Phase II Geo-Environmental Assessment

90 High Street
Girton
Cambridge
CB3 0QL

Prepared for:

Ms Catherine Stewart
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Girton
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CB3 0QL

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90 HIGH STREET, GIRTON

NON-TECHNICAL CLIENT SUMMARY

This report presents the findings of a Phase II Intrusive Investigation undertaken to determine ground conditions and establish if there are any environmental risks associated with the site to address outstanding planning conditions related to ground gas and to inform a conveyance. Pertinent findings and conclusions may be summarised as follows:

- The site comprises a rectangular parcel of land extending to the south-east from the High Street in Girton, containing Red House and Mill House, with two large sections of garden. An old clay, sand, and gravel pit which has been infilled is recorded within the gardens of the property and risks were highlighted by the Council associated with ground gas for which they requested further assessment.
- The objectives of this investigation were therefore two fold. Firstly, to investigate and assess the risks posed to the Mill House from landfill gases (methane and carbon dioxide) generated by any organic wastes backfilled into the pit. Secondly, to investigate the overall soil quality in the pit as it forms part of the wider garden for the Red House which is currently being sold.
- Intrusive works comprised the formation of five boreholes to a depth of 4.0m, with gas monitoring standpipes installed in four locations, two either side of Mill House and two over the pit. Ground conditions were found to comprise a thin layer of topsoil over made ground, which was recovered as a gravelly clay in most locations, with deeper made ground of mixed clays, sands and gravels with rare brick and bituminous material fragments in the location of the old pit. Natural soils were recovered under the made ground, as Head Deposits of clayey sands and gravel over Gault Formation clays.
- Laboratory analysis of shallow soils sampled from the infilled pit has identified that the adopted screening criteria protective of site users (residents) have not been exceeded by contaminants of concern. A return monitoring programme and consideration of the site's context and potential sources of soil gases has led to the gassing regime being designated as a very low risk, Characteristic Situation 1 (CS1) scenario for the Mill House building, for which no ground gas protection measures would be required. As such, the site is considered safe and suitable for its ongoing residential usage.
- It is recommended that a copy of this report be provided to the Environmental Health Department of South Cambridgeshire District Council for inclusion in their land quality records. This report should satisfy the outstanding conditions of the planning process relating to contamination and ground gas for the Mill House (Planning ref S/0169/16/FL).

The above points represent a simplified summary of the findings of this assessment and must not form the basis for key decisions for the proposed development. A thorough review of the details is contained within the following report, or alternatively get in touch and we'll talk you through it.

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		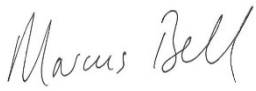
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Where ground investigations have been conducted, these have been limited to the level of detail required for the site in order to achieve the objectives of the investigation.

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

The National Planning Policy Framework 2019 requires a competent person to prepare site investigation information, which is defined as a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation. EPS considers that it fulfils these criteria and would welcome any request for staff CVs or case studies to demonstrate it.

As stated within DEFRA's Contaminated Land Statutory Guidance (2012), with any complex risk assessment it is possible that different suitably qualified people may reach slightly different conclusions when interpreting the same information. EPS recognises this and considers the conclusions presented within this report to be robust and appropriate but input from the Local Authority and their judgement in line with this guidance would still be welcomed.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

Figures

Tables

Appendices

1 INTRODUCTION

In September 2023, Environmental Protection Strategies Ltd (EPS) was commissioned by Ms Catherine Stewart to complete a Phase II Geo-Environmental Assessment Report at 90 High Street, Girton, Cambridge, CB3 0QL ('the site'); see Figure 1.

The work was commissioned in order to satisfy outstanding planning conditions related to ground gas risks on the Mill House and satisfy conveyancing concerns raised regarding soil quality in an infilled pit in the garden of Red House.

The Mill House was subject to planning permission a replacement annexe and garage under South Cambridgeshire District Council's planning application Ref. S/0169/16/FL. The building was now complete but there was an outstanding planning conditions relating to ground gases.

Selected site photographs are included in Appendix A and the redevelopment layout for the Mill House is included in Appendix B.

This report presents the findings, conclusions, and recommendations of the Phase II Intrusive Investigation undertaken as instructed.

1.1 Objectives

The objectives of this investigation were as follows:

a) Investigate potential contaminant linkages (risks) identified in the planning conditions and conveyancing process by means of investigating shallow soils and soil gases.
b) Determine the potential risks posed by the site and make recommendations for further work that may be required, to ensure safe development in accordance the Environment Agency's *Land Contamination: Risk Management* guidance (LC:RM, 2020) and the *National Planning Policy Framework*.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRAs '*Contaminated Land Statutory Guidance*' (2012), BS10175 – '*Investigation of Potentially Contaminated Sites*', and BS 5930:2015+A1:2020 '*Code of practice for ground investigations*' , the following tasks were undertaken:

<u>Intrusive Investigation:</u>

- Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
- Health and safety briefing / site supervision.
- Drilling of five window sample boreholes to a depth of 4.0m below ground level (bgl) using a track-mounted percussive rig.
- Continual logging of ground conditions including inspection of samples for visual and olfactory contamination, and laboratory analysis of selected representative samples.
- Installation of gas monitoring standpipes at selected locations, with a return monitoring programme conducted (3 visits).

Reporting:

- Data collection
- Interpretation of data including completion of Generic Quantitative Risk Assessment

The findings and conclusions of these investigations are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of a soil sampling investigation conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements:

No investigation method is capable of completely identifying all ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by constructing a number of boreholes recover soil samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable and it may be possible that the conditions encountered may differ to those found during the investigation.

No visible evidence of Japanese Knotweed was identified during the site walkover. However, this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its' presence at certain times of the year. For this reason, EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

This report does not include a specific survey for the presence of Potential Asbestos Containing Material (PACM), rather it is a soil-survey where asbestos may be identified as a contaminant. Specialist contractors should be commissioned to make detailed assessments and recommendations if these materials are suspected.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made. EPS has targeted a specific feature of the property, and this report is not a comprehensive review of soil quality across the whole property.

Whilst it is recognised that information contained within this report may assist relevant and suitably qualified professionals, this report does not provide a geotechnical appraisal of ground conditions with respect to suitability of foundations or future structures, nor does it intend to identify a need for any associated geotechnical ground improvement works.

2 GEO-ENVIRONMENTAL SETTING

A Phase I Desk Study for the site was conducted by Argyll Environmental in August 2023. It is recommended that the reader review the Phase I report prior to reading this Phase II assessment:

- Site Solutions Search: The Red House, 90 High Street, Girton (Argyll Environmental, *Ref:* 315846659, *18th August 2023*)

The following section provides a brief summary of the information collected in relation to the site location and history.

2.1 Site & Location Description

Detail	Description
Location	The property lies east of High Street in the village of Girton, approximately 6km north-west of Cambridge city centre.
National Grid Reference	542370, 262520
Topographic Elevation	The site lies around 19-21m Above Ordnance Datum (AOD) and slopes gently down from east to west.
Description of Site	The land at 90 High Street, Girton is approximately 1.25ha in area, extending to the south-east from the road. The overall redline boundary includes the Red House, the larger original dwelling in the north-west corner of the land and the Mill House, a smaller barn-conversion type dwelling adjacent to the Red House. Gardens to the rear (east/southeast) of the property comprise a roughly rectangular wooded paddock containing mixed ornamental trees with marginal flowerbeds, opening to a larger grassed paddock containing a pond, shepherd's hut and deciduous copse at the rear. The two paddocks are separated by a wooden fence. The gardens are accessed by a gravel drive which runs from High Street to the edge of the grassed area.
Surrounding Land Use	The site lies within a residential village on the outskirts of Cambridge, with the majority of the surrounding land dedicated to residential housing and agricultural fields.

A plan showing the site location is provided as Figure 1. Selected site photographs are included as Appendix A.

2.2 Environmental Setting

Detail	Description
Geology	Geological mapping shows the site is underlain by superficial Head deposits (clay, silt, sand and gravel), over Gault Formation Mustone bedrock.
Hydrogeology	Groundwater vulnerability maps for the area show that the superficial deposits are classified as Secondary Aquifer (undifferentiated), while the underlying bedrock is classified as Unproductive Strata. The site does not lie within a Source Protection Zone for local groundwater abstraction. No groundwater abstractions are located within 500m.
Hydrology	The nearest surface water feature is a pond located within the site boundary to the east. Additionally, Beck Brook runs approximately NE-SW around 250m to the west of the site.
Landfill & Waste	One area of potentially infilled land is recorded, related to a sand, clay and gravel quarry located on site. The pit is located across the centre of the gardens to the rear of the property in a rough 'd' shape. No other landfill or waste sites are recorded in the local area (250m).
Radon Gas	The Argyll Environmental report does not highlight that the site is a radon affected area where radon protection measures might be needed.
Summary of Site History	The Phase I desk study indicates that: 'The site largely comprised open garden land, with a house and agricultural outbuildings in the north-west from at least c.1887. Alterations/extensions to the outbuildings in the north-west were undertaken over time, and by c.1902 a small gravel pit was noted in the centre-south, as shown on Figure 2. The gravel pit and agricultural outbuildings expanded significantly by c.1927, and outbuildings extended into the centre by the 1930s. By the 1960s the gravel pit was disused and appears to have been partially levelled, with some outbuildings cleared from the north-west by this time. Outbuildings were cleared from the centre by c.1973, with only minor footprint alterations observed in subsequent mapping.' (Argyll Environmental, August 2023)

2.3 Desk Study Conclusions & Recommendations

The Phase I Desk Study completed by Argyll Environmental identified the presence of infilled ground related to an old clay, sand, and gravel pit, but concluded that no liabilities related to contaminated land or flood risk were active, with no further action was required.

However, a memorandum produced by the Contaminated Land Officer for South Cambridgeshire District Council related to planning application (*Ref.* S/0169/16/FL) in July 2017 (included in Appendix C) identified the infilled land as a potential risk for ground gas migration.

As such, two planning conditions related to this risk were stipulated:

- The application site has been subject to an appropriate scheme for the investigation and monitoring of ground gas.
- Where required, detailed proposals for the mitigation or otherwise rendering harmless of any ground gas have been submitted to and approved in writing by the Local Planning Authority.

Technically the infilled feature is 'off-site' when compared to the redline planning boundary for the Mill House (S/0169/16/F). The risk of on-site gas migration is therefore pertinent to the Mill House but the physical interaction with infilled soils would not be, hence the Council's focus on ground gas risks. However as the whole property is now being sold inclusive of both dwellings, a query was raised over the soil quality in the infilled pit as that does sit in the wider garden for the Red House. Hence both aspects warranted investigation.

In the context of potentially unacceptable or acceptable risks as outlined within the Environment Agency's *Land Contamination: Risk Management* guidance, these contaminant linkages which pose potentially unacceptable risks and warrant further assessment to determine the most appropriate action are as follows:

- Generation and migration of ground gas to indoor air.
- Potential exposure of site users to contaminated soils from the infilled material.

It was therefore considered that the identified plausible contaminant linkages should be further investigated by means of exploratory intrusive investigation and ground gas monitoring to address the conditions. The findings of this work are detailed in the remainder of the report below.

3 SUMMARY OF INTRUSIVE INVESTIGATIONS

Intrusive ground investigations were undertaken on 16th October 2023 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of all site activities is presented in the following sections:

3.1 Exploratory Hole Locations

Exploratory hole locations were selected through consideration of the potential contaminant linkages identified through the planning conditions, the location of below ground utilities as well as operational and health & safety considerations.

Five window sample boreholes (WS01 – WS05) were formed at the site to a depth of 4.0m using a track-mounted percussive drilling rig. The rational for the placement of these boreholes is listed in the table below.

Location	Rationale
WS01	Provide information on the underlying shallow soils and install a standpipe on the far side of Mill House from the infilled pit.
WS02	Provide information on the underlying shallow soils and install a standpipe on the near side of Mill House from the infilled pit.
WS03 & WS04	Provide information on the underlying shallow soils and install standpipes in the location of the infilled pit.
WS05	Provide information on the extent of the former pit.

Standpipes were installed in boreholes WS01 - WS04. Groundwater sampling pipes were installed using 50mm diameter uPVC well casing and fitted with a gas tap. Slotted casing (1mm slot) was installed at each location from the base of the borehole to approximately 1.0m below the surface. The installations were completed to ground surface using plain casing. A filter pack of 2-3mm of washed gravel extended from the base of the boreholes to approximately 0.1m above the slotted section with a bentonite seal to surface. All installations were finished with flush-mounted, bolt-down headworks.

A borehole location plan is presented as Figure 2.

3.2 In-Situ Testing & Soil Sampling

Each borehole was logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids on a precautionary basis. Borehole logs are presented in Appendix D.

Where potentially volatile organic compounds are suspected, EPS carries a Photoionisation Detector (PID), which can be used to measure the relative concentrations of vapour associated with soil samples collected from different depths and locations at the site. In these circumstances, soil samples will be placed into plastic bags, sealed, shaken and then allowed to rest for a few minutes to allow time for volatile vapour to accumulate in the air trapped within the bag.

The PID probe will then be used to pierce the bag and sample the air above the soil to measure the concentration of volatile compounds that have accumulated. PID readings are only used to provide EPS with a basic means to quantify areas of volatile organic compound in the field to help guide the investigation. As potentially volatile organic compounds, specifically including petroleum hydrocarbons may be associated within infill material, PID readings were collected during this intrusive investigation. These readings are included within borehole logs presented as Appendix D and the results are discussed further in later sections.

A laboratory testing schedule is included as Table 1.

3.3 Ground Gas and Organic Vapour Monitoring

The presence and concentration of ground gases including carbon dioxide, oxygen, methane and organic vapours along with borehole flow rate were recorded on three separate occasions as part of a monitoring programme, conducted after the intrusive works. These return monitoring visits were completed using a GFM435 gas meter, PID and Flow Meter respectively and readings were taken on the 23rd October, 31st October and 6th November 2023.

A summary of the ground gas and organic vapour measurements recorded during the return monitoring programme are summarised in Table 1 of this report.

3.4 Laboratory Testing

Samples obtained for analysis of identified contaminants of concern were submitted to Element Materials Technology of Flintshire, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

4 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the ground investigation.

4.1 Ground Conditions

A total of five window sample boreholes were formed at the site and the ground conditions encountered, from surface level, were found to comprise:

- Topsoil
- Made Ground
- Head Deposits
- Gault Formation Mudstone

Site specific borehole logs are included as Appendix D and give descriptions and depths of strata encountered. A summary of the general strata encountered across the site is provided in the table below, with more detailed description given in the following sub sections.

Geological Strata	Maximum Depth to Base of Strata (m bgl)	Strata Thickness (m)
Topsoil	0.2	0.1-0.2
Made Ground	3.0	1.05-2.9
Head Deposits	3.5	0.5-1.1
Gault Formation	>4.0 (not proven)	>0.5->2.8 (not proven)

5.1.1 Topsoil

Topsoil was encountered from the surface in all locations beneath the grass covering and was observed as a brown slightly gravelly clay with flint and chert gravel and progressed to around 0.1m depth. Where encountered over the made ground, the topsoil obviously has been reworked.

5.1.2 Made Ground

In all locations except WS01, material interpreted as made ground was recovered. This varied slightly in character across the site, however generally comprised dark brown, gravelly clay from below the topsoil with occasional brick, sand lenses and dark staining to approximately 1.0mbgl. This was the only made ground recorded in WS02 by Mill House.

In the main location of the old pit (WS03-WS05), deeper made ground with greater variability was recorded beneath this initial layer. In WS03, a layer of reworked, sandy, gravelly clay was recovered to around 2.0mbgl. In WS04, layers of friable sandy clay, medium sand, and sandy, gravelly clay were recovered to approximately 2.5mbgl. In WS05, the dark brown, gravelly clay was deeper, to ~2.3mbgl and contained bituminous material, underlain by reworked grey clay with rare organic material.

5.1.3 Head Deposits

Below the made ground materials (topsoil in WS01) natural materials interpreted as the Head Deposits were recovered. In WS01 and WS02, this was recovered as a gravelly, sandy clay and in WS03 to WS05 as a clayey, sandy gravel. This progressed to ~3.0mbgl in most locations.

5.1.4 Gault Formation Mudstone

Directly underlying the Head Deposits, material interpreted as the Gault Formation Mudstone was encountered. This was recovered as a greyish brown clay with rare organic material.

4.2 Groundwater

Groundwater was not encountered during or upon completion of intrusive activities.

Well dips conducted on return visits found groundwater resting in all four installed monitoring wells. The table below summarises the resting groundwater levels recorded during the monitoring visits conducted on 23rd and 31st of October and 6th November 2023:

Borehole Location	Rest Level (m bgl) (26/10/2023)	Rest Level (m bgl) (31/10/2023)	Rest Level (m bgl) (06/11/2023)
WS01	1.2	1.32	1.25
WS02	1.42	1.46	1.38
WS03	2.19	2.16	2.08
WS04	2.54	2.5	2.41

4.3 Physical Evidence of Contamination

Despite the presence of a limited thickness of made ground, there was no palpable evidence of gross contamination encountered in any of the sampling locations during the investigation including any visual or olfactory evidence of hydrocarbon staining. Some organic materials were recorded within the made ground, however the quantity of this material recovered was limited. The soils encountered in the infilled pit may have been deposited as waste, but are not comparable to any typical municipal wastes which would be more putrescible and gas-generating in nature (such as modern domestic landfill).

The headspace testing that was undertaken on selected soil samples recovered during the works using a PID did not identify any concentration of volatile organic compounds above minimum instrument detection limits of <0.1ppmV.

4.4 Laboratory Analysis – Soil

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix E. The key results of laboratory testing on environmental soil samples are summarised below.

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (m bgl)
			Min	Max	
Arsenic	4	4	11.3	22	WS03 (1.0-1.2)
Cadmium	4	0	-		-
Chromium III	4	4	25.4	53.5	WS04 (1.2-1.5)
Chromium IV	4	0	-		-
Copper	4	4	15	21	WS03 (0.0-0.3)
Lead	4	4	14	53	WS03 (0.0-0.3)
Mercury	4	2	0.1	0.2	WS03 (0.0-0.3)
Nickel	4	4	23.2	31.3	WS03 (1.0-1.2)
Selenium	4	0	-		-
Zinc	4	4	62	112	WS03 (0.0-0.3)
Naphthalene	4	1	0.05		WS04 (1.2-1.5)
Benzo[a]pyrene	4	2	0.49	1.31	WS04 (1.2-1.5)
Dibenz(ah)anthracene	4	2	0.07	0.16	WS04 (1.2-1.5)
PAH 16 Total	4	2	5.1	11.9	WS04 (1.2-1.5)
Phenols	4	0	-		-
BTEX	4	0	-		-
TPH CWG	2	2	80	115	WS04 (1.2-1.5)
Total Aliphatics	2	0	-		-
Total Aromatics	2	2	80	115	WS04 (1.2-1.5)
EC16-EC21	2	2	10	18	WS04 (1.2-1.5)
EC21-EC35	2	2	70	88	WS04 (1.2-1.5)
EC35-EC40	2	1	9		WS04 (1.2-1.5)
Asbestos (%)	4	0	-		-

Notes: - Contaminant not found above laboratory detection limits PAH Polycyclic Aromatic Hydrocarbons
BTEX Benzene, Toluene, Ethylbenzene, Xylenes
TPH CWG Total Petroleum Hydrocarbons (Criteria Working Group)

- The extractable petroleum hydrocarbons have been interpreted by the laboratory as PAHs, so the TPH compounds listed above are likely to be reflective of the PAH compounds speciated separately in the table.

4.5 Soil Gas Results

Ground gas and organic vapour monitoring was conducted on three occasions following the intrusive investigation, on the 23rd October, 31st of October and 6th November 2023.

Results of the monitoring are summarised below and presented in full in Table 2 along with calculated gas screening values, set out in CIRIA guidance *'Assessing Risks Posed by Hazardous Ground Gases to Buildings'*.

Borehole	Flow Rate (l/hr)	CH_4 Max Detections (%v/v)	CO_2 Range of Detections (%v/v)
WS01	<0.1	<0.1	0.7-1.7
WS02	<0.1	<0.1	0.4-2.0
WS03	<0.1-0.1	<0.1	1.7-3.6
WS04	<0.1	<0.1	5.3-11.2

Notes: CH_4 Methane CO_2 Carbon Dioxide

Concentrations of hydrogen sulphide (H_2S) and volatile organic compounds (VOCs) were not recorded above minimum instrument detection limits at any installation during the monitoring programme.

Analysis of the data collected during the monitoring programme is included in later sections of this report.

5 ENVIRONMENTAL APPRAISAL

The following section outlines the approach applied to assessing the risks posed to human health, then identifies any sample results found by this investigation which warrant further consideration. In accordance with the Environment Agency's *Land Contamination: Risk Management*, this section represents the second tier of Stage 1, the Generic Quantitative Risk Assessment.

5.1 Human Health

5.1.1 Land Use Setting

It is understood that the site is to be purchased for continued residential use. In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health in these soft landscaped areas, relevant generic screening values most applicable to this land use have been utilised. A land use setting of Residential (With Home Grown Produce) has been adopted as it is considered the most representative.

The technical framework used to derive DEFRA's Category 4 Screening Levels (Policy Companion Document '*SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination')* outlines the relevant factors for determining land use selection in the application of the screening levels and the following key considerations have been taken into account.

5.1.2 Generic Screening – Soils

The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports* (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels (S4ULs) for Human Health Risk Assessment* – LQM and CIEH (2015)
- *Soil Generic Assessment Criteria for Human Health Risk Assessment* - EIC/AGS/CL:AIRE (2010)

Category 4 Screening Levels (C4SLs) provide generic suitable for use screening values for common contaminants in a variety of land uses and are also utilised as appropriate generic screening criteria.

Where assessment of the risk to human health from asbestos in soil is concerned there is no nationally recognised suitable for use /generic screening value commonly referred to through the planning system. Due to this, it is necessary to take a more qualitative approach to the risks posed to future site users from asbestos on a site-specific basis.

Generic screening criteria used to assess the risk to human health are provided in Appendix F.

5.1.3 Assessment of Results- Human Health

The results of the screening process for on-site human receptors showed that generic screening criteria representative of risks to future site users were not exceeded for any contaminant at any location. The soils appear suitable for their residential use in their current state.

5.2 Ground Gas and Organic Vapour Monitoring

An initial assessment of risks posed by ground gas generation has been undertaken through consideration of defined Gas Screening Values (GSV) or site characteristic hazardous gas flow rate, in accordance with the following guidance:

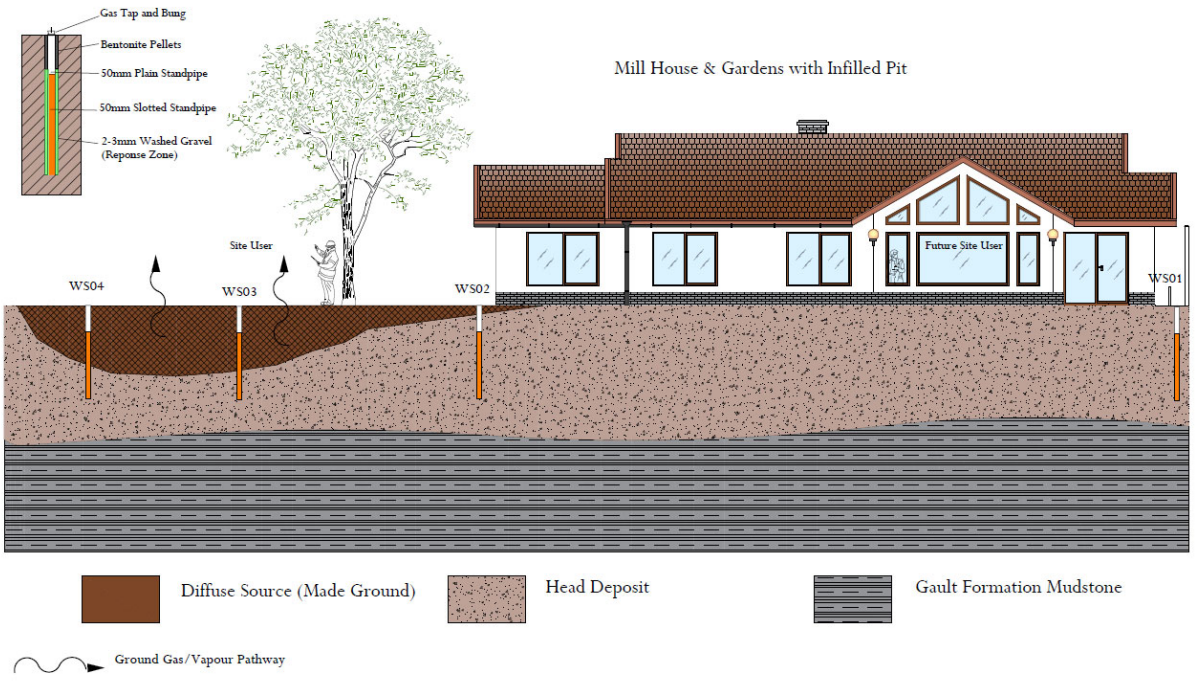
- CIRIA 665 – '*Assessing Risks Posed by Hazardous Ground Gasses to Buildings' (2007).*
- NHBC – '*Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present' (March 2007).*
- British Standard BS8485:2015 – '*Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings'*

This aspect was primarily included in the investigation due to the reasonably significant thicknesses of made/ infilled ground expected due to the presence of a former clay, sand, and gravel pit located in the gardens of the property, which could represent a potential source of ground gas and/ or organic vapours.

It is acknowledged that three monitoring visits may not constitute a comprehensive monitoring programme for a recognised source of gas under C665 and as such, the assessment of the associated risks is considered an initial assessment at this stage; albeit the value of further monitoring visits is considered to be limited based on the conceptualisation of the site.

The gas screening values have been calculated as per the CIRIA 665 guidance *'Assessing Risks Posed by Hazardous Ground Gases to Buildings'* however the gas screening values presented by EPS within this report have also been defined based on the BS 8485:2015 guidance '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' which suggests that gas screening values should not only be based on measured data '*but ultimately derived using professional judgement*'.

The illustrative conceptual ground gas model below has been created with consideration of the previous Phase I Desk Study and planning conditions, to illustrate the potential source of ground gas and migration routes based on the nature of the monitoring well installations and site-specific conditions.



5.2.1 Ground Gas & Organic Vapour Risk Assessment

Results of ground gas monitoring undertaken following the initial intrusive investigation are presented in full as Table 2, along with gas screening values (GSV's).

At the time of writing, it is understood the property is intended for continued residential use, and as such the '*Modified Wilson and Card Classification System*' has been used to assess the risks from ground gases (in accordance with CIRIA C665).

Initially GSV's have been calculated according to the CIRIA C665 guidance, this is done by multiplying the maximum borehole flow rate (l/hr) by the maximum gas concentration (%). For example, monitoring data reporting a maximum flow rate of 3.5 l/hr and a maximum concentration of 4% methane would have a GSV of 0.14 (4/100 x 3.5).

In typical ground gas risk assessments, monitoring would be completed prior to development, meaning a 'worst case' GSV would be applicable to the entire site. As this report is retrospectively addressing the planning conditions, it is possible to make more site-specific risk assessment, assisted by the placement of monitoring wells either side of the existing property, as well as on the infilled pit (see illustrated model above).

The BS8485:2015 guidance advocates for the use of '*professional judgement*' in defining GSV's, in this case, it is EPS' professional judgement that the worst case GSV's recorded in WS04 (directly over the pit) are not representative of the gas risk to the property, which are indicated by monitoring values from WS01 and WS02. As such the representative GSVs used to assess the ground gas risk are:

- Methane (CH_4): <0.0001 l/hr

- Carbon Dioxide (CO_2): <0.002 l/hr

The calculated GSVs are representative of Characteristic Situation 1 (CS1) conditions, which denotes likely 'very low risk' from ground gases to be currently present.

It is acknowledged that CO_2 concentrations of up to 9.5% may increase a site characterisation to CS2. As such, the area directly above the pit would likely fall into CS2, 'low risk', where gas protection measures would be required. However, given the only location where CO_2 was encountered above 5%, WS04, is located away from the property, coupled with the absence of any notable flow throughout the monitoring programme and low CO_2 GSV's from monitoring wells on the near and far-side of the house, classification of the site as 'very low risk' or 'Characteristic Situation 1' (CS1) is considered appropriate. Given the ground profile and soil types, the ability of gases to migrate laterally westwards and accumulate in the Mill House would appear a less preferential pathway then the gases simply venting directly to atmosphere.

In terms of organic vapours, the field observations, laboratory results of soil and groundwater analysis and monitoring data do not suggest that there are any discernible risks associated with the volatilisation of organic compounds and ingress into indoor (or outdoor) air. No volatile organic compounds were detected in the gas monitoring. In the soil analysis, the majority of the recorded petroleum hydrocarbons were outside of the volatile range and the laboratory interpreted these detections as PAHs, which are low mobility/volatility hydrocarbons.

5.3 Summary of Findings

Through consideration of the site's history and geo-environmental setting, the Contaminated Land Officer for South Cambridgeshire District Council highlighted that a contaminant linkage could be active and present risks to future site users of the residential Mill House development. This linkage was associated with the anticipated presence of on-site infill (made ground) in the area of an old clay, sand, and gravel pit and the potential for ground gas to migrate into the onsite buildings.

To retrospectively address the planning conditions related to ground gas and provide an indication of the quality of soils used to infill the old pit, five window sample boreholes were formed to a maximum depth of 4.0mbgl, with monitoring standpipes installed at four locations. A return monitoring programme was conducted for ground gas and organic vapour.

Laboratory analysis of shallow soils sampled from the infilled pit has identified that the adopted screening criteria protective of future site users (including residents) have not been exceeded by contaminants of concern.

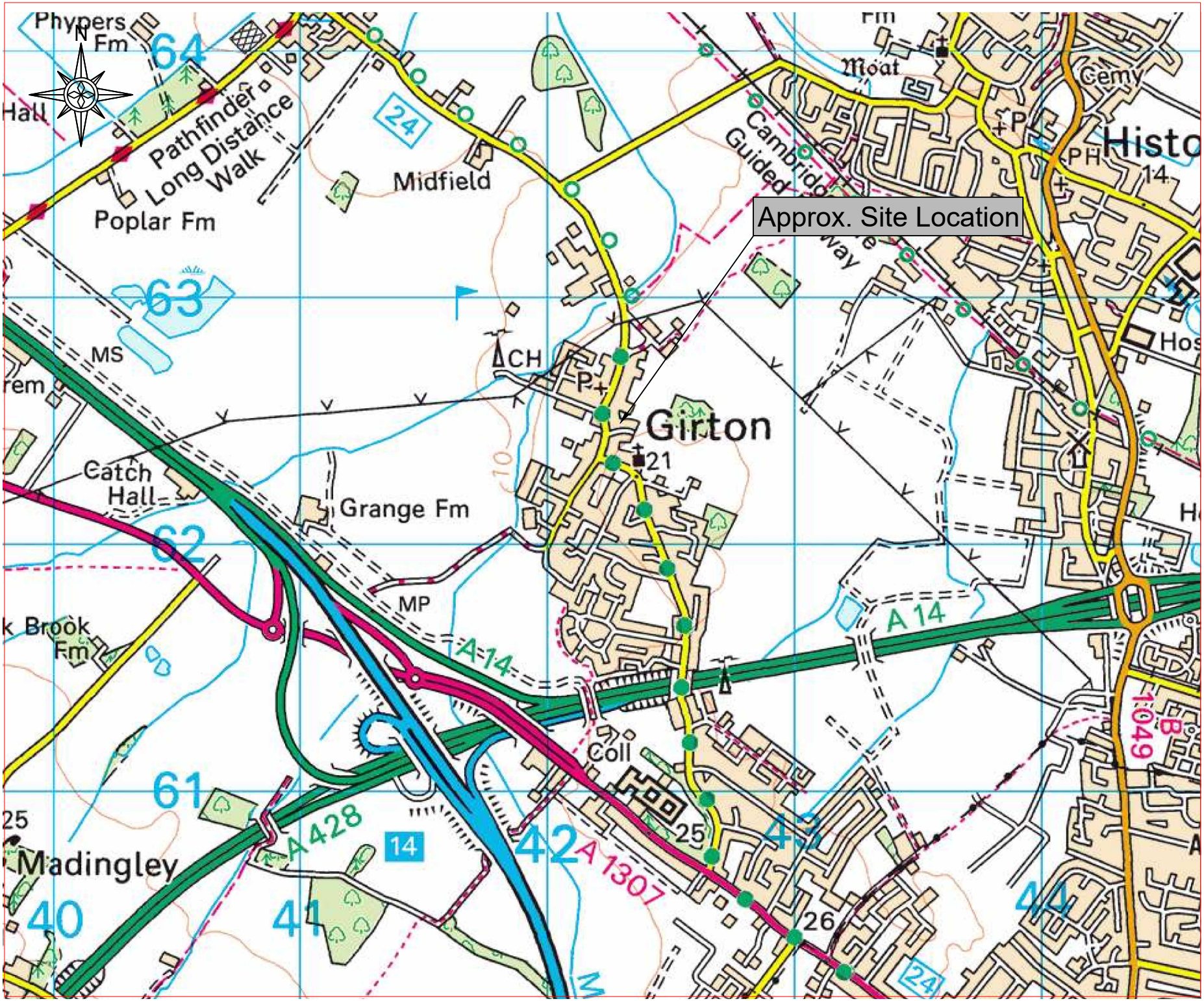
With all due consideration of the site condition, the ground gassing regime for the Mill House property has been determined as falling into a Characteristic Situation 1 (CS) 'very low risk' scenario.

In the context of potentially unacceptable or acceptable risks as outlined within the Environment Agency's *Land Contamination: Risk Management* guidance, the site is considered safe for continued use as a residential property.

It is recommended that a copy of this report be provided to the Environmental Health Department of South Cambridgeshire District Council for inclusion in their land quality records. This report should satisfy the outstanding conditions of the planning process relating to contamination and ground gas.

If the Client or new property owner wishes for EPS to remove the monitoring standpipes, please contact EPS and it can be arranged.

FIGURES



Rev	Date	Drawn	Description	Ch'k'd

eps

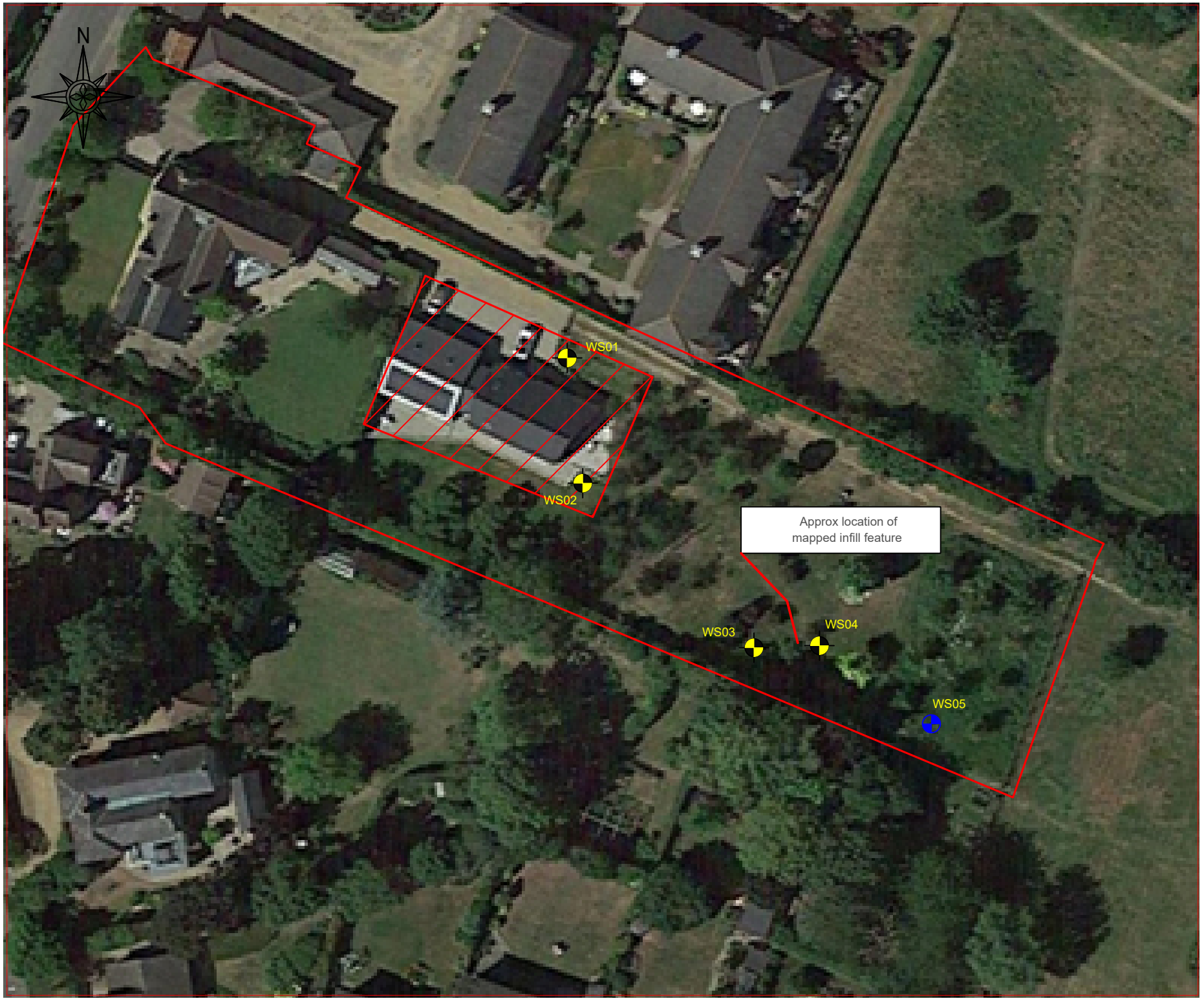
The Geotechnical and Environmental Engineers
www.epstrategies.co.uk

Site
90 High Street
Girton

Client
Ms. Catherine Stewart

Title
Figure 1: Site Location Plan

Surveyed:		Drawn by:	AO
Checked by:	AO	Date:	Nov 2023
Scale [A4 Sheet]	NTS	Drawing Reference	UK23.6692_001
Job No	UK23.6692	Rev	01



Approx boundary of 90 High St (RED HOUSE)

Approx boundary of redevelopment site
S/0169/16/FL (MILL HOUSE)

KEY:

EPS WINDOWLESS SAMPLE BOREHOLE

EPS MONITORING BOREHOLE

Rev	Date	Drawn	Description	Ch'k'd

The Geotechnical and Environmental Engineers
www.epstrategies.co.uk

Site

90 High Street
Girton

Client

Ms. Catherine Stewart

Title

Figure 2: Borehole Location Plan

Surveyed:		Drawn by:	AO
Checked by:	AO	Date:	Nov 2023

Scale [A4 Sheet]	Drawing Reference
NTS	UK23.6692_002

Job No	Rev
UK23.6692	01

TABLES

Table 1 – Laboratory Testing Schedule (Environmental)

Sample ID	Sample Depth (m bgl)	EPS Mini Suite	EPS TPH Suite
WS03	0.0-0.3	1	1
WS03	1.0-1.2	1	-
WS04	0.2-0.4	1	-
WS04	1.2-1.5	1	1

Notes:

mbgl	meters below ground level
1	Sample Taken
-	Sample Not Analysed
EPS Mini Suite	Organic Matter, Cyanide, Metals, PAH's, Phenols, Asbestos
EPS TPH Suite	Total Petroleum Hydrocarbons

Table 2– Soil Gas Monitoring Results

Visit No. 1 – 23/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS01	>10s	<0.1	<0.1	1.4	18.5	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	1.7	17.9			<0.1		
	>1m	<0.1	<0.1	1.7	17.8			<0.1		
	>1m 30s	<0.1	<0.1	1.7	17.7			<0.1		
	>2m	<0.1	<0.1	1.7	17.7			<0.1		
	>2m 30s	-	<0.1	1.7	17.7			-		
	>3m		<0.1	1.7	17.7					
	>3m 30s		<0.1	1.7	17.7					
	>4m		<0.1	1.7	17.7					
	>4m 30s		<0.1	1.7	17.7					
	>5m		<0.1	1.7	17.7	1	<0.1			
Min		<0.1	<0.1	1.4	17.7	<0.1	<0.1	<0.1	<0.0001	<0.0014
Max				1.7	18.5	1		<0.1	<0.0001	<0.0017

***Notes**: Readings collected at an atmospheric pressure of 1008mbar on a clear, dry and cold day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings.*

CH_4	*Methane*	*CO_2*	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 1 – 23/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS02	>10s	<0.1	<0.1	2.0	18.2	1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	2.0	17.5			<0.1		
	>1m	<0.1	<0.1	1.9	17.7			<0.1		
	>1m 30s	<0.1	<0.1	1.9	17.5			<0.1		
	>2m	<0.1	<0.1	1.9	17.6			<0.1		
	>2m 30s	-	<0.1	1.9	17.6			-		
	>3m		<0.1	1.9	17.6					
	>3m 30s		<0.1	1.9	17.6					
	>4m		<0.1	1.9	17.5					
	>4m 30s		<0.1	1.9	17.5					
	>5m		<0.1	1.9	17.5	1	<0.1			
Min		<0.1	<0.1	1.9	17.5	1	<0.1	<0.1	<0.0001	<0.0019
Max				2.0	18.2			<0.1	<0.0001	<0.002

Notes: *Readings collected at an atmospheric pressure of 1004mbar (falling to 1003mbar) on a clear, dry and cold day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings.*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 1 – 23/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS03	>10s	0.1	<0.1	3.6	16.0	1	<0.1	<0.1	-	-
	>30s	0.1	<0.1	3.0	15.5			<0.1		
	>1m	0.1	<0.1	2.8	15.8			<0.1		
	>1m 30s	<0.1	<0.1	2.7	15.9			<0.1		
	>2m	<0.1	<0.1	2.7	15.9			<0.1		
	>2m 30s	-	<0.1	2.5	16.0			-		
	>3m		<0.1	2.5	16.1					
	>3m 30s		<0.1	2.4	16.2					
	>4m		<0.1	2.4	16.3					
	>4m 30s		<0.1	2.4	16.2					
	>5m		<0.1	2.5	16.0	4	<0.1			
Min		<0.1	<0.1	2.4	15.5	1	<0.1	<0.1	<0.0001	<0.0024
Max		0.1		3.6	16.3	4		<0.1	0.0001	0.0036

Notes: *Readings collected at an atmospheric pressure of 1002mbar on a clear, dry and cold day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	*CO_2*	*Carbon Dioxide*
O_2 Oxygen		*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 1 – 23/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS04	>10s	<0.1	<0.1	8.6	12.8	1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	11.2	7.3			<0.1		
	>1m	<0.1	<0.1	11.2	7.1			<0.1		
	>1m 30s	<0.1	<0.1	11.2	7.2			<0.1		
	>2m	<0.1	<0.1	11.2	7.1			<0.1		
	>2m 30s	-	<0.1	11.0	7.3			-		
	>3m		<0.1	10.9	7.4					
	>3m 30s		<0.1	10.6	7.6					
	>4m		<0.1	10.2	7.9					
	>4m 30s		<0.1	9.9	8.2					
	>5m		<0.1	9.5	8.7	3	<0.1			
Min		<0.1	<0.1	8.6	7.1	1	<0.1	<0.1	<0.0001	<0.0086
Max				11.2	12.8	3		<0.1	<0.0001	<0.012

Notes: *Readings collected at an atmospheric pressure of 1003mbar (falling to 1001mbar) on a clear, dry and cold day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 2 – 31/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS01	>10s	<0.1	<0.1	1.1	19.2	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	1.5	17.9			<0.1		
	>1m	<0.1	<0.1	1.5	17.9			<0.1		
	>1m 30s	<0.1	<0.1	1.5	17.9			<0.1		
	>2m	<0.1	<0.1	1.5	17.9			<0.1		
	>2m 30s	-	<0.1	1.5	17.8			-		
	>3m		<0.1	1.5	17.8					
	>3m 30s		<0.1	1.5	17.8					
	>4m		<0.1	1.5	17.8					
	>4m 30s		<0.1	1.5	17.8					
	>5m		<0.1	1.5	17.8	<0.1	<0.1			
Min		<0.1	<0.1	1.1	17.8	<0.1	<0.1	<0.1	<0.0001	<0.0011
Max				1.5	19.2			<0.1	<0.0001	<0.0015

***Notes**: Readings collected at an atmospheric pressure of 1000mbar on an overcast and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	*CO_2*	*Carbon Dioxide*
O_2 Oxygen		*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 2 – 31/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS02	>10s	<0.1	<0.1	1.4	18.7	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	0.9	19.3			<0.1		
	>1m	<0.1	<0.1	0.7	19.6			<0.1		
	>1m 30s	<0.1	<0.1	0.6	19.8			<0.1		
	>2m	<0.1	<0.1	0.6	19.8			<0.1		
	>2m 30s	-	<0.1	0.5	19.9			-		
	>3m		<0.1	0.5	19.9					
	>3m 30s		<0.1	0.5	19.9					
	>4m		<0.1	0.5	19.9					
	>4m 30s		<0.1	0.5	19.9					
	>5m		<0.1	0.5	19.9	<0.1	<0.1			
Min		<0.1	<0.1	0.5	18.7	<0.1	<0.1	<0.1	<0.0001	<0.0005
Max				1.4	19.9			<0.1	<0.0001	<0.0014

Notes: *Readings collected at an atmospheric pressure of 1000mbar (falling to 999mbar) on an overcast and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 2 – 31/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS03	>10s	<0.1	<0.1	1.9	19.0	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	1.9	17.2			<0.1		
	>1m	<0.1	<0.1	1.8	17.4			<0.1		
	>1m 30s	<0.1	<0.1	1.7	17.5			<0.1		
	>2m	<0.1	<0.1	1.7	17.5			<0.1		
	>2m 30s	-	<0.1	1.7	17.5			-		
	>3m		<0.1	1.7	17.5					
	>3m 30s		<0.1	1.7	17.5					
	>4m		<0.1	1.7	17.5					
	>4m 30s		<0.1	1.7	17.5					
	>5m		<0.1	1.7	17.5	<0.1	<0.1			
Min		<0.1	<0.1	1.7	17.5	<0.1	<0.1	<0.1	<0.0001	<0.0017
Max				1.9	19.0	<0.1		<0.1	<0.0001	<0.0019

Notes: *Readings collected at an atmospheric pressure of 999mbar (falling to 998mbar) on an overcast and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 2 – 31/10/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS04	>10s	<0.1	<0.1	5.3	15.7	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	8.3	9.2			<0.1		
	>1m	<0.1	<0.1	8.4	9.1			<0.1		
	>1m 30s	<0.1	<0.1	8.5	9.1			<0.1		
	>2m	<0.1	<0.1	8.5	9.0			<0.1		
	>2m 30s	-	<0.1	8.5	9.0			-		
	>3m		<0.1	8.5	9.0					
	>3m 30s		<0.1	8.5	9.0					
	>4m		<0.1	8.5	9.0					
	>4m 30s		<0.1	8.5	9.0					
	>5m		<0.1	8.5	9.0	<0.1	<0.1			
Min		<0.1	<0.1	5.3	9.0	<0.1	<0.1	<0.1	<0.0001	<0.0053
Max				8.5	15.7			<0.1	<0.0001	<0.0085

Notes: *Readings collected at an atmospheric pressure of 998mbar on an overcast day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 3 – 6/11/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS01	>10s	<0.1	<0.1	0.7	19.9	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	0.8	19.5			<0.1		
	>1m	<0.1	<0.1	0.7	19.5			<0.1		
	>1m 30s	<0.1	<0.1	0.7	19.5			<0.1		
	>2m	<0.1	<0.1	0.7	19.6			<0.1		
	>2m 30s	-	<0.1	0.7	19.6			-		
	>3m		<0.1	0.7	19.6					
	>3m 30s		<0.1	0.7	19.6					
	>4m		<0.1	0.7	19.6					
	>4m 30s		<0.1	0.7	19.6					
	>5m		<0.1	0.7	19.6	<0.1	<0.1			
Min		<0.1	<0.1	0.7	19.5	<0.1	<0.1	<0.1	<0.0001	<0.0007
Max				0.8	19.9			<0.1	<0.0001	<0.0008

***Notes**: Readings collected at an atmospheric pressure of 995mbar (falling to 994mbar) on a clear, dry, and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	*CO_2*	*Carbon Dioxide*
O_2 Oxygen		*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 3 – 6/11/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS02	>10s	<0.1	<0.1	0.9	19.7	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	0.6	19.8			<0.1		
	>1m	<0.1	<0.1	0.5	19.9			<0.1		
	>1m 30s	<0.1	<0.1	0.5	20.0			<0.1		
	>2m	<0.1	<0.1	0.4	20.0			<0.1		
	>2m 30s	-	<0.1	0.4	20.0			-		
	>3m		<0.1	0.4	20.0					
	>3m 30s		<0.1	0.4	20.0					
	>4m		<0.1	0.4	20.0					
	>4m 30s		<0.1	0.4	20.0					
	>5m		<0.1	0.4	20.0	<0.1	<0.1			
Min		<0.1	<0.1	0.4	19.7	<0.1	<0.1	<0.1	<0.0001	<0.0004
Max				0.9	20.0			<0.1	<0.0001	<0.0009

Notes: *Readings collected at an atmospheric pressure of 995mbar (falling to 994mbar) on a clear, dry, and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 3 – 6/11/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS03	>10s	<0.1	<0.1	3.1	15.6	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	2.4	16.0			<0.1		
	>1m	<0.1	<0.1	2.3	16.1			<0.1		
	>1m 30s	<0.1	<0.1	2.3	16.2			<0.1		
	>2m	<0.1	<0.1	2.2	16.3			<0.1		
	>2m 30s	-	<0.1	2.2	16.3			-		
	>3m		<0.1	2.2	16.3					
	>3m 30s		<0.1	2.3	16.3					
	>4m		<0.1	2.2	16.3					
	>4m 30s		<0.1	2.2	16.3					
	>5m		<0.1	2.2	16.3	<0.1	<0.1			
Min		<0.1	<0.1	2.2	15.6	<0.1	<0.1	<0.1	<0.0001	<0.0022
Max				3.1	16.3	<0.1		<0.1	<0.0001	<0.0031

Notes: *Readings collected at an atmospheric pressure of 994mbar on a clear, dry and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	CO_2	*Carbon Dioxide*
O_2	*Oxygen*	*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

Visit No. 3 – 6/11/2023

Borehole ID	Duration	Flow Rate (l/hr)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (% v/v)	CO (ppmV)	H_2S (ppmV)	VOC's (ppmV)	CH_4 GSV (l/hr)	CO_2 GSV (l/hr)
WS04	>10s	<0.1	<0.1	6.9	14.0	<0.1	<0.1	<0.1	-	-
	>30s	<0.1	<0.1	10.4	6.1			<0.1		
	>1m	<0.1	<0.1	10.5	6.0			<0.1		
	>1m 30s	<0.1	<0.1	10.5	6.0			<0.1		
	>2m	<0.1	<0.1	10.5	6.0			<0.1		
	>2m 30s	-	<0.1	10.5	6.0			-		
	>3m		<0.1	10.5	6.0					
	>3m 30s		<0.1	10.4	6.0					
	>4m		<0.1	10.4	6.0					
	>4m 30s		<0.1	10.4	6.0					
	>5m		<0.1	10.3	6.1	<0.1	<0.1			
Min		<0.1	<0.1	6.9	6.0	<0.1	<0.1	<0.1	<0.0001	<0.0069
Max				10.5	14.0			<0.1	<0.0001	<0.0105

Notes: *Readings collected at an atmospheric pressure of 994mbar on a clear, dry and cool day, prior to recording the readings from the equipment, the equipment is tested in ambient air to ensure that it is functioning as intended with no unexpected readings*

CH_4	*Methane*	*CO_2*	*Carbon Dioxide*
O_2 Oxygen		*CO*	*Carbon Monoxide*
H_2S	*Hydrogen Sulphide*	*VOC's*	*Volatile Organic Compounds*
ppmV	*Parts Per Million Volume*	*GSV*	*Gas Screening Value*

APPENDICES

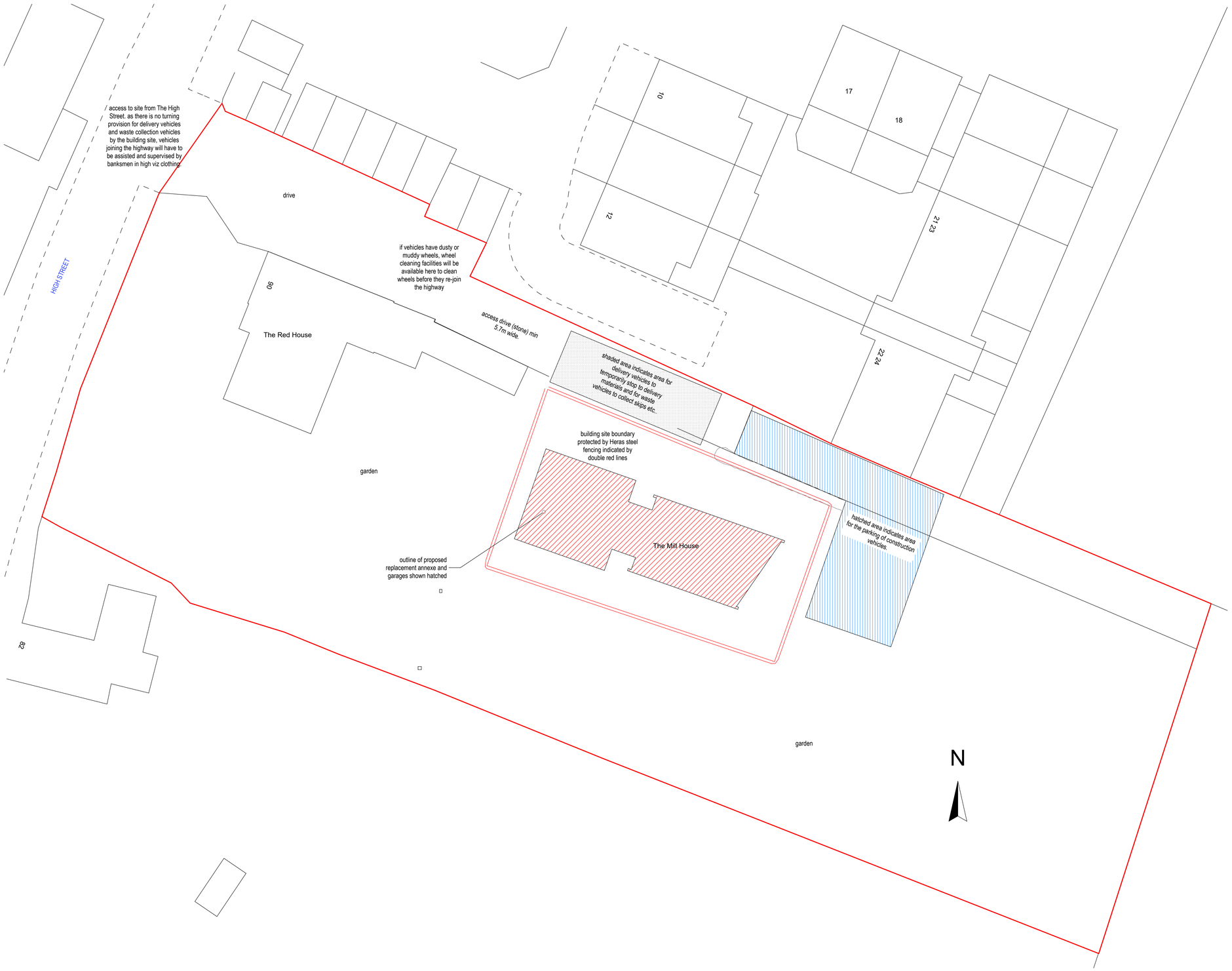
APPENDIX A

Selected Site Photographs

Photo 1: Access to site looking south-east with Mill House in frame	Photo 2: Wooded paddock containing location of infilled pit, looking north-west
	
Photo 3: Recovery from WS01, showing Head Deposits and Gault Formation clay	Photo 4: Recovery from WS03, showing made ground onto Head Deposit and Gault Formation clay
	
Photo 5: Recovery from WS05, showing deeper made ground onto Head Deposit and Gault Formation clay	Photo 6: Installed monitoring well set flush with surface
	

APPENDIX B

Development Plan (S/0169/16/FL – Mill House)



Construction traffic site plan 1:200

SUBJECT TO PLANNING APPROVAL

DANIEL AGUILAR BA(hons) arch DipArch
acre cottage acre road carlton newmarket suffolk cb89lf t: 01223 290077 e: daguilar@stabletech.com

client :	job :	drawing :
Mrs. C. Stewart	Replacement 2 bedroom annexe Rear of Red House 90 Girton High Street	Construction traffic plan

scale:	date:	drn.:	job no.:	drg. no.:	rev.:
as shown @ A1	January 2016	da	A447-16	03	PL

APPENDIX C

SCDC Environmental Services Consultation - S/2176/17/FL

ENVIRONMENTAL HEALTH DEPARTMENT

M E M O R A N D U M

TO: Planning & New Communities – Rachael Forbes
S/2176/17/FL

FROM: Health Environmental Services – Contaminated Land Officer

12/07/2017

THE MILL HOUSE, 90 HIGH STREET, GIRTON, CB3 0QL - AMENDED LOCATION OF PREVIOUSLY APPROVED REPLACEMENT ANNEXE AND GARAGE (PLANNING REF S/0169/16/FL)

I wish to confirm that I have received a copy of the above application and have considered the implications of the proposals.

The above site is adjacent (within 50m) a former landfill/area of unknown filled ground and there is potential for ground gas migration, therefore I recommend that no development approved by this permission shall be commenced until:

a) The application site has been subject to an appropriate scheme for the investigation and monitoring of ground gas.

b) Where required, detailed proposals for the mitigation or otherwise rendering harmless of any ground gas have been submitted to and approved in writing by the Local Planning Authority.

Reason – To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised together with those to controlled water, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors in accordance with policy DP/1 of the adopted Local Development Framework 2007

Please return a copy of the decision notice regarding this application, quoting the Department's reference, when it has been determined.

CLAIRE SPROATS
SCIENTIFIC OFFICER (CONTAMINATED LAND)

APPENDIX D

Site Specific Borehole Logs

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: 90 High Street, Girton	Project No. UK23.6692	Co-ords: 9217E - 6844175N	Hole Type WLS
Location: 90 High Street, Girton, Cambridge, CB3 0QL		Level:	Scale 1:21
Client: Ms Catherine Stewart		Dates: 16/10/2023	Logged By AO

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.40	PID	PID=0.00	0.10			Dark brown slightly gravelly CLAY, gravels fine flint and chert (TOPSOIL)
								Firm light brown sandy gravelly CLAY, gravels fine to medium subangular flint and chert (Head Deposit)
					1.20			Firm to stiff light greyish brown CLAY (Gault Formation)
					4.00			End of Borehole at 4.000m

1 2 3 4

Remarks

No Groundwater Encountered & Reached Target Depth

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: 90 High Street, Girton	Project No. UK23.6692	Co-ords: 9223E - 6844148N	Hole Type WLS
Location: 90 High Street, Girton, Cambridge, CB3 0QL		Level:	Scale 1:21
Client: Ms Catherine Stewart		Dates: 16/10/2023	Logged By AO

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.50	PID	PID=0.00	0.10			Dark brown slightly gravelly CLAY, gravels fine flint and chert (TOPSOIL)
								MADE GROUND: dark brown gravelly CLAY, gravels medium subangular brick and chert with rare sand pockets, occasional dark staining
					1.15			Firm olive-brown slightly gravelly sandy CLAY, gravels fine subangular chert (Head Deposit)
					2.20			Firm to stiff light greyish brown CLAY (Gault Formation)
					4.00			End of Borehole at 4.000m

1 2 3 4

Remarks

No Groundwater Encountered & Reached Target Depth

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name:	90 High Street, Girton	Project No. UK23.6692	Co-ords: 9276E - 6844119N
Location:	90 High Street, Girton, Cambridge, CB3 0QL		Level:
Client:	Ms Catherine Stewart		Dates: 16/10/2023

Hole Type: WLS

Scale: 1:21

Logged By: AO

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.00 - 0.30	ES		0.10			Dark brown slightly gravelly CLAY, gravels fine flint and chert (TOPSOIL)
		0.50	PID	PID=0.00				MADE GROUND: dark brown gravelly CLAY, gravels medium subangular brick and chert, occasional dark staining
		1.00 - 1.20	ES		1.00			MADE GROUND: brown to olive brown sandy gravelly CLAY, gravels fine subangular chert, sand medium
		1.50	PID	PID=0.00				
					1.90			Medium dense light brown slightly clayey sandy GRAVEL, gravels fine subrounded chert (Head Deposit)
					2.80			Firm to stiff light greyish brown CLAY (Gault Formation)
					4.00			End of Borehole at 4.000m

1 2 3 4

Remarks

No Groundwater Encountered & Reached Target Depth