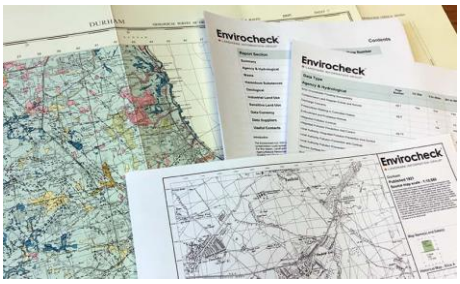



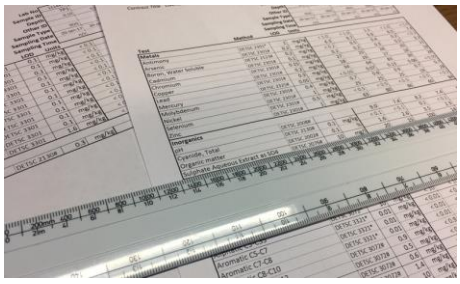

Phase 3: Remediation Statement (Rev 1)

Spaines Road, Fartown, Huddersfield

Ahmadiyya Association UK

S190527/REM

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PHASE 3 REMEDIATION STATEMENT (REV 1)

SPAINES ROAD, FARTOWN, HUDDERSFIELD

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Revision	Date	Prepared By	Signed
Rev 1	June 2021	A Cutts *Senior Engineering Geologist*	
		Checked By	
		R Woods *Principal Geotechnical Engineer*	
		Approved By	
		R Woods *Principal Geotechnical Engineer*	

1 OBJECTIVES & PRINCIPLES OF REMEDIATION STATEMENT

Solmek have been commissioned by Design Studio North Architects on behalf of Ahmadiyya Association UK to prepare a Remediation Statement for the redevelopment of land at Spaines Road, Fartown, Huddersfield, HD2 2SD. A site location plan is presented in Appendix A, Figure 1.

The proposed development is outlined to be the alteration and extension of an existing mosque with associated parking, access roads and soft landscaping. The proposed layout is shown in Figure 2.

Sources of information, including previous work undertaken at the site, are detailed below:

- *Solmek Phase 1 Desk Study Report, (S170702, July 2017)*
- *Solmek Phase 2 Site Investigation (S190527, July 2019)*
- *Solmek Ground Gas Report (S190527/GAS, November 2019)*

This Remediation Statement outlines the objectives of the remediation works that are required to render the site suitable for the proposed development and its immediate surroundings, which mainly comprises residential buildings to the south and west with sports pitches to the north and east.

Site works shall be supervised periodically by a suitably qualified engineer. Agreed dates and milestones for site visits can be agreed between Solmek and the contractor following approval of the Remediation Statement from the Local Authority.

2 REVIEW OF SITE HISTORY AND INVESTIGATION WORKS

2.1 Previous and Current Land Use

A brief summary of the historical mapping indicates that the site was mostly undeveloped agricultural land. A pavilion, grandstand and a third building were constructed by the late 1800's and remined relatively unchanged until 2000 by which time the smaller of the buildings was demolished.

The site currently consists of two buildings with the remainder of the site made up of hardstanding or soft landscaping.

The main building on the site, located within the northeast, is the former pavilion which is currently used as the mosque proposed for extension. The second building on the site is a single storey rectangular brick building.

2.2 Fieldwork and Ground Conditions

Information from the Solmek Phase 2 site investigation report (S190527) has been used to obtain brief ground conditions detailed in sections 2.2.2 to 2.2.5 inclusive.

2.2.1 Fieldwork

A ground investigation was carried out by Solmek in June 2019 which comprised of five small percussive boreholes (BH1 to BH5 inclusive). Ground gas wells were installed within three boreholes (BH1, BH2 and BH3).

Six machine excavated trial pits (TP1 to TP6 inclusive) were dug to depths of 2.00mbgl to supplement the small percussive boreholes.

In addition, three rotary open hole boreholes (RBH1 to RBH3 inclusive) were drilled to depths of up to 30.00mbgl. The boreholes were drilled to determine deeper ground conditions and locate any possible coal mine workings.

A plan showing the location of all positions is presented in Appendix A, Figure 2.

2.2.2 Made Ground

Made ground was proven within the boreholes and trial pits to a maximum depth of 1.70mbgl. The made ground varied across the site and comprised a surface layer of either gravel, tarmac or concrete to depths of between 0.05mbgl (TP6) and 0.40mbgl (BH's 4 and 5).

This was underlain with either sandy slightly gravelly clay fill or slightly clayey gravelly sand fill. Locally (BH2) a 0.50m thick layer of concrete underlay the gravel fill. The gravel components within the made ground comprised dolomite in the surfacing and concrete, sandstone in the clay fill and dolomite, brick and concrete in the gravel fill. Locally ash was recorded within the gravel fill within RBH2 and RBH3.

2.2.3 Natural Deposits

Natural ground generally comprised firm to stiff consistency slightly sandy slightly gravelly, locally sandy, medium to high strength clay of medium plasticity to depths between 2.10mbgl (BH1) and 4.30mbgl (BH2).

In the trial pits the natural stratum comprised soft consistency slightly sandy clay. The gravel component within the cohesive stratum comprised sandstone.

2.2.4 Solid Geology

Within the small percussive boreholes highly weathered sandstone recovered as clayey sandy gravel was noted across the site from 2.10mbgl (BH1) to the base of each borehole at 5.00mbgl.

In the trial pits completely weathered mudstone was recovered as a sandy gravelly clay from between 1.50mbgl (TP1) and 1.90mbgl (TP6) to the base of the excavations at 2.00mbgl.

In the rotary boreholes solid geology of sandstone with underlying beds of mudstone was proven to depths of 30.00mbgl. Coal seams were proven in RBH1 at 9.60mbgl and again at 12.90mbgl, in RBH2 at 12.30mbgl and in RBH3 at 4.50mbgl.

2.2.5 Groundwater

Groundwater was encountered in the rotary boreholes only at depths of between 2.80mbgl (RBH2) and 4.30mbgl (RBH3) during the investigation.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

2.3 Contamination Assessment

To provide information upon the possibility of ground contamination five samples comprising cohesive and granular fill between 0.20mbgl and 1.00mbgl were subject to chemical contamination analysis.

2.3.1 Historical Contamination Results

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing had been compared to a series of LQM S4UL and C4SL thresholds based on a residential without home grown produce land use.

In terms of metals, semi-metals, non-metals and inorganic determinants, none of the five samples subject to testing returned any values above relevant threshold values considered to cause long term harm to human health.

No asbestos was detected in the five samples to date.

Two 'hotspot' areas of concern within the shallow made ground were identified where levels of TPH aromatic fraction C21-35, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranene, Dibenzo(ah)anthracene, Id'(123cd) pyrene and Total PAH in BH3 (0.20-0.40m) and BH5 (0.20-0.40m) were above the S4UL threshold values.

The made ground within BH3 contained ash and clinker.

WAC testing was carried out on one sample of soil (BH3, 0.20-0.40m). The results showed that the Total Organic Carbon and Loss on Ignition were above the Hazardous Waste threshold. TPH (Mineral Oil), Total PAH as well as pH were also above the inert waste threshold or the Stable Non-Reactive Waste category. Fluoride was above the Inert Waste threshold.

2.3.2 Contamination Analysis

Based on the shallow soil contamination testing it was considered that the levels of contamination are likely to pose a risk to future users of the site. This pollutant linkage however would be severed as long as all contaminated areas are covered either by buildings, hardstanding or a clean cover system.

Additionally, some "hotspot" remediation would be required in the area around BH3 and BH5 where hydrocarbon impacted soils were detected.

During any further construction activities, if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

Where soft landscaped areas are proposed as part of the final development, they should be provided with a clean cover system comprising imported topsoil (due to lack of suitable material on site) to a depth of 150mm over imported subsoil (due to lack of suitable material on site) to 300mm. Appropriate certification would be required to ensure that the imported materials are clean and free from deleterious materials in accordance with the Local Authority Guidelines '*Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants'* (Yorkshire and Lincolnshire Pollution Advisory Group Version 4.1 – June 2021). The use of the clean over system should break source receptor pathways from potentially harmful chemicals recorded within made ground.

Appropriate PPE was recommended for construction workers in contact with the onsite fill materials and suitable hygiene practices along with damping down the site to reduce dust and prevent windblown contaminants leaving site should be adopted. It was advised that a 'watching brief' is undertaken during the initial site strip and any excavation works and advice sought if asbestos is found or suspected. All works should be undertaken in accordance with the Control of Asbestos Regulations 2012.

Due to the generally low contamination found across the site, the low permeability clay acting as an aquiclude and the distance to surface waters, the development was considered to represent a low risk to groundwater or surface water receptors.

In terms of services, pH levels precluded the use of copper and wrapped steel pipes.

2.3.3 Historical Contamination Results – Gas Assessment

Ground gas was monitored from pipework installed in BH1 to BH3 inclusive during the fieldwork. A series of six visits were undertaken over July and September 2019 whereby no methane was detected, carbon dioxide ranged from 0.00 to 9.30% and oxygen levels ranged between 2.20% and 9.30%.

The gas screening values from the monitoring visits together with the elevated carbon diaoxide (>5%) placed the site in **Characteristic Situation (CS) 2.**

3 REMEDIATION STRATEGY

3.1 Objectives

Based on the Site Investigation Reports, the following remediation targets have been determined:

- Provide hard cover to the majority of the site, including building extension footprints, roads, parking and paving thus removing pathways between potential sources of contamination (made ground) and receptors (future users of the site and construction workers).
- Provide suitable ground conditions (clean cover system) in proposed soft landscaped areas

suitable for plant growth.

- To resolve contamination issues in order to protect those receptors identified to be at risk, and thereby render the site suitable for the proposed development.
- Safe strip, excavation and stockpiling of potentially contaminated materials (from within the area around BH3 and BH5). This material will then either be safely encapsulated beneath hardstanding (i.e. building footprints, roads, parking areas) or removed from site to an appropriate waste facility. This would protect those receptors identified to be at risk (namely construction workers and future site users) thus rendering the site safe during the proposed construction and development phase.
- Strip the site to appropriate formation levels for construction
- Implement suitable gas protection measures within the building design to eliminate the potential for ground gas migration into the structures from the underlying ground.
- Provide guidance on how the remediation targets will be checked and validated.

A Remediation Statement comprising excavation, disposal, and inclusion of clean soils is to be adopted. The Site Investigation Report contains information that can be used to gauge the typical quantities to be addressed.

3.2 General

The purpose of the remediation works is to:

- To reduce liabilities associated with ground conditions by reclaiming the site within a framework of risk assessment.
- To facilitate successful redevelopment of the site for development within the existing constraints.
- To ensure that the public and residents around the site are not exposed to contamination.
- To make the site safe for future occupiers.
- To enable the site ground quality to comply with UK environmental legislation.
- To provide a sustainable and cost effective solution.

3.3 Proposed Remediation Strategy

The above objectives will be achieved by undertaking the following remediation works prior to development taking place:

3.3.1 Hard Landscaped Areas & Excavation

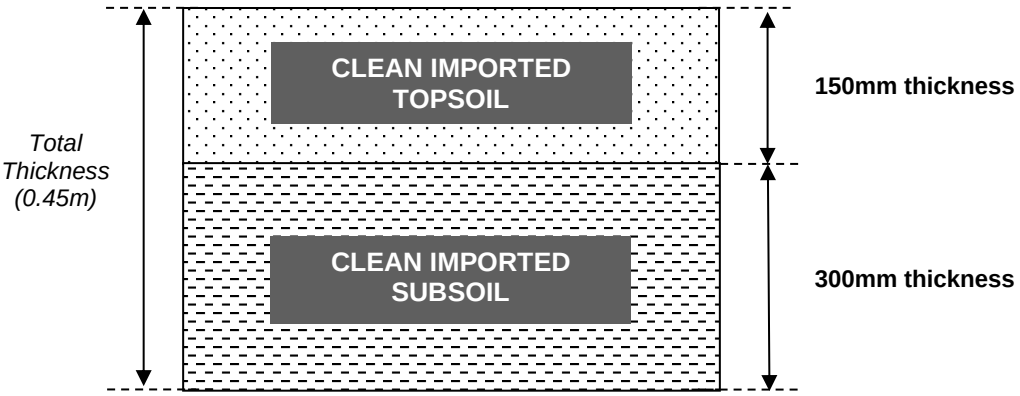
- Areas beneath proposed parking zones or other areas of hard landscape, including the building footprint itself, will require little or no remediation other than removal of materials to satisfy appropriate formation levels for construction. This provides a barrier to potential underlying contamination within the made ground and protects groundwater from surface infiltration.
- Soils that are to be excavated in order to achieve finished levels and/or are suspected of being contaminated shall be excavated and placed in contained and covered stockpiles prior to being removed from site.
- Material taken off site must be subject to WAC testing either by Solmek or by the appropriate waste disposal company. The disposal contractor can advise if any further tests are required depending on the volume of material to be exported to landfill.
- The Contractor shall provide appropriate measures to prevent collapse of excavations and de-watering apparatus to prevent water accumulation within excavations. All excavations left open shall be securely fenced.
- Once the above works are complete, the contractor shall backfill all excavations. Backfilling shall be undertaken in a controlled manner in accordance with an engineering specification appropriate to the type of material to be used.

3.3.2 Soft Landscaped Areas

- Proposed soft landscaped areas should implement a 450mm growing medium layer. This layer should be placed over proposed soft landscaped areas and other parts of the site that will not be covered by buildings, roads, or hardstanding. The layer should include imported clean topsoil to a depth of 150mm over imported clean subsoil to 300mm. The thickness of capping was selected due

to the proposed end use as soft landscaped areas rather than gardens.

- All materials forming the growing medium must be tested, installed and verified in accordance with the Local Authority Guidelines 'Verification Requirements for Cover Systems, Technical Guidance for Developers, Landowners and Consultants' (Yorkshire and Lincolnshire Pollution Advisory Group Version 4.1 – June 2021).
- The imported topsoil should be BS 3882:2015 compliant and 'suitable for their intended purpose'. BS3882:2015 relates to nutrient content of topsoil and phytotoxic contamination and does not consider contaminants that pose a risk specifically to human health. Soils should also be tested for contaminants that are considered to pose a risk to human health in addition to BS3882:2015 to ensure that they are suitable for their intended use.
- Guidance from KP2, Page 5 of 'Verification Requirements for Cover Systems, Technical Guidance for Developers, Landowners and Consultants' (Yorkshire and Lincolnshire Pollution Advisory Group Version 4.1 – June 2021) states that chemical testing will normally be required for any materials utilised as cover materials **prior** to placement.
- Using Appendix 1A of the same document the number of tests for the imported topsoil and subsoil is dependent on the type of source. Brownfield/Screened Soil requires a minimum of 6no. samples or 1 sample per 50-100m^3 of material, whichever is greater before bringing to site. Greenfield/Manufactured Soil requires a minimum of 3no. samples or 1 sample per 50-250m^3 of material, whichever is greater before bringing to site.
- In line with guidance from Appendix 1A the testing schedule and assessment criteria for the samples is discussed in Section 5.
- Samples of soil tested above threshold levels cannot be used in proposed garden areas.
- Prior to installing soft landscaped areas the site operatives must mitigate against potentially contaminating clean materials with soil and dust generated from underlying contaminated ground or any other stockpiled materials onsite. All clean materials should therefore be stockpiled on visqueen and covered by visqueen.
- The diagram below gives an overview of the minimum thicknesses that should be placed by the site operatives in soft landscaped areas:



3.3.3 Localised Contamination Hotspot (BH3/BH5)

- Areas around BH3 and BH5 should be targeted to delineate hydrocarbon impacted soils.
- As a minimum each area should be excavated down to natural ground and at least 3.00m across.
- All materials within the 3.00m^2 area will be excavated and placed on visqueen sheeting for WAC testing and removal from site.
- The Solmek engineer will obtain validation samples from the sides and base of the excavation.
- Should visually stained or olfactory odour materials be encountered in these areas, excavations will continue both horizontally and vertically until 'clean' soils are exposed.
- Once 'clean' material is exposed the Solmek engineer will obtain validation samples from the sides and base of the excavation.
- The validation results should be compared to the threshold tables presented in Appendix B. Any failed results will mean further excavation works, re-sampling and testing.
- During sampling a PID meter will be used to check for levels of VOCs.
- Any contaminated material should be stockpiled on visqueen sheets and contamination testing including WAC analysis should be undertaken. The results of the tests will determine whether or not

material may remain on site or be disposed of in a safe manner.

- It is anticipated that any contaminated soils will be removed from site to a suitable landfill facility.
- Material taken off site will be subject to WAC testing by Solmek or the appropriate waste disposal company. The disposal contractor can advise if any further tests are required depending on the volume of material to be exported to landfill. Given the TPH levels recorded in BH3, this material is likely to be considered as Hazardous Waste.
- The Contractor shall provide appropriate measures to prevent collapse of excavations and de-watering apparatus to prevent water accumulation within excavations. All excavations left open shall be securely fenced.
- The area of excavations should then be backfilled with suitable Type 1 inert gravel/clean site-won material.

3.3.4 *Asbestos*

- Although asbestos was not detected from the soil samples subjected to testing, the possibility exists that asbestos containing materials may still be present on site and currently lie undetected. It is therefore advised that a 'watching brief' is undertaken during site works and excavation works. Advice should be sought if asbestos is found or suspected.
- All excavated materials for removal off site should be tested for asbestos determination and asbestos quantification, if positive asbestos results are recorded.
- If asbestos is suspected or found the impacted soils should be transported under special precautions to prevent asbestos fibres becoming airborne.
- The material must remain wet (moisture content of >15%) during transportation and construction workers should employ appropriate PPE in accordance with HSE guidelines.

3.3.5 *Treating Unknown Contamination*

- During any construction activities should any zones of odorous, brightly coloured or suspected contaminated ground be encountered then work should cease immediately in that area (except for site investigation works) and the Local Planning Authority must be notified in writing within two working days.
- Solmek should also be contacted to arrange a site visit. Further contamination testing may be required and the results of the tests will determine whether or not material may remain on site or be disposed of in a safe manner.

3.3.6 *Installation of Gas Protection Measures*

- The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
- In accordance with the procedure described in *BRE Publication BR211 Radon: Guidance on Protective Measures for New Dwellings*, no radon protection measures are necessary in the construction of new dwellings or extensions.
- The primary pathway for the migration to the surface of potential hazardous ground gas is considered to be the pore spaces within the underlying made ground.
- In accordance with BS 8485:2015, "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings", Table 3, Page 21, the end use of the building equates to a Type C building (public, medium/large space) forming a medium risk (Table 4, Page 22).
- The **Characteristic Situation 2** conditions for this type of building require a minimum of 2.5 points for adequate gas protection for the building (Table 4, Page 22). This can be achieved from a range of measures described in Section 7 of BS8485:2015 to generate a point score.
- The protection measures and calculated score in accordance with BS8485:2015 are presented in Table 1 below:

TABLE 1: PROPOSED GAS PROTECTION MEASURES

Protection Measures	Details	Score (BS8485:2015)
Structural Barrier: Ground Floor	**Floor & Sub Structure Design:** Precast Suspended segmental subfloor	**0** from Table 5, Page 23.

Ventilation Protection Measures: Passive Subfloor Dispersal Layer	**Design** Good Performance Ventilation-Clear Void Subfloor void.	**1.5** from Table 6, Page 25
Gas Resistant Membrane	Membrane must conform to the following criteria: a) Methane and Carbon Dioxide resistant. b) Average gas transmission rate <40.0ml/day/m^2/atm for sheets and joints. c) Sufficiently strong to withstand installation/in-service stresses. d) Must remain serviceable for the design life of building. e) Provide a complete barrier to entry of relevant gases and vapour. f) Verified in accordance with CIRIA C735	**2** from Table 7, Page 27.
Total Score		**3.5**

- The proposed subfloor design and gas protection measures to be implemented will generate a total score of 3.5. This is at the minimum protection measures of **CS2**.
- A datasheet for a typical membrane that should be used is presented in Appendix D. BS8485:2015 recommends that the installation of the membrane is undertaken and verified in accordance with any guidance by the manufacturer (Appendix D) and also CIRIA C735.
- In particular, it is recommended attention is paid to the "*Jointing and Sealing*" section of Appendix C, which details the extent of the overlap and the method of sealing.
- The requirement of gas verification is a function of the nature of the development and is assessed on a risk-based system as shown in Table 2 below.

TABLE 2: RISK-BASED GAS ASSESSMENT

Considerations	Risk
Gas Regime: CS2	**Moderate**
Complexity of Design: Simple incorporating limited service entries, a gas membrane and a clear/polystyrene sub-floor void.	**Low**
Installation Workforce: Building contractor. The contractor is required to install the gas protection measures in line with the YALPAG Verification Proforma, adopted from CIRIA C735.	**Low**

- The installer would carry out in house inspection of the installation and verification as required to provide a 'Certificate of Conformity'.
- The inspection should comprise the proforma "Visual Inspection of Gas Protection Measures" set out in CIRIA C735 and referenced by YALPAG (Appendix C).
- Any non-conformances should be remedied via repair in the first instance, or if this is not deemed sufficient, the impacted section should be replaced and re-inspected.
- Any repairs that are required should be instructed and observed on the same day as the site visit or

re-inspected at a later date.

- Information on the manufacturer guidance for repairing punctures or perforations is provided in Appendix D in the section "*Punctures*"
- It is recommended that a protective layer is applied to the gas membrane as soon as possible after installation.
- Following the installation of the gas membrane, it is recommended that all contractors continuing to work at the site are informed of the following, either via an induction or a toolbox talk:
    - The location of the gas membrane/protective layer and how to recognise it
    - Advice on safe working in the area of the gas membrane in order to reduce the risk of damage i.e. use of protective mats, care used to avoid dropping tools/materials etc.
    - The procedure for advising if any accidental damage of the membrane/protective layer has occurred
- Following the installation of membrane, the verifier should either report directly to the Council, or instead provide the above information to Solmek, which will then be included within the Phase 4 Validation report to be issued for planning purposes. Any subsequent repairs undertaken to the membrane should also be noted with details of the repairs being provided to Solmek.

4 GENERAL REMEDIAL WORKS

4.1 Soil Import Methodology

The importation of soils will be undertaken as part of the contract for the preparatory and remedial works, in which case imported soils will be stockpiled in a location agreed with Solmek and the Client. This location should be quarantined, with the imported material sited upon visqueen and covered if necessary, away from potential sources of on-site contamination. Alternatively, the developer may choose to import soil at a later stage in the development. Sources, types of suitable material and the moisture content at which they may be placed and compacted shall be approved by Solmek.

Consideration should be given to the YALPAG Guidance *"Verification Requirements for Cover Systems",* and in particular to the Overview Flowchart provided within (Appendix C of this report). Any prospective suppliers of soil should first be questioned, in line with Appendix 1B of the YALPAG document, "Questions to Ask Your Soil Supplier Relating to Soil Quality". Confirming that the soil supplier is aware of the expected soil quality is mandatory in order to ensure the imported soil is of sufficient quality.

In addition, upon delivery a visual inspection should be undertaken of the soil, with photographs taken for records.

The visual inspection should ensure that the material is free from deleterious materials. Any imported material shall NOT contain the following:

- Colliery shales.
- Ironstone shales.
- Materials containing sulphates.
- Any Japanese Knotweed fragments (rhizomes, leaves, stems etc).
- Materials susceptible to frost damage, weathering and mechanical damage.
- Deleterious made ground materials such as bricks, ash, tarmac, concrete and glass.

Fill areas shall be built up evenly over the full area of each phase, unless the Contract requires otherwise, and sufficient camber shall be maintained at all times to enable surface water to drain from them. The containment or disposal of surface water during the construction period shall be the Contractor's responsibility. The Contractor shall ensure that excavations and areas to be filled are free from organic material, loose soil, rubbish and standing water.

Material in fill areas which has deteriorated due to the ingress of surface water or the trafficking of the Contractor's plant shall be removed and replaced.

Following placement, the clean cover layer needs to be verified by a Solmek Engineer to ensure that the cover layer is formed from appropriate materials and is of sufficient thickness.

4.2 Excavation of Potentially Contaminated Material

Soils that are to be excavated in order to achieve finished levels and/or are suspected of being contaminated shall be excavated and placed in contained and covered stockpiles prior to being removed from site.

Material taken off site must be subject to WAC testing either by Solmek or by the appropriate waste disposal company. The disposal contractor can advise if any further tests are required depending on the volume of material to be exported to landfill. Solmek advise that TPH levels encountered locally (BH3) are likely to be classified as Hazardous Waste, but Waste Classification would be needed to confirm this.

The Contractor shall provide appropriate measures to prevent collapse of excavations and de-watering apparatus to prevent water accumulation within excavations. All excavations left open shall be securely fenced. Any potentially contaminated water encountered during the works shall be stored appropriately to prevent it being discharged from the site, and chemical analysis undertaken. The contractor should make proper arrangements to treat or dispose of the water once the chemical analysis results are available.

4.3 Backfilling of Excavations

Once the above works are complete, the contractor shall backfill all excavations. Backfilling shall be undertaken in a controlled manner in accordance with an engineering specification appropriate to the type of material to be used.

4.4 Short-Term Health and Safety Implications

There will be a short period whereby contaminated soils may be exposed or moved on site. There is a risk at this time of dust exposure to workers and the public, and secondly, of dermal contact to workers. To mitigate any risks of dust exposure, consideration should be given to BRE: *The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance.* With respect to minimising risks to construction staff, all works should adhere to HSE guidance: *Protection of Workers and the General Public During the Development of Contaminated Land*. In addition, adequate site safety measures should be taken within the Construction (Design & Management) Regulations 2015 safety regime on site, as applicable, whilst detailed method statements should be prepared and adhered to for all works.

5 VALIDATION TESTING AND REPORTING

On satisfactory completion of the works Solmek will provide a Validation Report to the Client. The Validation Report will provide certification that the remediation works have been carried out in accordance with this Remediation Statement. The Validation Report will include a summary of the remediation works undertaken, laboratory test results, drawings supplied by the Contractor's surveyor, and details of any other relevant matters.

Depending on the progression of construction on-site, it may be necessary to produce Interim Validation Reports on a plot-by-plot basis, however, a Final Validation Report will be prepared which will summarise the whole site.

The Validation Report(s) issued on completion of works will cover the following elements:

- Validation testing of imported soils (if any) in accordance with the Local Authority Guidelines '*Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants'* (Yorkshire and Lincolnshire Pollution Advisory Council Version 4.1 – June 2021).
- Validation of clean cover system thickness with photographic evidence
- Evidence of waste disposal records.
- Confirmation of haulier and disposal facilities.
- Records of environmental issues.
- Diary/log sheets of Part time supervision/visits by suitably qualified Engineer.
- References to the implementation and verification of the ground gas protection measures, which will incorporate photographs, diagrams, datasheets of the products used and completed verification proforma.

5.1 Soils Analysis

Based on the findings presented within the Site Investigation Report, as part of the validation works the clean cover system materials will undergo the following suite of testing:

- Inorganic determinants (metals, semi-metals and non-metals)
- TPHCWG
- Speciated PAH
- Phenol
- pH
- Organic Matter Content
- Asbestos and Asbestos Quantification

Soil test results will then be compared against a series of LQM/CIEH Suitable 4 Use Levels (S4UL). Results will be compared to thresholds based on a residential land use without home grown produce. The latest LQM/CIEH S4UL were published in December 2014. In the absence of LQM/CIEH S4UL, Category 4 Screening Levels (March 2014), EA CLEA Thresholds (from Version 1.06, May 2011) and EA Lower Tier Threshold values shall be adopted.

The S4UL threshold value tables are shown in Appendix B.

SOLMEK

APPENDIX A

Contains Bing® Imagery ©Microsoft 2016

Title
Site Location Plan

Project
Proposed Mosque, Spaines Road

Client
Ahmadiyya Association UK

Date
April 2021

Fig No.
Figure 1

Scale
On map

Key

Approx. Site Boundary

N

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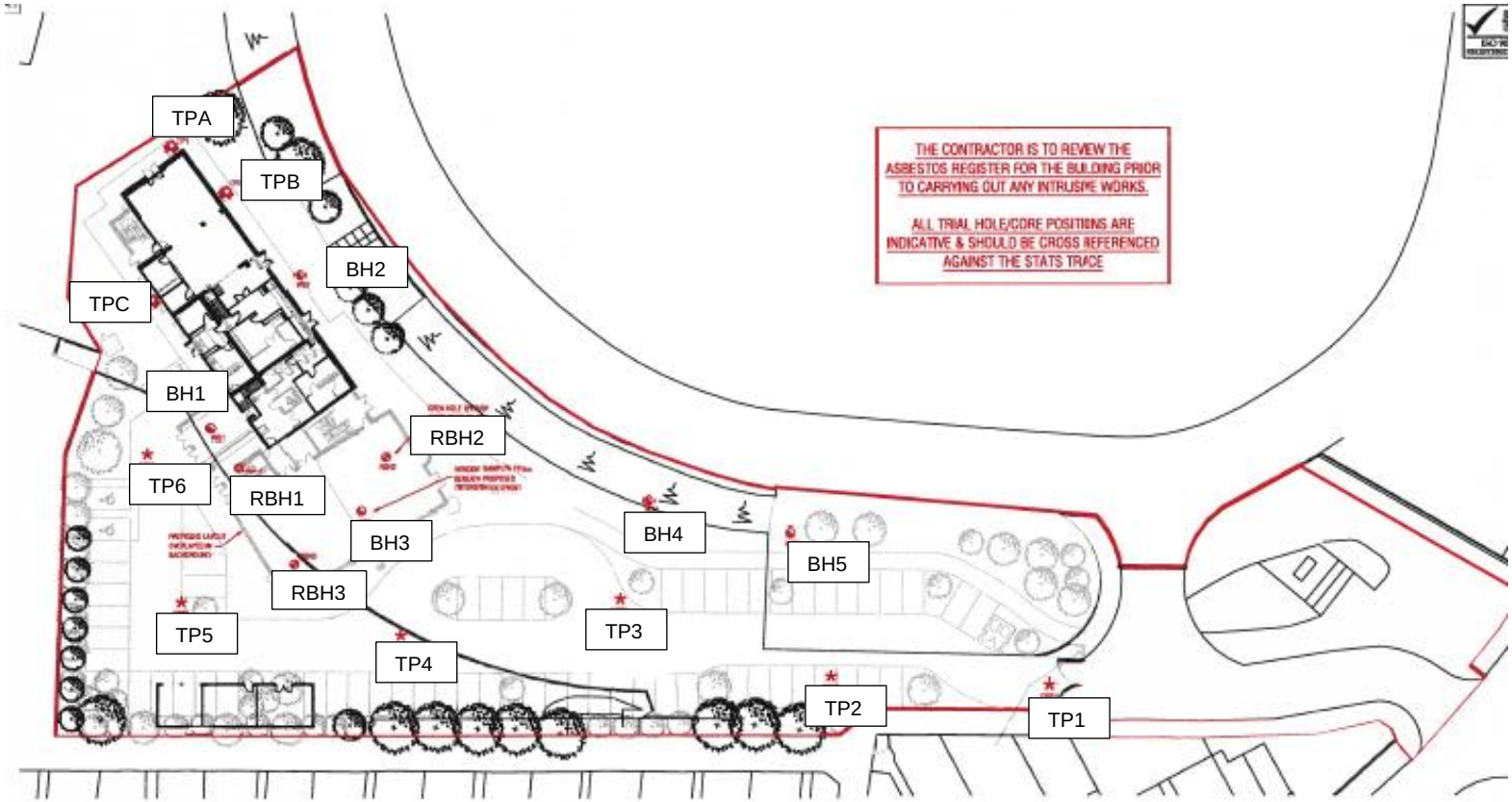

Title

Borehole and Trial Pit Location Plan

Project

Proposed Mosque, Spaines Road

Client

Ahmadiyya Association UK

Date

April 2021

Fig No.

Figure 2

Scale

On map

Key

N

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SOLMEK

APPENDIX B

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Residential Without HGP Value	Number of Results Exceeding Threshold Value
Metals						
Beryllium	mg/kg				1.7	
Cadmium	mg/kg				85	
Chromium III	mg/kg				910	
Copper	mg/kg				7100	
Lead	mg/kg				310*	
Inorganic Mercury	mg/kg				56	
Nickel	mg/kg				180	
Zinc	mg/kg				40000	
Semi metals and non metals						
Arsenic	mg/kg				40	
Boron	mg/kg				11000	
Selenium	mg/kg				430	
Vanadium	mg/kg				1200	
Inorganic chemicals						
Cyanide (total)	mg/kg				73.8**	
W.S. Sulphate	mg/l				2000^	
Other						
pH	pH				<5.5^	

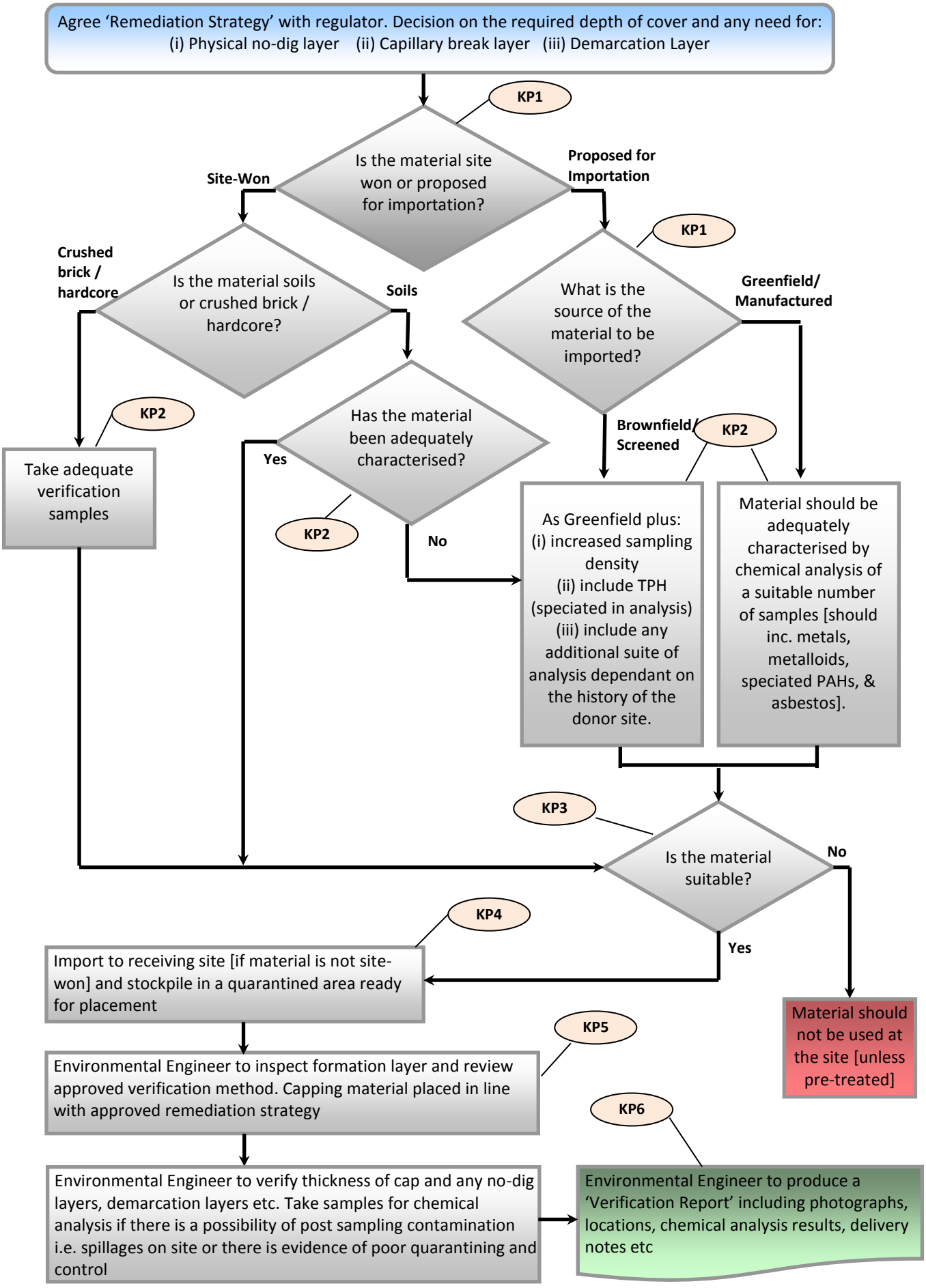
* *Category 4 Screening Levels, March 2014*
** *CLEA Software Version 1.06 (pH7 and 1%SOM)*
^ *EA Threshold Values*
HGP Home Grown Produce

TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS (RES WO HGP)

Determinand	Units	Number of Samples above LOD	Minimum Level	Maximum Level	S4UL 1% SOM	S4UL 2.5% SOM	S4UL 6% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions								
C5-6	mg/kg				42	78	160	
C6-8	mg/kg				100	230	530	
C8-10	mg/kg				27	65	150	
C10-12	mg/kg				130	330	770	
C12-16	mg/kg				1100	2400	4400	
C16-35	mg/kg				65000	92000	110000	
TPH Aromatic Fractions								
C5-7 (Benzene)	mg/kg				370	690	1400	
C7-8 (Toluene)	mg/kg				860	1800	3900	
C8-10	mg/kg				47	110	270	
C10-12	mg/kg				250	590	1200	
C12-16	mg/kg				1800	2300	2500	
C16-21	mg/kg				1900	1900	1900	
C21-35	mg/kg				1900	1900	1900	
Speciated PAH								
Naphthalene	mg/kg				2.3	5.6	13	
Acenaphthylene	mg/kg				2900	4600	6000	
Acenaphthene	mg/kg				3000	4700	6000	
Fluorene	mg/kg				2800	3800	4500	
Phenanthrene	mg/kg				1300	1500	1500	
Anthracene	mg/kg				31000	35000	37000	
Fluoranthene	mg/kg				1500	1600	1600	
Pyrene	mg/kg				3700	3800	3800	
Benz' (a)anth' ene	mg/kg				11	14	15	
Chrysene	mg/kg				30	31	32	
Benz' (b)fluor' ene	mg/kg				3.9	4.0	4.0	
Benz' (k)fluor' ene	mg/kg				110	110	110	
Benz' (a)pyrene	mg/kg				3.2	3.2	3.2	
Benz (ghi)per' ene	mg/kg				360	360	360	
Diben(ah)anth'ene	mg/kg				0.31	0.32	0.32	
Id' (123cd)pyrene	mg/kg				45	46	46	
Total PAH	mg/kg				50*	50*	50*	
Phenol	mg/kg				750	1300	2300	
* *EA Threshold Values*								

APPENDIX C

Overview Flowchart



APPENDIX D

Gas Barrier
CE Mark to EN 13967

- **BBA approved, fully complies with BS8485:2015**
- **Low permeability to methane, radon and carbon dioxide**
- **Approved for use in NHBC Amber 2 applications**
- **Multi-layer reinforced LDPE membrane with aluminium core**
- **High puncture and tear resistance**

Description

Visqueen Gas Barrier is a 400 gsm multi-layer reinforced polyethylene membrane with an integral 20 micron aluminium foil that is approved for use in BS8485:2015 and NHBC Amber 2 applications. For ease of identification on site Visqueen Gas Barrier is coloured blue on one side and silver on the reverse. The barrier combines strength and performance with flexibility and easy installation. Visqueen Gas Barrier also acts as a damp proof membrane.

BS8485:2015

When risk assessing under BS8485:2015 for sites which are effected by methane and carbon dioxide then the Visqueen Gas Barrier is an ideal solution.

The membrane has been modified to be 400 gsm with the multi layer structure greatly enhanced to improve its puncture and impact performance.

Visqueen utilise a 20 microns foil to avoid issues associated with thinner (12microns) foils.

Application

The Building Regulations require that proper precautions be taken to prevent danger to health and safety when building on contaminated land. Visqueen Gas Barrier offers a safe solution for the protection of buildings against methane, radon, stythe (a gas commonly found from disused mines, also known as blackdamp), and carbon dioxide, when installed in accordance with the relevant codes of practice such as BRE, CIRIA and the Chartered Institute of Environmental Health Ground Gas Handbook

Typically these are sites previously used as coalfields, landfill or are contaminated industrial sites.

The membrane should be installed blue side up

System components

- Visqueen Double Sided Jointing Tape
- Visqueen Gas Resistant (GR) Foil Tape
- Visqueen Top Hat Units
- Visqueen TreadGUARD1500
- Visqueen Detailing Strip

Installation Guidelines

Visqueen Gas Barrier and ancillary components must be installed in accordance with the recommendations of Building Research Establishment BRE 414 “Protective measures for housing on gas contaminated land” and CIRIA C665 “Assessing risks posed by hazardous ground gases to buildings”, NHB C guidelines, and the Chartered Institute of Environmental Health Ground Gas Handbook. The product is not intended for use where there is a risk of hydrostatic pressure. **The membrane should be installed blue side up**.

The membrane should be installed on a compacted sand blinding layer or smooth concrete float finish. In areas where high levels of unsupported membrane occur it is recommended that Visqueen Pre Applied Membrane is used. To avoid slip or shear planes and high compressive loadings it is not recommended

to take the membrane through the wall. In order to provide a continuous barrier across the cavity Visqueen Gas Resistant DPC should be taken through the blockwork and incorporated below the damp proof course cavity tray in the outer leaf.

Laps can be joined together by either using the Visqueen Gas Barrier jointing system or welded by our specialist on-site contractors.

Jointing and Sealing
Visqueen Gas Barrier should be overlapped by at least 150mm (Welded membranes can be by less than 150mm as long as the joint integrity is not compromised) and bonded with Visqueen Double Sided Tape. The joint should be secured with Visqueen Foil Backed Girth Jointing Tape. Ensure that the membrane is clean and dry at the time of jointing

Airtight seals should be formed around all service entry points. Visqueen Pre-formed Top Hat Units must be used for sealing service entry pipes. The base of the top hat should be sealed using Visqueen Double Sided Tape and Visqueen Foil Backed Girth Jointing Tape is used to secured the joint

Punctures
If the membrane is punctured or perforated, then a patch of material with identical thickness should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen Double Sided Jointing Tape and seal with Visqueen Foil Backed Jointing Tape. Alternatively a patch can be formed using Visqueen Detailing Strip and lapped at least 150mm beyond the limits of the puncture. External and Internal corners should be round and reinforced with Visqueen Detailing Strip. Where this is not possible and the 3 dimensional shapes are complex it is recommended a pre-formed unit is used.

NB. In demanding site conditions use Visqueen GR Lap Tape as a high performance alternative to Visqueen Foil Jointing Tape.

Ventilation
When medium to high levels of ground gases are present or when the generation of gases still occurs, then an open void beneath the ground floor should be constructed, as ventilation beneath the ground floor will dilute and disperse the gases to atmosphere. Open voids are normally restricted to beam and block floors or other precast concrete floor systems, an alternative for providing ventilation to in situ concrete floor slabs is to install a Visqueen Ventilation System.

Covering
Visqueen Gas Barrier should be covered by a protective layer as soon as possible after installation. Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying a screed or final floor covering. A minimum thickness of 50mm screed is recommended. When reinforced concrete is to be laid over the barrier the wire reinforcements and spacers must be prevented from contacting the barrier.

It is recommended that the barrier is covered with Visqueen Protection Boards or screed before positioning the reinforcement. When underfloor heating is being installed, it is recommended that the barrier is positioned between the blinded hardcore and insulation. This will protect the insulation from moisture and avoid any risk of overheating the membrane.

Storage and Handling
Visqueen Gas Barrier is classified as non-hazardous when used in accordance with the relevant Code of Practice (CP 1021973). The product is chemically inert and is not affected by acids and alkalis that may be present in the sub-soils. The material is not recommended for uses where it will be exposed to long periods of outdoor weathering as exposure to ultraviolet light will embrittle the product. Weathering will not occur when the membrane is installed in accordance with CP102 1973. Care should be taken to avoid accidental damage when handling the membrane on site. When the weather is cold, Visqueen Double Sided Jointing Tape and Visqueen Foil Backed Girth Jointing Tape should be kept in a warm, dry place until needed. Installation is not recommended below 5°C.

Technical Data and CE Mark

Gas Barrier
CE Mark to EN 13967

Visqueen Gas Barrier complies with the requirements and clauses of EN 13967 - Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic rubber basement tanking sheet - Definitions and characteristics.

British Board of Agrement performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control, and issued the certificate of constancy of conformity of the factory production control 0836–CPR–13/F060 applies.

DATASHEET

Technical Support: 0333 202 6800
LAST UPDATED: 09.05.2018

VISQUEEN GAS BARRIER

Gas Barrier
CE Mark to EN 13967

Product Data

Product Data

heading	Characteristic	Test method	Units	Compliance criteria	Value or Statement
	Visible defects	EN 1850 -2	-	Pass/Fail	Pass
	Length	EN 1848-2	m	-0%/+10%	25 or 50
	Width	EN 1848-2	m	-0%/+10%	2
	Thickness	EN 1849-2	mm	-10%/+10%	0.52
	Mass	EN 1849-2	g/m2	-7%/+7%	400
	Tensile Strength - MD	EN EN12311	N	>MLV	350
	Tensile Strength - CD	EN EN12311	N/mm2	>MLV	350
	Tensile Elongation - MD	EN EN12311	%	>MLV	17
	Tensile Elongation - CD	EN EN12311	%	>MLV	15
	Joint Strength	EN12317-2	N	>MLV	332
	Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass
	Resistance to impact	EN 12691	mm	>MLV	200
	Dart Impact	BS 2782	g	MDV	731
	Low temperature flexibility	EN 495-5	oC	-40	Pass
	Durability against ageing	EN 1296 and EN 1928	-	Pass/Fail	Pass
	Durability Chemical Resistance	EN 1847	-	Pass/Fail	Pass
	Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	358
	Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	368
	Resistance to static loading	EN 12730	Kg	>MLV	Pass 20
	Water vapour transmission - resistance	EN 1931	MNs/g	MDV	7000
	Water vapour transmission - permeability	EN 1931	g/m2/d	MDV	0.03
	Reaction to Fire	EN 13501-1	Class	MDV	F
	BS8485:2015 testing requirements				
	Mass	EN 1849-2	g/m2	Average >370	400
	Methane Permeability	ISO15105-1	mls/m2/d/atm	Pass/Fail	<40 Pass
	Puncture CBR	BS EN ISO 12236	N	MDV	1114
	Impact resistance	EN12691	mm	MDV	1000
	Tensiles Yield strength MD	ASTM D4885-01	kN/m	MDV	12.5
	Tensiles Yield strength CD	ASTM D4885-02	kN/m	MDV	7.3
	Yield elongation MD	ASTM D4885-03	%	MDV	18
	Yield elongation CD	ASTM D4885-04	%	MDV	19
	Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	48.2
	Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	44.8
	Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	53.5
	Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	60.6

DATASHEET

Technical Support: 0333 202 6800
LAST UPDATED: 09.05.2018

Appendix A

Gas Barrier
CE Mark to EN 13967

About Visqueen

Visqueen is the market leader in the manufacture and supply of structural waterproofing and gas protection systems. Visqueen offers the complete package – a proven, reliable range backed by a technical support service that goes unmatched in the market - everything you would expect from a reputable and ethical company.

Complete Range, Complete Solution

- Structural Waterproofing
- Damp Proof Course
- Damp Proof Membranes
- Gas Protection and Gas Venting
- Vapour Control Layers
- Stormwater Protection

Download Library

- Technical Datasheet
- Standard Details
- Technical Service
- Visqueen Gas Protection Brochure
- NBS Clauses
- BBA Certificates
- Material Safety Datasheets
- Specification Guide

Find your local stockist

Search our directory of Visqueen specification Specialist Centres to locate your nearest Visqueen Partner.

Technical support throughout your project

We are specialists in our field and can help you specify the correct solutions with the necessary performance levels, in accordance with building regulations.

- Nationwide site support team
- Specification advice
- Installation guidance & project sign off
- System design including CAD details

CPD Seminars and Training Academy

Gas Protection CPD
The specification, technical design, and installation of gas protection systems, enabling the sustainable regeneration of brownfield sites.

Structural Waterproofing CPD
The specification, technical design, and installation of structural waterproofing systems for protection against water and damp ingress in both above and below ground projects.

Visqueen Training Academy
We are now able to offer exclusive in depth training opportunities on a wide variety of Visqueen products at our Training Academy.

Visqueen Special Projects
We provide high-level expertise, comprehensive support and experience in all types of waterproofing and gas protection.

VISQUEEN
Part of RPC bpi group
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0333 202 6800 enquiries@visqueen.com www.visqueen.com

APPENDIX E

Appendix 5 –Verification Proforma

Copied Directly From Appendix A5 CIRIA C735

Mallett, H, Cox (nee Taffel-Andureau), L, Wilson, S, Corban, M (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, CIRIA, C735, London (ISBN: 978-0-86017-739-5). Go to: www.ciria.org

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name:	Gas characteristic situation:
Job number:	Type of development and building/block checked: (residential/ commercial/other)
Date:	Building description:
Visit by:	Foundation type: (suspended floor/raft/other)
Weather at time of inspection:	Gas protection type: passive/active

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	
1.2	Gas membrane type	
1.3	Gas membrane condition	
1.4	Joining tape product	
1.5	Lapping design	
1.6	Laps, welds and joints seals	
1.7	Service entries seals	
2 Passive venting		
2.1	Sub-floor void	
2.2	External wall airbricks	
2.3	Internal sleeper walls	
2.4	External vent trenches/ducts	
3 Active venting		
3.1	System details	
Additional notes:		

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade 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.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	**Description**

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: **Signature:** **Date:**

APPENDIX F

UK BACKGROUND

Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".*

Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."*

Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

PRELIMINARY CONCEPTUAL MODEL

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)

Classification	Definition	Example
Severe	Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in *significant harm*, damage or both.	High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings.
Moderate	Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term.	Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years.
Mild	Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years.	The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater.
Minor	Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact.	The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics.

PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

Classification	Definition
High Likelihood	There is a viable pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence that the receptor has been harmed or polluted.
Likely	There is a viable pollutant linkage and all elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a viable pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

Risk = Probability x Consequence		Consequence			
		Severe	Moderate	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness ($CaCO_3$) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

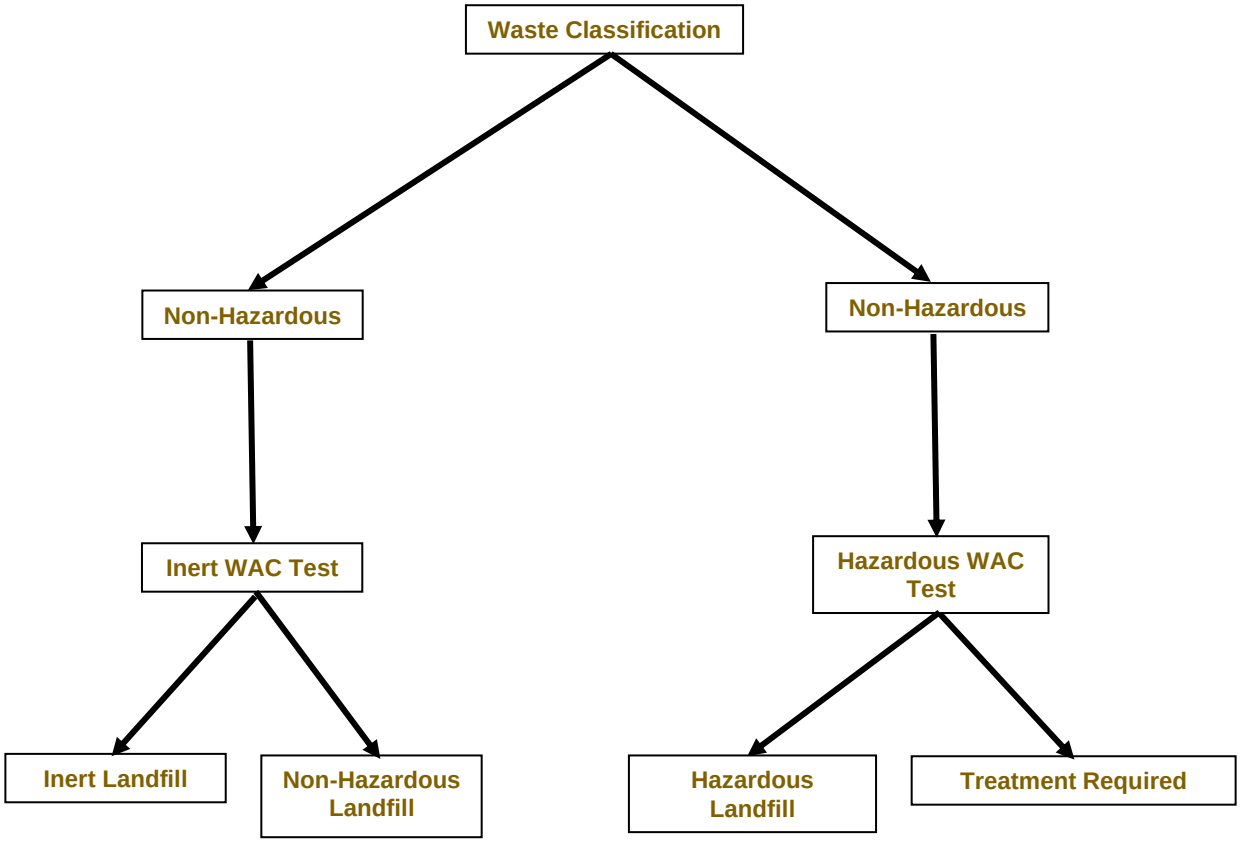
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste (2015)*. This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

The below flow chart provides further information on the waste classification process.



CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

	Pipe Material (Threshold concentrations in mg/kg)					
Parameter group	**PE**	**PVC**	**Barrier pipe (PE-AL-PE)**	**Wrapped Steel**	**Wrapped Ductile Iron**	**Copper**
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
Specific suite identified as relevant following site investigation						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2021)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.