4245 Park Approach
Thorpe Park, Leeds
LS15 8GB

t: 0113 264 9960
f: 0113 264 9962
e: info@thesiriusgroup.com

Mr M Jones
Barratt Homes and David Wilson Homes West Yorkshire
Vico Court
Ring Road
Lower Wortley
Leeds
LS12 6AN

25th April 2017

Ref. C6138/JL/6572 Rev 2

Dear Mark

RE: Carrs Lane, Cudworth – Gas Assessment Letter (Rev 2)

Following issue of our Geoenvironmental Appraisal Report (GAR) for the above site (Ref. C6138A Rev 2, dated April 2017), please find attached the results of the gas monitoring undertaken (complete set).

Sirius has previously compiled an addendum gas risk assessment for the site in December 2014 (Letter Ref. C6138/JL/6572). Since the issue of the letter report the development layout, including the south eastern and south western site boundaries, have altered slightly and subsequently the development area has reduced. This current report makes reference to the updated development layout (Urban Design's Proposed Site Layout, ref. YW-04-03-Rev Z, dated 20th April 2017), however the conclusions and recommendations given within are based on the original, larger development area. Therefore this letter report should be read with consideration to the revised development layout plan.

As part of the Sirius ground investigation undertaken in September 2014, gas and groundwater monitoring wells were installed within seven window sample boreholes (WS1 to WS7). The positions of the window sample boreholes are shown on Drawing No. C6138A/05 in the GAR.

During the completion of the monitoring programme two wells were lost / destroyed, namely WS2 and WS7 to the sites south western and southern boundary. This

occurred between monitoring visits no. 1 and visit no. 2 and as such no further monitoring has been completed to these installed wells. Sirius consider the loss of these installed wells as relatively insignificant (on a site scale), owing to the spread of installed wells across the site, in relation to potential gas sources.

Gas monitoring visits have been undertaken on six occasions between 3rd October and 9th December 2014, monitoring for concentrations of methane, carbon dioxide, hydrogen sulphide, carbon monoxide and oxygen, together with flow rates, using an infra-red gas analyser and flow pod. In addition, volatile organic compounds (VOCs) were also monitored using a photoionization detector, owing to the sites historical setting i.e. proximity of a former gasometer/ historical landfill site and infilled reservoir.

Gas monitoring was undertaken during atmospheric pressures between 996mb and 1018mb, and covered falling and steady pressure trends. Steady state concentrations of up to 3.4% v/v carbon dioxide were recorded in WS3 on 27th October 2014 (visit no. 3). No methane has been detected during the monitoring visits. A maximum recorded steady state flow rate of 0.5l/hr was recorded in WS7 on 3rd October 2014 (visit no. 1). Soils remained well oxygenated.

Low/background concentrations of carbon monoxide and hydrogen sulphide were detected, with a maximum recorded concentration for both at 4ppm, in comparison to HSE Workplace Exposure Limits (WEL) presented in EH40/2005 of 30ppm and 5ppm, repsectively (for an long term exposure limit – 8hr time weighted average period). Based on the findings of this investigation specific gas protection measures for hydrogen sulphide and carbon monoxide are not considered necessary.

Low/non-detect concentrations of VOCs were identified during the monitoring period, with a maximum of 2.0ppm recorded in WS4 on 27th October 2014 (visit no. 3).

Based on the results received as part of this investigation, and positive gas flow rates, a maximum gas screening value (GSV) of 0.017l/hr for carbon dioxide has been calculated.

Based on the derived GSV, and in accordance with Table 2 presented in BS8485:2015, the soil gas regime can be classed as **CS1**. For the proposed residential development, CS1 does not require special precautions with regards to ground gas.

Radon protection measures are <u>not</u> required for the proposed development on this site.

We trust that the above and attached is satisfactory and self-explanatory, and that you will forward this letter to the appropriate regulators for their comment / approval.

Please do not hesitate to contact the undersigned for any further information.

Yours sincerely

Mark Brennan
Associate

For and on behalf of
Sirius Geotechnical & Environmental Ltd

Enc. 6 x gas and groundwater monitoring sheets, dated between 3rd October 2014 and 9th December 2014.

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes
Site: Cudworth
Date: 03/10/2014
Job No: C6138
Visit No: 1 of 6
Operator: AE
Project Manager: JL

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Worst-credible GSVs		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS1	ND	ND	ND	ND	0.1	0.1	2	1	2	1	21.2	21.2	ND	ND	ND	ND	ND	ND	NA	0.0001	ND	2.10	54.13	NA	NAT - G & Bed	
WS2	ND	ND	ND	ND	0.9	0.9	4	1	2	1	20.3	20.3	ND	ND	0.5	0.5	1	5	NA	0.0045	ND	3.00	42.39	NA	NAT - G & Bed	Cover smashed, well tap missing. Replaced well tap and left for 2 hours before monitoring.
WS3	ND	ND	ND	ND	1.7	1.6	3	1	2	1	19.9	19.9	ND	ND	ND	ND	ND	ND	NA	0.0016	2.92	4.50	37.53	34.61	NAT - G, C, Coal & Bed	Cover smashed, well tap missing. Replaced well tap and left for 2 hours before monitoring. C. 1.5m of water in well. Purged approx 1 litre Very slow recharge, came back to do gas monitoring and had only recharged c.200mm No odour, no sheen, brown in colour.
WS4	ND	ND	ND	ND	1.3	1.3	3	1	2	1	20.0	20.0	ND	ND	ND	ND	ND	ND	NA	0.0013	1.30	2.05	55.56	54.26	NAT - C & Bed	
WS5	ND	ND	ND	ND	1.5	1.4	3	1	1	ND	21.5	21.5	ND	ND	ND	ND	ND	ND	NA	0.0014	ND	2.05	38.70	NA	NAT - C & Bed	Cover removed, well tap missing. Replaced well tap and left for 2 hours before monitoring.
WS6	ND	ND	ND	ND	1.8	1.8	2	1	2	1	19.7	19.7	ND	ND	ND	ND	ND	ND	NA	0.0018	ND	2.05	35.50	NA	NAT - C	
WS7	ND	ND	ND	ND	2.2	2.1	4	1	2	1	19.8	19.8	ND	ND	0.5	0.5	1	5	NA	0.0105	ND	2.05	41.99	NA	NAT - G & Bed	Cover removed and well tap missing. Replaced well tap and left for 2 hours before monitoring.
Max	ND	ND	ND	ND	2.2	2.1	4	1	2	1	21.5	21.5	ND	ND	0.5	0.5	1	5	NA	0.0105	2.92	4.50	55.56	54.26		
Min	**ND**	**ND**	**ND**	**ND**	**0.1**	**0.1**	**2**	**1**	**1**	**ND**	**19.7**	**19.7**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0001**	**1.30**	**2.05**	**35.50**	**34.61**		

Worst-possible GSVs	
NA	**0.0105**

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular
Bed - Bedrock

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip meter and Photo-ionisation detector used.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None	X	Slight		Cloudy		Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:			09:30	Start			15:30	End		
Barometric pressure (mbar):			1012	Start			1010	End		
Pressure trend (Daily):			X	Falling		Steady		Rising		
Source:	wunderground.com									
Air Temperature (Deg. C):			18	Before			25	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 21.1

PID: Phocheck3000
Calibrated range: 0-100ppm
Calibration gas: isobutylene
Response time: 0.1
Accuracy: plus/ minus 5% displayer reading
Date of last calibration: 25/11/2013
Date of next calibration: 26/11/2014

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes
Site: Cudworth
Date: 16/10/2014
Job No: C6138
Visit No: 2 **of** 6
Operator: AE
Project Manager: JL

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Worst-credible GSVs		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS1	ND	ND	ND	ND	0.3	0.3	4	1	4	1	20.8	20.9	ND	ND	ND	ND	ND	ND	NA	0.0003	ND	NR	54.13	NA	NAT - G & Bed	
WS3	ND	ND	ND	ND	2.4	2.4	1	ND	4	1	18.8	18.8	ND	ND	ND	ND	ND	ND	NA	0.0024	2.96	4.50	37.53	34.57	NAT - G, C, Coal & Bed	
WS4	ND	ND	ND	ND	ND	ND	1	ND	3	1	21.5	21.5	ND	ND	ND	ND	ND	ND	NA	NA	1.64	2.05	55.56	53.92	NAT - C & Bed	Approx 10L of surface water purged in order to monitor gas as well was completely filled with water. Left for 3 hours before returning to monitor gas and allow GW levels to return.
WS5	ND	ND	ND	ND	0.4	0.4	4	2	3	1	21.2	21.2	ND	ND	ND	ND	ND	ND	NA	0.0004	ND	2.05	38.70	NA	NAT - C & Bed	Vandalised, gas tap removed. Replaced gas tap and left for 2 hours before returning to monitor gas.
WS6	ND	ND	ND	ND	0.2	0.2	1	ND	2	1	21.5	21.5	ND	ND	ND	ND	ND	ND	NA	0.0002	ND	2.05	35.50	NA	NAT - C	Vandalised, gas tap removed. Replaced with gas tap and left for 2 hours before returning to monitor gas. Metal well cover also damaged - has since been replaced
Max	ND	ND	ND	ND	2.4	2.4	4	2	4	1	21.5	21.5	ND	ND	ND	ND	ND	NA	NA	0.0024	2.96	4.50	55.56	53.92		
Min	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**1**	**ND**	**2**	**1**	**18.8**	**18.8**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0002**	**1.64**	**2.05**	**35.50**	**34.57**		

Worst-possible GSVs	
NA	**0.0024**

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equipment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip meter and Photo-ionisation detector used.
WS2 and WS7 wells destroyed between visits 1 and 2.

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong	
Cloud cover:		None		Slight		Cloudy	X	Overcast	
Precipitation:	X	None		Slight		Moderate		Heavy	
Time monitoring performed:			11.00	Start			15.00	End	
Barometric pressure (mbar):			998	Start			996	End	
Pressure trend (Daily):			X	Falling		Steady		Rising	
Source:	wunderground.com								
Air Temperature (Deg. C):			18	Before			18	After	

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 21.8

PID: Phocheck3000
Calibrated range: 0-100ppm
Calibration gas: isobutylene
Response time: 0.1
Accuracy: plus/ minus 5% displayer reading
Date of last calibration: 25/11/2013
Date of next calibration: 26/11/2014

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes
Site: Cudworth
Date: 27/10/2014
Job No: C6138
Visit No: 3 **of** 6
Operator: AE
Project Manager: JL

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS1	ND	ND	ND	ND	0.1	0.1	1	ND	2	1	21.7	21.7	ND	ND	ND	ND	ND	ND	NA	0.0001	ND	2.10	54.13	NA	NAT - G & Bed	
WS3	ND	ND	ND	ND	3.4	3.4	3	3	2	1	17.3	17.3	ND	ND	ND	ND	ND	ND	NA	0.0034	3.02	4.45	37.53	34.51	NAT - G, C, Coal & Bed	
WS4	ND	ND	ND	ND	0.8	0.8	3	3	4	2	20.6	20.6	2.0	ND	3.5	ND	20	60	NA	0.0008	0.70	2.05	55.56	54.86	NAT - C & Bed	
WS5	ND	ND	ND	ND	0.8	0.7	1	ND	2	1	20.6	20.6	ND	ND	ND	ND	ND	ND	NA	0.0007	1.98	2.00	38.70	NA	NAT - C & Bed	
WS6	ND	ND	ND	ND	0.2	0.2	4	1	2	1	21.2	21.2	ND	ND	ND	ND	ND	ND	NA	0.0002	ND	2.05	35.50	NA	NAT - C	Vandalised - Well cover removed and well tap taken off. Replaced gas tap to monitor after leaving for 2 hours.
Max	ND	ND	ND	ND	3.4	3.4	4	3	4	2	21.7	21.7	2	ND	3.5	ND	20.0	60	NA	0.0034	3.02	4.45	55.56	54.86		
Min	**ND**	**ND**	**ND**	**ND**	**0.1**	**0.1**	**1**	**ND**	**2**	**1**	**17.3**	**17.3**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0001**	**0.70**	**2.00**	**35.50**	**34.51**		
																			Worst-possible GSVs							
																			NA	**0.0034**						

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip mete and Photo-ionisation detector used.
WS2 and WS7 wells destroyed between visits 1 and 2.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen
Wind:		Calm		Light	X	Moderate		Strong	
Cloud cover:		None		Slight	X	Cloudy		Overcast	
Precipitation:	X	None		Slight		Moderate		Heavy	
Time monitoring performed:			10:00	Start			15:00	End	
Barometric pressure (mbar):			1006	Start			1006	End	
Pressure trend (Daily):				Falling	X	Steady		Rising	
Source:	wunderground.com								
Air Temperature (Deg. C):			16	Before			18	After	

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 21.6

PID: Photocheck3000
Calibrated range: 0-100ppm
Calibration gas: isobutylene
Response time: 0.1
Accuracy: plus/ minus 5% displayer reading
Date of last calibration: 25/11/2013
Date of next calibration: 26/11/2014

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes **Job No:** C6138
Site: Cudworth **Visit No:** 4 **of** 6
Date: 18/11/2014 **Operator:** AE **Project Manager:** JL

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Worst-credible GSVs		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS1	ND	ND	ND	ND	0.1	0.1	1	ND	3	1	20.4	20.4	ND	ND	ND	ND	ND	ND	NA	0.0001	ND	2.08	54.13	NA	NAT - G & Bed	
WS3	ND	ND	ND	ND	2.4	2.4	2	1	3	1	17.7	17.7	ND	ND	ND	ND	ND	ND	NA	0.0024	2.98	4.44	37.53	34.55	NAT - G, C, Coal & Bed	
WS4	ND	ND	ND	ND	0.2	0.2	1	ND	ND	ND	20.3	20.3	ND	ND	ND	ND	ND	ND	NA	0.0002	1.48	2.01	55.56	54.08	NAT - C & Bed	Filled with water, bailed out completely and left for 3.5 hours before monitoring gas..
WS5	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	19.9	19.9	ND	ND	0.3	0.3	1	10	NA	0.0003	1.00	2.04	38.70	NA	NAT - C & Bed	Well tap replaced and left for 3.5 hours after cap being removed.
WS6	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	20.6	20.6	ND	ND	ND	ND	ND	ND	NA	NA	0.82	2.05	35.50	NA	NAT - C	
Max	ND	ND	ND	ND	2.4	2.4	2	1	3	1	20.6	20.6	ND	ND	0.3	0.3	1	10	NA	0.0024	2.98	4.44	55.56	54.08		
Min	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**17.7**	**17.7**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0001**	**0.82**	**2.01**	**35.50**	**34.55**		

Worst-possible GSVs	
NA	**0.0072**

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip meter and photo-ionisation detector used.
WS2 and WS7 wells destroyed between visits 1 and 2.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	X	Overcast		
Precipitation:		None	X	Slight		Moderate		Heavy		
Time monitoring performed:			10:00	Start			16:00	End		
Barometric pressure (mbar):			1011	Start			1009	End		
Pressure trend (Daily):			X	Falling		Steady		Rising		
Source:	wunderground.com									
Air Temperature (Deg. C):			10	Before			11	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400

Gas Range: CH_4 0 - 100% CO_2 0 - 100% O_2 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: CH_4 0.0 CO_2 0.0 O_2 20.4

PID: Phocheck3000
Calibrated range: 0-100ppm
Calibration gas: isobutylene
Response time: 0.1
Accuracy: plus/ minus 5% displayer reading
Date of last calibration: 25/11/2013
Date of next calibration: 26/11/2014

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes
Site: Cudworth
Date: 27/11/2014
Job No: C6138
Visit No: 5 **of** 6
Operator: AE **Project Manager:** JL

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS1	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.3	20.3	NR	ND	ND	ND	ND	ND	NA	0.0001	ND	2.08	54.13	NA	NAT - G & Bed	
WS3	ND	ND	ND	ND	2.2	2.2	ND	ND	ND	ND	17.7	17.7	NR	ND	ND	ND	ND	ND	NA	0.0022	2.76	4.42	37.53	34.77	NAT - G, C, Coal & Bed	
WS4	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.1	20.1	NR	ND	ND	ND	ND	ND	NA	0.0001	1.47	2.01	55.56	54.09	NAT - C & Bed	Filled with water, bailed out completely and left for 1 hour before monitoring gas.
WS5	ND	ND	ND	ND	0.3	0.2	ND	ND	ND	ND	20.2	20.2	NR	ND	ND	ND	ND	ND	NA	0.0002	0.73	2.01	38.70	NA	NAT - C & Bed	
WS6	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	20.1	20.1	NR	ND	0.1	ND	1	ND	0.0001	0.0002	1.19	2.03	35.50	NA	NAT - C	
Max	ND	ND	ND	ND	2.2	2.2	ND	ND	ND	ND	20.3	20.3	NR	ND	0.1	ND	1	ND	0.0001	0.0022	2.76	4.42	55.56	54.09		
Min	**ND**	**ND**	**ND**	**ND**	**0.1**	**0.1**	**ND**	**ND**	**ND**	**ND**	**17.7**	**17.7**	**NR**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0001**	**0.73**	**2.01**	**35.50**	**34.77**		

Worst-possible GSVs	
0.0001	**0.0022**

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip meter used.
WS2 and WS7 wells destroyed between visits 1 and 2.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	X	Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:			10:00	Start			12:00	End		
Barometric pressure (mbar):			1004	Start			1003	End		
Pressure trend (Daily):			X	Falling		Steady		Rising		
Source:	wunderground.com									
Air Temperature (Deg. C):			8	Before			8	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 20.2

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes
Site: Cudworth
Date: 09/12/2014
Job No: C6138
Visit No: 6 of 6
Operator: AE
Project Manager: JL

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Worst-credible GSVs		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS1	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.0	20.0	NR	ND	ND	ND	ND	ND	NA	0.0001	ND	2.10	54.13	NA	NAT - G & Bed	
WS3	ND	ND	ND	ND	2.1	2.1	ND	ND	3	ND	18.2	18.2	NR	ND	ND	ND	ND	ND	NA	0.0021	2.84	4.50	37.53	34.69	NAT - G, C, Coal & Bed	
WS4	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.1	20.1	NR	ND	ND	ND	ND	ND	NA	0.0001	1.43	2.05	55.56	54.13	NAT - C & Bed	Filled with water up to well cover. Bailed at start of day and left for 2 hours before gas monitoring.
WS5	ND	ND	ND	ND	0.4	0.4	ND	ND	ND	ND	19.9	19.9	NR	ND	ND	ND	ND	ND	NA	0.0004	1.02	2.05	38.70	NA	NAT - C & Bed	
WS6	ND	ND	ND	ND	0.3	0.2	ND	ND	ND	ND	19.9	20.0	NR	ND	ND	ND	ND	ND	NA	0.0002	1.12	2.04	35.50	NA	NAT - C	
Max	ND	ND	ND	ND	2.1	2.1	ND	ND	3	ND	20.1	20.1	NR	ND	ND	ND	ND	ND	NA	0.0021	2.84	4.50	55.56	54.13		
Min	**ND**	**ND**	**ND**	**ND**	**0.1**	**0.1**	**ND**	**ND**	**ND**	**ND**	**18.2**	**18.2**	**NR**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA**	**0.0001**	**1.02**	**2.04**	**35.50**	**34.69**		

Worst-possible GSVs	
NA	**0.0021**

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.
Two-phased dip meter used.
WS2 and WS7 wells destroyed between visits 1 and 2.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong	
Cloud cover:		None		Slight		Cloudy	X	Overcast	
Precipitation:		None	X	Slight		Moderate		Heavy	
Time monitoring performed:			10	Start				End	
Barometric pressure (mbar):			1018	Start			1015	End	
Pressure trend (Daily):			X	Falling		Steady		Rising	
Source:	wunderground.com								
Air Temperature (Deg. C):			4	Before			5	After	

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 20.0