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E: admin@engage-es.com.au

M: 0478 362 005

**ENGAGE
ENVIRONMENTAL
SERVICES**

ABN 13 629 353 662

**QUARTERLY
GROUNDWATER
MONITORING**

**SCONE WASTE
FACILITY
NOBLET ROAD
SCONE NSW**



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OFFICE

1/545 Main Road
Glendale NSW 2285

Ph: 0478 362 005

Email: admin@engage-es.com.au

FIELD OFFICE

Unit 1, 104 George St
Singleton NSW 2330

Ph: 0478 364 588

Engage Environmental Services Pty Limited: ABN 13 629 353 662



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ABBREVIATIONS

The following is a list of common abbreviations used in the Contamination Sector within environmental reports.

B(a)P	Benzo(a)Pyrene
BGL	Below Ground Level
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)
EPL	Environmental Protection License
ESL	Ecological Screening Level
LOR	Limit of Reporting
LOT	Allotment
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
PAH	Polycyclic Aromatic Hydrocarbons
PCOC	Potential Contaminant of Concern
PCB	Polychlorinated Biphenyls
QA/QC	Quality Assurance and Quality Control
SAC	Site Acceptance Criteria
SEPP	State Environmental Planning Policy
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TRH	Total Recoverable Hydrocarbons
UHSC	Upper Hunter Shire Council
VOC	Volatile Organic Compounds
WHS	Work Health Safety



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Figure 1 Site layout with sample locations

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Attachment B	NATA Accredited Laboratory Results
Attachment C	Calibration Certificate
Attachment D	Field Data Sheets

1.0 INTRODUCTION

General

Under the requirements of the NSW EPA Environmental Protection Licence (EPL) 5863, Upper Hunter Shire Council (UHSC) is required to conduct quarterly and annual groundwater monitoring of the Scone Waste Facility located on Noblet Road, Scone NSW 2337.

The Quarterly Groundwater Monitoring Report provides a snapshot of the groundwater conditions at the Site in relation to the current Site Criteria and satisfies the groundwater monitoring requirements of the EPL.

The Scone Waste Facility is an active landfill, it has the potential to be a polluting activity or to adversely impact the groundwater within the immediate vicinity and down hydraulic gradient of the site if there was a leak within the landfill.

Engage Environmental Services (Engage) was commissioned by UHSC to undertake this quarterly round of groundwater monitoring at the site. The quarterly groundwater monitoring was carried out on 25th January 2024.

This report has been prepared utilising information supplied by the client, publicly accessible information, information obtained as part of the onsite fieldwork and analysis, information from Government bodies and from experience, knowledge, and current industry practice.

Briefing

The briefing provided by Upper Hunter Shire Council and contained within EPL 5863 indicates that quarterly groundwater monitoring is required at five locations on the site, monitoring wells A to E (MWA-MWE). Monitoring Well D is located within the landfill and the monitoring well accesses the perched water table (leachate) within the landfill. Comparisons against established criteria and historical data allow for trending of data. Trending of data can highlight seasonal variations, increases in analyte concentrations, decreases in analyte concentrations and fluctuations within the dataset. Over a time period the dataset can reveal increasing/decreasing trends highlighting potential site issues.

Refer to **Figure 1: Site Layout with Sample Locations**

2.0 SITE CRITERIA AND SAMPLING FREQUENCY

The groundwater analytical suite and sampling frequency were provided by UHSC and the EPL. Each of the wells have the same sampling regime and analytical suite for sample analysis. The site criterion are sourced from the 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, unless otherwise stated.

Table 1: Analytes, Site Criteria and Sampling Frequency for Groundwater Monitoring Wells - Quarterly.

	Analytes/Pollutant	Units	Site Criteria NEPM	Sampling Frequency
			2013 and ANZW 2018 Fresh Water 95%	
IONS	Calcium	mg/L	NA	Quarterly
	Alkalinity (total)	mg/L	NA	Quarterly
	Chloride	mg/L	NA	Quarterly
	Fluoride	mg/L	NA	Quarterly
	Potassium¹	mg/L	410	Quarterly
	Magnesium	mg/L	NA	Quarterly
	Sulphate	mg/L	NA	Quarterly
HEAVY METALS	Iron	mg/L	0.3	Quarterly
	Manganese	mg/L	1.9	Quarterly
PHENOLS	Total phenolics	mg/L	0.32	Quarterly
OCP	Organochlorine Pesticide³ (OCP)	mg/L	0.00001	Quarterly
MISC. INORGANICS	pH	pH	6.5 – 8	Quarterly
	Sodium	mg/L	NA	Quarterly
	Ammonia²	mg/L	0.9	Quarterly
	Nitrate	mg/L	50	Quarterly
	Total organic carbon	mg/L	4	Quarterly
	Electrical conductivity	µS/cm	NA	Quarterly

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

3.0 SAMPLING METHODOLOGY

Groundwater Sampling

The five well locations were identified on the site. The site map was cross-referenced to the markings on the monitoring wells to ensure the correct wells were being sampled. Purging and sampling of monitoring wells was conducted in accordance with the NEPM (NEPC, 2013) and the *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DECC, 2007).

Purging is the process of removing stagnant water from a well, immediately prior to sampling, causing its replacement by groundwater from the adjacent formation that is representative of actual aquifer conditions. In order to determine when a well has been adequately purged, the physical parameters (pH \pm 0.1 unit, electrical conductivity \pm 5%, temperature \pm 0.20, reduction-oxidation (redox) \pm 10%; and dissolved oxygen \pm 10%.) are monitored while the groundwater is removed during purging.

The physical parameters were measured at regular intervals using a YSI Quatro Pro Plus Water Quality Meter. Stable conditions were indicated by monitoring for three consecutive readings of the physical parameters.

Collection of samples were direct into laboratory issued sampling containers for specific analytes. Samples were obtained using a disposable bailer. Care was taken so the bailer did not contact the sample container. All samples were collected and filled into the correct sample containers, a meniscus was formed on each sampling container prior to sealing to reduce or eliminate head space. The samples were placed immediately into a portable cooler to prevent the loss of potential volatile components.

Decontamination procedures between sampling events and sampling locations was undertaken. Sampling equipment was cleaned before and after sampling to prevent cross contamination. The cleaning procedure included:

- New nitrile disposable gloves for each well;
- Washing and wipe down with phosphate free laboratory grade detergent;
- Rinsing of brush before using brush on equipment;
- Using a brush on equipment if necessary;
- Rinsing with deionised water and wipe down with new wipe if necessary; and,
- New disposable bailer used for each well.

Appropriate decontamination procedures were appropriate during groundwater sampling.

4.0 RESULTS

The five groundwater monitoring wells were sampled during the January 2024 sampling event, results are detailed in **Tables 2 to 6**. Comparisons have been made to the previous rounds of monitoring (March – September 2022). Refer to **Attachment 1** – NATA Accredited Laboratory Results and **Attachment 3** – Data Log.

There was one exceedance of the site criteria for January in MWA, TOC at a concentration of 9mg/L.

Table 2 – Quarterly Groundwater Results and Comparison December 2022 – January 2024 (MWA)

	Analytes	Units	Site Criteria (mg/L)	MWA Dec 2022	MWA March 2023	MWA June 2023	MWA Sept 2023	MWA Jan 2024
IONS	Calcium	mg/L	NA	500	500	540	570	570
	Alkalinity (total)	mg/L	NA	510	510	520	540	560
	Chloride	mg/L	NA	5800	7100	6300	8000	7200
	Fluoride	mg/L	NA	0.1	0.1	0.1	0.1	0.1
	Potassium¹	mg/L	410	3	3	4	4	4
	Magnesium	mg/L	NA	960	1000	1000	1100	1200
	Sulphate	mg/L	NA	52	56	66	62	100
HEAVY METALS	Iron	mg/L	0.3	0.68	0.180	<LOR	0.01	<LOR
	Manganese	mg/L	1.9	0.037	0.010	0.012	0.07	0.038
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR	<LOR
OCP	OCP³	mg/L	0.0000	<LOR	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.7	6.8	6.6	6.9	7.0
	Sodium	mg/L	NA	1900	1800	2100	2000	2000
	Ammonia²	mg/L	0.9	<LOR	0.17	0.007	0.043	0.066
	Nitrate	mg/L	0.7	0.47	0.49	0.63	0.59	0.6
	Total Organic	mg/L	4	8	3	3	5	9
	EC	µS/cm	NA	20000	20000	19000	20000	19000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There was one exceedance of the site criteria for January in MWB, TOC at a concentration of 14mg/L.

Table 3 – Quarterly Groundwater Results and Comparison December 2022 – January 2024 (MWB)

	Analytes	Units	Site Criteria (mg/L)	MWB Dec 2022	MWB March 2023	MWB June 2023	MWB Sept 2023	MWB Jan 2024
IONS	Calcium	mg/L	NA	440	420	470	470	480
	Alkalinity (total)	mg/L	NA	430	440	450	440	470
	Chloride	mg/L	NA	3400	4800	4200	5200	4700
	Fluoride	mg/L	NA	0.3	0.3	0.3	0.2	0.3
	Potassium¹	mg/L	410	3	3	3	4	3
	Magnesium	mg/L	NA	580	600	600	630	640
	Sulphate	mg/L	NA	60	82	91	110	100
HEAVY METALS	Iron	mg/L	0.3	0.07	0.14	<LOR	<LOR	<LOR
	Manganese	mg/L	1.9	0.01	0.012	0.017	0.016	0.013
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.9	6.9	6.9	6.9	7.1
	Sodium	mg/L	NA	1300	1300	1500	1400	1400
	Ammonia²	mg/L	0.9	<LOR	<LOR	0.073	0.037	0.03
	Nitrate	mg/L	0.7	0.31	0.30	0.38	0.26	0.26
	Total Organic Carbon	mg/L	4	7	7	9	9	14
	EC	µS/cm	NA	14000	14000	14000	14000	13000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There was one exceedance of the site criteria for January in MWC, TOC at a concentration of 14mg/L.

Table 4 – Quarterly Groundwater Results and Comparison December 2022 – January 2024 (MWC)

	Analytes	Units	Site	MWC	MWC	MWC	MWC	MWC
			Criteria (mg/L)	Dec 2022	March 2023	June 2023	Sept 2023	Jan 2024
IONS	Calcium	mg/L	NA	300	310	380	390	420
	Alkalinity (total)	mg/L	NA	950	910	990	880	890
	Chloride	mg/L	NA	3100	4200	4000	5500	5300
	Fluoride	mg/L	NA	0.2	0.2	0.2	0.2	0.2
	Potassium¹	mg/L	410	2	2	2	3	2
	Magnesium	mg/L	NA	410	450	500	550	600
	Sulphate	mg/L	NA	71	82	87	91	98
HEAVY METALS	Iron	mg/L	0.3	1.4	1.4	<LOR	<LOR	<LOR
	Manganese	mg/L	1.9	2.1	1.6	1.4	1.9	1.5
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.7	6.9	6.8	6.9	7.0
	Sodium	mg/L	NA	1500	1600	1900	1800	1900
	Ammonia²	mg/L	0.9	0.016	0.010	<LOR	<LOR	<LOR
	Nitrate	mg/L	0.7	0.11	0.11	0.05	0.068	0.03
	Total Organic	mg/L	4	10	7	8	8	14
	EC	µS/c	NA	13000	13000	14000	15000	15000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

MWD is a leachate monitoring well which provides access to the perched landfill leachate water table. The Site Criteria for this particular well is only used as a general indicator of the leachate water quality.

**Table 5 – Quarterly Groundwater Results and Comparison June 2022 – June 2023
(MWD) Leachate Well**

	Analytes	Unit s	Site Criteria (mg/L)	MWD Dec 2022	MWD March 2023	MWD June 2023	MWD Sept 2023	MWD Jan 2024
IONS	Calcium	mg/L	NA	220	110	160	160	160
	Alkalinity (total)	mg/L	NA	1900	2200	2300	1900	2000
	Chloride	mg/L	NA	2000	2800	2200	3400	2200
	Fluoride	mg/L	NA	0.3	0.2	0.3	0.2	0.3
	Potassium¹	mg/L	410	100	1	130	110	120
	Magnesium	mg/L	NA	220	120	270	280	230
	Sulphate	mg/L	NA	200	95	62	51	32
HEAVY METALS	Iron	mg/L	0.3	2.6	3.1	0.87	0.88	1.1
	Manganese	mg/L	1.9	0.49	0.38	0.38	0.39	0.47
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR	<LOR
OCP	OCP³	mg/L	0.0000	<LOR	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.5	7.6	7.4	7.8	7.6
	Sodium	mg/L	NA	1300	790	1600	1500	1400
	Ammonia²	mg/L	0.9	180	230	220	200	190
	Nitrate	mg/L	0.7	<LOR	<LOR	<LOR	<LOR	<LOR
	Total Organic	mg/L	4	190	440	220	240	270
	EC	µS/c	NA	11000	12000	11000	3600	9700

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There was one exceedance of the site criteria for January in MWE, TOC at a concentration of 19mg/L.

**Table 6 –Quarterly Groundwater Results and Comparison June 2022 – June 2023
(MWE)**

	Analytes	Units	Threshold Criteria (mg/L)	MWE Dec 2022	MWE March 2023	MWE June 2023	MWE Sept 2023	MWE Jan 2024
IONS	Calcium	mg/L	NA	88	180	130	130	110
	Alkalinity (total)	mg/L	NA	1700	1300	1200	1100	1100
	Chloride	mg/L	NA	490	960	940	1300	1300
	Fluoride	mg/L	NA	0.4	0.4	0.5	0.4	0.4
	Potassium¹	mg/L	410	0.8	140	0.9	1	0.9
	Magnesium	mg/L	NA	93	250	130	140	130
	Sulphate	mg/L	NA	110	210	180	240	210
HEAVY METALS	Iron	mg/L	0.3	0.71	2.1	<LOR	0.02	<LOR
	Manganese	mg/L	1.9	0.59	0.88	0.66	1.1	0.9
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.2	7.3	7.2	7.4	7.3
	Sodium	mg/L	NA	590	1300	730	760	830
	Ammonia²	mg/L	0.9	0.018	0.034	0.039	0.12	0.015
	Nitrate	mg/L	0.7	<LOR	0.02	0.007	0.01	<LOR
	Total Organic Carbon	mg/L	4	7	6	5	5	19
	EC	µS/cm	NA	4200	5000	5100	5500	5800

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs

5.0 DISCUSSION

The inferred hydraulic gradient for the site is a down gradient towards Parsons Gully to the west. The location of the four monitoring wells surrounding the landfill place wells MWA, MWB and MWC down-hydraulic gradient and well MWE up-hydraulic gradient of the landfill. Well MWD is located within the perched landfill water table, this enables access to the leachate within the landfill.

The following is a summary of the significant results for January 2024 in relation to the Site Criteria. Key increasing trends, decreasing trends and exceedances of the threshold criteria are indicated.

MWA

MWA is located in the northwest section of the site and is considered to be a down-hydraulic gradient monitoring well. There is farmland adjoining to the north and west of this location. There is one exceedance of the site criteria:

- The TOC concentration increased from 5 mg/L in September to 9 mg/L in January 2024, remaining above site Criteria of 4 mg/L.

The following changes have occurred in the water quality of MWA since the previous monitoring period in September 2023:

- Sulphate concentration increased from 62 mg/L in September 2023 to 100 mg/L in January 2024;
- Magnesium concentration increased from 1100 mg/L to 1200 mg/L;
- Alkalinity concentration increased from 540 mg/L in September 2023 to 560 mg/L in January 2024;
- Chloride concentration decreased from 8000mg/l to 7200mg/L;
- Ammonia concentration increased from 0.043 mg/L in the September 2023 to 0.066mg/L in January 2024.

All other analytes reported concentrations consistent with previous monitoring data.

MWB

MWB is located in the southwest section of the site and is considered to be a down-hydraulic gradient monitoring well. There is farmland to the south and west of this location. There is one exceedance of the site criteria:

- The TOC concentration increased from 9 mg/L in September 2023 to 14 mg/L in January 2024, remaining above site Criteria of 4 mg/L.

The following significant changes have occurred in the water quality of MWB since the previous monitoring period in September 2023:

- Alkalinity concentration increased from 440 mg/L to 470mg/L;
- Chloride concentration decreased from 5200mg/L to 4700mg/L;

All other analytes reported concentrations consistent with previous monitoring data.

MWC

MWC is located on the southern boundary of the site, down hydraulic gradient of the landfill and onsite dam. There is farmland to the south of well, along with a stand of vegetation immediately south of the well. There was one concentration which exceeded the site criteria:

- TOC concentration of 14 mg/L in MWC was exceeding the Site Criteria (4 mg/L), this has increased since the previous reported concentration in September 2023 (8 mg/L).

The following changes have occurred in the water quality of MWC the previous monitoring period in September:

- The Magnesium concentration has increased since September from 550 mg/L to 600mg/L in January 2024.
- A concentration of Manganese (1.5mg/L) was reported in MWC, a decrease compared to the previous concentrations reported in September 2023 (1.9 mg/L);
- There was an increase in concentrations of Calcium from 390mg/L to 420mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

MWD

The water collected and analysed from well MWD is landfill leachate and as such the Site Criteria is not used to compare the results against. The results of MWD are used as an indicator of current conditions within the landfill with trends and seasonal variations apparent. MWD is also to be used as a comparison to the external monitoring wells.

The following changes occurred in the water quality of the landfill leachate well MWD since the previous monitoring period in September:

- Iron concentration increased from 0.88 mg/L in September 2023 to 1.1 mg/L in January 2024;
- The TOC concentration has increased from 240mg/L to 270 mg/L in comparison to September;
- There was a decrease in Chloride concentration from 3400 mg/L to 2200 mg/L.
- Potassium increased from 110mg/L to 120 mg/L.
- Magnesium decreased from 280 mg/L to 230 mg/L

- Sodium decreased from 1500 mg/L to 1400 mg/L;
- Sulphate concentration decreased from 51mg/L to 32 mg/L;
- Manganese concentration increased from 0.39mg/L to 0.47mg/L.

MWE

MWE is located on the eastern boundary of the site and is considered to be an up-gradient groundwater monitoring well. There are a series of dams to the east of the well. There was one concentration which exceeded the site criteria. The following changes have occurred in the water quality of MWE the previous monitoring period in March:

- The TOC concentration increased from 5mg/L to 19 mg/L, above the site criteria of 4mg/L;

The following changes have occurred in the water quality of MWE:

- The Iron concentration decreased from 0.02 mg/L to below LOR, below the site criteria of 0.3mg/L.
- There was a decrease in concentrations of Calcium, from 130 mg/L to 110 mg/L.
- Magnesium decreased from 140 mg/L to 130 mg/L.
- Sodium increased from 760 mg/L to 830 mg/L;
- Sulphate decreased from 240 mg/L to 210 mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

The following analytes exceeded the Threshold Criteria during the January 2024 sampling event, excluding the Leachate Monitoring well (MWD); TOC in MWA, MWB, MWC and MWE. Refer to **Attachment 3** – Data Log.

There has been significant heat / rainfall events throughout the region in the last 6 months. These events have had an impact on the analyte concentrations.

Site Maintenance

The leachate well remains broken off at the ground level. No immediate maintenance is required on the other wells.

6.0 CONCLUSIONS

There are seasonal fluctuations and localised weather events which would have impacted the local and regional groundwater conditions. Trending of the analytes sampled over time may indicate a seasonal fluctuation, an anomaly or highlight an issue on the site (or surrounding area). The trending of analytes occurs in the annual groundwater monitoring report with a running comparison in the quarterly monitoring reports.

The results and discussion of the laboratory sample analysis from the Scone Waste Facility during the January 2024 quarterly sampling event displayed several ongoing exceedances of the Site Criteria from the previous monitoring period.

The following analytes exceeded the Site Criteria for the January 2024 sampling event; TOC in MWA, MWB, MWC and MWE.

Continued sampling and data collection will allow robust trending and statistical analysis of data to occur.

The next water sampling event will be a quarterly monitoring event which will be undertaken in March 2024.

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 6* 2011, updated Nov 2018;
- *Contaminated Land Management Act 1997* (NSW);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 2011);
- *Contaminated Sites: Consultants reporting on Contaminated Lands* (NSW EPA 2020)
- *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 land sampling design guidelines part 1 – application* (NSW EPA 2022)
- *Contaminated land sampling design guidelines part 2 – interpretation* (NSW EPA 2022)
- *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 1996);
- *Environmental Guidelines Solid Waste Landfills* Second edition, (NSW EPA 2016);
- *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 1998);
- *National Environment Protection (Assessment of Site Contamination) Measure (No.1)* (NEPM, 2013) as amended;
- *State Environmental Planning Policy (Resilience and Hazards) 2021*;
- *Storage and Handling of Dangerous Goods Code of Practice 2005*;
- *Work Health and Safety Act 2011* (NSW) and associated regulations.

FIGURE
SITE LAYOUT



Legend

- Sample Location
- Site boundary

Image: SiX Maps NSW Gov.



ENGAGE Environmental
Services Pty Limited
113 Reservoir Rd
Glendale NSW 2285
0478 362005

Title
Sampling Locations Noblet Road, Scone

Client	Project No.	Figure No	Date
UHSC	E2424	1	1/02/2024
admin@engage-es.com.au	Scale NA	Compiled DB	Revision 1

ATTACHMENT A
DATALOG

ENGAGE ENVIRONMENTAL SERVICES				Threshold Criteria	NA	NA	NA	NA	0.3	NA	0.0001	NA	6.5–8	NA	0.9	0.7	NA	4	0.32	NA	
Well Id	Lab Report	Date	Monitoring frequency	Units	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
				Analytes	Calcium	Alkalinity	Chloride	Fluoride	Iron	Magnesium	Manganese	Organochlorine pesticides (OCP)	pH	Sodium	Ammonia	Nitrate	Sulfate	Total organic carbon	Total phenolics	Electrical conductivity (EC)	
					Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
MWA	342575	25/01/2024	Quarterly		570	560	7200	0.1	<LOR	1200	0.038	<LOR	4	7	2000	0.066	0.6	100	9	<LOR	19000
MWB	342575	25/01/2024	Quarterly		480	470	4700	0.3	<LOR	640	0.013	<LOR	3	7.1	1400	0.03	0.26	100	14	<LOR	13000
MWC	342575	25/01/2024	Quarterly		420	890	5300	0.2	<LOR	600	1.5	<LOR	2	7	1900	<LOR	0.03	98	14	<LOR	15000
MWD	342575	25/01/2024	Quarterly		160	2000	2200	0.3	1.1	230	0.47	<LOR	120	7.6	1400	190	<LOR	32	270	<LOR	9700
MWE	342575	25/01/2024	Quarterly		110	1100	1300	0.4	<LOR	130	0.9	<LOR	0.9	7.3	830	0.015	<LOR	210	19	<LOR	5800

ATTACHMENT B
NATA ACCREDITED LABORATORY RESULTS

CERTIFICATE OF ANALYSIS 342575

Client Details

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

Sample Details

Your Reference	<u>E2424-0124-UHCS</u>
Number of Samples	5 Water
Date samples received	30/01/2024
Date completed instructions received	30/01/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
 Samples were analysed as received from the client. Results relate specifically to the samples as received.
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	06/02/2024
Date of Issue	06/02/2024
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Inorganics Supervisor
 Dragana Tomas, Senior Chemist
 Giovanni Agosti, Group Technical Manager

Authorised By

Nancy Zhang, Laboratory Manager

Organochlorine Pesticides in Water						
Our Reference		342575-1	342575-2	342575-3	342575-4	342575-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	2/02/2024	2/02/2024	2/02/2024	2/02/2024	2/02/2024
Date analysed	-	02/02/2024	02/02/2024	02/02/2024	02/02/2024	02/02/2024
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
HCB	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
gamma-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
Endosulfan II	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
Endrin Aldehyde	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
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 4-Chloro-3-NBTF	%	82	82	77	71	67

Total Phenolics in Water						
Our Reference		342575-1	342575-2	342575-3	342575-4	342575-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	31/01/2024	31/01/2024	31/01/2024	31/01/2024	31/01/2024
Date analysed	-	31/01/2024	31/01/2024	31/01/2024	31/01/2024	31/01/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved						
Our Reference		342575-1	342575-2	342575-3	342575-4	342575-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	01/02/2024	01/02/2024	01/02/2024	01/02/2024	01/02/2024
Date analysed	-	01/02/2024	01/02/2024	01/02/2024	01/02/2024	01/02/2024
Iron-Dissolved	µg/L	<10	<10	<10	1,100	<10
Manganese-Dissolved	µg/L	38	13	1,500	470	900

Ion Balance						
Our Reference		342575-1	342575-2	342575-3	342575-4	342575-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Date analysed	-	30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Calcium - Dissolved	mg/L	570	480	420	160	110
Potassium - Dissolved	mg/L	4	3	2	120	0.9
Sodium - Dissolved	mg/L	2,000	1,400	1,900	1,400	830
Magnesium - Dissolved	mg/L	1,200	640	600	230	130
Hardness	mgCaCO ₃ /L	6,200	3,800	3,500	1,400	820
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	560	470	890	2,000	1,100
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	560	470	890	2,000	1,100
Sulphate, SO ₄	mg/L	100	100	98	32	210
Chloride, Cl	mg/L	7,200	4,700	5,300	2,200	1,300
Ionic Balance	%	-2.0	-3.0	-4.0	-6.0	-9.0

Miscellaneous Inorganics						
Our Reference		342575-1	342575-2	342575-3	342575-4	342575-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Date analysed	-	30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
pH	pH Units	7.0	7.1	7.0	7.6	7.3
Electrical Conductivity	µS/cm	19,000	13,000	15,000	9,700	5,800
Ammonia as N in water	mg/L	0.066	0.030	<0.005	190	0.015
Fluoride, F	mg/L	0.1	0.3	0.2	0.3	0.4
Total Organic Carbon	mg/L	9	14	14	270	19
Nitrate as N in water	mg/L	0.60	0.26	0.03	<0.005	<0.005

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 +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Client Reference: E2424-0124-UHCS

QUALITY CONTROL: Organochlorine Pesticides in Water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			02/02/2024	[NT]	[NT]	[NT]	[NT]	02/02/2024	[NT]
Date analysed	-			02/02/2024	[NT]	[NT]	[NT]	[NT]	05/02/2024	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	109	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	116	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	102	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	117	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	121	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	125	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	135	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	121	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	115	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	85	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	81	[NT]	[NT]	[NT]	[NT]	73	[NT]

Client Reference: E2424-0124-UHCS

QUALITY CONTROL: Total Phenolics in Water						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	342575-2
Date extracted	-			31/01/2024	1	31/01/2024	31/01/2024		31/01/2024	31/01/2024
Date analysed	-			31/01/2024	1	31/01/2024	31/01/2024		31/01/2024	31/01/2024
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	103	130

Client Reference: E2424-0124-UHCS

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			01/02/2024	[NT]	[NT]	[NT]	[NT]	01/02/2024	[NT]
Date analysed	-			01/02/2024	[NT]	[NT]	[NT]	[NT]	01/02/2024	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	96	[NT]

Client Reference: E2424-0124-UHCS

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	342575-5
Date prepared	-			30/01/2024	1	30/01/2024	30/01/2024		30/01/2024	30/01/2024
Date analysed	-			30/01/2024	1	30/01/2024	30/01/2024		30/01/2024	30/01/2024
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	570	570	0	91	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	4	4	0	90	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2000	2000	0	105	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1200	1100	9	95	[NT]
Hardness	mgCaCO ₃ /L	3	Metals-020	[NT]	1	6200	6100	2	[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	560	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	560	[NT]		99	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	1	100	[NT]		94	#
Chloride, Cl	mg/L	1	Inorg-081	<1	1	7200	[NT]		99	#
Ionic Balance	%		Inorg-040	[NT]	1	-2.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	4	30/01/2024	30/01/2024		[NT]	[NT]
Date analysed	-			[NT]	4	30/01/2024	30/01/2024		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	4	160	[NT]		[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	4	120	[NT]		[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	4	1400	[NT]		[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	4	230	[NT]		[NT]	[NT]
Hardness	mgCaCO ₃ /L	3	Metals-020	[NT]	4	1400	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	[NT]	4	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	4	2000	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	4	<5	[NT]		[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	[NT]	4	2000	[NT]		[NT]	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	[NT]	4	32	34	6	[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	4	2200	2400	9	[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	4	-6.0	[NT]		[NT]	[NT]

Client Reference: E2424-0124-UHCS

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	342575-3
Date prepared	-			30/01/2024	1	30/01/2024	30/01/2024		30/01/2024	30/01/2024
Date analysed	-			30/01/2024	1	30/01/2024	30/01/2024		30/01/2024	30/01/2024
pH	pH Units		Inorg-001	[NT]	1	7.0	[NT]		101	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	19000	[NT]		107	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.066	[NT]		97	86
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.1	0.1	0	98	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	9	9	0	112	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.60	[NT]		98	96

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	342575-5
Date prepared	-			[NT]	2	30/01/2024	30/01/2024		[NT]	30/01/2024
Date analysed	-			[NT]	2	30/01/2024	30/01/2024		[NT]	30/01/2024
pH	pH Units		Inorg-001	[NT]	2	7.1	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	2	13000	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	2	0.030	0.030	0	[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	2	0.3	[NT]		[NT]	102
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	2	14	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	2	0.26	0.26	0	[NT]	[NT]

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

MISC_INORG:Nitrate as N in water/pH:Samples were out of the recommended holding time for this analysis.

Dissolved Metals: no filtered, preserved sample was received for #3 & #4, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.

Note: there is a possibility some elements may be underestimated.

ION_BALANCE:

Percent recovery is not applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.

ATTACHMENT C
CALIBRATION CERTIFICATE

Electrode Quality Certificate

Electrode: HI7698194-3 Parameter: EC SN: J88036 Recommended for: HI98194

Description: EC sensor with screw type connector

Hanna Instruments certifies that this electrode has been produced, calibrated and tested to meet all applicable Hanna Instruments Procedures, using standards and reference instruments, the accuracy of which is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO 9001.

Standard Reference Materials: EC: SRM 999 [NIST]

Tests performed using reference devices:

EC (@ 25 °C):	Offset (air) [μ S/cm]:	0	
	Tolerance [μ S/cm]:	+1	
	Reading [μ S/cm]:	0	Passed
	EC (standard) [mS/cm]:	12.88	
	Tolerance [mS/cm]:	10.30 - 15.46	
	Reading [mS/cm]:	12.61	Passed
EC response time (12.88 mS/cm – 5.00 mS/cm)*:	Standard time [s]:	<5	Passed
	Tolerance [s]:	+1	

*) Evaluated for 90 % of step; NP = not performed.

Quality control and testing criteria have been met.

Date: 2023.06.26

QC Inspector: Szigyarto N. / Engineer

[Name / Title of Signatory]

Signature: 

EQC_HI7698194-3_rev.0.1_December 2018

Instrument Quality Certificate

Instrument: HI98494 Serial Number: M04200028111 SW version, Meter: 1.05 Bluetooth version: 1.00

Description: Multiparameter Bluetooth Portable pH/ORP/EC/opdo Waterproof Meter

Hanna Instruments certifies that this instrument has been produced, calibrated and tested to meet all applicable Hanna Instruments procedures, using standards and reference instruments, the accuracy of which is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO 9001. The following tests have been performed according with the reference from the QC Procedure of the meter.

The results are listed below:

A. Functionality tests	Reference	Result
A.1. Switch On/Off test	8.3	Passed
A.2. LCD test	8.3	Passed
A.3. Sound test	8.3	Passed
A.4. Keyboard test	8.3	Passed
A.5. Real time clock test	8.3	Passed
A.6. Eeprom test	8.3	Passed
A.7. Measurement test (pH, ORP, EC, opdo, T)	8.4	Passed
A.8. PC connection test USB	8.5	Passed
A.9. PC connection test Bluetooth	8.5	Passed
A.10. Log download test	8.5	Passed
A.11. Factory calibration test	8.5	Passed
B. Aesthetic Control	Reference	Result
B.1. Visual Inspection	8.1	Passed
B.2. Labeling and Marking	8.2	Passed

Calibration, functionality test, aesthetic control and packing have been met.

Date: 2023.06.29

QC Inspector: Tudor Coman / Engineer

[Name / Title of Signatory]

Signature: 

IQC_HI98494_rev.0.1_September 2020

ATTACHMENT D
FIELD DATA SHEETS

GROUNDWATER MONITORING FIELD DATA SHEET

Project: E2424-0124 Score	Sample ID: MWA
Client: UHSC	Sampler: DB
Site Address: Noblet Road Score	Date: 25.1.24

Well Information			
Monument damaged: Rusty	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
Casing above ground:0.77.....	m agl	Weather Conditions:	
Standing water level: 6.594.....	m bgl	Temperature >15 <input type="checkbox"/>	15-20 <input type="checkbox"/>
Total well depth:15.66	m bgl	20-25 <input type="checkbox"/>	25-30 <input checked="" type="checkbox"/>
Initial well volume:9.066.....	L	Clear <input type="checkbox"/>	Partly cloudy <input checked="" type="checkbox"/>
Water level after purging:8.378.....	m bgl		Overcast <input type="checkbox"/>
Volume of water purged:1.78.....	L	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/>
Water level at time of sampling:8.575.....	m bgl		Moderate breeze <input type="checkbox"/>
Well purged dry:	YES / NO		Windy <input type="checkbox"/>
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/>
			Rain <input type="checkbox"/>

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity	Comments
9:12am	1.78	28.11	5.27	222.3	23.06	28.08	Water clear no smell or sheen
9:14am	1.28	28.48	5.31	219.4	21.09	17.58	
9:16am	1.22	28.47	5.28	215.2	21.12	17.60	
9:18am	1.24	28.48	5.30	216.0	21.10	17.58	

Water Quality and General Comments:

Water was clear, no odour or sheen or hydrocarbon odour. Grassy vegetation around monument and no standing water around monument.

GROUNDWATER MONITORING FIELD DATA SHEET

Project: E2424-0124 Score	Sample ID: MWB
Client: UHSC	Sampler: DB
Site Address: Noblet Road Score	Date: 25.1.24

Well Information			
Monument damaged: Rusty	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: Rusty	YES / NO / N/A	Odours from groundwater:	YES / NO / N/A
Casing above ground:0.8.....	m agl	Weather Conditions:	
Standing water level: 6.545.....	m bgl	Temperature >15 <input type="checkbox"/>	15-20 <input type="checkbox"/>
Total well depth:14.04	m bgl	20-25 <input type="checkbox"/>	25-30 <input checked="" type="checkbox"/>
Initial well volume:7.495.....	L	Clear <input type="checkbox"/>	Partly cloudy <input checked="" type="checkbox"/>
Water level after purging:7.392.....	m bgl	Overcast <input type="checkbox"/>	
Volume of water purged:0.847.....	L	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/>
Water level at time of sampling:7.392.....	m bgl	Moderate breeze <input type="checkbox"/>	Windy <input type="checkbox"/>
Well purged dry:	YES / NO		
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/>
		Rain <input type="checkbox"/>	<input type="checkbox"/>

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (µS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity	Comments
10:08am	2.34	20.12	5.36	140.2	23.54	12.01	Clear water, no sheen
10:10am	1.45	19.91	5.42	134.4	21.33	11.9	
10:12am	2.49	19.39	5.31	126.2	21.28	5.91	

Water Quality and General Comments:

Water was clear no odour or sheen or hydrocarbon odour. Bush vegetation and grass around monument and no standing water around monument.

GROUNDWATER MONITORING FIELD DATA SHEET

Project: E2424-0124 Score	Sample ID: MWC
Client: UHSC	Sampler: DB
Site Address: Noblet Road Score	Date: 25.01.24

Well Information			
Monument damaged: Rusty	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
Casing above ground:0.75.....	m agl	Weather Conditions:	
Standing water level: 5.833.....	m bgl	Temperature >15 <input type="checkbox"/>	15-20 <input type="checkbox"/>
Total well depth:12.6	m bgl	20-25 <input type="checkbox"/>	25-30 <input type="checkbox"/> >30 X
Initial well volume:6.767.....	L	Clear X	Partly cloudy <input type="checkbox"/> Overcast X
Water level after purging:6.244.....	m bgl	Calm X	Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:0.411.....	L		Windy <input type="checkbox"/>
Water level at time of sampling:6.056.....	m bgl	Fine X	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.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity	Comments
10:46am	2.64	22.21	5.45	214.7	23.4	13.37	Clear water
10:48am	1.18	22.4	5.33	213.5	21.3	13.51	
10:50am	0.68	22.07	5.32	212.6	20.86	13.29	
10:53am	0.71	22.05	5.35	213.1	20.86	13.29	

Water Quality and General Comments:

Water was clear no odour or sheen or hydrocarbon odour. Grassy vegetation around monument and trees close by, and no standing water around monument.

GROUND WATER MONITORING FIELD DATA SHEET

Project: E2424-0124 Score	Sample ID: MWE
Client: UHSC	Sampler: DB
Site Address: Noblet Road Score	Date: 25.01.24

Well Information			
Monument damaged: Rusty	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: Rusty	YES / NO / N/A	Odours from groundwater:	YES / NO / N/A
Casing above ground:0.68.....	m agl	Weather Conditions:	
Standing water level: 5.273.....	m bgl	Temperature >15 <input type="checkbox"/>	15-20 <input type="checkbox"/>
Total well depth:9.46	m bgl	20-25 <input type="checkbox"/>	25-30 <input type="checkbox"/> >30 X
Initial well volume:0.364.....	L	Clear <input type="checkbox"/>	Partly cloudy X Overcast <input type="checkbox"/>
Water level after purging:5.637.....	m bgl	Calm <input type="checkbox"/>	Slight breeze X Moderate breeze <input type="checkbox"/>
Volume of water purged:	L		Windy <input type="checkbox"/>
Water level at time of sampling:5.643.....	m bgl		
Well purged dry:	YES / NO		
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X	Showers <input type="checkbox"/> Rain <input type="checkbox"/>

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (µS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity	Comments
11:32am	2.07	6299	5.37	-128.8	21.26	3.45	Clear water
11:34am	2.01	6900	5.29	-122.2	20.09	3.8	
11.36am	2.03	6551	5.51	-120.3	20.59	3.2	

Water Quality and General Comments:

Water was clear, no sheen or hydrocarbon odour. Slight sulphur odour. Vegetation around monument and no standing water around monument.