

22 February 2024

Lithgow City Council
PO Box 19,
180 Mort Street
Lithgow NSW 2790

Attention: Nigel Campbell, Waste & Recycling Manager

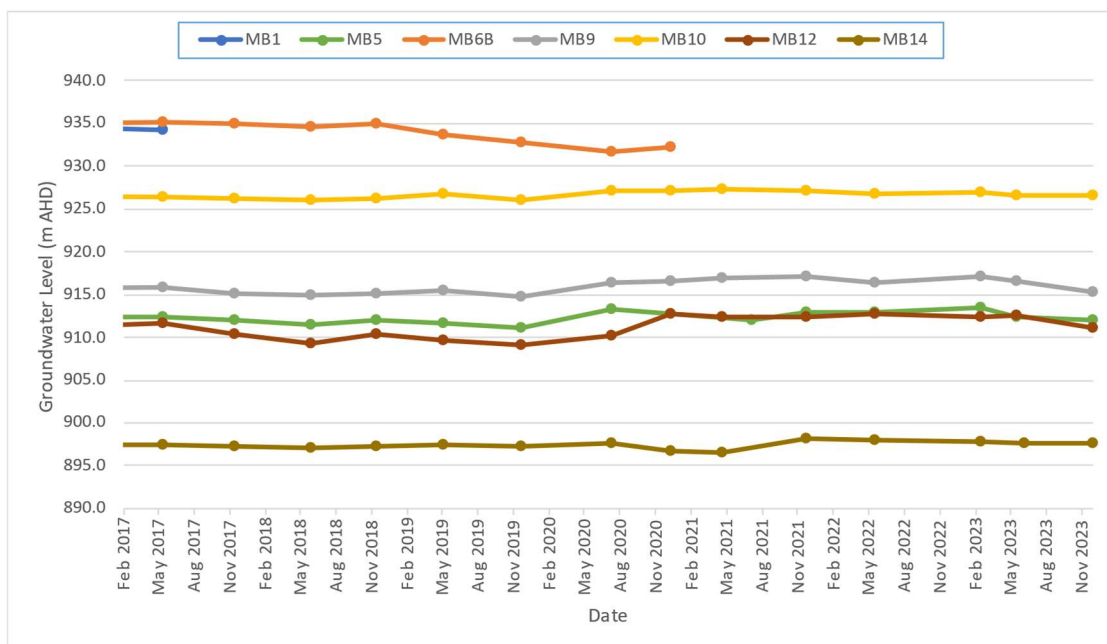
Environmental Monitoring of Lithgow Solid Waste Facility, Under Environment Protection Licence 6004 – November 2023

Premise has completed scheduled groundwater and accumulated landfill gas monitoring at Lithgow Solid Waste Facility, located off Geordie Street, Lithgow on 28 November 2023. Leachate discharge monitoring from point LW1 was also conducted.

Groundwater Levels

Groundwater was gauged at five (5) groundwater monitoring bores across the site. Groundwater gauging data is included in **Table 1** (attached), and elevation trends are shown on **Figure 1**.

Figure 1 – Lithgow Solid Waste Facility – Groundwater Elevations



No groundwater was recorded in monitoring station MB1. Observations were as follows:

- Depths to groundwater ranged from 2.89 metres below ground level (mbgl) at MB14, to 13.65 mbgl at MB9. Corrected groundwater elevations ranged from 897.68 metres Australian Height Datum (mAHD) at MB14, to 926.58 mAHD at MB10.
- Inference of groundwater elevations, calculated from available survey data from installed groundwater monitoring bores, indicate a flow direction to the south-west.

Groundwater Quality

Groundwater samples were able to be collected from bores MB5, MB9, MB10, MB12 and MB14. Samples were couriered to SGS Laboratories in Alexandria, NSW, who are NATA accredited to perform the scheduled analysis. Results of analysis are included in Table 2 (attached), and laboratory certificates have also been appended to this letter.

Groundwater quality has been assessed by comparison to criteria (where available) adopted from Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* – Primary Industries: Water quality for irrigation and general water use.

- Laboratory measured pH ranged from 3.8 at MB12 to 6.8 at MB14. pH of groundwater at MB12 was verified by field probe measurement, and outside the guideline range considered suitable for pumping, irrigation and stock watering (6.0 to 8.5 pH units).
- Electrical conductivity (EC) ranged from 100 $\mu\text{S}/\text{cm}$ at piezometer MB10 to 1700 $\mu\text{S}/\text{cm}$ at piezometer MB5.
- Total dissolved solids (TDS) ranged from 56 mg/L at MB10 to 960 mg/L at MB5. TDS concentrations were below the livestock watering 'loss of production' tolerance limit for the most susceptible livestock category, poultry (3000 mg/L – ANZECC & ARMCANZ, 2000).
- The chemical oxygen demand (COD) of groundwater samples ranged from less than the laboratory limit of reporting (LOR) of 10 mg/L at MB9 and MB10, to 49 mg/L at MB14.
- Total alkalinity in groundwater ranged from below the laboratory LOR of 5 mgCaCO₃/L at MB12, to 360 mgCaCO₃/L at MB5. Alkalinity of groundwater exceeded the guideline hardness value for potential fouling of waters (350 mg/L) at MB5.
- Groundwater chloride concentrations ranged from 9.5 mg/L at MB10 to 310 mg/L at MB12. All concentrations were below the guideline value for protection of moderately sensitive crops (350 mg/L).
- Fluoride concentrations in groundwater were recorded at below the LOR of 0.1 mg/L at all monitoring bores, with the exception of MB9 (0.13 mg/L). All concentrations were below the guideline value of 1 mg/L for long term irrigation use (up to 100 years).
- Sulfate concentrations in groundwater ranged from 2 mg/L at MB9 to 130 mg/L at MB12.
- Calcium concentrations ranged from 5.7 mg/L at MB10 to 100 mg/L at MB14.

- Magnesium concentrations ranged from 4.3 mg/L at MB10 to 32 mg/L at MB14.
- Potassium concentrations ranged from 1.9 mg/L at MB10 to 49 mg/L at MB5.
- Concentrations of sodium ranged from 6.4 mg/L at MB10 to 120 mg/L at MB5 and MB12. Sodium concentrations were below the guideline level for irrigation to moderately sensitive crops (<230 mg/L).
- Ammonia concentrations in groundwater ranged from 0.08 mgN/L at MB10 to 11 mgN/L at MB12.
- Nitrate concentrations ranged from less than the laboratory LOR of 0.005 mgN/L at MB14, to 8.4 mgN/L at MB5. The nitrate concentration in groundwater was an increase since the previous monitoring (4.3 mgN/L in May 2023), however nitrate concentrations at MB5 have been observed to fluctuate.
- Phosphorus concentrations in groundwater ranged from less than the laboratory LOR of 0.02 mg/L at MB12 and MB14, to 0.04 mg/L at MB5. Phosphorus concentrations in groundwater did not exceed the guideline value of 0.05 mg/L for long term irrigation use (up to 100 years).
- Aluminium concentrations in groundwater were recorded to range 0.006 mg/L at MB14 to 9.2 mg/L at MB12. Aluminium concentrations in groundwater exceeded the long-term (up to 100 years) irrigation guideline concentration of 5 mg/L at MB12.
- Hexavalent chromium concentrations were below the laboratory LOR of 0.004 mg/L. Total chromium concentrations in groundwater were recorded to range from less than the laboratory LOR of 0.001 mg/L at MB5, MB10, MB12 and MB14, to 0.001 mg/L at MB9. Concentrations of hexavalent chromium were lower than the long-term (up to 100 years) irrigation guideline concentration of 0.1 mg/L.
- Iron concentrations ranged from 0.18 mg/L at MB5, to 47 mg/L at MB9. Iron concentrations at all monitoring points exceeded the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L, with the exception of MB5.
- Manganese concentrations ranged from 0.049 mg/L at MB10 to 4.5 mg/L at MB9. Manganese concentrations at locations MB5, MB9 and MB12 exceeded the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Total organic carbon (TOC) in groundwater ranged from 1.0 mg/L at MB10 to 8.4 mg/L at MB5.
- Total phenols were recorded at concentrations below the laboratory LOR of 0.05 mg/L at all groundwater monitoring points.
- Organochlorine pesticides and organophosphorus pesticides were below respective laboratory LORs at all groundwater monitoring points.
- Total petroleum hydrocarbons (TPH) and total recoverable hydrocarbons (TRH) were below respective laboratory LORs at all groundwater monitoring points, with the exceptions of:
 - TPH C₆-C₉ fraction at MB12 (0.11 mg/L).
 - TPH C₁₀-C₁₄ fraction at MB12 (0.051 mg/L).

- TPH C₁₅-C₂₈ fraction at MB12 (0.20 mg/L).
- TRH C₆-C₁₀ fraction at MB12 (0.11 mg/L).
- TRH >C₁₀-C₁₆ fraction at MB12 (0.085 mg/L).

Leachate

The leachate sample collected from LW1 was couriered to SGS Laboratories in Alexandria, NSW, who are NATA accredited to perform the scheduled analysis. Results of analysis are included in **Table 2** (attached), and laboratory certificates have also been appended to this letter.

Leachate quality has been assessed by comparison to criteria (where available) adopted from Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 – Primary Industries: Water quality for irrigation and general water use*.

- Laboratory measured pH was recorded at 7.1, noted to be slightly alkaline.
- Total alkalinity was recorded at 210 mg/L, which was below the guideline hardness value for potential fouling of waters (350 mg/L).
- The recorded chloride concentration was 230 mg/L, and below the guideline value for protection of moderately sensitive crops (350 mg/L).
- The fluoride concentration of leachate was recorded to be below the laboratory LOR of 0.1 mg/L, and below the guideline value of 1 mg/L for long term irrigation use (up to 100 years).
- The leachate sulfate concentration was recorded to be 33 mg/L.
- Calcium in leachate was recorded to be 75 mg/L.
- Magnesium in leachate was recorded to be 26 mg/L.
- Potassium in leachate was recorded to be 41 mg/L.
- Sodium in leachate was recorded to be 100 mg/L. The sodium concentration was below the guideline level for irrigation to moderately sensitive crops (230 mg/L).
- Total organic carbon (TOC) was recorded at 7.4 mg/L.
- The ammonia concentration of leachate was recorded to be 0.06 mgN/L.
- The nitrate concentration of leachate was recorded to be 1.7 mgN/L.
- Iron in leachate was recorded to be 0.2 mg/L, and above the long term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Manganese in leachate was recorded to be 0.3 mg/L, and above the long term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Total phenolics in leachate were recorded at below the laboratory LOR of 0.05 mg/L.

Accumulated Landfill Gas Monitoring

Accumulated (building) gas methane monitoring is conducted using a zeroed and calibrated methane gas detector, currently the Ventis MX4 Gas Meter. The threshold level for closer investigation and potential action is 12,500 parts per million (1.25 % v/v) of methane in any building on the facility or within 250 m of landfilled areas. If methane is detected above this limit, daily testing is recommended until ventilation or other measures have controlled the methane concentration. The monitoring frequency is in accordance with EPL requirements.

The following procedure is used to monitor accumulated landfill gas:

1. Before starting, prepare field notebook and check that gas analyser is working. Date, time and person(s) conducting monitoring are all recorded.
2. All enclosed buildings within 250 m of active or capped areas of landfill are monitored. All rooms are investigated, with the gas meter allowed to detect for a period of approximately one minute in each.
3. Starting in the middle of each room, with the instrument probe at head height, the ambient concentration of methane present is recorded. Locations or features such as service ingress points, floor cracks / penetrations, skirting boards and joins between walls and floors are subsequently investigated.
4. Larger spaces also have a perimeter walk conducted as well as investigation of alcoves and pits.
5. The highest concentration of methane found at any location in each structure is recorded.

Gas concentrations in buildings and sheds within the required monitoring distance of 250 metres of filled areas were all below the respective threshold concentration of 1.25 % (v/v) during the monthly monitoring rounds conducted in July 2023 to January 2024. Results of gas monitoring are included in **Table 3** (attached)

The next routine monitoring for groundwater, leachate and accumulated landfill gas is scheduled for May 2024. Surface water monitoring is required to take place any calendar month when a surface water discharge is recorded. Please do not hesitate to contact us with any questions or comments you may have regarding this report.

Yours sincerely



BRENDAN STUART

Senior Environmental Scientist

No. of Attachments – 5:

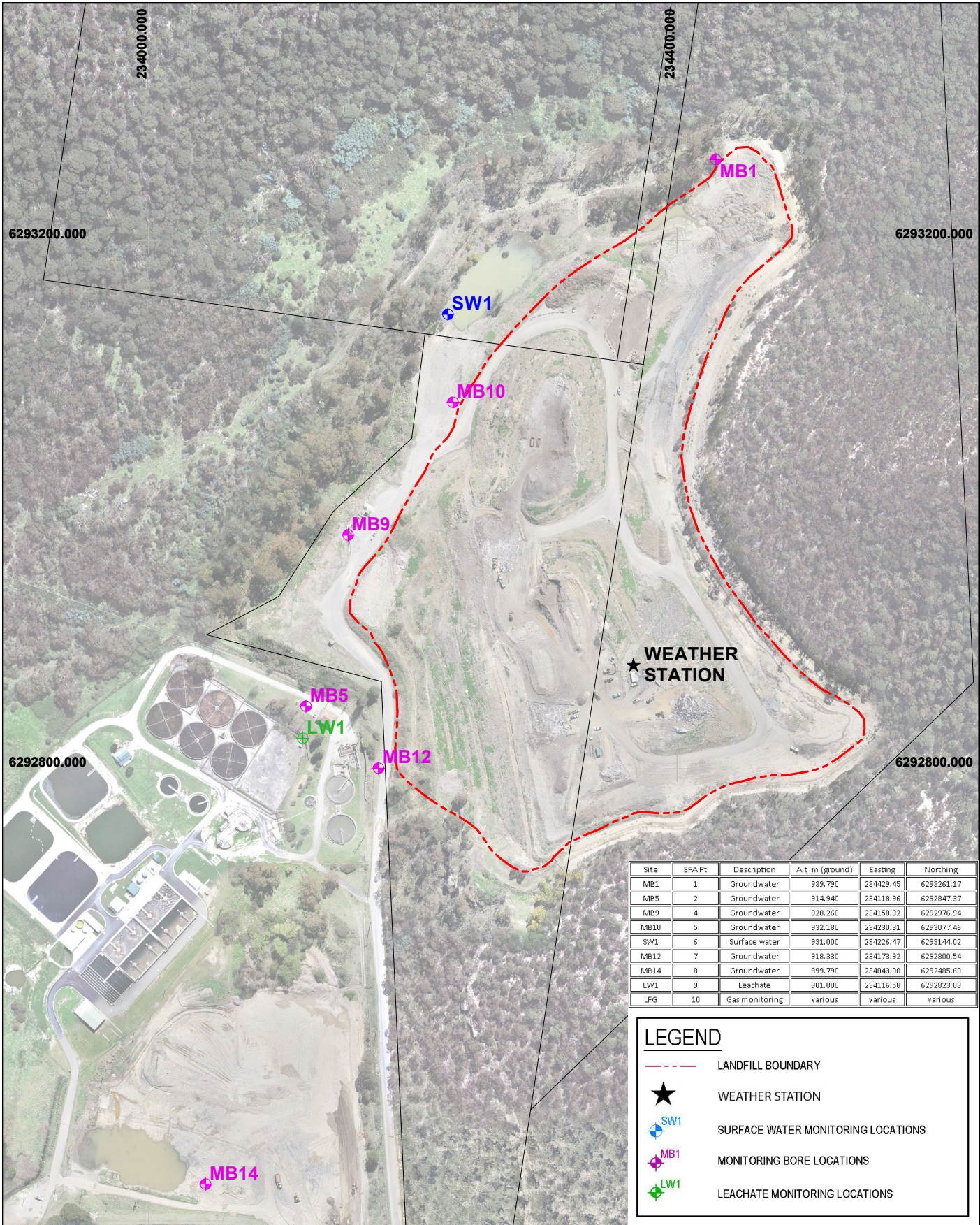
Environmental Monitoring Point Locations

Table 1 – Groundwater Level Measurements

Table 2 – Results of Laboratory Analyses (Groundwater & Leachate) – November 2023

Table 3 – Accumulated Landfill Gas Monitoring

SGS Laboratories Analytical Reports – November 2023



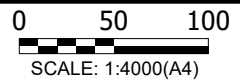
Site	EPA Pt	Description	Alt_m (ground)	Easting	Northing
MB1	1	Groundwater	939.790	234429.45	6293261.17
MB5	2	Groundwater	914.940	234118.96	6292847.37
MB9	4	Groundwater	928.260	234150.92	6292976.94
MB10	5	Groundwater	932.180	234230.31	6293077.46
SW1	6	Surface water	931.000	234226.47	6293144.02
MB12	7	Groundwater	918.330	234173.92	6292800.54
MB14	8	Groundwater	899.790	234043.00	6292485.60
LW1	9	Leachate	901.000	234116.58	6292823.03
LFG	10	Gas monitoring	various	various	various

LEGEND

- - - LANDFILL BOUNDARY
- ★ WEATHER STATION
- ◆ SW1 SURFACE WATER MONITORING LOCATIONS
- MB1 MONITORING BORE LOCATIONS
- LW1 LEACHATE MONITORING LOCATIONS

DRAWING No:
LCC-MONIT_PLAN

CLIENT: LITHGOW CITY COUNCIL
 CEH REF: 3/668TH
 SURVEY: MONITORING PLAN
 PROPERTY: LITHGOW SOLID WASTE DEPOT
 LOCALITY: 62 GEORDIE STREET, HERMITAGE FLAT, NSW



NOTES:
MGA COORDINATES AND AHD DATUM
BOUNDARIES HAVE NOT BEEN SURVEYED
Border size = 185mm x 272mm on A4 paper.



CEH SURVEY
 CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
 "Astrolabe" 1 Rutherford Lane,
 LITHGOW 2790
 ABN: 66 056 544 551 Office: (02) 6351 2281
 Email: survey@ceh.com.au Website: www.ceh.com.au



DATE	18-03-2022
AMENDED	
SURVEYOR	TH
DRAWN	TH
CHECKED	



TABLE 1: LITHGOW SOLID WASTE FACILITY - GROUNDWATER LEVEL RESULTS

Ground Water Levels: 28-Nov-23

Piezometer Details:

	Ground Elev (mAHD)	Stickup (m)	Elevation Top PVC (mAHD)	Date	Measured (m)	GWL (mAHD)	Well Depth (m)	Well Base (mAHD)	Water Column (m)
MB1	939.790	0.86	940.650	28/11/2023	NMWL	-	6.5	934.15	nil
MB5	914.940	0.80	915.740	28/11/2023	3.65	912.09	9.8	905.94	6.15
MB6B	946.290	0.75	947.040	28/11/2023	NMWL	-	19.3	927.74	nil
MB9	928.260	0.69	928.950	28/11/2023	13.65	915.30	17.1	911.85	3.45
MB10	932.180	0.73	932.910	28/11/2023	6.33	926.58	13.7	919.21	7.37
MB12	918.330	0.76	919.090	28/11/2023	8.06	911.03	22.3	896.84	14.19
MB14	899.790	0.78	900.570	28/11/2023	2.89	897.68	17.7	882.87	14.81

Definitions:

- Stickup: Height of piezometer pipe above ground surface.
- Ground Elev: Actual elevation of ground at the piezometer relative to an arbitrary datum. All ground elevations are measured to the same datum, hence Piezo GWLs are relative to each other.
- GWL: Actual elevation of groundwater at the piezometer relative to an arbitrary datum.
- Measured: Depth of groundwater measured from the top of the piezometer pipe.

Date	MB1		MB5		MB6B		MB9		MB10		MB12		MB14	
	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)
25-Oct-11	NMWL		3.20	912.54	9.92	937.12	12.62	916.33	5.77	927.14	8.69	910.40	2.80	897.77
08-Feb-12	5.85	934.80	3.26	912.48	4.68	942.36	12.71	916.24	5.83	927.08	8.77	910.32	NMWL	
15-Mar-12	3.11	937.54	2.29	913.45	7.82	939.22	11.56	917.39	5.51	927.40	7.95	911.14	2.64	897.93
24-Apr-12	NMWL		2.55	913.19	7.47	939.57	12.10	916.85	5.78	927.13	8.24	910.85	2.67	897.90
31-May-12	5.55	935.10	3.07	912.67	9.71	937.33	12.73	916.22	6.04	926.87	8.43	910.66	2.64	897.93
30-Oct-12	NMWL		3.29	912.45	14.64	932.40	13.33	915.62	6.19	926.72	8.90	910.19	3.11	897.46
17-Apr-13	5.81	934.84	2.87	912.87	13.55	933.49	12.80	916.15	6.10	926.81	8.50	910.59	2.91	897.66
23-Oct-13	NMWL		3.44	912.30	13.97	933.07	13.60	915.35	6.35	926.56	9.01	910.08	3.09	897.48
02-Apr-14	4.90	935.75	3.98	911.76	11.00	936.04	13.66	915.29	5.75	927.16	9.04	910.05	3.20	897.37
02-Jun-14	NMWL		3.96	911.78	NMWL		NMWL		NMWL		NMWL		NMWL	
21-Oct-14	NMWL		3.81	911.93	11.41	935.63	13.13	915.82	6.01	926.90	8.89	910.20	2.97	897.60
21-Apr-15	NMWL		3.56	912.18	14.98	932.06	13.19	915.76	6.26	926.65	9.06	910.03	3.27	897.30
13-Oct-15	NMWL		3.34	912.40	12.18	934.86	13.30	915.65	6.30	926.61	8.35	910.74	3.06	897.51
15-May-17	6.36	934.30	3.37	912.38	11.88	935.16	13.09	915.86	6.58	926.34	7.45	911.64	3.05	897.52
13-Nov-17	NMWL		3.80	911.94	12.15	934.89	13.84	915.11	6.63	926.28	8.70	910.39	3.29	897.28
29-May-18	NMWL		4.19	911.55	12.38	934.66	13.99	914.96	6.83	926.08	9.84	909.25	3.50	897.07
13-Nov-18	NMWL		3.80	911.94	12.15	934.89	13.84	915.11	6.63	926.28	8.70	910.39	3.29	897.28
06-May-19	NMWL		4.05	911.69	13.31	933.73	13.48	915.47	6.13	926.78	9.45	909.64	3.20	897.37
19-Nov-19	NMWL		4.58	911.16	14.25	932.79	14.21	914.74	6.86	926.05	9.95	909.14	3.36	897.21
08-Jul-20	NMWL		2.52	913.22	15.40	931.64	12.52	916.43	5.73	927.18	8.97	910.12	2.91	897.66
10-Dec-20	NMWL		NMWL		14.85	932.19	12.39	916.56	5.71	927.20	6.35	912.74	3.89	896.68
20-Apr-21	NMWL		NMWL		NMWL		11.97	916.98	5.60	927.31	6.79	912.30	3.96	896.61
05-Jul-21	NMWL		3.65	912.09	NMWL		NMWL		NMWL		NMWL		NMWL	
24-Nov-21	NMWL		2.90	912.84	NMWL		11.91	917.04	5.70	927.21	6.69	912.40	2.45	898.12
18-May-22	NMWL		2.79	912.95	NMWL		12.62	916.33	6.20	926.71	6.29	912.80	2.50	898.07
16-Feb-23	NMWL		2.28	913.46	NMWL		11.90	917.05	6.04	926.87	6.74	912.35	2.84	897.73
17-May-23	NMWL		3.32	912.42	NMWL		12.37	916.58	6.29	926.62	6.60	912.49		
07-Jun-23													2.95	897.62
28-Nov-23	NMWL		3.65	912.09	NMWL		13.65	915.30	6.33	926.58	8.06	911.03	2.89	897.68

TABLE 2: LITHGOW SOLID WASTE FACILITY - RESULTS OF LABORATORY ANALYSIS
NOVEMBER 2023

GROUNDWATER & LEACHATE



Group	Analyte	LOR	Units	Criteria	Sample ID	MB5	MB9	MB10	MB12	MB14	LW1
					Sample Date / Time	28/11/2023 0:00	28/11/2023 0:00	28/11/2023 0:00	28/11/2023 0:00	28/11/2023 0:00	28/11/2023 0:00
Physical Parameters	pH (Lab)	0	No unit	6.0 - 8.5	PS	6.4	6.4	6	3.8	6.8	7.1
	Electrical Conductivity (Lab)	2	µS/cm	4478	PS	1700	570	100	1300	810	-
	Total Dissolved Solids	10	mg/L	3000	PS	960	260	56	740	470	-
	Chemical Oxygen Demand	10	mg/L	-	PS	26	< 10	< 10	21	49	21
Alkalinity	Total Alkalinity as CaCO3	5	mg/L	350	PS	360	250	27	< 5	330	210
Anions	Chloride	1	mg/L	350	PS	300	27	9.5	310	35	230
	Fluoride	0.1	mg/L	1	PS	< 0.1	0.13	< 0.1	< 0.1	< 0.1	< 0.1
	Sulfate (SO4)	1	mg/L	-	PS	36	2	8.2	130	50	33
Cations	Calcium (Ca)	0.2	mg/L	1000	PS	84	48	5.7	22	100	75
	Magnesium (Mg)	0.1	mg/L	-	PS	31	13	4.3	18	32	26
	Potassium (K)	0.1	mg/L	-	PS	49	23	1.9	16	9.3	41
	Sodium (Na)	0.5	mg/L	230	PS	120	18	6.4	120	18	100
Forms of Carbon	Total Organic Carbon	0.2	mg/L	-	PS	8.4	3.2	1	7.8	3.5	7.4
Nutrients	Ammonia (NH3) as N	0.01	mg/L	-	PS	4.4	9.3	0.08	11	0.19	0.06
	Nitrate (NO3) as N	0.005	mg/L	-	PS	8.4	0.019	0.19	0.011	< 0.005	1.7
	Total Phosphorus	0.02	mg/L	0.05	PS	0.04	0.03	0.03	< 0.02	< 0.02	-
Trace Metals	Aluminium (Al)	0.005	mg/L	5	PS	0.08	0.24	0.42	9.2	0.006	-
	Chromium (Cr)	0.001	mg/L	-	PS	< 0.001	0.001	< 0.001	< 0.001	< 0.001	-
	Hexavalent Chromium (Cr-VI)	0.004	mg/L	0.1	PS	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	-
	Iron (Fe)	0.005	mg/L	0.2	PS	0.18	47	1.1	30	0.83	0.2
	Manganese (Mn)	0.001	mg/L	0.2	PS	0.84	4.5	0.049	1.2	0.078	0.3
Phenolics	Total Phenols	0.05	mg/L	-	PS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
OC Pesticides	Aldrin	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Alpha BHC	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Alpha Chlordane	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Alpha Endosulfan	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Beta BHC	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Beta Endosulfan	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Delta BHC	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Dieldrin	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Endosulfan sulphate	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Endrin	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Endrin aldehyde	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Endrin ketone	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Heptachlor	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Heptachlor epoxide	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Hexachlorobenzene (HCB)	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Lindane (gamma BHC)	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Methoxychlor	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	p,p'-DDD	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	p,p'-DDE	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	p,p'-DDT	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	o,p'-DDD	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	o,p'-DDT	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Gamma Chlordane	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	trans-Nonachlor	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Isodrin	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Mirex	0.1	µg/L	-	PS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
	Total OC Pesticides	1	µg/L	-	PS	< 1	< 1	< 1	< 1	< 1	< 1
OP Pesticides	Azinphos-methyl	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Bromophos Ethyl	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Chlorpyrifos (Chlorpyrifos Ethyl)	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Diazinon (Dimpylate)	0.5	µg/L	-	PS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
	Dichlorvos	0.5	µg/L	-	PS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
	Dimethoate	0.5	µg/L	-	PS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
	Ethion	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Fenitrothion	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Malathion	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Parathion-ethyl (Parathion)	0.2	µg/L	-	PS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
	Methidathion	0.5	µg/L	-	PS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
	Total Petroleum Hydrocarbons	TRH C6-C9	40	µg/L	-	PS	< 40	< 40	< 40	110	< 40
TRH C10-C14		50	µg/L	-	PS	< 50	< 50	< 50	51	< 50	-
TRH C15-C28		200	µg/L	-	PS	< 200	< 200	< 200	200	< 200	-
TRH C29-C36		200	µg/L	-	PS	< 200	< 200	< 200	< 200	< 200	-
TRH C37-C40		200	µg/L	-	PS	< 200	< 200	< 200	< 200	< 200	-
TRH C10-C40		320	µg/L	-	PS	< 320	< 320	< 320	< 320	< 320	-
Total Recoverable Hydrocarbons	TRH C6-C10	50	µg/L	-	PS	< 50	< 50	< 50	110	< 50	-
	TRH C6-C10 minus BTEX (F1)	50	µg/L	-	PS	< 50	< 50	< 50	110	< 50	-
	TRH >C10-C16	60	µg/L	-	PS	< 60	< 60	< 60	85	< 60	-
	TRH >C10-C16 minus Naphthalene (F2)	60	µg/L	-	PS	< 60	< 60	< 60	85	< 60	-
	TRH >C16-C34 (F3)	500	µg/L	-	PS	< 500	< 500	< 500	< 500	< 500	-
	TRH >C34-C40 (F4)	500	µg/L	-	PS	< 500	< 500	< 500	< 500	< 500	-
BTEXN Analytes	Benzene (F0)	0.5	µg/L	-	PS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-

mg/L milligrams per litre
 µg/L micrograms per litre
 µS/cm microsiemens per centimetre
 LOR limit of reporting
 PS primary sample
 Criteria Criteria adopted from Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - 'Primary Industries: Water Quality for irrigation and general water use', 2000
 within criteria
 criteria exceeded

**TABLE 3: LITHGOW SOLID WASTE FACILITY - ACCUMULATED LANDFILL GAS MONITORING
METHANE (as %, v/v)**



		Date	07/02/2023	15/03/2023	20/04/2023	17/05/2023	07/06/2023	26/07/2023	31/08/2023	22/09/2023	19/10/2023	28/11/2023	05/12/2023	11/01/2024
Location	LOR	Units												
Site Shed	0.005	%	< 0.005	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Weighbridge	0.005	%	< 0.005	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Office (STP)	0.005	%	< 0.005	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Green Shed (STP)	0.005	%	< 0.005	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pump Room (STP)	0.005	%	< 0.005	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

LOR limit of reporting

CLIENT DETAILS

Contact **Brendan Stuart**
 Client **PREMISE**
 Address **LEVEL 1
 100 BRUNSWICK STREET
 FORTITUDE VALLEY QLD 4006**

Telephone **61 2 6939 5000**
 Facsimile **(Not specified)**
 Email **Brendan.stuart@premise.com.au**

Project **217500 - Lithgow SWF**
 Order Number **217500**
 Samples **6**

LABORATORY DETAILS

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

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

SGS Reference **SE257518 R0**
 Date Received **30 Nov 2023**
 Date Reported **11 Dec 2023**

COMMENTS

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

SIGNATORIES



Akheevar BENIAMEEN
Chemist



Huong CRAWFORD
Production Manager



Kamrul AHSAN
Senior Chemist



Ly Kim HA
Organic Section Head



Shane MCDERMOTT
Inorganic/Metals Chemist



Teresa NGUYEN
Organic Chemist



Ying Ying ZHANG
Laboratory Technician

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Number			SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Matrix			Water	Water	Water	Water
Sample Date			28 Nov 2023	28 Nov 2023	28 Nov 2023	28 Nov 2023
Sample Name			MB5	MB9	MB10	MB12

Volatile Petroleum Hydrocarbons in Water Method: AN433 Tested: 7/12/2023

TRH C6-C10	µg/L	50	<50	<50	<50	110
TRH C6-C9	µg/L	40	<40	<40	<40	110

Surrogates

d4-1,2-dichloroethane (Surrogate)	%	-	93	93	94	90
d8-toluene (Surrogate)	%	-	95	96	96	94
Bromofluorobenzene (Surrogate)	%	-	102	104	99	103

VPH F Bands

Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	110

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403 Tested: 6/12/2023

TRH C10-C14	µg/L	50	<50	<50	<50	51
TRH C15-C28	µg/L	200	<200	<200	<200	200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH C10-C40	µg/L	320	<320	<320	<320	<320

TRH F Bands

TRH >C10-C16	µg/L	60	<60	<60	<60	85
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	<60	85
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500

OC Pesticides in Water Method: AN420 Tested: 6/12/2023

Alpha BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	µg/L	0.1	-	-	-	-
p,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Mirex	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total OC	µg/L	1	-	-	-	-
Total OC	µg/L	1	<1	<1	<1	<1

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Number			SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Matrix			Water	Water	Water	Water
Sample Date			28 Nov 2023	28 Nov 2023	28 Nov 2023	28 Nov 2023
Sample Name			MB5	MB9	MB10	MB12

OC Pesticides in Water Method: AN420 Tested: 6/12/2023 (continued)

Surrogates

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	71	70	70	71

OP Pesticides in Water Method: AN420 Tested: 6/12/2023

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Azinphos-methyl	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Bromophos Ethyl	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Diazinon (Dimpylate)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Dichlorvos	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Methidathion	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Parathion-ethyl (Parathion)	µg/L	0.2	<0.2	<0.2	<0.2	<0.2

Surrogates

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
2-fluorobiphenyl (Surrogate)	%	-	76	88	82	91
d14-p-terphenyl (Surrogate)	%	-	108	126	125	132

Total Phenolics in Water Method: AN295 Tested: 4/12/2023

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Total Phenols	mg/L	0.05	<0.05	<0.05	<0.05	<0.05

Anions by Ion Chromatography in Water Method: AN245 Tested: 5/12/2023

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Chloride	mg/L	1	300	27	9.5	310
Sulfate, SO4	mg/L	1	36	2.0	8.2	130
Fluoride	mg/L	0.1	<0.10	0.13	<0.10	<0.10
Nitrate Nitrogen, NO3-N	mg/L	0.005	8.4	0.019	0.19	0.011

Ammonia Nitrogen by Discrete Analyser Method: AN291 Tested: 1/12/2023

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Ammonia Nitrogen, NH ₃ as N	mg/L	0.01	4.4	9.3	0.08	11

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Number			SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Matrix			Water	Water	Water	Water
Sample Date			28 Nov 2023	28 Nov 2023	28 Nov 2023	28 Nov 2023
Sample Name			MB5	MB9	MB10	MB12

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293(Sydney only) Tested: 5/12/2023

Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	0.04	0.03	0.03	<0.02
--	------	------	------	------	------	-------

pH in water Method: AN101 Tested: 1/12/2023

pH**	No unit	-	6.4	6.4	6.0	3.8
------	---------	---	-----	-----	-----	-----

Conductivity and TDS by Calculation - Water Method: AN106 Tested: 1/12/2023

Conductivity @ 25 C	µS/cm	2	1700	570	100	1300
---------------------	-------	---	------	-----	-----	------

Total Dissolved Solids (TDS) in water Method: AN113 Tested: 4/12/2023

Total Dissolved Solids Dried at 175-185°C	mg/L	10	960	260	56	740
---	------	----	-----	-----	----	-----

Alkalinity Method: AN135 Tested: 1/12/2023

Total Alkalinity as CaCO3	mg/L	5	360	250	27	<5
---------------------------	------	---	-----	-----	----	----

COD in Water Method: AN179/AN181 Tested: 5/12/2023

Chemical Oxygen Demand	mg/L	10	26	<10	<10	21
------------------------	------	----	----	-----	-----	----

Parameter	Units	LOR	SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Number			SE257518.001	SE257518.002	SE257518.003	SE257518.004
Sample Matrix			Water	Water	Water	Water
Sample Date			28 Nov 2023	28 Nov 2023	28 Nov 2023	28 Nov 2023
Sample Name			MB5	MB9	MB10	MB12

Forms of Carbon Method: AN190 Tested: 5/12/2023

Total Organic Carbon as NPOC	mg/L	0.2	8.4	3.2	1.0	7.8
------------------------------	------	-----	------------	------------	------------	------------

Hexavalent Chromium in water by Discrete Analyser Method: AN283 Tested: 1/12/2023

Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004	<0.004	<0.004	<0.004
---------------------------	------	-------	--------	--------	--------	--------

Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 5/12/2023

Calcium, Ca	mg/L	0.2	84	48	5.7	22
Magnesium, Mg	mg/L	0.1	31	13	4.3	18
Potassium, K	mg/L	0.1	49	23	1.9	16
Sodium, Na	mg/L	0.5	120	18	6.4	120

Trace Metals (Total) in Water by ICPMS Method: AN022/AN318 Tested: 6/12/2023

Total Aluminium	µg/L	5	80	240	420	9200
Total Chromium	µg/L	1	<1	1	<1	<1
Total Iron	µg/L	5	180	47000	1100	30000
Total Manganese	µg/L	1	840	4500	49	1200

Sample Number	SE257518.005	SE257518.006
Sample Matrix	Water	Water
Sample Date	28 Nov 2023	28 Nov 2023
Sample Name	MB14	LW1
Parameter	Units	LOR

Volatile Petroleum Hydrocarbons in Water Method: AN433 Tested: 7/12/2023

TRH C6-C10	µg/L	50	<50	-
TRH C6-C9	µg/L	40	<40	-

Surrogates

d4-1,2-dichloroethane (Surrogate)	%	-	92	-
d8-toluene (Surrogate)	%	-	90	-
Bromofluorobenzene (Surrogate)	%	-	102	-

VPF F Bands

Benzene (F0)	µg/L	0.5	<0.5	-
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	-

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403 Tested: 6/12/2023

TRH C10-C14	µg/L	50	<50	-
TRH C15-C28	µg/L	200	<200	-
TRH C29-C36	µg/L	200	<200	-
TRH C37-C40	µg/L	200	<200	-
TRH C10-C40	µg/L	320	<320	-

TRH F Bands

TRH >C10-C16	µg/L	60	<60	-
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	-
TRH >C16-C34 (F3)	µg/L	500	<500	-
TRH >C34-C40 (F4)	µg/L	500	<500	-

OC Pesticides in Water Method: AN420 Tested: 6/12/2023

Alpha BHC	µg/L	0.1	<0.1	-
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	-
Beta BHC	µg/L	0.1	<0.1	-
Lindane (gamma BHC)	µg/L	0.1	<0.1	-
Delta BHC	µg/L	0.1	<0.1	-
Heptachlor	µg/L	0.1	<0.1	-
Aldrin	µg/L	0.1	<0.1	-
Isodrin	µg/L	0.1	<0.1	-
Heptachlor epoxide	µg/L	0.1	<0.1	-
Gamma Chlordane	µg/L	0.1	<0.1	-
Alpha Chlordane	µg/L	0.1	<0.1	-
Alpha Endosulfan	µg/L	0.1	<0.1	-
o,p'-DDE	µg/L	0.1	-	-
p,p'-DDE	µg/L	0.1	<0.1	-
Dieldrin	µg/L	0.1	<0.1	-
Endrin	µg/L	0.1	<0.1	-
Beta Endosulfan	µg/L	0.1	<0.1	-
o,p'-DDD	µg/L	0.1	<0.1	-
p,p'-DDD	µg/L	0.1	<0.1	-
Endrin aldehyde	µg/L	0.1	<0.1	-
Endosulfan sulphate	µg/L	0.1	<0.1	-
o,p'-DDT	µg/L	0.1	<0.1	-
p,p'-DDT	µg/L	0.1	<0.1	-
Endrin ketone	µg/L	0.1	<0.1	-
Methoxychlor	µg/L	0.1	<0.1	-
Mirex	µg/L	0.1	<0.1	-
trans-Nonachlor	µg/L	0.1	<0.1	-
Total OC	µg/L	1	-	-
Total OC	µg/L	1	<1	-

	Sample Number	SE257518.005	SE257518.006
	Sample Matrix	Water	Water
	Sample Date	28 Nov 2023	28 Nov 2023
	Sample Name	MB14	LW1
Parameter	Units	LOR	

OC Pesticides in Water Method: AN420 Tested: 6/12/2023 (continued)

Surrogates

Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	78	-
---	---	---	-----------	---

OP Pesticides in Water Method: AN420 Tested: 6/12/2023

Azinphos-methyl	µg/L	0.2	<0.2	-
Bromophos Ethyl	µg/L	0.2	<0.2	-
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.2	<0.2	-
Diazinon (Dimpylate)	µg/L	0.5	<0.5	-
Dichlorvos	µg/L	0.5	<0.5	-
Dimethoate	µg/L	0.5	<0.5	-
Ethion	µg/L	0.2	<0.2	-
Fenitrothion	µg/L	0.2	<0.2	-
Malathion	µg/L	0.2	<0.2	-
Methidathion	µg/L	0.5	<0.5	-
Parathion-ethyl (Parathion)	µg/L	0.2	<0.2	-

Surrogates

2-fluorobiphenyl (Surrogate)	%	-	91	-
d14-p-terphenyl (Surrogate)	%	-	125	-

Total Phenolics in Water Method: AN295 Tested: 4/12/2023

Total Phenols	mg/L	0.05	<0.05	<0.05
---------------	------	------	-------	-------

Anions by Ion Chromatography in Water Method: AN245 Tested: 5/12/2023

Chloride	mg/L	1	35	230
Sulfate, SO4	mg/L	1	50	33
Fluoride	mg/L	0.1	<0.10	<0.10
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.005	1.7

Ammonia Nitrogen by Discrete Analyser Method: AN291 Tested: 1/12/2023

Ammonia Nitrogen, NH ₃ as N	mg/L	0.01	0.19	0.06
--	------	------	-------------	-------------

	Sample Number	SE257518.005	SE257518.006
	Sample Matrix	Water	Water
	Sample Date	28 Nov 2023	28 Nov 2023
	Sample Name	MB14	LW1
Parameter	Units	LOR	

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293(Sydney only) Tested: 5/12/2023

Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	<0.02	-
--	------	------	-------	---

pH in water Method: AN101 Tested: 1/12/2023

pH**	No unit	-	6.8	7.1
------	---------	---	-----	-----

Conductivity and TDS by Calculation - Water Method: AN106 Tested: 1/12/2023

Conductivity @ 25 C	µS/cm	2	810	-
---------------------	-------	---	-----	---

Total Dissolved Solids (TDS) in water Method: AN113 Tested: 5/12/2023

Total Dissolved Solids Dried at 175-185°C	mg/L	10	470	-
---	------	----	-----	---

Alkalinity Method: AN135 Tested: 1/12/2023

Total Alkalinity as CaCO3	mg/L	5	330	210
---------------------------	------	---	-----	-----

COD in Water Method: AN179/AN181 Tested: 7/12/2023

Chemical Oxygen Demand	mg/L	10	49	21
------------------------	------	----	----	----

	Sample Number	SE257518.005	SE257518.006
	Sample Matrix	Water	Water
	Sample Date	28 Nov 2023	28 Nov 2023
	Sample Name	MB14	LW1
Parameter	Units	LOR	

Forms of Carbon Method: AN190 Tested: 5/12/2023

Total Organic Carbon as NPOC	mg/L	0.2	3.5	7.4
------------------------------	------	-----	------------	------------

Hexavalent Chromium in water by Discrete Analyser Method: AN283 Tested: 5/12/2023

Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004	-
---------------------------	------	-------	--------	---

Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 5/12/2023

Calcium, Ca	mg/L	0.2	100	75
Magnesium, Mg	mg/L	0.1	32	26
Potassium, K	mg/L	0.1	9.3	41
Sodium, Na	mg/L	0.5	18	100

Trace Metals (Total) in Water by ICPMS Method: AN022/AN318 Tested: 6/12/2023

Total Aluminium	µg/L	5	6	-
Total Chromium	µg/L	1	<1	-
Total Iron	µg/L	5	830	200
Total Manganese	µg/L	1	78	300

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB298346	mg/L	5	<5	3%	102%

Ammonia Nitrogen by Discrete Analyser Method: ME-(AU)-[ENV]AN291

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Ammonia Nitrogen, NH ₃ as N	LB298366	mg/L	0.01	<0.01	4 - 5%	101%	95%

Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB298563	mg/L	1	<0.05	0 - 2%	95%
Sulfate, SO ₄	LB298563	mg/L	1	<1.0	2 - 5%	96%
Fluoride	LB298563	mg/L	0.1	<0.10	0 - 12%	98%
Nitrate Nitrogen, NO ₃ -N	LB298563	mg/L	0.005	<0.005	3 - 7%	99%

COD in Water Method: ME-(AU)-[ENV]AN179/AN181

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chemical Oxygen Demand	LB298569	mg/L	10	<10	0 - 6%	88%
	LB298818	mg/L	10	<10	3 - 14%	83%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity @ 25 C	LB298345	µS/cm	2	<2	0%	102%

Forms of Carbon Method: ME-(AU)-[ENV]AN190

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon as NPOC	LB298565	mg/L	0.2	<0.2	1 - 6%	85%	93%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS
	Reference					%Recovery
Hexavalent Chromium, Cr6+	LB298352	mg/L	0.004	<0.004	0%	97%
	LB298591	mg/L	0.004	<0.004	0%	109%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS	MS
	Reference					%Recovery	%Recovery
Calcium, Ca	LB298547	mg/L	0.2	<0.2	0%	104%	107%
Magnesium, Mg	LB298547	mg/L	0.1	<0.1	1%	105%	106%
Potassium, K	LB298547	mg/L	0.1	<0.1	5%	98%	97%
Sodium, Na	LB298547	mg/L	0.5	<0.5	5%	101%	106%

OC Pesticides in Water Method: ME-(AU)-[ENV]AN420

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS
	Reference					%Recovery
Alpha BHC	LB298705	µg/L	0.1	<0.1	0%	NA
Hexachlorobenzene (HCB)	LB298705	µg/L	0.1	<0.1	0%	NA
Beta BHC	LB298705	µg/L	0.1	<0.1	0%	NA
Lindane (gamma BHC)	LB298705	µg/L	0.1	<0.1	0%	NA
Delta BHC	LB298705	µg/L	0.1	<0.1	0%	92%
Heptachlor	LB298705	µg/L	0.1	<0.1	0%	93%
Aldrin	LB298705	µg/L	0.1	<0.1	0%	92%
Isodrin	LB298705	µg/L	0.1	<0.1	0%	NA
Heptachlor epoxide	LB298705	µg/L	0.1	<0.1	0%	NA
Gamma Chlordane	LB298705	µg/L	0.1	<0.1	0%	NA
Alpha Chlordane	LB298705	µg/L	0.1	<0.1	0%	NA
Alpha Endosulfan	LB298705	µg/L	0.1	<0.1	0%	NA
p,p'-DDE	LB298705	µg/L	0.1	<0.1	0%	NA
Dieldrin	LB298705	µg/L	0.1	<0.1	0%	93%
Endrin	LB298705	µg/L	0.1	<0.1	0%	92%
Beta Endosulfan	LB298705	µg/L	0.1	<0.1	0%	NA
o,p'-DDD	LB298705	µg/L	0.1	<0.1	0%	NA
p,p'-DDD	LB298705	µg/L	0.1	<0.1	0%	NA
Endrin aldehyde	LB298705	µg/L	0.1	<0.1	0%	NA
Endosulfan sulphate	LB298705	µg/L	0.1	<0.1	0%	NA
o,p'-DDT	LB298705	µg/L	0.1	<0.1	0%	NA
p,p'-DDT	LB298705	µg/L	0.1	<0.1	0%	85%
Endrin ketone	LB298705	µg/L	0.1	<0.1	0%	NA
Methoxychlor	LB298705	µg/L	0.1	<0.1	0%	NA
Mirex	LB298705	µg/L	0.1	<0.1	0%	NA
trans-Nonachlor	LB298705	µg/L	0.1	<0.1	0%	NA
Total OC	LB298705	µg/L	1	<1		

Surrogates

Parameter	QC	Units	LOR	MB	DUP %RPD	LCS
	Reference					%Recovery
Tetrachloro-m-xylene (TCMX) (Surrogate)	LB298705	%	-	83%	2%	79%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

OP Pesticides in Water Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Azinphos-methyl	LB298705	µg/L	0.2	<0.2	0%	NA
Bromophos Ethyl	LB298705	µg/L	0.2	<0.2	0%	NA
Chlorpyrifos (Chlorpyrifos Ethyl)	LB298705	µg/L	0.2	<0.2	0%	128%
Diazinon (Dimpylate)	LB298705	µg/L	0.5	<0.5	0%	139%
Dichlorvos	LB298705	µg/L	0.5	<0.5	0%	97%
Dimethoate	LB298705	µg/L	0.5	<0.5	0%	NA
Ethion	LB298705	µg/L	0.2	<0.2	0%	136%
Fenitrothion	LB298705	µg/L	0.2	<0.2	0%	NA
Malathion	LB298705	µg/L	0.2	<0.2	0%	NA
Methidathion	LB298705	µg/L	0.5	<0.5	0%	NA
Parathion-ethyl (Parathion)	LB298705	µg/L	0.2	<0.2	0%	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
2-fluorobiphenyl (Surrogate)	LB298705	%	-	70%	7%	88%
d14-p-terphenyl (Surrogate)	LB298705	%	-	108%	10%	77%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	LCS %Recovery
pH**	LB298345	No unit	-	99%

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Total Dissolved Solids Dried at 175-185°C	LB298462	mg/L	10	<10	1 - 3%
	LB298615	mg/L	10	<10	4%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total Phenolics in Water Method: ME-(AU)-[ENV]AN295

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phenols	LB298419	mg/L	0.05	<0.05	0 - 14%	99%	97%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion) as P	LB298617	mg/L	0.02	<0.02	6%	106%	103%

Trace Metals (Total) in Water by ICPMS Method: ME-(AU)-[ENV]AN022/AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Aluminium	LB298683	µg/L	5	<5	8%	108%	
Total Chromium	LB298683	µg/L	1	<1	0 - 18%	102%	NA
Total Iron	LB298683	µg/L	5	<5		110%	
Total Manganese	LB298683	µg/L	1	<1	2%	103%	129%

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB298705	µg/L	50	<50	71%
TRH C15-C28	LB298705	µg/L	200	<200	99%
TRH C29-C36	LB298705	µg/L	200	<200	127%
TRH C37-C40	LB298705	µg/L	200	<200	NA
TRH C10-C40	LB298705	µg/L	320	<320	NA

TRH F Bands

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH >C10-C16	LB298705	µg/L	60	<60	88%
TRH >C10-C16 - Naphthalene (F2)	LB298705	µg/L	60	<60	NA
TRH >C16-C34 (F3)	LB298705	µg/L	500	<500	107%
TRH >C34-C40 (F4)	LB298705	µg/L	500	<500	140%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH C6-C10	LB298824	µg/L	50	<50	0%	90%	104%
TRH C6-C9	LB298824	µg/L	40	<40	0%	91%	108%

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
d4-1,2-dichloroethane (Surrogate)	LB298824	%	-	93%	0%	102%	104%
d8-toluene (Surrogate)	LB298824	%	-	90%	3%	99%	104%
Bromofluorobenzene (Surrogate)	LB298824	%	-	97%	21%	96%	79%

VPH F Bands

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene (F0)	LB298824	µg/L	0.5		0%	NA	NA
TRH C6-C10 minus BTEX (F1)	LB298824	µg/L	50	<50	0%	85%	109%

METHOD

METHODOLOGY SUMMARY

AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN022	The water sample is digested with Nitric Acid and made up to the original volume similar to APHA3030E.
AN022/AN318	Following acid digestion of un filtered sample, determination of elements at trace level in waters by ICP-MS technique, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN181	Analysis of COD by Semi Closed Reflux: The sample is refluxed with strong acid and a known excess of oxidant. After digestion the unreduced oxidant is back titrated to determine the amount of oxidant consumed. The chemically oxidised matter is calculated in terms of oxygen equivalents. Reference APHA 5220 B.
AN190	TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO ₂ is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
AN190	Chemical oxygen demand can be calculated/estimated based on the O ₂ /C relation as 2.67*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.

METHOD

METHODOLOGY SUMMARY

AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO ₂ , NO ₃ and SO ₄ are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN279/AN293(Sydney)	The sample is digested with Sulphuric acid, K ₂ SO ₄ and CuSO ₄ . All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN283	Hexavalent Chromium via DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr ⁶⁺ . If total chromium is also measured the trivalent form of chromium Cr ³⁺ can be calculated from the difference (Total Cr - Cr ⁶⁺). Reference APHA3500CrB.
AN291	Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 660 nm by Discrete Analyser.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pyrazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C ₆ -C ₉ , C ₁₀ -C ₁₄ , C ₁₅ -C ₂₈ and C ₂₉ -C ₃₆ and in recognition of the NEPM 1999 (2013), >C ₁₀ -C ₁₆ (F ₂), >C ₁₆ -C ₃₄ (F ₃) and >C ₃₄ -C ₄₀ (F ₄). Where F ₂ is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C ₆ -C ₉ /C ₆ -C ₁₀ fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

METHOD

METHODOLOGY SUMMARY

AN433

VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

Calculation

Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
***	Indicates that both * and ** apply.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received. Solid samples expressed on a dry weight basis.

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

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

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

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

Note that in terms of units of radioactivity:

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

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

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.