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ENGAGE ENVIRONMENTAL SERVICES

ABN 13 629 353 662

UPPER HUNTER SHIRE COUNCIL – QUARTERLY GROUNDWATER MONITORING EVENT

SCONE WASTE FACILITY
NOBLET ROAD
SCONE NSW

PROJECT NAME	Groundwater Monitoring – Scone Waste Facility –Quarterly Monitoring Round
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This report is limited to the scope defined herein. Sampling and chemical analysis of environmental media are based on representative samples, the intensity of those samples being in accordance with the usual levels of testing carried out for this type of investigation and appropriate for the objectives of this report. Due to the inherent variability in environmental media, Engage cannot warrant that the whole overall condition of the Site is identical or substantially similar to the representative samples.

ABBREVIATIONS

A list of the common abbreviations used throughout environmental reports is provided below:

B(a)P	Benzo(a)Pyrene
BGS	Below Ground Surface
BH	Borehole
BTEX	Benzene, Toluene, Ethyl Benzene, Xylene
CLM	Contaminated Land Management
CSM	Conceptual Site Model
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority (NSW)
LOR	Limit of Reporting
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticides
OEH	Office of Environmental and Heritage
OPP	Organophosphorus Pesticides
OH&S	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCOC	Potential Contaminant of Concern
PCB	Polychlorinated Biphenyls
PQL	Practical Quantification Limit
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SAC	Site Acceptance Criteria
SEPP	State Environmental Planning Policy
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TRH	Total Recoverable Hydrocarbons
VOC	Volatile Organic Compounds
WHS	Work Health Safety

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1.0 INTRODUCTION

General

Engage Environmental Services (Engage) was engaged by Upper Hunter Shire Council (the Client) to conduct quarterly groundwater monitoring of the Scone Waste Facility located on Noblet Road, Scone, NSW, 2337. Refer to **Figure 1**.

The Groundwater Monitoring Report provides and overview of the current condition of groundwater at the Site in relation to the Site Criteria and satisfies the groundwater monitoring requirements of Environmental Protection Licence 5863.

The report has been prepared utilising information obtained as part of the investigation process, from previous monitoring reports and from experience, knowledge, and current industry practice in the monitoring of similar sites. It is anticipated that quarterly monitoring will be undertaken in April, July and October with annual reporting undertaken in the January reporting period.

Quarterly groundwater monitoring was undertaken on 27th March 2019 by staff of Engage.

Scope of Works

The scope of work provided by Upper Hunter Shire Council indicates that annual groundwater monitoring is required at the following groundwater sampling locations:

- MWA;
- MWB;
- MWC;
- MWD (landfill leachate monitoring well); and,
- MWE .

Refer to **Figure 2:** *Site Layout with Sample Locations*

2.0 MONITORING PARAMETERS

The following sample analysis parameters and monitoring frequency were provided by Upper Hunter Shire Council for the Groundwater Wells. Threshold Criteria are primarily sourced from Australian and New Zealand guidelines for fresh and marine water quality (ANZW 2018) 95% trigger values and National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013.

Table 2a: Analytes, Threshold Criteria and Monitoring Frequency for Groundwater Monitoring Wells.

Analytes	Units	Threshold Criteria NEPM 2013 and ANZECC 2000 Fresh Water 95%	Monitoring Frequency
Calcium	mg/L	NA	Quarterly
Alkalinity (total)	mg/L	NA	Quarterly
Chloride	mg/L	NA	Quarterly
Fluoride	mg/L	NA	Quarterly
Iron	mg/L	0.3[E]	Quarterly
Magnesium	mg/L	NA	Quarterly
Manganese	mg/L	1.9[D]	Quarterly
Organochlorine pesticides	mg/L	0.00001[F]	Quarterly
Potassium	mg/L	410[Q]	Quarterly
pH	pH	6.5 – 8	Quarterly
Sodium	mg/L	NA	Quarterly
Ammonia	mg/L	0.9[D]	Quarterly
Nitrate	mg/L	50	Quarterly
Sulfate	mg/L	NA	Quarterly
Total organic carbon	mg/L	4	Quarterly
Total phenolics	mg/L	0.32	Quarterly
Electrical conductivity (EC)	µS/cm	NA	Quarterly
Total dissolved solids	mg/L	NA	Yearly
Biochemical Oxygen Demand	mg/L	NA	Yearly
Phosphate	mg/L	0.015[G]	Yearly
Arsenic III & V	mg/L	0.024 (III), 0.013 (V)	Yearly
Aluminium	mg/L	0.055 (pH> 6.5)	Yearly
Barium	mg/L	NA	Yearly
Cadmium	mg/L	0.0002	Yearly
Cobalt	mg/L	0.001[M]	Yearly
Copper	mg/L	0.0014	Yearly
Chromium VI	mg/L	0.001[D]	Yearly

Table 2a: Analytes, Threshold Criteria and Monitoring Frequency for Groundwater Monitoring Wells (cont.)

Sampling Parameter	Units	Threshold Criteria NEPM 2013 and ANZECC 2000 Fresh Water	Monitoring Frequency
Chromium III	mg/L	27[M]	Yearly
Lead	mg/L	0.0034	Yearly
Mercury	mg/L	0.0006	Yearly
Zinc	mg/L	0.008[D]	Yearly
TPH	mg/L	0.26[I]	Yearly
Benzene	mg/L	0.95	Yearly
Toluene	mg/L	0.18[L]	Yearly
Ethylbenzene	mg/L	0.3[P]	Yearly
Xylene (o+p)	mg/l	0.35	Yearly
CVCs/VOCCs:			
- **Total**	mg/L	NA	Yearly
- **Tetrachlorethene (TCE)**	mg/L	NA	Yearly
- **1,1,2-Trichloroethane (TCA)**	mg/L	6.5	Yearly
- **Tetrachloroethene (PCE)**	mg/L	0.05[N]	Yearly
- **1,1-Dichloroethene**	mg/L	0.03[N]	Yearly
- **Vinyl Chloride**	mg/L	0.0003[N]	Yearly
PCBs	mg/L	0.00001[A]	Yearly
PAHs	mg/L	0.016[B]	Yearly
OPPs	mg/L	0.006[C]	Yearly

A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs
B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs
C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
G - Filterable Reactive Phosphate
M – Trigger value for marine waters utilised
N - NEPM 2013 drinking water criteria
P - Australian Drinking Water Guidelines 2011
Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

3.0 SAMPLING METHODOLOGY

Groundwater Sampling

Groundwater samples were collected from five well locations. Purging and sampling of monitoring wells was conducted in accordance with the NEPM (NEPC, 2013), the *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DECC, 2007).

Wells were purged with disposable bailers whilst being measured for physiochemical stability to indicate the flow of formation groundwater. Physiochemical properties were measured at regular intervals following the purging of each equipment volume using a YSI Quatro Pro Plus Water Quality Meter. Stable conditions were indicated by monitoring the following parameters for three consecutive readings of:

PH ± 0.1 unit;
EC± 5%;
Temp ± 0.20;
Redox ± 10%; and,
Dissolved Oxygen ± 10%.

Samples were obtained using a disposable bailer. Groundwater samples were collected into laboratory prepared sample containers for specific analytes, i.e. into a combination of plastic unpreserved, plastic preserved, glass amber unpreserved and preserved glass vials. All samples were collected and filled into the respective sample containers so no head space remained in the sample container, with no loss of any preservation agents, where present. Groundwater samples for metals were lab filtered prior to testing. All samples were then placed immediately into a chilled esky to prevent the loss of potential volatile components.

Decontamination procedures between sampling events and sampling locations are outlined below.

Sampling equipment was cleaned prior to sampling and between sample locations to prevent cross contamination. The cleaning procedure included:

- Washing and brush scrub with phosphate free laboratory grade detergent;
- Rinsing with water of a potable quality;
- Rinsing with deionised water; and,
- New disposable bailer used for each well.

It is opinion of Engage that decontamination procedures were appropriate during groundwater sampling and that no cross contamination can be inferred.

4.0 RESULTS

All wells were sampled during the January 2019 sampling event, results are detailed below. Refer to **Table 4a** to **4e** for results. Refer to **Figure 2** for sampling locations.

Table 4a –Groundwater Results Comparison March 2019 (MWA) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA July 2018	MWA Oct 2018 (Dec)	MWA Jan 2019	MWA March 2019
Calcium	mg/L	NA	590	560	630	610
Alkalinity (total)	mg/L	NA	480	470	530	510
Chloride	mg/L	NA	7300	6600	6400	6400
Fluoride	mg/L	NA	0.14	0.14	0.1	0.2
Iron	mg/L	0.3[E]	0.170	ND	ND	**1.8**
Magnesium	mg/L	NA	1100	1100	1200	1200
Manganese	mg/L	1.9[D]	0.010	0.01	0.006	0.07
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	4.4	4.4	3.4	3.4
pH	pH	6.5 – 8	6.7	6.7	7.1	6.8
Sodium	mg/L	NA	1900	2000	2200	2500
Ammonia	mg/L	0.9[D]	0.16	0.02	0.013	0.02
Nitrate	mg/L	0.7	ND	0.25	0.59	0.44
Sulfate	mg/L	NA	42	49	44	39
Total Organic Carbon	mg/L	4	2.3	2.6	4	4
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/cm	NA	19000	20000	19000	20000

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs
B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs
C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
G - Filterable Reactive Phosphate
M – Trigger value for marine waters utilised
N - NEPM 2013 drinking water criteria
P - Australian Drinking Water Guidelines 2011
Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

Table 4b – Groundwater Results Comparison March 2019 (MWB) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB July 2018	MWB Oct 2018 (Dec)	MWB Jan 2019	MWB March 2019
Calcium	mg/L	NA	590	550	600	610
Alkalinity (total)	mg/L	NA	400	380	430	430
Chloride	mg/L	NA	5600	5500	5100	5000
Fluoride	mg/L	NA	0.26	0.27	0.3	0.3
Iron	mg/L	0.3[E]	0.021	ND	ND	**2.1**
Magnesium	mg/L	NA	720	670	750	770
Manganese	mg/L	1.9[D]	0.007	0.006	0.007	0.067
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	3.6	3.6	3	2.9
pH	pH	6.5 – 8	6.9	6.9	7.1	6.9
Sodium	mg/L	NA	1500	1600	1800	2000
Ammonia	mg/L	0.9[D]	0.08	0.05	0.009	ND
Nitrate	mg/L	0.7	ND	0.51	**0.75**	**0.75**
Sulfate	mg/L	NA	74	76	82	76
Total Organic Carbon (TOC)	mg/L	4	3.5	**4.2**	**5**	**5**
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/c	NA	15000	15000	14000	16000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs

B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs

C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP

D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance

E - Interim working level, in absence of reliable trigger value

F - Trigger value for DDT used in absence of trigger value for total OCP

G - Filterable Reactive Phosphate

M – Trigger value for marine waters utilised

N - NEPM 2013 drinking water criteria

P - Australian Drinking Water Guidelines 2011

Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

Table 4c – Groundwater Results Comparison March 2019 (MWC) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWC July 2018	MWC Oct 2018 (Dec)	MWC Jan 2019	MWC Mar 2019
Calcium	mg/L	NA	350	350	380	370
Alkalinity (total)	mg/L	NA	590	580	690	680
Chloride	mg/L	NA	4200	4200	4100	4000
Fluoride	mg/L	NA	0.23	0.22	0.3	0.3
Iron	mg/L	0.3[E]	0.019	ND	ND	**16**
Magnesium	mg/L	NA	490	500	570	570
Manganese	mg/L	1.9[D]	**9.1**	**6.5**	**7.4**	**10**
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	2.6	2.4	2.3	2.2
pH	pH	6.5 – 8	6.7	6.7	7	6.8
Sodium	mg/L	NA	1400	1500	1800	2100
Ammonia	mg/L	0.9[D]	0.09	0.07	0.015	0.006
Nitrate	mg/L	0.7	**0.95**	**2.2**	**2.2**	**2**
Sulfate	mg/L	NA	140	160	160	150
Total Organic Carbon (TOC)	mg/L	4	**6.5**	**8.8**	**9**	**11**
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/c	NA	12000	13000	12000	14000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs

B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs

C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP

D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance

E - Interim working level, in absence of reliable trigger value

F - Trigger value for DDT used in absence of trigger value for total OCP

G - Filterable Reactive Phosphate

M – Trigger value for marine waters utilised

N - NEPM 2013 drinking water criteria

P - Australian Drinking Water Guidelines 2011

Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

Table 4d – Groundwater Results Comparison March 2019 (MWD) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD (leachate) July 2018	MWD (leachate) Oct 2018 (Dec)	MWD (leachate) Jan 2019	MWD (leachate) Mar 2019
Calcium	mg/L	NA	96	120	86	72
Alkalinity (total)	mg/L	NA	2500	2700	2600	2700
Chloride	mg/L	NA	3300	3400	2700	3000
Fluoride	mg/L	NA	0.28	0.28	0.3	0.3
Iron	mg/L	0.3[E]	**2.0**	**1.5**	**2.1**	**28**
Magnesium	mg/L	NA	220	240	150	170
Manganese	mg/L	1.9[D]	0.180	0.19	0.34	0.22
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	210	220	200	210
pH	pH	6.5 – 8	7.6	7.5	7.8	7.7
Sodium	mg/L	NA	1700	1900	2000	2400
Ammonia	mg/L	0.9[D]	**330**	**340**	**290**	**290**
Nitrate	mg/L	0.7	ND	ND	ND	ND
Sulfate	mg/L	NA	81	59	120	46
Total Organic Carbon (TOC)	mg/L	4	**320**	**340**	**270**	**410**
Total phenolics	mg/L	0.32	0.05	0.09	0.06	ND
EC	µS/c	NA	13000	14000	12000	14000

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs
B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs
C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
G - Filterable Reactive Phosphate
M – Trigger value for marine waters utilised
N - NEPM 2013 drinking water criteria
P - Australian Drinking Water Guidelines 2011
Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

As MWD is within the perched landfill leachate water table, the Threshold Criteria are only applicable as indicators of general water quality for comparison to the wells surrounding the landfill. Exceedances of the Threshold Criteria for MWD are expected and do not indicate contamination is leaving the site.

Table 4e – Groundwater Results Comparison March 2019 (MWE) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWE July 2018	MWE Oct 2018 (Dec)	MWE Jan 2019	MWE March 2019
Calcium	mg/L	NA	56	55	56	53
Alkalinity (total)	mg/L	NA	1200	1200	1300	1200
Chloride	mg/L	NA	270	300	270	270
Fluoride	mg/L	NA	0.51	0.52	0.6	0.6
Iron	mg/L	0.3[E]	0.015	0.008	ND	**10**
Magnesium	mg/L	NA	53	55	59	59
Manganese	mg/L	1.9[D]	0.160	ND	0.009	0.16
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	1.3	0.7	ND	ND
pH	pH	6.5 – 8	7.4	7.3	7.7	7.4
Sodium	mg/L	NA	530	550	660	710
Ammonia	mg/L	0.9[D]	0.09	0.22	0.018	0.045
Nitrate	mg/L	0.7	ND	ND	0.006	ND
Sulfate	mg/L	NA	92	120	110	110
Total Organic Carbon (TOC)	mg/L	4	**6**	**6.5**	**9**	**9**
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/c	NA	2900	3000	2200	3100

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
A - Trigger value for Aroclor 1254 used in absence of trigger value for total PCBs
B - Trigger value for Naphthalene used in absence of reliable trigger value for total PAHs
C - Trigger value of Azinphos methyl used in absence of reliable trigger value for total OPP
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
G - Filterable Reactive Phosphate
M – Trigger value for marine waters utilised
N - NEPM 2013 drinking water criteria
P - Australian Drinking Water Guidelines 2011
Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

5.0 DISCUSSION

The inferred hydraulic gradient is to the west. Wells MWA, MWB and MWC are located down-hydraulic gradient of the landfill. Well MWE is considered to be up-hydraulic gradient of the landfill. Well MWD is located within the perched landfill water table, being the leachate within the landfill.

The water sampled from well MWD is landfill leachate and as such the Threshold Criteria is not used as a comparison, only as an indicator of current conditions. MWD is to be used as a general indicator of water quality within the landfill for comparison to the external monitoring wells.

The following is a summary of the results of the March 2019 sampling event in relation to the Threshold Criteria. Key increasing or decreasing trends and exceedances of the threshold criteria are shown:

MWA

- Iron has increased significantly from a non-detection to a concentration of 1.8mg/L, above the site criteria of 0.3mg/L.
- Manganese has increased significantly from 0.006mg/L (January 2019) to 0.07mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

MWB

- A concentration of TOC (5 mg/L) was reported in MWB exceeding the Threshold Criteria (4 mg/L). This is consistent with the previous monitoring event in January 2019. This well has fluctuated and exceeded the Threshold Criteria for TOC in the past year;
- Iron has increased significantly from a non-detection to a concentration of 2.1mg/L, above the site criteria of 0.3mg/L;
- Nitrate has remained consistent with the previous sampling event with a concentration of 0.75mg/L, above the site criteria of 0.7mg/L; and,
- Manganese has increased significantly from 0.007mg/L (January 2019) to 0.067mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

MWC

- A concentration of Manganese (10 mg/L) was reported in MWC exceeding the Threshold Criteria (1.9 mg/L), representing a continued elevated trend in concentration from 7.4mg/L in January;

- A concentration of TOC (11 mg/L) was reported in MWC exceeding the Threshold Criteria (1.9 mg/L), which is an increase from the previous reported concentration in January 2019 (9 mg/L);
- A concentration of Nitrate (2.0 mg/L) was reported in MWC exceeding the Threshold Criteria (0.7 mg/L), which is a small decrease from the previous reported concentration in January 2019 (2.2mg/L); and,
- A concentration of Iron (16 mg/L) was reported in MWC exceeding the Threshold Criteria (0.03 mg/L). This represents a significant increase from the January 2019 concentration reported as a non-detection.

All other analytes reported concentrations consistent with previous monitoring data.

MWD

- Well MWD was reported to contain no detection of Nitrate, giving no indication that the Nitrate in the affected wells is sourced from the landfill being that this well is into the leachate aquifer. The Nitrate may be migrating onto the site from the farmland to the north through the local ground water.

The following changes and annual detections occurred in the in the landfill leachate well MWD;

- Ammonia has remained steady at a concentration of 290 mg/L;
- Iron concentration of 28 mg/L has significantly increased since the January 2019 concentration of 2.1 mg/L; and,
- TOC has increased from 270 mg/L to a concentration of 410 mg/L;

MWE

- A concentration of TOC (9 mg/L) was reported in MWE remaining steady with the January 2019 sampling event. The TOC concentration in MWE indicates that TOC is likely to be elevated in the local groundwater;
- Iron has increased significantly from a non-detection to a concentration of 10 mg/L, above the site criteria of 0.3mg/L; and,
- Manganese has increased from 0.009mg/L (January 2019) to 0.016mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

Summary

The Threshold Criteria used for TOC is intended for drinking water, not groundwater. Due to the magnitude of the exceedances and the intention of the Threshold Criteria used, these exceedances are regarded as minor.

The following analytes exceeded the Threshold Criteria during the March 2019 sampling event, excluding the Leachate Monitoring well (MWD); Iron in MWA, MWB, MWC and MWE, TOC in MWB, MWC and MWE, Manganese in MWC (with other wells showing increasing concentrations), Nitrate in MWC. Refer to **Attachment 3** – Data Log. The surrounding land uses are likely impacting the local groundwater conditions.

6.0 CONCLUSIONS

The results of laboratory analysis of the samples collected from the Scone Waste Landfill during the March 2019 quarterly sampling event confirmed several exceedances of the Threshold Criteria in the wells external to the landfill. The Threshold Criteria are sourced from the ANZW 2018 Guidelines for Fresh Water 95% level of protection, NEPM 2013 and Australian Drinking Water Guidelines 2011.

The following analytes exceeded the Threshold Criteria the March 2019 sampling; Iron in MWA, MWB, MWC and MWE, TOC in MWB, MWC and MWE, Manganese in MWC (with other wells showing increasing concentrations) and Nitrate in MWC.

The majority of exceedances are explained by local conditions or regarded as minor. Trending of these analytes over time may indicate a seasonal fluctuation of regional groundwater conditions. There has been a period of drought encompassing the local area in recent times.

The concentrations reported in MWD are substantially higher than other wells, this indicates that it is unlikely that major releases of landfill leachate into the local groundwater are occurring.

The elevated concentrations of Iron, Manganese, Nitrate, TOC, in the landfill external wells does not indicate the concentrations are due to the landfill leachate, future testing and trending of data will allow for appropriate comparisons.

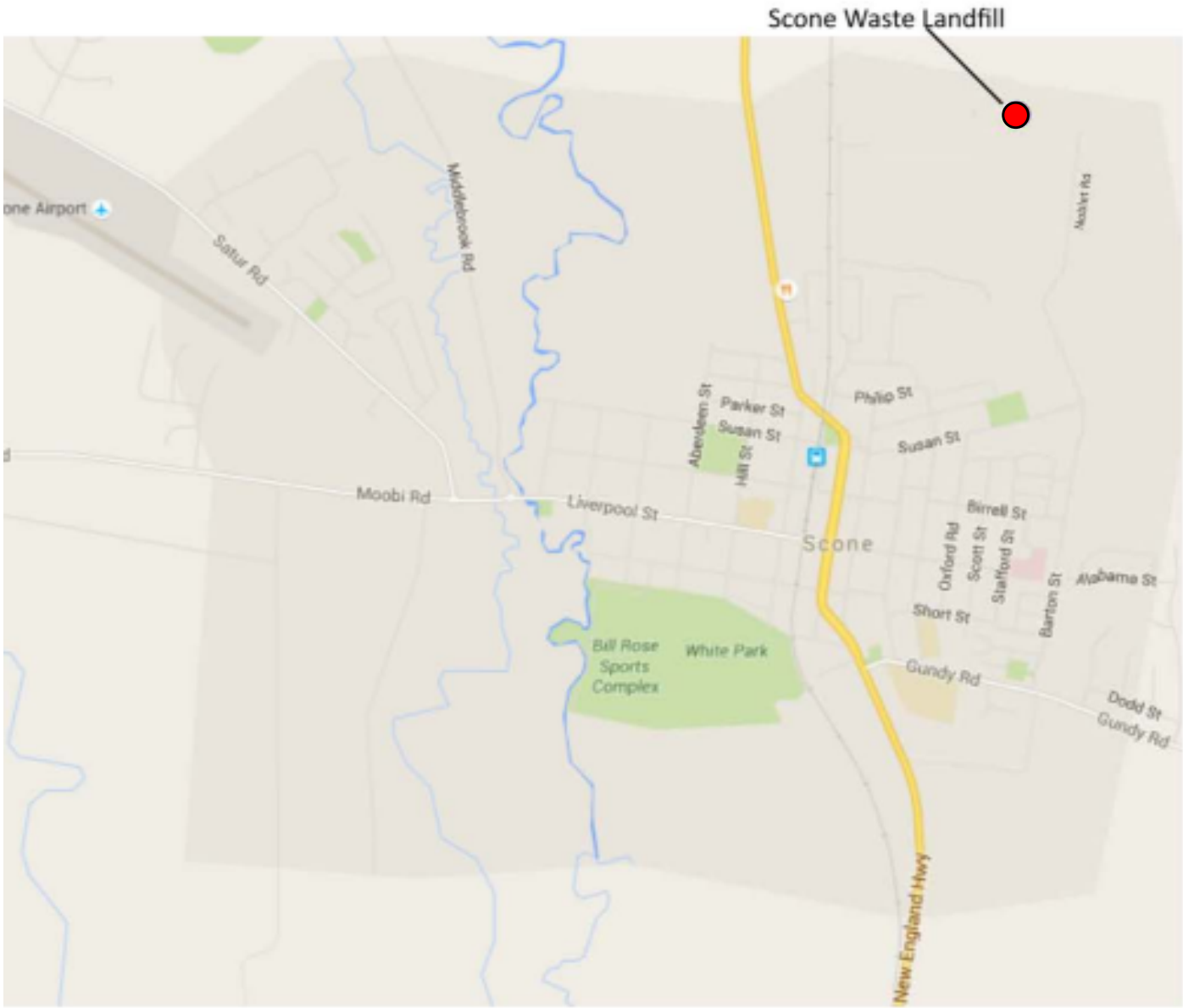
There were no other exceedances of the Threshold Criteria. Further monitoring may reveal the source and extent of elevated concentrations of particular analytes. As more data becomes available, it will become clearer which analytes are consistently elevated and may allow for determining the source of contamination.

The next water sampling event will be a quarterly monitoring which will be undertaken in June 2019.

REFERENCES

- *Australian and New Zealand Guidelines for the Management of Contaminated Sites* (ANZECC/NHMRC 1992);
- *Australia and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZW, 2018);
- *Australian Drinking Water Guidelines, National Water Quality Management Strategy* 2011;
- Chapman, G A, Murphy, C L, Tille, P J, Atkinson, G and Morse, R J, *Sydney Soil Landscapes Map*, Series 9130 (1989);
- *Contaminated Land Management Act 1997* (NSW);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 2011);
- *Contaminated Sites: Guidelines on Duty to Report Contamination under the Contamination Land Management Act 1997* (NSW DECC, 2009);
- *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DEC, 2007);
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report* (NSW EPA 1999);
- *Contaminated Sites: Sampling Design Guidelines* (NSW EPA 1995);
- *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 1996);
- *Health - Based Soil Investigation Levels, Imray, P & Langley, A, National Environmental Health Forum Monographs, Soil Series No. 2 (2nd Ed), South Australian Health Commission* (NEHF 1998b);
- *National Environment Protection (Assessment of Site Contamination) Measure (No.1)* (NEPC, 2013);
- *Storage and Handling of Dangerous Goods Code of Practice 2005*;
- *Work Health and Safety Act 2011* (NSW) and associated regulations.
- R.W. Young *and others*, Ferruginous weathering under cool temperate climates during the Late Pleistocene in southeastern Australia, *Zeitschrift fur Geomorphologie*, 38(1), 1994;
- *Quality Criteria for Water*, U.S. Environmental Protection Agency, July 1976;
- *Potassium in Drinking-water Background document for development of WHO Guidelines for Drinking-water Quality*, World Health Organization, 2009;
- *Ambient Water Quality Guidelines for Organic Carbon*, Ministry of Environment, Lands and Parks, British Columbia, Canada 2001.

FIGURE 1: SITE LOCATION – Local



Legend

● **SITE LOCATION**

Image Reference: Google Maps

N

ENGAGE ENVIRONMENTAL SERVICES
Office
Phone 0478 362 005

Title: Site Location - Local					
Client: Upper Hunter Shire Council	Project No.: E04-0119		Figure No: 1		Date: 29/01/2019
Scale: N/A	Complied: SJC	Checked: SC	Drawing Number: E0007		Revision: 0

FIGURE 2: SITE LAYOUT WITH SAMPLING LOCATIONS

Legend

MONITORING WELL LOCATION

Image Reference: Google Maps

N

ENGAGE ENVIRONMENTAL SERVICES

Office
Phone 0478 362 005

Title: Site with Sampling Locations					
Client: Upper Hunter Shire Council	Project No.: E04-0119		Figure No: 2		Date: 29/01/2019
Scale: N/A	Complied: SJC	Checked: SC	Drawing Number: E0008		Revision: 0

ATTACHMENT 1 : NATA CERTIFIED ANALYTICAL RESULTS

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 214447

Client Details

Client	Engage Environmental Services
Attention	Stephen Challinor
Address	113 Reservoir Rd, GLENDALE, NSW, 2285

Sample Details

Your Reference	**E04-0319-UHSC**
Number of Samples	5 Water
Date samples received	28/03/2019
Date completed instructions received	28/03/2019

Analysis Details

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

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

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

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

Report Details

Date results requested by	04/04/2019
Date of Issue	04/04/2019

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
Giovanni Agosti, Group Technical Manager
Nancy Zhang, Laboratory Manager, Sydney
Nick Sarlamis, Inorganics Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By

Jacinta Hurst, Laboratory Manager

OCP in water						
Our Reference		214447-1	214447-2	214447-3	214447-4	214447-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		27/03/2019	27/03/2019	27/03/2019	27/03/2019	27/03/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	03/04/2019	03/04/2019	03/04/2019	03/04/2019	03/04/2019
Date analysed	-	04/04/2019	04/04/2019	04/04/2019	03/04/2019	03/04/2019
HCB	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate TCMX	%	72	74	83	71	74

Total Phenolics in Water						
Our Reference		214447-1	214447-2	214447-3	214447-4	214447-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		27/03/2019	27/03/2019	27/03/2019	27/03/2019	27/03/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/04/2019	04/04/2019	04/04/2019	04/04/2019	04/04/2019
Date analysed	-	04/04/2019	04/04/2019	04/04/2019	04/04/2019	04/04/2019
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

HM in water - total						
Our Reference		214447-1	214447-2	214447-3	214447-4	214447-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		27/03/2019	27/03/2019	27/03/2019	27/03/2019	27/03/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	01/04/2019	01/04/2019	01/04/2019	01/04/2019	01/04/2019
Date analysed	-	01/04/2019	01/04/2019	01/04/2019	01/04/2019	01/04/2019
Iron-Total	µg/L	1,800	2,100	16,000	28,000	10,000
Manganese-Total	µg/L	70	67	10,000	220	160

Miscellaneous Inorganics						
Our Reference	UNITS	214447-1	214447-2	214447-3	214447-4	214447-5
Your Reference		MWA	MWB	MWC	MWD	MWE
Date Sampled		27/03/2019	27/03/2019	27/03/2019	27/03/2019	27/03/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/03/2019	28/03/2019	28/03/2019	28/03/2019	28/03/2019
Date analysed	-	28/03/2019	28/03/2019	28/03/2019	28/03/2019	28/03/2019
Ammonia as N in water	mg/L	0.020	<0.005	0.006	290	0.045
pH	pH Units	6.8	6.9	6.8	7.7	7.4
Electrical Conductivity	µS/cm	20,000	16,000	14,000	14,000	3,100
Fluoride, F	mg/L	0.2	0.3	0.3	0.3	0.6
Total Organic Carbon	mg/L	4	5	11	410	9
Nitrate as N in water	mg/L	0.44	0.75	2.0	<0.05	<0.005

Ion Balance						
Our Reference		214447-1	214447-2	214447-3	214447-4	214447-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		27/03/2019	27/03/2019	27/03/2019	27/03/2019	27/03/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/03/2019	28/03/2019	28/03/2019	28/03/2019	28/03/2019
Date analysed	-	28/03/2019	28/03/2019	28/03/2019	28/03/2019	28/03/2019
Calcium - Dissolved	mg/L	610	610	370	72	53
Potassium - Dissolved	mg/L	3.4	2.9	2.2	210	<0.5
Sodium - Dissolved	mg/L	2,500	2,000	2,100	2,400	710
Magnesium - Dissolved	mg/L	1,200	770	570	170	59
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	510	430	680	2,700	1,200
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	510	430	680	2,700	1,200
Sulphate, SO4	mg/L	39	76	150	46	110
Chloride, Cl	mg/L	6,400	5,000	4,000	3,000	270
Ionic Balance	%	11	9.0	9.0	-4.0	5.0

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
Inorg-055	Nitrate - determined colourimetrically. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Soils are analysed following a KCl extraction.
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. Alternatively determined by colourimetry/turbidity using Discrete Analyer.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

QUALITY CONTROL: OCP in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	214447-2
Date extracted	-			03/04/2019	1	03/04/2019	03/04/2019		03/04/2019	03/04/2019
Date analysed	-			03/04/2019	1	04/04/2019	04/04/2019		03/04/2019	04/04/2019
HCB	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-BHC	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	112	72
gamma-BHC	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	103	65
Heptachlor	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	107	66
delta-BHC	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	106	68
Heptachlor Epoxide	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	114	72
gamma-Chlordane	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	107	69
Dieldrin	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	133	85
Endrin	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	116	73
pp-DDD	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	89	64
Endosulfan II	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endrin Aldehyde	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	101	72
Methoxychlor	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	87	1	72	65	10	90	79

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	214447-2
Date extracted	-			04/04/2019	1	04/04/2019	04/04/2019		04/04/2019	04/04/2019
Date analysed	-			04/04/2019	1	04/04/2019	04/04/2019		04/04/2019	04/04/2019
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	101	96

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			01/04/2019	[NT]	[NT]	[NT]	[NT]	01/04/2019	[NT]
Date analysed	-			01/04/2019	[NT]	[NT]	[NT]	[NT]	01/04/2019	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	109	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	214447-2
Date prepared	-			28/03/2019	1	28/03/2019	28/03/2019		28/03/2019	28/03/2019
Date analysed	-			28/03/2019	1	28/03/2019	28/03/2019		28/03/2019	28/03/2019
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.020	[NT]		95	[NT]
pH	pH Units		Inorg-001	[NT]	1	6.8	6.9	1	103	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	20000	20000	0	97	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.2	0.2	0	101	79
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	4	4	0	109	105
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.44	[NT]		97	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	214447-2
Date prepared	-			28/03/2019	1	28/03/2019	28/03/2019		28/03/2019	28/03/2019
Date analysed	-			28/03/2019	1	28/03/2019	28/03/2019		28/03/2019	28/03/2019
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	610	620	2	107	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3.4	3.4	0	118	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2500	2500	0	120	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1200	1200	0	104	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	510	490	4	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	510	490	4	102	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	39	39	0	90	76
Chloride, Cl	mg/L	1	Inorg-081	<1	1	6400	6800	6	84	#
Ionic Balance	%		Inorg-040	[NT]	1	11	9.0	20	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

ION BALANCE
Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
Ion Balance - Dissolved Metals: The preserved sample provided was not identified as either total or dissolved, therefore the unpreserved sample was filtered through 0.45um filter at the lab.
Note: there is a possibility some elements may be underestimated.

Total Metals: The preserved sample provided was not identified as either total or dissolved, therefore the analysis was conducted from the unpreserved sample.
Note: there is a possibility some elements may be underestimated

Ion Balance - For the determination of dissolved metals the unpreserved sample
was filtered through 0.45um filter at the lab due to the appearance
of colloids and/or sediment in the supplied HNO3 bottle (it appears
the sample has not been field filtered).

MISC_INORG: Nitrate as N PQL has been raised due to matrix interferences. Samples were diluted and reanalysed however same results were achieved.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

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

Combo1=TRH/BTEX/Pb
Combo2=TRH/BTEX/PAH/Pb
Combo3=TRH/BTEX/PAH/Met
Combo4=TRH/BTEX/PAH/Met/Phen
Combo5=TRH/BTEX/PAH/OC/PCB/Met
Combo6=TRH/BTEX/PAH/OC/OP/PCB/Met
Combo7=TRH/BTEX/PAH/OC/PCB/Met/Phen
Combo8=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen
Combo9=TRH/BTEX/PAH/OC/PCB/Met/Phen/CN
Combo10=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen/CN
Combo11=TRH/BTEX/PAH/OC/PCB/12met/Phen/CN
Combo12=TRH/BTEX/PAH/OC/PCB/Met/TCLP-PAH ,6 Met
Combo13=TRH/BTEX/PAH/OC/OP/PCB/Met/TCLP-PAH ,6Met

A Combo with an 'A' Indicates Asbestos is also needed.

Client: Engage Environmental Services	Client Project Name / Number / Site etc (le report title): E04-0319 - UHSC
Contact Person: Stephen Challinor	
Project Mgr: Stephen	PO No.:
Sampler: Stephen Challinor	Envirolab Quote No. :
Address: 113 Reservoir Rd, Glendale NSW 2285	Date results required: Or choose: STANDARD *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 0478 362 005 Mob: 0478362005	Report format: esdat / equis /
Email: stephen.challinor@engage-es.com.au; admin@engage-es.com.au	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	OCP	Cation suite: Ca, K, Na, Mg	Anions major: Chloride, Sulfate, alkalinity	phenols	Ammonia	Iron	manganese	Fluoride	TOC	Nitrate	EC	pH				Provide as much information about the sample as you can
1	MWA		27/03/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X				
2	MWB		27/03/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X				
3	MWC		27/03/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X				
4	MWD		27/03/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X				leachate
5	MWE		27/03/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X				

Relinquished by (Company): Engage Environmental Services	Received by (Company): ECS	*Lab use only:*
Print Name: Stephen Challinor	Print Name: Andy Zhang	Samples Received: Cool or Ambient (circle one)
Date & Time: 28.3.19	Date & Time: 28/3 11:17.	Temperature Received at: (if applicable)
Signature:	Signature: AZ.	Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Page No:

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

Job No: 214447

Date Received: 28/3.
Time Received: 11:17
Received by: AZ
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

ATTACHMENT 2 : CALIBRATION CERTIFICATE

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 18G103121

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		324189	pH 9.71
2. pH 7.00		pH 7.00		320613	pH 7.03
3. pH 4.00		pH 4.00		324985	pH 4.11
4. mV		229.6mV		325420/325421	229.1mV
5. EC		2.76mS		324347	2.76mS
6. D.O		0.00ppm		10175	0.00ppm
7. Temp		22°C		MultiTherm	21.8°C

Calibrated by: Maria Orlova

Calibration date: 21/03/2019

Next calibration due: 20/04/2019

ATTACHMENT 3 - DATALOG

ENGAGE ENVIRONMENTAL SERVICES			Threshold Criteria	NA	NA	NA	NA	0.3	NA	1.9	0.00001	NA	6.5–8	NA	0.9	0.7	NA	4	0.32	NA
			Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm
			Analytes	Calcium	Alkalinity	Chloride	Fluoride	Iron	Magnesium	Manganese	Organochlorine pesticides (OCP)	Potassium	pH	Sodium	Ammonia	Nitrate	Sulfate	Total organic carbon	Total phenolics	Electrical conductivity (EC)
			Monitoring frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
MWA	214447	27/03/2019	--	610	510	6400	0.2	1.8	1200	0.070	<0.2	3.4	6.8	2500	0.02	0.44	39	4	<0.05	20000
MWB	214447	27/03/2019	--	610	430	5000	0.3	2.1	770	0.067	<0.2	2.9	6.9	2000	<0.005	0.75	76	5	<0.05	16000
MWC	214447	27/03/2019	--	370	680	4000	0.3	16	570	10	<0.2	2.2	6.8	2100	0.006	2	150	11	<0.05	14000
MWD	214447	27/03/2019	--	72	2700	3000	0.3	28	170	0.22	<0.2	210	7.7	2400	290	<0.05	46	410	<0.05	14000
MWE	214447	27/03/2019	--	53	1200	270	0.6	10	59	0.16	<0.2	<0.5	7.4	710	0.045	<0.005	110	9	<0.05	3100

ATTACHMENT 4 : FIELD MONITORING SHEETS

GROUNDWATER FIELD DATA SHEET

Project Code: E04	**Sample ID:** MWA
Project:Scone Waste Facility	**Well Collar RL:**
Client:UHSC	**Sampler(s):** SC
Address:	**Signature:**
BH ID: MWA	**Date:** 27/3/19

Well Status

Monument damaged:	YES / NO / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / NO / N/A	Cap on PVC casing:	YES / NO / N/A
Cement footing damaged:	YES / NO / N/A	Water in monument casing:	YES / NO / N/A
Standing water, vegetation around monument:	YES / NO / N/A glass	Internal obstruction in casing:	YES / NO / N/A
Well Damaged:	YES / NO / N/A	Odours from groundwater:	YES / NO / N/A

Nearby works: .....

.....

Comments: .....

.....

Casing above ground:	0.74	m agl	
Standing water level:	7.70	m bgl	
Total well depth:	15.82	m bgl	
Initial well volume:		L	
Water level after purging:		m bgl	
Volume of water purged:		L	
Water level at time of sampling:	9.44	m bgl	
Well purged dry:		YES / NO	
Purging equipment:	Bailer		
Sample equipment:			

Weather Conditions:

Temperature: 15-20 ☐ 20-25 ☑ 25-30 ☐ >30 ☐

Clear ☑ Partly cloudy ☐ Overcast ☐

Calm ☑ Slight breeze ☐ Moderate breeze ☐ Windy ☐

Fine ☑ Showers ☐ Rain ☐

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

Water Quality Details:

Time am / pm	DO (mg/L^{-1})	EC (µS cm^{-1})	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
9.40	1.90	14577	7.7	209.4	20.9		
9.41		15.25	7.32	208.7	20.9		
9.43	0.27	14866	7.05	210.0		9.27	
9.45	0.47	14730	6.98	209.3	20.9	9.39	
9.46	0.44	14819	6.92	212.8	20.8	9.46	
9.47	0.45	14902	6.88	216.4	20.8	9.53	

Additional Comments:

No odour, no sheen

GROUNDWATER FIELD DATA SHEET

Project Code: E04	**Sample ID:** MW3
Project:Scone Waste Facility	**Well Collar RL:**
Client:UHSC	**Sampler(s):** SC
Address:	**Signature:**
BH ID: MW3	**Date:** 27/3/19

Well Status

Monument damaged:	(YES) / NO / N/A	Well ID visible:	(YES) / NO / N/A
Locked well casing:	YES / (NO) / N/A	Cap on PVC casing:	(YES) / NO / N/A
Cement footing damaged:	(YES) / NO / N/A	Water in monument casing:	YES / (NO) / N/A
Standing water, vegetation around monument:	(YES) / NO / N/A shrub	Internal obstruction in casing:	YES / (NO) / N/A
Well Damaged:	YES / (NO) / N/A	Odours from groundwater:	YES / (NO) / N/A

Nearby works: .....

.....

Comments: .....

.....

Casing above ground:	0.76	m agl	
Standing water level:	7.61	m bgl	
Total well depth:	15.94	m bgl	
Initial well volume:		L	
Water level after purging:		m bgl	
Volume of water purged:		L	
Water level at time of sampling:	9.15	m bgl	
Well purged dry:		YES / (NO)	
Purging equipment:	Bailer		
Sample equipment:			

Weather Conditions:

Temperature: 15-20 ☐ 20-25 ☑ 25-30 ☐ >30 ☐

Clear ☑ Partly cloudy ☐ Overcast ☐

Calm ☐ Slight breeze ☑ Moderate breeze ☐ Windy ☐

Fine ☑ Showers ☐ Rain ☐

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

Water Quality Details:

Time am / pm	DO (mg/L^{-1})	EC (µS cm^{-1})	pH	Redox (mV)	Temp (°C)	Salinity (% Refract) ppt	Comments
10.02	0.79	12424	7.31	183.4	20.6	7.86	
10.04	0.61	12415	7.20	190.7	20.5	7.86	
10.06	0.60	12424	7.12	191.1	20.5	7.88	
10.07	0.60	12433	7.10	191.9	20.4	7.89	
10.09	0.63	12444	7.10	190.1	20.5	7.88	

Additional Comments:

Fine black sediment, NO odour, no sheen, slightly cloudy

GROUNDWATER FIELD DATA SHEET

Project Code: E04	**Sample ID:** MWC
Project:Scone Waste Facility	**Well Collar RL:**
Client:UHSC	**Sampler(s):** SC
Address:	**Signature:**
BH ID: MWC	**Date:** 27/3/19

Well Status

Monument damaged:	(YES) / NO / N/A	Well ID visible:	(YES) / NO / N/A
Locked well casing:	YES / (NO) / N/A	Cap on PVC casing:	(YES) / NO / N/A
Cement footing damaged:	(YES) / NO / N/A	Water in monument casing:	YES / (NO) / N/A
Standing water, vegetation around monument:	YES / (NO) / N/A	Internal obstruction in casing:	YES / (NO) / N/A
Well Damaged:	YES / (NO) / N/A	Odours from groundwater:	YES / (NO) / N/A

Nearby works: .....

.....

Comments: .....

.....

Casing above ground:	0.75	m agl	
Standing water level:	7.90	m bgl	
Total well depth:	12.57	m bgl	
Initial well volume:		L	
Water level after purging:		m bgl	
Volume of water purged:		L	
Water level at time of sampling:	8.68	m bgl	
Well purged dry:		YES / NO	
Purging equipment:	Bailer		
Sample equipment:			

Weather Conditions:

Temperature 15-20 ☐ 20-25 ☑ 25-30 ☐ >30 ☐

Clear ☑ Partly cloudy ☐ Overcast ☐

Calm ☐ Slight breeze ☑ Moderate breeze ☐ Windy ☐

Fine ☑ Showers ☐ Rain ☐

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

Water Quality Details:

Time am / pm	DO (mg/L^{-1})	EC (µS cm^{-1})	pH	Redox (mV)	Temp (°C)	Salinity (ppt % Refract)	Comments
10.52	0.64	11235	7.24	186.4	21.1	6.94	
10.55	.40	11129	7.07	193.7	20.9	6.92	
10.57	.41	11109	6.97	193.2	20.8	6.92	
10.59	0.41	11115	6.97	193.1	20.9	6.92	

Additional Comments:

Brown sediment no odour no sheen

GROUNDWATER FIELD DATA SHEET

Project Code: E04	**Sample ID:** MW01
Project:Scone Waste Facility	**Well Collar RL:**
Client:UHSC	**Sampler(s):** SC
Address:	**Signature:**
BH ID: MW01	**Date:** 27/3/19

Well Status

Monument damaged:	(YES) / NO / N/A	Well ID visible:	YES / (NO) / N/A
Locked well casing:	YES / (NO) / N/A	Cap on PVC casing:	(YES) / NO / N/A
Cement footing damaged:	(YES) / NO / N/A	Water in monument casing:	YES / (NO) / N/A
Standing water, vegetation around monument:	YES / (NO) / N/A	Internal obstruction in casing:	YES / (NO) / N/A
Well Damaged:	(YES) / NO / N/A	Odours from groundwater:	(YES) / NO / N/A

Nearby works: Compaction and grading, stockpiles

Comments: Tyres securely well to avoid further damaged

Casing above ground:	m agl	**Weather Conditions:**		
Standing water level: 9.9	m bgl	Temperature	15-20 ☐	20-25 ☐
Total well depth:	m bgl		25-30 ☑	>30 ☐
Initial well volume:	L			
Water level after purging:	m bgl	Clear ☑	Partly cloudy ☐	Overcast ☐
Volume of water purged:	L			
Water level at time of sampling:	m bgl	Calm ☐	Slight breeze ☑	Moderate breeze ☐
Well purged dry:	YES / NO		Windy ☐	
Purging equipment: Bailer				
Sample equipment:		Fine ☑	Showers ☐	Rain ☐

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

Water Quality Details:

Time am / pm	DO (mg/L^{-1})	EC (µS cm^{-1})	pH	Redox (mV)	Temp (°C)	Salinity (% Refract) ppt	Comments
	0.79	11673	7.47	-228	26.2	6.29	
	0.60	11675	7.47	-229	26.1	6.30	

Additional Comments:

Leachate - green colour

GROUNDWATER FIELD DATA SHEET

Project Code: E04	**Sample ID:** MWE
Project:Scone Waste Facility	**Well Collar RL:**
Client:UHSC	**Sampler(s):** SC
Address:	**Signature:**
BH ID: MWE	**Date:** 27/3/19

Well Status

Monument damaged:	YES / ~~NO~~ / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / NO / N/A	Cap on PVC casing:	YES / NO / N/A
Cement footing damaged:	YES / NO / N/A	Water in monument casing:	YES / NO / N/A
Standing water, vegetation around monument:	YES / NO / N/A	Internal obstruction in casing:	YES / NO / N/A
Well Damaged:	YES / NO / N/A	Odours from groundwater:	YES / NO / N/A

Nearby works: .....

.....

Comments: .....

.....

Casing above ground: 0.75	m agl	**Weather Conditions:**	
Standing water level: 6.22	m bgl	Temperature	15-20 ☐ 20-25 ☐ 25-30 ☑ >30 ☐
Total well depth: 9.33	m bgl		
Initial well volume:	L		
Water level after purging:	m bgl	Clear ☑	Partly cloudy ☐ Overcast ☐
Volume of water purged:	L		
Water level at time of sampling: 7.75	m bgl	Calm ☐	Slight breeze ☑ Moderate breeze ☐
Well purged dry:	YES / NO		Windy ☐
Purging equipment:			
Sample equipment: Bailer		Fine ☑	Showers ☐ Rain ☐

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

Water Quality Details:

Time am / pm	DO (mg/L^{-1})	EC (µS cm^{-1})	pH	Redox (mV)	Temp (°C)	Salinity (% Refract) ppt	Comments
11.10	1.10	2944	7.75	126.6	21.0	1.64	
11.13	0.41	2874	7.6	109.2	20.8	1.63	
11.15	0.39	2857	7.53	60.1	20.6	1.62	
11.18	0.40	2801	7.73	58.1	20.6	1.61	

Additional Comments:

grey brown sed, no odour, no sheen