PRELIMINARY REPORT OF GROUND GAS MONITORING DATA COLLECTED FROM ATLANTIC WAY, BARRY

Prepared for
Biogen Power Limited

ENCIA ENVIRONMENTAL LIMITED
Bryn Pica
Llwydcoed
ABERDARE
RHONDDA CYNON TAF
CF44 0BX

TELEPHONE: 01685 870770
FACSIMILE: 01685 874684

Project Quality Assurance
Information Sheet

Preliminary Ground Gas Monitoring Report
Atlantic Way, Barry

CQA Report Reference	:	BP1008/2/001	***Report Status***	: FINAL
			Report Date	: 17th December 2008
Prepared for	:	Biogen Power Ltd 6 Croft Court Whitehills Business Park Blackpool Lancashire FY4 5PR		
Issued by	:	Encia Environmental Limited Bryn Pica Llwydcoed Aberdare CF44 0BX		

Prepared by :

Jeremy Jones
Engineer

Approved by :

Mark Griffiths
Principal Consultant

CONTENTS

APPENDICES

APPENDIX I - Ground Gas Monitoring Results

1. INTRODUCTION

1.1 Encia Environmental Limited (Encia) was instructed by Biogen Power Limited (Biogen) to carry out background ground gas monitoring at the Barry Docks site, South Wales. The site is currently under consideration for the development of a waste to energy plant. Background ground gas monitoring data was collected from the site over 6 visits by Encia between the 21st November and the 9th December 2008. The data is presented in Appendix I.

1.2 The site is located in the docks area of Barry, South Wales, adjacent to Atlantic Way. The site comprises of 1.5ha of disused, overgrown land.

1.4 During the Phase II Site Investigation undertaken by Capita Symonds (Structures) Ltd (Capita), four boreholes were installed across the site. These were used by Encia for the monitoring of ground gas during the aforementioned period.

2. HISTORY

2.1 Section 2.4 of the Phase II Site I Capita Symonds Structures Ltd. investigation report carried out by Capita (SS/016890/P2SI-1, September 2008) identifies a history of waste disposal at the site. The south-eastern half of the site was predominately used for waste disposal with evidence of such activities stretching back to the 1940's.

3. AIMS OF REPORT

3.1 The aims of this report is to provide an initial evaluation of the ground gas monitoring data collected from the site collected from the site and to offer recommendations to the Client as how best to progress the ground gas risk assessment for the site.

4. SITE GROUND CONDITIONS & MONITORING INFRASTRUCTURE

4.1 The report carried out by Capita suggests that the ground comprises of estuarine deposits overlain by made ground. The site's ground gas monitoring infrastructure comprises of 4 ground gas monitoring boreholes, ranging in depth from 7.57m bgl to 11.55m bgl.

5. MONITORING METHODOLOGY

5.1 Upon arrival at the site, the prevailing weather conditions are recorded including but not restricted to precipitation, temperature, barometric pressure.

5.2 General ground conditions for the site are recorded.

5.3 A visual inspection of the monitoring point and immediate area surrounding the installation is made. Any damage or occurrences, which may affect the quality of the data recovered or impede data collection is recorded.

5.4 Once the sampling tube has been securely connected to the installations sampling nozzle, the valve is opened. Once the relative pressure has stabilised the process of sampling can be begin.

5.5 The flow and/or the relative pressure of the monitoring installation are recorded to allow an assessment of the ground gas concentrations.

5.6 A Geotechnical Instruments GA2000 gas analyser is used to monitor the boreholes on site. The instrument takes readings of the concentration of gases and parameters shown in Table 1 below. If the readings have stabilised after 60seconds the steady state concentrations are recorded, if the concentrations have not stabilised monitoring is continued until they do. If they do not stabilise this is noted.

Table 1

Gas/parameter	**Units of measurement**
Light Hydrocarbons recorded as Methane (CH_4)	%v/v
CO_2	%v/v
O_2	%v/v
Balance	%v/v
CH_4	%LEL
Peak CH_4	%v/v
Peak CO_2	%v/v
Min O_2	%v/v
BP	(mb)
Rel. Pressure	(mb)

5.7 After the gas readings have been stored, the sampling tube is removed from installation's sampling nozzle. The end bung is then removed and the installation is dipped to determine the depth to head of water and the depth to base.

5.8 The depth to head is measured by the use of a down borehole dipper. The dipper is lowered slowly until an alarm sounds signifying that it has reached water. This level is recorded before the dipper is lowered to the base of the installation.

5.9 When the depth to head and depth to base of the installation have been determined, the dipper is removed and the bung replaced ensuring the sampling nozzle's valve is closed. The borehole cover is then shut and secured.

6.0 ANALYSIS OF RESULTS

6.1 No methane was detected in any of the monitoring installations during the ground gas monitoring visits undertaken between the 25th of November and 9th of December.

6.2 Steady state CO_2 ranged between 1.7 and 9.7%v/v. Highest recorded level of peak CO_2 was 9.7% recorded in Borehole 104 on the 25th November 2008.

6.3 The lowest recorded concentration of O_2 was at 3.1%v/v in borehole 102 on the 21st November 2008. A range of O_2 values were recorded in all boreholes, 3.1 – 19.9%v/v however, boreholes 102 & 104 often displayed the lowest values.

6.4 Ground gas monitoring of the installations indicated very low flow rates of ground gas. Relative pressures typically ranged between -3.81 and 0.33mb. A reading of 19.82mb was recorded at borehole 103 on the 5th of December.

This reading appears to be an outlier within the context of the data group as a whole but should not be discounted given the limited period over which the data set was gathered.

6.5 No CO or H_2S gas were detected in any of the monitoring installations during the ground gas monitoring visits undertaken between the 25th of November and 9th of December.

7.0 CONCLUSIONS

7.1 No methane was detected in any of the monitoring installations during the ground gas monitoring visits undertaken between the 25th of November and 9th of December 2008.

7.2 Elevated concentrations of CO_2 were recorded of between 3.1 and 19.9%v/v.

7.3 The low and negative relative pressures recorded at the site would suggest that there is no or little migration of ground gases, specifically CH_4 and CO_2 during the monitoring period if 21st November to the 9th of December 2008.

8.0 RECOMMENDATIONS

8.1 Further ground gas monitoring would enable a larger data set to be obtained over a longer period which would assist in a more comprehensive understanding of the ground gas conditions at the site and allow a more accurate risk assessment to be developed. This should take account of the potential influence of atmospheric conditions and tidal responses on ground gas migration. It is recommended that gas monitoring should be continued at a frequency of once per month for a period of six months. This schedule should be reviewed after four months to ascertain whether continuance is required to the full six months.

8.2 If deemed necessary by the further monitoring recommended above, an additional borehole can be installed as part of the detailed design process to allow the direct characterisation of the waste to be determined. Specifically this would permit an assessment of the stage of degradation and direct measurement of gas production if any. Therefore, a more accurate assessment of the potential hazards at source can be made. If it can be demonstrated that there is no hazard at source, the risk to the proposed 'target' development will be shown to be negligible.

9.0 REFERENCES

9.1 Capita Symonds (Structures) Ltd. Phase II Intrusive Investigation and Assessment for a site off Atlantic Way, Barry. (Ref SS/016890/P2SI-1) - September 2008

APPENDIX I

Ground Gas Monitoring Results

BIOGEN POWER - ATLANTIC WAY, BARRY
GROUND GAS AND WATER MONITORING RESULTS

JOB NUMBER - BP1008/2

Date :- Friday 21st November 2008
Personnel :- J. Jones
Instrument :- Geotechnical Instruments GA2000PLUS Infra Red Gas Analyser
Serial No. :- GA07310
Date of last factory calibration :- 10/11/2008
Next service due :- 01/05/2009
Date of last Gas Check :- 10/11/2008
Date downloaded :- 21/11/2008 12:25
Computer & User Info :- IBMTP-JJ

Ground Conditions :- Dry
Weather Conditions :- Dry Cold 8.1°C
Monitoring Point Conditions :- All boreholes intact.
Evidence that there has been standing water around borehole 104

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	21/11/2008 08:17	2.45	7.87	0	2.5	19.3	78.2	0	0	2.5	19.3	1017	0	2	0	LOW
BH102	21/11/2008 08:23	3.01	7.87	0	9.2	3.1	87.7	0	0	9.2	3.2	1016	-0.06	0	0	LOW
BH103	21/11/2008 08:54	0.50	11.55	0	1.9	19.9	78.2	0	0	1.9	19.9	1017	0.05	2	0	LOW
BH104	21/11/2008 08:39	3.04	7.57	0	9.2	7.5	83.3	0	0	9.2	7.5	1016	0.16	0	0	LOW

Monitoring Exercise Commentary :-

Ground Gas Monitoring results indicated that no Methane was detected with steady state CO2 and O2 values recorded in %v/v columns noted above. Peak CO2 and O2 readings matched that of steady state.
CO was detected within BH101 and B103 at a level of 2ppm in each installation. No H2S was detected in any of the installations.
Dipping of the installations indicates that they have not moved or settled significantly since the Phase II SI though there may have been some silting especially in BH103.
Groundwater monitoring within the installations indicates that the groundwater levels has risen since the result published in the Phase II SI.

Date :- Tuesday 25th November 2008
Personnel :- J.Jones
Instrument :- Geotechnical Instruments GA2000PLUS Infra Red Gas Analyser
Serial No. :- GA07310
Date of last factory calibration :- 10/11/2008
Next service due :- 01/05/2009
Date of last Gas Check :- 10/11/2008
Date downloaded :- 25/11/2008
Computer & User Info :- IBMTP-JJ

Ground Conditions :- Dry
Weather Conditions :- Dry, Cold, 4°C
Monitoring Point Conditions :- All boreholes intact

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	25/11/2008 08:26	2.40	7.87	0	2.9	18.3	78.8	0	0	3.0	18.1	1023	0.00	1	0	LOW
BH102	25/11/2008 08:35	3.00	7.87	0	3.6	17.7	78.7	0	0	3.6	17.7	1022	0.32	0	0	LOW
BH103	25/11/2008 08:42	0.55	11.55	0	7.7	7.3	85.0	0	0	7.8	7.3	1022	0.22	2	0	LOW
BH104	25/11/2008 08:50	3.06	7.57	0	9.7	6.0	84.3	0	0	9.7	6.0	1023	0.33	1	0	LOW

Monitoring Exercise Commentary :-

Ground Gas Monitoring results indicated that no Methane was detected with steady state CO2 and O2 values recorded in %v/v columns noted above. Peak CO2 and O2 readings matched that of steady state.
CO was detected within BH101 and BH103 & BH 104 at a level no more than 2ppm in each installation. No H2S was detected in any of the installations.
There has been no change in the DTB of the installations.
Groundwater monitoring within the installations indicates little change in DTH since the previous monitoring visit.

Date :- Friday 28th November 2008
Personnel :- J.Jones
Instrument :- Geotechnical Instruments GA2000PLUS Infra Red Gas Analyser
Serial No. :- GA07310
Date of last factory calibration :- 10/11/2008
Next service due :- 01/05/2009
Date of last Gas Check :- 10/11/2008
Date downloaded :- 28/11/2008
Computer & User Info :- IBMTP-JJ

Ground Conditions :- Damp
Weather Conditions :- Light rain, 3°C
Monitoring Point Conditions :- All boreholes intact

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	28/11/2008 07:20	3.07	7.66	0	3.1	18.6	78.3	0	0	3.1	18.5	999	0.02	0	0	LOW
BH102	28/11/2008 07:29	3.07	7.68	0	1.7	18.7	79.6	0	0	5.6	13.0	998	0.08	2	0	LOW
BH103	28/11/2008 07:48	0.61	11.55	0	2.6	19.9	77.5	0	0	2.6	18.5	998	-2.20	1	0	LOW
BH104	28/11/2008 07:38	3.14	7.57	0	9.0	6.8	84.2	0	0	9.0	6.8	998	0.22	0	0	LOW

Monitoring Exercise Commentary :-

Ground Gas Monitoring results indicated that no Methane was detected with steady state CO2 and O2 values recorded in %v/v columns noted above. Peak CO2 and O2 readings matched that of steady state for BH 101,103 & 104.
CO2 peaked at 5.6 for BH 102
CO was detected within BH102 and BH103 at a level no more than 2ppm in each installation. No H2S was detected in any of the installations.
There has been no change in the DTB of the installations since the last visit.
Groundwater monitoring within the installations indicates a varied increase in DTH across the site since the previous visit.

Date :- Monday 1st December 2008
Personnel :- J.Jones
Instrument :- Geotechnical Instruments GA2000PLUS Infra Red Gas Analyser
Serial No. :- GA07310
Date of last factory calibration :- 10/11/2008
Next service due :- 01/05/2009
Date of last Gas Check :- 10/11/2008
Date downloaded :- 05/12/2008
Computer & User Info :- IBMTP-JJ

Ground Conditions :- Dry
Weather Conditions :- Clear, Dry, Frosty, -1°C
Monitoring Point Conditions :- All boreholes intact

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	01/12/2008 07:24	3.11	7.66	0	4.3	15.9	79.8	0	0	4.3	15.9	1004	0.18	4	0	LOW
BH102	01/12/2008 07:31	3.11	7.68	0	4.8	13.8	81.4	0	0	4.8	13.9	1004	0.20	1	0	LOW
BH103	01/12/2008 07:48	0.62	11.55	0	2.6	20.7	76.7	0	0	2.6	19.3	1005	-3.81	3	0	LOW
BH104	01/12/2008 07:39	3.18	7.57	0	9.3	7.0	83.7	0	0	9.3	6.9	1005	0.33	1	0	LOW

Monitoring Exercise Commentary :-

Ground Gas Monitoring results indicated that no Methane was detected with steady state CO2 and O2 values recorded in %v/v columns noted above. Peak CO2 and O2 readings matched that of steady state.
CO was detected within BH102 and BH103 at a level no more than 2ppm in each installation. No H2S was detected in any of the installations.
There has been no change in the DTB of the installations since the last visit.
Groundwater monitoring within the installations indicates a slight increase in DTH across the site since the previous visit.

BIOGEN POWER - ATLANTIC WAY, BARRY
GROUND GAS AND WATER MONITORING RESULTS

JOB NUMBER - BP1008/2

Date :- Friday 5th December 2008
Personnel :- J.Jones
Instrument :- Geotechnical Instruments GA2000 Infra Red Gas Analyser
Serial No. :- GA05172
Date of last factory calibration :- 28/11/2008
Next service due :- 01/06/2009
Date of last Gas Check :- 28/11/2008
Date downloaded :- 05/12/2008
Computer & User Info :- AMGENCAD Jeremy Jones

Ground Conditions :- Wet
Weather Conditions :- 6°C, light rain
Monitoring Point Conditions :- Boreholes 101, 102 & 103 intact.
No readings were taken at borehole 104 as the monitoring point was flooded.

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	05/12/2008 07:24	3.17	7.66	0	2.0	19.7	78.3	0	0	2.0	19.7	982	-0.29	0	0	N/R
BH102	05/12/2008 07:33	3.16	7.68	0	8.7	5.0	86.3	0	0	8.6	5.0	982	-0.32	0	0	N/R
BH103	05/12/2008 07:46	0.47	11.55	0	3.5	19.5	77.0	0	0	3.5	19.3	982	19.82	0	0	N/R
BH104	-	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R

Monitoring Exercise Commentary :-

Ground Gas Monitoring results indicated that no Methane was detected with steady state CO2 and O2 values recorded in %v/v columns noted above. Peak CO2 and O2 readings matched that of steady state.
Neither CO or H2S were detected in any of the installations.
Dipping of the installations indicates that they have not moved since the previous visit.
Groundwater monitoring within the installations indicates that there has been little change in DTH since the previous visit.
The area around monitoring point BH104 was water logged, therefore no monitoring could be undertaken during the visit.

Date :- Tuesday 9th December 2008
Personnel :- J.Jones
Instrument :- Geotechnical Instruments GA2000 Infra Red Gas Analyser
Serial No. :- GA05172
Date of last factory calibration :- 28/11/2008
Next service due :- 01/06/2009
Date of last Gas Check :- 28/11/2008
Date downloaded :- 09/12/2008
Computer & User Info :- AMGENCAD Jeremy Jones

Ground Conditions :- Frosty, damp in places
Weather Conditions :- 2°C, Clear, dry
Monitoring Point Conditions :- All boreholes intact.

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm
BH101	09/12/2008 07:13	3.24	7.66	0	3.9	16.7	79.4	0	0	3.9	16.7	1022	-0.49	0	0	N/R
BH102	09/12/2008 07:23	3.24	7.68	0	9.3	4.3	86.4	0	0	9.3	4.3	1022	-0.46	0	0	N/R
BH103	09/12/2008 07:41	0.55	11.55	0	3.5	18.5	78.0	0	0	8.8	9.6	1022	-3.04	0	0	N/R
BH104	09/12/2008 07:32	3.30	7.57	0	8.9	7.8	83.3	0	0	9.2	6.9	1022	-0.54	0	0	N/R

Monitoring Exercise Commentary :-

Ground Gas Monitoring indicated that no Methane was detected.
Neither CO or H2S were detected in any of the installations.
Dipping of the installation indicates that they have not moved since the previous visit.
Groundwater monitoring within the installations indicates that there has been little change in DTH since the previous visit.

Date :-
Personnel :-s
Instrument :-
Serial No. :-
Date of last factory calibration :-
Next service due :-
Date of last Gas Check :-
Date downloaded :-
Computer & User Info :-

Ground Conditions :-
Weather Conditions :-
Monitoring Point Conditions :-

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm

Monitoring Exercise Commentary :-

Date :-
Personnel :-
Instrument :-
Serial No. :-
Date of last factory calibration :-
Next service due :-
Date of last Gas Check :-
Date downloaded :-
Computer & User Info :-

Ground Conditions :-
Weather Conditions :-
Monitoring Point Conditions :-

Key :- DTH - Depth to Head (groundwater level) metres. DTB - Depth to Base of Installation (metres)

Borehole ID	Date/Time	Ins' DTH (m)	Ins' DTB (m)	CH4 %v/v	CO2%v/v	O2%v/v	Balance %v/v	CH4 %LEL	Peak CH4	Peak CO2	Min O2	BP (mb)	Rel. Pressure (mb)	CO ppm	H2S ppm	H2 ppm

Monitoring Exercise Commentary :-