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Australia

CRINGILA PS MONTHLY
SUBSURFACE GAS
MONITORING REPORT –
MARCH 2019

April 2019
J153825-02

Department of Education
Cringila Public School







C107826 :RC

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Cringila PS Monthly Subsurface Gas Monitoring Report – March 2019

Department of Education

Cringila Public School

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1 INTRODUCTION

This report summarises the findings of the March 2019 monthly round of subsurface gas monitoring carried out at Cringila Public School, located at 35 Sheffield Street, Cringila NSW (refer **Figure 1** in **Appendix A** for site layout).

The works were undertaken on the 15th of March 2019. The work forms part of an ongoing monitoring program prepared for the site in response to a Clean-Up Notice issued to the site (Notice No. 1557944, dated 25th October 2017). Works are undertaken in conjunction with weekly near-surface temperature monitoring and ambient air quality monitoring for the purpose of assessing subsurface gas risk associated with combusting coal fill processes identified within the north western hotspot area within the school grounds.

2 CLIMATIC CONDITIONS

Daily meteorological data obtained from the Albion Park Weather (Wollongong Airport) (station 068241) was collected prior to and during the monitoring round to provide meteorological data and to assist in accounting for changes in gas concentrations between monitoring events.

The weather station is situated approximately 14km south of the site. **Table 1** below summarises the meteorological variation experienced in the vicinity of the site leading up to and during the monitoring event.

Table 1: Weather Observations – Albion Park (station 068241)

Date	Temperature		Rainfall	Wind Parameters				Barometric Pressure	
	9am	3pm		9am		3pm		9am	3pm
	°C	°C	mm	Direction	Speed (km/hr)	Direction	Speed (km/hr)	hPa	hPa
9/03/2019	21.2	24.4	0	SSW	17	SE	13	1018.3	1017.2
10/03/2019	20.9	27.1	0	W	4	ENE	20	1015.8	1009.1
11/03/2019	23.5	24.6	0	SSW	13	E	20	1011.4	1009.2
12/03/2019	24.9	33.8	0	WSW	9	WSW	33	1007.3	1004.1
13/03/2019	19.2	21	0	WSW	11	S	13	1018.3	1017.2
14/03/2019	22.2	24.3	0.2	E	7	NE	17	1014.7	1010.5
15/03/2019	20	22.4	19.8	SSW	31	SSW	28	1015.2	1016.9

The weather observations (as demonstrated in **Table 1** above) indicate the following:

- Temperatures during the week prior, and on the morning of monitoring were mild to warm, and were observed to increase throughout the day;
- Moderate rainfall (19.8mm) was observed on the day of monitoring;
- High wind speeds (>10km/ph) were recorded consistently in the afternoons of the week prior to the day of monitoring. Morning wind speeds were generally lower; and
- Barometric pressure was observed to fluctuate over the week prior to monitoring, peaking on the 9th and 13th of March.

3 FIELDWORK METHODOLOGY

Fieldwork was undertaken on the 15th of March. Monitoring was carried out using a calibrated GA5000 Landfill Gas Meter (calibration certificates are provided in **Appendix B**). The monitoring ports of the GA5000 were fitted to the X-cap of each of the 9 subsurface monitoring wells and subsurface gas and flow rate recorded (refer to **Figure 3** of **Appendix A** for locations);

- Methane (CH₄) - (%v/v): Maximum and stable concentrations;
- Carbon Dioxide (CO₂) - (%v/v): Maximum and stable concentrations;
- Oxygen (O₂) - (%v/v): Minimum and stable concentrations;
- Carbon Monoxide (CO) - (ppm): Maximum concentration;
- Hydrogen Sulphide (H₂S) - (ppm): Maximum concentration;
- Relative pressure (mbar);
- Atmospheric pressure (mbar);
- Balance (v/v%); and
- Flow rate (L/hr): stabilised concentration (in monitoring wells only).

Service pits were assessed by inserting the GA5000 nozzle into the pits with the sampling tube inserted at least 30 cm below the cover grate for a minimum of 30 seconds. Locations of service pits monitored (P1 to P5) are presented in **Figure 3** of **Appendix A**.

4 ASSESSMENT CRITERIA

4.1 Criteria for Ground Gases

Criteria for ground gases in gas monitoring wells is selected based on the threshold levels presented in *Solid Waste Landfills Guideline* (NSW EPA 2016) and presented in **Table 2**.

Analyte	Threshold level reference	Unit	Threshold Level	Comments
CH ₄	NSW EPA 2016 ⁽¹⁾	% (volume/volume)	1.0	The threshold level for further investigation and corrective action
CO ₂			1.5	

Note:

1. The threshold levels for further investigation and corrective action are detection of methane at concentrations above 1% (volume/volume) carbon dioxide at concentrations of 1.5% (volume/volume) above established natural background levels.

When above levels are exceeded, further characterisation of the obtained values through the calculation of Gas Screening Values (GSV) will be required. Both on-site and off-site risk associated with subsurface landfill gas is further characterised through the calculation of the GSV. Using both the total concentration and flow rate, the level of risk associated with identified subsurface gas concentrations at each of these locations can be assessed. The method of deriving a GSV and associated landfill gas risk has been adopted by the calculations below specified in the Modified Wilson and Card classification *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* (NSW EPA 2012).

GSV refer to the concentration of CH₄ or CO₂ gas measured in a monitoring well multiplied by the measured borehole flow rate.

Table 3 below presents a summary of the Modified Wilson and Card classification used to calculate GSV and CS as well as risk classification in accordance with the guideline.

Table 3: GSV and CS and Characterising Landfill Gas Risk (NSW EPA 2012)			
Gas Screening Value Threshold (L/hr)	Characteristic Gas Situation	Risk Classification	Additional Factors
<0.07	1	Very low risk	Typically CH ₄ <1% v/v and/or CO ₂ <5% v/v, otherwise consider increase to Situation 2 ¹
<0.7	2	Low risk	Borehole flow rate not to exceed 70L/hr otherwise consider increase to Situation 3
<3.5	3	Moderate risk	-
<15	4	Moderate to high risk	Consider need for Level 3 risk assessment
<70	5	High risk	Level 3 risk assessment required
>70	6	Very high risk	

Gas criteria Applicable criteria for service pits is presented in **Table 4**.

Table 4: Threshold Levels for Service Pits				
Analyte	Threshold level reference	Unit	Threshold Level	Comments
CH ₄	NSW EPA 2016 ⁽¹⁾	% (volume/volume)	1.0	The threshold level for further investigation and corrective action
CO ₂			1.5	
CO ₂	Safe Work Australia HSIS ⁽²⁾	ppm	TWA ⁽³⁾ : 5000 STEL ⁽⁴⁾ : 30,000	Work Place Exposure Standards
H ₂ S	Safe Work Australia HSIS ⁽²⁾	ppm	TWA: 10 STEL: 15	- Only applicable to service pits to assess risks for utility workers
CO	Safe Work Australia HSIS ⁽²⁾	ppm	TWA: 30	- Not applicable for ground gas

5 MONITORING RESULTS

5.1 Subsurface Gas Well Monitoring

A summary of subsurface gas well results is presented below in **Table 5**.

¹ This was discussed in the scope of the Phase 2 Environmental Site Assessment (Greencap 2018), as indoor monitoring at School Building is regularly undertaken and results obtained so far did not indicate any gas intrusion, GSV values obtained during this monitoring program that are less than 0.07 will be considered as Very Low Risk.

CH₄ was detected only in monitoring well GG8, at a level above the adopted NSW EPA standard.

CO₂ concentrations were detected in exceedance of the adopted 1.5% threshold in wells GG2, GG3, GG4, GG5, GG6, GG7, GG8 and GG9.

Measured flow rates recorded in all subsurface monitoring wells were consistently 0.0L/hr.

Detections of CO and H₂S recorded during the March monitoring round were all well below threshold levels. O₂ concentrations ranged between 4.5%v/v (GG9) and 19.8%v/v (GG1).

5.2 Characteristic Gas Situation

GSVs calculated for CH₄ and CO₂ in each of the monitored wells indicated a Characteristic Gas Situation of CS1 "Very Low Risk" according to the Modified Wilson and Card classification method presented below.

Table 5: Subsurface Gas Results

Well ID	Monitoring Date	Time	Relative Pressure (mb)	Stable Flow Rate (L/hr)	Methane		Gas Screening Value	Carbon Dioxide		Gas Screening Value	Oxygen (%v/v)	Carbon Monoxide (ppm)	Hydrogen Sulfide (ppm)	Balance (%)	Barometric Pressure (mBar)
					Peak (%v/v)	Stable (%v/v)		Peak (%v/v)	Stable (%v/v)						
GG1	15/03/2019	11:10	0.03	0.0	0.0	0.0	0.00	0.2	0.2	0.00	19.8	0	0	80	1012
GG2	15/03/2019	11:25	0.63	0.0	0.0	0.0	0.00	2.2	2.2	0.00	17.1	0	1	80.7	1012
GG3	15/03/2019	11:45	0.05	0.0	0.0	0.0	0.00	6.0	6.0	0.00	13.3	0	0	80.7	1012
GG4	15/03/2019	11:35	-0.50	0.0	0.0	0.0	0.00	11.9	11.9	0.00	6.4	0	0	81.6	1012
GG5	15/03/2019	11:50	0.00	0.0	0.0	0.0	0.00	6.8	6.8	0.00	11	0	0	82.2	1012
GG6	15/03/2019	12:00	-0.10	0.0	0.0	0.0	0.00	5.6	5.6	0.00	14.7	0	0	79.7	1012
GG7	15/03/2019	12:10	-0.12	0.0	0.0	0.0	0.00	3.9	3.9	0.00	14.4	0	0	81.7	1013
GG8	15/03/2019	12:20	0.07	0.0	2.1	2.1	0.00	3.9	1.9	0.00	17.2	0	0	79.5	1013
GG9	15/03/2019	12:30	0.03	0.0	0.0	0.0	0.00	16.9	16.0	0.00	4.5	0	0	79.6	1013

Hazardous Ground Gas Guideline Criteria

	Denotes Characteristic Gas Situation of 1 (NSW EPA (2012), <i>Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases</i>)
	Denotes Characteristic Gas Situation of 2 (NSW EPA (2012), <i>Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases</i>)
	Denotes Characteristic Gas Situation of 3 (NSW EPA (2012), <i>Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases</i>)
	Elevated above the 1% volume criteria for CH ₄ and 1.5% CO ₂ presented in the NSW EPA <i>Solid Waste Landfill Guidelines</i>

5.3 Service Pits

A total of 12 service pits were monitored in the field for potential accumulated or venting gas. Gas readings were taken from within the service pits, as well as above the service pits (approximately 1m directly above). A summary of gas results from within and above service pits is presented in **Table 6** below.

No detectable concentrations of CH₄ were identified in any of the accessible service pits across the school. Low concentrations of CO₂ were detected within service pits P1, P2, P4, P8 & P10 - the CO₂ concentration recorded is below the threshold levels specified in the NSW EPA (2016). Concentrations of CO and H₂S were not detected in service pits during the March monitoring round - these detections remain below Work Place Exposure Standard.

Due to operational constraints, service pits P9 and P12 were not accessible during the March monitoring round.

Table 6: Service Pit Readings

Service Pit		CH ₄ (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	CO (ppm)	H ₂ S (ppm)
P1	(1m above pit)	0.0	0.1	20.6	0.0	0.0
	(within pit)	0.0	0.1	20.5	0.0	0.0
P2	(1m above pit)	0.0	0.0	20.5	0.0	0.0
	(within pit)	0.0	0.8	19.5	0.0	0.0
P3	(1m above pit)	0.0	0.0	20.6	0.0	0.0
	(within pit)	0.0	0.0	20.5	0.0	0.0
P4	(1m above pit)	0.0	0.0	20.6	0.0	0.0
	(within pit)	0.0	0.1	20.5	0.0	0.0
P5	(1m above pit)	0.0	0.0	20.4	0.0	0.0
	(within pit)	0.0	0.0	20.5	0.0	0.0
P6	(1m above pit)	0.0	0.0	20.6	0.0	0.0
	(within pit)	0.0	0.0	20.5	0.0	0.0
P7	(1m above pit)	0.0	0.0	20.5	0.0	0.0
	(within pit)	0.0	0.0	20.4	0.0	0.0
P8	(1m above pit)	0.0	0.0	20.5	0.0	0.0
	(within pit)	0.0	0.1	20.4	0.0	0.0
P9	(1m above pit)	0.0	0.0	20.3	0.0	0.0
	(within pit)	Inaccessible				
P10	(1m above pit)	0.0	0.1	20.1	0.0	0.0
	(within pit)	0.0	0.1	20.2	0.0	0.0
P11	(1m above pit)	0.0	0.0	20.5	0.0	0.0
	(within pit)	0.0	0.0	20.5	0.0	0.0
P12	(1m above pit)	0.0	0.0	20.6	0.0	0.0
	(within pit)	Inaccessible				

6 MONTHLY SITE INSPECTION CHECKLIST

During the monthly subsurface gas monitoring round, a monthly site inspection checklist is also compiled. Refer to the Monthly Site Inspection Checklist for the month of March.

7 FINDINGS

The main findings of this monitoring round can be summarised as follows:

- All monitoring wells had a GSV of 1 (Very Low Risk). Therefore, detections of CO₂ and CH₄ are not considered to pose a risk to site users or nearby receptors.
- The presence of CH₄ at GG8 is deemed to be due to biodegradation of coal.
- Results have indicated that gas emissions from service pits were below relevant criteria and indicative of background concentrations.

8 CONCLUSIONS

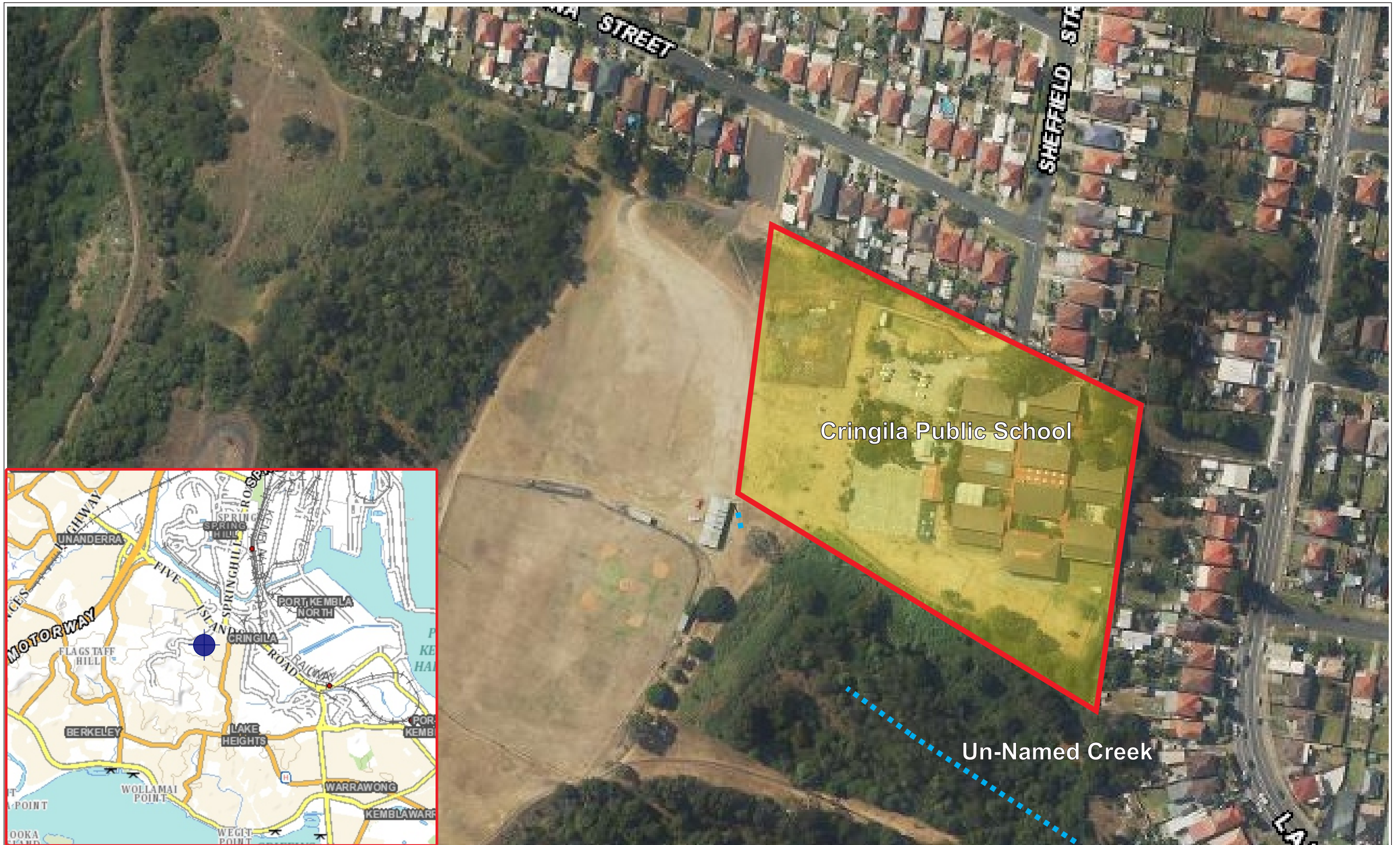
Results of this monitoring round indicate the site is Very Low Risk. No unacceptable risk to human health and/or environment was identified during the March monitoring round.

Cringila PS Monthly Subsurface Gas Monitoring Report – March 2019

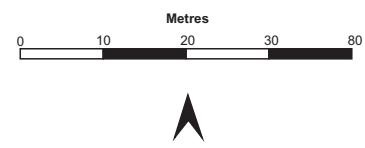
Department of Education

Cringila Public School

Appendix A: Figures



- Legend:**
- Site Boundary
 - Drainage



Level 2, 11-17 Khartoum Road
 North Ryde, NSW 2113
 Ph: 02-9889-1800
 Fx: 02-9889-1811

Client Name:		Department of Education			
Client Number:		C107471		Project Number: J155958	
Project Description: Monthly Monitoring Report- Cringila Public School					
Address:		Cringila Public School			
Prepared:	AMW	Reviewed:	MB	Date:	19/06/2018
Figure 1		Site Location and Regional Context			

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Legend:

- Site Boundary
- Groundwater Monitoring Well
- Ground Gas Monitoring Well
- Service Pit Location

Metres

0 10 20 30 40

▲

		Client Name: Department of Education	
		Client Number: C107471	Project Number: J155958-01
Level 2, 11-17 Khartoum Road North Ryde, NSW 2113 Ph: 02-9889-1800 Fx: 02-9889-1811		Project Description: Monthly Monitoring Report - Cringila Public School	
Address: Cringila Public School		Prepared: AMW	Reviewed: MB
Figure G: Groundwater Well, Gas Well and Service Pit Locations		Date: 19/06/2018	

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Cringila Public School

Appendix B: Calibration Certificates


airmet

 Air-Met Scientific Pty Ltd
 1300 137 067

Gas Calibration Certificate

 Instrument GA5000
 Serial No. G505732
 Sensors CH4, CO2, O2, CO, H2S

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
	Display	✓	
Grill Filter	Intensity	✓	
	Operation (segments)	✓	
Pump	Condition	✓	
	Seal	✓	
PCB	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
Connectors	Condition	✓	
Sensor	Condition	✓	
	O2	✓	
	CH4	✓	
	CO2	✓	
	CO	✓	
Alarms	H2S	✓	
	Beeper	✓	
Software	Settings	✓	
Datalogger	Version		
Download	Operation		
Other tests:			

Certificate of Calibration

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

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
O2		20.9% Vol O2		Fresh Air	20.8% O2
CH4		60% CH4	NATA	SY244	59.8% CH4
CO2		40% CO2	NATA	SY244	40.2% CO2
CO		95ppm CO	NATA	SY174	95ppm CO
H2S		25ppm H2S	NATA	SY174	25ppm H2S

Calibrated by:

Sarah Lian

Calibration date:

13/03/2019

Next calibration due:

9/09/2019