DLA Environmental Services
A Pacific Environment company

QUARTERLY GROUNDWATER MONITORING

THE SCONE WASTE LANDFILL

Noblet Road
Scone
NSW 2337

Upper Hunter Shire Council

DLH1186_H000894

October 2016

PROJECT NAME	Scone Waste Landfill Groundwater Monitoring
PROJECT ID	DLH1186
DOCUMENT CONTROL NUMBER	H000894
PREPARED FOR	Upper Hunter Shire Council
APPROVED FOR RELEASE BY	Stephen Challinor
DISCLAIMER AND COPYRIGHT	This report is subject to the copyright statement located at www.pacific-environment.com © Pacific Environment Operations Pty Ltd ABN 86 127 101 642

DOCUMENT CONTROL

VERSION	DATE	COMMENT	PREPARED BY	REVIEWED BY
H00894	09.11.2016	Final Copy	Jon Mansfield	Stephen Challinor

DLA Environmental Services Pty Ltd: ABN 80 601 661 634

BRISBANE
Level 1, 59 Melbourne Street, South Brisbane, Qld 4101
PO Box 3306, South Brisbane, Qld 4101
Ph: +61 7 3004 6400
Ph: +61 7 3004 6400

Unit 1, 22 Varley Street
Yeerongpilly, Qld 4105
Ph: +61 7 3004 6460

ADELAIDE
35 Edward Street, Norwood SA 5067
PO Box 3187, Norwood, SA 5067
Ph: +61 8 8332 0960
Fax: +61 7 3844 5858

PERTH
Level 1, Suite 3
34 Queen Street, Perth, WA 6000
Ph: +61 8 9481 4961
Fax: +61 2 9870 0999

SYDNEY
Suite 1, Level 1, 146 Arthur Street
North Sydney, NSW 2060
Ph: +61 2 9870 0900
Fax: +61 2 9870 0999

DLA ENVIRONMENTAL SERVICES
Unit 3, 38 Leighton Place
Hornsby, NSW 2077
Ph: +61 2 9476 1765
Fax: +61 2 9476 1557

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

HUNTER
42b Church Street, Maitland NSW 2320
Ph: +61 2 49330001
Email: hunter@dlaenvironmental.com.au

DISCLAIMER

DLA Environmental Services (DLA) acts in all professional matters as a faithful advisor to the Client and exercises all reasonable skill and care in the provision of its professional services. Reports are commissioned by and prepared for the exclusive use of the Client. They are subject to and issued in accordance with the agreement between the Client and DLA. DLA is not responsible for any liability and accepts no responsibility whatsoever arising from the misapplication or misinterpretation by third parties of the contents of its reports.

Except where expressly stated, DLA does not attempt to verify the accuracy, validity or comprehensiveness of any information supplied to DLA for its reports. Reports cannot be copied or reproduced in whole or part for any purpose without the prior written agreement of DLA.

Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to DLA is both complete and accurate. It is further assumed that normal activities were being undertaken at the site on the day of the site visit(s), unless explicitly stated otherwise.

ABBREVIATIONS

ACM	Asbestos Containing Material
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Above-ground Storage Tank
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)Pyrene
BGL	Below Ground Level
BH	Borehole
BTEX	Benzene, Toluene, Ethyl Benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DA	Development Application
DEC	Department of Environment and Conservation (NSW)
DECC	Department of Environment and Climate Change (NSW)
DECCW	Department of Environment, Climate Change and Water (NSW)
DLA	DLA Environmental Services
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EMP	Environmental Management Plan
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
HIL	Health-Based Investigation Level
LOR	Limit of Reporting
MW	Monitoring Well
NATA	National Association of Testing Authorities, Australia
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
OCP	Organochlorine Pesticides
OEH	Office of Environmental and Heritage
OPP	Organophosphorus Pesticides
OH&S	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photo-Ionisation Detector
PQL	Practical Quantification Limit
QA/QC	Quality Assurance and Quality Control
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
SAC	Site Acceptance Criteria
SAQP	Sampling Analysis and Quality Plan
SEPP	State Environmental Planning Policy
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WHS	Work Health Safety

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1.0 INTRODUCTION

1.1 General

DLA Environmental Services (DLA) was commissioned by Upper Hunter Shire Council to undertake annual and quarterly surface and groundwater monitoring at The Scone Waste Landfill located on Noblet Rd, Scone. It is anticipated that quarterly monitoring will be undertaken in April, July and October with annual reporting undertaken in the January reporting period.

Quarterly water monitoring was undertaken on 6th October 2016 by staff of DLA.

1.2 Scope of Works

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

- MWA
- MWB
- MWC
- MWD (landfill leachate monitoring well)
- 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 95% trigger values and National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013.

Table 1: Analytes, Threshold Criteria and Monitoring Frequency for Groundwater Monitoring Wells.

Analytes	Units	Threshold Criteria NEPM 2013 and ANZECC 2000 Fresh Water 95%	Monitoring Frequency
Calcium	mg/L	NA	Quarterly
Alkalinity (total)	mg/L	NA	Quarterly
Chloride	mg/L	NA	Quarterly
Fluoride	mg/L	NA	Quarterly
Iron	mg/L	0.3[E]	Quarterly
Magnesium	mg/L	NA	Quarterly
Manganese	mg/L	1.9[D]	Quarterly
Organochlorine pesticides	mg/L	0.00001[F]	Quarterly
Potassium	mg/L	410[Q]	Quarterly
pH	pH	6.5 – 8	Quarterly
Sodium	mg/L	NA	Quarterly
Ammonia	mg/L	0.9[D]	Quarterly
Nitrate	mg/L	0.7	Quarterly
Sulfate	mg/L	NA	Quarterly
Total organic carbon	mg/L	4	Quarterly
Total phenolics	mg/L	0.32	Quarterly
Electrical conductivity (EC)	µS/cm	NA	Quarterly
Total dissolved solids	mg/L	NA	Yearly
Biochemical Oxygen Demand	mg/L	NA	Yearly
Phosphate	mg/L	0.015[G]	Yearly
Arsenic III & V	mg/L	0.024 (III), 0.013 (V)	Yearly
Aluminium	mg/L	0.055 (pH> 6.5)	Yearly
Barium	mg/L	NA	Yearly
Cadmium	mg/L	0.0002	Yearly
Cobalt	mg/L	0.09[M]	Yearly
Copper	mg/L	0.0014	Yearly
Chromium VI	mg/L	0.001[D]	Yearly

Table 1: Analytes, Threshold Criteria and Monitoring Frequency for Groundwater Monitoring Wells (cont…)

Sampling Parameter	Units	Threshold Criteria NEPM 2013 and ANZECC 2000 Fresh Water	Monitoring Frequency
Chromium (total)	mg/L	0.001	Yearly
Lead	mg/L	0.0034	Yearly
Mercury	mg/L	0.0006	Yearly
Zinc	mg/L	0.008[D]	Yearly
TPH	mg/L	0.6[I]	Yearly
Benzene	mg/L	0.95	Yearly
Toluene	mg/L	0.18[L]	Yearly
Ethylbenzene	mg/L	0.08[L]	Yearly
CVCs/VOCCs:			
- **Total**	mg/L	NA	Yearly
- **Tetrachlorethene (TCE)**	mg/L	NA	Yearly
- **1,1,1-Trichloroethane (TCA)**	mg/L	6500 (1,1,2 TCA)	Yearly
- **Tetrachloroethene (PCE)**	mg/L	0.05[N]	Yearly
- **1,2-Dichloroethene**	mg/L	0.03[P]	Yearly
Vinyl Chloride	mg/L	0.0003[N]	Yearly
PCBs	mg/L	0.00003[A]	Yearly
PAHs	mg/L	0.016[B]	Yearly
OPPs	mg/L	0.00002[C]	Yearly

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

3.0 SAMPLING METHODOLOGY

3.1 Groundwater Sampling

Groundwater samples were collected from five well locations. Purging and sampling of monitoring wells was conducted in accordance with the NEPM 2013 Guidelines for the Assessment and Management of Groundwater Contamination (NSW DEC, 2007) and the Murray-Darling Basin Groundwater Quality Sampling Guidelines.

Wells were purged with a low flow peristaltic pump or disposable bailer whilst being measured for physiochemical stability to indicate the flow of formation water. Physiochemical properties were measured using a YSI Quatro Pro Plus Water Quality Meter and a flow through cell. Stable conditions were indicated by monitoring the measured parameters for three consecutive readings.

Groundwater samples were collected into laboratory prepared sample containers for specific analytes, i.e. into a combination of plastic unpreserved, plastic preserved, glass amber unpreserved and preserved glass vials. All samples were collected and filled into the respective sample containers so no head space remained in the sample container, with no loss of any preservation agents, where present. Groundwater samples for metals were field filtered with a 0.45 micron filter prior to placement into acid preserved plastic containers. All samples were then placed immediately into a chilled esky to prevent the loss of potential volatile components.

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

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

- Washing and brush scrub with phosphate free laboratory grade detergent;
- Rinsing with water of a potable quality;
- Rinsing with deionised water; and,
- Disposable Teflon tubing was used with the low flow pump and was replaced between sample locations (Groundwater Sampling Only).

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

4.0 RESULTS

All wells were sampled during the October 2016 sampling event, results are detailed below.

Refer to **Table 4a – Table 4e** for results. Refer to **Figure 3** for sampling locations.

Table 4a – Groundwater Results Comparison October 2016

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA Jan 2016	MWA Apr 2016	MWA July 2016	MWA Oct 2016
Calcium	mg/L	NA	630	700	620	580
Alkalinity (total)	mg/L	NA	430	460	460	430
Chloride	mg/L	NA	7800	7300	7900	7400
Fluoride	mg/L	NA	ND	0.1	0.12	0.15
Iron	mg/L	0.3[E]	ND	ND	0.021	ND
Magnesium	mg/L	NA	1100	1300	1200	1100
Manganese	mg/L	1.9[D]	0.01	0.009	0.021	0.02
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	4	3.1	3.7	4.4
pH	pH	6.5 – 8	7	7	7.1	6.8
Sodium	mg/L	NA	2200	2800	2200	2100
Ammonia	mg/L	0.9[D]	0.2	0.006	0.14	0.14
Nitrate	mg/L	0.7	0.24	0.62	0.36	0.50
Sulfate	mg/L	NA	34	43	35	37
Total Organic Carbon (TOC)	mg/L	4	**4.2**	3	**6.1**	**6.2**
Total phenolics	mg/L	0.32	0.25	ND	0.03	0.22
EC	µS/cm	NA	23000	18000	21000	21000

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
Q – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009
NA – Not Applicable

Table 4b – Groundwater Results Comparison October 2016

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB Jan 2016	MWB Apr 2016	MWB July 2016	MWB Oct 2016
Calcium	mg/L	NA	650	720	650	600
Alkalinity (total)	mg/L	NA	370	380	390	360
Chloride	mg/L	NA	6000	6300	6100	6000
Fluoride	mg/L	NA	ND	0.3	0.24	0.22
Iron	mg/L	0.3[E]	ND	0.02	0.008	0.006
Magnesium	mg/L	NA	810	880	820	830
Manganese	mg/L	1.9[D]	0.012	0.007	0.008	0.008
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	3.5	2.6	3.1	3.6
pH	pH	6.5 – 8	7	7.1	7.1	6.9
Sodium	mg/L	NA	1700	2300	1700	1800
Ammonia	mg/L	0.9[D]	0.15	ND	0.10	0.09
Nitrate	mg/L	0.7	**1.3**	**1.3**	**0.95**	**1.1**
Sulfate	mg/L	NA	69	61	69	69
Total Organic Carbon (TOC)	mg/L	4	**7**	4	**7.6**	**6.6**
Total phenolics	mg/L	0.32	0.31	ND	ND	0.14
EC	µS/c	NA	18000	15000	16000	17000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

Table 4c – Groundwater Results Comparison October 2016

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWC Jan 2016	MWC Apr 2016	MWC July 2016	MWC Oct 2016
Calcium	mg/L	NA	56	290	55	67
Alkalinity (total)	mg/L	NA	750	660	730	630
Chloride	mg/L	NA	630	3700	610	770
Fluoride	mg/L	NA	0.34	0.3	0.24	0.34
Iron	mg/L	0.3[E]	ND	0.038	0.006	ND
Magnesium	mg/L	NA	110	420	93	120
Manganese	mg/L	1.9[D]	**4.9**	**3.1**	**5.4**	**5.6**
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	0.9	1.4	1.0	1.1
pH	pH	6.5 – 8	7.2	7.2	7.4	7.1
Sodium	mg/L	NA	590	1900	580	620
Ammonia	mg/L	0.9[D]	0.12	ND	0.05	0.04
Nitrate	mg/L	0.7	ND	**4.9**	0.15	ND
Sulfate	mg/L	NA	300	220	220	180
Total Organic Carbon (TOC)	mg/L	4	**21**	**9**	**24**	**24**
Total phenolics	mg/L	0.32	ND	ND	ND	ND
EC	µS/c	NA	4300	9600	3300	3900

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

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

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

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

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

NA – Not Applicable

Table 4d – Groundwater Results Comparison October 2016

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD (leachate) Jan 2016	MWD (leachate) Apr 2016	MWD (leachate) July 2016	MWD (leachate) Oct 2016
Calcium	mg/L	NA	170	160	250	210
Alkalinity (total)	mg/L	NA	1200	2200	1200	1600
Chloride	mg/L	NA	1000	2600	1000	1600
Fluoride	mg/L	NA	0.32	0.3	0.14	0.27
Iron	mg/L	0.3[E]	**0.33**	**2.2**	**0.52**	**1.2**
Magnesium	mg/L	NA	110	230	120	150
Manganese	mg/L	1.9[D]	0.87	0.45	0.960	0.6
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	110	180	120	140
pH	pH	6.5 – 8	7.3	7.7	7.3	7.3
Sodium	mg/L	NA	690	1900	630	1000
Ammonia	mg/L	0.9[D]	**110**	**210**	**80**	**150**
Nitrate	mg/L	0.7	ND	ND	ND	ND
Sulfate	mg/L	NA	18	35	140	110
Total Organic Carbon (TOC)	mg/L	4	**140**	**290**	**140**	**200**
Total phenolics	mg/L	0.32	**0.47**	ND	0.01	0.07
EC	µS/c	NA	5800	9600	5200	7800

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
Q – 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 October 2016

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWE Jan 2016	MWE Apr 2016	MWE July 2016	MWE Oct 2016
Calcium	mg/L	NA	80	67	57	61
Alkalinity (total)	mg/L	NA	750	890	970	900
Chloride	mg/L	NA	850	640	470	560
Fluoride	mg/L	NA	0.35	0.5	0.30	0.41
Iron	mg/L	0.3[E]	0.019	0.034	0.021	0.012
Magnesium	mg/L	NA	79	72	66	67
Manganese	mg/L	1.9[D]	0.23	0.24	0.43	0.110
OCP	mg/L	0.00001[F]	ND	ND	ND	ND
Potassium	mg/L	410[Q]	1.1	0.9	1.6	1.3
pH	pH	6.5 – 8	7.4	7.6	7.6	7.3
Sodium	mg/L	NA	690	840	610	650
Ammonia	mg/L	0.9[D]	0.12	0.026	0.04	0.04
Nitrate	mg/L	0.7	ND	0.01	ND	ND
Sulfate	mg/L	NA	200	160	110	120
Total Organic Carbon (TOC)	mg/L	4	**10**	**7**	**16**	**16**
Total phenolics	mg/L	0.32	0.02	ND	ND	0.01
EC	µS/c	NA	4600	3200	3100	3600

Samples highlighted in **Bold** exceed threshold criteria
ND = No Detection above Laboratory LOR
D – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
E - Interim working level, in absence of reliable trigger value
F - Trigger value for DDT used in absence of trigger value for total OCP
Q – 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 and as such the Threshold Criteria is not used as a comparison, only as an indicator of current conditions. MWD is to be used as a general indicator of water quality within the landfill for comparison to the external monitoring wells.

The following exceedances of the Threshold Criteria occurred in the October 2016 sampling event:

- MWC exceeded the Manganese Threshold Criteria (1.9 mg/L) with a concentration of 5.6 mg/L. This is an increase from the July 2016 concentration of 5.4 mg/L and is the highest reading to date. Well MWD, the leachate well, had a minor detect of manganese, providing no indication that the Manganese is sourced from the landfill. Well MWE up-hydraulic gradient of MWC and MWD also had a minor detection reported for Manganese. The Manganese may be migrating onto the site through the local ground water.

- Nitrate in MWB exceeded the Threshold Criteria (0.7 mg/L) with a concentration of 1.1 mg/L. This is an increase from the 0.95 mg/L reported in July 2016. Exceedances of nitrate have been consistent in MWB since October 2016. Well MWD the leachate well, had minor detection of Nitrate, giving no indication that the Nitrate in the affected wells is sourced from the landfill. The Nitrate may be migrating onto the site from the farmland to the north through the local ground water.

- Exceedances of the Threshold Criteria (4 mg/L) for TOC occurred in wells MWA, MWB, MWC and MWE. MWA exceeded the Threshold Criteria (4 mg/L) with a TOC reading of 6.2 mg/L, increasing slightly from the July 2016 reading of 6.1 mg/L. MWB decreased to 6.6 mg/L from the July 2016 sampling event of 7.6 mg/L. MWC has exceeded the Threshold criteria (4 mg/L) consistently since October 2015 with the past two readings being the highest recorded exceedance (24 mg/L). MWE has exceeded the Threshold criteria (4 mg/L) consistently since October 2015 with the past two readings being the highest recorded exceedance (16 mg/L). The Threshold Criteria used for TOC is intended for drinking water, not groundwater. Due to the magnitude of the exceedances and the intention of the Threshold Criteria used, these exceedances are regarded as minor. The TOC concentration in MWE indicates that TOC is likely to be elevated in the local groundwater.

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

- Ammonia concentration has increased to 150 mg/L from the July 2016 concentration of 80 mg/L and has consistently been substantially higher than in the surrounding wells;
- Iron concentration has decreased to a minor detect from the July 2016 concentration of 0.52 mg/L.
- TOC concentration has increased to 200 mg/L from the July 2016 sampling event (140 mg/L).

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

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 October 2016 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 October 2016 sampling event; Manganese in MWC, Nitrate in MWC, TOC in MWA, MWB, MWC and MWE. There were no other exceedances of the Threshold Criteria in the wells surrounding the landfill.

Some exceedances have been explained by local conditions or regarded as minor due to the criteria being Australian Drinking Water Guidelines. Trending of these analytes over time may indicate a seasonal fluctuation of regional groundwater conditions. All remaining exceedances are in MWD which is the leachate monitoring well. Exceeding concentrations in MWD are substantially higher than other wells, this indicates that it is unlikely that releases of landfill leachate into the local groundwater are occurring.

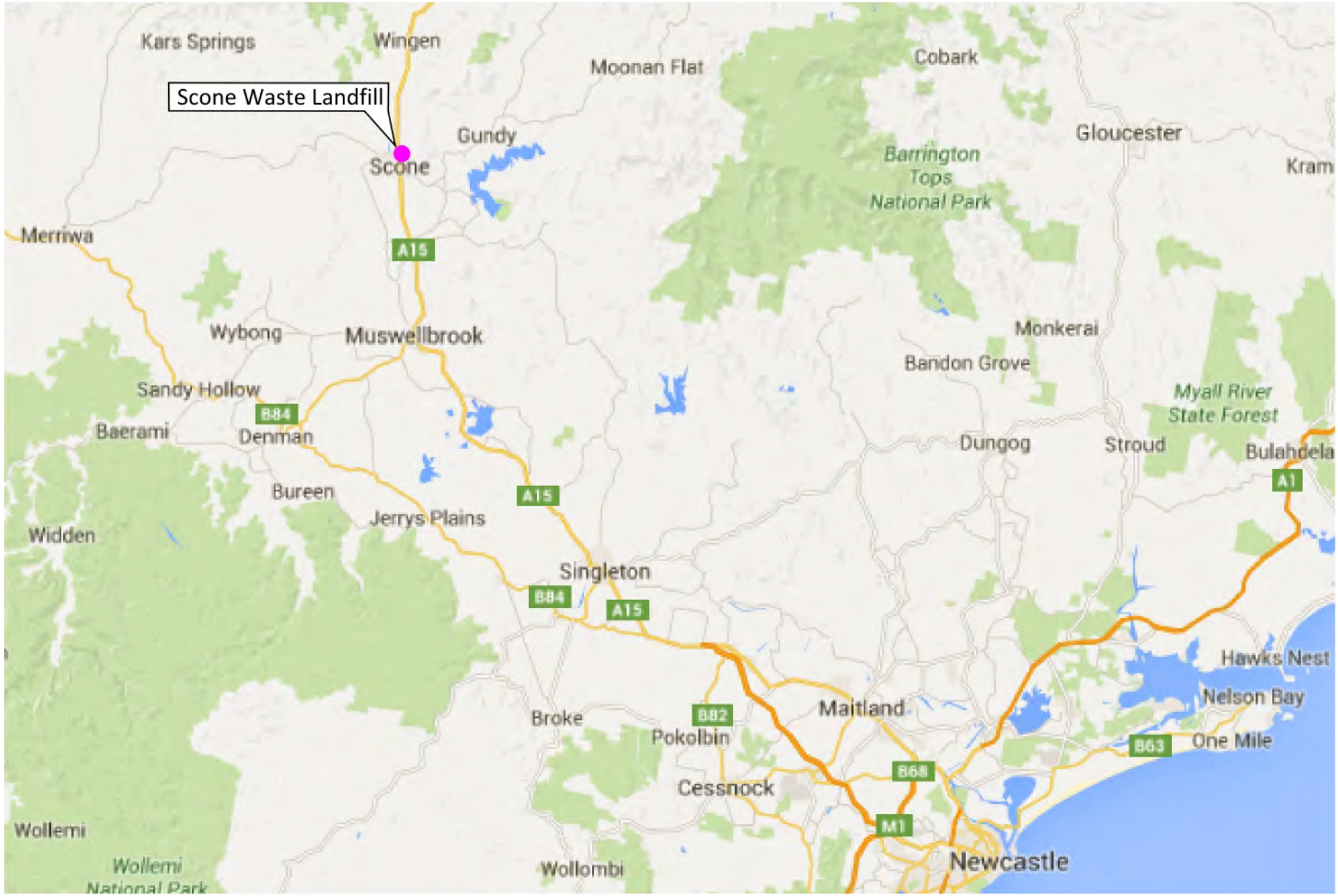
The elevated concentrations of Manganese, Nitrate, TOC in the landfill external wells does not indicate the concentrations are due to the landfill leachate, future testing and trending of data will allow for appropriate comparisons. Further monitoring may reveal the source and extent of elevated concentrations 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 annual monitoring which will be undertaken in January 2017.

7.0 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* (ANZECC, 2000);
- *Australian Drinking Water Guidelines, National Water Quality Management Strategy* 2011;
- Chapman, G A, Murphy, C L, Tille, P J, Atkinson, G and Morse, R J, *Sydney Soil Landscapes Map*, Series 9130 (1989);
- *Contaminated Land Management Act 1997* (NSW);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 2011);
- *Contaminated Sites: Guidelines on Duty to Report Contamination under the Contamination Land Management Act 1997* (NSW DECC, 2009);
- *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DEC, 2007);
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report* (NSW EPA 1999);
- *Contaminated Sites: Sampling Design Guidelines* (NSW EPA 1995);
- *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 1996);
- *Health - Based Soil Investigation Levels, Imray, P & Langley, A, National Environmental Health Forum Monographs, Soil Series No. 2 (2nd Ed), South Australian Health Commission* (NEHF 1998b);
- *National Environment Protection (Assessment of Site Contamination) Measure (No.1)* (NEPC, 2013);
- *Storage and Handling of Dangerous Goods Code of Practice 2005*;
- Pacific Southwest, Region 9 Regional Screening Levels (US EPA, 2014);
- *Work Health and Safety Act 2011* (NSW) and associated regulations.
- R.W. Young *and others*, Ferruginous weathering under cool temperate climates during the Late Pleistocene in southeastern Australia, *Zeitschrift fur Geomorphologie*, 38(1), 1994,
- *Quality Criteria for Water*, U.S. Environmental Protection Agency, July 1976.
- *Potassium in Drinking-water Background document for development of WHO Guidelines for Drinking-water Quality*, World Health Organization, 2009
- *Ambient Water Quality Guidelines for Organic Carbon*, Ministry of Environment, Lands and Parks, British Columbia, Canada 2001

FIGURE 1 – SITE LOCATION REGIONAL



Legend

- Site location - Noblet Rd, Scone

N

Approximate Scale

0m 10 km 20 km 30 km 40 km 50 km

DLA Environmental Services
A Pacific Environment company

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

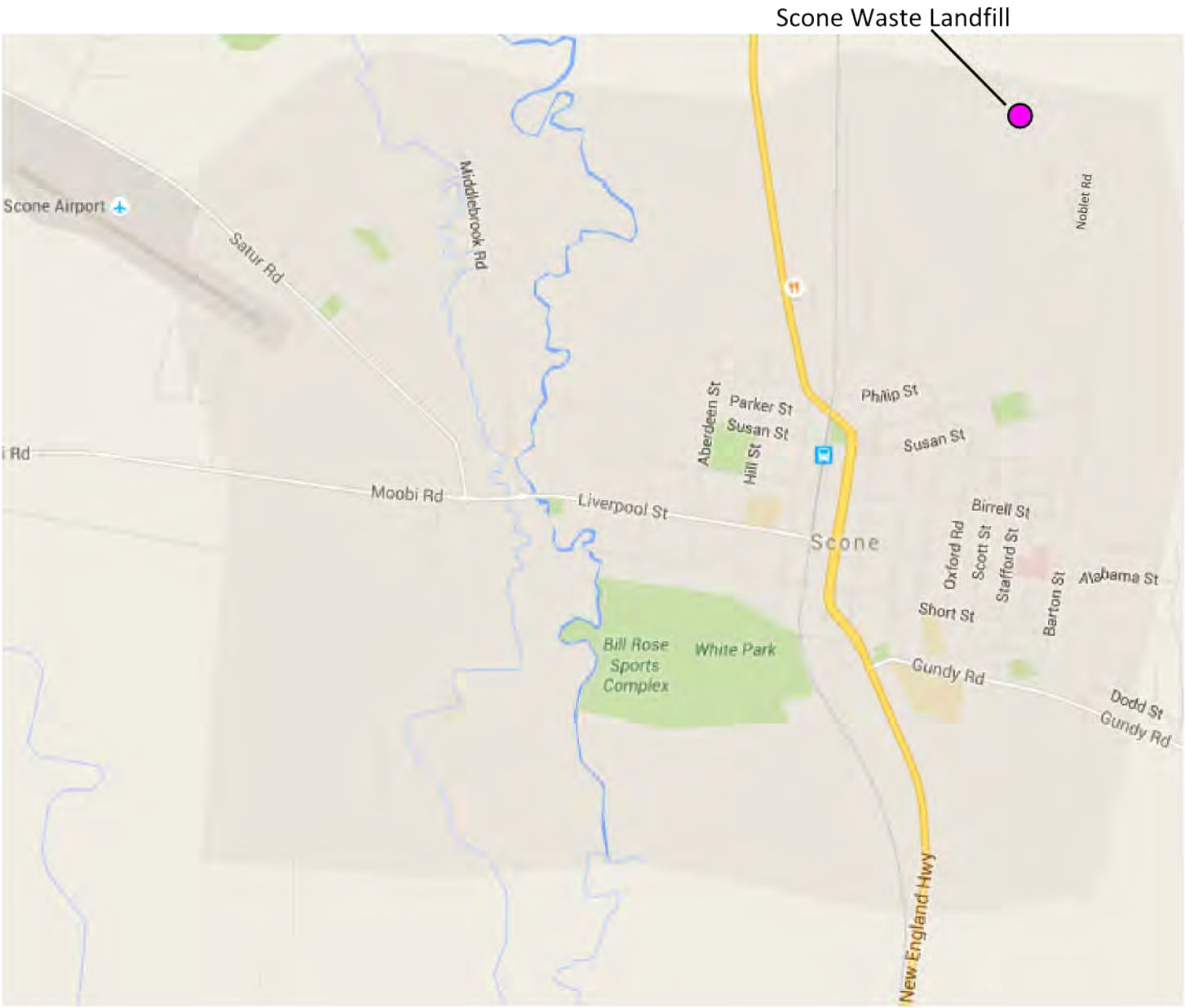
Maitland Office
Phone (02) 4933 0001

Title: Site location regional

Client	Project No.	Figure No	Date
Upper Hunter Shire Council	DLH1186	1	3/11/2015
	Scale: As Shown	Compiled: BF	Revision: R01

FIGURE 2 – SITE LOCATION LOCAL

N



Legend

Site Location - Noblet Rd, Scone

Approximate Scale

0 km 0.5 km 1 km

DLA Environmental Services
A Pacific Environment company

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

Maitland Office
Phone (02) 4933 0001

Title: Site location local

Client	Figure No	Date
Upper Hunter Shire Council	2	3/11/2015

Project No.	Scale	Compiled	Revision
DLH1186	As Shown	BF	R01

FIGURE 3 - SITE LAYOUT WITH SAMPLE LOCATIONS

Legend

Groundwater well location

N

Approximate Scale

0m 50m 100m

DLA Environmental Services
A Pacific Environment company

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

Maitland Office
Phone (02) 4933 0001

Title: Site layout with sample locations

Client	Project No.	Figure No	Date
Upper Hunter Shire Council	DLH1186	3	16/10/2015
	Scale: As Shown	Compiled: BF	Revision: R01

ATTACHMENT 1 – NATA CERTIFIED ANALYTICAL RESULTS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Stephen Challinor
Client	DLA ENVIRONMENTAL SERVICES PTY LTD
Address	42b Church St Maitland NSW 2320
Telephone	61 2 4933 0001
Facsimile	61 2 98700999
Email	stephen.challinor@dlaenvironmental.com.au
Project	**DLH1186**
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	**SE157863 R0**
Date Received	7/10/2016
Date Reported	13/10/2016

COMMENTS

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

SIGNATORIES

Dong Liang
Metals/Inorganics Team Leader

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

OC Pesticides in Water [AN400/AN420] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
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: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Total Phenols	mg/L	0.01	**0.22**	**0.14**	<0.01	**0.07**	**0.01**

Forms of Carbon [AN190] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Total Organic Carbon as NPOC	mg/L	0.2	6.2	6.6	24	200	16

Ammonia Nitrogen by Discrete Analyser (Aquakem) [AN291] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Ammonia Nitrogen, NH_3 as N	mg/L	0.01	**0.14**	**0.09**	**0.04**	**150**	**0.04**

Anions by Ion Chromatography in Water [AN245] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Chloride	mg/L	1	**7400**	**6000**	**770**	**1600**	**560**
Sulphate, SO4	mg/L	1	**37**	**69**	**180**	**110**	**120**
Fluoride	mg/L	0.1	**0.15**	**0.22**	**0.34**	**0.27**	**0.41**
Nitrate Nitrogen, NO3-N	mg/L	0.005	**0.50**	**1.1**	<0.025↑	<0.025↑	<0.025↑

pH in water [AN101] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
pH**	No unit	-	**6.8**	**6.9**	**7.1**	**7.3**	**7.3**

Conductivity and TDS by Calculation - Water [AN106] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Conductivity @ 25 C	µS/cm	2	**21000**	**17000**	**3900**	**7800**	**3600**
Total Dissolved Solids (by calculation)	mg/L	2	**12000**	**10000**	**2400**	**4700**	**2100**

Alkalinity [AN135] Tested: 11/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Bicarbonate Alkalinity as CaCO3	mg/L	5	**430**	**360**	**630**	**1600**	**900**
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	**430**	**360**	**630**	**1600**	**900**

Acidity and Free CO2 [AN140] Tested: 11/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Acidity to pH 8.3	mg CaCO3/L	5	200	150	86	250	110

Metals in Water (Dissolved) by ICPOES [AN320/AN321] Tested: 11/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Calcium, Ca	mg/L	0.1	580	600	67	210	61
Magnesium, Mg	mg/L	0.1	1100	830	120	150	67
Sodium, Na	mg/L	0.1	2100	1800	620	1000	650
Potassium, K	mg/L	0.2	4.4	3.6	1.1	140	1.3

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 10/10/2016

PARAMETER	UOM	LOR	MWA WATER - 6/10/2016 SE157863.001	MWB WATER - 6/10/2016 SE157863.002	MWC WATER - 6/10/2016 SE157863.003	MWD WATER - 6/10/2016 SE157863.004	MWE WATER - 6/10/2016 SE157863.005
Iron, Fe	µg/L	5	<5	**6**	<5	**1200**	**12**
Manganese, Mn	µg/L	1	**20**	**8**	**5600**	**600**	**110**

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.
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 CO2 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 O2/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, NO2, NO3 and SO4 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 Dichloroisocyanuate, 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/AN321	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/AN321	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.
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
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. APHA4500CO2 D.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	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

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/terms-and-conditions. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

ATTACHMENT 2 – YSI WATER QUALITY METER CALIBRATION CERTIFICATE

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 10H100319

airmet
Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		NH1818	pH 6.97
2. pH 4.00		pH 4.00		NF1636	pH 4.05
3. mV		231.8mV		NK1960/NK1959	231.8mV
4. EC		2.76mS		NH1109	2.77mS
5. D.O		0.00ppm		4005	0.00ppm
6. Temp		21.1°C		MultiTherm	21.1°C

Calibrated by: SB Sophie Boler

Calibration date: 28/09/2016

Next calibration due: 28/10/2016

ATTACHMENT 3 – DATA LOG

			Threshold Criteria	NA	NA	NA	NA	0.3	NA	1.9	0.00001	NA	6.5–8	NA	0.9	0.7	NA	4	0.32	NA	NA	NA	0.015	0.024 (III) 0.013 (V)	0.055 (pH> 6.5)	NA	0.0002	0.09	0.0014	0.001	NA	0.0034	0.0006	0.008	0.26	0.95	0.18	0.08	NA	NA	6500	0.05	0.03	0.0003	0.00003	0.016	0.00002
			Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			Analytes	Calcium	Alkalinity	Chloride	Fluoride	Iron	Magnesium	Manganese	Organochlorine pesticides (OCP)	Potassium	pH	Sodium	Ammonia	Nitrate	Sulfate	Total organic carbon	Total phenolics	Electrical conductivity (EC)	Total dissolved solids	Biochemical oxygen demand	Phosphate	Arsenic III & V	Aluminium	Barium	Cadmium	Cobalt	Copper	Chromium VI	Chromium (total)	Lead	Mercury	Zinc	TPH	Benzene	Toluene	Ethylbenzene	total	Tetrachloroethene (TCE)	1,1,1-Trichloroethene (TCA)	Tetrachloroethene (PCE)	1,2-Dichloroethene	Vinyl Chloride	PCBs	PAHs	OPPs
			Monitoring frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly
Monitoring Well	Chemical Report	Date Sampled	Comment	CVCs/VOCCs																																												
MWA	135493	6/10/2015		620	440	7700	0.1	ND	1200	0.028	ND	3.2	6.8	2400	0.006	**0.76**	66	4	ND	19000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWB	135493	6/10/2015		650	370	6300	0.3	ND	840	0.008	ND	2.6	6.9	1900	ND	**1.3**	100	**5**	ND	16000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWC	135493	6/10/2015		62	730	690	0.4	ND	130	**2.2**	ND	0.6	7.1	670	ND	0.17	350	**18**	ND	3900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	135493	6/10/2015	leachate	150	2400	2800	0.3	**1.8**	220	0.46	ND	170	7.6	1700	**310**	ND	66	**330**	ND	11000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWE	135493	6/10/2015		75	700	860	0.5	0.015	89	0.44	ND	1.7	7.4	730	0.006	ND	140	**8**	ND	4000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWA	SE148082	14/01/2016		630	430	7800	ND	ND	1100	0.01	ND	4	7	2200	0.2	**0.24**	34	**4.2**	0.25	23000	16000	ND	**0.22**	0.001	ND	0.77	ND	ND	ND	ND	ND	ND	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWB	SE148082	14/01/2016		650	370	6000	ND	ND	810	0.012	ND	3.5	7	1700	0.15	**1.3**	69	**7**	0.31	18000	15000	ND	**0.13**	0.002	ND	0.62	ND	ND	ND	ND	0.001	ND	ND	**0.012**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWC	SE148082	14/01/2016		56	750	630	0.34	ND	110	**4.9**	ND	0.9	7.2	590	0.12	ND	300	**21**	ND	4300	2400	ND	**0.19**	0.003	ND	0.047	ND	0.011	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWD	SE148082	14/01/2016	leachate	170	1200	1000	0.32	**0.33**	110	0.87	ND	110	7.3	690	**110**	ND	18	**140**	**0.47**	5800	2500	48	**0.13**	0.017	ND	0.49	ND	0.004	ND	ND	0.031	ND	ND	**0.026**	**34**	0.0028	0.0034	0.023	0.0351	ND	ND	ND	ND	0.0059	ND	0.004	ND
MWE	SE148082	14/01/2016		80	750	850	0.35	0.019	79	0.23	ND	1.1	7.4	690	0.12	ND	200	**10**	0.02	4600	2200	ND	**0.25**	0.005	ND	0.048	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWA	144481	7/04/2016		700	460	7300	0.1	ND	1300	0.009	ND	3.1	7	2800	0.006	**0.62**	43	3	ND	18000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWB	144481	7/04/2016		720	380	6300	0.3	0.02	880	0.007	ND	2.6	7.1	2300	ND	**1.3**	61	4	ND	15000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWC	144481	7/04/2016		290	660	3700	0.3	0.038	420	**3.1**	ND	1.4	7.2	1900	ND	**4.9**	220	**9**	ND	9600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	144481	7/04/2016	leachate	160	2200	2600	0.3	**2.2**	230	0.45	ND	180	7.7	1900	**210**	ND	35	**290**	ND	9600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWE	144481	7/04/2016		67	890	640	0.5	0.034	72	0.24	ND	0.9	7.6	840	0.026	0.01	160	**7**	ND	3200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWA	SE154534	6/07/2016		620	460	7900	0.12	0.021	1200	0.021	ND	3.7	7.1	2200	0.14	0.36	35	**6.1**	0.03	21000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWB	SE154534	6/07/2016		650	390	6100	0.24	0.008	820	0.008	ND	3.1	7.1	1700	0.10	**0.95**	69	**7.6**	ND	16000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWC	SE154534	6/07/2016		55	730	610	0.24	0.006	93	**5.400**	ND	1.0	7.4	580	0.05	0.15	220	**24**	ND	3300	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	SE154534	6/07/2016	leachate	250	1200	1000	0.14	**0.520**	120	0.960	ND	120	7.3	630	80	ND	140	**140**	0.01	5200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWE	SE154534	6/07/2016		57	970	470	0.30	0.021	66	0.430	ND	1.6	7.6	610	0.04	ND	110	**16**	ND	3100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWA	SE157863	6/10/2016		580	430	7400	0.15	ND	1100	0.020	ND	4.4	6.8	2100	0.14	0.50	37	**6.2**	0.22	21000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MWB	SE157864	6/10/2016		600	360	6000	0.22	0.006	830	0.008	ND	3.6	6.9	1800	0.09	**1.1**	69	**6.6**	0.14	17000	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MWC	SE157865	6/10/2016		67	630	770	0.34	ND	120	5.600	ND	1.1	7.1	620	0.04	ND	180	**24**	ND	3900	2400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MWD	SE157866	6/10/2016	leachate	210	1600	1600	0.27	0.001	150	0.600	ND	140	7.3	1000	**150**	ND	110	**200**	0.07	7800	4700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MWE	SE157867	6/10/2016		61	900	560	0.41	0.012	67	0.110	ND	1.3	7.3	650	0.04	ND	120	**16**	0.01	3600	2100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

***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.**