Date: 16th September 2024
Reference: 15-974 V36

GAS MEMBRANE VALIDATION – BENNETT STREET

Project Name:	Bennett Street
Project Number:	15-974
Client:	Kellen Homes
Date:	11-09-2025
Project Manager:	M. Dee
Engineer:	M. Dee
Ground Gas Risk Assessment:	Vapor Membranes Required
Gas Membrane Installers Name & Qualifications:	JCW Gas Membranes Ltd, NVQ Level 2 – Installation of Gas Membranes in Construction
Plot:	160 & 161

OVERVIEW

GeoEnginSteer attended site under the supervision of E3P to confirm the integrity of installed gas measures for Plot 160 and 161 through tracer gas testing on 11th September 2025.

The plot floor areas had been screeded with exterior walls built, as such, the gas protective system was covered and unable to be visually inspected. E3P were provided photos from the client showing the installation of a black membrane, additionally, E3P have undertaken visual inspection and confirmed the installation of a Juta TitanFlex (black) membrane on all plots completed to date across the wider site. E3P photographs of membrane provided to E3P are appended to this report.

E3P inspected air vents and confirmed the installation of a minimum of three telescopic air vents on the exterior walls of the plot. As per the Build Phase Contamination Risk Mitigation Strategy (report ref: 15-974-R5), sub-floor voids require inspection and validation at 50% ratio of substructures completed. E3P undertook subfloor void inspections for similar Plots 24-25 and 71-76 on 22nd January 2025, inspections confirmed there was a minimum void space of 150 mm for each plot, with sub-floor void inspection record and photographs appended to this letter.

GeoEnginSeer undertook integrity testing of the membrane under the supervision of E3P. Integrity testing was undertaken utilising tracer gas leak detection methodologies for all plots, with one test undertaken per plot. GeoEnginSteer integrity testing results and reports are appended to this letter.

The test results show that the tracer gas was present under the foundation but wasn't migrating up into the properties, indicating that the membrane is working as required.

MEMBRANE SPECIFICATION: JUTA TITANFLEX (BLACK)

GROUND GAS PROTECTION
GP® TITANFLEX®
TECHNICAL DATA SHEET

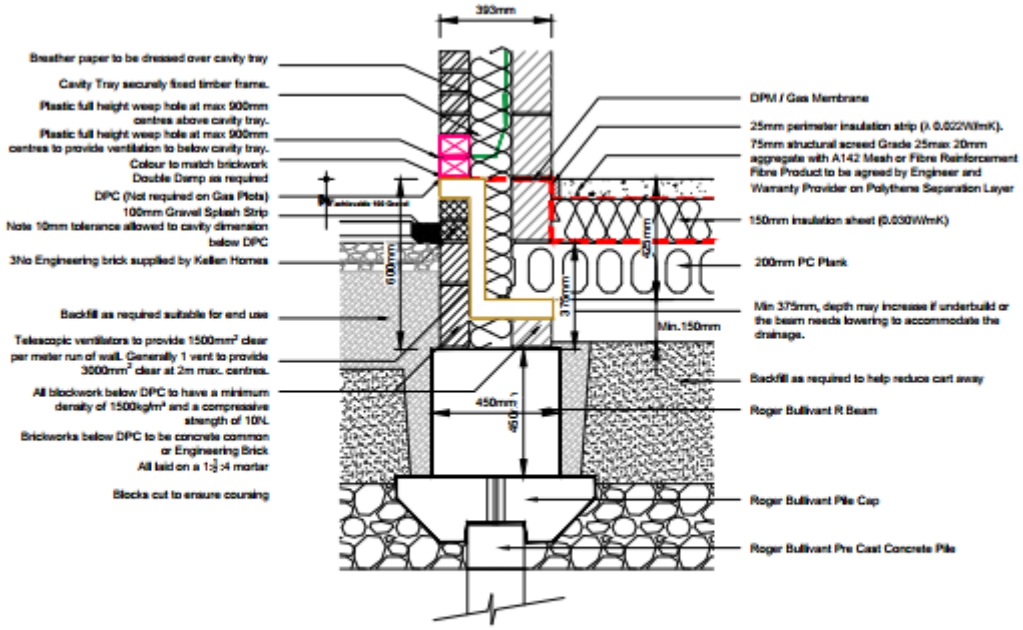
GP® TITANFLEX®

Feature	Characteristics	Test Method	GP® TITANFLEX®
Physical Properties	Thickness	EN 1849-2	0.5 mm
	Width	EN 1849-2	2 m
	Length	EN 1849-2	50 m
	Weight	EN 1849-2	500 g/m²
Hydraulic Press	Water Vapour Transmission Rate	EN 1931	0.11 - 0.18 g/m²/day
	Water Tightness (60 kPa)	EN 1928	Pass
	Water Tightness (196 kPa - 20 m Water Head) (Basement Application)	EN 1928	Pass
Mechanical Properties	Resistance to Static Load	EN 12730-B	≥ 20 kg
	Puncture Resistance	EN 12236	≥ 2.0 kN
	Tensile Strength (MD)	EN 12311-1	> 550 N/50mm
	Tensile Strength (CMD)	EN 12311-1	> 400 N/50mm
	Tensile Elongation (MD/CMD)	EN 12310-1	> 550 %
	Tear Resistance (MD/CMD)	EN 12310-1	> 300 N
	Resistance to Impact	EN 12691-B	650 mm
	Reaction to Fire	EN 13501-1	E Class
	Resistance to Artificial Ageing	EN 1296/EN 1928	Pass
	Resistance to Chemicals	EN 1296/EN 1928	Pass
Compliance and Certification	CE Mark - EN13967:2012		
	NHBC Standards Compliant		
	CIRIA C748 Compliant		
	BS 8485:2015 Compliant		
Vapour Permeability 100% Concentration	Transmission Rate of Benzene	EN ISO 15105-2	< 3.6 mg/m²/day
	Transmission Rate of Toluene	EN ISO 15105-2	< 13.8 mg/m²/day
	Transmission Rate of Ethyl Benzene	EN ISO 15105-2	< 2.7 mg/m²/day
	Transmission Rate of Xylenes (M,P,O)	EN ISO 15105-2	< 7.7 mg/m²/day
	Transmission Rate of Hexane	EN ISO 15105-2	< 0.6 mg/m²/day
	Transmission Rate of Vinyl Chloride	EN ISO 15105-2	< 0.05 mg/m²/day
	Transmission Rate of Trichloroethene (TCE)	EN ISO 15105-2	< 54.7 mg/m²/day
	Transmission Rate of Tetrachloroethene (PCE)	EN ISO 15105-2	< 26.2 mg/m²/day
	Transmission Rate of Naphthalene	EN ISO 15105-2	< 0.0006 mg/m²/day
	Transmission Rate of CIS-1,2-Dichloroethylene	EN ISO 15105-2	< 1.1 mg/m²/day
Gas Permeability	Methane Permeability	EN ISO 15105-1	0.13 ml/m²/day/atm
	Methane Permeability (Jointed)	EN ISO 15105-1	1.00 ml/m²/day/atm
	Carbon Dioxide Permeability	EN ISO 15105-1	3.01 ml/m²/day/atm
	Vinyl Chloride Gas Permeability	EN ISO 15105-1	0.04 ml/m²/day/atm
	Radon Permeability	K124/02/95	1.0 x 10^{-12} m²/S

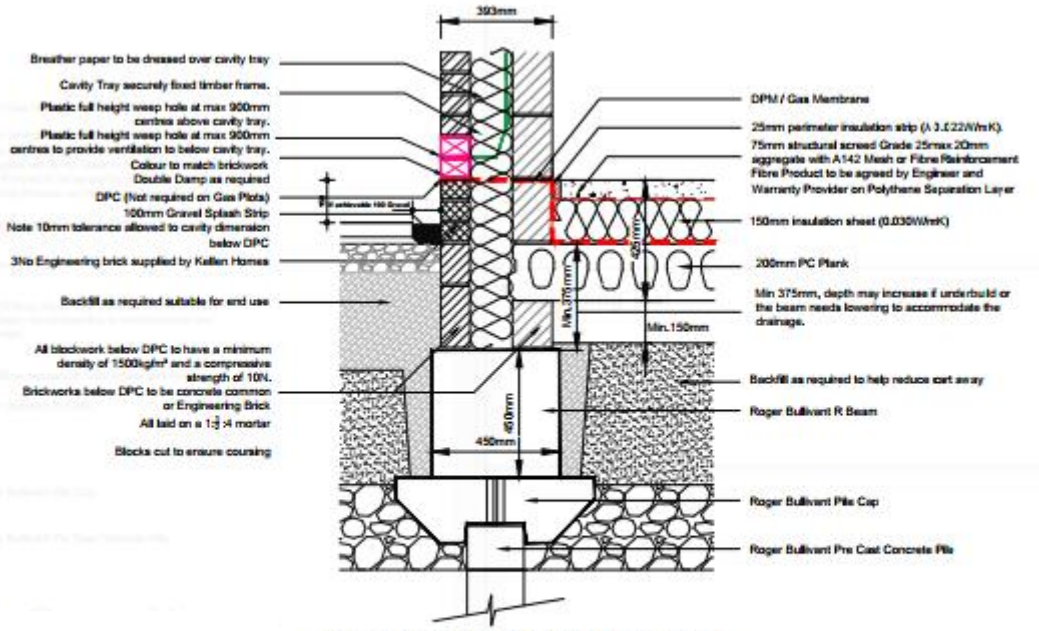
JUTA | TITANTECH

Juta.co.uk

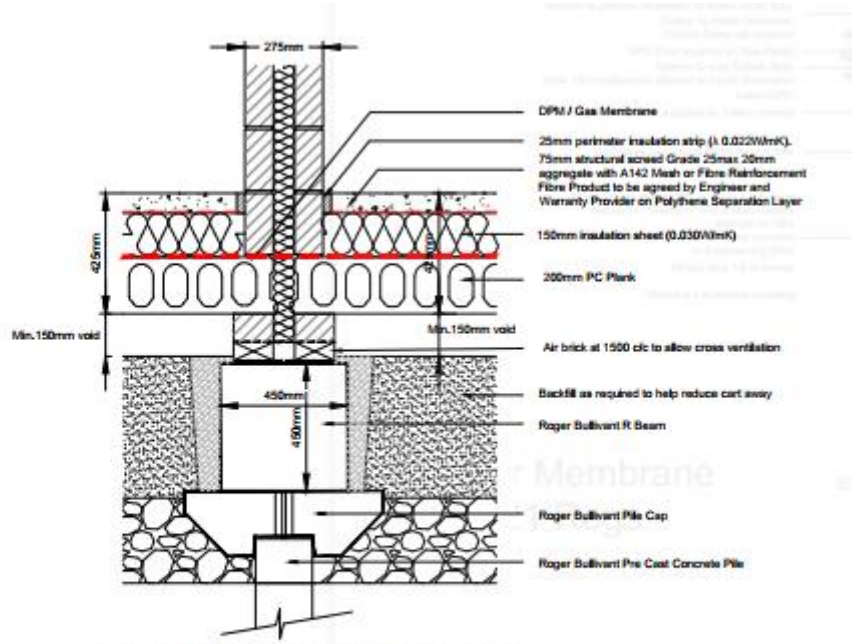
STRUCTURAL ENGINEER'S SUBSTRUCTURE DESIGN



BENNETT STREET SUBSTRUCTURE DETAIL
APARTMENTS
Locations with Telescopic Vents



BENNETT STREET SUBSTRUCTURE DETAIL
APARTMENTS
Locations with Telescopic Vents



PROPOSED DEVELOPMENT PLAN



The sub floor void validation photographs are enclosed within this letter. For information, Table 1 includes references and validation dates of previously validated plots.

Table 1 – Validation Letter Reference

PLOT NUMBER	DATE	REPORT REFERENCE
9-15	19-10-2023	V1
16 & 17	24-10-2023	V2
18 & 19	01-11-2023	V3
Apartment Block 3	08-03-2024	V4
Apartment Block 1	14-03-2024	V5
Apartment Block 2	19-03-2024	V6
136-138 and 147-148	15-05-2024	V7
130-135	28-06-2024	V8
123-127	06-08-2024	V9
119-122	22-08-2024	V10
112-114	23-08-2024	V11
117-118	06-09-2024	V12
105 - 107	16-09-2024	V13
95, 96, 101-104, 128, 129	23-09-2024	V14
139-146	16-09-2024	V15
91-94, 97, 98	02-10-2024	V16
99-100 and 91-92 garages	04-10-2024	V17
80-86	11-10-2024	V18
89-90	06-11-2024	V19
71-76	14-11-2024	V20
77-79 and 87-88	12-11-2024	V21
170-172	22-11-2024	V22
162-169	28-11-2024	V23
60-65	02-12-2024	V24
66-70	04-12-2024	V25
49-59 and 149-150	22-01-2025	V26
20-23	27-01-2025	V27
24-25	30-01-2025	V28
43-48, 155-159	20-02-2025	V29
29-30, 151-154	04-03-2025	V30
1-4, 33-36	12-03-2025	V31
31-32	18-03-2025	V32
26-28	20-03-2025	V33
37-42	19-05-2025	V34
5-8	10-06-2025	V35
160-161	11-09-2025	V36

Floor Void Inspection

22 Jan 2025 / Jordan James

Complete

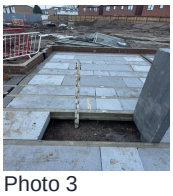
Score	14 / 14 (100%)
Site Name	Bennett st
Project Number	15974
Conducted on	22 Jan 2025 9:20 AM GMT
Prepared by	Jordan James
Location	20 Stone Yard Close Manchester England M12 United Kingdom (53.47074978574324, -2.208280331766715)
Plot Inspection	14 / 14 (100%)
Plot Inspection 1	2 / 2 (100%)
Plot Number	24
Is the void clear?	Yes
Depth of Void	250


Photo 1

Are Sleeper Walls Vented?	Yes


Photo 2

Plot Inspection 2	2 / 2 (100%)
Plot Number	25
Is the void clear?	Yes
Depth of Void	200


Photo 3

Are Sleeper Walls Vented?	Yes


Photo 4

Plot Inspection 3	2 / 2 (100%)
Plot Number	71
Is the void clear?	Yes
Depth of Void	150


Photo 5

Are Sleeper Walls Vented?	Yes


Photo 6

Plot Inspection 4	2 / 2 (100%)
Plot Number	72
Is the void clear?	Yes
Depth of Void	200


Photo 7

Are Sleeper Walls Vented?	Yes


Photo 8

Plot Inspection 5	2 / 2 (100%)
Plot Number	73
Is the void clear?	Yes
Depth of Void	150


Photo 9

Are Sleeper Walls Vented?	Yes


Photo 10

Plot Inspection 6	2 / 2 (100%)
Plot Number	75
Is the void clear?	Yes
Depth of Void	170


Photo 11

Are Sleeper Walls Vented?	Yes


Photo 12

Plot Inspection 7	2 / 2 (100%)
Plot Number	76
Is the void clear?	Yes
Depth of Void	180


Photo 13

Are Sleeper Walls Vented?	Yes


Photo 14

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14

GeoEnginSeer

FREELANCE DILETTANTE GEOLOGIST

Bennett Street, West Gorton, Manchester, E3P

Verification Completion Report for Ground Gas Protection Systems

Date	11.09.25

Project Title	Bennett Street
GES Report Number	2513
Date	11.09.25
Client	Whittaker and Pointon Ltd.
Weather	16°C cloudy light wind 0.1 - 1 kmh
Development Type	Residential
Foundation Type	Block and Beam
Plot Numbers	160 & 161 (retro tracer gas test)
GES Job Ref:	1526
Visit By	Paul Carter- Jones

Report By	**Checked/Approved By**
Signature [redacted]	*Signature:* [redacted]
Name: Paul Carter – Jones	*Name: Ben Crowther*

Company Contact Details

Kellen Homes,

1st Floor 103 Dalton Avenue,

Birchwood Park,

Warrington,

United Kingdom,

WA3 6YF

BGA British Geomembrane Association
THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

1. GAS MEMBRANE

1.1 Condition Of Subgrade and Underside Of Gas Membrane

Check that the subgrade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria.

Unable to check.

1.2 Gas Membrane Type

Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers.

Unable to check.



1.3 Laps, Welds and Joint Seals

Joints lapped and sealed in accordance with manufacturers requirements/specification. Minimum overlap insured? Welds complete? Appropriate joining/double sided tape used?

Unable to check.

1.4 Service Entries Seals

How many pipe penetrations? Top hats seal arrangements fixed around service entries? Use of jubilee clips? Etc.

Unable to check.

BGA British Geomembrane Association

THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

2. VENTILATION SYSTEMS

2.1 Subfloor Void

Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?

Unable to check.

2.2 External Wall Airbricks

How many? Size? Positioning? Spacing? Etc.

Air bricks (9”x3”) were spaced around the properties.





2.3 Active Venting

Type of air supply: mechanical, natural, combined? Location/condition/number of fans/vents? Location and size of inlets? Provision of air cleaning devices and air heaters? Supply and exhaust duct work? Alarm provision/installation? Gas monitoring system in under-floor void?

N/A

2.4 Testing Of Air Flow

Is the air flowing sufficiently through ventilation? Anemometer reading? Smoke test? Tracer gas?

Tracer gas test carried out through air vents.

BGA British Geomembrane Association

THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

3. INSPECTION AND INTEGRITY DETAILS

On the 11th of September 2025 I attended Bennett Street site in Manchester, to carry out a retro tracer gas integrity test on plots 160 and 161.

A base line reading of background gasses was taken on the handheld GMI gas detector both outside and inside the property and also inside the garages.

The air vents were then sealed, and a tracer gas (carbon dioxide) was pumped in through selected air vents (that were opened then re-sealed) and readings were taken on the opposite side of the property to show that the foundation of the property was filled sufficiently with the tracer gas.

A test was carried out with the gas detector to show the tracer gas was present under the foundation.

An internal walk around with the gas detector was then carried out.

Please see results below. [redacted] [redacted]

BGA British Geomembrane Association
THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

PLOT NO.	C02	LEL	CH4	02	NOTES
160	0.00	00	0.0	20.4	Baseline reading before gas injection
	0.00	00	0.0	20.4	After gas injection. No leaks detected, membrane acting as expected
161	0.00	00	0.0	20.4	Baseline reading before gas injection
	0.00	00	0.0	20.4	After gas injection. No leaks detected, membrane acting as expected

BGA British Geomembrane Association

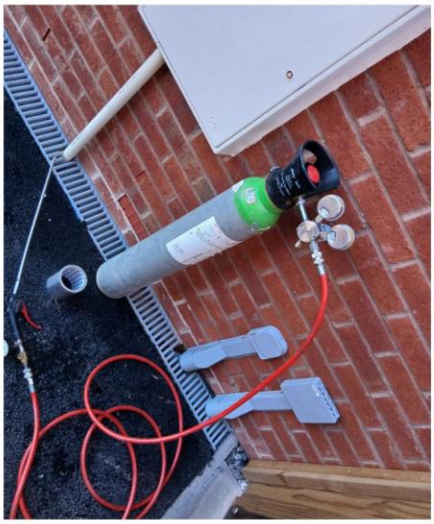
THE RADON COUNCIL

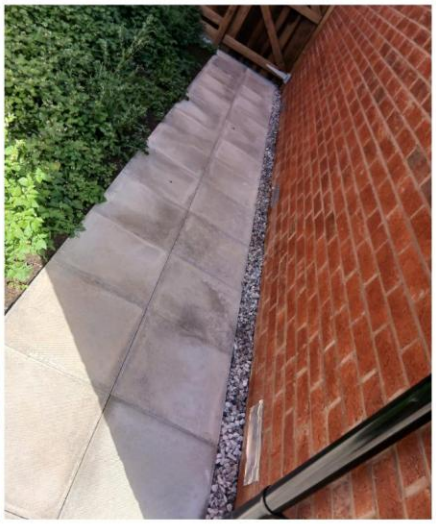
Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

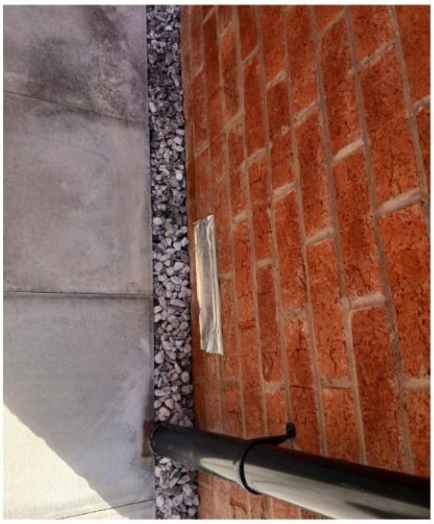
4. PHOTOGRAPHIC RECORDS

Plots 160 & 161:









BGA British Geomembrane Association

THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

Base line readings:



BGA British Geomembrane Association

THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

Readings after gas injection:



BGA British Geomembrane Association

THE RADON COUNCIL

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

Site plan:



BGA British Geomembrane Association

THE RADON COUNCIL

Gas Protection Verification

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921

5. CONCLUSION OF SITE VISIT

5.1 Details Of Installers

Are the installers suitably qualified / trained? Names of installers / company details?

JCW Group Ltd qualified installers of Gas Membranes

5.2 Pass / Fail?

Are the measures inspected acceptable / NOT acceptable? Do they comply with the specifications? Is attention required to specific issues?

PASS

5.3 Additional notes

Remedial actions to be taken? Re-visit to be arranged?

None.

If you have any questions regarding the above, please do not hesitate to contact me.

Yours sincerely

[redacted]

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA-QT, SGPV
For and on behalf of GeoEnginSeer Ltd.

Commorragh, 1 Harrison Street, Cornholme, Todmorden, OL14 8LF : 07817108921
geoenginseer@gmail.com

6.0 Limitations and Challenges of Verification Reporting

This report is based on the information that has been made available to us from the client, contractor and architect regarding the site. The conclusions drawn in the report are considered correct although any subsequent additional information or actions may allow refinement of the conclusions. It should be noted that: The report has been prepared under the express instructions and solely for the use of the Client.

The findings of this report represent the professional opinion of experienced Ground Gas System Surveyors. GeoEnginSeer Ltd does not provide legal advice and the advice of lawyers may also be required.

All work carried out in preparing this report has utilised and is based upon understanding of current relevant UK standards and codes, technology, and legislation. (BS8485:2015+A1:2019 & CIRIA 735).

Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

The report is limited to the boundaries identified by the Client on this site and confirmed within this document.

Should additional services be introduced, or service conduits are not sealed or have services provided through them at a later date that are not sealed to the conduit and or gas protection system, a retrospective fit may be required.

If a site is left open for prolonged periods following verification or works are conducted that may damage the integrity of the installation by follow on trades repairs may be needed, the standards observed in a positive verification report may be compromised. Intellectual rights to this document may be rescinded.

Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV
For and on behalf of geoenginseer.
www.Geoenginseer.co.uk 07817108921