RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Technical Note

Project:	Low Moor Road, Sutton In Ashfield
Document No:	P16-549
Client:	Hallam Land Management Ltd
Subject:	Technical Note – Permeability Testing and Ground Gas Monitoring
Date:	13th September 2017
Prepared by:	A McVey – Senior Geo-Environmental Consultant
Authorised by:	Stewart Friel – Director

1.0 Introduction

In March 2017, Rodgers Leask Environmental Ltd (RLE) was commissioned by Hallam Land Management Ltd to undertake site investigation works at Low Moor Road, Sutton in Ashfield. The site investigation focussed on the northeast portion of land referred to as the RR parcel.

It is understood the site is to be redeveloped for a residential end use.

2.0 Objectives

The objectives of this investigation are to:

- Undertake window sample and cable percussive boreholes to determine depth of Made Ground in the former landfill area.
- Install boreholes with gas monitoring apparatus to enable assessment of the ground gas regime in the northern portion of the site in the area of the former landfill so that recommendations for gas protection measures can be provided.
- Undertake soil infiltration testing to determine the soil infiltration rate of the underlying natural strata and assess suitability for soakaway drainage. One fill per trial pit was required to inform preliminary infiltration rates for soakaway design.
- Give an indication of approximate pile lengths in the area of the former landfill in the north of the site.
- Conclusions and recommendations for further works if considered to be required.

3.0 Site Setting

The Site is located to the southwest of Sutton-in-Ashfield, Nottinghamshire. The Site centre co-ordinates are at approximately 451556E, 357656N.

British Geology Survey (BGS) digital mapping indicates that there is a record of in-filled ground comprising artificial deposits recorded within the northern portion of the site. This is described by the Environment Agency (EA) as a disused sand quarry which was used for land filling between 1980 and 1983. Deposited waste was described as 'inert waste' consisting largely of unaltered once buried waste such as glass, concrete, bricks, tiles, soil

and stones.

One area of superficial deposits is mapped on site encroaching onto the southwest portion of the site described by the BGS as glaciofluvial sand and gravel deposits.

The entire site is underlain by bedrock comprising the Lenton Sandstone Formation typified by red/brown with buff mottled fine to medium sandstone.

4.0 Site Investigation Works

4.1 Site Works

An intrusive investigation was carried between the 18th and 20th May 2017 by RLE and comprised the following scope of works:

- A total of six soakage trial pits (TPSA01 to TPSA04 inclusive) were excavated across the southern portion of the site to enable soil infiltration testing.
- A total of 2no CP boreholes (CP01 & CP02) were advanced in the area of the former landfill to determine the type and depth of Made Ground in the landfill and to enable subsequent ground gas monitoring to be carried out.
- A total of 8no WS boreholes (WS01 to WS08) were advanced in the approximate area of the former landfill to determine the type and extent of Made Ground in the landfill and to enable subsequent ground gas monitoring to be carried out.

The approximate location of the exploratory holes are indicated on the exploratory hole location plan, ref: P16-549 -100-A contained in **Enclosure 1** of this report.

4.2 Ground Conditions

The ground conditions encountered comprised Made Ground Topsoil / natural Topsoil overlying granular and cohesive Made Ground deposits overlying weathered Lenton Sandstone Formation deposits. Details of the findings are summarised as follows:

Strata Encountered	Depth encountered to top of strata (range, m)	Depth encountered to base of strata (m) [range, m]	Thickness of strata (m) [range, m]
MADE GROUND TOPSOIL Encountered across the northern half of the site in the areas of the former landfill. Comprising dark brown sandy topsoil with gravel of quartzite and occasional brick.	0	0.2 to 0.6	0.2 to 0.45
TOPSOIL Encountered across the southern half of the site comprising dark brown sandy Topsoil.	0	0.2 to 0.6	0.2 to 0.6

Strata Encountered	Depth encountered to top of strata (range, m)	Depth encountered to base of strata (m) [range, m]	Thickness of strata (m) [range, m]
MADE GROUND Encountered in the northern portion of the site. Typically consisting of sand and gravels of brick, concrete, coal, limestone, quartzite and occasional clay. Within CPBH101 pockets of topsoil were encountered between 1.0m and 2.7mbgl and in CPBH102, fragments of wood were encountered between 0.4mbgl and 6.0mbgl.	0.2 to 0.6	0.8 to 8.6	0.35 to 8.30
LENTON SANDTONE FORMATION Encountered below the Made Ground in the northern half of the site and the topsoil in the southern half of the site recovered as orange brown and reddish brown sand with occasional quartzite and sandstone gravels. A stiff reddish brown clay (similar in appearance to completely weathered mudstone) was encountered in the base of 2.no soakaway test pit locations (TPSA01 and TPSA04). A band of clay was also encountered in TPSA03 between 0.2m and 0.5mbgl.	0.2 to 8.60	Not proven by boreholes	Not proven by boreholes

Groundwater was not encountered at any of the exploratory hole locations.

No visual or olfactory evidence of contamination was encountered during the investigation works.

A detailed description of ground conditions encountered is contained within the exploratory hole logs presented within **Enclosure 2** of this report.

4.3 Soil Infiltration Testing

A total of six soakage trial pits (TPSA01 to TPSA06 inclusive) were excavated across the southern portion of the site (outside the landfill area) to enable soil infiltration testing. All trial pits were excavated using a JCB 3CX type excavator. Trial pits were excavated to depths of between 1.3m bgl and 1.6m bgl ensuring vertical sides which were trimmed square.

An RLE Engineer directed and logged the infiltration testing of the soakage trial pits under guidance of BRE Digest 365 ‘Soakaway Design’ and in accordance with BS5930 2015 ‘Code of Practice for Site Investigations’. BRE 365 states ‘the soakaway should discharge from full to half volume within 24 hours in readiness for subsequent storm inflow.’

Using a water bowser, all soakage trial pit locations were rapidly filled with water, ensuring the flow did not cause the collapse of the side walls. The water level and the time taken for

the pits to drain were recorded. Each pit was filled once to allow for preliminary infiltration rates to be calculated. Where possible, each pit was left for 24 hours to assess if each pit would discharge from full to half volume in readiness for subsequent storm inflow.

Rodgers Leask Ltd, commissioned to design the proposed drainage strategy, was consulted prior to undertaking the intrusive works in order to establish the required locations for the infiltration tests.

As recommended in the BRE document, the determination of infiltration rates can use the design method adopting the results determined from 75% to 25% effective depth. However, the time taken to drain to 75% was not reached within 4 of the trial test pits (TPSA02, TPSA03, TPSA04 and TPSA06). Where 75% of the effective water depth was not achieved during the test, the data gathered at these locations was used to extrapolate the time taken to drain to75% of the effective water depth so that an infiltration rate can be derived.

In the remaining 2 locations (TPSA01 and TPSA05), 75% of the effective water depth was achieved allowing actual infiltration rates to be calculated. The actual and derived soil infiltration rates are summarised in **Table 1** below and the data is presented in **Enclosure 3.**

Table 1: Soil Infiltration Test Results

Location	Water Level at Beginning (m bgl)	Soil Infiltration Rate (f) (m/s)	Water discharged from Full to Half Volume within 24 Hours	Soil Horizon
TPSA01	0.3	1.28×10^{-05}	Yes	Sand and Clay - Lenton Sandstone Formation
TPSA02	0.32	$*2.02 \times 10^{-06}$	*Yes	Sand - Lenton Sandstone Formation
TPSA03	0.5	$*3.02 \times 10^{-06}$	*Yes	Sand and Clay - Lenton Sandstone Formation
TPSA04	0.25	$*1.51 \times 10^{-06}$	*Yes	Sand and Clay - Lenton Sandstone Formation
TPSA05	0.25	7.87×10^{-06}	Yes	Sand - Lenton Sandstone Formation
TPSA06	0.28	$*4.24 \times 10^{-06}$	*Yes	Sand - Lenton Sandstone Formation

*Infiltration rates derived from extrapolated data.

4.4 Ground Gas Monitoring

The risk to end users from ground gas has been assessed in accordance with the following documents:

- British Standards BS8485:2015 – Code of practise for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
- CIRIA C665: Assessing risks posed by hazardous ground gas to buildings, 2007.

A minimum of 12 gas monitoring visits over a period of 6 months is recommended in accordance with CIRIA C665. This assessment is based on a moderate generation potential (former inert landfill) and a high sensitivity development (residential). However, as an initial assessment, a total of 6 gas monitoring visits have been conducted over a period of 3 months.

Gas monitoring has been carried out using a Geotechnical Instruments GA2000 infra-red landfill gas analyser with integral flow measuring capability. Monitoring has been carried out within all of the boreholes on site on dates ranging between the 27th April 2017 and 19th July 2017. Gas monitoring was predominantly carried out where atmospheric pressure was >1000mb but with pressure noted to be falling. However, it should be noted that gas monitoring has been carried out on three occasions where the barometric pressure was recorded <1000mb (lowest recorded at 987mb whilst pressure was in a falling state). A summary of the maximum borehole hazardous gas flow rates for carbon dioxide and methane recorded during each monitoring visit undertaken is presented below in **Table 2** and the gas monitoring data sheets are presented in **Enclosure 4.**

Table 2: Ground Gas Monitoring Results Summary

Monitoring Visit	Max. CH_4 Concentration* (%v/v)	Max. CO_2 Concentration* (%v/v)	Max. Steady Gas Flow Rate (l/hr)	Borehole Hazardous Gas Flow Rate, Q_{hg} CH_4 (l/hr)	Borehole Hazardous Gas Flow Rate, Q_{hg} CO_2 (l/hr)
27.04.17	<0.1	7.7	0.1	0.0001	0.0077
02.05.17	<0.1	5.8	<0.1	0.0001	0.0058
17.05.17	2.1	7.6	<0.1	0.0021	0.0076
26.05.17	2.2	9.1	<0.1	0.0022	0.0091
29.06.17	3.4	6.3	<0.1	0.0034	0.0063
19.07.17	3.1	13.9	<0.1	0.0031	0.0139

* Including peak and steady values

The data obtained from the six gas monitoring visits can be summarised into the following salient points:

- The data suggests that there is no direct correlation between CO_2 concentration and atmospheric pressure. However, the maximum CO_2 concentration recorded coincided with the lowest recorded pressure event (987mb falling pressure) during the last gas monitoring visit.
- Methane was only detected in CPBH01, CPBH02, WS04 and WS05 but at concentrations of <5% v/v.
- Methane was detected in CPBH01 on the last 4 monitoring occasions and in CPBH02 during the 1st, 3rd, 4th and 6th monitoring occasion during both rising and falling barometric trends. The two CP boreholes had gas monitoring wells installed to 8.5m (approximate base of the fill).
- Methane was detected in WS04 on the last two monitoring visits only which coincided with low and falling barometric pressures.
- Generally, the presence of methane coincided with low and falling atmospheric

pressure suggesting that there may be some direct correlation between the two.

- All data to date is limited and two of the boreholes in which methane was identified at the highest concentrations were encountered when drilled deeper, suggesting that methane detection may be related to the nature of the inert fill at depth.
- Gas flow rates have been recorded to be very low to negligible irrespective of atmospheric pressure. This suggests a negligible gas source which is consistent with the inert nature of the fill.
- Concentrations of carbon monoxide were generally recorded at very low levels (1ppm or less) or below in all boreholes on every monitoring occasion.

5.0 Conclusions & Recommendations

5.1 Soil Infiltration Testing

A total of six soakage trial pits (TPSA01 to TPSA06) were excavated across the southern portion of the site (outside the landfill area) to enable soil infiltration testing under guidance of BRE Digest 365 'Soakaway Design'

Infiltration rates ranging between 1.5 x 10^{-6} m/s and 1.3 x 10^{-5} m/s were recorded for the Lenton Sandstone Formation (LSF) in this area of the site.

The testing indicates that the LSF displays variable rates of infiltration, generally towards the lower end of rates which would be considered feasible for the use of soakaways. This may be attributed to layers and pockets of cohesive strata encountered in the base of selected trial pits or the amount of fines within the sand. The advice of a drainage engineer should therefore be sought with regard to assessing the suitability of the ground for on plot or basin type methods of infiltration. Should these prove insufficient for the proposed development, an alternative means of surface water drainage would be required.

Further targeted on site testing to full BRE365 specification may be required should plot specific soakaways or an infiltration basis be proposed.

5.2 Ground Gas Monitoring

Both the CIRIA Report and the British Standard require the calculation of a Gas Screening Value (GSV). This is calculated as the maximum recorded percentage gas concentrations multiplied by the maximum gas flow rate. Where concentrations or flow rates which are less than the limit of detection on the analyser have been recorded, the limit of detection has been used (0.1% for gas concentration, 0.1 l/hr for gas flow rates).

Gas screening values have been calculated using the following figures, and based on worst case hazardous gas concentrations and flow rates from all boreholes:

C_{hg} Methane (% v/v)	C_{hg} Carbon Dioxide (% v/v)	Steady Gas Flow Rate (l/hr)	Hazardous Gas Flow Rate, Q_{hg} CH_4 (l/hr)	Hazardous Gas Flow Rate, Q_{hg} CO_2 (l/hr)	Implied Characteristic Situation (CS)	NHBC Traffic Light System
3.4	13.9	0.1	0.0034	0.0139	CS-1	Green

BS8485 states that 'Where a development is to be built directly on or very close to the source of gas, then the Q_{hg} adopted as the site or zone GSV should be based on gas measurements of the source'. The source of the highest gas concentrations and flow rates were associated with borehole installations targeted within the Made Ground (inert landfill material).

In accordance with the NHBC Traffic Light System, based on the calculated gas screening value, the area of former landfill would be classified as 'Green'. However, in accordance with guidance presented within CIRIA C665, it is recommended that an Amber 1 classification is adopted at the site corresponding to a low to intermediate gas regime, for the following reasons:

- Made ground has been consistently encountered across the monitoring area and is likely to be consistently present in-between monitoring locations presenting a continued source of soil gas;
- Carbon dioxide has been recorded above 5% on numerous separate monitoring occasions in different boreholes across the former landfill area but has typically been recorded at <10% v/v during the monitoring period;
- Methane has been recorded above 1% in only one of the deeper cable percussion boreholes (CPBH01) on 4 separate monitoring occasions and in CPBH02 on only 1 out of 6 monitoring occasions within the former landfill area;

At this stage, it is considered that Amber 1 gas protection measures would be required, for any development coinciding with the area of the former landfill. Gas protection measures commensurate with Amber 1 conditions would typically comprise a membrane and ventilated sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414 (Johnson, 2001).

Certification is not a requirement of Amber 1 classified sites; however BS 8485:2015 recommends that all membranes are verified in accordance with CIRIA C735. In addition, the Local Authority may require all membrane installations to be independently verified / certified. This requirement should be confirmed with the Local Authority prior to development.

The data collated would suggest that the domestic landfill located adjacent to the northeast of the site is either not generating significant concentrations of gas or is not migrating significantly onto the site, as methane has not been detected within the boreholes located closest to the off-site landfill. Methane has generally been detected at low concentrations with maximum concentrations recorded within the deeper CP boreholes which generally suggests that the methane is potentially being generated in the deeper fill as opposed to migrating from off site. The concentrations of methane recorded in the CP boreholes might be attributed to organic remnants encountered at these locations. Within CPBH101 pockets of topsoil were encountered between 1.0m and 2.7mbgl and wood fragments were encountered between 0.4mbgl and 6.0mbg in CPBH102, whereby both could be considered as a potential source of methane.

In general, the available data is considered consistent with the recorded and verified inert nature of the waste deposited in the landfill, and is not considered to represent a significant source of ground gas (generally low gas concentrations and flow rates recorded). The risk

could be mitigated by incorporating relevant gas protection measures within buildings overlying the landfill material. However, further gas monitoring is recommended across the site to confirm this preliminary assessment prior to development. The Local Authority may require a longer monitoring period is conducted during the worst case weather events such as sustained periods of low pressure.

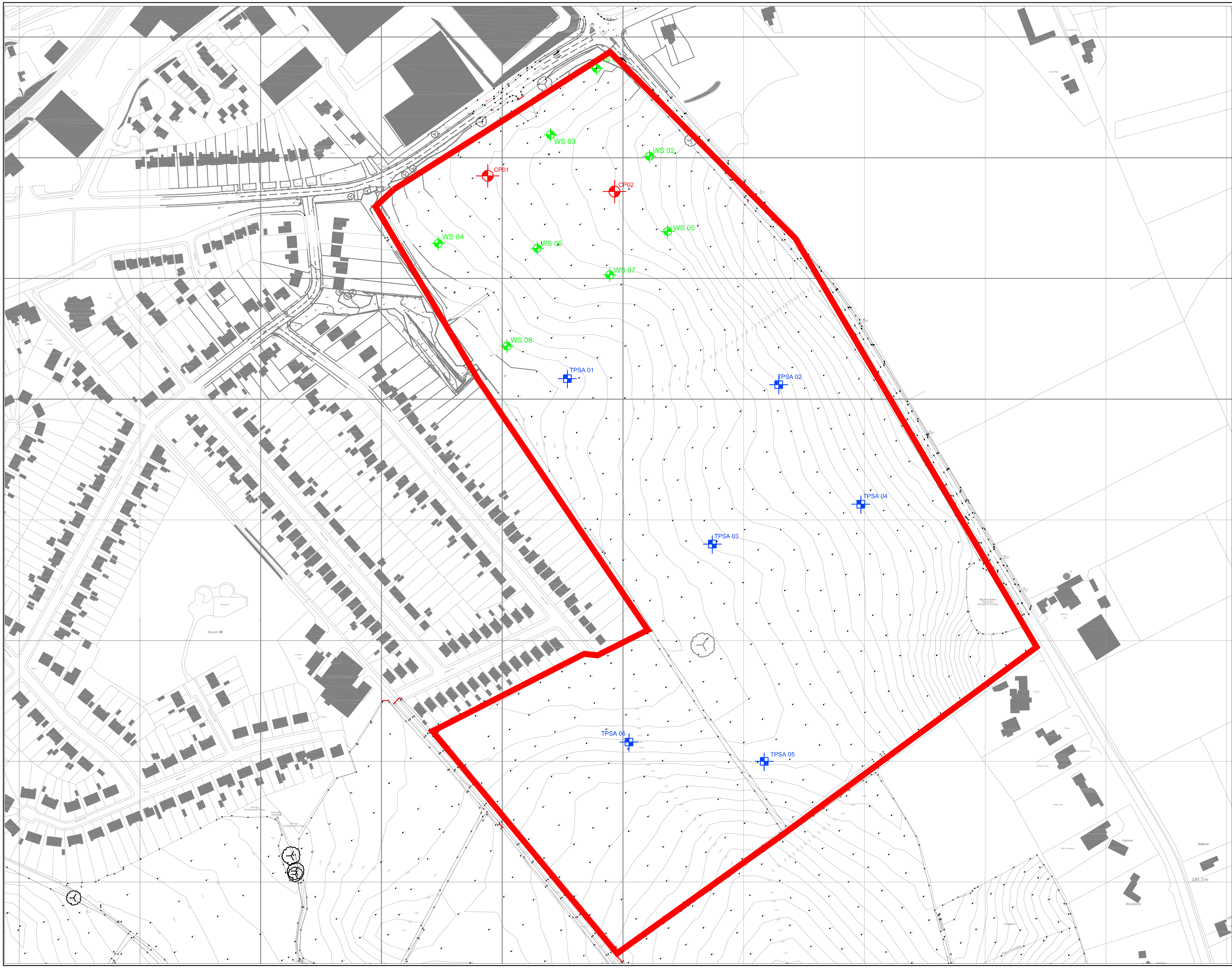
5.3 Depth of Made Ground and Influence on Foundation Design

Variable depths of Made Ground deposits have been encountered across the area of the site where the former inert landfill is located in the north east of the site. The available data would suggest that Made Ground deposits of up to 9.4m deep can be expected in the centre of the former landfill (but which could potentially extend deeper). As such, a piled foundation solution would be required for any plot coinciding within this area of the site. Piles would be required to transfer loads to the underlying very dense gravelly sand (Lenton Sandstone Formation) encountered below the Made Ground. At this stage, based on the available data, pile lengths of circa.10m should be expected and the Made Ground encountered would suggest that driven piles should be suitable.

On the outskirts of the inert landfill, shallower Made Ground deposits have been encountered (<2.5m deep) which may suggest that the use of traditional foundations could potentially be feasible within any plots coinciding with areas of shallower Made Ground. This would be dependent on the stability of the Made Ground materials and type of material encountered.

It is recommended that further investigation and delineation works should be carried out across the area of the former inert landfill should this area be considered for redevelopment to determine the number of potential plots requiring piled foundations / traditional foundations to be adopted.

Enclosure 1: RLE Exploratory Hole Location Plan



GENERAL NOTES

NO DIMENSIONS TO BE SCALED OFF THIS DRAWING.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.

ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY

Denotes approximate location of site boundary

TPSA 01 — Approximate location and reference of Machine Excavated Trial Pit Soakaway Test

CP 01 — Approximate location and reference of Cable Percussive Borehole

WS 01 — Approximate location and reference of Window Sample Borehole

Rev.	Date	Amendments	By	Chk. by
A	10.4.17	Amended to fit site constraints after pre start site meeting.	MC	IPB

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Consulting Geotechnical & Environmental Engineers

Client
Hallam Land Management

Project
Land Off Low Moor Road Sutton in Ashfield

Drawing Title
Borehole and Trial Pit / Soakaway Test Pit Location Plan

Status
INFORMATION

Scale	Drawn	Checked	Date
NTS	AT	IPB	12/04/17

Project No.	Drawing No.	Rev.
P16-549	100	A

File Path:

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Enclosure 2: RLE Exploratory Hole Logs

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451578E - 358574N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
						MADE GROUND - Brown sandy gravelly, slightly clayey reworked topsoil. Gravel is fine to coarse, sub-angular to sub-rounded quartzite and occasional brick.			
					0.45	MADE GROUND - Red/brown occasionally black sandy gravel. Gravel is fine to coarse, sub-angular burnt shale and occasional brick.			
0.70	D1	ES			0.60	MADE GROUND - Black ashy gravelly sand containing occasional fragments of glass. Gravel is fine to coarse, sub-angular coal, sandstone and brick.			
1.00	D2	ES			0.80	Medium dense orange/brown fine to medium grained SAND containing occasional fine quartzite gravel. [LENTON SANDSTONE FORMATION]			
1.00		SPT	N=13 (2,2/2,3,4,4)		1				
						Hard drill from 1.5m			
2.00		SPT	50 (8,17/50 for 145mm)		2	*Becoming very dense at 2.0m*			
					2.30	End of Borehole at 2.300m			
					3				
					4				
					5				

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 2.3m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451627E - 358524N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
						MADE GROUND - Brown slightly sandy clayey gravelly reworked topsoil. Gravel is fine to coarse, sub-angular brick, sandstone and quartzite.			
					0.30	MADE GROUND - Orange/brown slightly clayey gravelly sand. Gravel is fine to coarse, sub-rounded to sub-angular sandstone, quartzite and limestone.			
					0.60	MADE GROUND - Soft to firm orange/brown occasionally mottled black very sandy clay.			
1.00		SPT	N=5 (1,1/1,1,2,1)		1.00	MADE GROUND - Soft to firm grey/black sandy gravelly reworked clay. Contains occasional small tree fragments. Gravel is fine to coarse, sub-angular sandstone, brick and quartzite.			
1.20	D1	ES				*Hard drill between 1.5 - 2.0m*			
2.00	D2	ES			2.00	MADE GROUND - Orange/brown/black slightly clayey sandy gravel. Occasional lenses of reworked soft to firm clay. Gravel is fine to coarse, sub-angular coal, brick, sandstone, limestone and slag.			
2.00		SPT	N=25 (9,13/7,6,6,6)			*Rope/twine at 2.3m*			
						Occasional limestone cobbles at 2.6m			
3.00		SPT	N=9 (3,2/3,2,2,2)						
					3.40	Very dense orange/brown gravelly fine to coarse SAND. Gravel is fine to medium, sub-angular to angular of sandstone. [LENTON SANDSTONE FORMATION]			
					3.50	End of Borehole at 3.500m			

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 3.5m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451540E - 358519N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
					0.30	MADE GROUND - Brown sandy gravelly, slightly clayey reworked topsoil. Gravel is fine to coarse, sub-angular to sub-rounded quartzite and occasional brick.			
					0.70	MADE GROUND - Black slightly clayey gravelly SAND containing lenses of reworked black clay. Gravel is fine to coarse, sub-angular to sub-rounded brick, sandstone and quartzite. *Hard drill between 0.6 - 1.0m*			
0.75	D1	ES			0.85	MADE GROUND - Red/brown gravel. Gravel is fine to coarse, sub-angular to angular burnt shale, brick and occasional slag.			
0.90	D2	ES							
1.00		SPT	N=21 (11,8/7,6,4,4)		1.20	MADE GROUND - Dense black sandy gravel. Gravel is fine to coarse, sub-angular to rounded quartzite with fine brick and coal.			
1.30	D3	ES				Medium dense orange/brown fine to medium SAND containing occasional quartzite gravel.			
2.00		SPT	N=35 (3,5/5,8,10,12)		2.65	End of Borehole at 2.650m			

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 2.65m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451447E - 358429N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	19/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
0.10	D1	ES			0.20	MADE GROUND - Brown sandy gravelly, slightly clayey reworked topsoil. Gravel is fine to coarse, sub-angular to sub-rounded quartzite and occasional brick.			
0.40	D2	ES			0.50	MADE GROUND - Orange/brown silty reworked sand.			
1.00		SPT	50 (3,8/50 for 155mm)		1.06	MADE GROUND - Stiff black/grey ashy gravelly clay. Gravel is sub-angular to sub-rounded, fine to coarse, coal, brick, limestone and quartzite.			
						End of Borehole at 1.060m			

1 2 3 4 5

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 1.06m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451637E - 358439N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
0.10	D1	ES				MADE GROUND - Brown slightly clayey sandy gravelly topsoil. Gravel is fine to coarse, sub-rounded to sub-angular quartzite and occasional brick.			
					0.30	MADE GROUND - Orange/brown clayey silty gravelly reworked sand. Containing lenses of orange/brown reworked sand containing clay/silt. Gravel is fine to coarse quartzite.			
0.60	D2	ES							
1.00		SPT	N=10 (5,8/3,3,2,2)		1.00	MADE GROUND - Stiff to firm brown sandy gravelly mixed clay containing occasional cobbles of limestone and brick. Gravel is fine to coarse, sub-angular to angular brick, limestone and coal.			
2.00		SPT	N=14 (2,1/2,2,5,5)						
					2.50	MADE GROUND - Red/brown gravelly slightly clayey reworked sand. Gravel is fine to coarse, sub-angular brick and red sandstone.			
3.00		SPT	N=7 (3,2/2,2,2,1)			*Concrete cobble at 3.1m*			
						Sandy clay lense between 3.15 and 3.25m			
4.00		SPT	N=15 (4,2/2,2,3,8)		4.45	End of Borehole at 4.450m			

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole terminated at 4.45m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS06**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451529E - 358425N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	19/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
					0.30	MADE GROUND - Brown sandy slightly gravelly topsoil. Gravel is quartzite.			
1.00		SPT	N=27 (10,12/4,11,9,3)		1.00	MADE GROUND - Orange/brown slightly clayey gravelly sand. Gravel is sub-rounded, fine to coarse quartzite.			
1.10	D1	ES				MADE GROUND - Medium dense, white/grey sandy gravel. Gravel is fine to coarse, sub-angular to angular of limestone, brick and quartzite. *Hard drill between 1.0 - 1.4m*			
					1.40	MADE GROUND - Firm grey mottled black gravelly silty reworked clay. Gravel is limestone, brick and quartzite.			
					1.70	MADE GROUND - Black clayey sandy slightly ashy gravel. Gravel is brick, sandstone, concrete, quartzite and coal. Wood fragments and lenses of reworked clay encountered throughout.			
2.00	D2	ES							
2.00		SPT	N=7 (2,2/2,1,2,2)						
3.00		SPT	N=13 (4,3/2,4,3,4)						
					3.40	End of Borehole at 3.400m			

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 3.4m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS07**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451589E - 358403N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
					0.35	MADE GROUND - Brown sandy clayey gravelly reworked topsoil. Gravel is fine to coarse, sub-angular quartz and brick.			
					0.60	MADE GROUND - Red/brown fine to coarse reworked sand with occasional brown clay lenses.			
0.70	D1	ES				MADE GROUND - Firm brown occasionally black mottled ashy very sandy gravelly clay. Gravel is fine to coarse, sub-angular coal, limestone, sandstone and brick with occasional grey slag fragment.			
1.00		SPT	N=12 (2,2/2,1,3,6)		1.00	Medium dense brown gravelly fine to coarse SAND. Gravel is quartzite. [LENTON SANDSTONE FORMATION]			
1.20	D2	ES			1.30	Medium dense orange/brown fine to coarse SAND. [LENTON SANDSTONE FORMATION]			
						Hard drill from 1.5m			
					1.80	End of Borehole at 1.800m			

Remarks

1. No Water Encountered 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 1.8m 4. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **WS08**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451504E - 358344N	Hole Type WLS
Location:	Sutton In Ashfield		Level:		Scale 1:25
Client:	Hallam Land Management		Dates:	19/04/2017	Logged By VH

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
0.30	D1	ES				Dark brown very sandy gravelly reworked TOPSOIL. Gravels of quartzite.			
0.70	D2	ES			0.60	Light brown fine to medium SAND containgin occasional quartzite gravel. [LENTON SANDSTONE FORMATION]			
1.00		SPT	N=10 (2,2/3,2,2,3)		0.80	Medium dense light grey with occasional green mottling slightly silty fine to coarse SAND containing occasional lenses of sandy silt. [LENTON SANDSTONE FORMATION]			
					1.30	Medium dense orange/brown silty fine to coarse SAND. [LENTON SANDSTONE FORMATION]			
					1.70	Dense orange/brown fine to coarse SAND with occasional clay lenses. [LENTON SANDSTONE FORMATION]			
2.00		SPT	N=31 (3,3/5,6,10,10)						
3.00		SPT	50 (9,11/50 for 165mm)			*Becoming very dense at 3.0m.*			
					3.30	End of Borehole at 3.300m			

Remarks

1. Groundwater at 2.5m 2. No visual or olfactory evidence of contamination encountered
3. Borehole refused at 3.3m 4. Gas and Groundwater monitoring well installed.

Trial Pit Log

TrialPit No
TPSA01
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451554E - 358317N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 2.00 x 0.60 Depth 1.30	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.25	Orange brown fine to coarse SAND. [LENTON SANDSTONE FORMATION]		
					1.10	Firm to stiff red brown silty CLAY.		
					1.30	End of Pit at 1.300m		

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Trial Pit Log

TrialPit No
TPSA02
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451729E - 358312N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 2.00 × 0.60 Depth 1.45	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.20	Orange brown fine to medium SAND. Gravels of occasional fine to medium, sub-rounded quartzite. [LENTON SANDSTONE FORMATION]		
					1.45	End of Pit at 1.450m		

1
2
3
4
5

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Trial Pit Log

TrialPit No
TPSA03
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451647E - 358180N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 2.00 x 0.60 Depth 1.60	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.20	Firm to stiff red brown sandy CLAY with pockets of red brown SAND. [LENTON SANDSTONE FORMATION]		
					0.50	Red brown fine to medium SAND. [LENTON SANDSTONE FORMATION]		
					1.60	End of Pit at 1.600m		

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Trial Pit Log

TrialPit No
TPSA04
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451797E - 358213N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 2.00 x 0.60 Depth 1.40	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.30	Orange brown fine to medium SAND. [LENTON SANDSTONE FORMATION]		
					1.00	Stiff reddish brown occasionally greenish grey and yellow silty sandy CLAY.		
					1.40	End of Pit at 1.400m		

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Trial Pit Log

TrialPit No
TPSA05
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451717E - 358000N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 1.20 x 0.60 Depth 1.40	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.25	Orange red brown fine to medium SAND. Occasional gravels of fine to coarse, sub-rounded quartzite to 1.0m. [LENTON SANDSTONE FORMATION]		
					1.40	End of Pit at 1.400m		

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Trial Pit Log

TrialPit No
TPSA06
Sheet 1 of 1

Project Name: Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords: 451605E - 358216N Level:	Date 19/04/2017
Location: Sutton In Ashfield		Dimensions (m): 2.00 x 0.60 Depth 1.30	Scale 1:25
Client: Hallam Land Management			Logged AM

Samples & In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strike
Depth	Ref.	Type	Results					
						Dark brown sandy TOPSOIL.		
					0.30	Red orange brown fine to medium SAND. [LENTON SANDSTONE FORMATION]		
					1.10	Orange red brown fine to medium SAND with occasional pockets of stiff red silty clay. [LENTON SANDSTONE FORMATION]		
					1.30	End of Pit at 1.300m		

Remarks: 1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Excavation backfilled with arisings on completion.

Stability: Stable

Borehole Log

Borehole No. **CP01**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451488E - 358485N	Hole Type CP
Location:	Sutton In Ashfield		Level:		Scale 1:50
Client:	Hallam Land Management		Dates:	18/04/2017	Logged By RW

Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
					0.20	MADE GROUND - Dark brown sandy topsoil.			
						MADE GROUND - Stiff red brown sandy clay.			
1.20		SPT	50 (2,10/15,27,8,)		1.00	MADE GROUND - Brown grey medium ashy gravelly sand. Gravel is angular to sub-angular, fine to coarse brick with occasional pockets of topsoil.			
2.00		SPT	N=21 (5,6/7,5,4,5)		2.70				
3.00		SPT	N=50 (9,9/13,12,15,10)			Very dense red brown silty gravelly SAND. Gravels of fine to medium sub-rounded quartzite. [LENTON SANDSTONE FORMATION]			
4.00		SPT	N=50 (4,9/11,12,12,15)		4.45	End of Borehole at 4.450m			

1
2
3
4
5
6
7
8
9
10

Remarks

1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Gas and Groundwater monitoring well installed.

Borehole Log

Borehole No. **CP02**

Sheet 1 of 1

Project Name:	Low Moor Road, Sutton-in-Ashfield	Project No. P16-549	Co-ords:	451593E - 358472N	Hole Type CP
Location:	Sutton In Ashfield		Level:		Scale 1:50
Client:	Hallam Land Management		Dates:	19/04/2017	Logged By RW

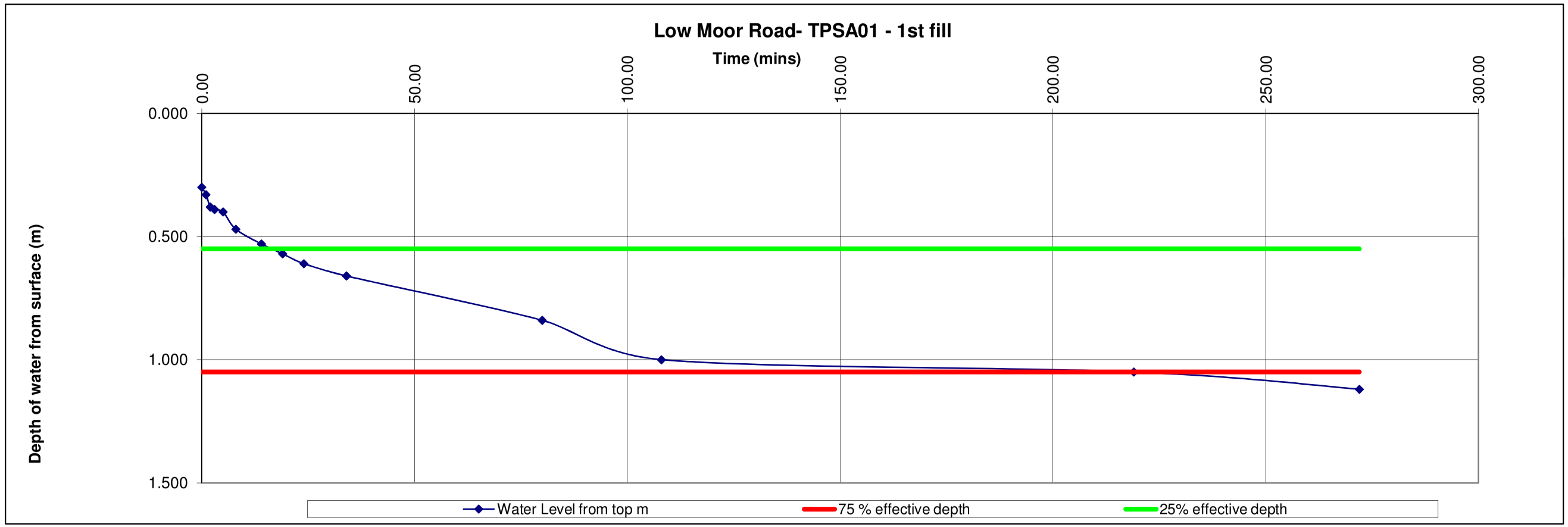
Sample and In Situ Testing				Level (m)	Depth (m)	Stratum Description	Legend	Water Strikes	Well
Depth (m)	Ref.	Type	Results						
					0.30	MADE GROUND - Dark brown sandy topsoil.			
					0.40	MADE GROUND - Red brown clayey sand.			
						MADE GROUND - Brown ashy fine sand containing fragments of brick and wood.			
1.20		SPT	N=8 (2,2/2,1,2,3)						
2.00		SPT	N=23 (3,4/7,8,5,3)						
3.00		SPT	N=16 (2,1/2,4,8,2)						
4.00		SPT	N=18 (4,8/5,5,3,5)						
5.00		SPT	N=6 (2,1/2,2,1,1)						
6.00		SPT	N=13 (5,4/6,3,2,2)		6.00	MADE GROUND - Brown sandy gravel. Gravel is sub-rounded to sub-angular fine to coarse brick and sandstone.			
7.00		SPT	N=13 (2,3/4,1,5,3)						
8.00		SPT	N=22 (5,4/7,4,3,8)						
					8.60	Very dense red brown silty gravelly SAND. Gravel is fine to medium sub-rounded quartzite.			
9.00		SPT	50 (5,5/50 for 150mm)						
					9.45	End of Borehole at 9.450m			

Remarks

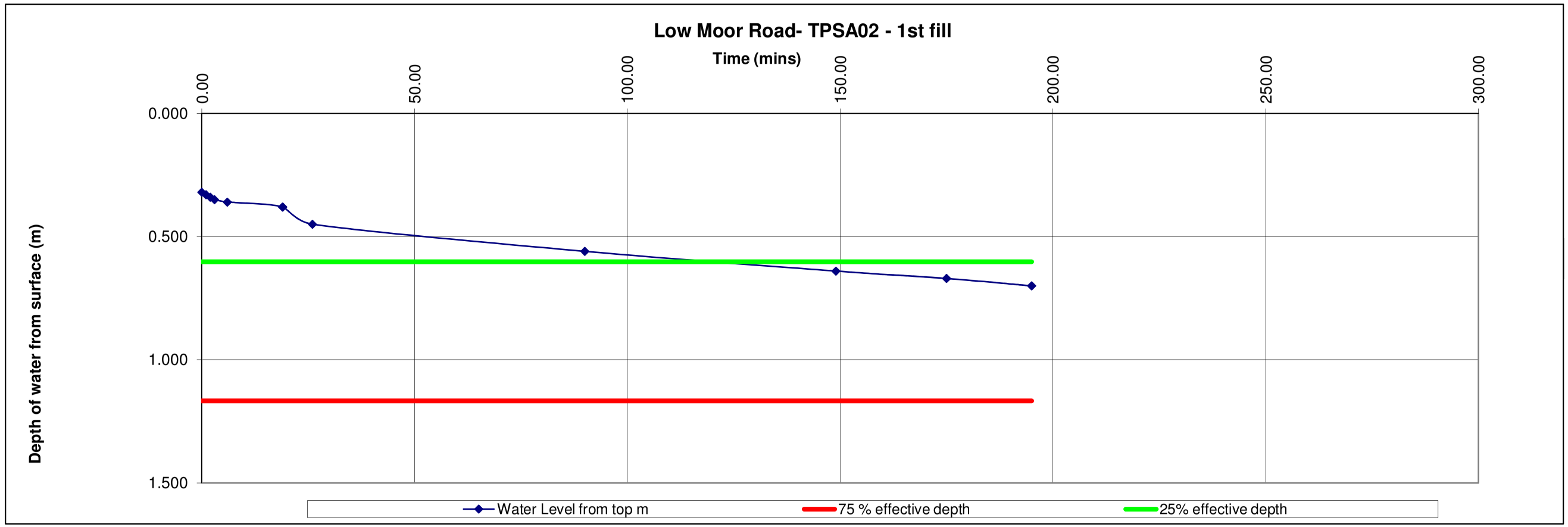
1. No Groundwater Encountered 2. No visual or olfactory evidence of contamination encountered
3. Gas and Groundwater monitoring well installed.

Enclosure 3: Soil Infiltration Test Result

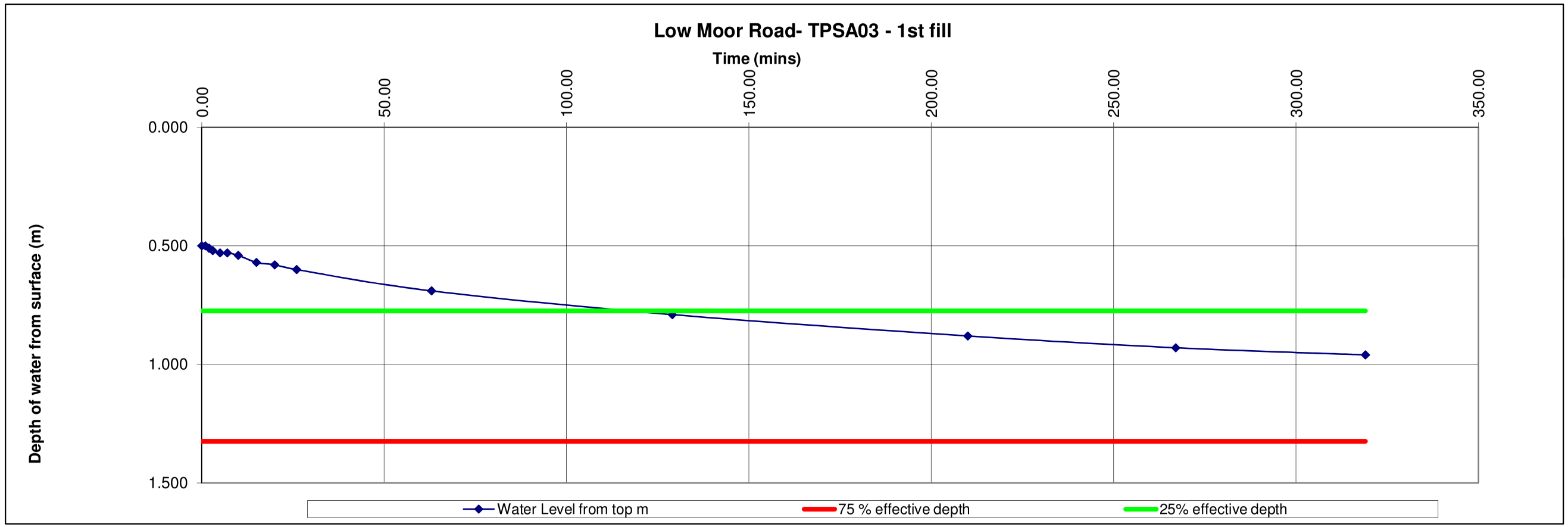
BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA01		
Depth	1.30		
Length	2.00		
Width	0.60		
water level from surface at start	0.30		
Time to 25 % empty mins	14.00		
Time to 75 % empty mins	219.00		
Time for outflow between 75% and 25 % effective depth mins	205		
Height of water in TP	1		
Effective depth m	1		
75% effective depth	1.05		
25% effective depth	0.55		
vol between 75% and 25% m3	0.6		
Mean Surface Area m50 m2	3.8		
Soil Infiltration Rate f m/s	1.28E-05		


Low Moor Road- TPSA01 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
0.000
0.500
1.000
1.500
Depth of water from surface (m)
Water Level from top m
75 % effective depth
25% effective depth

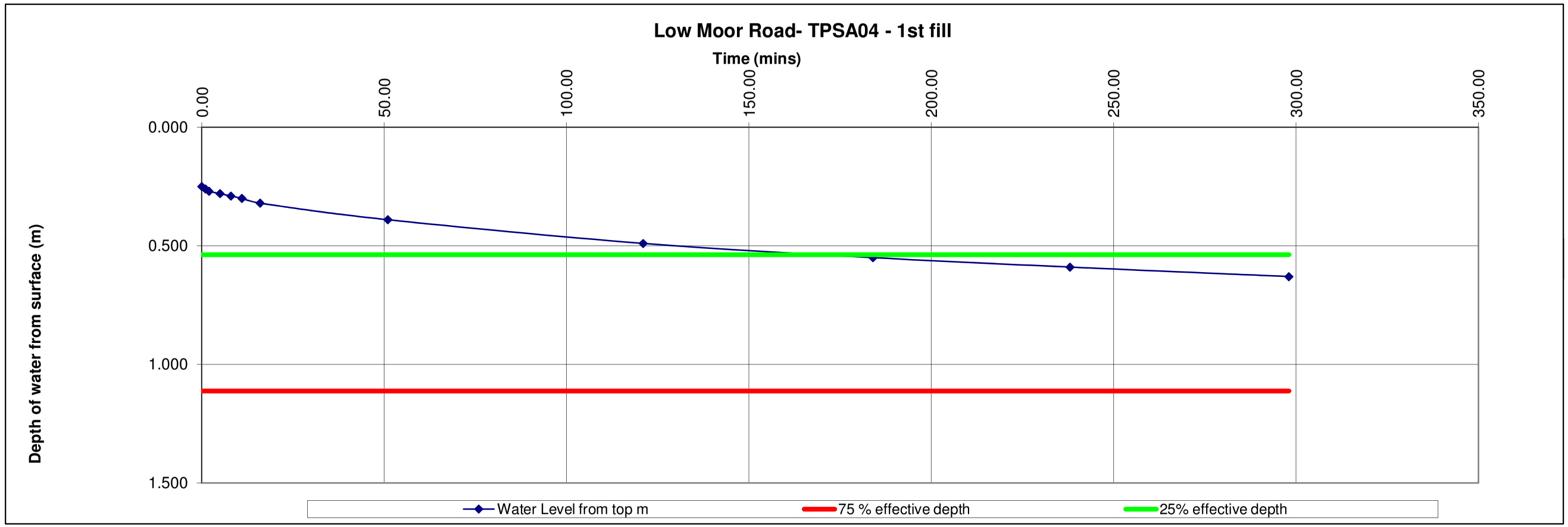
BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA02		
Depth	1.45		
Length	2.00		
Width	0.60		
water level from surface at start	0.32		
Time to 25 % empty mins	90.00		
Time to 75 % empty mins	1439.00		
Time for outflow between 75% and 25 % effective depth mins	1349		
Height of water in TP	1.13		
Effective depth m	1.13		
75% effective depth	1.17		
25% effective depth	0.60		
vol between 75% and 25% m3	0.678		
Mean Surface Area m50 m2	4.138		
Soil Infiltration Rate f m/s	2.02E-06		


Low Moor Road- TPSA02 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
0.000
0.500
1.000
1.500
Depth of water from surface (m)
Water Level from top m
75 % effective depth
25% effective depth

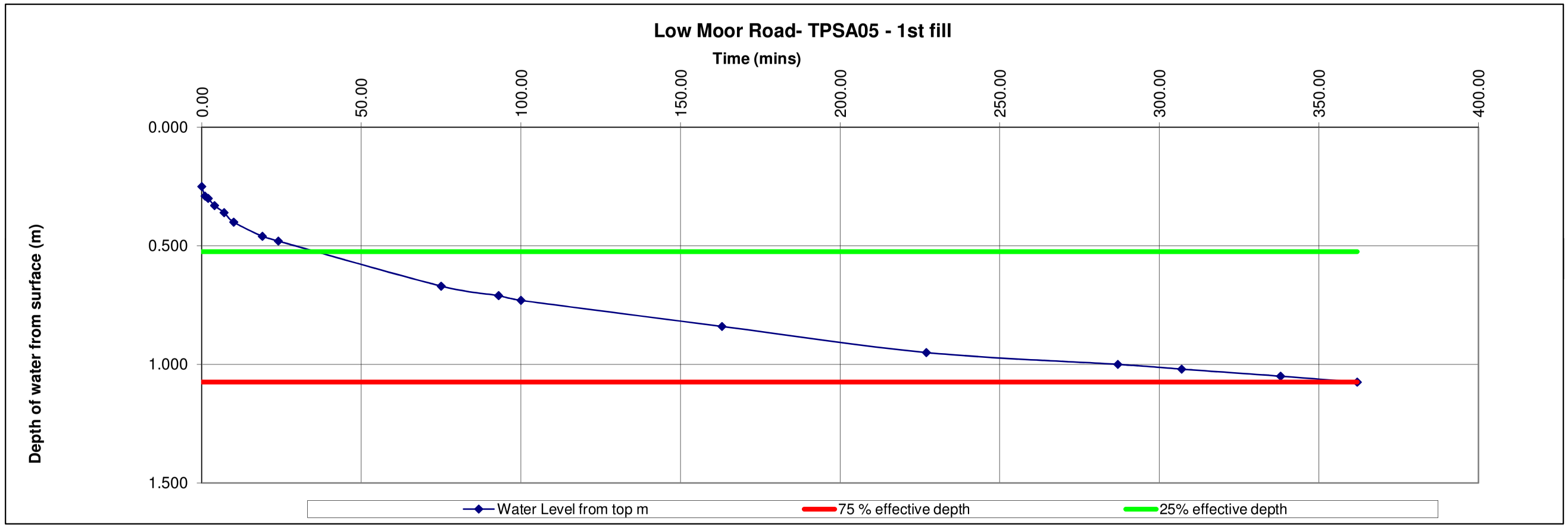
BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA03		
Depth	1.60		
Length	2.00		
Width	0.60		
water level from surface at start	0.50		
Time to 25 % empty mins	63.00		
Time to 75 % empty mins	960.00		
Time for outflow between 75% and 25 % effective depth mins	897		
Height of water in TP	1.1		
Effective depth m	1.1		
75% effective depth	1.33		
25% effective depth	0.78		
vol between 75% and 25% m3	0.66		
Mean Surface Area m50 m2	4.06		
Soil Infiltration Rate f m/s	3.02E-06		


Low Moor Road- TPSA03 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Depth of water from surface (m)
0.000
0.500
1.000
1.500
Water Level from top m
75 % effective depth
25% effective depth

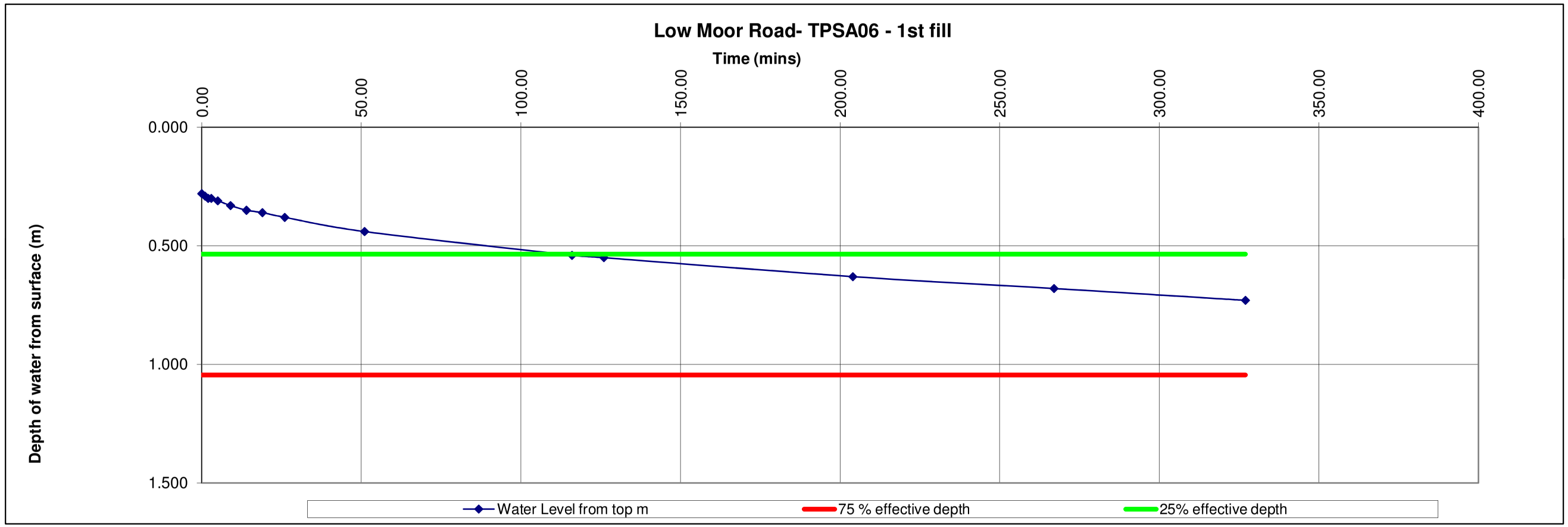
BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA04		
Depth	1.40		
Length	2.00		
Width	0.60		
water level from surface at start	0.25		
Time to 25 % empty mins	184.00		
Time to 75 % empty mins	2000.00		
Time for outflow between 75% and 25 % effective depth mins	1816		
Height of water in TP	1.15		
Effective depth m	1.15		
75% effective depth	1.11		
25% effective depth	0.54		
vol between 75% and 25% m3	0.69		
Mean Surface Area m50 m2	4.19		
Soil Infiltration Rate f m/s	1.51E-06		


Low Moor Road- TPSA04 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Depth of water from surface (m)
0.000
0.500
1.000
1.500
Water Level from top m
75 % effective depth
25% effective depth

BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA05		
Depth	1.35		
Length	1.80		
Width	0.60		
water level from surface at start	0.25		
Time to 25 % empty mins	24.00		
Time to 75 % empty mins	362.00		
Time for outflow between 75% and 25 % effective depth mins	338		
Height of water in TP	1.1		
Effective depth m	1.1		
75% effective depth	1.08		
25% effective depth	0.53		
vol between 75% and 25% m3	0.594		
Mean Surface Area m50 m2	3.72		
Soil Infiltration Rate f m/s	7.87E-06		


Low Moor Road- TPSA05 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
0.000
0.500
1.000
1.500
Depth of water from surface (m)
Water Level from top m
75 % effective depth
25% effective depth

BRE Digest 365 Soakaway Tests - P16-549 - Low Moor Road			
Insert field data into yellow shaded areas			
Trial Pits			
	TPSA06		
Depth	1.30		
Length	2.00		
Width	0.60		
water level from surface at start	0.28		
Time to 25 % empty mins	116.00		
Time to 75 % empty mins	740.00		
Time for outflow between 75% and 25 % effective depth mins	624		
Height of water in TP	1.02		
Effective depth m	1.02		
75% effective depth	1.05		
25% effective depth	0.54		
vol between 75% and 25% m3	0.612		
Mean Surface Area m50 m2	3.852		
Soil Infiltration Rate f m/s	4.24E-06		


Low Moor Road- TPSA06 - 1st fill
Time (mins)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
0.000
0.500
1.000
1.500
Depth of water from surface (m)
Water Level from top m
75 % effective depth
25% effective depth

Enclosure 4: Gas Monitoring Data Sheets

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	AM
Job No.	P16-549	**Date:**	27-04-201

Atmospheric Pressure:	1005 -1004 mb	**Weather Conditions:**	Fine
State:	Falling	**Temperature:**	9°C

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Barom mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
9:35	**WS01**	<0.1	<0.1	0	<0.1	<0.1	6.5	6.5	17.2	17.2	0	0	0	0	2.00	Dry	1005
9:40	**WS02**	<0.1	<0.1	0	<0.1	<0.1	0.1	0.1	21.5	21.5	0	0	0	0	3.20	Dry	1005
9:55	**WS03**	<0.1	<0.1	0	<0.1	<0.1	1.7	1.7	17.5	17.5	0	0	0	0	2.50	Dry	1005
9:59	**WS04**	<0.1	<0.1	0	<0.1	<0.1	1.6	1.6	20.5	20.5	0	0	0	0	1.00	Dry	1005
10:10	**WS05**	0.1	<0.1	0	<0.1	<0.1	7.7	7.7	5.8	5.8	0	0	0	0	4.00	Dry	1005
10:15	**WS06**	-0.1	<0.1	0	<0.1	<0.1	1.4	1.2	20.3	20.3	0	0	0	0	2.60	Dry	1004
10:30	**WS07**	<0.1	<0.1	0	<0.1	<0.1	2.0	2.0	19.7	19.7	0	0	0	0	1.80	Dry	1004
10:40	**WS08**	<0.1	<0.1	0	<0.1	<0.1	0.7	0.7	21.4	21.4	0	0	0	0	2.50	1.85	1004
10:50	**CPBH01**	<0.1	<0.1	0	<0.1	<0.1	0.3	0.3	21.0	21.0	0	0	0	0	8.5	Dry	1004
10:55	**CPBH02**	0.1	0.1	0	0.2	0.2	2.0	1.6	18.8	18.8	0	0	1	1	3.45	Dry	1004

NOTES
Monitoring order is from **Left to Right** across this table (expect when using a PID, which should be used first).
Monitoring should be for **NO less than 3 minutes**, unless there have been fluctuations between initial and steady state recorded during the 3 minutes, or high concentrations of gases are initially recorded. Monitoring should then be up to 10 minutes or steady state.

Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	RW
Job No.	P16-549	**Date:**	02-05-2017

Atmospheric Pressure:	1006-1004 mb	**Weather Conditions:**	Fine
State:	Falling	**Temperature:**	11 °C

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Barom mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
9:33	**WS01**	<0.1	<0.1	0	<0.1	<0.1	5.8	5.8	18.1	17.9	0	0	0	0	2.00	Dry	1006
10:11	**WS02**	<0.1	<0.1	-3	<0.1	<0.1	<0.1	<0.1	20.7	20.7	0	0	0	0	3.20	Dry	1006
9:58	**WS03**	<0.1	<0.1	0	<0.1	<0.1	0.2	0.2	20.7	20.7	0	0	0	0	2.50	Dry	1006
9:40	**WS04**	<0.1	<0.1	-2	<0.1	<0.1	2.0	2.0	19.6	19.7	0	0	0	0	1.00	Dry	1006
11:00	**WS05**	<0.1	<0.1	0	<0.1	<0.1	0.2	0.2	19.9	19.9	0	0	0	0	4.00	Dry	1003
10:36	**WS06**	-0.1	<0.1	-3	<0.1	<0.1	3.1	3.1	15.4	15.4	0	0	0	0	2.60	Dry	1004
10:54	**WS07**	<0.1	<0.1	0	<0.1	<0.1	1.8	1.8	18.5	18.5	0	0	0	0	1.80	Dry	1004
10:48	**WS08**	<0.1	<0.1	+1	<0.1	<0.1	0.9	0.9	19.9	19.9	0	0	0	0	2.50	Dry	1004
10:25	**CPBH01**	<0.1	<0.1	-1	<0.1	<0.1	0.1	0.1	20.5	20.5	0	0	0	0	8.5	Dry	1006
9:48	**CPBH02**	<0.1	<0.1	+1	<0.1	<0.1	0.2	0.2	20.8	20.8	0	0	0	0	3.45	Dry	1006

NOTES
Monitoring order is from **Left to Right** across this table (expect when using a PID, which should be used first).
Monitoring should be for **NO less than 3 minutes**, unless there have been fluctuations between initial and steady state recorded during the 3 minutes, or high concentrations of gases are initially recorded. Monitoring should then be up to 10 minutes or steady state.

Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	RW
Job No.	P16-549	**Date:**	17-05-2017

Atmospheric Pressure:	1001 - 999 mb	**Weather Conditions:**	Rain
State:	Falling	**Temperature:**	9°C

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Barom mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
11:11	**WS01**	<0.1	<0.1	+13	<0.1	<0.1	4.9	4.9	17.5	17.5	0	0	0	0	2.00	Dry	1000
10:00	**WS02**	+0.1	<0.1	0	<0.1	<0.1	3.0	3.0	11.0	11.0	0	0	0	0	3.20	Dry	1001
10:07	**WS03**	<0.1	<0.1	0	<0.1	<0.1	1.1	1.1	17.0	17.0	0	0	0	0	2.50	Dry	1001
10:15	**WS04**	<0.1	<0.1	+2	<0.1	<0.1	7.6	7.6	9.7	9.1	0	0	0	0	1.00	Dry	1001
11:07	**WS05**	<0.1	<0.1	0	0.1	0.1	4.1	4.1	8.9	8.9	0	0	0	0	4.00	Dry	999
10:51	**WS06**	<0.1	<0.1	+2	<0.1	<0.1	2.1	2.1	14.4	14.4	0	0	0	0	2.60	Dry	1000
10:40	**WS07**	<0.1	<0.1	0	0.1	0.1	1.1	1.1	17.1	17.3	0	0	0	0	1.80	Dry	1000
10:35	**WS08**	<0.1	<0.1	0	<0.1	<0.1	0.8	0.8	20.1	20.1	0	0	0	0	2.50		1001
10:25	**CPBH01**	<0.1	<0.1	+1	2.1	2.1	2.2	2.2	0.5	0.5	1	1	0	0	8.5	Dry	1001
11:00	**CPBH02**	<0.1	<0.1	+1	0.1	0.1	1.1	1.1	4.6	4.6	0	0	0	0	3.45	Dry	1000

NOTES
Monitoring order is from **Left to Right** across this table (expect when using a PID, which should be used first).
Monitoring should be for **NO less than 3 minutes**, unless there have been fluctuations between initial and steady state recorded during the 3 minutes, or high concentrations of gases are initially recorded. Monitoring should then be up to 10 minutes or steady state.

Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	AM
Job No.	P16-549	**Date:**	26-05-2017

Atmospheric Pressure:	1003 mb	**Weather Conditions:**	Sunny
State:	Rising	**Temperature:**	25°C

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Barom mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
10:00	**WS01**	-0.2	-0.2	+2.56	<0.1	<0.1	4.9	4.9	16.3	16.3	0	0	0	0	2.00	Dry	1003
10:40	**WS02**	-0.1	-0.1	+4.30	<0.1	<0.1	7.2	7.2	10.6	10.6	0	0	0	0	3.20	Dry	1003
10:30	**WS03**	-0.1	-0.1	+4.89	<0.1	<0.1	9.1	9.1	0.8	0.8	0	0	0	0	2.50	Dry	1003
10:15	**WS04**	-0.1	-0.1	+0.54	<0.1	<0.1	4.2	4.2	2.5	2.4	0	0	0	0	1.00	Dry	1003
11:10	**WS05**	-0.1	-0.1	+3.04	<0.1	<0.1	6.9	6.9	12.1	12.1	0	0	0	0	4.00	Dry	1003
10:54	**WS06**	<0.1	<0.1	+0.92	<0.1	<0.1	6.9	6.9	0.9	0.9	2	2	0	0	2.60	Dry	1003
-	**WS07**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1003
11:00	**WS08**	<0.1	<0.1	NR	<0.1	<0.1	1.6	1.6	18.2	18.2	0	0	0	0	2.50	Dry	1003
10:25	**CPBH01**	-0.1	-0.1	+0.61	2.2	2.2	2.3	2.3	1.4	1.1	1	1	0	0	8.5	Dry	1003
10:48	**CPBH02**	-0.1	-0.1	+0.88	1.7	1.7	6.9	6.9	0.7	0.7	1	1	0	0	3.45	Dry	1003

NOTES
Monitoring order is from **Left to Right** across this table (expect when using a PID, which should be used first).
Monitoring should be for **NO less than 3 minutes**, unless there have been fluctuations between initial and steady state recorded during the 3 minutes, or high concentrations of gases are initially recorded. Monitoring should then be up to 10 minutes or steady state.

Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	RW
Job No.	P16-549	**Date:**	29-06-2017

Atmospheric Pressure:	992mb	**Weather Conditions:**	Drizzle
State:	Falling	**Temperature:**	11 ℃

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Baro m mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
09:30	**WS01**	<0.1	<0.1	+1.05	<0.1	<0.1	4.1	4.1	18.9	18.9	0	0	0	0	2.00	Dry	992
-	**WS02**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF
-	**WS03**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF
10:00	**WS04**	<0.1	<0.1	-1.68	3.4	3.4	6.3	6.3	0.4	0.4	0	0	0	0	1.00	Dry	992
10:52	**WS05**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF
10:20	**WS06**	<0.1	<0.1	+1.3	<0.1	<0.1	6.2	6.2	1.4	1.4	0	0	0	0	2.60	Dry	992
10:33	**WS07**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF
10:26	**WS08**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF
09:55	**CPBH01**	<0.1	<0.1	-0.39	2.6	2.6	3.4	3.4	1.6	1.6	0	0	0	0	8.5	Dry	992
10:15	**CPBH02**	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF	DNF

NOTES
Monitoring order is from **Left to Right** across this table (expect when using a PID, which should be used first).
Monitoring should be for **NO less than 3 minutes**, unless there have been fluctuations between initial and steady state recorded during the 3 minutes, or high concentrations of gases are initially recorded. Monitoring should then be up to 10 minutes or steady state.
DNF – Did Not Find

Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				

RODGERS LEASK ENVIRONMENTAL
Consulting Geotechnical & Environmental Engineers

Ground Gas Monitoring Form

Site Name:	Low Moor Road, Sutton in Ashfield	**RLE Engineer:**	RW
Job No.	P16-549	**Date:**	19-07-2017

Atmospheric Pressure:	990 - 987mb	**Weather Conditions:**	Drizzle
State:	Falling	**Temperature:**	18℃

Time	BH Ref.	Gas Flow Rate (l/hr)		B/H Pressure (Pa)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		CO (% ppm)		H2S (% ppm)		Depth of Borehole installation (m bgl)	Depth to Water (m bgl)	Barom mb
		Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
09:30	**WS01**	<0.1	<0.1	+7	<0.1	<0.1	3.9	3.9	17.3	17.3	0	0	0	0	2.00	Dry	990
09:38	**WS02**	<0.1	<0.1	0	<0.1	<0.1	13.3	13.9	3.3	2.3	0	0	0	0	3.20	Dry	990
09:45	**WS03**	<0.1	<0.1	-10	<0.1	<0.1	9.7	9.7	1.3	1.3	0	0	0	0	2.50	Dry	990
10:05	**WS04**	<0.1	<0.1	-15	3.0	3.1	6.3	6.3	1.1	0.4	0	0	0	0	1.00	Dry	989
10:52	**WS05**	<0.1	<0.1	0	<0.1	<0.1	7.5	7.5	11.5	11.3	0	0	0	0	4.00	Dry	987
10:40	**WS06**	<0.1	<0.1	+3	0.2	0.2	8.8	8.8	1.0	0.8	0	0	0	0	2.60	Dry	988
10:33	**WS07**	<0.1	<0.1	+1	<0.1	<0.1	4.5	4.5	15.1	14.9	0	0	0	0	1.80	Dry	988
10:26	**WS08**	<0.1	<0.1	0	<0.1	<0.1	1.5	1.5	19.2	19.2	0	0	0	0	2.50	2.35	988
09:55	**CPBH01**	<0.1	<0.1	0	2.6	2.6	3.3	3.3	<0.1	<0.1	0	0	0	0	8.5	Dry	990
10:15	**CPBH02**	<0.1	<0.1	0	0.8	0.9	6.6	7.6	4.4	3.1	0	0	0	0	3.45	Dry	989

NOTES
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Equipment used:	Infra Red Gas Analyser	Geotechnical Instruments GA2000 Gas Analyser	**Last calibrated:**	05/04/2017
	MiniRAE PID	-	**Last calibrated:**	-
Visible signs of vegetation Stress:		-		
Other Comments/ Observations/Tests:				