

Kier Construction

Regional Building Midlands
Tugsten Building, Central Boulevard
Blythe Valley Park
Solihull
West Midlands
B90 8AU

AG3030B-23-AR05

19th September 2023

For the attention of Suzannah Elliott

Dear Suzannah,

Re: Abbey Fields Leisure Centre, Kenilworth

Further to your instruction of the 4th August 2023 to carry out the installation of monitoring standpipes and undertake supplementary ground gas/groundwater level monitoring at the above site, we have pleasure in presenting the results. This report has been prepared on behalf of Kier Construction (the Client).

BACKGROUND

The site is located at Abbey Fields Leisure Centre, Kenilworth, approximately 150m southwest of Kenilworth town centre within the Abbey Fields Park. The site comprises an active demolition site for the former public swimming pool.

Applied Geology has previously produced two ground investigation reports for the site as follows:

- A Phase I Desk Study and limited Phase II intrusive ground investigation (Pre-demolition) for a previous development proposal, which included partial demolition and refurbishment of the existing leisure complex, (Report ref. AG3030-19-AK69) dated September 2020, on behalf of Mace Limited (Project Manager to the Landowner):
- A post demolition Phase II intrusive investigation for the current development proposal which includes redevelopment of the site as a new swimming pool (Report ref AG3030A-22-AQ29 Issue 2 dated May 2023) on behalf of the Client.

The original pre-demolition (September 2020) ground investigation identified ground gases associated with decomposition of organic material in Made Ground and/or Alluvium underlying the site, and volatile hydrocarbons associated with a possible historical tank as an potential on-site source. As a result, ground gas monitoring standpipes were installed within selected boreholes to enable ground gas and groundwater level monitoring to be undertaken. Four rounds of ground gas monitoring were completed as part of this investigation which recorded Methane concentrations of between less than 0.1% and 0.6% (by volume), carbon dioxide concentrations of between 0.2% and 14.1%, Oxygen concentration of between 1.8% (significantly depleted) and 20.2% (near atmospheric levels) and average three-minute flow rates of between less than 0.1l/hr and 0.3l/h. In addition to this, it was noted to be likely that



the majority of any Alluvium beneath the proposed extension will be removed as a result of the creation of the new swimming pool and construction of the building extension, and that, given the use of the building as a leisure centre, the building will be well ventilated. It was therefore considered that no gas protection measures are required for the proposed development.

The September 2020 report also stated that the site is not in a radon affected area, with <1% of homes above the Action Level, therefore, no radon protection measures are considered necessary for new properties.

Following the issue of this report, comments received from Warwick District Council Environmental Health Officer as part of the planning application process requested additional information and assessment relating the ground gas risk for the site and the potential on-site source of the low level methane and carbon dioxide that had been detected.

Ground gas monitoring was not included in the scope of the initial post demolition ground investigations works. Therefore, Applied Geology were subsequently instructed to return to site and drill 4No. additional boreholes and install ground gas/groundwater monitoring standpipes targeted to within the Alluvium and carry out further ground gas monitoring within the footprint of the proposed building in order to provide an updated gas risk assessment.

This letter presents the results of the additional boreholes and monitoring together with an updated ground gas risk assessment and therefore supersedes the previous gas risk assessment included in the previous reports.

SUMMARY OF GROUND CONDITIONS

Published BGS Maps indicate the site is underlain by Superficial Deposits of Alluvium (clay, silt, sand and gravel) across the majority of the site underlain by Solid geology of the Kenilworth Sandstone Formation (sandstone), with Kenilworth Sandstone Formation (mudstone) shown to be adjacent to the southeast of the site. River Terrace Deposits (sand and gravel) are indicated to outcrop directly to the north of the site and potentially extend beneath the Alluvium.

Prior to demolition, an initial layer of hardstanding or Topsoil/Made Ground was encountered overlying varying depths of Made Ground, up to a maximum of 2.00m below ground level (bgl). After demolition, hardstanding was mainly absent and Made Ground was encountered ranging between 0.35m and 3.30m thick, deepest in the area of the former swimming pool which had been grubbed out and backfilled with crushed demolition material. Beneath the Made Ground, Alluvium was encountered to depths between 1.5 and >5.45m bgl in the majority of locations underlain by Solid Geology of the Kenilworth Sandstone Formation.

The additional boreholes drilled for the installation of the recent ground gas monitoring standpipes generally confirmed the ground conditions encountered previously with Made Ground recorded between 1.10m and 1.70m bgl. DCS202 terminated within Made Ground at 0.60m bgl due to a refusal/obstruction and therefore was not installed. Underlying the Made Ground, Alluvium was recorded to a maximum depth of 3.70m bgl underlain by strata of the Kenilworth Sandstone Formation. Copies of the borehole logs from these recent boreholes ref. DCS201 to DCS204 are presented in Appendix B.

Made Ground was noted to be free of any putrescible material so has been discounted as a possible source of ground gas.

INSTRUMENTATION AND MONITORING

As part of the 2020 ground investigation, 50mm diameter standpipes were installed in boreholes, as follows. Copies of the relevant borehole records for these holes are presented in Appendix B for ease of reference:

Location	Standpipe installation response zone (m bgl)	Stratum
BHA	2.0 - 5.0	Alluvium and Kenilworth Sandstone Formation
DCS1	1.0 – 5.0	Alluvium and Kenilworth Sandstone Formation
DCS4	2.0 - 4.0	Kenilworth Sandstone Formation

Four phases of ground gas monitoring were undertaken as part of the pre-demolition (2020) investigation, between 1st to 22nd July 2020 including during 2 periods of low atmospheric pressure.

In order to facilitate additional ground gas monitoring, 4No. additional DCS boreholes were drilled to a maximum depth of 3.80m bgl in July 2023. 50mm diameter standpipes were installed in 3 of these boreholes to target Alluvial soils, as follows:

Location	Standpipe installation response zone (m bgl)	Stratum
DCS201	1.50 – 2.80	Alluvium
DCS203	1.20 – 2.50	Alluvium
DCS204	1.70 – 2.20	Alluvium

DCS202 was unable to be installed within the target strata due to shallow refusal and therefore no standpipe was installed in this location. An exploratory hole plan is presented in Appendix A (Dwg No. AG3030B-23-02).

As part of this recent post demolition works, an additional three ground gas monitoring visits of the recently installed standpipes (DCS201, DCS203 and DCS204) have been undertaken between 17th August and 1st September 2023, including during two periods of falling and one period of low atmospheric pressure (1004mb or less based on standard pressure at sea level).

In total, 7no. rounds of ground gas monitoring have been undertaken at the site, during which each monitoring well was monitored for concentrations of carbon dioxide, methane, oxygen, VOCs by PID, flow rates and differential pressures and water level. The monitoring records are included in Appendix C.

RESULTS AND ASSESSMENT

Copies of the gas monitoring results from the previous 2020 ground investigation and these current works are present in Appendix C.

Gas screening values have been calculated for each installation using highest concentrations and highest flow rates in accordance with CIRIA C665. The GSVs are as follows:

Stratum	BH	Response Zone (m bgl)	Ground water level (m bgl)	Max. Methane (%)	Max. Carbon Dioxide (%)	Max. Steady Flow (l/hr)	GSV Methane (l/hr)	GSV Carbon Dioxide (l/hr)
2023 Monitoring								
Alluvium	DCS201	1.50-2.80	1.00- 1.06	0.2	0.1	0.2	0.0004	0.0002
	DCS203	1.20- 2.50	DRY	0.2	1.0	0.1	0.0002	0.001
	DCS204	1.70-2.20	0.96-1.76	0.7	<0.1	0.1	0.0007	0.0001
2020 Monitoring								
Alluvium/ Kenilworth Sandstone Formation	BHA	1.50- 2.80	2.04-2.10	<0.1	1.3	<0.1	0.001	0.0013
	DCS1	1.20-2.50	1.11-1.25	0.6	6.6	0.3	0.0018	0.0198
Kenilworth Sandstone Formation	DCS4	1.70- 2.20	2.15-2.22	<0.1	14.1	<0.1	0.001	0.0141

Green highlighted cells indicate CS-1 conditions.

Blue highlighted cells indicate a completely flooded response zone.

Gas monitoring recorded methane concentrations between 0.1% and 0.7% v/v with the highest recorded in DCS204 on the last visit.

Carbon dioxide concentrations generally ranged from <0.1% v/v to 1.0% v/v with the exception of DCS1 and DCS4, which recorded 6.6% and 14.1% v/v respectively during the 2020 monitoring. Two of the seven monitoring visits recorded carbon dioxide concentrations >5%.

Oxygen concentrations between 2.5% (depleted) and 20.2% (atmospheric) by volume, with depleted levels associated with DCS1, DCS203, DCS204 installations. VOC concentrations were recorded between <0.1ppm and 1.5ppm and are considered negligible.

Flow readings taken over a three-minute average period recorded flow rates between the limit of detection (<0.1 l/hr) and 0.3 l/hr. It is noted that flow readings from two of the three recent rounds of monitoring were negative values suggesting gas flow was into the monitoring standpipe which may have been caused by atmospheric pumping and/or changes in groundwater level between monitoring visits.

Gas Screening Values (GSV) of 0.0018 l/hr and 0.0198 l/hr are calculated respectively in accordance with CIRIA C665.

CONCLUSIONS & RECOMMENDATIONS

During the previous and recent ground investigation works no on-site source of ground gas was identified. Whilst Made Ground and Alluvium were encountered beneath the site, neither were noted to contain significant organic or putrescible material which could result in gas production. In addition, much of the Alluvium was noted to be saturated and below groundwater levels.

It is considered that the elevated carbon dioxide concentrations (>5%) recorded during two of the seven gas monitoring visits is likely due to be naturally occurring and not as a result of decomposition of Made Ground or Alluvium. Reference to the CL:AIRE Research Bulletin RB17 (November 2012) suggests that natural soils are capable of naturally producing carbon dioxide concentrations of up to 15% but that this does not necessarily pose a risk to development.

Based on the conceptual model, the ground conditions encountered and the calculated GSVs the site can be characterised as Situation 1 (BS 8485:2015+A1:2019). It is also considered to

be likely some of the Alluvium beneath the proposed building and swimming pool will be removed during construction, and given the use of the proposed building as a leisure centre, the building will be well ventilated. It is therefore considered that no gas protection measures are required for the proposed development.

Radon protection measures are not considered necessary.

It is recommended that this gas risk assessment and site classification be approved by the Local Authority prior to commencement of construction.

Should you have any queries please do not hesitate to contact us.

Yours sincerely

For and on behalf of Applied Geology Ltd

Prepared by:



C Ellis BEng (Hons) FGS ACSM
Lead Project Geologist

Checked by:



S Day BSc (Hons) MSc CGeol FGS SiLC
Director

General Notes

APPENDICES

Appendix A - Drawings

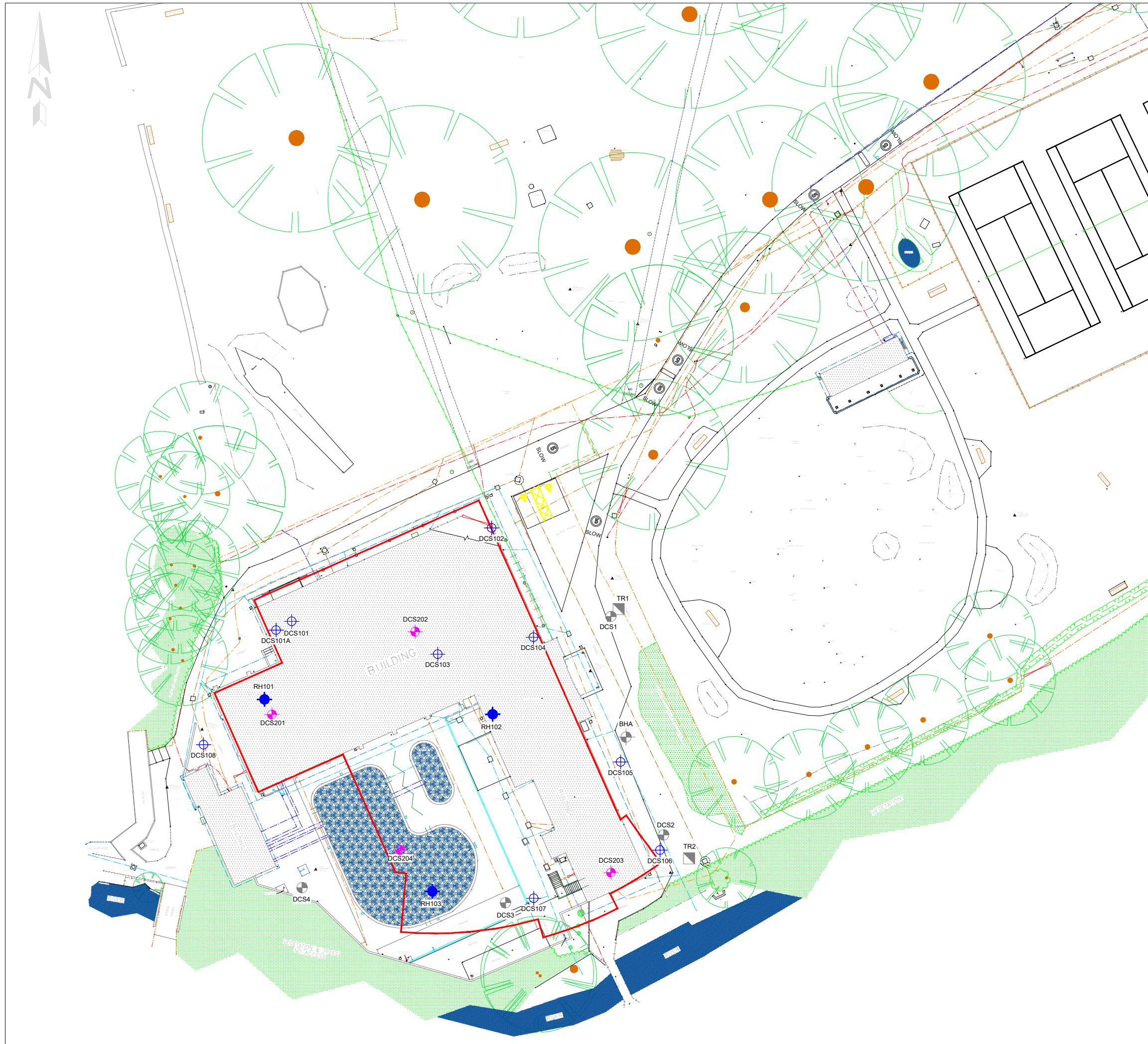
Appendix B - Logs

Appendix C – Monitoring Results








GENERAL NOTES

- A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.
- B) Where any data supplied by the Client or other external source, including that from previous site investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Applied Geology for inaccuracies within this data.
- C) Whilst the report may express an opinion on possible configurations of strata between or beyond the exploratory locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy.
- D) Comments on groundwater (and landfill gas) conditions are based on observations made during the course of the present and past investigations or with reference to published data unless otherwise stated. It should be noted, however, that groundwater (and landfill gas) levels vary due to seasonal (or atmospheric conditions) or other effects.
- E) The copyright of this report and other plans and documents prepared by Applied Geology is owned by Applied Geology and no such report, plan or document may be reproduced, published or adapted without the written consent of Applied Geology. Complete copies of the report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its submission.
- F) This report is prepared and written in the context of the proposals stated in the introduction to the report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Applied Geology for re-assessment and if necessary, re-appraisal.
- G) The survey was conducted and this report was prepared for the sole internal use and reliance of the Client. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Applied Geology. If an unauthorised third party comes into possession of this report they rely on it at their peril and Applied Geology owes them no duty of care and skill.
- H) Ground conditions should be monitored during the construction of the works and the recommendations of the report re-evaluated in the light of this data by the supervising geotechnical or geo-environmental engineers.
- I) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.
- J) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.
- K) Applied Geology operates as a Consultancy and does not operate it's own laboratory for soil testing, this work being sub contracted to known and respected, generally UKAS accredited, laboratories. Applied Geology can therefore not be held responsible for the testing carried out.

APPENDIX A



Key:

-  Driven Continuous Sampling Borehole
-  Rotary Borehole
-  Gas Monitoring Borehole
-  Proposed Building Outline
- Historical Investigation by Applied Geology 2019:
-  Driven Continuous Sampling Borehole
-  Cable Percussion Borehole
-  Hand Dug Service Trench

Drawing based on Darnton B3 Architecture Dwg No. 12944 DB3 B01 ZZ DR A 90003 dated 19/03/2019 and Darnton B3 Architecture Dwg No. 12943 DB3 B01 XX A 90002 Rev C dated 30/10/2019.

APPLIED GEOLOGY

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Client:
 KIER CONSTRUCTION

Project:
 ABBEY FIELDS LEISURE CENTRE,
 KENILWORTH

Title:
 EXPLORATORY HOLE LOCATION PLAN

Drawn by: KM	Checked by: CE	Paper Size: A3
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Scale: 1:500	Date: 15/09/2023
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Drawing No: AG3030B-23-02	Revision: 0
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APPENDIX B

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS201

Project Abbey Fields Leisure Centre, Kenilworth

Project No.

AG3030B-23

Client Kier Construction

Sheet

1 of 1

Start 07/08/2023

Coordinates

Scale

1:25

End 07/08/2023

Ground Level

Total Depth

4.25m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
S	1.00	N = 5	116mm /100%	(1.50)		Brown very sandy slightly clayey GRAVEL with low cobble content. Gravel is fine to coarse angular fragments of brick and concrete. Cobbles are angular brick and concrete. (MADE GROUND)			
						<i>Below 1.00m bgl: loose.</i>			
S	2.00	N = 7	101mm /80%	(1.30)	1.50	Soft thinly laminated dark grey slightly sandy SILT/CLAY with occasional fragments of wood. (ALLUVIUM)			
						<i>Below 2.30m bgl: becomes firm.</i>			
S	3.00	N = 9	92mm /80%	(0.60)	2.80	Loose dark grey thinly laminated slightly silty medium SAND with occasional black staining. (ALLUVIUM)			
			79mm /100%		3.40	Dark grey sandy GRAVEL. Gravel is fine to coarse rounded quartzite. (ALLUVIUM)			
S	3.80	N >50		(0.55)	3.70	Very hard reddish brown thinly laminated slightly sandy CLAY. (KENILWORTH SANDSTONE FORMATION)			
					4.25	End of Borehole at 4.25m			

Installation: 50mm diameter standpipe installed to 2.80m bgl.

Remarks: DCS201 located 5m southeast of RH101. Base of borehole collapsed between 2.30m and 3.80m bgl. Borehole terminated at 4.25m bgl due to refusal.

Groundwater Strikes					Drilled: DH
Depth Strike	Rose to	Remarks	Cased	Sealed	
4.20	4.20				Logged: EY
					Checked: AS

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS202

Project Abbey Fields Leisure Centre, Kenilworth

Project No.

AG3030B-23

Client Kier Construction

Sheet

1 of 1

Start 07/08/2023

Coordinates

Scale

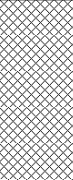

1:25

End 07/08/2023

Ground Level

Total Depth

0.60m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
					(0.60)	Brown very sandy slightly clayey GRAVEL with low cobble content. Gravel is fine to coarse angular fragments of brick and concrete. Cobbles are angular brick and concrete. (MADE GROUND)			
					0.60	End of Borehole at 0.60m			

Installation:

Remarks: DCS202 located 2m west of DCS103. Borehole terminated at 0.60m bgl due to refusal.

Groundwater Strikes					Drilled: DH Logged: EY Checked: AS
Depth Strike	Rose to	Remarks	Cased	Sealed	

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS203

Project Abbey Fields Leisure Centre, Kenilworth

Project No.

AG3030B-23

Client Kier Construction

Sheet

1 of 1

Start 07/08/2023

Coordinates

Scale

1:25

End 07/08/2023

Ground Level

Total Depth

2.91m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
					(0.80)	Soft brown gravelly clayey medium SAND with occasional roots and rootlets. Gravel is medium to coarse subangular fragments of brick, concrete, asphalt and medium to coarse rounded quartzite and sandstone. (MADE GROUND)			
					0.80				
					(0.30)	Firm greyish brown slightly clayey slightly gravelly medium SAND. Gravel is fine to coarse rounded quartzite and sandstone and fine to medium subangular fragments of brick. (MADE GROUND)			
					1.10				
C	1.20	N = 6			(1.10)	Loose thinly laminated brown slightly gravelly very clayey medium SAND. Gravel is medium to coarse rounded quartzite and sandstone. (ALLUVIUM)			
			116mm /80%						
S	2.00	N = 38			2.20				
					(0.20)	Dense thinly laminated reddish brown mottled greyish green slightly clayey medium SAND with occasional rounded medium quartzite gravel. (ALLUVIUM)			
			101mm /80%		2.40				
S	2.50	N >50			(0.51)	Extremely weak greenish grey SANDSTONE with frequent orangish brown staining on surfaces. (KENILWORTH SANDSTONE FORMATION)			
					2.91	End of Borehole at 2.91m			

Installation: 50mm diameter standpipe installed to 2.50m bgl.

Remarks: DCS203 located 5.7m southwest of DCS106. Hand dug service inspection pit excavated to 1.20m bgl. Borehole terminated at 2.91m bgl due to SPT refusal.

Groundwater Strikes					Drilled: DH
Depth Strike	Rose to	Remarks	Cased	Sealed	
2.40	2.40				Logged: EY
					Checked: AS

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS204

Project Abbey Fields Leisure Centre, Kenilworth

Project No.

AG3030B-23

Client Kier Construction

Sheet

1 of 1

Start 07/08/2023

Coordinates

Scale

1:25

End 07/08/2023

Ground Level

Total Depth

4.20m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
C	1.00	N = 23	116mm /100%	(1.70)	1.70	Brown very sandy slightly clayey GRAVEL with low cobble content. Gravel is fine to coarse angular fragments of crushed concrete. (MADE GROUND)			
						Firm brown mottled grey slightly clayey gravelly coarse SAND with occasional roots and rootlets. Gravel is fine to coarse rounded quartzite. (ALLUVIUM)			
S	3.00	N = 30	101mm /100%	(2.10)	2.10	Stiff becoming very stiff reddish brown mottled greyish green thinly laminated slightly sandy silty CLAY with occasional black staining. (KENILWORTH SANDSTONE FORMATION)			
						<p><i>Below 3.30m bgl: becomes very stiff.</i></p> <p><i>Between 3.40m and 3.55m bgl: bands of greenish grey sand.</i></p> <p><i>Below 3.60m bgl: frequent mudstone lithorelicts.</i></p>			
S	3.80	N >50	92mm /80%	4.20	4.20	End of Borehole at 4.20m			

Installation: 50mm diameter standpipe installed to 2.20m bgl.

Remarks: DCS204 located 7m north of RH103. Borehole terminated at 4.20m bgl due to refusal. Groundwater not encountered.

Groundwater Strikes					Drilled: DH
Depth Strike	Rose to	Remarks	Cased	Sealed	
					Logged: EY
					Checked: AS

SPT SUMMARY SHEET

Project: Abbey Fields Leisure Centre, Kenilworth
Client: Kier Construction
Project No: AG3030B-23

Borehole No.	Borehole depth (m)	Bottom depth (m)	Casing depth (m)	Water Level (m)	Equipment ref.	Seating Drive		Test Drive				Test Type	N Value							
						Blows	Pen (mm)	Blows		Pen (mm)				Total Pen (mm)						
DCS201	1.00	1.45			110.119	1	0	75	75	1	1	1	2	75	75	75	75	300	S	5
DCS201	2.00	2.45			110.119	1	2	75	75	1	2	2	2	75	75	75	75	300	S	7
DCS201	3.00	3.45			110.119	1	2	75	75	2	2	2	3	75	75	75	75	300	S	9
DCS201	3.80	4.25			110.119	8	12	75	75	12	13	13	12	75	75	75	70	295	S	>50
DCS203	1.20	1.65			110.119	2	1	75	75	1	1	2	2	75	75	75	75	300	C	6
DCS203	2.00	2.45			110.119	5	6	75	75	8	10	10	10	75	75	75	75	300	S	38
DCS203	2.50	2.91			110.119	7	12	75	75	13	14	14	9	75	75	75	30	255	S	>50
DCS204	1.00	1.45			110.119	4	5	75	75	5	6	6	6	75	75	75	75	300	C	23
DCS204	2.00	2.45			110.119	2	3	75	75	3	2	2	3	75	75	75	75	300	C	10
DCS204	3.00	3.45			110.119	3	4	75	75	7	7	8	8	75	75	75	75	300	S	30
DCS204	3.80	4.20			110.119	8	12	75	75	13	16	16	5	75	75	75	20	245	S	>50

Notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005
2. N values have not been subjected to any correction.
3. Test carried out using split spoon S, or solid cone C.



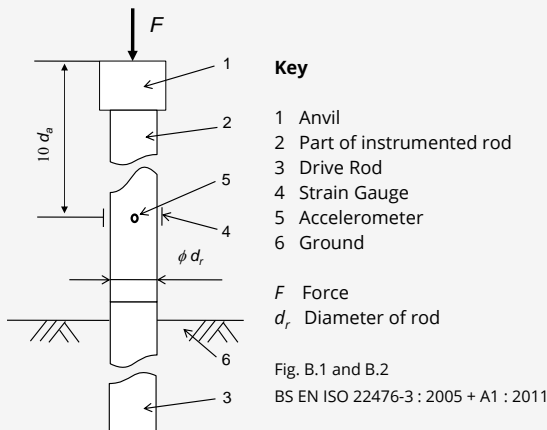
SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer Premier
 Test No EQU2023_34
 Client Applied Geology

Test Depth (m) 9.20
 Mass of hammer $m = 63.5\text{kg}$
 Falling height $h = 0.76\text{m}$
 $E_{\text{theor}} = m \times g \times h = 473\text{J}$

Characteristics of the instrumented rod



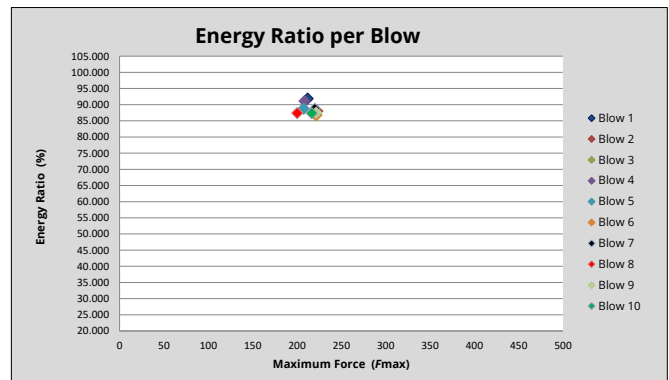
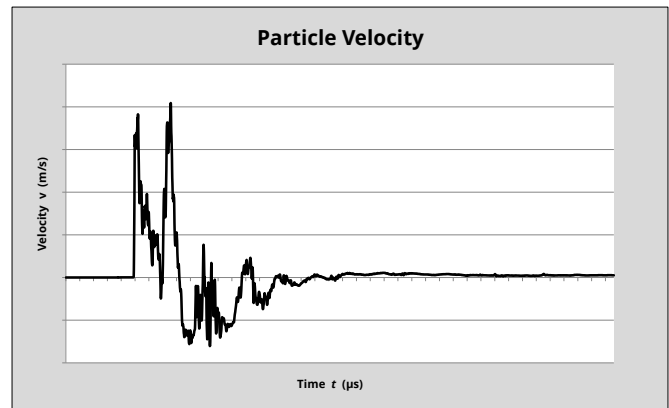
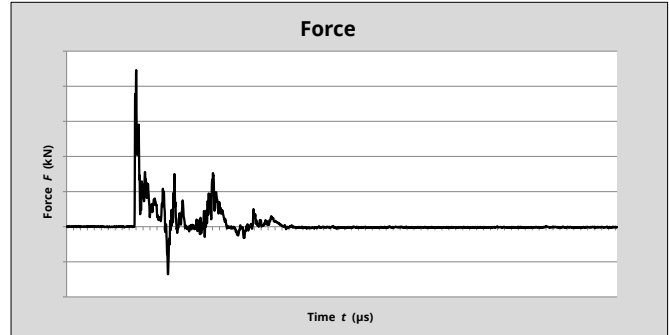
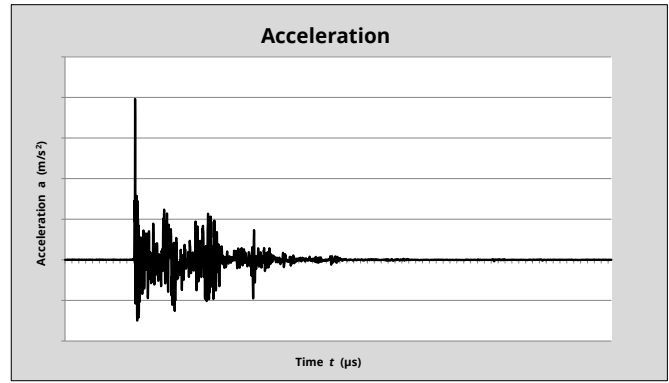
Diameter $d_r = 0.052\text{ m}$
 Length of instrumented rod 0.558 m
 Area $A = 11.61\text{ cm}^2$
 Modulus $E_o = 206843\text{ MPa}$

DATE OF TEST	VALID UNTIL	HAMMER ID
03/02/2023	03/02/2024	110 119

$E_{\text{meas}} = 0.419\text{ kN-m}$

$E_{\text{theor}} = 0.473\text{ kN-m}$










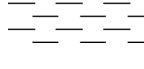



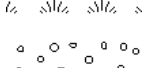
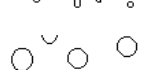
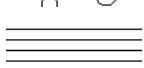


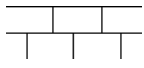






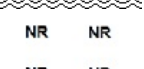

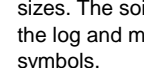

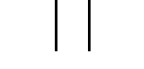
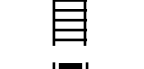
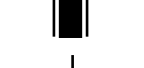
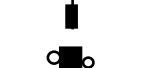
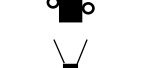



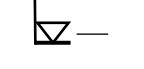

Comments



Energy Ratio (Er) = $\frac{E_{\text{meas}}}{E_{\text{theor}}}$ **88.48%**
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Equipe SPT Analyzer Operator ks	Certificate prepared by 	Certificate checked by 	Certificate date 06/03/2023
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Exploratory Hole Log Key Sheet

Sample Notation	Backfill Symbols	Legend Symbols
D Small Disturbed sample B Bulk Disturbed sample ES Environmental sample U Undisturbed U100 sample UT Undisturbed UT100 sample C Core sample W Water sample	 Sand  Gravel  Concrete  Bentonite  Arisings  Grout	 Topsoil  Made Ground  Concrete  Clay  Silt  Sand  Gravel  Peat  Cobbles  Boulders  Mudstone  Siltstone  Sandstone  Limestone  Chalk  Coal  Breccia  Conglomerate  Shale  Igenous Rock  Metamorphic Rock  No Recovery  No Recovery
In Situ Test Notation S Standard Penetration Test S (C) Standard Penetration Test (cone) HV Hand Shear Vane Test PID Photoionization Detector Test MEXE Mexecone Cone Penetrometer Test PP Pocket Penetrometer Test K Permeability Test	Installation Symbols  Plain Standpipe  Slotted Standpipe  Piezometer  Vibrating Wire Piezometer  Inclinometer  Extensometer (with magnet locations)	
Results Notation Cu Shear Strength kN/m ² N SPT N Value - PID VOC Concentration ppm () U/UT Blow Count -	Groundwater (GW)  Rise  Groundwater Strike - with Recorded Rise  Strike  Groundwater Strike - No Recorded Rise	
Rotary Core Notation TCR Total Core Recovery SCR Solid Core Recovery RQD Rock Quality Designation FI Fracture Index If Fracture Spacing NI Non Intact NR No Recovery NA Not Applicable		
Ease of Dig VE Very Easy E Easy M Moderate H Hard VH Very Hard		
General Notes		
<p>1. Details of the standpipe/piezometer are given on the log. The 'Install' column shows a graphical representation of the installed including depth of instruments including slotted section or piezometer depth, and backfill details.</p> <p>2. Standard Penetration Test is defined in BS EN ISO 17892. Total N value is shown on the logs, full details of the test increments, equipment references, water and casing levels shown on the SPT Summary Sheet.</p>		<p>Note: Most soils comprise a mixture of particle sizes. The soil type is graphically represented on the log and may be a combination of these symbols.</p>

APPENDIX C

Ground Gas Monitoring and Flow Results

Project Number: AG3030B-22

Date and Time of Monitoring: 17/08/2023 15:45

Project Name: Abbey Fields Leisure Centre, Kenilworth

Phase of Monitoring: 1 of 3

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS201	1.0	0.2	0.2	1.29	0.2	0.2	< 0.1	< 0.1	20.0	20.0	50	1.00
DCS203	< 0.1	< 0.1	< 0.1	0.02	0.2	0.2	0.7	0.7	6.4	6.4	50	DRY
DCS204	< 0.1	< 0.1	< 0.1	0.05	0.1	0.1	< 0.1	< 0.1	7.2	7.2	50	1.55

Additional gases (if required)

BH No.	VOCs (ppm)			
DCS201	0.5			
DCS203	1.5			
DCS204	1.5			

Borehole specific comments/observations
DCS201 - Flow initial of 1.00 l/h
DCS203 - Initial VOC of 5.2ppm

Meteorological Data

Atmospheric Pressure (mb)	Start: 1011
Atmospheric Pressure (mb)	Finish: 1011
Pressure Rising or Falling	Falling
Weather Conditions	Sunny
Atmospheric Oxygen (% vol)	20.9
Wind Speed & Direction	19km/h SE
Ambient Air Temperature (°C)	24.0

Site Data

Monitoring Personnel	Kerys Webb
GPS Instrument	
Gasmeter Serial Number	G505737
PID Serial Number	115558
Ground Conditions (vegetation stress, visual contamination):	

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

Ground Gas Monitoring and Flow Results

Project Number: AG3030B-22

Date and Time of Monitoring: 24/08/23 10:30am

Project Name: Abbey Fields Leisure Centre, Kenilworth

Phase of Monitoring: 2 of 3

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS201	< 0.1	-0.3	-0.1	-2.81	0.1	0.1	0.1	0.1	19.4	19.4	50	1.00
DCS203	< 0.1	< 0.1	< 0.1	-4.05	0.2	0.2	0.9	0.9	2.5	2.5	50	DRY
DCS204	< 0.1	< 0.1	< 0.1	-3.64	0.2	0.2	0.1	< 0.1	6.0	6.0	50	1.76

Additional gases (if required)

BH No.	VOCs (ppm)			Diameter of installation (mm)
DCS201	-			50.0
DCS203	-			50.0
DCS204	-			50.0

Borehole specific comments/observations
PID malfunction - VOCs not measured.

Meteorological Data

Atmospheric Pressure (mb)	Start: 1004
Atmospheric Pressure (mb)	Finish: 1004
Pressure Rising or Falling	Falling
Weather Conditions	Overcast
Atmospheric Oxygen (% vol)	21
Wind Speed & Direction	8 km/h NE
Ambient Air Temperature (°C)	22

Site Data

Monitoring Personnel	Kerys Webb
GPS Instrument	
Gasmeter Serial Number	G505737
PID Serial Number	
Ground Conditions (vegetation stress, visual contamination):	

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

Ground Gas Monitoring and Flow Results

Project Number: AG3030B-22

Date and Time of Monitoring: 01/09/2023 10:45

Project Name: Abbey Fields Leisure Centre, Kenilworth

Phase of Monitoring: 3 of 3

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS201	-0.4	-0.5	-0.4	-7.21	0.2	0.2	< 0.1	0.1	20.1	20.1	50	1.06
DCS203	-0.1	-0.1	-0.1	-0.02	0.1	0.1	1.0	1.0	3.3	3.3	50	DRY
DCS204	< 0.1	< 0.1	< 0.1	0.02	0.7	0.7	0.1	< 0.1	7.3	7.3	50	0.96

Additional gases (if required)

BH No.	VOCs (ppm)			Diameter of installation (mm)
DCS201	0.1			50.0
DCS203	1.4			50.0
DCS204	0.3			50.0

Borehole specific comments/observations

Meteorological Data

Atmospheric Pressure (mb)	Start: 1003
Atmospheric Pressure (mb)	Finish: 1004
Pressure Rising or Falling	Steady
Weather Conditions	Overcast
Atmospheric Oxygen (% vol)	21
Wind Speed & Direction	5 km/h
Ambient Air Temperature (°C)	19

Site Data

Monitoring Personnel	Ella Young
GPS Instrument	
Gasmeter Serial Number	G505737
PID Serial Number	115558
Ground Conditions (vegetation stress, visual contamination):	

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

Gas Monitoring Equipment Specification and Accuracy Details

Instrument Specifications


Instrument	Atmospheric Pressure Range	Temperature Range	Flow Range	Flow Resolution	Borehole Pressure Range
GA5000	500-1500 mb +/- 5 mb	-10°C to + 50°C	0-20 lt/hr +/- 0.3 l/hr	0.1l/hr	+.500/-500 mbar +/- 4 mbar
Phocheck Tiger	-	-20 to + 60°C (Certified to -15 to + 45°C)	-	-	-

Instrument Accuracy

Instrument		Methane	Lower Explosive Limit	Carbon Dioxide	Oxygen	Volatile Organic Compounds	Hydrogen Sulphide	Carbon Monoxide
GA5000	Detection Range	0-100%	-	0 -100%	0-25%	NA	0 -50ppm response <30 secs	0 - 1000ppm response <30 Secs
	Detection Accuracy	./- 0.5% @ 0 to 70%, ./-1.5% @ 70 to 100% Response < 10 secs	N/A	./- 0.5% @ 0 to 60%, ./-1.5% @ 60 to 100% Response < 10 secs	./- 1.0% @ 0 to 25%, Response < 20 secs	NA	./- 1.5% FS	./- 2% of FS
Phocheck Tiger	Detection Range	N/A	N/A	N/A	N/A	1 ppb - 10,000 ppm	N/A	N/A
	Detection Accuracy	N/A	N/A	N/A	N/A	+/- 1ppb +/- 5% of actual displayed accuracy +/- One digit Response < 2sec	N/A	N/A

Calibration Frequency

Equipment Serial Numbers

<p>Instruments are calibrated annually.</p> <p>Details of the instrument calibration certificates and service records are available if required.</p>		
	GA5000 (G503948, G505383, G505737)	
	Phocheck Tiger - (T-108308, T-109597, T-109598, T-110423)	