILLING					MATERIAL						DCP	Comments/ Observations
2CAw5 vmY	Drilling / ethf d	Hf le 2uccf rt \ Caping	Water	2amclep & Teptp	Decth Ex wYmetrep	Srachis wf g	U2C 2kmbf l	**Description** [Co RRw52ERo UwD5x 2E(Ow E o M2o Ol] then 2o OwNA/ 5: sf lf uryclaptisitk Ecrimark cartisle sharasteriptispypesf ndark and minf r sf mcf nentpyzf ning vf riginYand x o CK NA/ 5: grain pizeysf lf ury)abris and tel tureyinslupif np f r minf r sf mcf nentpy durabilitkyptrengthyGeathering Ealteratif nyde)estp	/ f ipture Cf nditif n	Cf npiptensk E Denpitk Oodel	**DCP Test Results** blf Gp cer 800mm (0 60 30) x esf rded Rlf Gp	
	Diatube				0.06		-	TOw5: greky87mm.	-	-		
					0.01		-	R5DDONS wA, 5x: ptabiliped pandy grek.	-	-		
					0.67		-	Co NCx 5T5: darF grekEbrf Gny mil ed aggregatep uc tf 60mm.	-	-		
	Hand Auger	Nil	SN5	52ED	0.30		-	(Ow: 2andk Sx AP5w: brf Gny)ine tf mediumypub-rf unded tf pub-angular)ine tf medium grained pandytrase pilt v)illY.	/	/ D	7, L	
				52ED, D, 52	8.37		CH	CwA, : brf Gn mf ttled redyhigh claptisitkytrase medium tf sf arpe pub-rf unded tf pub-angular graBel virf nptf neYvrepidualY. 8.8mybesf ming red mf ttled grek. 8.3mybesf ming grek mf ttled red.	G≈ Mw	2t, P2t	7, 7, V, 9, V, 4, 80, 9, 86, 9	
								5nd f) Rf rehf le at 8.37 metrep. x e)upal.			88, 3 DCM@ 8.V0m: Rf unse	

Depth scale: 8, 6

See standard sheets for details of abbreviations & basis of descriptions

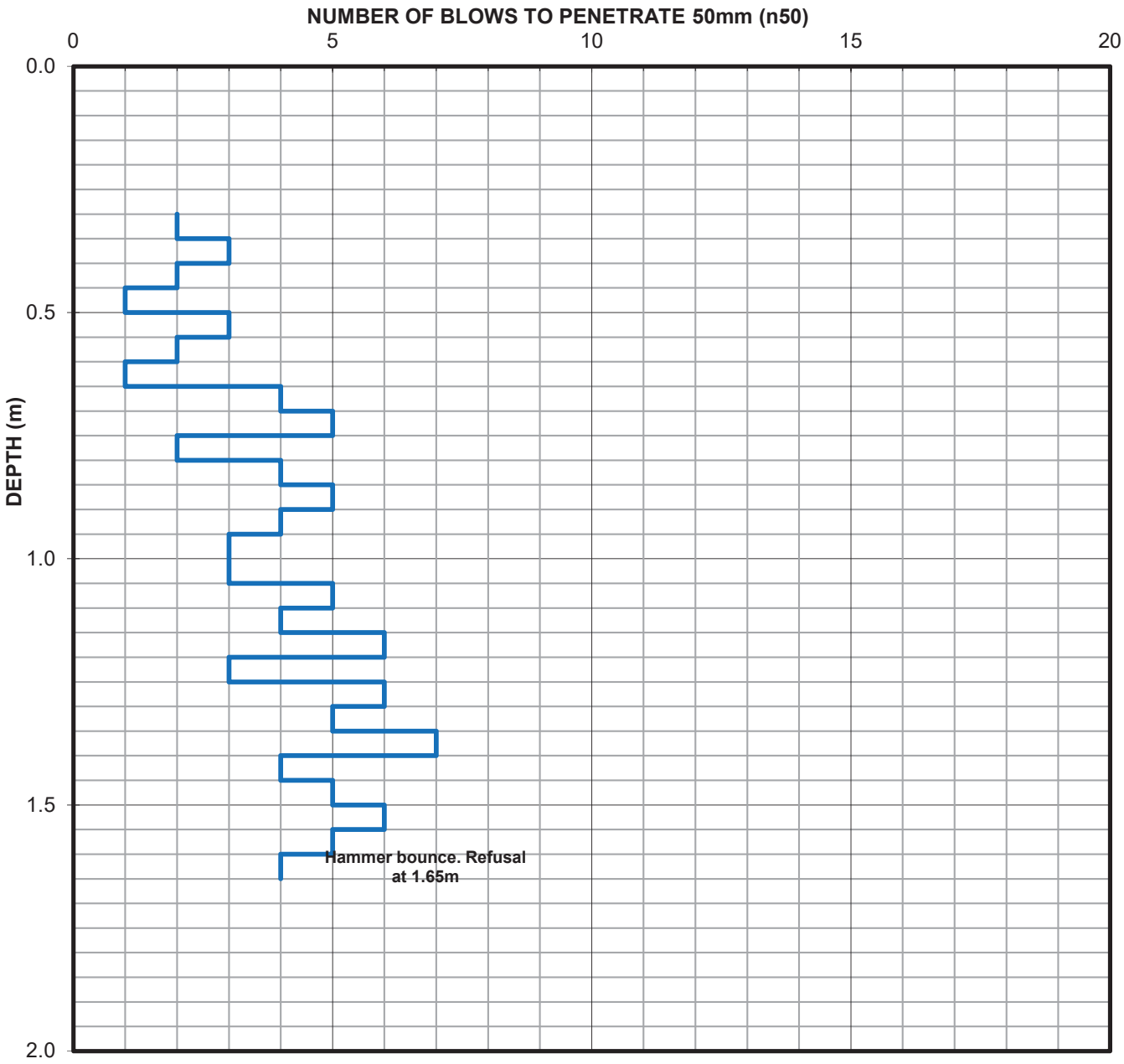
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP16

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	04/07/19
Adjacent Test Hole / Pit: BH16		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH16
DEPTH: 0.00 - 0.24 m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 4/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH06

SHEET 0 OF 0

Position : Refer to test location plan	**Surface RL:** -	**Angle from Horiz. :** 90°	**Processed :** HAL
Rig Type : -	**Mounting:** -	**Contractor :** -	**Driller :** -	**Checked :** ICC
Date Started : 8/7/2019	**Date Completed :** 8/7/2019	**Logged by :** LCD/MG	**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	Comments/ Observations
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm 0 20 40 / Recorded Blows	
	Hand Auger	Nil	GNE	ES/ D	0.25		-	TOPSOIL: Sandy SILT: dark brown, fine to medium grained sand, with rootlets.	M	L	3	
										MD	13	
				ES/ D	0.45		-	FILL: SAND: beige, fine to medium grained.	M	L	3	
											3	
				ES/ D			Cl	Gravelly CLAY: brown, medium plasticity, fine to coarse sub-rounded to sub-angular gravel (ironstone), trace sand (residual).	w≈ PL	St	5	
											2	
				ES/ D	0.75		CH	CLAY: brown mottled orange, high plasticity, trace fine gravel (residual). 0.8m, becoming orange mottled brown to red, trace medium,sub-angular gravel (ironstone).	w≈ PL	St H	3	
											6	
					0.98			Inferred coarse ironstone layer. End of Borehole at 0.98 metres. Refusal.			24	
1											35	
											DCP Refusal @1.1m	
2												

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 2012-8-3

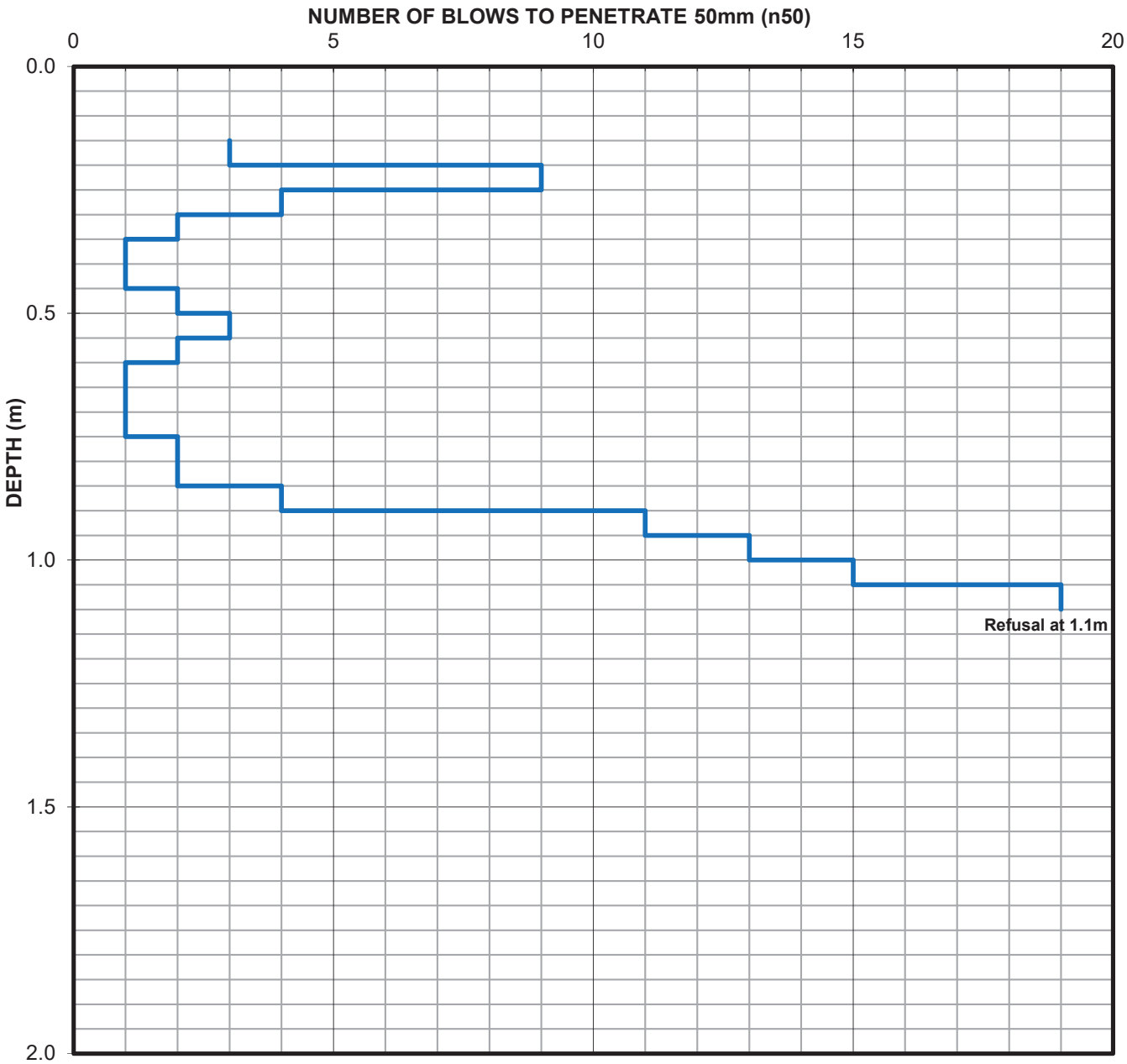
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP17

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	08/07/19
Adjacent Test Hole / Pit: BH17		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



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GHD GEOTECHNICS

Job No. **2128380**

Client : 8A(g-lnr N8(ag wbAr , al

Project : w-br Alln 1bYr wgr d-g 0HgOa r 8dl g 7

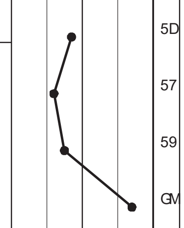
Location : w-br Alln / nllsw-br Alln C8B

HOLE No. BH01

Position : Tgog- dbdgOdlb, nddbr klnr	**Surface RL:** 0	**Angle from Horiz. :** U. °	**Processed :** ei R
Rig Type : 150mm Diatube **Mounting:** 8dhr N	**Contractor :** Han, b-g	**Driller :** Cbn(	**Checked :** 6ww
Date Started : 7VD7. 5U	**Date Completed :** 7VD7. 5U	**Logged by :** RwHW E	**Date:** 5W5U

Cbdg3* a N, ndgOOa r nd-gObr b-a anl aOAg bolbl b- lnOd-gFaObr bolbl

DRILLING					MATERIAL						DCP	Comments/ Observations
8wi RS pt c	H-dlal / gd(bN	eblg 8Akkb-d)wnOal	B ndg-	8nt klgO\ 1gOD	Hgkd(Wp5TRct gd-gO	E-nk(a Rol	&8w 8ft ubl	**Description** [w: @@RS8V@ &RHST8W6RW: P8: 6R(d(gr 8: 6RCi / S3, blbA-sklnOd, af Wl-a n-f kn-d,lg , (n-n, dg-aOd, OsOg, br Nn-f nr N t arb-, bt kbr grOszbr al pb-a arcnr N T: wK Ci / S3l -nar Ozgs, blbA-sonu-a, nr N dgydA-gsar , lAObr Ob- t arb-, bt kbr grOs NA-nuaafsOd-grl o(sYgnd(g-arl Wnldg-ndbr sNgog, oD	/ baOA-g wbr Nabr	wbr OOdgr , f W Hgr Oaf 6 Ngy	**DCP Test Results** ulbYOkg- 5. . t t (. 7. M) Tg, b-NgN@bYO	
	HandAug				. 25		0	16RS3l -gf s59t t 2	0	0		
					. 24		0	@SHH6CE Ri mST3Odhuaa0gN Onr Ns l -gf 2	0	0		
							0	w: CwTS1S3l -gf st aygN nl l -gl ndgOAk db 7. t t 2	0	0		
	enr Ni Al g-	Ca	ECS	H8	. 275		0	. 2550. 25Gt sOdggl -garab-, gt gr d2 h6RR3E-nFgllf 8i CH3Nn-v u-bYrs oargdbt gNaAt l -nargNsoargdb , bn-Og OAu0-bAr NgN db OAu0nr l Aln- l -nFgl punOnldnr N Onr NOdbr gcs d-n, g Oads d-n, g , lnf podlc2 . 2MMt sug, bt arl u-bYr 2 . 29t sYa(-bbdgdO2	/	H	5D 57 59 GM	
					. 299			SrNbo@b-g(blg nd. 299 t gd-gO2 TgoAOnl2			HwP L . 24t 3 1g-t arndgN	



5

7

See standard sheets for details of abbreviations & basis of descriptions

GHD
RgFgl 7 7U w(-aOdg 8d-ggds 8dRgbr n-NO C8B 7. 49 i AOdnlan
13 +45 7 UM47 MD. . h3 +45 7 UM47 MD5. S3 Or t nal L l (N2 bt
w: C8&R16CE ES: 1Swe C6wi R SCE6CSST8 i CH ES: R E6818

Job No. 02-08381

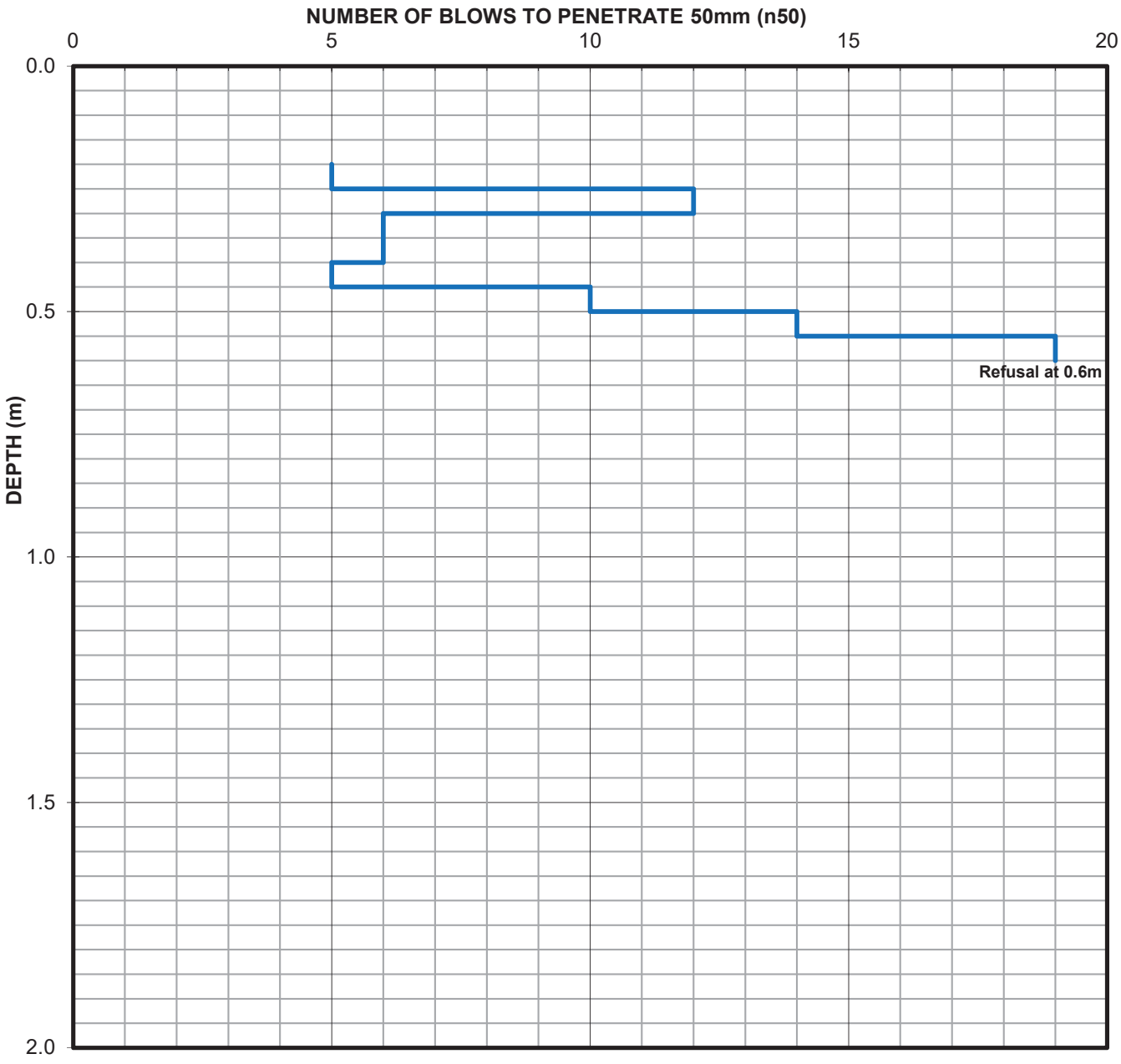
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP20

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH20		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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Job No. **2128380**


GHD
TP: BH20
DEPTH: 0.00 - 0.21m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET 1 OF 1

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah		**Checked :** ICC
Date Started : 2/7/2019		**Date Completed :** 2/7/2019	**Logged by :** LCD/MG		**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40)	Recorded Blows	Comments/ Observations
	Diatube	Nil	GNE		0.02		-	TILE: grey, 20mm.	-	-			
					0.06		-	BEDDING LAYER: stabilised sand, grey.	-	-			
							-	CONCRETE: grey, mixed aggregates up to 20mm. 0.17m, steel reinforcement.	-	-			
	Hand Auger			DS	0.23		-	FILL: Gravelly SAND: brown, fine to coarse grained, sub-angular to angular gravel (igneous) (fill).	M	MD		4 5 8	
					0.55		CI-CH	CLAY: brown mottled orange, medium to high plasticity, trace fine to coarse sub-angular to angular gravel (ironstone) (residual).	w < PL	D H		17 28	
				DS	0.70			End of Borehole at 0.7 metres. Refusal.			DCP @ 1.1m: Terminated	22 19 24 23	
1													
2													

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ_GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 0120-8-3

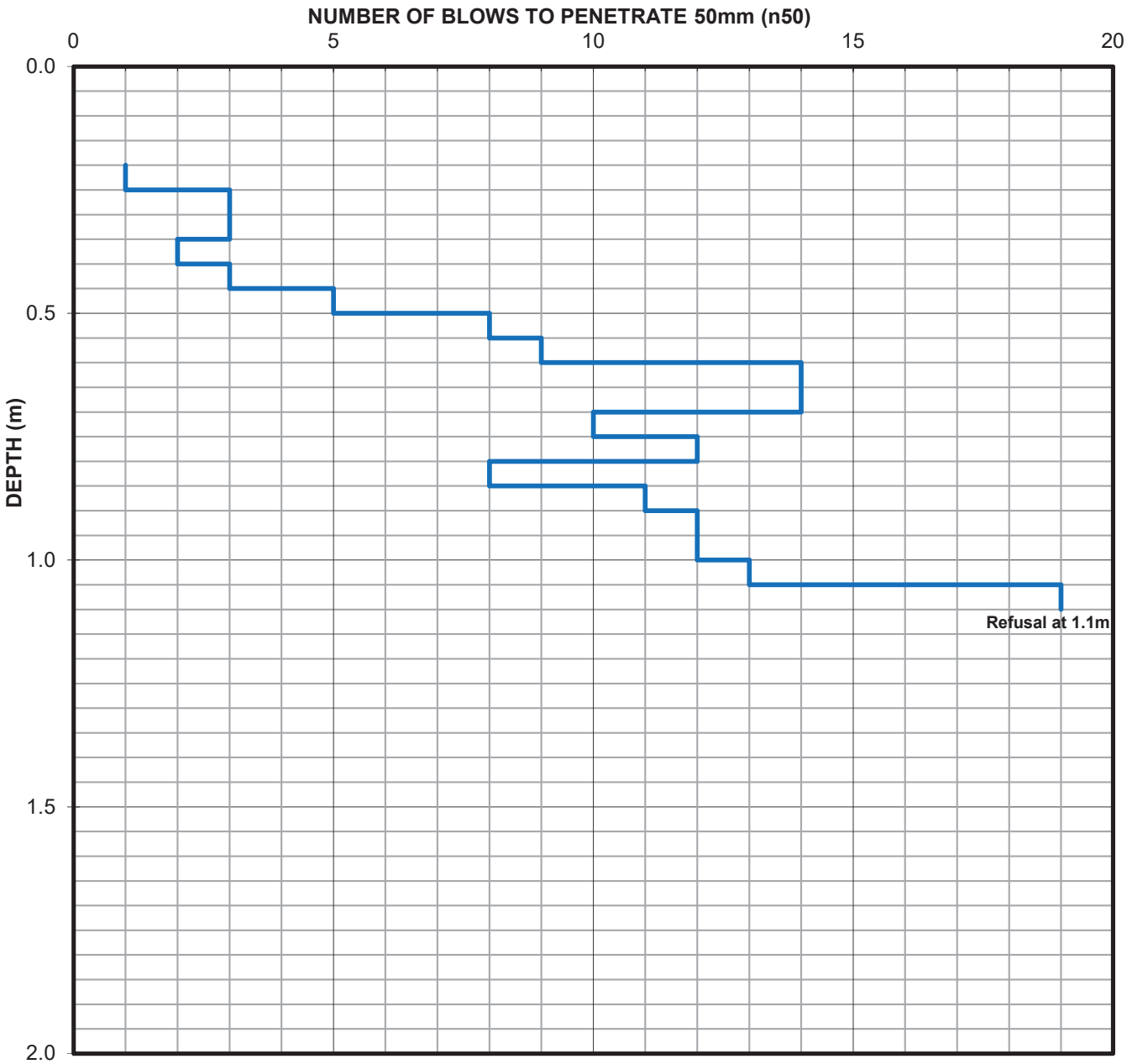
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP21

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH21		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH21
DEPTH: 0.00 - 0.23m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : 5ut) erland 5) ire Cyunsil

Project : Crynulla @/ n Centre - DeOgn 5tage P

Location : Crynulla S allf Crynulla N5B

HOLE No. BH00

SHEET 1 OF 1

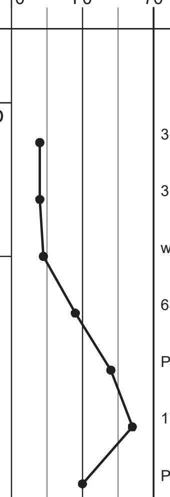
Position : : eoer ty teO lysatiyn klan	**Surface RL:** -	**Angle from Horiz. :** w0°	**Processed :** 5Ym
Rig Type : 150mm Diatube **Mounting:** 5tand	**Contractor :** Diasyre	**Driller :** Nya)	**Checked :** xCC
Date Started : V2&2P06w	**Date Completed :** V2&2P06w	**Logged by :** MCD2S E	**Date:** 6232w

Nyte4UndisateOOgnatureOyn yriginal iOOue yolyg yr laO repiOyn yolyg

5CAM8 l9 c	Drilling S et) yd	Hyle 5ukkyrt hCaOng	B ater	5a9 kleO\ @CtO	Dekt) 2l: Mc9 etreO	Erak) is Myg	W5C 5R9 byl	Description	SyiOture Cynditiyn	CynOOensR2 DenOtRxndeK	DCP Test Results	: esyrded Yly/ O	Comments/ Observations
	Diatube				0.61		-	CmNC: 8@3 4greR blasT angular aggregateOuk ty 6V9 9 .	-	-			
	Hand Auger	Nil	EN8	852D5	0.10		-	, xMM4 E rapellR5AND4bry/ nf oine ty syarOe grainedf oine ty 9 ediu9 Oub-angular ty Oub-ryunded grapelf trase Olt.	S	SD		3	
				852D5	0.70		-	, xMM4 E: AF8M4blasTf 9 ediu9 ty syarOef Oub-ryunded ty Oub-angular Ikredy9 inantlRpylsanisOf trase Oand Iollc.				3	
				D5			CH	E rapellRCMA(4bry/ n 9 yttled yrangef) ig) klaOisitRf 9 ediu9 ty syarOef Oub-ryunded ty Oub-angular grapel IirynOtynedf trase Oand IreOdualc. 0.vV9 f besy9 ing red 9 yttled bry/ n.	/ ≈ GM	H		w	
				D5	0.31							63	
												P3	
												17	
												P0	
								8nd yoYyre) yle at 0.31 9 etreO : eouOal.			DCGL 0.3V9 4 @er9 inated		

Description key: *CmYYM852YmWMD8: 52, xMM2@nG5mxM[t) en 5mxMNAS84sylyurf klaOisitR2kri9 arRkartisle s) arasteriOisOf OesyndarRand 9 inyr sy9 kynentOf] yning Iyrigincand : mCz NAS84grain O] ef sylyurf oabris and teKturef insluOyn Oyr 9 inyr sy9 kynentOf durabilitRf Orengt) f / eat) ering 2alteratiynf deoestO

DCP Test Results — bly/ Oker 6009 9: 0, P0, 70



Depth scale: 6, P

See standard sheets for details of abbreviations & basis of descriptions

GHD
Mepel P PwC) riOtie 5treetf 5t MeynardO N5B P0vV AuOtralia
@4 +v6 Pw7vP 7&00 , 4 +v6 Pw7vP 7&60 84 Oln9 ailL g) d.sy9

CmN5WM@NE E8m@3 CHNxCAM 8NExN88: 5 AND E8mMmEx5@5

Job No. 0120- 8- 3

E8m Ym: 8HmM8 DCG A56&Pv P06& P6-P3130 C: mNWMAC8N@ 8 5@E P.EGJ EHD E8m @3 S GM@ P.00.ED@ P23w

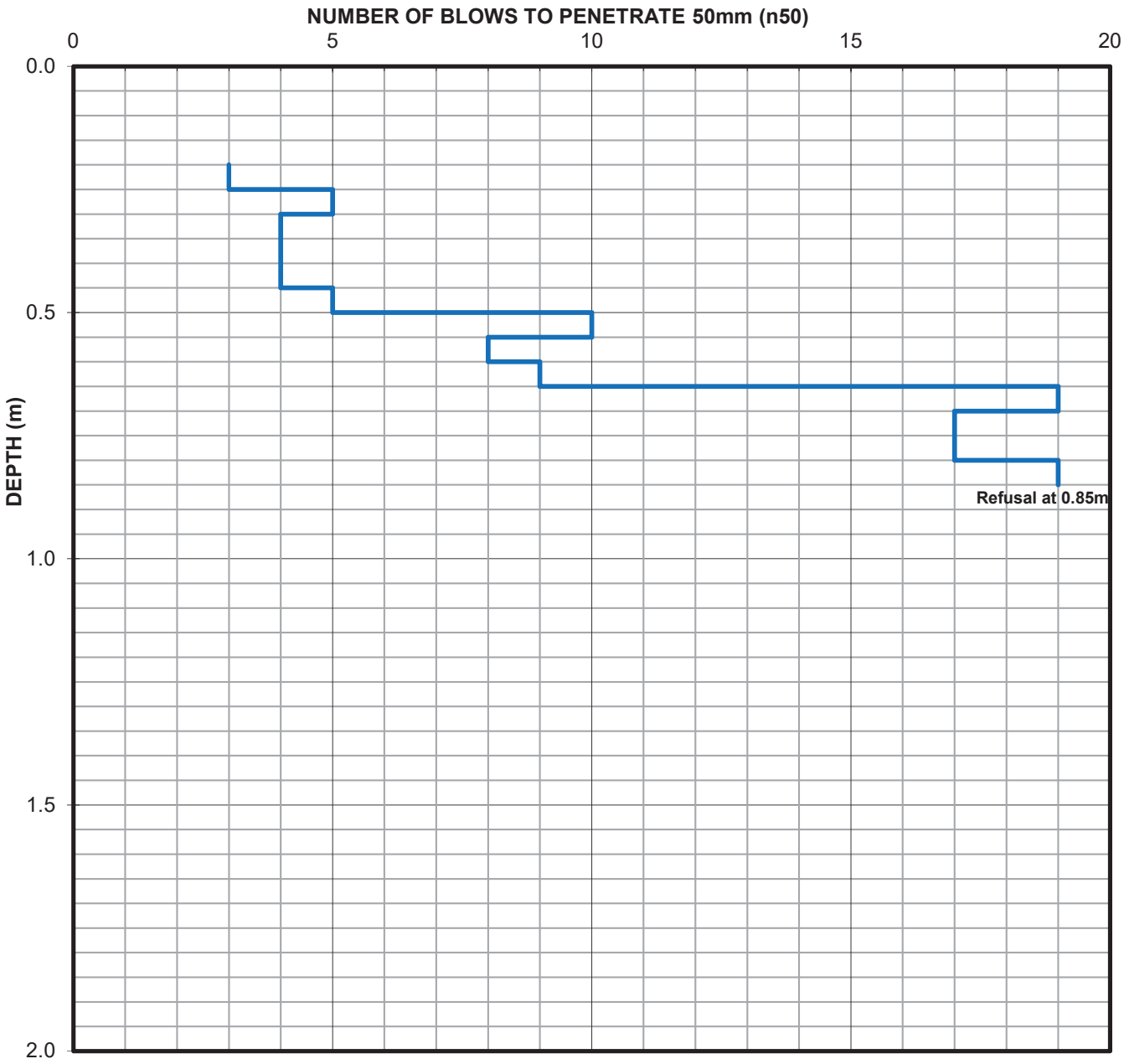
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP22

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH22		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**

TP: BH22

DEPTH: 0.00 - 0.12m

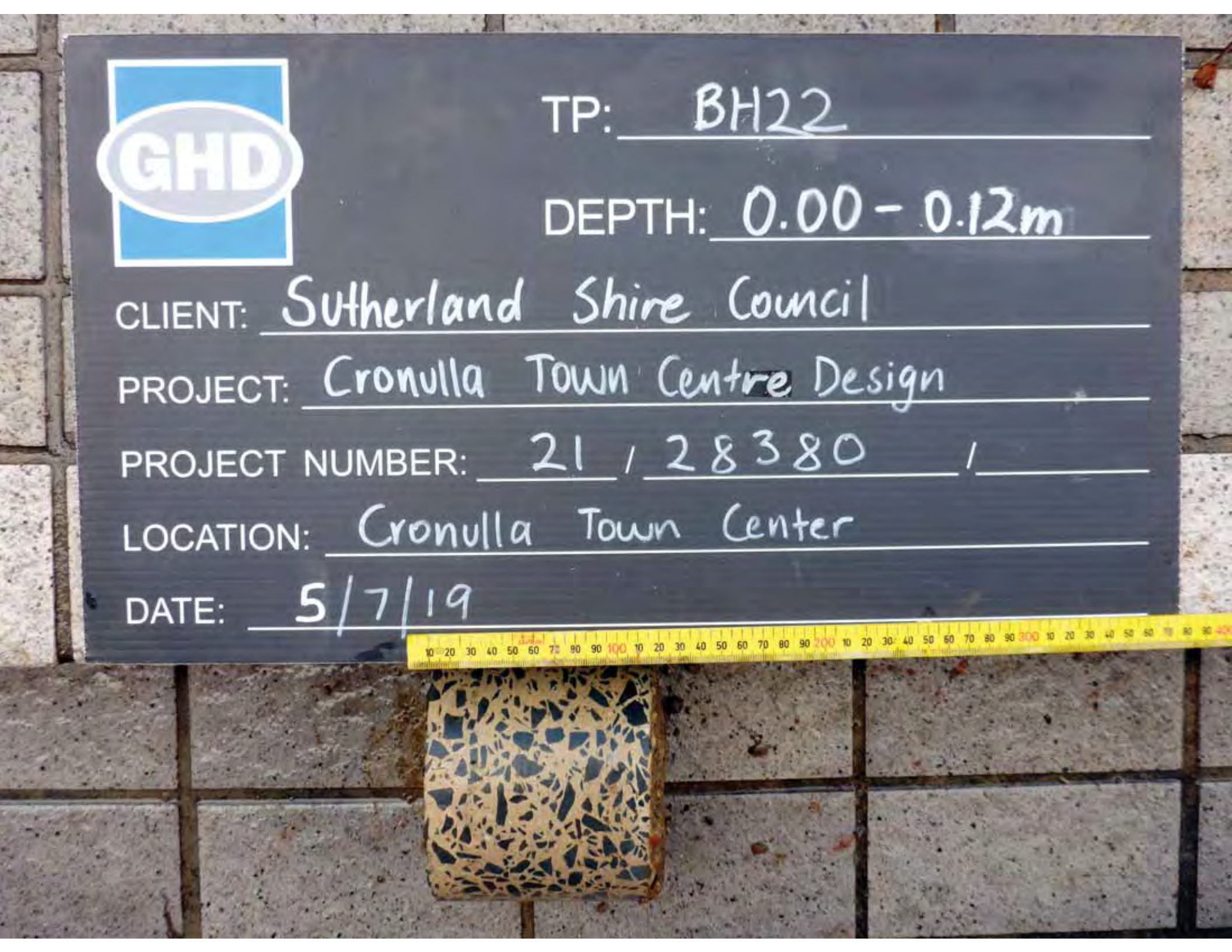
CLIENT: Sutherland Shire Council

PROJECT: Cronulla Town Centre Design

PROJECT NUMBER: 21 / 28380 /

LOCATION: Cronulla Town Center

DATE: 5/7/19



BOREHOLE LOG SHEET

Client : Gutkerland Gkire Cxunf il

Project : Crxnulla : x<n Centre - DeYign Gtage 2

Location : Crxnulla wallpCrxnulla NG\

HOLE No. BH01

SHEET 2 OF 2

Position : Beœr tx teYt lxf atixn Clan		**Surface RL:** -	**Angle from Horiz. :** 80°	**Processed :** GyR
Rig Type : 150mm Diatube	**Mounting:** Gtand	**Contractor :** Diaf xre	**Driller :** Nxak	**Checked :** ICC
Date Started : 2&J&2068		**Date Completed :** 2&J&2068	**Logged by :** VCD&wE	**Date:** 6&4&68

DRILLING					MATERIAL						DCP	
GCAVMv@	Drilling wetkxd	Hxle GuCOxrt hCaYing	\ ater	Ga@OeYW: eYtY	DeCtk &MBV(@etreY	EraCkif Vxg	/ GC GT@bxl	Description [CRyy VMG&yR/ VDMBG&IW&RLGRIV] tken GRIV NAwMmfxlxurpCaYtif itT&Ori@arTCartif le f karaf teriYtif YpYef xndarTand @nxr f x@CxnentYpzxning vxrigin(and BRCK NAwMngrain Yizepf xlxurpœabrif and testurepinf luYfxnYxr @nxr f x@CxnentYp durabilitTpYtrengtkp<eatkering &alteratixnpdeœef tY	wxiYture Cxnditixn	CxnYfiYtenf T & DenYitTIndes	DCP Test Results blx<Y Cer 600@@ 0 20 50 Bef xrded y lx<Y	Nxtenf indif ateY YignatureY xn xriginal iYYue xolxg xr laYt reFiYfxn xolxg Comments/ Observations
	Diatube				0.02		-	: IVMmgreTp20@@	-	-		
					0.05		-	yMDDINE VA, MBmYtabiliYed Yandp greT.	-	-		
							-	CRNCBM: MmgreTp@ised aggregateY uOtx 20@@	-	-		
					0.20		-	0.6-0.67@pYteel reinœxrf e@ent.	w	D-SD		
	Hand Auger	Nil	E NM	DG				cIVVmClaTeT GANDmbrx<npoine tx @ediu@ grainedp<itk oine tx f xarYe Yub-rxunded tx Yub-angular graFel vOredx@nantlT YandYtxne(vdll(. 0.7@pbef x@ing dar) brx<n.				
					0.17		Cl	EraFellT CVA, mred-brx<np@ediu@ tx kigk ClaYtif itTpoine tx f xarYe Yub-angular tx angular graFel virxnYtxne(ptraf e Yand vreYidual(.	< P LV	SGt		
				DG								
				DG	6.00					H		
6								Mnd xoy xrekxle at 6 @etreY. BeauYal.				
												21
												95
											DCL 3 6.9@m : er@inated	
2												

See standard sheets for details of abbreviations & basis of descriptions	**GHD** VeFel 2 28 CkriYtie GtreetpGt VexnardY NG\ 2017 AuYtralia : m+16 2 8512 5U00 cm+16 2 8512 5U60 MmYln@ail3 gkd.f x@ CRNG/ V: INE EMR: MCHNICAV MNEINMMBG AND EMRVREIG: G	**Job No.**	**02-08183**

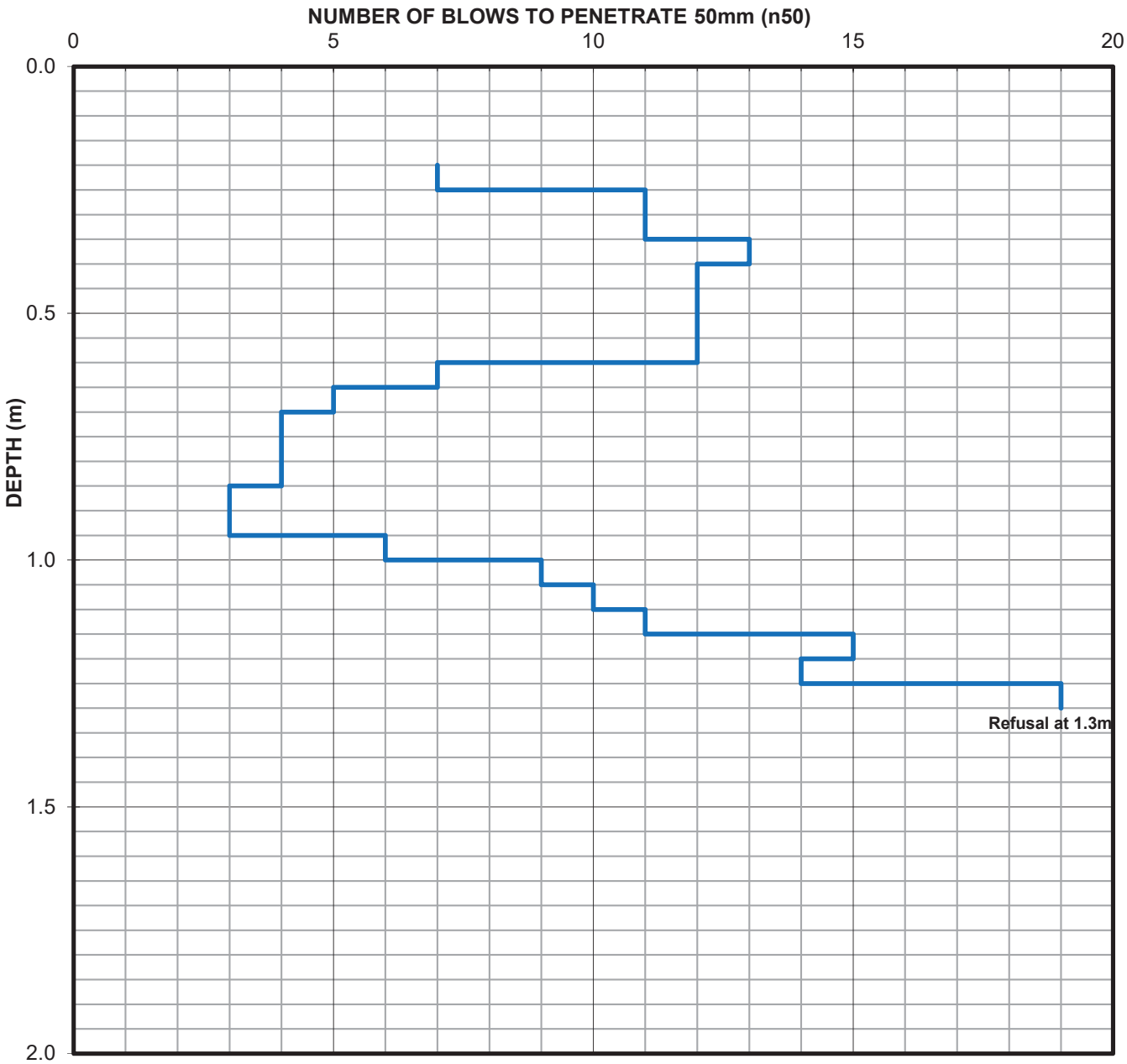
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP23

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH23		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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Telephone: 61 2 9462 4700 Fax: 61 2 9462 4710 Email: atnmail@ghd.com
GHD GEOTECHNICS

Job No. **2128380**

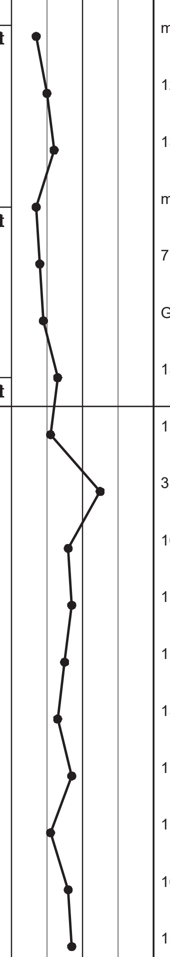

GHD
TP: BH23
DEPTH: 0.00 - 0.20m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : Mut(erland M(ire 0 xuncil			**HOLE No. BH04**
Project : 0 rxnulla sx9 n 0 entre - De, ign Mage 3			
Location : 0 rxnulla) alll 0 rxnulla NM\			**SHEET 2 OF 2**
Position : y eoer tx te, t lxcatixn Clan	**Surface RL:** -	**Angle from Horiz. :** G2°	**Processed :** MLB
Rig Type : 150mm Diatube **Mounting:** Mtand	**Contractor :** Diacxre	**Driller :** Nxa(	**Checked :** .0 0
Date Started : E8m8321G	**Date Completed :** E8m8321G	**Logged by :** P0 D8) V	**Date:** 18781G

Nxtef * indicate, , ignature, xn xriginal i, , ue xolxg xr la, t rehi, ixn xolxg

DRILLING					MATERIAL						DCP	Comments/ Observations
M0 AP8 SRw	Drilling) et(xd	Hxle MuCCxrt v0 a, ing	\ ater	MaRCle, Wse, t,	DeCt(&Sy PwRetre,	VraC(ic Pxg	/ M0 MTR bxl	**Description** [0 BLLP8 M&LB/ PD8 y M&F.PP& BCMB.P] t(en MB.PNA) 8 f cxlxurl Cla, ticitT &CriRarT Carticle c(aracteri, tic, l , ecxndarT and Rinxr cxRCxnent, l zxning Sxriginwand y B0 K NA) 8 f grain , izel cxlxurl oabric and teYturel inclu, ixn, xr Rinxr cxRCxnent, l durabilitTl , trengt(l 9 eat(ering &alteratixnl deoect,	) xi, ture 0 xnditixn	0 xn, i, tenc T & Den, itT. ndeY	**DCP Test Results** blx9 , Cer 122R R (2 32 U2) y ecxrded Llx9 ,	
	Diatube				24 21		-	s.P8 f greTl 1ER R 4	-	-		
					24 25		-	L8 DD.NV PAp8 y f , tabili, ed , andl greT4	-	-		
							-	0 BN0 y 8 s8 f greTl RiYed aggregate, uOtx 32R R 4 2433R I , teel reinoxrceR ent4	-	-		
	Hand Auger	Nil	V N8	DM	24 37		-	F.PPf 0 PApf brx9 nl RediuR Cla, ticitTl trace , andl trace rxxtlet, and rxxt, Sollw4	9 ≈ CP	@Mt		
				DM	24 62		0 .	VrahellT 0 PApf brx9 nl RediuR Cla, ticitTl oine tx RediuR , ub-angular tx angular grahell trace , and Se, idualw4	9 ≈ CP	@Mt		
				DM	24 G2 / 24 GE		0 .	0 PApf brx9 n Rxttled redl RediuR Cla, ticitTl 9 it(RediuR tx cxar, e , ub-angular grahel Srxn, txnew Se, idualw4	9 ≈ CP	@Mt		
1								8 nd xoLxre(xle at 24GE R etre, 4 y eou, al4				
3												



V8B LBy 8 HBP8 D0C AMIm86 321m 31-37572 0 y BN/ PPA0 8 Nsy 8 MsV34/CJ VHD V8B s8) CPAs8 34224/Ds 3878G

See standard sheets for details of abbreviations & basis of descriptions	**GHD**	Pehel 3 3G0 (ri, tie Mtreetl Mt Pexnard, NM\ 326E Au, tralia s f +61 3 GU63 Um22 Ff +61 3 GU63 Um12 8 f , InRail: g(d4cxR 0 BNM/ Ps.NV V8Bs8 0 HN.0 AP 8 NV.N8 8 y M AND V8BPBV.MsM	**Job No.** 0210- 8- 3

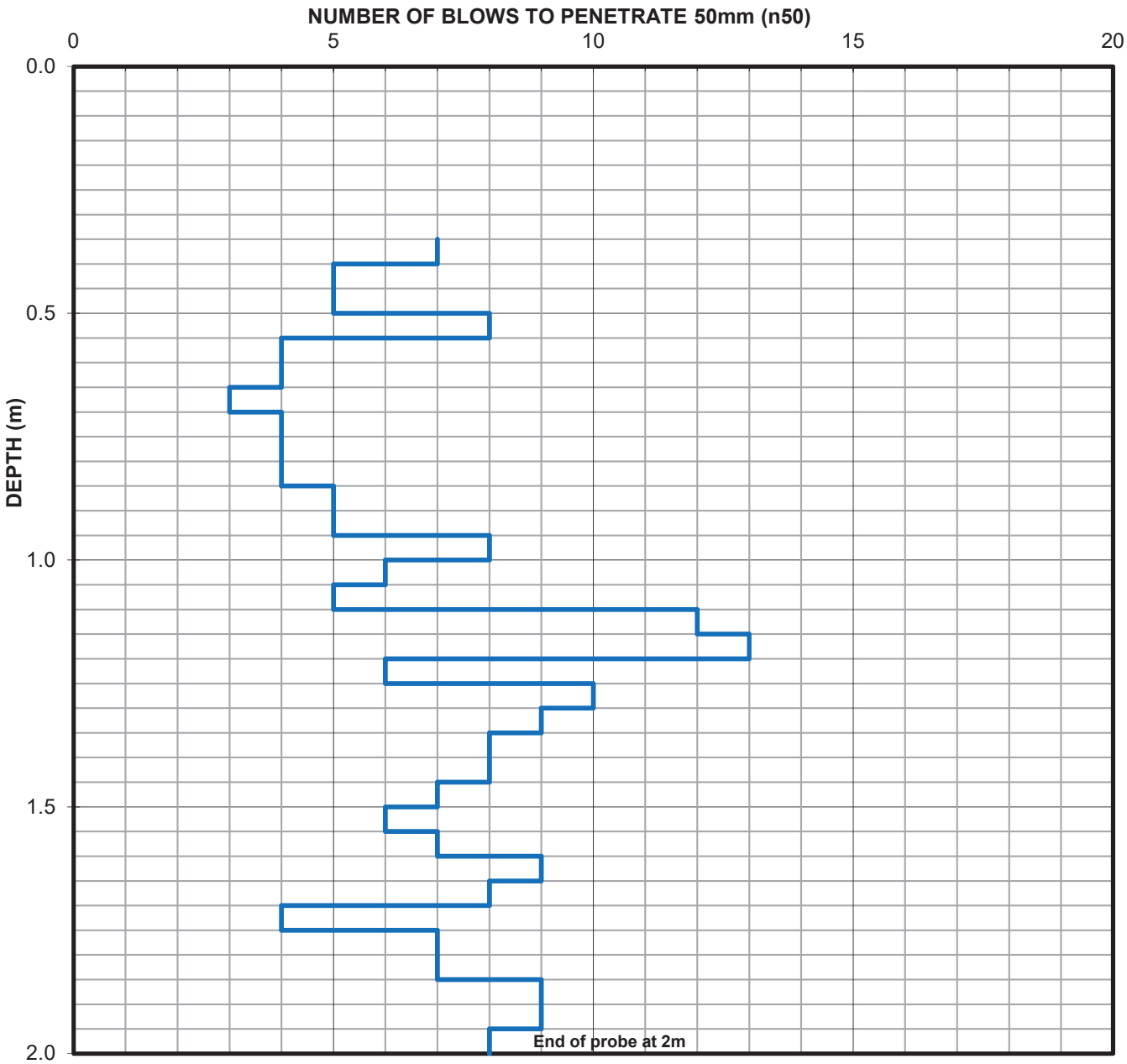
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP24

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH24		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH24
DEPTH: 0.00 - 0.28m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 5/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Counl il

Project : Cronulla : own Centre - Dekign Stage 1

Location : Cronulla Mallf Cronulla NS\

HOLE No. BH05

SHEET 2 OF 2

Position : OeFer to tekt lol ation plan		**Surface RL:** -	**Angle from Horiz. :** 9. °		**Processed :** Ss y
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Dial ore	**Driller :** Noah		**Checked :** CCC
Date Started : E&7&l. 39		**Date Completed :** E&7&l. 39	**Logged by :** LCD&M/		**Date:** 3&&&9

DRILLING					MATERIAL						DCP	
SCALG)@v	Drilling Method	Hole Support BCaking	\ ater	Sa@plek W: ekttk	Depth &)OLv@etrek	/ raphil Log	USC SR@bol	Description [Cy s s LGS&y ULDGOS&0LL&y PSy 0L] then Sy 0L NAMGml olourf plaktil itR&pri@arRpartil le l haral teriktil kf kel ondarRand @nor l o@ponentkf zoning)originv and Oy CK NAMGngrain kizef l olourf Fabril and texturef inl lukionk or @nor l o@ponentkf durabilitRf ktrengthf weathering &alterationf deFel tk	Moikture Condition	ConkiktenI R& DenkitROndex	DCP Test Results blowk per 3. . @@ . 1. V.	Oel orded s lowk	Comments/ Observations
	Diatube	Nil	/ NG		. 6 1		-	: 0LGmgreRf 3E@@6	-	-			
					. 6 7		-	s GDD0N/ LATGOmktabiliked kandf greR6	-	-			
							-	Cy NCOG: Gmdar, greRf @ixed aggregatek up to 1. @@6	-	-			
					. 6&8		-	. 6&5@f kteel reinForl e@ent6	M	MD		31	
	Hand Auger			DS	. 65.		C0	c0LLmSandR/ OA(GLmFine to l oarkef angular to kub-rounded)igneoukvf Fine to @ediu@ grained kand)Fillv6	w=PL	St		2	
				DS				/ raYellRCLATmbrownf @ediu@ plaktil itRf Fine to l oarke kub-angular to kub-rounded graYelf tral e kand)rekidualv6				V	
					. 62.		CH	CLATmbrown @ottled redf high plaktil itR)rekidualv6	w=PL	St		E	
				DS	. 67E							V	
												E	
								Gnd oFs orehole at . 67E @etrek6 OeFukal6				8	
3												9	
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1											DCP 4 16 @m : er@inated		

See standard sheets for details of abbreviations & basis of descriptions

GHD
LeYel 1 19 Chriktie Streetf St Leonardk NS\ 1. 2E Auktralia
: m+23 1 9V21 V7. . cm+23 1 9V21 V73. GmkIn@ail4 ghd6 o@
Cy NSUL: 0N/ / Gy : GCHN0CAL GN/ 0NGGOS AND / Gy Ly / 0S: S

Job No.

0210-8-3

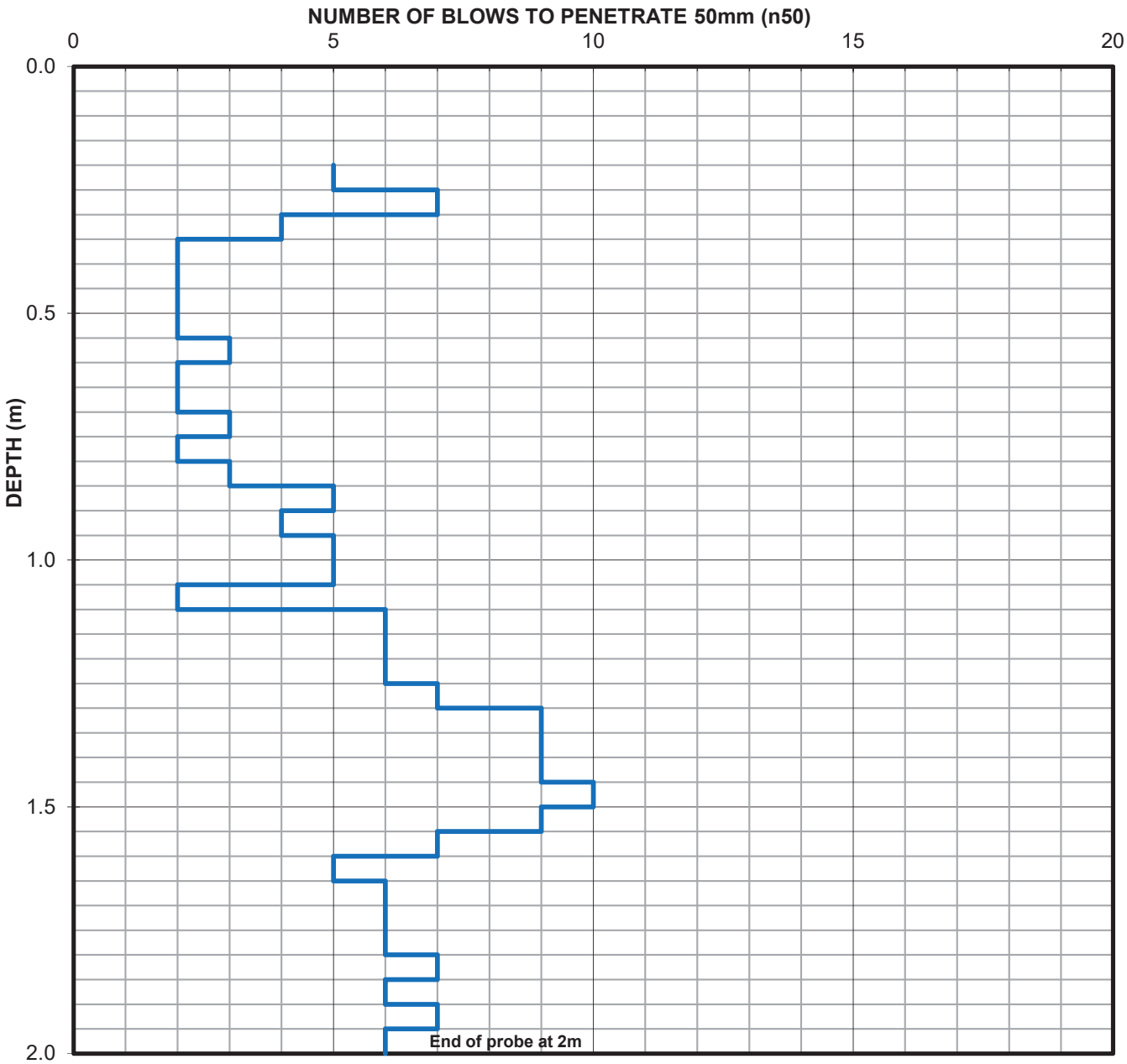
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP25

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH25		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**

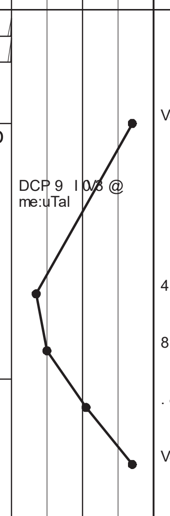

GHD
TP: BH25
DEPTH: 0.00 - 0.18m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 5/7/19

BOREHOLE LOG SHEET

Client : 6ut\ erland 6\ ire Cf uncil			**HOLE No. BH06**
Project : Crf nulla pf wn Centre - DeTign 6tage .			**SHEET 2 OF 2**
Location : Crf nulla MallYCrf nulla N6&			
Position : me:er tf teTt lf catif n olan	**Surface RL:** -	**Angle from Horiz. :** 1l °	**Processed :** 6RO
Rig Type : 150mm Diatube **Mounting:** 6tand	**Contractor :** Diacf re	**Driller :** Nf a\	**Checked :** yCC
Date Started : . G4GI 81	**Date Completed :** . G4GI 81	**Logged by :** LCDGME	**Date:** 8G6G81

Nf te@ indicateT TignatureT f n f riginal iTTue f : lf g f r laTt re)iTif n f : lf g

DRILLING					MATERIAL						DCP	Comments/ Observations
6CAL7 v3 (	Drilling Met\ f d	Hf le 6uoof rt WCaTing	& ater	6a3 oleT / peTtT	Deot\ GmL(3 etreT	Erao\ ic Lf g	U6C 6B3 bf l	**Description** [CORRL76GROULD7m6G: kyLLGBOP6OyL] t\ en 6OyL NAM7@ f lf urYolaTticitBGori3 arBoarticle c\ aracteriTticTYTecf ndarBand 3 inf r cf 3 of nentTYzf ning vf rigin(and mOCK NAM7@ grain TizeYcf lf urY:abric and textureYincluTif nT f r 3 inf r cf 3 of nentTY durabilitBYTtrengt\ Yweat\ ering Galteratif nYde:ectT	Mf iTture Cf nditif n	Cf nTiTtencBG DenTitBYndex	**DCP Test Results** blf wT oer 8l l 3 3 (l . l Sl)	mecf rded Rlf wT	
	Diatube				l 0 .		-	pyL7@ dar, greBY823 3 0	-	-			
					l 0 2		-	R7DDyNE LAs 7m@ TtabiliTed TandY greB0	-	-			
					l 0 l		-	CONCm7p7@ greBY3 ixed aggregateT uo tf . l 3 3 l 0823 YTteel rein:f rce3 ent0	-	-		VS	
	Hand Auger	Nil	EN7	76GD6 76GD6			-	kyLL@ 6iltB E mAF7L@ dar, brf wnY :ine tf cf arTeYTub-angular tf Tub-rf unded virf nTtf ne(Ytrace Tand v.ill(0 l 0 -l 0 . 3 Yrf f tletT0 l 0/23 Ybecf 3 ing brf wn0	M	MD	DCP 9 l 0/3 @ me:uTal	4 8l	
				76GD6	l 0/52		CH	E ra) ellB CLAs @ brf wnYlf w tf 3 ediu3 olaTticitBY:ine tf cf arTe Tub-angular tf Tub-rf unded gra) el virf nTtf ne(Ytrace Tand v.ill(0 l 0h23 Ybecf 3 ing red-brf wn0	w < PL	H		. 8 VS	
					l 0l l			7nd f : Rf re\ f le at l 0l 3 etreT0 me:uTal0			DCP 9 l 0l3 @ me:uTal		



8

.

E7O ROm7HOL7_DCP A684.5 .l 84 .8-.hVhl CmONULLAC7Npm7 6pE.GEPJ EHD E7O p7MPLAp7 .0l GEDp .GGl 81

See standard sheets for details of abbreviations & basis of descriptions	**GHD** Le)el . . 1 C\ riTtie 6treetY6t Lef nardT N6& . l 52 AuTtralia p@ +58 . 1S5. S4l l k@ +58 . 1S5. S48l 7@ Tln3 ail9 g\ d0cf 3 CON6ULpyNE E7Op7CHNyCAL 7NEyN77m6 AND E7OLOEy6p6	**Job No.** 0210- 8- 3

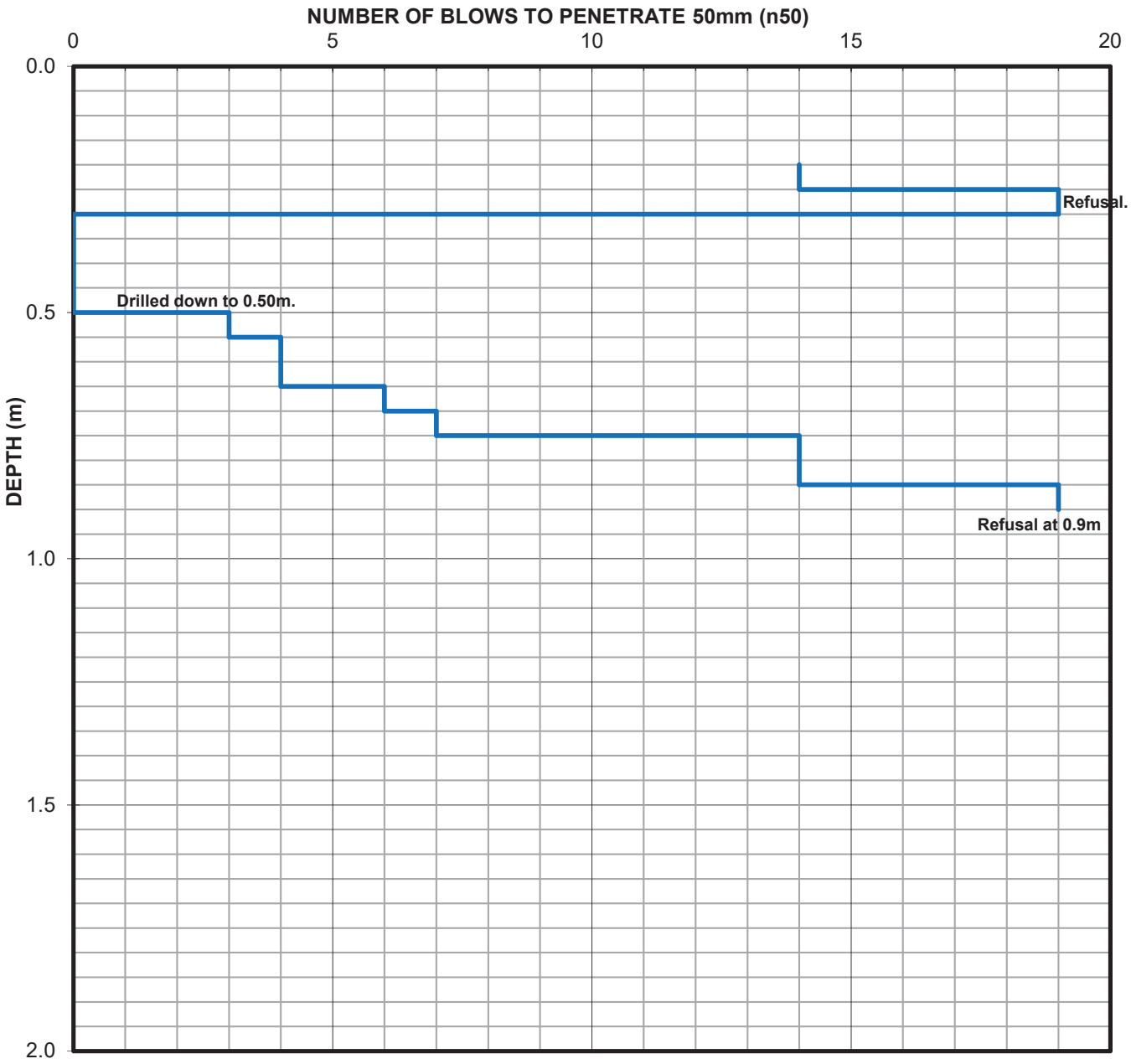
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP26

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH26		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**

BOREHOLE LOG SHEET

Client : SAd(g-lnr N S(ag wFAr val
Project : w-Fr Alln sFc r wgr d-g 0 HgRal r Sdhl g 7
Location : w-Fr Alln Gnllkw-Fr Alln CSB

HOLE No. BH01

SHEET 2 OF 2

Position : 1 g0g- dF dgRdlFvndFr hlnr	**Surface RL:** 0	**Angle from Horiz. :** U. x	**Processed :** Sbf
Rig Type : 150mm Diatube **Mounting:** Sdhr N	**Contractor :** HanvF-g	**Driller :** CFn(	**Checked :** mvw
Date Started : 7/&/7. 4U **Date Completed :** 7/&/7. 4U		**Logged by :** TwH/GD	**Date:** 4/M/4U

DRILLING					MATERIAL						DCP	Comments/ Observations
Swi TE @O	H-dlal Ggd(FN | e Flg SAhhF-d) wnRal	B ndg-	Snt hlgR\ sgRdR	Hghd(/ @TOt gdgR	D-nh(av TFI	WSw Syt uFI	**Description** [wf bbTES/bf WTHE1 S/YmT/sf PSf mT] d(gr Sf mTCi GE3vFIFA-khlnRdvady / h-al n-y hn-dvlg v(n-nvdg-aRdvRkRgvFr Nn-y nr N t ar F- vFt hFr gr dRkzFr al @-al ar OnrN 1 f wK Ci GE3l -nar RazgkvFIFA-k0nu-av nr N dg, dA-gkar vlARaFr RF- t ar F- vFt hFr gr dRk NA-nuadaykRdgr l d(kc gnd(g-al / nldg-ndFr kNg0gvdR	GFaRdA-g wFr NdaFr	wFr Rdgr yy / Hgr Rdy/ mNg,	**DCP** Test Results ulFc Rhg- 4. . t t (. 7. 5.)	1 gvF-NgNb lFc R	
	Hand Aug	Cal	DCE		. 2 5		0	wf Cw1 EsE @smTEC3Nn-: l -gyk 57t t 2	0	0			
					. 2l7		0	bEHHmCD Ti oE1 3RdhuaaRgN Rnr Nk l -gy2	0	0			
							0	wf Cw1 EsE3Nn-: l -gykt a,gN nl l -gl ndgRAh dF 7. t t 2 . 27t kRdggl -gar 0F-vgt gr d2	0	0		4.	
	enr Ni Al g-			ES/ HS	. 2l94		0	YmTT3D-npglly Si CH3u-Fc r k0ar g dF t gNaAt l -nargNk0ar g dF vFn-Rg RAu0-FAr NgN dF RAu0nr l Aln- l -npgl @n-gNFt ar nr dy unRnldOdnvg Ngu-aR @lnRROdnvg -FFdgdR @lldO2 . 25t kc ad(-FFdRkt gNaAt dF vFn-Rgk RAu0-FAr NgN dF RAu0nr l Aln- l -npgl @lnRnldnr N Rnr NRdFr gO2	G	H		7M	
					. 28.			Er N F6bF-g(Flg nd. 28t gdgR2 1 g6ARnl2			HwP L . 28t 3 1 g6ARnl		

Depth scale: 4, 7

See standard sheets for details of abbreviations & basis of descriptions	**GHD** Tgpgl 7 7U w(-aRdg SdggdkSdTgFr n-NR CSB 7. _8 i ARdnlan s3 + _4 7 U5_7 5&. Y3 + _4 7 U5_7 5&4. E3 RFr t nal L l (N2vFt wf CSWTsmCD DEf sEwe Cmwi T ECDmCEE1 S i CH DEf Tf DmSsS	**Job No.** 02-01813

DEf °bf 1Eef TE°HwP°i S4&7 °7. 4& 74l7MM w1f CWTTi wECs1E°SsD72DPJ DeH°DEf °sEGPTi sE 72. 2DHs 7/M4U

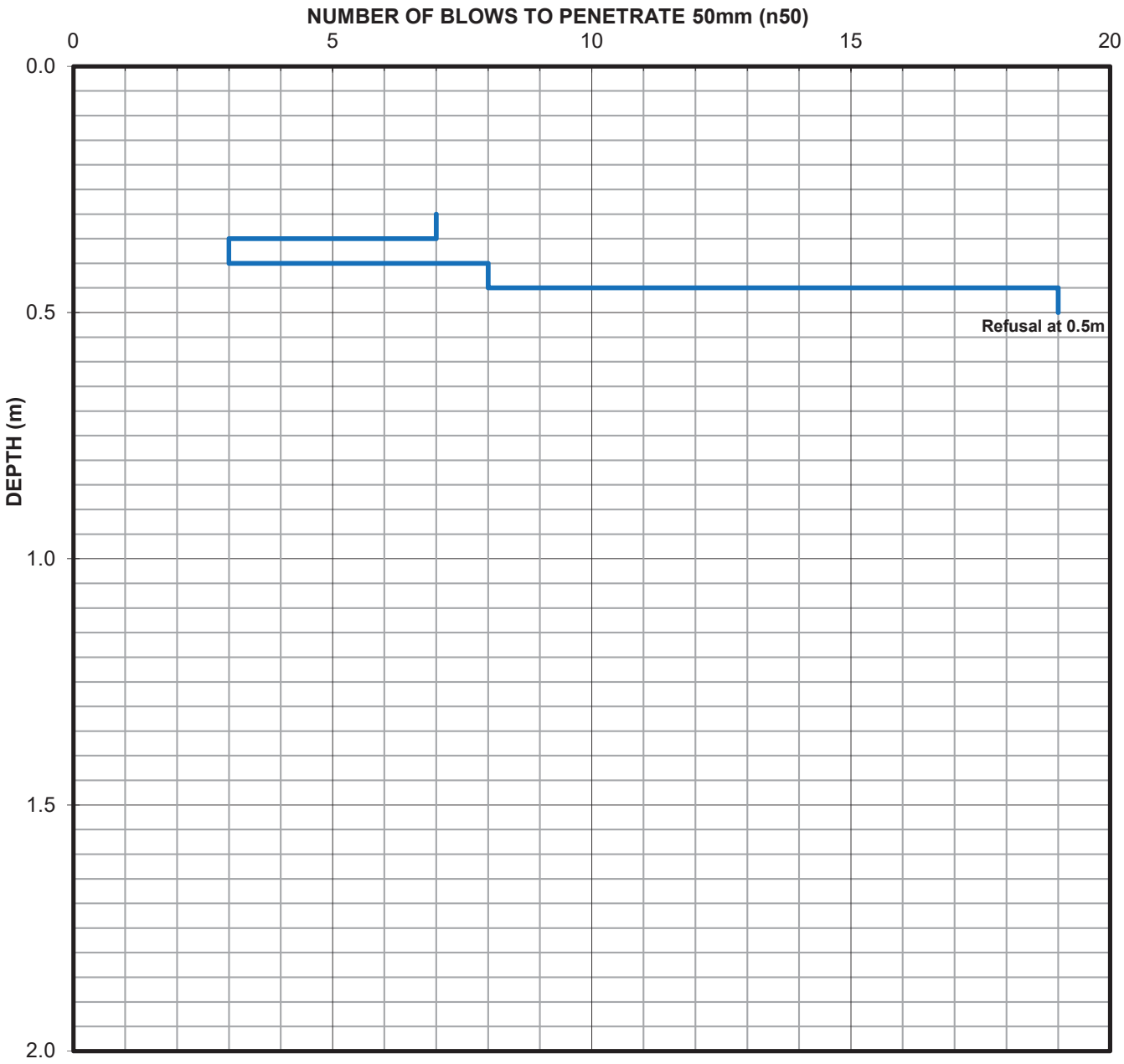
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP28

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH28		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH28
DEPTH: 0.00 - 0.31m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : SAd(g-Inr N S(ag MhAr val

Project : M-hr Alln f hc r Mgr d-g 0 Hg6al r Sdhl g 7

Location : M-hr Alln GnllyM-hr Alln CSB

HOLE No. BH09

SHEET 2 OF 2

Position : 3 g1g- dh dg6dlhvndhr , Inr	**Surface RL:** 0	**Angle from Horiz. :** &. x	**Processed :** SkR
Rig Type : 150mm Diatube	**Mounting:** Sdhr N	**Contractor :** Hanvh-g	**Driller :** Chn(	**Checked :** @M
Date Started : 7/9/7. 4&	**Date Completed :** 7/9/7. 4&	**Logged by :** mMH/GD	**Date:** 4/K/4&

DRILLING					MATERIAL						DCP	Comments/ Observations
SMi mE sL T	H-dlal Ggq(hN | e hlg SA, , h-d) Mn6al	B ndg-	SnL , lg6 \ f g6d6	Hg, d(/ s3 mTL gd-g6	D-n, (av mhl	WSMS: L uhl	**Description** *MRk k mES/k RWmHE3 S/Y@mf RwSR@d(gr SR@Ci GEt vhlhA-y, In6dvad / , -aL n-: , n-dvlg v(n-nvdg-a6dv6y6gvhr Nn-: nr N L ar h- vhL , hr gr d6y] hr ar l sh-al ar TnrN 3 RMz Ci GEt l -nar 6aJgyvhlhA-y1hu-av nr N dgodA-gyarvlA6ahr 6 h- L ar h- vhL , hr gr d6y NA-nuadady6d-gr l d(yc gnd(g-ar l / nldg-ndhr yNg1gvd6	Gh6dA-g Mhr Nathr	Mhr 6d6dgr v: / Hgr 6ad @Ngo	**DCP Test Results** ulhc 6 , g- 4. . L L	3 gvh-NgNk lhc 6	
	HandAug	Ca	DCE		. 2 5		0	MRCM3 Ef E sf @ETt Nn-Ol -g: y 5. 055L L 2	0	0			
					. 244		0	kEHH@D mi bE3 t 6dhuala6gN 6nr Ny ugal g2	0	0			
							0	MRCM3 Ef Et Nn-Ol -g: yL aogN nl l -gl ndg6 A, dh 7. L L 2	0	0			
	enr Ni Al g-			ES/ HS	. 279		0	. 27FL y6dggl -gar1h-vgL gr d2 Y@mt D-npgll: Si CHt u-hc r y1arg dh L gNaAL l -nargNyL gNaAL 6Au0-hAr NgN dh 6Au0nr l Aln- l -npgl s, -gNhL ar nr d: un6nldTyd-nvg -hhdgd6yd-nvg vln: sHT2	G	GH0 H	HMw P . 28L t 3 g1A6nl	44 48 7.	
					. 285			Er N h1k h-g(hlg nd. 285 L gd-g62 3 g1A6nl2					

4

7

See standard sheets for details of abbreviations & basis of descriptions

GHD
mgpgl 7 7& M(-a6dg Sd-ggdy Sdmghr n-N6 CSB 7. 85 i A6d-nlan
f t +84 7 &F87 F9. . Yt +84 7 &F87 F94. Et 6lr L nalP l (N2vhL
MRCSWhf @D DERf EMe C@i m ECD@EE3 S i CH DERmRD@f S

Job No. 0210- 8- 3

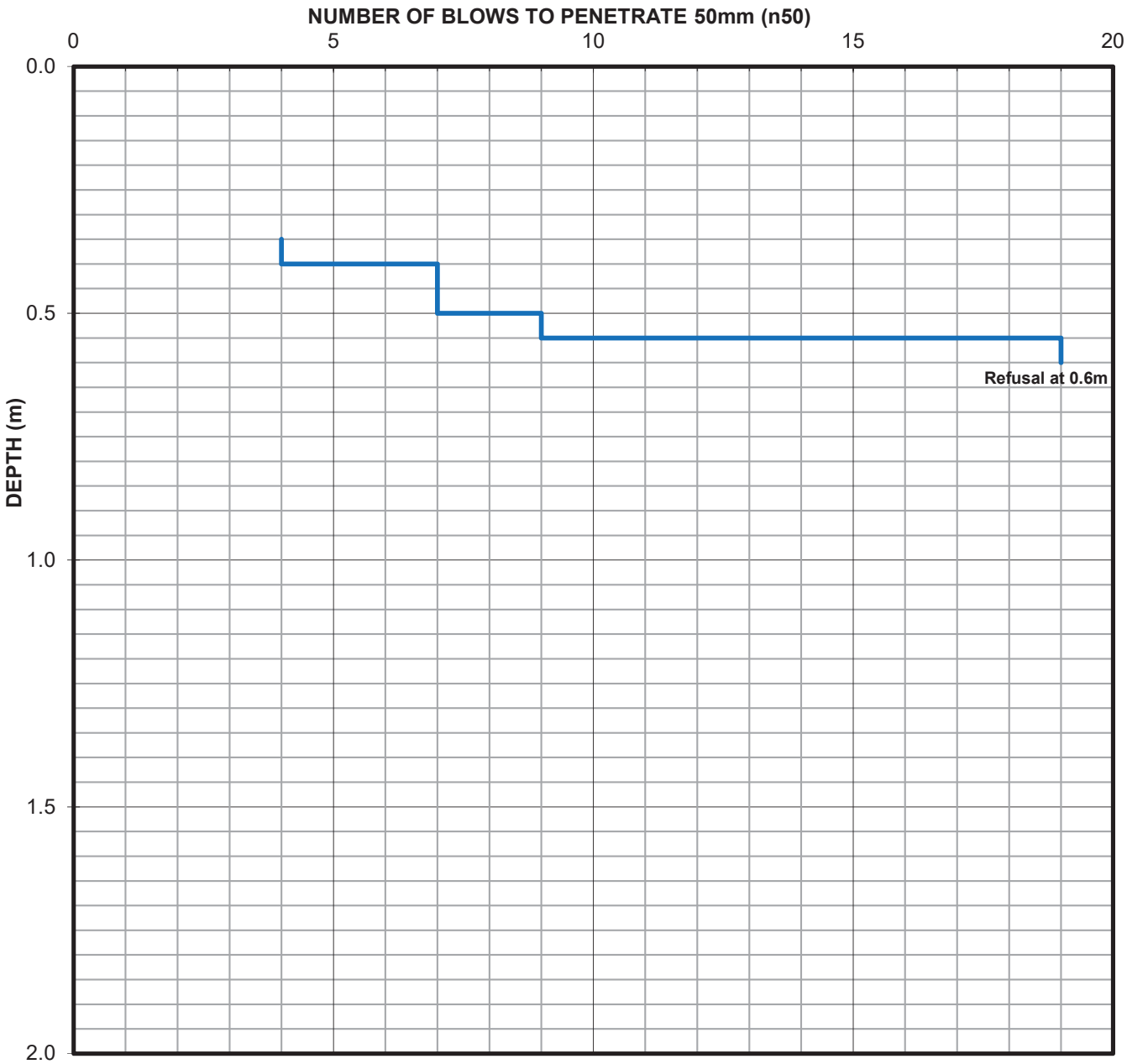
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP29

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH29		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH 29
DEPTH: 0.00 - 0.28m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

GEO_BOREHOLE_DCP_AS1726_2017_21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH01

SHEET - OF -

Position : Refer to test location plan		**Surface RL:** -	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah		**Checked :** ICC
Date Started : 2/7/2019		**Date Completed :** 2/7/2019	**Logged by :** LCD/MG		**Date:** 1/8/19

DRILLING					MATERIAL						DCP	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm (0 20 40) Recorded Blows	Comments/ Observations
	Diatube	Nil	GNE		0.02		-	TILE: white, 15mm.	-	-		
					0.04		-	BEDDING LAYER: stabilised sand, grey.	-	-		
	Hand Auger			ES/ DS	0.16		-	CONCRETE: grey, mixed aggregates up to 20mm. 0.11m, steel reinforcement.	M	D	14 15 32	
					0.45			FILL: Gravelly SAND: brown, fine to coarse grained sand, fine to coarse sub-rounded to sub-angular gravel (basalt and sandstone), trace rootlets (fill).				
								0.45m, with cobbles (sandstone). End of Borehole at 0.45 metres. Refusal.			DCP @ 0.5m: Refusal	
1												
2												

Note: * indicates signatures on original issue of log or last revision of log

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 2-823031

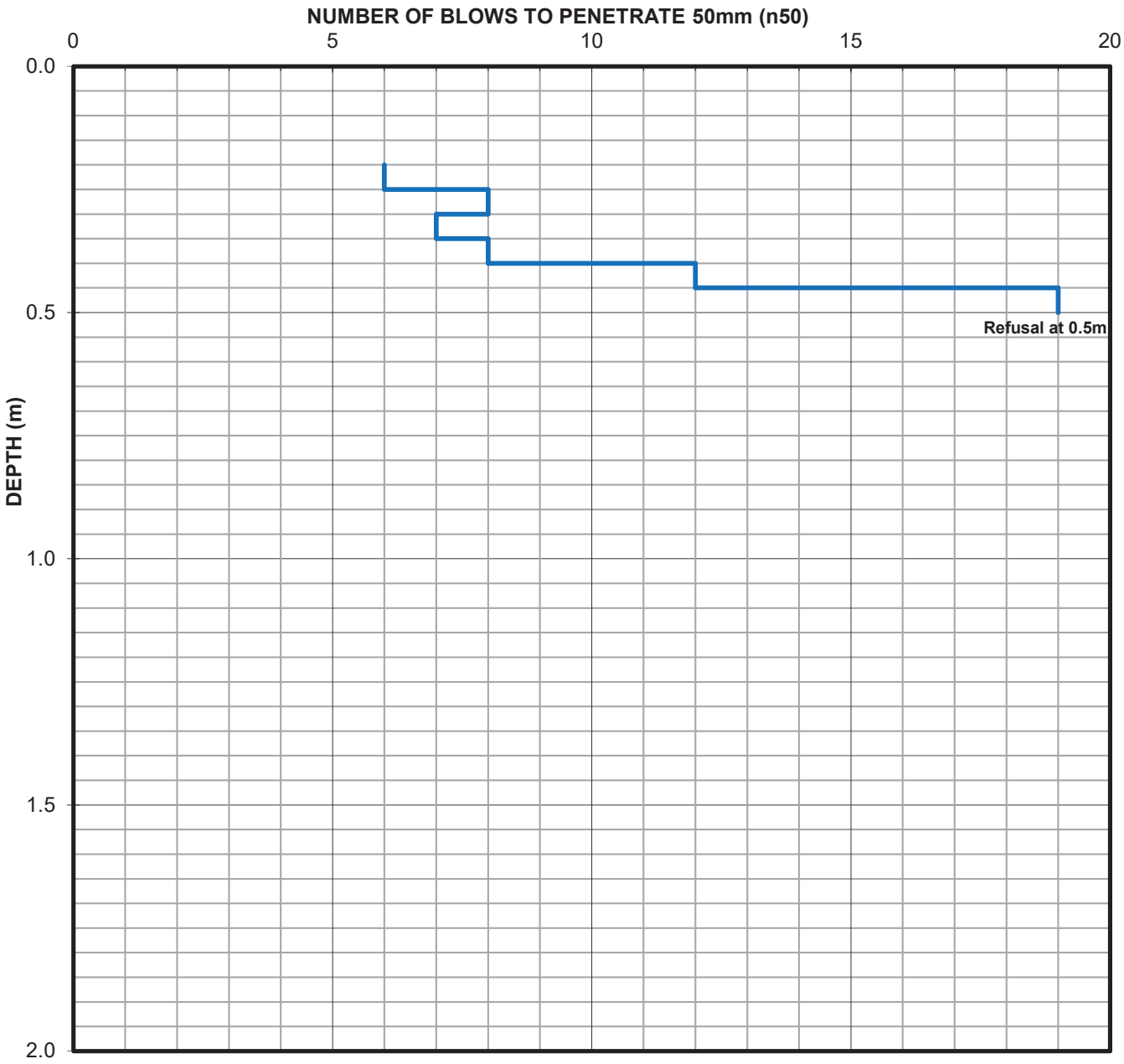
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP30

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH30		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No.
2128380


GHD
TP: BH30
DEPTH: 0.00 - 0.18m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : 2utf eNadA 2f iNe Gpudoi-
Project : GNpdu–a @Rd GedtNe CDe4ir d 2tar e 6
Location : GNpdu–a / a–sGNpdu–a I 2Y

HOLE No. BH01

SHEET 1 OF 1

Position : Ve9eNtp te4t -poatipd x-ad	**Surface RL:** C	**Angle from Horiz. :** W0_	**Processed :** / gE
Rig Type : 150mm Diatube **Mounting:** 2tadA	**Contractor :** DiaopNe	**Driller :** I paf	**Checked :** mGG
Date Started : 6BB607W	**Date Completed :** 6BB607W	**Logged by :** : GDB E	**Date:** 7B B'W

I pteLUidAioate4 4ir datuNe4 pd pNr ida-i44ue p9-pr pNa4t Ne*i4ipd p9-pr

DRILLING					MATERIAL						DCP		Comments/ Observations
2Gg: S (P)	DN-idr / etf pA	np-e 2uxxpN vGa4idr	Y ateN	2aP x-e4 h @e4t4	Dextf B(V:) P etNe4	ENaxf io: pr	\ 2G 2kP bp-	**Description** [Gy TT: S2B Ty \ : DSV2B m: B@y M2y m] tf ed 2y m I g/ SLop-puNs x-a4tioitk BxNP aNk xaNtio-e of aNaoteNi4tio4s4eopdAaNk adA P idpNopP xpdedt4szpdidr (pNr id) adA Vy GK I g/ SLr Naid 4izesop-puNs9abNb adA te, tuNesido-u4ipd4 pNP idpNopP xpdedt4s AuNabi-itks4tNedr tf sReatf eNdr Ba-teNatipdsAe9eot4	/ pi4tuNe GpdAitipd	Gpd4i4tedok B Ded4itk rdAe,	**DCP Test Results** b-pR4 xeN700P P (0, 60, 80)	VeopNeA T-pR4	
Diatube H nadA gur eN	I i-	El S	D2	0.06		C	@nSLRf ites60P P .	C	C			
					0.01		C	TSDDm E : gOSVL4tabi-i4eA 4adAs r Nek.	C	C			
							C		C	C			
					0.73		C	Gy I GVS@SLr NeksP i, eA ar r Ner ate4 ux tp 60P P . 0.71P LbeopP idr AaNF r Nek.	/	D	●	60	
					0.80			I m: L2adAk EVgc S: LAaNF r Neks 9de tp opaNes4ubGadr u-aNs9de tp opaNe r NaideA 4adAs Ritf Nppt4 (9–).					
					0.85		C	Gy I GVS@SLAaNF r Neks ar r Ner ate4 ux tp 60P P .	C	C	DGMw 0.61P L Ve9u4a-		
								SdA p9TpNef p-e at 0.85 P etNe4. Ve9u4a-.					

7

6

See standard sheets for details of abbreviations & basis of descriptions	**GHD** : e*e- 6 6WGf Ni4tie 2tNeets2t : epdaNe4 I 2Y 6051 gu4tNa-ia @L H57 6 W856 &300 I L H57 6 W856 &370 SL 4-dP ai-w r f AopP Gy I 2\ : @hE ESy @SGnI mGg: Sl EmSSV2 gl D ESy : y Em2@2	**Job No.** **21-28083**

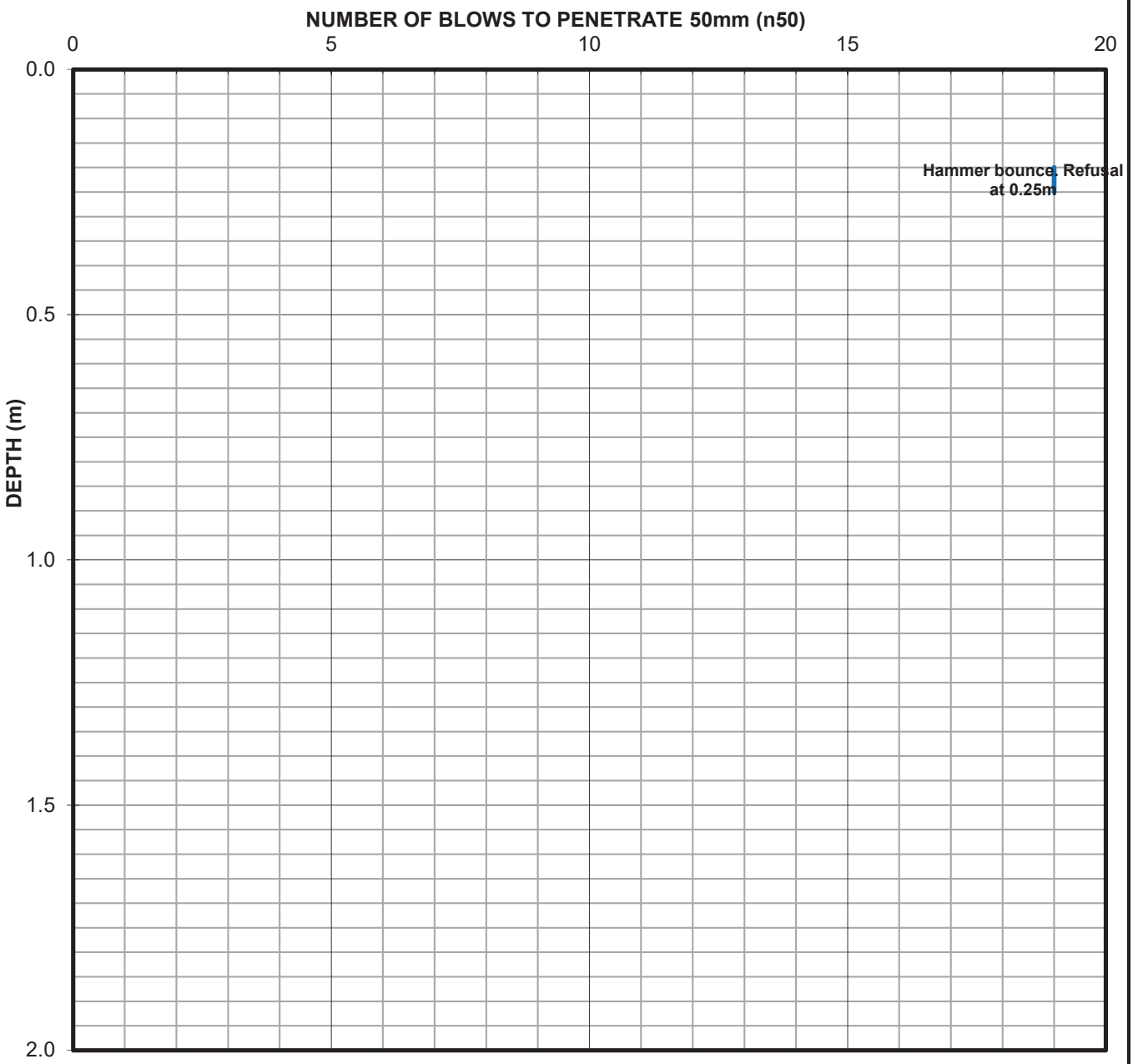
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP31

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH31		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH31
DEPTH: 0.00 - 0.36m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 3/7/19

BOREHOLE LOG SHEET

Client : Sutwerland Swire 3 punoil
Project : 3 rpnulla spL n 3 entre - Def ign Stage 1
Location : 3 rpnulla Mallh3 rpnulla NS\

HOLE No. BH01

SHEET 2 OF 2

Position : : eRer tp tef t lpoatipn xlan		**Surface RL:** -	**Angle from Horiz. :** 708	**Processed :** MAG
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diaopre	**Driller :** Npaw	**Checked :** T3 3
Date Started : 1/U/1027		**Date Completed :** 1/U/1027	**Logged by :** I 3 D/MG	**Date:** 2/K/27

Nptem9indioatef f ignaturef pn priginal if f ue pRpg pr laf t reRf ipn pRpg

DRILLING					MATERIAL						DCP		Comments/ Observations
S3 AI E v@(	Drilling Metwpd	Hple Suxxprt) 3 af ing	\ ater	Sa@xlef Wsef tf	Dextw/ v. I (@etref	Graxwio I pg	&S3 SY@bpl	**Description** *3 y , , I ES/, y &I DE: S/c T I /sy CSy T [twen Sy T NAMEmoplpurhxlaf tioitY/ xri@arYxartiole owaraoterif tiof hf eopndarY and @npr op@xpnentf h] pning vprigin(and : y 3 z NAMEmgrain f i] ehoplpurhRabrio and teQurehinoluf ipnf pr @npr op@xpnentf h durabilitYhf trengtwhL eatwering / alteratipnhdeRotf	Mpif ture 3 pnditipn	3 pnf if tenoY/ Denf itY TndeO	**DCP Test Results** blpL f xer 200@@ 0 10 40	: eprded , lpL f	
	Hand Auger Diatube	Nil	GNE		0.02		-	sT EmL witeh25@@	-	-			
					0.04		-	, EDDTNG I ABE: mf tabilif ed f andh greY.	-	-			
							-	3 y N3 : EsEmgreYh@jOed aggregate ux tp 10@@	-	-			
					0.11		-	0.1@hf teel reinRproe@ent.					
				ES/ DS	0.65		-	c T I mGraFellY SANDmbrpL nhRne tp oparf e grained f andhRne tp oparf e f ub-rpunded tp f ub-angular graFel vf andf tpne(htraoe f ilt vRl(. 0.11-0.14@htraoe rpptf and rpptletf .	M	D	•	60	
								End pR, prewple at 0.65 @etref . : eRuf al.			D3 C P 0.4@m : eRuf al		

2

1

See standard sheets for details of abbreviations & basis of descriptions

GHD
I eFel 1 17 3 wrif tie StreethSt I epnardf NS\ 10_5 Auf tralia
s m+_2 1 74_1 4U00 c m+_2 1 74_1 4U20 Emf In@ailP gwd.op@
3 y NS&I s TNG GEy s E3 HNT3 AI ENGTNEE: S AND GEy I y GTSs S

Job No.
12-18083

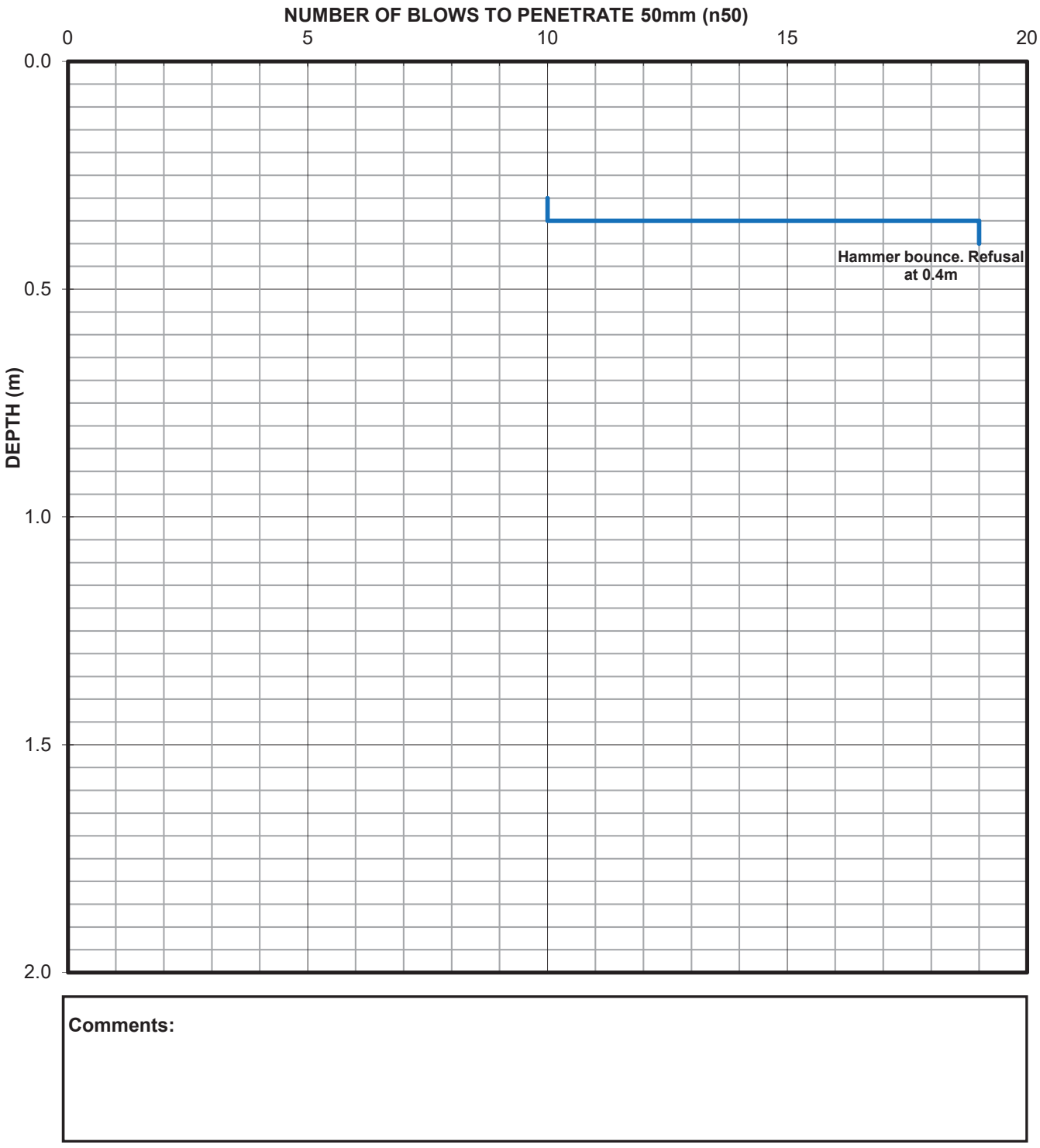
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP32

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH32		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**

TP: BH32

DEPTH: 0.00 - 0.22m

CLIENT: Sutherlands Shire Council

PROJECT: Cronulla Town Centre Design GI

PROJECT NUMBER: 21 / 28380 /

LOCATION: Cronulla Town Center

DATE: 2/7/19

BOREHOLE LOG SHEET

Client : 6utyerland 6yire Counf il

Project : Cronulla Town Centre - De: ign 6tage .

Location : Cronulla Mall, Cronulla N6W

HOLE No. BH00

SHEET 2 OF 2

Position : @erear to te: t lof ation xlan	**Surface RL:** -	**Angle from Horiz. :** Ul °	**Processed :** MAE
Rig Type : 150mm Diatube	**Mounting:** 6tand	**Contractor :** Diaf ore	**Driller :** Noay	**Checked :** pCC
Date Started : . G4GI 5U	**Date Completed :** . G4GI 5U	**Logged by :** LCDGME	**Date:** 5G3G5U

DRILLING					MATERIAL						DCP	
6CAL7 (9)	Drilling Metyod	Hole 6uxxort \ Ca: ing	Water	6a9 xle: & Te: t:	Dexty G(@L) 9 etre:	Eraxyif Log	/ 6C 6R9 bol	Description [Cs BBL76Gs / LD7@6GpLGs P6s pL] tyen 6s pL NAM73f olour, xla: tif itRGxri9 arRxartif le f yaraf teri: tif : , : ef ondarRand 9 inor f o9 xonent: , zoning (origin) and @s CK NAM73grain : ize, f olour, nabrif and teOure, inf lu: ion: or 9 inor f o9 xonent: , durabilitR : trengty, weatyering Galteration, denef t:	Moi: ture Condition	Con: i: tenf RG Den: itRpndeO	DCP Test Results blow: xer 5I I 9 9	Comments/ Observations
	Diatube				I 0. I 0 2		- - -	Tp L73wyite, 529 9 0 B7DDpNE LAY7@8: tabili: ed : and, greR0 Cs NC@7T73greR 9 iQed aggregate: ux to . I 9 9 0	- - -	- - -		
	Hand Auger	Nil	E N7	76GD6 D6 D6	I 0 5 I 0 12 505I		- CH	I 05V9 , : teel reinnorf e9 ent0 cpLL36iltRE@Ak7L3darF brown, nime to 9 ediu9 , : ub-rounded to : ub-angular gravel (igneou:), traf e : and (nill)0 I 0 5-I 0 V9 , wity root: and rootlet: 0 I 0h29 , bef o9 ing brown0 EravellRCLAY3reddi: y-brown, 9 ediu9 xla: tif itR, nime to f oar: e : ub-angular to angular gravel, wity : and (re: idual)0 50 9 , traf e root: 0	M w < PL	D H	DCP 8 I0 9 3 @em: al DCP 8 50 9 3 @em: al	@ef orded Blow: . I 52 5V . . 5S 54 5V 51
5								7nd omBoreyole at 505 9 etre: 0 @em: al0				

Note3* indif ate: : ignature: on original l: : ue omlog or la: t revi: ion omlog

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level . . UCyri: tie 6treet, 6t Leonard: N6W . I V2 Au: tralia
T3 +V5 . USV. S4I I c3 +V5 . USV. S45I 73 : In9 ail8 gyd0f o9
Cs N6/ LTpNE E7s T7CHNpCAL 7NEpN77@6 AND E7s Ls Ep6T6

Job No.
12-18083

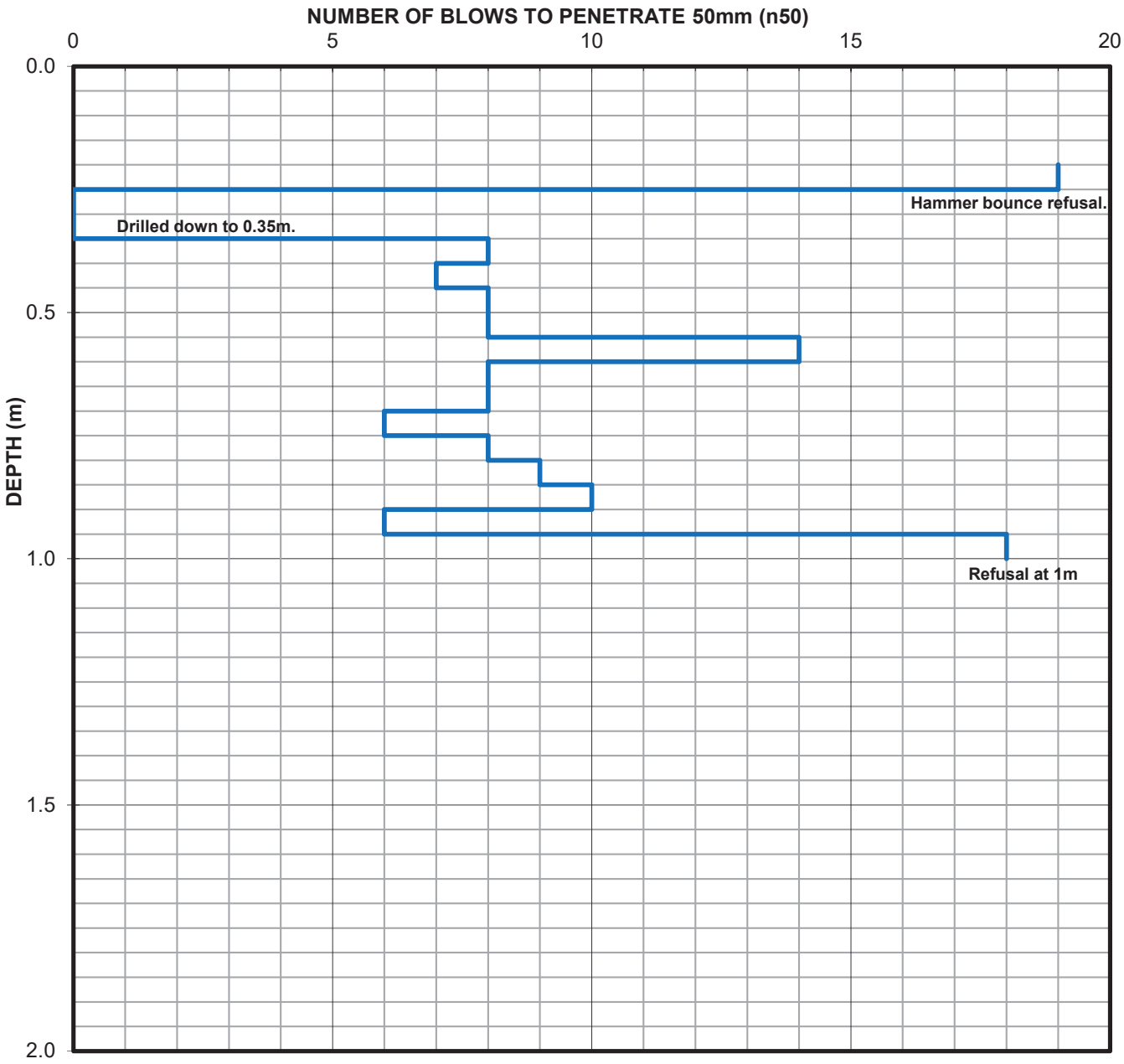
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP33

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH33		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH33
DEPTH: 0.00 - 0.21 m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : Sutherland Shire Council
Project : Cronulla Town Centre - Design Stage 2
Location : Cronulla Mall, Cronulla NSW

HOLE No. BH04

SHEET 1 OF 1

Position : Refer to test location plan	**Surface RL:** -	**Angle from Horiz. :** 90°	**Processed :** MAG
Rig Type : 150mm Diatube	**Mounting:** Stand	**Contractor :** Diacore	**Driller :** Noah	**Checked :** ICC
Date Started : 2/7/2019	**Date Completed :** 2/7/2019	**Logged by :** LCD/MG	**Date:** 1/8/19

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL						DCP	Comments/ Observations
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: colour, plasticity / primary particle characteristics, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	DCP Test Results blows per 100mm 0 20 40 / Recorded Blows	
	Diatube	Nil	GNE		0.01		-	TILE: white, 15mm.	-	-		
					0.05		-	BEDDING LAYER: stabilised sand, grey.	-	-		
							-	CONCRETE: grey, mixed aggregates up to 30mm. 0.2m, steel reinforcement.	-	-		
	Hand Auger			ES/ DS/ QCI	0.25		Cl	Gravelly CLAY: brown, medium plasticity, fine to coarse sub-rounded to sub-angular gravel (ironstone), with roots and rootlets, trace sand, trace silt (residual).	w≈ PL	H	9 22 24 23	
					0.75			End of Borehole at 0.75 metres. Refusal.			20 DCP @ 0.8m: Refusal	
1												
2												

GEO_BOREHOLE_DCP_AS1726_2017 21-28380 CRONULLACENTRE_STG2.GPJ GHD_GEO_TEMPLATE 2.00.GDT 2/8/19

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 21-28083

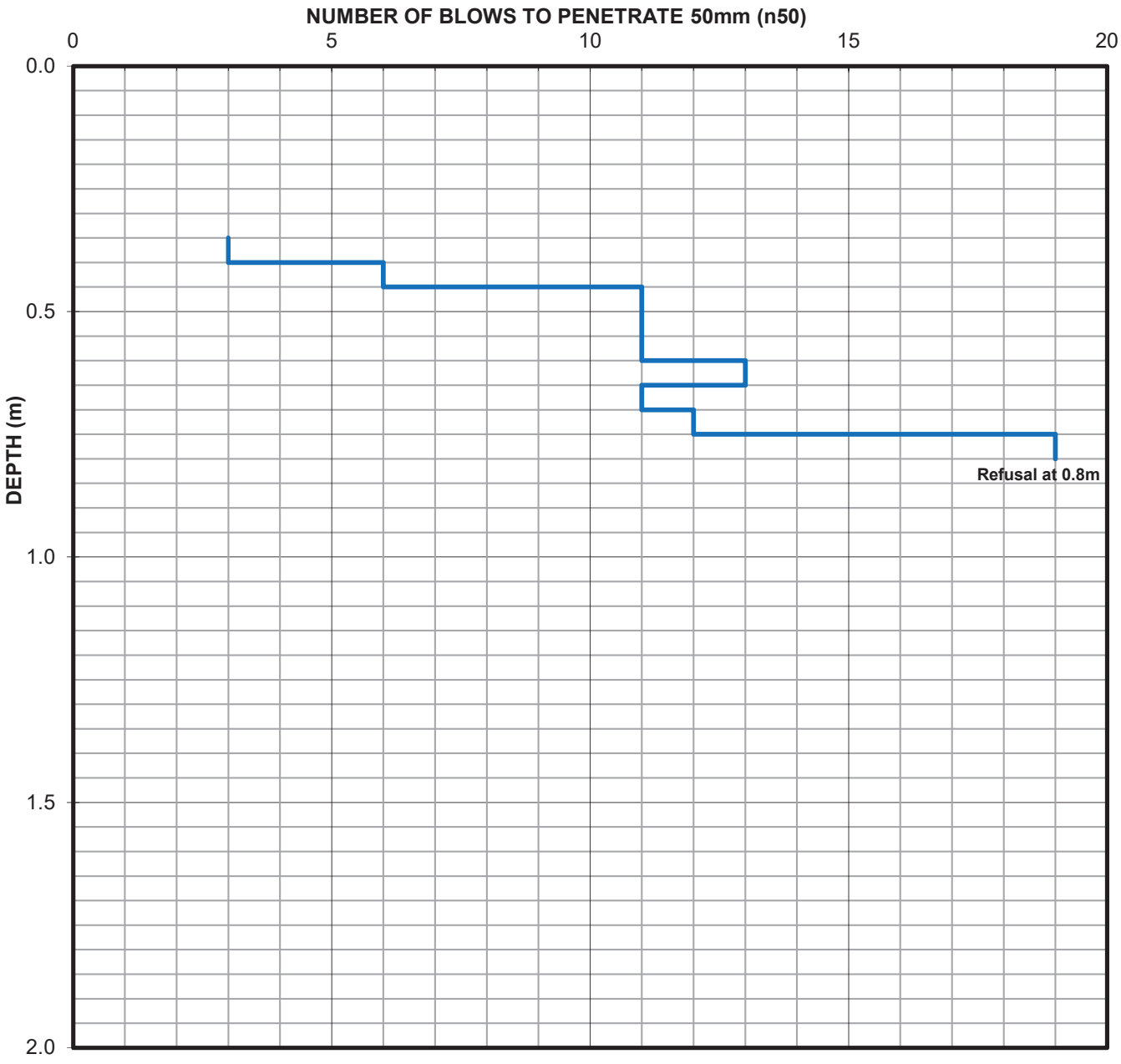
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Cronulla Mall, Cronulla, NSW

PROBE: DCP34

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	02/07/19
Adjacent Test Hole / Pit: BH34		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH34
DEPTH: 0.00 - 0.25m
CLIENT: Sutherlands Shire Council
PROJECT: Cronulla Town Centre Design GI
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla Town Center
DATE: 2/7/19

BOREHOLE LOG SHEET

Client : Gut) erland G) ire COunf il

Project : CrOhulla , Own Centre - Depign Gtage 9

Location : MOnrO<arcYCrOhulla NG\

HOLE No. BH01B

SHEET 1 OF 1

Position : : eTer tOtept lOf atiOn slan	**Surface RL:** -	**Angle from Horiz. :** U0°	**Processed :** MAE
Rig Type : 150mm Diatube	**Mounting:** Drill	**Contractor :** Diaf Ore	**Driller :** NOa)	**Checked :** ICC
Date Started : S&&8002U	**Date Completed :** S&&8002U	**Logged by :** PCD&ME	**Date:** 2&&2U

DRILLING					MATERIAL						DCP	
GCAP6 k@F	Drilling Met) Od	HOle GussOrt hCaping	\ ater	Ga@slep W, eptp	Dest) &k PF@etrep	Eras)if POg	/ GC GB@bOd	Description [Cy ((P6 G&(y / PD6: G&IPP&, y <Gy IP] t) en Gy IP NAM6 mf OlOurYslaptif itB&sri@arBsartif le f) araf teriptif pYpef OndarBand @nOr f O@sOhentpYzOning kOriginFand : y CK NAM6 ngrain pizeYf OlOurYTabrif and teRureYinf lupiOnp Or @nOr f O@sOhentpY durabilitBYptrengt) Yweat) ering &alteratiOnYdeTef tp	MOpture COnditiOn	COnpiptenf B & DenpitB InderR	DCP Test Results blOwp ser 200@@ 0 90 10 : ef Orded (lOwp	Comments/ Observations
	Diatube				0.20		-	Cy NC: 6, 6 mgreBY@jRed aggregatep us tO 90@@.	-	-		
	Hand Auger	Nil	E N6	6G	0.50		-	x IPPmE raoellB GANDmblaf c greBY @ediu@ tOf Oarpe grainedYgraoel ip TneYpub-rOunded tOpub-angular kTllF.	M	P		
					0.10		-	x IPPmE raoellB CPAv mbrOwn-greBY @ediu@ slaptif itBYTneYpub-angular tOpub-rOunded graoelYtraf e pand kTllF.	w= <P	VGt		
					0.70		Cl	E raoellB CPAv mBellOw @Ottled redY @ediu@ slaptif itBYf OarpeY pub-angular tOangular graoel kirOnptOneFkrepidualF.	w L <P	Gt		
								6nd OT(Ore) Ole at 0.7 @etrep. : eTupal.			DC< 3 2.2S@m : eTupal	

See standard sheets for details of abbreviations & basis of descriptions

GHD
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, m+72 9 U179 1400 xm+72 9 U179 1420 6mpln@ail3 g) d.f O@
Cy NG/ P, INE E6y , 6CHNICAP 6NEIN66: G AND E6y Py EIG, G

Job No. 21-28380

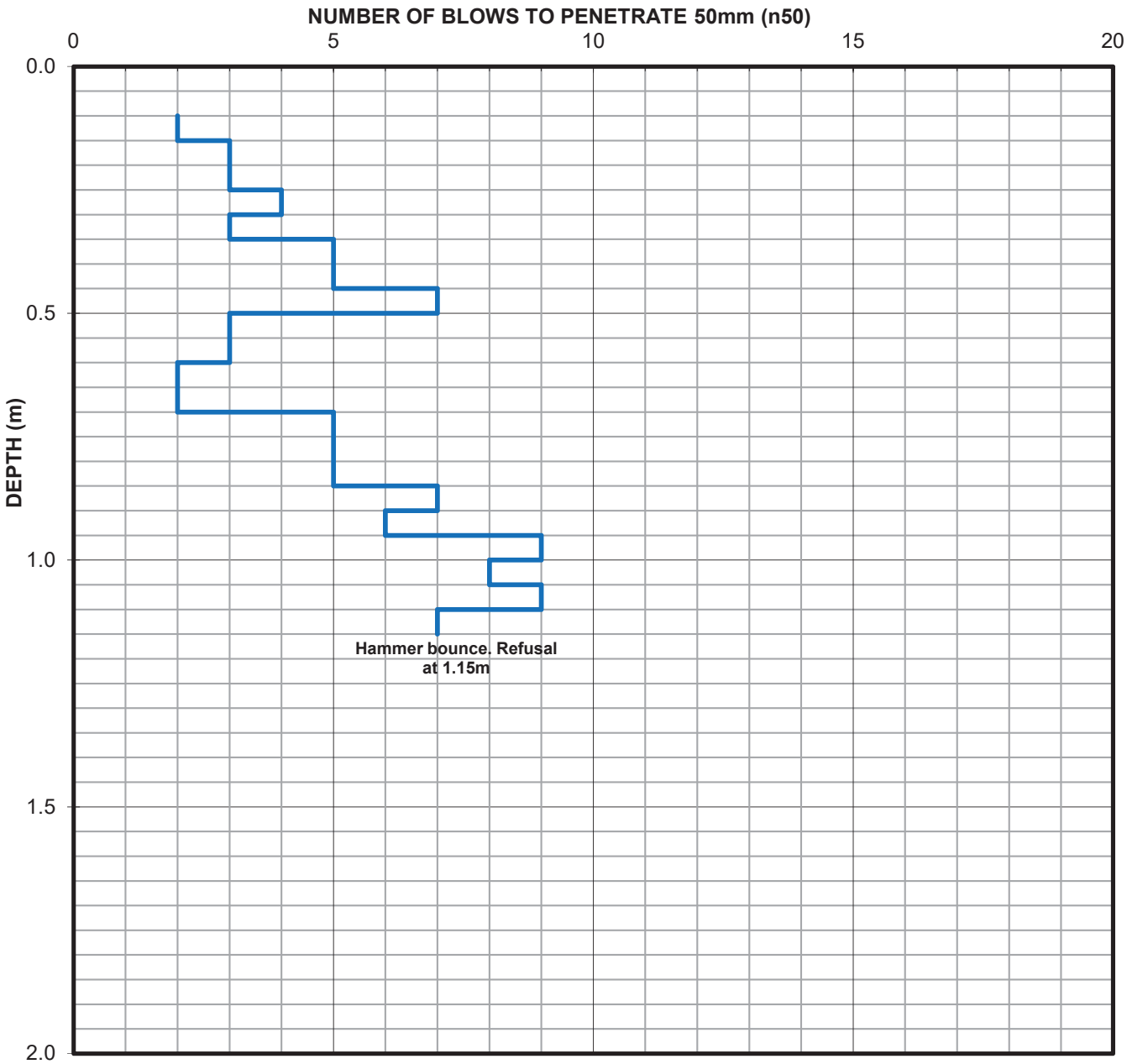
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Monro Park, Cronulla, NSW

PROBE: DCP01B

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

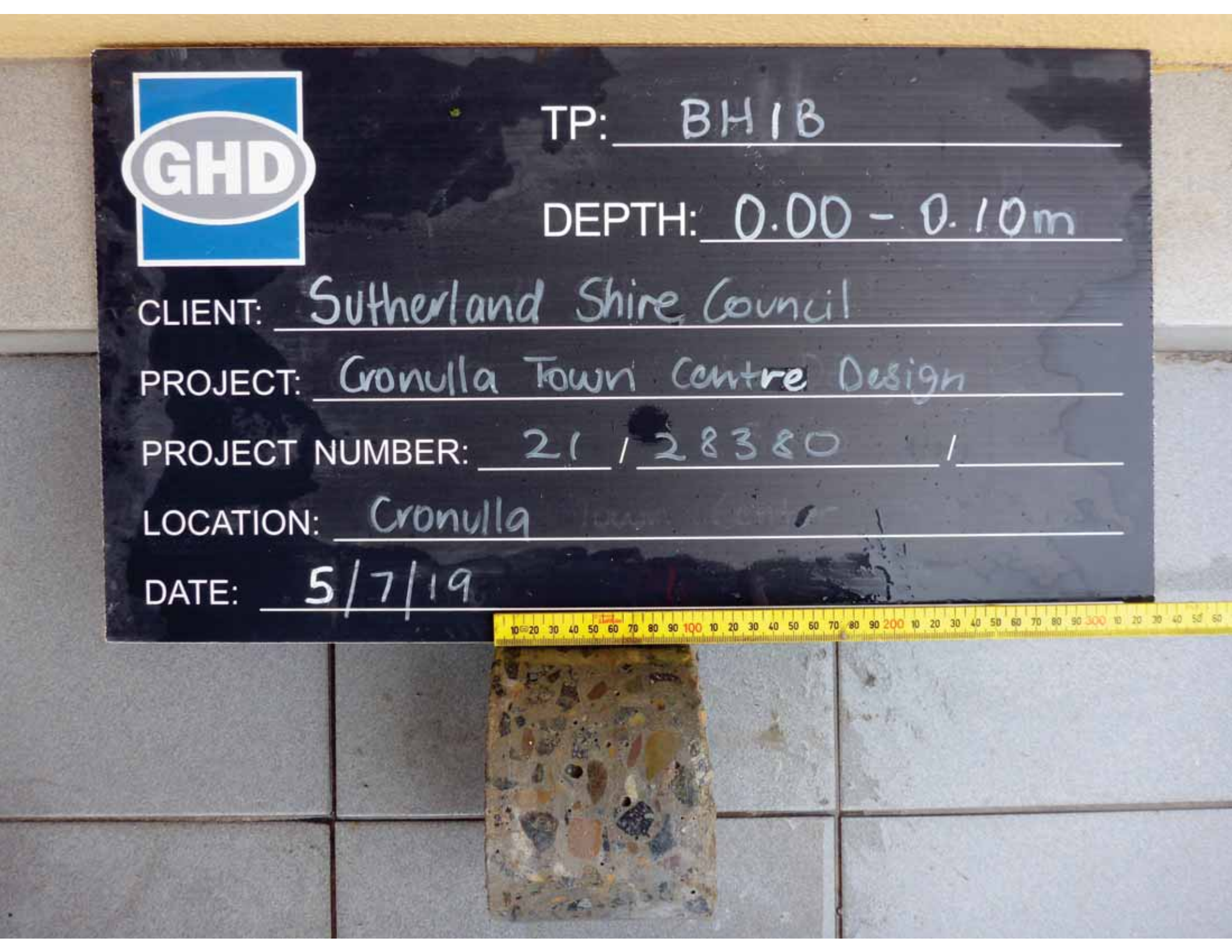
Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH01B		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS
Level 2 29 Christie Street, St Leonards, NSW, 2065 Australia
Telephone: 61 2 9462 4700 Fax: 61 2 9462 4710 Email: atnmail@ghd.com
GHD GEOTECHNICS

Job No. **2128380**


GHD
TP: BH1B
DEPTH: 0.00 - 0.10m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla
DATE: 5/7/19

BOREHOLE LOG SHEET

Client : 9uP erland 9) ire C: unkil
Project : Cr: nulla b: Dn CenPe - EeTign 9Page L
Location : / : nr: GarhCCr: nulla N9\

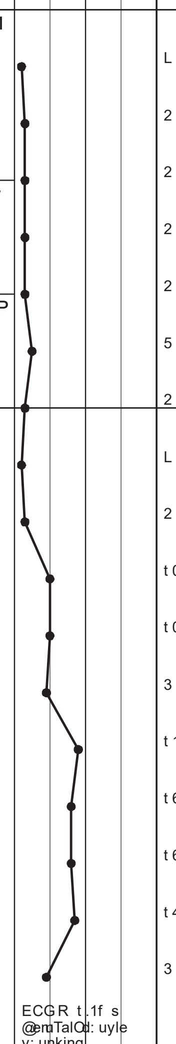
HOLE No. BH01B

SHEET 2 OF 2

Position : @erar P. PeTP: kaP. n vlan	**Surface RL:** -	**Angle from Horiz. :** 30°	**Processed :** / AS
Rig Type : - **Mounting:** -	**Contractor :** -	**Driller :** -	**Checked :** ICC
Date Started : 58l4L0t 3	**Date Completed :** 58l4L0t 3	**Logged by :** MCE8 S	**Date:** t 8l8 3

N: Pes* indikaPT TignaPureT : n : riginal iTTue : m: g : r laTPeYiTi: n : m: g

9CAM pf c	Erilling / eP: d	H: le 9uvv: rP BCaTing	\ aPer	9af vleT WbeTPT	EevP 8p@Mcf ePeT	Srav)ik M g	&9C 9, f y: l	Description	/ : iTPure C: ndiP: n	C: nTiTPenk, 8 EenTiP, Index	DCP Test Results	Comments/ Observations
	Hand Auger	Nil	SN7				-	bo G9o IMs9and, 9IMbsdarh yr: DnO rime TandOPake r: : PePT.	/	M		
				798E9	0.20		-	wIMMs9ilP, CMAFsred-yr: DnO f ediuf vlaTPkiP, OPake graYelO f ediuf P. k: arTe Tuy-r: unded P. Tuy-angular graYel pr: nTP. necpillc.	/	w		
				E9	0.50		CI	CMAFsyr: Dn and redO, ell: D f : PPed : rangeOf ediuf vlaTPkiP, O Pake r: : PePT preTidualc.	D~ GM	9P		
					0.40			7nd : m(: re) : le aP 0.4 f ePeT. @eruTal.				



Depth scale: t, L

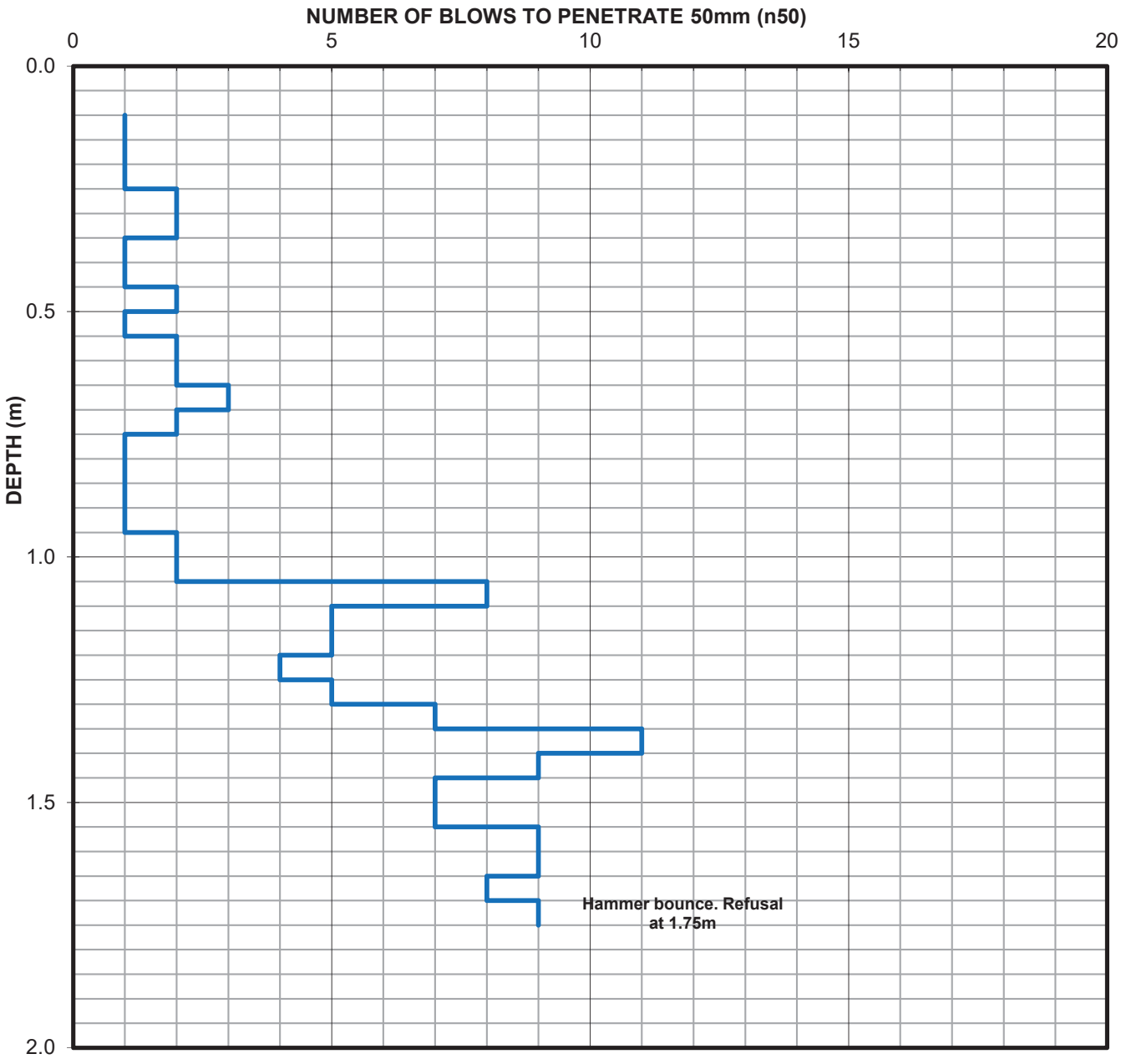
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Monro Park, Cronulla, NSW

PROBE: DCP02B

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH02B		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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Level 2 29 Christie Street, St Leonards, NSW, 2065 Australia
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GHD GEOTECHNICS

Job No. **2128380**

BOREHOLE LOG SHEET

HOLE No. BH01B

SHEET - OF -

Client : 3bM(lHrgi at 3(AH NybaxAg			
Project : Nnyabgi fySa NHaMHr 5HRAea 3MeH0			
Location : Eyany / i nQ Nnyabgi d3B			
Position : mHHnMMMRMyxiMya ogi a	**Surface RL:** r	**Angle from Horiz. :** L-°	**Processed :** Eu2
Rig Type : - **Mounting:** r	**Contractor :** r	**Driller :** r	**Checked :** INN
Date Started : 68&0-PL	**Date Completed :** 68&0-PL	**Logged by :** GN58E2	**Date:** P8/8PL

DRILLING					MATERIAL						DCP	Comments/ Observations
3NuG7 p4F	5nyae EHMyt	DyH3booyM hNiRae	BiMh	3i4ogR\ fHR	5HbM8pmG4HMHR	2rio(AGye	W3N3T4 kyg	**Description**	EyaRNyatMya	NyaRMaxT8 5HaMlatHK	**DCP Test Results**	
							r	fs/3sIG@iatT3IGf@irOknySa, :AHeriAaHt Rat, MxHnyyMgHMR pMoRyAgC	E	E5		
				73853	-C-		r	IIGG@AMNGuc@irOknySa, 4HtA4 M(Ae(ogiRMAT, MxH nyyMHMRpAgC	S~ / G	3M		
	Diat ubeHn	dAg	2d7	73853	-C-		r	IIGG@NgTHT2mu)7G@irOknySa,	E	E5		
				73853	-C6		Nl	4HtA4 MxyirRH, Rokrnybat Ht M Rokriaebgineri vHgporHty4 AaiaMT AyaRMaHFpAgC -C4, SAMnyyMRC	S~ / G	3M		
				73853	-C16			NGuc@THgyS4yMgHt yriaeHknySa, rHt, 4HtA4 ogiRMAT, MxHnyyMR pnHRAbigFC				
P								7at y: YyrH(ygHiM-C16 4HMHRC mHbRigC				
0											5N/ 9 PCV64 @ mHbRig	

See standard sheets for details of abbreviations & basis of descriptions

GHD

GHVHg00LN(nRMH3MHHM3MGHyairt R d3B 0-16 ubRMgA
f @+1P0Lw10w&-- I@+1P0Lw10w&P- 7@Rg4iA9 e(tGy4

Nsd3WGfld2 27sf7NDdINuG7d2ld77m3 ud5 27sGs2l3f3

Job No. 2-823130

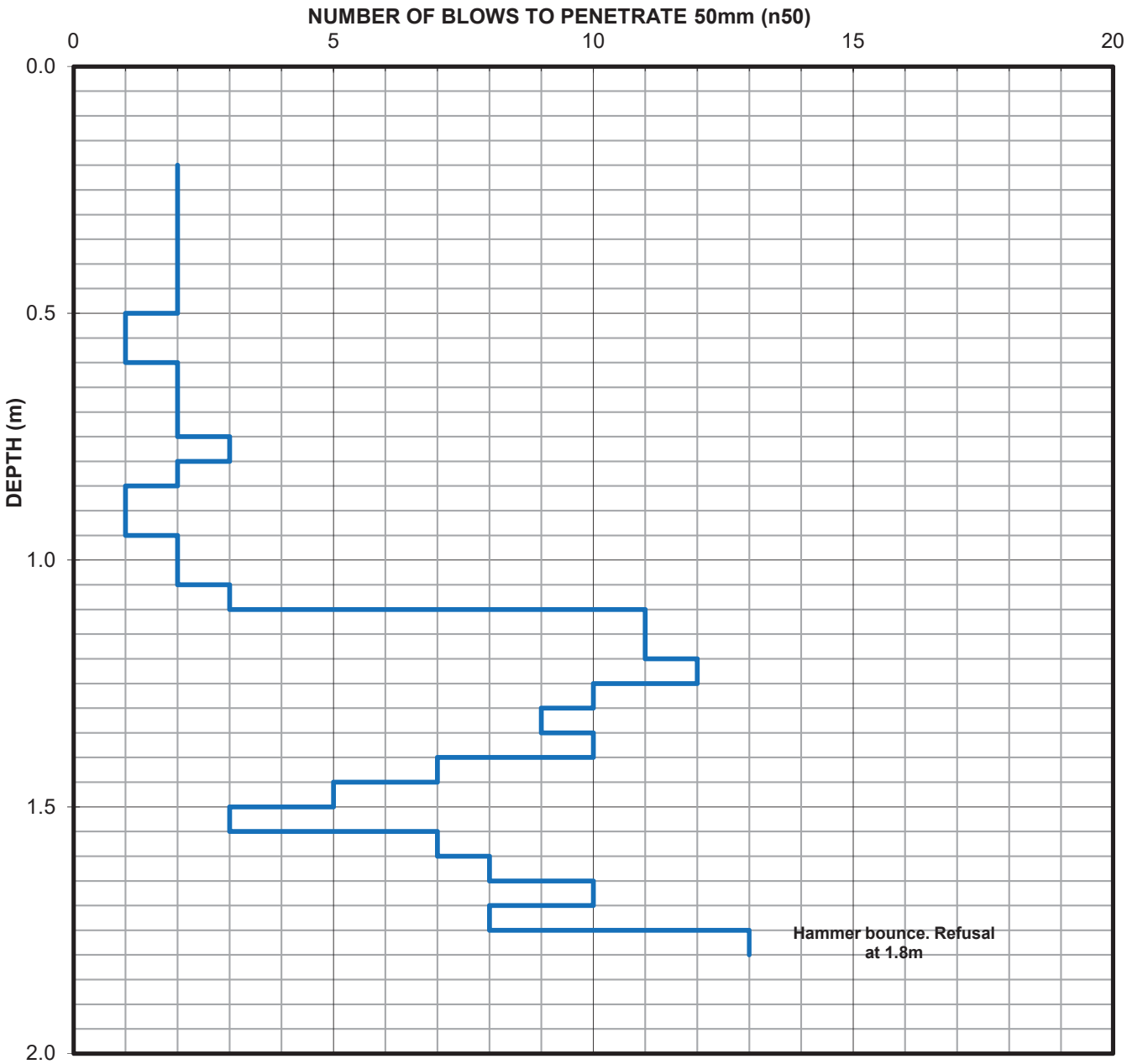
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Monro Park, Cronulla, NSW

PROBE: DCP03B

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH03B		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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GHD GEOTECHNICS

Job No. **2128380**

BOREHOLE LOG SHEET

Client : Eutverland Evire Cyunpil

Project : Crynulla f yMn Centre - DeRgn Etage 3

Location : Oeapv warl A(eTCrynulla NEh

HOLE No. BH04B

SHEET 1 OF 1

Position : me:er ty teR lypatiyn xlan	**Surface RL:** -	**Angle from Horiz. :** & °	**Processed :** GAS
Rig Type : 150mm Diatube	**Mounting:** Etand	**Contractor :** Diapyre	**Driller :** Nyav	**Checked :** CC
Date Started : 2\5\3. 1&	**Date Completed :** 2\5\3. 1&	**Logged by :** PCD\GS	**Date:** 1\L\1&

DRILLING					MATERIAL						DCP	
ECAP/ c4)	Drilling Getvyd	Hyle Euxxyrt YCaRing	h ater	Ea4 xleRB f eRR	Dextv \ amP) 4 etreR	Sraxvip Pyg	WEC Es4 byl	Description	GyiRure Cynditiyn	CynRIRenps \ DenRits ChdeK	DCP Test Results	Comments/ Observations
	Diatube	Nil	SN/	DE	. 6 1		-	f CP/ @blue-gresT134 4 6	-	-		
					. 6 7		-	C/ DDCNS PAk/ m@RtabiliRed RandT sellyM-gres6	-	-		
							-	C, NCm/ f / @gresTaggregateRux ty 3. 4 4 6	-	-		
	Hand Auger				. 633		-	. 6IL-. 6314 @Rteel rein:yrpe4 ent6	G	GD		
				DE	. 68.		C0- CH	oCPP@Eands SmAF/ P@darl bryMnT :ine ty pyarReTRub-angular ty Rub-ryunded cxredy4 inantls (ylpanipR)T:ine ty pyarRe grained RandTtrape RIt cill)6	M~ wP	Et		
				DE	. 652			CPAk @range 4 yttled red and gresT 4 ediu4 ty vigv xlaRtipits creRdual)6				
								/ nd y: Oyrevyle at . 652 4 etreR6 me:uRal6				

DCw 9 16 4 @ me:uRal

See standard sheets for details of abbreviations & basis of descriptions

GHD
Pe(el 3 3& CvriRtie EtreetTEt PeynardR NEh 3. 72 AuRtralia
f @+71 3 &873 85. . o@+71 3 &873 851. / @Rin4 ail9 gvd@y4
C, NEWPf CNS S/ , f / CHNCCAP / NSCN/ / mE AND S/ , P, SCEf E

Job No. 21-28380

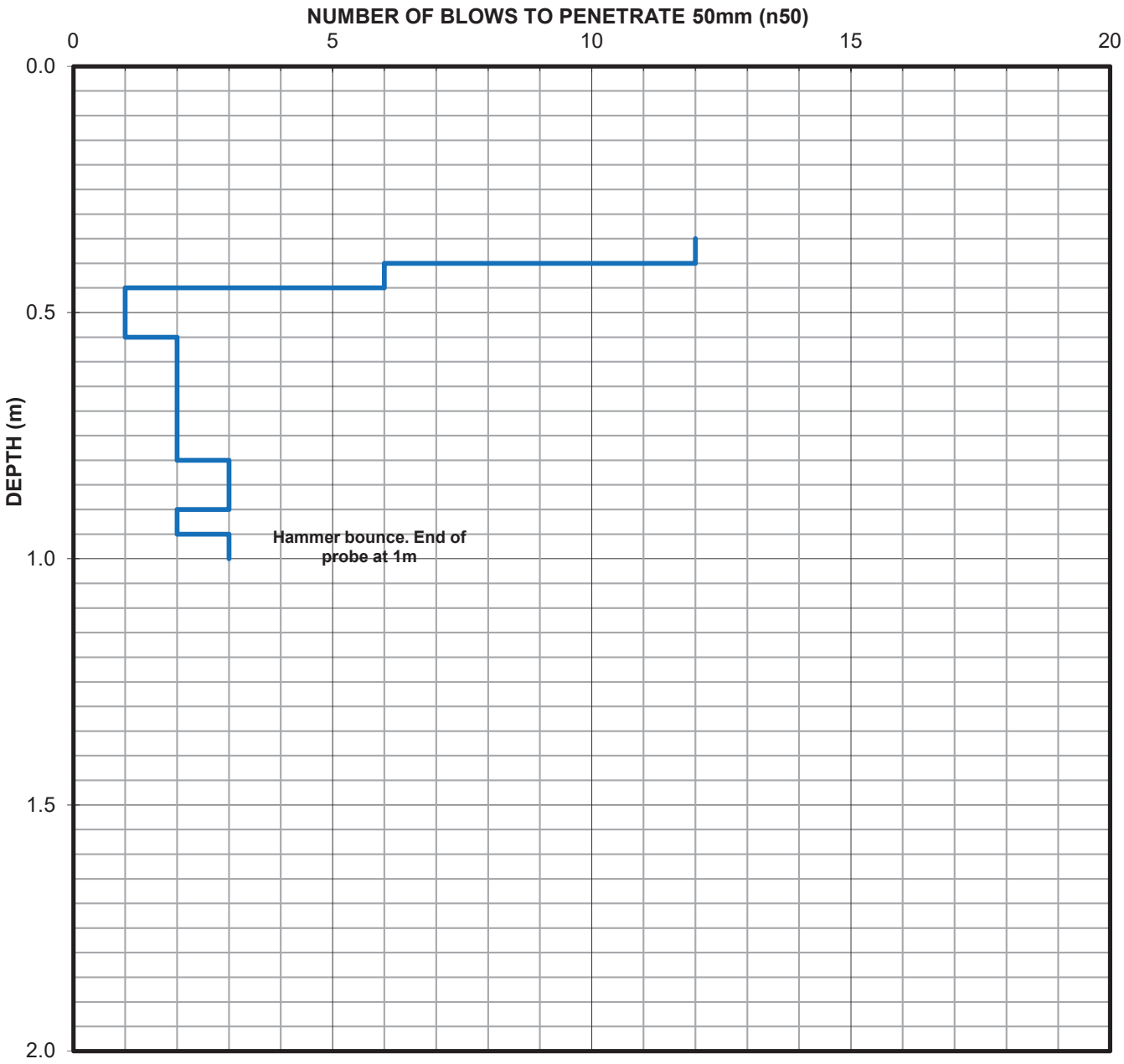
DYNAMIC CONE PENETROMETER LOG SHEET

Client: Sutherland Shire Council
Project: Cronulla Town Centre Design Stage 2
Location: Beach Park Ave, Cronulla, NSW

PROBE: DCP04B

AS 1289.6.3.2-1997 (Cone Tip) 510 mm drop height.

Position:	**Chainage:** N/A	**Operator:**	LCD/MG
Elevation:	**Offset:** Refer Test Location Plan	**Date:**	05/07/19
Adjacent Test Hole / Pit: BH04B		**Checked:**	ICC
Position Relative to Test Hole / Pit: On location		**Date:**	11/07/19



Comments:

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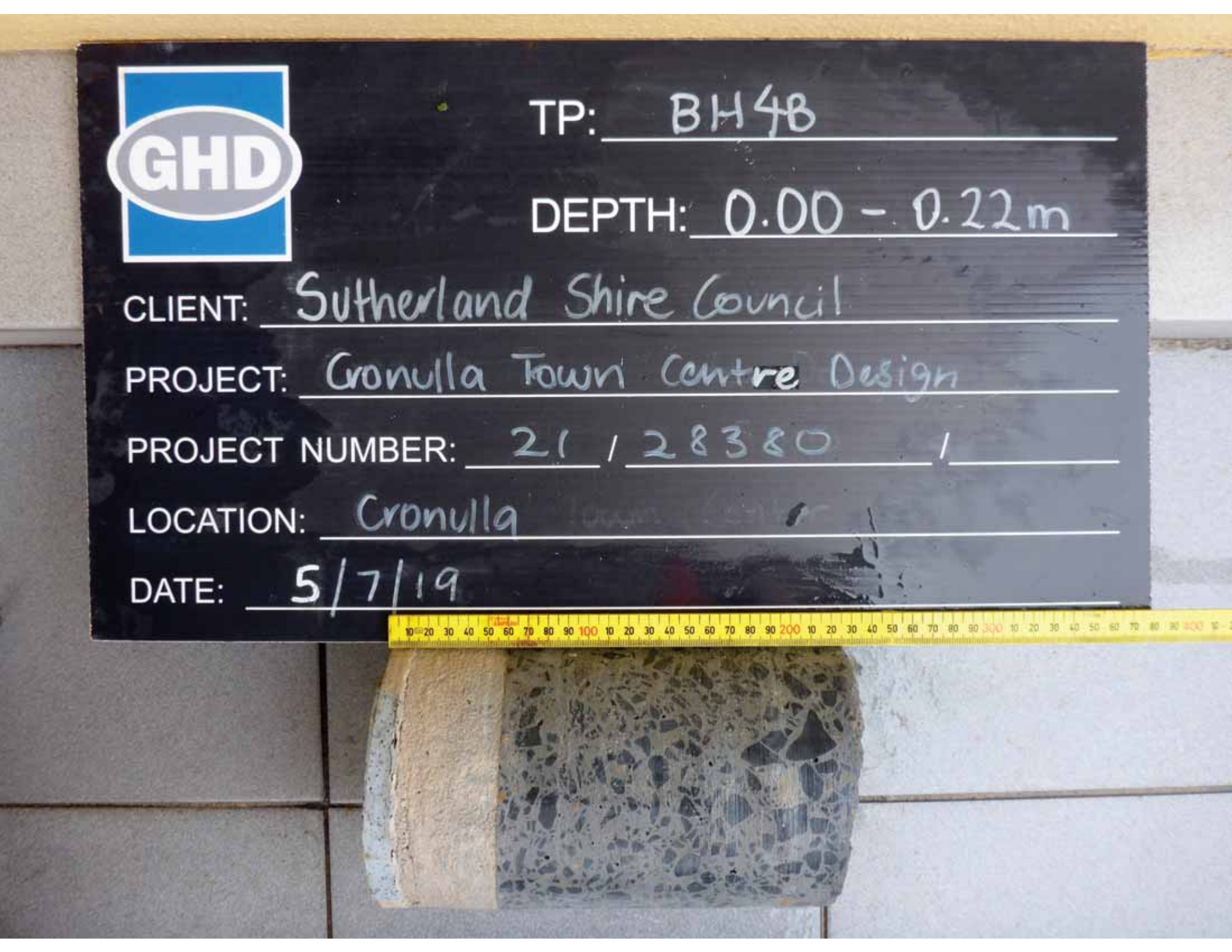
Job No. **2128380**


GHD
TP: BH4B
DEPTH: 0.00 - 0.22m
CLIENT: Sutherland Shire Council
PROJECT: Cronulla Town Centre Design
PROJECT NUMBER: 21 / 28380 /
LOCATION: Cronulla
DATE: 5/7/19

Appendix D – Geotechnical laboratory testing certificates

LABORATORY TESTING

GHD
Specialist Services in Geotechnical Engineering, Geology, Field/Laboratory Testing and Hydrogeology
www.ghd.com/Geotechnical

GENERAL

Samples extracted during the fieldwork stage of a site investigation may be “disturbed” or “undisturbed” (as generally indicated on the test hole logs) depending upon the nature and purpose of the sample as well as the method of extraction, transportation, extrusion and testing. This aspect should be taken into account when assessing test results, which must of necessity, reflect the effects of such disturbance.

All soil properties (as measured by laboratory testing) exhibit inherent variability and thus a certain statistical number of tests is required in order to predict an average property with any degree of confidence. The site variability of soil strata, future changes in moisture and other conditions and the discrete sampling positions must also be considered when assessing the representative nature of the laboratory programme.

Certain laboratory test results provide interpreted soil properties as derived by conventional mathematical procedures. The applicability of such properties to engineering design must be assessed with due regard to the site, sample condition, procedure and project in hand.

TESTING

Laboratory testing is normally carried out in accordance with Australian Standard AS 1289 as amended, or in NSW, Roads and Maritime Services (RMS) standards when specified. The routine Australian Standard tests are as follows:

Moisture Content	AS1289 2.1.1	
Liquid Limit	AS1289 3.1.1	collectively known as Atterberg Limits
Plastic Limit	AS1289 3.2.1	
Plasticity Index	AS1289 3.3.1	
Linear Shrinkage	AS1289 3.4.1	
Particle Density	AS1289 3.5.1	
Particle Size Distribution	AS1289 3.6.1, 3.6.2 and 3.6.3	
Emerson Class Number	AS1289 3.8.1	collectively, Dispersive Classification
Percent Dispersion	AS1289 3.8.2	
Pinhole Dispersion Classification	AS1289 3.8.3	
Hole Erosion (HE)	GHD Method	
No Erosion Filter (NEF)	GHD Method	
Organic Matter	AS1289 4.1.1	
Sulphate Content	AS1289 4.2.1	
pH Value	AS1289 4.3.1	
Resistivity	AS1289 4.4.1	
Standard Compaction	AS1289 5.1.1	
Modified Compaction	AS1289 5.2.1	
Dry Density Ratio	AS1289 5.4.1	
Minimum Density	AS1289 5.5.1	
Density Index	AS1289 5.6.1	
California Bearing Ratio	AS1289 6.1.1 and 6.1.2	
Shear Box	AS1289 6.2.2	
Undrained Triaxial Shear	AS1289 6.4.1 and 6.4.2	
One Dimensional Consolidation	AS1289 6.6.1	
Permeability Testing	AS1289 6.7.1, 6.7.2 and 6.7.3	

Where tests are used which are not covered by appropriate standard procedures, details are given in the report.

LABORATORIES

Our Australian laboratories are NATA accredited to AS ISO / IEC17025 for the listed tests.

The oedometer, triaxial and shear box equipment are fully automated for continuous operation using computer controlled data acquisition, processing and plotting systems.

Ref: DS5.5.2 Issue 0 Date: 05/10/2018

Sydney Laboratory
Unit 5/43 Herbert St
Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1901732
Issue No: 1
This report replaces all previous issues of report no 'SYD1901732'.

Client:
Sutherland Shire Council
4 Eton St
Sutherland NSW 2232

Project: 2128380 Cronulla Mall

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: Jure G Vukovic (Senior Laboratory Technician)

Date of Issue: 30/07/2019

Sample Details

GHD Sample No	SYD19-0308-05
Client Sample ID	BH02-B
Date Sampled	05/07/2019
Sampled By	Sampled by GHD
Location	Cronulla Mall
BH / TP No.	BH02-B
Depth (m)	0.5 - 0.7m
Soil Description	CLAY;pale grey/red/brown

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	18.7	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	47	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	27	

Comments

N/A

Sydney Laboratory
Unit 5/43 Herbert St
Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1901731
Issue No: 1
This report replaces all previous issues of report no 'SYD1901731'.

Client:
Sutherland Shire Council
4 Eton St
Sutherland NSW 2232

Project: 2128380 Cronulla Mall

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: Jure G Vukovic (Senior Laboratory Technician)

Date of Issue: 30/07/2019

Sample Details

GHD Sample No	SYD19-0308-04
Client Sample ID	BH03
Date Sampled	05/07/2019
Sampled By	Sampled by GHD
Location	Cronulla Mall
BH / TP No.	BH03
Depth (m)	0.6 - 0.7m
Soil Description	CLAY; red/brown

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	23.6	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	69	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	32	
Plasticity Index (%)	AS 1289.3.3.1	37	

Comments

N/A

Sydney Laboratory
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Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1901730
Issue No: 1
This report replaces all previous issues of report no 'SYD1901730'.

Client:
Sutherland Shire Council
4 Eton St
Sutherland NSW 2232

Project: 2128380 Cronulla Mall

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: Jure G Vukovic (Senior Laboratory Technician)

Date of Issue: 30/07/2019

Sample Details

GHD Sample No	SYD19-0308-03
Client Sample ID	BH10
Date Sampled	05/07/2019
Sampled By	Sampled by GHD
Location	Cronulla Mall
BH / TP No.	BH10
Depth (m)	0.5 - 0.7m
Soil Description	Gravelly CLAY; grey/red/brown

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	10.5	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	35	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	19	

Comments

N/A

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Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1901728
Issue No: 1
This report replaces all previous issues of report no 'SYD1901728'.

Client:
Sutherland Shire Council
4 Eton St
Sutherland NSW 2232

Project: 2128380 Cronulla Mall

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: Jure G Vukovic (Senior Laboratory Technician)

Date of Issue: 30/07/2019

Sample Details

GHD Sample No	SYD19-0308-01
Client Sample ID	BH22
Date Sampled	05/07/2019
Sampled By	Sampled by GHD
Location	Cronulla Mall
BH / TP No.	BH22
Depth (m)	0.65 - 0.80m
Soil Description	Gravelly CLAY; red/brown

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	17.6	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	59	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	26	
Plasticity Index (%)	AS 1289.3.3.1	33	
Date Tested		24/07/2019	

Comments

N/A

Sydney Laboratory
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Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax:(02) 9462 4710

Aggregate/Soil Test Report

Report No: SYD1901729
Issue No: 1
This report replaces all previous issues of report no 'SYD1901729'.

Client:
Sutherland Shire Council
4 Eton St
Sutherland NSW 2232

Project: 2128380 Cronulla Mall

Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited Laboratory Number: 679

Approved Signatory: Jure G Vukovic (Senior Laboratory Technician)

Date of Issue: 30/07/2019

Sample Details

GHD Sample No	SYD19-0308-02
Client Sample ID	BH33
Date Sampled	05/07/2019
Sampled By	Sampled by GHD
Location	Cronulla Mall
BH / TP No.	BH33
Depth (m)	1.0 - 1.1m
Soil Description	Gravelly CLAY; red/brown

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	21.0	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	78	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	33	
Plasticity Index (%)	AS 1289.3.3.1	45	

Comments

N/A

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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 222366

Client Details

Client	GHD Pty Ltd
Attention	David Brooke
Address	57-63 Herbert Street, Artarmon, NSW, 2064

Sample Details

Your Reference	**2128380**
Number of Samples	3 SOIL
Date samples received	25/07/2019
Date completed instructions received	25/07/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	01/08/2019
Date of Issue	29/07/2019

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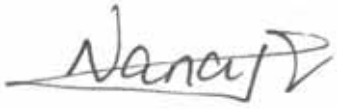
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Nancy Zhang, Laboratory Manager, Sydney

Authorised By



Nancy Zhang, Laboratory Manager

Misc Inorg - Soil				
Our Reference		222366-1	222366-2	222366-3
Your Reference	UNITS	BH22	BH03	BH02-B
Depth		0.65-0.8	0.6-0.7	0.5-0.7
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	26/07/2019	26/07/2019	26/07/2019
Date analysed	-	26/07/2019	26/07/2019	26/07/2019
pH 1:5 soil:water	pH Units	6.3	6.0	6.6
Electrical Conductivity 1:5 soil:water	µS/cm	110	58	65
Chloride, Cl 1:5 soil:water	mg/kg	20	20	46
Sulphate, SO4 1:5 soil:water	mg/kg	160	66	35

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			26/07/2019	1	26/07/2019	26/07/2019		26/07/2019	[NT]
Date analysed	-			26/07/2019	1	26/07/2019	26/07/2019		26/07/2019	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.3	6.5	3	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	110	130	17	106	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	20	20	0	98	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	160	190	17	104	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Appendix E – Chemical laboratory reports

GHD Pty Ltd WOLLONGONG
Level 3, 200 Crown St
Wollongong
NSW 2500

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Colee Quayle**

Report **665007-S-V2**
Project name WASTE CLASSIFICATION
Project ID 2128380
Received Date Jul 10, 2019

Client Sample ID			BH1 0.2-0.3	BH02 0.5-0.6	BH05 0.25-0.35	BH12 0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13112	S19-Jl13113	S19-Jl13114	S19-Jl13115
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 04, 2019	Jul 03, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	-	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	-	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	-	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	-	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	-	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	-	< 100
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	-	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	-	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	-	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	-	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	-	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	78	81	-	64
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	-	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	-	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5

Client Sample ID			BH1 0.2-0.3	BH02 0.5-0.6	BH05 0.25-0.35	BH12 0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13112	S19-Jl13113	S19-Jl13114	S19-Jl13115
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 04, 2019	Jul 03, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	67	66	-	72
p-Terphenyl-d14 (surr.)	1	%	74	76	-	86
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	-	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Dibutylchlorendate (surr.)	1	%	95	97	-	94
Tetrachloro-m-xylene (surr.)	1	%	71	71	-	75
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	-	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2

Client Sample ID			BH1 0.2-0.3	BH02 0.5-0.6	BH05 0.25-0.35	BH12 0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13112	S19-Jl13113	S19-Jl13114	S19-Jl13115
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 04, 2019	Jul 03, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	-	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Omethoate	2	mg/kg	< 2	< 2	-	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Triphenylphosphate (surr.)	1	%	92	108	-	110
Heavy Metals						
Arsenic	2	mg/kg	2.3	11	< 2	16
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	31	43	29	38
Copper	5	mg/kg	74	< 5	72	7.9
Lead	5	mg/kg	5.7	18	< 5	19
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	130	< 5	130	12
Zinc	5	mg/kg	68	< 5	55	12
% Moisture	1	%	8.2	11	12	18

Client Sample ID			BH16 1.3-1.4	BH17 0.25-0.45	BH22 0.3-0.4	BH26 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13116	S19-Jl13117	S19-Jl13118	S19-Jl13121
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 05, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50

Client Sample ID			BH16 1.3-1.4	BH17 0.25-0.45	BH22 0.3-0.4	BH26 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13116	S19-Jl13117	S19-Jl13118	S19-Jl13121
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 05, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C16-C34	100	mg/kg	< 100	< 100	150	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	150	< 100
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	62	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	130	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	192	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	74	74	71	78
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	0.6	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	0.6	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	1.2	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	69	82	73	74
p-Terphenyl-d14 (surr.)	1	%	76	96	88	81
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05

Client Sample ID			BH16 1.3-1.4	BH17 0.25-0.45	BH22 0.3-0.4	BH26 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13116	S19-Jl13117	S19-Jl13118	S19-Jl13121
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 05, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	86	96	104	91
Tetrachloro-m-xylene (surr.)	1	%	75	81	75	73
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			BH16 1.3-1.4	BH17 0.25-0.45	BH22 0.3-0.4	BH26 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13116	S19-Jl13117	S19-Jl13118	S19-Jl13121
Date Sampled			Jul 04, 2019	Jul 08, 2019	Jul 05, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	95	123	126	112
Heavy Metals						
Arsenic	2	mg/kg	14	7.1	8.0	22
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	23	31	36	150
Copper	5	mg/kg	< 5	20	100	28
Lead	5	mg/kg	22	39	11	29
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	31	13	41
Zinc	5	mg/kg	< 5	54	21	21
% Moisture	1	%	17	7.9	7.3	6.3

Client Sample ID			BH28 0.35-0.4	BH29 0.3-0.45	BH30 0.2-0.3	BH34 0.25-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13122	S19-Jl13123	S19-Jl13124	S19-Jl13127
Date Sampled			Jul 02, 2019	Jul 02, 2019	Jul 02, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	71	70	70	84

Client Sample ID			BH28 0.35-0.4	BH29 0.3-0.45	BH30 0.2-0.3	BH34 0.25-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13122	S19-Jl13123	S19-Jl13124	S19-Jl13127
Date Sampled			Jul 02, 2019	Jul 02, 2019	Jul 02, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	1.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	1.7	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	2.0	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	0.8	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	1.1	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	0.7	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	1.2	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	0.8	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	0.8	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	1.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	1.1	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	1.6	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	9.6	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	70	67	62	69
p-Terphenyl-d14 (surr.)	1	%	77	87	73	67
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	94	98	83	83
Tetrachloro-m-xylene (surr.)	1	%	71	72	64	66

Client Sample ID			BH28 0.35-0.4	BH29 0.3-0.45	BH30 0.2-0.3	BH34 0.25-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13122	S19-Jl13123	S19-Jl13124	S19-Jl13127
Date Sampled			Jul 02, 2019	Jul 02, 2019	Jul 02, 2019	Jul 02, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	109	121	95	80
Heavy Metals						
Arsenic	2	mg/kg	4.9	9.2	5.7	14
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	38	39	62	110
Copper	5	mg/kg	42	56	< 5	< 5
Lead	5	mg/kg	14	27	15	23
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	88	32	5.4	5.1
Zinc	5	mg/kg	50	49	14	< 5
% Moisture	1	%	7.7	19	6.5	7.4

Client Sample ID			BH01-B 0.2-0.3	BH03-B 0.1-0.2	QC2	QC3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13128	S19-Jl13129	S19-Jl13131	S19-Jl13132
Date Sampled			Jul 05, 2019	Jul 05, 2019	Jul 03, 2019	Jul 04, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	180	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	180	< 100	< 100
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	130	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	100	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	230	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	86	74	78	79
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	0.6	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	0.7	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	0.8	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	0.8	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	2.9	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	63	58	113	118
p-Terphenyl-d14 (surr.)	1	%	70	88	116	117

Client Sample ID			BH01-B 0.2-0.3	BH03-B 0.1-0.2	QC2	QC3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13128	S19-Jl13129	S19-Jl13131	S19-Jl13132
Date Sampled			Jul 05, 2019	Jul 05, 2019	Jul 03, 2019	Jul 04, 2019
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	81	101	127	131
Tetrachloro-m-xylene (surr.)	1	%	66	66	110	113
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			BH01-B 0.2-0.3	BH03-B 0.1-0.2	QC2	QC3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-Jl13128	S19-Jl13129	S19-Jl13131	S19-Jl13132
Date Sampled			Jul 05, 2019	Jul 05, 2019	Jul 03, 2019	Jul 04, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	90	135	116	108
Heavy Metals						
Arsenic	2	mg/kg	9.3	3.2	31	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	29	8.8	72	24
Copper	5	mg/kg	< 5	13	< 5	55
Lead	5	mg/kg	9.4	57	31	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	110
Zinc	5	mg/kg	< 5	71	110	53
% Moisture	1	%	9.2	24	20	8.4

Client Sample ID			TRIP SPIKE	TRIP BLANK
Sample Matrix			Soil	Soil
Eurofins Sample No.			S19-Jl13157	S19-Jl13158
Date Sampled			Jul 01, 2019	Jul 01, 2019
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene[N02]	0.5	mg/kg	-	< 0.5
TRH C6-C10	20	mg/kg	-	< 20
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	20	mg/kg	-	< 20
BTEX				
Benzene	0.1	mg/kg	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	111	125

Sample History

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

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
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jul 11, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons	Sydney	Jul 12, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Jul 12, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Jul 12, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Eurofins | mgt Suite B7			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jul 11, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Jul 29, 2019	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8	Melbourne	Jul 11, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins | mgt Suite B10			
Organochlorine Pesticides	Melbourne	Jul 11, 2019	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8270)			
Organophosphorus Pesticides	Melbourne	Jul 11, 2019	14 Days
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS (USEPA 8081)			
% Moisture	Melbourne	Jul 10, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

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NATA # 1261
Site # 23736

Company Name: GHD Pty Ltd WOLLONGONG
Address: Level 3, 200 Crown St
Wollongong
NSW 2500

Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 30, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	BH1 0.2-0.3	Jul 04, 2019		Soil	S19-Jl13112	X				X	X		
2	BH02 0.5-0.6	Jul 08, 2019		Soil	S19-Jl13113					X	X		
3	BH05 0.25-0.35	Jul 04, 2019		Soil	S19-Jl13114			X		X			
4	BH12 0.5-0.6	Jul 03, 2019		Soil	S19-Jl13115	X				X	X		
5	BH16 1.3-1.4	Jul 04, 2019		Soil	S19-Jl13116					X	X		
6	BH17 0.25-0.45	Jul 08, 2019		Soil	S19-Jl13117					X	X		
7	BH22 0.3-0.4	Jul 05, 2019		Soil	S19-Jl13118					X	X		
8	WB1	Jul 08, 2019		Water	S19-Jl13119							X	

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Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
9	BH26 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13120	X							
10	BH26 0.4-0.5	Jul 02, 2019		Soil	S19-Jl13121	X				X	X		
11	BH28 0.35-0.4	Jul 02, 2019		Soil	S19-Jl13122	X				X	X		
12	BH29 0.3-0.45	Jul 02, 2019		Soil	S19-Jl13123	X				X	X		
13	BH30 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13124	X				X	X		
14	BH32 0.22-0.35	Jul 02, 2019		Soil	S19-Jl13125	X							
15	BH33 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13126	X							
16	BH34 0.25-0.4	Jul 02, 2019		Soil	S19-Jl13127					X	X		
17	BH01-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13128					X	X		
18	BH03-B 0.1-0.2	Jul 05, 2019		Soil	S19-Jl13129	X				X	X		

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Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
19	BH03-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13130	X							
20	QC2	Jul 03, 2019		Soil	S19-Jl13131					X	X		
21	QC3	Jul 04, 2019		Soil	S19-Jl13132					X	X		
22	BH1 0.9-1.0	Jul 04, 2019		Soil	S19-Jl13145		X						
23	BH1 1.6-1.7	Jul 04, 2019		Soil	S19-Jl13146		X						
24	BH02 0.4-0.5	Jul 08, 2019		Soil	S19-Jl13147		X						
25	BH12 0.7-0.8	Jul 03, 2019		Soil	S19-Jl13148		X						
26	BH17 0.45-0.75	Jul 08, 2019		Soil	S19-Jl13149		X						
27	BH17 0.75-0.8	Jul 08, 2019		Soil	S19-Jl13150		X						
28	BH22 0.15-0.3	Jul 05, 2019		Soil	S19-Jl13151		X						
29	BH26 0.7-0.8	Jul 02, 2019		Soil	S19-Jl13152		X						

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Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
30	BH02-B 0.3-0.5	Jul 05, 2019		Soil	S19-JI13153		X						
31	BH03-B 0.3-0.35	Jul 05, 2019		Soil	S19-JI13154		X						
32	BH03-B 0.5-0.65	Jul 05, 2019		Soil	S19-JI13155		X						
33	QC1	Jul 02, 2019		Soil	S19-JI13156		X						
34	TRIP SPIKE	Jul 01, 2019		Soil	S19-JI13157				X				
35	TRIP BLANK	Jul 01, 2019		Soil	S19-JI13158								X
Test Counts						11	12	1	1	16	15	1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Lab Sample ID	Units	Result	Repeat				Qualifying Code
Repeat Analysis								
Polycyclic Aromatic Hydrocarbons								
Acenaphthene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Acenaphthylene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Anthracene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Benz(a)anthracene	S19-Jl13123	mg/kg	0.8	0.7				
Benzo(a)pyrene	S19-Jl13123	mg/kg	1.1	0.9				
Benzo(b&j)fluoranthene	S19-Jl13123	mg/kg	0.7	0.5				
Benzo(g.h.i)perylene	S19-Jl13123	mg/kg	1.2	0.6				
Benzo(k)fluoranthene	S19-Jl13123	mg/kg	0.8	0.8				
Chrysene	S19-Jl13123	mg/kg	0.8	0.8				
Dibenz(a.h)anthracene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Fluoranthene	S19-Jl13123	mg/kg	1.5	1.6				
Fluorene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Indeno(1.2.3-cd)pyrene	S19-Jl13123	mg/kg	1.1	0.5				
Naphthalene	S19-Jl13123	mg/kg	< 0.5	< 0.5				
Phenanthrene	S19-Jl13123	mg/kg	< 0.5	0.7				
Pyrene	S19-Jl13123	mg/kg	1.6	1.6				
2-Fluorobiphenyl (surr.)	S19-Jl13123	%	67	91				
p-Terphenyl-d14 (surr.)	S19-Jl13123	%	87	92				

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/kg	< 0.2			0.2	Pass	
Bolstar	mg/kg	< 0.2			0.2	Pass	
Chlorfenvinphos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos-methyl	mg/kg	< 0.2			0.2	Pass	
Coumaphos	mg/kg	< 2			2	Pass	
Demeton-S	mg/kg	< 0.2			0.2	Pass	
Demeton-O	mg/kg	< 0.2			0.2	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	
Dimethoate	mg/kg	< 0.2			0.2	Pass	
Disulfoton	mg/kg	< 0.2			0.2	Pass	
EPN	mg/kg	< 0.2			0.2	Pass	
Ethion	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Ethyl parathion	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Malathion	mg/kg	< 0.2			0.2	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Merphos	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Monocrotophos	mg/kg	< 2			2	Pass	
Naled	mg/kg	< 0.2			0.2	Pass	
Omethoate	mg/kg	< 2			2	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Pirimiphos-methyl	mg/kg	< 0.2			0.2	Pass	
Pyrazophos	mg/kg	< 0.2			0.2	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Terbufos	mg/kg	< 0.2			0.2	Pass	
Tetrachlorvinphos	mg/kg	< 0.2			0.2	Pass	
Tokuthion	mg/kg	< 0.2			0.2	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	110			70-130	Pass	
Naphthalene	%	112			70-130	Pass	
TRH C6-C10	%	113			70-130	Pass	
TRH C6-C10	%	94			70-130	Pass	
TRH >C10-C16	%	88			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	115			70-130	Pass	
TRH C10-C14	%	93			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	109			70-130	Pass	
Toluene	%	107			70-130	Pass	
Ethylbenzene	%	106			70-130	Pass	
m&p-Xylenes	%	103			70-130	Pass	
o-Xylene	%	105			70-130	Pass	
Xylenes - Total	%	106			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	95			70-130	Pass	
Acenaphthylene	%	90			70-130	Pass	
Anthracene	%	87			70-130	Pass	
Benz(a)anthracene	%	73			70-130	Pass	
Benzo(a)pyrene	%	72			70-130	Pass	
Benzo(b&j)fluoranthene	%	82			70-130	Pass	
Benzo(g.h.i)perylene	%	71			70-130	Pass	
Benzo(k)fluoranthene	%	95			70-130	Pass	
Chrysene	%	102			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dibenz(a.h)anthracene	%	73			70-130	Pass	
Fluoranthene	%	90			70-130	Pass	
Fluorene	%	92			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	78			70-130	Pass	
Naphthalene	%	93			70-130	Pass	
Phenanthrene	%	90			70-130	Pass	
Pyrene	%	94			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	91			70-130	Pass	
4.4'-DDD	%	87			70-130	Pass	
4.4'-DDE	%	83			70-130	Pass	
4.4'-DDT	%	76			70-130	Pass	
a-BHC	%	92			70-130	Pass	
Aldrin	%	94			70-130	Pass	
b-BHC	%	77			70-130	Pass	
d-BHC	%	87			70-130	Pass	
Dieldrin	%	100			70-130	Pass	
Endosulfan I	%	88			70-130	Pass	
Endosulfan II	%	81			70-130	Pass	
Endosulfan sulphate	%	98			70-130	Pass	
Endrin	%	104			70-130	Pass	
Endrin aldehyde	%	97			70-130	Pass	
Endrin ketone	%	73			70-130	Pass	
g-BHC (Lindane)	%	108			70-130	Pass	
Heptachlor	%	86			70-130	Pass	
Heptachlor epoxide	%	80			70-130	Pass	
Hexachlorobenzene	%	100			70-130	Pass	
Methoxychlor	%	70			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	88			70-130	Pass	
Dimethoate	%	81			70-130	Pass	
Ethion	%	96			70-130	Pass	
Fenitrothion	%	90			70-130	Pass	
Methyl parathion	%	87			70-130	Pass	
Mevinphos	%	71			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	116			80-120	Pass	
Cadmium	%	120			80-120	Pass	
Chromium	%	101			80-120	Pass	
Copper	%	100			80-120	Pass	
Lead	%	100			80-120	Pass	
Mercury	%	111			75-125	Pass	
Nickel	%	98			80-120	Pass	
Zinc	%	117			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M19-Jl19142	NCP	%	82			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M19-Jl19142	NCP	%	87			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Jl13307	NCP	%	106			75-125	Pass	
Cadmium	M19-Jl13307	NCP	%	104			75-125	Pass	
Chromium	M19-Jl13307	NCP	%	118			75-125	Pass	
Copper	M19-Jl13307	NCP	%	115			75-125	Pass	
Lead	M19-Jl13307	NCP	%	110			75-125	Pass	
Mercury	M19-Jl13307	NCP	%	94			70-130	Pass	
Nickel	M19-Jl13307	NCP	%	114			75-125	Pass	
Zinc	M19-Jl13307	NCP	%	115			75-125	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	S19-Jl13115	CP	%	91			70-130	Pass	
Dimethoate	S19-Jl13115	CP	%	76			70-130	Pass	
Ethion	S19-Jl13115	CP	%	90			70-130	Pass	
Fenitrothion	S19-Jl13115	CP	%	120			70-130	Pass	
Methyl parathion	S19-Jl13115	CP	%	107			70-130	Pass	
Mevinphos	S19-Jl13115	CP	%	73			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Jl13117	CP	%	92			70-130	Pass	
Acenaphthylene	S19-Jl13117	CP	%	89			70-130	Pass	
Anthracene	S19-Jl13117	CP	%	85			70-130	Pass	
Benz(a)anthracene	S19-Jl13117	CP	%	87			70-130	Pass	
Benzo(a)pyrene	S19-Jl13117	CP	%	92			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Jl13117	CP	%	87			70-130	Pass	
Benzo(g.h.i)perylene	S19-Jl13117	CP	%	119			70-130	Pass	
Benzo(k)fluoranthene	S19-Jl13117	CP	%	85			70-130	Pass	
Chrysene	S19-Jl13117	CP	%	92			70-130	Pass	
Dibenz(a.h)anthracene	S19-Jl13117	CP	%	120			70-130	Pass	
Fluoranthene	S19-Jl13117	CP	%	99			70-130	Pass	
Fluorene	S19-Jl13117	CP	%	90			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Jl13117	CP	%	126			70-130	Pass	
Naphthalene	S19-Jl13117	CP	%	89			70-130	Pass	
Phenanthrene	S19-Jl13117	CP	%	89			70-130	Pass	
Pyrene	S19-Jl13117	CP	%	102			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	K19-Jl12965	NCP	%	85			70-130	Pass	
4.4'-DDD	K19-Jl12965	NCP	%	76			70-130	Pass	
4.4'-DDE	K19-Jl12965	NCP	%	96			70-130	Pass	
4.4'-DDT	K19-Jl12965	NCP	%	80			70-130	Pass	
a-BHC	K19-Jl12965	NCP	%	86			70-130	Pass	
Aldrin	K19-Jl12965	NCP	%	88			70-130	Pass	
b-BHC	K19-Jl12965	NCP	%	96			70-130	Pass	
d-BHC	K19-Jl12965	NCP	%	119			70-130	Pass	
Dieldrin	K19-Jl12965	NCP	%	98			70-130	Pass	
Endosulfan I	K19-Jl12965	NCP	%	92			70-130	Pass	
Endosulfan II	K19-Jl12965	NCP	%	89			70-130	Pass	
Endosulfan sulphate	K19-Jl12965	NCP	%	101			70-130	Pass	
Endrin	K19-Jl12965	NCP	%	102			70-130	Pass	
Endrin aldehyde	K19-Jl12965	NCP	%	96			70-130	Pass	
Endrin ketone	K19-Jl12965	NCP	%	93			70-130	Pass	
g-BHC (Lindane)	K19-Jl12965	NCP	%	87			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor	K19-Jl12965	NCP	%	79			70-130	Pass	
Heptachlor epoxide	K19-Jl12965	NCP	%	78			70-130	Pass	
Hexachlorobenzene	K19-Jl12965	NCP	%	95			70-130	Pass	
Methoxychlor	K19-Jl12965	NCP	%	77			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Jl13492	NCP	%	86			70-130	Pass	
TRH C6-C10	S19-Jl13492	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Jl13492	NCP	%	86			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Jl13492	NCP	%	90			70-130	Pass	
Toluene	S19-Jl13492	NCP	%	94			70-130	Pass	
Ethylbenzene	S19-Jl13492	NCP	%	95			70-130	Pass	
m&p-Xylenes	S19-Jl13492	NCP	%	92			70-130	Pass	
o-Xylene	S19-Jl13492	NCP	%	93			70-130	Pass	
Xylenes - Total	S19-Jl13492	NCP	%	92			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	M19-Jl16671	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M19-Jl16671	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M19-Jl16671	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	M19-Jl16671	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M19-Jl16671	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	M19-Jl16671	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Jl15872	NCP	mg/kg	8.4	7.0	19	30%	Pass	
Cadmium	S19-Jl15872	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Jl15872	NCP	mg/kg	25	17	39	30%	Fail	Q15
Copper	S19-Jl15872	NCP	mg/kg	13	8.7	38	30%	Fail	Q15
Lead	S19-Jl15872	NCP	mg/kg	13	11	16	30%	Pass	
Mercury	S19-Jl15872	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-Jl15872	NCP	mg/kg	16	12	32	30%	Fail	Q15
Zinc	S19-Jl15872	NCP	mg/kg	34	25	32	30%	Fail	Q15
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Indeno(1.2.3-cd)pyrene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Jl13113	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S19-Jl13113	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S19-Jl13113	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Bolstar	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorfenvinphos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos-methyl	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Coumaphos	S19-Jl13113	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Demeton-S	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dimethoate	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
EPN	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethyl parathion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Malathion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl parathion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Monocrotophos	S19-Jl13113	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Naled	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Omethoate	S19-Jl13113	CP	mg/kg	< 2	< 2	<1	30%	Pass	

Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Phorate	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pirimiphos-methyl	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pyrazophos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Terbufos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tetrachlorvinphos	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	S19-Jl13113	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl13113	CP	%	11	11	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl13127	CP	%	7.4	7.7	4.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Jl13491	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Jl13491	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Jl13491	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Jl13491	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Jl13491	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Jl13491	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Jl13491	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-Jl13491	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-Jl13491	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Comments

Trip spike sample was inadvertently spiked to a lower concentration.

This report has been revised (V2) to include repeat PAH result for sample S19-Jl13123.

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	Yes
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.
N04	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.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

GHD Pty Ltd WOLLONGONG
Level 3, 200 Crown St
Wollongong
NSW 2500

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Colee Quayle**

Report **665007-W-V2**
Project name WASTE CLASSIFICATION
Project ID 2128380
Received Date Jul 10, 2019

Client Sample ID			**WB1**
Sample Matrix			**Water**
Eurofins Sample No.			**S19-Jl13119**
Date Sampled			**Jul 08, 2019**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	97
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	0.001	mg/L	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001
Anthracene	0.001	mg/L	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001
Chrysene	0.001	mg/L	< 0.001
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001
Fluoranthene	0.001	mg/L	< 0.001
Fluorene	0.001	mg/L	< 0.001

Client Sample ID			WB1
Sample Matrix			Water
Eurofins Sample No.			S19-Jl13119
Date Sampled			Jul 08, 2019
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001
Naphthalene	0.001	mg/L	< 0.001
Phenanthrene	0.001	mg/L	< 0.001
Pyrene	0.001	mg/L	< 0.001
Total PAH*	0.001	mg/L	< 0.001
2-Fluorobiphenyl (surr.)	1	%	56
p-Terphenyl-d14 (surr.)	1	%	93
Heavy Metals			
Arsenic	0.001	mg/L	< 0.001
Cadmium	0.0002	mg/L	< 0.0002
Chromium	0.001	mg/L	< 0.001
Copper	0.001	mg/L	< 0.001
Lead	0.001	mg/L	< 0.001
Mercury	0.0001	mg/L	< 0.0001
Nickel	0.001	mg/L	< 0.001
Zinc	0.005	mg/L	0.006

Sample History

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

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
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Jul 11, 2019	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Jul 11, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jul 11, 2019	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Eurofins | mgt Suite B7			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jul 11, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Jul 11, 2019	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8	Melbourne	Jul 12, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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Site # 23736

Company Name: GHD Pty Ltd WOLLONGONG
Address: Level 3, 200 Crown St
Wollongong
NSW 2500

Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 30, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	BH1 0.2-0.3	Jul 04, 2019		Soil	S19-Jl13112	X				X	X		
2	BH02 0.5-0.6	Jul 08, 2019		Soil	S19-Jl13113					X	X		
3	BH05 0.25-0.35	Jul 04, 2019		Soil	S19-Jl13114			X		X			
4	BH12 0.5-0.6	Jul 03, 2019		Soil	S19-Jl13115	X				X	X		
5	BH16 1.3-1.4	Jul 04, 2019		Soil	S19-Jl13116					X	X		
6	BH17 0.25-0.45	Jul 08, 2019		Soil	S19-Jl13117					X	X		
7	BH22 0.3-0.4	Jul 05, 2019		Soil	S19-Jl13118					X	X		
8	WB1	Jul 08, 2019		Water	S19-Jl13119							X	

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Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 30, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
9	BH26 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13120	X							
10	BH26 0.4-0.5	Jul 02, 2019		Soil	S19-Jl13121	X				X	X		
11	BH28 0.35-0.4	Jul 02, 2019		Soil	S19-Jl13122	X				X	X		
12	BH29 0.3-0.45	Jul 02, 2019		Soil	S19-Jl13123	X				X	X		
13	BH30 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13124	X				X	X		
14	BH32 0.22-0.35	Jul 02, 2019		Soil	S19-Jl13125	X							
15	BH33 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13126	X							
16	BH34 0.25-0.4	Jul 02, 2019		Soil	S19-Jl13127					X	X		
17	BH01-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13128					X	X		
18	BH03-B 0.1-0.2	Jul 05, 2019		Soil	S19-Jl13129	X				X	X		

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NSW 2500

Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 30, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
19	BH03-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13130	X							
20	QC2	Jul 03, 2019		Soil	S19-Jl13131					X	X		
21	QC3	Jul 04, 2019		Soil	S19-Jl13132					X	X		
22	BH1 0.9-1.0	Jul 04, 2019		Soil	S19-Jl13145		X						
23	BH1 1.6-1.7	Jul 04, 2019		Soil	S19-Jl13146		X						
24	BH02 0.4-0.5	Jul 08, 2019		Soil	S19-Jl13147		X						
25	BH12 0.7-0.8	Jul 03, 2019		Soil	S19-Jl13148		X						
26	BH17 0.45-0.75	Jul 08, 2019		Soil	S19-Jl13149		X						
27	BH17 0.75-0.8	Jul 08, 2019		Soil	S19-Jl13150		X						
28	BH22 0.15-0.3	Jul 05, 2019		Soil	S19-Jl13151		X						
29	BH26 0.7-0.8	Jul 02, 2019		Soil	S19-Jl13152		X						

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Company Name: GHD Pty Ltd WOLLONGONG
Address: Level 3, 200 Crown St
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Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 30, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
30	BH02-B 0.3-0.5	Jul 05, 2019		Soil	S19-JI13153		X						
31	BH03-B 0.3-0.35	Jul 05, 2019		Soil	S19-JI13154		X						
32	BH03-B 0.5-0.65	Jul 05, 2019		Soil	S19-JI13155		X						
33	QC1	Jul 02, 2019		Soil	S19-JI13156		X						
34	TRIP SPIKE	Jul 01, 2019		Soil	S19-JI13157				X				
35	TRIP BLANK	Jul 01, 2019		Soil	S19-JI13158								X
Test Counts						11	12	1	1	16	15	1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
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							
BTEX							
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							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
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							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	116			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH C10-C14	%	128			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	106			70-130	Pass	
Toluene	%	106			70-130	Pass	
Ethylbenzene	%	107			70-130	Pass	
m&p-Xylenes	%	102			70-130	Pass	
Xylenes - Total	%	104			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	97			70-130	Pass	
TRH C6-C10	%	120			70-130	Pass	
TRH >C10-C16	%	121			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	90			70-130	Pass	
Acenaphthylene	%	88			70-130	Pass	
Anthracene	%	84			70-130	Pass	
Benz(a)anthracene	%	82			70-130	Pass	
Benzo(a)pyrene	%	81			70-130	Pass	
Benzo(b&j)fluoranthene	%	89			70-130	Pass	
Benzo(g.h.i)perylene	%	120			70-130	Pass	
Benzo(k)fluoranthene	%	87			70-130	Pass	
Chrysene	%	92			70-130	Pass	
Dibenz(a.h)anthracene	%	113			70-130	Pass	
Fluoranthene	%	95			70-130	Pass	
Fluorene	%	95			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	103			70-130	Pass	
Naphthalene	%	84			70-130	Pass	
Phenanthrene	%	92			70-130	Pass	
Pyrene	%	95			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	94			80-120	Pass	
Cadmium	%	112			80-120	Pass	
Chromium	%	118			80-120	Pass	
Copper	%	117			80-120	Pass	
Lead	%	105			80-120	Pass	
Mercury	%	108			75-125	Pass	
Nickel	%	113			80-120	Pass	
Zinc	%	95			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M19-Jl14129	NCP	%	79			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M19-Jl14129	NCP	%	73			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-Jl11859	NCP	%	97			70-130	Pass	
Acenaphthylene	M19-Jl11859	NCP	%	90			70-130	Pass	
Anthracene	M19-Jl11859	NCP	%	87			70-130	Pass	
Benz(a)anthracene	M19-Jl11859	NCP	%	76			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(a)pyrene	M19-Jl11859	NCP	%	103			70-130	Pass	
Benzo(b&j)fluoranthene	M19-Jl11859	NCP	%	80			70-130	Pass	
Benzo(g.h.i)perylene	M19-Jl11859	NCP	%	102			70-130	Pass	
Benzo(k)fluoranthene	M19-Jl11859	NCP	%	103			70-130	Pass	
Chrysene	M19-Jl11859	NCP	%	100			70-130	Pass	
Dibenz(a.h)anthracene	M19-Jl11859	NCP	%	98			70-130	Pass	
Fluoranthene	M19-Jl11859	NCP	%	94			70-130	Pass	
Fluorene	M19-Jl11859	NCP	%	100			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M19-Jl11859	NCP	%	79			70-130	Pass	
Naphthalene	M19-Jl11859	NCP	%	104			70-130	Pass	
Phenanthrene	M19-Jl11859	NCP	%	94			70-130	Pass	
Pyrene	M19-Jl11859	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	P19-Jl12405	NCP	%	123			75-125	Pass	
Cadmium	P19-Jl12405	NCP	%	107			75-125	Pass	
Chromium	P19-Jl12405	NCP	%	118			75-125	Pass	
Copper	P19-Jl12405	NCP	%	109			75-125	Pass	
Lead	S19-Jl12365	NCP	%	84			75-125	Pass	
Mercury	P19-Jl12405	NCP	%	101			70-130	Pass	
Nickel	P19-Jl12405	NCP	%	114			75-125	Pass	
Zinc	S19-Jl12365	NCP	%	104			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S19-Jl13119	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S19-Jl13119	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S19-Jl13119	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S19-Jl13119	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S19-Jl13119	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S19-Jl13119	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenanthrene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Pyrene	M19-Jl14532	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	P19-Jl12405	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	P19-Jl12405	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	P19-Jl12405	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	P19-Jl12405	NCP	mg/L	0.16	0.15	3.0	30%	Pass	
Lead	S19-Jl12365	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	P19-Jl12405	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	P19-Jl12405	NCP	mg/L	0.001	< 0.001	50	30%	Fail	Q15
Zinc	S19-Jl12365	NCP	mg/L	< 0.005	0.017	140	30%	Fail	Q15

Comments

Trip spike sample was inadvertently spiked to a lower concentration.

This report has been revised (V2) to include repeat PAH result for sample S19-Jl13123.

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	Yes
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.
N04	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.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Certificate of Analysis

GHD Pty Ltd WOLLONGONG
Level 3, 200 Crown St
Wollongong
NSW 2500

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention:	Colee Quayle
Report	665007-V2-AID
Project Name	WASTE CLASSIFICATION
Project ID	2128380
Received Date	Jul 10, 2019
Date Reported	Jul 17, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name WASTE CLASSIFICATION
Project ID 2128380
Date Sampled Jul 02, 2019 to Jul 05, 2019
Report 665007-V2-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
BH1 0.2-0.3	19-Jl13112	Jul 04, 2019	Approximate Sample 104g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH12 0.5-0.6	19-Jl13115	Jul 03, 2019	Approximate Sample 30g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH26 0.2-0.3	19-Jl13120	Jul 02, 2019	Approximate Sample 91g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH26 0.4-0.5	19-Jl13121	Jul 02, 2019	Approximate Sample 108g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH28 0.35-0.4	19-Jl13122	Jul 02, 2019	Approximate Sample 52g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH29 0.3-0.45	19-Jl13123	Jul 02, 2019	Approximate Sample 112g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH30 0.2-0.3	19-Jl13124	Jul 02, 2019	Approximate Sample 116g Sample consisted of: Brown coarse-grained soil, rocks and sand stone	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH32 0.22-0.35	19-Jl13125	Jul 02, 2019	Approximate Sample 43g Sample consisted of: Brown coarse-grained soil, rocks and sand stone	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
BH33 0.2-0.3	19-Jl13126	Jul 02, 2019	Approximate Sample 60g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH03-B 0.1-0.2	19-Jl13129	Jul 05, 2019	Approximate Sample 23g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
BH03-B 0.2-0.3	19-Jl13130	Jul 05, 2019	Approximate Sample 84g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.

Sample History

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

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
Asbestos - LTM-ASB-8020	Sydney	Jul 17, 2019	Indefinite

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NATA # 1261
Site # 23736

Company Name: GHD Pty Ltd WOLLONGONG
Address: Level 3, 200 Crown St
Wollongong
NSW 2500

Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 665007
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 10, 2019 9:00 AM
Due: Jul 29, 2019
Priority: 5 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	BH1 0.2-0.3	Jul 04, 2019		Soil	S19-Jl13112	X				X	X		
2	BH02 0.5-0.6	Jul 08, 2019		Soil	S19-Jl13113					X	X		
3	BH05 0.25-0.35	Jul 04, 2019		Soil	S19-Jl13114			X		X			
4	BH12 0.5-0.6	Jul 03, 2019		Soil	S19-Jl13115	X				X	X		
5	BH16 1.3-1.4	Jul 04, 2019		Soil	S19-Jl13116					X	X		
6	BH17 0.25-0.45	Jul 08, 2019		Soil	S19-Jl13117					X	X		
7	BH22 0.3-0.4	Jul 05, 2019		Soil	S19-Jl13118					X	X		
8	WB1	Jul 08, 2019		Water	S19-Jl13119							X	

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Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
9	BH26 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13120	X							
10	BH26 0.4-0.5	Jul 02, 2019		Soil	S19-Jl13121	X				X	X		
11	BH28 0.35-0.4	Jul 02, 2019		Soil	S19-Jl13122	X				X	X		
12	BH29 0.3-0.45	Jul 02, 2019		Soil	S19-Jl13123	X				X	X		
13	BH30 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13124	X				X	X		
14	BH32 0.22-0.35	Jul 02, 2019		Soil	S19-Jl13125	X							
15	BH33 0.2-0.3	Jul 02, 2019		Soil	S19-Jl13126	X							
16	BH34 0.25-0.4	Jul 02, 2019		Soil	S19-Jl13127					X	X		
17	BH01-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13128					X	X		
18	BH03-B 0.1-0.2	Jul 05, 2019		Soil	S19-Jl13129	X				X	X		

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Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
19	BH03-B 0.2-0.3	Jul 05, 2019		Soil	S19-Jl13130	X							
20	QC2	Jul 03, 2019		Soil	S19-Jl13131					X	X		
21	QC3	Jul 04, 2019		Soil	S19-Jl13132					X	X		
22	BH1 0.9-1.0	Jul 04, 2019		Soil	S19-Jl13145		X						
23	BH1 1.6-1.7	Jul 04, 2019		Soil	S19-Jl13146		X						
24	BH02 0.4-0.5	Jul 08, 2019		Soil	S19-Jl13147		X						
25	BH12 0.7-0.8	Jul 03, 2019		Soil	S19-Jl13148		X						
26	BH17 0.45-0.75	Jul 08, 2019		Soil	S19-Jl13149		X						
27	BH17 0.75-0.8	Jul 08, 2019		Soil	S19-Jl13150		X						
28	BH22 0.15-0.3	Jul 05, 2019		Soil	S19-Jl13151		X						
29	BH26 0.7-0.8	Jul 02, 2019		Soil	S19-Jl13152		X						

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Sample Detail						Asbestos - AS4964	HOLD	Metals M8	BTEX	Moisture Set	Eurofins | mgt Suite B10	Eurofins | mgt Suite B7	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X		X	X	X	X
Sydney Laboratory - NATA Site # 18217						X			X		X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
30	BH02-B 0.3-0.5	Jul 05, 2019		Soil	S19-JI13153		X						
31	BH03-B 0.3-0.35	Jul 05, 2019		Soil	S19-JI13154		X						
32	BH03-B 0.5-0.65	Jul 05, 2019		Soil	S19-JI13155		X						
33	QC1	Jul 02, 2019		Soil	S19-JI13156		X						
34	TRIP SPIKE	Jul 01, 2019		Soil	S19-JI13157				X				
35	TRIP BLANK	Jul 01, 2019		Soil	S19-JI13158								X
Test Counts						11	12	1	1	16	15	1	1

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

This report has been revised (V2) to include repeat PAH result for sample S19-Jl13123.

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	Yes
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
N/A	Not applicable

Asbestos Counter/Identifier:

Chamath JHM Annakkage	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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Sample Receipt Advice

Company name:	**GHD Pty Ltd WOLLONGONG**
Contact name:	Colee Quayle
Project name:	WASTE CLASSIFICATION
Project ID:	2128380
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Jul 10, 2019 9:00 AM
Eurofins reference:	**665007**

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.

☑ Appropriate sample containers have been used.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Notes

Samples BH32 0.22-0.35 & BH33 0.2-0.3 logged for asbestos analysis.

Contact notes

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

Nibha Vaidya on Phone : +61 (2) 9900 8415 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Colee Quayle - colee.quayle@ghd.com.

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Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name :	GHD Pty Ltd	Contact Name:	Colee Quayle 0403 242 431	Purchase Order :	N/A	COC Number :	20190709A
Office Address :	Level 11 200 Crown St	Project Manager :	Mark George	PROJECT Number :	2128380	Eurofins | mgt quote ID :	National Agreement
	Wollongong, NSW 2500	Email for results :	colee.quayle@ghd.com	PROJECT Name :	Waste Classification	Data output format:	ESDAT

Special Directions & Comments :

Eurofins | mgt Oil water batch number:

	Sample ID	Depth	Date	Matrix	Suite B10 (TRH, BTEX, PAH, OCP, OPP, Metals)	Asbestos ID (absence / presence)	Suite B7 (TRH, BTEX, PAH, Metals)	TRH C6-C9	BTEX	Suite M8 (metals)	Hold
1	BH01	0.2-0.3	4/07/2019	Soil	X	X					
2	BH01	0.9-1.1	4/07/2019	Soil							X
3	BH01	1.6-1.7	4/07/2019	Soil							X
4	BH02	0.4-0.5	8/07/2019	Soil							X
5	BH02	0.5-0.6	8/07/2019	Soil	X						
6	BH05	0.25-0.5	4/07/2019	Soil						X	
7	BH12	0.5-0.6	3/07/2019	Soil	X	X					
8	BH12	0.7-0.8	3/07/2019	Soil							X
9	BH16	1.3-1.4	4/07/2019	Soil	X						
10	BH17	0.25-0.45	8/07/2019	Soil	X						
11	BH17	0.45-0.75	8/07/2019	Soil							X
12	BH17	0.75-0.8	8/07/2019	Soil							X
13	BH22	0.15-0.3	5/07/2019	Soil							X
14	BH22	0.3-0.4	5/07/2019	Soil	X						
15	Trip spike	-	8/7/19	Soil					X		
16	Trip blank	-	8/7/19	Soil				X	X		
17	WB1	-	8/07/2019	Water			X				
18											
19											

Some common holding times (with correct preservation). For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

	Containers:						Please test volatile components on the following individual samples
	Vials	Glass	Plastic	Glass Jar	Ice	Ziplock	
1				X	X	X	
2				X	X	X	
3				X	X	X	
4				X	X		
5				X	X		
6				X	X		
7				X	X	X	
8				X	X	X	
9				X	X		
10				X	X		
11				X	X		
12				X	X		
13				X	X		
14				X	X		
15	X						
16	X						
17	X	X	X				
18							
19							

GHD Staff	Courier	Laboratory Staff
Relinquished By: Mitch Gerdes	Received By:	Received By: Lina D
Date & Time: 8/07/2019	Date & Time:	Date & Time: 10/07/19 4:00 AM
Signature: M. Gerdes	Signature:	Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 4 DAY ☐
5 DAY ☑ 10 DAY ☐ Other: Same Day

Method Of Shipment

☐ Courier
☑ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 11.2°C

Report number: 665007

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☑ **Sydney**
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Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name :	GHD Pty Ltd	Contact Name:	Colee Quayle 0403 242 431	Purchase Order :	N/A
Office Address :	Level 11 200 Crown St	Project Manager :	Mark George	PROJECT Number :	2128380
	Wollongong, NSW 2500	Email for results :	colee.quayle@ghd.com	PROJECT Name :	Waste Classification

COC Number :	20190709B
Eurofins | mgt quote ID :	National Agreement
Data output format:	ESDAT

Special Directions & Comments :

Eurofins | mgt DI water batch number:

	Sample ID	Depth	Date	Matrix	Suite B10 (TRH, BTEX, PAH, OCP, OPP, Metals)	Asbestos ID (absence / presence)	Suite B7 (TRH, BTEX, PAH, Metals)	TRH C6-C9	BTEX	Suite M8 (metals)	Hold
1	BH26	0.2-0.3	2/07/2019	Soil		X					
2	BH26	0.4-0.5	2/07/2019	Soil	X	X					
3	BH26	0.7-0.8	2/07/2019	Soil							X
4	BH28	0.35-0.4	2/07/2019	Soil	X	X					
5	BH29	0.3-0.45	2/07/2019	Soil	X	X					
6	BH30	0.2-0.3	2/07/2019	Soil	X	X					
7	BH32	0.22-0.35	2/07/2019	Soil		X					X
8	BH33	0.2-0.3	2/07/2019	Soil		X					X
9	BH34	0.25-0.4	2/07/2019	Soil	X						
10	BH01-B	0.2-0.3	5/07/2019	Soil	X						
11	BH02-B	0.3-0.5	5/07/2019	Soil							X
12	BH03-B	0.1-0.2	5/07/2019	Soil	X	X					
13	BH03-B	0.2-0.3	5/07/2019	Soil		X					
14	BH03-B	0.3-0.35	5/07/2019	Soil							X
15	BH03-B	0.5-0.65	5/07/2019	Soil							X
16	QC1	-	2/07/2019	Soil							X
17	QC2	-	3/07/2019	Soil	X						
18	QC3	-	4/07/2019	Soil	X						
19											

Some common holding times (with correct preservation).
For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous Iron	7 days	ASLP, TCLP	7 days

Containers:						Please test volatile components on the following individual samples
Vials	Glass	Plastic	Glass Jar	Ice	Ziplock	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X		
			X	X		
			X	X		
			X	X	X	
			X	X	X	
			X	X	X	
			X	X	X	
			X	X		
			X	X		
			X	X		

GHD Staff	Courier	Laboratory Staff
Relinquished By: Mitch Gerdes	Received By:	Received By: Lina D.
Date & Time: 5/07/2019	Date & Time:	Date & Time: 10/07/19 9:00 AM
Signature: M. Gerdes	Signature:	Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other: Same Day

Method Of Shipment

☐ Courier
☑ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 11.2 °C

Report number: 665007

GHD Pty Ltd WOLLONGONG
Level 3, 200 Crown St
Wollongong
NSW 2500

Attention: **Colee Quayle**

Report **668181-L**
Project name WASTE CLASSIFICATION
Project ID 2128380
Received Date Jul 29, 2019

Client Sample ID			BH29 0.3-0.45	BH01 0.2-0.3	BH05 0.25-0.35	BH26 0.4-0.5
Sample Matrix			**US Leachate**	**US Leachate**	**US Leachate**	**US Leachate**
Eurofins Sample No.			**M19-JI42765**	**M19-JI45808**	**M19-JI45809**	**M19-JI45810**
Date Sampled			**Jul 03, 2019**	**Jul 03, 2019**	**Jul 03, 2019**	**Jul 03, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	< 0.001	-	-	-
Acenaphthylene	0.001	mg/L	< 0.001	-	-	-
Anthracene	0.001	mg/L	< 0.001	-	-	-
Benz(a)anthracene	0.001	mg/L	< 0.001	-	-	-
Benzo(a)pyrene	0.001	mg/L	< 0.001	-	-	-
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001	-	-	-
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	-	-	-
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	-	-	-
Chrysene	0.001	mg/L	< 0.001	-	-	-
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	-	-	-
Fluoranthene	0.001	mg/L	< 0.001	-	-	-
Fluorene	0.001	mg/L	< 0.001	-	-	-
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	-	-	-
Naphthalene	0.001	mg/L	< 0.001	-	-	-
Phenanthrene	0.001	mg/L	0.003	-	-	-
Pyrene	0.001	mg/L	< 0.001	-	-	-
Total PAH*	0.001	mg/L	0.003	-	-	-
2-Fluorobiphenyl (surr.)	1	%	78	-	-	-
p-Terphenyl-d14 (surr.)	1	%	59	-	-	-
Heavy Metals						
Chromium	0.01	mg/L	-	-	-	< 0.01
Nickel	0.01	mg/L	-	0.03	0.04	-
USA Leaching Procedure						
Leachate Fluid[C01]		comment	1.0	1.0	1.0	1.0
pH (initial)	0.1	pH Units	9.4	9.2	9.2	9.1
pH (Leachate fluid)	0.1	pH Units	5.1	5.1	5.1	5.1
pH (off)	0.1	pH Units	6.2	6.7	6.5	5.2
pH (USA HCl addition)	0.1	pH Units	1.7	1.6	1.6	1.6

Client Sample ID			BH28 0.35-0.4	BH34 0.25-0.4
Sample Matrix			US Leachate	US Leachate
Eurofins Sample No.			M19-Jl45811	M19-Jl45812
Date Sampled			Jul 03, 2019	Jul 03, 2019
Test/Reference	LOR	Unit		
Heavy Metals				
Chromium	0.01	mg/L	-	< 0.01
Nickel	0.01	mg/L	0.02	-
USA Leaching Procedure				
Leachate Fluid[C01]		comment	1.0	1.0
pH (initial)	0.1	pH Units	9.2	8.9
pH (Leachate fluid)	0.1	pH Units	5.1	5.1
pH (off)	0.1	pH Units	6.8	5.2
pH (USA HCl addition)	0.1	pH Units	1.6	1.6

Sample History

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

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
Polycyclic Aromatic Hydrocarbons	Melbourne	Jul 30, 2019	7 Days
- Method:			
Heavy Metals	Melbourne	Jul 29, 2019	180 Days
- Method:			

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

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6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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

Company Name: GHD Pty Ltd WOLLONGONG
Address: Level 3, 200 Crown St
Wollongong
NSW 2500

Project Name: WASTE CLASSIFICATION
Project ID: 2128380

Order No.:
Report #: 668181
Phone: 02 4222 2300
Fax: 02 4222 2301

Received: Jul 29, 2019 10:22 AM
Due: Jul 31, 2019
Priority: 2 Day
Contact Name: Colee Quayle

Eurofins Analytical Services Manager : Alena Bounkeua

Sample Detail						Chromium	Nickel	Polycyclic Aromatic Hydrocarbons	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	BH29 0.3-0.45	Jul 03, 2019		US Leachate	M19-Jl42765			X	X
2	BH01 0.2-0.3	Jul 03, 2019		US Leachate	M19-Jl45808		X		X
3	BH05 0.25-0.35	Jul 03, 2019		US Leachate	M19-Jl45809		X		X
4	BH26 0.4-0.5	Jul 03, 2019		US Leachate	M19-Jl45810	X			X
5	BH28 0.35-0.4	Jul 03, 2019		US Leachate	M19-Jl45811		X		X
6	BH34 0.25-0.4	Jul 03, 2019		US Leachate	M19-Jl45812	X			X
Test Counts						2	3	1	6

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-Jl37647	NCP	%	73			70-130	Pass	
Acenaphthylene	M19-Jl37647	NCP	%	87			70-130	Pass	
Anthracene	M19-Jl37647	NCP	%	103			70-130	Pass	
Benz(a)anthracene	M19-Jl37647	NCP	%	83			70-130	Pass	
Benzo(a)pyrene	M19-Jl37647	NCP	%	78			70-130	Pass	
Benzo(b&j)fluoranthene	M19-Jl37647	NCP	%	101			70-130	Pass	
Benzo(g.h.i)perylene	M19-Jl37647	NCP	%	96			70-130	Pass	
Benzo(k)fluoranthene	M19-Jl37647	NCP	%	99			70-130	Pass	
Chrysene	M19-Jl37647	NCP	%	90			70-130	Pass	
Dibenz(a.h)anthracene	M19-Jl37647	NCP	%	86			70-130	Pass	
Fluoranthene	M19-Jl37647	NCP	%	85			70-130	Pass	
Fluorene	M19-Jl37647	NCP	%	71			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M19-Jl37647	NCP	%	120			70-130	Pass	
Naphthalene	M19-Jl37647	NCP	%	99			70-130	Pass	
Phenanthrene	M19-Jl37647	NCP	%	102			70-130	Pass	
Pyrene	M19-Jl37647	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Chromium	M19-Jl45812	CP	%	95			75-125	Pass	
Nickel	M19-Jl45812	CP	%	96			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenanthrene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Pyrene	M19-Jl37646	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Chromium	M19-Jl45812	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Nickel	M19-Jl45812	CP	mg/L	0.02	0.02	6.0	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	Yes
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
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Alena Bounkeua	Analytical Services Manager
Joseph Edouard	Senior Analyst-Organic (VIC)
Emily Rosenberg	Senior Analyst-Metal (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

eurofins | Environment Testing

Melbourne
6 Monterey Road
Dandenong South Vic 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd WOLLONGONG**
Contact name:	Colee Quayle
Project name:	WASTE CLASSIFICATION
Project ID:	2128380
COC number:	Not provided
Turn around time:	2 Day
Date/Time received:	Jul 29, 2019 10:22 AM
Eurofins reference:	**668181**

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.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

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

Alena Bounkeua on Phone : or by e.mail: AlenaBounkeua@eurofins.com

Results will be delivered electronically via e.mail to Colee Quayle - colee.quayle@ghd.com.

Enviro Sample Vic

From: Alena Bounkeua
Sent: Monday, 29 July 2019 10:22 AM
To: Enviro Sample Vic
Subject: *2 day TAT* Batch 665007 - Additional analysis

Additional analysis please – 665007

Please only log TCLP PAH – 2 day TAT

(I will handle the repeat)

Thanks,

D.S 03/07

J113123 – G353 –

Kind Regards,

Alena Bounkeua
Eurofins | mgt
Phone: +61 2 9900 8414
Mobile: +61 429 365 410
Email: AlenaBounkeua@eurofins.com

From: Colee Quayle [mailto:Colee.Quayle@ghd.com]
Sent: Monday, 29 July 2019 7:19 AM
To: Alena Bounkeua
Subject: Batch 665007 - Additional analysis

EXTERNAL EMAIL*

Hi Alena

Would you please re-analyse this sample for PAH and also carry out TCLP PAH:

BH29 0.3-0.45
S19-Jl13123

TAT: 48 hrs – thanks.

29/7

Regards

Colee Quayle | A GHD Associate
M. Sci. (Proj Mgt), B. Apps. Sci. (Geo/Env)
Senior Environmental Scientist
Team Leader Contamination – Canberra Illawarra South Coast

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Level 11, 200 Crown St Wollongong NSW 2500 Australia | www.ghd.com

668181

Enviro Sample Vic

From: Alena Bounkeua
Sent: Monday, 29 July 2019 3:51 PM
To: Enviro Sample Vic
Subject: *2 day TAT* - Additional analysis

Hi Melbourne,

Please add the below additional analysis to this report logged earlier today.

New Report: 668181

Parent Report: 665007

Thanks!

Kind Regards,

Alena Bounkeua
Eurofins|Environment Testing
Phone: +61 2 9900 8414
Mobile: +61 429 365 410
Email: AlenaBounkeua@eurofins.com

From: Colee Quayle [mailto:Colee.Quayle@ghd.com]
Sent: Monday, 29 July 2019 3:49 PM
To: Alena Bounkeua
Subject: RE: Batch 665007 - Additional analysis

Darwin EF 29/7 3:49 PM

668181

EXTERNAL EMAIL*

Hi Alena

Would you please carry out TCLP on the following samples:

Sample ID	Depth	Lab ID	TCLP
BH01	0.2-0.3	S19-Jl13112	Nickel
BH05	0.25-0.35	S19-Jl13114	Nickel
BH26	0.4-0.5	S19-Jl13121	Chromium
BH28	0.35-0.4	S19-Jl13122	Nickel
BH34	0.25-0.4	S19-Jl13127	Chromium

4353

TAT: 48 hrs – Thanks.

Regards

Colee Quayle | A GHD Associate
M. Sci. (Proj Mgt), B. Apps. Sci. (Geo/Env)
Senior Environmental Scientist

Appendix F – Calibration certificate

PID Calibration Certificate

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument PhoCheck Tiger
Serial No. T-114168

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)		
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	PID	✓	10.6 ev
Alarms	Beeper	✓	Low: 50ppm; High: 100ppm; TWA: N/A; STEL: N/A
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		98ppm Isobutylene	NATA	SY137		97.8ppm

Calibrated by: Sarah Lian

Calibration date: 17/06/2019

Next calibration due: 17/07/2019

Appendix G – Summary of laboratory results and quality control samples

TABLE LR1:

SUMMARY OF LABORATORY RESULTS FOR SOIL SAMPLES FOR WASTE CLASSIFICATION

Heavy Metals, TRH, BTEX, PAH, OCP, OPP and asbestos

(All results in mg/kg, unless otherwise stated)

							Site 1 - Cronulla Mall, Cronulla Street																	Site 2 - Monro Park and Beach Park Avenue		
Sample ID	**THRESHOLD CONCENTRATIONS[1]**						BH01	QC3 (Duplicate of BH01)	BH02	BH05	BH12	QC2 (Duplicate of BH12)	BH16	BH17	BH22	BH26	BH26	BH28	BH29	BH29 (Repeat)	BH30	BH32	BH33	BH34	BH01-B	BH03-B	BH03-B
Depth (m)							0.2-0.3	0.2-0.3	0.5-0.6	0.25-0.35	0.5-0.6	0.5-0.6	1.3-1.4	0.25-0.45	0.3-0.4	0.2-0.3	0.4-0.5	0.35-0.4	0.3-0.45	0.3-0.45	0.2-0.3	0.22-0.35	0.2-0.3	0.25-0.4	0.2-0.3	0.1-0.2	0.2-0.3
Date of Sampling	**General Solid Waste**			**Restricted Solid Waste**			04-Jul-19	04-Jul-19	08-Jul-19	04-Jul-19	03-Jul-19	03-Jul-19	04-Jul-19	08-Jul-19	05-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	02-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19
Soil Layer Description (Texture)	**CT1 (mg/kg)**	**SCC1 (mg/kg)**	**TCLP1 (mg/L)**	**CT2 (mg/kg)**	**SCC2 (mg/kg)**	**TCLP2 (mg/L)**	Fill (Gravelly Sand) red/bl volcanic gravels	Fill (Gravelly Sand) red/bl volcanic gravels	Fill (clay)	Fill (Sandy Gravel)	Fill (reworked residual), black gravels, odours noted	Fill (reworked residual), black gravels	Residual (Clay)	Fill (Sand)	Fill (black, gravel)	Fill (Silty Gravel)	Fill (Silty Gravel)	Fill (Gravelly Sand)	Fill (Gravelly Sand)	Fill (Gravelly Sand)	Fill (Gravelly Sand)	Fill (Gravelly Sand)	Fill (Silty Gravel)	Residual	Fill (Gravelly Sand)	Fill (Silty Clay)	Fill (Silty Clay)
HEAVY METALS (TOTAL)																										
Arsenic	100 [3]			400 [5]			2.3	< 2	11	< 2	16	31	14	7.1	8.0	-	22	4.9	9.2	-	5.7	-	-	14	9.3	3.2	-
Cadmium	20 [3]			80 [5]			< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	-	< 0.4	< 0.4	< 0.4	-	< 0.4	-	-	< 0.4	< 0.4	< 0.4	-
Chromium[6]	100 [3]	1,900 [2]		400 [5]	7,600 [4]		31	24	43	29	38	72	23	31	36	-	150	38	39	-	62	-	-	110	29	8.8	-
Copper	N/A			N/A			74	55	< 5	72	7.9	< 5	< 5	20	100	-	28	42	56	-	< 5	-	-	< 5	< 5	13	-
Lead	100 [3]			400 [5]			5.7	< 5	18	< 5	19	31	22	39	11	-	29	14	27	-	15	-	-	23	9.4	57	-
Mercury	4 [3]			16 [5]			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-
Nickel	40 [3]	1,050 [2]		160 [5]	4,200 [4]		130	110	< 5	130	12	< 5	< 5	31	13	-	41	88	32	-	5.4	-	-	5.1	< 5	< 5	-
Zinc	N/A			N/A			68	53	< 5	55	12	110	< 5	54	21	-	21	50	49	-	14	-	-	< 5	< 5	71	-
TCLP HEAVY METALS (mg/L)																										
Chromium			5 [7]			20 [8]	-	-	-	-	-	-	-	-	-	-	< 0.01	-	-	-	-	-	-	< 0.01	-	-	-
Nickel			2 [7]			8 [8]	0.03	-	-	0.04	-	-	-	-	-	-	-	0.02	-	-	-	-	-	-	-	-	-
TOTAL RECOVERABLE HYDROCARBONS																										
TRH C6-C9	650 [2]			2,600 [4]			< 20	< 20	< 20	-	< 20	< 20	< 20	< 20	< 20	-	< 20	< 20	< 20	-	< 20	-	-	< 20	< 20	< 20	-
TRH C10-C14							< 20	< 20	< 20	-	< 20	< 20	< 20	< 20	< 20	-	< 20	< 20	< 20	-	< 20	-	-	< 20	< 20	< 20	-
TRH C15-C28							< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	62	-	< 50	< 50	< 50	-	< 50	-	-	< 50	< 50	130	-
TRH C29-C36							< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	130	-	< 50	< 50	< 50	-	< 50	-	-	< 50	< 50	100	-
TRH C10-36 (Total)	10,000 [2]			40,000 [4]			< 50	< 50	< 50	-	< 50	< 50	< 50	< 50	192	-	< 50	< 50	< 50	-	< 50	-	-	< 50	< 50	230	-
BTEX																										
Benzene	10 [3]			40 [5]			< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-
Toluene	288 [3]			1,152 [5]			< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-
Ethylbenzene	600 [3]			2,400 [5]			< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-
Total Xylene	1,000 [3]			4,000 [5]			< 0.3	< 0.3	< 0.3	-	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	-	< 0.3	< 0.3	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS																										
Benzo(a)pyrene	0.8 [3]	10 [2]		3.2 [5]	23 [4]		< 0.5	< 0.5	< 0.5	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	< 0.5	1.1	0.9	< 0.5	-	-	< 0.5	< 0.5	< 0.5	-
Total PAH	200 [2]			800 [4]			< 0.5	< 0.5	< 0.5	-	< 0.5	< 0.5	< 0.5	1.2	< 0.5	-	< 0.5	< 0.5	9.6	8.7	< 0.5	-	-	< 0.5	< 0.5	2.9	-
POLYCYCLIC AROMATIC HYDROCARBONS TCLP (mg/L)																										
Benzo(a)pyrene			0.04 [7]			0.16 [8]	-	-	-	-	-	-	-	-	-	-	-	-	< 0.001	-	-	-	-	-	-	-	-
Total PAH							-	-	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-	-	-
ORGANOCHLORINE PESTICIDES	<50 [5]			<50 [5]			< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	< 0.05	-
ORGANOPHOSPHORUS PESTICIDES	<50 [5]			<50 [5]			< 0.2	< 0.2	< 0.2	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	< 0.2	< 0.2	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2	-
ASBESTOS							ND	-	-	-	ND	-	-	-	-	ND	-	ND	ND		ND	ND	ND	-	-	ND	ND

NOTES:

Bold	Concentration exceed the respective General Solid Waste Criteria
Bold	Concentration exceed the respective Restricted Solid Waste Criteria
Bold	Contains asbestos

1 Based on NSW EPA (2014) Waste Classification Guidelines - Part 1 Classifying Waste
2 Specific Contaminant Concentration (SCC1) for General Solid Waste
3 Contamination Threshold Value (CT1) for General Solid Waste
4 Specific Contaminant Concentration (SCC2) for Restricted Solid Waste
5 Contamination Threshold Value (CT2) for Restricted Solid Waste
6 Based on Chromium VI
7 Leachable Concentration (TCLP1) for General Solid Waste
8 Leachable Concentration (TCLP2) for Restricted Solid Waste
LOR Laboratory reporting limit
ND Not Detected

Table QAQC1: Relative Percentage Difference for Soil Samples

Batch		665007			665007		
		Primary Sample Conc. (mg/kg)	**Intra-laboratory duplicate Sample Conc. (mg/Kg)**	**RPD (%)**	**Primary Sample Conc. (mg/kg)**	**Intra-laboratory duplicate Sample Conc. (mg/Kg)**	**RPD (%)**
Sample No.	Laboratory Reporting Limits (mg/kg)	BH01	QC3		BH12	QC2	
Depth (m)	Eurofins	0.2-0.3	0.2-0.3		0.5-0.6	0.5-0.6	
HEAVY METALS							
Arsenic	2	2.3	< 2	NC	16	31	64
Cadmium	0.4	< 0.4	< 0.4	ND	< 0.4	< 0.4	ND
Chromium	5	31	24	25	38	72	62
Copper	5	74	55	29	7.9	< 5	NC
Lead	5	5.7	< 5	NC	19	31	48
Mercury	0.1	< 0.1	< 0.1	ND	< 0.1	< 0.1	ND
Nickel	5	130	110	17	12	< 5	NC
Zinc	5	68	53	25	12	110	161
TOTAL RECOVERABLE HYDROCARBONS							
TRH C6-C9	20	< 20	< 20	ND	< 20	< 20	ND
TRH C10-C14	20	< 20	< 20	ND	< 20	< 20	ND
TRH C15-C28	50	< 50	< 50	ND	< 50	< 50	ND
TRH C29-C36	50	< 50	< 50	NC	< 50	< 50	NC
TRH C10-36 (Total)	100	< 50	< 50	NC	< 50	< 50	NC
BTEX							
Benzene	0.1	< 0.1	< 0.1	ND	< 0.1	< 0.1	ND
Toluene	0.1	< 0.1	< 0.1	ND	< 0.1	< 0.1	ND
Ethylbenzene	0.1	< 0.1	< 0.1	ND	< 0.1	< 0.1	ND
Total Xylene	0.3	< 0.3	< 0.3	NC	< 0.3	< 0.3	NC
POLYCYCLIC AROMATIC HYDROCARBONS							
Benzo(a)pyrene	0.5	< 0.5	< 0.5	ND	< 0.5	< 0.5	ND
Total PAH	0.5	< 0.5	< 0.5	ND	< 0.5	< 0.5	ND
ORGANOCHLORINE PESTICIDES	Various	< LOR	< LOR	ND	< LOR	< LOR	ND
ORGANOPHOSPHORUS PESTICIDES	Various	< LOR	< LOR	ND	< LOR	< LOR	ND

Notes:

Bold RPD exceeds control limit of 30% for soil if:
- Result < 10 times LOR then No Limit
- Result > 10 times LOR then control limit of 30%

RPD Relative Percentage Difference
NA Not Applicable
ND Not Detected
NC Contaminant is not detected in primary sample but is detected in duplicate sample, or vice versa
LOR Limit of Reporting
- No result or guideline

TABLE QAQC2
SUMMARY OF FIELD CONTROL SAMPLES LABORATORY RESULTS

Sample ID	WB01	Trip Spike	Trip Blank
Date of Sampling	08-Jul-19	01-Jul-19	01-Jul-19
QAQC Type	Rinsate - Hand Auger	Trip Spike	Trip Blank
Batch	665007	665007	665007
Unit	mg/L	mg/kg	mg/kg
Matrix	Water	Soil	Soil
HEAVY METALS (TOTAL)			
Arsenic	< 0.001	-	-
Cadmium	< 0.0002	-	-
Chromium	< 0.001	-	-
Copper	< 0.001	-	-
Lead	< 0.001	-	-
Mercury	< 0.0001	-	-
Nickel	< 0.001	-	-
Zinc	**0.006**	-	-
TOTAL PETROLEUM HYDROCARBONS			
F1 (C6-C10)	< 0.02	-	< 20
F1 (C6-C10 less BTEX)	< 0.02	-	-
F2 (>C10-C16)	< 0.05	-	-
F2 (>C10-C16 less naphthalene)	< 0.05	-	-
F3 (>C16-C34)	< 0.1	-	-
F4 (>C34-C40)	< 0.1	-	-
BTEX			
Benzene	< 0.001	< 0.1*	< 0.1
Toluene	< 0.001	< 0.1*	< 0.1
Ethylbenzene	< 0.001	< 0.1*	< 0.1
Total Xylene	< 0.003	< 0.3*	< 0.3
POLYCYCLIC AROMATIC HYDROCARBONS	< LOR	-	-

Notes:

Bold	Concentration exceeds control limit
-	Not Analysed
ND	Not Detected

QAQC Control Ordinates

Rinsate Blank	Recovery concentrations to be ND
Trip Spike	Recovery concentrations to between 60% and 110%
Trip Blank	Recovery concentrations to be ND
*	The laboratory indicated that the sample was inadvertently spiked to a lower concentration

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