

Spariss Leisure Limited
Markfield Lane
Botcheston
Leicestershire
LE9 9FH

Dear Sirs,

Re: Forest Hill Golf & Country Club – Gas Addendum Letter

Background

The works described and reported herein follow on from the assessments and investigations which have been completed at the above site. This letter report should not be referred to in isolation, and should be read in conjunction with the following;

- Erda Associates Ltd., Phase II Geo-Environmental Assessment – Forest Hill Golf & Country Club, Botcheston (dated May 2020, ref: EAL.15.20).

As part of the ground investigation works, we have recently installed gas monitoring boreholes at the above site. A total of six monitoring visits have been undertaken between 11th May 2020 and 18th June 2020. Copies of the monitoring well location plan and gas monitoring data sheets are enclosed in **Appendix A** and **Appendix B**, respectively.

Gas Monitoring Assessment

The analyser used detects concentrations by volume (%v/v) of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂). The analyser also detects flow rate and atmospheric pressure.

Based on the gas monitoring results contained in **Appendix B**, a maximum carbon dioxide concentration of 10.6% by volume during the visit on 3rd June 2020. A maximum methane concentration of 11.3% by volume was also recorded on the visit on 3rd June 2020. A maximum flow rate of 0.2l/hr was recorded on 11th June 2020.

Based on the above, the GSV for carbon dioxide has been calculated as 0.0212l/hr, and the GSV for methane has been calculated as 0.0226l/hr. Therefore, the site is classified as Characteristic Situation 2, for which gas protection measures will be required.

Based on the guidance contained in BS8485: 2015+A1: 2019 *CoP for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, the following specification is recommended for the foundations based on Characteristic Situation 2:

- Reinforced cast in situ suspended floor slab with minimal penetrations.
- Minimum 2000g gas protection membrane (resistant to both carbon dioxide and methane) installed.
- Laps and joints bonded as per manufacturers details.
- All service entries sealed.

OR if precast beam and block is to be used:

- A passive sub floor dispersal layer conforming to at least 'good performance'.
- This should be in the form of a clear void, polystyrene void former blanket, geo-composite void former blanket or no-fines gravel layer.
- Gas membrane as above.

The above measures are considered suitable to reduce the risk of ground gas to acceptable levels for end users of the site.

Conclusion and Recommendations

The assessment has identified that the site is classified as being Characteristic Situation 2, and gas protection measures will be required. It is considered that the above recommended protection measures will be sufficient to reduce the risk of ground gas to acceptable levels for end users of the site.

It is important to note that some of the concentrations of methane encountered were in excess of the lower explosive limit. Therefore, it is recommended that all site works that have the potential to generate sparks, or that require the use of a flame, are not undertaken in enclosed spaces which do not benefit from the CS2 protection measures specified above. These works should also be undertaken in well ventilated areas, preferably outdoors if possible. Where possible these types of works should be avoided. Potential low oxygen levels in deep trenches or pits should also be considered as a potential risk should personnel access be required.

Copies of this letter report should be forwarded to the Local Authority for review and approval. It is likely that they will request a Remediation Method Statement which compiles and details all remediation works that are required to make the site suitable for the proposed end use.

Should you have any queries, or require any further information, please do not hesitate to contact us.

Yours Sincerely

A handwritten signature in black ink, appearing to read 'P. Devitt'.

Phil Devitt, BSc MSc FGS MRICS
Director

Encl.
Appendix A – Figures
Appendix B – Gas Monitoring Data

Appendix A

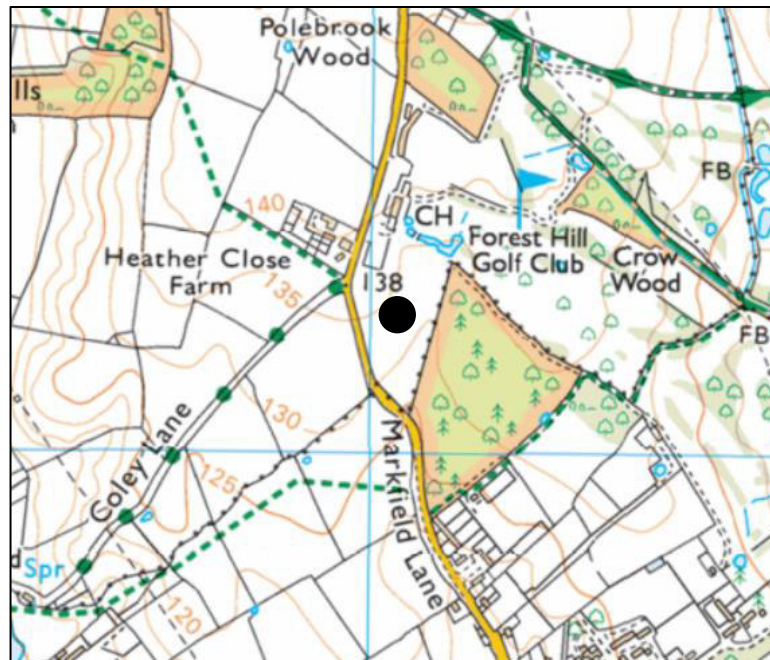




KEY:

● Approximate Site Location

DO NOT SCALE



TITLE:

Site Location Plan

PROJECT:

Forest Hill Golf Club, Botcheston

PROJECT No:

EAL.15.20

DATE:

06/2020

SCALE :

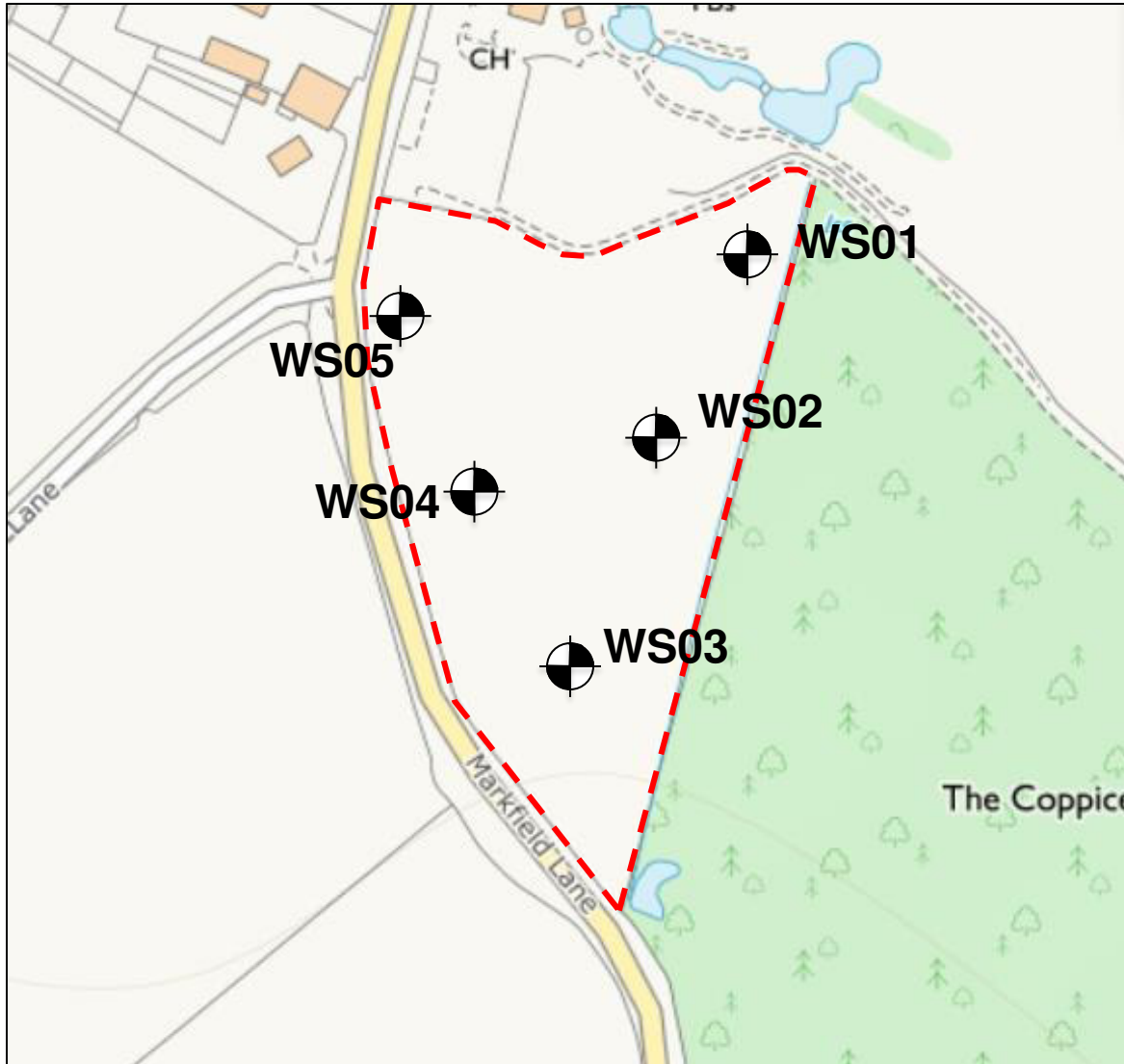
NTS

DRAWN :

PD

DWG No:

Figure 1



KEY:



Site Boundary



Gas Monitoring Well

DO NOT SCALE



TITLE:

Monitoring Borehole Location Plan

PROJECT:

Forest Hill Golf Club, Botcheston

PROJECT No:

EAL.15.20

DATE:

06/2020

SCALE :

NTS

DRAWN :

PD

DWG No:

Figure 2

Appendix B





Web: www.erda-ltd.co.uk
 Email: p.devitt@erda-ltd.co.uk
 Phone: 07531 051197

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Spariss Leisure Limited		Job No:	EAL15.20		Instruments Used:	GA5000				
Project:	Forest Hill Golf Club		Date:	11.05.2020		Monitored By:	Enital				
Weather:	Overcast										
Installation No.	Peak ¹		Steady ²				Total gas flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
	CH ₄	CO ₂	CH ₄	LEL	CO ₂	O ₂					
	(% vol)	(% vol)	(% vol)	(%)	(% vol)	(% vol)					
WS01	2.9	3.2	2.9	58.0	3.2	13.9	0.0	1011	4.08	4.40	
WS02	0.3	1.1	0.3	6.0	1.1	19.0	0.0	1011	3.06	4.49	
WS03	0.0	0.2	0.0	0.0	0.2	21.4	0.0	1011	3.50	4.36	
WS04	0.0	0.7	0.0	0.0	0.7	21.0	-0.1	1011	Dry	2.60	
WS05	0.0	3.7	0.0	0.0	3.7	19.1	0.0	1011	Dry	2.37	

¹ The peak reading is the maximum recorded level during a monitoring event.
² The steady reading is the level which remained constant after approximately 2 minutes.

[illegible]

¹ The peak reading is the maximum recorded level during a monitoring event.

² The steady reading is the level which remained constant after approximately 2 minutes.



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GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Spariss Leisure Limited		Job No:	EAL15.20		Instruments Used:	GA5000				
Project:	Forest Hill Golf Club		Date:	29.05.20		Monitored By:	Enital				
Weather:	Sunny										
Installation No.	Peak ¹		Steady ²				Total gas flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
	CH ₄	CO ₂	CH ₄	LEL	CO ₂	O ₂					
	(% vol)	(% vol)	(% vol)	(%)	(% vol)	(% vol)					
WS01	7.6	9.2	7.6	>>>	9.1	1.2	0.0	1015	4.15	4.40	
WS02	5.0	7.3	5.0	100.0	7.3	4.1	0.0	1015	3.46	4.49	
WS03	10.6	4.8	10.5	>>>	4.8	0.9	0.0	1015	2.73	4.36	
WS04	0.3	3.2	0.0	6.0	3.2	14.7	0.0	1015	Dry	2.60	
WS05	0.0	2.9	0.0	0.0	2.9	19.6	0.0	1015	Dry	2.37	

¹ The peak reading is the maximum recorded level during a monitoring event.
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GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Spariss Leisure Limited		Job No:	EAL15.20		Instruments Used:	GA5000				
Project:	Forest Hill Golf Club		Date:	03.06.20		Monitored By:	Enital				
Weather:	Light rain										
Installation No.	Peak ¹		Steady ²				Total gas flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
	CH ₄	CO ₂	CH ₄	LEL	CO ₂	O ₂					
	(% vol)	(% vol)	(% vol)	(%)	(% vol)	(% vol)					
WS01	10.7	10.6	10.7	>>>	10.6	1.1	0.0	996	3.87	4.40	
WS02	6.4	8.4	6.4	>>>	8.4	4.7	0.0	996	3.85	4.49	
WS03	11.3	5.3	11.3	>>>	5.3	0.7	0.0	996	3.32	4.36	
WS04	1.9	8.3	1.9	38.0	8.3	3.8	0.0	996	Dry	2.60	
WS05	0.0	2.3	0.0	0.0	2.3	19.8	0.0	996	Dry	2.37	

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GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Spariss Leisure Limited		Job No:	EAL15.20			Instruments Used:	GA5000			
Project:	Forest Hill Golf Club		Date:	11.06.20			Monitored By:	Enital			
Weather:	Moderate rain										
Installation No.	Peak ¹		Steady ²				Total gas flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
	CH ₄	CO ₂	CH ₄	LEL	CO ₂	O ₂					
	(% vol)	(% vol)	(% vol)	(%)	(% vol)	(% vol)					
WS01	0.1	1.6	0.1	0.0	1.6	20.1	0.2	1002	3.81	4.40	
WS02	0.0	1.0	0.0	0.0	1.0	20.5	0.0	1002	3.84	4.49	
WS03	0.1	0.5	0.1	0.0	0.5	20.6	0.0	1002	3.32	4.36	
WS04	0.0	3.6	0.0	0.0	3.6	15.8	0.0	1002	2.52	2.60	
WS05	0.0	2.7	0.0	0.0	2.7	19.0	0.1	1002	Dry	2.37	

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GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	Spariss Leisure Limited		Job No:	EAL15.20		Instruments Used:	GA5000				
Project:	Forest Hill Golf Club		Date:	18.06.20		Monitored By:	Enital				
Weather:	Moderate rain										
Installation No.	Peak ¹		Steady ²				Total gas flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
	CH ₄	CO ₂	CH ₄	LEL	CO ₂	O ₂					
	(% vol)	(% vol)	(% vol)	(%)	(% vol)	(% vol)					
WS01	6.2	6.2	6.2	>>>	6.2	8.7	0.0	995	4.20	4.40	
WS02	0.4	1.4	0.1	8.0	1.4	7.0	0.0	995	1.14	4.49	
WS03	9.5	4.0	9.5	>>>	4.0	3.9	0.0	995	2.35	4.36	
WS04	0.0	0.6	0.0	0.0	0.6	21.1	0.0	995	1.41	2.60	
WS05	0.0	1.5	0.0	0.0	1.5	19.8	0.0	995	1.00	2.37	

¹ The peak reading is the maximum recorded level during a monitoring event.
² The steady reading is the level which remained constant after approximately 2 minutes.