

GREENCAP

Going Further in Managing Risk

104 Market Street
Wollongong NSW 2500
Australia

CRINGILA PUBLIC SCHOOL
MONTHLY SUBSURFACE GAS
MONITORING REPORT –
MAY 2019







May 2019
J153825-02

NSW Department
of Education
Cringila Public School

35 Sheffield Street
Cringila NSW 2502

C107826 :TO/RC

Document Control

Document Quality Management Details.			
Report Name:	Cringila PS Monthly Subsurface Gas Monitoring Report – May 2019		
Site Details:	Cringila Public School, 35 Sheffield Street, Cringila NSW		
Project Number:	J153825-02		
Client Name:	NSW Department of Education		
Client Number:	C107826		
Signatures:	<table border="0"> <tr> <td>Prepared By:  Tom Oyston Property Risk Consultant</td> <td>Authorised By:  Rowan Clark Property Risk/Environmental Consultant</td> </tr> </table>	Prepared By:  Tom Oyston Property Risk Consultant	Authorised By:  Rowan Clark Property Risk/Environmental Consultant
Prepared By:  Tom Oyston Property Risk Consultant	Authorised By:  Rowan Clark Property Risk/Environmental Consultant		

Issue Status

Version No.	Date	Creator/s	Reviewer
1	24/05/2019	Tom Oyston	Rowan Clark

Document Circulation

No of Copies	Type	Customer Name	Position & Company
1	Electronic	Greg Mott	Senior Group Leader, School Infrastructure

Statements of Limitation

All and any Services proposed by GreenCap to the Client are subject to the Terms and Conditions listed on the GreenCap website at: www.greencap.com.au/about-green-cap/terms-and-conditions. Unless otherwise expressly agreed to in writing and signed by GreenCap, GreenCap does not agree to any alternative terms or variation of these terms if subsequently proposed by the Client. The Services are to be carried out in accordance with the current and relevant industry standards of testing, interpretation and analysis. The Services are to be carried out in accordance with Commonwealth, State or Territory legislation, regulations and/or guidelines. The Client will be deemed to have accepted these Terms when the Client signs the Proposal (where indicated) or when the Company commences the Services at the request (written or otherwise) of the Client.

The services were carried out for the Specific Purpose, outlined in the body of the Proposal. To the fullest extent permitted by law, GreenCap, its related bodies corporate, its officers, consultants, employees and agents assume no liability, and will not be liable to any person, or in relation to, any losses, damages, costs or expenses, and whether arising in contract, tort including negligence, under statute, in equity or otherwise, arising out of, or in connection with, any matter outside the Specific Purpose.

The Client acknowledges and agrees that proposed investigations rely on information provided to GreenCap by the Client or other third parties. GreenCap makes no representation or warranty regarding the completeness or accuracy of any descriptions or conclusions based on information supplied to it by the Client, its employees or other third parties during provision of the Services. The Client releases and indemnifies GreenCap from and against all Claims arising from errors, omissions or inaccuracies in documents or other information provided to GreenCap by the Client, its employees or other third parties. Under no circumstances shall GreenCap have any liability for, or in relation to, any work, reports, information, plans, designs, or specifications supplied or prepared by any third party, including any third party recommended by GreenCap.

The Client will ensure that GreenCap has access to all sites and buildings as required by or necessary for GreenCap to undertake the Services. Notwithstanding any other provision in these Terms, GreenCap will have no liability to the Client or any third party to the extent that the performance of the Services is not able to be undertaken (in whole or in part) due to access to any relevant sites or buildings being prevented or delayed due to the Client or their respective employees or contractors expressing safety or health concerns associated with such access.

GreenCap, its related bodies corporate, its officers, employees and agents assume no liability and will not be liable for lost profit, revenue, production, contract, opportunity, loss arising from business interruption or delay, indirect or consequential loss or loss to the extent caused or contributed to by the Client or third parties, suffered or incurred arising out of or in connection with our Proposals, Reports, the Project or the Agreement. In the event GreenCap is found by a Court or Tribunal to be liable to the Client for any loss or damage arising in connection with the Services, the Client's entitlement to recover damages from GreenCap shall be reduced by such amount as reflects the extent to which any act, default, omission or negligence of the Client, or any third party, caused or contributed to such loss or damage. Unless otherwise agreed in writing and signed by both parties, GreenCap's total aggregate liability will not exceed the total consulting fees paid by the client in relation to this Proposal. For further detail, see GreenCap's Terms and Conditions available at www.greencap.com.au/about-green-cap/terms-and-conditions

The Report is provided for the exclusive use of the Client for this Project only, in accordance with the Scope and Specific Purpose as outlined in the Agreement, and only those third parties who have been authorised in writing by GreenCap. It should not be used for other purposes, other projects or by a third party unless otherwise agreed and authorised in writing by GreenCap. Any person relying upon this Report beyond its exclusive use and Specific Purpose, and without the express written consent of GreenCap, does so entirely at their own risk and without recourse to GreenCap for any loss, liability or damage. To the extent permitted by law, GreenCap assumes no responsibility for any loss, liability, damage, costs or expenses arising from interpretations or conclusions made by others, or use of the Report by a third party. Except as specifically agreed by GreenCap in writing, it does not authorise the use of this Report by any third party. It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

The conclusions, or data referred to in this Report, should not be used as part of a specification for a project without review and written agreement by GreenCap. This Report has been written as advice and opinion, rather than with the purpose of specifying instructions for design or redevelopment. GreenCap does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in relation to the site it investigated. This Report should be read in whole and should not be copied in part or altered. The Report as a whole sets out the findings of the investigations. No responsibility is accepted by GreenCap for use of parts of the Report in the absence (or out of context) of the balance of the Report.

Cringila PS Monthly Subsurface Gas Monitoring Report – May 2019

NSW Department of Education

Cringila Public School

Table of Contents

1	Introduction.....	1
2	Climatic Conditions.....	1
3	Fieldwork Methodology.....	2
	3.1 Subsurface Gas Wells.....	2
	3.2 Service Pits.....	2
4	Assessment Criteria.....	2
	4.1 Criteria for Ground Gases.....	2
5	Monitoring Results.....	4
	5.1 Subsurface Gas Well Monitoring.....	4
	5.2 Characteristic Gas Situation.....	4
	5.3 Service Pits.....	6
6	Monthly Site Inspection checklist.....	7
7	Findings.....	7
8	Conclusions.....	7
	Appendix A: Figures.....	VIII
	Appendix B: Calibration Certificate.....	IX

1 INTRODUCTION

This report summarises the findings of the May 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 17th May 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
11/05/2019	16.9	19.2	0	WSW	31	SSE	17	1015.4	1018.3
12/05/2019	17.0	19.2	0.2	W	20	E	19	1027.0	1026.1
13/05/2019	15.6	21.3	0	NNW	Calm	NE	19	1029.6	1025.0
14/05/2019	19.5	19.7	0	SE	6	SE	20	1027.1	1026.2
15/05/2019	16.6	20.4	0	NE	Calm	NE	15	1030.7	1028.0
16/05/2019	16.3	20.9	0	WSW	2	E	13	1029.4	1025.7
17/05/2019	18.2	22.1	0	NW	Calm	ENE	17	1027.7	1024.9

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, and were observed to increase throughout the day;
- Little to no rainfall was observed during the week prior to the day of monitoring;
- High wind speeds (>10km/hr) were recorded consistently in the afternoons of the week prior to monitoring. Morning wind speeds were generally lower; and
- Barometric pressure was observed to fluctuate over the week prior to monitoring, peaking two (2) days prior to the day of monitoring.

3 FIELDWORK METHODOLOGY

Fieldwork was undertaken on 17th May 2019. Monitoring was carried out using a calibrated GA5000 Landfill Gas Meter (calibration certificates are provided in **Appendix B**).

3.1 Subsurface Gas Wells

The monitoring ports of the GA5000 were fitted to the X-cap of each of the 9 (GG1 to GG9) subsurface monitoring wells. Subsurface gas and flow rate were recorded as well as concentrations of the following Hazardous Gases (refer to **Figure 2** of **Appendix A** for monitoring 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 (within subsurface gas monitoring wells only).

3.2 Service Pits

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. The locations of service pits monitored (P1 to P12) are presented in **Figure 2** 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 below 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 the above-mentioned 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 any 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 concentrations 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 Characteristic Situation (CS) as well as the risk classification in accordance with the Guideline.

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	

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

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

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.

5 MONITORING RESULTS

5.1 Subsurface Gas Well Monitoring

A summary of the subsurface gas well results is presented below in **Table 5: Subsurface Gas Results**.

CO₂ concentrations were detected in exceedance of the adopted NSW EPA (2016) threshold in wells GG3, GG4, GG5, GG6, GG7 and GG9.

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

Detections of CO and H₂S recorded during the May 2019 monitoring round were all below the adopted threshold levels.

O₂ concentrations ranged between 4.7%v/v (GG4) and 20.4%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 in **Table 3**.

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	17/05/2019	11:10	-0.26	0.0	0.0	0.0	0.00	0.1	0.1	0.00	20.4	0	0	79.5	1022
GG2	17/05/2019	11:00	-0.31	0.0	0.0	0.0	0.00	0.6	0.6	0.00	20.3	0	0	79.1	1022
GG3	17/05/2019	9:20	-0.76	0.0	0.1	0.1	0.00	5.4	5.4	0.00	12.7	0	0	81.8	1021
GG4	17/05/2019	9:15	-0.85	0.0	0.1	0.1	0.00	10.2	10.2	0.00	4.7	0	0	85	1020
GG5	17/05/2019	9:30	-0.50	0.0	0.0	0.0	0.00	7.6	7.6	0.00	4.8	0	1	87.6	1021
GG6	17/05/2019	9:45	-1.29	0.0	0.0	0.0	0.00	3.0	3.0	0.00	15.2	0	0	81.7	1021
GG7	17/05/2019	9:55	-0.40	0.0	0.0	0.0	0.00	2.9	2.9	0.00	15.5	0	0	81.7	1021
GG8	17/05/2019	10:15	-8.90	0.0	0.1	0.1	0.00	0.9	0.8	0.00	9.8	0	0	88.9	1021
GG9	17/05/2019	10:25	-0.38	0.0	0.0	0.0	0.00	12.0	12.0	0.00	7.1	0	0	80.9	1021

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% for CO ₂ presented in the NSW EPA <i>Solid Waste Landfill Guidelines (2016)</i>

5.3 Service Pits

A total of 12 service pits were monitored in the field for potential accumulated or venting gases. 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 P3, P5, P6, P7 & P12; however, the CO₂ concentration recorded in these pits is below the threshold levels specified in the NSW EPA (2016) Guideline. Concentrations of CO and H₂S were not detected in service pits during the May 2019 monitoring round - these detections remain below the Workplace Exposure Standard (Safe Work Australia, 2013).

Due to operational and access constraints, service pits P2 and P9 were not accessible during the May 2019 monitoring round.

Table 6: Service Pit Gas Results

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	0.0	20.1	0.0	0.0
	(within pit)	0.0	0.0	20.0	0.0	0.0
P2	(1m above pit)	Inaccessible				
	(within pit)	Inaccessible				
P3	(1m above pit)	0.0	0.1	20.4	0.0	0.0
	(within pit)	0.0	0.1	20.4	0.0	0.0
P4	(1m above pit)	0.0	0.0	20.1	0.0	0.0
	(within pit)	0.0	0.0	20.0	0.0	0.0
P5	(1m above pit)	0.0	0.1	21.0	0.0	0.0
	(within pit)	0.0	0.1	21.1	0.0	0.0
P6	(1m above pit)	0.0	0.1	20.4	0.0	0.0
	(within pit)	0.0	0.1	20.3	0.0	0.0
P7	(1m above pit)	0.0	0.1	20.3	0.0	0.0
	(within pit)	0.0	0.1	20.0	0.0	0.0
P8	(1m above pit)	0.0	0.0	20.2	0.0	0.0
	(within pit)	0.0	0.0	20.1	0.0	0.0
P9	(1m above pit)	0.0	0.0	20.4	0.0	0.0
	(within pit)	Inaccessible				
P10	(1m above pit)	0.0	0.0	20.4	0.0	0.0
	(within pit)	0.0	0.0	20.4	0.0	0.0
P11	(1m above pit)	0.0	0.0	20.2	0.0	0.0
	(within pit)	0.0	0.0	20.3	0.0	0.0
P12	(1m above pit)	0.0	0.0	21.3	0.0	0.0
	(within pit)	0.0	0.1	21.2	0	0

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 May 2019 for details.

7 FINDINGS

The main findings of this subsurface gas 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.
- 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 May 2019 monitoring round.

Cringila PS Monthly Subsurface Gas Monitoring Report – May 2019

NSW Department of Education

Cringila Public School

Appendix A: Figures



Legend:

- Site Boundary
- Drainage

Metres

0 10 20 30 40 50 60 70 80

▲

GREENCAP
Going Further in Managing Risk

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		

Disclaimer: Greencap Pty Ltd has produced this map for the purpose of presenting a summary of relevant spatial information and gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability (including without limitation liability for negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Service Layer Credits: © 2016 NSW Land and Property Information (Six Maps)



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	

Disclaimer: Grencap Pty Ltd has produced this map for the purpose of presenting a summary of relevant spatial information and gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability (including without limitation liability for negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Service Layer Credits: © 2016 NSW Land and Property Information (Six Maps)

**Cringila PS Monthly Subsurface Gas Monitoring
Report – May 2019**

NSW Department of Education

Cringila Public School

Appendix B: Calibration Certificate


airmet

 Air-Met Scientific Pty Ltd
 1300 137 067

Gas Calibration Certificate
Instrument GA5000
Serial No. G505859
Sensors CH4, CO2, O2, CO, H2S

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

Certificate of Calibration

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

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
O2		20.9% Vol O2		Fresh Air	20.9% O2
CH4		60% CH4	NATA	SY244	59.8% CH4
CO2		40% CO2	NATA	SY244	39.9% CO2
CO		95ppm CO	NATA	SY174	95ppm CO
H2S		25ppm H2S	NATA	SY174	25ppm H2S

Calibrated by:

Sen Philip

Calibration date: 15/05/2019

Next calibration due: 11/11/2019