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Our Ref: aw/5902b.2920.GGA

Wednesday, 05 July 2017

Waterstone Homes Ltd
Number One
Waterton Park
Bridgend
CF31 3PH

BY EMAIL

Dear Sirs,

PROPOSED RESIDENTIAL DEVELOPMENT, GENE METALS
GROUND GAS ADDENDUM REPORT

1.0 INTRODUCTION

Further to the issue of our exploratory Preliminary Geo-environmental and Geotechnical Assessment (Ref: ESP.5902.02.2608), we have now completed the scheduled gas monitoring, and are pleased to provide our ground gas addendum report. This report presents an assessment of the ground gas conditions at the site (see Figure 1). It does not consider its geo-environmental or geotechnical status and should not be construed as an assessment of these aspects. Our previous report should be referred to for full site context. Our previous risk assessment for the site (Ref: ESP.5902.02.2608) we identified a number of potential sources of hazardous ground gas including:

- General Made Ground including spilt petroleum hydrocarbons and chlorinated solvents from the historical uses of the site;
- A historical tip within the former quarry immediately below the south-eastern boundary – it is not known whether this was a colliery spoil tip or municipal/inert landfill;
- General worked ground (probable colliery or ironworks) tips within 250m of the site.

2.0 SUMMARY EXPLORATORY WORKS

Four windowless sampler boreholes were constructed to a maximum depth of 2.35m on the 20th July 2016, with the rationale for each hole constructed outlined in Table 1. The positions of the boreholes are shown in Figure 2. The borehole logs are appended in Enclosure A, and are summarised below:

- **Made Ground:** encountered in WS1 and WS4 to a maximum depth of 1.80m as a very loose silty PFA sand with fragments of brick, metal and roots.
- **Made Ground:** encountered in WS2 to a maximum depth of 1.20m as a very gravelly silty sand of clinker, ash and coal; fragments of metal, brick and plastic sheeting; and a hydrocarbon odour.

- **Glacial Diamicton:** encountered in WS1 to a maximum depth of 2.30m as a soft to firm sandy slightly gravelly clay.
- **Birthdir Sandstone:** encountered to the base of all boreholes as a slightly clayey sandy gravel of angular sandstone, with occasional sandstone cobbles.

3.0 INSTALLATION OF GROUND GAS MONITORING WELLS

50mm diameter gas and groundwater monitoring wells comprising slotted plastic pipe with a gravel surround, a bentonite seal above and below the response zone and flush cover, were installed in BH1, BH2 and BH3 to monitor for potential ground gases, as outlined in Table 1, below.

Table 1: Well Installations

Well ID	Date of Installation	Response Zone Depth	Response Zone/Stratum	Rationale
WS1	20/07/2016	1.0 – 2.0m	Made Ground	2
WS2	20/07/2016	1.0 – 1.2m	Made Ground	2
WS4	20/07/2016	1.0 – 2.0m	Made Ground/Birthdir Sandstone	2

Notes on Table 1:
1. Details of each monitoring well are presented on the individual ESP borehole records presented in Enclosure A.
2. Well installed to investigate the on-site sources of hazardous ground gas.

4.0 LIMITATIONS OF INVESTIGATION

4.1 Groundwater

The groundwater level is typically routinely recorded during the monitoring. However, the significance of the groundwater is not always fully appreciated. If the water table is particularly high or varies greatly, there is the potential for the water to rise above the response zone. This can prevent the ingress of soil gas into the well. The lack of concentrations in the well can subsequently give false readings.

A rising groundwater level can cause an increase in gas concentration. Rising groundwater will reduce the pore space in which the soil gas exists. The soil gas will be displaced upwards causing the soil gas to migrate upwards and be released from the ground into the atmosphere, or into buildings or boreholes (the piston effect). Reference to CIRIA C665 indicates several factors influencing the migration of gases and vapours.

The groundwater levels recorded during the six monitoring visits are presented on Table 2 below, including the groundwater monitoring data from a set of boreholes installed in a following phase of work at the site (ESP5209b.04 – reporting in progress). Due to the presence of high groundwater levels in WS2, monitoring was not possible on visits 7 and 8.

Table 2: Monitored Groundwater Levels

Well ID	Groundwater Depth Between (mbgl)
WS1	Dry – 1.70m
WS2	Dry – ground level (possible artesian water pressures)
WS4	Dry
BH201	2.50m - ground level (possible artesian pressures)
BH202	1.30m – 0.10m
BH203	2.70m – 0.87m
BH204	7.15m – 4.90m
BH205	23.60m – 11.85m

Groundwater levels can vary, often significantly, during changing weather conditions and particularly seasonally and this should be considered when planning construction and dewatering works.

4.2 Rainfall

High rainfall will cause groundwater levels to rise, resulting in a reduced available pore space in which soil gas can exist. Some of the gas will dissolve. However, the reduced pore space will result in an increase in gas concentrations, and increase in potential release of the gases into the atmosphere.

4.3 Hydrogeology

The presence of groundwater will inhibit the movement of gases within the ground. Water in the soil matrix will flow more easily in a horizontal direction than vertically. Gas bubbles will tend to form and combine in a horizontal plane as water in the soil matrix is displaced in the preferential horizontal direction. As more bubbles accumulate in the horizontal plane they link up forming networks resulting in open cracks or fissures, within the soil matrix, through which gas can flow with little resistance. Some proportion of gas may also dissolve in the water.

5.0 HAZARDOUS GAS ASSESSMENT

5.1 Results of Gas Monitoring

Six monitoring visits have been undertaken in total between the 4th August 2016 and 13th March 2017 in line with CIRIA C665.

On each monitoring visit, the installed wells were monitored for levels of groundwater and hazardous ground gas. Groundwater levels were measured using a dip meter from the site surface. Gas Data LMSxi G3.18e portable monitoring equipment was used to measures levels of hazardous ground gas. This uses an infra-red methane (CH_4) and carbon dioxide (CO_2) detector, coupled with pressure, temperature and flow sensors. Due to an instrument malfunction, visit 2 and 3 must be discounted due to unreliable readings.

Volatile Organic Compound (VOC) headspace analysis was also carried out during the monitoring of each installation in order to provide an indication if volatile chemical compounds were present. This was carried out by a handheld Photo Ionisation Detector (PID). The atmospheric pressure was measured during each visit.

It should be noted that the monitoring visits were undertaken during a period where barometric pressures ranged from 993mb to 1020mb. Rising pressure/high pressure systems cause air to flow into the ground, diluting gas concentrations. The solubility of gas also increases with pressure, which could result in lower gas emissions as more gas will be dissolved within groundwater.

The monitoring regime has encompassed, low, high, falling and steady atmospheric pressures over the course of the assessment.

The full results of the gas and groundwater monitoring are appended to this report as Enclosure B and summarised in Table 3 below.

Table 3: Summary of gas monitoring data (Visits 1 to 8)

Well	Response Zone Depth (m)	No visits	Maximum Methane (%)	Maximum Carbon dioxide (%)	Lowest Oxygen (%)	Max Gas Flow (L/hr)	VOCs (ppm)	Atmospheric pressure (mb)
WS1	1.0m-9.0m	6	0.1	1.0	20.7	0.0	20.0	993-1020
WS2	1.0m-4.0m	4	0.4	0.9	14.8	0.0	8.7	
WS4	1.0m-5.0m	5	0.3	2.2	20.4	0.1	4.2	

NOTES - ND = Non detectable levels.

The monitoring by ESP indicated levels of methane between non-detect and 0.4%, and carbon dioxide between non-detect and 2.2%. Oxygen was depleted where the levels of carbon dioxide were elevated with the lowest recording being 14.8%. The maximum gas flow rate recorded was 0.1 l/hr.

During the monitoring regime, the maximum levels of VOCs were between non-detect and 20.0ppm, with the highest levels recorded in WS1. Subsequent testing as part of a separate phase of work on the site (ESP5902.04) has identified hydrocarbon contamination in soil and soil leachate samples tested, as well as slightly elevated levels of VOCs in the groundwater. As we understand, the client is liaising with remediation contractors for the site and these aspects should be factored into the design of the remediation strategy.

5.2 Ground Gas Risk Characterisation

The results have been assessed in accordance with the modified Wilson and Card Classification (as presented in CIRIA C665 2007 and BS8485 2015). The results are summarised in Table 4 below.

Table 4: Maximum Gas/Flow Levels & Calculated GSV

Hazardous Gas	Maximum Recorded Level (%)	Maximum Gas Flow Rate (L/hr)	GSV (L/hr)
Methane	0.4	0.1	$4.0x10^{-4}$
Carbon dioxide	2.2	0.1	$2.2x10^{-3}$

Based on the results obtained to date, the corresponding gas screening value (GSV) values classify the site as Characteristic Situation 1 (CS1), however this is a guideline value only and additional factors must be taken into account when determining the final CS classification for the site.

Given the other influencing factors identified at the site, such as site history, covering of Made Ground and potential off-site gas sources it may be prudent to raise the classification to CS-2.

Table 3 of BS8485: 2015 designates the site as Type A, meaning the minimum score (points) required to protect against a CS2 classified site for Type A buildings is 3.5, as shown by table 4 of BS8485:2015.

Increasing the classification of the site to CS-2 will also provide some assurances given that earthworks are proposed, and that the remediation strategy is still being designed.

5.3 Recommended Protection Measures

To achieve the minimum gas protection score of '3.5' a combination of two or more of the following three types of protection measures should be used:

- Structural barrier i.e. floor slab or basement slab and wall if present;
- Ventilation measures; and
- Gas resistant membrane.

Based on the proposed foundation and floor slab design and in accordance with Tables 5, 6 and 7 of BS8485:2015 the following points are achieved, which will achieve the required 3.5 points:

a. Cast in situ monolithic well reinforced ground bearing raft or well reinforced cast in situ or suspended floor slab with minimal penetrations (**1.0 point or 1.5 point** - conservative, as no option for precast slab);
b. Good performance passive subfloor dispersal layer in accordance with Annex B (**1.5 points**) with the criteria for void formers presented in Table 6 adhered to – this could be considered in lieu of a pressure relief pathway to achieve the design score;
c. Taped and sealed membrane gas resistant membrane meeting all criteria outlined in Table 7 of BS8485:2015 (**2 points**). Note – If the membrane installed does not meet all criteria outlined in Table 7 (BS8485:2015), then the score is zero.

If the design cannot incorporate the reinforcement required or the level of membrane installation required, then alternative protection measures such as vented void spaces will be required. It should also be noted that the use of block and beam type flooring does not offer any "points" of protection.

Where basements are proposed, it will be necessary to suitably incorporate the recommended ground gas protection measures into the basement construction.

5.4 Radon

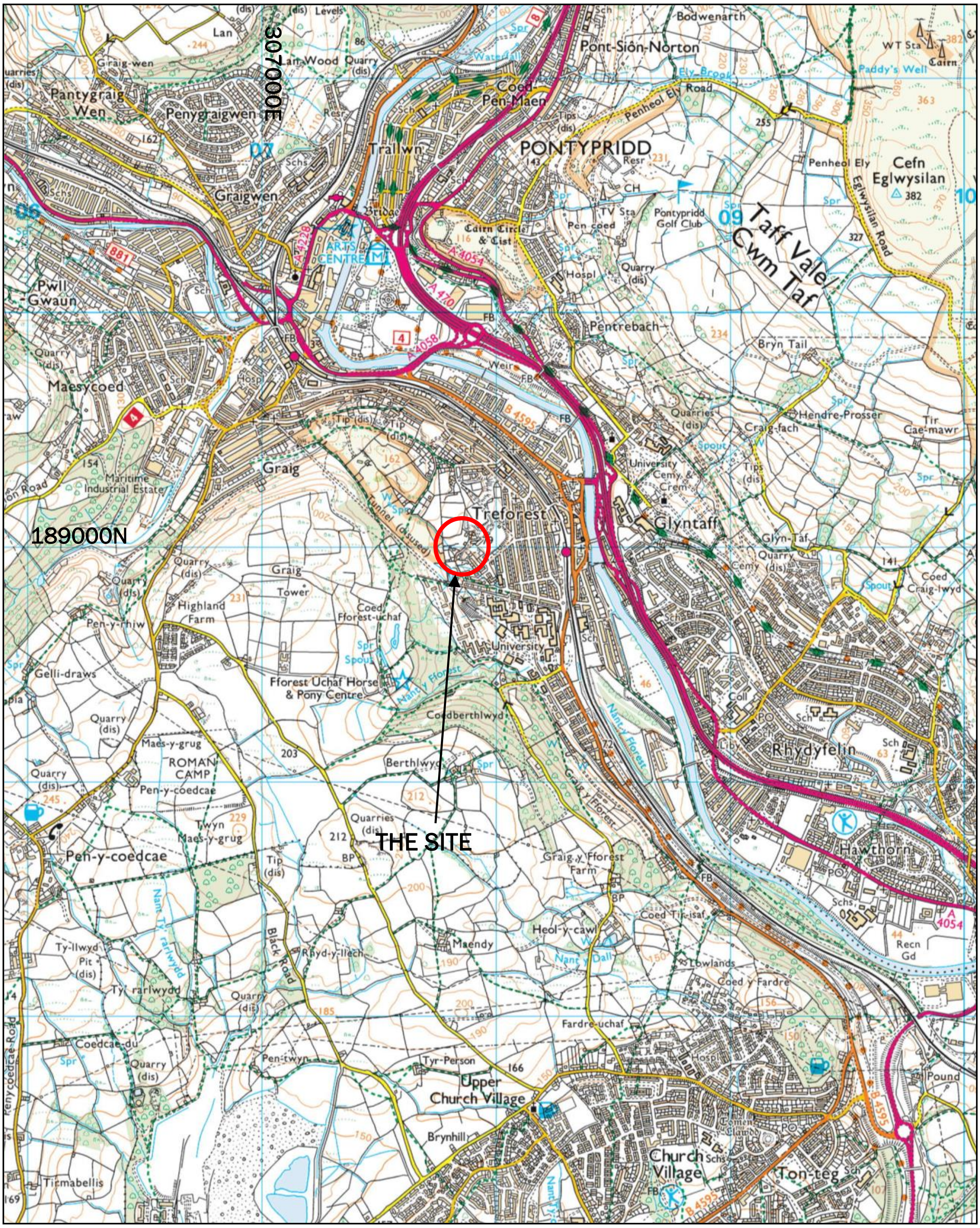
The preliminary risk assessment indicated that no radon protection is required.

We trust the above meets with your present requirements. However, should you have any queries or require any further information, please do not hesitate to contact us.

Yours sincerely,

Alex Wilding

Enc. Figure 1: Site Location Plan
Figure 2: Exploratory Hole Location Plan
Enclosure A: Exploratory Hole Records
Enclosure B: Gas Monitoring Results
Enclosure C: Groundwater Monitoring Results
General Notes



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PROJECT:	PROPOSED RESIDENTIAL DEVELOPMENT GENE METALS, TREFOREST
SCALE:	1: 25,000 (approx. at A4)
FIGURE 1:	SITE LOCATION PLAN

esp
ENGINEERS
GEOLOGISTS
SCIENTISTS
EARTH SCIENCE PARTNERSHIP
33 Cardiff Road, Taffs Well, Cardiff CF15 7RB
Tel: 029 2081 3385 enquiries@earthsciencepartnership.com

N

Approximate extent of
Proposed Cut in Development

BH201

BH202

BH203

BH204

BH205

WS1

WS2

WS3

WS4

WS5

ST1
E 307826.641
N 189018.839
Z 104.956

ST2
E 307881.361
N 189047.589
Z 100.623

ST3
E 307876.897
N 189030.987
Z 98.390

BUILDING

DIRECTION OF FLOW

PIPE 0.5m
IL=106.70

PIPE 0.5m
IL=104.47

O/H LINE

TP

Tip (dis)

Inaccessible
Quarry Face

Mast

Waymc

esp
ENGINEERS
GEOLOGISTS
SCIENTISTS

Notes:

- Phase Two Windowless Sample Borehole Location (2016). Gas monitoring wells are installed in WS1, WS2 and WS4.
- Phase Three Borehole Location (2017)

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST.

Scale: 1:500 (approx. at A3)

FIGURE 2:
EXPLORATORY HOLE LOCATION PLAN – DEVELOPMENT SITE

EARTH SCIENCE PARTNERSHIP
33 Cardiff Road, Taffs Well,
Cardiff CF15 7RB Tel: 029 2081 3385
enquiries@earthsciencepartnership.com

5902b.2920

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Proposed Residential Development
Site Location: Gene Metals, Treforest
Client: Waterstone Homes
Project No: 5902b.02

Drilling method Windowless Sampler
Equipment Dart Rig

Start date: 20-07- 2016
End date: 20-07- 2016
Backfill date: 20-07- 2016

Driller: GSTL
Logged by: MTE
Date logged: 20-07-2016

Ground Level: 100.20 mOD
Easting: 307875 m
Northing: 189030 m

WS1

Depth	Sample Type	Sample Class	Test Details Type	Test Details Result	TSR (%)	Water Depth	Casing Depth	Strata Details Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Install-ations
								Scrub vegetation over very loose grey silty pfa SAND with fine to medium fragments of angular brick, metal and roots. 0.5m: PID = 0ppm, 1.0m: PID = 0ppm (MADE GROUND)			(1.80) 1		
0.50	ES												
1.00	B		C	1 (1,1/1,0,0,0)									
								Grey angular coarse GRAVEL of concrete. (MADE GROUND)			1.80 (0.05) 1.85	98.40 98.35	
1.90	ES							Soft to firm orange-brown sandy slightly gravelly CLAY with rootlets. 1.9m:PID = 0ppm (PROBABLE GLACIAL DIAMICTON)			2 (0.45)		
1.95	D		C	50 (2,5/50 for 225mm)									
								Very dense brown mottled light brown sandy silty clayey GRAVEL of angular fine to coarse SANDSTONE with occasional fine cobbles of sandstone. (BRITHDIR SANDSTONE)			2.30 (0.05) 2.35	97.90 97.85	
								End of Borehole at 2.380m			3		

Progress & Standing Water Levels					Water Strikes							Chiselling			Hole Diameter		Casing Diameter	
Date	Time	Hole Depth	Casing Depth	Water Depth	Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed	Depth Top	Depth Base	Duration	Hole Depth	Hole Diameter	Casing Diameter	Casing Depth

General Remarks

1. Grid reference at centre of site. Elevation approximate only and interpolated from topographic survey.
2. Service pit hand dug to 1.2m prior to drilling.
3. Sample notation E: Environmental sample (1 plastic tub, 1 amber jar and 1 vial).
4. No groundwater identified during drilling. Borehole terminated on sandstone bedrock.
5. 50mm dia gas/groundwater well installed with response zone between 1.0 and 2.0m depth.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Proposed Residential Development
Site Location: Gene Metals, Treforest
Client: Waterstone Homes
Project No: 5902b.02

Drilling method Windowless Sampler
Equipment Dart Rig

Start date: 20-07- 2016
End date: 20-07- 2016
Backfill date: 20-07- 2016

Driller: GSTL
Logged by: MTE
Date logged: 20-07-2016

Ground Level: 106.10 mOD
Easting: 307875 m
Northing: 189030 m

WS2

Depth	Sample Type	Sample Class	Test Details Type	Test Details Result	TSR (%)	Water Depth	Casing Depth	Strata Details Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
0.40	ES							Scrub vegetation over dark brown very gravelly silty SAND of ash, clinker and coal. Fragments of metal, brick, plastic sheeting, glass and sandstone. Hydrocarbon (probable diesel) odour. 0.4m: PID = 105ppm, 0.8m: PID = 175ppm, 0.9m: PID = 160ppm. (MADE GROUND)			(1.20)		
0.80	B												
0.90	D												
			C	50 (9,11/50 for 150mm)				No Recovery. Probable grey brown medium to coarse grained SANDSTONE (inferred from adjacent trial pits). (BRITHDIR SANDSTONE)			1.20 (0.10) 1.30	104.90 104.80	
								End of Borehole at 1.300m					

1
2
3

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
19-07-2016	12:00	0.70		0.00	0.00	

Chiselling

Depth Top	Depth Base	Duration

Hole Diameter

Hole Depth	Hole Diameter

Casing Diameter

Casing Diameter	Casing Depth

General Remarks

1. Grid reference at centre of site. Elevation approximate only and interpolated from topographic survey.
2. Service pit hand dug to 1.2m prior to drilling.
3. Sample notation E: Environmental sample (1 plastic tub, 1 amber jar and 1 vial).
4. Little penetration by borehole in sandstone bedrock.
5. 50mm dia gas/groundwater well installed with response zone between 0.5 and 1.3m depth.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Proposed Residential Development
Site Location: Gene Metals, Treforest
Client: Waterstone Homes
Project No: 5902b.02

Drilling method Windowless Sampler
Equipment Dart Rig

Start date: 20-07- 2016
End date: 20-07- 2016
Backfill date: 20-07- 2016

Driller: GSTL
Logged by: MTE
Date logged: 20-07-2016

Ground Level: 102.10 mOD
Easting: 307875 m
Northing: 189030 m

WS3

Depth	Sample Type	Sample Class	Test Details Type	Test Details Result	TSR (%)	Water Depth	Casing Depth	Strata Details Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
0.30	ES							Dense dark grey and dark brown very sandy occasionally cobbly GRAVEL. Gravel and cobbles are fine to coarse brick, metal, wire, wood, plastic and occasional slag. Slight hydrocarbon (possibly diesel) odour. 0.3m:PID = 69ppm. (MADE GROUND)			(1.40)		
0.50	D												
1.00	D		C	28 (3,3/4,6,8,10)							1		
1.50	D		C	50 (7,11/50 for 150mm)				Medium dense becoming very dense brown clayey gravelly SAND with coarse angular sandstone gravel. Probable sandstone at base of borehole. 1.5m:PID=40ppm (GLACIAL DIAMICTON)				1.40	100.70	
											(0.50)		
								End of Borehole at 1.900m			1.90	100.20	
											2		
											3		

Progress & Standing Water Levels				
Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes						
Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Chiselling		
Depth Top	Depth Base	Duration

Hole Diameter	
Hole Depth	Hole Diameter

Casing Diameter	
Casing Diameter	Casing Depth

General Remarks

1. Grid reference at centre of site. Elevation approximate only and interpolated from topographic survey.
2. Service pit hand dug to 1.2m prior to drilling.
3. Sample notation E: Environmental sample (1 plastic tub, 1 amber jar and 1 vial).
4. No groundwater identified during drilling. Borehole terminated on possible sandstone bedrock.
5. Borehole backfilled with arisings on completion - No installation.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Proposed Residential Development
Site Location: Gene Metals, Treforest
Client: Waterstone Homes
Project No: 5902b.02

Drilling method Window Sampler
Equipment Dart Rig

Start date: 20-07- 2016
End date: 20-07- 2016
Backfill date: 20-07- 2016

Driller: GSTL
Logged by: MTE
Date logged: 20-07-2016

Ground Level: 98.90 mOD
Easting: 307875 m
Northing: 189030 m

WS4

Depth	Sample Type	Sample Class	Test Details Type	Test Details Result	Water Depth	Casing Depth	Strata Details Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
0.30	ES						Scrub vegetation over very loose to loose grey silty pfa SAND with fine to medium gravel sized fragments of angular brick, metal, clinker and roots to 0.4m. 0.3m & 0.6m: PID = 0ppm. (MADE GROUND)			(1.50)		
0.60	B									1		
			C	4 (2,1/1,1,1,1)								
										1.50	97.40	
1.60	D						Firm brown mottled orange-brown and black sandy gravelly CLAY with roots. 1.6m:PID = 0ppm (MADE GROUND)			(0.25)		
1.80	B						Grey and reddish brown GRAVEL of subangular to angular sandstone. 1.8m:PID = 0ppm (BRITHDIR SANDSTONE)			1.75	97.15	
			C	50 (9,9/50 for 75mm)						(0.50)		
							End of Borehole at 2.250m			2.25	96.65	
										3		

Progress & Standing Water Levels					Water Strikes							Chiselling			Hole Diameter		Casing Diameter	
Date	Time	Hole Depth	Casing Depth	Water Depth	Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed	Depth Top	Depth Base	Duration	Hole Depth	Hole Diameter	Casing Diameter	Casing Depth

General Remarks

1. Grid reference at centre of site. Elevation approximate only and interpolated from topographic survey.
2. Service pit hand dug to 1.2m prior to drilling.
3. Sample notation E: Environmental sample (1 plastic tub, 1 amber jar and 1 vial).
4. No groundwater identified during drilling. Borehole terminated on sandstone bedrock.
5. 50mm dia gas/groundwater well installed with response zone between 1.0 and 2.0m depth.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Proposed Residential Development
Site Location: Gene Metals, Treforest
Client: Waterstone Homes
Project No: 5902b.02

Drilling method Windowless Sampler
Equipment Dart Rig

Start date: 20-07-2016
End date: 20-07-2016
Backfill date: 20-07-2016

Driller: GSTL
Logged by: MTE
Date logged: 20-07-2016

Ground Level: 103.80 mOD
Easting: 307875 m
Northing: 189030 m

WS5

Depth	Sample Type	Sample Class	Test Details Type	Test Details Result	TSR (%)	Water Depth	Casing Depth	Strata Details Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
0.20	ES							Dark brown gravelly clayey SAND with occasional fragments of tarmacadam and numerous fragments of metal, glass, wood and roots. 0.2m: PID = 0ppm. (MADE GROUND)			(0.40)		
											0.40	103.40	
0.50	ES							Soft becoming firm orange-brown silty sandy occasionally gravelly CLAY. Gravel is fine and subangular to angular sandstone. 0.5m:PID = 0ppm (GLACIAL DIAMICTON)			(0.40)		
0.60	D									→			
								Medium dense brown clayey gravelly SAND with fine to coarse subangular to angular sandstone gravel. 1.2m: PID = 0ppm (GLACIAL DIAMICTON)			0.80	103.00	
											1		
											(0.50)		
1.20	B		C	46 (2,2/23,5,7,11)									
1.40	B							Very dense brown mottled light brown sandy silty clayey angular fine to coarse sandstone GRAVEL with occasional sandstone cobbles. 1.4m: PID = 94ppm (BRITHDIR SANDSTONE)			1.30	102.50	
			C	50 (10,10/50 for 75mm)							(0.60)		
								End of Borehole at 1.900m			1.90	101.90	
											2		
											3		

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
19-07-2016	12:00	0.80		0.00	0.00	

Chiselling

Depth Top	Depth Base	Duration

Hole Diameter

Hole Depth	Hole Diameter

Casing Diameter

Casing Diameter	Casing Depth

General Remarks

1. Grid reference at centre of site. Elevation approximate only and interpolated from topographic survey.
2. Service pit hand dug to 1.2m prior to drilling.
3. Sample notation E: Environmental sample (1 plastic tub, 1 amber jar and 1 vial).
4. Borehole terminated on sandstone bedrock.
5. Borehole backfilled with arisings on completion. No installation.

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)
Project Ref. 5902b.02

esp ENGINEERS GEOLOGISTS SCIENTISTS

Monitoring Event 1

Date:	4-Aug-16	**Atmospheric Pressure (start):**	1,002 mb	**Trend:**	steady
Time:	14:00	**Atmospheric Pressure (end):**	1,002 mb		
Engineer:	mte	**Site Status:**	developed		
Weather:	dry	**Ground Conditions:**	hard/soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	2.38			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.4	0.0	0.0	21.5	0.0	0.0	0.0
After 30 Seconds		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	0.0
After 1 Minute		0.0	0.0	78.7	0.0	0.0	21.2	0.0	0.0	0.0
After 2 Minutes		0.0	0.0	78.7	0.0	0.0	21.2	0.0	0.0	0.0
Steady State		0.0	0.0	78.7	0.0	0.0	21.2	0.0	0.0	0.0
min		*0.0*	*0.0*	*78.4*	*0.0*	*0.0*	*21.2*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*78.7*	*0.0*	*0.0*	*21.5*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	1.30			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	79.1	0.0	0.0	20.8	0.0	0.0	0.0
After 30 Seconds		0.0	0.0	78.9	0.0	0.0	21.0	0.0	0.0	0.0
After 1 Minute		0.0	0.0	78.0	0.0	0.0	21.1	0.0	0.0	0.0
After 2 Minutes		0.0	0.0	78.0	0.0	0.0	21.0	0.0	0.0	0.0
Steady State		0.0	0.0	78.0	0.0	0.0	21.0	0.0	0.0	0.0
min		*0.0*	*0.0*	*78.0*	*0.0*	*0.0*	*20.8*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*79.1*	*0.0*	*0.0*	*21.1*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:		Bung too tight to remove								

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	2.25			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.5	0.0	0.0	22.5	0.0	0.0	0.0
After 30 Seconds		0.0	0.0	78.3	1.7	0.0	19.7	0.0	0.0	0.0
After 1 Minute		0.0	0.0	78.2	2.1	0.0	19.5	0.0	0.0	0.0
After 2 Minutes		0.0	0.0	78.2	2.2	0.0	19.5	0.0	0.0	0.0
Steady State		0.0	0.0	78.2	2.2	0.0	19.5	0.0	0.0	0.0
min		*0.0*	*0.0*	*78.2*	*0.0*	*0.0*	*19.5*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*78.5*	*2.2*	*0.0*	*22.5*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)
Project Ref. 5902b.02

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Monitoring Event 2

Date:	15-Aug-16	**Atmospheric Pressure (start):**	1,012 mb	**Trend:**	falling
Time:	14.00	**Atmospheric Pressure (end):**	1,010 mb		
Engineer:	AW	**Site Status:**	developed		
Weather:	Dry, sunny	**Ground Conditions:**	soft ground		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	2.38			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	97.5	0.4	0.0	1.6	0.0	0.2	16.0
After 30 Seconds		0.0	0.0	96.8	1.4	0.0	1.7	0.0	0.0	16.0
After 1 Minute		0.0	0.0	96.9	1.4	0.0	1.6	0.0	0.1	20.0
After 2 Minutes		0.0	0.0	96.9	1.4	0.0	1.6	0.0	-0.1	16.0
Steady State		0.0	0.0	96.8	1.4	0.0	1.6	0.0	0.0	16.0
min		*0.0*	*0.0*	*96.8*	*0.4*	*0.0*	*1.6*	*0.0*	*-0.1*	*16.0*
max		*0.0*	*0.0*	*97.5*	*1.4*	*0.0*	*1.7*	*0.0*	*0.2*	*20.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	1.30			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	97.6	0.5	0.0	2.1	0.0	0.0	8.7
After 30 Seconds		0.0	0.0	97.6	0.1	0.0	2.2	0.0	0.0	8.7
After 1 Minute		0.0	0.0	97.7	0.1	0.0	2.1	0.0	0.1	8.7
After 2 Minutes		0.0	0.0	97.5	0.1	0.0	2.1	0.0	0.0	8.7
Steady State		0.0	0.0	97.6	0.1	0.0	2.1	0.0	0.0	8.7
min		*0.0*	*0.0*	*97.5*	*0.1*	*0.0*	*2.1*	*0.0*	*0.0*	*8.7*
max		*0.0*	*0.0*	*97.7*	*0.5*	*0.0*	*2.2*	*0.0*	*0.1*	*8.7*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	2.25			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	98.9	0.1	0.0	0.9	0.0	0.0	0.0
After 30 Seconds		0.0	0.0	97.3	1.6	0.0	1.0	0.0	0.0	0.0
After 1 Minute		0.0	0.0	97.3	1.7	0.0	1.0	0.0	0.1	0.0
After 2 Minutes		0.0	0.0	97.2	1.6	0.0	1.0	0.0	0.0	0.0
Steady State		0.0	0.0	97.2	1.6	0.0	1.0	0.0	0.0	0.0
min		*0.0*	*0.0*	*97.2*	*0.1*	*0.0*	*0.9*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*98.9*	*1.7*	*0.0*	*1.0*	*0.0*	*0.1*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:										

Key:
dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
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(Spot Monitoring)

Project Ref. 5902b.02

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Monitoring Event 3

Date:	31-Aug-16	**Atmospheric Pressure (start):**	1,010 mb	**Trend:**	falling
Time:	9.30	**Atmospheric Pressure (end):**	1,008 mb		
Engineer:	AW	**Site Status:**	developed		
Weather:	Drizzle	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	2.38			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	96.8	0.1	0.0	2.4	0.0	0.2	3.7
After 30 Seconds		0.0	0.0	95.4	1.9	0.0	2.4	0.0	0.1	2.4
After 1 Minute		0.0	0.0	95.2	2.2	0.0	2.5	0.0	0.1	2.4
After 2 Minutes		0.0	0.0	95.3	2.2	0.0	2.4	0.0	0.0	2.9
Steady State		0.0	0.0	95.2	2.2	0.0	2.5	0.0	0.0	3.0
min		*0.0*	*0.0*	*95.2*	*0.1*	*0.0*	*2.4*	*0.0*	*0.0*	*2.4*
max		*0.0*	*0.0*	*96.8*	*2.2*	*0.0*	*2.5*	*0.0*	*0.2*	*3.7*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:	No cover over the well									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.90			**Groundwater depth (m):**		0.30		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	96.7	0.1	0.0	2.7	0.0	-0.1	6.4
After 30 Seconds		0.0	0.0	96.5	0.8	0.0	2.7	0.0	0.0	2.7
After 1 Minute		0.0	0.0	96.9	0.3	0.0	2.7	0.0	0.0	1.5
After 2 Minutes		0.0	0.0	97.3	0.0	0.0	2.6	0.0	0.0	1.8
Steady State		0.0	0.0	97.3	0.0	0.0	2.6	0.0	0.0	2.1
min		*0.0*	*0.0*	*96.5*	*0.0*	*0.0*	*2.6*	*0.0*	*-0.1*	*1.5*
max		*0.0*	*0.0*	*97.3*	*0.8*	*0.0*	*2.7*	*0.0*	*0.0*	*6.4*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	2.25			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	97.5	0.2	0.0	2.4	0.0	0.0	3.5
After 30 Seconds		0.0	0.0	97.5	0.0	0.0	2.4	0.0	0.0	4.2
After 1 Minute		0.0	0.0	97.5	0.0	0.0	2.4	0.0	0.0	0.5
After 2 Minutes		0.0	0.0	97.5	0.0	0.0	2.4	0.0	0.0	0.3
Steady State		0.0	0.0	97.5	0.0	0.0	2.4	0.0	0.0	0.2
min		*0.0*	*0.0*	*97.5*	*0.0*	*0.0*	*2.4*	*0.0*	*0.0*	*0.2*
max		*0.0*	*0.0*	*97.5*	*0.2*	*0.0*	*2.4*	*0.0*	*0.0*	*4.2*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)						**Methane:**	**0 L/hr**	**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)						**Methane:**	**0.00 L/hr**	**Carbon Dioxide**	**0 L/hr**	
Comments:	Cover and bung removed and next to borehole on arrival									

Key:

dP - differential pressure (well-atmosphere)

LEL - Lower Explosive Limit (methane)

N_2 - nitrogen

CO_2 - carbon dioxide (DL<0.1%)

>> - methane level > LEL (5%)

CH_4 - methane (DL <0.2%)

O_2 - oxygen

H_2S - Hydrogen sulphide

PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
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(Spot Monitoring)

Project Ref. 5902b.02

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Monitoring Event 4

Date:	13-Sep-16	**Atmospheric Pressure (start):**	999 mb	**Trend:**	steady
Time:	15:00	**Atmospheric Pressure (end):**	999 mb		
Engineer:	LD	**Site Status:**	developed		
Weather:	Overcast with showers	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	2.38			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.2	0.0	0.0	21.7	0.0	0.0	3.0
After 30 Seconds		0.0	0.0	78.5	0.0	0.0	21.4	0.0	0.0	2.1
After 1 Minute		0.0	0.0	78.5	0.0	0.0	21.4	0.0	0.0	2.0
After 2 Minutes		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	2.0
Steady State		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	2.0
min		*0.0*	*0.0*	*78.2*	*0.0*	*0.0*	*21.3*	*0.0*	*0.0*	*2.0*
max		*0.0*	*0.0*	*78.6*	*0.0*	*0.0*	*21.7*	*0.0*	*0.0*	*3.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	No cover over the well									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.90			**Groundwater depth (m):**		0.45		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	79.9	0.0	0.0	20.0	0.0	0.0	5.8
After 30 Seconds		0.0	0.0	80.1	0.0	0.0	19.8	0.0	0.0	3.4
After 1 Minute		0.0	0.0	80.1	0.0	0.0	19.8	0.0	0.0	1.0
After 2 Minutes		0.0	0.0	79.5	0.0	0.0	20.4	0.0	0.0	1.0
Steady State		0.0	0.0	79.5	0.0	0.0	20.4	0.0	0.0	1.0
min		*0.0*	*0.0*	*79.5*	*0.0*	*0.0*	*19.8*	*0.0*	*0.0*	*1.0*
max		*0.0*	*0.0*	*80.1*	*0.0*	*0.0*	*20.4*	*0.0*	*0.0*	*5.8*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	2.25			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.8	0.2	0.0	20.9	0.0	0.0	3.0
After 30 Seconds		0.0	0.0	78.9	0.1	0.0	20.9	0.0	0.0	2.5
After 1 Minute		0.0	0.0	78.9	0.1	0.0	20.9	0.0	0.0	2.0
After 2 Minutes		0.0	0.0	78.9	0.1	0.0	20.9	0.0	0.0	0.1
Steady State		0.0	0.0	80.0	0.1	0.0	20.9	0.0	0.0	0.1
min		*0.0*	*0.0*	*78.8*	*0.1*	*0.0*	*20.9*	*0.0*	*0.0*	*0.1*
max		*0.0*	*0.0*	*80.0*	*0.2*	*0.0*	*20.9*	*0.0*	*0.0*	*3.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Cover and bung removed and next to borehole on arrival									

Key:

dP - differential pressure (well-atmosphere)

LEL - Lower Explosive Limit (methane)

N_2 - nitrogen

CO_2 - carbon dioxide (DL<0.1%)

>> - methane level > LEL (5%)

CH_4 - methane (DL <0.2%)

O_2 - oxygen

H_2S - Hydrogen sulphide

PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)

Project Ref. 5902b.02

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Monitoring Event 5

Date:	21-Sep-16	**Atmospheric Pressure (start):**	1,004 mb	**Trend:**	steady
Time:	1000	**Atmospheric Pressure (end):**	1,004 mb		
Engineer:	AW	**Site Status:**	developed		
Weather:	Dry, overcast	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.3	78.4	0.1	0.1	21.0	0.0	0.0	0.0
After 30 Seconds		0.0	0.0	78.2	1.0	0.0	20.7	0.0	0.0	0.0
After 1 Minute		0.0	0.0	78.2	1.0	0.0	20.7	0.0	0.0	0.0
After 2 Minutes		0.0	0.0	78.3	1.0	0.0	20.7	0.0	0.0	0.0
Steady State		0.0	0.0	78.3	1.0	0.0	20.7	0.0	0.0	0.0
min		*0.0*	*0.0*	*78.2*	*0.1*	*0.0*	*20.7*	0.0	*0.0*	*0.0*
max		*0.0*	*0.3*	*78.4*	*1.0*	*0.1*	*21.0*	0.0	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	No cover over the well									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.95			**Groundwater depth (m):**		0.32		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		-4.0	10.6	81.9	0.9	0.4	18.6	0.0	-1.0	3.0
After 30 Seconds		-2.0	6.2	81.9	0.7	0.3	17.1	0.0	-0.8	2.5
After 1 Minute		-1.0	5.1	81.9	0.7	0.3	17.3	0.0	-0.4	2.0
After 2 Minutes		0.0	2.1	81.0	0.6	0.2	18.1	0.0	-0.3	0.1
Steady State		0.0	0.0	79.5	0.5	0.0	19.9	0.0	-0.2	0.1
min		*-4.0*	*0.0*	*79.5*	*0.5*	*0.0*	*17.1*	0.0	*-1.0*	*0.1*
max		*0.0*	*10.6*	*81.9*	*0.9*	*0.4*	*19.9*	0.0	*-0.2*	*3.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**-0.0008 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**-0.001 L/hr**	
Comments:										

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.7	0.3	0.0	20.7	0.0	0.0	7.1
After 30 Seconds		0.0	0.0	78.9	0.0	0.0	21.0	0.0	0.0	1.8
After 1 Minute		0.0	0.0	79.0	0.0	0.0	20.9	0.0	0.0	1.5
After 2 Minutes		0.0	0.0	79.0	0.0	0.0	20.9	0.0	0.0	1.2
Steady State		0.0	0.0	79.0	0.0	0.0	20.9	0.0	0.0	1.2
min		*0.0*	*0.0*	*78.7*	*0.0*	*0.0*	*20.7*	0.0	*0.0*	*1.2*
max		0.0	0.0	*79.0*	*0.3*	0.0	*21.0*	0.0	0.0	*7.1*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)

Project Ref. 5902b.02

esp ENGINEERS GEOLOGISTS SCIENTISTS

Monitoring Event 6

Date:	6-Oct-16	**Atmospheric Pressure (start):**	1,014 mb	**Trend:**	steady
Time:	11.15	**Atmospheric Pressure (end):**	1,013 mb		
Engineer:	AW	**Site Status:**	developed		
Weather:	Dry, overcast	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.3	0.3	0.0	21.3	0.0	-0.1	0.0
After 30 Seconds		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	0.0
After 1 Minute		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	0.0
After 2 Minutes		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	0.0
Steady State		0.0	0.0	78.6	0.0	0.0	21.3	0.0	0.0	0.0
min		*0.0*	*0.0*	*78.3*	*0.0*	*0.0*	*21.3*	0.0	*-0.1*	*0.0*
max		*0.0*	*0.0*	*78.6*	*0.3*	*0.0*	*21.3*	0.0	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	No cover over the well									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.95			**Groundwater depth (m):**		0.33		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	83.3	0.1	0.1	16.7	0.0	0.0	3.1
After 30 Seconds		0.0	0.0	84.6	0.1	0.1	15.2	0.0	0.0	2.2
After 1 Minute		0.0	0.0	85.1	0.1	0.1	14.8	0.0	0.0	2.6
After 2 Minutes		0.0	0.0	85.1	0.1	0.1	14.8	0.0	0.0	
Steady State		0.0	0.0	85.1	0.1	0.1	14.8	0.0	0.0	
min		*0.0*	*0.0*	*83.3*	*0.1*	*0.1*	*14.8*	0.0	*0.0*	*2.2*
max		*0.0*	*0.0*	*85.1*	*0.1*	*0.1*	*16.7*	0.0	*0.0*	*3.1*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading										
After 30 Seconds										
After 1 Minute										
After 2 Minutes										
Steady State										
min		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Bung missing									

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)

Project Ref. 5902b.02

esp
ENGINEERS
GEOLOGISTS
SCIENTISTS

Monitoring Event 7

Date:	6-Mar-17	**Atmospheric Pressure (start):**	993 mb	**Trend:**	steady
Time:	10.30am	**Atmospheric Pressure (end):**	993 mb		
Engineer:	AW	**Site Status:**	Warehouses now demolished.		
Weather:	Dry, overcast	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID (not available)	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	1.95			**Groundwater depth (m):**		1.70		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.2	0.0	0.0	21.7	0.0	0.0	n/a
After 30 Seconds		0.0	0.0	78.3	0.0	0.0	21.6	0.0	0.0	n/a
After 1 Minute		0.0	0.0	78.4	0.0	0.0	21.5	0.0	0.0	n/a
After 2 Minutes		0.0	0.0	78.4	0.0	0.0	21.5	0.0	0.0	n/a
Steady State		0.0	0.0	78.4	0.0	0.0	21.5	0.0	0.0	n/a
min		*0.0*	*0.0*	*78.2*	*0.0*	*0.0*	*21.5*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*78.4*	*0.0*	*0.0*	*21.7*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Cover and bung replaced on the 4th March 2017.									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.95			**Groundwater depth (m):**		0.00		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading										
After 30 Seconds										
After 1 Minute										
After 2 Minutes										
Steady State										
min		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Bung missing and water at top of standpipe.									

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.0	78.7	0.6	0.0	20.6	0.0	0.0	n/a
After 30 Seconds		0.0	0.0	78.5	0.9	0.0	20.5	0.0	0.0	n/a
After 1 Minute		0.0	0.0	78.6	0.9	0.0	20.4	0.0	0.0	n/a
After 2 Minutes		0.0	0.0	78.6	0.9	0.0	20.4	0.0	0.1	n/a
Steady State		0.0	0.0	78.6	0.9	0.0	20.4	0.0	0.0	n/a
min		*0.0*	*0.0*	*78.5*	*0.6*	*0.0*	*20.4*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*78.7*	*0.9*	*0.0*	*20.6*	*0.0*	*0.1*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Bung replaced on the 4th of March 2017.									

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

PROPOSED RESIDENTIAL DEVELOPMENT
GENE METALS, TREFOREST
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)

Project Ref. 5902b.02

esp ENGINEERS GEOLOGISTS SCIENTISTS

Monitoring Event 8

Date:	13-Mar-17	**Atmospheric Pressure (start):**	1,020 mb	**Trend:**	falling
Time:	09.30am	**Atmospheric Pressure (end):**	1,019 mb		
Engineer:	AW	**Site Status:**	Warehouses now demolished.		
Weather:	Dry, sunny	**Ground Conditions:**	soft surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	16-Jun-17		
Instrument:	Phocheck 2000+ PID (not available)	**Next Calibration Due Date:**	2-Feb-17		

Well ID:	**WS1**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/Diamicton		
		Well depth (m):	1.95			**Groundwater depth (m):**		1.75		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.5	78.0	0.0	0.0	22.0	0.0	0.0	n/a
After 30 Seconds		0.0	0.7	78.3	0.0	0.0	21.6	0.0	0.0	n/a
After 1 Minute		0.0	1.0	78.3	0.0	0.0	21.6	0.0	0.0	n/a
After 2 Minutes		0.0	0.6	78.3	0.0	0.0	21.6	0.0	0.0	n/a
Steady State		0.0	0.5	78.3	0.0	0.0	21.6	0.0	0.0	n/a
min		*0.0*	*0.5*	*78.0*	*0.0*	*0.0*	*21.6*	*0.0*	*0.0*	*0.0*
max		*0.0*	*1.0*	*78.3*	*0.0*	*0.0*	*22.0*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Cover and bung replaced on the 4th March 2017.									

Well ID:	**WS2**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground		
		Well depth (m):	0.95			**Groundwater depth (m):**		0.00		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading										
After 30 Seconds										
After 1 Minute										
After 2 Minutes										
Steady State										
min		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
max		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Bung missing and water at top of standpipe.									

Well ID:	**WS4**	**Well dia.(mm):**	50	**Date installed:**	20/07/2016	**Response stratum:**		Made Ground/ Brithdir Sandstone		
		Well depth (m):	1.95			**Groundwater depth (m):**		dry		
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	0.3	78.4	0.0	0.0	21.5	0.0	-0.1	
After 30 Seconds		0.0	2.0	78.1	0.9	0.1	20.8	0.0	0.0	
After 1 Minute		0.0	4.8	78.1	0.9	0.3	20.7	0.0	0.0	
After 2 Minutes		0.0	1.7	78.4	0.8	0.1	20.7	0.0	0.0	
Steady State		0.0	2.0	78.4	0.9	0.1	20.7	0.0	0.0	
min		*0.0*	*0.3*	*78.1*	*0.0*	*0.0*	*20.7*	*0.0*	*-0.1*	*0.0*
max		*0.0*	*4.8*	*78.4*	*0.9*	*0.3*	*21.5*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Bung replaced on the 4th of March 2017.									

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (DL<0.1%)
>> - methane level > LEL (5%)
CH_4 - methane (DL <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds

Borehole ID	Groundwater Monitoring		
	Depth to groundwater (m) (Level (mOD))		
	VISIT 1 04/05/2017	VISIT 2 01/06/2017	VISIT 3 13/06/2017
BH201	1.36	2.50	0.0
	(105.89)	(104.75)	(107.25)
BH202	0.7	1.30	0.1
	(101.15)	(100.55)	(101.75)
BH203	2.47	2.70	0.87
	(99.5)	(99.27)	(101.1)
BH204	4.9	7.15	6.49
	(93.75)	(91.5)	(92.16)
BH205	23.6	13	11.85
	(73.05)	(83.65)	(84.8)

GENERAL NOTES

1. Earth Science Partnership (ESP) believes that providing information about limitations is essential to help clients identify and therefore manage their risks. These risks can be mitigated through further investigation or research, but they cannot be eliminated. This report may not be used for any purpose other than that for which it was commissioned.

2. This report includes available factual data for the site as obtained only from the sources described in the text. The data are related to the site on the basis of the site location and boundary information provided by the client. The findings and opinions conveyed in this assessment are based on the information obtained from a variety of sources as detailed in the report, which ESP believe are reliable. Nevertheless, ESP cannot and does not guarantee the authenticity or reliability of the information it has relied on. It is possible that the assessment failed to indicate the existence of further sources of information on the site. Assuming such sources do exist, their information could not have been considered in the formulation of the opinions and findings in this report. It should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.

3. In preparing this report it has been assumed that all past and present occupants of the site have provided all relevant and other information, especially relating to known or potential hazards. This report is not required to identify insufficiencies or mistakes in the information provided by the user/owner or from any other source, but has sought to compensate for these where obvious in the light of other information.

4. Reports are normally prepared and written in the context of a stated purpose, and should not, therefore be used in a different context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission.

5. The opinions presented in this report are based on the findings derived from a site inspection, investigations and a review of historical and other records. The report details any indicators that may suggest that hazardous substances exist at the site at levels likely to warrant mitigation. Not finding such indicators does not mean that hazardous substances do not exist at the site. The most recent site inspection was undertaken as detailed within the report. Circumstances on sites are subject to change and certain indicators of the presence of hazardous substances that may have been latent at the time of this inspection may subsequently have become observable.

6. The work carried out for the assessment can only investigate a small portion of the subsurface conditions. Certain indicators or evidence of hazardous substances may have been outside the limited portion of the subsurface investigated, latent at the time of the work or only partially intercepted by the works, and thus their full significance could not be appreciated. In this regard, groundwater levels are particularly susceptible to variation and it should be noted that groundwater levels are subject to diurnal, seasonal, and climatic changes and are solely dependent on the time the ground investigation was carried out and the weather before and during the investigation.

7. Accordingly, it is possible that the assessment failed to indicate the presence or significance of hazardous substances. Assuming such substances exist, their presence could not have been considered in the formulation of the report's findings and opinions. The conclusions resulting from this study and contained in this report are not necessarily indicative of future conditions or operating practices at or adjacent to the site. Where differing ground conditions or suspect materials are encountered during future site works, additional specialist advice should be sought to assess whether the new information will materially affect the recommendations currently provided herein and whether further consideration is required. Any limiting factors should be assessed by an appropriately qualified specialist.

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