



# **QUARTERLY GROUNDWATER MONITORING THE SCONE WASTE LANDFILL**

## **THE SCONE WASTE LANDFILL**

Noblet Road  
Scone  
NSW 2337

Upper Hunter Shire Council

DLH1186/0450054\_H001985

July 2018

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VERSION	DATE	COMMENT	PREPARED BY	REVIEWED BY
H001985	26.07.2018		Michael Mercer/ Kathrine Skeen	Stephen Challinor

ERM Services Australia Pty Ltd: ABN 80 601 661 634

#### ADELAIDE

5 Peel Street  
Adelaide, SA, 5000  
Ph: +61 8 8332 0960  
Fax: +61 7 3844 5858

#### BRISBANE

Level 4, 201 Leichardt Street  
Brisbane, Qld 4000  
Ph: +61 7 3004 6400

#### MELBOURNE

Level 10, 224 Queen Street  
Melbourne, Vic 3000  
Ph: +61 3 9036 2637  
Fax: +61 2 9870 0999

#### PERTH

Level 18, 140 St Georges Terrace  
Perth, WA 6000  
Ph: +61 8 9481 4961

#### NEWCASTLE

Level 4, 45 Watt St  
Newcastle NSW 2300  
Ph: +61 2 4933 0001

#### MELBOURNE

Level 6, 99 King Street  
Melbourne, Vic 3000  
Ph: +61 3 9036 2637  
Fax: +61 2 9870 0999

#### SYDNEY

Unit 11 Macquarie Link, 227 Lane Cove Rd  
Macquarie Park, NSW 2113  
Ph: +61 2 9476 1765  
Fax: +61 2 9476 1557

309 Kent Street  
North Sydney, NSW 2000  
Ph: +61 2 9870 0900  
Fax: +61 2 9870 0999

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## ABBREVIATIONS

<b>ANZECC</b>	Australian and New Zealand Environment and Conservation Council
<b>ARMCANZ</b>	Agriculture and Resource Management Council of Australia and New Zealand
<b>DEC</b>	Department of Environment and Conservation (NSW)
<b>EC</b>	Electrical Conductivity
<b>EPA</b>	Environment Protection Authority (NSW)
<b>ERM</b>	Environmental Resources Management (formerly DLA Environmental Services)
<b>NEPC</b>	National Environment Protection Council
<b>NEPM</b>	National Environment Protection Measure
<b>NHMRC</b>	National Health and Medical Research Council
<b>NRMMC</b>	Natural Resource Management Ministerial Council
<b>NSW</b>	New South Wales
<b>OCP</b>	Organochlorine Pesticides
<b>TOC</b>	Total Organic Carbon

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## 1.0 INTRODUCTION

### 1.1 General

ERM Services Australia (ERM) was engaged by Upper Hunter Shire Council (the Client) to conduct annual and quarterly surface and groundwater monitoring of the following area:

**Scone Waste Facility Area**  
Noblet Road Scone NSW 2337 (the Site).

Refer to **Figure 1: Site Location Regional** and **Figure 2: Site Location Local**.

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 the New South Wales (NSW) Environmental Protection Authority (EPA) Environmental Protection Licence 5863.

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

Quarterly groundwater monitoring was undertaken on Thursday 12<sup>th</sup> July 2018 by staff of ERM.

### 1.2 Scope of Works

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

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

Refer to **Figure 3: 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* (ANZECC, 2000), *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)* ('NEPM', NEPC 2013), and the *Australian Drinking Water Guidelines* (NHMRC / NRMCC, 2011).

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

Analytes	Units	Threshold Criteria	
		NEPM 2013 / ANZECC 2000 Fresh Water 95%	Monitoring Frequency
Calcium	mg/L	NA	Quarterly
Alkalinity (total)	mg/L	NA	Quarterly
Chloride	mg/L	NA	Quarterly
Fluoride	mg/L	NA	Quarterly
Iron	mg/L	0.3 <sup>B</sup>	Quarterly
Magnesium	mg/L	NA	Quarterly
Manganese	mg/L	1.9 <sup>A</sup>	Quarterly
Organochlorine pesticides (OCP)	mg/L	0.00001 <sup>C</sup>	Quarterly
Potassium	mg/L	410 <sup>D</sup>	Quarterly
pH	pH	6.5 – 8	Quarterly
Sodium	mg/L	NA	Quarterly
Ammonia	mg/L	0.9 <sup>A</sup>	Quarterly
Nitrate	mg/L	0.7	Quarterly
Sulfate	mg/L	NA	Quarterly
Total organic carbon (TOC)	mg/L	4	Quarterly
Total phenolics	mg/L	0.32	Quarterly
Electrical conductivity (EC)	µS/cm	NA	Quarterly

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

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

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

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

## 3.0 SAMPLING METHODOLOGY

### 3.1 Groundwater Sampling

Groundwater samples were collected from well locations MWA, MWB, MWC, MWD and MWE. 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 DEC, 2007).

Wells were purged using a disposable bailer whilst being measured for physiochemical stability to indicate the flow of formation water. Physiochemical properties were measured at regular intervals following the purging of each equipment volume using an InSitu Water Quality Meter. Stable conditions were indicated by monitoring the following parameters for three consecutive readings of:

- pH  $\pm$  0.1 unit;
- Electrical Conductivity  $\pm$  5%;
- Temperature  $\pm$  0.20;
- Redox Potential  $\pm$  10%; and
- Dissolved Oxygen  $\pm$  10%.

Samples were obtained using a dedicated disposable bailer which was changed between each monitoring well to minimise the potential for cross contamination. 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; and
- Rinsing with deionised water.

Groundwater samples were collected into laboratory prepared and supplied sample containers for specific analytes (i.e. into a combination of plastic unpreserved, plastic preserved, glass amber unpreserved and preserved glass vials). 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 collected for metals analysis were filtered through 0.45 $\mu$ m filter. Samples were placed immediately into a chilled cooler to minimise the likelihood for the loss of potential volatile components.

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



## 4.0 RESULTS

All wells were sampled during the April 2018 sampling event, results are detailed below.

Refer to **Table 4a – Table 4e** for a tabulated summary of the laboratory results.

Refer to **Figure 3** for sampling locations.

**Table 4a – Groundwater Results Comparison April 2018**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA Oct 2017	MWA Jan 2018	MWA Apr 2018	MWA July 2018
Calcium	mg/L	NA	600	590	640	590
Alkalinity (total)	mg/L	NA	470	490	490	480
Chloride	mg/L	NA	7600	7200	7100	7300
Fluoride	mg/L	NA	0.14	0.13	0.13	0.14
Iron	mg/L	0.3 <sup>B</sup>	0.034	ND	ND	0.17
Magnesium	mg/L	NA	1100	1200	1200	1100
Manganese	mg/L	1.9 <sup>A</sup>	0.014	0.010	0.02	0.01
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	4.9	4.9	4.4	4.4
pH	pH	6.5 – 8	6.6	7.0	6.9	6.7
Sodium	mg/L	NA	2000	2000	2100	1900
Ammonia	mg/L	0.9 <sup>A</sup>	0.42	0.12	0.16	0.16
Nitrate	mg/L	0.7	0.41	ND	ND	ND
Sulfate	mg/L	NA	43	40	41	42
TOC	mg/L	4.0	<b>5.0</b>	<b>5.6</b>	3.6	2.3
Total phenolics	mg/L	0.32	ND	ND	0.02	ND
EC	µS/cm	NA	20000	20000	21000	19000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

**Table 4b – Groundwater Results Comparison April 2018**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB Oct 2017	MWB Jan 2018	MWB Apr 2018	MWB July 2018
Calcium	mg/L	NA	610	600	650	590
Alkalinity (total)	mg/L	NA	380	420	390	400
Chloride	mg/L	NA	6000	5400	5700	5600
Fluoride	mg/L	NA	0.26	0.24	0.28	0.26
Iron	mg/L	0.3 <sup>B</sup>	0.005	ND	ND	0.02
Magnesium	mg/L	NA	790	810	810	720
Manganese	mg/L	1.9 <sup>A</sup>	0.009	0.005	0.01	0.01
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	4.1	3.6	3.6	3.6
pH	pH	6.5 – 8	6.7	7.0	7.2	6.9
Sodium	mg/L	NA	1600	1700	1700	1500
Ammonia	mg/L	0.9 <sup>A</sup>	0.09	0.09	0.09	0.08
Nitrate	mg/L	0.7	<b>0.75</b>	ND	0.46	ND
Sulfate	mg/L	NA	70	66	70	74
TOC	mg/L	4.0	<b>6.3</b>	<b>6.2</b>	<b>4.8</b>	3.5
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/cm	NA	16000	16000	16000	15000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

**Table 4c – Groundwater Results Comparison April 2018**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWC Oct 2017	MWC Jan 2018	MWC Apr 2018	MWC July 2018
Calcium	mg/L	NA	35	200	270	350
Alkalinity (total)	mg/L	NA	720	580	550	590
Chloride	mg/L	NA	500	2400	3200	4200
Fluoride	mg/L	NA	0.41	0.26	0.31	0.2
Iron	mg/L	0.3 <sup>B</sup>	ND	ND	ND	0.019
Magnesium	mg/L	NA	73	330	440	490
Manganese	mg/L	1.9 <sup>A</sup>	<b>4.6</b>	<b>12</b>	<b>15</b>	<b>9.1</b>
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	0.9	1.8	1.8	2.6
pH	pH	6.5 – 8	7.1	6.9	6.9	6.7
Sodium	mg/L	NA	490	1100	1400	1400
Ammonia	mg/L	0.9 <sup>A</sup>	0.41	0.16	0.22	0.1
Nitrate	mg/L	0.7	ND	<b>1.7</b>	<b>2.5</b>	<b>1</b>
Sulfate	mg/L	NA	110	110	130	140
TOC	mg/L	4.0	<b>19</b>	<b>12</b>	<b>9.0</b>	<b>6.5</b>
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/cm	NA	2400	3000	8700	12000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

**Table 4d – Groundwater Results Comparison April 2018**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD	MWD	MWD	MWD
			(leachate) Oct 2017	(leachate) Jan 2018	(leachate) Apr 2018	(leachate) July 2018
Calcium	mg/L	NA	190	160	120	96
Alkalinity (total)	mg/L	NA	2500	2400	2500	2500
Chloride	mg/L	NA	3700	3100	3600	3300
Fluoride	mg/L	NA	0.32	0.30	0.34	0.28
Iron	mg/L	0.3 <sup>B</sup>	0.3	<b>1.1</b>	<b>1.1</b>	<b>2</b>
Magnesium	mg/L	NA	260	270	290	220
Manganese	mg/L	1.9 <sup>A</sup>	0.28	0.29	0.18	0.18
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	210	220	200	210
pH	pH	6.5 – 8	7.2	7.7	7.7	7.6
Sodium	mg/L	NA	1800	1900	1900	1700
Ammonia	mg/L	0.9 <sup>A</sup>	<b>350</b>	<b>330</b>	<b>320</b>	<b>330</b>
Nitrate	mg/L	0.7	ND	ND	ND	ND
Sulfate	mg/L	NA	240	93	110	81
TOC	mg/L	4.0	<b>320</b>	<b>340</b>	<b>340</b>	<b>320</b>
Total phenolics	mg/L	0.32	0.03	0.03	0.05	0.065
EC	µS/cm	NA	13000	13000	14000	13000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

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

**Table 4e – Groundwater Results Comparison April 2018**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWE Oct 2017	MWE Jan 2018	MWE Apr 2018	MWE July 2018
<b>Calcium</b>	mg/L	NA	56	56	59	56
<b>Alkalinity (total)</b>	mg/L	NA	1100	1200	1200	1200
<b>Chloride</b>	mg/L	NA	310	280	280	270
<b>Fluoride</b>	mg/L	NA	0.51	0.47	0.56	0.51
<b>Iron</b>	mg/L	0.3 <sup>B</sup>	0.015	0.01	ND	0.02
<b>Magnesium</b>	mg/L	NA	55	55	53	53
<b>Manganese</b>	mg/L	1.9 <sup>A</sup>	0.055	0.24	0.14	0.16
<b>OCP</b>	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND
<b>Potassium</b>	mg/L	410 <sup>D</sup>	1.4	1.6	1.2	1.3
<b>pH</b>	pH	6.5 – 8	7.4	7.4	7.4	7.4
<b>Sodium</b>	mg/L	NA	520	520	550	530
<b>Ammonia</b>	mg/L	0.9 <sup>A</sup>	0.38	0.04	0.07	0.09
<b>Nitrate</b>	mg/L	0.7	ND	ND	ND	ND
<b>Sulfate</b>	mg/L	NA	110	91	85	92
<b>Total Organic</b>	mg/L	4.0	<b>17</b>	<b>15</b>	<b>7.9</b>	<b>6</b>
<b>Total phenolics</b>	mg/L	0.32	ND	ND	ND	ND
<b>EC</b>	µS/cm	NA	3000	3000	3200	2900

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

## 5.0 DISCUSSION

Due to the sites topography, the inferred hydraulic gradient is generally 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, as such the Threshold Criteria is not applicable. 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 July 2018 sampling event in relation to the Threshold Criteria. The following exceedances of the Threshold Criteria occurred:

- Nitrate in MWC exceeded the Threshold Criteria (0.7 mg/L) with a concentration of 1.0 mg/L, a decrease from the 2.5 mg/L reported in April 2018. There has been no nitrate detected in leachate well MWD which suggests that the landfill is not the source of the nitrate. The nitrate may be migrating onto the Site through groundwater from the adjoining farmland.
- Manganese in MWC exceeded the Threshold Criteria (1.9 mg/L) with a concentration of 9.1 mg/L, a decrease from the 15.0 mg/L reported in April 2018. Manganese concentrations in leachate well MWD have been consistently below the Threshold Criteria which suggests that the landfill is not the source of the Manganese.
- Total Organic Carbon (TOC) exceeded the Threshold Criteria (4 mg/L) in two monitoring wells. TOC concentrations in MWC decreased to 6.5 mg/L from the 9.0 mg/L reported in April 2018. A decreased in TOC concentration was also reported in MWE (6 mg/L from 7.9 mg/L in April 2018). It should be noted that the Threshold Criteria used for TOC is intended for drinking water. Due to the extent of the exceedances and the intention of the Threshold Criteria used, these exceedances are regarded as minor. The TOC concentration in MWE, located up-hydraulic gradient, indicates that TOC is likely to be elevated in the local groundwater.

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

The following notable changes occurred within the groundwater analytes in landfill leachate well MWD:

- Ammonia in MWD exceeded the Threshold Criteria (0.9mg/L) with a concentration of 320 mg/L. This well has reported similar concentrations in the past three monitoring events; and,

- Iron in MWD exceeded the Threshold Criteria (0.3mg/L) with a concentration of 2mg/L, an increase from the 1.1 mg/L reported in April 2018.

Refer to **Attachment 3** – Data Log.

The data will be viewed on a trending basis as more results become available.

## 6.0 CONCLUSIONS

The results of laboratory analysis of the samples collected from the Scone Waste Landfill during the July 2018 quarterly sampling event confirmed several exceedances of the Threshold Criteria in the wells external to the landfill. The Threshold Criteria are sourced from the ANZECC 2000 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 July 2018 sampling event: nitrate, manganese and TOC in MWC, and TOC in MWE. There were no other exceedances of the Threshold Criteria in wells external to the landfill.

Some exceedances have been explained by local conditions or regarded as minor due to the criteria being Australian Drinking Water Guidelines. Historical results of these analytes over time may indicate a seasonal fluctuation of regional groundwater conditions. Exceeding concentrations of iron, ammonia and TOC were reported in MWD. With the exception of TOC no exceedances of these analytes were reported in any wells surrounding the landfill indicating it is unlikely that releases of landfill leachate into the local groundwater is occurring. Exceedances of TOC in wells surrounding the landfill are expected to be attributed to background concentrations.

In conclusions, the elevated concentrations of nitrate, manganese and TOC in the monitoring wells surrounding the landfill do not necessarily indicate the concentrations are due to the landfill leachate, future testing and trending of data will allow for appropriate comparisons. 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 the quarterly monitoring event undertaken in October 2018.



## 7.0 REFERENCES

ANZECC/ARMCANZ (2000). *Australian Water Quality Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, October 2000.

NEPC (1999). *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)*. National Environment Protection Council.

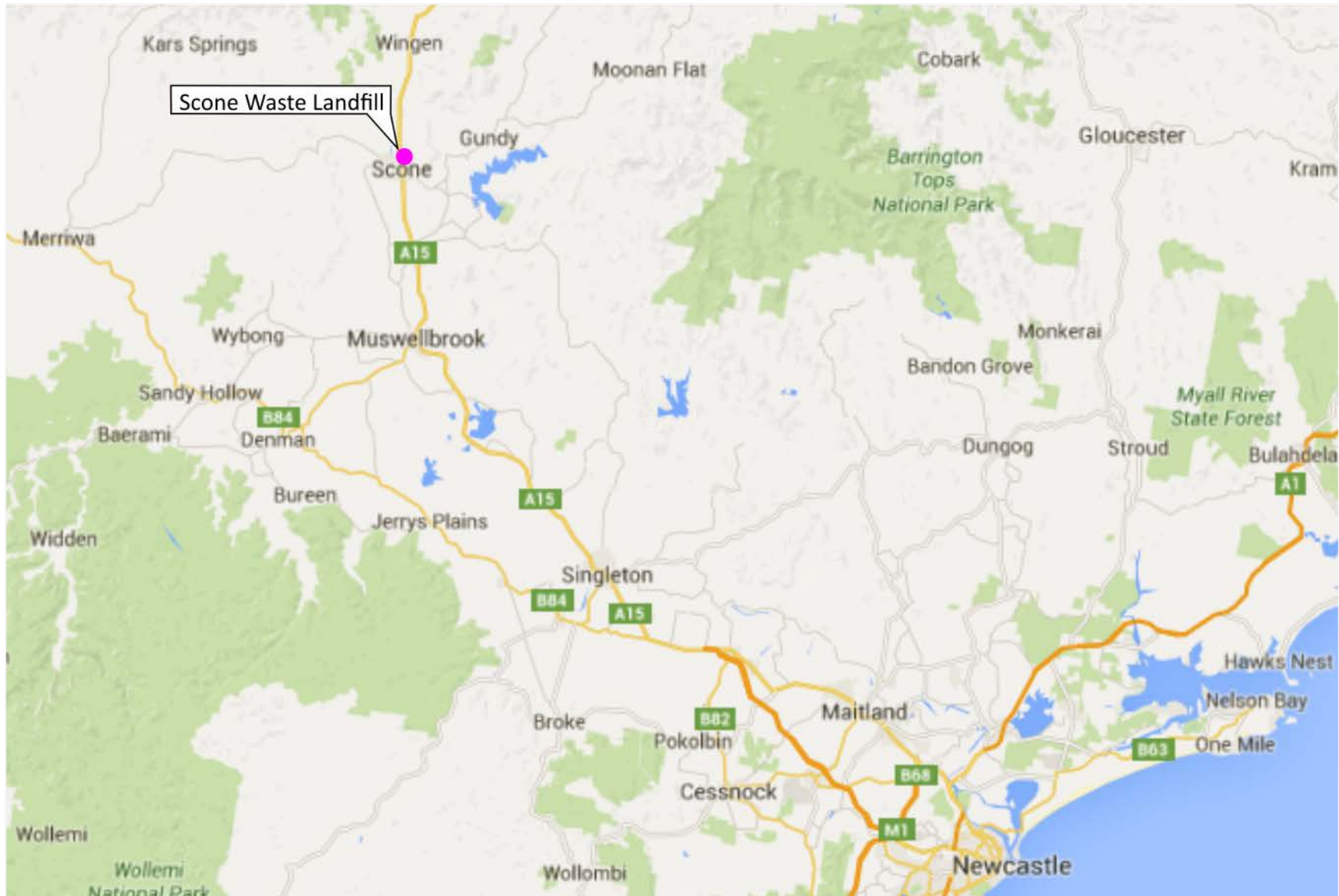
NHMRC / NRMCC (2011). *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*. National Health and Medical Research Council, National Resource Management Ministerial Council.

NSW DEC (2007). *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination*. New South Wales Department of Environment and Conservation.

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**FIGURE 1 – SITE LOCATION REGIONAL**

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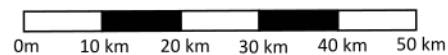


**Legend**

● Site location - Noblet Rd, Scone



**Approximate Scale**



Sydney Office  
Phone (02) 9476 1765  
Fax (02) 9476 1557

Maitland Office  
Phone (02) 4933 0001

Title  
**Site location regional**

Client <b>Upper Hunter Shire Council</b>	Project No. <b>DLH1186</b>	Figure No <b>1</b>	Date <b>15/5/2018</b>
Scale <b>As Shown</b>	Compiled <b>KS</b>	Revision <b>R02</b>	

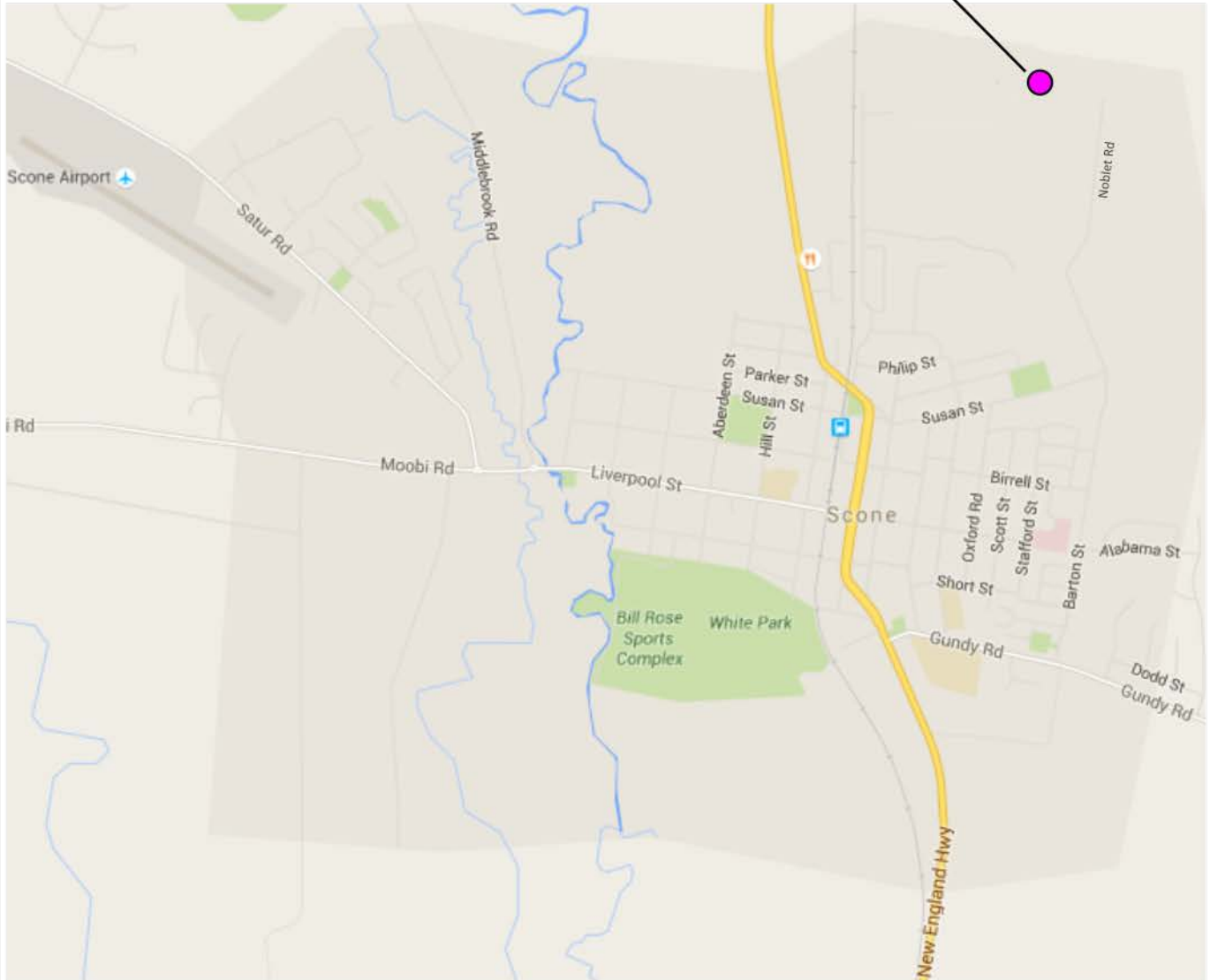
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**FIGURE 2 – SITE LOCATION LOCAL**

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Scone Waste Landfill



**Legend**

● Site Location - Noblet Rd, Scone

Approximate Scale



Sydney Office Phone (02) 9476 1765  
Maitland Office Phone (02) 4933 0001  
Fax (02) 9476 1557

**Title**  
Site location local

Client		Figure No	Date
Upper Hunter Shire Council		2	15/5/2018
Project No.	Scale	Compiled	Revision
DLH1186	As Shown	KS	R02

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**FIGURE 3** – SITE LAYOUT WITH SAMPLE LOCATIONS

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**Legend**

● Groundwater well location



Approximate Scale  
 0m 50m 100m



Sydney Office  
 Phone (02) 9476 1765  
 Fax (02) 9476 1557

Maitland Office  
 Phone (02) 4933 0001

Title Site layout with sample locations			
Client Upper Hunter Shire Council	Project No. DLH1186	Figure No 3	Date 15/5/2018
	Scale As Shown	Compiled KS	Revision R02

---

**ATTACHMENT 1 – NATA CERTIFIED ANALYTICAL RESULTS**

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CLIENT DETAILS

Contact Stephen Challinor  
 Client ERM SERVICES AUSTRALIA PTY LTD  
 Address Level 4, 45 Watt St  
 Newcastle  
 NSW 2300

Telephone 0409 223 465  
 Facsimile 61 2 98700999  
 Email stephen.challinor@erm.com

Project **DLH1186-0450054**  
 Order Number (Not specified)  
 Samples 5

LABORATORY DETAILS

Manager Huong Crawford  
 Laboratory SGS Alexandria Environmental  
 Address Unit 16, 33 Maddox St  
 Alexandria NSW 2015

Telephone +61 2 8594 0400  
 Facsimile +61 2 8594 0499  
 Email au.environmental.sydney@sgs.com

SGS Reference **SE181445 R0**  
 Date Received 13/7/2018  
 Date Reported 20/7/2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

Ion Chromatography - The Limit of Reporting (LOR) has been raised for NO3-N due to high conductivity of the sample requiring dilution.

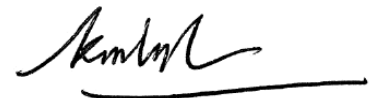
SIGNATORIES



**Dong Liang**  
 Metals/Inorganics Team Leader



**Kamrul Ahsan**  
 Senior Chemist



**Ly Kim Ha**  
 Organic Section Head

OC Pesticides in Water [AN420] Tested: 16/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER	WATER	WATER	WATER	WATER
			12/7/2018 SE181445.001	12/7/2018 SE181445.002	12/7/2018 SE181445.003	12/7/2018 SE181445.004	12/7/2018 SE181445.005
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Total Phenolics in Water [AN289] Tested: 18/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Total Phenols	mg/L	0.01	<0.01	<0.01	<0.01	<b>0.05</b>	<0.01

Forms of Carbon [AN190] Tested: 18/7/2018

PARAMETER	UOM	LOR	MWA WATER - 12/7/2018 SE181445.001	MWB WATER - 12/7/2018 SE181445.002	MWC WATER - 12/7/2018 SE181445.003	MWD WATER - 12/7/2018 SE181445.004	MWE WATER - 12/7/2018 SE181445.005
Total Organic Carbon as NPOC	mg/L	0.2	<b>2.3</b>	<b>3.5</b>	<b>6.5</b>	<b>320</b>	<b>6.0</b>

Ammonia Nitrogen by Discrete Analyser (Aquakem) [AN291] Tested: 17/7/2018

PARAMETER	UOM	LOR	MWA WATER - 12/7/2018 SE181445.001	MWB WATER - 12/7/2018 SE181445.002	MWC WATER - 12/7/2018 SE181445.003	MWD WATER - 12/7/2018 SE181445.004	MWE WATER - 12/7/2018 SE181445.005
Ammonia Nitrogen, NH <sub>3</sub> as N	mg/L	0.01	<b>0.16</b>	<b>0.08</b>	<b>0.09</b>	<b>330</b>	<b>0.09</b>

Anions by Ion Chromatography in Water [AN245] Tested: 16/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Chloride	mg/L	1	<b>7300</b>	<b>5600</b>	<b>4200</b>	<b>3300</b>	<b>270</b>
Sulfate, SO4	mg/L	1	<b>42</b>	<b>74</b>	<b>140</b>	<b>81</b>	<b>92</b>
Fluoride	mg/L	0.1	<b>0.14</b>	<b>0.26</b>	<b>0.23</b>	<b>0.28</b>	<b>0.51</b>
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.050 †	<0.050 †	<b>0.95</b>	<0.050 †	<0.010 †

pH in water [AN101] Tested: 16/7/2018

PARAMETER	UOM	LOR	MWA WATER - 12/7/2018 SE181445.001	MWB WATER - 12/7/2018 SE181445.002	MWC WATER - 12/7/2018 SE181445.003	MWD WATER - 12/7/2018 SE181445.004	MWE WATER - 12/7/2018 SE181445.005
pH**	No unit	-	<b>6.7</b>	<b>6.9</b>	<b>6.7</b>	<b>7.6</b>	<b>7.4</b>

Conductivity and TDS by Calculation - Water [AN106] Tested: 16/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Conductivity @ 25 C	µS/cm	2	<b>19000</b>	<b>15000</b>	<b>12000</b>	<b>13000</b>	<b>2900</b>
Total Dissolved Solids (by calculation)	mg/L	2	<b>12000</b>	<b>9200</b>	<b>7400</b>	<b>8000</b>	<b>1700</b>



Alkalinity [AN135] Tested: 16/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Bicarbonate Alkalinity as CaCO3	mg/L	5	<b>480</b>	<b>400</b>	<b>590</b>	<b>2500</b>	<b>1200</b>
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5	<5
Phenolphthalein Alkalinity as CaCO3*	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L	5	<b>480</b>	<b>400</b>	<b>590</b>	<b>2500</b>	<b>1200</b>

Acidity and Free CO2 [AN140] Tested: 18/7/2018

PARAMETER	UOM	LOR	MWA WATER - 12/7/2018 SE181445.001	MWB WATER - 12/7/2018 SE181445.002	MWC WATER - 12/7/2018 SE181445.003	MWD WATER - 12/7/2018 SE181445.004	MWE WATER - 12/7/2018 SE181445.005
Acidity to pH 8.3	mg CaCO3/L	5	<b>200</b>	<b>130</b>	<b>190</b>	<b>290</b>	<b>87</b>

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 17/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Calcium, Ca	mg/L	0.1	<b>590</b>	<b>590</b>	<b>350</b>	<b>96</b>	<b>56</b>
Magnesium, Mg	mg/L	0.1	<b>1100</b>	<b>720</b>	<b>490</b>	<b>220</b>	<b>53</b>
Sodium, Na	mg/L	0.1	<b>1900</b>	<b>1500</b>	<b>1400</b>	<b>1700</b>	<b>530</b>
Potassium, K	mg/L	0.2	<b>4.4</b>	<b>3.6</b>	<b>2.6</b>	<b>210</b>	<b>1.3</b>

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 18/7/2018

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 12/7/2018 SE181445.001	WATER - 12/7/2018 SE181445.002	WATER - 12/7/2018 SE181445.003	WATER - 12/7/2018 SE181445.004	WATER - 12/7/2018 SE181445.005
Iron, Fe	µg/L	5	<b>170</b>	<b>21</b>	<b>19</b>	<b>2000</b>	<b>15</b>
Manganese, Mn	µg/L	1	<b>10</b>	<b>7</b>	<b>9100</b>	<b>180</b>	<b>160</b>

METHOD

METHODOLOGY SUMMARY

- AN020** Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
- AN101** pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
- AN106** Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
- AN106** Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
- AN135** Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
- AN140** Acidity by Titration: The water sample is titrated with sodium hydroxide to designated pH end point. In a sample containing only carbon dioxide, bicarbonates and carbonates, titration to pH 8.3 at 25°C corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. Method reference APHA 2310 B.
- AN190** TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO<sub>2</sub> is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
- AN190** Chemical oxygen demand can be calculated/estimated based on the O<sub>2</sub>/C relation as 2.67\*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.
- AN245** Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO<sub>2</sub>, NO<sub>3</sub> and SO<sub>4</sub> are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
- AN289** Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
- AN291** Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 670 nm by Discrete Analyser.
- AN318** Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
- AN320** Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
- AN320** Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements . Reference APHA 3120 B.
- AN420** SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- Calculation** Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported . APHA4500CO<sub>2</sub> D.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.  
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

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**SGS Environmental Services**  
**Unit 16, 33 Maddox Street**  
**Alexandria NSW 2015**  
**Telephone No: (02) 85940400**  
**Facsimile No: (02) 85940499**

**Email:** au.samplereceipt.sydney@sgs.com

### CHAIN OF CUSTODY & ANALYSIS REQUEST

Company Name: <u>ERM Services</u>	Project Name/No: <u>DLH1186/0450054</u>
Address: <u>Level4, 45 Watt Street, Newcastle NSW 2300</u>	Purchase Order No: _____
Contact Name: <u>Stephen Challinor</u>	Results Required By: _____
	Telephone: <u>49035500 or 0419144141 or 0409223456</u>
	Facsimile: _____
	Email Results: <u>hunter@ERM.DLAHunterOfficeMailbox@erm.com &amp; Kathrine.skeen@erm.com &amp; Stephen.challinor@erm.com</u>

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	WQ3	fluoride	Chloride	Iron	manganese	organochlorine pesticides	ammonia	nitrate	TOC	total phenolics						Comments	
MWA	12/7/18	1	X				X	X	X	X	X	X	X	X	X	X							
MWB	12/7/18	2	X				X	X	X	X	X	X	X	X	X	X							
MWC	12/7/18	3	X				X	X	X	X	X	X	X	X	X	X							
MWD	12/7/18	4	X				X	X	X	X	X	X	X	X	X	X							Leachate
MWE	12/7/18	5	X				X	X	X	X	X	X	X	X	X	X							

**SGS EHS Alexandria Laboratory**

**SE181445 COC**  
 Received: 13-Jul-2018

Relinquished By: <u>Kath Skeen</u>	<u>12/7/18</u>	Received By: <u>Nessa</u>	Date/Time: <u>13/7/18 10:35</u>
Relinquished By: _____	Date/Time: _____	Received By: _____	Date/Time: _____
Samples Intact: <u>Yes/No</u>	Temperature: <u>Ambient / Chilled</u>	Sample Cooler Sealed: <u>Yes/No</u>	Laboratory Quotation No: _____
Comments: <u>metals not field filtered</u>			

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**ATTACHMENT 2 – YSI WATER QUALITY METER CALIBRATION CERTIFICATE**

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## Calibration Report


**Instrument Details:**

Instrument Model:	SMARTROLL™ MP
Full Scale Pressure Range:	0 - 250 ft (0 - 76 m)
Serial Number:	588881
Manufacture Date:	2018-05-17

**Calibration Details:**

Calibration Result:	PASS
Calibration Date:	2018-05-03
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/-0.1 C from 0 C to +50 C
Nominal Range of Applied Pressure:	0 - 250 feet
Pressure Accuracy Specification:	+/-0.3% FS
Conductivity Calibration:	Pass with a cell constant of 1.00.
Rugged Dissolved Oxygen Calibration:	Pass with an optical phase difference of +/- 2 degrees.
pH/ORP Check:	Pass with mV readings of +/- 5 mV.

**Post-Calibration Check:**

Parameter	Applied (PSI)	Reported (PSI)	Deviation (PSI)
Pressure	7	7.002	-0.002
Pressure	65	65.025	-0.025
Pressure	123	123.029	-0.029
Pressure	84.334	84.369	-0.035
Pressure	45.667	45.695	-0.028
Pressure	7	7.025	-0.025

**Calibration Procedures and Equipment Used:**

Automated calibration procedures used.  
 Calibrated in 900, 9000, & 90000  $\mu\text{S}/\text{cm}$  conductivity standards.  
 Manu MENSOR Model 8100 Serial No 570135  
 Manu HART Model 1504 Serial No B42917  
 Manu Fluke Model 5665 Serial No B431401

**Notes:**

- Standards used in the calibration are traceable to the National Institute of Standards and Technology.
- This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
- A calibration interval of 12 to 18 months is recommended.
- The post-calibration data is collected at nominal +15C.
- 1.0 PSI = 6.894757 kPa.

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**ATTACHMENT 3 – DATA LOG**

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**ATTACHMENT 4 – GROUNDWATER FIELD DATA SHEETS**

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## GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH4120 (DLR0450060) DLH1186	Sample ID: <u>MWA</u>
Project: <u>Downer Light Rail</u> <u>Score</u>	Well Collar RL:
Client: <u>Downer</u> <u>URS</u>	Sampler(s): <u>K-5</u>
Address: <u>Noblet Rd, Score NSW</u>	Signature: <u>[Signature]</u>
BH ID:	Date: <u>12-7-18</u>

### Well Status

Monument damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / N/A	Well ID visible:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / N/A
Locked well casing:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A	Cap on PVC casing:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / N/A
Cement footing damaged:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A	Water in monument casing:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A
Standing water, vegetation around monument:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A	Internal obstruction in casing:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A
Well Damaged:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A	Odours from groundwater:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / N/A
Nearby works:	<u>Monument cap falls off - some rusting</u>		
Comments:			
Casing above ground: <u>0.75</u> m agl	Weather Conditions:		
Standing water level: <u>7.01 (toc)</u> ( <u>6.26</u> ) m bgl	Temperature	15-20 <input type="checkbox"/>	20-25 <input checked="" type="checkbox"/>
Total well depth: <u>15.60 (toc)</u> ( <u>14.65</u> ) m bgl		25-30 <input 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 type="checkbox"/>	Slight breeze <input checked="" type="checkbox"/>	Moderate breeze <input type="checkbox"/>
Volume of water purged: <u>4.5</u> 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 / <input checked="" type="radio"/> NO			
Purging equipment: <u>bar</u>			
Sample equipment:			

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

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (SPC) (μS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (ppt)	Comments
9-52	3.74	20724.1	6.76	159.9	18.78	12.5	
53	3.16	20647	6.76	159.8	18.92	12.4	
54	3.59	20557.5	6.76	159.1	19.04	12.4	

### Additional Comments:

Clear, slight white sed.  
well purged

## GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH4120 (DLH0450060) <i>Ex 44536</i>	Sample ID: <i>MWB</i>
Project: <i>Downer Light Rail</i> <i>Stone Landfill</i>	Well Collar RL:
Client: <i>Downer</i> <i>UHS</i>	Sampler(s): <i>R-5</i>
Address: <i>Abdel Rd, Stone</i>	Signature: <i>[Signature]</i>
BH ID:	Date: <i>2.7.18</i>

### Well Status

Monument damaged: <input checked="" type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N/A	Well ID visible: <input checked="" type="radio"/> YES <input 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 type="radio"/> YES <input checked="" type="radio"/> NO <input type="radio"/> N/A	Water in monument casing: <input type="radio"/> YES <input checked="" 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 type="radio"/> YES <input checked="" type="radio"/> NO <input type="radio"/> N/A	Odours from groundwater: <input type="radio"/> YES <input checked="" type="radio"/> NO <input type="radio"/> N/A
Nearby works: <i>Monument cap falls off - slight rushing</i>	
Comments: <i>Monument cap falls off - slight rushing</i>	
Casing above ground: <i>0.75</i> m agl	Weather Conditions:
Standing water level: <i>6.94 to 6.19</i> m bgl	Temperature 15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth: <i>16.07 to 15.32</i> m bgl	25-30 <input 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: <i>4.5</i> 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 <input type="radio"/> NO <input checked="" type="radio"/>	
Purging equipment: <i>Brile</i>	
Sample equipment:	

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

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (SPC) (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (ppt)	Comments
10.14	3.07	16021	6.87	106.5	19.63	9.5	
10.15	3.06	16057	6.87	107.5	19.63	9.5	
10.16	3.03	16018.1	6.87	106.5	19.67	9.5	

### Additional Comments:

Clear, slight white sed.

## GROUNDWATER FIELD DATA SHEET

DLA Project Code: <del>DLH4120 (DLH0450060)</del> 1186	Sample ID: MWC
Project: <del>Downer Light Rail</del> Stone	Well Collar RL:
Client: <del>Downer</del> UHSC	Sampler(s): K.S
Address: Noble Rd Stone	Signature: <i>[Signature]</i>
BH ID:	Date: 12-7-18

### Well Status

Monument damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Well ID visible:	<input checked="" type="radio"/> YES / <input 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 type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Water in monument casing:	<input type="radio"/> YES / <input checked="" 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 type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Odours from groundwater:	<input type="radio"/> YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Nearby works:	.....		
Comments:	Monument cap falls off - slight rusting		
Casing above ground:	0-70 m agl	Weather Conditions:	
Standing water level:	5.05 (tol) (4.35 m bgl)	Temperature	15-20 <input checked="" type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth:	12.73 (tol) (12.03 m bgl)		25-30 <input 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:	2.5 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:	<input checked="" type="radio"/> YES / <input type="radio"/> NO		
Purging equipment:	<i>perri pump</i>		
Sample equipment:			

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

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (SPC) (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (ppt)	Comments
9:00	5.60	11957.0	7.34	108.7	17.03		
9:30	5.53	11929.2	6.78	107.8	17.37	6.9	
9:31	5.04	11929.2	6.78	108.0	17.40	6.9	

### Additional Comments:

*slight brown color*

## GROUNDWATER FIELD DATA SHEET

DLA Project Code: <u>DLH4120 (DLH0450060) DLH186</u>	Sample ID: <u>MWD</u>
Project: <u>Downer Light Rail</u> <u>Scene landfill</u>	Well Collar RL:
Client: <u>Downer</u> <u>MSE</u>	Sampler(s): <u>K.S</u>
Address: <u>Noble Rd, Scene</u>	Signature: <u>[Signature]</u>
BH ID:	Date: <u>12-7-18</u>

### Well Status

Monument damaged: YES / NO / <u>N/A</u>	Well ID visible: YES / NO / <u>N/A</u>
Locked well casing: YES / NO / <u>N/A</u>	Cap on PVC casing: YES / NO / <u>N/A</u>
Cement footing damaged: YES / NO / <u>N/A</u>	Water in monument casing: YES / NO / <u>N/A</u>
Standing water, vegetation around monument: YES / <u>NO</u> / <u>N/A</u>	Internal obstruction in casing: YES / NO / <u>N/A</u>
Well Damaged: YES / <u>NO</u> / <u>N/A</u>	Odours from groundwater: <u>YES</u> / NO / <u>N/A</u>
Nearby works: .....	
Comments: .....	
Casing above ground: ..... m agl	Weather Conditions:
Standing water level: <u>0.73</u> m bgl	Temperature 15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth: <u>10.10</u> m bgl	25-30 <input 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 type="checkbox"/> Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged: <u>0.5</u> 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: <u>Bailer</u>	
Sample equipment:	

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

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (SPC) (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (ppt)	Comments
10.57	0.78	13406.6	7.60	-201.9	26.66	7.8	
10.58	0.83	13398.6	7.60	-199.6	26.62	7.8	
10.59	0.79	13392.0	7.60	-202.3	26.63	7.8	

### Additional Comments:

green - yellow with black sediments  
strong methane, weak odour



## GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH4120 (DLH0450060) - <u>D11186</u>	Sample ID: <u>MWE</u>
Project: <u>Downer Light Rail Stone Landfill</u>	Well Collar RL:
Client: <u>Downer</u>	Sampler(s): <u>K-S</u>
Address: <u>Nabbed Rd Stone</u>	Signature: <u>[Signature]</u>
BH ID:	Date: <u>12.7.18</u>

### 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:	.....		
Comments:	<u>Slight rusting on monument</u>		
Casing above ground: <u>0.70</u>	m agl	Weather Conditions:	
Standing water level: <u>4.30 (top)</u>	(3.6 m bgl)	Temperature	15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth: <u>9.50 (top)</u>	(8.8 m bgl)		25-30 <input 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: <u>2</u>	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 / <input checked="" type="radio"/> NO		
Purging equipment: <u>Bailer</u>			
Sample equipment:			

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

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (SPC) (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (ppt)	Comments
10-40	2.24	3036.4	7.41	-20.4	19.51	1.6	
10-41	2.22	3033.0	7.41	-20.2	19.54	1.6	
10-42	2.20	3031.4	7.41	-19.9	19.59	1.6	

### Additional Comments:

fine roots, slight earthy colour, slight <sup>white-</sup> brown color  
some white sed, cloudy.