

REMEDIAL STRATEGY REPORT
FOR LAND BOUNDED BY
CULCHETH LANE AND TANDLEWOOD MEWS, NEWTON HEATH, MANCHESTER
M40 1LU

Prepared for: -

Style Builders Limited

On behalf of: -

M. Kenny Properties Ltd

The Land Consultancy Limited
Fairweather House
4 Parker Lane
Whitestake
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Q164 SFK (TLC985) rep AOE Style 230518
May 2018

**Project Quality Assurance
Information Sheet**

***Remedial Strategy Report for Land Bounded by Culcheth Lane and Tandlewood Mews,
Newton Heath, Manchester M40 1LU.***

Job Number : TLC985

Report Status : Final

Survey Dates : N/A

Report Date : May 2018

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Report Issue Record		
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1.0 INTRODUCTION

1.1 The Commission and Brief

- 1.1.1 The Land Consultancy Limited (TLC) has been commissioned by Style Builders Ltd, on behalf of M. Kenny Properties Ltd, to prepare a remedial strategy report for a plot of land situated within the Newton Heath district of east Manchester; the plot is bounded by Culcheth Lane and Tandlewood Mews and the postcode of the property is M40 1LU.
- 1.1.2 The following Phase 1 and Phase 2 site investigation reports have already issued for the property:
- Earth Environmental & Geotechnical Phase 1 desk study report dated February 2014 and referenced A0374/G/1.
 - 'Report on Phase 2 Geo-Environmental Ground Investigation Works undertaken on Land bounded by Culcheth Lane and Tandlewood Mews, Newton Heath, Manchester M40 1LU', dated May 2018 and referenced Q136 SFK (TLC985) rep AOE Style 080518 and issued by TLC.
- 1.1.3 The above reports should be consulted for detailed background information if required.
- 1.1.4 This document presents the remediation objectives necessary to render the site suitable for the proposed development.
- 1.1.5 The geo-environmental site investigation works carried out by TLC will help discharge contaminated land planning conditions which have been imposed on the redevelopment of the site by Manchester City Council. The planning application number is 111312/FO/2016/N1.

1.2 The Proposed Development

- 1.2.1 It is understood that this former public house site, is intended to be redeveloped with 6no. three storey townhouses (Class C3), together with parking and small garden areas. A proposed development plan is presented in Drawing No. TLC985/03 in Appendix A.
- 1.2.2 The 3no. houses proposed for the rear of the site adjacent to Tandlewood Mews, are intended to be supported on spread foundations which will need extending by trench fill to depths of $\approx 2.00\text{m}$ at some locations. The 3no. houses proposed for the front of the site, adjacent to Culcheth Lane, are intended to be supported on piled foundations. It is understood that the Style Builders Ltd would like to incorporate ground bearing floorslabs into each of the proposed developments.

2.0 BACKGROUND

2.1 Site Description and Desk Study Information

- 2.1.1 The site location is displayed on Drawing Nos. TLC985/01a and 01b in Appendix A. Site details are summarised in the table below and a more detailed site plan is presented in Drawing No. TLC985/02.

Detail	Remarks
Location & Site Boundaries	Located in a residential setting in the Newton Heath district of Manchester, on land bounded by Culcheth Lane (NE) and Tandlewood Mews (SE). A path forms the NW site boundary.
NGR	388346E, 400225N
Elevation, Shape & Area	≈85m AOD; roughly triangular shaped (orientated NE-SW); ≈775m ² .
Topography	Site = approximately level. Surrounding area = slopes down very gently to S.
Condition (at time of site investigation)	Far SW = grass and weed covered. Remainder of site = part covered with dark brownish grey sandy gravelly CLAY containing abundant cobbles and boulders, and part covered with tarmac. Gravels, cobbles and boulders comprised principally of concrete, brick and sandstone. It should be noted that at the time Earth Environmental & Geotechnical completed their desk study (2014), a derelict public house was present in the N corner of the site.

- 2.1.2 A summary of the main desk study findings is presented in the table below:

Detail	Remarks
Historical	Maps for 1893 & 1908 show a building in the N corner of the site; the remainder of the site is undeveloped. Plans for 1951-1952 indicate that the building in N corner is a public house. A boundary wall is indicated in the far SW of the (the area to the SW of this wall is currently weed covered). No potentially contaminating land usage was identified adjacent to the site boundaries.
Geology & Mining	Drift – Devensian Glacial Till (diamicton); Solid – Collyhurst Sandstone. The site is not affected by known faulting (<i>TLC – from 1:50,000 2010 BGS solid plan – Sheet 85, dated 2010</i>). Coal seams are unlikely to be present beneath the site at shallow depth. The site is not located within a Coal Authority defined 'Development High Risk Area'. The CA state that no known mine entries are located within, or within 20m of, the site boundary.
Landfilling/Waste Related Industry	No landfills or waste related industry were identified within at least 250m of the site.
Nearest Surface Water Receptors	No surface waters identified within influencing distance of the site.
Hydrogeology	Collyhurst Sandstone – Principal Aquifer. Site does not lie within influencing distance of a groundwater abstraction well. The site does not lie within a groundwater source protection zone.
Radon Gas	Unlikely to be affected.

2.2 Ground Investigation

- 2.2.1 A site investigation, which comprised the formation of 5no. small diameter boreholes (WS1 to WS5), was undertaken over the site to depths of between 5.00m to 6.45m bgl; these works were undertaken on 17th April 2018. 2no. of the boreholes were installed for subsequent groundwater level monitoring and sampling purposes. Samples of the recovered soil and groundwater were obtained for laboratory testing purposes (chemical and geotechnical). Groundwater level monitoring was undertaken on 23rd April 2018.

Ground Conditions (Soil, Water, and Gas)

- 2.2.2 Borehole locations are displayed on Drawing No. TLC985/02 in Appendix A. A summary of the borehole findings is summarised in the table below:

Stratum	Depth to Base (bgl) (Thickness)	Notes/Consistency/Strength Parameters
Made Ground	1.00 to 2.40m	Made Ground deposits were recorded at all locations. Comprised of layers of both cohesive and granular soils materials. Cobbles and boulders were often encountered in to ≈1m bgl.
Devensian Glacial Till	4.80 to 5.30m (not penetrated in WS1 – proven to 5.00m only)	Comprised of extremely closely to very closely fissured dark brown mottled grey sandy gravelly CLAY. Fissuring and mottling were absent below 3.00-4.00m bgl. Thin (≤10mm) sand horizons were occasionally recorded. Clay consistency was typically firm to stiff or stiff. However, weathered soft and soft to firm clay was recorded in WS5 (1.30-1.65m); firm clays were then described to 1.95m bgl.
Sand	5.45m+ to 6.45m+ (not penetrated)	Brown fine and medium grained SAND was encountered below the Glacial Till. The provenance of the sand is uncertain (may be of Glacial origin or may represent completely weathered Collyhurst Sandstone).
Groundwater – Groundwater seepages/minor ingresses were often recorded within the Made Ground at depths of ≥0.60m. Minor groundwater ingresses were associated with the thin sand bands which were occasionally noted within the Glacial Till. Standing groundwater levels recorded across the site following completion of the site works ranged from 2.15m to 2.54m bgl.		
General – No visual or olfactory evidence for the presence of potentially mobile contamination was recorded. Contamination observations were limited to ash, cinders, brick, concrete, glass, pottery, plastic, timber, breeze block, mortar and scrap metal fragments; 'burnt' odours were associated with the Made Ground recovered from WS2 between 0.75-1.00m bgl.		

Hazardous Gas

2.2.3 A gas risk assessment was carried out in accordance with CL:AIRE RB17¹ dated 2012. No gas monitoring has been carried out on the site.

2.2.4 Based on the most likely TOC content of the none ash and cinder rich Made Ground (3.1% to 5.1% w/w), the thickness of the Made Ground (average 1.74m thick) and the likely age of the vast majority of the Made Ground (>20years old), the site falls within Characteristic Situation 3 (CS3) as presented within CIRIA report C665.

2.2.5 Using the guidance within BS 8485:2015², for CS3 and the proposed development, a gas protection score of 4.5 is given. A score of 4.5 can be achieved by incorporating the following into the floorslab design:

- A reinforced cast in-situ suspended floorslab with minimal penetrations – will give 1 points worth of protection;

or,

- a cast in-situ ground-bearing floorslab (with only nominal mesh reinforcement) – will give 0.5 points worth of protection;

incorporating both a

- subfloor gas dispersal layer – will give 1.5 to 2.5 points worth of protection;

and a

- gas resistant membrane – will give a further 2 points worth of protection.

2.2.6 Further detail is given within TLC's Phase 2 site investigation report.

¹ CL:AIRE research bulletin RB17, dated November 2012 and entitled 'A Pragmatic Approach to Ground Gas Risk Assessment'.

² BS 8485:2015 *Incorporating corrigendum No.1*. 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

Contamination

- 2.2.7 With respect to human health, the Made Ground is heavily contaminated with benzo(a)pyrene (BaP). 5no. out of 6no. samples analysed recorded BaP concentrations (5.14-25.6mg/kg) which are above the 5.0mg/kg BaP screening level for the protection of human health. Several samples also recorded slightly elevated lead concentrations (218-270mg/kg) when compared to the 200mg/kg lead screening level.
- 2.2.8 5no. samples of Made Ground were analysed for asbestos fibres. Loose chrysotile asbestos fibres were detected in one sample; subsequent quantification of the amount of asbestos within the sample recorded an asbestos concentration of 0.002% w/w. This is slightly above the 0.001% guideline concentration for asbestos in soil. Asbestos fibres within the Made Ground may therefore also pose a risk to human health.
- 2.2.9 The Made Ground was considered to be physically unsuitable for use as topsoil within the proposed garden areas.
- 2.2.10 The Principal Aquifer beneath the site was not considered to be at significant risk of being affected by site borne contamination.
- 2.2.11 To protect end users from the asbestos, lead and benzo(a)pyrene contamination, it was advised that an environmental cover system (capping layer) should be installed over the Made Ground in garden areas, with the surface layer of the cover system comprising of at least 150mm of imported clean suitable for use topsoil.
- 2.2.12 Introduction of the topsoil would provide a suitable rooting medium plants and grasses. However, where deeper rooting species are proposed (e.g. shrubs/trees), specialist advice should be sought.
- 2.2.13 Due to the presence of low level organic contamination within the Made Ground soils across the site, it was advised that a United Utilities pipeline risk assessment for potable water supply would need to be completed.

3.0 FURTHER WORK

3.1 United Utilities Risk Assessment

- 3.1.1 A risk assessment undertaken using the guidance set out within the following United Utilities document, will need to be completed at some stage to determine the type of pipe materials to be used to bring the buildings' water supply into the site from Short Avenue: 'United Utilities Water guidance for the selection of water pipes in land potentially affected by contamination', dated May 2011.

4.0 BUILD PHASE REMEDIATION WORKS AND VALIDATION

4.1 Remediation and Validation Requirements

4.1.1 A summary of the remediation and validation works required to be undertaken is presented within the table below:

Pollution Linkage being Broken	Remediation Requirements	Validation Requirements
Uptake of contaminants identified in the Made Ground by direct contact, ingestion of soil, inhalation of dust and consumption of home grown produce.	<u>Environmental Cover System</u> Considering the elevated soil concentrations encountered in the Made Ground an environmental cover system is recommended. The environmental cover system should be as follows: Gardens: 600mm thick environmental cover system comprising: Either 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 500mm comprising clean inert fill and sufficient topsoil for a growing medium. Or geotextile membrane and at least 600mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. Diagrams of typical environmental cover systems are shown in Appendix B. Exposed Made Ground soils should be kept damp in dry weather to reduce the risk of contaminated dust/asbestos fibres being released into the air.	Measuring the depth of the installed environmental cover system and providing photographic evidence. Photographic evidence of the granular break layer or geotextile layer will also be collected. Chemical validation of imported soils: see Section 4.1.2 below. The subsoil layer can be replaced by additional topsoil.
Migration of ground gas into buildings via cracks in floorslabs, floorslab service penetrations etc.	<u>Gas Protection Measures</u> In accordance with CL:AIRE RB17 dated 2012, the site falls within Characteristic Situation 3 (CS3). Using the guidance within BS 8485:2015, for CS3 and the proposed development, a gas protection score of 4.5 is given. A score of 4.5 is intended to be achieved by: - A cast in-situ ground-bearing floorslab (mesh reinforced) – will give 0.5points worth of protection. - A subfloor gas dispersal layer. To comprise of a 200mm thick layer of inert rounded gravel (no fines, size =20-30mm) containing surrounding 75mm perforated plastic drainage pipes (installed no more than 3m apart) fitted to airbricks (via telescopic vents). Sub-floor gas dispersal layers can provide between 1.5-2.5points worth of protection. It is intended that this layer will provide at least 2 points of protection. - Visqueen gas barrier to be used and joined to a Visqueen gas resistant dpc which will sit on the walls. Associated Visqueen double sided tape and Visqueen gas resistant (GR) foil tape to be used to join & seal the gas barrier sheets together as well as the gas barrier to the gas resistant dpc. Only a single service penetration of each floorslab is proposed (waste water pipe). This will be sealed to the gas membrane using the Visqueen tape. Providing that it is correctly installed, the gas barrier will provide 2points worth of protection. The Visqueen gas barrier will be installed over the floorslab and will be protected by a 50mm thick layer of screed. Specification sheets for the Visqueen gas barrier and gas resistant dpc are presented in Appendix C.	Validation of gas protection measures should be in line with CIRIA 735³ and should include photographic evidence of a suitably sealed gas membrane, and how the membrane has been sealed around service penetrations.
Potable Water Supply	<u>Potable Water Pipes</u> A United Utilities potable water supply pipe risk assessment is required to determine the type of water pipe to be used.	Delivery notes of pipe material. Photographs of the installed pipe.
Other Considerations	<u>Unexpected Contamination</u> The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination including asbestos containing material) be encountered at the site, TLC and the Local Authority should be informed and further assessment of the material may be required.	

³ CIRIA (2014). 'Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas'. CIRIA C735.

	Re-use of site won material To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following: 1,000 tonnes (c. 600m³) of non-hazardous soil 5,000 tonnes (c. 3,000m³) of natural sand and gravels. 50,000 tonnes (c. 25,000m³) of bituminous material to be used in roadways. 5,000 tonnes (c. 3,000m³) of crushed concrete / stone. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. If a MMP is required this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no sham recovery'. All of the above materials would need to be tested at the rate and analytical suites presented in Section 4.1.2 below. Health and Safety Considerations In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance⁴) should be adopted by all workers involved with site enabling and construction works.
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4.1.2 Validations of Imported / Site Won Soils

4.1.2.1 Any additional imported / site won soil used onsite in gardens and soft landscaping areas will need to be chemically validated to ensure it is "suitable for use".

4.1.2.2 A summary of the sampling requirements is presented in the table below. If material is imported, then ideally the material should be sampled at source; however, where this is not possible then material imported should be segregated onsite based on source and soil type.

Material Type	Source	Suite of Analysis	Sampling Rates*
Topsoil	Greenfield	Suite A	1 sample per 50m³
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 50m³
	Site won natural material	Suite A	
		First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.
Physical Stone Break Layer	Recycled Stone (6F2 / screened)	Suite B	1 sample per 500m³

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

*Minimum sampling rate of 3 samples per source.

4.1.2.3 If site won soil is to be used then this should be stockpiled onsite ready for testing.

4.1.2.4 Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

4.1.2.5 In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882⁵). TLC advise this information is provided by the supplier before material is imported onto site.

4.1.3 Soil Assessment Criteria

4.1.3.1 Results of imported / site won soil testing will be screened against appropriate assessment criteria for a residential end use.

⁴ HSE (1991). 'Protection of Workers and the General Public During Development of Contaminated Land'. London HMSO.

⁵ BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

4.1.3.2 With regards to the soil risk assessment TLC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).

4.1.3.3 Justification for using the above hierarchy is presented below.

4.1.3.4 New C4SLs have recently been published^{6,7}. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))⁸ used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs 'could be used under the planning regime, as well as within Part 2A'. Based on these comments TLC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

4.1.3.5 Where no C4SLs have been generated TLC will use the LQM S4ULs⁹. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions^{10,11,12,13}. TLC consider the main risk drivers for PAHs are benzo(a)pyrene (BaP) and naphthalene. This is due to BaP possibly being a carcinogen and most toxic of the PAHs^{14,15} and naphthalene the most volatile and soluble¹⁶. The new C4SLs indicate BaP as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible according to CL:AIRE (2013). For BaP to be used as a surrogate marker it should follow the profile described by the HPA (2008)¹⁷ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

4.1.3.6 Where applicable, appropriate Soil Organic Matter (SOM) will be used for any soil assessment.

4.1.3.7 A summary of the generic assessment criteria is provided in Appendix D.

4.2 Disposal

4.2.1 Any material disposed offsite should be taken to a suitably licensed recycling facility. Provision of waste tickets and details of the facility should be provided for the Completion Report.

⁶ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

⁷ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

⁸ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

⁹ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

¹⁰ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

¹¹ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

¹² EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

¹³ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

¹⁴ EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

¹⁵ USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

¹⁶ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5-079/TR1.

¹⁷ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

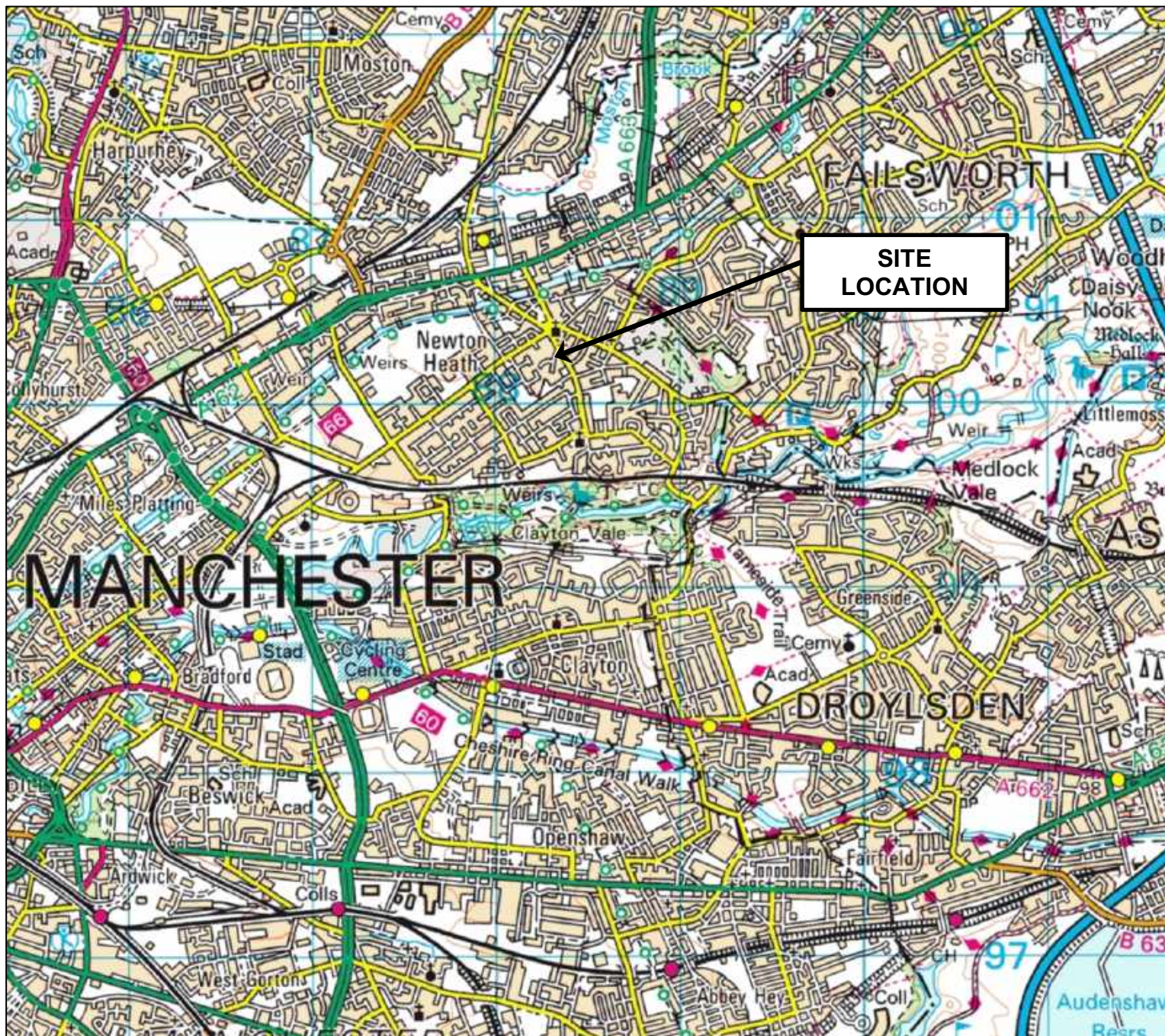
5.0 SITE COMPLETION REPORT

- 5.1 All remedial and validation works undertaken on the site shall be fully documented for inclusion within a Site Completion Report.
- 5.2 Once all the remediation and validation work has been completed and documented to the satisfaction of the Regulators the contaminated land conditions may be discharged.

APPENDICES

APPENDIX A

DRAWINGS



**SITE
LOCATION**



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Project:

Land Bounded by Culcheth Lane and Tandlewood Mews, Newton Heath, Manchester M40 1LU

Title:

Site Location Plan

Scale:

NTS

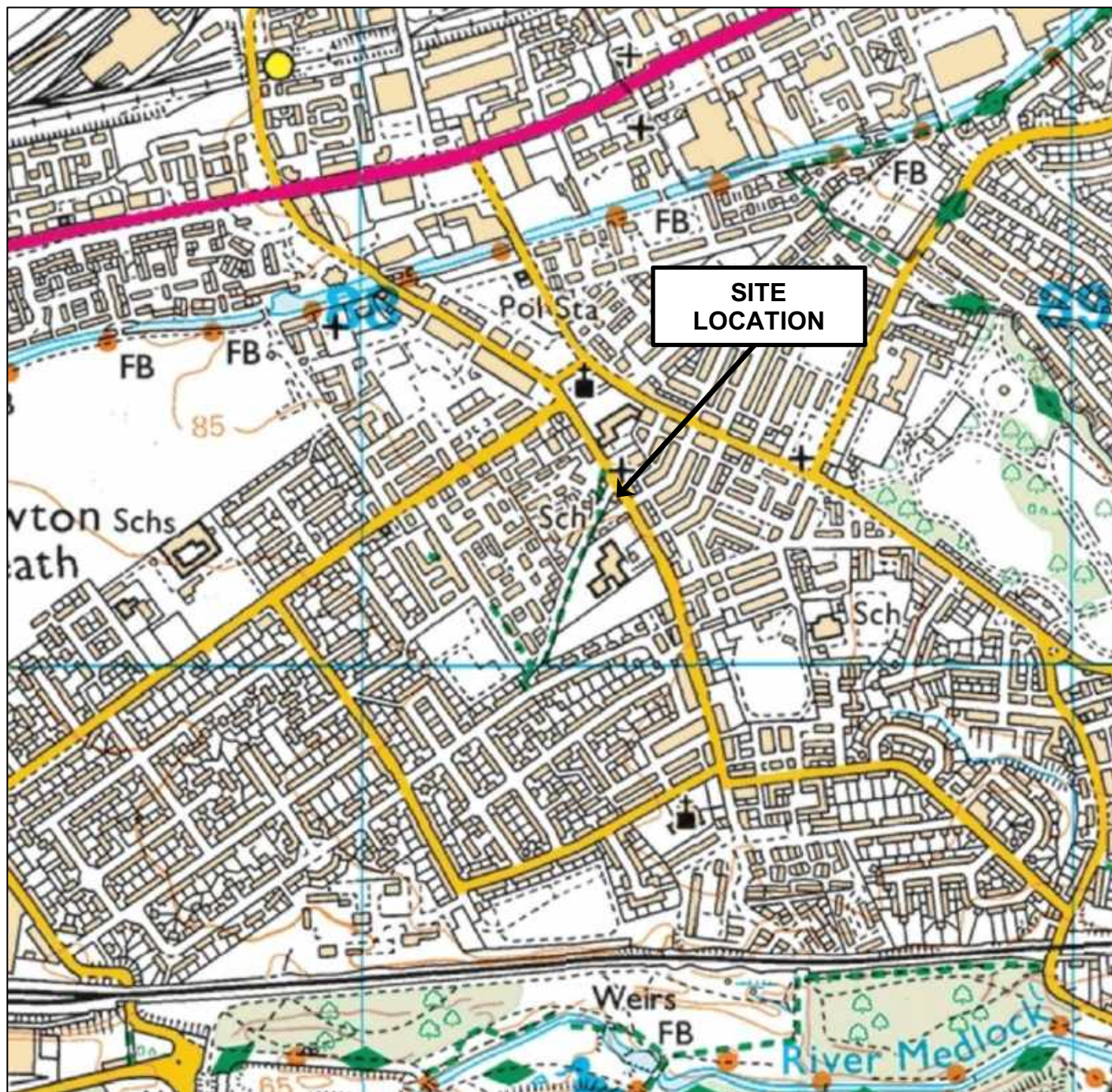
Drawn by:

SFK

Date:

10/04/2018

Drawing No.: TLC985/01a



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Project:

Land Bounded by Culcheth Lane and Tandlewood Mews, Newton Heath, Manchester M40 1LU

Title:

Site Location Plan

Scale:

NTS

Drawn by:

SFK

Date:

10/04/2018

Drawing No.: TLC985/01b



**SITE
BOUNDARY**



Borehole location. WS2 & WS4 were installed.

THE LAND CONSULTANCY LIMITED

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Project:

Land Bounded by Culcheth Lane and Tandlewood Mews, Newton Heath, Manchester M40 1LU

Title:

Site Boundary & Exploratory Hole Plan – Shows Position of former Public House.

Scale:

As Shown

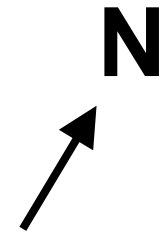
Drawn by:

SFK

Date:

15/05/2018

Drawing No.: TLC985/02



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Project:

Land Bounded by Culcheth Lane and Tandlewood Mews, Newton Heath, Manchester M40 1LU

Title:

Proposed Site Layout Plan

Scale:

NTS

Drawn by:

SFK

Date:

15/05/2018

Drawing No.: TLC985/03

APPENDIX B

ENVIRONMENTAL COVER SYSTEM DETAIL

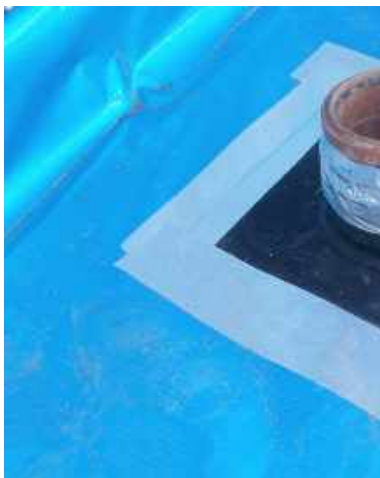
ENVIRONMENTAL COVER SYSTEM DETAIL

GARDEN AREAS					
Either Physical Break Layer			Or	Geotextile Membrane	
↑ 0.6m (min) ↓		150mm (minimum) chemically validated TOPSOIL.		↑	150mm (minimum) chemically validated TOPSOIL.
		350mm chemically validated SUBSOIL.		0.6m (min) ↓	450mm chemically validated SUBSOIL.
		100mm (minimum) PHYSICAL BREAK LAYER.			GEOTEXTILE MEMBRANE, (at base of subsoil)
		Existing MADE GROUND.			Existing MADE GROUND.

APPENDIX C
GROUND GAS PROTECTIONS

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

VISQUEEN



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.



Product Data

Gas Barrier
CE Mark to EN 13967

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



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.



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The information given in this datasheet is based on data and knowledge correct at the time of printing. Statements made are of a general nature and are not intended to apply to any use or application outside any referred to in the datasheet. As conditions of usage and installation are beyond our control we do not warrant performance obtained but strongly recommend that our installation guidelines and the relevant British Standard Codes of Practice are adhered to. Please contact us if you are in any doubt as to the suitability of application.



Gas Resistant DPC CE Mark to EN 14909

Page 1



- Complies with BS8485:2015 for gas protection
- Tested & passed to ISO 15105-1 methane permeability method
- Aluminium foil to resist methane, radon, CO2 and low levels of hydrocarbon
- Easy to apply using traditional methods
- Independently assessed

DESCRIPTION

Visqueen Gas Resistant (GR) Damp Proof Course is a flexible polyethylene DPC with an aluminium foil designed to prevent the transmission of carbon dioxide, radon, methane and low level hydrocarbon vapours. This is in addition to the product's usage as a damp proof course. Resistance to harmful gases is achieved by an integral aluminium film.

APPLICATION

Visqueen Gas Resistant (GR) DPC should be used on any site where carbon dioxide, radon, methane or low level hydrocarbon vapours are a problem. Methane can occur in any construction on any site previously used for landfill. Such conditions can exist on household, commercial and industrial sites. Visqueen Gas Resistant (GR) DPC has excellent physical characteristics and good cold flexibility performance. It is suitable for vertical, horizontal, stepped and cavity tray applications.

Good Practice Tip

To avoid slip or shear planes it is not recommended to take membranes through the wall. In order to provide a continuous barrier across the cavity Visqueen Gas Resistant DPC should be sealed to the membrane, taken through the blockwork, up the wall and incorporated below the damp proof course on the cavity tray outer leaf

IMPORTANT

Where the DPC may be in direct contact with hydrocarbon contamination the use of Visqueen GX DPC must be considered.

The DPC must be installed with the black side facing up.

System components and jointing

All DPC laps must be a minimum of 100mm and bonded together with Visqueen Zedex DPC Jointing Tape.

Installation

Visqueen Gas Resistant (GR) DPC should be installed in accordance with BS 8215:1991, BS 8000: Part 3, 2001 and BS 5628: Part 3, 2005. All horizontal DPCs must be bedded on both sides with fresh mortar. All DPCs must project through the full width of the wall, including any externally applied rendering and project 5mm beyond the finished external face. All cavities must be kept clear of mortar droppings and other debris. Any mortar droppings reaching the DPCs must be removed before they harden, avoiding the use of sharp objects for removal. Reference should also be made to NHB C guidance notes and BRE Report BR211.

The DPC must be installed with the black side facing up.

VISQUEEN



Gas Resistant DPC CE Mark to EN 14909

Page 2

All DPC laps must be a minimum of 100mm and bonded together with Visqueen Zedex DPC Jointing Tape.

STORAGE AND HANDLING

Visqueen Gas Resistant (GR) DPC is classified as non-hazardous when used in accordance with the relevant British Standards. The product is chemically inert and is not affected by acids and alkalis that may be present in the subsoils.

The DPC should be stored in a warm, dry and environment above 5oC.

Technical Data and CE Mark

Visqueen Gas Resistant Damp Proof Course complies with the requirements and clauses of EN 14909 - Flexible sheets for waterproofing - Plastic and rubber damp proof courses - Definitions and characteristics.

Visqueen Gas Resistant DPC products are manufactured under a Quality Management System (ISO 9001) - Certificate of Compliance reference no. 4560-3 by Knight International applies.



Gas Resistant DPC

CE Mark to EN 14909

Product Data

Product Data

Characteristic	Test method	Units	Compliance criteria	Value or Statement
Visible defect	EN 1850 -2	-	Pass/Fail	Pass
Length	EN 1848-2	m	-0%/+10%	30
Width	EN 1848-2	m	-0%/+10%	0.5 to 1
Straightness	EN 1848-2	-	Pass/Fail	Pass
Thickness	EN 1849-2	mm	-20%/+20%	0.5
Mass	EN 1849-2		-12%/+12%	257;379;475
Watertightness	EN 1928	-	Pass/Fail	Pass
Resistance to impact	EN 12691	mm	>MLV	40
Durability (artificial ageing)	EN 1296 and EN 1928	-	Pass/Fail	Pass
Durability (alkali)	Annex C	-	Pass/Fail	NPD
Resistance to low temperature	EN 495-5	?C	<MLV	-40
Resistance to tearing (nail shank)	EN 12310-1	N	MDV	280 310
Water vapour permeability properties	EN 1931		+20%	0.13
Resistance to static loading	EN 12730	Kg	>MLV	20
Reaction to fire	EN 13501-1		Class	F
Methane Permeability	ISO 15105-1		MDV	13
Reaction to Fire	EN 13501-1	Class	MDV	F





Visqueen Building Products

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.

System Accessories

To ensure full waterproofing protection please use the following certified system components:

- Visqueen High Performance (HP) Tanking Primer
- Visqueen TreadGUARD1500
- Visqueen Protect&Drain
- Visqueen Top Hat Unit

Downloads Library

- Technical Datasheet
- Declaration of Performance
- Visqueen's Guide to CE Marking

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Distributor Support

Our specification Stocking Centres can access a free library of sales support tools, bespoke catalogues and more, [click here](#).

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



APPENDIX D

GENERIC ASSESSMENT CRITERIA

General Assessment Criteria (GAC) Screening Values for the Protection of Human Health

Screening Values shown are for a Sandy Loam soil with a pH of 7.0

With respect to elemental mercury, hydrocarbons and other organic contamination, it is assumed that free phase contamination is not present.

		All Concentrations are in mg/kg DW																		Source	
		Residential with Plant Uptake			Residential without Plant Uptake			Allotments			Commercial			Public Open Space (in a Residential Area)			Public Open Space (Park)				
		SOM (%)			SOM (%)			SOM (%)			SOM (%)			SOM (%)			SOM (%)				
12.56			12.56			12.56			12.56			12.56			12.56			12.56			
METALS AND SEMI-METALS																					
	Antimony	ND			550			ND			7500			ND			ND			c	
	Arsenic	37			40			43			640			79			170			a (SAUL)	
	Barium	ND			1300			49			640			79			170			b (CASL)	
	Beryllium	1.7			35			1.7			22000			ND			ND			c	
	Boron	290			11000			45			240000			21000			46000			a (SAUL)	
	Cadmium	11			85			1.9			190			120			532			a (SAUL)	
	Cadmium	26			149			4.9			410			220			880			b (CASL)	
	Chromium (III)	910			18000			18000			8600			1500			33000			a (SAUL)	
	Chromium (VI)	6			33			33			33			7.7			220			b (CASL)	
	Chromium (VI)	21			170			170			49			23			250			a (SAUL)	
	Copper	2400			7100			520			68000			12000			44000			b (CASL)	
	Lead	200			310			80			2330			630			1300			b (CASL)	
	Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			a (SAUL)	
	Mercury (inorganic)	40			56			19			1100			120			240			a (SAUL)	
	Mercury (Methyl)	11			15			6			320			40			68			a (SAUL)	
	Molybdenum	ND			670			ND			17000			ND			ND			c	
	Nickel	130			180			53			980			230			800			a (SAUL)	
	Selenium	250			430			88			12000			1100			1800			a (SAUL)	
	Vanadium	410			1200			91			9000			2000			5000			a (SAUL)	
	Zinc	3700			40000			620			730000			81000			170000			a (SAUL)	
PETROLEUM HYDROCARBONS																					
	Aliphatic EC 5-8	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	a (SAUL)	
	Aliphatic EC >8-10	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	a (SAUL)	
	Aliphatic EC >10-12	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	a (SAUL)	
	Aliphatic EC >12-16	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000 (283)	a (SAUL)	
	Aliphatic EC >16-35	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4400 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	23000 (24)	25000 (59)	26000 (142)	a (SAUL)	
	Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	a (SAUL)	
	Aromatic EC 5-7 (benzene)	70	140	300	370	680	1400	13	27	57	56000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	78000 (1220)	84000 (2260)	92000 (4710)	a (SAUL)	
	Aromatic EC >7-8 (toluene)	130	220	380	180	380	380	22	51	120	56000 (89)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (89)	96000 (1920)	100000 (4360)	a (SAUL)	
	Aromatic EC >8-10	34	83	190	47	10	270	8.8	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	a (SAUL)	
	Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	a (SAUL)	
	Aromatic EC >12-16	140	330	660	180	330	2500	23	57	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	a (SAUL)	
	Aromatic EC >16-21	260	640	930	1900	1900	46	110	260	2800	28000	28000	28000	3800	3800	3800	7600	7700	7800	a (SAUL)	
	Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	a (SAUL)	
	Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	a (SAUL)	
	Aliphatic + Aromatic EC >44-70	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	a (SAUL)	
POLYNUCLEAR AROMATIC HYDROCARBONS																					
	Acenaphthene	210	510	1100	3000 (57.0)	4700 (141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	a (SAUL)	
	Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	83000 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	a (SAUL)	
	Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	a (SAUL)	
	Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	a (SAUL)	
	Benzo(b)fluoranthene	2.2	3.0	3.2	3.0	3.2	3.2	0.97	2.0	3.5	35	35	36	5.7	5.7	5.7	11	12	13	a (SAUL)	
	Benzo(k)fluoranthene	2.6	3.3	3.7	3.3	4.0	4.0	0.96	2.1	3.8	44	44	45	7.1	7.2	7.2	13	15	16	a (SAUL)	
	Benzo(g,h,i)perylene	320	340	350	360	390	400	290	470	500	3900	4000	4000	640	640	640	1400	1500	1600	a (SAUL)	
	Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	a (SAUL)	
	Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	a (SAUL)	
	Dibenz(a,h)anthracene	0.24	0.28	0.30	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	a (SAUL)	
	Fluoranthene	280	560	890	1500	1600	160	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	a (SAUL)	
	Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	68000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	a (SAUL)	
	Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	160	180	a (SAUL)	
	Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	a (SAUL)	
	Phenanthrene	95	220	440	1300 (36.0)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	a (SAUL)	
	Pyrene	620	1200	2000	3700	3800 (76.5)	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	a (SAUL)	
	Coal Tar (BaP used as a surrogate marker)	-	-	5.0	-	-	5.3	-	-	5.7	-	-	77	-	-	10	-	-	21	b (CASL)	
	Coal Tar (BaP used as a surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	a (SAUL)	
BTX COMPOUNDS																					
	Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	a (SAUL)	
	Toluene	-	-	0.87	-	-	3.3	-	-	0.18	-	-	98	-	-	140	-	-	230	b (CASL)	
	Ethylbenzene	47	110	260	880 (869)	1900	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	a (SAUL)	
	Xylene, o-	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	41000	41000	17000 (478)	24000 (1120)	33000 (2620)	a (SAUL)	
	Xylene, m-	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	42000	42000	42000	17000 (625)	24000 (1470)	32000 (3460)	a (SAUL)	
	Xylene, p-	56	140	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	43000	43000	43000	17000 (576)	23000 (1350)	31000 (3170)	a (SAUL)	
	Xylenes (mixed isomers)	56	140	310	79	180	430	28	67	160	5900 (576)	14000 (1350)	30000 (3170)	41000	41000	41000				a (SAUL)	
* Based on lowest of the 3 xylene congener results returned																					
PHENOL, CHLOROPHENOLS & OTHER PHENOL COMPOUNDS																					
	Phenol	120	200	380	440	690	1200	23	42	83	440	690	1300	440	690	1300	440	690	1300	a (SAUL)	
	Chlorophenols (except Pentachlorophenol)	0.87	210	4.5	0.13	940	0.39	4300	0.10	330	3500	4300	4300	1100	620	1100	620	1100	1100	a (SAUL)	
	Pentachlorophenol	0.22	0.52	3.1	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	a (SAUL)	
	2,4-Dimethylphenol	19	43	97	210	410	730	3.1	7.2	17	16000 (1380)	240.									

General Assessment Criteria (GAC) Screening Values for the Protection of Human Health

Screening Values shown are for a Sandy Loam soil with a pH of 7.0

With respect to elemental mercury, hydrocarbons and other organic contamination, it is assumed that free phase contamination is not present.

	All Concentrations are in mg/kg DW																		Source		
	Residential with Plant Uptake			Residential without Plant Uptake			Allotments			Commercial			Public Open Space (in a Residential Area)			Public Open Space (Park)					
	SOM (%)			SOM (%)			SOM (%)			SOM (%)			SOM (%)			SOM (%)					
	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
Tetrachloroethene (PCE)	0.18	0.39	0.90	0.18	0.40	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810 (424)	1100 (951)	1500	a (S4UL)		
Tetrachloromethane (Carbon Tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.130	0.45	1.0	2.4	2.9	6.3	14	890	920	950	190	270	400	a (S4UL)		
Trans 1,2 Dichloroethene	0.19	0.34	0.70	0.19	0.35	0.71	0.93	1.9	4.0	22.0	40	81	ND	ND	ND	ND	ND	ND	c		
Trichloroethene (TCE)	0.016	0.034	0.075	0.017	0.036	0.080	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	a (S4UL)		
Trichloromethane (Chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	a (S4UL)		
Tribromomethane (Bromoform)	2.8	5.9	13	5.2	11	23	0.95	2.1	4.6	760	1500	3100	ND	ND	ND	ND	ND	ND	c		
Vinyl Chloride (Chloroethene)	0.00064	0.00087	0.0014	0.00077	0.0010	0.0015	0.00055	0.0010	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5.0	5.4	a (S4UL)		
CHLOROBENZENES + other BENZENE RELATED COMPOUNDS																					
Bromobenzene	0.87	2.0	4.7	0.91	2.1	4.9	3.2	7.6	18	97	220	520	ND	ND	ND	ND	ND	ND	c		
Chlorobenzene	0.46	1.0	2.4	0.46	1.0	2.4	5.9	14	32	56	30	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	a (S4UL)		
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	a (S4UL)		
1,3-Dichlorobenzene	0.40	1.0	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	a (S4UL)		
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	a (S4UL)		
Hexachlorobenzene	1.8 (0.20)	3.3 (0.50)	4.9	4.1 (0.20)	5.7 (0.50)	6.7 (1.2)	0.47	1.1	2.5	110 (0.20)	120	120	16	16	16	30	30	30	a (S4UL)		
Isopropylbenzene	11	27	64	12	28	67	32	79	190	1400 (390)	3300 (950)	7700 (2250)	ND	ND	ND	ND	ND	ND	c		
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7.0	640 (43.0)	770 (107)	830	100	100	100	190	190	190	a (S4UL)		
Propylbenzene	34	82	190	40	97	230	34	83	200.0	4100 (402)	9700 (981)	21000 (2330)	ND	ND	ND	ND	ND	ND	c		
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	26	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (769)	a (S4UL)		
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	1500	530	1300	15000	17000	18000	1700 (318)	2600 (786)	4000 (1880)	a (S4UL)		
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	a (S4UL)		
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (738)	830	830	830	1500 (122)	1600	1600	a (S4UL)		
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.90	2.2	49 (39.4)	120 (38.1)	240 (235)	78	78	79	110 (39)	120	130	a (S4UL)		
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	a (S4UL)		
1,2,4-Trimethylbenzene	0.35	0.85	2.0	0.41	0.99	2.3	0.38	0.93	2.2	42	99	220	ND	ND	ND	ND	ND	ND	c		
PESTICIDES																					
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	a (S4UL)		
Dieldrin	0.97	2.0	3.5	7.0	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	31	31	a (S4UL)		
Atrazine	3.3	7.60	17.4	610	620	620	0.50	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	a (S4UL)		
Dichlorvos	0.032	0.066	0.14	6.4	6.5	6.5	0.0049	0.010	0.022	140	140	140	16	16	16	26	26	27	a (S4UL)		
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.9	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	a (S4UL)		
Beta-Endosulfan	7.0	17	39	190 (0.00007)	320 (0.0002)	440 (0.0004)	1.1	2.7	6.4	6300 (0.00007)	7800 (0.0002)	8700	1200	1200	1200	2400	2400	2500	a (S4UL)		
Alpha-Hexachlorocyclohexane (inc. Lindane)	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	a (S4UL)		
Beta-Hexachlorocyclohexane (inc. Lindane)	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	a (S4UL)		
Gamma-Hexachlorocyclohexane (inc. Lindane)	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	a (S4UL)		
PHTHALATES																					
Bis (2-Ethylhexyl) Phthalate	280 (6.68)	610 (21.6)	1100 (51.7)	2700 (6.68)	2800 (21.6)	2800 (51.7)	47 (6.68)	120 (21.6)	280 (51.7)	85000 (6.68)	86000 (21.6)	86000 (51.7)	ND	ND	ND	ND	ND	ND	c		
Butyl Benzyl Phthalate	1400 (26.3)	3300 (64.7)	7200 (154)	42000 (26.3)	44000 (64.7)	7200 (154)	220 (26.3)	550 (64.7)	1300 (154)	940000 (26.3)	940000 (64.7)	950000 (154)	ND	ND	ND	ND	ND	ND	c		
Diethyl Phthalate	120 (13.7)	260 (29.1)	570 (65)	1900 (13.7)	3500 (29.1)	6300 (65)	19 (13.7)	41 (29.1)	94 (65)	150000 (13.7)	220000 (29.1)	290000 (65)	ND	ND	ND	ND	ND	ND	c		
Di-n-Butyl Phthalate	13 (4.65)	31 (11.4)	67 (27.3)	450 (4.65)	450 (11.4)	450 (27.3)	2.0	5.0	12	15000 (4.65)	15000 (11.4)	15000 (27.3)	ND	ND	ND	ND	ND	ND	c		
Di-n-Octyl Phthalate	2300 (32.6)	2800 (81.5)	3100 (196)	3400 (32.6)	3400 (81.5)	3400 (196)	940 (32.6)	2100 (81.5)	3900 (196)	89000 (32.6)	89000 (81.5)	89000 (196)	ND	ND	ND	ND	ND	ND	c		
TOLUENE COMPOUNDS & EXPLOSIVES																					
2,4,6-Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.40	1000	1000	1000	130	130	130	260	270	270	a (S4UL)		
2,4-Dinitrotoluene	1.5	3.2	7.2	170 (141)	170	170	0.22	0.49	1.10	3700 (141)	3700 (299)	3800 (669)	ND	ND	ND	ND	ND	ND	c		
2,6-Dinitrotoluene	0.78	1.7	3.9	78	84	87	0.12	0.27	0.61	1900 (287)	1900 (622)	1900 (1400)	ND	ND	ND	ND	ND	ND	c		
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	a (S4UL)		
HMX	5.7	13	28	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	a (S4UL)		
OTHER COMPOUNDS																					
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	a (S4UL)		
2-Chloronaphthalene	3.7	9.2	22	3.80	9.3	22	40	98	230	390	960	2200 (669)	ND	ND	ND	ND	ND	ND	c		
Bisphenyl	66 (34.4)	160	360	220 (34.4)	500 (84.3)	980 (201)	14	35	83	33000 (84.3)	83	48000 (201)	ND	ND	ND	ND	ND	ND	c		
Styrene	8.1	19	43	35	78	170	1.6	3.7	8.7	3300 (626)	6500 (1440)	11000 (3350)	ND	ND	ND	ND	ND	ND	c		
Methyl Tert-Butyl Ether (MTBE)	49	84	160	73	120	220	23	44	90	7900	13000	24000	ND	ND	ND	ND	ND	ND	c		
Tributyl Tin Oxide	0.25	0.59	1.3	1.4	3.1	5.7	0.042	0.10	4.0	130 (41.3)	180 (101)	200 (241)	ND	ND	ND	ND	ND	ND	c		
Hexachloro-1,3-Butadiene	0.29	0.70	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	a (S4UL)		

■ The GAC presented exceeds the solubility saturation limit, which is presented in brackets. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL need to be considered separately.

■ The GAC presented exceeds the vapour saturation limit, which is presented in brackets.

Source References

a Nathanael, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanael, J.F., 'The LQM/CI/EH S4ULs for Human Health Risk Assessment', Dated 2015 and published by Land Quality Press, Nottingham.

b Defra, 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination (SP1010): Final Project Report', March 2014; & Defra, 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination (SP1010): Policy Companion Document', March 2014. Values are advised to be used by the NHBC - see Issue 15 of their 'Technical Extra' document dated October 2014.

c CL:AIRE / AGS / EIC (December 2009), 'The Soil Generic Assessment Criteria for Human Health Risk Assessment'.