



The Environmental Protection Group Ltd



Detailed quantitative gas risk assessment

Land east of Knowle Lane

Fair Oak

May 2021



The Environmental Protection Group Telephone: 01925 652980 Fax: 01925 652983

Warrington Business Park

Email: epg@epg-ltd.co.uk www.epg-ltd.co.uk

Long Lane Warrington WA2 8TX

Company Number: 3506162



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Appendix B: Surface emission and flux box survey results

SUMMARY

Historic records in the form of maps, plans, aerial photographs and regulatory records indicate that the site is in an area of intensive historic sand extraction and landfilling. An area of dilute and disperse landfill in the form of an infilled sand pit immediately adjacent to the site boundary to the west, and developed for commercial use c.2000 has been identified as a potential source of historic gases in a position to impact the site.

Historic records and current site conditions across the site indicate that the infilled sand pit may also have extended into this area, however the site strip prior to placement of the carpark formation material in 2008 resulted in the removal of any potentially gas generating material.

Gas monitoring data has identified that there is gas within the underlying soils and groundwater. High frequency monitoring data combined with a detailed appraisal of the gas regime has identified that source of the gas is residual gases from the adjacent dilute and disperse landfill, dissolved within groundwater or stored within soil pores. There is no evidence of advective flow occurring.

Based on all the lines of evidence presented above, it has been identified that in relation to the proposed high-rise residential development the site should be conservatively considered a CS2 classification, with a requirement for basic gas protection measures.

The required gas protection measures are specified broadly following BS 8485 guidance as follows:

For commercial or flatted development – Type B building in accordance with BS8485:2015 (3.5 points required):

- Installation of a gas resistant membrane. The membrane to be specified in accordance with BS8485:2015 and installed/verified in accordance with CIRIA Report C735, Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases. Furthermore, it must be robust enough to withstand construction and should be a minimum of 0.6mm thick in between the scrim (e.g. Juta GP1) **BS8485, Table 7 – 2 points;** and
- Construction of an open void (minimum 225mm deep) beneath all residential properties, passively vented via air bricks constructed on at least two opposite walls, providing an actual opening of at least 1500mm² for each metre run of wall. All beams and sleeper walls beneath the properties to be constructed so as to allow cross ventilation. **BS8485, Table 6 – 2.5 points.**

The membrane must be installed by a qualified and experienced installer (minimum one operative to hold an NVQ Level 2 in Gas Protection Installation). The membrane installations to all plots (100%

coverage) are to be independently inspected by an independent verifier who should be able to demonstrate their competence, training and relevant experience. The inspection process should include a thorough visual inspection of the membrane. In the event of holes being identified during the membrane inspection process the inspection regime should be extended to include integrity testing (i.e. dielectric testing, or similar).

All (100%) joints, pipe penetrations etc. of the membrane should be independently air lanced to ASTM D4437.

Prior to construction works commencing, a Specification and Design Report for the gas membrane installation should be completed (to include construction detailing drawings) and a Verification Plan agreed. These reports should be submitted to the Local Authority Contaminated Land Officer for comment and approval.

It has been determined by others in a detailed human health risk assessment that the concentrations of contaminants identified within soils do not represent a risk to residential end users, however it is recommended that as a precaution, clean imported topsoil be placed within areas of soft landscaping to a sufficient depth to represent an adequate growth medium, and to a minimum of 150mm.

1. INTRODUCTION

1.1 Purpose

In 2017, planning permission was granted for a hybrid commercial and low-rise/high-rise residential development covering a large site comprising distinct northern and southern areas connected by a narrow dog-leg (reference F/17/80640). Development of the northern area has been predominantly completed, and preliminary works have commenced on the southern area. Due to changes in the commercial (office space) market as a result of the ongoing pandemic a new application has been submitted relating to the southern area only, comprising a proposed change from office buildings to high-rise residential buildings. The proposed layout and associated infrastructure remain unchanged.

In 2017 and 2018 the Environmental Protection Group Limited (EPG) were appointed by Parsons Construction Limited (the Client) to undertake works relating to the original planning permission, with the following resultant reports:

- *Preliminary gas and vapour risk assessment.* EPG, March 2017, reference EPG/8615/2017/PRA/V1 (Report 1);
- *Appraisal of gas regime pursuant to surrender of environmental permit.* EPG, November 2017, reference EPG/8615/2017/PS/V1 (Report 2);
- *Detailed quantitative gas risk assessment.* EPG, January 2018, reference EPG/8615/2018/DQRA/V1 (Report 3);
- *Piling risk assessment.* EPG, April 2018, reference EPG/8615/2018/PRA/V1 (Report 4); and
- *Remediation method statement.* Environmental Protection Group, June 2018, reference EPG 8615/2018/RMS/V1 (Report 5).

Subsequently, in line with the amended planning application, EPG produced a letter report entitled *New planning application – impact on required gas protection measures*, December 2020, reference EPG/8615/2020/amended development. In response to the submission of the letter report, Eastleigh Borough Council contaminated land officer has advised the following:

Application No: F/21/89759

Address: Land East of Knowle Lane, Fair Oak, SO50 7DZ

Description: Conversion of planning permissions for office buildings B, C, D and E granted under F/17/80640, F/18/83954, F/18/84480 and F/20/87889 to 48 apartments (24 x 1 bedroom and 24 x 2

bedroom) with associated parking and landscaping and controlled pedestrian access to adjacent Site of Interest of Nature Conservation.

Regards the above application, the submitted contaminated land document (ref. EPG/8615/2020) dated 7th December 2020, is insufficient to address contaminated land concerns previously raised for this site. Due to the change in land use, the applicant is expected to submit a minimum of a desktop study (DTS) to address the change in potential contaminant linkages and the associated increased level of risk posed by potential contamination to the residential end users. The DTS should include a modified preliminary conceptual site model (CSM) and risk assessment with recommendations where required.

As such I would recommend that the following standard contaminated land conditions are placed on the Decision Notice, should you be mindful to grant permission:-

A. No work shall commence on site until the following has been submitted to, and approved in writing by the LPA:

- a. Report of Preliminary Investigation comprising a Desk Study, Conceptual Site Model, and Preliminary Risk Assessment documenting previous and existing land uses of the site and adjacent land in accordance with UK Land contamination risk management (LCRM) national guidance and including BS10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of Practice, and, unless otherwise agreed with the LPA,*
- b. Report of a site investigation documenting the ground conditions of the site and incorporating chemical and gas analysis identified as appropriate by the Preliminary Investigation and in accordance with BS10175:2011+A2:2017, and BS 8576:2013 and unless otherwise agreed with the LPA,*
- c. Detailed site-specific scheme for remedial works and measures to be undertaken to avoid the risk from contaminants and/or gases when the site is developed and proposals for future maintenance and monitoring*

Such a scheme shall include nomination of a competent person to oversee the implementation of the works.

B. The development hereby permitted shall not be occupied / brought into use until there has been submitted to the LPA verification by the competent person approved under the provisions of condition A(c) that any remediation scheme required and approved under the provisions of condition A(c) has been implemented fully in accordance with the approved details (unless varied with the written permission of the LPA in advance of implementation).

Unless agreed in writing with the LPA such verification shall comply with UK Land contamination risk management (LCRM) and the guidance contained in EA Guidance for the Safe Development of Housing on Land Affected by Contamination - R&D Publication 66: 2008. Typically such a report would comprise:

- a. A description of the site and its background, and summary of relevant site information,*
- b. a description of the remediation objectives and remedial works carried out*
- c. verification data, including - data (sample locations/analytical results, as built drawings of the implemented scheme, photographs of the remediation works in progress, etc.*
- d. Certificates demonstrating that imported and / or material left in situ is free from contamination, gas / vapour membranes have been installed correctly*

Thereafter the scheme shall be monitored and maintained in accordance with the scheme approved under condition A(c)

This report is intended to fulfil the requirements of the recommended condition A (a) and (b). It should be read in conjunction to the Reports 1 to 5 listed above.

1.2 The site

The site is located in Fair Oak, approximately four miles to the east of Eastleigh, Hampshire. It is bounded to the north by open agricultural ground, to the east by rough open ground, to the south by a closed engineered landfill, and to the west by commercial premises operated by B Sky B. The current site boundary (outlined in purple) is shown in Figure 1 below, with the additional area of now completed development covered by the previous application outlined in green for context. The previous application also included land to the southeast extending down to a pond, designated as a Site of Interest of Nature Conservation (SINC).



Figure 1: Site location plan

The original preliminary gas and vapour risk assessment (**Report 1**) referred to above comprised a detailed review of information available at the time of writing (2017). This is reproduced below, with the area currently under review referred to as Zone B. It is considered beneficial to fully reproduce this information in order that the current site can be considered in context, with amendments to text where appropriate. Text reproduced verbatim is presented in italics.

The site is an irregular shape, and due to this and the varied recent, current and proposed land uses, will be considered as three separate zones (A to C). Zone A is approximately rectangular and comprises a closed and partially backfilled sand quarry sloping gently to the south. Zone B is a rough rectangle angled from the northwest to the southeast, is relatively level and covered with mixed crush, and currently serves as a car park and site office (portacabin) location. Zone C is a rough rectangle

angled from the northwest to the southeast. It initially slopes steeply to the southeast, and is predominantly rough grass and brush, before continuing to slope more gently down to a large pond surrounded by much undergrowth and trees.

The tarmac covered access road to zones A and B runs from Knowle Lane along the southern boundary of Zone A before following the northern boundary of Zone B to the car park entrance.

The total site is approximately 3.63 Hectares and is centered at National Grid Reference 450600 118520.

The location of the site is shown in Figure 1 (now 2).



Figure 2: Previous site boundary

An engineer from EPG undertook a site walkover on 23 February 2017 accompanied by the Client. The current layout of the site at the time of the walkover is presented in Figure 2 (now 3). The Client

advised that at the time of purchase, a relatively level platform had been created across Zone B reportedly using arisings from the creation of the pond at the base of the site. Any Made Ground present in Zone A and Zone B was removed after purchase, exposing either natural or reworked material, which was then fully leveled. The arisings were then combined with crushed concrete and incorporated into the carpark formation material in Zone B.

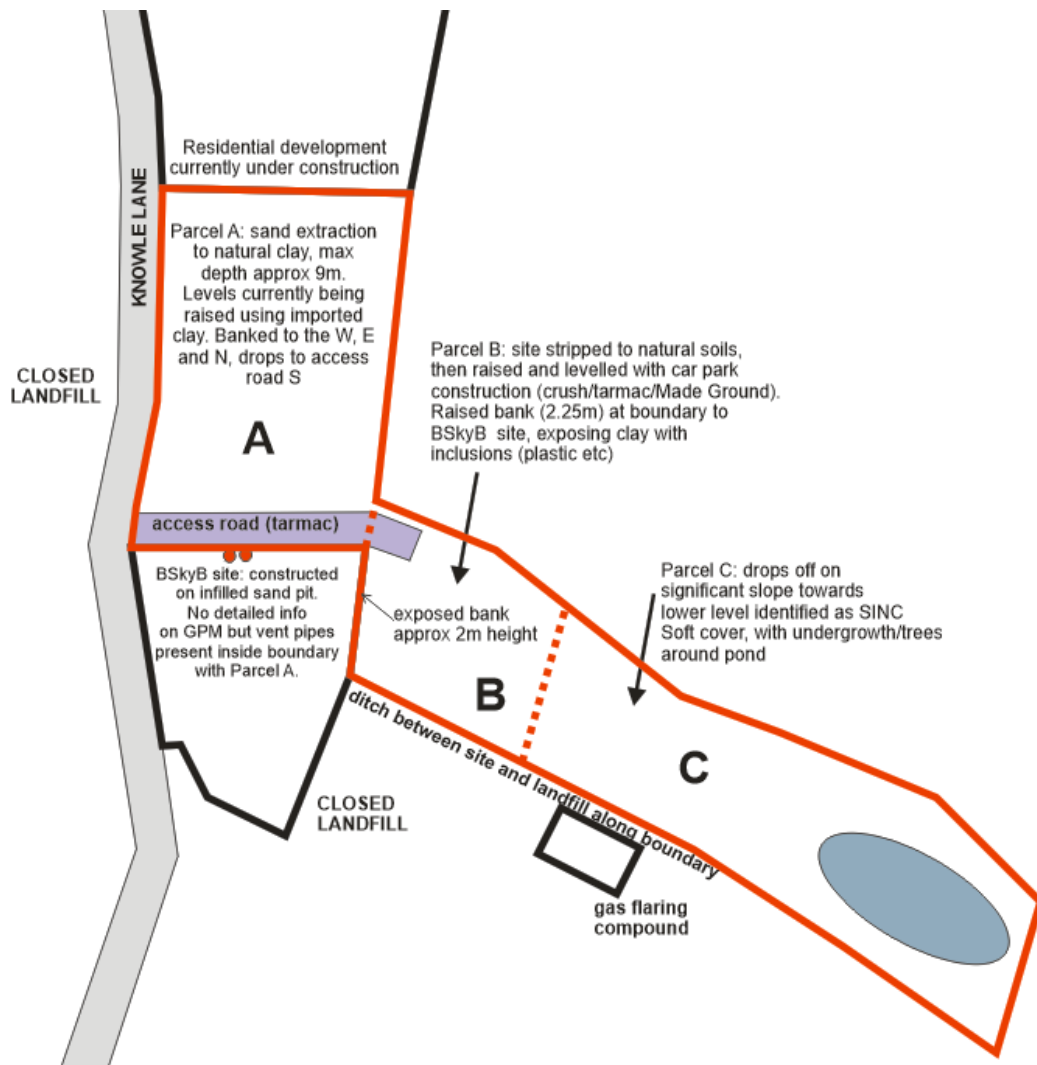


Figure 3: Site layout, February 2017

It is notable that the previous boundary between Zone B and Zone C is now located further to the southeast. This occurred in line with an amended application relating to the proposed office development in this area, submitted and approved in 2020 under planning reference F/20/87889.

1.3 Information sources

The original PRA report (**Report 1**) was informed via the following sources of information:

- Reports provided by the Client and Eastleigh Borough Council as follows:
 - *Review of archival information, the Fair Oak landfill complex.* Landscan, May 2005;
 - *Fair Oak landfill study – final interpretative report.* Card Geotechnics Limited, June 2012. Reference CG/5515 revision 1;
 - *Ground gas assessment letter report.* Geo-Environmental Services Limited, March 2014. Reference GE8053/GR02/140325;
 - *Desk study report for the land at CWM site, Knowle Lane, Fair Oak.* Geo-Environmental Services Limited, September 2014. Reference GE10033-DSR-SEPT14 version 1.0;
 - *Ground investigation report for the land at CWM site, Knowle Lane, Fair Oak.* Geo-Environmental Services Limited, May 2015. Reference GW10615/GIR.MAY15 version 1.0;
 - *Desk study report for land east of Knowle Lane, Fair Oak.* Geo-Environmental Services Limited, January 2017. Reference GE10117-DSR-JAN17 version 1.0;
- Waste Acceptance Criteria analytical results for imported backfill material;
- Drawing PLA-03 revision F: *Restoration contours.* White Young Green, 2014;
- Drawing ENC-180317-7F1A provisional: *Topographical survey.* Encompass Surveys, 2017;
- Drawing 16-1092-M 02: *Masterplan site layout.* Urban Pulse Design, 2017;
- Drawing 5271:70 revision E: *Offsite FW sewer plan and longitudinal section.* MJA Consulting, 2015;
- Word of mouth records from the Client;
- Historic maps obtained from Landmark Information Group;
- British Geological Survey geological map: Southampton, England and Wales Sheet 315;
- Review of available web-based data resources, notably the Environment Agency's 'What's in your backyard?' service, and the British Geological Survey's Geology of Britain viewer and borehole scans;

- Spot and high frequency gas monitoring results, 2017; and
- Results of surface emissions survey, November 2017.

1.4 Development proposals

At the time that the PRA (**Report 1**) was produced, the development proposals for the larger site comprised a combination of traditional low-rise houses, limited high-rise residential structures, and commercial (office) buildings with associated infrastructure. A plan of the proposed development at that time is presented as Figure 4 below.

It can be seen that construction is limited to zones A and B only. Zone C is not being considered for redevelopment, and the lower level has been designated as a Site of Importance for Nature Conservation (SINC), which will remain undisturbed during development works. All available historic information indicates that this area has remained open and undeveloped. On this basis, it will not be considered further in this report.



Figure 4: Development proposals, 2017

At the time that the PRA (**Report 1**) was produced (2017), backfilling of the sand extraction area in Zone A with imported predominantly clay materials was almost complete, and on completion it was proposed to remove the carpark formation materials from Zone B and dispose of offsite, prior to reinstating levels using additional imported predominantly clay materials. The backfilling of Zone A was complete by 2018, with full details presented in the subsequent reports listed above.

The proposed layout of the commercial (office) buildings in Zone B was amended in 2020 under planning permission reference F/20/87889, as detailed in drawing 16-1092-080-C, an extract of which is presented below as Figure 5. The proposed residential high-rise development is based on exactly the same layout, with no changes proposed to the foundation construction or associated infrastructure, including no proposals for additional areas of soft landscaping.



Figure 5: Proposed residential high-rise development across Zone B

At the time of writing, the original carpark formation material has been removed, and the construction levels achieved using a combination of reworked site-won natural soils and imported predominantly clay material. The piles and ring beams to Buildings B and C have been installed, together with the drainage and surface water attenuation tanks beneath the car park area in the northern part of the

site. The lower area (Buildings D and E) has been reduced to the formation levels determined for the previous application and covered with a crushed concrete piling mat.

A recent aerial photograph is presented as Figure 6 below.



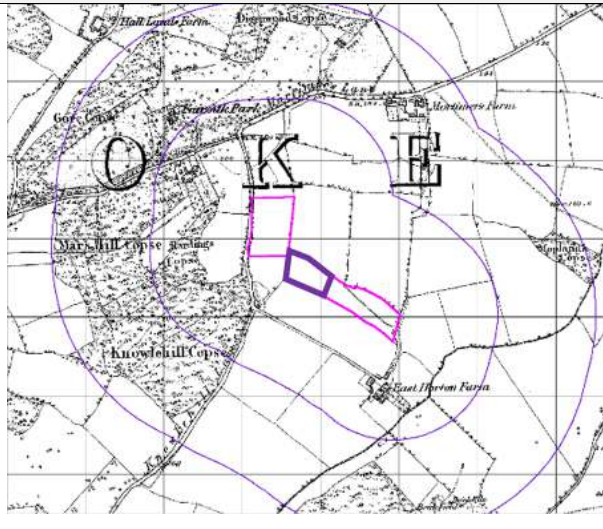
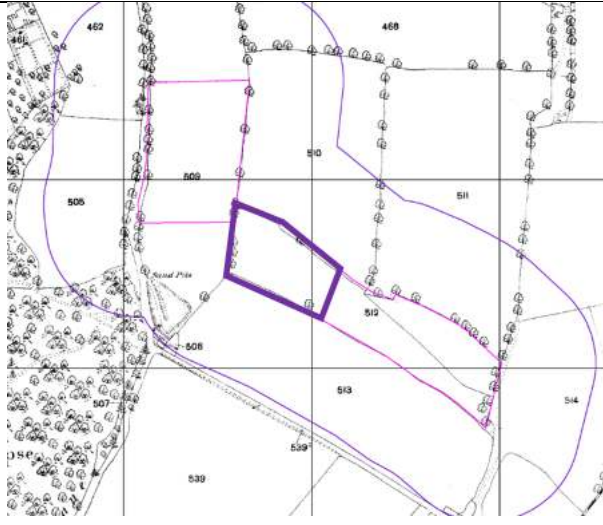
Figure 6: Recent aerial photograph of site

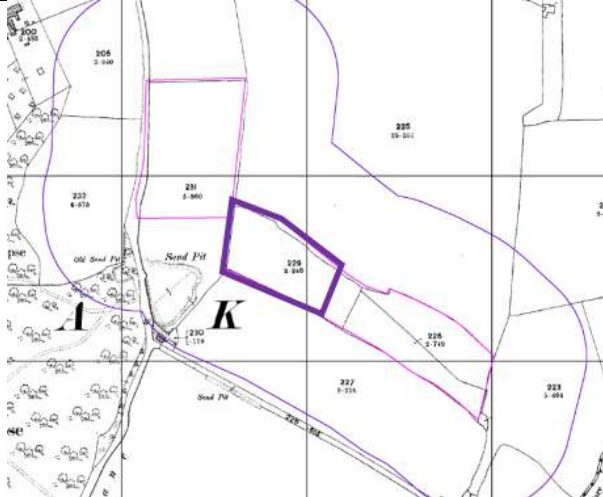
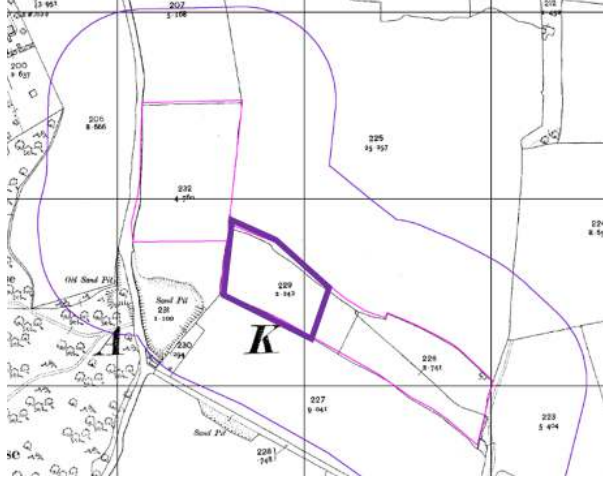
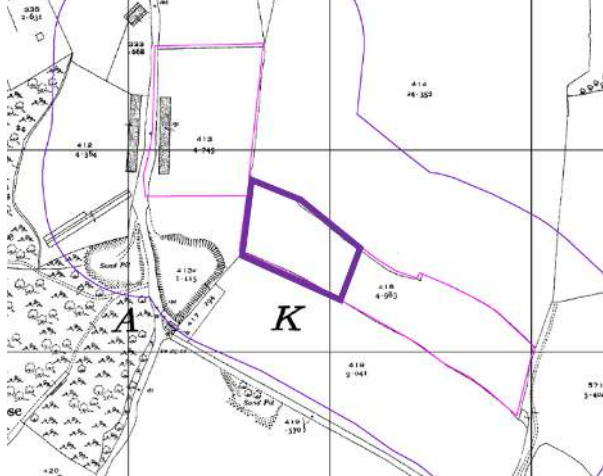
2. BACKGROUND INFORMATION

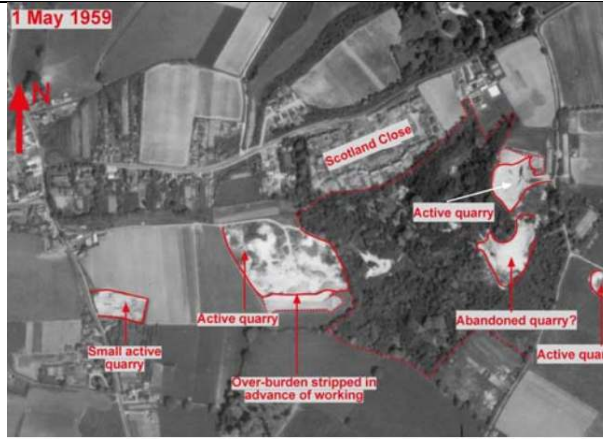
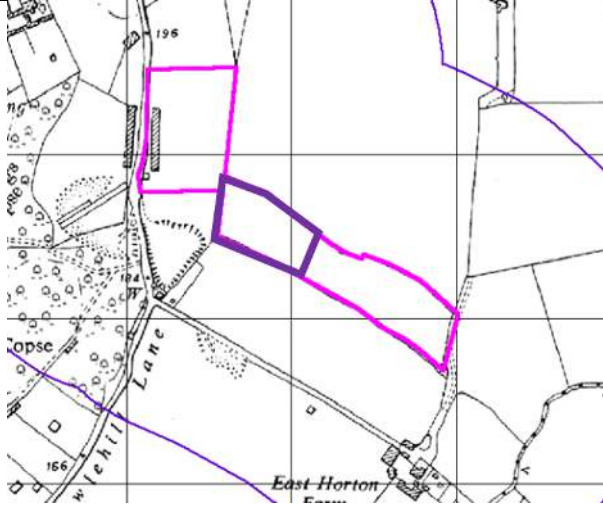
The background information presented below was drawn together for the 2017 preliminary risk assessment report (**Report 1**). The generic site boundary shown relates to Zones A, B and C, whilst the current site boundary is denoted in purple.

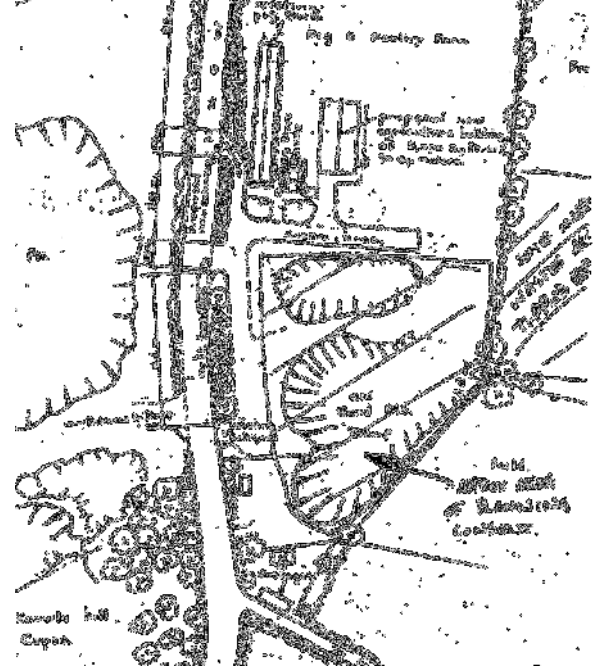
2.1 Historic maps

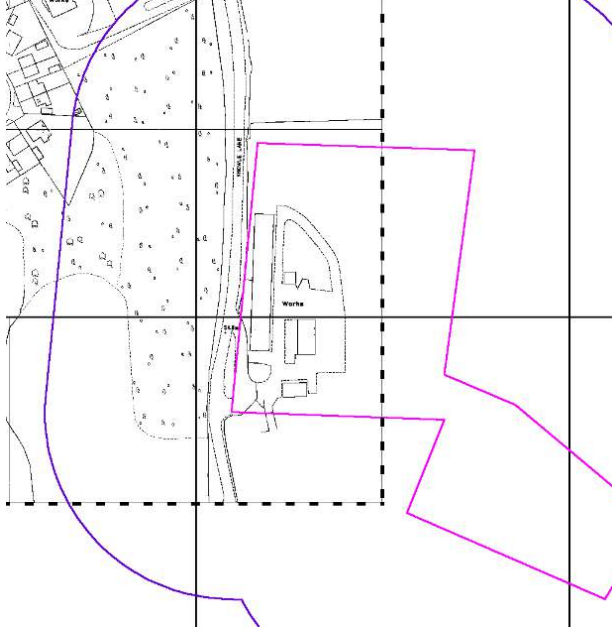
Table 1: Extracts from historic maps with commentary

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
c. 1871 The site comprises open fields in a predominantly agricultural area. A small excavation is indicated to the southwest of the dogleg, with a structure (use unclear) immediately south of the excavation. <i>Mortimer's Lane</i> and <i>Knowlehill Lane</i> (now Knowle Lane) are present following the approximate line of the current day.	
c. 1885 No significant changes. The excavation is identified as <i>Sand Pits</i>.	

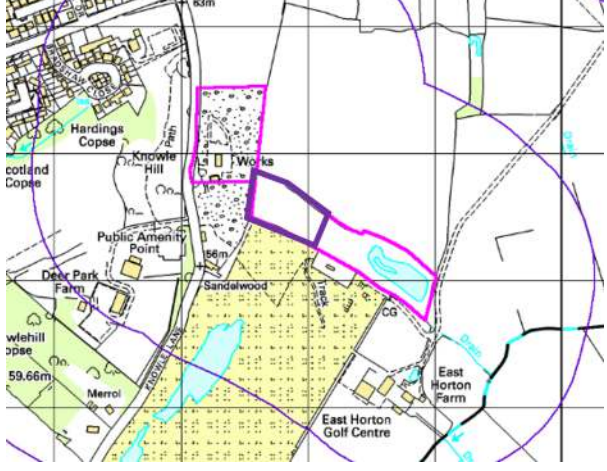
Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
c. 1896 No significant changes. The <i>Sand Pit</i> has increased in size, and an additional pit is identified to the west of <i>Knowlehill Lane</i>, denoted <i>Old Sand Pit</i>. A third long narrow <i>Sand Pit</i> is located on the southwest boundary of the access road to <i>East Horton Farm</i>, southwest of the site.	
c. 1909 The two active <i>Sand Pits</i> have both marginally increased in size.	
c. 1941 An unidentified long rectangular structure is shown in Zone A, running north to south along the western boundary. This is mirrored by a second structure on the other side of <i>Knowlehill Lane</i>. The <i>Sand Pit</i> at the dogleg appears to have remain unchanged, however the excavation previously denoted <i>Old Sand Pit</i> has increased in size and is now denoted <i>Sand Pit</i>, indicating an active status, as has one to the southwest of the site.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
1947: aerial photo and interpretative notes – extract from <i>Review of archival information, the Fair Oak landfill complex</i>. Landscan Investigations, May 2005. The photograph focuses on land to the west of Knowle Lane, and identifies a number of active and abandoned sand pits/quarries.	
1959: aerial photo and interpretative notes – extract from <i>Review of archival information, the Fair Oak landfill complex</i>. Landscan Investigations, May 2005. Additional and more extensive sand extraction activities are apparent.	
C: 1962 The northernmost <i>Sand Pit</i> has extended further.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
c. 1974 1:2,500 No significant changes shown.	
Date unknown – extract from <i>Report on site investigation at Knowle Lane, Fair Oak</i>. Structural Soils Limited, April 1998. Reference 71207 (as submitted pursuant to development of BSKyB site, courtesy of Eastleigh Borough Council). The extent of the sand pit in the dogleg is indicated, also denoted <i>Dump</i>, suggestive of backfilling with waste. Note: reference is made to inert waste deposited immediately to the east. Proposed new <i>access road</i> and <i>agricultural building</i> identified adjacent to the existing <i>Piggery</i>. It is likely that this drawing originated as part of the planning application for construction of the agricultural building on Zone B, with additional information added by Structural Soils with regards to infilling of the old sand pit and placement of inert wastes to the east.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
1985: aerial photo and interpretative notes – extract from <i>Review of archival information, the Fair Oak landfill complex</i>. Landscan Investigations, May 2005. Land immediately west of <i>Knowle Lane</i> is restored to grass and scrub. Landfilling operations are underway further to the west of the site. The original sand pit in the dogleg now appears as rough ground, possibly linked to the northern part of the site. The southernmost sand pit is now denoted <i>Abandoned Quarry</i>. A second structure is shown within the site, immediately east of the Piggery building. It is likely that this is the agricultural building identified in the drawing above. A compound is located off Knowle Lane at the entrance to the landfill.	
c. 1984 The northern part of the site is now denoted <i>Works</i>.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
1986: aerial photo and interpretative notes – extract from <i>Review of archival information, the Fair Oak landfill complex</i>. Landscan Investigations, May 2005. Landfilling operations to the west of the site are now complete, and restoration has commenced.	
c. 1993 The original <i>Piggery</i> structure is no longer shown. A <i>Pond</i> is now evident in the southernmost portion of the site. The access road to <i>East Horton Farm</i> is no longer shown, and an extensive <i>Sand Pit</i> is denoted extending from the southern site boundary to the southwest. The compound off Knowle Lane to the west is identified as <i>Public Amenity Point</i>. Additional commercial/industrial development has occurred further to the southwest, identified as <i>Deer Park Farm</i> (an industrial estate). The pond is clearly shown in Zone C.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
c. 1999 aerial photo The sand extraction works southwest of the site have significantly extended. No evidence of infilling is apparent. The extent of Deer Park Farm industrial estate can be seen.	
c. 2000 The status of the sand extraction works is unclear, however the colouring (yellow represents sand in the raster-map key) suggests that landfilling has not yet commenced in this area.	

Commentary	Extracts from historic maps Ordnance Survey Licence 0100056695
c. 2016 The BSKyB development in the dogleg is complete. The agricultural building is no longer shown; however a small structure is present immediately to the north of the access road. The extensive area of sand extraction southwest of the site has been restored to rough grassland, and a compound and structure is present immediately south of the boundary. The site compound and carpark is evident within Zone B.	

It can be seen from the historic maps that the site and the surrounding area have evolved considerably since the earliest available map edition of c.1871. In terms of potential gas generation sources, the larger area has been subjected to extensive sand extraction and landfilling activities over an extended period. Based on the information above, no excavation/landfilling took place within the site boundary, however this should not be considered definitive based on historic images only.

From the information presented above, four separate areas of filling are located in the direct vicinity of the site, as summarised in Figure 4 (now 7) below.

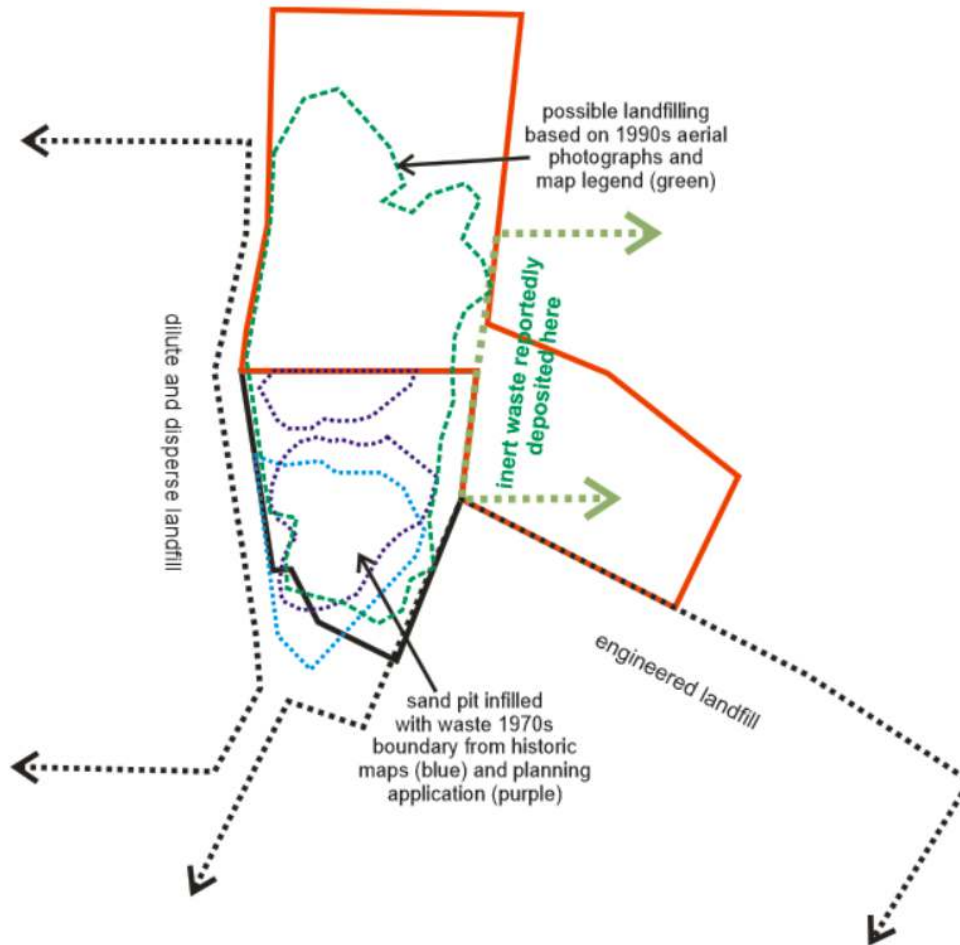


Figure 7: Approximate location of landfill in the direct vicinity of the site

2.2 Dilute and disperse landfill

Dilute and disperse landfills incorporate no containment features, allowing the products of decaying waste (in the form of leachate, gas and vapour) to disperse 'naturally'. The *Review of archival information* report (Landsan, 2005) identifies that filling was undertaken and completed in phases, as illustrated in Figure 8.



Figure 8: Indicative dates of phased infilling

This diagram indicates that infilling immediately west and south of the site was complete by 1974, suggesting that the waste has been in place for >45 years. The nature of dilute and disperse landfilling affords continuous replenishment of oxygen and water to the waste, which increases the rate of degradation of organic material in comparison to modern contained systems. The majority of organic waste within this area will have completed the degradation phase, with the exception of complex organics which will continue to degrade slowly over a much longer period.

On this basis, it can be considered that the dilute and disperse landfill to the west of the site no longer represents a source of rapid gas generation, but rather a source of gas through diffusive migration only (in dissolved or gaseous form).

2.3 Engineered landfill

The operational dates for the SITA landfill were determined from a press release dated 15 January 2009:

'Restoration work is pressing ahead at a Hampshire landfill site after it officially accepted its last delivery of waste. An estimated 1 million tonnes of waste has been disposed of at the Fair Oak landfill site since it opened for business in 2000.....including builders and commercial waste.....'

Information has been obtained from the Environment Agency (EA) relating to the post-closure gas and leachate control and containment features. They have confirmed that the site does have an efficient full gas extraction system, and that the operator carries out perimeter gas monitoring. Details of compliance limits for emissions from gas flaring and the landfill gas engine combined with the results of perimeter gas monitoring enable the closed engineered landfill to be discounted as a viable source of gas migration to within the site boundary.

The gas flaring compound is located immediately southwest of the site boundary.

2.4 Supplementary information

The *Desk study report* for the larger site (GESL, 2017) includes a Landmark report which contains some supplementary information relating to landfilling activities. Those in the vicinity of the site are indicated on Figure 9 below, although it should be noted that accuracy of locations and boundaries is not guaranteed. Those features that are considered non-relevant to this report are not detailed further, however those which identify the boundaries of landfilling are briefly summarised in Table 2.

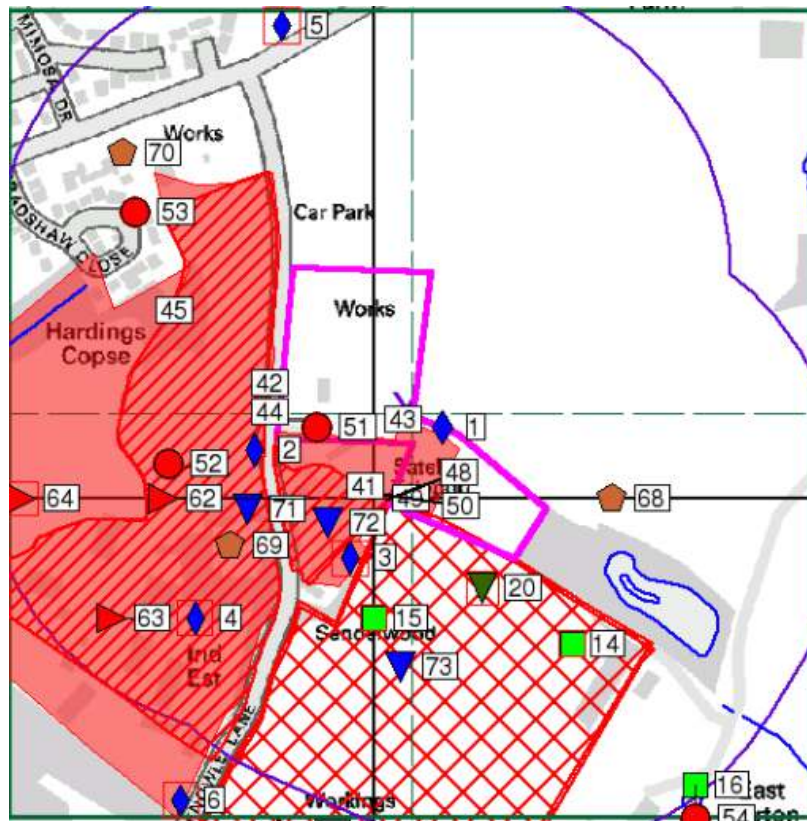


Figure 9: Extract from Landmark report, summarising landfill features

Table 2: Details of relevant features

Reference	Details (as provided in Landmark report)
	BGS recorded landfill site (boundary)
41	No details provided
42	No details provided
	Environment Agency historic landfill (polygon)
43	License holder: M J Passingham Limited Start date: 1972. End date: not supplied Waste type: inert, industrial, commercial, household and liquid sludge
44	License holder: Winchester Rural District Council Start date: 1966. End date: not supplied Waste type: inert, industrial, commercial, household and liquid sludge

Reference	Details (as provided in Landmark report)
45	License holder: Sunny Bank Tipping Limited Start date: not supplied. End date: not supplied Waste type: inert, industrial and commercial
46	License holder: Sunny Bank Tipping Limited Start date: 1977. End date: not supplied Waste type: inert, industrial and commercial
47	License holder: Sunnybank Sand Limited Start date: 1985. End date: not supplied Waste type: inert, industrial, commercial and household
	Licensed waste management facility (boundary)
48	License holder: Sita Southern Limited License issued: 2015. License status: effective Site category: waste landfilling, excluding inert waste
49/50	License holder: Sita Southern Limited License issued: 2001. License status: inactive Site category: landfill site taking special waste
 These identity points have not been detailed as they relate to features irrelevant to this report	

The BGS recorded landfill site and licensed waste management facility boundaries coincide with those represented in Figure 7 (section 2.1), however there is some variation with the Environment Agency historic landfill boundary reference 43 in terms of its lateral extent. Conservatism is a requisite in any preliminary risk assessment process, and as such the extent of landfilling associated with the historic sand pit beneath the current BSKyB site will be considered as presented by the Environment Agency records unless factual information indicates otherwise. This is appropriate, as the delineation presented in Figure 7 is based on 'snap shots' presented by relatively temporally spaced maps. It should be noted that there is no record of the placement of inert materials to the east of the site, and as such (and given that the material is described as inert), this will not be considered further.

2.5 Site use – Zone B

Based on historic maps and aerial photographs, the site compound remained open agricultural land until purchased by the Client in 2008, although some indication of disturbed ground can be seen in the 1986 and 1999 aerial photographs, and the site compound associated with Zone A is evident in the 2016 aerial photograph. Reportedly, arisings from the initial excavation of the large pond to the south of the compound were placed across the area to create a semi-level platform. After purchase

by the Client, the compound was reportedly stripped of any made ground to natural soils (to include reworked natural soils), and levelled, prior to placement of formation materials (including site-won inert made ground from both the site and the compound area) to serve as a carpark and office compound. On the shared boundary with BSKyB, these works reduced final levels by approximately 2.25m, leaving a bank of exposed clay with inclusions of e.g. plastic (as recorded in the PRA (**Report 1**)), suggesting that the infilled sandpit located within BSKyB did extend across the boundary to within the compound area, as indicated by Environment Agency records. Subsequently, all Made Ground and carpark formation material have been removed prior to importing predominantly clay material in order to achieve the required construction formation levels.

This Zone shares a boundary with the engineered landfill, with a shallow ditch located outside the fence line separating the two sites.

2.6 BSKyB site

Historical information identifies that an extensive sand pit was present across the majority of this area and was backfilled with unknown fill in the 1970s (exact date unknown). The lateral and vertical extent of the infilled pit is unclear.

A pre-development site investigation was undertaken across the BSKyB site in 1998. The encountered ground conditions support the historic information, with made ground being recorded to a maximum proven depth of 8.3m. Descriptions of made ground vary from relatively innocuous materials to domestic waste. Odours were recorded in a number of excavations, described variously as *strong oil odour*, *weak oil odour*, *organic odour*, *odour of oil-based substance*, *strong gas smell*, *strong petrol smell* and *strong chemical smell*.

A summary of the thicknesses of made ground recorded during the 1998 site investigation is presented in Figure 10. Based on a consideration of the thicknesses and type of made ground encountered, the lateral extent of the pit remains unclear – it seems likely that the actual extent is somewhere between that indicated by Environment Agency records and that presented on historic documents. It is evident that a significant thickness of fill extends north of the BSKyB boundary as suggested by aerial photographs and the exposed bank of fill material on the boundary.

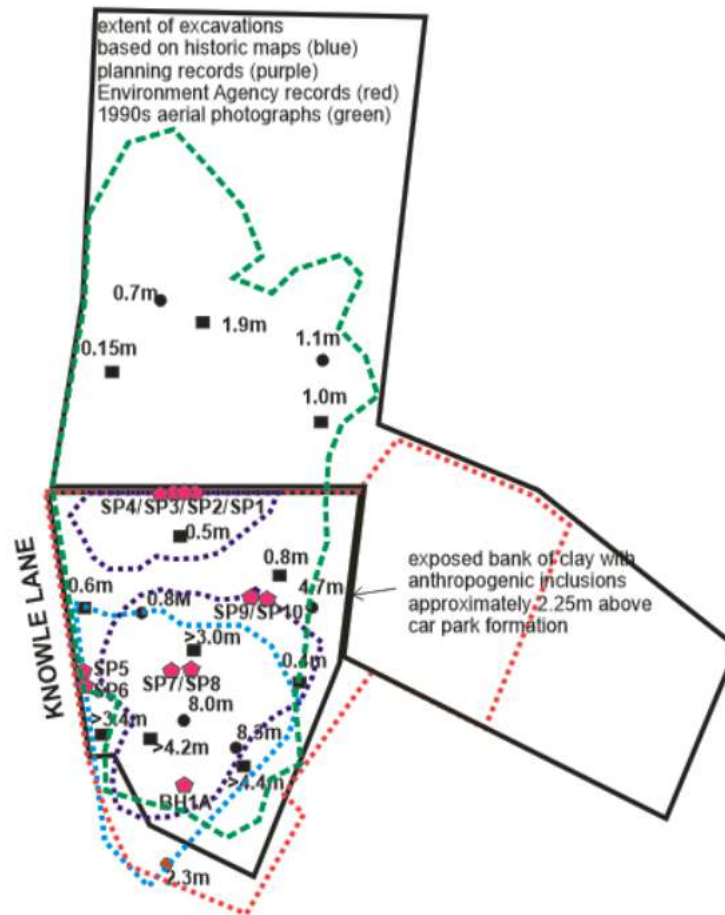


Figure 10: Recorded thickness of made ground in relation to potential extent of pit

The site was subsequently developed as a disaster recovery centre for BSKyB. Planning conditions required an investigation and appropriate mitigation measures. The site investigation report suggests that the installation of gas membranes combined with passively vented voids would be an appropriate approach to gas protection measures.

Correspondence with a representative of Sky has produced the following response:

We have completed gas monitoring once a year since 2001.

I believe that we were only obliged to complete testing for 5 years after install, but we decided to carry on.

The only time I can remember, since 2001, that we had an elevated reading was in 2009. This was caused by the sample point not being clean, i.e. it had a trace of soil in it which provided an inaccurate reading. When we cleaned the sample point and re tested, it was all good.

In addition, monitoring results from 2006 and 2007 have been provided, together with a drawing indicating the location of monitoring points. The approximate locations are presented in Figure 10 above. The letter accompanying the monitoring results advises:

The venting system at B SkyB Fair Oak is designed so that landfill gases entering the underfloor venting layer are diluted by the incoming air flow and then the resulting mixture of landfill gases and air is vented to the atmosphere.

This information supports the assumption that gas protection and venting measures were incorporated into the development, in the form of a membrane combined with a ventilated void or venting layer beneath building slabs, passively venting to a number of points across the site. In addition, a single borehole (BH1A) has been retained for monitoring purposes.

Monitoring results from 2016 and 2017 recorded a maximum of 0.1% methane and 4.3% carbon dioxide within vent stacks and a maximum of 2.2% methane and 12.4% carbon dioxide within the borehole, with a corresponding flow of 0.0l/hr. The low concentrations of gas recorded within the borehole and vent stacks, and the ratio of methane to carbon dioxide supports the hypothesis that the bulk gas generation phase peaked some time ago, leaving residual gases in soil pore spaces and dissolved in groundwater.

2.7 Natural geology

Geological maps identify bedrock comprising the London Clay Formation (LCF) across the site. No superficial deposits are identified in the area, however an element of the LCF in the form of the Whitecliff Sand Member is indicated to be present across the western part of the site. The overall dip of strata across the site is to the south west, and the underlying Upper Chalk is at around 50m BGL (British Geological Survey 1:50,000 series *England and Wales sheet 315 – Southampton*).

The Whitecliff Sand Member (WSM) is described as fine-grained sand occurring as lenticular bodies within the upper parts of the London Clay Formation as thin discontinuous beds and channels. Within the Southampton area, the London Clay Formation consists predominantly of interbedded silty sandy clay. None of the strata identified represent a potential source of bulk permanent gases.

2.8 Groundwater

The overall dip of strata across the site is to the southwest. Based on natural geology only, it is considered likely that the sandy elements of the LCF (such as the WSM) will contain groundwater perched upon the less- or non-permeable clay elements. The prevalent direction of flow of the perched waters will be locally dependant on the extent and dip of the underlying clay surface.

Leachate within the dilute and disperse landfill to the west, and beneath the BskyB site will migrate predominantly to the southwest, however it is likely to 'pool' within the waste, enabling diffusive migration of dissolved gases within groundwater in all directions along a concentration gradient.

2.9 Discussion

Historic records in the form of maps, plans, aerial photographs and regulatory records presented above have identified that the site is located in an area of intensive historic sand extraction and landfilling. It is considered that the infilled sand pit to the west (now underlying the BskyB development) is the most likely potential source of historic gases in a position to impact the site. The infill material likely extended beyond the site boundary into the site prior to 2008, however this was all removed in order to create a platform for the site compound at that time.

Recently imported material used in backfilling operations across the northern part of the site is not considered to be a potential source of gas, based on information presented in the environmental permit surrender report (Report 2). Likewise, the engineered landfill on the southern boundary of the site is not considered a viable potential source due to integrated control measures. It is likely that the dilute and disperse landfill to the west of Knowle Lane is in continuity with the infilled sandpit in terms of groundwater, however this source can be considered inclusive with the sandpit.

This is summarised in Figure 11 below.

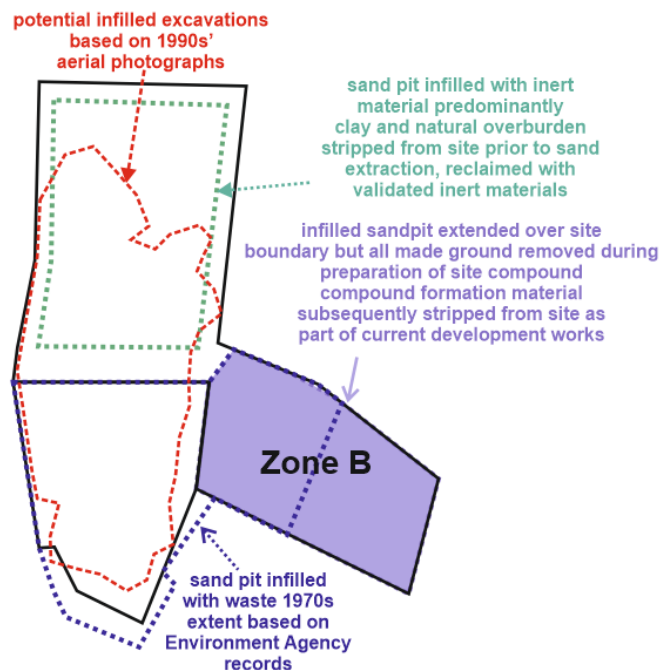


Figure 11: Approximate extent of landfilling based on all information (excluding engineered)

In summary, it is evident that potential pollutant pathways may exist with adjacent land parcels, and that the site cannot be considered in isolation from the areas of dilute and disperse landfilling within the Fair Oak landfill complex. Extensive areas of historic sand extraction and landfill are prevalent across the area, and it must be concluded that they are in hydraulic and gaseous continuity despite being tipped at different times and with different waste compositions. The exception to this is the modern engineered landfill to the south of the site and the more recently infilled area of sand excavation to the northwest (Zone A).

3. GROUND CONDITIONS

This section summarises the available information detailing site conditions, taken from the following source documents:

- *Factual report on a site investigation.* Albury S I Limited, November 2015; and
- *Ground investigation report.* Geo-Environmental Services Limited, October 2017.

3.1 Summary of pre-development works ground conditions

A geotechnical investigation was undertaken in 2015 by Albury S I, comprising two boreholes, and an additional investigation was undertaken by GESL in 2017 comprising four boreholes. The approximate locations of the exploratory holes are indicated in Figure 12 below, and the ground conditions as described in the logs summarised within Table 3.

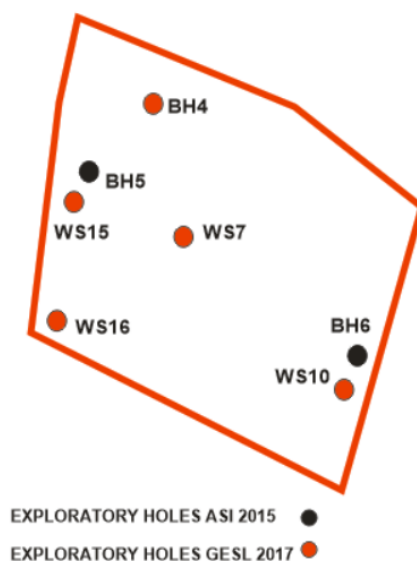


Figure 12: Approximate location of recent exploratory holes

Table 3: Summary of ground conditions

Reference	Ground Conditions
BH5-ASI 2015	GL-1.6: MG brown grey very sandy clay with gravel and brick 1.6-4.5: MG brown sandy clay with black flecks of iron oxide and gravel 4.5-5.0: MG blue-grey organic sandy clay, oxidises to a brown colouration on exposure 5.0-5.5 (end): MG brown grey sand with pockets of clay No groundwater encountered
BH6-ASI 2015	GL-2.0 (end): MG brown grey very sandy clay with gravel and chalk particles No groundwater encountered

Reference	Ground Conditions
BH4-GESL 2017	GL-1.6: MG clay, stone, brick and concrete rubble fill 1.6-3.6: brown silty Clay (WSM) 3.6-4.8: brown silty sandy Clay (WSM) 4.8-15.0 (end): brown grey silty Clay (LCF) Groundwater strike at 1.4m, rising to 1.1m after 20 minutes
WS7-GESL 2017	GL-1.9: MG dark brown sandy clay with some gravel of brick, concrete, clinker, flint and rare chalk 1.9-4.2: orange brown grey mottled sandy Clay (WSM) 4.2-5.0 (end): orange brown and grey silty Sand (LCF) No groundwater encountered Standpipe installed, response zone between 1.0m and 5.0m
WS10-GESL 2017	GL-1.5: MG brown sandy clay with some gravel of chalk and flint and rare brick and concrete 1.5-4.0: orange brown grey mottled sandy Clay (WSM) 4.0-5.0 (end): dark grey sandy Clay (LCF) No groundwater encountered Standpipe installed, response zone between 1.0m and 5.0m
WS15-GESL 2017	GL-0.2: MG tarmac with hardcore sub base 0.2-0.4: MG brown sandy clay with some gravel of chalk, flint, brick and tarmac 0.4-0.6: MG brick rubble including whole bricks 0.6-1.1: MG brown sandy clay with some gravel of brick, concrete, clinker and flint 1.1-4.7: orange brown sandy Clay (WSM) 4.7-5.0 (end): grey brown sandy Clay (LCF) No groundwater encountered Standpipe installed, response zone between 1.0m and 5.0m
WS16-GESL 2017	GL-1.9: MG brown sandy clay and clayey sand with some gravel of brick, concrete, chalk, clinker and flint 1.9-3.9: orange brown clayey Sand (WSM) 3.9-5.0 (end): dark grey sandy Clay (LCF) No groundwater encountered Standpipe installed, response zone between 1.0m and 5.0m
MG is Made Ground WSM is Whitecliff Sand Member LCF is London Clay Formation	

At the time of the site investigations (2015 and 2017) Zone B was in use as a site compound and carpark. Recorded ground conditions show made ground to be present across the site to a varied thickness, with a maximum thickness of 5.5m recorded in BH5-ASI. In the main, descriptions indicate that made ground comprises the compound base of mixed hard core over sandy clay, although it should be noted that the description of material encountered in BH5-ASI below 1.6m is similar to the natural soils described across the site in other exploratory holes. With the exception of clinker recorded in WS7, WS15 and WS16, none of the material identified represents a source of gas. Clinker predominantly comprises lignin, a complex polymer that biodegrades very slowly, and does not represent a source of rapid gas generation.

The encountered natural soils comprise the Whitecliff Sand Member over the London Clay Formation.

Based on historic maps and aerial photographs, Zone B remained open agricultural land until purchased by the Client in 2008, although some indication of disturbed ground can be seen in the 1999 aerial photograph. Reportedly, arisings from the initial excavation of the large pond to the south of the compound (also open agricultural land) were placed across the area to create a semi-level platform. After purchase by the Client, the compound was reportedly stripped of any made ground to

natural soils (to include reworked natural soils), and levelled, prior to placement of formation materials (including site-won inert made ground). On the shared boundary with BSKyB, these works reduced final levels by approximately 2.25m, leaving a bank of exposed clay with inclusions of e.g. plastic, indicating that the infilled sandpit located within BSKyB extended across the boundary. The lack of such inclusions encountered within subsequent exploratory holes supports the Client's report of removal of all made ground prior to placement of formation materials.

3.2 Contaminants in soil

A detailed human health risk assessment for the larger site (Zone A and Zone B) is presented within the Ground investigation report produced by Geo-Environmental Services in 2017 (reference GE16117-GIR-OCT17-V1.1), which is re-submitted with this report in support of the current amended application. It details the findings in terms of both commercial and residential end-uses, and concludes that 'it is considered that remedial measures are unlikely to be required within areas of soft landscaping for the protection of end-users from soil contamination. It is considered that the use of clean imported topsoil will be required within proposed areas of soft landscaping, with these soils to be laid to a depth of at least 150mm, suitable to act as a growing medium.

3.3 Groundwater

During site investigation, groundwater was only encountered in BH4-GESL, at a depth of 1.4m rising to 1.1m. Subsequent groundwater monitoring records within standpipes are variable, and a gradient cannot be accurately determined. It is considered likely that there is a high level of continuity throughout the perched/ groundwater bodies both on and off site.

3.4 Discussion

Based on the above, it is considered that the only source-pathway-receptor scenario requiring further consideration within this report is that of gas migration to within the site boundary and/or buildings.

4. PRELIMINARY CLASSIFICATION OF GAS REGIME

CIRIA Report C665¹ and BS8485: 2015 + A1:2019² detail the use of the system proposed by Wilson and Card to aid interpretation of gas monitoring results in terms of actual risk for commercial and high rise residential developments. The method uses both concentration and flow rates to define a characteristic situation for the site. Initially a hazardous gas flow rate (HGFR) is derived, representative of the actual flow of gas from each borehole on each monitoring occasion. This, combined with a consideration of other factors such as maximum concentration, is used to define a gas screening value GSV to characterise the site. The higher the classification the greater the theoretical risk posed by the presence of gas. The classification system as detailed in C665 is presented in Table 4.

Table 4: Modified Wilson and Card approach after CIRIA C665

Characteristic situation (CS)	Risk classification	Gas screening value (GSV) l/hr threshold
1	Very low risk	<0.07
2	Low risk	<0.7
3	Moderate risk	<3.5
4	Moderate to high risk	<15

Additional factors for consideration are also provided:

CS1: Typically methane <1% and/or carbon dioxide <5%, otherwise consider increase to CS2.

CS2: Borehole flow rate not to exceed 70l/hr, otherwise consider increase to CS3.

The system provides guidance on classification based on GSV, but also typical maximum concentrations of carbon dioxide and/or methane. It also relies on a comprehensive understanding of the source, and the behaviour of gases within soils beneath the site, to enable professional judgement to be applied in terms of whether the maximum concentrations recorded are indicative of a need to increase the classification indicated by the GSV.

¹ C665 *Assessing risks posed by hazardous ground gases to buildings*. Construction Industry Research and Information Association, (2007);

² BS8485:2015 + A1:2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new building*. British Standards Institution, 2015/2019.

4.1 Spot gas monitoring results

Four standpipes were installed across the site in WS7, WS10, WS15 and WS16. Gas monitoring across the larger site was undertaken on six occasions, between August 2017 and October 2017, however not all installations were monitored on all events. The results of the spot monitoring are summarised in Table 5, and presented in full within Appendix A.

Table 5: Summary of spot monitoring results

ID	CH ₄ (%v/v)	CO ₂ (%v/v)	Flow (l/hr)	Atmospheric pressure (mB)	Groundwater (mBGL)	Comments
WS7	30.2	6.4	3.4	990 falling fast	2.20	RZ 1.0m to 5.0m in clayey made ground over natural sandy clay/silty sand
	23.6	4.0	-34.1	1012 rising	1.60	
	34.2	6.6	0.0	1007 falling	2.35	
WS10	1.7	3.5	0.0	1007 falling	0.68	RZ 1.0m to 5.0m in clayey made ground over natural sandy clay. Response zone fully submerged
	1.0	6.1	-25.7	1008 steady	0.73	
	0.0	2.2	1.3	990 falling fast	0.9	
	1.1	2.4	-15.3	1012 rising	0.96	
	14.1	9.8	-14.6	1007 falling	1.0	
	12.9	8.9	-42.7	996 rising	-----	
WS15	0.0	8.7	-7.6	1007 falling	1.30	RZ 1.0m to 5.0m in natural sandy clay
	0.6	9.6	0.0	1008 steady	1.65	
	0.6	11.0	0.0	990 falling fast	1.80	
	0.0	9.5	0.0	1012 rising	1.57	
	0.4	9.4	0.0	1007 falling	1.97	
	0.0	8.2	0.0	996 rising	-----	
WS16	0.0	2.6	0.0	1007 falling	2.46	RZ 1.0m to 5.0m in clayey made ground over natural clayey sand/sandy clay
	0.0	6.1	0.0	1008 steady	2.60	
	0.0	9.6	0.0	990 falling fast	2.47	
	0.0	7.8	0.0	1012 rising	2.74	
	0.0	8.9	-7.6	1007 falling	2.78	
	0.0	9.5	0.0	996 rising	-----	

The response zone in WS10 was fully submerged throughout the monitoring programme, and as such the results cannot be considered representative of site conditions. A preliminary categorisation has been undertaken using current UK guidance.

4.2 Classification of gas regime

HGFRs for both methane and carbon dioxide based on the recorded flow and concentration in each installation have been calculated and are presented in Table 6 below together with the associated characteristic situation classification.

Table 6: Classification of current site conditions

ID	Flow (l/hr)	CH ₄ (%)	CO ₂ (%)	HGFR CH ₄ (l/hr)	HGFR CO ₂ (l/hr)	CS
WS7	3.4	30.2	6.4	1.0268	0.2176	CS2
	0.1	23.6	4.0	0.0236	0.004	CS1
	0.1	34.2	6.6	0.0342	0.0066	CS1

ID	Flow (l/hr)	CH ₄ (%)	CO ₂ (%)	HGFR CH ₄ (l/hr)	HGFR CO ₂ (l/hr)	CS
WS10	1.7	3.5	0.1	0.0017	0.0061	CS1
	1.0	6.1	0.1	0.001	0.0286	CS1
	0.1	2.2	1.3	0.0013	0.0024	CS1
	1.1	2.4	0.1	0.0011	0.0098	CS1
	14.1	9.8	0.1	0.0141	0.0098	CS1
	12.9	8.9	0.1	0.0129	0.0089	CS1
WS15	0.1	8.7	0.1	0.0001	0.0087	CS1
	0.6	9.6	0.1	0.0006	0.0096	CS1
	0.6	11.0	0.1	0.0006	0.011	CS1
	0.1	9.5	0.1	0.0001	0.0095	CS1
	0.4	9.4	0.1	0.0004	0.0094	CS1
	0.1	8.2	0.1	0.0001	0.0082	CS1
WS16	0.1	2.6	0.1	0.0001	0.0026	CS1
	0.1	6.1	0.1	0.0001	0.0061	CS1
	0.1	9.6	0.1	0.0001	0.0096	CS1
	0.1	7.8	0.1	0.0001	0.0078	CS1
	0.1	8.9	0.1	0.0001	0.0089	CS1
	0.1	9.5	0.1	0.0001	0.0095	CS1
CS is characteristic situation. Where flow is <0.1l/hr or negative, 0.1l/hr has been used as recommended in BS8485. Where concentration is <0.1%, 0.1% has been used as recommended in BS8485.						

4.3 Discussion

It is notable that elevated or marginally elevated concentrations of methane were recorded in all standpipes, however with the exception of the initial monitoring event in WS7, all results are indicative of characteristic situation 1 in terms of HGFR. This supports the hypothesis that the original source of gas is the dilute and disperse landfill beneath the BSKyB site, which has resulted in a secondary source in the form of gas being stored within soil pores and dissolved in groundwater. The presence of sandy strata within the natural soils indicates that there is a strong hydraulic and gaseous continuity with the aged waste beneath the BSKyB site. On the basis of these results alone, it would be feasible to recommend characteristic situation 1, however the history and the location of the site indicate a conservative approach should be applied in terms of CS2. Given the proximity of the site to the adjacent landfill, additional lines of evidence are required to support this conclusion.

5. HIGH FREQUENCY MONITORING

In order to explore the gas regime further, GasfluX high frequency monitoring units were installed within WS7 over a seven-day period in order to enable a robust appraisal of the gas regime within the site. The benefit of these units is that they enable the high frequency monitoring of flow within the standpipe in conjunction with the monitoring of gas concentrations and atmospheric pressure. All parameters are recorded on an approximately hourly basis.

The GasfluX units were installed on 20th October 2017 and decommissioned on 26th October 2017. During this period, a broad range of atmospheric pressure was experienced, which enables us to gain an understanding of the level of sensitivity to changes in atmospheric pressure. The results of the high frequency monitoring are presented below.

5.1 High frequency monitoring results

WS7 is located in the centre of Zone B, with a response zone extending between 1.0m and 5.0mBGL, in sandy clay with inclusions of brick, concrete, flint and chalk, over natural sandy clay and silty sand. During spot monitoring, concentrations of methane between 23.6% and 34.2%, carbon dioxide between 4.0% and 6.6%, and oxygen between 0.0% and 5.5% were recorded. Flow rates were recorded at between -34.1l/hr and 3.4l/hr, and groundwater ranged between 1.6mBGL and 2.35mBGL.

Figure 13 illustrates the recorded concentrations of methane and carbon dioxide in relation to atmospheric pressure.

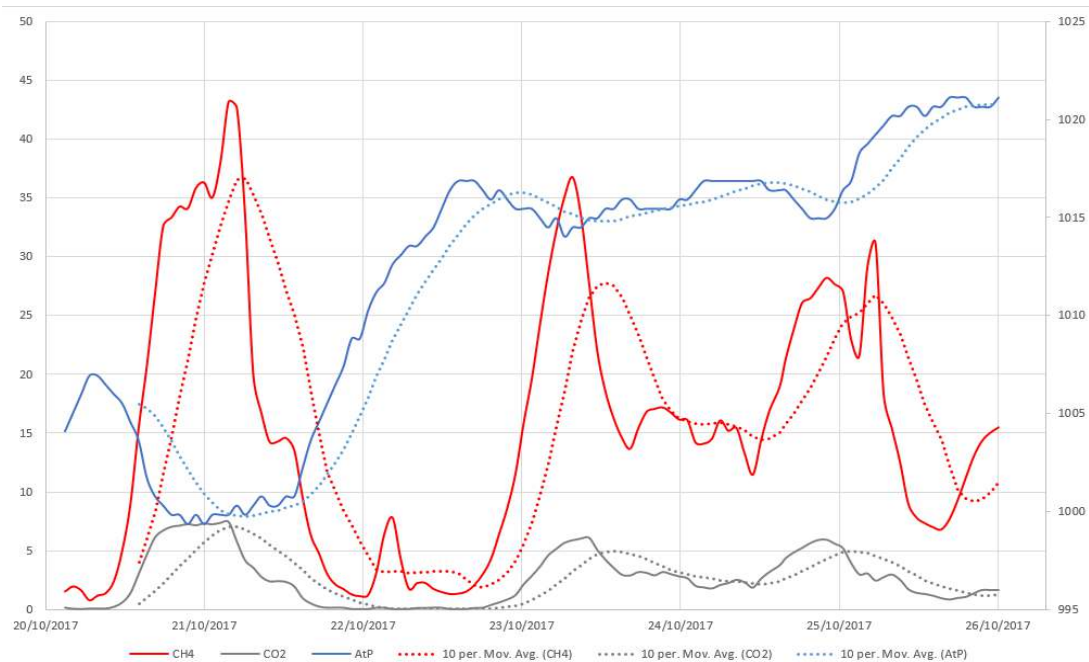


Figure 13: Concentrations of methane and carbon dioxide in relation to atmospheric pressure

A high sensitivity to atmospheric pressure was demonstrated, with very variable concentrations being recorded. This suggests that the soils in the vicinity of WS7 are relatively permeable, which is supported by the descriptions in the log.

The relationship between pressure and gas concentration within soil pores is complex, due to a number of factors including the following:

- As pressure rises, gas reduces in volume, which can result in a flow of 'fresh' air into the ground, diluting soil gas concentrations. Conversely, falling pressure results in an increase in volume and hence concentrations. This is more prevalent on sites without a comprehensive impermeable cover such as this site;
- An increase in pressure increases the solubility of gases. If shallow/perched groundwater is present, this results in an increase in gases dissolving into the water, and a corresponding decrease in concentrations within pore spaces.

Both of these factors will result in a corresponding reduction in flow rates, as illustrated in Figure 14 below:

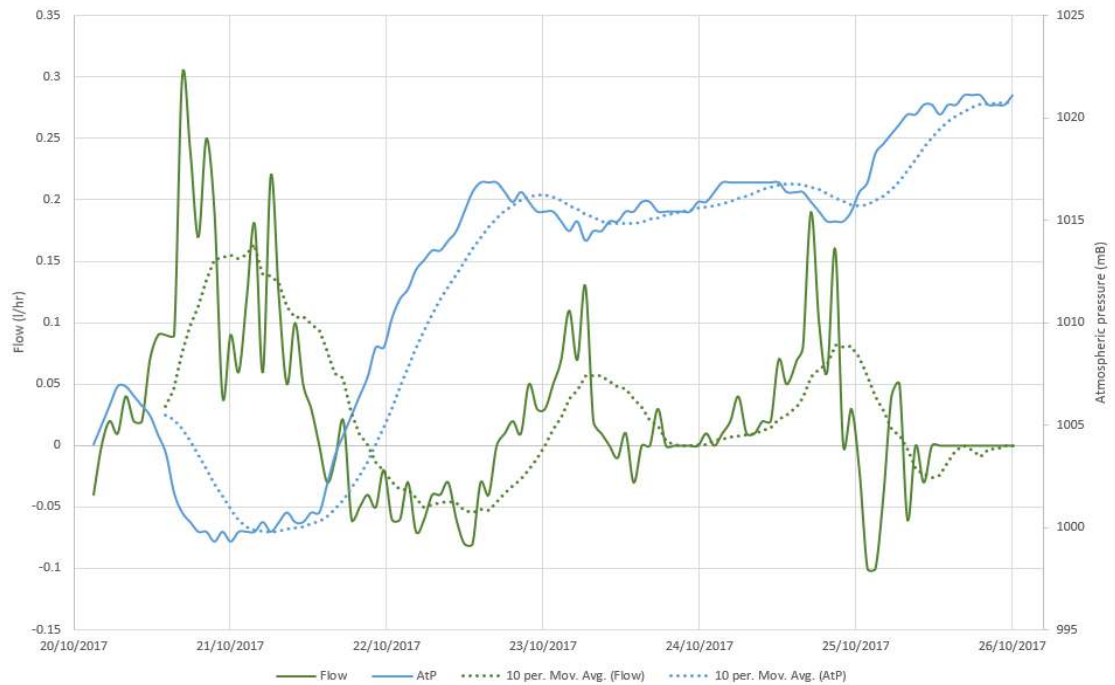


Figure 14: WS7 flow in relation to atmospheric pressure

The moving average trendlines show this relationship clearly. As barometric pressure increases, there is a clear decrease in borehole flow, and vice versa. Both graphs are indicative of gas either stored in soil pores or dissolved in groundwater, with the predominant migration mechanism being diffusion along gas concentration gradients rather than pressure driven (advective) flow caused by bulk gas generation. This is supported by the low flow rates, with the maximum recorded being 0.31l/hr. Negative flow was also recorded, coinciding with periods of rising and high pressure – this also supports the theory of diffusive flow only (if an element of advective flow was present, atmospheric pressure would be insufficient to prevent even limited positive flow occurring).

In order to contextualise the high frequency monitoring results, calculated HGFRs are presented in Figure 15.

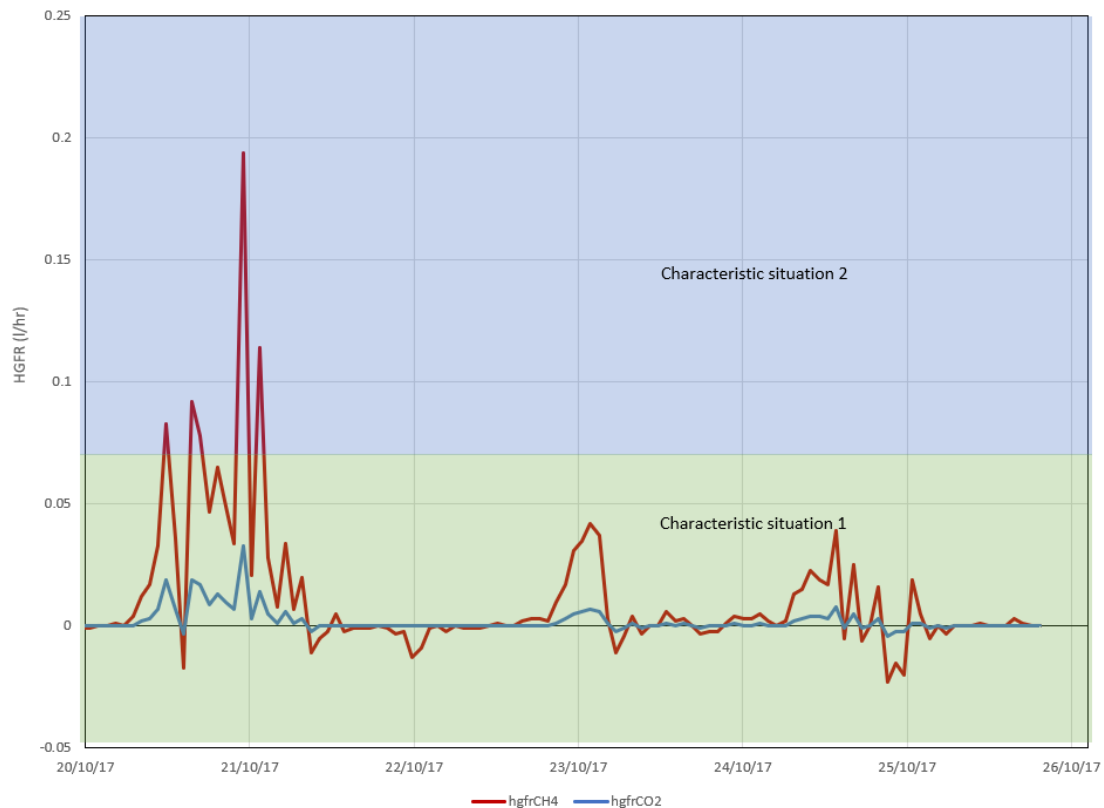


Figure 15: High frequency hazardous gas flow rates for methane and carbon dioxide

It can be seen that, with the exception of a peak at the beginning of the monitoring period for methane HGFRs, coinciding with the falling and low atmospheric pressure, all results fall within CS1 classification.

5.2 Discussion

All lines of evidence indicate that there are high concentrations of gas dissolved within groundwater and stored within underlying soil pores due to the site's location within an area of historic landfilling and highly variable permeability. It is a well-known phenomenon that lenses of lower permeability soils can act as reservoirs for gaseous or liquid compounds, as is illustrated in Figure 16.

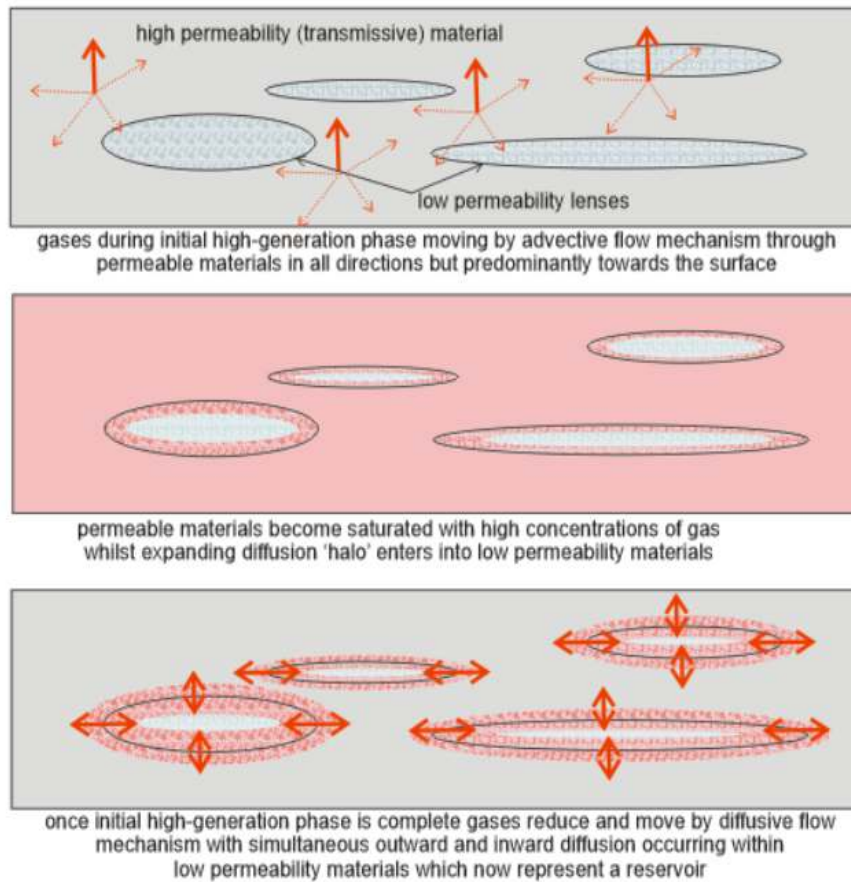


Figure 16: Low permeability soils acting as a reservoir after advective flow has ended

Classification of high frequency monitoring results based on HGFRs has identified that all of the results are category CS1 or CS2.

6. SURFACE EMISSIONS SURVEY

It is considered that the elevated concentrations of gas recorded in WS7 is representative of high concentrations of gas dissolved in groundwater or stored in soil pores, however this does not translate into equivalent surface emissions.

In order to demonstrate this, a surface emissions survey was undertaken across the site. The surface of the site was surveyed on the 21st November 2017, using a TDL methane detector connected to an Enidata PDA to log surface methane concentrations and GPS locations at three to four second intervals. It was undertaken on a 5m transect/grid spacing. The results are presented below as a contour plot (Figure 17) and at a larger scale showing the grid points in Appendix B.

Records of atmospheric pressure in Southampton in the preceding five days shows that the 21st is located within a period of falling pressure, which should induce an associated increase in both concentration and flow. Therefore, the surface emissions survey will give a good indication of whether unacceptable emissions of gas are occurring from the ground.

Table 7: Regional atmospheric pressure trend leading up to surface emissions survey

Date	16 th	17 th	18 th	19 th	20 th	21 st	22 nd
Atmospheric pressure (mBa)	1023.9	1023.5	1028	1023	1016	1010	998

The survey comprised a total of 1181 monitoring points. It can be seen from the contour plot that all grid points recorded a concentration of between 0ppm and 5ppm, which is typical of sites where there are negligible gas emissions from the ground. Monitoring in the vicinity of and within the well head of WS7, where elevated concentrations of methane were recorded during both spot and continuous monitoring, did not record increased concentrations.



Figure 17: Surface emissions survey results

6.1 Flux chamber test

The use of a flux chamber enables the measurement of surface flux over a period of time. The chamber is placed on the surface, and the concentrations of methane inside the chamber are recorded at regular intervals. As the surface area covered and the internal volume of the chamber are known, this enables the surface flux to be calculated. To supplement the surface emissions survey, a flux chamber test was conducted in the vicinity of WS7. The test was carried out in accordance with Environment Agency LFTGN 07³ and took place over the period of an hour. The results are presented in full in Appendix B.

³ Guidance on monitoring landfill gas surface emissions. LFTGN07 v2, Environment Agency, 2010

Concentrations adjacent to WS7 remained below the lower level of detection until 25 minutes into the test, at which time they increased to 1ppm (0.0001%) where they remained steady for the remainder of the hour. This marginal increase is due to the constant withdrawal of very small volumes of air from within the sealed flux chamber over a period of time, which produces a localized drop in pressure and resultant 'draw' on the surface.⁴

The results again indicate that there are no significant surface emissions from the site surface.

⁴ *A critical evaluation of current methods of detecting landfill gas surface emission rates.* S Haines, 1998

7. CONCEPTUAL SITE MODEL

7.1 Sources

A viable source of permanent gases has been identified in the vicinity of the site, in the form of an infilled sandpit immediately to the west, infilled with waste in the late 1960s/early 1970s. No sources have been identified within the site boundary. No pre-purchase site investigation records relating to the site are available, however information provided by the Client supported by site investigation records indicate that made ground across the area was removed prior to placement of carpark formation materials.

A human health risk assessment in relation to contaminants within soils has been undertaken by others, and the results identify that no exceedances in terms of commercial or residential end uses were recorded.

7.2 Pathways

Gas primarily migrates via either pressure driven (advective) flow or via diffusive flow. Within landfill, the primary mechanism for migration of gases is generally dependent on the gas generation potential and stage of decomposition of the fill. The potential source of gas identified above is >45 years old, and comprises waste placed within a non-engineered environment. As such, given the free movement of oxygen and water throughout the waste, the gas generation phase will have peaked some time ago.

All the lines of evidence presented above indicate that the prevalent migration mechanism of off-site gases onto the site is either through groundwater in a dissolved phase, or via diffusive flow in soils. Migration via diffusive flow occurs over a concentration gradient, with the furthest extent of the continuum being at normal background levels. In terms of vertical migration this results in the concentrations at the surface being equivalent to atmospheric background concentration.

7.3 Receptors

The proposed high-rise residential end use will be considered as the most sensitive receptor.

7.4 Conceptual site model

The conditions described in sections above are schematically presented in Figure 18 below.

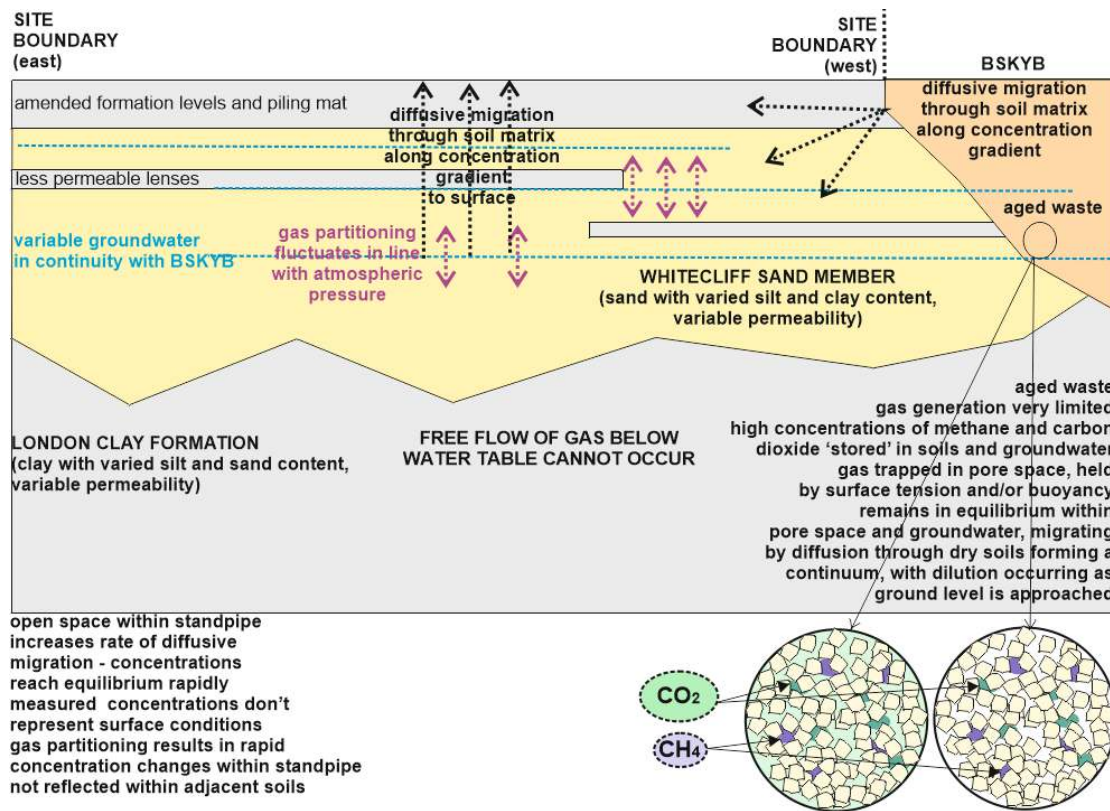


Figure 18: Conceptual site model

7.5 Potential pollutant linkages

A potential receptor has been identified in the form of the proposed high-rise residential development across the site. The original source of gas occurrence within the site boundary has been identified as aged dilute and disperse landfill immediately to the west of the site, in hydraulic and gaseous continuity with the site.

Extensive investigation into the current gas regime has identified that although elevated and marginally elevated concentrations of gas are present within the soils across the site, these do not translate into surface emissions of methane (which can also be considered representative of carbon dioxide in this instance). As such, there is no valid pathway between the identified source and receptor. On this basis, it can be considered that no pollutant linkages exist.

7.6 CIRIA classification

Based on all the lines of evidence detailed above, it is considered that the actual site conditions, as represented by the surface emissions survey and high frequency monitoring, should conservatively

be classified as CS2 when determining the requirement for gas protection measures within the proposed high rise residential development.

8. CONCLUSION

Historic records in the form of maps, plans, aerial photographs and regulatory records indicate that the site is in an area of intensive historic sand extraction and landfilling. An area of dilute and disperse landfill in the form of an infilled sand pit immediately adjacent to the site boundary to the west, and developed for commercial use c.2000 has been identified as a potential source of historic gases in a position to impact the site.

Historic records and current site conditions across the site indicate that the infilled sand pit may also have extended into this area, however the site strip prior to placement of the carpark formation material in 2008 resulted in the removal of any potentially gas generating material.

Gas monitoring data has identified that there is gas within the underlying soils and groundwater. High frequency monitoring data combined with a detailed appraisal of the gas regime has identified that source of the gas is residual gases from the adjacent dilute and disperse landfill, dissolved within groundwater or stored within soil pores. There is no evidence of advective flow occurring.

Based on all the lines of evidence presented above, it has been identified that in relation to the proposed high-rise residential development the site should be conservatively considered a CS2 classification, with a requirement for basic gas protection measures.

The required gas protection measures are specified broadly following BS 8485 guidance as follows:

For commercial or flatted development – Type B building in accordance with BS8485:2015 (3.5 points required):

- Installation of a gas resistant membrane. The membrane to be specified in accordance with BS8485:2015 and installed/verified in accordance with CIRIA Report C735, Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases. Furthermore, it must be robust enough to withstand construction and should be a minimum of 0.6mm thick in between the scrim (e.g. Juta GP1) **BS8485, Table 7 – 2 points;** and
- Construction of an open void (minimum 225mm deep) beneath all residential properties, passively vented via air bricks constructed on at least two opposite walls, providing an actual opening of at least 1500mm² for each metre run of wall. All beams and sleeper walls beneath the properties to be constructed so as to allow cross ventilation. **BS8485, Table 6 – 2.5 points.**

The membrane must be installed by a qualified and experienced installer (minimum one operative to hold an NVQ Level 2 in Gas Protection Installation). The membrane installations to all plots (100% coverage) are to be independently inspected by an independent verifier who should be able to demonstrate their competence, training and relevant experience. The inspection process should include a thorough visual inspection of the membrane. In the event of holes being identified during the membrane inspection process the inspection regime should be extended to include integrity testing (i.e. dielectric testing, or similar).

All (100%) joints, pipe penetrations etc. of the membrane should be independently air lanced to ASTM D4437.

Prior to construction works commencing, a Specification and Design Report for the gas membrane installation should be completed (to include construction detailing drawings) and a Verification Plan agreed. These reports should be submitted to the Local Authority Contaminated Land Officer for comment and approval.

It has been determined by others in a detailed human health risk assessment that the concentrations of contaminants identified within soils do not represent a risk to residential end users, however it is recommended that as a precaution, clean imported topsoil be placed within areas of soft landscaping to a sufficient depth to represent an adequate growth medium, and to a minimum of 150mm.

APPENDIX A

Project: Knowle Lane Resi
Ref: GE16117
Client:



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS1	07/08/17	10	0.0	0.7	20.2	0.0	0.6	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	07/08/17	20	0.0	0.7	20.2	0.0	0.60	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	07/08/17	30	0.0	0.7	20.1	0.0	0.60	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	07/08/17	60	0.0	1.4	19.3	0.0	0.60	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	07/08/17	120	0.0	3.7	16.9	0.0	0.60	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	07/08/17	10	0.0	0.1	21.0	0.0	0.0	1008	0.45	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	07/08/17	20	0.0	0.1	21.0	0.0	0.00	1008	0.45	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	07/08/17	30	0.0	0.1	20.9	0.0	0.00	1008	0.45	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	07/08/17	60	0.0	0.1	20.9	0.0	0.00	1008	0.45	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	07/08/17	120	0.0	0.1	20.9	0.0	0.00	1008	0.45	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	07/08/17	10	0.0	5.4	10.4	0.0	0.1	1009	3.09	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	07/08/17	20	0.0	8.7	10.0	0.0	0.10	1009	3.09	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	07/08/17	30	0.0	8.9	9.7	0.0	0.10	1009	3.09	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	07/08/17	60	0.0	9.1	9.3	0.0	0.10	1009	3.09	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	07/08/17	120	0.0	9.4	8.8	0.0	0.10	1009	3.09	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	07/08/17	10	0.0	0.3	20.5	0.0	1.8	1009	3.03	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	07/08/17	20	0.0	0.3	20.6	0.0	1.80	1009	3.03	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	07/08/17	30	0.0	0.2	20.6	0.0	1.80	1009	3.03	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	07/08/17	60	0.0	0.3	20.6	0.0	1.80	1009	3.03	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	07/08/17	120	0.0	0.4	20.5	0.0	1.80	1009	3.03	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	07/08/17	10	1.3	9.0	4.3	0.0	0.0	1008	2.13	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 1
WS5	07/08/17	20	1.9	12.1	0.5	0.0	0.00	1008	2.13	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 2
WS5	07/08/17	30	2.1	12.4	0.3	0.0	0.00	1008	2.13	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 2
WS5	07/08/17	60	2.1	12.5	0.1	0.0	0.00	1008	2.13	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 2
WS5	07/08/17	120	2.2	12.8	0.0	0.0	0.00	1008	2.13	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 2
WS6	07/08/17	10							0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	07/08/17	20				-	-	-	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	07/08/17	30				-	-	-	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	07/08/17	60				-	-	-	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	07/08/17	120				-	-	-	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	07/08/17	10	0.0	4.2	13.0	0.0	0.0	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	07/08/17	20	0.0	8.5	10.9	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	07/08/17	30	0.0	9.5	9.4	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	07/08/17	60	0.0	10.5	8.3	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	07/08/17	120	0.0	10.9	8.1	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS9	07/08/17	10	25.0	0.8	7.2	0.0	0.2	1009	4.45	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	07/08/17	20	40.0	0.9	1.1	0.0	0.20	1009	4.45	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	07/08/17	30	41.5	0.9	2.2	0.0	0.20	1009	4.45	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	07/08/17	60	40.0	0.9	2.9	0.0	0.20	1009	4.45	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	07/08/17	120	33.0	0.8	5.9	0.0	0.20	1009	4.45	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS10	07/08/17	10	1.2	2.7	14.5	0.0	0.0	1010	0.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	07/08/17	20	1.5	3.4	12.7	0.0	0.00	1010	0.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	07/08/17	30	1.7	3.5	12.5	0.0	0.00	1010	0.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	07/08/17	60	1.7	3.5	12.4	0.0	0.00	1010	0.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	07/08/17	120	1.7	3.5	12.4	0.0	0.00	1010	0.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS11	07/08/17	10	4.0	1.0	14.7	-1.0	0.1	1010	4.00	-0.040	-0.010	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS11	07/08/17	20	7.4	1.7	10.6	-1.0	0.10	1010	4.00	-0.074	-0.017	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN

Project: Knowle Lane Resi
Ref: GE16117
Client:



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS11	07/08/17	30	10.2	2.2	7.4	-1.0	0.10	1010	4.00	-0.102	-0.022	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	07/08/17	60	14.6	3.1	3.2	-1.0	0.10	1010	4.00	-0.146	-0.031	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	07/08/17	120	17.4	4.0	1.0	-1.0	0.10	1010	4.00	-0.174	-0.040	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS12	07/08/17	10	18.3	0.3	10.0	0.0	0.0	1009	3.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS12	07/08/17	20	24.1	0.2	5.9	0.0	0.00	1009	3.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	07/08/17	30	27.3	0.2	4.4	0.0	0.00	1009	3.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	07/08/17	60	34.4	0.1	1.1	0.0	0.00	1009	3.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	07/08/17	120	37.2	0.1	0.0	0.0	0.00	1009	3.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS13	07/08/17	10	8.2	2.3	1.0	0.0	0.1	1007	1.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	07/08/17	20	12.1	4.0	0.8	0.0	0.10	1007	1.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	07/08/17	30	13.4	4.3	0.4	0.0	0.10	1007	1.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	07/08/17	60	14.4	4.5	0.2	0.0	0.10	1007	1.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	07/08/17	120	14.6	4.6	0.1	0.0	0.10	1007	1.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS14	07/08/17	10	1.6	0.3	5.0	0.0	0.1	1008	3.06	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	07/08/17	20	2.1	0.3	0.9	0.0	0.10	1008	3.06	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	07/08/17	30	2.2	0.3	0.4	0.0	0.10	1008	3.06	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	07/08/17	60	2.3	0.3	0.2	0.0	0.10	1008	3.06	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	07/08/17	120	2.3	0.3	0.1	0.0	0.10	1008	3.06	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	07/08/17	10	0.0	4.3	10.4	-7.6	0.0	1009	1.30	0.000	-0.327	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS15	07/08/17	20	0.0	8.0	0.7	-7.6	0.00	1009	1.30	0.000	-0.608	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	07/08/17	30	0.0	8.2	0.1	-7.6	0.00	1009	1.30	0.000	-0.623	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	07/08/17	60	0.0	8.3	0.0	-7.6	0.00	1009	1.30	0.000	-0.631	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	07/08/17	120	0.0	8.7	0.0	-7.6	0.00	1009	1.30	0.000	-0.661	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	07/08/17	10	0.0	1.5	9.0	0.0	0.0	1009	2.46	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	07/08/17	20	0.0	1.9	3.7	0.0	0.00	1009	2.46	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	07/08/17	30	0.0	2.0	3.1	0.0	0.00	1009	2.46	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	07/08/17	60	0.0	2.1	2.0	0.0	0.00	1009	2.46	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	07/08/17	120	0.0	2.6	2.9	0.0	0.00	1009	2.46	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	25/08/17	10	0.0	3.2	17.6	0.0	0.4	1008	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	25/08/17	20	0.0	4.2	16.0	0.0	0.40	1008	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	25/08/17	30	0.0	4.3	15.8	0.0	0.40	1008	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	25/08/17	60	0.0	4.4	15.6	0.0	0.40	1008	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	25/08/17	120	0.0	4.4	15.6	0.0	0.40	1008	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	25/08/17	10	0.0	0.8	20.2	0.0	0.7	1008	0.90	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	25/08/17	20	0.0	0.7	20.3	0.0	0.70	1008	0.90	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	25/08/17	30	0.0	0.7	20.4	0.0	0.70	1008	0.90	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	25/08/17	60	0.0	0.5	20.6	0.0	0.70	1008	0.90	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	25/08/17	120	0.0	0.4	20.7	0.0	0.70	1008	0.90	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	25/08/17	10	0.4	4.8	17.7	0.0	0.5	1009	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	25/08/17	20	0.0	5.0	14.6	0.0	0.50	1009	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS3	25/08/17	30	0.0	5.1	14.5	0.0	0.50	1009	3.10	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	25/08/17	60	0.0	5.3	14.2	0.0	0.50	1009	3.10	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	25/08/17	120	0.0	6.0	13.6	0.0	0.50	1009	3.10	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	25/08/17	10	0.0	2.6	16.8	0.0	2.0	1010	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	25/08/17	20	0.0	3.6	15.4	0.0	2.00	1010	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	25/08/17	30	0.0	3.7	15.1	0.0	2.00	1010	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	25/08/17	60	0.0	3.7	15.0	0.0	2.00	1010	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/QHgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS4	25/08/17	120	0.0	3.9	14.8	0.0	2.00	1010	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	25/08/17	10	6.7	13.8	2.4	0.0	0.3	1008	2.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	25/08/17	20	10.4	14.9	0.7	0.0	0.30	1008	2.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	25/08/17	30	11.0	15.4	0.4	0.0	0.30	1008	2.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	25/08/17	60	11.3	15.7	0.1	0.0	0.30	1008	2.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	25/08/17	120	11.3	15.9	0.1	0.0	0.30	1008	2.80	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS6	25/08/17	10				-55.3	0.1	1010	0.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	25/08/17	20				-55.3	0.10	1010	0.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	25/08/17	30				-55.3	0.10	1010	0.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	25/08/17	60				-55.3	0.10	1010	0.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	25/08/17	120				-55.3	0.10	1010	0.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	25/08/17	10	0.0	7.6	12.8	0.0	0.0	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	25/08/17	20	0.0	9.2	11.2	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	25/08/17	30	0.0	9.7	10.3	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	25/08/17	60	0.0	11.5	8.9	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	25/08/17	120	0.0	12.1	8.4	0.0	0.00	1009	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS9	25/08/17	10	35.3	1.4	1.9	5.8	0.1	1010	4.40	2.047	0.081	CS3	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	25/08/17	20	41.2	1.4	1.9	5.8	0.10	1010	4.40	2.390	0.081	CS3	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	25/08/17	30	44.8	1.4	0.5	5.8	0.10	1010	4.40	2.598	0.081	CS3	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	25/08/17	60	46.1	1.4	0.1	5.8	0.10	1010	4.40	2.674	0.081	CS3	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	25/08/17	120	46.3	1.4	0.0	5.8	0.10	1010	4.40	2.685	0.081	CS3	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS10	25/08/17	10	0.0	4.4	20.0	-25.7	0.0	1009	0.73	0.000	-1.131	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	25/08/17	20	0.5	4.9	18.1	-25.7	0.00	1009	0.73	-0.129	-1.259	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	25/08/17	30	0.8	5.0	17.7	-25.7	0.00	1009	0.73	-0.206	-1.285	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS10	25/08/17	60	1.0	5.1	17.4	-25.7	0.00	1009	0.73	-0.257	-1.311	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 1
WS10	25/08/17	120	1.0	6.1	17.3	-25.7	0.00	1009	0.73	-0.257	-1.568	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	AMBER 1	GREEN	AMBER 1
WS11	25/08/17	10	14.5	2.8	10.6	-3.5	0.0	1008	4.20	-0.508	-0.098	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	25/08/17	20	21.0	4.5	8.8	-3.5	0.00	1008	4.20	-0.735	-0.158	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS11	25/08/17	30	24.4	4.4	7.4	-3.5	0.00	1008	4.20	-0.854	-0.154	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS11	25/08/17	60	31.1	5.5	4.7	-3.5	0.00	1008	4.20	-1.089	-0.193	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS11	25/08/17	120	38.9	7.4	0.8	-3.5	0.00	1008	4.20	-1.362	-0.259	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS12	25/08/17	10	18.0	0.2	8.0	0.0	0.2	1008	1.70	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS12	25/08/17	20	26.7	0.2	3.2	0.0	0.20	1008	1.70	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	25/08/17	30	29.2	0.2	2.5	0.0	0.20	1008	1.70	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	25/08/17	60	33.4	0.2	0.4	0.0	0.20	1008	1.70	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	25/08/17	120	34.9	0.3	0.1	0.0	0.20	1008	1.70	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS13	25/08/17	10	5.4	2.4	6.0	0.0	0.2	1010	2.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	25/08/17	20	8.0	3.3	0.5	0.0	0.20	1010	2.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	25/08/17	30	8.5	3.3	0.2	0.0	0.20	1010	2.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	25/08/17	60	8.6	3.3	0.1	0.0	0.20	1010	2.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	25/08/17	120	8.1	3.1	0.0	0.0	0.20	1010	2.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS14	25/08/17	10	1.7	0.2	1.6	0.0	0.0	1009	3.29	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	25/08/17	20	2.4	0.3	0.4	0.0	0.00	1009	3.29	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	25/08/17	30	2.6	0.3	0.2	0.0	0.00	1009	3.29	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	25/08/17	60	2.7	0.3	0.0	0.0	0.00	1009	3.29	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	25/08/17	120	2.7	0.3	0.0	0.0	0.00	1009	3.29	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	25/08/17	10	0.6	7.4	4.0	0.0	0.7	1009	1.65	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS15	25/08/17	20	0.0	9.1	0.6	0.0	0.70	1009	1.65	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	25/08/17	30	0.0	9.3	0.2	0.0	0.70	1009	1.65	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	25/08/17	60	0.0	9.4	0.2	0.0	0.70	1009	1.65	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	25/08/17	120	0.0	9.6	0.1	0.0	0.70	1009	1.65	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	25/08/17	10	0.0	4.4	6.5	0.0	0.0	1009	2.60	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	25/08/17	20	0.0	4.9	3.7	0.0	0.00	1009	2.60	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	25/08/17	30	0.0	5.0	3.5	0.0	0.00	1009	2.60	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS16	25/08/17	60	0.0	5.1	3.3	0.0	0.00	1009	2.60	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	25/08/17	120	0.0	6.1	3.3	0.0	0.00	1009	2.60	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS1	08/09/17	10	0.0	3.4	16.5	0.0	-	990	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/09/17	20	0.0	4.8	15.5	0.0	-	990	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/09/17	30	0.0	4.4	15.4	0.0	-	990	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/09/17	60	0.0	4.6	15.5	0.0	-	990	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/09/17	120	0.0	4.8	15.1	0.0	-	990	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	08/09/17	10	0.0	1.1	19.6	0.0	-	990	1.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	08/09/17	20	0.0	0.8	20.0	0.0	-	990	1.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	08/09/17	30	0.0	0.7	20.1	0.0	-	990	1.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	08/09/17	60	0.0	0.6	20.3	0.0	-	990	1.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	08/09/17	120	0.0	0.5	20.3	0.0	-	990	1.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	08/09/17	10	0.0	7.6	12.4	0.0	-	991	3.00	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	08/09/17	20	0.0	9.2	10.1	0.0	-	991	3.00	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	08/09/17	30	0.0	9.4	9.7	0.0	-	991	3.00	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	08/09/17	60	0.0	9.5	9.4	0.0	-	991	3.00	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS3	08/09/17	120	0.0	9.7	9.1	0.0	-	991	3.00	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	08/09/17	10	0.0	4.7	15.4	0.0	-	992	3.68	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	08/09/17	20	0.0	7.7	11.1	0.0	-	992	3.68	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	08/09/17	30	0.0	7.9	10.4	0.0	-	992	3.68	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	08/09/17	60	0.0	8.0	10.1	0.0	-	992	3.68	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	08/09/17	120	0.0	7.9	10.2	0.0	-	992	3.68	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS5	08/09/17	10	6.1	13.0	3.1	0.0	-	990	3.07	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	08/09/17	20	9.2	16.9	0.3	0.0	-	990	3.07	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	08/09/17	30	10.2	17.1	0.1	0.0	-	990	3.07	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	08/09/17	60	10.5	17.3	0.0	0.0	-	990	3.07	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	08/09/17	120	10.4	17.6	0.0	0.0	-	990	3.07	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS6	08/09/17	10	1.2	0.3	19.7	0.0	-	991	0.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS6	08/09/17	20	8.0	0.7	14.2	0.0	-	991	0.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS6	08/09/17	30	19.9	1.2	6.4	0.0	-	991	0.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS6	08/09/17	60	24.7	1.3	3.6	0.0	-	991	0.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS6	08/09/17	120	26.2	1.4	2.8	0.0	-	991	0.05	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS7	08/09/17	10	19.6	5.4	2.3	3.4	-	991	2.20	0.666	0.184	CS2	CS2	NO	NO	NO	AMBER 2	AMBER 2	GREEN	AMBER 1
WS7	08/09/17	20	27.0	6.1	0.7	3.4	-	991	2.20	0.918	0.207	CS3	CS2	NO	NO	NO	AMBER 2	RED	GREEN	AMBER 1
WS7	08/09/17	30	29.4	6.3	0.1	3.4	-	991	2.20	1.000	0.214	CS3	CS2	NO	NO	NO	AMBER 2	RED	GREEN	AMBER 1
WS7	08/09/17	60	30.0	6.3	0.0	3.4	-	991	2.20	1.020	0.214	CS3	CS2	NO	NO	NO	AMBER 2	RED	GREEN	AMBER 1
WS7	08/09/17	120	30.2	6.4	0.0	3.4	-	991	2.20	1.027	0.218	CS3	CS2	NO	NO	NO	AMBER 2	RED	GREEN	AMBER 1
WS8	08/09/17	10	0.0	10.0	8.1	0.0	-	991	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	08/09/17	20	0.0	11.5	5.4	0.0	-	991	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	08/09/17	30	0.0	12.2	5.6	0.0	-	991	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS8	08/09/17	60	0.0	13.1	5.1	0.0	-	991	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	08/09/17	120	0.0	13.2	5.0	0.0	-	991	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS9	08/09/17	10	25.1	1.4	2.6	29.3	-	992	4.30	7.354	0.410	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	08/09/17	20	37.2	1.5	0.5	29.3	-	992	4.30	10.900	0.440	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	08/09/17	30	39.8	1.6	0.1	29.3	-	992	4.30	11.661	0.469	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	08/09/17	60	40.6	1.6	0.0	29.3	-	992	4.30	11.896	0.469	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS9	08/09/17	120	40.8	1.6	0.0	29.3	-	992	4.30	11.954	0.469	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS10	08/09/17	10	0.2	0.9	19.8	1.3	-	991	0.90	0.003	0.012	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/09/17	20	0.0	1.9	19.5	1.3	-	991	0.90	0.000	0.025	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/09/17	30	0.0	2.2	19.3	1.3	-	991	0.90	0.000	0.029	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/09/17	60	0.0	2.2	19.3	1.3	-	991	0.90	0.000	0.029	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/09/17	120	0.0	2.2	19.3	1.3	-	991	0.90	0.000	0.029	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS11	08/09/17	10	9.1	3.2	2.1	0.0	-	992	2.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	08/09/17	20	10.8	3.5	0.5	0.0	-	992	2.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	08/09/17	30	11.6	3.6	0.1	0.0	-	992	2.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	08/09/17	60	12.0	3.7	0.0	0.0	-	992	2.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	08/09/17	120	12.2	3.7	0.0	0.0	-	992	2.68	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS12	08/09/17	10	21.5	0.1	4.0	1.5	-	992	4.10	0.323	0.002	CS2	CS1	NO	NO	NO	AMBER 1	RED	GREEN	GREEN
WS12	08/09/17	20	29.1	0.1	0.5	1.5	-	992	4.10	0.437	0.002	CS2	CS1	NO	NO	NO	AMBER 1	RED	GREEN	GREEN
WS12	08/09/17	30	31.3	0.1	0.1	1.5	-	992	4.10	0.470	0.002	CS2	CS1	NO	NO	NO	AMBER 1	RED	GREEN	GREEN
WS12	08/09/17	60	32.0	0.1	0.0	1.5	-	992	4.10	0.480	0.002	CS2	CS1	NO	NO	NO	AMBER 1	RED	GREEN	GREEN
WS12	08/09/17	120	32.7	0.2	0.0	1.5	-	992	4.10	0.491	0.003	CS2	CS1	NO	NO	NO	AMBER 1	RED	GREEN	GREEN
WS13	08/09/17	10	7.4	1.9	15.7	-11.8	-	992	4.05	-0.873	-0.224	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	08/09/17	20	10.4	2.1	15.2	-11.8	-	992	4.05	-1.227	-0.248	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	08/09/17	30	9.9	1.7	15.4	-11.8	-	992	4.05	-1.168	-0.201	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	08/09/17	60	7.5	1.3	17.3	-11.8	-	992	4.05	-0.885	-0.153	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	08/09/17	120	6.2	1.0	17.8	-11.8	-	992	4.05	-0.732	-0.118	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS14	08/09/17	10	0.6	0.5	5.3	0.0	-	992	3.40	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS14	08/09/17	20	1.4	0.5	0.5	0.0	-	992	3.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	08/09/17	30	1.6	0.2	0.5	0.0	-	992	3.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	08/09/17	60	1.6	0.4	0.0	0.0	-	992	3.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	08/09/17	120	1.6	0.4	0.0	0.0	-	992	3.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	08/09/17	10	0.0	0.3	4.0	0.0	-	992	1.80	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS15	08/09/17	20	0.0	9.5	1.0	0.0	-	992	1.80	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	08/09/17	30	0.0	9.8	0.3	0.0	-	992	1.80	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	08/09/17	60	0.0	11.0	0.0	0.0	-	992	1.80	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS15	08/09/17	120	0.6	9.9	0.0	0.0	-	992	1.80	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	08/09/17	10	0.0	6.5	8.8	0.0	-	992	2.47	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	08/09/17	20	0.0	8.6	4.7	0.0	-	992	2.47	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	08/09/17	30	0.0	8.7	4.1	0.0	-	992	2.47	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	08/09/17	60	0.0	8.9	3.9	0.0	-	992	2.47	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	08/09/17	120	0.0	9.6	4.0	0.0	-	992	2.47	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS1	22/09/17	10	0.0	2.4	17.8	0.0	0.0	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/09/17	20	0.0	2.8	17.4	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/09/17	30	0.0	2.1	17.2	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/09/17	60	0.0	3.0	17.0	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/09/17	120	0.0	3.0	17.0	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/QHgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS2	22/09/17	10	5.1	14.3	2.3	0.0	0.2	1012	3.25	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS2	22/09/17	20	8.4	17.4	0.4	0.0	0.20	1012	3.25	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS2	22/09/17	30	9.4	17.1	0.1	0.0	0.20	1012	3.25	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS2	22/09/17	60	9.8	18.0	0.0	0.0	0.20	1012	3.25	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS2	22/09/17	120	9.6	18.3	0.0	0.0	0.20	1012	3.25	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS3	22/09/17	10	0.0	1.4	19.0	0.0	0.1	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	22/09/17	20	0.0	1.5	18.8	0.0	0.10	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	22/09/17	30	0.0	1.5	18.7	0.0	0.10	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	22/09/17	60	0.0	1.6	18.4	0.0	0.10	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	22/09/17	120	0.0	1.7	18.3	0.0	0.10	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	22/09/17	10	0.0	3.4	16.3	0.0	0.4	1012	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	22/09/17	20	0.0	3.9	15.3	0.0	0.40	1012	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	22/09/17	30	0.0	4.0	14.9	0.0	0.40	1012	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	22/09/17	60	0.0	4.1	14.9	0.0	0.40	1012	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	22/09/17	120	0.0	4.1	15.0	0.0	0.40	1012	3.70	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	22/09/17	10	0.0	0.8	20.2	0.0	0.0	1012	0.71	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	22/09/17	20	0.0	0.7	20.3	0.0	0.00	1012	0.71	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	22/09/17	30	0.0	0.6	20.3	0.0	0.00	1012	0.71	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	22/09/17	60	0.0	0.6	20.2	0.0	0.00	1012	0.71	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	22/09/17	120	0.0	0.6	20.1	0.0	0.00	1012	0.71	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	22/09/17	10	27.0	1.3	4.2	40.0	0.5	1012	0.30	10.800	0.520	CS4	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS6	22/09/17	20	47.3	14.0	0.3	40.0	0.50	1012	0.30	18.920	5.600	CS5	CS4	NO	NO	NO	RED	RED	RED	AMBER 2
WS6	22/09/17	30				40.0	0.50	1012	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	22/09/17	60				40.0	0.50	1012	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	22/09/17	120				40.0	0.50	1012	0.30	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS7	22/09/17	10	8.9	1.6	14.0	-34.1	0.0	1012	1.60	-3.035	-0.546	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS7	22/09/17	20	9.2	1.3	14.9	-34.1	0.00	1012	1.60	-3.137	-0.443	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS7	22/09/17	30	10.4	2.0	15.0	-34.1	0.00	1012	1.60	-3.546	-0.682	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS7	22/09/17	60	15.9	2.7	9.6	-34.1	0.00	1012	1.60	-5.422	-0.921	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS7	22/09/17	120	23.6	4.0	5.5	-34.1	0.00	1012	1.60	-8.048	-1.364	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS8	22/09/17	10	0.1	4.6	16.1	0.0	0.0	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/09/17	20	0.0	5.0	15.6	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS8	22/09/17	30	0.0	5.2	15.5	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	22/09/17	60	0.0	6.6	14.5	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	22/09/17	120	0.0	6.7	14.2	0.0	0.00	1012	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS9	22/09/17	10	29.7	0.9	7.0	0.0	0.4	1012	4.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	22/09/17	20	37.0	1.2	0.4	0.0	0.40	1012	4.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	22/09/17	30	39.3	1.2	0.1	0.0	0.40	1012	4.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	22/09/17	60	40.3	1.3	0.0	0.0	0.40	1012	4.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	22/09/17	120	40.3	1.3	0.0	0.0	0.40	1012	4.40	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS10	22/09/17	10	0.0	0.9	20.0	-15.3	0.0	1012	0.96	0.000	-0.138	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/09/17	20	0.2	1.8	19.6	-15.3	0.00	1012	0.96	-0.031	-0.275	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/09/17	30	0.8	2.2	19.2	-15.3	0.00	1012	0.96	-0.122	-0.337	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/09/17	60	1.1	2.3	19.1	-15.3	0.00	1012	0.96	-0.168	-0.352	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	22/09/17	120	1.1	2.4	19.1	-15.3	0.00	1012	0.96	-0.168	-0.367	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS11	22/09/17	10	15.4	3.3	12.5	-71.9	0.0	1012	3.91	-11.073	-2.373	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS11	22/09/17	20	19.8	4.9	11.0	-71.9	0.00	1012	3.91	-14.236	-3.523	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/QHgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS11	22/09/17	30	23.2	4.6	9.4	-71.9	0.00	1012	3.91	-16.681	-3.307	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS11	22/09/17	60	29.3	5.1	6.9	-71.9	0.00	1012	3.91	-21.067	-3.667	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS11	22/09/17	120	43.2	8.6	1.8	-71.9	0.00	1012	3.91	-31.061	-6.183	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS12	22/09/17	10	18.3	0.0	8.0	0.0	0.0	1013	4.00	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS12	22/09/17	20	29.3	0.0	0.6	0.0	0.00	1013	4.00	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	22/09/17	30	32.3	0.1	0.0	0.0	0.00	1013	4.00	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	22/09/17	60	32.6	0.1	0.0	0.0	0.00	1013	4.00	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS12	22/09/17	120	34.6	0.2	-0.1	0.0	0.00	1013	4.00	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS13	22/09/17	10	12.0	3.6	2.0	0.0	0.1	1012	1.16	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	22/09/17	20	14.3	3.9	0.2	0.0	0.10	1012	1.16	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	22/09/17	30	15.1	3.9	0.0	0.0	0.10	1012	1.16	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	22/09/17	60	16.9	4.2	0.0	0.0	0.10	1012	1.16	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	22/09/17	120	18.4	4.5	0.0	0.0	0.10	1012	1.16	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS14	22/09/17	10	1.3	0.5	7.6	0.0	0.0	1014	3.32	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	22/09/17	20	2.0	0.4	0.7	0.0	0.00	1014	3.32	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	22/09/17	30	2.1	0.4	0.1	0.0	0.00	1014	3.32	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	22/09/17	60	2.2	0.4	0.0	0.0	0.00	1014	3.32	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	22/09/17	120	2.2	0.4	0.0	0.0	0.00	1014	3.32	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	22/09/17	10	0.0	7.5	4.5	0.0	0.0	1013	1.57	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	22/09/17	20	0.0	9.2	0.5	0.0	0.00	1013	1.57	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	22/09/17	30	0.0	9.4	0.1	0.0	0.00	1013	1.57	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	22/09/17	60	0.0	9.5	0.0	0.0	0.00	1013	1.57	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	22/09/17	120	0.0	9.5	0.0	0.0	0.00	1013	1.57	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	22/09/17	10	0.0	4.6	8.3	0.0	0.0	1013	2.74	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS16	22/09/17	20	0.0	5.2	5.5	0.0	0.00	1013	2.74	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	22/09/17	30	0.0	5.4	5.1	0.0	0.00	1013	2.74	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	22/09/17	60	0.0	5.1	4.1	0.0	0.00	1013	2.74	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	22/09/17	120	0.0	7.8	3.1	0.0	0.00	1013	2.74	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS1	10/10/17	10	0.0	2.4	18.0	0.0	0.0	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	10/10/17	20	0.0	2.6	17.7	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	10/10/17	30	0.0	2.7	17.5	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	10/10/17	60	0.0	2.7	17.5	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	10/10/17	120	0.0	2.7	17.4	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	10/10/17	10	0.7	3.6	14.8	0.0	0.0	1007	1.23	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	10/10/17	20	0.9	3.2	15.3	0.0	0.00	1007	1.23	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	10/10/17	30	0.9	3.1	15.4	0.0	0.00	1007	1.23	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	10/10/17	60	0.8	3.0	15.5	0.0	0.00	1007	1.23	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	10/10/17	120	0.8	3.1	15.1	0.0	0.00	1007	1.23	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	10/10/17	10	0.0	4.5	15.8	0.0	0.0	1007	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	10/10/17	20	0.0	4.7	15.3	0.0	0.00	1007	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	10/10/17	30	0.0	4.8	15.1	0.0	0.00	1007	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	10/10/17	60	0.0	5.0	14.7	0.0	0.00	1007	3.10	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS3	10/10/17	120	0.0	5.5	14.3	0.0	0.00	1007	3.10	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	10/10/17	10	0.0	2.4	17.3	0.0	0.7	1007	3.82	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	10/10/17	20	0.0	3.4	15.9	0.0	0.70	1007	3.82	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	10/10/17	30	0.0	3.5	15.7	0.0	0.70	1007	3.82	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	10/10/17	60	0.0	3.5	15.5	0.0	0.70	1007	3.82	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/QHgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS4	10/10/17	120	0.0	3.8	15.1	0.0	0.70	1007	3.82	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS5	10/10/17	10	6.5	14.3	2.0	0.0	0.4	1007	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	10/10/17	20	10.7	17.9	0.4	0.0	0.40	1007	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	10/10/17	30	11.3	18.4	0.1	0.0	0.40	1007	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	10/10/17	60	11.5	18.6	0.0	0.0	0.40	1007	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	10/10/17	120	11.5	18.7	0.0	0.0	0.40	1007	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS6	10/10/17	10	27.0	5.0	0.0	55.6	0.0	1006	0.26	15.012	2.780	CS5	CS3	NO	NO	NO	RED	RED	AMBER 2	AMBER 1
WS6	10/10/17	20	44.0	2.7	1.2	55.6	0.00	1006	0.26	24.464	1.501	CS5	CS3	NO	NO	NO	RED	RED	AMBER 1	GREEN
WS6	10/10/17	30	45.0	1.2	2.2	55.6	0.00	1006	0.26	25.020	0.667	CS5	CS2	NO	NO	NO	RED	RED	GREEN	GREEN
WS6	10/10/17	60				55.6	0.00	1006	0.26	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	10/10/17	120				55.6	0.00	1006	0.26	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS7	10/10/17	10	26.0	6.2	1.2	0.0	0.0	1007	2.35	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS7	10/10/17	20	31.1	6.3	0.3	0.0	0.00	1007	2.35	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS7	10/10/17	30	33.4	6.4	0.1	0.0	0.00	1007	2.35	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS7	10/10/17	60	34.0	6.5	0.0	0.0	0.00	1007	2.35	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS7	10/10/17	120	34.2	6.6	0.0	0.0	0.00	1007	2.35	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS8	10/10/17	10	0.2	6.0	13.8	0.0	0.0	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	AMBER 1
WS8	10/10/17	20	0.0	8.9	10.2	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	10/10/17	30	0.0	9.3	9.5	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS8	10/10/17	60	0.0	10.1	8.7	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS8	10/10/17	120	0.0	10.6	8.4	0.0	0.00	1007	DRY	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 2
WS9	10/10/17	10	27.0	1.2	2.5	0.0	0.0	1007	4.50	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	10/10/17	20	37.9	1.4	0.3	0.0	0.00	1007	4.50	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	10/10/17	30	39.2	1.4	0.1	0.0	0.00	1007	4.50	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	10/10/17	60	39.9	1.4	0.0	0.0	0.00	1007	4.50	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS9	10/10/17	120	40.0	1.4	0.0	0.0	0.00	1007	4.50	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS10	10/10/17	10	1.7	2.0	19.2	-14.6	0.0	1007	1.00	-0.248	-0.292	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	10/10/17	20	3.0	3.2	18.0	-14.6	0.00	1007	1.00	-0.438	-0.467	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	10/10/17	30	4.2	3.8	17.4	-14.6	0.00	1007	1.00	-0.613	-0.555	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	10/10/17	60	4.8	3.9	17.2	-14.6	0.00	1007	1.00	-0.701	-0.569	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	10/10/17	120	14.1	9.8	12.0	-14.6	0.00	1007	1.00	-2.059	-1.431	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 1
WS11	10/10/17	10	21.0	4.9	0.8	-19.3	0.0	1008	4.07	-4.053	-0.946	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	RED	GREEN	GREEN
WS11	10/10/17	20	29.9	6.3	6.7	-19.3	0.00	1008	4.07	-5.771	-1.216	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS11	10/10/17	30	34.2	6.6	5.6	-19.3	0.00	1008	4.07	-6.601	-1.274	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS11	10/10/17	60	40.7	7.6	3.1	-19.3	0.00	1008	4.07	-7.855	-1.467	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS12	10/10/17	120	47.8	9.6	0.7	-19.3	0.00	1008	4.07	-9.225	-1.853	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	RED	GREEN	AMBER 1
WS13	10/10/17	10	5.7	2.0	6.3	0.0	0.0	1008	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	10/10/17	20	8.2	2.0	0.4	0.0	0.00	1008	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	10/10/17	30	8.9	2.3	0.1	0.0	0.00	1008	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	10/10/17	60	9.2	2.3	0.0	0.0	0.00	1008	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS13	10/10/17	120	9.3	2.3	0.0	0.0	0.00	1008	3.20	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS14	10/10/17	10	1.8	0.5	1.3	0.0	0.0	1007	3.60	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	10/10/17	20	2.2	0.5	0.3	0.0	0.00	1007	3.60	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	10/10/17	30	2.4	0.5	0.1	0.0	0.00	1007	3.60	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	10/10/17	60	2.5	0.5	0.0	0.0	0.00	1007	3.60	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	10/10/17	120	2.4	0.5	0.0	0.0	0.00	1007	3.60	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	10/10/17	10	0.0	6.5	7.2	0.0	0.1	1007	1.97	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1

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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/QHgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS15	10/10/17	20	0.2	9.0	4.0	0.0	0.10	1007	1.97	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	10/10/17	30	0.3	9.2	0.1	0.0	0.10	1007	1.97	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	10/10/17	60	0.3	9.2	0.0	0.0	0.10	1007	1.97	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	10/10/17	120	0.4	9.4	0.0	0.0	0.10	1007	1.97	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	10/10/17	10	0.0	5.5	9.4	-7.6	0.0	1007	2.78	0.000	-0.418	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	10/10/17	20	0.0	7.1	7.2	-7.6	0.00	1007	2.78	0.000	-0.540	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	10/10/17	30	0.0	7.2	7.0	-7.6	0.00	1007	2.78	0.000	-0.547	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	10/10/17	60	0.0	7.6	6.7	-7.6	0.00	1007	2.78	0.000	-0.578	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	10/10/17	120	0.0	8.9	4.9	-7.6	0.00	1007	2.78	0.000	-0.676	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS1	20/10/17	10	0.0	1.1	19.5	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	20/10/17	20	0.0	1.2	19.3	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	20/10/17	30	0.0	1.2	19.2	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	20/10/17	60	0.0	1.2	19.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	20/10/17	120	0.0	1.2	19.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS2	20/10/17	10	6.0	3.9	15.0	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS2	20/10/17	20	7.1	4.4	14.8	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS2	20/10/17	30	7.0	4.1	15.2	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS2	20/10/17	60	6.4	3.9	15.5	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS2	20/10/17	120	5.4	3.3	16.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS3	20/10/17	10	0.0	0.1	20.7	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	20/10/17	20	0.0	0.0	20.7	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	20/10/17	30	0.0	0.0	20.7	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	20/10/17	60	0.0	0.0	20.6	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS3	20/10/17	120	0.0	0.0	20.6	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	20/10/17	10	0.0	4.3	16.2	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS4	20/10/17	20	0.0	7.3	11.5	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	20/10/17	30	0.0	7.4	10.9	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	20/10/17	60	0.0	7.6	10.6	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS4	20/10/17	120	0.0	7.7	10.4	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	CO2>CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS5	20/10/17	10	9.0	12.0	5.0	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	20/10/17	20	11.1	16.4	1.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	20/10/17	30	12.0	17.0	0.5	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	20/10/17	60	12.3	17.7	0.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS5	20/10/17	120	12.2	18.4	0.0	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	CH4>CS1 limit	CO2>CS1 limit	GREEN	AMBER 2	GREEN	AMBER 2
WS6	20/10/17	10	31.0	0.8	7.0	107.0	-	997	-	33.170	0.856	CS5	CS3	YES	NO	NO	RED	RED	AMBER 1	GREEN
WS6	20/10/17	20	38.6	0.9	6.1	107.0	-	997	-	41.302	0.963	CS5	CS3	YES	NO	NO	RED	RED	AMBER 1	GREEN
WS6	20/10/17	30				107.0	-	997	-	0.000	0.000	CS1	CS1	YES	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	20/10/17	60				107.0	-	997	-	0.000	0.000	CS1	CS1	YES	NO	NO	GREEN	GREEN	GREEN	GREEN
WS6	20/10/17	120				107.0	-	997	-	0.000	0.000	CS1	CS1	YES	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	20/10/17	10	0.0	0.4	20.4	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	20/10/17	20	0.0	0.5	20.3	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	20/10/17	30	0.0	0.5	20.3	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	20/10/17	60	0.0	0.8	20.0	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	20/10/17	120	0.0	1.1	19.7	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	20/10/17	10	3.5	3.3	17.7	-42.7	-	999	-	-1.495	-1.409	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS10	20/10/17	20	6.4	4.7	16.2	-42.7	-	999	-	-2.733	-2.007	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	GREEN
WS10	20/10/17	30	8.2	5.0	15.7	-42.7	-	999	-	-3.501	-2.135	CS1	CS1	NO	CH4>CS1 limit	NO	GREEN	AMBER 2	GREEN	AMBER 1

Project: Knowle Lane Resi
Ref: GE16117
Client:



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS10	20/10/17	60	8.7	5.2	15.6	-42.7	-	999	-	-3.715	-2.220	CS1	CS1	NO	CH ₄ >CS1 limit	CO ₂ >CS1 limit	GREEN	AMBER 2	GREEN	AMBER 1
WS10	20/10/17	120	12.9	8.9	15.3	-42.7	-	999	-	-5.508	-3.800	CS1	CS1	NO	CH ₄ >CS1 limit	CO ₂ >CS1 limit	GREEN	AMBER 2	GREEN	AMBER 1
WS14	20/10/17	10	1.5	0.5	9.8	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	CH ₄ >CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	20/10/17	20	2.1	0.5	0.7	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	CH ₄ >CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	20/10/17	30	2.2	0.5	0.3	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	CH ₄ >CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	20/10/17	60	2.3	0.4	0.0	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	CH ₄ >CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS14	20/10/17	120	2.3	0.5	0.0	0.0	-	997	-	0.000	0.000	CS1	CS1	NO	CH ₄ >CS1 limit	NO	GREEN	AMBER 1	GREEN	GREEN
WS15	20/10/17	10	0.0	1.2	19.1	0.0	-	998	-	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS15	20/10/17	20	0.0	7.3	7.2	0.0	-	998	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	20/10/17	30	0.0	8.5	4.4	0.0	-	998	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	20/10/17	60	0.0	8.3	3.1	0.0	-	998	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS15	20/10/17	120	0.0	8.2	2.5	0.0	-	998	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	20/10/17	10	0.0	5.8	7.0	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	20/10/17	20	0.0	9.0	0.8	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	20/10/17	30	0.0	9.2	0.3	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	20/10/17	60	0.0	9.3	0.1	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
WS16	20/10/17	120	0.0	9.5	0.0	0.0	-	996	-	0.000	0.000	CS1	CS1	NO	NO	CO ₂ >CS1 limit	GREEN	GREEN	GREEN	AMBER 1
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	10								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	20								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	30								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	60								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
-	-	120								0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

APPENDIX B

Knowle Lane Pit
Surface Emissions Monitoring

21 November 2017

Approval Sheet

Customer: Environmental Protection Group

Site: Knowle Lane Pit

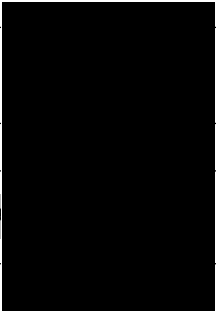
Project Title: Surface Emissions Monitoring

Project Manager: P Sanders

Project Staff: J Freestone, C Keightley, T Freestone

Address: enitail
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DE

Tel: 01902 798798
Fax: 01902 798711

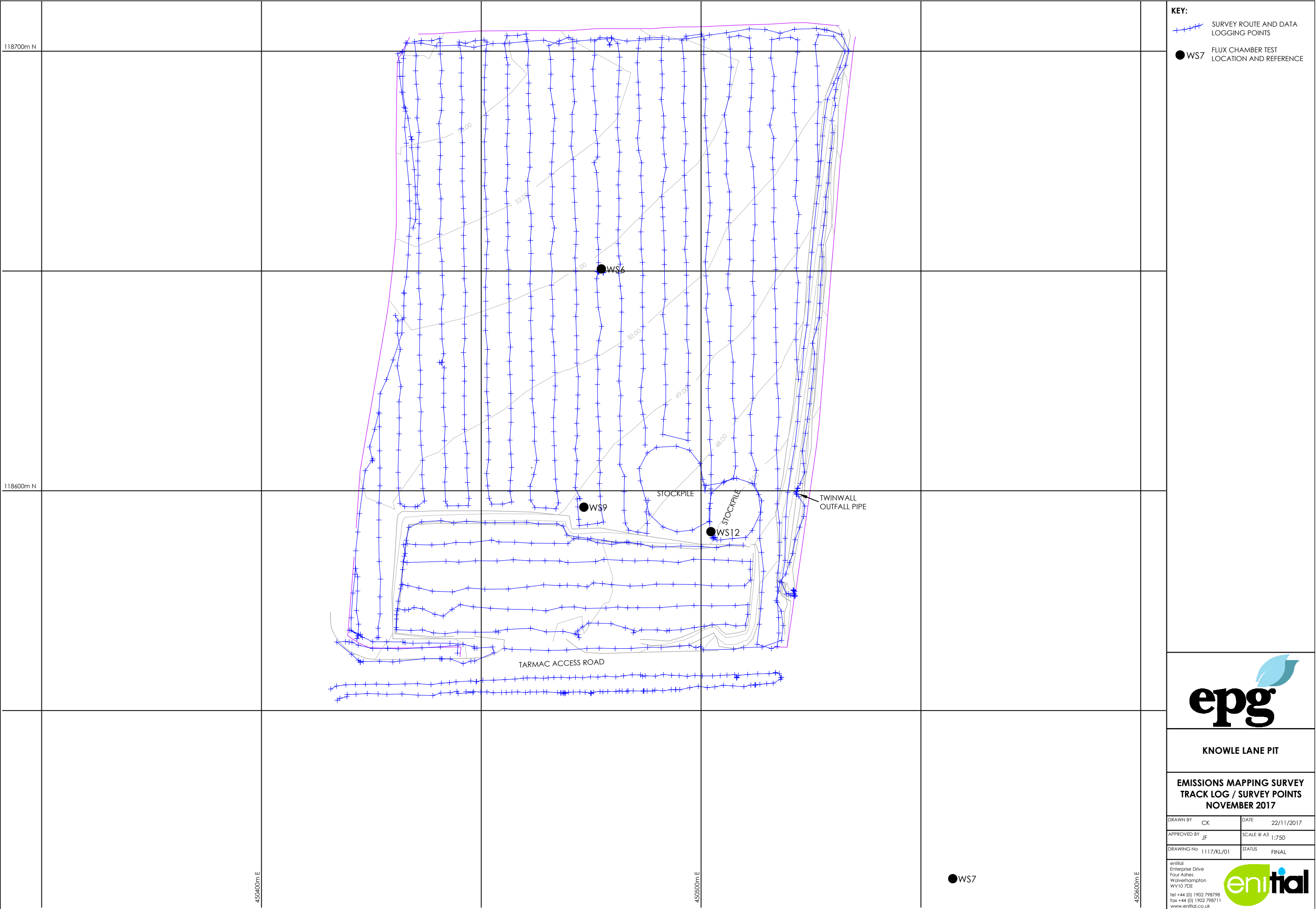
Issue	Status	Date	Prepared By		Date
1	Final	22/11/2017	J Freestone		22/11/2017
			Checked By		Date
			C Keightley		22/11/2017

Contents

1. Emissions Mapping Survey Plans
2. Flux Chamber Results and Calculations
3. Field Log
4. Geotech TDL500 and Huberg Laser One Calibration Certificates

1.0

Emissions Mapping Survey Plans



KEY:

---+---+---+ SURVEY ROUTE AND DATA LOGGING POINTS

● WS7 FLUX CHAMBER TEST LOCATION AND REFERENCE



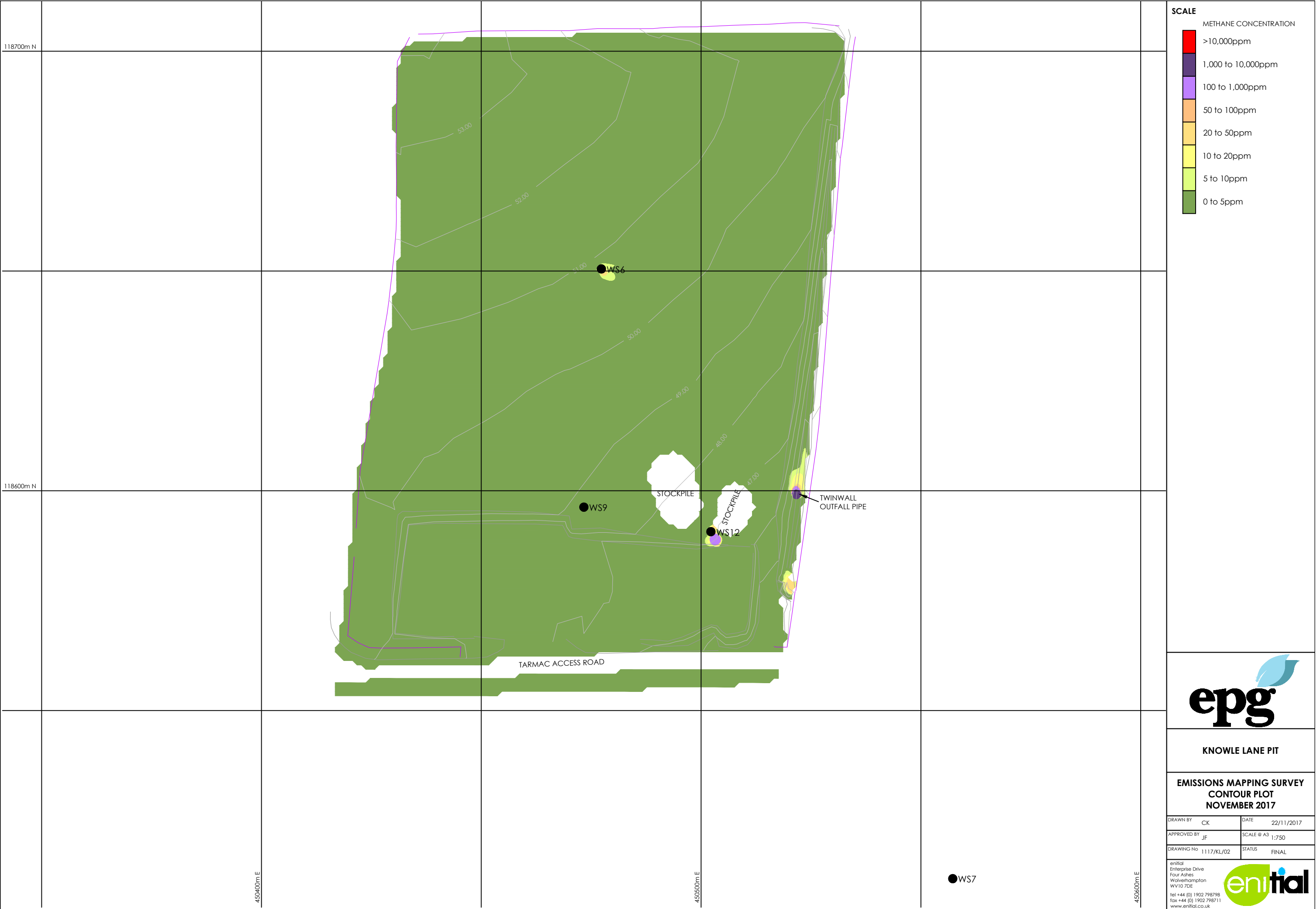
KNOWLE LANE PIT

EMISSIONS MAPPING SURVEY
TRACK LOG / SURVEY POINTS
NOVEMBER 2017

DRAWN BY	CK	DATE	22/11/2017
APPROVED BY	JF	SCALE @ A3	1:750
DRAWING No	1117/KL/01	STATUS	FINAL

enitl
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DE
tel +44 (0) 1902 798798
fax +44 (0) 1902 798711
www.enitl.co.uk





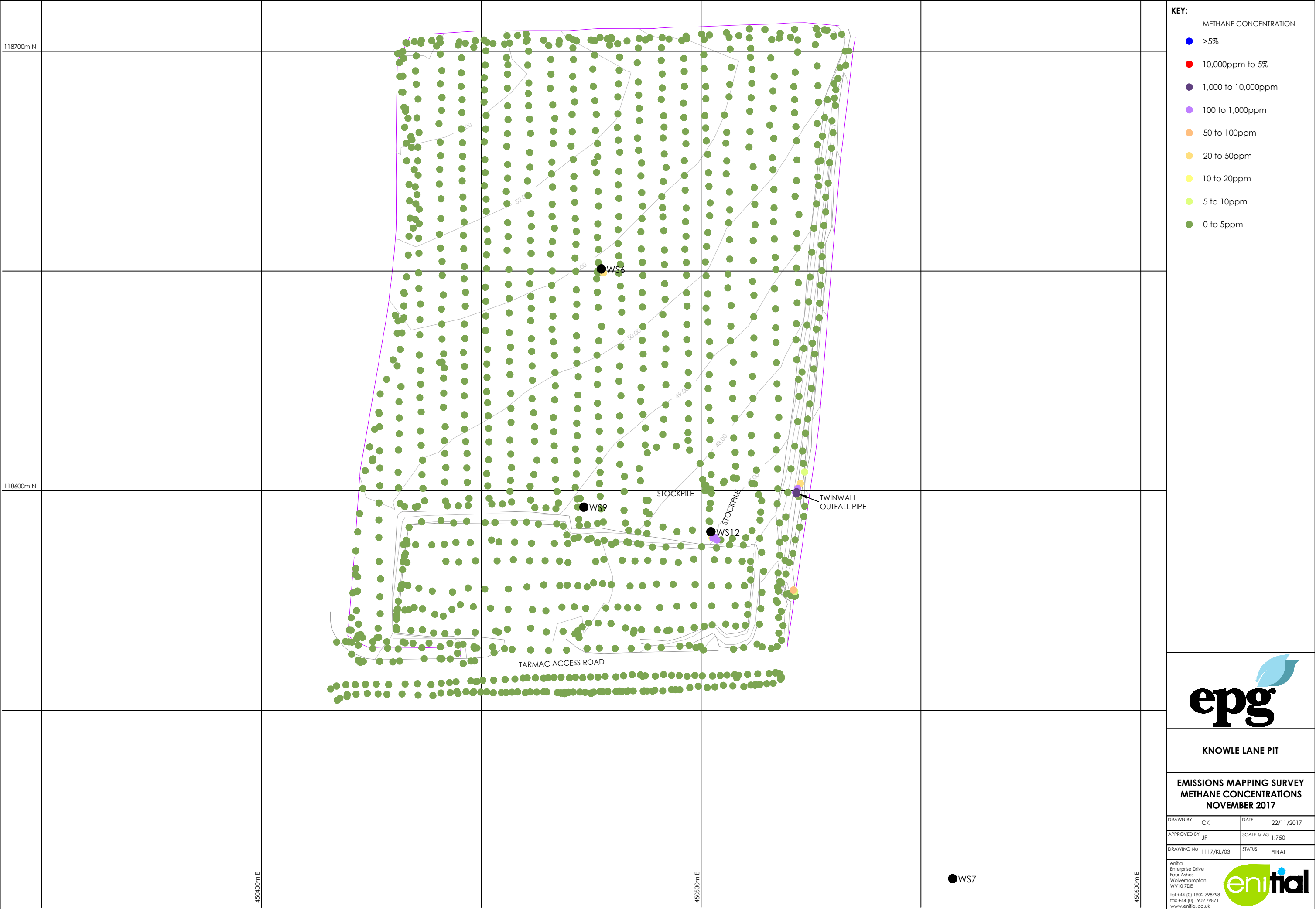
KNOWLE LANE PIT

EMISSIONS MAPPING SURVEY
CONTOUR PLOT
NOVEMBER 2017

DRAWN BY	CK	DATE	22/11/2017
APPROVED BY	JF	SCALE @ A3	1:750
DRAWING No	1117/KL/02	STATUS	FINAL

enitl
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DE
tel +44 (0) 1902 798798
fax +44 (0) 1902 798711
www.enitl.co.uk





2.0

Flux Chamber Results and Calculations

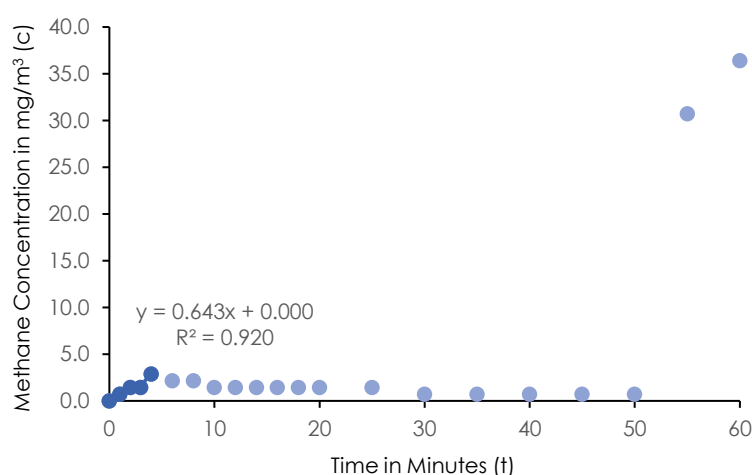
Knowle Lane Pit

FCT-WS6 Flux Chamber Test Results

November 2017



Test ID	Date & Time	Test Time in Seconds	Absolute Methane (ppm)	Background Methane (ppm)	Adjusted Methane (ppm)	Adjusted Methane (mg/m ³)	Easting	Northing
WS6	21/11/2017 11:17	0	2	2	0	0.0	450477.32	118650.47
WS6	21/11/2017 11:18	60	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 11:19	120	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:20	180	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:21	240	6	2	4	2.9	450477.32	118650.47
WS6	21/11/2017 11:23	360	5	2	3	2.1	450477.32	118650.47
WS6	21/11/2017 11:25	480	5	2	3	2.1	450477.32	118650.47
WS6	21/11/2017 11:27	600	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:29	720	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:31	840	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:33	960	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:35	1080	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:37	1200	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:42	1500	4	2	2	1.4	450477.32	118650.47
WS6	21/11/2017 11:47	1800	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 11:52	2100	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 11:57	2400	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 12:02	2700	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 12:07	3000	3	2	1	0.7	450477.32	118650.47
WS6	21/11/2017 12:12	3300	45	2	43	30.7	450477.32	118650.47
WS6	21/11/2017 12:17	3600	53	2	51	36.4	450477.32	118650.47



r^2 **0.920**
 dc/dt 0.011
 V/A 0.246
Q Value 0.00263 mg/m²/sec

Data comment: data has an r^2 value of ≥ 0.8 and is considered as having a high degree of association between time (t) and concentration (c)

Notes:

Background level of methane at test location recorded as 2ppm. All readings adjusted by background reading and rounded to nearest whole ppm value in line with resolution of TDL500/Laser One (1ppm)

Data highlighted yellow denotes data used in flux calculations in line with methodology presented in the Environment Agency Guidance on Monitoring Landfill Gas Surface Emissions LFTGN 07 v2 March 2010. Methane concentration readings converted from ppm into mg/m³ by a multiplication factor of 0.714

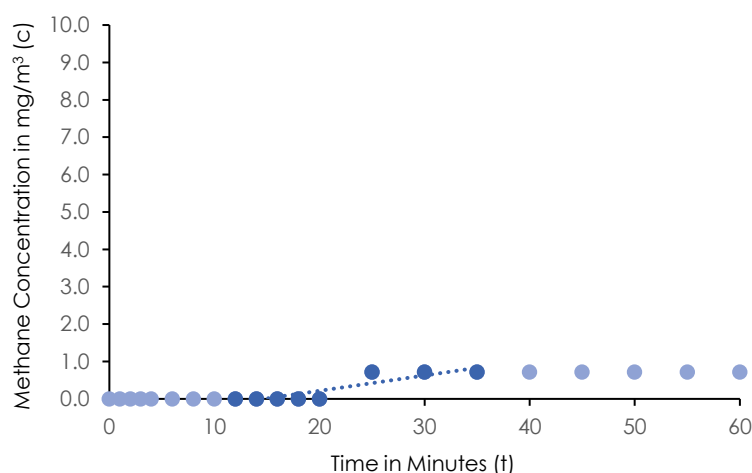
Knowle Lane Pit

FCT-WS7 Flux Chamber Test Results

November 2017



Test ID	Date & Time	Test Time in Seconds	Absolute Methane (ppm)	Background Methane (ppm)	Adjusted Methane (ppm)	Adjusted Methane (mg/m ³)	Easting	Northing
WS7	21/11/2017 12:27	0	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:28	60	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:29	120	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:30	180	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:31	240	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:33	360	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:35	480	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:37	600	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:39	720	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:41	840	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:43	960	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:45	1080	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:47	1200	2	2	0	0.0	450557.24	118511.75
WS7	21/11/2017 12:52	1500	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 12:57	1800	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:02	2100	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:07	2400	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:12	2700	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:17	3000	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:22	3300	3	2	1	0.7	450557.24	118511.75
WS7	21/11/2017 13:27	3600	3	2	1	0.7	450557.24	118511.75



r^2 **0.803**

dc/dt 0.001

V/A 0.246

Q Value 0.00017 mg/m²/sec

Data comment: data has an r^2 value of ≥ 0.8 and is considered as having a high degree of association between time (t) and concentration (c)

Notes:

Background level of methane at test location recorded as 2ppm. All readings adjusted by background reading and rounded to nearest whole ppm value in line with resolution of TDL500/Laser One (1ppm)

Data highlighted yellow denotes data used in flux calculations in line with methodology presented in the Environment Agency Guidance on Monitoring Landfill Gas Surface Emissions LFTGN 07 v2 March 2010. Methane concentration readings converted from ppm into mg/m³ by a multiplication factor of 0.714

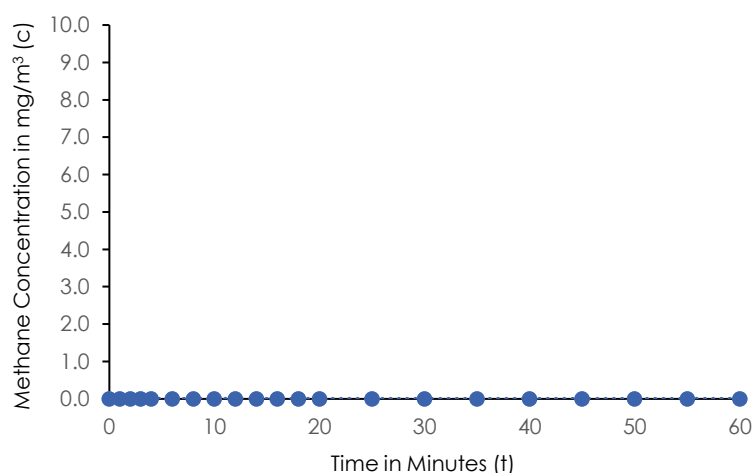
Knowle Lane Pit

FCT-WS9 Flux Chamber Test Results

November 2017



Test ID	Date & Time	Test Time in Seconds	Absolute Methane (ppm)	Background Methane (ppm)	Adjusted Methane (ppm)	Adjusted Methane (mg/m ³)	Easting	Northing
WS9	21/11/2017 11:06	0	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:07	60	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:08	120	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:09	180	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:10	240	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:12	360	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:14	480	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:16	600	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:18	720	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:20	840	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:22	960	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:24	1080	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:26	1200	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:31	1500	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:36	1800	2	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:41	2100	3	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:46	2400	3	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:51	2700	3	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 11:56	3000	3	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 12:01	3300	3	3	0	0.0	450473.34	118596.28
WS9	21/11/2017 12:06	3600	2	3	0	0.0	450473.34	118596.28



r^2 N/A

dc/dt 0.000

V/A 0.246

Q Value 0.00000 mg/m²/sec

Data comment: No concentration increase above background levels

Notes:

Background level of methane at test location recorded as 3ppm. All readings adjusted by background reading and rounded to nearest whole ppm value in line with resolution of TDL500/Laser One (1ppm)

Data highlighted yellow denotes data used in flux calculations in line with methodology presented in the Environment Agency Guidance on Monitoring Landfill Gas Surface Emissions LFTGN 07 v2 March 2010. Methane concentration readings converted from ppm into mg/m³ by a multiplication factor of 0.714

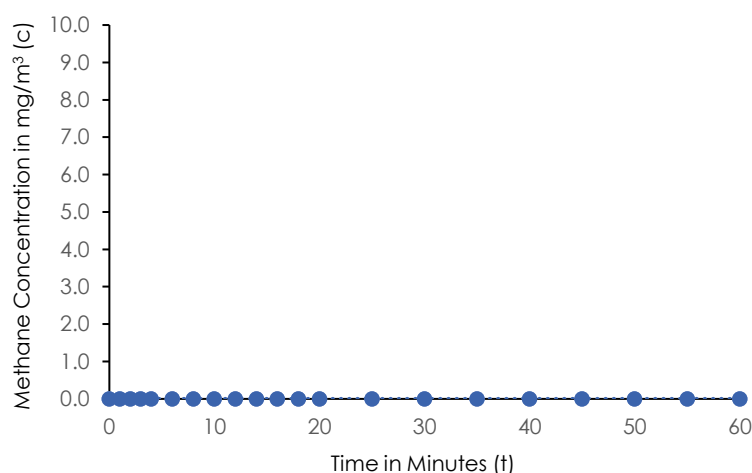
Knowle Lane Pit

FCT-WS12 Flux Chamber Test Results

November 2017



Test ID	Date & Time	Test Time in Seconds	Absolute Methane (ppm)	Background Methane (ppm)	Adjusted Methane (ppm)	Adjusted Methane (mg/m ³)	Easting	Northing
WS12	21/11/2017 12:08	0	3	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:09	60	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:10	120	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:11	180	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:12	240	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:14	360	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:16	480	3	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:18	600	3	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:20	720	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:22	840	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:24	960	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:26	1080	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:28	1200	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:33	1500	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:38	1800	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:43	2100	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:48	2400	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:53	2700	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 12:58	3000	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 13:03	3300	2	3	0	0.0	450502.24	118590.69
WS12	21/11/2017 13:08	3600	2	3	0	0.0	450502.24	118590.69



r^2 N/A
 dc/dt 0.000
 V/A 0.246
Q Value 0.00000 mg/m²/sec

Data comment: No concentration increase above background levels

Notes:

Background level of methane at test location recorded as 3ppm. All readings adjusted by background reading and rounded to nearest whole ppm value in line with resolution of TDL500/Laser One (1ppm)

Data highlighted yellow denotes data used in flux calculations in line with methodology presented in the Environment Agency Guidance on Monitoring Landfill Gas Surface Emissions LFTGN 07 v2 March 2010. Methane concentration readings converted from ppm into mg/m³ by a multiplication factor of 0.714

3.0

Field Log

Knowle Lane Pit

Emissions Mapping and Flux Chamber Survey

Field Log



Date & Time	Personnel	Weather Comment	Ground Conditions	Atmospheric Temp (°C)	Atmospheric Pressure (mbar)	Wind Speed (mph)	Wind Direction	Equipment Type	Equipment Serial Number	Calibration Due Date	110ppm Gas Check	Flux Chamber Reference
21/11/2017 07:45	J Freestone	Low-level cloud	Wet	11	1013	4	SW	Huberg Laser One	17912	24/07/2018	108.2	KVFB2
21/11/2017 14:30				13	1010	9	SW	Geotech TDL500	6940315	13/12/2017	107.4	KVFB

4.0

Geotech TDL500 and Huberg Laser One Calibration Certificates

Certificate Of Calibration

Delivered to : ENITIAL
NOTTINGHAMSHIRE - UK

Date of the report : 13/12/2016

Identifier of the detector

Detector name : Inspectra Laser

Serial Number : **6940315**

Scale numbers : 1

Next visit : 13/12/2017

Method of Checking

Internal procedures : ATE04226

Calibration Bench n° : 13

Each scale of the checked apparatus was the subject of a measurement for zero value, and of a measurement for the value of the concentration of the gas standard injected .

Scale	Gaz	Concentration of the gas standard	Traceability of the gas (N° of production)	Specifications (awaited posted values)	Uncertainty on the concentration of the gas standard
PPM	CH4	0,001% GAS	15-0865	10 PPM(± 10% relative)	± 2% relative
PPM	CH4	0,05% GAS	040005718077	500 PPM(± 10% relative)	± 2% relative
PPM	CH4	0,25% GAS	040004352449	2507 PPM(± 10% relative)	± 2% relative
PPM	CH4	1% GAS	040005338322	10000 PPM(± 10% relative)	± 2% relative
PPM	CH4	2% GAS	040004034267	20040 PPM(± 10% relative)	± 2% relative
PPM	CH4	100% GAS	82A-2850906	999950 PPM(± 10% relative)	± 2% relative

Base : CH4

Name	Gaz	Usual gas injected	Awaited value	Value read on the detector	Corrected value	Tolerance	Result
PPM	AZOTE	0 PPM	0 PPM	0 PPM	Without	5 PPM	Conforms
PPM	CH4	10 PPM	10 PPM	9,6 PPM	Without	10 %	Conforms
PPM	CH4	500 PPM	500 PPM	537,7 PPM	Without	10 %	Conforms
PPM	CH4	2500 PPM	2524 PPM	2683,7 PPM	Without	10 %	Conforms
PPM	CH4	10000 PPM	9990 PPM	10618,5 PPM	Without	10 %	Conforms
PPM	CH4	20000 PPM	20030 PPM	20932 PPM	Without	10 %	Conforms
PPM	CH4	1000000 PPM	999950 PPM	1043160 PPM	Without	10 %	Conforms

Result of the checking

The detector is considered to be in conformity with the specifications of reference

This document includes 1 page.

The reproduction of this report is authorized only in the shape of integral photographic facsimile.

This document is carried out according to the recommendations of the booklet of documentation X 07-011 defining the report of checking. It can be used to show the connection of the means of measurement to the national or international standards, provided it answers the recommendations of the booklet of documentation X 07-015.

Calibration certificate number 40714

Instrument LaserOne01

Serial number Huberg

17912.17

Description of the calibration procedure

UNI IEC ISO 14253-1: 2013 defines that the maximum permissible error limits are greater of the measurement uncertainty, calibration of the instrument is performed by measuring the response of the detection sensor compared to known concentrations. When the detected error is less than the maximum permissible error limits of the measuring equipment (as specified in its datasheet), the calibration is compliant.

Check of the instrument between 0 ÷ 10000 ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response1 (ppm)	Response2 (ppm)	Response3 (ppm)	Average response (ppm)	Max error (ppm)	Max error (% F.s.)
1000	0	0	0	0	0,00	0,00	0,00
1000	100	98	98	99	98,33	2,00	0,20
1000	1000	997	998	997	997,33	3,00	0,30

Uncertainty	0,30	%
Max % error	0,30	% Fs

Check of the instrument between 0 ÷ 100 % vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response1 (%vol)	Response2 (%vol)	Response3 (%vol)	Average response (%vol)	Max error (%vol)	Max error (% F.s.)
10	0	0	0	0	0,00	0,00	0,00
10	2,2	2,1	2,2	2,2	2,17	0,10	1,00
100	100	100	100	100	100,00	0,00	0,00

Uncertainty	1,00	%
Max % error	1,00	% Fs

Ambient condition by calibration

Temperature : 21 °C
Pressure : 1013 mBar
U.R. : 42 %

Calibration gas cylinders¹

Concentration	Serial Number	Date of expire	GAS
Air	010212	26/01/2022	AIR
99,7 PPM	288116	15/10/2017	CH4
996 PPM	126837	26/01/2018	CH4
2,19 % VOL	011632	08/09/2019	CH4
100 % VOL	003655	12/11/2018	CH4

Calibration results : POSITIVE

Next scheduled calibration

: 24/07/2018

Calibration date : 24/07/2017

Calibration supervisor

: Randi Mirco

¹ The certificate of the gases could be downloaded at the following address <http://www.huberg.com/certificati>