CONSULTING EARTH SCIENTISTS

18 February 2021

CES Document Reference:
CES161003-HC-AH

Centurion Project Management
Level 25, 88 Phillip Street
Sydney NSW 2000

RE: HPE CM: LCC: 18 Randwick Close Casula Review

For the attention of Nick Winberg

Dear Sirs,

1 INTRODUCTION

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Centurion Group Pty Ltd (the Client) to carry out groundwater sampling and assessment at 18 Randwick Close, Casula, New South Wales (NSW) (the Site) in order to respond to two issues raised by Liverpool City Council in their letter *RE: HPE CM: LCC: 18 Randwick Close Casula Review* dated 23 October 2020.

Works were conducted in general accordance with the applicable legislation and guidelines including but not limited to:

- National Environmental Protection Measures (Assessment of Site Contamination) Measure 1999 (NEPC), 2013);
- Contaminated Land Guidelines: Consultants Reporting on Contaminated Land (NSW EPA, April 2020).
- The Guidelines on the Duty to report Contamination under the Contaminated Land Management Act 1997 (NSW EPA, 2015); and

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- Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality (ANZG, 2018).

2 BACKGROUND

In correspondence Adam Flynn of Liverpool City Council (LCC), by email: *RE: HPE CM: LCC: 18 Randwick Close Casula Review* (dated 23 October 2020) LCC requested the Client address the following issues:

1. *The Guidelines on the Duty to report Contamination under the Contaminated Land Management Act 1997 published by NSW EPA (2015) outlines when contamination should be reported to the NSW EPA pursuant to section 60 of the Contaminated Land Management Act 1997 (CLM Act).*
   The suitably qualified consultant is to confirm whether there is a need to report the contamination based on the noted document above; and

2. *It is also noted that the groundwater table may be incumbered as a result of the basement carparks that are proposed to be constructed onsite. It is assumed that the groundwater is likely to be captured and discharged into the stormwater system.*
   Concern is raised with the discharge of groundwater that does not meet ANZG (2018) criteria into the stormwater infrastructure as this may constitute water pollution upon discharge. The consultant is to make note and advise on how this can be mitigated/ minimised, if possible.

CES has prepared two reports relating to the contamination status of the site to support a development application:

- *Stage I – Preliminary Site Investigation* (CES161003-HC-AC, dated 1 February 2017); and
- *Detailed Site Investigation (DSI)* (CES161003-HC-AF, dated 18 September 2020).

The DSI (CES, 2020) recommended that while groundwater exceedances of the adopted site assessment criteria were identified, the exceedances were '*...unlikely to pose an unacceptable risk to Glenfield Creek or the Georges River*' and that '*...remediation or management of groundwater is not required for the proposed development*'.

3 SCOPE OF WORKS

To respond to the two items identified by LCC the following scope of works was adopted:

- Developed the three existing monitoring wells to improve well performance and maximise the potential for the obtained water sample to be representative of the formation groundwater quality;
- Collected three groundwater samples (and two Quality Assurance and Quality Control (QAQC) samples) from the existing monitoring wells using a foot valve;
- Groundwater samples were submitted to a National Association of Testing Authorities (NATA) accredited laboratory for analysis for 8 common metals and metalloids;
- One groundwater sample was also analysed for hardness to allow for the revision of the site assessment criteria for nickel and zinc in accordance with ANZG (2018);
- Commissioned a survey of groundwater monitoring wells to obtain accurate groundwater elevations to determine the likely direction of groundwater flow. The survey was undertaken by SDN Land Surveyors Pty Ltd;
- Reviewed revised development plans and site conditions to determine the likelihood of groundwater discharge being required by the development during and following construction phase;
- Prepared this letter which:
    - Details the results of fieldwork and revised groundwater assessment;
    - Provides recommendations relating to the Duty to Report under Contaminated Land Management Act 1997 as presented in the Guidelines on the Duty to report Contamination under the Contaminated Land Management Act 1997 published by NSW EPA (2015), in the context of the revised groundwater assessment; and
    - Provides an assessment of the likelihood of groundwater discharge from the site being required by the development during and following construction phase.

4 RESULTS

Fieldwork was undertaken as follows:

- Groundwater well development was completed on 12 November 2020;
- Groundwater sampling was undertaken on 23 November 2020; and
- Survey of groundwater well elevations was completed on 24 December 2020.

Field data sheets from groundwater well development and sampling are presented as Appendix A and calibration certificates for the water quality meter and interface probe are presented as Appendix B.

4.1 GROUNDWATER WELL SURVEY

Survey results are presented as Appendix C, with the elevation of well headworks presented on Table T1.

4.2 GROUNDWATER GAUGING

Standing groundwater levels were measured in the monitoring wells using a calibrated interface probe. No free LNAPL was detected in the groundwater monitoring wells on 12 and 23 November 2020.

Groundwater gauging results from both the monitoring/developing events are presented in Table T1. Groundwater levels ranged between 34.83 to 35.29 mAHD. Groundwater water levels remained relatively consistent between development and sampling events.

Groundwater contours have been prepared based on the measured groundwater elevations using the nearest neighbour method and are presented on Figure 1. Groundwater contours indicate the groundwater flow direction is likely to be towards the north-east.

4.3 FIELD OBSERVATIONS

The details of field observations, including standing water levels, colour, turbidity and odours are presented in Table T1.

No odours or visual indicators of contamination were detected.

4.4 FIELD PARAMETERS

Groundwater field parameter data is presented in Table T1.

Field parameters indicate that the water beneath the Site is generally circum-neutral to mildly acidic, moderately to well oxygenated, and a strongly to mildly reducing environment was present.

4.5 LABORATORY RESULTS

Laboratory Certificates of Analysis, Sample Receipt Notification, and COC documentation is presented as Appendix D.

Based on the hardness detected in groundwater sample GW1 the site assessment criteria for nickel and zinc have been revised as recommended by ANZG (2018), using the formula presented in Table 3.4.3 of ANZECC (2000). The revised criteria are presented in Table T2.

A summary of laboratory analysis and a comparison of the analysis results to the ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Fresh Water 95% species protection) are presented in Table T2. Groundwater analysis results from the DSI (CES, 2020) sampled 28 August 2020 are also presented in Table T2 for reference.

The laboratory results for the current monitoring event detected concentrations below the adopted groundwater criteria with the exception of the following:

- Copper in GW1 (10 µg/L) and GW3 (18 µg/L) exceeded the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Fresh water, 95% species protection) (ANZG, 2018) criteria of 1.4 µg/L.

Nickel and zinc concentrations detected did not exceed the revised criteria. Similarly, the nickel and zinc concentrations detected as part of the DSI (CES 2020) did not exceed the revised screening criteria.

QAQC samples conformed to the data acceptance criteria. QAQC assessment results and data acceptance criteria are provided in Tables T3 and T4, respectively.

5 DISCUSSION

Based on the groundwater contours presented on Figure 1, the direction of groundwater flow is likely to be to the north-east. This differs from the groundwater flow direction assumed in the DSI (CES,2020), which assessed the likely groundwater flow to be to the east based on site topography and nearby water bodies.

Metal and metalloid concentrations detected in November 2020 were generally consisted with previous results, with the exception of copper in GW2 which reduced from 29 µg/L in

August to less that the laboratory Practical Quantitation Limit (PQL) of 1 µg/L, and therefore below the adopted screening criteria (1.4 µg/L).

Copper concentrations were also reduced in GW1, from 34 µg/L (August 2020) to 10 µg/L (November 2020), while in GW3 copper concentrations increased from 4 µg/L to 18 µg/L. As a result, GW1 and GW3 copper concentrations remained in excess of the ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Fresh Water 95% species protection).

The results confirm the DSI assessment with respect to requiring remediation and/or management as:

- Groundwater flow is likely to be to the north-east, towards Brickmakers Creek which feeds Cabramatta Creek, with the Georges River likely the receiving water body;
- Concentrations in most hydraulically up-gradient GW1 monitoring well may indicate that the concentrations are indicative of background levels or a result of offsite sources and not contamination produced by the Site's historical use;
- The groundwater is in low permeability clay and Bringelly shale (expected permeability range is 10^{-13} to 10^{-9} m/s [Freeze and Cherry, Groundwater, 1979]); and
- Copper concentrations are likely to be subject to extensive natural attenuation through physical processes such as advection, diffusion, and sorption as groundwater flows to the receiving water body, therefore copper concentrations are unlikely to impact the receiving water body.

5.1 ISSUE 1: DUTY TO REPORT CONTAMINATION

Section 2.5 of *Guidelines on the Duty to Report Contamination Under the Contaminated Land Management Act 1997* (NSW EPA, 2015) specify the following:

> "*The duty to report is not intended to capture the notification of:*
>
> - *widespread diffuse urban pollution that is not attributed to a specific industrial, commercial or agricultural activity".*

With respect to metal concentrations in excess of the adopted screening criteria identified during the DSI (CES, 2020) and recent groundwater monitoring, the following is noted:

- Groundwater flow has been calculated (using gauging and survey data from the 23 November and 22 December 2020, respectively) to be towards the north-east;
- Copper is not a contaminant generally associated with the Site's main historical activity of poultry processing. That is to say that an onsite potential source of copper has not been identified.

  The addition of copper sulfate to poultry feed is known to be common industry practice, however no evidence of storage of feed (presence of feed stores in aerial photographs) have been identified or are considered likely to be associated with poultry processing;
- Concentrations of copper in site soils were not elevated to an extent that would indicate a source copper with the potential to lead to groundwater contamination;
- The Site's historical poultry processing sheds are located hydraulically downgradient groundwater monitoring well GW1 and cross gradient of GW2. The poultry processing sheds are therefore unlikely to be the source of the copper impact.
- GW1 and GW2 are located approximately 35 m and 40 m from their respective up hydraulic gradient site boundaries. Both monitoring wells detected elevated copper concentrations in excess of the ANZG (2018) criteria in August 2020 and GW1 in November 2020. Review of historic aerial photographs of the site did not identify a onsite copper source up hydraulic gradient of GW1 and GW2; and
- GW2 is hydraulically cross gradient of GW1, which indicates that the copper impact in groundwater is either a diffuse source, a point source a distance away from GW1 and GW2 to allow for sufficient diffusion to distribute the impact or multiple onsite sources (which is unlikely given no onsite sources have been identified);

Based on the above, it is unlikely that copper groundwater contamination is resultant from the Site's historical activity and is likely resultant from diffuse urban pollution. As evidenced by copper contamination present within hydraulically up-gradient groundwater monitoring well, GW1.

Therefore, it is unreasonable that the elevated copper concentrations represent a duty to report under the *Guidelines on the Duty to Report Contamination Under the Contaminated Land Management Act 1997* (NSW EPA, 2015).

5.2 ISSUE 2: DISCHARGE OF GROUNDWATER

Groundwater gauging results indicate groundwater levels range between 34.83 and 35.29 mAHD. Development plans (Project No. 2016098, Drawing No. DA-109, FLOOR PLAN –

BASEMENT 1, provided in Appendix E) indicate that the lowest point of the proposed basement is to be constructed at 35.35 m AHD, 0.06 m above the highest groundwater elevation detected. As such based on the measured groundwater levels, discharge of groundwater is highly unlikely to be required.

In addition, CES understands through discussions with the Client's civil engineer consultancy, Taylor Thomson Whitting, that:

- The basement floor slab and lowest 1 m of the basement walls will be water-proofed;
- Any localised sumps or shafts extending below the groundwater table will be fully tanked;
- In the highly unlikely event of groundwater seepage into the basement from above 1 m from the basement floor, approximately 1.0 m above the recorded groundwater level, suitable seepage collection infrastructure (Agricultural Lines) is proposed to collect seepage. Seepage water will be combined with site stormwater prior to discharge; and
- Groundwater seepage into the basement is considered highly unlikely, given the low permeability formation encountered at the site, the groundwater elevation detected below the basement floor slab and the treatment of basement slab and walls.

Based on the details above, if in the highly unlikely event that discharge of groundwater is required by the development, the volume of groundwater to be discharged is likely to be negligible, and discharged in combination with site stormwater, and is therefore it is considered unlikely to impact the receiving water body.

During construction deeper excavation may be required, which may result in groundwater seepage which requires management. Given the ground conditions encountered during investigations (low formation permeability and groundwater elevations below the proposed basement floor) seepage volumes are likely to be low and onsite management may be suitable.

If discharge of groundwater seepage is required, treatment of groundwater may be required prior to reduce copper concentrations and meet discharge criteria.

6 SUMMARY

In consideration of the above, the following is noted:

- It is unreasonable that the elevated copper concentrations represent a duty to report the contamination based on *Guidelines on the Duty to Report Contamination Under the Contaminated Land Management Act 1997* (NSW EPA 2015);
- Groundwater discharged during the construction phase may require treatment to reduce copper concentrations and meet discharge criteria; and
- Discharge of groundwater following construction is highly unlikely, and if required is likely to consist of very small volumes of groundwater. Groundwater will be combined with site stormwater discharges and as such and is considered unlikely to impact the receiving water body.

Should you require further information or clarification of any details, please do not hesitate to contact the undersigned on 02 8569 2200.

For and on behalf of Consulting Earth Scientists Pty Ltd.

Andrew Carras
Environmental Geologist

Mark Challoner

Certified Environmental Practitioner: Site Contamination Specialist
Principal Environmental Scientist

List of References
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7 REFERENCES

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

CES (2016), *Preliminary Geotechnical Investigation Report 18 Randwick Close, Casula, NSW* dated 7 December 2017, CES Document Reference CES161003-HC-AB.

CES (2017), *Stage 1 – Preliminary Site Investigation, 18 Randwick Close, NSW*, dated 1 February 2017, CES Document Reference CES161003-HC-AC.

Freeze and Cherry (1979) *Groundwater*.

NEPC, 2013: National Environment Protection Council (2013*).* National Environment Protection (Assessment of Site Contamination) Measure. *Schedule B(1) Guideline on Investigation Levels For Soil and Groundwater.*

NEPC, 2013: National Environment Protection Council (2013*).* National Environment Protection (Assessment of Site Contamination) Measure. *Schedule B(2) Guideline on Site Characterisation.*

NSW EPA (2015) *The Guidelines on the Duty to report Contamination under the Contaminated Land Management Act 1997*

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Figures

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Title

Figure 1: Groundwater Flow Gradient

CES Project ID:	Date:
CES161003-HC	24/10/2016
Prepared By: M. Thompson	Checked By; D. Lowe

Tables

Table T1: Groundwater Field Parameter Measurement and Observation Results

Well ID	Date	TOC	SWL	SWL	Total Depth	pH	EC	DO	Eh	Temp	Observations
		mAHD	m BTOC	mAHD	m BTOC		µS/cm	mg/L	mV	°C	
GW1	21/08/2020	40.31	5.17	35.14	9.06	5.85	26,411	0.34	-86.1	20.0	Slightly cloudy light brown, low turbidity, no odour, no sheen.
	12/11/2020	40.31	5.11	35.20	9.06	6.46	23,115	2.59	14.7	21.6	Dark brown, high turbidity, organic odour
	23/11/2020	40.31	5.16	35.15	9.07	6.11	20,511	0.25	-104.7	20.6	Brown/grey, no odour, high turbidity
GW2	21/08/2020	38.71	3.47	35.24	9.04	6.51	20,351	0.42	82	20.0	Light brown, low turbidity, no odour no sheen.
	12/11/2020	38.71	3.42	35.29	9.05	6.73	20,203	4.19	86.1	20.5	Dark brown, high turbiddity, no odour.
	23/11/2020	38.71	3.55	35.16	9.03	6.23	19,711	1.18	97.9	20.2	Brown, no odour, high turbidity
GW3	21/08/2020	39.13	4.17	34.96	9.06	6.50	11,641	3.59	140	18.9	Slightly cloudy light brown, low turbidity, no odour, no sheen.
	12/11/2020	39.13	3.97	35.16	9.05	6.87	2,184	4.23	57.7	20.6	Light brown, high turbidity, no odour
	23/11/2020	39.13	4.30	34.83	9.05	6.40	2,533	3.78	6.4	20.9	Light brown, low turbidity, no odour

m BTOC: metres below top of casing
SWL: Standing water level
EC: Electrical conductivity
DO: Dissolved oxygen
Eh: Redox potential
Temp: Temperature
µS/cm: Micro siemens per centimetre
mg/L: milligram per litre
mV: millivolts
°C: Degrees Celsius

Table T2: Summary of Groundwater Results and Comparison to Adopted Screening Criteria

	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Fresh water, 95% species protection)		Lab Report	249512	256422	249512	256422	249512	256422
			Project Number	CES161003-HC					
			Sample	GW1		GW2		GW3	
			Date Sampled	24/08/2020	23/11/2020	24/08/2020	23/11/2020	24/08/2020	23/11/2020
		Units	PQL						
Arsenic	13	µg/L	1	<1	1	<1	<1	1	2
Cadmium	0.5	µg/L	0.1	<0.1	<0.1	0.3	0.2	<0.1	<0.1
Chromium	39 [A]	µg/L	1	<1	<1	<1	<1	<1	<1
Copper	1.4	µg/L	1	34	10	29	<1	4	18
Lead	983 [A]	µg/L	1	<1	<1	1	<1	<1	<1
Mercury	0.06	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	488 [A]	µg/L	1	170	58	6	2	3	5
Zinc	355 [A]	µg/L	1	87	24	60	5	5	17
Calcium - Dissolved	-	mg/L	0.5	-	79	-	-	-	-
Magnesium - Dissolved	-	mg/L	0.5	-	590	-	-	-	-
Hardness	-	mgCaCO3/L	3	-	2600	-	-	-	-

[A] - Amended for hardness data

Exceeds Freshwater Criteria

Table T3: Groundwater QAQC Assessment Results

			256422	256422	ES2041679				
			CES161003-HC	CES161003-HC	CES161003-HC	**Average**	**Blind RPD**	**Average**	**Split RPD**
		Sample	GW3	QW2	QW2A				
		Date Sampled	23/11/2020				**%**		**%**
	Units	PQL							
Arsenic	µg/L	1.00	2	2	1	2	0.0%	2	66.7%
Cadmium	µg/L	0.10	<0.1	<0.1	<0.1	N/A	N/A	N/A	N/A
Chromium	µg/L	1.00	<1	<1	<1	N/A	N/A	N/A	N/A
Copper	µg/L	1.00	18	18	15	18	0.0%	17	18.2%
Lead	µg/L	1.00	<1	<1	<1	N/A	N/A	N/A	N/A
Mercury	µg/L	0.05	<0.05	<0.05	<0.1	N/A	N/A	N/A	N/A
Nickel	µg/L	1.00	5	5	5	5	0.0%	5	0.0%
Zinc	µg/L	1.00	17	16	16	17	6.1%	17	6.1%

Appendix A
Field Data Sheets

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GROUNDWATER FIELD DATA SHEET

Client: Centurion Group	**CES Project Code:** CES161003-HL
Project: RANDWICK CLOSE, CASULA	**Location:** CASULA
Sampler (s): AC **Signature(s):**	**Project Manager:** A CARUANA
BH ID: GW1	**Sample ID:** GW1
Purging Date: 21/8/20	**Sampling Date:** 21/8/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments: Total 9.06	YES/NO		

Standing Water Level (SWL): 5.17 (mBTOC)

~~Well volume:~~ (L)

~~Water level after purging:~~ (mBTOC)

~~Water level at time of sampling~~: (mBTOC)

~~Volume of water purged~~: (L)

Purging equipment: per Pump / micro-Purging / Bailer / Foot Valve

Sampling equipment: per Pump / Bailer

Weather Conditions

Temperature: 14 °C

Clear / Partly Cloudy / Overcast

Calm / Slight breeze / Moderate Breeze / Windy

Fine / Showers / Rain

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments	DTW
902	0	1.28	25846	5.90	78.1	20.2	slightly cloudy, light brown, low turb, no odour	5.29
3	0.5	0.39	26490	5.85	-23.6	20.1	" "	5.33
6	1.0	0.39	26535	5.84	-43.4	20.1	" "	5.36
9	1.5	0.32	26501	5.81	-68.1	20.1	" "	5.40
13	2.0	0.32	26486	5.84	-81.7	20.0	" "	5.43
16	2.5	0.34	26398	5.85	-83.4	20.0	" "	5.45
20	3.0	0.39	26411	5.85	-86.1	20.0	" "	5.49

Groundwater field parameters at the end of purging to be marked "Field Measurements".

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GROUNDWATER FIELD DATA SHEET

Client:	**CES Project Code:**
Project:	**Location:** CASULA
Sampler (s): A. CARUANA **Signature(s):**	**Project Manager:** A CARUANA
BH ID: GW2	**Sample ID:** GW2
Purging Date: 21/8/20	**Sampling Date:** 21/8/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

Total 9.04

Standing Water Level (SWL): 3.47	(mBTOC)	Weather Conditions Temperature: 13	°C
~~Well volume:~~	(L)		
~~Water level after purging:~~	(mBTOC)	(Clear) Partly Cloudy Overcast	
~~Water level at time of sampling:~~	(mBTOC)		
~~Volume of water purged:~~	(L)	(Calm) Slight breeze Moderate Breeze	
Purging equipment:	(Pump) / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	(Pump) / Bailer	(Fine) Showers Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments	DTW
946	0	1.21	20516	6.58	46.7	20.3	No odour, ~~No~~ Low Turb.	3.54
3	0.5	0.47	20287	6.51	81.1	20.0		3.59
6	1.0	0.46	20296	6.51	81.4	20.0		3.61
9	1.5	0.45	20298	6.51	81.6	20.0		3.63
12	2.0	0.44	20309	6.51	81.9	20.0		3.66
15	2.5	0.42	20351	6.51	82.0	20.0		3.69

Groundwater field parameters at the end of purging to be marked "Field Measurements".

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GROUNDWATER FIELD DATA SHEET

Client: Centurion Group	**CES Project Code:** CES161003-HC
Project: RANDWICK CLOSE, CASULA	**Location:** CASULA
Sampler (s): A CARRAS **Signature(s):**	**Project Manager:** A. CARRAS
BH ID: GW3	**Sample ID:** GW3
Purging Date: 21/8/20	**Sampling Date:** 21/8/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

Total 9.06

Standing Water Level (SWL): 4.17 (mBTOC)

~~Well volume:~~ (L)

~~Water level after purging:~~ (mBTOC)

~~Water level at time of sampling~~: (mBTOC)

~~Volume of water purged:~~ (L)

Purging equipment: Peri Pump / micro-Purging / Bailer / Foot Valve

Sampling equipment: Peri Pump / Bailer

Weather Conditions

Temperature: 13 °C

Clear / Partly Cloudy / Overcast

Calm / Slight breeze / Moderate Breeze / Windy

Fine / Showers / Rain

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO ($mg.L^{-1}$)	EC ($uS.cm^{-1}$)	pH -	Eh mV	Temp. (°C)	D to W	Comments
Start @ 813am	0	3.58	13650	6.90	97.4	18.7	4.24	Slightly cloudy, Light brown, no odour
3	0.5	3.71	12011	6.56	131.0	18.5	4.27	
6	1	3.63	11790	6.56	133.1	18.5	4.29	
10	1.5	3.63	11701	6.51	139.2	18.8	4.32	
14	2	3.55	11683	6.50	139.9	18.9	4.35	
17	2.5	3.59	11641	6.50	140.0	18.9	4.36	

Groundwater field parameters at the end of purging to be marked "Field Measurements".

QW1 / QW1A TAKEN

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GROUNDWATER FIELD DATA SHEET

Client:	**Centurion Project Management**	**CES Project Code:**	**CES161003-HC**
Project:	**18 Randwick Close, Casula**	**Location:**	**Casula**
Sampler (s):	Lucas Peralta **Signature(s):**	**Project Manager:**	**M. Challoner**
BH ID:	GW1	**Sample ID:**	—
Purging Date:	12/4/2020	**Sampling Date:**	—

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO GRASS	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

Standing Water Level (SWL):	5.11	(mBTOC)	Weather Conditions		
Total Well Depth:	9.06	(mBTOC)	Temperature:		°C
Well volume:	8	(L)	Clear	Partly Cloudy	Overcast
Volume of water purged:	24 PURGED DRY	(L)			
			Calm	Slight breeze	Moderate Breeze
Purging equipment:		Pump / micro-Purging / Bailer / Foot Valve	Windy		
Sampling equipment:	N/A	Pump / Bailer / micro-Purging	Fine	Showers	Rain

Purging Details

SWL (mBTOC) Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
6.79	16	2.99	24117	6.92	11.9	21.6	DARK BROWN, HIGH FULVS, ORG. ODOUR, ROOTS
7.54	20	2.24	24220	6.43	22.4	21.4	"
DRY	~~40~~ 24	2.59	23115	6.46	14.7	21.6	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Centurion Project Management**	**CES Project Code:**	**CES161003-HC**
Project:	**18 Randwick Close, Casula**	**Location:**	**Casula**
Sampler (s):	Lucas Peralta **Signature(s):**	**Project Manager:**	**M. Challoner**
BH ID:	GW2	**Sample ID:**	—
Purging Date:	12/11/2020	**Sampling Date:**	—

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO GRASS	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

Standing Water Level (SWL):	3.42 (mBTOC)	Weather Conditions	
Total Well Depth:	9.05 (mBTOC)	Temperature:	°C
Well volume:	11.2 (L)	Clear / Partly Cloudy / Overcast	
Volume of water purged:	(L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	Pump / Bailer / micro-Purging N/A	Fine / Showers / Rain	

Purging Details

~~Elapsed time (min)~~ SWL (mBTOC)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
4.89	10	3.53	19906	7.28	96.1	20.8	DARK BROWN, HIGH TURB., ODOURLESS
5.56	20	2.87	18833	6.86	80.0	20.1	"
6.98	40	2.64	19984	6.68	75.5	20.2	"
7.03	50	4.19	20203	6.73	86.1	20.5	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Centurion Project Management**	**CES Project Code:**	**CES161003-HC**
Project:	**18 Randwick Close, Casula**	**Location:**	**Casula**
Sampler (s):	Lucas Peralta **Signature(s):**	**Project Manager:**	**M. Challoner**
BH ID:	GW3	**Sample ID:**	—
Purging Date:	12/11/2020	**Sampling Date:**	—

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO GRASS	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

Standing Water Level (SWL):	3.97 (mBTOC)	Weather Conditions	
Total Well Depth:	9.05 (mBTOC)	Temperature:	°C
Well volume:	10.2 (L)	Clear / Partly Cloudy / Overcast	
Volume of water purged:	32 (L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	N/A Pump / Bailer / micro-Purging	Fine / Showers / Rain	

Purging Details

~~Elapsed time (min)~~ SWL (mBTOC)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
5.74	10	4.88	2035	7.83	42.4	21.1	LIGHT BROWN, HIGH TURBIDITY, ODOURLESS
6.92	20	4.20	1747	7.10	52.3	20.7	"
8.52	~~30~~	4.23	2184	6.97	57.7	20.6	"
DRY	~~32~~						

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client: Centurion	**CES Project Code:** CES161003
Project: CASULA	**Location:** 18 Randwick Close, CASULA
Sampler (s): A CARLOS **Signature(s):**	**Project Manager:** A CHARLES
BH ID: GW1	**Sample ID:** GW1
Purging Date: 23/11/20	**Sampling Date:** 23/11/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

	9.07	Weather Conditions	
Standing Water Level (SWL):	5.16 (mBTOC)	Temperature: 21	°C
Well volume:	(L)		
Water level after purging:	(mBTOC)	Clear / Partly Cloudy / Overcast	
Water level at time of sampling:	(mBTOC)		
Volume of water purged:	(L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	Pump / Bailer FV	Fine / Showers / Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
0	0	0.54	19,811	6.01	-23.1	21.2	Brown/grey, high turb, no odour, no sheen
2	8	0.31	20,101	6.08	-45.2	20.9	"
4	16	0.27	20,397	6.10	-71.1	20.6	"
6	24	0.25	20,511	6.11	-104.7	20.6	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client: Centurion	**CES Project Code:** CES161003
Project: CASULA	**Location:** 18 Randwick Close, CASULA
Sampler (s): ACHARYA **Signature(s):**	**Project Manager:** ACHARYA
BH ID: GW2	**Sample ID:** GW2
Purging Date: 23/11/20	**Sampling Date:** 23/11/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

	9.03	Weather Conditions	
Standing Water Level (SWL):	3.55 (mBTOC)	Temperature:	21 °C
Well volume:	(L)		
Water level after purging:	(mBTOC)	Clear / Partly Cloudy / Overcast	
Water level at time of sampling:	(mBTOC)		
Volume of water purged:	(L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	Pump / Bailer (FV)	Fine / Showers / Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
0	0	3.21	16,517	6.52	31.2	21.2	Brown, high turb, no odour, no sheen.
3	10	1.54	17,481	6.29	69.2	20.5	" "
6	20	1.23	19,322	6.25	83.1	20.3	" "
9	30	1.18	19,711	6.23	97.9	20.2	" "

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client: Centurion	**CES Project Code:** CES26 161003
Project: CASULA	**Location:** 17 Rondwick Close, CASULA
Sampler (s): A Cannon **Signature(s):**	**Project Manager:** A Cannon
BH ID: GW3	**Sample ID:** GW3
Purging Date: 23/11/20	**Sampling Date:** 23/11/20

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments:	YES/NO		

9.05

Weather Conditions

Standing Water Level (SWL): 4.30	(mBTOC)	Temperature: 21	°C
Well volume:	(L)		
Water level after purging:	(mBTOC)	Clear / Partly Cloudy / Overcast	
Water level at time of sampling:	(mBTOC)		
Volume of water purged:	(L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	Pump / Bailer FV	Fine / Showers / Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
0	0	5.10	1,751	6.71	-20.1	21.6	Light brown, low turb, no odour, no sheen
2	9	4.10	2,481	6.52	-3.1	21.0	"
4	18	3.86	2,528	6.43	4.2	20.9	"
6	27	3.78	2,533	6.40	6.4	20.9	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

Appendix B
Calibration Certificates

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 12D100012

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		352607	pH 9.56
2. pH 7.00		pH 7.00		330737	pH 6.93
3. pH 4.00		pH 4.00		347027	pH 4.17
4. mV		229.6mV		351758/357173	229.6mV
5. EC		2.76mS		343511	2.76mS
6. D.O		0.00ppm		1904288592	0.00ppm
7. Temp		22°C		MultiTherm	20.8°C

Calibrated by: Sarah Lian

Calibration date: 19/08/2020

Next calibration due: 19/09/2020

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (30M)**
Serial No. **4019**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Chris Edwards**

Calibration date: **19-Aug-20**

Next calibration due: **18-Oct-20**

Oil / Water Interface Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument **Geotech Interface Meter (30M)**
Serial No. **4357**

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Chris Edwards**

Calibration date: **10/11/2020**

Next calibration due: **9/01/2021**

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **18G103299**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		355386	pH 9.85
2. pH 7.00		pH 7.00		355072	pH 6.86
3. pH 4.00		pH 4.00		351412	pH 3.80
4. mV		229.6mV		357172/357173	229.8mV
5. EC		2.76mS		350510	2.74mS
6. D.O		0.00ppm		10959	0.00ppm
7. Temp		22.1°C		MultiTherm	22.2°C

Calibrated by: **Kylie Rawlings**

Calibration date: **5/11/2020**

Next calibration due: **5/12/2020**

Oil / Water Interface Meter

Instrument Geotech Interface Meter (30M)
Serial No. 3969

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Ashok Hettigama**

Calibration date: **27/10/2020**

Next calibration due: **26/12/2020**

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 18J104319

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		355386	pH 9.82
2. pH 7.00		pH 7.00		330737	pH 7.01
3. pH 4.00		pH 4.00		351412	pH 4.04
4. mV		231.8mV		357172/357173	231.8mV
5. EC		2.76mS		350510	2.76mS
6. D.O		0.00ppm		10959	0.00pm
7. Temp		21.1°C		MultiTherm	21.2°C

Calibrated by: **Kylie Rawlings**

Calibration date: **28/10/2020**

Next calibration due: **27/11/2020**

Appendix C
Survey Results

STUART DE NETT
LAND SURVEYORS

22 December 2020

Our Ref: 12379

RE: MONITORING WELLS
PROPERTY: 18 RANDWICK CLOSE, CASULA

	MGA COORDINATES		AHD HEIGHTS		
Point	**Easting**	**Northing**	**Top of Pipe**	**Surface Level**	**Type**
GW1	305593.5	6241726.3	40.31	39.80	Protruding
GW2	305661.5	6241682.6	38.71	38.35	Protruding
GW3	305672.0	6241749.7	39.125	38.56	Protruding

Methodology: RTK GNSS (GDA94) for position (+/-10mm)
Differential levelling for MW height (+/-3mm)
RTK GNSS (AUSGeoid09) for all other levels (+\-25mm)

AHD Origin: SSM 76560 RL 44.699

Stuart de Nett | Registered Surveyor | E: office@landsurveyors.net.au | W: www.landsurveyors.net.au |
PH: 9526 6333 | Unit 4A, 38 Waratah Street, Kirrawee | PO Box 490, Gymea NSW 2227

Appendix D
Laboratory Certificates

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

CERTIFICATE OF ANALYSIS 256422

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Andrew Carras
Address	Suite 3, Level 1, 55 Grandview Street, Pymble, NSW, 2073

Sample Details

Your Reference	**CES161003**
Number of Samples	4 WATER
Date samples received	23/11/2020
Date completed instructions received	23/11/2020

Analysis Details

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

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

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

Report Details

Date results requested by	30/11/2020
Date of Issue	30/11/2020

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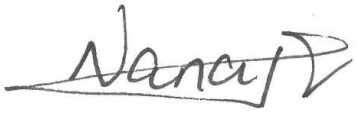
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

HM in water - dissolved					
Our Reference	UNITS	256422-1	256422-2	256422-3	256422-4
Your Reference		GW1	GW2	GW3	QW2
Date Sampled		23/11/2020	23/11/2020	23/11/2020	23/11/2020
Type of sample		WATER	WATER	WATER	WATER
Date prepared	-	25/11/2020	25/11/2020	25/11/2020	25/11/2020
Date analysed	-	25/11/2020	25/11/2020	25/11/2020	25/11/2020
Arsenic-Dissolved	µg/L	1	<1	2	2
Cadmium-Dissolved	µg/L	<0.1	0.2	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	10	<1	18	18
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	58	2	5	5
Zinc-Dissolved	µg/L	24	5	17	16

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			25/11/2020	1	25/11/2020	25/11/2020		25/11/2020	[NT]
Date analysed	-			25/11/2020	1	25/11/2020	25/11/2020		25/11/2020	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	105	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	107	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	10	10	0	101	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	111	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	109	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	58	58	0	102	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	24	21	13	104	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Andrew Carras

Sample Login Details

Your reference	CES161003
Envirolab Reference	256422
Date Sample Received	23/11/2020
Date Instructions Received	23/11/2020
Date Results Expected to be Reported	30/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	4 WATER
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	HM in water - dissolved
GW1	✓
GW2	✓
GW3	✓
QW2	✓

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.

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: CES	Client Project Name/Number/Site etc (ie report title):
Contact Person: ANDREW CARRAS	
Project Mgr: ANDREW CARRAS	PO No.: CES 161003
Sampler: " "	Envirolab Quote No. :
Address: PYMBLE	Date results required: Or choose: ~~standard~~ / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: Mob: 0430246466	Additional report format: esdat / equis /
Email: andrew.carras@consultingearth.com.au mark.challoner@...	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Metals														Provide as much information about the sample as you can
1	GW1	—	23/11/20	water	X														
2	GW2	↓	↓	↓	↓														
3	GW3																		
~~EES~~ 4	QW2																		
ALS 5	QW2A	↓	↓	↓	↓														Send to ALS

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): ~~A CARRAS~~ CES	Received by (Company): ELS Syd	*Lab Use Only*	
Print Name: A - CARRAS	Print Name: K. Core	Job number: 256422 -	Cooling: Ice / Ice pack / None
Date & Time: 23/11/20	Date & Time: 23-11-2020 1700	Temperature: 10.2	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / (STD)	

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2041679**	Page	: 1 of 2
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: CES161003	Date Samples Received	: 24-Nov-2020 15:00
Order number	: ----	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: ----	Issue Date	: 01-Dec-2020 11:41
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QW2A**	----	----	----	----
			Sampling date / time	23-Nov-2020 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2041679-001**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.001**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.015**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.005**	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.016**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2041679**

Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: andrew.carras@consultingearth.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: CES161003	Page	: 1 of 3
Order number	: ----	Quote number	: ES2020CONEAR0002 (EN/333)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 24-Nov-2020 15:00	Issue Date	: 25-Nov-2020
Client Requested Due Date	: 01-Dec-2020	Scheduled Reporting Date	: **01-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 15.4'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-02 8 Metals
ES2041679-001	23-Nov-2020 00:00	QW2A	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ANDREW CARRAS

- *AU Certificate of Analysis - NATA (COA)	Email	andrew.carras@consultingearth.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	andrew.carras@consultingearth.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	andrew.carras@consultingearth.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	andrew.carras@consultingearth.com.au
- A4 - AU Tax Invoice (INV)	Email	andrew.carras@consultingearth.com.au
- Chain of Custody (CoC) (COC)	Email	andrew.carras@consultingearth.com.au
- EDI Format - ENMRG (ENMRG)	Email	andrew.carras@consultingearth.com.au
- EDI Format - ESDAT (ESDAT)	Email	andrew.carras@consultingearth.com.au
- EDI Format - XTab (XTAB)	Email	andrew.carras@consultingearth.com.au

MARK CHALLONER

- *AU Certificate of Analysis - NATA (COA)	Email	mark.challoner@consultingearth.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mark.challoner@consultingearth.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mark.challoner@consultingearth.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mark.challoner@consultingearth.com.au
- A4 - AU Tax Invoice (INV)	Email	mark.challoner@consultingearth.com.au
- Chain of Custody (CoC) (COC)	Email	mark.challoner@consultingearth.com.au
- EDI Format - ENMRG (ENMRG)	Email	mark.challoner@consultingearth.com.au
- EDI Format - ESDAT (ESDAT)	Email	mark.challoner@consultingearth.com.au
- EDI Format - XTab (XTAB)	Email	mark.challoner@consultingearth.com.au

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2041679**	Page	: 1 of 4
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Telephone	: +61-2-8784 8555
Project	: CES161003	Date Samples Received	: 24-Nov-2020
Site	: ----	Issue Date	: 01-Dec-2020
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
QW2A	**23-Nov-2020**	**----**	----	----	**27-Nov-2020**	22-May-2021	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
QW2A	**23-Nov-2020**	**----**	----	----	**30-Nov-2020**	21-Dec-2020	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

QUALITY CONTROL REPORT

Work Order	: **ES2041679**	Page	: 1 of 3
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: CES161003	Date Samples Received	: 24-Nov-2020
Order number	: ----	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: ----	Issue Date	: 01-Dec-2020
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3389121)									
ES2041677-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.232	0.234	1.21	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.018	0.008	80.7	No Limit
ES2041677-019	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.064	0.064	0.00	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3389122)									
ES2041677-013	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2041679-001	QW2A	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3389121)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.0	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.9	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	92.8	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.3	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.2	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.5	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3389122)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.9	83.0	105

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3389121)							
ES2041677-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	92.1	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	95.0	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	84.4	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	89.8	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	87.0	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	91.9	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	93.9	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3389122)							
ES2041677-004	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	90.4	70.0	130

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

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Client: CES
Contact Person: ANDREW CARRAS
Project Mgr: ANDREW CARRAS
Sampler: " "
Address: PYMBLE
Phone: Mob: 0430276466
Email: andrew.carras@consultingearth.com.au mark.challoner@ ...

Client Project Name/Number/Site etc (ie report title):
PO No.: CES 161003
Envirolab Quote No. :
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat / equis /
Lab Comments:

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Metals	Comments (Provide as much information about the sample as you can)
1	GW1	—	23/11/20	water	X	
2	GW2	↓	↓	↓	↓	
3	GW3	↓	↓	↓	↓	
~~ES1~~ ~~5~~ 4	QW2	↓	↓	↓	↓	
ALS ~~5~~	QW2A (1)	↓	↓	↓	↓	Send to ALS

Relinquished by ELSYD e Mclem 24/11/20 815 [signature]

Environmental Division Sydney
Work Order Reference
ES2041679
Telephone : + 61-2-8784 8555

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

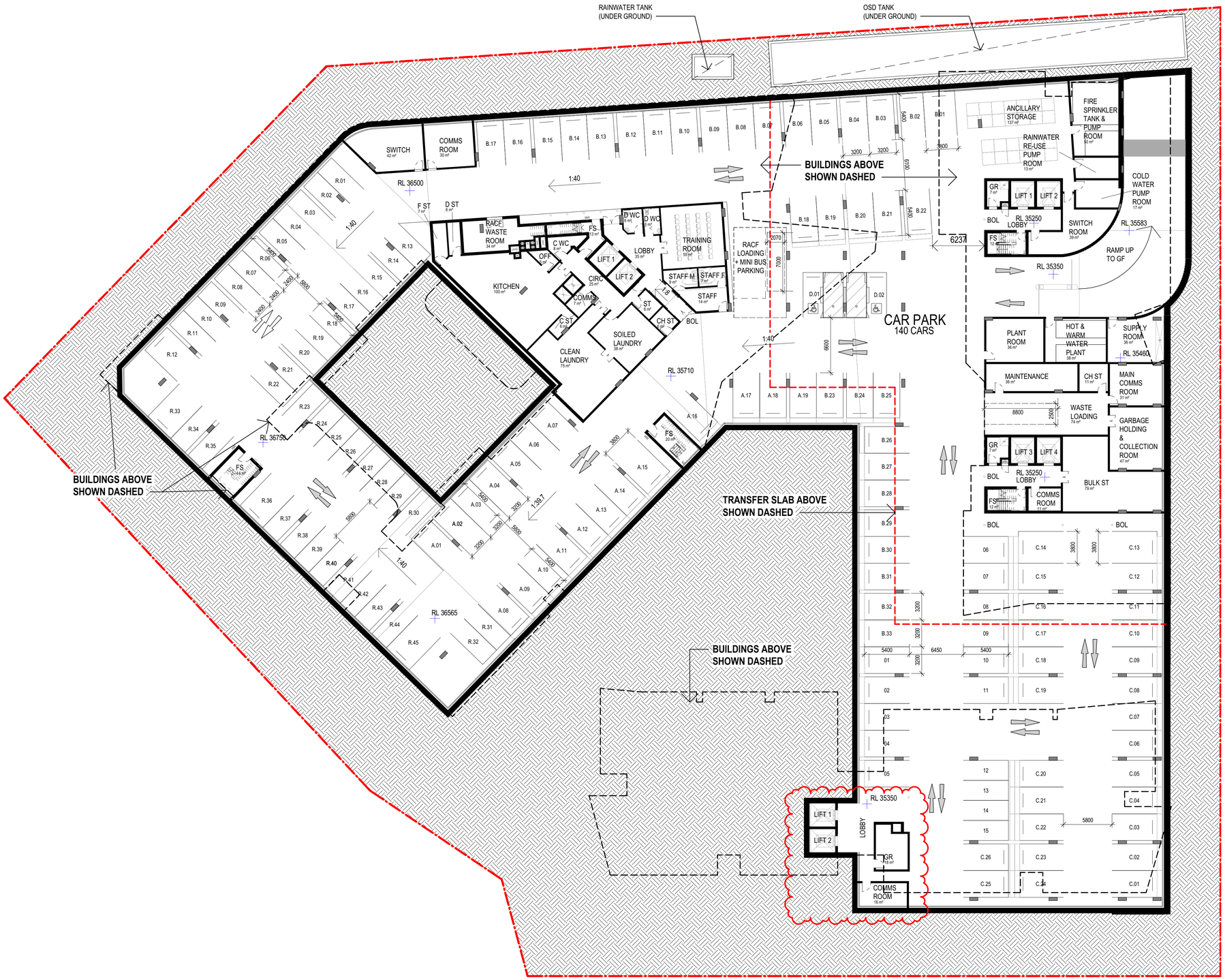
Relinquished by (Company): ~~A CARRAS~~ CES	Received by (Company): ELS Syd	Lab Use Only	
Print Name: A - CARRAS	Print Name: K Lore	Job number: 256422 -	Cooling: (Ice) / Ice pack / None
Date & Time: 23/11/20	Date & Time: 23.11.2020 1700	Temperature: 10.2	Security seal: (Intact) / Broken / None
Signature: [signature]	Signature: [signature]	TAT Req - SAME day / 1 / 2 / 3 / 4 / (STD)	

Rec Sofh 24/11/20 1500 15.4C

Appendix E
Basement Plans

AMENDMENTS

ISSUE	DESCRIPTION	APPROVED	DATE
A	FOR DEVELOPMENT APPLICATION	RP	15/11/19
B	FOR DEVELOPMENT APPLICATION	RP	07/01/21



0 2 4 6 8 10 20 1:250

THIS DRAWING ISSUE HAS BEEN REVIEWED FOR

DEVELOPMENT APPLICATION

APPROVED BY: GA
CHECKED BY: RP

CLIENT
SUMMIT CARE

DRAWING
FLOOR PLAN - BASEMENT 1

SHEET CREATED	SCALE @ A1	DRAWN
06/02/16	1 : 250	RP/PK

PROJECT No.	DISCP.	DRAWING No.	ISSUE
2016098	A	DA-109	B

PROJECT
CASULA AGED CARE

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Nominated Architects: Damian Barker (8192), John Gow (6790), Daniel Hudson (8315)

JACKSON TEECE