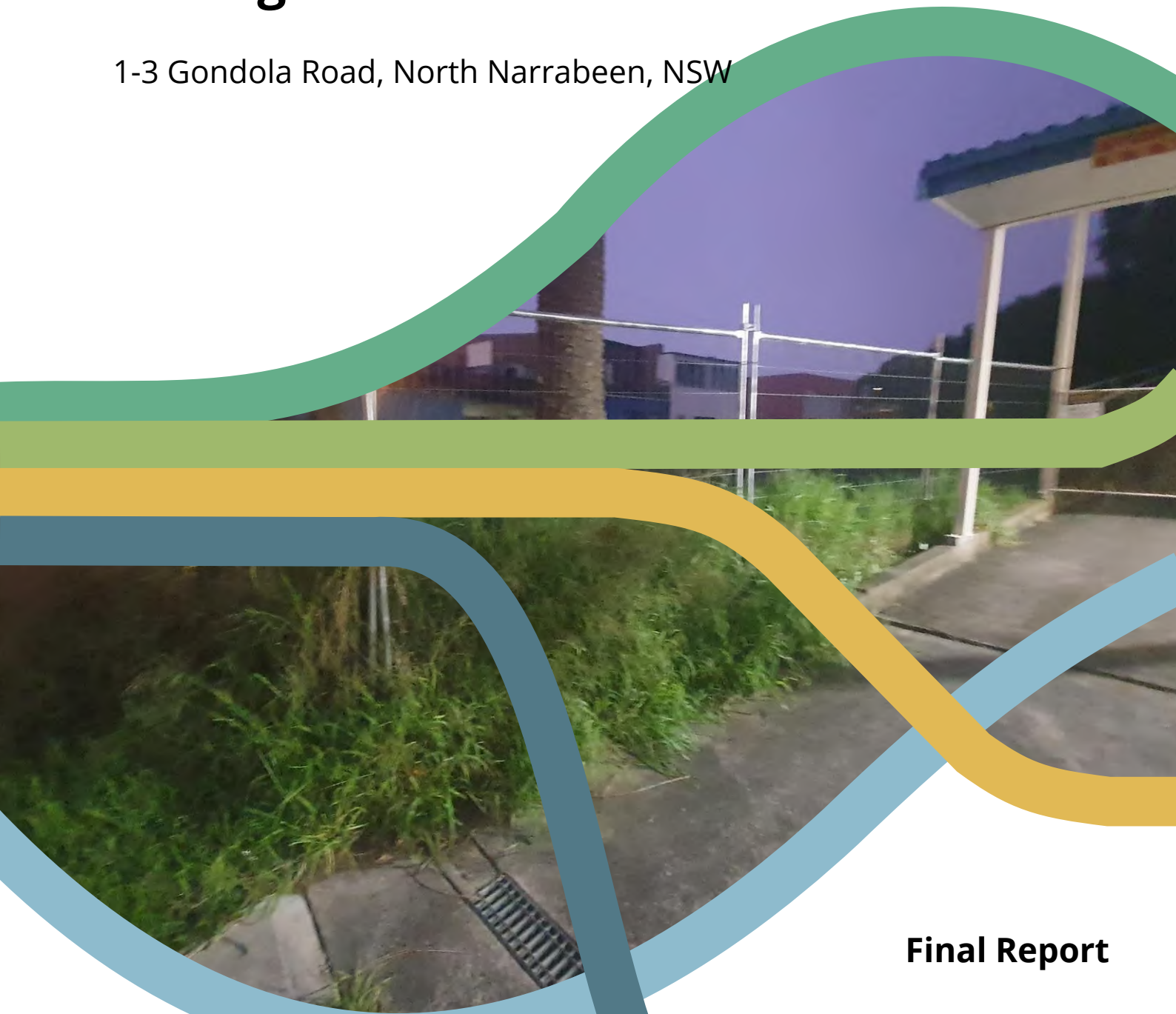
Hydrogeology Assessment and Groundwater Dewatering Management Plan

1-3 Gondola Road, North Narrabeen, NSW



Final Report

P2310036JR05V01

August 2024

Prepared For Brett Crowther

environmental science & engineering

Project Details

Report Title	Hydrogeology Assessment and Groundwater Dewatering Management Plan: 1-3 Gondola Road, North Narrabeen, NSW
Client	Brett Crowther
Document	P2310036JR05V01
Director	Daniel Martens
Manager	Gray Taylor
Principal Author	Trystan Richards

Document History

Issue	Issue Date	Status	Description / Comment	Author	Reviewer	Approved
1	12/08/2024	Final	For development application	TR	BM	GT

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1 Introduction

1.1 Overview

This report documents a Hydrogeology Assessment (**HA**) and Groundwater Dewatering Management Plan (**GDMP**) completed by Martens and Associates Pty Ltd (**MA**) on behalf of Brett Crowther (the **Client**), for proposed new three storey mixed use development with basement carpark with bulk excavation up to approximately 1.1mAHD at 1-3 Gondola Road, North Narrabeen, NSW (the **Site**).

This report has been prepared to support a development application (**DA**) to Northern Beach Council (**NBC**).

1.2 Proposed Development

1.2.1 Overview

MA understands from provided architectural plans that the development will include construction of a new three storey mixed-use building. The development will include one level of basement carpark with bulk excavation to approximately 1.1 mAHD with a lift well base level of approximately -0.1 mAHD.

1.2.2 Basement Extent

The proposal includes a single level basement with a finished floor level of 1.4 mAHD, equivalent to a bulk excavation of up to approximately 1.2 m below existing ground level (**mbgl**) to allow for a 300 mm slab to be constructed. The eastern portion of the basement contains a garage ramp from Minarto Lane, grading from a proposed level of 2 mAHD to the basement finished floor level at 1.4 mAHD. Two lifts are proposed as part of the development are expected to have lift well base levels of approximately -0.1 mAHD.

From review of preliminary structural plans provided by Mackenzie Architects International the ultimate basement construction is to include an OSD. Final structural details and methodology of OSD will be provided by the project structural engineer at the detailed design stage.

Development plans and the approximate extent of the proposed basement is shown in Appendix B.

1.3 Scope

1.3.1 Hydrogeological Assessment (HA)

The scope of the HA is noted as:

1. Undertake a desktop review of available site information including topography, geology, soil landscape and acid sulfate soils (**ASS**) risk.

2. Site inspection to assess the serviceability and condition of existing monitoring well (**MW01**).

3. Installation of one groundwater monitoring well (**MW02**) in conjunction with a geotechnical investigation.

4. Purging and development of installed monitoring wells approximately one week following Site inspection.

5. Collection of one groundwater sample from each monitoring well and subsequent laboratory analysis to assess groundwater quality.

6. Assessment of aquifer permeability characteristics through the completion of slug tests.

7. Manual measurement of groundwater levels in each monitoring well using an electronic dip meter, and monitoring of groundwater level using a data logger for a period of approximately one month.

1.3.2 Groundwater Dewatering Management Plan (GDMP)

The scope of the GDMP is as follows:

1. Assessment of anticipated groundwater interception by the proposed development

2. Calculation of predicted groundwater infiltration rates and dewatering volumes during basement and lift well construction (based on assumed timeframes).

3. Provide a monitoring plan for the duration of the construction dewatering in accordance with current Water NSW requirements.

1.4 Other Assessments

The following relevant assessments have been completed by MA for the Site:

a. *Geotechnical, Hydrogeological and Acid Sulfate Soil Assessment: 3 Gondola Road, North Narrabeen, NSW.* Report ref: P2108694JR02V03 (**MA, 2022**).

b. *Site Contamination Assessment: 1-3 Gondola Road, North Narrabeen NSW.* Report ref P2310036JR01V01 (**MA, 2024a**).

c. *Geotechnical And Acid Sulfate Soil Assessment: 1 – 3 Gondola Road, North Narrabeen, NSW.* Report ref P2310036JR02V01 (**MA, 2024b**).

d. *Acid Sulfate Management Plan: 1 – 3 Gondola Road, North Narrabeen, NSW.* Report ref P2310036JR04V01 (**MA, 2024c**).

Where required in this report, reference has been made to the findings of the above reports.

2 Hydrogeological Assessment

2.1 Site Details

A summary of Site details is provided in Table 1, with site locality plan provided in Appendix A.

Table 1: Site detail summary.

Item	Description
Site address	1-3 Gondola Road, North Narrabeen, NSW
Legal identifier	Lot 187 and 188 DP 16719 (Six Maps)
Surveyed area	1289.3 m^2 (C & A Surveyors, 2024)
Topography	The Site is relatively flat with grades < 5%. 3 Gondola Rd elevation ranges from 5.61 mAHD in the centre to 1.95 mAHD along the northern boundary (C & A Surveyors, 2024). 1 Gondola Rd elevations range from 1.91 mAHD in the northeast corner to 2.15 mAHD at the centre of the western boundary (C & A Surveyors, 2024).
Geology	The Sydney 1:100,000 Geological Sheet 9030 (Herbert, 1983) describes site geology as silty peaty quartz sand, silt and clay. Ferruginous and humic cementation in places. Common shell layers
Soil landscape	The NSW Environment and Heritage eSPADE website identifies the site as having soils of the Warriewood landscape having soils of deep, well sorted, sandy humus podzols and dark, mottled siliceous sands, overlying buried acid peats in depressions; deep podzols and pale siliceous sands on sandy rises
Acid sulfate soils	The Pittwater Local Environment Plan 2014, Acid Sulfate Soil Map (Sheet ASS – 019), the site is located within Class 3 ASS risk

2.2 Fieldworks

2.2.1 Well Installation and Development

Site inspection and installation of groundwater wells was undertaken over two separate events on 14 July 2023 and 7 March, 2024, in conjunction with geotechnical and ASS investigations at the Site. The following works were undertaken:

- Detailed Site walkover inspection.
- Drilling of 10 boreholes (BH101 – BH102 and BH201 – BH208) to a maximum investigation depth of 10.00 mbgl.
- Installation of two groundwater monitoring wells (MW01 – MW02) at each BH201(part of previous works at 3 gondola road) and BH202, with flush mounted gatic covers.

- Development of each groundwater well.
- Installation of data logger in MW02 for continuous monitoring of groundwater levels and barometric pressure.

2.2.2 Collection of Groundwater Samples

Subsequent inspection of the Site was undertaken on 11 April 2024. The following works were undertaken:

- Manual measurement of groundwater levels in each monitoring well using an electronic dip meter.
- Field screening of groundwater quality parameters using a water quality meter at each monitoring well.
- Collection of representative groundwater samples from each monitoring well location for laboratory analysis.
- Installation of data logger in MW01 for continuous monitoring of groundwater levels.

2.3 Groundwater Monitoring

2.3.1 Monitoring Methodology

Groundwater monitoring was undertaken at MW02 between 7 March 2024 and 5 July, 2024 and MW01 between 11 April 2024 – 5 July 2024. Works undertaken included:

- Continuous monitoring using a data logger at 15 minute recording intervals.
- Manual dip meter measurements taken at the beginning and end of the continuous monitoring period.
- Efforts to perform rising and falling slug tests in each monitoring well for calculation of hydraulic conductivity (k) across the Site.

2.3.2 Monitoring Results

Dip meter measurements and continuous data logger recordings are summarised in Table 2 and Table 3 respectively, and a graphical plot of collected groundwater level data is provided in Figure 1.

Table 2: 'Dip' groundwater measurement summary.

Date	Groundwater levels			
	MW01		MW02	
	mbgl	mAHD	mbgl	mAHD
4 April, 2024	1.31	0.69	1.52	0.48

Date	Groundwater levels			
	MW01		MW02	
	mbgl	mAHD	mbgl	mAHD
11 April 2024	1.13	0.87	1.4	0.6
13 May 2024	1.15	0.85	1.45	0.55
13 June 2024	1.29	0.71	1.54	0.46
5 July 2024	1.19	0.81	1.41	0.59

Table 3: Monitoring data summary (7/03/2024 – 5/07/2024).

Monitoring Well	Surface Level (mAHD)	Groundwater Level (mbgl / mAHD)			Range (m)
		Minimum	Mean	Maximum	
MW01[1]	2.00	-1.43 / 0.57	-1.22 / 0.78	-1.00 / 1.00	0.43
MW02	2.00	-1.78 / 0.22	-1.54 / 0.47	-1.01 / 0.99	0.78

1. Note: MW01 was only monitored between 11 April 2024 – 5 July 2024.

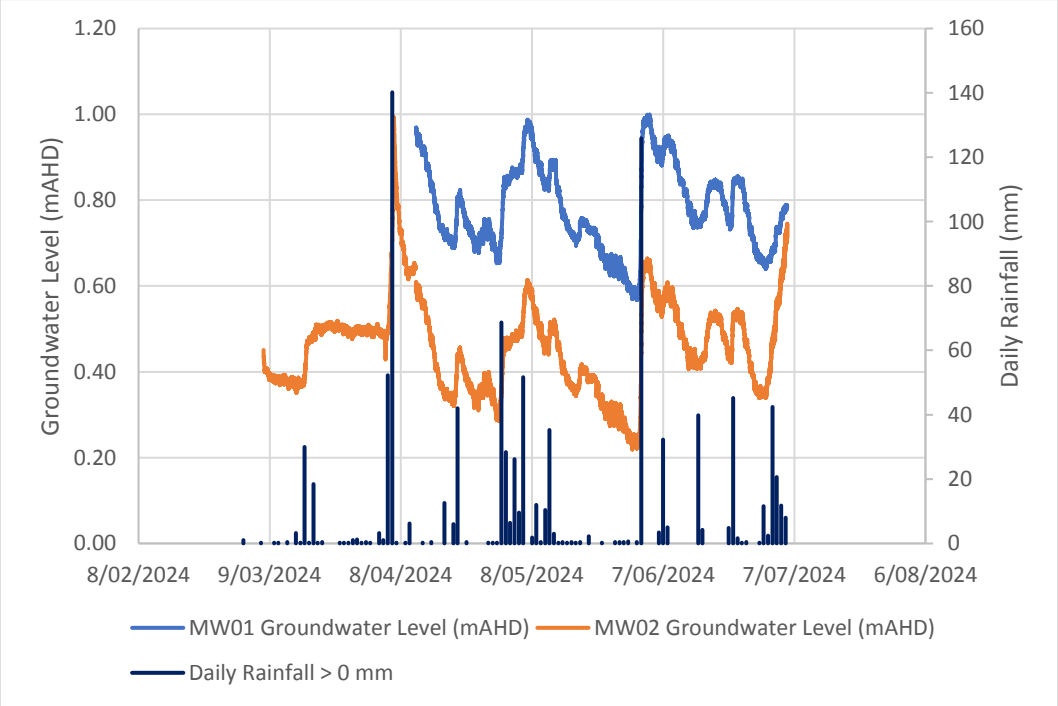


Figure 1: Plot of groundwater level data.

Some amount of groundwater level variation was recorded throughout the monitoring period. Rapid groundwater level response was observed during heavy or prolonged rainfall with increases in groundwater levels closely reacting to rainfall recharge. It is noted that the monitoring period was conducted during a period of consistent and at times heavy rainfall which is likely the reason for observed groundwater level variance. During dry periods with little to no rainfall, Site groundwater levels would be expected to remain generally stable.

The groundwater gradient across the Site was observed to be relatively flat with a slight gradient to the east (noting only two monitoring wells).

2.4 Groundwater Quality Testing

2.4.1 Testing Methodology

Groundwater was sampled from each monitoring well to allow initial data assessment of groundwater quality in accordance with NSW DPIE (2022). All wells were sampled during Site inspection on 11 April, 2024.

Each well was purged using low flow peristaltic pump, with water quality parameters continually assessed through a flow cell unit until pH, EC, DO, turbidity and temperature measurements stabilised. Field screening of parameters was undertaken and groundwater samples were collected in laboratory supplied bottles with appropriate preservations.

Two groundwater samples were submitted to a NATA accredited laboratory (Envirolab Pty Ltd) and tested for the following:

- Ionic Balance (Ca, K, Mg, Na, OH, CO3, HCO3, total alkalinity, Cl, SO4)
- Nutrients (N, NOx, NH3, P, PO4)
- TOC
- Microbes (faecal coliforms, enterococci, E. coli)
- Hydrocarbons (BTEX, TRH, PAH)
- Physical Parameters (pH, EC, DO, SAR, TDS, TSS, turbidity)
- Heavy metals (aluminium, antimony, arsenic barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, uranium, vanadium, zinc, silicon).

2.4.2 Testing Results

Laboratory results for pH, electrical conductivity (EC) and chloride (Cl) are summarised in Table 4.

Table 4: Summary of pH, EC and Cl results.

Monitoring well	pH	EC (µS / cm)	Chloride (mg / L)
MW01	7.0	12,000	3,900
MW02	7.2	2,300	420

Based on the above results, groundwater at the Site is brackish, and neutral.

Groundwater sampled for Site Contamination Assessment (MA, 2024a) were assessed against the ANZG (2018) marine water 95% guideline, based on the closest major water way from the Site being South Creek, which drains from Narrabeen Lagoon into the Pacific Ocean. To assess potential vapour risk from the adjacent service station (which may present an offsite risk to Site groundwater), results were also compared to health screening levels (**HSL**) provided in NEPM (2013). Laboratory results found concentrations of all COPC to meet the adopted testing criteria for all analytes.

All groundwater results were found to be below the adopted guideline criteria. Of note, contamination associated with services station use were reported below the laboratory detection limit.

A detailed table of results showing individual contaminant concentrations compared to adopted testing criteria is provided in Appendix E, and chain of custody documentation and laboratory certificates are provided in Appendix F.

2.5 Hydraulic Conductivity

Rising and falling head slug tests were attempted on MW01 and MW04 on 11 April and13 May 2024. Slug tests were unable to provide reliable hydraulic conductivity (k) data for the Site. Therefore, using values taken from E. Scott Bair and Lahm, 2006 hydraulic conductivity of medium sand was estimated to be of the order 5 - 15 m / day.

3 Groundwater Dewatering Management Plan

3.1 Collection of Groundwater

Groundwater seepage into the basement excavation is expected to be collected via appropriately located spoon drains and sump(s). A submersible pump in the sump(s) shall direct water to Council stormwater provided baseline data confirmation (Section 2.4.2). During warmer / dry weather, evaporate loss may result in less groundwater being collected during construction.

3.2 Anticipated Extent of Groundwater Interception

Groundwater level data collected during the primary monitoring period (Section 2.3) indicate that the average groundwater level across the Site ranged from approximately 0.46 mAHD and 0.76 mAHD with upper bound levels in order of 0.99 mAHD and 1.00 mAHD.

Based on Site construction plans, bulk excavation for construction of the basement will be across the Site is to be taken to 1.1 mAHD, with excavation of lift wells expected to be to -0.1 mAHD. Analysis of rainfall and groundwater levels indicated bulk excavation is only expected to intercept groundwater with occurrences of high rainfall with groundwater quickly returning to Site averages in the following days (Figure 1). Excavation of lift wells is expected to intercept approximately 0.73 m into the groundwater table.

A diagram showing approximate mean groundwater elevations across the Site is provided in Figure 2.

Figure 2: Expected mean groundwater level.

3.3 Dewatering Volume

Dewatering is only expected to be required during the lift well construction works, including construction of lift wells slab and perimeter walling (including tanking). We anticipate that the dewatering timeframe will likely be in the order of one month. In light of this, we expect total construction dewatering volumes to be approximately 0.63 ML over the one month dewatering timeframe.

Groundwater dewatering volume calculations are provided in Appendix D. The following is noted:

- An inflow rate of approximately 7.52 ML / year is estimated for a maximum predicted groundwater take in the order of 0.63 ML over the dewatering timeframe of up to one month.
- Predicted volumes may depend somewhat on the rate of excavation progress and adjustment of groundwater profiles beyond the excavation as well as evaporation rates.
- Monitoring was completed following a period of significant rainfall; it is likely that actual groundwater table at the time of dewatering may be lower than predicted.

- Due to difficulties encountered during slug test attempts, hydraulic conductivity for medium sands are assumed and not Site specific.

3.4 Anticipated Offsite Impacts

Anticipated offsite impacts of groundwater dewatering have been assessed as follows:

1. Groundwater flow impacts including mounding and flow diversion are likely to be minimal given the scale of the proposed basement, local flat hydraulic gradient and the permeability of underlying sand.

2. A review of the Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas* indicates that there are groundwater dependent ecosystems (GDE) within 100 m of the Site. Due to the minimal nature of the proposed dewatering and, partial cut off walls such as diaphragm walls or secant pile walls noted in MA, 2024b impact on nearby GDEs are expected to be negligible.

3. Two acid sulfate soils (ASS) assessments were undertaken for the Site and documented in MA 2022 and MA 2024b. Based on laboratory testing of Site soils, ASS indicators (acid / sulfur trails) were identified in soils collected from depths below 1.2 mbgl. Given the temporary nature of the proposed dewatering and cut off walls noted in MA 2024b, anticipated dewatering to a level of approximately - 0.1 mAHD, risk to actual or potential ASS from dewatering is considered minimal. Any material and groundwater collected during excavation and dewatering process is to be managed in accordance with Site ASS Management Plan (MA, 2024c).

4. Assessment of settlement as a result of dewatering has been documented in the geotechnical and acid sulfate soils assessment (MA, 2024b). Impacts are considered acceptable, subject to recommendations provided in MA (2024b).

3.5 Dewatering Management

3.5.1 Treatment Requirements

On the basis of the groundwater sampling undertaken (which indicates that groundwater is brackish, neutral and meets ANZG (2018) guidelines) the following options for disposal of groundwater from the dewatering process will need to be considered:

1. Discharge to stormwater.

2. Discharge of groundwater to sewer under a trade waste license.

We note resampling of all groundwater wells at the Site be taken to confirm groundwater characterisation, noting only one round of sampling has been completed to date.

3.5.2 Licensing Requirements

Under Section 92 of the Water Management Act (2000), a Water Supply Works (**WSW**) approval will be required for the construction works given the proposal will intercept the groundwater table.

As total groundwater take is expected to be less than 3 ML over dewatering timeframe of up to one month, a Water Access License (**WAL**) will not be required from WaterNSW under the Water Management Act (2000).

Applications for a WSW approval are to be submitted to WaterNSW for approval prior to construction dewatering being undertaken.

3.5.3 Monitoring Requirements

Monitoring of groundwater levels, groundwater discharge quality and groundwater take will be required to be undertaken in accordance with NSW DPIE (2022) requirements. The scope of monitoring will be contingent on the type of treatment and disposal that is implemented in light of our recommendations in Section 3.5.1. Monitoring requirements shall be included as part of the final dewatering management plan which will be required to be submitted to WaterNSW for the Water Supply Work approval.

3.6 Comments

Further works will need to be undertaken following development approval but prior to construction to meet the requirements of WaterNSW and NSW DPIE (2022) and to inform a WSW approval. This will include, but may not be limited to:

1. Appropriate monitoring and sampling of at least three monitoring wells prior to the commencement of construction works in accordance with NSW DPIE (2022) requirements.
2. Determination of baseline data.
3. Preparation of a detailed dewatering management and monitoring plan.

4 References

Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas.* http://www.bom.gov.au/water/groundwater/gde/map.shtml. Accessed July 2024.

C & A Surveyors (2024) Detail & Boundary Identification Survey of Lot 187 & 188 in DP 16719, Located at No. 1-3 Gondola Road, North Narrabeen

E. Scott Bair and Lahm, T.D. (2006). Practical Problems in Groundwater Hydrology. Prentice Hall.

Herbert C (1983) Sydney 1:100 000 Geological Sheet 9130, 1st edition. Geological Survey of New South Wales, Sydney.

Mackenzie Architects International (2024) *Multi Residential Development: 1 – 3 Gondola Rd North Narrabeen 2101*

Martens and Associates (2022) *Geotechnical, Hydrogeological and Acid SUlfate Soil Assessment: 3 Gondola Road, North Narrabeen NSW* (ref: P2108694JR02V03).

Martens and Associates (2024a) *Site Contamination Assessment: 1-3 Gondola Road, North Narrabeen NSW* (ref P2310036JR01V01).

Martens and Associates (2024b) *Geotechnical and Acid Sulfate Soil Assessment: 1 – 3 Gondola Road, North Narrabeen, NSW* (ref P2310036JR02V01).

Martens and Associates (2024c) *Acid Sulfate Management Plan: 1 – 3 Gondola Road, North Narrabeen, NSW* (ref P2310036JR04V01).

NSW Department of Environment & Heritage (eSPADE, NSW soil and land information), www.environment.nsw.gov.au. Accessed 26/04/2024.

NSW Department of Planning, Industry & Environment (2022) *Minimum requirements for building site groundwater investigations and reporting.* Referred to as NSW DPIE (2022)

Water Quality Australia (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Referred to as ANZG (2018).

Appendix A – Mapset

0 6 12 18 24 30 m

1:500 @ A4

Viewport A

Image: Nearmap (2024)
Data Source: ELVIS DEM

Map Title / Figure:
Site Map

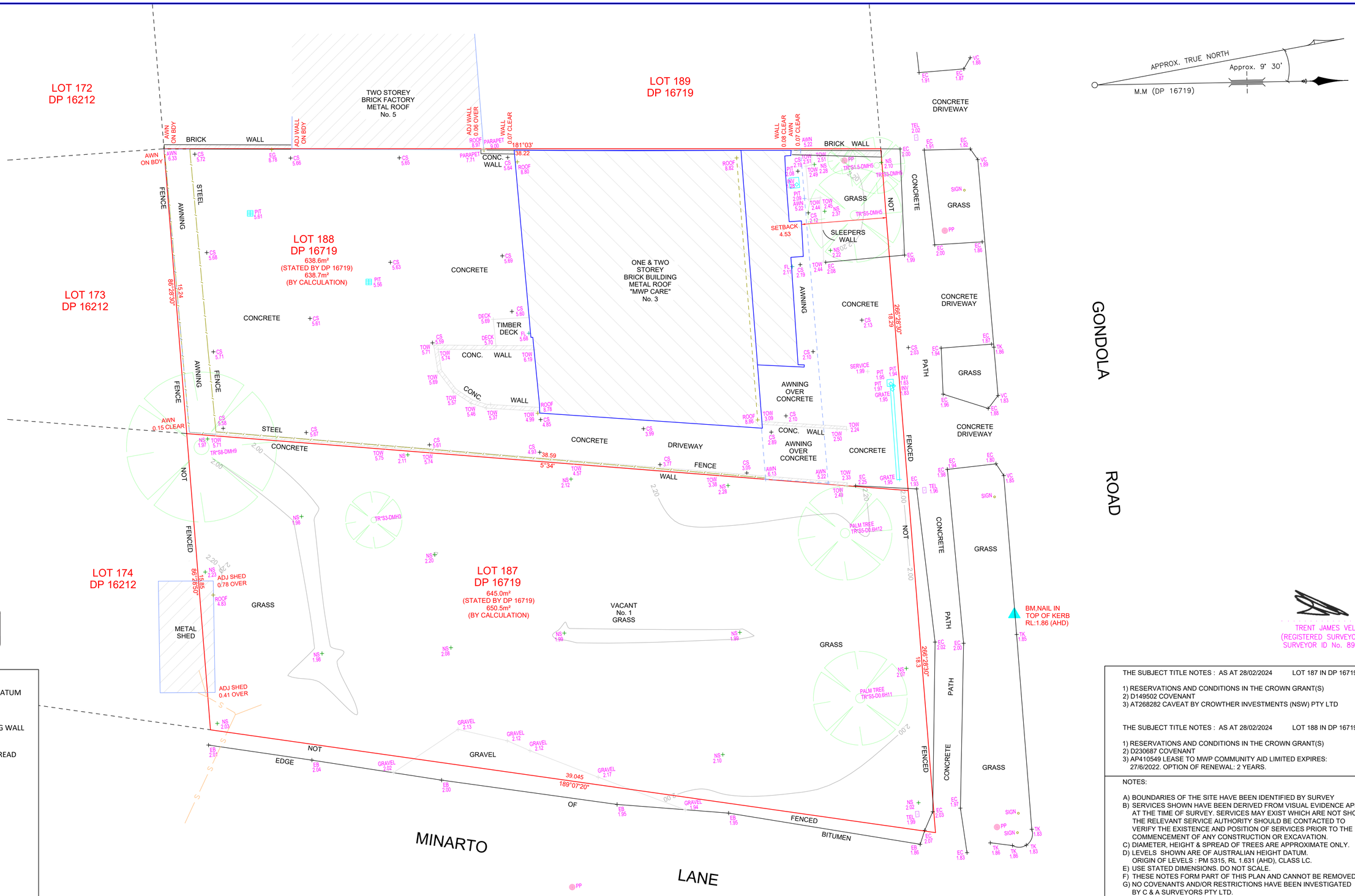
Map 01	Map
1-3 Gondola Road, North Narrabeen, NSW	Site
Mixed Use Development	Project
Hydrogeological Assessment	Sub-Project
Brett Crowther	Client
08/07/2024	Date

martens
Environment | Water | Geotechnics | Civil | Projects

Project No: P2310036 Map Set: MS03-R01 EPSG: 7856

Appendix B – Site Survey and Architectural Plans

A1



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TRENT JAMES VELLA
(REGISTERED SURVEYOR)
SURVEYOR ID No. 8959

LEGEND:

AHD	AUSTRALIAN HEIGHT DATUM
AWN	AWNING
BM	BENCH MARK
BOW	BOTTOM OF WALL
BRW	BOTTOM OF RETAINING WALL
CONC	CONCRETE
CS	CONCRETE SURFACE
D/H/S	DIAMETER/HEIGHT/SPREAD
EB	EDGE OF BITUMEN
EC	EDGE OF CONCRETE
EG	EAVE & GUTTER
EP	ELECTRICAL BOX
FL	FLOOR LEVEL
HYD	HYDRANT
IC	INSPECTION COVER
INV	INVERT LEVEL
KO	KERB OUTLET
LH	LAMP HOLE
LIP	LIP OF KERB
NS	NATURAL SURFACE
PP	POWER POLE
RL	REDUCED LEVEL
RTK	ROLLING TOP OF KERB
SL	SURFACE LEVEL
SIP	SEWER INSPECTION POINT
SMH	SEWER MAN HOLE
SV	STOP VALE
TEL	TELSTRA PIT
TK	TOP OF KERB
TOW/TW	TOP OF WALL
TRW	TOP OF RETAINING WALL
VC	VEHICLE CROSSING
W-B	WALL TO BOUNDARY
WM	WATER METER

THE SUBJECT TITLE NOTES : AS AT 28/02/2024 LOT 187 IN DP 16719

1) RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2) D149502 COVENANT
3) AT268282 CAVEAT BY CROWTHER INVESTMENTS (NSW) PTY LTD

THE SUBJECT TITLE NOTES : AS AT 28/02/2024 LOT 188 IN DP 16719

1) RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2) D230687 COVENANT
3) AP410549 LEASE TO MWP COMMUNITY AID LIMITED EXPIRES: 27/6/2022. OPTION OF RENEWAL: 2 YEARS.

NOTES:

A) BOUNDARIES OF THE SITE HAVE BEEN IDENTIFIED BY SURVEY
B) SERVICES SHOWN HAVE BEEN DERIVED FROM VISUAL EVIDENCE APPARENT AT THE TIME OF SURVEY. SERVICES MAY EXIST WHICH ARE NOT SHOWN. THE RELEVANT SERVICE AUTHORITY SHOULD BE CONTACTED TO VERIFY THE EXISTENCE AND POSITION OF SERVICES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION.
C) DIAMETER, HEIGHT & SPREAD OF TREES ARE APPROXIMATE ONLY.
D) LEVELS SHOWN ARE OF AUSTRALIAN HEIGHT DATUM. ORIGIN OF LEVELS : PM 5315, RL 1.631 (AHD), CLASS LC.
E) USE STATED DIMENSIONS. DO NOT SCALE.
F) THESE NOTES FORM PART OF THIS PLAN AND CANNOT BE REMOVED.
G) NO COVENANTS AND/OR RESTRICTIONS HAVE BEEN INVESTIGATED BY C & A SURVEYORS PTY LTD.

REVISION No	DESCRIPTION	DATE
V1	PLAN ISSUED	8/03/2024
V2	.....	../../..
V3	.....	../../..
V4	.....	../../..

C&A SURVEYORS
30 Grose Street, Parramatta, NSW 2150
Ph: 96309299 email: Operations@candasurveyors.com.au
www.candasurveyors.com.au

DETAIL & BOUNDARY IDENTIFICATION SURVEY OF LOT 187 & 188 IN DP 16719, LOCATED AT No. 1-3, GONDOLA ROAD, NORTH NARRABEEN.

APPROXIMATE LOCATION OF BURIED SEWER MAIN BY SYDNEY WATER DBYD RECORDS
APPROXIMATE LOCATION OF BURIED WATER MAIN (WM) BY SYDNEY WATER DBYD RECORDS
ELECTRIC LINE
TELSTRA PIT
STOP VALVE
POWER POLE
WATER METER
HYDRANT
TREE
D/H/S DIAMETER/HEIGHT/SPREAD

INSTRUCTING PARTY:	Joseph El-Hage @ Mackenzie Architects International	SURVEYED BY: EH	DATUM: AHD
LGA: NORTHERN BEACHES	AREA BDY DP: LOT 187-645.0 m² LOT 188-638.6 m²	DRAWN BY: SU	CHECKED BY: KO
SURVEY DATE: 29/02/2024	AREA BY CALC: LOT 187-650.5 m² LOT 188-638.7 m²	SCALE: 1:100@A1	REF.NO: 31813-24 DET/ID
DATE DRAWN: 8/03/2024	CONTOUR INTERVAL: 0.2 m	REV No: V1	SHEET: 1 OF 1

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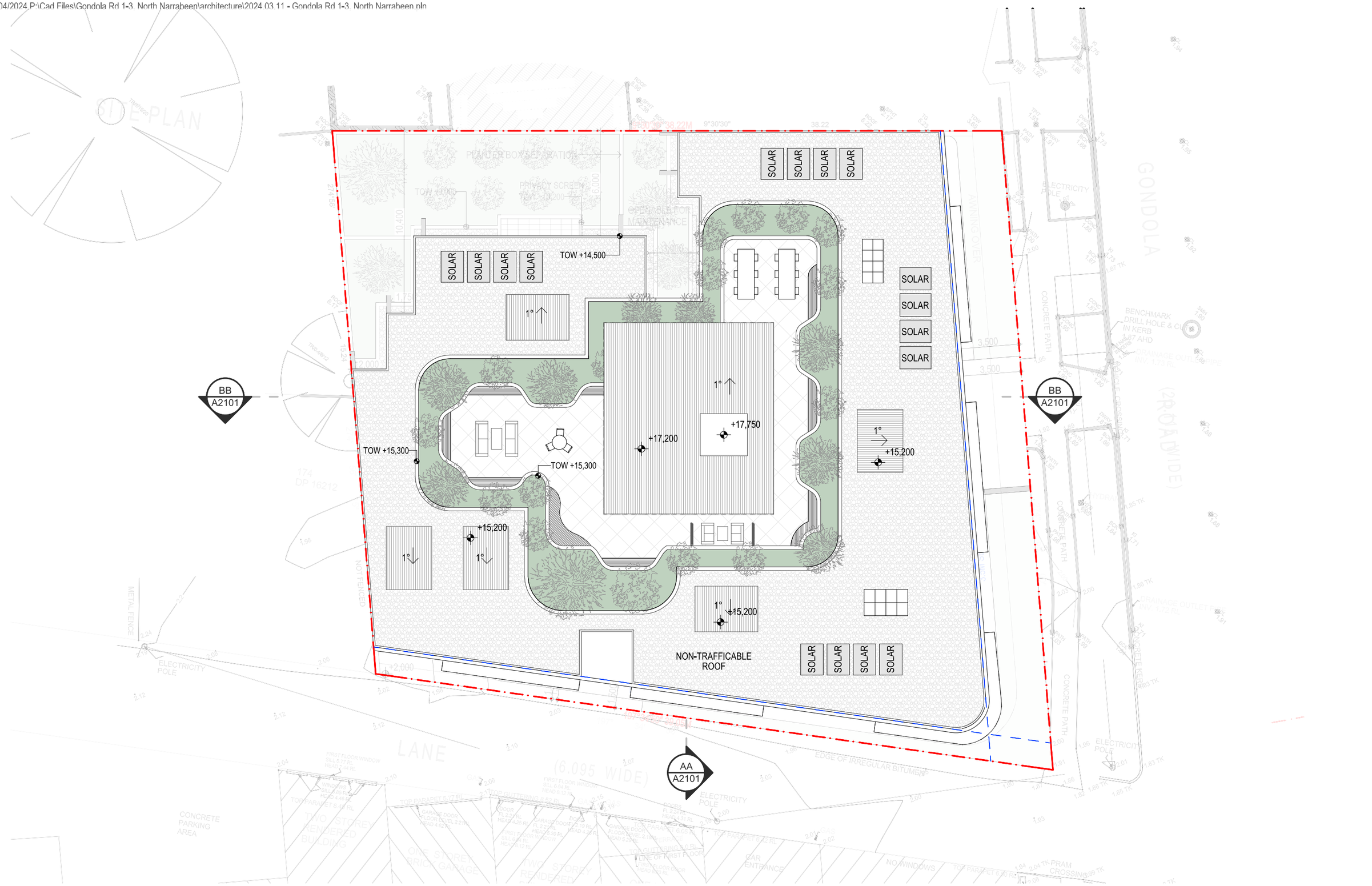

mackenzie architects international	736 PACIFIC HWY Gordon NSW 2072 Phone: (02) 9967 9966 Fax: (02) 9967 9977 www.mainternational.com.au info@mainternational.com.au	Nominated Architect No.6033 ABN 76 091 107 201 ACN 091107201	SURVEY

0 1 2 3 4 5 10

LEGEND
DO NOT SCALE DRAWINGS
VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT NORTH

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
SITE PLAN

DRAWN BY	SCALE:	DRAWING NO.:	ISSUE:
J.E	1:200@A3	**A0005**	**A**
CHECKED BY D.M			

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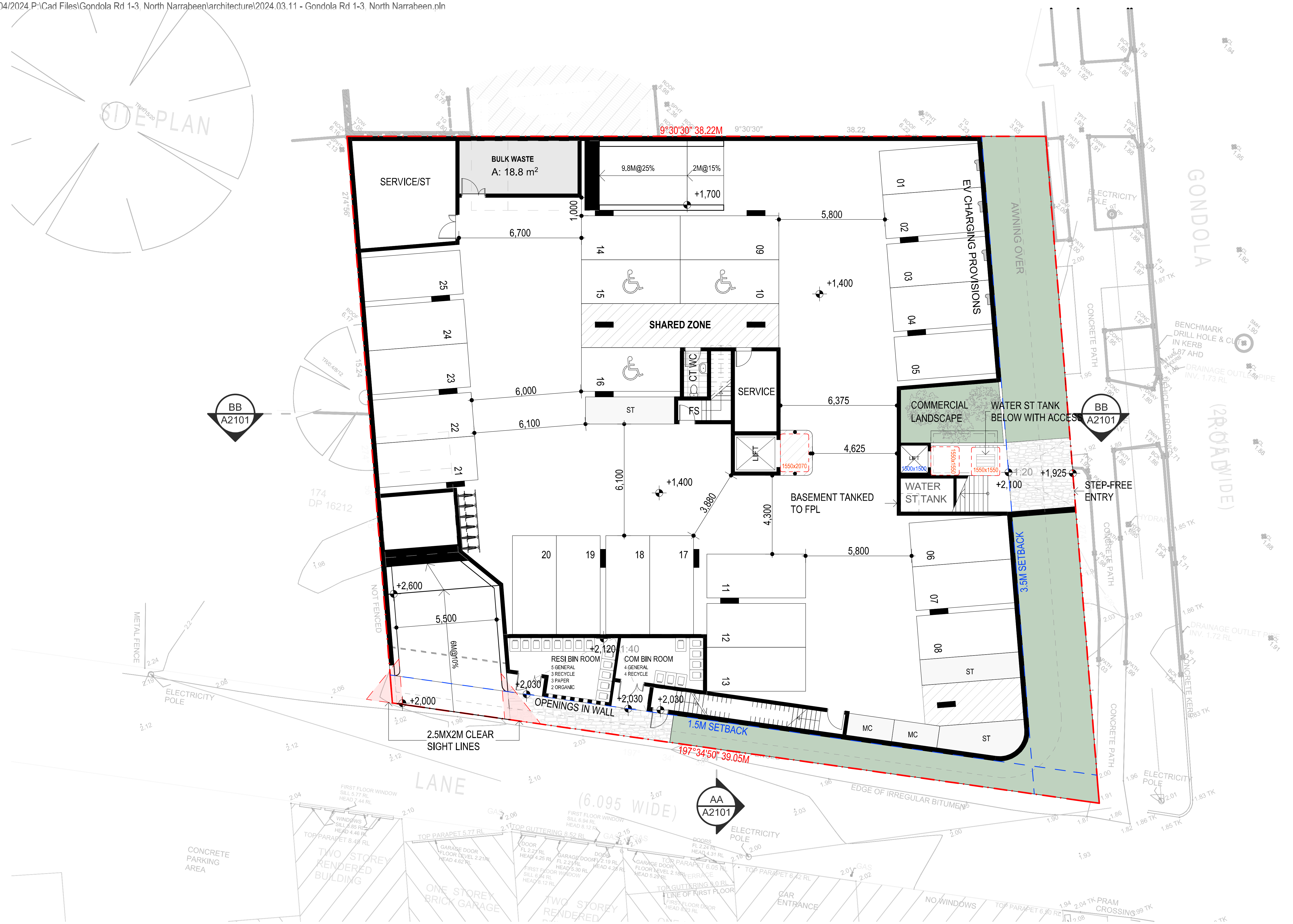

SITE PLAN
SERVICE/ST
BULK WASTE
A: 18.8 m²
9.8M@25%
2M@15%
+1,700
9°30'30" 38.22M
9°30'30"
38.22
6,700
5,800
1,000
14
09
15
10
+1,400
SHARED ZONE
EV CHARGING PROVISIONS
01
02
03
04
05
AWNING OVER
GONDOLA
(20.115 WIDE)
ELECTRICITY POLE
CONCRETE PATH
BENCHMARK DRILL HOLE & CUT IN KERB
25
24
23
22
21
16
CT WC
SERVICE
ST
FS
6,000
6,100
6,375
COMMERCIAL LANDSCAPE
WATER ST TANK BELOW WITH ACCESS
BB
A2101
LIFT
1550x2070
4,625
1500x1500
1550x1550
1:20
+1,925
+2,100
WATER ST TANK
STEP-FREE ENTRY
174
DP 16212
6,100
+1,400
3,880
4,300
BASEMENT TANKED TO FPL
5,800
20
19
18
17
06
07
08
11
12
13
+2,600
5,500
6M@10%
NOT FENCED
METAL FENCE
3.5M SETBACK
RESI BIN ROOM
5 GENERAL
3 RECYCLE
3 PAPER
2 ORGANIC
COM BIN ROOM
4 GENERAL
4 RECYCLE
+2,120
1:40
+2,030
+2,030
+2,030
+2,000
OPENINGS IN WALL
ST
MC
MC
ST
1.5M SETBACK
197°34'50" 39.05M
2.5MX2M CLEAR SIGHT LINES
ELECTRICITY POLE
LANE
(6.095 WIDE)
AA
A2101
EDGE OF IRREGULAR BITUMEN
CONCRETE PARKING AREA
TWO STOREY RENDERED BUILDING
ONE STOREY BRICK GARAGE
TWO STOREY RENDERED
CAR ENTRANCE
NO WINDOWS

![M A I logo]

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ACN 091107201

LEGEND
0 2 3 4 5 10
DO NOT SCALE DRAWINGS
VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT NORTH
N

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
BASEMENT PLAN

DRAWN BY	SCALE:	DRAWING NO.:	ISSUE:
J.E	1:200@A3	**A1001**	**A**
CHECKED BY D.M			

SITE PLAN

9°30'30" 38.22M

INTERCOMM SECURITY TO BASEMENT

ROLLER SECURITY GATE

2M@12.5%

9.8M@25%

3,800

3,200

+4,150

+4,400

EV CHARGING PROVISIONS

C01 C02 C03 C04 C05

COM WC 2390x2330MM

LOUVRES ABOVE

AWNING OVER

COMMERCIAL

A: 250.45 m²

5,800

+4,400

FS

3,500

BB A2101

6,370

C06 C07 C08

COMMERCIAL LANDSCAPE BELOW

LIFT 1550x2070

4,265

LIFT 1800x1800

+2,100

1,400

1550x1550

+4,150

3,400

2M@12.5%

4.6M@25%

6,085

LOADING/CAR WASH

VAN 3x6

WATER ST TANK BELOW WITH ACCESS

+3,000

V01

2M@20%

5,800

C09

LOUVRES ABOVE

3.5M SETBACK

+2,600

V02

+4,400

+4,400

6M@10%

V03

C10

COMMERCIAL

A: 146.04 m²

TEMP. BIN HOLDING AREA

2,400

2,400

+2,000

1,500

1.5M SETBACK

197°34'50" 39.05M

AA A2101

GONDOLA (20M ROAD WIDE)

BENCHMARK DRILL HOLE & CUT IN KERB 1.87 AHD

DRAINAGE OUTLET PIPE INV. 1.73 RL

ELECTRICITY POLE

CONCRETE PATH

VEHICLE CROSSING

HYDRANT

DRAINAGE OUTLET PIPE INV. 1.72 RL

CONCRETE KERB

PRAM CROSSING

LANE (6.095 WIDE)

EDGE OF IRREGULAR BITUMEN

NO WINDOWS

CAR ENTRANCE

CONCRETE PARKING AREA

TWO STOREY RENDERED BUILDING

ONE STOREY BRICK GARAGE

TWO STOREY RENDERED

METAL FENCE

NOT FENCED

174 DP 16212

274°56'

15.24

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AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT NORTH

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
GROUND FLOOR PLAN

DRAWN BY J.E
CHECKED BY D.M
SCALE: 1:200@A3
DRAWING NO.: A1002
ISSUE: A

SITE PLAN

9°30'30" 38.22M

PLANTER BOX SEPARATION

PRIVACY SCREEN TOW +10,200

TOW +9,000

6,000

10,400

OPENABLE FOR MAINTENANCE

3,000

BALCONY A: 105.72 m² +8,000

BED 01 A: 16.16 m² 4050 x 4200

BED 02 3350 x 3300

1,750

2,000

BED 01 A: 18.15 m² 3750 x 3500

WIR

ENS

U101 3 BED A: 120.52 m²

L/D 6000 x 6100

BED 03 3600 x 3200

1,600

BB A2101

BED 02 3150 x 4200

ENS

KTH

BTH

LDY

SERVICE

+8,000

1,600

KTH

L/D 4300 x 5700

U102 2 BED A: 87.98 m² 4,000

BALCONY A: 10 m²

KTH

U103 2 BED A: 76.04 m² L/D 5550 x 5000 4,260

BALCONY A: 10 m²

BTH ENS

BED 01 A: 13.2 m² 3300 x 3800

BED 02 3000 x 3200

BTH

ENS

BED 01 A: 11.66 m² 3100 x 3200

BED 02 3000 x 3300

1,500

3.5M SETBACK

197°34'50" 39.05M

PTY

KTH

U104 2 BED A: 78.76 m² L/D 5550 x 5350 4,000

BALCONY A: 10 m²

BED 02 3250 x 3200

BED 02 3550 x 3300

ENS

WIR

BED 01 A: 17.04 m² 4200 x 4100

PTY

KTH

U107 (A/S) 3 BED A: 128.63 m²

BED 03 3400 x 3000

BTH

L/D 5400 x 5650

BALCONY A: 12.36 m²

ENS

WIR

BED 01 A: 16.26 m² 4250 x 4150

BTH

3,500

BED 02 3200 x 3400

PTY KTH

U106 (A/S) 3 BED A: 120.9 m²

L/D 5800 x 5600

BALCONY A: 12 m²

3.5M SETBACK

BB A2101

BTH

BED 03 4150 x 3600

WIR

U105 3 BED A: 120.32 m²

L/D 6800 x 4800

BALCONY A: 12 m²

KTH

PTY

BED 02 3250 x 3200

BED 03 3050 x 3500

ENS

BED 01 A: 19.68 m² 3800 x 4800

AA A2101

GONDOLA ROAD (ROAD WIDE)

BENCHMARK DRILL HOLE & CROSS IN KERB RL 7.87 AHD

ELECTRICITY POLE

CONCRETE PATH

CONCRETE KERB

METAL FENCE

NO FENCE

LANE (6.095 WIDE)

EDGE OF IRREGULAR BITUMEN

CONCRETE PARKING AREA

TWO STOREY BRICK & TILE RENDERED BUILDING

ONE STOREY BRICK GARAGE

TWO STOREY RENDERED RESIDENCE

CAR ENTRANCE

NO WINDOWS

PRAM CROSSING

174 DP 16212

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ACN 091107201

SCALE LEGEND 0 1 2 3 4 5 10

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VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT NORTH

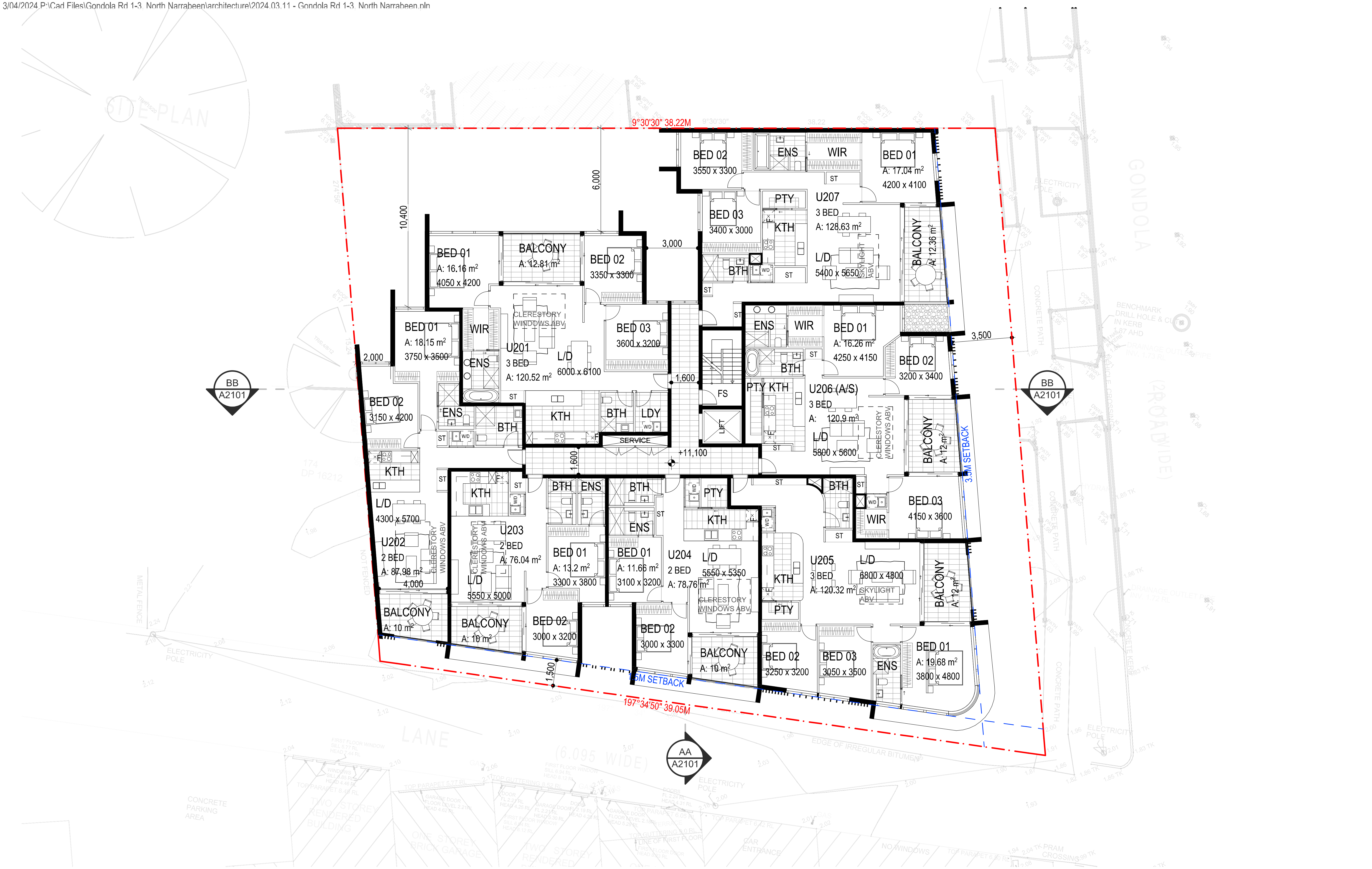
MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101

PROJECT NO.
15/19

DRAWING:
FIRST FLOOR PLAN

DRAWN BY J.E
CHECKED BY D.M
SCALE: 1:200@A3
DRAWING NO.: A1003
ISSUE: A

3/04/2024 P:\Cad Files\Gondola Rd 1-3, North Narrabeen\architecture\2024.03.11 - Gondola Rd 1-3, North Narrabeen.pln



9°30'30" 38.22M
197°34'50" 39.05M
BED 02
3550 x 3300
ENS
WIR
BED 01
A: 17.04 m2
4200 x 4100
ST
U207
3 BED
A: 128.63 m2
BED 03
3400 x 3000
PTY
KTH
L/D
5400 x 5650
BALCONY
A: 12.36 m2
BTH
ST
SKYLIGHT ABV
10,400
6,000
3,000
BED 01
A: 16.16 m2
4050 x 4200
BALCONY
A: 12.81 m2
BED 02
3350 x 3300
CLERESTORY WINDOWS ABV
BED 01
A: 18.15 m2
3750 x 3500
WIR
U201
3 BED
A: 120.52 m2
L/D
6000 x 6100
BED 03
3600 x 3200
ENS
2,000
BED 02
3150 x 4200
ENS
BTH
KTH
BTH
LDY
SERVICE
1,600
FS
LIFT
+11,100
ENS
WIR
BED 01
A: 16.26 m2
4250 x 4150
BTH
BED 02
3200 x 3400
3,500
PTY KTH
U206 (A/S)
3 BED
A: 120.9 m2
L/D
5800 x 5600
CLERESTORY WINDOWS ABV
BALCONY
A: 12 m2
3.5M SETBACK
BB
A2101
KTH
L/D
4300 x 5700
U202
2 BED
A: 87.98 m2
4,000
CLERESTORY WINDOWS ABV
KTH
U203
2 BED
A: 76.04 m2
L/D
5550 x 5000
BTH
ENS
BED 01
A: 13.2 m2
3300 x 3800
BTH
ENS
BED 01
A: 11.66 m2
3100 x 3200
U204
2 BED
A: 78.76 m2
L/D
5550 x 5350
PTY
KTH
BTH
WIR
BED 03
4150 x 3600
U205
3 BED
A: 120.32 m2
L/D
6800 x 4800
SKYLIGHT ABV
KTH
PTY
BALCONY
A: 12 m2
BALCONY
A: 10 m2
BALCONY
A: 10 m2
BED 02
3000 x 3200
BED 02
3000 x 3300
BALCONY
A: 10 m2
BED 02
3250 x 3200
BED 03
3050 x 3500
ENS
BED 01
A: 19.68 m2
3800 x 4800
1,500
1.5M SETBACK
AA
A2101
LANE
(6.095 WIDE)
GONDOLA
(20 ROAD WIDE)
CONCRETE PATH
ELECTRICITY POLE
METAL FENCE
CONCRETE PARKING AREA
BENCHMARK DRILL HOLE & CUT IN KERB
EDGE OF IRREGULAR BITUMEN
SITE PLAN

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VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

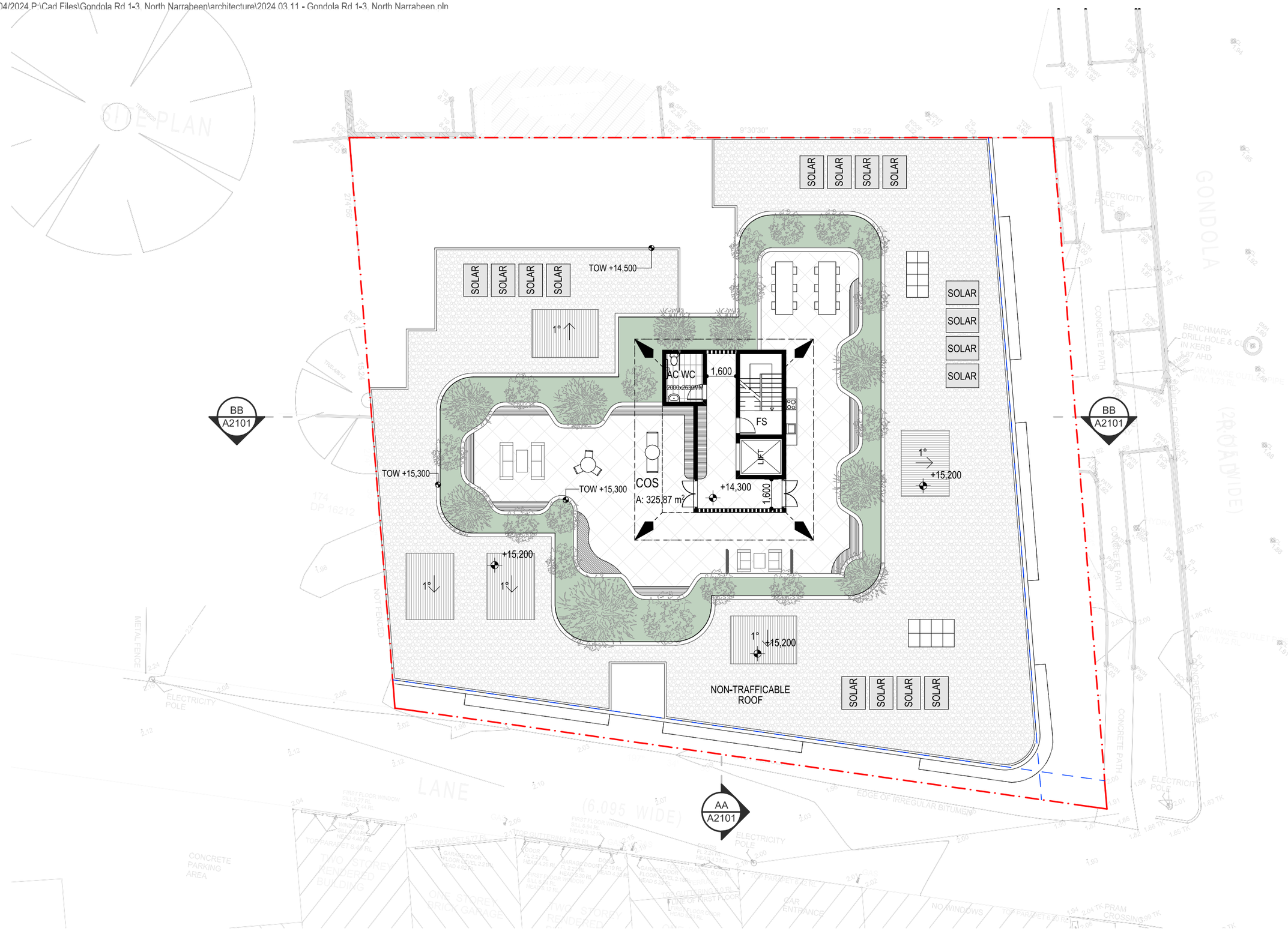
No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT NORTH

PROJECT: MULTI RESIDENTIAL DEVELOPMENT
1-3 Gondola Rd North Narrabeen 2101
PROJECT NO. 15/19

DRAWING: SECOND FLOOR PLAN

DRAWN BY: J.E
CHECKED BY: D.M
SCALE: 1:200@A3
DRAWING NO.: A1004
ISSUE: A



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LEGEND
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VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

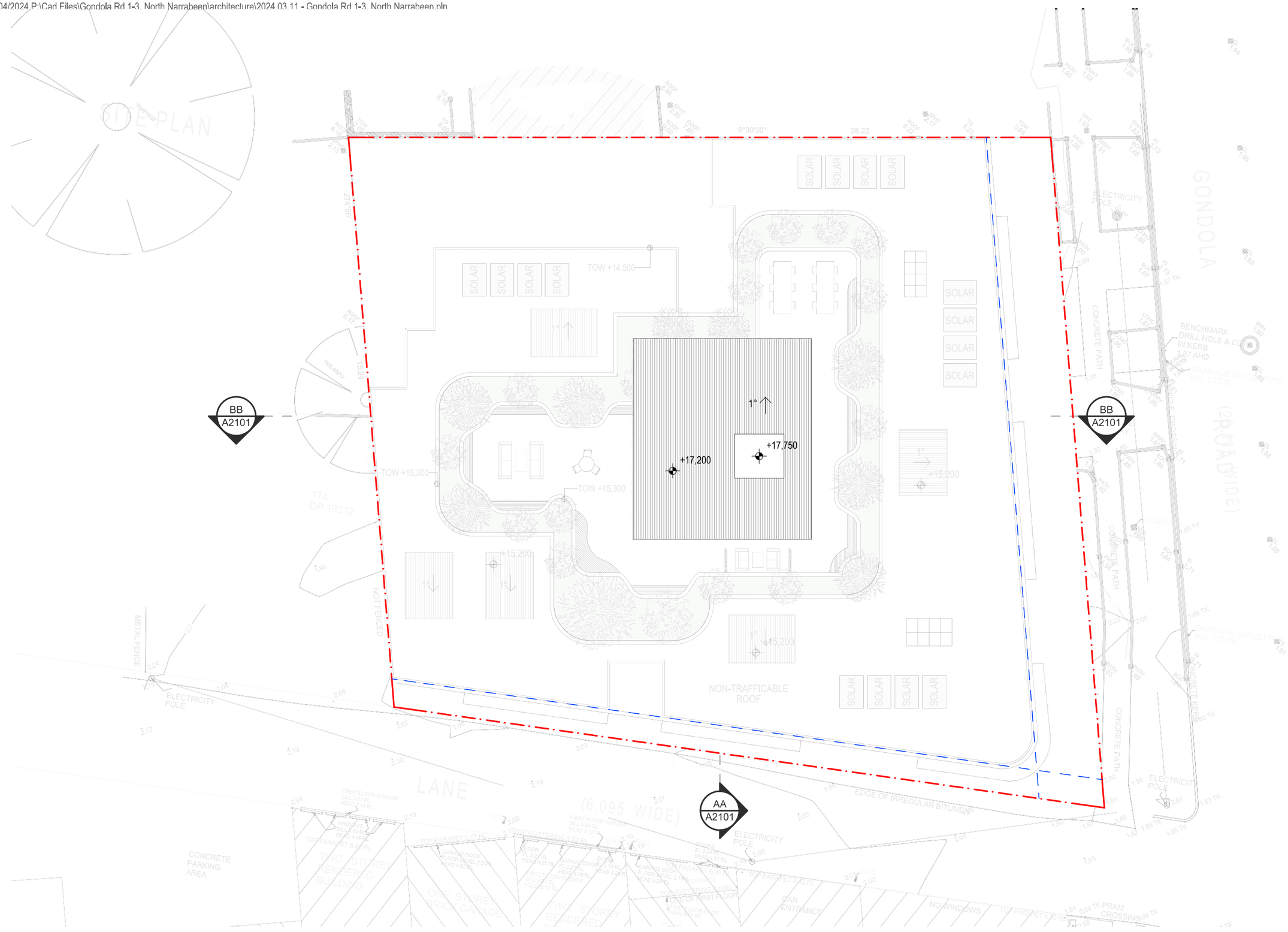
PROJECT NORTH

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
COS FLOOR PLAN

DRAWN BY	SCALE:	DRAWING NO.:	ISSUE:
J.E	1:200@A3	A1005	A
CHECKED BY			
D.M			

3/04/2024 P:\Cad Files\Gondola Rd 1-3, North Narrabeen\architecture\2024 03 11 - Gondola Rd 1-3, North Narrabeen.pln



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AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

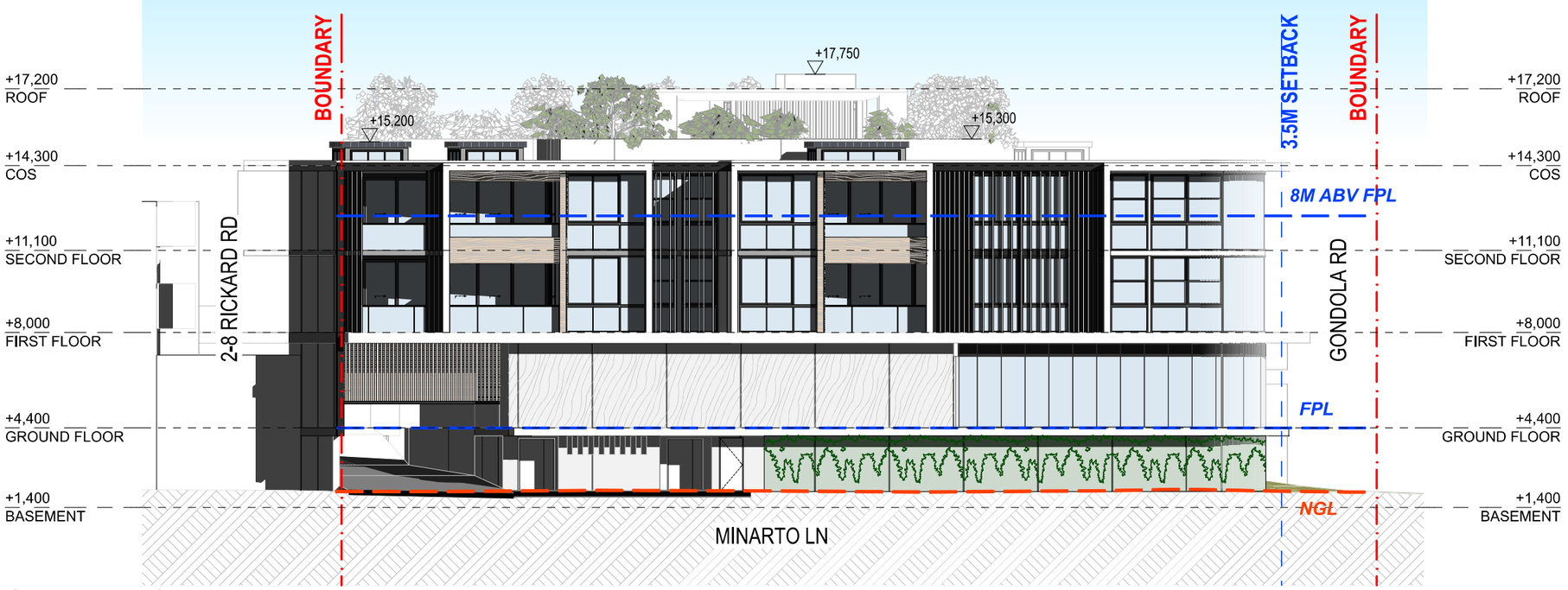
PROJECT NORTH

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
ROOF PLAN

DRAWN BY	SCALE:	DRAWING NO.:	ISSUE:
J.E	1:200@A3	**A1006**	**A**
CHECKED BY D.M			

NORTH ELEVATION



EAST ELEVATION

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ACN 091107201

0 1 2 3 4 5 10

LEGEND
DO NOT SCALE DRAWINGS
VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

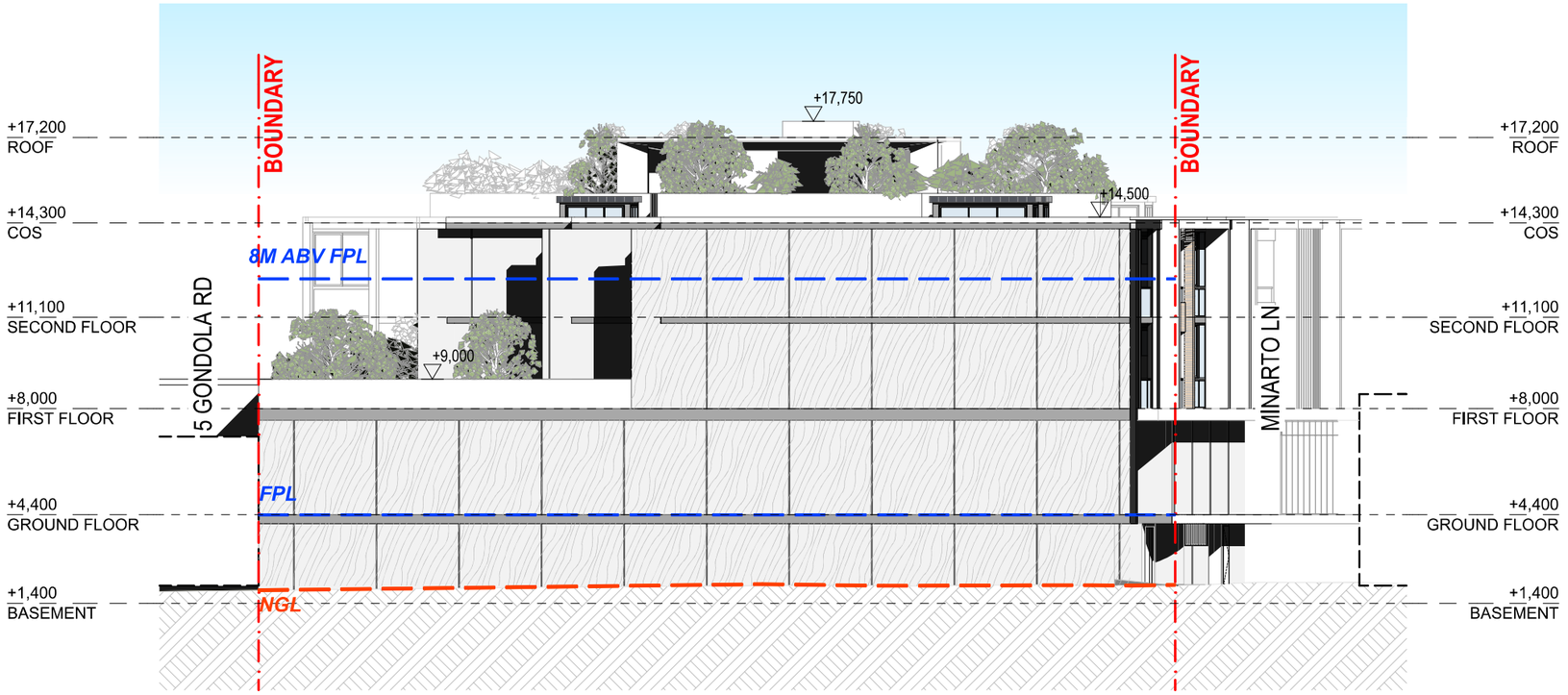
No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101

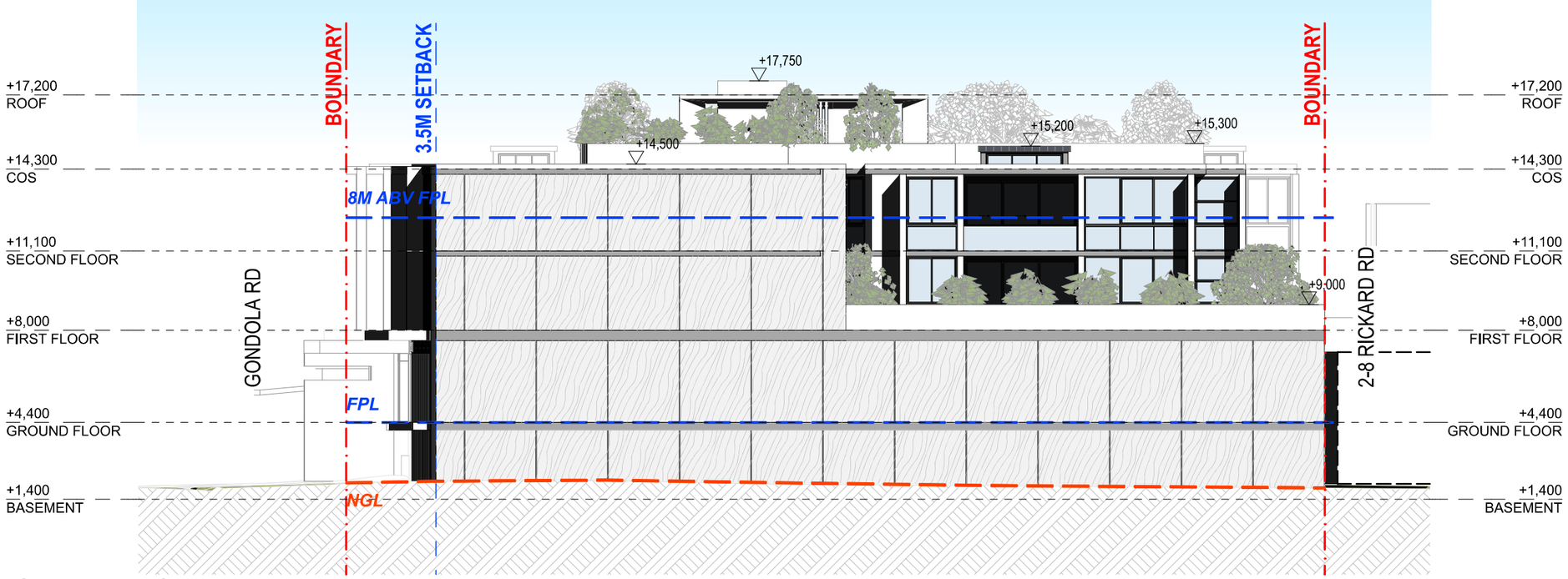
PROJECT NO.
15/19

DRAWING:
NORTH & EAST ELEVATIONS

DRAWN BY J.E
CHECKED BY D.M
SCALE: 1:200@A3
DRAWING NO.: A2001
ISSUE: A



SOUTH ELEVATION



WEST ELEVATION

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ABN 76 091 107 201
ACN 091107201

0 1 2 3 4 5 10

LEGEND
DO NOT SCALE DRAWINGS
VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

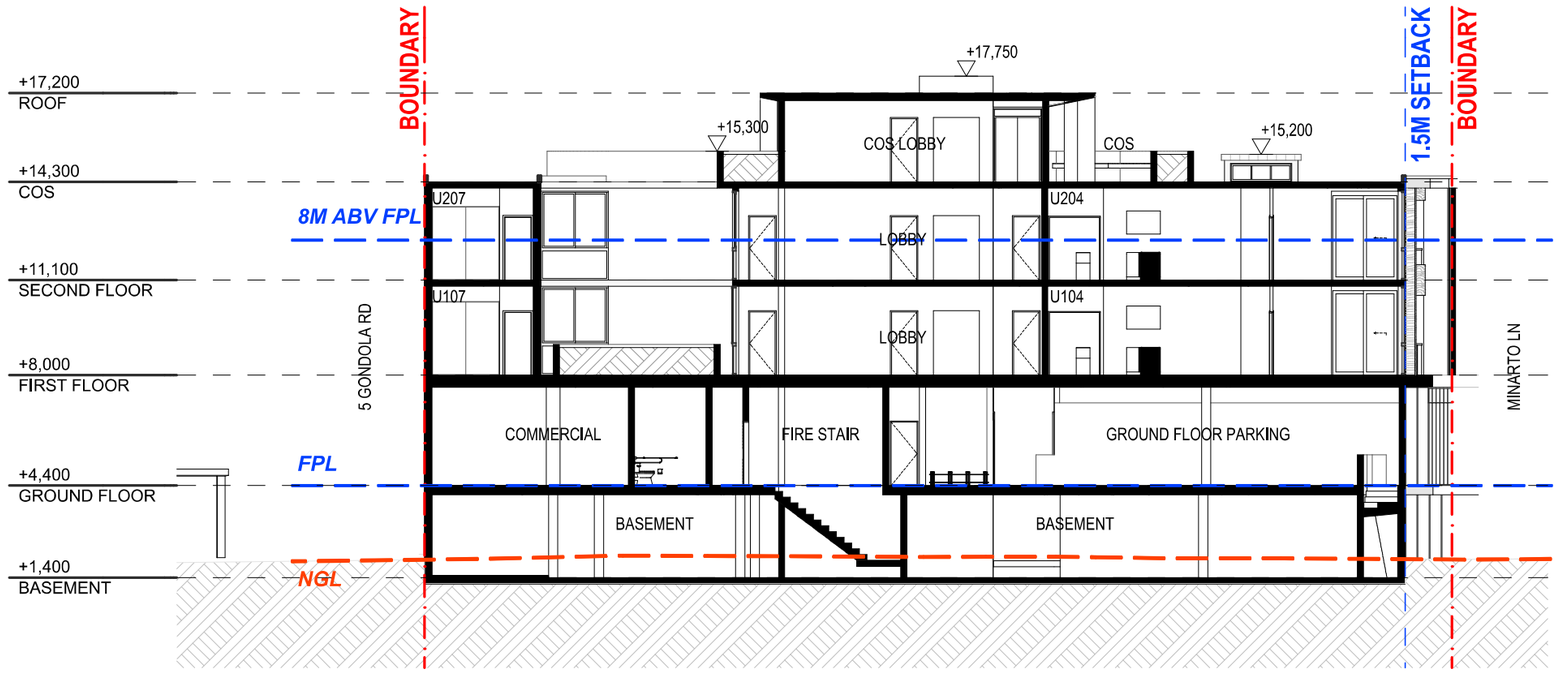
No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

PROJECT
MULTI RESIDENTIAL DEVELOPMENT
1-3 Gondola Rd North
Narrabeen 2101

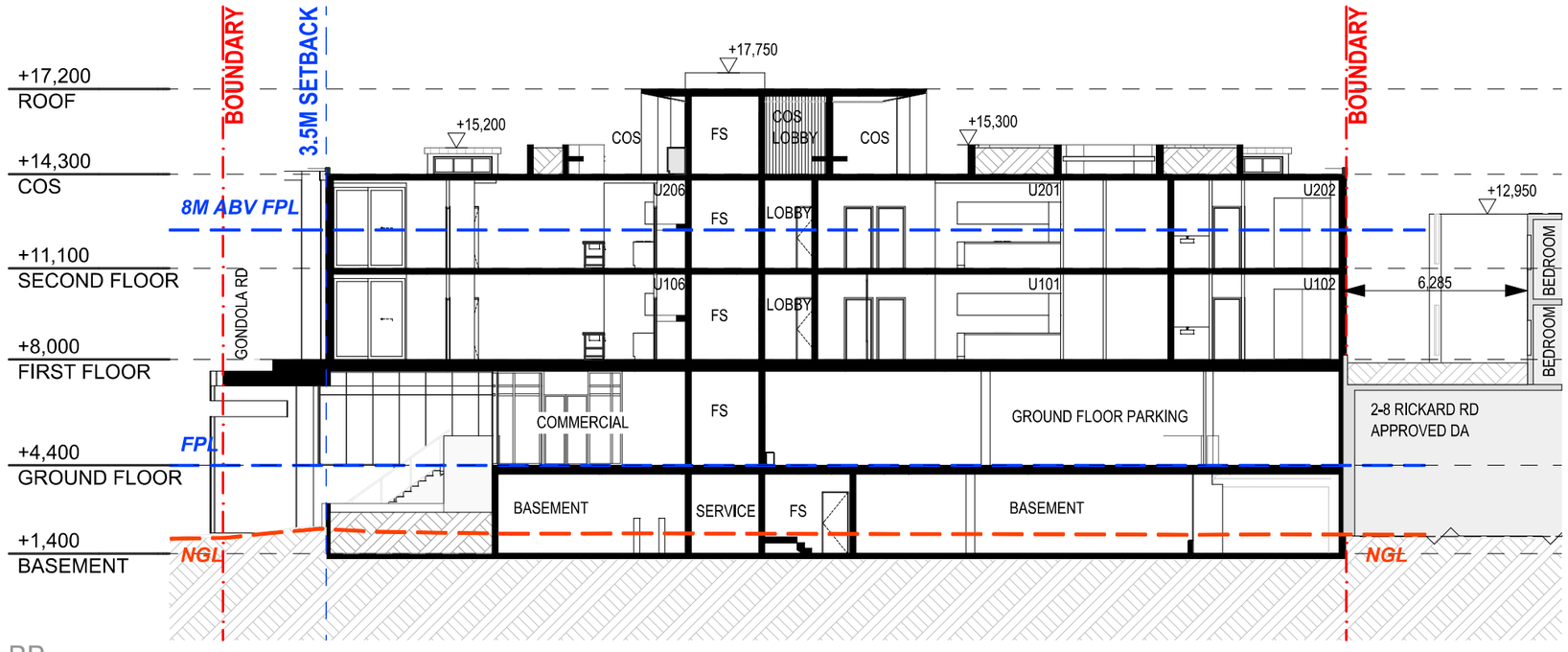
PROJECT NO.
15/19

DRAWING:
SOUTH & WEST ELEVATIONS

DRAWN BY: J.E
CHECKED BY: D.M
SCALE: 1:200@A3
DRAWING NO.: A2002
ISSUE: A



SECTION AA



SECTION BB

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LEGEND
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VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

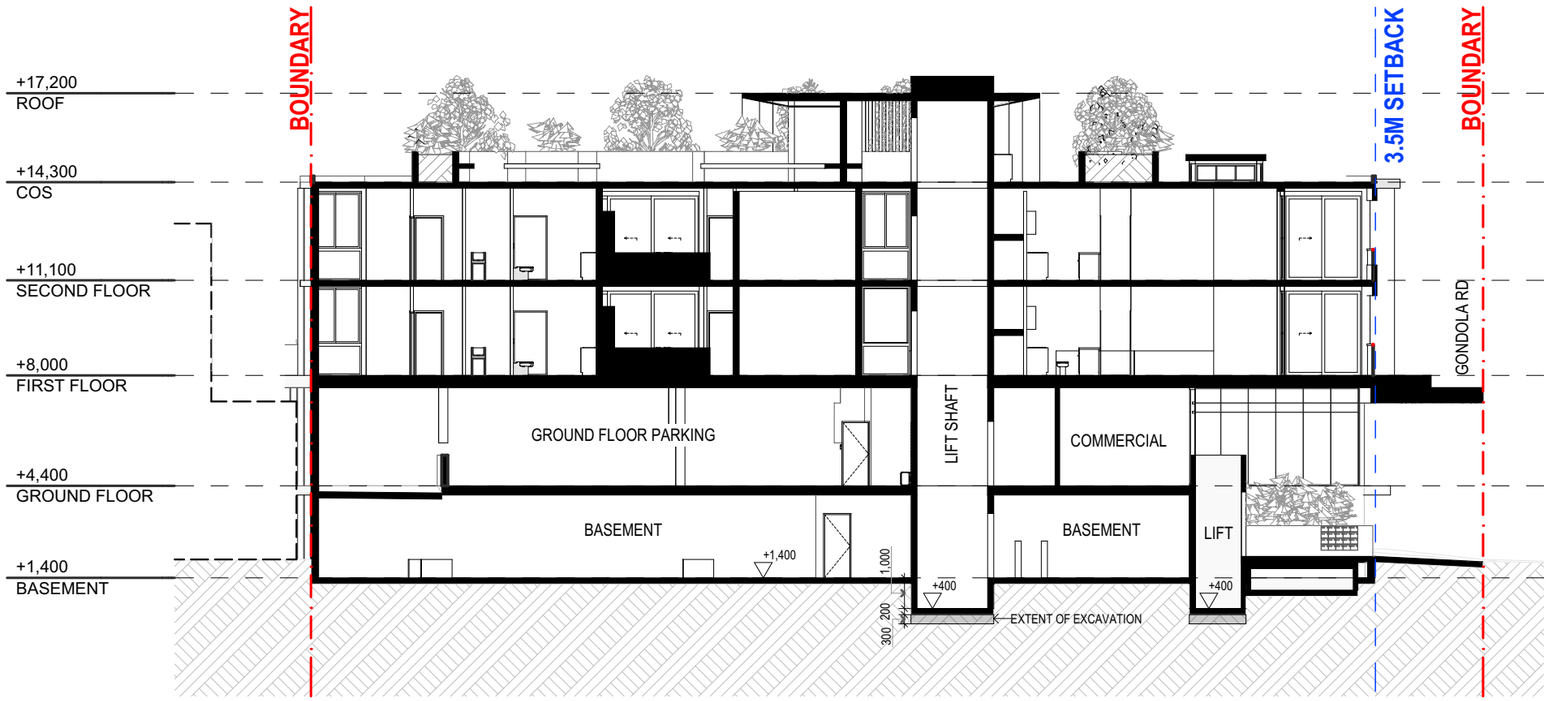
AMENDMENTS

No.	REVISION	BY	DATE
A	DA	J.E	03.04.2024

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North
Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
SECTIONS

DRAWN BY J.E
CHECKED BY D.M
SCALE: 1:200@A3
DRAWING NO.: A2101
ISSUE: A



LIFT SECTION CC

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0 1 2 3 4 5 10

LEGEND
DO NOT SCALE DRAWINGS
VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK

AMENDMENTS

No.	REVISION	BY	DATE

PROJECT NORTH

MULTI RESIDENTIAL DEVELOPMENT
PROJECT
1-3 Gondola Rd North Narrabeen 2101
PROJECT NO.
15/19

DRAWING:
LIFT SECTION

DRAWN BY J.E
CHECKED BY D.M
SCALE: 1:200@A3
DRAWING NO.:
ISSUE:

Appendix C – Borehole Logs

CLIENT	Brett Crowther		COMMENCED	07/03/2024	COMPLETED	07/03/2024	**REF BH201**
PROJECT	Geotechnical & ASS Assessment		LOGGED	AH/RM	CHECKED	WB	Sheet 1 OF 1
SITE	1-3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary deposits	VEGETATION	Grass	PROJECT NO. P2310036
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE	151.29571	RL SURFACE	2 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 8.50 m depth	LATITUDE	-33.70815	ASPECT	North/Northeast	SLOPE < 2 %

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V				2.00	0.1-0.2/S/1 D 0.10-0.20 m			SP	FILL: SAND; medium grained; brown; trace gravels (road base and sandstone); trace plastic fragments; inferred poorly compacted.			FILL
				0.30				SP	SAND; fine to medium grained; dark brown, black.	D		MARINE DEPOSITS
				1.70	0.8-0.9/S/1 D 0.80-0.90 m SPT 1.00-1.45 m 2, 2, 2 N = 4 1.0-1.45/SPT/1 1.3-1.4/S/1 D 1.30-1.40 m							
			1									
					2.0/S/1 D 2.00 m						VL	
			2	*2.50*								
				-0.50	SPT 2.50-2.95 m 0, 1, 2 N = 3 2.5-2.95/SPT/1			SP	SAND; fine to medium grained; dark brown, black; trace shells, organics.			
			3									
	L	Inflow			SPT 4.00-4.45 m 3, 5, 6 N = 11 4.0-4.45/SPT/1							
			4									
										W		
			5		SPT 5.50-5.95 m 4, 8, 8 N = 16 5.5-5.95/SPT/1							
				5.80								
WB			6	-3.80					Black, dark grey, black brown.		MD	
			7									
			8	*8.50*								
									Hole Terminated at 8.50 m (Target depth reached)			
			9									
			10									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - BOREHOLE

CLIENT	Brett Crowther		COMMENCED	07/03/2024	COMPLETED	07/03/2024	**REF BH202**
PROJECT	Geotechnical & ASS Assessment		LOGGED	AH/RM	CHECKED	WB	Sheet 1 OF 1
SITE	1-3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary deposits	VEGETATION	Grass	PROJECT NO. P2310036
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE	151.29583	RL SURFACE	2 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 10.00 m depth	LATITUDE	-33.70785	ASPECT	North/Northeast	SLOPE < 2 %

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V			0	2.00				SP	FILL: SAND; medium grained; brown; trace gravels (road base and sandstone); trace plastic fragments; inferred poorly compacted.			FILL
				0.40	0.2-0.3/S/1 D							
				0.20-0.30 m								
				1.60				SP	SAND; fine to medium grained; brown, orange brown.	D		MARINE DEPOSITS
					0.8-0.9/S/1 D						L	
			1		0.80-0.90 m							
				1.10	SPT 1.00-1.45 m							
				0.90	2, 3, 5			SP	SAND; fine to medium grained; black.			
					N = 8							
		▽		*1.50*	1.0-1.45/SPT/1							
				0.50				SP	SAND; fine to medium grained; pale brown, grey.			
AD/V				*2.00*								
			2	0.00	2.0/S/1 D 2.00 m			SP	SAND; fine to medium grained; grey; dark grey.			
					SPT 2.50-2.95 m						VL	
					1, 0, 2							
					N = 2							
			3		2.5-2.95/SPT/1							
					SPT 4.00-4.45 m							
					1, 2, 4						L	
					N = 6							
			4		4.0-4.45/SPT/1							
				5.00								
HSA	L	Inflow	5	-3.00					Inferred medium dense.			
										W		
			6									
			7								MD	
			8									
			9									
			10	*10.00*					Hole Terminated at 10.00 m (Target depth reached)			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	Brett Crowther		COMMENCED	07/03/2024	COMPLETED	07/03/2024	**REF BH202/MW02**
PROJECT	Geotechnical & ASS Assessment		LOGGED	AH/RM	CHECKED	WB	Sheet 1 OF 1
SITE	1-3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary deposits	VEGETATION	Grass	PROJECT NO. P2310036
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE	151.29583	RL SURFACE	2 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 10.00 m depth	LATITUDE	-33.70785	ASPECT	North/Northeast	SLOPE < 2 %

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
AD/V		Inflow	1	2.00 0.40 1.60 1.10 0.90 1.50 0.50 2.00 0.00	0.2-0.3/S1 D 0.20-0.30 m 0.8-0.9/S1 D 0.80-0.90 m SPT 1.00-1.45 m 2, 3, 5 N = 8 1.0-1.45/SPT/1 2.0/S1 D 2.00 m			SP SP SP SP	FILL: SAND; medium grained; brown; trace gravels (road base and sandstone); trace plastic fragments; inferred poorly compacted. SAND; fine to medium grained; brown, orange brown. SAND; fine to medium grained; black. SAND; fine to medium grained; pale brown, grey. SAND; fine to medium grained; grey; dark grey.	D	L	MW02 Concrete Bentonite Casing. Screen.
HSA	L	Inflow	3 4 5 6 7 8 9		SPT 2.50-2.95 m 1, 0, 2 N = 2 2.5-2.95/SPT/1 SPT 4.00-4.45 m 1, 2, 4 N = 6 4.0-4.45/SPT/1					W	VL L MD	Sand
			10	10.00					Hole Terminated at 10.00 m			

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Engineering Log - TEST

CLIENT	Brett Crowther		COMMENCED	07/03/2024	COMPLETED	07/03/2024	**REF BH203**
PROJECT	Geotechnical & ASS Assessment		LOGGED	AH/RM	CHECKED	WB	Sheet 1 OF 1
SITE	1-3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary deposits	VEGETATION	Grass	PROJECT NO. P2310036
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE	151.29586	RL SURFACE	2 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 5.00 m depth	LATITUDE	-33.70801	ASPECT	North/Northeast	SLOPE < 2 %

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	L	Inflow	1	2.00	0.5/S/1 D 0.50 m			SP	FILL: SAND; medium grained; brown; trace gravels (road base and sandstone); trace plastic fragments; inferred poorly compacted.			FILL
					1.0/S/1 D 1.00 m							
				1.20								
				0.80				SP	SAND; fine to medium grained; brown, dark brown; inferred very loose to loose.	D		MARINE DEPOSITS
				1.50								
			2	0.50				SP	SAND; fine to medium grained; brown, dark brown; trace organics; inferred very loose to loose.			
				2.50								
				-0.50	2.5/S/1 D 2.50 m			SP	SAND; fine to medium grained; brown, orange; trace shells; inferred very loose to loose.			
			3		3.0/S/1 D 3.00 m					M	VL - L	
				4.00								
			4	-2.00	4.0/S/1 D 4.00 m			SP	SAND; fine to medium grained; dark brown, orange; trace organics; inferred very loose to loose.			
				5.00						W		
			5		5.0/S/1 D 5.00 m				Hole Terminated at 5.00 m (Target depth reached)			
			6									
			7									
			8									
			9									
			10									

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Engineering Log - BOREHOLE

CLIENT	Mackenzie Architects International Pty Ltd		COMMENCED	14/07/2023	COMPLETED	14/07/2023	**REF BH201**
PROJECT	Preliminary Site Investigation		LOGGED	WX	CHECKED		Sheet 1 OF 1
SITE	3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary	VEGETATION	Nil	PROJECT NO. P2108694
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE		RL SURFACE	m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.70 m depth	LATITUDE		ASPECT	North	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HSA		Inflow	1	0.25	0.3-0.5/S/Dupe02 D 0.30-0.50 m				CONCRETE.			PAVEMENT
					0.7-0.8/S/1 D 0.70-0.80 m			SM	FILL: Silty SAND; medium grained; brown; with shell inclusions.			FILL
			2	1.50				SP	SAND; brown, dark brown; with trace silt; trace shells.			MARINE DEPOSITS
			3									
			4	4.00					Grey / brown.			
			5									
			6	6.00					Grey, occasional blackish grey / brown.			
			7	7.70								
			8						Hole Terminated at 7.70 m (Target depth reached)			
			9									

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Engineering Log - BOREHOLE

CLIENT	Mackenzie Architects International Pty Ltd		COMMENCED	14/07/2023	COMPLETED	14/07/2023	**REF BH201/MW01**
PROJECT	Preliminary Site Investigation		LOGGED	WX	CHECKED		Sheet 1 OF 1
SITE	3 Gondola Road, North Narrabeen, NSW		GEOLOGY	Quartenary	VEGETATION	Nil	PROJECT NO. P2108694
EQUIPMENT		4WD truck-mounted hydraulic drill rig	LONGITUDE		RL SURFACE	m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.70 m depth	LATITUDE		ASPECT	North	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID MW01 Static Water Level
HSA		Inflow	1	0.25	0.3-0.5/S/Dupe02 D 0.30-0.50 m				CONCRETE.			Concrete
								SM	FILL: Silty SAND; medium grained; brown; with shell inclusions.			Casing. Cuttings
					0.7-0.8/S/1 D 0.70-0.80 m							Bentonite
			2	1.50				SP	SAND; brown, dark brown; with trace silt; trace shells.			
			3									
			4	4.00					Grey / brown.			Sand
			5									
			6	6.00					Grey, occasional blackish grey / brown.			Screen.
			7	7.70								
			8						Hole Terminated at 7.70 m (Target depth reached)			
			9									

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Engineering Log - TEST

Appendix D – Dewatering Modelling

4.000

Method ST-na Revised 20.1.2022

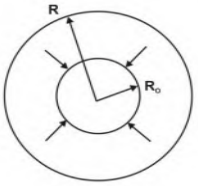
PROJECT DETAILS

Site	1-3 Gondola Road, North Narrabeen	Date	5-Jul-24
Project	Mixed use development	Assessor	TR
Project Ref	P2310036	Reviewer	BM

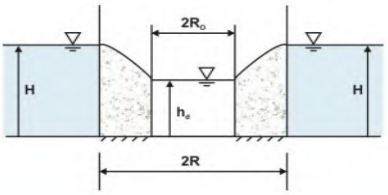
SIDEWALL INFLOW

Method: Dupuit solution, Bear (1979)

FACTOR	Enter Data	Unit
H - Average static head outside excvation	0.720	m
h_d - Head in excvation (0 if dry)	0.000	m
R_o - Equivalent excavation radius	1.450	m
R - Equivalent radius to constant head boundary	29.910	m
K - Hydraulic conductivity	15.000	m/d
Qs - Sidewall inflow	8.071	m^3/d



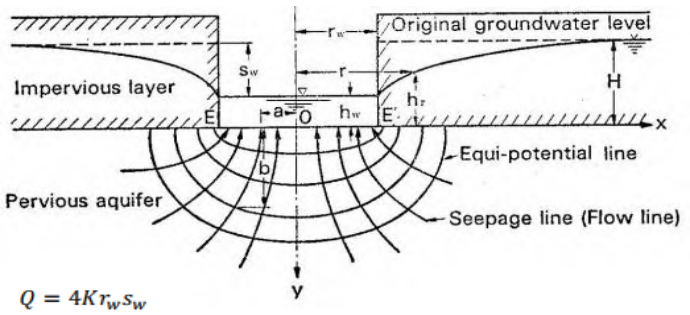
$$Q \quad -\pi K \frac{(H^2 - h_d^2)}{\ln\left\{\frac{R}{R_0}\right\}}$$



EXCAVATION BASE INFLOW

Method: Forchheimer (1914)

FACTOR	Enter Data	Unit
H - Average static head outside excvation	0.720	m
h_d - Head in excvation (0 if dry)	0.000	m
r_w (=R_o) - Equivalent excavation radius	1.450	m
Kh:Kv ratio	0.200	-
K - Hydraulic conductivity	3.000	m/d
S_w - Head difference in excvation	0.720	m
Qb - Base inflow	12.528	m^3/d



$$Q = 4Kr_w s_w$$

SUMMARY

Qs - Sidewall inflow	8.071	m^3/d
Qb - Base inflow	12.528	m^3/d
Qtotal	20.599	m^3/d
	7.519	ML/year

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Appendix E – Laboratory Summary Table

			BTEX						TRH											
			Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.001	1	1	1	2	1	10	10	50	50	100	100	50	0.0002	0.1	0.1	0.1	0.1
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)			0.07	700	180	80													0.4	
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand				5,000 | 5,000 | 5,000						6,000 | 6,000 | 7,000										
Field ID	**Location Code**	**Date**																		
MW01		**11 Apr 2024**	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<0.0002	<0.1	<0.1	<0.1	<0.1
MW02		**11 Apr 2024**	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<0.0002	<0.1	<0.1	<0.1	<0.1
Statistics																				
Number of Detects			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Maximum Concentration			**<0.001**	**<1**	**<1**	**<1**	**<2**	**<1**	**<10**	**<10**	**<50**	**<50**	**<100**	**<100**	**<50**	**<0.0002**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Average Concentration *			**0.0005**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**5**	**5**	**25**	**25**	**50**	**50**	**25**	**0.0001**	**0.05**	**0.05**	**0.05**	**0.05**
Median Concentration *			**0.0005**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**5**	**5**	**25**	**25**	**50**	**50**	**25**	**0.0001**	**0.05**	**0.05**	**0.05**	**0.05**
Standard Deviation *			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

2013, NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand

			PAH											TPH				
			Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of positives)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0005	0.0001	10	50	100	100	50
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)			0.2				1.4			70	2								
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand																			
Field ID	**Location Code**	**Date**																	
MW01		**11 Apr 2024**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0001	<10	<50	<100	<100	<50
MW02		**11 Apr 2024**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0001	<10	<50	<100	<100	<50
Statistics																			
Number of Detects			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Maximum Concentration			**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.0005**	**<0.0001**	**<10**	**<50**	**<100**	**<100**	**<50**
Average Concentration *			**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.00025**	**0.00005**	**5**	**25**	**50**	**50**	**25**
Median Concentration *			**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.00025**	**0.00005**	**5**	**25**	**50**	**50**	**25**
Standard Deviation *			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

2013, NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand

			Biological			Inorganics														
			Faecal Coliforms	E. Coli	Enterococci	Hardness (filtered)	Electrical Conductivity (Non Compensated)	Reactive Silica	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N (filtered)	Chloride	Dissolved Oxygen (Lab)	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N) (filtered)	Nitrite (as N) (filtered)	Organic Nitrogen as N	Nitrogen (Total Oxidised)
			CFU/100mL	cfu/100 ml	org/100ml	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			1	1	1	3	1	0.1	5	5	5	5	0.005	1	0.1		0.1	0.005	0.005	0.2	0.005
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)													0.91								
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand																					
Field ID	**Location Code**	**Date**																			
MW01		**11 Apr 2024**	500	500		1,300	12,000	14	240	<5	<5	240	0.21	3,900	8.3	0	6.0	1.4	0.052	5.8	1.5
MW02		**11 Apr 2024**	<1,000	<1,000	<10	610	2,300	12	490	<5	<5	490	0.040	420	8.4	-3.0	0.4	8.0	0.036	0.4	8.1
Statistics																					
Number of Detects			**1**	**1**	**0**	**2**	**2**	**2**	**2**	**0**	**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Maximum Concentration			**<1,000**	**<1,000**	**<10**	**1,300**	**12,000**	**14**	**490**	**<5**	**<5**	**490**	**0.21**	**3,900**	**8.4**	**0**	**6**	**8**	**0.052**	**5.8**	**8.1**
Average Concentration *			**500**	**500**		**955**	**7,150**	**13**	**365**	**2.5**	**2.5**	**365**	**0.12**	**2,160**	**8.4**	**-1.5**	**3.2**	**4.7**	**0.044**	**3.1**	**4.8**
Median Concentration *			**500**	**500**	**5**	**955**	**7,150**	**13**	**365**	**2.5**	**2.5**	**365**	**0.125**	**2,160**	**8.35**	**-1.5**	**3.2**	**4.7**	**0.044**	**3.1**	**4.8**
Standard Deviation *			**0**	**0**		**488**	**6,859**	**1.4**	**177**	**0**	**0**	**177**	**0.12**	**2,461**	**0.071**	**2.1**	**4**	**4.7**	**0.011**	**3.8**	**4.7**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

2013, NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand

												Organic
			Nitrogen (Total)	pH (Lab)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sodium Absorption Ratio	Sulphate	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)	Turbidity (Lab)	Total Organic Carbon
			mg/L	-	mg/L	mg/L	mg/L	-	mg/L	mg/L	mg/L	NTU	mg/L
EQL			0.1		0.05	0.005	0.5	0.01	1	5	5	0.1	1
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)													
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand													
Field ID	**Location Code**	**Date**											
MW01		**11 Apr 2024**	7.5	7.0	0.4	<0.005	2,300	27	590	8,800	90	120	9
MW02		**11 Apr 2024**	8.5	7.2	1.4	0.11	230	3.9	94	1,800	120	210	15
Statistics													
Number of Detects			**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Maximum Concentration			**8.5**	**7.2**	**1.4**	**0.11**	**2,300**	**27**	**590**	**8,800**	**120**	**210**	**15**
Average Concentration *			**8**	**7.1**	**0.9**	**0.056**	**1,265**	**15**	**342**	**5,300**	**105**	**165**	**12**
Median Concentration *			**8**	**7.1**	**0.9**	**0.05625**	**1,265**	**15.45**	**342**	**5,300**	**105**	**165**	**12**
Standard Deviation *			**0.71**	**0.14**	**0.71**	**0.076**	**1,464**	**16**	**351**	**4,950**	**21**	**64**	**4.2**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

2013, NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand

			Metals																	
			Aluminium (filtered)	Antimony (filtered)	Arsenic (filtered)	Barium (filtered)	Beryllium (filtered)	Boron (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Cobalt (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Lithium (filtered)	Manganese (filtered)	Mercury (filtered)	Molybdenum (filtered)	Nickel (filtered)	Selenium (filtered)	Silicon
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL			0.01	0.001	0.001	0.001	0.0005	0.02	0.0001	0.001	0.001	0.001	0.01	0.001	0.001	0.005	0.00005	0.001	0.001	0.001	200
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)									0.0055		0.001	0.0013		0.0044			0.0004		0.07		
Field ID	**Location Code**	**Date**																			
MW01		**11 Apr 2024**	<0.01	0.001	<0.001	0.056	<0.0005	0.52	<0.0001	<0.001	0.001	<0.001	<0.01	<0.001	0.027	0.25	<0.00005	0.003	<0.001	<0.001	3,900
MW02		**11 Apr 2024**	<0.01	0.002	0.005	0.023	<0.0005	0.07	<0.0001	<0.001	<0.001	0.001	0.02	<0.001	0.007	0.01	<0.00005	0.004	<0.001	<0.001	3,000
Statistics																					
Number of Results			**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Number of Detects			**0**	**2**	**1**	**2**	**0**	**2**	**0**	**0**	**1**	**1**	**1**	**0**	**2**	**2**	**0**	**2**	**0**	**0**	**2**
Minimum Detect			**ND**	**0.001**	**0.005**	**0.023**	**ND**	**0.07**	**ND**	**ND**	**0.001**	**0.001**	**0.02**	**ND**	**0.007**	**0.01**	**ND**	**0.003**	**ND**	**ND**	**3,000**
Maximum Concentration			**<0.01**	**0.002**	**0.005**	**0.056**	**<0.0005**	**0.52**	**<0.0001**	**<0.001**	**0.001**	**0.001**	**0.02**	**<0.001**	**0.027**	**0.25**	**<0.00005**	**0.004**	**<0.001**	**<0.001**	**3,900**
Maximum Detect			**ND**	**0.002**	**0.005**	**0.056**	**ND**	**0.52**	**ND**	**ND**	**0.001**	**0.001**	**0.02**	**ND**	**0.027**	**0.25**	**ND**	**0.004**	**ND**	**ND**	**3,900**
Median Concentration *			**0.005**	**0.0015**	**0.00275**	**0.0395**	**0.00025**	**0.295**	**0.00005**	**0.0005**	**0.00075**	**0.00075**	**0.0125**	**0.0005**	**0.017**	**0.13**	**0.000025**	**0.0035**	**0.0005**	**0.0005**	**3,450**
Standard Deviation *			**0**	**0.00071**	**0.0032**	**0.023**	**0**	**0.32**	**0**	**0**	**0.00035**	**0.00035**	**0.011**	**0**	**0.014**	**0.17**	**0**	**0.00071**	**0**	**0**	**636**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

			Silver (filtered)	Strontium (filtered)	Uranium (filtered)	Vanadium (filtered)	Zinc (filtered)
			mg/L	mg/L	µg/L	mg/L	mg/L
EQL			0.001	0.001	0.5	0.001	0.001
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)			0.0014			0.1	0.008
Field ID	**Location Code**	**Date**					
MW01		**11 Apr 2024**	<0.001	1.6	1.2	<0.001	0.003
MW02		**11 Apr 2024**	<0.001	1.5	3.2	0.012	<0.001
Statistics							
Number of Results			**2**	**2**	**2**	**2**	**2**
Number of Detects			**0**	**2**	**2**	**1**	**1**
Minimum Detect			**ND**	**1.5**	**1.2**	**0.012**	**0.003**
Maximum Concentration			**<0.001**	**1.6**	**3.2**	**0.012**	**0.003**
Maximum Detect			**ND**	**1.6**	**3.2**	**0.012**	**0.003**
Median Concentration *			**0.0005**	**1.55**	**2.2**	**0.00625**	**0.00175**
Standard Deviation *			**0**	**0.071**	**1.4**	**0.0081**	**0.0018**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

ANZG, July 2023, ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)

Appendix F – Laboratory Analytical Documentation

COC: 11/04/24, 1340

martens
consulting engineers since 1989

CHAIN OF CUSTODY FORM

Water Testing													
Name	P2310036 – 1-3 Gondola Road, North Narrabeen												
Martens Contact Officer	Trystan Richards					Contact Email	trichards@martens.com.au						
Sampling and Shipping	Sample Date	11/04/2024		Dispatch Date		11/04/2024	Turnaround Time		standard				
	Our Reference	P2310036COC03V01				Shipping Method (X)	Hand		Post		Courier	X	
	On Ice (X)	X	No Ice (X)		Other (X)								
Laboratory													
Name	EnviroLab												
Sample Delivery Address	12 Ashley Street, Chatswood												
Delivery Contact	Name		Phone	9910 6200	Fax		Email	samplereceipt@envirolabservices.com.au					
Please Send Report By (X)	Post		Fax		Email	X	Reporting Email Address	trichardsi@martens.com.au gtaylor@martens.com.au bmcgiffin@martens.com.au					

Sample ID	Ionic Balance	Nutrient Suite	Microbiology suite	Dissolved HM*	TRH, BTEXN, PAH	Dissolved SiO_2	TSS	TOC	Turbidity	TDS	pH	EC	DO	SAR
MW01	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MW02	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Note: *Please filter for HM from non-preservative bottles.

ENVIROLAB

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

Job No: 348642

Date Received: 11/4/24
Time Received: 1655
Received By: ew
Temp: Cool/Ambient
Cooling: Ice/Icepack 1°C.
Security: Intact/Broken/None

Head Office
Suite 201, 20 George St
Hornsby NSW 2077, Australia
Ph 02 9476 9999 Fax 02 9476 8767

> mail@martens.com.au
> www.martens.com.au
MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

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 348642

Client Details

Client	Martens & Associates Pty Ltd
Attention	Trystan Richards
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P2310036 - 1-3 Gondola Road, North Narrabeen**
Number of Samples	2 Water
Date samples received	11/04/2024
Date completed instructions received	11/04/2024

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.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	18/04/2024
Date of Issue	19/04/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Greta Petzold, Operation Manager
Hannah Nguyen, Metals Supervisor
Loren Bardwell, Development Chemist
Nick Sarlamis, Assistant Operation Manager
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date extracted	-	14/04/2024	14/04/2024
Date analysed	-	15/04/2024	15/04/2024
TRH C_6 - C_9	µg/L	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	131	130
Surrogate Toluene-d8	%	114	114
Surrogate 4-Bromofluorobenzene	%	91	91

svTRH (C10-C40) in Water			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date extracted	-	15/04/2024	15/04/2024
Date analysed	-	16/04/2024	16/04/2024
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50
Surrogate o-Terphenyl	%	93	86

PAHs in Water			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date extracted	-	15/04/2024	15/04/2024
Date analysed	-	16/04/2024	16/04/2024
Naphthalene	µg/L	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	87	94

HM in water - dissolved			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date prepared	-	17/04/2024	17/04/2024
Date analysed	-	17/04/2024	17/04/2024
Arsenic-Dissolved	µg/L	<1	5
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	1
Lead-Dissolved	µg/L	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	<1
Zinc-Dissolved	µg/L	3	<1

Metals in Waters - Acid extractable			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date prepared	-	15/04/2024	15/04/2024
Date analysed	-	16/04/2024	16/04/2024
Phosphorus - Total	mg/L	0.4	1.4

Miscellaneous Inorganics			
Our Reference	UNITS	348642-1	348642-2
Your Reference		MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date prepared	-	11/04/2024	11/04/2024
Date analysed	-	11/04/2024	11/04/2024
Ammonia as N in water	mg/L	0.21	0.040
Nitrate as N in water	mg/L	1.4	8.0
Nitrite as N in water	mg/L	0.052	0.036
NOx as N in water	mg/L	1.5	8.1
Total Nitrogen in water	mg/L	7.5	8.5
TKN in water	mg/L	6.0	0.4
Phosphate as P in water	mg/L	<0.005	0.11
Organic Nitrogen as N	mg/L	5.8	0.4
Total Organic Carbon	mg/L	9	15
Total Suspended Solids	mg/L	90	120
Turbidity	NTU	120	210
Sodium Adsorption Ratio	-	27	3.9
Total Dissolved Solids (grav)	mg/L	8,800	1,800
pH	pH Units	7.0	7.2
Electrical Conductivity	µS/cm	12,000	2,300
Dissolved Oxygen*	mg/L	8.3	8.4
Silica (Reactive - SiO_2)	mg/L	14	12

Ion Balance			
Our Reference		348642-1	348642-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date prepared	-	11/04/2024	11/04/2024
Date analysed	-	11/04/2024	11/04/2024
Calcium - Dissolved	mg/L	150	180
Potassium - Dissolved	mg/L	76	7.3
Sodium - Dissolved	mg/L	2,300	230
Magnesium - Dissolved	mg/L	230	38
Hardness (calc) equivalent $CaCO_3$	mg/L	1,300	610
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	240	490
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	240	490
Sulphate, SO4	mg/L	590	94
Chloride, Cl	mg/L	3,900	420
Ionic Balance	%	0	-3.0

Microbiologocal Testing			
Our Reference	UNITS	348642-1	348642-2
Your Reference		MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date of testing	-	12/04/2024	12/04/2024
Faecal Coliforms	cfu/100mL	500	<1000
E. coli	cfu/100mL	500	<1000
Enterococci	cfu/100mL	30 A	<10

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
Inorg-001	pH - Measured using pH meter and electrode. 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.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:- TDS = EC * 0.6
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA latest edition, 2130-B.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
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.
Inorg-112	Dissolved Oxygen using membrane electrode. Note this analysis should ideally be carried out immediately after sampling.
INORG-120	Reactive Silica (SiO2) determined colorimetrically. Waters samples are filtered on receipt prior to analysis.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
Metals-021	Determination of Mercury by Cold Vapour AAS.

Method ID	Methodology Summary
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	[NT]
Date extracted	-			14/04/2024	[NT]	[NT]	[NT]	[NT]	14/04/2024	[NT]
Date analysed	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	107	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	103	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	121	[NT]	[NT]	[NT]	[NT]	107	[NT]
Surrogate Toluene-d8	%		Org-023	113	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	96	[NT]	[NT]	[NT]	[NT]	94	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	348642-1
Date extracted	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	15/04/2024
Date analysed	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	16/04/2024
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	121
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	104	112
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	86	95
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	121
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	104	112
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	86	95
Surrogate o-Terphenyl	%		Org-020	91	[NT]	[NT]	[NT]	[NT]	90	93

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	348642-1
Date extracted	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	15/04/2024
Date analysed	-			16/04/2024	[NT]	[NT]	[NT]	[NT]	16/04/2024	16/04/2024
Naphthalene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	83
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	78	76
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	91	80
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	74
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	79	78
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	83
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	72	71
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	86	87
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	84	[NT]	[NT]	[NT]	[NT]	99	92

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Date analysed	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	97	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	348642-2
Date prepared	-			15/04/2024	[NT]	[NT]	[NT]	[NT]	15/04/2024	15/04/2024
Date analysed	-			16/04/2024	[NT]	[NT]	[NT]	[NT]	16/04/2024	16/04/2024
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	89	89

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			11/04/2024	1	11/04/2024	11/04/2024		11/04/2024	[NT]
Date analysed	-			11/04/2024	1	11/04/2024	11/04/2024		11/04/2024	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.21	[NT]		103	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	1.4	[NT]		99	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.052	[NT]		101	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	1.5	[NT]		99	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	7.5	[NT]		87	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	6.0	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		115	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	5.8	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	9	[NT]		84	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	90	83	8	97	[NT]
Turbidity	NTU	0.1	Inorg-022	<0.1	1	120	[NT]		100	[NT]
Sodium Adsorption Ratio	-	0.01	Metals-020	<0.01	1	27	[NT]		96	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	8800	[NT]		102	[NT]
pH	pH Units		Inorg-001	[NT]	1	7.0	[NT]		99	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	12000	[NT]		100	[NT]
Dissolved Oxygen*	mg/L	0.1	Inorg-112	<0.1	1	8.3	[NT]		[NT]	[NT]
Silica (Reactive - SiO_2)	mg/L	0.1	INORG-120	<0.1	1	14	[NT]		95	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			11/04/2024	[NT]	[NT]	[NT]	[NT]	11/04/2024	[NT]
Date analysed	-			11/04/2024	[NT]	[NT]	[NT]	[NT]	11/04/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	103	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	96	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	104	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	117	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	114	[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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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.

Report Comments

Microbiology analysed by Sonic Food & Water Testing. Report No. W2408699 & W2408700
A: Approximate
The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised

Dissolved Metals: no filtered, preserved sample was received, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

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CERTIFICATE OF ANALYSIS 348642-A

Client Details

Client	Martens & Associates Pty Ltd
Attention	Trystan Richards
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P2310036 - 1-3 Gondola Road, North Narrabeen**
Number of Samples	Additional analysis
Date samples received	11/04/2024
Date completed instructions received	26/04/2024

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.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	03/05/2024
Date of Issue	26/04/2024

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

Results Approved By
Hannah Nguyen, Metals Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

All metals in water-dissolved			
Our Reference		348642-A-1	348642-A-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date prepared	-	17/04/2024	17/04/2024
Date analysed	-	17/04/2024	17/04/2024
Aluminium-Dissolved	µg/L	<10	<10
Antimony-Dissolved	µg/L	1	2
Arsenic-Dissolved	µg/L	<1	5
Barium-Dissolved	µg/L	56	23
Beryllium-Dissolved	µg/L	<0.5	<0.5
Boron-Dissolved	µg/L	520	70
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Cobalt-Dissolved	µg/L	1	<1
Copper-Dissolved	µg/L	<1	1
Iron-Dissolved	µg/L	<10	20
Lead-Dissolved	µg/L	<1	<1
Lithium-Dissolved	µg/L	27	7
Manganese-Dissolved	µg/L	250	10
Mercury-Dissolved	µg/L	<0.05	<0.05
Molybdenum-Dissolved	µg/L	3	4
Nickel-Dissolved	µg/L	<1	<1
Selenium-Dissolved	µg/L	<1	<1
Silver-Dissolved	µg/L	<1	<1
Strontium-Dissolved	µg/L	1,600	1,500
Uranium-Dissolved	µg/L	1.2	3.2
Vanadium-Dissolved	µg/L	<1	12
Zinc-Dissolved	µg/L	3	<1

Metals in Water - Dissolved			
Our Reference		348642-A-1	348642-A-2
Your Reference	UNITS	MW01	MW02
Date Sampled		11/04/2024	11/04/2024
Type of sample		Water	Water
Date digested	-	17/04/2024	17/04/2024
Date analysed	-	17/04/2024	17/04/2024
Silicon*- Dissolved	mg/L	3.9	3.0

Method ID	Methodology Summary
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.

QUALITY CONTROL: All metals in water-dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Date analysed	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	[NT]	[NT]	[NT]	[NT]	119	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Lithium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	97	[NT]
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Silver-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Strontium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: Metals in Water - Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Date analysed	-			17/04/2024	[NT]	[NT]	[NT]	[NT]	17/04/2024	[NT]
Silicon*- Dissolved	mg/L	0.2	Metals-020	<0.2	[NT]	[NT]	[NT]	[NT]	98	[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
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Quality Control Definitions

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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.

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

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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.

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

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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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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.

Report Comments

Dissolved Metals: no filtered, preserved sample was received, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

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SAMPLE RECEIPT ADVICE

Client Details

Client	Martens & Associates Pty Ltd
Attention	Trystan Richards

Sample Login Details

Your reference	P2310036 - 1-3 Gondola Road, North Narrabeen
Envirolab Reference	348642
Date Sample Received	11/04/2024
Date Instructions Received	11/04/2024
Date Results Expected to be Reported	18/04/2024

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	1
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Microbiology suite assumed as Faecal Coliforms, E.Coli, Enterococci as previous jobs

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	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	Metals in Waters -Acid extractable	Ammonia as N in water	Nitrate as N in water	Nitrite as N in water	NOx as N in water	Total Nitrogen in water	TKN in water	Phosphate as P in water	Organic Nitrogen as N	Total Organic Carbon	Total Suspended Solids	Turbidity	Sodium Adsorption Ratio	Total Dissolved Solids(grav)	pH	Electrical Conductivity	Dissolved Oxygen*	Silica (Reactive - SiO2)	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hardness (calc) equivalent CaCO3	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Microbiologocal Testing
MW01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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.