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Engage Environmental Services

ABN 13 629 353 662

**UPPER HUNTER
SHIRE COUNCIL –
GROUNDWATER
MONITORING**

**SCONE WASTE FACILITY
NOBLET ROAD
SCONE NSW**

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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
PSI	Preliminary Site Investigation
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

TABLE OF CONTENTS

1.0	INTRODUCTION	5
	General	5
	Scope of Works.....	5
2.0	MONITORING PARAMETERS.....	6
3.0	SAMPLING METHODOLOGY.....	8
	Groundwater Sampling	8
4.0	RESULTS	9
5.0	DISCUSSION.....	24
6.0	CONCLUSIONS	27
	REFERENCES	28

FIGURES

Figure 1	Site location local
Figure 2	Site layout with sample locations

ATTACHMENTS

Attachment 1	NATA certified analytical results
Attachment 2	YSI water quality meter calibration certificate
Attachment 3	Data log
Attachment 4	Analyte Trend Graphs
Attachment 5	Groundwater Field Data Sheets

1.0 INTRODUCTION

General

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

The Groundwater Monitoring Report provides an 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.

Annual water monitoring was undertaken on 29th January 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	Monitoring Frequency
		2013 and ANZECC 2000 Fresh Water 95%	
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 \pm 0.1 unit;
- EC \pm 5%;
- Temp \pm 0.20;
- Redox \pm 10%; and,
- Dissolved Oxygen \pm 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,
- Disposable Teflon tubing was used with the low flow pump and was replaced between sample locations (Groundwater Sampling Only).

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 4j** for results. Refer to **Figure 2** for sampling locations.

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

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA Jan 2018	MWA Apr 2018	MWA July 2018	MWA Oct 2018 (Dec)	MWA Jan 2019
Calcium	mg/L	NA	590	640	590	560	630
Alkalinity (total)	mg/L	NA	490	490	480	470	530
Chloride	mg/L	NA	7200	7100	7300	6600	6400
Fluoride	mg/L	NA	0.13	0.13	0.14	0.14	0.1
Iron	mg/L	0.3 ^E	ND	ND	0.170	ND	ND
Magnesium	mg/L	NA	1200	1200	1100	1100	1200
Manganese	mg/L	1.9 ^D	0.010	0.02	0.010	0.01	0.006
OCP	mg/L	0.00001 ^F	ND	ND	ND	ND	ND
Potassium	mg/L	410 ^Q	4.9	4.4	4.4	4.4	3.4
pH	pH	6.5 – 8	7.0	6.9	6.7	6.7	7.1
Sodium	mg/L	NA	2000	2100	1900	2000	2200
Ammonia	mg/L	0.9 ^D	0.12	0.16	0.16	0.02	0.013
Nitrate	mg/L	0.7	ND	ND	ND	0.25	0.59
Sulfate	mg/L	NA	40	41	42	49	44
Total Organic Carbon	mg/L	4	5.6	3.6	2.3	2.6	4
Total phenolics	mg/L	0.32	ND	0.02	ND	ND	ND
EC	µS/cm	NA	20000	21000	19000	20000	19000

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 – Annual Groundwater Results Comparison January 2019 (MWA) Yearly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA	MWA
			Jan 2018	Jan 2019
Total dissolved solids	mg/L	NA	18000	19000
Biochemical Oxygen Demand (BOD)	mg/L	NA	ND	ND
Phosphate	mg/L	0.015 ^G	0.06	0.082
Arsenic III & V	mg/L	0.024 (III), 0.013 (V)	0.001	ND
Aluminium	mg/L	0.055 (pH> 6.5)	ND	0.01
Barium	mg/L	NA	0.006	0.59
Cadmium	mg/L	0.0002	0.0002	ND
Cobalt	mg/L	0.09 ^M	ND	ND
Copper	mg/L	0.0014	ND	ND
Chromium VI	mg/L	0.001 ^D		ND
Chromium III	mg/L	27	0.006	0.002
Lead	mg/L	0.0034	0.002	ND
Mercury	mg/L	0.0006	ND	ND
Zinc	mg/L	0.008 ^D	ND	0.007
TPH	mg/L	0.6 ^I	0.009	ND
Benzene	mg/L	0.95	ND	ND
Toluene	mg/L	0.18 ^L	ND	ND
Ethylbenzene	mg/L	0.08 ^L	ND	ND
CVCs/VOCCs:				
- Total	mg/L	NA	ND	ND
- Tetrachlorethene (TCE)	mg/L	NA	ND	ND
- 1,1,2-Trichloroethane (TCA)	mg/L	6.500	ND	ND
- Tetrachloroethene (PCE)	mg/L	0.05 ^N	ND	ND
- 1,1-Dichloroethene	mg/L	0.03 ^P	ND	ND
- Vinyl Chloride		0.0003 ^N	ND	ND
PCBs	mg/L	0.00003 ^A	ND	ND
PAHs	mg/L	0.016 ^B	ND	ND
OPPs	mg/L	0.00002 ^C	ND	ND

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 – Annual Groundwater Results Comparison January 2019 (MWB) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB Jan 2018	MWB Apr 2018	MWB July 2018	MWB Oct 2018 (Dec)	MWB Jan 2019
Calcium	mg/L	NA	600	650	590	550	600
Alkalinity (total)	mg/L	NA	420	390	400	380	430
Chloride	mg/L	NA	5400	5700	5600	5500	5100
Fluoride	mg/L	NA	0.24	0.28	0.26	0.27	0.3
Iron	mg/L	0.3 ^E	ND	ND	0.021	ND	ND
Magnesium	mg/L	NA	810	810	720	670	750
Manganese	mg/L	1.9 ^D	0.005	0.01	0.007	0.006	0.007
OCP	mg/L	0.00001 ^F	ND	ND	ND	ND	ND
Potassium	mg/L	410 ^Q	3.6	3.6	3.6	3.6	3
pH	pH	6.5 – 8	7.0	7.2	6.9	6.9	7.1
Sodium	mg/L	NA	1700	1700	1500	1600	1800
Ammonia	mg/L	0.9 ^D	0.09	0.09	0.08	0.05	0.009
Nitrate	mg/L	0.7	ND	0.46	ND	0.51	0.75
Sulfate	mg/L	NA	66	70	74	76	82
Total Organic Carbon (TOC)	mg/L	4	6.2	4.8	3.5	4.2	5
Total phenolics	mg/L	0.32	ND	ND	ND	ND	ND
EC	µS/c	NA	16000	16000	15000	15000	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 – Annual Groundwater Results Comparison January 2019 (MWB) Yearly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB	MWB
			Jan 2018	Jan 2019
Total dissolved solids	mg/L	NA	14000	10000
Biochemical Oxygen Demand (BOD)	mg/L	NA	ND	ND
Phosphate	mg/L	0.015 ^G	ND	0.035
Arsenic III & V	mg/L	0.024 (III), 0.013 (V)	0.001	0.001
Aluminium	mg/L	0.055 (pH> 6.5)	ND	0.02
Barium	mg/L	NA	0.54	0.47
Cadmium	mg/L	0.0002	ND	ND
Cobalt	mg/L	0.09 ^M	ND	ND
Copper	mg/L	0.0014	ND	ND
Chromium VI	mg/L	0.001 ^D		ND
Chromium III	mg/L	27	0.004	0.002
Lead	mg/L	0.0034	0.002	ND
Mercury	mg/L	0.0006	ND	ND
Zinc	mg/L	0.008 ^D	ND	0.005
TPH	mg/L	0.6 ^I	ND	ND
Benzene	mg/L	0.95	ND	ND
Toluene	mg/L	0.18 ^L	ND	ND
Ethylbenzene	mg/L	0.08 ^L	ND	ND
CVCs/VOCCs:				
- Total	mg/L	NA	ND	ND
- Tetrachlorethene (TCE)	mg/L	NA	ND	ND
- 1,1,2-Trichloroethane (TCA)	mg/L	6500 (1,1,2 TCA)	ND	ND
- Tetrachloroethene (PCE)	mg/L	0.05 ^N	ND	ND
- 1,1-Dichloroethene	mg/L	0.03 ^P	ND	ND
- Vinyl Chloride		0.0003 ^N	ND	ND
PCBs	mg/L	0.00003 ^A	ND	ND
PAHs	mg/L	0.016 ^B	ND	ND
OPPs	mg/L	0.00002 ^C	ND	ND

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 4e – Annual Groundwater Results Comparison January 2019 (MWC) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWC Jan 2018	MWC Apr 2018	MWC July 2018	MWC Oct 2018 (Dec)	MWC Jan 2019
Calcium	mg/L	NA	200	270	350	350	380
Alkalinity (total)	mg/L	NA	580	550	590	580	690
Chloride	mg/L	NA	2400	3200	4200	4200	4100
Fluoride	mg/L	NA	0.26	0.31	0.23	0.22	0.3
Iron	mg/L	0.3 ^E	ND	ND	0.019	ND	ND
Magnesium	mg/L	NA	330	440	490	500	570
Manganese	mg/L	1.9 ^D	12	15	9.1	6.5	7.4
OCP	mg/L	0.00001 ^F	ND	ND	ND	ND	ND
Potassium	mg/L	410 ^Q	1.8	1.8	2.6	2.4	2.3
pH	pH	6.5 – 8	6.9	6.9	6.7	6.7	7
Sodium	mg/L	NA	1100	1400	1400	1500	1800
Ammonia	mg/L	0.9 ^D	0.16	0.22	0.09	0.07	0.015
Nitrate	mg/L	0.7	1.7	2.5	0.95	2.2	2.2
Sulfate	mg/L	NA	110	130	140	160	160
Total Organic Carbon (TOC)	mg/L	4	12	9.0	6.5	8.8	9
Total phenolics	mg/L	0.32	ND	ND	ND	ND	ND
EC	µS/c	NA	8700	11000	12000	13000	12000

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 4f – Annual Groundwater Results Comparison January 2019 (MWC) Yearly Analytes

Sampling Parameter	Units	Threshold	MWC	MWC
		Criteria (mg/L)	Jan 2018	Jan 2019
Total dissolved solids	mg/L	NA	5300	12000
Biochemical Oxygen Demand (BOD)	mg/L	NA	ND	23
Phosphate	mg/L	0.015 ^G	ND	0.081
Arsenic III & V	mg/L	0.024 (III),	ND	ND
Aluminium	mg/L	0.055	0.01	0.01
Barium	mg/L	NA	0.27	0.38
Cadmium	mg/L	0.0002	ND	0.0001
Cobalt	mg/L	0.09 ^M	0.024	0.012
Copper	mg/L	0.0014	0.004	ND
Chromium VI	mg/L	0.001 ^D		ND
Chromium (total)	mg/L	0.001	ND	ND
Lead	mg/L	0.0034	ND	ND
Mercury	mg/L	0.0006	ND	ND
Zinc	mg/L	0.008 ^D	ND	0.005
TPH	mg/L	0.6 ^I	ND	ND
Benzene	mg/L	0.95	ND	ND
Toluene	mg/L	0.18 ^L	ND	ND
Ethylbenzene	mg/L	0.08 ^L	ND	ND
CVCs/VOCCs:				
- Total	mg/L	NA	ND	ND
- Tetrachlorethene (TCE)	mg/L	NA	ND	ND
- 1,1,2-Trichloroethane (TCA)	mg/L	6500	ND	ND
- Tetrachloroethene (PCE)	mg/L	0.05 ^N	ND	ND
- 1,1-Dichloroethene	mg/L	0.03 ^P	ND	ND
- Vinyl Chloride		0.0003 ^N	ND	ND
PCBs	mg/L	0.00003 ^A	ND	ND
PAHs	mg/L	0.016 ^B	ND	ND
OPPs	mg/L	0.00002 ^C	ND	ND

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 4g – Annual Groundwater Results Comparison January 2019 (MWD) Quarterly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD (leachate) Jan 2018	MWD (leachate) Apr 2018	MWD (leachate) July 2018	MWD (leachate) Oct 2018 (Dec)	MWD (leachate) Jan 2019
Calcium	mg/L	NA	160	120	96	120	86
Alkalinity (total)	mg/L	NA	2400	2500	2500	2700	2600
Chloride	mg/L	NA	3100	3600	3300	3400	2700
Fluoride	mg/L	NA	0.30	0.34	0.28	0.28	0.3
Iron	mg/L	0.3 ^E	1.1	1.1	2.0	1.5	2.1
Magnesium	mg/L	NA	270	290	220	240	150
Manganese	mg/L	1.9 ^D	0.29	0.18	0.180	0.19	0.34
OCP	mg/L	0.00001 ^F	ND	ND	ND	ND	ND
Potassium	mg/L	410 ^Q	220	200	210	220	200
pH	pH	6.5 – 8	7.7	7.7	7.6	7.5	7.8
Sodium	mg/L	NA	1900	1900	1700	1900	2000
Ammonia	mg/L	0.9 ^D	330	320	330	340	290
Nitrate	mg/L	0.7	ND	ND	ND	ND	ND
Sulfate	mg/L	NA	93	110	81	59	120
Total Organic Carbon (TOC)	mg/L	4	340	340	320	340	270
Total phenolics	mg/L	0.32	0.03	0.05	0.05	0.09	0.06
EC	µS/c	NA	13000	14000	13000	14000	12000

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 4h – Annual Groundwater Results Comparison January 2019 (MWD) Yearly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD (leachate) Jan 2018	MWD (leachate) Jan 2019
Total dissolved solids	mg/L	NA	7100	8500
Biochemical Oxygen Demand (BOD)	mg/L	NA	29	97
Phosphate	mg/L	0.015 ^G	0.06	0.83
Arsenic III & V	mg/L	0.024 (III), 0.013	0.01	0.013
Aluminium	mg/L	0.055 (pH> 6.5)	ND	0.02
Barium	mg/L	NA	1.1	1.1
Cadmium	mg/L	0.0002	ND	ND
Cobalt	mg/L	0.09 ^M	0.032	0.027
Copper	mg/L	0.0014	ND	ND
Chromium VI	mg/L	0.001 ^D	0.006	ND
Chromium (total)	mg/L	27	0.05	0.033
Lead	mg/L	0.0034	ND	ND
Mercury	mg/L	0.0006	ND	ND
Zinc	mg/L	0.008 ^D	0.012	0.012
TPH	mg/L	0.6 ^I	0.006	5.22
Benzene	mg/L	0.95	0.0035	ND
Toluene	mg/L	0.18 ^L	0.0012	ND
Ethylbenzene	mg/L	0.08 ^L	0.027	ND
CVCs/VOCCs:				
- Total	mg/L	NA	0.097	0.025
- Tetrachlorethene (TCE)	mg/L	NA	ND	0.031
- 1,1,2-Trichloroethane (TCA)	mg/L	6.5	ND	ND
- Tetrachloroethene (PCE)	mg/L	0.05 ^N	ND	ND
- 1,1-Dichloroethene	mg/L	0.03 ^P	ND	ND
- Vinyl Chloride		0.0003 ^N	ND	ND
PCBs	mg/L	0.00003 ^A	ND	ND
PAHs	mg/L	0.016 ^B	0.006	0.017
OPPs	mg/L	0.00002 ^C	ND	ND

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 4i – Annual Groundwater Results Comparison January 2019 (MWE) Quarterly Analytes

Sampling Parameter	Unit s	Threshold Criteria (mg/L)	MWE Jan 2018	MWE Apr 2018	MWE July 2018	MWE Oct 2018 (Dec)	MWE Jan 2019
Calcium	mg/	NA	56	59	56	55	56
Alkalinity (total)	mg/	NA	1200	1200	1200	1200	1300
Chloride	mg/	NA	280	280	270	300	270
Fluoride	mg/	NA	0.47	0.56	0.51	0.52	0.6
Iron	mg/	0.3 ^E	0.01	ND	0.015	0.008	ND
Magnesium	mg/	NA	55	53	53	55	59
Manganese	mg/	1.9 ^D	0.24	0.14	0.160	ND	0.009
OCP	mg/	0.00001 ^F	ND	ND	ND	ND	ND
Potassium	mg/	410 ^Q	1.6	1.2	1.3	0.7	ND
pH	pH	6.5 – 8	7.4	7.4	7.4	7.3	7.7
Sodium	mg/	NA	520	550	530	550	660
Ammonia	mg/	0.9 ^D	0.04	0.07	0.09	0.22	0.018
Nitrate	mg/	0.7	ND	ND	ND	ND	0.006
Sulfate	mg/	NA	91	85	92	120	110
Total Organic Carbon (TOC)	mg/	4	15	7.9	6	6.5	9
Total phenolics	mg/	0.32	ND	ND	ND	ND	ND
EC	µS/c	NA	3000	3200	2900	3000	2200

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 4j – Annual Groundwater Results Comparison January 2019 (MWE) Yearly Analytes

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWE	MWE
			Jan 2018	Jan 2019
Total dissolved solids	mg/L	NA	1700	2000
Biochemical Oxygen Demand (BOD)	mg/L	NA	ND	6
Phosphate	mg/L	0.015 ^G	0.11	0.26
Arsenic III & V	mg/L	0.024 (III), 0.013 (V)	0.006	0.005
Aluminium	mg/L	0.055 (pH > 6.5)	ND	0.02
Barium	mg/L	NA	0.04	0.039
Cadmium	mg/L	0.0002	0.0002	0.0002
Cobalt	mg/L	0.09 ^M	0.008	0.004
Copper	mg/L	0.0014	0.004	0.001
Chromium VI	mg/L	0.001 ^D	ND	ND
Chromium (total)	mg/L	0.001	ND	ND
Lead	mg/L	0.0034	ND	ND
Mercury	mg/L	0.0006	ND	ND
Zinc	mg/L	0.008 ^D	ND	ND
TPH	mg/L	0.6 ^I	ND	ND
Benzene	mg/L	0.95	ND	ND
Toluene	mg/L	0.18 ^L	ND	ND
Ethylbenzene	mg/L	0.08 ^L	ND	ND
CVCs/VOCCs:				
- Total	mg/L	NA	ND	ND
- Tetrachlorethene (TCE)	mg/L	NA	ND	ND
- 1,1,2-Trichloroethane (TCA)	mg/L	6.5	ND	ND
- Tetrachloroethene (PCE)	mg/L	0.05 ^N	ND	ND
- 1,1-Dichloroethene	mg/L	0.03 ^P	ND	ND
- Vinyl Chloride		0.0003 ^N	ND	ND
PCBs	mg/L	0.00003 ^A	ND	ND
PAHs	mg/L	0.016 ^B	ND	ND
OPPs	mg/L	0.00002 ^C	ND	ND

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 January 2019 sampling event in relation to the Threshold Criteria. Key increasing or decreasing trends and exceedances of the threshold criteria are shown:

MWA

- MWA had no exceedances of the Threshold Criteria other than a concentration of Phosphate (0.082 mg/L) exceeding the Threshold Criteria (0.015 mg/L). This is an increase from the concentration of 0.06 mg/L in January last year.;

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 an increase in concentration from the October 2018 sampling event (4.2 mg/L). This well has fluctuated and exceeded the Threshold Criteria for TOC in the past year;
- A concentration of Phosphate (0.035 mg/L) was reported in MWB, representing an increase from January 2018 of a non-detection.

All other analytes reported concentrations consistent with previous monitoring data.

MWC

- A concentration of Manganese (7.4 mg/L) was reported in MWC exceeding the Threshold Criteria (1.9 mg/L), representing a continued elevated trend in concentration;
- A concentration of TOC (9 mg/L) was reported in MWC exceeding the Threshold Criteria (1.9 mg/L), which is consistent with previous reported concentrations;
- A concentration of Nitrate (2.2 mg/L) was reported in MWC exceeding the Threshold Criteria (0.7 mg/L), which is consistent with previous reported concentrations;

-
- A concentration of Phosphate (0.081 mg/L) was reported in MWC exceeding the Threshold Criteria (0.015 mg/L). This represents an increase from the January 2018 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 decreased from 340 mg/L to a concentration of 290 mg/L;
- Iron concentration of 2.1 mg/L has increased since the October 2018 concentration of 1.5 mg/L;
- TOC has decreased from 340 mg/L to a concentration of 270 mg/L;
- Phosphate concentration of 0.83 mg/L has increased since the January 2018 concentration of 0.06 mg/L;
- Benzene concentration of 5.22 mg/L which represents a significant increase from the January 2018 concentration of 0.0035 mg/L; and
- Vinyl Chloride reported a concentration of 0.025 mg/L which represents a significant decrease from the January 2018 concentration of 0.097 mg/L.

MWE

- A concentration of TOC (9 mg/L) was reported in MWE exceeding the Threshold Criteria (1.9 mg/L), which is consistent with previous reported concentrations. The TOC concentration in MWE indicates that TOC is likely to be elevated in the local groundwater;
- A concentration of Phosphate (0.26 mg/L) was reported in MWE exceeding the Threshold Criteria (0.015 mg/L), which represents an increase in concentration from the January 2018 sampling event (0.11 mg/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.

All other analytes in all other wells reported detections which were within the Threshold Criteria.

The following analytes exceeded the Threshold Criteria during the January 2019 sampling events; Phosphate in MWA, MWB and MWE, TOC in MWB, MWC and MWE, Manganese in MWC, 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 January 2019 annual 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 during the January 2019 sampling events; Hexavalent Chromium in MWA, TOC in MWB, MWC and MWE, Manganese in MWC, Phosphate in MWC and Zinc in MWE.

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.

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 Manganese, Nitrate, TOC, Phosphate 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.

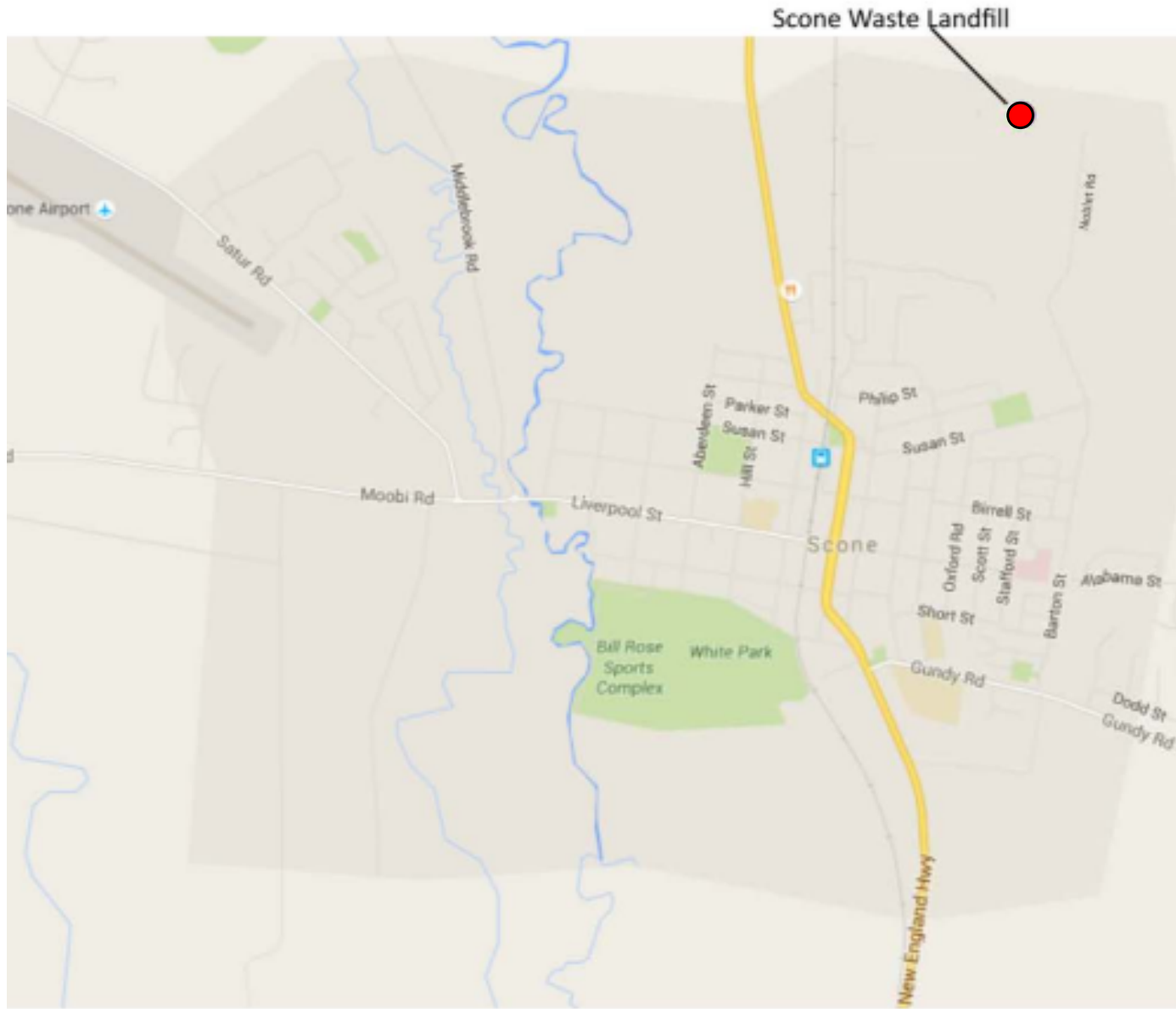
There were no other exceedances of the Threshold Criteria. Further monitoring may reveal the source and extent of elevated concentrations of particular analytes. As more data becomes available, it will become clearer which analytes are consistently elevated and may allow for determining the source of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

The next water sampling event will be a quarterly monitoring which will be undertaken in April 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



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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



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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



CERTIFICATE OF ANALYSIS 210422

Client Details

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

Sample Details

Your Reference	<u>E04-0119-UHSC</u>
Number of Samples	5 Water
Date samples received	30/01/2019
Date completed instructions received	30/01/2019

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	06/02/2019
Date of Issue	06/02/2019

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
Jeremy Faircloth, Organics Supervisor
Nick Sarlamis, Inorganics Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

VHC's in water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019
Dichlorodifluoromethane	µg/L	<10	<10	<10	<100	<10
Chloromethane	µg/L	<10	<10	<10	<100	<10
Vinyl Chloride	µg/L	<10	<10	<10	<100	<10
Bromomethane	µg/L	<10	<10	<10	<100	<10
Chloroethane	µg/L	<10	<10	<10	<100	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<100	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<10	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<10	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<10	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<10	<1
Bromochloromethane	µg/L	<1	<1	<1	<10	<1
Chloroform	µg/L	<1	<1	<1	<10	<1
2,2-dichloropropane	µg/L	<1	<1	<1	<10	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<10	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<10	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<10	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<10	<1
Dibromomethane	µg/L	<1	<1	<1	<10	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<10	<1
Trichloroethene	µg/L	<1	<1	<1	<10	<1
Bromodichloromethane	µg/L	<1	<1	<1	<10	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<10	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<10	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<10	<1
1,3-dichloropropane	µg/L	<1	<1	<1	<10	<1
Dibromochloromethane	µg/L	<1	<1	<1	<10	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<10	<1
Tetrachloroethene	µg/L	<1	<1	<1	<10	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<10	<1
Chlorobenzene	µg/L	<1	<1	<1	<10	<1
Bromoform	µg/L	<1	<1	<1	<10	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<10	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<10	<1
Bromobenzene	µg/L	<1	<1	<1	<10	<1
2-chlorotoluene	µg/L	<1	<1	<1	<10	<1

VHC's in water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
4-chlorotoluene	µg/L	<1	<1	<1	<10	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<10	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<10	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<10	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<10	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<10	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<10	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<10	<1
Surrogate Dibromofluoromethane	%	103	100	105	103	102
Surrogate toluene-d8	%	97	97	97	99	98
Surrogate 4-BFB	%	99	91	98	97	97

vTRH(C6-C10)/BTEXN in Water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019
TRH C ₆ - C ₉	µg/L	<10	<10	<10	<100	<10
TRH C ₆ - C ₁₀	µg/L	<10	<10	<10	<100	<10
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	<10	<10	<100	<10
Benzene	µg/L	<1	<1	<1	<10	<1
Toluene	µg/L	<1	<1	<1	<10	<1
Ethylbenzene	µg/L	<1	<1	<1	25	<1
m+p-xylene	µg/L	<2	<2	<2	31	<2
o-xylene	µg/L	<1	<1	<1	<10	<1
Naphthalene	µg/L	<1	<1	<1	16	<1
Surrogate Dibromofluoromethane	%	103	100	105	103	102
Surrogate toluene-d8	%	97	97	97	99	98
Surrogate 4-BFB	%	99	91	98	97	97

svTRH (C10-C40) in Water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
TRH C ₁₀ - C ₁₄	µg/L	<50	<50	<50	980	<50
TRH C ₁₅ - C ₂₈	µg/L	<100	<100	<100	4,000	<100
TRH C ₂₉ - C ₃₆	µg/L	<100	<100	<100	240	<100
TRH >C ₁₀ - C ₁₆	µg/L	<50	<50	<50	1,400	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<50	1,300	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100	<100	<100	3,800	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	74	95	97	110	108

PAHs in Water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019
Naphthalene	µg/L	<1	<1	<1	17	<1
Acenaphthylene	µg/L	<1	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	17	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	96	103	104	96	100

OCP in water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
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	%	80	87	93	79	89

OP Pesticides in water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate TCMX	%	80	87	93	79	89

PCBs in Water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Aroclor 1016	µg/L	<2	<2	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2	<2	<2
Surrogate TCLMX	%	80	87	93	79	89

Total Phenolics in Water						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	0.06	<0.05

HM in water - dissolved						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019	31/01/2019	31/01/2019
Arsenic-Dissolved	µg/L	<1	1	<1	13	5
Cadmium-Dissolved	µg/L	<0.1	<0.1	0.1	<0.1	0.2
Chromium-Dissolved	µg/L	2	2	<1	33	<1
Copper-Dissolved	µg/L	<1	<1	<1	<1	1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium-Dissolved	µg/L	590	470	380	1,100	39
Zinc-Dissolved	µg/L	7	5	5	12	<1
Iron-Dissolved	µg/L	<10	<10	<10	2,100	<10
Manganese-Dissolved	µg/L	6	7	7,400	340	9
Aluminium-Dissolved	µg/L	10	20	10	20	20
Cobalt-Dissolved	µg/L	<1	<1	12	27	4

Miscellaneous Inorganics						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/01/2019	30/01/2019	30/01/2019	30/01/2019	30/01/2019
Date analysed	-	30/01/2019	30/01/2019	30/01/2019	30/01/2019	30/01/2019
pH	pH Units	7.1	7.1	7.0	7.8	7.7
Electrical Conductivity	µS/cm	19,000	14,000	12,000	12,000	2,200
BOD	mg/L	<5	<5	23	97	6
Ammonia as N in water	mg/L	0.013	0.009	0.015	290	0.018
Fluoride, F	mg/L	0.1	0.3	0.3	0.3	0.6
Total Dissolved Solids (grav)	mg/L	19,000	10,000	12,000	8,500	2,000
Total Organic Carbon	mg/L	4	5	9	270	9
Phosphate as P in water	mg/L	0.082	0.035	0.081	0.83	0.26
Nitrate as N in water	mg/L	0.59	0.75	2.2	<0.01	0.006
Hexavalent Chromium, Cr ⁶⁺	mg/L	<0.005	<0.005	<0.005	<0.25	<0.005

Ion Balance						
Our Reference		210422-1	210422-2	210422-3	210422-4	210422-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		29/01/2019	29/01/2019	29/01/2019	29/01/2019	29/01/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/01/2019	30/01/2019	30/01/2019	31/01/2019	30/01/2019
Date analysed	-	30/01/2019	30/01/2019	30/01/2019	31/01/2019	30/01/2019
Calcium - Dissolved	mg/L	630	600	380	86	56
Potassium - Dissolved	mg/L	3.4	3.0	2.3	200	<0.5
Sodium - Dissolved	mg/L	2,200	1,800	1,800	2,000	660
Magnesium - Dissolved	mg/L	1,200	750	570	150	59
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	530	430	690	2,600	1,300
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	530	430	690	2,600	1,300
Sulphate, SO ₄	mg/L	44	82	160	120	110
Chloride, Cl	mg/L	6,400	5,100	4,100	2,700	270
Ionic Balance	%	8.0	5.0	5.0	-9.0	1.0

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-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
Inorg-024	Hexavalent Chromium (Cr6+) - determined colourimetrically.
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-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Soils are analysed following a water 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 Analyser.
Inorg-091	BOD - Analysed in accordance with APHA latest edition 5210 D and in house INORG-091.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Client Reference: E04-0119-UHSC

QUALITY CONTROL: VHC's in water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			01/02/2019	[NT]	[NT]	[NT]	[NT]	01/02/2019	[NT]
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	77	[NT]
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: VHC's in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
<i>Surrogate</i> Dibromofluoromethane	%		Org-013	100	[NT]	[NT]	[NT]	[NT]	101	[NT]
<i>Surrogate</i> toluene-d8	%		Org-013	98	[NT]	[NT]	[NT]	[NT]	101	[NT]
<i>Surrogate</i> 4-BFB	%		Org-013	100	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			01/02/2019	[NT]	[NT]	[NT]	[NT]	01/02/2019	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	95	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	100	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate toluene-d8	%		Org-016	98	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-016	100	[NT]	[NT]	[NT]	[NT]	100	[NT]

Client Reference: E04-0119-UHSC

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	210422-2
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
TRH C ₁₀ - C ₁₄	µg/L	50	Org-003	<50	1	<50	<50	0	97	96
TRH C ₁₅ - C ₂₈	µg/L	100	Org-003	<100	1	<100	<100	0	81	79
TRH C ₂₉ - C ₃₆	µg/L	100	Org-003	<100	1	<100	<100	0	100	93
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	1	<50	<50	0	97	96
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	1	<100	<100	0	81	79
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	1	<100	<100	0	100	93
Surrogate o-Terphenyl	%		Org-003	81	1	74	96	26	108	95

Client Reference: E04-0119-UHSC

QUALITY CONTROL: PAHs in Water							Duplicate		Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	210422-2
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			01/02/2019	1	01/02/2019	01/02/2019		01/02/2019	01/02/2019
Naphthalene	µg/L	1	Org-012	<1	1	<1	<1	0	85	79
Acenaphthylene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Fluorene	µg/L	1	Org-012	<1	1	<1	<1	0	87	91
Phenanthrene	µg/L	1	Org-012	<1	1	<1	<1	0	89	81
Anthracene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-012	<1	1	<1	<1	0	89	86
Pyrene	µg/L	1	Org-012	<1	1	<1	<1	0	95	91
Benzo(a)anthracene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-012	<1	1	<1	<1	0	100	92
Benzo(b,j+k)fluoranthene	µg/L	2	Org-012	<2	1	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-012	<1	1	<1	<1	0	104	100
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1	1	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	129	1	96	108	12	114	102

Client Reference: E04-0119-UHSC

QUALITY CONTROL: OCP in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	210422-2
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
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	88	103
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	90	101
Heptachlor	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	70	74
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	70	82
Heptachlor Epoxide	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	80	89
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	84	96
Dieldrin	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	94	105
Endrin	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	80	84
pp-DDD	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	81	90
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	85	93
Methoxychlor	µg/L	0.2	Org-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	71	1	80	88	10	92	96

Client Reference: E04-0119-UHSC

QUALITY CONTROL: OP Pesticides in water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	210422-3
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Azinphos-methyl (Guthion)	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Bromophos ethyl	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Chlorpyriphos	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	78	80
Chlorpyriphos-methyl	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Dichlorvos	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	77	85
Dimethoate	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	81	85
Fenitrothion	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	96	92
Malathion	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	86	108
Parathion	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	93	111
Ronnel	µg/L	0.2	Org-008	<0.2	1	<0.2	<0.2	0	76	78
Surrogate TCMX	%		Org-008	71	1	80	88	10	87	91

Client Reference: E04-0119-UHSC

QUALITY CONTROL: PCBs in Water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	210422-3
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Aroclor 1016	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-006	<2	1	<2	<2	0	75	73
Aroclor 1260	µg/L	2	Org-006	<2	1	<2	<2	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	71	1	80	88	10	87	91

Client Reference: E04-0119-UHSC

QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	210422-2
Date extracted	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Date analysed	-			31/01/2019	1	31/01/2019	31/01/2019		31/01/2019	31/01/2019
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	103	82

Client Reference: E04-0119-UHSC

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	94	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	93	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]

Client Reference: E04-0119-UHSC

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	210422-2
Date prepared	-			30/01/2019	1	30/01/2019	30/01/2019		30/01/2019	30/01/2019
Date analysed	-			30/01/2019	1	30/01/2019	30/01/2019		30/01/2019	30/01/2019
pH	pH Units		Inorg-001	[NT]	1	7.1	[NT]		102	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	19000	[NT]		105	[NT]
BOD	mg/L	5	Inorg-091	<5	1	<5	[NT]		102	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.013	[NT]		100	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.1	[NT]		100	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	19000	19000	0	110	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	4	5	22	92	96
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	0.082	[NT]		113	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.59	[NT]		92	[NT]
Hexavalent Chromium, Cr ⁶⁺	mg/L	0.005	Inorg-024	<0.005	1	<0.005	<0.005	0	115	[NT]

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			30/01/2019	[NT]	[NT]	[NT]	[NT]	30/01/2019	[NT]
Date analysed	-			30/01/2019	[NT]	[NT]	[NT]	[NT]	30/01/2019	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	100	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	107	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	92	[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.
<p>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.</p>	

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

pH analysed outside holding time

VHC's in water - PQL has been raised as the sample 4 was foamy and required dilution.

vTRH & BTEXN in Water NEPM - PQL has been raised as the sample 4 was foamy and required dilution.

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

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

Client: Engage Environmental Services
Contact Person: Stephen Challinor
Project Mgr: Stephen
Sampler: Stephen Challinor
Address: 113 Reservoir Rd, Glendale NSW 2285
Phone: 0478 362 005 Mob: 0478362005
Email: stephen.challinor@engage-es.com.au,
admin@engage-es.com.au

Client Project Name / Number / Site etc (ie report title):
E04-0119 - UHSC
PO No.:
Envirolab Quote No.:
Date results required:
Or choose: STANDARD
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

- 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.

Sample Information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 8 with 12 metals: Fe, Mn, As, Al, Ba, Cd, Co, Cu, Cr, Pb, Hg, Zn	Cation suite: Ca, K, Na, Mg	Anions major: Chloride, Sulfate, alkalinity	Chromium Hexavalent	Ammonia	BOD	Chlorinated volatile compounds	Fluoride	TOC	TDS	Phosphate	Nitrate	EC	pH	Provide as much information about the sample as you can
1	MWA		29/01/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	MWB		29/01/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	MWC		29/01/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	MWD		29/01/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	leachate
5	MWE		29/01/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Relinquished by (Company): Engage Environmental Services
Print Name: Stephen Challinor
Date & Time: 30/1/19
Signature: [Signature]

Received by (Company): ELS
Print Name: K. Gore
Date & Time: 30.1.19 11:17
Signature: [Signature]

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 16.2 (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book Page No:

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

Job No: 20422
Date Received: 30.1.19
Time Received: 11:17
Received by: KG
Temp: Cool Ambient
Cooling: Ice Icepack
Security: Intact Broken/None

ATTACHMENT 2 : CALIBRATION CERTIFICATE


airmet

 Air-Met Scientific Pty Ltd
 1300 137 067

Multi Parameter Water Meter

 Instrument YSI Quatro Pro Plus
 Serial No. 13C100781

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
	Display	✓	
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 9.72
2. pH 7.00		pH 7.00		317272	pH 6.85
3. pH 4.00		pH 4.00		320612	pH 3.99
4. mV		234mV		325420/325421	234.1mV
5. EC		2.76mS		320325	2.76mS
6. D.O		0.00ppm		10175	0.00ppm
7. Temp		20.1°C		MultiTherm	19.9°C

Calibrated by:

Sophie Boler

Calibration date:

24/01/2019

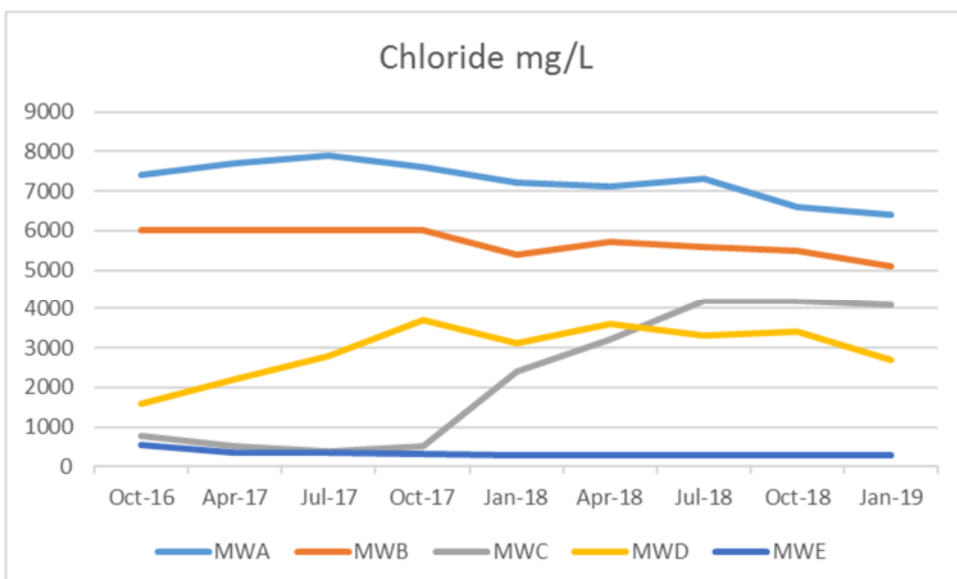
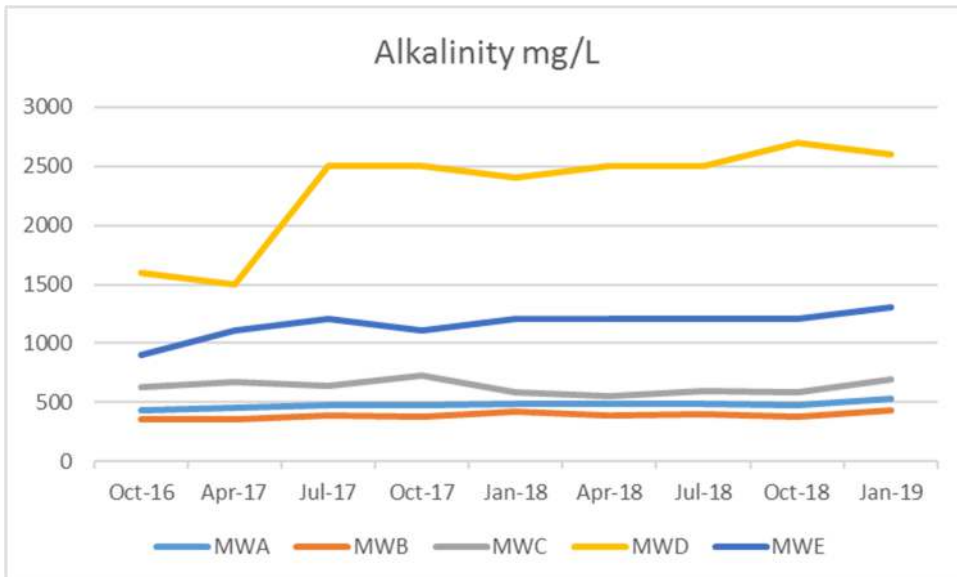
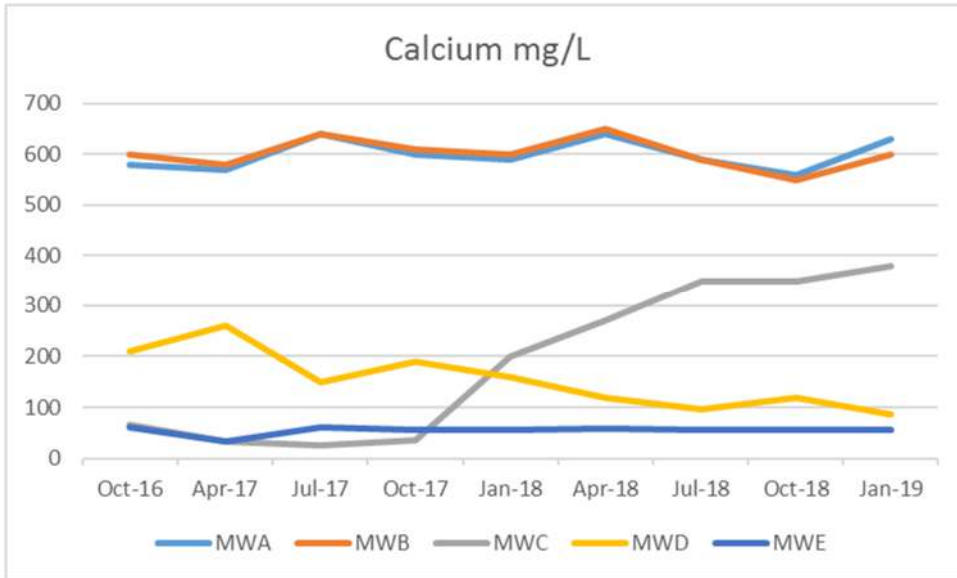
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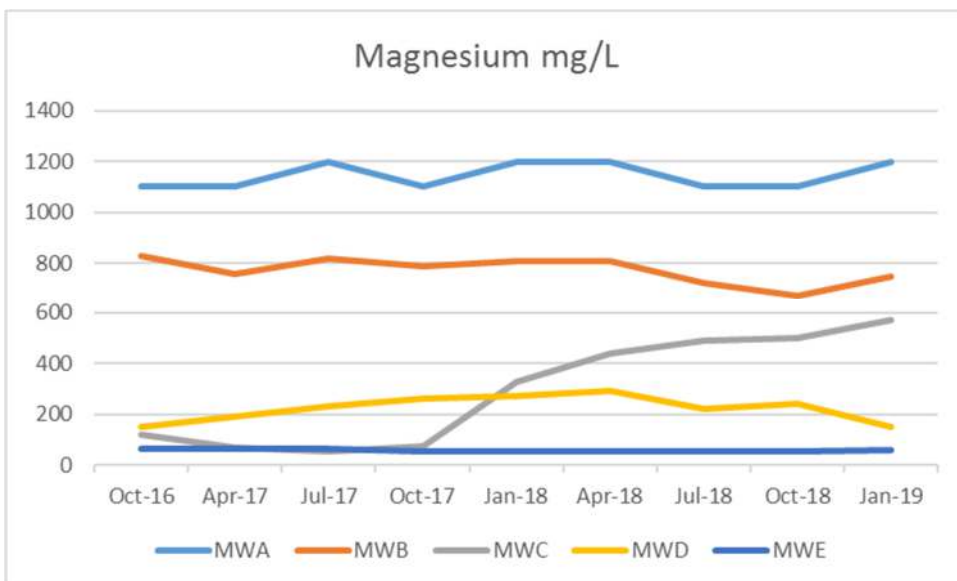
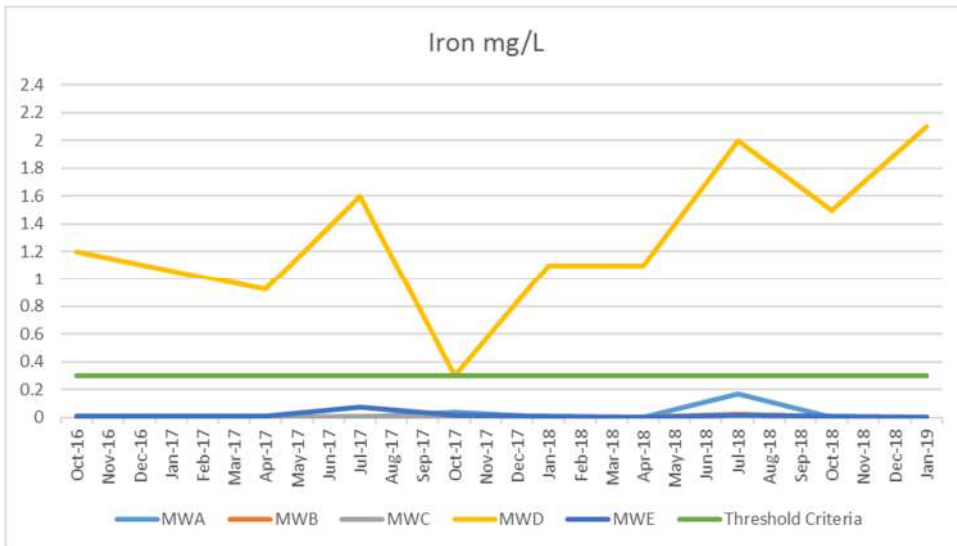
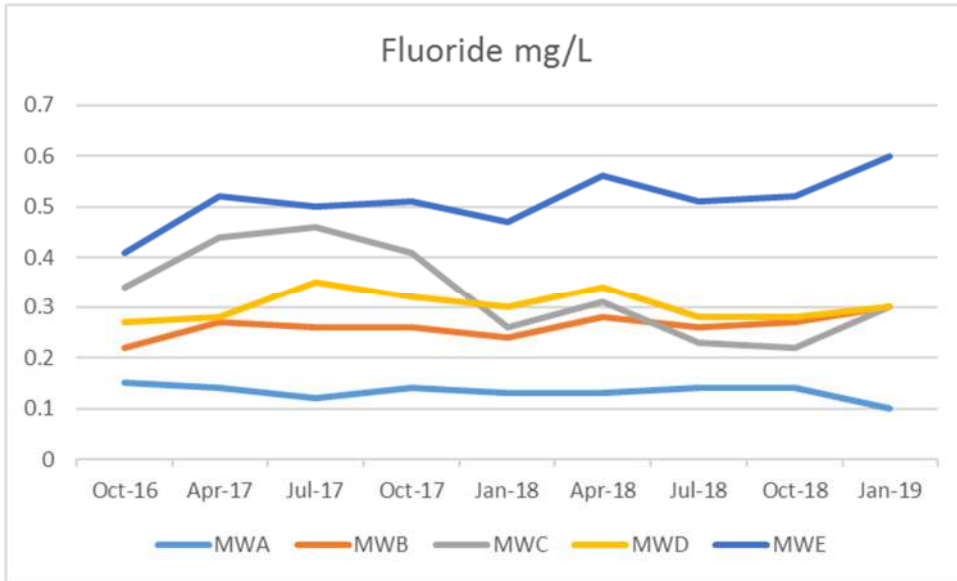
23/02/2019

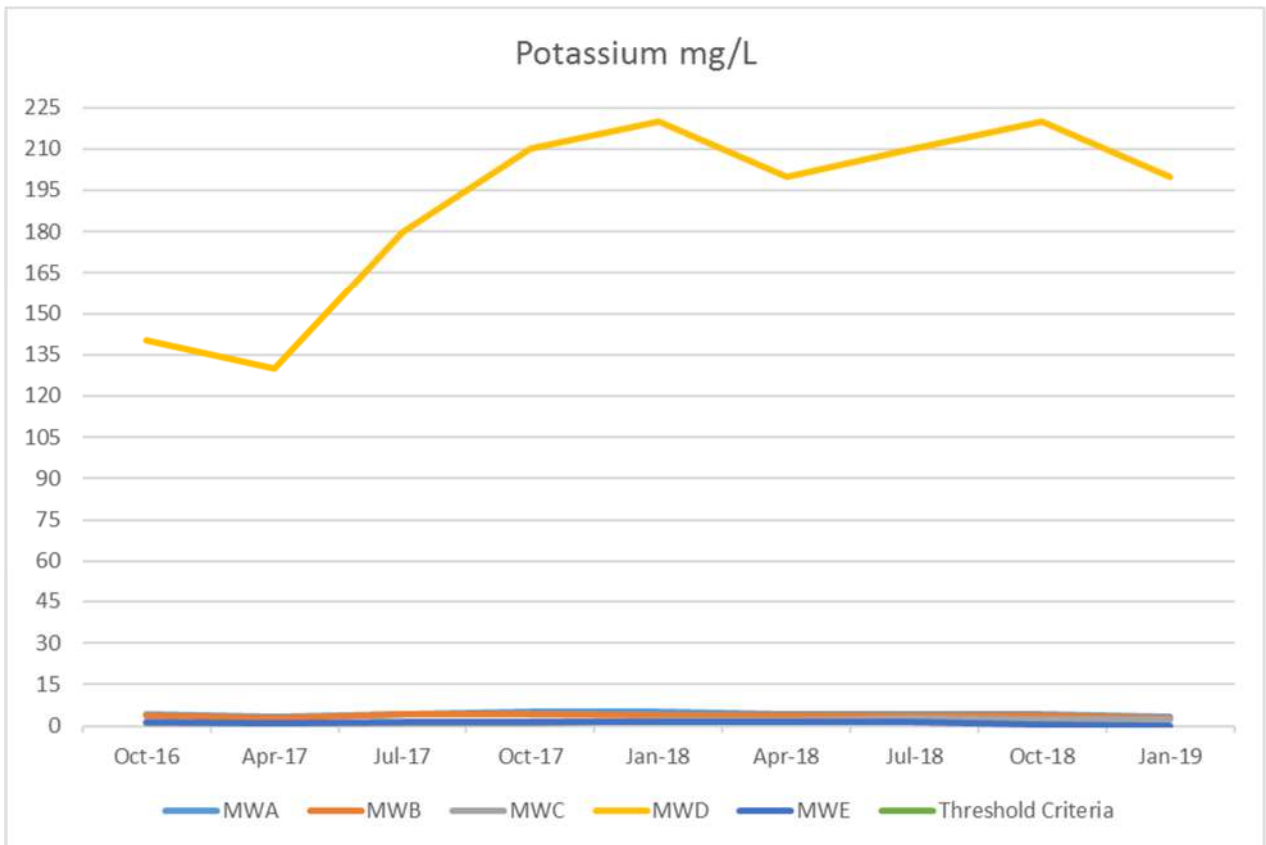
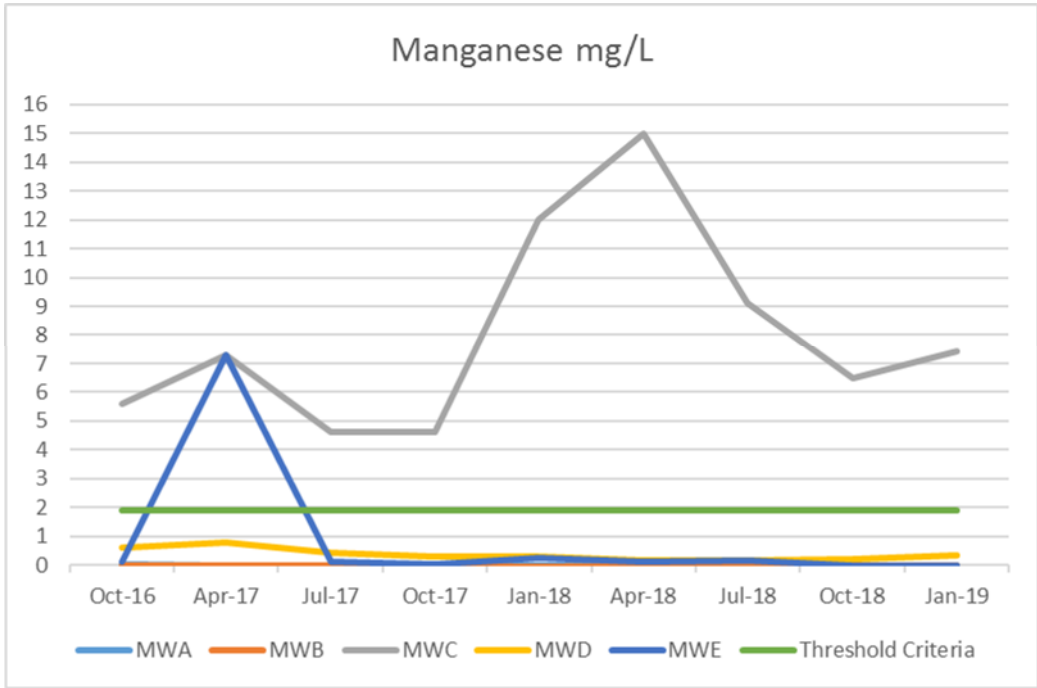
ATTACHMENT 3 - DATALOG

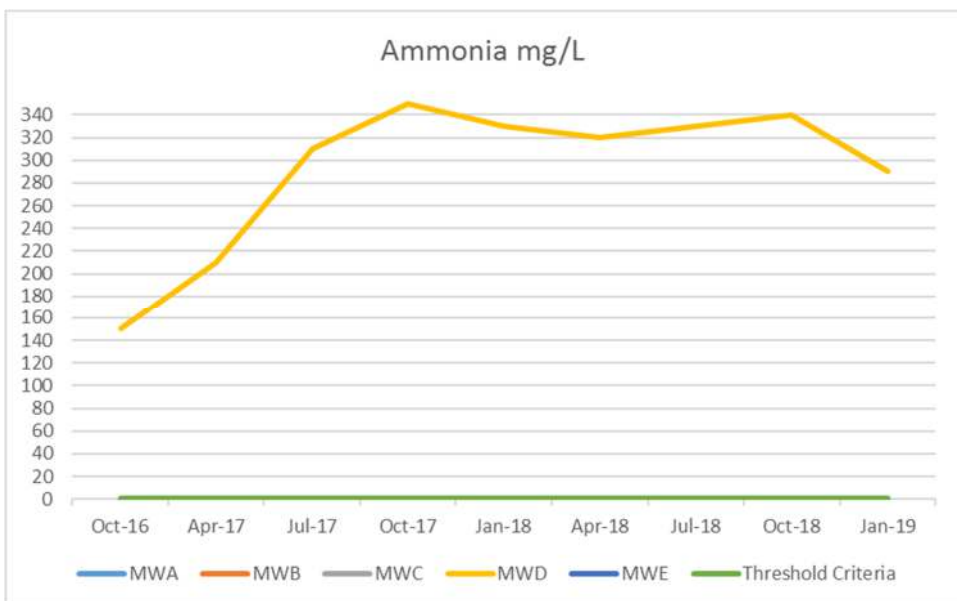
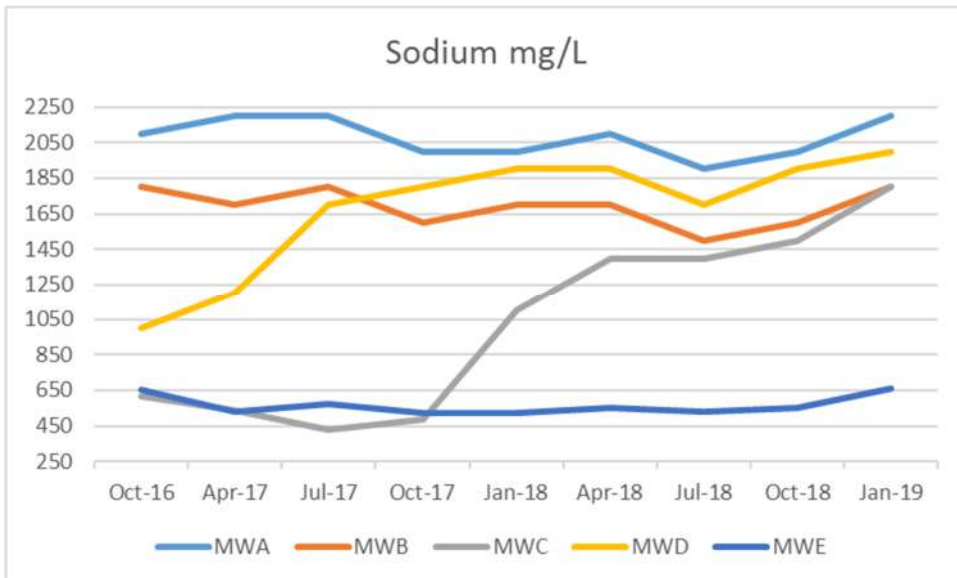
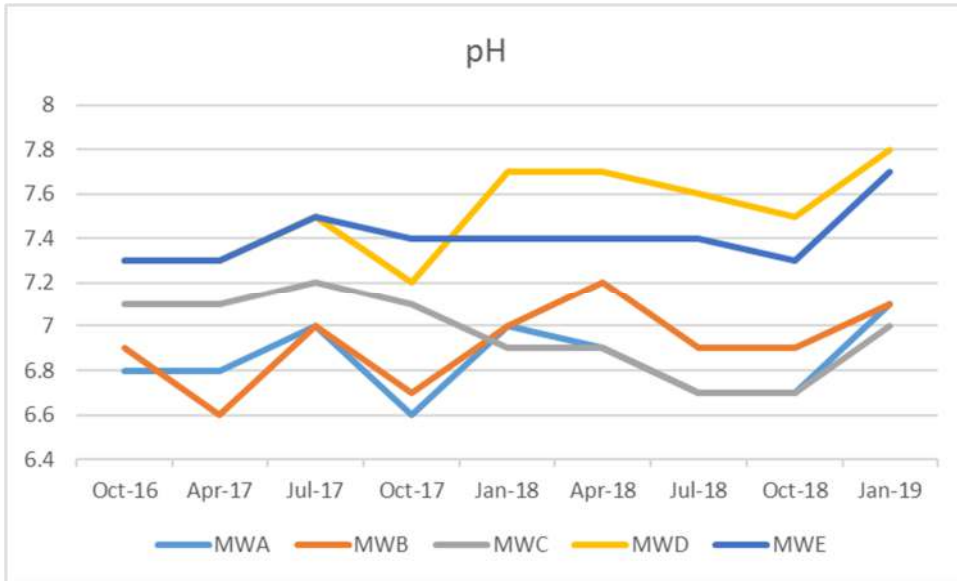
ENGAGE ENVIRONMENTAL SERVICES			Threshold Criteria	NA	NA	NA	NA	0.3	NA	1.9	0.00001	NA	6.5-8	NA	0.9	0.7	NA	4	0.32	NA	NA	NA	0.015	0.024 (III)	0.013 (IV)	0.055 (pH>6.5)	NA	0.0002	0.09	0.0014	0.001	NA	0.0034	0.0006	0.008	0.016	0.26	0.95	0.18	0.08	0.35	NA	6500	0.05	0.03	0.0003	0.00003	0.00002
			Units	mg/L	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	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			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)	Total dissolved solids	Biochemical oxygen demand	Phosphate	Arsenic III & V	Aluminium	Barium	Calcium	Cobalt	Copper	Chromium VI	Chromium (total)	Lead	Mercury	Zinc	PAHs	TRH	Benzene	Toluene	Ethylbenzene	total xylene	Tetrachloroethene (TCE)	1,1,1-Trichloroethene (TCA)	Tetrachloroethene (PCE)	1,2-Dichloroethene	Vinyl Chloride	PCBs	OPs	
			Monitoring frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	
MWA	210422	29/01/2019		630	530	6400	0.1	<0.010	1200	0.006	<0.0002	3.4	7.1	2200	0.013	0.59	44	4	<0.05	19000	19000	<5	0.082	<0.001	0.01	0.59	<0.0001	<0.001	<0.001	<0.005	0.002	<0.001	<0.05	0.007	<0.001	<0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.010	<0.002	<0.0002	
MWB	210422	29/01/2019		600	430	5100	0.3	<0.010	750	0.007	<0.0002	3	7.1	1800	0.009	0.75	82	5	<0.05	14000	10000	<5	0.035	0.001	0.02	0.47	<0.0001	<0.001	<0.001	<0.005	0.002	<0.001	<0.05	0.005	<0.001	<0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.010	<0.002	<0.0002		
MWC	210422	29/01/2019		380	690	4100	0.3	<0.010	570	7.4	<0.0002	2.3	7	1800	0.015	2.2	160	9	<0.05	12000	12000	<5	0.081	<0.001	0.01	0.38	0.0001	0.012	<0.001	<0.005	<0.001	<0.001	<0.05	0.005	<0.001	<0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.010	<0.002	<0.0002		
MWD	210422	29/01/2019		86	2600	2700	0.3	2.1	150	0.34	<0.0002	200	7.8	2000	290	<0.01	120	270	0.06	12000	8500	97	0.83	0.013	0.02	1.1	<0.0001	0.027	<0.001	<0.25	<0.033	<0.001	<0.05	0.012	0.017	5.22	<0.010	<0.010	0.025	0.031	<0.01	<0.01	<0.010	<0.002	<0.0002			
MWE	210422	29/01/2019		56	1300	270	0.6	<0.010	59	0.009	<0.0002	<0.5	7.7	660	0.018	0.006	110	9	<0.05	2200	2000	6	0.26	0.005	0.02	0.039	0.0002	0.004	0.001	<0.005	<0.001	<0.001	<0.05	<0.001	<0.001	<0.1	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.010	<0.002	<0.0002			

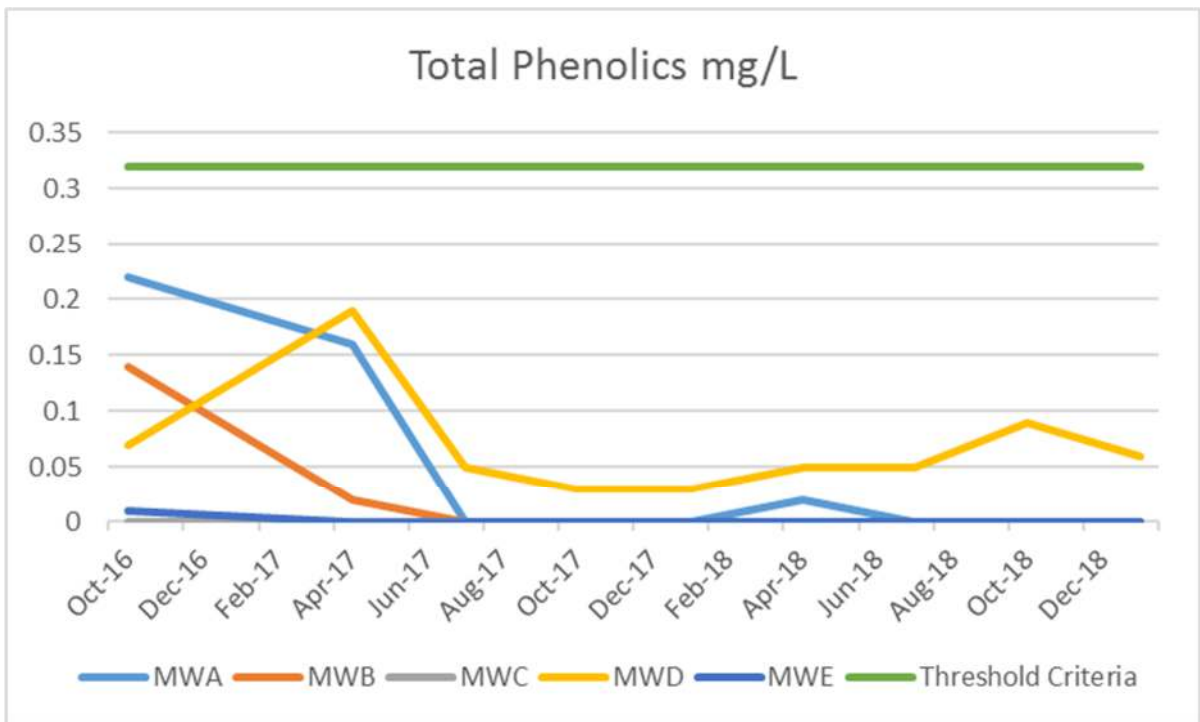
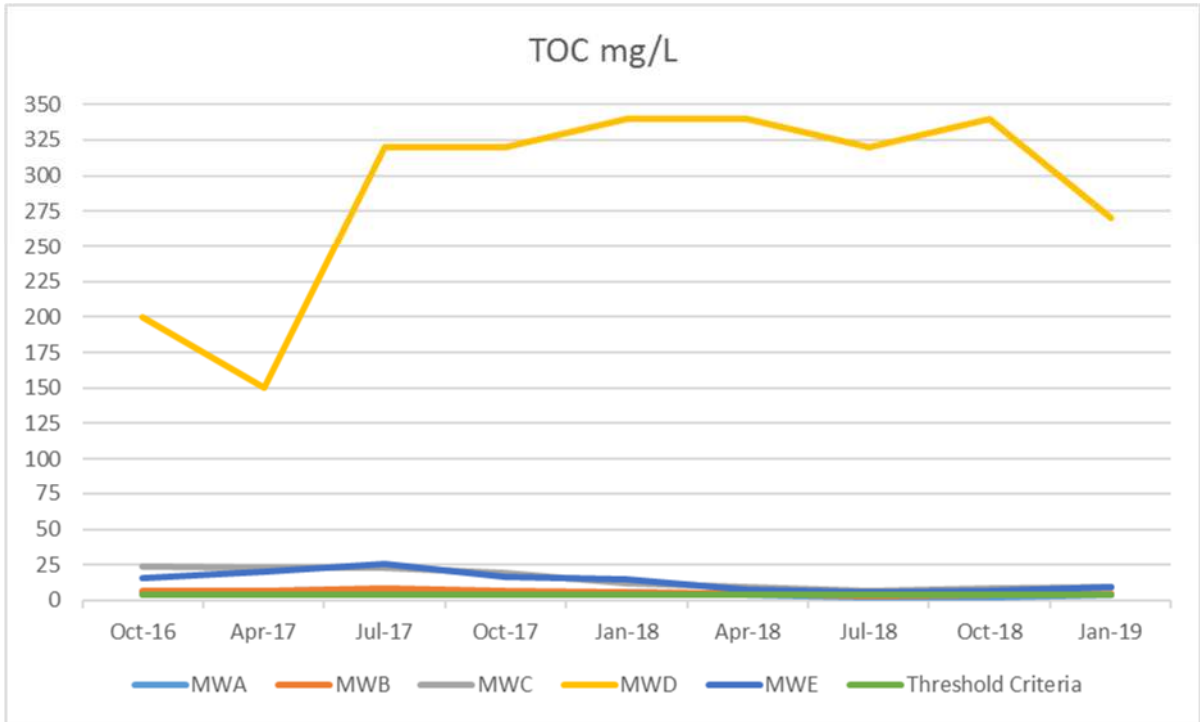
ATTACHMENT 4 – ANALYTE TREND GRAPHS

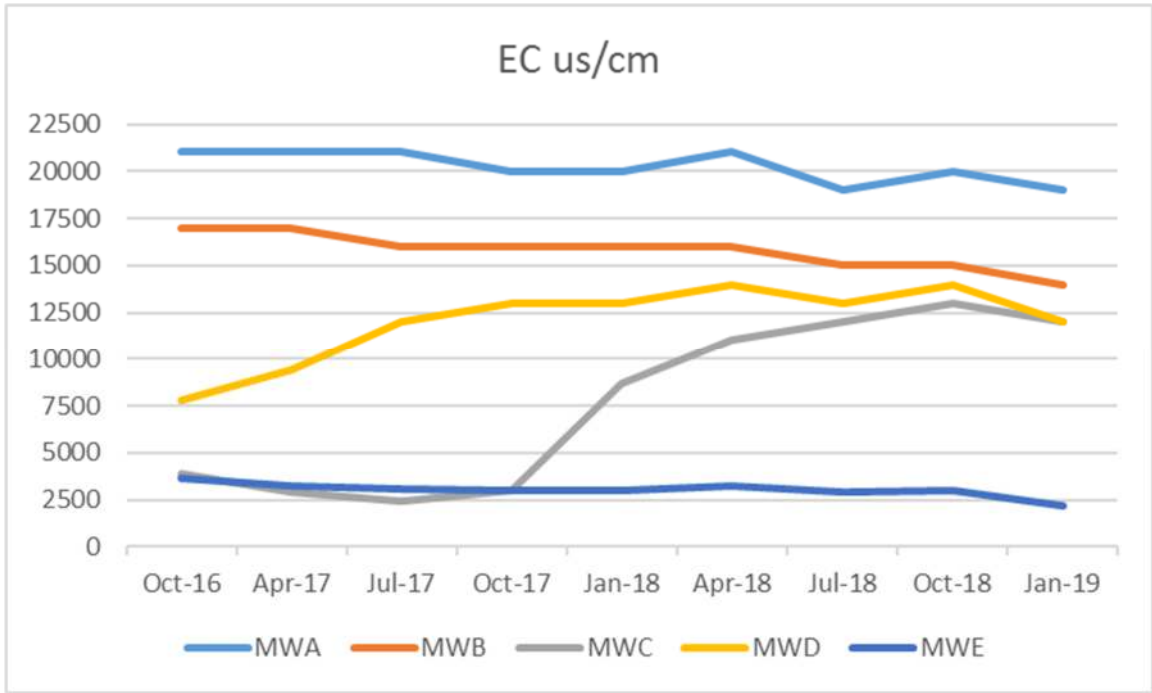












ATTACHMENT 5 : FIELD MONITORING SHEETS

GROUNDWATER FIELD DATA SHEET

Project Code: <u>E04</u>	Sample ID: <u>MWA</u>
Project: <u>Score Waste Facility</u>	Well Collar RL:
Client: <u>OHSC</u>	Sampler(s): <u>SC</u>
Address:	Signature: <u>[Signature]</u>
BH ID: <u>MWA</u>	Date: <u>20/1/19</u>

Well Status

Monument damaged: <input type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Well ID visible: <input type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	
Locked well casing: YES / <input type="radio"/> NO / <input type="radio"/> N/A	Cap on PVC casing: <input type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	
Cement footing damaged: YES / <input type="radio"/> NO / <input type="radio"/> N/A	Water in monument casing: YES / <input type="radio"/> NO / <input type="radio"/> N/A	
Standing water, vegetation around monument: <input type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A <u>grass</u>	Internal obstruction in casing: YES / <input type="radio"/> NO / <input type="radio"/> N/A	
Well Damaged: <u>NA</u>	Odours from groundwater: YES / <input type="radio"/> NO / <input type="radio"/> N/A	
Nearby works: <u>NA</u>		
Comments:		

Casing above ground: <u>0.74</u> m agl	Weather Conditions:
Standing water level: <u>7.38</u> m bgl	Temperature 15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth: <u>15.51</u> m bgl	25-30 <input checked="" type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: L	Clear <input checked="" type="checkbox"/> Partly cloudy <input type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging: m bgl	Calm <input checked="" type="checkbox"/> Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged: L	Windy <input type="checkbox"/>
Water level at time of sampling: <u>9.28</u> m bgl	Fine <input checked="" type="checkbox"/> Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry: YES / <input type="radio"/> NO	
Purging equipment: <u>Bailer</u>	
Sample equipment: <u>Bailer</u>	

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

Water Quality Details: MS/LM

Time am / pm	DO (mg/L ⁻¹)	EC (μ S cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
<u>8.45</u>	<u>21.1</u>	<u>20313</u>	<u>6.50</u>	<u>185.2</u>	<u>21.3</u>		
<u>8.47</u>	<u>24.2</u>	<u>20305</u>	<u>6.45</u>	<u>195.1</u>	<u>21.3</u>		
<u>8.49</u>	<u>24.1</u>	<u>20310</u>	<u>6.45</u>	<u>195.2</u>	<u>21.3</u>		

Additional Comments:

Slightly cloudy no odour no green

GROUNDWATER FIELD DATA SHEET

Project Code: E04	Sample ID: MWB
Project: Stone Waste Facility	Well Collar RL:
Client: OHSX	Sampler(s): SC
Address:	Signature: <i>[Signature]</i>
BH ID: MWB	Date: 29/1/19

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: N/A			
Comments:			
Casing above ground: 0.75	m agl	Weather Conditions:	
Standing water level: 7.40	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth: 15.95	m bgl		25-30 <input checked="" type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume:	L	Clear <input checked="" type="checkbox"/>	Partly cloudy <input type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging:	m bgl	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:	L	Windy <input type="checkbox"/>	
Water level at time of sampling: 8.14	m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES/NO		
Purging equipment: Bailer			
Sample equipment: Bailer			

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
9.10	39.4	15982	6.62	155.2	21.1		
9.13	34.7	15870	6.60	154.1	21.1		
9.16	34.7	15870	6.60	155.1	21.1		

Additional Comments:

Fine Black sediment, no odour, no sheen, cloudy

GROUNDWATER FIELD DATA SHEET

Project Code: <u>E04</u>	Sample ID: <u>MWC</u>
Project: <u>Sore Waste Facility</u>	Well Collar RL:
Client: <u>UNSC</u>	Sampler(s): <u>SC</u>
Address:	Signature: <u>[Signature]</u>
BH ID: <u>MWC</u>	Date: <u>29/1/19</u>

Well Status

Monument damaged:	YES / NO / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / <u>NO</u> / N/A	Cap on PVC casing:	YES / <u>NO</u> / N/A
Cement footing damaged:	YES / <u>NO</u> / N/A	Water in monument casing:	YES / <u>NO</u> / N/A
Standing water, vegetation around monument:	YES / <u>NO</u> / N/A	Internal obstruction in casing:	YES / <u>NO</u> / N/A
Well Damaged:	YES / <u>NO</u> / N/A	Odours from groundwater:	YES / <u>NO</u> / N/A
Nearby works: <u>N/A</u>			
Comments:			
Casing above ground: <u>0.75</u>	m agl	Weather Conditions:	
Standing water level: <u>6.73</u>	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth: <u>13.58</u>	m bgl		25-30 <input type="checkbox"/> >30 <input checked="" type="checkbox"/>
Initial well volume:	L	Clear <input checked="" type="checkbox"/>	Partly cloudy <input type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging:	m bgl	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:	L		Windy <input type="checkbox"/>
Water level at time of sampling:	m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES / <u>NO</u>		
Purging equipment: <u>Baker</u>			
Sample equipment: <u>Baker</u>			

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 (μ S cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
9.40	32.1	13470	6.52	143.2	21.1		
9.42	31.2	13560	6.55	144.1	21.1		
9.46	31.8	13500	6.55	145.2	21.1		

Additional Comments:

Fine black sediment, no green, no odour, cloudy

GROUNDWATER FIELD DATA SHEET

Project Code: <u>E04</u>	Sample ID: <u>MW1</u>
Project: <u>Stone Waste Facility</u>	Well Collar RL:
Client: <u>UHSC</u>	Sampler(s): <u>SC</u>
Address:	Signature: <u>[Signature]</u>
BH ID: <u>MW1</u>	Date: <u>29/1/19</u>

Well Status

Monument damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Well ID visible:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Locked well casing:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Cap on PVC casing:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Cement footing damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Water in monument casing:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Standing water, vegetation around monument:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Internal obstruction in casing:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Well Damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Odours from groundwater:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Nearby works: <u>Compaction, grading, stockpiling</u>			
Comments: <u>Monument has been destroyed, tyre stack protects the well currently</u>			
Casing above ground: <u>—</u>	m agl	Weather Conditions:	
Standing water level:	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth:	m bgl		25-30 <input type="checkbox"/> >30 <input checked="" type="checkbox"/>
Initial well volume:	L	Clear <input checked="" type="checkbox"/>	Partly cloudy <input type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging:	m bgl	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:	L		Windy <input type="checkbox"/>
Water level at time of sampling:	m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES / NO		
Purging equipment:			
Sample equipment: <u>Zuber</u>			

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 ($\mu\text{S cm}^{-1}$)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
	<u>60</u>	<u>13920</u>	<u>7.13</u>	<u>-156.6</u>	<u>25.2</u>		
	<u>62</u>	<u>13870</u>	<u>7.15</u>	<u>-141.4</u>	<u>25.2</u>		
	<u>62</u>	<u>13900</u>	<u>7.15</u>	<u>-142.4</u>	<u>25.2</u>		

Additional Comments:

Leachate

GROUNDWATER FIELD DATA SHEET

Project Code: E04	Sample ID: MWE
Project: Stone waste Facility	Well Collar RL:
Client: UNSL	Sampler(s): SC
Address:	Signature:
BH ID: MWE	Date: 24/1/19

Well Status

Monument damaged:	YES / <input checked="" type="radio"/> NO / N/A	Well ID visible:	YES / <input checked="" type="radio"/> NO / N/A
Locked well casing:	YES / <input checked="" type="radio"/> NO / N/A	Cap on PVC casing:	YES / <input checked="" type="radio"/> NO / N/A
Cement footing damaged:	YES / <input checked="" type="radio"/> NO / N/A	Water in monument casing:	YES / <input checked="" type="radio"/> NO / N/A
Standing water, vegetation around monument:	YES / <input checked="" type="radio"/> NO / N/A	Internal obstruction in casing:	YES / <input checked="" type="radio"/> NO / N/A
Well Damaged:	YES / <input checked="" type="radio"/> NO / N/A	Odours from groundwater:	YES / <input checked="" type="radio"/> NO / N/A
Nearby works: N/A			
Comments:			
Casing above ground: 0.75 m agl			
Standing water level: 5.97 m bgl			
Total well depth: 9.38 m bgl			
Initial well volume: L			
Water level after purging: 7.21 m bgl			
Volume of water purged: L			
Water level at time of sampling: m bgl			
Well purged dry: YES / <input checked="" type="radio"/> NO			
Purging equipment: Bailer			
Sample equipment: Bailer			

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
10.00	68	3116	7.4	-81	20.5		
10.02	43	3200	7.2	-82	20.5		
10.05	32	3150	7.19	-80.1	20.5		
10.07	31	3114	7.19	-83.6	20.5		

Additional Comments:

no odour or other, fine brown sediment.