

**Design
for a better
*future /***

NSW Department of Education

**Quarterly Subsurface
Gas Monitoring Report
– Q4 2024**

Cringila Public School –
35 Sheffield Street,
Cringila NSW

wsp

December 2024

Question today *Imagine tomorrow* Create for the future

Quarterly Subsurface Gas Monitoring Report – Q4 2024
Cringila Public School – 35 Sheffield Street, Cringila NSW

NSW Department of Education

WSP
104 Market Street
Wollongong NSW 2500
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

	Name	Date	Signature
Prepared by:	Hamish Cowan	10/01/2025	
Reviewed by:	Andres Grigaliunas	13/01/2025	
Approved by:	Andres Grigaliunas	13/01/2025	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

This document may contain confidential and legally privileged information, neither of which are intended to be waived, and must be used only for its intended purpose. Any unauthorised copying, dissemination or use in any form or by any means other than by the addressee, is strictly prohibited. If you have received this document in error or by any means other than as authorised addressee, please notify us immediately and we will arrange for its return to us.



Table of Contents

Statements of LimitationsError! Bookmark not defined.

1	Introduction	1
2	Climatic Conditions.....	2
3	Fieldwork Methodology	3
3.1	Subsurface Gas Wells	3
3.2	Service Pits	3
4	Assessment Criteria.....	4
4.1	Criteria for Ground Gases	4
5	Monitoring Results	6
5.1	Subsurface Gas Well Monitoring	6
5.2	Characteristic Gas Situation	6
5.3	Service Pits	8
6	Quarterly Site Inspection Checklist	10
7	Findings	11
8	Conclusions	12

List of tables

Table 2.1	Weather Observations – Albion Park (station 068241).....	2
Table 4.1	Threshold Levels for Hazardous Gases	4
Table 4.2	GSV and CS and Characterising Landfill Gas Risk (NSW EPA 2012)	4
Table 4.3	Threshold Levels for Service Pits	5
Table 5.1	Subsurface Gas Results	7
Table 5.2	Service Pit Gas Results	8

List of appendices

Appendix A Figures

Appendix B Calibration Certificates

1 Introduction

This report summarises the findings of the Q4 2024 quarterly 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 5th of December 2024. 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 were undertaken in conjunction with quarterly near-surface and in-situ temperature monitoring and ambient air quality monitoring for the purpose of assessing subsurface gas risk associated with combusting coal fill processes identified within the former 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 a week 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 2.1 below summarises the meteorological variation experienced in the vicinity of the site leading up to and during the monitoring event.

Table 2.1 Weather Observations – Albion Park (station 068241)

Date	Temperature		Rainfall	Wind Parameters				Barometric Pressure	
	9am	3pm		9am		3pm		9am	3pm
	°C	°C		Direction	Speed (km/hr)	Direction	Speed (km/hr)	hPa	hPa
29/11/2024	21.4	21.7	13.2	Calm	Calm	S	7	1019.1	1017.7
30/11/2024	21.6	22.8	62.0	NE	20	NE	20	1011.9	1007.6
1/12/2024	26.9	20.6	25.8	ENE	13	NNW	9	1006.3	1005.9
2/12/2024	27.0	27.7	8.6	Calm	Calm	ENE	26	1008.8	1006.6
3/12/2024	25.0	29.3	0.0	Calm	Calm	WNW	13	1007.2	1005.6
4/12/2024	22.4	24.1	0.0	SSE	13	ESE	17	1016.9	1017.7
5/12/2024	21.6	24.2	0.0	ENE	11	ENE	26	1021.6	1018.1

The weather observations (as demonstrated in **Table 2.1** above) indicate the following:

- Temperatures during the week prior to and on the morning of monitoring showed mild weather for the week prior to monitoring;
- Heavy rainfall was recorded on the 30th of November and the 1st of December. Moderate rainfall was recorded on the 29th of November and the 2nd of December;
- Low wind speeds (<10km/h) were recorded on 29th November, and 2nd-3rd of December mornings prior to monitoring. High wind speeds (>10km/h) were recorded on most afternoons and the mornings of 30th November, 1st of December and the 4th and 5th of December.
- Barometric pressure fluctuated throughout the week prior to monitoring, with pressures starting high on the 29th of November before falling to low pressure mid week on the 2nd December. Pressures then rose back to high levels on the 5th December.

3 Fieldwork Methodology

Fieldwork was undertaken on 5th of December 2024. 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 was selected based on the threshold levels presented in *Solid Waste Landfills Guideline* (NSW EPA 2016) and presented below in Table 4.1.

Table 4.1 Threshold Levels for Hazardous Gases

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	

Notes 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 4.2 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.

Table 4.2 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	

Applicable Gas criteria for service pits is presented below in Table 4.3.

Table 4.3 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 — Only applicable to service pits to assess risks for utility workers
H ₂ S	Safe Work Australia HSIS ⁽²⁾	ppm	TWA: 10 STEL: 15	— Not applicable for ground gas
CO	Safe Work Australia HSIS ⁽²⁾	ppm	TWA: 30	

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 5.1 and discussed below:

- CH₄ was not detected in any subsurface monitoring wells
- CO₂ was detected in exceedance of the adopted NSW EPA (2016) threshold in monitoring wells GG3, GG4, GG5, GG6, GG7 and GG9. As the measured flow rates in the wells were all <0.1L/hr, gas screening values were all “very low risk”;
- Measured flow rates recorded in all subsurface monitoring wells were consistently between 0.0L/hr and 0.1L/hr; and
- CO was not detected in any monitoring wells. H₂S was detected in wells GG3, GG5 and GG7 at very low levels of concentration. O₂ concentrations ranged between 11.2%v/v (GG9) and 15.6%v/v (GG3).

Due to access constraints, subsurface monitoring wells GG1 and GG2 could not be assessed during the **Q4** 2024 monitoring round. Monitoring well GG8 was previously found to have penetrated an underground sewer pipe and has been removed (past gas results for well GG8 should also be considered inaccurate).

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 4.2.

Table 5.1 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	24/09/2024														
GG2	24/09/2024														
GG3	5/12/2024	11:06	0.02	0.0	0.0	0.0	0.00	4.6	4.2	0.00	15.6	0	1	80.1	1014
GG4	5/12/2024	10:59	0.02	0.0	0.1	0.1	0.00	8.8	8.8	0.00	11.3	0	0	84.3	1014
GG5	5/12/2024	11:16	0.05	0.1	0.0	0.0	0.00	4.4	4.2	0.00	15.0	0	1	80.7	1014
GG6	5/12/2024	11:36	0.00	0.0	0.0	0.0	0.00	5.7	5.7	0.00	13.0	0	0	81.3	1014
GG7	5/12/2024	11:29	0.07	0.0	0.0	0.0	0.00	4.1	2.9	0.00	14.4	0	1	82.7	1014
GG8	5/12/2024														
GG9	5/12/2024	11:45	0.03	0.0	0.0	0.0	0.00	7.1	6.9	0.00	11.2	0	0	81.3	1014

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 Solid Waste Landfill Guidelines (2016)

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 5.2 and discussed below:

- CH₄, CO and H₂S were not detected above or within any of the accessible service pits;
- CO₂ was detected in low concentrations in service pit P1 (up to 0.1%); and
- Due to access constraints, service pits P2, and 5 and within P11 and P12 could not be assessed during the Q4 2024 monitoring round.

Table 5.2 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	0.1	20.4	0.0	0.0
	(within pit)	0.0	0.0	20.4	0.0	0.0
P2	(1m above pit)	Inaccessible				
	(within pit)					
P3	(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
P4	(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
P5	(1m above pit)	Inaccessible				
	(within pit)					
P6	(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
P7	(1m above pit)	0.0	0.0	20.3	0.0	0.0
	(within pit)	0.0	0.0	20.3	0.0	0.0
P8	(1m above pit)	0.0	0.0	20.3	0.0	0.0
	(within pit)	0.0	0.0	20.3	0.0	0.0
P9	(1m above pit)	0.0	0.0	20.3	0.0	0.0
	(within pit)	0.0	0.0	20.3	0.0	0.0
P10	(1m above pit)	0.0	0.0	20.2	0.0	0.0
	(within pit)	0.0	0.0	20.2	0.0	0.0
P11	(1m above pit)	0.0	0.0	20.4	0.0	0.0
	(within pit)	Inaccessible				
P12	(1m above pit)	0.0	0.0	20.4	0.0	0.0

	(within pit)	Inaccessible
--	--------------	--------------

6 Quarterly Site Inspection Checklist

During the quarterly subsurface gas monitoring round, a quarterly site inspection checklist is also completed. Refer to the **Quarterly Site Inspection Checklist** for Q4 2024 for details.

7 Findings

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

- All monitoring wells had a Characteristic Gas Situation of 1 (Very Low Risk). Therefore, detections of CO₂ and CH₄ are not considered to pose a risk to site users or nearby receptors; and
- 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 Q4 2024 monitoring round.

9 Limitations Statement

This Report is provided by WSP Australia Pty Limited (WSP) for Department of Education - Southern NSW AMU (Client) in response to specific instructions from the Client and in accordance with WSP's proposal dated 29/05/2024.

9.1 Permitted purpose

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

9.2 Qualifications and assumptions

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information*), those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

9.3 Use and reliance

This Report should be read in its entirety and must not be copied, distributed or referred to in part only. The Report must not be reproduced without the written approval of WSP. WSP will not be responsible for interpretations or conclusions drawn by the reader. This Report (or sections of the Report) should not be used as part of a specification for a project or for incorporation into any other document without the prior agreement of WSP.

WSP is not (and will not be) obliged to provide an update of this Report to include any event, circumstance, revised Information or any matter coming to WSP's attention after the date of this Report. Data reported and Conclusions drawn are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

This Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose. The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) any Conclusions contained within the Report and implement them in an appropriate, suitable and timely manner.

In the absence of express written consent of WSP, no responsibility is accepted by WSP for the use of the Report in whole or in part by any party other than the Client for any purpose whatsoever. Without the express written consent of WSP, any use which a third party makes of this Report or any reliance on (or decisions to be made) based on this Report is at the sole risk of those third parties without recourse to WSP. Third parties should make their own enquiries and obtain independent advice in relation to any matter dealt with or Conclusions expressed in the Report.

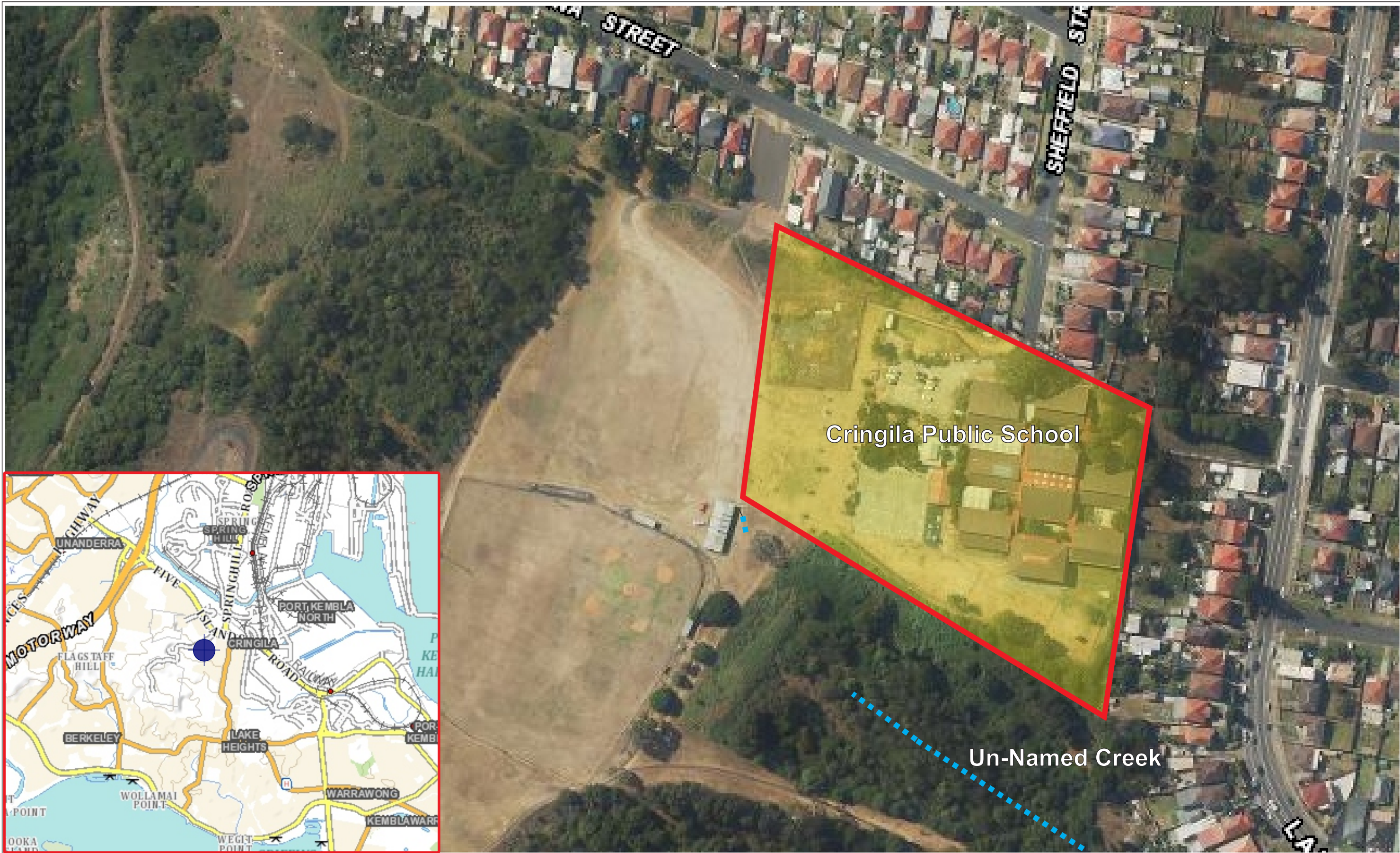
9.4 Disclaimer

No warranty, undertaking or guarantee whether expressed or implied, is made with respect to the data reported or the Conclusions drawn. To the fullest extent permitted at law, WSP, its related bodies corporate and its officers, employees and agents assumes no responsibility and will not be liable to any third party for, or in relation to any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of profit, loss of revenue, loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, site depredation costs, business interruption or economic loss) of any kind whatsoever, suffered on incurred by a third party.

Appendix A

Figures





Legend:

- Site Boundary
- Drainage

0 10 20 30 40 50 60 70 80 Metres

▲

GREENCAP
Going Further in Managing Risk

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			

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

010203040

Metres

GREENCAP

Going Further in Managing Risk

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: J155958-01	
Project Description:		Monthly Monitoring Report - Cringila Public School			
Address:		Cringila Public School			
Prepared:	AMW	Reviewed:	MB	Date:	19/06/2018
Figure 2		Groundwater Well, Gas Well and Service Pit Locations			

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)

Appendix B

Calibration Certificates





Air-Met Scientific Pty Ltd
1300 137 067

Gas Calibration Certificate

Instrument **GA5000**
Serial No. **G508339**
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:

Diffusion mode	Aspirated mode				
Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
O2		20.9% O2		Fresh Air	20.9% O2
CH4		60% CH4	NATA	SY644	60% CH4
CO2		40% CO2	NATA	SY644	39.9% CO2
CO		100ppm CO	NATA	SY653	100 ppm CO
H2S		25ppm H2S	NATA	SY653	25 ppm H2S

Calibrated by:

Nausheen Mazari

Calibration date:

28/11/2024

Next calibration due:

28/12/2024

About Us

WSP is one of the world's leading engineering professional services consulting firms, bringing together approximately 65,000+ talented people around the globe. We are technical experts who design and provide strategic advice on sustainable solutions and engineer Future Ready™ projects that will help societies grow for lifetimes to come. wsp.com

