

Our reference: EB1824A/GB/6334

3 February 2016

Fusion Students  
1<sup>st</sup> Floor  
506 Centennial Park  
ELSTREE  
WD6 3FG

To Whom It May Concern

**Re: Phase 2 Gas Monitoring**

Further to the issue of our Phase 2 Intrusive Investigation Report document reference no. EB1824A/GB/6101 Dec 2015 for the above site, we submit herein our addendum gas monitoring report which is to be read in conjunction with the aforementioned document.

***Monitoring***

Gas monitoring pipework was installed within boreholes BH1, BH2, WS1, WS3 and WS4. to assess if there are any risks from ground gas.

Gas monitoring has been undertaken across the site on six occasions between 6.11.15 and 13.1.16.

During the visits barometric pressure was recorded between 977 and 1025 millibars.

***Carbon Dioxide***

Levels of carbon dioxide varied between 0.3% and 5.3%  $V/V$  with a maximum gas flow rate of 0.1l/hr.

The highest readings were recorded within borehole BH2 and WS3.

Based on the flow rate of 0.1/hr and the highest recorded carbon dioxide concentration of 5.3%, a maximum gas screening value (GSV) of 0.0053/hr is calculated, as follows:  $(5.3/100) \times 0.1 = 0.0053\text{l/hr}$ .

***Methane***

Methane was found to vary between undetectable and 0.1%  $V/V$  with a maximum gas flow rate of 0.1l/hr.

Based on the flow rate limit of 0.1l/hr and the highest recorded methane concentration of 0.1%, a gas screening value of 0.0001l/hr is calculated as follows:  $(0.1/100) \times 0.1 = 0.0001\text{l/hr}$ .

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## **Conclusions**

With reference to Situation A non-traditional construction as defined by the NHBC and the modified Wilson & Card classification as contained within CIRIA C665, given that the maximum carbon dioxide level exceeds the maximum recommended concentration of 5% it is considered that gas protection should be incorporated into the development in accordance with 'gas characteristic situation 2'.

The results of the gas monitoring can be referred to below.

If you require any further advice please do not hesitate to contact us.

Yours sincerely

Graham Behrens  
Principal Engineer  
For and on behalf of  
**Curtins Consulting Ltd**

Enc: Gas Monitoring Results

<b>Background Readings:</b>	<b>Date of Visit</b> 06/11/2015					
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>
	<0.1	0.1	21.0	<0.1	<0.1	NR
	Weather Conditions			Overcast		
	Ground Conditions (dry/wet etc.)			Wet		
Atmospheric Pressure (mb)			1003			

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level	Depth of Well	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	mBGL	mBGL	
BH1	15:05	1003	<0.1	<0.1	<0.1	1.7	1.7	19.2	19.2	<0.1	<0.1	1.0	1.0	NR	NR	5.16	5.91	N
BH2	15:21	1005	<0.1	<0.1	<0.1	1.5	1.5	18.7	18.7	<0.1	<0.1	<0.1	<0.1	NR	NR	8.95	9.72	N
WS1	15:30	1004	<0.1	<0.1	<0.1	2.8	2.8	17.4	17.4	<0.1	<0.1	<0.1	<0.1	NR	NR	DRY	1.09	N
WS3	15:17	1004	<0.1	<0.1	<0.1	2.5	2.5	17.7	17.7	<0.1	<0.1	<0.1	<0.1	NR	NR	1.82	1.91	N
WS4	15:12	1003	<0.1	<0.1	<0.1	3.0	3.0	16.9	16.9	<0.1	<0.1	<0.1	<0.1	NR	NR	DRY	2.04	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By:	<b>LH</b>	Checked By:	<b>DA</b>
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<b>Background Readings:</b>	<b>Date of Visit</b> 20/11/2015													
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>								
	<0.1	0.1	21.3	<0.1	<0.1	NR								
	Weather Conditions			Overcast										
	Ground Conditions (dry/wet etc.)			Wet										
Atmospheric Pressure (mb)			999											

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level	Depth of Well	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	mBGL	mBGL	
BH1	15:30	999	<0.1	<0.1	<0.1	4.1	4.1	19.2	19.2	0	<0.1	<0.1	<0.1	0.1	<0.1	5.08	5.85	N
WS1	15:35	999	<0.1	<0.1	<0.1	3.9	3.9	18.7	18.7	0	<0.1	<0.1	<0.1	<0.1	<0.1	DRY	1.05	N
WS3	15:25	999	<0.1	<0.1	<0.1	5.2	5.2	17.7	17.7	0	<0.1	<0.1	<0.1	0.1	<0.1	1.70	1.90	N
WS4	15:20	999	<0.1	<0.1	<0.1	3.6	3.6	16.9	16.9	0	<0.1	<0.1	<0.1	0.1	<0.1	1.90	1.99	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By:	<b>LH</b>	Checked By:	<b>WGG</b>
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<b>Background Readings:</b>	<b>Date of Visit</b> 09/12/2015							
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>		
	<0.1	<0.1	21.3	<0.1	<0.1	<0.1		
	Weather Conditions			Sunny, cold				
	Ground Conditions (dry/wet etc.)			Wet				
Atmospheric Pressure (mb)			1025					

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level	Depth of Well	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	mBGL	mBGL	
BH1	14:35	1025	<0.1	<0.1	<0.1	1.2	1.2	20.9	20.9	<0.1	<0.1	1.0	1.0	NR	NR	4.99	5.72	Y
BH2	14:45	1024	<0.1	<0.1	<0.1	0.3	0.3	20.6	20.6	<0.1	<0.1	<0.1	<0.1	NR	NR	8.94	9.76	Y
WS1	14:55	1024	<0.1	<0.1	<0.1	2.3	2.3	18.8	18.8	<0.1	<0.1	<0.1	<0.1	NR	NR	DRY	1.10	N
WS3	15:05	1025	<0.1	<0.1	<0.1	1.9	1.9	18.7	18.7	<0.1	<0.1	<0.1	<0.1	NR	NR	1.87	1.91	N
WS4	15:15	1025	<0.1	<0.1	<0.1	2.6	2.6	18.1	18.1	<0.1	<0.1	<0.1	<0.1	NR	NR	DRY	2.03	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By: <b>FA</b>	Checked By: <b>DA</b>
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<b>Background Readings:</b>	<b>Date of Visit</b> 22/12/2015											
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>						
	<0.1	<0.1	21.1	<0.1	<0.1	<0.1						
	<b>Weather Conditions</b>			Windy								
	<b>Ground Conditions (dry/wet etc.)</b>			Wet								
<b>Atmospheric Pressure (mb)</b>			1007									

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level mBGL	Depth of Well mBGL	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			
BH1	13:15	1007	<0.1	<0.1	<0.1	1.1	1.1	21.0	21.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.62	5.72	Y
BH2	13:25	1007	<0.1	<0.1	<0.1	1.0	1.0	20.8	20.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.88	9.75	Y
WS1	13:35	1007	<0.1	<0.1	<0.1	2.0	2.0	19.1	19.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	DRY	1.10	N
WS3	13:45	1006	<0.1	<0.1	<0.1	1.9	1.9	19.1	19.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.98	1.92	N
WS4	13:55	1006	<0.1	<0.1	<0.1	2.1	2.1	18.8	18.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	DRY	2.03	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By: <b>FA</b>	Checked By: <b>DA</b>
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<b>Background Readings:</b>	<b>Date of Visit</b> 04/01/2016													
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>								
	<0.1	<0.1	21.2	<0.1	<0.1	<0.1								
	Weather Conditions			Overcast										
	Ground Conditions (dry/wet etc.)			Wet										
Atmospheric Pressure (mb)			977											

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level	Depth of Well	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	mBGL	mBGL	
BH1	12:30	977	<0.1	<0.1	<0.1	4.1	4.1	16.9	16.9	<0.1	<0.1	<0.1	<0.1	0.1	0.1	4.77	5.73	N
BH2	12:40	977	<0.1	<0.1	<0.1	5.3	5.3	14.7	14.7	<0.1	<0.1	<0.1	<0.1	0.2	0.2	8.87	9.75	N
WS1	12:50	977	<0.1	<0.1	<0.1	3.9	3.9	15.9	15.9	<0.1	<0.1	<0.1	<0.1	0.3	0.3	DRY	1.06	N
WS3	13:00	977	<0.1	<0.1	<0.1	5.1	5.1	10.9	10.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.10	1.90	N
WS4	13:10	977	<0.1	<0.1	<0.1	3.9	3.9	13.7	13.7	<0.1	<0.1	<0.1	<0.1	0.2	0.2	1.34	2.00	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By:	<b>MG</b>	Checked By:	<b>VT</b>
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<b>Background Readings:</b>	<b>Date of Visit</b> 13/01/2016					
	<b>CH<sub>4</sub>%v/v</b>	<b>CO<sub>2</sub>%v/v</b>	<b>O<sub>2</sub>%v/v</b>	<b>H<sub>2</sub>Sppm</b>	<b>COppm</b>	<b>VOC ppm</b>
	0.1	<0.1	21.4	<0.1	<0.1	<0.1
	Weather Conditions			Clear		
	Ground Conditions (dry/wet etc.)			Damp		
Atmospheric Pressure (mb)			1011			

Hole No:	Time (hh:mm)	Atmos. Pressure (mb)	Gas Flow Rate (l/hr)	CH <sub>4</sub> % v/v		CO <sub>2</sub> % v/v		O <sub>2</sub> % v/v		H <sub>2</sub> S ppm		CO ppm		VOC ppm		Water Level mBGL	Depth of Well mBGL	Water Sample Y / N
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			
BH1	13:00	1011	<0.1	0.1	0.1	1.0	1.0	19.5	19.5	<0.1	<0.1	<0.1	<0.1	0.1	0.1	4.50	5.75	N
BH2	12:50	1010	<0.1	0.1	0.1	0.2	0.2	21.0	21.0	<0.1	<0.1	<0.1	<0.1	0.1	0.1	8.84	9.75	N
WS1	12:44	1010	<0.1	0.1	0.1	1.8	1.8	17.2	17.2	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.72	1.07	N
WS3	Not monitored																	
WS4	12:55	1010	<0.1	0.1	0.1	3.9	3.9	13.9	13.9	<0.1	<0.1	<0.1	<0.1	0.1	0.1	1.23	2.03	N

ND = Below detection limit of instrument. NR = Not Read.

Readings Taken By: <b>MG</b>	Checked By: <b>VT</b>
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