Helensburgh Waste Disposal Depot

Environment Protection Licence 5861

Annual Report

Period 29 May 2016 – 28 May 2017

Reference: Z17/145668

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ABBREVIATIONS

ANZECC	Australian and New Zealand Environment Conservation Council
Ca	Calcium
$CaCO_3$	Calcium Carbonate
CFU	Colony Forming Units
CH_4	Methane
Cl	Chloride
Cr	Chromium
DC	Development Consent
DO	Dissolved Oxygen
EPL	Environmental Protection Licence
K	Potassium
LEMP	Landfill Environmental Management Plan
Mg	Magnesium
Na	Sodium
NH_3	Ammonia
OEH	The Office of Environment & Heritage
Ppm	Parts per Million
SO_4	Sulfate
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
Zn	Zinc

1 INTRODUCTION

1.1 BACKGROUND

The city of Wollongong is located 80 kilometres south of Sydney and is Australia's 9th largest city. The Wollongong City Council (Council) governance area occupies a relatively narrow coastal strip bordered by the Royal National Park to the north, the Windang Bridge and Yallah to the south, the Tasman Sea to the east and the escarpment to the west.

Council ceased accepting waste at the Helensburgh Waste Disposal Depot (the site) after 30 June 2012. Subsequent to closure the site has been capped with no less than 300mm of cover material in anticipation of a full site rehabilitation construction commencing in 2015. The rehabilitation construction will incorporate an impervious liner into the site cap to reduce leachate infiltration levels and to aid the speed at which the sites waste contamination levels stabilise.

The site is located on Nixon Place, Helensburgh on NSW Department of Lands titled land for which Council holds a licence agreement. The site is situated at the northern extent of Council's governance area and is located on approximately 6.4 hectares of land extending across portions of Lots 621 and 915 of DP 752033.

Council holds an Environmental Protection Licence (EPL) number 5861, for 'Waste Disposal – Application to Land' for the site. Despite the sites closure on 30 June 2012, Council manages the site in accordance with the sites Landfill Environmental Management Plan (LEMP) in accord with the requirements of the sites EPL and Development Consent (DC).

1.2 SITE HISTORY

The site operated for over forty years. Prior to the establishment of waste disposal operations, the site was vacant bushland. In the initial years of operation, the site functioned as a trench and fill operation, with a significant amount of waste incinerated within the trenches. It is understood that from the 1960's until approximately the early 1990's, the site operated as a sanitary depot accepting mainly nightsoil and putrescible wastes. Limited environmental controls were in-place at this time. The site continued to accept these types of waste until 1991, when putrescible waste ceased to be accepted. From 1991 to 2012, the site was only permitted by Council to accept "General Solid Non Putrescible" style wastes e.g. furniture, wood, paper, plastics etc. (although the EPL allows the site to accept putrescible wastes if required). In regard to the sites landform, following completion of the trench and fill operations, landfilling operations shifted to land raise operations which involved the construction of a small mound created from the deposited waste materials. Final land raising operations were completed in the site's central and southern area towards the end of the sites functional life.

In its final year of operation, the site received approximately 7,463 tonnes of waste, of which approximately 2,222 tonnes was sent to landfill (excluding cover material). The remainder (approximately 5,241 tonnes) was recycled. Material used for daily covering of the waste was mainly obtained from a combination of clean fill materials delivered to the site and material sourced on the site. Council also used landfill lids on the site in order to reduce the amount of daily cover required. The lids comprised a portable rigid steel frame covered by heavy duty fabric, which were lifted on and off partly filled areas of waste at the end of each day's operations, reducing daily cover requirements at this site by approximately half. Since closure the lids have been transferred to Whytes Gully for continued beneficial use.

1.3 OBJECTIVES OF THE ANNUAL REPORT

Condition R1.1 of the EPL specifies that Council must provide an Annual Report to accompany the Annual Return for the site. The objective of this report is to provide this review.

1.4 RELEVANT DOCUMENTS

This annual report refers to information and data from the following documents:

- Helensburgh Waste Disposal Depot – Annual Return for Period 29 May 2015 to 28 May 2016. By Wollongong City Council July 2016
- Helensburgh Waste Disposal Depot – Annual Return for Period 29 May 2014 to 28 May 2015. By Wollongong City Council July 2015.
- Helensburgh Waste Disposal Depot – Annual Return for Period 29 May 2013 to 28 May 2014. By Wollongong City Council July 2014.
- Helensburgh Waste Disposal Depot – Annual Return for Period 01 June 2012 to 31 May 2013. By Wollongong City Council July 2013.
- Helensburgh Waste Disposal Depot – Annual Return for Period 01 June 2011 to 31 May 2012. By Wollongong City Council July 2012
- Helensburgh Waste Disposal Depot – Annual Return for Period 01 June 2010 to 31 May 2011. By Wollongong City Council July 2011.
- Helensburgh Waste Disposal Depot – Annual Report for Period 01 June 2009 to 31 May 2010. By GHD July 2010.

2 KEY LICENCE ISSUES

2.1 ENVIRONMENTAL PROTECTION LICENCE ANNUAL RETURNS

The Environment Protection Authority NSW (EPA) has issued an *Environmental Protection Licence* (Licence No. 5861) for the landfill and recycling operations on site. The licence, issued under the *Protection of the Environment Operations Act 1997,* requires an annual return to be submitted to the EPA, detailing:

a) Statement of compliance; and
b) Monitoring and complaints summary.
c) Tabulated results of all monitoring data required by the licence.
d) A graphical presentation of the data for at least three years (if available).
e) Notations made regarding any statistically significant variations or anomalies.
f) An analysis and interpretation of all monitoring data.
g) Identification of any deficiencies in environmental performance and action taken.
h) Recommendations on improving the sites environmental performance.

The EPL Annual Returns for the 2009 to 2015 reporting periods were reviewed to provide a background to this report. The Annual Returns can be summarised as follows:

01 June 2009 to 31 May 2010

B1. Pollution complaints - One.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Ten non compliances
C2. Details of non-compliance

1. *Three missed conductivity measurements*
2. *One round of groundwater monitoring missed*
3. *Two missed ammonia measurements*
4. *One round of groundwater monitoring missed*
5. *Two missed ammonia measurements*
6. *One round of groundwater monitoring missed*
7. *Two missed ammonia measurements*
8. *One round of surface water monitoring missed*
9. *Two missed ammonia, faecal coliforms and dissolved oxygen tests*
10. *Four missed potassium tests*

01 June 2010 to 31 May 2011

B1. Pollution complaints - Four.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non compliances.
C2. Details of non-compliance – N/A

01 June 2011 to 31 May 2012

B1. Pollution complaints - Eleven.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non compliances.
C2. Details of non-compliance – N/A

01 June 2012 to 31 May 2013

B1. Pollution complaints – Nil.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non-compliance.
C2. Details of non-compliance – N/A

29 May 2013 to 28 May 2014

B1. Pollution complaints – Nil.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non-compliance.
C2. Details of non-compliance – N/A

29 May 2014 to 28 May 2015

B1. Pollution complaints – Nil.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non-compliance.
C2. Details of non-compliance – N/A

29 May 2015 to 28 May 2016

B1. Pollution complaints – Nil.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil
C2. Details of non-compliance – N/A

29 May 2016 to 28 May 2017

B1. Pollution complaints – Nil.
B2. Concentration monitoring summary – Complete.
B3. Volume or mass monitoring summary - None required.
C1. Compliance with licence condition – Nil non-compliance
C2. Details of non-compliance – N/A

Other Disclosure: On 31 August 2016 The EPA requested that Council Show Cause with regard to an alleged Breach of Section 153E of the Protection of the Environment Operations Act 1997 relating to the "testing" of the Pollution Incidence Response Management Plan (PIRMP) at the Helensburgh site. As agreed with the EPA (as per the communication dated 21 September 2016), the desktop testing of the PIRMP is considered to be a suitable method to verify the plans adequacy, given the inherent low risk of pollution incidences and resulting evacuations taking place on this non-operational site.

The EPL has had several variations applied to it in recent years. These changes include:

- Amended in June 2016, to include five new landfill gas monitoring points (LGB5, LGB6, LGB7, LGB8 & LGB9) and additionally three of the landfill gas monitoring points previously on the licence (LGMB2; LGMB3 & LGMB4) have been removed.
- Licence amended in September 2015 to include reference to approved landfill closure rehabilitation construction plans.
- Amendment of the text description to include 'part lots' within the Licenced Area, October 2014.
- Incorporation of additional ground water monitoring wells, gas migration monitoring wells and final closure capping profile on 20 May 2013.
- Scheduled Activity and Waste Classification structure altered on 17 October 2008.
- Environmentally sensitive or inappropriate landfilling classification removed from licence on 12 June 2008.
- Environmentally sensitive or inappropriate landfilling classification added to licence on 18 March 2008.
- Clarification of noise appropriated operating hours on 16 May 2006.
- Slag and asphalt chippings added to appropriate cover materials list on 17 May 2005.

3 REVIEW OF LANDFILL MONITORING DATA

3.1 SURFACE WATER MONITORING

3.1.1 SURFACE WATER MONITORING TABULATED RESULTS

As per the sites EPL, stormwater overflow events and the monitoring point 8 were monitored with the following results:

Table 3.1.1(a) Stormwater overflow monitoring results at point 1

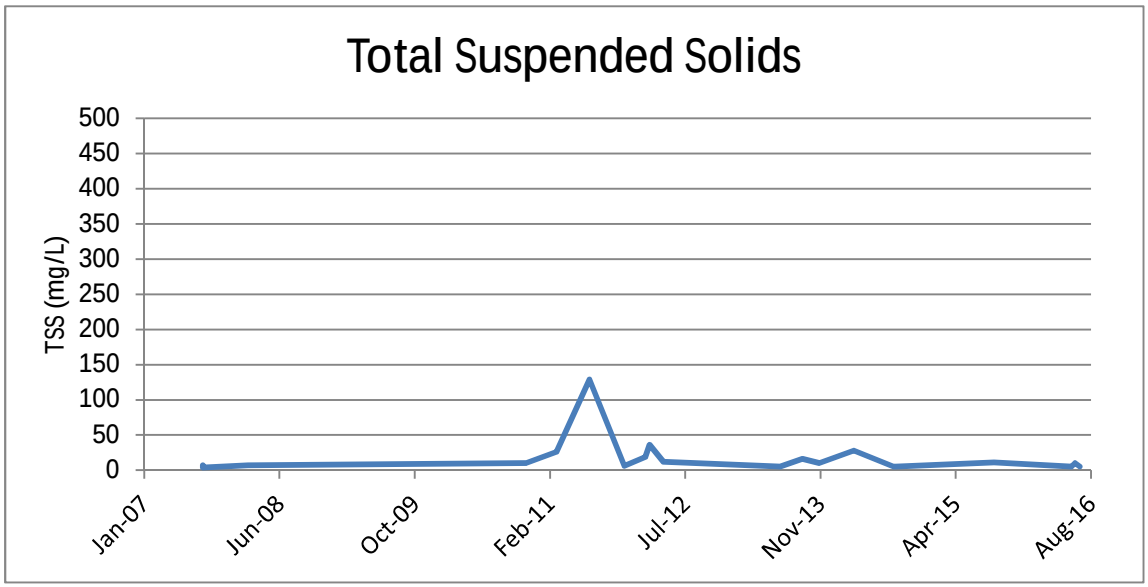
Analyte	7/6/2016	20/6/2016	8/7/2016
Suspended Solids	5	10	5
pH	7.7	7.5	7.5

Table 3.1.1(b) Water quality at monitoring point 8

Analyte	Unit	Aug-16	Nov-16	Feb-17	May-17
Conductivity	µS/cm	422	1130	326	1300
Dissolved Oxygen	mg/L	7.95	5.84	9.27	9.64
Faecal Coliforms	CFU/100mL	8	4	170	110
Nitrogen (Ammonia)	mg/L	1.79	6.3	0.02	9.78
Potassium	mg/L	11	41	15	47
Redox Potential	mV	49	5.9	138	39
Total Dissolved Solids	mg/L	218	554	220	790
Total Organic Carbon	mg/L	6	30	14	26
pH	pH	6.4	8.6	8.9	7.5

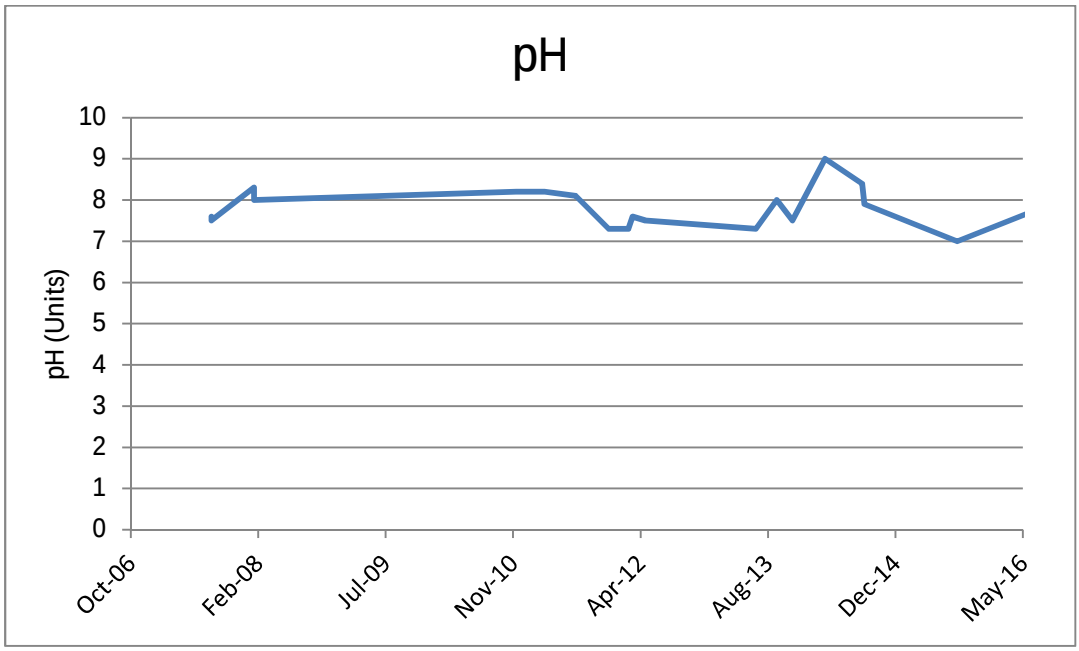
3.1.2 Data Presentation Stormwater overflow

3.1.2.1 Total suspended Solids



Apart from an individual spike in July 2011, the onsite stormwater treatment has managed sediment at consistently low levels.

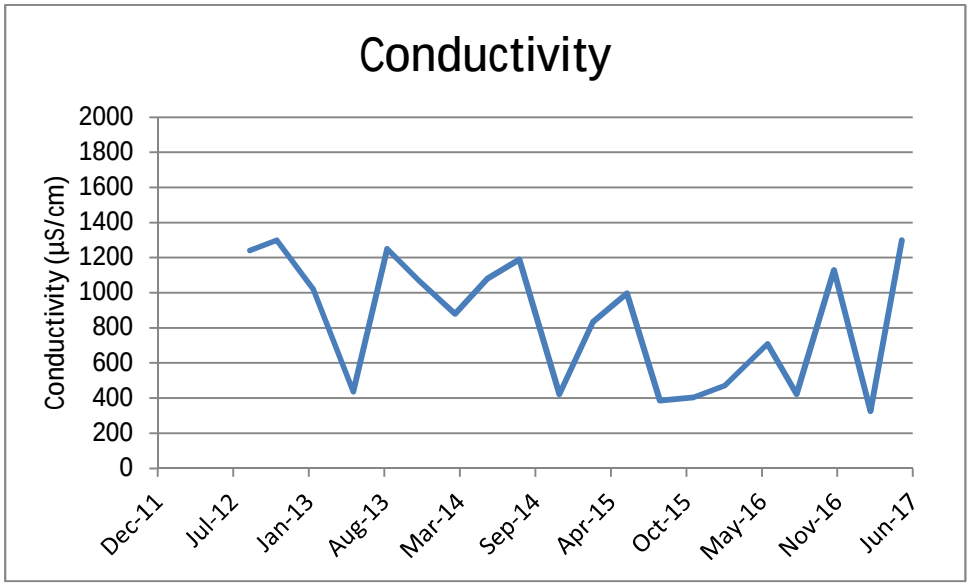
3.1.2.2 pH



The pH derived from onsite stormwater has been consistent within "normal" ranges for pH. The pH was elevated slightly in March 2014 but has since returned to expected levels.

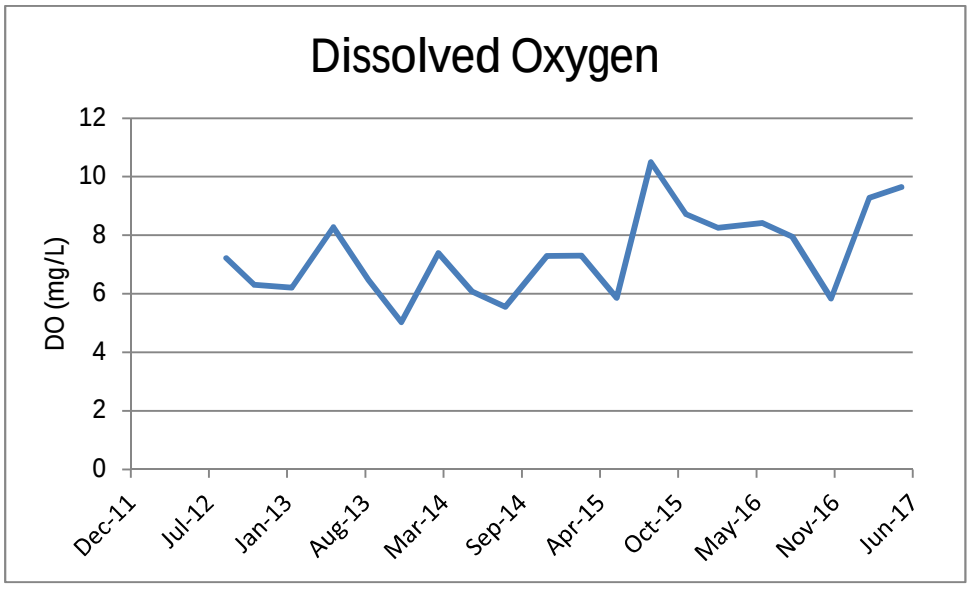
3.1.3 Quarterly stormwater quality in the Pony Club pond

3.1.3.1 Conductivity



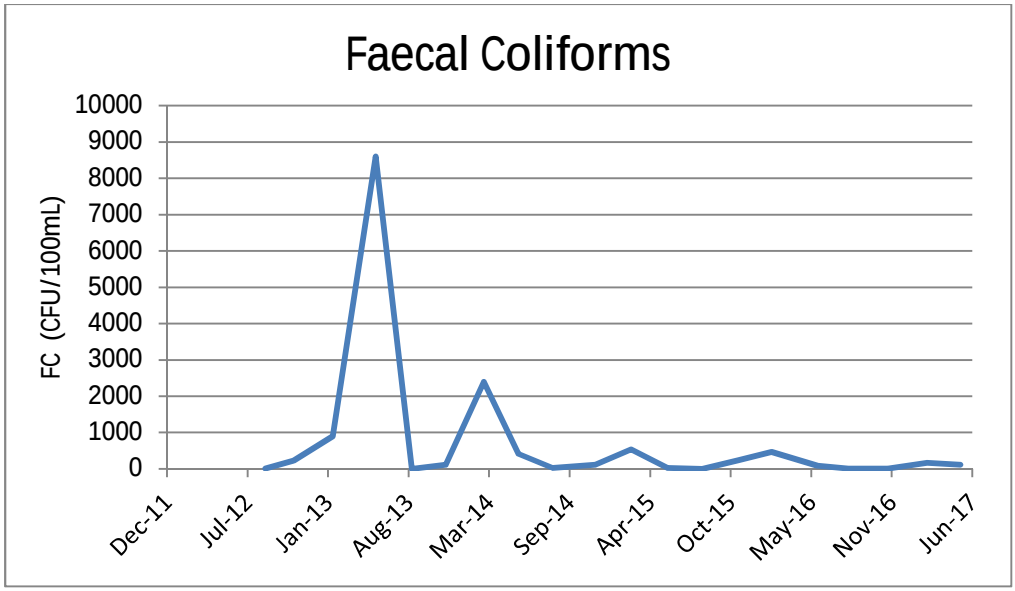
Conductivity is a measure of the waters ability to pass electrical current, usually though positively or negatively charged inorganic dissolved solids (e.g. sodium, magnesium, calcium, iron). The conductivity results for the pond have fluctuated consistently within the range of approximately 1,000µS/cm for the last 5 years.

3.1.3.2 Dissolved Oxygen



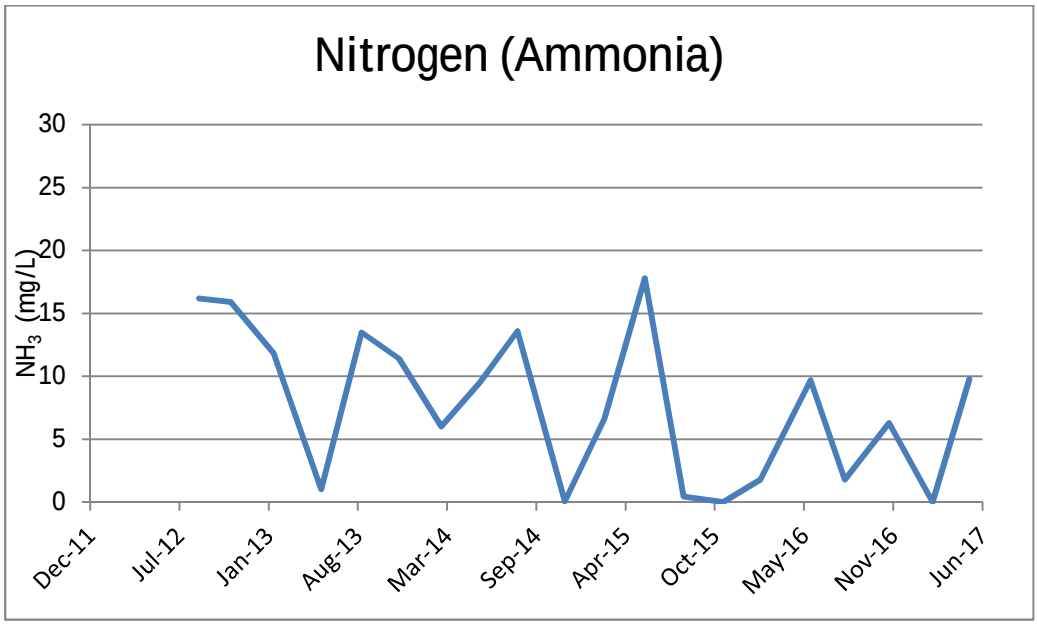
Dissolved oxygen levels can be depleted by biological activity associated with the nitrification process (common in leachate). The dissolved oxygen levels have continued within the historic ranges expected.

3.1.3.3 Faecal coliforms



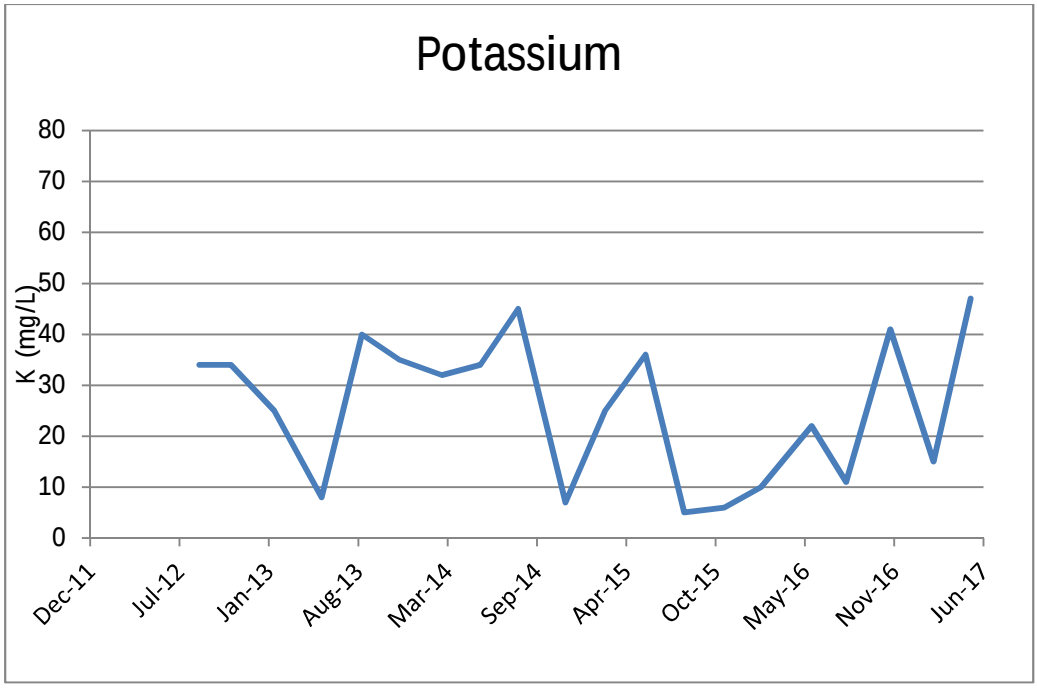
Coliforms are bacteria that live in animal intestines that can be found in excrement. The results displayed indicate that animal excrement may have been present in the pond in late 2011 and May 2013.

3.1.3.4 Nitrogen as ammonia



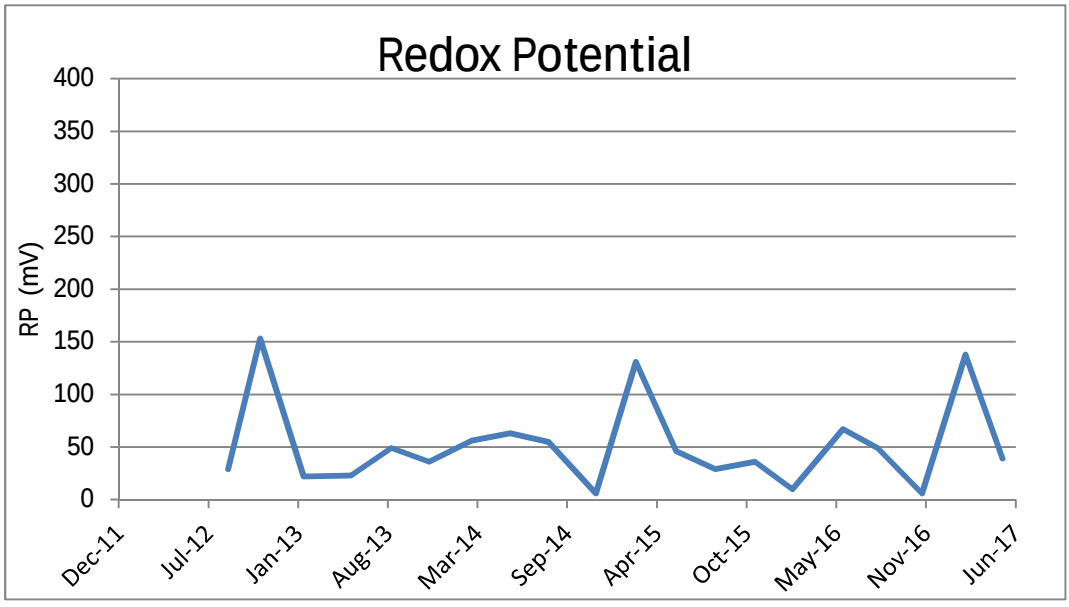
The trend for Nitrogen as Ammonia has been ultimately stable over time fluctuating at a maximum between 2 and 18 mg/L. This sampling period is well within that expected range. Therefore, there is no indication that leachate is entering the pond.

3.1.3.5 Potassium



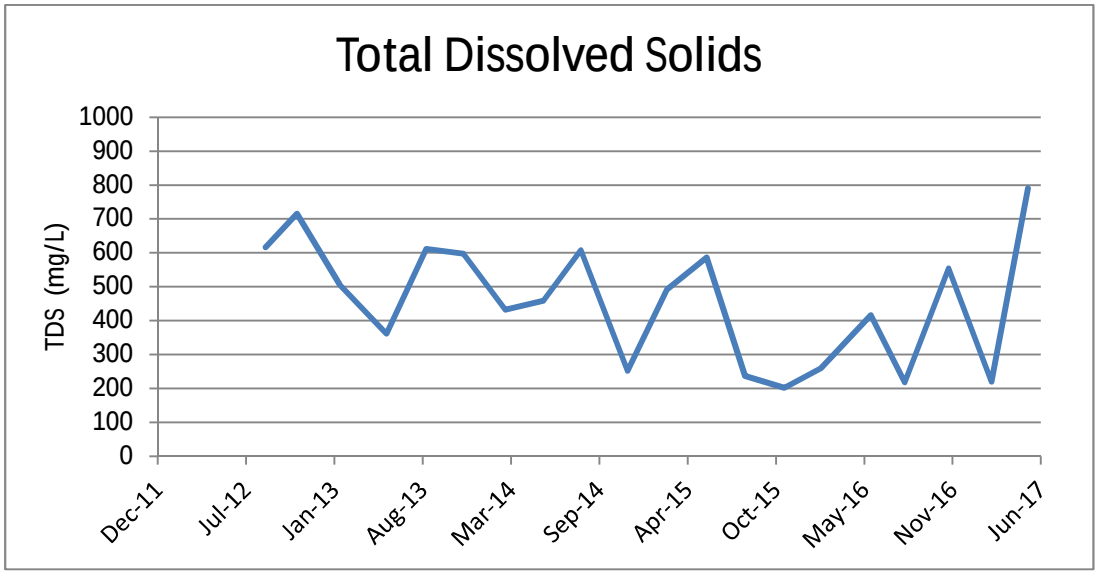
Potassium is present in bodies of water outside coastal areas generally through weathering of clays and agricultural purposes (leaching of fertiliser). Potassium levels have fluctuated between approx. 5-47mg/l over 5 years of sampling, this year's data is in line with previous data.

3.1.3.6 Redox Potential



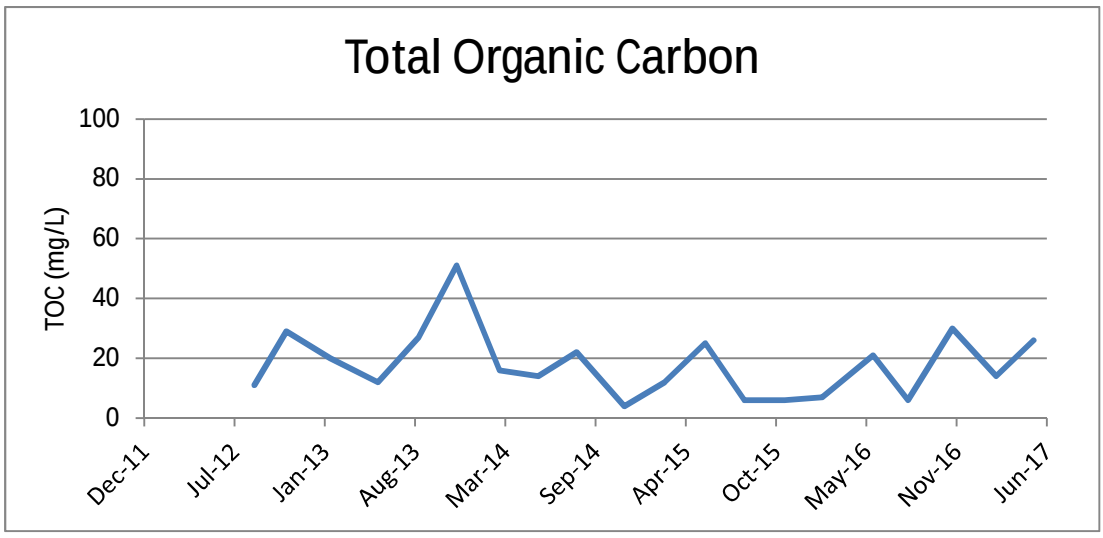
The Redox data from this sampling period is in line with historical trends. Redox reactions involve the transfer of electrons from a donor to a receptor and can be useful in determining if aerobic or anaerobic activity is occurring in a system.

3.1.3.7 Total dissolved solids



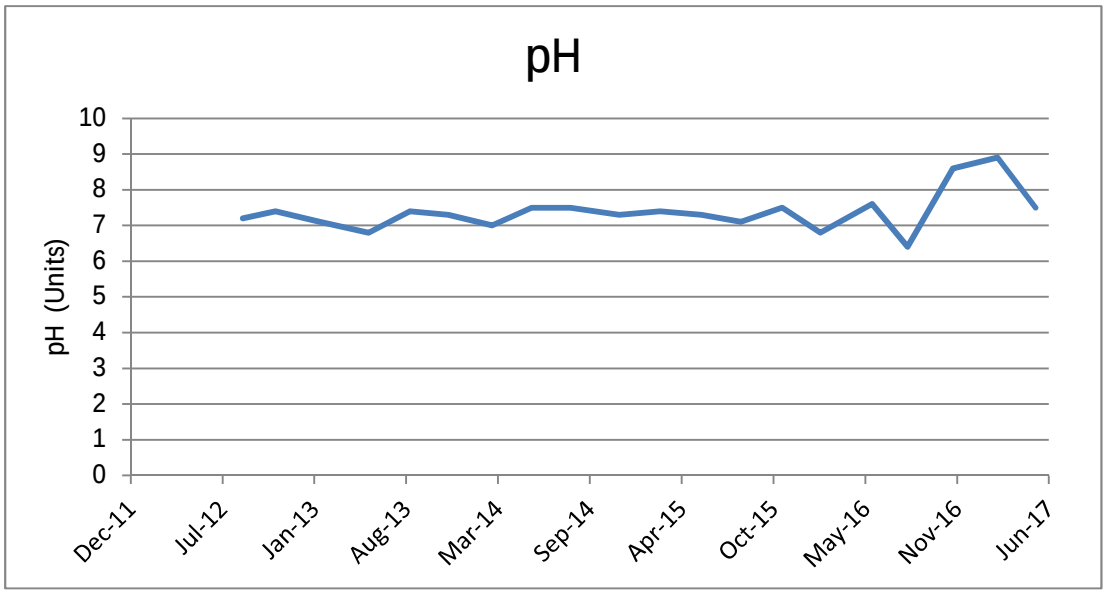
The *2011 Australian Drinking Water Guidelines 6* states that total dissolved solids levels of less than 600mg/L indicate good quality drinking water. High levels of dissolved solids can be sourced from salts derived from leachate infiltration. The samples taken indicate that the pond continues to demonstrate mild fluctuations between 200-800 mg/L.

3.1.3.8 Total Organic Carbon



Microbial degradation of organic matter can increase the total organic carbon content in water and may provide evidence of contamination by natural compounds derived from the landfilling of organic matter. The amount of total organic carbon during this reporting period has remained within historical ranges.

3.1.3.9 pH



The pH levels in the pond have exhibited very little fluctuation over the 5 years of sampling and within optimal levels for the natural environment.

3.1.3 Stormwater Results Interpretation

From the data analysed for the stormwater pond the overall result has demonstrated stability of results in line with historical data and fluctuations.

3.2 GROUND WATER MONITORING

3.2.1 Tabulated Results

Table 3.2.1(a) Quarterly analyte testing results for August 2016

	Monitoring Points								
Analyte	Units/ Ref	5	6	7	12	13	14	15	16
Alkalinity	mg/L	<1	137	<1	196	30	18	6	<1
Calcium	mg/L	26	35	<1	66	25	9	10	4
Chloride	mg/L	82	20	122	17	46	10	16	37
Magnesium	mg/L	20	18	5	21	9	4	5	4
Nitrogen	mg/L	<0.01	0.05	0.01	<0.01	0.24	<0.01	<0.01	<0.01
Potassium	mg/L	<1	3	<1	2	4	2	27	<1
Sodium	mg/L	41	15	110	18	21	8	10	23
Water Level	m	1.43	1.59	<1	1.68	1.92	1.68	1.6	2.5
Sulfate	mg/L	85	10	121	39	25	16	47	24
TDS	mg/L	349	293	264	331	217	98	175	129
TOC	mg/L	3	7	3	5	3	2	3	<1
pH	pH	4.4	6.5	4.2	6.6	5.5	5	4.5	4.3

Table 3.2.1(b) Quarterly analyte testing results for November 2016

	Monitoring Points								
Analyte	Units/ Ref	5	6	7	12	13	14	15	16
Alkalinity	mg/L	<1	67	<1	DRY	8	15	11	<1
Calcium	mg/L	21	20	<1	DRY	15	10	12	4
Chloride	mg/L	74	29	76	DRY	42	30	17	40
Magnesium	mg/L	16	10	5	DRY	8	5	5	4
Nitrogen	mg/L	0.04	0.05	0.02	DRY	0.02	0.35	0.06	<0.01
Potassium	mg/L	<1	3	1	DRY	5	3	27	2
Sodium	mg/L	50	27	109	DRY	27	12	11	25
Water Level	m	3.9	3.8	4.6	DRY	3.64	3.62	3.33	6.08
Sulfate	mg/L	83	35	94	DRY	37	15	64	21
TDS	mg/L	306	217	302	DRY	517	149	188	133
TOC	mg/L	14	7	6	DRY	4	2	3	4
pH	pH	4.7	6	4.5	DRY	5.3	5.4	5.3	4.5

Table 3.2.1(c) Quarterly analyte testing results for February 2017

	Monitoring Points								
Analyte	Units/ Ref	5	6	7	12	13	14	15	16
Alkalinity	mg/L	3	87	<1	179	27	7	7	2
Calcium	mg/L	18	31	<1	63	12	6	13	5
Chloride	mg/L	79	30	68	47	12	12	15	40
Magnesium	mg/L	18	18	6	23	6	3	6	8
Nitrogen	mg/L	0.24	0.02	0.55	0.02	0.01	0.2	0.07	0.28
Potassium	mg/L	<1	6	2	3	4	4	34	5
Sodium	mg/L	52	20	90	26	14	9	12	26
Water Level	m	4.26	3.32	4.99	3.24	3.26	2.99	7.06	7.06
Sulfate	mg/L	95	44	111	39	23	17	75	37
TDS	mg/L	328	342	323	436	150	94	230	158
TOC	mg/L	5	19	4	15	4	2	6	7
pH	pH	4.7	6.8	6.9	5.6	4.7	4.5	4.3	4.5

Table 3.2.1(d) Quarterly analyte testing results for May 2017

	Monitoring Points								
Analyte	Units/ Ref	5	6	7	12	13	14	15	16
Alkalinity	mg/L	10	190	<1	10	21	18	4	<1
Calcium	mg/L	21	41	<1	8	25	8	6	4
Chloride	mg/L	73	13	103	14	38	12	12	34
Magnesium	mg/L	20	27	4	8	13	5	4	4
Nitrogen	mg/L	0.16	<0.01	0.04	<0.01	0.02	0.06	0.02	0.02
Potassium	mg/L	<1	5	<1	3	8	5	21	<1
Sodium	mg/L	43	21	100	37	36	10	14	34
Water Level	m	3.1	1.73	2.78	2.58	2.66	2.25	2.78	3.09
Sulfate	mg/L	96	<1	96	68	28	14	28	23
TDS	mg/L	326	284	304	160	330	110	112	115
TOC	mg/L	5	11	3	9	10	2	4	1
pH	pH	5.1	6.9	4.4	5	5.6	5.7	5	4.7

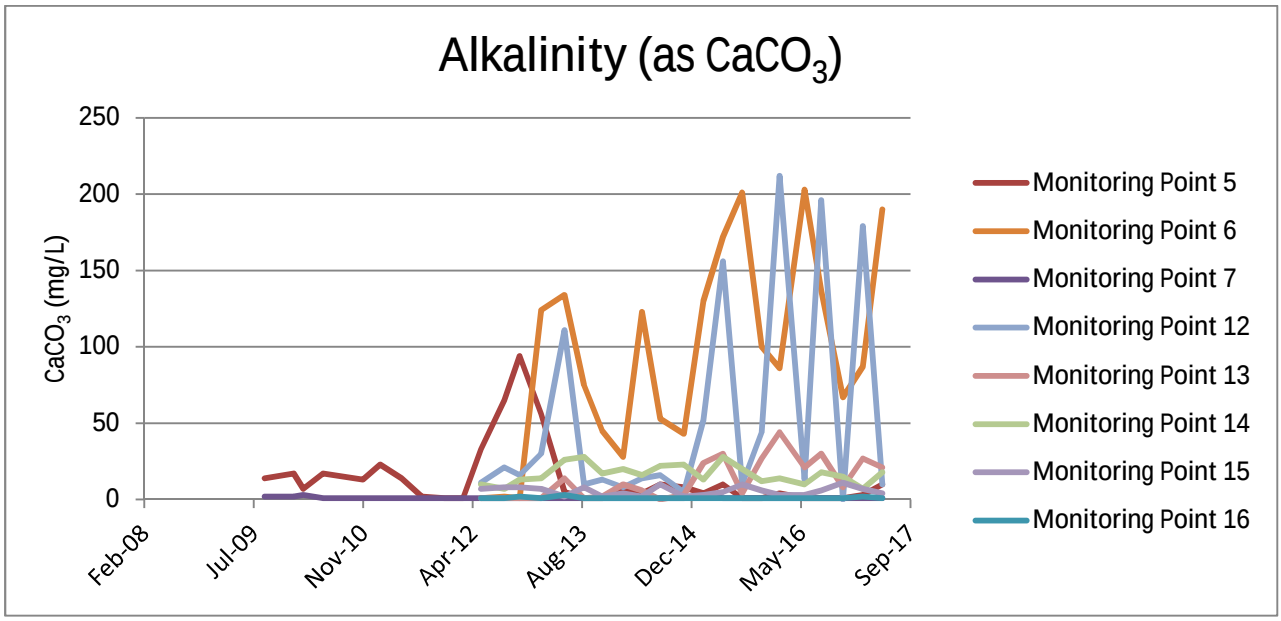
Table 3.2.1(e) Annual analyte testing August 2016 results

Analyte	Units /Ref	Monitoring Points							
		5	6	7	12	13	14	15	16
Aluminium	mg/L	1.58	4.56	2.26	3.84	13.6	2.03	0.27	0.67
Arsenic	mg/L	<0.001	0.005	<0.001	0.002	0.004	<0.001	<0.001	<0.001
Barium	mg/L	0.03	0.118	0.018	0.119	0.044	0.006	0.006	0.006
Benzene	µg/L	<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
Chromium (hex.)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	0.016	0.002	<0.001	<0.001
Cobalt	mg/L	0.004	0.014	<0.001	<0.001	0.001	0.002	<0.001	0.008
Copper	mg/L	0.005	0.011	0.004	0.009	0.019	0.036	0.001	0.015
Ethyl Benzene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2
Fluoride	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	mg/L	0.009	0.006	0.002	0.001	0.015	0.003	0.001	0.003
Manganese	mg/L	0.138	0.355	0.032	0.01	0.038	0.008	0.047	0.036
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	0.37	0.02	0.52	0.03	0.63	0.22	5.1	0.44
Nitrite	mg/L	<0.01	<0.01	<0.01	0.03	0.63	0.22	5.1	<0.01
OCP	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
OPP	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH	µg/L	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2
Total Phenolics	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TPH	µg/L	<50	<50	<50	<50	<50	<50	<50	<50
Xylene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2
Zinc	mg/L	0.41	0.019	0.027	0.012	0.2	0.044	0.012	0.03

Site investigations by GHD in 2011 have confirmed a predominant approximate west to east groundwater flow direction towards the adjacent Hacking River. The groundwater flow direction should be used to contextualise monitoring bore locations and elevated results, please refer to the sites Environmental Monitoring Locations located in Annexure A of this document.

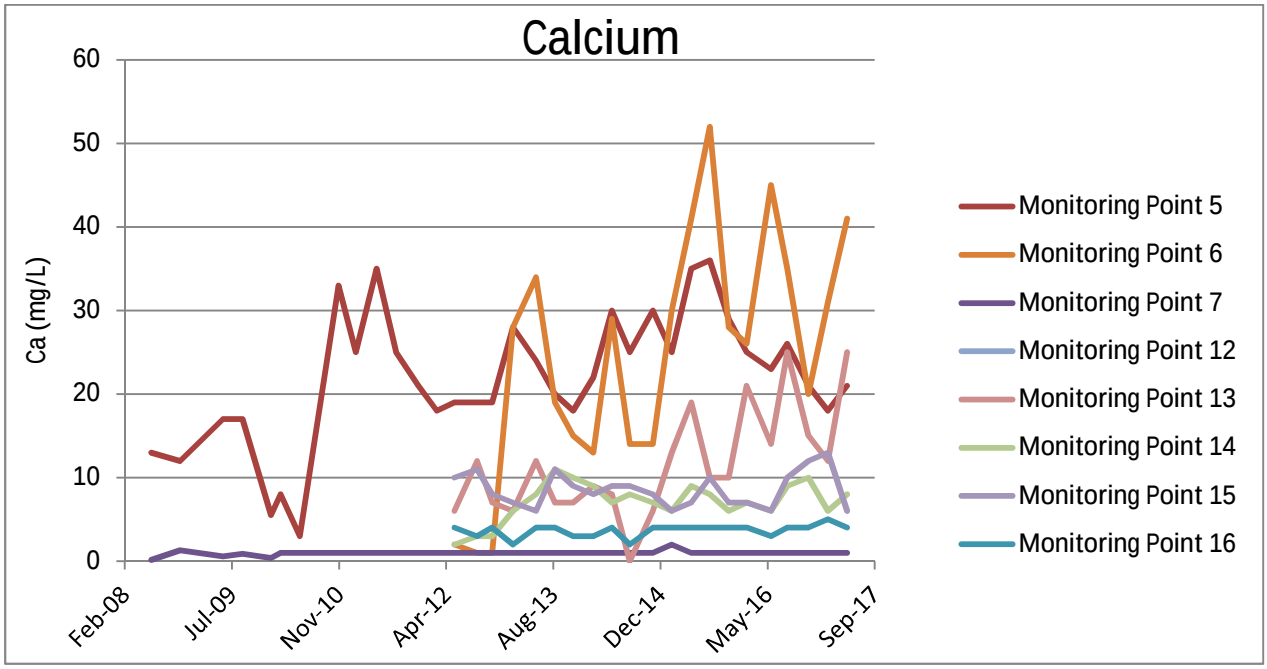
3.2.1.1 Data Presentation – Quarterly Monitoring

3.2.1.1(a) Alkalinity



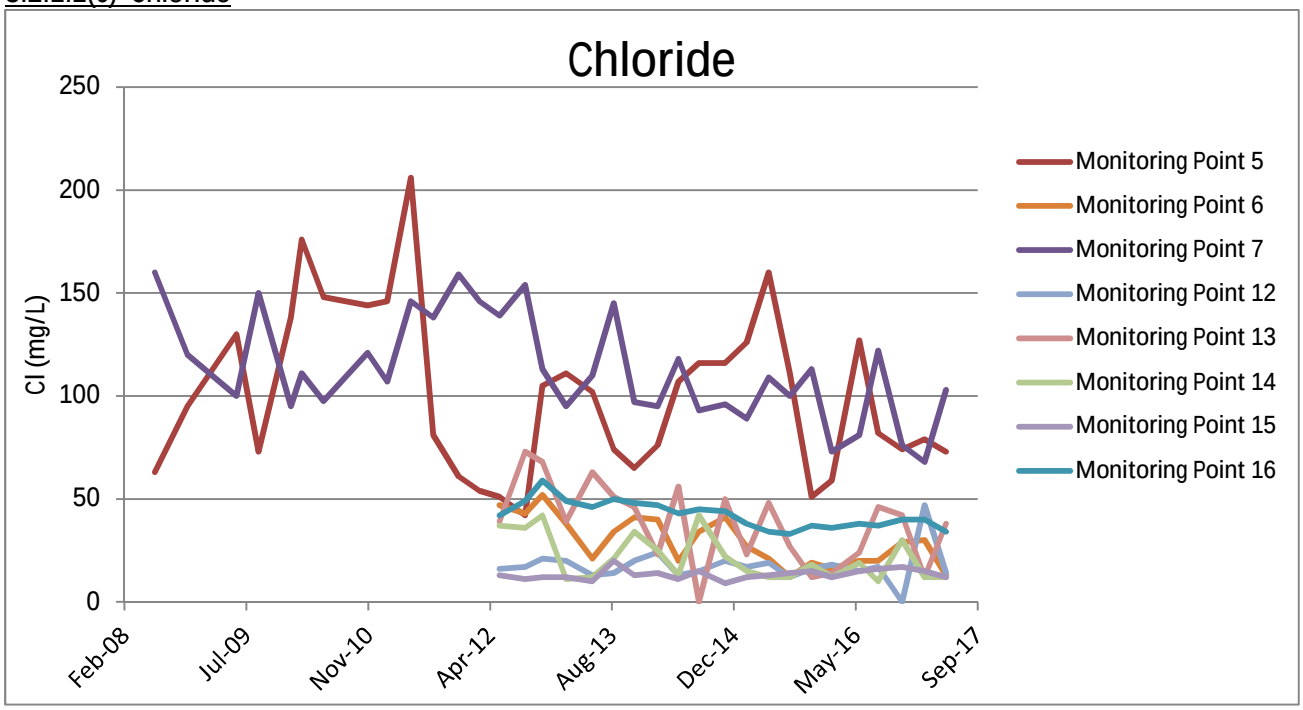
Increased alkalinity levels can be caused by many chemical processes including the denitrification process common in landfill leachate. Denitrification is the anaerobic biological reduction of nitrate (NO_3) to nitrogen (N_2) in its gaseous form. Under anoxic conditions microorganisms consume the oxygen in the nitrate and liberate the nitrogen. This process produces calcium carbonate as a by-product. Samples analysed over the reporting period are within historical levels under 200mg/L.

3.2.1.1(b) Calcium



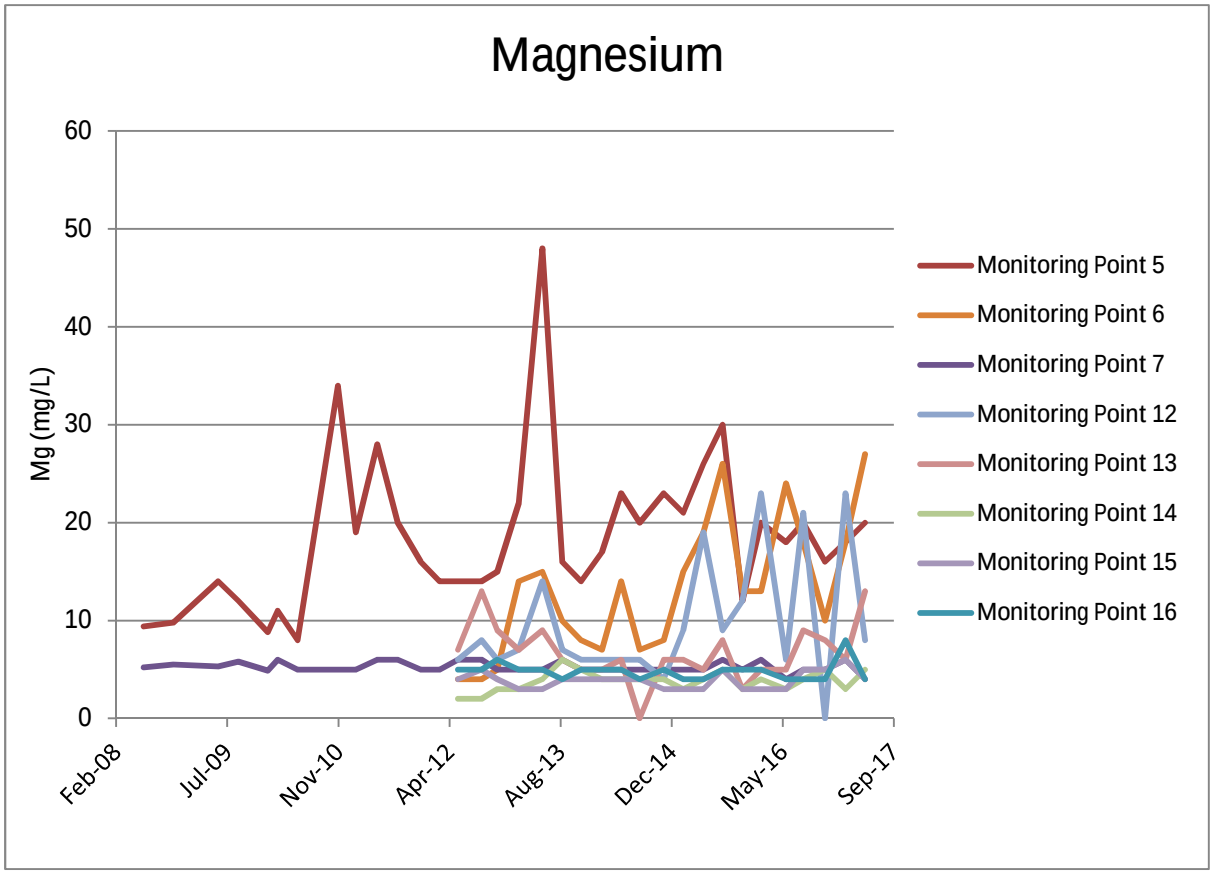
The groundwater monitoring wells show individually stable trends for calcium levels. The calcium levels sampled would be considered 'soft' in the 0-60mg/L area. 'Hard' water would be considered in the region of 120-180mg/L.

3.2.1.1(c) Chloride



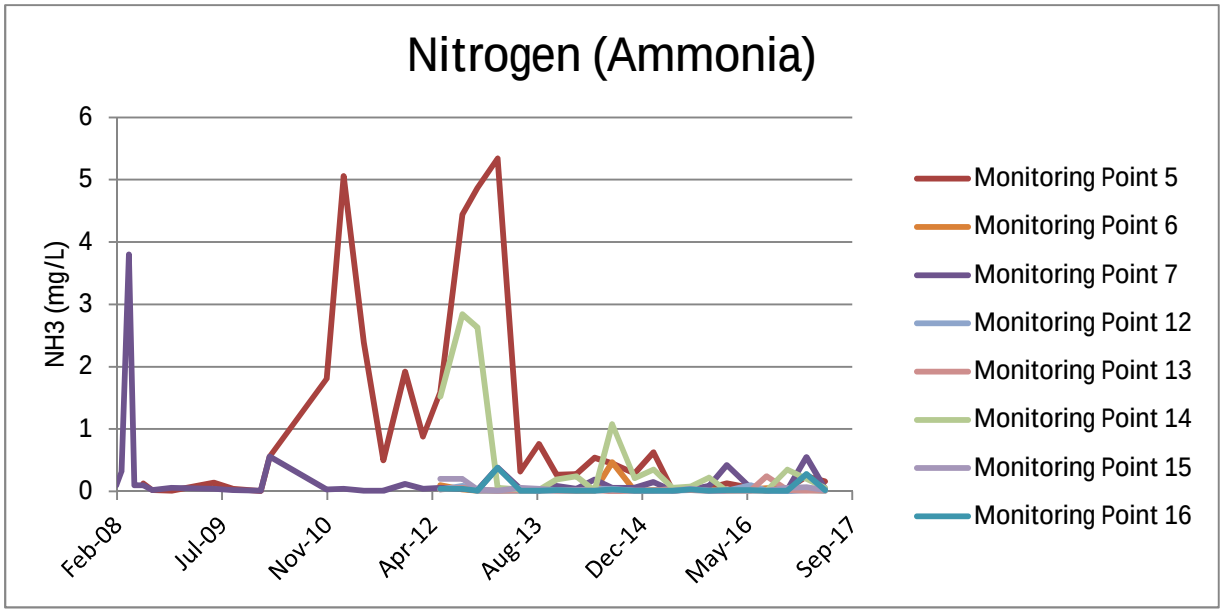
The trends for chloride monitoring have been in line or lower than the historical levels over the data range available. Large quantities of inorganic ions such as chloride can be an indicator of leachate contamination of groundwater. A sudden increase in these ions can act as early warning system. The sampling history for chloride suggests that leachate presence in the groundwater is not apparent. In fact the chloride levels are below the 250mg/L aesthetic criteria that are described in the *2011 Australian Drinking Water Guidelines 6*.

3.2.1.1(d) Magnesium



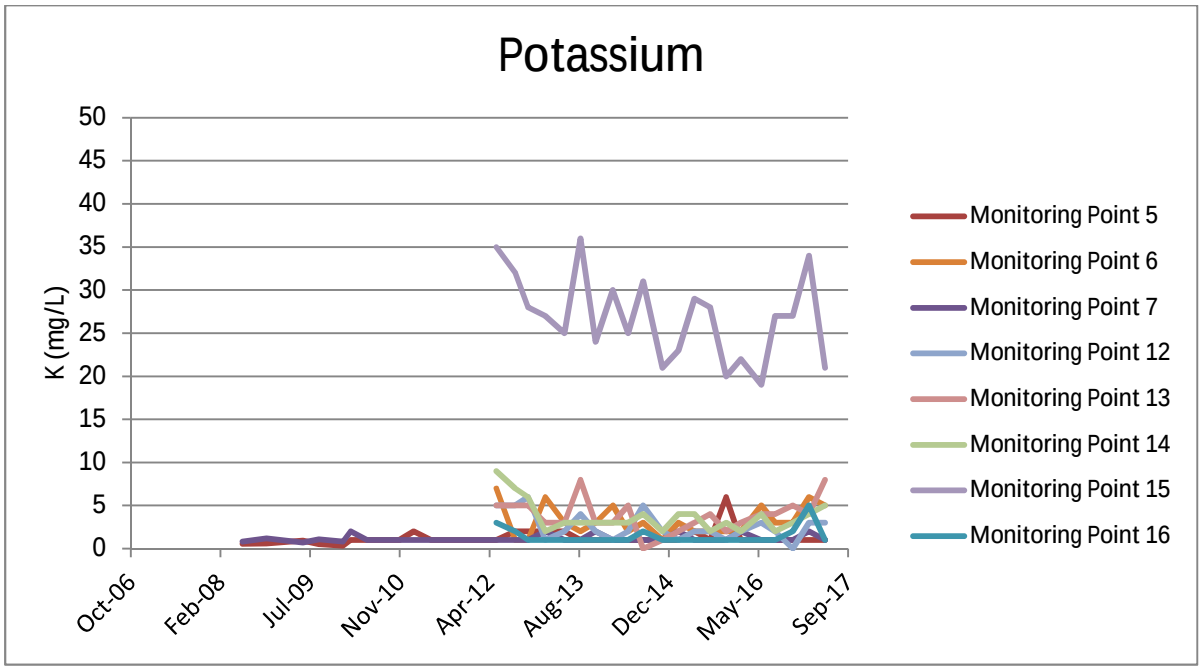
Groundwater monitoring well results are in line with historical levels and have maintained consistent levels with the exception of point 5 (located up gradient of the site) and Point 6 (located east of the pony club site). However, point 5 & 6 are still considered to be at relative low levels. The magnesium levels sampled would be considered 'soft' in the 0-60mg/L area. 'Hard' water would be considered in the region of 120-180mg/L.

3.2.1.1(e) Nitrogen as ammonia



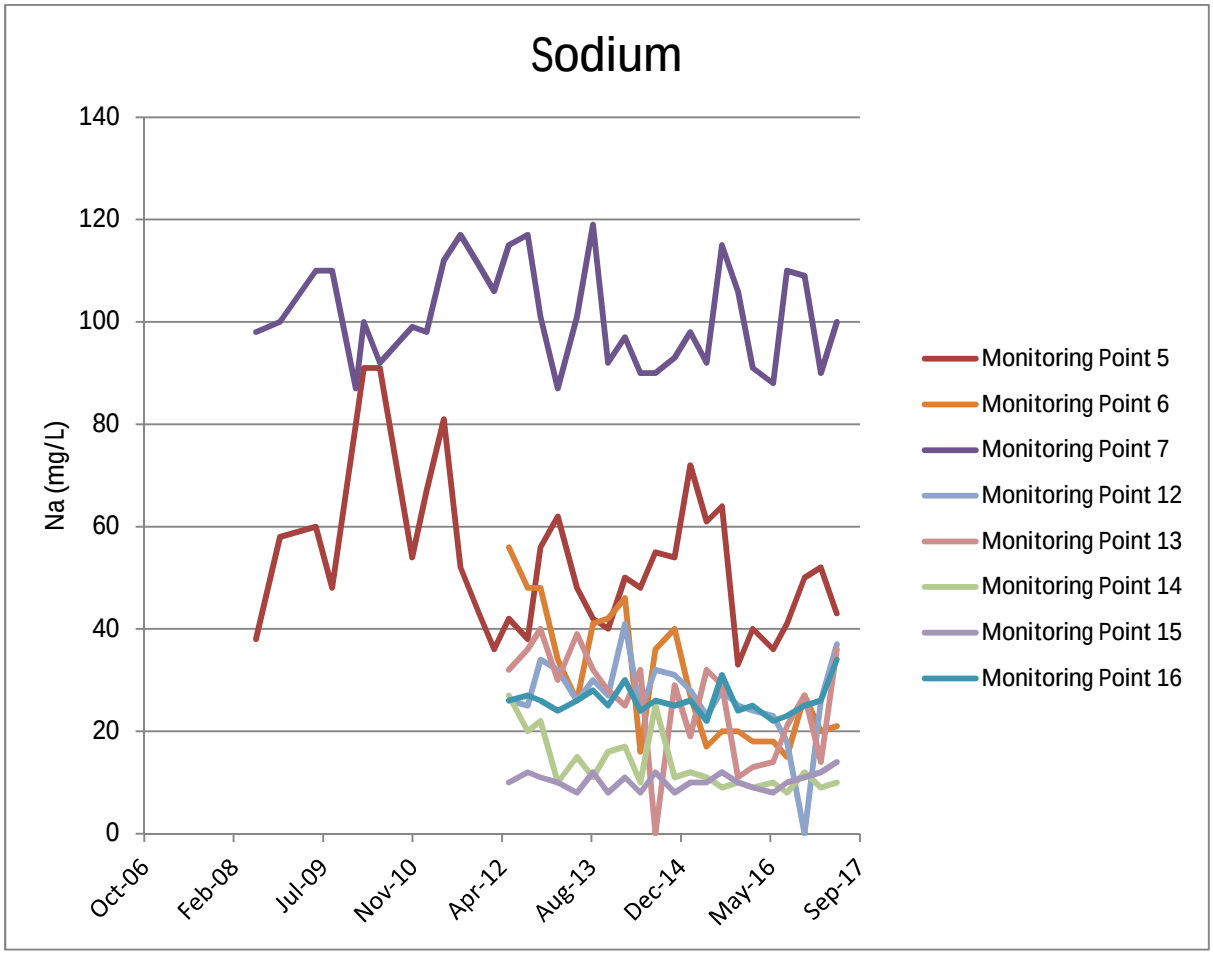
The groundwater monitoring wells for this reporting period show that the results are tracking in line with expectations derived from previous years data. The relatively low results for ammonia in down gradient Monitoring Points indicate that the groundwater departing the site is not affected by Ammonia, which is perhaps the clearest signature of leachate.

3.2.1.1(f) Potassium



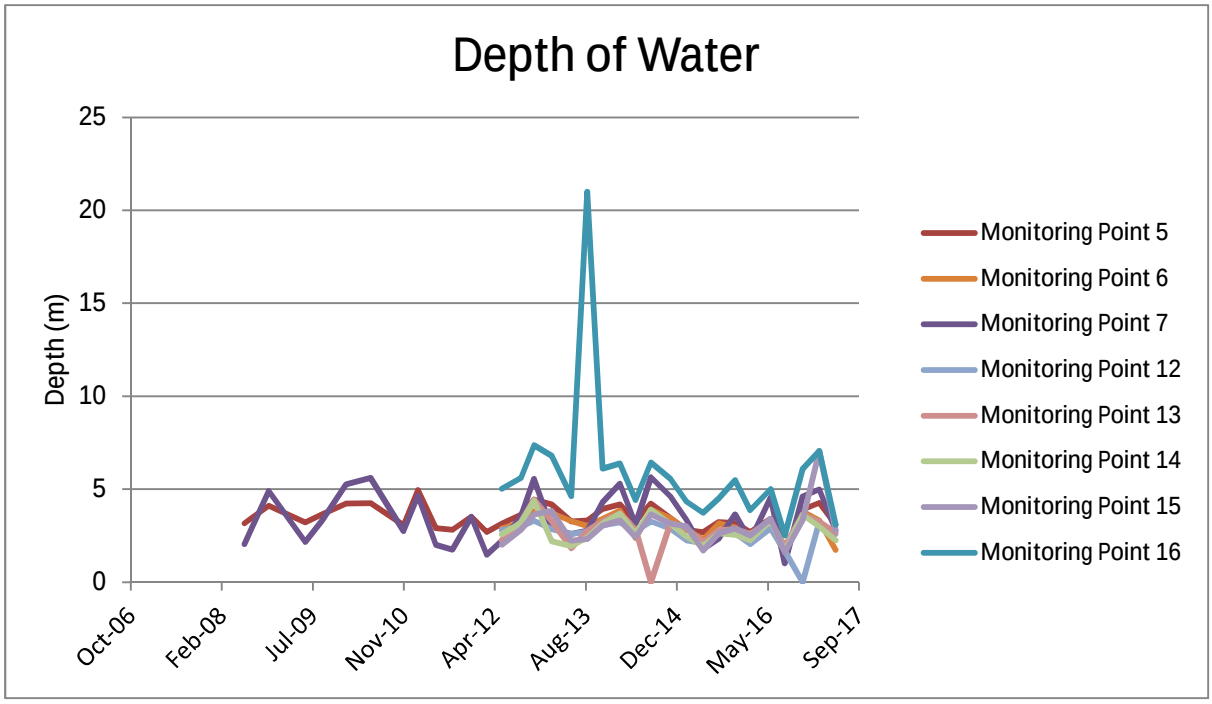
Potassium is present in groundwater systems outside coastal areas generally through weathering of clays and agricultural purposes (leaching of fertiliser). Potassium may also be present in the breakdown of glass and especially cathode ray tubes. Analytical results indicate that potassium levels in the groundwater have not increased relative to historic levels over the available results period. The breakdown of clay materials on the down gradient slope towards the Hacking River may be the reason for the relative elevation of potassium in monitoring point 15.

3.2.1.1(g) Sodium



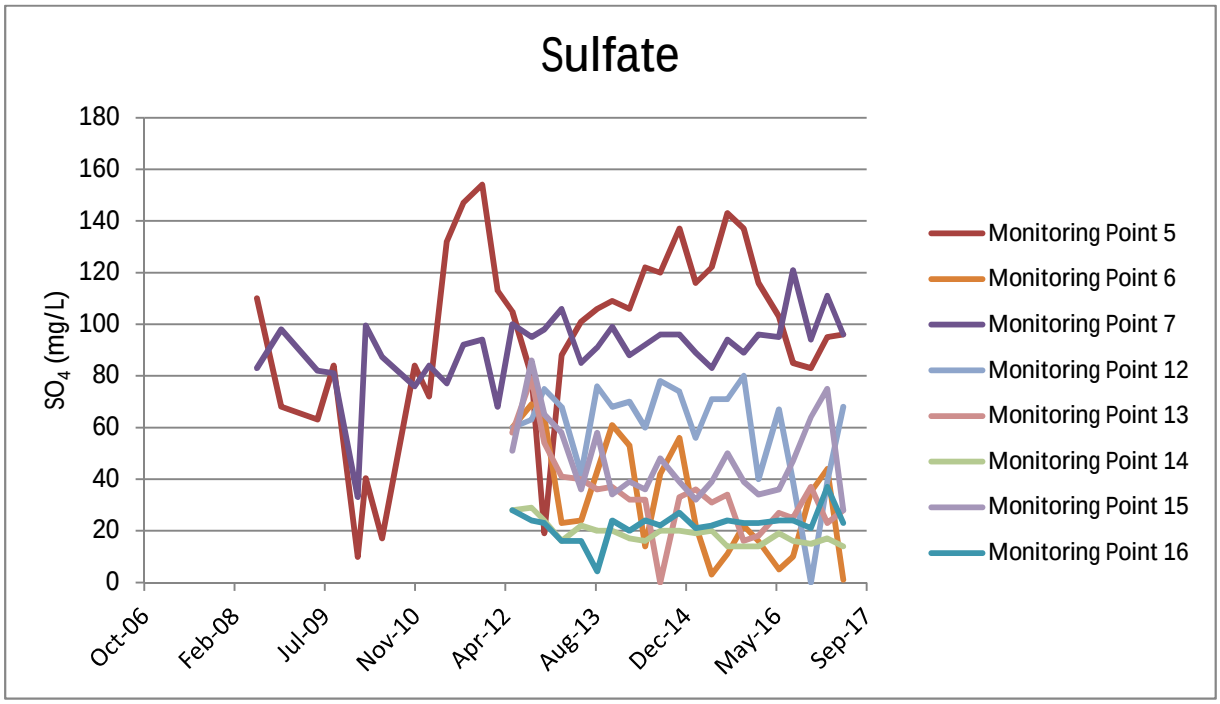
The trend for sodium has been below 120mg/L over the history of available results. High sodium levels are another indicator of leachate infiltrating the groundwater. The *2011 Australian Drinking Water Guidelines 6* set a maximum level of sodium in drinking water at 180mg/L for aesthetic reasons. The sodium results experienced in the groundwater at Helensburgh indicate that the groundwater is not contaminated by leachate.

3.2.1.1(h) Standing water level



Groundwater level trends have been fairly stable albeit a spike in August 2013, following this (note: given the large depth, this result is probably erroneous) levels returned to normal. Samples from this reporting period appear consistent across the numerous monitoring points.

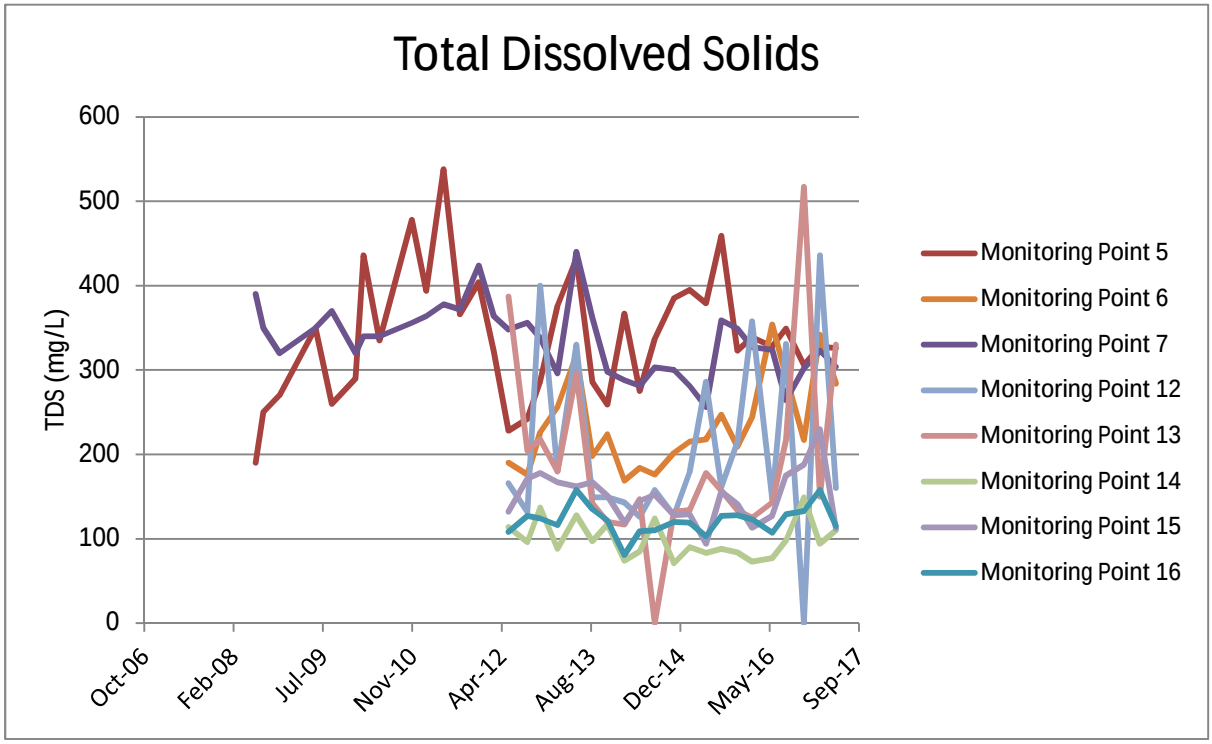
3.2.1.1(i) Sulfate



The *2011 Australian Drinking Water Guidelines 6* sets maximum sulfate levels in drinking water as 500mg/L. The sulfate levels in the groundwater monitoring wells are in line with the historical levels and are below the drinkable water maximum standard. Inorganic ions such as sulfate provide a good

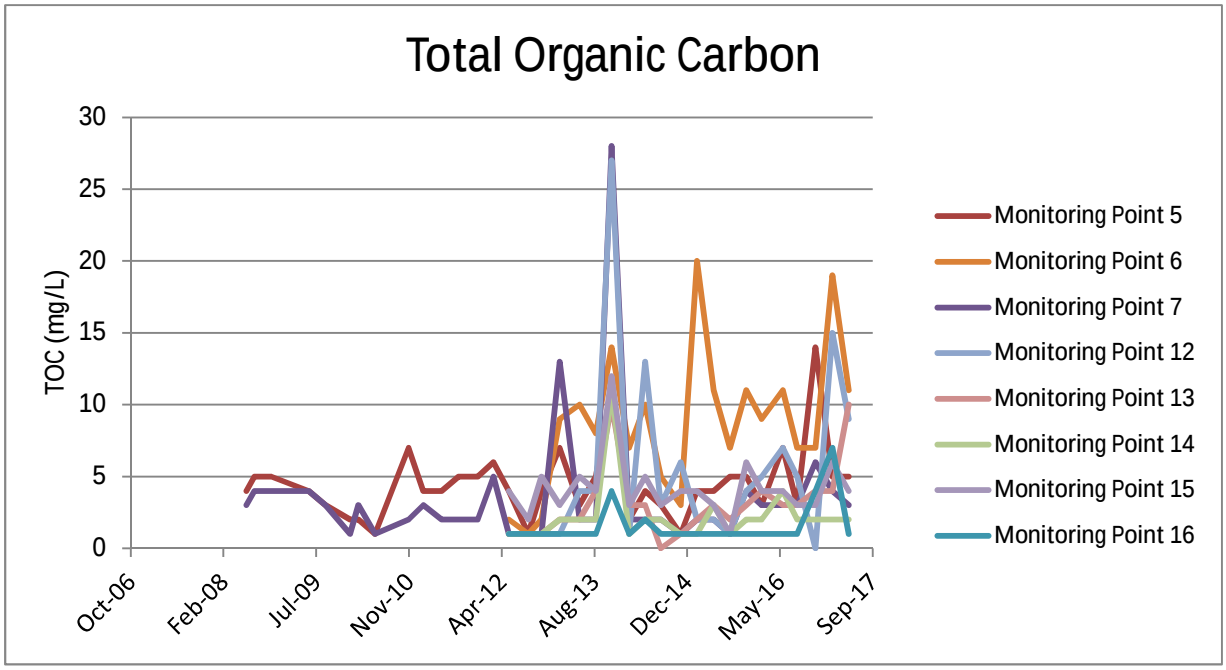
indication of groundwater contamination by landfill leachate. A sudden increase in these ions can act as early warning system.

3.2.1.1(j) Total dissolved solids



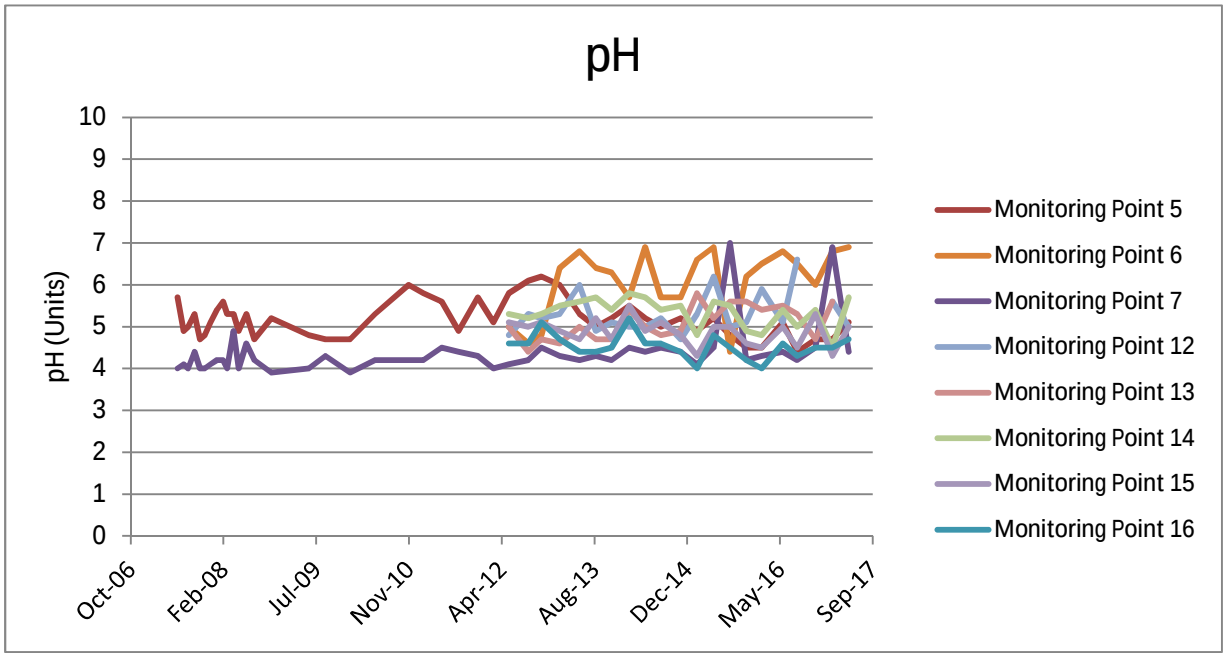
The *2011 Australian Drinking Water Guidelines 6* states that total dissolved solids levels of less than 600mg/L indicate good quality drinking water. The dissolved solids levels in the groundwater monitoring wells are in line with historical trends. High levels of dissolved solids can be sourced from salts derived from leachate infiltration. Monitoring Point 13 were slightly elevated in November 2016 but returned to normal levels in May 2017.

3.2.1.1(k) Total organic carbon



Microbial degradation of organic matter can increase the total organic carbon content in water and may provide evidence of groundwater contamination by organic compounds derived from the landfilling of organic matter. It should also be noted that organic materials have not been landfilled at the Helensburgh site since 1991.

3.2.1.1(l) pH

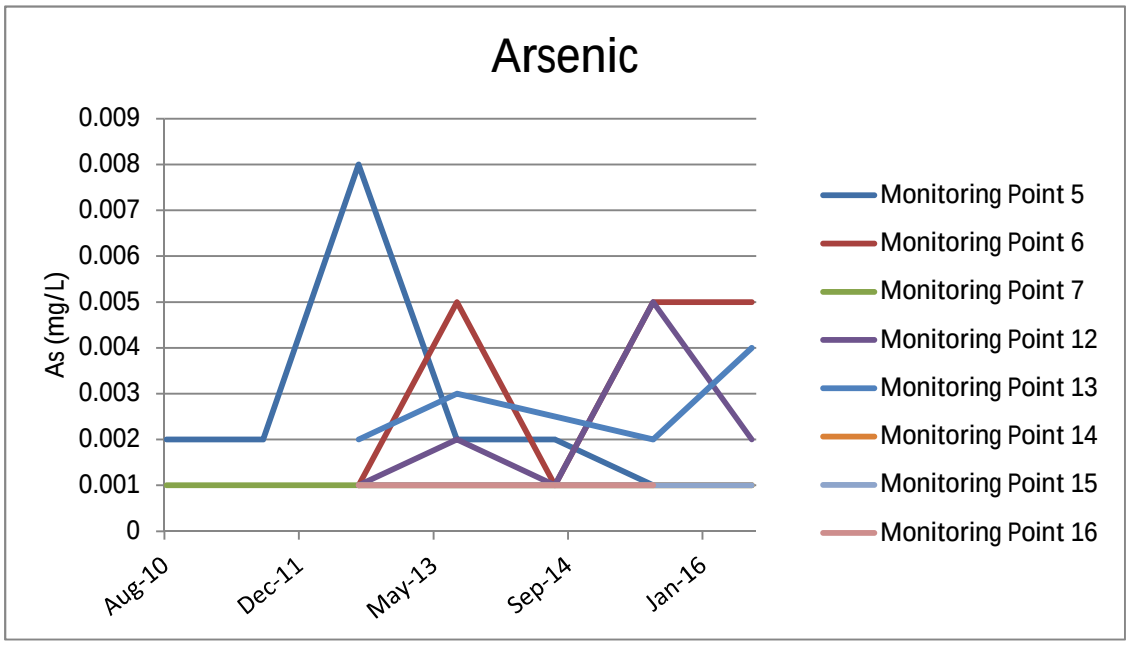


The pH levels indicated in the groundwater monitoring wells range from 4-7 units. The relatively low pH found naturally in the groundwater on site give an increased propensity for heavy metals to breakdown and travel through the groundwater system.

3.2.2 Data Presentation – Annual Monitoring

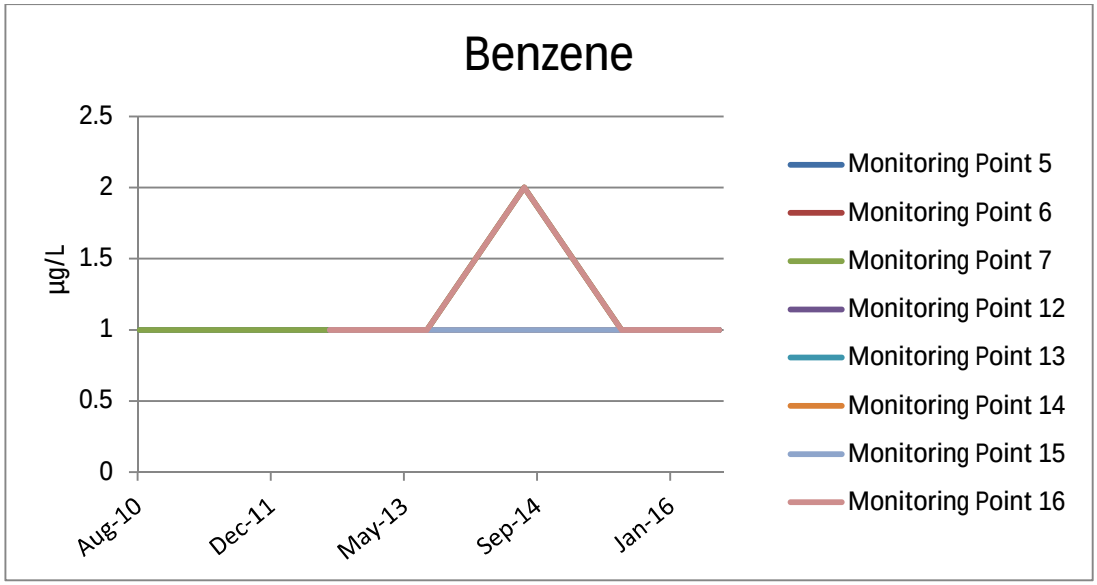
Many of the sampled analytes over the sampling period have displayed such low contamination level that the results have been near or below detectable limits. There is little sense in graphically displaying analytes that hover on or below laboratory detectable limits; therefore some analytes have been omitted from the graphical displays.

3.2.2.1 Arsenic



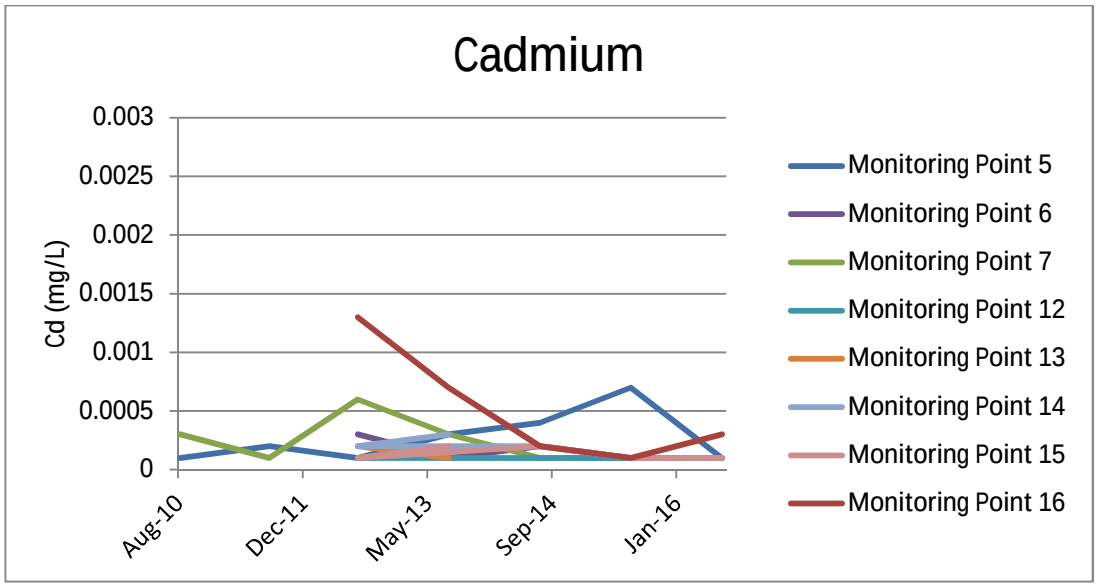
Results from this sampling period show that arsenic is present in extremely low concentrations.

3.2.2.2 Benzene



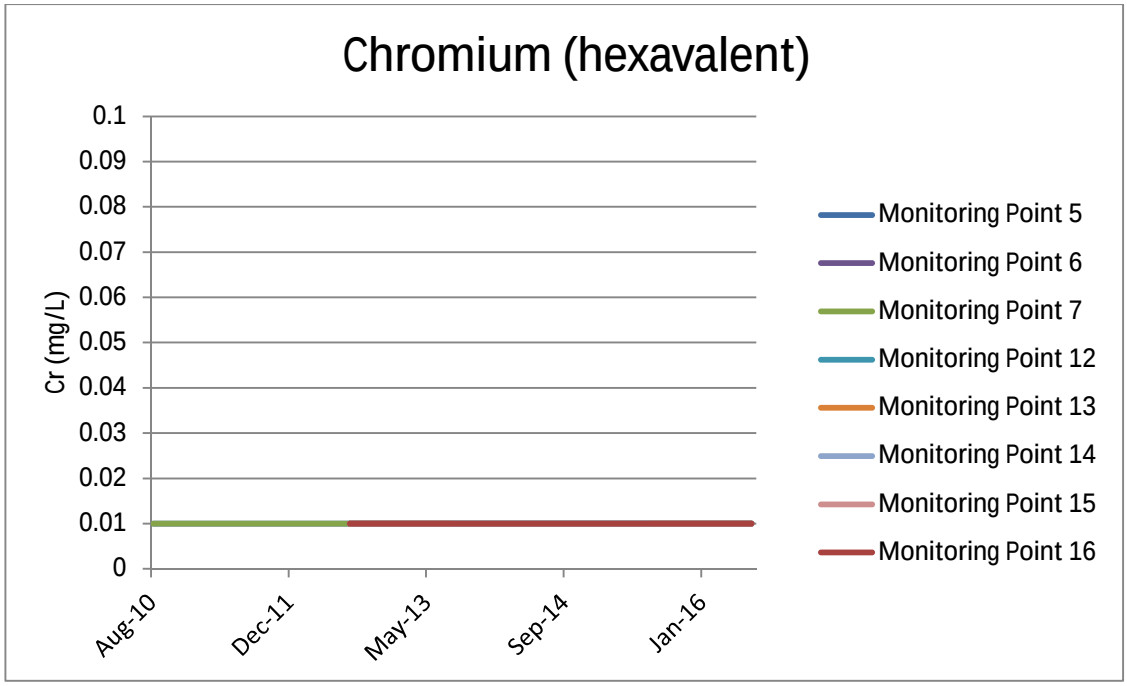
Results from this sampling period show that Benzene is present in minor concentrations all of which are extremely low or below detectability limits.

3.2.2.3 Cadmium



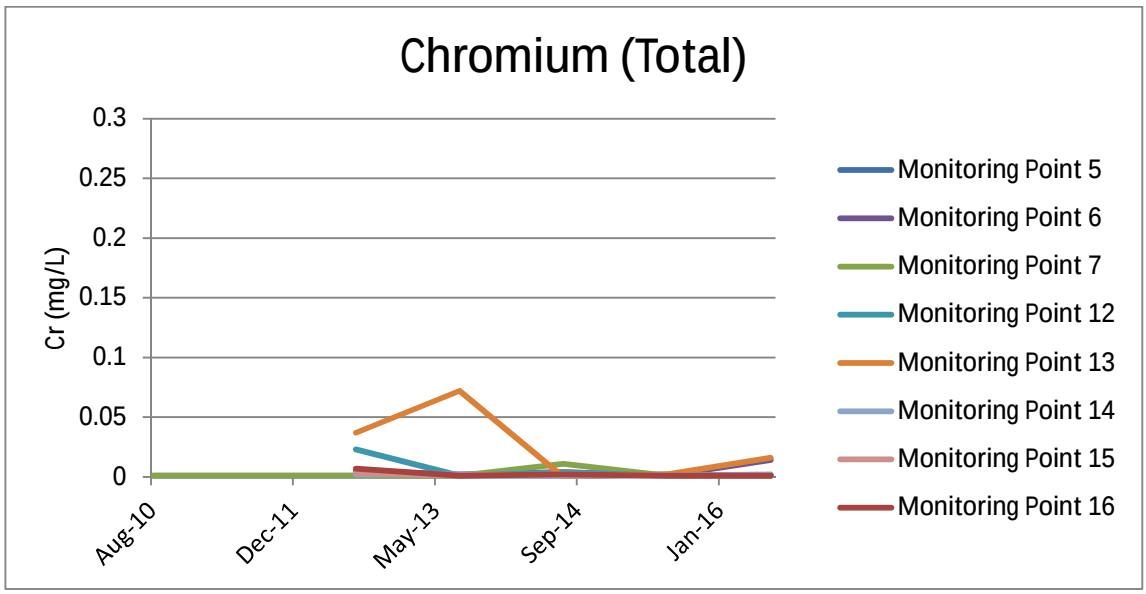
Results from this sampling period show that Cadmium is present in minor concentrations which are very low.

3.2.2.4 Chromium (hexavalent)



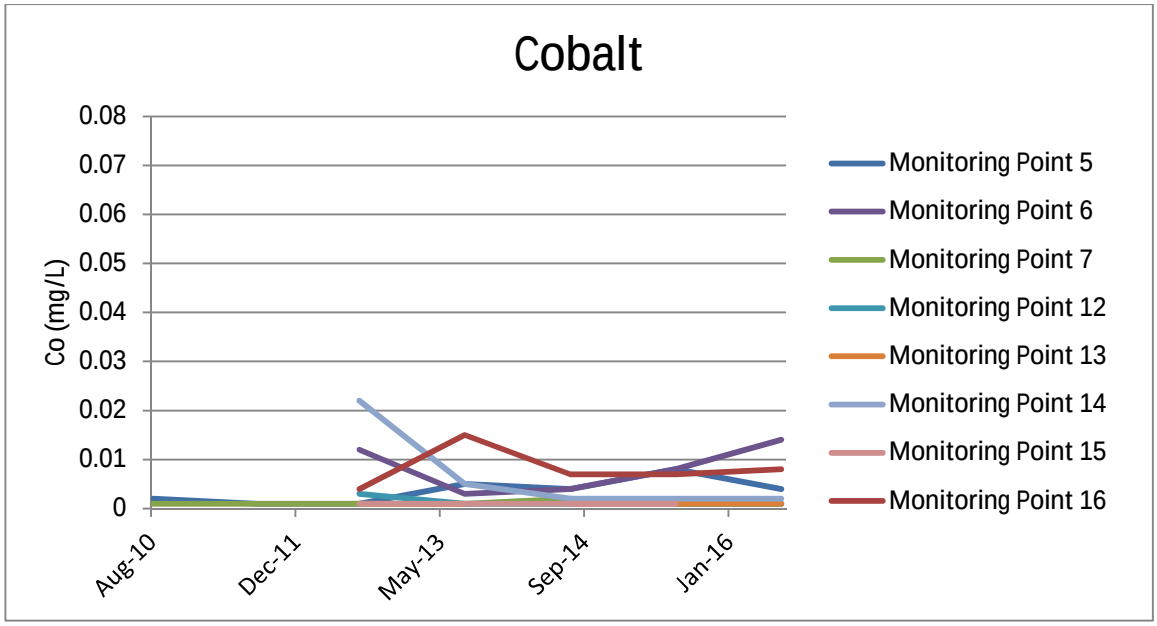
Results from this sampling period show that Chromium is not present at the site.

3.2.2.5 Chromium (total)



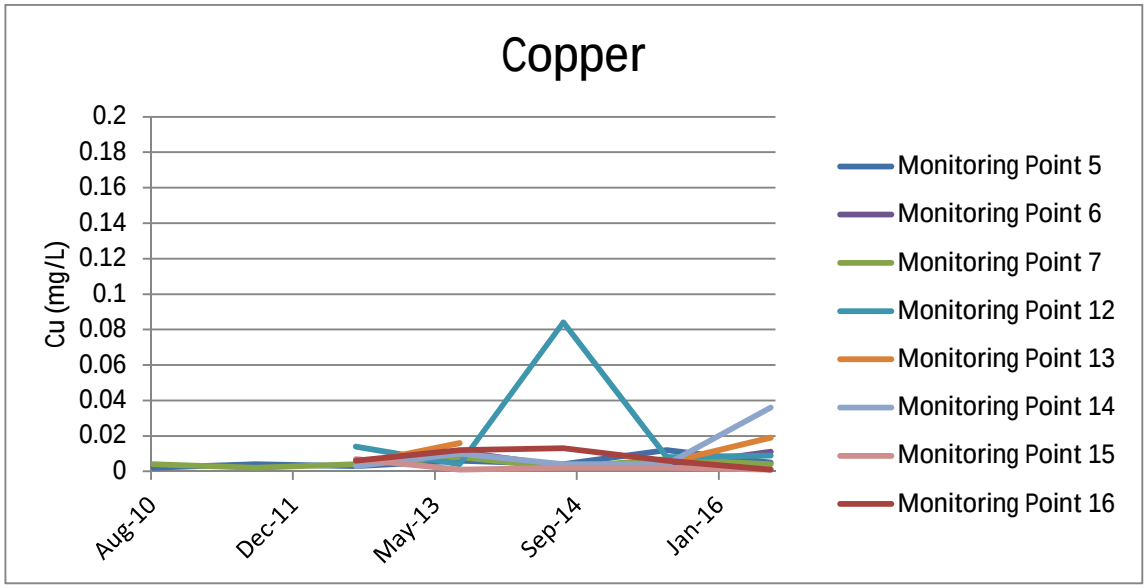
Results from this sampling period show that Chromium contamination is extremely unlikely.

3.2.2.6 Cobalt



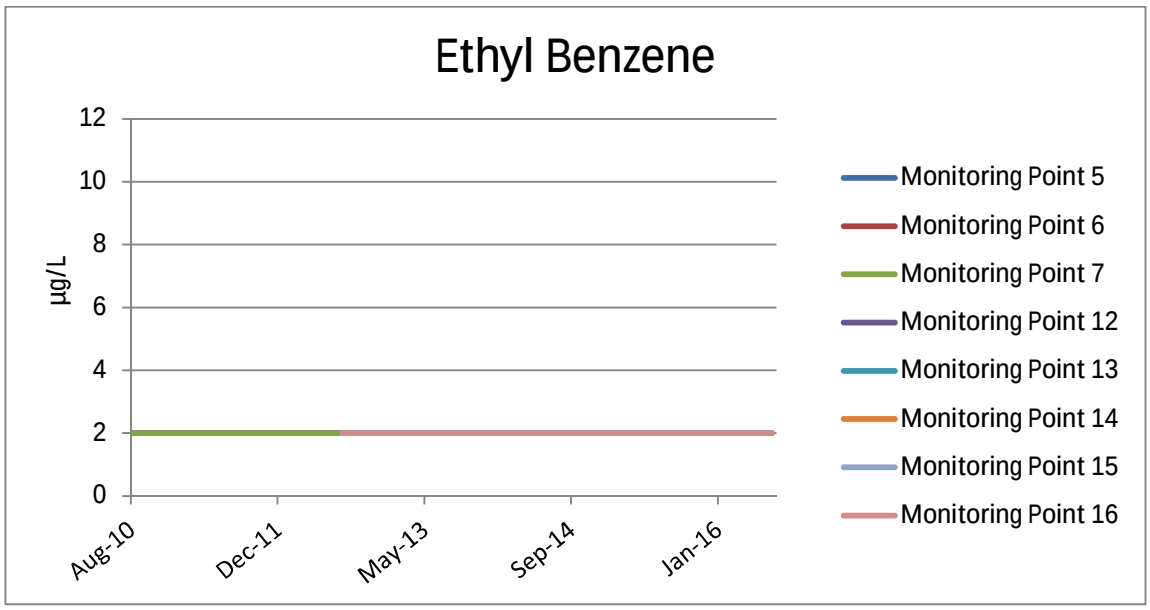
Results from this sampling period show that Cobalt is present in minor concentrations which are quite low.

3.2.2.7 Copper



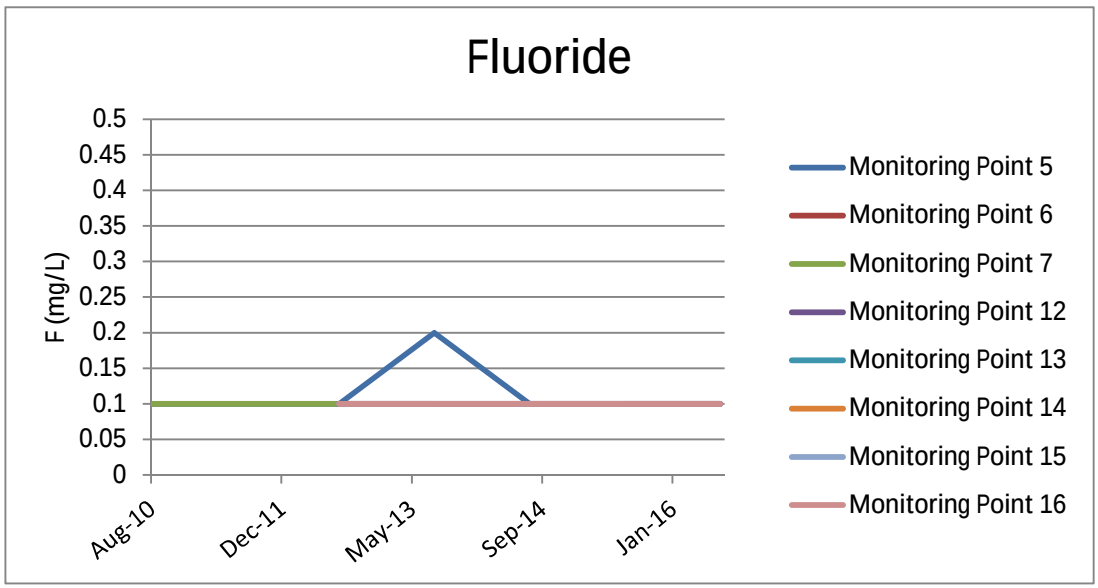
Results from this sampling period show that Copper contamination levels are extremely low. Monitoring point 12 has returned to the lower levels following the elevated result in September 2014.

3.2.2.8 Ethyl benzene



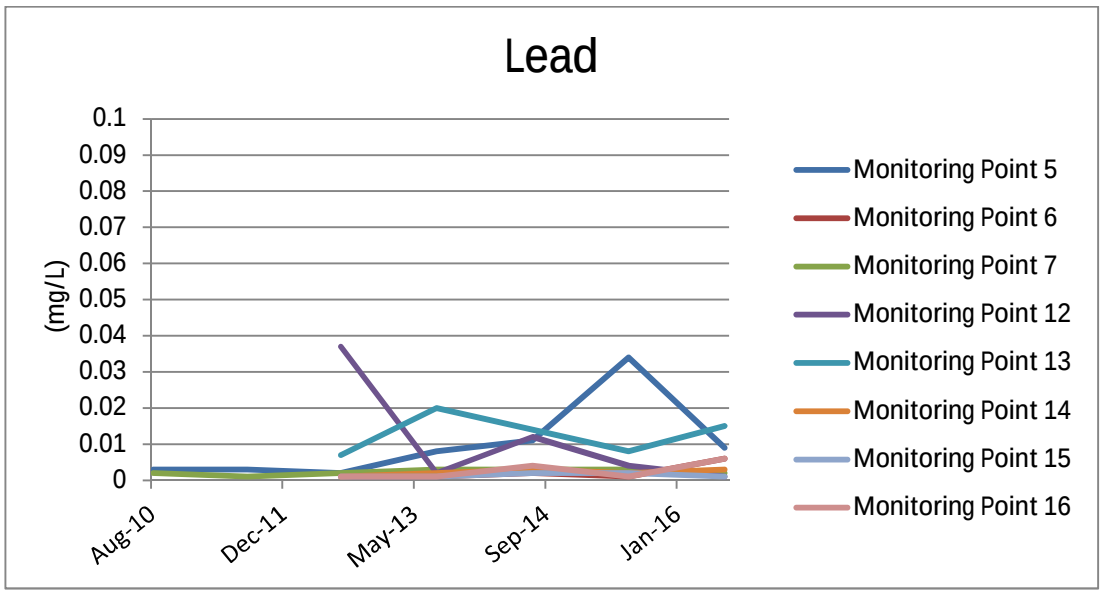
Ethyl Benzene results are invariably so low that they are undetectable in laboratory testing.

3.2.2.9 Fluoride



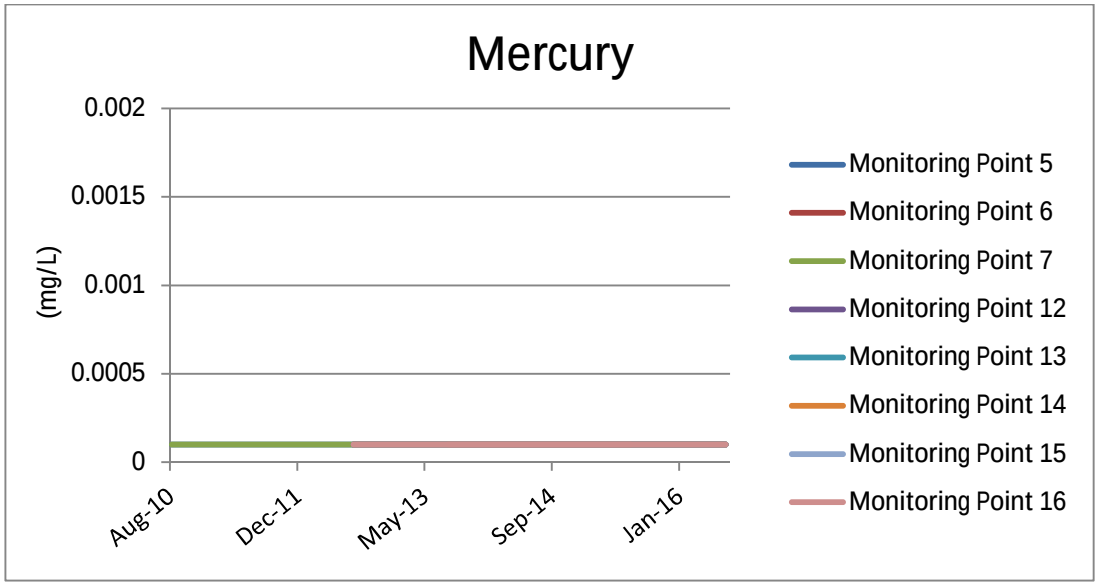
Fluoride levels are extremely low on the site

3.2.2.10 Lead



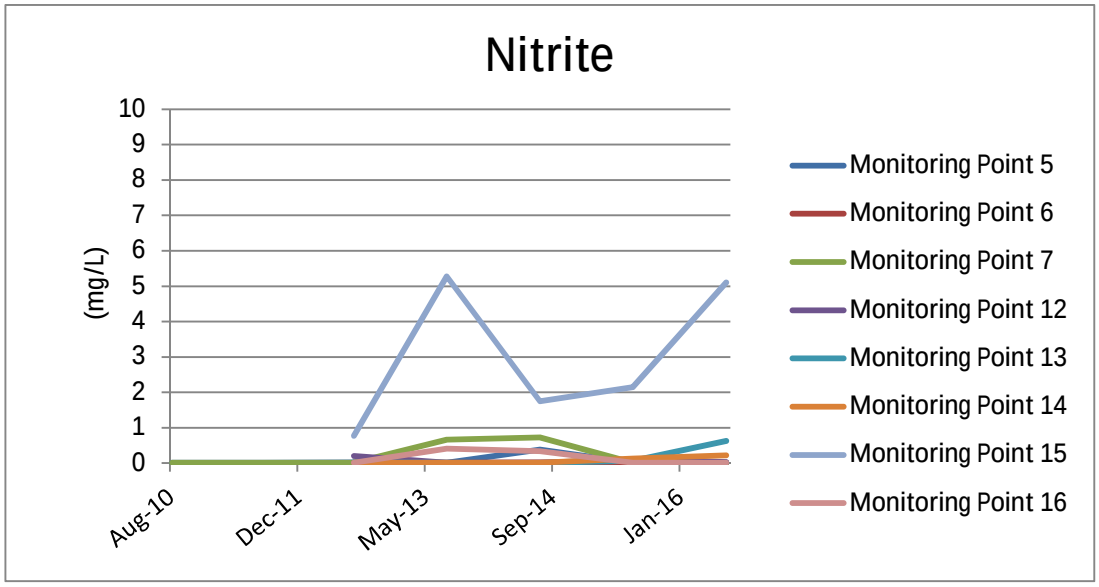
Results from this sampling period show that Lead is present in very low concentrations.

3.2.2.11 Mercury



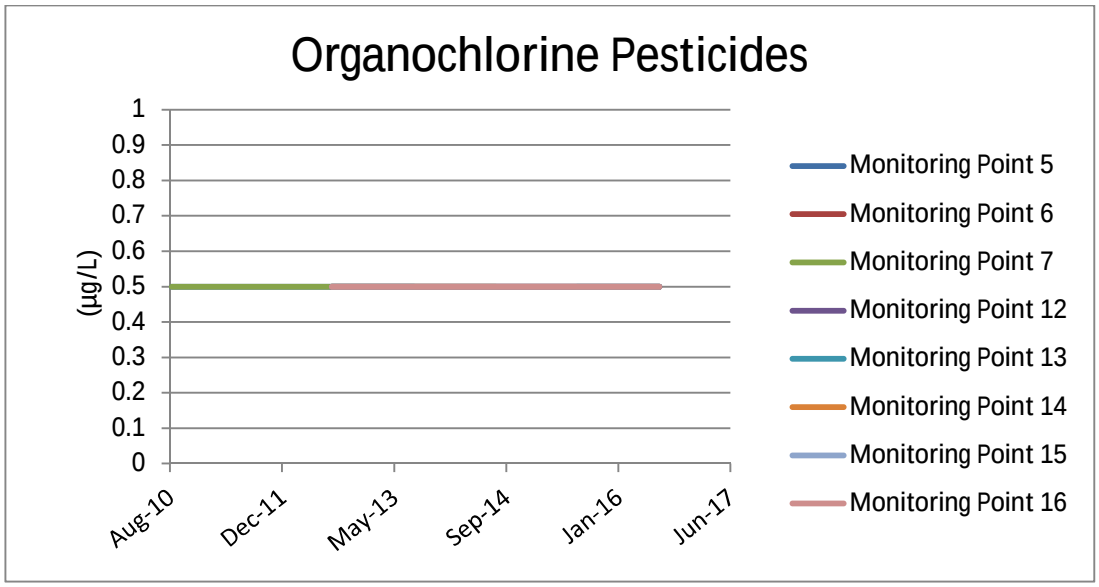
Mercury levels are consistently below detectability limits.

3.2.2.12 Nitrite



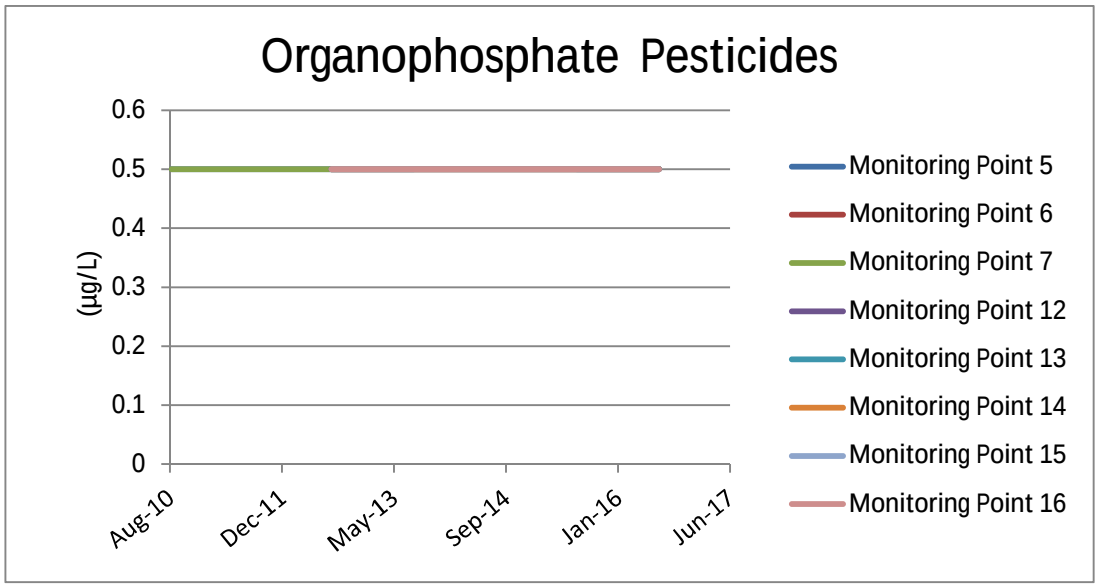
Results from this sampling period show that Nitrite is present in minor concentrations which are quite low. Monitoring Point 15 demonstrates an outlying result from the group mean.

3.2.2.13 Organochlorine pesticides



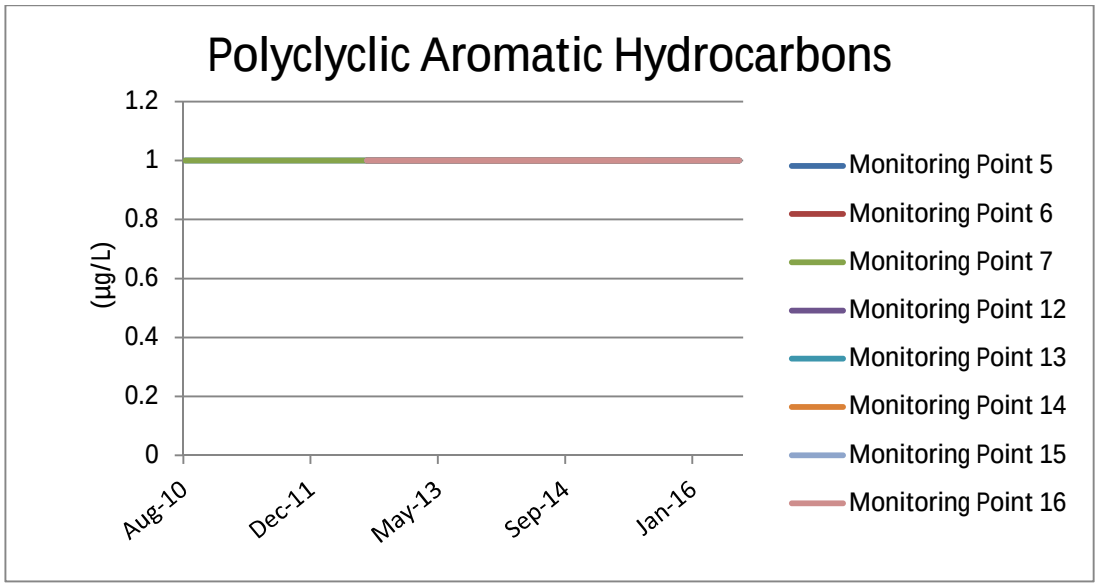
Results from this sampling period show that Organochlorine pesticides volumes at the site are below laboratory detectability limits.

3.2.2.14 Organophosphate pesticides



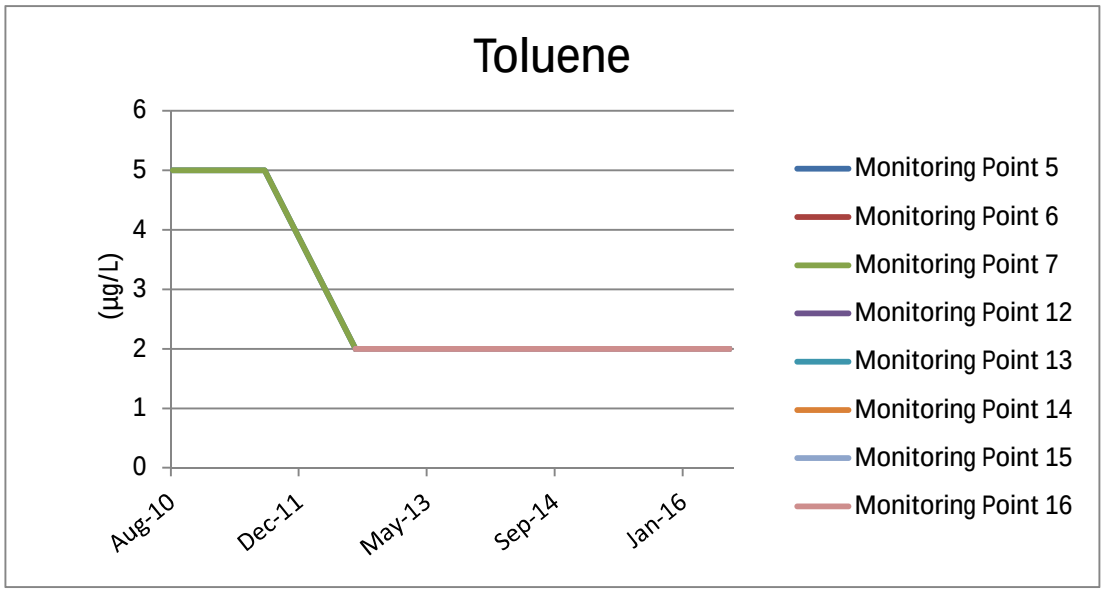
R Results from this sampling period show that Organophosphate pesticides volumes at the site are below laboratory detectability limits.

3.2.2.15 Polycyclic aromatic hydrocarbons



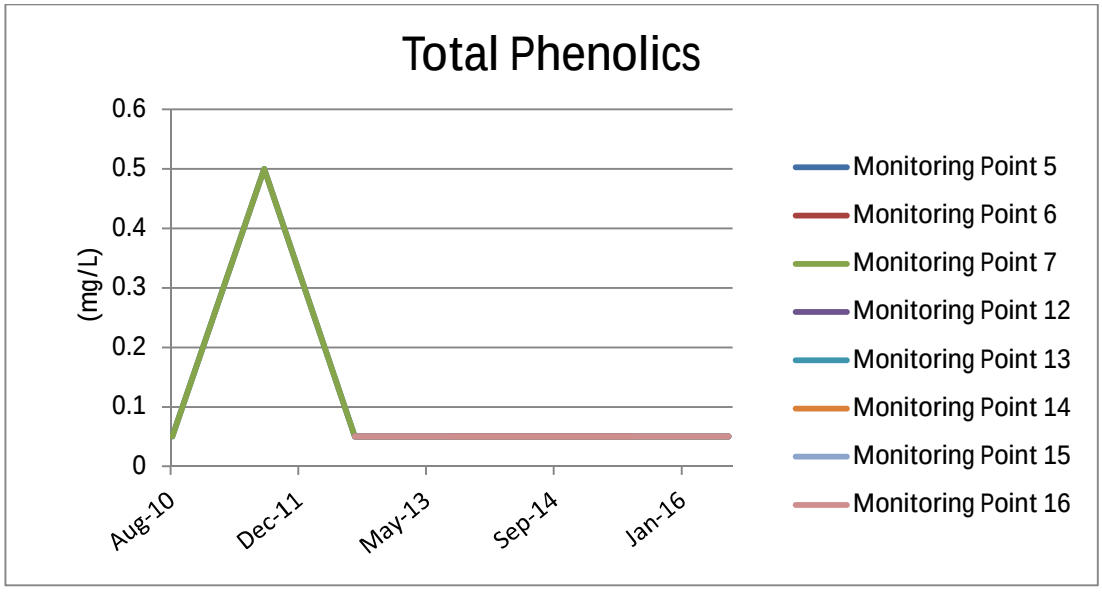
Results from this sampling period show that Polycyclic Aromatic Hydrocarbons volumes at the site are below laboratory detectability limits.

3.2.2.16 Toluene



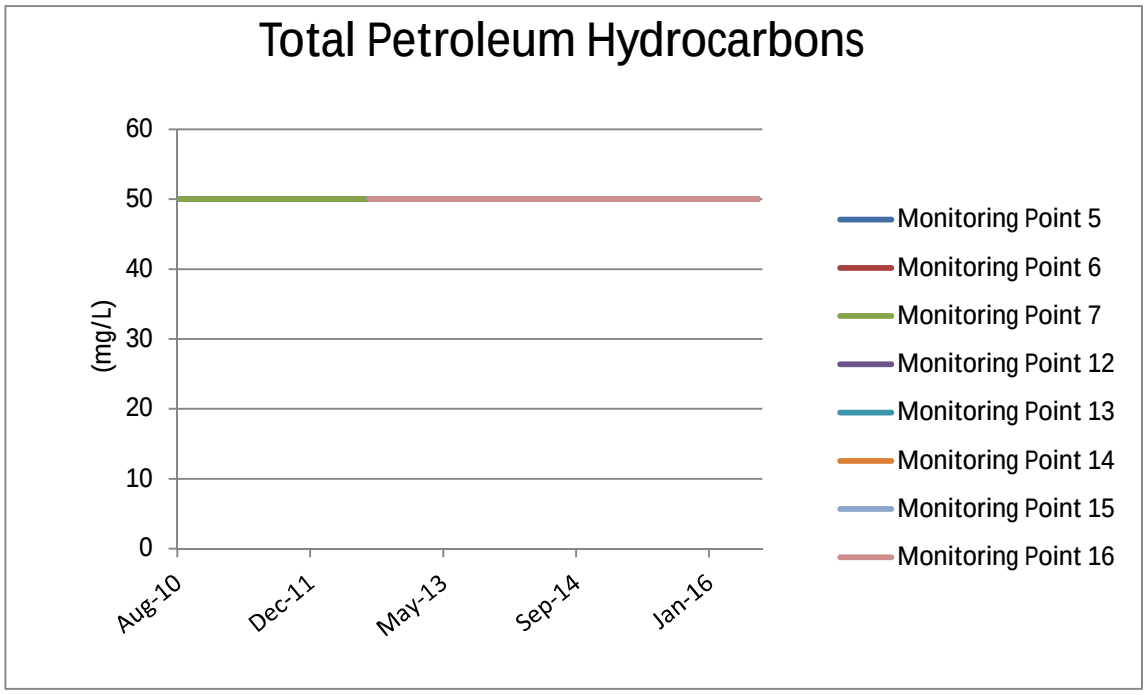
Results from this sampling period show that Toluene is present in minor concentrations which are quite low.

3.2.2.17 Total Phenolics



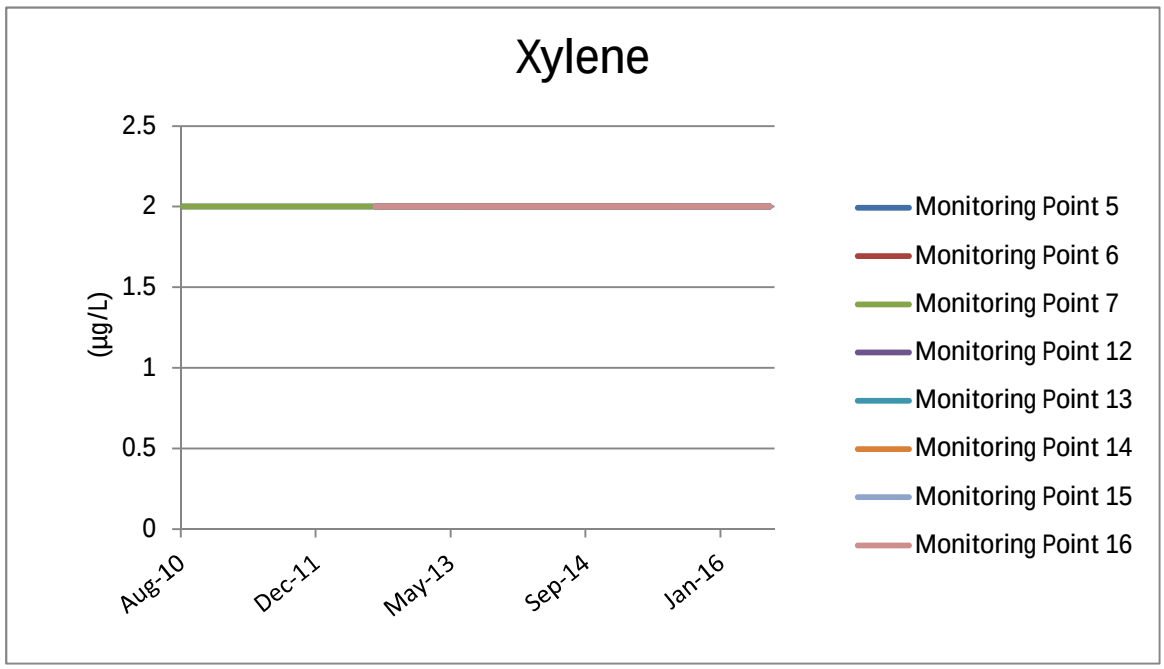
Results from this sampling period show that Total Phenolics is present in minor concentrations which are quite low.

3.2.2.18 Total Petroleum Hydrocarbons



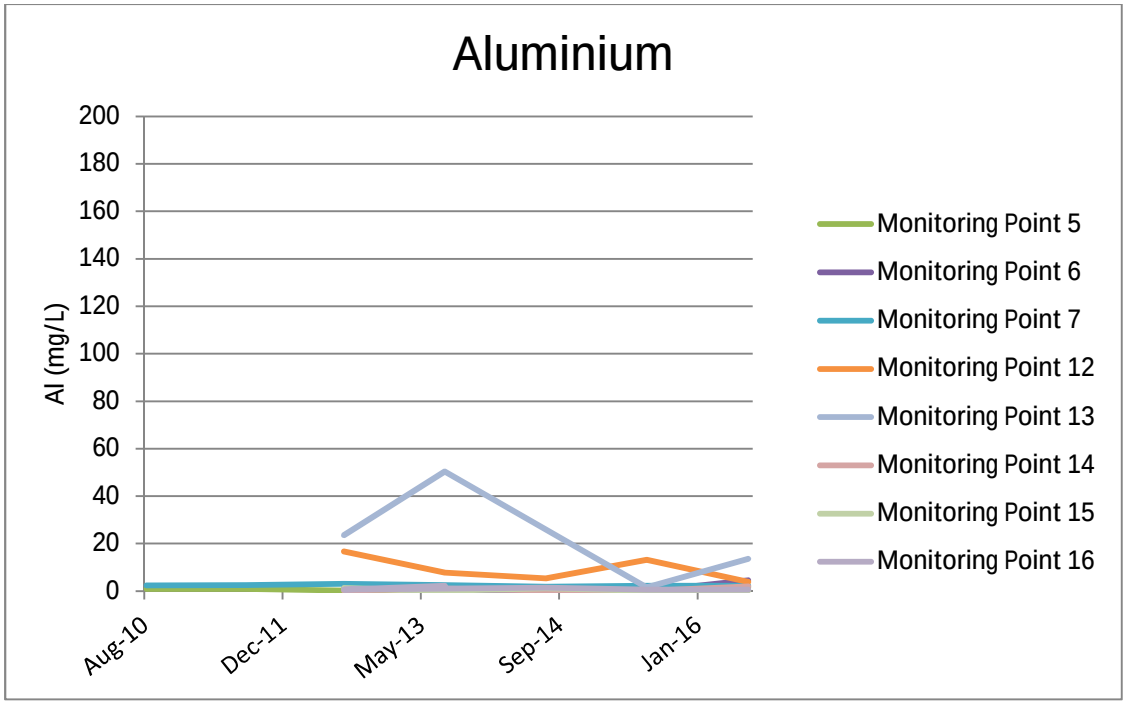
Results from this sampling period show that Total Petroleum Hydrocarbon volumes at the site are below laboratory detectability limits.

3.2.2.19 Xylene



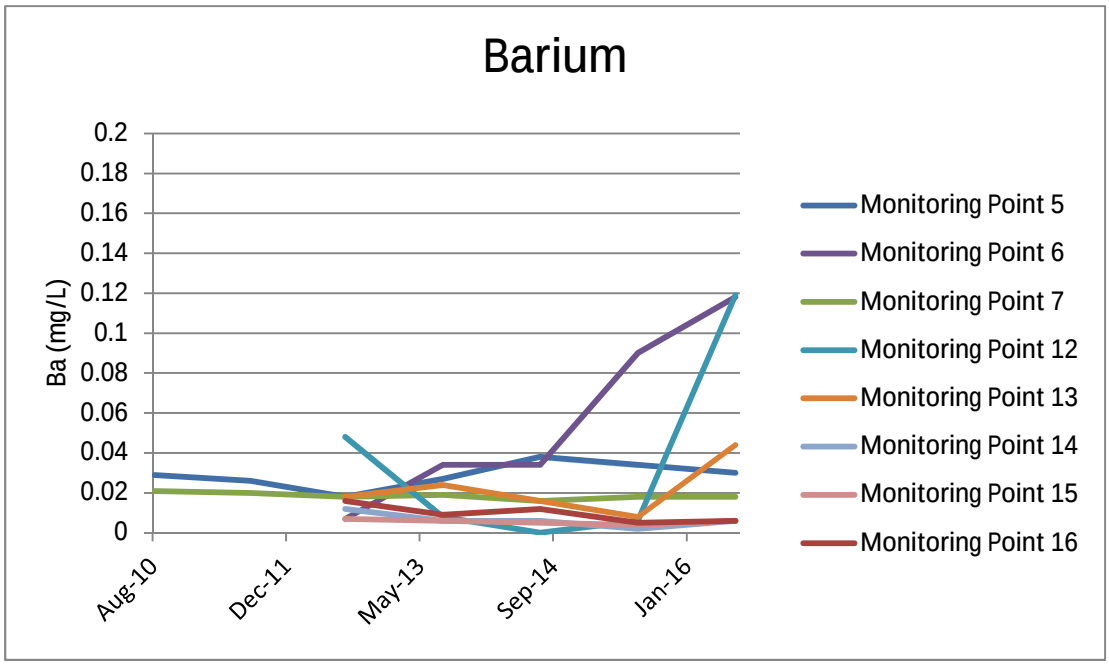
Results from this sampling period show that xylene volumes at the site are below laboratory detectability limits.

3.2.2.20 Aluminium



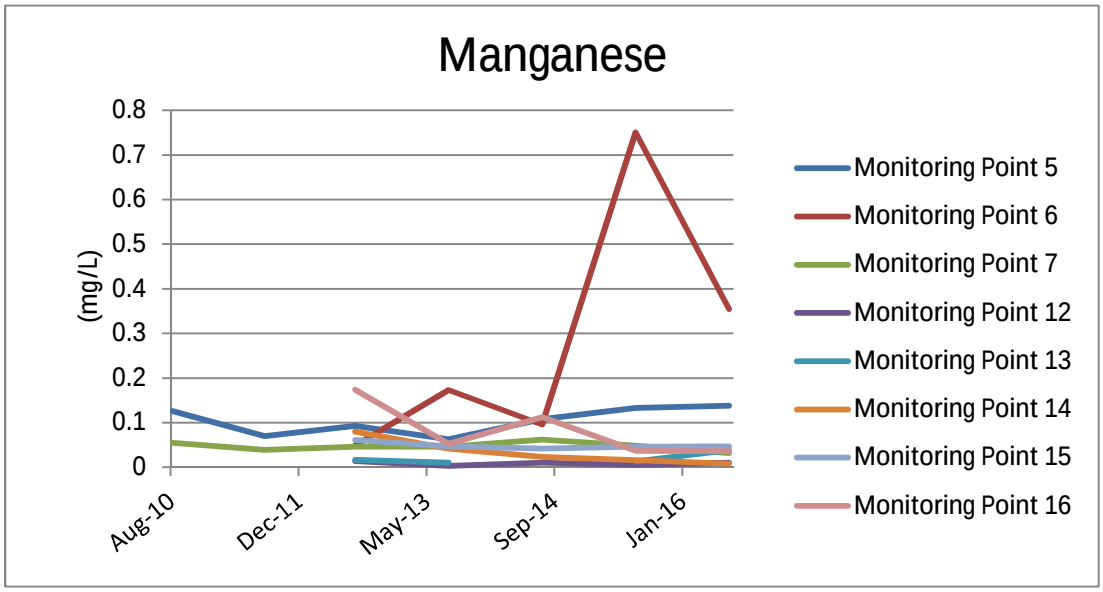
Aluminium levels in the sampled groundwater monitoring wells have traditionally been maintained at a consistent low level. However, relative higher levels of aluminium detected in Monitoring Points 12 and 13 in 2013 which both represent the groundwater flow prior to intercepting the former landfill site. Anthropogenic sources of aluminium in groundwater are generally related to low pH runoff and colliery based leachate.

3.2.2.21 Barium results presentation



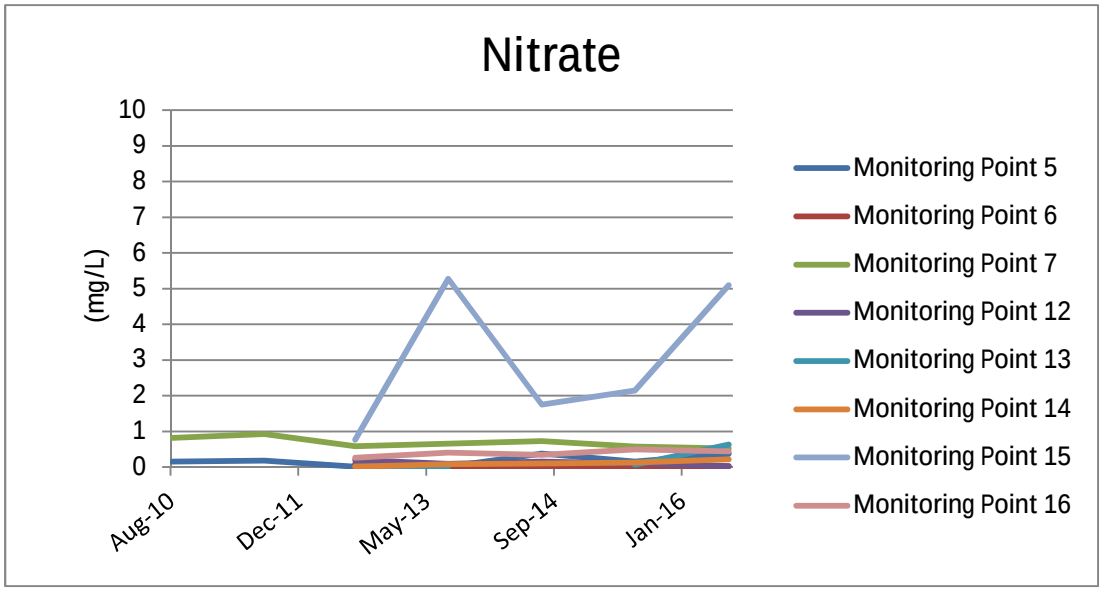
The *2011 Australian Drinking Water Guidelines 6* states that a maximum of 2 mg/L of barium is safe for consumption. Anthropogenic sources of barium in groundwater include bleaches, dyes and drillers mud. Barium levels are therefore extremely low and relatively stable in the sites groundwater.

3.2.2.22 Manganese results presentation



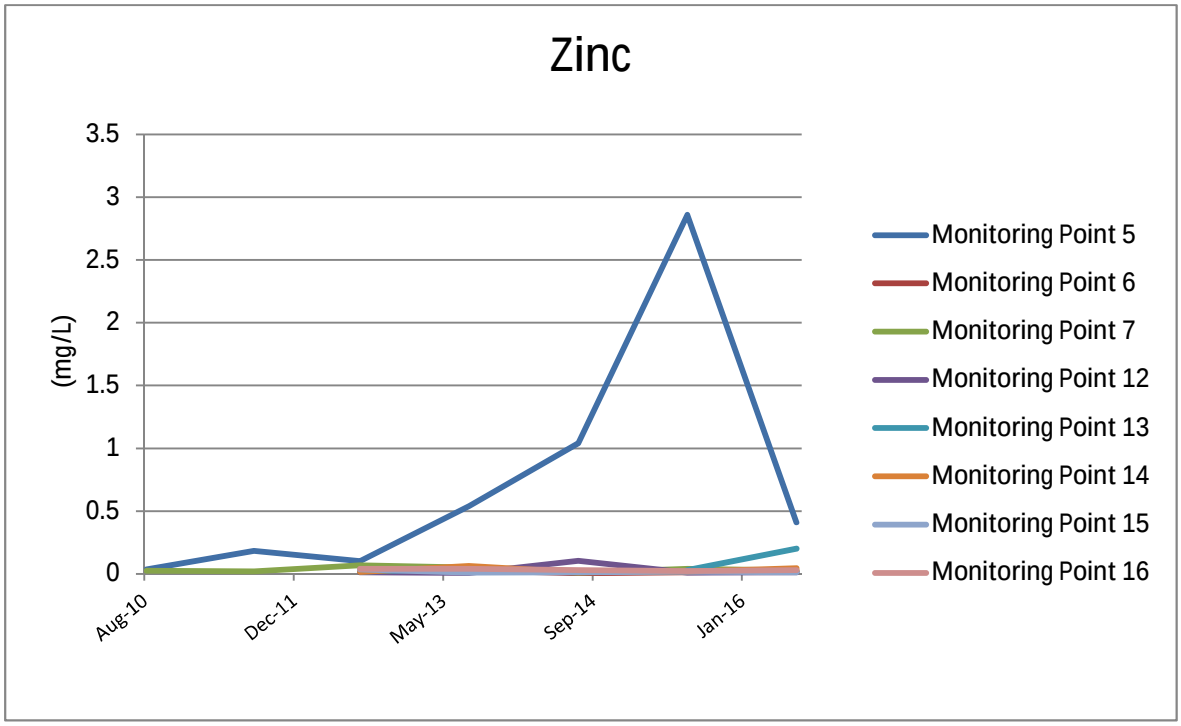
The *2011 Australian Drinking Water Guidelines 6* states that a maximum of 0.5 mg/L of manganese is safe for consumption. Manganese can be a strong indicator of landfill leachate in groundwater leached from hazardous waste sites and often derived from battery disposal.

3.2.2.23 Nitrate results presentation



The *2011 Australian Drinking Water Guidelines 6* states that a maximum of 50 mg/L of nitrate is safe for consumption. Denitrification is a process common in leachate treatment with the anaerobic biological reduction of nitrate (NO_3) to nitrogen (N_2) in its gaseous form. Under anoxic conditions microorganisms consume the oxygen in the nitrate and liberate the nitrogen. The relatively low levels of nitrate sampled particularly in downstream monitoring points 6, 7 and 15, indicate that landfill leachate is not present in the groundwater.

3.2.2.24 Zinc results presentation



The *2011 Australian Drinking Water Guidelines 6* states that for aesthetic reasons a maximum of 3 mg/L of zinc is desirable for consumption. Landfill sites can be an anthropogenic source of zinc in groundwater, however the extremely low levels of zinc detected indicate that landfill leachate is not intercepting the groundwater system around the site. Monitoring Point 5 is showing a rapid decrease. This sample Point is upstream of the landfill in respect to the flow of groundwater.

3.2.3 Groundwater Testing Results Interpretation

Results indicate that there has been no definitive increase in concentration levels for any of the analytes detailed when compared to the historical results and trends (where available). Key indicators of landfill leachates potential ingress into ground water including ammonia, nitrate, nitrite levels and other less poignant indicators as tested do not conclude that that landfill leachate is entering the surrounding ground water system.

3.3 TRADE WASTE MONITORING RESULTS

As required in Clause M6.2 in the sites sampling in accordance with Wollongong City Councils Trade Waste Agreement with Sydney Water are tabulated below

DATE	Unit	20/7/2016	23/9/2016	17/11/2016	12/1/2017	16/3/2017	17/5/2017
Meter Reading (start)		26839.75	29299.96	30872.99	31054.01	31697	34710
Meter Reading (finish)		26877.05	29326.77	30886.65	31057.05	31751	34747
TWDF		100	100	100	100	100	100
Volume Dishcharged	KL	37	37.3	26.8	13.7	3.04	54
Volume Dishcharged (corrected)	KL	37.6	37.3	26.8	13.7	3.04	54
Discrete Start pH (start)	pH unit	7.5	7.2	7.4	7	6.8	7.2
Total Dissolved Solids	mg/L	878	1010	1200	1040	734	780
Suspended Solids (SS)	mg/L	71	6	5	20	51	5
Iron	mg/L	25.9	0.61	0.97	4.38	16	0.22
Ammonia as N	mg/L	16.7	22.6	29.8	24.8	8.1	10.8
pH Finish	pH unit	7.5	7.4	7.3	7.4	6.7	7.5
Temperature	Celsius	19	16	18	25	23	23

3.4 LEACHATE POND MONITORING

3.4.1 Tabulated Results

As per the EPL, the leachate pond was monitored with the following results:

Analyte	Units	Aug- 16
Alkalinity (as Calcium Carbonate	mg/L	624
Aluminium	mg/L	0.19
Arsenic	mg/L	<0.001
Barium	mg/L	0.252
Benzene	µg/L	<1
Cadmium	mg/L	<0.0001
Calcium	mg/L	118
Chloride	mg/L	58
Chromium (Hexavalent)	mg/L	<0.01
Chromium (Total)	mg/L	0.001
Cobalt	mg/L	0.001
Conductivity	µS/cm	1380
Copper	mg/L	0.017
Ethyl Benzene	µg/L	<2
Fluoride	mg/L	0.1
Lead	mg/L	<0.001
Magnesium	mg/L	44
Manganese	mg/L	<0.112
Mercury	mg/L	<0.0001
Nitrate	mg/L	3.84
Nitrite	mg/L	0.13
Nitrogen (Ammonia)	mg/L	19.7
Organochlorine pesticides	µg/L	<0.5
Organophosphate pesticides	µg/L	<0.5
Phosphorus (Total)	mg/L	0.03
Polycyclic Aromatic Hydrocarbons	µg/L	<1
Potassium	mg/L	33
Sodium	mg/L	102
Sulfate	mg/L	24
Toluene	µg/L	<2
Total Phenolics	mg/L	<0.05
Total Dissolved Solids	mg/L	798
Total Organic Carbon	mg/L	19
Total Petroleum Hydrocarbons	µg/L	790
Total Suspended Solids	mg/L	6
Xylene	µg/L	<2
Zinc	mg/L	0.024
pH	pH	7

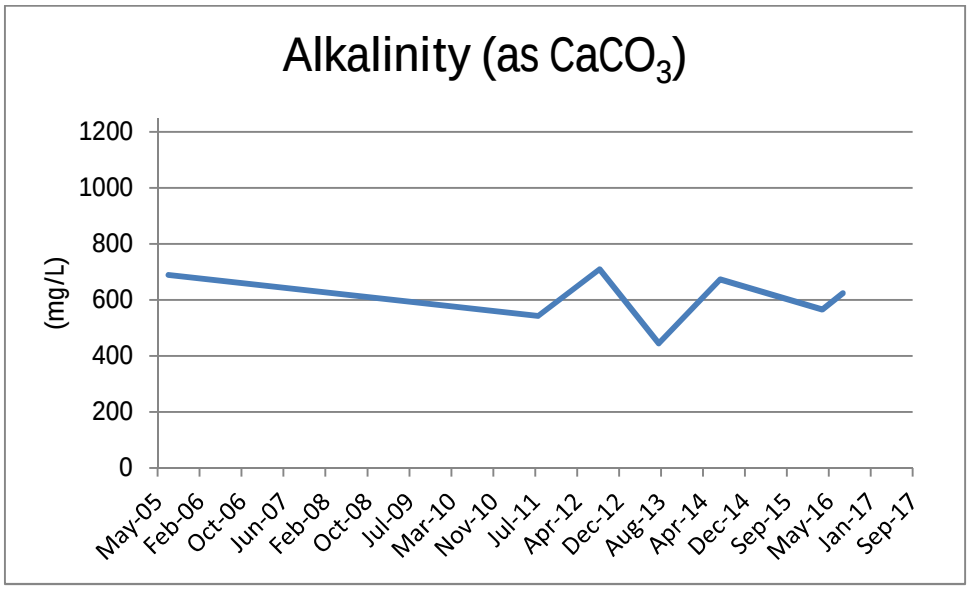
There is minimal history available for many of the analytes tested in the leachate dam at the Helensburgh Waste Disposal Depot. The data presented is only where there is a documented history of any results to draw comparisons to. All analytes that are sampled but not modelled are either near or below testable laboratory limits or isolated results that do not have historical data with which to compare.

3.4.2 Data Presentation

Please Note: only analytes with tangible results are modelled. Those not modelled below are:

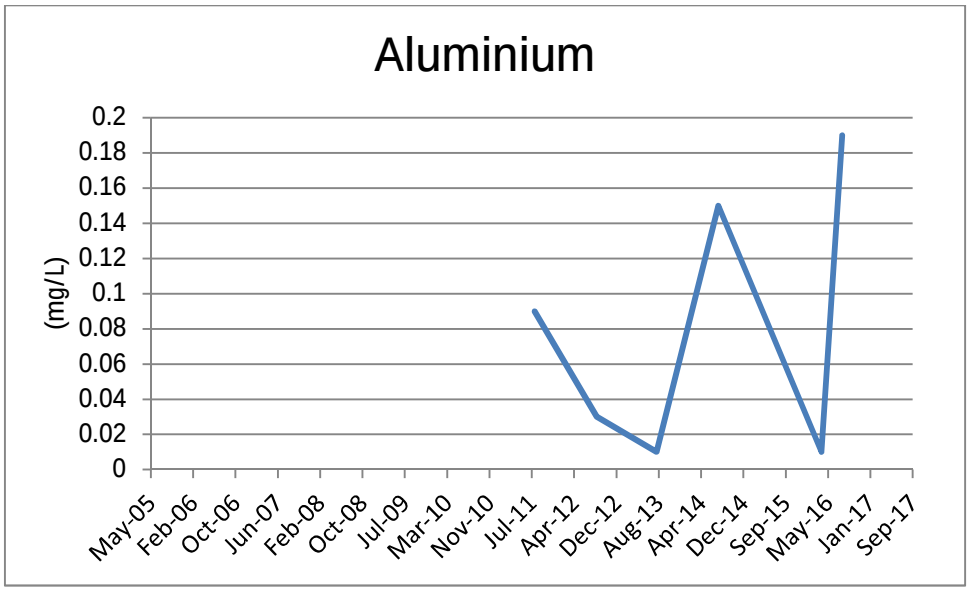
- Benzene
- Cadmium'
- Chromium (Hexavalent)
- Ethyl Benzene
- Lead
- Mercury
- Organochlorine pesticides
- Organophosphate pesticides
- Xylene
- Total Phenolics
- Toluene
- Polycyclic Aromatic Hydrocarbons

3.4.2.1 Alkalinity as Calcium



Alkalinity levels in the sites leachate are approximately 4 times higher than the highest groundwater result. Therefore indicating that leachate is probably not escaping the storage pond.

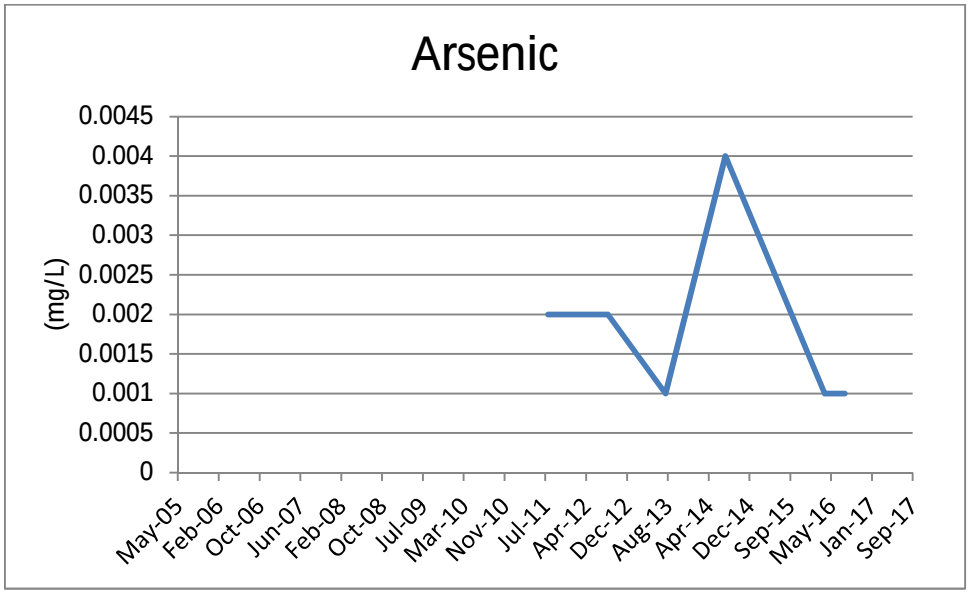
3.4.2.2 Aluminium



There are relatively low levels of Aluminium in the Leachate Pond. Samples in the boreholes surrounding the leachate dam are higher, but that does not conclude that there is leachate migration.

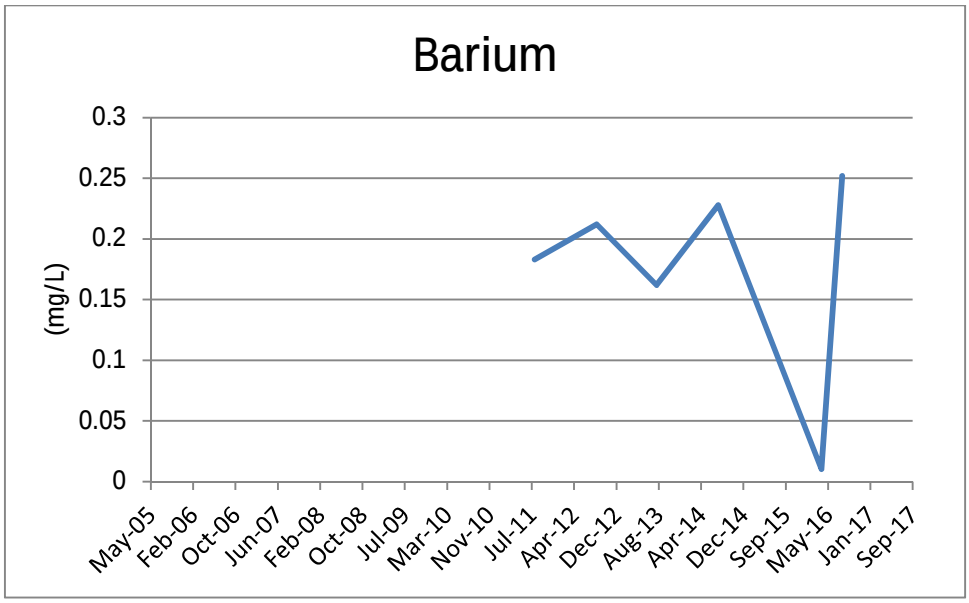
Aluminium samples will be closely monitored and assessed to determine if levels are continuing to increase.

3.4.2.3 Arsenic



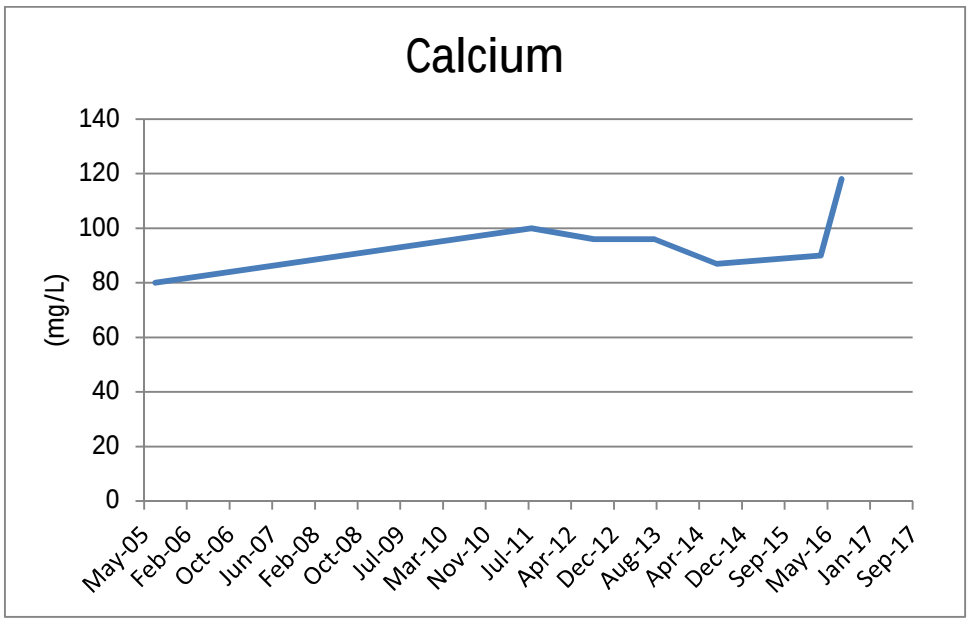
There are low levels of Arsenic in the Leachate Pond. Arsenic found in the surrounding boreholes is slightly higher than the leachate pond but not consistent enough to say it is from the leachate.

3.4.2.4 Barium



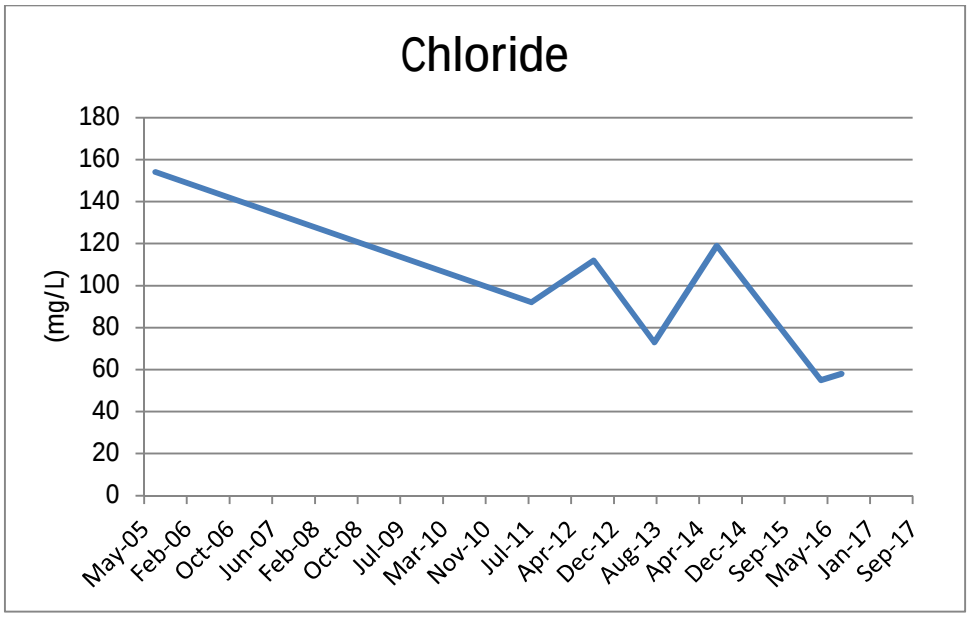
There are low levels of Barium in the Leachate Pond. Samples in the boreholes surrounding the leachate dam are higher, but that does not conclude that there is leachate migration.

3.4.2.5 Calcium



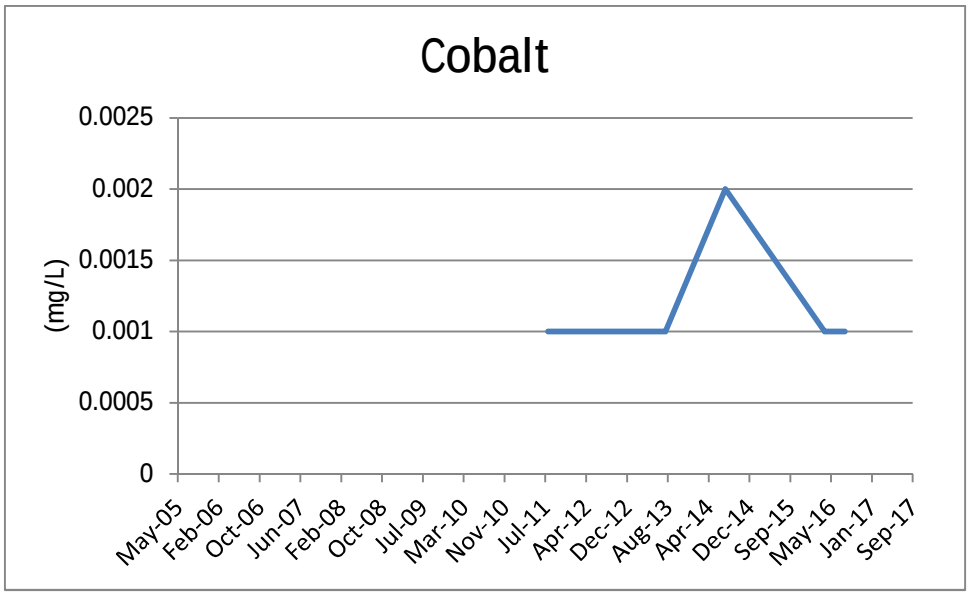
Calcium sampling is within this period has been stable and in line with previous years. There was a minor increase in May 2016, further data will need to be gathered to determine if there is a rising trend developing.

3.4.2.6 Chloride



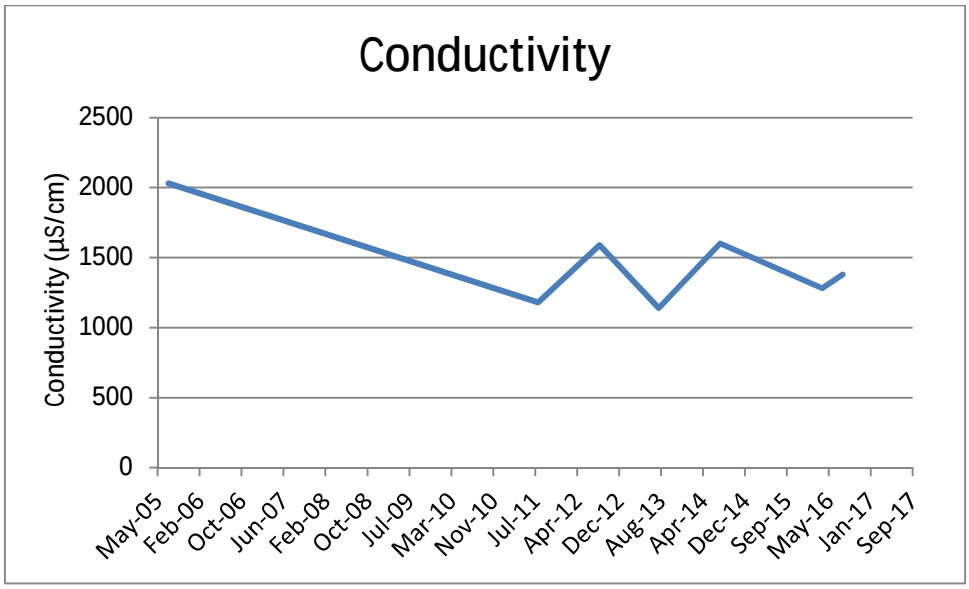
Chloride sampling has been showing a downward trend.

3.4.2.7 Cobalt



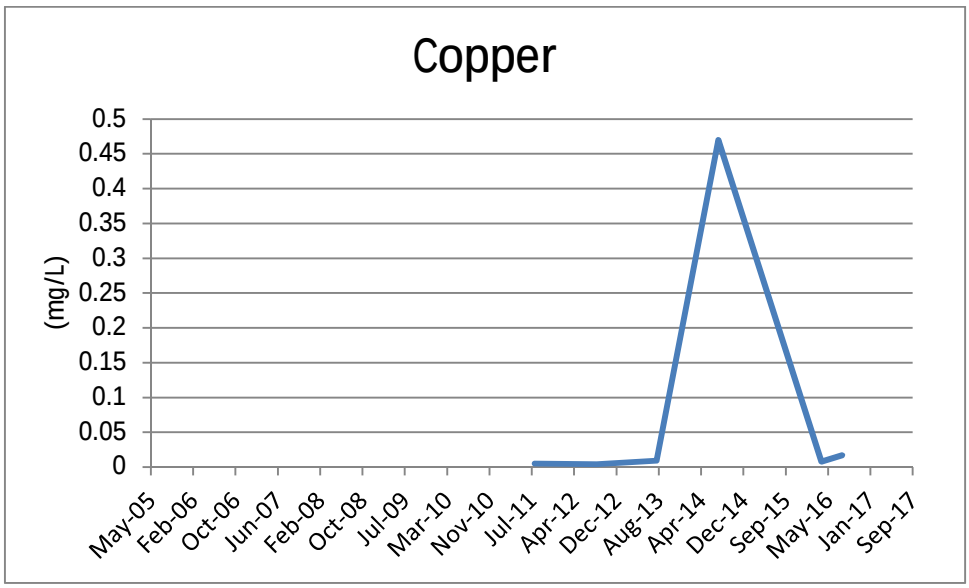
Cobalt spiked in April 2014, but has since returned to low levels.

3.4.2.8 Conductivity



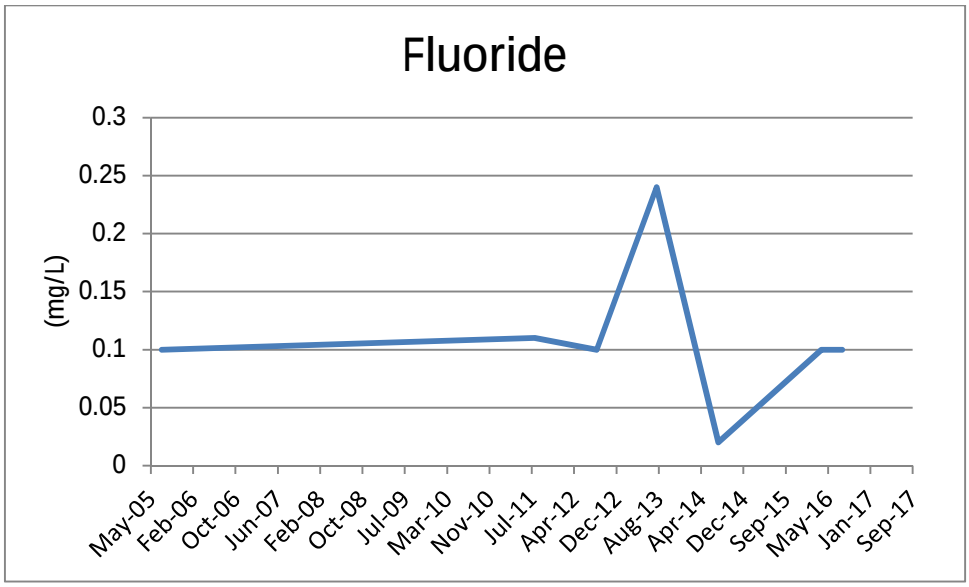
Electrical conductivity levels are higher than the surrounding stormwater pond, suggesting that leachate is being effectively contained and treated.

3.4.2.9 Copper



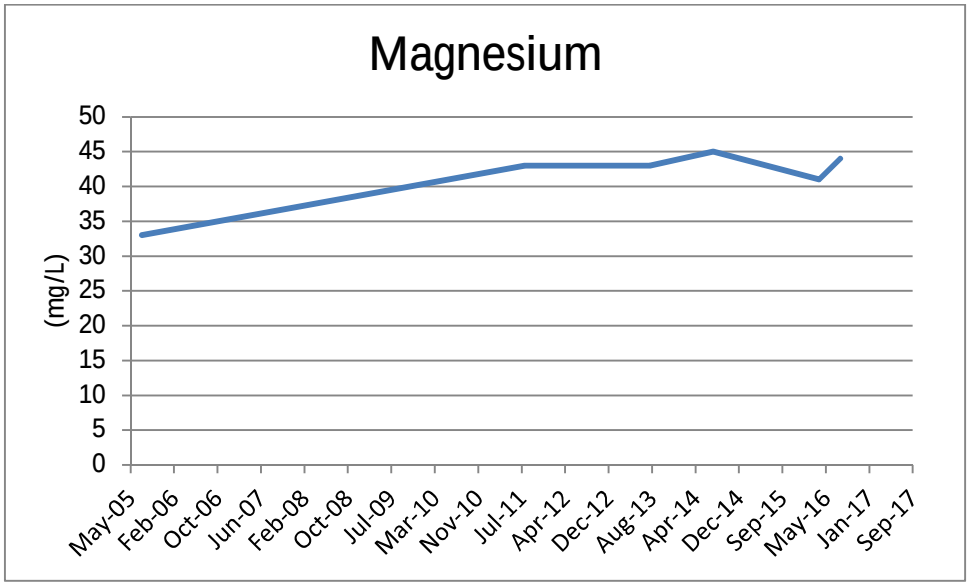
Copper levels spiked in April 2014, but have since returned to previous low levels.

3.4.2.10 Fluoride



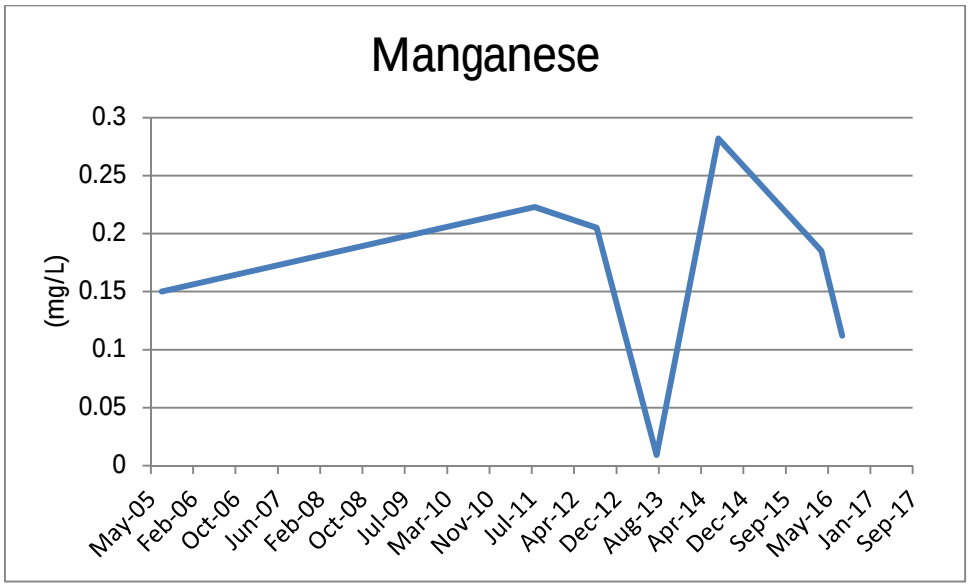
Fluoride was trending down until April 2014, but has since began to rise, Fluoride in the surrounding bore holes is less then 0.1mg/L so this is a good indicator that the leachate is being captured.

3.4.2.11 Magnesium



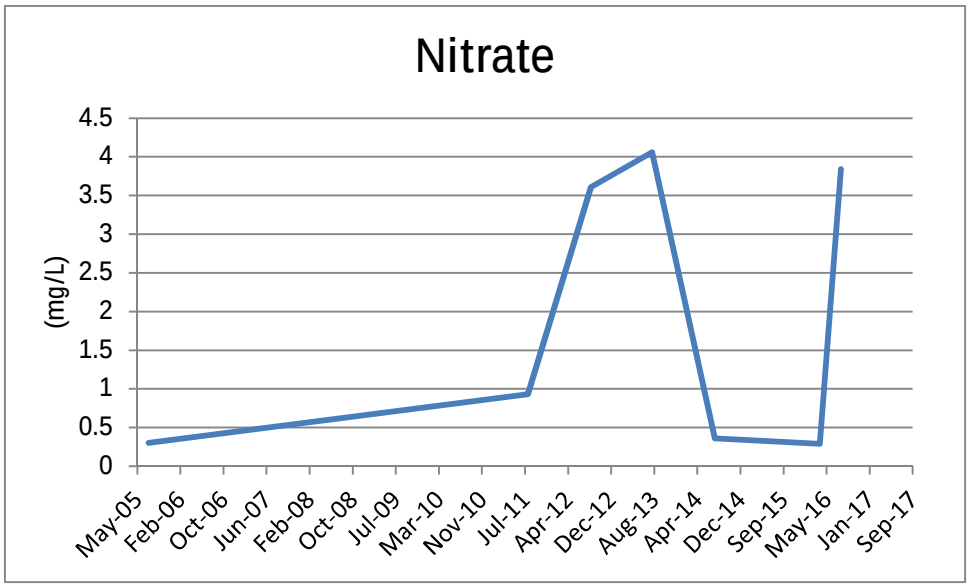
Magnesium levels have started to trend down in the last few years, Magnesium results are in line with historical data.

3.4.2.12 Manganese



Manganese sampling during this reporting period has continued to downward trend of data.

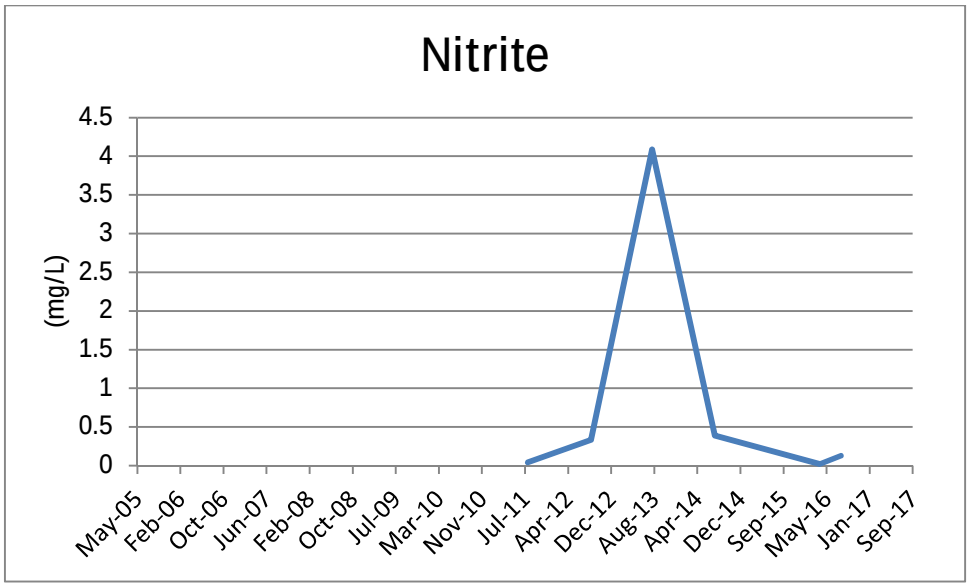
3.4.2.13 Nitrate



Nitrate sampling peaked in August 2013, Nitrate levels have returned a higher reading in borehole 15.

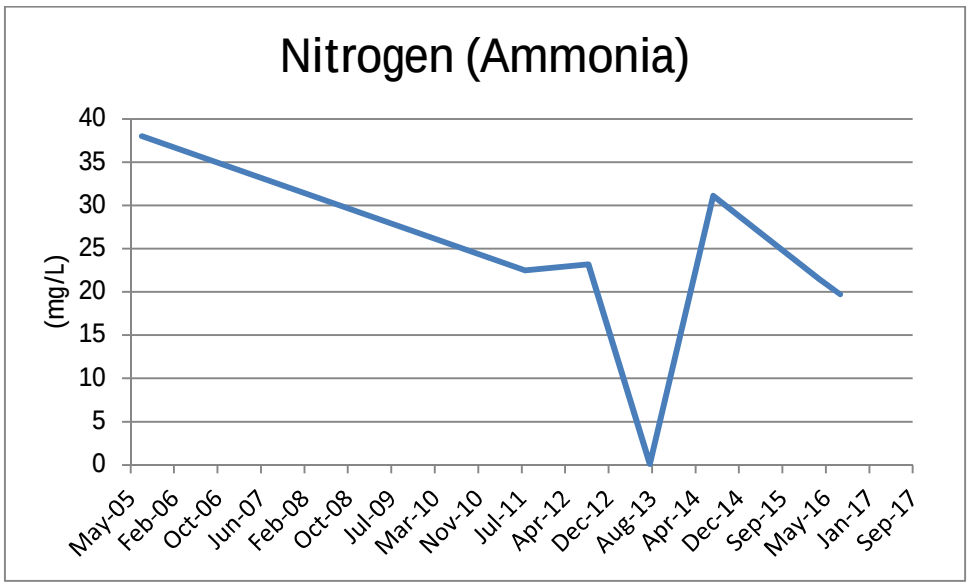
Nitrate levels have been between the ranges of 0.9 – 4 over the past years and this is in line with that range.

3.4.2.14 Nitrite



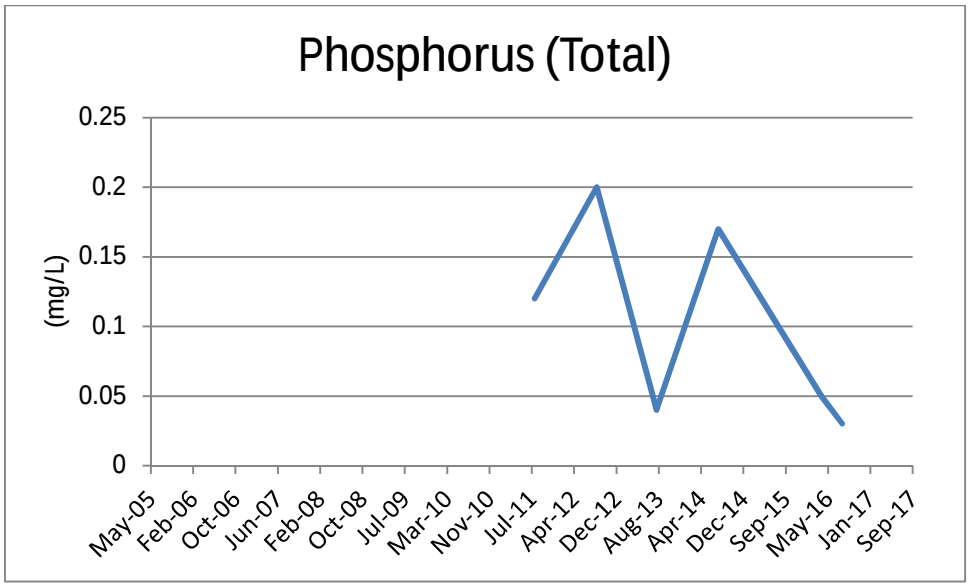
Nitrite sampling peaked in August 2013, and has since been declining, from December 2014 it has been on following trends this sampling is indicative of the last few years.

3.4.2.15 Nitrogen (Ammonia)



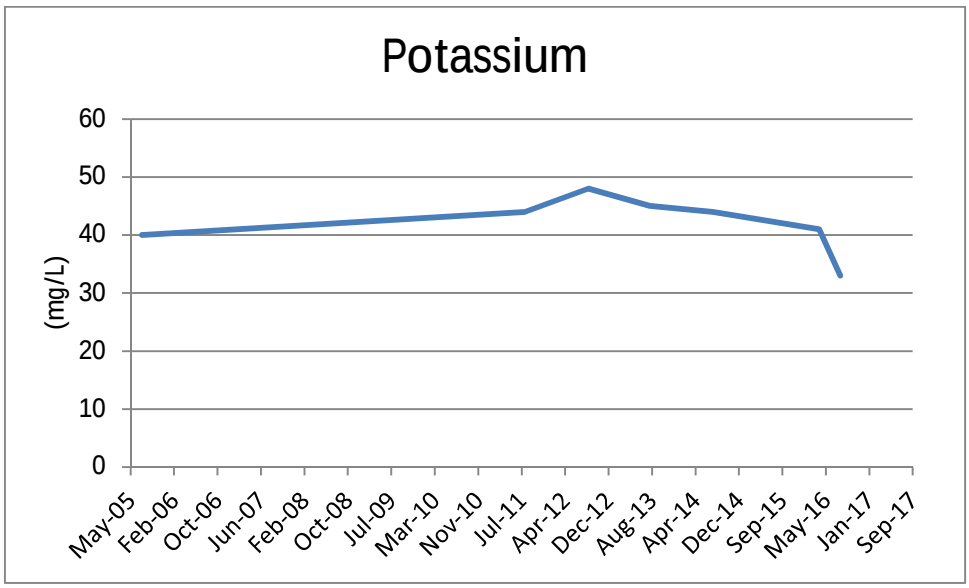
Nitrogen has continued on the downward trend since April 2014, this sampling period follows that downward trend.

3.4.2.16 Phosphorus (Total)



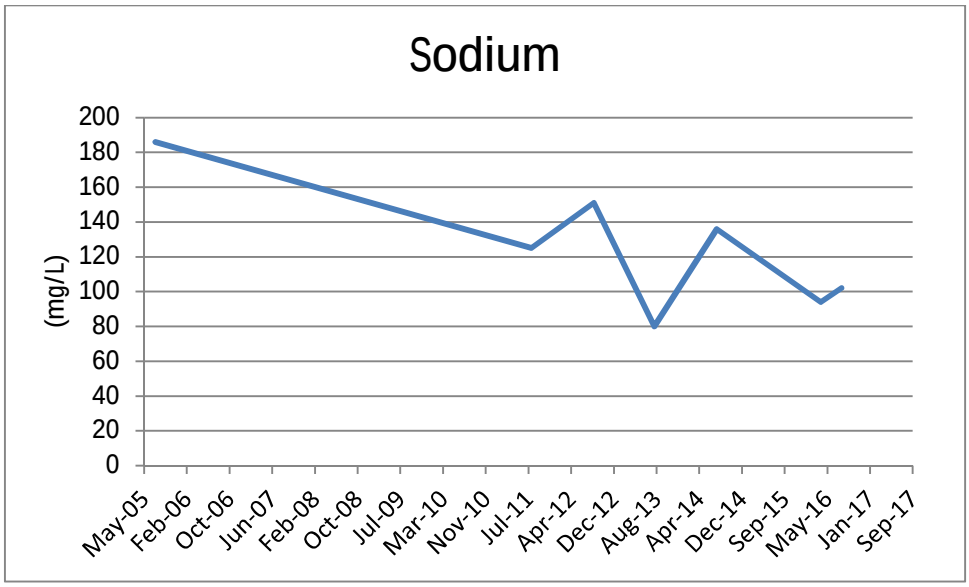
Phosphorus has been erratic in the past sampling, however all at low levels. This sampling period has returned levels consistent with a downward trend.

3.4.2.17 Potassium



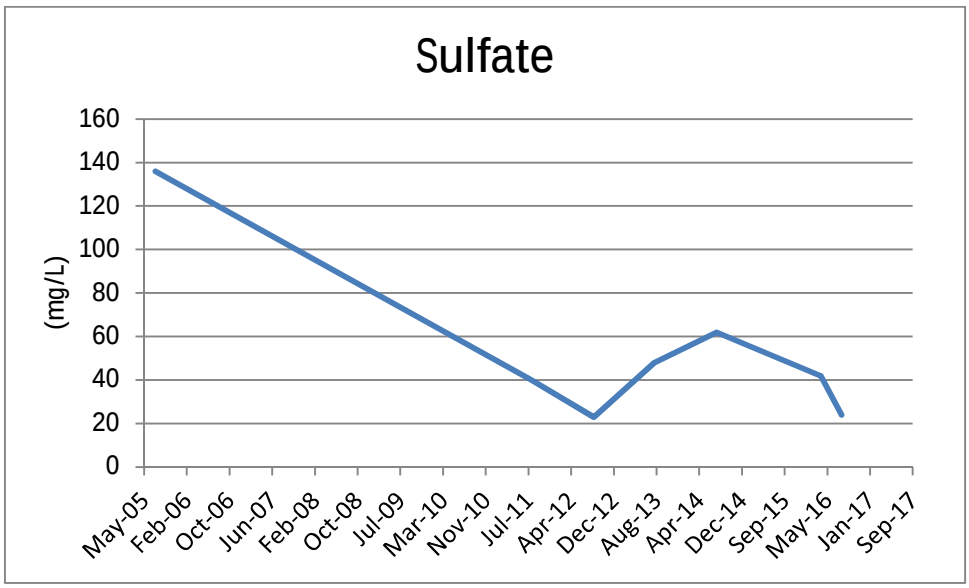
Potassium has continued to decrease since August 2012.

3.4.2.18 Sodium



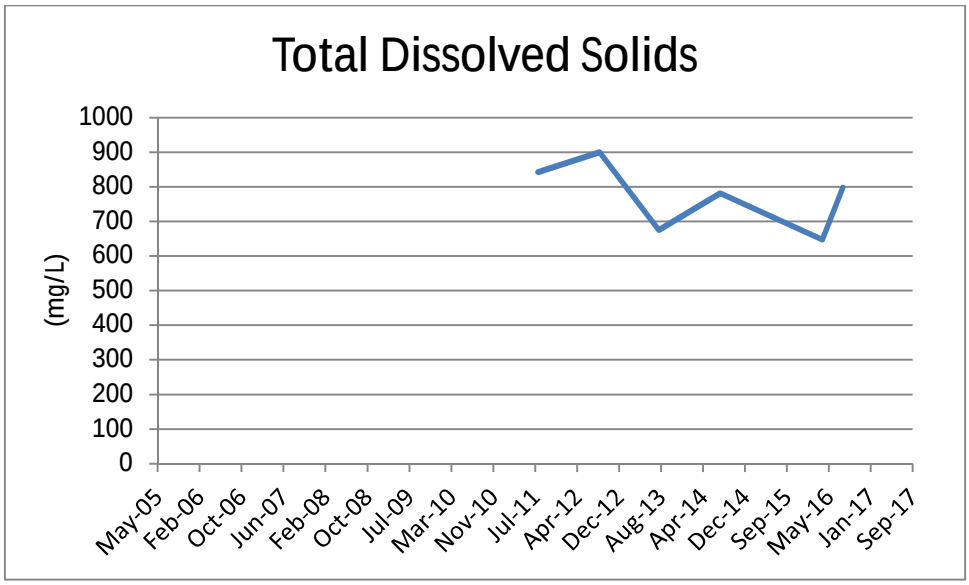
Sodium has been trending downwards since the sampling commenced in May 2005. This year's results are not unusual and trending as per historical data.

3.4.2.19 Sulfate



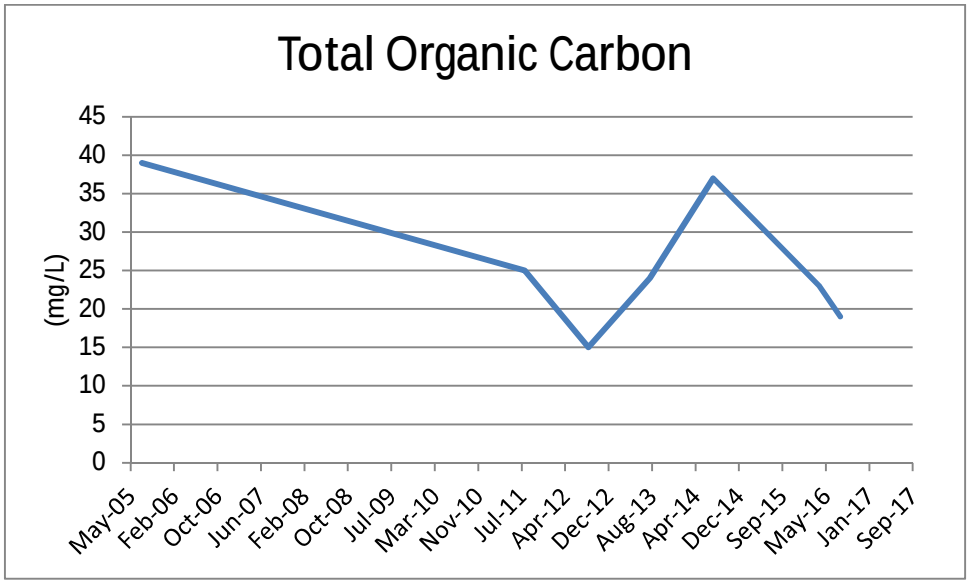
Sulfate has been trending downwards since the sampling commenced in May 2005. There was a spike in April 2014, but following this spike the results returned to the downward trend.

3.4.2.20 Total Dissolved Solids



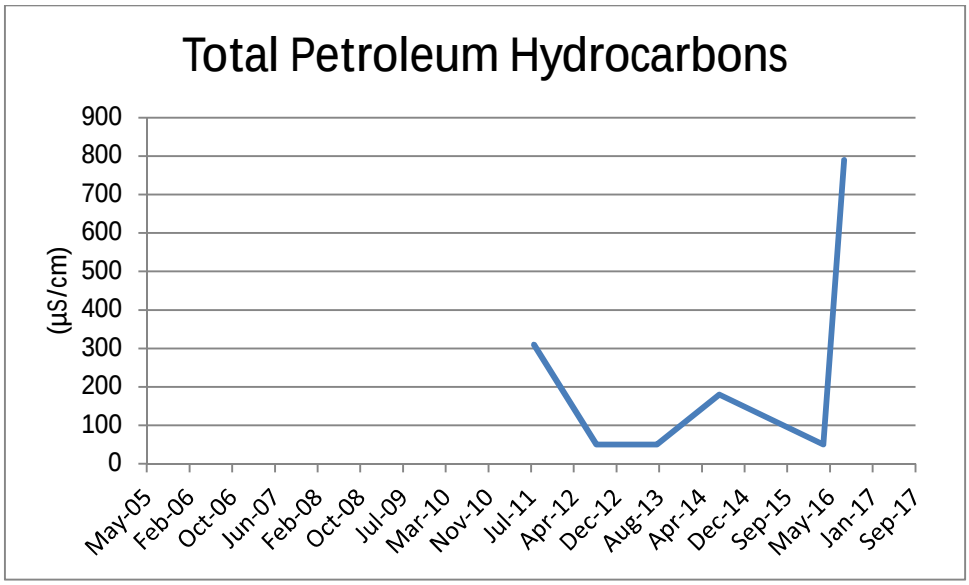
Total dissolved solids have been trending downwards since sampling commenced. Surrounding boreholes have a much lower concentration of TDS indicating that leachate is not migrating from the leachate ponds.

3.4.2.21 Total Organic Carbon



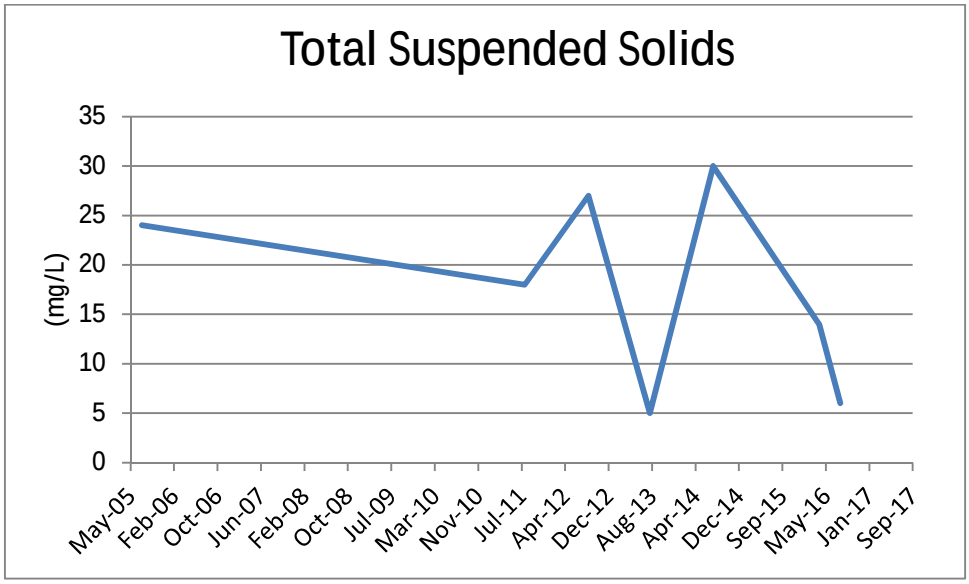
Sampling for this period has continued to show a downward trend.

3.4.2.22 Total Petroleum Hydrocarbons



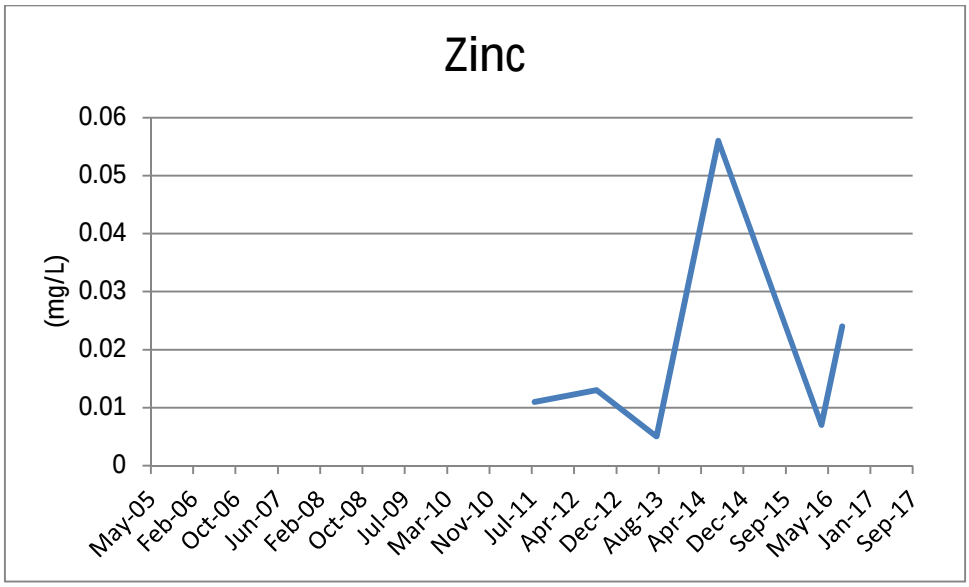
Total Petroleum Hydrocarbons have had an abrupt spike. This will be observed in the leachate ponds at the next sample interval to ascertain whether this was a data abnormality.

3.4.2.23 Total Suspended Solids



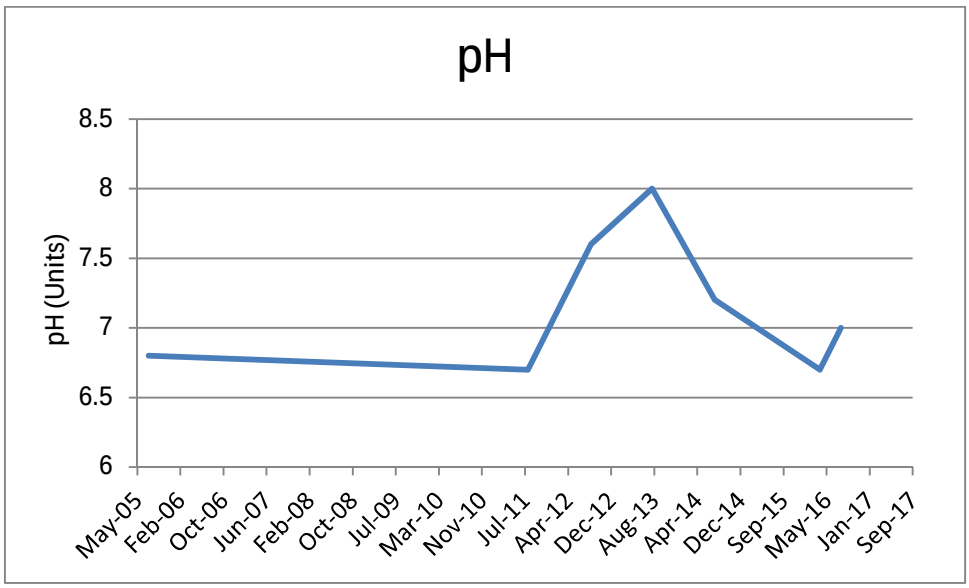
Total Suspended Solids have been declining since April 2014, this year's sampling has continued to decline as per the trend.

3.4.2.24 Zinc



Zinc sampling has continued to follow historical trends. This year's sampling is consistent with previous years.

3.4.2.25 pH



pH levels in the leachate pond have remained stable over a relatively long sample period. The pH averages around 7.5 which would foster the aerobic nitrification process in the leachate.

3.4.3 Leachate Pond Results Interpretation

The results for the leachate pond water shows that the composition of the leachate may have improved slightly in regard to environmental consequence. The overall positive trend reflects the increased environmental controls implemented on site and the ban on putrescible waste types many years prior.

Further, the benefits of sampling leachate quality in a leachate pond are minimal aside from potential comparison to surrounding stormwater pond quality. But even in this instance, the extent of the analytes tested is far more onerous than would be used to indicate cross contamination.

3.5 AIR EMISSIONS MONITORING

3.5.1 Tabulated Results

Table 3.5.1(a) Methane monitoring results.
Presented results are the methane concentration measured in the strategically placed gas migration monitoring bores for the previous reporting periods.

Date	Results Above Recommended Threshold 500ppm	Accumulation Above Recommended Threshold 1250ppm
1/9/2016	1	1

Presented results are the numbers of individual results derived from monthly sampling that are above the EPA Benchmark Technique recommended threshold levels for further action regarding surface emissions (500 ppm) and accumulation levels (1,250 ppm).

Table 3.5.1(b) Methane monitoring results in Migration Monitoring Assets

Methane Concentration (ppm) - Landfill Gas Migration Monitoring Bores				
Monitoring Point Number	August 2012 (ppm)	August 2013 (ppm)	August 2014 (ppm)	August 2015 (ppm)
4	0.6	1.3	1.2	0.3
9	<0.1	0.5	0.4	0.1
10	70.6	3.5	3.9	1.7
11	1.7	2.3	2.0	2.3

Methane Concentration (ppm) - Landfill Gas Migration Monitoring Bores	
Monitoring Point Number	August 2016 (ppm)
3	-
4	2.0
17	2.0
18	4139
19	3
20	2.5
21	2.6

3.5.2 Data Presentation

Monitoring point 3 is a surface monitoring grid at 25m intervals across the site.

Monitoring point 18 (a newly installed well) returned a result of 4,139ppm on the 1st of September 2016. Then the monitoring point was retested and returned a result of 2,500ppm. Discussions with ALS laboratories regarding this increased amount of methane suggested that this is due to the sampling point in this well exposed to increased pressure. Investigations are continuing into this well. An increased sampling regime has been implemented and advice on the bore quality will be completed to inform the rehabilitation model current in design. This well is continuously capped and does not vent to the atmosphere. Therefore, there are no emissions venting to the air.

Helensburgh has had a clamshell monitoring device installed to better understand the landfill gas at the site. Helensburgh will be undergoing rehabilitation in the near future which will enable Council to better understand and account for gas flows at the site.

3.5.3 Air Emissions Monitoring Results Interpretation

Apart from the single instance of accumulation in a new landfill gas well, the broader site does not seem to be producing significant amounts of landfill gas, which is as expected for a former non-putrescible site.

To address a potential problem identified in the 2010-2011 Annual Environmental Management Report regarding a lack of data able to be ascertained from properties within 250m of the landfill footprint due to refused entry, Council installed four gas monitoring bores in 2011 and another five new gas bores were installed at the site in November 2015. The bores are strategically positioned as directed by GHD's landfill gas team and will provide information regarding any potential migration of landfill gas offsite towards residences and will be used to inform the rehabilitation construction of the site. Testing completed indicates that gas migration is not evident.

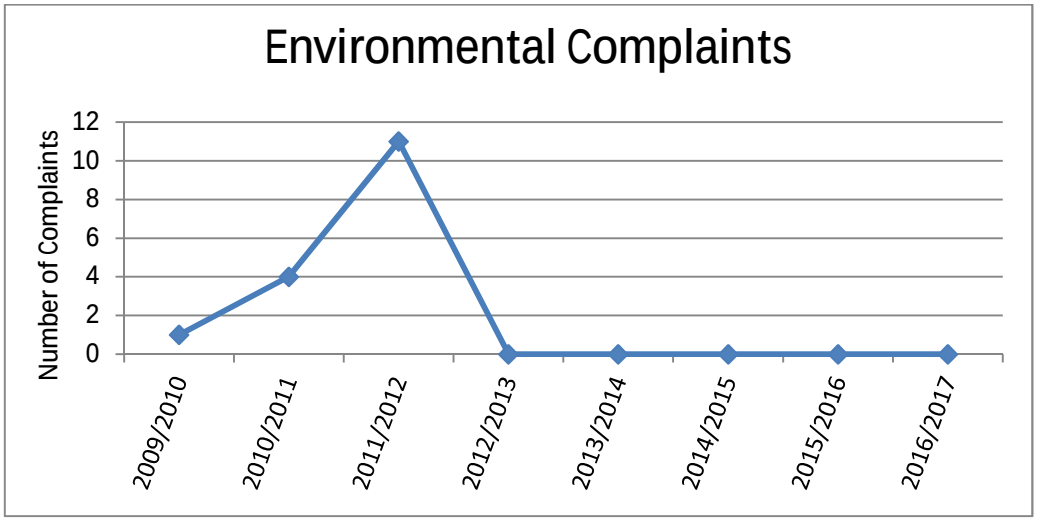
3.6 ENVIRONMENTAL COMPLAINTS

3.6.1 Tabulated Results

Table 3.6.1 Tabulated complaints for the reporting period and historically

Year	Environmental Complaints
2009/2010	1
2010/2011	4
2011/2012	11
2012/2013	0
2013/2014	0
2014/2015	0
2015/2016	0
2016/2017	0

3.6.2 Environmental Complaints Results Interpretation



There were no environment related complaints that were attributed to the site in the previous five reporting periods. This is as expected due to the site being closed.

4 SITE SUMMATION

4.1 DEFICIENCY IDENTIFICATION & REMEDIATION

No deficiencies were identified in the presented Annual Environmental Management Report. However, some further observations are recommended.

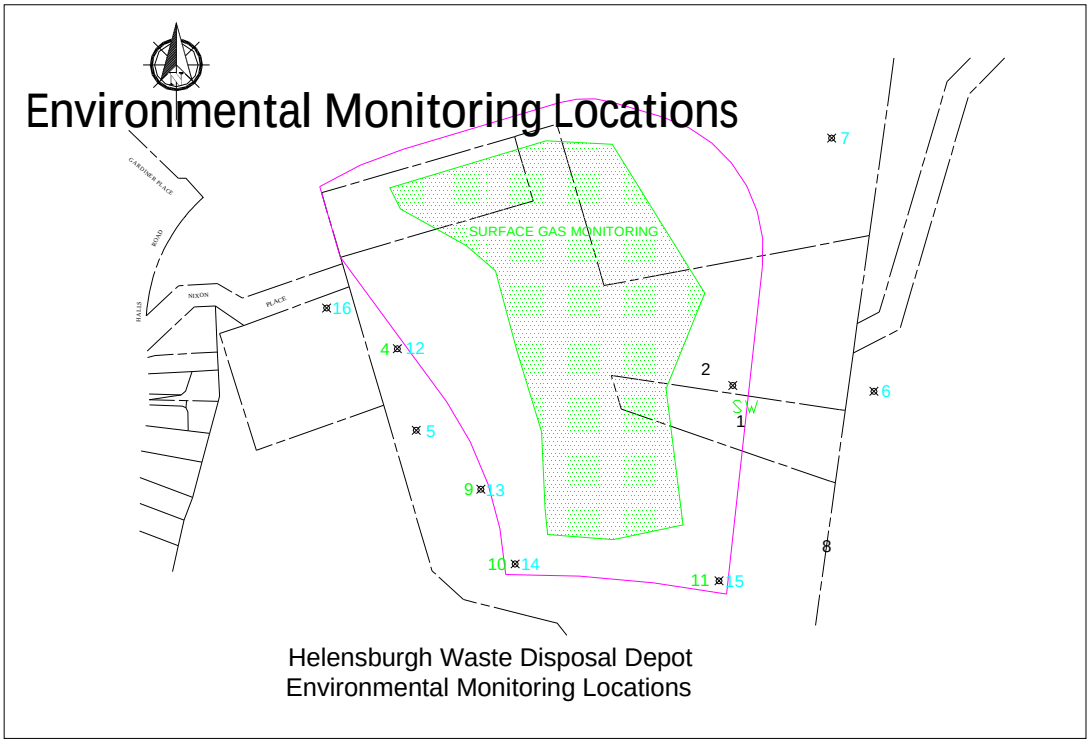
4.1.1 Gas Accumulation in New Landfill Gas Well 18

As discussed in Section 3.5, Council has installed an expanded gas monitoring network and installed a gas clam shell device to monitor and create real time trend information regarding landfill gas flows at the site. The expanded network and clam shell device will aid council's gas management and risk prediction profiling to help create informed design decisions for the imminent landfill rehabilitation construction.

4.2 CONCLUSION

The site is performing adequately within the individual criteria and limits assigned to it in regard to environmental performance. The lack of deficiencies in conjunction with low levels of environmentally disruptive pollutants shows that Council has maintained good environmental performance considering the fact that the landfill is unlined. Council will continue to monitor the site in accordance with the sites EPL despite the fact that the site is now closed.

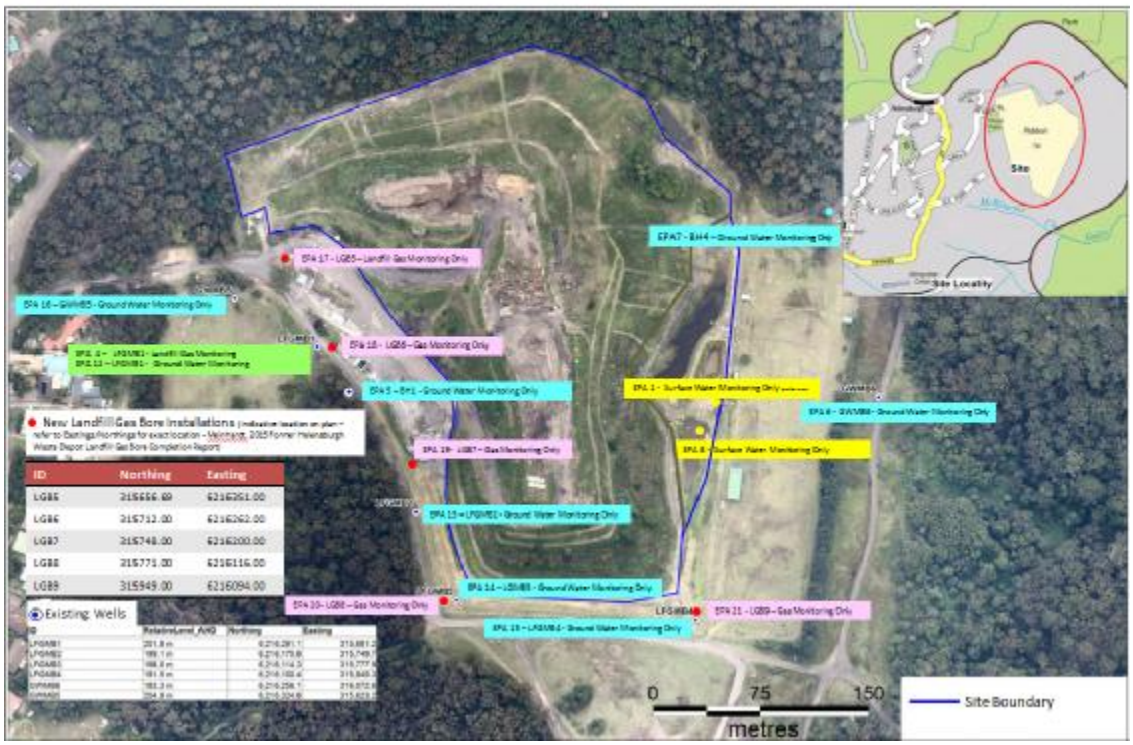
Annexure A



Helensburgh Waste Disposal Depot
Environmental Monitoring Locations

Helensburgh Waste Disposal Facility – 5861

Environmental Monitoring Points (Refer to eastings and northings for exact location)



Annexure B

Annual Return

NSW EPA

ANNUAL RETURN

LICENCE NO	**5861**
LICENCE HOLDER	WOLLONGONG CITY COUNCIL
REPORTING PERIOD	29-May-2016 to 28-May-2017

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates above and specify the new dates to which this Annual Return relates below:

REVISED REPORTING PERIOD ____ / ____ / ____ **to** ____ / ____ / ____

(Note: the revised reporting period also needs to be entered in Section H)

THIS ANNUAL RETURN MUST BE RECEIVED BY THE EPA BEFORE 28-Jul-2017

Your Annual Return must be completed, including certification in Section H, and submitted to the EPA no later than 60 Days after the end of the reporting period for your licence.

Failure to submit this Annual Return within 60 days after the reporting period ends may result in:

- **the issue of a Penalty Notice for $1500 (individuals) or $3000 (corporations);**

OR

- **prosecution.**

Please send your completed Annual Return by **Registered Post** to:

Regulatory and Compliance Support Unit
Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

It is an offence to supply any information in this form to the EPA that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect.

THERE IS A MAXIMUM PENALTY OF $250,000 FOR A CORPORATION OR $120,000 FOR AN INDIVIDUAL.

Details provided in this Annual Return will be available on the EPA's Public Register in accordance with section 308 of the *Protection of the Environment Operations Act 1997*.

Annual Return

WOLLONGONG CITY COUNCIL

Use the checklist below to ensure that you have completed your Annual Return correctly.
(✓ the boxes)

CHECKLIST		
☑	Section A:	All licence details are correct
☑	Section B1:	You have entered the correct number in the complaints table
☑	Section B2 – B3:	If there are tables, you have provided the required details
☐	Section C:	You have answered question 1, and 2 if applicable
☐	Section D:	If applicable, you have completed all load calculation worksheets
☐	Section E:	You have answered question 1, 2, 3, 4, 5 and 6 if applicable
☐	Section F:	You have answered question 1, 2 and 3 if applicable
☐	Section G:	You have answered question 1 and question 2, 3 and 4 or question 5 through to 11 if applicable
☐	Section H:	The Annual Return has been signed by appropriate person(s) and, if applicable, the revised reporting period entered
☐	Make a copy of the completed Annual Return and keep it with your licence records	

Please send your completed Annual Return by **Registered Post** to:

Regulatory and Compliance Support Unit
Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

Annual Return

WOLLONGONG CITY COUNCIL

NSW EPA

A Statement of Compliance - Licence Details

ALL licence holders must check that the licence details in Section A are correct

If there are changes to any of these detailsyou **must advise the EPA and apply as soon as possible for a variation to your licence or for a licence transfer.**

Licence variation and transfer application forms are available on the EPA website at: http://www.epa.nsw.gov.au/licensing, or from regional offices of the EPA, or by contacting us on telephone 02 9995 5700.

If you are applying to vary or transfer your licence you must still complete this Annual Return.

A1 Licence Holder

Licence Number	5861
Licence Holder	WOLLONGONG CITY COUNCIL
Trading Name *(if applicable)*	
ABN	63 139 525 939

A2 Premises to which Licence Applies (if applicable)

Common Name (if any)	HELENSBURGH WASTE DISPOSAL DEPOT
Premises	NIXON PLACE HELENSBURGH NSW 2508

A3 Activities to which Licence Applies

Waste disposal (application to land)

A4 Other Activities (if applicable)

A5 Fee-Based Activity Classifications

Note that the fee based activity classification is used to calculate the administrative fee.

Fee-based activity	Activity scale	Unit of measure
Waste disposal by application to land		capacity

A6 Assessable Pollutants (Not Applicable)

B Monitoring and Complaints Summary

B1 Number of Pollution Complaints

Number of complaints recorded by the licensee during the reporting period. **If no complaints were received enter nil in the attached box, otherwise complete the table below.**	NIL

Pollution Complaint Category	Number of Complaints
Air	
Water	
Noise	
Waste	
Other	

B2 Concentration Monitoring Summary

For each monitoring point identified in your licence complete all the details for each pollutant listed in the tables provided below.

If concentration monitoring is **not** required by your licence, **no tables** will appear below.
Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

Discharge & Monitoring Point 1

Overflow drain, DP1 - Overflow from stormwater pond as specified in Drawing No 500 of City of W'gong, Helensburgh Waste Depot Ext, Leachate Disposal Syst, Site Plan, 10.11.95

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
pH	pH	0	3	7.5	7.57	7.7

Total suspended solids	milligrams per litre	0	3	5	6.67	10

Monitoring Point 2

Leachate Dam, Leachate Dam

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	1	1	624	624	624
Aluminium	milligrams per litre	1	1	0.19	0.19	0.19
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.252	0.252	0.252
Benzene	milligrams per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	1	1	118	118	118
Chloride	milligrams per litre	1	1	58	58	58
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	0.001	0.001	0.001
Cobalt	milligrams per litre	1	1	0.001	0.001	0.001
Conductivity	microsiemens per centimetre	4	4	858	1324.5	1600

Copper	milligrams per litre	1	1	0.017	0.017	0.017
Ethyl benzene	milligrams per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	1	0.1	0.1	0.1
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	1	1	44	44	44
Manganese	milligrams per litre	1	1	0.112	0.112	0.112
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	3.84	3.84	3.84
Nitrite	milligrams per litre	1	1	0.13	0.13	0.13
Nitrogen (ammonia)	milligrams per litre	1	1	19.7	19.7	19.7
Organochlorine pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
pH	pH	1	1	7	7	7
Phosphorus (total)	milligrams per litre	1	1	0.03	0.03	0.03
Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	1	1	33	33	33

Sodium	milligrams per litre	1	1	102	102	102
Sulfate	milligrams per litre	1	1	24	24	24
Toluene	milligrams per litre	1	1	<2	<2	<2
Total dissolved solids	milligrams per litre	1	1	798	798	798
Total organic carbon	milligrams per litre	1	1	19	19	19
Total petroleum hydrocarbons	milligrams per litre	1	1	790	790	790
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Total suspended solids	milligrams per litre	1	1	6	6	6
Xylene	milligrams per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.024	0.024	0.024

Monitoring Point 3

Landfill gas monitoring, Areas where intermediate or final cover has been placed

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0.0001	0.000203	0.0006

Monitoring Point 4

Landfill gas monitoring, LFGMB1 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0.0002	0.0002	0.0002

Monitoring Point 5

Ground water monitoring, BH1 - bore hole as shown on Plan 20298/SK 02 Site Plan

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	1	3.75	10
Aluminium	milligrams per litre	1	1	1.58	1.58	1.58
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.03	0.03	0.03
Benzene	~~milligrams~~ per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	0.0001	0.0001	0.0001
Calcium	milligrams per litre	4	4	18	21.50	26
Chloride	milligrams per litre	1	1	73	77	82
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Cobalt	milligrams per litre	1	1	0.004	0.004	0.004

Copper	milligrams per litre	1	1	0.005	0.005	0.005
Ethyl benzene	~~milligrams~~ per litre	1	1	<0.002	<0.002	<0.002
Fluoride	milligrams per litre	1	1	0.1	0.1	0.1
Lead	milligrams per litre	1	1	0.009	0.009	0.009
Magnesium	milligrams per litre	4	4	16	18.5	20
Manganese	milligrams per litre	1	1	0.138	0.138	0.138
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	0.37	0.37	0.37
Nitrite	milligrams per litre	1	1	<0.01	<0.01	<0.01
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.11	0.24
Organochlorine pesticides	~~milligrams~~ per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	~~milligrams~~ per litre	1	1	<0.5	<0.5	<0.5
pH	pH	4	4	4.4	4.73	5.1
Polycyclic aromatic hydrocarbons	~~milligrams~~ per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	1	1	1
Sodium	milligrams per litre	4	4	41	46.5	52

Standing Water Level	metres	4	4	1·43	3·17	4·26
Sulfate	milligrams per litre	4	4	83	89·75	96
Toluene	milligrams per litre	1	1	< 2	< 2	< 2
Total dissolved solids	milligrams per litre	4	4	306	327·25	349
Total organic carbon	milligrams per litre	4	4	3	6·75	14
Total petroleum hydrocarbons	milligrams per litre	1	1	<0·05	<0·05	<0·05
Total Phenolics	milligrams per litre	1	1	<0·05	<0·05	<0·05
Xylene	milligrams per litre	1	1	<0·002	<0·002	<0·002
Zinc	milligrams per litre	1	1	0·41	0·41	0·41

Monitoring Point 6

Groundwater monitoring, GWMB6 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	67	120·25	190
Aluminium	milligrams per litre	1	1	4·56	4·56	4·56
Arsenic	milligrams per litre	1	1	0·005	0·005	0·005
Barium	milligrams per litre	1	1	0·118	0·118	0·118

Benzene	~~milligrams~~ per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	4	4	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	1	1	20	31.75	41
Chloride	milligrams per litre	4	4	13	23	30
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Cobalt	milligrams per litre	1	1	0.014	0.014	0.014
Copper	milligrams per litre	1	1	0.011	0.011	0.011
Ethyl benzene	~~milligrams~~ per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead	milligrams per litre	1	1	0.006	0.006	0.006
Magnesium	milligrams per litre	4	4	10	18.25	27
Manganese	milligrams per litre	1	1	0.355	0.355	0.355
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	0.02	0.02	0.02
Nitrite	milligrams per litre	1	1	<0.01	<0.01	<0.01

Annual Return

WOLLONGONG CITY COUNCIL

NSW EPA

Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.03	0.05
Organochlorine pesticides	micrograms per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	micrograms per litre	1	1	<0.5	<0.5	<0.5
pH	pH	4	4	6	6.55	6.9
Polycyclic aromatic hydrocarbons	micrograms per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	3	4.25	6
Sodium	milligrams per litre	4	4	15	20.75	27
Standing Water Level	metres	4	4	1.59	2.61	3.8
Sulfate	milligrams per litre	4	4	1	22.5	44
Toluene	micrograms per litre	1	1	<2	<2	<2
Total dissolved solids	milligrams per litre	4	4	217	284	342
Total organic carbon	milligrams per litre	4	4	7	11	19
Total petroleum hydrocarbons	micrograms per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	micrograms per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.019	0.019	0.019

Monitoring Point 7

Ground water monitoring, BH4 - bore hole as shown on Plan 20298/SK 02 Site Plan

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	1	1	1
Aluminium	milligrams per litre	1	1	2.26	2.26	2.26
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.018	0.018	0.018
Benzene	milligrams per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	1	1	1
Chloride	milligrams per litre	4	4	68	92.25	122
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Cobalt	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.004	0.004	0.004
Ethyl benzene	milligrams per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1

Lead	milligrams per litre	1	1	0.002	0.002	0.002
Magnesium	milligrams per litre	4	4	4	5	6
Manganese	milligrams per litre	1	1	0.032	0.032	0.032
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	0.52	0.52	0.52
Nitrite	milligrams per litre	1	1	<0.01	<0.01	<0.01
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.16	0.55
Organochlorine pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
pH	pH	4	4	4.2	5	6.9
Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	1	1.25	2
Sodium	milligrams per litre	4	4	90	102.25	110
Standing Water Level	metres	4	4	1	3.34	4.99
Sulfate	milligrams per litre	4	4	94	105.5	121
Toluene	milligrams per litre	1	1	<2	<2	<2

Total dissolved solids	milligrams per litre	4	4	264	298.25	323
Total organic carbon	milligrams per litre	4	4	3	4	6
Total petroleum hydrocarbons	milligrams per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	milligrams per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.027	0.027	0.027

Monitoring Point 8

Surface water monitoring, WCC ref - Pony Club as shown on Plan 20298/SK 02 Site Plan

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	4	4	326	794.50	1300
Dissolved Oxygen	milligrams per litre	4	4	5.84	8.18	9.64
Faecal Coliforms	colony forming units per 100 millilitres	4	4	4	73	170
Nitrogen (ammonia)	milligrams per litre	4	4	0.02	4.47	9.78
pH	pH	4	4	6.4	7.85	8.9
Potassium	milligrams per litre	4	4	11	28.50	47
Redox potential	millivolts	4	4	59	57.98	138

Total dissolved solids	milligrams per litre	4	4	218	445.50	790
Total organic carbon	milligrams per litre	4	4	6	19	30

Monitoring Point 12

Groundwater monitoring, LFGMB1 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	10	128.33	196
Aluminium	milligrams per litre	1	1	3.84	3.84	3.84
Arsenic	milligrams per litre	1	1	0.002	0.002	0.002
Barium	milligrams per litre	1	1	0.119	0.119	0.119
Benzene	milligrams per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	8	4567	66
Chloride	milligrams per litre	4	4	14	26	47
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.009	0.009	0.009

Ethyl benzene	~~milligrams~~ per litre	1	1	< 2	< 2	< 2
Fluoride	milligrams per litre	1	1	< 0.01	< 0.01	< 0.01
Lead	milligrams per litre	1	1	0.001	0.001	0.001
Magnesium	milligrams per litre	4	4	8	17.33	23
Manganese	milligrams per litre	1	1	0.01	0.01	0.01
Mercury	milligrams per litre	1	1	< 0.0001	< 0.0001	< 0.0001
Nitrate	milligrams per litre	1	1	0.03	0.03	0.03
Nitrite	milligrams per litre	1	1	0.03	0.03	0.03
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.01	0.02
Organochlorine pesticides	~~milligrams~~ per litre	1	1	< 0.5	< 0.5	< 0.5
Organophosphate pesticides	~~milligrams~~ per litre	1	1	< 0.5	< 0.5	< 0.5
Polycyclic aromatic hydrocarbons	~~milligrams~~ per litre	1	1	< 1	< 1	< 1
Potassium	milligrams per litre	4	4	2	2.67	3
Sodium	milligrams per litre	4	4	18	27	37
Standing Water Level	metres	4	4	1.68	2.5	3.24
Sulfate	milligrams per litre	4	4	39	48.67	66

Toluene	milligrams per litre	1	1	<2	<2	<2
Total dissolved solids	milligrams per litre	4	4	160	309	436
Total organic carbon	milligrams per litre	4	4	5	9.67	15
Total petroleum hydrocarbons	milligrams per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	milligrams per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.012	0.012	0.012

Monitoring Point 13

Groundwater monitoring, LFGMB2 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	8	21-50	30
Aluminium	milligrams per litre	1	1	13.6	13.6	13.6
Arsenic	milligrams per litre	1	1	0.004	0.004	0.004
Barium	milligrams per litre	1	1	0.044	0.044	0.044
Benzene	milligrams per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001

Calcium	milligrams per litre	4	4	12	19·25	25
Chloride	milligrams per litre	4	4	12	34·50	46
Chromium (hexavalent)	milligrams per litre	1	1	<0·01	<0·01	<0·01
Chromium (total)	milligrams per litre	1	1	0·016	0·016	0·016
Copper	milligrams per litre	1	1	0·019	0·019	0·019
Ethyl benzene	milligrams per litre	1	1	<2	22	<2
Fluoride	milligrams per litre	1	1	<0·1	<0·1	<0·1
Lead	milligrams per litre	1	1	0·05	0·05	0·05
Magnesium	milligrams per litre	4	4	6	9	13
Manganese	milligrams per litre	1	1	0·038	0·038	0·038
Mercury	milligrams per litre	1	1	<0·0001	<0·0001	<0·0001
Nitrate	milligrams per litre	1	1	0·63	0·63	0·63
Nitrite	milligrams per litre	1	1	0·63	0·63	0·63
Nitrogen (ammonia)	milligrams per litre	4	4	0·01	0·07	0·24
Organochlorine pesticides	milligrams per litre	1	1	<0·5	<0·5	<0·5
Organophosphate pesticides	milligrams per litre	1	1	<0·5	<0·5	<0·5

Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	4	5.25	8
Sodium	milligrams per litre	4	4	14	24.50	36
Standing Water Level	metres	4	4	1.92	2.87	3.64
Sulfate	milligrams per litre	4	4	23	28.25	37
Toluene	milligrams per litre	1	1	<2	<2	<2
Total dissolved solids	milligrams per litre	4	4	150	303.50	517
Total organic carbon	milligrams per litre	4	4	3	5.25	10
Total petroleum hydrocarbons	milligrams per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	milligrams per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.2	0.2	0.2

Monitoring Point 14

Groundwater monitoring, LFGMB3 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	7	14.50	18

Aluminium	milligrams per litre	1	1	2.03	2.03	2.03
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.006	0.006	0.006
Benzene	micrograms per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	6	8.25	10
Chloride	milligrams per litre	4	4	10	16	30
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	0.002	0.002	0.002
Copper	milligrams per litre	1	1	0.036	0.036	0.036
Ethyl benzene	micrograms per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead	milligrams per litre	1	1	0.003	0.003	0.003
Magnesium	milligrams per litre	4	4	3	4.25	5
Manganese	milligrams per litre	1	1	0.008	0.008	0.008
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001

Nitrate	milligrams per litre	1	1	0.22	0.22	0.22
Nitrite	milligrams per litre	1	1	0.22	0.22	0.22
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.16	0.35
Organochlorine pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	2	3.5	5
Sodium	milligrams per litre	4	4	8	9.75	12
Standing Water Level	metres	4	4	1.68	2.64	3.62
Sulfate	milligrams per litre	4	4	14	15.50	17
Toluene	milligrams per litre	1	1	<2	<2	<2
Total dissolved solids	milligrams per litre	4	4	94	112.75	149
Total organic carbon	milligrams per litre	4	4	2	2	2
Total petroleum hydrocarbons	milligrams per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	milligrams per litre	1	1	<2	<2	<2

Zinc	milligrams per litre	1	1	0.044	0.044	0.044

Monitoring Point 15

Groundwater monitoring, LFGMB4 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	4	7	11
Aluminium	milligrams per litre	1	1	0.27	0.27	0.27
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.006	0.006	0.006
Benzene	micrograms ~~milligrams~~ per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	6	10.25	13
Chloride	milligrams per litre	4	4	12	15	17
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.001	0.001	0.001
Ethyl benzene	micrograms ~~milligrams~~ per litre	1	1	<2	<2	<2

Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	4	5	6
Manganese	milligrams per litre	1	1	0.047	0.047	0.047
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	5.1	5.1	5.1
Nitrite	milligrams per litre	1	1	5.1	5.1	5.1
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.04	0.07
Organochlorine pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Organophosphate pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1
Potassium	milligrams per litre	4	4	21	27.25	34
Sodium	milligrams per litre	4	4	10	11.75	14
Standing Water Level	metres	4	4	1.6	3.69	7.06
Sulfate	milligrams per litre	4	4	28	53.50	75
Toluene	milligrams per litre	1	1	<2	<2	<2

Total dissolved solids	milligrams per litre	4	4	112	176.25	230
Total organic carbon	milligrams per litre	4	4	3	4	6
Total petroleum hydrocarbons	milligrams per litre	1	1	<50	<50	<50
Total Phenolics	milligrams per litre	1	1	<0.05	<0.05	<0.05
Xylene	milligrams per litre	1	1	<2	<2	<2
Zinc	milligrams per litre	1	1	0.012	0.012	0.012

Monitoring Point 16

Groundwater monitoring, GWMB5 - "Well Locations - Installation of Groundwater and Gas Monitoring Wells - Helensburgh Waste Facility, Nixon Place, Helensburgh", Douglas Partners, December 2011

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	1	1.25	2
Aluminium	milligrams per litre	1	1	0.27	0.27	0.27
Arsenic	milligrams per litre	1	1	<0.001	<0.001	<0.001
Barium	milligrams per litre	1	1	0.006	0.006	0.006
Benzene	milligrams per litre	1	1	<1	<1	<1
Cadmium	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Calcium	milligrams per litre	4	4	4	4.25	5

Chloride	milligrams per litre	4	4	34	37.75	40
Chromium (hexavalent)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Chromium (total)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Copper	milligrams per litre	1	1	0.001	0.001	0.001
Ethyl benzene	milligrams per litre	1	1	<2	<2	<2
Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead	milligrams per litre	1	1	<0.001	<0.001	<0.001
Magnesium	milligrams per litre	4	4	4	5	8
Manganese	milligrams per litre	1	1	0.047	0.047	0.047
Mercury	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nitrate	milligrams per litre	1	1	5.1	5.1	5.1
Nitrite	milligrams per litre	1	1	5.1	5.1	5.1
Nitrogen (ammonia)	milligrams per litre	4	4	0.01	0.08	0.28
Organochlorine pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.05
Organophosphate pesticides	milligrams per litre	1	1	<0.5	<0.5	<0.5
Polycyclic aromatic hydrocarbons	milligrams per litre	1	1	<1	<1	<1

Potassium	milligrams per litre	4	4	1	2.25	5
Sodium	milligrams per litre	4	4	23	27	34
Standing Water Level	metres	4	4	2.5	4.68	7.06
Sulfate	milligrams per litre	4	4	21	26.25	37
Toluene	~~milligrams~~ µg/L per litre	1	1	< 2	< 2	< 2
Total dissolved solids	milligrams per litre	4	4	115	133.75	158
Total organic carbon	milligrams per litre	4	4	1	3.25	7
Total petroleum hydrocarbons	~~milligrams~~ µg/L per litre	1	1	< 50	< 50	< 50
Total Phenolics	milligrams per litre	1	1	< 0.05	< 0.05	< 0.05
Xylene	~~milligrams~~ µg/L per litre	1	1	< 2	< 2	< 2
Zinc	milligrams per litre	1	1	0.012	0.012	0.012

Monitoring Point 17

Landfill Gas Monitoring, LGB5 - "Former Helensburgh Waste Depot Landfill Gas Bore Completion Report", Meinhardt, December 2015 (E315656 N6216351). EPA Reference: DOC16/279048

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0.0002	0.0002	0.0002

Monitoring Point 18

Landfill Gas Monitoring, LGB6 - "Former Helensburgh Waste Depot Landfill Gas Bore Completion Report", Meinhardt, December 2015 (E315712 N6216262). EPA Reference: DOC16/279048

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0·25	0·25	0·25

Monitoring Point 19

Landfill Gas Monitoring, LGB7 - "Former Helensburgh Waste Depot Landfill Gas Bore Completion Report", Meinhardt, December 2015 (E315748 N6216200). EPA Reference: DOC16/279048

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0·0003	0·0003	0·0003

Monitoring Point 20

Landfill Gas Monitoring, LGB8 - "Former Helensburgh Waste Depot Landfill Gas Bore Completion Report", Meinhardt, December 2015 (E315771 N6216116). EPA Reference: DOC16/279048

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0·00025	0·00025	0·00025

Monitoring Point 21

Landfill Gas Monitoring, LGB9 - "Former Helensburgh Waste Depot Landfill Gas Bore Completion Report", Meinhardt, December 2015 (E315949 N6216094). EPA Reference: DOC16/279048

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Methane	percent by volume	1	1	0·00026	0·00026	0·00026

B3 Volume or Mass Monitoring Summary

For each monitoring point identified in your licence complete the details of the volume or mass monitoring indicated in the tables provided below.

If volume or mass monitoring is not required by your licence, **no tables** will appear below.

Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

C Statement of Compliance - Licence Conditions

C1 Compliance with Licence Conditions

(☑ the boxes)

1 Were all conditions of the licence complied with (including monitoring and reporting requirements)? ☑ Yes ☐ No

(✓ a box)

2 If you answered 'No' to question 1, please supply the following details for each non -compliance in the format, or similar format , provided on the following page.

Please use a separate page for each licence condition that has not been complied with.

a) What was the specific licence condition that was not complied with?

b) What were the particulars of the non -compliance?

c) What were the date(s) when the non -compliance occurred, if applicable?

d) If relevant, what was the precise location where the non -compliance occurred?

Attach a map or diagram to the Statement to show the precise location.

e) What were the registrati on numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance?

f) What was the cause of the non-compliance?

g) What action has been, or will be, taken to mitigate any adverse effects of the non -compliance?

h) What action has been, or will be, taken to prevent a recurrence of the non -compliance?

3. How many pages have you attached?

Each attached page must be initialled by the person(s) who signs Section G of this Annual Return

NIL

C2 Details of Non-Compliance with Licence

Licence condition number not complied with
Summary of particulars of the non-compliance **(NO MORE THAN 50 WORDS)**
If required, further details on particulars of non-compliance
Date(s) when the non-compliance occurred, if applicable
If relevant, precise location where the non-compliance occurred (attach a map or diagram)
If applicable, registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
Cause of non-compliance
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Action taken or that will be taken to prevent a recurrence of the non-compliance

D Statement of Compliance - Load-Based Fee Calculation Worksheets

If you are not required to monitor assessable pollutants by your licence, no worksheets will appear below. Please go to Section E.

If assessable pollutants have been identified on your licence (see licence condition L2), complete the following worksheets for each assessable pollutant to determine your load-based fee for the licence fee period to which this Annual Return relates.

Loads of assessable pollutants must be calculated using any of the methods provided in the EPA's Load Calculation Protocol for the relevant activity. A Load Calculation Protocol would have been sent to you with your licence. If you require additional copies you can download the Protocol from the EPA's website or you can contact us on telephone 02 9995 5700.

You are required to keep all records used to calculate licence fees for four years after the licence fee was paid or became payable, whichever is the later date.

PENALTIES APPLY FOR SUPPLYING FALSE OR MISLEADING INFORMATION

D1 - D8 (Not Applicable)

E Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan (PIRMP) Under Section 153A of the POEO Act 1997

1 Have you prepared a PIRMP as required under s153A of the Protection of the Environment Operations Act 1997?

(✓ a box) ☑ Yes ☐ No

If you answered 'Yes' to question 1, please tick the appropriate box to indicate the following:

2 Is the PIRMP available at the premises?

(✓ a box) ☑ Yes ☐ No

3 Is the PIRMP available in a prominent position on a publicly accessible web site?

(✓ a box) ☑ Yes ☐ No

If the PIRMP is available on a publicly accessible web site please indicate clearly below the address of the web site where the PIRMP can be accessed:

Web site Address www.wollongong.nsw.gov.au/services/household/pages/wastebinanalyticalmonitoringdata.aspx

4 Has the PIRMP been tested in the last 12 months?

(✓ a box) ☑ Yes ☐ No

If you answered 'Yes' to question 4 please indicate clearly below the date that the PIRMP was last tested:

The PIRMP was last tested on 27 / 02 / 2017

5 Has the PIRMP been updated?

(✓ a box) ☑ Yes ☐ No

If you answered 'Yes' to question 5 please indicate clearly below the date that the PIRMP was last updated:

The PIRMP was last updated on 28 / 02 / 2017

6 How many times has the PIRMP been activated in this reporting period? 0

If the PIRMP has been activated, please indicate clearly below the date/s when the PIRMP was activated:

The PIRMP was activated on __ / __ / ____

The EPA's guidelines for preparation of pollution incident response management plans are available at

http://www.epa.nsw.gov.au/legislation/20120227epgreppirmp.htm

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F Statement of Compliance - Requirement to Publish Pollution Monitoring Data Under Section 66(6) of the POEO Act 1997

1 Are there any conditions attached to your licence that require pollution monitoring to be undertaken?

(✓ a box) ☑ Yes ☐ No

If you answered 'Yes' to question 1, please tick the appropriate box to indicate the following:

2 Do you operate a web site?

(✓ a box) ☑ Yes ☐ No

3 Is the pollution monitoring data published on your web site in accordance with the EPA's written requirements for publishing pollution monitoring data?

(✓ a box) ☑ Yes ☐ No

If you publish pollution monitoring data on a web site please indicate clearly below the address of the web site where the pollution monitoring data can be accessed:

Web site address www.wollongong.nsw.gov.au/services/household/pages/westcliffmonitoringdata.aspx

The EPA's written requirements for publishing pollution monitoring data are available at http://www.epa.nsw.gov.au/legislation/20120263reqpubpmdata.htm

Note - if you do not maintain a web site, you must provide a copy of any monitoring data that relates to pollution, to any person requests a copy of the data at no charge to the person requesting the data.

G Statement of Compliance - Environmental Management Systems and Practices

1 Do you have an environmental management system (EMS) certified to ISO 14001 or any other demonstrated equivalent system[1]? (see note below on demonstrated equivalent)

(✓ a box) ☐ Yes ☑ No

If your answer to question 1 is 'No', please proceed to question 5. If your answer to question 1 is 'Yes', please proceed to question 2.

2 When was the last check of the EMS[2] completed (see note below on check of EMS)? __/__/____

3 Were there any non-conformances related to environmental issues identified in the last check of the EMS?

(✓ a box) ☐ Yes ☐ No

4 If there were non-conformances identified, were these non-conformances rectified?

(✓ a box) ☐ Yes ☐ No

If you answered 'No' to question 1, please answer questions 5 - 11. If you answered 'Yes' to question 1 please proceed to section H. Questions 5-11 relate to any documented environmental practices, procedures and systems in place. Refer to http://www.epa.nsw.gov.au/licensing/EMCP.htm for guidance on how to complete questions 5 to 11. If unsure of the answer, tick No.

5 Have you conducted an assessment of your activities and operations to identify the aspects that have a potential to cause environmental impacts and implemented operational controls to address these aspects?

(✓ a box) ☑ Yes ☐ No

6 Have you established and implemented an operational maintenance program, including preventative maintenance?

(✓ a box) ☑ Yes ☐ No

7 Do you keep records of regular inspections and maintenance of plant and equipment?

(✓ a box) ☑ Yes ☐ No

8 Do you conduct regular site audits to assess compliance with environmental legal requirements and assess conformance to the requirements of any documented environmental practices, procedures and systems in place?

(✓ a box) ☑ Yes ☐ No

9 Are the audits of documented environmental practices, procedures and systems undertaken by a third party?

(✓ a box) ☐ Yes ☑ No

10 Have you established and implemented an environmental improvement or management plan?

(✓ a box) ☑ Yes ☐ No

11 Do you train staff in environmental issues that may arise from your activities and operations and keep records of this

(✓ a box) ☑ Yes ☐ No

[1] Demonstrated equivalent refers to an environmental management system that the EPA considers is equivalent to the accountability, procedures, documentation and record keeping requirements of an ISO 14001 system. For further information go to:
http://www.epa.nsw.gov.au/resources/licensing/150402-environmental-management-systems-guidelines.pdf

[2] Undertaking a 'check of an EMS' refers to the ISO 14001 requirements that an organisation demonstrates conformity to the requirements of its EMS and to the standard, these checks require third-party certification that requirements have been met.

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NSW EPA

H Signature and Certification

This Annual Return may only be signed by a person(s) with legal authority to sign it as set out in the categories below. **Please tick (✓) the box** next to the category that describes how this Annual Return is being signed.

If you are uncertain about who is entitled to sign or which category to tick, please contact us on telephone 02 9995 5700.

If the licence holder is:	the Annual Return must be signed and certified by one of the following:
an individual	☐ the individual licence holder, or ☐ a person acting on behalf of the individual licence holder in accordance with a power of attorney for the individual. A copy of the power of attorney must be submitted with the Annual Return.
a company	☐ by two directors, or ☐ by a director and a company secretary, or ☐ if a proprietary company that has a sole director who is also the sole company secretary - by that director, or ☐ by a person delegated to sign a copy of the Annual Return on the company's behalf in accordance with the Corporations Act 2001. Delegation of authority must be submitted with the Annual Return, or. ☐ by affixing the common seal, in accordance with the Corporations Act 2001
a public authority other than a Council	☐ by the Chief Executive Officer of the public authority, or ☐ by a person delegated to sign on the public authority's behalf in accordance with its legislation.
a local Council	☑ by the General Manager in accordance with s377 of the Local Government Act 1993 , or ☐ by affixing the seal of the Council in a manner authorised under the Local Government Act 1993.

It is an offence to supply any information in this form that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect. There is a maximum penalty of $250,000 for a corporation or $120,000 for an individual.

I/We

- *declare that the information in the Monitoring and Complaints Summary in section B of this Annual Return is correct and not false or misleading in a material respect, and*
- *certify that the information in the Statement of Compliance in sections A, C, D, E, F and G and any pages attached to Section C is correct and not false or misleading in a material respect.*

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates below and specify the new dates to which this Annual Return relates below:

For the reporting period 29-May-2016 to 28-May-2017 or ___/___/___ to ___/___/___

SIGNATURE: _____ SIGNATURE: _____

NAME: (printed) DAVID FARMER NAME: (printed) _____

POSITION: GENERAL MANAGER POSITION: _____

DATE: 25 / 07 / 2017 DATE: ___/___/___

SEAL(if signing under seal)

PLEASE ENSURE THAT ALL APPROPRIATE BOXES HAVE BEEN COMPLETED AND THAT THE CHECKLIST ON PAGE 2 OF THE ANNUAL RETURN HAS BEEN COMPLETED