FOUNDATION EARTH SCIENCES

ACID SULPHATE SOIL ASSESSMENT (ASSA)

Property Address
921 Punchbowl Road, Punchbowl NSW

Prepared for
Westwood Pty Ltd

Date

April 2022

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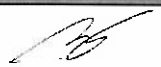
Prepared		Emerson You	9/3/2022
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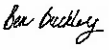
Authorised		Benjamin Buckley	01/04/2022

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ABBREVIATIONS

AASS	Actual Acid Sulphate Soils
AHD	Above Height Datum
ANC	Acid Neutralising Capacity
ASS	Acid Sulphate Soils
ASSMAC	Acid Sulphate Soils Management Advisory Committee
ASSMP	Acid Sulphate Soils Management Plan
BGL	Below Ground Level
DNR&M	Department of Natural resources and Mines
DO	Dissolved Oxygen
EC	Electric Conductivity
EIL	Ecological Investigation Level
EPA	Environmental Protection Authority
HIL	Health-based Investigation Level
LOR	Limit of reporting
NV	Neutralising Value
PASS	Potential Acid Sulphate Soils
POCAS	Peroxide Oxidation Combined Acidity and Sulphate
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
QASSIT	Queensland Acid Sulphate Soils Investigation Team
SPOCAS	Suspended Peroxide Oxidation Combined Acidity and Sulphate
SPOS	Peroxide Oxidisable
TAA	Total Actual Acidity
TCLP	Toxicity Characteristic Leaching Procedure
TPA	Total Potential Acidity
TSA	Total Sulfidic Acidity
TSS	Total Suspended Solids
VENM	Virgin Excavated Natural Material

1.0 INTRODUCTION

Foundation Earth Sciences (FES) was appointed by Westwood Pty Ltd to prepare an Acid Sulphate Soil Assessment (ASSA) for the property located 921 Punchbowl Road, Punchbowl NSW, referred to as 'the site'. The site is located in the Canterbury-Bankstown Council municipality.

Refer to **Figure 1** – Site Locality and **Figure 2** – Site Features and Borehole Location Plan.

The site is currently occupied by one registered club consisting of car park area, driveways and grassed area. The site is proposed to be redeveloped into a mixed use development including new registered club in the southern portion of the site, retail tenancies on the ground floor, new internal road, pocket park, landscape areas, five blocks of residential units in the north and four levels of residential units above the ground floor registered club.

An ASS assessment is required as disturbances to Potential Acid Sulphate Soil (PASS) or Actual Acid Sulphate Soils, which may occur during construction and excavation works, can result in the formation of acid. The acid, once formed, could then damage infrastructure or harm ecological systems. The results of the field parameters from this assessment should only be used as a preliminary study to determine if further investigations are required. If results exceed the criteria, then further work, including an ASS Management Plan, may be required.

2.0 OBJECTIVES

The purpose of the ASS Assessment is to determine the presence or absence of ASS at the site. In the absence of ASS, it is essential to assess for the presence of Potential

Acid Sulphate Soils (PASS). If the results do not meet criteria an Acid Sulphate Soil Management Plan will be required.

This assessment reviewed the presence of ASS / PASS in the portion of the site that may require excavation.

3.0 SCOPE OF WORKS

The scope of works of the ASS Assessment included:

- Review of previous environmental assessments;
- Site walkover;
- Targeted soil boring, sampling and testing for ASS at the site;
- Groundwater sampling;
- Interpretation of field test analysis and findings;
- NATA Accredited laboratory testing; and
- Reporting in accordance with relevant assessment guidelines / regulations

4.0 ASSESSMENT CRITERIA

When assessing ASS at sites in NSW Acid Sulphate Soils Management Advisory Committee (ASSMAC) (1998) Acid Sulphate Soils Assessment Guidelines apply.

A review of NSW Department of Land & Water Conservation (DLWC) Acid Sulphate Soil Risk Maps (Edition Two, December 1997, Scale 1:250,000) was undertaken. The risk maps do not detail the severity of the ASS, but only provide an indication that they may be present. The decision to classify certain areas as ASS is based on a number of geomorphic conditions and site criteria. The following points are used to

determine if ASS is likely to exist (extracted from ASSMAC (1998) Acid Sulphate Soils Assessment Guidelines):

- Sediments of recent geological age (Holocene) ~ 10 000 yr.
- Soil horizons less than 5m AHD (Australian Height Datum).
- Marine or estuarine sediments and tidal lakes.
- In coastal wetlands or back swamp areas; waterlogged or scalded areas; interdune swales or coastal sand dunes.
- In areas where the dominant vegetation is mangroves, reeds, rushes and other swamp tolerant and marine vegetation.
- In areas identified in geological descriptions or in maps bearing sulphide minerals, coal deposits or former marine shales/sediments.
- Deeper older estuarine sediments >10m below the ground surface, Holocene or Pleistocene age.

Based on the above information in order to determine whether there is a potential for acid sulphate soils to be present within a site, reference was made to the NSW Department of Land & Water Conservation (DLWC) Acid Sulphate Soil Risk Maps (Edition Two, December 1997, Scale 1:250,000). A review of the "Botany Bay" map indicated that a portion of the site is located in "Disturbed Terrain". A review of the Bankstown LEP 2015 indicated the site is located in the area of "Class 3".

The following soil indicators are used to determine if ASS is actually present on a site:

- field pH ≤4 in soils
- presence of shell
- any jarosite horizons or substantial iron oxide mottling in auger holes, in surface encrustations or in any material dredged or excavated and left exposed. Jarosite is not always found, however, in actual acid sulphate soils.

The following soil indicators are used to determine if PASS is actually present on a site:

- waterlogged soils, unripe muds (soft, buttery, blue grey or dark greenish grey) or estuarine silty sands or sands (mid to dark grey) or bottom sediments of estuaries or tidal lakes (dark grey to black)
- presence of shell
- soil pH usually neutral but may be acid -positive Peroxide Test (see section 7.2 Field pH results).

5.0 SITE INFORMATION

5.1 Site Identification

The site is identified as follows:

Table 1: Site Identification Review

Site Identifier	Site Details	
Site Location	921 Punchbowl Road, Punchbowl NSW	
Lot/DP	Lot A in DP378634; Lot D in DP 382627; Lot 6 in DP5245 Lot 14&15 in DP132440; Lot 1 in DP236825	
Site Coordinates #	SW corner: Latitude: -33.922595, Longitude: 151.201726	
Parish	Botany	
County	Cumberland	
Site Area	Approximate 1.790 hectares	
Local Government Area (LGA)	Canterbury-Bankstown	
Zoning##	B1 – Neighbourhood Centre R2 - Low Density Residential SP2 - Infrastructure	
Surrounding Land Uses	*North*	Residential
	South	Road then commercial
	East	Road then Service Station
	West	Commercial Storage

Notes: # Six Maps
refer to NSW Planning Portal
https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address
//www.planningportal.nsw.gov.au/find-a-property

5.2 Topography

The topography viewed on NSW ESPADE indicated the following for the Birrong Fluvial Landscape. Level to gently undulating alluvial floodplains with local relief <5m and slope gradients <3%. Broad concave valleys. Most drainage lines have been converted to lined concrete and brick channels.

Based on the site inspection it was determined that the site area had a slight slope of 2^0 to the north west.

5.3 Local Geology & Surface Waters

The borders the following two geological profiles:

- The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Quaternary Age soils consisting of silty to peaty quartz sand, silt and clay. Ferruginous and humic cementation in places with common shell layers.
- The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Triassic Age Shale of the Wianamatta Group, comprising black to dark grey shale and laminite.

The nearest downgradient watercourse is a stormwater channel that is located beneath the site running through the central portion of the site in east west direction and along the western boundary in a north south direction. The stormwater channels appear to drain into Salt Pan Creek located approximately 531m south west of the site, which eventually discharges into the Georges River.

5.4 Proposed Development

The site is currently occupied by one registered club consisting of car park area, driveways and grassed area. The site is proposed to be redeveloped into a mixed use development including new registered club in the southern portion of the site, retail tenancies on the ground floor, new internal road, pocket park, landscape areas, five blocks of residential units in the north and four levels of residential units above the ground floor registered club.

Refer to **Appendix C** - Proposed Development Plans.

6.0 SOIL BORING AND SAMPLING

A soil sampling and analysis program was used to consolidate the nature and degree of Acid Sulphate Soils present in the surface and subsurface geology. Samples were collected from six boreholes within the site. The borehole locations are presented in **Figure 2** – Site Features and Borehole Location Plan.

Field analysis was performed on the collected samples for pH_f and pH_{fox} in accordance with the required sampling techniques of the *ASSMAC (1998) Assessment Guidelines* – ASSMAC (1998) Field pH and peroxide test protocol).

6.1 Quality Assurance/Quality Control (QA/QC)

Standard QA/QC procedures were followed. The decontamination of sampling equipment and the hand auger was achieved by washing with phosphate-free detergent and tap water, followed by final rinsing with distilled water. This was conducted after the collection of samples.

Standard sampling and analysing procedures are in accordance with and set out in the *NSW ASSMAC (1998) "Acid Sulphate Soils Assessment Guidelines"*.

7.0 FIELD RESULTS

7.1 Soil Observations

Based on information from all boreholes, the surface and sub-surface profile across the site is generalised as follows:

- Fill: Silty Clay, Clayey Silt;
- Natural: Silty CLAY, Clayey SILT, Peaty CLAY
- Bedrock: SHALE;

No unusual colouring or shells were detected in the soil suggesting the presence of pyrite (iron sulphide) or jarosite was unlikely.

Refer to **Appendix B** – Borehole Logs.

7.2 Field pH Results

The results of the field pH tests are presented in the table below:

Table 2: Summary of field analysis results

Sample	Depth (m)	pH		pH		Change in pH ($pH_f - pH_{fox}$)	Effervescence Reaction Rate
		H_2O	Soil pH_f	H_2O_2	Soil pH_{fox}		
AS1	0.2	-	7.8	-	6.2	1.6	Low reaction
AS1	0.5	-	7.6	-	6.1	1.5	Low reaction
AS1	1	-	8.4	-	6.4	2	Low reaction
AS1	1.5	-	8.5	-	6.2	2.3	Low reaction
AS1	2	-	8.7	-	6.2	2.5	Low reaction
AS1	2.5	-	8.3	-	6	2.3	Low reaction
AS1	3	-	8.2	-	8.7	-0.5	Volcanic reaction
AS1	3.5	-	8.4	-	8.9	-0.5	Volcanic reaction
AS1	4	-	8.4	-	8.8	-0.4	Volcanic reaction
AS1	4.3	-	8.4	-	6.2	2.2	Low reaction
AS2	0.2	-	8.1	-	8	0.1	Volcanic reaction
AS2	0.5	-	7.9	-	7.7	0.2	Volcanic reaction
AS2	1	-	8.1	-	8.3	-0.2	Volcanic reaction
AS2	1.5	-	8.1	-	8	0.1	Volcanic reaction
AS2	2	-	7.4	-	8	-0.6	Volcanic reaction
AS2	2.5	-	8	-	8.7	-0.7	Volcanic reaction
AS2	3	-	8.1	-	8.7	-0.6	Volcanic reaction
AS2	3.5	-	8.6	-	9	-0.4	Volcanic reaction
AS2	4	-	8.6	-	8.7	-0.1	Volcanic reaction
AS2	4.5	-	8.2	-	6.4	1.8	High reaction
AS3	0.2	-	8.5	-	6.1	2.4	Medium reaction
AS3	0.5	-	9	-	7.8	1.2	Volcanic reaction
AS3	1	-	7.2	-	3.9	3.3	Volcanic reaction
AS3	1.5	-	7.4	-	6.3	1.1	Volcanic reaction
AS3	2	-	7.5	-	7.3	0.2	Volcanic reaction
AS3	2.5	-	7.8	-	7.8	0	Volcanic reaction
AS3	3	-	8	-	8.1	-0.1	Volcanic reaction
AS3	3.5	-	8.1	-	8.6	-0.5	Volcanic reaction
AS3	4	-	7.4	-	6.5	0.9	Volcanic reaction
AS4	0.2	-	5.5	-	3.7	1.8	Medium reaction

AS4	0.5	-	4.9	-	3.7	1.2	Low reaction
AS4	1	-	7	-	7.9	-0.9	Volcanic reaction
AS4	1.5	-	7.5	-	6.1	1.4	Volcanic reaction
AS4	2	-	8.2	-	8.4	-0.2	Volcanic reaction
AS4	2.5	-	8.1	-	9.2	-1.1	Volcanic reaction
AS4	3	-	7.9	-	8.5	-0.6	Volcanic reaction
AS4	3.5	-	7.7	-	8.3	-0.6	Volcanic reaction
AS4	4	-	8	-	8.1	-0.1	Volcanic reaction
AS5	0.2	-	5.4	-	4.4	1	Low reaction
AS5	0.5	-	5.9	-	4.3	1.6	Low reaction
AS5	1	-	7.6	-	7.9	-0.3	Volcanic reaction
AS5	1.5	-	7.5	-	6.4	1.1	Low reaction
AS5	2	-	7.8	-	8.2	-0.4	Medium reaction
AS5	2.5	-	7.8	-	8.2	-0.4	Volcanic reaction
AS5	3	-	7.6	-	7.4	0.2	Medium reaction
AS5	3.5	-	7.4	-	7.4	0	Medium reaction
AS6	0.1	-	8.2	-	6	2.2	Medium reaction
AS6	0.5	-	7.2	-	4.2	3	Medium reaction
AS6	1	-	7.4	-	5.2	2.2	Medium reaction
AS6	1.5	-	7	-	6.6	0.4	Volcanic reaction
AS6	2	-	7.9	-	8.7	-0.8	Volcanic reaction
AS6	2.5	-	7.9	-	8.4	-0.5	High reaction
AS6	3	-	7.9	-	8.7	-0.8	Volcanic reaction
AS6	3.5	-	8.2	-	8.8	-0.6	High reaction
AS6	4	-	8	-	6.6	1.4	Medium reaction
AS6	4.5	-	8.2	-	8.3	-0.1	Volcanic reaction

Notes:

- pH_f refers to pH field (soil and distilled H_2O).
- pH_{fox} refers to pH field oxidised (soil and peroxide).
- Change in pH refers to pH field minus pH field oxidised.
- **Bold and highlighted** refers to detections.

To investigate the pH of the soils (pH_f) water was added to the soil samples. pH_f of the investigated samples was above 4. This indicates the soils from which the samples were collected *did not* contain actual ASS.

To investigate the presence of PASS, 30% peroxide (H_2O_2) was added to soil samples and the resulting pH of the mixture was measured (field test protocols are presented in Appendix D of the ASSMAC (1998) Field pH and peroxide test protocol). The pH dropped by at least two units and the reaction rating was high to volcanic in a number of samples as per Table 2. Based on the field analysis further laboratory investigation was warranted.

7.3 Groundwater Results

In coastal areas where there are acid sulphate soils and shallow groundwater, altering the water table (as a direct or indirect outcome of the proposed activity) can result in oxidation of the sulfidic materials and acidification of both surface and groundwater.

The analysis of groundwater or drain water for the soluble chloride: soluble sulphate (CL^-: SO_4^{2-}) ratio can indicate that sulfidic material in the vicinity of the site is being, or has been, oxidised. In order to undertake this test, water samples should be submitted for laboratory analysis. The locations of each borehole or sampling site should be clearly marked on a map with grid references for each sample location.

Where the analysis indicates that there is an elevated level of sulphate ions relative to the chloride ions, these results provide a good indication of the presence of acid sulphate soils in the landscape. A CL^-: SO_4^{2-} ratio of less than four (CL^-: SO_4^{2-}<4) and certainly a ratio less than two, is a strong indication of an extra source of sulphate from previous sulphide oxidation (Mulvey 1993).

However, the CL^-: SO_4^{2-} ratio becomes less predictive in freshwater or as brackish water approaches that of freshwater. And with groundwater, as the layer supplying most of the water within a hole will influence the final analysis outcomes, properly installed "nested" piezometers, accessing particular strata or horizon/ depth

intervals, will assist in overcoming sampling limitations and improve the reliability of results (Mulvey 1997).

The ANZG 2018 Australian and New Zealand Guidelines for Fresh and Marine Water Quality recommend Water Quality Criteria for protection of aquatic ecosystems and it should be met for the discharge of water into the environment.

Table 3: Summary of Groundwater Analysis

	pH	EC (uS/cm)	TDS (mg/L)	Soluble Chloride (mg/L)	Soluble Sulfate (mg/L)	(CL^-: SO_4^{2-})
BH1/GW1	6.7	17,000	18,000	5,400	490	11
ANZG Fresh Water	*6.5-8.0*	125-2200[1]	*0-1500*	-	-	-

1 – ANZG 2018 Default Trigger values for lowland rivers in south eastern Australia

2 – Yellow highlight indicates exceedance of adopted criteria

Based on the groundwater testing results provided in Table 3, the groundwater **does NOT have** an indication of an extra source of sulphate from previous sulfide oxidation due to the ratio of CL^-: SO_4^{2-}>4 in BH1/GW1. However, the ratio is less predictive in freshwater or brackish water. The recorded EC results are indicative of brackish water.

The PH is within the ANZG 2018 criteria.; the EC & TDS values are over the ANZG 2018 criteria.

8.0 SUSPENDED PEROXIDE OXIDATION COMBINED ACIDITY & SULPHATE (SPOCAS) RESULTS

Following the field tests undertaken by FES (administered Envirolab), fifteen (15) soil samples from FES (collected 17th February, 2022) were submitted to the NATA certified laboratory of Envirolab for the SPOCAS test.

The soils were assessed against the guidelines set out in Acid Sulphate Soils Management Advisory Committee (ASSMAC) (1998) *Acid Sulphate Soils Assessment Guidelines*. The action criteria selected was based on excavation of more than 1,000 tonnes of soils disturbed within the site. The results are assessed against the available criteria, those being:

Coarse to Fine Texture Soils

- Sulphur Trail (S_{pos}) = 0.03%
- Acid Trail (TPA) = 18 mol H^+/tonne

The laboratory analysis results are presented in the following table:

Table 4: Laboratory Results - SPOCAS

Sample	Profile	Depth (m)	S-POS (%) (sulphur trail)	TAA (mol H^+/ tonne)	TPA (mol H^+/ tonne) (acid trail)	TSA (mol H^+/tonne) (acid trail)	Lime Calculation (kg $CaCO_3$/t includes 1.5 safety factor).
AS1	Silty Clay	1	<0.005	<5	<5	<5	<0.75
AS1	Silty CLAY	2	<0.005	<5	<5	<5	<0.75
AS1	Silty CLAY	3	<0.005	<5	<5	<5	<0.75
AS3	Peaty CLAY	1	0.01	<5	<5	<5	0.92
AS3	Silty CLAY	2	0.006	<5	<5	<5	<0.75
AS3	Silty CLAY	3	<0.005	<5	<5	<5	<0.75
AS4	Silty CLAY	0.5	<0.005	22	16	<5	1.8
AS4	Silty CLAY	1.5	<0.005	<5	<5	<5	<0.75
AS4	Silty CLAY	3	<0.005	<5	<5	<5	<0.75
AS5	Silty Clay	0.2	<0.005	10	10	<5	0.83
AS5	Silty CLAY	1	<0.005	<5	<5	<5	<0.75
AS5	Silty CLAY	2.5	<0.005	<5	<5	<5	<0.75
AS6	Clayey SILT	1	<0.005	<5	<5	<5	<0.75
AS6	Clayey SILT	2	<0.005	<5	<5	<5	<0.75
AS6	Clayey SILT	4	<0.005	<5	<5	<5	<0.75
ASSMAC Guidelines Fine to Coarse Texture		-	***0.03***	-	***18***	***18***	-

Notes:

- Guidelines follow the ASSMAC "Acid Sulphate Soils Assessment Guidelines 1998".
- Fine Texture Criteria based upon clay content of > or equal to 40%
- Medium Texture Criteria based upon clay content of 5-40%
- Criteria based upon more than 1000 tonnes disturbed
- **Bold values exceed ASSMAC guidelines**

When comparing the results summarised above in Table 4 to Table 4.4 (ASSMAC) for fine to coarse texture soils it can be determined that the percentage of oxidisable Sulphur (SPOS) & acid trail (TPA/TSA) were below the action criteria.

9.0 CHROMIUM REDUCIBLE SULPHUR RESULTS

Chromium Reducible sulphur method calculates the potential acidity from analysis of sulphide content. This method does not include sulphur from organics and sulphates (e.g. gypsum) and detects as low sulphide content and is therefore suitable to determine potential interferences caused by naturally occurring acidity within the soils. The laboratory results are presented in the following table:

Table 5: Laboratory Results – Chromium Reducible Sulphur

Sample	Depth	Chromium Reducible Sulphur (%)
Sampling dated 17th February 2022		
AS1	1	0.006
AS1	2	<0.005
AS1	3	<0.005
AS3	1	0.007
AS3	2	<0.005
AS3	3	<0.005
AS4	0.5	0.007
AS4	1.5	0.005
AS4	3	<0.005
AS5	0.2	<0.005
AS5	1	0.009
AS5	2.5	0.007
AS6	1	<0.005
AS6	2	<0.005
AS6	4	<0.005
SPOS Action Criteria		**0.03**

The results from the Table 5 indicated the following:

- A lack of oxidisable sulphur compounds detected within the soil at all borehole locations.

10.0 DISCUSSION AND CONCLUSION

The assessment of acid sulphate material can be quite complex and can have a lot of interferences associated with the test methods and soil matrix. The following points outline the evidence to support the site is ***not impacted:***

- Analysis using the Chromium reducible suite indicated that oxidisable sulphur compounds were either not detected and/or below the relevant action criteria.
- Analysis via the SPOCAS test indicated the percentage of oxidisable Sulphur (SPOS) & acid trails (TPA/TSA) were below the relevant action criteria;
- The risk maps indicate portion of the site located in Disturb Terrain with the impacted depths ranging from 4m BGL, however, the bedrock starts approximately from 3.3 to 4m BGL.
- The site is located at an elevation of approximately 7-8m AHD according to google earth. Acid Sulphate Soils occur in soil horizons *less than 5m AHD* (Australian Height Datum).

Therefore, it has been determined that the site **is NOT impacted by acid sulphate soils** in the vicinity of the borehole locations designated as **AS1 to AS6** to a maximum depth of **5.0m BGL**. Furthermore, an Acid Sulphate Soil Management Plan (ASSMP) is not required for the site as it is not impacted with AASS/PASS to the maximum depth of analysis.

We would be pleased to provide further information or discuss any aspect of our report. Please do not hesitate to contact the undersigned should you have any queries.

REFERENCES

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018).
- Australian Government Department of Agriculture and Water Resources (2018), National Acid Sulfate Soils Guidance – National Acid Sulfate Soil Sampling and Identification Methods Manual, June 2018.
- Stone Y, Ahern C.R and Blunden B (1998), 'Acid Sulphate Soil Manual 1998', Acid Sulphate Soils Management Advisory Committee, Wollongbar, NSW, Australia.

LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although subsurface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the report is used after a protracted delay. There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site.

There is no investigation that is thorough enough to preclude the presence of material that presently or in the future, may be considered hazardous at the site. Since regulatory criteria are constantly changing, concentrations of contaminants presently considered low may, in the future, fall under different regulatory standards that require remediation.

Opinions are judgements that are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Although the information provided by an Acid Sulphate Soils Assessment and Management Plan can reduce exposure to risks, no assessment, however diligently carried out, can eliminate them. It must be noted that these findings are professional findings and have limitations. Even a rigorous professional assessment may fail to detect all ASS and/or PASS on a site. Sulphates may be present in areas that were not surveyed or sampled.

FIGURE 1: SITE LOCATION

Key Site Location	FOUNDATION EARTH SCIENCES	**DRAWN** EY	**SITE LOCATION**
		FIGURE 1	Westwood Pty Ltd
		Job # E2232-3	921 Punchbowl Road, Punchbowl NSW

FIGURE 2: SITE FEATURES AND BOREHOLE LOCATION PLAN

Feature No	Details
a	Club / Commercial Building
b	Carpark
c	Power Transmission Tower
d	Loading Dock

Key			
Site Location		DRAWN EY	Site Features & Borehole Locations Plan
Benviron Group 2016		Figure 2	Westwood Pty Ltd
FES Acid Sulphate Soil Locations		Job # E2232-3	921 Punchbowl Road, Punchbowl NSW

FOUNDATION EARTH SCIENCES

APPENDIX A: NATA ACCREDITED LABORATORY CERTIFICATES

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 289262

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk
Address	PO Box 4405, East Gosford, NSW, 2250

Sample Details	
Your Reference	**E2232-3, Punchbowl**
Number of Samples	56 Soil
Date samples received	18/02/2022
Date completed instructions received	18/02/2022

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	25/02/2022
Date of Issue	25/02/2022

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

Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

sPOCAS field test						
Our Reference	UNITS	289262-1	289262-2	289262-3	289262-4	289262-5
Your Reference		AS1	AS1	AS1	AS1	AS1
Depth		0.2	0.5	1	1.5	2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.8	7.6	8.4	8.5	8.7
pH_{FOX} (field peroxide test)*	pH Units	6.2	6.1	6.4	6.2	6.2
Reaction Rate*	-	Low reaction	Low reaction	Low reaction	Low reaction	Low reaction

sPOCAS field test						
Our Reference	UNITS	289262-6	289262-7	289262-8	289262-9	289262-10
Your Reference		AS1	AS1	AS1	AS1	AS1
Depth		2.5	3	3.5	4	4.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	8.3	8.2	8.4	8.4	8.4
pH_{FOX} (field peroxide test)*	pH Units	6.0	8.7	8.9	8.8	6.2
Reaction Rate*	-	Low reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	Low reaction

sPOCAS field test						
Our Reference	UNITS	289262-11	289262-12	289262-13	289262-14	289262-15
Your Reference		AS2	AS2	AS2	AS2	AS2
Depth		0.2	0.5	1	1.5	2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	8.1	7.9	8.1	8.1	7.4
pH_{FOX} (field peroxide test)*	pH Units	8.0	7.7	8.3	8.0	8.0
Reaction Rate*	-	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction

sPOCAS field test						
Our Reference	UNITS	289262-16	289262-17	289262-18	289262-19	289262-20
Your Reference		AS2	AS2	AS2	AS2	AS2
Depth		2.5	3	3.5	4	4.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	8.0	8.1	8.6	8.6	8.2
pH_{Fox} (field peroxide test)*	pH Units	8.7	8.7	9.0	8.7	6.4
Reaction Rate*	-	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	High reaction

sPOCAS field test						
Our Reference	UNITS	289262-21	289262-22	289262-23	289262-24	289262-25
Your Reference		AS3	AS3	AS3	AS3	AS3
Depth		0.2	0.5	1	1.5	2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	8.5	9.0	7.2	7.4	7.5
pH_{Fox} (field peroxide test)*	pH Units	6.1	7.8	3.9	6.3	7.3
Reaction Rate*	-	Medium reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction

sPOCAS field test						
Our Reference	UNITS	289262-26	289262-27	289262-28	289262-29	289262-30
Your Reference		AS3	AS3	AS3	AS3	AS4
Depth		2.5	3	3.5	4	0.2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.8	8.0	8.1	7.4	5.5
pH_{Fox} (field peroxide test)*	pH Units	7.8	8.1	8.6	6.5	3.7
Reaction Rate*	-	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	Medium reaction

sPOCAS field test						
Our Reference	UNITS	289262-31	289262-32	289262-33	289262-34	289262-35
Your Reference		AS4	AS4	AS4	AS4	AS4
Depth		0.5	1	1.5	2	2.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	4.9	7.0	7.5	8.2	8.1
pH_{FOX} (field peroxide test)*	pH Units	3.7	7.9	6.1	8.4	9.2
Reaction Rate*	-	Low reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction	Volcanic reaction

sPOCAS field test						
Our Reference	UNITS	289262-36	289262-37	289262-38	289262-39	289262-40
Your Reference		AS4	AS4	AS4	AS5	AS5
Depth		3	3.5	4	0.2	0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.9	7.7	8.0	5.4	5.9
pH_{FOX} (field peroxide test)*	pH Units	8.5	8.3	8.1	4.4	4.3
Reaction Rate*	-	Volcanic reaction	Volcanic reaction	Volcanic reaction	Low reaction	Low reaction

sPOCAS field test						
Our Reference	UNITS	289262-41	289262-42	289262-43	289262-44	289262-45
Your Reference		AS5	AS5	AS5	AS5	AS5
Depth		1	1.5	2	2.5	3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.6	7.5	7.8	7.8	7.6
pH_{FOX} (field peroxide test)*	pH Units	7.9	6.4	8.2	8.2	7.4
Reaction Rate*	-	Volcanic reaction	Low reaction	Medium reaction	Volcanic reaction	Medium reaction

sPOCAS field test						
Our Reference	UNITS	289262-46	289262-47	289262-48	289262-49	289262-50
Your Reference		AS5	AS6	AS6	AS6	AS6
Depth		3.5	0.1	0.5	1	1.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.4	8.2	7.2	7.4	7.0
pH_{Fox} (field peroxide test)*	pH Units	7.4	6.0	4.2	5.2	6.6
Reaction Rate*	-	Medium reaction	Medium reaction	Medium reaction	Medium reaction	Volcanic reaction

sPOCAS field test						
Our Reference	UNITS	289262-51	289262-52	289262-53	289262-54	289262-55
Your Reference		AS6	AS6	AS6	AS6	AS6
Depth		2	2.5	3	3.5	4
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
pH_F (field pH test)*	pH Units	7.9	7.9	7.9	8.2	8.0
pH_{Fox} (field peroxide test)*	pH Units	8.7	8.4	8.7	8.8	6.6
Reaction Rate*	-	Volcanic reaction	High reaction	Volcanic reaction	High reaction	Medium reaction

sPOCAS field test		
Our Reference	UNITS	289262-56
Your Reference		AS6
Depth		4.5
Type of sample		Soil
Date Sampled		17/02/2022
Date prepared	-	21/02/2022
Date analysed	-	21/02/2022
pH_F (field pH test)*	pH Units	8.2
pH_{Fox} (field peroxide test)*	pH Units	8.3
Reaction Rate*	-	Volcanic reaction

Method ID	Methodology Summary
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. Based on section H, Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			21/02/2022	1	21/02/2022	21/02/2022		21/02/2022	
Date analysed	-			21/02/2022	1	21/02/2022	21/02/2022		21/02/2022	
pH_F (field pH test)*	pH Units		Inorg-063		1	7.8	7.6	3	102	
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		1	6.2	6.2	0	102	

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-				11	21/02/2022	21/02/2022		21/02/2022	
Date analysed	-				11	21/02/2022	21/02/2022		21/02/2022	
pH_F (field pH test)*	pH Units		Inorg-063		11	8.1	8.0	1	101	
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		11	8.0	7.9	1	101	

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-				21	21/02/2022	21/02/2022			
Date analysed	-				21	21/02/2022	21/02/2022			
pH_F (field pH test)*	pH Units		Inorg-063		21	8.5	8.4	1		
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		21	6.1	6.1	0		

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-				31	21/02/2022	21/02/2022			
Date analysed	-				31	21/02/2022	21/02/2022			
pH_F (field pH test)*	pH Units		Inorg-063		31	4.9	4.8	2		
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		31	3.7	3.6	3		

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-				41	21/02/2022	21/02/2022			
Date analysed	-				41	21/02/2022	21/02/2022			
pH_F (field pH test)*	pH Units		Inorg-063		41	7.6	7.4	3		
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		41	7.9	7.8	1		

QUALITY CONTROL: sPOCAS field test					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-				51	21/02/2022	21/02/2022			
Date analysed	-				51	21/02/2022	21/02/2022			
pH_F (field pH test)*	pH Units		Inorg-063		51	7.9	7.9	0		
pH_{FOX} (field peroxide test)*	pH Units		Inorg-063		51	8.7	8.5	2		

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.

The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

FOUNDATION EARTH SCIENCES

Chain of Custody Record

Client Details:	Foundation Earth Sciences PO Box 4405, East Gosford NSW 2250 email: ben@foundationes.com.au michael@foundationes.com.au; ray@foundationes.com.au ph: +61466 385 221	**Project Manager:**	Michael Silk
		Sampled By:	RL/EY
		Purchase Order #:	N/A
Delivery Details:	Envirolab Pty Ltd 12 Ashley Street, Chatswood NSW 2067 email: ahie@envirolab.com.au ph: +612 9910 6200	**Page #:**	1 of 2
Project #: E2232-3			
Project Name: Punchbowl			
Quote #:			
Turnaround: Standard			

					Analytes													Sample Comments
#	Sample ID	Depth	Date Sampled	Matrix	ph	CEC	%CLAY	ASS Field Test pH f & pH fox	TRH	BTEXN	PAH	OC	PCB	Asbestos ID	Asbestos %w/w (NEPM /WA)	TRH C6-C10 & BTEXN		Envirolab Suites	
																			Keep
1	AS1	0.2	17.2.2022	Soil				x											Keep
2	AS1	0.5	17.2.2022	Soil				x											Keep
3	AS1	1	17.2.2022	Soil				x											Keep
4	AS1	1.5	17.2.2022	Soil				x											Keep
5	AS1	2	17.2.2022	Soil				x											Keep
6	AS1	2.5	17.2.2022	Soil				x											Keep
7	AS1	3	17.2.2022	Soil				x											Keep
8	AS1	3.5	17.2.2022	Soil				x											Keep
9	AS1	4	17.2.2022	Soil				x											Keep
10	AS1	4.3	17.2.2022	Soil				x											Keep
11	AS2	0.2	17.2.2022	Soil				x											Keep
12	AS2	0.5	17.2.2022	Soil				x											Keep
13	AS2	1	17.2.2022	Soil				x											Keep
14	AS2	1.5	17.2.2022	Soil				x											Keep
15	AS2	2	17.2.2022	Soil				x											Keep
16	AS2	2.5	17.2.2022	Soil				x											Keep
17	AS2	3	17.2.2022	Soil				x											Keep
18	AS2	3.5	17.2.2022	Soil				x											Keep
19	AS2	4	17.2.2022	Soil				x											Keep
20	AS2	4.5	17.2.2022	Soil				x											Keep
21	AS3	0.2	17.2.2022	Soil				x											Keep
22	AS3	0.5	17.2.2022	Soil				x											Keep
23	AS3	1	17.2.2022	Soil				x											Keep
24	AS3	1.5	17.2.2022	Soil				x											Keep
25	AS3	2	17.2.2022	Soil				x											Keep
26	AS3	2.5	17.2.2022	Soil				x											Keep
27	AS3	3	17.2.2022	Soil				x											Keep
28	AS3	3.5	17.2.2022	Soil				x											Keep
29	AS3	4	17.2.2022	Soil				x											Keep

A289262

Special Directions and Coments: Keep in freezer within same day of sampling

Relinquished by	Emerson	Received By	Christine
Signature		Signature	
Date	18.2.2022	Date	18/02/22 1745

FOUNDATION EARTH SCIENCES

Chain of Custody Record

Client Details:	**Foundation Earth Sciences** PO Box 4405, East Gosford NSW 2250 email: ben@foundationes.com.au michael@foundationes.com.au; ray@foundationes.com.au ph: +61466 385 221	**Project Manager:** Michael Silk **Sampled By:** RL/EY **Purchase Order #:** N/A **Page #:** 2 of 2	**Project #:** E2232-3 **Project Name:** Punchbowl **Quote #:** **Turnaround:** Standard
Delivery Details:	**Envirolab Pty Ltd** 12 Ashley Street, Chatswood NSW 2067 email: ahle@envirolab.com.au ph: +612 9910 6200		

	#	Sample ID	Depth	Date Sampled	Matrix	Analytes: ph	CEC	%CLAY	ASS Field Test pH f & pH fox	TRH	BTEXN	PAH	OC	PCB	Asbestos ID	Asbestos %w/w (NEPM /WA)	TRH C6-C10 & BTEXN		Envirolab Suites	Sample Comments
30	30	AS4	0.2	17.2.2022	Soil				x											
31	31	AS4	0.5	17.2.2022	Soil				x											Keep
32	32	AS4	1	17.2.2022	Soil				x											Keep
33	33	AS4	1.5	17.2.2022	Soil				x											Keep
34	34	AS4	2	17.2.2022	Soil				x											Keep
35	35	AS4	2.5	17.2.2022	Soil				x											Keep
36	36	AS4	3	17.2.2022	Soil				x											Keep
37	37	AS4	3.5	17.2.2022	Soil				x											Keep
38	38	AS4	4	17.2.2022	Soil				x											Keep
39	39	AS5	0.2	17.2.2022	Soil				x											Keep
40	40	AS5	0.5	17.2.2022	Soil				x											Keep
41	41	AS5	1	17.2.2022	Soil				x											Keep
42	42	AS5	1.5	17.2.2022	Soil				x											Keep
43	43	AS5	2	17.2.2022	Soil				x											Keep
44	44	AS5	2.5	17.2.2022	Soil				x											Keep
45	45	AS5	3	17.2.2022	Soil				x											Keep
46	46	AS5	3.5	17.2.2022	Soil				x											Keep
47	47	AS6	0.1	17.2.2022	Soil				x											Keep
48	48	AS6	0.5	17.2.2022	Soil				x											Keep
49	49	AS6	1	17.2.2022	Soil				x											Keep
50	50	AS6	1.5	17.2.2022	Soil				x											Keep
51	51	AS6	2	17.2.2022	Soil				x											Keep
52	52	AS6	2.5	17.2.2022	Soil				x											Keep
53	53	AS6	3	17.2.2022	Soil				x											Keep
54	54	AS6	3.5	17.2.2022	Soil				x											Keep
55	55	AS6	4	17.2.2022	Soil				x											Keep
56	56	AS6	4.5	17.2.2022	Soil				x											Keep
	57																			Keep

Envirolab Services
JLAB 12 Ashley St
Chatswood NSW
Ph: (02) 9910 6200
Job No: 289262
Date Received: 18/02/22
Time Received: 1741
By: CP
Temp: Cool/Ambient
Cooling: Ice/Gel
Security: Intact/Broken

Special Directions and Coments: Keep in freezer within same day of sampling

Relinquished by	Emerson	Received By	Christina
Signature		Signature	
Date	18.2.2022	Date	18/02/22 1741

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk

Sample Login Details	
Your reference	E2232-3, Punchbowl
Envirolab Reference	289262
Date Sample Received	18/02/2022
Date Instructions Received	18/02/2022
Date Results Expected to be Reported	25/02/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	56 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	15
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	*POCAS field test
AS1-0.2	✓
AS1-0.5	✓
AS1-1	✓
AS1-1.5	✓
AS1-2	✓
AS1-2.5	✓
AS1-3	✓
AS1-3.5	✓
AS1-4	✓
AS1-4.3	✓
AS2-0.2	✓
AS2-0.5	✓
AS2-1	✓
AS2-1.5	✓
AS2-2	✓
AS2-2.5	✓
AS2-3	✓
AS2-3.5	✓
AS2-4	✓
AS2-4.5	✓
AS3-0.2	✓
AS3-0.5	✓
AS3-1	✓
AS3-1.5	✓
AS3-2	✓
AS3-2.5	✓
AS3-3	✓
AS3-3.5	✓
AS3-4	✓
AS4-0.2	✓
AS4-0.5	✓
AS4-1	✓

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

Sample ID	sPOCAS field test
AS4-1.5	✓
AS4-2	✓
AS4-2.5	✓
AS4-3	✓
AS4-3.5	✓
AS4-4	✓
AS5-0.2	✓
AS5-0.5	✓
AS5-1	✓
AS5-1.5	✓
AS5-2	✓
AS5-2.5	✓
AS5-3	✓
AS5-3.5	✓
AS6-0.1	✓
AS6-0.5	✓
AS6-1	✓
AS6-1.5	✓
AS6-2	✓
AS6-2.5	✓
AS6-3	✓
AS6-3.5	✓
AS6-4	✓
AS6-4.5	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 289818

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk
Address	PO Box 4405, East Gosford, NSW, 2250

Sample Details	
Your Reference	**E2232-3, Punchbowl**
Number of Samples	1 Water
Date samples received	25/02/2022
Date completed instructions received	25/02/2022

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	04/03/2022
Date of Issue	03/03/2022
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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***	

Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics		
Our Reference	UNITS	289818-1
Your Reference		BH1/GW1
Date Sampled		24/02/2022
Type of sample		Water
Date prepared	-	25/02/2022
Date analysed	-	25/02/2022
pH	pH Units	6.7
Electrical Conductivity	µS/cm	17,000
Chloride, Cl	mg/L	5,400
Sulphate, SO4	mg/L	490
Total Dissolved Solids (grav)	mg/L	18,000

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-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
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: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			25/02/2022		[NT]	[NT]	[NT]	25/02/2022	[NT]
Date analysed	-			25/02/2022		[NT]	[NT]	[NT]	25/02/2022	[NT]
pH	pH Units		Inorg-001	[NT]		[NT]	[NT]	[NT]	100	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1		[NT]	[NT]	[NT]	98	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1		[NT]	[NT]	[NT]	100	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1		[NT]	[NT]	[NT]	88	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5		[NT]	[NT]	[NT]	111	[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.

The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012

FOUNDATION EARTH SCIENCES

Chain of Custody Record

Client Details: Foundation Earth Sciences PO Box 4405, East Gosford NSW 2250 ben@foundationes.com.au michael@foundationes.com.au ray@foundationes.com.au ph: +61466 385 221	**Project Manager:** Michael Silk		**Project #:** E2282-3
Delivery Details: Envirolab Pty Ltd - Sydney Office 12 Ashley Street, Chatswood NSW 2067 email: ahie@envirolab.com.au ph: +612 9910 6200	**Sampled By:** EY **Purchase Order #:** N/A **Page #:** 1		**Project Name:** Punchbowl **Quote #:** **Turnaround time:** Standard

#	Sample ID	Depth	Date Sampled	Matrix	pH	EC	TDS	Soluble Chloride	Soluble Sulfate								Envirolab Suites	Sample Comments
1	BH1/GW1	-	24.2.2022	Water	x	x	x	x	x									Keep

Special Directions and Coments:

Relinquished by	EY	Received By	RG
Signature	[signature]	Signature	25/2/2022
Date	25.2.2022	Date	1440

ENVIROLAB Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 289818

Date Received: 25/2/22
Time Received: 1440
Received by: RS
Temp: Cool/Ambient 6°C
Cooling: Ice/Icepack
Security: Intact/Broken/None

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk

Sample Login Details	
Your reference	E2232-3, Punchbowl
Envirolab Reference	289818
Date Sample Received	25/02/2022
Date Instructions Received	25/02/2022
Date Results Expected to be Reported	04/03/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH	Electrical Conductivity	Chloride, Cl	Sulphate, SO4	Total Dissolved Solids(grav)
BH1/GW1	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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

CERTIFICATE OF ANALYSIS 289262-A

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk
Address	PO Box 4405, East Gosford, NSW, 2250

Sample Details	
Your Reference	E2232-3, Punchbowl
Number of Samples	additional analysis
Date samples received	18/02/2022
Date completed instructions received	28/02/2022

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	08/03/2022
Date of Issue	08/03/2022
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Results Approved By
Jenny He, Chemist

Authorised By

Nancy Zhang, Laboratory Manager

sPOCAS + %S w/w						
Our Reference	UNITS	289262-A-3	289262-A-5	289262-A-7	289262-A-23	289262-A-25
Your Reference		AS1	AS1	AS1	AS3	AS3
Depth		1	2	3	1	2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
pH $_{kcl}$	pH units	7.8	6.8	6.8	5.3	6.0
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{ox}$	pH units	6.6	6.6	7.8	4.3	6.8
TPA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANC_E	% $CaCO_3$	0.25	0.19	0.31	[NT]	0.25
a-ANC_E	moles H^+ /t	50	38	62	[NT]	50
s-ANC_E	%w/w S	0.08	0.06	0.10	[NT]	0.08
S_{KCl}	%w/w S	0.01	0.006	0.008	<0.005	0.006
S_P	%w/w	0.01	0.005	0.007	0.01	0.01
S_{POS}	%w/w	<0.005	<0.005	<0.005	0.01	0.006
a-S_{POS}	moles H^+ /t	<5	<5	<5	8	<5
Ca_{KCl}	%w/w	0.03	0.008	0.02	0.04	0.02
Ca_P	%w/w	0.04	0.007	0.02	0.05	0.03
Ca_A	%w/w	<0.005	<0.005	<0.005	0.007	<0.005
Mg_{KCl}	%w/w	0.047	0.048	0.053	0.055	0.077
Mg_P	%w/w	0.056	0.048	0.062	0.049	0.071
Mg_A	%w/w	0.009	<0.005	0.009	<0.005	<0.005
S_{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	[NT]	[NT]	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	<5	<5	<5	12	<5
s-Net Acidity	%w/w S	<0.01	<0.01	<0.01	0.02	<0.01
Liming rate	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	0.92	<0.75
s-Net Acidity without -ANCE	%w/w S	<0.01	<0.01	<0.01	0.02	<0.01
a-Net Acidity without ANCE	moles H^+ /t	<5	<5	<5	12	<5
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	0.92	<0.75

sPOCAS + %S w/w						
Our Reference	UNITS	289262-A-27	289262-A-31	289262-A-33	289262-A-36	289262-A-39
Your Reference		AS3	AS4	AS4	AS4	AS5
Depth		3	0.5	1.5	3	0.2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
pH $_{kcl}$	pH units	6.7	4.3	6.5	6.7	4.5
TAA pH 6.5	moles H^+ /t	<5	22	<5	<5	10
s-TAA pH 6.5	%w/w S	<0.01	0.04	<0.01	<0.01	0.02
pH $_{ox}$	pH units	7.3	4.6	6.4	8.3	4.6
TPA pH 6.5	moles H^+ /t	<5	16	<5	<5	10
s-TPA pH 6.5	%w/w S	<0.01	0.03	<0.01	<0.01	0.02
TSA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANC_E	% $CaCO_3$	0.25	[NT]	[NT]	0.31	[NT]
a-ANC_E	moles H^+ /t	50	[NT]	[NT]	62	[NT]
s-ANC_E	%w/w S	0.08	[NT]	[NT]	0.10	[NT]
S_{KCl}	%w/w S	0.005	0.02	0.006	0.01	0.02
S_P	%w/w	0.007	0.02	0.01	0.009	0.02
S_{POS}	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
a-S_{POS}	moles H^+ /t	<5	<5	<5	<5	<5
Ca_{KCl}	%w/w	0.03	0.04	0.007	0.02	0.06
Ca_P	%w/w	0.03	0.04	0.01	0.02	0.05
Ca_A	%w/w	<0.005	0.010	0.006	<0.005	<0.005
Mg_{KCl}	%w/w	0.078	0.089	0.031	0.065	0.066
Mg_P	%w/w	0.082	0.086	0.059	0.072	0.064
Mg_A	%w/w	<0.005	<0.005	0.028	0.007	<0.005
S_{HCl}	%w/w S	[NT]	0.022	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	<0.005	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	[NT]	<5	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	[NT]	<0.01	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	<5	24	<5	<5	11
s-Net Acidity	%w/w S	<0.01	0.04	<0.01	<0.01	0.02
Liming rate	kg $CaCO_3$ /t	<0.75	1.8	<0.75	<0.75	0.83
s-Net Acidity without -ANCE	%w/w S	<0.01	0.04	<0.01	<0.01	0.02
a-Net Acidity without ANCE	moles H^+ /t	<5	24	<5	<5	11
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	1.8	<0.75	<0.75	0.83

sPOCAS + %S w/w						
Our Reference	UNITS	289262-A-41	289262-A-44	289262-A-49	289262-A-51	289262-A-55
Your Reference		AS5	AS5	AS6	AS6	AS6
Depth		1	2.5	1	2	4
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
pH $_{kcl}$	pH units	6.4	6.8	4.9	6.0	6.6
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{ox}$	pH units	7.6	7.6	5.5	7.9	7.2
TPA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANC_E	% $CaCO_3$	0.31	0.25	[NT]	0.31	0.22
a-ANC_E	moles H^+ /t	62	50	[NT]	62	45
s-ANC_E	%w/w S	0.10	0.08	[NT]	0.10	0.07
S_{KCl}	%w/w S	0.009	0.01	<0.005	<0.005	<0.005
S_P	%w/w	0.008	0.01	<0.005	<0.005	<0.005
S_{POS}	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
a-S_{POS}	moles H^+ /t	<5	<5	<5	<5	<5
Ca_{KCl}	%w/w	0.006	0.01	0.009	0.007	0.02
Ca_P	%w/w	0.006	0.01	0.008	0.01	0.03
Ca_A	%w/w	<0.005	<0.005	<0.005	<0.005	0.005
Mg_{KCl}	%w/w	0.051	0.073	0.061	0.073	0.065
Mg_P	%w/w	0.055	0.066	0.055	0.066	0.067
Mg_A	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
S_{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	[NT]	[NT]	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	<5	<5	5	<5	<5
s-Net Acidity	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
Liming rate	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	<0.75	<0.75
s-Net Acidity without -ANCE	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity without ANCE	moles H^+ /t	<5	<5	5.0	<5	<5
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	<0.75	<0.75

SCr						
Our Reference	UNITS	289262-A-3	289262-A-5	289262-A-7	289262-A-23	289262-A-25
Your Reference		AS1	AS1	AS1	AS3	AS3
Depth		1	2	3	1	2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Chromium Reducible Sulfur	%w/w	0.006	<0.005	<0.005	0.007	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	4	<3	<3	4	<3

SCr						
Our Reference	UNITS	289262-A-27	289262-A-31	289262-A-33	289262-A-36	289262-A-39
Your Reference		AS3	AS4	AS4	AS4	AS5
Depth		3	0.5	1.5	3	0.2
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Chromium Reducible Sulfur	%w/w	<0.005	0.007	0.005	<0.005	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	<3	5	3	<3	<3

SCr						
Our Reference	UNITS	289262-A-41	289262-A-44	289262-A-49	289262-A-51	289262-A-55
Your Reference		AS5	AS5	AS6	AS6	AS6
Depth		1	2.5	1	2	4
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Date prepared	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Date analysed	-	03/03/2022	03/03/2022	03/03/2022	03/03/2022	03/03/2022
Chromium Reducible Sulfur	%w/w	0.009	0.007	<0.005	<0.005	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	6	4	<3	<3	<3

Method ID	Methodology Summary
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on National acid sulfate soils identification and laboratory methods manual June 2018. Ideally samples should be received in the laboratory at <4oC. Please refer to SRA for sample temperature on receipt. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL results reported.
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate. Based on National acid sulfate soils identification and laboratory methods manual June 2018. The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL results reported.

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/03/2022	3	03/03/2022	03/03/2022		03/03/2022	
Date analysed	-			03/03/2022	3	03/03/2022	03/03/2022		03/03/2022	
pH $_{kcl}$	pH units		Inorg-064		3	7.8	7.6	3	98	
TAA pH 6.5	moles H$^+$/t	5	Inorg-064	<5	3	<5	<5	0	83	
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	3	<0.01	<0.01	0		
pH $_{ox}$	pH units		Inorg-064		3	6.6	6.5	2	90	
TPA pH 6.5	moles H$^+$/t	5	Inorg-064	<5	3	<5	<5	0	101	
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	3	<0.01	<0.01	0		
TSA pH 6.5	moles H$^+$/t	5	Inorg-064	<5	3	<5	<5	0		
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	3	<0.01	<0.01	0		
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	3	0.25	0.21	17		
a-ANC_E	moles H$^+$/t	5	Inorg-064	<5	3	50	42	17		
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	3	0.08	0.07	13		
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	3	0.01	0.01	0		
S_P	%w/w	0.005	Inorg-064	<0.005	3	0.01	0.01	0		
S_{POS}	%w/w	0.005	Inorg-064	<0.005	3	<0.005	<0.005	0		
a-S_{POS}	moles H$^+$/t	5	Inorg-064	<5	3	<5	<5	0		
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	3	0.03	0.03	0		
Ca_P	%w/w	0.005	Inorg-064	<0.005	3	0.04	0.04	0		
Ca_A	%w/w	0.005	Inorg-064	<0.005	3	<0.005	0.005	0		
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	3	0.047	0.051	8		
Mg_P	%w/w	0.005	Inorg-064	<0.005	3	0.056	0.060	7		
Mg_A	%w/w	0.005	Inorg-064	<0.005	3	0.009	0.009	0		
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	3					
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	3					
a-S_{NAS}	moles H$^+$/t	5	Inorg-064	<5	3					
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	3					
Fineness Factor	-	1.5	Inorg-064	<1.5	3	1.5	1.5	0		
a-Net Acidity	moles H$^+$/t	5	Inorg-064	<5	3	<5	<5	0		
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	3	<0.01	<0.01	0		
Liming rate	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	3	<0.75	<0.75	0		
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	3	<0.01	<0.01	0		

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
a-Net Acidity without ANCE	moles H^+/t	5	Inorg-064	<5	3	<5	<5	0	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	3	<0.75	<0.75	0	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-				41	03/03/2022	03/03/2022			
Date analysed	-				41	03/03/2022	03/03/2022			
pH_{kcl}	pH units		Inorg-064		41	6.4	6.4	0		
TAA pH 6.5	moles H^+/t	5	Inorg-064		41	<5	<5	0		
s-TAA pH 6.5	%w/w S	0.01	Inorg-064		41	<0.01	<0.01	0		
pH_{ox}	pH units		Inorg-064		41	7.6	7.8	3		
TPA pH 6.5	moles H^+/t	5	Inorg-064		41	<5	<5	0		
s-TPA pH 6.5	%w/w S	0.01	Inorg-064		41	<0.01	<0.01	0		
TSA pH 6.5	moles H^+/t	5	Inorg-064		41	<5	<5	0		
s-TSA pH 6.5	%w/w S	0.01	Inorg-064		41	<0.01	<0.01	0		
ANC_E	% $CaCO_3$	0.05	Inorg-064		41	0.31	0.31	0		
a-ANC_E	moles H^+/t	5	Inorg-064		41	62	62	0		
s-ANC_E	%w/w S	0.05	Inorg-064		41	0.10	0.10	0		
S_{KCl}	%w/w S	0.005	Inorg-064		41	0.009	0.009	0		
S_P	%w/w	0.005	Inorg-064		41	0.008	0.008	0		
S_{POS}	%w/w	0.005	Inorg-064		41	<0.005	<0.005	0		
a-S_{POS}	moles H^+/t	5	Inorg-064		41	<5	<5	0		
Ca_{KCl}	%w/w	0.005	Inorg-064		41	0.006	0.006	0		
Ca_P	%w/w	0.005	Inorg-064		41	0.006	<0.005	18		
Ca_A	%w/w	0.005	Inorg-064		41	<0.005	<0.005	0		
Mg_{KCl}	%w/w	0.005	Inorg-064		41	0.051	0.051	0		
Mg_P	%w/w	0.005	Inorg-064		41	0.055	0.054	2		
Mg_A	%w/w	0.005	Inorg-064		41	<0.005	<0.005	0		
Fineness Factor	-	1.5	Inorg-064		41	1.5	1.5	0		
a-Net Acidity	moles H^+/t	5	Inorg-064		41	<5	<5	0		
s-Net Acidity	%w/w S	0.01	Inorg-064		41	<0.01	<0.01	0		
Liming rate	kg $CaCO_3$/t	0.75	Inorg-064		41	<0.75	<0.75	0		
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064		41	<0.01	<0.01	0		
a-Net Acidity without ANCE	moles H^+/t	5	Inorg-064		41	<5	<5	0		
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064		41	<0.75	<0.75	0		

QUALITY CONTROL: SCr						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/03/2022	3	03/03/2022	03/03/2022		03/03/2022	[NT]
Date analysed	-			03/03/2022	3	03/03/2022	03/03/2022		03/03/2022	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	3	0.006	0.008	29	123	[NT]
a-Chromium Reducible Sulfur	moles H^+/t	3	Inorg-068	<3	3	4	5	22	[NT]	[NT]

QUALITY CONTROL: SCr						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	41	03/03/2022	03/03/2022		[NT]	[NT]
Date analysed	-			[NT]	41	03/03/2022	03/03/2022		[NT]	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	[NT]	41	0.009	0.008	12	[NT]	[NT]
a-Chromium Reducible Sulfur	moles H^+/t	3	Inorg-068	[NT]	41	6	5	18	[NT]	[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.

The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Ming To

Subject: FW: Results for Registration 289262 E2232-3, Punchbowl
Attachments: E2232-3 Punchbowl ASS 28.2.2022 SPOCAS.pdf

Ref: 289262-A
TAT: Standard
Due: 07/03/2022
MT

289262-A

From: Emerson You <emerson@foundationes.com.au>
Sent: Monday, 28 February 2022 11:22 AM
To: Nick Sarlamis <NSarlamis@envirolab.com.au>; Customer Service <CustomerService@envirolab.com.au>
Cc: ray@foundationes.com.au; michael@foundationes.com.au; ben@foundationes.com.au
Subject: Re: Results for Registration 289262 E2232-3, Punchbowl

Hi,

can we please organized further test for the job. COC attached

Thanks

Emerson YOU
Foundation Earth Sciences
Civil and Environmental Engineer

emerson@foundationes.com.au
0409784783

FOUNDATION EARTH SCIENCES

On Fri, 25 Feb 2022 at 17:56, Nick Sarlamis <NSarlamis@envirolab.com.au> wrote:

FOUNDATION EARTH SCIENCES

Chain of Custody Record

Client Details:	Foundation Earth Sciences PO Box 4405, East Gosford NSW 2250 email: ben@foundationes.com.au michael@foundationes.com.au; ray@foundationes.com.au ph: +61466 385 221	**Project Manager:**	Michael Silk
		Sampled By:	RL/EY
Delivery Details:	Envirolab Pty Ltd 12 Ashley Street, Chatswood NSW 2067 email: ahie@envirolab.com.au ph: +612 9910 6200	**Purchase Order #:**	N/A
		Page #:	1 of 2

Project #: E2232-3

Project Name: Punchbowl

Quote #:

Turnaround: Standard

#	Sample ID	Depth	Date Sampled	Matrix	Analytes														Sample Comments
					ph	CEC	%CLAY	ASS Field Test pH f & pH fox	TRH	BTEXN	PAH	OC	PCB	SPOCAS & Chromium Reducible	Asbestos %w/w (NEPM /WA)	TRH C6-C10 & BTEXN		Envirolab Suites	
1	3 AS1	1	17.2.2022	Soil										x					Keep
2	5 AS1	2	17.2.2022	Soil										x					Keep
3	7 AS1	3	17.2.2022	Soil										x					Keep
4	23 AS3	1	17.2.2022	Soil										x					Keep
5	25 AS3	2	17.2.2022	Soil										x					Keep
6	27 AS3	3	17.2.2022	Soil										x					Keep
7	31 AS4	0.5	17.2.2022	Soil										x					Keep
8	33 AS4	1.5	17.2.2022	Soil										x					Keep
9	36 AS4	3	17.2.2022	Soil										x					Keep
10	39 AS5	0.2	17.2.2022	Soil										x					Keep
11	41 AS5	1	17.2.2022	Soil										x					Keep
12	44 AS5	2.5	17.2.2022	Soil										x					Keep
13	49 AS6	1	17.2.2022	Soil										x					Keep
14	51 AS6	2	17.2.2022	Soil										x					Keep
15	55 AS6	4	17.2.2022	Soil										x					Keep
														x					Keep

Special Directions and Coments: refer to lab cert 289262

Relinquished by	Emerson	Received By	Ming Yan To.
Signature		Signature	M?
Date	28.2.2022	Date	envirolabservices 28/02/2022 11:22

Ref: 289262-A

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Foundation Earth Sciences Pty Ltd
Attention	Michael Silk

Sample Login Details	
Your reference	E2232-3, Punchbowl
Envirolab Reference	289262-A
Date Sample Received	18/02/2022
Date Instructions Received	28/02/2022
Date Results Expected to be Reported	07/03/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	additional analysis
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	15
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolab.com.au	Email: jhurst@envirolab.com.au

Analysis Underway, details on the following page:

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12 Ashley St Chatswood NSW 2067
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Sample ID	8POCAS (AS WW	SCr	On Hold
AS1-0.2			✓
AS1-0.5			✓
AS1-1	✓	✓	
AS1-1.5			✓
AS1-2	✓	✓	
AS1-2.5			✓
AS1-3	✓	✓	
AS1-3.5			✓
AS1-4			✓
AS1-4.3			✓
AS2-0.2			✓
AS2-0.5			✓
AS2-1			✓
AS2-1.5			✓
AS2-2			✓
AS2-2.5			✓
AS2-3			✓
AS2-3.5			✓
AS2-4			✓
AS2-4.5			✓
AS3-0.2			✓
AS3-0.5			✓
AS3-1	✓	✓	
AS3-1.5			✓
AS3-2	✓	✓	
AS3-2.5			✓
AS3-3	✓	✓	
AS3-3.5			✓
AS3-4			✓
AS4-0.2			✓
AS4-0.5	✓	✓	
AS4-1			✓

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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Sample ID	sPOCAS + %S w/w	SCr	On Hold
AS4-1.5	✓	✓	
AS4-2			✓
AS4-2.5			✓
AS4-3	✓	✓	
AS4-3.5			✓
AS4-4			✓
AS5-0.2	✓	✓	
AS5-0.5			✓
AS5-1	✓	✓	
AS5-1.5			✓
AS5-2			✓
AS5-2.5	✓	✓	
AS5-3			✓
AS5-3.5			✓
AS6-0.1			✓
AS6-0.5			✓
AS6-1	✓	✓	
AS6-1.5			✓
AS6-2	✓	✓	
AS6-2.5			✓
AS6-3			✓
AS6-3.5			✓
AS6-4	✓	✓	
AS6-4.5			✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

APPENDIX B: BOREHOLE LOGS

BOREHOLE : AS1

FOUNDATION EARTH SCIENCES

CLIENT NAME: Westwood Pty Ltd **JOB NUMBER:** E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196 **PROJECT:** Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** RL **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** --- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
ADT	▼		0.10			Asphalt Concrete					
					FILL	FILL, silty clay, low to medium plasticity, brown, with a few gravels	M	S-F	0.2		
			0.5						0.5		0.5
			0.50		CH	Silty CLAY, medium to high plasticity, brown-orange-grey	M	F-St			
			1.0						1		1.0
			1.5						1.5		1.5
			2.0						2		2.0
			2.5						2.5		2.5
			3.0						3	Seepage encountered at 3.0mBGL dated 17/2/2022	3.0
			3.5						3.5		3.5
			4.0						4		4.0
			4.30			SHALE, extremely weathered, extremely low strength, grey-red	M		4.3		4.5
			4.5								
			4.50			Borehole AS1 terminated at 4.50m					
			5.0								5.0
			5.5								5.5

Comments

D - Dry, M - Moist, W - Wet

VS - Very Soft, S - Soft, F - Firm, St - Stiff, VSt - Very Stiff, H - Hard

VL - Very Loose, L - Loose, MD - Medium Dense, D - Dense, VD - Very Dense

FOUNDATION EARTH SCIENCES

BOREHOLE : AS2

CLIENT NAME: Westwood Pty Ltd

JOB NUMBER: E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196

PROJECT: Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** RL **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** --- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
			0.10			Asphalt Concrete					
ADT			0.5		FILL	FILL, clayey silt, low to medium plasticity, dark brown-brown, with a few gravels	M	S-F	0.2 0.5		0.5
			0.80		ML	Clayey SILT, low to medium plasticity, pale brown, with red ironstain rocks	M	F	1		1.0
			1.0						1.5		1.5
			1.5								
			2.0						2		2.0
			2.00		CH	Silty CLAY, medium to high plasticity, pale red-brown, with ironstain rocks			2.5		2.5
			2.5								
			3.0						3		3.0
			3.5						3.5		3.5
			4.0						4		4.0
			4.10			SHALE, extremely weathered, extremely low strength, grey-brown, with clay band			4.5		4.5
			4.5								
			5.0								5.0
			5.00			Borehole AS2 terminated at 5.00m					
			5.5								5.5

Comments:

D - Dry
M - Moist
W - Wet

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

BOREHOLE : AS3

FOUNDATION EARTH SCIENCES

CLIENT NAME: Westwood Pty Ltd **JOB NUMBER:** E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196 **PROJECT:** Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** RL **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** --- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
ADT			0.10			Asphalt Concrete					
					FILL	FILL, silty clay, low to medium plasticity, brown	M	S	0.2		
			0.40	0.5	CH	Clayey SILT, low to medium plasticity, grey	M	S-F	0.5		0.5
			0.60		Pt	Peaty CLAY, medium to high plasticity, grey	M	S-F			
				1.0					1		1.0
			1.10		CH	Silty CLAY, medium to high plasticity, orange-red	M	F-St			
				1.5					1.5		1.5
			2.00	2.0		interbedded with ironstain rocks band			2		2.0
				2.5					2.5		2.5
				3.0					3		3.0
				3.5					3.5		3.5
				4.0					4		4.0
			4.10			SHALE, extremely weathered, extremely low strength, grey	M				4.5
			4.40	4.5		Borehole AS3 terminated at 4.40m					
				5.0							5.0
				5.5							5.5

Comments:

D - Dry, M - Moist, W - Wet

VS - Very Soft, S - Soft, F - Firm, St - Stiff, VSt - Very Stiff, H - Hard

VL - Very Loose, L - Loose, MD - Medium Dense, D - Dense, VD - Very Dense

FOUNDATION EARTH SCIENCES

BOREHOLE : AS4

CLIENT NAME: Westwood Pty Ltd **JOB NUMBER:** E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196 **PROJECT:** Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** RL **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** -- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
			0.10			Asphalt Concrete					
			0.20		FILL	FILL, silty clay, low to medium plasticity, dark brown, trace of gravel	M	S-F	0.2		
			0.5		CH	Silty CLAY, medium to high plasticity, orange	M	F-St	0.5		0.5
			1.0						1		1.0
			1.5						1.5		1.5
ADT			2.0						2		2.0
		2.00				interbedded with ironstain rock band					
			2.5						2.5		2.5
			3.0						3		3.0
			3.5						3.5		3.5
			4.0						4		4.0
		4.20				SHALE, extremely weathered, extremely low strength, grey, interbedded with clay band	M				
			4.5								4.5
		4.80				Borehole AS4 terminated at 4.80m					
			5.0								5.0
			5.5								5.5

Comments:

D - Dry, M - Moist, W - Wet

VS - Very Soft, S - Soft, F - Firm, St - Stiff, VSt - Very Stiff, H - Hard

VL - Very Loose, L - Loose, MD - Medium Dense, D - Dense, VD - Very Dense

BOREHOLE : AS5

FOUNDATION EARTH SCIENCES

CLIENT NAME: Westwood Pty Ltd **JOB NUMBER:** E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196 **PROJECT:** Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** RL **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** --- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
ADT			0.10			Asphalt Concrete					
			0.20		FILL	FILL, silty clay, low to medium plasticity, brown	M	S-F	0.2		
					CH	Silty CLAY, medium to high plasticity, orange-grey	M	F-St	0.5		0.5
			0.5								
									1		1.0
			1.0								
									1.5		1.5
			1.5								
									2		2.0
			2.0								
									2.5		2.5
			2.5								
									3		3.0
			3.0								
			3.30			SHALE, extremely weathered, extremely low strength, grey, with clay band	M		3.5		3.5
			3.5								
			4.0								4.0
			4.00			Borehole AS5 terminated at 4.00m					
			4.5								4.5
			5.0								5.0
			5.5								5.5

Comments:

D - Dry, M - Moist, W - Wet

VS - Very Soft, S - Soft, F - Firm, St - Stiff, VSt - Very Stiff, H - Hard

VL - Very Loose, L - Loose, MD - Medium Dense, D - Dense, VD - Very Dense

FOUNDATION EARTH SCIENCES

BOREHOLE : AS6

CLIENT NAME: Westwood Pty Ltd **JOB NUMBER:** E2232-3

SITE ADDRESS: 921 Punchbowl Road, Punchbowl NSW 2196 **PROJECT:** Acid Sulphate Soil Assessment

Date Started : 17/02/2022 **Completed :** 17/02/2022 **Logged By :** EY **Checked By :** MS

Borehole Location : Refer to site plan **Surface RL :** --- **Datum :** m AHD

Equipment : Drill Rig **Borehole Size :** 100mm **Slope :** -90°

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture	Consistence	Samples Tests Remarks	Additional Observations	Depth (m)
ADT		0.05	0.05		FILL	Asphalt Concrete					
						FILL, silty clay, low to medium plasticity, dark brown, trace of gravel	M	S-F	0.1		
			0.5						0.5		0.5
		0.60	0.60		ML	Clayey SILT, low to medium plasticity, brown-yellow-grey	M	F-St			
			1.0						1		1.0
			1.5						1.5		1.5
			2.0						2		2.0
			2.5						2.5		2.5
			3.0						3		3.0
		3.10	3.10			with trace of ironstain rocks fragments					
			3.5						3.5		3.5
			4.0						4		4.0
			4.5						4.5		4.5
		4.70	4.70			SHALE, extremely weathered, extremely low strength, grey-pale grey					
			5.0								5.0
		5.00	5.00			Borehole AS6 terminated at 5.00m					
			5.5								5.5

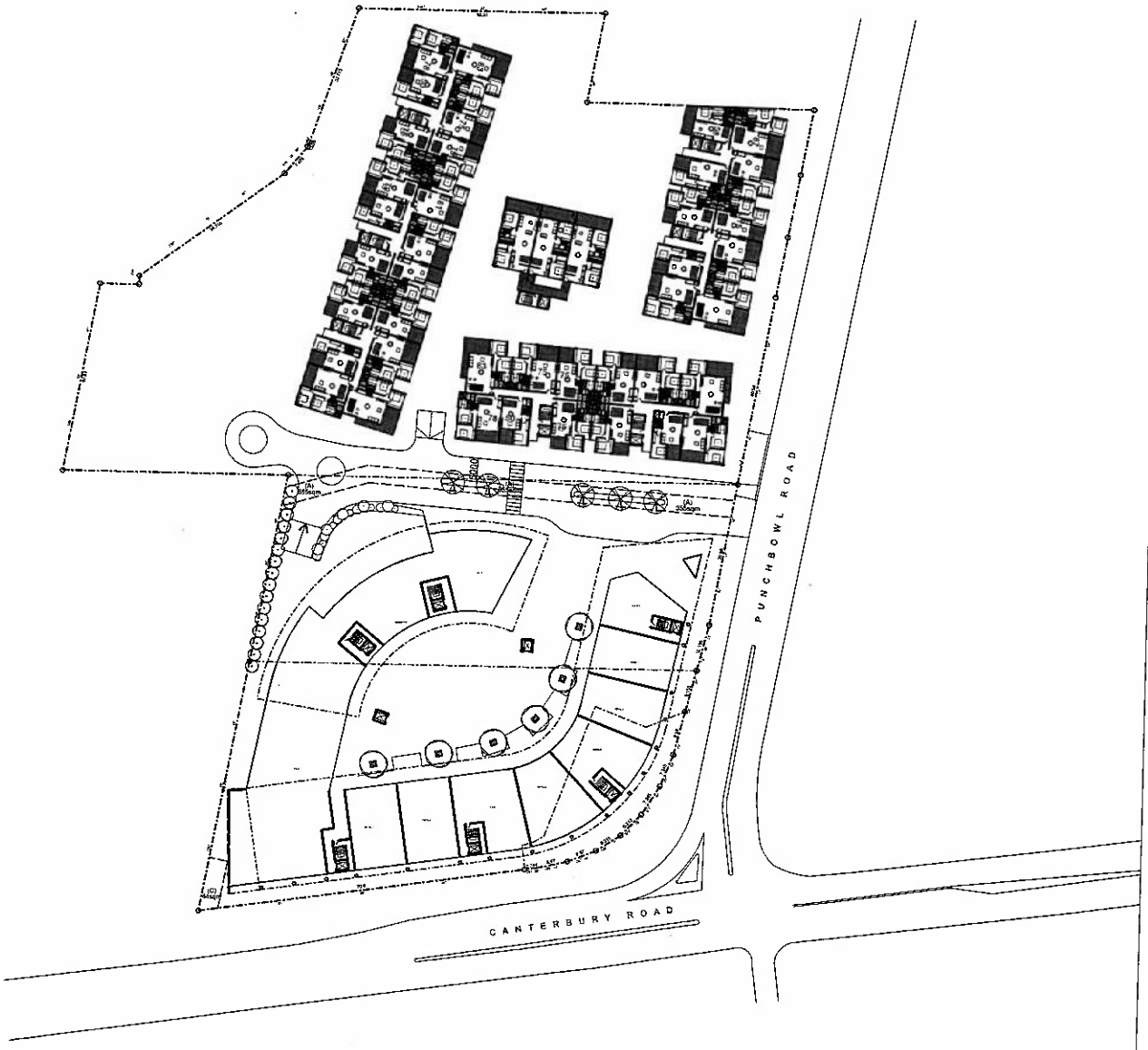
Comments:

D - Dry, M - Moist, W - Wet

VS - Very Soft, S - Soft, F - Firm, St - Stiff, VSt - Very Stiff, H - Hard

VL - Very Loose, L - Loose, MD - Medium Dense, D - Dense, VD - Very Dense

APPENDIX C: PROPOSED DEVELOPMENT PLANS



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Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Ground Floor Plan

Scale	Date	Drawn	Checked
1:500@ A1 1:1000@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.02		A

Design File Ref: Arch/Activ/921 Punchbowl Rd.DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
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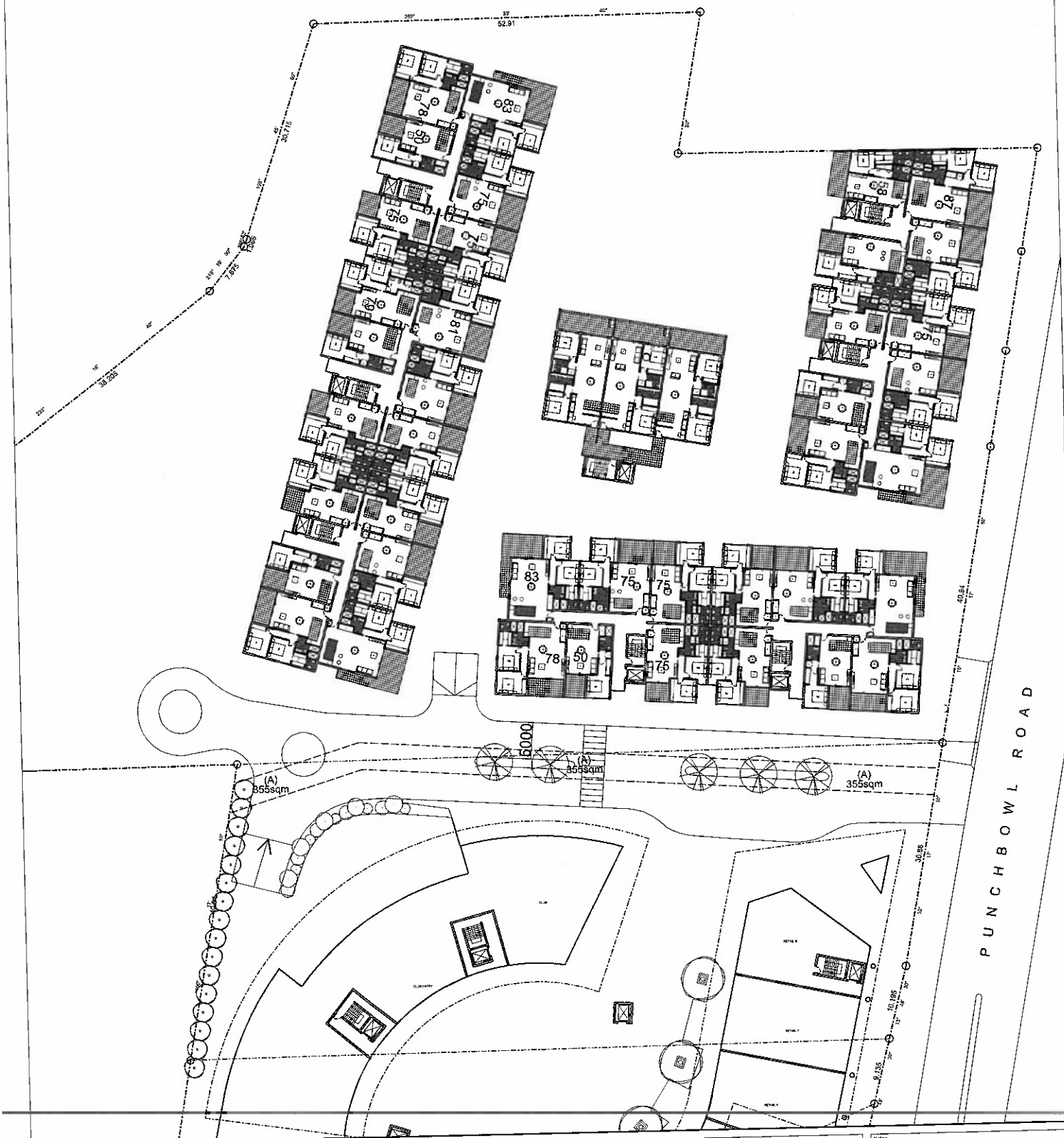
Design Architect: Chris Tsioulos - Reg. No. 5143



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Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Ground: North

Scale	Date	Drawn	Checked
1:250@ A1 1:500 @ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.01		A

Design File Ref: Arch/Active/921 Punchbowl Rd DA

Issue	Date	Description	By

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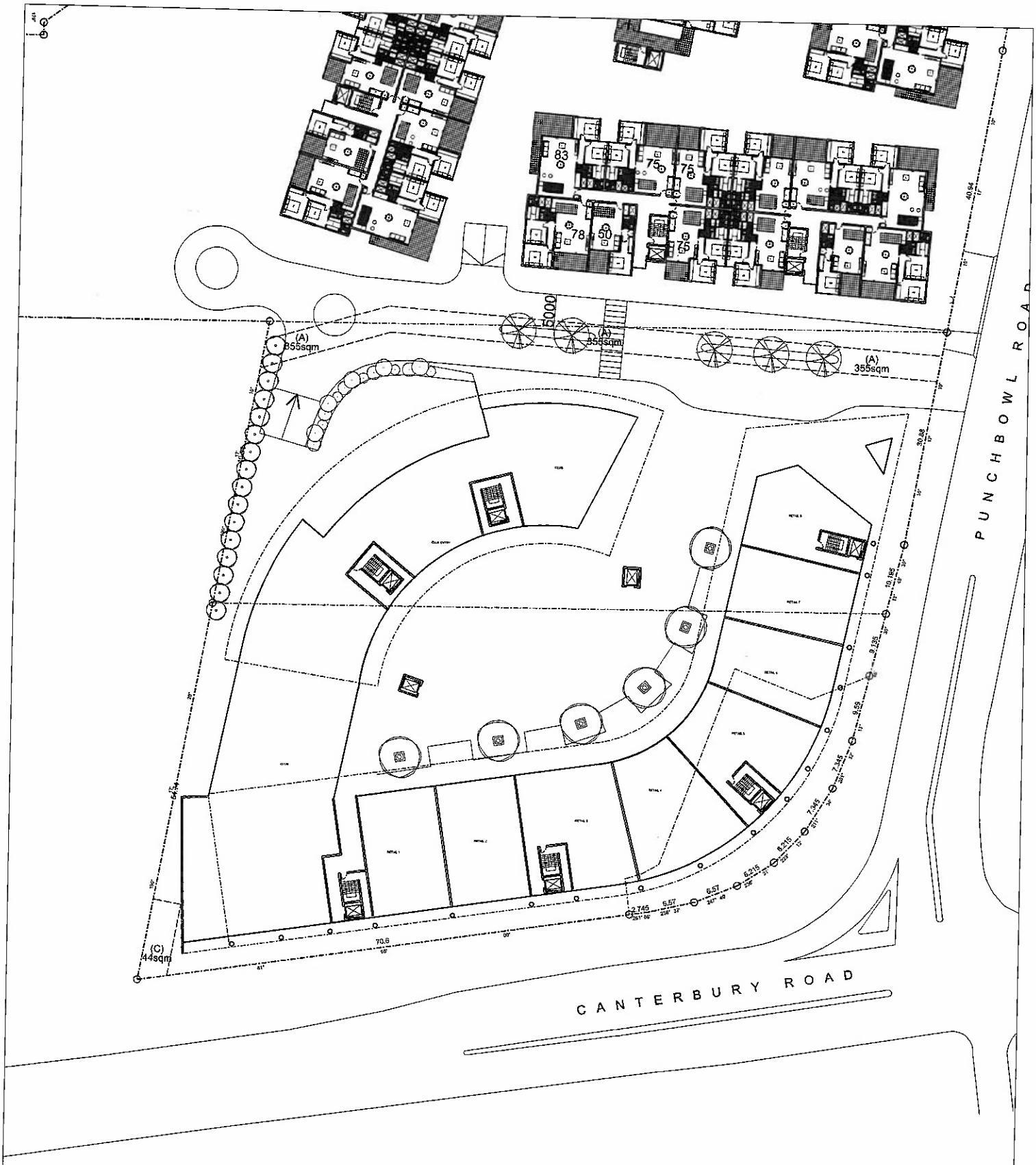
Design Architect: Chris Tsioulos - Reg. No. 5143



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Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Ground: South

Scale	Date	Drawn	Checked
1:250@ A1 1:500 @ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.00		A

Design File Ref: Arch/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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Design Architect: Chris Tsioulos - Reg. No. 6143

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Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: First Floor Plan

Scale	Date	Drawn	Checked
1:500@ A1 1:1000@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.08		A

Design File Ref: Arch/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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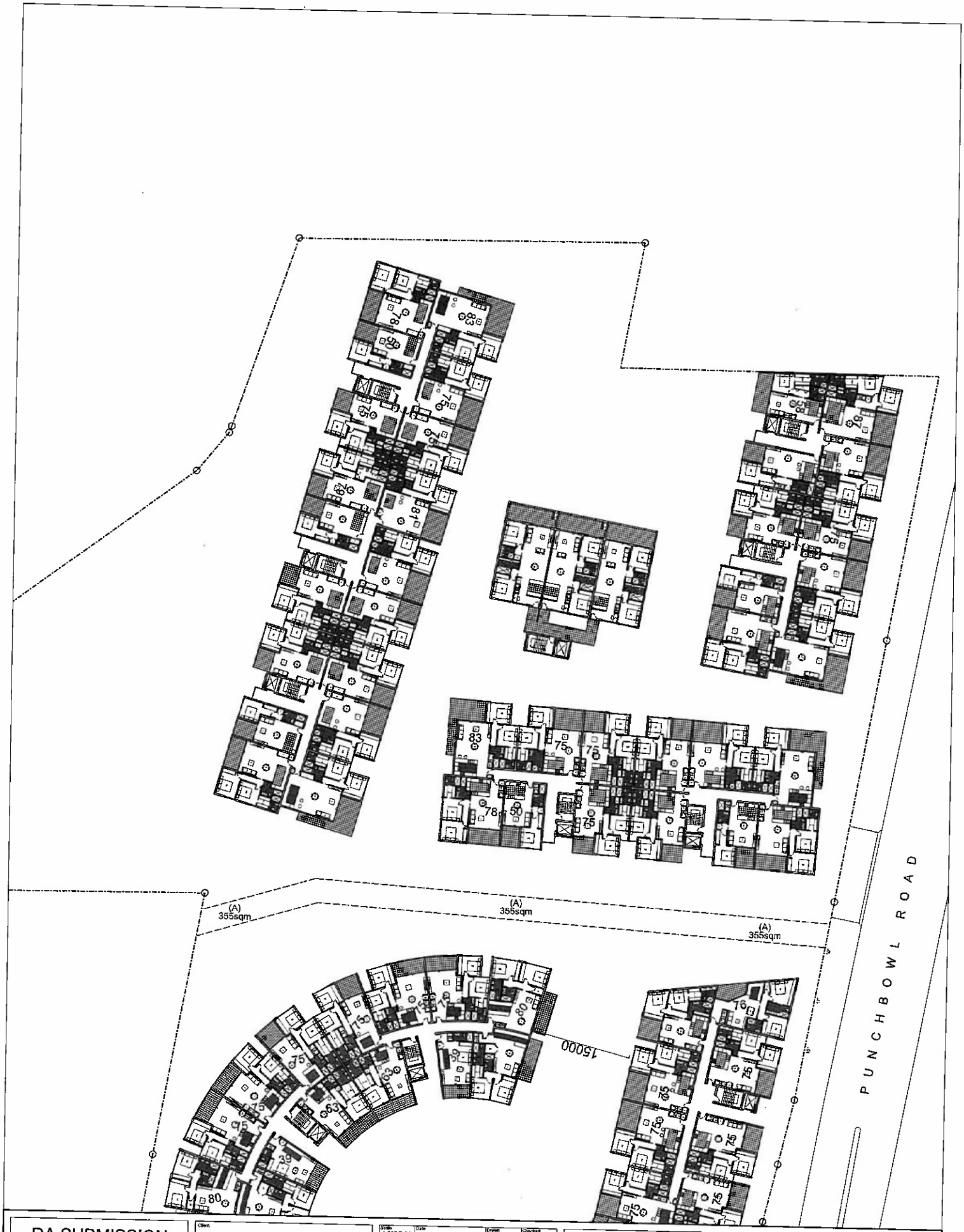
Larger scale drawings and written dimensions take preference.

Design Architect: Chris Talotsis - Reg. No. 5143



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Client
TBA

Project
Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title
First: North

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.07		A

Design File Ref: Arch/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
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Design Architect: Chris Tsioulos - Reg. No. 5143

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Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: First: South

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.06		A

Design File Ref: Archi/Active/921 Punchbowl Rd DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
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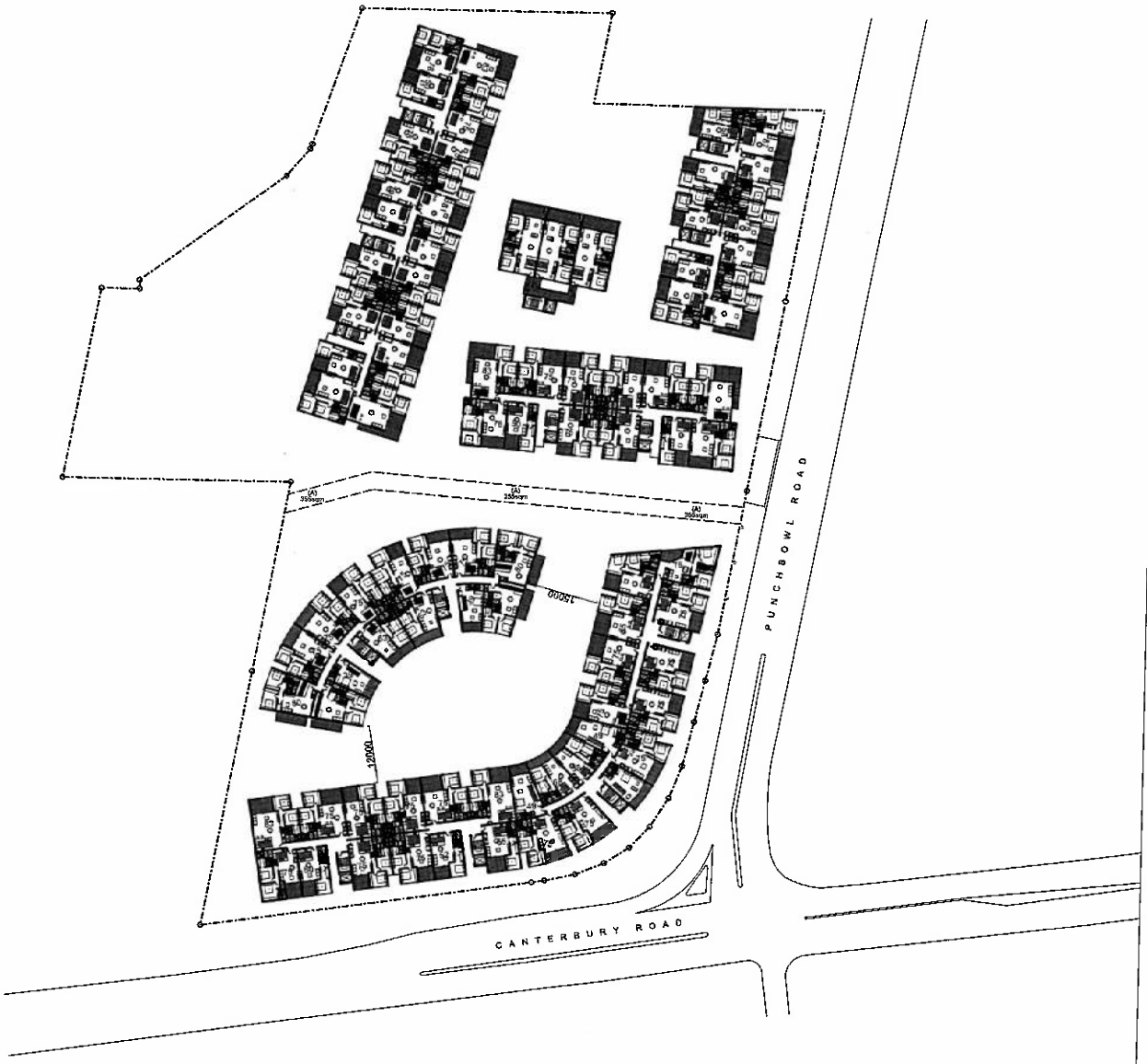
All dimensions to be checked on site prior to commencement of work.
All discrepancies to be brought to the attention of the Architect.
Larger scale drawings and written dimensions take preference.

Design Architect: Chris Tsioulos - Reg. No. 5143



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Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Second Floor Plan

Scale	Date	Drawn	Checked
1:500 @ A1 1:1000 @ A3	21.07.16	AS	CT
Job No. 00 00 00	Drawing No. DA 1.05		Issue A

Design File Ref: Archi/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes:
Drawings in this set are not for construction.
Do not scale from drawings.
All dimensions to be checked on site prior to commencement of work.
All discrepancies to be brought to the attention of the Architect.
Larger scale drawings and written dimensions take preference.

Design Architect: Chris Tsiolos - Reg. No. 5143

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Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Second: North

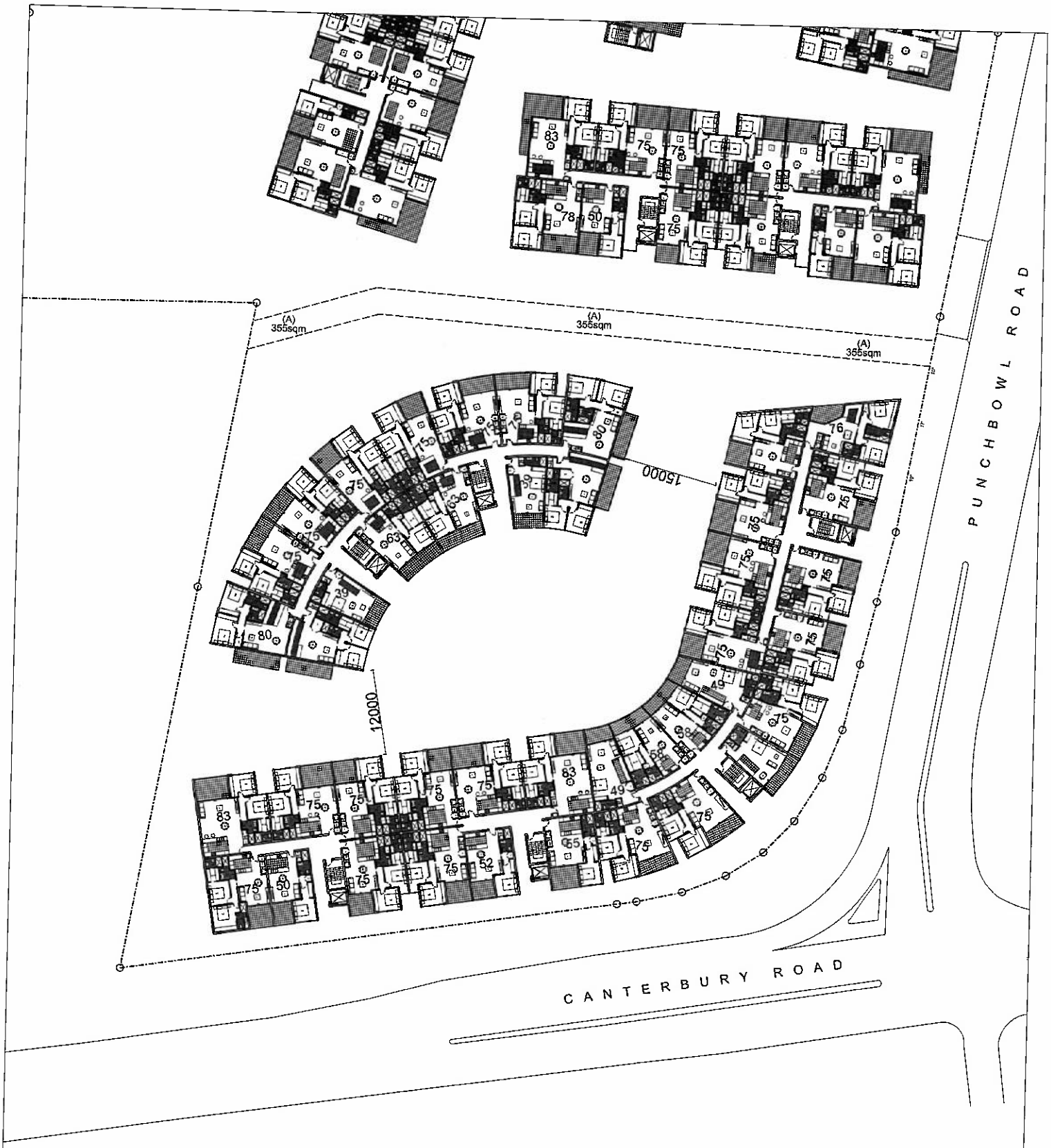
Scale	Date	Drawn	Checked
1:250 @ A1 1:500 @ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.04		A

Design File Ref: Arc/Active/921 Punchbowl Rd.DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
Do not scale from drawings.
All dimensions to be checked on site prior to commencement of work.
All discrepancies to be brought to the attention of the Architect.
Larger scale drawings and written dimensions take preference.

Design Architect: Chris Tsioulos - Reg. No. 5143



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Client
TBA

Project
Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title
Second: South

Scale	Date	Drawn	Checked
1:250 @ A1 1:500 @ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.03		A

Design File Ref: Archi/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
Do not scale from drawings.
All dimensions to be checked on site prior to commencement of work.
All discrepancies to be brought to the attention of the Architect.
Larger scale drawings and written dimensions take preference.

Design Architect: Chris Tsioulos - Reg. No. 5143

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ACN: 161 791 715

Client:
TBA

Project
Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title
Third Floor Plan

Scale	Date	Drawn	Checked
1:500@ A1 1:1000@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.11		A

Design File Ref; Archicad/v/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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All dimensions to be checked on site prior to commencement of work.
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Design Architect: Chris Tsioulos - Reg. No. 5143

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Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Third: North

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.10		A

Design File Ref: Archi/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
Drawings in this set are not for construction.
Do not scale from drawings.
All dimensions to be checked on site prior to commencement of work.
All discrepancies to be brought to the attention of the Architect.
Larger scale drawings and written dimensions take preference.
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Design Architect: Chris Talculos - Reg. No. 5143

DA SUBMISSION

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E: info@cmtarchitects.com
Web: www.cmtarchitects.com
ACN: 161 791 715

Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Third: South

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.09		A

Design File Ref: Arch/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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Design Architect: Chris Talaulas - Reg. No. 5143

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Web: www.cmtarchitects.com
ACN: 151 791 715

Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Fourth Floor Plan

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.14		A

Design File Ref: Archi/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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Design Architect: Chris Taloulos - Reg. No. 5143

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Client
TBA

Project
Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title
Fourth: North

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No.	Drawing No.		Issue
00 00 00	DA 1.13		A

Design File Ref: Archi/Active/921 Punchbowl Rd.DA

Issue	Date	Description	By

Notes
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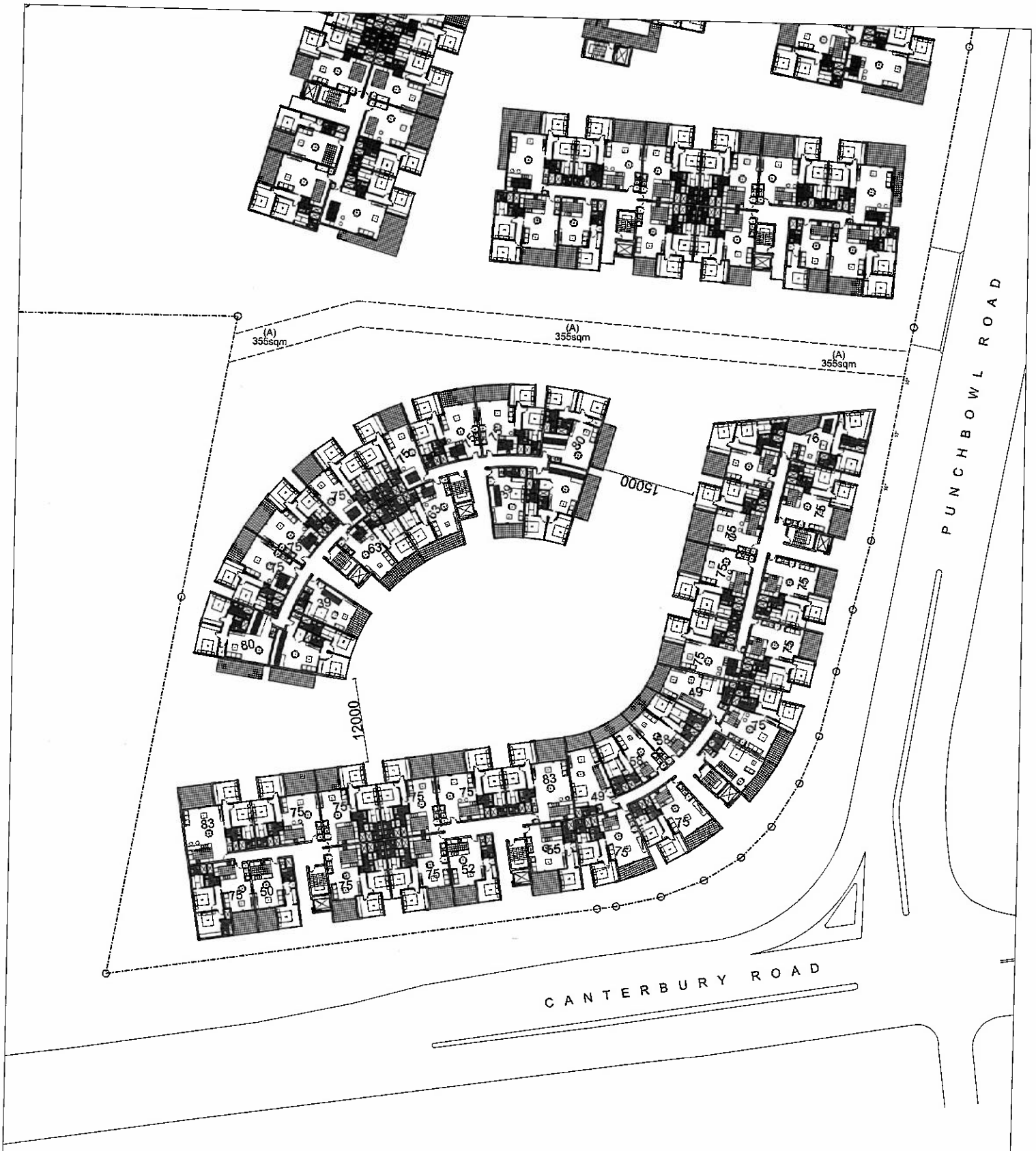
Design Architect: Chris Talaulos - Reg. No. 5143



DA SUBMISSION

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ACN: 161 791 715

Client: TBA

Project: Residential Development
No. 921 Punchbowl Rd,
Punchbowl NSW 2196

Drawing Title: Fourth: South

Scale	Date	Drawn	Checked
1:250@ A1 1:500@ A3	21.07.16	AS	CT
Job No. 00 00 00	Drawing No. DA 1.12		Issue A

Design File Ref: Archi/Active/921 Punchbowl Rd/DA

Issue	Date	Description	By

Notes
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Larger scale drawings and written dimensions take preference.

Design Architect: Chris Tsiolakis - Reg. No. 5143

MIXED USE DEVELOPMENT

21 Canterbury Road, Punchbowl

DWG NO.	DRAWING TITLE	SCALE	ISSUE	DATE
000	COVER SHEET & LOCATION PLAN	N.T.S.	E	01.06.2017
100	LANDSCAPE MASTERPLAN	1:400	E	01.06.2017
C100	LANDSCAPE MASTERPLAN RENDER	1:400	E	01.06.2017
101	LANDSCAPE PLAN - CIVIC PLAZA	1:200	E	01.06.2017
102	LANDSCAPE PLAN - RESIDENTIAL	1:200	E	01.06.2017
103	LANDSCAPE PLAN - RESIDENTIAL	1:200	E	01.06.2017
104	LANDSCAPE PLAN - LEVEL 3 TERRACE	1:50	E	01.06.2017
501	LANDSCAPE DETAILS	AS SHOWN	E	01.06.2017
502	LANDSCAPE SPECIFICATION & INDICATIVE PLANT SCHEDULE		E	01.06.2017

01/000 LOCATION PLAN
N.T.S.

NOT FOR CONSTRUCTION

The contractor will check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	28.07.2016

LEGEND

Key Plan

Client:
Waldron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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Landscape Architects

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Fax: (61 2) 9699 2877
www.siteimage.com.au
Site Image (NSW) Pty Ltd
ABN 44 991 282 260

DEVELOPMENT APPLICATION

Drawing Name:
COVER SHEET

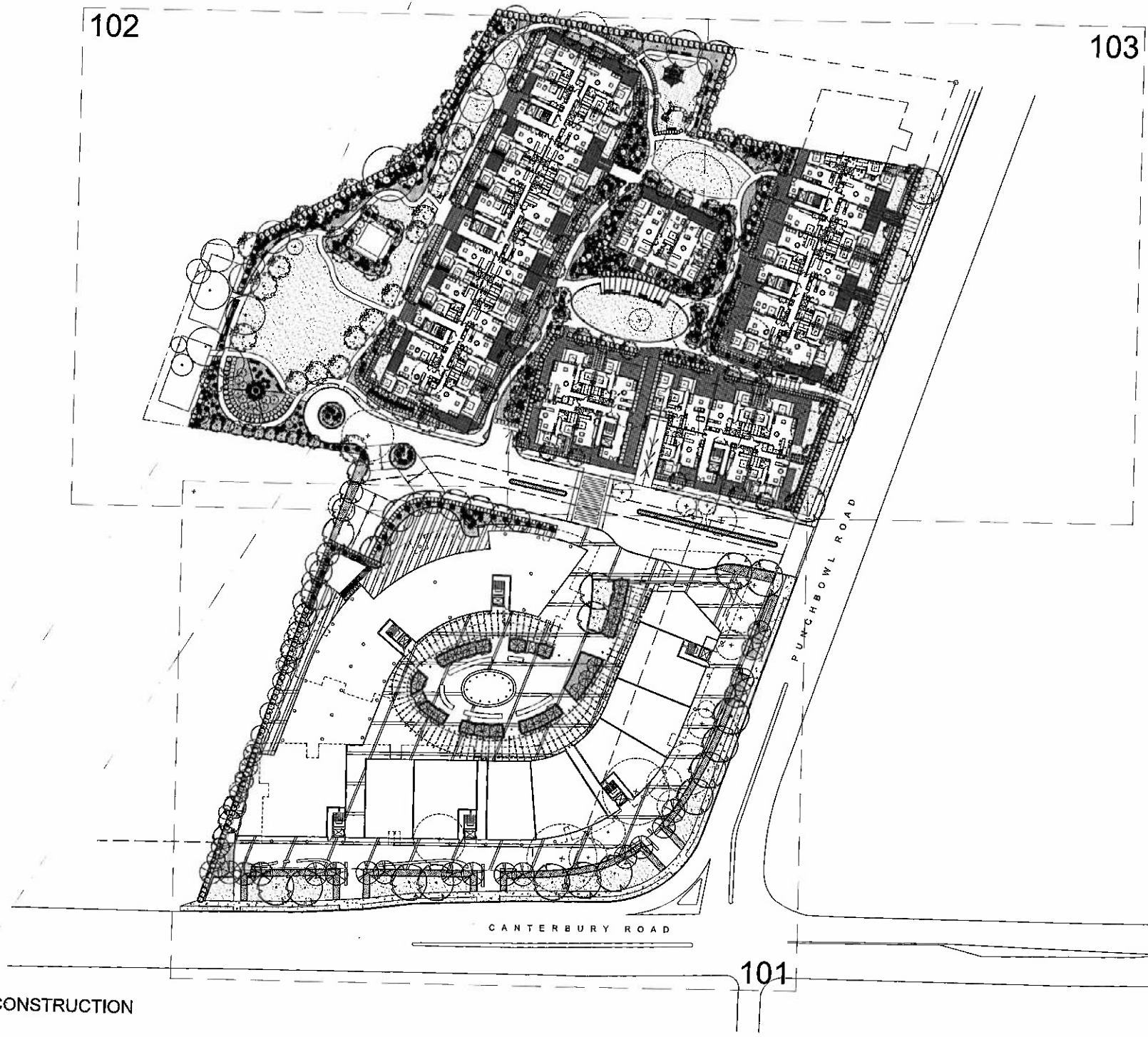
Scale: 1:1000 @ A1
0 5 10 20 50m

Job Number:
SS16-3349

Drawing Number:
000

Issue:
E

Sheet _ of _



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Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	AN	RS	28.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Palm Trees
- Proposed Shrub Planting
- Proposed Accent Planting
- Proposed Groundcover
- Turf
- Proposed Paving Type 1
- Proposed Paving Type 2
- Proposed Bench Seating
- Proposed Pergola Structure

Key Plan:

Client:
Waldron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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Site Image (NSW) Pty Ltd
ABN 44 001 282 550
Landscape Architects

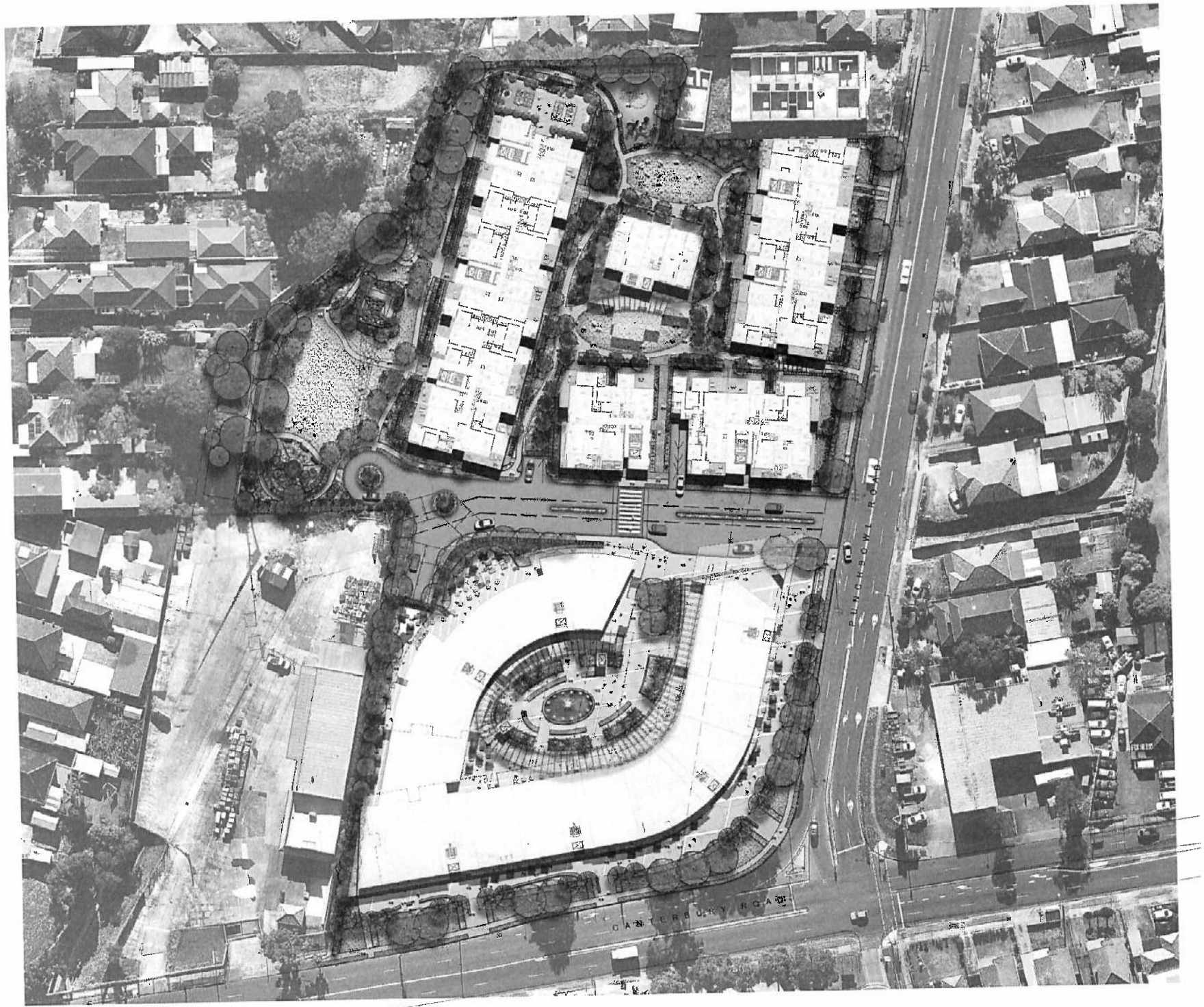
DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE MASTERPLAN

Scale: 1:400 @ A1
0 2 4 8 12 20m
Sheet _ of _
Job Number: SS16-3349
Drawing Number: 100
Issue: E

NOT FOR CONSTRUCTION

A1



NOT FOR CONSTRUCTION

A1

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Issue	Revision	Description	Drawn	Check	Date
E		For DA	PH	RS	04.08.2017
D		For DA	NP	RS	23.03.2017
C		For Approval	PH	RS	13.12.2016
B		For Review	PH	RS	21.11.2016
A		For Review	NH	RS	28.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Palm Trees
- Proposed Shrub Planting
- Proposed Accent Planting
- Proposed Groundcover
- Turf
- Proposed Paving Type 1
- Proposed Paving Type 2
- Proposed Bench Seating
- Proposed Pergola Structure

Key Plan:

Client:
Walcron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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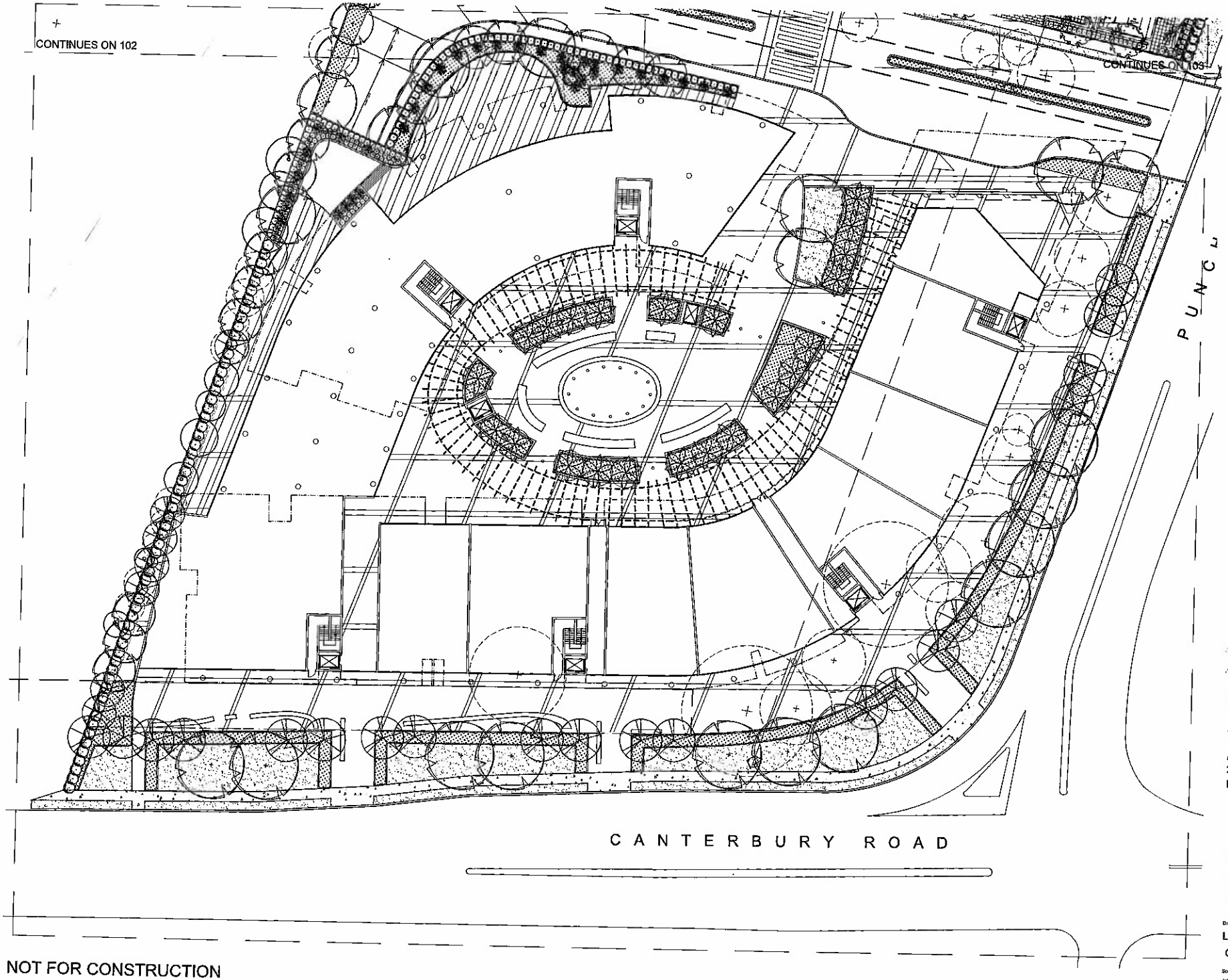
DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE MASTERPLAN

Scale: 1:400 @ A1
Job Number
SS16-3349

Sheet _ of _
0 4 8 12 20m
Drawing Number: C100
Issue: E



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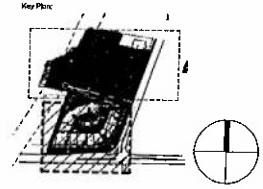
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	28.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Palm Trees
- Proposed Shrub Planting
- Proposed Accent Planting
- Proposed Groundcover
- Turf
- Proposed Paving Type 1
- Proposed Paving Type 2
- Proposed Bench Seating
- Proposed Pergola Structure

Key Plan:



Client:
Waldron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE PLAN
CIVIC PLAZA

Scale: 1:200 @ A1
Job Number: SS16-3349
Drawing Number: 101
Sheet _ of _
Title
Issue: E

NOT FOR CONSTRUCTION

A1

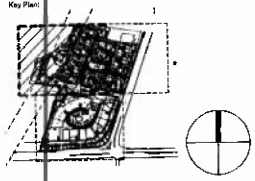
This contractor must check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	12.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	28.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Palm Trees
- Proposed Shrub Planting
- Proposed Accent Planting
- Proposed Groundcover
- Turf
- Proposed Paving Type 1
- Proposed Paving Type 2
- Proposed Bench Seating
- Proposed Pergola Structure

Key Plan:



Client:
Walcron Hill Developments

Architect:
CMT Architects

Project:
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Punchbowl

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DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE PLAN
RESIDENTIAL

Scale: 1:200 @ A1
0 2 4 6 10m

Job Number: SS16-3349
Drawing Number: 102
Issue: E

CONTINUES ON 101

CONTINUES ON 103

NOT FOR CONSTRUCTION

A1

NOT FOR CONSTRUCTION

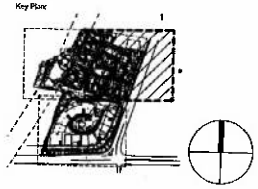
A1

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	15.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	25.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Palm Trees
- Proposed Shrub Planting
- Proposed Accent Planting
- Proposed Groundcover
- Turf
- Proposed Paving Type 1
- Proposed Paving Type 2
- Proposed Bench Seating
- Proposed Pergola Structure

Key Plan:



Client:
Waldron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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Fax: (61 2) 9698 2977
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DEVELOPMENT APPLICATION

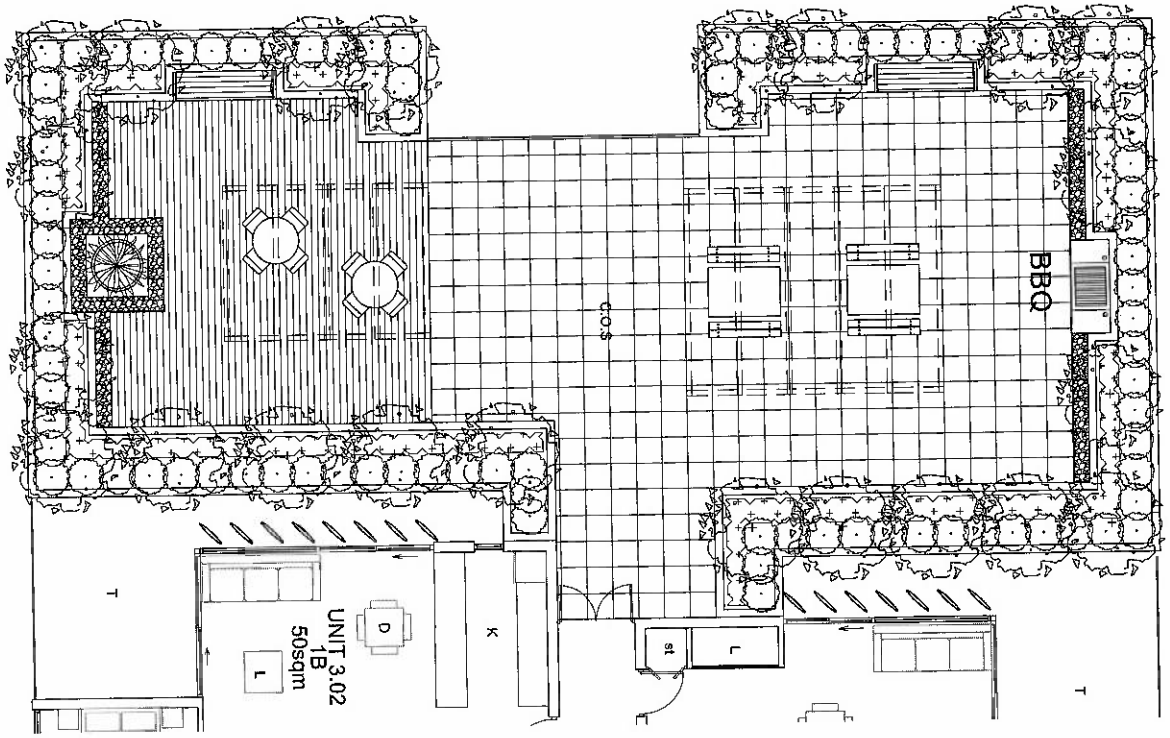
Drawing Name:
LANDSCAPE PLAN
RESIDENTIAL

Scale: 1:200 @ A1
Job Number:
SS16-3349

Drawing Number:
103

Issue:
E

Sheet _ of _
0 2 4 6 10m



01/104 LANDSCAPE PLAN - LEVEL 3 TERRACE
SCALE 1:50

NOT FOR CONSTRUCTION

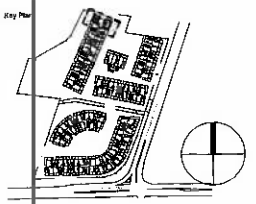
A1

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.05.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	28.07.2016

LEGEND

- Proposed Tree Planting
- Proposed Shrub Planting
- Proposed Groundcover
- Proposed Pot Planting
- Proposed Pebble Paving
- Proposed Timber Decking
- Proposed Paving
- Proposed Table & Chairs
- Proposed Pergola Structure
- BBQ facilities

Key Plan



Client:
Waldron Hill Developments

Architect:
CM+ Architects

Project:
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Punchbowl

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Fax: +61 2) 9698 2877
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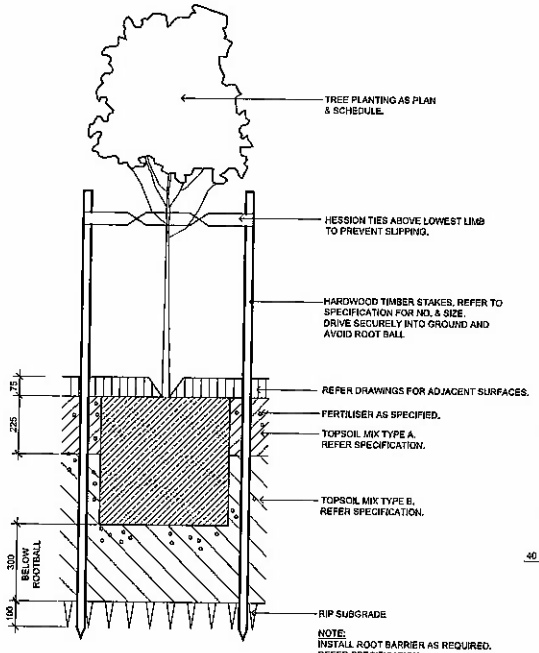
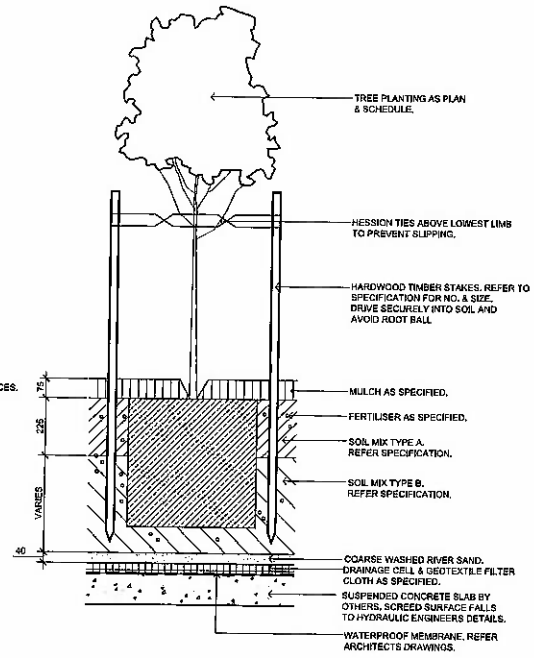
DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE PLAN
LEVEL 3 TERRACE

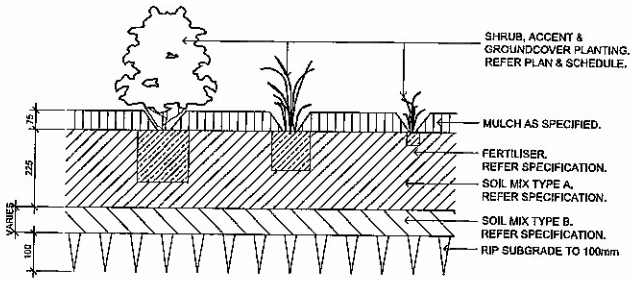
Scale: 1:50 @ A1
0 0.5 1 1.5 2 2.5m
Job Number: SS16-3349
Drawing Number: 104
Issue: D
Sheet _ of _



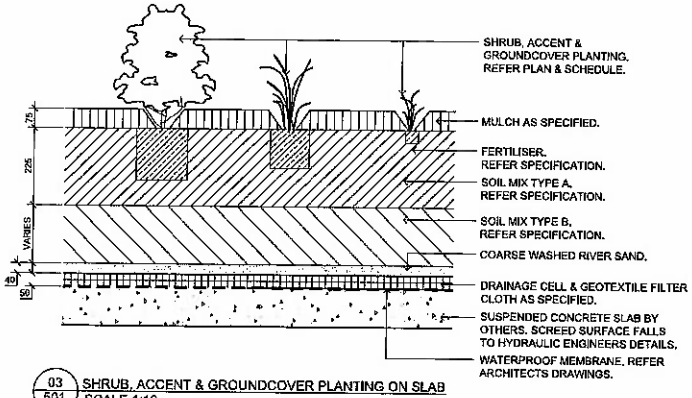
01/501 75-200L TREE PLANTING ON GRADE
SCALE 1:10



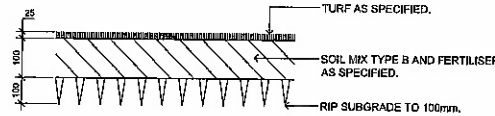
02/501 75-200L TREE PLANTING ON SLAB
SCALE 1:10



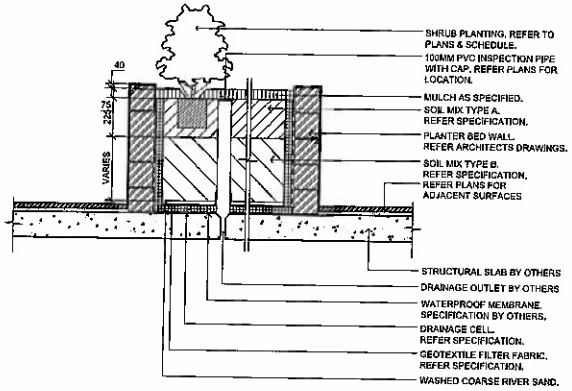
05/501 SHRUB, ACCENT & GROUNDCOVER PLANTING ON GRADE
SCALE 1:10



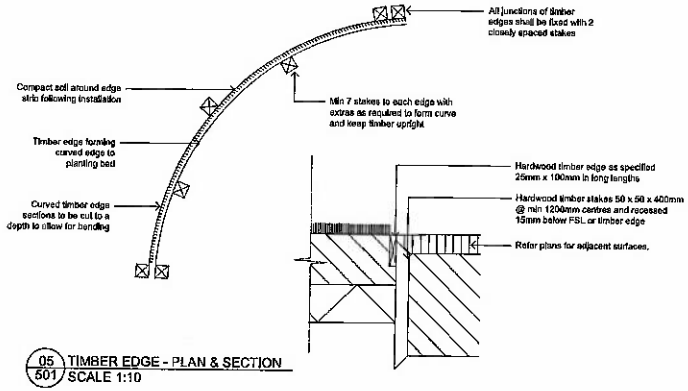
03/501 SHRUB, ACCENT & GROUNDCOVER PLANTING ON SLAB
SCALE 1:10



04/501 TURF ON EVEN GRADE
SCALE 1:10



06 TYP. RAISED PLANTER BED ON SUSPENDED SLAB - SECTION
SCALE 1:20



05/501 TIMBER EDGE - PLAN & SECTION
SCALE 1:10

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.06.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	28.07.2016

LEGEND

Key Plan

Client:
Waldron Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE DETAILS

Sheet _ of _

Scale: AS SHOWN
Job Number: SS16-3349
Drawing Number: 501
Issue: E

NOT FOR CONSTRUCTION

A1

21 Canterbury Road, Punchbowl
INDICATIVE PLANT SCHEDULE

BOTANIC NAME	COMMON NAME	HEIGHT	WIDTH	POT SIZE	WATER USE	INDIGENOUS/ EXOTIC
TREES						
Acer negundo	Box Alder	15m	8m	100Lt	L	Exotic
Brachychiton acerifolius	Illawarra Flame Tree	25m	5m	100Lt	L	Indigenous
Corymbia maculata	Spotted Gum	30m	8m	100Lt	L	Indigenous
Elaeocarpus reticulatus	Blueberry Ash	12m	5m	100Lt	L	Indigenous
Eucalyptus moluccana	Grey Box	14m	8m	100Lt	L	Indigenous
Eucalyptus robusta	Swamp Mahogany	15m	5m	100Lt	L	Indigenous
Fraxinus 'Raywood'	Claret Ash	10m	7m	100Lt	M	Exotic
Lagestroemia indica	Crepe Myrtle	6m	3m	75Lt	L	Exotic
Magnolia grandiflora 'Exmouth'	Southern Magnolia	12m	8m	100L	M	Exotic
Magnolia 'Little Gem'	Dwarf Magnolia	5m	3m	75Lt	H	Exotic
Melaluca quinqenervia	Broad Leaf Paperbark	15m	7m	100Lt	L	Indigenous
Pistacia chinensis	Pistachio	8m	4m	75L	M	Exotic
Tristaniopsis laurina	Water Gum	10m	8m	100Lt	L	Indigenous
Waterhousia floribunda	Weeping Lillypilly	15m	8m	100Lt	M	Indigenous
SHRUBS						
Abelia grandiflora	Abelia	2m	2m	300mm	L	Exotic
Acmena smithii 'Allyn Magic'	Dwarf Acmena	0.5m	0.5m	300mm	L	Indigenous
Acmena smithii 'Cherry Surprise'	Cherry Surprise	3m	2m	300mm	L	Indigenous
Banksia oricifolia	Heath Banksia	4m	3m	300mm	L	Indigenous
Buxus microphylla	Japanese Box	1.5m	1.5m	300mm	M	Exotic
Breynia oblongifolia	Coffee Bush	3m	1.5m	300mm	L	Indigenous
Callistemon citrinus 'White Anzac'	Lemon Scented Bottlebrush	1m	2m	300mm	L	Exotic
Callistemon viminalis Little John	Little John Bottlebrush	0.8m	0.8m	300mm	L	Exotic
Ceratopetalum gummiferum	NSW Christmas Bush	6m	01.5m	300mm	L	Indigenous
Convolvulus cenorum	Silver Bush	0.6m	0.8m	300mm	L	Exotic
Elaeocarpus reticulatus	Blueberry Ash	3m	3m	300mm	L	Indigenous
Eriostemon myoporoides	Wax Flower	1.5m	1.5m	300mm	L	Indigenous
Gardenia augusta Florida	Gardenia	1.5m	1.5m	300mm	H	Exotic
Leucophyta brownii	Cushion Bush	1m	1m	300mm	L	Exotic
Murraya paniculata	Mock Orange	3m	2m	300mm	M	Exotic
Persoonia levis	Broad-leaf Geebung	4m	2m	300mm	L	Indigenous
Pittosporum tobira 'Miss Muffet'	Dwarf Pittosporum	0.8m	1.5m	300mm	L	Exotic
Photinia glabra 'Rubens'	Dwarf Photinia	3m	2m	300mm	L	Exotic
Rhaphiolepis Oriental Pearl	Indian Hawthorne	1.5m	2m	300mm	L	Exotic
Syzygium australe 'Tiny Trev'	Dwarf Lilly Pilly	0.8m	0.8m	300mm	M	Exotic
Syzygium 'Caeste'	Pink Flowering Lilly Pilly	2.5m	1.5m	300mm	M	Exotic
Viburnum tinus	Laurestinus	3m	2m	300mm	L	Exotic
Westringia fruticosa	Native Rosemary	2m	2m	300mm	L	Indigenous
ACCENT						
Asplenium australasicum	Birds Nest Fern	1m	1m	300mm	L	Indigenous
Cycas revoluta	Japanese Sago	1.5m	1.5m		M	Exotic
Doryanthes excelsa	Gymea Lily	2m	2m	200mm	L	Indigenous
Phormium tenax 'Bronze Baby'	Dwarf Flax	0.75m	0.8m		L	Exotic
Strelitzia reginae	Bird of Paradise	1.5m	1.5m	300mm	M	Exotic
Yucca Sp.	Yucca	1.5m	1m	200mm	L	Exotic
GROUNDCOVERS AND GRASSES						
Carpobrotus glaucescens	Pigface	1m	1m	150mm	L	Exotic
Carex appressa	Tall Sedge	0.8m	0.6	150mm	M	Indigenous
Convolvulus mauritanicus	Ground Morning Glory	0.1m	0.9m	150mm	L	Exotic
Clivia miniata	Kaffir Lily	0.45m	0.5m	150mm	H	Exotic
Dianella 'Breeze'	Breeze Flax Lily	0.7m	0.6m	150mm	L	Indigenous
Dianella caerulea	Paroo Lily	0.8m	0.6m	150mm	L	Indigenous
Dianella 'Cassa Blue'	Cassa Blue Flax Lily	0.40	0.40	150mm	L	Indigenous
Dianella 'Silver Streak'	Silver Streak Flax Lily	0.5m	0.4m	150mm	L	Indigenous
Hardenbergia violaecea	False Sarsaparilla	0.3m	2m	150mm	L	Exotic
Hibbertia scandens	Climbing Guinea Flower	0.3m	4m	150mm	L	Indigenous
Imperata cylindrica	Blady Grass/Cogon Grass	0.6m	0.3m	150mm	M	Exotic
Microlaena stipoides	Weeping Grass	0.7m	0.3m	150mm	L	Indigenous
Liriope muscari 'Evergreen Giant'	Lily Turf	0.8m	0.5m	150mm	M	Exotic
Lomandra longifolia	Matt Rush	1m	0.5m	150mm	L	Indigenous
Lomandra longifolia 'Tanika'	Mat Rush	0.3m	0.7m	150mm	L	Indigenous
Poa poiformis 'Courtney'	Poa	0.5m	0.2m	150mm	L	Indigenous
Scaevola aemula 'Mauve Clusters'	Purple Fan Flower	0.3m	0.8m	150mm	M	Exotic
Themeda australis	Kangaroo Grass	0.6m	0.3m	150mm	L	Indigenous
Trachelospermum jasminoides	Star Jasmine	.75m	6m	150mm	M	Exotic
Viola hederacea	Native Violet	0.1m	0.3m	150mm	L	Indigenous

NOT FOR CONSTRUCTION

A1

LANDSCAPE SPECIFICATION NOTES

GENERALLY
THE CONTRACTOR SHALL PLACE ORDERS FOR THE DELIVERY OF ALL MATERIALS, SUPPLIES, ETC., IMMEDIATELY AFTER SIGNING THE CONTRACT AND ENSURE THE SUPPLIERS GUARANTEE DELIVERY AT ALL TIMES TO ACCORD WITH THE CONSTRUCTION PROGRAM.

SITE PREPARATION
ENSURE ALL PROVISIONS FOR LANDSCAPE TO BE PROVIDED BY THE BUILDER ARE COMPLETE AND ALL CONTRACTORS RUBBISH AND DEBRIS IS REMOVED;

DRAINAGE CELL AND FILTER FABRIC
FOR ON-SLAB AREAS INSTALL AN APPROVED 'DRAINAGE CELL' PRODUCT TO COMPREHENSIVELY COVER THE BOTTOM OF ALL PLANTERS.

OVER DRAINAGE CELL TO ON-SLAB AREAS, A POLYFELT GEOTEXTILE LINING (AS SUPPLIED BY 'POLYFELT TS' OR APPROVED EQUIVALENT) IS TO BE INSTALLED TO COVER THE BOTTOM OF ALL PLANTERS, TURNED UP 300MM AND TAPED TO THE PLANTER SIDES TO ENSURE SOIL MIX DOES NOT ESCAPE INTO DRAINAGE OUTLETS/HOLES.

INSTALL MIN. 50MM COARSE RIVER SAND OVER ALL GEOTEXTILE LINING PRIOR TO INSTALLATION OF SOIL MIX.

ABORIST MANAGEMENT OF TREE PROTECTION
A QUALIFIED AND APPROVED ABORIST IS TO BE CONTRACTED TO UNDERTAKE OR MANAGE THE INSTALLATION OF PROTECTIVE FENCING, AND TO UNDERTAKE SUCH MEASURES AS HE DEEMS APPROPRIATE TO PRESERVE THE SUBJECT TREES TO BE RETAINED. THE ARBORIST IS TO BE RETAINED FOR THE ENTIRE CONTRACT PERIOD TO UNDERTAKE ONGOING MANAGEMENT AND REVIEW OF THE TREES.

IMPORTED SOIL MIX
IMPORTED LIGHTWEIGHT SOIL MIX FOR ON-SLAB AREAS AND POTS:
LIGHTWEIGHT SOIL MIX SHALL BE COMPOSED OF THE FOLLOWING MATERIALS AND MIXED IN THE GIVEN PROPORTIONS TO PRODUCE A MATERIAL WITH A PH 6.0-6.5

SOIL MIX PER CUBIC METRE SHALL CONSIST OF:
- 30% KENTHURST BLACK LOAM
- 30% DOUBLE WASHED COARSE SAND
- 20% AUSTRALIAN PEAT
- 10% COMPOSTED BARK FINES
- 10% COMPOSTED HARDWOOD DUST

FERTILISER PER CUBIC METRE SHALL CONSIST OF
- 500GMS CALCIUM NITRATE
- 500GMS POTASSIUM SULPHATE
- 750GMS SUPERPHOSHATE MICRO FINE
- 1 KG IBDU (NITROGEN SLOW RELEASE)
- 1 KG SLOW RELEASE NUTRICOTE

PLANT MATERIAL
ALL PLANTS SHALL BE WELL GROWN, DISEASE FREE NURSERY STOCK, AND TRUE TO SPECIES TYPE. NO SPECIES SHALL BE SUBSTITUTED WITHOUT THE APPROVAL OF THE SUPERINTENDENT. NO VARIEGATED STRAIN SHALL BE USED UNLESS NOMINATED.

ALL PLANTS SHALL BE OF THE SIZE AND QUALITY CONSISTENT WITH THE NORMAL INDUSTRY EXPECTATION FOR THE NOMINATED CONTAINER SIZE. PLANTS NOT CONSISTENT WITH THE ABOVE MAY BE REJECTED WITH REPLACEMENT STOCK SUBJECT TO THE APPROVAL OF THE SUPERINTENDENT.

ALLOW TWO AGRIFORM SLOW RELEASE PELLETS PER 5-25 LITRE PLANT AND ONE PER 150MM PLANT. ALL FERTILISER IS TO BE APPLIED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.

MULCH
TO MASS PLANTING AREAS AND STREET TREES INSTALL 75MM THICKNESS OF GRADED PINE BARK AS SUPPLIED BY AUSTRALIAN NATIVE LANDSCAPES P/L OR APPROVED EQUIVALENT. ALL MULCH SHALL BE FREE OF VEGETATIVE REPRODUCTIVE PARTS OF WEEDS

IRRIGATION SYSTEM
SUPPLY AN AUTOMATIC WATERING SYSTEM USING 'TORO IRRIGATION SYSTEM' OR SIMILAR APPROVED, WITH MICRO-JET SPRINKLER HEADS AND LOW DENSITY, RUBBER MODIFIED POLYPROPYLENE RETICULATION, TO INCLUDE FILTERS, BENDS JUNCTIONS, ENDS AND OTHER ANCILLARY EQUIPMENT. THE LANDSCAPER SHALL NOMINATE HIS SOURCE OF SUPPLY FOR THE WATERING SYSTEM AND OBTAIN APPROVAL FROM THE SUPERINTENDENT BEFORE PLACING ORDERS FOR EQUIPMENT OR SUPPLY.

A SCHEMATIC PLAN OF THE PROPOSED IRRIGATION SYSTEM IS TO BE PREPARED BY THE CONTRACTOR, SHOWING SOLENOIDS, PIPE DIAMETERS, AND ALL NOZZLE AND TRICKLE ATTACHMENT TYPES (INCLUDING SPRAY/HEAD ANGLE), FOR REVIEW BY THE SUPERINTENDENT PRIOR TO INSTALLATION

THE CONTRACTOR IS TO LIASE WITH THE HYDRAULIC ENGINEER AND COUNCIL AS NECESSARY, TO ENSURE THE THE IRRIGATION SYSTEM CONFORMS WITH ALL THE COUNCIL AND WATER BOARD CODES AND REQUIREMENTS.

PROVIDE AN AUTOMATIC CONTROLLER THAT PROVIDES FOR TWO WEEK SCHEDULING AND HOURLY MULTI-CYCLE OPERATION. THE CONTROLLER SHALL MANUAL OVERRIDE. PROGRAMMING SHALL BE UNDERTAKEN BY THE CONTRACTOR WHO SHALL ADVISE ON THE OPERATION OF THE SYSTEM.

PROVISION OF SECURE HOUSING FOR THE AUTOMATIC IRRIGATION CONTROLLER TO BE LOCATED IN ASSOCIATION WITH THE LANDSCAPE CONTRACTOR AND LOCATION CONFIRMED BY THE SUPERINTENDENT. WIRING TO CONNECT REMOTE SOLENOID LOCATIONS IS TO BE PROVIDED. THE CONTROLLER SHALL BE LOCATED IN A DRY PLACE, PROTECTED FROM THE WEATHER, AND ALL CABLE CONNECTIONS SHALL BE MADE WITH WATERPROOF CONNECTORS.

WATER SUPPLY POINTS TO BE SUPPLIED BY BUILDER.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE AND GUARANTEE SATISFACTORY OPERATION OF THE IRRIGATION SYSTEM.

AFTER THE SYSTEM HAS BEEN INSTALLED TO THE SATISFACTION OF THE SUPERINTENDENT, THE INSTALLATION SHALL BE TESTED UNDER KNOWN WORKING CONDITIONS. ACCEPTANCE OF THE INSTALLED PLANT AND EQUIPMENT SHALL BE SUBJECT TO THESE BEING SATISFACTORY.

TREATED PINE TIMBER EDGING
TIMBER EDGE: 100 X 25mm CCA TREATED RADIATA PINE
TIMBER STAKES: 50 X 50 X 500mm CCA TREATED RADIATA PINE--SHARPENED AT ONE END.
INSTALL IN LOCATIONS SHOWN ON THE DRAWINGS FLUSH TO FINISHED SURFACE LEVELS.

TURF
TURF ALL LANDSCAPE AREAS AS SHOWN ON THE LANDSCAPE DRAWINGS. TURF IS TO HAVE AN EVEN THICKNESS OF NOT LESS THAN 25mm. OBTAIN TURF FROM AN APPROVED GROWER. FURNISH A WARRANTY FROM THE GROWER THAT THE TURF IS FREE FROM WEEDS AND OTHER FOREIGN MATTER. DELIVER TURF TO THE SITE WITHIN 24 HOURS OF BEING CUT, AND LAY IT WITHIN 24 HOURS OF BEING DELIVERED.

TO PREPARE GRADED AREAS TO RECEIVE TURF, EXCAVATE THE AREA AND CULTIVATE SO AS TO ALLOW FOR IMPORTING OF 100mm OF TURF UNDERLAY SOIL. REMOVE ALL STONES OVER 50mm ø AND REMOVE ALL WEEDS AND FOREIGN MATTER. SPREAD SOIL MIX A.B.S TO A DEPTH OF 100mm AND GRADE TO APPROPRIATE LEVELS TO ACHIEVE GENERAL EVEN GRADES TO DRAINAGE OUTLETS INSTALLED BY OTHERS.

LAY THE TURF ALONG THE LAND CONTOURS WITH STAGGERED, CLOSE BUTTED JOINTS, SO THAT THE FINISHED TURF SURFACE IS FLUSH WITH ADJACENT FINISHED SURFACES OF PAVING AND THE LIKE. AS SOON AS PRACTICABLE AFTER LAYING, ROLL THE TURF WITH A ROLLER WEIGHING NOT MORE THAN 90kg PER METRE OF WIDTH FOR SANDY OR LIGHT SOILS.

WATER AS NECESSARY TO KEEP THE SOIL MOIST TO A DEPTH OF 100MM. PROTECT NEWLY TURFED AREAS AGAINST TRAFFIC UNTIL GRASS IS ESTABLISHED. FERTILISE TWO WEEKS AFTER LAYING FERTILISE A.B.S

'TOP DRESS' THE TURF WHEN IT IS ESTABLISHED TO A DEPTH OF 10MM WITH COARSE WASHED RIVER SAND. RUB THE DRESSING WELL INTO THE JOINTS AND CORRECT ANY UNEVENNESS IN THE TURF SURFACES.

MAINTENANCE
THE CONTRACTOR SHALL MAINTAIN THE CONTRACT AREAS BY THE IMPLEMENTATION OF INDUSTRY ACCEPTED HORTICULTURAL PRACTICES, AS WELL AS RECTIFYING ANY DEFECTS THAT BECOME APPARENT IN THE WORKS UNDER NORMAL USE.

THE CONTRACTOR SHALL MAINTAIN THE WORKS AND MAKE GOOD ALL THE DEFECTS.

LANDSCAPE MAINTENANCE SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: WATERING, ADJUSTMENT OF THE IRRIGATION SYSTEM, RUBBISH REMOVAL, REPLACING FAILED PLANTS, MAINTAINING MULCH, PRUNING, INSECT AND DISEASE CONTROL, AND CLEANING OF THE SURROUNDING AREA.

The contractor shall check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Revision Description	Drawn	Check	Date
E	For DA	PH	RS	01.08.2017
D	For DA	NP	RS	23.01.2017
C	For Approval	PH	RS	13.12.2016
B	For Review	PH	RS	21.11.2016
A	For Review	NH	RS	26.07.2016

LEGEND

Key Plan:

Client:
Walcon Hill Developments

Architect:
CMT Architects

Project:
21 Canterbury Road
Punchbowl

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Site Image (NSW) Pty Ltd
ABN 44 601 282 360
Landscape Architects

DEVELOPMENT APPLICATION

Drawing Name:
LANDSCAPE SPECIFICATIONS & INDICATIVE PLANT SCHEDULE
Sheet _ of _

Scale: AS SHOWN
Job Number: SS16-3349
Drawing Number: 502
Issue: E

CANTERBURY ROAD
BRAMHALL AVENUE
PUNCHBOWL ROAD
PUNCHBOWL ROAD